INTRODUCTION

HOW TO USE THIS MANUAL

IN002–02

INDEX

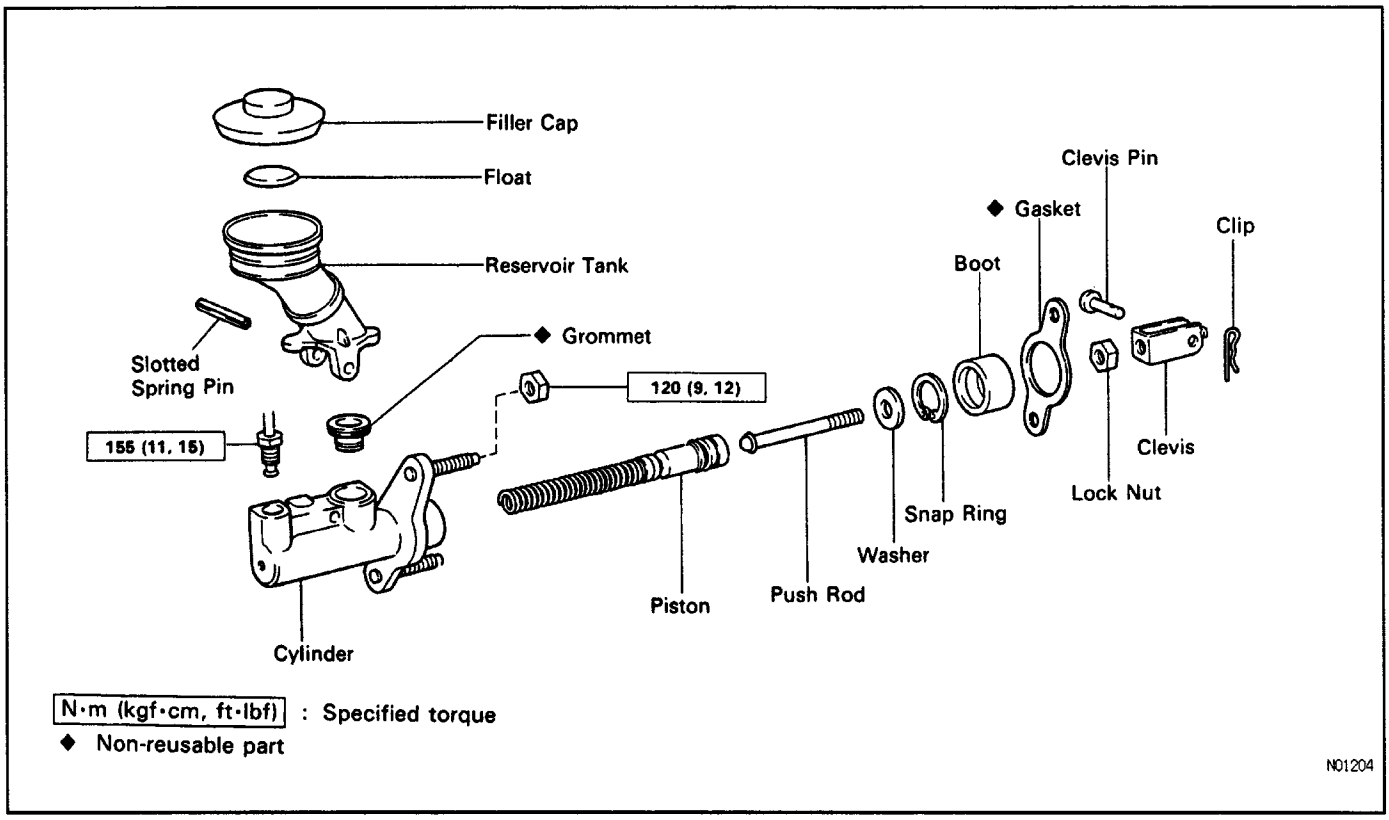
An INDEX is provided on the first page of each section to guide you to the item to be repaired. To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

GENERAL DESCRIPTION

At the beginning of each section, a General Description (Precautions) is given that pertains to all repair operations contained in that section.
Read these precautions before starting any repair task.

REPAIR PROCEDURES

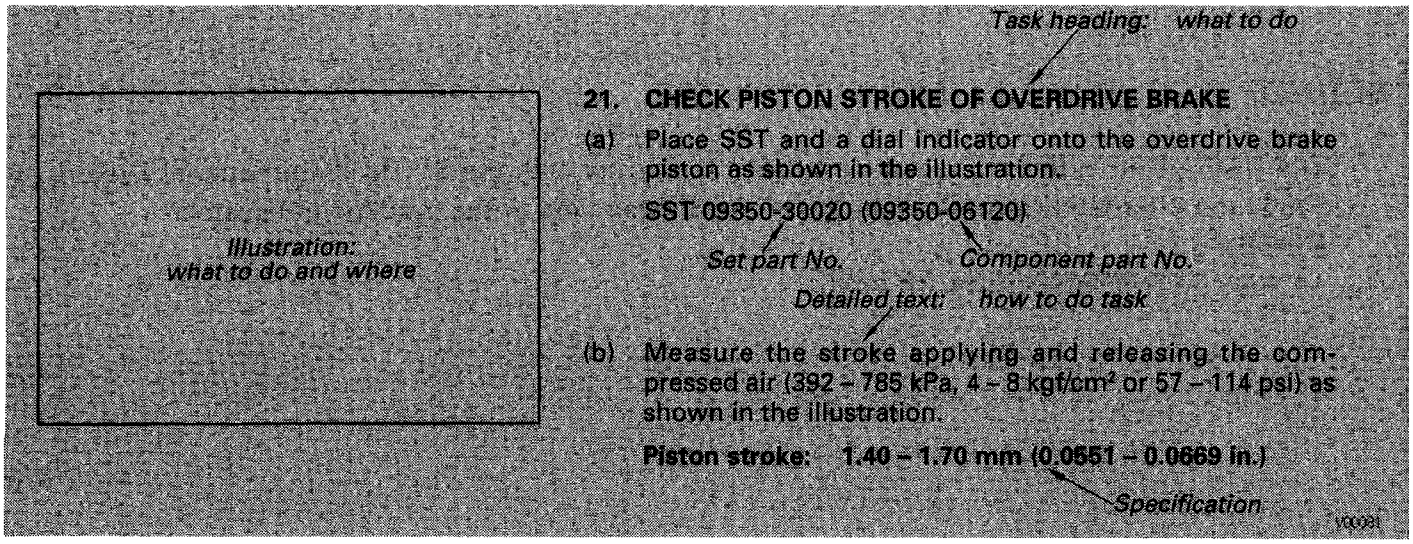
Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.
Example:



The procedures are presented in a step–by–step format:

- The illustration shows what to do and Where to do it.
- The task heading tells what to do.
- The detailed text tells how to perform the task and gives other information such as specifications and warnings.

Example:



This format provides the experienced technician with a FAST TRACK to the information needed. The upper case task heading can be read at a glance when necessary, and the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

REFERENCES

References have been kept to a minimum. However, when they are required you are given the page to refer to.

SPECIFICATIONS

Specifications are presented in bold type throughout the text where needed. You never have to leave the procedure to look up your specifications. They are also found Appendix A, for quick reference.

CAUTIONS, NOTICES, HINTS:

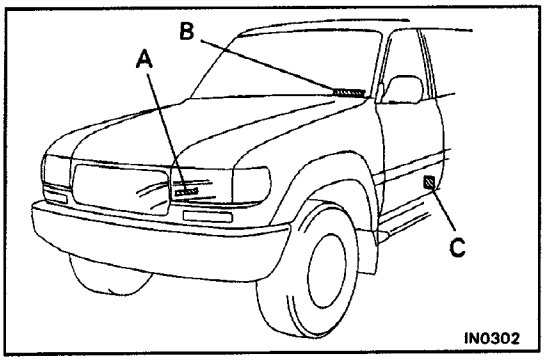
- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- HINTS are separated from the text but do not appear in bold. They provide additional information to help you efficiently perform the repair.

SI UNIT

The UNIT given in this manual are primarily expressed with the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the yard/pound system.

Example:

Torque: 30 N–m (310 kgf–cm, 22 ft–lbf)

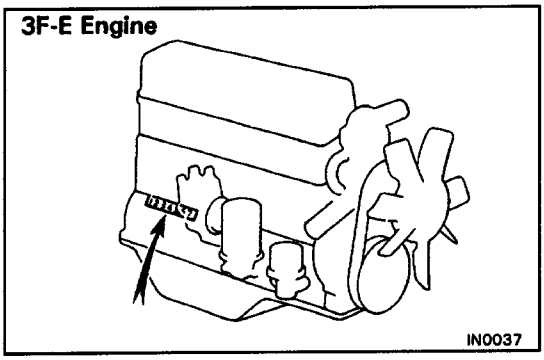


IDENTIFICATION INFORMATION IN003–04

VEHICLE IDENTIFICATION NUMBER

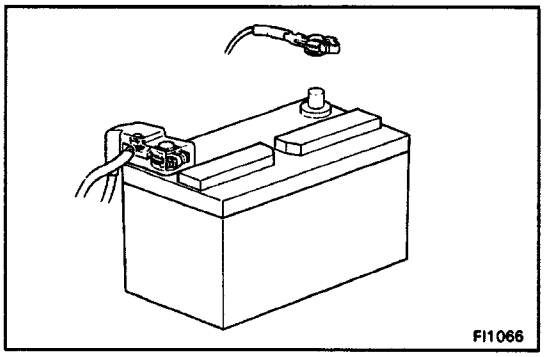
The vehicle identification number is stamped on the outer surface of the front right side frame. This number is also stamped on the vehicle identification number plate at the top of the left instrument panel. The certification regulation label is affixed on the left side lower front door.

A. Vehicle Identification Number
B. Vehicle Identification Number Plate
C. Certification Regulation Label



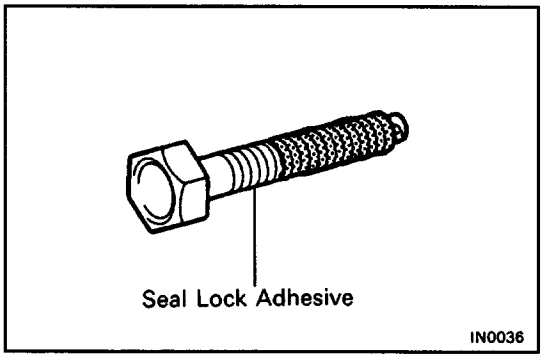
ENGINE SERIAL NUMBER IN004–01

The engine serial number is stamped on the engine block as shown.



GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in the appropriate order to facilitate reassembly.
3. Observe the following:
   (a) Before performing electrical work, disconnect the negative cable from the battery terminal.
   (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (–) terminal which is grounded to the vehicle body.
   (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable str–aight up without twisting or prying it.
   (d) Clean the battery terminal posts and cable ter–minals with a shop rag. Do not scrape them with a file or other abrasive objects.
   (e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installa–tion. Do not use a hammer to tap the terminal onto the post.
   (f) Be sure the cover for the positive (+) terminal is properly in place.
4. Check hose and wiring connectors to make sure that they are secure and correct.
5. Non–reusable parts
   (a) Always replace cotter pins, gaskets, O–rings and oil seals etc. with new ones.
   (b) Non–reusable parts are indicated in the com–ponent illustrations by the "◆" symbol.

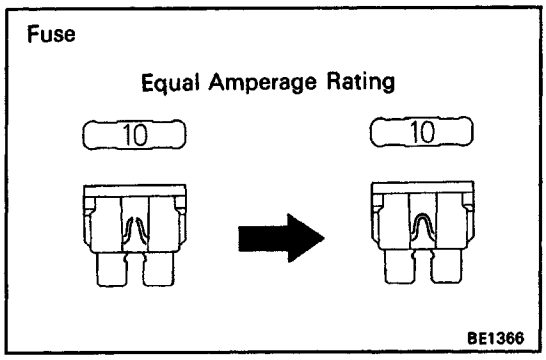


6. Precoated parts
   Precoated parts are bolts and nuts, etc. that are coated with a seal lock adhesive at the factory.
   (a) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.

(b) When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply the specified seal lock adhesive to the bolt, nut or threads.

(c) Precoated parts are indicated in the component illustrations by the "★" symbol.

7. When necessary, use a sealer on gaskets to prevent leaks.
8. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.
9. Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work proce–dure. A list of SST and SSM can be found at the back of this manual.



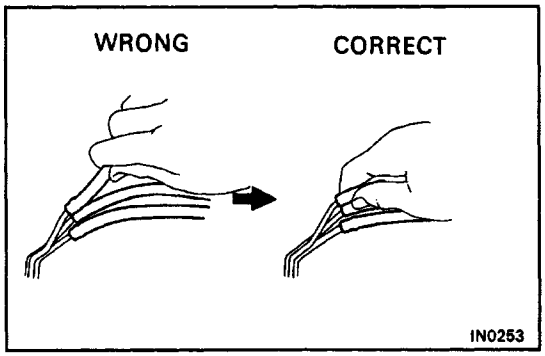
10. When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the rating or use one with a lower rating.

11. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations (See page IN–16)

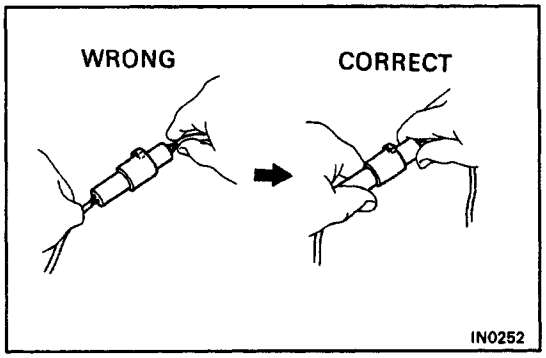
(a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels at the opposite end in order to ensure safety.

(b) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on a vehicle raised on a jack alone, even for a small job that can be finished quickly.

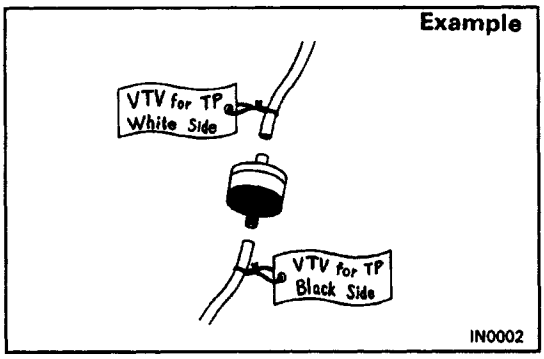
12. Observe the following precautions to avoid damage to the parts:
    (a) Do not open the cover or case of the ECU unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)



    (b) To disconnect vacuum hoses, pull on the end, not the middle of the hose.
    (c) To pull apart electrical connectors, pull on the connector itself, not the wires.
    (d) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.
    (e) When steam cleaning an engine, protect the distributor, air filter, and VCV from water.
    (f) Never use an impact wrench to remove or install temperature switches or temperature sensors.
    (g) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
    (h) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step–down adapter instead. Once the hose has been stretched, it may leak.



13. Tag hoses before disconnecting them:
    (a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
    (b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.



PRECAUTION

IN006–01

FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

CAUTION: If large amounts of unburned gasoline flow into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

1. Use only unleaded gasoline.

2. Avoid prolonged idling.

Avoid running the engine at idle speed for more than 20 minutes.

3. Avoid spark jump test.

(a) Perform spark jump test only when absolutely necessary. Perform this test as rapidly as possible.

(b) While testing, never race the engine.

4. Avoid prolonged engine compression measurement.

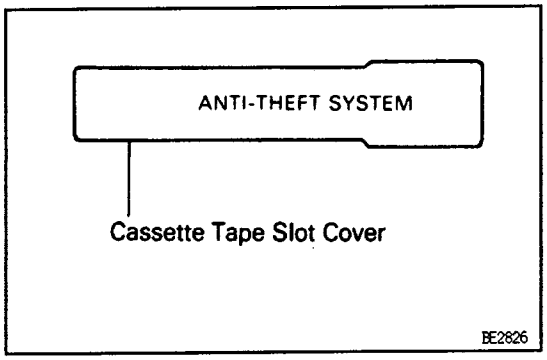
Engine compression tests must be done as rapidly as possible.

5. Do not run engine when fuel tank is nearly empty.

This may cause the engine to misfire and create an extra load on the converter.

6. Avoid coasting with ignition turned off and prolonged braking.

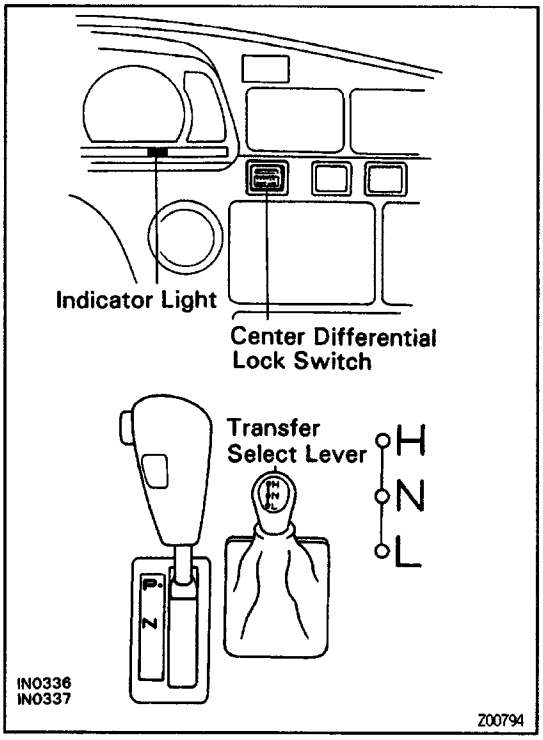
7. Do not dispose of used catalyst along with parts contaminated with gasoline or oil.



FOR VEHICLES WITH AN AUDIO SYSTEM WITH BUILT–IN ANTI–THEFT SYSTEM

Audio System displaying the sign ”ANTI–THEFT SYSTEM” shown on the left has a built–in anti–theft system which makes the audio system soundless if stolen.

If the power source for the audio system is cut even once, the anti–theft system operates so that even if the power source is reconnected, the audio system will not produce any sound unless the ID number selected by the customer is input again. Accordingly, when performing repairs on vehicles equipped with this system, before disconnecting the battery terminals or removing the audio system the customer should be asked for the ID number so that the technician can input the ID number afterwards, or else a request made to the customer to input the ID number. For the method to input the ID number or cancel the anti–theft system, refer to the Owner’s Manual.



WHEN SERVICING FULL–TIME 4WD VEHICLES

IN00X–01

The full–time 4WD Land Cruiser Station Wagon is equipped with the mechanical lock type center differential system. When carrying out any kind of servicing or testing on a full–time 4WD in which the front or rear wheels are made to rotate (braking test, speedometer test, on–vehicle wheel balancing, etc.), or when towing the vehicle, be sure to observe the precautions given below. If incorrect preparations or test procedures are used, the test cannot be successfully carried out, and may be dangerous as well. Therefore, before beginning any such servicing or test, be sure to check the following items:

(1) Center differential lock type
(2) Center differential mode position (FREE or LOCK)
(3) Whether wheels should be touching ground or jacked up
(4) Transmission gear position
(5) Transfer gear position (H or L)
(6) Maximum testing vehicle speed
(7) Maximum testing time

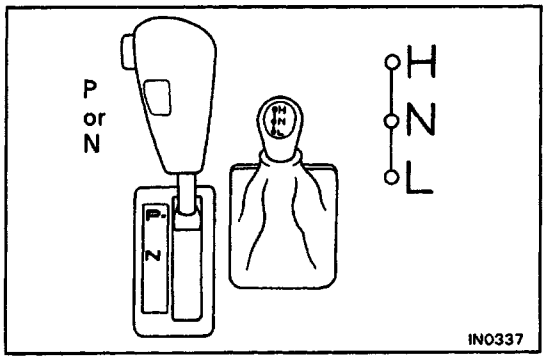
Also be sure to observe the following cautions:

(1) Never accelerate or decelerate the vehicle suddenly.
(2) Observe the other cautions given for each individual test.

Before Beginning Test

During tests with a brake tester or chassis dynamometer, such as braking force tests or speedometer tests, if only the front or rear wheels are to be rotated, it is necessary to set the position of the center differential to the FREE position or to the LOCK position depending on the type of test being performed.

(1) Select the position of the center differential by pushing the center differential lock switch with the transfer select lever to ”H” position.
(2) After selecting the position, confirm the operation of indicator light.



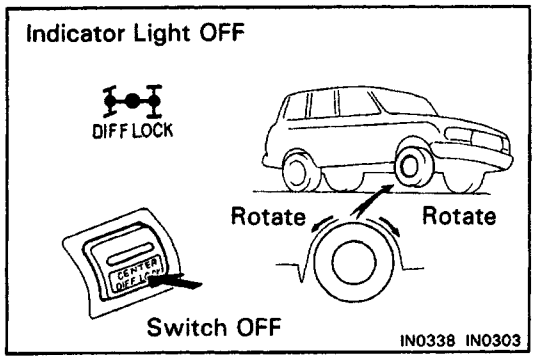
HINT:

- Move the vehicle backward or forward slightly if the indicator light does not operate correctly when the center differential lock switch is turned ON or OFF.
- When the transfer select lever is put in ”L” position, the center differential is put in LOCK condition regardless of the position of the center differential lock switch.
- Transfer H ↔ L Gear Shifting Procedure:
  When shifting, always put the shift lever of the automatic transmission in P or N range. In other ranges, the gears of the transfer clash, and switching cannot occur.

CAUTIONS WHEN CENTER DIFFERENTIAL CONTROL SWITCH IS TURNED ON

- Operate the switch only when all four wheels are stopped or when driving with the wheels in a straight line.
- Never operate the switch under the following conditions.

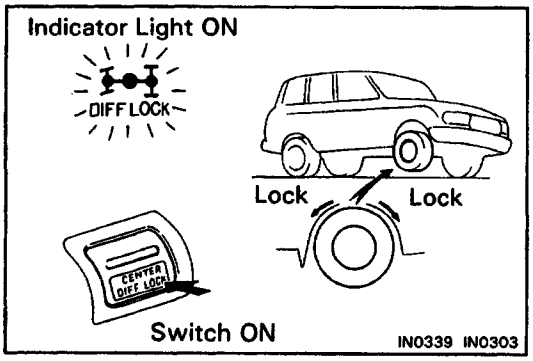
(1) When any tire is slipping.
(2) When any tire is spinning freely.
(3) When swerving or cornering.



FREE Position

Center Differential Lock		Transfer Select Lever	Wheel
Control Switch	Indicator Light		
OFF	OFF	H	A lifted wheel can be rotated even if only one wheel is lifted up, as long as transmission is in N range.

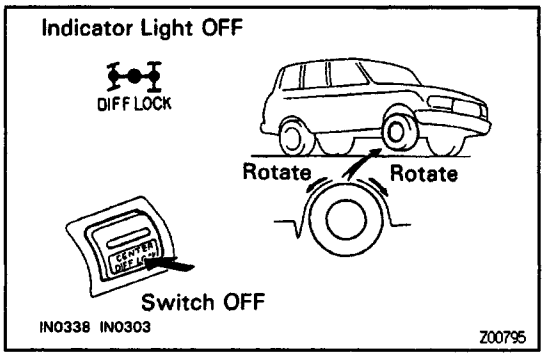
V00598



LOCK Position

Center Differential Lock		Transfer Select Lever	Wheel
Control Switch	Indicator Light		
ON	ON	H	A lifted wheel cannot be rotated if only one wheel is lifted up, even if transmission is in N range.
OFF	ON	L	

V00599

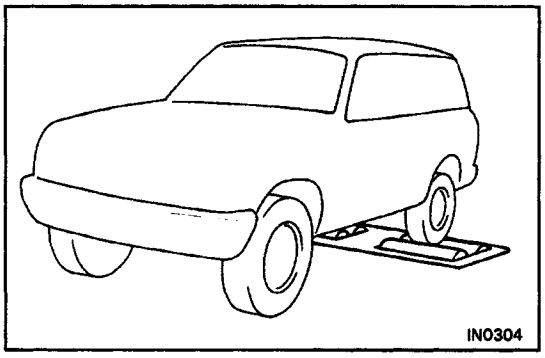


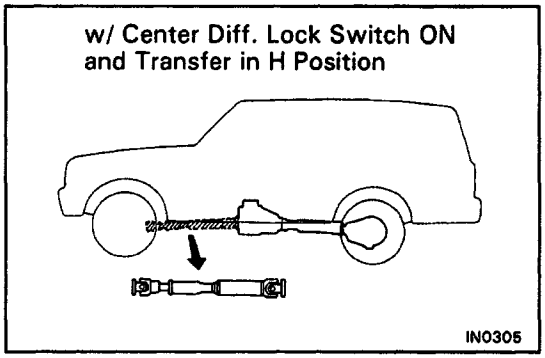
Braking Force Test (Vehicle Speed: Below 0.5 km/h or 0.3 mph)

When performing low – speed type brake tester measurements, observe the following instructions.

(1) Put the center differential in FREE position.
- Shift the transfer select lever to H position.
- Turn the center differential lock switch to OFF and check that the center differential lock indicator light goes off.

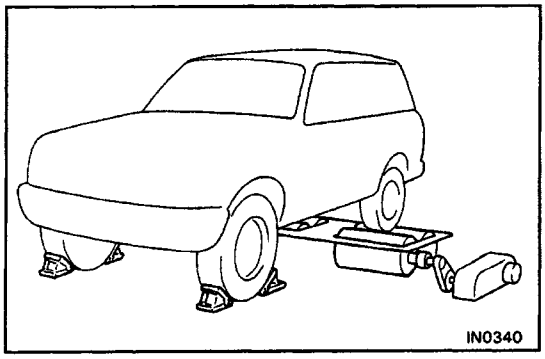
(2) Shift the transmission shift lever to N range.
(3) Idle the engine, operate the brake booster and perform the test.





Speedometer Test or Other Tests (Using Speedometer Tester or Chassis Dynamometer)

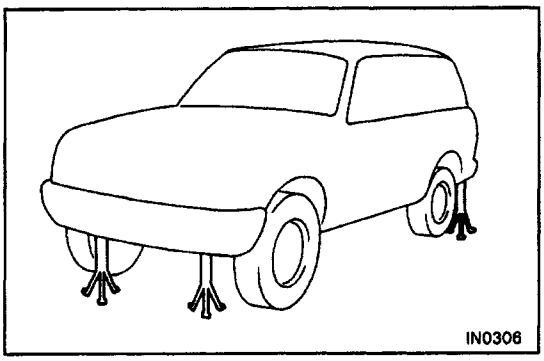
(1) Remove the front propeller shaft, put the center differential in LOCK position, then put the rear wheels on the tester roller and perform the test.
(2) When performing tests, observe the following precautions.



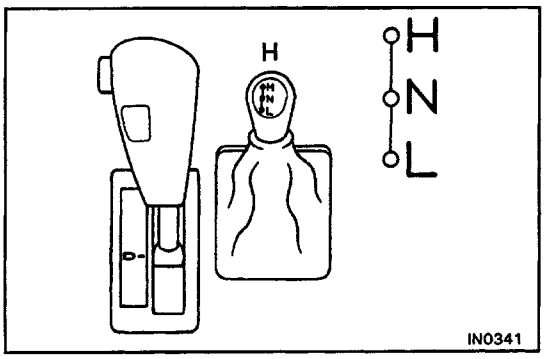
- Check that the center differential is securely in LOCK condition.
- Confirm that the vehicle is securely immobilised.
- Never operate the brakes suddenly, suddenly drive the wheels, or suddenly decelerate.

On–Vehicle Wheel Balancing

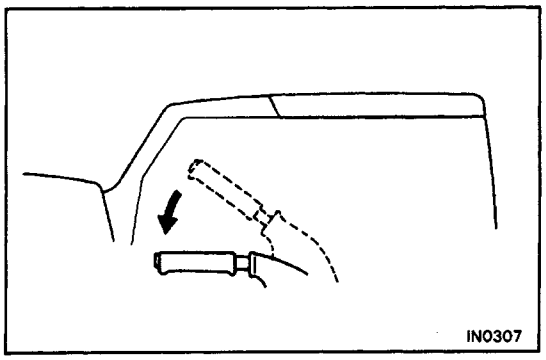
When doing on–vehicle wheel balancing on a full–time 4WD vehicle, to prevent the wheels from rotating at different speeds or in different directions from each other (which could lead to damage to the center differential or transfer gears), always be sure to observe the following precautions:



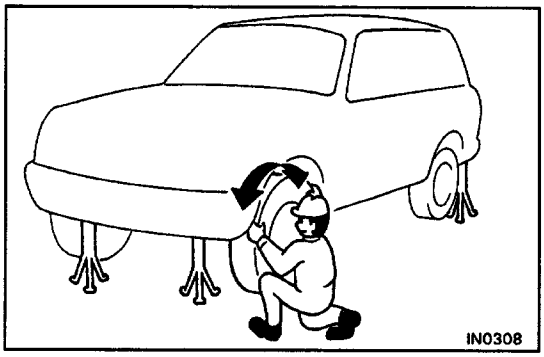
(1) All four wheels should be jacked up, clearing the ground completely.



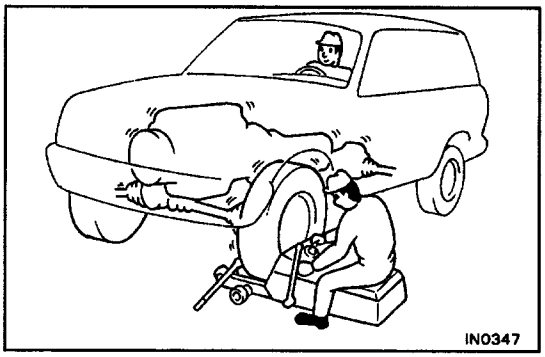
(2) The center differential should be in the LOCK position with the transfer gear in H position.



(3) The parking brake lever should be fully released.



(4) None of the brakes should be allowed to drag.



(5) The wheels should be driven with both the engine and the wheel balancer.

HINT: When doing this be careful of the other wheels, which will rotate at the same time.

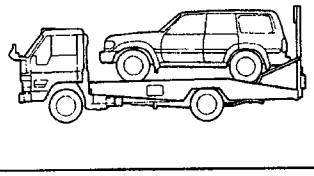
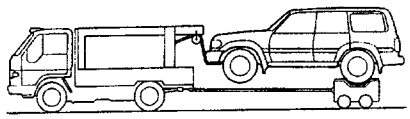
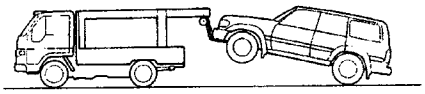
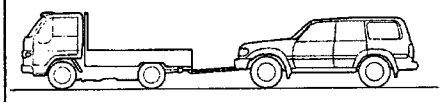
(6) Avoid sudden acceleration, deceleration and bra–king.

(7) Carry out the wheel balancing with the transmission in ”D” or ”3” range.

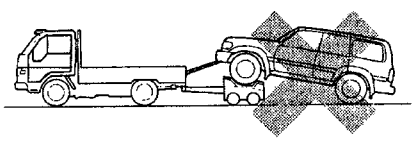
WHEN TOWING FULL–TIME 4WD VEHICLES

IN00Y–01

1. Use one of the methods shown below to tow the vehicle.
2. When there is trouble with the chassis and drivetrain, use method (1) (flat bed truck) or method (2) (sling type tow truck with dollies)
3. Recommended Methods: No. (1), (2) or (3)
   Emergency Method: No.(4)

Towing Method \ Condition	Parking Brake	Transmission Shift Lever Position	Transfer Shift Lever Position	Center Differential Lock Switch	Center Differential
① Flat Bed Truck  IN0309	Applied	"P" Range	"H" Position	OFF	FREE (Normal Driving)
② Sling-Type Tow Truck with Dollies  IN0310					
③ Sling-Type Tow Truck (Front wheels must be able to rotate freely)  IN0311	Released	"N" Range	"N" Position	OFF	↑
④ Towing with Rope  IN0312	Released	"N" Range	"N" Position	OFF	↑
	HINT: Do not tow the vehicle at a speed faster than 45 km/h (30 mph) or a distance greater than 80 km (50 miles).				

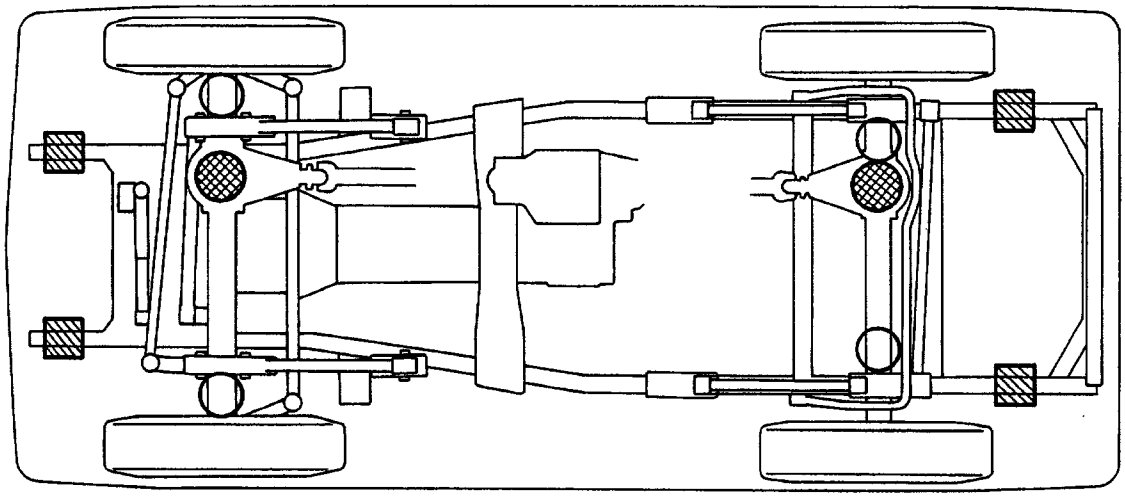
HINT: Do not use any towing methods other than those shown above.
For example, the towing method shown below is dangerous, so do not use it.

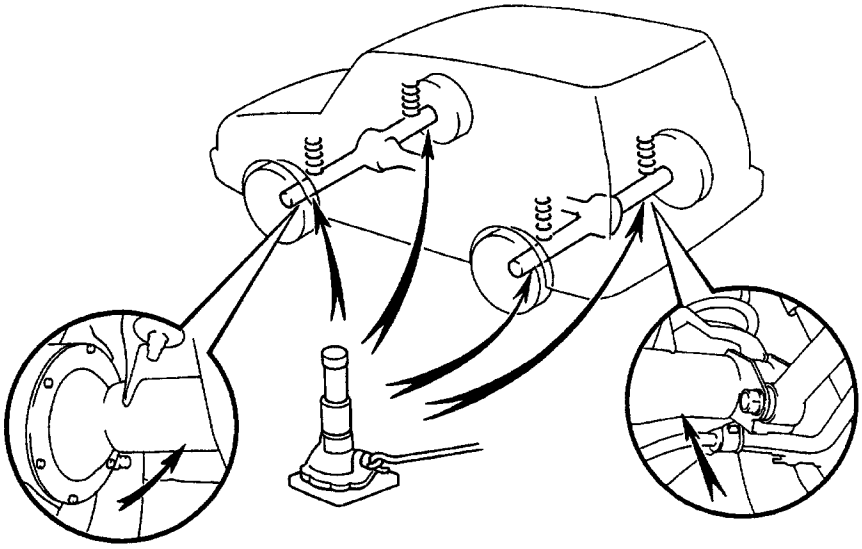
NO  IN0313	During towing with this towing method, there is a danger of the drive train heating up and causing breakdown, or of the front wheels flying off the dolly.

V00600

VEHICLE LIFT AND SUPPORT LOCATIONS

IN007–01





JACK POSITION

Front ..... Under the front differential
Rear ..... Under the rear differential
SCREW TYPE JACK POSITION

SUPPORT POSITION
Safety stand .....

IN0314
IN0342

Z00796

ABBREVIATIONS USED IN THIS MANUAL

IN009–01

A/C	Air Conditioner
AI	Air Injection
ASV	Air Switching Valve
A/T	Automatic Transmission
ATF	Automatic Transmission Fluid
A.T.P.	Automatic Transmission Parking
BTDC	Before Top Dead Center
BVSV	Bimetal Vacuum Switching Valve
CALIF.	Vehicles Sold in California
CB	Circuit Breaker
CCS	Cruise Control System
CD	Compact Disc
CRS	Child Restraint System
CVJ	Constant Velocity Joint
DP	Dash Pot
ECU	Electronic Control Unit
EFI	Electronic Fuel Injection
EGR	Exhaust Gas Recirculation
ELR	Emergency Locking Retractor
ESA	Electronic Spark Advance
EVAP	Evaporative (Emission Control)
EX	Exhaust (manifold, valve)
Ex.	Except
FED	Vehicles Sold in USA Except California
FIPG	Formed in Place Gasket
FL	Fusible Link
HAC	High Altitude Compensation
IG	Ignition
IN	Intake (manifold, valve)
ISC	Idle Speed Control
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LH	Left–Hand
LHD	Left–Hand Drive
LSP & BV	Load Sensing Proportioning and By–Pass Valve
Max.	Maximum
Min.	Minimum
MP	Multipurpose
OC	Oxdation Catalyst
O/D	Overdrive
OHC	Over Head Camshaft
O/S	Oversized
OVCV	Outer Vent Control Valve
PCV	Positive Crankcase Ventilation
PS	Power Steering
RH	Right–Hand
RHD	Right–Hand Drive
SC	Spark Control
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
SW	Switch
TCCS	Toyota Computer Controlled System
TDC	Top Dead Center
T/M	Transmission
TP	Throttle Positioner
TWC	Three–Way Catalyst
U/S	Undersize
VCV	Vacuum Control Valve
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
w/	With
w/o	Without
4WD	Four Wheel Drive Vehicles (4 x4)

MAINTENANCE

GENERAL NOTES:

- There are two separate maintenance schedules, namely A and B, which apply to different driving conditions. Find out how the vehicle is driven, and select the appropriate sched–ule.
- Every service item in the periodic maintenance list must be performed .
- Next to the columns of periods in the schedule, reference pages have been added for easy access to service data and procedures necessary for each operation.
- Periodic maintenance service must be performed according to whichever interval occurs first, the miles or the months.
- Maintenance services after the last period should be per–formed at the same interval as before unless otherwise noted.
- Skipping even one item in the list can cause the engine to run poorly and increase exhaust emissions.

MAINTENANCE SCHEDULE

SCHEDULE A

Conditions:

- Towing a trailer, using a camper or car top carrier.
- Repeated short trips of less than 5 miles (8 km) with outside temperatures remain below freezing.
- Extensive idling and/or low speed driving for long distances, such as police, taxi or door–to–door delivery use.
- Operating on dusty, rough, muddy or salt spread roads.

Maintenance operations: A = Check and adjust if necessary;
R = Replace, change or lubricate;
I = Inspect and correct or replace if necessary

System	Service interval (Odometer reading or months, whichever comes first) / Maintenance items		Maintenance services beyond 60,000 miles (96,000 km) should continue to be performed at the same intervals shown in each maintenance schedule.																Months	See page (item No.)
		Miles x 1,000	3.75	7.5	11.25	15	18.75	22.5	26.25	30	33.75	37.5	41.25	45	48.75	52.5	56.25	60		
		km x 1,000	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96		
ENGINE	Valve clearance★					A				A				A				A	A :Every 24 months	MA–6 (item 12)
	Drive belts(1)									I								I	I : 36 months, 72 months	MA–4 (item 1)
	Engine oil and oil filter★		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R : Every 6 months	MA–5 (item 5)
	Engine coolant(2)													R					R : 36 months	MA–5 (item 6)
	Exhaust pipes and mountings					I				I				I				I	I : Every 24 months	MA–6 (item 10)
FUEL	Air Filter ★(3)		I	I	I	I	I	I	I	R	I	I	I	I	I	I	I	R	I : Every 6 months R : Every 36 months	MA–5 (item 3,4)
	Fuel lines and connections(4)									I								I	I : Every 36 months	MA–6 (item 9)
	Fuel tank cap gasket																	R	R : Every 72 months	MA–6 (item 8)
IGNITION	Spark plugs★*									R								R	R : Every 36 months	MA–4 (item 2)
EVAP	Charcoal canister	California only																I	I : Every 72 months	MA–5 (item 7)
EXHAUST	Oxygen sensors*	Except California	R: 80,000 miles (128,000 km) only.																	MA–6 (item 11)
BRAKES	Brake linings and drums(5)			I		I		I		I		I		I		I		I	I : Every 12 months	MA–7 (item 14)
	Brake pads and discs			I		I		I		I		I		I		I		I	I : Every 12 months	MA–8 (item 15)
	Brake line pipes and hoses					I				I				I				I	I : Every 24 months	MA–7 (item 13)
CHASSIS	Steering linkage			I		I		I		I		I		I		I		I	I : Every 12 months	MA–8 (item 16)
	Ball joints and dust covers			I		I		I		I		I		I		I		I	I : Every 12 months	MA–8 (item 16)
	Automatic transmission					R				R				R				R	R : Every 24 months	MA–9 (item 19)
	Transfer and differential					R				R				R				R	R : Every 24 months	MA–10 (item 20)
	Steering gear box oil(6)					I				I				I				I	I : Every 24 months	MA–8 (item 17)
	Front wheel bearing and thrust bush grease									R								R	R : Every 36 months	MA–10 (item 21)
	Steering knuckle and chassis grease(7)			R		R		R		R		R		R		R		R	R : Every 12 months	MA–11 (item 22)
	Propeller shah grease(7)			R		R		R		R		R		R		R		R	R : Every 12 months	MA–11 (item 22)
	Bolts and nuts on chassis and body(7)			I		I		I		I		I		I		I		I	I : Every 12 months	MA–12 (item 23)

Maintenance services indicated by a star (★) or asterisk (*) are required under the terms of the Emission Control Systems Warranty (ECSW). See Owners Guide or Warranty Booklet for complete warranty information.
★ For vehicle sold in California * For vehicle sold outside California

HINT:
(1) After 60,000 miles (96,000 km or 72 months, inspect every 7,500 miles (12,000 km) or 12 months.
(2) After 45,000 miles (72,000 km or 36 months, replace every 30,000 miles (48,000 km) or 24 months.
(3) Applicable when operating mainly on dusty roads. If not, follow schedule B.
(4) Includes inspection of fuel tank band and vapor vent system.
(5) Also applicable to lining drum for parking brake.
(6) Inspect the steering gear box for oil leakage only.
(7) If the propeller shaft has been immersed in water, it should be re–greased within a day.
(8) Applicable only when operating mainly on rough, muddy roads. The applicable parts are listed below. For other usage conditions, refer to SCHEDULE B.
• Bolts for sheet installation.

SCHEDULE B

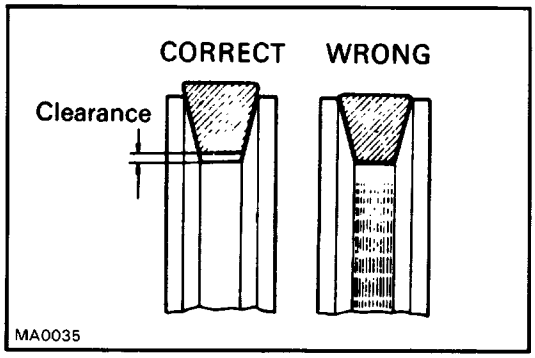
Conditions: Conditions other than those listed for SCHEDULE A.

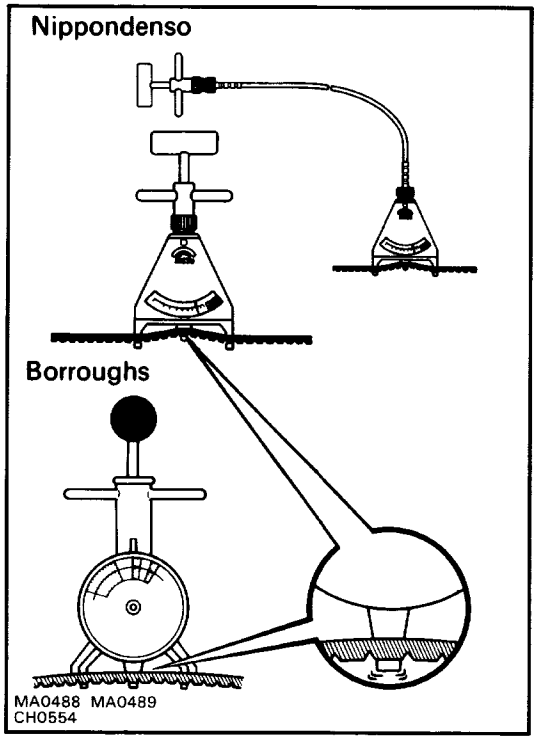
Maintenance operations: A = Check and adjust if necessary;
R = Replace, change or lubricate;
I = Inspect and correct or replace if necessary

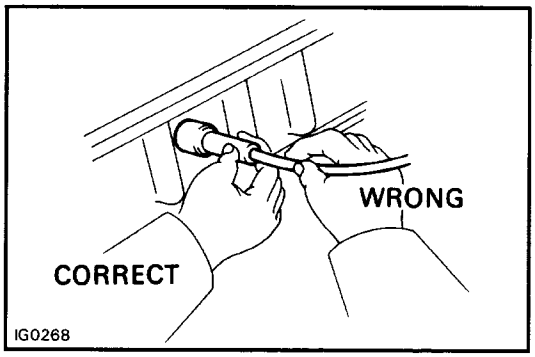
System	Service interval (Odometer reading or months, whichever comes first) / Maintenance items		Maintenance services beyond 60,000 miles (96,000 km) should be performed at the same intervals shown in each maintenance schedule.									See page (item No.)
		Miles x 1,000	7.5	15	22.5	30	37.5	45	52.5	60	Months	
		km x 1,000	12	24	36	48	60	72	84	96		
ENGINE	Valve clearance★			A		A		A		A	A :Every 24 months	MA–6 (item 12)
	Drive belts(1)					I				I	I : 36 months, 72 months	MA–4 (item 1)
	Engine oil and oil filter★		R	R	R	R	R	R	R	R	R : Every 12 months	MA–5 (item 5)
	Engine coolant (2)							R			R : 36 months	MA–5 (item 6)
	Exhaust pipes and mountings					I				I	I : Every 36 months	MA–6 (item 10)
FUEL	Air Filter★					R				R	R : Every 36 months	MA–5 (item 4)
	Fuel lines and connections (3)					I				I	I : Every 36 months	MA–6 (item 9)
	Fuel tank cap gasket									R	R : Every 72 months	MA–6 (item 8)
IGNITION	Spark plugs★*					R				R	R : Every 36 months	MA–4 (item 2)
EVAP	Charcoal canister	California only								I	I : Every 72 months	MA–5 (item 7)
EXHAUST	Oxygen sensors*	Except California	R : 80,000 miles (128,000 km) only.								———	MA–6 (item 11)
BRAKES	Brake linings and drums (4)			I		I		I		I	I : Every 24 months	MA–7 (item 14)
	Brake pads discs (Front and rear)			I		I		I		I	I : Every 24 months	MA–8 (item 15)
	Brake line pipes and hoses			I		I		I		I	I : Every 24 months	MA–7 (item 13)
CHASSIS	Steering linkage			I		I		I		I	I : Every 24 months	MA–8 (item 16)
	Ball joints and dust covers			I		I		I		I	I : Every 24 months	MA–8 (item 16)
	Front wheel bearing and thrust bush grease					R				R	R : Every 36 months	MA–10 (item 21)
	Steering knuckle and chassis grease(5)			R		R		R		R	R : Every 24 months	MA–11 (item 22)
	Propeller shaft grease(5)			R		R		R		R	R : Every 24 months	MA–11 (item 22)
	Automatic transmission			I		I		I		I	I : Every 24 months	MA–9 (item 18)
	Transfer, differential and steering gear box oil(6)			I		I		I		I	I : Every 24 months	MA–8 (item 17) MA–9 (item 18)
	Bolt and nuts on chassis and body(7)			I		I		I		I	I : Every 24 months	MA–12 (item 23)

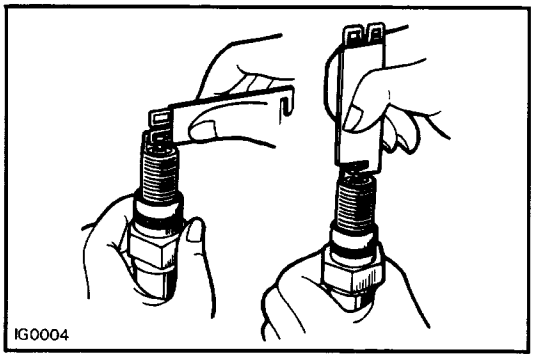
Maintenance services indicated by a star (★) or asterisk (*) are required under the terms of the Emission Control Systems Warranty (ECSW). See Owner's Guide or Warranty Booklet for complete warranty information.
★ For vehicle sold in California * For vehicle sold outside California.

HINT:
(1) After 60,000 miles (96,000 km) or 72 months, inspect every 7,500 miles (12,000 km) or 12 months.
(2) After 45,000 miles (72,000 km) or 36 months, replace every 30,000 miles (48,000 km) or 24 months.
(3) Includes inspection of fuel tank band vapor vent system.
(4) Also applicable to lining drum for parking brake.
(5) If the propeller shaft has been immersed in water, it should be re–greased within a day.
(6) Inspect the steering gear box for oil leakage only.
(7) The applicable parts are listed below.
• Bolts for sheet installation.









MAINTENANCE OPERATIONS

ENGINE

Cold Engine Operations

1. INSPECT DRIVE BELTS

(a) Visually check the belt for cracks, oiliness or wear.
Check that the belt does not touch the bottom of the pulley groove.

If necessary, replace the drive belt.

(b) Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:
Nippondenso BTG–20 (95506–00020) or
Borroughs No. BT–33–73F

Drive belt tension:

Alternator	**Used belt 100 ± 20 lbf**
	New belt 145 ± 25 lbf
PS Pump	**Used belt 100 ± 20 lbf**
(Air Pump)	**New belt 145 ± 25 lbf**
A/C	**Used belt 80 ± 20 lbf**
	New belt 125 ± 25 lbf

If necessary, adjust the drive belt tension.

HINT:

- When checking the tension, be sure the gauge is on the belt protrusion. (ex. A/C drive belt).
  "New belt" refers to a belt which has been used for less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a new belt, run the engine for about 5 minutes and then recheck the tension.

2. REPLACE SPARK PLUGS

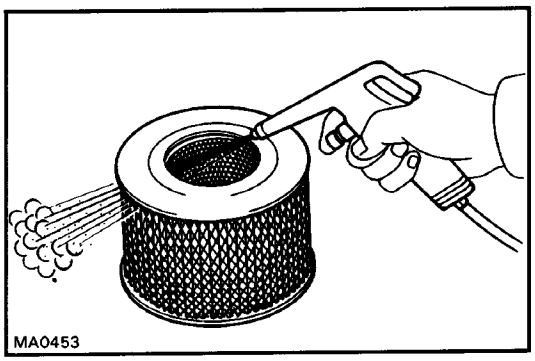
(a) Disconnect the high–tension cords of the spark plug at the boot. Do not pull on the cords.

(b) Remove the spark plugs.

(c) Set the gap on the new plugs.

Correct electrode gap: 1.1 mm (0.043 in.)

Recommended spark plugs: ND W16EXR–U11
NGK BPR5EY11



3. INSPECT AIR FILTER

(a) Visually check that the air cleaner element is not excessively dirty, damaged or oily.
If necessary, replace the air cleaner element.

(b) Clean the element with compressed air.
First blow from inside thoroughly, then blow off the out–side of the element.

4. REPLACE AIR FILTER

Replace the used air cleaner element with a new one.

5. REPLACE ENGINE OIL AND OIL FILTER

(See page LU–5)

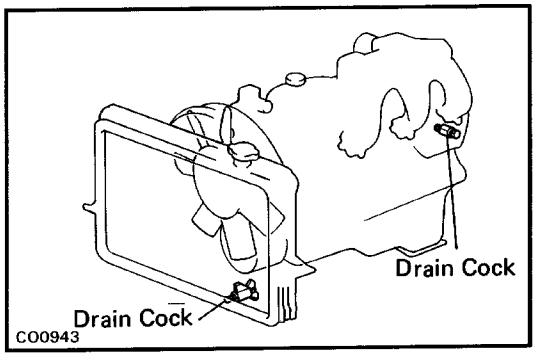
Oil grade: API grade SG multigrade, fuel–efficient and recommended viscosity oil.

Engine oil capacity:

Drain and refill

w/ Oil filter change

7.8 liters (8.2 US qts, 7.0 Imp. qts)



6. REPLACE ENGINE COOLANT

(a) Drain the coolant from radiator and engine drain cocks.

(b) Close the drain cocks.

(c) Fill the system with coolant.

Coolant capacity:

w/ Front heater

17.5 liters (18.5 US qts, 15.4 Imp. qts)

w/ Front and rear heaters

19.5 liters (20.6 US qts, 17.2 Imp. qts)

Use a good brand of ethylene–glycol type coolant, mixed according to the manufacturer's instructions.

NOTICE:

- **Do not use alcohol type coolant.**
- **The coolant should be mixed with dernineralized water or distilled water.**

7. CALIFORNIA VEHICLES ONLY:

INSPECT CHARCOAL CANISTER

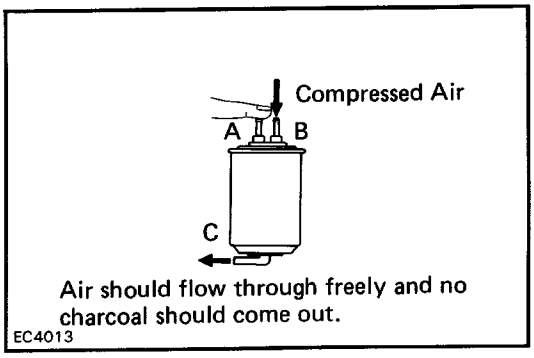
(a) Disconnect the hoses to the charcoal canister. Label the hoses for correct reinstallation.

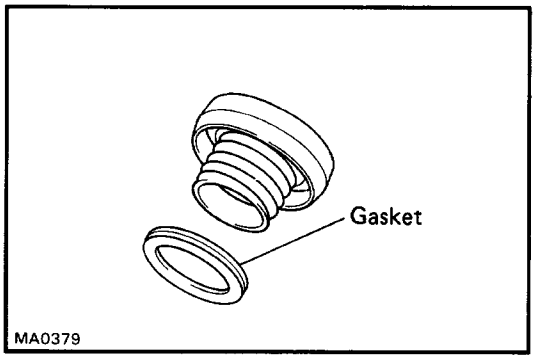
(b) Plug pipe A with your finger and blow compressed air (294 kPa, 3 kgf/cm^2 or 42 psi) through pipe B (fuel tank side).

- Check that air comes out of the bottom pipe C without resistance.
- Check that no activated charcoal comes out.
If necessary, replace the charcoal canister.

HINT: Do not attempt to wash the charcoal.

(c) Connect the hoses to the charcoal canister.





8. REPLACE GASKET IN FUEL TANK CAP

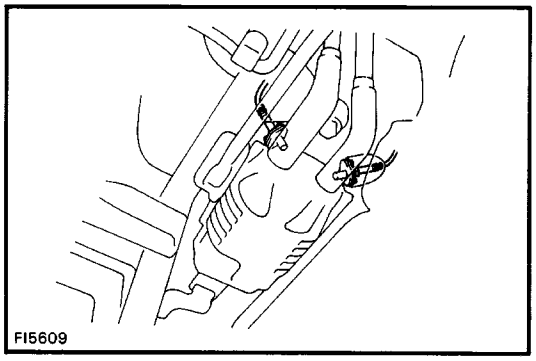
(a) Remove the old gasket (O–ring) from the tank cap. Do not damage the cap.
(b) Install the new gasket by hand.
(c) Inspect the cap for damage or cracks.
(d) Install the cap and check the torque limiter.

9. INSPECT FUEL LINES AND CONNECTIONS

Visually inspect the fuel lines for cracks, leakage, loose connections, deformation or tank band looseness.

10. INSPECT EXHAUST PIPES AND MOUNTINGS

Visually inspect the pipes, hangers, and connections for severe corrosion, leaks or damage.



11. EXCEPT CALIFORNIA VEHICLES:

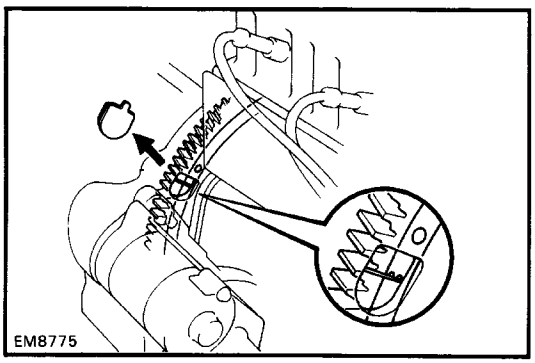
REPLACE OXYGEN SENSORS

(a) Disconnect the oxygen sensor connector.
(b) Remove the two nuts, heat insulator, oxygen sensor and gasket from the exhaust manifold.
(c) Install new gasket, oxygen sensor and heat insulator with the two nuts.

Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

(d) Inspect the oxygen sensor operation.

(See page FI–84)



Hot Engine Operations

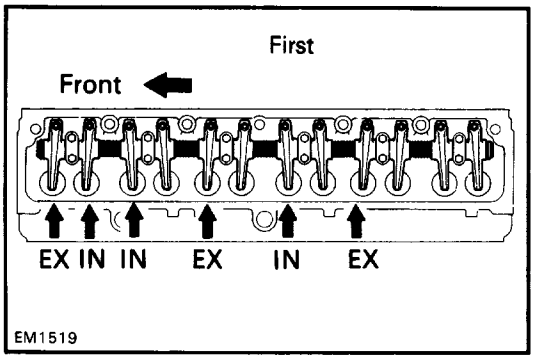
12. ADJUST VALVE CLEARANCE

(a) Warm up the engine to normal operating tempera–ture.
(b) Stop the engine and remove the cylinder head cover.
(c) Set No.1 cylinder to TDC/compression.

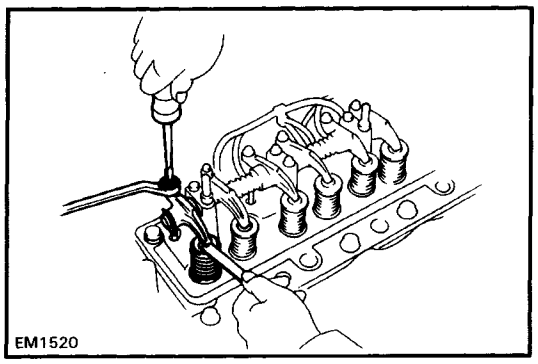
- Align the TDC mark of the drive plate with the timing pointer by turning the crankshaft clock–wise with a wrench.
- Check that the rocker arms on the No. 1 cylinder are loose and rocker arms on the No. 6 are tight. If not, turn the crankshaft one revolution (360˚) and align the mark as above.

(d) Adjust the clearance of half of valves.

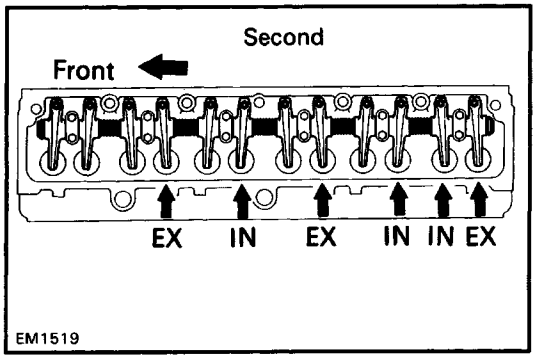
- Adjust only those valves indicated by arrows.



Valve clearance (Hot):
Intake 0.20 mm (0.008 in.)
Exhaust 0.35 mm (0.014 in.)



- Using a thickness gauge, measure the valve clearance between the valve stem and rocker arm.
  Loosen the lock nut and turn the adjusting screw to set the proper clearance.
  Hold the adjusting screw in position and tighten the lock nut.
- Recheck the valve clearance. The thickness gauge should slide with a very slight drag.

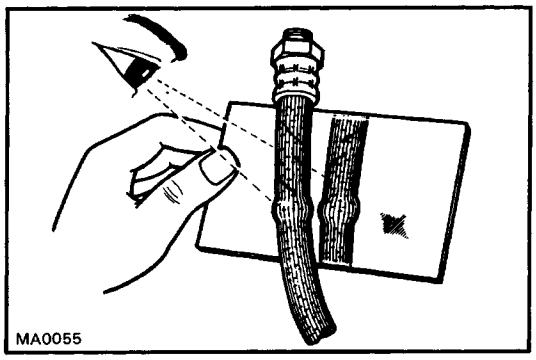


(e) Turn the crankshaft pulley one revolution (360°) and align the mark as above.
Adjust only the valves indicated by arrows.
(f) Reinstall the cylinder head cover.

BRAKES

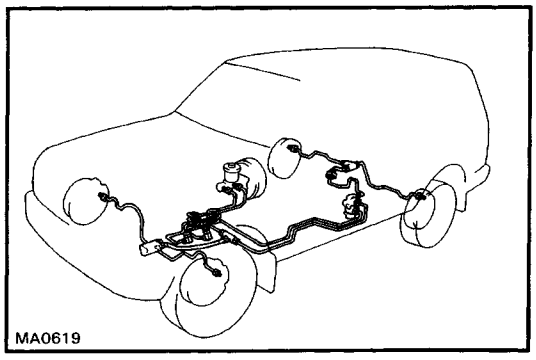
13. INSPECT BRAKE LINE PIPES AND HOSES

HINT: Inspect them in a well lighted area. Inspect the entire circumference and length of the brake hoses using a mirror as required. Turn the front wheels fully right or left before inspecting the front brake.



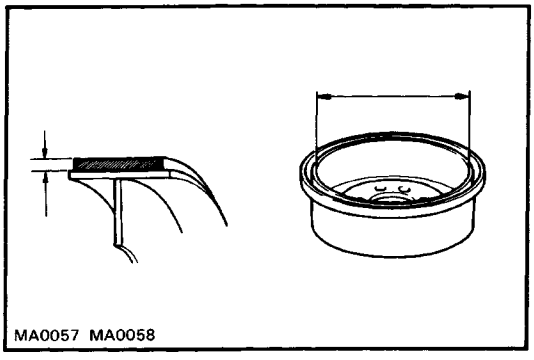
(a) Check all brake lines and hoses for:

- Damage
- Corrosion
- Wear
- Leaks
- Deformation
- Bends
- Cracks
- Twists



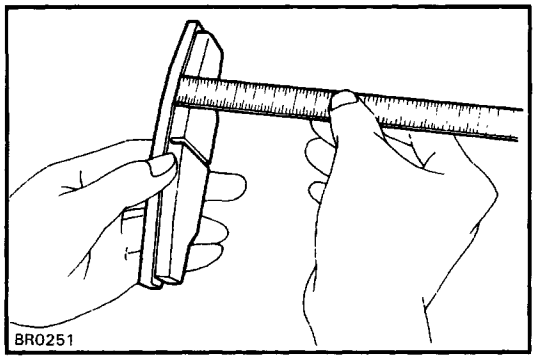
(b) Check all clamps for tightness and connections for leakage.
(c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system.
(d) Check that the lines installed in grommets pass through the center of the grommets.

14. INSPECT REAR BRAKE LININGS AND DRUMS



(a) Check the lining–to drums contact condition and lining wear.
Minimum lining thickness: 1.5 mm (0.059 in.)
(b) Check the brake drum for scoring or wear.
Maximum drum inside diameter:
297.0 mm (11.693 in.)
(c) Clean the brake parts with a damp cloth.

HINT: Do not use compressed air to clean the brake parts.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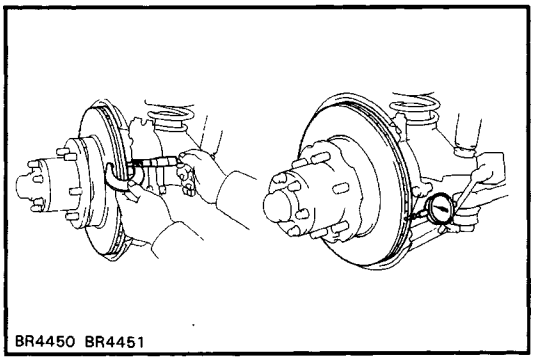
15. INSPECT FRONT BRAKE PADS AND DISCS

(a) Check the thickness of the disc brake pads and check for irregular wear.

Minimum pad thickness: 4.0 mm (0.157 in.)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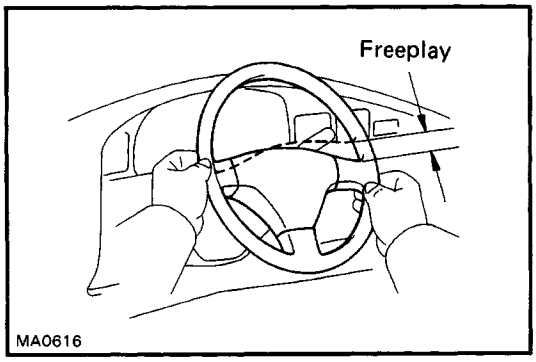
(b) Check the disc for wear or runout.

Minimum disc thickness: 23.0 mm (0.906 in.)

Maximum disc runout: 0.15 mm (0.0059 in.)



MA0616

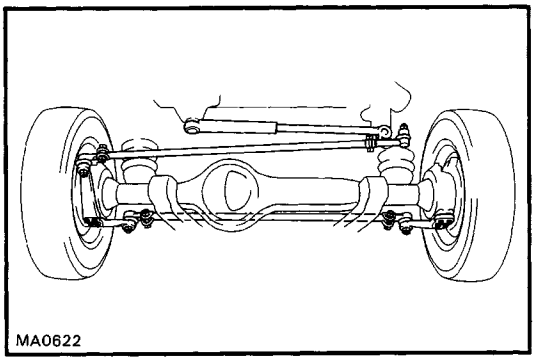
CHASSIS

16. INSPECT STEERING LINKAGE AND DUST COVERS

(a) Check the steering wheel freeplay.

Maximum steering wheel freeplay: 40 mm (1.57 in.)

With the vehicle stopped and pointed straight ahead,rock the steering wheel gently back and forth with light finger pressure.


MA0622

(b) Check the steering linkage for looseness or damage.

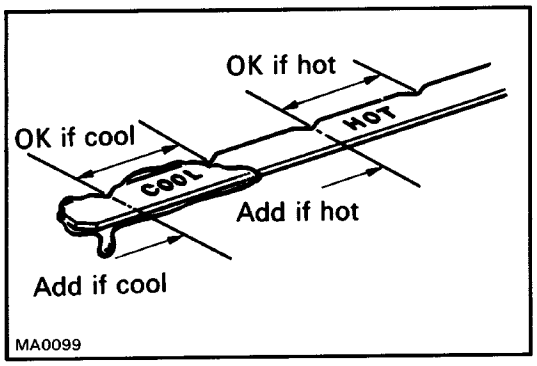
Check that:

- Tie rod and relay ends do not have excessive play.
- Dust seals and boots are not damaged.

(c) Inspect the dust cover for damage.

17. INSPECT STEERING GEAR HOUSING OIL

Check the steering gear box for oil leakage.
If leakage is found, check for cause and repair.



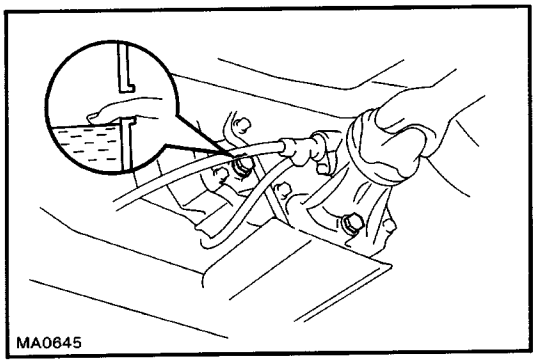
18. CHECK OIL LEVEL IN AUTOMATIC TRANSMISSION, TRANSFER AND DIFFERENTIAL OIL

(a) (Automatic transmission)

Check the automatic transmission fluid level.

If leakage is found, check for cause and repair.

Transmission fluid: ATF DEXRON® II

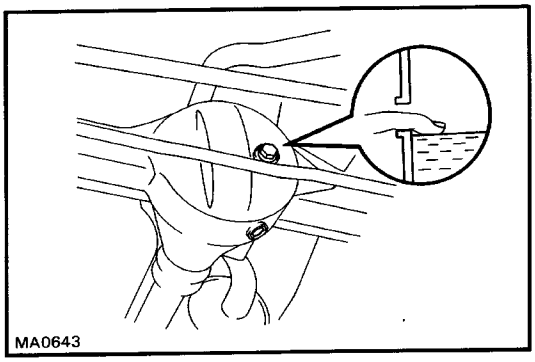


(b) (Transfer)

Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole.

If the level is low, add oil until it begins to run out the filler hole.

Transfer oil:
Oil grade API GL–4 or GL–5
Viscosity SAE 75W–90



(c) (Differential)

Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole.

If the level is low, add oil until it begins to run out the filler hole.

Differential oil:
Oil grade API GL–5 hypoid gear oil
Viscosity Above –18˚C (0˚F) SAE 90
Below –18˚C (0˚F) SAE 80W–90 or 80W

19. REPLACE AUTOMATIC TRANSMISSION FLUID

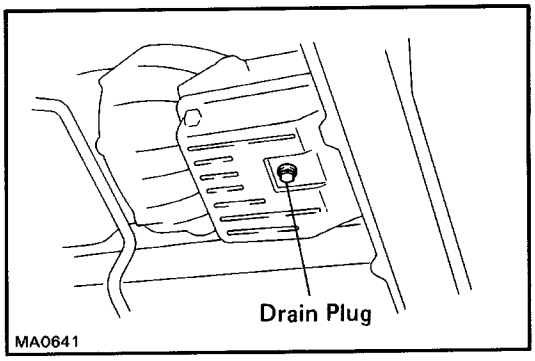
(a) Remove the drain plug and drain the fluid.

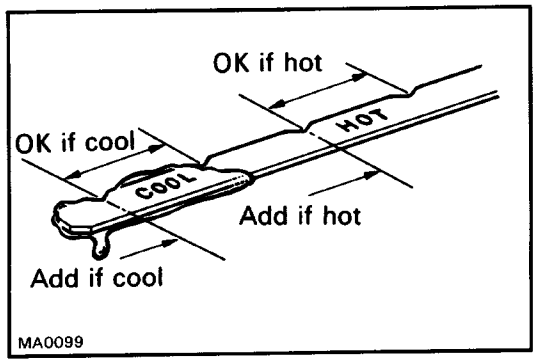
(b) Reinstall the drain plug securely.

(c) With the engine ”OFF”, add new fluid through the dipstick tube.

Fluid: ATF DEXRON® II

Drain and refill capacity (Reference):
6.0 liters (6.3 US qts, 5.3 Imp. qts)



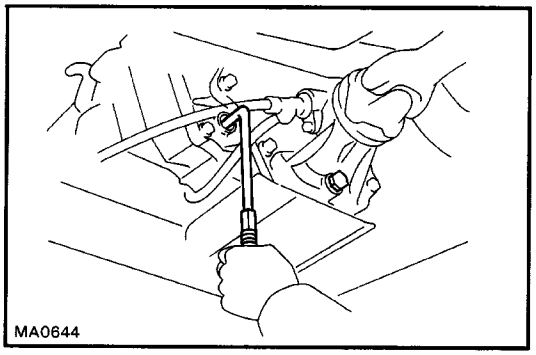


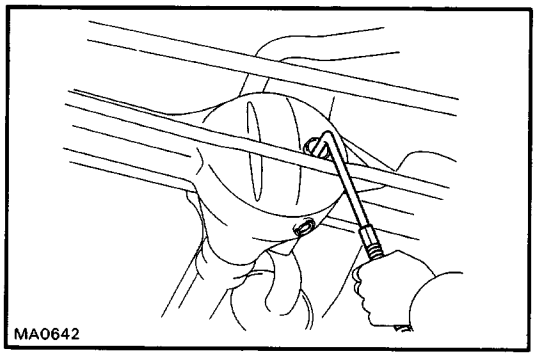
(d) Start the engine and shift the selector into all posi–tions from ”P” through ”L”, and then shift into ”P”.

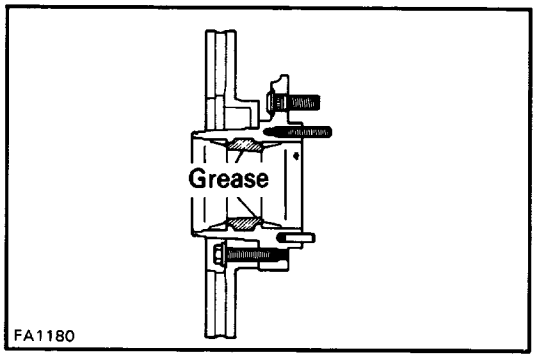
(e) With the engine idling, check the fluid level.

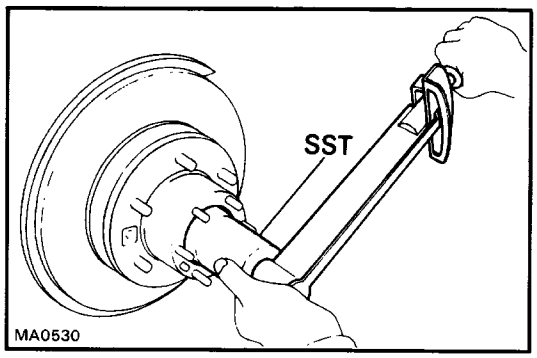
Add fluid up to the ”COOL” level on the dipstick.

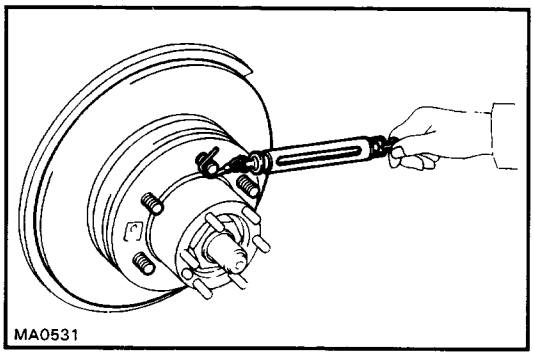
NOTICE: Do not overfill.











20. REPLACE TRANSFER AND DIFFERENTIAL OIL

(a) Remove the drain plug and drain the oil.
(b) Reinstall drain plug securely.
(c) Add new oil until it begins to run out of the filter hole.

Oil grade and viscosity: See page MA–9
Oil capacity:
Transfer oil
2.1 liters (2.2 US qts, 1.8 Imp. qts)
Differential oil
Front 2.8 liters (3.0 US qts, 2.5 Imp. qts)
Rear 3.25 liters (3.4 US qts, 2.9 Imp, qts)

21. REPACK FRONT WHEEL BEARINGS

(a) Change the front wheel bearing grease.

- Remove the front axle hub and bearings.
- Wash the inner and outer bearings, and check for damage.
- Remove the grease from the axle hub and check the inner and outer bearing races for damage.
- Pack the bearings and axle hubs with lithium base multipurpose grease.

Grease grade: Lithium base multipurpose grease (NLGI No.2)

(b) Install the inner bearing and oil seal into the axle hub.
(c) Install the axle hub, outer bearing and thrust washer, and adjust the wheel bearing preload.

- Using SST, torque the adjusting nut.
  SST 09607–60020

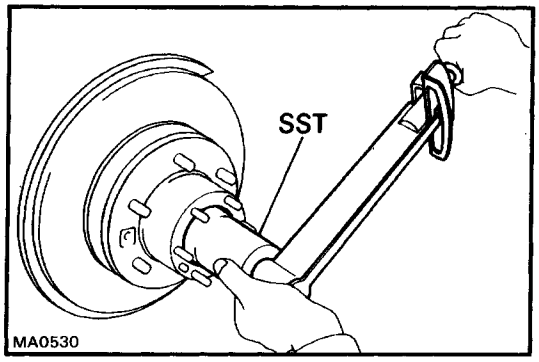
Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)

- Turn the hub right and left two or three times to allow the bearing to settle.
- Using SST, loosen the adjusting nut until it can be turned by hand.
  SST 09607–60020
- Using a spring tension gauge, measure the fric–tional force of the oil seal at the hub bolt.
- Using SST, retighten the adjusting nut.
  SST 09607–60020

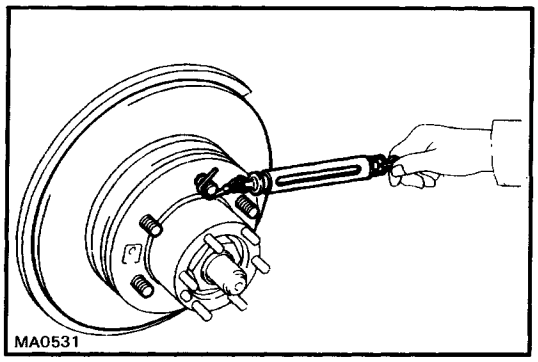
Torque:
4.0 – 6.8 N–m (40 – 70 kgf–cm, 35 – 60 in.–lbf)

- Check that the bearing has no freeplay.
- Using a spring tension gauge, check the preload.

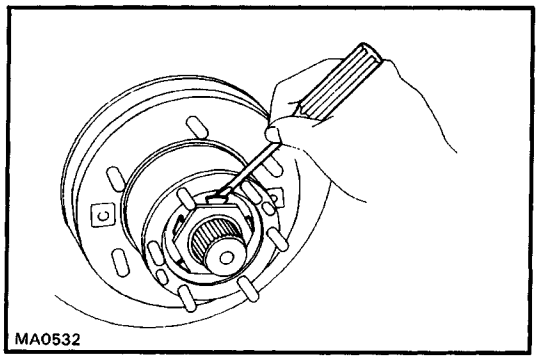
Preload (starting): 27 – 56 N
(2.8 – 5.7 kgf, 6.2 – 12.6 lbf)



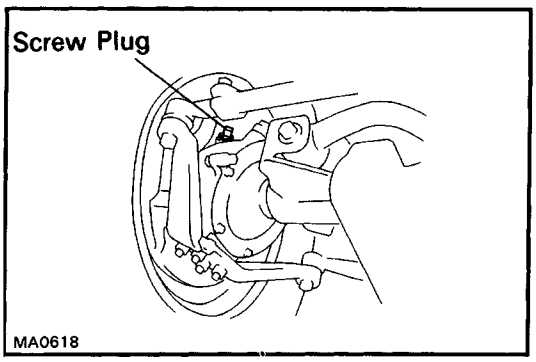
(d) Install a new lock washer and the lock nut.
(e) Using SST, torque the lock nut.
SST 09607–60020
Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)



(f) Using a spring tension gauge, recheck the preload.
Preload (starting): 27 – 56 N
(2.8 – 5.7 kgf, 6.2 – 12.6 lbf)
If not within specification, adjust with the adjusting nut.



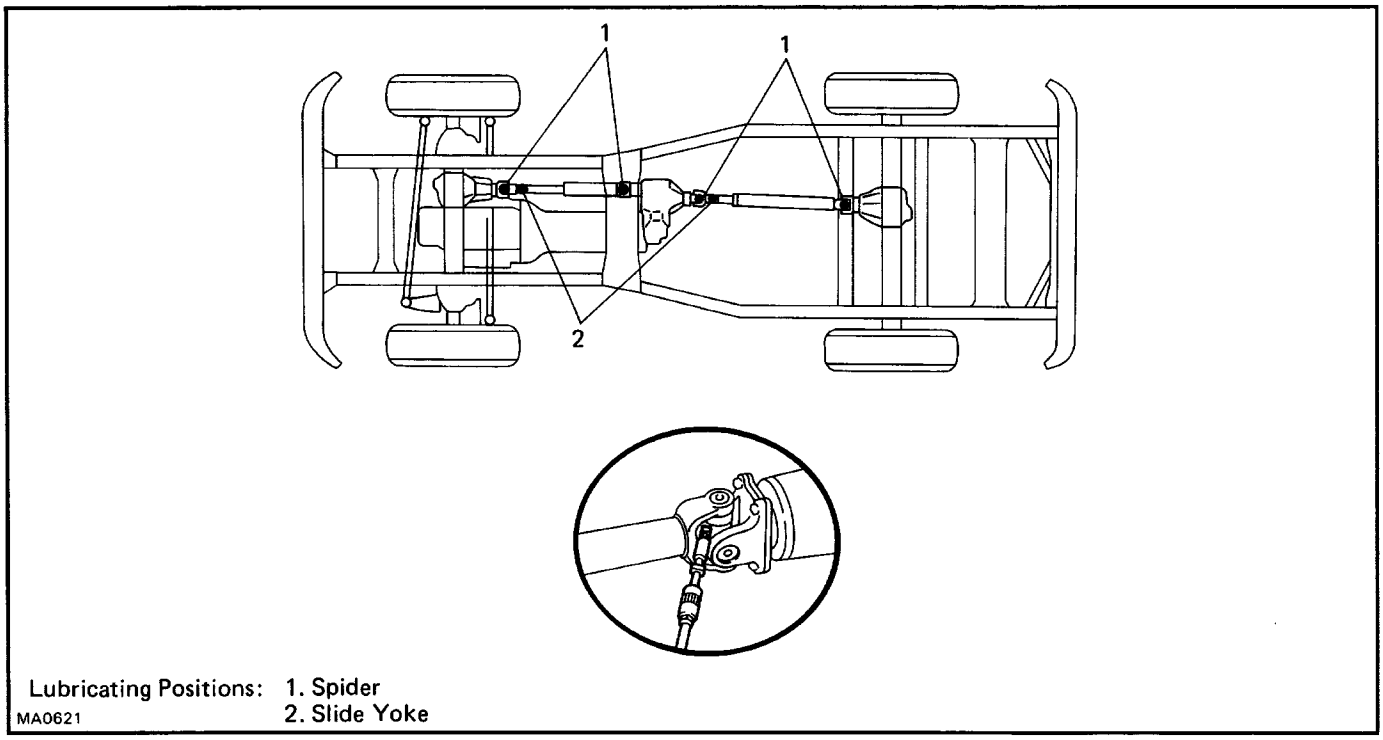
(g) Secure the lock nut by bending one of the lock washer teeth outward and the other lock washer teeth inward.



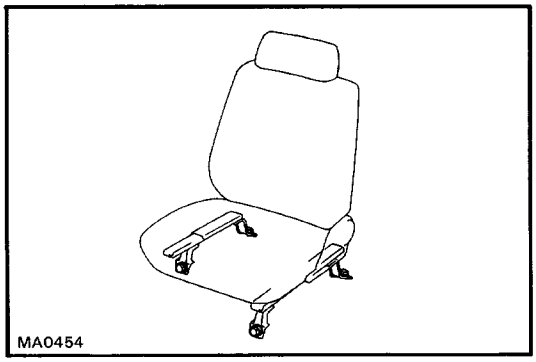
22. LUBE STEERING KNUCKLE CHASSIS AND PROPELLER SHAFT

(a) Remove the screw plug from each steering knuckle and pack with lubricant.
Steering knuckle grease:
Molybdenum disulphide lithium base chassis grease (NLG1 No. 2)
(b) Reinstall the two screw plugs.

(c) Lubricate chassis components, referring to the lubri cation chart. Before pumping in grease, wipe off any mud and dust on the grease fitting.
Grease grade
Lithium base chassis grease (NLGI No.2)



Lubricating Positions: 1. Spider
2. Slide Yoke
MA0621



23. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

(a) Tighten the following parts:

- Front seats
- Mounting bolts

Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)

(b) In addition to the scheduled maintenance items, check for loose or missing bolts and nuts of the following.

- Steering system
- Drive train
- Suspension system
- Fuel tank mounts
- Engine mounts, etc.

24. FINAL INSPECTION

(a) Check the operation of the body parts:

- Hood
  Auxiliary catch operates properly
  Hood locks securely when closed
- Front and rear doors
  Door locks operate properly
  Doors close properly
- Seats
  Seat adjusts easily and locks securely in any position
  Front seat back locks securely in any position
  Folding–down rear seat backs lock securely

(b) Road test

- Check the engine and chassis for abnormal noises.
- Check that the vehicle does not wander or pull to one side.
- Check that the brakes work properly and do not drag.

(c) Be sure to deliver a clean car and especially check:

- Steering wheel
- Shift lever knob
- All switch knobs
- Door handles
- Seats

GENERAL MAINTENANCE

These are maintenance and inspections items which are considered to be the owner's responsi–bility. They can be performed by the owner or he can have them done at a service shop. These items include those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are con–sidered to be reasonable for the owner to perform. Items and procedures for general maintenance are as follows.

OUTSIDE VEHICLE

1. TIRES

(a) Check the pressure with a gauge. If necessary, adjust.

(b) Check for cuts, damage or excessive wear.

2. WHEEL NUTS

When checking the tires, check the nuts for looseness or for missing nuts. If necessary, tighten them.

3. TIRE ROTATION

It is recommended that the tires be rotated every 7,500 miles (12,000 km)

4. WINDSHIELD WIPER BLADES

Check for wear or cracks whenever they do not wipe cleanly, If necessary replace.

5. FLUID LEAKS

(a) Check underneath for leaking fuel, oil, water or other fluid.

(b) If you smell gasoline fumes or notice any leak, have the cause found and cor–rected.

6. DOORS AND ENGINE HOOD

(a) Check that all doors and the tailgate operate smoothly, and that all latches lock securely.

(b) Check that the engine hood secondary latch secures the hood from opening when the primary latch is released.

INSIDE VEHICLE

7. LIGHTS

(a) Check that the headlight, stop light, taillights, turn signal lights, and other lights are all working.

(b) Check the headlight aim.

8. WARNING LIGHTS AND BUZZERS

Check that all warning lights and buzzers function properly.

9. HORN

Check that it is working.

10. WINDSHIELD GLASS

Check for scratches, pits or abrasions.

11. WINDSHIELD WIPER AND WASHER

(a) Check operation of the wipers and washer.

(b) Check that the wipers do not streak.

12. WINDSHIELD DEFROSTER

Check that air comes out from the defroster outlet when operating the heater or air con–ditioner.

13. REAR VIEW MIRROR

Check that it is mounted securely.

14. SUN VISORS

Check that they move freely and are mounted securely.

15. STEERING WHEEL

Check that it has specified freeplay. Be alert to changes in steering condition, such as hard steering, excessive freeplay or strange noise.

16. SEATS

(a) Check that the seat adjusters operate smoothly.

(b) Check that all latches lock securely in any position.

(c) Check that the head restraints move up and down smoothly and that the locks hold securely in any latched position.

(d) For fold–down seat backs, check that the latches lock securely.

17. SEAT BELTS

(a) Check that the seat belt system such as the buckles, retractors and anchors op–erate properly and smoothly.

(b) Check that the belt webbing is not cut, frayed, worn or damaged.

18. ACCELERATOR PEDAL

Check the pedal for smooth operation and uneven pedal effort or catching.

19. BRAKE PEDAL

(a) Check the pedal for smooth operation.
(b) Check that the pedal has the proper re–serve distance and freeplay.
(c) Check the brake booster function.

20. BRAKES

At a safe place, check that the brakes do not pull to one side when applied.

21. PARKING BRAKE

(a) Check that the lever has the proper travel.
(b) On a safe incline, check that vehicle is held securely with only the parking brake applied.

22. AUTOMATIC TRANSMISSION ”PARK” MECHANISM

(a) Check the lock release button of the selector lever for proper and smooth operation.
(b) On a safe incline, check that vehicle is held securely with the selector lever in ”P” position and all brakes released.

UNDER HOOD

23. WINDSHIELD WASHER FLUID

Check that there is sufficient fluid in the tank.

24. ENGINE COOLANT LEVEL

Check that the coolant level is between the ”FULL” and ”LOW” lines on the see–through reservoir.

25. RADIATOR AND HOSES

(a) Check that the front of the radiator is clean and not blocked with leaves, dirt or bugs.
(b) Check the hoses for cracks, kinks, rot or loose connections.

26. BATTERY ELECTROLYTE LEVEL

Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case. If level is low, add distilled water only.

27. BRAKE FLUID LEVEL

Check that the brake fluid level is near the upper level line on the see–through reservoir.

28. ENGINE DRIVE BELTS

Check all drive belts for fraying, cracks, wear or oiliness.

29. ENGINE OIL LEVEL

Check the level on the dipstick with the en–gine turned off.

30. POWER STEERING FLUID LEVEL

Check the level on the dipstick.
The level should be in the ”HOT” or ”COLD” range depending on the fluid temperature.

31. AUTOMATIC TRANSMISSION FLUID LEVEL

(a) Park the vehicle on a level surface.
(b) with the engine idling and the parking brake applied, shift the selector into all positions from ”P” to ”L”, and then shift into ”P”.
(c) Pull out the dipstick and wipe off the fluid with a clean rag. Re–insert the dip–stick and check that the fluid level is in the HOT range.
(d) Perform this check with the fluid at nor–mal driving temperature (70 – 80˚C or 158 – 176˚F).

HINT: Wait until the engine cools down (approx. 30 min.) before checking the fluid level after extended high speed driving in hot weather, driving in heavy traffic or pulling a trailer.

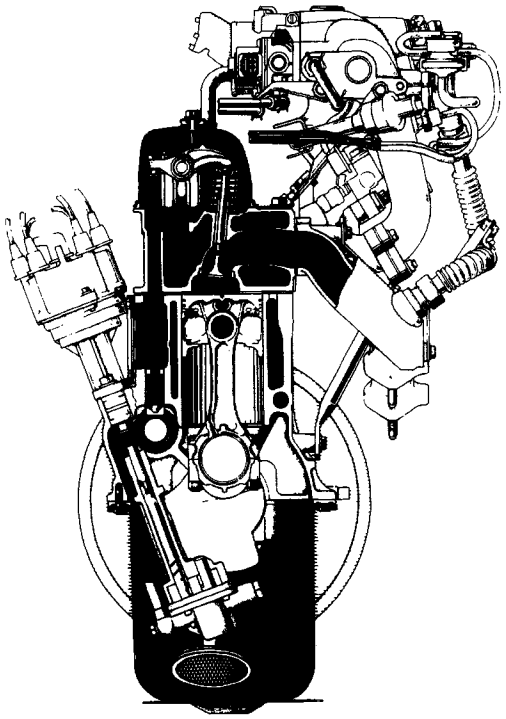
32. EXHAUST SYSTEM

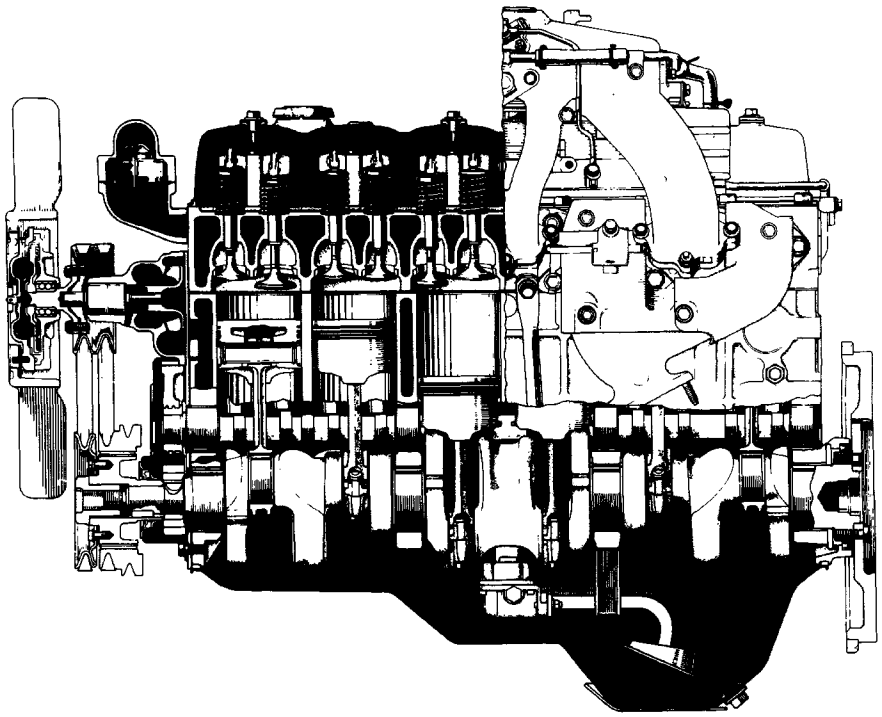
Visually inspect for cracks, holes or loose supports.
If any change in the sound of the exhaust or smell of the exhaust fumes is noticed, have the cause located and corrected.

ENGINE MECHANICAL

DESCRIPTION

The 3F–E engine is an in–line 6–cylinder 4.0 liter OHV 12 valve engine.





EM9011
EM9012

The 3F–E engines are an in–line 6–cylinder engine with the cylinders numbered 1–2–3–4–5–6 from the front. The crankshaft is supported by 4 bearings specified by the inside of the crankcase.

The crankshaft is integrated with 9 weights which are cast along with it for balance. Oil holes are built into the center of the crankshaft for supplying oil to the connecting rods, pistons and other components.

These engine's ignition order is 1–5–3–6–2–4. The cylinder head is made of case iron, with a counter–flow type intake and exhaust layout and with wedge type combustion chambers. The spark plugs are located in the right side of the combustion chambers.

Exhaust and intake valves are equipped with irregular pitch springs which are capable of following the valves even at high engine speeds.

Each valve lifter is lifted up by the rotation of the camshaft so that valve is driven via a push rod and rocker arm.

The camshaft is located in the cylinder block. The camshaft is turned by the crankshaft by means of the timing gears. To rotate the camshaft once, the crankshaft must rotate twice because the camshaft timing gear has twice as many teeth as the crankshaft timing gear.

Pistons are made of high temperature–resistant aluminum alloy.

Piston pins are the full–floating type, with the pins fastened to neither the piston boss nor the connecting rods. Instead, snap rings are fitted on both ends of the pins, preventing the pins from falling out.

The No. 1 compression ring is made of steel and the No. 2 compression ring is made of cast iron. The oil ring is made of a combination of steel and stainless steel. The outer diameter of each piston ring is slightly larger than the diameter of the piston and the flexibility of the rings allows them to hug the cylinder walls when they are mounted on the piston. Compression rings No. 1 and No. 2 work to prevent the leakage of gas from the cylinder and the oil ring works to scrape oil off the cylinder walls to prevent it from entering the combustion chamber.

The cylinder block is made of cast iron. It has 6 cylinders which are approximately 1.6 times the length of the piston stroke. The top of the cylinders is closed off by the cylinder head and the lower end of the cylinders becomes the crankcase, in which the crankshaft is installed. In addition, the cylinder block contains a water jacket, through which coolant is pumped to cool the cylinders.

The oil pan is bolted onto the bottom of the cylinder block. The oil pan is an oil reservoir made of pressed steel sheet. A dividing plate is included inside the oil pan to keep sufficient oil in the bottom of the pan even when the vehicle is tilted. This dividing plate also prevents the oil from making waves when the vehicle is stopped suddenly and thus shifting the oil away from the oil pump suction pipe.

TROUBLESHOOTING

ENGINE OVERHEATING

Problem	Possible cause	Remedy	Page
Engine overheats	Cooling system faulty Incorrect ignition timing	Troubleshoot cooling system Reset timing	CO–4 IG–11

HARD STARTING

Problem	Possible cause	Remedy	Page
Engine will not crank or cranks slowly	Starting system faulty	Troubleshoot starting system	ST–2
Engine will not start/ hard to start (cranks OK)	No fuel supply to injector • No fuel in tank • Fuel pump not working • Fuel filter clogged • Fuel line clogged or leaking	Troubleshoot EFI system	FI–9
	EFI system problems	Repair as necessary	
	Ignition problems • Ignition coil • Igniter • Distributor	Perform spark test	IG–5
	Spark plug faulty	Inspect plugs	IG–6
	High–tension cords disconnected or broken	Inspect cords	IG–6
	Vacuum leaks • PCV line • EGR line • Intake manifold • Air intake chamber • Throttle body • ISC valve • Brake booster line	Repair as necessary	
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Low compression	Check compression	EM–12

ROUGH IDLING

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses	Spark plug faulty	Inspect plugs	IG–6
	High–tension cord faulty	Inspect cords	IG–6
	Ignition problems • Ignition coil	Inspect coil	IG–7
	• Igniter	Inspect igniter	IG–7
	• Distributor	Inspect distributor	IG–7
	Incorrect ignition timing	Reset timing	IG–11
	Vacuum leaks • PCV line • EGR line • Intake manifold • Air intake chamber	Repair as necessary	

ROUGH IDLING (Cont'd)

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses (Cont'd)	• Throttle body • ISC valve • Brake booster line		
	Air suction between air flow meter and throttle body		
	Incorrect idle speed	Check ISC system	FI–44 FI–76
	Incorrect valve clearance	Adjust valve clearance	EM–9
	EFI system problems	Repair as necessary	
	Engine overheats	Check cooling system	CO–4
	Low compression	Check compression	EM–12

ENGINE HESITATES/POOR ACCELERATION

Problem	Possible cause	Remedy	Page
Engine hesitates/ poor acceleration	Spark plug faulty	Inspect plugs	IG–6
	High–tension cord faulty	Inspect cords	IG–6
	Vacuum leaks	Repair as necessary	
	• PCV line		
	• EGR line		
	• Intake manifold		
	• Air intake chamber		
	• Throttle body		
	• ISC valve		
	• Brake booster line		
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG–11
	Incorrect valve clearance	Adjust valve clearance	EM–9
	Fuel system clogged	Check fuel system	
	Air cleaner clogged	Check air cleaner	MA–5
	EFI system problems	Repair as necessary	
	Emission control system problem (Cold engine)		
	• EGR system always on	Check EGR system	EC–11
	Engine overheats	Check cooling system	CO–4
	Low compression	Check compression	EM–12

ENGINE DIESELING

Problem	Possible cause	Remedy	Page
Engine diesels (runs after ignition switch turned off)	EFI system problems	Repair as necessary	

AFTER FIRE, BACKFIRE

Problem	Possible cause	Remedy	Page
Muffler explosion (after fire) on deceleration only	Deceleration fuel cut system always off	Check EFI (fuel cut) system	
Muffler explosion (after fire) all the time	Air cleaner clogged EFI system problem Incorrect ignition timing	Check air cleaner Repair as necessary Reset timing	MA–5 IG–11
Engine backfires	EFI system problem Vacuum leak • PCV line • EGR line • Intake manifold • Air intake chamber • Throttle body • ISC valve • Brake booster line Air suction between air flow meter and throttle body Insufficient fuel flow Incorrect ignition timing Incorrect valve clearance Carbon deposits in combustion chambers	Repair as necessary Check hoses and repair as necessary Repair as necessary Troubleshoot fuel system Reset timing Adjust valve clearance Inspect cylinder head	 FI–9 IG–11 EM–9 EM–13

EXCESSIVE OIL CONSUMPTION

Problem	Possible cause	Remedy	Page
Excessive oil consumption	Oil leak PCV line clogged Piston ring worn or damaged Valve stem and guide bushing worn Valve stem oil seal worn	Repair as necessary Check PCV system Check rings Check valves and guide bushing Check seals	 EC–4 EM–63 EM–20

POOR GASOLINE MILEAGE

Problem	Possible cause	Remedy	Page
Poor gasoline mileage	Fuel leak	Repair as necessary	
	Air cleaner clogged	Check air cleaner	MA–5
	Incorrect ignition timing	Reset timing	IG–11
	EFI system problems • Injector faulty • Deceleration fuel cutoff system faulty	Repair as necessary	
	Idle speed too high	Check ISC system	FI–44 FI–76
	Spark plug faulty	Inspect plugs	IG–6
	EG R system always on	Check EGR system	EC–11
	Low compression	Check compression	EM–12
	Tires improperly inflated	Inflate tires to proper pressure	
	Brakes drag	Troubleshoot brakes	

UNPLEASANT ODOR

Problem	Possible cause	Remedy	Page
Unpleasant odor	Incorrect idle speed	Check ISC system	FI–44 FI–76
	Incorrect ignition timing	Reset timing	IG–11
	Vacuum leaks • PCV line • EGR line • Intake manifold • Air intake chamber • Throttle body • ISC valve • Brake booster line	Repair as necessary	
	EFI system problems	Repair as necessary	

ENGINE TUNE–UP

INSPECTION OF ENGINE COOLANT

(See steps 1 and 2 on page CO–5)

INSPECTION OF ENGINE OIL

(See steps 1 and 2 on page LU–4)

INSPECTION OF AIR FILTER

(See step 3 on page MA–5)

INSPECTION OF BATTERY

(See steps 1 and 2 on page CH–3)

Standard specific gravity:

1.25 –1.27 when fully charged at 20˚C (68˚F)

INSPECTION OF HIGH–TENSION CORDS

(See page IG–6)

Maximum resistance: 25 kΩ per cord

INSPECTION OF SPARK PLUGS

(See page IG–6)

Recommended spark plug: ND W16EXR–U11

NGK BPR5EY11

Correct electrode gap: 1.1 mm (0.043 in.)

INSPECTION OF ALTERNATOR DRIVE BELT

(See page CH–3)

Drive belt tension:

New belt 145 ± 25 lbf

Used belt 100 ± 20 lbf

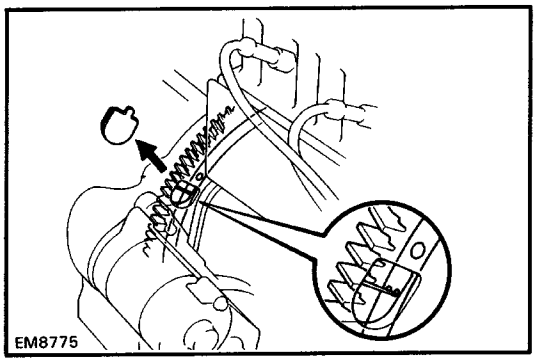
INSPECTION AND ADJUSTMENT OF VALVE CLEARANCE

HINT: Inspect and adjust the valve clearance after engine has reached normal operating temperature.

1. REMOVE AIR CLEANER HOSE

2. REMOVE CYLINDER HEAD COVER

(See step 21 on page EM–16)

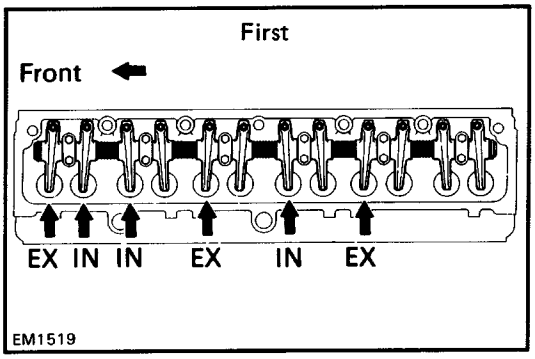


3. SET NO–1 CYLINDER TO TDC/COMPRESSION

(a) Align the TDC mark of the drive plate with the timing pointer by turning the crankshaft clockwise with a wrench.

(b) Check that the rocker arms on the No. 1 cylinder are loose and rocker arms on the No. 6 are tight.

If not, turn the crankshaft one revolution (360˚) and align the mark as above.



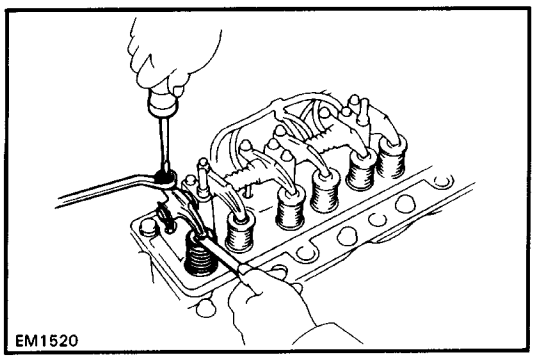
4. INSPECT AND ADJUST VALVE CLEARANCE

(a) Measure only those valves indicated by arrows.

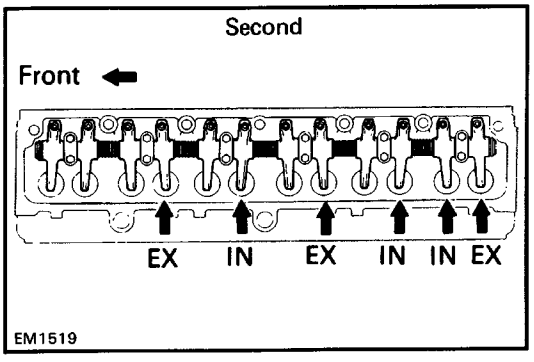
Valve clearance (Hot):

Intake 0.20 mm (0.008 in.)

Exhaust 0.35 mm (0.014 in.)



- Using a thickness gauge, measure the valve clearance between the valve stem and rocker arm. Loosen the lock nut and turn the adjusting screw to set the proper clearance.
  Hold the adjusting screw in position and tighten the lock nut.
- Recheck the valve clearance. The thickness gauge should slide with a very slight drag.



(b) Turn the crankshaft one revolution (360˚) clockwise and align the mark as above step 3 (a). Adjust only the valves indicated by arrows.

5. INSTALL CYLINDER HEAD COVER

(See step 6 on page EM–31)

6. INSTALL AIR CLEANER HOSE

INSPECTION OF IDLE SPEED

HINT: Allow the engine to warm up to normal operating temperature.

Idle speed: 650 rpm

INSPECTION AND ADJUSTMENT OF IGNITION TIMING

(See steps 10 to 14 on page IG–11)

Ignition timing:
7˚BTDC @ idle
(w/ Terminals TE1 and E1 connected)

IDLE AND OR 2,500 RPM CO/HC CHECK

HINT: This check is used only to determine whether or not the idle and/or 2,500 rpm CO/HC complies with reg–ulations.

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system con–nected
(d) All accessories switched OFF
(e) All vacuum lines properly connected

HINT: All vacuum hoses for EGR system, etc. should be properly connected.

(f) EFI system wiring connectors fully plugged
(g) Idle speed correct
(h) Ignition timing set correctly
(i) Transmission in neutral
(j) Tachometer and CO/HC meter calibrated and at hand

2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX.2 MINUTES

4. INSERT CO/HC METER TESTING PROBE INTO TAIL PIPE AT LEAST 40 cm (1.3 ft)

5. CHECK CO/HC AT IDLE AND/OR 2,500 RPM

Complete the measuring within three minutes.

HINT:

When performing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the regula–tions.

If the CO/HC reading at 2,500 rpm does not comply with regulations, try the following procedure.

Race the engine again at 2,500 rpm for approx. 1 minute, and quickly repeat step 4 and 5 above. This may correct the problem.

INSPECTION OF IDLE SPEED

HINT: Allow the engine to warm up to normal operating temperature.

Idle speed: 650 rpm

INSPECTION AND ADJUSTMENT OF IGNITION TIMING

(See steps 10 to 14 on page IG–11)

Ignition timing:
7˚BTDC @ idle
(w/ Terminals TE1 and E1 connected)

IDLE AND OR 2500 RPM CO HC CHECK

HINT: This check is used only to determine whether or not the idle and/or 2,500 rpm CO/HC complies with reg–ulations.

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system con–nected
(d) All accessories switched OFF
(e) All vacuum lines properly connected

HINT: All vacuum hoses for EGR system, etc. should be properly connected.

(f) EFI system wiring connectors fully plugged
(g) Idle speed correct
(h) Ignition timing set correctly
(i) Transmission in neutral
(j) Tachometer and CO/HC meter calibrated and at hand

2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX.2 MINUTES

4. INSERT CO/HC METER TESTING PROBE INTO TAIL PIPE AT LEAST 40 cm (1.3 ft)

5. CHECK CO/HC AT IDLE AND/OR 2,500 RPM

Complete the measuring within three minutes.

HINT:

When performing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the regula–tions.

If the CO/HC reading at 2,500 rpm does not comply with regulations, try the following procedure.

Race the engine again at 2,500 rpm for approx. 1 minute, and quickly repeat step 4 and 5 above. This may correct the problem.

Troubleshooting

If the CO/HC does not comply with regulations, perform troubleshooting in the order given below.

1. Check oxygen sensor operation.
   (See page FI–85)
2. See the table below for possible cause, and then inspect and correct the applicable causes if necessary.

HC	CO	Problem	Cause
High	Normal	Rough idle	1. Faulty ignition: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high–tension cords • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valve 4. Leaky intake and exhaust valves 5. Leaky cylinder
High	Low	Rough idle (Fluctuating HC reading)	1. Vacuum leak: • PCV hose • EGR valve • Intake manifold • Air intake chamber • Throttle body • ISC valve • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Faulty EFI system • Faulty pressure regulator • Clogged fuel return line • Defective water temp. sensor • Defective air temp. sensor • Faulty ECU • Faulty injector • Faulty cold start injector • Faulty throttle position sensor • Air flow meter

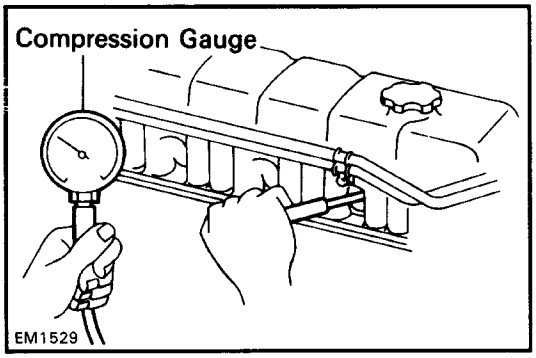
COMPRESSION CHECK

HINT: If there is lack of power, excessive oil consump–tion or poor fuel economy, measure the cylinder com–pression pressure.

1. WARM UP AND STOP ENGINE

2. DISCONNECT DISTRIBUTOR CONNECTOR

3. DISCONNECT COLD START INJECTOR CONNECTOR



4. REMOVE SPARK PLUGS

5. CHECK CYLINDER COMPRESSION PRESSURE

(a) Insert a compression gauge into the spark plug hole.

(b) Fully open the throttle valve.

(c) While cranking the engine with the starter, measure the compression pressure.

HINT: Always use a fully charged battery to obtain en–gine revolutions of more than 200 rpm.

NOTICE: This measurement must be done for as short a time as possible.

(d) Repeat steps (a) through (c) for each cylinder.

Compression pressure:
1,030 kPa (10.5 kgf/cm^2, 149 psi)
Minimum pressure:
785 kPa (8.0 kgf/cm^2, 114 psi)
Difference between each cylinder:
49 kPa (0.5 kgf/cm^2, 7 psi)

(e) If compression of one or more cylinders is low, pour a small amount of engine oil into that cylinder through the spark plug hole and repeat steps (a) through (c) for the cylinder with low compression.

- If adding oil helps the compression, probably the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seated improperly, or there may be leakage past the gasket surface.

6. REINSTALL SPARK PLUGS

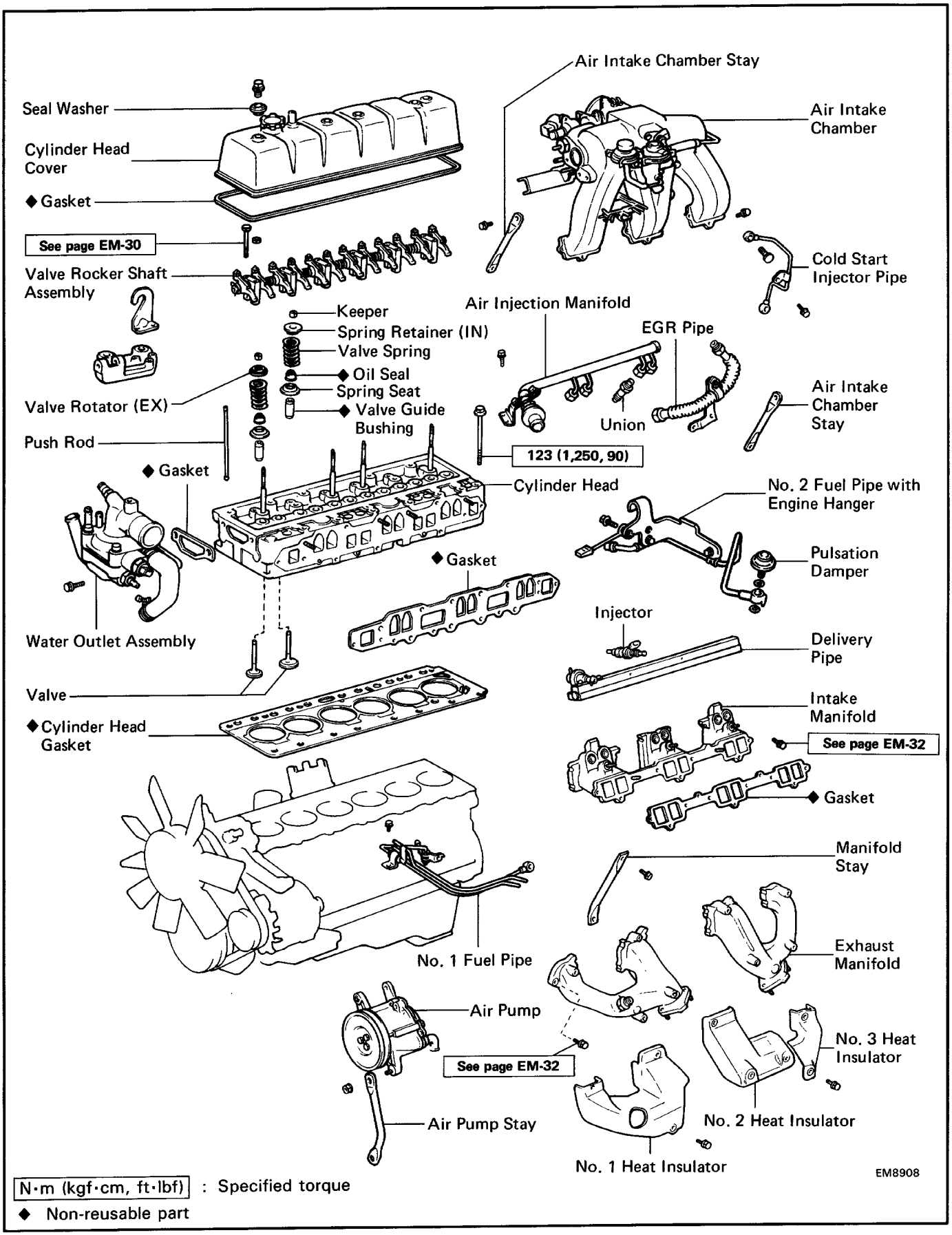
Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)

7. RECONNECT COLD START INJECTOR CONNECTOR

8. RECONNECT DISTRIBUTOR CONNECTOR

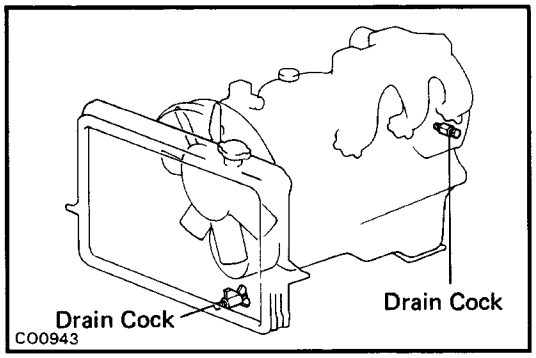
CYLINDER HEAD

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part



REMOVAL OF CYLINDER HEAD

(See page EM–13)

1. DRAIN ENGINE COOLANT

(See page CO–5)

2. DISCONNECT CABLE FROM NEGATIVE TERMINAL

3. REMOVE HOOD

4. DISCONNECT ACCELERATOR AND THROTTLE CABLES

5. REMOVE AIR INTAKE HOSE, AIR FLOW METER AND AIR CLEANER CAP

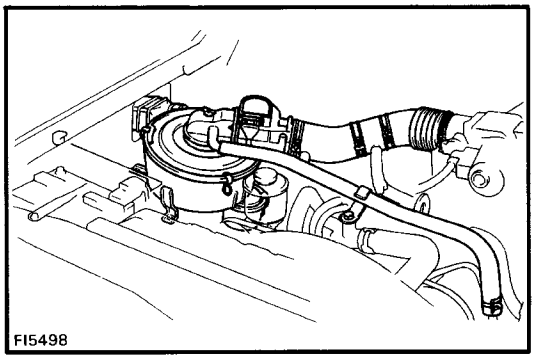
(a) Disconnect the air flow meter connector and clamp.

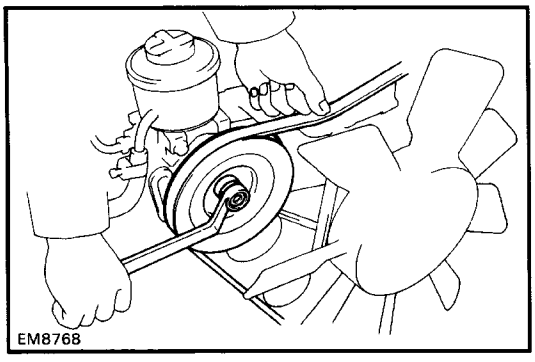
(b) Disconnect the following hoses:

- ISC hose
- Air pump hose
- Distributor hose
- PCV hose
- Three hoses from the intake chamber rear side
- Two hoses from the VCV of the charcoal canister

(c) Loosen the air intake hose clamp.

(d) Remove the wing nut and loosen the three clips, and remove the air intake hose, air flow meter and air cleaner cap.





6. REMOVE PS PUMP WITHOUT DISCONNECTING HOSES

(a) Push on the drive belt to hold the pulley in place and loosen the pulley nut.

(b) Loosen the idler pulley and adjusting bolts, and remove the drive belt.

(c) Remove the drive pulley and woodruff key.

(d) Remove PS mount bolts, and remove the PS pump from the bracket.

7. REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES

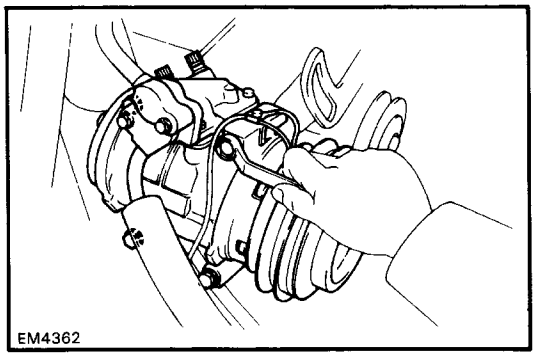
(a) Disconnect the connector.

(b) Loosen the idler pulley nut.

(c) Screw in the adjusting bolt, and remove the drive belt.

(d) Remove the four compressor mount bolts.

(e) Put aside the compressor, and suspend it to the fender apron with the string.



8. REMOVE PS PUMP AND A/C COMPRESSOR BRACKETS

9. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS AND IGNITION COIL

10. REMOVE HEATER WATER (OIL COOLER) PIPE

(a) Disconnect the hoses from the water outlet, water pump, oil cooler and heater water pipe.

(b) Remove the bolts and heater water (oil cooler) pipe from the cylinder head.

11. DISCONNECT RADIATOR UPPER HOSE

12. DISCONNECT FUEL HOSES

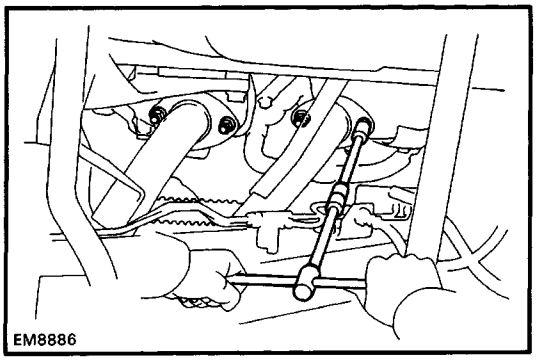
13. RAISE VEHICLE

NOTICE: Be sure the vehicle is securely supported.

14. DISCONNECT EXHAUST PIPE FROM EXHAUST MANIFOLD

(a) Loosen the bolt and disconnect the clamp from the bracket.

(b) Remove the four nuts, and disconnect the exhaust pipe.

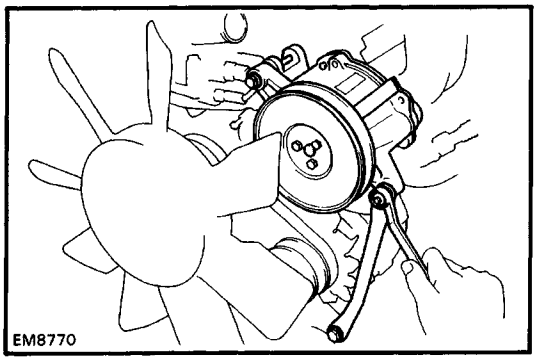


15. REMOVE AIR PUMP

(a) Disconnect the air hose.

(b) Remove the bolt, nut and air pump stay.

(c) Remove the through bolt, nut and air pump.

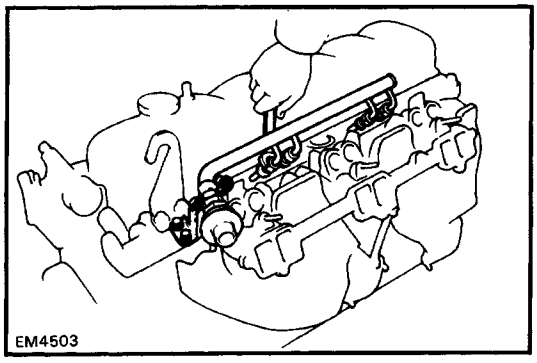


16. REMOVE DELIVERY PIPE AND INJECTORS

(See steps 4 to 9 on pages FI–62, FI–63)

17. REMOVE AIR INJECTION MANIFOLD

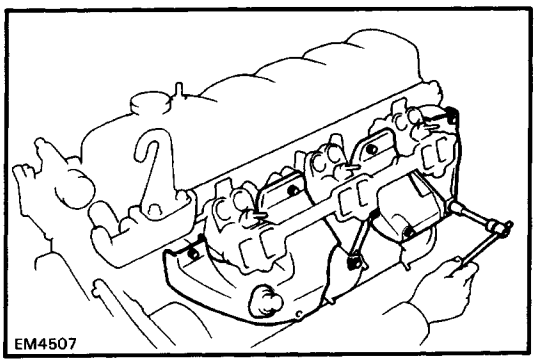
Remove the two bolts, four union nuts and air injection manifold.

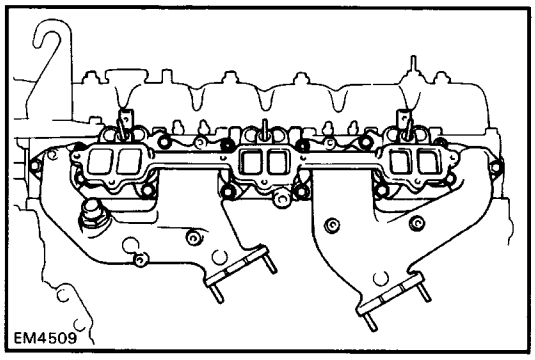


18. REMOVE INTAKE AND EXHAUST MANIFOLDS

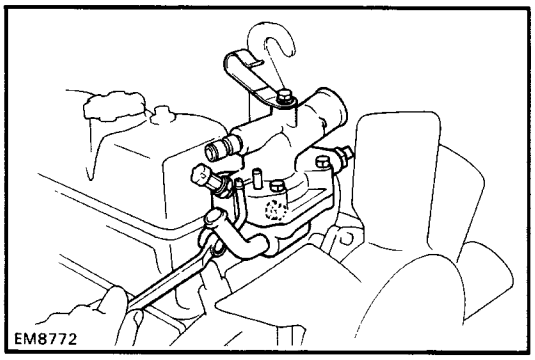
(a) Remove the two bolts and manifold stay.

(b) Remove the six bolts and three manifold heat insu–lators.





(c) Remove the ten bolts, four nuts, intake manifold, exhaust manifolds and gasket.

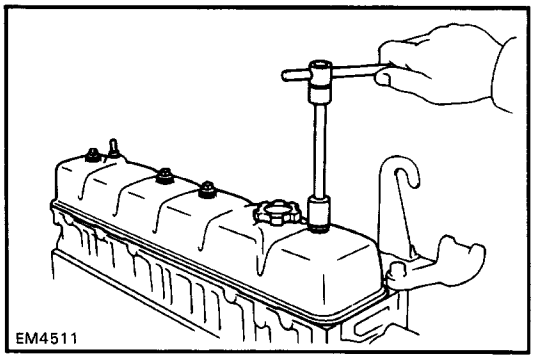


19. REMOVE WATER OUTLET ASSEMBLY

(a) Disconnect the water by–pass hose from the water outlet.

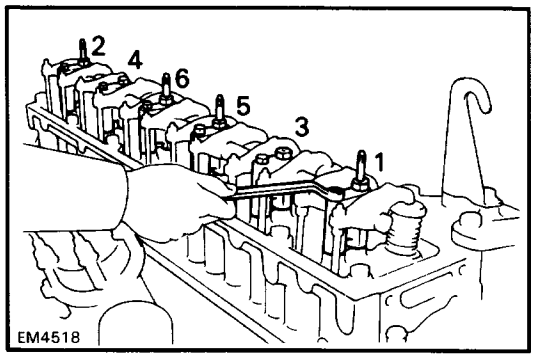
(b) Remove the two bolts holding the water outlet housing to the cylinder head, and remove the water outlet assembly and gasket.

20. REMOVE SPARK PLUGS



21. REMOVE CYLINDER HEAD COVER

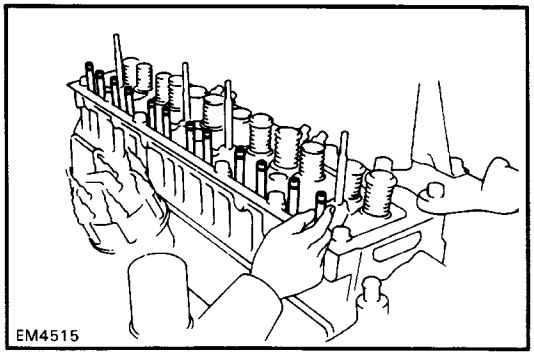
Remove the four cap nuts, seal washers, cylinder head cover and gasket.



22. REMOVE VALVE ROCKER SHAFT ASSEMBLY

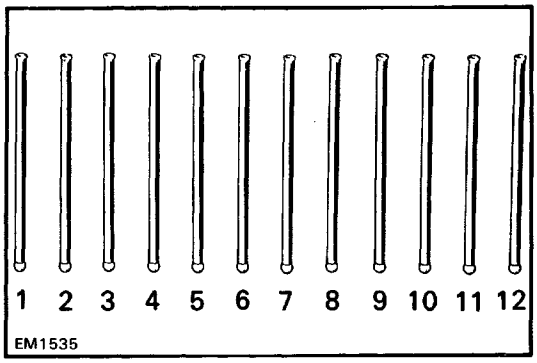
(a) Uniformly loosen and remove the eight bolts and four nuts in several passes, in the sequence shown.

(b) Remove the rocker shaft assembly.

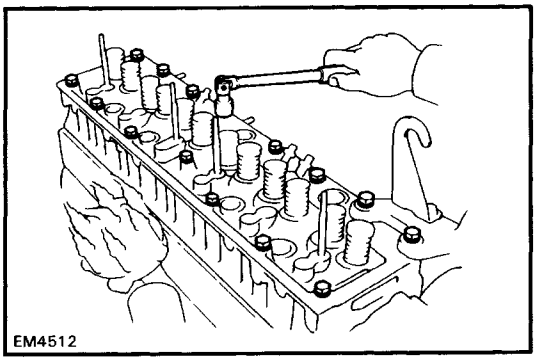


23. REMOVE PUSH RODS

Remove the twelve push rods i n order, beginning from the No. 1 push rod.



HINT: Arrange the push rods in correct order.

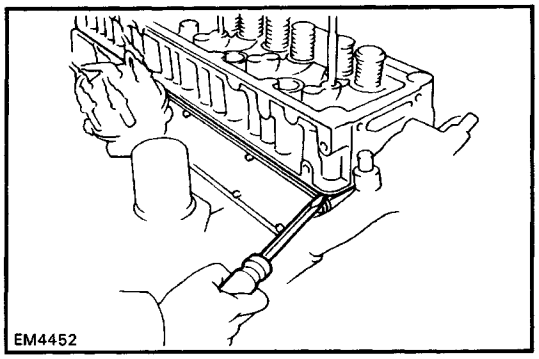


24. REMOVE CYLINDER HEAD

(a) Uniformly loosen and remove the fifteen head bolts in several passes, in the sequence shown.

NOTICE: Head warpage or cracking could result from removing the bolts in incorrect order.

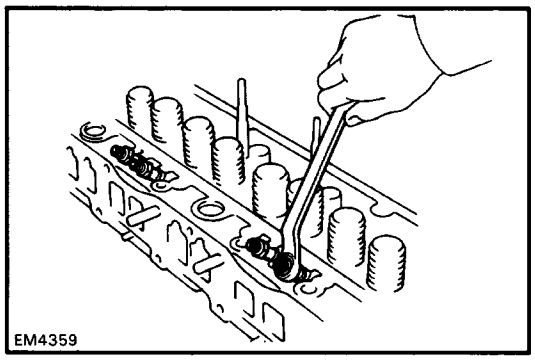
(b) Remove the air pump bracket with engine hanger.



(c) Lift the cylinder head from the dowels on the cylin– der block and place it on wooden blocks on a bench.

HINT: If the cylinder head is difficult to liftoff, pry with a screwdriver between the cylinder head and block saliences.

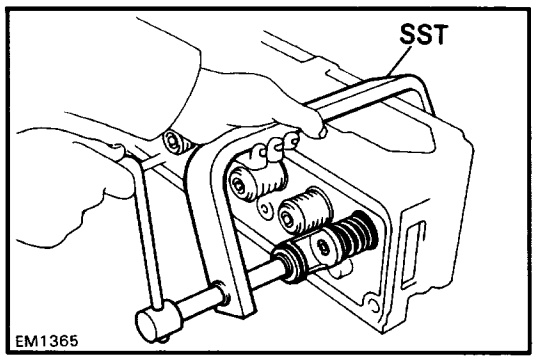
NOTICE: Be careful not to damage the cylinder head and block surface on the cylinder and head gasket sides.



DISASSEMBLY OF CYLINDER HEAD

(See page EM–13)

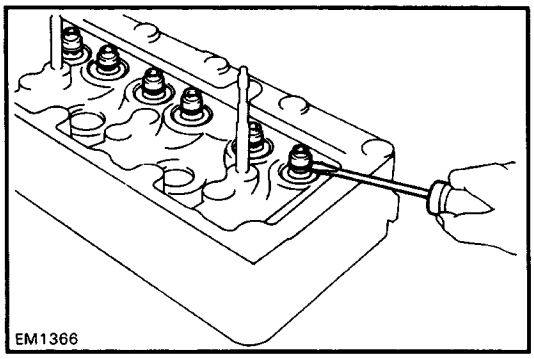
1. REMOVE AIR INJECTION MANIFOLD UNIONS



2. REMOVE VALVES

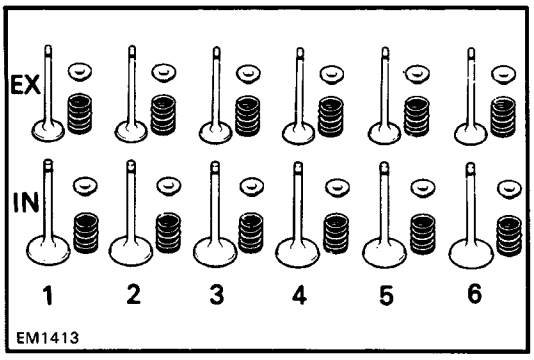
(a) Using SST, press the valve springs and remove the two keepers.
SST 09202–43013

(b) Remove the spring retainer (or valve rotator), valve springs and valve.

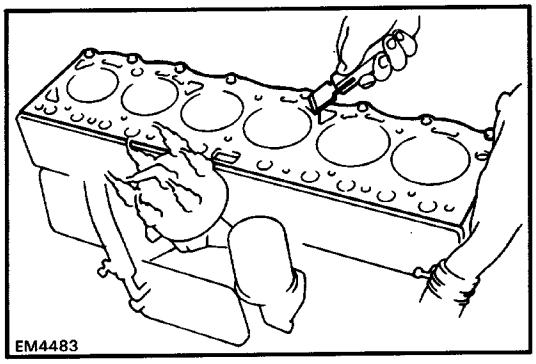


(c) Using a screwdriver, pry out the valve stem oil seal.

(d) Remove the valve spring seat.



HINT: Arrange the valves, valve springs and spring re–tainers (or valve rotators) in correct order.



INSPECTION, CLEANING AND REPAIR OF CYLINDER HEAD COMPONENTS

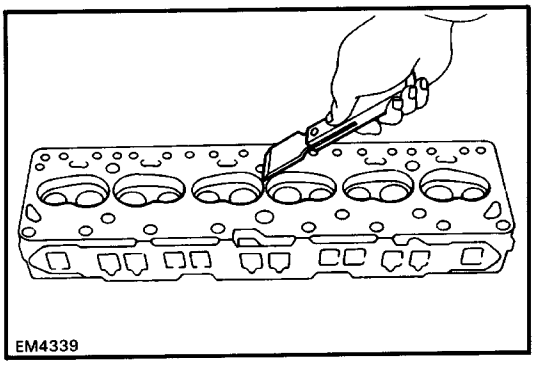
1. CLEAN TOP OF PISTONS AND TOP OF BLOCK

(a) Turn the crankshaft and bring each piston to top dead center. Using a gasket scraper, remove all the carbon from the piston top.

(b) Remove all the gasket material from the top of the block.

(c) Blow carbon and oil from the bolt holes.

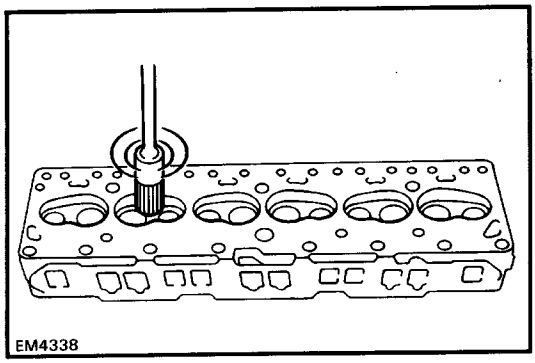
CAUTION: Protect your eyes when using high pressure air.



2. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket material from the manifold and head surface.

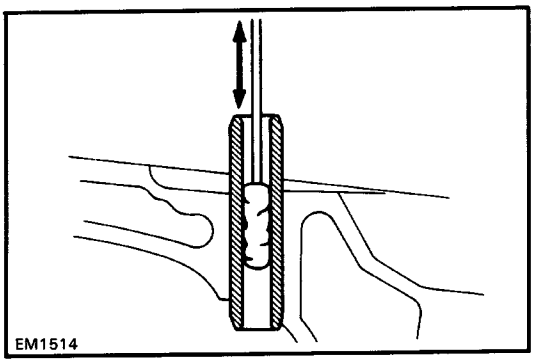
NOTICE: Be careful not to scratch the surfaces.



3. CLEAN COMBUSTION CHAMBERS

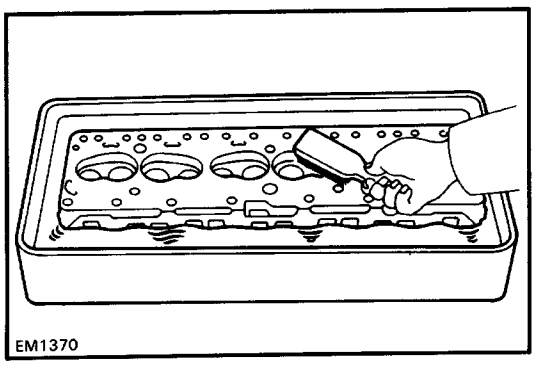
Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE: Be careful not to scratch the head gasket contact surface.



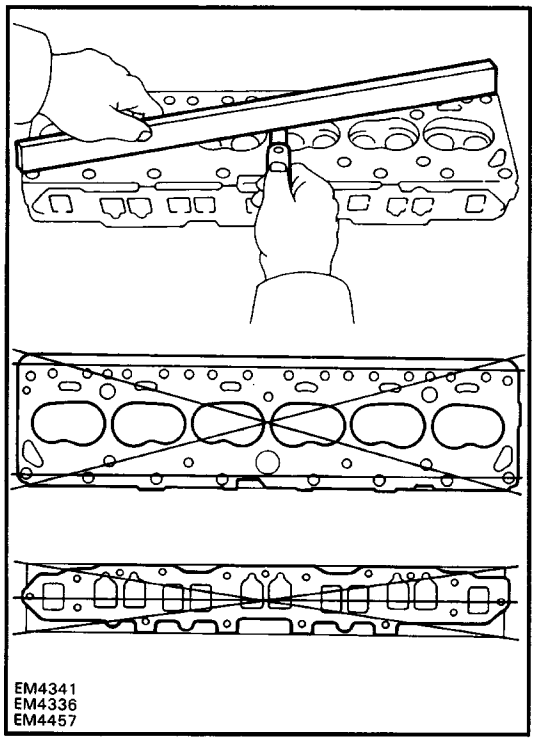
4. CLEAN VALVE GUIDE BUSHINGS

Using a valve guide bushing brush and solvent, clean all the guide bushings.



5. CLEAN CYLINDER HEAD

Using a soft brush and solvent, thoroughly clean the head.

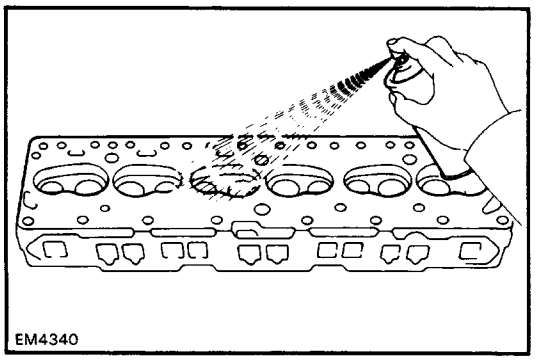


6. INSPECT CYLINDER HEAD FOR FLATNESS

Using a precision straight edge and thickness gauge, measure the surfaces contacting the cylinder block and manifolds for warpage.

Maximum warpage:
Cylinder block side 0.15 mm (0.0059 in.)
Manifold side 0.10 mm (0.0039 in.)

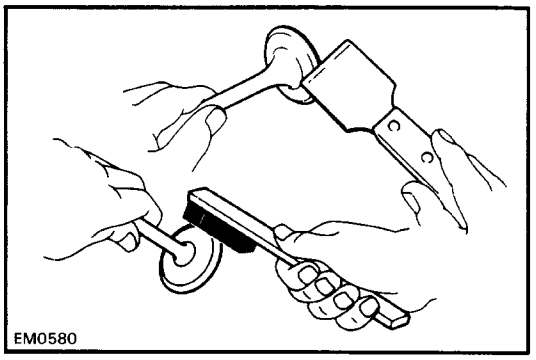
If warpage is greater than maximum, replace the cylinder head.



7. INSPECT CYLINDER HEAD FOR CRACKS

Using a dye penetrant, check the combustion chamber, intake and exhaust ports, head surface and the top of the head for cracks.

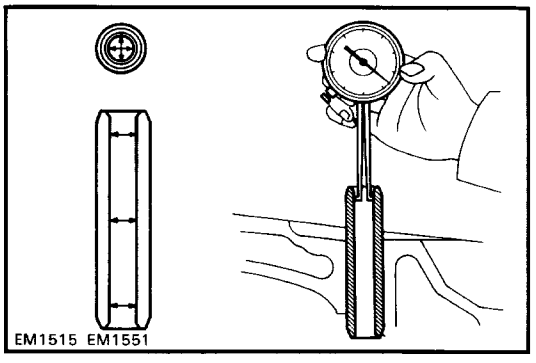
If cracked, replace the head.



8. CLEAN VALVES

(a) Use a gasket scraper, chip any carbon from the valve head.

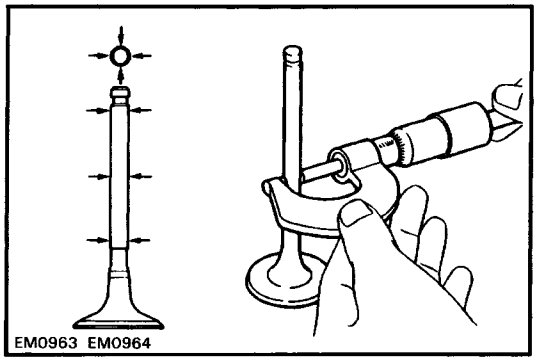
(b) Using a wire brush, thoroughly clean the valve.



9. INSPECT VALVE STEMS AND GUIDE BUSHINGS

(a) Using a caliper gauge, measure the inside diameter of the valve guide bushing.

Guide bushing inside diameter:
8.010–8.030 mm (0.3154–0.3161 in.)


EM0963 EM0964

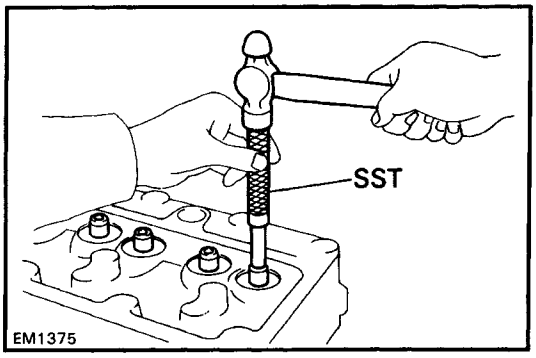
(b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:
Intake 7.970 – 7.985 mm
(0.3138 – 0.3144 in.)
Exhaust 7.960 – 7.975 mm
(0.3134 – 0.3140 in.)

(c) Subtract the valve stem diameter measurement from the valve guide bushing inside diameter measure–ment.

Standard oil clearance:
Intake 0.025 – 0.060 mm
(0.0010 – 0.0024 in.)
Exhaust 0.035 – 0.070 mm
(0.0014 – 0.0028 in.)
Maximum oil clearance:
Intake 0.10 mm (0.0039 in.)
Exhaust 0.12 mm (0.0047 in.)

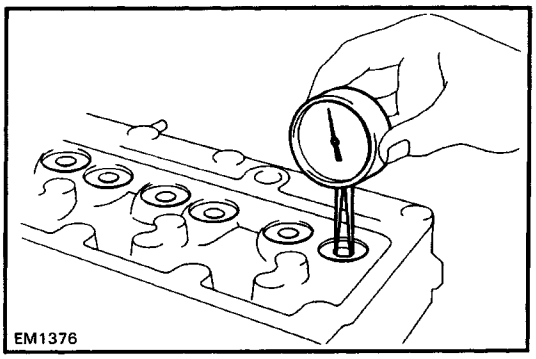
If the clearance is greater than maximum, replace the valve and guide bushing.



EM1375

10. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

(a) Using SST and a hammer, drive out the valve guide bushing.
SST 09201–60011


EM1376

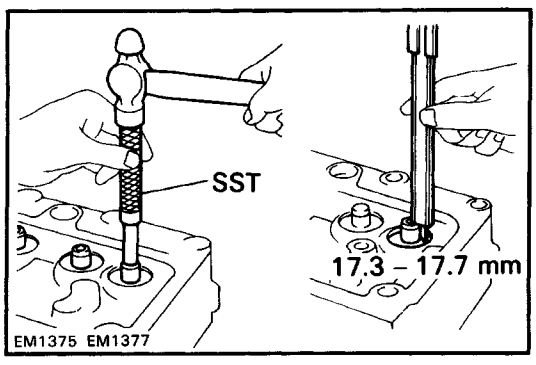
(b) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Standard valve guide bore (cold):
14.000 –14.018 mm (0.5512 – 0.5519 in.)

If the bushing bore diameter of the cylinder head is more than 14.018 mm (0.5512 in.), machine the bore to the following dimensions and install an oversized bushing (O/S 0.05).

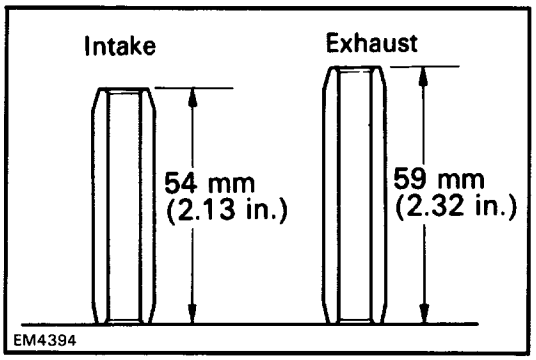
Rebored cylinder head bushing bore dimensions:
14.050 –14.068 mm (0.5531 – 0.5539 in.)

If the bushing bore diameter of the cylinder head is greater than 14.068 mm (0.5539 in.), replace the cylin–der head.

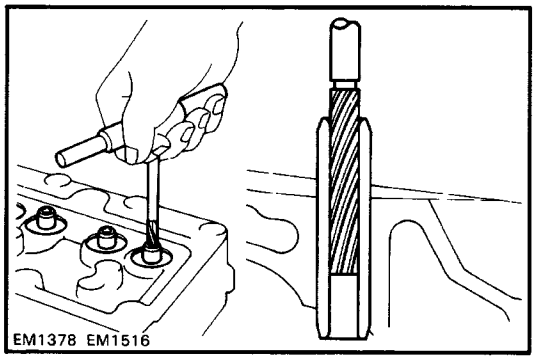


EM1375 EM1377

(c) Using SST and a hammer, drive in a new valve guide bushing to so it is protruding 17.3 –17.7 mm (0.681 – 0.697 in.) from the cylinder head.
SST 09201–60011

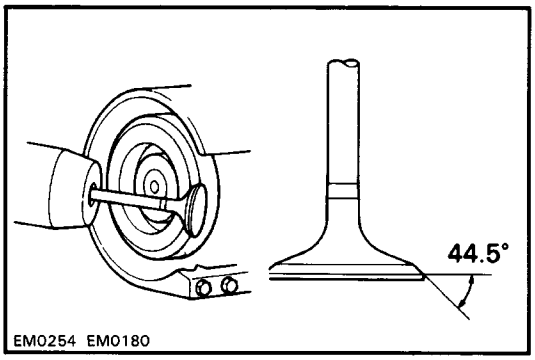


HINT: Different bushings are used for the intake and exhaust.



(d) Using a sharp 8.0 mm reamer, ream the valve guide bushing to obtain the specified clearance between the valve guide bushing and the new valve.

Intake clearance: 0.025 – 0.060 mm
(0.0010 – 0.0024 in.)
Exhaust clearance: 0.035 – 0.070 mm
(0.0014 – 0.0028 in.)

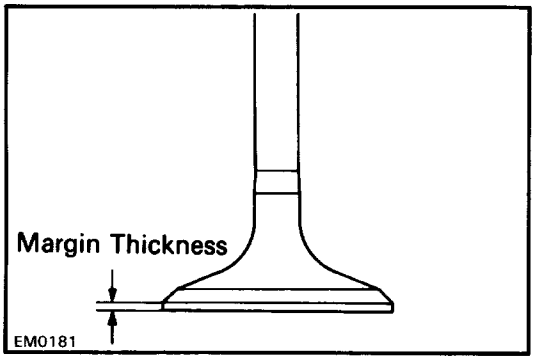


11. INSPECT AND GRIND VALVES

(a) Grind the valve only enough to remove pits and carbon.

(b) Check that the valve is ground to the correct valve face angle.

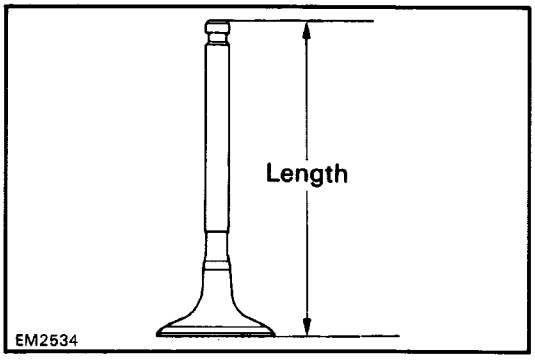
Valve face angle: 44.5°



(c) Check the valve head margin thickness.

Standard margin thickness:
Intake 1.5 – 2.1 mm (0.059 – 0.083 in.)
Exhaust 1.7 – 2.3 mm (0.067 – 0.091 in.)
Minimum margin thickness:
Intake 1.0 mm (0.039 in.)
Exhaust 1.2 mm (0.047 in.)

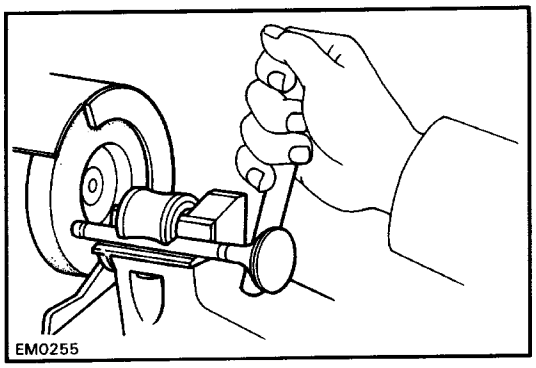
If the valve head margin thickness is less than minimum, replace the valve.



(d) Check the valve overall length.

Standard overall length:
Intake 124.8 mm (4.913 in.)
Exhaust 128.0 mm (5.039 in.)
Minimum overall length:
Intake 124.3 mm (4.894 in.)
Exhaust 127.5 mm (5.020 in.)

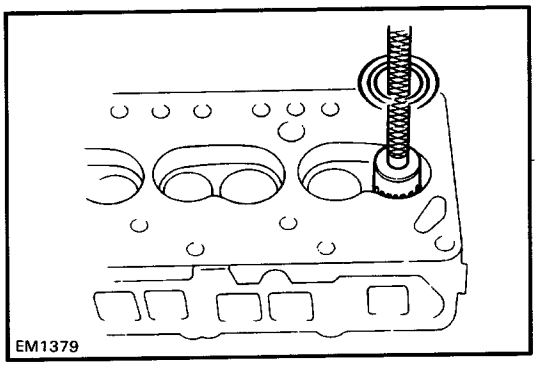
If the valve overall length is less than minimum, replace the valve.


EM0255

(e) Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

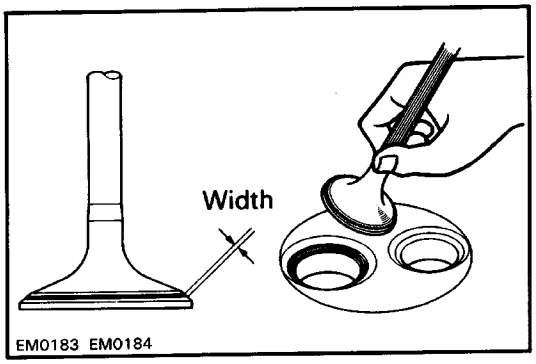
NOTICE: Do not grind off more than the minimum overall length.


EM1379

12. INSPECT AND CLEAN VALVE SEATS

(a) Using a 45˚ carbide cutter, resurface the valve seats.

Remove only enough metal to clean the seats.



EM0183 EM0184

(b) Check the valve seating position.

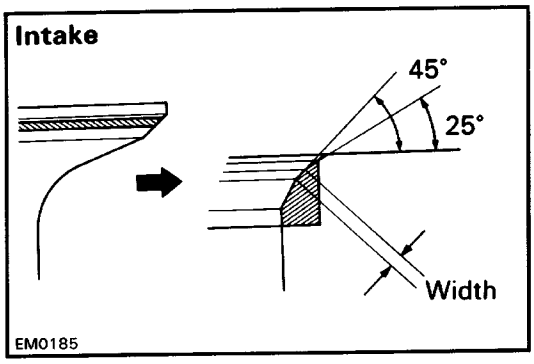
Apply a thin coat of prussian blue (or white lead) to the valve face. Install the valve. While applying light pressure to the valve, do not rotate the valve.

(c) Check the valve face and seat for the following:

- If blue appears 360˚ around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360˚ around the valve seat, the guide and seat are concentric. If not, resurface the seat.
- Check that the seat contact is on the middle of the valve face with the following width:

Intake 1.1 –1.7 mm (0.043 – 0.067 in.)

Exhaust 1.4 – 2.0 mm (0.055 – 0.079 in.)

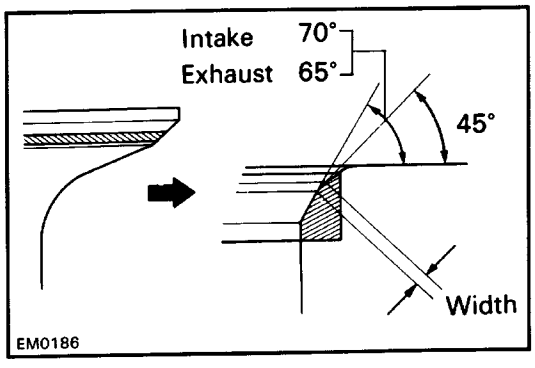


EM0185

If not, correct the valve seat as follows:

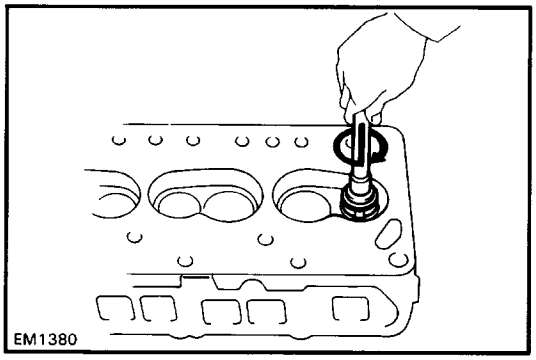
(1) (intake)

If the seating is too high on the valve face, use 25˚ (IN) and 45˚ cutters to correct the seat.

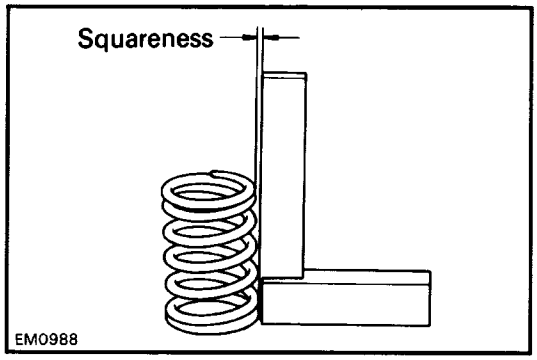


EM0186

(2) If the seating is too low on the valve face, use 70˚ (IN) or 65˚ (EX) and 45˚ cutters to correct the seat.



(d) Hand–lap the valve and valve seat with an abrasive compound.
(e) After hand–lapping, lean the valve and valve seat.

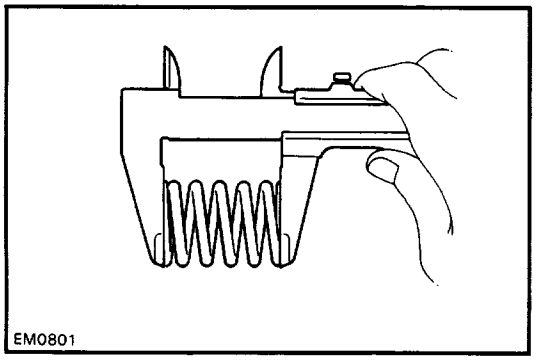


13. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the squareness of the valve spring.

Maximum squareness: 1.8 mm (0.071 in.)

If squareness is greater than maximum, replace the valve spring.

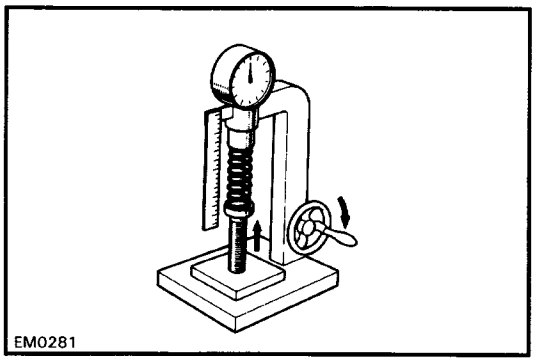


(b) Using calipers, measure the free length of the valve spring.

Standard free length: 51.5 mm (2.028 in.)

Minimum free length: 50.0 mm (1.967 in.)

If the length is less than minimum, replace the valve.

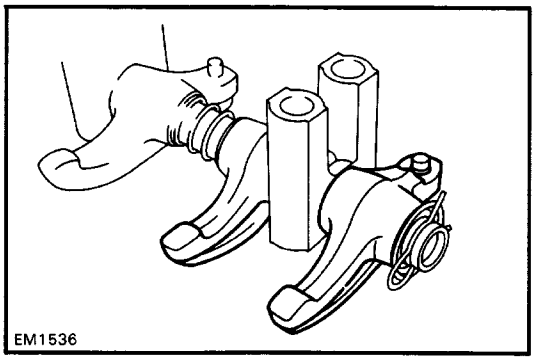


(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Standard installed tension:
319 N (32.5 kgf, 71.6 lbf) at 43.0 mm (1.693 in.)

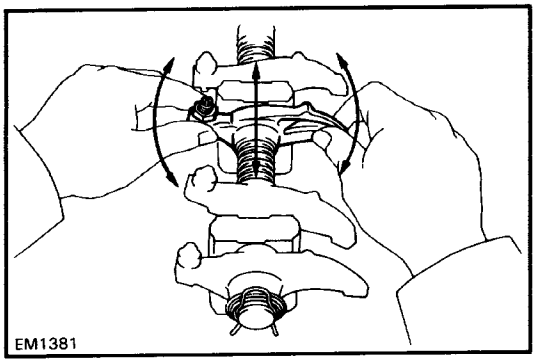
Minimum installed tension:
265 N (27 kgf, 59.5 lbf)

If the installed tension is less than minimum, replace the valve spring.



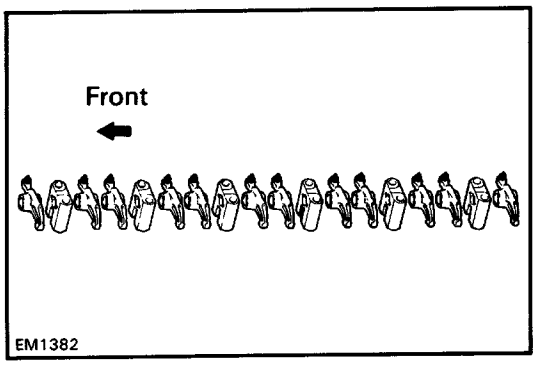
14. INSPECT ROCKER ARM AND SHAFT

(a) Inspect the valve contacting surface of the rocker arm for wear.


EM1381

(b) Inspect the rocker arm–to–shaft clearance by moving each rocker arm as shown in the illustration.

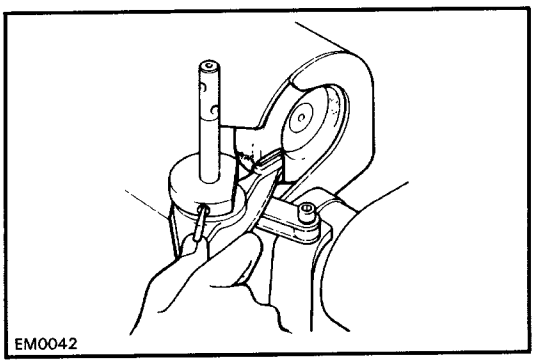
If movement is felt, disassemble and inspect.



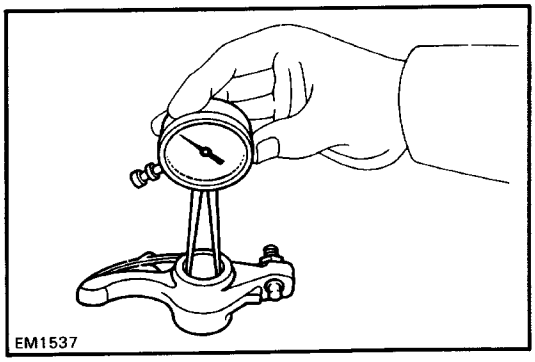
EM1382

(c) Disassemble the valve rocker shaft assembly.

HINT: Arrange the rocker arms and rocker supports in correct order.


EM0042

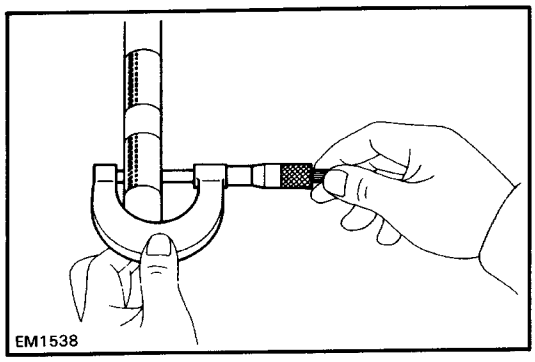
If the contacting surface of the rocker arm is worn, resurface it with a valve refacer and oil stone or replace the rocker arm.


EM1537

(d) Inspect the oil clearance between the rocker arm and shaft.

- Using a caliper gauge, measure the inside diameter of the rocker arm.

Rocker arm inside diameter:
18.494 –18.515 mm (0.7281 – 0.7289 in.)


EM1538

- Using a micrometer, measure the diameter of the rocker shaft.

Rocker shaft diameter:
18.464 –18.485 mm (0.7269 – 0.7278 in.)

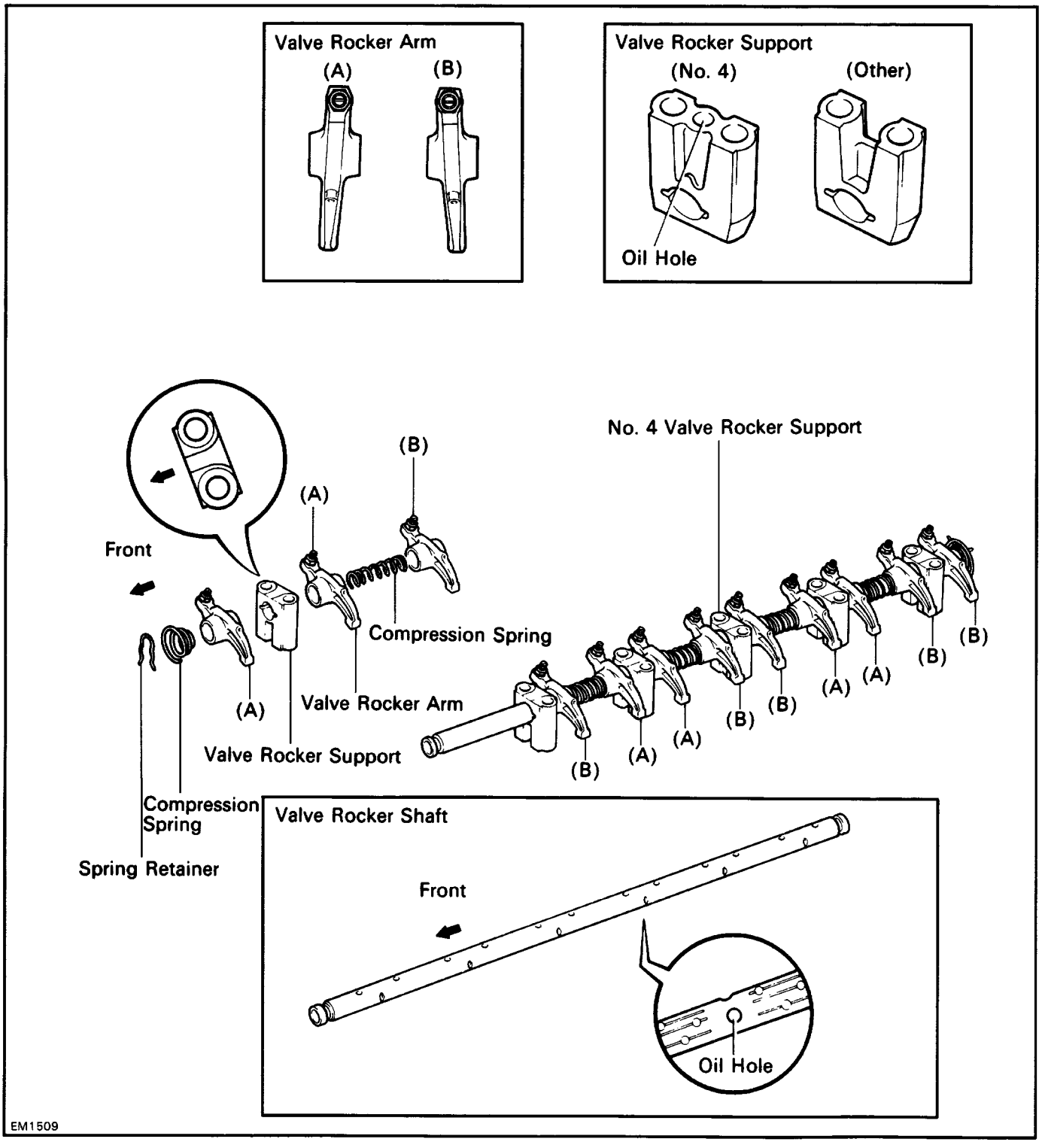
- Subtract the rocker shaft diameter measurement from the inside diameter measurement of the rocker arm.

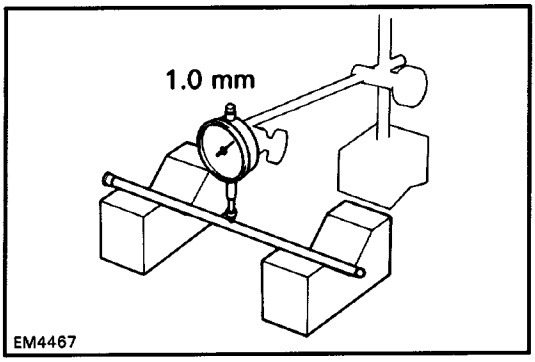
Standard oil clearance: 0.009 – 0.051 mm (0.0004 – 0.0020 in.)

Maximum oil clearance: 0.08 mm (0.0031 in.)

If the clearance is greater than maximum, replace the rocker arm and shaft.

(e) Assemble the valve rocker shaft assembly as shown.





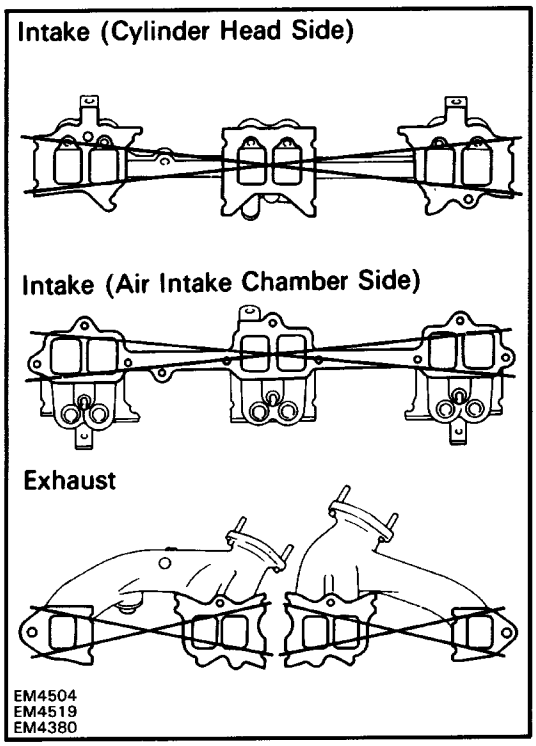
15. INSPECT PUSH RODS

(a) Place the push rod on V–blocks.

(b) Using a dial indicator, measure the circle runout at the center of the push rod.

Maximum circle runout: 1.0 mm (0.039 in.)

If the circle runout is greater than maximum, replace the push rod.

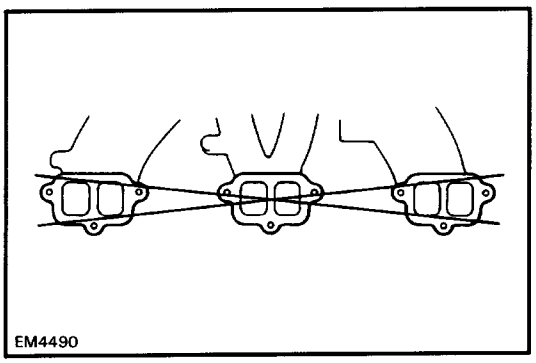


16. INSPECT INTAKE AND EXHAUST MANIFOLDS

Using a precision straight edge and thickness gauge, measure the surfaces contacting the cylinder head and air intake chamber for warpage.

Maximum warpage: 0.50 mm (0.0197 in.)

If the warpage is greater than maximum, replace the manifold.



17. INSPECT AIR INTAKE CHAMBER

Using a precision straight edge and thickness gauge, measure the surfaces contacting the intake manifold for warpage.

Maximum warpage: 0.2 mm (0.008 in.)

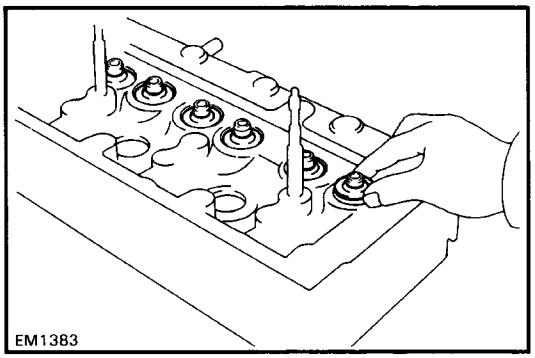
If the warpage is greater than maximum, replace the air intake chamber.

ASSEMBLY OF CYLINDER HEAD

(See page EM–13)

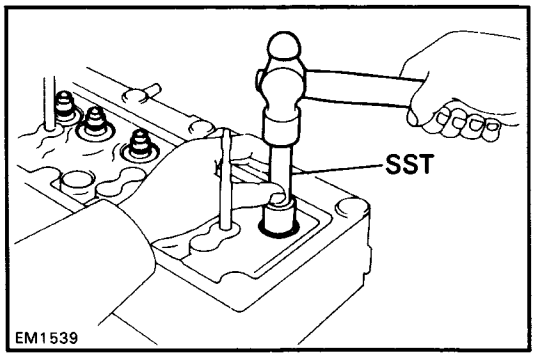
HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.

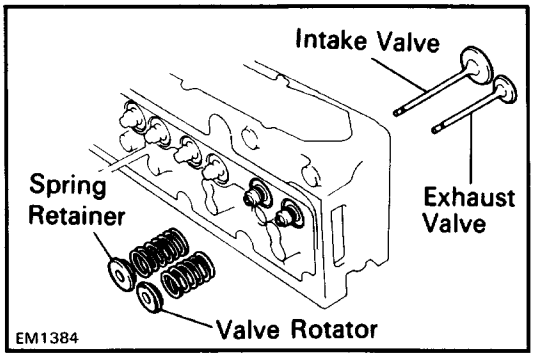


1. INSTALL VALVES

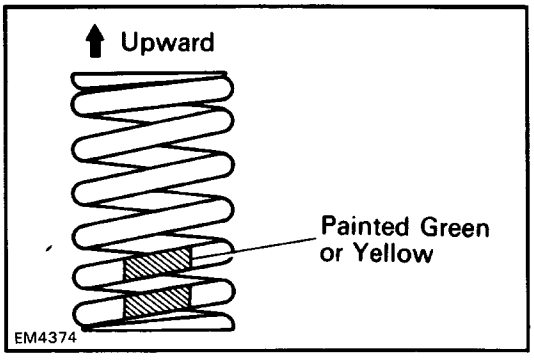
(a) Place the valve spring seat on spring seat.



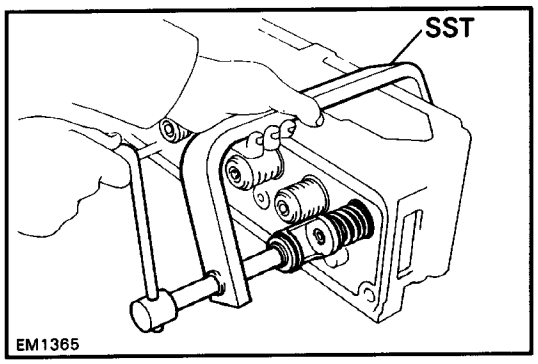
(b) Using SST and a hammer, tap in a new oil seal.
SST 09201–31010



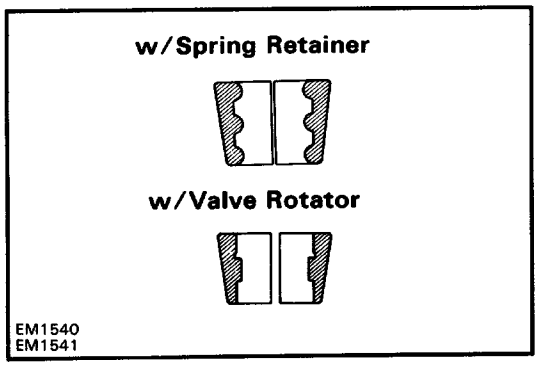
(c) Install the valve, spring and spring retainer (or valve rotator).



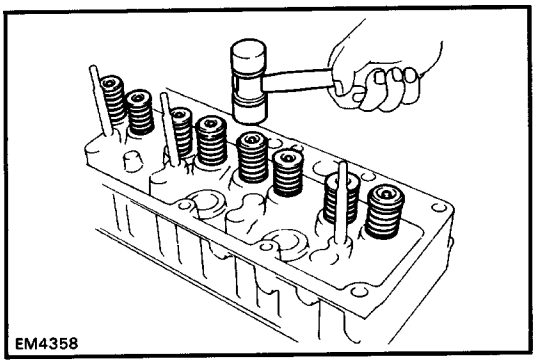
HINT: Install the spring in the correct direction as illus–tration.



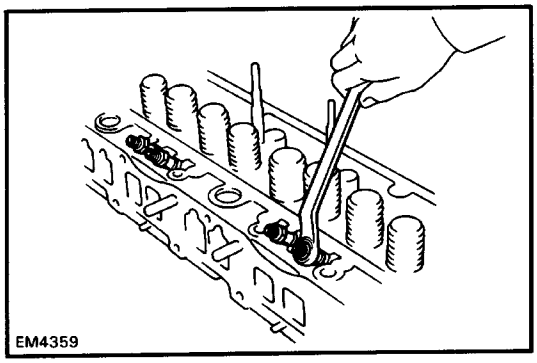
(d) Using SST, compress the valve spring and place the two keepers around the valve stem.
SST 09202–43013



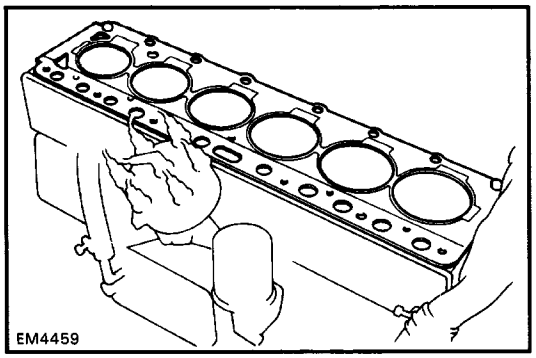
HINT: Different keepers are used for the spring retainer and valve rotator.



(e) Using a plastic–faced hammer, lightly tap the valve stem tip to assure proper fit.



2. INSTALL AIR INJECTION MANIFOLD UNIONS



INSTALLATION OF CYLINDER HEAD

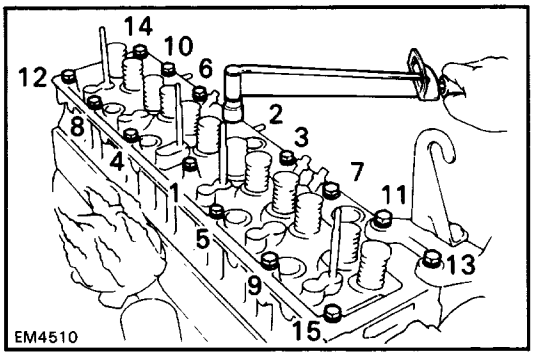
(See page EM–13)

1. INSTALL CYLINDER HEAD

(a) Place a new cylinder head gasket on the cylinder block.

NOTICE: Be careful of the installation direction.

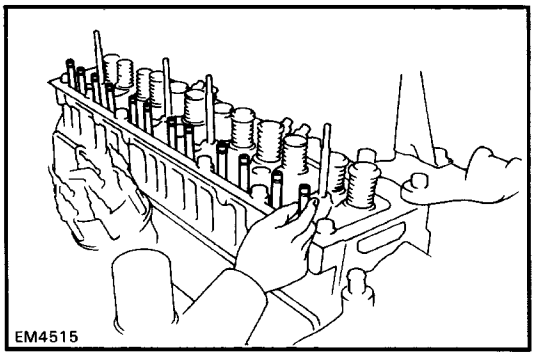
(b) Place the cylinder head on the cylinder head gasket.



(c) Apply a light coat of engine oil on the threads and under the cylinder head bolts.

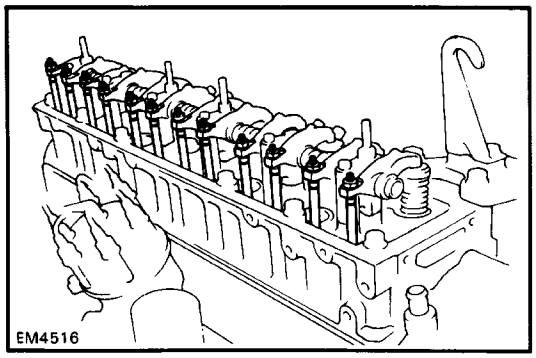
(d) Install and uniformly tighten the ten cylinder head bolts with the plate washers in several passes, in the sequence shown.

Torque: 123 N–m (1,250 kgf–cm, 90 ft–lbf)



2. INSTALL PUSH RODS

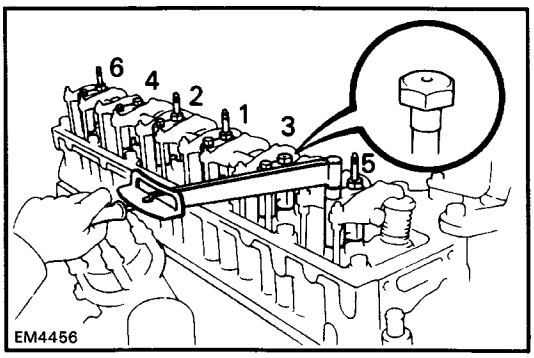
Install the twelve push rods.



3. INSTALL VALVE ROCKER SHAFT ASSEMBLY

(a) Place the rocker shaft assembly on the cylinder head.

(b) Align the rocker arm adjusting screws with the heads of the push rods.



(c) Install and uniformly tighten the eight bolts and four nuts in several passes, in the sequence shown.

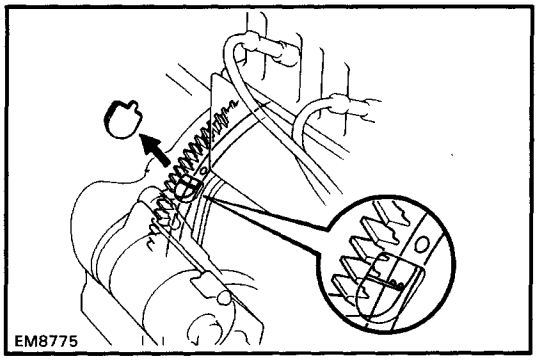
Torque:

12 mm bolt head

24 N–m (240 kgf–cm, 17 ft–lbf)

14 mm bolt head and nut

33 N–m (340 kgf–cm, 25 ft–lbf)

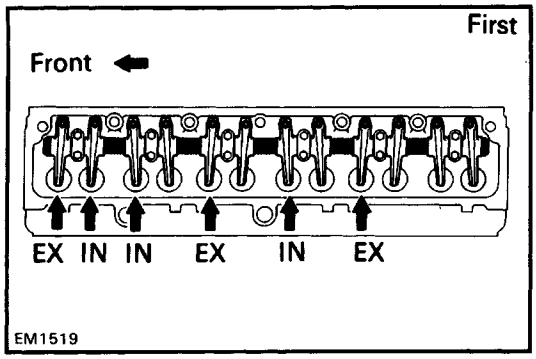


4. ADJUST VALVE CLEARANCE

(a) Set the No. 1 cylinder to TDC /compression.

- Align the TDC mark of the drive plate with the timing pointer by turning the crankshaft clock–wise with a wrench.
- Check that the rocker arms on the No. 1 cylinder are loose and rocker arms on the No. 6 are tight.

If not, turn the crankshaft one revolution (360˚) and align the mark as above.



(b) Adjust only those valves indicated by arrows.

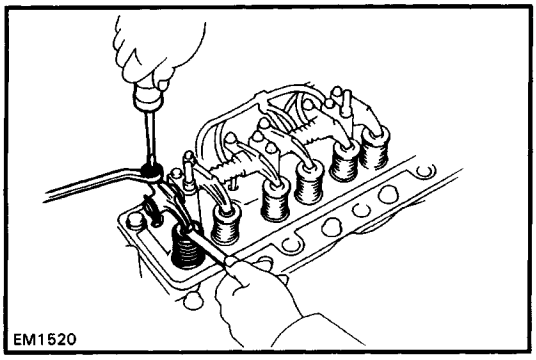
(Reference)

Valve clearance (Hot):

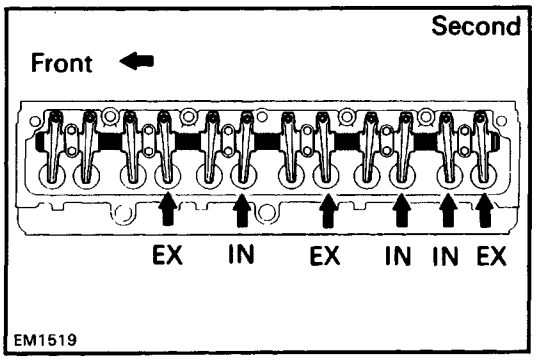
Intake 0.20 mm (0.008 in.)

Exhaust 0.35 mm (0.014 in.)

HINT: After warm up, readjust the valve clearance.

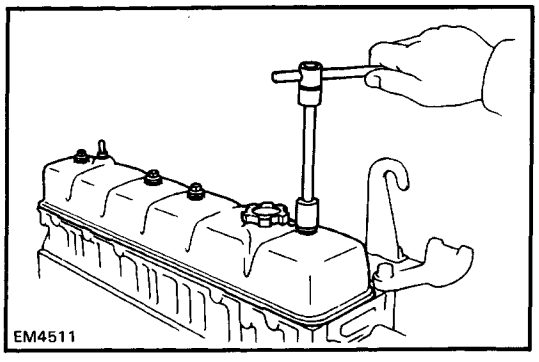


- Using a thickness gauge, measure the valve clearance between the valve stem and rocker arm. Loosen the lock nut and turn the adjust-ing screw to set the proper clearance.
  Hold the adjusting screw in position and tight-en the lock nut.
- Recheck the valve clearance. The thickness gauge should slide with a very slight drag.



(c) Turn the crankshaft pulley one revolution (360˚) and align the mark as above.
Adjust only the valves indicated by arrows.

5. INSTALL SPARK PLUGS

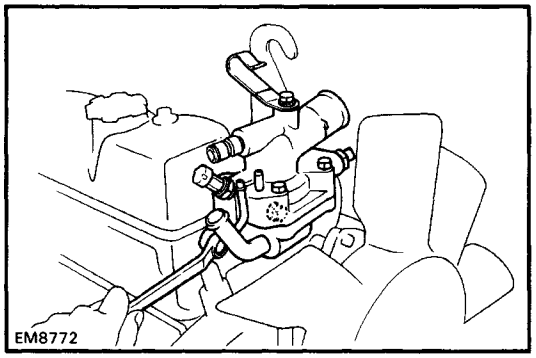


6. INSTALL CYLINDER HEAD COVER

(a) Install a new gasket to the cylinder head cover.

(b) Install the cylinder head cover with four seal wash–ers and cap nuts.

Torque: 8.8 N–m (90 kgf–cm, 78 in.–lbf)

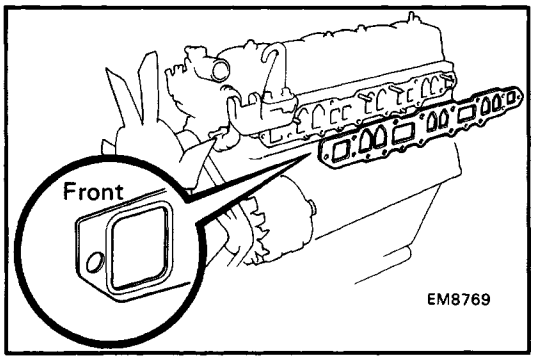


7. INSTALL WATER OUTLET ASSEMBLY

(a) Install. a new gasket and the water outlet assembly with the two bolts.

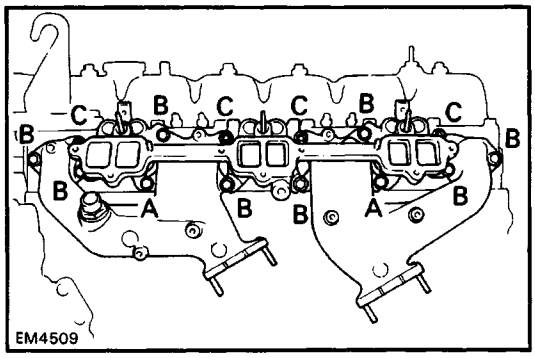
Torque: 2.5 N–m (250 kgf–cm, 18 ft–lbf)

(b) Connect the water by–pass hose.



8. INSTALL INTAKE AND EXHAUST MANIFOLDS

(a) Place a new gasket so that the front mark is toward the front side.



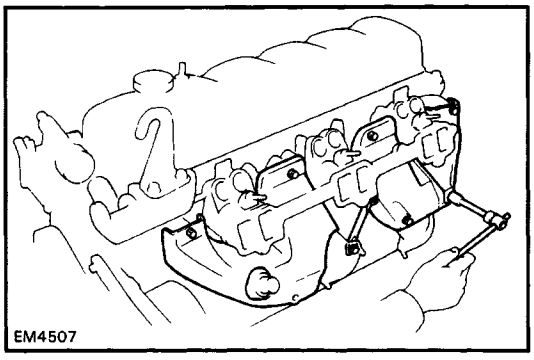
(b) Install the intake manifold and exhaust manifolds with the ten bolts, four plate washers and nuts. Torque the bolts and nuts.

Torque:

17 mm bolt (A) 69 N–m (700 kgf–cm, 51 ft–lbf)

14 mm bolt (B) 50 N–m (510 kgf–cm, 37 ft–lbf)

Nut (C) 56 N–m (570 kgf–cm, 41 ft–lbf)

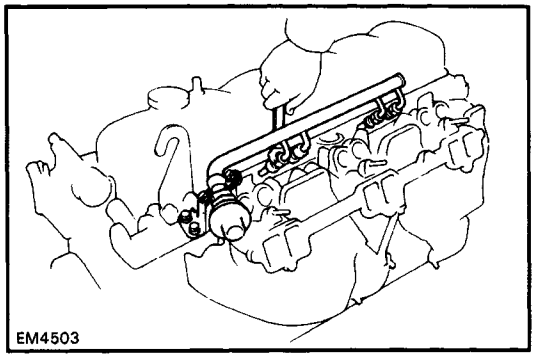


(c) Install the three manifold heat insulators with the six bolts.

Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)

(d) Install the manifold stay with the two bolts.

Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)



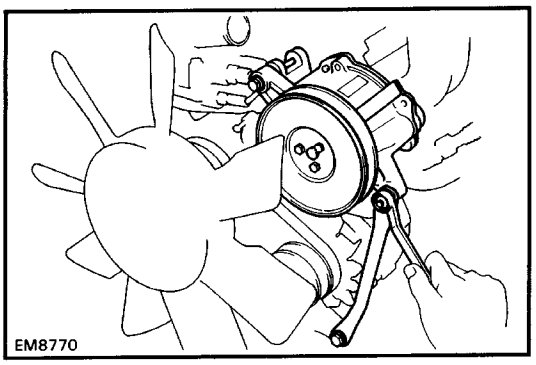
9. INSTALL AIR INJECTION MANIFOLD

Install the air injection manifold with the four union nuts and two clamp bolts.

Torque: 21 N–m (210 kgf–cm, 15 ft.–lbf)

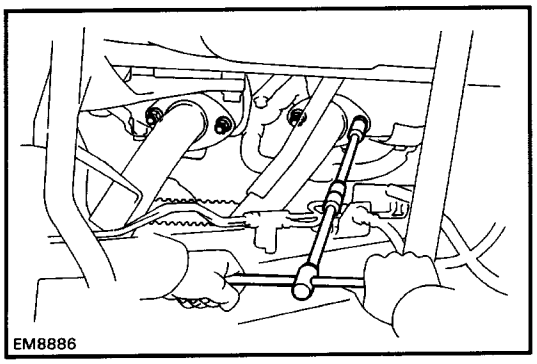
10. INSTALL INJECTORS AND DELIVERY PIPE

(See steps 1 to 6 on pages FI–65 to FI–67)



11. INSTALL AIR PUMP

(a) Install the air pump with the through bolt and nut.
(b) Install the air pump stay with the bolt and nut.
(c) Connect the air hose.



12. RAISE VEHICLE

NOTICE: Be sure the vehicle is securely supported.

13. CONNECT EXHAUST PIPE TO EXHAUST MANIFOLD

(a) Place two new gasket on the exhaust pipe.
(b) Connect the exhaust pipe with four new nuts.
Torque the nuts.

Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)

14. CONNECT FUEL HOSES

15. CONNECT RADIATOR UPPER HOSE

16. INSTALL HEATER WATER (OIL COOLER) PIPE

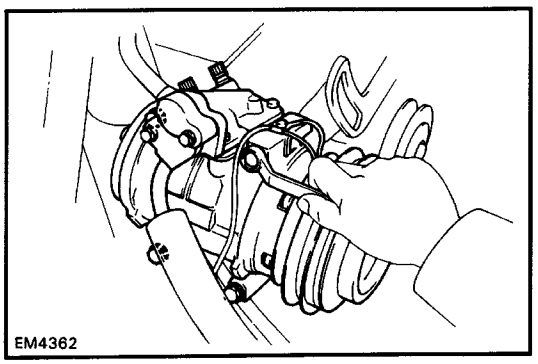
(a) Install the heater water (oil cooler) pipe with the bolts.
(b) Connect the hoses to the water outlet, water pump, oil cooler and heater water pipe.

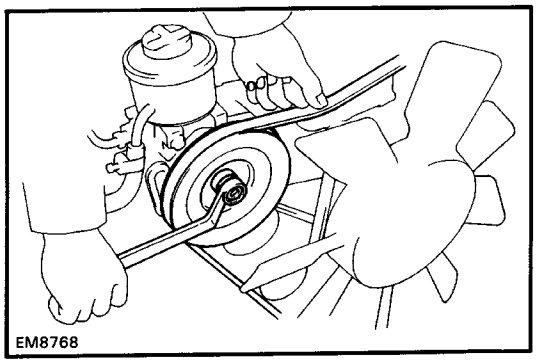
17. CONNECT HIGH–TENSION CORDS TO SPARK PLUGS AND IGNITION COIL

18. INSTALL PS PUMP AND A/C COMPRESSOR BRACKETS

19. INSTALL A/C COMPRESSOR

(a) Install the A/C compressor with the four bolts.
(b) Install and adjust the drive belt.
(See page MA–4)

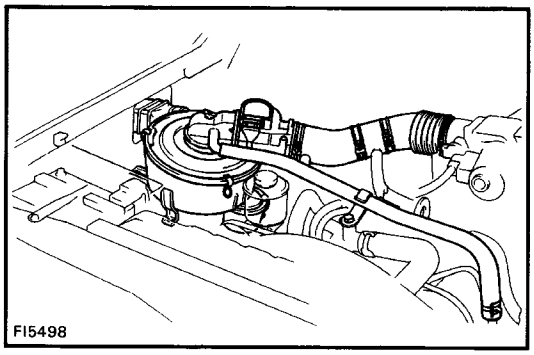




20. INSTALL PS PUMP

(a) Install the PS pump with the two bolts. Do not tighten the bolts.
(b) Install the woodruff key, drive pulley with the plate washer spring washer and mount nut.
(c) Install and adjust drive belt
(See page MA–4)
(d) Push on the drive belt to hold the pulley in place and torque the pulley nut.

Torque: 47 N–m (480 kgf–cm, 35 ft–lbf)



21. INSTALL AIR INTAKE HOSE, AIR FLOW METER AND AIR CLEANER CAP

(a) Install the air intake hose, air flow meter and air cleaner cap with the wing nut and three clips.

(b) Connect the following hoses:

- ISC hose
- Air pump hose
- Distributor hose
- PCV hose
- Three hoses from the intake chamber rear side
- Two hoses from the VCV of the charcoal canister

22. CONNECT ACCELERATOR AND THROTTLE CABLES, AND ADJUST THEM

23. FILL WITH ENGINE COOLANT (See page CO–5)

Capacity:
w/ Front heater
17.5 liters (18.5 US qts, 15.4 Imp. qts)
w/ Front and rear heaters
19.5 liters (20.6 US qts, 17.2 Imp. qts)

24. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

25. START ENGINE AND CHECK FOR LEAKS

26. PERFORM ENGINE ADJUSTMENT

(a) Adjust the ignition timing.
(See steps 10 to 14 on page IG–11)
Ignition timing: 7° BTDC @ idle
(w/ Terminals TE1 and E1 connected)

(b) Adjust the valve clearance. (See page EM–9)
Valve clearance (Hot):
Intake 0.20 mm (0.008 in.)
Exhaust 0.35 mm (0.014 in.)

27. INSTALL HOOD

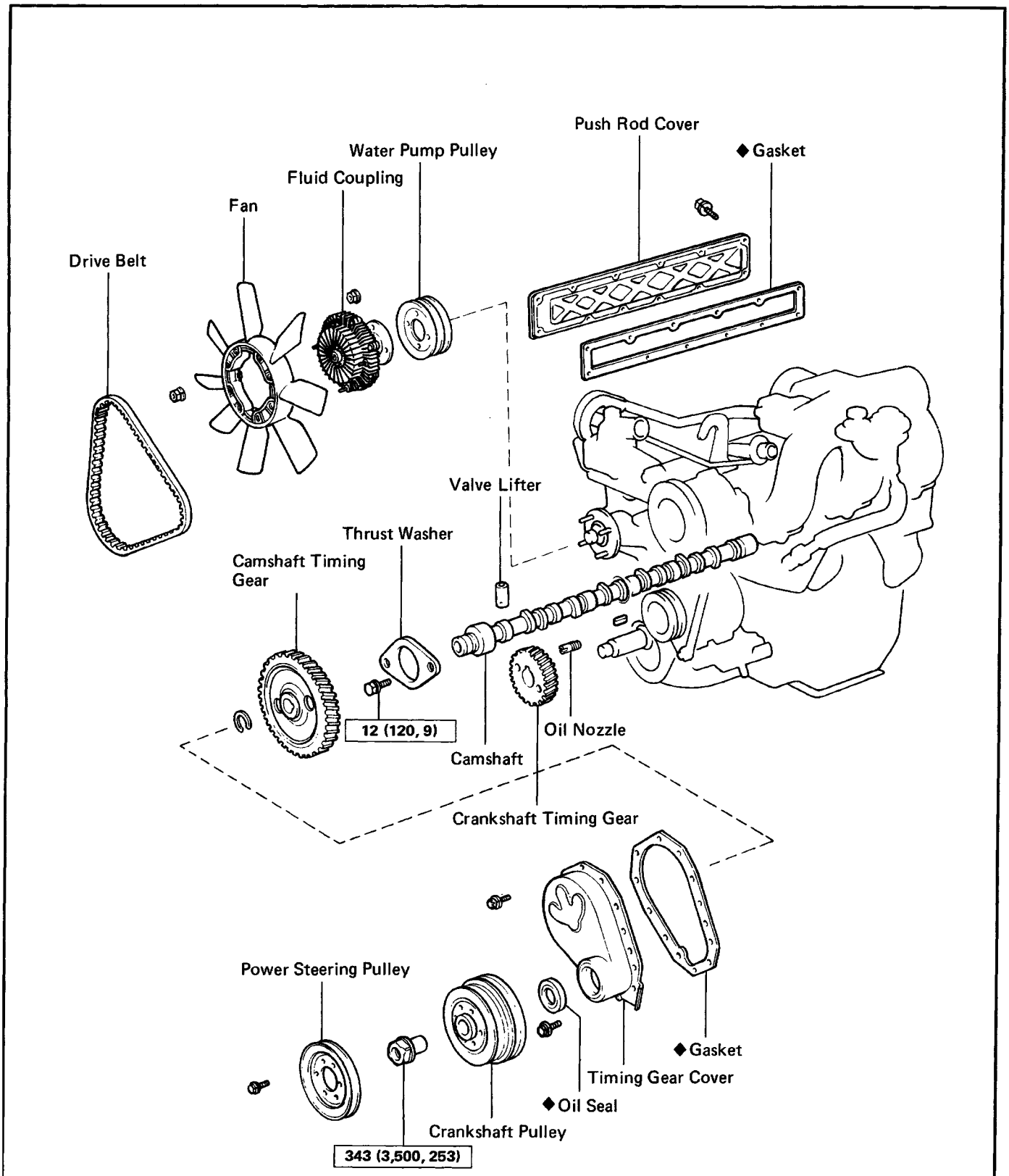
28. PERFORM ROAD TEST

Check for abnormal noise, shock, slippage and smooth operation.

29. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL

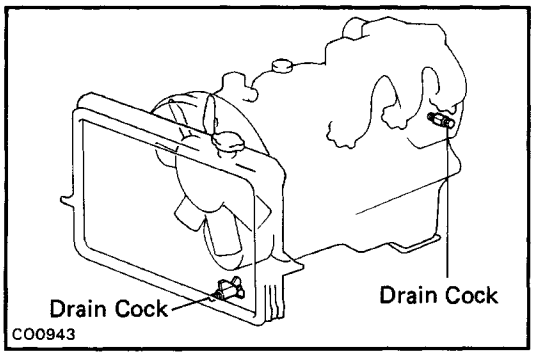
TIMING GEARS AND CAMSHAFT

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part



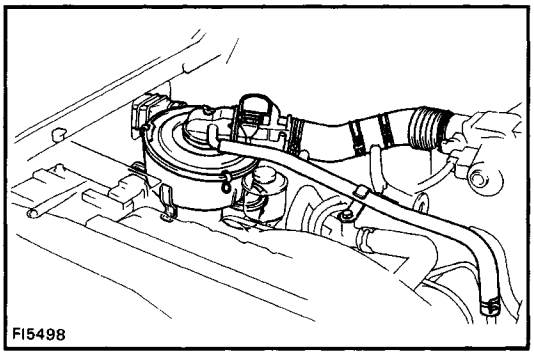
REMOVAL OF TIMING GEARS AND CAMSHAFT

(See page EM–35)

1. DRAIN ENGINE COOLANT

(See page CO–5)

2. DISCONNECT ACCELERATOR AND THROTTLE CABLES



3. REMOVE AIR INTAKE HOSE, AIR FLOW METER AND AIR CLEANER ASSEMBLY

(a) Disconnect the air flow meter connector and clamp.

(b) Disconnect the following hoses:

- ISC hose
- Air pump hose
- Distributor hose
- PCV hose
- Three hoses from the intake chamber rear side
- Two hoses from the VCV of the charcoal canister

(c) Loosen the air intake hose clamp.

(d) Remove the wing nut and loosen the three clips, and remove the air intake hose, air flow meter and air cleaner cap.

4. LOOSEN PS DRIVE PULLEY NUT

Push on the drive belt to hold the pulley in place and loosen the pulley nut.

5. REMOVE FLUID COUPLING WITH FAN AND WATER PUMP PULLEY

(See steps 2 to 6 on pages CO–6 and CO–7)

6. REMOVE PS PUMP AND A/C COMPRESSOR

(See steps 6 and 7 on page EM–14)

7. REMOVE PS AND A/C COMPRESSOR BRACKETS

8. REMOVE PS IDLER PULLEY AND BRACKET ASSEMBLY

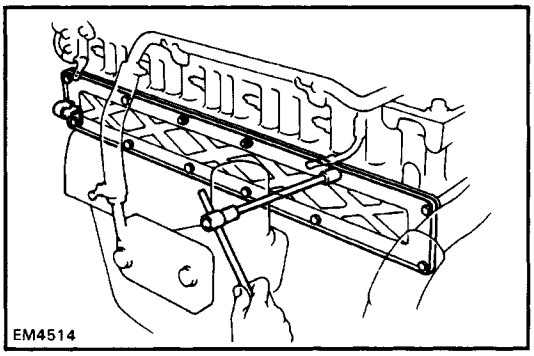
9. REMOVE DISTRIBUTOR

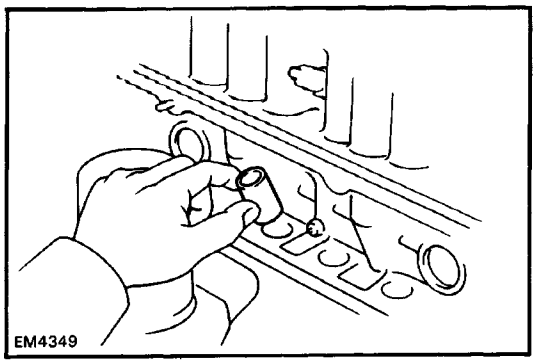
10. REMOVE VALVE ROCKER SHAFT ASSEMBLY

(See steps 21 to 23 on pages EM–16, EM–17)

11. REMOVE PUSH ROD COVER

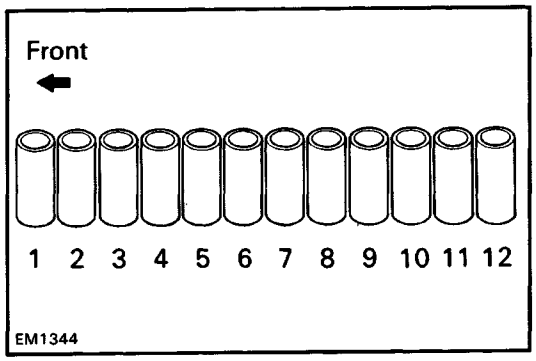
Remove the ten bolts, two nuts, push rod cover and gasket.



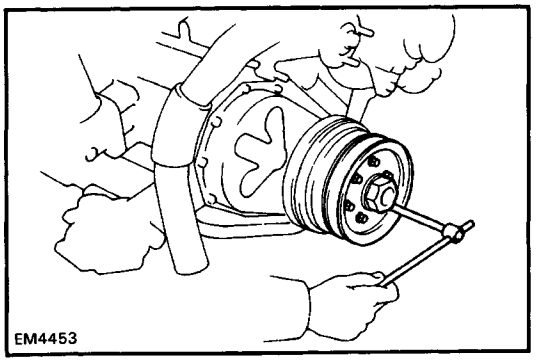


12. REMOVE VALVE LIFTERS

Remove the twelve valve lifters in order, beginning from the No.1 valve lifter.

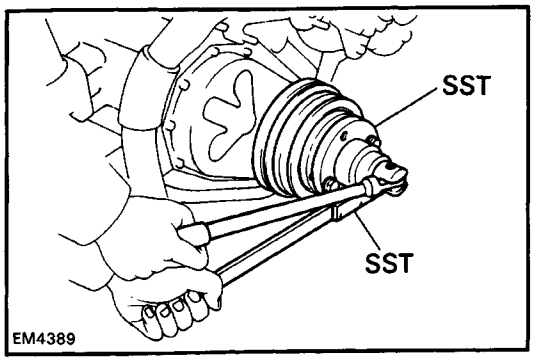


HINT: Arrange the valve lifters in correct order.



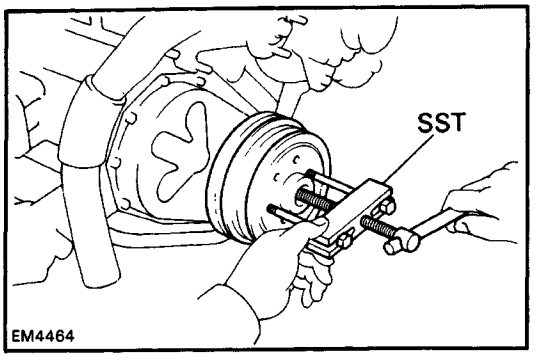
13. REMOVE PS PULLEY FROM CRANKSHAFT PULLEY

Remove the six bolts and PS pulley.



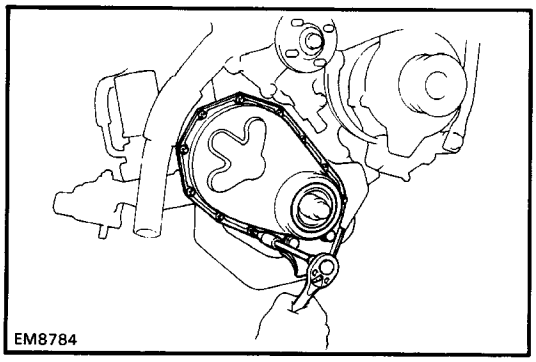
14. REMOVE CRANKSHAFT PULLEY

(a) Using SST and a 46 mm socket wrench, remove the pulley mount bolt.
SST 09213–58011 and 09330–00021



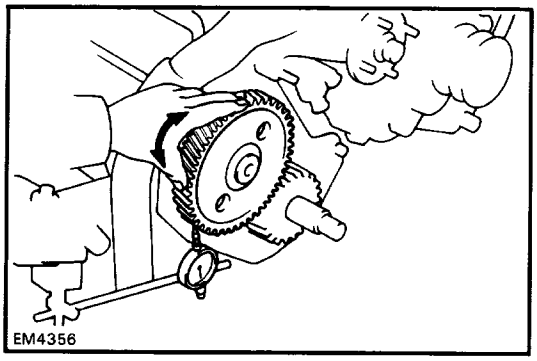
(b) Using SST, remove the pulley.
SST 09213–60017 (09213–00020, 09213–00030, 09213–00090)

15. REMOVE OIL COOLER PIPE WITH HOSE



16. REMOVE TIMING GEAR COVER

Using a torx wrench and socket wrench, remove the ten torx bolts, two bolt, gear cover and gasket.
Torx wrench: T30 (Part No. 09042–00010 or locally manufactured tool.)



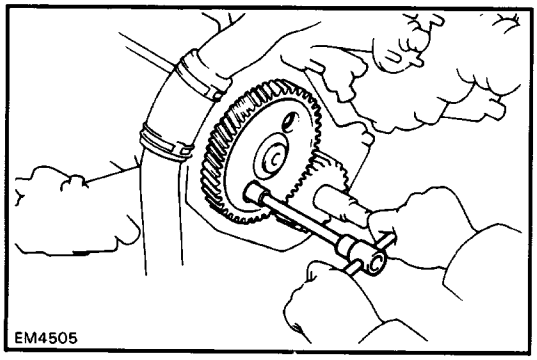
17. CHECK TIMING GEAR BACKLASH

Using a dial indicator, measure the backlash at several places while turning the camshaft clockwise and counterclockwise.

Standard backlash: 0.100 – 0.183 mm (0.0039 – 0.0072 in.)

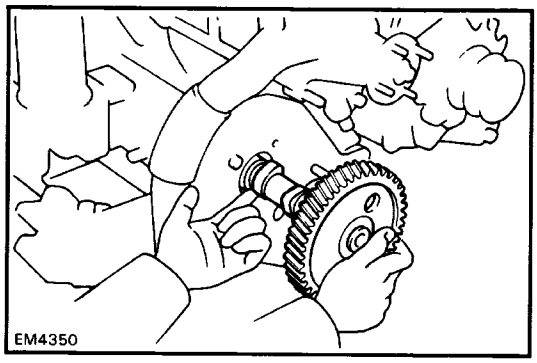
Maximum backlash: 0.25 mm (0.0098 in.)

If the backlash is greater than maximum, replace the camshaft and crankshaft timing gears.



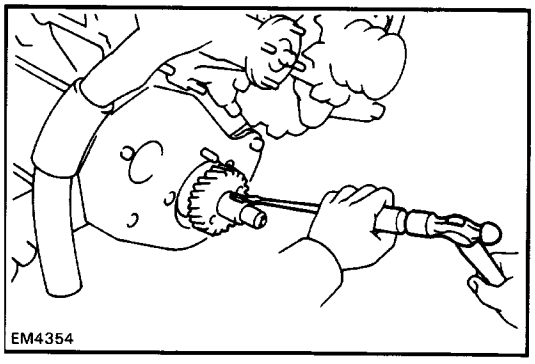
18. REMOVE CAMSHAFT TIMING GEAR AND CAMSHAFT ASSEMBLY

(a) Remove the two bolts.



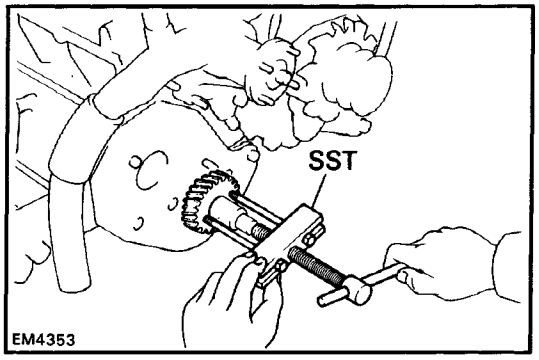
(b) Carefully pull out the camshaft and timing gear assembly.

NOTICE: Be careful not to damage the camshaft bearing.



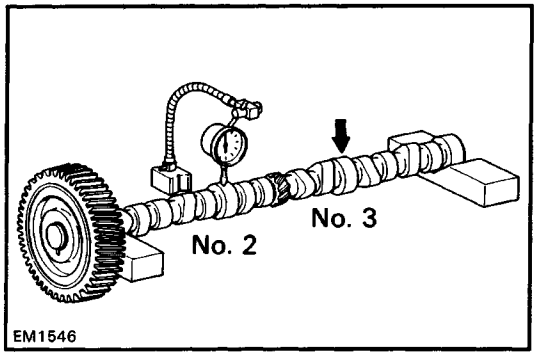
19. REMOVE CRANKSHAFT TIMING GEAR

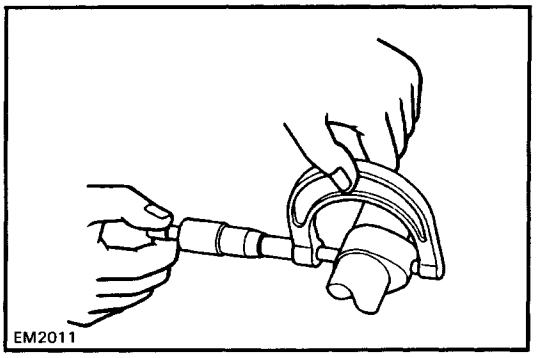
(a) Using a screwdriver and hammer, tap out the crankshaft pulley set key.



(b) Using SST, remove the timing gear.
SST 09213–60017 (09213–00020, 09213–00030, 09213–00090)

20. IF NECESSARY, REMOVE OIL NOZZLE





INSPECTION OF TIMING GEARS AND CAMSHAFT

INSPECT CAMSHAFT

(a) Place the camshaft on V–blocks and, using a dial indicator, measure the circle runout at the No. 2 and No.3 journals.

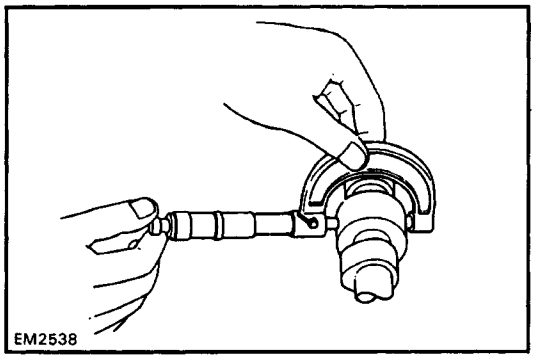
Maximum circle runout: 0.30 mm (0.0118 in.)

If the circle runout is greater than maximum, replace the camshaft.

(b) Using a micrometer, measure the cam lobe height.

Standard cam lobe height:
Intake 38.36 – 38.46 mm
(1.5102 –1.5142 in.)
Exhaust 38.25 – 38.35 mm
(1.5059 –1.5098 in.)
Minimum cam lobe height:
Intake 38.0 mm (1.496 in.)
Exhaust 37.9 mm (1.492 in.)

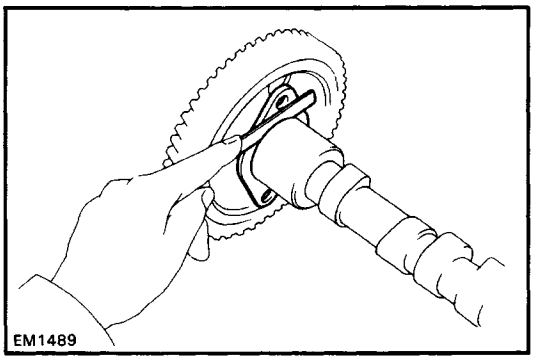
If the lobe height is less than minimum, replace the camshaft.



(c) Using a micrometer, measure the the journal diame–ter.

Journal diameter (from front side):
STD size No. 1 47.955 – 47.975 mm
(1.8880 –1.8888 in.)
No. 2 46.455 – 46.475 mm
(1,8289 –1.8297 in.)
No. 3 44.955 – 44.975 mm
(1.7699 –1.7707 in.)
No. 4 43.455 – 43.475 mm
(1.7108 –1.7116 in.)
U/S 0.25 No. 1 47.715 – 47.725 mm
(1.8785 –1.8789 in.)
No. 2 46.215 – 46.225 mm
(1.8195 –1.8199 in.)
No. 3 44.715 – 44.725 mm
(1.7604 –1.7608 in.)
No. 4 43.215 – 43.225 mm
(1.7014 –1.7018 in.)
U/S 0.50 No. 1 47.465 – 47.475 mm
(1.8687 –1.8691 in.)
No. 2 45.965 – 45.975 mm
(1.8096 –1.8888 in.)
No. 3 44.465 – 44.475 mm
(1.7506 –1.7510 in.)
No. 4 42.965 – 42.975 mm
(1.6915 –1.6919 in.)

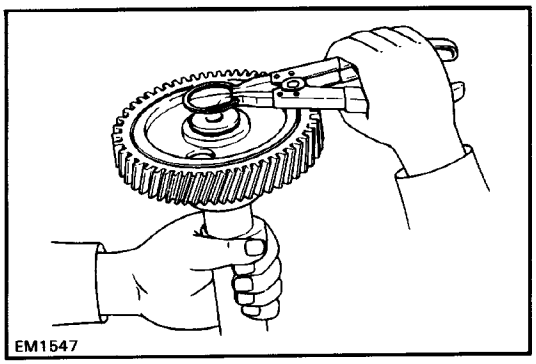
If the journal diameter is not within specification, check the oil clearance. (See page EM–68)



(d) Using a thickness gauge, measure the thrust clear–ance between the thrust plate and camshaft.

Standard thrust clearance: 0.200 – 0.290 mm
(0.0079 – 0.0114 in.)
Maximum thrust clearance: 0.33 mm (0.0130 in.)

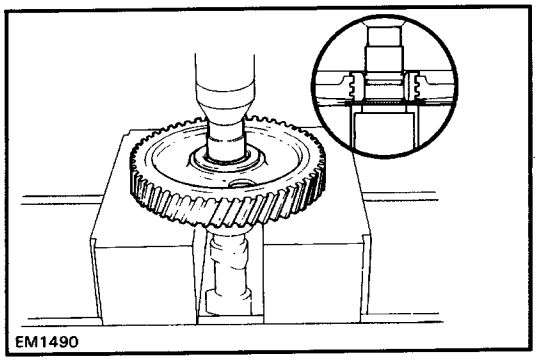
If the clearance is greater than maximum, replace the thrust plate. If necessary, replace the camshaft.


EM1547

DISASSEMBLY AND ASSEMBLY OF CAMSHAFT AND CAMSHAFT TIMING GEAR

1. DISASSEMBLE CAMSHAFT AND CAMSHAFT TIMING GEAR

(a) Using snap ring pliers, remove the snap ring.

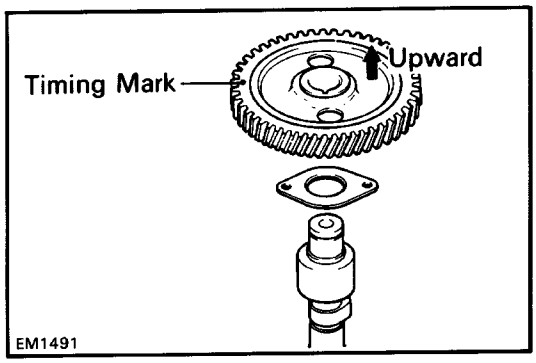

EM1490

(b) Using a socket wrench and press, press out camshaft.

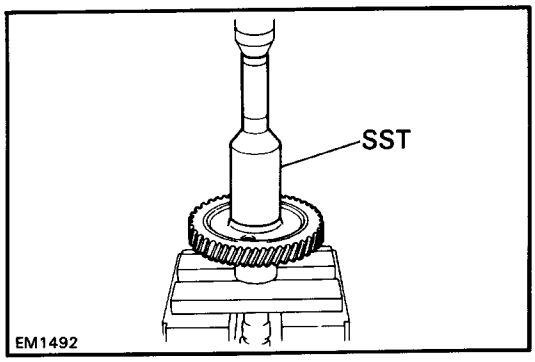
2. ASSEMBLE CAMSHAFT AND CAMSHAFT TIMING GEAR

(a) Install the timing gear set key to the camshaft.

(b) Assemble the camshaft, thrust plate and timing gear as shown.

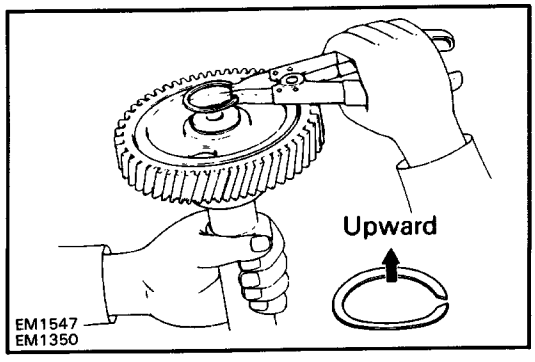


EM1491



EM1492

(c) Using SST and a press, align the timing gear set key with the key groove of the timing gear, and press in the camshaft.
SST 09214–60010



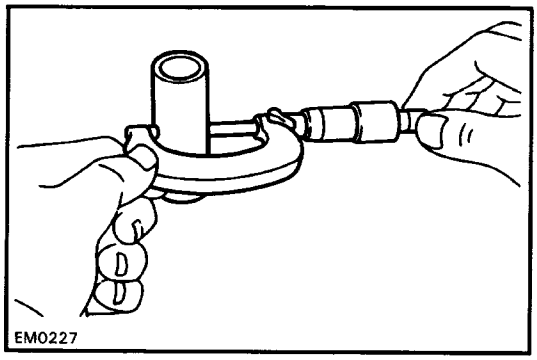
EM1547
EM1350

(d) Using snap ring pliers, install the snap ring as shown.

3. CHECK CAMSHAFT THRUST CLEARANCE

(See page EM–40)

Thrust clearance: 0.200 – 0.290 mm
(0.0079 – 0.0114 in.)



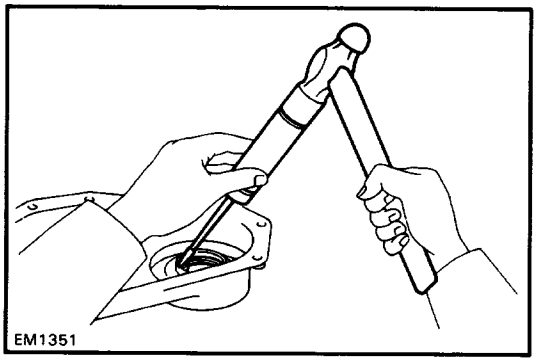
INSPECTION OF VALVE LIFTERS

INSPECT VALVE LIFTERS

Using a micrometer, measure the valve lifter diameter.

Lifter diameter:
STD size 21.387 – 21.404 mm
(0.8420 – 0.8427 in.)
O/S 0.05 21.437 – 21.454 mm
(0.8440 – 0.8446 in.)

If the diameter is not within specification, check the oil clearance. (See page EM–70)



REPLACEMENT OF CRANKSHAFT FRONT OIL SEAL

REPLACE CRANKSHAFT FRONT OIL SEAL

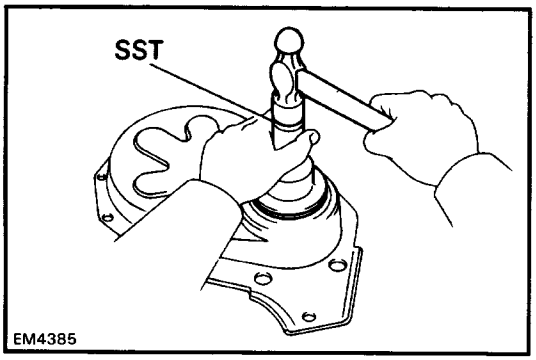
HINT: There are two methods (A and B) to replace the oil seal as follows.

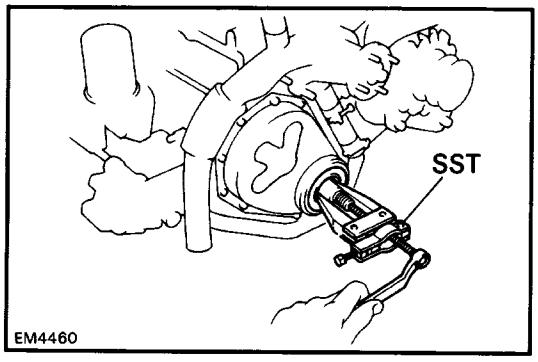
A. If timing gear cover is removed from cylinder block:

(a) Using a screwdriver and hammer, tap out the oil seal.

(b) Using SST and a hammer, tap in a new oil seal.
SST 09223–50010

(c) Apply MP grease to the oil seal.



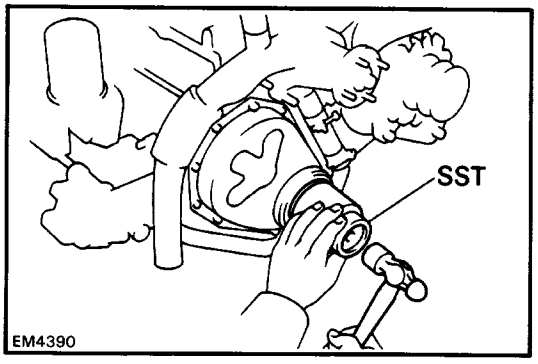


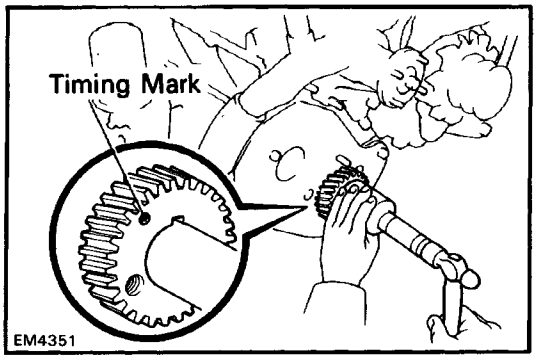
B. If timing gear cover is installed to cylinder block:

(a) Using SST, remove the oil seal.
SST 09308–10010

(b) Apply MP grease to a new oil seal lip.

(c) Using SST and a hammer tap in the oil seal.
SST 09238–47012





INSTALLATION OF TIMING GEARS AND CAMSHAFT

(See page EM–35)

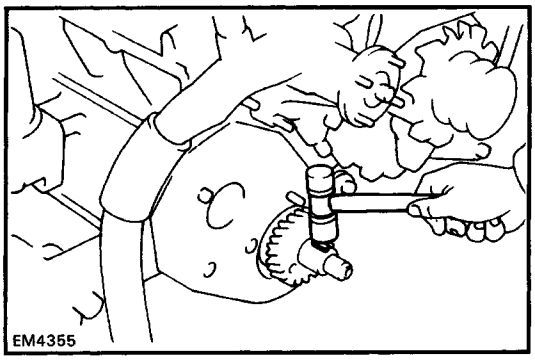
1. INSTALL CRANKSHAFT TIMING GEAR

(a) Put the timing gear on the crankshaft with timing mark facing forward.

(b) Align the timing gear set key with the key groove of the timing gear.

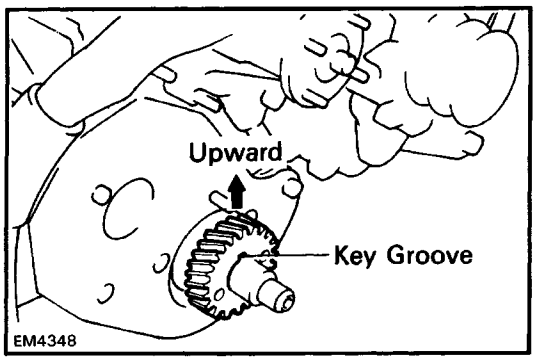
(c) Using SST and a hammer, tap in the timing gear.
SST 09214–60010

(d) Using a plastic–faced hammer, tap in the crankshaft pulley set key.

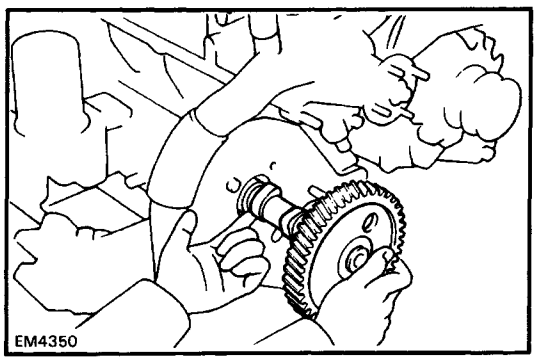


2. INSTALL CAMSHAFT TIMING GEAR AND CAMSHAFT ASSEMBLY

(a) Set the crankshaft timing gear with the key groove facing upward by turning the crankshaft clockwise.

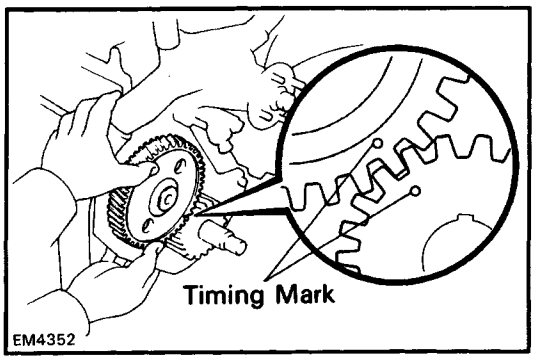


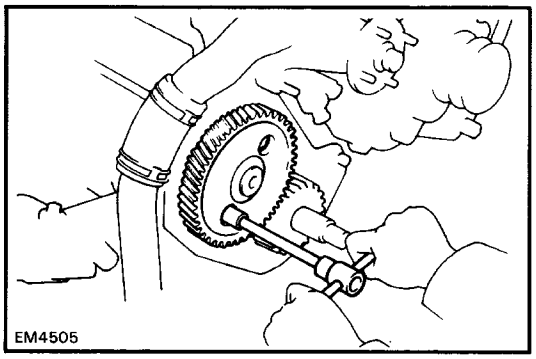
(b) insert the camshaft into the cylinder block.
NOTICE: Be careful not to damage the camshaft bearings.



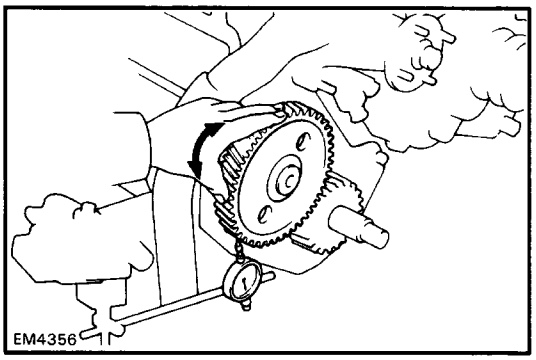
(c) Align the timing marks of the crankshaft and camshaft timing gears and mesh the gears.

HINT: At this time, No. 6 cylinder should be at TDC/ compression.





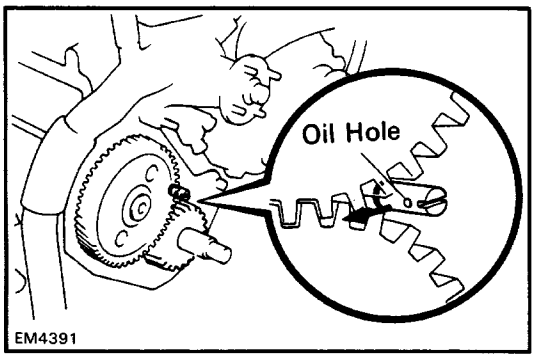
(d) Install the two bolts mounting the thrust washer to the cylinder block. Torque the bolts.
Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)



3. CHECK TIMING GEAR BACKLASH

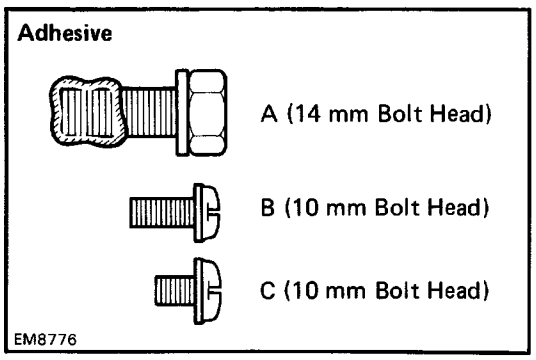
Using a dial indicator, measure the backlash at several places while turning the camshaft clockwise and counterclockwise.

Standard backlash: 0.100 – 0.183 mm (0.0039 – 0.0072 in.)
Maximum backlash: 0.25 mm (0.0098 in.)



4. INSTALL OIL NOZZLE

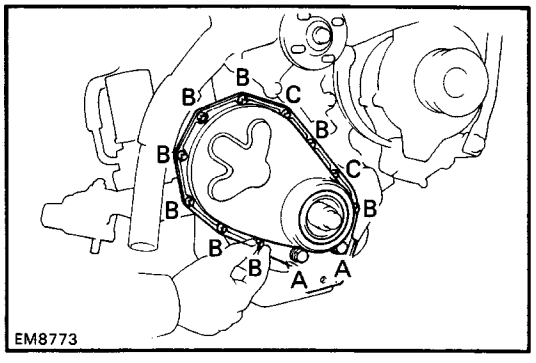
(a) Install and set the oil nozzle in position.
(b) Using a chisel and hammer, stake the threads of the oil nozzle.



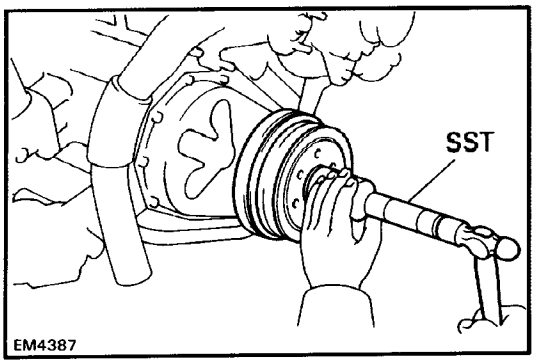
5. INSTALL TIMING GEAR COVER AND CRANKSHAFT PULLEY

HINT: There are three size of timing gear cover bolts indicated A, B and C.

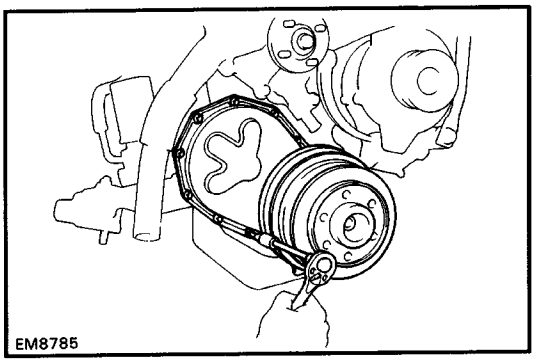
(a) Apply adhesive to the threads of the two A bolts.
Adhesive: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent



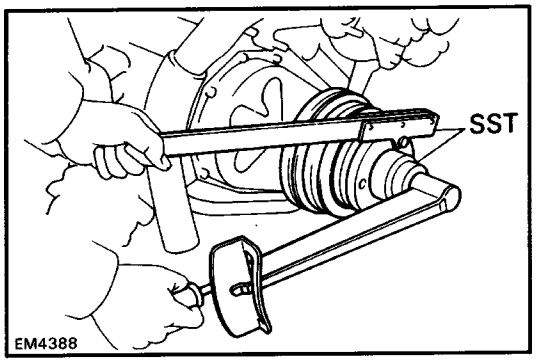
(b) Install a new gasket and the gear cover with the twelve bolts. Finger tighten all bolts.



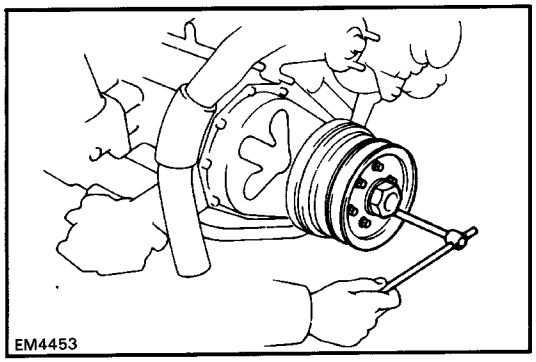
(c) Align the pulley set key with the key groove of the pulley.
(d) Using SST and a hammer, tap in the pulley.
SST 09214–60010



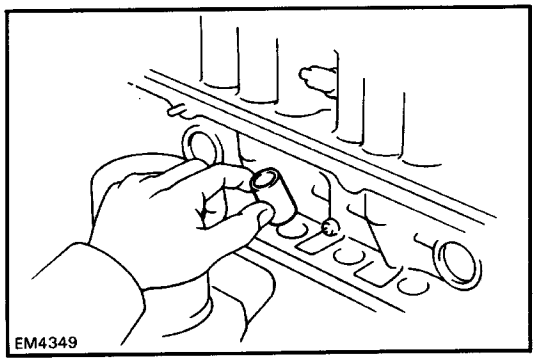
(e) After installing the pulley, using a torx wrench and socket wrench, torque the cover bolts.
Torx wrench: T30 (Part No. 09042–00010 or locally manufactured tool.)
Torque:
Bolt A 25 N–m (250 kgf–cm, 18 ft–lbf)
Bolts B and C 4.9 N–m (50 kgf–cm, 443 in.–lbf)



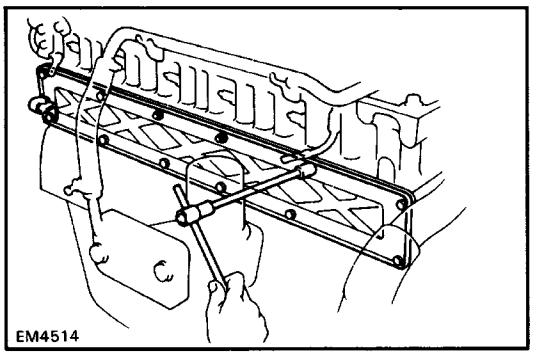
(f) Using SST and a 46–mm socket wrench, install and torque the pulley mount bolt.
SST 09213–58011 and 09330–00021
Torque: 343 N–m (3,500 kgf–cm, 253 ft–lbf)

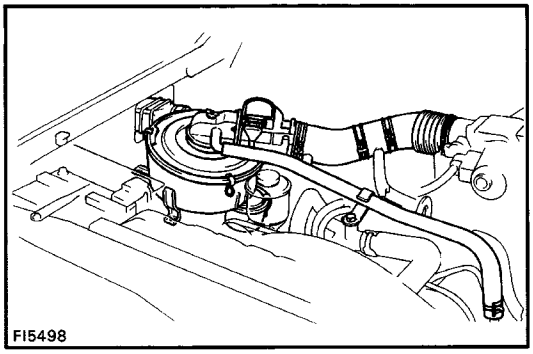


6. INSTALL PS PULLEY TO CRANKSHAFT PULLEY
Install the PS pulley with the six bolts. torque the bolts.
Torque: 18 N–m (185 kgf –cm, 13 ft–lbf)



7. INSTALL VALVE LIFTERS
Carefully insert the twelve lifters into the lifter bore.





8. INSTALL PUSH ROD COVER

Install a new gasket and the push rod cover with the ten bolts and two nuts.

Torque: 3.9 N–m (40 kgf–cm, 35 in.–lbf)

9. INSTALL VALVE ROCKER SHAFT ASSEMBLY (See steps 2 to 4 on pages EM–30, EM–31)

10. INSTALL DISTRIBUTOR (See page IG–10)

11. INSTALL WATER PUMP PULLEY AND FLUID COUPLING WITH FAN (See page CO–9)

12. INSTALL PS IDLER PULLEY AND BRACKET ASSEMBLY

13. INSTALL PS AND A/C COMPRESSOR BRACKETS

14. INSTALL PS PUMP AND A/C COMPRESSOR (See steps 19 and 20 on page EM–33)

15. INSTALL AIR INTAKE HOSE, AIR FLOW METER AND AIR CLEANER ASSEMBLY

(a) Install the air intake hose, air flow meter and air cleaner cap with the wing nut and three clips.

(b) Connect the following hoses:

- ISC hose
- Air pump hose
- Distributor hose
- PCV hose
- Three hoses from the intake chamber rear side
- Two hoses from the VCV of the charcoal canister

16. CONNECT ACCELERATOR AND THROTTLE CABLES, AND ADJUST THEM

17. FILL WITH ENGINE COOLANT (See page CO–5)

18. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

19. START ENGINE AND CHECK FOR LEAKS

20. PERFORM ENGINE ADJUSTMENT

(a) Adjust the ignition timing.

(See steps 10 to 14 on page IG–11)

Ignition timing: 7° BTDC @ idle (w/ Terminals TE1 and E1 connected)

(b) Adjust the valve clearance. (See page EM–9)

Valve clearance (Hot):
Intake 0.20 mm (0.008 in.)
Exhaust 0.35 mm (0.014 in.)

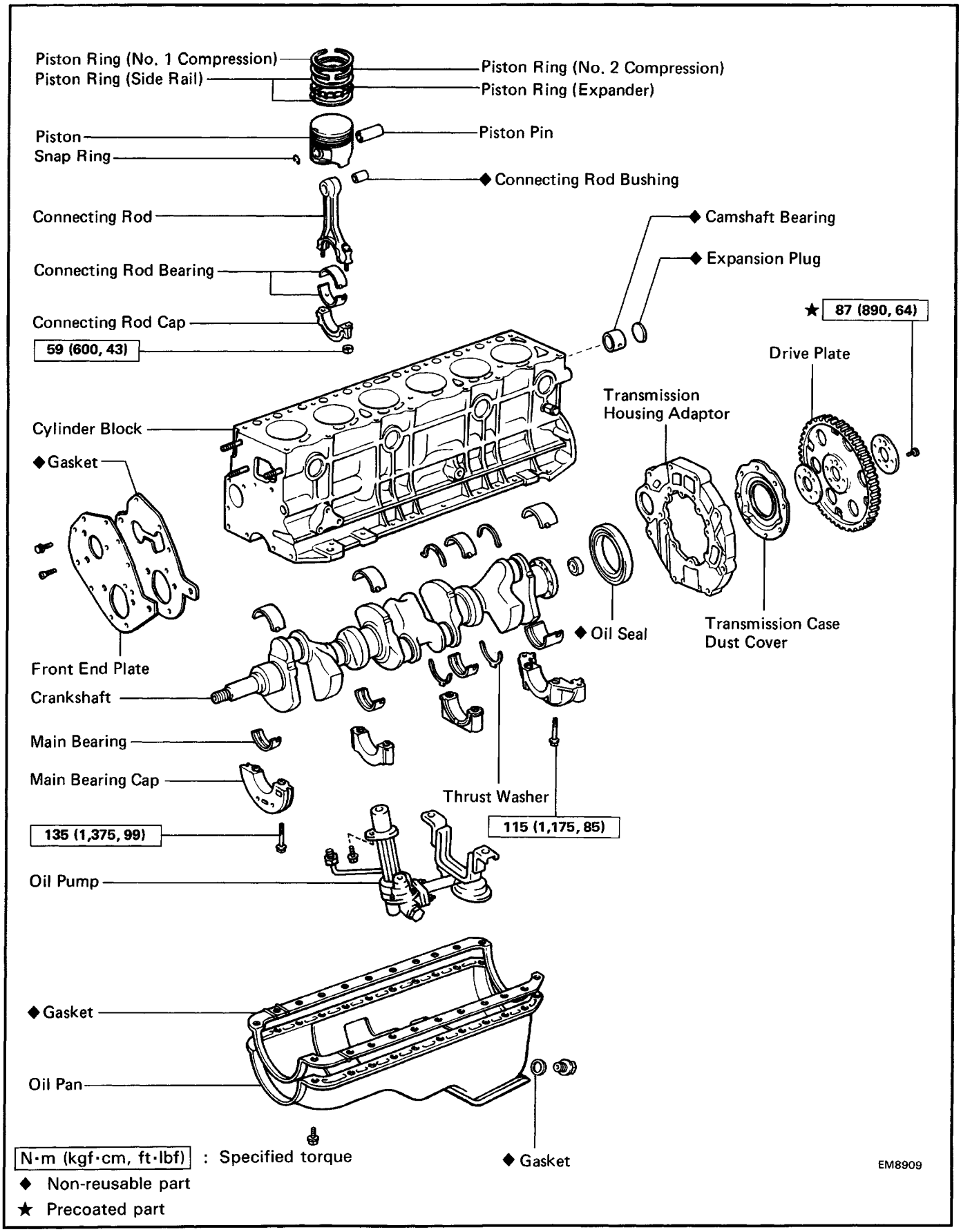
21. PERFORM ROAD TEST

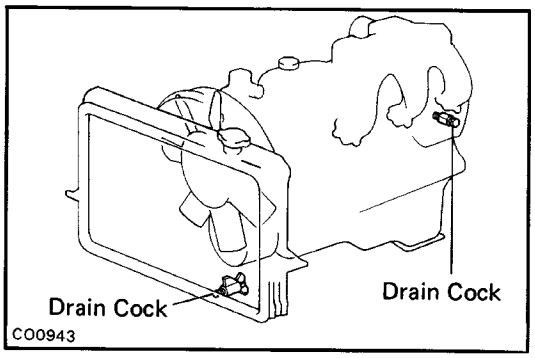
Check for abnormal noise, shock, slippage and smooth operation.

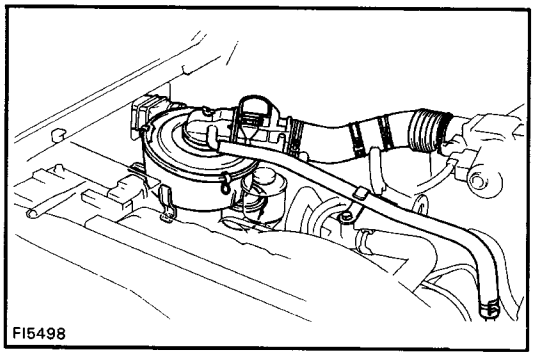
22. RECHECK ENGINE COOLANT LEVEL

CYLINDER BLOCK

COMPONENTS







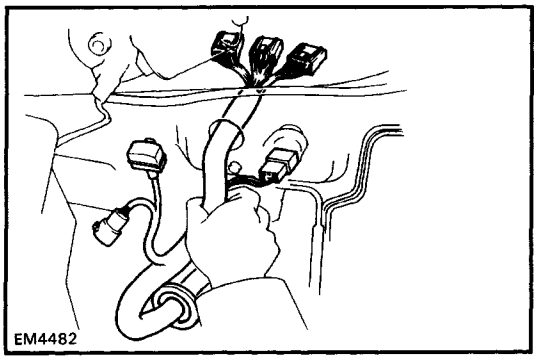
REMOVAL OF ENGINE

1. DRAIN ENGINE COOLANT
(See page CO–5)
2. DRAIN ENGINE OIL
3. REMOVE HOOD
4. REMOVE BATTERY AND BATTERY TRAY
5. DISCONNECT ACCELERATOR AND THROTTLE CABLES
6. REMOVE AIR INTAKE HOSE, AIR FLOW METER AND AIR CLEANER ASSEMBLY
(a) Disconnect the air flow meter connector and clamp.
(b) Disconnect the following hoses:
- ISC hose
- Air pump hose
- Distributor hose
- PCV hose
- Three hoses from the intake chamber rear side
- Two hoses from the VCV of the charcoal canister

(c) Disconnect the air intake hose clamp.
(d) Remove the wing nut and loosen the three clips, and remove the air intake hose, air flow meter and air cleaner cap.
(e) Remove the air cleaner element.
(f) Remove the three bolts and air cleaner case.
7. REMOVE COOLANT RESERVOIR TANK
8. REMOVE RADIATOR
(See page CO–14)
9. DISCONNECT FOLLOWING WIRES AND CONNECTORS
(a) Oil pressure connector
(b) High tension cord from ignition coil
(c) Neutral start switch and transfer connectors located near the starter
(d) Front differential lock connector
(e) Starter wire and connector
(f) Ground strap from starter
(g) Oxygen sensor connectors
(h) Alternator wire and connector
(i) Cooling fan connector
(j) Check connector
(k) Connector on RH fender apron

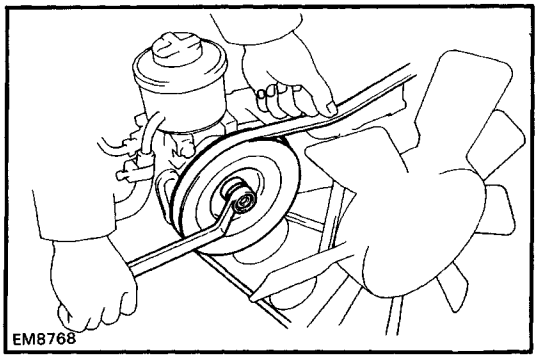
10. DISCONNECT FOLLOWING HOSES:

(a) Heater hoses
(b) Fuel hoses
(c) Transfer hose
(d) Brake booster hose
(e) PS air control valve hose
(f) Al hoses
(g) Distributor hose
(h) Emission control hoses



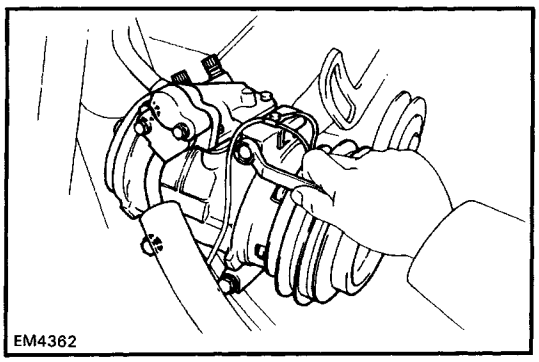
11. DISCONNECT EFI WIRE HARNESS FROM ECU

(a) Remove the glove box.
(b) Disconnect the four connectors.
(c) Pull out the EFI wire harness from the cowl panel.



12. REMOVE PS PUMP WITHOUT DISCONNECTING HOSES

(a) Push on the drive belt to hold the pulley in place and loosen the pulley nut.
(b) Loosen the idler pulley nut and adjusting bolt, and remove the drive belt.
(c) Remove the pulley mount nut, drive pulley and woodruff key.
(d) Remove PS mount bolts, and remove the PS pump from the bracket.



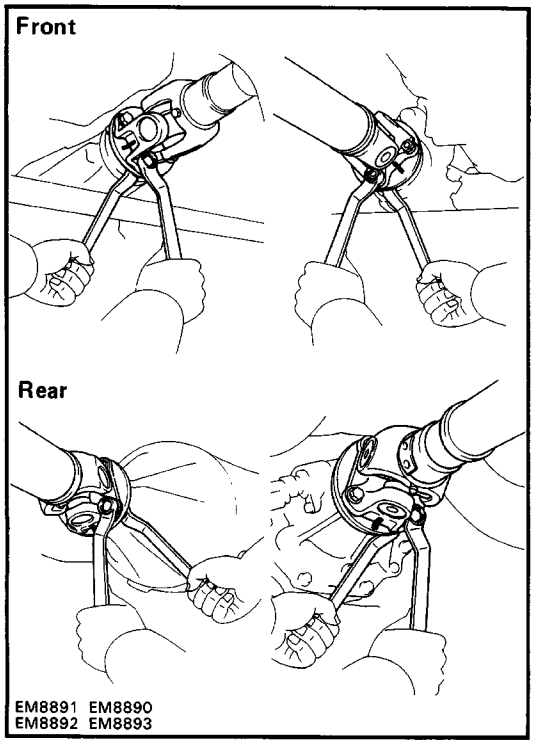
13. REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES

(a) Disconnect the connector.
(b) Loosen the idler pulley nut and adjusting bolt, and remove the drive belt.
(c) Remove the four compressor mount bolts.
(d) Put aside the compressor, and suspend it to the fender apron with the string.

14. RAISE VEHICLE

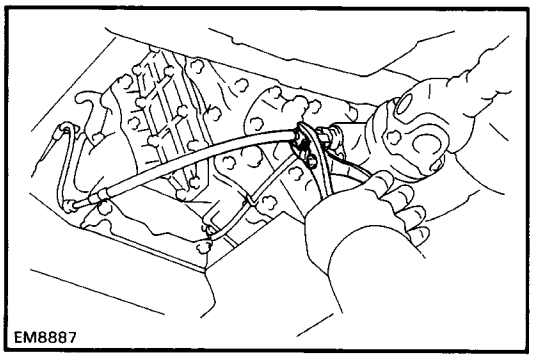
NOTICE: Be sure the vehicle is securely supported.

15. REMOVE TRANSFER UNDER COVER

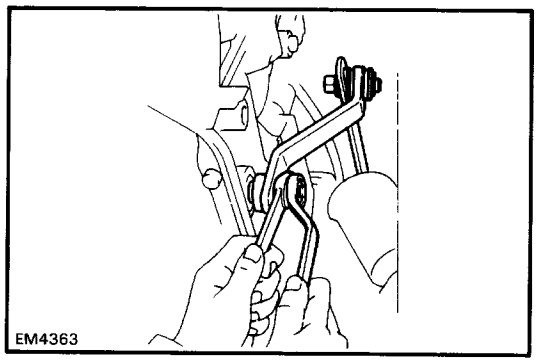


16. REMOVE FRONT AND REAR PROPELLER SHAFTS

(a) Put matchmarks on the flanges.
(b) Remove the four bolts and nuts.
(c) Remove the four nuts.
(d) Remove the propeller shaft.

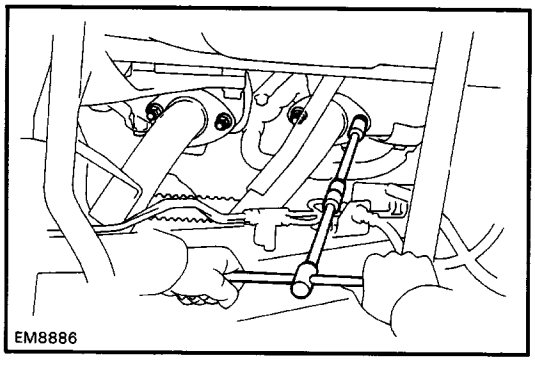


17. DISCONNECT SPEEDOMETER CABLE



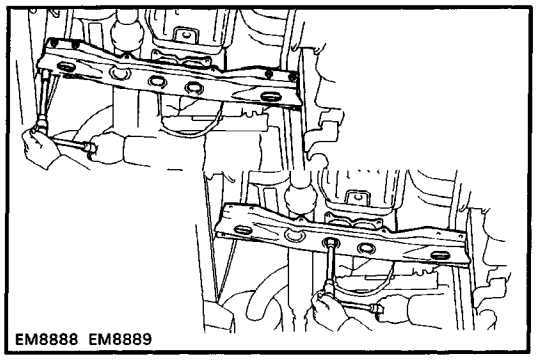
18. DISCONNECT TRANSMISSION CONTROL ROD

Remove the two nuts and disconnect the control rod.



19. DISCONNECT EXHAUST PIPE FROM EXHAUST MANIFOLD

(a) Remove the exhaust pipe front bracket.
(b) Remove the four nuts, and disconnect the exhaust pipe.

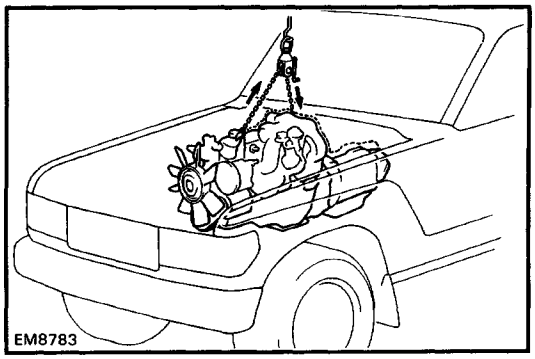

EM8888 EM8889

20. PLACE JACK UNDER TRANSMISSION

Be sure to put a wooden block between the jack and the transmission pan to prevent damage.

21. REMOVE FRAME CROSSMEMBER

Remove the eight bolts and two nuts, and then remove the frame crossmember.


EM8783

22. REMOVE ENGINE WITH TRANSMISSION

(a) Attach the engine hoist chain to the two engine hangers.

(b) Remove the mount nuts and washers.

(c) Lift the engine with transmission out of the vehicle slowly and carefully.

HINT: Make sure the engine is clear of all wiring and hoses.

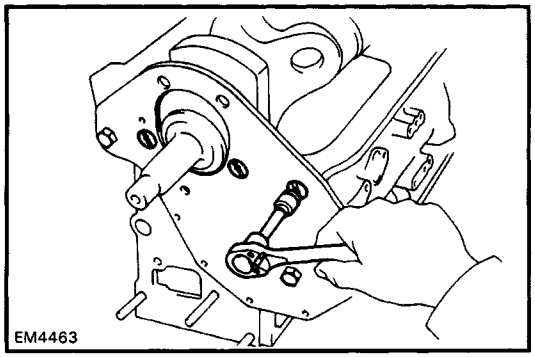
(d) Place the engine and transmission assembly onto the stand.

23. REMOVE A/T OIL COOLER PIPES

24. REMOVE TRANSMISSION FROM ENGINE

PREPARATION FOR DISASSEMBLY

1. REMOVE DRIVE PLATE
2. REMOVE TRANSMISSION HOUSING ADAPTOR
3. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY
4. REMOVE CYLINDER HEAD
(See page EM–14)
5. REMOVE ALTERNATOR
6. REMOVE WATER PUMP
7. REMOVE TIMING GEAR AND CAMSHAFT
(See pages EM–36 to EM–39)
8. REMOVE OIL COOLER AND OIL FILTER BRACKET
(See page LU–14)
9. REMOVE OIL PAN AND OIL PUMP
(See page LU–8)

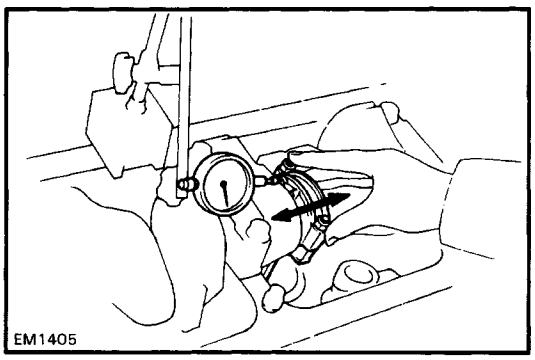


DISASSEMBLY OF CYLINDER BLOCK

(See page EM–47)

1. REMOVE FRONT END PLATE

(a) Using a torx socket wrench, remove the three screws.
(b) Remove the two bolts, front end plate and gasket.

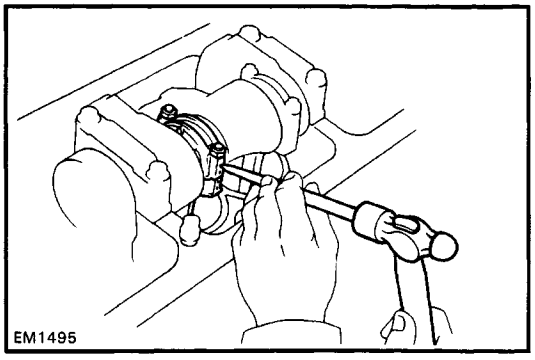


2. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the rod back and forth.

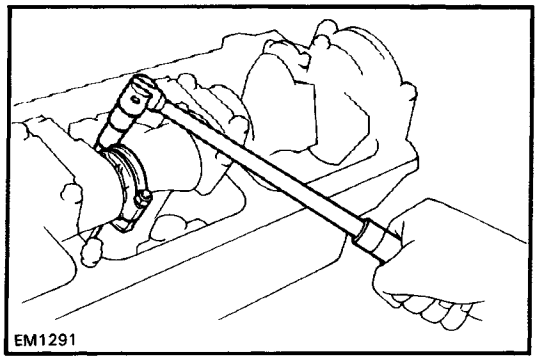
Standard thrust clearance: 0.160 – 0.300 mm (0.0063 – 0.0118 in.)
Maximum thrust clearance: 0.40 mm (0.0156 in.)

If clearance is greater than maximum, replace the con–necting rod assembly. If necessary, replace the crankshaft.

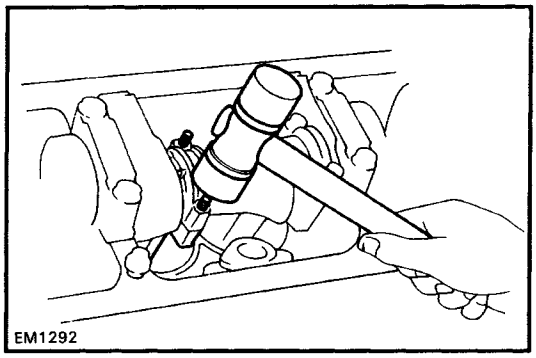


3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Using a punch or numbering stamp, place the matchmarks on the rod and cap to ensure correct reas-sembly.

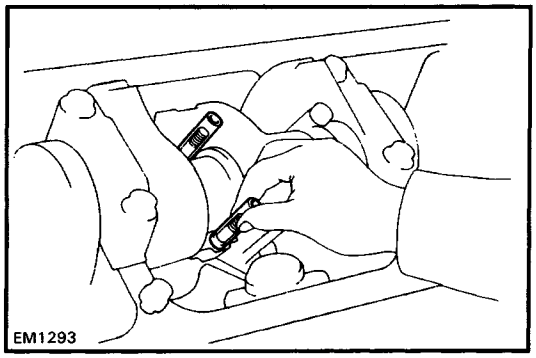


(b) Remove the connecting rod cap nuts.

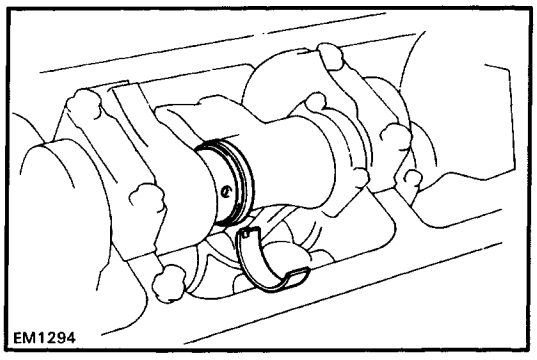


(c) Using a plastic–faced hammer, lightly tap the con–necting rod bolts and lift off the connecting rod cap.

HINT: Keep the lower bearing inserted with the con–necting rod cap.



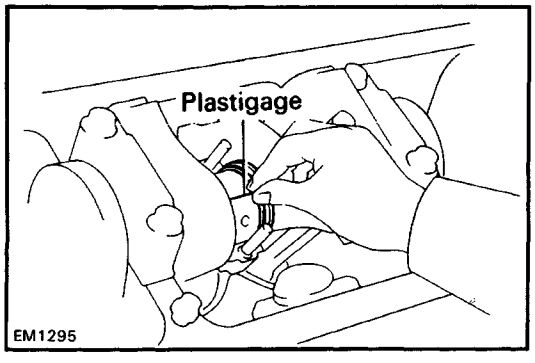
(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



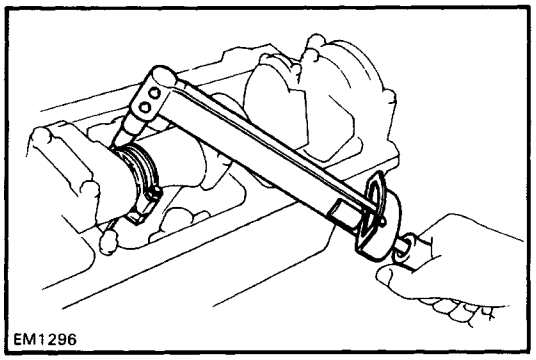
(e) Clean the crank pin and bearing.

(f) Check the crank pin and bearing for pitting and scratches.

If the crank pin or bearing are damaged, replace the bear-ings. If necessary, grind or replace the crankshaft.

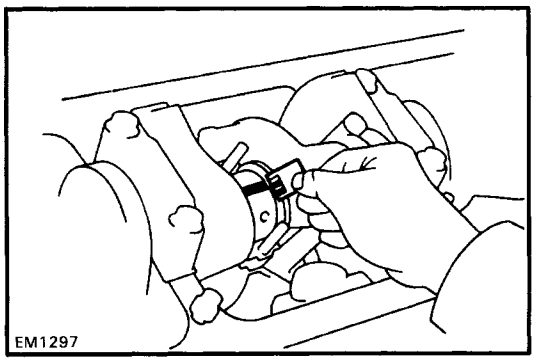


(g) Lay a strip of Plastigage across the crank pin.



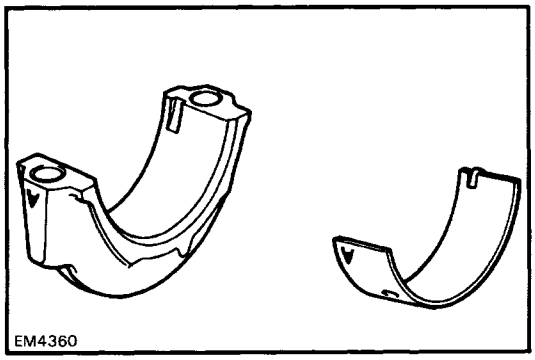
(h) Install the connecting rod cap.
(See step 7 on page EM–75)
Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)

HINT: Do not turn the crankshaft.



(i) Remove the connecting rod cap.
(j) Measure the Plastigage at its widest point.
Standard oil clearance:
STD size 0.020 – 0.050 mm
(0.0008 – 0.0020 in.)
U/S 0.25 and 0.50 0.019 – 0.063 mm
Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.

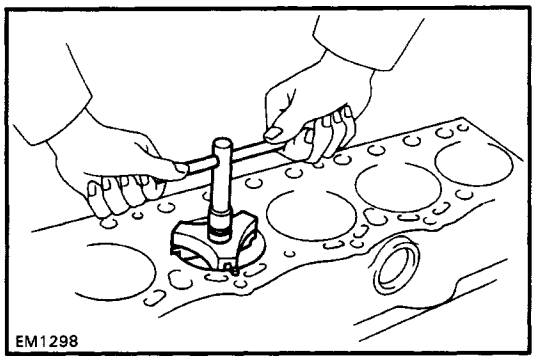


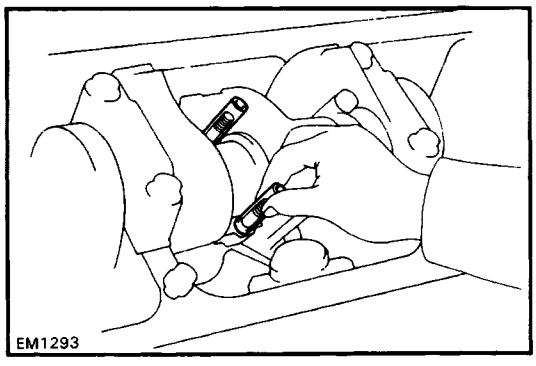
HINT: If using a standard bearing, replace with one having the same number marked on the connecting rod cap.
There are three sizes of standard bearings, marked A, B and C.
(Reference)
Standard bearing thickness (at center wall):
Mark ”A” 1.484 –1.488 m m
(0–0584 –0.0586 in.)
Mark ”B” 1.488 –1.492 mm
(0.0586 – 0.0587 in.)
Mark ”C” 1.492 – 1.496 mm
(0.0587 – 0.0589 in.)

(k) Completely remove the Plastigage.

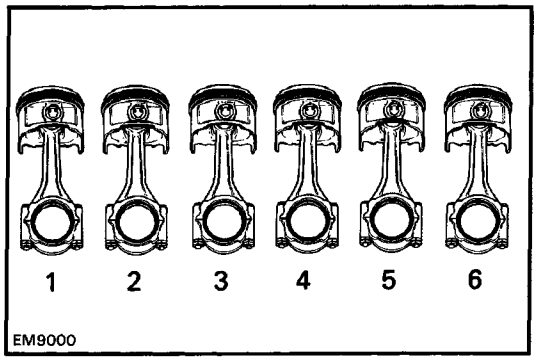
4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

(a) Remove all the carbon from the top of the cylinder.

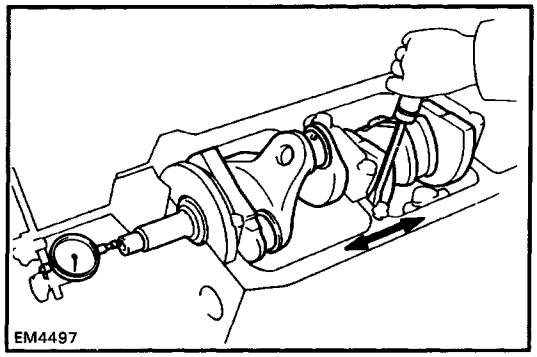




(b) Cover the rod bolts with a short piece of hose to protect the crankshaft from damage.
(c) Push the piston, connecting rod assembly and the upper bearing through the top of the cylinder block.



HINT:
- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.



5. CHECK CRANKSHAFT THRUST CLEARANCE

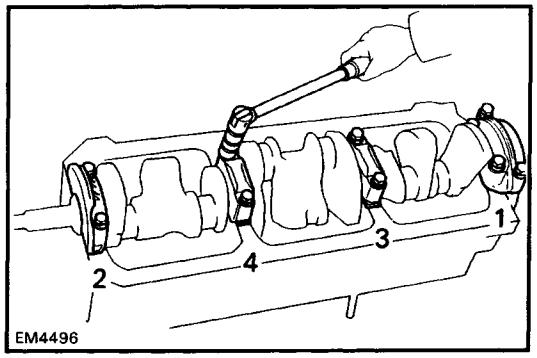
Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance: 0.015 – 0.204 mm (0.0006 – 0.0080 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

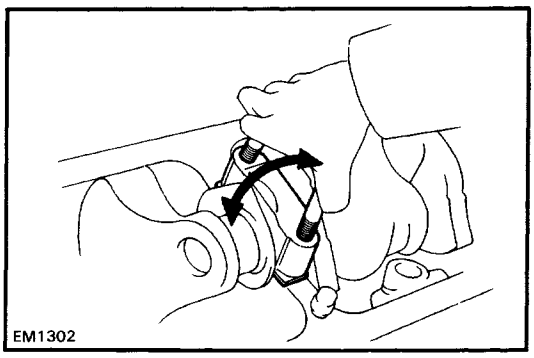
If the clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer size: STD, O/S 0.125, 0.25



6. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

(a) Uniformly loosen and remove the main bearing cap bolts in several passes, in the sequence shown.

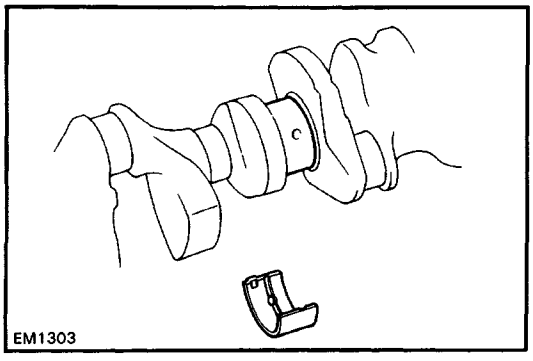


(b) Using the removed main bearing cap bolts, wiggle the cap back and forth, and remove the caps, lower bearings and lower thrust washers (No. 3 cap only).

HINT:
- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust wash–ers in correct order.

(c) Lift out the crankshaft.

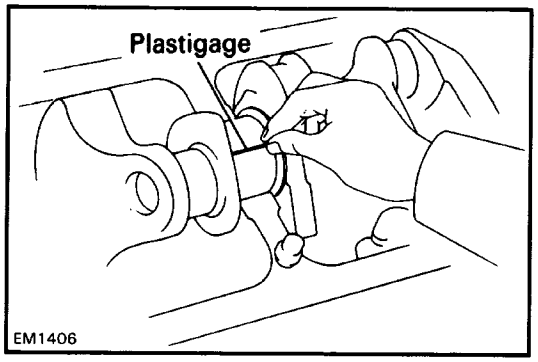
HINT: Keep the upper bearings and upper thrust wash–ers together with the cylinder block.



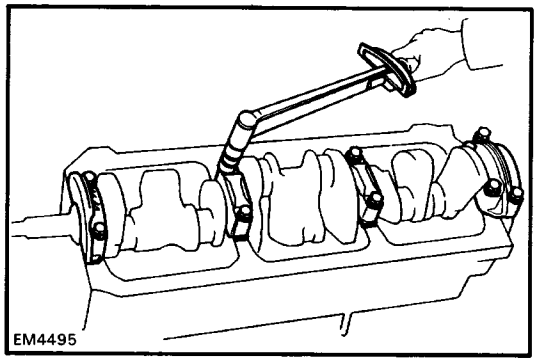
(d) Clean each journal and bearing.

(e) Check each journal and bearing for pitting and scratches.

If the journal or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.



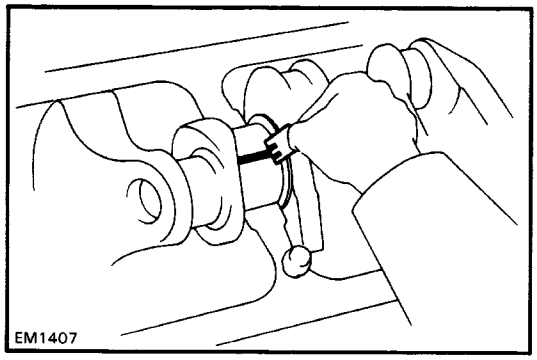
(f) Place the crankshaft on the cylinder block.
(g) Lay a strip of Plastigage across each journal.



(h) Install the main caps.
(See step 5 on page EM–74)

Torque:
19 mm bolt head
135 N–m (1,375 kgf–cm, 99 ft–lbf)
17 mm bolt head
115 N–m (1,175 kgf–cm, 85 ft–lbf)

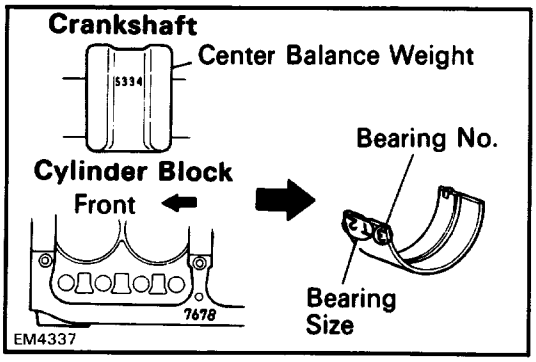
HINT: Do not turn the crankshaft.



(i) Remove the main bearing caps.
(j) Measure the Plastigage at its widest point.

Standard oil clearance:
STD size 0.016 – 0.056 mm
(0.0006 – 0.0022 in.)
U/S 0.25 and 0.50 0.021 – 0.067 mm
(0.0008 – 0.0026 in.)
Maximum oil clearance: 0.10 mm (0.0039 in.)

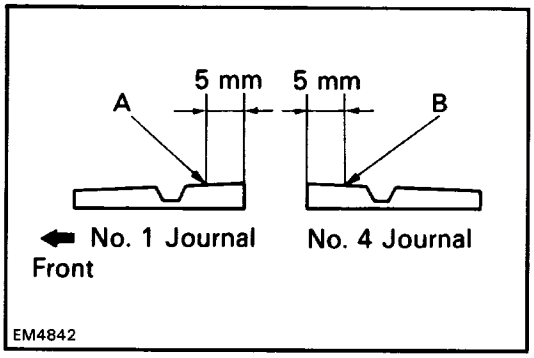
HINT: If replacing the cylinder block subassembly the bearing standard clearance will be:
0.004 – 0.060 mm (0.002 – 0.0024 in.)
If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.
HINT: If replacing a standard size bearing with a stan–dard oil clearance, replace with one having the same number. If the number of the bearing cannot be deter–mined, select a bearing from the table below according to the numbers imprinted on the cylinder block and crankshaft. There are five sizes of standard bearings, marked T1, T2, T3, T4 and T5.



	Number marked								
Crankshaft	3			4			5		
Cylinder block	6	7	8	6	7	8	6	7	8
Bearing	T3	T4	T5	T2	T3	T4	T1	T2	T3

Example: Crankshaft ”5”, Cylinder Block ”7”
= Bearing ”T2”

(Reference)
Crankshaft journal diameter:
Mark ”3” No–1 66.972 – 66.980 mm
(2.6367 – 2.6370 in.)
No–2 68.472 – 68.480 mm
(2.6957 – 2.6961 in.)
No–3 69.972 – 69.980 mm
(2.7548 – 2.7551 in.)
No–4 71.472 – 71.480 mm
(2.8139 – 2.8142 in.)
Mark ”4” No.1 66.980 – 66.988 mm
(2.6370 – 2.6373 in.)
No.2 68.480 – 68.488 mm
(2.6961 – 2.6964 in.)
No–3 69.980 – 69.988 mm
(2.7551 – 2.7554 in.)
No–4 71.480 – 71.488 mm
(2.8142 – 2.8145 in.)
Mark ”5” No–1 66.988 – 66.996 mm
(2.6373 – 2.6376 in.)
No.2 68.488 – 68.496 mm
(2.6964 – 2.6967 in.)
No–3 69.988 – 69.996 mm
(2.7554 – 2.7557 in.)
No.4 71.488 – 71.496 mm
(2.8”145 – 2.8148 in.)
Cylinder block main journal bore diameter:
Mark ”6” No.1 72.010 – 72.018 mm
(2.8350 – 2.8353 in.)
No.2 73.510 – 73.518 mm
(2.8941 – 2.8944 in.)
No–3 75.010 – 75.018 mm
(2.9531 – 2.9535 in.)
No.4 76.510 – 76.518 mm
(3.0122 – 3.0125 in.)
Mark ”7” No.1 72.018 – 72.026 mm
(2.8353 – 2.8357 in.)
No.2 73.518 – 73.526 mm
(2.8944 – 2.8947 in.)
No.3 75.018 – 75.026 mm
(2.9535 – 2.9538 in.)
No.4 76.518 – 76.526 mm
(3.0125 – 3.0128 in.)
Mark ”8” No–1 72.026 – 72.034 mm
(2.8357 – 2.8360 in.)
No.2 73.526 – 73.534 mm
(2.8947 – 2.8950 in.)
No.3 75.026 – 75.034 mm
(2.9538 – 2.9541 in.)
No.4 76.526 – 76.534 mm
(3.0128 – 3.0131 in.)

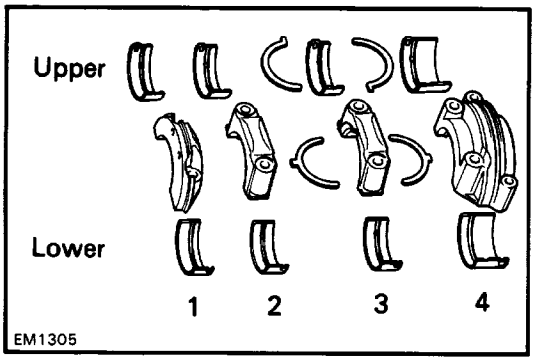


Standard bearing thickness (at center wall):

Mark ”T1” 2.493 – 2.497 mm
(0.0981 – 0.0983 in.)
Mark “T2” 2.497 – 2.501 mm
(0.0983 – 0.0985 in.)
Mark “T3” 2.501 – 2.505 mm
(0.0985 – 0.0986 in.)
Mark ’74” 2.505 – 2.509 mm
(0.0986 – 0.0988 in.)
Mark ’75” 2.509 – 2.513 mm
(0.0988 – 0.0989 in.)

HINT: Check the bearing thickness of No. 1 and No. 4 journals in the positions A, B shown in the illustration.

(k) Completely remove the Plastigage.

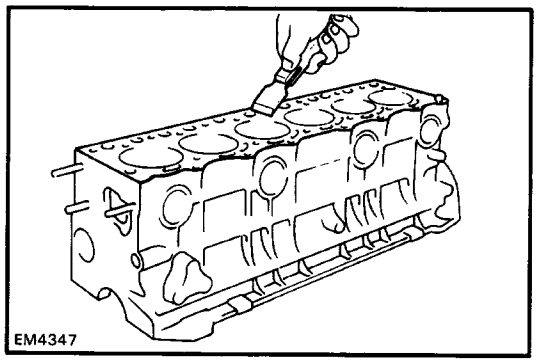


7. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the upper bearings and upper thrust washers.

HINT: Arrange the caps, bearings and thrust washers in correct order.



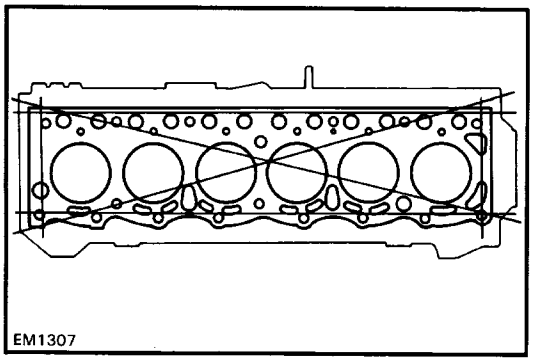
INSPECTION OF CYLINDER BLOCK

1. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket material from the cylinder block surface.

2. CLEAN CYLINDER BLOCK

Using a soft brush and solvent, clean the block.

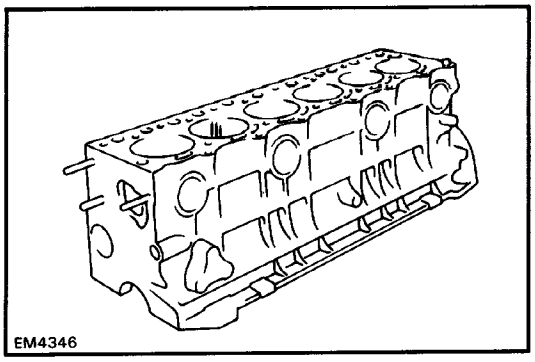


3. INSPECT TOP OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and thickness gauge, measure the surfaces contacting the cylinder head gasket for warpage.

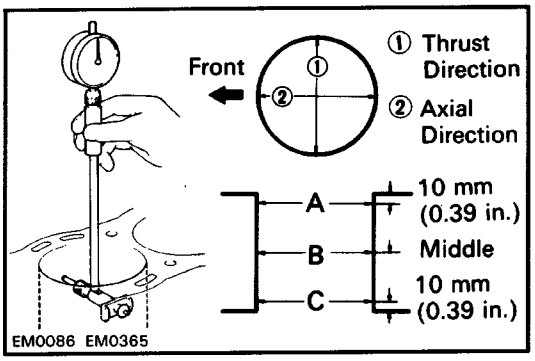
Maximum warpage: 0.15 mm (0.0059 in.)

If warpage is greater than maximum, replace the cylinder block.



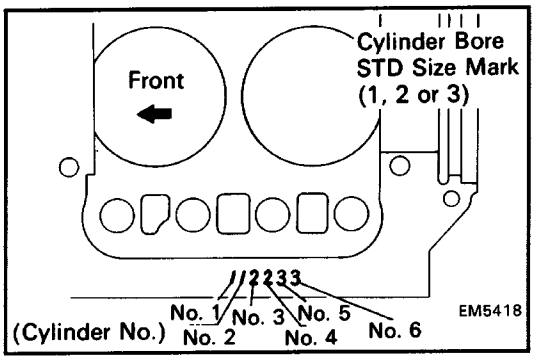
4. INSPECT CYLINDERS FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches.
If deep scratches are present, rebore all six cylinders. If necessary, replace the cylinder block.



5. INSPECT CYLINDER BORE DIAMETER

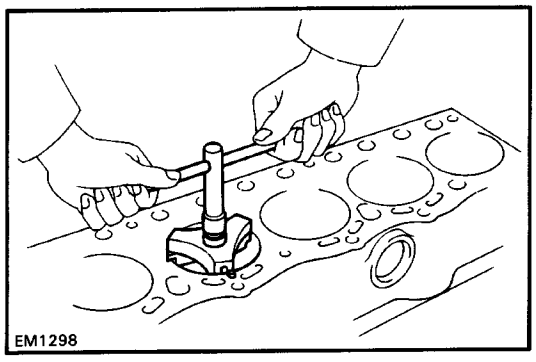
Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.



HINT: There are 3 standard sizes for the cylinder bore diameter which are marked on the cylinder block as shown in the illustration.

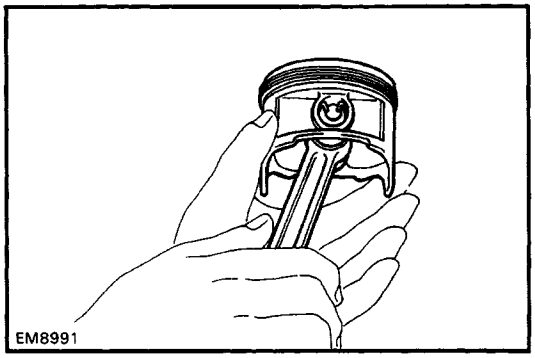
Standard diameter:
STD size
Mark ”1 ” 94. 000 – 94.010 mm
(3.7008 – 3.7012 in.)
Mark ”2” 94.010 – 94.020 mm
(3.7012 – 3.7016 in.)
Mark ”3” 94.020 – 94.030 mm
(3.7016 – 3.7020 in.)
Maximum diameter:
STD size 94.23 mm (3.7098 in.)
O/S 0.50 94.73 mm (3.7295 in.)
O/S 1.00 95.23 mm (3.7492 in.)
O/S 1.50 95.73 mm (3.7689 in.)

If the diameter is greater than maximum, rebore all six cylinders. If necessary, replace the cylinder block.



6. REMOVE CYLINDER RIDGE

If the wear is less than 0.2 mm (0.008 in.), use a ridge reamer to machine the top of the cylinder.

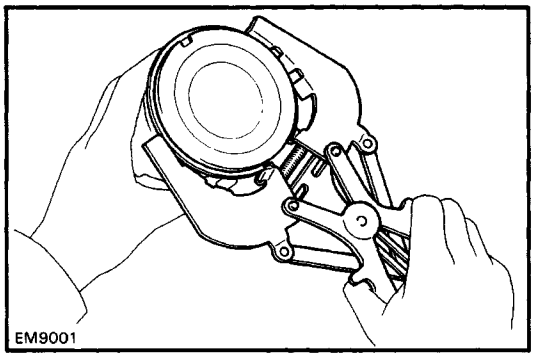


DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLIES

(See page EM–47)

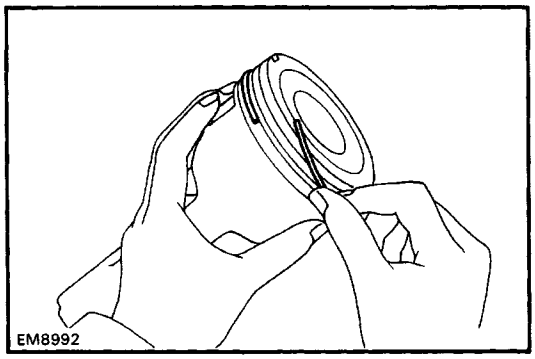
1. CHECK FIT BETWEEN PISTON AND PIN

Try to move the piston back and forth on the piston pin.
If any movement is felt, replace the piston and pin as a set.



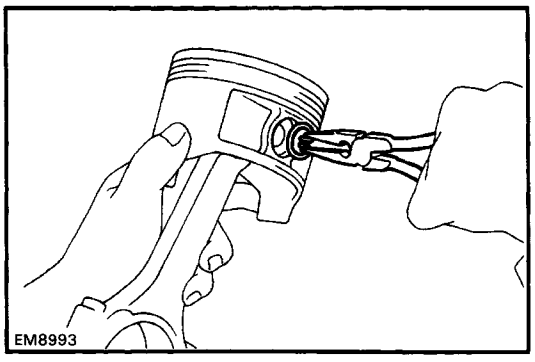
2. REMOVE PISTON RINGS

(a) Using a piston ring expander, remove the compres–sion rings.



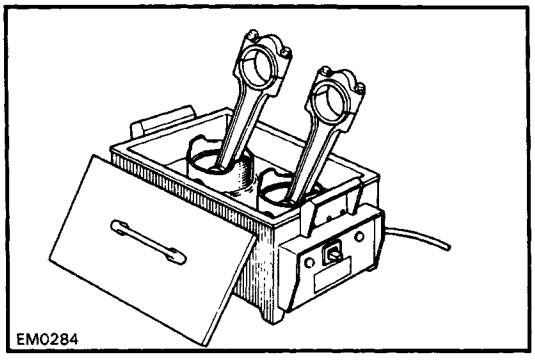
(b) Remove the two side rails and oil ring expander by hand.

HINT: Arrange the rings in correct order.

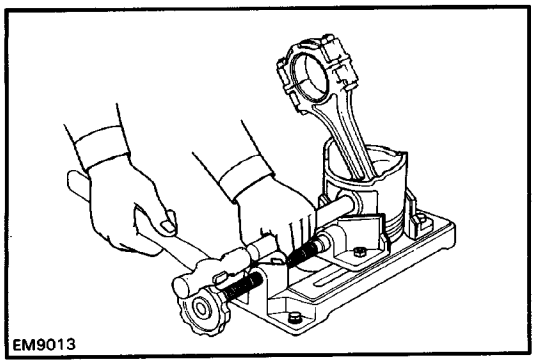


3. DISCONNECT CONNECTING ROD FROM PISTON

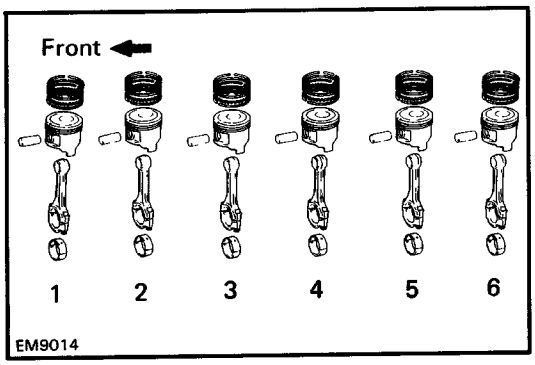
(a) Using needle–nose pliers, remove the snap rings from the piston.



(b) Gradually heat the piston to approx. 80˚C (176˚F).

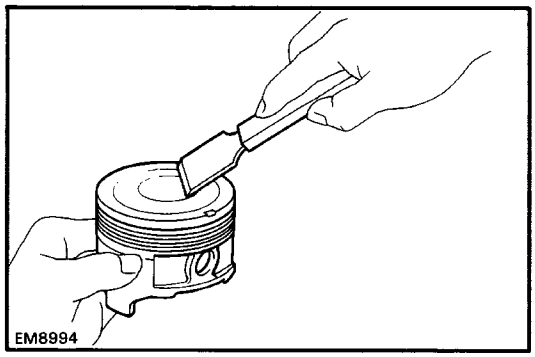


(c) Using a plastic–faced hammer and brass bar, lightly tap out the piston and remove the connecting rod.



HINT:

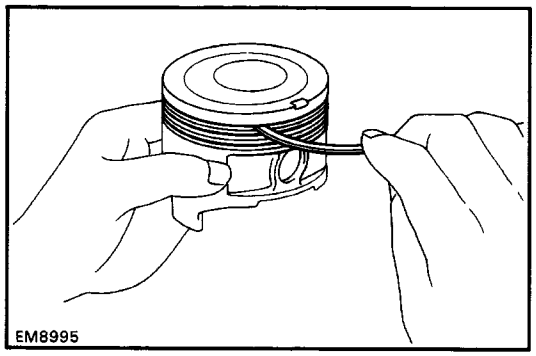
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.


EM8994

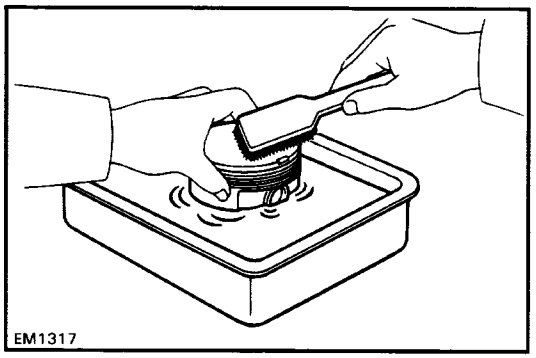
INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLIES

1. CLEAN PISTONS

(a) Using a gasket scraper, remove the carbon from the piston top.


EM8995

(b) Using a groove cleaning tool or broken ring, clean the ring grooves.

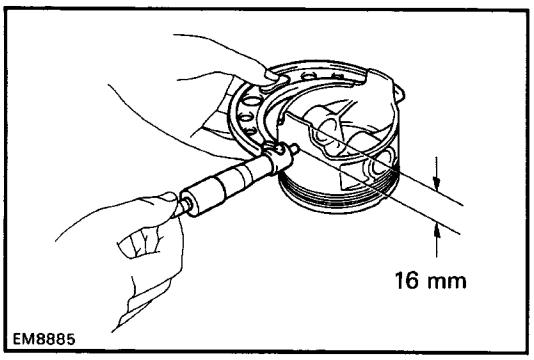

EM1317

(c) Using a soft brush and solvent, thoroughly clean the piston.

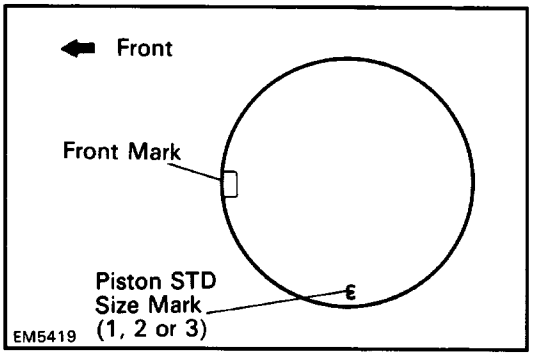
NOTICE: Do not damage the piston.

2. INSPECT PISTON DIAMETER AND OIL CLEARANCE

(a) Using a micrometer, measure the piston diameter at a right angle to the piston pin hole center line, 16 mm (0.63 in.) below the skirt bottom edge.



EM8885



EM5419

HINT: There are 3 sizes of standard pistons, marked 1, 2 or 3 as shown in the illustration.

Standard diameter:

STD size

Mark “1” 93.963 – 93.973 mm

(3.6993 – 3.6997 in.)

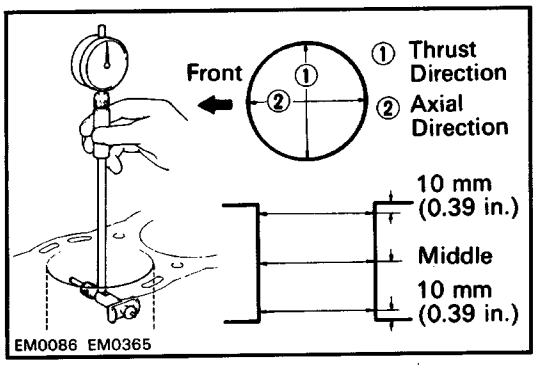
Mark ”2” 93.973 – 93.983 mm

(3.6997 – 3.7001 in.)

Mark ”3” 93.983 – 93.993 mm

(3.7001 – 3.7005 in.)

O/S 0.50	**94.463 – 94.493 mm (3.7190 – 3.7202 in.)**
O/S 1.00	**94.963 – 94.993 mm (3.7387 – 3.7399 in.)**
O/S 1.50	**95.463 – 95.493 mm (3.7584 – 3.7596 in.)**

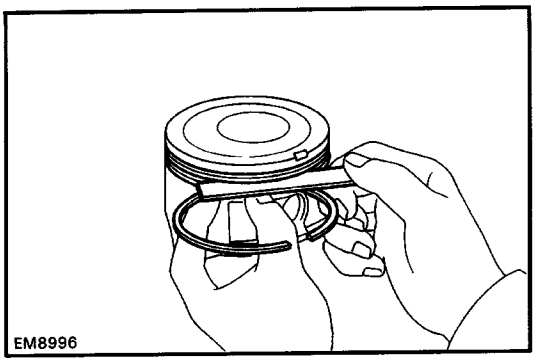


(b) Measure the cylinder bore diameter in thrust direc–tions. (See step 5 on page EM–59)

(c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Oil clearance: 0.027 – 0.047 mm
(0.0011 – 0.0019 in.)

If the oil clearance is not within specification, replace the piston. If necessary, rebore all six cylinders and replace all six pistons. If necessary, replace the cylinder block, install a piston with the same mark as marked on the cylinder block.

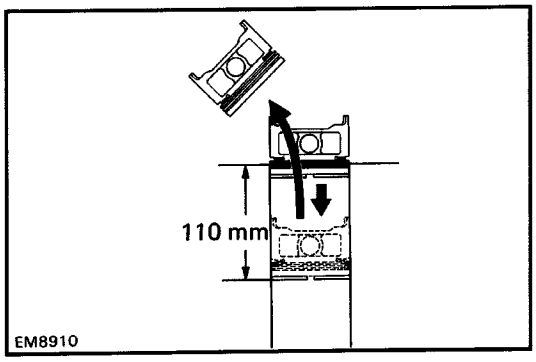


3. INSPECT CLEARANCE BETWEEN WALL OF PISTON RING GROOVE AND NEW PISTON RING

Using a thickness gauge, measure the clearance between new piston ring and the wall of the piston ring groove.

Ring groove clearance:
No.1 0.030 – 0.070 mm (0012 – 0.0028 in.)
No.2 0.050 – 0.090 mm (0020 – 0.0035 in.)

If the clearance is not within specification, replace the piston.



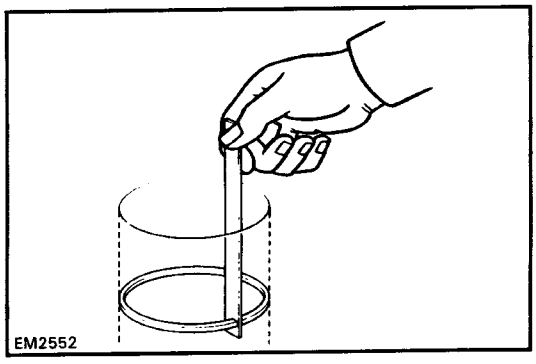
4. INSPECT PISTON RING END GAP

(a) Insert the piston ring into the cylinder bore.

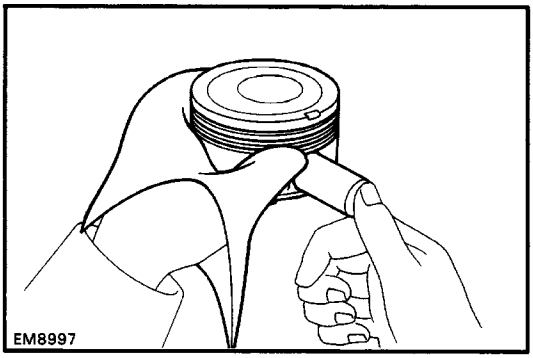
(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel.
(110 mm or 4.33 in. from top surface of cylinder block)

(c) Using a thickness gauge, measure the end gap.

Standard end gap:
No.1 0.200 – 0.420 mm
(0.0079 – 0.0165 in.)
No.2 0.050 – 0.720 mm
(0.0197 – 0.0283 in.)
Oil (Side rail) 0.200 – 0.820 mm
(0.0079 – 0.0323 in.)
Maximum end gap:
No.1 1.02 mm (0.0402 in.)
No.2 1.32 mm (0.0520 in.)
Oil (Side rail) 1.42 mm (0.0599 in.)



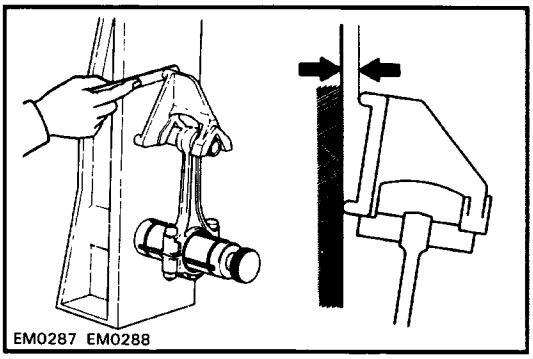
If the gap is greater than maximum, replace the piston ring. If the gap is greater than maximum, even with a new piston ring, rebore the cylinder and use an O/S piston ring.



5. CHECK PISTON PIN FIT

At 80˚C (176˚F) you should be able to push the pin into the piston With your thumb.

If the pin can be installed at a lower temperature, replace the piston and pin as a set.



6. INSPECT CONNECTING RODS

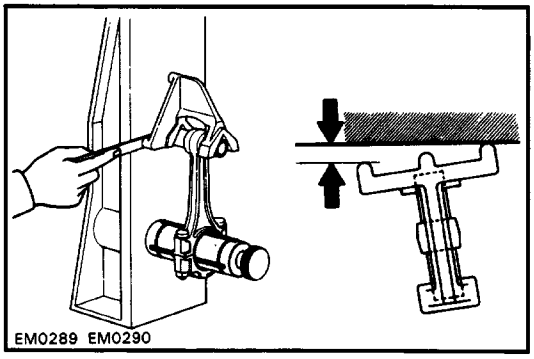
(a) Using a rod aligner and thickness gauge, check the connecting rod alignment.

- Check for bend.

Maximum bend:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If bend is greater than maximum, replace the connecting rod assembly.

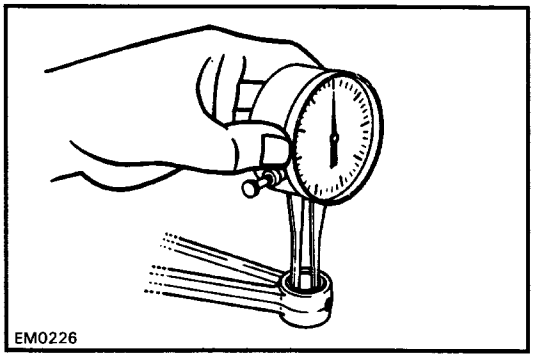


- Check for twist.

Maximum twist:

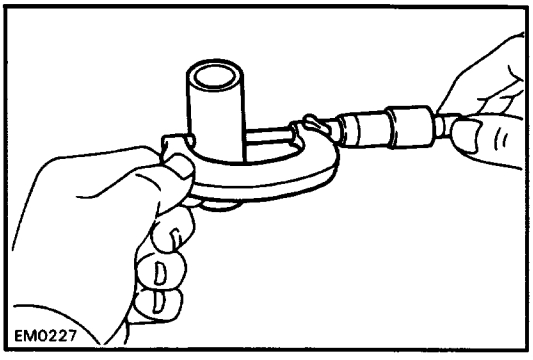
0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connecting rod assembly.



(b) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

Bushing inside diameter: 22.012 – 22.027 mm (0.8666 – 0.8672 in.)



(c) Using a micrometer, measure the piston pin diame–ter.

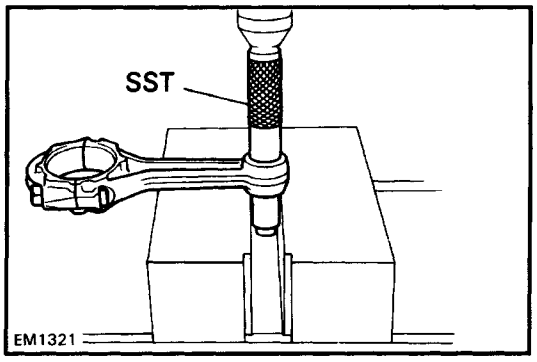
Piston pin diameter: 22.004 – 22.019 mm (0.8663 – 0.8669 in.)

(d) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

Standard oil clearance: 0.005 – 0.011 mm (0.0002 – 0.0004 in.)

Maximum oil clearance: 0.03 mm (0.0012 in.)

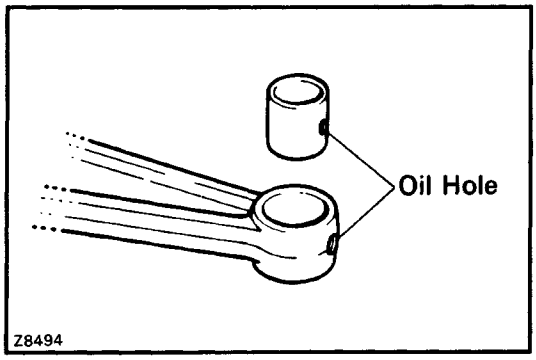
If the oil clearance is greater than maximum, replace the connecting rod bushing. If necessary, replace the piston and piston pin assembly.



REPLACEMENT OF CONNECTING ROD BUSHINGS

1. REMOVE CONNECTING ROD BUSHING

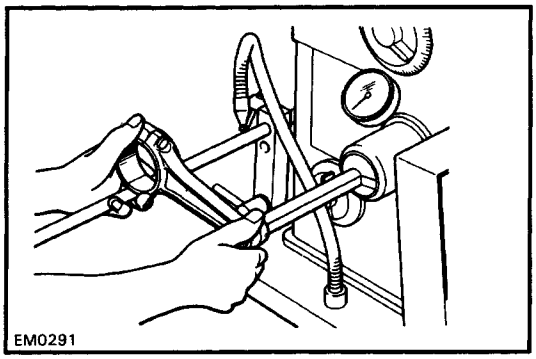
Using SST and a press, press out the bushing.
SST 09222–30010



2. INSTALL NEW CONNECTING ROD BUSHING

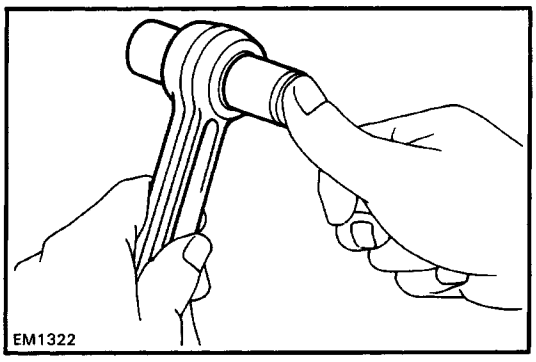
(a) Align the oil holes of the bushing and connecting rod.

(b) Using SST and a press, press in the bushing.
SST 09222–30010



3. HONE ROD BUSHING AND CHECK PISTON PIN FIT IN CONNECTING ROD

(a) Using a pin hole grinder, hone the bushing to obtain the specified clearance between the bushing and piston pin.



(b) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil and push it into the connecting rod with your thumb.

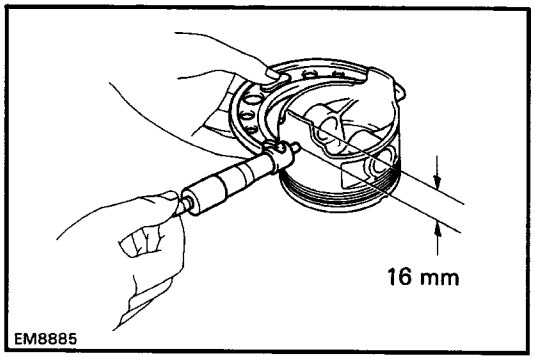
BORING OF CYLINDERS

HINT:

- Bore all six cylinders for the oversized piston outside diameter.
- Replace the piston rings with ones to match the over–sized pistons.

1. SELECT OVERSIZED PISTONS

Oversized piston diameter:
O/S 0.50 94.463 – 94.493 mm
(3.7190 – 3.7202 in.)
O/S 1.00 94.963 – 94.993 mm
(3.7387 – 3.7399 in.)
O/S 1.50 95.463 – 95.493 mm
(3.7584 – 3.7596 in.)



2. CALCULATE AMOUNT TO BORE CYLINDER

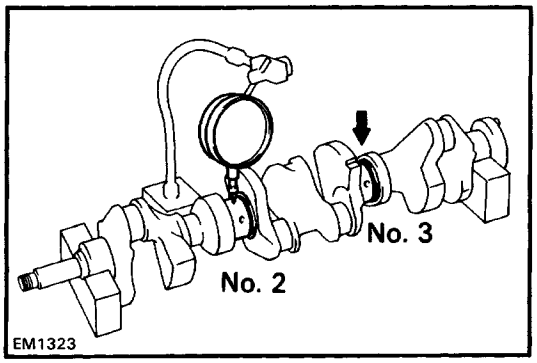
(a) Using a micrometer, measure the piston diameter at a right angle to the piston pin hole center line, 16 mm (0.63 in.) below the skirt bottom edge.

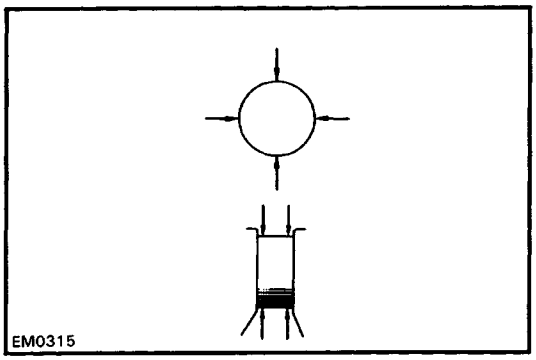
(b) Calculate the amount each cylinder is to be rebored as follows:

Size to be rebored = P + C – H
P = Piston diameter
C = Piston clearance
0.027 – 0.047 mm (0.0012 – 0.0020 in.)
H = Allowance for honing
0.02 mm (0.0008 in.) or less

3. BORE AND HONE CYLINDERS TO CALCULATED DIMENSIONS

Maximum honing: 0.02 mm (0.0008 in.)
NOTICE: Excess honing will destroy the finished roundness.





INSPECTION AND REPAIR OF CRANKSHAFT

1. INSPECT CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout at the No.2 and No.3 journals.

Maximum circle runout: 0.12 mm (0.0048 in.)

If the circle runout is greater than maximum, replace the crankshaft.

2. INSPECT MAIN JOURNALS AND CRANK PINS

(a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter (from front side):
STD size No–1 66.972 – 66.996 mm
(2.6367 – 2.6376 in.)
No.2 68.472 – 68.496 mm
(2.6957 – 2.6967 in.)
No.3 69.972 – 69.996 mm
(2.7548 – 2.7557 in.)
No.4 71.472 – 71.496 mm
(2.8139 – 2.8148 in.)
U/S 0.25 No.1 66.745 – 66.755 mm
(2.6278 – 2.6281 in.)
No.2 68.245 – 68.255 mm
(2.6868 – 2.6872 in.)
No.3 69.745 – 69.755 mm
(2.7459 – 2.7463 in.)
No.4 71.245 – 71.255 mm
(2.8049 – 2.8053 in.)
U/S 0.50 No–1 66.495 – 66.505 mm
(2.6179 – 2.6183 in.)
No.2 67.995 – 68.005 mm
(2.6770 – 2.6774 in.)
No–3 69.495 – 69.505 mm
(2.7360 – 2.7364 in.)
No.4 70.995 – 71.005 mm
(2.7951 – 2.7955 in.)

Crank pin diameter:
STD size 52.988 – 53.000 mm
(2.0861 – 2.0866 in.)
U/S 0.25 52.701 – 52.711 mm
(2.0748 – 2.0752 in.)
U/S 0.50 52.451 – 52.461 mm
(2.0650 – 2.0654 in.)

If the diameter is not within specification, check the oil clearance. If necessary, grind or replace the crankshaft.

(b) Check each main journal and crank pin for taper and out–of–round as shown.

Maximum taper and out–of–round: 0.02 mm (0.0008 in.)

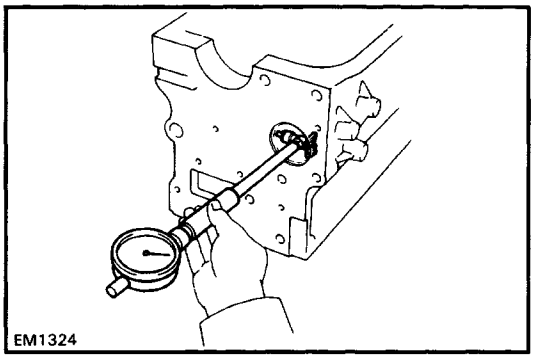
If taper or out–of–round is greater than maximum, replace the crankshaft.

3. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure step 2). Install new main journal and/or crank pin undersized bearings.

INSPECTION AND REPAIR OF CAMSHAFT BEARINGS

1. INSPECT CAMSHAFT OIL CLEARANCE



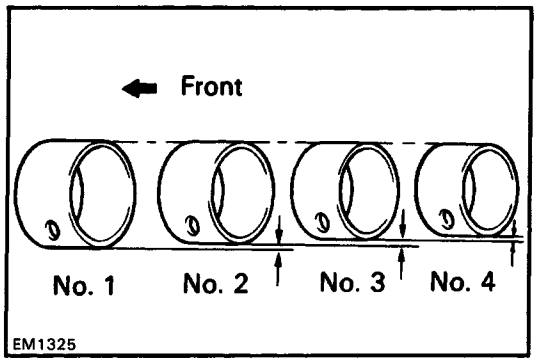
(a) Using a cylinder gauge, measure the inside diameter of the camshaft bearing.

Bearing inside diameter (from front side)
STD size No.1 48.000 – 48.030 mm
(1.8898 –1.8909in.)
No.2 46.500 – 46.530 mm
(1.8307 –1.8319 in.)
No.3 45.000 – 45.030 mm
(1.7717 –1.7728 in.)
No.4 43.500 – 43.530 mm
(1.7126 –1.7138 in.)
U/S 0.25 No.1 47.750 – 47.825 mm
(1.8799 –1.8829 in.)
No.2 46.250 – 46.325 mm
(1.8209 –1.8238 in.)
No.3 44.750 – 44.820 mm
(1.7618 –1.7646 in.)
No.4 43.250 – 43.320 mm
(1.7028 –1.7055 in.)
U/S 0.50 No.1 47.500 – 47.575 mm
(1.8701 –1.8730 in.)
No.2 46.000 – 46.075 mm
(1.8110 –1.8140 in.)
No.3 44.500 – 44.570 mm
(1.7520 –1.7547 in.)
No.4 43.000 – 43.070 mm
(1.6929 –1.6957 in.)

(b) Subtract the journal diameter measurement (See page EM–40) from the bearing inside diameter measurement.

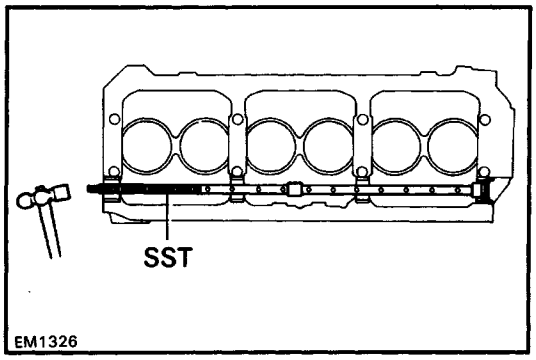
Standard clearance:
STD size 0.025 – 0.075 mm
(0.0010 – 0.0030 in.)
U/S0.25and0.50
No.1 and No.2 0.025 – 0.110 mm
(0.0010 – 0.0043 in.)
No.3 and No.4 0.025 – 0.105 mm
(0.0010 – 0.0041 in.)
Maximum clearance:
STD size 0.10 mm (0.0039 in.)
U/S 0.25 and 0.50 0.15 mm (0.0059 in.)

If the clearance is greater than maximum, replace the camshaft bearings. If necessary, grind or replace the camshaft.



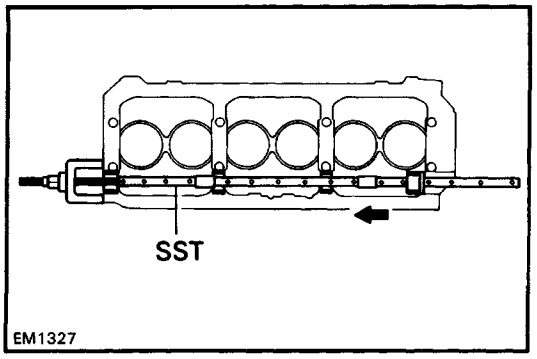
2. IF NECESSARY, REPLACE CAMSHAFT BEARINGS

HINT: The outside diameter varies with each bearing.



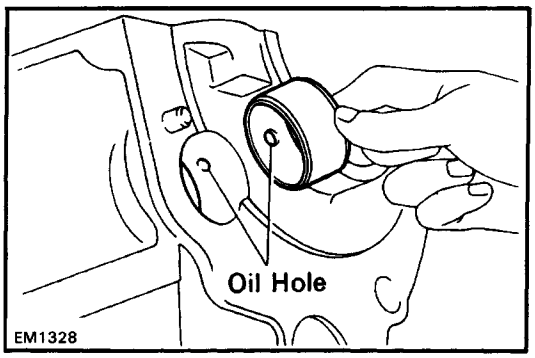
A. Remove expansion plug

Using SST and a hammer, tap out the expansion plug.
SST 09215–00100 (09215–00130, 09215–00150, 09215–00210)



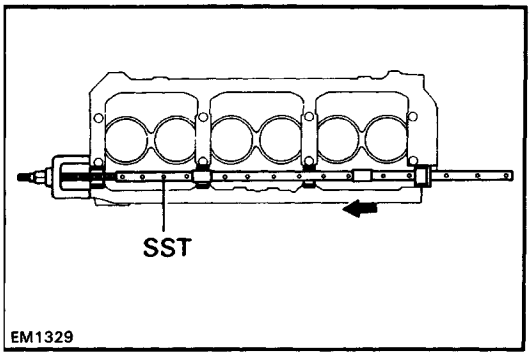
B. Remove camshaft bearings

Using SST, remove the bearings.
SST 09215–00012 (09215–00020, 09215–00030 09215–00410, 09215–00420) and 09215–00100 (09215–00130, 09215–00140, 09215–00150, 09215–00160, 09215–00240, 09215–00270)



C. Install new camshaft bearings

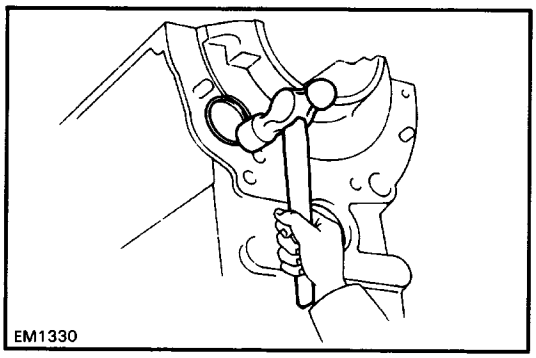
(a) Align the oil holes of the bearing and cylinder block.



(b) Using SST install the bearings.
SST 09215–00012 (09215–00020, 09215–00030, 09215–00410, 09215–00420) and 09215–00100 (09215–00130, 09215–00140, 09215–00150, 09215–00160, 09215–00240, 09215–00270)

D. Ream camshaft bearings

Ream the bearings to the finished diameter.
(See page EM–68)



E. Install expansion plug

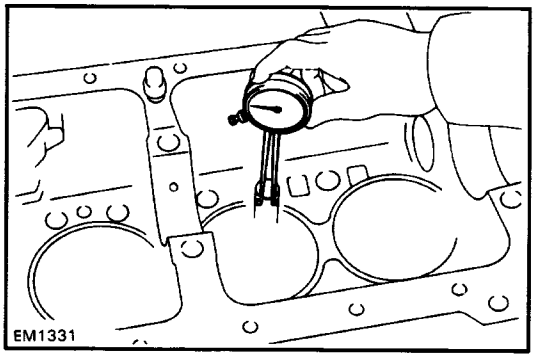
(a) Apply sealant to the expansion plug surface of the cylinder block.

Sealant: Part No. 08833–00070, THREE BOND 1324 or equivalent

(b) Using a hammer, tap in a new expansion plug until its surface is flush with the cylinder block edge.

3. IF NECESSARY, GRIND AND HONE CAMSHAFT JOURNALS

Grind and hone the journals to the undersized finished diameter. (See page EM–40)



INSPECTION OF VALVE LIFTER BORES

INSPECT VALVE LIFTER OIL CLEARANCE

(a) Using a caliper gauge, measure the valve lifter bore diameter.

Bore diameter: 21.417 – 21.443 mm (0.8432 – 0.8442 in.)

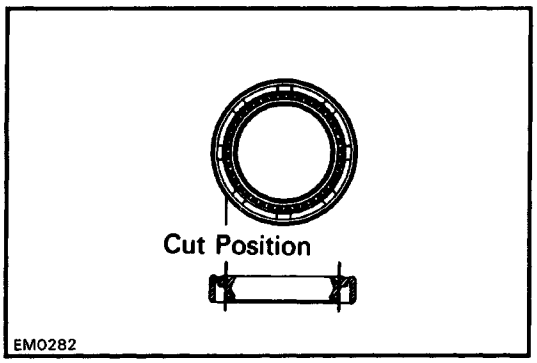
(b) Subtract the valve lifter diameter measurement (See page EM–42) for diameter measurement.

Standard oil clearance: 0.013 – 0.056 mm (0.0005 – 0.0022 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve lifters.

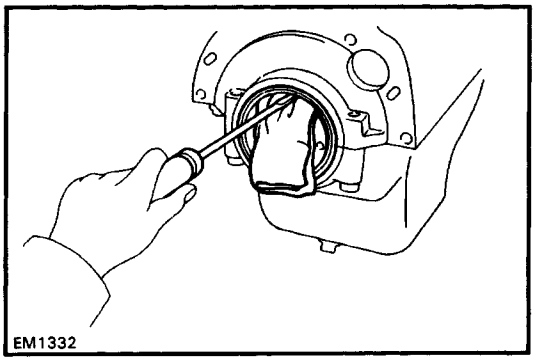
Valve lifter size: STD, O/S 0.05



REPLACEMENT OF CRANKSHAFT REAR OIL SEAL

REPLACE CRANKSHAFT REAR OIL SEAL

(a) Using a knife, cut off the oil seal lip.

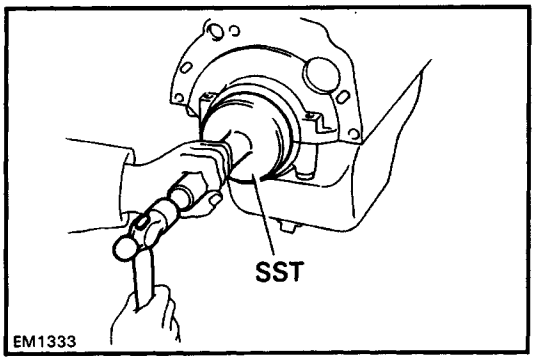


(b) Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the crankshaft.

Tape the screwdriver tip.

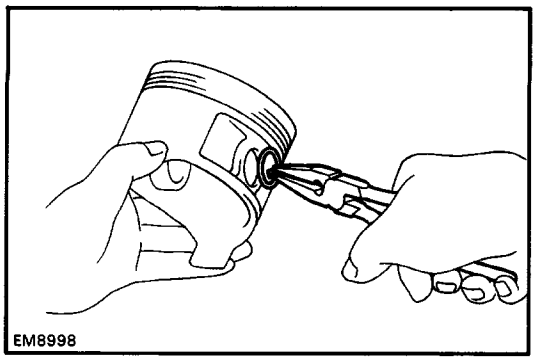
(c) Check the oil seal lip contact surface of the crankshaft for cracks or damage.



(d) Apply MP grease to a new oil seal lip.

(e) Using SST and a hammer, tap in the oil seal until its surface is flush with the cylinder block and main bearing cap edges.

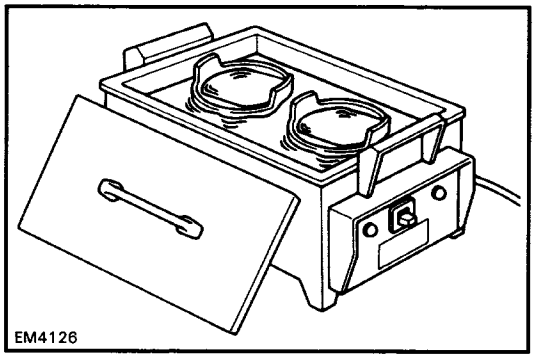
SST 09223–60010


EM8998

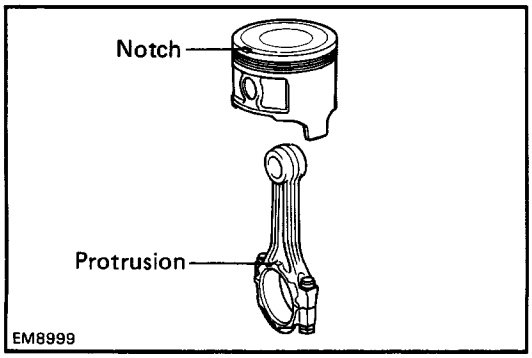
ASSEMBLY OF PISTON AND CONNECTING ROD

1. ASSEMBLE PISTON AND CONNECTING ROD

(a) Install a new snap ring on one side of the piston pin hole.


EM4126

(b) Gradually heat the piston to approx. 80˚C (176˚F).

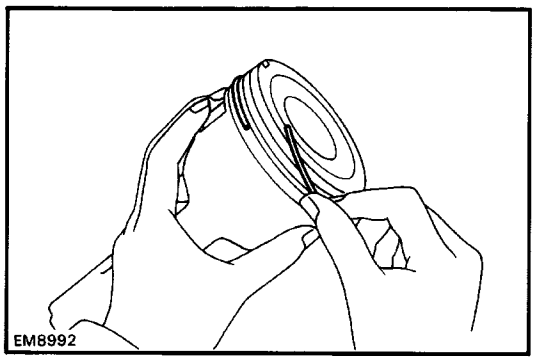


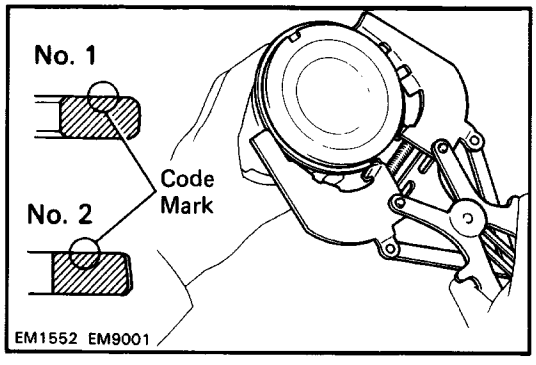
EM8999

(c) Coat the piston pin with engine oil.
(d) Align the notch of the piston with the protrusion of the connecting rod and push in the piston pin with your thumb.
(e) Install a new snap ring on the other side of the pin hole.

2. INSTALL PISTON RINGS

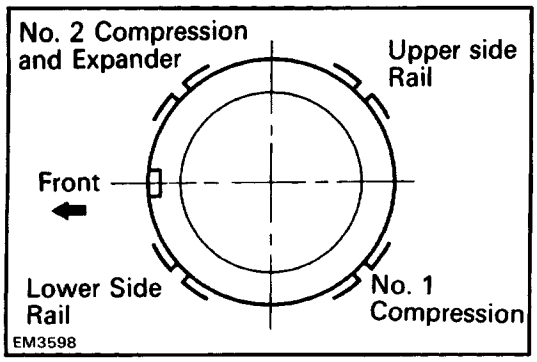
(a) Install the oil ring expander and two side rails by hand.


EM8992



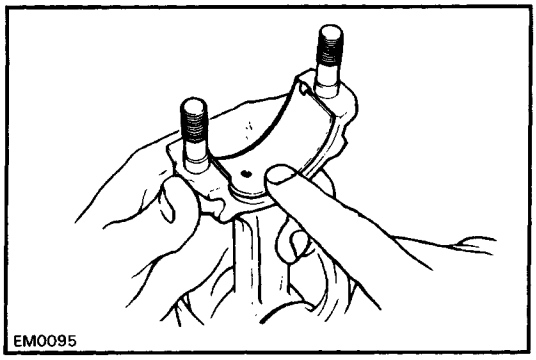
EM1552 EM9001

(b) Using a piston ring expander, install the two com–pression rings with the code mark facing upward.



(c) Position the piston rings so that the ring ends are as shown.

NOTICE: Do not align the end gaps.



3. INSTALL CONNECTING ROD BEARINGS

(a) Align the bearing claw with the claw groove of the connecting rod or connecting rod cap.

(b) Install the bearing in the connecting rod and rod cap.

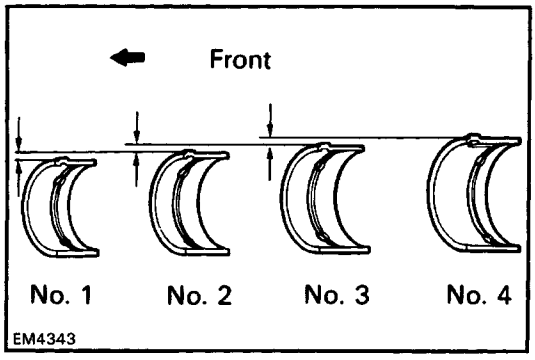
NOTICE: Install the bearings with the oil hole in the connecting rod.

ASSEMBLY OF CYLINDER BLOCK

(See page EM–47)

HINT:

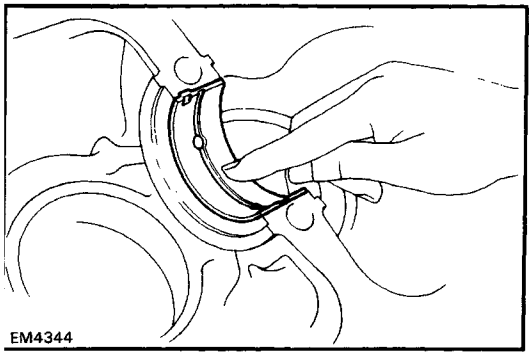
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O–rings and oil seals with new parts.



1. INSTALL MAIN BEARINGS

HINT:

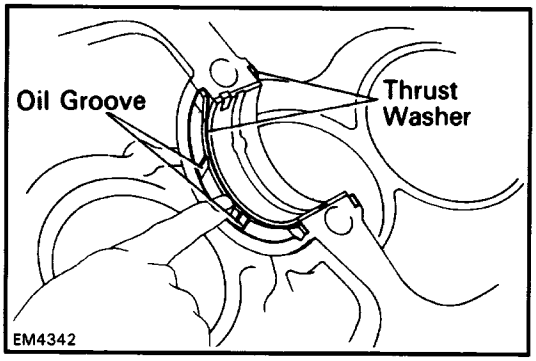
- The outside diameter varies with each bearing.
- All main bearing have oil holes except No. 1 and No. 4 bearings on the lower side.



(a) Align the bearing claw with the the claw groove of the main bearing cap or cylinder block.

(b) Install the bearing in the cylinder block and bearing caps.

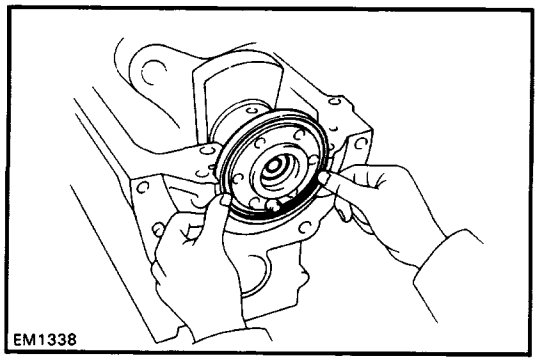
NOTICE: Install the bearing with the oil hole in the block.



2. INSTALL UPPER THRUST WASHERS

Install the thrust washers under the No. 3 main journal cap position of the block with the oil grooves facing outward.

3. PLACE CRANKSHAFT ON CYLINDER BLOCK

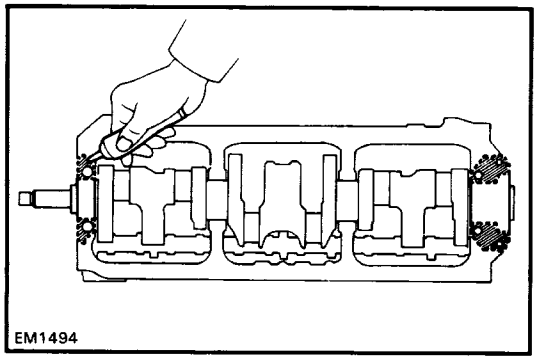


4. INSTALL NEW CRANKSHAFT REAR OIL SEAL

(a) Apply MP grease to the oil seal lip.

(b) Push in the oil seal until its surface is flush with the cylinder block edge.

NOTICE: Be careful not to install the oil seal slant–wise.

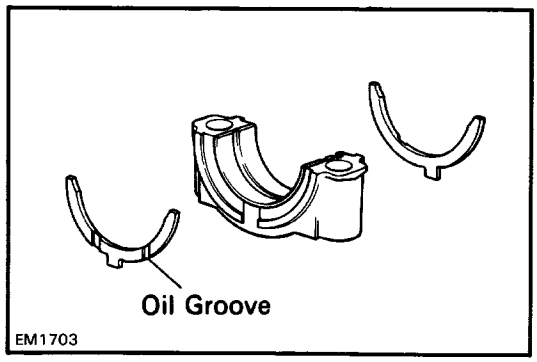


5. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS

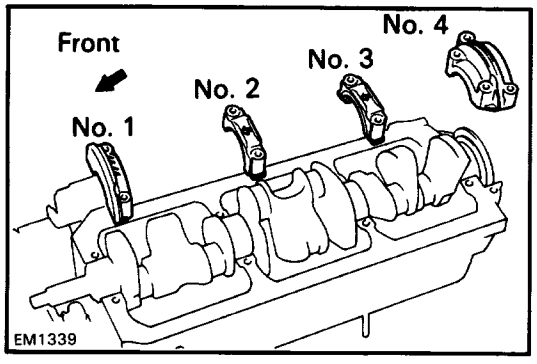
(a) Apply seal packing to the main bearing installation surface of the cylinder block.

Seal packing: Part No. 08820–00080 or equivalent

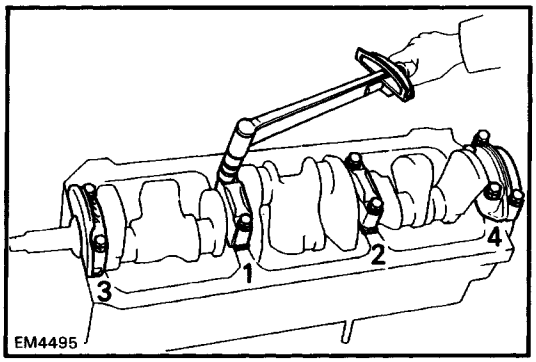
NOTICE: Be careful not to apply seal packing to the main bearing.



(b) Install the lower thrust washers on the No. 3 main bearing cap with the grooves facing outward.



(c) Install the main bearing caps in their proper loca–tion.



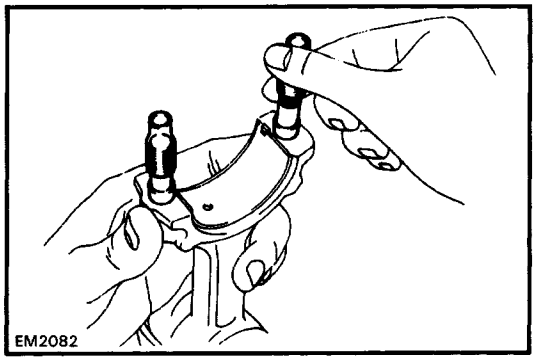
(d) Apply a light coat of engine oil to the threads and the bolt heads of the main bearing caps.
(e) Install and uniformly tighten the ten bolts of the main bearing caps in several passes, in the sequence shown.

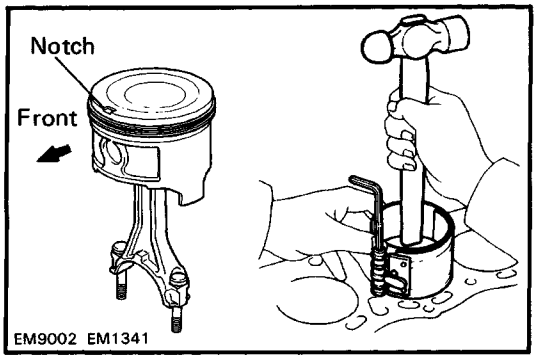
Torque:
19 mm bolt head
135 N–m (1,375 kgf–cm, 99 ft–lbf)
17 mm bolt head
115 N–m (1,175 kgf–cm, 85 ft–lbf)

(f) Check that the crankshaft turns smoothly.
(g) Check the crankshaft thrust clearance.
(See step 5 on page EM–55)

6. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

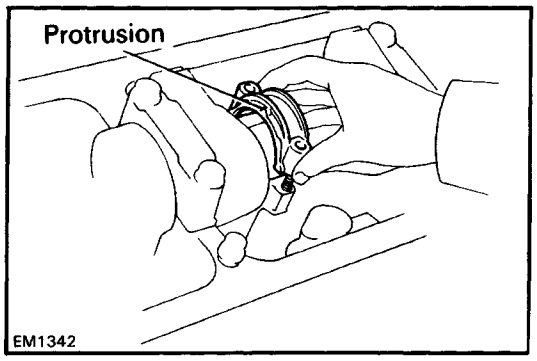
(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



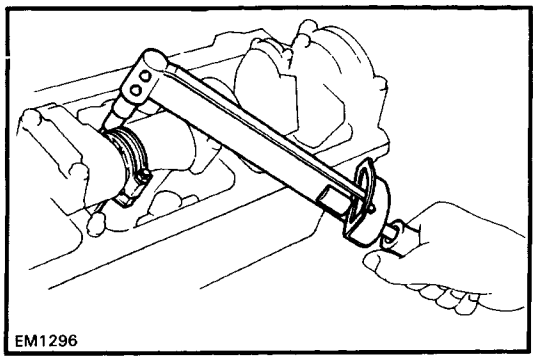


(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into the cylinder with the notch of the piston facing forward.

7. INSTALL CONNECTING ROD CAPS



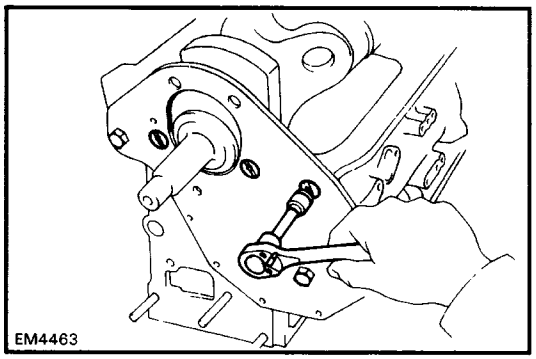
(a) Match the numbered cap with the numbered connecting rod.
(b) Install the connecting rod cap with the protrusion facing forward.



(c) Apply a light coat of engine oil to the threads and under the nuts of the connecting rod cap.
(d) Install and alternately tighten the connecting rod cap nuts in several passes.

Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)

(e) Check that the crankshaft turns smoothly.
(f) Check the connecting rod thrust clearance.
(See step 2 on page EM–52)



8. INSTALL FRONT END PLATE

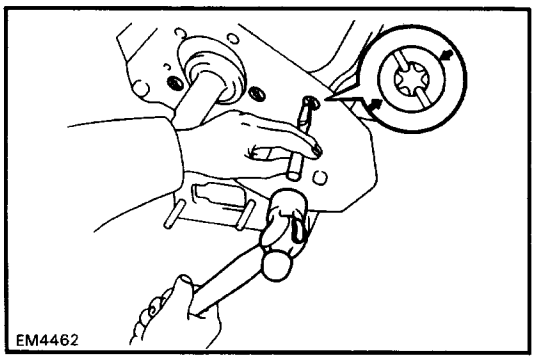
(a) Install. the end plate with the two bolts.

(b) Using a torx socket wrench, torque the screws.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)

(c) Torque the bolts.

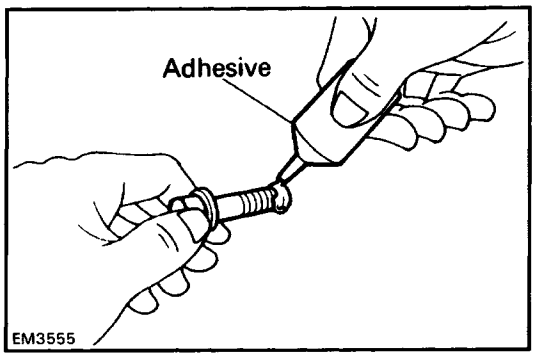
Torque: 30 N–m (310 kgf–cm, 22 ft–lbf)

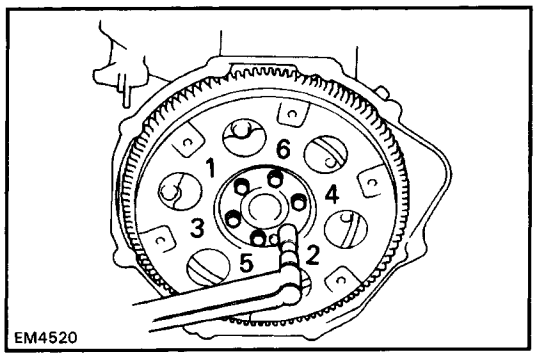


(d) Using a chisel and hammer, stake the screws.

POST ASSEMBLY

1. INSTALL OIL PUMP AND OIL PAN
(See page LU–12)
2. INSTALL OIL COOLER AND OIL FILTER BRACKET
(See page LU–16)
3. INSTALL TIMING GEARS AND CAMSHAFT
(See pages EM–43 to EM–46)
4. INSTALL WATER PUMP
5. INSTALL CYLINDER HEAD
(See page EM–30)
6. REMOVE ENGINE STAND
7. INSTALL TRANSMISSION HOUSING ADAPTOR





8. INSTALL DRIVE PLATE

(a) Clean the mount bolt threads and crankshaft bolt holes of any residual sealer, oil or foreign particles. Remove any oil with kerosene or gasoline.

(b) Apply adhesive to two or three threads of the mount bolt end.

Adhesive: Part No. 08833–00070, THREE BOND 1324 or equivalent

HINT:

- This sealant will not harden while exposed to air.
- It will act as a sealer or binding agent only when ap–plied to threads, etc. when the air is cut off.

(c) Install the drive plate on the crankshaft.

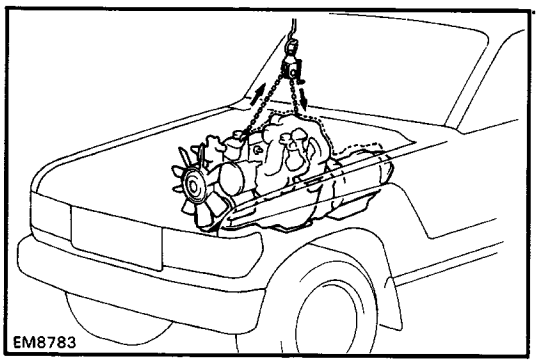
(d) Install and uniformly tighten the bolts in several passes, in the sequence shown.

Torque: 87 N–m (890 kgf–cm, 64 ft–lbf)

INSTALLATION OF ENGINE

1. INSTALL TRANSMISSION TO ENGINE

2. INSTALL A/T OIL COOLER PIPES



3. INSTALL ENGINE WITH TRANSMISSION IN VEHICLE

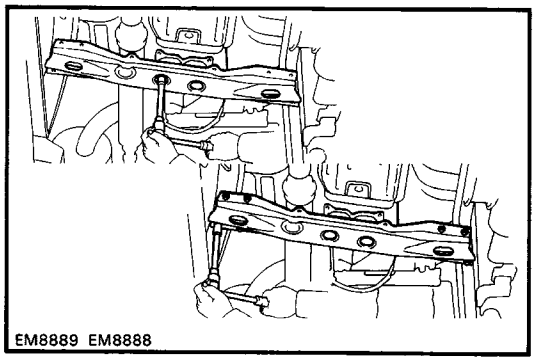
(a) Attach the engine hoist chain to the engine hangers.

(b) Lower the engine into the engine compartment.

(c) Align the engine with the transmission and engine mounting supports.

(d) Install the washers and mount nuts.

(e) Remove the hoist chain.



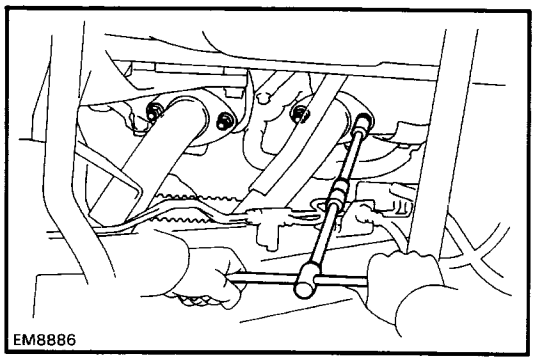
4. RAISE VEHICLE

NOTICE: Be sure the vehicle is securely supported.

5. INSTALL FRAME CROSSMEMBER

Install the frame crossmember with the eight bolts and two nuts.

Torque: Bolt 39 N–m (400 kgf–cm, 29 ft–lbf)
Nut 59 N–m (600 kgf–cm, 43 ft–lbf)

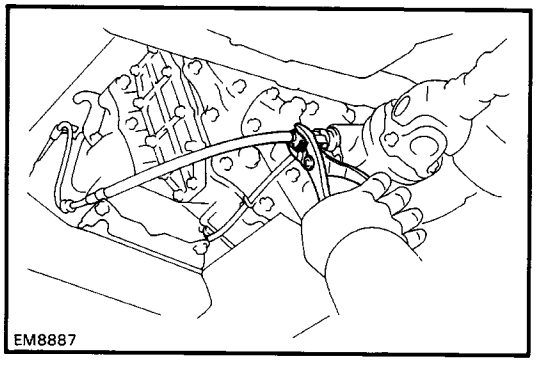


6. CONNECT EXHAUST PIPE TO EXHAUST MANIFOLD

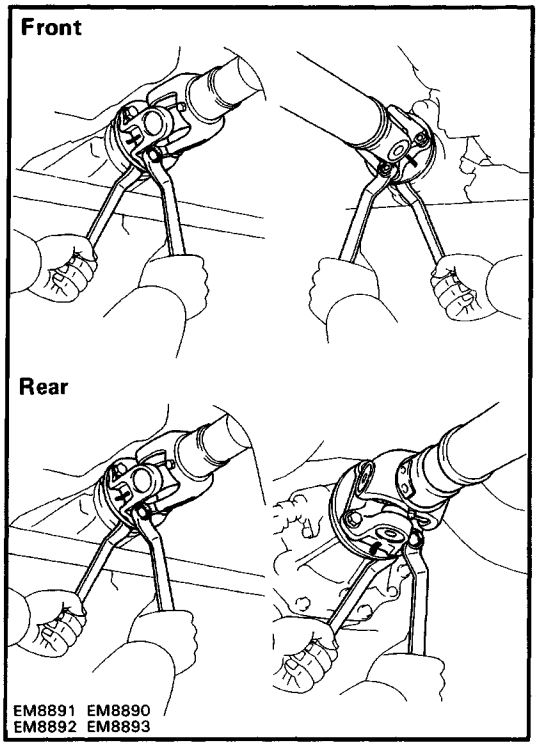
(a) Place two new gaskets on the exhaust pipe.

(b) Connect the exhaust pipe with four new nuts.

Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)



7. CONNECT SPEEDOMETER CABLE



8. INSTALL FRONT AND REAR PROPELLER SHAFTS

(Front)

(a) Align the matchmarks on the flanges and connect the flanges with the four nuts.

(b) Torque the nuts.

Torque: 88 N–m (900 kgf–cm, 65 ft–lbf)

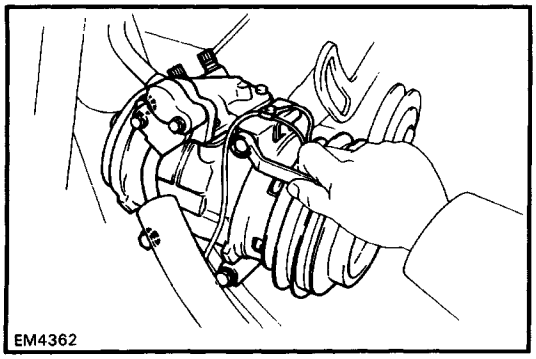
(Rear)

(a) Align the matchmarks on the flanges and connect the flanges with the four bolts and nuts.

(b) Torque the bolts and nuts.

Torque: 88 N–m (900 kgf–cm, 65 ft–lbf)

9. INSTALL TRANSFER UNDER COVER

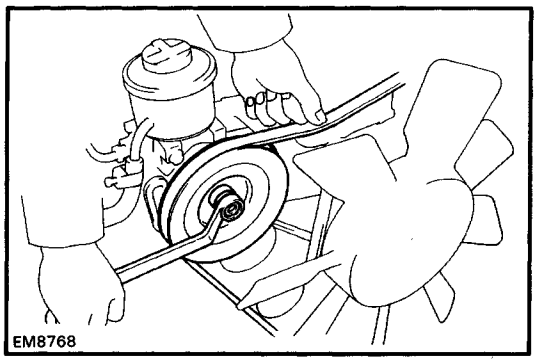


10. INSTALL A/C COMPRESSOR

(a) Install the A/C compressor with the four bolts.

(b) Install and adjust the drive belt.

(See page MA–4)



11. INSTALL PS PUMP

(a) Install the PS pump with the two bolts. Do not tighten the bolts.

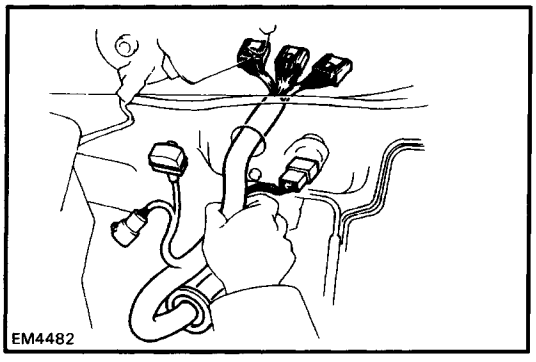
(b) Install the woodruff key, drive pulley with the plate washer spring washer and mount nut.

(c) Install and adjust drive belt

(See page MA–4)

(d) Push on the drive belt to hold the pulley in place and torque the pulley nut.

Torque: 47 N–m (480 kgf–cm, 35 ft–lbf)



12. CONNECT EFI WIRE HARNESS TO ECU

(a) Push in the EFI wire harness through the cowl panel.

(b) Connect the four connectors.

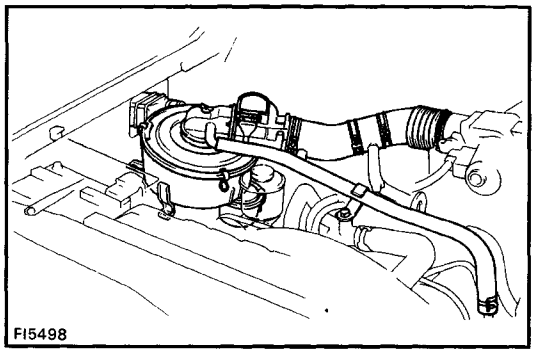
(c) Install the glove box.

13. CONNECT FOLLOWING HOSES:
(a) Heater hoses
(b) Fuel hoses
(c) Transfer hose
(d) Brake booster hose
(e) PS air control valve hose
(f) Al hoses
(g) Distributor hose
(h) Emission control hoses

14. CONNECT FOLLOWING WIRES AND CONNECTORS
(a) Oil pressure connector
(b) High tension cord from ignition coil
(c) Neutral start switch and transfer connectors located near the starter
(d) Front differential lock connector
(e) Starter wire and connector
(f) Ground strap from starter
(g) Oxygen sensor connectors
(h) Alternator wire and connector
(i) Cooling fan connector
(j) Check connector
(k) Connector on RH fender apron

15. INSTALL RADIATOR
(See page CO–20)

16. INSTALL COOLANT RESERVOIR TANK



17. INSTALL AIR INTAKE HOSE, AIR FLOW METER AND AIR CLEANER ASSEMBLY
(a) Install the air cleaner case with the three bolts.
(b) Install the air cleaner element.
(c) Install the air intake hose, air flow meter and air cleaner cap with the wing nut and three clips.
(d) Connect the following hoses:
- ISC hose
- Air pump hose
- Distributor hose
- PCV hose
- Three hoses from the intake chamber rear side
- Two hoses from the VCV of the charcoal canister

18. CONNECT ACCELERATOR AND THROTTLE CABLES, AND ADJUST THEM

19. FILL WITH ENGINE COOLANT (See page CO–5)
Capacity
w/ Front heater
17.5 liters (18.5 US qts, 15.4 Imp. qts)
w/ Front and rear heaters
19.5 liters (20.6 US qts. 17.2 Imp. qts)

20. FILL WITH ENGINE OIL (See page LU–6)

Capacity:

Drain and refill

w/o Oil filter change

7.0 liters (7.4 US qts, 6.2 Imp. qts)

w/ Oil filter change

7.8 liters (8.2 US qts, 6.9 Imp. qts)

Dry fill 8.0 liters (8.5 US qts, 7.0 Imp. qts)

21. INSTALL BATTERY TRAY AND BATTERY

22. START ENGINE AND CHECK FOR LEAKS

23. PERFORM ENGINE ADJUSTMENT

(a) Adjust the ignition timing.

(See steps 10 to 14 on page IG–11)

Ignition timing: 7° BTDC @ idle

(w/ Terminals TE1 and E1

connected)

(b) Adjust the valve clearance. (See page EM–9)

Valve clearance (Hot):

Intake 0.20 mm (0.008 in.)

Exhaust 0.35 mm (0.014 in.)

24. INSTALL HOOD

25. PERFORM ROAD TEST

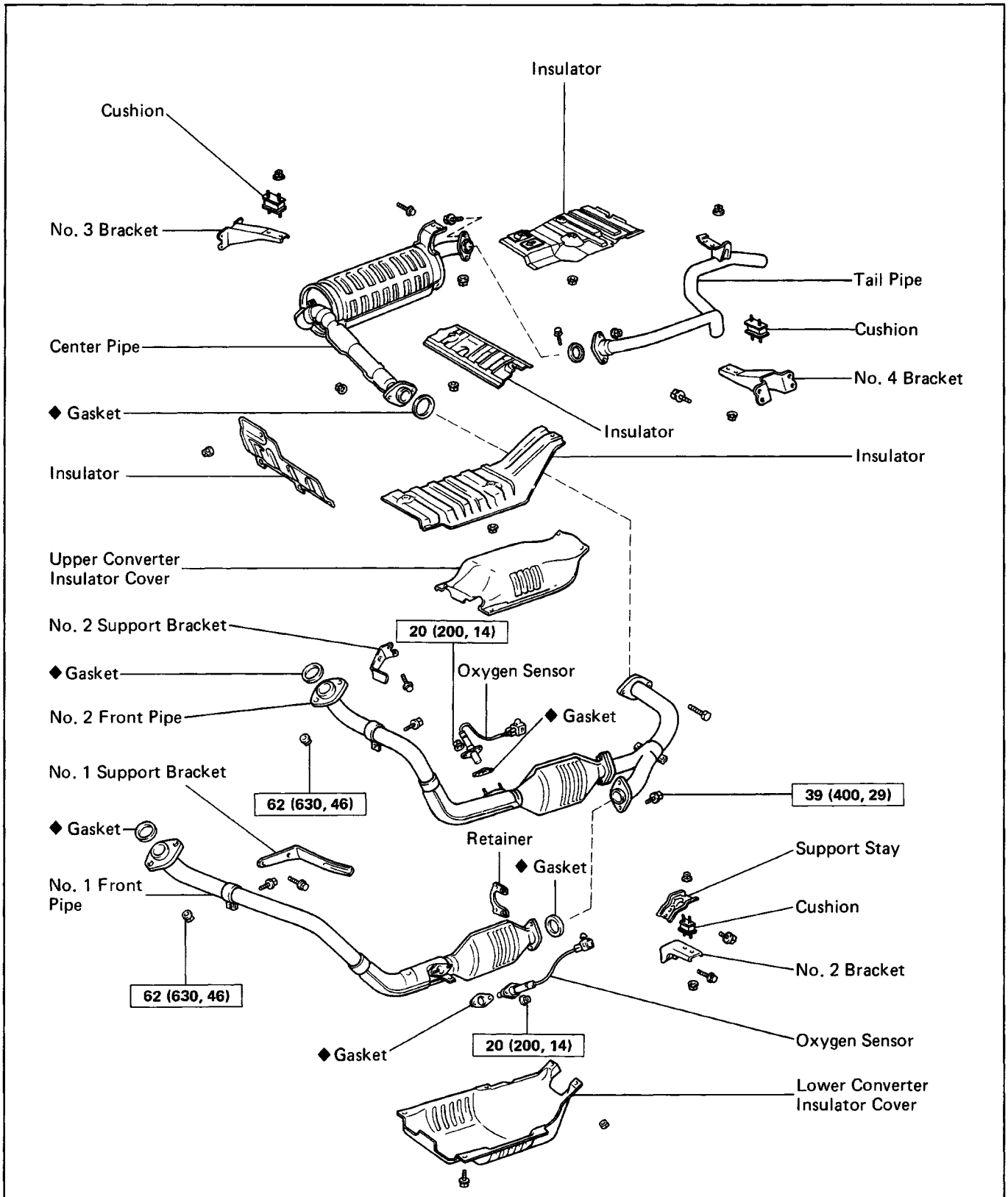
Check for abnormal noise, shock, slippage and smooth operation.

26. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL

EXHAUST SYSTEM

EXHAUST PIPE

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

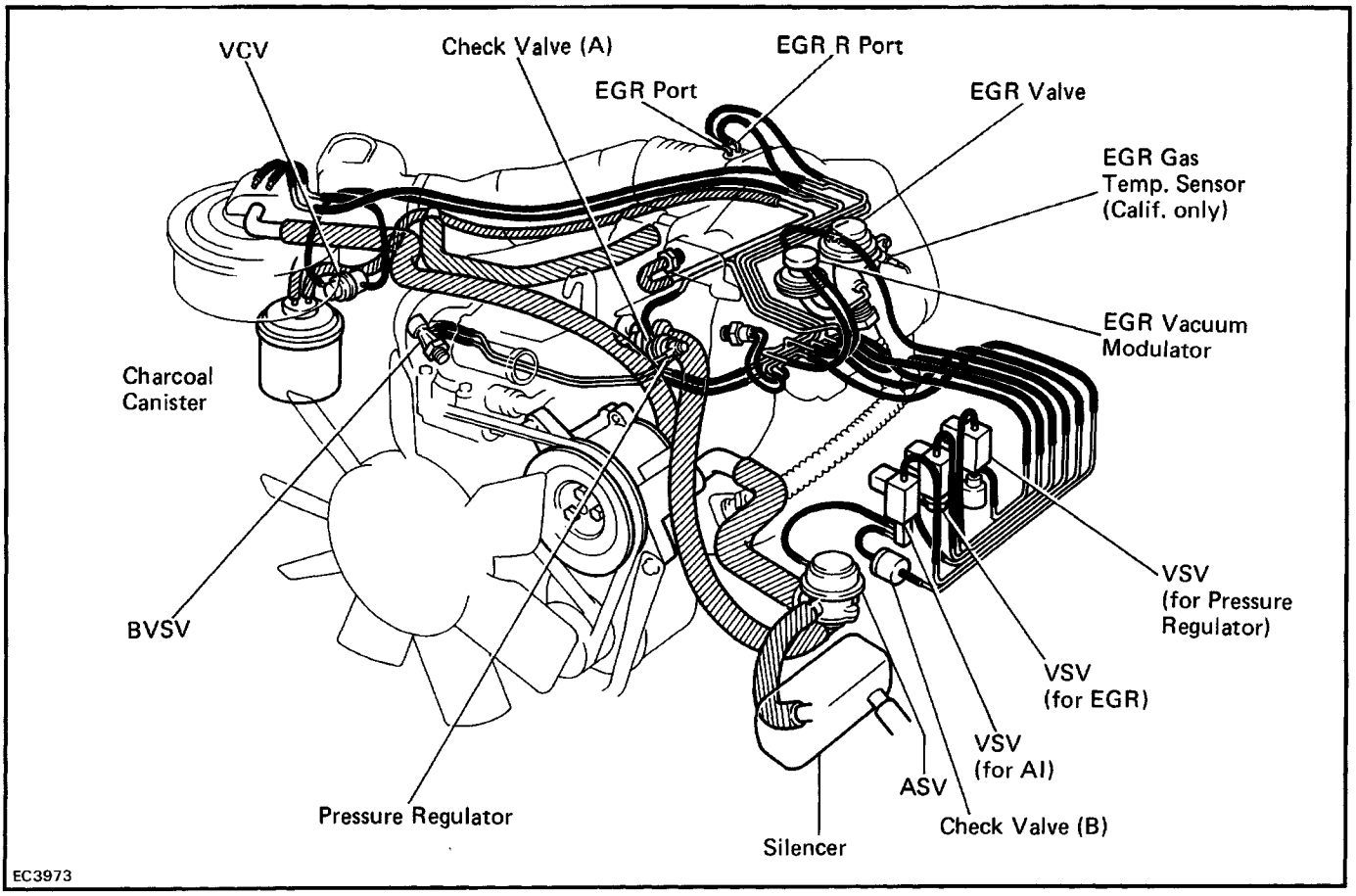
EMISSION SYSTEMS

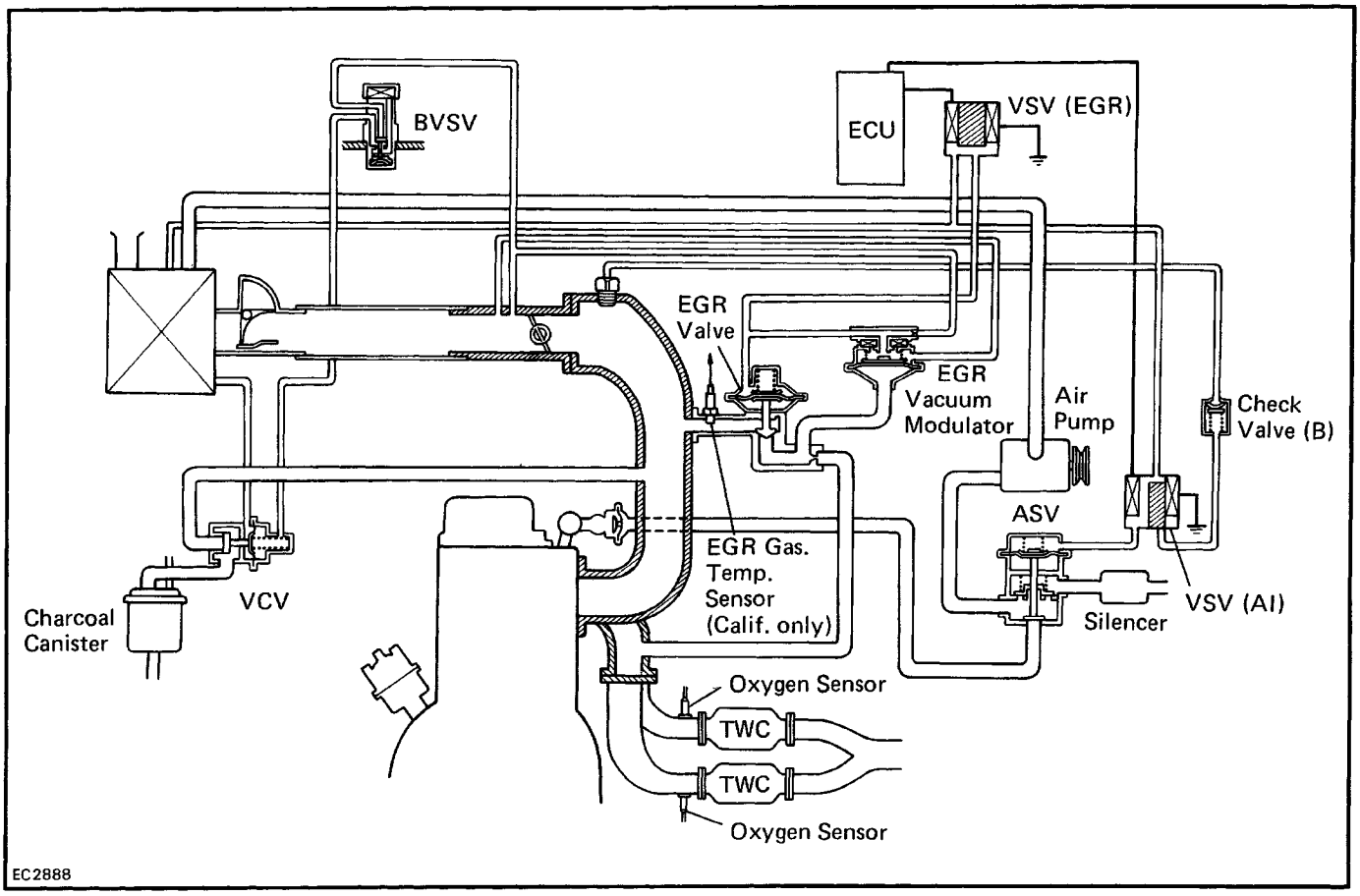
SYSTEM PURPOSE

System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduces blow–by gas (HC)
Fuel evaporative emission control	EVAP	Reduces evaporative HC
Exhaust gas recirculation	EGR	Reduces NOx
Air injection	AI	Reduces CO and HC
Three–way catalyst	TWC	Reduces CO, HC and NOx
Electronic fuel injection*	EFI	Regulates all engine conditions for reduction of exhaust emissions.

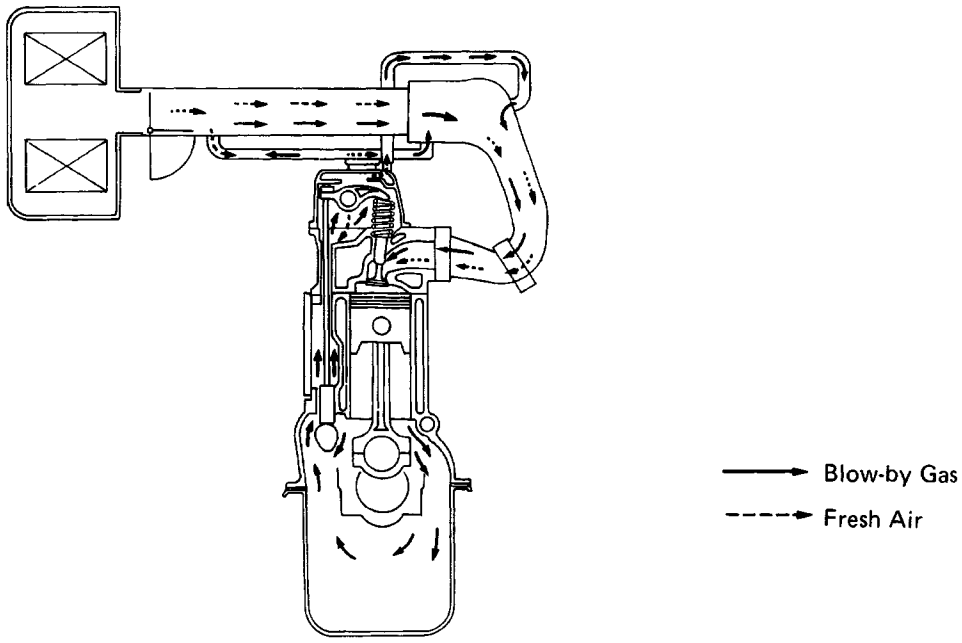
*For inspection and repair of the EFI system, refer to the EFI section of this manual.

COMPONENT LAYOUT AND SCHEMATIC DRAWING





POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

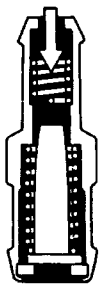


EC4016

To reduce HC emissions, crankcase blow–by gas (HC) is routed through the PCV valve to the intake manifold for combustion in the cylinders.

Engine not Running or Backfiring

Intake Manifold Side

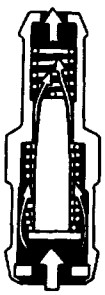


Cylinder Head Side

- PCV VALVE IS CLOSED.

EC1007

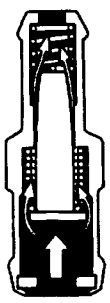
Normal Operation



- PCV VALVE IS OPEN.
- VACUUM PASSAGE IS LARGE.

EC1008

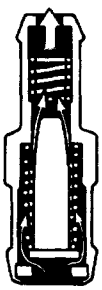
Idling or Decelerating



- PCV VALVE IS OPEN.
- VACUUM PASSAGE IS SMALL.

EC1009

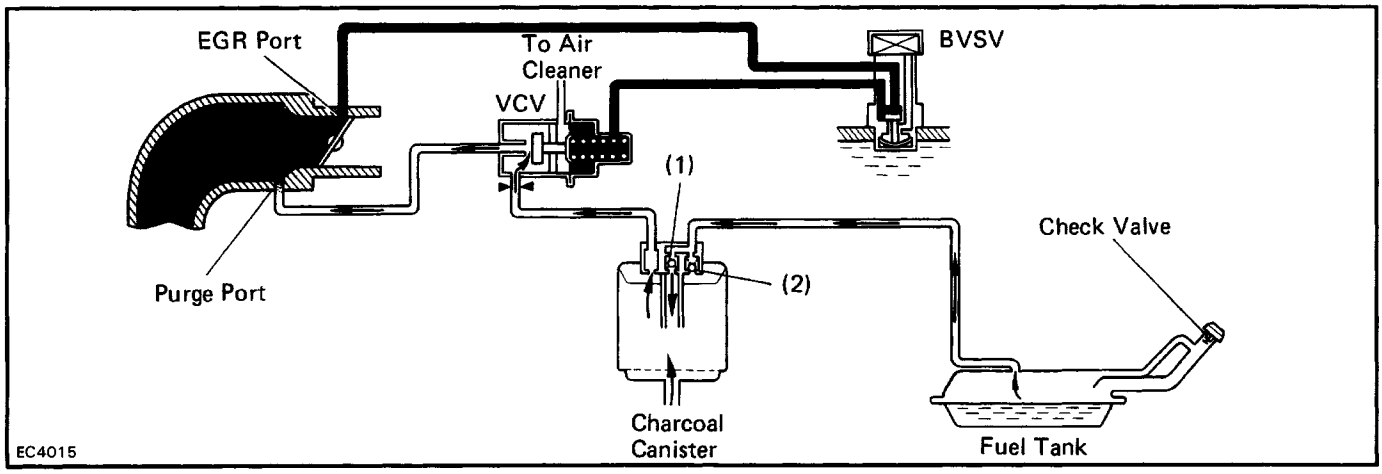
Acceleration or High Load



- PCV VALVE IS FULLY OPEN.

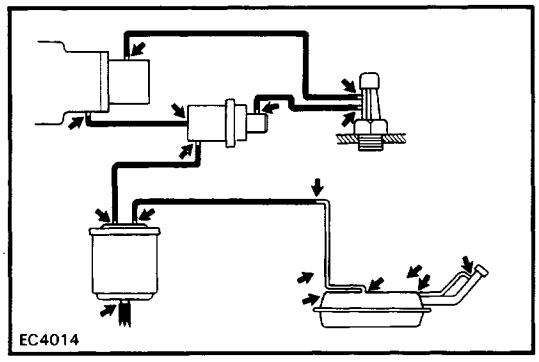
EC1010

FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM



To reduce HC emission, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

Coolant Temp.	BVSV	Vacuum at EGR Port	VCV	Check Valve (1)	Check Valve (2)	Check Valve in Cap	Evaporated Fuel (HC)
Below 45°C (113°F)	CLOSED	—	CLOSED			—	HC from tank is absorbed into the canister.
Above 64°C (147°F)	OPEN	Blow 50 mmHg. (1.97 in. Hg)	CLOSED				
		Above 70 mmHg. (2.76 in. Hg)	OPEN			—	HC from canister is led into air intake chamber.
High pressure in tank				OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister.
High vacuum in tank		—		CLOSED	OPEN	OPEN	Air is led into the fuel tank.



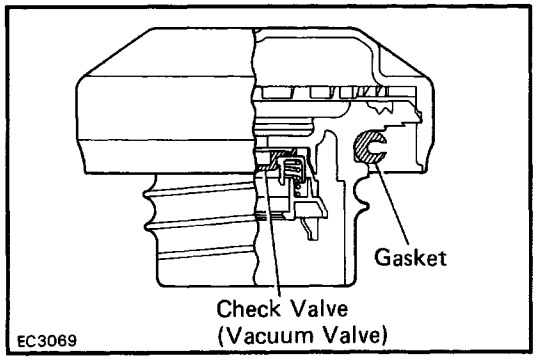
INSPECTION OF FUEL VAPOR LINES, FUEL TANK AND TANK CAP

1. VISUALLY INSPECT LINES AND CONNECTIONS

Look for loose connections, kinks or damage.

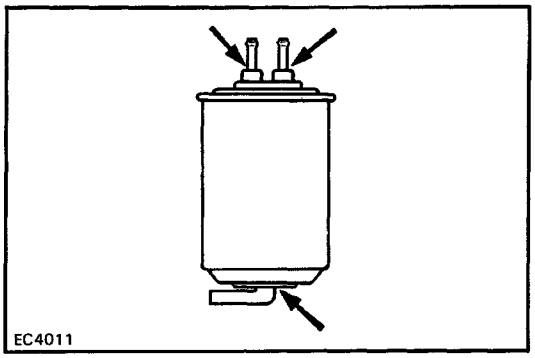
2. VISUALLY INSPECT FUEL TANK

Look for deformation, cracks or fuel leakage.



3. VISUALLY INSPECT FUEL TANK CAP

Look for a damaged or deformed gasket and cap.
If necessary, repair or replace the cap.

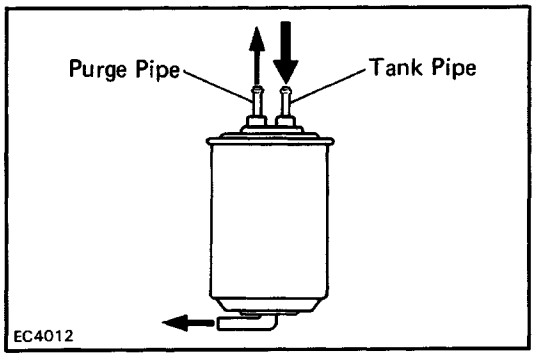


INSPECTION OF CHARCOAL CANISTER

1. REMOVE CHARCOAL CANISTER

2. VISUALLY INSPECT CHARCOAL CANISTER CASE

Look for cracks or damage.

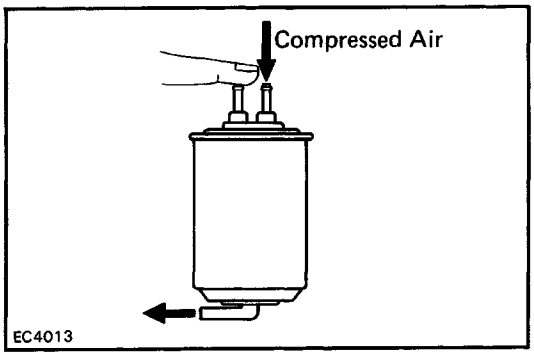


3. CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE

(a) Using low pressure compressed air, blow into the tank pipe and check that the air flows without resis–tance from the other pipes.

(b) Blow into the purge pipe and check that the air does not flow from the other pipes.

If a problem is found, replace the charcoal canister.



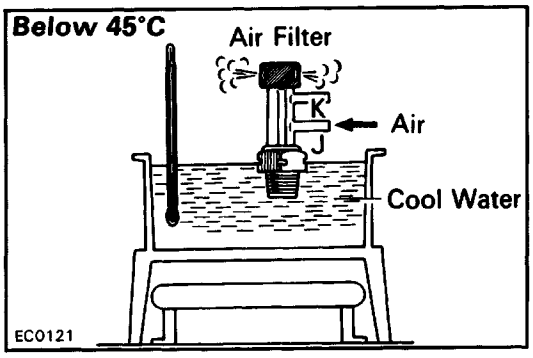
4. CLEAN FILTER IN CANISTER

Clean the filter by blowing 294 kPa (3 kgf/cm^2, 43 psi) of compressed air into the tank pipe, while holding the other upper canister pipe closed.

HINT:

- Do not attempt to wash the canister.
- No activated carbon should come out.

5. INSTALL CHARCOAL CANISTER



INSPECTION OF BVSV

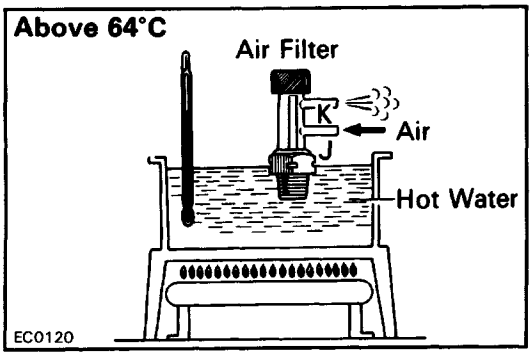
CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV from the water outlet.

(c) Cool the BVSV to below 45˚C (113˚F) with cool water.

(d) Check that air flows from pipe J to the air filter.



(e) Heat the BVSV to above 64˚C (147˚F) with hot water.

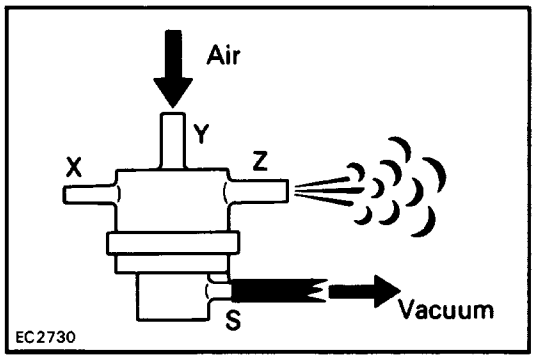
(f) Check that air flows from pipe J to pipe K.

If a problem is found, replace the BVSV.

(g) Apply sealant to the threads of the BVSV and rein–stall.

Sealant: Part No. 08833–00070, THREE BOND 1324 or equivalent

(h) Fill the radiator with coolant.

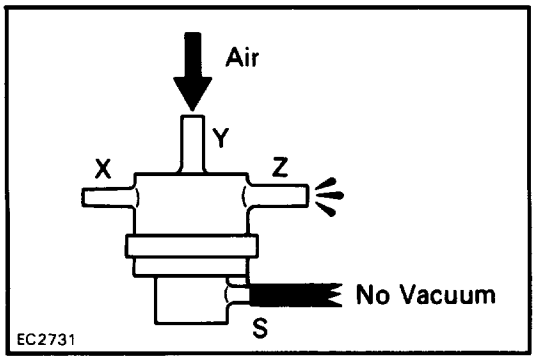


INSPECTION OF VCV

CHECK VCV BY BLOWING AIR INTO PIPE

(a) Apply vacuum above 70 mmHg (2.76 in.Hg) to pipe S.

(b) Blow air into pipe Y and check that air comes out of pipe Z.

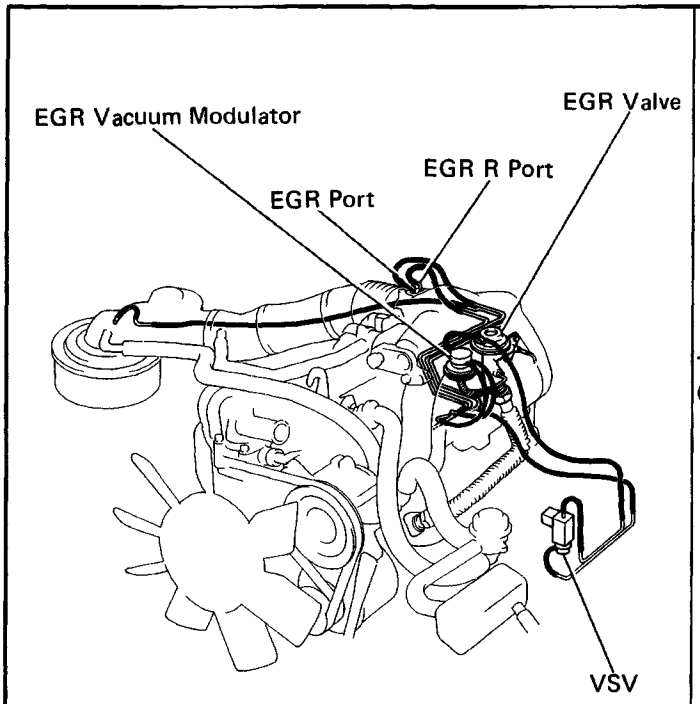


(c) Stop the applied vacuum.

(d) Blow air into pipe Y and check that air does not come out of pipe Z.

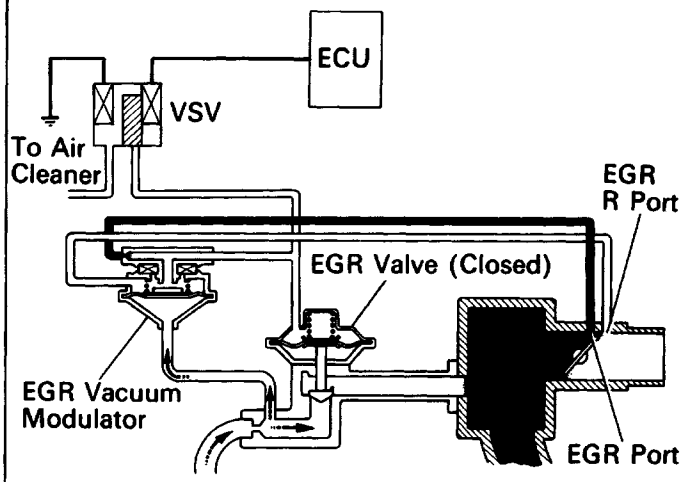
If a problem is found, replace the VCV.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM



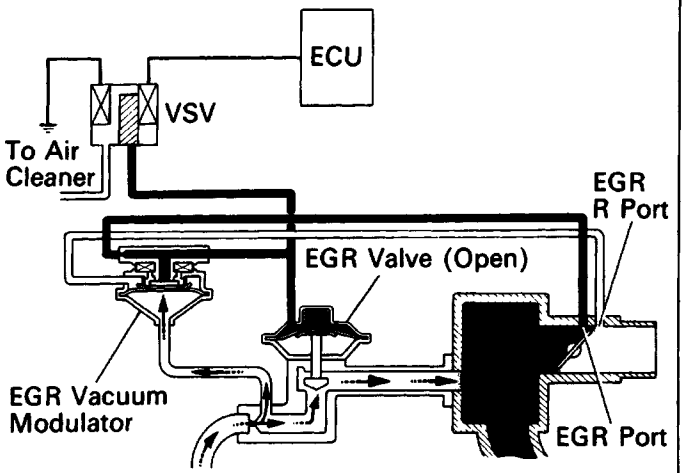
EC3980

(1)



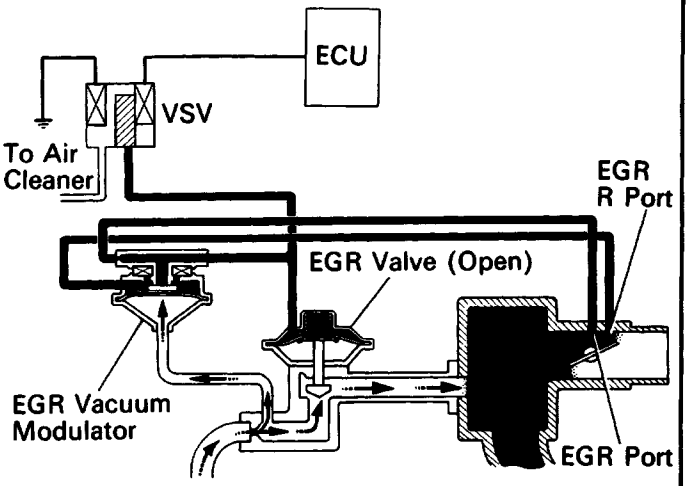
EC2931

(2)



EC2932

(3)



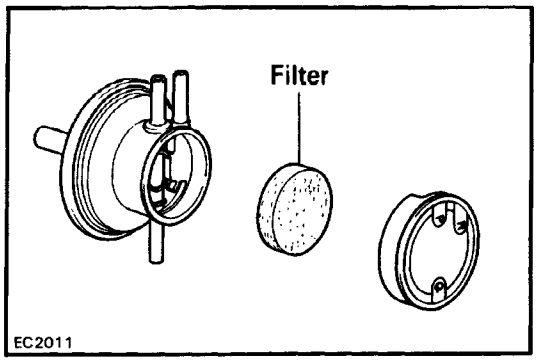
EC2933

To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

Coolant Temp.	Engine RPM	Driving Condition	Intake Air Volume	VSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 47°C (117°F)			—	OFF	—	—		—	CLOSED	Not recirculated
Above 53°C (127°F)	Above 3,500 rpm	—	—	OFF	—	—		—	CLOSED	Not recirculated
	Below 3,500 rpm	Deceleration	—	OFF	—	—			CLOSED	Not recirculated
		Ex. deceleration	LOW	OFF	—	—		—	CLOSED	Not recirculated
			HIGH	OFF	—	—			CLOSED	Not recirculated
				ON	Positioned below EGR port	—			CLOSED	Not recirculated
					Positioned between EGR port and EGR R port	(1) LOW	*Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
						(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated
					Positioned above EGR port	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

*Pressure increase → Modulator closes → EGR valve opens → Pressure drops
EGR valve closes ← Modulator opens

**When the throttle valve is positioned above the R port, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.

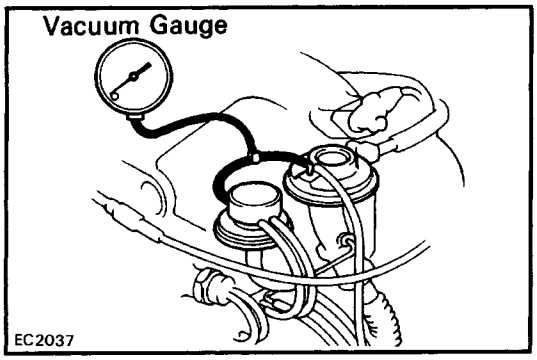


INSPECTION OF EGR SYSTEM

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.

(b) Using compressed air, clean the filter.

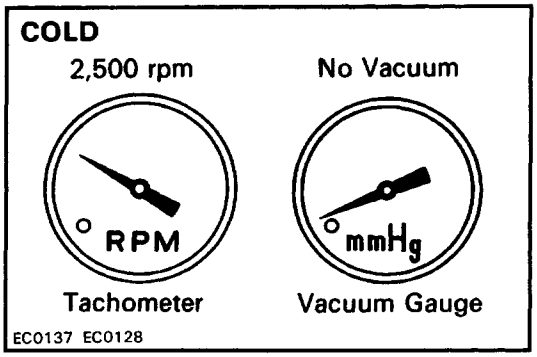


2. PREPARATION

Using a 3–way connector, connect a vacuum gauge to the hose between the EGR valve and vacuum pipe.

3. CHECK SEATING OF EGR VALVE

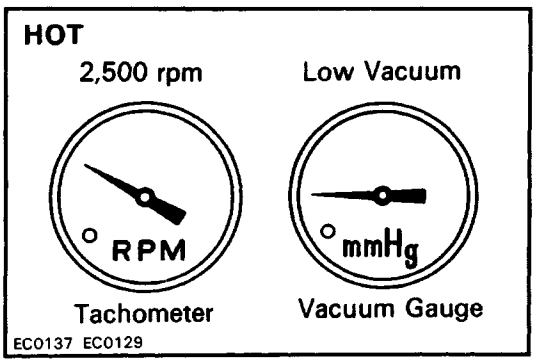
Start the engine and check that the engine starts easily and runs smoothly at idle.



4. CHECK VSV WITH COLD ENGINE

(a) The coolant temperature should be below 53˚C (127˚F).

(b) Check that the vacuum gauge indicates zero at 2,500 rpm.

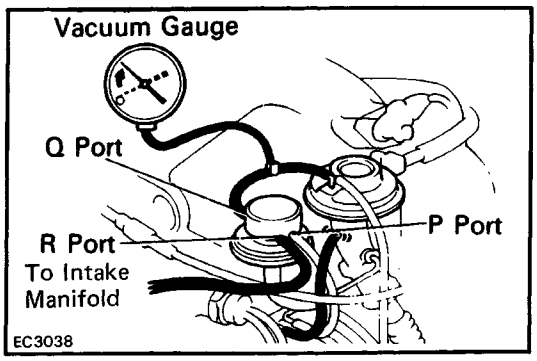


5. CHECK VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indicates low vacuum at 2,500 rpm.

(c) Check that the vacuum gauge indicates zero at idle.

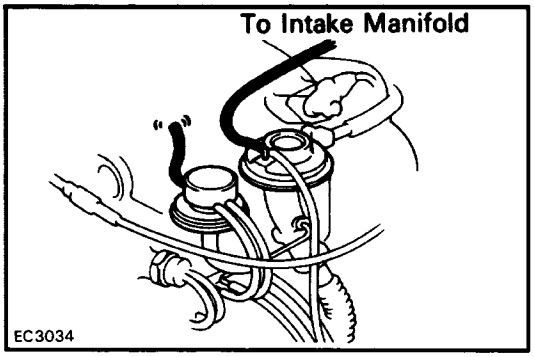


(d) Disconnect the vacuum hose from port R of the EGR vacuum modulator and connect port R directly to the intake manifold with another hose.

(e) Check that the vacuum gauge indicates high vac–uum at 2,500 rpm.

HINT: As a large amount of EGR gas enters, the engine will misfire slightly.

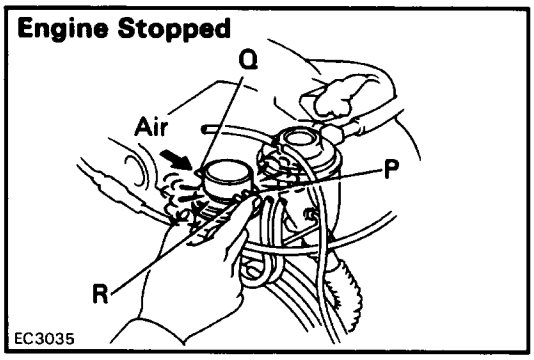
(f) Remove the vacuum gauge and reconnect the vac–uum hoses to the proper locations.



6. CHECK EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idling.
(b) Check that the engine runs rough or stops.
(c) Reconnect the vacuum hoses to the proper location.

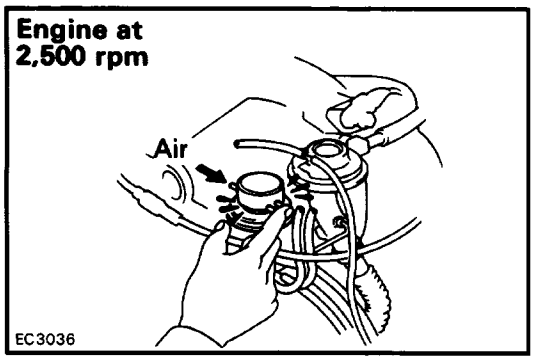
IF NO PROBLEM IS FOUND WITH THIS INSPECTION, SYSTEM IS FUNCTIONING; OTHERWISE INSPECT EACH PART



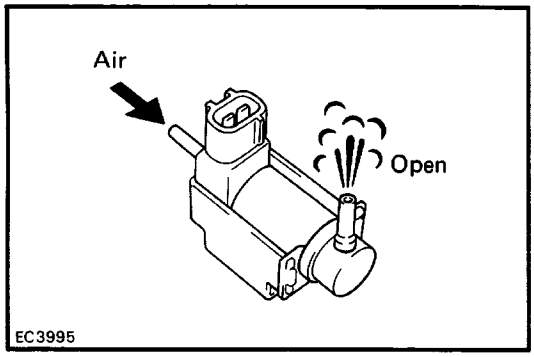
INSPECTION OF EGR VACUUM MODULATOR

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from ports P, Q and R of the EGR vacuum modulator.
(b) Block ports P and R with your finger.
(c) Blow air into port Q. Check that the air passes through to the air filter side freely.



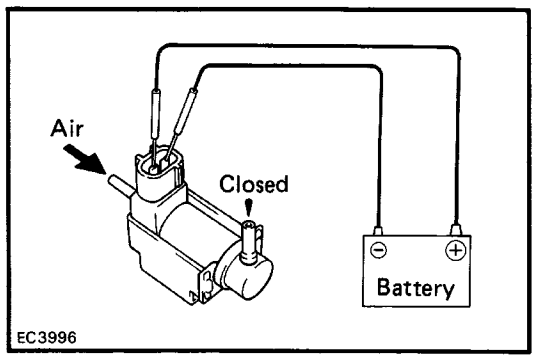
(d) Start the engine and maintain speed at 2,500 rpm.
(e) Repeat the above test. Check that there is a strong resistance to air flow.
(f) Reconnect the vacuum hoses to the proper loca–tions.



INSPECTION OF VSV

INSPECT VSV

(a) Blow air into a pipe and check that the VSV is open.



(b) Apply battery voltage across the terminals.
(c) Blow air into pipe and check that the VSV is closed.

If a problem is found, replace the VSV.

INSPECTION OF EGR VALVE

1. REMOVE EGR VALVE

Check the valve for sticking and heavy carbon deposits.
If a problem is found, replace it.

2. REINSTALL EGR VALVE WITH NEW GASKET

INSPECTION OF WATER TEMPERATURE SENSOR

(See page FI–86)

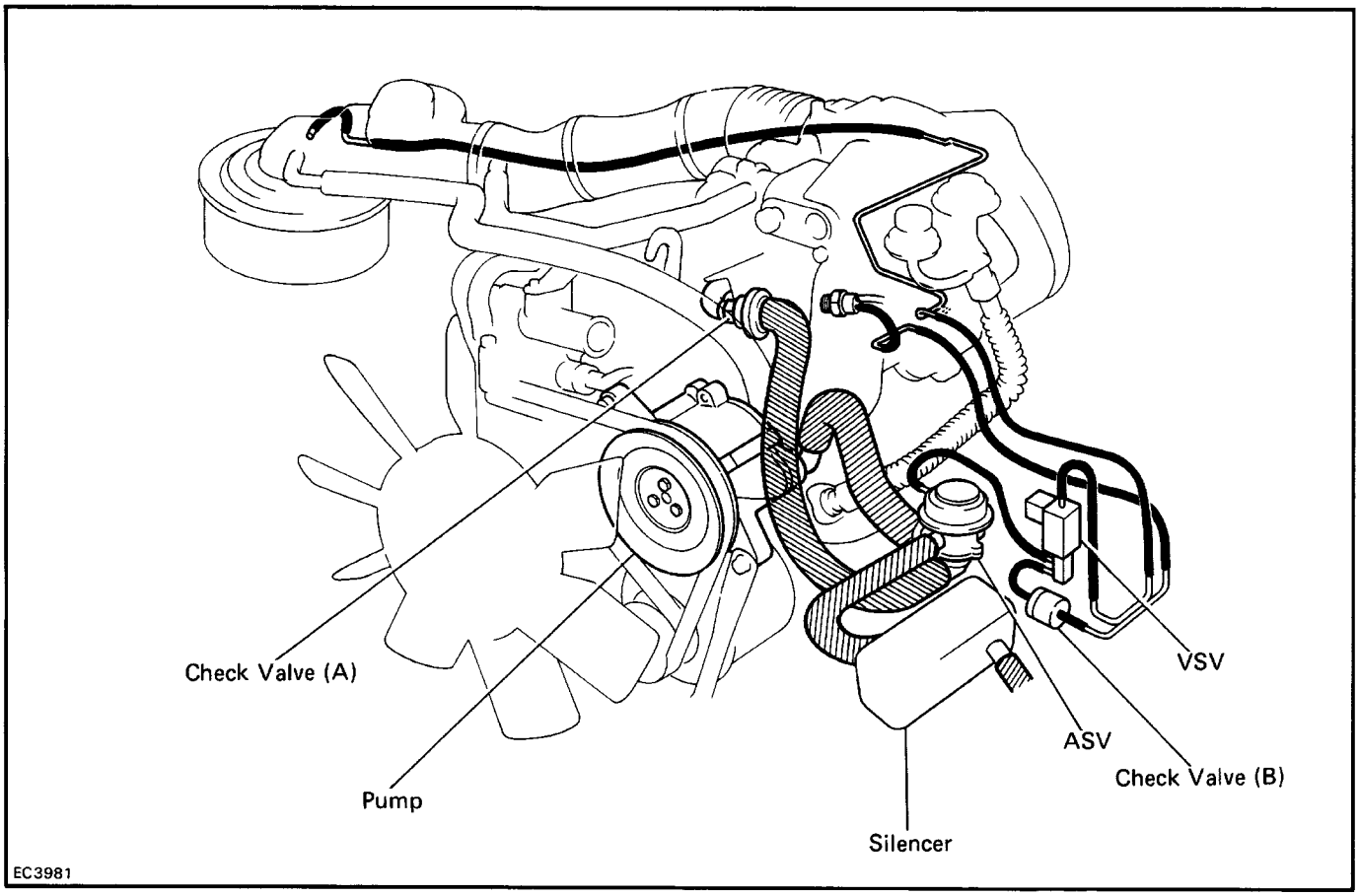
INSPECTION OF THROTTLE POSITION SENSOR

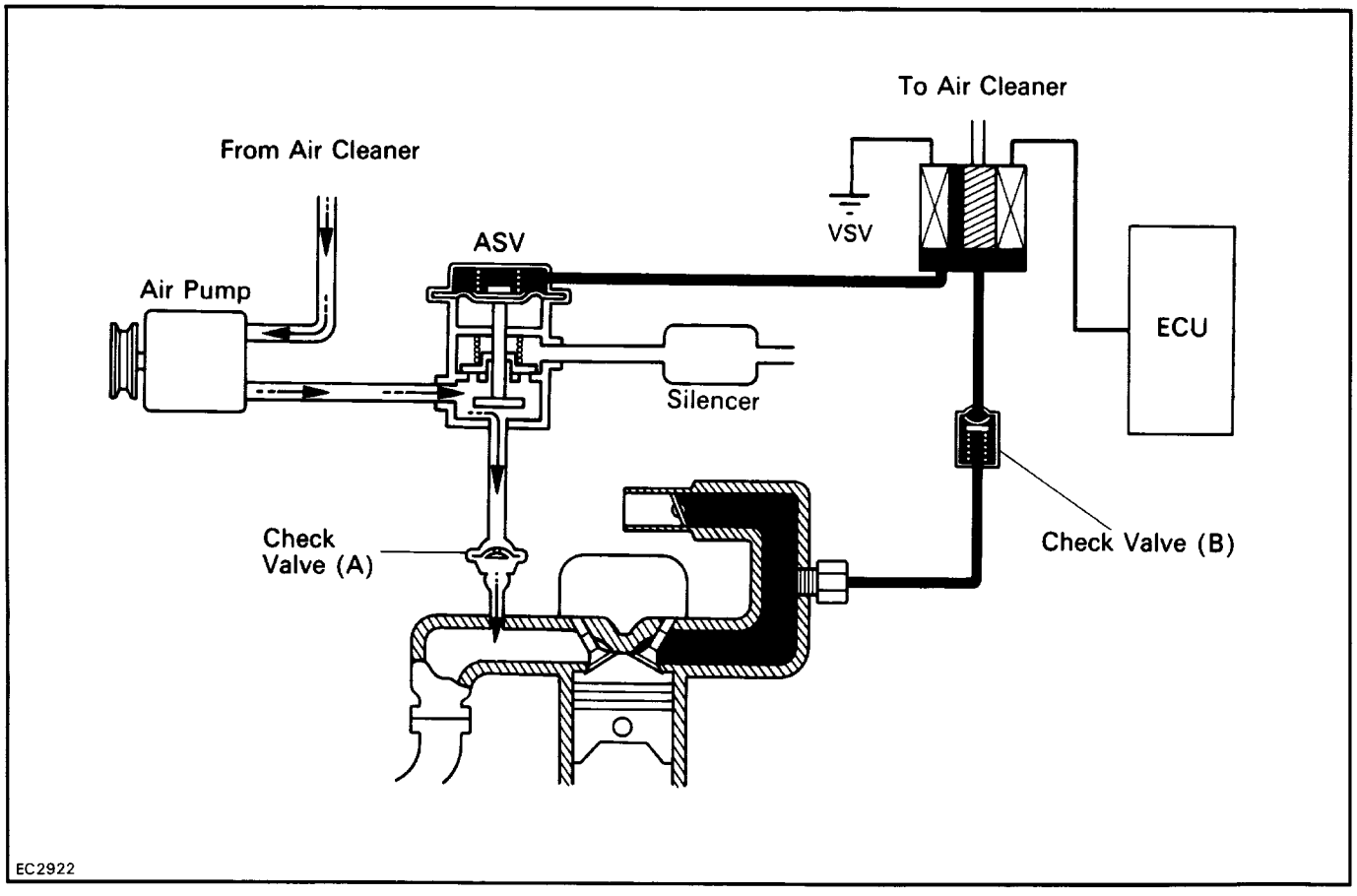
(See page FI–76)

INSPECTION OF AIR FLOW METER

(See page FI–74)

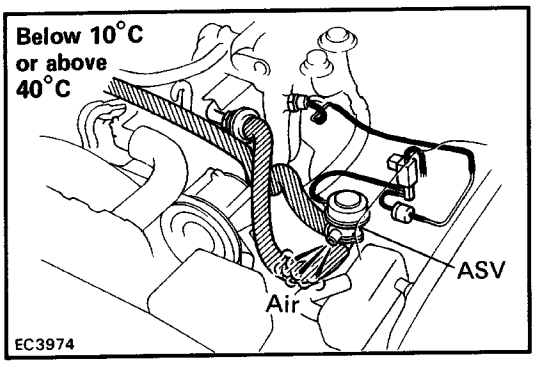
AIR INJECTION (AI) SYSTEM

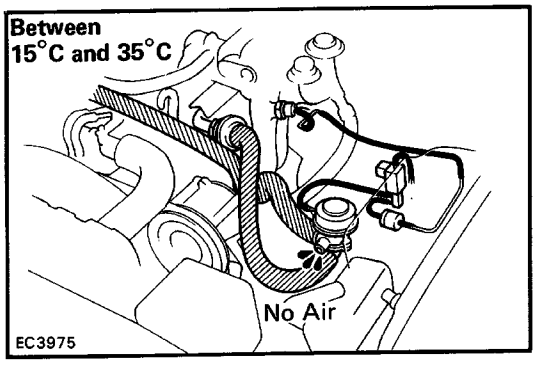


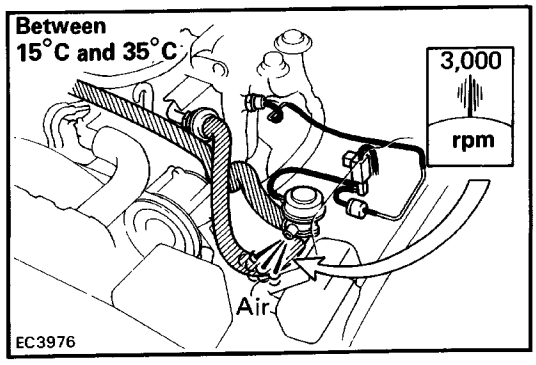


For reburning the unburnt CO,HC in the exhaust port, compressed air from the air pump is blown into the exhaust port.

Coolant Temp.	Driving Condition	Engine RPM	Vehicle Speed	VSV	ASV	AI System
Below 10˚C (50˚F)				OFF	CLOSED	OFF
Between 15 – 35˚C (59 – 95˚F)	—			**ON**	OPEN	**ON**
Above 40˚C (104˚F)	Ex. deceleration			OFF	CLOSED	OFF
	Deceleration	Above 2,000 rpm		OFF	CLOSED	OFF
		Blow 2,000 rpm	Above 6 mph (10 km/h)	**ON**	OPEN	**ON**







INSPECTION OF AI SYSTEM

1. VISUALLY CHECK HOSES AND TUBES FOR CRACKS, KINKS, DAMAGE OR LOOSE CONNECTIONS

2. PREPARATION

Disconnect the air by–pass hose from the ASV.

3. CHECK ASV WITH FOLLOWING TEMPERATURE:

(a) The coolant temperature should be below 10˚C (50˚F) or above 40˚C (104˚F).

(b) Start the engine and check that air is discharged from the ASV.

(c) The coolant temperature should be between 15˚C (59˚F) and 35˚C (95˚F).

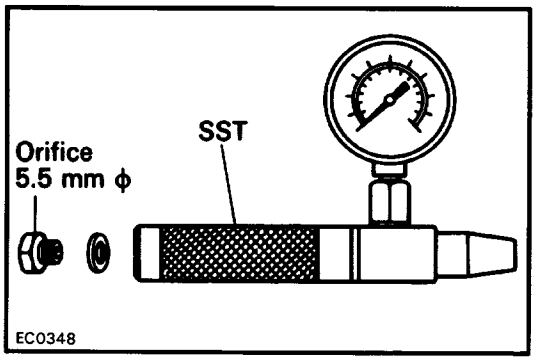
(d) With engine idling, check that air is not discharged from the ASV.

(e) The coolant temperature should be between 15˚C (59˚F) and 35˚C (95˚F).

(f) Increase the engine speed to 3,000 rpm and check that air is discharged from the ASV.

INSPECTION OF AIR PUMP DRIVE BELT

(See page MA–4)



INSPECTION OF AIR PUMP

1. CHECK AIR PUMP FOR ABNORMAL NOISE

2. CHECK AIR PUMP DISCHARGE PRESSURE

(a) Connect SST (air pump tester) to the hose at the air pump outlet.
SST 09258–14010

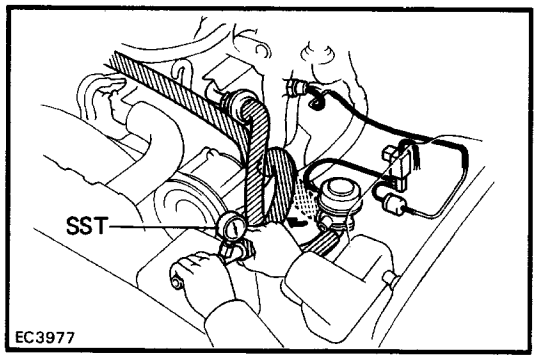
(b) Select and use a specified orifice (5.5 mm dia. or 0.217 in.) on the SST.

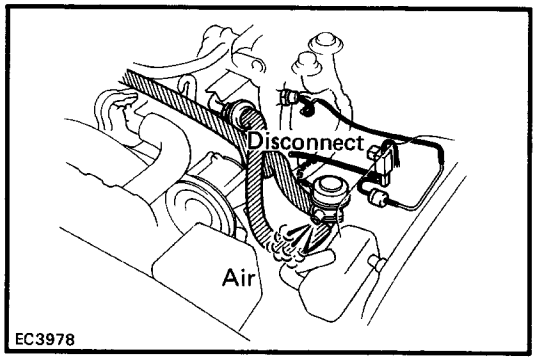
(c) Set the engine speed at 1,200 rpm.

(d) The gauge of the SST should indicate in the green zone.

If the SST indicates in the red zone, replace the pump assembly.

(e) Reconnect the hose to the proper location.



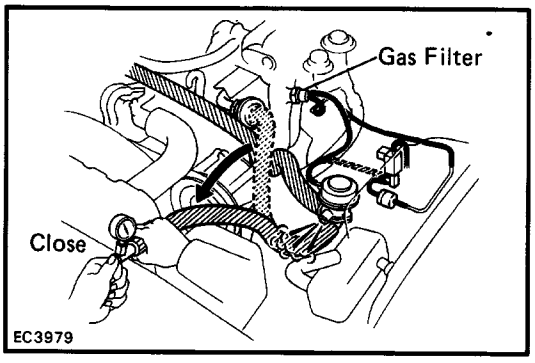


INSPECTION OF ASV

1. CHECK ASV OPERATION

(a) Disconnect the vacuum hose from the ASV.

(b) Check that air comes out from the ASV.



2. CHECK OPENING PRESSURE OF RELIEF VALVE

(a) Disconnect the air hose from the check valve.

(b) Connect SST (air pump tester) to the hose.
SST 09258–14010

(c) Disconnect the vacuum hose from the VSV and connect the vacuum hose to the gas filter.

(d) Close the orifice on the SST with your finger.

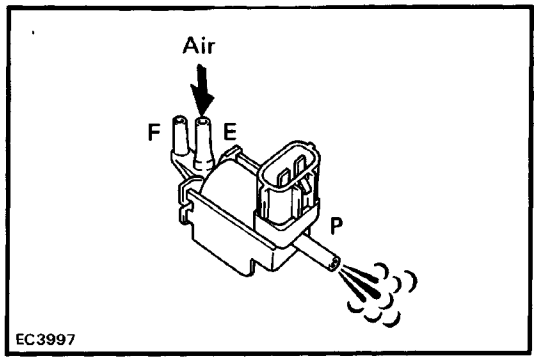
(e) Increase the engine speed gradually and measure the relief valve opening pressure.

Opening pressure:

39 – 59 kPa

(0.40 – 0.60 kgf/cm^2, 5.7 – 8.5 psi)

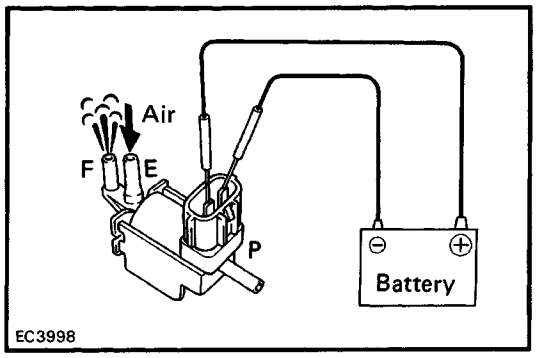
(f) Remove the SST and reconnect the hose to the proper location.



INSPECTION OF VSV

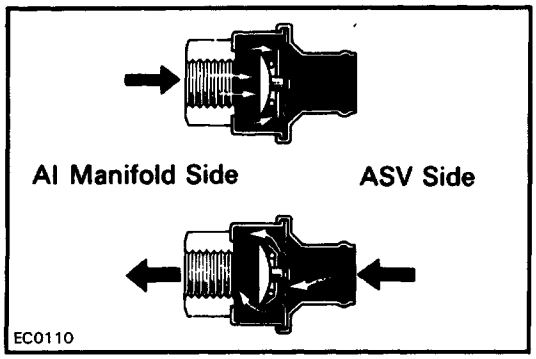
INSPECT VSV

(a) Blow air into pipe E and check that air comes out of pipe P.



(b) Apply battery voltage across the terminals.
(c) Blow air into pipe E and check that air comes out of pipe F.

If a problem is found, replace the VSV.

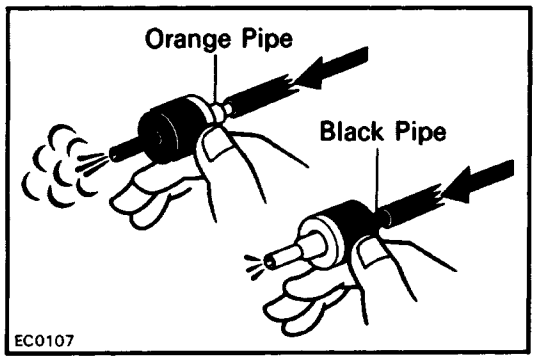


INSPECTION OF CHECK VALVE (A)

CHECK VALVE BY BLOWING AIR FROM EACH SIDE

(a) Check that air does not flow from manifold side to ASV side.
(b) Check that air flows from ASV side to manifold side.

If a problem is found, replace the valve.



INSPECTION OF CHECK VALVE (B)

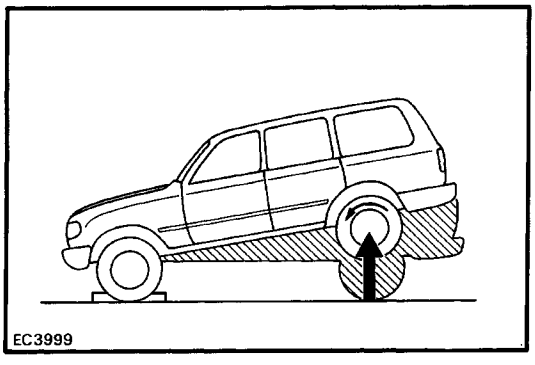
CHECK VALVE BY BLOWING AIR FROM EACH SIDE

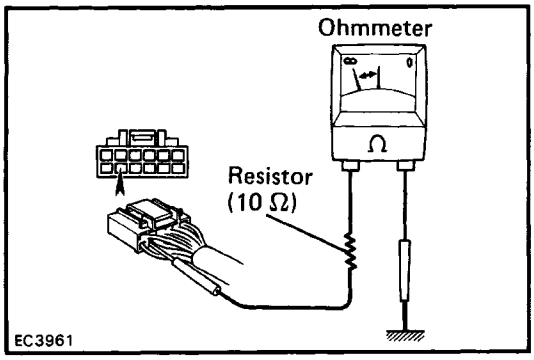
(a) Check that air flows from the orange pipe to the black side.
(b) Check that air does not flow from the black pipe to the orange pipe.

INSPECTION OF SPEED SENSOR

1. JACK UP ONE REAR WHEEL TO CLEAR GROUND AND CHECK FRONT WHEELS
2. RELEASE PARKING BRAKE
3. SET SHIFT LEVER INTO NEUTRAL
4. FOUR WHEEL DRIVE CONTROL LEVER TO H
5. CENTER DIFFLOCK SWITCH TO OFF
6. UNPLUG WIRING CONNECTOR FROM EFI ECU

EFI ECU location: Behind the glove box





5. CHECK ON–OFF CYCLES OF SPEED SENSOR

(a) Place the positive (+) terminal of the ohmmeter on the wiring connector terminal and the negative (–) terminal on ground.

(b) Turn the rear wheel.

(c) Check that the ohmmeter needle deflects consis–tently.

NOTICE: The ohmmeter probe should be inserted from the rear side of the connector.

If the ohmmeter needle does not deflect, check that the speed sensor terminals at the backside of the speedome–ter air properly connected. If the connection is proper, replace the speedometer assembly.

6. RECONNECT WIRING CONNECTOR TO COMPUTER

INSPECTION OF WATER TEMPERATURE SENSOR

(See page FI–86)

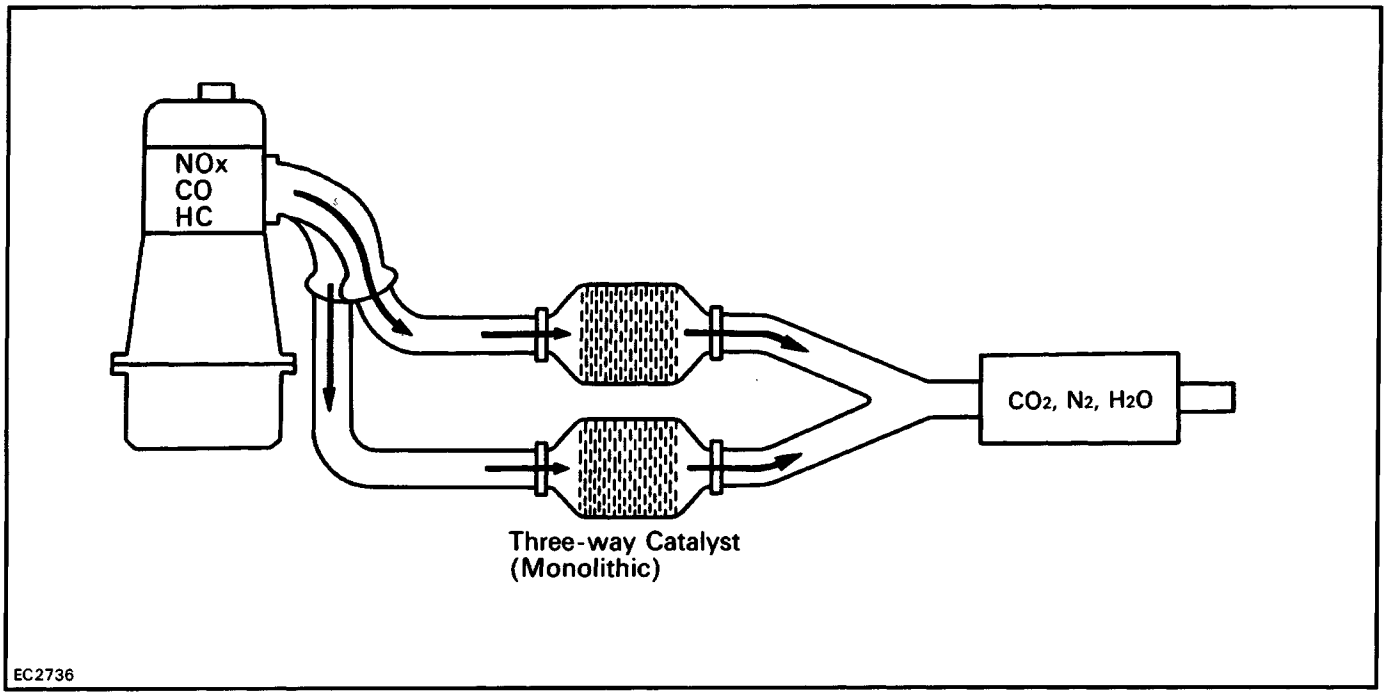
INSPECTION OF THROTTLE POSITION SENSOR

(See page FI–76)

INSPECTION OF AIR FLOW METER

(See page FI–74)

THREE–WAY CATALYST (TWC) SYSTEM



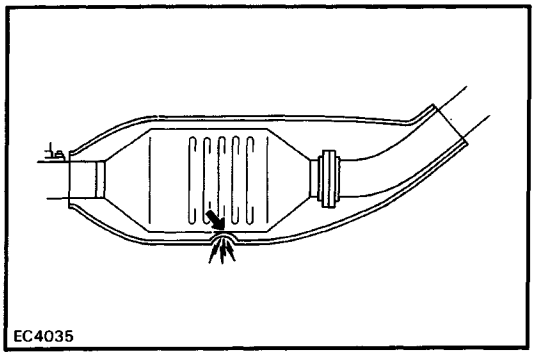
To reduce CO, HC and NOx emissions, they are oxidized, reduced and converted to nitrogen (N_2), carbon dioxide (CO_2) and water (H_2O) by the catalyst.

Exhaust Port		TWC		Exhaust Gas
HC, CO and NOx	→	Oxidation and reduction	→	CO_2 H_2O N_2

INSPECTION OF EXHAUST PIPE ASSEMBLY

1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE

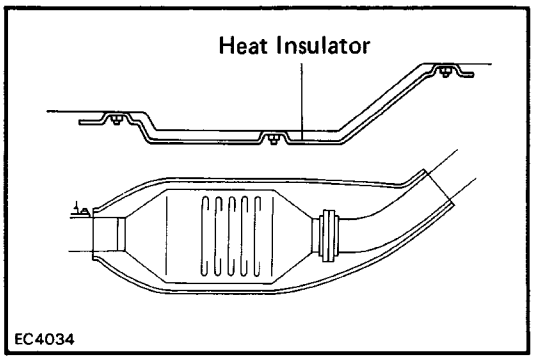
2. CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE



INSPECTION OF CATALYST CONVERTER

CHECK FOR DENTS OR DAMAGE

If any part of the protector is damaged or dented to the extent that it comes into contact with the catalyst, repair or replace it.

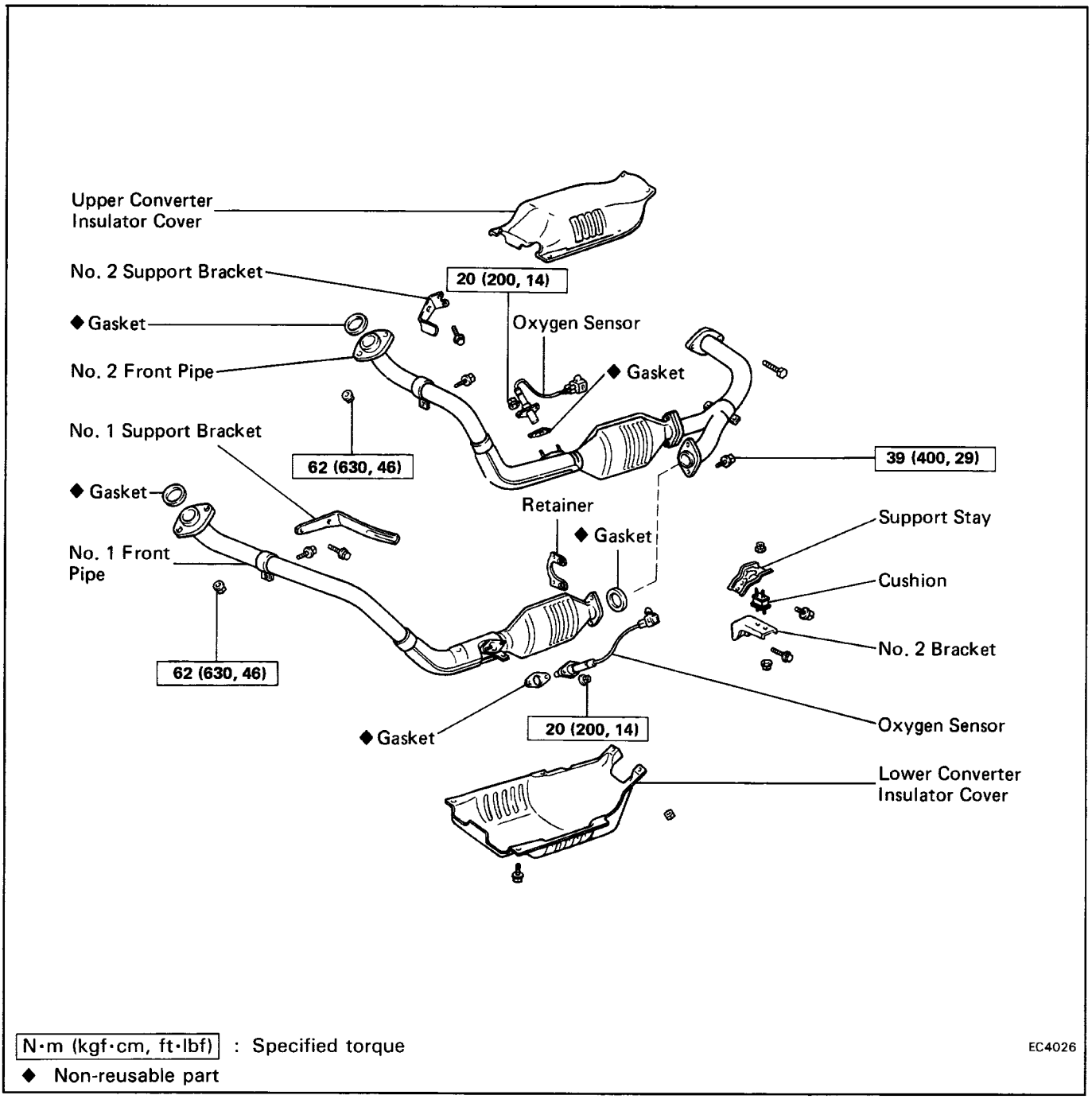


INSPECTION OF HEAT INSULATOR

1. CHECK HEAT INSULATOR FOR DAMAGE
2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR

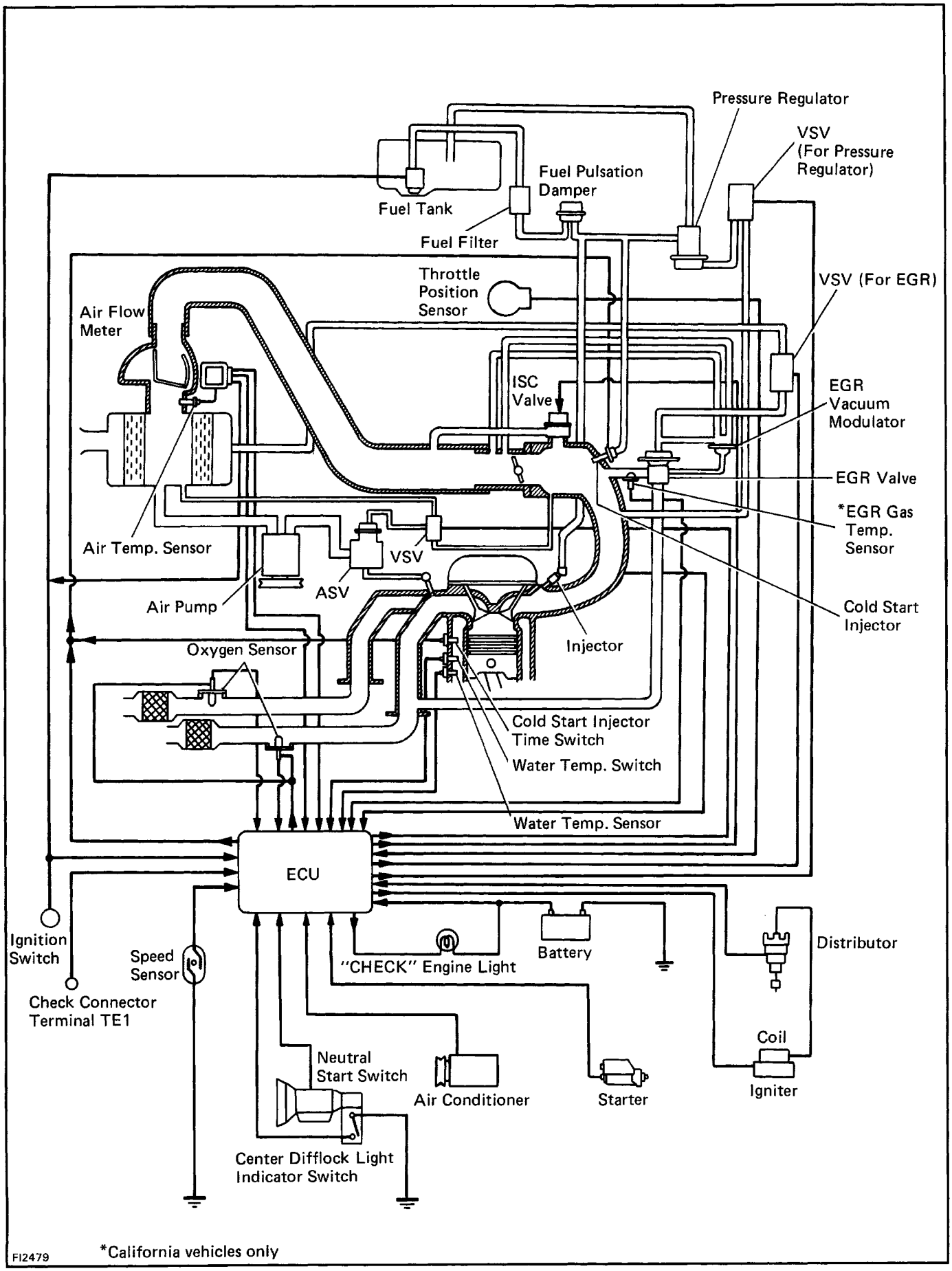
REPLACEMENT OF CATALYTIC CONVERTER

COMPONENTS



EFI SYSTEM

SYSTEM DESCRIPTION



The EFI system is composed of three basic subsystems: Fuel Induction, Air Induction and Electronic Control Systems.

FUEL SYSTEM

Fuel is supplied under constant pressure to the EFI injectors by an electric fuel pump. The injec–tors inject a measured quantity of fuel into the intake manifold in accordance with signals from the ECU (Electronic Control Unit).

AIR INDUCTION SYSTEM

The air induction system provides sufficient air for engine operation.

ELECTRONIC CONTROL SYSTEM

The 3F–E engine is equipped with a Toyota Com–puter Control System (TCCS) which centrally controls the EFI, ESA, ISC, Diagnosis systems, etc. by means of an Electronic Control Unit (ECU –formerly EFI computer) employing a microcom–puter.

By means of the ECU, the TCCS controls the following functions:

1. Electronic Fuel Injection (EFI)
   The ECU receives signals from various sen–sors indicating changing engine operating conditions such as:
   - Intake air volume
   - Intake air temperature
   - Coolant temperature
   - Engine rpm
   - Acceleration/deceleration
   - Exhaust oxygen content etc.

   These signals are utilized by the ECU to de–termine the injection duration necessary for an optimum air–fuel ratio.
2. Electronic Spark Advance (ESA)
   The ECU is programmed with data for opti–mum ignition timing under any and all oper–ating conditions. Using data provided by sensors which monitor various engine func–tions (rpm, coolant temperature, etc.), the microcomputer (ECU) triggers the spark at precisely the right instant. (See IG section)
3. Idle Speed Control (ISC)
   The ECU is programmed with target idling speed values to respond to different engine conditions (coolant temperature, air condi–tioner on/off, etc.). Sensors transmit signals to the ECU which control the flow of air through the by–pass of the throttle valve and adjust idle speed to the target value.
   (See pages FI–40, FI–72)
4. Exhaust Gas Recirculation (EGR)
   The ECU controls the EGR system according to coolant temperature, engine rpm, throttle angle, vehicle speed and inlet air flow rate.
5. Air Injection (Al)
   The ECU controls the Al system according to coolant temperature, engine rpm, throttle angle, vehicle speed and inlet air rate.
6. Diagnosis
   The ECU detects any malfunctions or abnor–malities in the sensor network and lights a ”CHECK” engine warning light on the instru–ment panel. At the same time, the trouble is identified and a diagnostic code is recorded by the ECU. The diagnostic code can be read by the number of blinks of the ”CHECK” en–gine warning light when terminals TE1 and E1 are connect–circuited. The diagnostic codes are referred to in a later page.
   (See pages FI–24, FI–25)
7. Fail–Safe Function
   When an abnormality occurs in any of the ECU input signals, the ECU substitutes a standard valve stored in the microcomputer memory in order to prevent engine malfunc–tion. Also, if the abnormality is serious, the ECU stops the engine.
8. Back–Up Function
   Even when an abnormality occurs in the ECU, it provides regular fuel injection and control of the ignition timing to provide ve–hicle driveability.

PRECAUTIONS

1. Before working on the fuel system, disconnect the cable from the negative (–) terminal of the battery.

HINT: Any diagnostic code retained by the computer will be erased when the battery terminal is removed. Therefore, if necessary, read the diagnosis before removing the battery terminal.

2. Do not smoke or work open flame when working the fuel system.

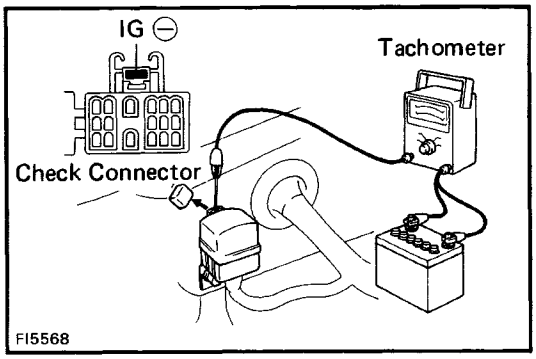
3. Keep gasoline off rubber or leather parts.

INSPECTION PRECAUTIONS

MAINTENANCE PRECAUTIONS

1. CHECK CORRECT ENGINE TUNE–UP

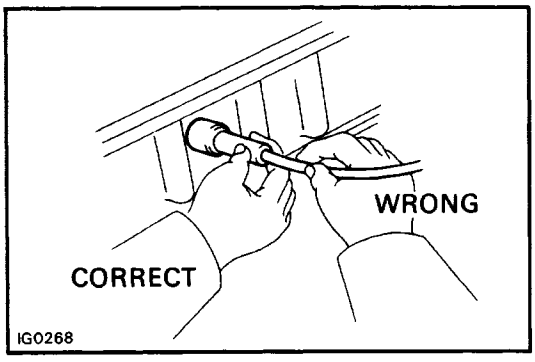
(See page EM–8)



2. PRECAUTIONS WHEN CONNECTING GAUGE

(a) Use the battery as the power source for the timing light, tachometer, etc.

(b) Connect the test probe of a tachometer to the terminal IG (–) of the check connector.



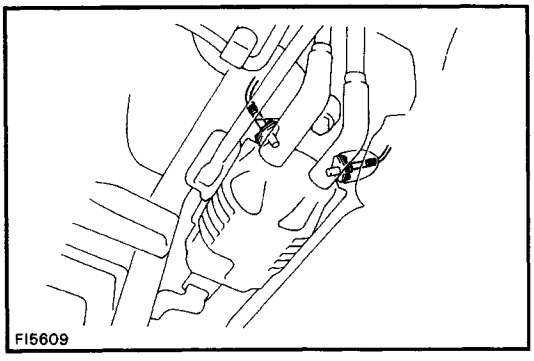
3. IN EVENT OF ENGINE MISFIRE FOLLOWING PRECAUTIONS SHOULD BE TAKEN

(a) Check proper connection of battery terminals, etc,

(b) Handle high–tension cords carefully.

(c) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.

(d) When cleaning the engine compartment, be especially careful to protect the electrical system from water.



4. PRECAUTIONS WHEN HANDLING OXYGEN SENSORS

(a) Do not allow oxygen sensor to drop or hit against an object.

(b) Do not allow the sensor to come into contact with water.

PRECAUTIONS

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INSPECTION PRECAUTIONS

MAINTENANCE PRECAUTIONS

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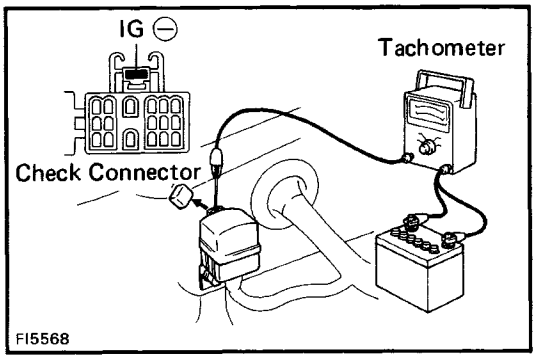
(See page EM–8)



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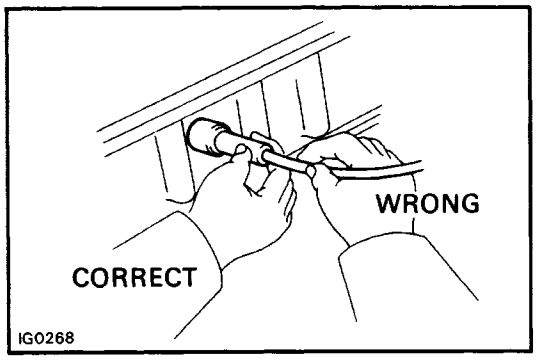

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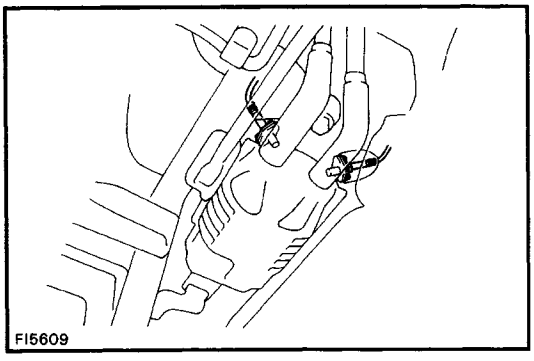

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(a) Do not allow oxygen sensor to drop or hit against an object.

(b) Do not allow the sensor to come into contact with water.

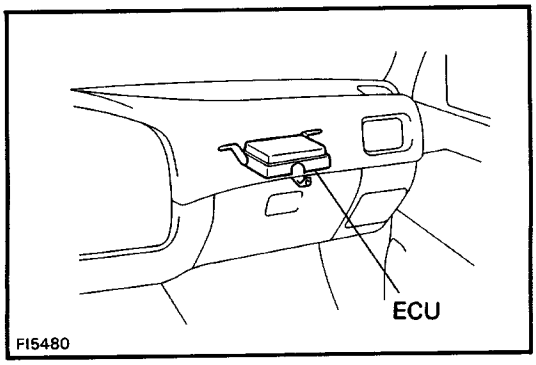
IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)

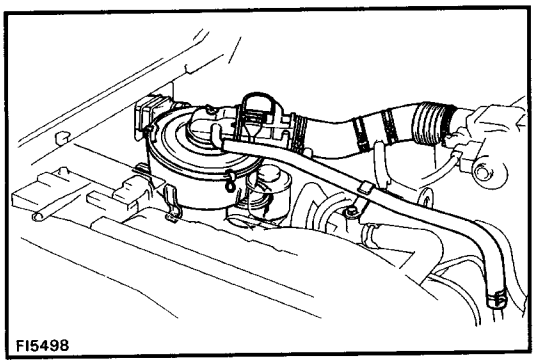
The ECU has been designed so that it will not be affected by outside interference.

However, if your vehicle is equipped with a CB radio trans–ceiver, etc. (even one with about 10 W output), it may, at times, have an effect upon ECU operation, especially if the an–tenna and feeder are installed nearby.

Therefore, observe the following precautions:

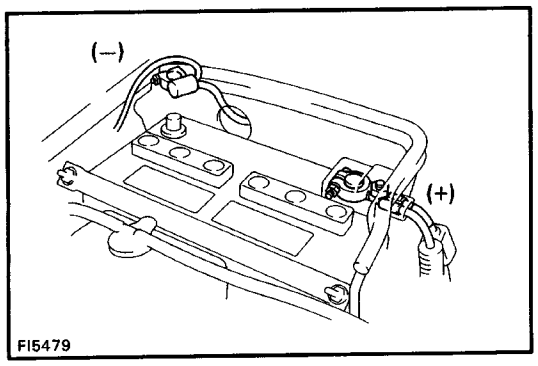
1. Install the antenna as far as possible from the ECU. The ECU is located behind the glove box, so the antenna should be installed at the rear side of the vehicle.
2. Keep the antenna feeder as far away as possible from the ECU wires–at least 20 cm (7.87 in.) and, especially, do not wind them together.
3. Check that the feeder and antenna are properly adjusted.
4. Do not equip your vehicle with a powerful mobile radio system.
5. Do not open the cover or the case of the ECU unless absolutely necessary.
   (If the IC terminals are touched, the IC may be destroyed by static electricity.)





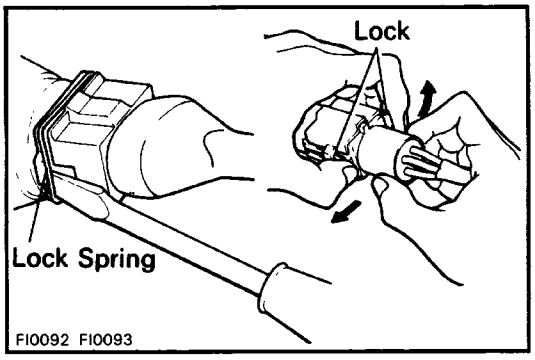
AIR INDUCTION SYSTEM

1. Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
2. Disconnection, looseness or cracks in the parts of the air induction system between the air flow meter and cylinder head will allow air suction and cause the engine to run out of tune.

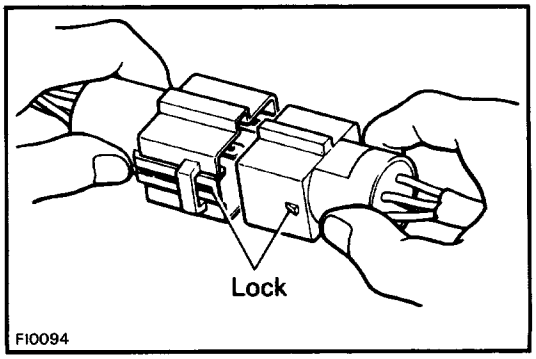


ELECTRONIC CONTROL SYSTEM

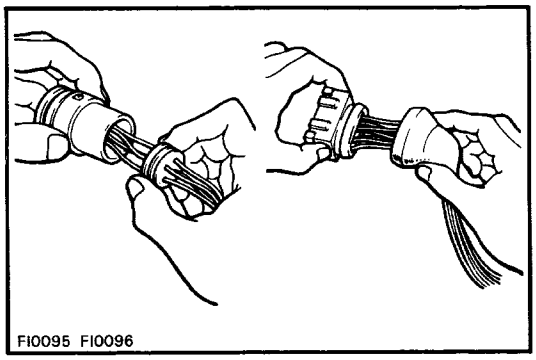
1. Before removing EFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch OFF or disconnecting the battery terminals.
2. When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (–) cables.
3. Do not jolt parts during removal or installation. Handle all EFI parts carefully, especially the ECU.
4. Do not be careless during troubleshooting as there are numerous transistor circuits and contact with terminal can cause further trouble.
5. When inspecting during rainy weather, take care to pre–vent entry of water. Also, when washing the engine com–partment, prevent water from getting on EFI parts and wiring connectors.
6. Parts should be replaced as an assembly.



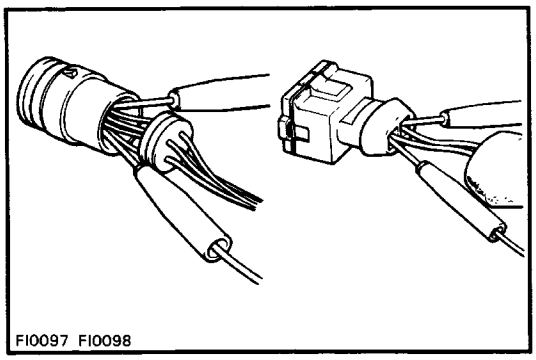
7. Care is required when pulling out and inserting wiring connectors.
   (a) Release the lock and pull out the connector.



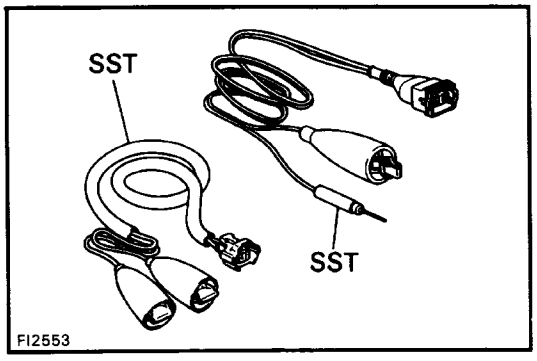
   (b) Fully insert the connector and check that it is locked.



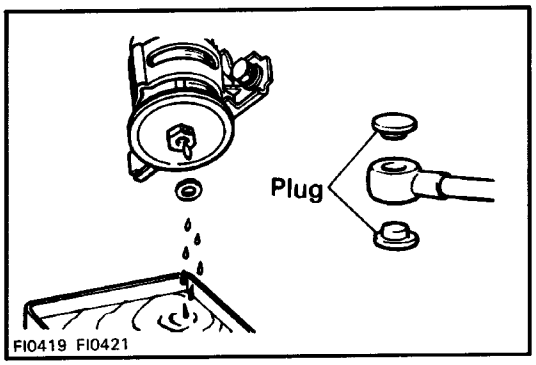
8. When inspecting a connector with a volt/ohmmeter.
   (a) Carefully take out the sealing plug or boot if it is a water–proof type connector.



   (b) Insert the test probe into the connector from the wiring side when checking continuity, amperage or voltage.
   (c) Do not apply unnecessary force to the terminal.
   (d) After checking, reinstall the sealing plug or boot on the connector securely.

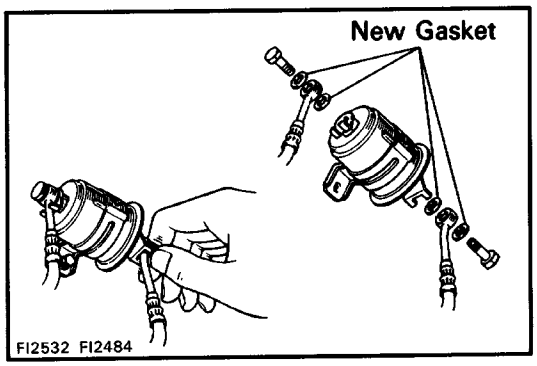


9. Use SST for inspection or test of the injector, cold start injector or its wiring connector.
   SST 09842–30050 and 09842–30070

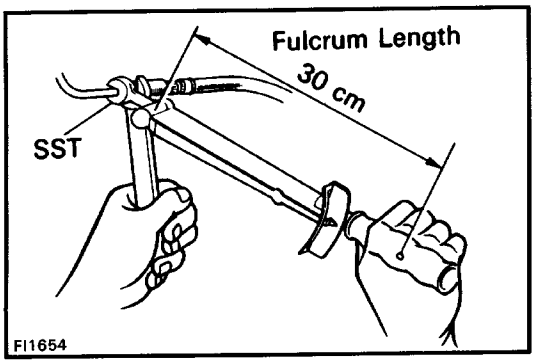


FUEL SYSTEM

1. When disconnecting the high fuel pressure line, a large amount of gasoline will spill out, so observe the follow–ing procedure:
   (a) Put a a container under the connection.
   (b) Slowly loosen the connection.
   (c) Disconnect the connection.
   (d) Plug the connection with a rubber plug.

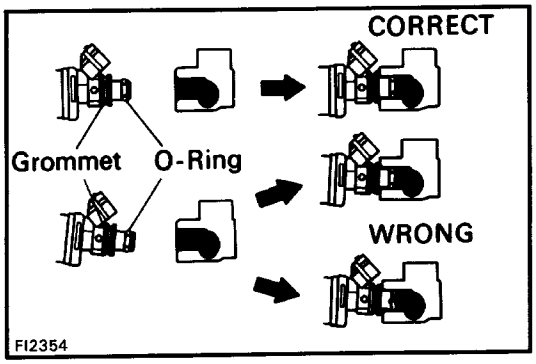


2. When connecting the flare nut or union bolt on the high pressure pipe union, observe the following procedure:
   (Union Bolt Type)
   (a) Always use a new gasket.
   (b) Tighten the union bolt by hand.
   (c) Tighten the union bolt to the specified torque.

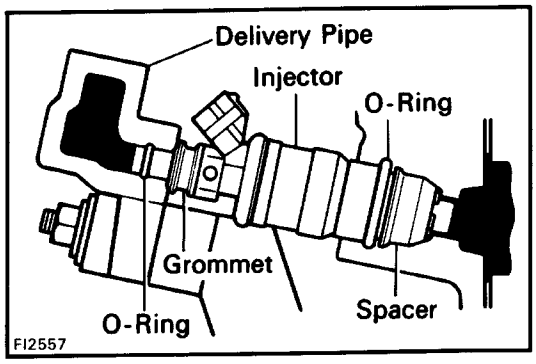


   (Flare Nut Type)
   (a) Apply a light coat of engine oil to the flare and tighten the flare nut by hand.
   (b) Using SST, tighten the flare nut to specified torque.
   SST 09631–22020

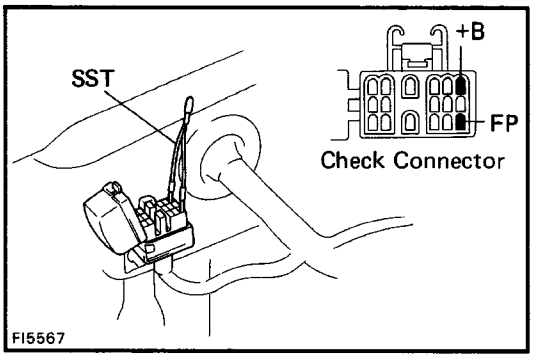
   HINT: Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).



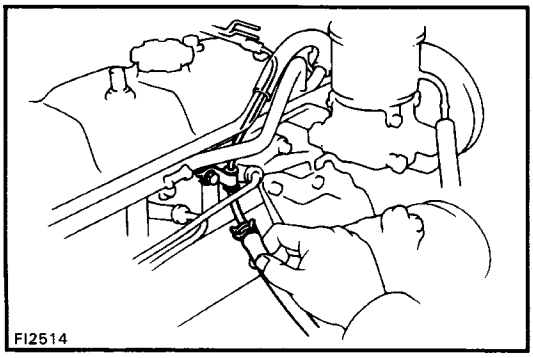
3. Observe the following precautions when removing and installing the injectors.
   (a) Never reuse the O–ring.
   (b) When placing a new O–ring on the injector, take care not to damage it in any way.
   (c) Coat the new O–ring with spindle oil or gasoline before installing – never use engine, gear or brake oil.



4. Install the injector to delivery pipe and cylinder head as shown in the illustration.



5. Check that there are no fuel leaks after performing any maintenance on the fuel system.
   (a) With engine stopped, turn the ignition switch ON.
   (b) Using SST, connect terminals +B and FP of the check connector.
   SST 09843–18020



(c) When the fuel return hose is pinched, the pressure within high pressure line will rise to approx. 392 kPa (4 kgf/cm^2, 57 psi). In this state, check to see that there are no leaks from any part of the fuel system.

NOTICE: Always pinch the hose. Avoid bending as it may cause the hose to crack.

TROUBLESHOOTING

TROUBLESHOOTING HINTS

1. Engine troubles are usually not caused by the EFI system. When troubleshooting, always first check the condition of the other systems.
   (a) Electronic source
      - Battery
      - Fusible links
      - Fuses

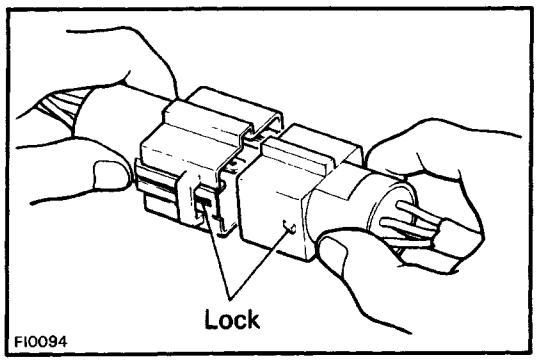
   (b) Body ground
   (c) Fuel supply
      - Fuel leakage
      - Fuel filter
      - Fuel pump

   (d) Ignition system
      - Spark plugs
      - High–tension cords
      - Distributor
      - Ignition coil
      - Igniter

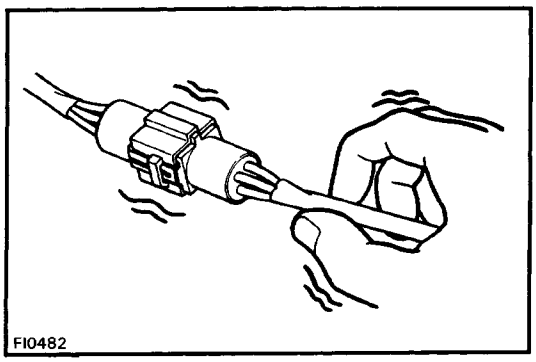
   (e) Air induction system
      - Vacuum leaks

   (f) Emission control system
      - PCV system
      - EGR system
      - AI system

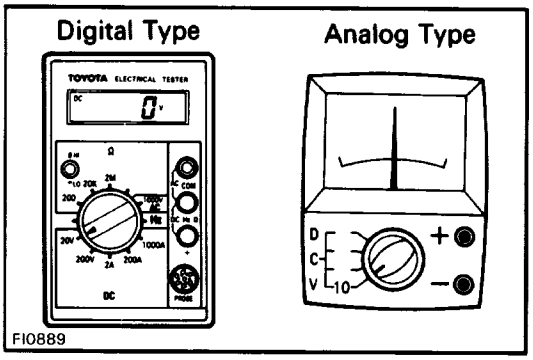
   (g) Others
      - Ignition timing (ESA system)
      - Idle speed (ISC system)
      - etc.



2. The most frequent cause of problems is simply a bad contact in wiring connectors. Always check that connec–tions are secure.
   When inspecting the connector, pay particular attention to the following points:
   (a) Check to see that the terminals are not bent.
   (b) Check to see that the connector is pushed in com–pletely and locked.
   (c) Check to see that there is no signal change when the connector is slightly tapped or wiggled.



3. Sufficiently troubleshoot for other causes before replac–ing the ECU, as the ECU is of high quality and it is expensive.



4. Use a volt/ohmmeter with high impedance (10 kΩ / V minimum) for troubleshooting of the electrical circuit.
(See page FI–31)

TROUBLESHOOTING PROCEDURES

SYMPTOM – DIFFICULT TO START OR NO START (ENGINE WILL NOT CRANK OR CRANKS SLOWLY)

CHECK ELECTRIC SOURCE → BAD → 1. Battery
(1) Connection
(2) Gravity – Drive belt – charging system
(3) Voltage
2. Fusible links

OK ↓

CHECK STARTING SYSTEM → BAD → 1. Ignition switch
2. Starter
3. Neutral start switch
4. Wiring/ Connection

SYMPTOM – DIFFICULT TO START OR NO START (CRANKS OK)

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI–21)
→ Malfunction code(s) → Diagnostic code(s)
(See pages FI–24, FI–25)

Normal code ↓

DOES ENGINE START WITH ACCELERATOR PEDAL DEPRESSED? → OK → ISC system
(1) ISC valve
(2) Wiring connection

NO ↓

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE → BAD → 1. Oil filler cap
2. Oil dipstick
3. Hose connections
4. PCV hoses
5. EGR system – EGR valve stays open

OK ↓

CHECK IGNITION SPARK
(See page IG–5)
→ BAD → 1. High–tension cords
2. Distributor
3. Ignition coil
4. Igniter

OK CONTINUED ON PAGE FI–11

OK CONTINUED FROM PAGE FI–10

CHECK SPARK PLUGS
Standard: 1.1 mm (0.043 in.)
HINT: Check compression pressure and valve clearance if necessary.

NO →
1. Spark plugs
2. Compression pressure
Minimum: 8.0 kg/cm^2
(114 psi, 785 kPa) at 200 rpm
3. Valve clearance (Hot)
Standard: IN 0.20 mm (0.008 in.)
EX 0.35 mm (0.014 in.)

BAD (All Plugs WET) →
1. Injector(s) – shorted or leaking
2. Injector wiring – short circuited
3. Cold start injector – leakage
(See page FI–52)
4. Cold start injector time switch
(See page FI–81)

OK

CHECK FUEL SUPPLY TO INJECTOR
1. Fuel in tank
2. Fuel pressure in fuel line
(1) Connect terminals +B and FP of the check connector.
(2) Fuel pressure at fuel hose of fuel filter can be felt.(See page FI–51)

BAD →
1. Fuel line – Leakage – deformation
2. Fuse
3. Fuel pump (See page FI–50)
4. Fuel filter
5. Fuel pressure regulator (See page FI–59)

OK

CHECK FUEL PUMP SWITCH IN AIR FLOW METER
Check continuity between terminals FC and E1 while measuring plate of air flow meter is open.

BAD → Air flow meter (See page FI–70)

OK

CHECK IGNITION TIMING
1. Connect terminals TE1 and E1 of the check connector.
2. Check ignition timing.
Standard: 7°BTDC @ idle
(w/ connected TE1 and E1)

NO → Ignition timing – Adjust (See page IG–11)

OK

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI–31)

BAD →
1. Wiring connection
2. Power to ECU
(1) Fusible links
(2) Fuses
(3) EFI main relay (See page FI–79)
3. Air flow meter (See page FI–66)
4. Water temp. sensor (See page FI–82)
5. Air– temp. sensor (See page FI–66)
6. Injection signal circuit
(1) Injector wiring
(2) ECU (See page FI–87)

SYMPTOM – ENGINE OFTEN STALLS

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI–21)

→ Malfunction code (s) → Diagnostic code(s)
(See pages FI–24, FI–25)

↓ Normal code

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

→ BAD →
1. Oil filler cap
2. Oil dipstick
3. Hose connections
4. PCV hoses
5. EGR system – EGR valve stays open

↓ OK

CHECK FUEL SUPPLY TO INJECTOR
1. Fuel in tank
2. Fuel pressure in fuel line
   (1) Connect terminals +B and FP of the check connector.
   (2) Fuel pressure at fuel hose of fuel filter can be felt. (See page FI–51)

→ BAD →
1. Fuel line – Leakage – Deformation
2. Fuses
3. Fuel pump (See page FI–50)
4. Fuel filter
5. Fuel pressure regulator (See page FI–59)

↓ OK

CHECK AIR FILTER ELEMENT

→ BAD → Element – Clean or replace

↓ OK

CHECK IDLE SPEED
Standard: 650 rpm

→ BAD →
ISC system
(1) Wiring connections
(2) ISC valve (See page FI–76)
(3) ECU (test by substitution)

↓ OK

CHECK IGNITION TIMING
1. Connect terminals TE1 and E1 of the check connector.
2. Check ignition timing.
   Standard: 7° BTDC @ idle
   (w/ connected TE1 and E1)

→ NO → Ignition timing – Adjust (See page IG–11)

↓ OK

CHECK SPARK PLUGS
Plug gap: 1.1 mm (0.043 in.)
HINT: Check compression pressure and valve clearance if necessary.

→ NO →
1. Spark plugs
2. Compression pressure
   Minimum: 785 kPa
   (8.0 kgf/cm^2, 114 psi) at 200 rpm
3. Valve Clearance (Hot)
   Standard: IN 0.20 mm (0.008 in.)
   EX 0.35 mm (0.014 in.)

↓ OK CONTINUED ON PAGE FI–13

OK CONTINUED FROM PAGE FI–12

CHECK COLD START INJECTOR
(See page FI–56)
→ BAD → 1. Cold start injector (See page FI–56)
2. Cold start injector time switch (See page FI–81)

OK

RECHECK FUEL PRESSURE
(See page FI–51)
→ BAD → 1. Fuel pump (See page FI–50)
2. Fuel filter
3. Fuel pressure regulator (See page FI–59)

OK

CHECK INJECTORS
(See page FI–61)
→ BAD → Injection condition

OK

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page **FI–31**)
→ BAD →
1. Wiring connections
2. Power to ECU
   (1) Fusible links
   (2) Fuses
   (3) EFI main relay (See page FI–79)
3. Air flow meter (See page FI–70)
4. Water temp. sensor (See page FI–82)
5. Air temp. sensor (See page FI–66)
6. Injection signal circuit
   (1) Injector wiring
   (2) ECU (See page FI–87)

SYMPTOM – ENGINE SOMETIMES STALLS

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI–21)
→ Malfunction code (s) → Diagnostic code(s)
(See pages FI–24, FI–25)

Normal code

CHECK AIR FLOW METER
(See page FI–70)
→ BAD → Air flow meter

OK

CHECK WIRING CONNECTORS AND RELAYS
Check for signal change when the connector or relay is slightly tapped or wiggled.
→ BAD →
1. Connectors
2. EFI main relay (See page FI–79)
3. Circuit opening relay (See page FI–80)

SYMPTOM – ROUGH IDLING AND/OR MISSING

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI–21)

Malfunction code (s) → Diagnostic code(s)
(See pages FI–24, FI–25)

Normal code ↓

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

BAD →
1. Oil filler cap
2. Oil dipstick
3. Hose connections
4. PCV hoses
5. EGR system – EGR valve stays open

OK ↓

CHECK AIR FILTER ELEMENT

BAD → Element – Clean or replace

OK ↓

CHECK IDLE SPEED
STD: 650 rpm

NO →
ISC system
(1) Wiring connections
(2) ISC valve (See page FI–76)
(3) ECU

OK ↓

CHECK IGNITION TIMING
1. Connect terminals TE1 and E1 of the check connector.
2. Check ignition timing.
Standard: 7° BTDC @ idle
(w/ connected TE1 and E1)

NO → Ignition timing – Adjust (See page IG–11)

OK ↓

CHECK SPARK PLUGS
Plug gap: 1.1 mm (0.043 in.)
HINT: Check compression pressure and valve clearance if necessary.

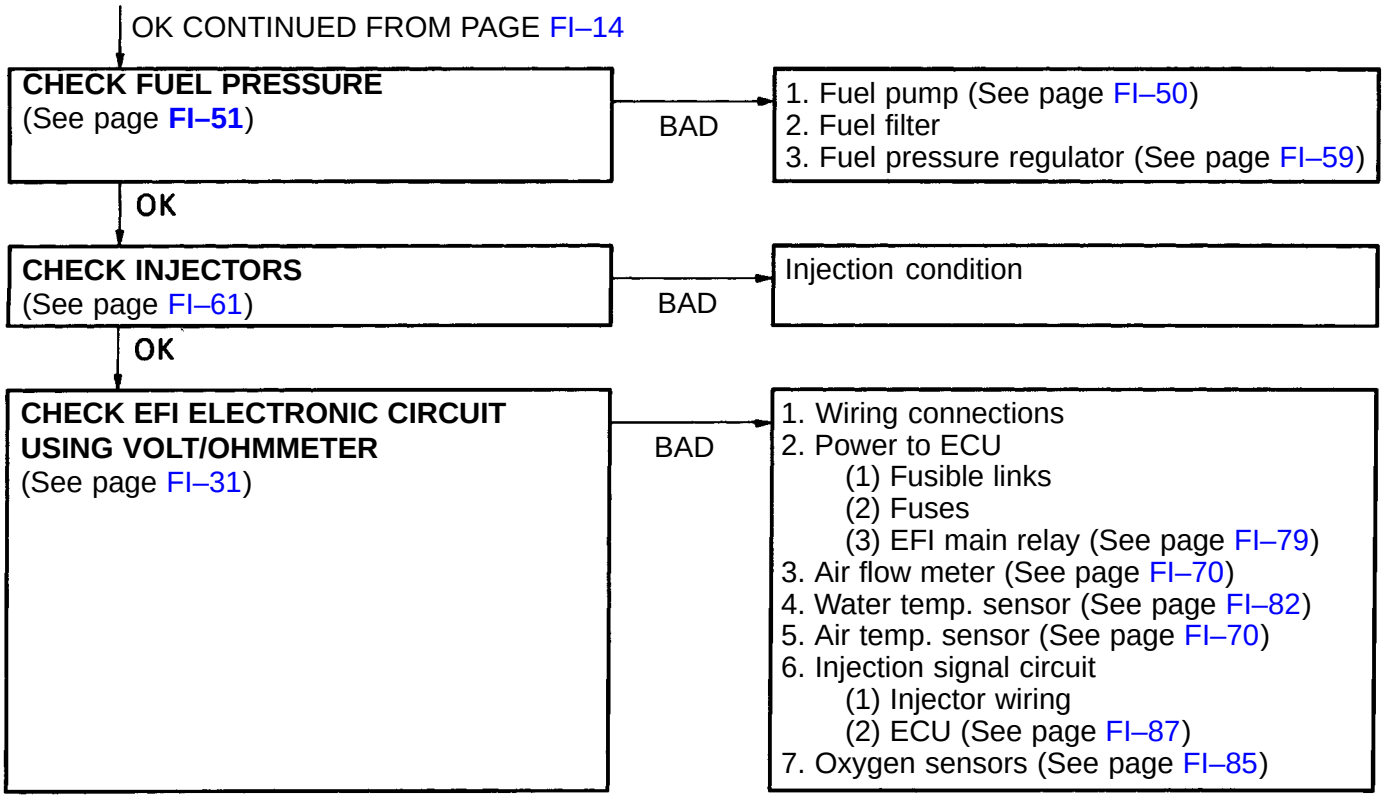
BAD →
1. Spark plugs and high–tension cords
2. Compression pressure
Minimum: 785 kPa
(8.0 kgf/cm^2, 114 psi) at 200 rpm
3. Valve clearance (Hot)
Standard: IN 0.20 mm (0.008 in.)
EX 0.35 mm (0.014 in.)

OK ↓

CHECK COLD START INJECTOR
(See page FI–52)

BAD →
1. Cold start injector (See page FI–52)
2. Cold start injector time switch.
(See page FI–81)

OK CONTINUED ON PAGE FI–15


OK CONTINUED FROM PAGE FI–14
CHECK FUEL PRESSURE
(See page FI–51)
BAD
1. Fuel pump (See page FI–50)
2. Fuel filter
3. Fuel pressure regulator (See page FI–59)
OK
CHECK INJECTORS
(See page FI–61)
BAD
Injection condition
OK
CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI–31)
BAD
1. Wiring connections
2. Power to ECU
(1) Fusible links
(2) Fuses
(3) EFI main relay (See page FI–79)
3. Air flow meter (See page FI–70)
4. Water temp. sensor (See page FI–82)
5. Air temp. sensor (See page FI–70)
6. Injection signal circuit
(1) Injector wiring
(2) ECU (See page FI–87)
7. Oxygen sensors (See page FI–85)

SYMPTOM – HIGH ENGINE IDLE SPEED (NO DROP)

CHECK ACCELERATOR LINKAGE
→ BAD → Linkage – Stuck
OK ↓

CHECK AIR CONDITIONER IDLE–UP CIRCUIT
→ BAD → ISC valve
OK ↓

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI–21)
→ Malfunction code(s) → Diagnostic code(s)
(See pages FI–24, FI–25)
Normal code ↓

CHECK ISC SYSTEM
→ BAD → 1. Wiring connections
2. ISC valve (See page FI–76)
3. Air conditioner switch
OK ↓

CHECK THROTTLE POSITION SENSOR (See page **FI–72**)
→ BAD → Throttle body
OK ↓

CHECK FUEL PRESSURE
(See page **FI–51**)
→ BAD → Fuel pressure regulator – High pressure
OK ↓

CHECK COLD START INJECTOR
(See page FI–56)
→ BAD → Cold start injector – linkage
OK ↓

CHECK INJECTORS
(See page **FI–61**)
→ BAD → Injectors – Leakage, Injection quantity
OK ↓

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI–31)
→ BAD →
1. Wiring connection
2. Power to ECU
   (1) Fusible links
   (2) Fuses
   (3) EFI main relay (See page FI–79)
3. Air flow meter (See page FI–70)
4. Water temp. sensor (See page FI–82)
5. Air temp. sensor (See page FI–70)
6. Injection signal circuit
   (1) Injector wiring
   (2) ECU (See page FI–87)

SYMPTOM – ENGINE BACKFIRES – Lean Fuel Mixture

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI–21)

→ Malfunction code(s) → Diagnostic code(s)
(See pages FI–24, FI–25)

↓ Normal code

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

→ BAD →
1. Oil filler cap
2. Oil dipstick
3. Hose connections
4. PCV hose(s)
5. EGR system – EGR valve stays open

↓ OK

CHECK IGNITION TIMING
1. Connect terminals TE1 and E1 of the check connector.
2. Check ignition timing.
Standard: 7° BTDC @ idle
(w/ connected TE1 and E1)

→ NO → Ignition timing – Adjust (See page IG–11)

↓ OK

CHECK COLD START INJECTOR
(See page FI–56)

→ BAD →
1. Cold start injector (See page FI–56)
2. Cold start injector time switch.
(See page FI–81)

↓ OK

CHECK FUEL PRESSURE
(See page **FI–51**)

→ BAD →
1. Fuel pump (See page FI–50)
2. Fuel filter
3. Fuel pressure regulator (See page FI–59)

↓ OK

CHECK INJECTORS
(See page FI–61)

→ BAD → Injectors – Clogged

↓ OK

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI–31)

→ BAD →
1. Wiring connection
2. Power to ECU
(1) Fusible links
(2) Fuses
(3) EFI main relay (See page FI–79)
3. Air flow meter (See page FI–70)
4. Water temp. sensor (See page FI–82)
5. Air temp. sensor (See page FI–70)
6. Throttle position sensor (See page FI–72)
7. Injection signal circuit
(1) Injector wiring
(2) Fuel cut RPM (See page FI–90)
(3) ECU (See page FI–87)
8. Oxygen sensors (See page FI–85)

SYMPTOM – MUFFLER EXPLOSION (AFTER FIRE) – Rich Fuel Mixture – Misfire

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI–21)

→ Malfunction code(s) → Diagnostic code(s)
(See pages FI–24, FI–25)

↓ Normal code

CHECK IGNITION TIMING
1. Connect terminals TE1 and E1 of the check connector.
2. Check ignition timing.
Standard: 7° BTDC @ idle
(w/ connected TE1 and E1)

→ NO → Ignition timing – Adjust (See page IG–11)

↓ OK

CHECK COLD START INJECTOR
(See page FI–52)

→ BAD →
1. Cold start injector (See page FI–56)
2. Cold start injector time switch.
(See page FI–81)

↓ OK

CHECK FUEL PRESSURE
(See page FI–51)

→ BAD → Fuel pressure regulator (See page FI–59)

↓ OK

CHECK INJECTORS (See page **FI–61**)

→ BAD → Injectors – Leakage

↓ OK

CHECK SPARK PLUGS
Plug gap: 1.1 mm (0.043 in.)
HINT: Check compression pressure and valve clearance if necessary.

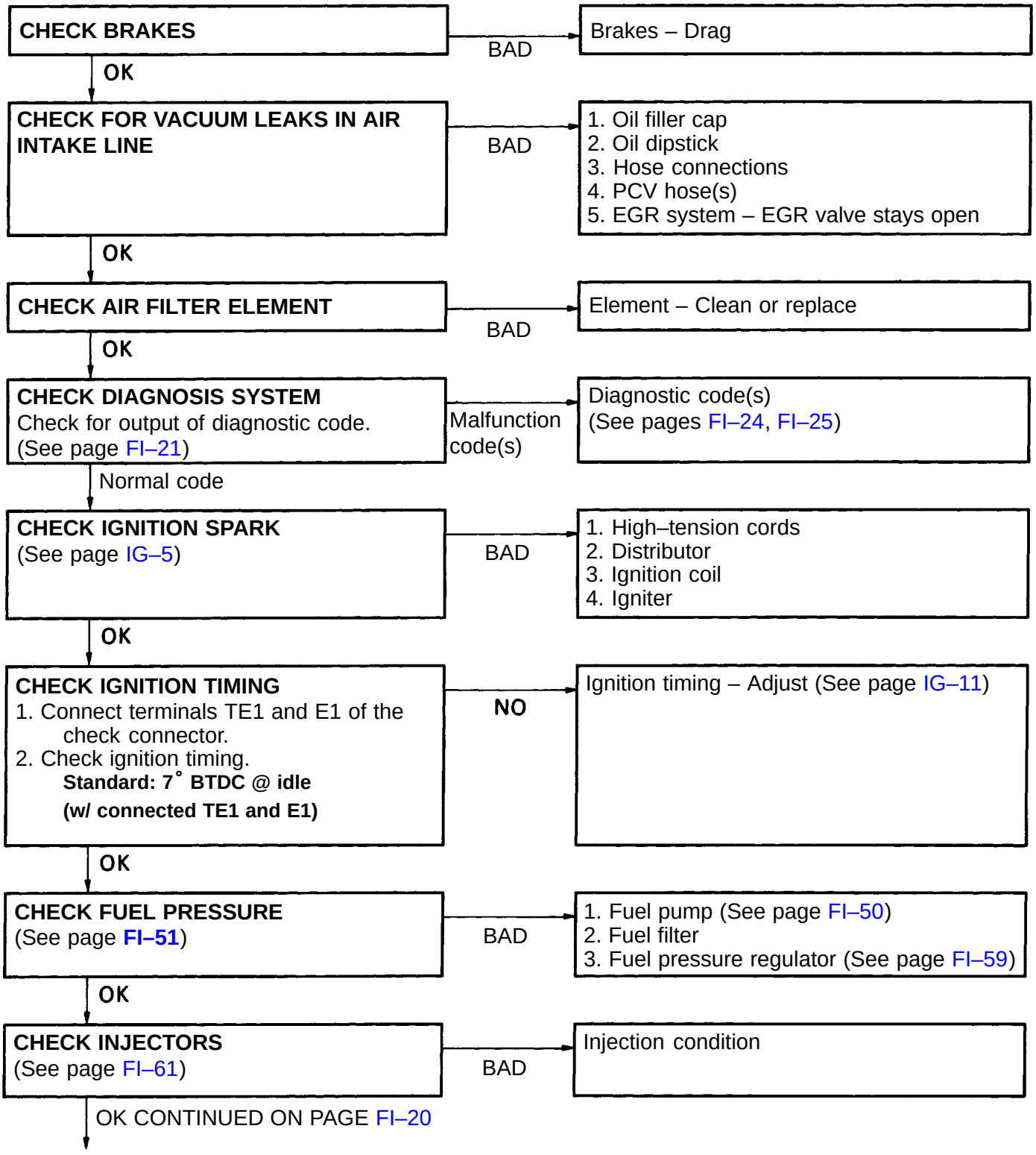
→ NO →
1. Spark plugs
2. Compression pressure
Minimum: 785 kPa
(8.0 kgf/cm^2, 114 psi) at 200 rpm
3. Valve clearance (Hot)
Standard: IN 0.20 mm (0.008 in.)
EX 0.35 mm (0.014 in.)

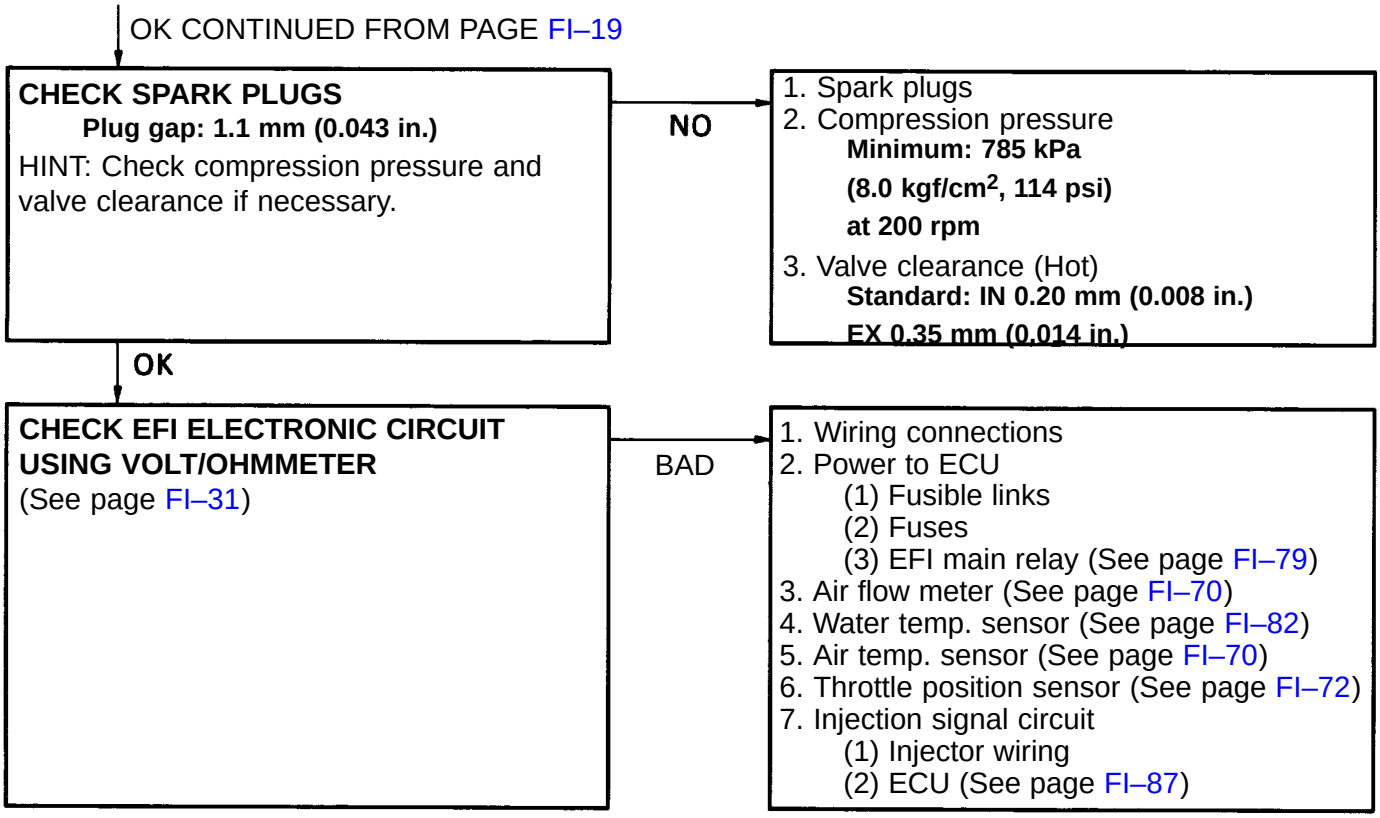
↓ OK

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI–31)

→ BAD →
1. Throttle position sensor
2. Injection signal circuit
(1) Injector wiring
(2) Fuel cut RPM (See page FI–90)
(3) ECU (See page FI–87)
3. Oxygen sensors (See page FI–85)

SYMPTOM – ENGINE HESITATES AND/OR POOR ACCELERATION



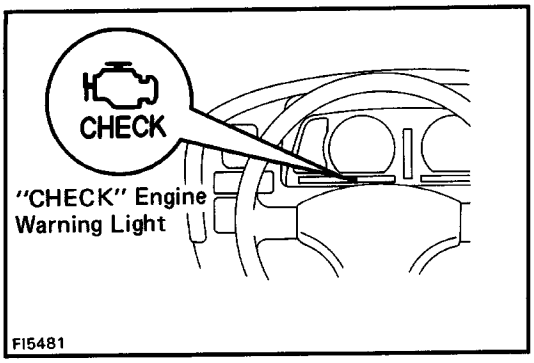

OK CONTINUED FROM PAGE FI–19
CHECK SPARK PLUGS
Plug gap: 1.1 mm (0.043 in.)
HINT: Check compression pressure and valve clearance if necessary.
NO
1. Spark plugs
2. Compression pressure
Minimum: 785 kPa
(8.0 kgf/cm2, 114 psi)
at 200 rpm
3. Valve clearance (Hot)
Standard: IN 0.20 mm (0.008 in.)
EX 0.35 mm (0.014 in.)
OK
CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER
(See page FI–31)
BAD
1. Wiring connections
2. Power to ECU
(1) Fusible links
(2) Fuses
(3) EFI main relay (See page FI–79)
3. Air flow meter (See page FI–70)
4. Water temp. sensor (See page FI–82)
5. Air temp. sensor (See page FI–70)
6. Throttle position sensor (See page FI–72)
7. Injection signal circuit
(1) Injector wiring
(2) ECU (See page FI–87)

DIAGNOSIS SYSTEM DESCRIPTION

The ECU contains a built–in self–diagnosis system by which troubles with the engine signal network are detected and a ”CHECK” engine warning light on the instrument panel flashes.

By analyzing various signals as shown in the later tables (See pages FI–24, FI–25), the ECU detects system malfunctions which are related to the various operating parameter sensors or actu–ator. The ECU stores the failure code associated with the detected failure until the diagnosis system is cleared by re–moving the EFI fuse with the ignition switch OFF.

The ”CHECK” engine warning light on the instrument panel informs the driver that a malfunction has been detected. The light goes out automatically when the malfunction has been cleared.



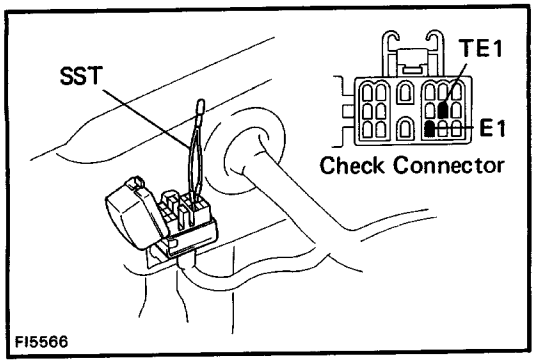
”CHECK” ENGINE WARNING LIGHT CHECK

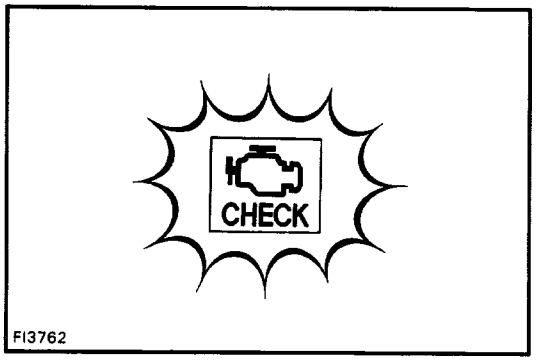
1. The ”CHECK” engine warning light will come on when the ignition switch is placed at ON and the engine is not running.
2. When the engine is started, the ”CHECK” engine warn–ing light should go out.
   If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

OUTPUT OF DIAGNOSTIC CODES

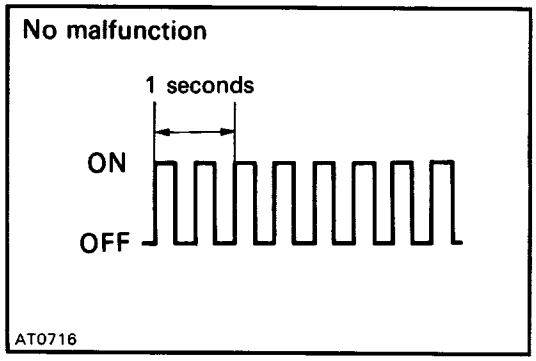
To obtain an output of diagnostic codes, proceed as follow:

1. Initial conditions
   (a) Battery voltage 11 volts or more
   (b) Throttle valve fully closed (throttle position sensor IDL points closed)
   (c) Transmission in neutral position
   (d) Accessories switched OFF
   (e) Engine at normal operating temperature
2. Turn the ignition switch to ON. Do not start the engine.
3. Using SST, connect terminals TE1 and E1 of the check connector.
   SST 09843–18020





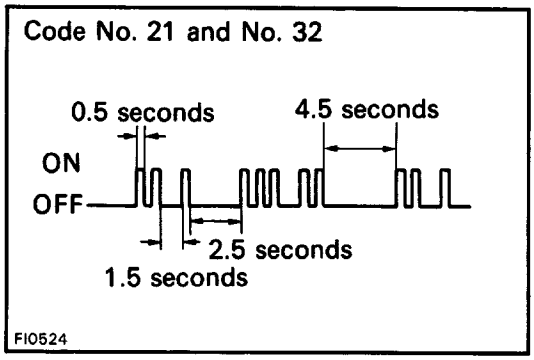
4. Read the diagnostic code as indicated by the number of flashes of the ”CHECK” engine warning light.



Diagnostic Codes (See pages FI–24, FI–25)

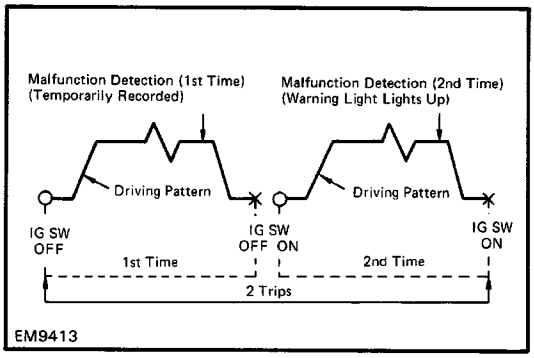
(a) Normal System Operation (no malfunction)

- The light will alternately blink ON and OFF 2 times per second.



(b) Malfunction Code Indication

- In the event of a malfunction, the light will blink every 0.5 seconds. The first number of blinks will equal the first digit of a 2–digit diagnostic code and, after a 1.5 second pause, the 2nd number of blinks will equal the 2nd. If there are two or more codes, there will be a 2.5 second pause between each.
- After all the codes have been output, there will be a 4.5 second pause and they will all be repeated as long as the terminals TE1 and E1 of the check connector are connected.

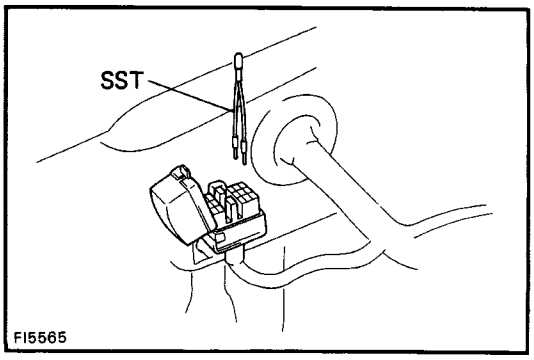


HINT: In the event of a number of trouble codes, indi–cation will begin from the smaller value and continue to the larger.

(c) (2 trip detection logic)

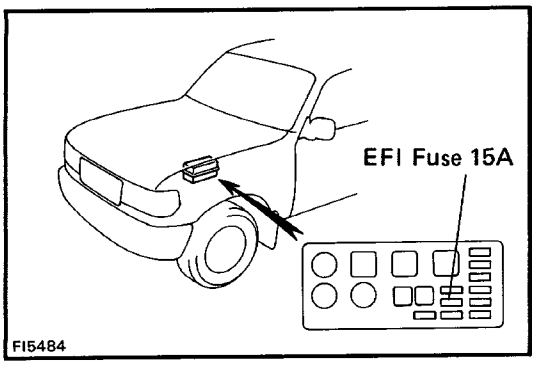
Diagnostic codes 25, 26, 27 and 71 use ”2 trip de–tection logic”. With this logic, when a malfunctions is first detected, the malfunction is temporarily stored in the ECU memory. If the same case is de–tected again during the second drive test, this sec–ond detection causes the ”CHECK” Engine Warning Light to light up.

The 2 trip repeats the same mode a 2nd time. (How–ever, the ignition switch must be turned OFF be–tween the 1 st time and 2nd time.) In the Test Mode, the ”CHECK” Engine Warning Light lights up the 1st time a malfunction is detected.



5. After the diagnosis check, remove SST.

SST 09843–18020



CANCELLING DIAGNOSTIC CODE

1. After repair of the trouble area, the diagnostic code retained in memory by the ECU must be cancelled out by removing the EFI fuse (15A) for 30 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.

HINT:

- Cancellation can also be done by removing the battery negative (–) terminal, but in this case, other memory systems (clock, etc.) will also be cancelled out.
- If the diagnostic code is not cancelled out, it will be retained by the ECU and appear along with a new code in the event of future trouble.
- If it is necessary to work engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic code has been recorded.

2. After cancellation, perform a road test of the vehicle to check that a ”normal” code is now read on the ”CHECK” engine warning light.

If the same diagnostic code appears, it indicates that the trouble area has not been repaired thoroughly.

DIAGNOSIS INDICATION

1. Including ”’normal”, the ECU is programmed with the following 17 (Ex. California vehicles) or 18 (California vehicles) diagnostic codes.
2. When 2 or more codes are indicated, the lowest number (code) will appear first.
3. All detected diagnostic codes, except code No.51, will be retained in memory by the ECU from the time of detection until cancellation.
4. Once the malfunction is cleared, the ”CHECK” engine warning light on the instrument panel will go out but the diagnostic code(s) remains stored in ECU memory (except for code No.51).

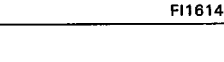
DIAGNOSTIC CODES

HINT:

- If a malfunction is detected during the diagnostic code check, refer to the circuit indicated in the table, and turn to the corresponding page.
- Your readings may vary from the parameters listed in the chart depending on the instruments used.

Code No.	Number of Check engine blinks	System	* 1 "CHECK" Engine Warning Light	Diagnosis	Trouble area	*2 Memory	See page
–	 FI1604	Normal	–	No malfunctions detected.	–	–	–
12	 FI1606	RPM Signal	ON	No "NE" or "G" signal to ECU within 2 seconds after cranking the engine.	• Distributor circuit • Distributor • Starter signal circuit • ECU	○	IG–4
13	 FI1607	RPM Signal	ON	No "NE" signal to ECU when engine speed is above 1,000 rpm.	• Distributor circuit • Distributor • ECU	○	–
14	 FI1608	Ignition Signal	ON	No "IGF" signal to ECU 6 – 8 times in succession.	• Igniter and ignition coil circuit • Igniter and ignition coil • ECU	○	FI–45
21	 FI1609	Oxygen Sensor Signal	ON	During air–fuel ratio feedback correction, voltage output from the oxygen sensor does not exceed a set value on the lean side and the rich side continuously for a certain period. *6 (2 trip detection logic)	• Oxygen sensor circuit • Oxygen sensor • ECU	○	FI–48
		Oxygen Sensor Heater Signal		Open or short circuit in oxygen sensor heater.	• Oxygen sensor heater circuit • Oxygen sensor heater • ECU		
22	 FI1610	Water Temp. Sensor Signal	ON	Open or short circuit in water temp. sensor signal.	• Water temp. sensor circuit • Water temp. sensor • ECU	○	FI–41
24	 FI1611	Intake Air Temp. Sensor Signal	ON*3	Open or short circuit in intake air temp. sensor signal.	• Intake air temp. sensor circuit • Intake air temp. sensor • ECU	○	FI–40
25	 FI2562	Air–fuel Ratio Lean Malfunction	ON	(1) Oxygen sensor output at 2,500 rpm is less than 0.45 V for at least 20 seconds when warmed up. Applies only to code 25 and for California models, excepting high–altitude areas. *4 (2) When the oxygen sensor signal oscillates beyond 0.45 V more than 60 times within a 5–second period while driving at speeds above 15 km/h at coolant temperature of 70°C (158°F) or above. *4 (3) When the air/fuel compensation value fluctuates more than 15 percent from the ECU nominal value within a 50–second period, at coolant temprature of 70°C (158°F) or above. *6 (2 trip detection logic) (1) ~ (3)	• Injector circuit • Injector • Fuel line pressure • Air flow meter • Air induction system • Oxygen sensor circuits • Oxygen sensors • Igition system • ECU	○	–
26	 FI2563	Air–fuel Ratio Rich Malfunction	ON		• Injector circuit • Injector • Fuel line pressure • Air flow meter • Cold start injector • ECU	○	–

DIAGNOSTIC CODES (Cont'd)

Code No.	Number of Check engine blinks	System	*1 "CHECK" Engine Warning Light	Diagnosis	Trouble area	* 2 Memory	See page
28	 FI2698	No. 2 Oxygen Sensor Signal / No. 2 Oxygen Sensor Heater	ON	Same as code No. 21	Same as code No. 21	○	FI–48
31	 FI1612	Air Flow Meter Signal	ON	Open circuit in VC and VS signal or short circuit between VS and E2 when idle contacts are closed.	• Air flow meter circuit • Air flow meter • EC U	○	FI–39
32	 FI1613	Air Flow Meter Signal	ON	Open circuit in E2 or short circuit between VC and VS.	• Air flow meter circuit • Air flow meter • ECU	○	FI–39
35	 FI2699	HAC Sensor Signal	ON	Open circuit in altitude compensation sensor signal.	• ECU	○	–
41	 FI1614	Throttle Position Sensor Signal	ON*3	Open or short circuit in throttle position sensor signal.	• Throttle position sensor circuit • Throttle position sensor • ECU	○	FI–39
42	 FI1615	Vehicle Speed Sensor Signal	OFF	No "SPD" signal for 8 seconds when engine speed is between 2,000 rpm and 5,000 rpm and coolant temp. is below 80°C (176°F) except when racing the engine.	• Vehicle speed sensor circuit • Vehicle speed sensor • ECU	○	–
43	 FI1616	Starter Signal	OFF	No "STA" signal to ECU until engine speed reaches 800 rpm with vehicle not moving	• Ignition switch circuit • Ignition switch • ECU	○	FI–43
*5 71	 FI2622	EGR System Malfunction	ON	30 secs. from start of EGR operation, EGR gas temp. is less than 100°C (212°F) with coolant temp. 60°C (140°F) or more. *6 (2 trip detection logic).	• EGR valve • EGR hose • EGR gas temp. sensor circuit • EGR gas temp. sensor • VSV for EGR • VSV circuit for EGR • ECU	○	FI–49
51	 FI1617	Switch Condition Signal	OFF	No "IDL" signal, "NSW" signal or "A/C" signal to ECU, with the check terminals E1 and TE1 connected.	• A/C switch circuit • A/C switch • A/C amplifire • Throttle position sensor circuit • Throttle position sensor • Neutral start switch • Acceleration pedal and cable • ECU	×	–

REMARKS

*1: "ON" displayed in the diagnosis mode column indicates that the "CHECK" engine Warning Light is lighted up when a malfunction is detected.
"OFF" indicates that the "CHECK" does not light up during malfunction diagnosis, even if a malfunction is detected.

*2: "○" in the memory column indicates that a diagnostic code is recorded in the ECU memory when a malfunction occurs. "x" indicates that a diagnostic code is not recorded in the ECU memory even if a malfunction occurs. Accordingly, output of diagnostic results is performed with the IG SW ON.

*3: The "CHECK" engine Warning Light comes on if malfunction occurs only for California specifications. (except High altitude area)

*4: No. (2) (3) in the diagnostic contents of codes No. 25 and 26 apply to California specification vehicles only, while (1) applies to all models.

*5: Code 71 is used only for California specifications.

*6: "2 trip detection logic" (See page FI–22)

DIAGNOSIS CODE DETECTION DRIVING PATTERN

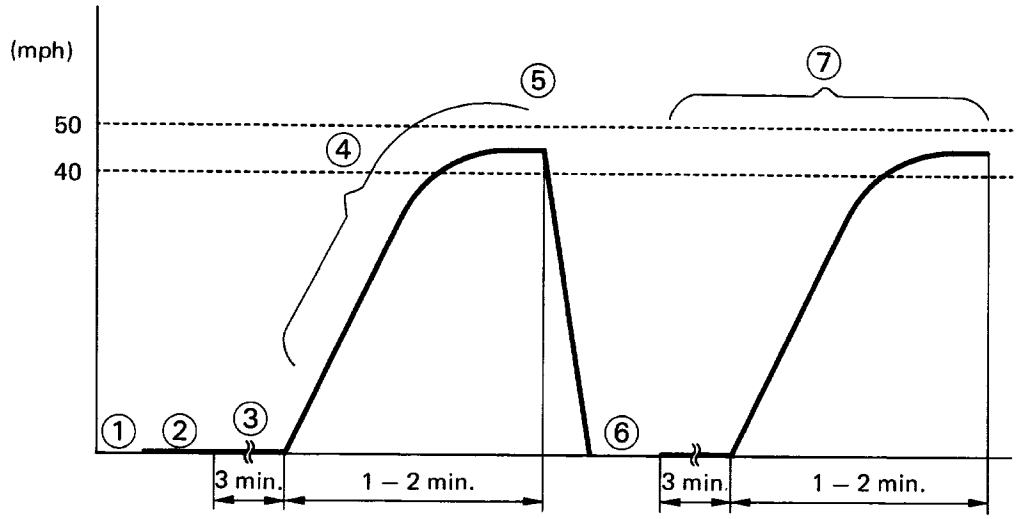
Purpose of the driving pattern.

(a) To simulate diagnosis code detecting procedure after diagnosis code is recorded.

(b) To verify that the repair has corrected the problem and that the diagnostic code is no longer stored.

Diag. Code	21,28	Oxygen Sensor Circuit

Malfunction: Main Oxygen Sensor Deterioration



(1) Disconnect the EFI fuse (15A) for 10 seconds or more, with ignition switch OFF.
Reinstall the fuse.

(2) Start the engine and warm the engine up with all ACC switch OFF.

(3) After the engine is warmed up, let it idle for 3 minutes.

(4) Acclerate gradually and maintain at approximately 1500 rpm, or within the 1300 to 1700 rpm range. Turn the A/C on, and drive in ”D” for automatic, or in case of manual transmission, up–shift appropriately. Shift carefully so that the engine speed would not fall below 1200 rpm. De–press the accelerator pedal gradually and maintain a steady speed to avoid engine braking.

(5) Maintain the vehicle speed at 40–50 mph.
Keep the vehicle running for 1 to 2 minutes after starting acceleration.

(6) After driving, stop at a safe place and turn the ignition switch off for 3 seconds or more.

(7) Start the engine and repeat steps (3), (4), and (5).

HINT: If a malfunction is detected the ”CHECK” engine warning light will light up during step(7).

NOTICE: If this procedure is not strictly followed, it would not be possible to detect the malfunctions.

DIAGNOSIS CODE DETECTION DRIVING PATTERN

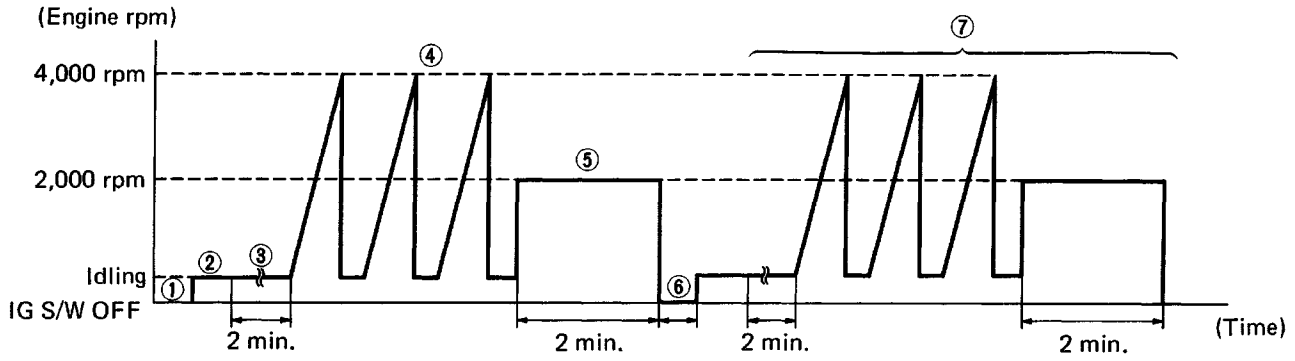
Purpose of the driving pattern.

(a) To simulate diagnosis code detecting procedure after diagnosis code is recorded.

(b) To verify that the repair has corrected the problem and that the diagnostic code is no longer stored.

Diag. Code 25	**Air–Fuel Ratio Lean Malfunction**
Diag. Code 26	**Air–Fuel Ratio Rich Malfunction**

Malfunction: Open or Short in Oxygen Sensor



P02492

① Disconnect the EFI fuse (15A) for 10 seconds or more, with ignition switch OFF.

② Start and warm up the engine.

③ After the engine is warmed up, let it idle for 2 minutes.

④. Rev the engine to 4,000 rpm three times.

⑤. Accelerate and maintain at 2,000 rpm for 2 minutes

⑥. Turn the ignition switch off for 10 seconds.

⑦. Start the engine and repeat steps (2), (3), (4), and (5).

HINT: If a malfunction is detected the ”CHECK” engine warning light will light up during step (7).

NOTICE: If this procedure is not strictly followed, it would not be possible to detect the malfunctions.

DIAGNOSIS CODE DETECTION DRIVING PATTERN

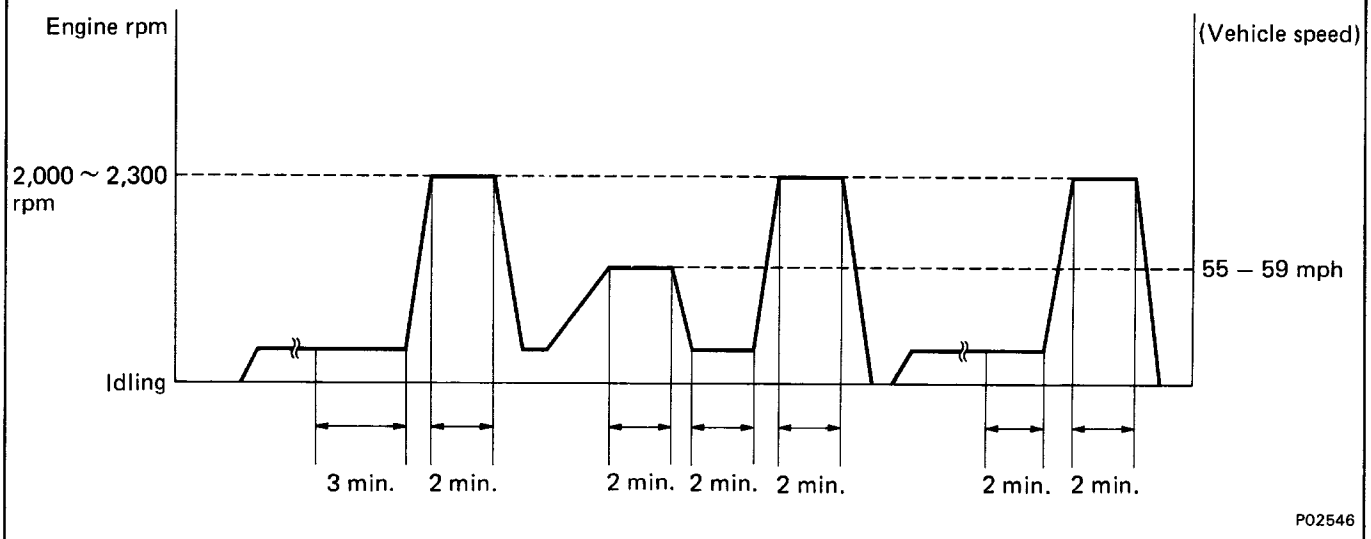
Purpose of the driving pattern.

(a) To simulate diagnosis code detecting procedure after diagnosis code is recorded.

(b) To verify that the repair has corrected the problem and that the diagnostic code is no longer stored.

Diag. Code 25	**Air–Fuel Ratio Lean Malfunction (California)**
Diag. Code 26	**Air–Fuel Ratio Rich Malfunction (California)**

Malfunction: Open or Short in Injector Leak, Blockage



HINT: Before this test, check the feedback voltage for oxygen sensor.

1. Disconnect the EFI fuse (15A) for 10 seconds or more, with ignition switch OFF.
2. Start and warm up the engine.
3. After the engine is warmed up, let it idle for 3 minutes.
   (After the engine has started, do not depress the accelerator pedal.)
4. Accelerate and maintain at 2,000 to 2,300 rpm for 2 minutes.
5. Drive the vehicle at 55 to 60 mph for 2 minutes.
6. Stop at a safe place and idle for 2 minutes.
7. Accelerate and maintain at 2,000 to 2,300 rpm for 2 minutes.
8. Turn the ignition switch OFF for 3 seconds or more.
9. Start and warm up the engine.
10. After the engine is warmed up, repeat steps 6 and 7.

HINT: If a malfunction is detected the ”CHECK” engine warning light will light up during step 10.

NOTICE: If this procedure is not strictly followed, it would not be possible to detect the malfunc–tions.

DIAGNOSIS CODE DETECTION DRIVING PATTERN

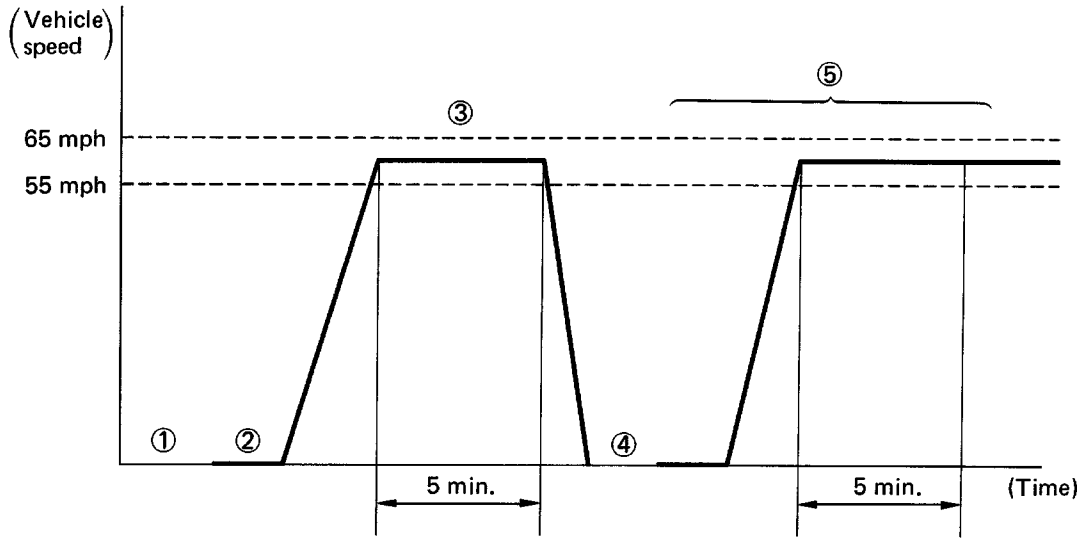
Purpose of the driving pattern.

(a) To simulate diagnosis code detecting procedure after diagnosis code is recorded.

(b) To verify that the repair has corrected the problem and that the diagnostic code is no longer stored.

Diag. Code 71	EGR System Malfunction (California)

Malfunction: Short in VSV Circuit for EGR, Loose EGR Hose, Valve Stuck



P02544

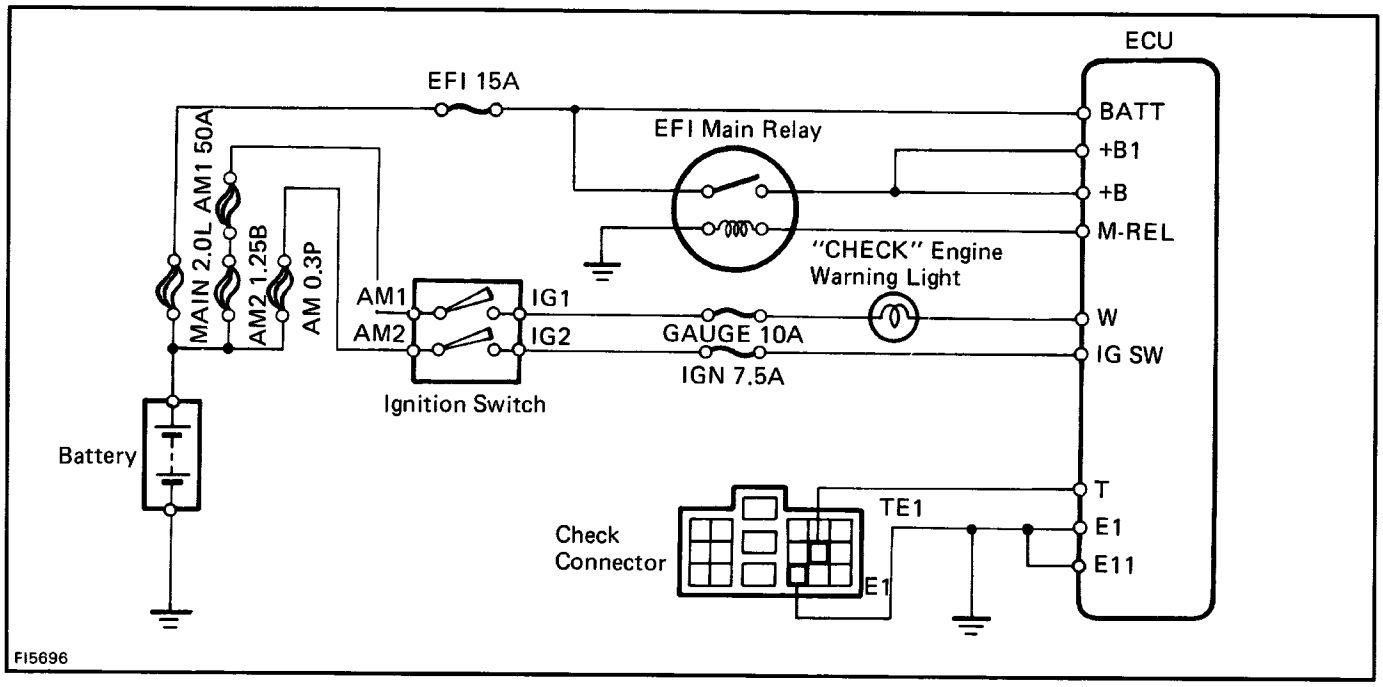
1. Disconnect the EFI fuse (15A) for 10 seconds or more, with ignition switch OFF.
2. Start and warm up the engine.
3. With the transmission in ”D” range and A/C switch OFF, drive at 55–65 mph for 5 minutes.
4. Stop at a safe place and turn the ignition switch OFF for 3 seconds or more.
5. Start the engine and repeat steps 2 and 3.

HINT: If a malfunction is detected the ”CHECK” engine warning light will light up during step 5.

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

If this procedure is not strictly followed, it would not be possible to detect the malfunctions.

INSPECTION OF DIAGNOSIS CIRCUIT



1. Does "CHECK" engine warning light come on when ignition switch is at ON?
   - YES → System Normal
   - NO → Does "CHECK" engine warning light come on when ECU terminal W is grounded to the body?
     - YES → Check wiring between ECU terminal E1 and body ground.
       - OK → Try another ECU.
       - BAD → Repair or replace.
     - NO → Check bulb, fuse and wiring between ECU and ignition switch.
       - BAD → Repair or replace.

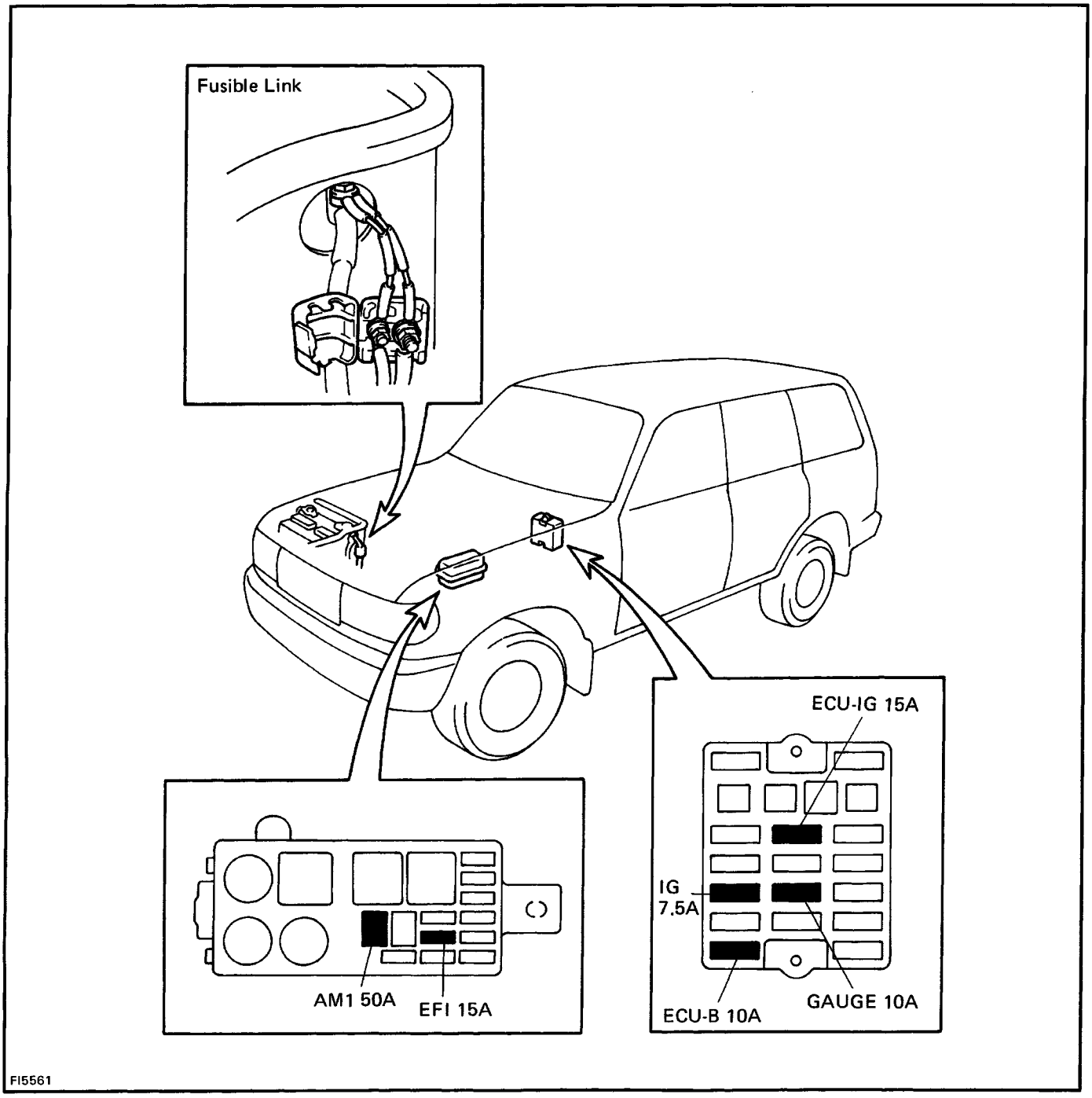
2. Does "CHECK" engine warning light go off when the engine is started?
   - YES → System Normal
   - NO → Check wiring between ECU and "CHECK" engine warning light.
     - BAD → Repair.
     - OK → Is there diagnostic code output when check connector terminals TE1 and E1 are connected?
       - NO → Check wiring between ECU terminal T and check connector terminal TE1, and ECU terminal E1 and check connector terminal E1.
         - OK → Try another ECU.
       - YES → Does "CHECK" engine warning light go out after repair according to malfunction code?
         - NO → Further repair required.
         - YES → System OK → Cancel out diagnostic code.

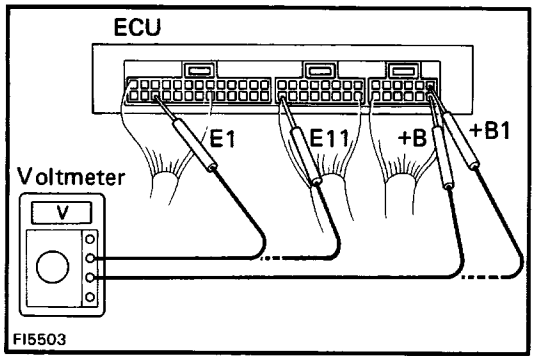
TROUBLESHOOTING WITH VOLT OHMMETER

HINT: The following troubleshooting procedures are designed for inspection of each separate system, and therefore the actual procedure may vary somewhat. However, troubleshooting should be performed referring to the inspection methods described in this manual. Before beginning inspection, it is best to first make a simple check of the fuses, fusible links and condition of the connectors.

The following troubleshooting procedures arebased on the supposition that the trouble lies in either a short or open circuit in a component out side the computer or a short circuit within the computer. If engine trouble occurs even though proper operating voltage is detected in the computer connector, then it can be assumed that the ECU is faulty and should be replaced.

LOCATION OF FUSES AND FUSIBLE LINKS





EFI SYSTEM CHECK PROCEDURE

HINT:

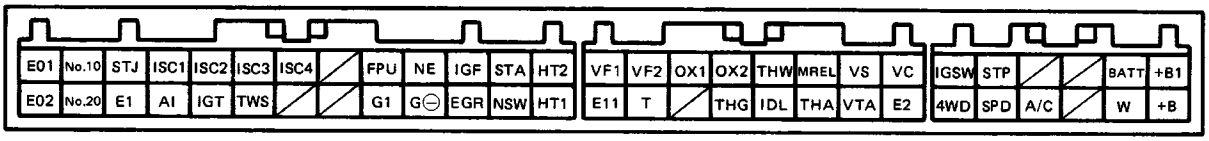
- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is ”ON”.

Using a voltmeter with high impedance (10 kΩ/V mini–mum), measure the voltage at each terminal of the wiring con nectors.

Terminals of ECU

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	ENGINE GROUND	G —	DISTRIBUTOR	M-REL	EFI MAIN RELAY
E02	ENGINE GROUND	IGF	IG N ITER	THA	AIR TEMP. SENSOR
No.10	INJECTOR (No.1, 2, 3)	EGR	EGR VSV	VS	AIR FLOW METER
No.20	INJECTOR (No.4, 5, 6)	STA	STARTER SWITCH	VTA	THROTTLE POSITION SENSOR
STJ	COLD START INJECTOR	NSW	NEUTRAL START SWITCH	VC	AIR FLOW METER or THROTTLE POSITION SENSOR
E1	COMPUTER GROUND	HT2	OXYGEN SENSOR HEATER	E2	SENSOR GROUND
ISC1	ISC MOTOR No.1 COIL	HT1	OXYGEN SENSOR HEATER	IG SW	IGNITION SWITCH
AI	AI VSV	VFI	CHECK CONNECTOR	4WD	CENTER DIFFLOCK INDICATOR
ISC2	ISC MOTOR No.2 COIL	E11	COMPUTER GROUND	STP	STOP LIGHT SWITCH
IGT	IGNITER	VF2	CHECK CONNECTOR	SPD	SPEED SENSOR
ISC3	ISC MOTOR No.3 COIL	T	CHECK CONNECTOR	A/C	A/C MAGNET SWITCH
TWS	WATER TEMP. SWITCH	OX1	OXYGEN SENSOR	BATT	BATTERY
ISC4	ISC MOTOR No.4 COIL	OX2	OXYGEN SENSOR	W	WARNING LIGHT
FPU	FPU VSV	*THG	EGR GAS TEMP. SENSOR	+B	EFI MAIN RELAY
G1	DISTRIBUTOR	THW	WATER TEMP. SENSOR	+B1	EFI MAIN RELAY
NE	DISTRIBUTOR	IDL	THROTTLE POSITION SENSOR		

ECU Terminals



*California vehicles only

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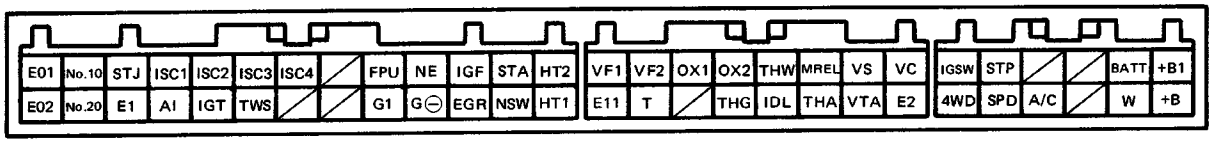
Voltage at ECU Wiring Connectors

No.	Terminals	Condition		STD Voltage	See page
1	BATT – E1 (E11)	—		10 – 14	FI–34
	IG SW – E1 (E11)	Ignition switch ON		10 – 14	FI–35
	M-REL – E1 (E11)				
	+B (+B1) – E1 (E11)				FI–36
2	IDL – E2	Ignition switch ON	Throttle valve open	4 – 6	FI–37
	VC – E2		—	4 – 6	FI–38
	VTA – E2		Throttle valve fully closed	0.1 – 1.0	
			Throttle valve fully open	3 – 5	
3	VC – E2	Ignition switch ON	—	4 – 6	FI–39
	VS – E2		Measuring plate fully closed	4 – 5	
			Measuring plate fully open	0.02 – 0.08	
		Idling		2 – 4	
		3,000 rpm		0.3 – 1.0	
4	THA – E2	Ignition switch ON	Intake air temperature 20°C (68°F)	1 – 3	FI–40
5	THW – E2	Ignition switch ON	Coolant temperature 80°C (176°F)	0.1 – 1.0	FI–41
6	No.10 – E01 No.20 – E02	Ignition switch ON		10 – 14	FI–42
7	STA – E1 (E11)	Cranking		6 – 14	FI–43
8	ISC1 ~ ISC4 – E1 (E11)	Ignition switch ON		10 – 14	FI–44
9	IGT – E1 (E11)	Idling		0.7 – 1.0	FI–45
10	W – E1 (E11)	No trouble ("CHECK" engine warning light off) and engine running		10 – 14	FI–46
11	A/C – E1 (E11)	Air conditioning ON		10 – 14	FI–47

ECU Terminals



* California vehicles only

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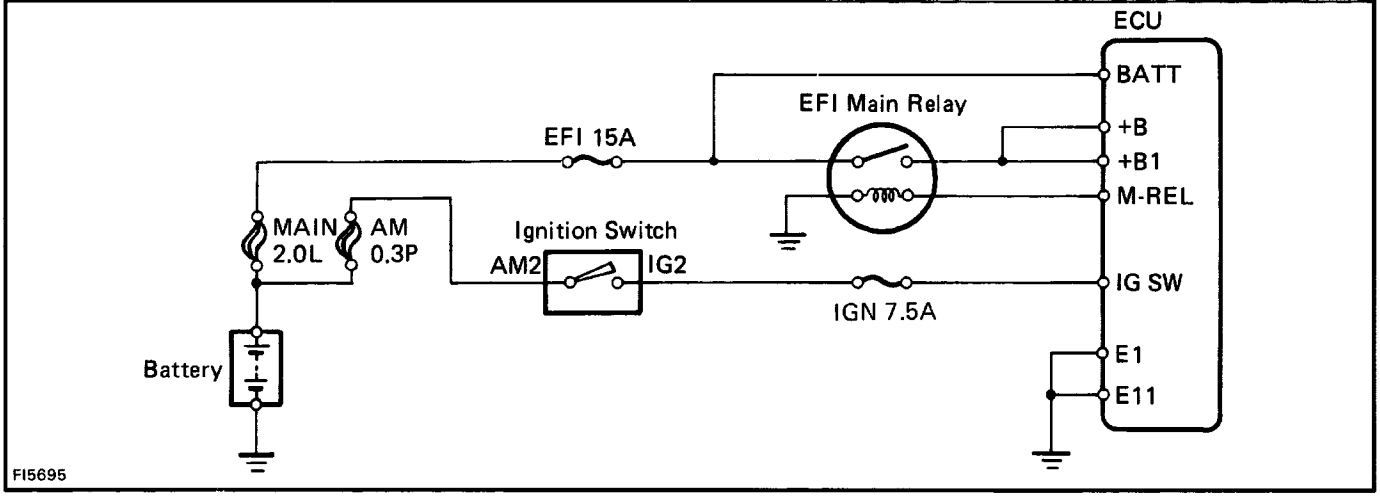
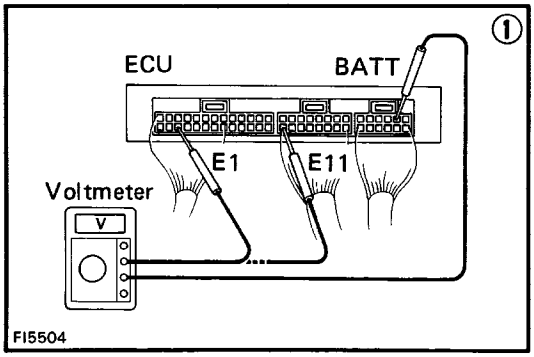
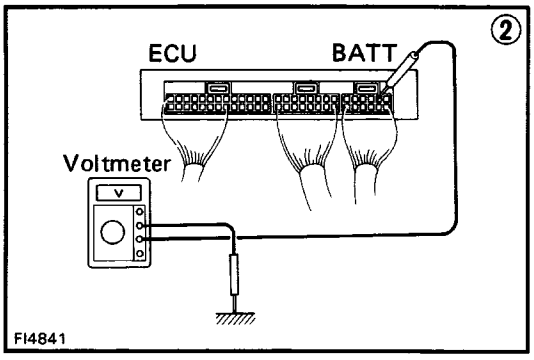
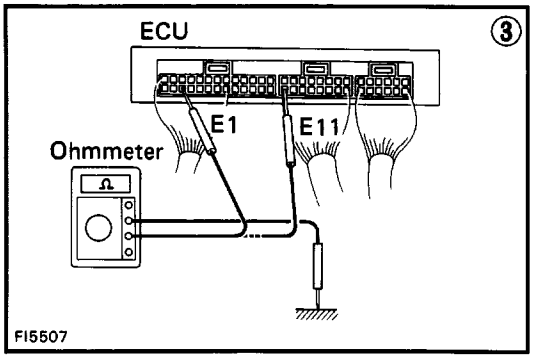
No.	Terminals	Trouble	Condition	STD Voltage
1	BATT–E1 (E11)	No voltage		10 – 14 V
	IG SW–E1 (E11)	No voltage	Ignition switch ON	10 – 14 V
	M-REL–E1 (E11)	No voltage	Ignition switch ON	10 – 14 V
	+B (+B1) –E1 (E11)	No voltage	Ignition switch ON	10 – 14 V









- **BATT–E1 (E11)**

① There is no voltage between ECU terminals BATT and E1 (E11).

↓

② Check that there is voltage between ECU terminal BATT and body ground.

NO → ↓ OK

③ Check wiring between ECU terminal E1 (E11) and body ground.

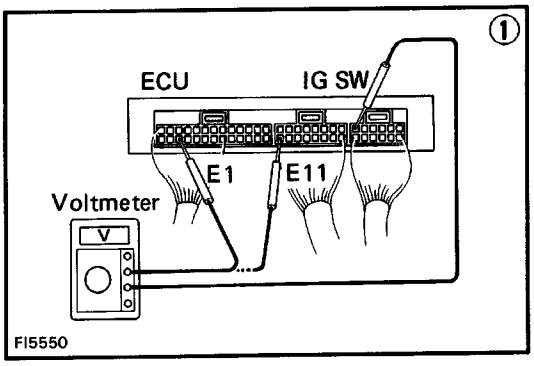
OK → Try another ECU.

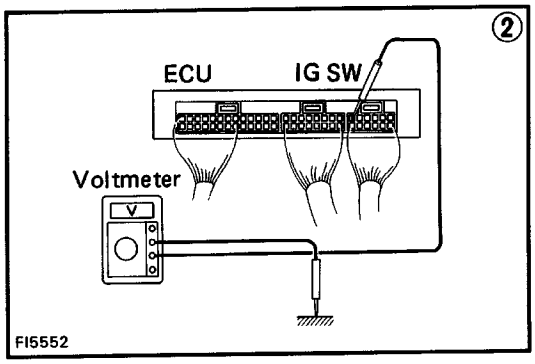
BAD → Repair or replace.

Check fuse and fusible link. BAD → Replace.

↓ OK

Check wiring between ECU terminal and battery. BAD → Repair or replace.





- **IG SW–E1 (E11)**

① There is no voltage between ECU terminals IG SW and E1 (E11). **(IG SW ON)**

↓

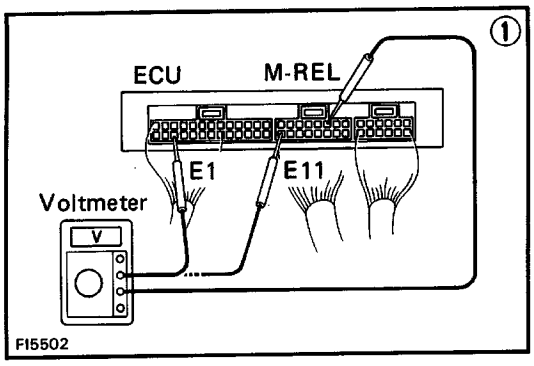
② Check that there is voltage between ECU terminal IG SW and body ground. **(IG SW ON)**

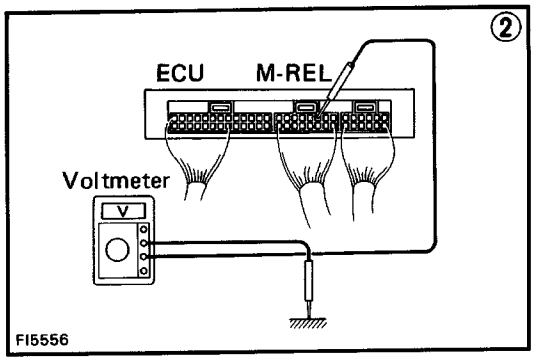
NO → Check fuse, fusible link and ignition switch. → BAD → Repair or replace.

OK → Check wiring between ECU terminal E1 (E11) and body ground.

OK → Try another ECU.

BAD → Replace or repair.





- **M–REL–E1 (E11)**

① There is no voltage between ECU terminals M–REL and E1 (E11). **(IG SW ON)**

↓

② Check that there is voltage between ECU terminal M–REL and body ground. **(IG SW ON)**

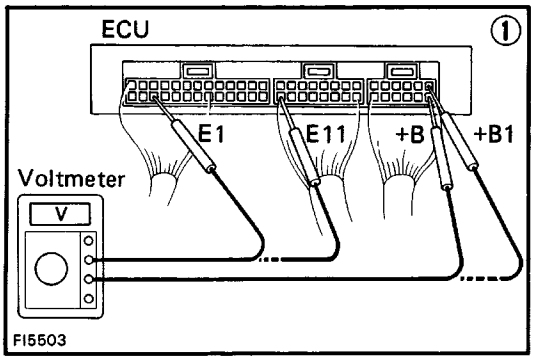
NO → Check EFI main relay and wiring harness. (See page FI–79) → BAD → Replace.

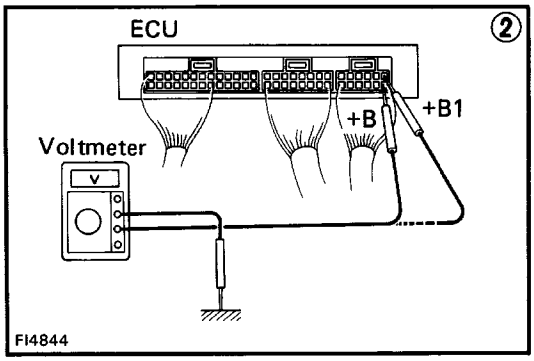
OK → Try another ECU.

OK → Check wiring between ECU terminal E1 (E11) and body ground.

OK → Try another ECU.

BAD → Replace or repair.





- **+B (+B1) –E1 (E11)**

①There is no voltage between ECU teminals +B (+B1) and E1 (E11). **(IG SW ON)**

↓

②Check that there is voltage between ECU terminal +B (+B1) and body ground. **(IG SW ON)**

NO / **OK**

OK → Check wiring between ECU terminal E1 (E11) and body ground.

OK → Try another ECU.

BAD → Replace or repair.

BAD → Check fuse, fusible link and wiring harness. → Repair or replace.

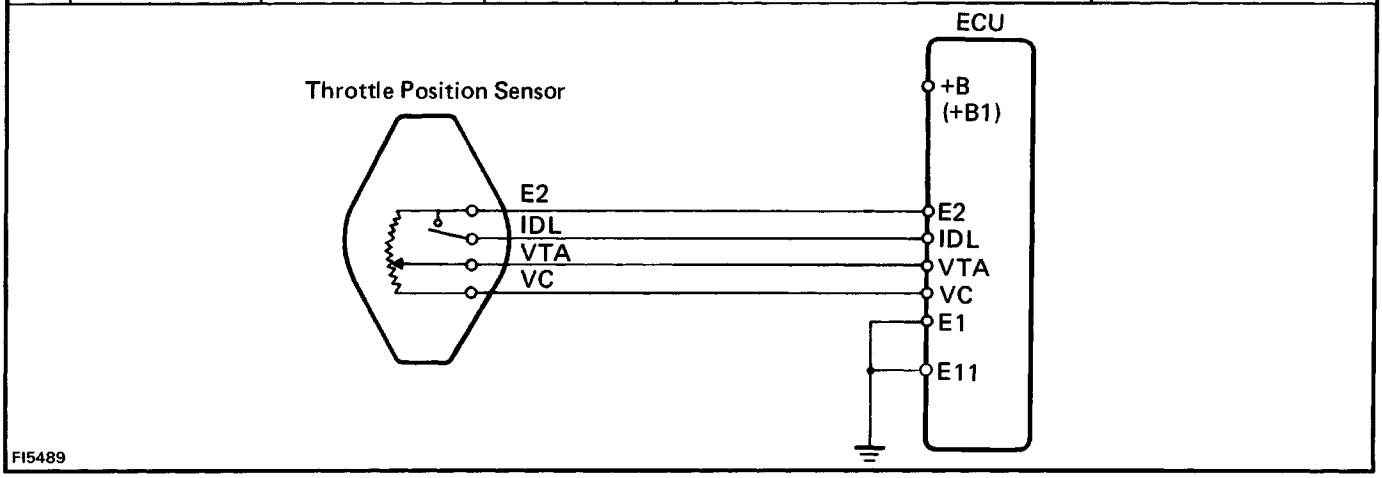
OK ↓

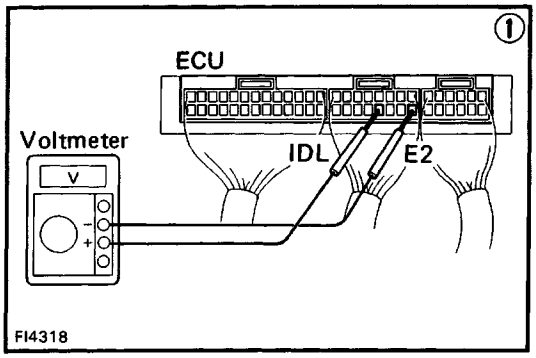
BAD → Check EFI main relay. → Replace.

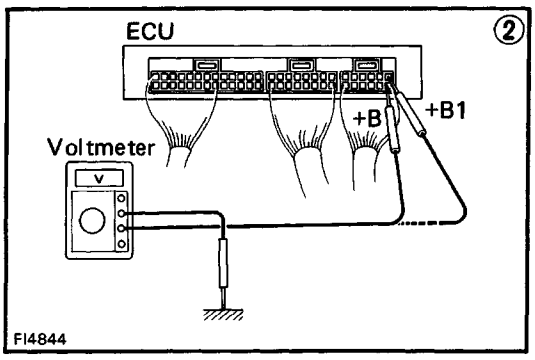
OK ↓

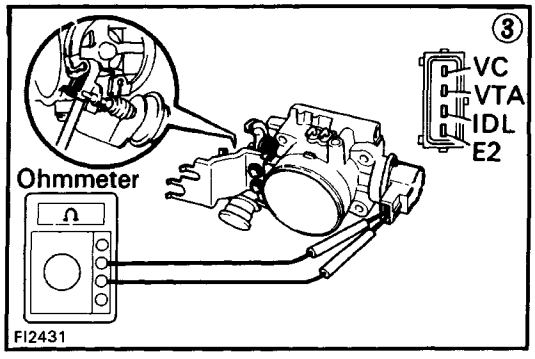
Refer to M–REL–E1 (E11) trouble section.

No.	Terminals	Trouble	Condition		STD Voltage
2	**IDL – E2**	No voltage	Ignition switch ON	Throttle valve open	**4 – 6 V**
	VC – E2				**4 – 6 V**
	VTA – E2			Throttle valve fully closed	**0.1 – 1.0 V**
				Throttle valve fully open	**3 – 5 V**









- **IDL–E2**

① There is no voltage between ECU terminals IDL and E2. **(IG SW ON)** (Throttle valve open)

② Check that there is voltage between ECU terminal +B (+B1) and body ground. **(IG SW ON)**

NO → Refer to No. 1

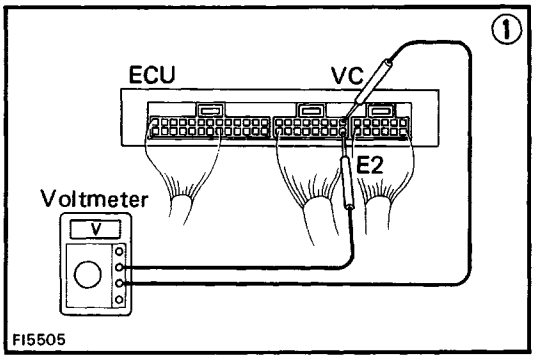
OK → Check wiring between ECU terminal E1 (E11) and body ground.

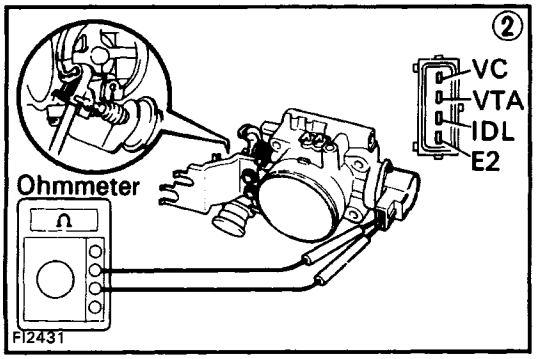
- **OK** → Try another ECU.
- **BAD** → Replace or repair.

Refer to No. 1 — **BAD** → Replace or repair.

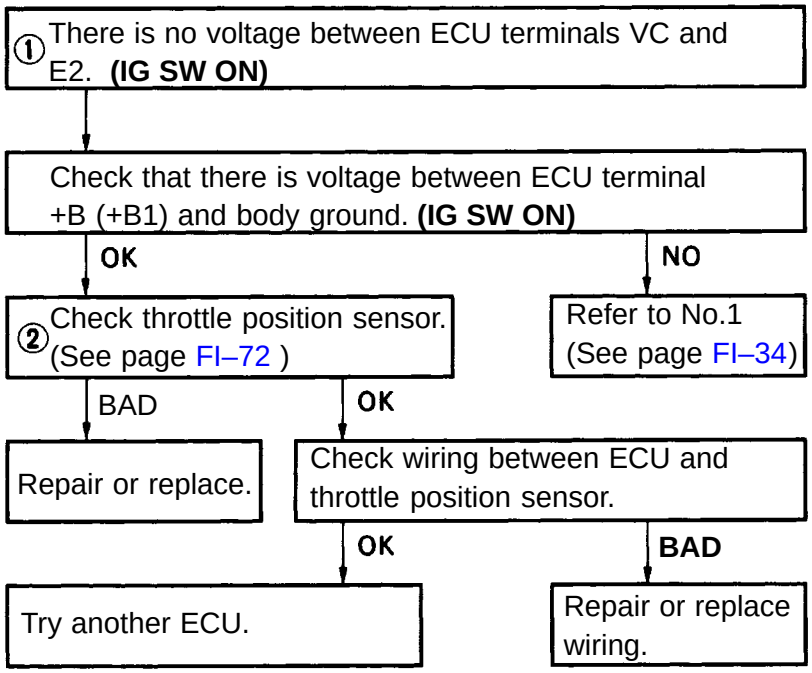
OK → ③ Check throttle position sensor.

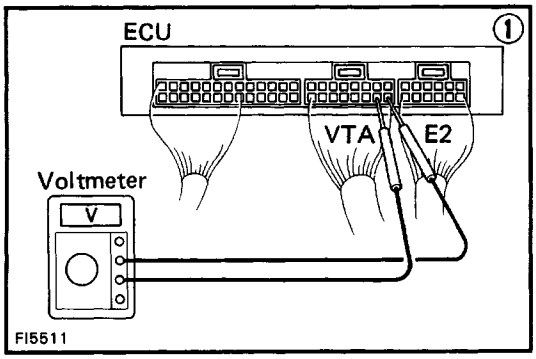
- **BAD** → Replace or repair throttle position sensor.
- **OK** → Check wiring between ECU and throttle position sensor.
  - **BAD** → Replace or repair.
  - **OK** → Try another ECU.

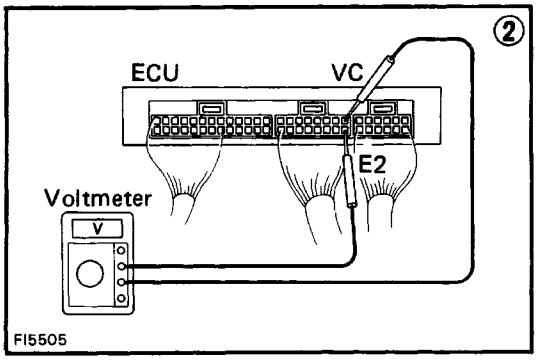

①
ECU
VC
E2
Voltmeter
V
FI5505

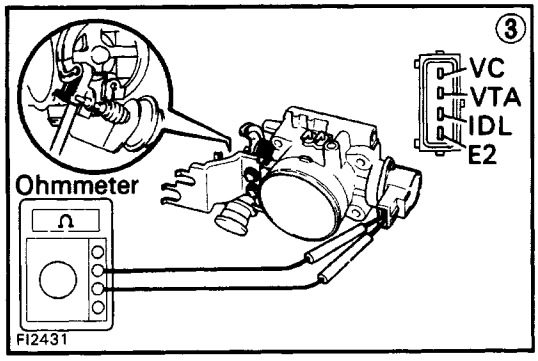

②
VC
VTA
IDL
E2
Ohmmeter
Ω
FI2431

- **VC–E2**

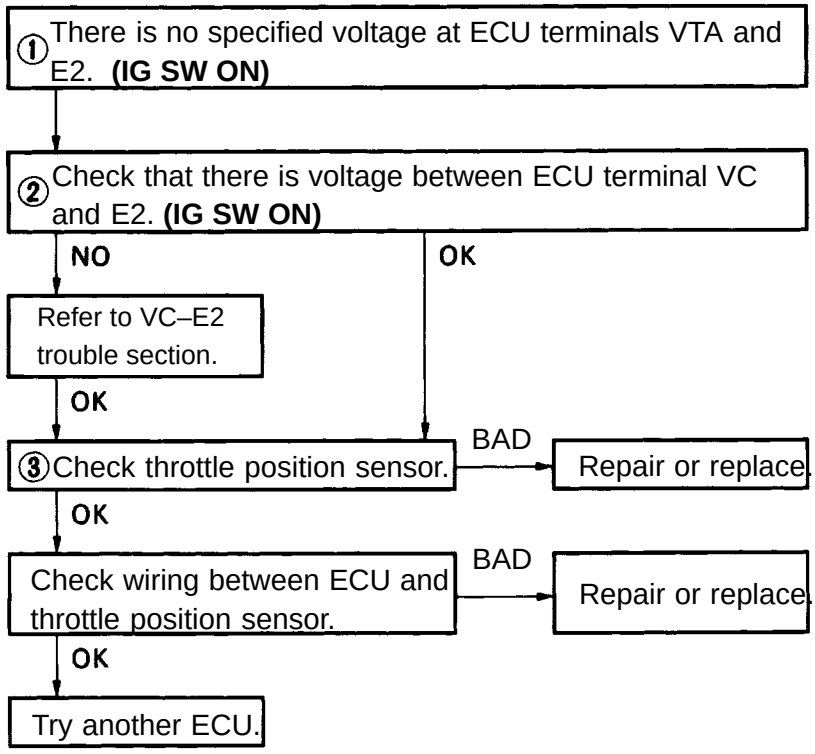

① There is no voltage between ECU terminals VC and E2. (IG SW ON)
Check that there is voltage between ECU terminal +B (+B1) and body ground. (IG SW ON)
OK
NO
② Check throttle position sensor. (See page FI–72)
Refer to No.1 (See page FI–34)
BAD
OK
Repair or replace.
Check wiring between ECU and throttle position sensor.
OK
BAD
Try another ECU.
Repair or replace wiring.


①
ECU
VTA
E2
Voltmeter
V
FI5511

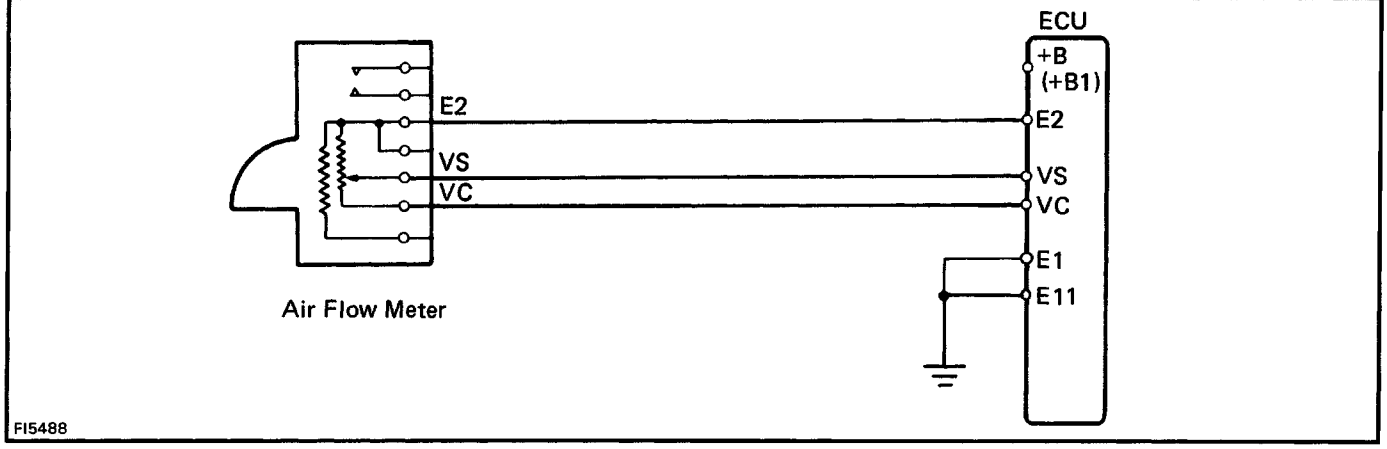

②
ECU
VC
E2
Voltmeter
V
FI5505

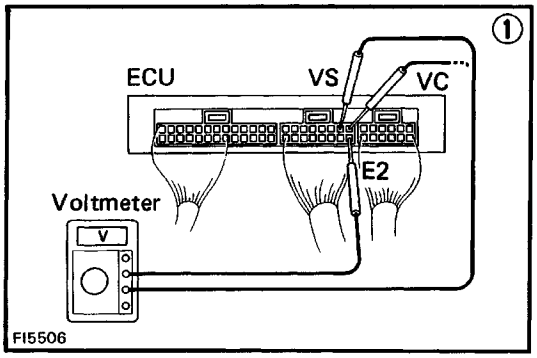

③
VC
VTA
IDL
E2
Ohmmeter
Ω
FI2431

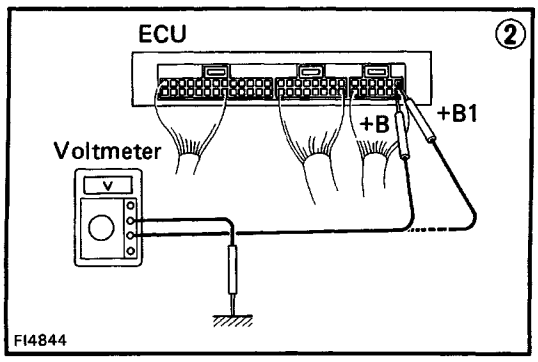
- **VTA–E2**

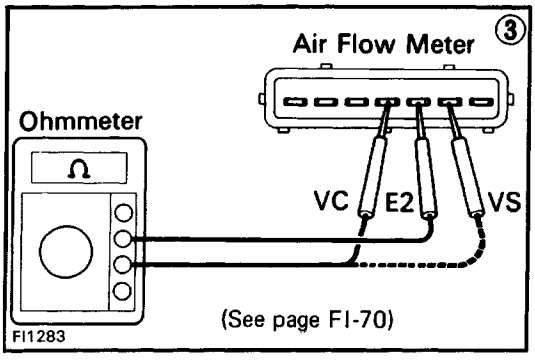

① There is no specified voltage at ECU terminals VTA and E2. (IG SW ON)
② Check that there is voltage between ECU terminal VC and E2. (IG SW ON)
NO
OK
Refer to VC–E2 trouble section.
OK
③ Check throttle position sensor.
BAD
Repair or replace.
OK
Check wiring between ECU and throttle position sensor.
BAD
Repair or replace.
OK
Try another ECU.

No.	Terminals	Trouble	Condition		STD Voltage
3	VC – E2	No voltage	Ignition switch ON		4 – 6 V
	VS – E2			Measuring plate fully closed	4 – 5 V
	VS – E2			Measuring plate fully open	0.02 – 0.08 V
	VS – E2		Idling		2 – 4 V
	VS – E2		3,000 rpm		0.3 – 1.0 V









①There is no voltage between ECU terminals VC or VS and E2. **(IG SW ON)**

↓

② Check that there is voltage between ECU terminal +B (+B1) and body ground. **(IG SW ON)**

OK ↓

NO → Refer to No. 1. (See page FI–34)

↓

Check wiring between ECU terminal E1 (E11) and body ground.

OK ↓

BAD → Repair or replace.

↓

③ Check air flow meter. (See page FI–70)

BAD → Replace air flow meter.

OK ↓

Check wiring between ECU and air flow meter.

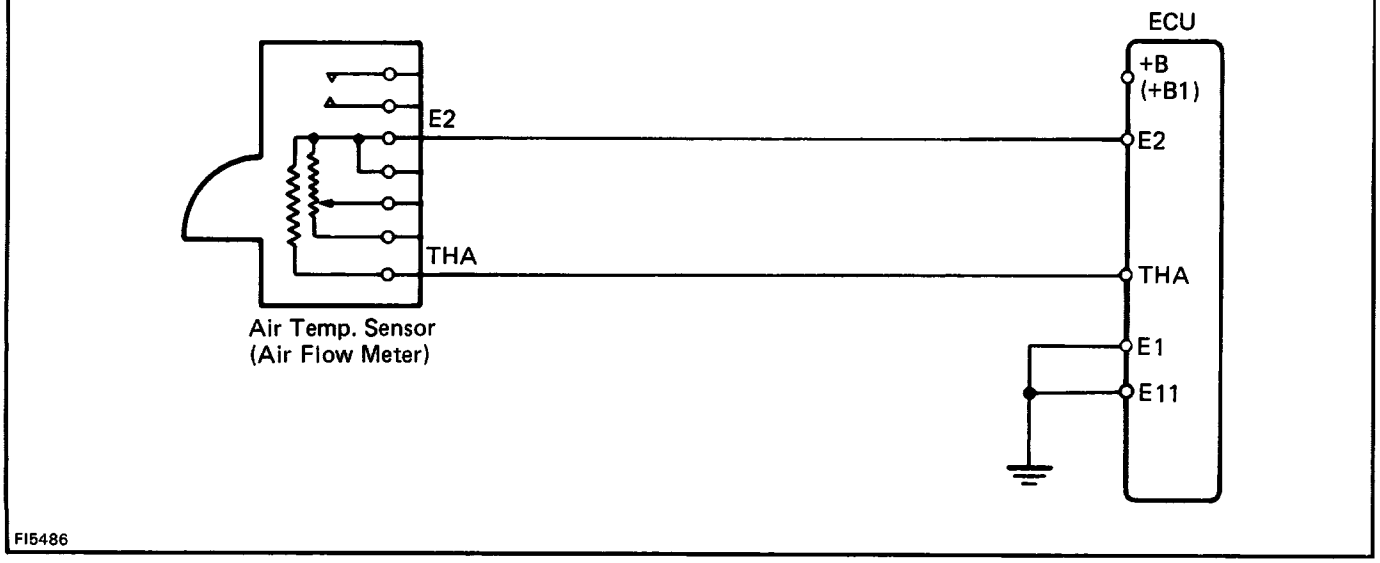
OK ↓

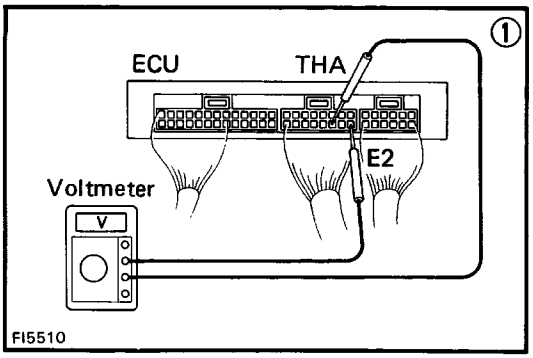
BAD → Repair or replace.

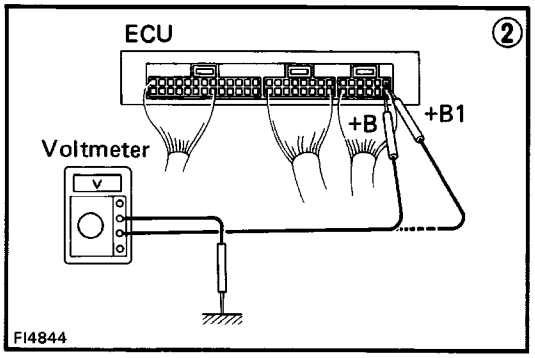
↓

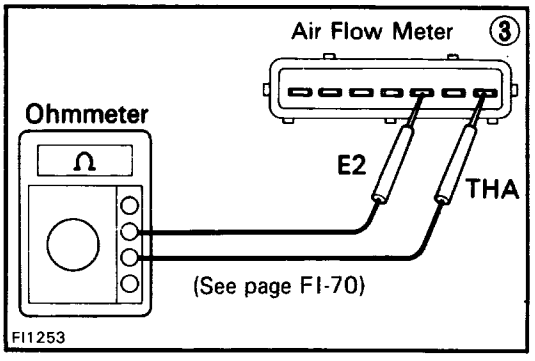
Try another ECU.

No.	Terminals	Trouble	Condition		STD Voltage
4	THA – E2	No voltage	Ignition switch ON	Intake air temperature 20°C (68°F)	1 – 3 V









① There is no voltage between ECU terminals THA and E2 **(IG SW ON)**

↓

② Check that there is voltage between ECU terminal +B (+B1) and body ground. **(IG SW ON)**

OK → ↓

NO → Refer to No. 1. (See page FI–34)

↓

Check wiring between ECU terminal E1 (E11) and body ground.

OK → ↓

BAD → Repair or replace.

↓

③ Check air temp. sensor. (See page FI–70)

BAD → Replace air flow meter.

OK → ↓

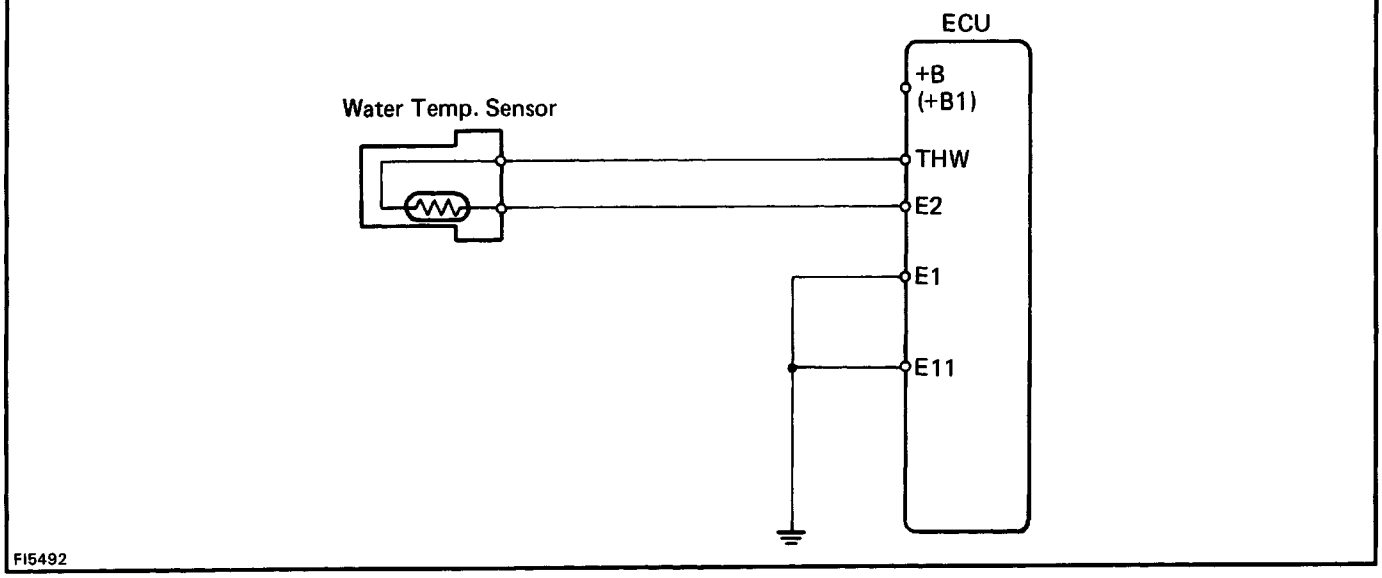
Check wiring between ECU and air temp. sensor.

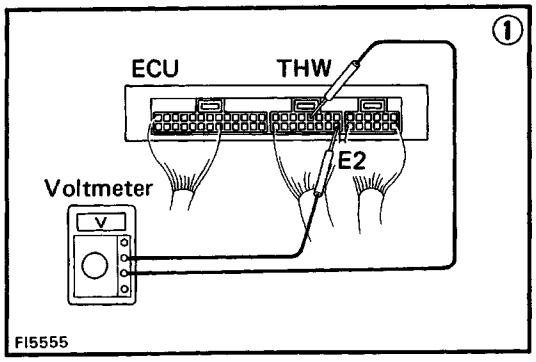
OK → ↓

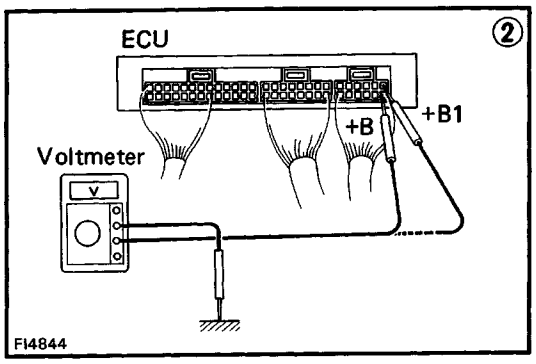
Try another ECU.

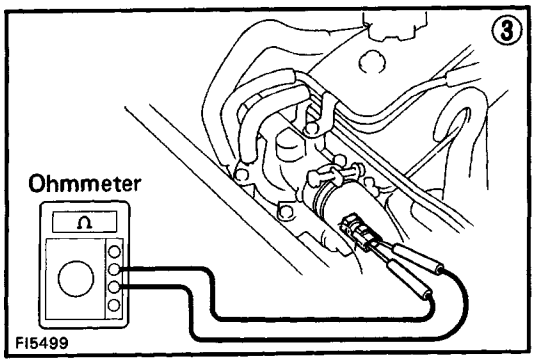
BAD → Repair or replace.

No.	Terminals	Trouble	Condition		STD Voltage
5	THW – E2	No voltage	Ignition switch ON	Coolant temperature 80°C (176°F)	0.1 – 1.0 V









① There is no voltage between ECU terminals THW and E2. **(IG SW ON)**

↓

② Check that there is voltage between ECU terminal +B (+B1) and body ground. **(IG SW ON)**

OK ↓ / **NO** → Refer to No.1 (See page FI–34)

↓

Check wiring between ECU terminal E1 (E11) and body ground.

OK ↓ / BAD → Repair or replace.

↓

③ Check water temp. sensor. (See page FI–82)

BAD → Replace water temp. sensor.

OK ↓

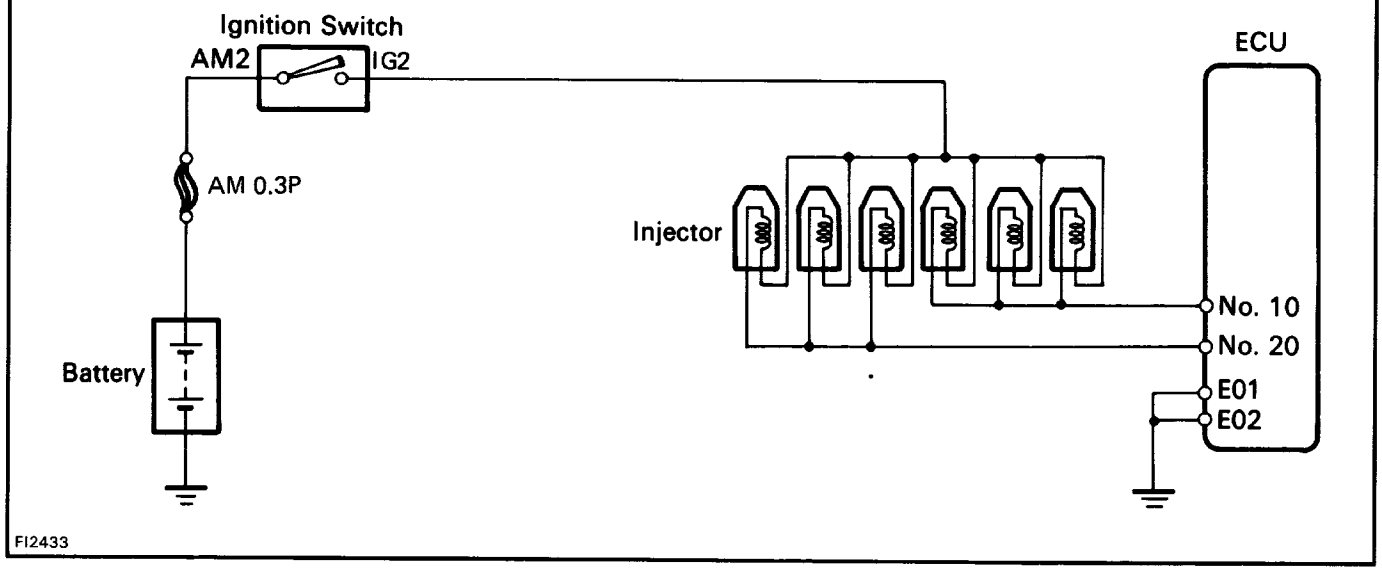
Check wiring between ECU and water temp. sensor.

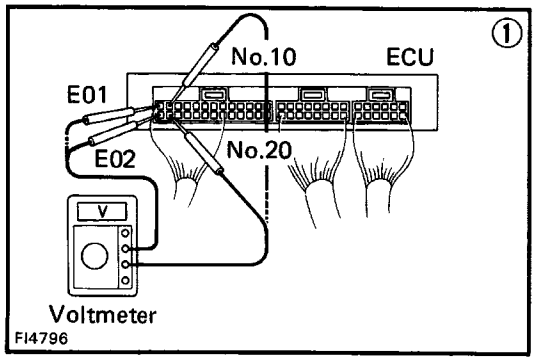
OK ↓ / BAD → Repair or replace.

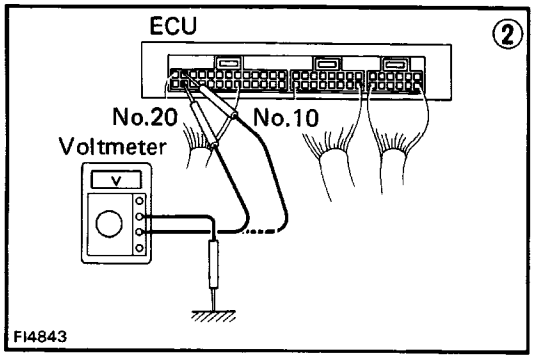
↓

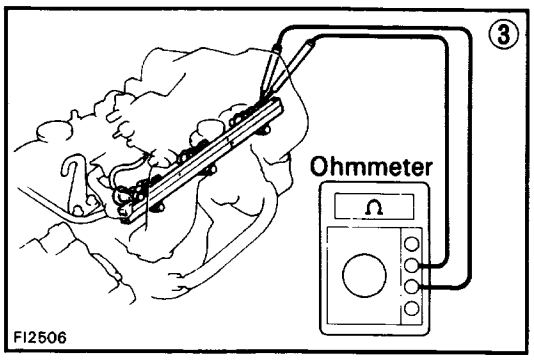
Try another ECU.

No.	Terminals	Trouble	Condition	STD Voltage
6	No. 10 – E01 No. 20 – E02	No voltage	Ignition switch ON	10 – 14 V









① There is no voltage between ECU terminal No. 10 and/or No. 20 and E01 and/or E02. **(IG SW ON)**

↓

② Check that there is voltage between ECU terminal No. 10 or No. 20 and body ground.

NO → Check wiring between ECU terminal E01 and/or E02 and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

OK ↓

Check fusible link and ignition switch.
- BAD → Repair or replace.

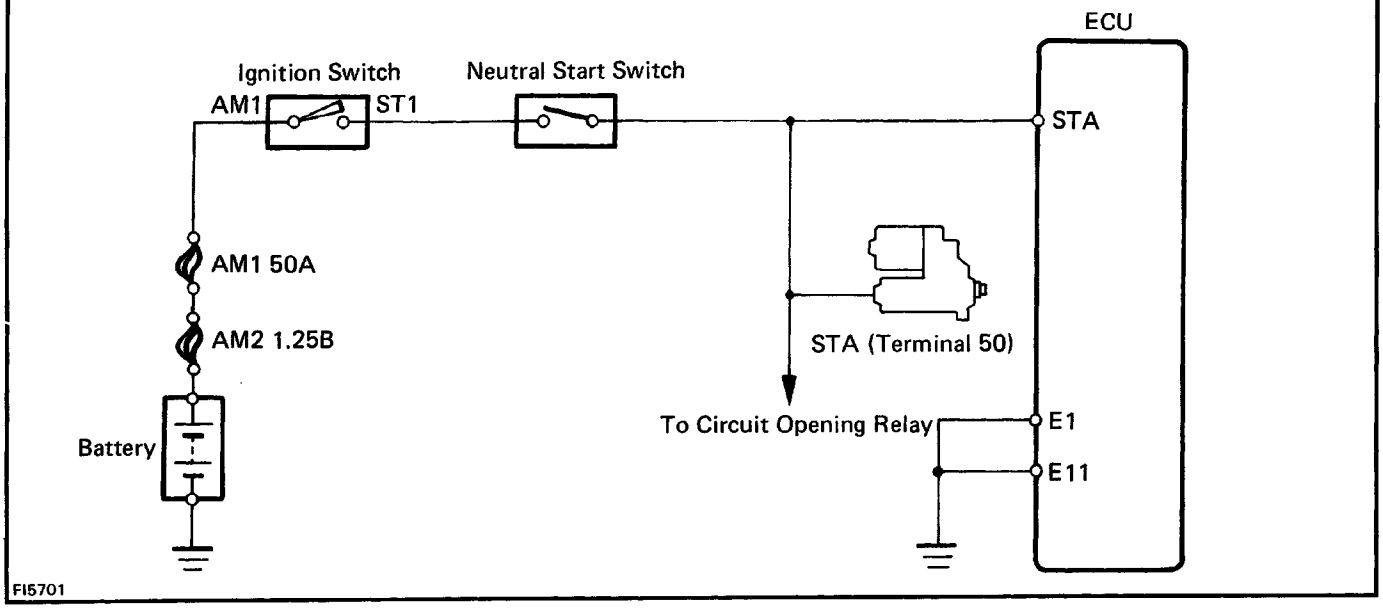
OK ↓

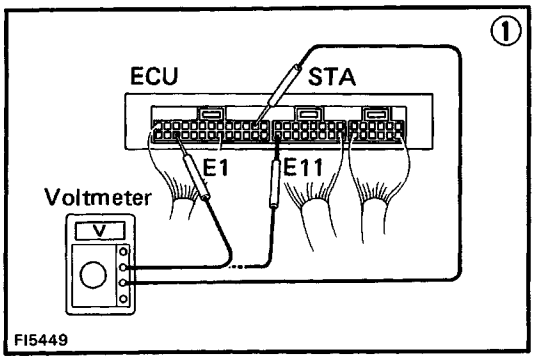
③ Check resistance of magnetic coil in each injector.
STD resistance: Approx. 13.8 Ω
- BAD → Replace injector.

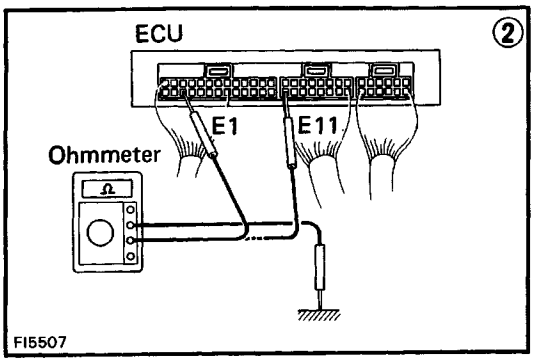
OK ↓

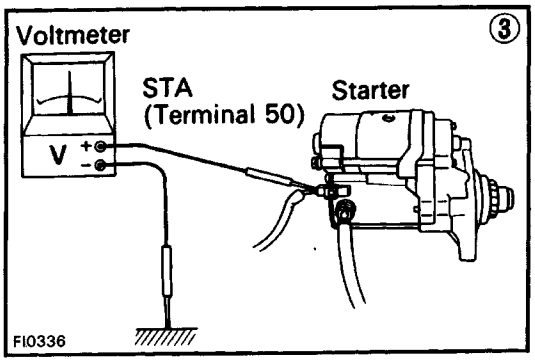
Check wiring between ECU terminal No. 10 and/or No. 20 and battery.
- BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD Voltage
7	STA–E1(E11)	No voltage	Cranking	6 – 14 V





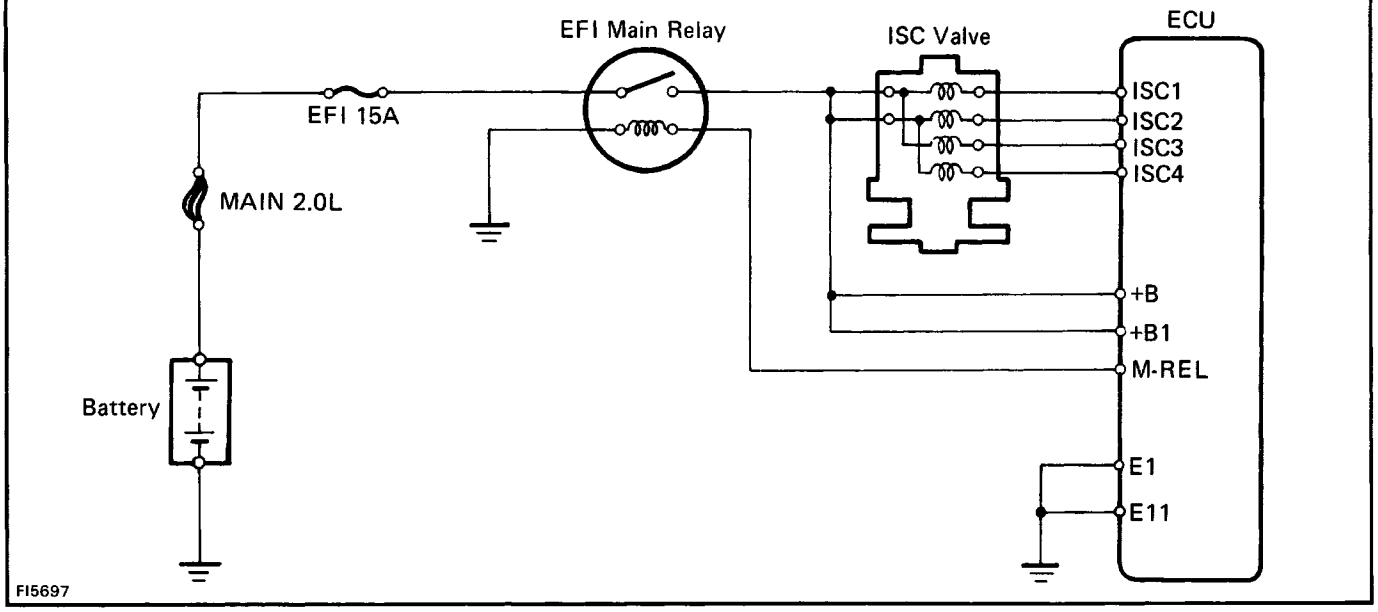


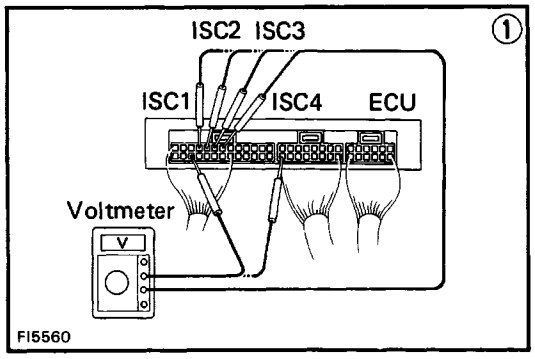


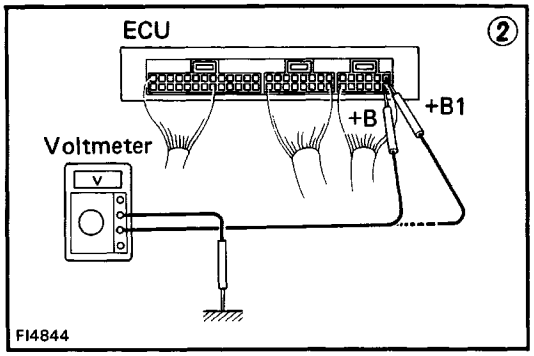
① There is no voltage between ECU terminals STA and E1 (E11) **(IG SW START)**

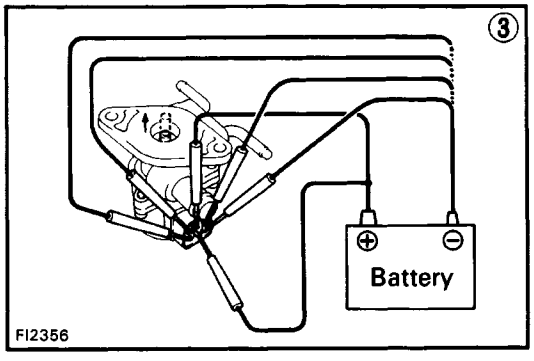
Check starter operation.
- OK → Check wiring between ECU terminal STA and ignition switch terminal ST1.
  - OK → ② Check wiring between ECU terminal E1 (E11) and body ground.
    - OK → Try another ECU.
    - BAD → Repair or replace.
  - BAD → Repair or replace.
- BAD → Check fusible link, battery, wiring ignition switch and neutral start switch.
  - BAD → Repair or replace.
  - OK → ③ Check that there is voltage at STA (50) terminal of starter **(IG SW START) STD voltage: 6 –14 V**
    - OK → Check starter.
    - NO → Check wiring between ignition switch terminal ST1 and starter terminal STA (50).

No.	Terminals	Trouble	Condition	STD Voltage
8	ISC1 ~ ISC4 – E1(E11)	No voltage	Ignition switch ON	10 – 14 V









① There is no voltage between ECU terminals ISC1 ~ ISC4 and E1 (E11). **(IG SW ON)**

② Check that there is voltage between ECU terminal +B (+B1) and body ground. **(IG SW ON)**

OK → Check wiring between ECU terminal E1 (E11) and body ground.

NO → Refer to No. 1. (See page FI–34)

OK → ③ Check ISC valve. (See page FI–76)

BAD → Repair or replace.

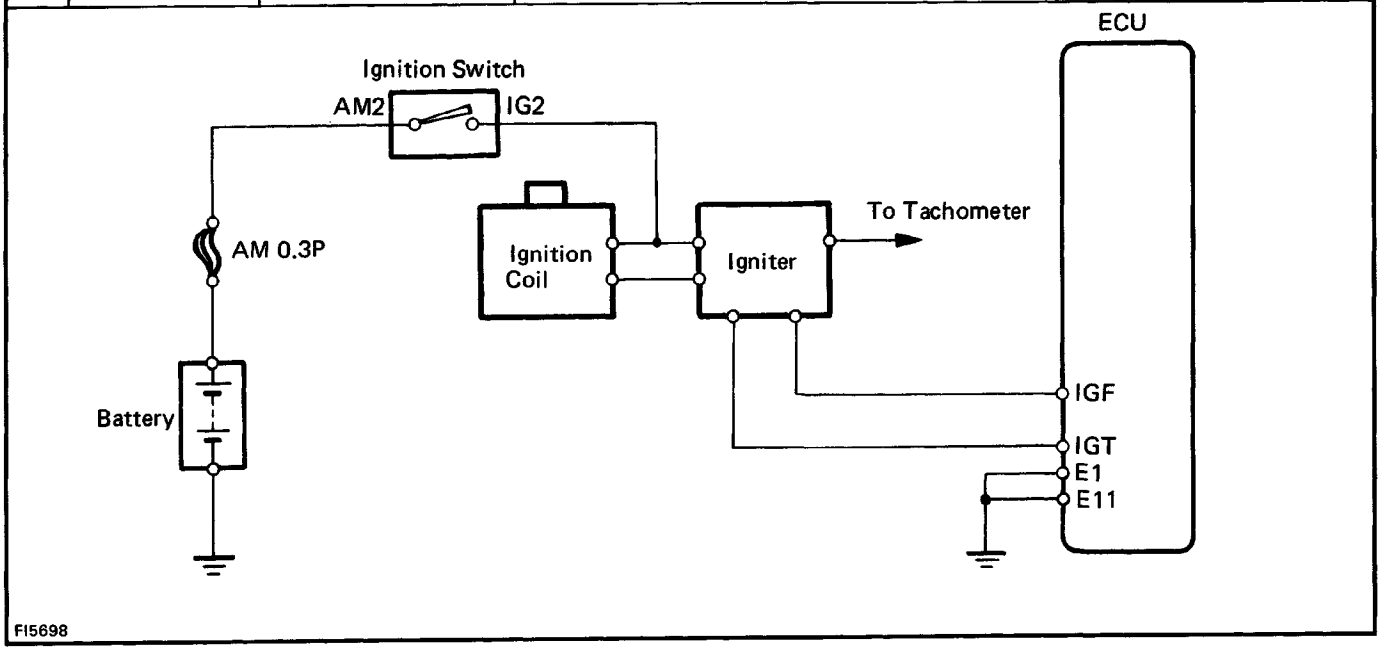
BAD → Replace ISC valve.

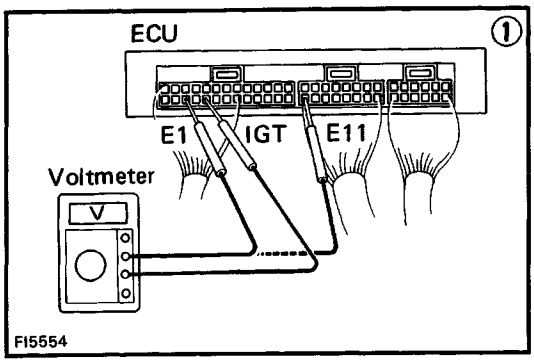
OK → Check wiring between ECU and EFI main relay.

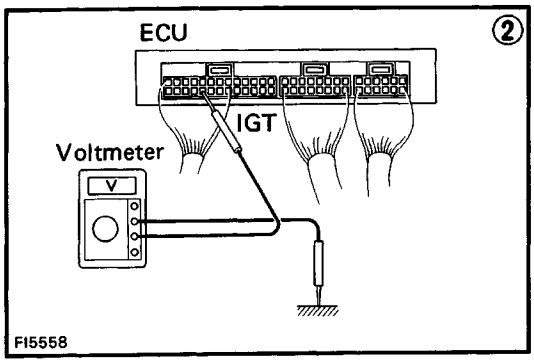
OK → Try another ECU.

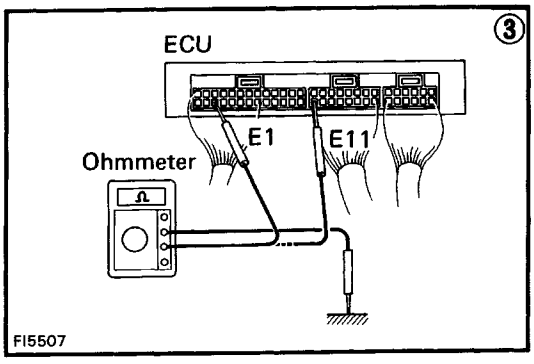
BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD Voltage
9	IGT—E1 (E11)	No voltage	Idling	0.7 – 1.0 V









① There is no voltage between ECU terminals IGT and E1 (E11). **(Idling)**

↓

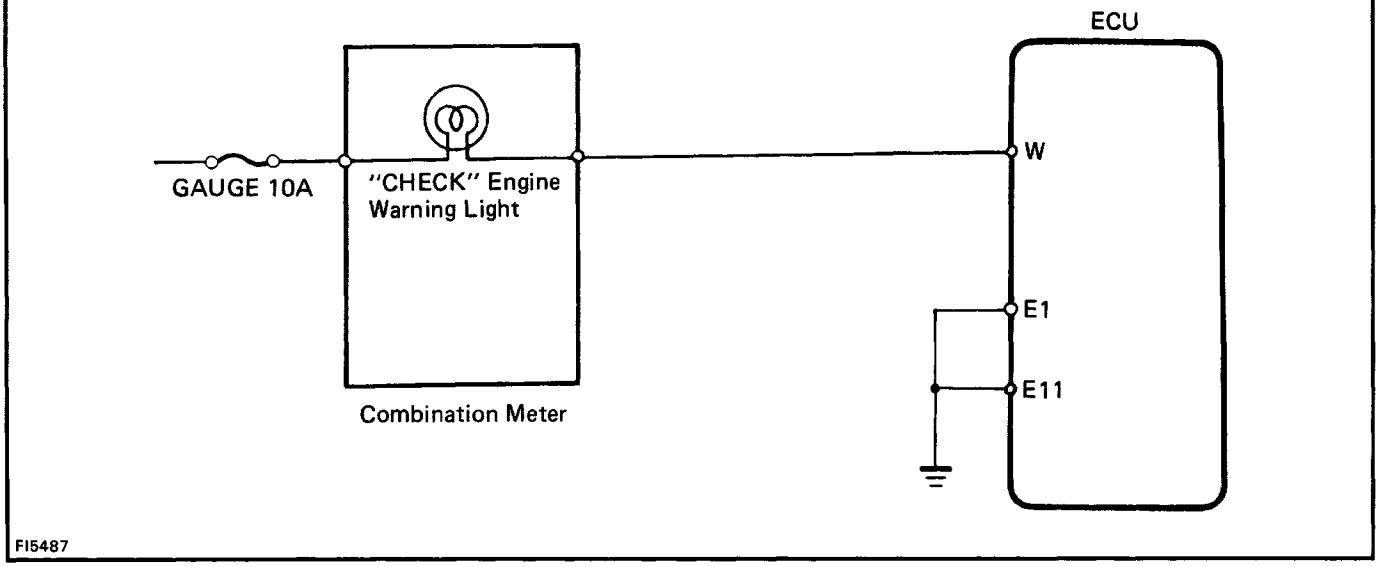
② Check that there is voltage between ECU terminal IGT and body ground. **(Idling)**

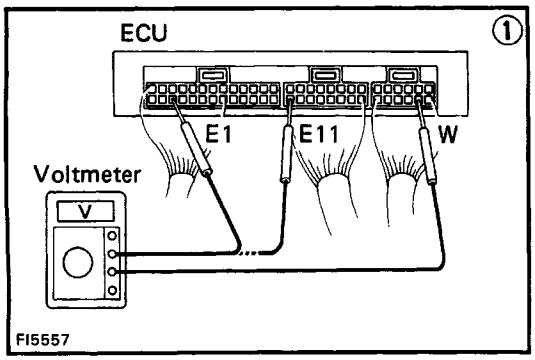
NO / **OK**

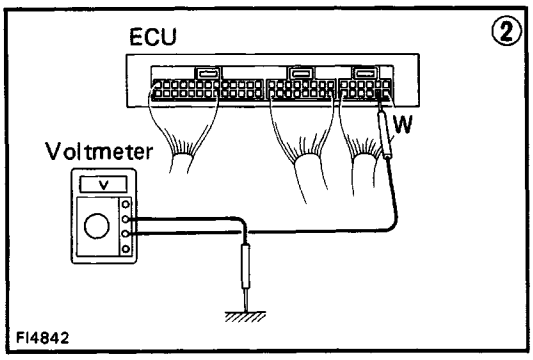
NO → ③ Check wiring between ECU terminal E1 (E11) and body ground.
- BAD → Repair or replace.
- **OK** → Try another ECU.

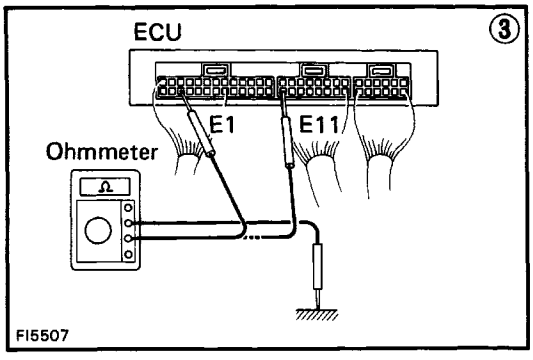
OK → Check fusible link and ignition switch.
- BAD → Repair or replace.
- **OK** → Check distributor. (See page IG–7)
  - BAD → Repair or replace.
  - **OK** → Check wiring between ECU and battery.
    - BAD → Repair or replace.
    - **OK** → Check igniter. (See page IG–7)
      - BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD Voltage
10	W—E1 (E11)	No voltage	No trouble (”CHECK” engine warning light off) and engine running	10 – 14 V









① There is no voltage between ECU terminals W and E1 (E11). **(Idling)**

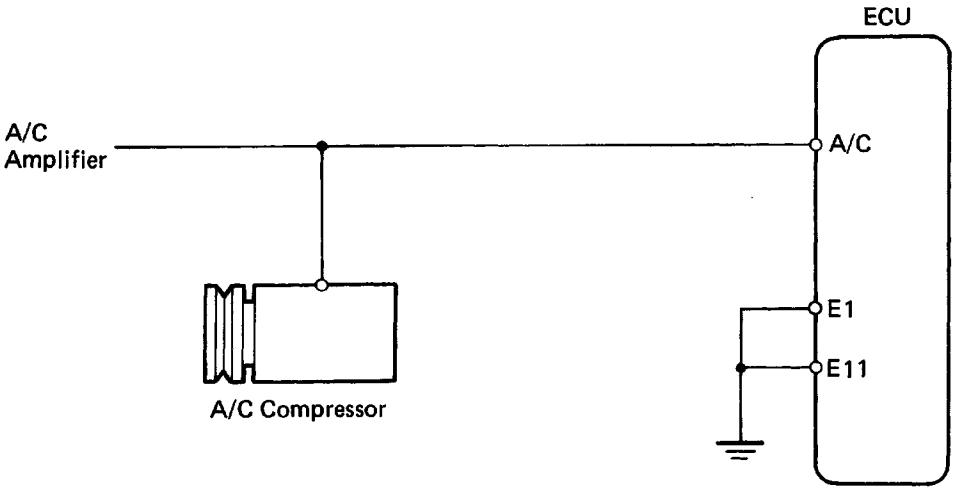
↓

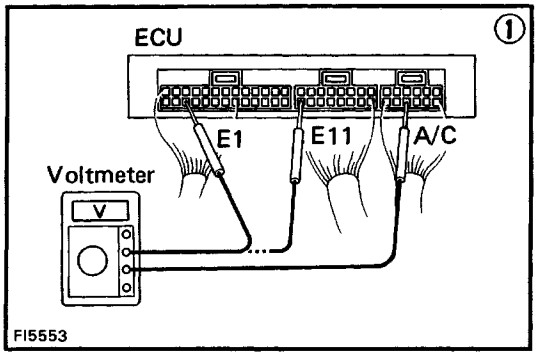
② Check that there is voltage between ECU terminal W and body ground.

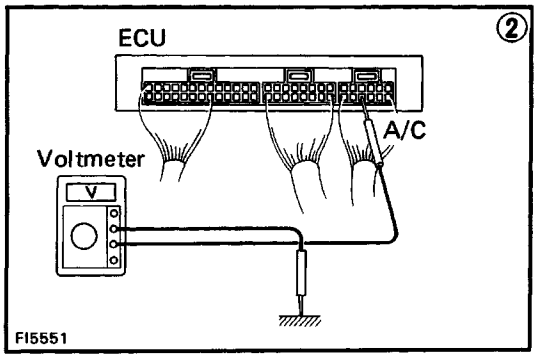
NO → ③ Check wiring between ECU terminal E1 (E11) and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

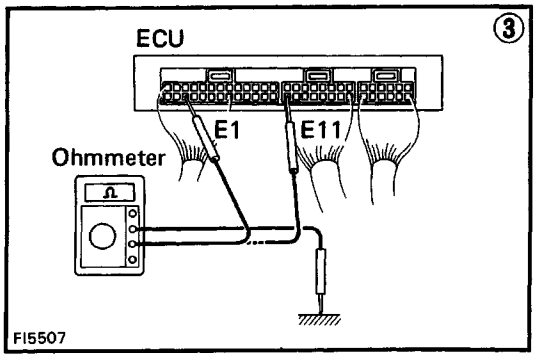
OK → Check GAUGE fuse (10A) and ”CHECK” engine warning light.
- OK → Check wiring between ECU terminal W and fuse.
  - BAD → Repair or replace.
- BAD → Repair or replace.
  - Fuse blows again. → Check wiring between ECU terminal W and fuse.
    - BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD Voltage
11	A/C–E1(E11)	No voltage	Air conditioning ON	10 – 14 V







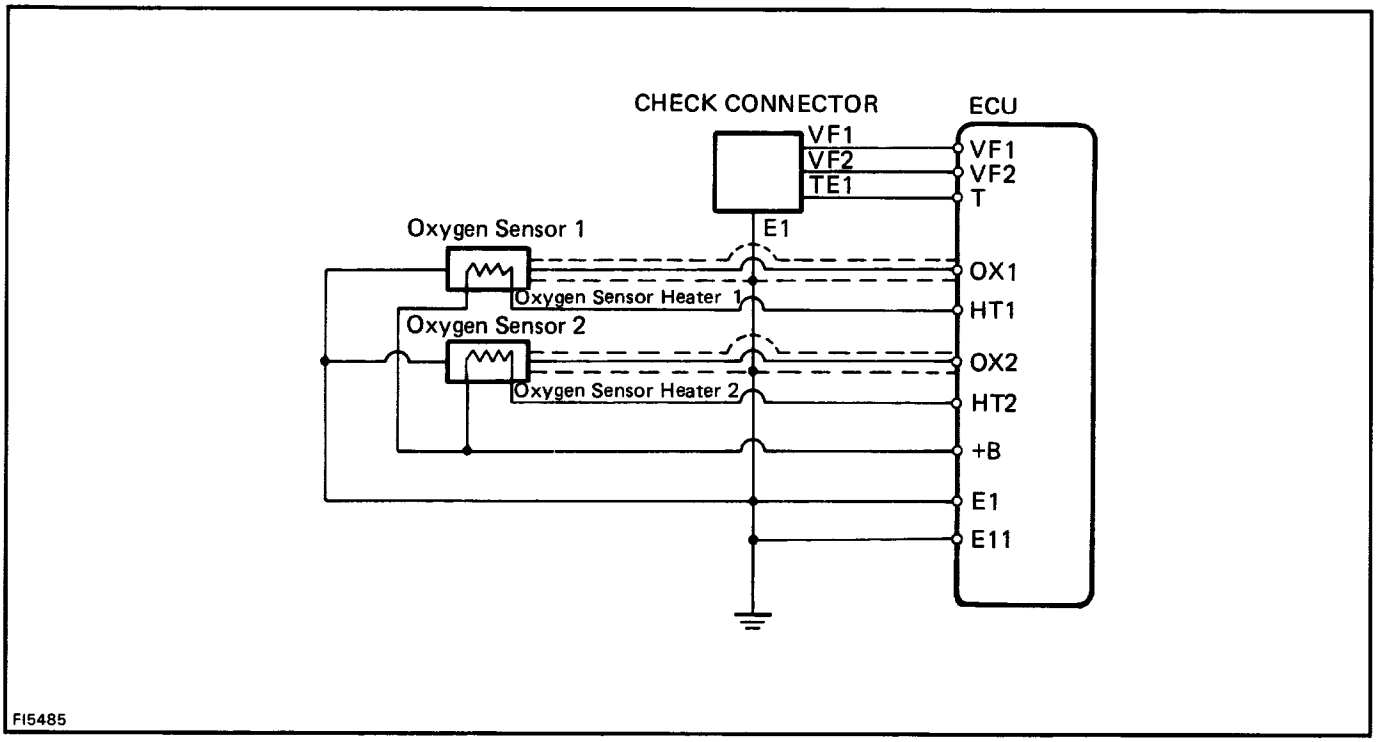


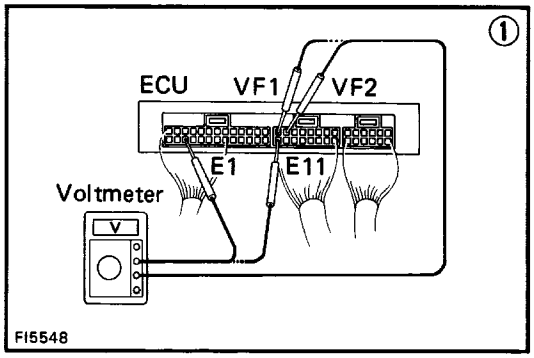
① There is no voltage between ECU terminals A/C and E1 (E11). (Air conditioning ON)

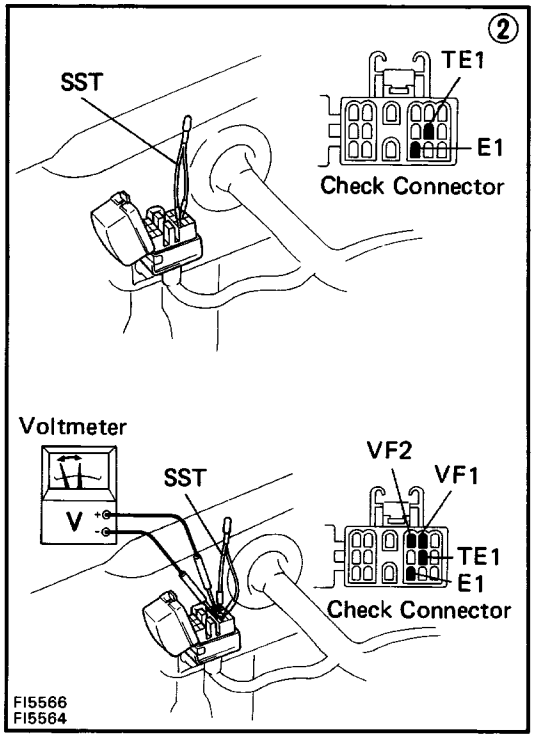
② Check that there is voltage between ECU terminal A/C and body ground.

NO → ③ Check wiring between ECU terminal E1 (E11) and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

OK → Check compressor running.
- OK → Check wiring between ECU terminal A/C and amplifier.
  - BAD → Repair or replace.
- BAD → Check that there is voltage between amplifier terminal and body ground.
  - BAD → Repair or replace.
  - OK → Check wiring between amplifier and ECU or compressor.
    - BAD → Repair or replace.







There is no voltage between ECU terminals VF1 or VF2 and E1 (E11).

Check that there is specified voltage between ECU terminal VF1 or VF2 and body ground.

NO → OK

Check wiring between ECU terminal E1 (E11) and body ground.

OK → Try another ECU.

BAD → Repair or replace.

Check for air suction into exhaust system. — BAD → Repair air suction.

OK

Check for air leak from air induction system. — BAD → Repair air leak.

OK

Check spark plugs. — BAD → Repair or replace.

OK

Check distributor and ignition system. — BAD → Repair or replace.

OK

Check fuel pressure. — BAD → Repair or replace.

OK

Check injectors. — BAD → Repair or replace.

OK

Check cold start injector. * — BAD → Repair or replace.

OK

Check air flow meter. — BAD → Repair or replace.

OK

Check operation of oxygen sensors. — OK → System normal.

BAD

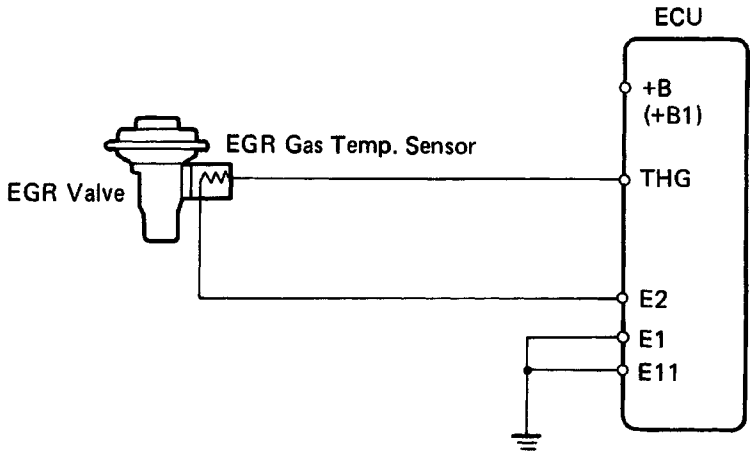
Check wiring between oxygen sensors and ECU connectors. — BAD → Repair wiring.

OK

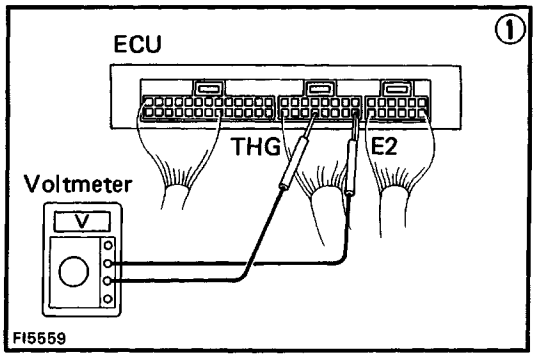
Replace oxygen sensors.

* Rich malfunction only

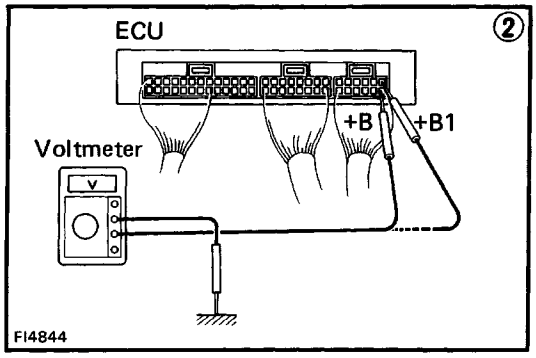
California vehicles only



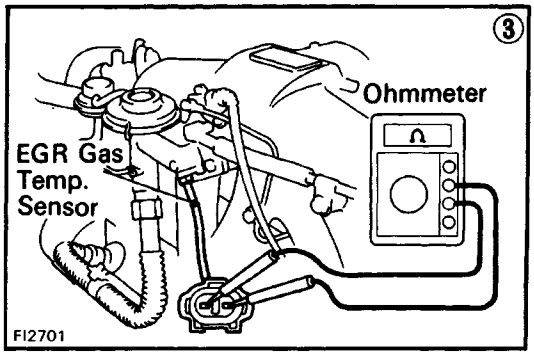
FI5491



FI5559



FI4844



FI2701

① No voltage between ECU terminals THG and E2. **(IG SW ON)**

② Check that there is voltage between ECU terminal +B (+B1) and body ground. **(IG SW ON)**

OK → Check wiring between ECU terminal E1 (E11) and body ground.

NO → Refer to No. 1. (See page FI–34)

Check wiring between ECU terminal E1 (E11) and body ground.

OK → Check EGR system.

BAD → Repair or replace.

Check EGR system.

BAD → Repair or replace.

OK → ③ Check EGR gas temp. sensor. (See page FI–84)

③ Check EGR gas temp. sensor. (See page FI–84)

BAD → Replace EGR gas temp. sensor.

OK → Check wiring between ECU and EGR gas temp. sensor.

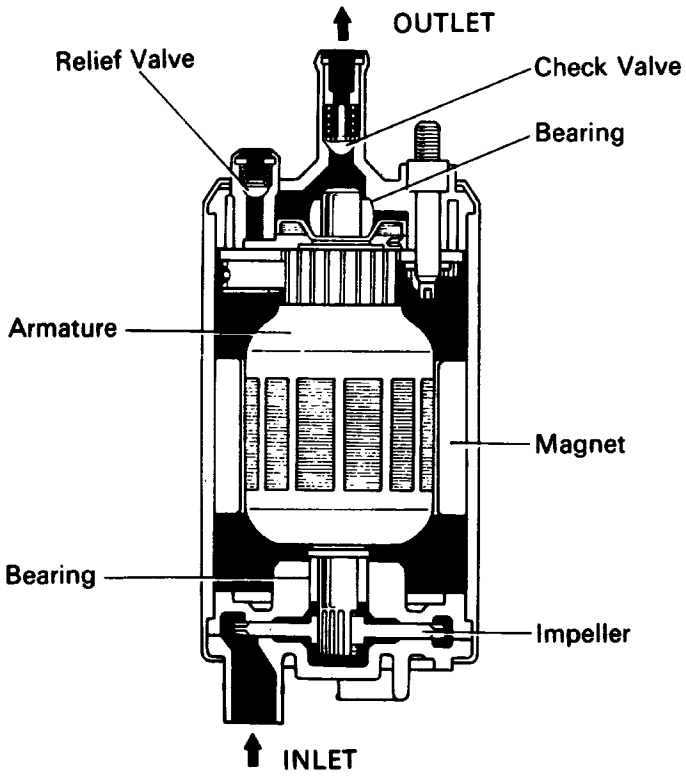
Check wiring between ECU and EGR gas temp. sensor.

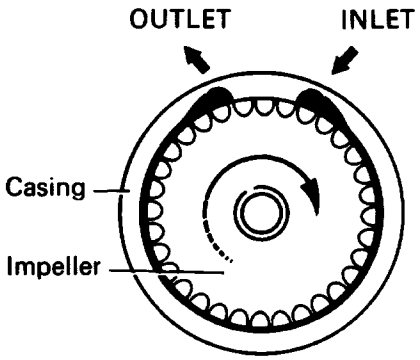
OK → Try another ECU.

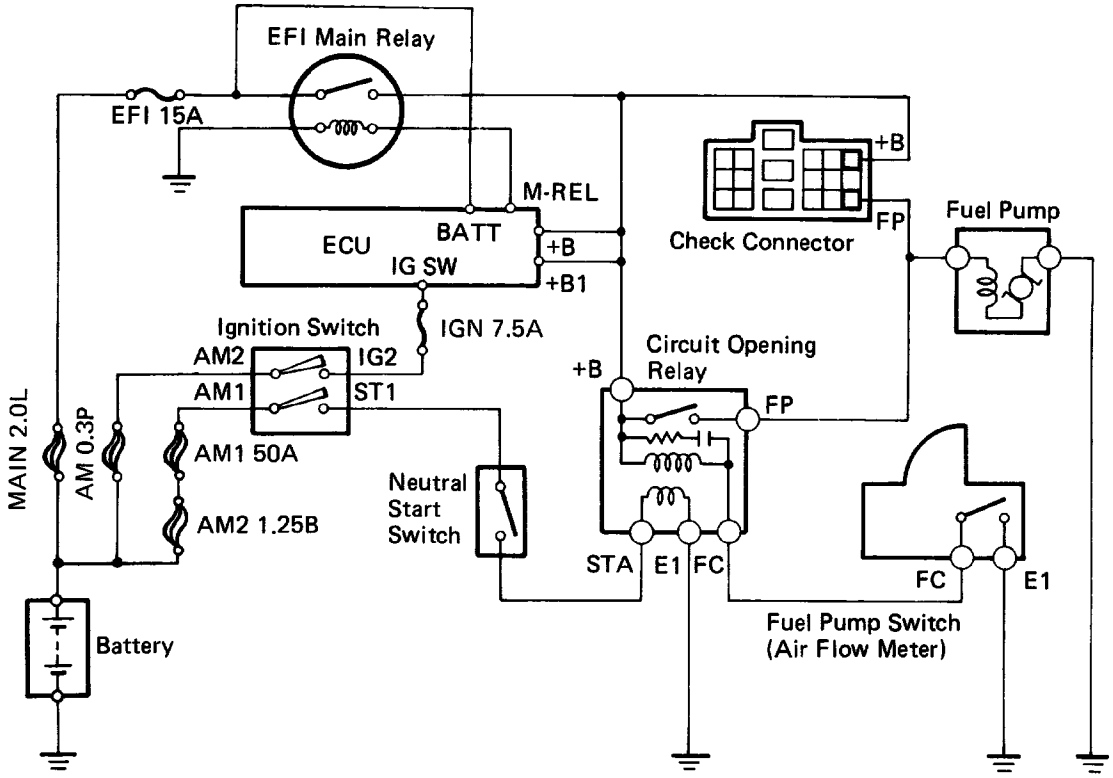
BAD → Repair or replace.

FUEL SYSTEM

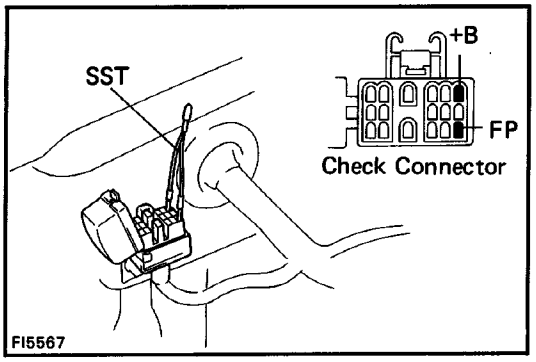
Fuel Pump







FI0530 FI1479
FI5700



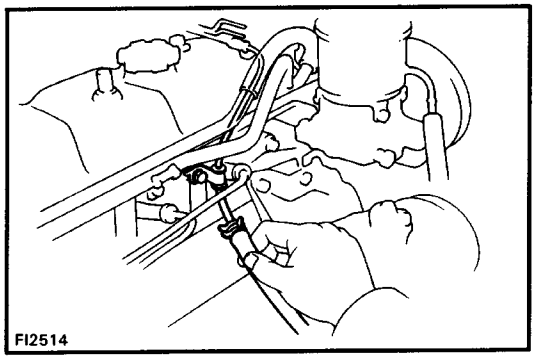
ON–VEHICLE INSPECTION

1. INSPECT FUEL PUMP OPERATION

(a) Turn the ignition switch ON.

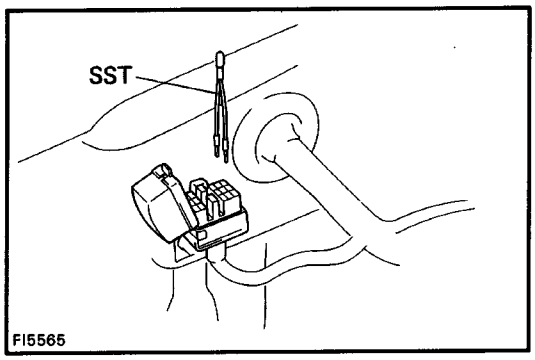
HINT: Do not start the engine.

(b) Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020



(c) Check that there is pressure in the fuel return hose.

HINT: At this time, you will hear fuel return noise.



(d) Remove SST.

(e) Turn the ignition switch OFF.

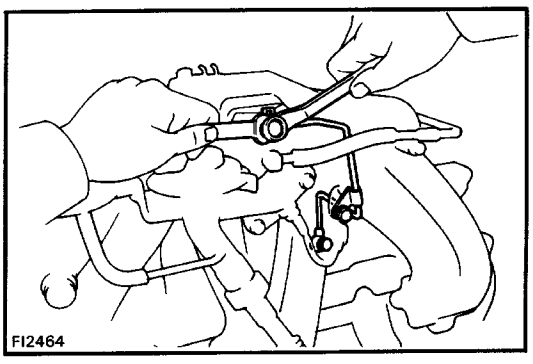
If there is no pressure, check the following parts:

- Fusible links
- Fuse (EFI 15A, IGN 7.5A)
- EFI main relay
- Fuel pump
- ECU
- Wiring connections

2. INSPECT FUEL PRESSURE

(a) Check the battery voltage above 11 volts.

(b) Disconnect the cable from the negative (–) terminal of the battery.

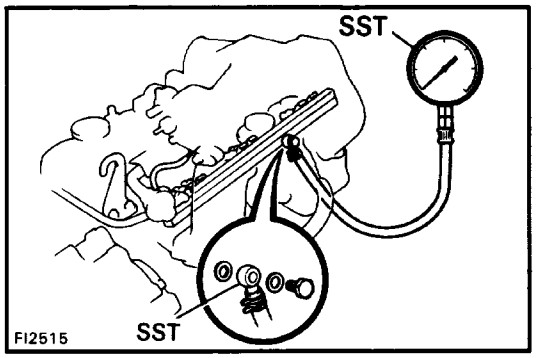


(c) Disconnect the cold start injector connector.

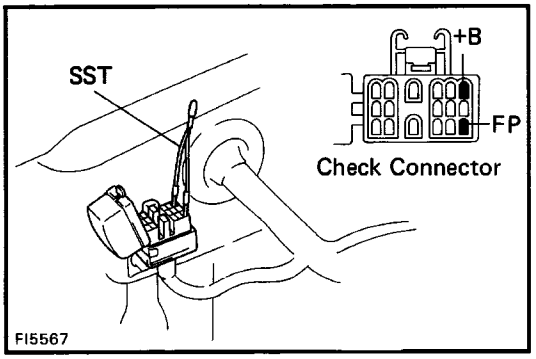
(d) Put a suitable container or shop towel under the cold start injector pipe.

(e) Remove the two union bolts, four gaskets, pipe clamp bolt and cold start injector pipe.

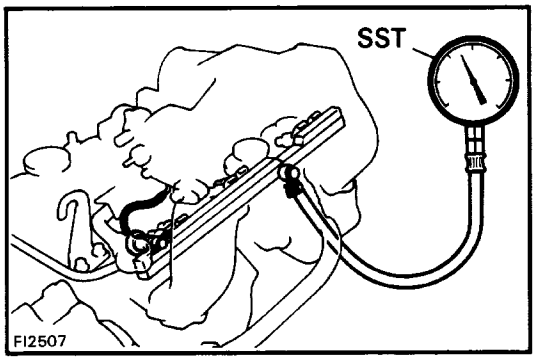
HINT: Slowly loosen the union bolt.



(f) Install SST (pressure gauge) to the delivery pipe with two new gaskets and union bolt.
SST 09268–45012 (09268–41080)
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)
(g) Wipe off any splattered gasoline.
(h) Reconnect the battery negative (–) cable.



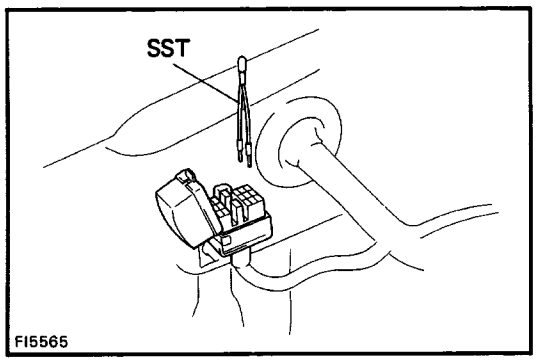
(i) Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020



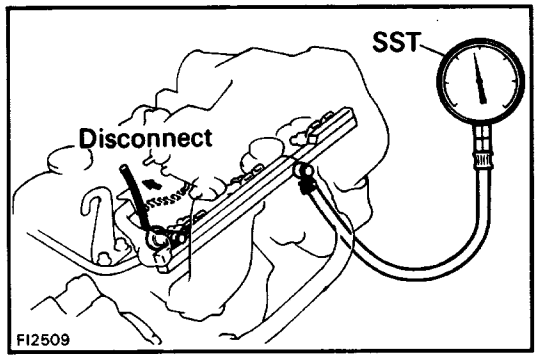
(j) Turn the ignition switch ON.
(k) Measure the fuel pressure.
Fuel pressure: 255 – 314 kPa
(2.6 – 3.2 kgf/cm^2, 37 – 46 psi)

If pressure is high, replace the fuel pressure regulator.
If pressure is low, check the following parts:

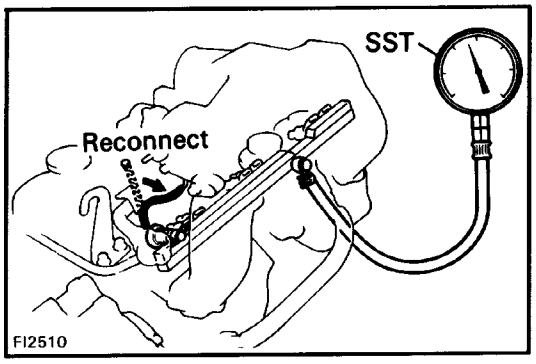
- Fuel hoses and connection
- Fuel pump
- Fuel filter
- Fuel pressure regulator

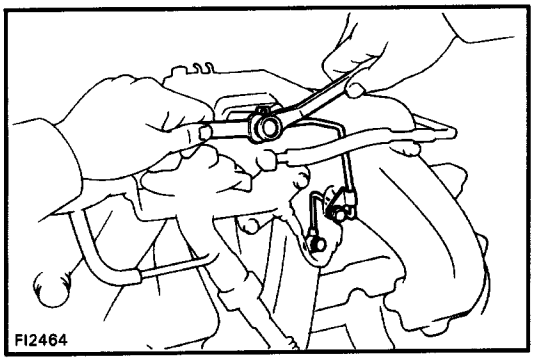


(l) Remove SST.



(m) Start the engine.
(n) Disconnect the vacuum sensing hose from the fuel pressure regulator.
(o) Measure the fuel pressure at idling.
Fuel pressure: 255 – 314 kPa
(2.6 – 3.2 kgf/cm^2, 37 – 46 psi)





(p) Reconnect the vacuum sensing hose to the fuel pressure regulator.

(q) Measure the fuel pressure at idling.

Fuel pressure: 226 – 265 kPa

(2.3 – 2.6 kgf/cm^2, 33 – 37 psi)

If pressure is not as specified, check the vaccum sensing hose and fuel pressure regulator.

(r) Stop the engine. Check that the fuel pressure remains 147 kPa (1.5 kgf/cm^2, 21 psi) or more for 5 minutes after the engine is turned off.

If pressure is not as specified, check the fuel pump, pressure regulator and/or injector.

(s) After checking fuel pressure, disconnect the battery negative (–) cable and carefully remove the SST to prevent gasoline from splashing.

(t) Install the cold start injector pipe with four new gaskets, the union bolts and pipe clamp bolt.

Torque:

Union bolt 19 N–m (195 kgf–cm, 14 ft–lbf)

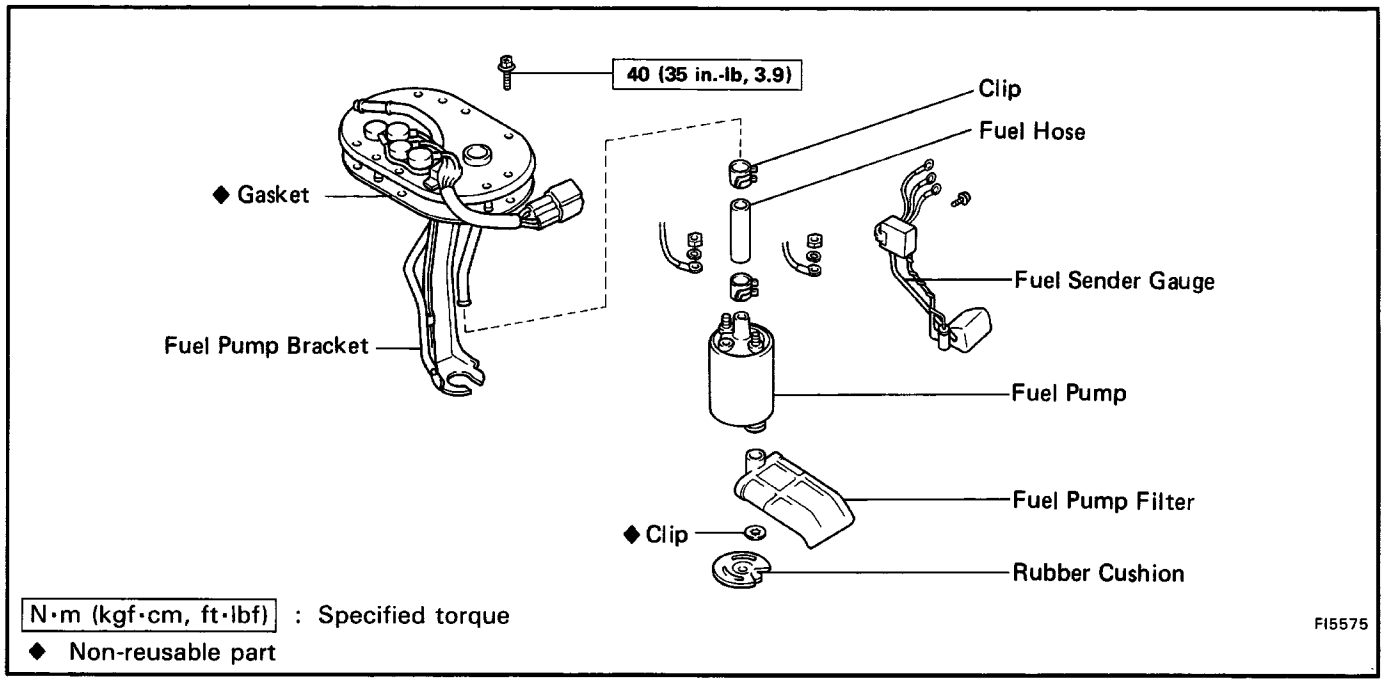
Clamp bolt 12 N–m (120 kgf–cm, 9 ft–lbf)

(u) Reconnect the cold start injector connector.

(v) Reconnect the cable to the negative (–) terminal of the battery.

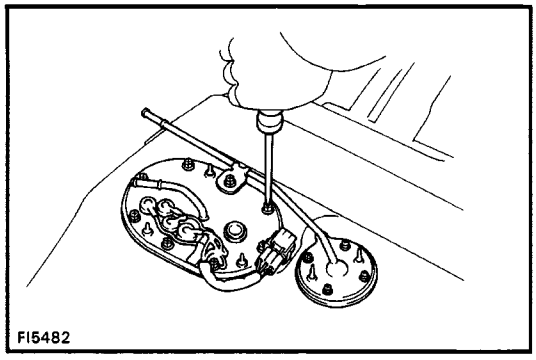
(w) Check for fuel leakage.

REMOVAL OF FUEL PUMP



1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

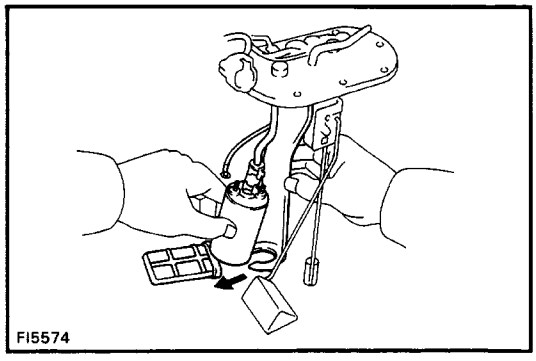
2. REMOVE SERVICE HOLE COVER



3. REMOVE FUEL PUMP BRACKET FROM FUEL TANK

(a) Remove the screw of the wire clamp.

(b) Remove the screws, pull out the pump bracket.

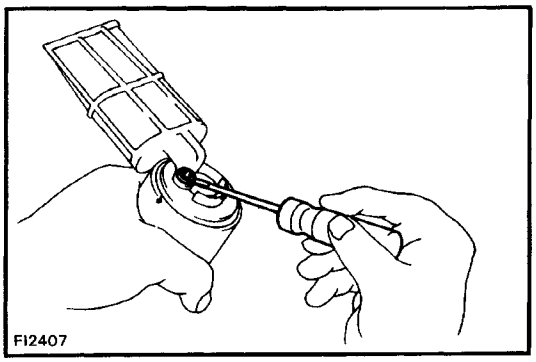


4. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET

(a) Pull off the lower side of the fuel pump from the bracket.

(b) Remove the two nuts, and disconnect the wires from the fuel pump.

(c) Remove the fuel pump from the fuel hose.



5. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

(a) Remove the rubber cushion.

(b) Using a small screwdriver, remove the clip.

(c) Pull out the pump filter.

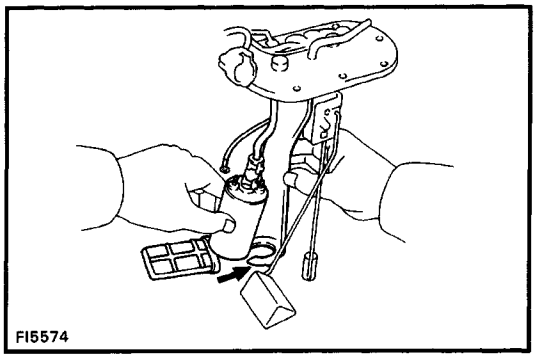
INSTALLATION OF FUEL PUMP

(See page FI–54)

1. INSTALL FUEL PUMP FILTER TO FUEL PUMP

(a) Install the pump filter with a new clip.

(b) Install the rubber cushion.

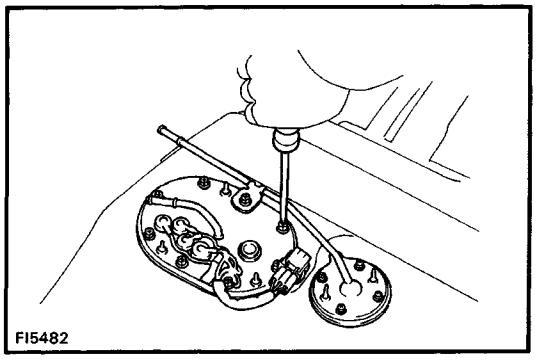


2. INSTALL FUEL PUMP TO FUEL PUMP BRACKET

(a) Connect the fuel hose to the outlet port of the fuel pump.

(b) Connect the wires to the fuel pump with the two nuts.

(c) Push the lower side of the fuel pump, and install the fuel pump.



3. INSTALL FUEL PUMP BRACKET TO FUEL TANK

(a) Install a new gasket and the pump bracket with the screws.

Torque: 3.9 N–m (40 kgf–cm, 35 in.–lbf)

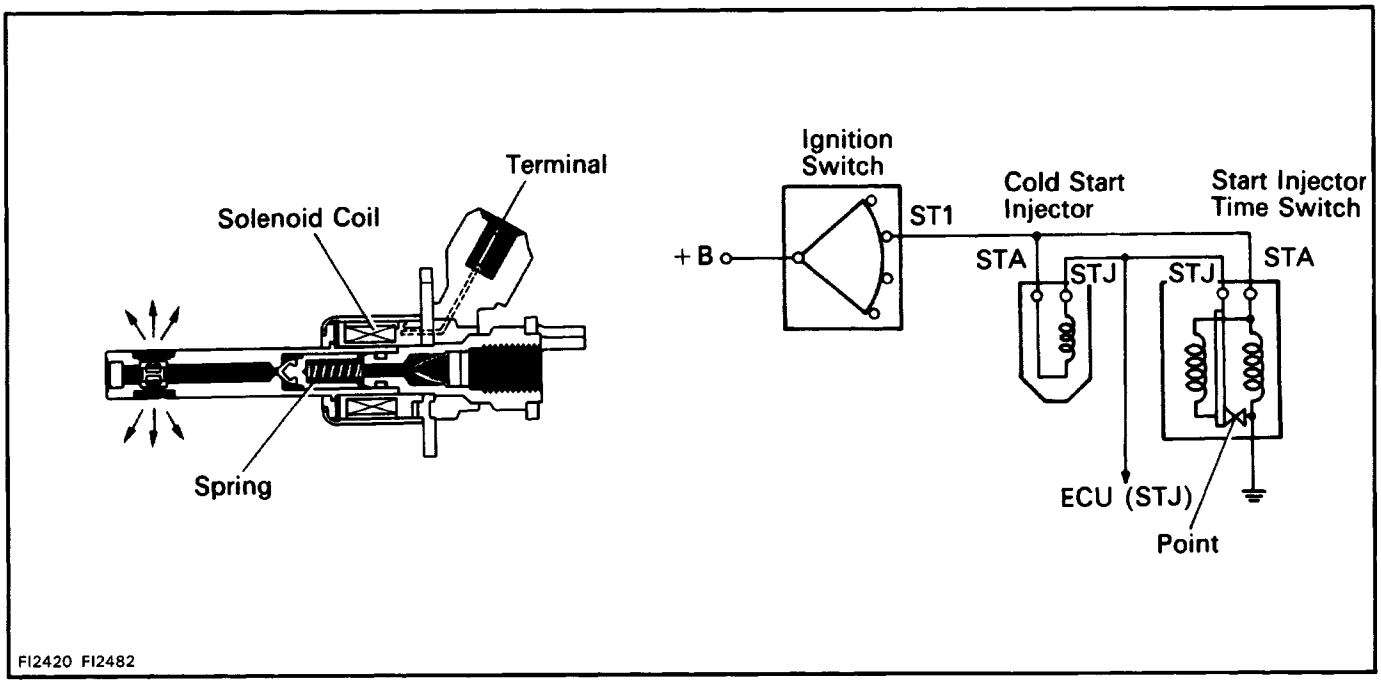
(b) Connect the wire clamp with the screw.

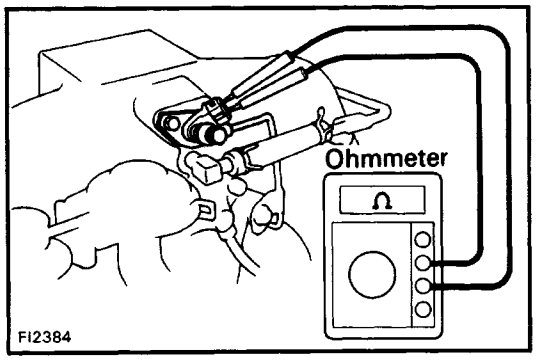
Torque: 2.0 N–m (20 kgf–cm, 17 in.–lbf)

4. INSTALL SERVICE HOLE COVER

5. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

Cold Start Injector





ON–VEHICLE INSPECTION

INSPECT RESISTANCE OF COLD START INJECTOR

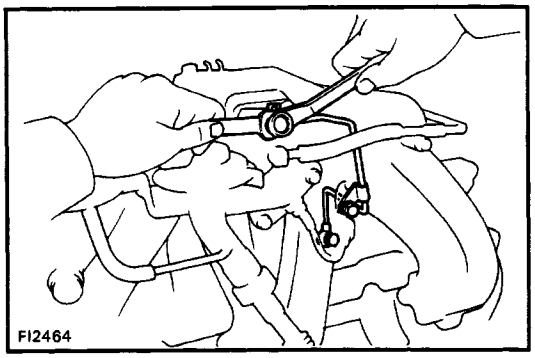
(a) Disconnect the cold start injector connector.

(b) Using an ohmmeter, measure the resistance between the terminals.

Resistance: 2 – 4 Ω

If the resistance is not as specified, replace the cold start injector.

(c) Reconnect the cold start injector connector.



REMOVAL OF COLD START INJECTOR

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

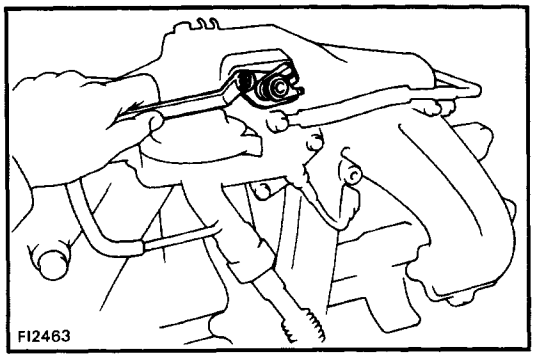
2. DISCONNECT COLD START INJECTOR CONNECTOR

3. REMOVE COLD START INJECTOR PIPE

(a) Put a suitable container or shop towel under the injector pipe.

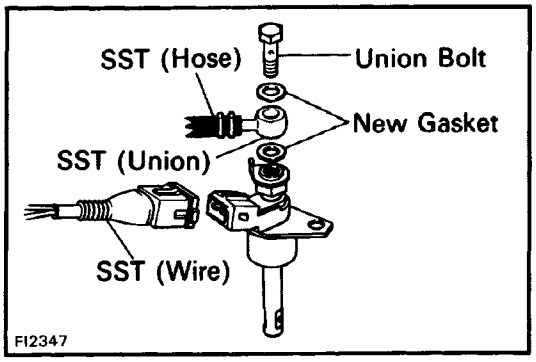
(b) Remove the two union bolts, four gaskets, pipe clamp bolt and injector pipe.

HINT: Slowly loosen the union bolts.



4. REMOVE COLD START INJECTOR

Remove the two bolts, cold start injector and gasket.



INSPECTION OF COLD START INJECTOR

1. INSPECT INJECTION OF COLD START INJECTOR

CAUTION: Keep clear of sparks during the test.

(a) Install SST (two unions) to the injector and delivery pipe with new gaskets and the union bolts.
SST 09268–41045 (09268–41080)

(b) Connect SST (hose) to the unions.
SST 09268–41045 (09268–41080)

(c) Connect SST (wire) to the injector.
SST 09842–30050

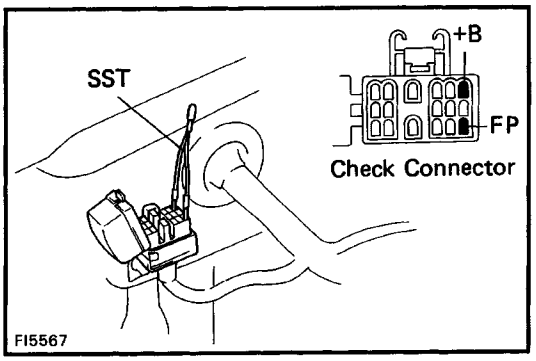
(d) Put a container under the injector.

(e) Reconnect the battery negative (–) cable.

(f) Turn the ignition switch ON.

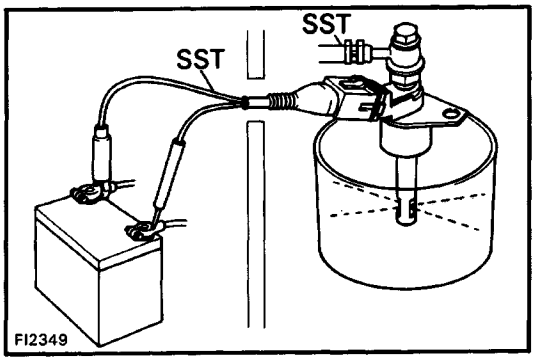
HINT: Do not start the engine.

(g) Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020



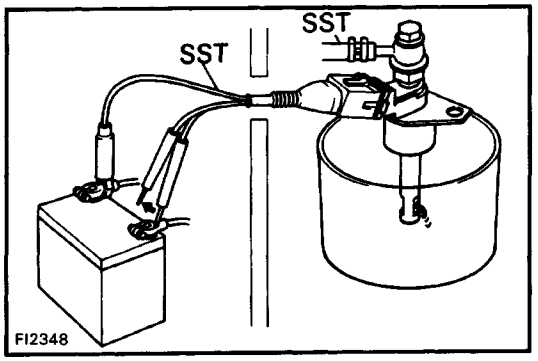
(h) Connect the test probes of the SST (wire) to the battery, and check that the fuel spray is as shown.
SST 09842–30050

NOTICE: Perform this check within the shortest possible time.



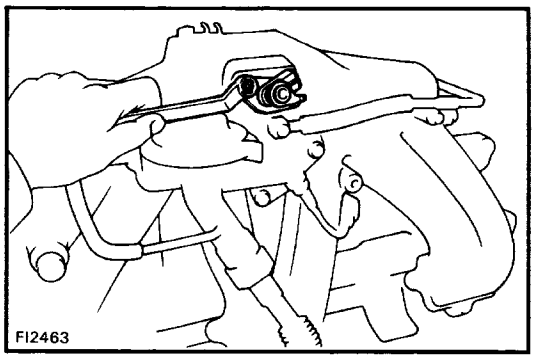
2. INSPECT LEAKAGE

(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check fuel leakage from the injector.
SST 09842–30050
Fuel drop: One drop or less per minute



(b) Disconnect the battery negative (–) cable.

(c) Remove SST.
SST 09268–41045, 09842–30050 and 09843–18020

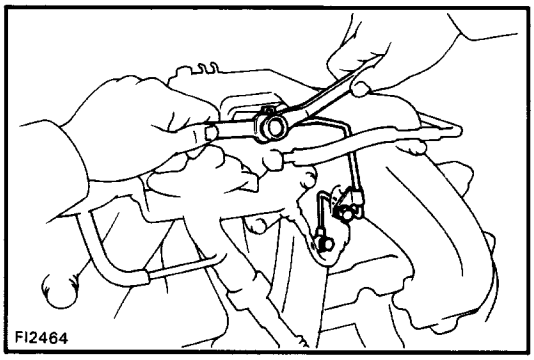


INSTALLATION OF COLD START INJECTOR

1. INSTALL COLD START INJECTOR

Install a new gasket and the injector with the two bolts.

Torque: 5.4 N–m (55 kgf–cm, 48in.–lbf)



2. INSTALL COLD START INJECTOR PIPE

Install the cold injector pipe with new four gaskets, the two union bolts and pipe clamp bolt.

Torque:

Union bolt 19 N–m (195 kgf–cm, 14 ft–lbf)

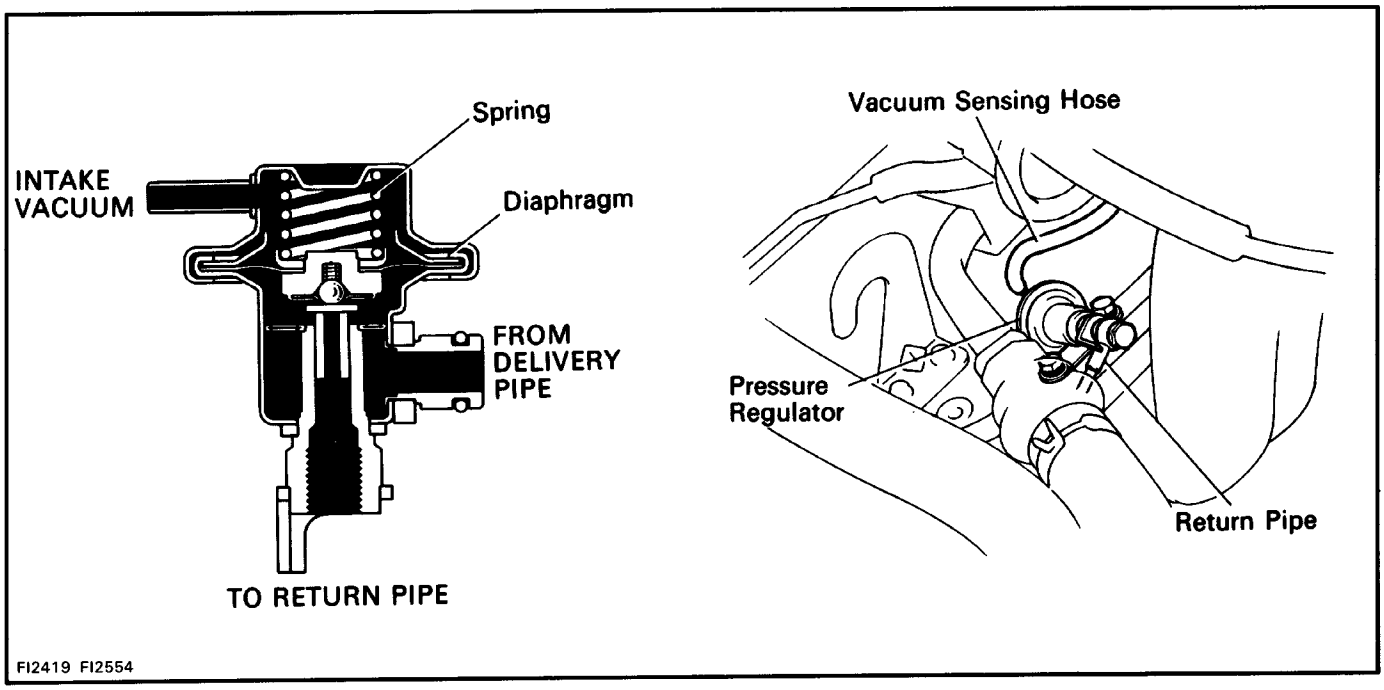
Clamp bolt 12 N–m (120 kgf–cm, 9 ft–lbf)

3. CONNECT COLD START INJECTOR CONNECTOR

4. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

5. CHECK FOR FUEL LEAKAGE (See page FI–8)

Fuel Pressure Regulator

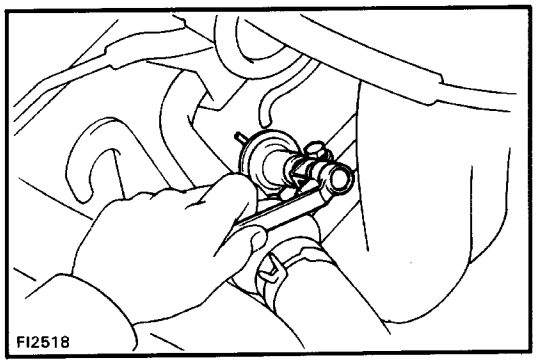


ON–VEHICLE INSPECTION

INSPECT FUEL PRESSURE (See page FI–51)

REMOVAL OF FUEL PRESSURE REGULATOR

1. DISCONNECT VACUUM SENSING HOSE

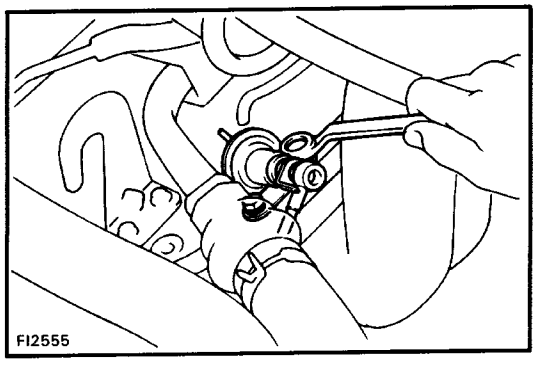


2. DISCONNECT FUEL RETURN PIPE

(a) Put a suitable container or shop towel under the pressure regulator.

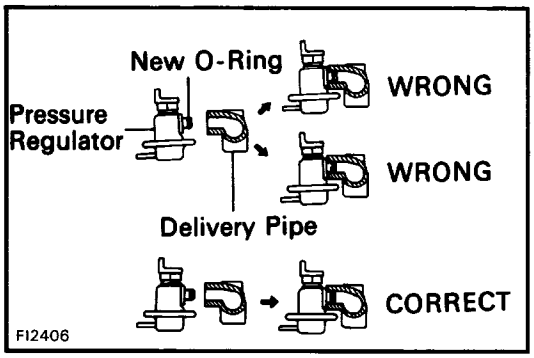
(b) Remove the union bolt and two gaskets, and disconnect the return pipe.

HINT: Slowly loosen the union bolt.



3. REMOVE FUEL PRESSURE REGULATOR

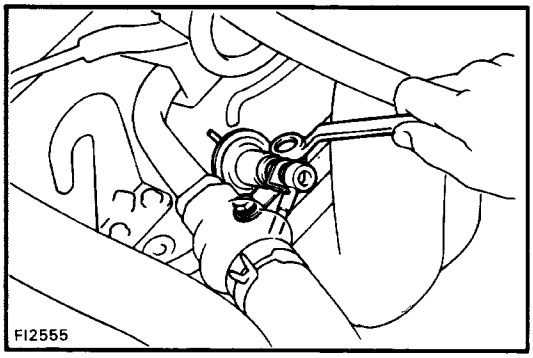
Remove the two bolts, and pull out the pressure regulator.



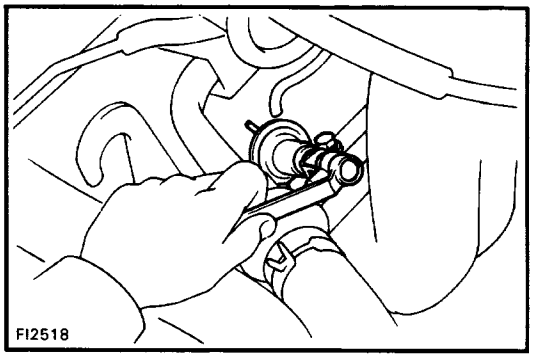
INSTALLATION OF FUEL PRESSURE REGULATOR

1. INSTALL FUEL PRESSURE REGULATOR

(a) Apply a light coat of gasoline to a new O–ring, and install it to the pressure regulator.



(b) Install the pressure regulator with the two bolts.
Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)



2. CONNECT FUEL RETURN PIPE

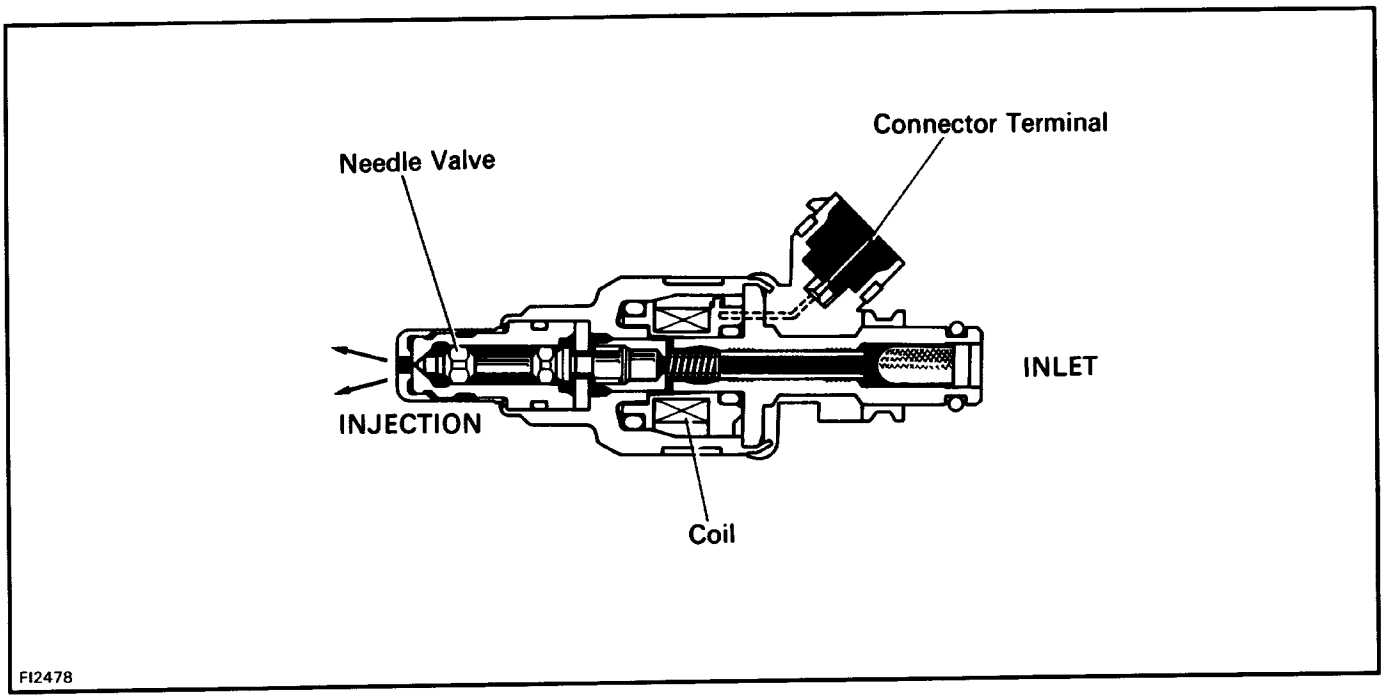
Install the return pipe with two new gaskets and the union bolt.

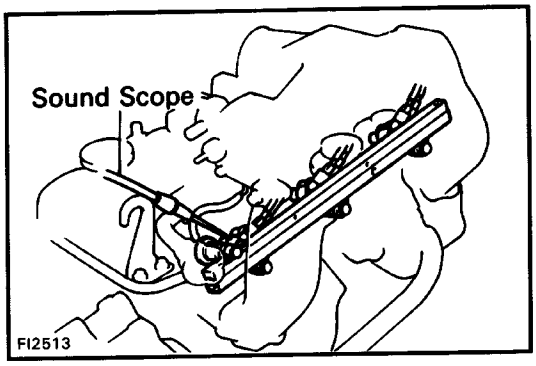
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

3. CONNECT VACUUM SENSING HOSE

4. CHECK FOR FUEL LEAKAGE (See page FI–8)

Injectors



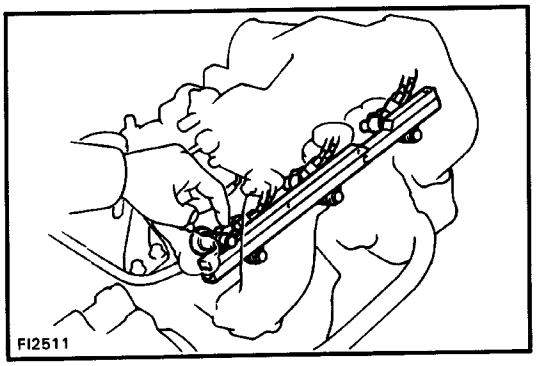


ON–VEHICLE INSPECTION

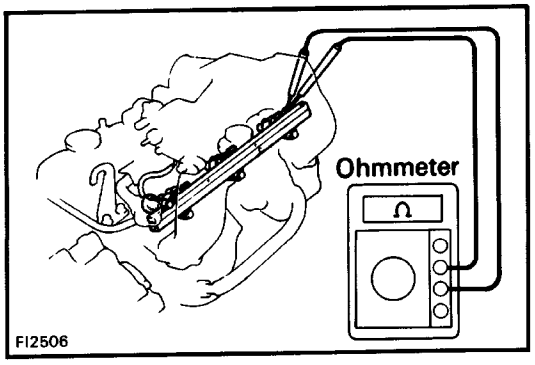
1. INSPECT INJECTOR OPERATION

Check operation sound from each injector.

(a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine rpm.



(b) If you have no sound scope, you can check the injector transmission operation with your finger. If no sound or an unusual sound is heard, check the wiring connector, injector or injection signal from ECU.



2. INSPECT INJECTOR RESISTANCE

(a) Disconnect the injector connector.

(b) Using an ohmmeter, measure the resistance between the terminals.

Resistance: Approx. 13.8Ω

If the resistance is not as specified, replace the injector

(c) Reconnect the injector connector.

REMOVAL OF INJECTOR

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DISCONNECT ACCELERATOR AND THROTTLE CABLES

3. REMOVE AIR INTAKE HOSE

4. DISCONNECT FOLLOWING HOSES:

(a) Emission control hoses

HINT: Before disconnecting the emission control hoses, use tags to identify how they should be reconnected.

(b) Air hose from Al check valve

(c) Vacuum sensing hose

(d) PCV hose

(e) Brake booster hose

5. DISCONNECT FOLLOWING CONNECTORS AND WIRE:

(a) ISC valve connector

(b) Throttle position sensor connector

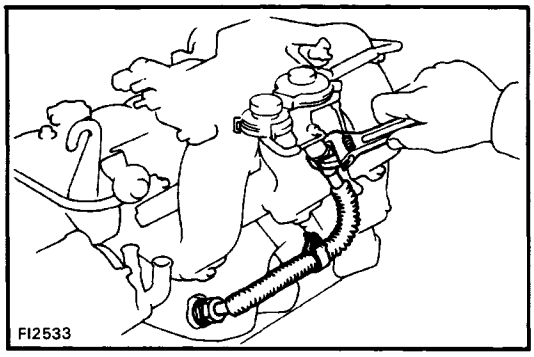
(c) Oxygen sensor connector

(d) Manifold temperature sensor connector

(e) Cold start injector connector

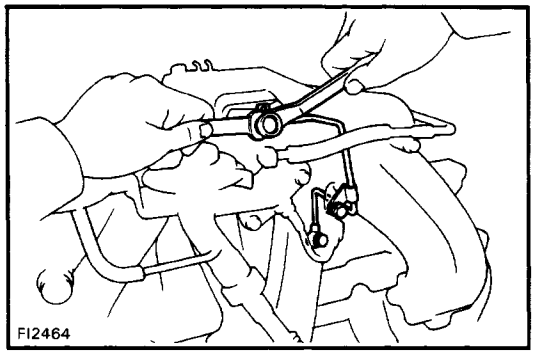
(f) EGR gas temp. sensor connector

(g) Ground strap

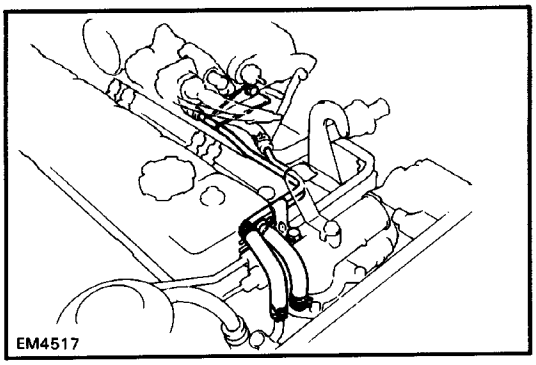


6. REMOVE AIR INTAKE CHAMBER

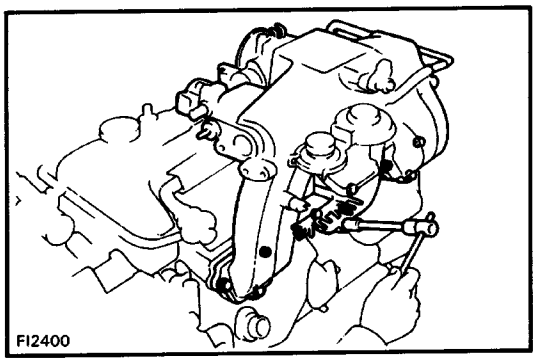
(a) Loosen the two union nuts, and remove the two clamp bolts and EGR pipe.



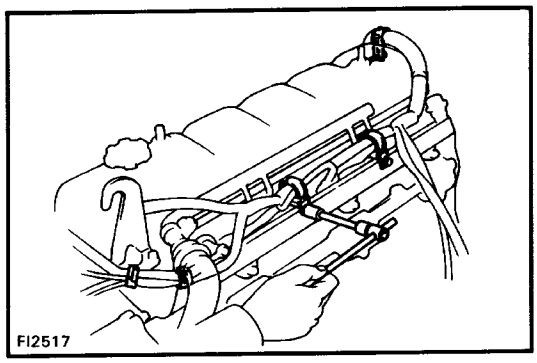
(b) Remove the two union bolts, four gaskets, clamp bolt and cold start injector pipe.



(c) Disconnect the water hoses and remove the two bolts and water by–pass pipe.
(d) Remove the four bolts and two intake chamber stays.

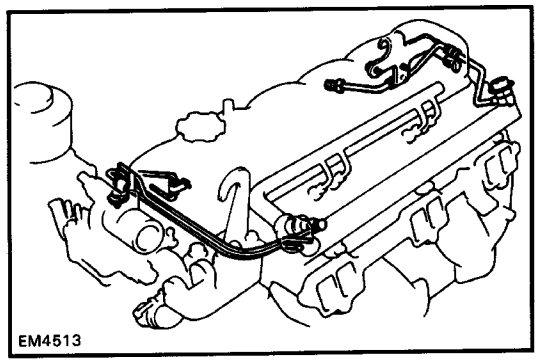


(e) Remove the seven bolts, two nuts and air intake chamber.
(f) Remove the bolt, manifold temperature sensor with stay and air intake chamber gasket.



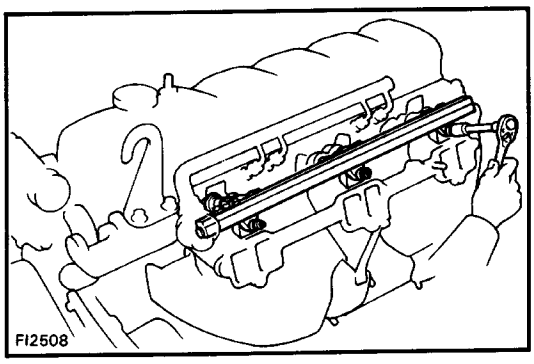
7. DISCONNECT ENGINE WIRE HARNESS ON INTAKE MANIFOLD

(a) Disconnect the following connectors:
(1) Cold start injector time switch connector
(2) Water temperature sensor connector
(3) Water temperature sender gauge connector
(4) Water temperature switch
(5) Six injector connectors
(b) Remove the two clamps and three clamp bolts, and disconnect the engine wire harness.



8. REMOVE NO.1 FUEL PIPE AND NO.2 FUEL PIPE WITH ENGINE HANGER

(a) Disconnect the fuel and vacuum hoses.
(b) Remove the pulsation damper and two gaskets.
(c) Remove the two bolts and No.2 fuel pipe with engine hanger.
(d) Remove the union bolt and two gaskets from the pressure regulator.
(e) Remove the two bolts and No.1 fuel pipe.

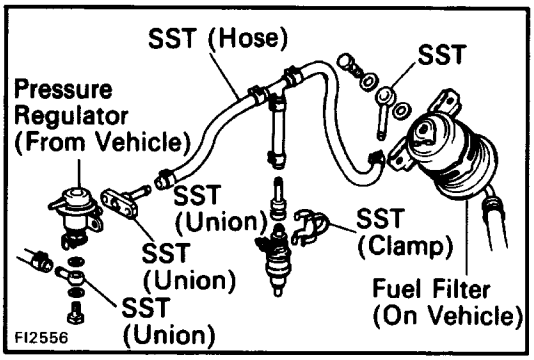


9. REMOVE DELIVERY PIPE AND INJECTORS

(a) Remove the three nuts, plate washers, spacers and delivery pipe together with the six injectors.

NOTICE: Be careful not to drop the injectors, when removing the delivery pipe.

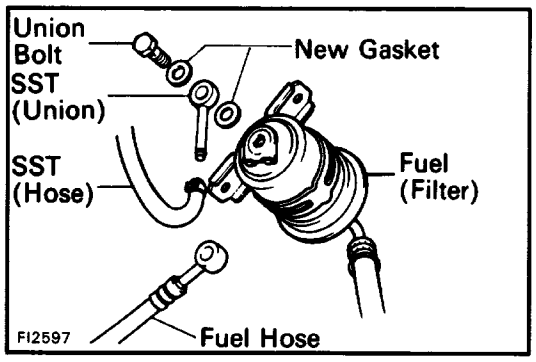
(b) Remove the six insulators, six spacers and three collars from the intake manifold.
(c) Pull out the six injectors from the delivery pipe.



INSPECTION OF INJECTORS

1. INSPECT INJECTOR INJECTION

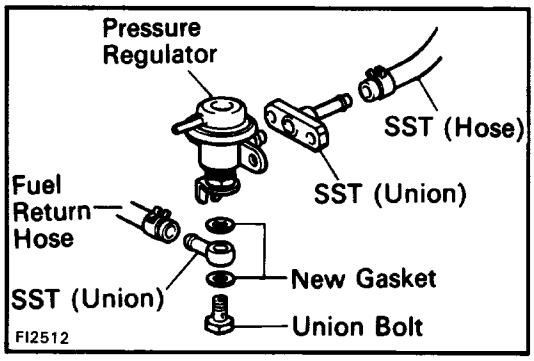
CAUTION: Keep clear of sparks during the test.



(a) Disconnect the fuel hose from the fuel filter outlet.

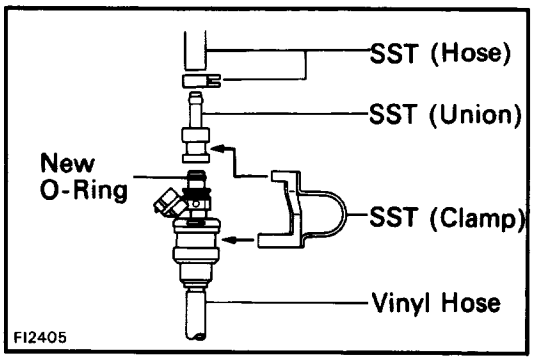
(b) Connect SST (union and hose) to the fuel filter outlet with.new gaskets and the union bolt.
SST 09268–41045 (90405–09015)

HINT: Use the vehicle's fuel filter.



(c) Remove the pressure regulator. (See page FI–59)

(d) Connect the fuel return hose and SST (hose) to the pressure regulator with SST (unions), new gaskets and union bolt.
SST 09268–41045 (09268–41080, 09268–41090)



(e) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268–41045

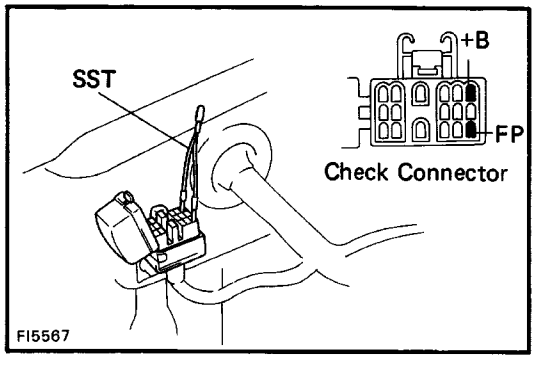
(f) Put the injector into the graduated cylinder.

HINT: Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.

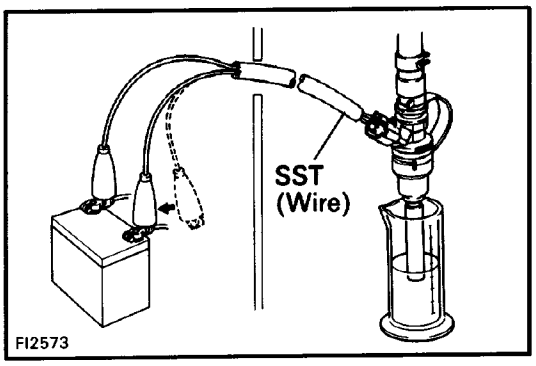
(g) Reconnect the battery negative (–) cable.

(h) Turn the ignition switch ON.

HINT: Do not start the engine.



(i) Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020



(j) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector two or three times.
SST 09842–30070

Volume: 47 – 59 cc (2.9 – 3.6 cu in.) per 15 sec.

Difference between each injector:

5 cc (0.3 cu in.) or less

If the injection volume is not as specified, replace the injector.

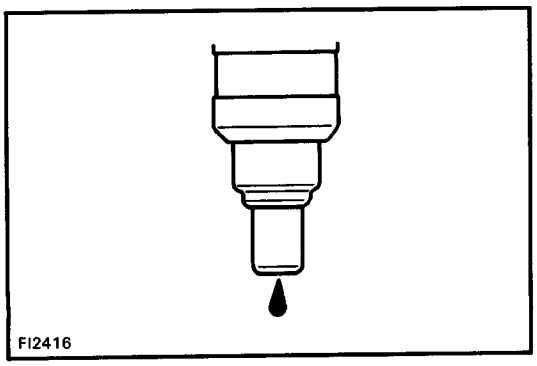
2. INSPECT LEAKAGE

(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30070

Fuel drop: One drop or less per minute.

(b) Disconnect the battery negative (–) cable.

(c) Remove SST.
SST 09268–41045 and 09843–18020

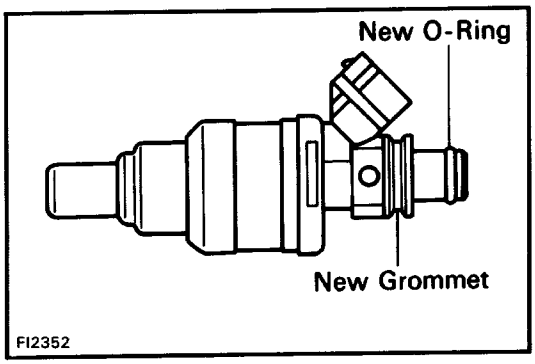


INSTALLATION OF INJECTORS

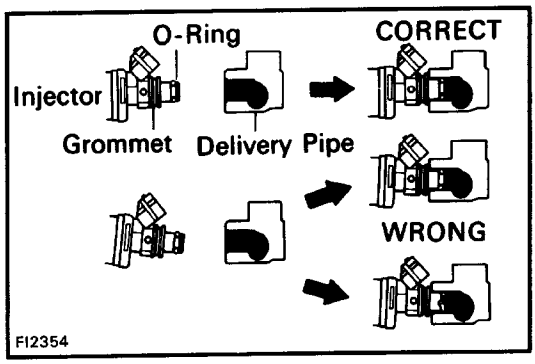
1. INSTALL INJECTORS AND DELIVERY PIPE

(a) Install a new grommet to the injector.

(b) Apply a light coat of gasoline to a new O–ring and install it to the injector.

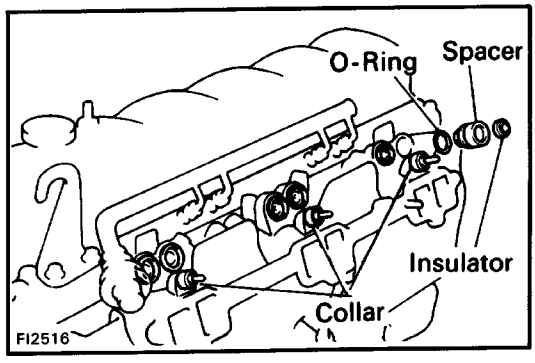


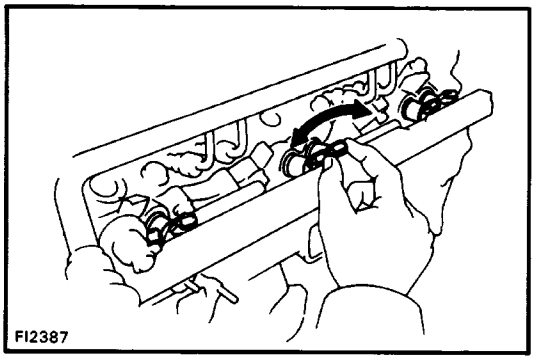
(c) While turning the injector left and right, install it to the delivery pipe. Install the six injectors.



(d) Install a new O–ring to the insulator.

(e) Place the six insulators, six spacers and three collars in position on the intake manifold.

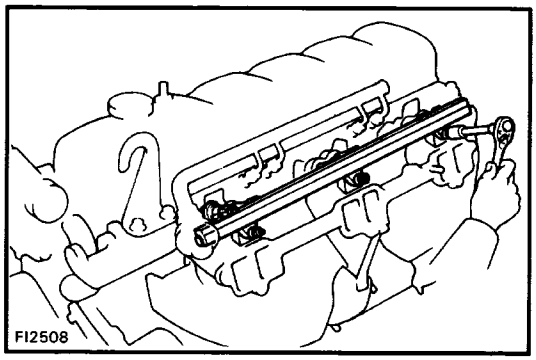




(f) Place the injectors together with the delivery pipe in position on the intake manifold.

(g) Check that the injectors rotate smoothly.

HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of O–rings. Replace the O–rings.



(h) Install the three spacers, plate washers and nuts. Torque the nuts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

2. INSTALL NO–1 FUEL PIPE AND NO.2 FUEL PIPE WITH ENGINE HANGER

(a) Install the No.1 fuel pipe with the two bolts.

(b) Install the union bolt and two new gaskets to the pressure regulator.

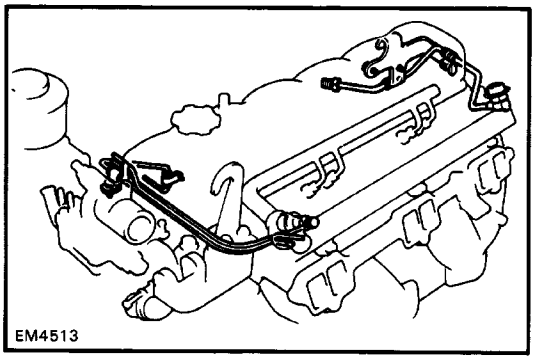
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

(c) Install the No.2 fuel pipe with engine hanger with the two bolts.

(d) Install the pulsation damper with the two new gas–ket.

Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

(e) Connect the two fuel hoses and vacuum hoses.



3. CONNECT ENGINE WIRE HARNESS ON INTAKE MANIFOLD

(a) Connect the following connectors:

(1) Cold start injector time switch connector

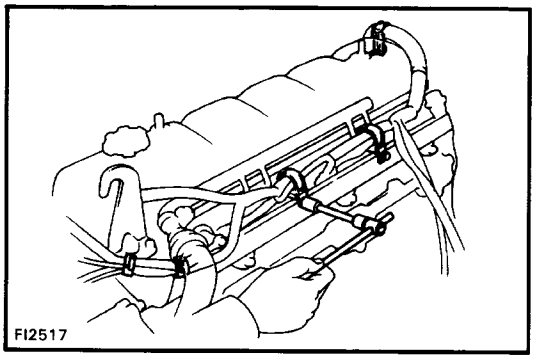
(2) Water temperature sensor connector

(3) Water temperature sender gauge connector

(4) Water temperature switch

(5) Six injector connectors

(b) Install the three clamp bolts and two clamps.



4. INSTALL AIR INTAKE CHAMBER

(a) Install a new gasket and air intake chamber with the seven bolts and two nuts.

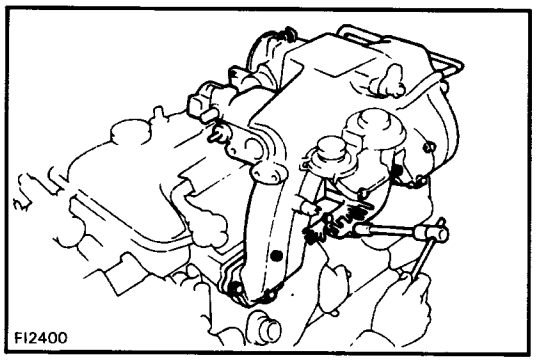
Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)

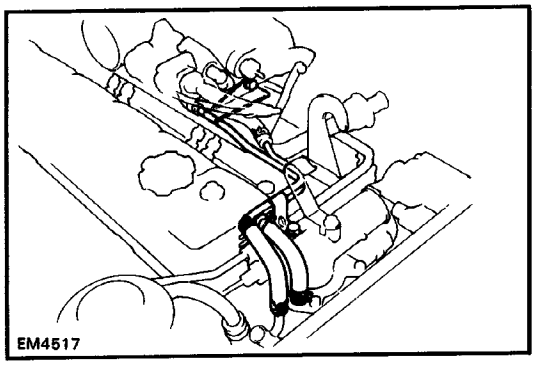
(b) Install the manifold temperature sensor with stay with the bolt.

Torque: 12 N–m (120 kgf–cm, 9 ft–lbfl

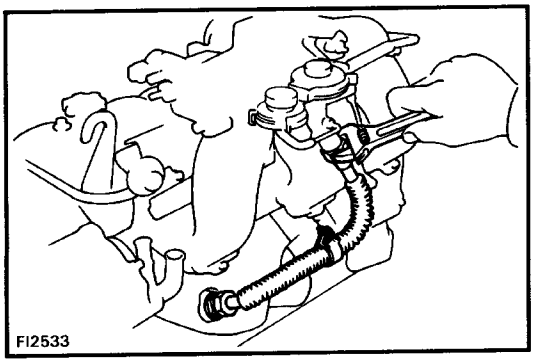
(c) Install the two intake chamber stays with the four bolts.

Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)





(d) Install the water by–pass pipe with the two bolts and connect the water hoses.
(e) Install the cold start injector pipe.
(See page FI–58)



(f) Install the EGR pipe with the two union nuts.
Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)
(g) Install the two clamp mount bolts.

5. CONNECT FOLLOWING CONNECTORS AND WIRE:
(a) ISC valve connector
(b) Throttle position sensor connector
(c) Oxygen sensor connector
(d) Manifold temperature sensor connector
(e) Cold start injector connector
(f) EGR gas temp. sensor connector
(g) Ground strap

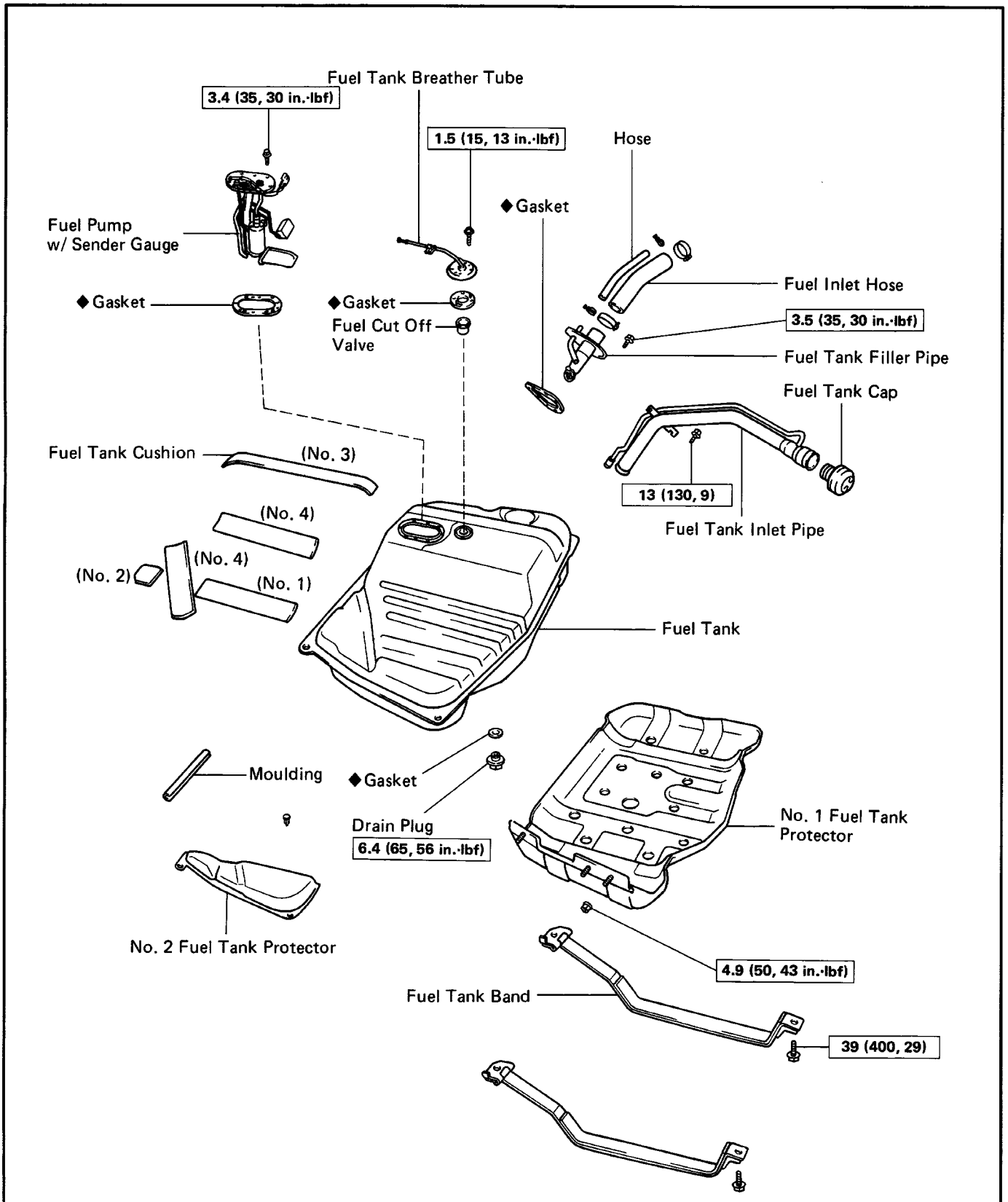
6. CONNECT FOLLOWING HOSES:
(a) Emission control hoses
(b) Air hose from Al check valve
(c) Vacuum sensing hose
(d) PCV hose
(e) Brake booster hose

7. INSTALL AIR INTAKE HOSE

8. CONNECT ACCELERATOR AND THROTTLE CABLES, AND ADJUST THEM

9. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

Fuel Tank and Lines
COMPONENTS

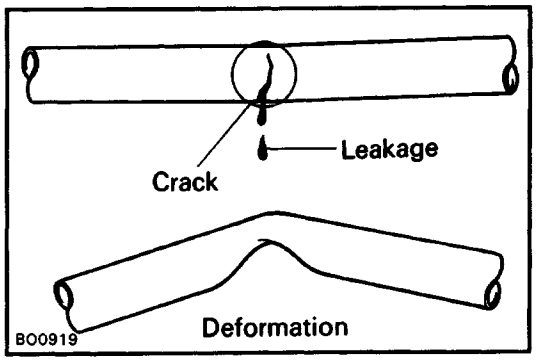


N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

FI5562

PRECAUTIONS

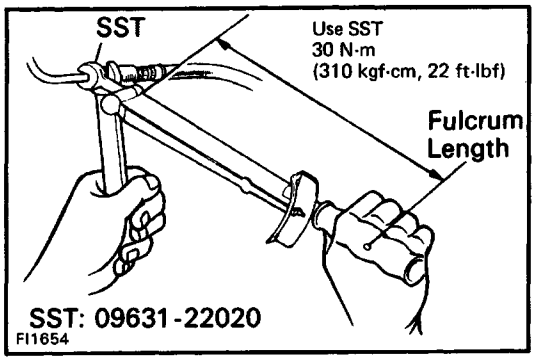
1. Always use new gaskets when replacing the fuel tank or component parts.
2. Apply the proper torque to all parts tightened.

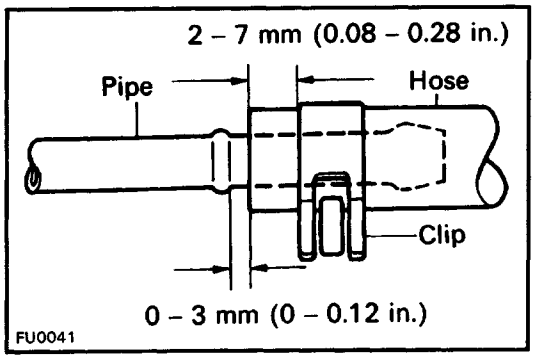


INSPECT FUEL LINES AND CONNECTIONS

(a) Check the fuel lines for cracks or leakage, and all connections for deformation.
(b) Check the fuel tank vapor vent system hoses and connections for looseness, kinks or damage.
(c) Check the fuel tank for deformation, cracks, fuel leakage or tank band looseness.
(d) Check the filler neck for damage or fuel leakage.
(e) Hose and tube connections are as shown in the illustration.

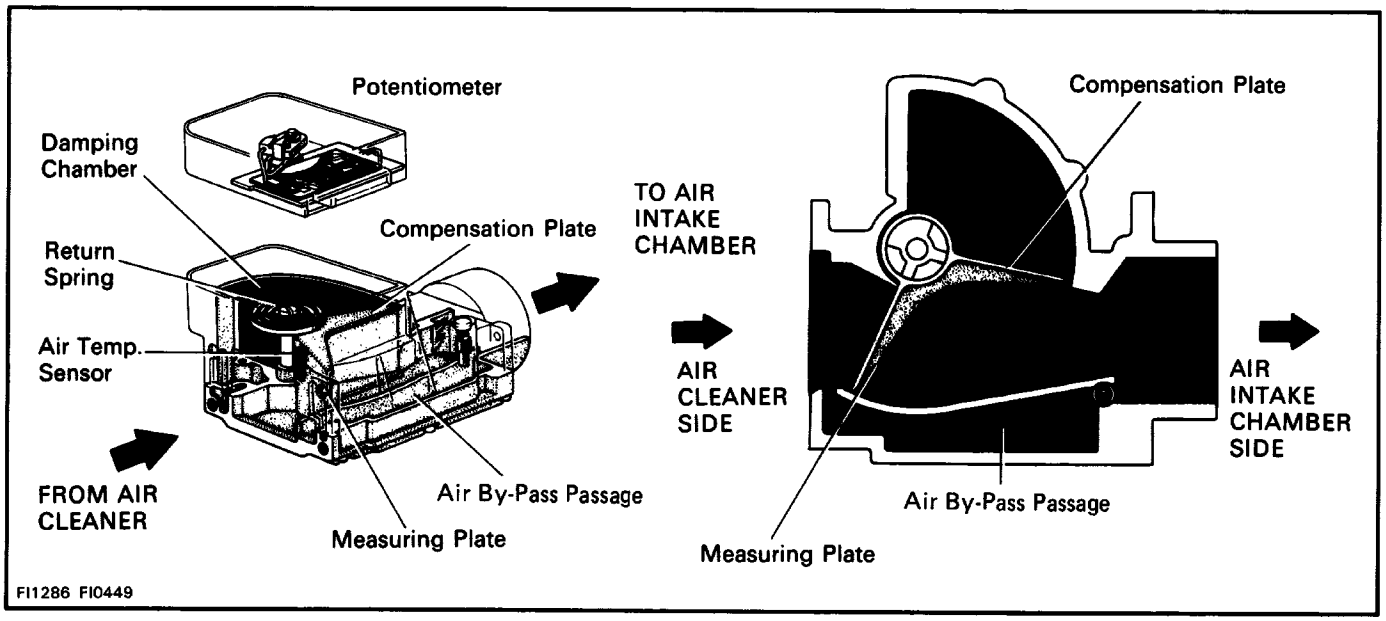
If a problem is found, repair or replace the parts as neces–sary.

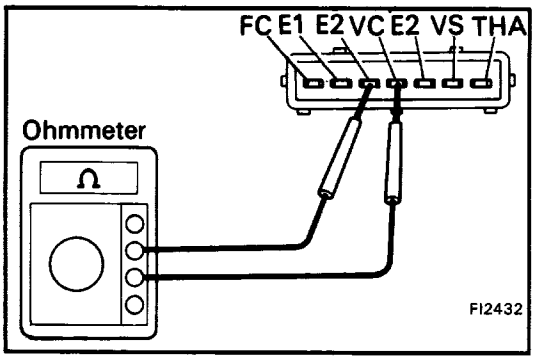


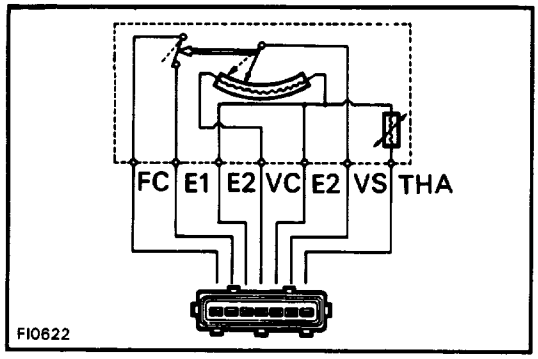


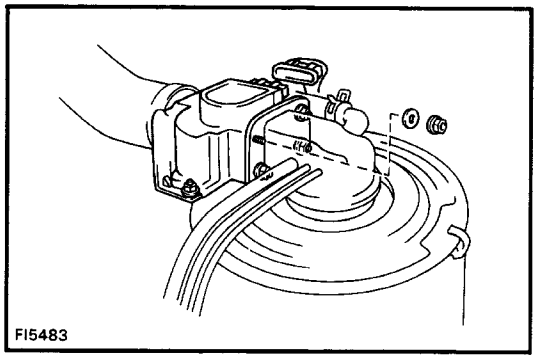
AIR INDUCTION SYSTEM

Air Flow Meter









ON–VEHICLE INSPECTION

INSPECT RESISTANCE OF AIR FLOW METER

(a) Disconnect the air flow meter connector.

(b) Using an ohmmeter, measure the resistance between each terminal.

Between terminals	Resistance	Temperature
E2 – VS	200 – 600 Ω	–
E2 – VC	200 – 400 Ω	–
E2 – THA	10 – 20 kΩ 4 – 7 kΩ 2 – 3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ	–20°C (–4°F) 0°C (32°F) 20°C (68°F) 40°C (104°F) 60°C (140°F)
E1 – FC	Infinity	–

If the resistance is not as specified, replace the air flow meter.

(c) Reconnect the air flow meter connector.

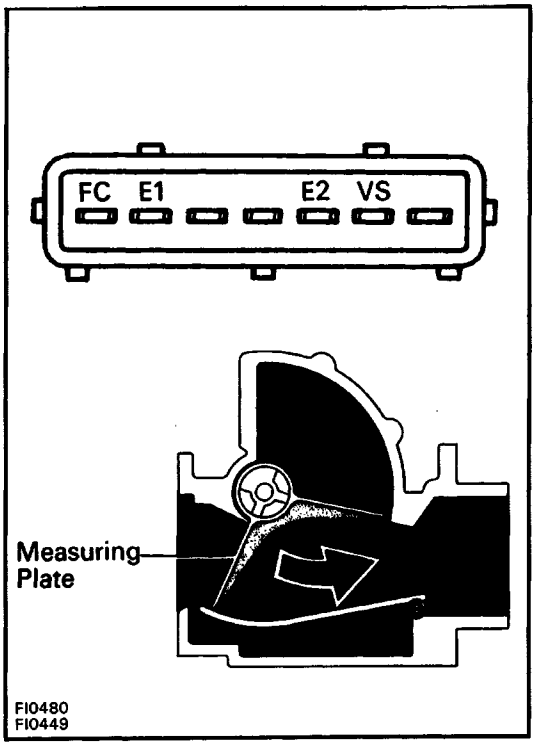
REMOVAL OF AIR FLOW METER

1. DISCONNECT AIR FLOW METER CONNECTOR

2. DISCONNECT AIR CLEANER HOSE

3. REMOVE AIR FLOW METER

Remove the bolt, four nuts and air flow meter.



INSPECTION OF AIR FLOW METER

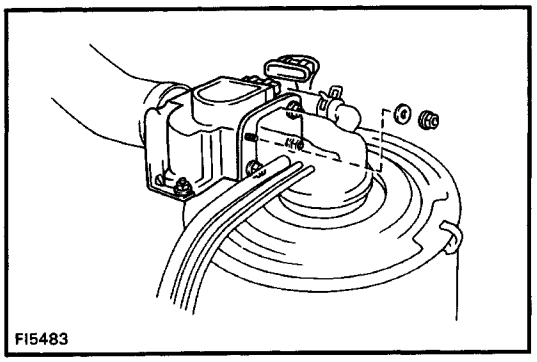
INSPECT RESISTANCE OF AIR FLOW METER

Using an ohmmeter, measure the resistance between each terminal by moving the measuring plate.

Between Terminals	Resistance (Ω)	Measuring plate opening
E1 – FC	Infinity	Fully closed
	Zero	Other than closed
E2–VS	200 – 600	Fully closed
	20 – 1,200	Fully open

HINT: Resistance between terminals E2 and VS will change in a wave pattern as the measuring plate slowly opens.

If the resistance is not as specified, replace the meter.



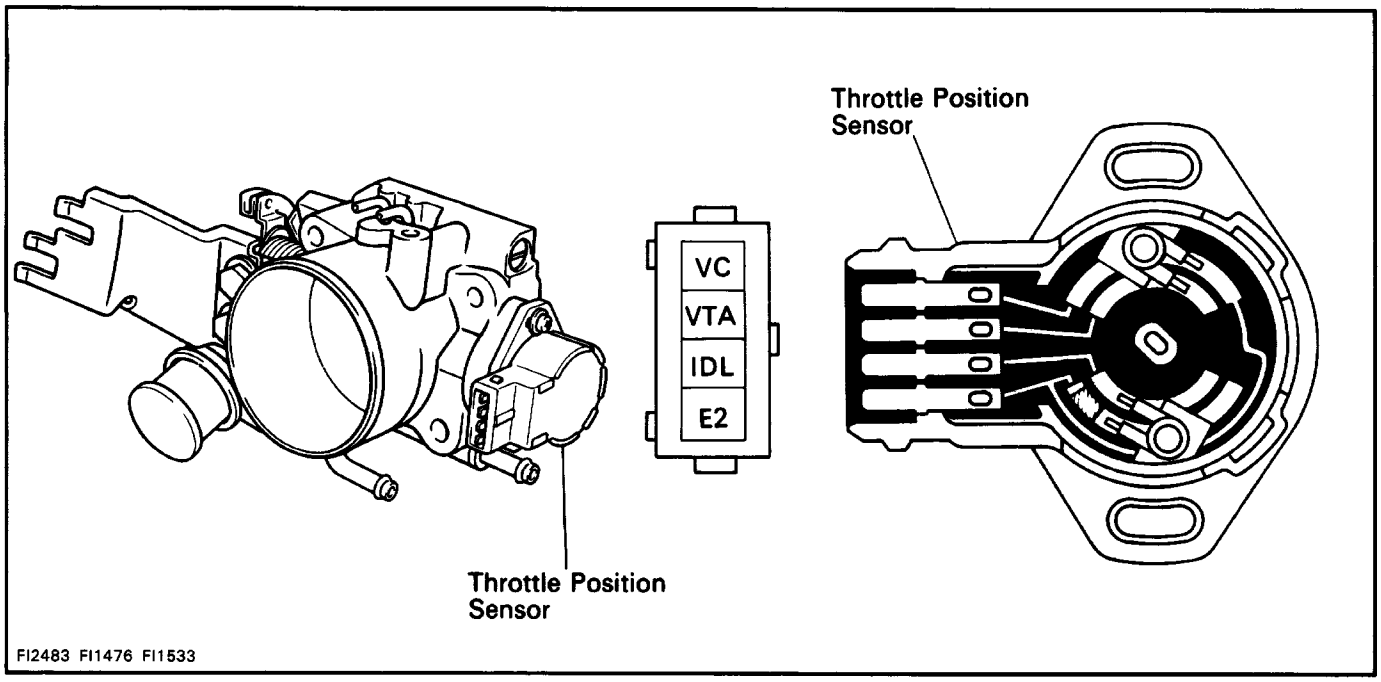
INSTALLATION OF AIR FLOW METER

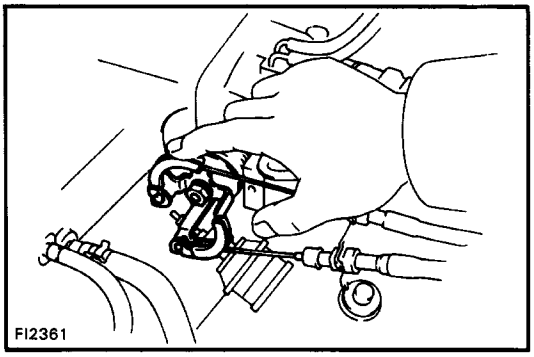
1. INSTALL AIR FLOW METER

2. CONNECT AIR CLEANER HOSE

3. CONNECT AIR FLOW METER CONNECTOR

Throttle Body

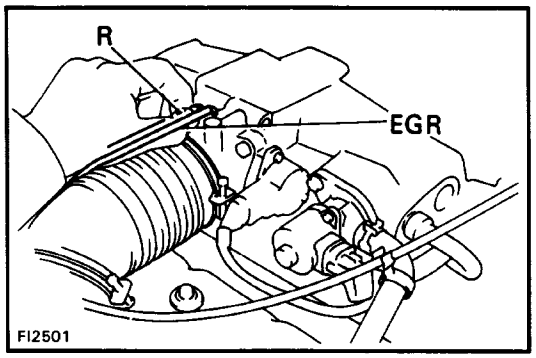




ON–VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

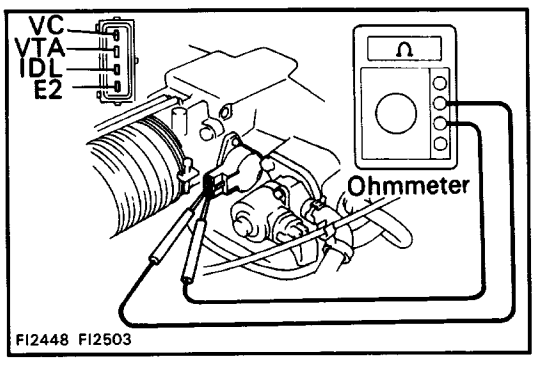
(a) Check that the throttle linkage moves smoothly.



(b) Check the vacuum at each port.

- Start the engine.
- Check the vacuum with your finger.

Port No.	At idling	Other than idling
EGR	No vacuum	Vacuum
R	No vacuum	Vacuum

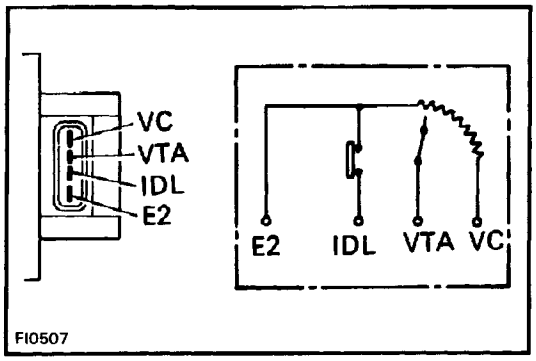


2. INSPECT THROTTLE POSITION SENSOR

(a) Disconnect the sensor connector.

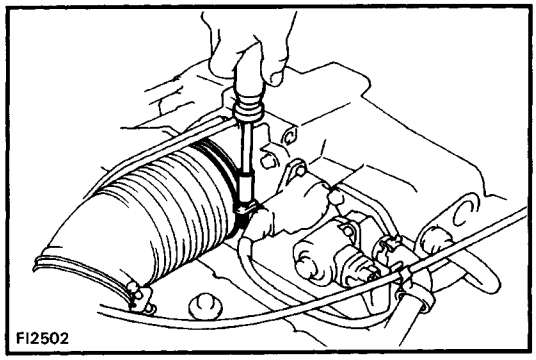
(b) Insert a thickness gauge between the throttle stop screw and stop lever.

(c) Using an ohmmeter, measure the resistance between each terminal.



Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E2	0.3 – 6.3 kΩ
0.77 mm (0.0303 in.)	IDL – E2	Less than 2.3 kΩ
1.09 mm (0.0429 in.)	IDL – E2	Infinity
Throttle valve fully opened position	VTA – E2	3.5 – 10.3 kΩ
	VC – E2	4.25 – 8.25 kΩ

(d) Reconnect the sensor connector.



REMOVAL OF THROTTLE BODY

1. DRAIN ENGINE COOLANT

2. DISCONNECT ACCELERATOR AND THROTTLE CABLES

3. DISCONNECT AIR CLEANER HOSE

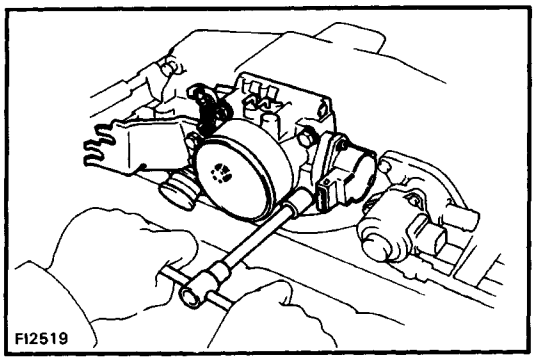
4. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR

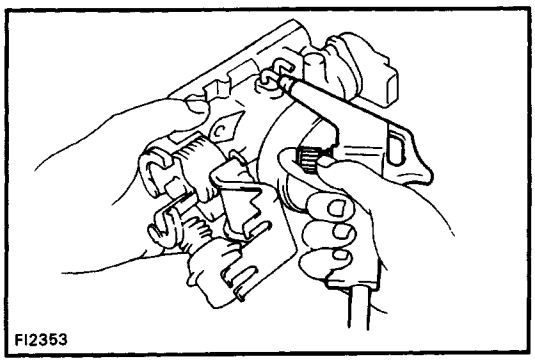
5. DISCONNECT WATER HOSES

6. DISCONNECT VACUUM HOSES

7. REMOVE THROTTLE BODY

Remove the three bolts, nut, throttle body and gasket.





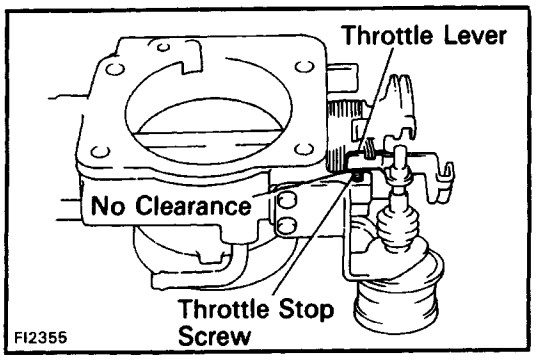
INSPECTION OF THROTTLE BODY

1. CLEAN THROTTLE BODY

(a) Using a soft brush and carburetor cleaner, clean the cast parts.

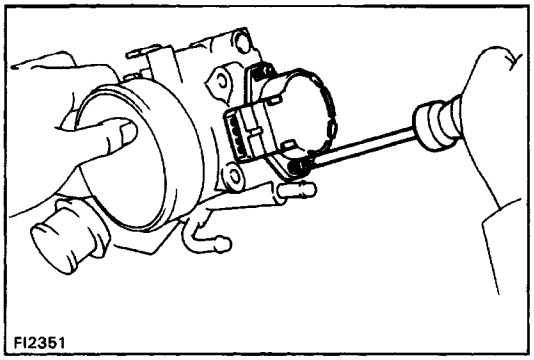
(b) Using compressed air, clean all the passages and apertures.

NOTICE: To prevent deterioration, do not clean the throttle position sensor.



2. INSPECT THROTTLE VALVE

Check that there is no clearance between the throttle stop check and throttle lever when the throttle valve is fully closed.

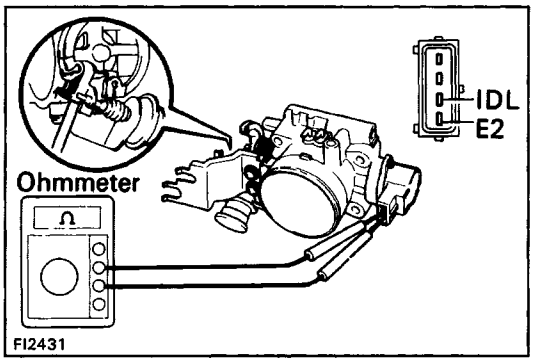


3. INSPECT THROTTLE POSITION SENSOR

(See step 2 on page FI–72)

4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

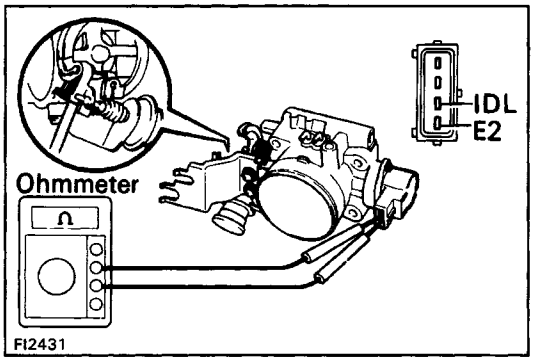
(a) Loosen the two set screws of the sensor.



(b) Insert a 0.93 mm (0.0366 in.) thickness gauge, between the throttle stop screw and stop lever.

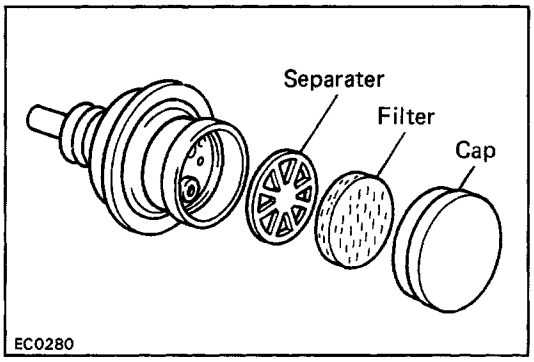
(c) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.

(d) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the two screws.



(e) Recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDL – E2)
0.77 mm (0.0303 in.)	Continuity
1.09 mm (0.0429 in.)	No continuity



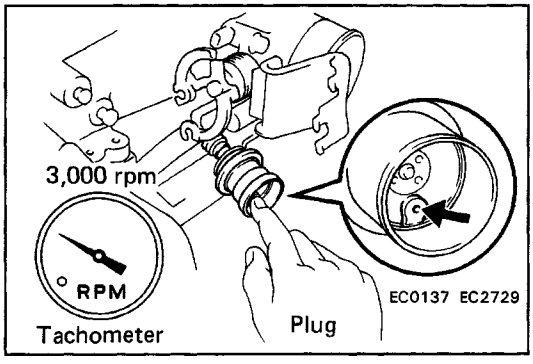
5. INSPECT DASH POT (DP)

A. WARM UP ENGINE

B. CHECK IDLE SPEED

C. DISCONNECT ISC CONNECTOR

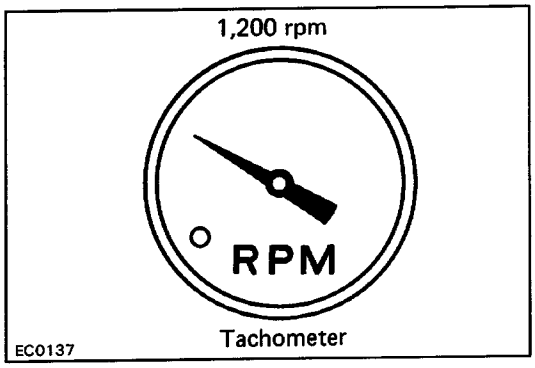
D. REMOVE CAP, FILTER AND SEPARATER FROM DP



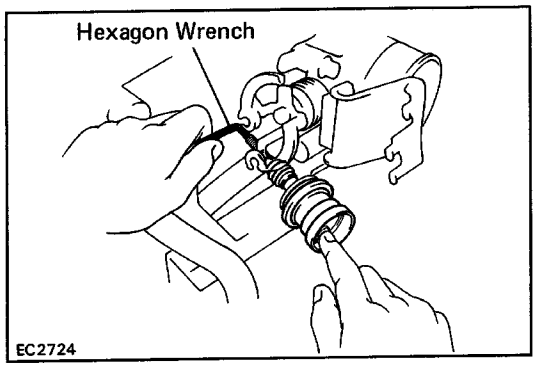
E. CHECK DP SETTING SPEED

(a) Maintain engine speed at 2,500 rpm.

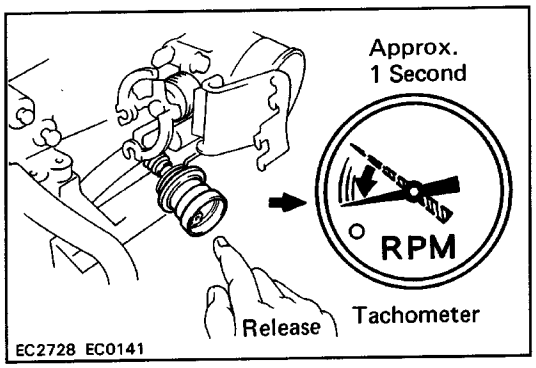
(b) Plug the VTV hole with your finger.



(c) Release the throttle valve.
(d) Check that the DP is set.
DP setting speed: 1,200 rpm.



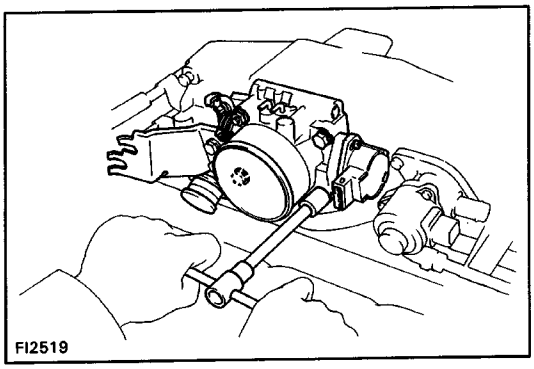
If not as specified, adjust with the DP adjusting screw.



F. CHECK OPERATION OF VTV

(a) Set the DP speed in the same procedure as above; (a) to (c).
(b) Remove your finger from the hole and check that the engine returns to idle in approx. 1 second.

G. REINSTALL DP SEPARATER, FILTER AND CAP
H. RECONNECT ISC CONNECTOR



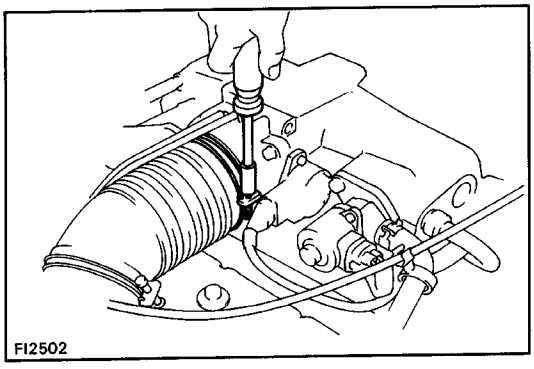
INSTALLATION OF THROTTLE BODY

1. INSTALL THROTTLE BODY

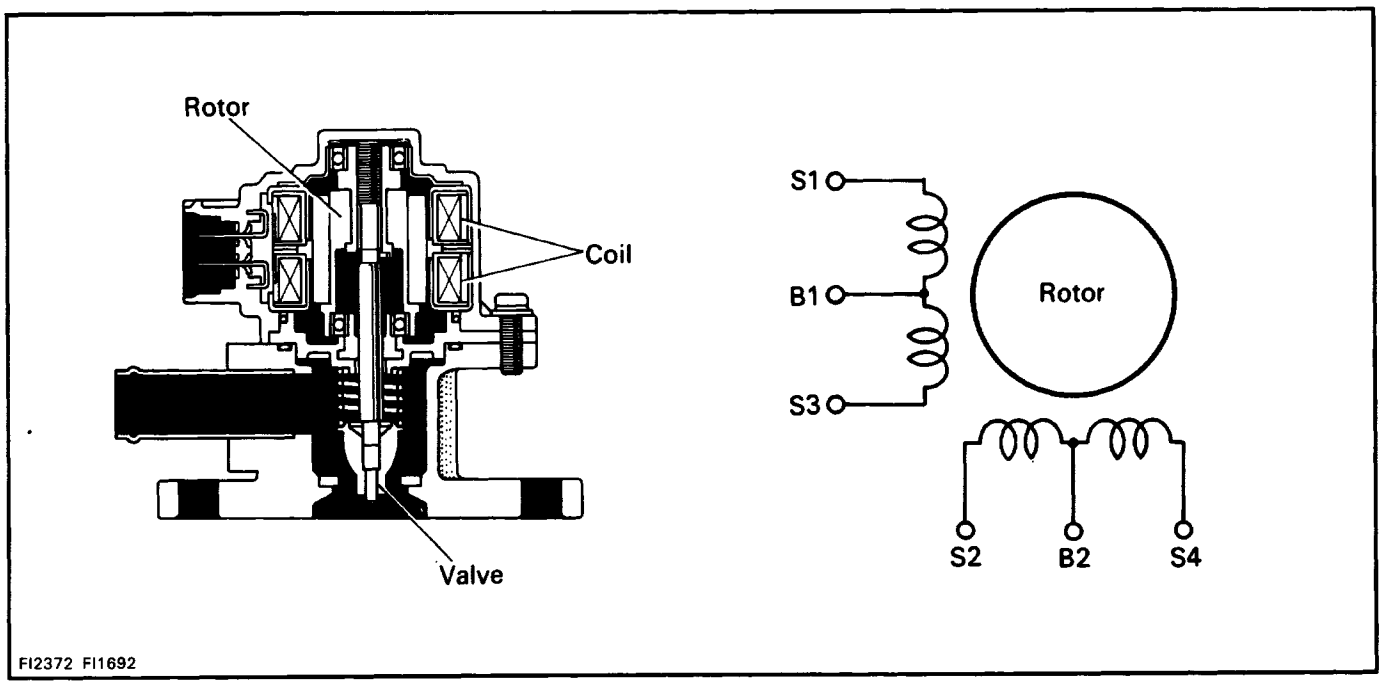
Install a new gasket and the throttle body with the three bolts and nut.

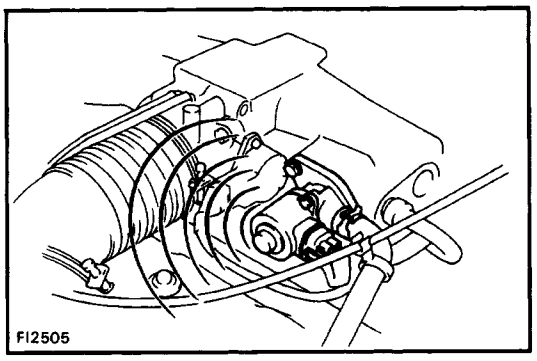
Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)

2. CONNECT WATER HOSES
3. CONNECT VACUUM HOSES
4. CONNECT THROTTLE POSITION SENSOR CONNECTOR
5. CONNECT AIR CLEANER HOSE
6. CONNECT ACCELERATOR AND THROTTLE CABLES, AND ADJUST THEM
7. FILL WITH ENGINE COOLANT (See page CO–5)



Idle Speed Control (ISC) Valve





ON–VEHICLE INSPECTION

CHECK FOR OPERATING SOUND FROM ISC VALVE

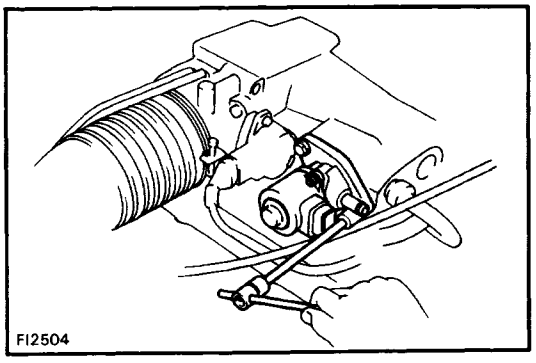
Check that there is a clicking sound immediately after stopping the engine.

REMOVAL OF ISC VALVE

1. DRAIN ENGINE COOLANT

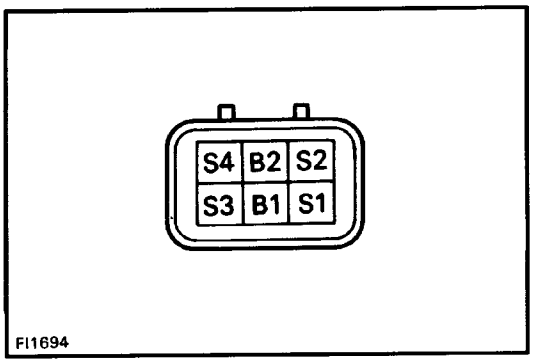
2. DISCONNECT ISC VALVE CONNECTOR

3. DISCONNECT AIR AND TWO WATER BY–PASS HOSES



4. REMOVE ISC VALVE

Remove the two bolts, ISC valve and gasket.



INSPECTION OF ISC VALVE

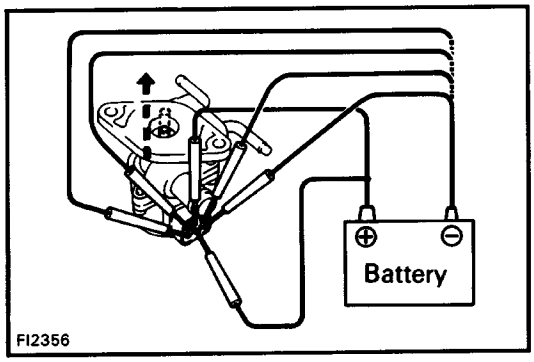
1. INSPECT ISC VALVE RESISTANCE

Using an ohmmeter, measure the resistance between terminal B1 – S1 or S3, and B2 – S2 or S4.

Resistance: B1 – S1 or S3 10 – 30 Ω

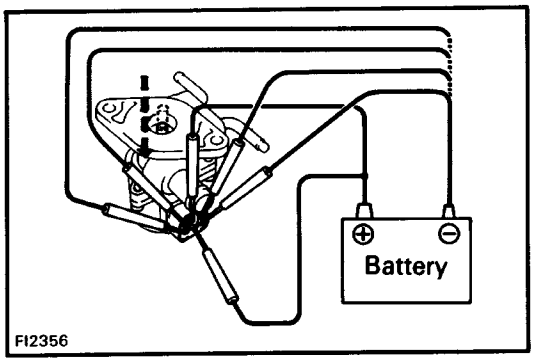
B2 – S2 or S4 10 – 30 Ω

If resistance is not as specified, replace the ISC valve.



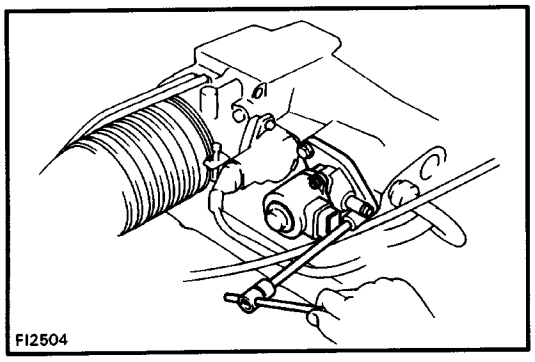
2. INSPECT ISC VALVE OPERATION

(a) Apply battery voltage to terminals B1 and B2, and while repeatedly grounding S1 → S2 → S3 → S4 → S1 in sequence, check that the valve moves toward the closed position.



(b) Apply battery voltage to terminals B1 and B2, and while repeatedly grounding S4 → S3 → S2 → S 1 → S4 in sequence, check that the valve moves toward the opened position.

If operation is not as specified, replace the ISC valve.



INSTALLATION OF ISC VALVE

1. INSTALL ISC VALVE

Install a new gasket and ISC valve with the two bolts.

Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)

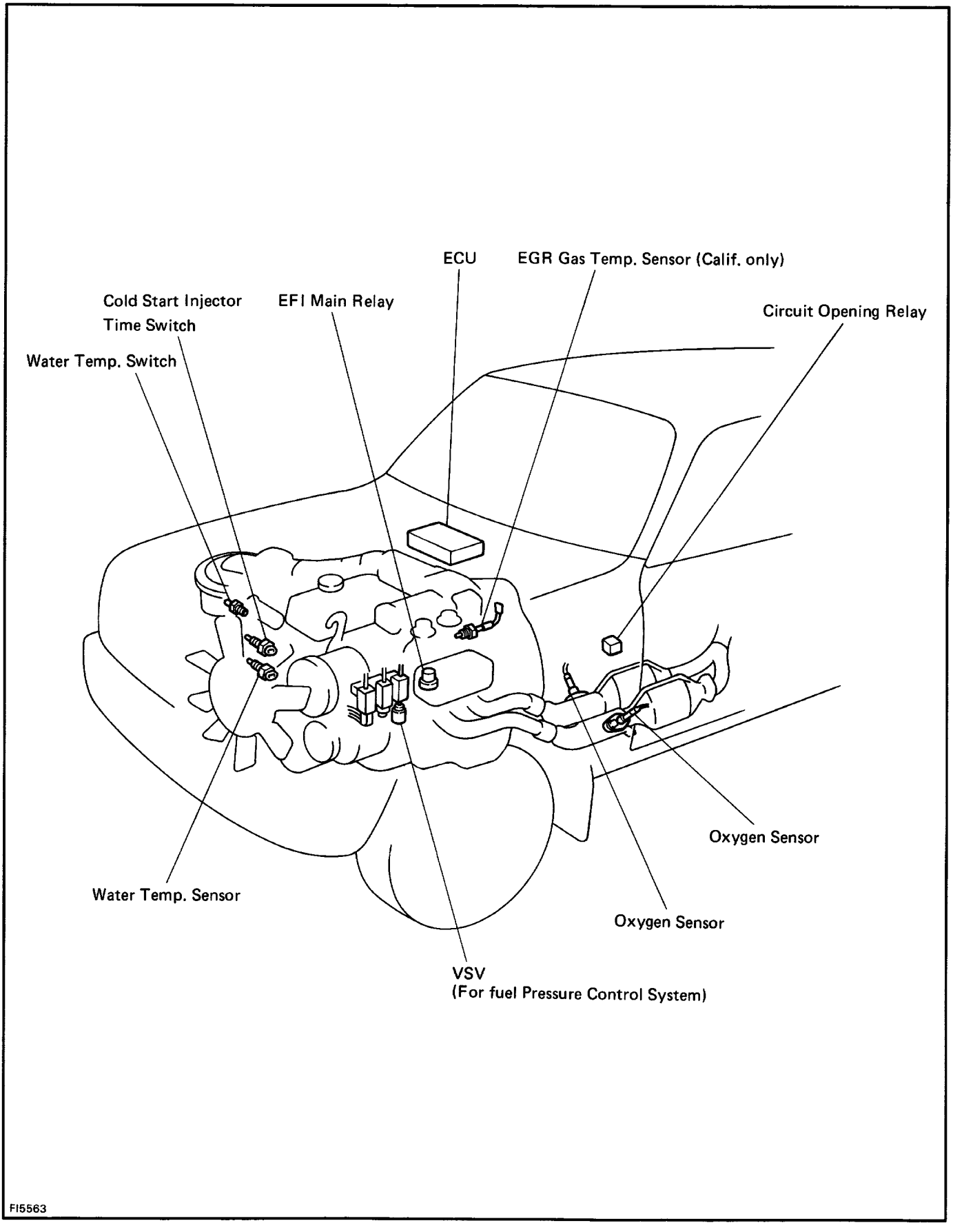
2. CONNECT TWO WATER BY–PASS AND AIR HOSES

3. CONNECT ISC VALVE CONNECTOR

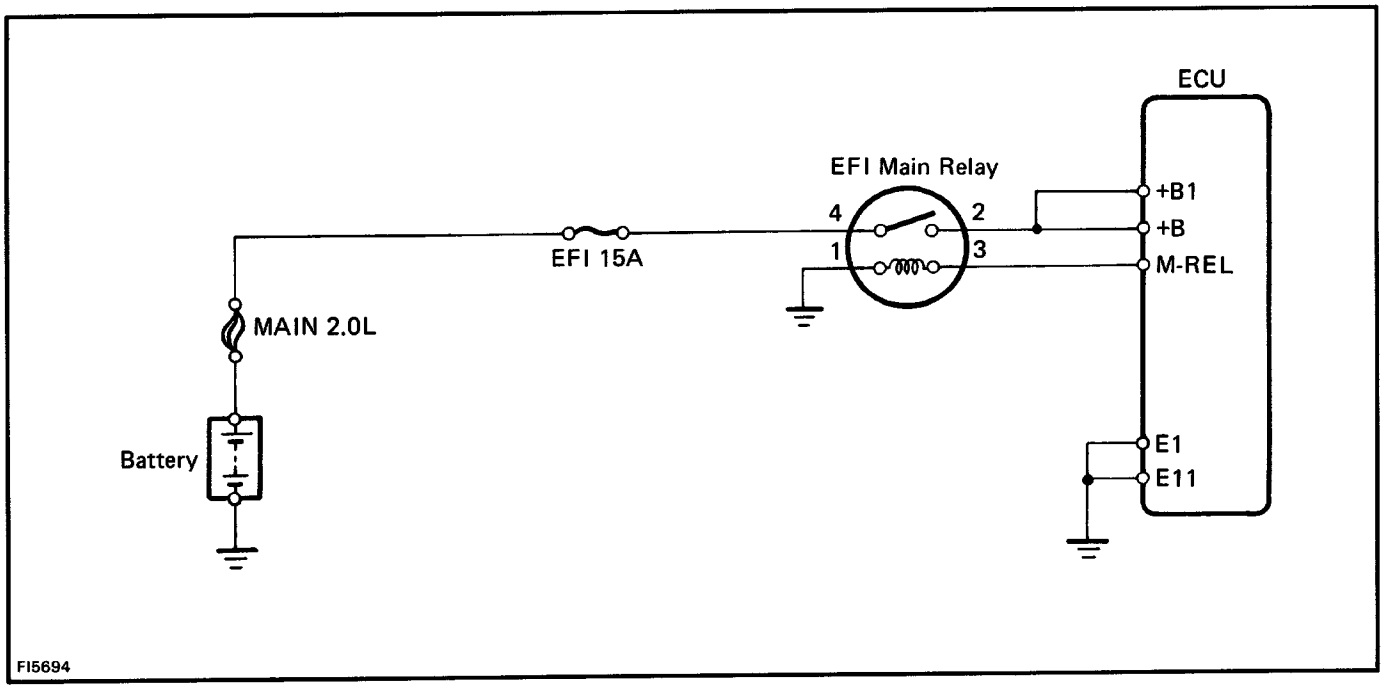
4. FILL WITH ENGINE COOLANT (See page CO–5)

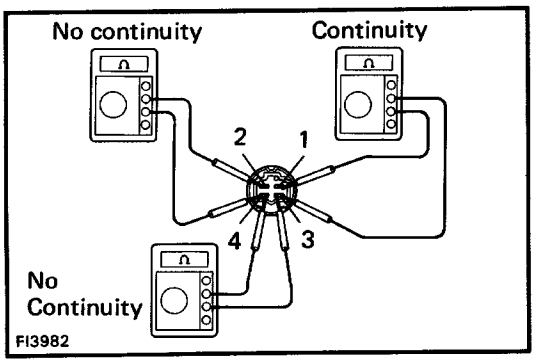
ELECTRONIC CONTROL SYSTEM

Location of Electronic Control Parts



EFI Main Relay





INSPECTION OF EFI MAIN RELAY

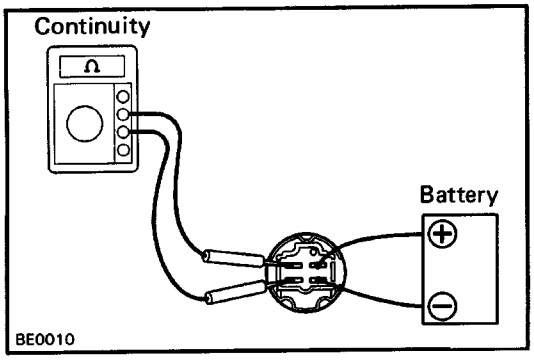
1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.

(b) Check that there is no continuity between terminals 2 and 4.

(c) Check that there is no continuity between terminals 3 and 4.

If continuity is not as specified, replace the relay.



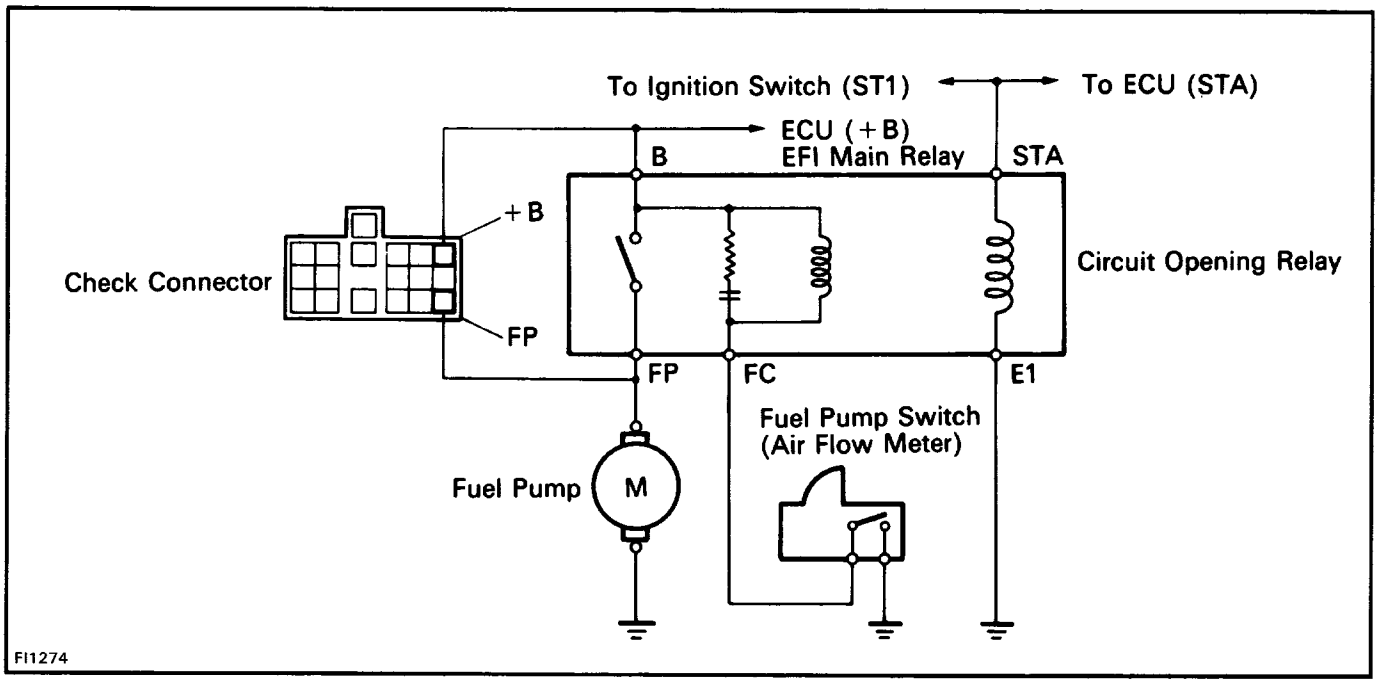
2. INSPECT RELAY OPERATION

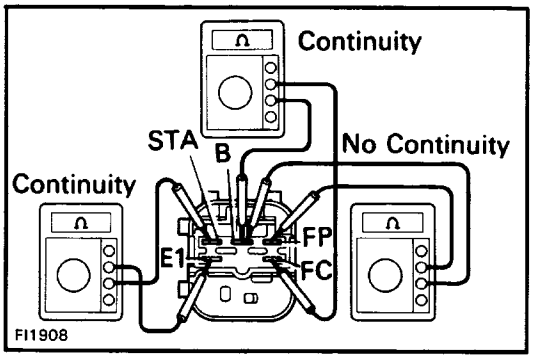
(a) Apply battery voltage across terminals 1 and 3.

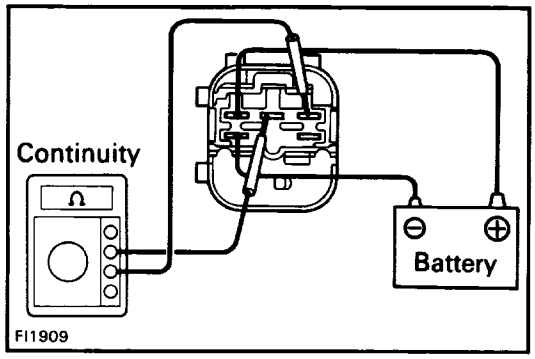
(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.

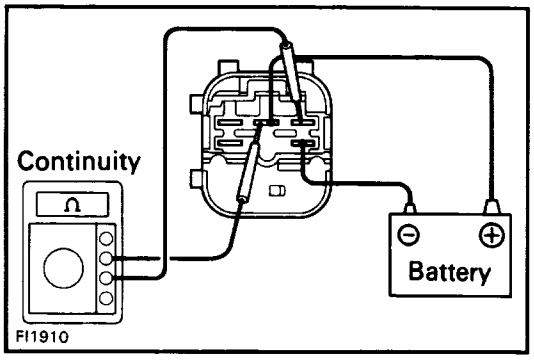
If operation is not as specified, replace the relay.

Circuit Opening Relay









INSPECTION OF CIRCUIT OPENING RELAY

1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals STA and E1.

(b) Check that there is continuity between terminals B and FC.

(c) Check that there is no continuity between terminals B and FP.

If continuity is not as specified, replace the relay.

2. INSPECT RELAY OPERATION

(a) Apply battery voltage across terminals STA and E1.

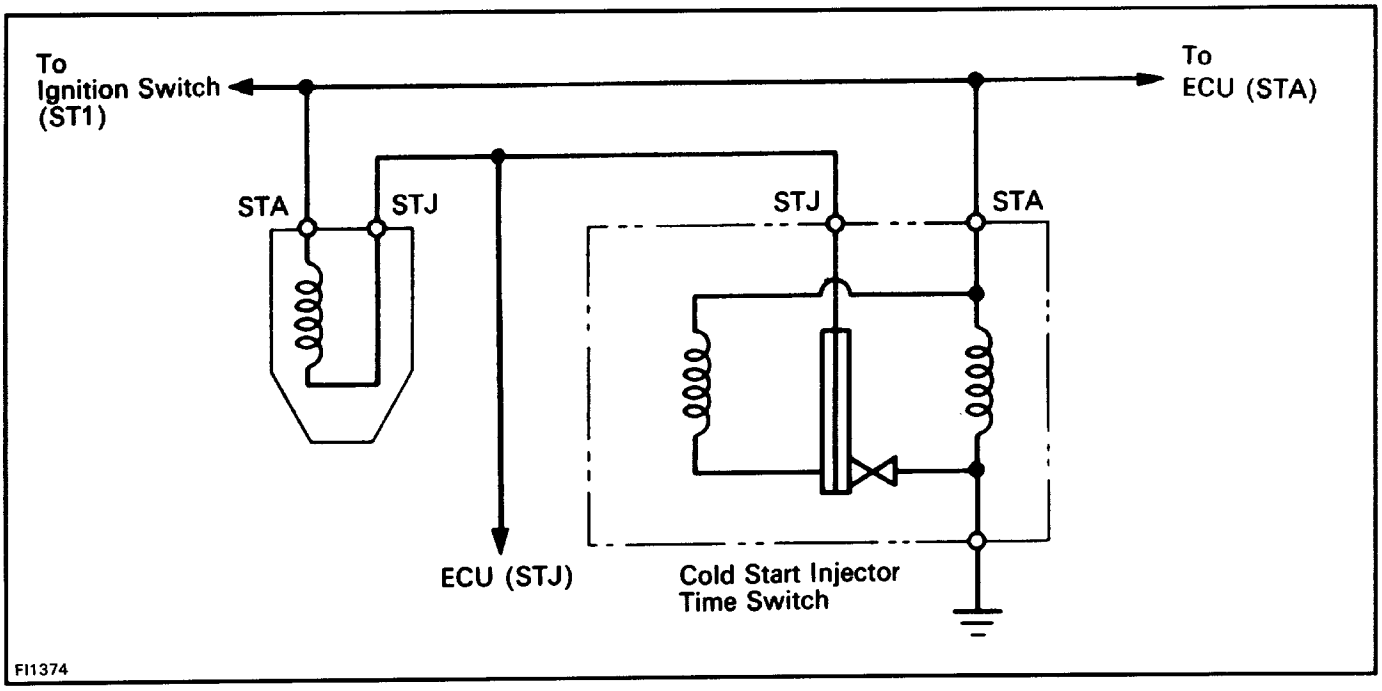
(b) Using an ohmmeter, check that there is continuity between terminals B and FP.

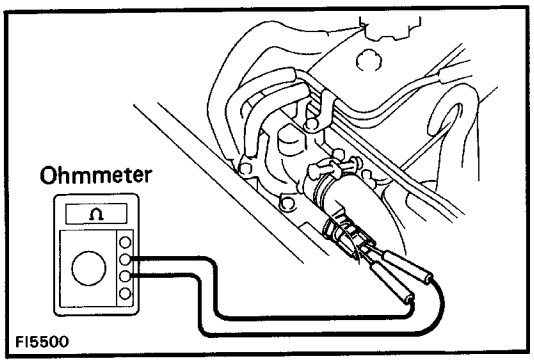
(c) Apply battery voltage across terminals B and FC.

(d) Check that there is continuity between terminals B and FP.

If operation is not as specified, replace the relay.

Cold Start Injector Time Switch





INSPECTION OF COLD START INJECTOR TIME SWITCH

INSPECT RESISTANCE OF COLD START INJECTOR TIME SWITCH

Using an ohmmeter, measure the resistance between each terminal.

Resistance:

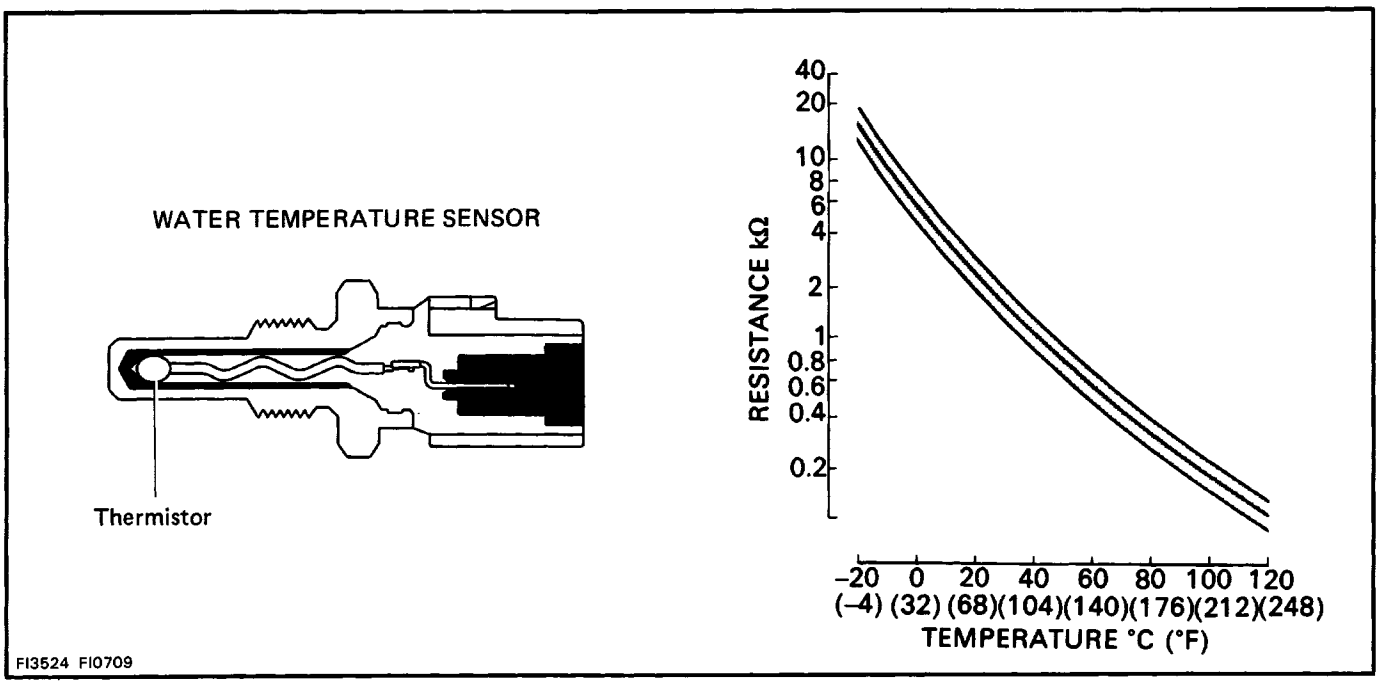
STA – STJ 30 – 50Ω below 15˚C (59˚F)

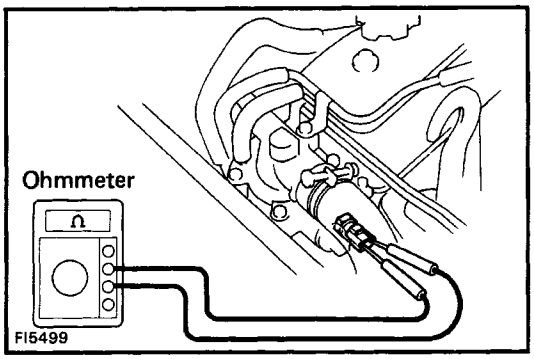
70 – 90Ω above 30˚C (86˚F)

STA – Ground 30 – 90Ω

If the resistance is not as specified, replace the switch.

Water Temperature Sensor





INSPECTION OF WATER TEMPERATURE SENSOR

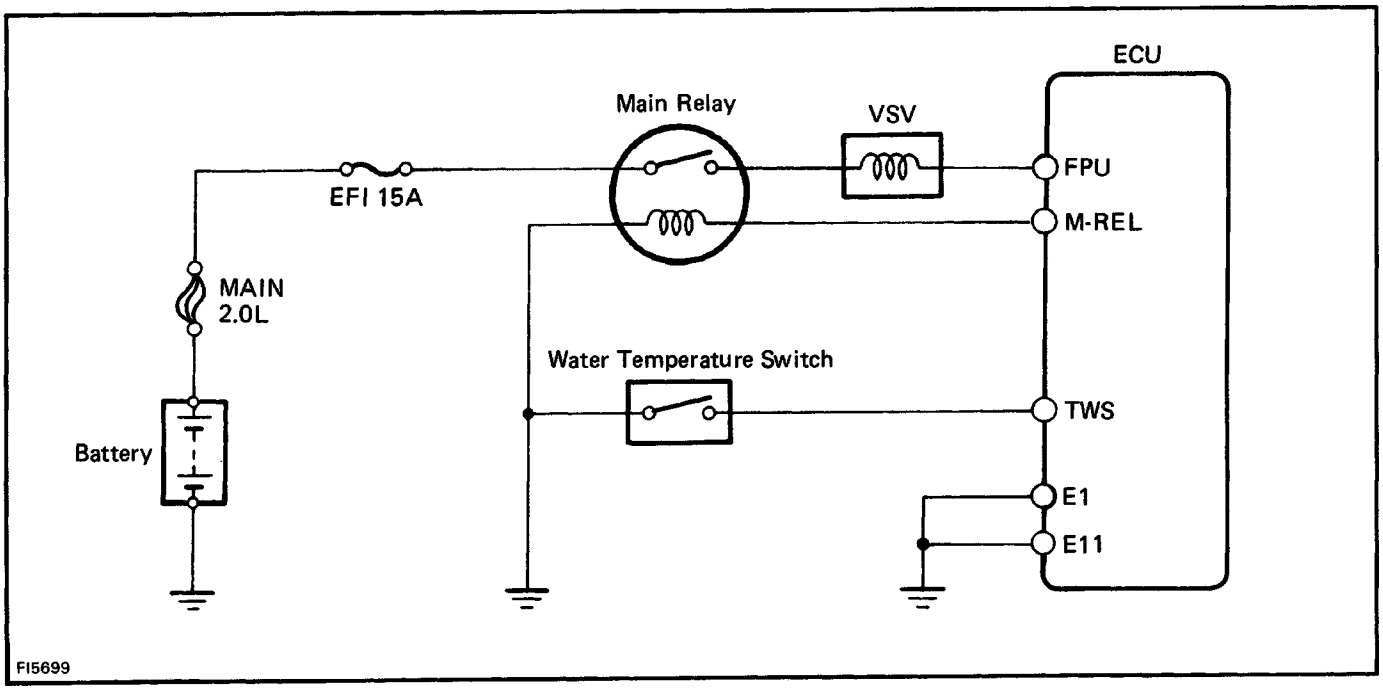
INSPECT RESISTANCE OF WATER TEMPERATURE SENSOR

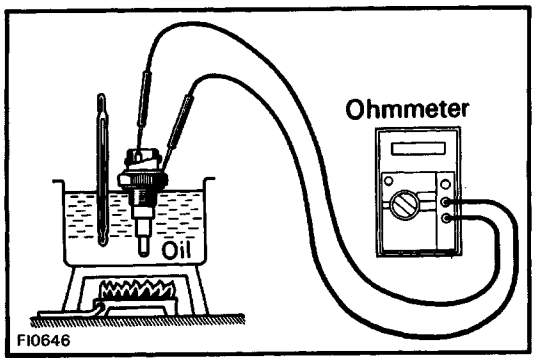
Using an ohmmeter, measure the resistance between the terminals.

Resistance: Refer to chart

If the resistance is not as specified, replace the sensor.

Fuel Pressure Control System





INSPECTION OF FUEL PRESSURE CONTROL SYSTEM

1. INSPECT WATER TEMPERATURE SWITCH

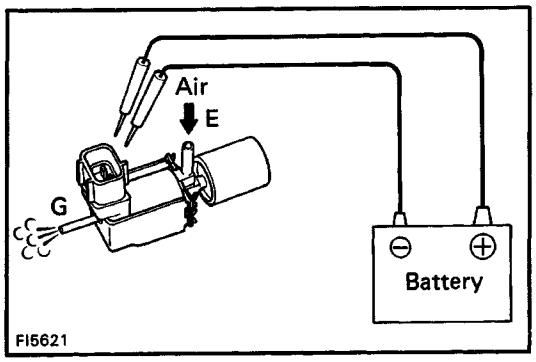
(a) Using an ohmmeter, check that there is no continu–ity between the terminal and body when the oil temperature is below 98˚C (208˚F).

(b) Check that there is continuity between the terminal and body when the oil temperature is above 105˚C (221˚F).

If operation is not as specified, replace the switch.

2. INSPECT VSV

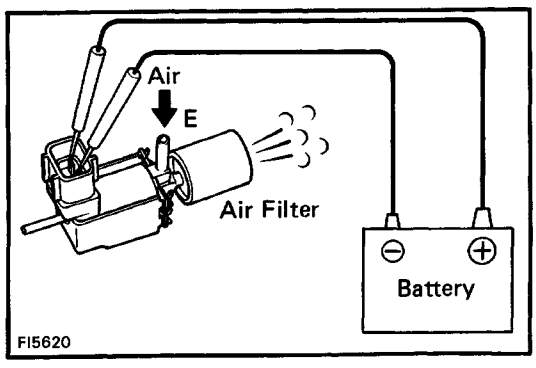
(a) Check that air flows from the pipe E to pipe G.



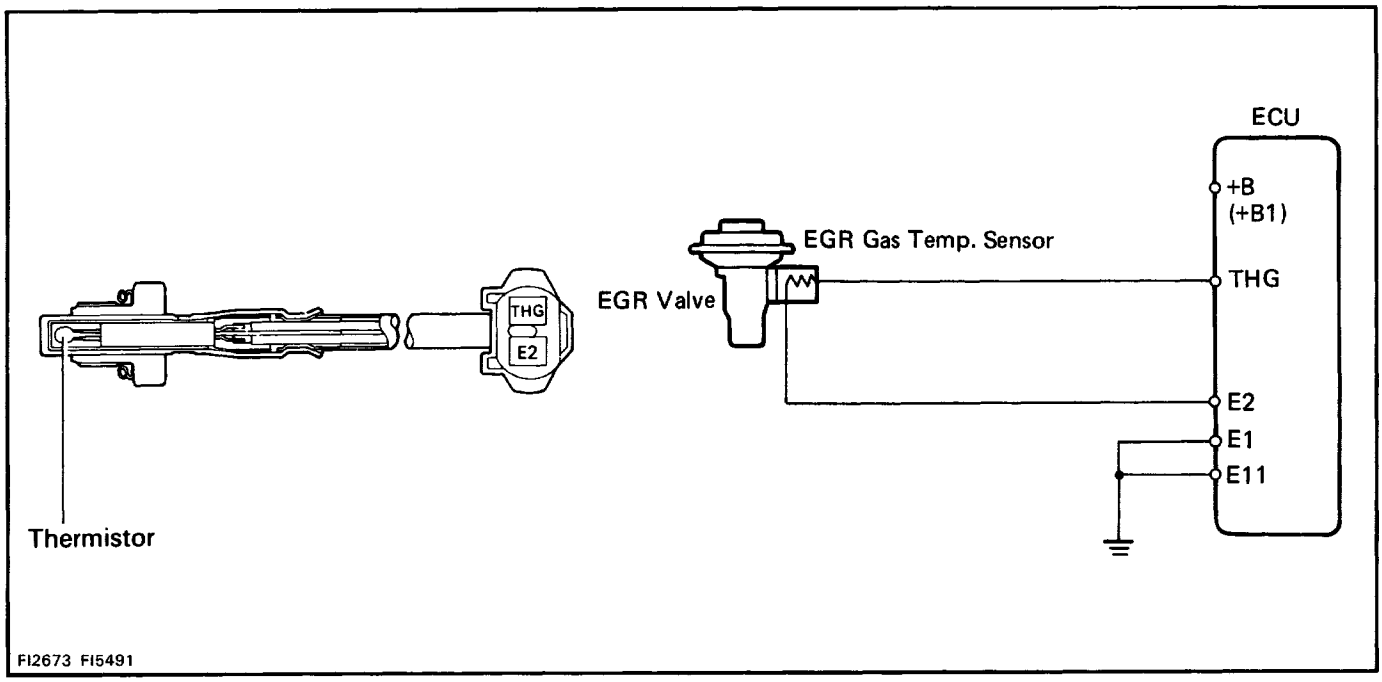
(b) Apply battery voltage across the terminals.

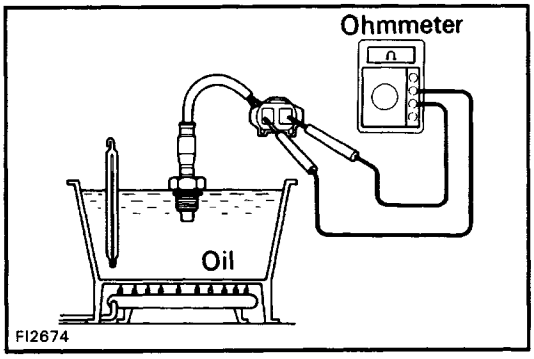
(c) Check that air flows from pipe E to air filter.

If operation is not as specified, replace the VSV.



EGR Gas Temperature Sensor (California Vehicles only)





INSPECTION OF EGR GAS TEMPERATURE SENSOR

INSPECT EGR GAS TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

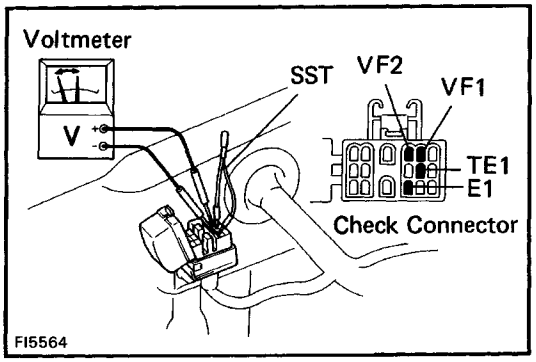
Resistance:

69.40 – 88.50 kΩ at 50˚C (112˚F)

11.89 –14.37 kΩ at 100˚C (212˚F)

2.79 – 3.59 kΩ at 150˚C (302˚F)

If the resistance is not as specified, replace the sensor.



Oxygen Sensors

INSPECTION OF OXYGEN SENSOR

1. WARM UP ENGINE

Allow the engine to reach normal operating temperature.

2. INSPECT FEEDBACK VOLTAGE

Connect the positive (+) probe of a voltmeter to terminal VF1 of the check connector, and negative (–) probe to terminal E1. Perform the test as follows:

Warm up the oxygen sensor with the engine at 2,500 rpm for approx. 120 seconds.

Connect terminals TE1 and E1 of the check connector. And maintain engine speed at 2,500 rpm.

Check the number of times the voltmeter needle fluctuates in 10 seconds.

- Less than 8 times
- 8 times or more
- Zero

Replace the ECU

After replacing the oxygen sensor

Zero again

Warm up the oxygen sensor with the engine at 2,500 rpm for approx. 120 seconds. And maintain engine at 2,500 rpm.

Normal

Check the number of times the voltmeter needle fluctuates in 10 seconds.

- 8 times or more
- Zero
- Less than 8 times

Disconnect terminals TE1 and E1 of the check connector. And maintain engine speed at 2,500 rpm.

Measure voltage between terminals VF1 (VF2) and E1.

- More than 0 V
- 0 V

Read and record diagnostic codes. (See pages FI–24, FI–25)

- Normal code, code Nos. 21, 25, 26 and 28
- Malfunction code(s) (Ex. code Nos. 21, 25, 26 and 28)

Repair the relevant diagnostic code.

① ② ③ ④

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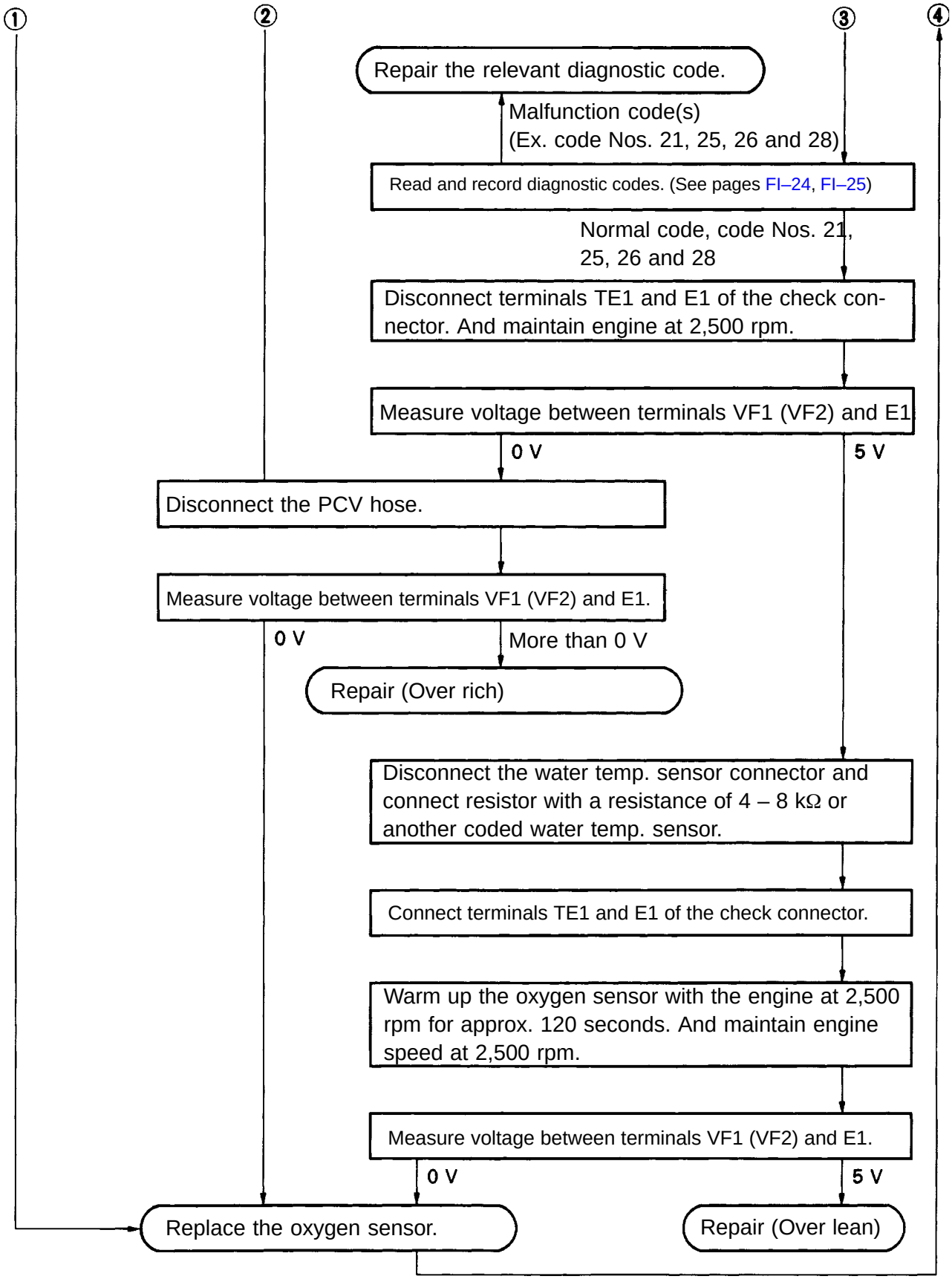
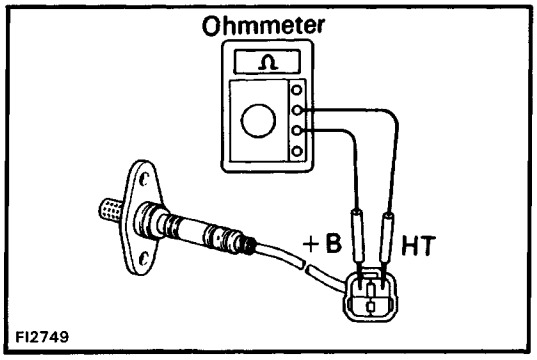
CONTINUED FROM PAGE FI–85



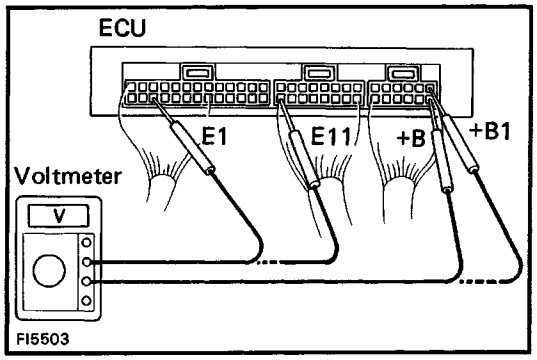


3. INSPECT HEATER RESISTANCE OF OXYGEN SENSOR

Using an ohmmeter, measure the resistance between the terminal +B and HT.

Resistance (Cold): 5.1 – 6.3 Ω

If the resistance is not as specified, replace the sensor.



Electronic Controlled Unit (ECU)

INSPECTION OF ECU

HINT: The EFI circuit can be checked by measuring the resistance and voltage at the wiring connectors of the ECU.

1. INSPECT VOLTAGE OF ECU

Check the voltage between each terminal of the wiring connectors.

- Turn the ignition switch ON.
- Measure the voltage at each terminal.

HINT:

- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is ON.

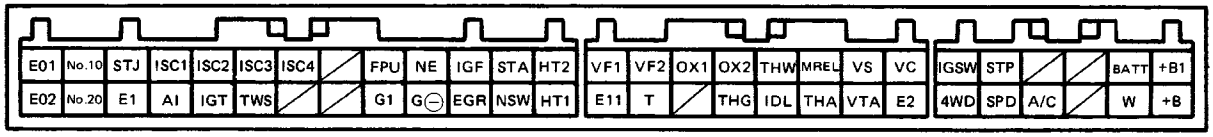
Voltage at ECU Wiring Connectors

Terminals	STD Voltage	Condition	
BATT—E1 (E11)	10 – 14	—	
IG SW—E1 (E11)		Ignition switch ON	
M-REL—E1 (E11)			
+B (+B1)—E1 (E11)			
IDL—E2	4 – 6	Ignition switch ON	Throttle valve open
VC—E2	4 – 6		—
VTA—E2	0.1 – 1.0		Throttle valve fully closed
	3 – 5		Throttle valve fully open
VC—E2	4 – 6	Ignition switch ON	—
VS—E2	4 – 5		Measuring plate fully closed
	0.02 – 0.08		Measuring plate fully open
	2 – 4	Idling	
	0.3 – 1.0	3,000 rpm	

Voltage at ECU Wiring Connectors (Cont'd)

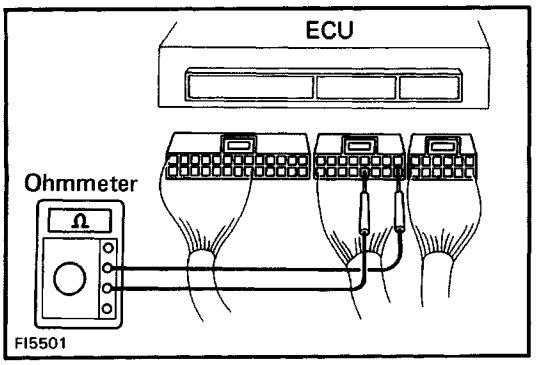
Terminals	STD Voltage	Condition	
THA – E2	1 – 3	Ignition switch ON	Intake air temperature 20˚C (68˚F)
THW – E2	0.1 – 1.0	Ignition switch ON	Coolant temperature 80˚C (176˚F)
No. 10 – E01 No. 20 – E02	10 – 14	Ignition switch ON	
STA – E1 (E11)	6 – 14	Cranking	
ISC1 ≀ ISC4 – E1 (E11)	10 – 14	Ignition switch ON	
IGT – E1 (E11)	0.7 – 1.0	Idling	
W – E1 (E11)	10 – 14	No trouble ("CHECK" engine warning light off) and engine running	
A/C – E1 (E11)	10 – 14	Air conditioning ON	
T – E1 (E11)	4 – 6	Ignition switch ON	Check connector TE1 and E1 not connect
	0		Check connector TE1 and E1 connect
NSW – E1 (E11)	0	Ignition switch ON	Shift position P or N range
	10 – 14		Ex. P or N range
4WD – E1 (E11)	10 – 14	Ignition switch ON	Center difflock switch ON
	0		Center difflock switch OFF
STP – E1 (E11)	10 – 14	Ignition switch ON	Stop light switch ON
	0		Stop light switch OFF

ECU Terminals



* California vehicles only

FI4786



2. INSPECT RESISTANCE OF ECU

NOTICE:

- **Do not touch the ECU terminals.**
- **The tester probe should be inserted into the wiring connector from the wiring side.**

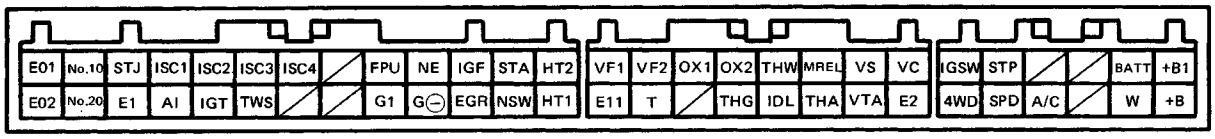
Check the resistance between each terminal of the wiring connectors.

- Disconnect the connectors from the ECU.
- Measure the resistance at each terminal.

Resistance of ECU Wiring Connectors

Terminals	Condition	Resistance (Ω)
IDL – E2	Throttle valve open	∞
	Throttle valve fully closed	Less than 2,300
VTA – E2	Throttle valve fully open	3,500 – 10,300
	Throttle valve fully closed	300 – 6,300
VC – E2	Air flow meter connector disconnected	4,250 – 8,250
VC – E2	Throttle position sensor connector disconnected	200 – 400
VS – E2	Measuring plate fully closed	20 – 600
	Measuring plate fully open	200 – 3,000
THA – E2	Intake air temperature 20°C (68°F)	2,000 – 1,200
THW – E2	Coolant temperature 80°C (176°F)	200 – 400
G1 – G⊖	Cold	185 – 265
NE – G⊖	Cold	
ISC1, ISC2 ISC3, ISC4 – +B		10 – 30

ECU Terminals



* California vehicles only

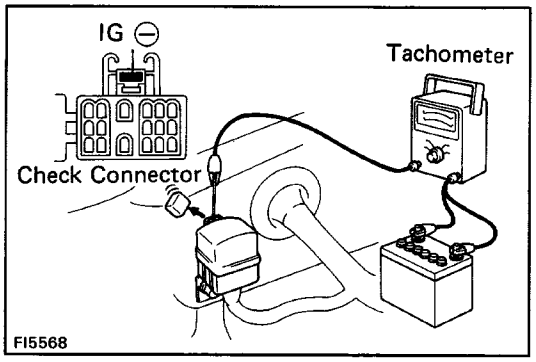
FI4786

Fuel Cut RPM

FUEL CUT RPM INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temper–ature.



2. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IG (–) of the check connector.

NOTICE:

- **Never allow the tachometer terminal to touch ground as it could result in damage to the ignniter and/or igni–tion coil.**
- **As some tachometers are not compatible with this ig–nition system, we recommend that you confirm the compatibility of yours before use.**

3. INSPECT FUEL CUT OPERATION

(a) Increase the engine speed to at least 2,500 rpm.
(b) Check for injector operating sound.
(c) Check that when the throttle lever is released, injec–tor operation sound stops momentarily and then re–sumes.

HINT:

- **The vehicle should be stopped.**
- **Accessories switched OFF.**

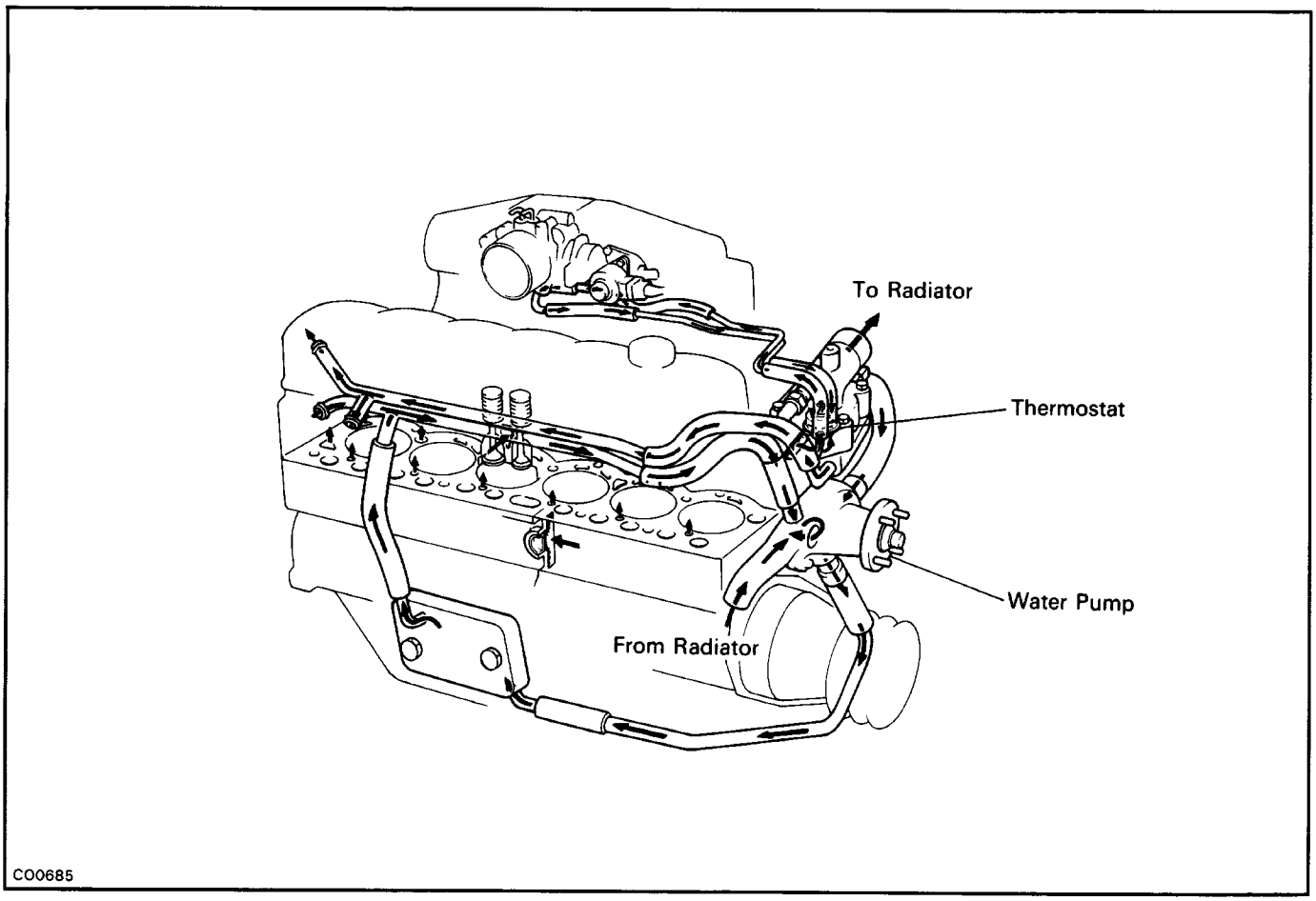
Fuel return rpm:
1,000 rpm

4. REMOVE TACHOMETER

COOLING SYSTEM

DESCRIPTION

This engine utilizes a pressurized water forced circulation cooling system which includes a thermostat mounted on the outlet side.



The cooling system is composed of the water jacket (inside the cylinder block and cylinder head), radiator, water pump, thermostat, cool–ing fan, hoses and other components.
Coolant which is heated in the water jacket is pumped to the radiator, through which cooling fan blows air to cool the coolant as it passes through. Coolant which has been cooled is then sent back to the engine by the water pump, where it cools the engine.
The water jacket is a network of channels in the shell of the cylinder block and cylinder head through which coolant passes. It is designed to provide adequate cooling of the cylinders in the combustion chambers which become the hottest during engine operation.

RADIATOR

The radiator performs the function of coolant, the coolant which has passed through the water jacket and become hot, and is mounted in the front of the vehicle. The radiator consists of an upper and lower tank, and a core which connects the two tanks. The upper tank contains the inlet for coolant from the water jacket and the filler in–let. It also has a hose attached through which ex–cess coolant or steam can flow. The lower tank contains the outlet for coolant and the drain cock. The core contains many tubes through which coolant flows from the upper tank to the lower tank as well as cooling fins which radiate heat away from the coolant in the tubes. The air sucked through the radiator by the cooling fan, as well as the wind generated by the vehicle's travel, passes through the radiator, cooling it. An automatic transmission fluid cooler is built into the lower tank of the radiator. A cooling fan with fluid coupling is mounted behind the radiator to assist the flow of air through the radiator.

When the temperature of the air passing through the radiator is low, the cooling fan reduces the fan speed i n order to quickly warm up the engine coolant. At high air temperatures, the fan speed is increased to reduce coolant temperature.

RADIATOR CAP

The radiator cap is a pressure type cap which seals the radiator, resulting in pressurization of the radiator as the coolant expands. The pressurization prevents the coolant from boiling even when the coolant temperature exceeds 100˚C (212˚F). A relief valve (pressurization valve) and a vacuum valve (negative pressure valve) are built into the radiator cap. The relief valve opens and lets steam escape through the overflow pipe when the pressure generated inside the coolant system exceeds the limit (coolant temperature: 100 – 120˚C, 230 – 248˚F, pressure; 29.4 – 98.1 kPa, 0.3 –1.0 kgf/cm^2, 4.3 – 14.2 psi). The vacuum valve opens to alleviate the vacuum which develops in the coolant system after the engine is stopped and the coolant temperature drops. The valve's opening allows the pressure in the cooling system to return to the coolant in the reservoir tank.

RESERVOIR TANK

The reservoir tank is used to catch coolant which overflows the cooling system as a result of volumetric expansion when the coolant is heated. The coolant in the reservoir tank returns to the radiator when the coolant temperature drops, thus keeping the radiator full at all times and avoiding needless coolant loss. Check the reservoir tank level to see if the coolant needs to be replenished.

WATER PUMP

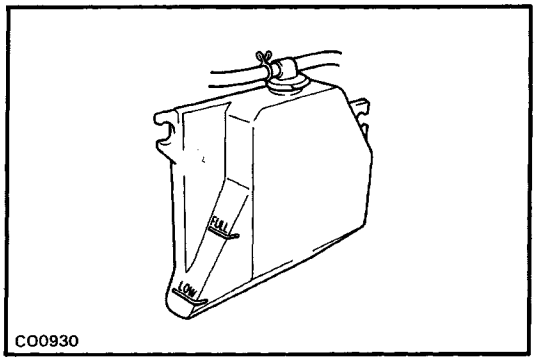
The water pump is used for forced circulation of coolant through the cooling system. It is mounted on the front of the cylinder block and driven by a V belt.

THERMOSTAT

The thermostat is a wax type and is mounted in the water outlet housing. The thermostat includes a type of automatic valve operated by fluctuations in the coolant temperature. This valve closes when the coolant temperature drops, preventing the circulation of coolant through the engine and thus permitting the engine to warm up rapidly. The valve opens when the coolant temperature has risen, allowing the circulation of coolant. Wax inside the thermostat expands when it is heated and contracts when it is cooled. Heating the wax thus generates pressure which overpowers the force of the spring which keeps the valve closed, thus opening the valve. When the wax cools, its contraction causes the force of the spring to take effect once more, closing the valve. The thermostat in this engine operates a temperature of 88˚C (191˚F).

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine overheats	Fan belt loose or missing	Adjust or replace belt	CH–3
	Dirt, leaves or insects on radiator or condenser	Clean radiator or condenser	
	Hoses, water pump, thermostat housing, radiator, heater, core plugs or head gasket leakage	Repair as necessary	
	Thermostat faulty	Check thermostat	CO–11
	Ignition timing retarded	Set timing	IG–11
	Fluid coupling faulty	Replace fluid coupling	
	Radiator hose plugged or rotted	Replace hose	
	Water pump faulty	Replace water pump	CO–6
	Radiator plugged or cap faulty	Check radiator	CO–13
	Cylinder head or block cracked or plugged	Repair as necessary	

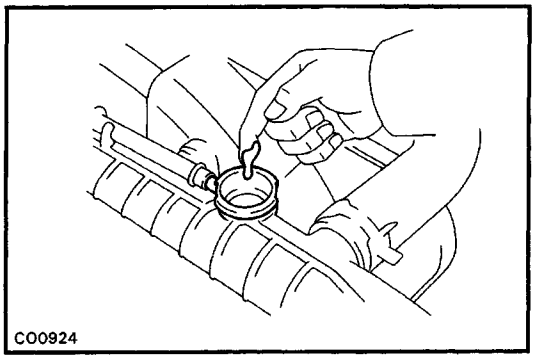


CHECK AND REPLACEMENT OF ENGINE COOLANT

1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR TANK

The coolant level should be between the ”LOW” and ”FULL” lines.

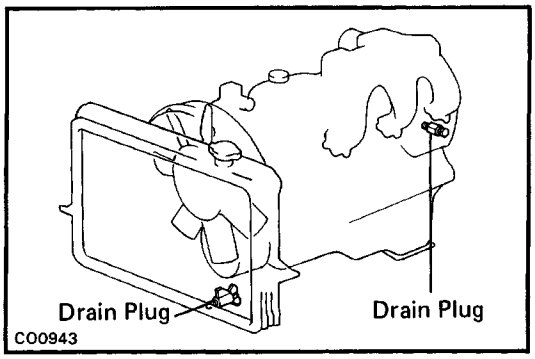
If low, check for leaks and add coolant up to the ”FULL” line.



2. CHECK ENGINE COOLANT QUALITY

There should not be any excessive rust deposits or scales around the radiator cap or radiator filler hole, and the coolant should be free from oil.

If excessively dirty, replace the coolant.



3. REPLACE ENGINE COOLANT

(a) Remove the radiator cap.

(b) Drain the coolant from the radiator and engine drain plugs.

(c) Close the drain plugs.

Torque (Engine drain plugs):
44 N–m (450 kgf–cm, 33 ft–lbf)

(d) Fill the system with coolant.

Use a good brand of ethylene–glycol base coolant, mixed according to the manufacturer’s directions. Using coolant which includes more than 50% ethylene–glycol (but not more than 70%) is recom–mended.

NOTICE:

- **Do not use alcohol type coolant.**
- **The coolant should be mixed with demineralized water or distilled water.**

Capacity:
w/ Front heater
17.5 liters (18.5 US qts, 15.4 Imp. qts)
w/ Front and rear heaters
19.5 liters (20.6 US qts, 17.2 Imp. qts)

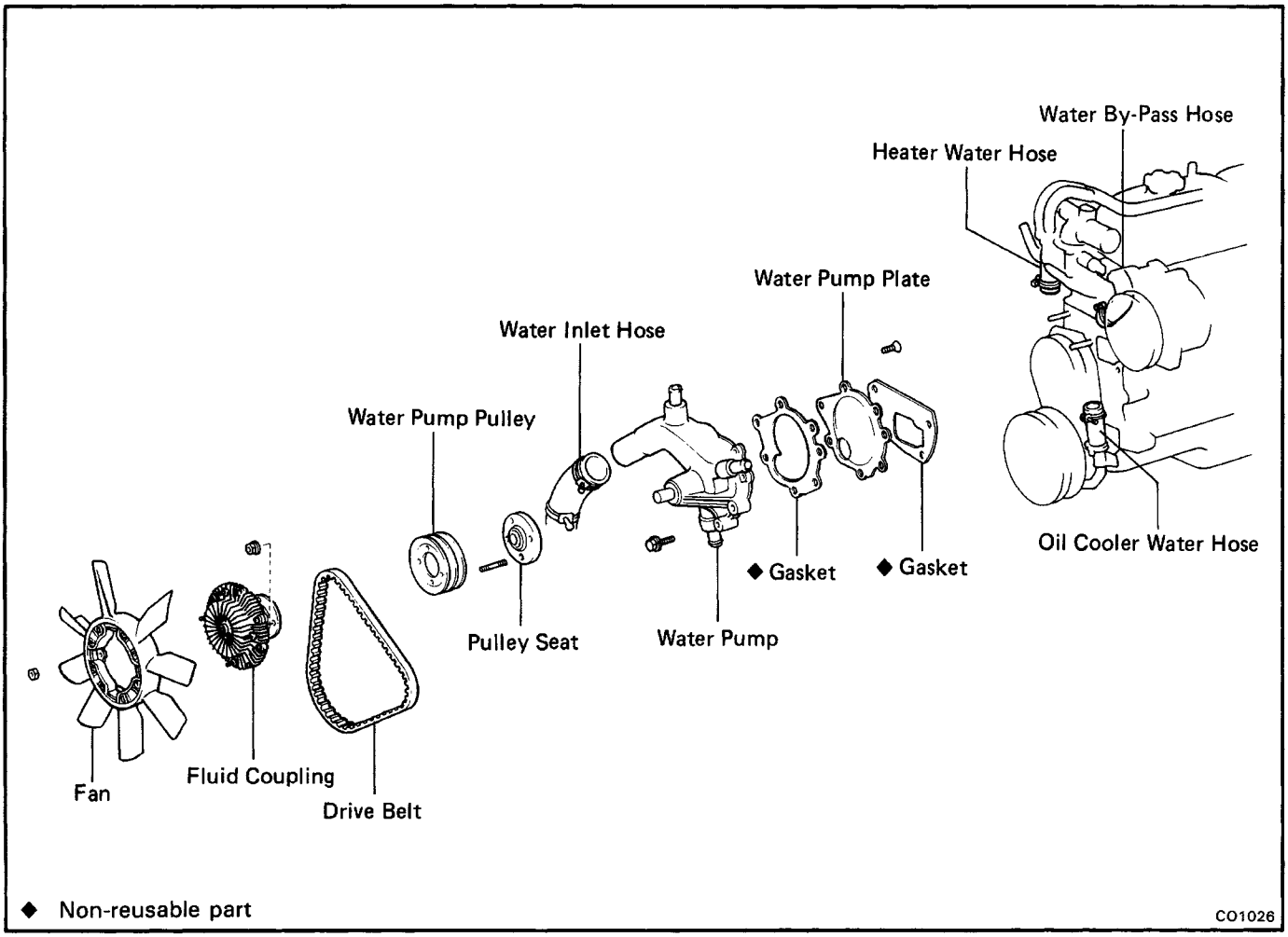
(e) Install the radiator cap.

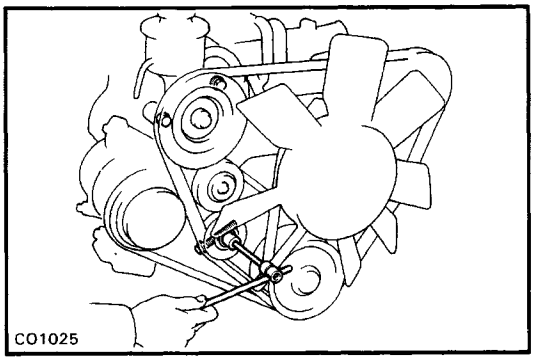
(f) Start the engine and check for leaks.

(g) Recheck the coolant level and refill as necessary.

WATER PUMP

COMPONENTS





REMOVAL OF WATER PUMP

1. DRAIN ENGINE COOLANT (See page CO–5)

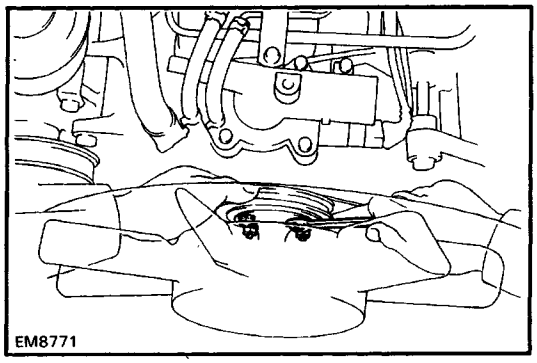
2. REMOVE PS DRIVE BELT

Loosen the PS mount, idler pulley and adjusting bolts, and remove the drive belt.

3. DISCONNECT COOLANT RESERVOIR HOSE

4. DISCONNECT RADIATOR INLET HOSE

5. REMOVE FAN SHROUD BOLTS



6. REMOVE ALTERNATOR DRIVE BELT, FAN, FLUID COUPLING AND WATER PUMP PULLEY

(a) Remove the four nuts holding the fluid coupling to the pulley seat.

(b) Loosen the alternator adjusting lock bolt, adjusting bolt, pivot bolt and nut, and remove the drive belt.

(c) Pull out the fan and fluid coupling with the fan shroud.

(d) Remove the fan from the fluid coupling.

7. REMOVE ALTERNATOR (See page CH–6)

8. REMOVE A/C DRIVE BELT

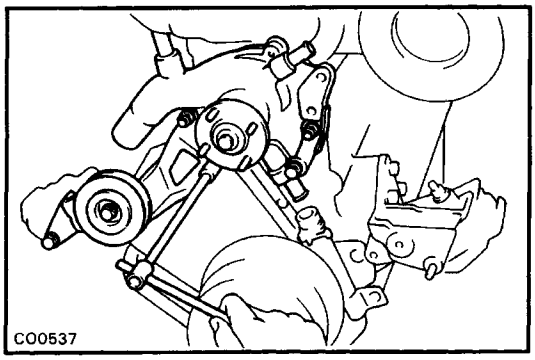
9. DISCONNECT HOSES FROM WATER PUMP

(a) Water inlet hose

(b) Water by–pass hose

(c) Heater water hose

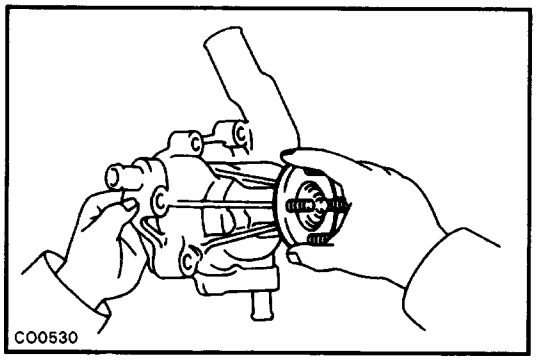
(d) Oil cooler water hoses



10. REMOVE WATER PUMP, PS IDLER PULLEY WITH BRACKET ASSEMBLY AND ALTERNATOR STAY BRACKET

(a) Remove the bolt, two nuts and PS idler pulley with bracket assembly.

(b) Remove the bolt, nut, alternator stay bracket, water pump and gasket.

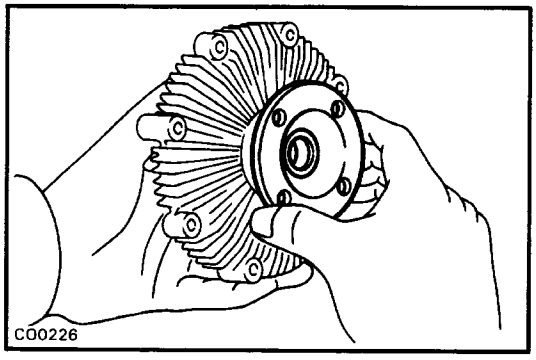


INSPECTION OF WATER PUMP COMPONENTS

1. INSPECT WATER PUMP

Turn the pulley seat and check that the water pump bearing is not rough or noisy.

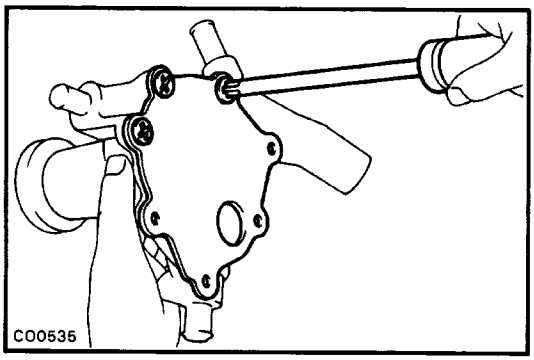
If necessary, replace the water pump.



2. INSPECT FLUID COUPLING

Check that the fluid coupling is not damaged and that no silicon oil leaks.

If necessary, replace the fluid coupling.

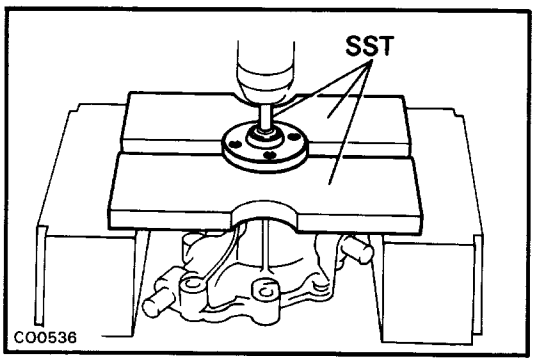


DISASSEMBLY OF WATER PUMP

(See page CO–6)

1. REMOVE WATER PUMP PLATE

Remove the three screws, plate and gasket.

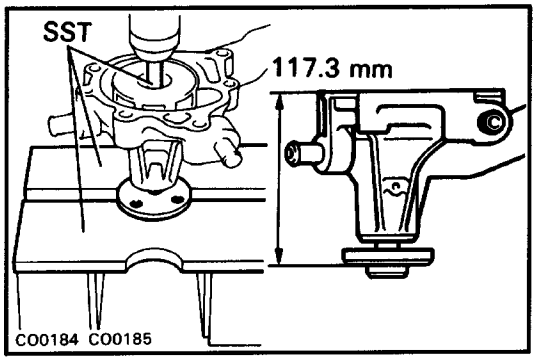


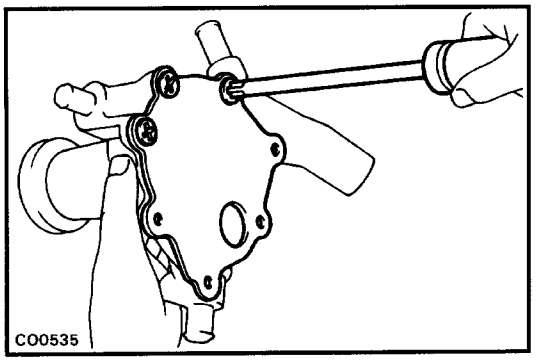
2. REMOVE PULLEY SEAT

(a) Remove the stud bolts.

(b) Using SST and a press, press the shaft of the bearing and remove the pulley seat.

SST 09236–00101 (09237–00010, 09237–00050)





ASSEMBLY OF WATER PUMP

(see page CO–6)

1. INSTALL WATER PUMP SEAT

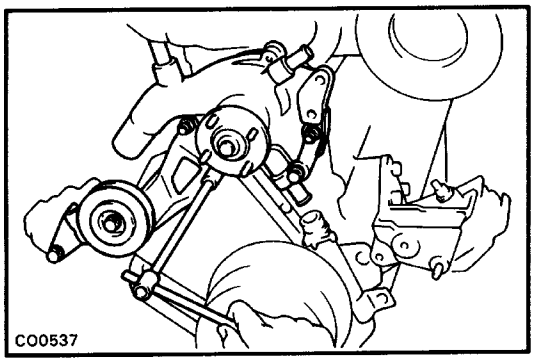
(a) Using SST and a press, press the shaft of the bearing and install the pulley seat to a distance specified below from the water pump body edge.
SST 09236–00101 (09237–00010, 09237–00050)

Distance: 117.3 mm (4.618 in.)

(b) Install the stud bolts.

2. INSTALL WATER PUMP PLATE

Install a new gasket and the water pump plate with the three screws.



INSTALLATION OF WATER PUMP

(see page CO–6)

1. INSTALL WATER PUMP, PS IDLER PULLEY WITH BRACKET ASSEMBLY AND ALTERNATOR STAY BRACKET

(a) Temporarily install a new gasket, the water pump and alternator stay bracket with the bolt and nut.

(b) Temporarily install the PS idler pulley with bracket assembly with the bolt and nuts.

(c) Torque the water pump mounting bolt and nuts.

Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)

2. INSTALL AND ADJUST A/C DRIVE BELT

(See page MA–4)

3. CONNECT HOSES TO WATER PUMP

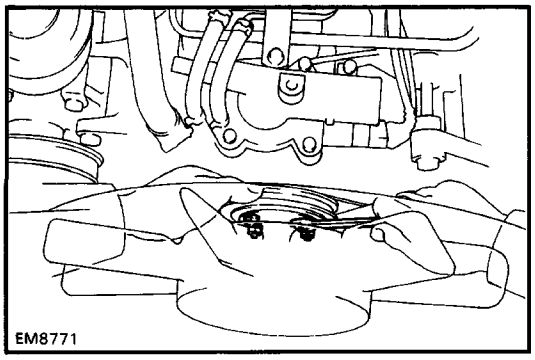
(a) Water inlet hose

(b) Water by–pass hose

(c) Heater water hose

(d) Oil cooler water hose

4. INSTALL ALTERNATOR (See page CH–14)



5. INSTALL WATER PUMP PULLEY, FLUID COUPLING, FAN AND ALTERNATOR DRIVE BELT

(a) Install fan to the fluid coupling.

(b) Place the fan shroud together with the fluid coupling in the position.

(c) Install the water pump pulley and fluid coupling with the four nuts.

(d) Place the drive belt onto each pulley.

(e) Stretch the belt tight and tighten the four nuts.

(f) Adjust the water pump drive belt tension. (See page MA–4)

6. INSTALL FAN SHROUD BOLTS

7. CONNECT RADIATOR INLET HOSE

8. CONNECT COOLANT RESERVOIR HOSE

9. INSTALL AND ADJUST PS DRIVE BELT (See page MA–4)

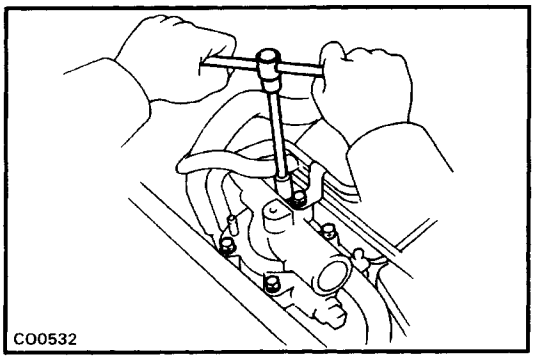
10. FILL WITH ENGINE COOLANT (See page CO–5)

11. START ENGINE AND CHECK FOR LEAKS

THERMOSTAT

REMOVAL OF THERMOSTAT

1. DRAIN ENGINE COOLANT (See page CO–5)
2. DISCONNECT RADIATOR INLET AND WATER BY–PASS HOSES FROM WATER OUTLET
3. DISCONNECT TWO VACUUM HOSES OF BVSV
4. DISCONNECT COLD START INJECTOR TIME SWITCH AND WATER TEMPERATURE SWITCH CONNECTORS
5. REMOVE WATER OUTLET



(a) Remove the clamp bolt of ISC water by–pass pipe.
(b) Remove the four bolts, water outlet and gasket.

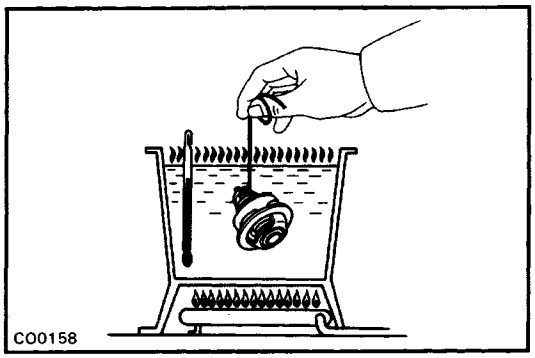
6. REMOVE THERMOSTAT

INSPECTION OF THERMOSTAT

INSPECT THERMOSTAT

HINT: The thermostat is numbered with the valve opening temperature.

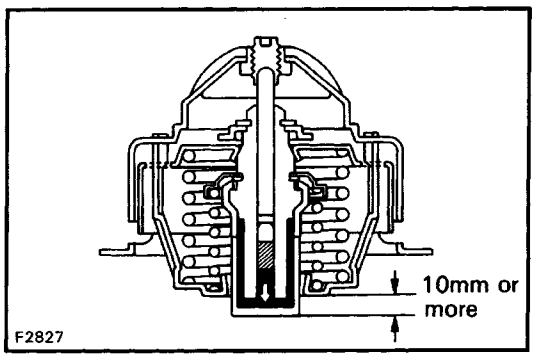
(a) Immerse the thermostat in water and gradually heat the water.



(b) Check the valve opening temperature.
Valve opening temperature: 86 – 90˚C (187 –194˚F)

If the valve opening temperature is not within specification, replace the thermostat.

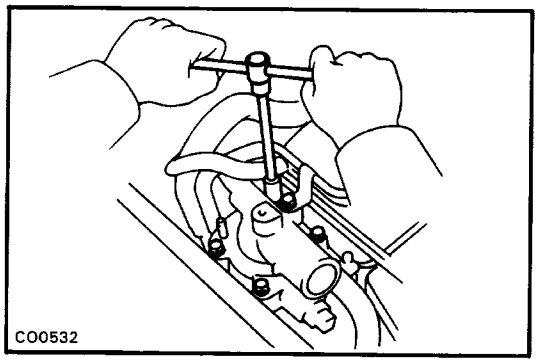
(c) Check the valve lift.
Valve lift:
10 mm (0.39 in.) or more at 100˚C (212˚F)



If the valve lift is less than specification, replace the thermostat.

(d) Check that the valve spring is tight when the thermostat is fully closed.

If necessary, replace the thermostat.



INSTALLATION OF THERMOSTAT

1. PLACE THERMOSTAT IN WATER OUTLET HOUSING

2. INSTALL WATER OUTLET

(a) Install a new gasket and the water outlet with the four bolts. Torque the bolts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

(b) Install the clamp bolt of ISC water by–pass pipe.

3. CONNECT COLD START INJECTOR TIME SWITCH AND WATER TEMPERATURE SWITCH CONNECTORS

4. CONNECT TWO VACUUM HOSES OF BVSV

5. CONNECT RADIATOR INLET AND WATER BY–PASS HOSES

6. FILL WITH ENGINE COOLANT (See page CO–5)

7. START ENGINE AND CHECK FOR LEAKS

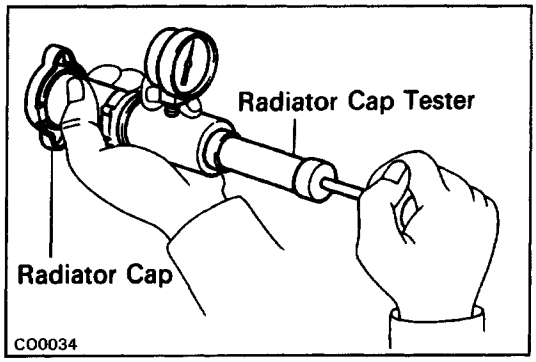
RADIATOR

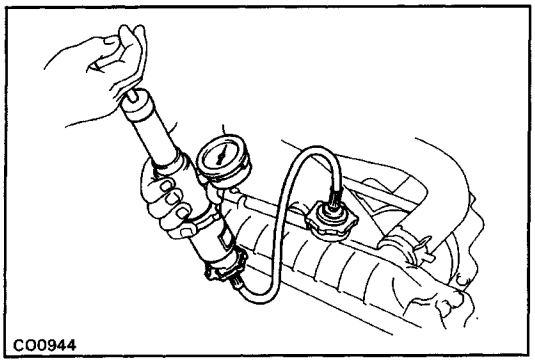
CLEANING OF RADIATOR

CLEAN RADIATOR

Using water or steam cleaner, remove any mud and dirt from the radiator core.

NOTICE: If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. If the cleaner nozzle pressure is 2,942 – 3,432 kPa (30 – 35 kgf/cm^2, 427 – 498 psi), keep a distance of at least 40 – 50 cm (15.75 – 19.69 in.) between the radiator core and cleaner nozzle.





INSPECTION OF RADIATOR

1. INSPECT RADIATOR CAP

Using a radiator cap tester, pump the tester until the relief valve opens. Check that the valve opens between 74 kPa (0.75 kgf/cm^2, 10.7 psi) and 103 kPa (1.05 kgf/cm^2, 14.9 psi).

Check that the pressure does not drop rapidly when pressure on the cap is below 59 kPa (0.6 kgf/cm^2, 8.5 psi).

If either check is not within limits, replace the cap.

2. INSPECT COOLING SYSTEM FOR LEAKS

(a) Fill the radiator with coolant and attach a radiator cap tester

(b) Warm up the engine.

(c) Pump it to 118 kPa (1.2 kgf/cm^2, 17 psi), check that pressure does not drop.

If the pressure drops, check for leaks from the hoses, radiator or water pump. If no external leaks are found, check the heater core, block and head.

REMOVAL OF RADIATOR

1. DRAIN ENGINE COOLANT
(See page CO–5)

2. REMOVE RADIATOR GRILLE

3. REMOVE ENGINE UNDER COVER

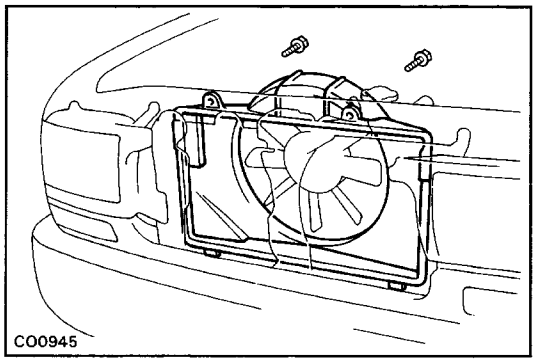
4. REMOVE BATTERY AND CASE

5. REMOVE RADIATOR RESERVOIR TANK

6. DISCONNECT RADIATOR INLET HOSE

7. REMOVE PS AND A/C BELT

8. REMOVE FAN SHROUD AND COOLING FAN wI FLUID COUPLING


CO0945

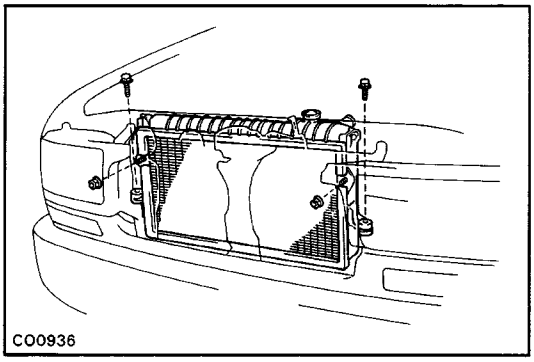
(a) Remove the alternator drive belt, fan w/ fluid coupling and water pump pulley.
(See step 6 on page CO–7)

(b) Remove the two bolts and fan shroud.

9. DISCONNECT RADIATOR OUTLET HOSE

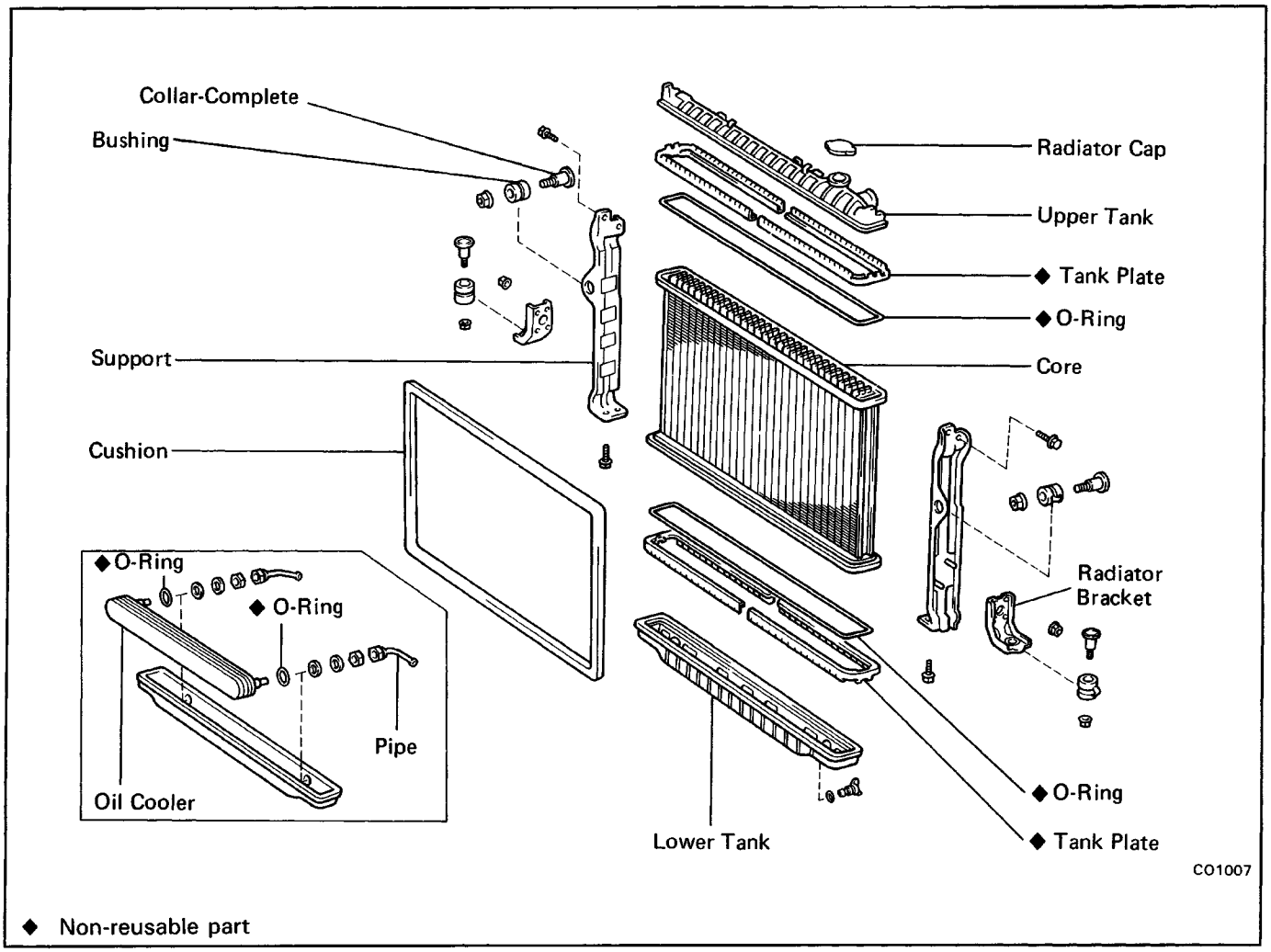
10. DISCONNECT A/T OIL COOLER HOSES

HINT: Be careful as some oil will leak out. Catch it in a suitable container.

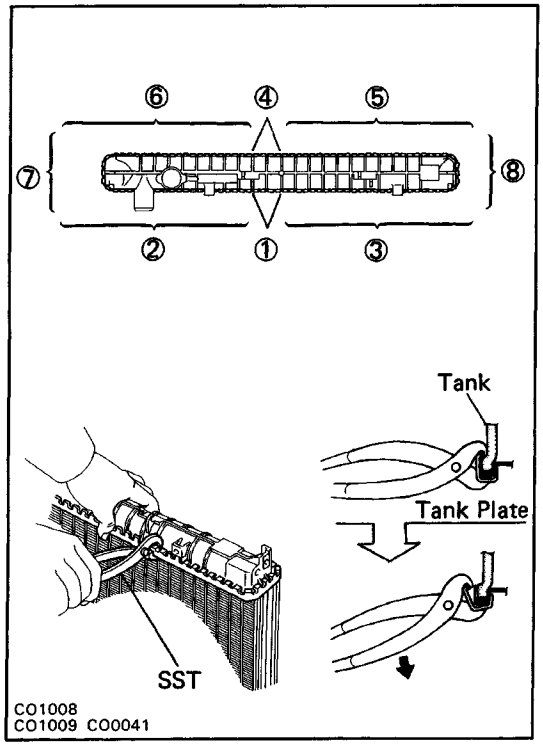

CO0936

11. REMOVE RADIATOR MOUNTING BOLTS, NUTS AND RADIATOR

DISASSEMBLY OF RADIATOR COMPONENTS



◆ Non-reusable part

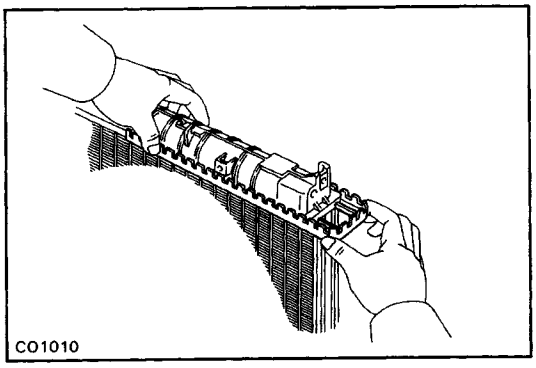


1. REMOVE TANK PLATE

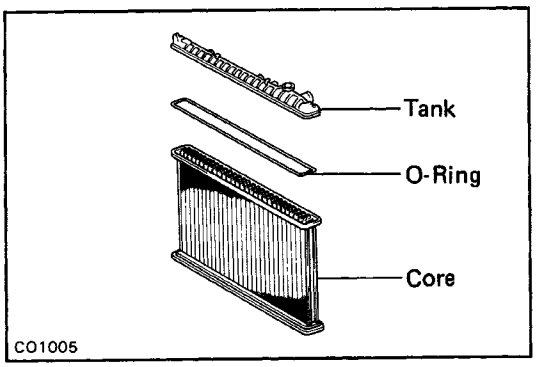
(a) Remove the eight bolts and two supports.

(b) Raise the claws of the tank plates with SST in the numerical order shown in the figure.
SST 09230–00010

HINT: Be careful not to damage the core plate.



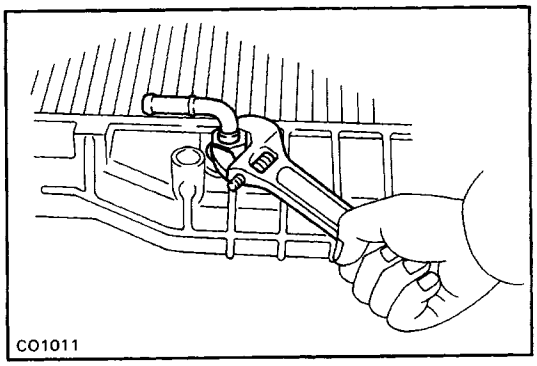
(c) Pull the tank plates outward.



2. REMOVE TANK

(a) Pull the tank upward.

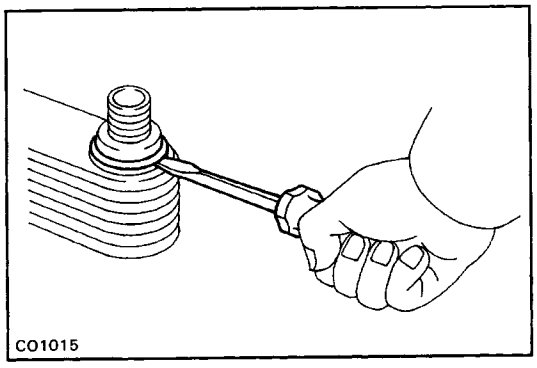
(b) Remove the O–ring.



3. REMOVE OIL COOLER FROM LOWER TANK

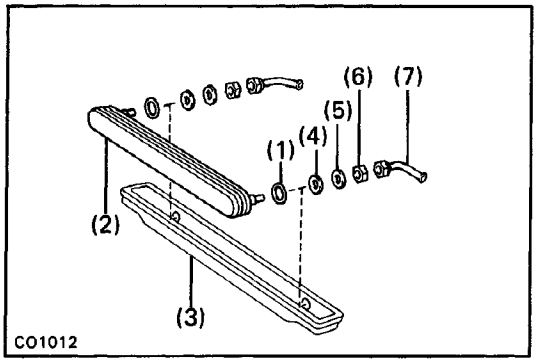
(a) Remove the pipes.

HINT: Make a note of the direction the pipes face.



(b) Remove the nuts, spring washers, plate washer: and oil cooler.

(c) Remove the O–ring from the oil cooler.



ASSEMBLY OF RADIATOR

(See page CO–15)

1. INSTALL OIL COOLER TO LOWER TANK

(a) Clean the O–ring contact surface of the lower tank and oil cooler.

(b) Install new O–rings (1) to the oil cooler (2).

(c) Install the oil cooler (2) to the lower tank (3).

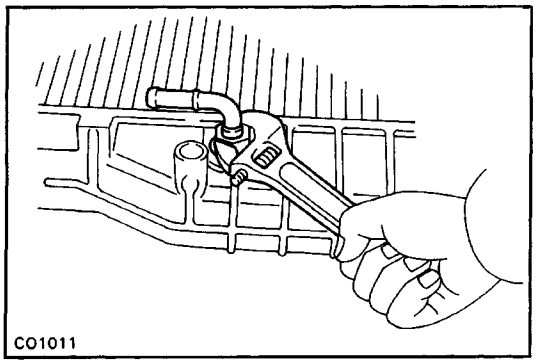
(d) Install the plate washers (4), spring washers (5) and nuts (6). Torque the nuts.

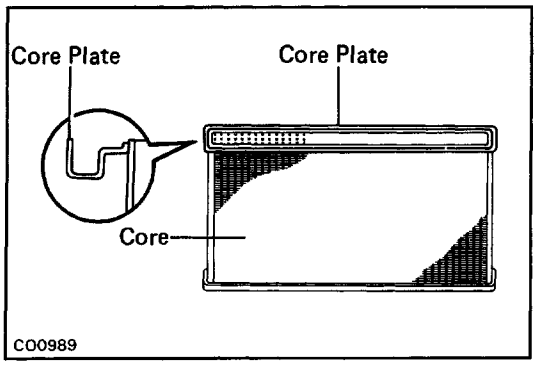
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

(e) Install the pipes (7).

Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)

HINT: Face the pipes in the same direction as they were before disassembly.

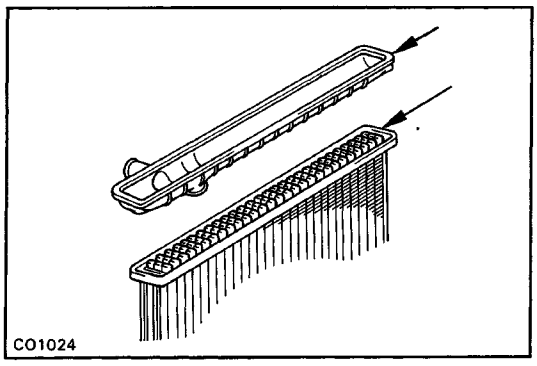




2. CHECK CORE PLATE FOR DAMAGE

HINT:

- If the sides of the core plate groove are deformed, re–assembly of the tank will be impossible. Therefore, first correct any deformation with pliers.
- Water leakage will result if the bottom of the core plate groove is damaged or dented. Therefore, repair or re–place if necessary.

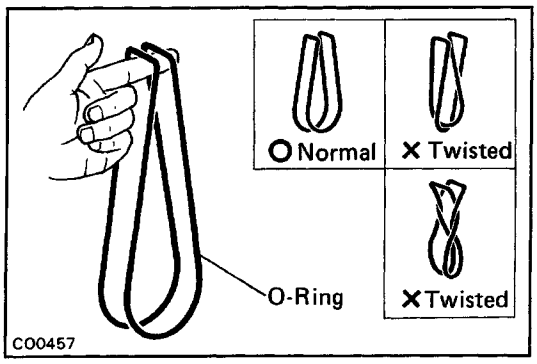


3. INSTALL TANK

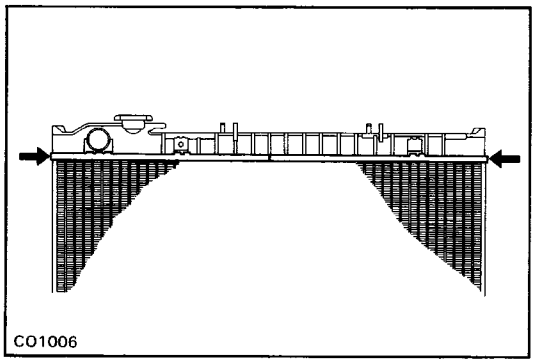
Install a new O–ring and the tank.

HINT:

- Clean the tank and core plate.

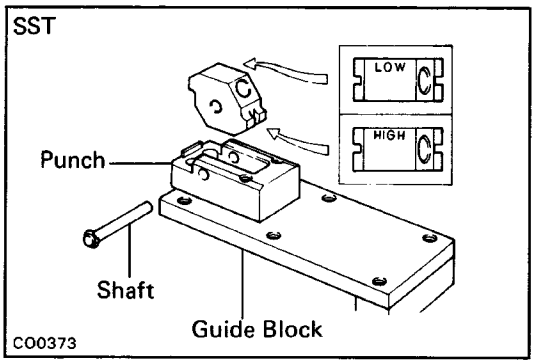


- Take out any twists.



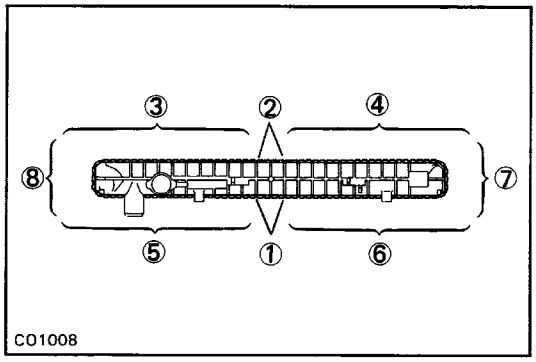
4. INSTALL TANK PLATE

Insert new tank plates from both ends in the direction of the arrows. Firmly set the tank plates in the core plate.

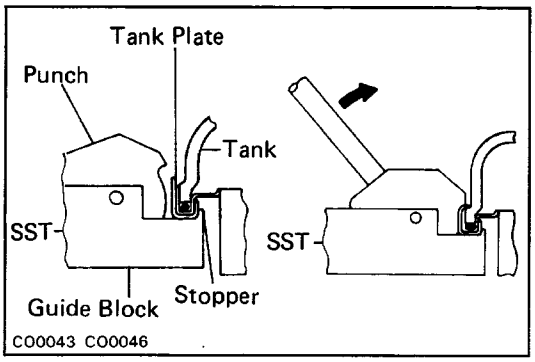


5. STAKE CLAWS OF TANK PLATES

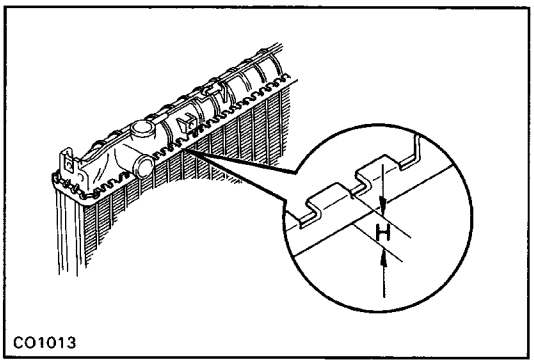
(a) Set the punch of SST to ”LOW”.
SST 09230–00010



(b) Stake the claws of the tank plates with SST in the numerical order shown in the figure.

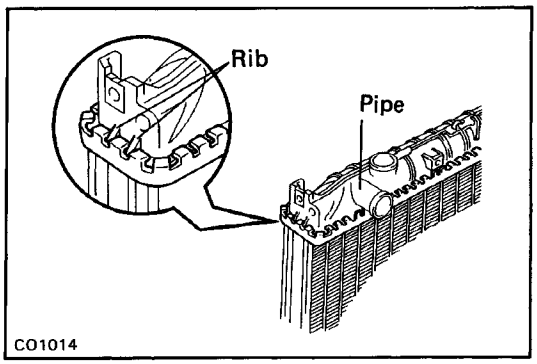


NOTICE: If the bottom of the core plate is staked with the SST on the guide block stopper, it may result in water leakage.

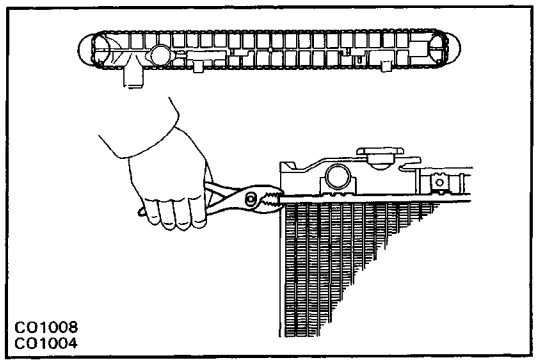


HINT:

- Stake with just enough pressure to leave a mark on the claw. The staked plate height (H) should be as follows:
  Plate height (H):
  9.2 – 9.6 mm (0.362 – 0.378 in.)

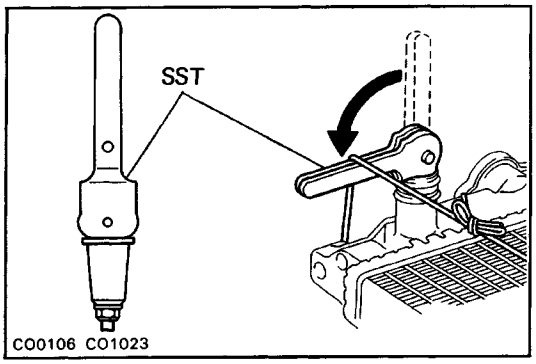


- Do not stake the areas protruding around the pipes, brackets or tank ribs.



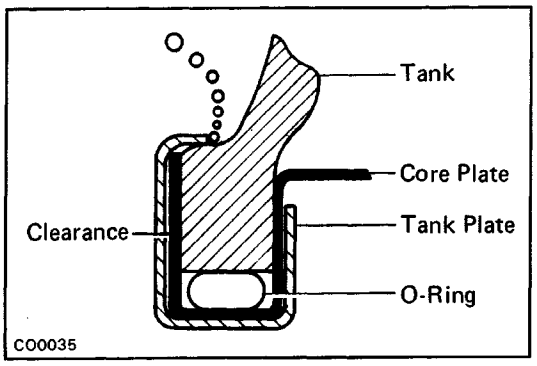
- The points shown in the illustration cannot be staked with the SST. Use pliers and be careful not to damage the core plates.

(c) Install the two supports with the eight bolts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



6. CHECK FOR WATER LEAKS

(a) Tighten the drain plug.
(b) Plug the inlet and outlet pipes of the radiator with SST.
SST 09230–00010
(c) Using a radiator cap tester, apply pressure to the radiator.
Test pressure: 147 kPa (1.5 kgf/cm^2, 21 psi)

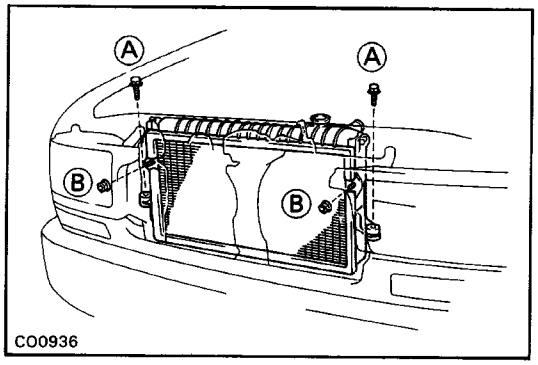


(d) Check for water leaks.

HINT: On radiators with resin tanks, there is a clearance between the core plate and tank plate where a minute amount of air will remain, giving the appearance of an air leak when the radiator is submerged in water. Therefore, before performing the water leak test,first swirl the radiator around in the water until all air bubbles disappear.

7. PAINT TANK PLATE

HINT: If the water leak test checks out okay, allow the radiator to completely dry and then paint the tank plate.



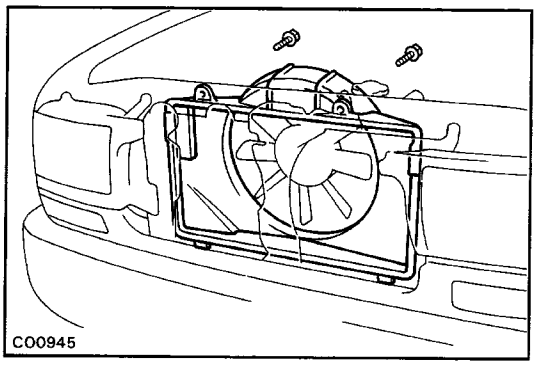
INSTALLATION OF RADIATOR

1. INSTALL RADIATOR

Torque: (A) 18 N–m (185 kgf–cm, 13 ft–lbf)
(B) 12 N–m (120 kgf–cm, 9 ft–lbf)

2. CONNECT A/T OIL COOLER

3. CONNECT RADIATOR OUTLET HOSE



4. INSTALL COOLING FAN w/ FLUID COUPLING AND FAN SHROUD

(a) Install the fan shroud with the two bolts.

(b) Install the water pump pulley, fan w/fluid coupling and alternator drive belt.
(See step 5 on page CO–10)

5. INSTALL PS AND A/C BELT

6. CONNECT RADIATOR INLET HOSE

7. INSTALL RADIATOR RESERVOIR TANK

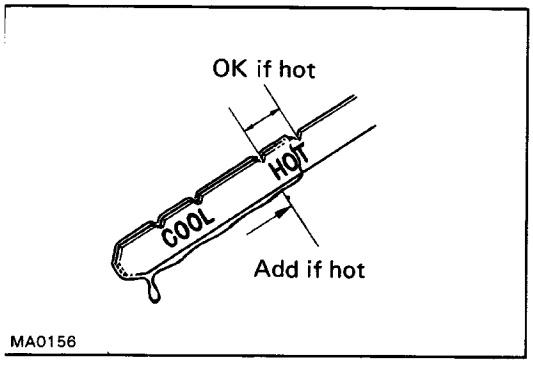
8. INSTALL BATTERY CASE AND BATTERY

9. INSTALL ENGINE UNDER COVER

10. INSTALL RADIATOR GRILLE

11. FILL WITH ENGINE COOLANT
(See page CO–5)

12. START ENGINE AND CHECK FOR LEAKS



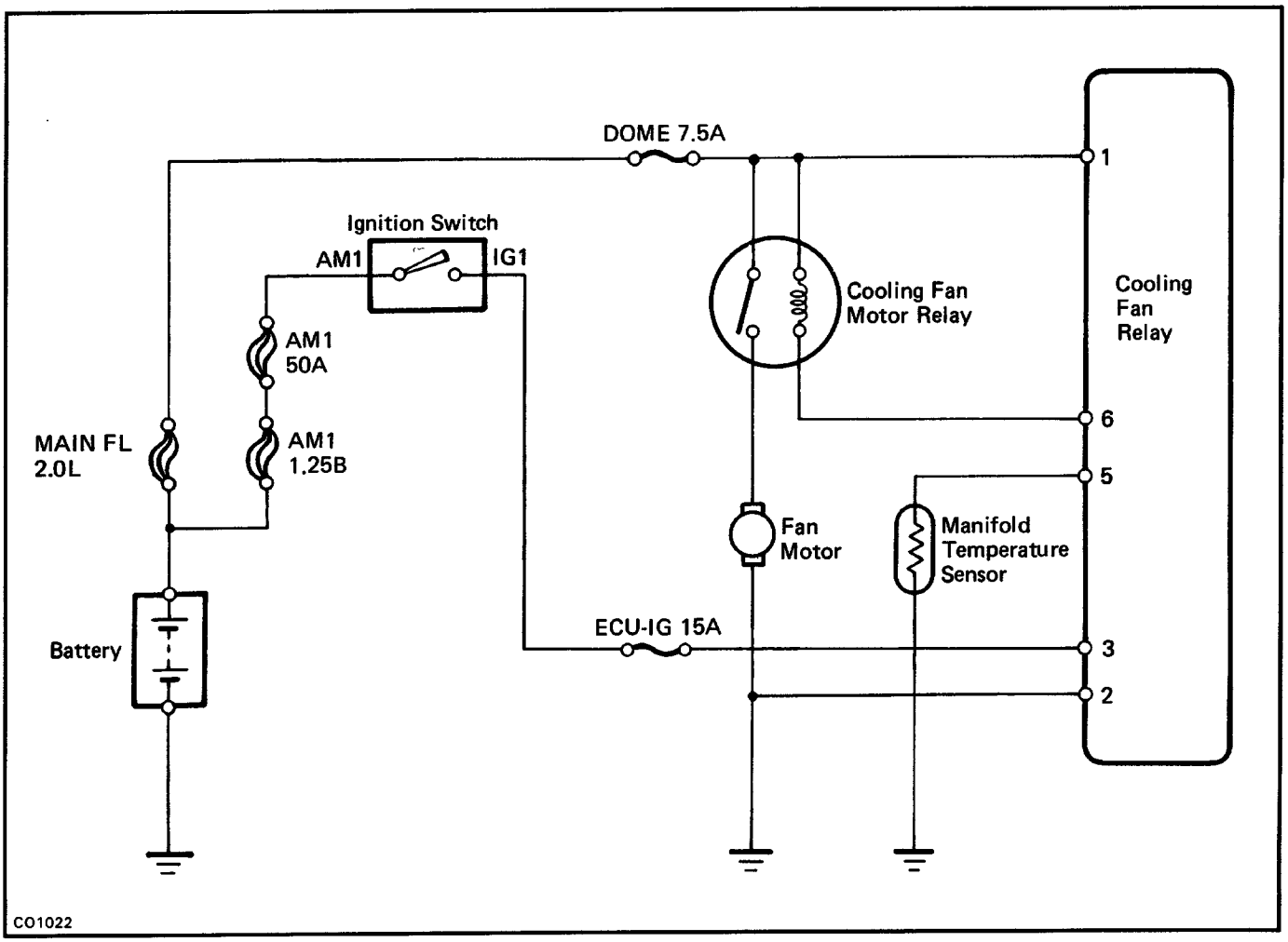
13. CHECK AUTOMATIC TRANSMISSION FLUID LEVEL

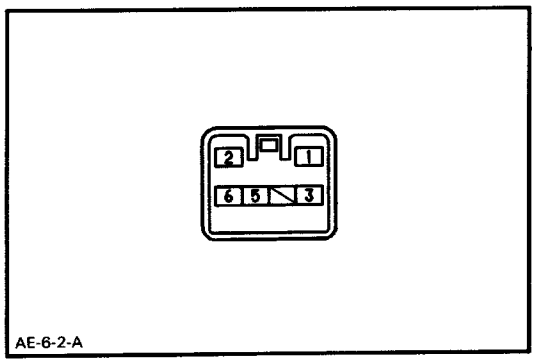
Fluid type: ATF DEXRON® II

NOTICE : Do not overfill.

ENGINE COMPARTMENT COOLING FAN

ENGINE COMPARTMENT COOLING FAN CIRCUIT





INSPECTION OF ENGINE COMPARTMENT COOLING FAN COMPONENTS

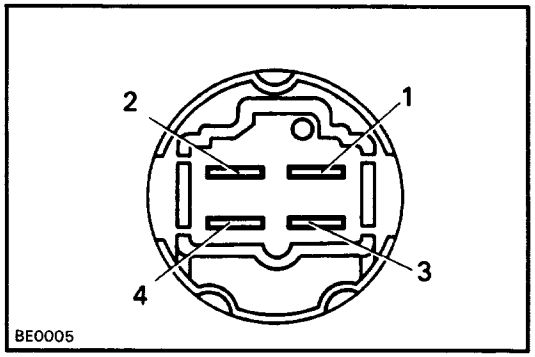
Cooling Fan Relay

INSPECT COOLING FAN RELAY CIRCUIT

(a) Remove the RH cowl side trim.

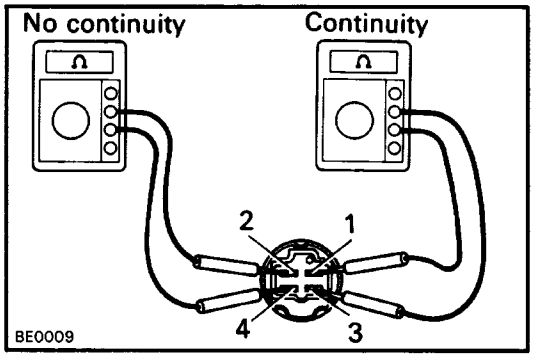
(b) Disconnect the relay connector and inspect the con–nector on wire harness side as shown in the below chart.

Check for	Between terminals	Condition	Specified value
Continuity	5 – Body ground	Always	Continuity
Voltage	3 – Body ground	Ignition switch ON	Battery voltage
Continuity	2 – Body ground	Always	Continuity
Voltage	1 – Body ground	Always	Battery voltage
Voltage	6 – Body ground	Fan motor does not operate	Battery voltage



Cooling Fan Motor Relay

LOCATION: Inside of the driver's cowl side trim.



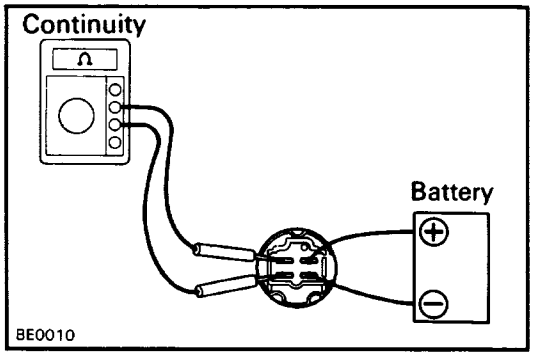
INSPECT COOLING FAN MOTOR RELAY

A. Inspect relay continuity

(a) Check that there is continuity between terminals 1 and 3.

(b) Check that there is no continuity between terminals 2 and 4.

If continuity is not as specified, replace the relay.

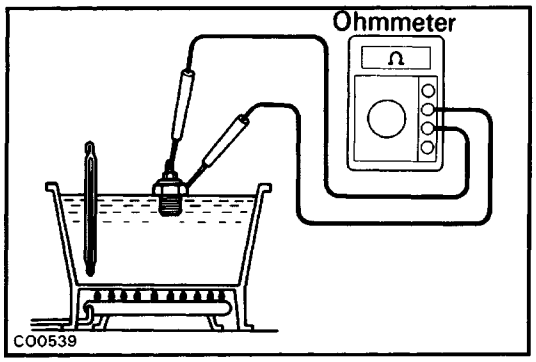


B. Inspect relay operation

(a) Apply battery voltage across terminals 1 and 3.

(b) Check that there is continuity between terminals 2 and 4.

If operation is not as described, replace the relay.



Manifold Temperature Sensor

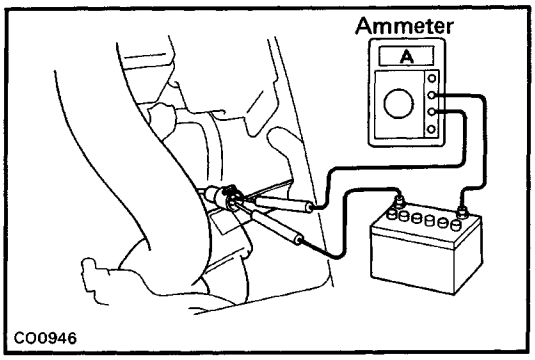
LOCATION: Near the intake chamber.

INSPECT MANIFOLD TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance of the tem–perature sensor terminals.

Oil temperature ˚C (˚F)	Resistance (Ω)
90˚C (194˚F)	Approx. 4 kΩ
110˚C (230˚F)	Approx. 2 kΩ

If each resistance value is not as shown in the above ta–ble, replace the temperature sensor.



Fan Motor

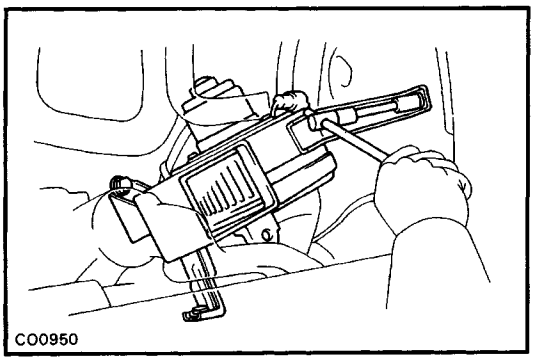
INSPECT FAN MOTOR

(a) Remove the shroud.

(b) Connect the battery and ammeter to the fan motor connector.

(c) Check to see that the motor rotates smoothly, and current is as follows:

Current: 2.8 – 3.8 A



REMOVAL OF ELECTRIC COOLING FAN

1. DISCONNECT FAN MOTOR CONNECTOR

2. REMOVE COOLING FAN AIR DUCT

3. REMOVE Al SILENCER AND STAY

4. REMOVE ELECTRIC COOLING FAN

Remove the three bolts and cooling fan.

INSTALLATION OF ELECTRIC COOLING FAN

1. INSTALL ELECTRIC COOLING FAN

2. INSTALL Al SILENCER STAY AND SILENCER

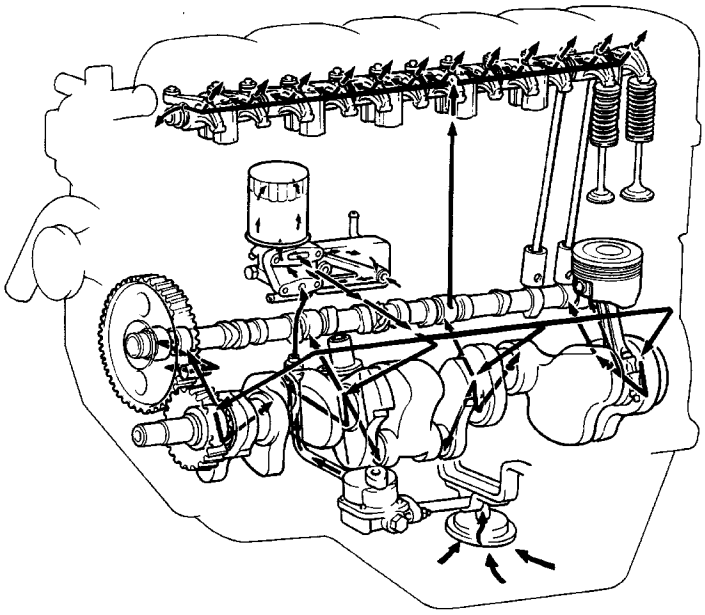
3. INSTALL COOLING FAN AIR DUCT

4. CONNECT FAN MOTOR CONNECTOR

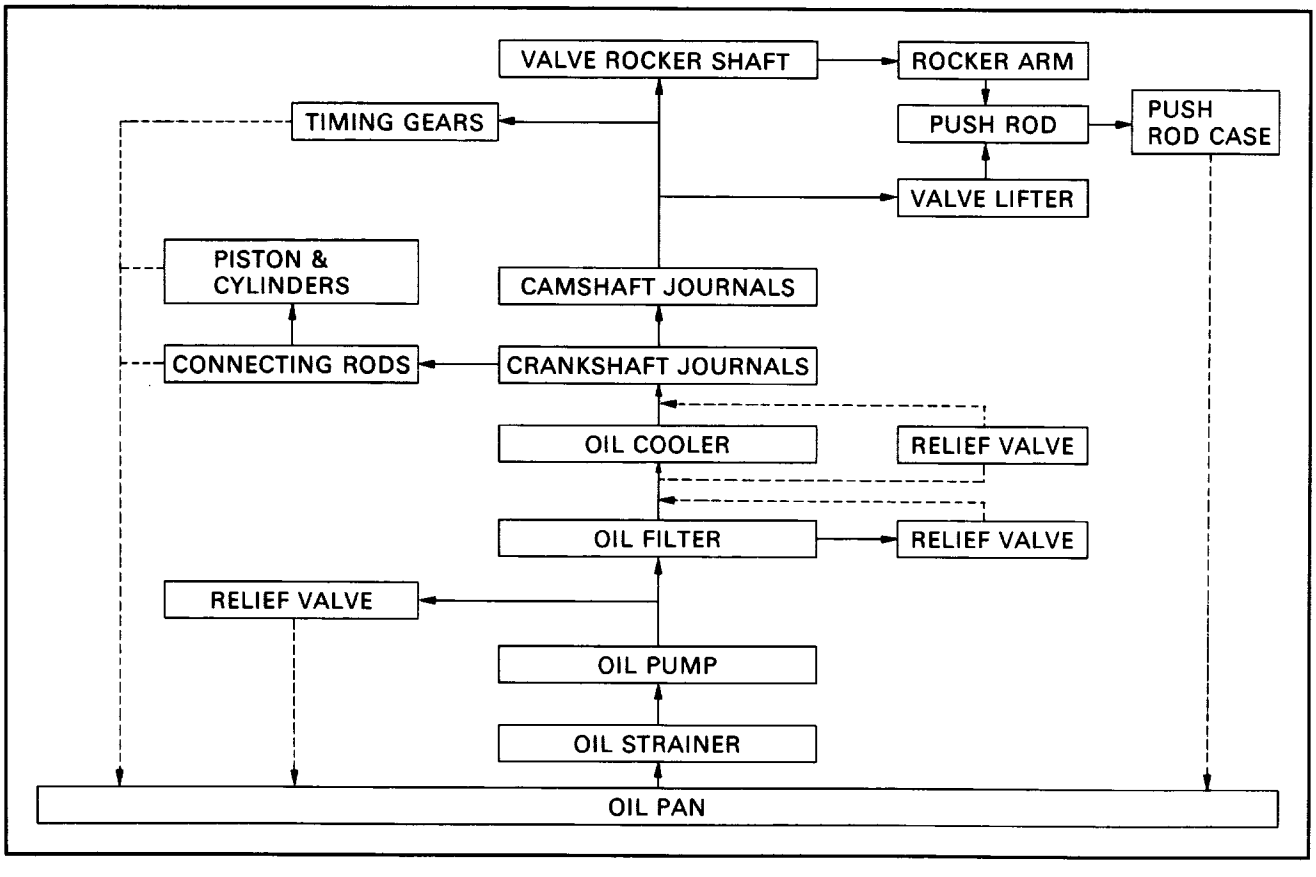
LUBRICATION SYSTEM

DESCRIPTION

A fully pressurized, fully filtered lubrication system has been adopted for this engine.



LU1065



A pressure feeding lubrication system has been adopted to supply oil to the moving parts of this engine. The lubrication system consists of an oil pan, oil pump, oil filter and other external parts which supply oil to the moving parts in the engine block. The oil circuit is shown in the illustration at the top of the previous page. Oil from the oil pan is pumped up by the oil pump. After it passes through the oil filter, it is fed through the various oil holes in the crankshaft and cylinder block. After passing through the cylinder block and performing its lubricating function, the oil is returned by gravity to the oil pan. A dipstick on the side of the oil pump body is provided to check the oil level.

OIL PUMP

The oil pump pumps up oil from the oil pan and sends it under pressure to the various parts of the engine. An oil strainer is mounted in front of the inlet to the oil pump. The oil pump itself is an internal gear pump, which uses a drive gear and driven gear inside the pump body. The drive gear rotates in one direction and the driven gear rotates in the opposite direction. When both gears rotate the oil is drawn into the space between the gear teeth and the pump body, and then discharged through the outlet.

OIL PRESSURE REGULATOR

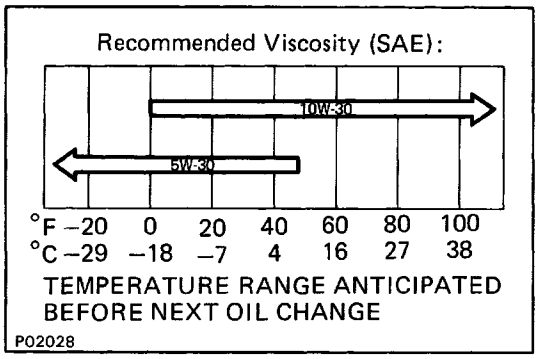
At high engine speeds, the engine oil supplied by the oil pump exceeds the capacity of the engine to utilize it. For that reason, the oil pressure regulator works to prevent an oversupply of oil. During normal oil supply, a coil spring and valve keep the by–pass closed, but when too much oil is being fed, the pressure become extremely high, overpowering the force of the spring and opening the valves. This allows the excess oil to flow through the valve and return to the oil pan.

OIL FILTER

The oil filter is a full flow type filter with a built–in paper filter element. Particles of metal from wear, airborn dirt, carbon other impurities can get in the oil during use and could cause accelerated wear or siezing if allowed to circulate through the engine. The oil filter, integrated into the oil line, removes these impurities as the oil passes through it. The filter is mounted outside the engine to simplify replacement of the filter element. A relief valve is also included in front of the filter element to relieve the high oil pressure in case the filter element becomes clogged with impurities. The relief valve opens when the oil pressure overpowers the force of the spring. Oil passing through the relief valve bypasses the oil filter and flows directly into the main oil hole in the engine.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Oil leakage	Cylinder head, cylinder block or oil pump body damaged or cracked Oil seal faulty Gasket faulty	Repair as necessary Replace oil seal Replace gasket	 EM–42, EM–71
Low oil pressure	Oil leakage Relief valve faulty Oil pump faulty Engine oil poor quality Crankshaft bearing faulty Connecting rod bearing faulty Oil filter clogged	Repair as necessary Repair relief valve Repair oil pump Replace engine oil Replace bearing Replace bearing Replace oil filter	 LU–10, LU–14 LU–7 LU–5 EM–55 EM–52 LU–5
High oil pressure	Relief valve faulty	Repair relief valve	LU–10, LU–14



OIL PRESSURE CHECK

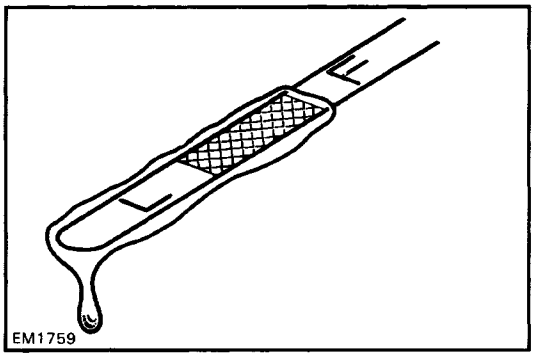
1. CHECK ENGINE OIL QUALITY

Check the oil for deterioration, entry of water, discoloring or thickening.

If oil quality is poor, replace it.

Oil grade: API grade SG. Multigrade and fuel–efficient engine oil.

Recommended viscosity is as shown.



2. CHECK ENGINE OIL LEVEL

The oil level should be between the ”L” and ”F” marks on the dipstick.

If low, check for leakage and add oil up to the ”F” mark.

3. REMOVE OIL PRESSURE SENDER GAUGE

4. INSTALL OIL PRESSURE GAUGE

5. START ENGINE

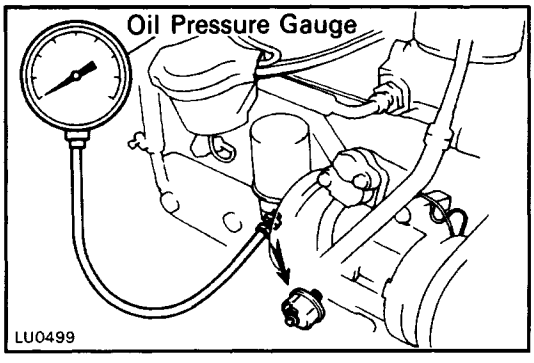
Start engine and warm it up to normal operating temper–ature.

6. CHECK OIL PRESSURE

Oil pressure:

At idle 29 kPa (0.3 kgf/cm^2, 4.3 psi) or more

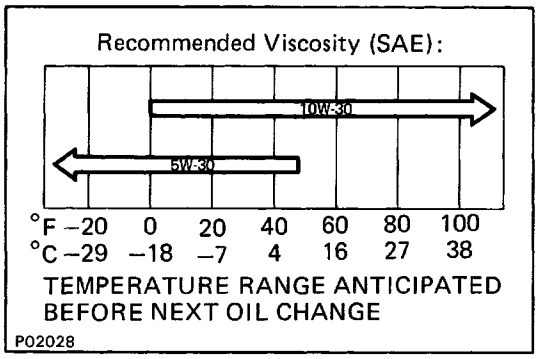
At 3,000 rpm 245 – 490 kPa (2.5 – 5.0 kgf/cm^2, 36 – 71 psi)



HINT: Check for oil leakage after reinstalling the oil pressure sender gauge.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Oil leakage	Cylinder head, cylinder block or oil pump body damaged or cracked	Repair as necessary	
	Oil seal faulty	Replace oil seal	EM–42, EM–71
	Gasket faulty	Replace gasket	
Low oil pressure	Oil leakage	Repair as necessary	
	Relief valve faulty	Repair relief valve	LU–10, LU–14
	Oil pump faulty	Repair oil pump	LU–7
	Engine oil poor quality	Replace engine oil	LU–5
	Crankshaft bearing faulty	Replace bearing	EM–55
	Connecting rod bearing faulty	Replace bearing	EM–52
	Oil filter clogged	Replace oil filter	LU–5
High oil pressure	Relief valve faulty	Repair relief valve	LU–10, LU–14



OIL PRESSURE CHECK

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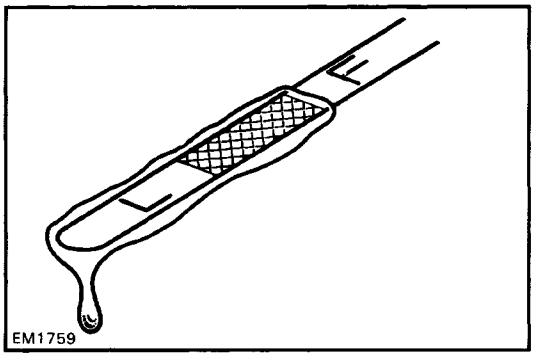
Oil grade: API grade SG. Multigrade and fuel–efficient engine oil.

Recommended viscosity is as shown.



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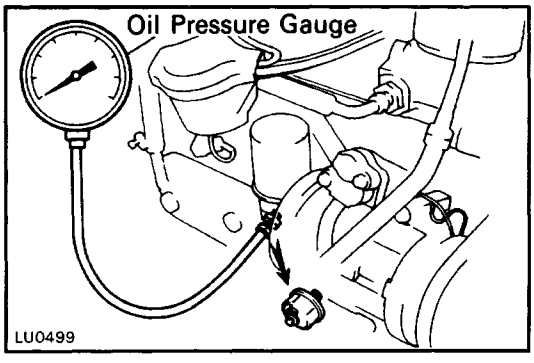
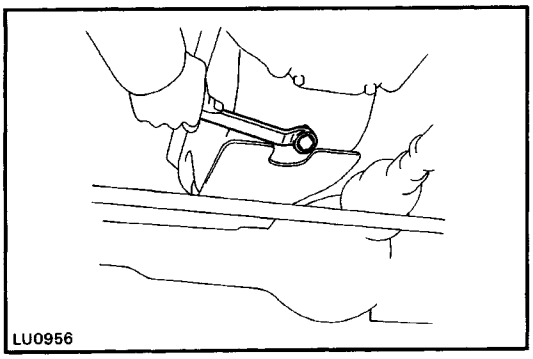


HINT: Check for oil leakage after reinstalling the oil pressure sender gauge.

REPLACEMENT OF ENGINE OIL AND OIL FILTER

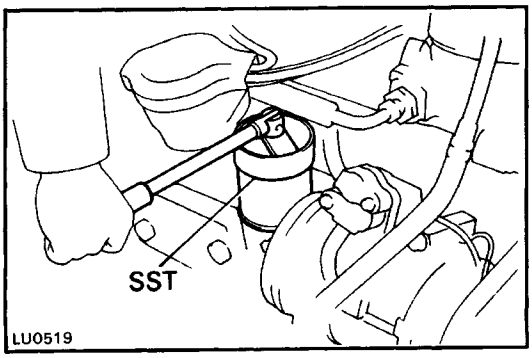
NOTICE:

- **Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.**
  Adequate means of skin protection and washing facilities should be provided.
- **Care should be taken, therefore, when changing engine oil, to minimize the frequency and length of time your skin is exposed to used engine oil. Protective clothing and gloves, that cannot be penetrated by oil, should be worn. The skin should be thoroughly washed with soap and water, or use waterless hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.**
- **In order to preserve the environment, used oil and used oil filters must be disposed of only at designated disposal sites.**



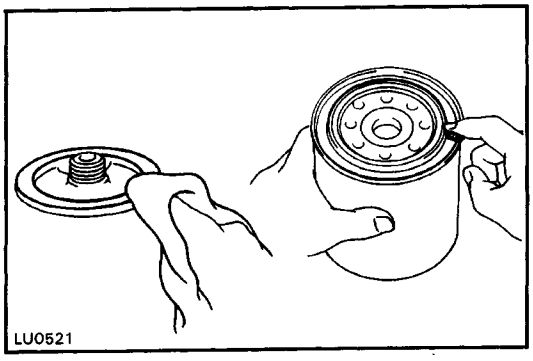
1. DRAIN ENGINE OIL

(a) Remove the oil filler cap.
(b) Remove the oil drain plug and drain the oil into a container.

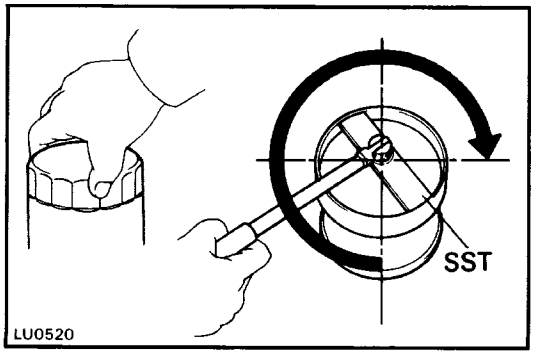


2. REPLACE OIL FILTER

(a) Using SST, remove the oil filter.
SST 09228–44011



(b) Clean and check the oil filter installation surface.
(c) Apply clean engine oil to the gasket of a new oil filter.



(d) Lightly screw in the oil filter to where you feel resis–tance.

(e) Using SST, tighten the oil filter an extra 3/4 turn.
SST 09228–44011

3. FILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gas–ket. Torque the drain plug.

Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

(b) Fill the engine with new oil. For detailed information on recommended viscosity, see page LU–4.

Capacity:
Drain and refill
w/o Oil filter change
7.0 liters (7.4 US qts, 6.2 Imp. qts)
w/ Oil filter change
7.8 liters (8.2 US qts, 6.9 Imp. qts)
Dry fill
8.0 liters (8.5 US qts, 7.0 Imp. qts)

(c) Install the oil filler cap with the gasket.

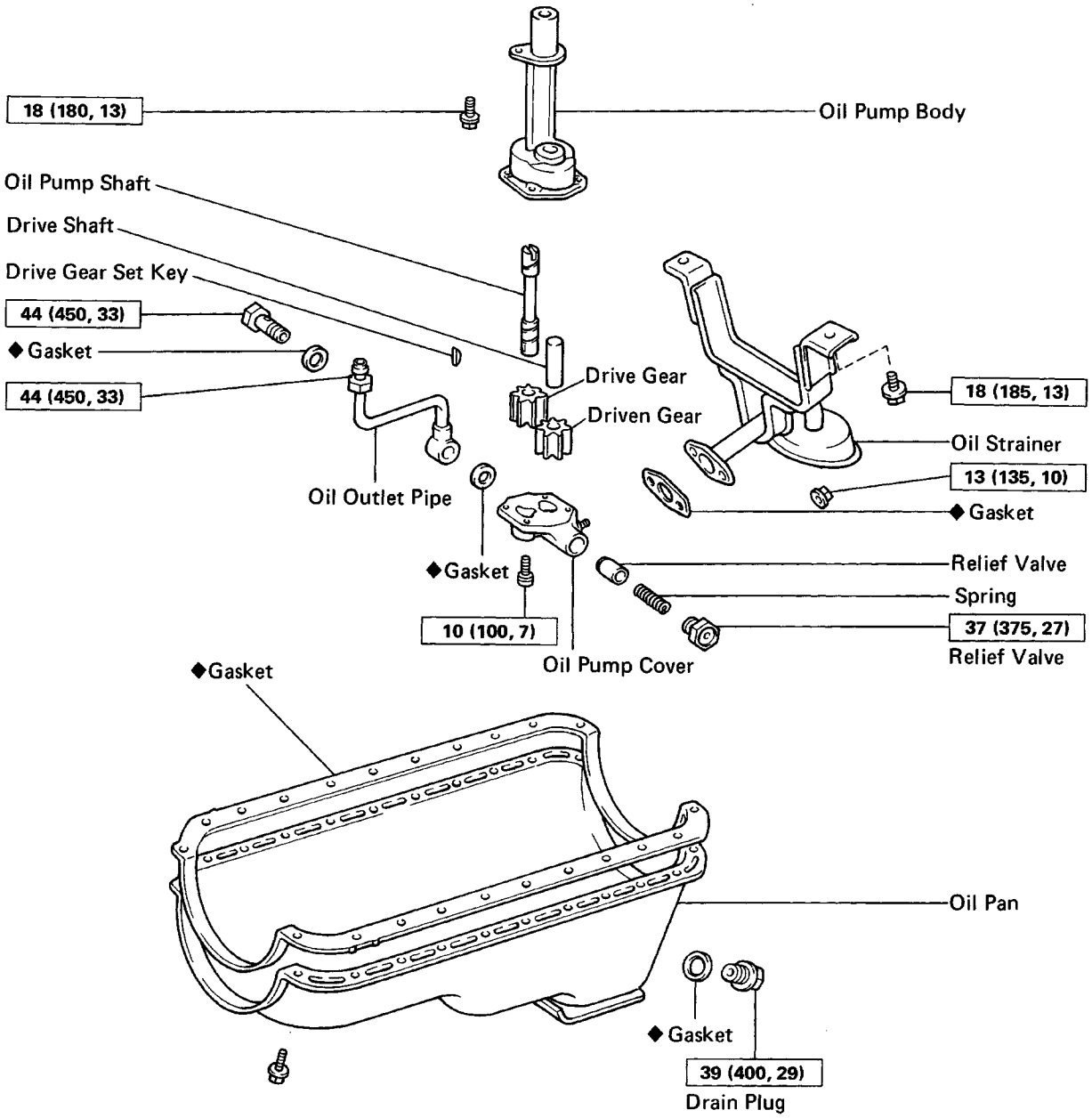
4. START ENGINE AND CHECK FOR LEAKS

5. RECHECK ENGINE OIL LEVEL

Recheck the engine oil level and refill if necessary.

OIL PUMP

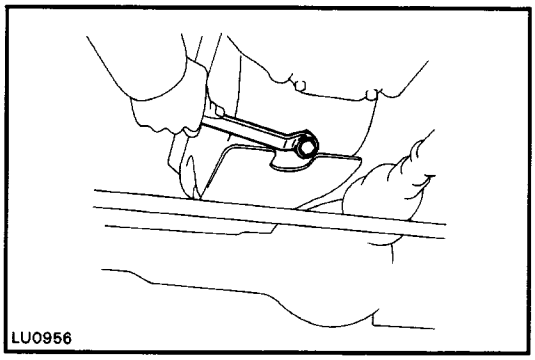
COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

LU0997



REMOVAL OF OIL PUMP

(See page LU–7)

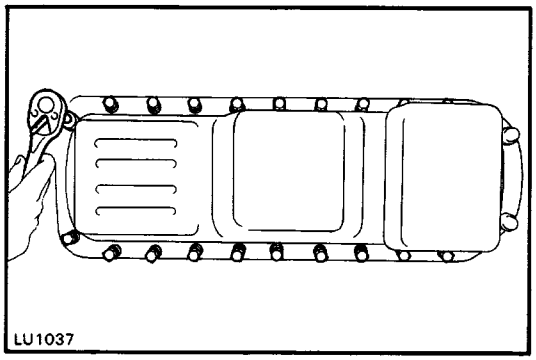
1. RAISE VEHICLE

NOTICE: Be sure the vehicle is securely supported.

2. DRAIN ENGINE OIL

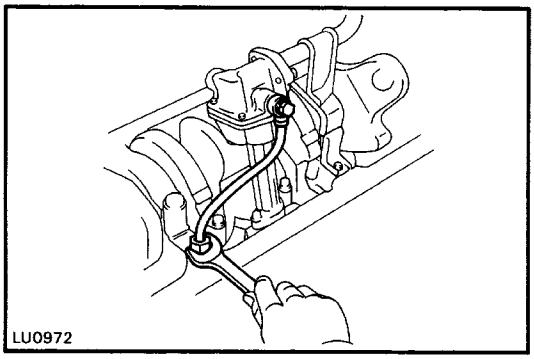
(a) Remove the oil filler cap.

(b) Remove the oil drain plug and drain the oil into a container.



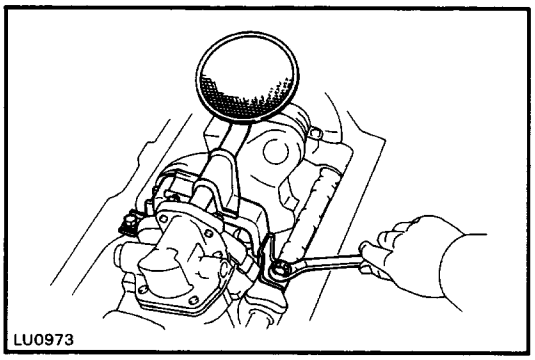
3. REMOVE OIL PAN

Remove the twenty–two bolts, oil pan and gasket.



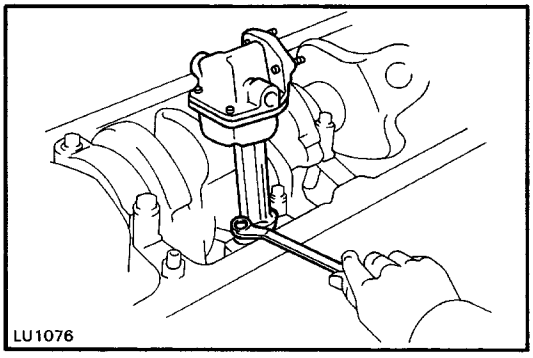
4. REMOVE OIL OUTLET PIPE

Remove the union nut, bolt, two gaskets and outlet pipe.

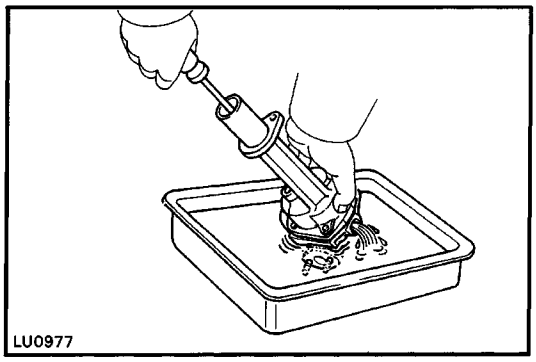


5. REMOVE OIL PUMP

(a) Remove the two bolts and nuts, remove the oil strainer and gasket.



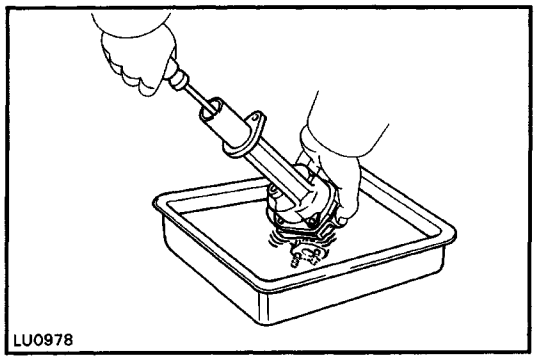
(b) Remove the bolt and oil pump.



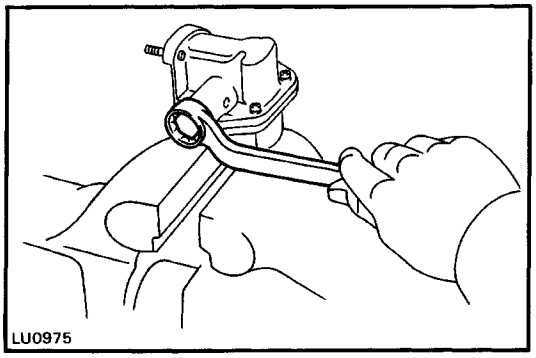
OPERATION CHECK OF OIL PUMP

CHECK PUMP OPERATION

(a) Using a screwdriver, immerse the oil inlet hole into clean engine oil and turn the oil pump shaft clock–wise. Oil should come out of the oil outlet hole.



(b) Close the oil outlet hole with your thumb, and turn the shaft as before. The shaft should be difficult to turn.



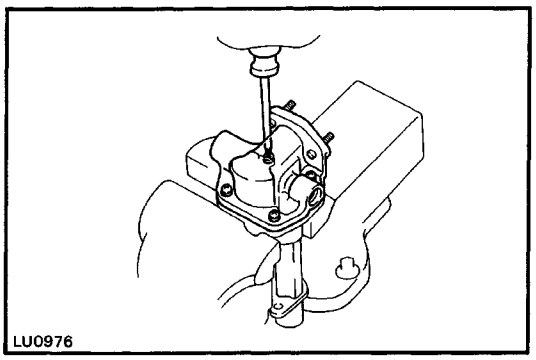
DISASSEMBLY OF OIL PUMP

(See page LU–7)

1. MOUNT OIL PUMP IN VISE

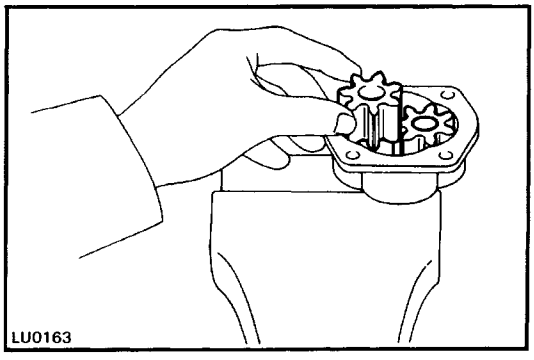
2. REMOVE RELIEF VALVE

Remove the plug, spring and relief valve.



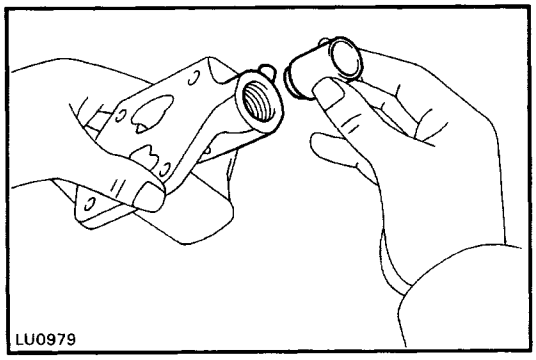
3. REMOVE OIL PUMP STRAINER

Remove the four screws and oil pump strainer.



4. REMOVE DRIVEN GEAR

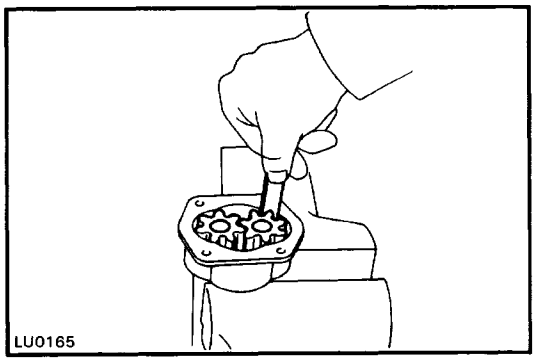
5. REMOVE DRIVE GEAR AND OIL PUMP SHAFT ASSEMBLY



INSPECTION OF OIL PUMP

1. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.
If it does not, replace the relief valve. If necessary, replace the oil pump assembly.



2. INSPECT DRIVE AND DRIVEN GEARS

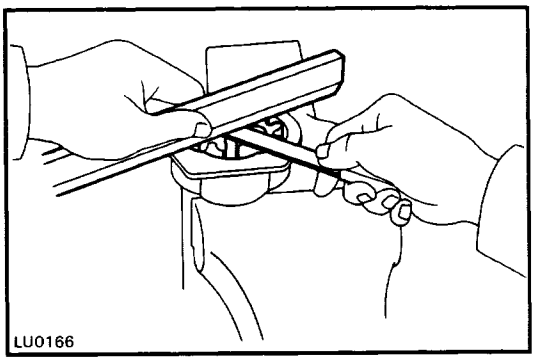
A. Inspect gear body clearance

Using a thickness gauge, measure the clearance between the gear and pump body.

Standard body clearance: 0.095 – 0.175 mm (0.0037 – 0.0069 in.)

Maximum body clearance: 0.20 mm (0.0079 in.)

If the clearance is greater than maximum, replace the gears or oil pump assembly.



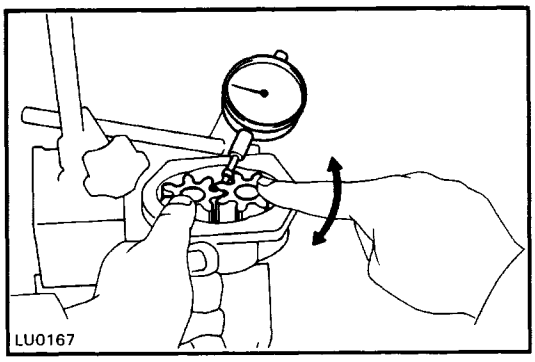
B. Inspect gear side clearance

Using a thickness gauge and precision straight edge, measure the clearance between the gear and precision straight edge.

Standard side clearance: 0.030 – 0.090 mm (0.0012 – 0.0035 in.)

Maximum side clearance: 0.15 mm (0.0059 in.)

If the clearance is greater than maximum, replace the gears. If necessary, the oil pump assembly.



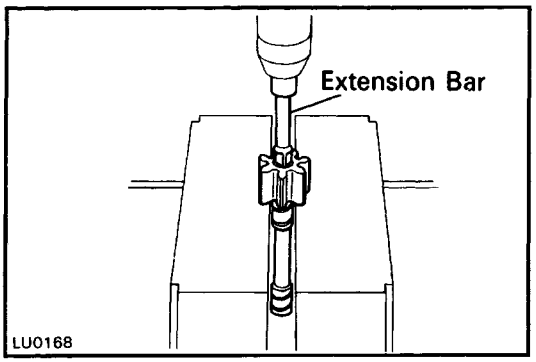
C. Inspect gear backlash

Using a dial indicator, measure the backlash while turning the driven gear clockwise and counterclockwise in several places.

Standard backlash: 0.500 – 0.600 mm (0.0197 – 0.0236 in.)

Maximum backlash: 0.95 mm (0.0374 in.)

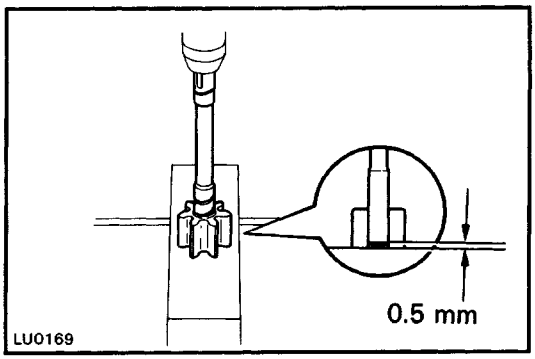
If the backlash is greater than maximum, replace the gears. If necessary, replace the shaft.



REPLACEMENT OF OIL PUMP COMPONENTS

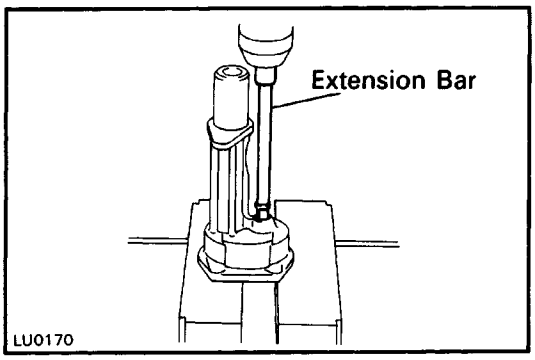
1. REPLACE DRIVE GEAR (OR OIL PUMP SHAFT)

(a) Using an extension bar and press, press out the oil pump shaft from the drive gear.



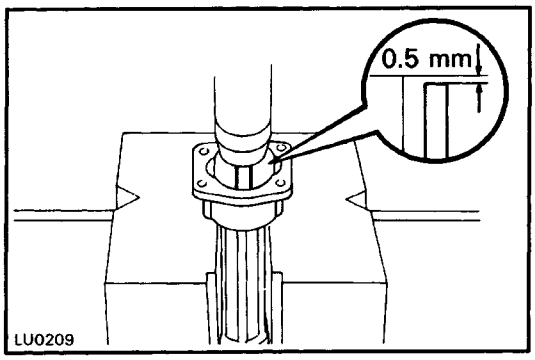
(b) Align the drive gear set key with the key groove of a new drive gear.

(c) Using a press, press in the oil pump shaft until it is 0.5 mm (0.020 in.) from the drive gear edge.

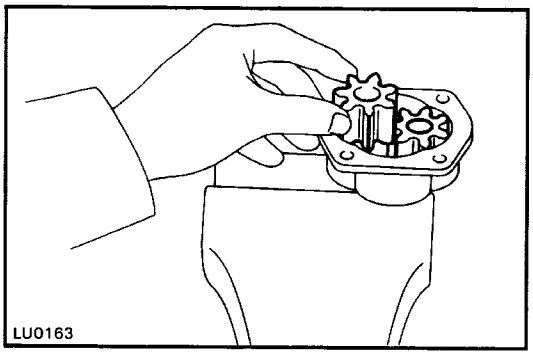


2. REPLACE DRIVEN SHAFT

(a) Using an extension bar and press, press out the driven shaft from the oil pump body.



(b) Using a press, press in a new driven shaft until it is 0.5 mm (0.020 in.) from the oil pump body edge.



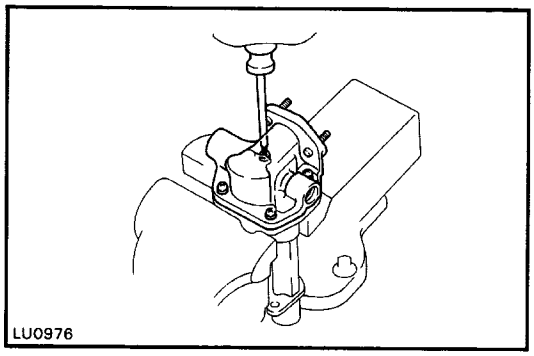
ASSEMBLY OF OIL PUMP

(see page LU–7)

1. MOUNT OIL PUMP BODY IN VISE

2. INSTALL DRIVE GEAR AND OIL PUMP SHAFT ASSEMBLY

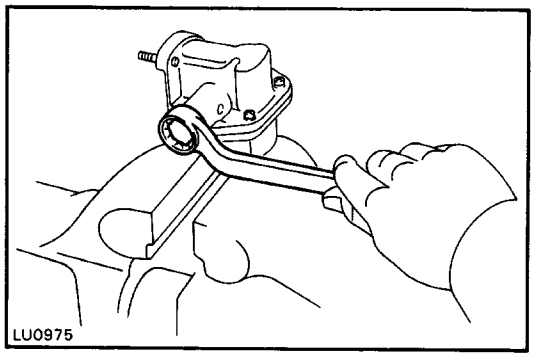
3. INSTALL DRIVEN GEAR



4. INSTALL OIL PUMP STRAINER

Install the oil pump strainer with the four screws.
Torque the screws.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



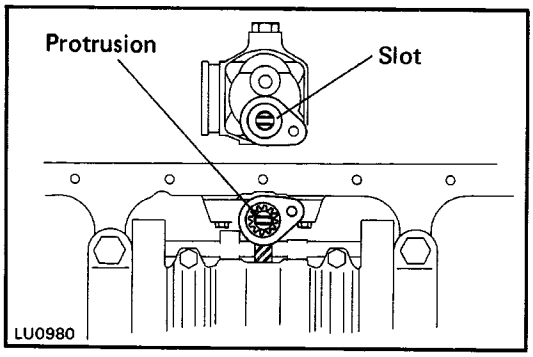
5. INSTALL RELIEF VALVE

Install the relief valve and spring with the relief valve plug. Torque the plug.

Torque: 37 N–m (375 kgf–cm, 27 ft–lbf)

6. CHECK OIL PUMP OPERATION

(See page LU–9)

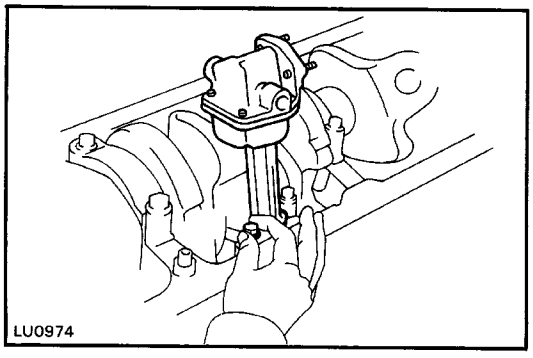


INSTALLATION OF OIL PUMP

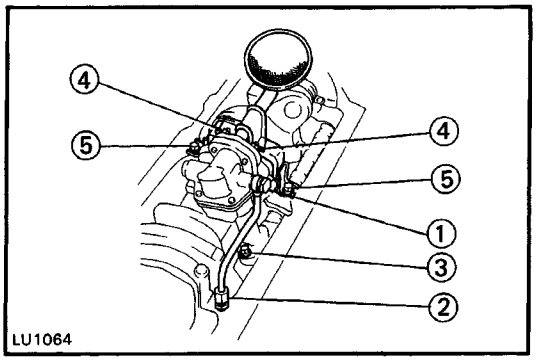
(See page LU–7)

1. INSTALL OIL PUMP

(a) Align the oil pump shaft slot of the oil pump with the governor shaft protrusion of the distributor.



(b) Temporarily install the oil pump with the bolt.

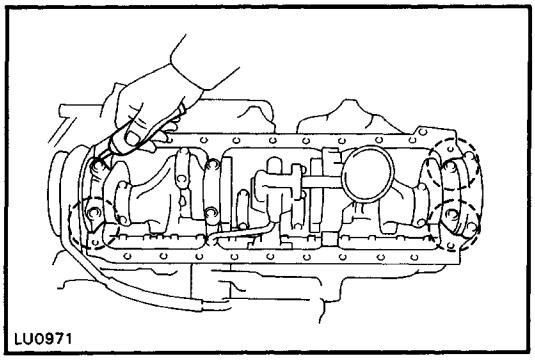


(c) Temporarily install the oil strainer and oil outlet pipe with new gaskets.

(d) Torque the nuts and bolts in the order shown in the illustration.

Torque: (1), (2) 44 N–m (450 kgf–cm, 33 ft–lbf)
(3) 18 N–m (180 kgf–cm, 13 ft–lbf)
(4) 13 N–m (135 kgf–cm, 10 ft–lbf)
(5) 13 N–m (185 kgf–cm, 13 ft–lbf)

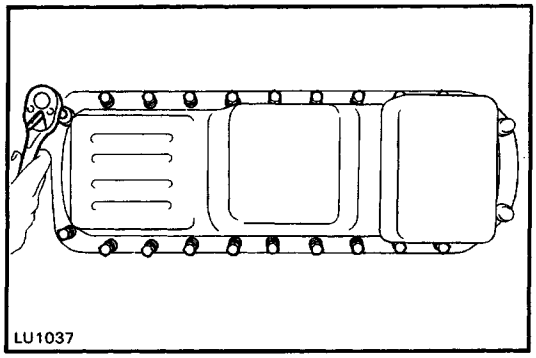
HINT: While torquing the oil strainer nuts (4), press the oil strainer down onto the cylinder block so there is no gap between the oil strainer and cylinder block.



2. INSTALL OIL PAN

(a) Apply seal packing to the cylinder block, the No. 1 and No. 4 main bearing caps as shown.

Seal packing: Part No. 08826–00080 or equivalent



(b) Install a new gasket and the oil pan with the twenty–two bolts.

Torque: 7.8 N–m (80 kgf–cm, 69 in–lbf)

3. FILL WITH ENGINE OIL (See step 3 on page LU–6)

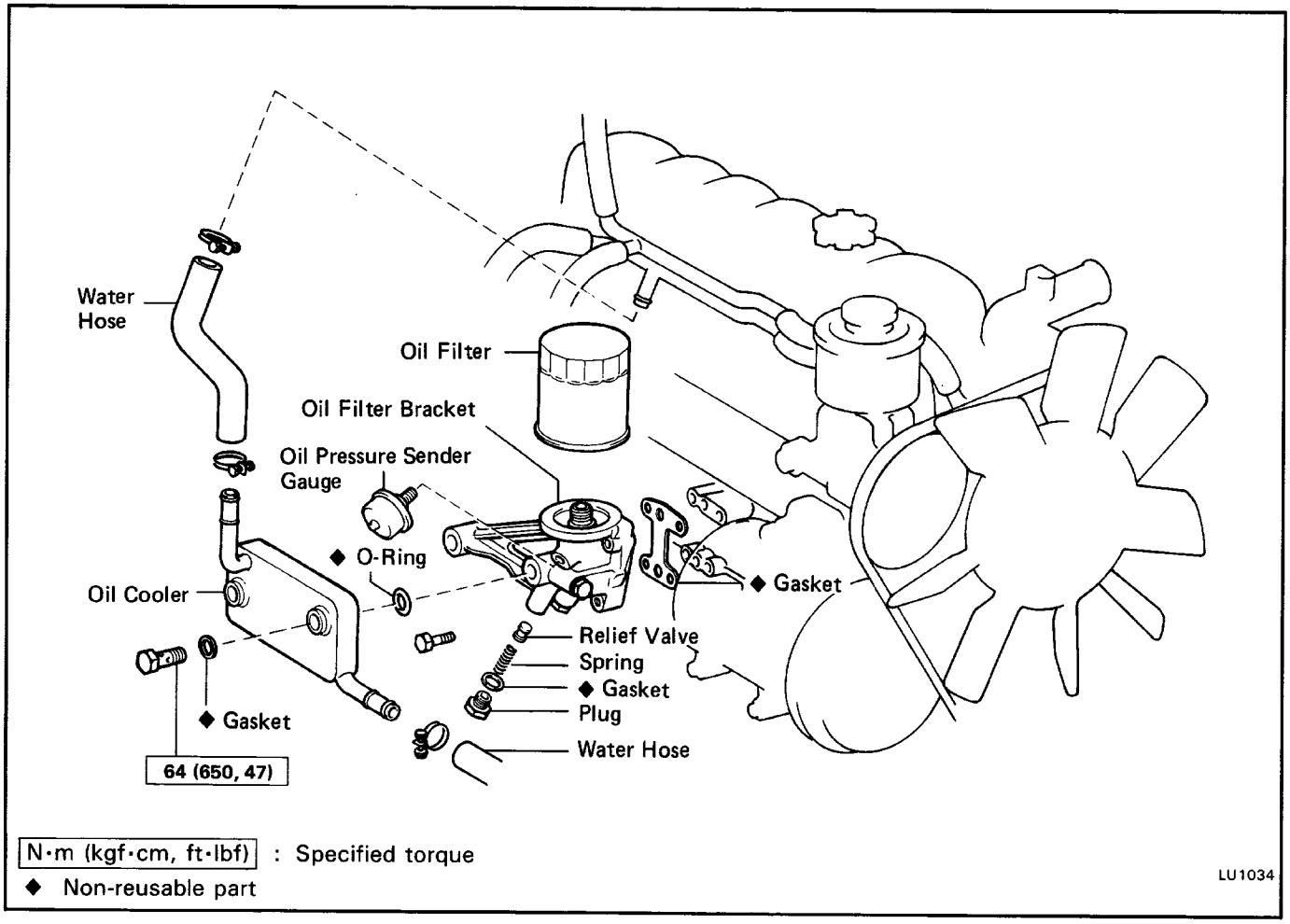
4. START ENGINE AND CHECK FOR LEAKS

5. RECHECK OIL LEVEL

Recheck the engine oil level and refill if necessary.

OIL COOLER AND RELIEF VALVE

COMPONENTS



REMOVAL OF OIL COOLER AND RELIEF VALVE

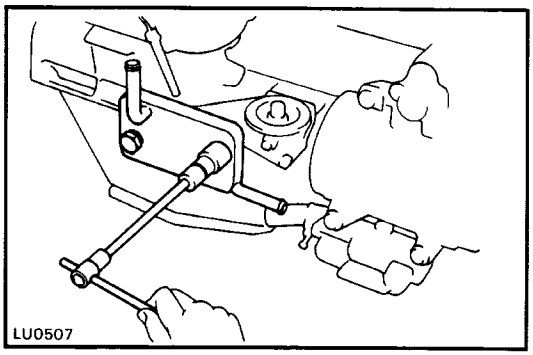
1. DRAIN ENGINE COOLANT (See page CO–5)

2. REMOVE AIR CLEANER HOSE

3. REMOVE OIL FILTER (See page LU–5)

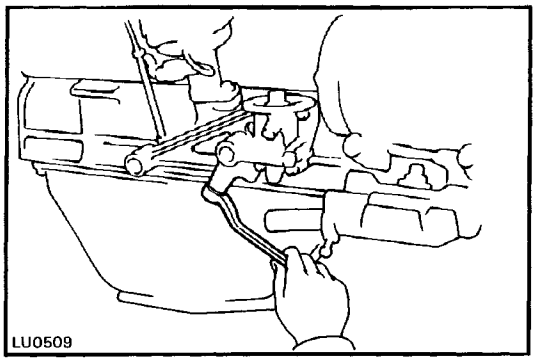
4. REMOVE OIL PRESSURE SENDER GAUGE

5. DISCONNECT OIL COOLER HOSES

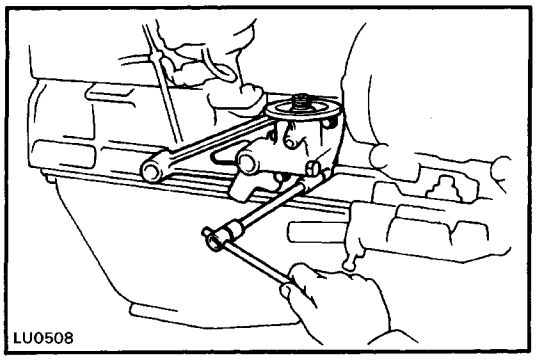


6. REMOVE OIL COOLER

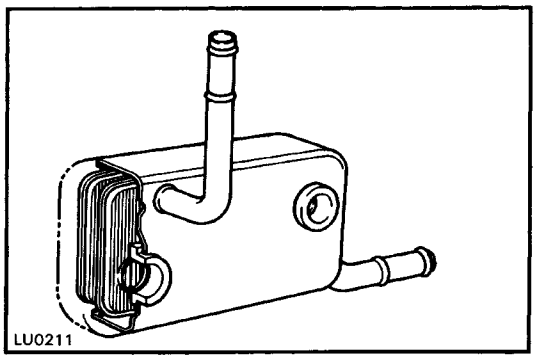
Remove the two union bolts, gaskets, oil cooler and O–rings.



7. REMOVE RELIEF VALVE
Remove the plug, gasket, spring and relief valve.

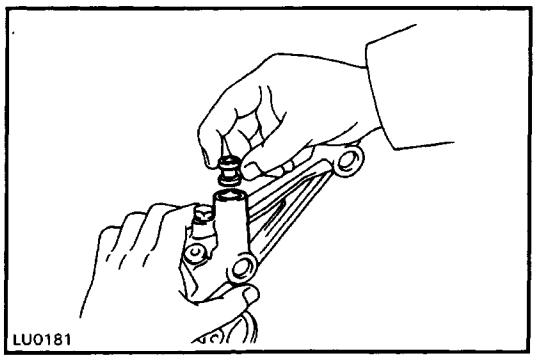


8. REMOVE OIL FILTER BRACKET
Remove the four bolts, oil filter bracket and gasket.

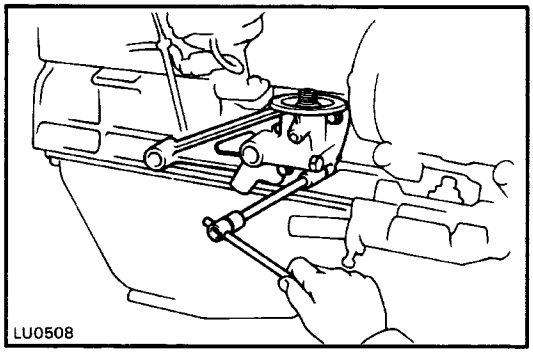


INSPECTION OF OIL COOLER AND RELIEF VALVE

1. INSPECT OIL COOLER
Check the oil cooler for damage or clogging.



2. INSPECT RELIEF VALVE
Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.
If operation is not as specified, replace the relief valve. If necessary, replace the oil filter bracket.



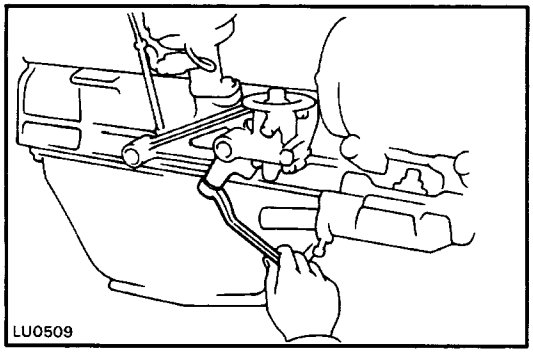
INSTALLATION OF OIL COOLER AND RELIEF VALVE

(See page LU–14)

1. INSTALL OIL FILTER BRACKET

Install a new gasket and oil filter bracket with the four bolts. Torque the bolts.

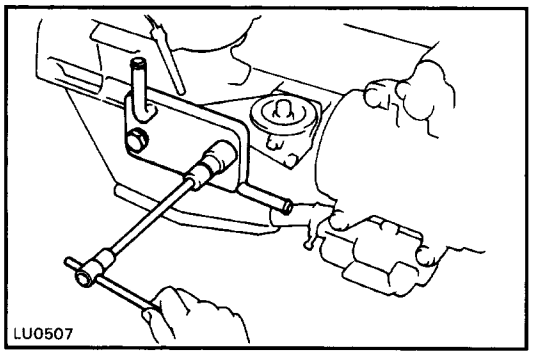
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



2. INSTALL RELIEF VALVE

Install the relief valve, spring, a new gasket and the plug. Torque the plug.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



3. INSTALL OIL COOLER

(a) Place two new O–rings in position on the oil cooler.

(b) Install the oil cooler, two new gaskets and the union bolts. Torque the union bolts.

Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)

4. CONNECT OIL COOLER HOSES

5. INSTALL OIL PRESSURE SENDER GAUGE

6. INSTALL OIL FILTER (See page LU–5)

7. INSTALL AIR CLEANER HOSE

8. FILL WITH ENGINE COOLANT

9. START ENGINE AND CHECK FOR LEAKS

10. CHECK ENGINE OIL LEVEL

(See step 3 on page LU–6)

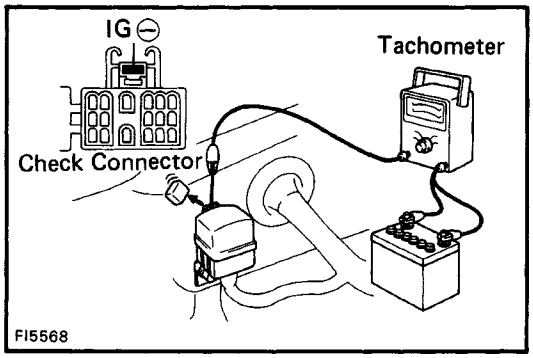
11. CHECK ENGINE COOLANT LEVEL

(See step 1 on page CO–5)

IGNITION SYSTEM

PRECAUTIONS

1. Do not leave the ignition switch on for more than 10 minutes without running the engine.

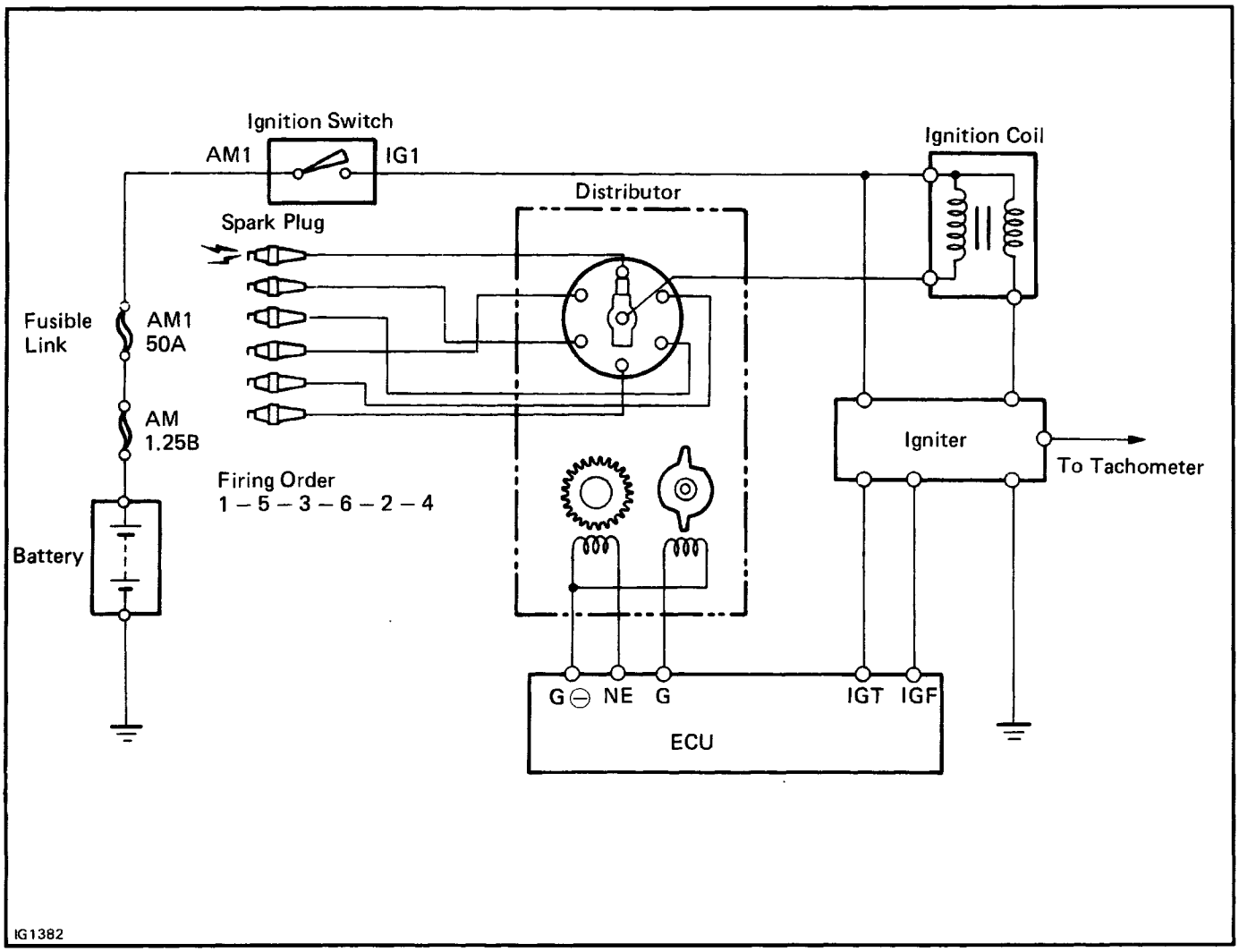


2. When a tachometer is connected to the system, connect the tachometer test probe to terminal IG (–) of the check connector.
3. As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before using.
4. NEVER allow the tachometer terminals to touch ground as this could damage the igniter and/or ignition coil.
5. Do not disconnect the battery when the engine is running.
6. Make sure that the igniter is properly grounded to the body.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not start/ hard to start (cranks ok)	Incorrect ignition timing	Reset timing	IG–11
	Ignition problems		
	• Ignition coil	Inspect coil	IG–7
	• Igniter	Inspect igniter	IG–7
	• Distributor	Inspect distributor	IG–7
	• High–tension cords	Inspect high–tension cords	IG–6
	Ignition wiring disconnected or broken	Inspect wiring	
Rough idle or stalls	Spark plugs faulty	Inspect plugs	IG–6
	Ignition wiring faulty	Inspect wiring	
	Incorrect ignition timing	Reset timing	IG–11
	Ignition problems		
	• Ignition coil	Inspect coil	IG–7
	• Igniter	Inspect igniter	IG–7
	• Distributor	Inspect distributor	IG–7
	• High–tension cords	Inspect high–tension cords	IG–6
Engine hesitates/ poor acceleration	Spark plugs faulty	Inspect plugs	IG–6
	Ignition wiring faulty	Inspect wiring	
	Incorrect ignition timing	Reset timing	IG–11
Engine dieseling (runs after ignition switch is turned off)	Incorrect ignition timing	Reset timing	IG–11
Muffler explosion (after fire) all the time	Incorrect ignition timing	Reset timing	IG–11
Engine backfires	Incorrect ignition timing	Reset timing	IG–11
Poor gasoline mileage	Spark plugs faulty	Inspect plugs	IG–6
	Incorrect ignition timing	Reset timing	IG–11
Engine overheats	Incorrect ignition timing	Reset timing	IG–11

IGNITION SYSTEM CIRCUIT



ELECTRONIC SPARK ADVANCE (ESA)

The ECU is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, intake air volume, eng. temperature, etc.) the microcomputer (ECU) triggers the spark at precisely the right instant.

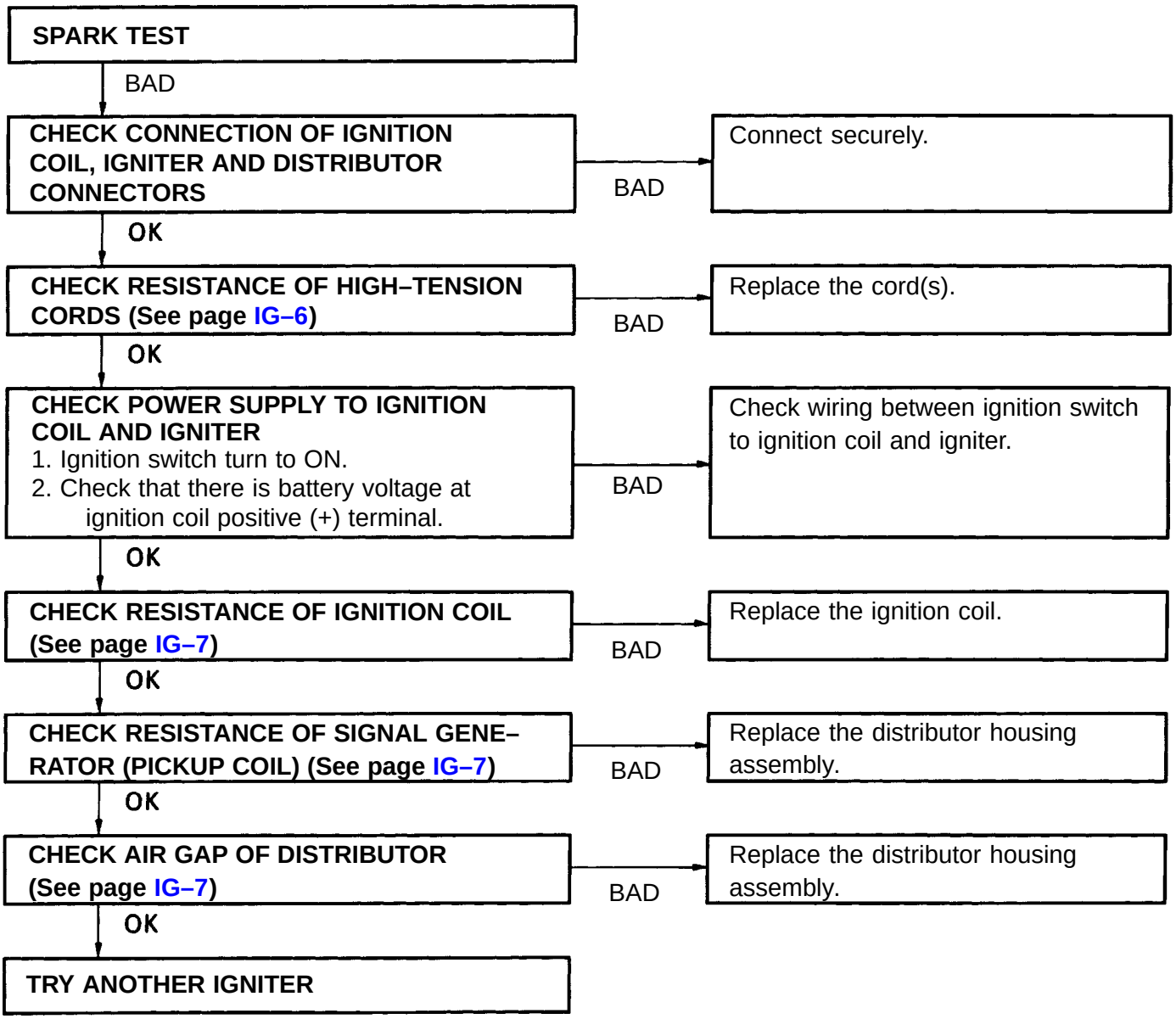
ON–VEHICLE INSPECTION

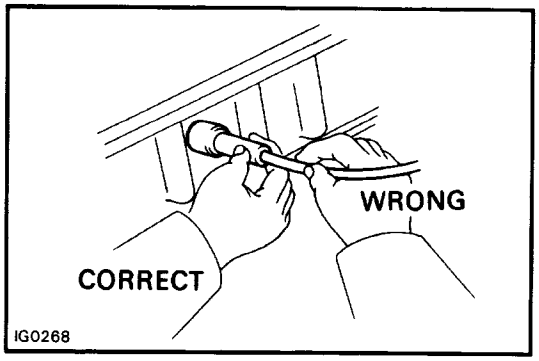
SPARK TEST

CHECK THAT SPARK OCCURS

(a) Disconnect high–tension cord from distributor.
(b) Hold the end approx.12.5 mm (0.50 in.) from body of vehicle.
(c) See if spark occurs while engine is being cranked.

HINT: To minimize the amount of gasoline injected into the cylinders during this test, crank the engine for no more than 1 – 2 seconds at a time.
If the spark does not occur, perfrom the test as follows:

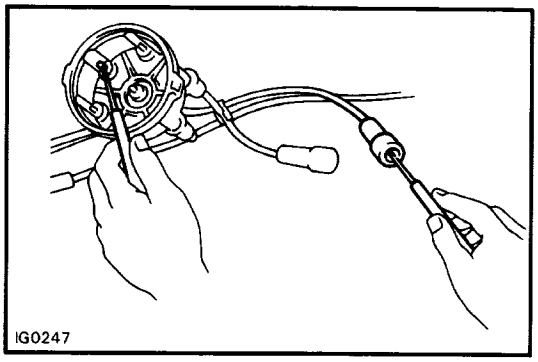




INSPECTION OF HIGH–TENSION CORDS

1. CAREFULLY REMOVE HIGH–TENSION CORDS BY THEIR RUBBER BOOTS FROM SPARK PLUGS

NOTICE: Pulling on or bending the cords may damage the conductor inside.

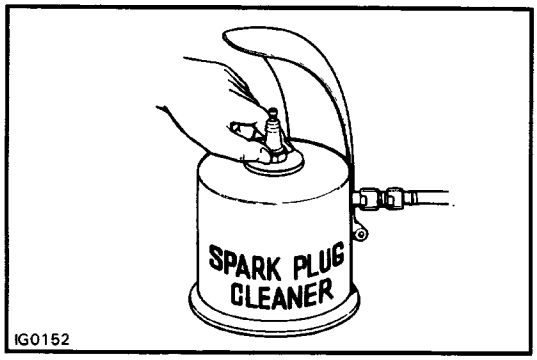


2. INSPECT HIGH–TENSION CORD RESISTANCE

Using an ohmmeter, measure the resistance without dis–connecting the distributor cap.

Maximum resistance: 25 kΩ per cord

If resistance is greater than maximum, check the termi–nals. If necessary, replace the high–tension cord and/or distributor cap.

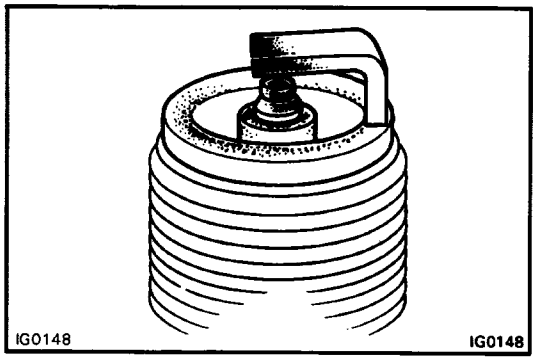


INSPECTION OF SPARK PLUGS

1. REMOVE SPARK PLUGS

2. CLEAN SPARK PLUGS

Using a spark plug cleaner or wire brush, clean the spark plug.

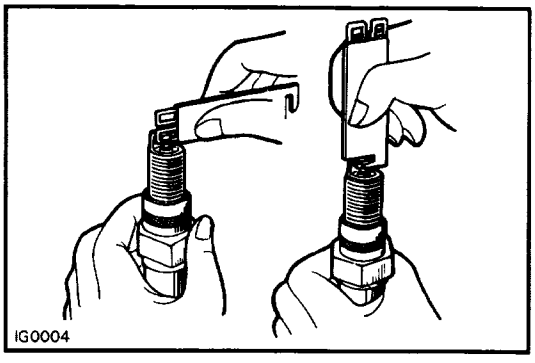


3. VISUALLY INSPECT SPARK PLUGS

Check the spark plug for electrode wear, thread damage and insulator damage.

If abnormal, replace the plugs.

Recommended spark plugs: ND W16EXR–U11
NGK BPR5EY11



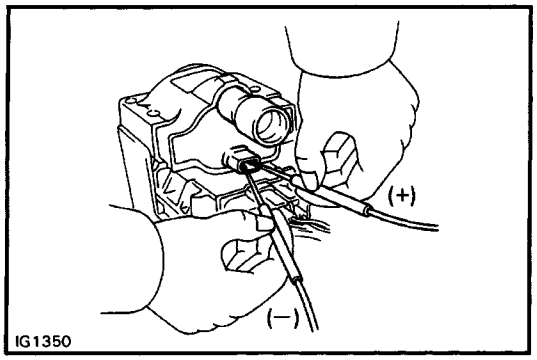
4. ADJUST ELECTRODE CAP

Carefully bend the outer electrode to obtain the correct electrode gap.

Correct electrode gap: 1.1 mm (0.043 in.)

5. INSTALL SPARK PLUGS

Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)



INSPECTION OF IGNITION COIL

1. DISCONNECT HIGH–TENSION CORD

2. INSPECT PRIMARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) and negative (–) terminals.

Primary coil resistance (Cold): 0.30 – 0.60 Ω

If the resistance is not as specified, replace the ignition coil.

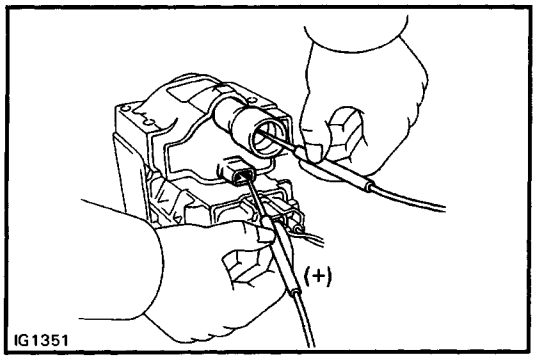
3. INSPECT SECONDARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) terminal and high–tension terminal.

Secondary coil resistance (Cold): 9.0 – 15.0 kΩ

If the resistance is not as specified, replace the ignition coil.

4. RECONNECT HIGH–TENSION CORD



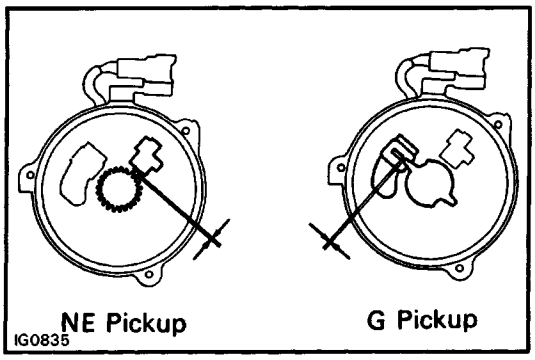
INSPECTION OF DISTRIBUTOR

1. INSPECT AIR GAPS

Using a thickness gauge, measure the gap between the signal rotor and pickup coil projection.

Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.)

If the gap is not as specified, replace the distributor.



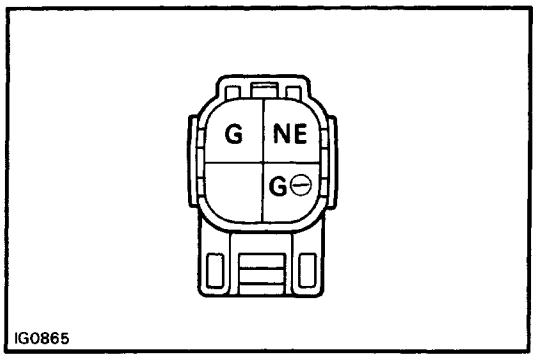
2. INSPECT PICKUP COIL RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

G pickup coil resistance (Cold) (G – G (–)):
185–265 Ω

NE pickup coil resistance (Cold) (NE – G (–)):
185–265 Ω

If the resistance is not as specified, replace the distributor.

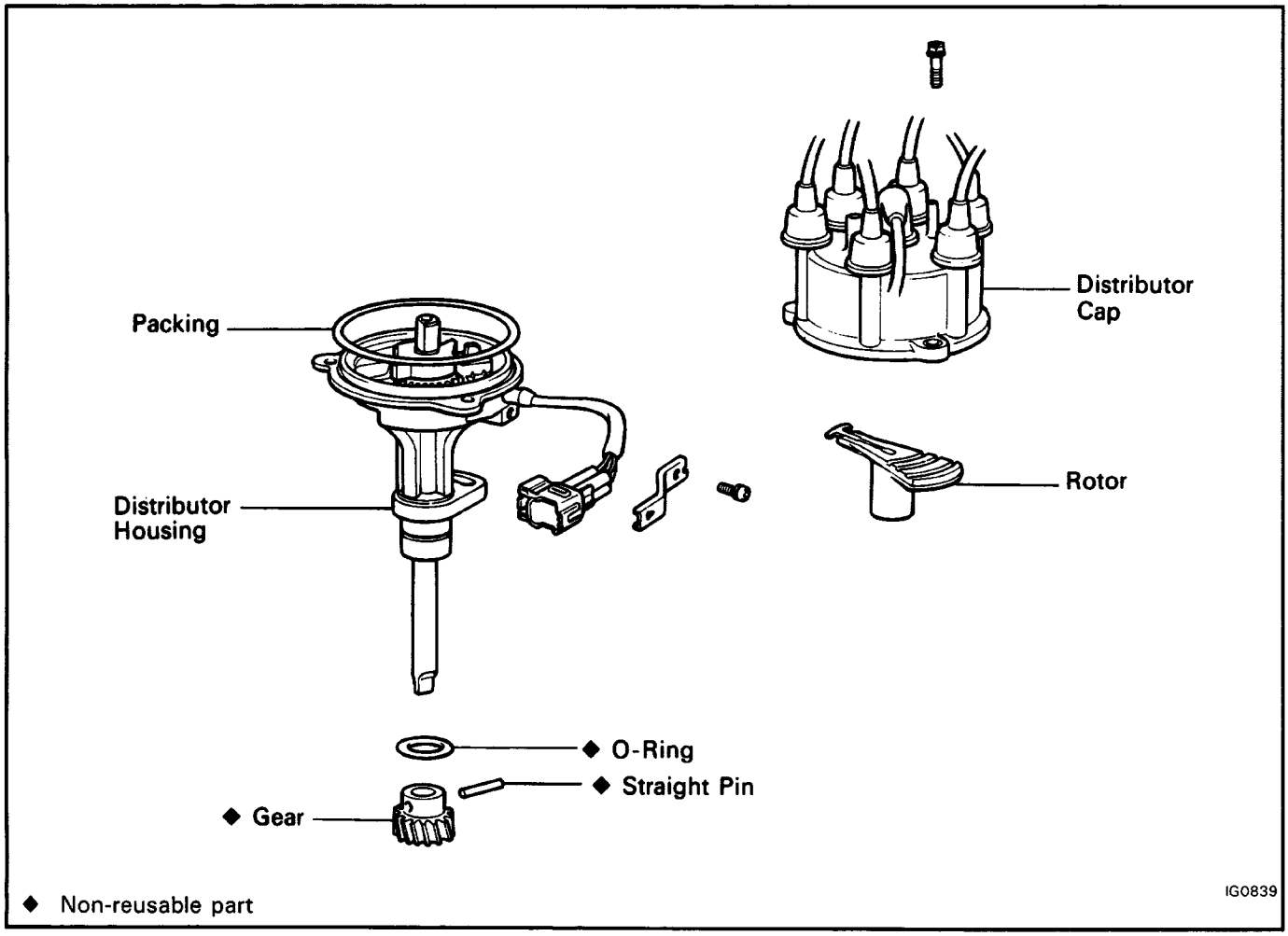


INSPECTION OF IGNITER

(See procedure Spark Test on page IG–5)

DISTRIBUTOR

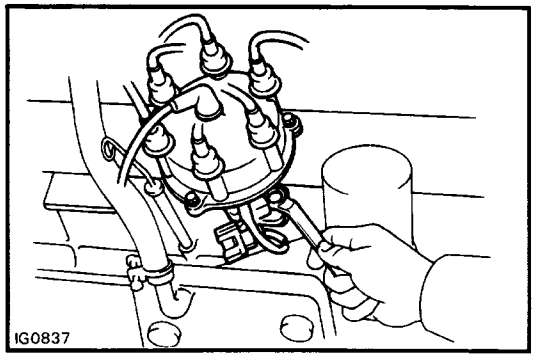
COMPONENTS



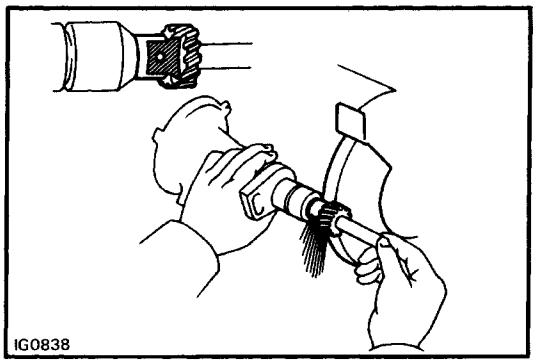
◆ Non-reusable part

REMOVAL OF DISTRIBUTOR

1. REMOVE AIR CLEANER HOSE
2. DISCONNECT DISTRIBUTOR CONNECTOR
3. DISCONNECT VENTILATION HOSES
4. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS AND IGNITION COIL



5. REMOVE DISTRIBUTOR
Remove the mount bolt and pull out the distributor.
6. REMOVE O–RING FROM DISTRIBUTOR HOUSING

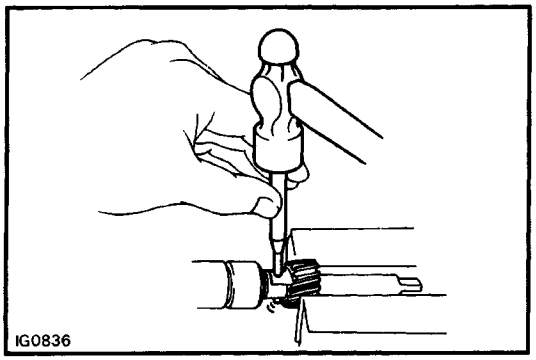


REPLACEMENT OF DISTRIBUTOR DRIVEN GEAR

1. REMOVE DRIVEN GEAR

(a) Using a grinder, grind the driven gear and straight pin.

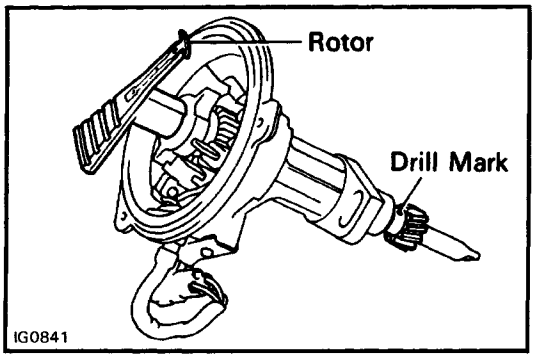
NOTICE: Be careful not to damage the governor shaft.



(b) Mount the driven gear in a vise.

(c) Using a pin punch and hammer, tap out the straight pin.

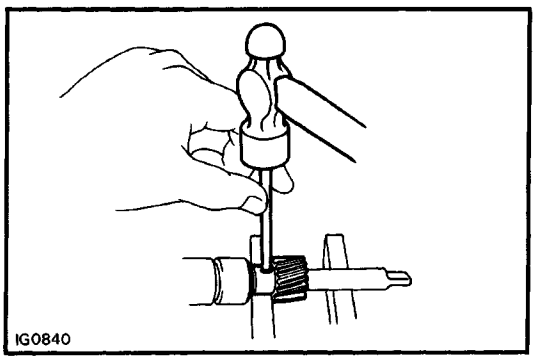
(d) Remove the driven gear.



2. INSTALL NEW DRIVEN GEAR

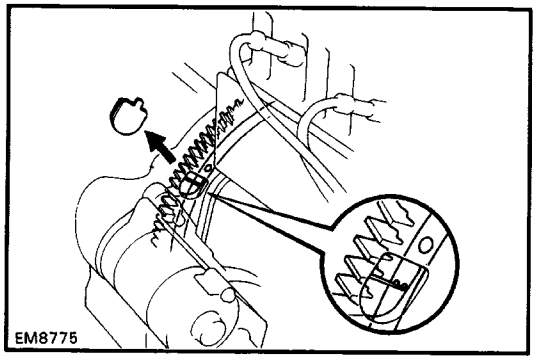
(a) Slide a new driven gear onto the governor shaft.

(b) Position the drill mark on the driven gear and rotor as shown.



(c) Install a new straight pin.

(d) Secure the ends of the straight pin.



INSTALLATION OF DISTRIBUTOR

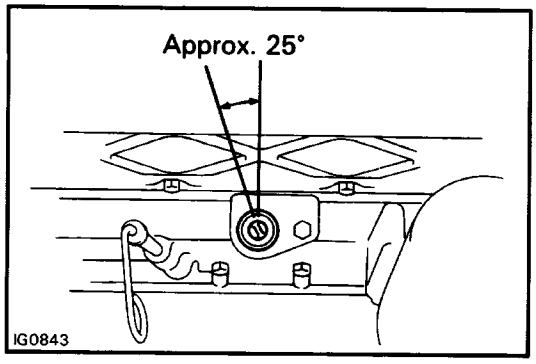
1. SET NO. 1 CYLINDER TO TDC/COMPRESSION

Set to TDC/compression in the following manner.

- Remove the No. 1 spark plug.
- Place your finger over the hole of the No. 1 spark plug and turn the crankshaft clockwise to TDC/ compression. If pressure is felt on your finger, this is TDC/compression. If not, repeat the process.
- Install the No. 1 spark plug.

2. SET OIL PUMP SHAFT SLOT

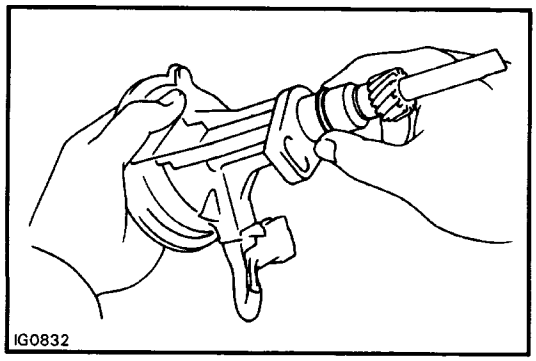
Position the oil pump shaft slot in the direction shown in the illustration.



3. INSTALL NEW O–RING

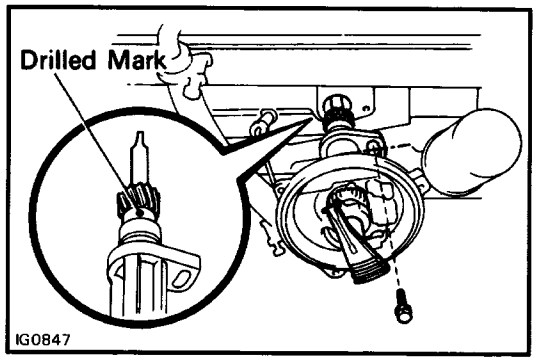
(a) Install a new O–ring to the housing.

(b) Apply a light coat of engine oil on the O–ring.



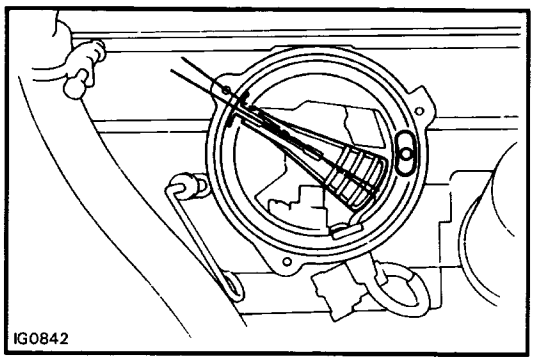
4. INSTALL DISTRIBUTOR

(a) Insert the distributor, aligning the center of the flange with that of the bolt hole on the cylinder head with drilled mark facing upward.



(b) When fully installed, the distributor should point as shown in the illustration.

(c) Lightly tighten the hold–down bolt.



5. INSTALL DISTRIBUTOR CAP WITH HIGH–TENSION CORDS

6. CONNECT HIGH–TENSION CORDS TO SPARK PLUGS

Firing order: 1 – 5 – 3 – 6 – 2 – 4

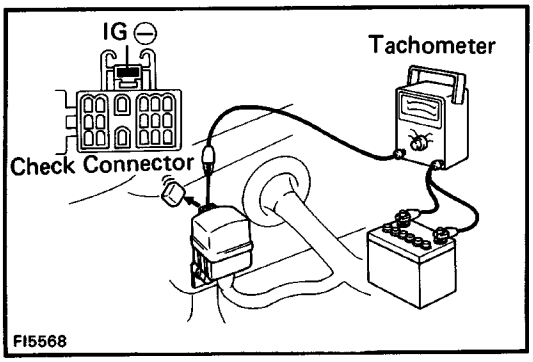
7. CONNECT VENTILATION HOSES

8. CONNECT DISTRIBUTOR CONNECTOR

9. INSTALL AIR CLEANER HOSE

10. WARM UP ENGINE

Allow the engine to reach normal operating temperature.

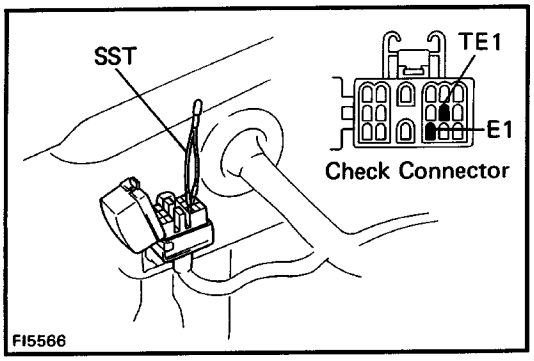


11. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

Connect the tachometer test probe to terminal IG(–) of the check connector.

NOTICE:

- **NEVER allow the tachoMeter terminals to touch ground as it could result in damage to the igniter and /or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before using.**



12. ADJUST IGNITION TIMING

(a) Using SST, connect terminals TE1 and E1 of the check connector.

SST 09843–18020

(b) Check the idle speed.

Idle speed: 650 rpm

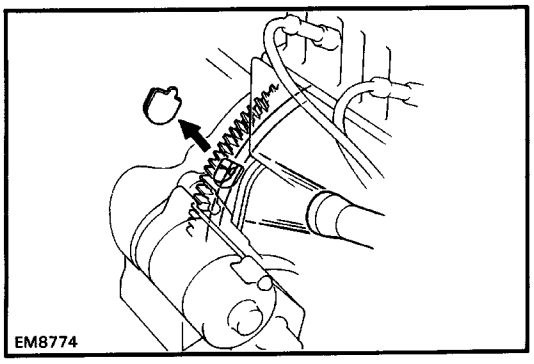
(c) Using a timing light, slowly turn the distributor until the timing mark on the drive plate is aligned with the 7˚ mark.

Ignition timing: 7˚ BTDC @ idle

(d) Tighten the distributor bolt and recheck the ignition timing.

Torque: 17 N–m (175 kgf–cm, 13 ft–lbf)

(e) Disconnect the check connector.



13. FURTHER CHECK IGNITION TIMING

Ignition timing: Approx. 12˚ BTDC @ idle

14. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

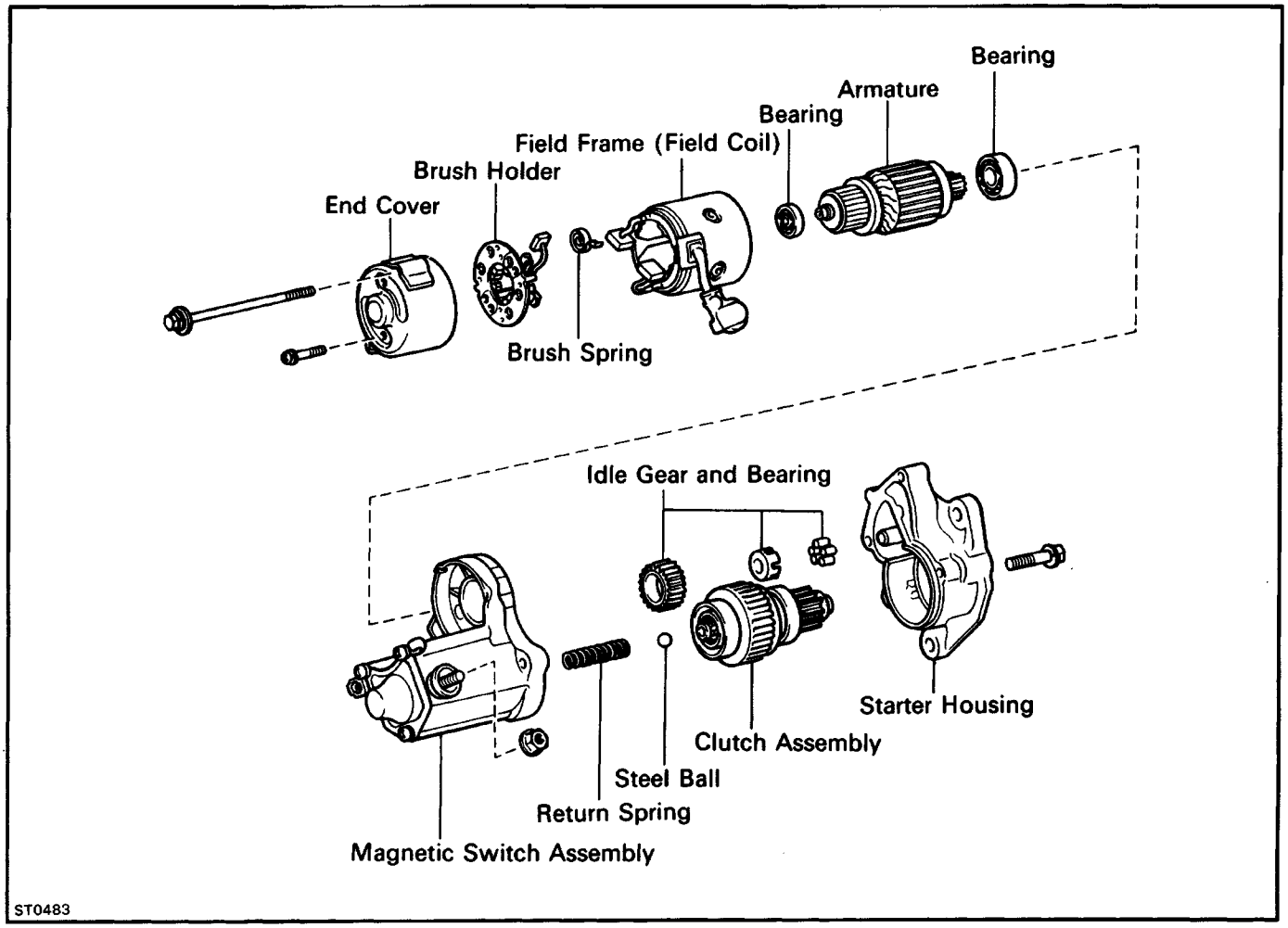
STARTING SYSTEM

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not crank	Battery charge low	Check battery specific gravity Charge or replace battery	CH–3
	Battery cables loose, corroded or worn	Repair or replace cable	
	Neutral start switch faulty	Replace switch	
	Fusible link blown	Replace fusible link	
	Starter faulty	Repair starter	ST–3
	Ignition switch faulty	Replace ignition switch	
Engine cranks slowly	Battery charge low	Check battery specific gravity Charge or replace battery	CH–3
	Battery cables loose, corroded or worn	Repair or replace cables	
	Starter faulty	Repair starter	ST–3
Starter keeps running	Starter faulty	Repair starter	ST–3
	Ignition switch faulty	Replace ignition switch	
	Short in wiring	Repair wiring	
Starter spins but engine will not crank	Pinion gear teeth broken or faulty starter	Repair starter	ST–3
	Drive plate teeth broken	Replace Drive plate	

STARTER

COMPONENTS

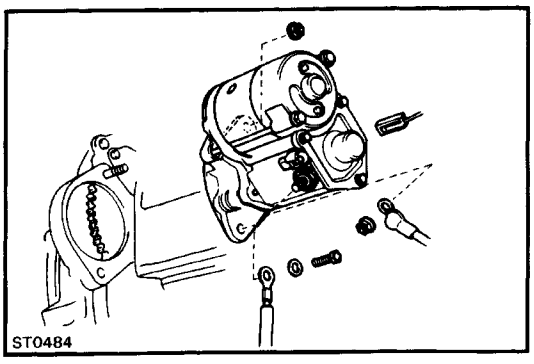


REMOVAL OF STARTER

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

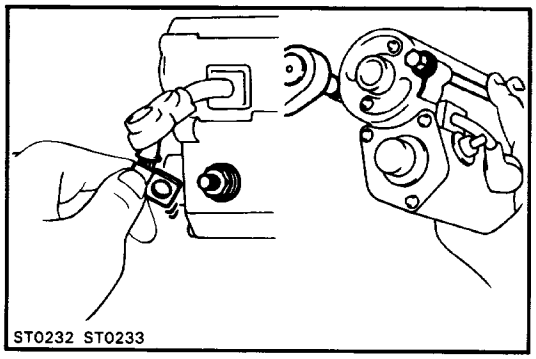
2. DISCONNECT CABLE AND CONNECTOR

Remove the nut and disconnect the battery cable from the magnetic switch on the starter motor.
Disconnect the connector from terminal 50.



3. REMOVE STARTER MOTOR

(a) Remove the bolt and disconnect the ground strap.
(b) Remove the nut and starter motor.



DISASSEMBLY OF STARTER

(See page ST–3)

1. REMOVE FIELD FRAME WITH ARMATURE FROM MAGNETIC SWITCH ASSEMBLY

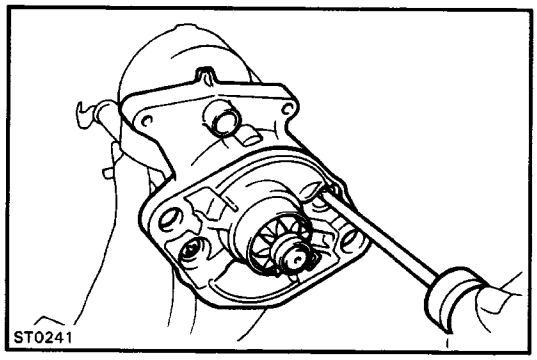
(a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.

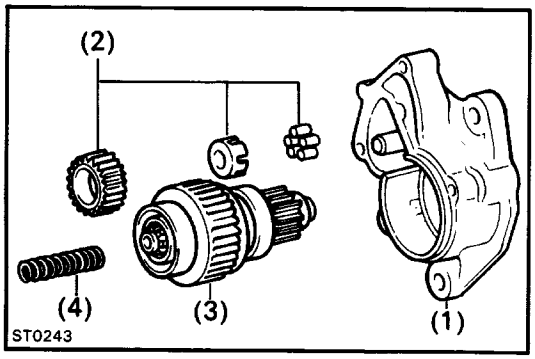
(b) Remove the two through bolts.

(c) Pull out the field frame with the armature from the magnetic switch assembly.

2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND IDLE GEAR

(a) Remove the two screws.





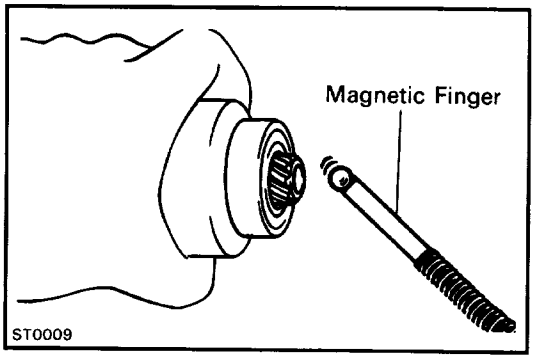
(b) Remove the following parts from the magnetic switch assembly:

(1) Starter housing

(2) Idle gear and bearing

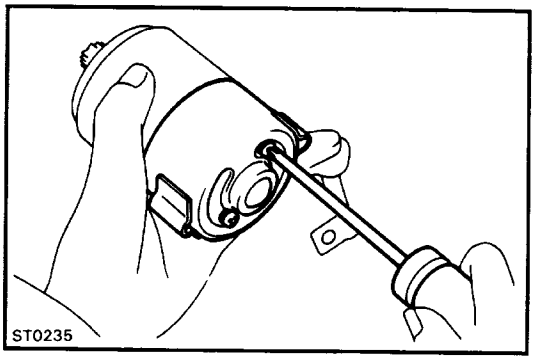
(3) Clutch assembly

(4) Return spring



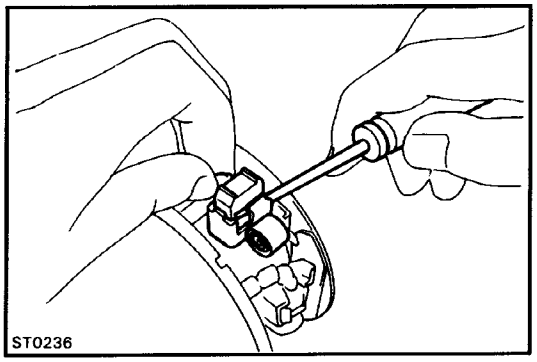
3. REMOVE STEEL BALL

Using a magnetic finger, remove the steel ball from the clutch shaft hole.



4. REMOVE BRUSH HOLDER

(a) Remove the two screws and end cover from the field frame.

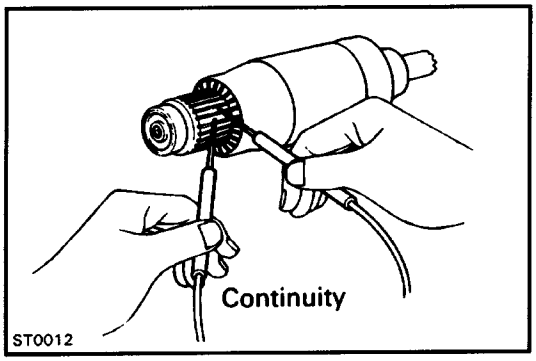


(b) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder.
Disconnect the four brushes and remove the brush holder.

5. REMOVE ARMATURE FROM FIELD FRAME

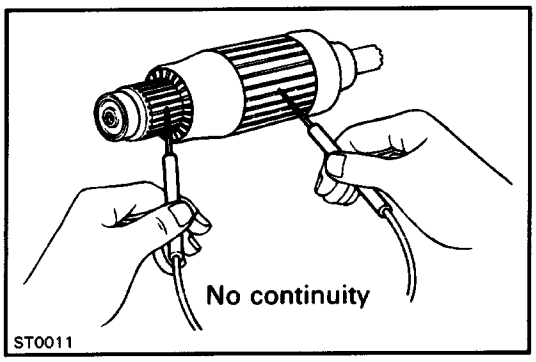
INSPECTION AND REPAIR OF STARTER

Armature Coil



1. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the commutator.
If there is no continuity between any segment, replace the armature.



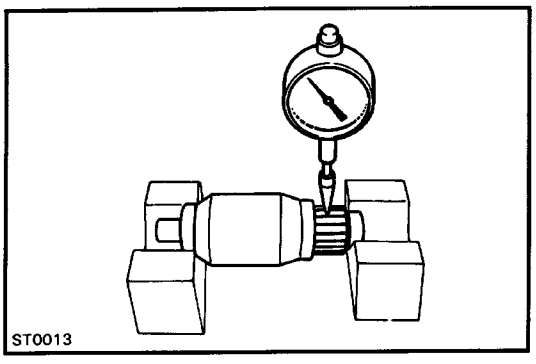
2. INSPECT COMMUTATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.
If there is continuity, replace the armature.

Commutator

1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

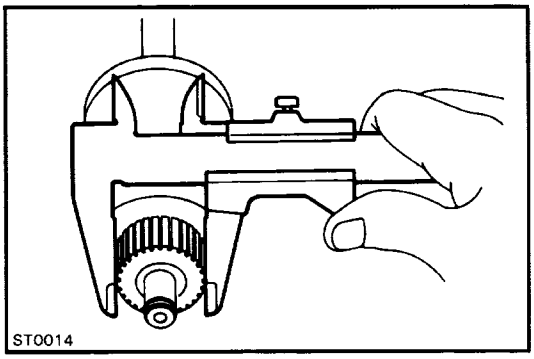
If the surface is dirty or burnt, correct it with sandpaper (No.400) or a lathe.



2. INSPECT COMMUTATOR CIRCLE RUNOUT

(a) Place the commutator on V–blocks.
(b) Using a dial indicator, measure the circle runout.
Maximum circle runout: 0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it with a lathe.



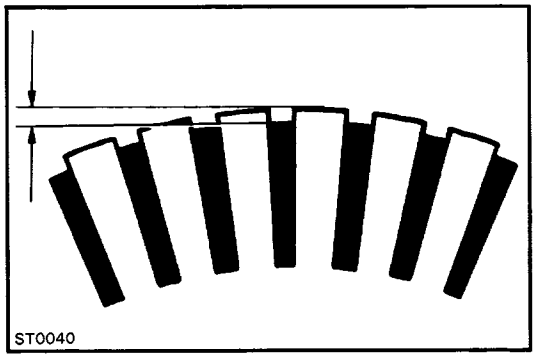
3. INSPECT COMMUTATOR DIAMETER

Using calipers, measure the commutator diameter.

Standard diameter: 34 mm (1.18 in.)

Minimum diameter: 29 mm (1.14 in.)

If the diameter is less than minimum, replace the armature.



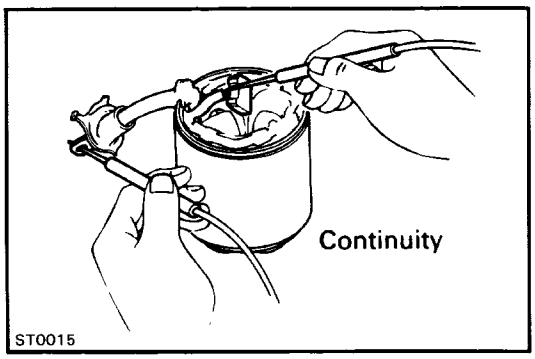
4. INSPECT UNDERCUT DEPTH

Check that the undercut depth is clean and free of foreign material. Smooth out the edge.

Standard undercut depth: 0.6 mm (0.024 in.)

Minimum undercut depth: 0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with a hacksaw blade.

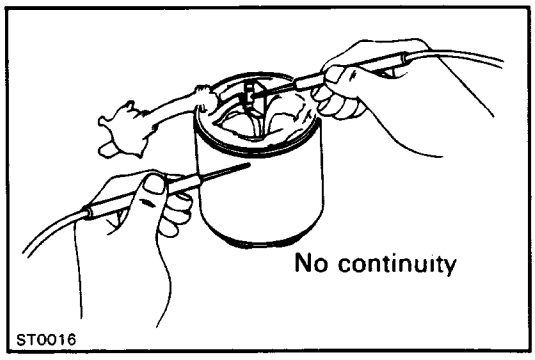


Field Frame (Field Coil)

1. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.

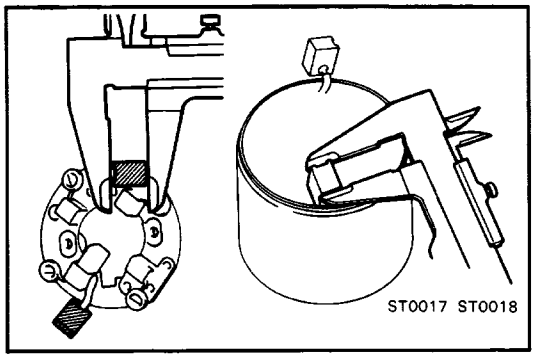
If there is no continuity, replace the field frame.



2. INSPECT FIELD COIL FOR GROUND

Using an ohmmeter, check that there is no continuity between the field coil end and field frame.

If there is continuity, repair or replace the field frame.



Brushes

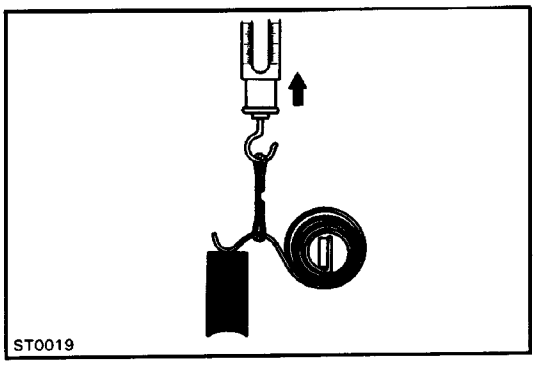
INSPECT BRUSH LENGTH

Using calipers, measure the brush length.

Standard length: 13.5 mm (0.531 in.)

Minimum length: 8.5 mm (0.335 in.)

If the length is less than minimum, replace the brush holder and field frame.



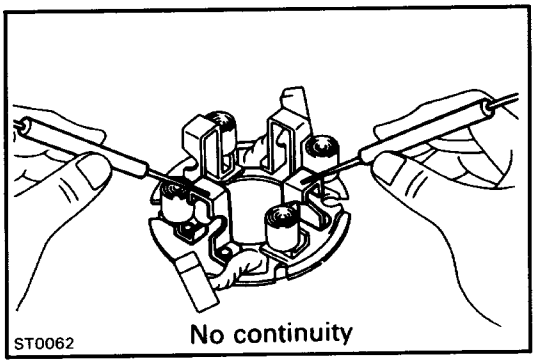
Brush Springs

INSPECT BRUSH SPRING LOAD

Take the pull scale reading the instant the brush spring separates from the brush.

Spring installed load:
18 – 24 N (1.79 – 2.41 kgf, 3.9 – 5.3 lbf)

If the installed load is not within specification, replace the brush springs.



Brush Holder

INSPECT BRUSH HOLDER INSULATION

Using an ohmmeter, check that there is no continuity between the positive (+) and negative (–) brush holders.
If there is continuity, repair or replace the brush holder.

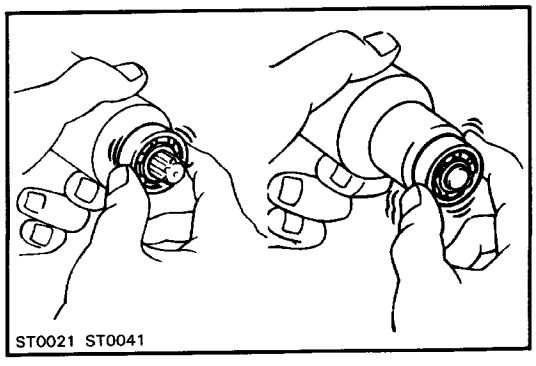
Clutch and Gears

1. INSPECT GEAR TEETH

Check the gear teeth on the idle gear and clutch assembly for wear or damage.
If damaged, replace the gear or clutch assembly.
If damaged, also check the drive plate ring gear for wear or damage.

2. INSPECT CLUTCH

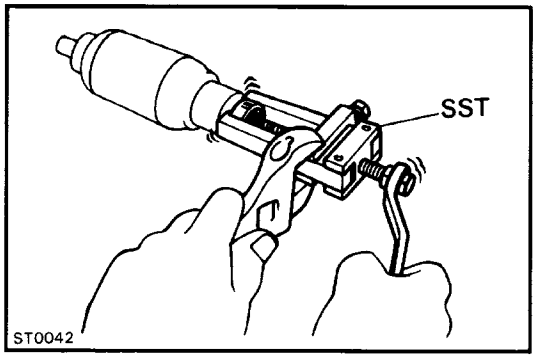
Rotate the clutch pinion gear clockwise and check that it turns freely. Try to rotate the clutch pinion gear counter–clockwise and check that it locks.
If necessary, replace the clutch assembly.



Bearings

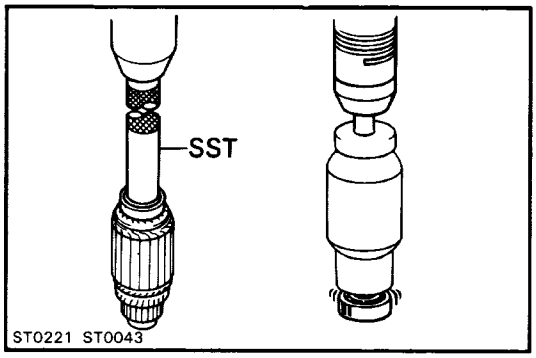
1. INSPECT BEARINGS

Turn each bearing by hand while applying inward force.
If resistance is felt or if the bearing sticks, replace the bearing.



2. IF NECESSARY, REPLACE BEARINGS

(a) Using SST, remove the bearing.
SST 09286–46011



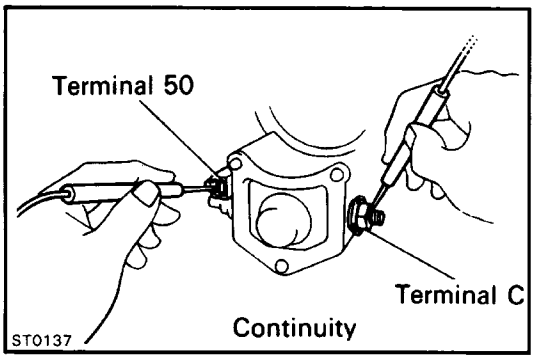
(b) Using SST and a press, press in a new front bearing.
SST 09285–76010

(c) Using a press, press in a new rear bearing.

Magnetic Switch

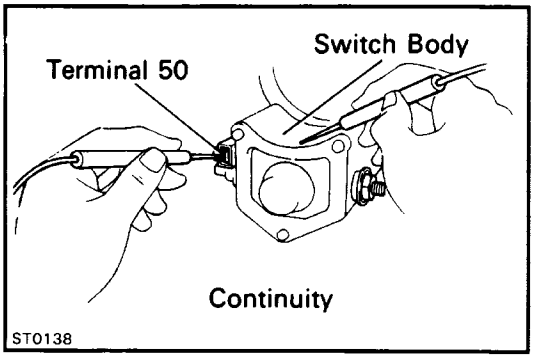
1. PERFORM PULL–IN COIL OPEN CIRCUIT TEST

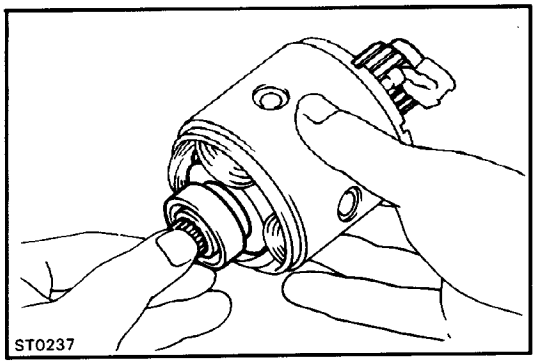
Using an ohmmeter, check that there is continuity between terminals 50 and C.
If there is no continuity, replace the magnetic switch assembly.



2. PERFORM HOLD–IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.
If there is no continuity, replace the magnetic switch assembly.





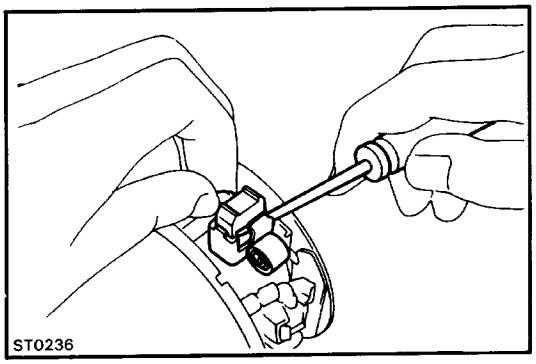
ASSEMBLY OF STARTER

(See page ST–3)

HINT: Use high –temperature grease to lubricate the bearings and gears when assembling the starter.

1. PLACE ARMATURE INTO FIELD FRAME

Apply grease to the armature bearings and insert the armature into the field frame.

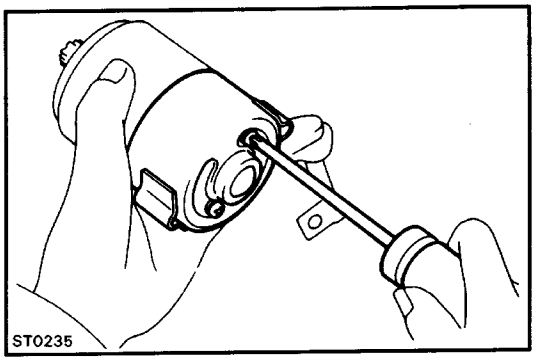


2. INSTALL BRUSH HOLDER

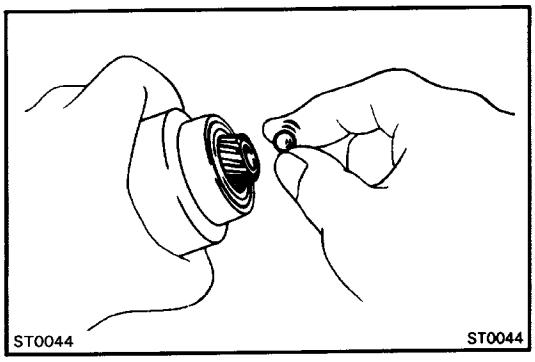
(a) Place the brush holder on the armature.

(b) Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder. Con– nect the four brushes.

HINT: Check that the positive (+) lead wires are not grounded.



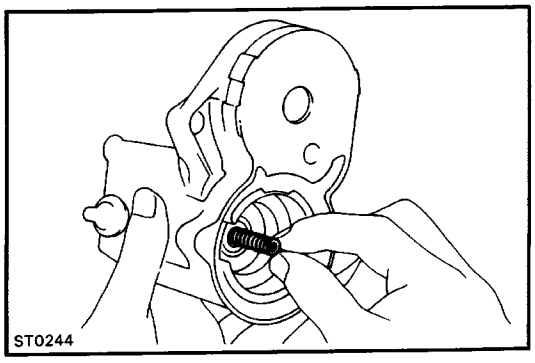
(c) Install the end cover to the field frame with the two screws.



3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

(a) Apply grease to the steel ball.

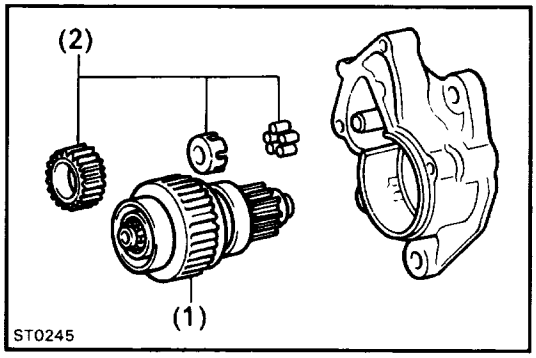
(b) Insert the steel ball into the clutch shaft hole.



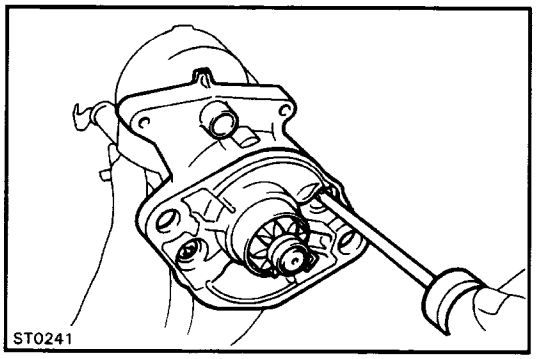
4. INSTALL CLUTCH ASSEMBLY, IDLE GEAR AND STARTER HOUSING

(a) Apply grease to the return spring, the clutch assem– bly, idle gear and bearing.

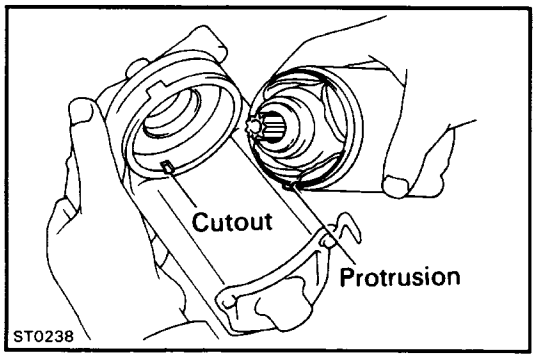
(b) Insert the return spring into the magnetic switch hole.



(c) Place the following parts in position on the starter housing:
(1) Clutch assembly
(2) Idle gear and bearing

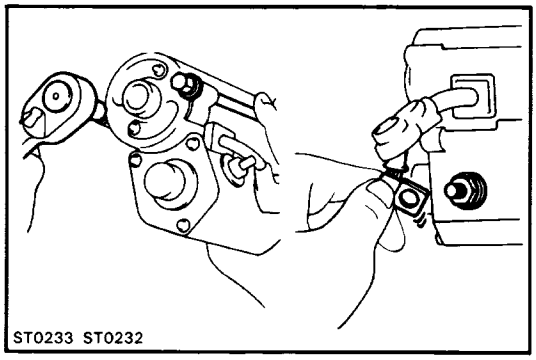


(d) Assemble the starter housing and magnetic switch assembly and install the two screws.

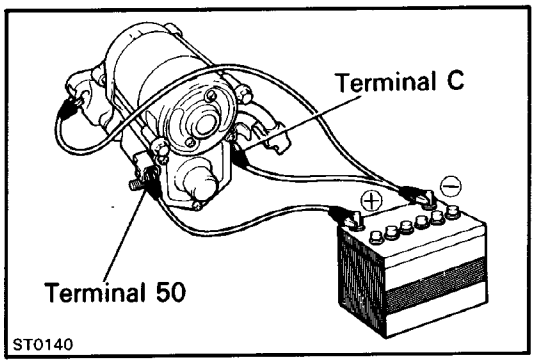


5. INSTALL FIELD FRAME WITH ARMATURE TO MAGNETIC SWITCH ASSEMBLY

(a) Align the protrusion of the field frame with the cutout of the magnetic switch assembly.



(b) Install the two through bolts.
(c) Connect the lead wire to the magnetic switch terminal C, and install the nut.



PERFORMANCE TEST OF STARTER

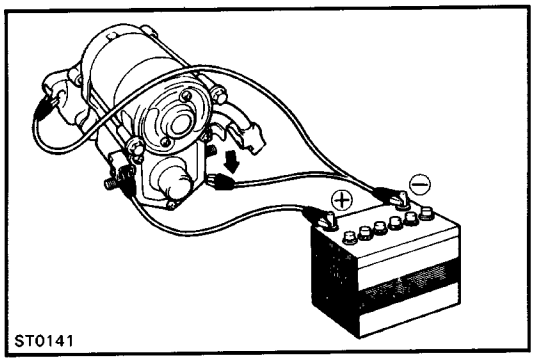
NOTICE: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

1. PERFORM PULL–IN TEST

(a) Disconnect the field coil lead wire from terminal C.

(b) Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear moves outward.

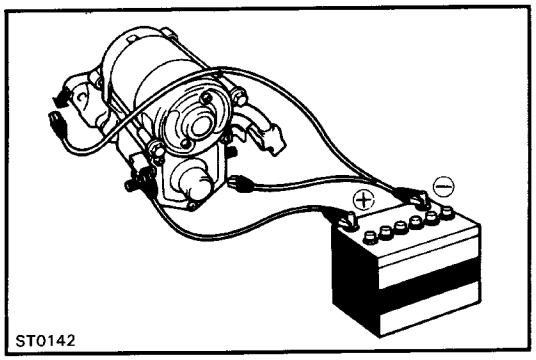
If the clutch pinion gear does not move, replace the mag–netic switch assembly.



2. PERFORM HOLD–IN TEST

While connected as above with the clutch pinion gear out, disconnect the negative (–) lead from terminal C. Check that the pinion gear remains out.

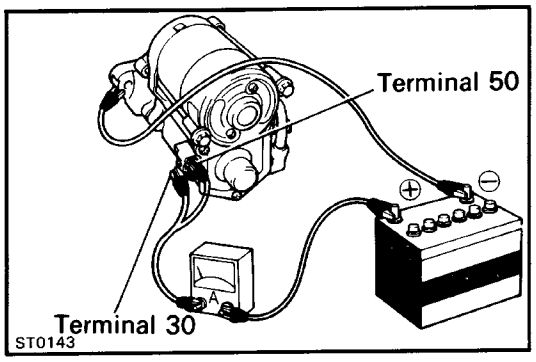
If the clutch pinion gear returns inward, replace the mag–netic switch assembly.



3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (–) lead from the switch body. Check that the clutch pinion gear returns inward.

If the clutch pinion gear does not return, replace the magnetic switch assembly.



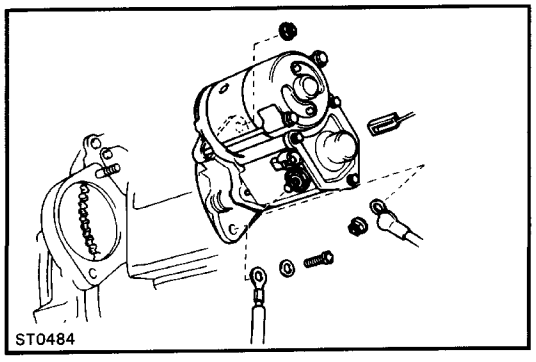
4. PERFORM NO–LOAD PERFORMANCE TEST

(a) Connect the battery and ammeter to the starter as illustration.

(b) Check that the starter rotates smoothly and steadily with the pinion gear moving out.

Check that the ammeter shows the specified cur–rent.

Specified current: 90 A or less at 11.5 V



INSTALLATION OF STARTER

1. INSTALL STARTER

Install the starter and ground strap with the bolt and nut.

2. CONNECT CONNECTOR AND CABLE TO STARTER

3. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

4. CHECK THAT ENGINE STARTS

CHARGING SYSTEM

PRECAUTIONS

1. Check that the battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is given a quick charge.
3. Do not perform tests with a high voltage insula–tion resistance tester.
4. Never disconnect the battery while the engine is running.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Discharge warning light does not light with ignition ON and engine not running	Fuse blown Light burned out Wiring connections loose IC regulator faulty Charge light relay faulty	Check ”CHARGE” and ”IGN” fuses Replace light Tighten loose connections Replace IC regulator Replace charge light relay	 CH–6 CH–15
Discharge warning light does not go out with engine running (battery requires fre–quent recharging)	Drive belt loose or worn Battery cables loose, corroded or worn Fuse blown Fusible link blown IC regulator or alternator faulty Wiring faulty Charge light relay faulty	Adjust or replace drive belt Repair or replace cables Check ”CHARGE” fuse Replace fusible link Check charging system Repair wiring Replace charge light relay	CH–3 CH–4 CH–15

PRECAUTIONS

1. Check that the battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is given a quick charge.
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TROUBLESHOOTING

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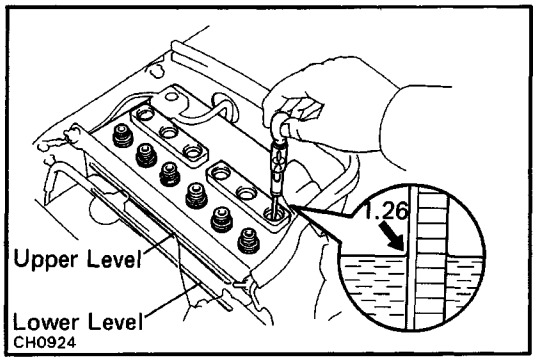
ON–VEHICLE INSPECTION



1. CHECK BATTERY SPECIFIC GRAVITY

(a) Check the specific gravity of each cell.

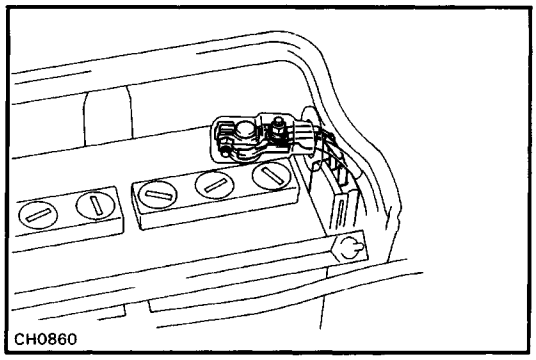
Standard specific gravity

When fully charged at 20˚C (68˚F): 1.25 – 1.27

If not within specification, charge the battery.

(b) Check the electrolyte quantity of each cell.

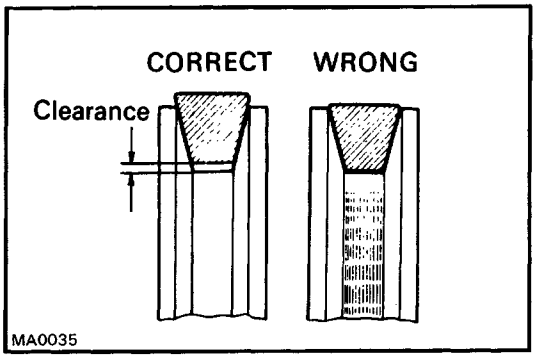
If insufficient, refill with distilled (or purified) water.



2. CHECK BATTERY TERMINALS, FUSIBLE LINKS AND FUSES

(a) Check that the battery terminals are not loose or corroded.

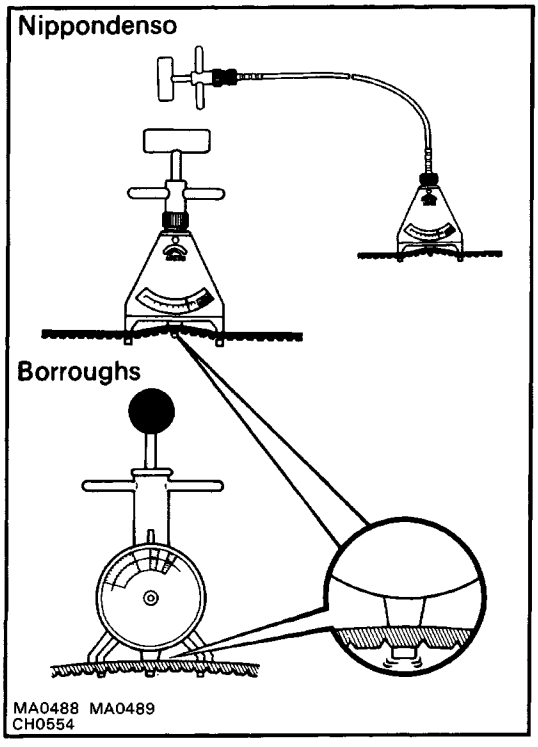
(b) Check the fusible links and fuses for continuity.



3. INSPECT DRIVE BELT

(a) Visually check the drive belt for cracks, oiliness or wear. Check that the belt does not touch the bottom of the pulley groove.

If necessary, replace the drive belt.



(b) Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

Nippondenso BTG–20 (95506–00020) or Borroughs NO. BT–33–73F

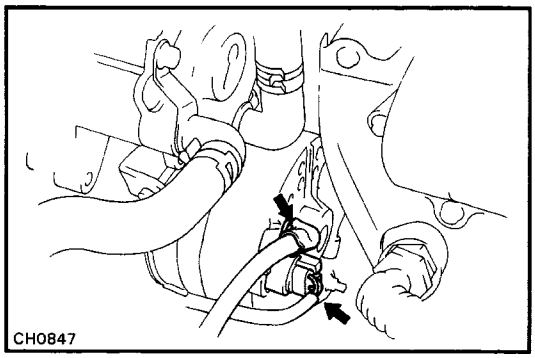
Drive belt tension: New belt 145 ± 25 lb

Used belt 100 ± 20 lb

If the belt tension is not as specified, adjust it.

HINT:

- When checking the tension, be sure the gauge is on the belt protrusion.
- ”New belt” refers to a belt which has been used for less than 5 minutes on a running engine.
- “Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the belt, run the engine for about 5 minutes and recheck the tension.



4. VISUALLY CHECK ALTERNATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.

(b) Check that there are no abnormal noises from the alternator while the engine is running.

5. CHECK DISCHARGE WARNING LIGHT CIRCUIT

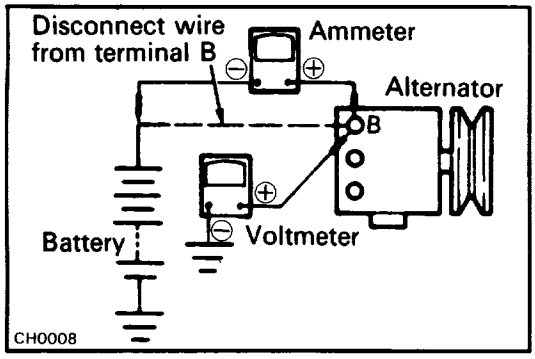
(a) Warm up the engine and turn it off.

(b) Turn off all accessories.

(c) Turn the ignition switch to "ON"'. Check that the charge light is lit.

(d) Start the engine. Check that the light goes out.

If the light does not come on and go off as specified, troubleshoot the discharge light circuit.

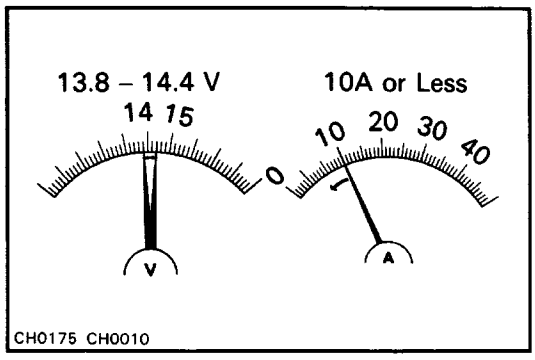


6. INSPECT CHARGING CIRCUIT WITHOUT LOAD

HINT: If a battery/alternator tester is available, connect the tester to the charging circuit according to the manufacturer's instructions.

(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:

- Disconnect the wire from terminal B of the alternator and connect the wire to the negative (–) terminal of the ammeter.
- Connect the test lead from the positive (+) terminal of the ammeter to terminal B of the alternator.
- Connect the positive (+) lead of the voltmeter to terminal B of the alternator.
- Ground the negative (–) lead of the voltmeter.



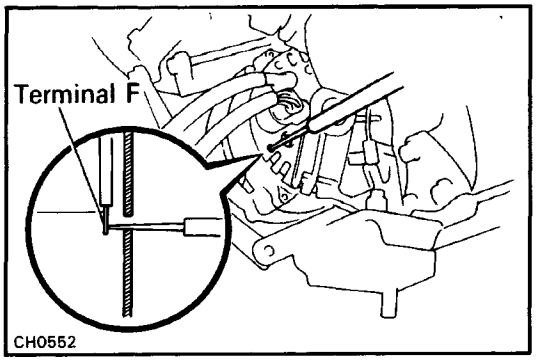
(b) Check the charging circuit as follows:

With the engine running from idling to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

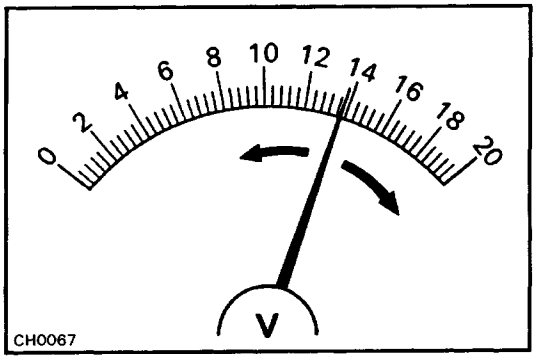
Standard voltage: 13.8 –14.4 V at 25˚C (77˚F)

If the voltage reading is not within standard voltage, replace the IC regulator.

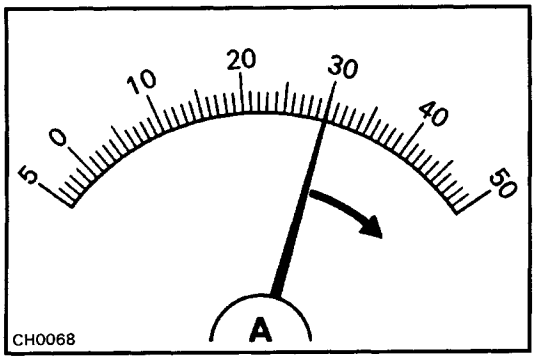


If the voltage reading is less than standard voltage, check the IC regulator and alternator as follows:

- With terminal F grounded, start the engine and check the voltage reading of terminal B.



- If the voltage reading is more than standard voltage, replace the IC regulator.
- If the voltage reading is less than standard voltage, check the alternator.

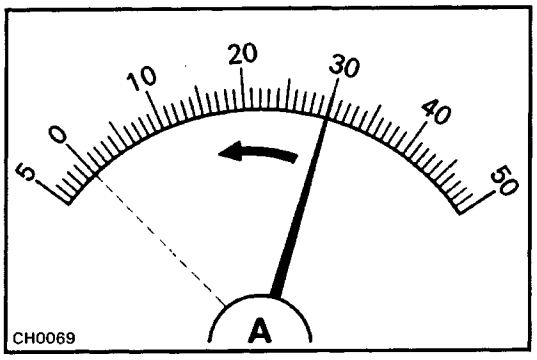


7. INSPECT CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater blower switch at ”HI”.

(b) Check the reading on the ammeter.

Standard amperage: 30 A or more

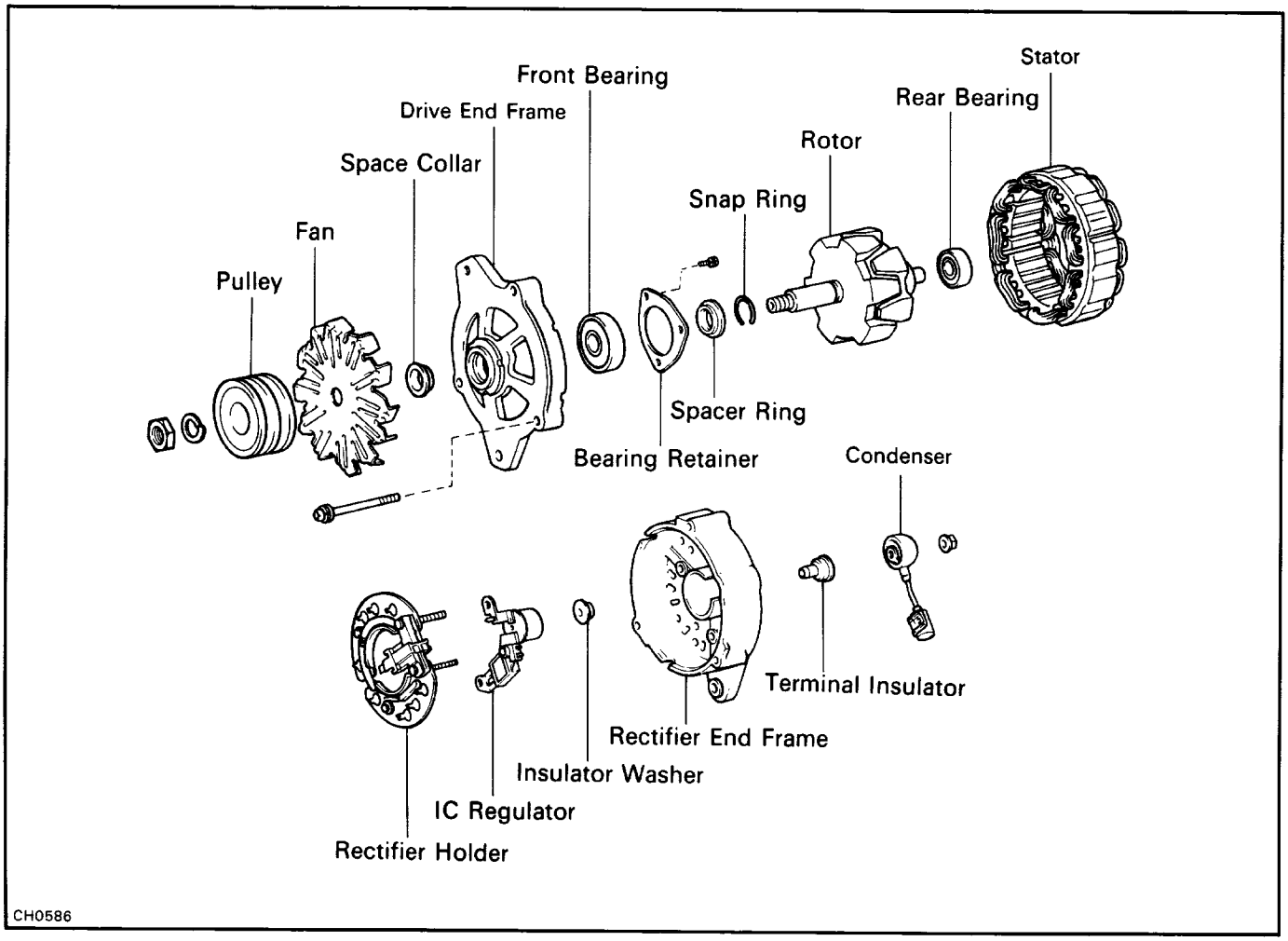


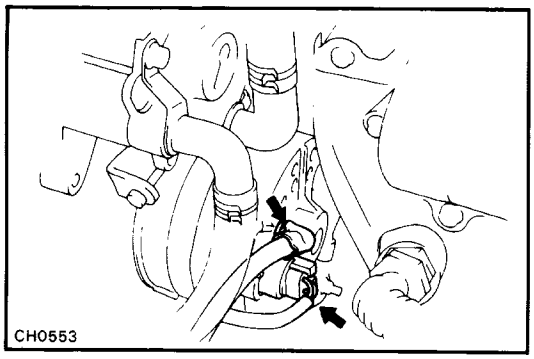
If the ammeter reading is less than 30 A, repair the alternator. (See page CH–6)

HINT: When the battery is fully charged, the indication will sometimes be less than 30 A.

ALTERNATOR

COMPONENTS



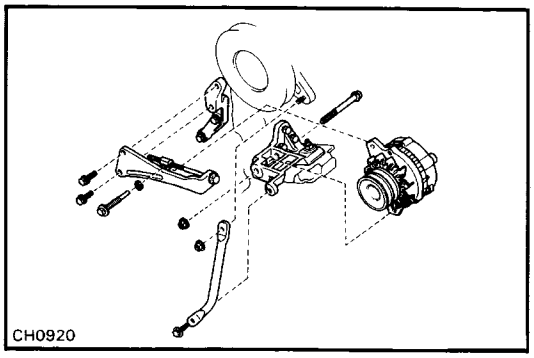


REMOVAL OF ALTERNATOR

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DISCONNECT CONNECTOR AND WIRE FROM ALTERNATOR

3. REMOVE DRIVE BELTS

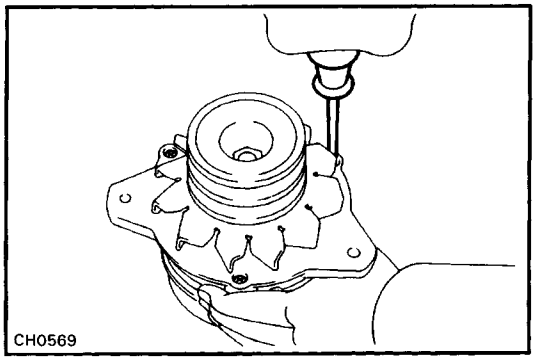


4. REMOVE ALTERNATOR

(a) Remove the bolt, nut and air pump stay.

(b) Remove the adjusting lock bolt, two bolts and adjusting bar.

(c) Remove the pivot bolt, nut and alternator.

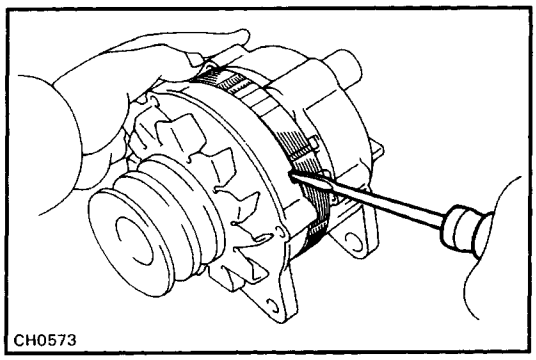


DISASSEMBLY OF ALTERNATOR

(See page CH–6)

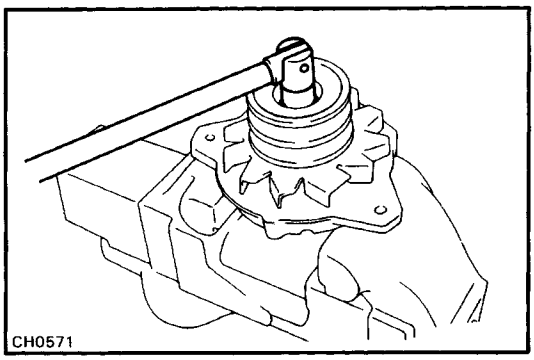
1. REMOVE DRIVE END FRAME AND ROTOR ASSEMBLY FROM STATOR

(a) Remove the three through screws.



(b) Using a screwdriver, pry the end frame and remove it together with the rotor.

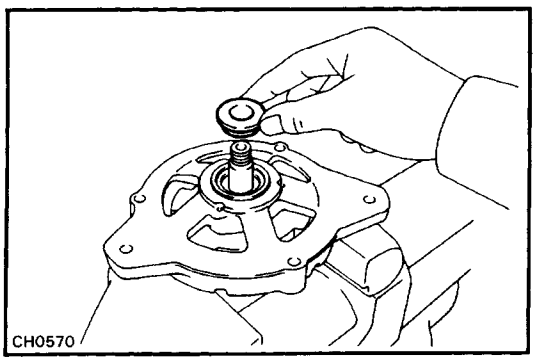
NOTICE: Do not pry the coil wires.



2. REMOVE PULLEY, FAN AND DRIVE END FRAME FROM ROTOR

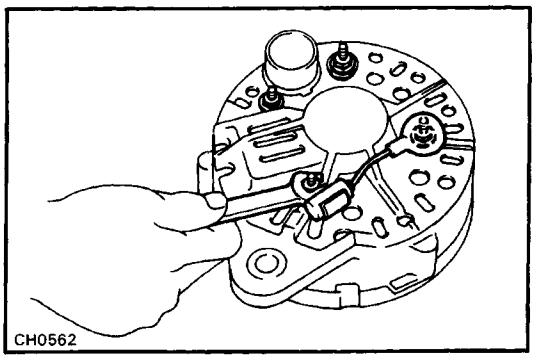
(a) Mount the rotor in a soft jaw vise.

(b) Remove the pulley nut, spring washer, pulley and fan.



(c) Remove the spacer collar and drive end frame.

(d) Remove the spacer ring and snap ring.

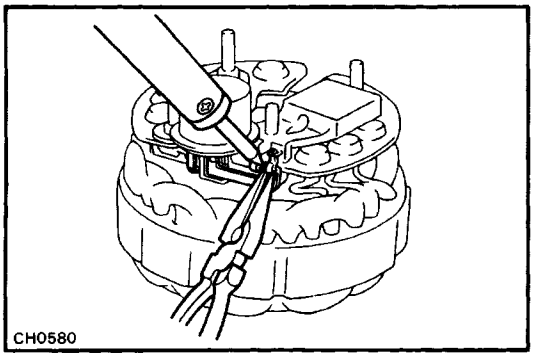


3. REMOVE RECTIFIER END FRAME

(a) Remove the four nuts, condenser and two terminal insulators.

(b) Remove the rectifier end frame.

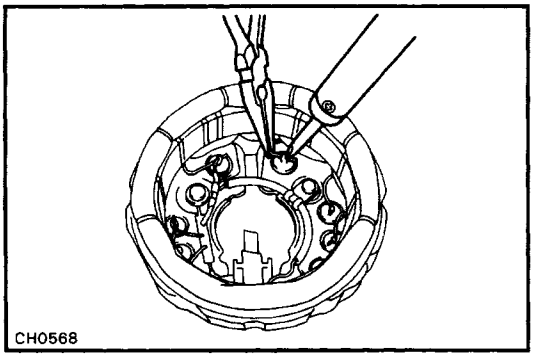
(c) Remove the insulator washer from the rectifier holder stud.



4. REMOVE IC REGULATOR

Hold the IC regulator terminal with needle–nose pliers, and unsolder the terminals.

NOTICE: Protect the rectifiers from heat.



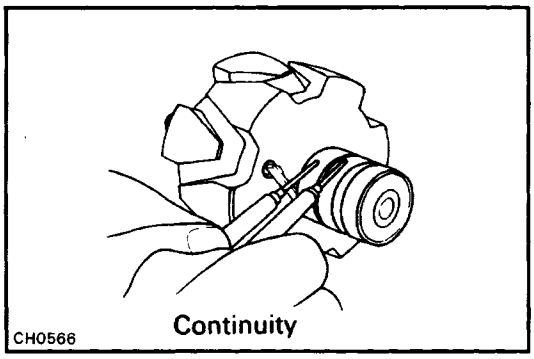
5. REMOVE RECTIFIER HOLDER

Hold the stator coil lead with needle–nose pliers, and unsolder the leads.

NOTICE: Protect the rectifiers from heat.

INSPECTION AND REPAIR OF ALTERNATOR

Rotor

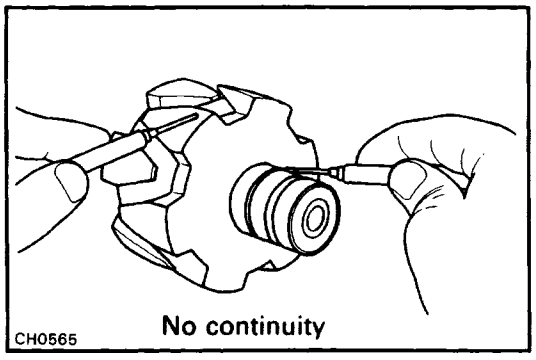


1. INSPECT ROTOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance: 2.8 – 3.0 Ω

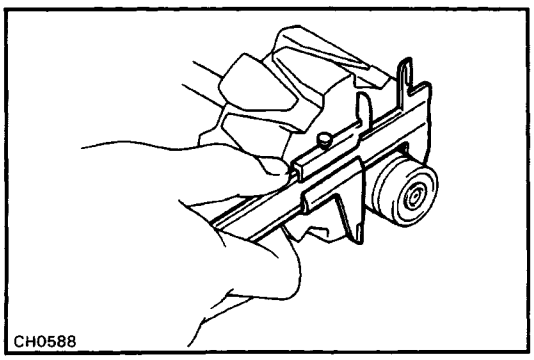
If there is no continuity, replace the rotor.



2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and the rotor.

If there is continuity, replace the rotor.



3. INSPECT SLIP RINGS

(a) Check the slip rings are not rough or scored.

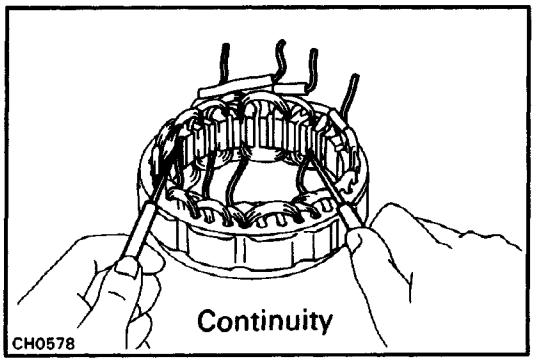
If rough or scored, replace the rotor.

(b) Using calipers, measure the slip ring diameters.

Standard diameter: 32.3 – 32.5 mm
(1.272 –1.280 in.)

Minimum diameter: 32.1 mm (1.264 in.)

If the diameter is less than minimum, replace the rotor.

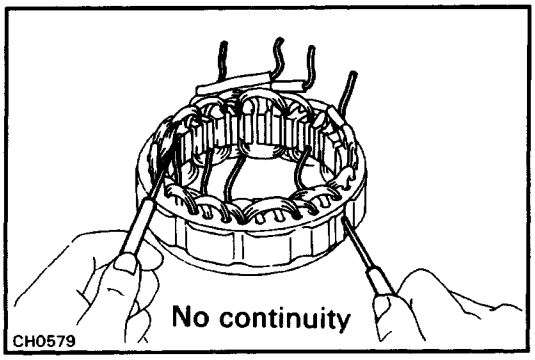


Stator

1. INSPECT STATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the coil leads.

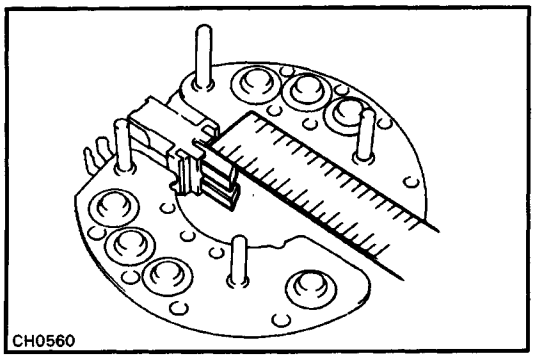
If there is no continuity, replace the stator.



2. INSPECT STATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the coil leads and stator core.

If there is continuity, replace the stator.



Brushes

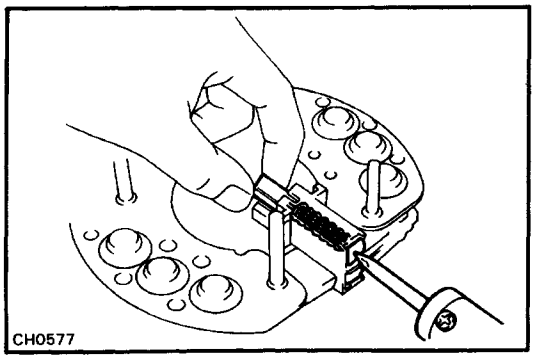
1. INSPECT EXPOSED BRUSH LENGTH

Using a scale, measure the exposed brush length.

Standard exposed length: 12.5 mm (0.492 in.)

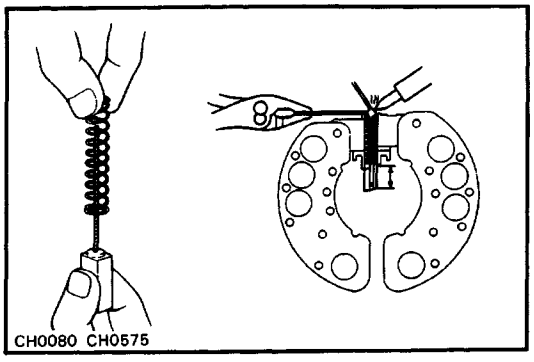
Minimum exposed length: 5.5 mm (0.217 in.)

If the length is less than minimum, replace the brushes.



2. IF NECESSARY, REPLACE BRUSHES

(a) Unsolder and remove the brush and spring.



(b) Insert the brush wire through the spring.

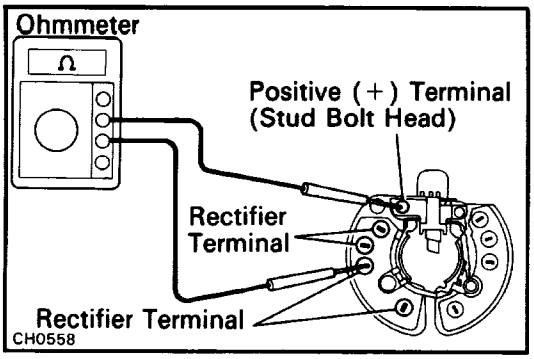
(c) Install the brush in the brush holder.

(d) Solder the wire to the brush holder at specified exposed length.

Exposed length: 12.5 mm (0.492 in.)

(e) Check that the brush moves smoothly in the brush holder.

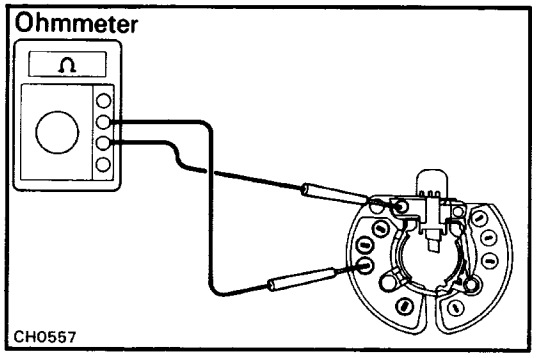
(f) Cut off any excess wire.



Rectifiers (Rectifier Holder)

1. INSPECT POSITIVE SIDE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to the positive (+) terminal and the other to each rectifier terminal.



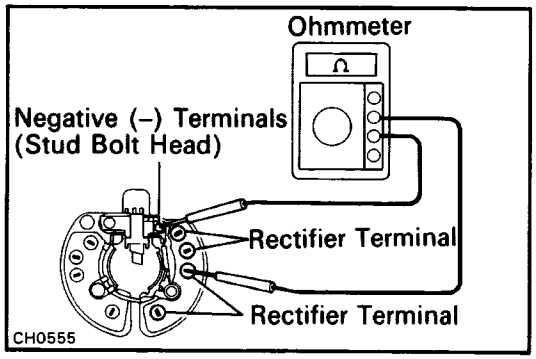
(b) Reverse the polarity of the tester and repeat step (a).

(c) Check that one shows continuity and the other shows no continuity.

If continuity is not as specified, replace the rectifier holder.

2. INSPECT NEGATIVE SIDE RECTIFIER

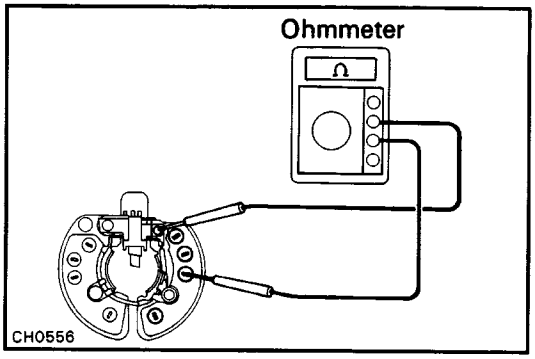
(a) Using an ohmmeter, connect one tester probe to the negative (–) terminal and the other to each rectifier terminal.



(b) Reverse the polarity of the tester probes and repeat step (a).

(c) Check that one shows continuity and the other shows no continuity.

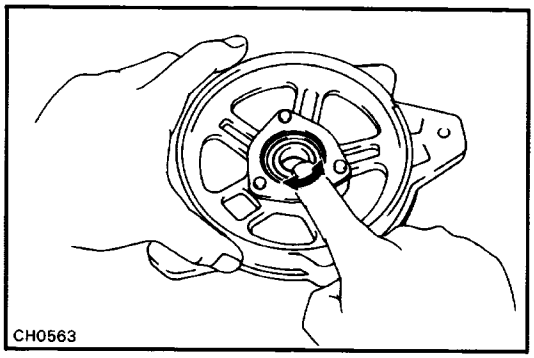
If continuity is not as specified, replace the rectifier holder.

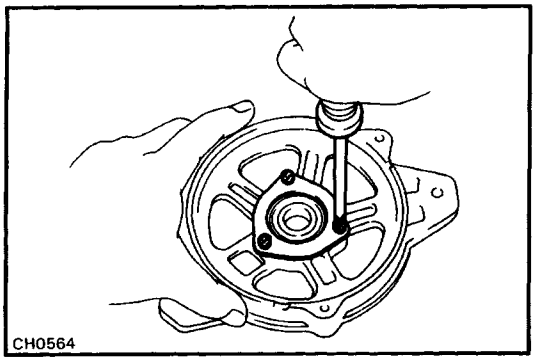


Bearings

1. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.

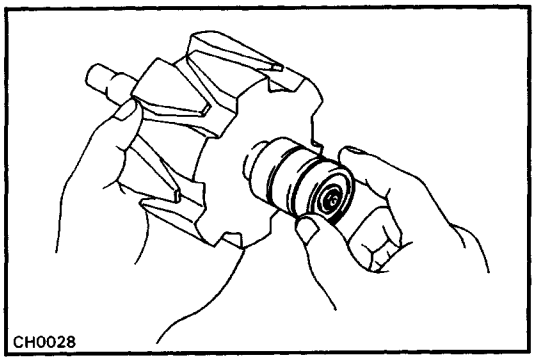




2. IF NECESSARY, REPLACE FRONT BEARING

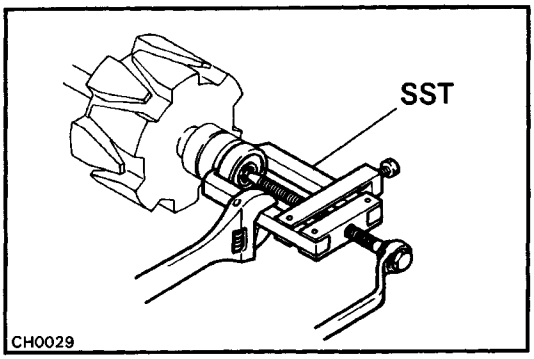
Remove the three screws and bearing retainer, and replace the bearing.

Torque: 3.4 N–m (35 kgf–cm, 30 in–lbf)



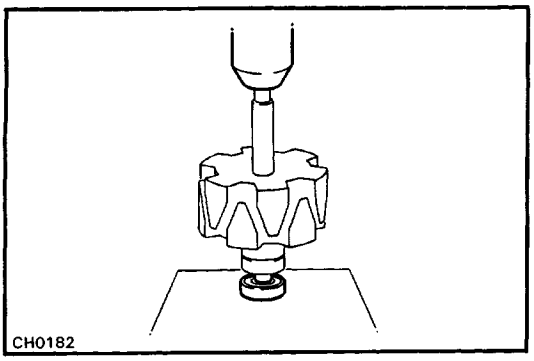
3. INSPECT REAR BEARING

Check that the bearing is not rough or worn.

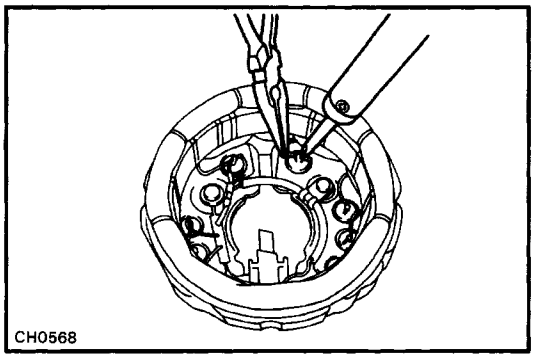


4. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing from the rotor shaft.
SST 09286–46011



(b) Using a press, press in a new rear bearing onto the rotor shaft.



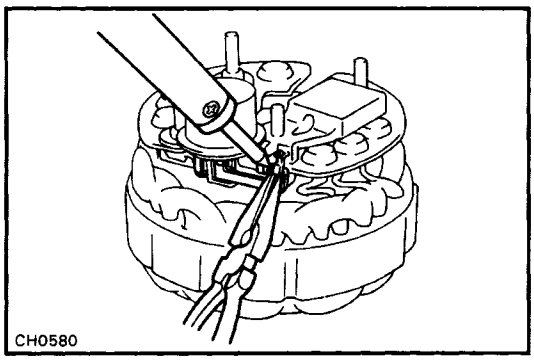
ASSEMBLY OF ALTERNATOR

(See page CH–6)

1. INSTALL RECTIFIER HOLDER TO STATOR

Hold the stator coil lead with needle–nose pliers while soldering the leads.

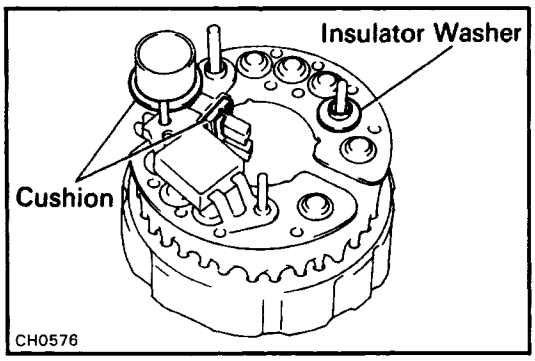
NOTICE: Protect the rectifiers from heat.



2. INSTALL IC REGULATOR

Hold the IC regulator terminal with needle–nose pliers while soldering the terminals.

NOTICE: Protect the rectifiers from heat.



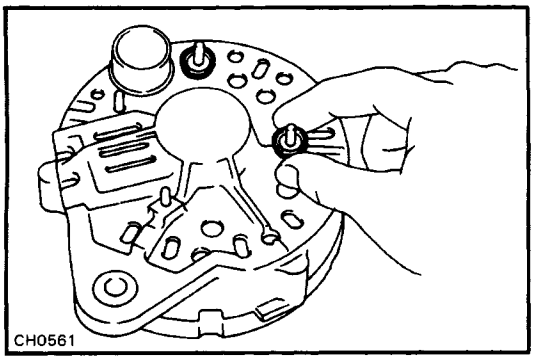
3. INSTALL RECTIFIER END FRAME TO RECTIFIER HOLDER

(a) Place the insulator washer on the positive (+) stud of the rectifier holder.

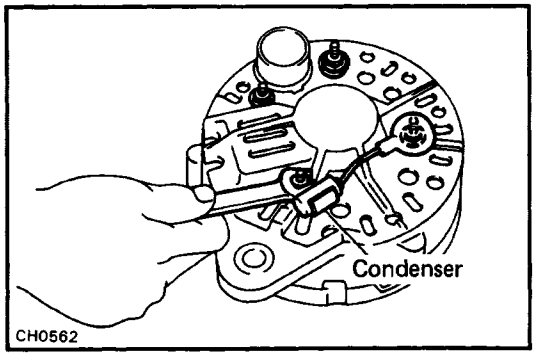
(b) Place the two cushions on the brush holder and alternator terminal.

(c) Place the rectifier end frame on the rectifier holder.

(d) Check that the wires are not touching the rectifier end frame.

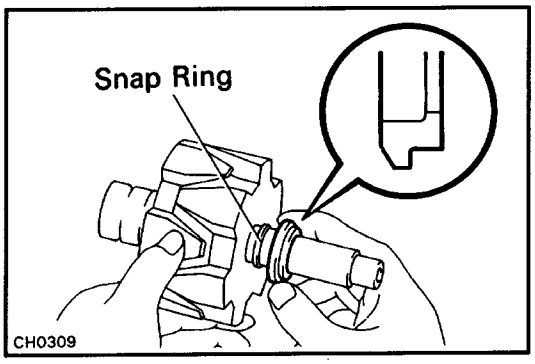


(e) Place the two terminal insulators on the positive (+) studs of the rectifier holder.



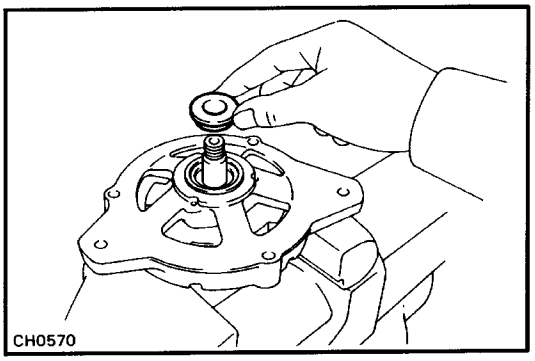
(f) Install the condenser and four nuts.

Torque: 4.4 N–m (45 kgf–cm, 39 in.–lbf)

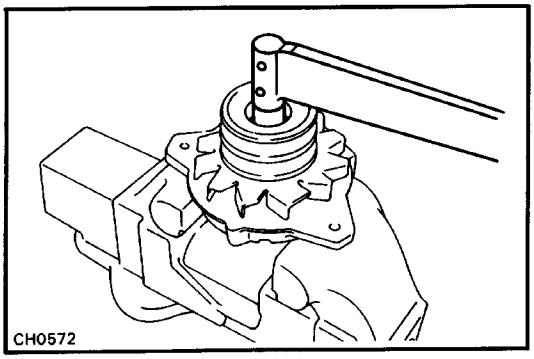


4. INSTALL DRIVE END FRAME, FAN AND PULLEY TO ROTOR

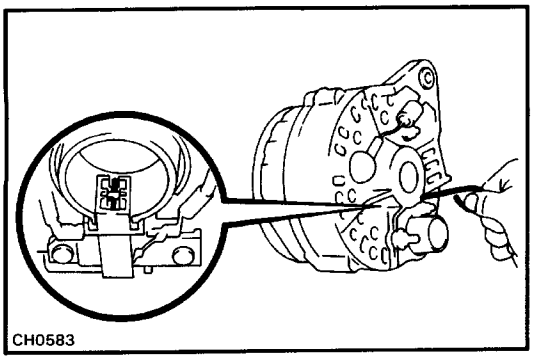
(a) Slide the snap ring and spacer ring onto the rotor shaft.



(b) Mount the rotor in a soft jaw vise.
(c) Slide the drive end frame and spacer collar.

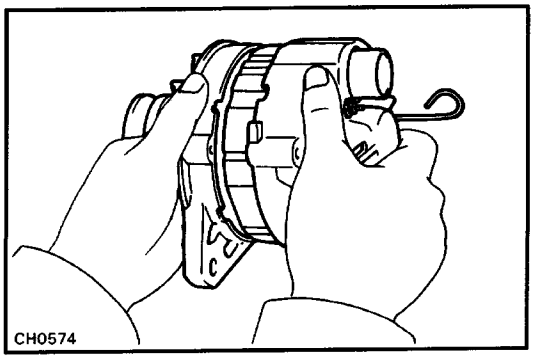


(d) Slide the fan, pulley and spring washer onto the rotor shaft.
(e) Install and torque the nut.
Torque: 61 N–m (625 kgf–cm, 45 ft.–lbf)

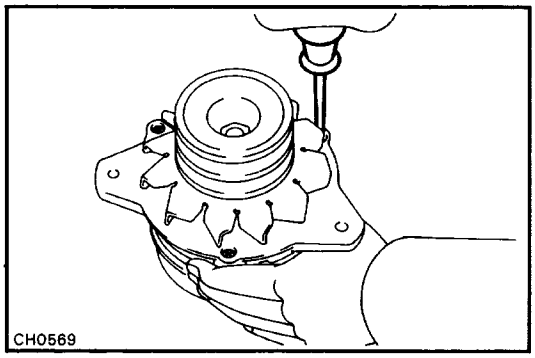


5. ASSEMBLE DRIVE END FRAME AND RECTIFIER END FRAME

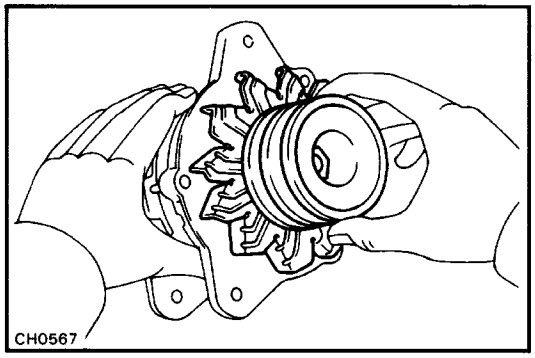
(a) Bend the rectifier lead wires back to clear the rotor.
(b) Using a curved tool, push the brushes in as far as they will go and hold them in place by inserting a stiff wire through the access hole in the rectifier end frame.



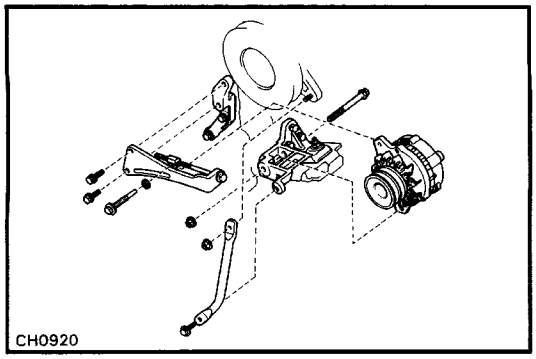
(c) Assemble the drive end frame and the rectifier end frame by inserting the rear bearing on the rotor shaft into the rectifier end frame.



(d) Install the three through screws.
(e) Remove the stiff wire from the access hole.
Torque: 5.9 N–m (60 kgf–cm, 52 in.–lbf)



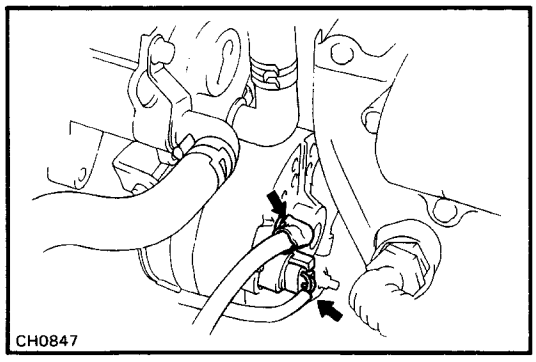
(f) Check that the rotor rotates smoothly.
(g) Seal the access hole.



INSTALLATION OF ALTERNATOR

1. INSTALL ALTERNATOR

(a) Mount the alternator on the alternator bracket with pivot bolt and nut. Do not tighten the bolt and nut.
(b) Install the adjusting bar with the two bolts and adjusting lock bolt. Do not tighten the adjusting lock bolt.
(c) Install the air pump stay with the bolt and nut.



2. INSTALL DRIVE BELTS

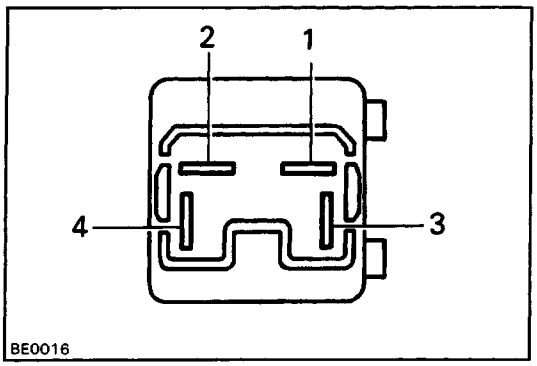
(a) Install the drive belt.
(b) Using a belt tension gauge, adjust the belt tension. (See page CH–3)
Drive belt tension: New belt 145 ± 25 lbf
Used belt 100 ± 20 lbf
(c) Tighten the pivot and adjusting lock bolts.

3. CONNECT CONNECTOR AND WIRE TO ALTERNATOR

4. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

5. PERFORM ON–VEHICLE INSPECTION

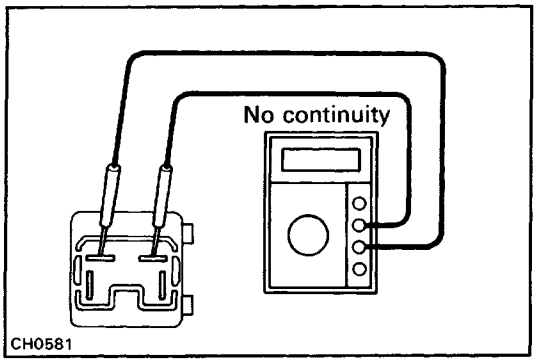
(See steps 5 to 7 on pages CH–4, CH–5)



CHARGE LIGHT RELAY

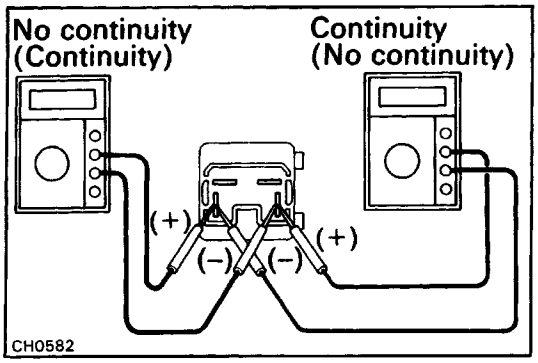
INSPECTION OF CHARGE LIGHT RELAY

LOCATION: In the engine room relay block.



1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is no continuity between terminals 1 and 2.

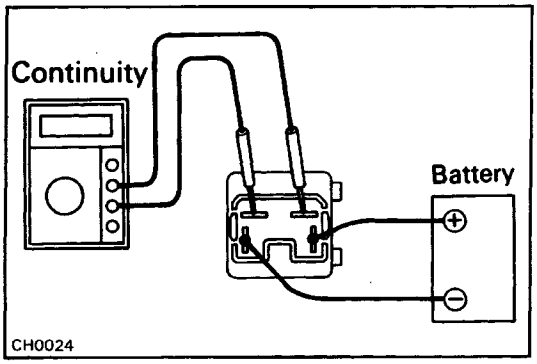


(b) Connect the one test probe to terminal 3 and the other to terminal 4.

(c) Reverse the polarity of test probes, and repeat step (b).

(d) Check that one shows continuity and other shows no continuity.

If continuity is not as specified, replace the relay.



2. INSPECT RELAY OPERATION

(a) Connect a positive (+) lead from the battery to terminal 3.

(b) Connect a negative (–) lead from the battery to terminal 4.

(c) Sing an ohmmeter, check for continuity between terminals 1 and 2.

If operation is not as specified, replace the relay.

AUTOMATIC TRANSMISSION (A440F)

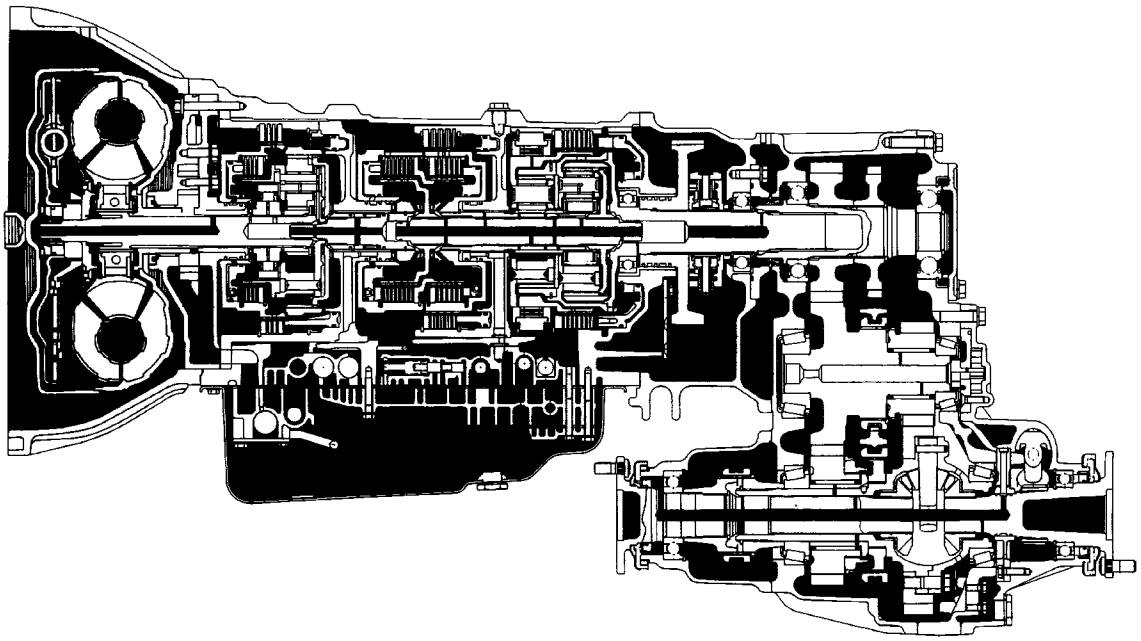
DESCRIPTION

GENERAL

The A440F automatic transmission is the four–speed automatic transmission with a two–speed transfer, developed with the aim of producing an easy–driving 4WD vehicle. A lock–up mechanism is built into the torque converter.

The A440F transmission is mainly composed of the torque converter, the overdrive (hereafter called O/D) planetary gear unit, 3–speed planetary gear unit, 2–speed transfer and the hydraulic control system.

Sectional View



Q00718

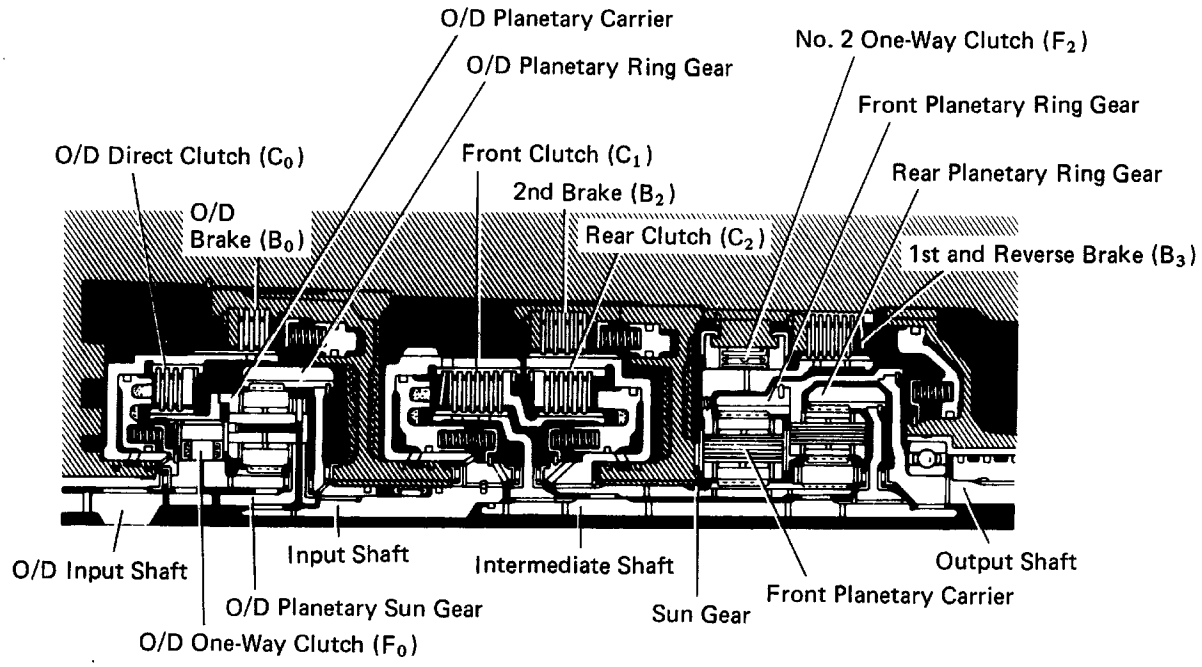
General Specifications

Type of Transmission				A440F
Type of Engine				3F-E
Torque Converter	Stall Torque Ratio			1.88 : 1
	Lock–Up Mechanism			Equipped
Gear Ratio	1st Gear			2.950
	2nd Gear			1.530
	3rd Gear			1.000
	O/D Gear			0.717
	Reverse Gear			2.678
Number of Discs and Plates (Disc/Plate)	C_1	Front Clutch		6/6
	C_2	Rear Clutch		5/5
	C_0	O/D Direct Clutch		3/3
	B_2	2nd Brake		4/4
	B_3	1st and Reverse Brake		6/6
	B_0	O/D Brake		3/3
ATF	Type			ATF DEXRON®II
	Capacity litter (US qts, Imp.qts)		Total	15.0 (15.9, 13.2)
			Drain and Refill	6.0 (6.3, 5.3)

OPERATION

Mechanical Operation

OPERATING CONDITIONS



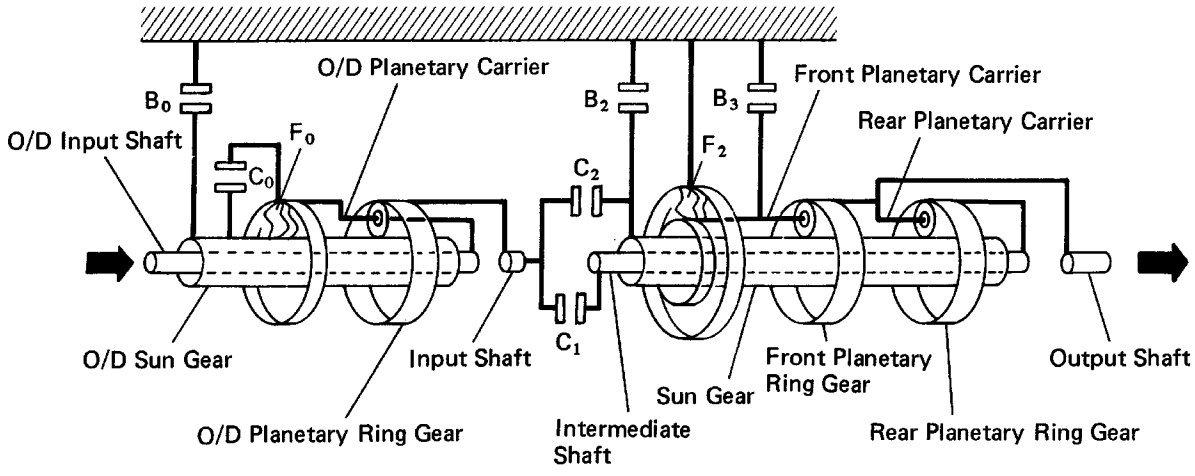
Q00717

○.....Operating

Shift lever position	Gear position	C_0	C_1	C_2	B_0	B_2	B_3	F_0	F_2
P	Parking	○						○	
R	Reverse	○		○			○	○	
N	Neutral	○						○	
D	1st	○	○					○	○
	2nd		○			○		○	
	3rd	○	○	○				○	
	O/D		○	○	○				
3	1st	○	○					○	○
	2nd		○			○		○	
	3rd	○	○	○				○	
2	2nd	○	○			○		○	
L	1st	○	○				○	○	○

FUNCTION OF COMPONENTS

NOMENCLATURE	OPERATION
O/D Direct Clutch (C_0)	Connects overdrive sun gear and overdrive carrier
O/D Brake (B_0)	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One–Way Clutch (F_0)	When transmission is being driven by engine, connects overdrive sun gear and overdrive carrier
Front Clutch (C_1)	Connects input shaft and intermediate shaft
Rear Clutch (C_2)	Connects input shaft and front & rear planetary sun gear
2nd Brake (B_2)	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise
1st & Reverse Brake (B_3)	Prevents front planetary carrier from turning either clockwise or counterclockwise
No.2 One–Way Clutch (F_2)	Prevents front planetary carrier from turning couterclockwise

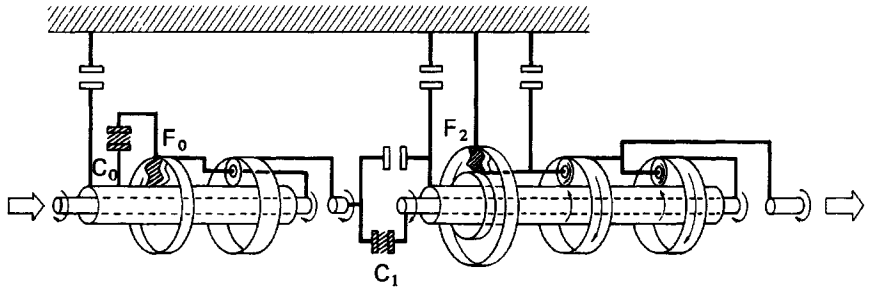


AT3917

FUNCTION OF COMPONENTS (Cont'd)

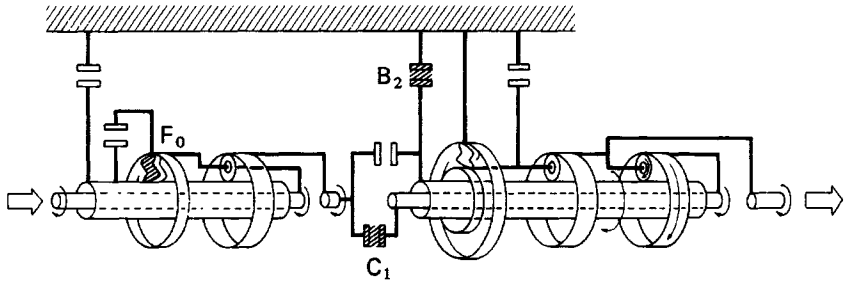
The conditions of operation for each gear position are shown on the following illustration:

D or 3 Range 1st Gear



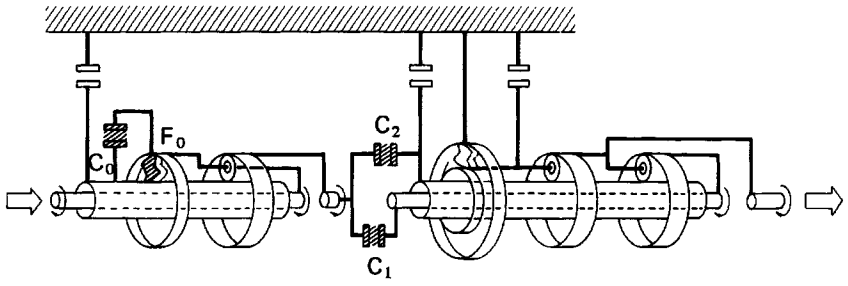
AT5949

D or 3 Range 2nd Gear



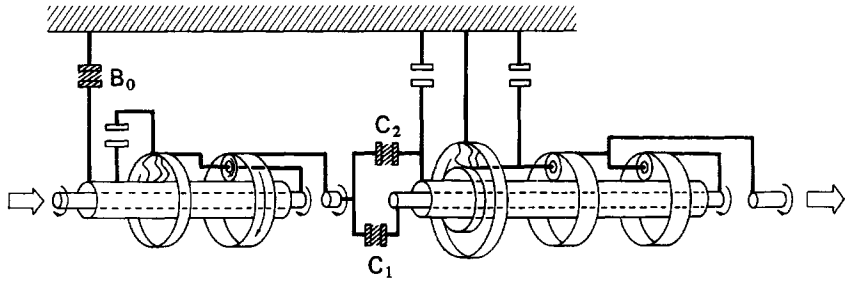
AT5950

D or 3 Range 3rd Gear



AT5951

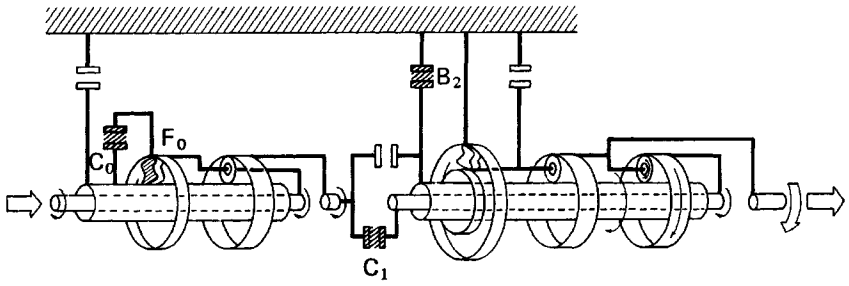
D Range O/D



AT5952

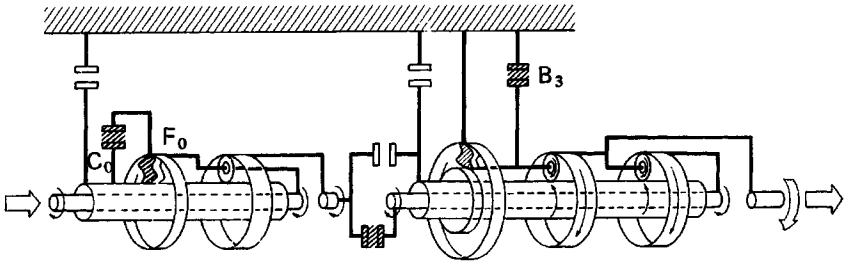
FUNCTION OF COMPONENTS (Cont'd)

2 Range 2nd Gear



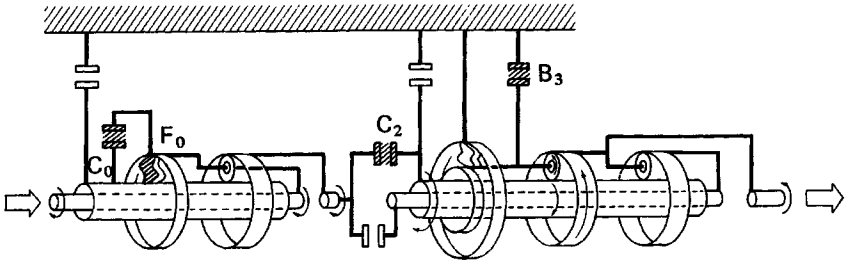
AT5953

L Range 1st Gear



AT5954

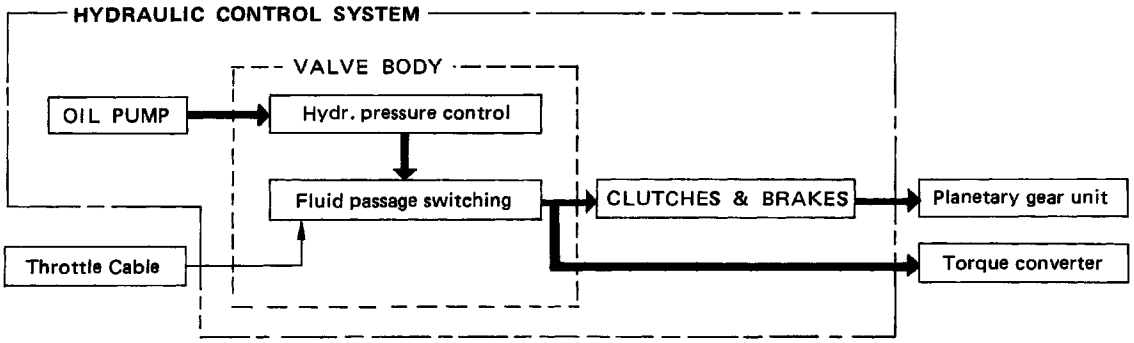
R Range Reverse Gear



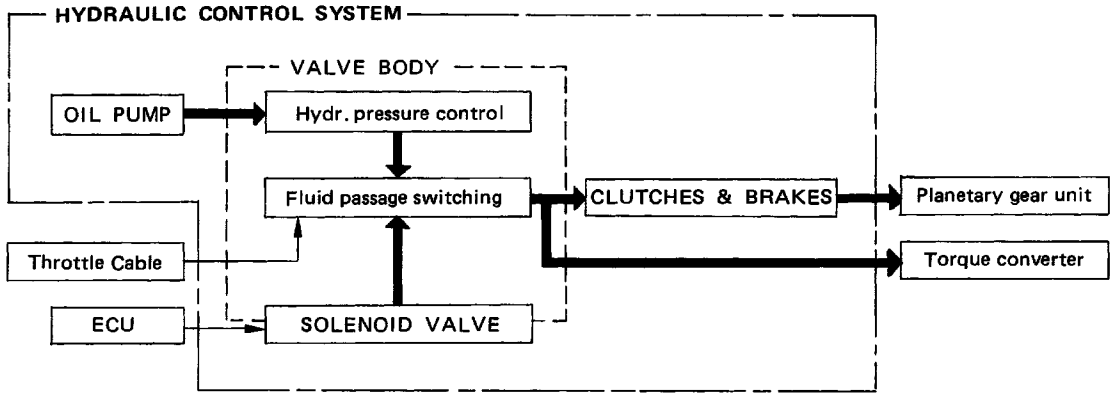
AT5955

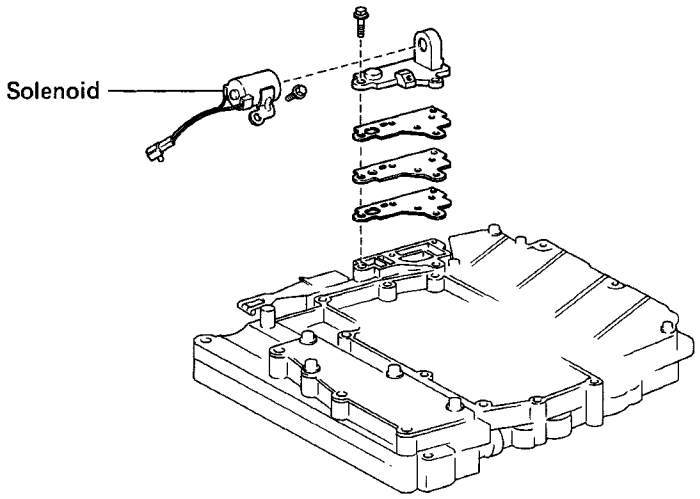
Hydraulic Control System

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valve, the accumu–lators, the clutches and brakes, as well as the fluid passages which connect all of these components.
Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter, clutches and brakes in accordance with the vehicle driving condi–tions.
There is a solenoid valve on the valve body.
The solenoid valve accompany with the cruise control system is turned on and off by signals from the ECU to operate the 3–4 shift valve, and change the gear shift position.



(w/ Cruise Control System)

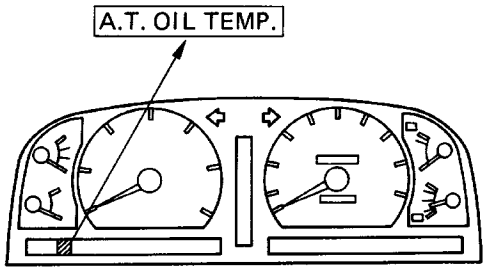


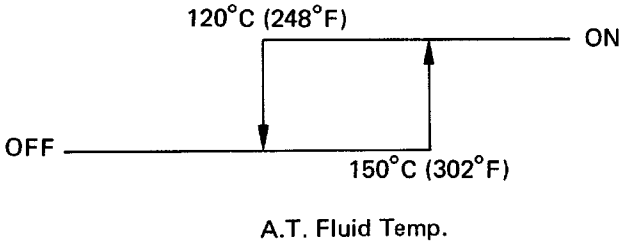


AT6022

A.T. FLUID TEMPERATURE WARNING SYSTEM

The ECU detects the A/T fluid temperature by means of a fluid temperature sensor fitted to the union. The A/T fluid may become extremely hot when the vehicle is under and extreme load, as when driving on sand or climbing uphill. Should the fluid temperature increase above 150˚C (302˚F), the ECU lights the warning light located in the combination meter. The light goes off when the temperature falls below 120˚C (248˚F).

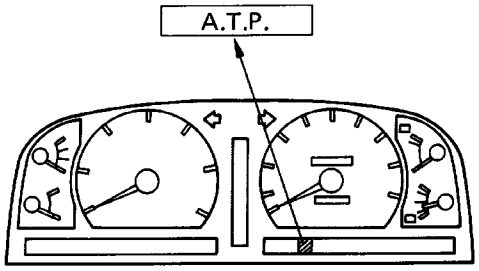


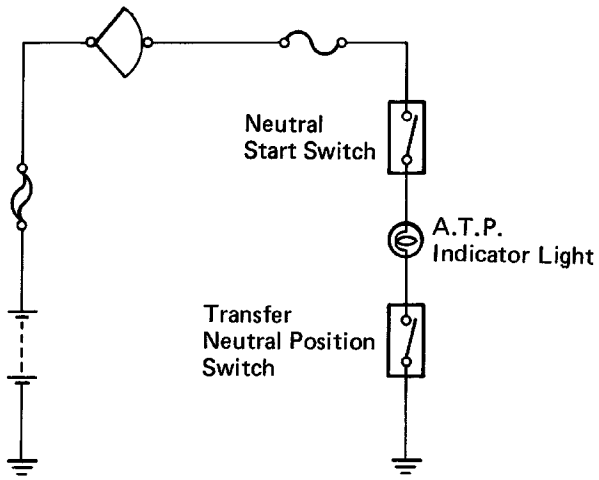


AT6023

A.T.P. (Automatic Transmission Parking) INDICATOR

The propeller shaft and wheels are free even when the transmission shift lever is set to ”P” as long as the transfer shift lever is in ”neutral” position: The A.T.P. indicator lights up to warn the driver that the propeller shaft and wheels are not locked. If the A.T.P. indicator light goes on, the transfer shift lever should be shifted to out of ”N” position.





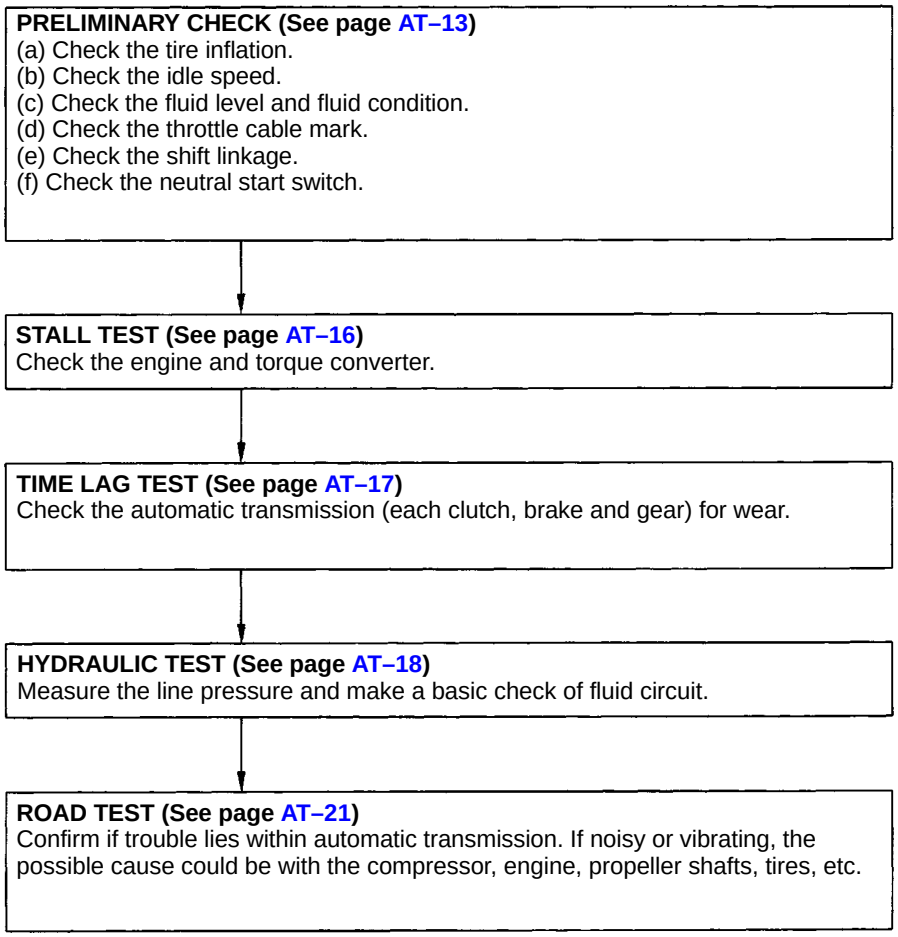
AT6024

AT3920

TROUBLESHOOTING

General Notes

1. Troubles occuring with the automatic transmission can be caused by either the engine or the transmis–sion itself. These two areas should be distinctly isolated before proceeding with troubleshooting.
2. Troubleshooting should begin with the simplest operation, working up in order of difficulty, but first determine whether the trouble lies within the engine, electrical control or transmission.
3. Proceed with the inspection as follows:



General TroubleshootIng

Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated Torque converter faulty Transmission faulty	Replace fluid Replace torque converter Disassemble and inspect transmission	AT–13 AT–28 ★
Vehicle does not move in any forward range or reverse	Manual linkage out of adjustment Valve body or primary regulator faulty Parking lock pawl faulty Torque converter faulty Converter drive plate broken Oil pump intake strainer blocked Transmission faulty	Adjust linkage Inspect valve body Inspect parking lock pawl Repalce torque converter Replace drive plate Clean strainer Disassembly and inspect transmission	AT–14 ★ ★ AT–28 AT–30 ★ ★
Shift lever position incorrect	Manual linkage out of adjustment Manual valve and lever faulty Transmission faulty	Adjust linkage Inspect valve body Disassembly and inspect transmission	AT–14 ★ ★
Harsh engagement into any drive range	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassembly and inspect transmission	AT–14 ★ ★ ★
Delayed 1–2, 2–3 or 3–O/D up–shift, or down–shifts from O/D–3 or 3–2 and shifts back to O/D or 3	Throttle cable out of adjustment Throttle cable and cam faulty Governor faulty Valve body faulty	Adjust throttle cable Inspect throttle cable and cam Inspect governor Inspect valve body	AT–14 ★ ★ ★
Slips on 1–2, 2–3 or 3–O/D up–shift, or slips or shudders on acceleration	Manual linkage out of adjustment Throttle cable out of adjustment Valve body faulty Transmission faulty	Adjust linkage Adjust throttle cable Inspect valve body Disassemble and inspect transmission	AT–14 AT–14 ★ ★
Drag, binding or tie–up on 1–2, 2–3 or 3–O/D up–shift	Manual linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–14 ★ ★

Remark ★: Refer to A440F Automatic Transmission Repair manual. (RM273U)

General Troubleshooting (Cont'd)

Problem	Possible cause	Remedy	Page
No lock–up	Valve body faulty Torque converter faulty Trasmission faulty	Inspect valve body Replace torque converter Disassemble and inspect transmission	★ AT–28 ★
Harsh down–shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator pistons Inspect valve body Disassemble and inspect transmission	AT–14 ★ ★ ★ ★
No down–shift when coasting	Governor faulty Valve body faulty	Inspect governor Inspect valve body	★ ★
Down–shift occurs too quickly or too late while coasting	Throttle cable out of adjustment Governor faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect governor Inspect valve body Disassemble and inspect transmission	AT–14 ★ ★ ★
No O/D–3, 3–2 or 2–1 kick–down	Throttle cable out of adjustment Governor faulty Valve body faulty	Adjust throttle cable Inspect governor Inspect valve body	AT–14 ★ ★
No engine braking in 2 or L range	Valve body faulty Transmission faulty	Inspect valve body Disassemble and inspect transmission	★ ★
Vehicle does not hold in P	Manual linkage out of adjustment Parking lock pawl cam and spring faulty	Adjust linkage Inspect cam and spring	AT–14 ★

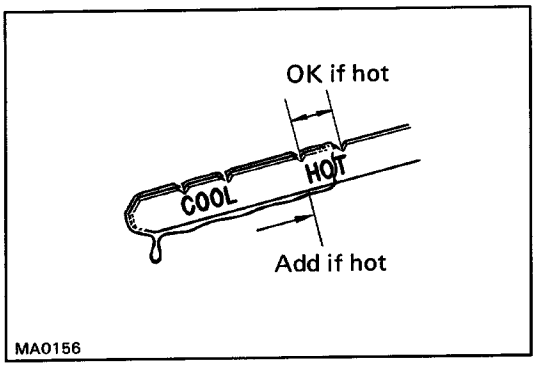
Remark ★ : Refer to A440F Automatic Transmission Repair manual. (RM273U)

Preliminary Check

1. CHECK FLUID LEVEL

HINT:

- The vehicle must have driven so that the engine and transmission are at normal operating temperature. (Fluid temperature: 70 – 80˚C or 158 – 176˚F)
- Only use the COOL range on the dipstick as a rough reference when the fluid is replaced or the engine does not run.



(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P posi–tion.

(c) Pull out the transmission dipstick and wipe it clean.

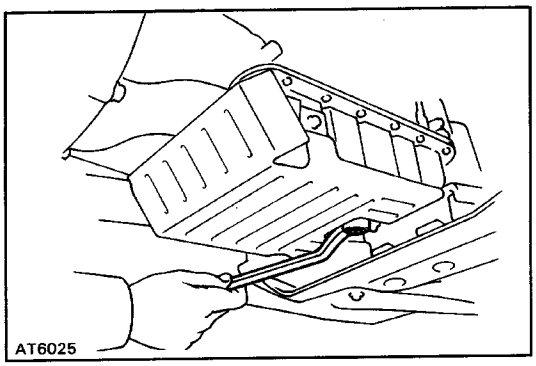
(d) Push it back fully into the tube.

(e) Pull it out and check that the fluid level is on the HOT range.

If the level is at the low side, add fluid.

Fluid type: ATF DEXRON® II

NOTICE: Do not overfill.



2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it in the fol–lowing procedure.

(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.

Torque: 27 N–m (280 kgf–cm, 20 ft–lbf)

(c) With the engine OFF, add new fluid through the oil filler tube.

Fluid type: ATF DEXRON® II

Capacity:

Total

w/o Oil cooler

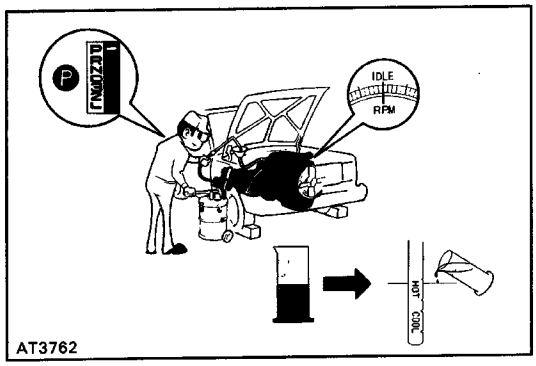
15.0 litters (15.9 US qts, 13.2 Imp. qts)

w/ Oil cooler

15.4 litters (16.3 US qts, 13.6 Imp. qts)

Drain and refill

6.0 litters (6.3 US qts, 5.3 Imp. qts)

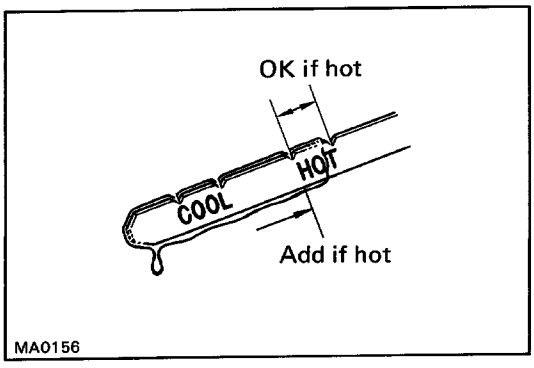


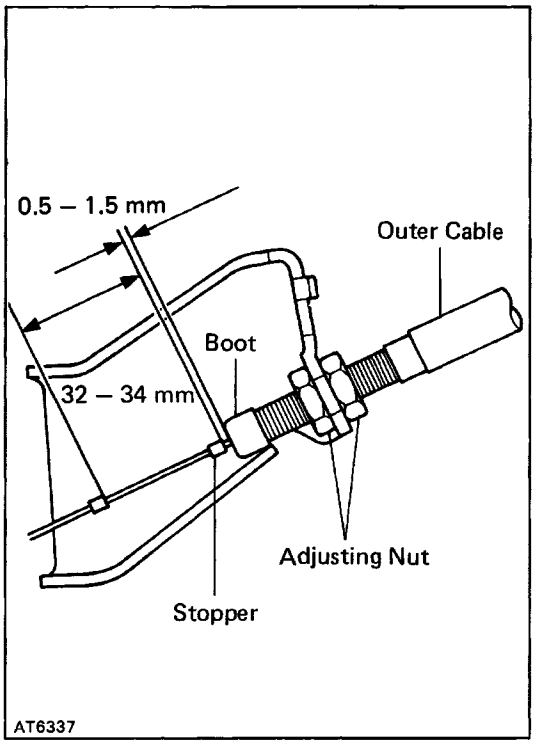
(d) Start the engine and shift the shift lever into all po–sitions from P to L position and then shift into P po–sition.

(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.

(f) Check the fluid level with the normal operating tem–perature (70 – 80˚C or 158 – 176˚F) and add as necessary.

NOTICE: Do not overfill.





3. INSPECT THROTTLE CABLE

(a) Check that the throttle cable is installed correctly and not bent.

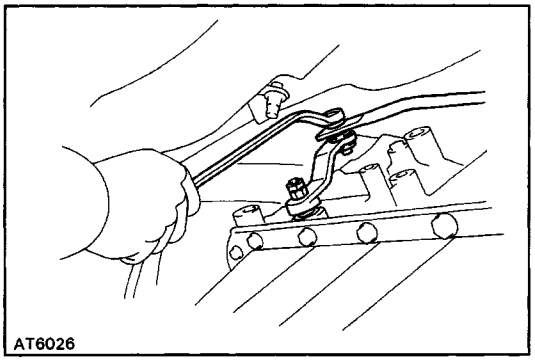
(b) With the throttle valve fully closed, measure the distance between the end of the boot and stopper on the cable.

Standard distance:

Fully closed 0.5 – 1.5 mm (0.020 – 0.059 in.)

Fully opened 32 – 34 mm (1.26 – 1.34 in.)

If the distance is not standard, adjust the cable by the adjusting nuts.



4. INSPECT TRANSMISSION SHIFT LEVER POSITION

When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(a) Loosen the nut on the control rod.

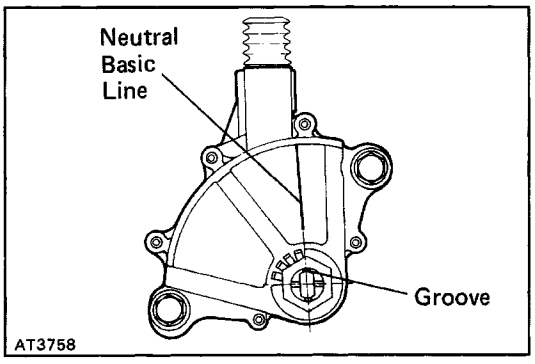
(b) Push the control shaft lever fully toward the rear of the vehicle.

(c) Return the control shaft lever two notches to N position.

(d) Set the shift lever to N position.

(e) While holding the shift lever lightly toward the R position side, tighten the control rod nut.

(f) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverse when shifting it to the R position.



5. INSPECT NEUTRAL START SWITCH

Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

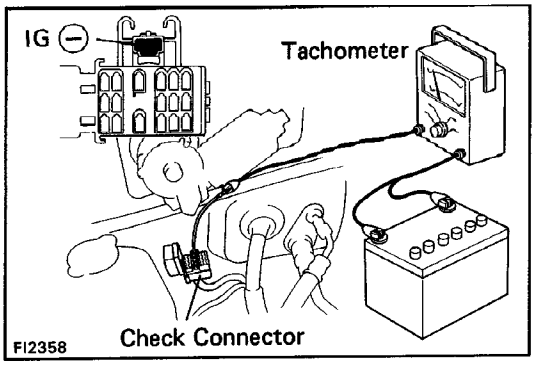
If not as started above, carry out the following adjustment procedures.

(a) Loosen the neutral start switch bolts and set the shift lever to the N position.

(b) Align the groove and neutral basic line.

(c) Hold in position and tighten the bolts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



6. INSPECT IDLE SPEED (N RANGE)

Connect tachometer test probe to the check connector terminal IG – , inspect the idle speed.

Idle speed: 650 rpm

Mechanical System Tests

STALL TEST

The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R ranges.

NOTICE:

- **Perform the test at normal operating fluid temperature (50 – 80˚C or 122 – 176˚F).**
- **Do not continuously run this test longer than 5 seconds.**

MEASURE STALL SPEED

(a) Warm up the transmission fluid.
(b) Chock the front and rear wheels.
(c) Connect a tachometer to the engine.
(d) Fully apply the parking brake.
(e) Step down strongly on the brake pedal with your left foot.
(f) Start the engine.
(g) Shift into the D range. Step all the way down on the accelerator pedal with your right foot.
Quickly read the stall speed at this time.

Stall speed: 1,950 ± 150 rpm

(h) Perform the same test in R range.

EVALUATION

(a) If the stall speed is the same for both ranges but lower than specified value:

- Engine output may be insufficient
- Stator one–way clutch is not operating properly

HINT: If more than 600 rpm below the specified value, the torque converter could be faulty.

(b) If the stall speed in D range is higher than specified:

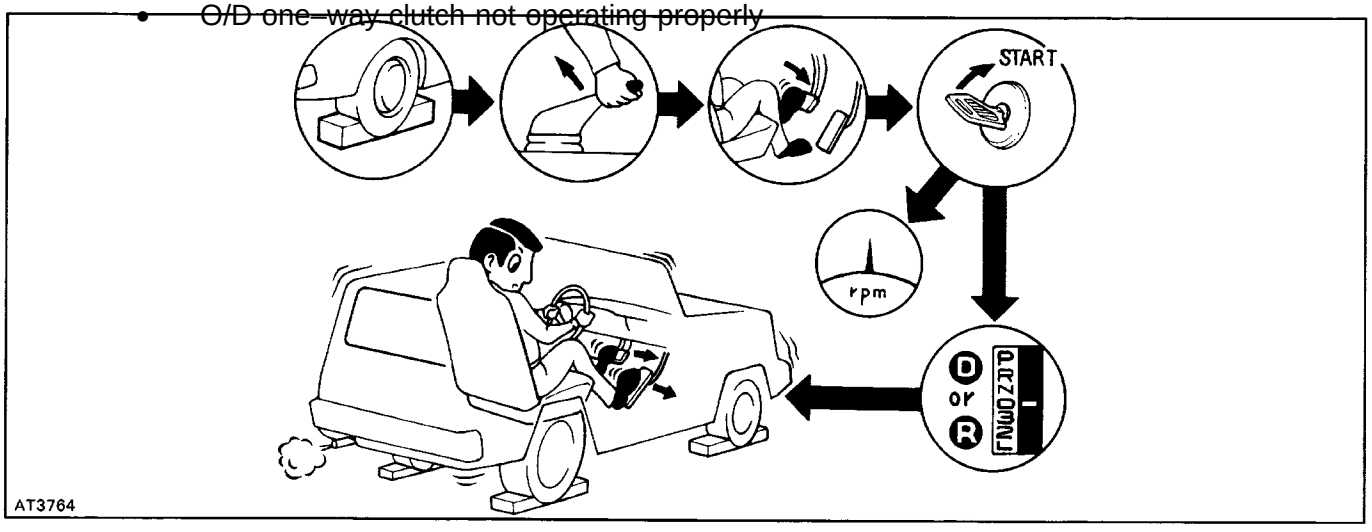
- Line pressure too low
- Front clutch slipping
- No.2 one–way clutch not operating properly
- O/D one–way clutch not operating properly

(c) If the stall speed in R range is higher than specified:

- Line pressure too low
- Rear clutch slipping
- First and reverse brake slipping
- O/D one–way clutch not operating properly

(d) If the stall speed in both R and D ranges are higher than specified:

- Line pressure too low
- Improper fluid level
- O/D one–way clutch not operating properly



TIME LAG TEST

If the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, front clutch, rear clutch and first and reverse brakes.

NOTICE:

- **Perform the test at normal operating fluid temperature (50 – 80˚C or 122 – 176˚F)**
- **Be sure to allow one minute intervals between tests.**
- **Make three measurements and take the average value.**

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Start the engine and check the idle speed.

Idle speed: 650 rpm

(c) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 0.7 seconds

(d) In same manner, measure the time lag N → R.

Time lag: Less than 1.2 seconds

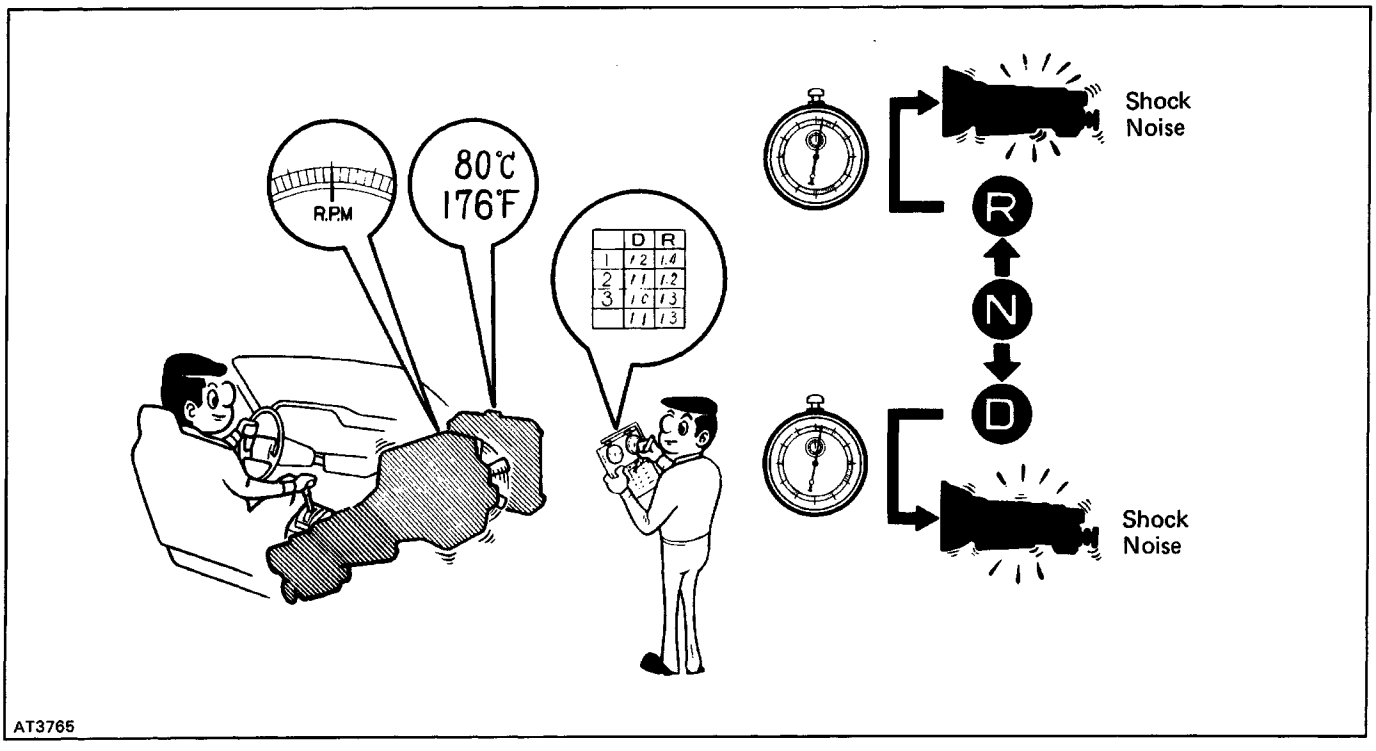
EVALUATION

(a) If N → D time lag is longer than specified:

- Line pressure too low
- Front clutch worn
- O/D one–way clutch not operating properly

(b) If N → R time lag is longer than specified:

- Line pressure too low
- Rear clutch worn
- First and reverse brake worn
- O/D one–way clutch not operating properly



HYDRAULIC TEST

1. MEASURE LINE PRESSURE

NOTICE: Perform the test at normal operating fluid temperature (50 – 80˚C or 122 – 176˚F)

(a) Warm up the transmission fluid.

(b) Remove the transmission case test plug and connect the hydraulic pressure gauge.

SST 09992–00094 (Oil pressure gauge)

(c) Fully apply the parking brake and chock the four wheels.

(d) Start the engine and check idling rpm.

(e) Step down strongly on the brake pedal with your left foot and shift into D range.

(f) Measure the line pressure when the engine is idling.

(g) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

(h) In the same manner, perform the test in R range.

kPa (kgf/cm^2, psi)

D range		R range	
Idling	Stall	Idling	Stall
363 – 422 (3.7 – 4.3, 53 – 61)	1,089 – 1,344 (11.1 – 13.6, 158 – 193)	441 – 539 (4.5 – 5.5, 64 – 78)	1,373 – 1,667 (14.0 – 17.0, 199 – 242)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and perform a retest.

EVALUATION

(a) If the measured values at all ranges are higher than specified:

- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective

(b) If the measured values at all ranges are lower than specified:

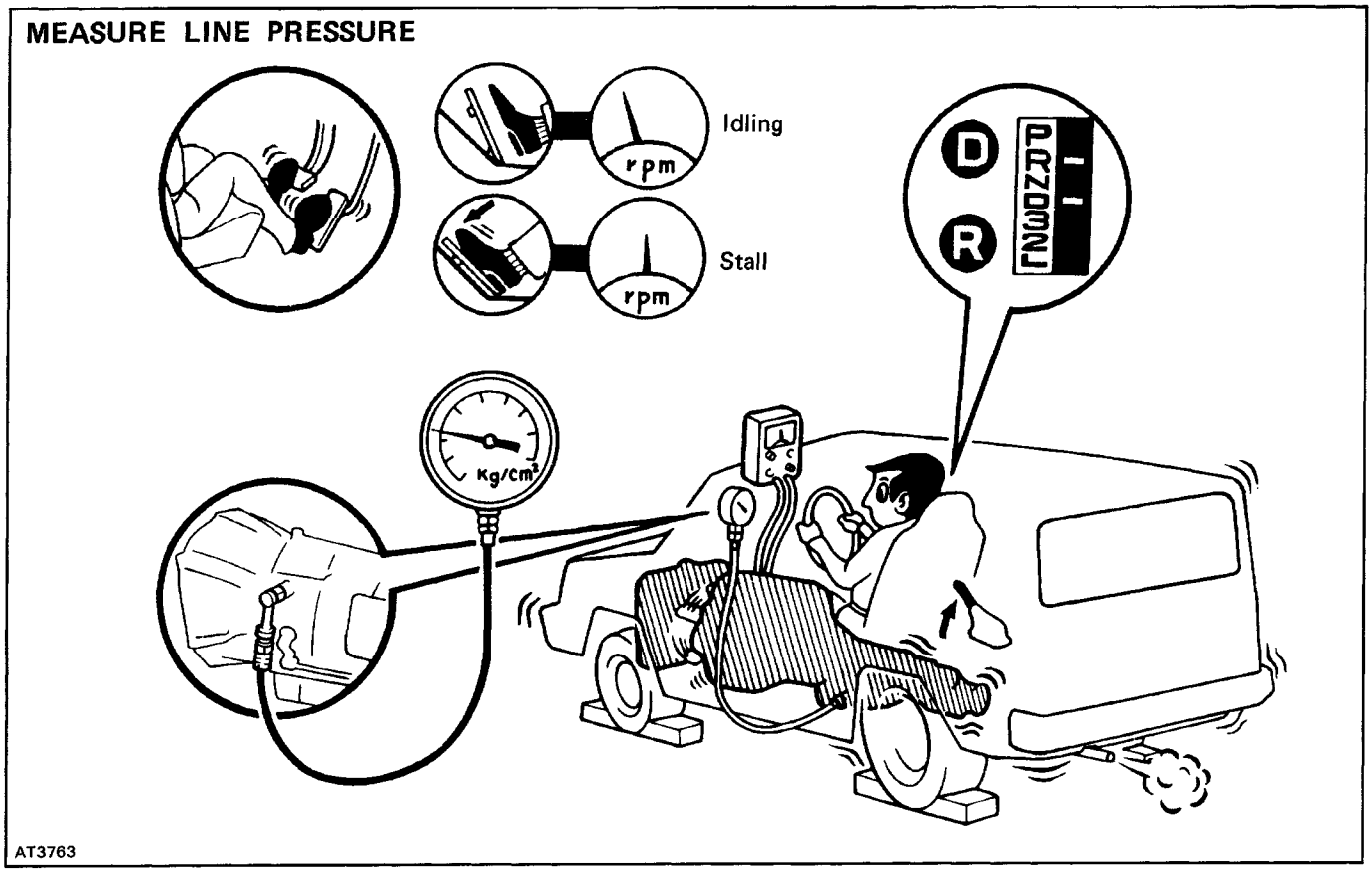
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective

(c) If pressure is low in the D range only:

- D range circuit fluid leakage
- Front clutch defective

(d) If pressure is low in the R range only:

- R range circuit fluid leakage
- Rear clutch defective
- First and reverse brake defective


MEASURE LINE PRESSURE
Idling
rpm
Stall
rpm
D
R
P N D 2 1
Kg/cm²
AT3763

2. MEASURE GOVERNOR PRESSURE

NOTICE:

- **Perform the test at normal operating fluid temperature (50 – 80˚C or 122 – 176˚F).**
- **Measurement can be made with a 1,000 rpm test, but if tests are to be made at 1,800 rpm and 3,500 rpm, it would be safer to do it on road or using a chassis dynamometer because an on–stand test could be hazardous.**

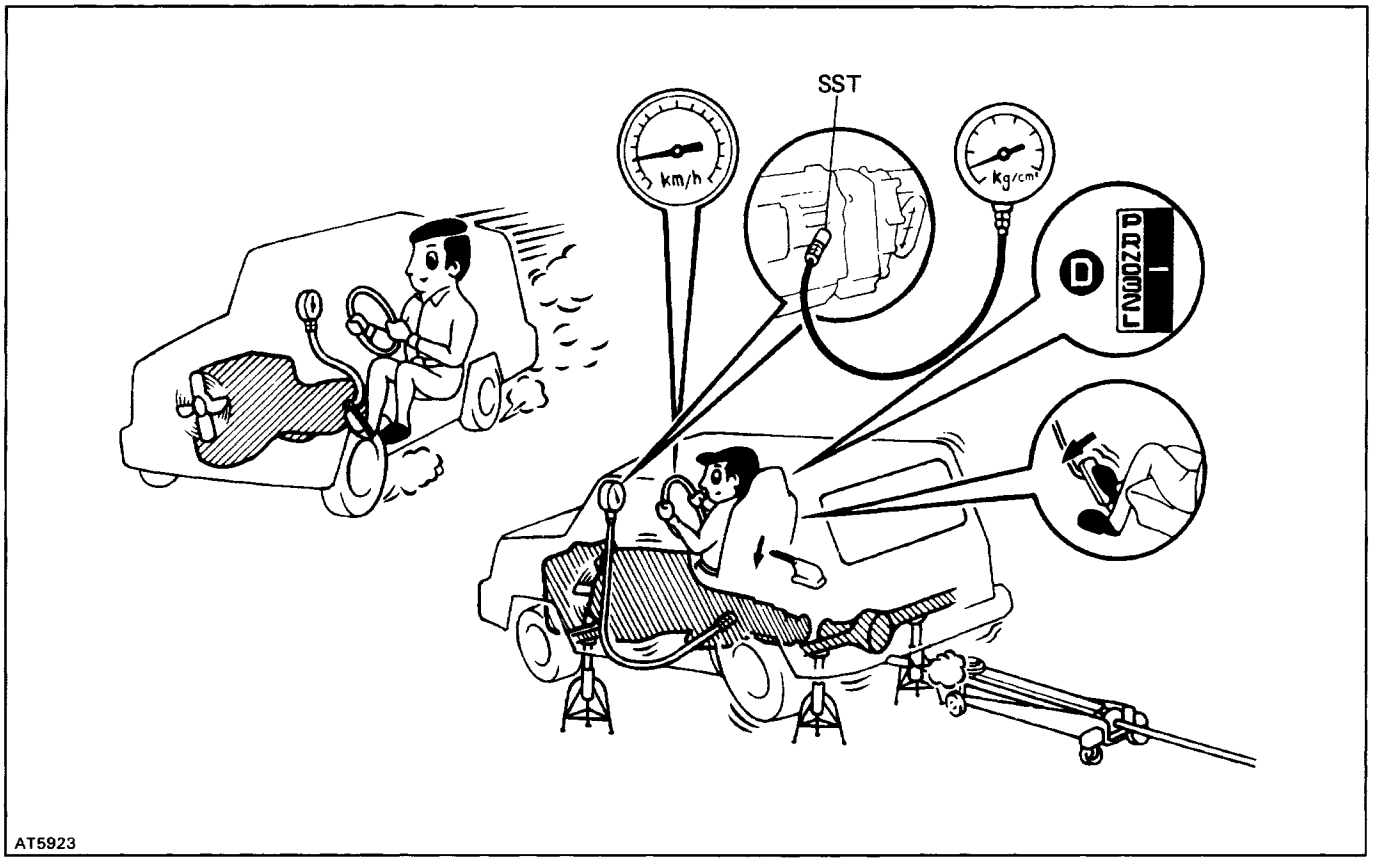
(a) Warm up the transmission fluid.
(b) Lock the center differential.
(c) Remove front propeller shaft. (See page PR–2)
(d) Jack up the vehicle and support it on stands.
(e) Remove the transmission case test plug and connect the hydraulic pressure gauge.
SST 09992–00094 (Oil pressure gauge)
(f) Check that the parking brake is not applied.
(g) Start the engine.
(h) Shift into the D range and measure the governor pressure at the speeds specified in the table.

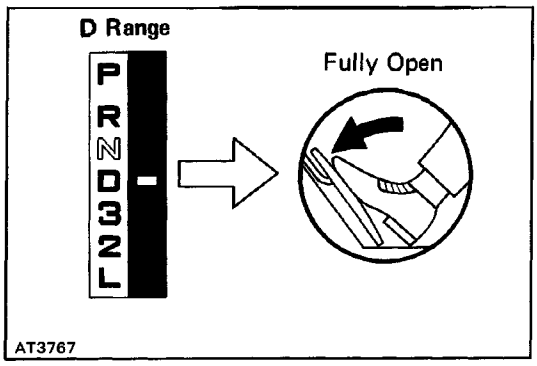
Output shaft rpm	Vehicle speed (Reference)	Governor pressure kPa (kgf/cm^2, psi)
1,000	32 km/h (20 mph)	78 – 118 (0.8 – 1.2, 11 – 17)
1,800	57 km/h (35 mph)	186 – 255 (1.9 – 2.6, 27 – 37)
3,500	111 km/h (69 mph)	549 – 618 (5.6 – 6.3, 80 – 90)

EVALUATION

If governor pressure is defective:

- Line pressure defective
- Fluid leakage in governor pressure circuit
- Governor valve operation defective





ROAD TEST

NOTICE: Perform the test at normal operating fluid temperature (50 – 80°C or 122 – 176°F)

1. D RANGE TEST

Shift into the D range and while driving with the accelerator pedal held constant at full throttle valve opening position, check the following points.

(a) Check to see that the 1 → 2, 2 → 3 and 3 → O/D up–shifts take place, and shift points should conform to those shown in the automatic shift schedule. (See page AT–24)

EVALUATION

(1) If there is no 1 → 2 up–shift:

- Governor valve is defective
- 1–2 shift valve is stuck

(2) If there is no 2 → 3 up–shift:

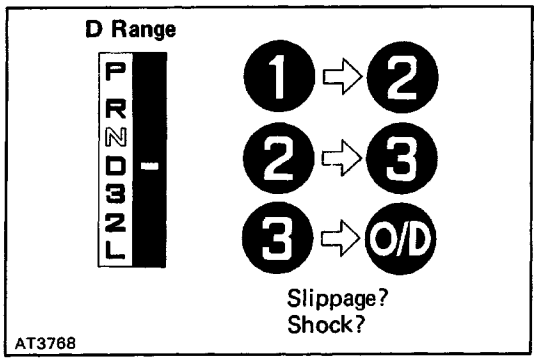
- Governor valve is defective
- 2–3 shift is valve stuck

(3) If there is no 3 → O/D up–shift:

- Governor valve is defective
- 3–4 shift valve is stuck

(4) If the shift point is defective:

- Throttle cable is out of adjustment
- Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–4 shift valve etc., are defective

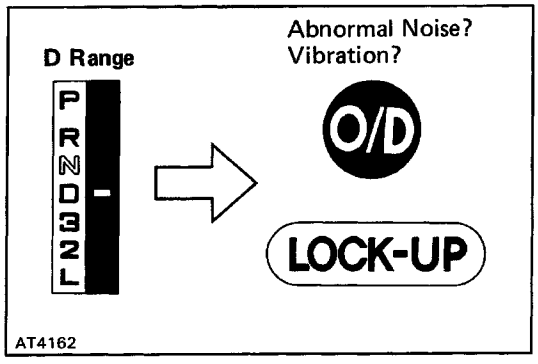


(b) In the same manner, check the shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up–shifts.

EVALUATION

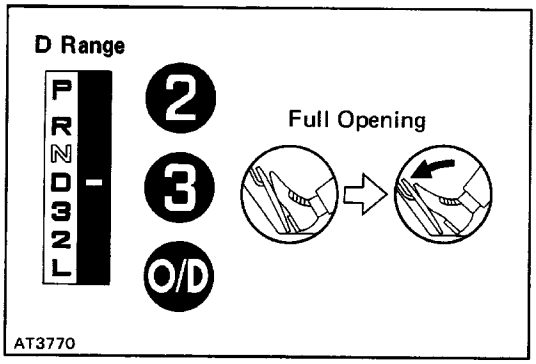
If the shock is excessive:

- Line pressure is too high
- Accumulator is defective
- Check ball is defective



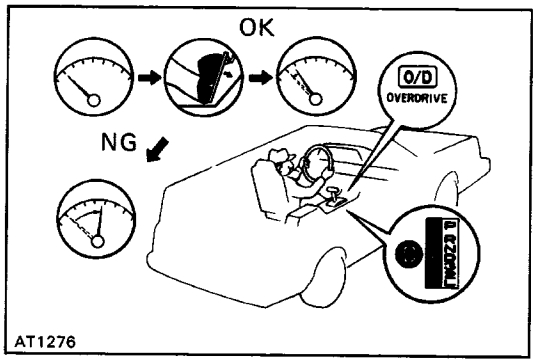
(c) Run in the O/D gear or lock–up of the D range and check for abnormal noise and vibration.

HINT: The check for the cause of abnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in the propeller shafts, differentials, torque converter, etc.



(d) While running in the 2nd, 3rd or O/D gear of the D range, check too see that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 or O/D → 3 kick–downs conform to those indicated on the automatic shift schedule.

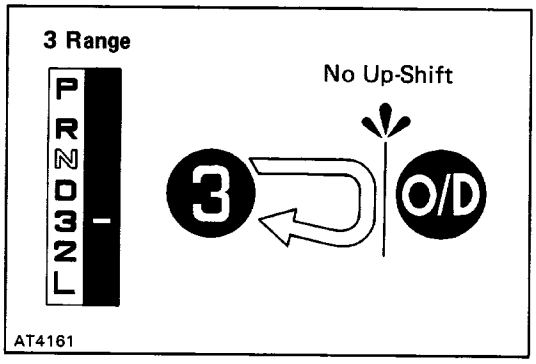
(e) Check for abnormal shock and slip at kick–down.



(f) Check for the lock–up mechanism.

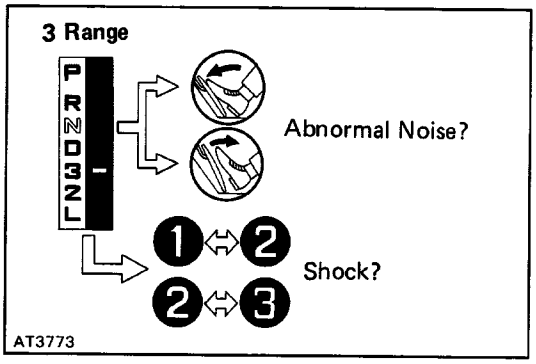
(1) Drive in O/D gear of the D range, at a steady speed (lock–up ON) of about 85 km/h (53 mph).

(2) Lightly depress the accelerator pedal and check that the engine rpm does not change abruptly. If there is a big jump in engine rpm, there is no lock–up.

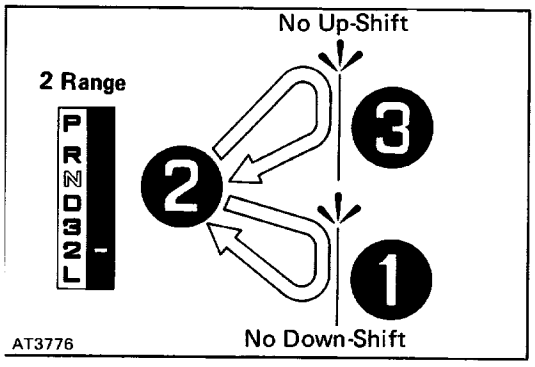


2. 3 RANGE TEST

(a) While running in the 3rd gear of the 3 range, check to see that there is no up–shift to the O/D gear.



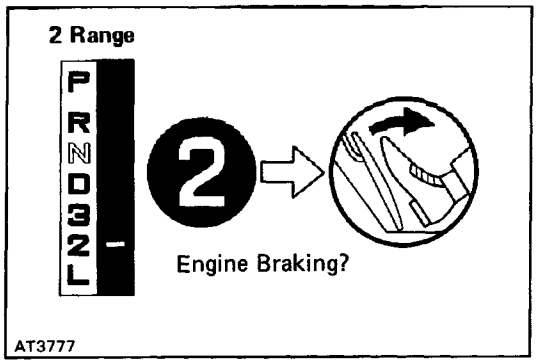
(b) Check for abnormal noise at acceleration and deceleration, and for shock at up–shift and down–shift.



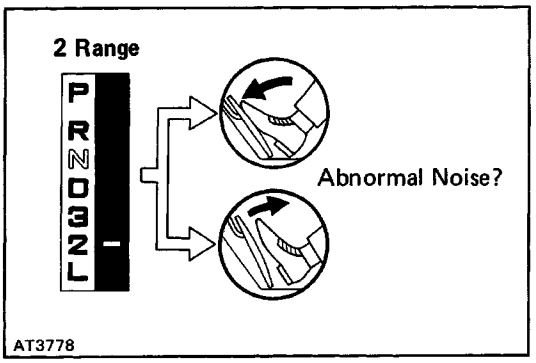
3. 2 RANGE TEST

(a) While running in the 2nd gear of the 2 range, check to see that there is no up–shift to the 3rd gear.

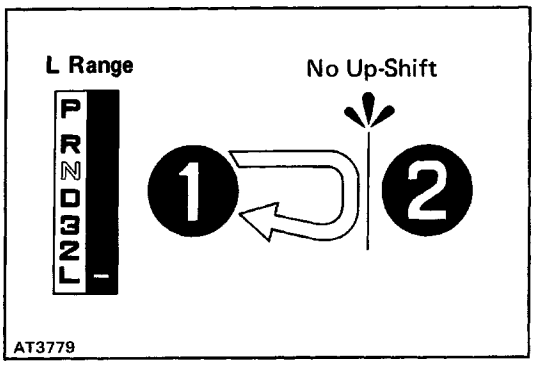
(b) While running in the 2nd gear of the 2 range, check to see that there is no down–shift to the 1st gear.



(c) While running in the 2nd gear of the 2 range, release the accelerator pedal and check the engine braking effect.

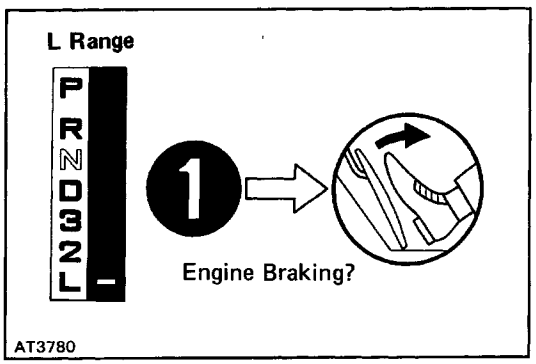


(d) Check for abnormal noise during acceleration and deceleration.



4. L RANGE TEST

(a) While running in the L range, check to see that there is no up–shift to the 2nd gear.

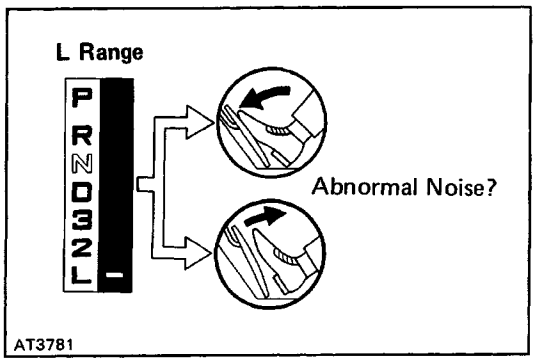


(b) While running in the L range, release the accelerator pedal and check the engine braking effect.

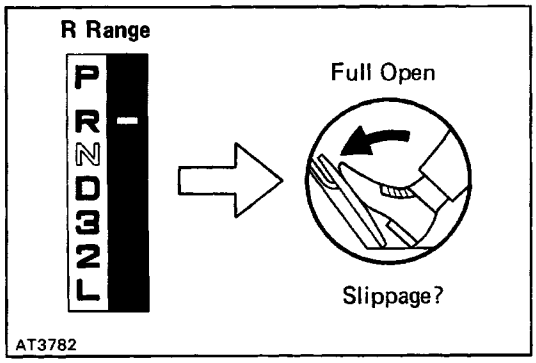
EVALUATION

If there is no engine braking effect:

- First and reverse brake is defective

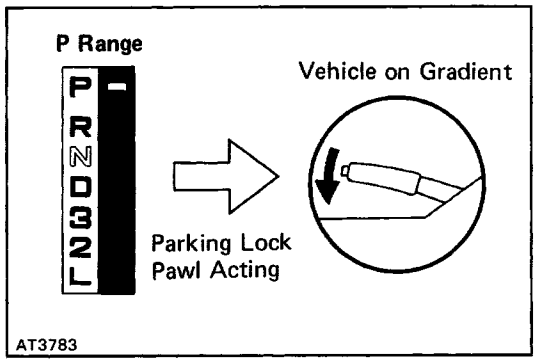


(c) Check for abnormal noise during acceleration and deceleration.



5. R RANGE TEST

Shift into the R range and, while starting at full throttle, check for slipping.



6. P RANGE TEST

Stop the vehicle on a gradient (more than 9%) and after shifting into the P range, release the parking brake. Then check to see that the parking lock pawl holds the vehicle in place.

Automatic Shift Schedule

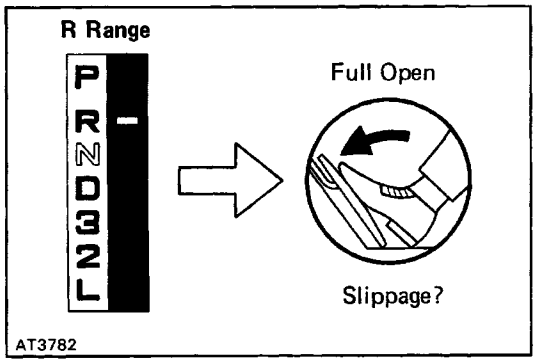
Tire size: P235/75R15

km/h (mph)

D range (throttle valve fully open)						(fully closed)		2 range	L range
1 → 2	2 → 3	3 → O/D	O/D → 3	3 → 2	2 → 1	Lock-up ON	Lock-up OFF	3 →2	2 → 1
33–46 (21–29)	75–88 (47–55)	110–123 (68–76)	101–114 (63–71)	66–78 (41–48)	28–41 (17–25)	71–82 (44–51)	65–76 (40–47)	77–90 (48–56)	36–48 (22–30)

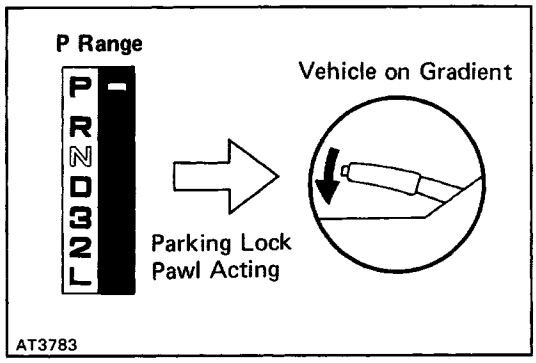
Tire size: 31 x 10.5R15

D range (throttle valve fully open)						(fully closed)		2 range	L range
1 → 2	2 → 3	3 → O/D	O/D → 3	3 → 2	2 → 1	Lock-up ON	Lock-up OFF	3 →2	2 → 1
36–50 (22–31)	81–95 (50–59)	118–132 (73–82)	109–123 (68–76)	71–84 (44–52)	31–44 (19–27)	76–88 (47–55)	70–82 (43–51)	83–97 (52–60)	38–52 (24–32)



5. R RANGE TEST

Shift into the R range and, while starting at full throttle, check for slipping.



6. P RANGE TEST

Stop the vehicle on a gradient (more than 9%) and after shifting into the P range, release the parking brake. Then check to see that the parking lock pawl holds the vehicle in place.

Automatic Shift Schedule

Tire size: P235/75R15

km/h (mph)

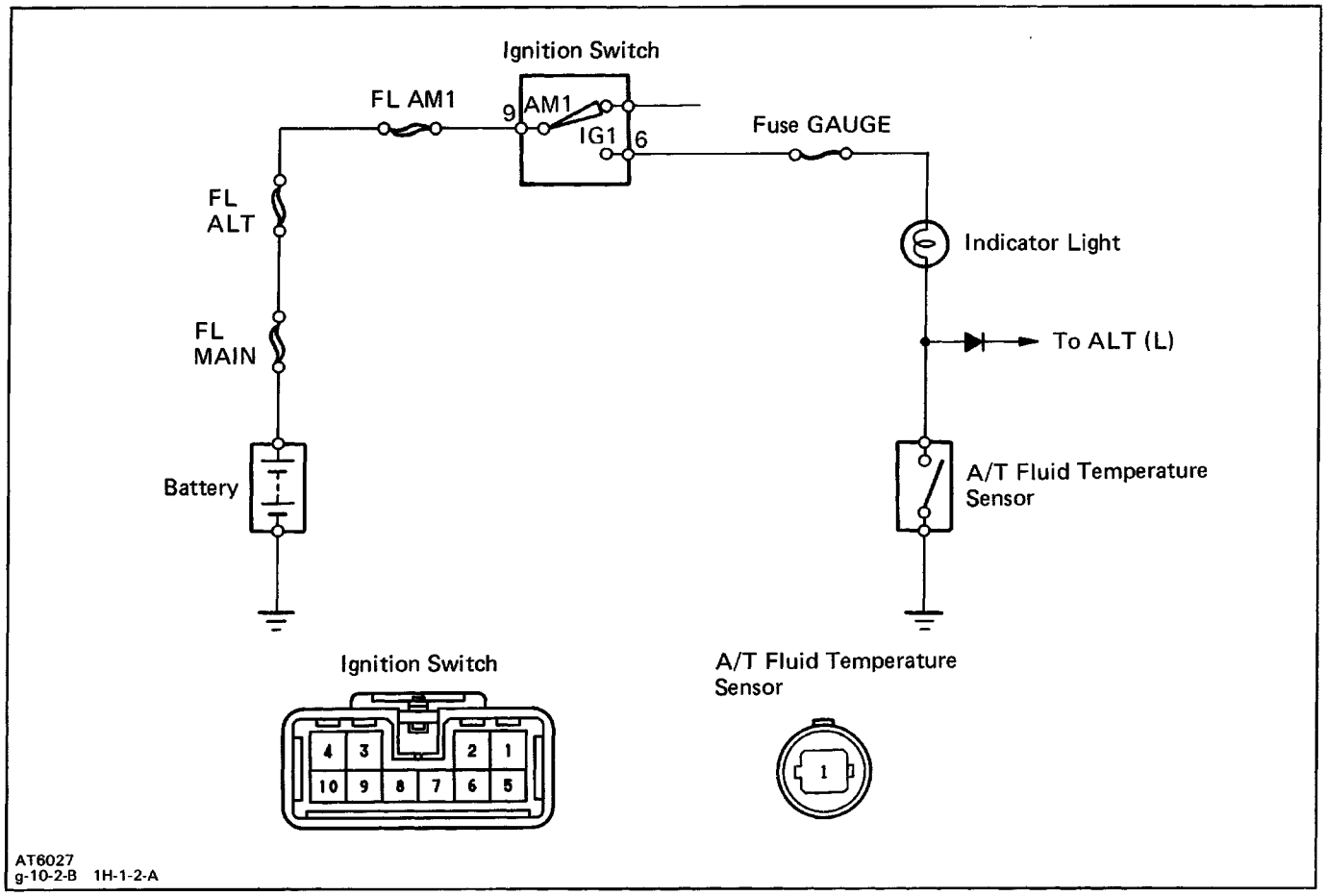
D range (throttle valve fully open)						(fully closed)		2 range	L range
1 → 2	2 → 3	3 → O/D	O/D → 3	3 → 2	2 → 1	Lock-up ON	Lock-up OFF	3 →2	2 → 1
33–46 (21–29)	75–88 (47–55)	110–123 (68–76)	101–114 (63–71)	66–78 (41–48)	28–41 (17–25)	71–82 (44–51)	65–76 (40–47)	77–90 (48–56)	36–48 (22–30)

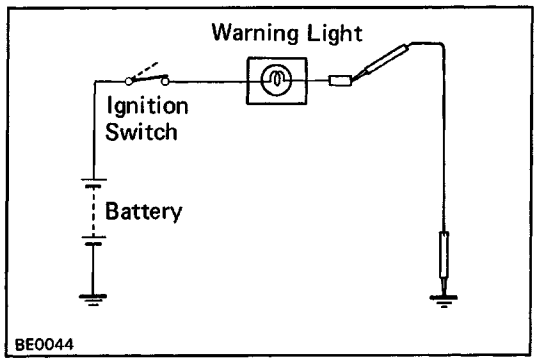
Tire size: 31 x 10.5R15

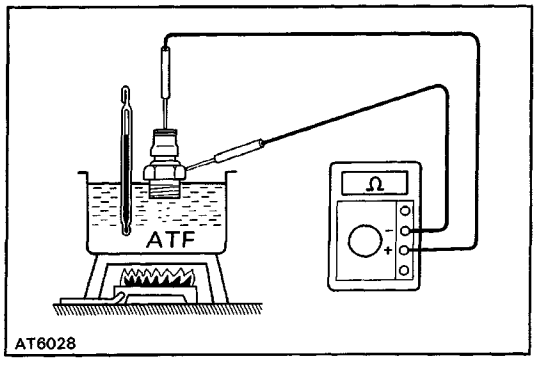
D range (throttle valve fully open)						(fully closed)		2 range	L range
1 → 2	2 → 3	3 → O/D	O/D → 3	3 → 2	2 → 1	Lock-up ON	Lock-up OFF	3 →2	2 → 1
36–50 (22–31)	81–95 (50–59)	118–132 (73–82)	109–123 (68–76)	71–84 (44–52)	31–44 (19–27)	76–88 (47–55)	70–82 (43–51)	83–97 (52–60)	38–52 (24–32)

A T Fluid Temperature Warning System

A/T FLUID TEMPERATURE WARNING SYSTEM CIRCUIT







INSPECTION OF A/T FLUID TEMPERATURE WARNING SYSTEM COMPONENTS

1. INSPECT A/T FLUID TEMPERATURE WARNING LIGHT

(a) Disconnect the connector from the temperature sen–sor. Connect terminal of the wire harness side con–nector and body ground.

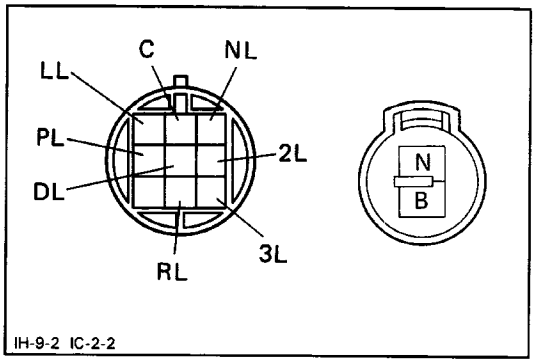
(b) Turn the ignition switch ON, check that the light go on.

If warning light does not light, test the bulb.

2. INSPECT A/T FLUID TEMPERATURE SENSOR

Check that there is continuity at the temperature of 145˚C – 155˚C (325˚F – 343˚F).

If continuity is not as specified, replace the sensor.



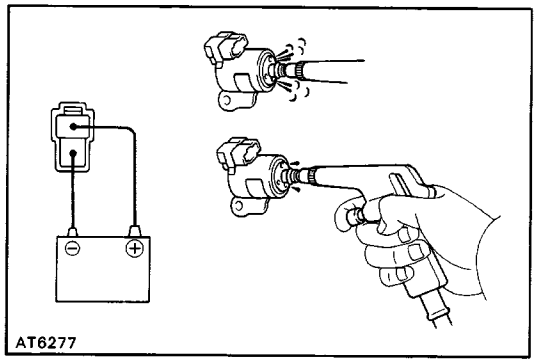
Neutral Start Switch

INSPECT NEUTRAL START SWITCH

Using an ohmmeter, check the continuity of the terminals for each switch position shown in the table below.

Terminal / Switch position	B	N	C	PL	RL	NL	DL	3L	2L	LL
P range	○	○	○	○						
R range			○		○					
N range	○	○	○			○				
D range			○				○			
3 range			○					○		
2 range			○						○	
L range			○							○

If continuity between terminals is not as specified, replace the switch.



O/D Solenoid (w/ Cruise Control System)

CHECK SOLENOID SEAL

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

(a) Applying compressed air, check that the solenoid valve opens.

(b) When supply battery voltage to the solenoid, check that the solenoid valve does not leak the air.

If operation is not as specified, replace the solenoid.

ON–VEHICLE REPAIR

Valve Body

REMOVAL OF VALVE BODY

1. MAKE PLATE TO RETAIN ACCUMULATOR PISTONS

A retainer is helpful for holding accumulator pistons in the case during removal and installation of the valve body.

The plate may be made from aluminum or plastic.

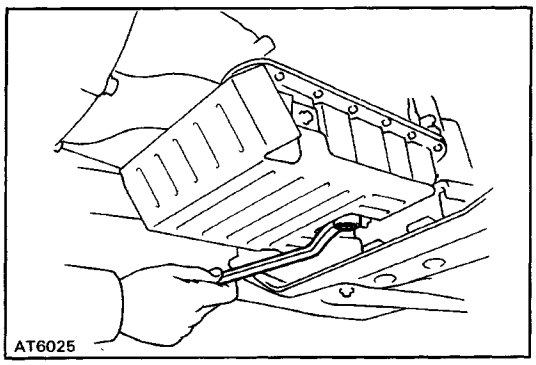
2. REMOVE TRANSMISSION AND TRANSFER UNDER COVERS

3. CLEAN TRANSMISSION EXTERIOR

To help prevent contamination, clean the exterior of the transmission.

4. DRAIN TRANSMISSION FLUID

Remove the drain plug and drain fluid into a suitable con–tainer.

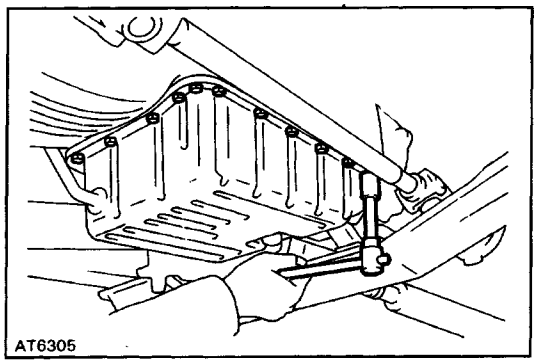


5. REMOVE OIL PAN AND GASKET

NOTICE: Some fluid will remain in the oil pan. Be careful not to damage the filler tube.

(a) Remove oil pan protector.

(b) Install the blade of SST between the transmission and oil pan, cut off applied sealer.
SST 09032–00010

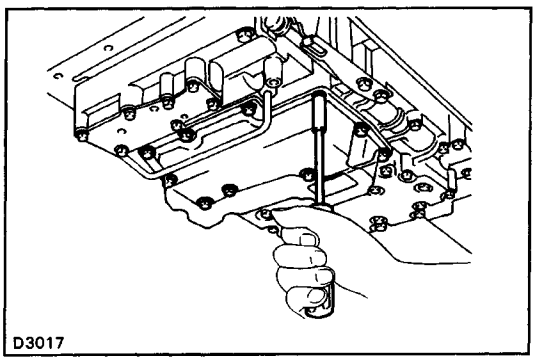


6. REMOVE OIL STRAINER AND GASKET

(a) Remove the ten bolts and oil strainer.

NOTICE: Be careful as some oil will come out with the filter.

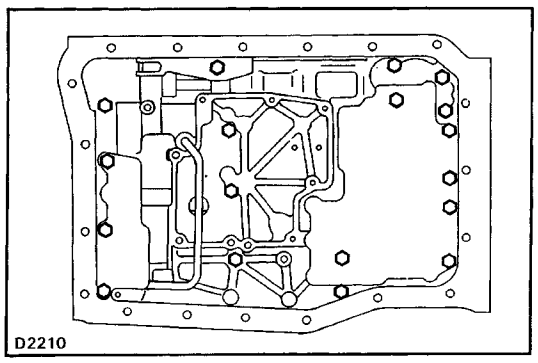
(b) Remove the gasket.

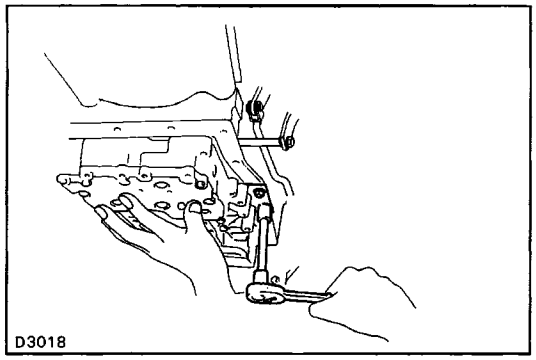


7. REMOVE VALVE BODY

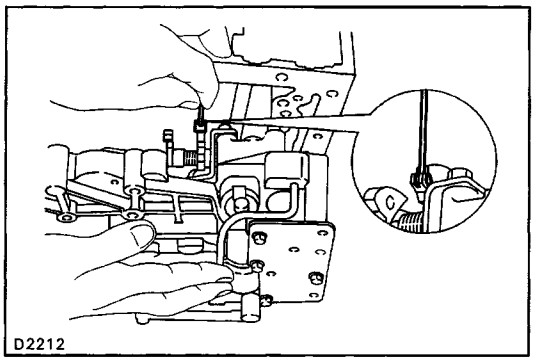
(a) Remove the eighteen bolts.

HINT: Support the valve body by hand to prevent it from falling.

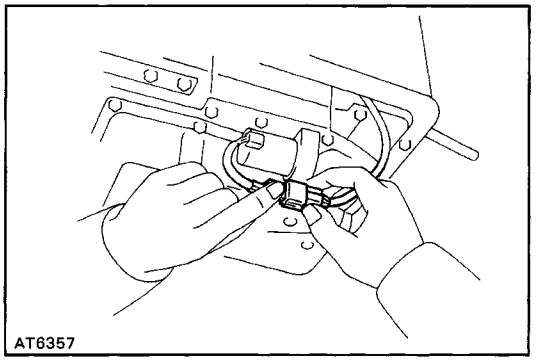




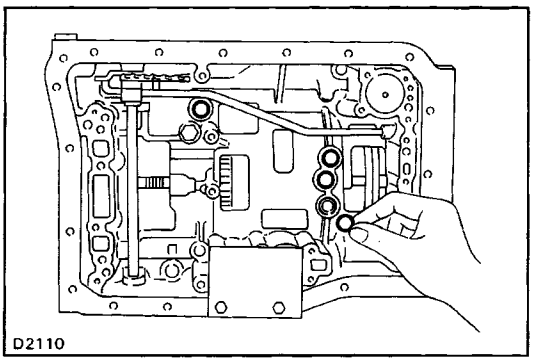
(b) Lower valve body slightly, and install the accumulator piston retaining plate. Hold in place with two pan bolts, and hand tighten.



(c) Disconnect the throttle cable from the cam and remove the valve body.



(d) (w/ Cruise Control System)
Disconnect the solenoid wiring, throttle cable and remove the valve body.

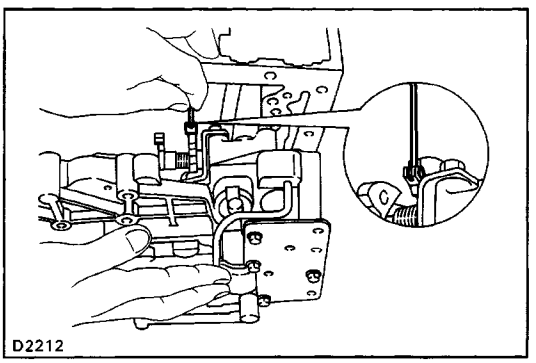


8. REMOVE FOUR CENTER SUPPORT APPLY GASKETS

INSTALLATION OF VALVE BODY

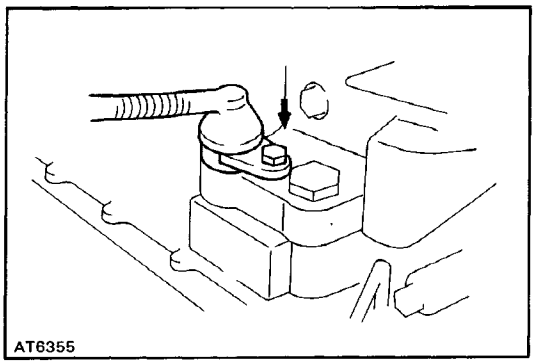
1. INSTALL FOUR CENTER SUPPORT APPLY GASKETS

Install the four center support apply gaskets, facing the pitted sides toward the transmission case.



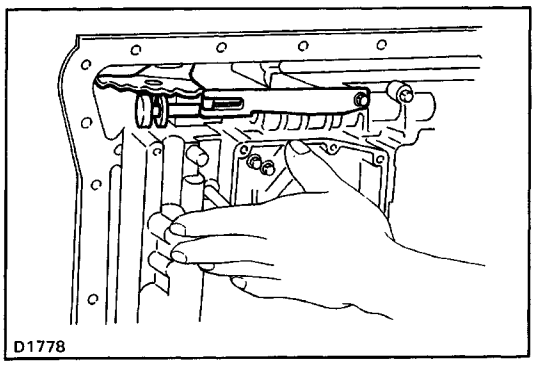
2. CONNECT THROTTLE CABLE TO CAM

Push the cable fitting into the cam.



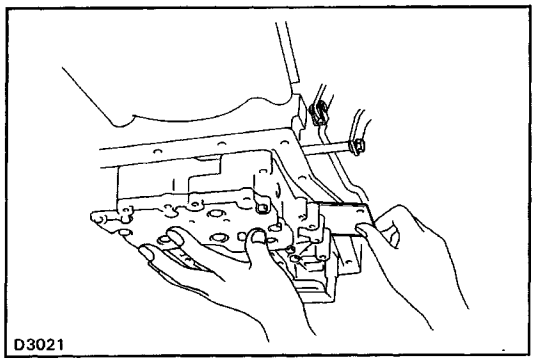
(w/ Cruise Control System)

Push the cable fitting into the cam and connect the solenoid wiring connector.

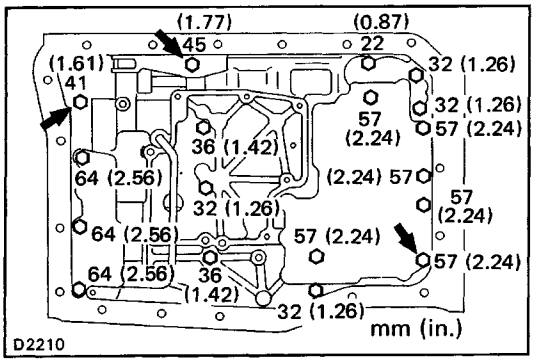


3. INSTALL VALVE BODY

(a) Align the manual valve lever with the manual valve.



(b) Remove the two pan bolts, and slide out the accumulator retaining plate.



4. INSTALL VALVE BODY BOLTS

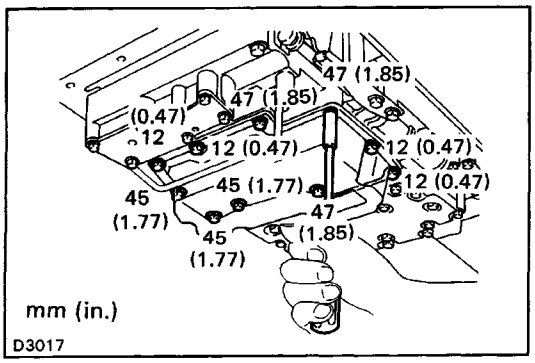
(a) Install the three bolts indicated by the arrows.

(b) Install the other bolts.

(c) Check that the manual valve lever contacts the center of the roller at the tip of the detent spring.

(d) Tighten the bolts.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

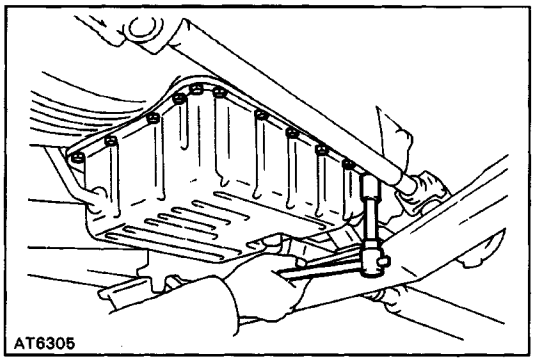


5. INSTALL OIL STRAINER

Be sure the strainer is clean. Install a new gasket and strainer.

Torque: 5 mm bolt 5.4 N–m (55 kgf–cm, 48 in.–lbf)

6 mm bolt 10 N–m (100 kgf–cm, 7 ft–lbf)



6. INSTALL PAN WITH NEW GASKET

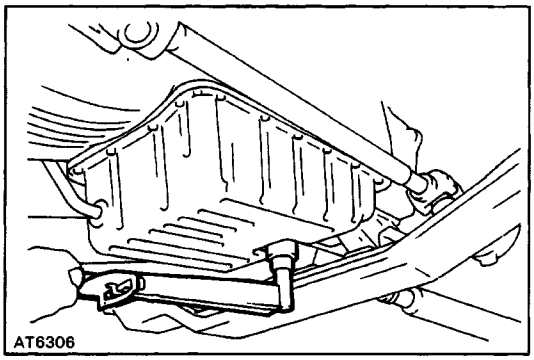
(a) Remove any packing material and be careful not to drop oil on the contacting surface of the transmis–sion case and oil pan.

(b) Apply seal packing to the oil pan.

Seal packing: Part No. 08826–00090, THREE BOND 1281B or equivalent

(c) Install and torque the twenty bolts.

Torque: 6.9 N–m (70 kgf–cm, 61 in.–lbf)



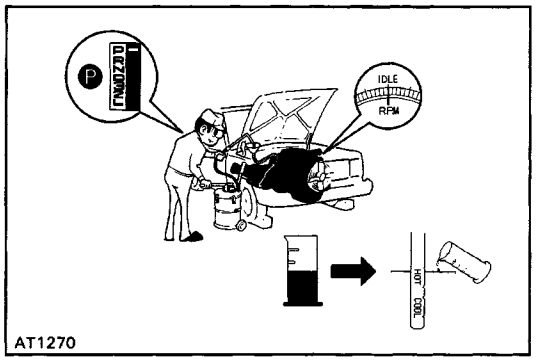
7. INSTALL DRAIN PLUG

(a) Install the drain plug with a new gasket.

(b) Torque the drain plug.

Torque: 27 N–m (280 kgf–cm, 20 ft–lbf)

8. INSTALL TRANSMISSION UNDER COVER AND TRANS–FER UNDER COVER

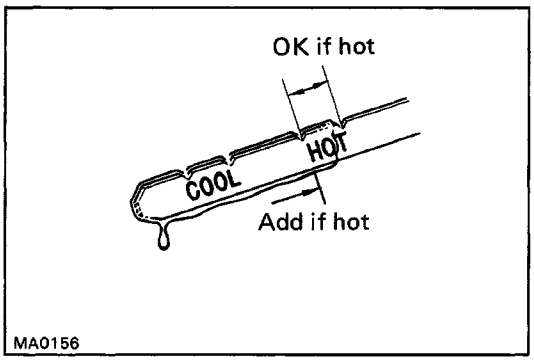


9. FILL TRANSMISSION WITH ATF

Add 6.0 liters (6.3 US qts, 5.3 Imp. qts)

NOTICE: Do not overfill.

Fluid type: ATF DEXRON® II



10. CHECK FLUID LEVEL (See page AT–13)

Throttle Cable

REMOVAL OF THROTTLE CABLE

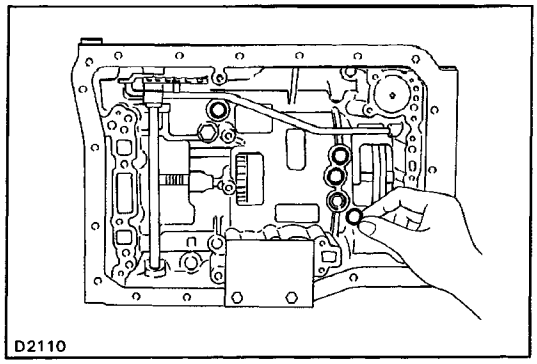
1. REMOVE FRONT PROPELLER SHAFT (See page PR–2)

2. DISCONNECT THROTTLE CABLE

(a) Disconnect the cable housing from the bracket.

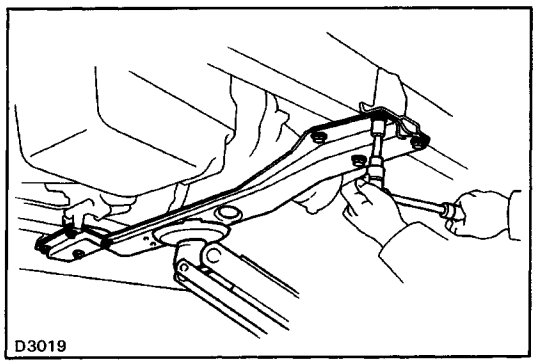
(b) Disconnect the cable from the throttle linkage.

(c) Disconnect the cable from the torque converter housing.



3. REMOVE VALVE BODY (See page AT–27)

4. REMOVE FOUR CENTER SUPPORT APPLY GASKETS



5. REMOVE FRAME CROSSMEMBER SET BOLTS

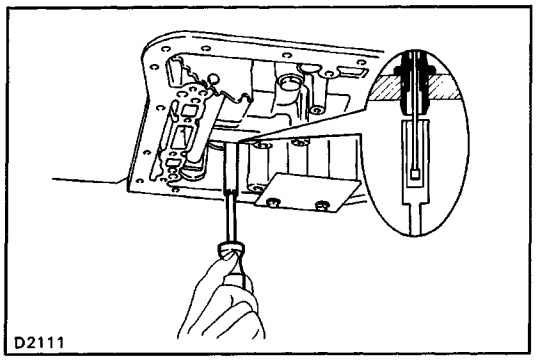
(a) Support the frame crossmember with jack.

(b) Remove the eight set bolts.

6. REMOVE THROTTLE CABLE CLAMP

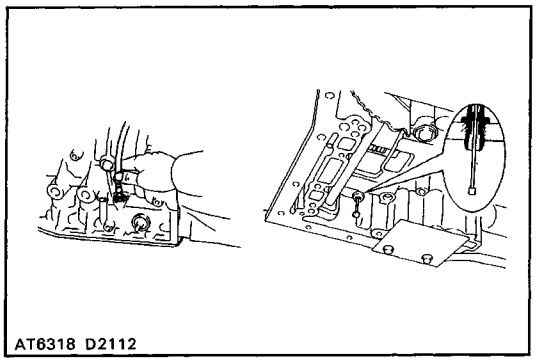
(a) Lower the jack.

(b) Remove the cable clamp from the transmission housing.



7. PUSH THROTTLE CABLE OUT OF TRANSMISSION CASE

Using 10 mm socket, push the throttle cable out.

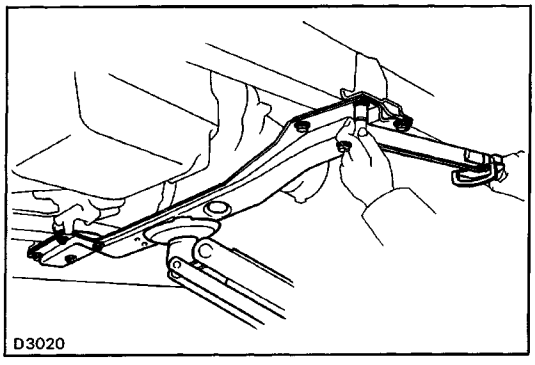


INSTALLATION OF THROTTLE CABLE

1. INSTALL CABLE IN TRANSMISSION CASE

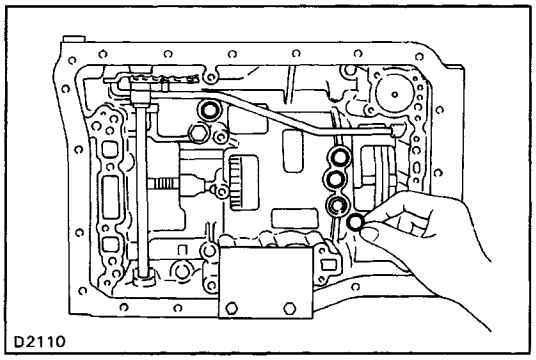
Be sure to push it in all the way.

2. INSTALL THROTTLE CABLE CLAMP TO TRANSMISSION HOUSING



3. INSTALL FRAME CROSSMEMBER SET BOLTS

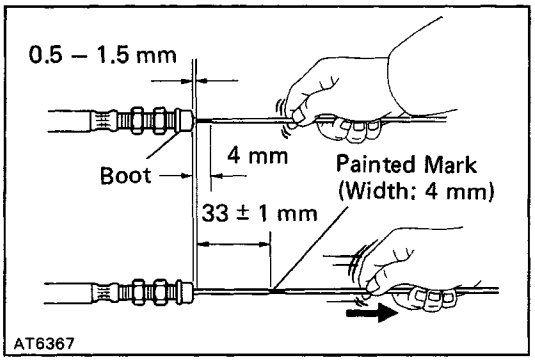
Torque: 61 N–m (620 kgf–cm, 45 ft–lbf)



4. INSTALL FOUR CENTER SUPPORT APPLY GASKETS

5. INSTALL VALVE BODY (See page AT–28)

6. INSTALL FRONT PROPELLER SHAFT (See page PR–2)



7. IF THROTTLE CABLE IS NEW, PAINT MARK ON INNER CABLE

HINT: New cables do not have a cable stopper installed. Therefore to mark adjustment possible, paint a mark as described below.

(a) Connect the throttle cable to the throttle cam of valve body.

(b) Pull the inner cable lightly until resistance is felt, and hold it.

(c) Paint a mark as shown, about 4 mm (0.16 in.) in width.

(d) Pull the inner cable fully, measure the cable stroke.

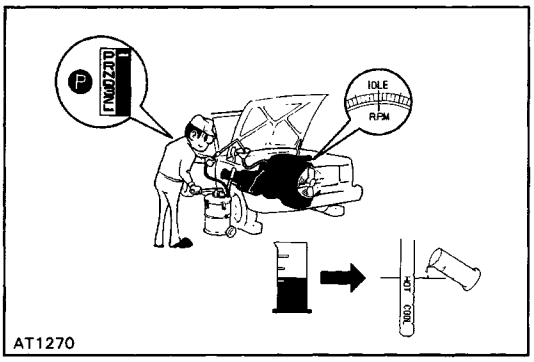
Cable stroke: 33 ± 1 mm (1.30 ± 0.04 in.)

8. CONNECT THROTTLE CABLE

(a) Connect the cable to the throttle linkage.

(b) Connect the cable housing to the bracket on the valve cover.

9. ADJUST THROTTLE CABLE (See page AT–14)

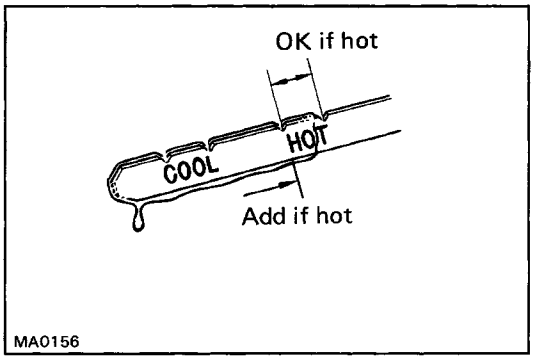


10. FILL TRANSMISSION WITH ATF

Add 6 liters (6.3 US qts, 5.3 Imp. qts)

NOTICE: Do not overfill.

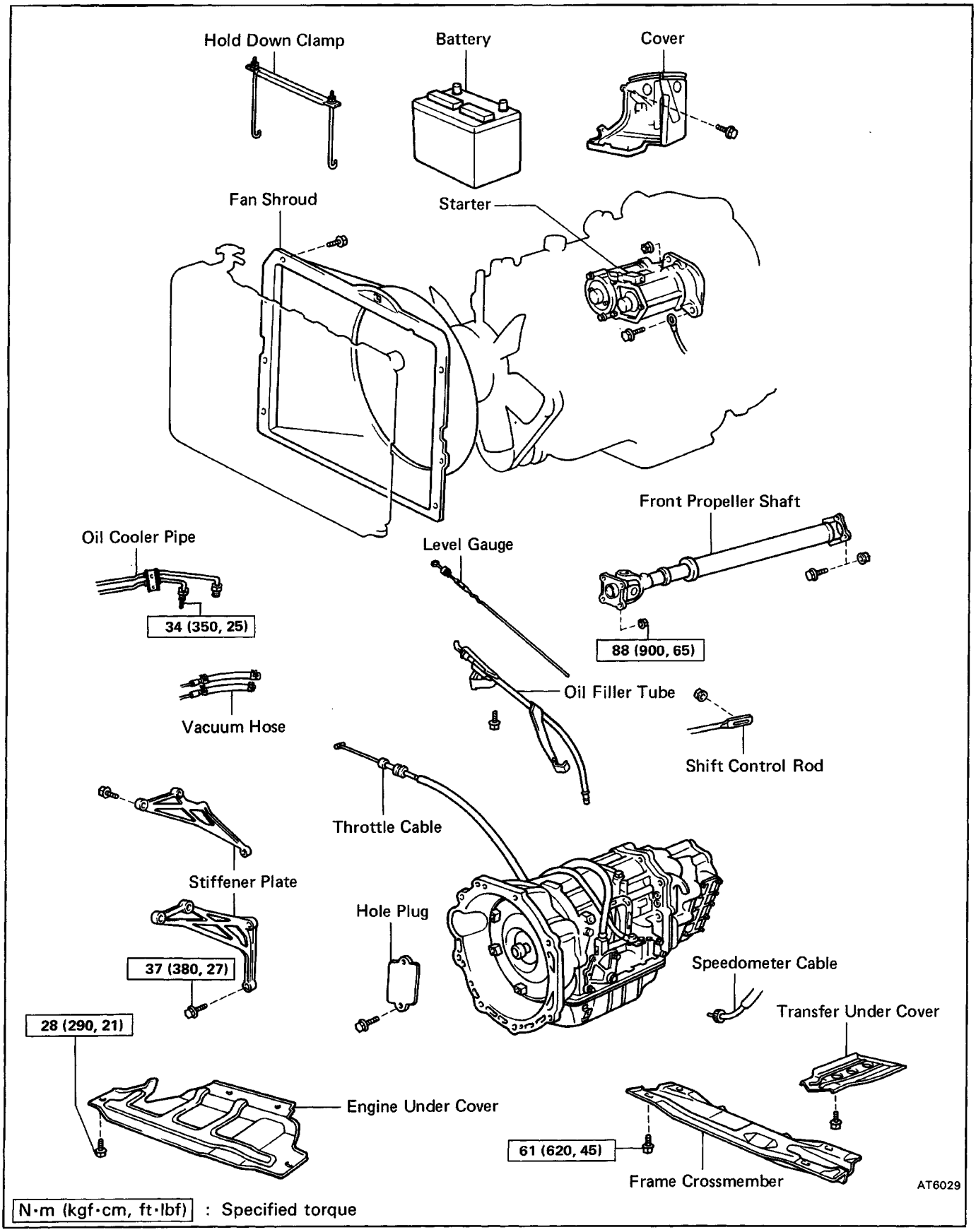
Fluid type: ATF DEXRON® II



11. CHECK FLUID LEVEL (Seepage AT–13)

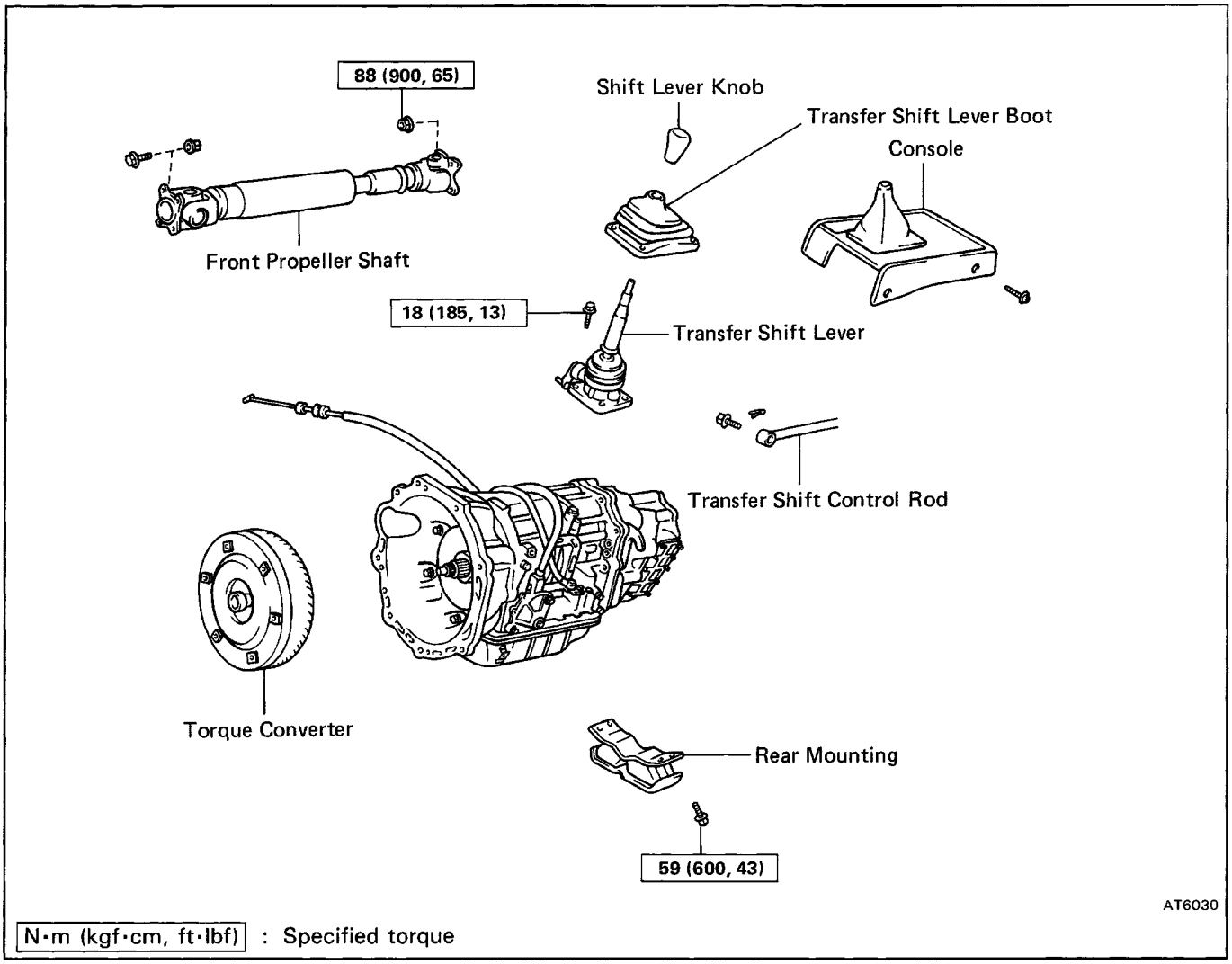
REMOVAL AND INSTALLATION OF TRANSMISSION

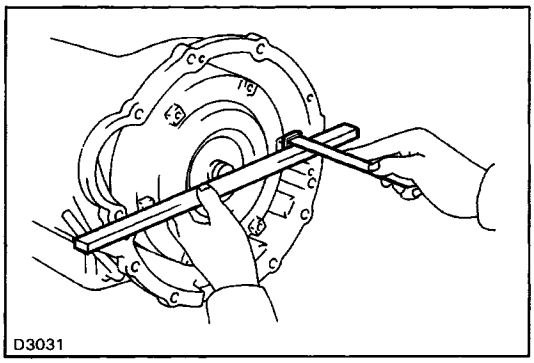
Remove and install the parts as shown.



N·m (kgf·cm, ft·lbf) : Specified torque

(Cont'd)





(MAIN POINT OF INSTALLATION)

1. CHECK TORQUE CONVERTER INSTALLATION

Using calipers and a straight edge, measure from the installed surface of the torque converter to the front surface of the transmission housing.

Correct distance: 15.7 mm (0.618 in.) or more

If the distance is less than the required standard, check for improper installation.

2. ADJUST TRANSMISSION THROTTLE CABLE

(See page AT–14)

3. FILL TRANSMISSION WITH ATF AND CHECK FLUID LEVEL (See page AT–13)

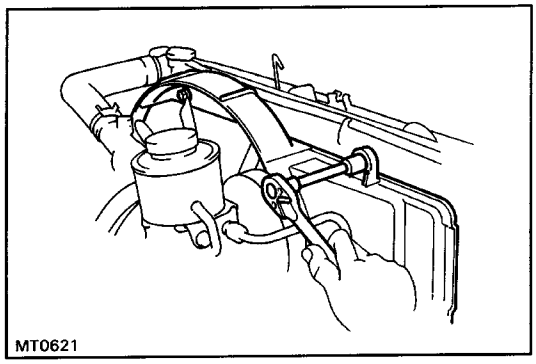
NOTICE: Do not overfill.

Fluid type: ATF DEXRON® II

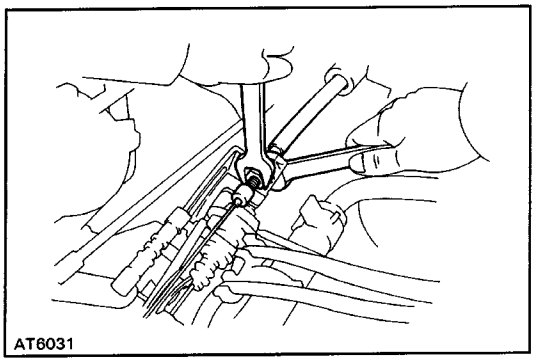
REMOVAL OF TRANSMISSION

1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL

2. REMOVE BATTERY AND COVER



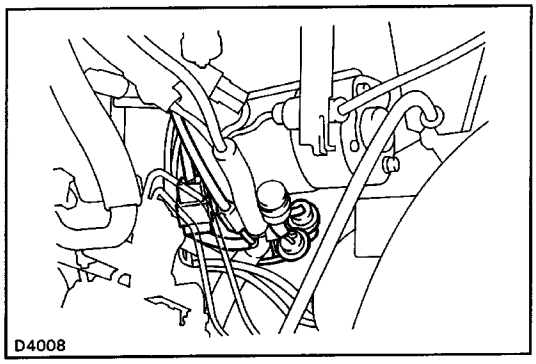
3. LOOSEN THE FAN SHROUD OF THE COOLING FAN TO AVOID DAMAGE TO THE FAN



4. DISCONNECT THROTTLE CABLE

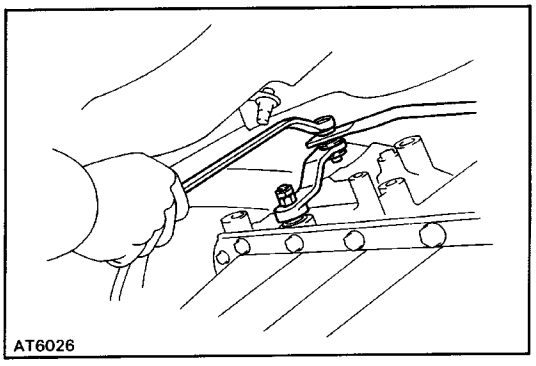
(a) Loosen the adjusting nuts and disconnect the cable housing from the bracket.

(b) Disconnect the cable from the throttle linkage.



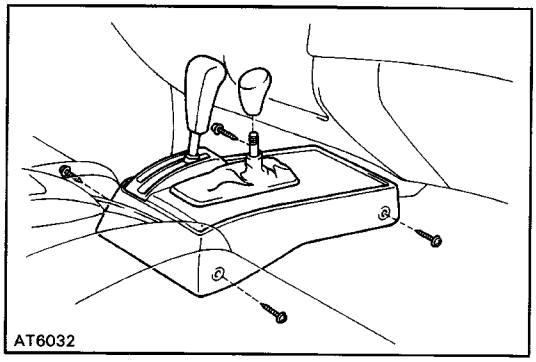
5. DISCONNECT CONNECTORS

Disconnect the connectors near the starter.

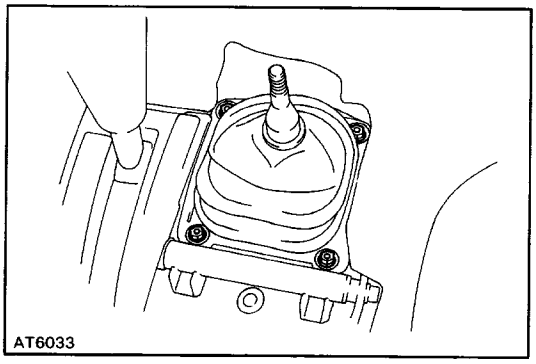


6. REMOVE TRANSFER SHIFT LEVER

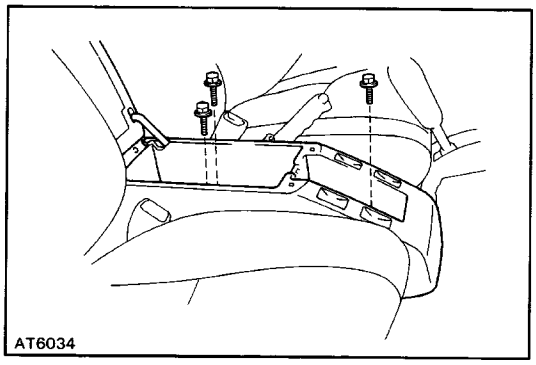
(a) Remove the nut and the transmission control rod.



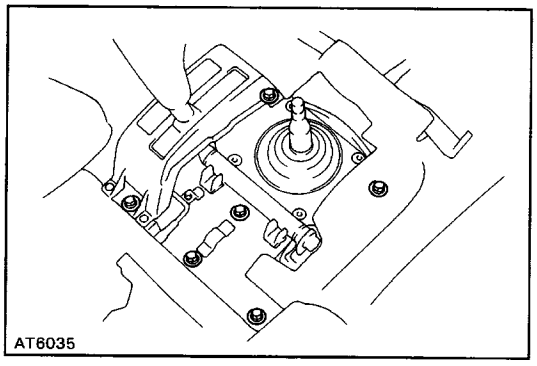
(b) Remove the transfer shift lever knob.
(c) Remove four screws and the console.



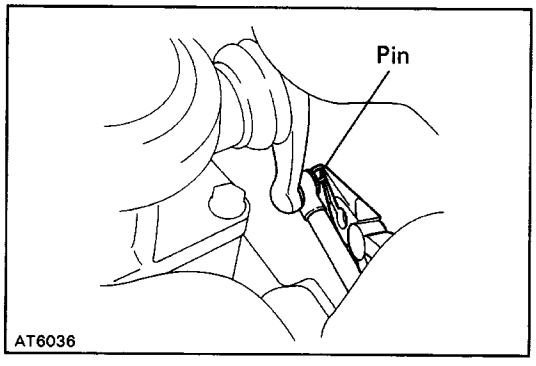
(d) Remove four bolts and transfer shift lever boot.



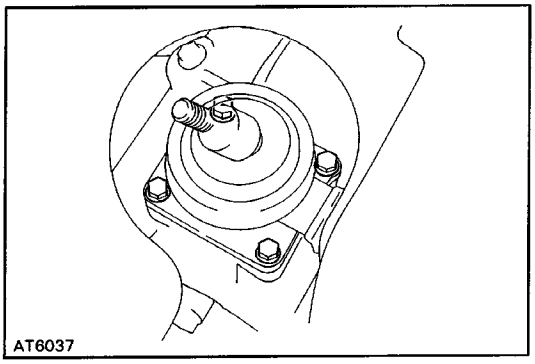
(e) Remove three bolts and the console box.



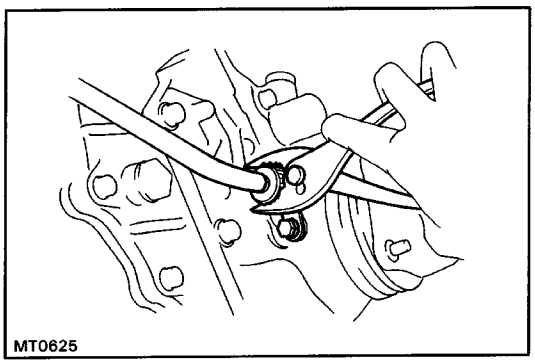
(f) Remove the six bolts and the transmission shift lever assembly.



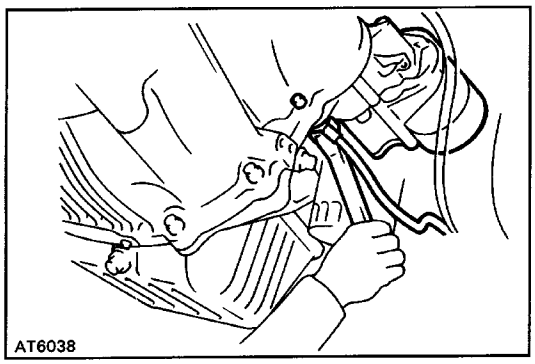
(g) Pull out the pin and disconnect the shift rod.



(h) Remove the four bolts and the transfer shift lever.



7. DISCONNECT SPEEDOMETER CABLE



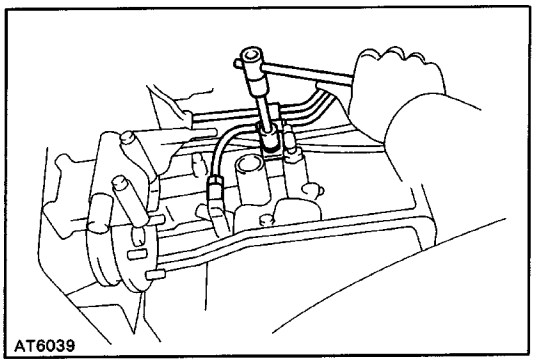
8. REMOVE FRONT AND REAR PROPELLER SHAFTS
(See page PR–2**)**

9. REMOVE STARTER

(a) Disconnect the connector and cable.

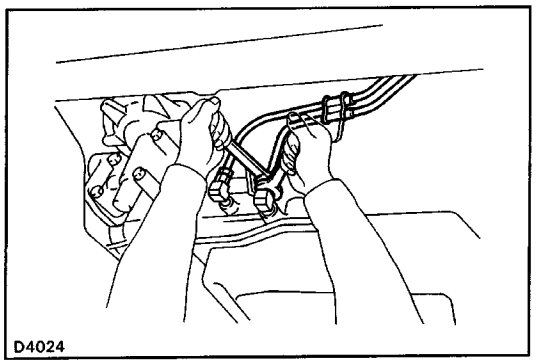
(b) Remove the bolt, nut and starter.

10. REMOVE OIL FILLER TUBE

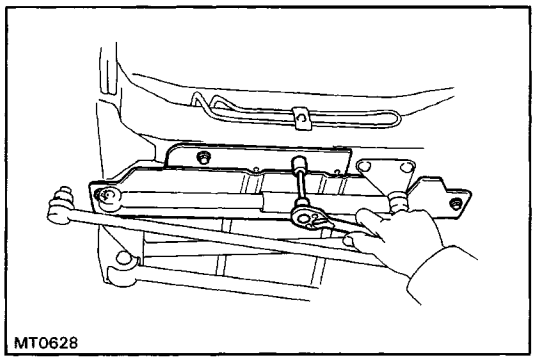


11. DISCONNECT TWO OIL COOLER TUBES

(a) Remove the cooler tube clamps.

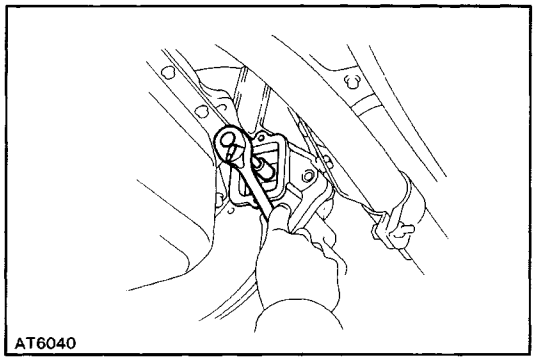


(b) Disconnect the two oil cooler tubes.



12. REMOVE UNDERCOVER

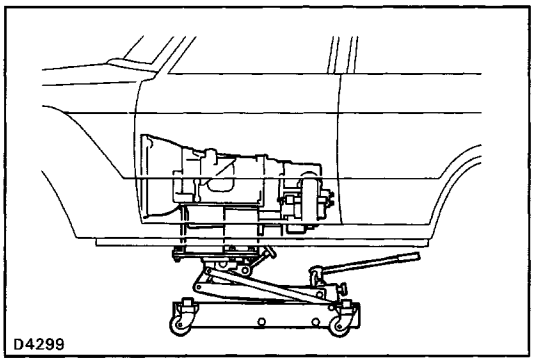
Remove four bolts and the under cover.



13. REMOVE SIX TORQUE CONVERTER MOUNTING BOLTS

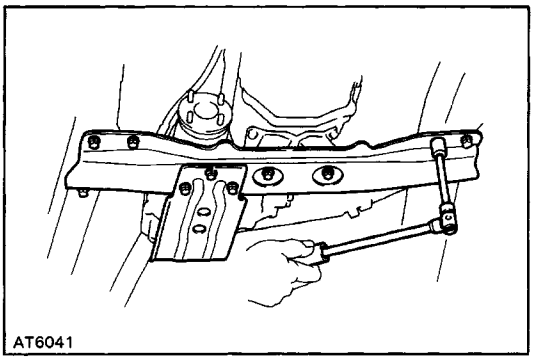
(a) Remove the end plate hole plug.

(b) Turn the crankshaft to gain access to each bolt. Remove six bolts.

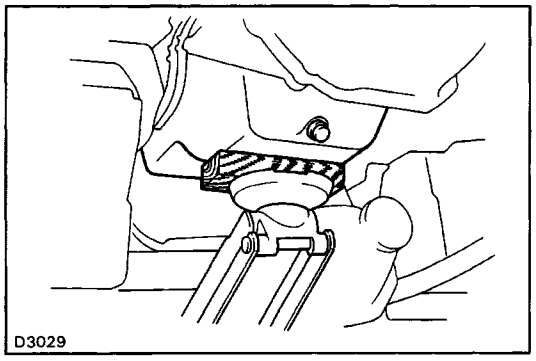


14. REMOVE FRAME CROSSMEMBER

(a) Support the transmission with the transmission jack.



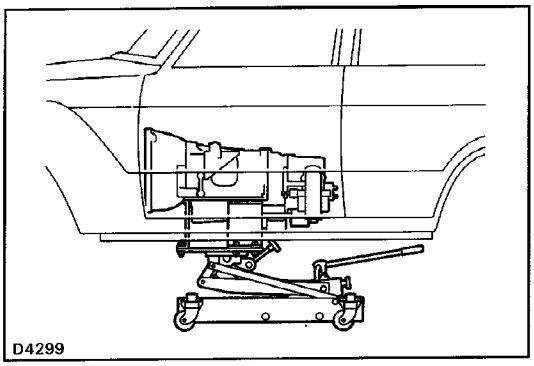
(b) Remove the eight bolts and two nuts, and then remove the frame crossmember.



15. REMOVE TRANSMISSION ASSEMBLY

(a) Be sure to out a wooden block or equivalent between the jack and the oil pan to prevent damage. Support the oil pan with a jack.

(b) Lower the rear end of transmission.


D4299

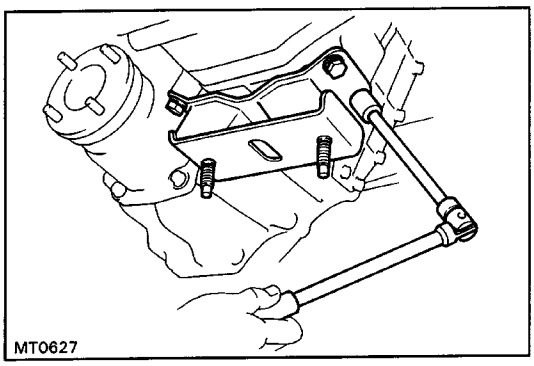
INSTALLATION OF TRANSMISSION

1. PLACE TRANSMISSION AT INSTALLATION POSITION

Jack up and push the transmission fully into position.

2. INSTALL TRANSMISSION BOLTS

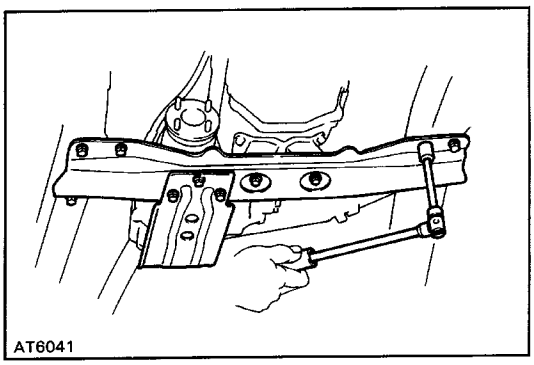
Torque: 72 N–m (730 kgf–cm, 53 ft–lbf)


MT0627

3. INSTALL ENGINE REAR MOUNTING AND CROSSMEMBER

(a) Install mounting with four bolts to the transmission.

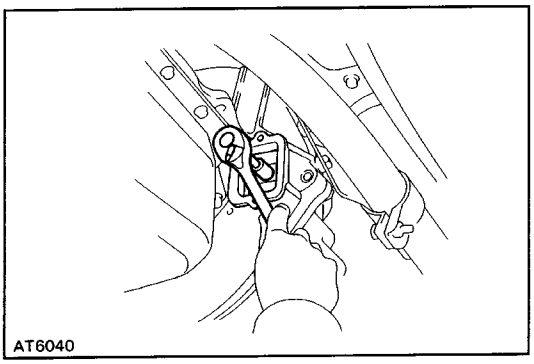
Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)


AT6041

(b) Install the crossmember with eight bolts and two nuts.

Torque: Bolt 61 N–m (620 kgf–cm, 45 ft–lbf)

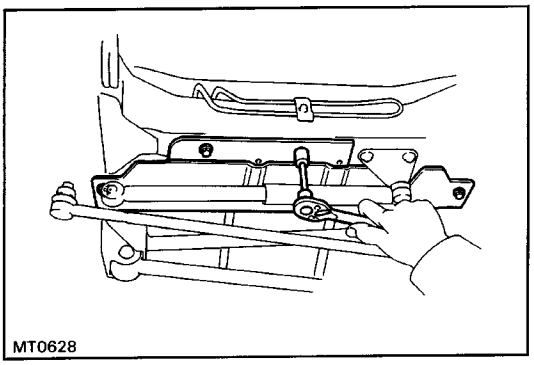
Nut 59 N–m (600 kgf–cm, 43 ft–lbf)


AT6040

4. INSTALL TORQUE CONVERTER MOUNTING BOLTS

(a) Install the six bolts while turning the crankshaft.

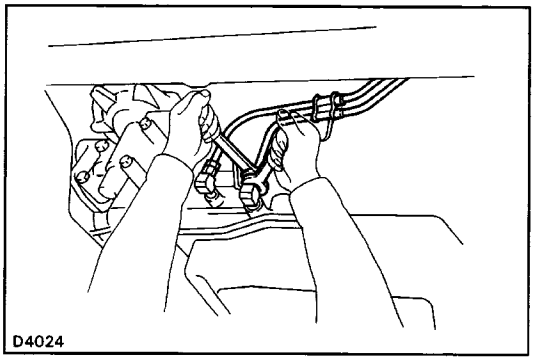
(b) Install the end plate hole plug.


MT0628

5. INSTALL UNDER COVER

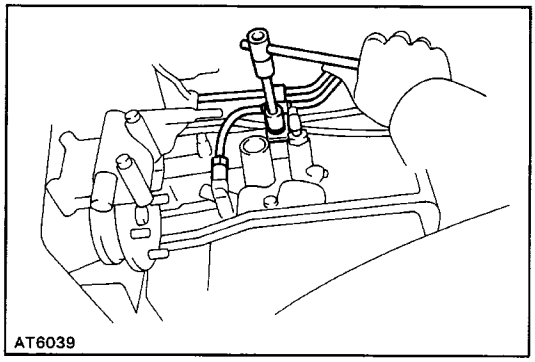
Install the under cover with four bolts.

Torque: 28 N–m (290 kgf–cm, 21 ft–lbf)

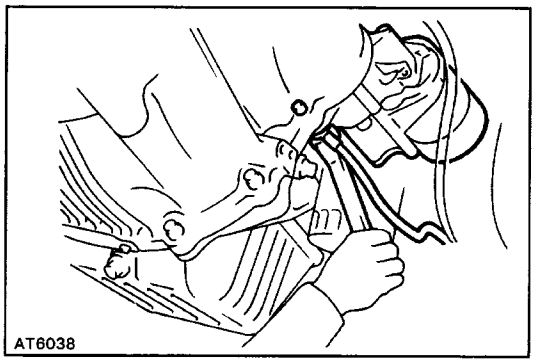


6. CONNECT TWO OIL COOLER TUBES

(a) Connect the two oil cooler tubes.
Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)

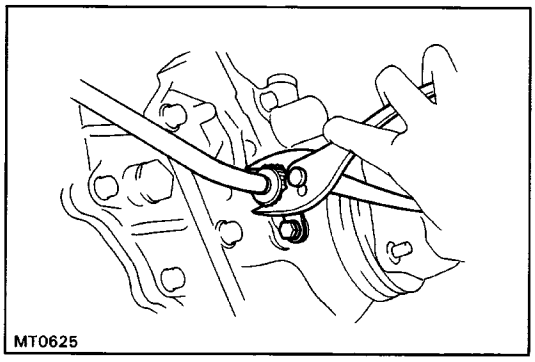


(b) Install the cooler clamp.
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

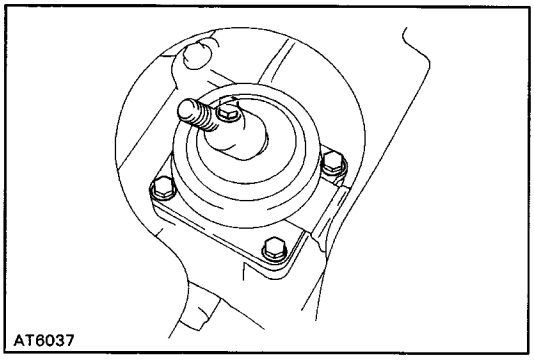


7. INSTALL FRONT AND REAR PROPELLER SHAFTS
(See page PR–2)
8. INSTALL OIL FILLER TUBE
9. INSTALL STARTER

(a) Install bolt, nut and the starter.
(b) Connect the connector and cable.

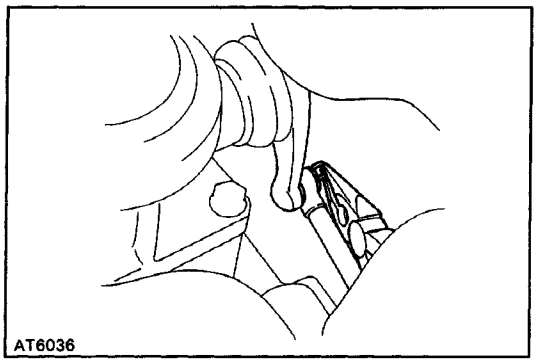


10. CONNECT SPEEDOMETER CABLE

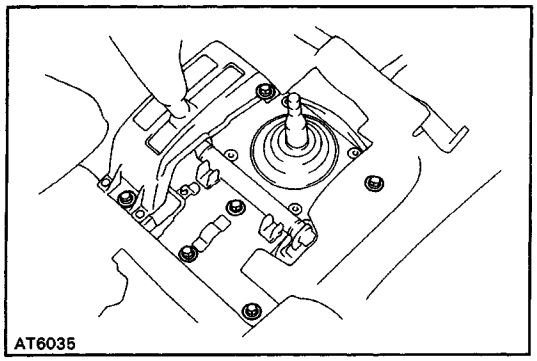


11. INSTALL TRANSFER SHIFT LEVER

(a) Install the shift lever with four bolts.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



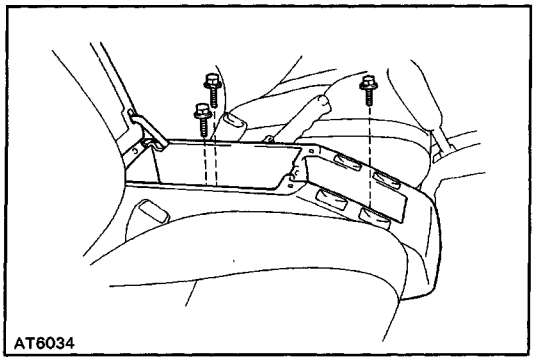
(b) Connect the shift rod and install the pin.



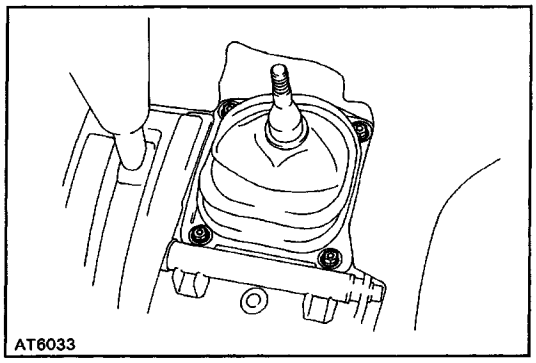
(c) Install the transmission shift lever assembly with six bolts.

Torque: 5.4 N–m (55 kgf–cm, 48 in–lbf)

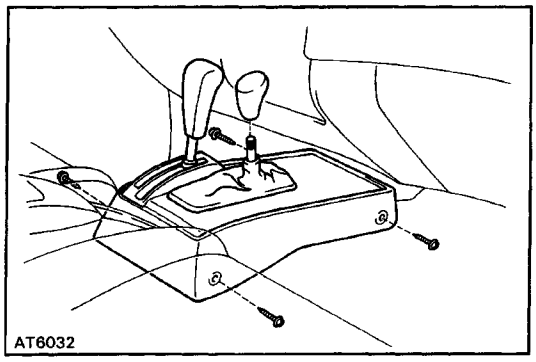
(d) Connect the connector.



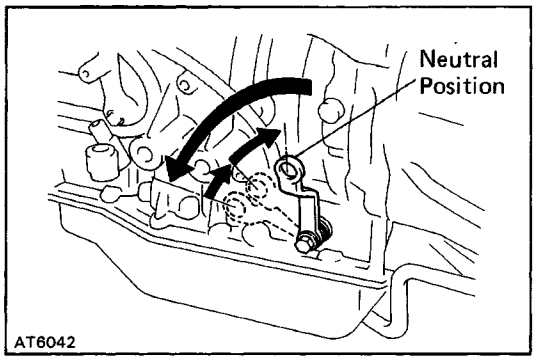
(e) Install the console box with three bolts.



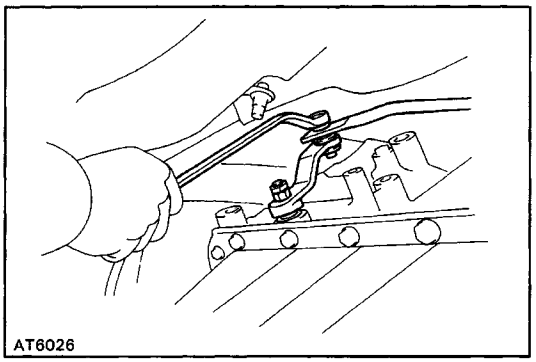
(f) Install transfer shift lever boot.



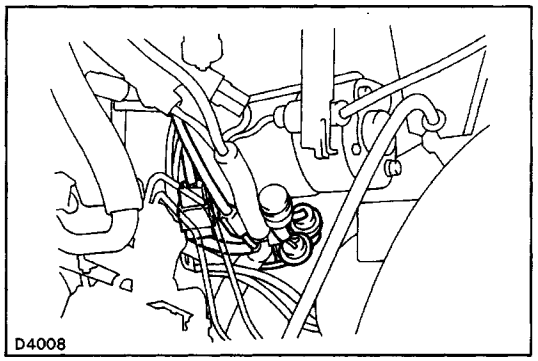
(g) Install the console and transfer shift lever knob.



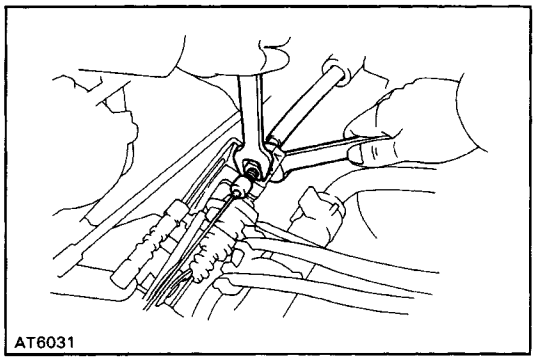
(h) Shift the shift lever from N position.
(i) Fully turn the control shaft lever back and return two notches. It is now in neutral position.



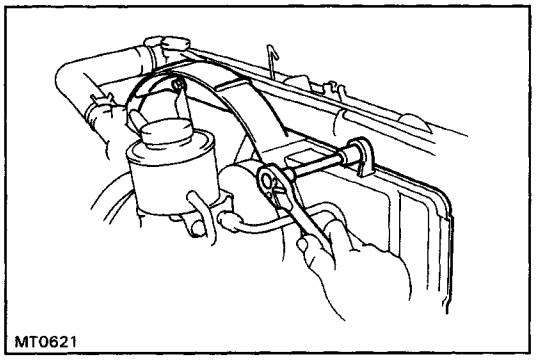
(j) Install the transmission control rod.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



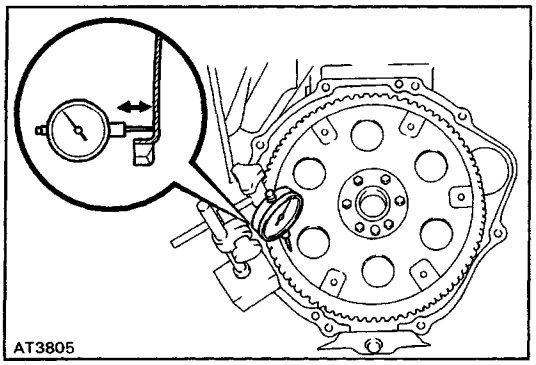
12. CONNECT CONNECTORS
Connect the connectors near the starter.

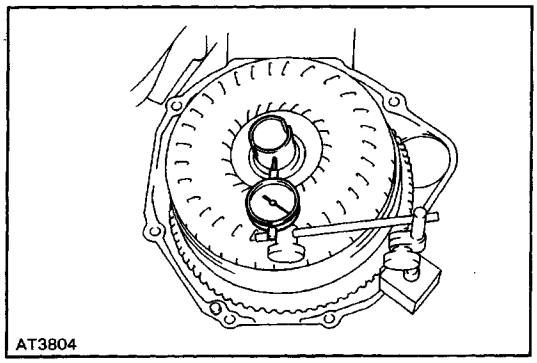


13. CONNECT THROTTLE CABLE
(a) Connect the cable from the throttle linkage.
(b) Tighten the adjusting nuts and connect the cable housing from the bracket.



14. TIGHTEN THE FAN SHROUD OF THE COOLING FAN TO AVOID DAMAGE TO THE FAN
15. INSTALL BATTERY AND COVER
16. CONNECT BATTERY CABLE FROM NEGATIVE TERMINAL





TORQUE CONVERTER AND DRIVE PLATE

INSPECTION OF TORQUE CONVERTER AND DRIVE PLATE

1. MEASURE DRIVE PLATE RUNOUT AND INSPECT

Set up a dial indicator and measure the drive plate runout.

If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of spacers and tighten the bolts.

Torque: 87 N–m (890 kgf–cm, 64 ft–lbf)

2. MEASURE TORQUE CONVERTER SLEEVE RUNOUT

(a) Temporarily mount the torque converter to the drive plate. Set up a dial indicator.

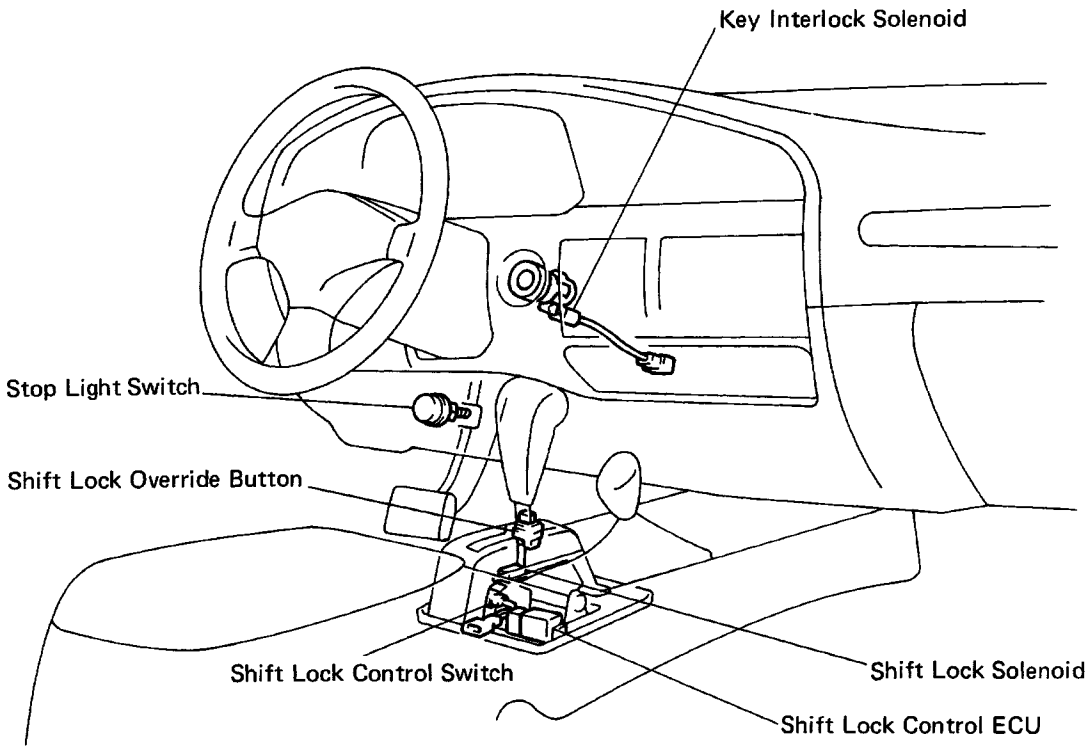
If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorientating the installation of the converter. If excessive runout cannot be corrected, replace the torque converter.

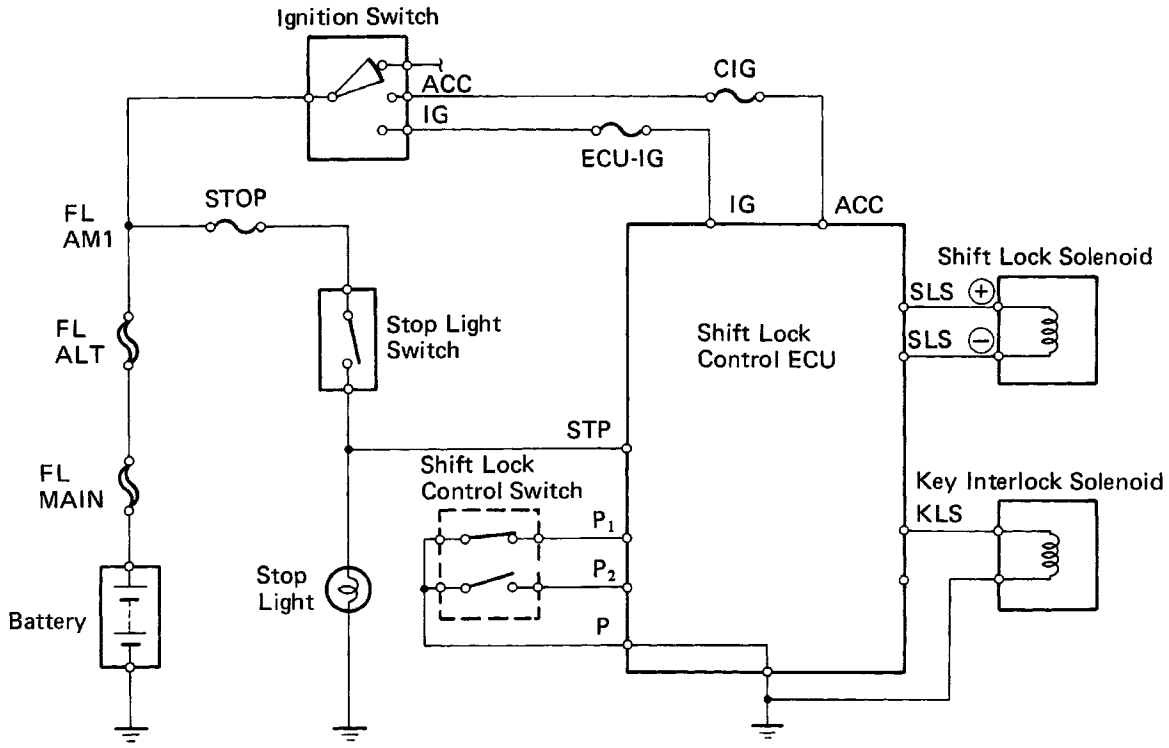
HINT: Mark the position of the converter to ensure correct installation.

(b) Remove the torque converter.

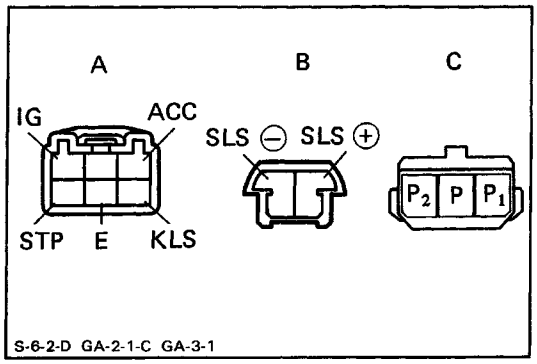
SHIFT LOCK SYSTEM

COMPONENT AND CIRCUIT





AT6141
AT5677

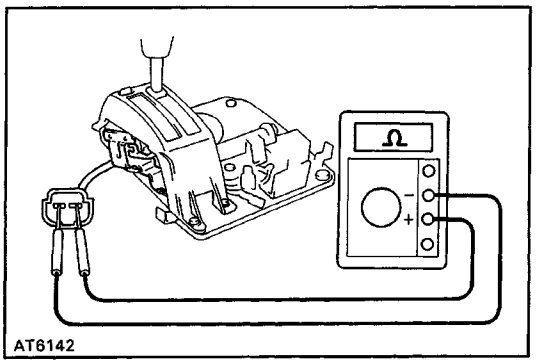


INSPECTION OF ELECTRIC CONTROL COMPONENTS

1. INSPECT SHIFT LOCK CONTROL ECU

Using a voltmeter, measure the voltage at each terminal.

Connector	Terminal	Measuring Condition	Voltage (V)
A	ACC – E	IG SW ACC position	10 – 14
	IG – E	IG SW ON position	10 – 14
	STP – E	Depress brake pedal	10 – 14
	KLS – E	① IG SW ACC position and P range	0
		② P → R, N, D, 2, L ranges	10 – 14
		③ ↑ (Approx. after one second)	6 – 9
B	SLS ⊕ – SLS ⊖	① IG SW ON position and P range	0
		② Depress brake pedal	8.5 – 13.5
		③ ↑ (Approx. after 20 seconds)	5.5 – 9.5
		④ P → R, N, D, 2, L range or release brake pedal	0
C	P_1 – P	① IG SW ON, P range and depress brake pedal	0
		② P → R, N, D, 2, L ranges	9 – 13.5
	P_2 – P	① IG SW ACC position and P range	9 – 13.5
		② P→ R, N, D, 2, L ranges	0

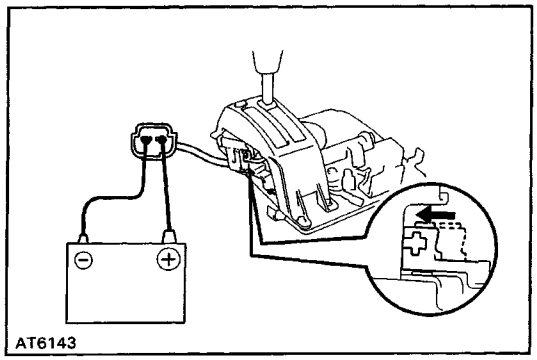


2. INSPECT SHIFT LOCK SOLENOID

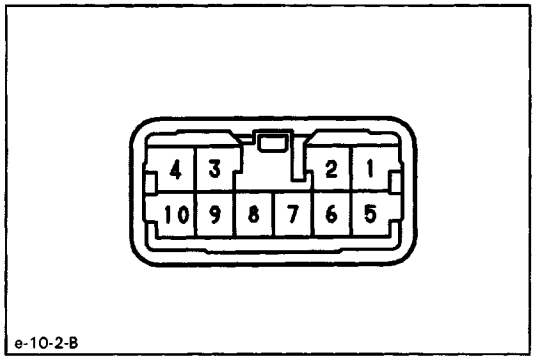
(a) Disconnect the solenoid connector.

(b) Using an ohmmeter, measure the resistance between terminals.

Standard resistance: 20 – 28 Ω



(c) Apply the battery voltage between terminals. At this time, confirm that a solenoid operation.

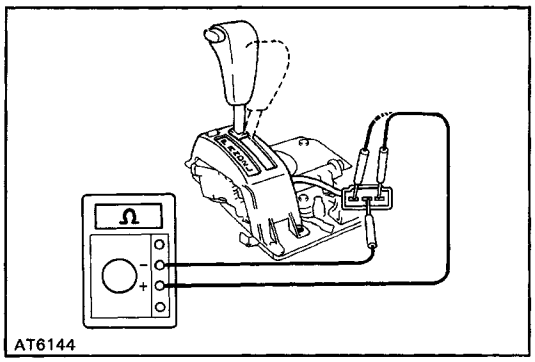


3. INSPECT KEY INTERLOCK SOLENOID

(a) Disconnect the solenoid connector.

(b) Using an ohmmeter, measure the resistance between terminals 1 and 5.

Standard resistance: 12 – 17 Ω



4. INSPECT SHIFT LOCK CONTROL SWITCH

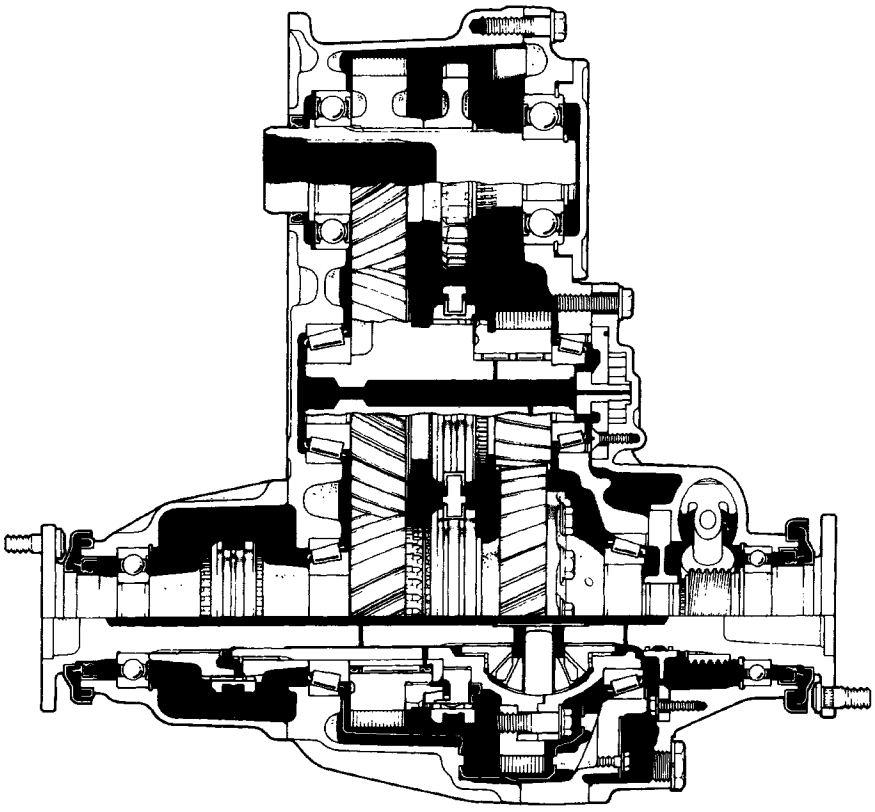
Inspect that there is continuity between terminals.

TRANSFER (Full–Time 4WD Type Transfer)

DESCRIPTION

TRANSFER

The transfer transmits the drive force from the transmission to the front and rear wheels.
The specifications and cross–section diagrams are as shown.



HF2A Transfer

TF0989

Specifications

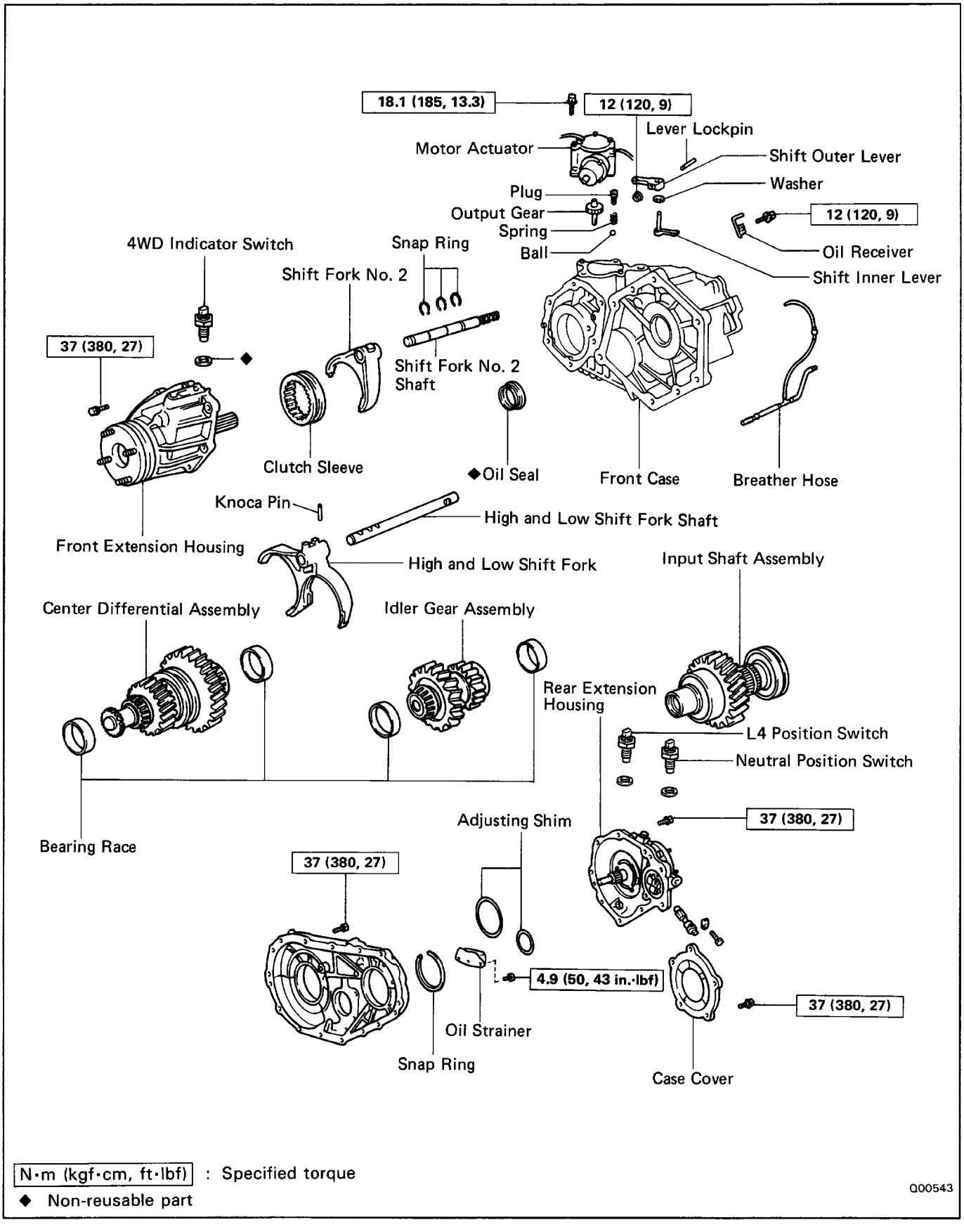
Type of Transmission		A440F
Type of Engine		3F-E
Type of Transfer		HF2A (For Full-Time)
Gear Ratio	High Speed Range	1.000
	Low Speed Range	2.488
Oil Capacity		1.3 liters (1.4 US qts, 1.1 Imp. qts)
Type of Oil		API GL-4 or GL-5 SAE 75W-90

PRECAUTIONS

When working with FIPG material, you must be observe the following.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket sur–faces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non–residue solvent.
- Apply the seal packing in approx. 1 mm (0.04 in.) bead along the sealing surface.
- Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.

(HF2A FOR FULL–TIME 4WD TYPE TRANSFER)
COMPONENTS



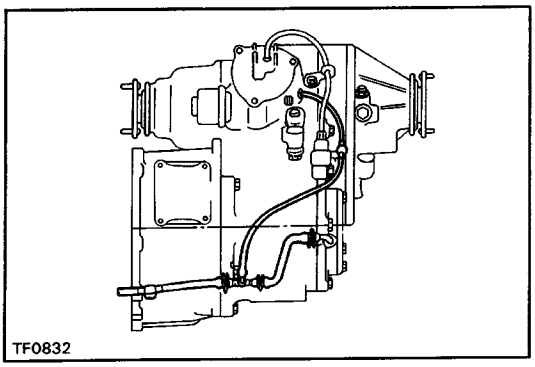
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

Q00543

DISASSEMBLY OF TRANSFER

(See page TF–4)

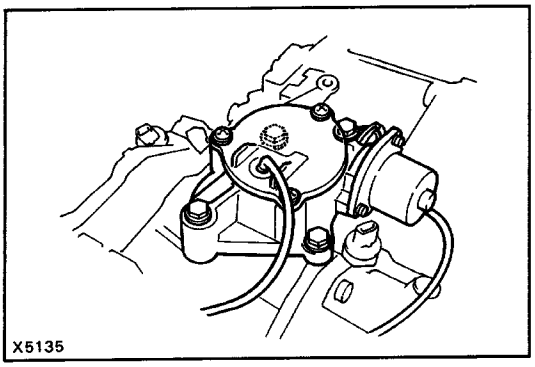
1. REMOVE BREATHER HOSE



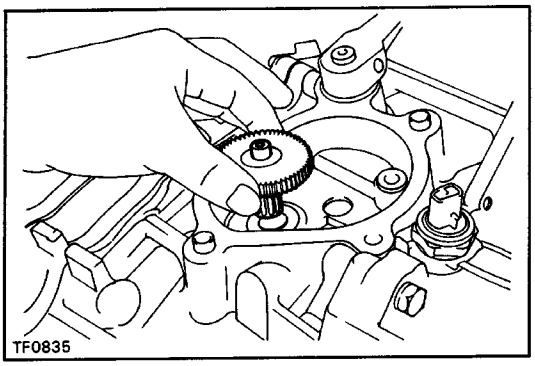
2. REMOVE MOTOR ACTUATOR

Remove the four bolts and motor actuator.

HINT: Remove the motor actuator in differential lock condition.

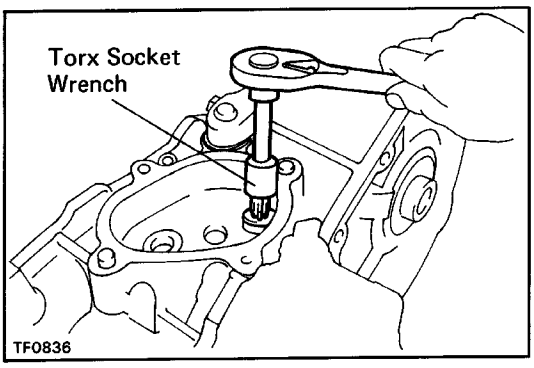


3. REMOVE OUTPUT GEAR

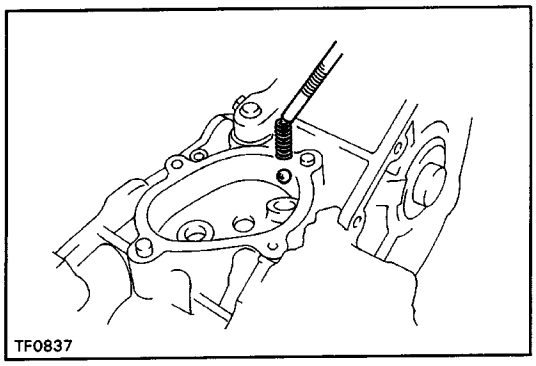


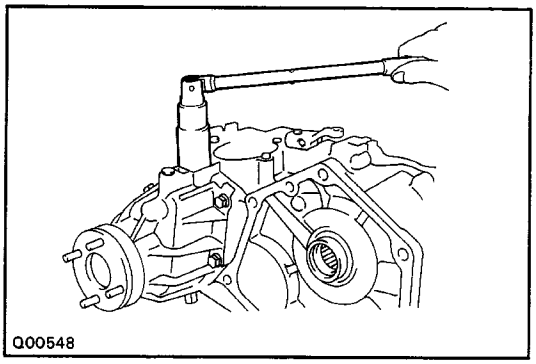
4. REMOVE SCREW PLUG, SPRING AND BALL

(a) Using a torx socket wrench, remove the screw plug.
(Torx socket wrench T40 09042–00020)



(b) Using a magnetic finger, remove the spring and ball.

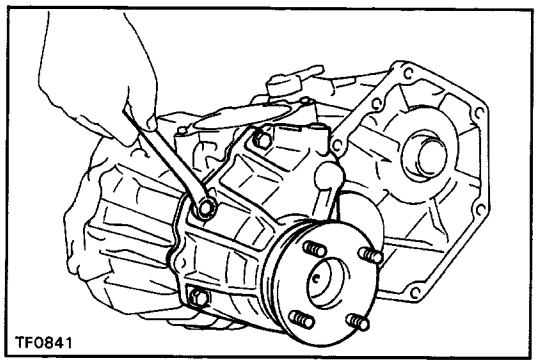




5. REMOVE TRANSFER INDICATOR SWITCHES

Remove the 4WD indicator switch, L4 position switch and neutral position switch.

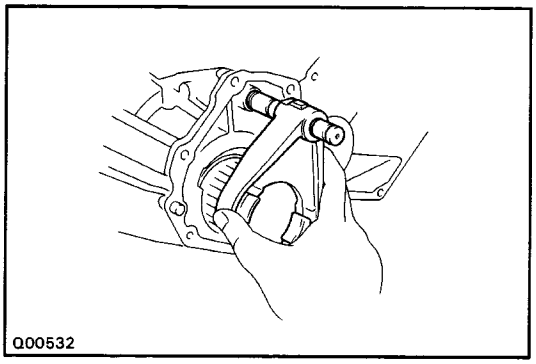
(See page TF–7)



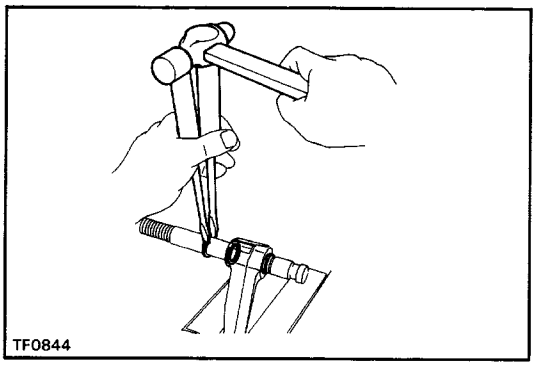
6. REMOVE FRONT EXTENSION HOUSING

Remove the six bolts and front extension housing.

HINT: If necessary, tap the front extension housing with a plastic hammer.



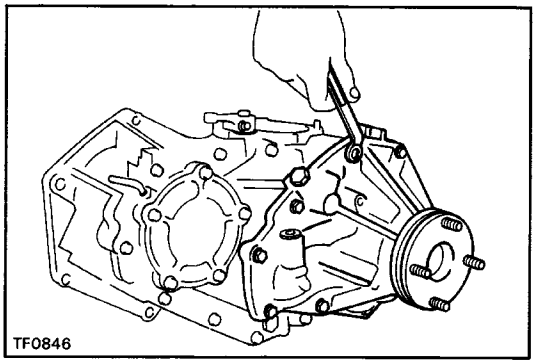
7. REMOVE CLUTCH SLEEVE, SHIFT FORK NO.2 AND FORK SHAFT



8. SEPARATE SHIFT FORK NO.2 AND FORK SHAFT

(a) Using two screwdrivers and a hammer, tap out the three snap rings.

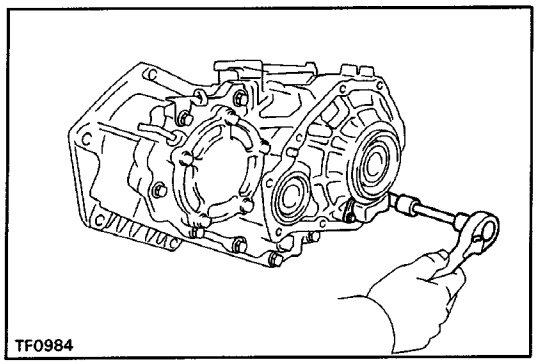
(b) Separate the shift fork No.2 and fork shaft.



9. REMOVE REAR EXTENSION HOUSING

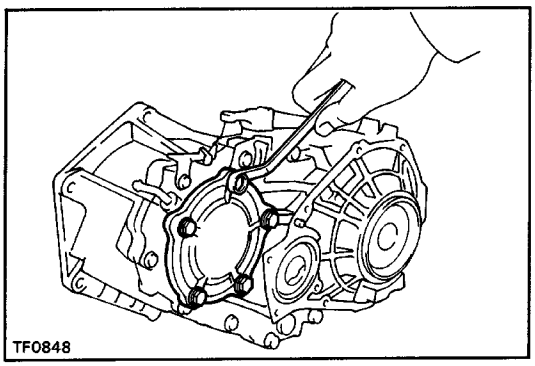
Remove the nine bolts and rear extension housing.

HINT: If necessary, tap the rear extension housing with a plastic hammer.



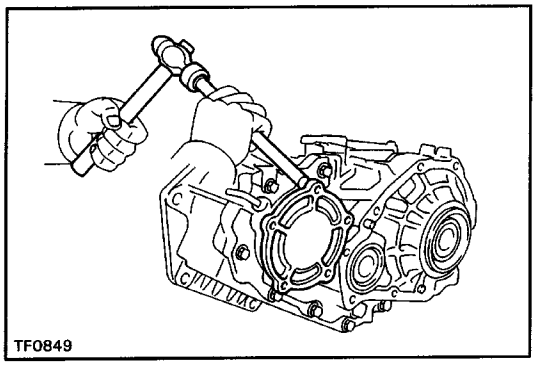
10. REMOVE OIL STRAINER FROM REAR CASE

Remove the two set bolts and oil strainer.

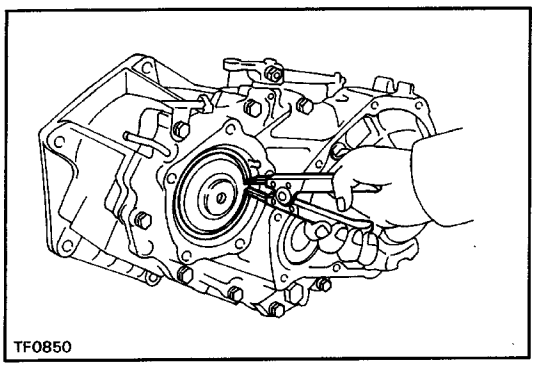


11. REMOVE CASE COVER

(a) Remove the five bolts.

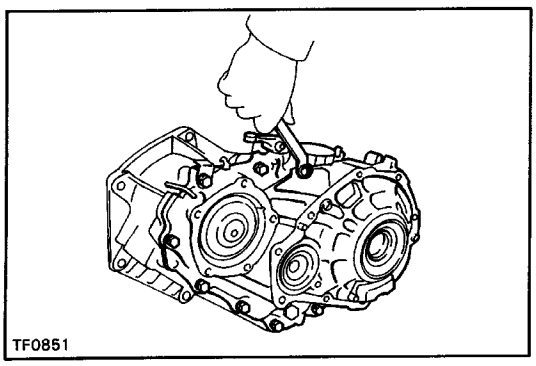


(b) Using a brass bar and hammer, tap the case cover and remove it.

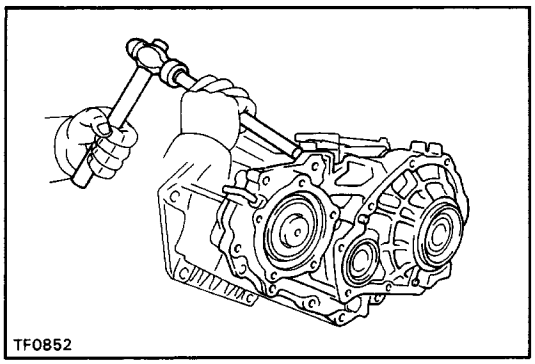


12. SEPARATE FRONT CASE AND REAR CASE

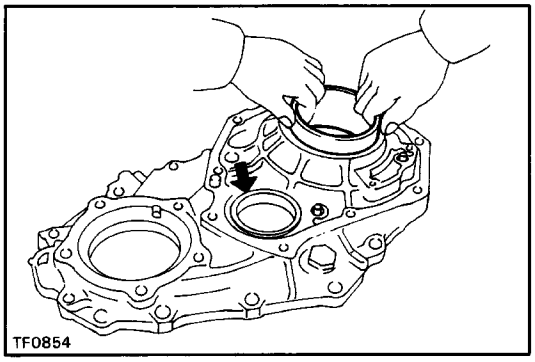
(a) Using snap ring pliers, remove the snap ring.



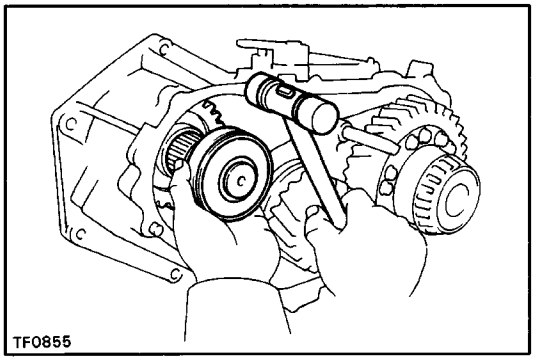
(b) Remove the eight bolts.



(c) Using a brass bar and hammer, tap the rear case and separate it.

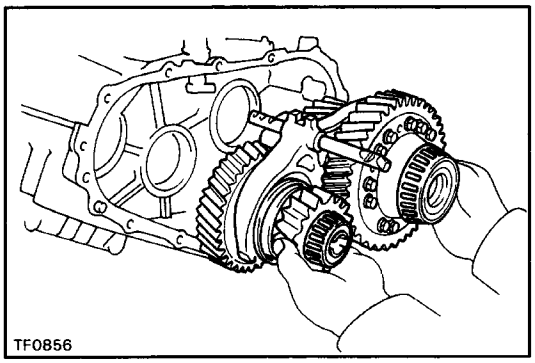


13. REMOVE TWO BEARING RACES FROM REAR CASE

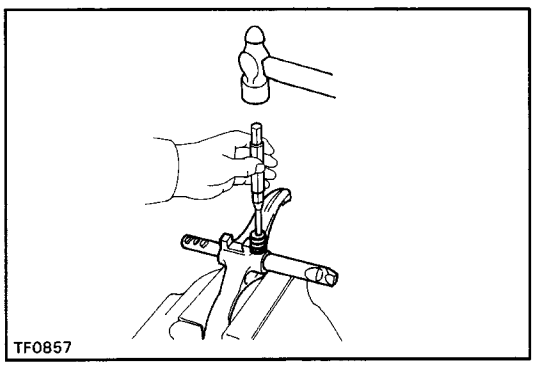


14. REMOVE INPUT SHAFT ASSEMBLY

Using a plastic hammer, remove the input shaft assembly.



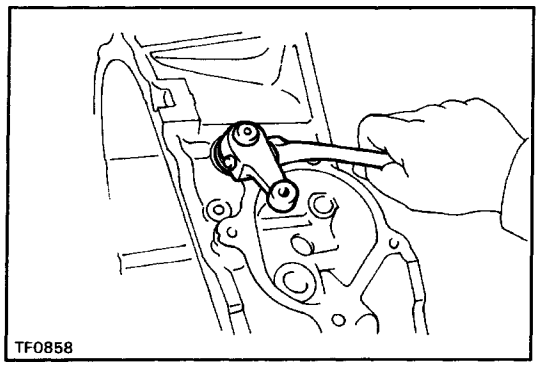
15. REMOVE IDLE GEAR ASSEMBLY, CENTER DIFFERENTIAL ASSEMBLY AND HIGH AND LOW SHIFT FORK ASSEMBLY



16. SEPARATE SHIFT FORK NO. 1 AND FORK SHAFT

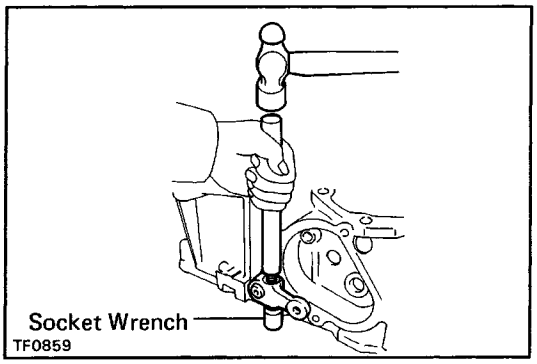
(a) Using a pin punch and hammer, drive out the slotted spring pin.

(b) Separate the shift fork No. 1 and fork shaft.

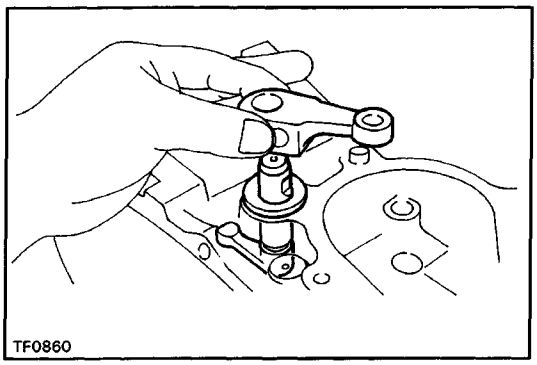


17. REMOVE SHIFT OUTER LEVER AND INNER LEVER

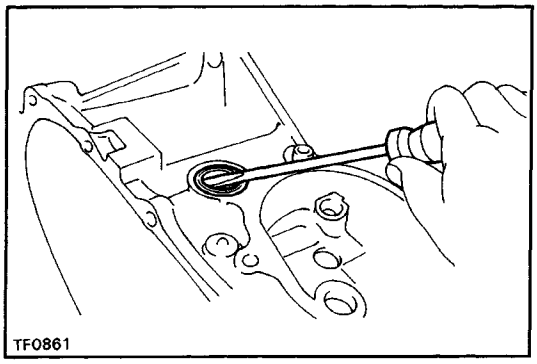
(a) Remove the nut and washer.



(b) Using a brass bar, hammer and socket wrench, tap out the lever lock pin.

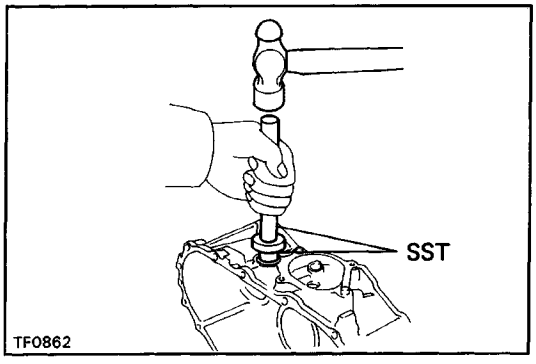


(c) Remove the shift outer lever and inner lever.

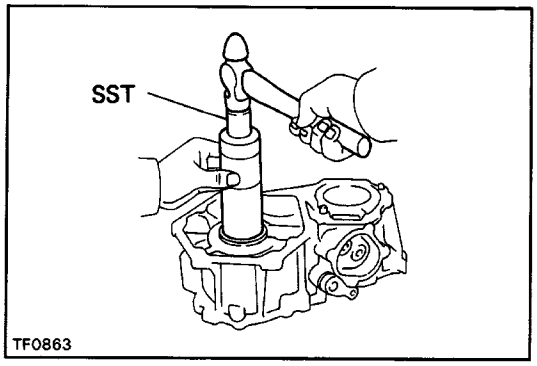


18. IF NECESSARY, REPLACE SHIFT LEVER OIL SEAL

(a) Using a screwdriver, pry out the oil seal.

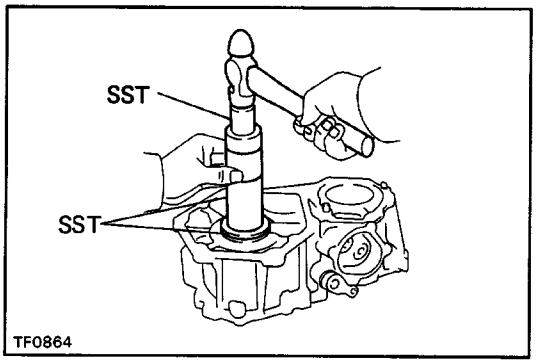


(b) Using SST and a hammer, drive in a new oil seal.
SST 09608–20012, (09608–00080, 09608–03020)

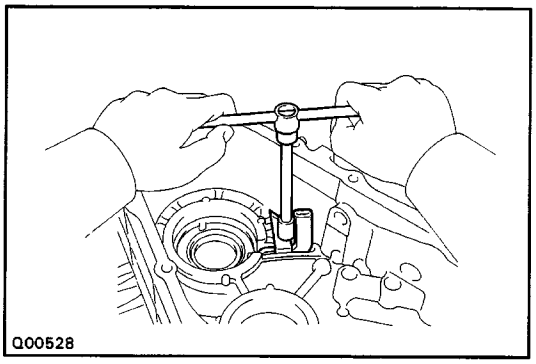


19. IF NECESSARY, REPLACE INPUT SHAFT OIL SEAL

(a) Using SST and a hammer, drive out the oil seal.
SST 09316–60010 (09316–00010)

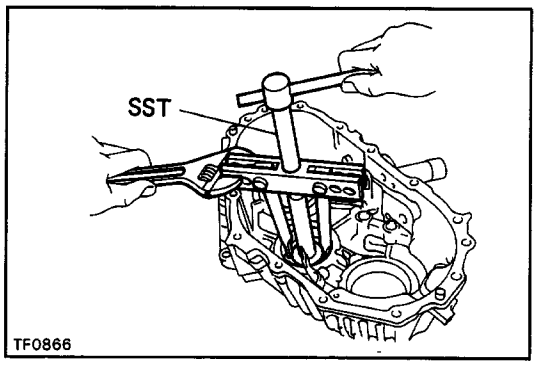


(b) Using SST and a hammer, drive in a new oil seal.
SST 09316–60010 (09316–00010, 09316–00030)



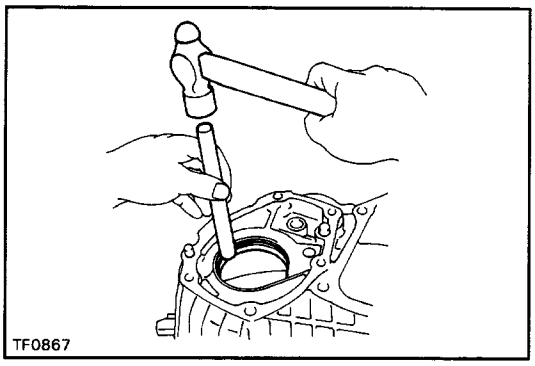
20. REMOVE OIL RECEIVER FROM FRONT CASE

Remove the set bolt and oil receiver.

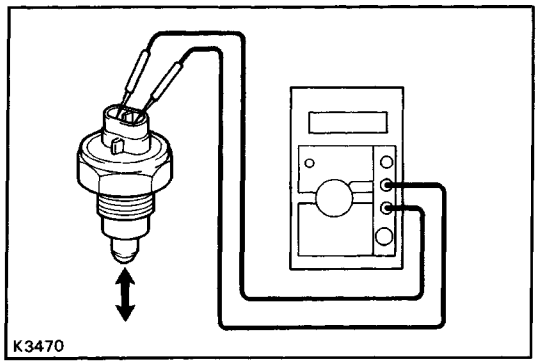


21. REMOVE TWO BEARING RACES FROM FRONT CASE

(a) Using SST, remove the bearing race.
SST 09950–20017



(b) Using a brass bar and hammer, remove the bearing race.



22. INSPECTION OF TRANSFER INDICATOR SWITCH

Check that there is continuity between terminals as shown.

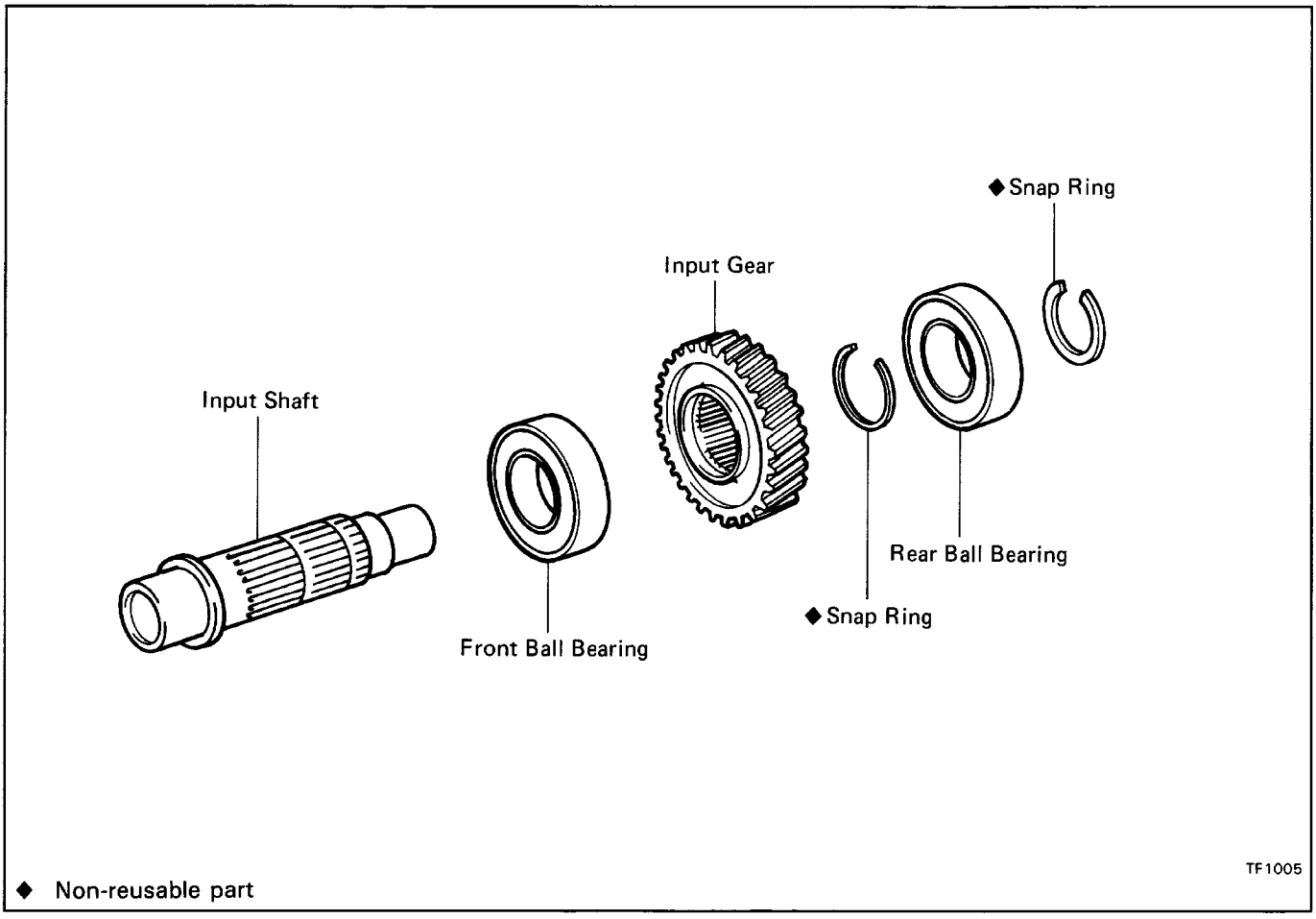
Switch Position	Specified
Push	Continuity
Free	No continuity

If continuity is not as specified, replace the switch.

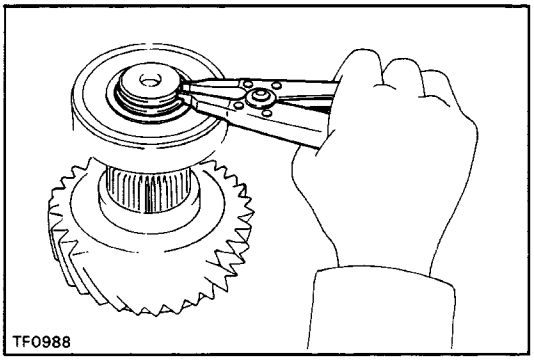
COMPONENT PARTS

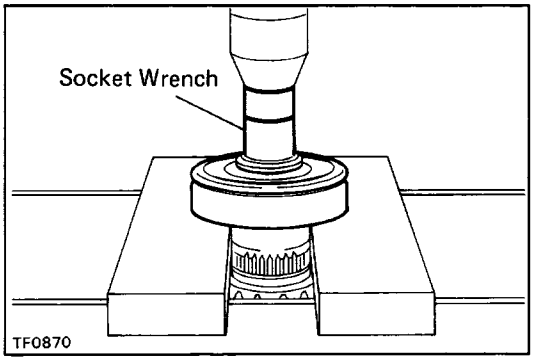
Input Shaft Assembly

COMPONENTS



◆ Non-reusable part



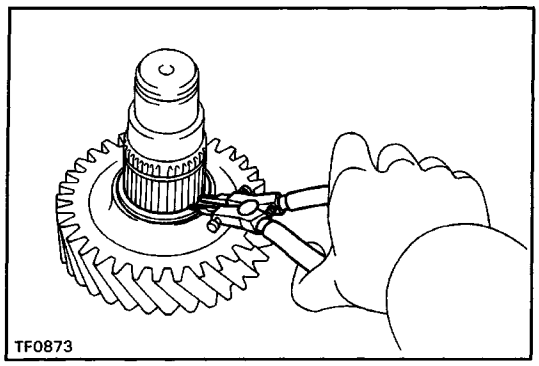


DISASSEMBLY OF INPUT SHAFT ASSEMBLY

1. REMOVE REAR BALL BEARING

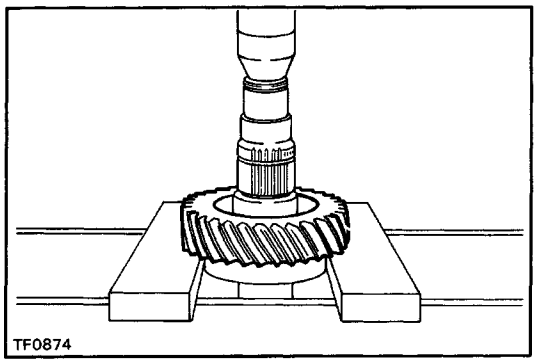
(a) Using snap ring pliers, remove the snap ring.

(b) Using a press and socket wrench, remove the rear ball bearing.

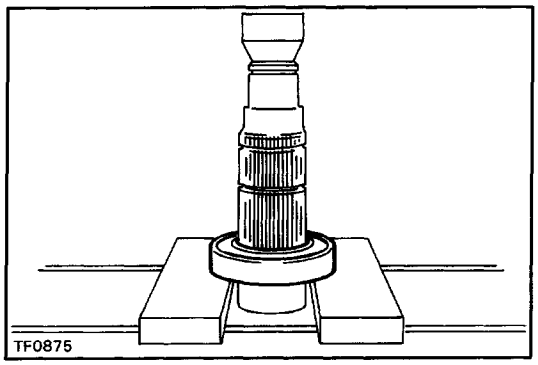


2. REMOVE INPUT GEAR

(a) Using snap ring pliers, remove the snap ring.

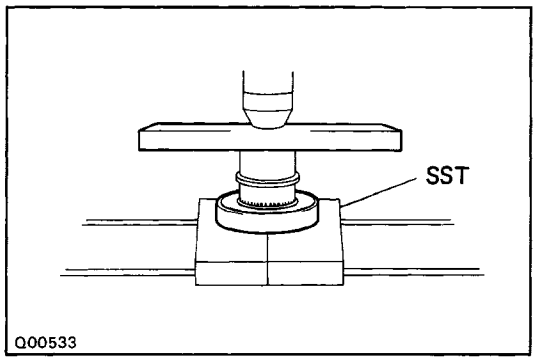


(b) Using a press, remove the input gear.



3. REMOVE FRONT BALL BEARING

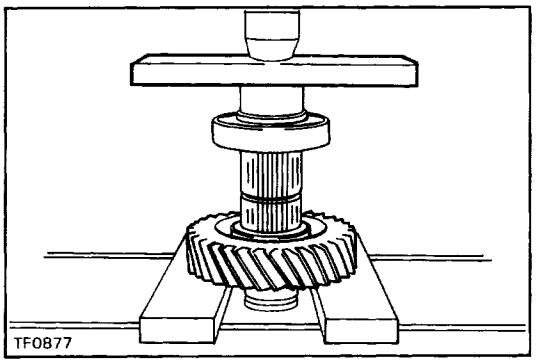
Using a press, remove the front ball bearing.



ASSEMBLY OF INPUT SHAFT ASSEMBLY

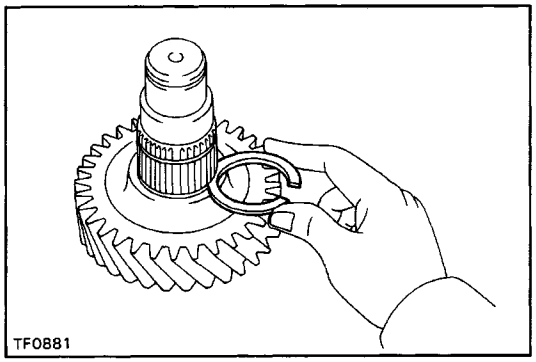
1. INSTALL FRONT BALL BEARING

Using SST and a press, install the front ball bearing.
SST 09527–30010



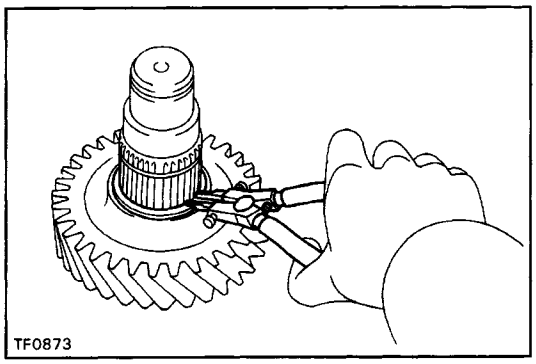
2. INSTALL INPUT GEAR

(a) Using a press, install the input gear.



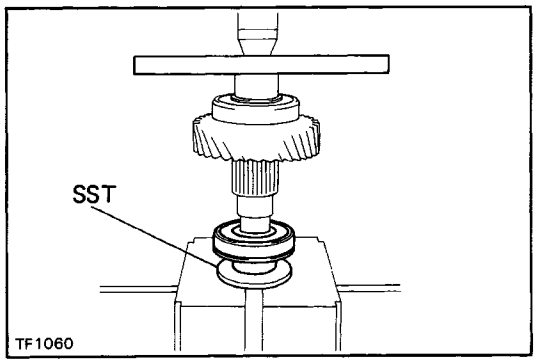
(b) Select a snap ring that will allow minimum axial play and install it on the shaft.

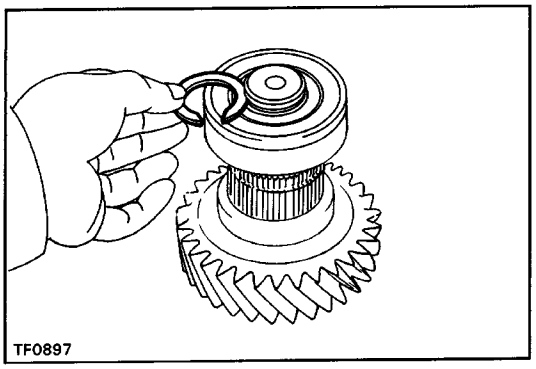
Mark	Thickness mm (in.)
A	2.0 (0.0787)
B	2.1 (0.0827)
C	2.2 (0.0866)
D	2.3 (0.0906)
E	2.4 (0.0945)
F	2.5 (0.0984)
G	2.6 (0.1024)
H	2.7 (0.1063)
J	2.8 (0.1102)

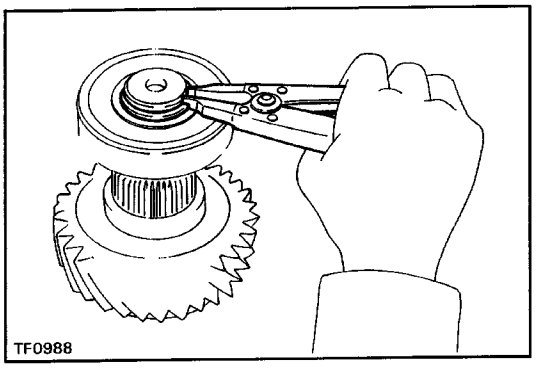


3. INSTALL REAR BALL BEARING

(a) Using SST and a press, install the rear ball bearing.
SST 09316–60010 (09316–00030)




TF0897

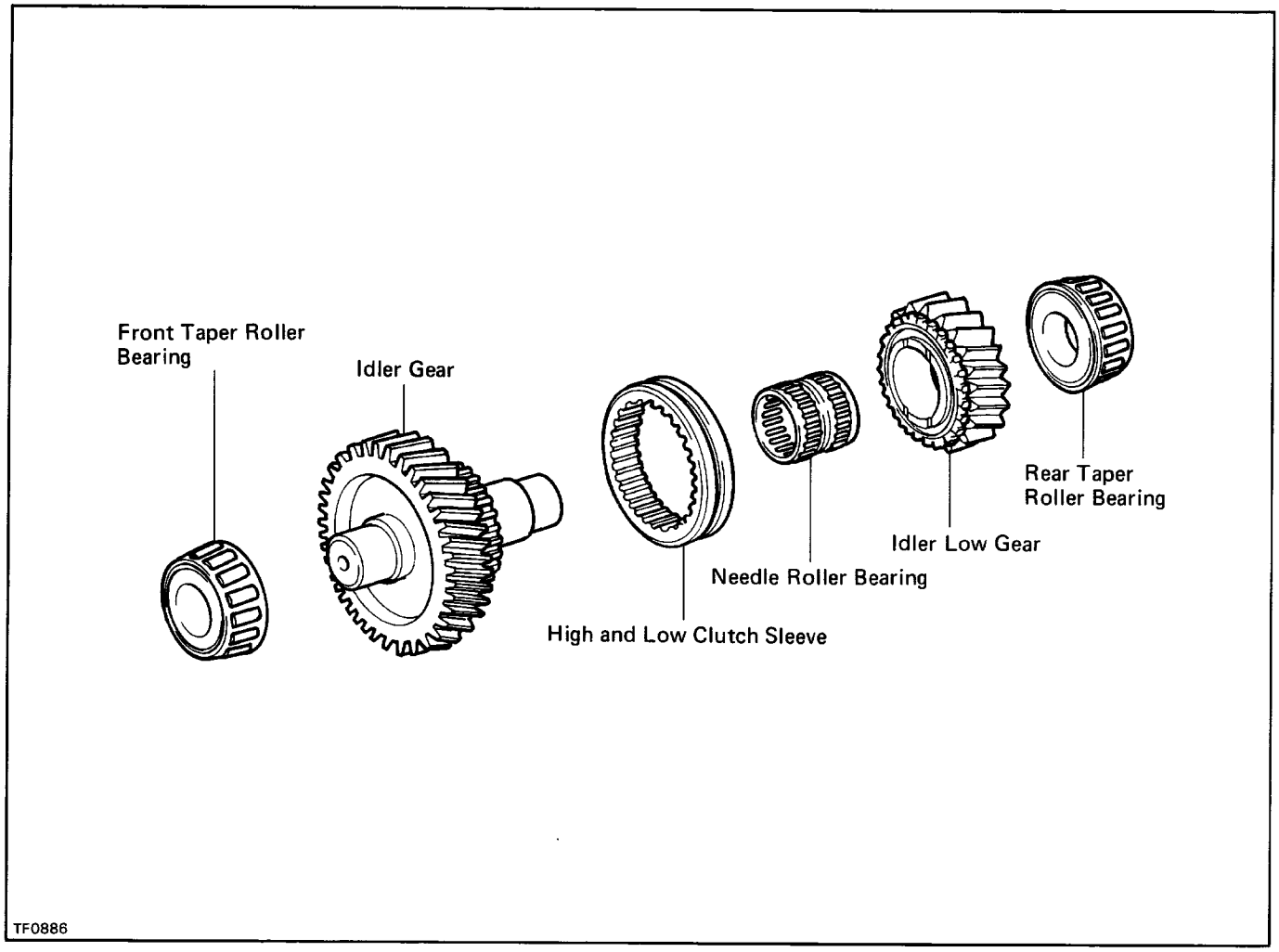

TF0988

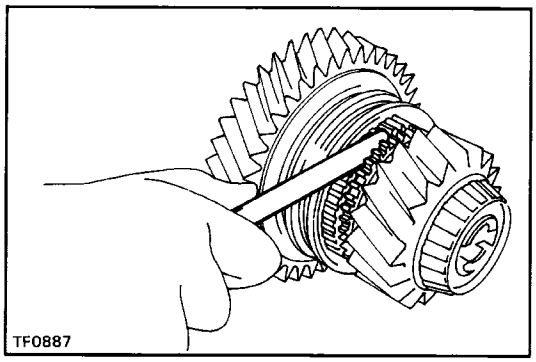
(b) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	2.0 (0.0787)
B	2.1 (0.0827)
C	2.2 (0.0866)
D	2.3 (0.0906)
E	2.4 (0.0945)

(c) Using snap ring pliers, install the snap ring.

Idler Gear Assembly
COMPONENTS





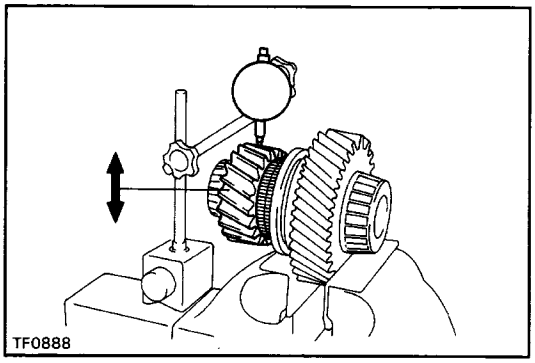
DISASSEMBLY OF IDLER GEAR ASSEMBLY

1. CHECK OIL CLEARANCE AND THRUST CLEARANCE OF IDLER LOW GEAR

(a) Using a feeler gauge, measure the idler low gear thrust clearance.

Standard clearance: 0.125 – 0.275 mm (0.0049 – 0.0108 in.)

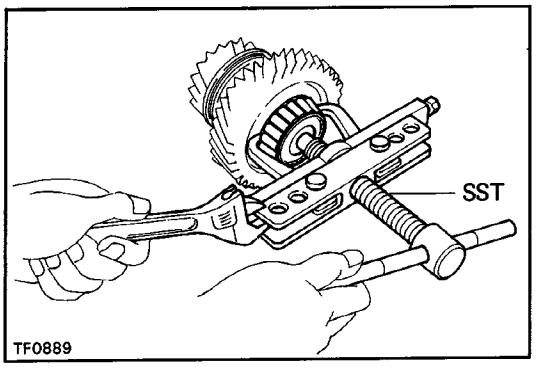
Maximum clearance: 0.275 mm (0.0108 in.)



(b) Using a dial indicator, measure the idler low gear oil clearance.

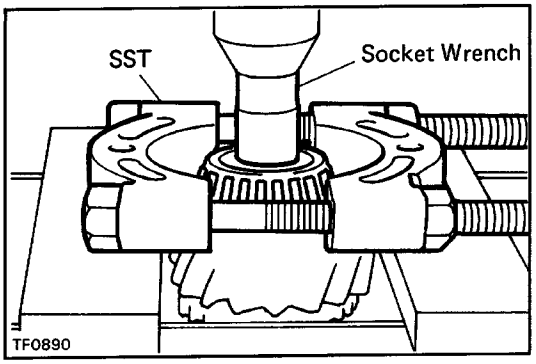
Standard clearance: 0.015 – 0.068 mm (0.0006 – 0.0027 in.)

Maximum clearance: 0.068 mm (0.0027 in.)



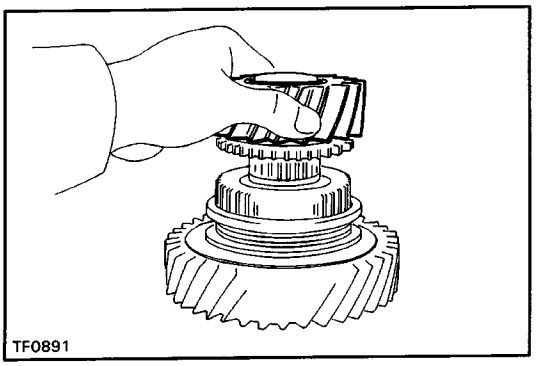
2. REMOVE FRONT TAPER ROLLER BEARING

Using SST, remove the front taper roller bearing.
SST 09950–20017

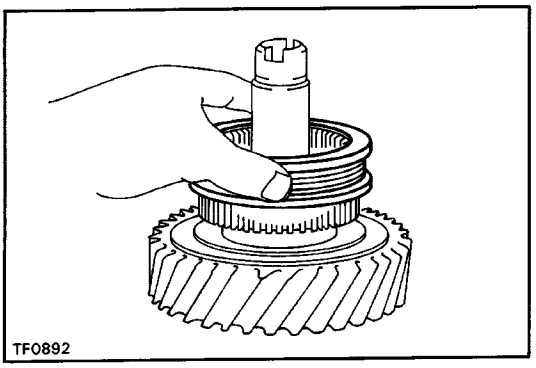


3. REMOVE REAR TAPER ROLLER BEARING

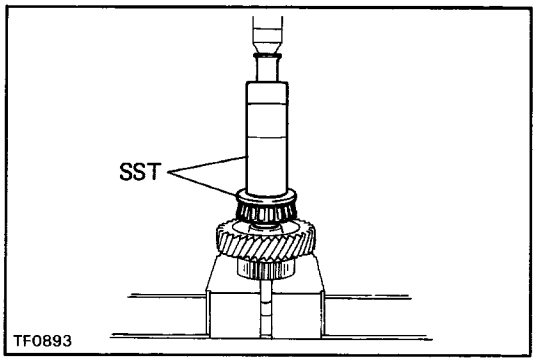
Using SST, press and socket wrench, remove the rear taper roller bearing.
SST 09950–00020



4. REMOVE IDLER LOW GEAR AND NEEDLE ROLLER BEARING



5. REMOVE HIGH AND LOW CLUTCH SLEEVE

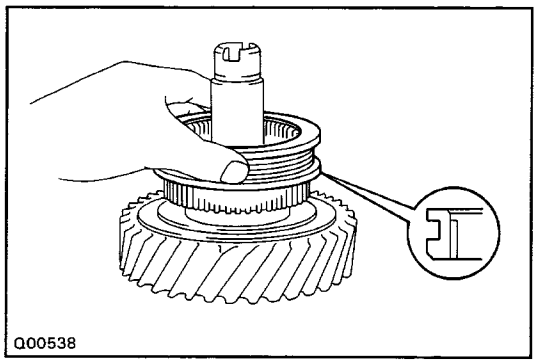


ASSEMBLY OF IDLER GEAR ASSEMBLY

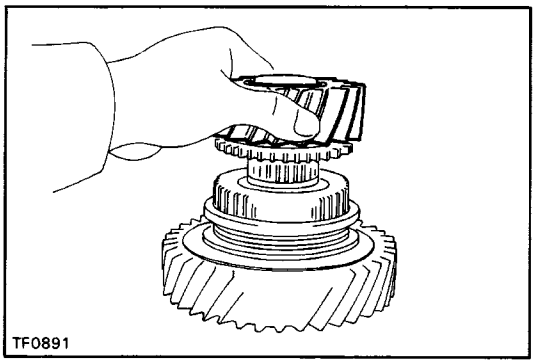
1. INSTALL FRONT TAPER ROLLER BEARING

Using SST and a press, install the front taper roller bear–ing.

SST 09316–60010 (09316–00010, 09316–00030)



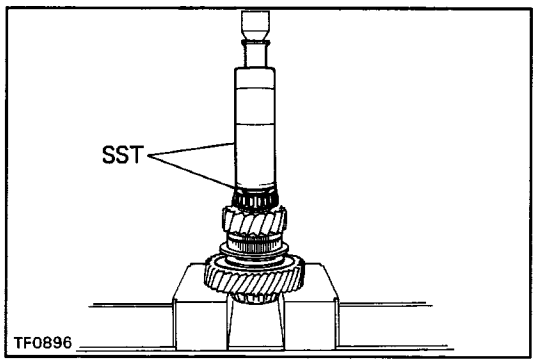
2. INSTALL HIGH AND LOW CLUTCH SLEEVE



3. INSTALL NEEDLE ROLLER BEARING AND IDLER LOW GEAR

(a) Apply gear oil to the needle roller bearing.

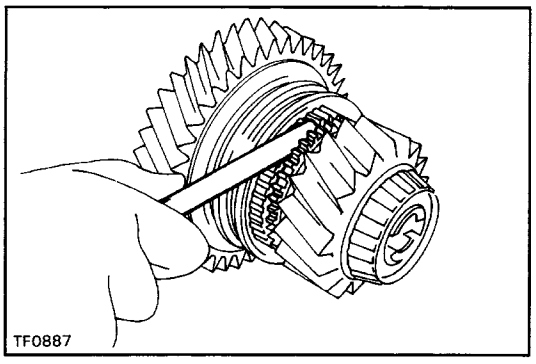
(b) Install the needle roller bearing and Idler low gear.



4. INSTALL REAR TAPER ROLLER BEARING

Using SST and a press, install the rear taper roller bear–ing.

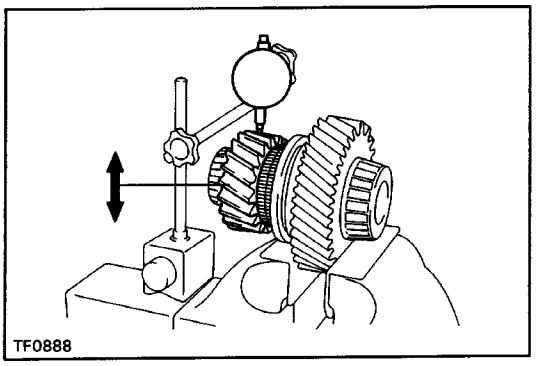
SST 09316–60010 (09316–00010, 09316–00070)



5. MEASURE OIL CLEARANCE AND THRUST CLEARANCE OF IDLE LOW GEAR

(a) Using a feeler gauge, measure the idler low gear thrust clearance.

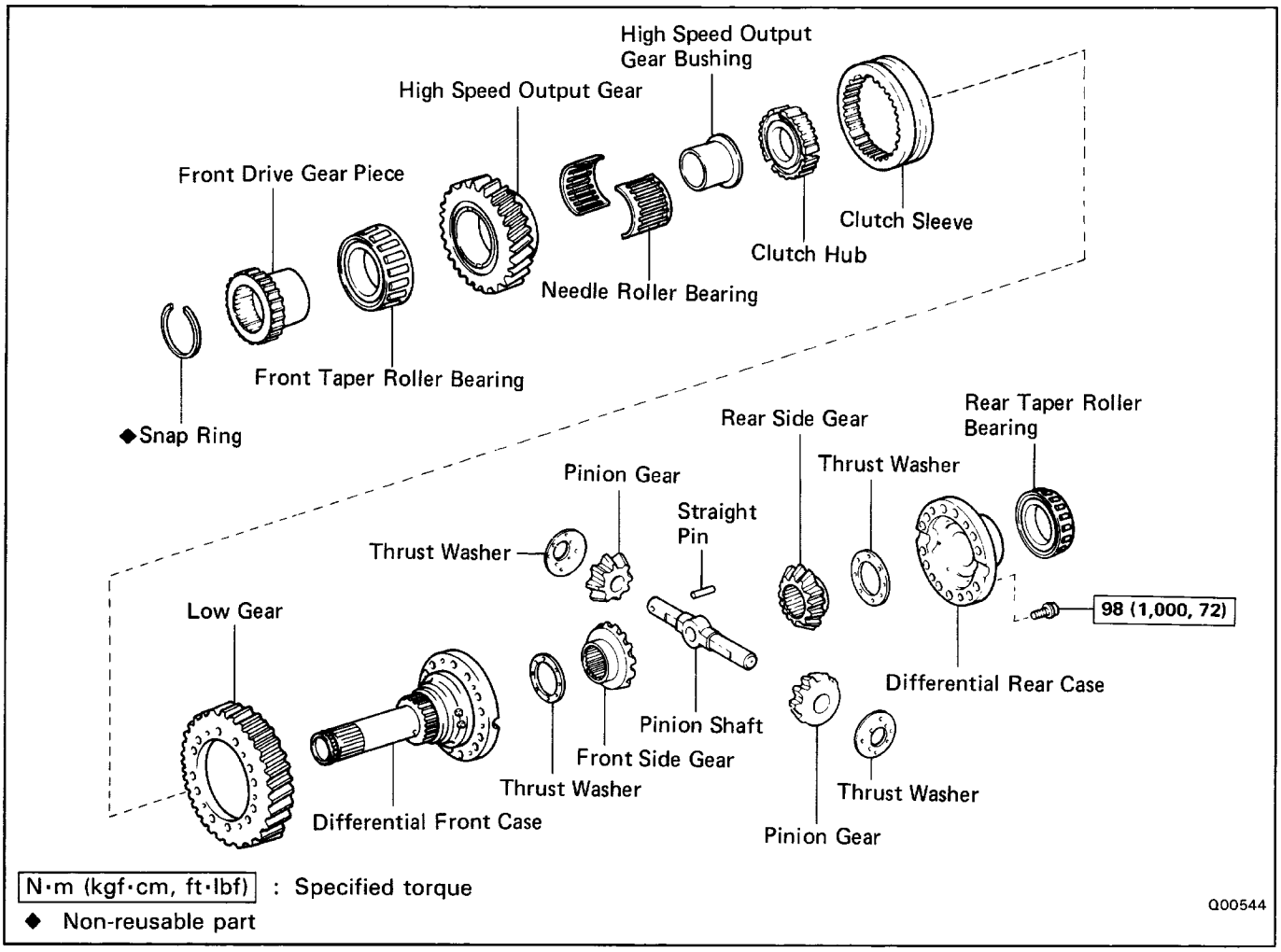
Standard clearance: 0.125 – 0.275 mm
(0.0049 – 0.0108 in.)
Maximum clearance: 0.275 mm (0.0108 in.)

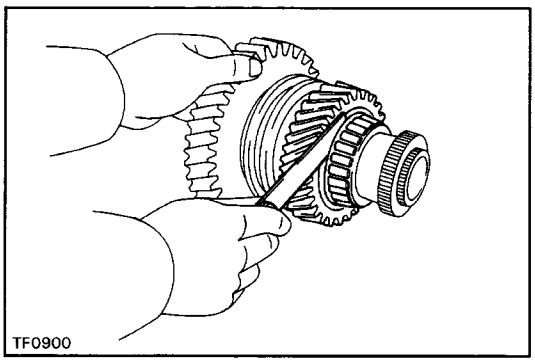


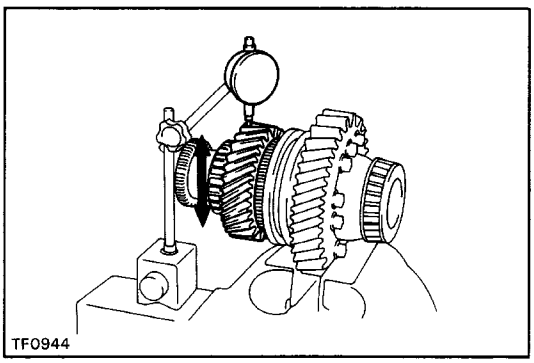
(b) Using a dial indicator, measure the idler low gear oil clearance.

Standard clearance: 0.015 – 0.068 mm
(0.0006 – 0.0027 in.)
Maximum clearance: 0.068 mm (0.0027 in.)

Center Differential Assembly
COMPONENTS







DISASSEMBLY OF CENTER DIFFERENTIAL ASSEMBLY

1. CHECK OIL CLEARANCE AND THRUST CLEARANCE OF HIGH SPEED GEAR

(a) Using a feeler gauge, measure the high speed gear thrust clearance.

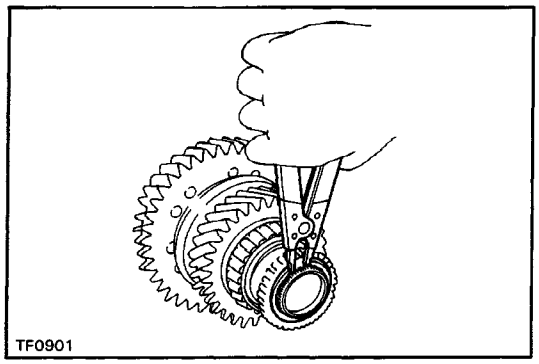
Standard clearance: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)

Maximum clearance: 0.25 mm (0.0098 in.)

(b) Using a dial indicator, measure the high speed gear oil clearance.

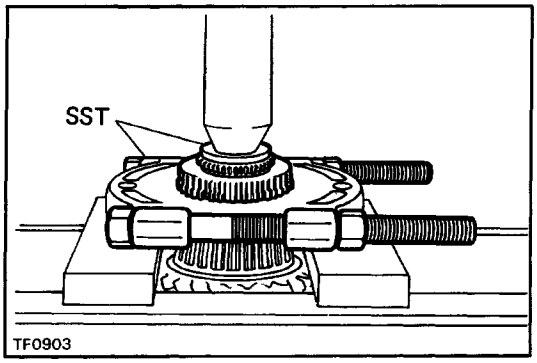
Standard clearance: 0.015 – 0.071 mm (0.0006 – 0.0028 in.)

Maximum clearance: 0.071 mm (0.0028 in.)



2. REMOVE FRONT DRIVE GEAR PIECE

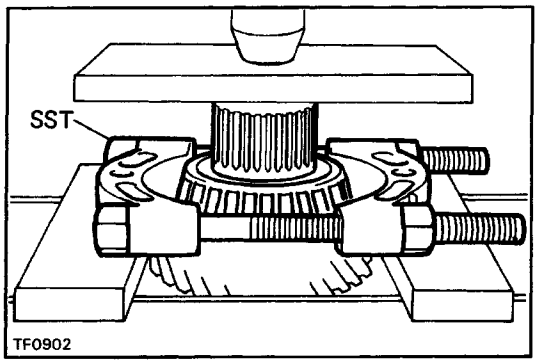
(a) Using snap ring pliers, remove the snap ring.



(b) Using SST and a press, remove the front drive gear piece.

SST 09950–20017, 09950–00020

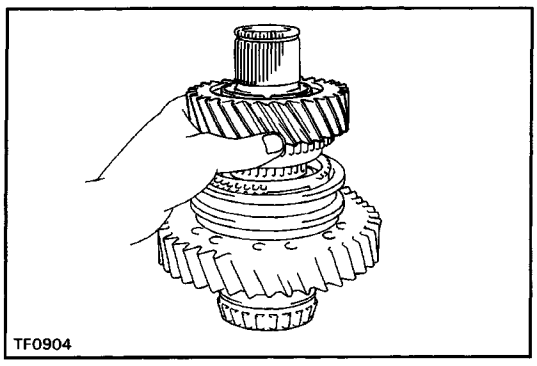
NOTICE: Be careful do not drop the center differential assembly.



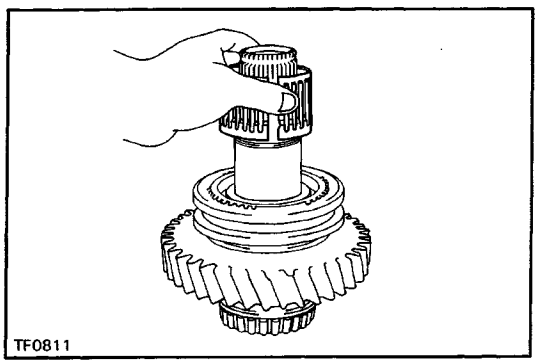
3. REMOVE FRONT TAPER ROLLER BEARING

Using SST and a press, remove the front taper roller bear–ing.

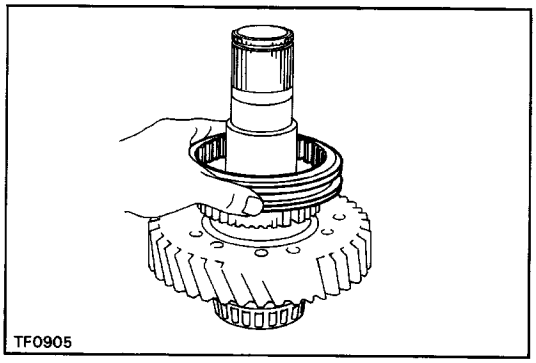
SST 09950–00020



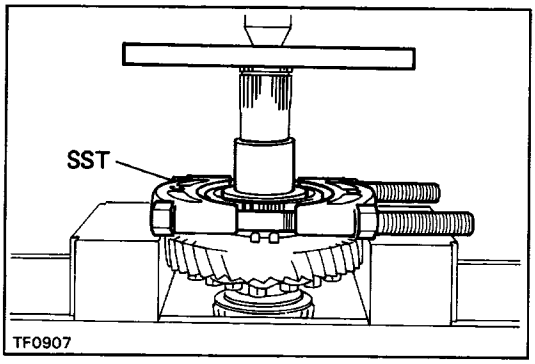
4. REMOVE HIGH SPEED OUTPUT GEAR AND SYNCHRO–NIZER RING



5. REMOVE NEEDLE ROLLER BEARING

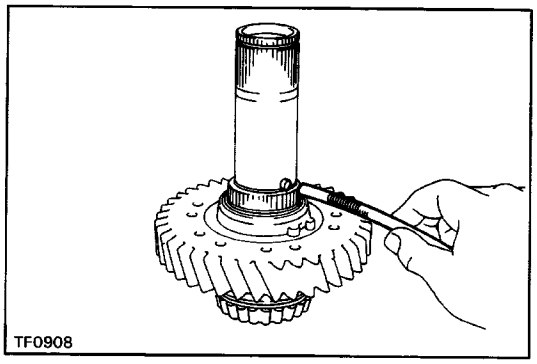


6. REMOVE HIGH AND LOW CLUTCH SLEEVE ASSEMBLY

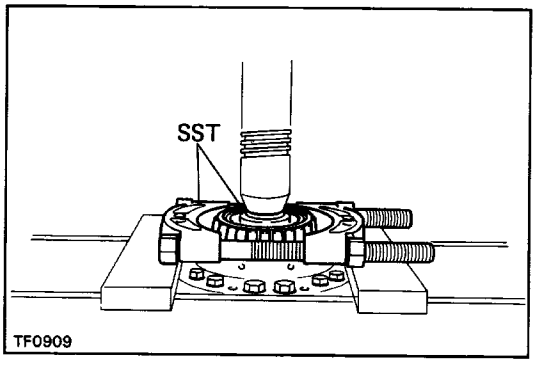


7. REMOVE HIGH SPEED OUTPUT GEAR BUSHING, CLUTCH HUB AND SHIFTING KEY RETAINER

(a) Using SST and a press, remove the high speed output gear bushing and clutch hub.
SST 09555–55010

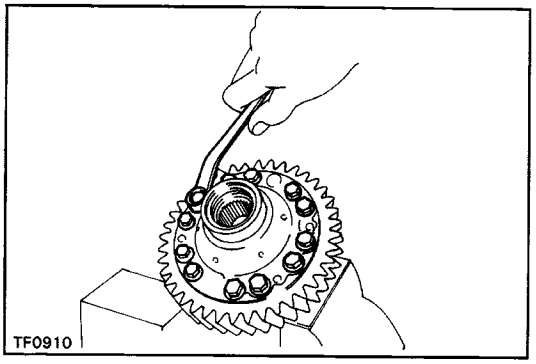


(b) Using a magnetic finger, remove the two straight pins.



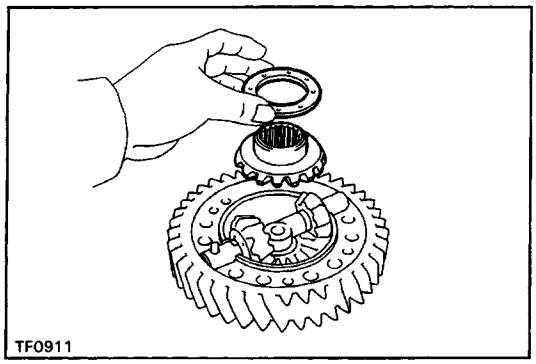
8. REMOVE REAR TAPER ROLLER BEARING

Using SST and a press, remove the rear taper roller bearing.
SST 09950–00020, 09950–20017 (09958–30010)

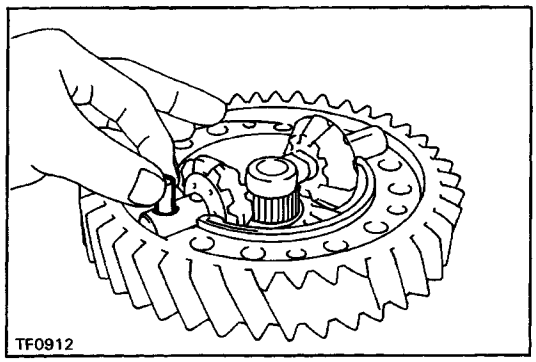


9. REMOVE DIFFERENTIAL REAR CASE

Remove the twelve bolts and differential rear case.

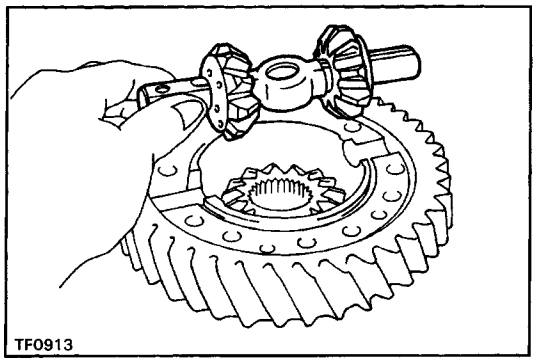


10. REMOVE REAR SIDE GEAR AND THRUST WASHER

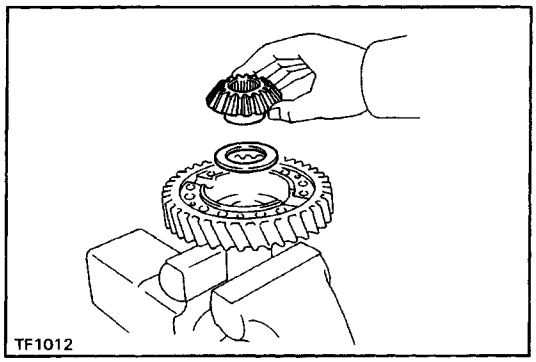


11. REMOVE PINION SHAFT, PINION GEAR AND THRUST WASHER

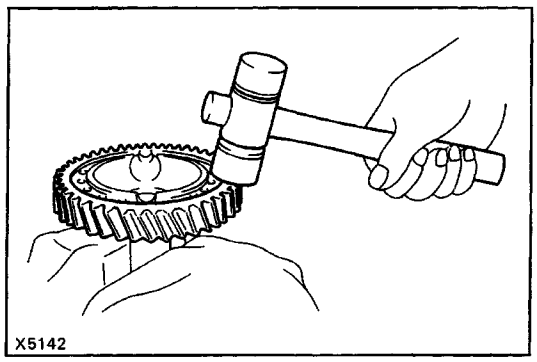
(a) Remove the straight pin.



(b) Remove the pinion shaft, pinion gear and thrust washer.



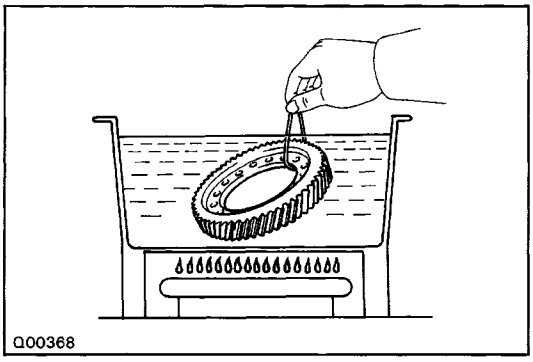
(c) Remove the front side gear and thrust washer.



12. REMOVE LOW GEAR

Using a plastic hammer, tap out the low gear.

NOTICE: Be careful do not damage the low gear.



ASSEMBLY OF CENTER DIFFERENTIAL ASSEMBLY

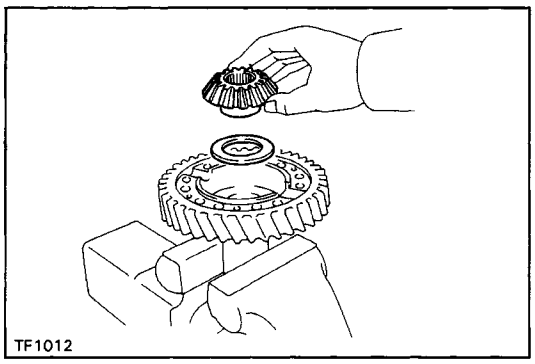
1. INSTALL LOW GEAR

(a) Clean the contact surface of the differential case.
(b) Heat the low gear in boiling water.
(c) Clean the contact surface of the low gear with cle–aning solvent.
(d) Then quickly install the low gear on the differential case.

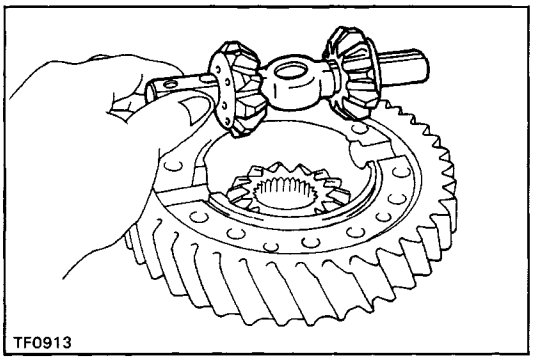
2. INSTALL PINION SHAFT, PINION GEAR AND THRUST WASHER

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

(a) Install the front side gear and thrust washer to the differential front case.



(b) Install the two pinion gears and thrust washers to the differential front case.

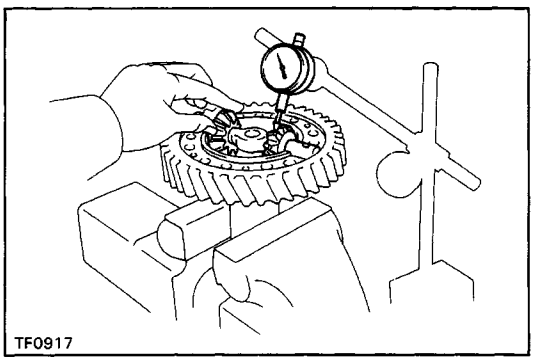


(c) Using a dial indicator, measure the front case back–lash.

HINT: Push the pinion shaft.

Minimum backlash: 0.05 mm (0.0020 in.)

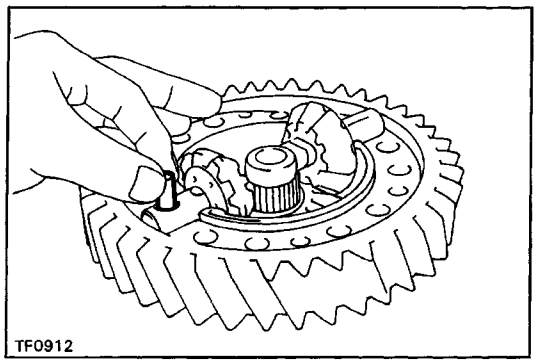
If the backlash is not within specification, replace the thrust washer with one of the correct size and reinstall the thrust washer.



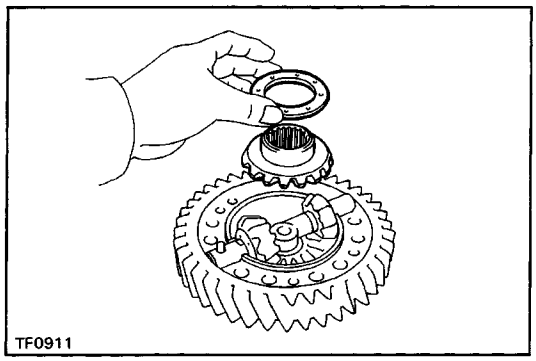
Thickness mm (in.)
1.70 (0.0669)
1.85 (0.0728)
2.00 (0.0787)
2.15 (0.0846)
2.30 (0.0906)
2.45 (0.0965)
2.60 (0.1024)
2.75 (0.1083)
2.90 (0.1142)
3.05 (0.1201)

(d) Measure the rear case backlash.

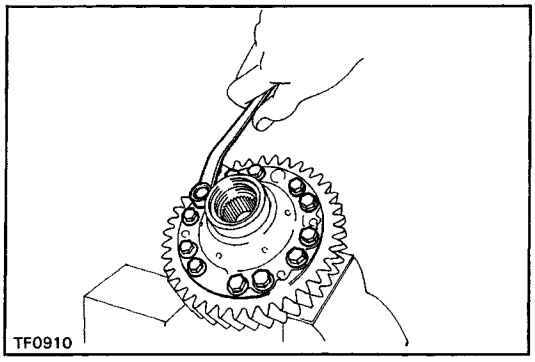
(See steps 1 to 4 on page TF–24)



3. INSTALL STRAIGHT PIN

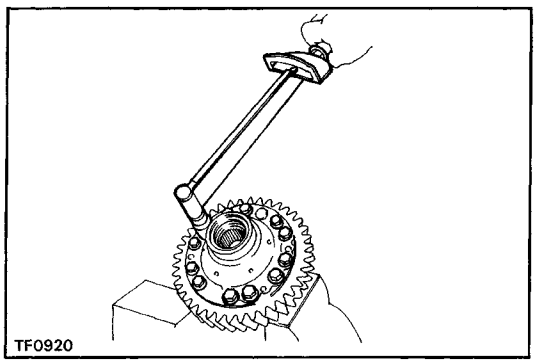


4. INSTALL REAR SIDE GEAR AND THRUST WASHER



5. INSTALL DIFFERENTIAL REAR CASE

Install the differential rear case and set bolts.

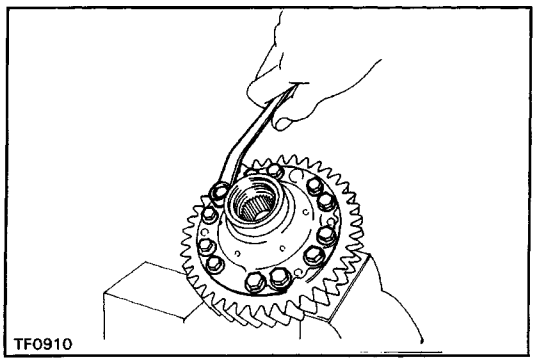


6. TORQUE REAR CASE SET BOLTS

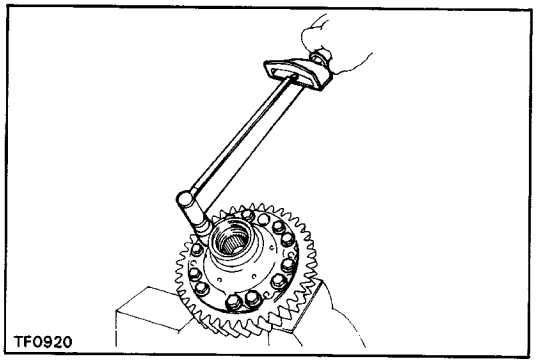
(a) Torque the rear case set bolts.

Torque: 88 N–m (900 kgf–cm, 65 ft–lbf)

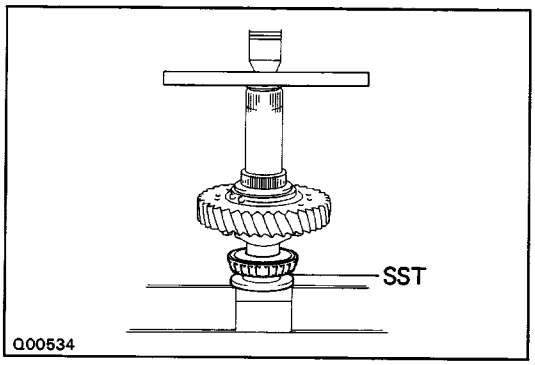
(b) Turn the pinion gear.



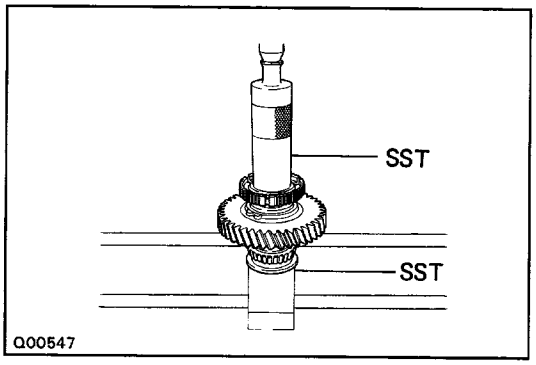
(b) Loosen the rear case set bolts.



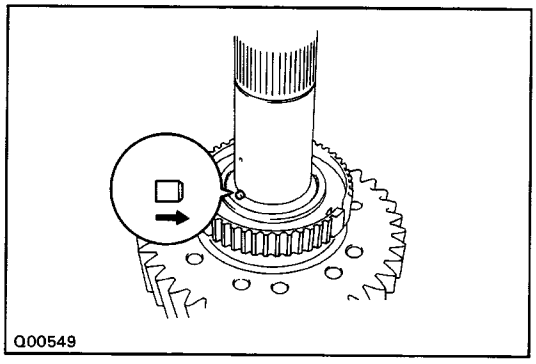
(c) Torque the rear case set bolts.
Torque: 98 N–m (1,000 kgf–cm, 72 ft–lbf)



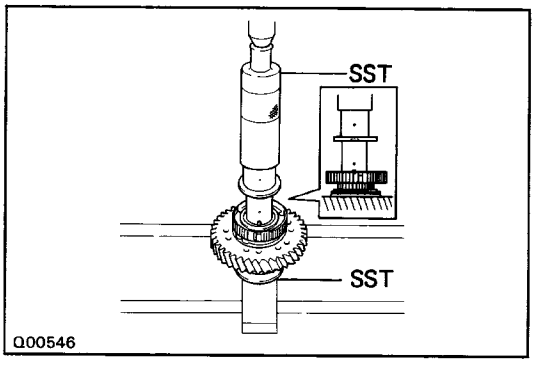
7. INSTALL REAR TAPER ROLLER BEARING
Using SST and a press, install the rear taper roller bear–ing.
SST 09316–12010



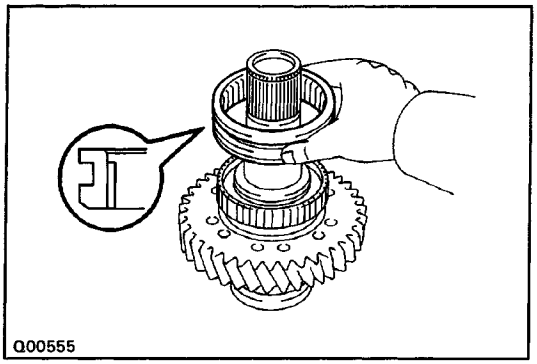
8. INSTALL CLUTCH HUB
Using SST and a press, install the clutch hub.
SST 09316–60010 (09316–60010)
09316–12010



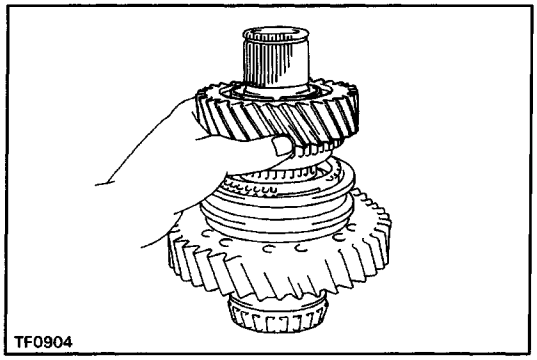
9. INSTALL HIGH SPEED OUTPUT GEAR BUSHING
(a) Apply MP grease to the straight pin.
(b) Install the straight pin.



(c) Using SST and a press, install the high speed bush–ing.
SST 09316–60010 (09316–00010), 09316–12010
NOTICE: Before pressing, align the holes on the bushing and shaft so that the pin on the shaft aligned with the cutting portion of the bushing.



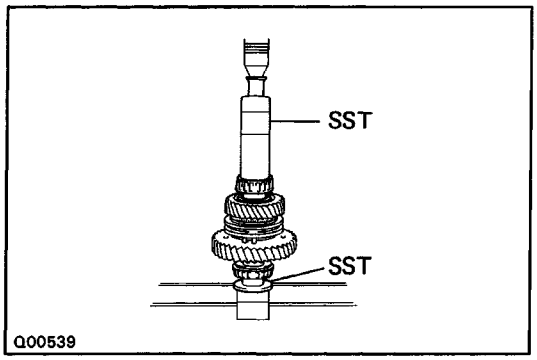
10. INSTALL HIGH AND LOW CLUTCH SLEEVE



11. INSTALL HIGH SPEED OUTPUT GEAR AND NEEDLE ROLLER BEARING

(a) Apply gear oil to the needle roller bearing.

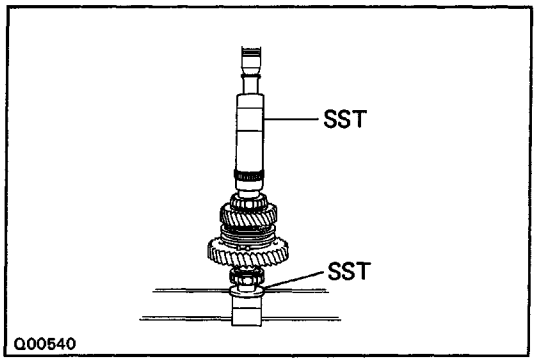
(b) Place the synchronizer ring on the gear and install the high speed output gear and needle roller bearing.



12. INSTALL FRONT TAPER ROLLER BEARING

Using SST and a press, install the front taper roller bear–ing.

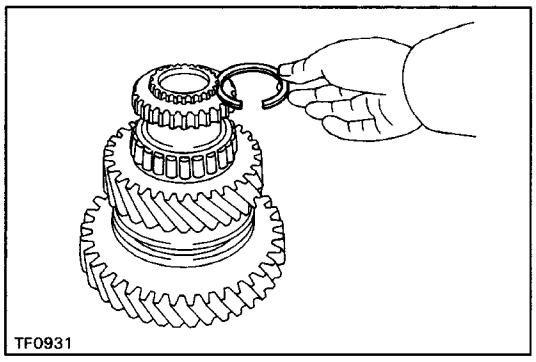
SST 09316–60010 (09316–00010)
09316–12010



13. INSTALL FRONT DRIVE GEAR PIECE

Using SST and a press, install the front drive gear piece.

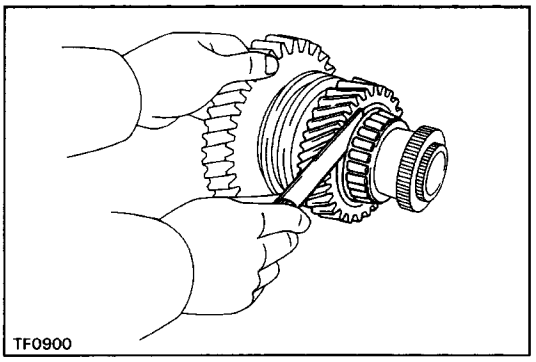
SST 09316–60010 (09316–00010)
09316–12010


TF0931

14. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness mm (in.)
A	2.00 (0.0787)
B	2.10 (0.0827)
C	2.20 (0.0866)
D	2.30 (0.0906)
E	2.40 (0.0945)
F	2.50 (0.0984)
G	2.60 (0.1024)
H	2.70 (0.1063)
J	2.80 (0.1102)
K	1.80 (0.0709)
L	1.90 (0.0748)

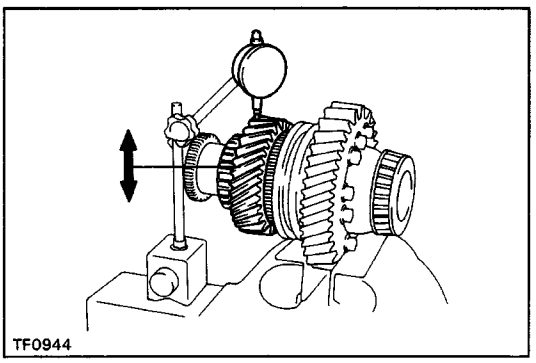

TF0900

15. MEASURE OIL CLEARANCE AND THRUST CLEARANCE OF HIGH SPEED GEAR THRUST CLEARANCE

(a) Using a feeler gauge, measure the high speed gear thrust clearance.

Standard clearance: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)

Maximum clearance: 0.25 mm (0.0098 in.)

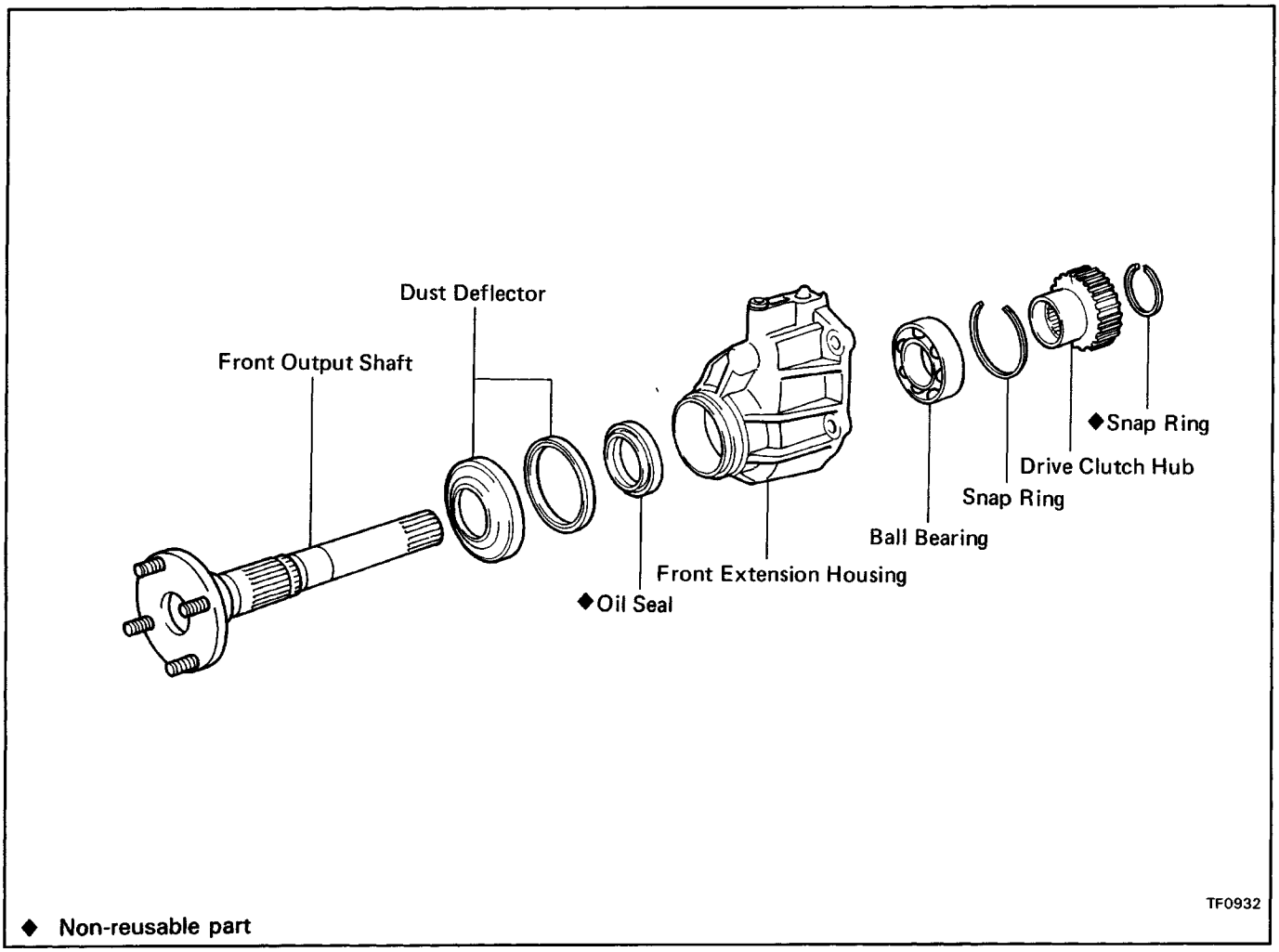

TF0944

(b) Using a dial indicator, measure the high speed gear oil clearance.

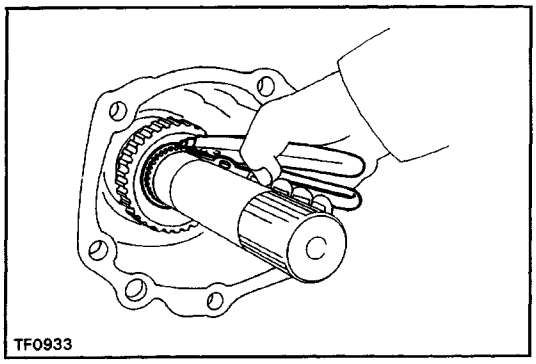
Standard clearance: 0.015 – 0.071 mm (0.0006 – 0.0028 in.)

Maximum clearance: 0.071 mm (0.0028 in.)

Front Extension Housing Assembly COMPONENTS



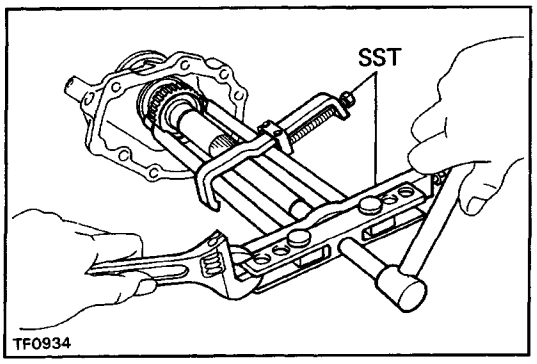
◆ Non-reusable part



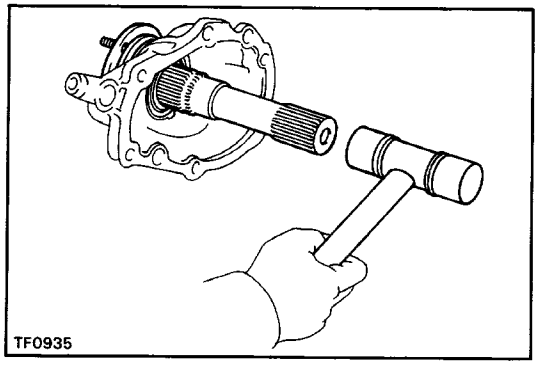
DISASSEMBLY OF FRONT EXTENSION HOUSING ASSEMBLY

1. REMOVE DRIVE CLUTCH HUB

(a) Using snap ring pliers, remove the snap ring.

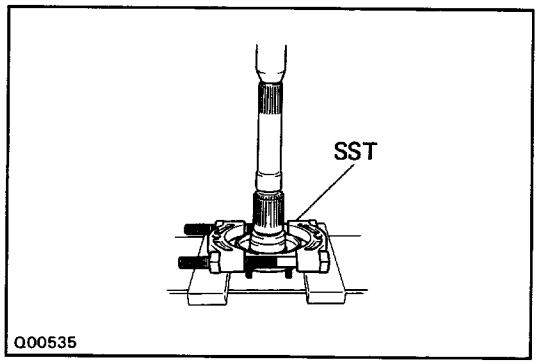


(b) Using SST, remove the drive clutch hub.
SST 09950–20017



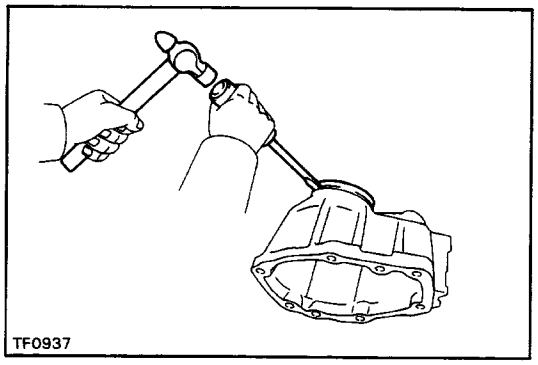
2. REMOVE FRONT OUTPUT SHAFT

Using a plastic hammer, drive out the front output shaft.

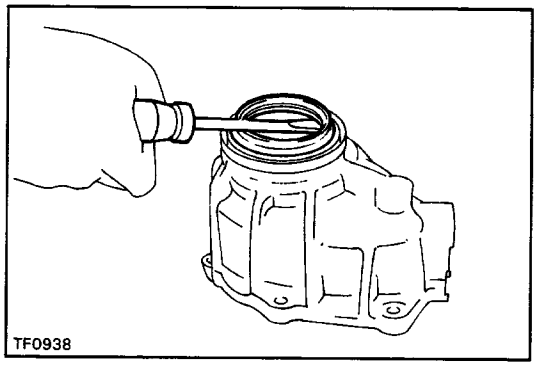


3. REMOVE DUST DEFLECTORS

(a) Using SST and a press, remove the dust deflector.
SST 09950–00020

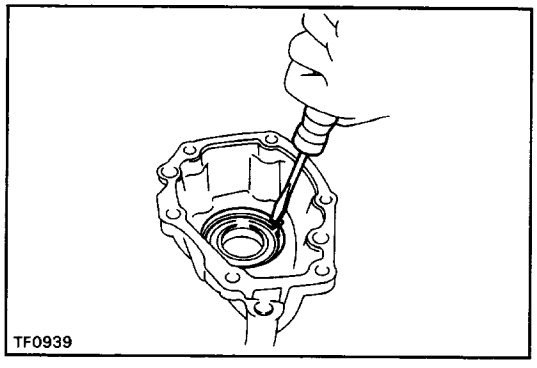


(b) Using a screwdriver and hammer, tap the dust de–flector and remove it.



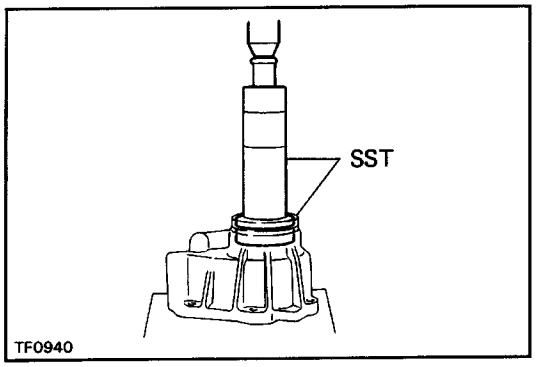
4. REMOVE OIL SEAL

Using a screwdriver, pry out the oil seal.

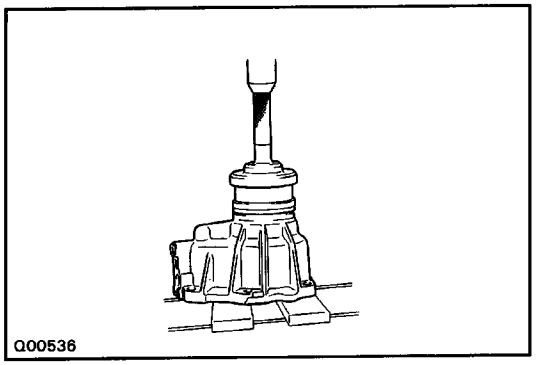


5. REMOVE BALL BEARING

(a) Using a screwdriver, remove the snap ring.



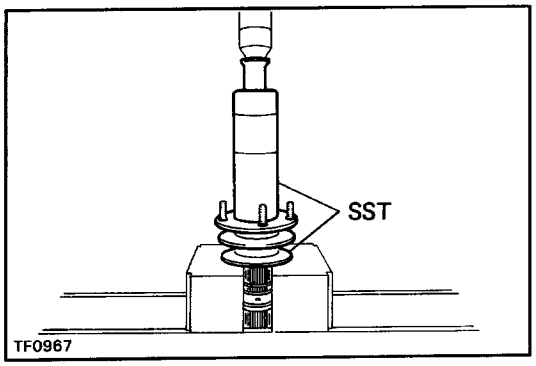
(b) Using SST and a press, remove the ball bearing.
SST 09316–60010 (09316–00010, 09316–00070)



ASSEMBLY OF FRONT EXTENSION HOUSING ASSEMBLY

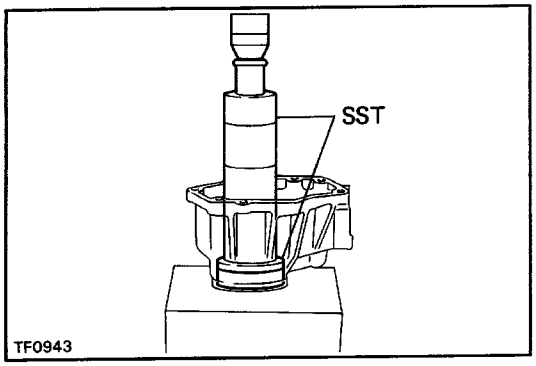
1. INSTALL DUST DEFLECTORS

(a) Using SST and a press, install the dust deflector.
SST 09223–41020, 09223–15020

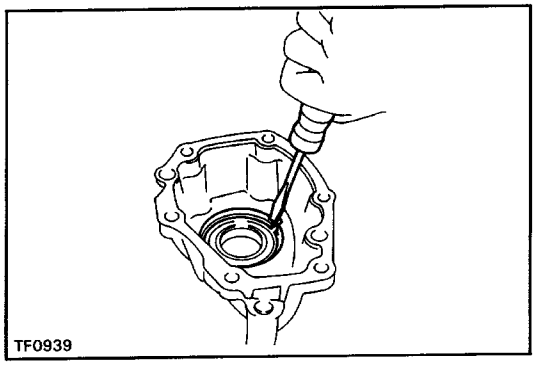


(b) Using SST and a press, install the dust deflector.
SST 09316–60010 (09316–00010), 09316–20011

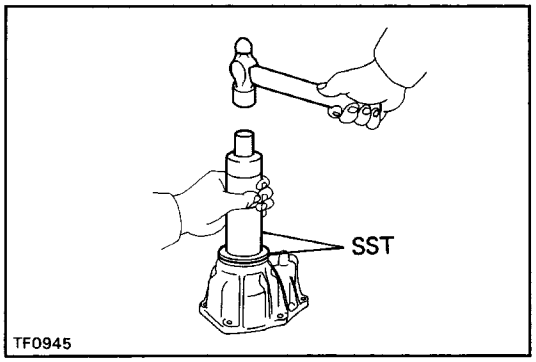
2. INSTALL BALL BEARING



(a) Using SST and a press, install the ball bearing.
SST 09316–60010 (09316–00010, 09316–00030)

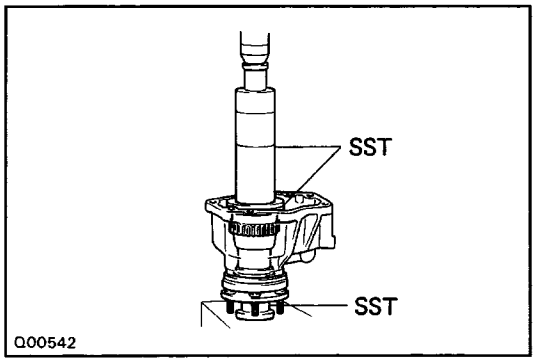


(b) Using a screwdriver, install the snap ring.



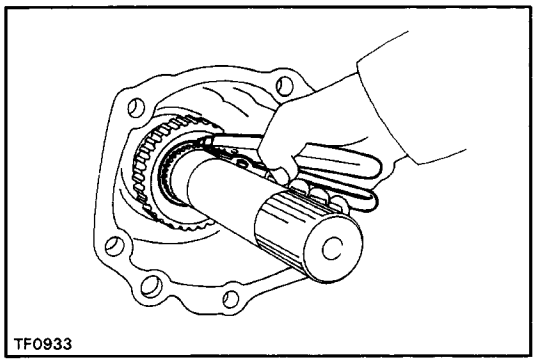
3. INSTALL OIL SEAL

Using SST and a hammer, drive in a new oil seal.
SST 09316–60010 (09316–00010, 09316–00060)



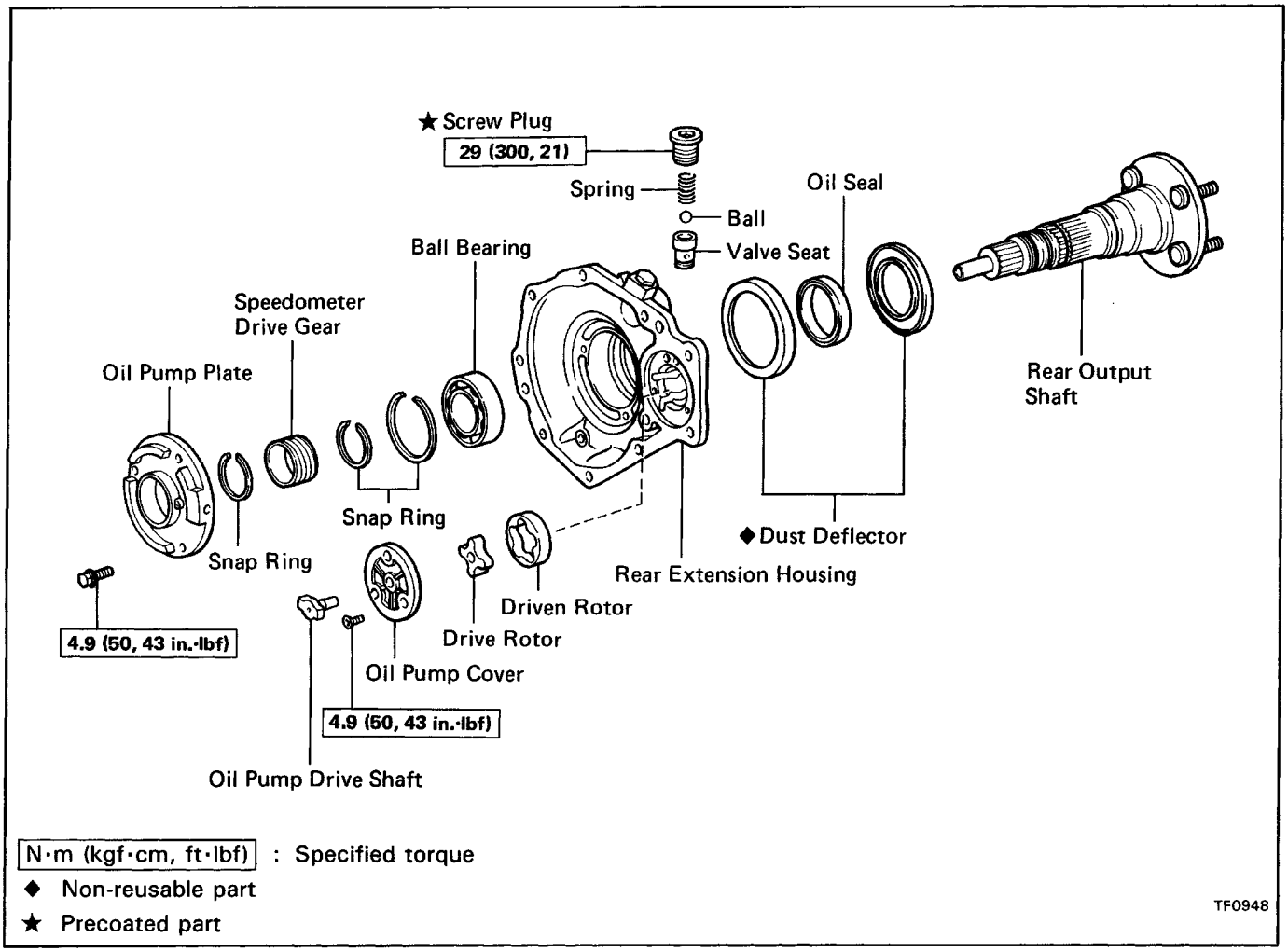
4. INSTALL FRONT OUTPUT SHAFT AND DRIVE CLUTCH HUB

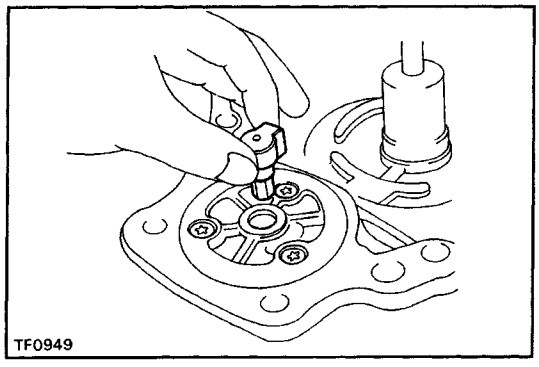
(a) Using SST and press, install the front output shaft and drive clutch hub.
SST 09316–20011, 09316–60010 (09316–00010, 09316–00040, 09316–00070)



(b) Using snap ring pliers, install the new snap ring.

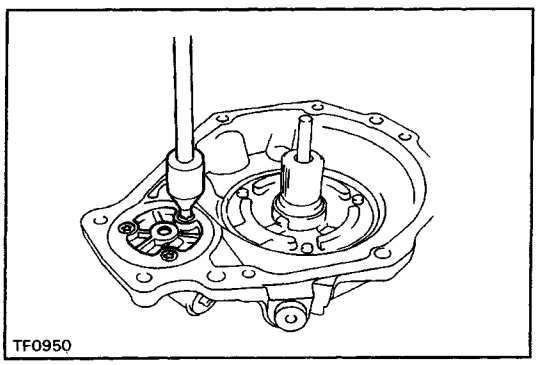
Rear Extension Housing Assembly COMPONENTS





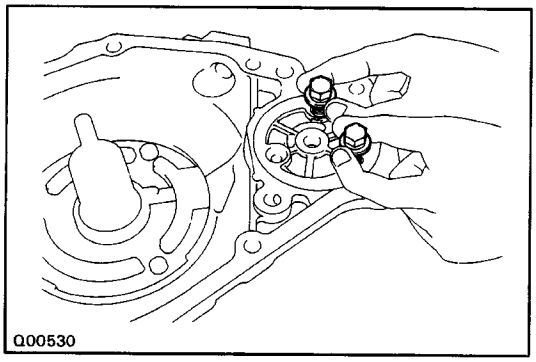
DISASSEMBLY OF REAR EXTENSION HOUSING ASSEMBLY

1. REMOVE OIL PUMP DRIVE SHAFT

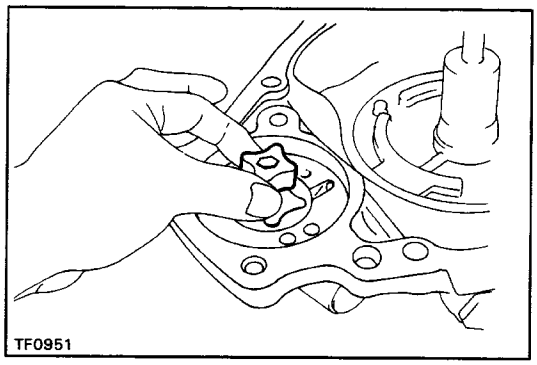


2. REMOVE OIL PUMP COVER

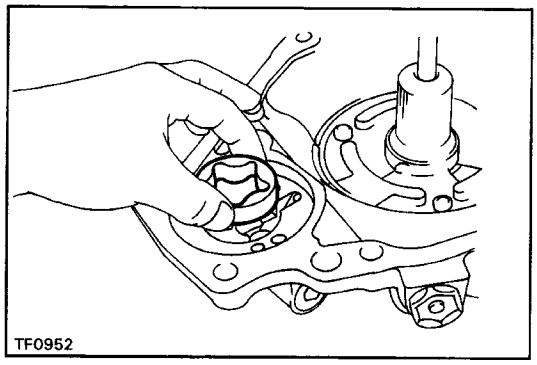
(a) Using a torx socket wrench, remove the three screws.
(Torx socket wrench T30 09042–00010)



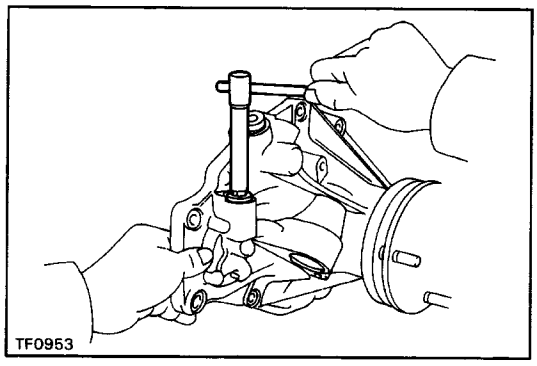
(b) Install two suitable bolts to the pump cover.
(c) Remove the pump cover from rear extension housing.



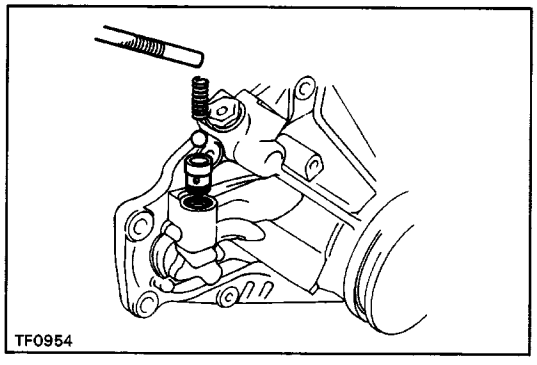
3. REMOVE DRIVE ROTOR



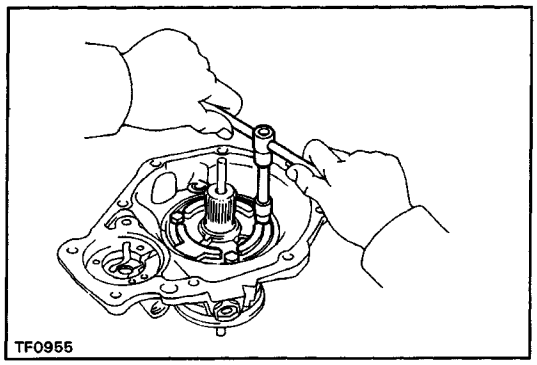
4. REMOVE DRIVEN ROTOR



5. REMOVE SCREW PLUG, SPRING, BALL AND VALVE SEAT
(a) Using a hexagon wrench, remove the screw plug.

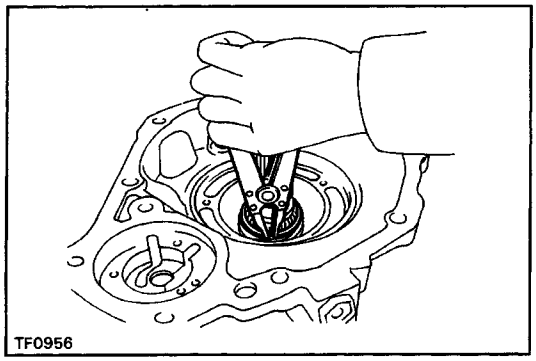


(b) Using a magnetic finger, remove the spring, ball and valve seat.



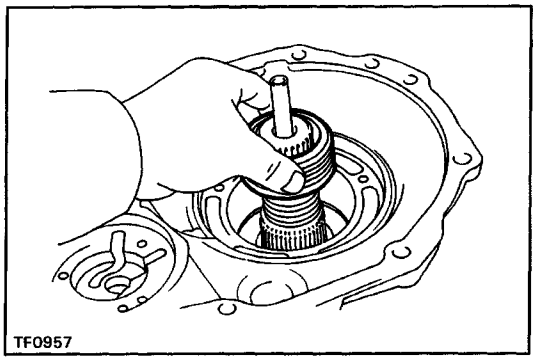
6. REMOVE OIL PUMP PLATE

Remove the three bolts and the oil pump plate.

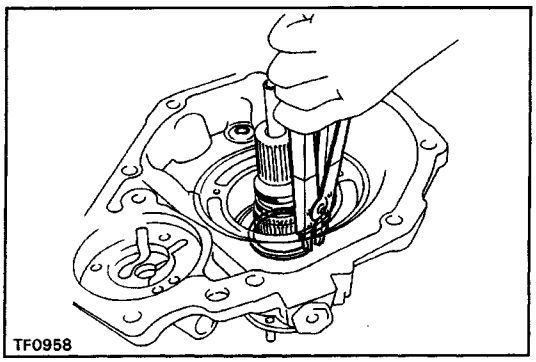


7. REMOVE SPEED METER DRIVE GEAR

(a) Using snap ring pliers, remove the snap ring.

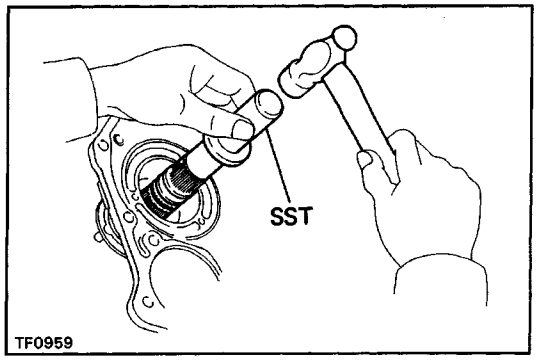


(b) Remove the speedometer drive gear.

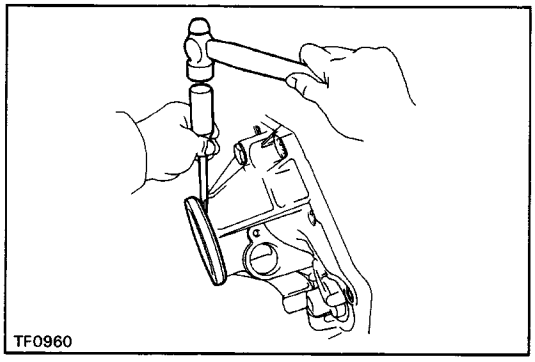


8. REMOVE REAR OUTPUT SHAFT

(a) Using snap ring pliers, remove the snap ring.

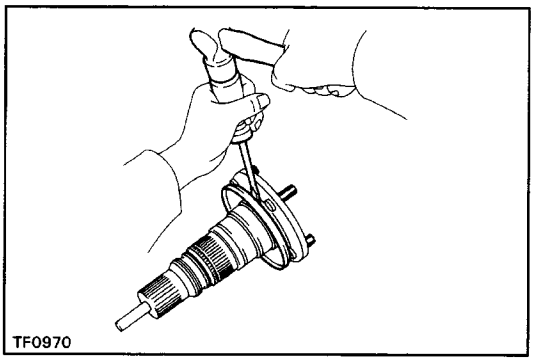


(b) Using SST and a hammer, remove the rear output shaft.
SST 09325–12010

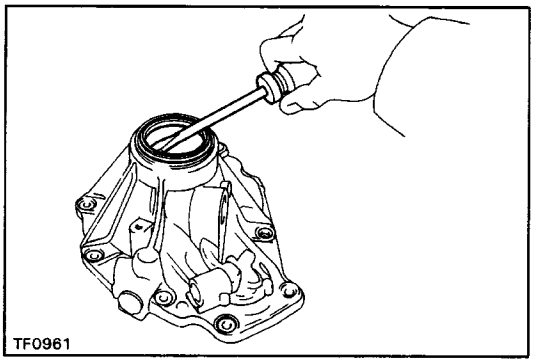


9. REMOVE DUST DEFLECTORS

(a) Using a screwdriver and hammer, remove the rear extension housing dust deflectors.

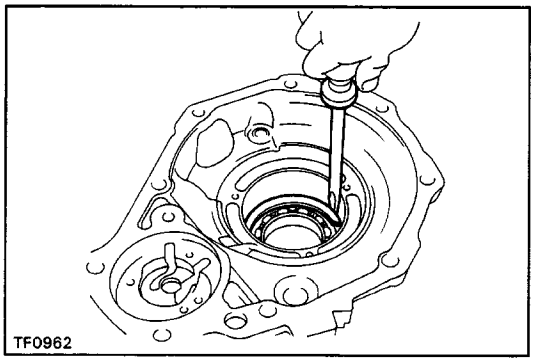


(b) Using a screwdriver and hammer, remove the rear output shaft dust deflector.



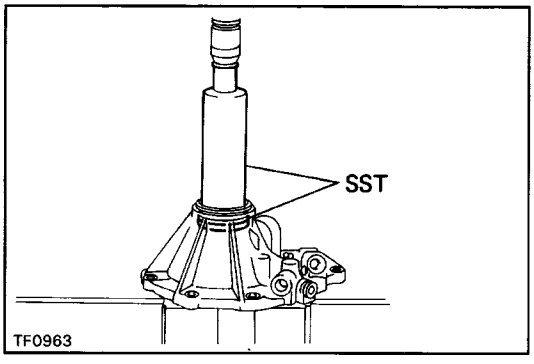
10. REMOVE OIL SEAL

Using a screwdriver, pry out the oil seal.

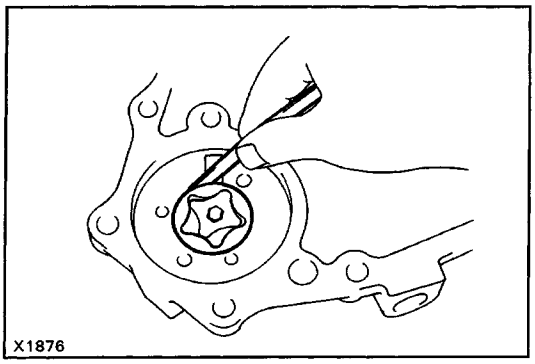


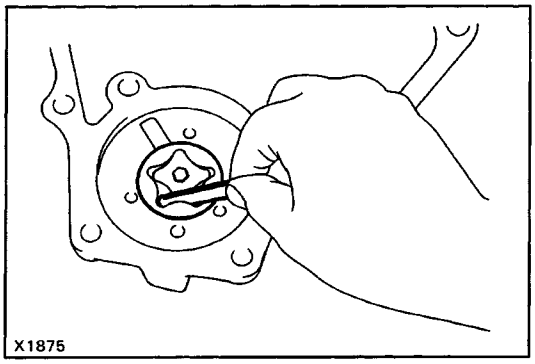
11. REMOVE BALL BEARING

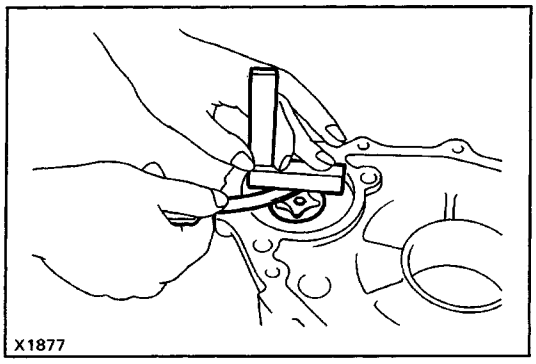
(a) Using a screwdriver, remove the snap ring.



(b) Using SST and a press, remove the ball bearing.
SST 09316–60010 (09316–00010, 09316–00020)







INSPECTION OF OIL PUMP

1. CHECK BODY CLEARANCE OF DRIVEN ROTOR

Install the drive rotor to the driven rotor.

Using a feeler gauge, measure body clearance between drive rotor and extension housing.

Standard body clearance: 0.08 – 0.17 mm (0.0031 – 0.0067 in.)

Maximum body clearance: 0.15 mm (0.0067 in.)

If the body clearance is greater than the maximum, re–place the drive rotor or driven rotor.

2. CHECK TIP CLEARANCE OF DRIVEN ROTOR

Using a feeler gauge, measure tip clearance between drive rotor and driven rotor.

Standard tip clearance: 0.05 – 0.15 mm (0.0020 – 0.0059 in.)

Maximum tip clearance: 0.15 mm (0.0059 in.)

If the tip clearance is greater than the maximum, replace the drive rotor or driven rotor.

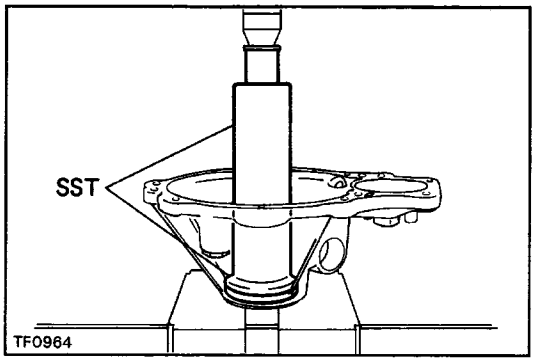
3. CHECK SIDE CLEARANCE OF OIL PUMP

Using a steel straight edge and a feeler gauge, measure the side clearance of oil pump.

Standard side clearance: 0.03 – 0.10 mm (0.0012 – 0.0039 in.)

Maximum side clearance: 0.10 mm (0.0039 in.)

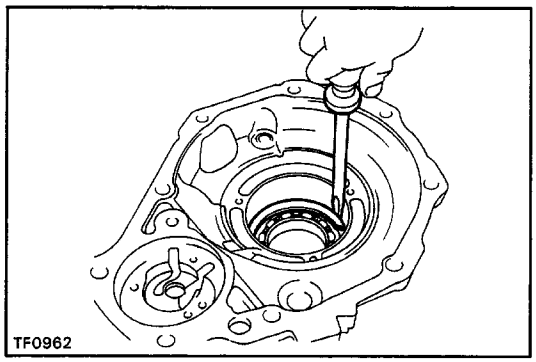
If the side clearance greater than the maximum, replace the drive rotor or driven rotor.



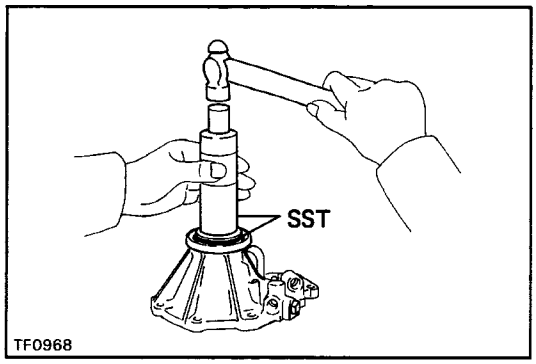
ASSEMBLY OF REAR EXTENSION HOUSING

1. INSTALL BALL BEARING

(a) Using SST and a press, install the ball bearing.
SST 09316–60010 (09316–00010, 09316–00030)

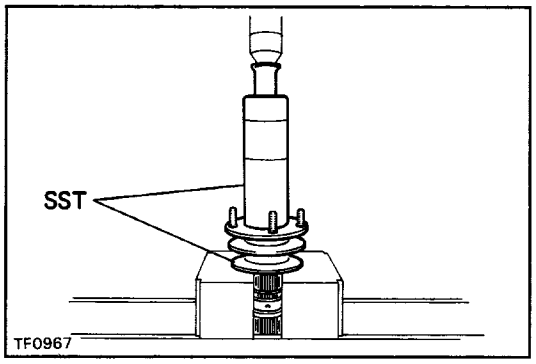


(b) Using a screwdriver, install the snap ring.

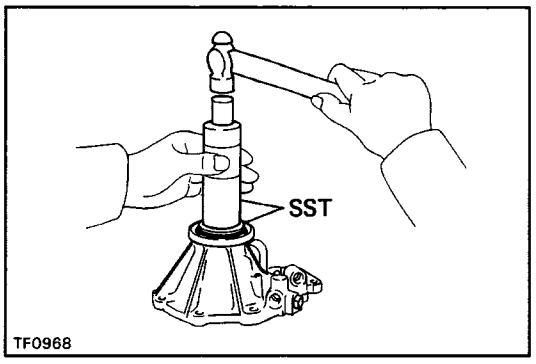


2. INSTALL DUST DEFLECTORS

(a) Using SST and a hammer, install a new rear extension housing dust deflector.
SST 09316–60010 (09316–00010, 09316–00040)

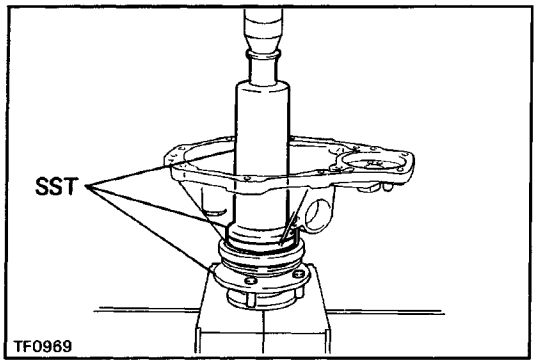


(b) Using SST and a press, install a new rear extension housing dust deflector.
SST 09316–20011, 09316–60010 (09316–00010)



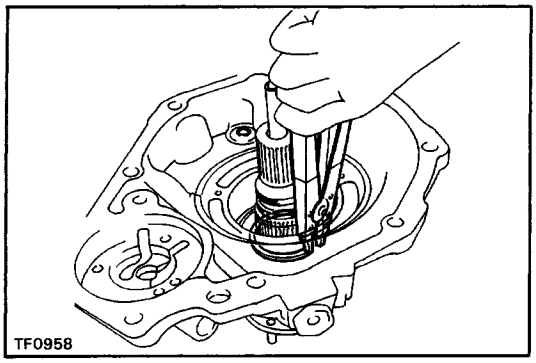
3. INSTALL OIL SEAL

Using SST and a hammer, drive in a new oil seal.
SST 09316–60010 (09316–00010, 09316–00030)

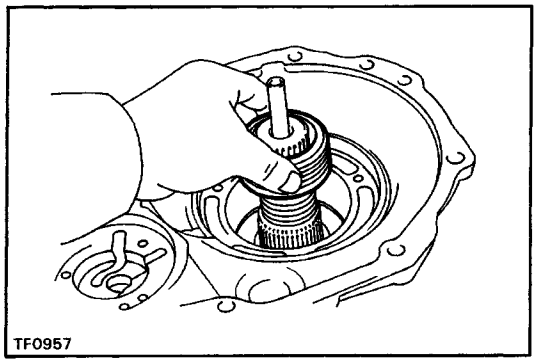


4. INSTALL REAR OUTPUT SHAFT

(a) Using SST and a press, install the rear output shaft.
SST 09316–60010 (09316–00010, 09316–00030)
09316–20011

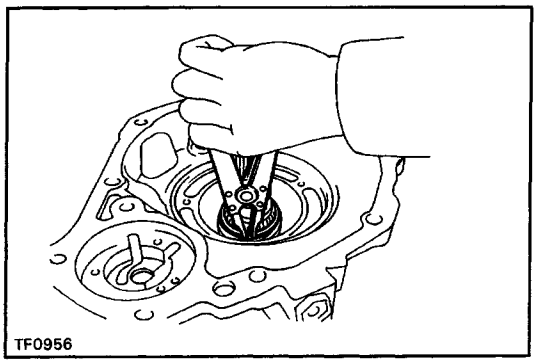


(b) Using snap ring pliers, install the snap ring.

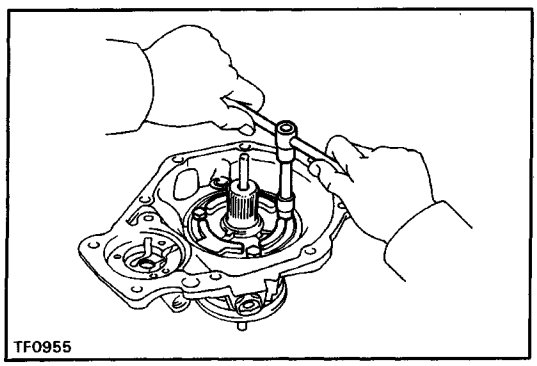


5. INSTALL SPEEDOMETER DRIVE GEAR

(a) Install the speedometer drive gear.



(b) Using snap ring pliers, install the snap ring.

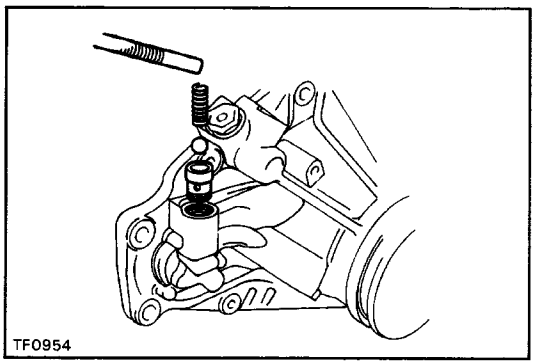


6. INSTALL OIL PUMP PLATE

(a) Install the oil pump plate.

(b) Install and torque the three bolts.

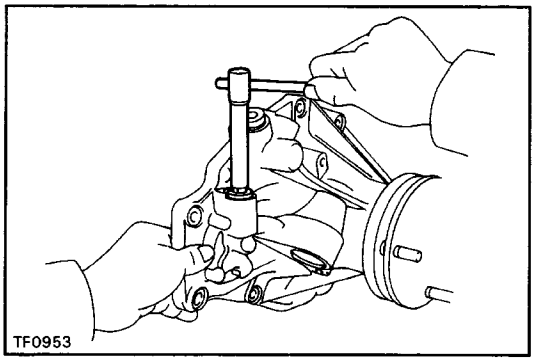
Torque: 4.9 N–m (5a kgf–cm, 43 in.–lbf)



7. INSTALL VALVE SEAT, BALL, SPRING AND SCREW PLUG

(a) Apply gear oil to the ball.

(b) Install the valve seat, ball and spring.

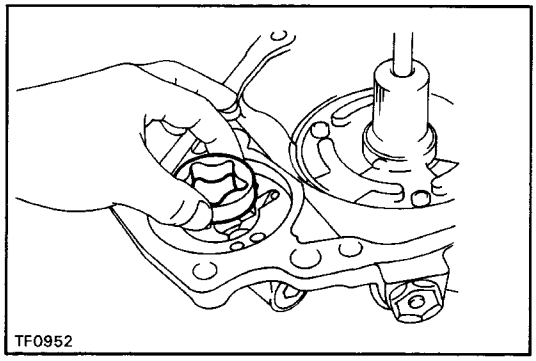


(c) Apply liquid sealer to the screw plug.

Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(d) Using a hexagon wrench, install and torque the screw plug.

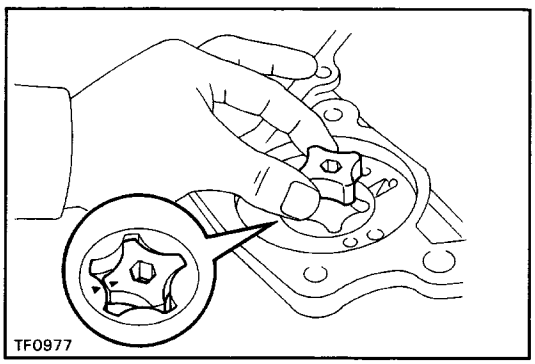
Torque: 29 N–m (300 kgf–cm, 21 ft–lbf)



8. INSTALL DRIVEN ROTOR

(a) Apply gear oil to the driven rotor.

(b) Install the driven rotor.

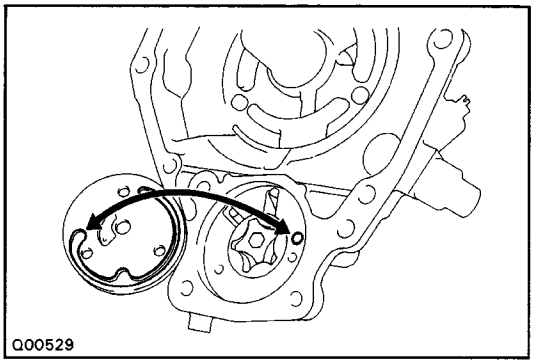


9. INSTALL DRIVE ROTOR

(a) Apply gear oil to the drive rotor.

(b) Install the drive rotor.

HINT: Align the alignment marks.



10. INSTALL OIL PUMP COVER

(a) Install the oil pump cover.

(b) Using a torx socket wrench, install and torque the three screws.

(Torx socket wrench T30 09042–00010)

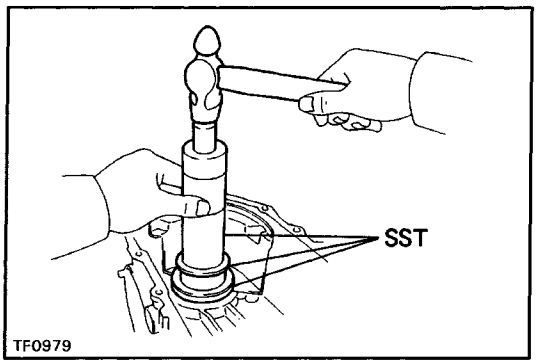
Torque: 4.9 N–m (50 kgf–cm, 43 in.–lbf)

NOTICE: Align the oil hole of the rear extension housing and oil groove end of the oil pump cover.

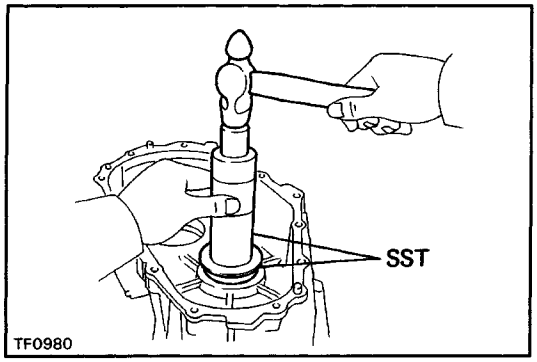
ASSEMBLY OF TRANSFER

1. INSTALL TWO BEARING RACES TO FRONT CASE

(a) Using SST and a hammer, install the center differential bearing race.
SST 09316–60010 (09316–00010, 09316–00030)
09316–20011



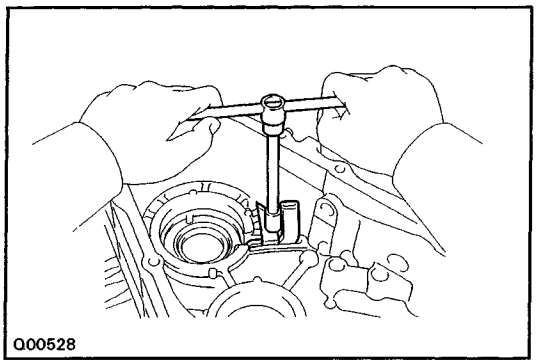
(b) Using SST and a hammer, install the idle gear bearing race.
SST 09316–60010 (09316–00010, 09316–00040)



2. INSTALL OIL RECEIVER TO FRONT CASE

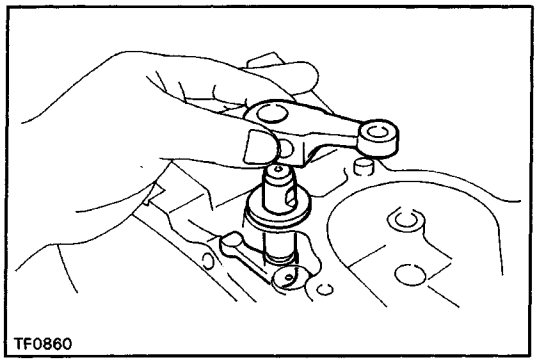
(a) Install the oil receiver.

(b) Install and torque the bolt.
Torque: 11.7 N–m (120 kgf–cm, 8.6 ft–lbf)

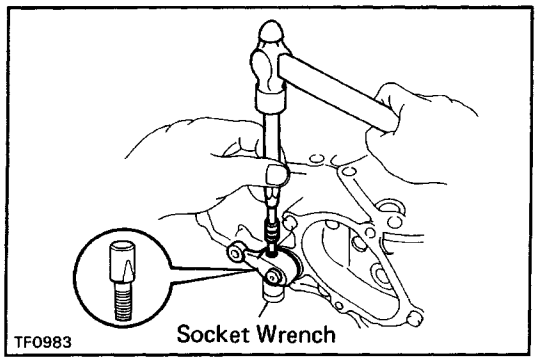


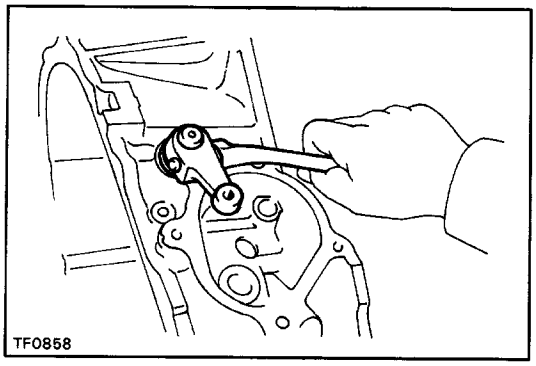
3. INSTALL SHIFT OUTER LEVER AND INNER LEVER

(a) Install the shift outer lever and inner lever.

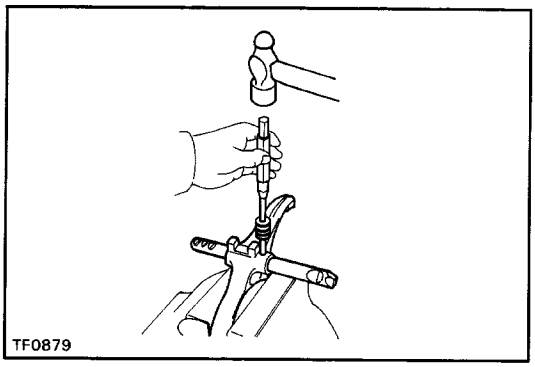


(b) Using a pin punch, hammer and socket wrench, install the lever lock pin.

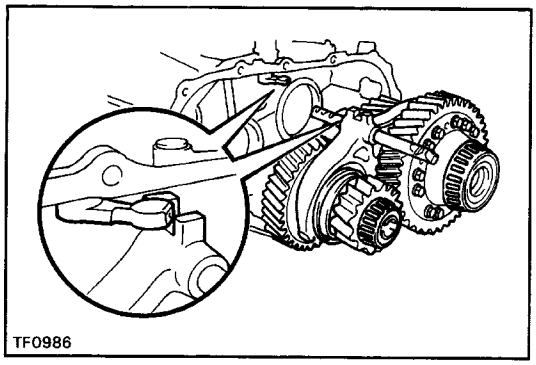




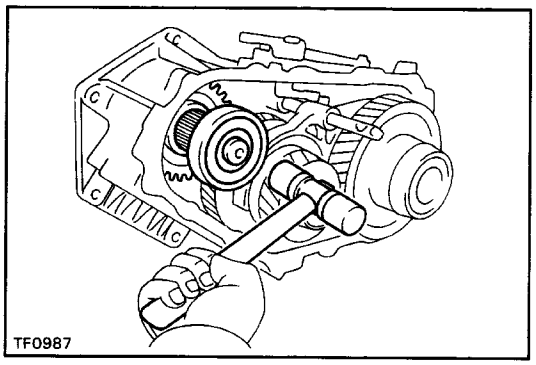
(c) Install the washer and nut.
Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)



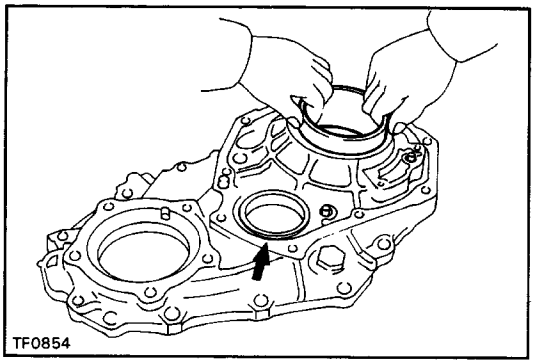
4. ASSEMBLE SHIFT FORK NO. 1 AND FORK SHAFT
Using a pin punch and a hammer, drive in the slotted spring pin.



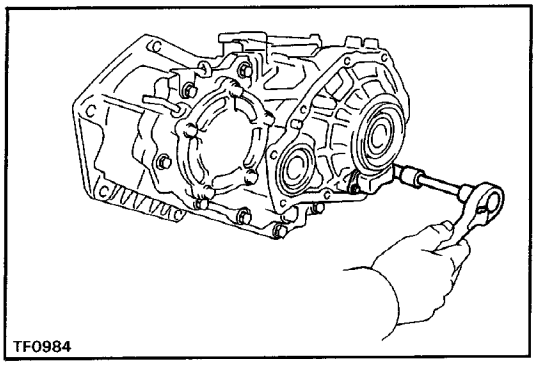
5. INSTALL IDLE GEAR ASSEMBLY, CENTER DIFFERENTIAL ASSEMBLY AND HIGH AND LOW SHIFT FORK ASSEMBLY TO FRONT CASE



6. INSTALL INPUT SHAFT ASSEMBLY
Using a plastic hammer, tap in the input shaft.



7. INSTALL TWO BEARING RACES TO REAR CASE

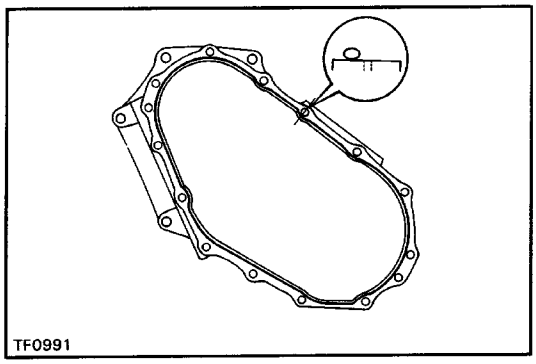


8. INSTALL OIL STRAINER TO REAR CASE

(a) Install the oil strainer.

(b) Install and torque the bolts.

Torque: 4.9 N–m (50 kgf–cm, 43 in.–lbf)



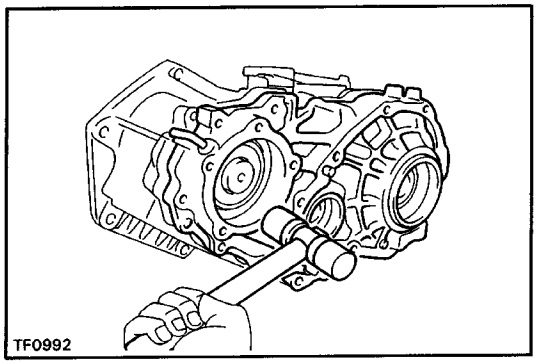
9. ASSEMBLE FRONT CASE AND REAR CASE

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the front case.

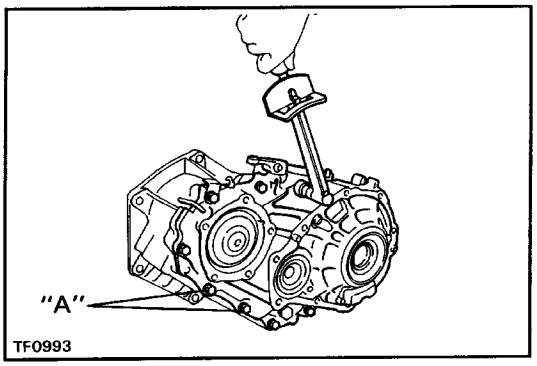
(b) Apply seal packing to the front case as shown.

Seal packing: Part No.08826–00090, THREE BOND 1281 or equivalent

HINT: Install the rear case as soon as the seal packing is applied.



(c) Using a plastic hammer, tap the rear case and assemble it.

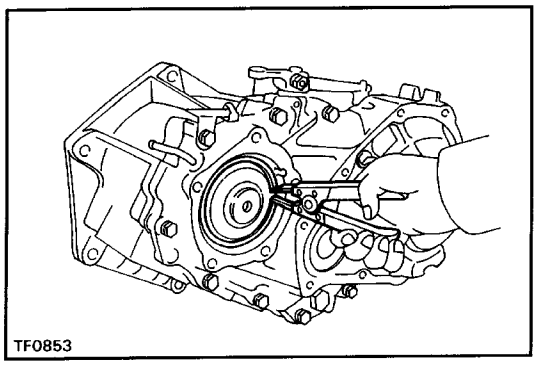


(d) Apply liquid sealer– to the "A" bolt threads.

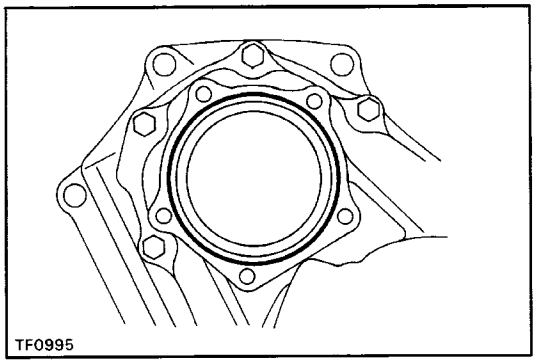
Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(e) Install and torque the eight bolts.

Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)



(f) Using snap ring pliers, install the snap ring.



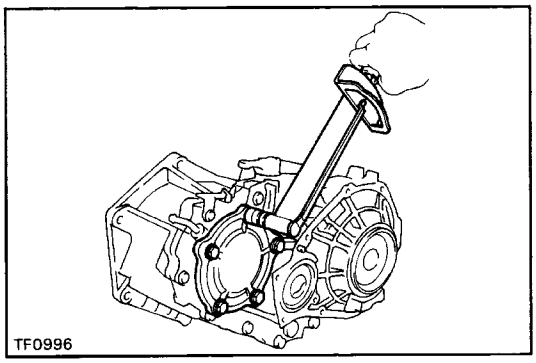
10. INSTALL CASE COVER

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the rear case.

(b) Apply seal packing to the rear case as shown.

Seal packing: Part No.08826–00090, THREE BOND 1281 or equivalent

HINT: Install the case cover as soon as the seal packing is applied.



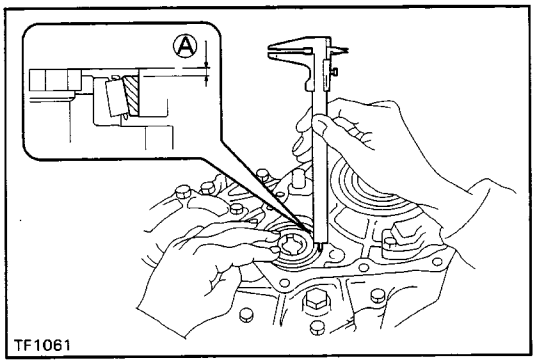
(c) Install the case cover.

(d) Apply liquid sealer to the bolt threads.

Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(e) Install and torque the five bolts.

Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)



11. SELECT ADJUSTING SHIMS FOR IDLER GEAR REAR TAPER ROLLER BEARING

(a) Using a vernier calipers, measure dimension (A).

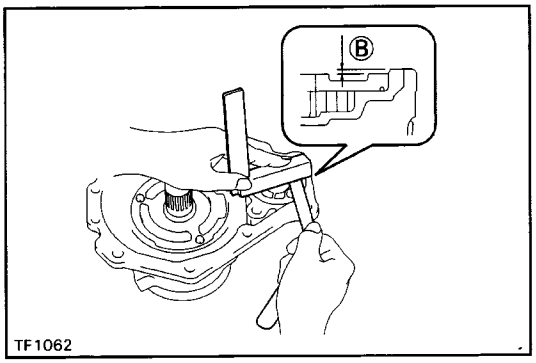
HINT: Lightly hold down the bearing outer race in the thrust direction to eliminate any looseness before making the measurement.

(b) Using a steel straight edge and feeler gauge, measure the clearance of dimension (B).

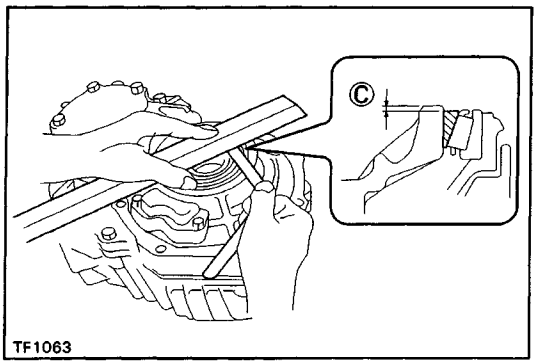
(c) Calculate the required thickness of the adjusting shim.

Thickness: Dimension (A) + Dimension (B) + (0.03 – 0.08 mm)

(d) From the following table, select a shim with a thickness fitting within the range of the calculation in (c).



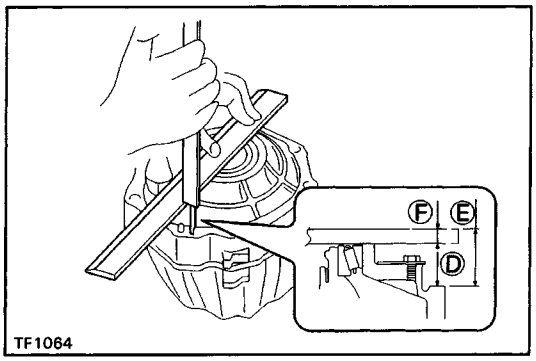
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
B	0.30 (0.0118)	H	3.20 (0.1260)
C	0.45 (0.0177)	J	3.40 (0.1339)
D	2.40 (0.0945)	K	3.60 (0.1417)
E	2.60 (0.1024)	L	3.80 (0.1496)
F	2.80 (0.1102)	M	0.55 (0.0216)
G	3.00 (0.1181)		



12. SELECT ADJUSTING SHIMS FOR OUTPUT SHAFT TAPER ROLLER BEARING

(a) Using a steel straight edge and feeler gauge, measure the clearance of dimension (C).

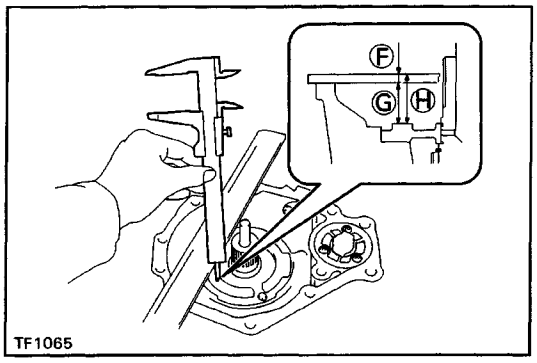
HINT: Lightly hold down the bearing outer race in the thrust direction to eliminate any looseness before making the measurement.



(b) Using a steel straight edge and vernier calipers, measure dimension (D).

HINT: Dimension (D) is the straight edge thickness (Dimension (F)) subtracted from Dimension (E) in the illustration to the left.

Dimension (D): Dimension (E) – Dimension (F)



(c) Using a steel straight edge and vernier calipers, measure dimension (G).

HINT: Dimension (G) is the straight edge thickness (Dimension (F)) subtracted from Dimension (H).

Dimension (G) : Dimension (H) – Dimension (F)

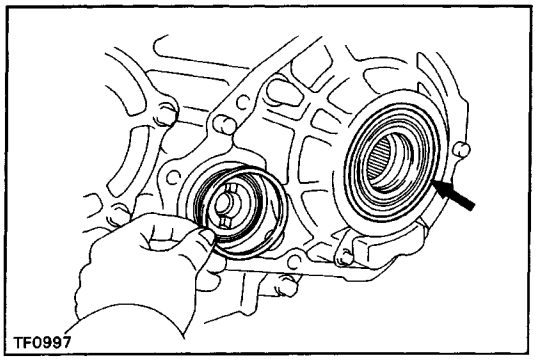
(d) Calculate the required thickness of the adjusting shim.

Thickness:

Dimension (G) – (Dimension (D) – Dimension (C)) + (0.02 – 0.07 mm)

(e) From the following table, select a shim with a thickness fitting within the range of the calculation in (d).

Mark	Thickness mm in.)	Mark	Thickness mm (in.)
B	0.30 (0.0118)	H	1.80 (0.0709)
C	0.45 (0.0177)	J	2.00 (0.0787)
D	1.00 (0.0394)	K	2.20 (0.0866)
E	1.20 (0.0472)	L	2.40 (0.0945)
F	1.40 (0.0551)	M	2.60 (0.1024)
G	1.60 (0.0630)	N	0.55 (0.0216)

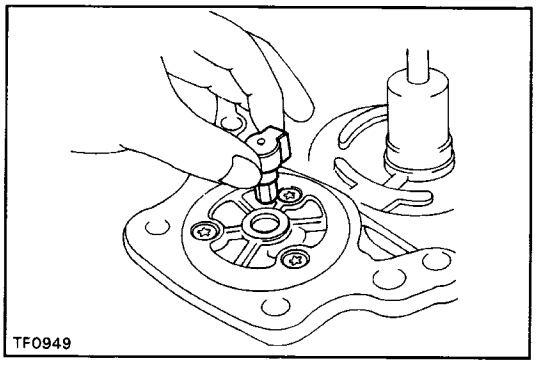


13. INSTALL ADJUSTING SHIMS TO IDLER GEAR AND OUTPUT SHAFT TAPER ROLLER BEARINGS

(a) Apply MP grease to the adjusting shims.

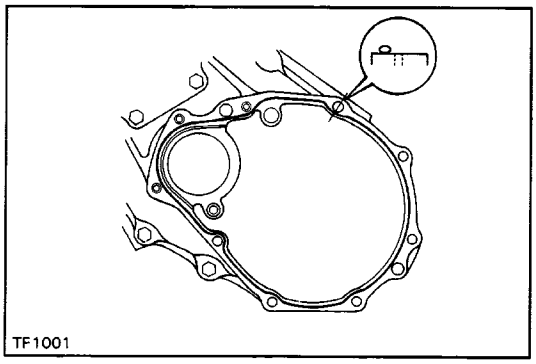
(b) Install the adjusting shims to bearing outer races.

HINT: Install the thinner shim on the bearing outer race side.



14. INSTALL REAR EXTENSION HOUSING

(a) Install the oil pump drive shaft.

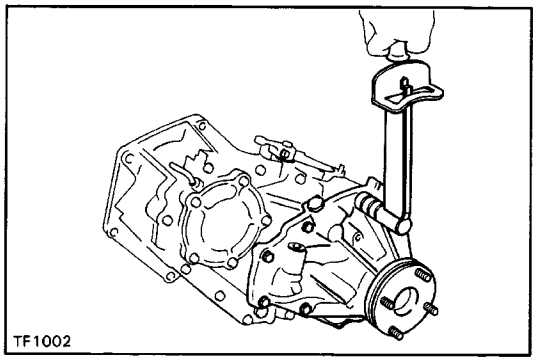


(b) Remove any packing material and be careful not to drop oil on the contacting surfaces of the rear case.

(c) Apply seal packing to the rear case as shown.

Seal packing: Part No.08826–00090, THREE BOND 1281 or equivalent

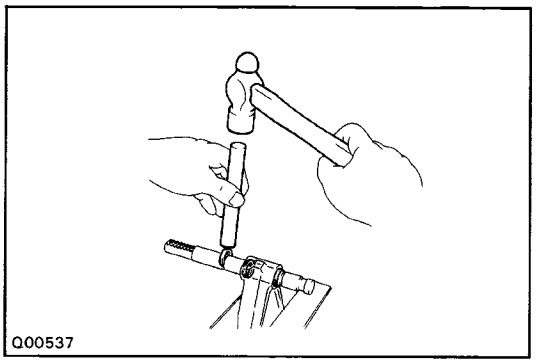
HINT: Install the rear extension housing as soon as the seal packing is applied.



(d) Install the rear extension housing.

(e) Install and torque the nine bolts.

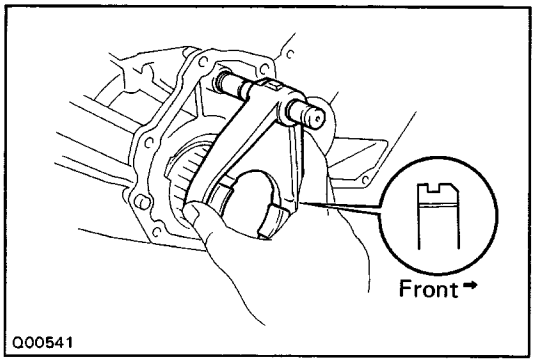
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)



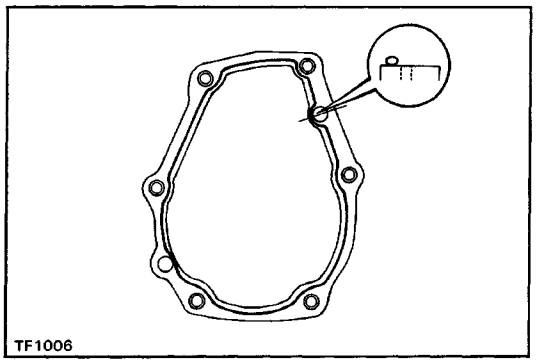
15. ASSEMBLE SHIFT FORK NO.2 AND FORK SHAFT

(a) Assemble the shift fork No.2 and fork shaft.

(b) Using a brass bar and hammer, tap in the snap rings.



16. INSTALL CLUTCH SLEEVE, SHIFT FORK NO.2 AND FORK SHAFT



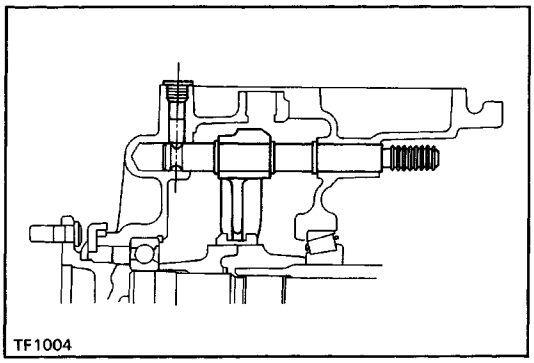
17. INSTALL FRONT EXTENSION HOUSING

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the front case.

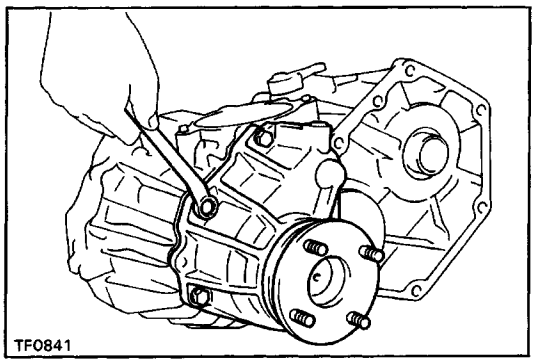
(b) Apply seal packing to the front case as shown.

Seal packing: Part No.08826–00090, THREE BOND 1281 or equivalent

HINT: Install the front extension housing as soon as the seal packing is applied.

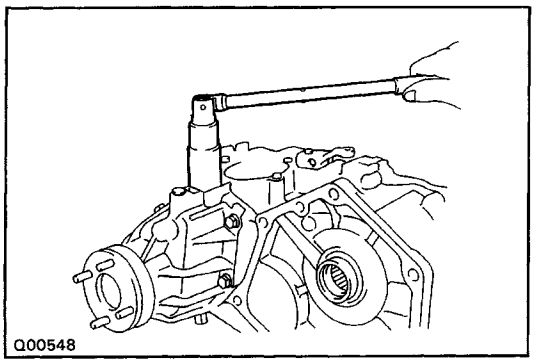


(c) Set the clutch sleeve in 4WD condition in differential lock condition, install the front extension housing.



(d) Install and torque the six bolts.

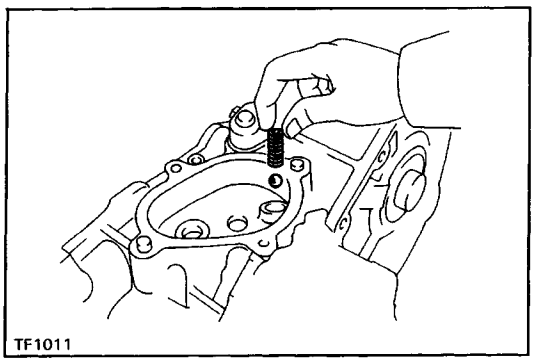
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)



18. INSTALL TRANSFER INDICATOR SWITCHES

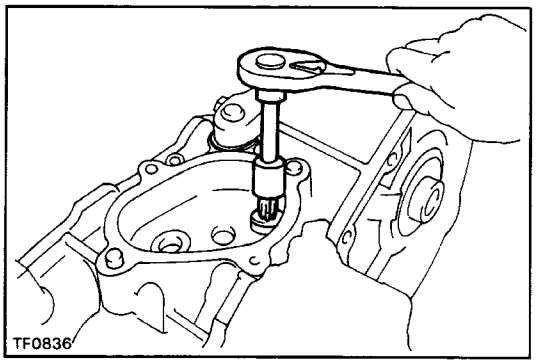
Install and torque the 4WD indicator switch, L4 position switch and neutral position switch.

Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)

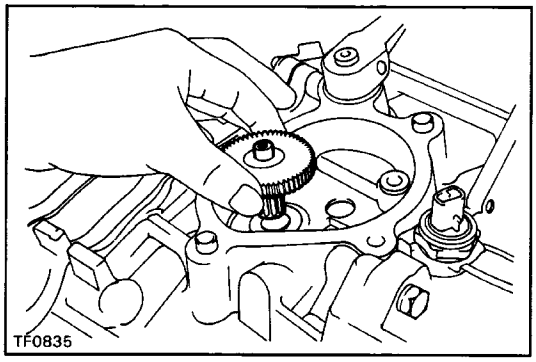


19. INSTALL BALL, SPRING AND SCREW PLUG

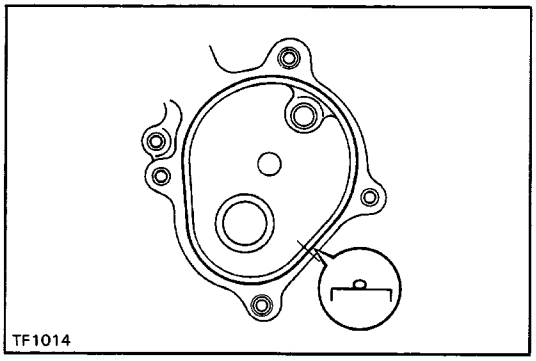
(a) Install the ball and spring.



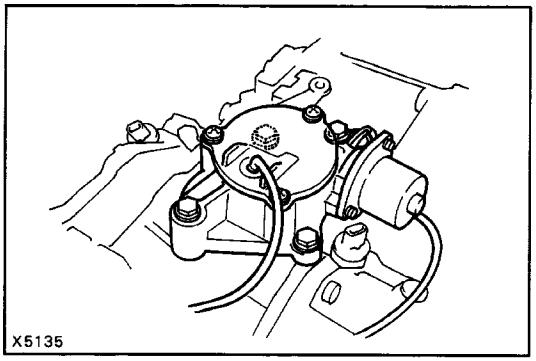
(b) Apply liquid sealer to the screw plug.
Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(c) Install and torque the screw plug.
(Torx socket wrench T40 09042–00020)
Torque: 19 N–m (190 kgf–cm, 14 ft–lbf)



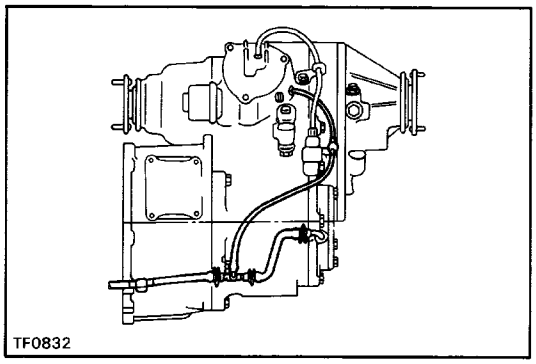
20. INSTALL OUTPUT GEAR
(a) Apply gear oil to the output gear.
(b) Install the output gear.
NOTICE: Do not turn the output gear.



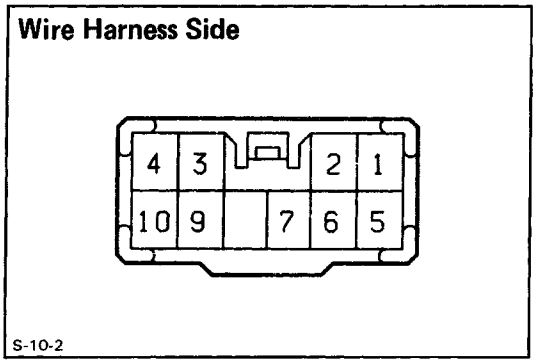
21. INSTALL MOTOR ACTUATOR
(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the front case.
(b) Apply seal packing to the front case as shown.
Seal packing: Part No.08826–00090,THREE BOND 1281 or equivalent
HINT: Install the motor actuator as soon as the seal packing is applied.



(c) Install the motor actuator.
HINT: Set the motor actuator in differential lock condition.
(d) Install and torque the four bolts.
Torque: 18.1 N–m (185 kgf–cm, 13.3 ft–lbf)



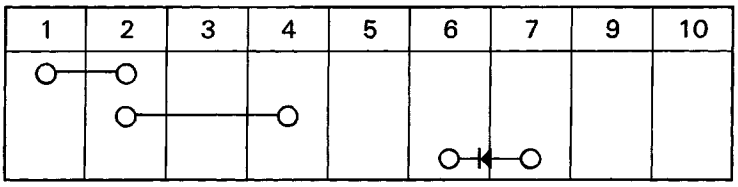
22. INSTALL BREATHER HOSE



PARTS INSPECTION

1. INSPECT CENTER DIFFERENTIAL LOCK CONTROL RERAY

(a) Check that there is continuity between terminals as shown in the chart.



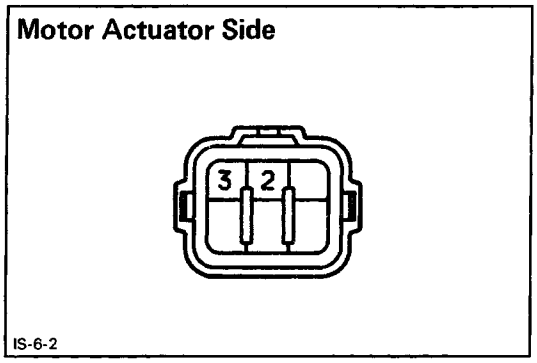
HINT: There is a diode between terminals 6 and 7. If the circuit shown no continuity, change the positive (+) and negative (–) probes and recheck the circuit.

(b) Apply battery voltage between terminals and check that there is continuity between terminals as shown in the chart.

Battery voltage ⊕	Battery voltage ⊖	1	2	3	4	5	6	7	8	9	10
6	5	○—○		○—○							
7	2									○—○	
9	10			○—○							

○—○ : Continuity
○—○ : No continuity

If continuity is not as specified, replace the relay.



2. INSPECT MOTOR ACTUATOR

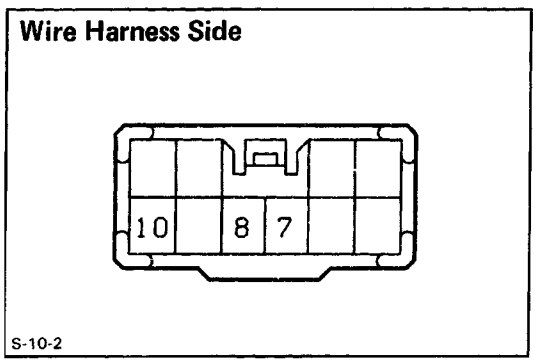
(a) Using an ohmmeter, measure the resistance between terminals 2 and 3.

Standard resistance: 0.3 – 100Ω

(b) Using an ohmmeter, measure the resistance between terminals 2 or 3 and body ground.

Standard resistance: More than 0.5 MΩ

If resistance value is not as specified, replace the motor actuator.



3. INSPECT CENTER DIFFERENTIAL LOCK SWITCH

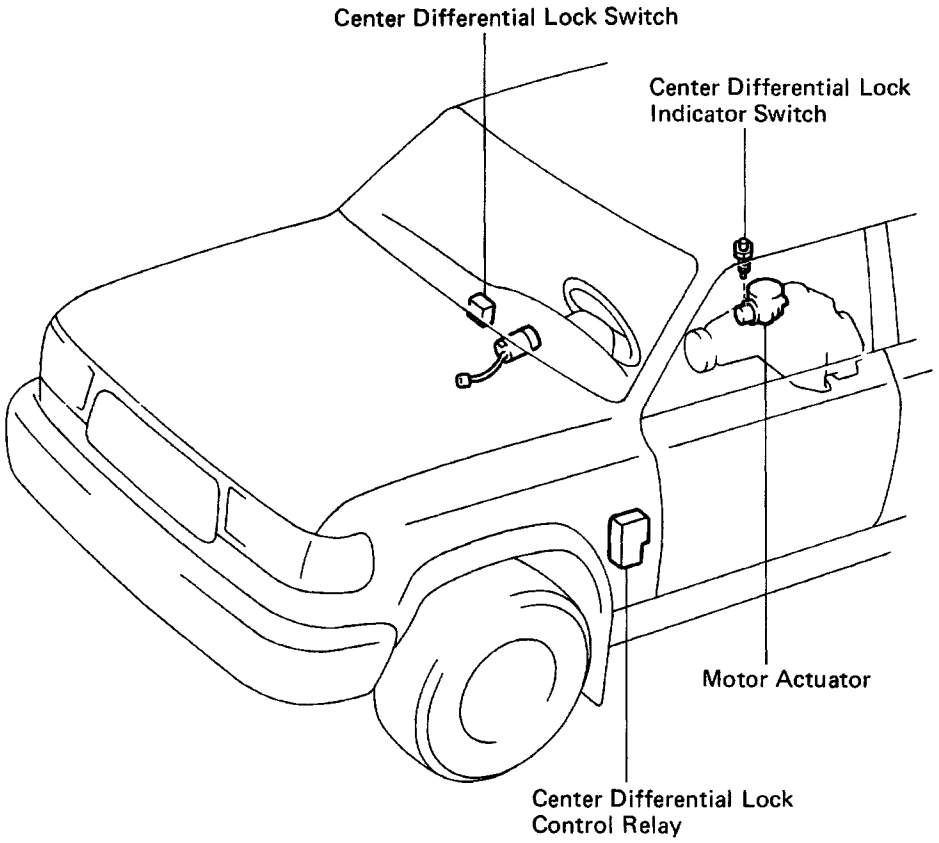
Check that there is continuity between terminals as shown in the chart.

Switch position \ Terminal	7	10	8
OFF	○—○		
ON	○—		—○

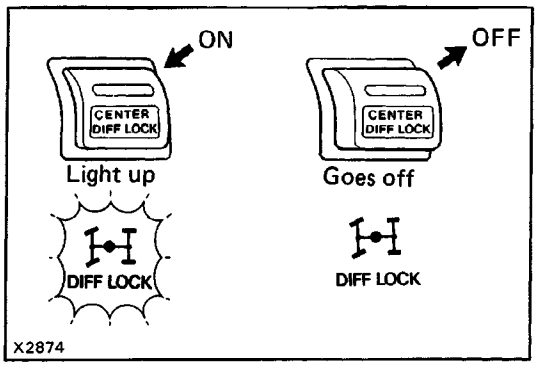
If continuity is not as specified, replace the switch.

MOTOR SHIFT CONTROL SYSTEM

PARTS LOCATION



TF0885



SYSTEM INSPECTION

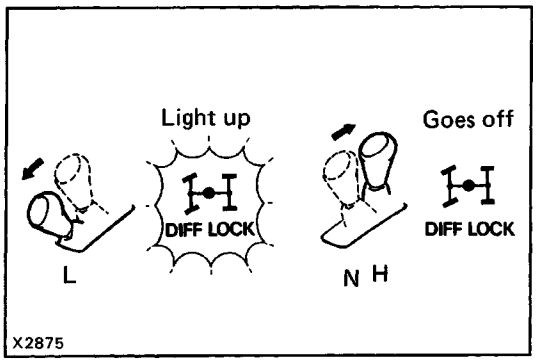
1. INSPECT CENTER DIFFERENTIAL LOCK SWITCH

(a) Start the engine and shift the transfer shift lever in H position.

(b) Check that the center differential lock indicator light comes on when the center differential lock switch is turned ON.

Check that the light goes off when the switch OFF.

HINT: There are times when the light will not go off unless the steering is straight ahead and acceleration and deceleration are performed slowly.



2. INSPECT SHIFT LEVER POSITION

(a) Start the engine, and center differential lock switch turned to OFF.

(b) Check that the center differential indicator light comes on when the transfer shift lever shifted to L position. Check that the light goes off when the lever is shifted to N or H position.

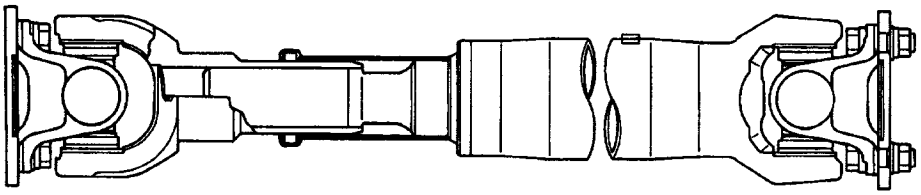
PROPELLER SHAFT

DESCRIPTION

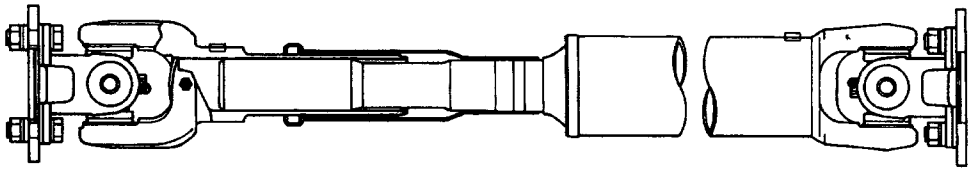
PROOK–01

The propeller shafts are the 2–joint type.

Front Propeller Shaft



Rear Propeller Shaft



R01399
R01398

Z00759

PRECAUTIONS

Be careful not to grip the propeller shaft tube too tightly in the vise as this will cause deformation.

TROUBLESHOOTING

You will find the cause of trouble more easily by properly using the table shown below. In this table, the numbers indicate the priority of the probable cause of trouble. Check each part in the order shown. If necessary, repair or replace the part.

Problem	Possible cause	Remedy	Page
Noise	Sleeve yoke spline worn Spider bearing worn or stuck	Replace sleeve yoke Replace spider bearing	PR–6 PR–6
Vibration	Propeller shaft runout Propeller shaft imbalance Sleeve ycike spline stuck	Replace propeller shaft Balance propeller shaft Replace sleeve yoke	PR–5 PR–6

V00590

PRECAUTIONS

Be careful not to grip the propeller shaft tube too tightly in the vise as this will cause deformation.

TROUBLESHOOTING

You will find the cause of trouble more easily by properly using the table shown below. In this table, the numbers indicate the priority of the probable cause of trouble. Check each part in the order shown. If necessary, repair or replace the part.

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Vibration	Propeller shaft runout Propeller shaft imbalance Sleeve ycike spline stuck	Replace propeller shaft Balance propeller shaft Replace sleeve yoke	PR–5 PR–6

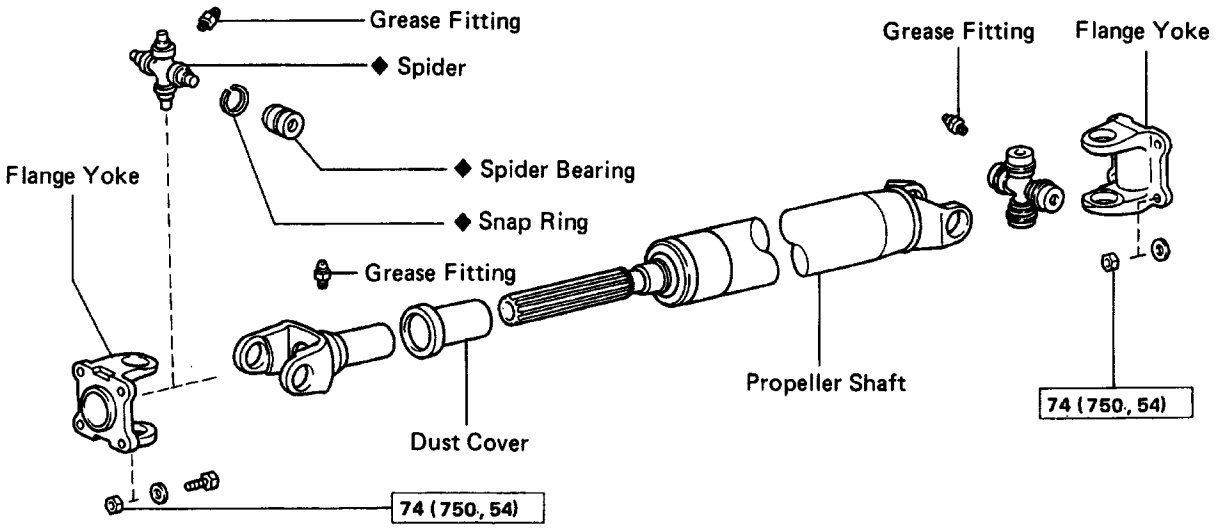
V00590

PROPELLER SHAFT

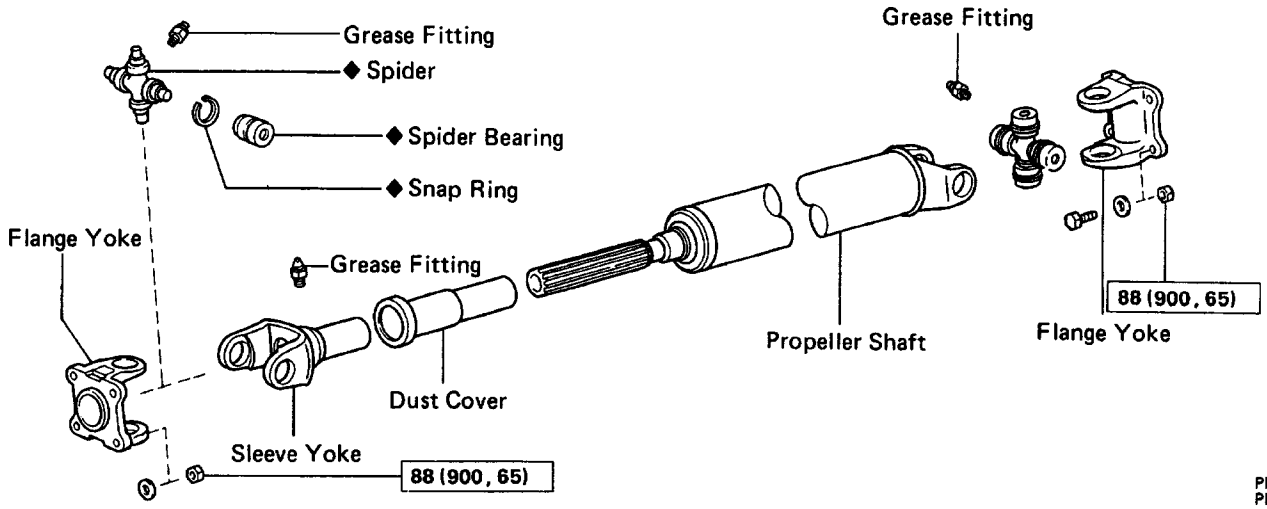
PR00L–01

COMPONENTS

• **Front Propeller Shaft**



• **Rear Propeller Shaft**

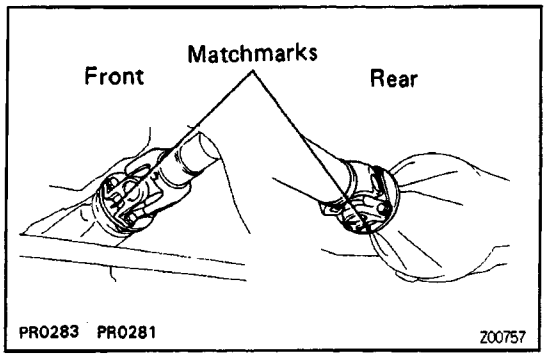


PR0278
PR0279

N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

Z00750

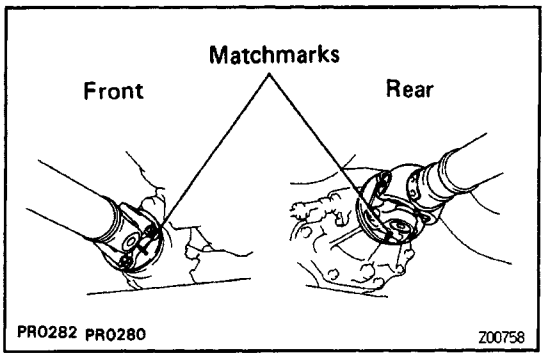


PROOM–01

FRONT AND REAR PROPELLER SHAFT REMOVAL

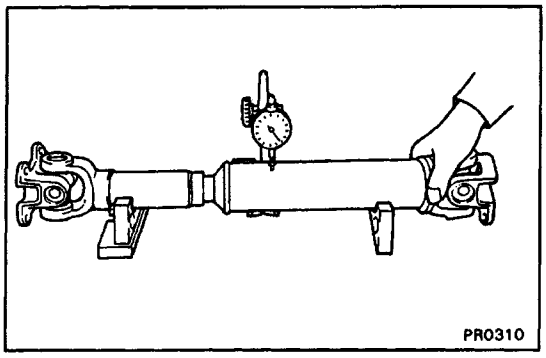
1. DISCONNECT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON DIFFERENTIAL

(a) Put matchmarks on the flanges.
(b) Remove the four bolts and nuts.



2. DISCONNECT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON TRANSFER

(a) Put matchmarks on the flange.
(b) Remove the four nuts.
(c) Remove the propeller shaft.



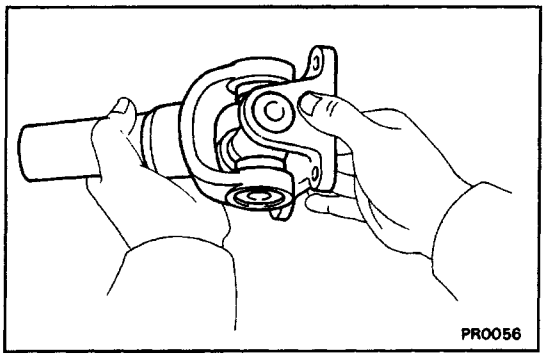
PROON–01

PROPELLER SHAFT INSPECTION

1. INSPECT FRONT AND REAR PROPELLER SHAFTS FOR DAMAGE OR RUNOUT

If shaft runout is greater than maximum, replace the shaft.

Maximum runout:
0.8 mm (0.031 in.)

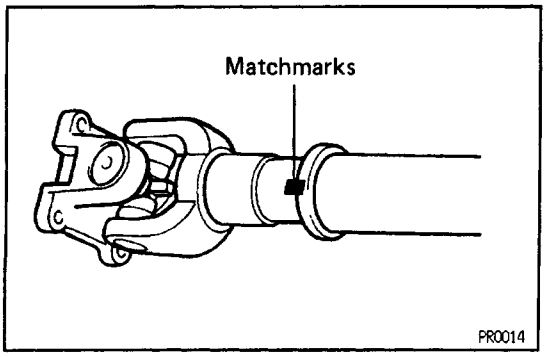


2. INSPECT SPIDER BEARING

(a) Inspect the spider bearings for wear or damage.
(b) Check the spider bearing axial play by turning the yoke while holding the shaft tightly.

Bearing axial play:
Less than 0.05 mm (0.0020 in.)

If necessary, replace the spider bearing.

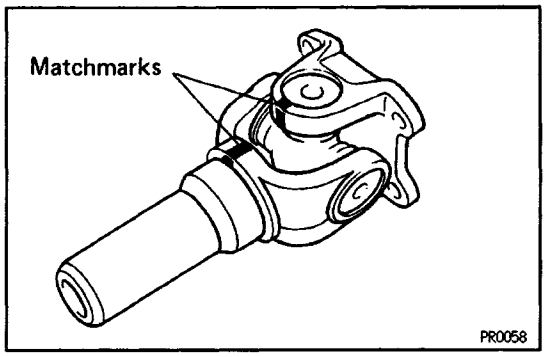


PROOP–01

PROPELLER SHAFT DISASSEMBLY

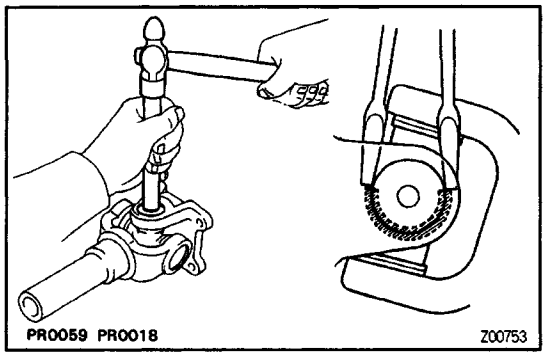
1. REMOVE SLEEVE YOKE FROM PROPELLER SHAFT

(a) Place the matchmarks on the sleeve yoke and shaft.
(b) Pull out the sleeve yoke from the shaft.



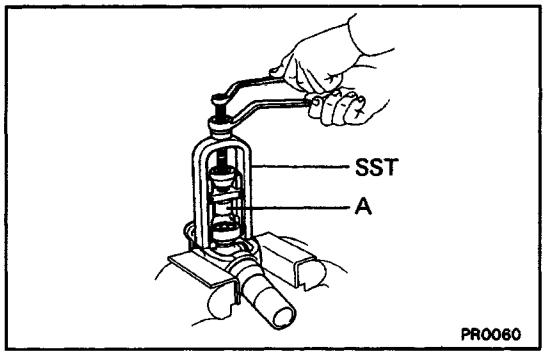
2. REMOVE SPIDER BEARING

(a) Put the matchmarks on the sleeve yoke and flange.



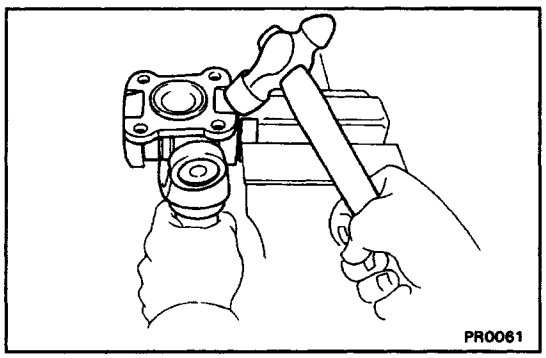
(b) Slightly tap in the bearing outer races.

(c) Using two screwdrivers, remove the four snap rings from the grooves.



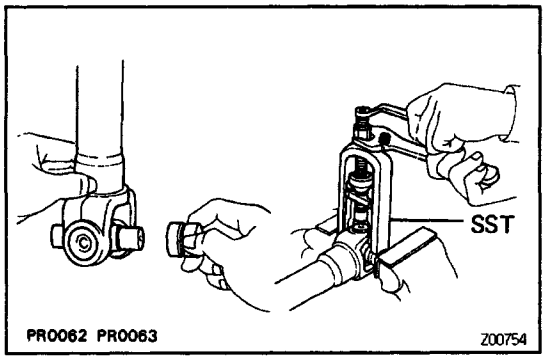
(d) Using SST, push out the bearing from the flange.
SST 09332 – 25010

HINT: Sufficiently raise the part indicated by A so that it does not come into contact with the bearing.



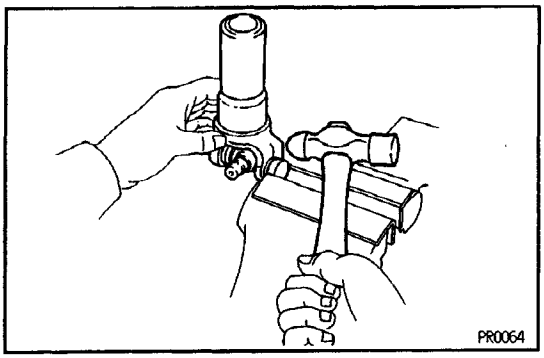
(e) Clamp the bearing outer race in a vise and tap off the flange with a hammer.

HINT: Remove the bearing on the opposite side in the same procedure.



(f) Install the two removed bearing outer races to the spider.

(g) Using SST, push out the bearing from the yoke.
SST 09332–25010



(h) Clamp the outer bearing race in a vise and tap off the yoke with a hammer.

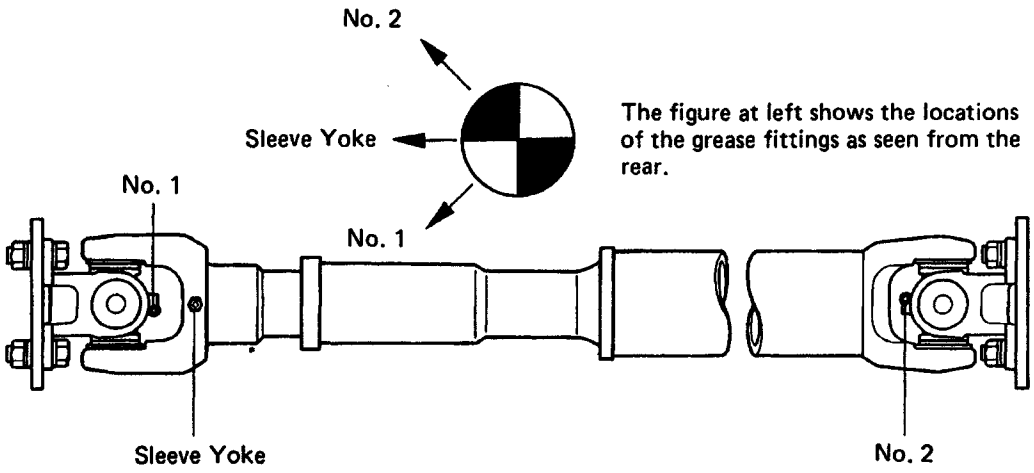
HINT: Remove the bearing on the opposite side in the same procedure.

PR000-01

PROPELLER SHAFT ASSEMBLY

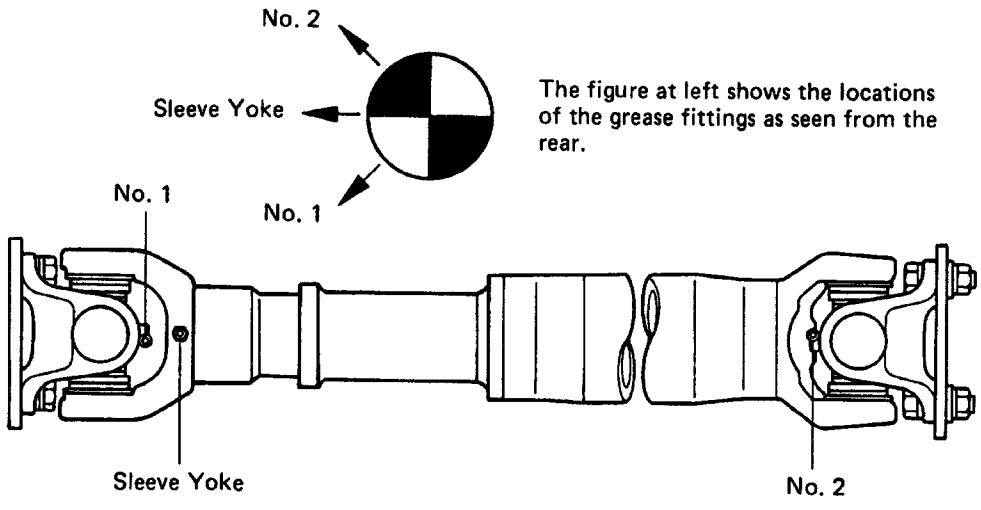
HINT: When replacing the spider, be sure that the grease fitting assembly hole is facing in the direction shown in figure.

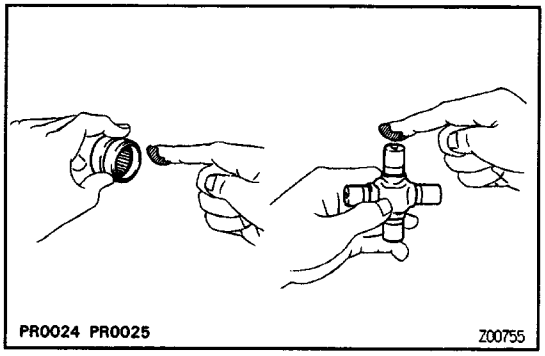
SPIDER GREASE FITTING ASSEMBLY DIRECTION
Front Propeller Shaft



PR0284

SPIDER GREASE FITTING ASSEMBLY DIRECTION
Rear Propeller Shaft

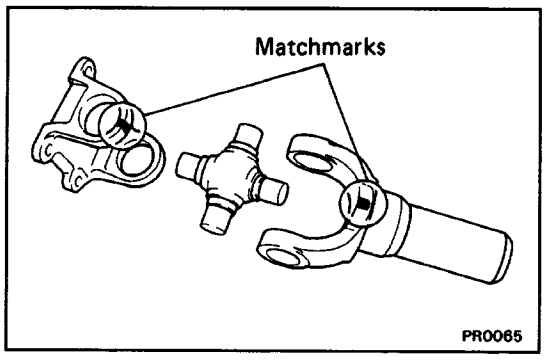




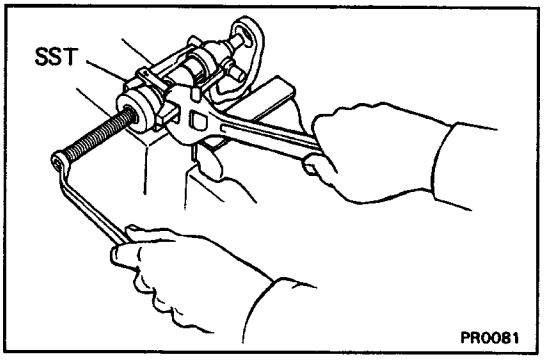
1. INSTALL SPIDER BEARING

(a) Apply MP grease to the spider and bearing.

HINT: Be careful not to apply too much grease.



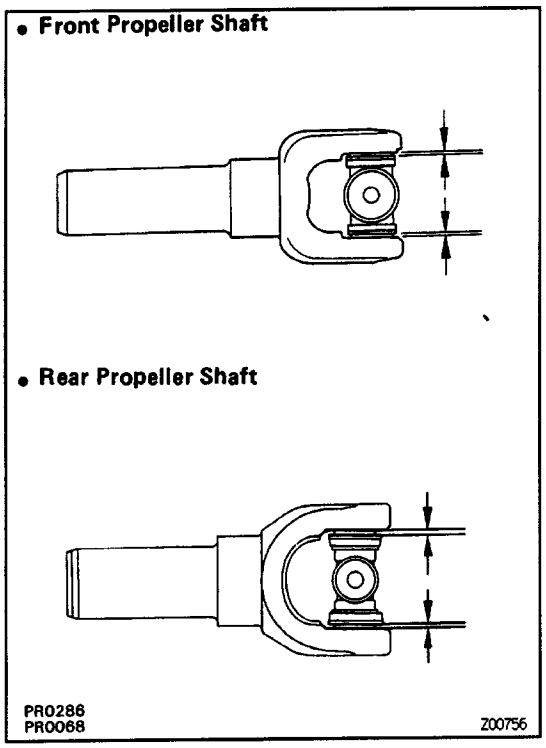
(b) Align the matchmarks on the yoke and flange.



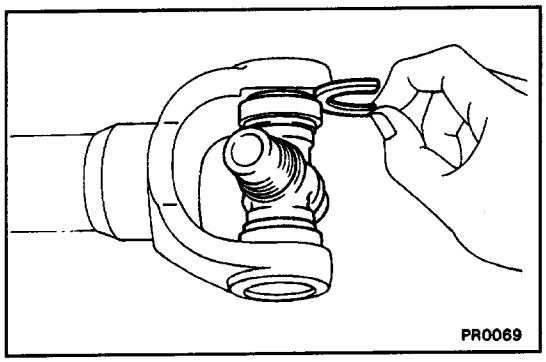
(c) Fit a new spider into the yoke.

(d) Using SST, install a new bearing on the spider.

SST 09332–25010



(e) Using SST, adjust both bearings so that the snap ring grooves are at maximum and equal widths.



(f) Install two snap rings of equal thickness which will allow 0–0.05 mm (0–0.0020 in.) axial play.

HINT: Do not reuse the snap rings.

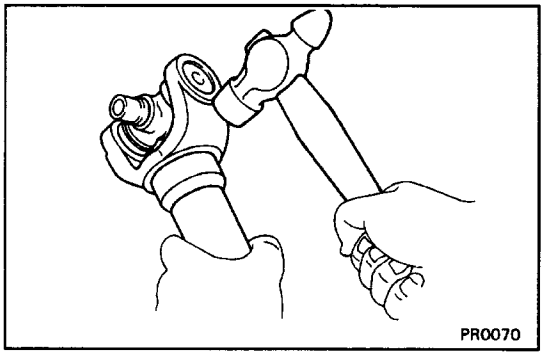
Thickness of snap ring

Front Propeller Shaft

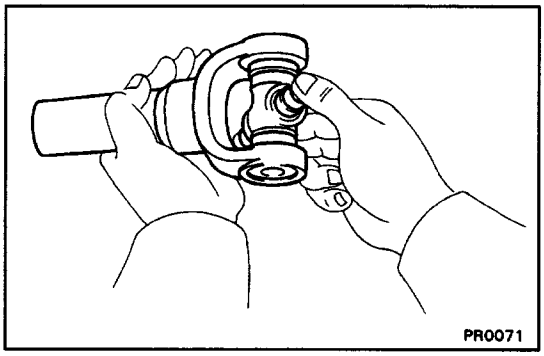
Color	Mark	Thickness mm (in.)
–	1	2.100 – 2.150 (0.0827 – 0.0846)
–	2	2.150 – 2.200 (0.0846 – 0.0866)
–	3	2.200 – 2.250 (0.0866 – 0.0886)
Brown	–	2.250 – 2.300 (0.0886 – 0.0906)
Blue	–	2.300 – 2.350 (0.0906 – 0.0925)
–	6	2.350 – 2.400 (0.0925 – 0.0945)
–	7	2.400 – 2.450 (0.0945 – 0.0965)
–	8	2.450 – 2.500 (0.0965 – 0.0984)

Rear Propeller Shaft

Color	Thickness mm (in.)
–	2.00 (0.0787)
Brown	2.03 (0.0799)
Blue	2.06 (0.0811)
–	2.09 (0.0823)

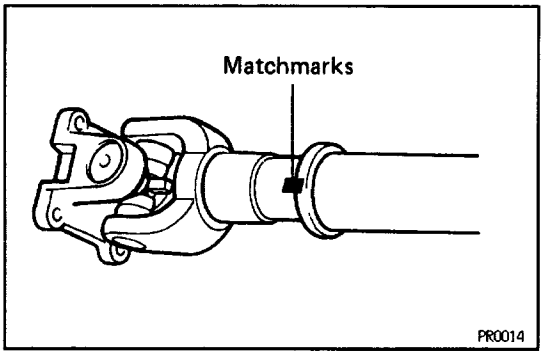


(g) Using a hemmer, tap the yoke until there is no clearance between the bearing outer race and snap ring.



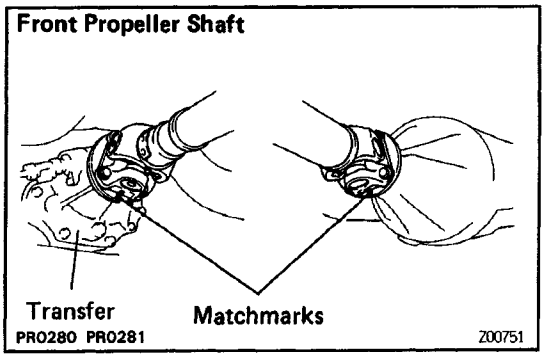
(h) Check that the spider bearing moves smoothly.
(i) Check the spider bearing axial play.
Bearing axial play:
Less than 0.05 mm (0.0020 in.)

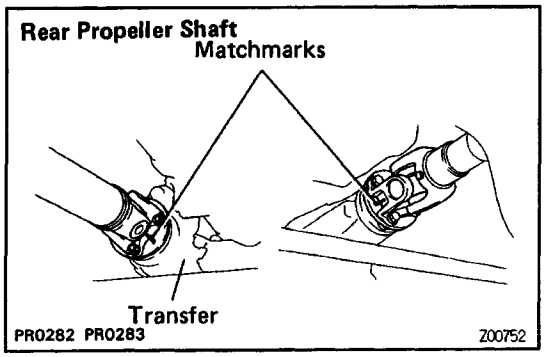
HINT: Install new spider bearing on the flange side in the procedure described above.



2. INSERT SLEEVE YOKE INTO PROPELLER SHAFT

(a) Apply MP grease to the propeller shaft spline and sleeve yoke sliding surface.
(b) Align the matchmarks on the sleeve yoke propeller shaft.
(c) Install the propeller shaft into the sleeve yoke.





FRONT AND REAR PROPELLER SHAFTS INSTALLATION

7. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON TRANSFER

(a) Align the matchmarks on the flanges and connect the flanges with four nuts.

(b) Torque the nuts.

Torque:

Front Propeller Shaft

74 N–m (750 kgf–cm, 54 ft–lbf)

Rear Propeller Shaft

88 N–m (900 kgf–cm, 65 ft–lbf)

HINT: When installing the washers, put them properly in place.

2. CONNECT PROPELLER SHAFT FLANGE ON DIFFERENTIAL

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

(b) Torque the bolts and nuts.

Torque:

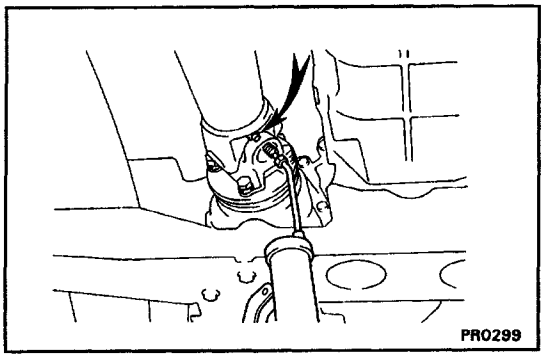
Front Propeller Shaft

74 N–m (750 kgf–cm, 54 ft–lbf)

Rear Propeller Shaft

88 N–m (900 kgf–cm, 65 ft–lbf)

HINT: When installing the washers, put them properly in place.



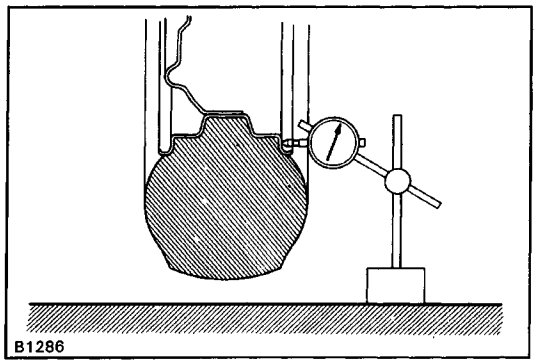
3. APPLY MP GREASE TO GREASE FITTING

With a grease gun, pump the MP grease into each fitting until it begins to flow around the oil seal.

SUSPENSION AND AXLE

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page	
			Front	Rear
Wanders/pulls	Tire worn or improperly inflated	Replace tire or inflate tires to proper pressure	A–17	A–17
	Alignment incorrect	Check front wheel alignment	SA–3	—
	Front or rear suspension parts loose or broken	Tighten or replace suspension parts	SA–47	SA–87
	Steering linkage loosen or worn	Tighten or replace steering linkage	SR–42	—
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–32	—
Bottoming	Vehicle overloaded	Check loading		
	Shock absorber worn out	Replace shock absorber	SA–47	SA–87
	Spring weak	Replace spring	SA–47	SA–87
Stay/pitches	Tires improperly inflated	Inflated tires to proper pressure	A–17	A–17
	Stabilizer bar bent or broken	Inspect stabilizer bar	SA–47	SA–87
	Shock absorber worn out	Replace shock absorber	SA–47	SA–87
Front wheel shimmy	Tires worn or improperly inflated	Replace tire or inflate tires to proper pressure		
	Wheels out of balance	Balance wheels		
	Shock absorber worn out	Replace shock absorber	SA–47	—
	Wheel alignment incorrect	Check front wheel alignment	SA–3	—
	Hub bearings worn	Replace hub bearings	SA–6	—
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–32	—
Abnormal tire wear	Tires improperly inflated	Inflated tire to proper pressure	A–17	A–17
	Shock absorbers worn out	Replace shock absorber	SA–47	SA–87
	Wheel alignment incorrect	Check wheel alignment	SA–3	SA–3
	Suspension parts worn	Replace suspension parts	SA–47	SA–87
Oil leak from axle	Oil seals worn or damaged	Replace oil seal	SA–14	SA–58
	Bearing retainer loose	Replace retainer	—	SA–58
	Axle housing cracked	Repair as necessary		
Oil leak from pinion shaft	Oil level too high or wrong grade	Drain and replace oil	SA–27	SA–70
	Oil seal worn or damaged	Replace oil seal	SA–23	SA–64
	Companion flange loose or damaged	Tighten or replace bearings	SA–27	SA–70
Noise in axle	Oil level low or wrong grade	Drain and replace oil	SA–27	SA–70
	Excessive backlash between pinion and ring or side gear	Check backlash	SA–30	SA–71
	Ring, pinion or side gears worn or chipped	Inspect gears	SA–30	SA–71
	Pinion shaft bearing worn	Replace bearing	SA–30	SA–71
	Axle shaft bearing worn	Replace bearing	SA–14	SA–58
	Differential bearing loose worn	Tighten or replace bearings	SA–30	SA–71



WHEEL ALIGNMENT

1. MAKE FOLLOWING CHECKS AND CORRECT ANY PROB–LEMS

(a) Check the tires for wear and proper inflation.

Cold tire inflation pressure: See page A–17

(b) Check the wheel runout.

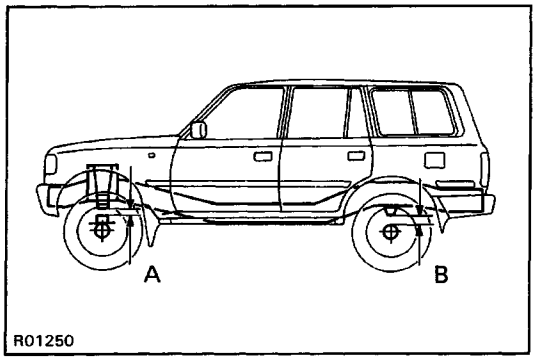
Lateral runout: 1.2 mm (0.047 in.) or less

(c) Check the front wheel bearings for looseness.

(d) Check the front suspension for looseness.

(e) Check the steering linkage for looseness.

(f) Check that the front absorbers work properly by us–ing the standard bounce test.



2. MEASURE FOLLOW SPRING CLEARANCE AND BUMPER STOPPER CLEARANCE

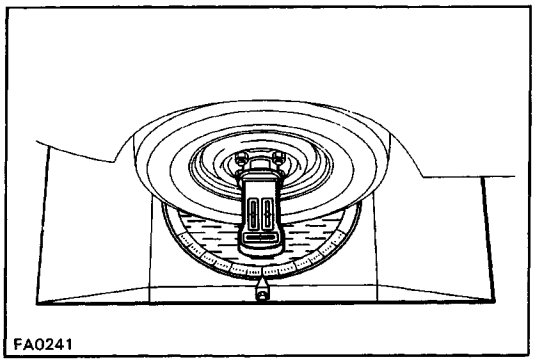
A (Follow spring clearance): 25 mm (0.98 in.)

B (Bumper stopper clearance): 45 mm (1.77 in.)

If the clearance of the vehicle is not standard, try to level the vehicle by rocking it down.

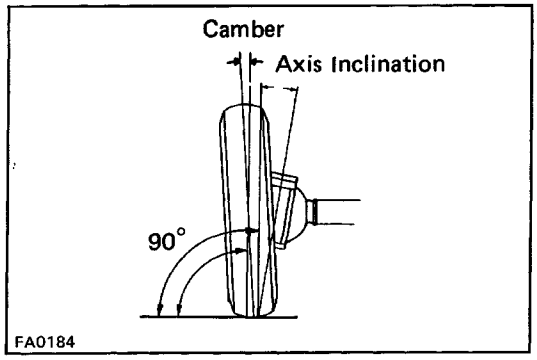
If still not correct, check for bad springs or suspension parts.

HINT: When measuring the chassis ground clearance, measure from the ground to the center of the lower sus–pension arm front mounting bolt.



3. INSTALL WHEEL ALIGNMENT EQUIPMENT

Follow the specific instructions of the equipment manu–facturer.



4. CHECK CAMBER AND STEERING AXIS INCLINATION

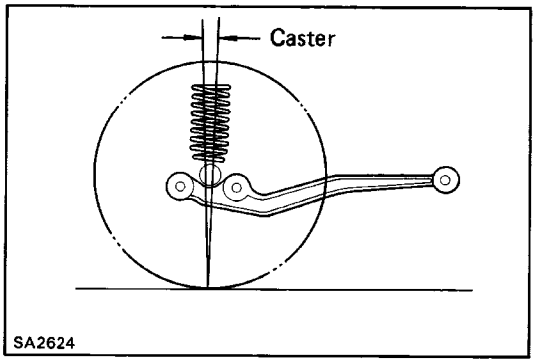
Camber: 1°00' ± 45'

Left–right error: 30' or less

Steering axis inclination: 13°00' + 45'

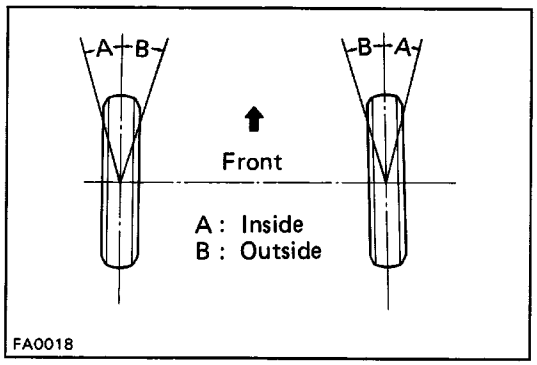
Left–right error: 30' or less

If the steering axis inclination is not as specified after camber have been correctly adjusted, recheck the steer–ing knuckle and front wheel for bending or looseness.



5. CHECK CASTER

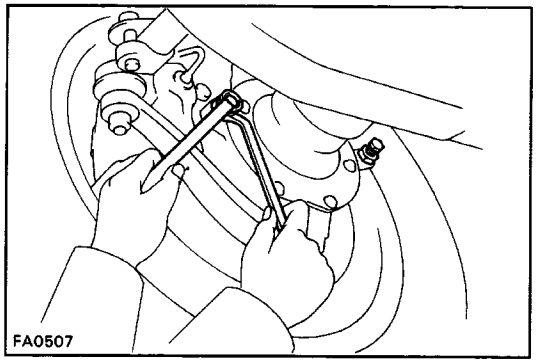
Tire	Caster
P235/75R15	3˚00' ± 1˚
31 x 10.50R15 LT(C)	1˚40' ± 1˚



6. ADJUST WHEEL ANGLE

Remove the caps of the knuckle stopper bolts and check the steering angles.

Wheel angle		
Max.	Inside wheel	35˚00' +0˚ –3˚
	Outside wheel	31˚00'

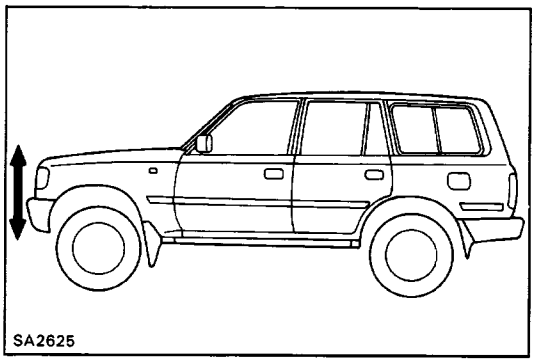


HINT: When the steering wheel is fully turned, make sure that the wheel is not touching the body or brake flexible hose.

If maximum steering angles differ from standard value, adjust the wheel angle with the knuckle stopper bolts.

Torque: 44 N–m (450 kgf–cm, 33 ft–lbf)

If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.

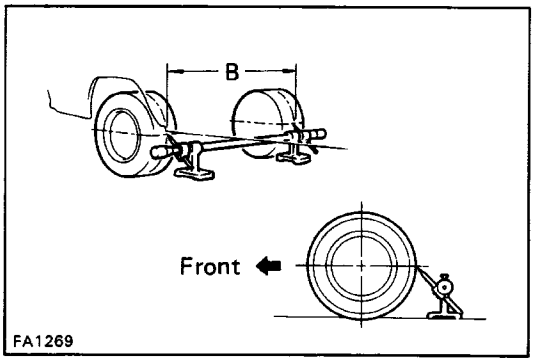


7. ADJUST TOE–IN

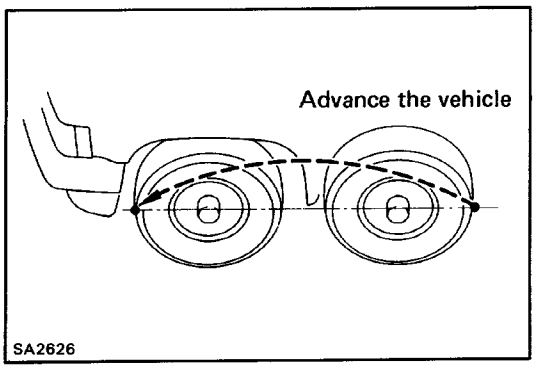
Adjust toe–in with a toe–in gauge in the following proce–dure.

(a) Rock the vehicle up and down to stabilize the sus–pension.

(b) Move the vehicle forward about 5 m (16.4 ft) with the front wheel in the straight–ahead position on the level place.

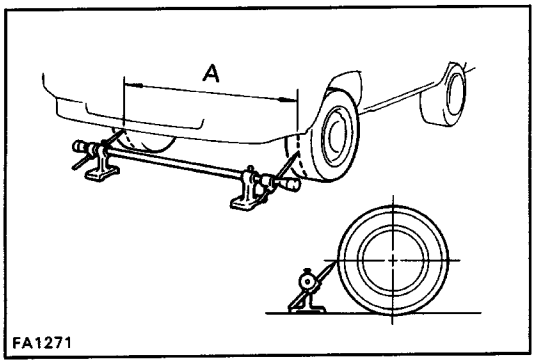


(c) Mark the center of each rear tread and measure the distance ”B” between the marks of the right and left tires.

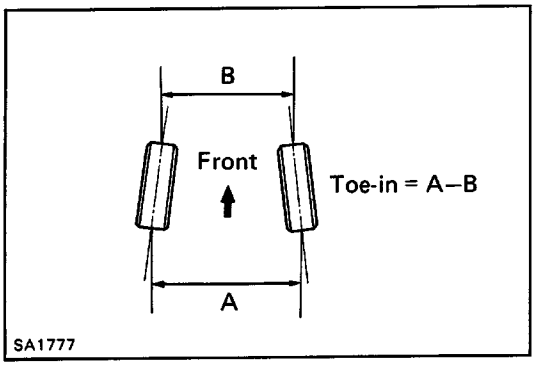


(d) Advance the vehicle until the marks on the rear sides of the tires come to the measuring heights of the gauge on the front side.

HINT: If the tire rolls too far, repeat from step (b).



(e) Measure the distance ”A” between the marks on the front of the tires.

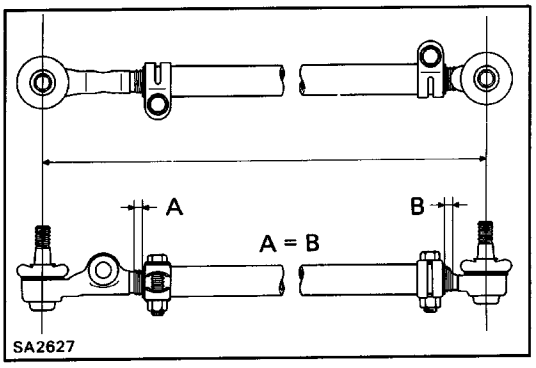


(f) Measure the toe–in.

Toe–in = A – B

Inspection standard: See page A–17

If toe–in is not specification, adjust by left and right tie rods.



(g) Loosen the clamp bolts and nuts.

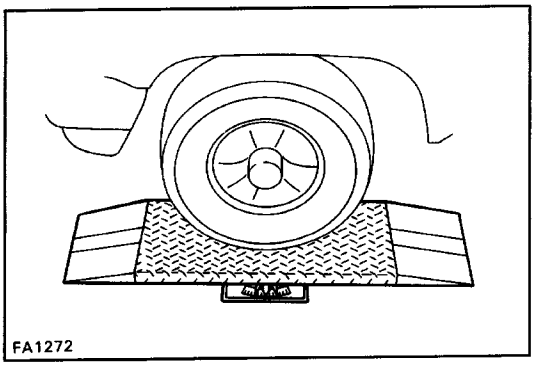
(h) Adjust toe–in turning the left and right tie rod tubes an equal amount.

Adjustment standard: See page A–17

(i) Torque the tie rod.

Torque: 37 N–m (375 kgf–cm, 27 ft–lbf)

HINT: Insure that the lengths of the tie rod ends are the same.

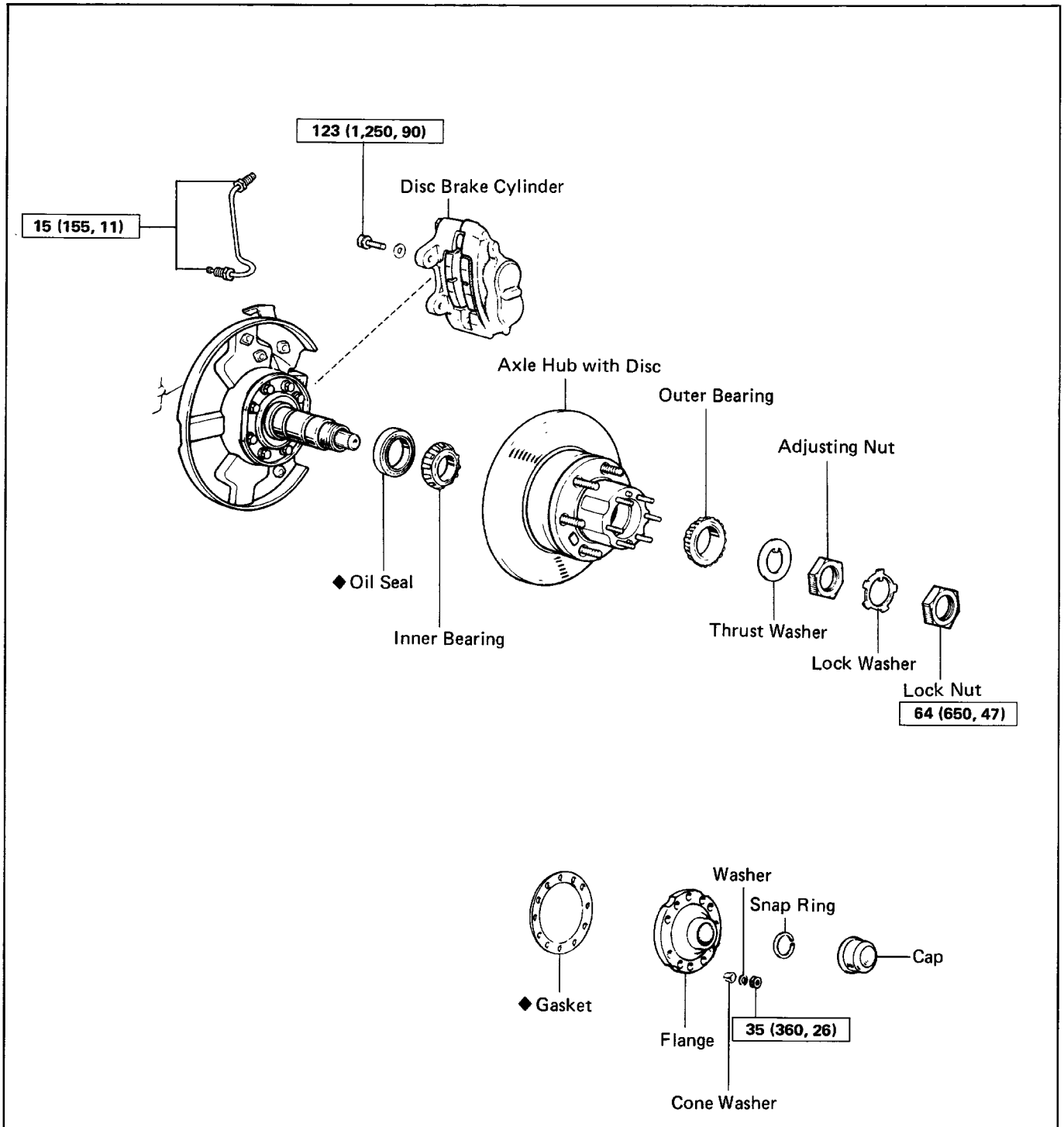


7. INSPECT SIDE SLIP (REFERENCE ONLY)

Side slip: 3.0 mm/m (0.118 in./3.3 ft) or less

FRONT AXLE HUB

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

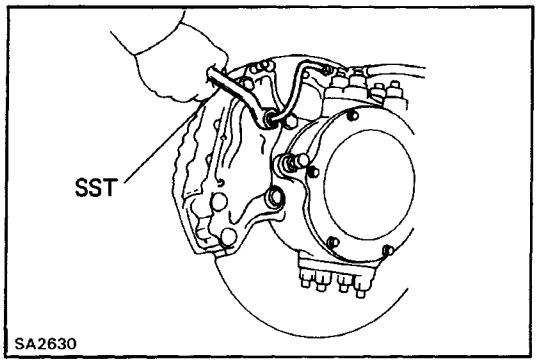
RO1021
SA2629

DISASSEMBLY OF FRONT AXLE HUB

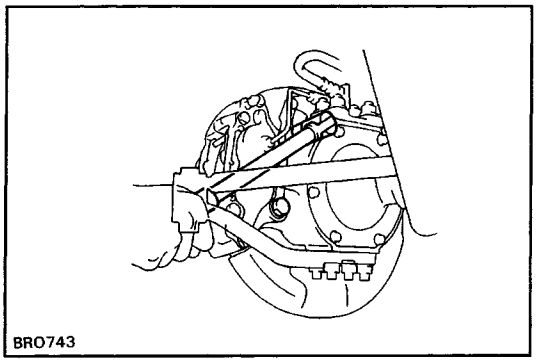
(See page SA–6)

1. REMOVE DISC BRAKE CYLINDER

(a) Using SST, disconnect the brake tube.
SST 09751–36011

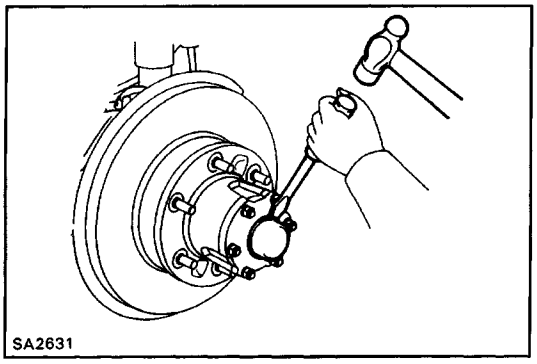


(b) Remove the two bolts and brake cylinder.

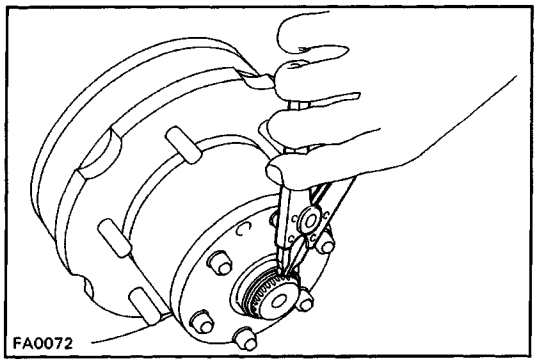


2. REMOVE FLANGE

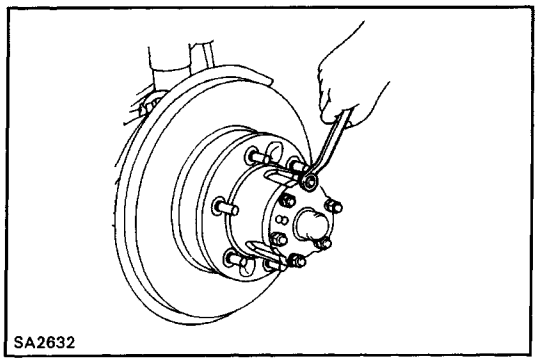
(a) Using a screwdriver and hammer, remove the grease cap from the flange.

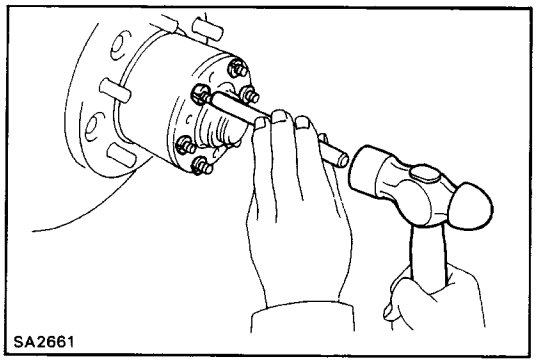


(b) Using a snap ring expander, remove the snap ring.

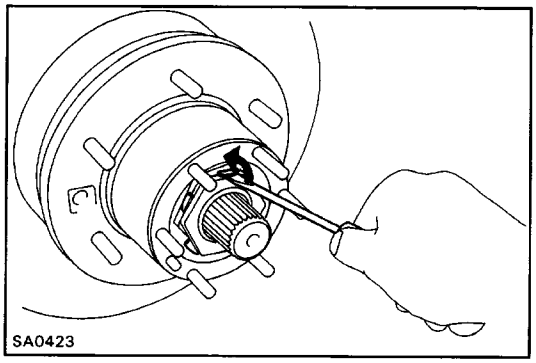


(c) Remove the six mounting nuts.



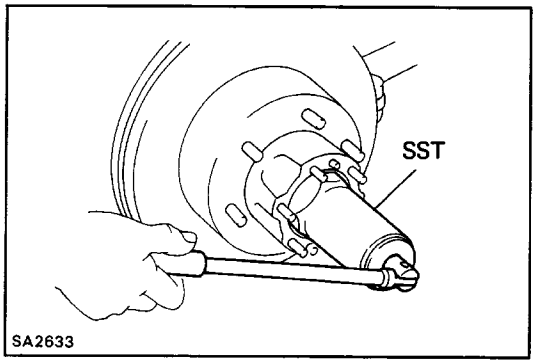


(d) Using a brass bar and hammer, tap the bolts heads and remove the cone washers.
(e) Pull out the flange.

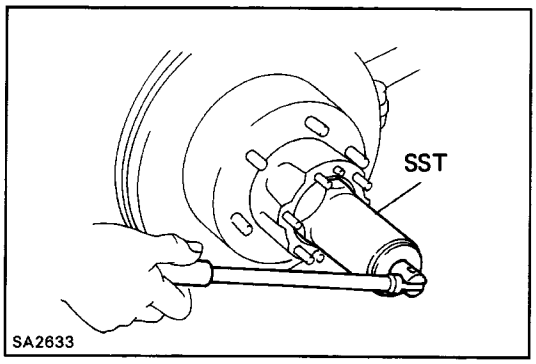


3. REMOVE AXLE HUB WITH DISC

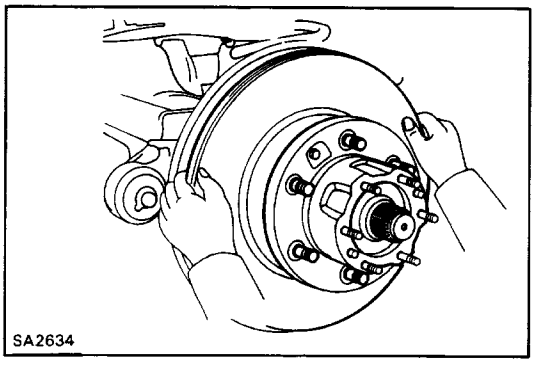
(a) Using a screwdriver, release the lock washer.



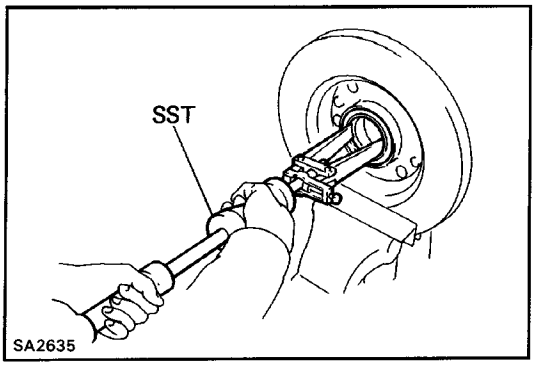
(b) Using SST, remove the lock nut.
SST 09607–60020
(c) Remove the lock washer.



(d) Using SST, remove the adjusting nut.
SST 09607–60020



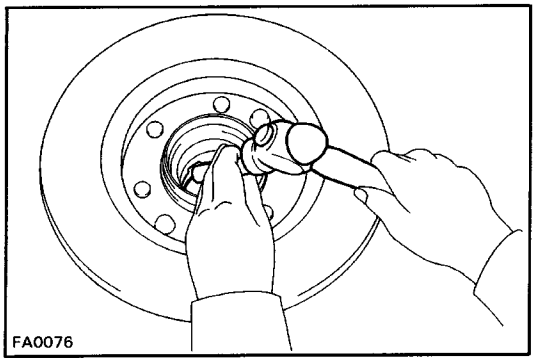
(e) Remove the axle hub with the disc.



4. REMOVE INNER BEARING AND OIL SEAL

(a) Using SST, remove the oil seal.
SST 09308–00010

(b) Remove the inner bearing from axle hub.



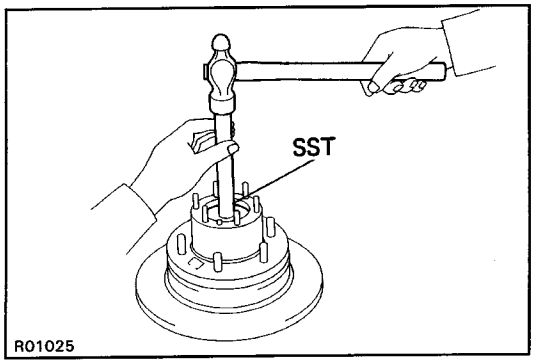
INSPECTION AND REPAIR OF FRONT AXLE HUB

1. INSPECT BEARING

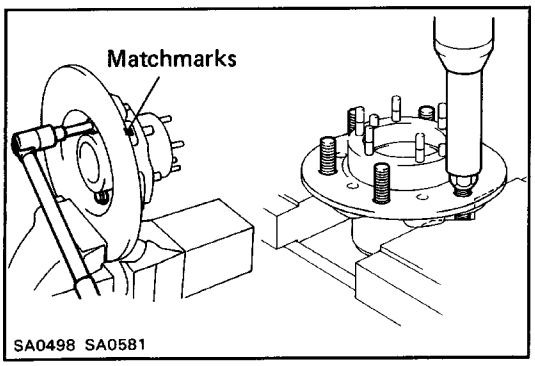
Clean the bearings and outer races and inspect them for wear or damage.

2. REPLACE BEARING OUTER RACE

(a) Using a brass bar and hammer, drive out the bearing outer race.



(b) Using SST, carefully drive in a new bearing outer race.
SST 09608–35014
Inner Bearing (09608–06020, 09608–06210)
Outer Bearing (09608–06020, 09608–06200)



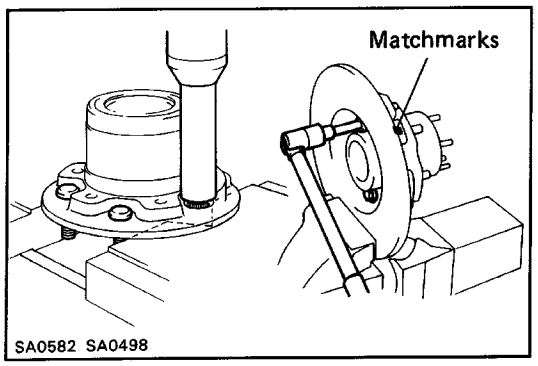
3. REPLACE HUB BOLTS

(a) Place matchmarks on the axle hub and rotor disc.

(b) Remove the six bolts and rotor disc from the axle hub.

(c) Install the nut to the hub bolt.

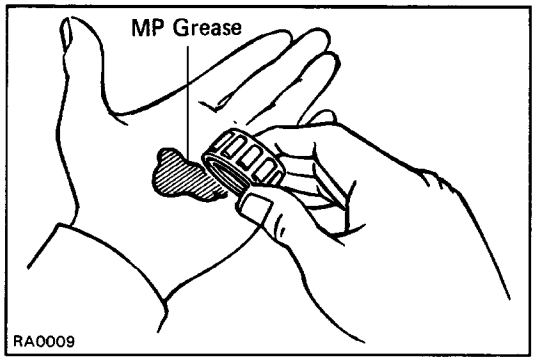
(d) Using an extension bar and press, press out the hub bolt.



(e) Using an extension bar and press, press in new hub bolt.

(f) Align the matchmarks on the axle hub and rotor disc.

(g) Install and torque the six bolts.
Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)

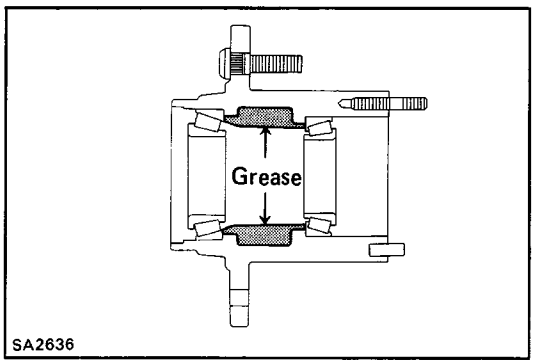


ASSEMBLY OF FRONT AXLE HUB

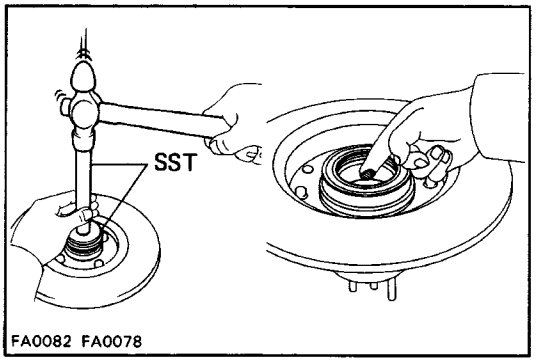
(See page SA–6)

1. PACK BEARINGS WITH MP GREASE

(a) Place MP grease in the palm of your hand.
(b) Pack grease into the bearing and continue until the grease oozes out from the outer side.
(c) Do the same around the bearing.

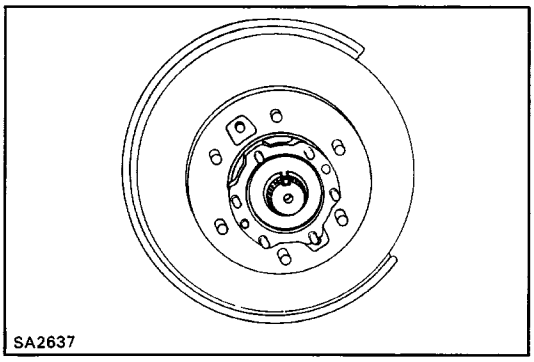


2. COAT INSIDE OF HUB AND CAP WITH MP GREASE



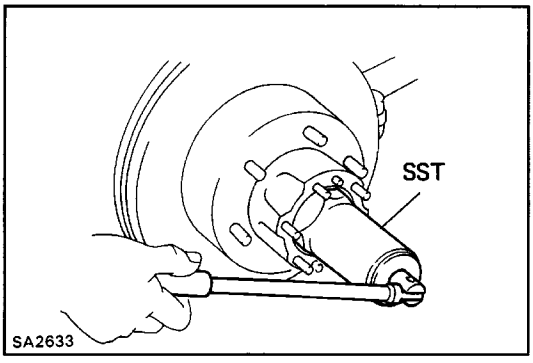
3. INSTALL INNER BEARING AND OIL SEAL

(a) Place inner bearing into the hub.
(b) Using SST, drive in the oil seal into the hub.
SST 09608–35014 (09608–06020, 09608–06150)
(c) Coat the oil seal with MP grease.



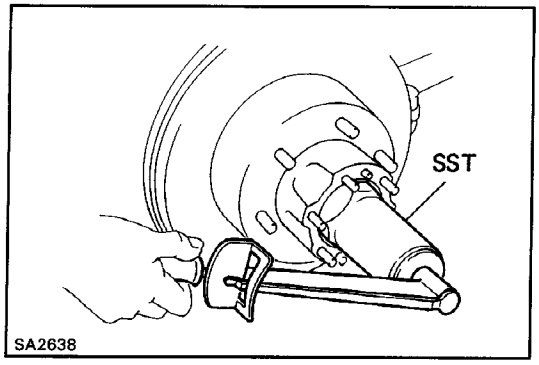
4. INSTALL AXLE HUB ON SPINDLE

(a) Place the axle hub on the spindle.
(b) Install the outer bearing and thrust washer.
(c) Install the thrust washer.

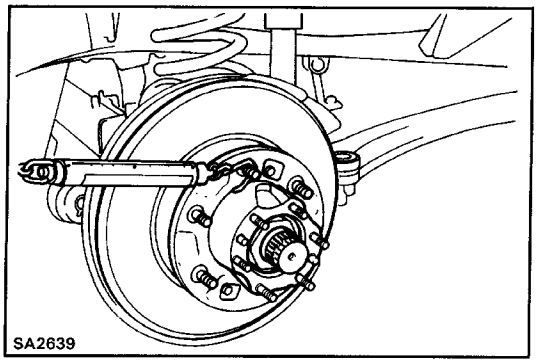


5. ADJUST PRELOAD

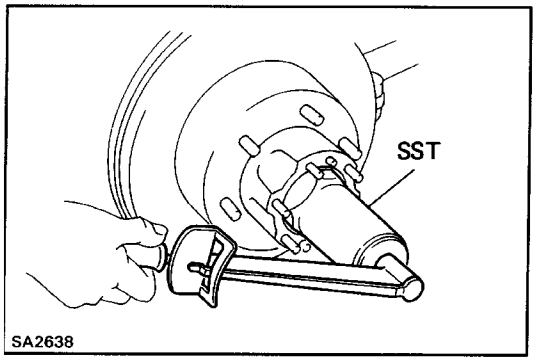
(a) Using SST, torque the bearing adjusting nut.
SST 09607–60020
Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)
(b) Turn the hub right and left two or three times.



(c) Using SST, torque the bearing adjusting nut.
SST 09607–60020
Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)
(d) Loosen the nut until it can turned by hand.

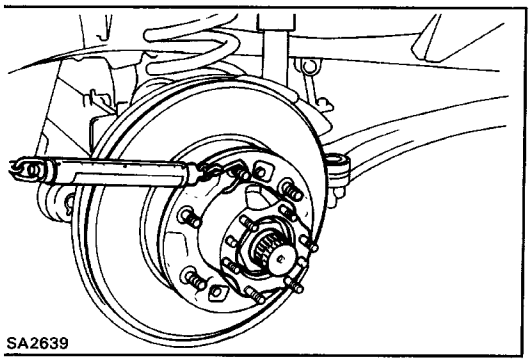


(e) Using a spring tension gauge, measure preload.
Preload (starting):
Frictional force plus 27 – 56 N
(2.8 –5.7 kgf, 6.2 – 12.6 lbf)

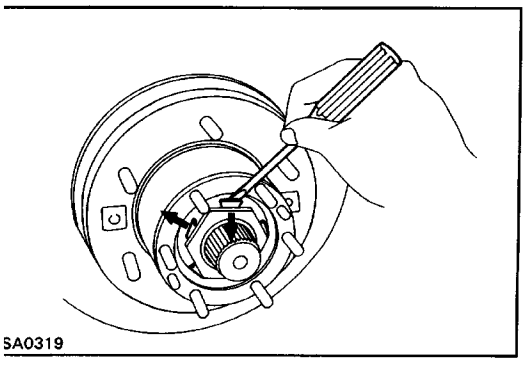


6. INSTALL LOCK WASHER AND LOCK NUT
(a) Install the lock washer and lock nut.
(b) Using SST, torque the lock nut.
SST 09607–60020

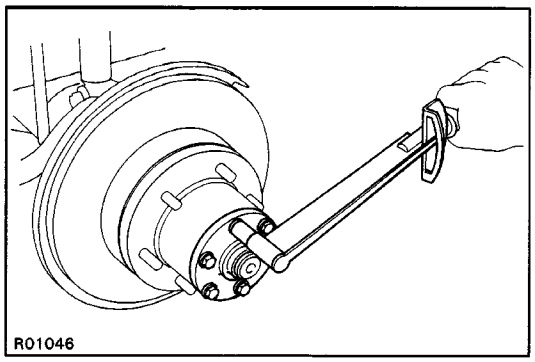
Torque: 63 N–m (650 kgf–cm, 47 ft–lbf)
(c) Check that the bearing has no play.



(d) Using a spring tension gauge, check the preload.
Preload (starting):
Frictional force plus 27 – 56 N
(2.8 –5.7 kgf, 6.2 – 12.6 lbf)
If not within specification, adjust with the adjusting nut after remove the lock washer and lock nut.

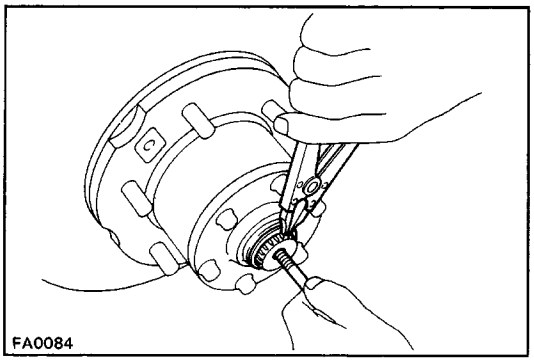


(e) Secure the lock nut by bending one of the lock washer tooth inward and another lock washer tooth outward.

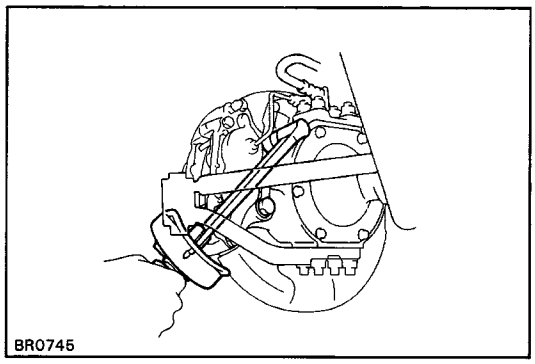


7. INSTALL FLANGE

(a) Place a new gasket in position on the axle hub.
(b) Install the flange to the axle hub.
(c) Install the six cone washers and nuts.
Torque the nuts.
Torque: 35 N–m (360 kgf–cm, 26 ft–lbf)

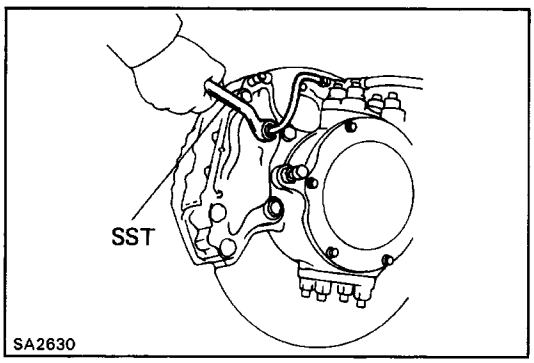


(d) Install the bolt in the axle shaft and pull it out.
(e) Using a snap ring expanders, install the snap ring.
(f) Remove the bolts.
(g) Install the cap to the flange.



8. INSTALL BRAKE CYLINDER

(a) Install the brake cylinder to the steering knuckle.
Torque: 123 N–m (1,250 kgf–cm, 90 ft–lbf)



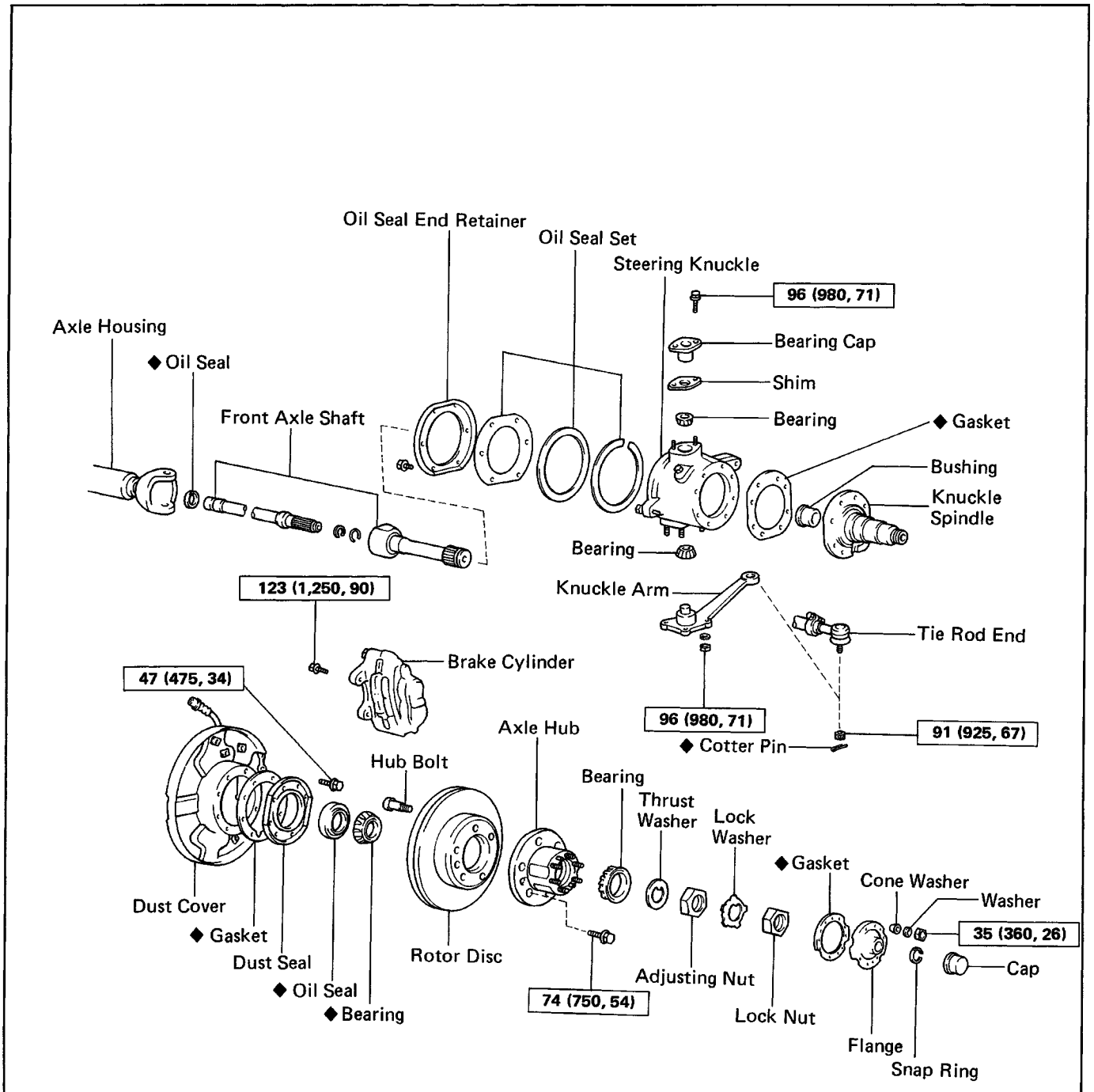
(b) Using SST, connect the brake tube.
SST 09751–36011
Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

9. BLEED BRAKE LINE

(See page BR–7)

STEERING KNUCKLE AND AXLE SHAFT

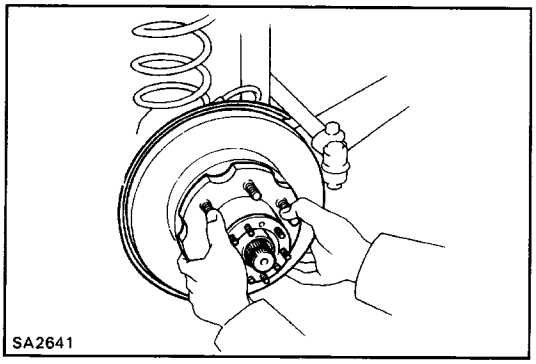
COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

RO1045

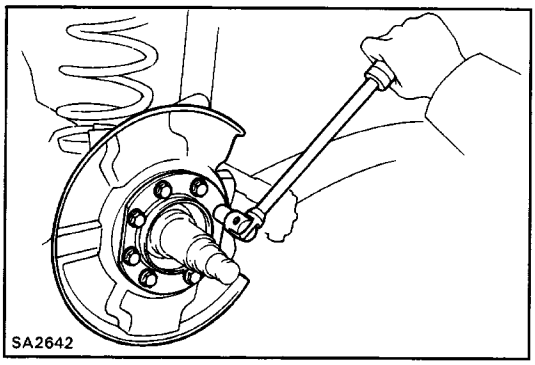


DISASSEMBLY OF STEERING KNUCKLE AND AXLE SHAFT

(See page SA–13)

1. REMOVE FRONT AXLE HUB

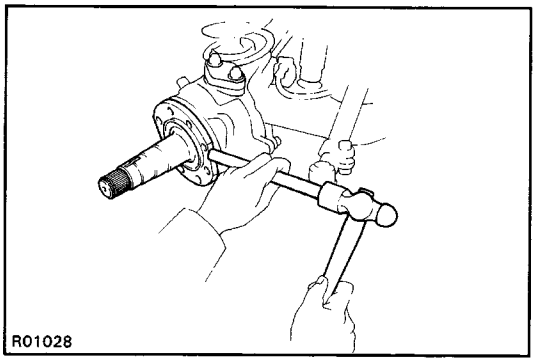
(See page SA–6)



2. REMOVE KNUCKLE SPINDLE MOUNTING BOLTS

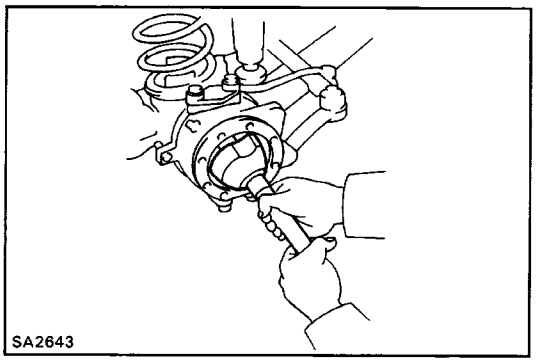
3. REMOVE DUST SEAL AND DUST COVER

Remove the eight bolts and the dust seal, dust cover and gasket.



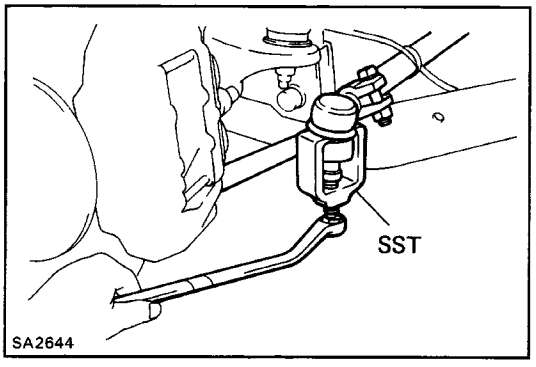
4. REMOVE KNUCKLE SPINDLE

Using a brass bar and hammer, tap the knuckle spindle off the steering knuckle.



5. REMOVE AXLE SHAFT

Position one flat part of the outer shaft upward and pull out the axle shaft.

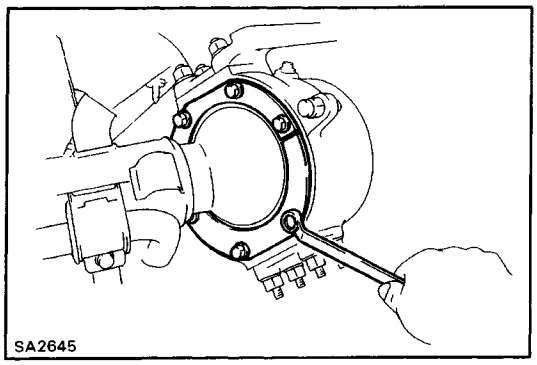


6. DISCONNECT TIE ROD END FROM KNUCKLE ARM

(a) Remove the cotter pin and castle nut.

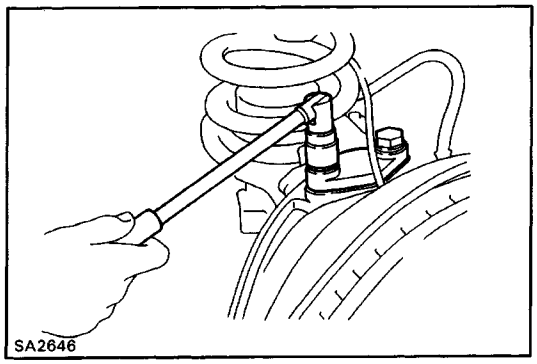
(b) Using SST, disconnect the tie rod end from the knuckle arm.

SST 09611–22012



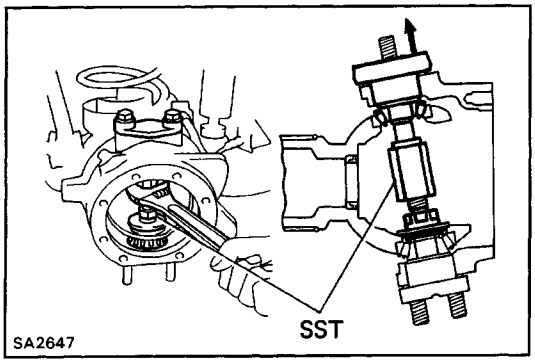
7. REMOVE OIL SEAL END RETAINER

Remove the six bolts and the retainer.



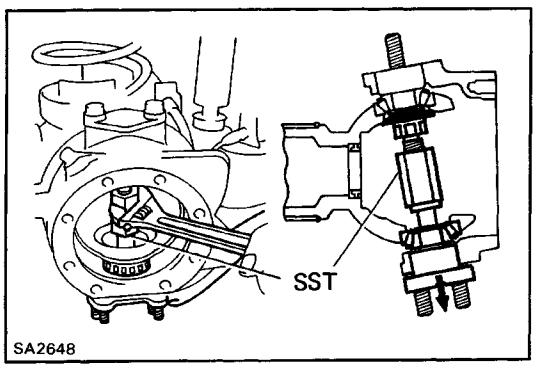
8. REMOVE KNUCKLE ARM AND BEARING CAP

(a) Remove the knuckle and bearing cap mounting nuts.

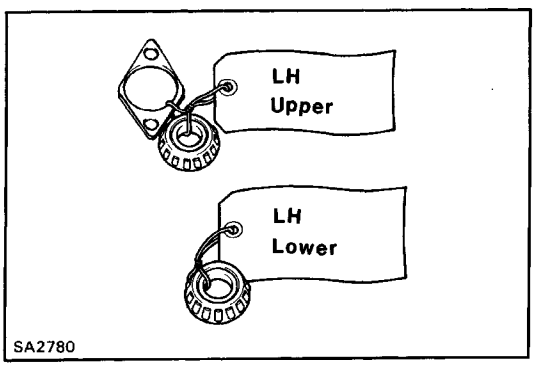


(b) Using SST, push out the knuckle arm and shims from the steering knuckle.
SST 09606–60020

HINT: Use the SST without a collar.



(c) Using SST, push out the bearing cap and shims from the steering knuckle.
SST 09606–60020



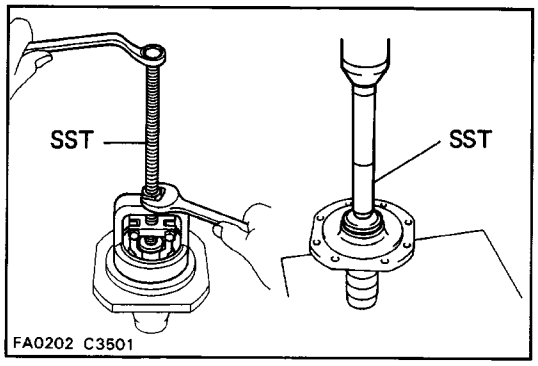
9. REMOVE STEERING KNUCKLE AND BEARING

HINT: Mark the removed adjusting shims and bearings so as to enable reassembling them to their proper posi–tions.

INSPECTION AND REPAIR OF STEERING KNUCKLE AND AXLE SHAFT

1. INSPECT KNUCKLE SPINDLE

Clean the knuckle spindle and inspect the bushing for wear or damage.



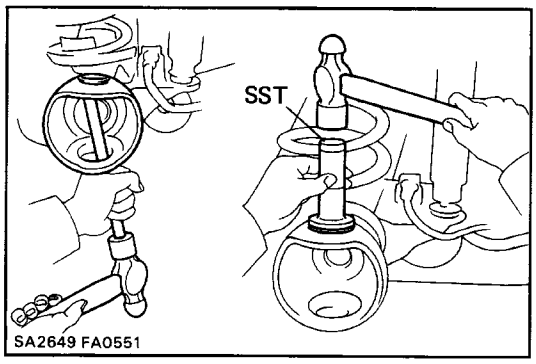
2. REPLACE BUSHING

(a) Using SST, remove the bushing.
SST 09612–65014 (09612–01010, 09612–01050)

(b) Using SST, press a new bushing into the spindle.
SST 09618–60010

3. INSPECT BEARING

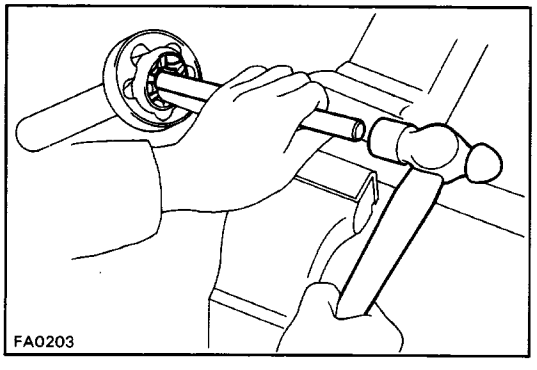
Clean the bearings and outer races and inspect them for wear or damage.



4. IF NECESSARY, REPLACE BEARING OUTER RACE

(a) Using a brass bar, drive out the bearing outer race.

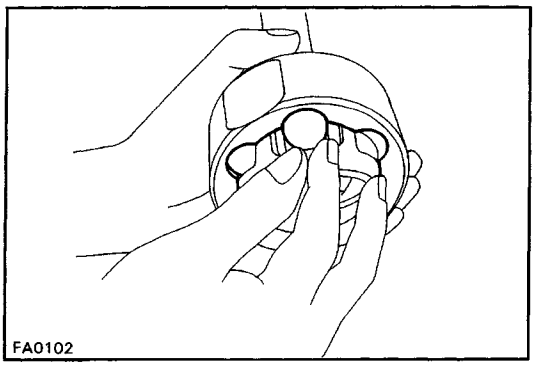
(b) Using SST, carefully drive in a new bearing outer race.
SST 09605–60010



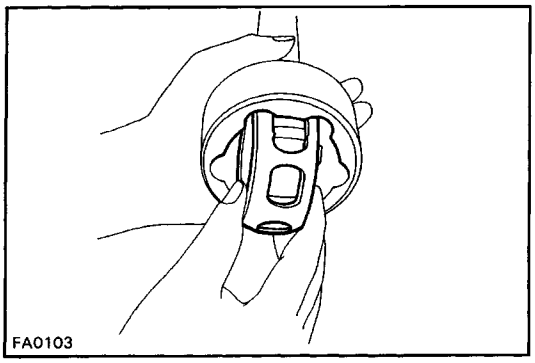
5. INSECT BIRFIELD JOINT INNER PARTS

(a) Hold the inner shaft in a vise.

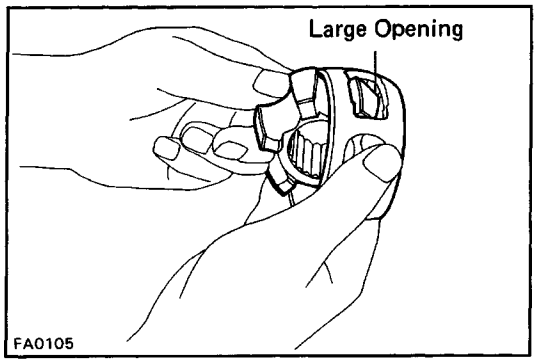
(b) Place a brass bar against the joint inner race and drive out the outer shaft.



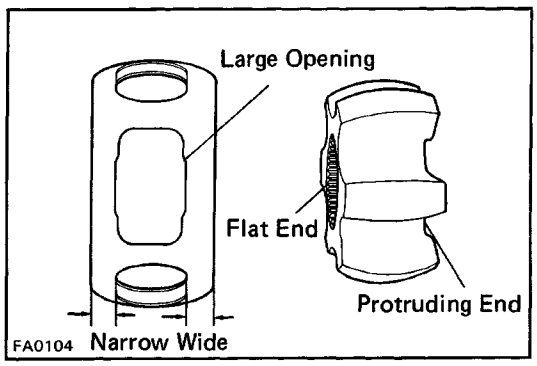
(c) Tilt the inner race and cage and take out the bearing balls one by one.



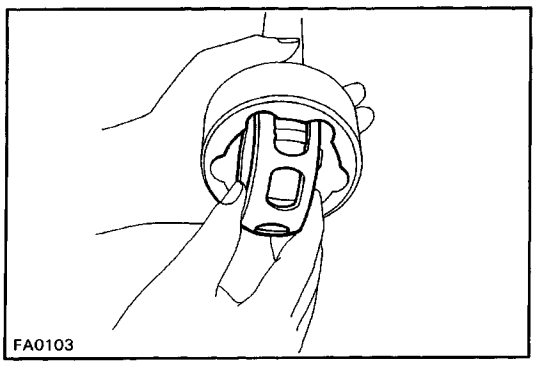
(d) Fit the two large openings in the cage against the protruding parts of the outershaft, and pull out the cage and inner race.



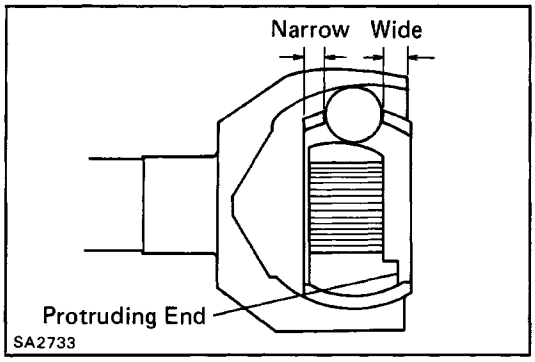
(e) Take out the inner race from the cage through the large opening.
(f) Clean and inspect the joint parts for wear or dam–age.



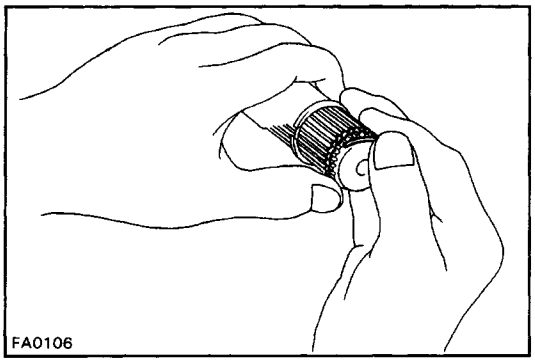
(g) Coat the joint inner parts and outer shaft inside with molybdenum disulphide lithium base grease.
(h) Install the inner race in the cage through the large opening.
(i) Position the protruding end of the inner race toward the wide side of the cage.



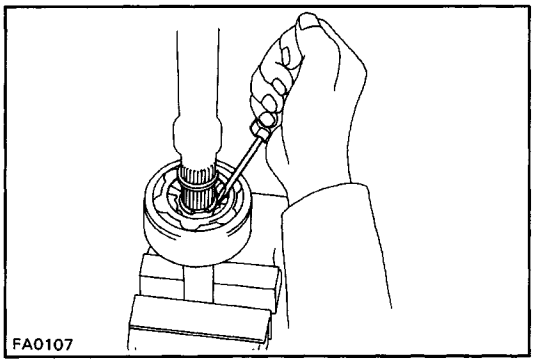
(j) Assemble the cage and inner race to the outer shaft by fitting the two large openings in the cage against the protruding parts of the outer shaft.



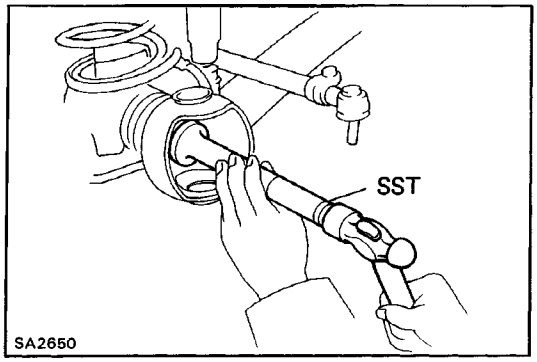
(k) Make sure to position the wide side of the cage and the inner race protruding end outward.
(I) Fit in the inner race and cage, and install the six bearing balls in the outer shaft.(See step (c))
(m) Pack molybdenum disulphide lithium base grease in the outer shaft.



(n) Install a new snap rings on the inner shaft.



(o) Hold the outer shaft in a vise and, while compress–ing the snap inner ring, install the inner shaft to the outer shaft.
(p) Verify that the inner shaft cannot be pulled out.

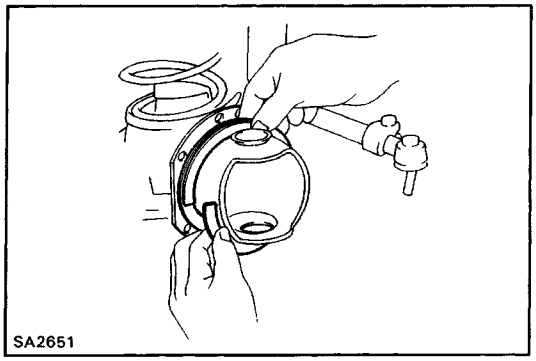


ASSEMBLY OF STEERING KNUCKLE AND AXLE SHAFT

(See page SA–13)

1. INSTALL OIL SEAL TO AXLE HOUSING

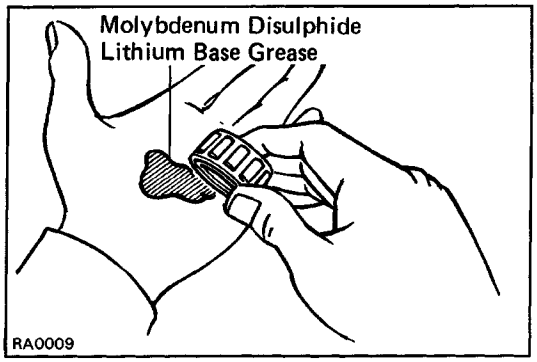
Using SST, drive in the oil seal into the axle housing.
SST 09618–60010



2. INSTALL OIL SEAL SET END RETAINER

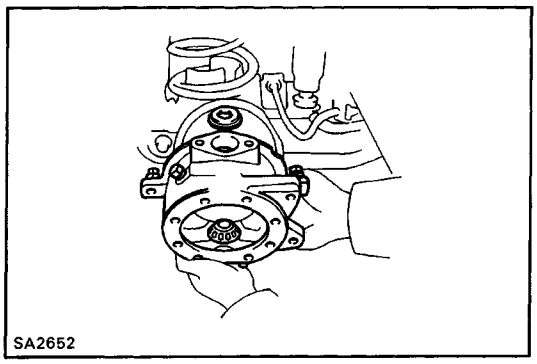
Install the parts in the following order:

(a) Felt dust seal
(b) Rubber seal
(c) Steel ring



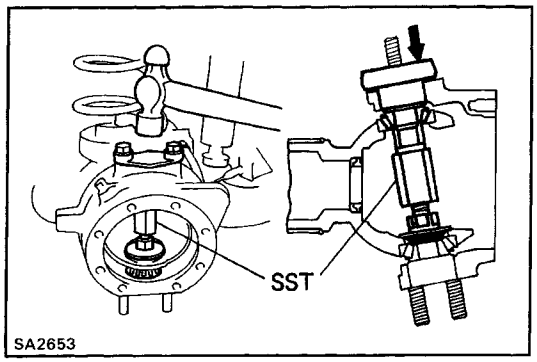
3. PACK BEARINGS WITH MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE

(a) Place molybdenum disulphide lithium base grease in the palm of your hand.
(b) Pack grease into the bearing, continuing until the grease oozes out from the other side.
(c) Do the same around the bearing circumference.



4. INSTALL STEERING KNUCKLE AND BEARINGS

(a) Place the bearings in positions on the knuckle and axle housing.
(b) Install the knuckle on the axle housing.

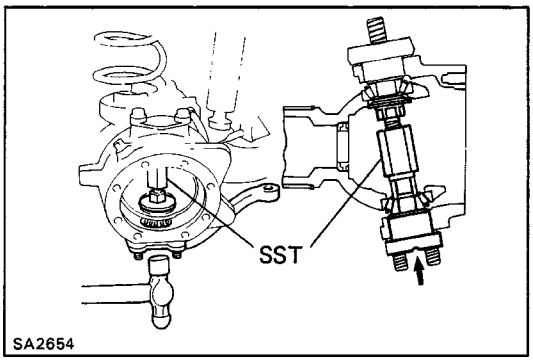


5. INSTALL KNUCKLE ARM AND BEARING CAP

(a) Using SST, support the upper bearing inner race.
SST 09606–60020

HINT: Use SST with a collar.

(b) Install the bearing cap over the shims that were originally used or were selected as described in the adjustment operations.
(c) Using a hammer, tap the bearing cap into the bearing inner race.

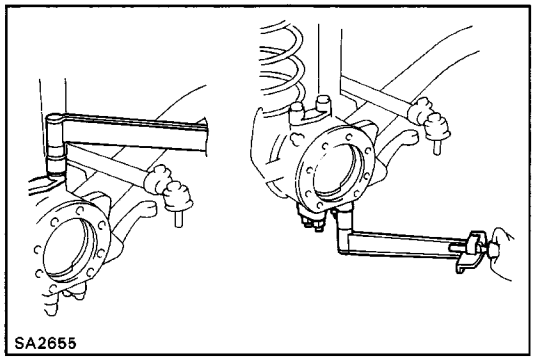


(d) Using SST, support the lower bearing inner race.
SST 09606–60020

HINT: Use SST with a collar.

(e) Using a hammer, tap the knuckle arm into the bearing inner race.

(f) Remove SST from the knuckle.



(Knuckle Arm)

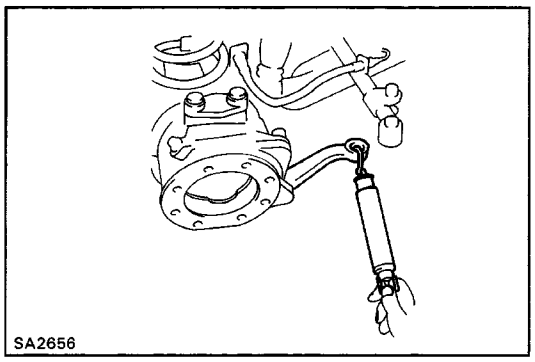
Install the cone washers, plate washers and torque the nuts.

Torque: 96 N–m (980 kgf–cm, 71 ft–lbf)

(Bearing Cap)

Install the spring washers and torque the nuts.

Torque: 96 N–m (980 kgf–cm, 71 ft–lbf)



6. MEASURE BEARINGS PRELOAD

Using a spring tension gauge, measure the preload.

Preload (starting): 25 – 44 N
(2.5 – 4.5 kgf, 5.6 – 9.9 lbf)

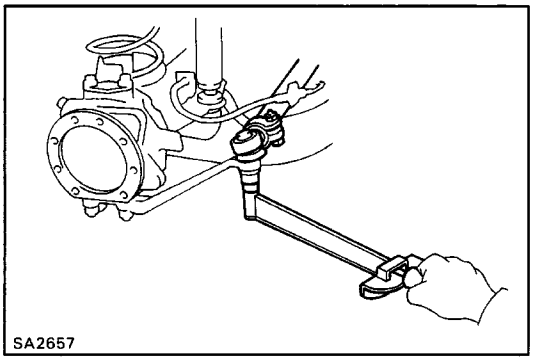
7. ADJUST BEARING PRELOAD

(a) Remove the bearing cap and the knuckle arm.
(See page SA–15)

(b) Select the adjusting shims.
Adjusting shim thickness

Thickness mm (in.)
0.1 (0.004)
0.2 (0.008)
0.5 (0.020)
1.0 (0.039)

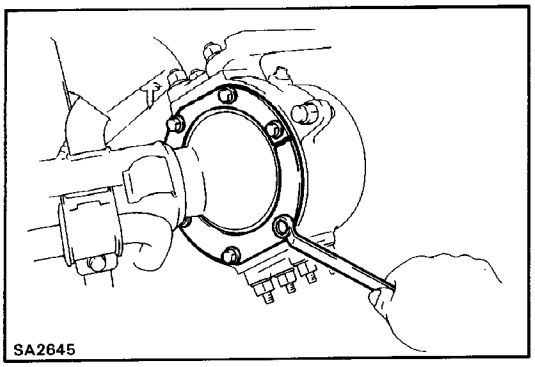
(c) Install the bearing cap and knuckle arm.
(See page SA–19)



8. CONNECT TIE ROD TO KNUCKLE ARM

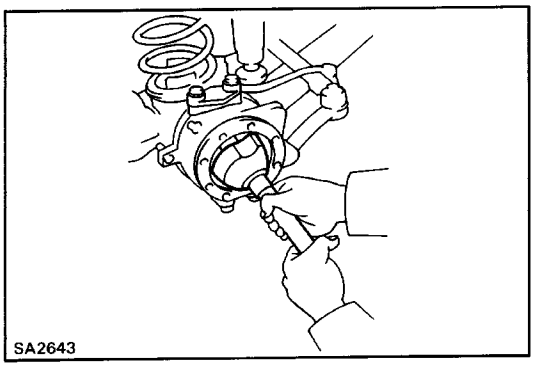
Torque the castle nut and secure it with a cotter pin.

Torque: 91 N–m (925 kgf–cm, 67 ft–lbf)



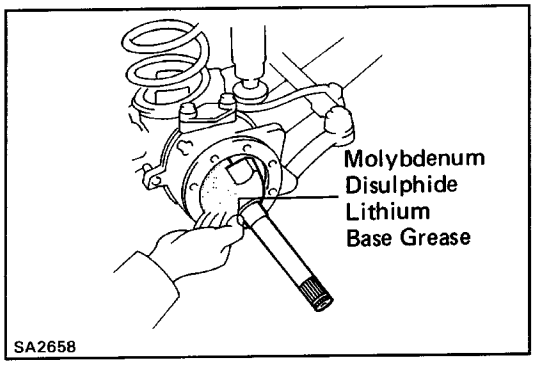
9 INSTALL OIL SEAL SET RETAINER TO KNUCKLE

Install the oil seal set retainer to steering knuckle with the six bolts.



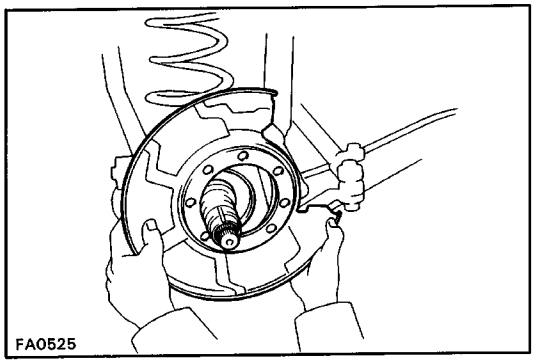
10. INSTALL AXLE SHAFT

Position one flat part of the outer shaft upward, and install the shaft.



11. PACK MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE

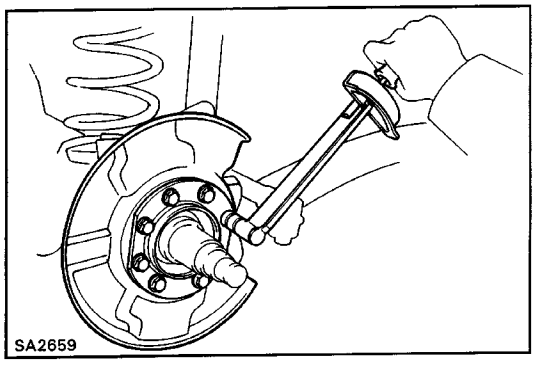
Pack molybdenum disulphide lithium base grease into the knuckle to about three fourths of the knuckle.



12. INSTALL KNUCKLE SPINDLE DUST COVER WITH NEW GASKETS AND DUST SEAL

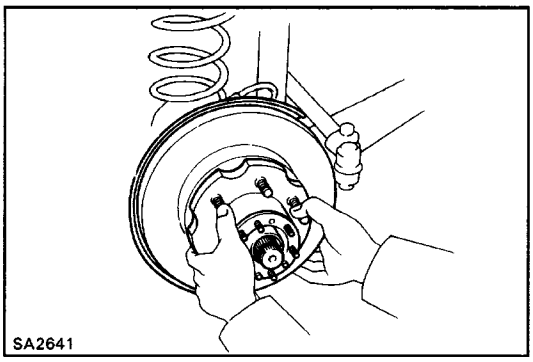
(a) Place a new gasket in the position on the knuckle and install the spindle.

(b) Place the gasket, dust cover and seal on the spindle.



(c) Torque the spindle mounting bolts.

Torque: 47 N–m (475 kgf–cm, 34 ft–lbf)

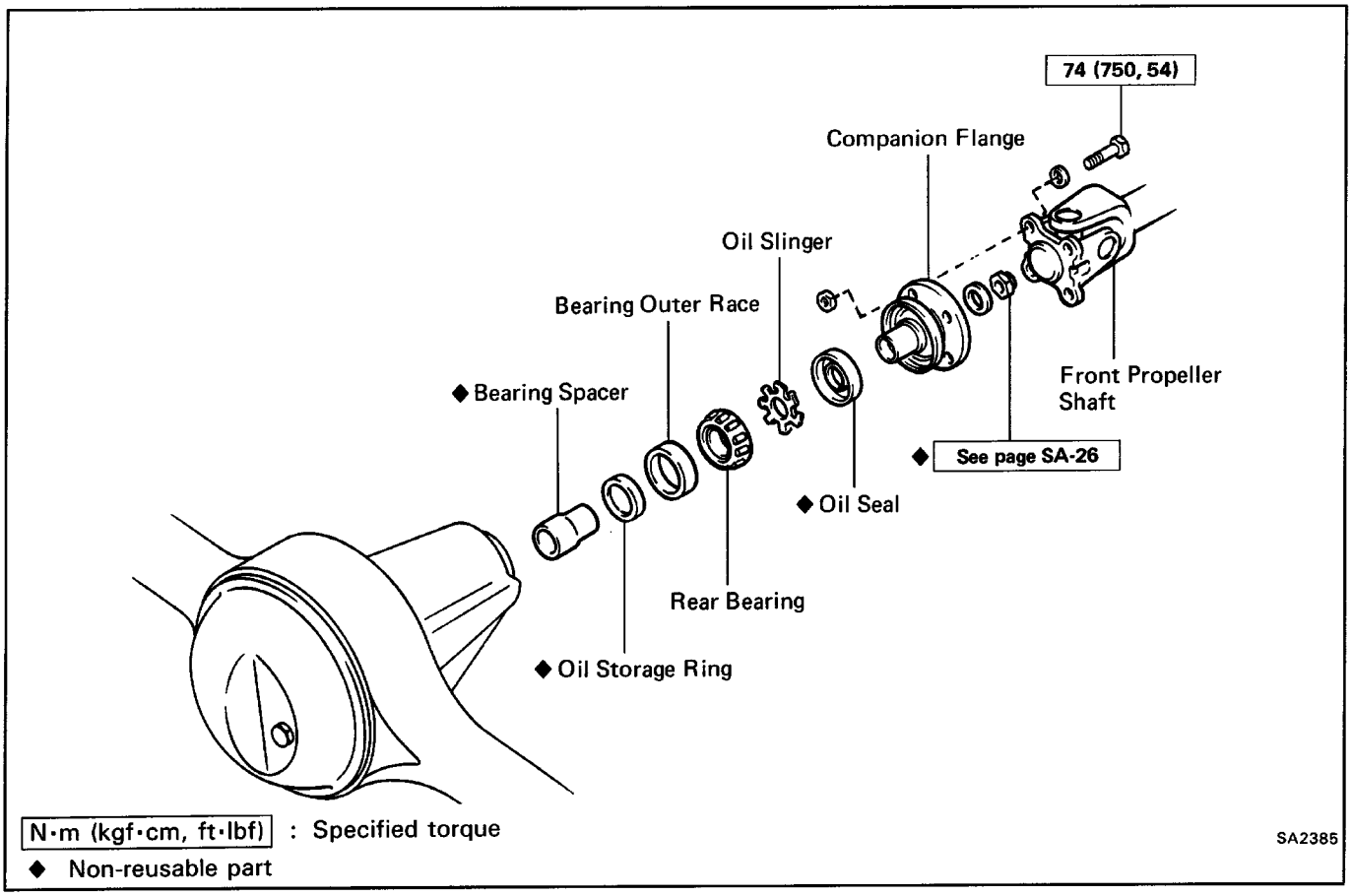


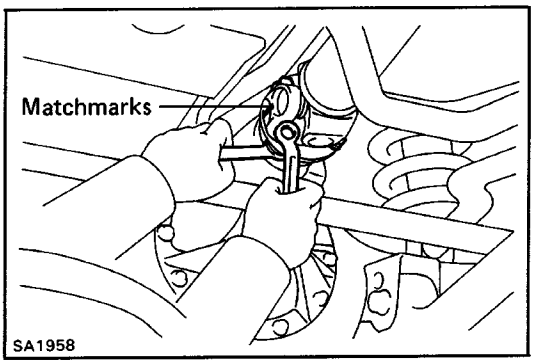
13. INSTALL AXLE HUB (See page SA–6)

FRONT DIFFERENTIAL

On–Vehicle Replacement of Oil Seal

COMPONENTS

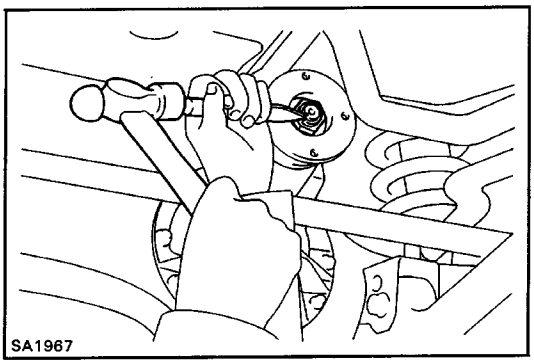




1. DISCONNECT FRONT PROPELLER SHAFT

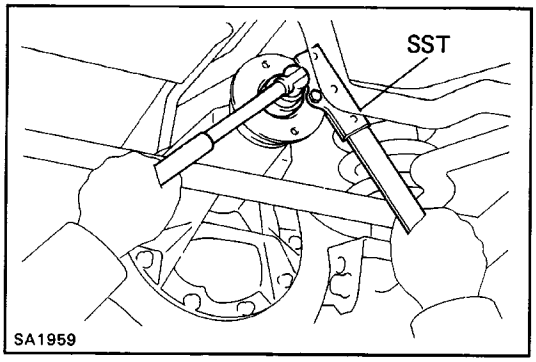
(a) Place matchmarks on the flanges.

(b) Remove the four bolts and nuts.

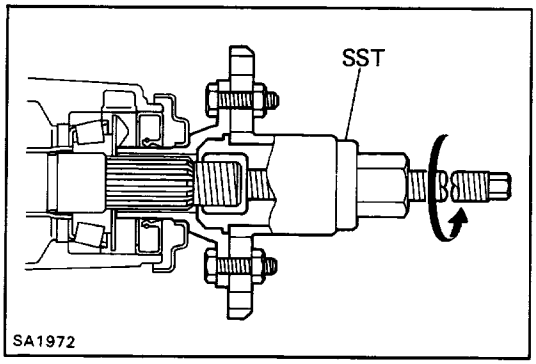


2. REMOVE COMPANION FLANGE

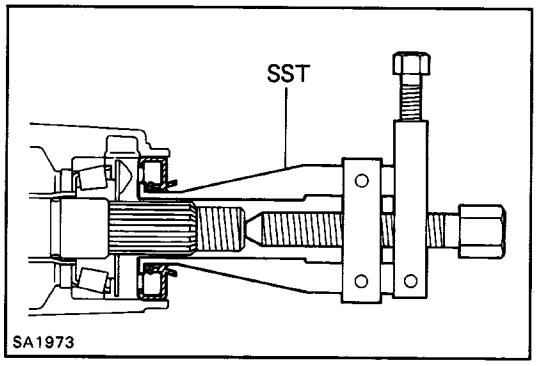
(a) Using a chisel and hammer, loosen the staked part of nut.



(b) Using SST to hold the flange, remove the nut and plate washer.
SST 09330–00021



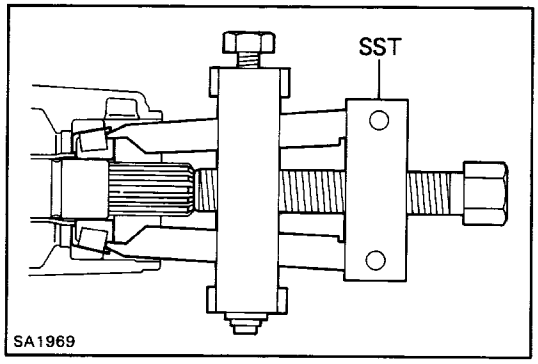
(c) Using SST, remove the companion flange.
SST 09557–22022 (09557–22050)



3. REMOVE OIL SEAL AND OIL SLINGER

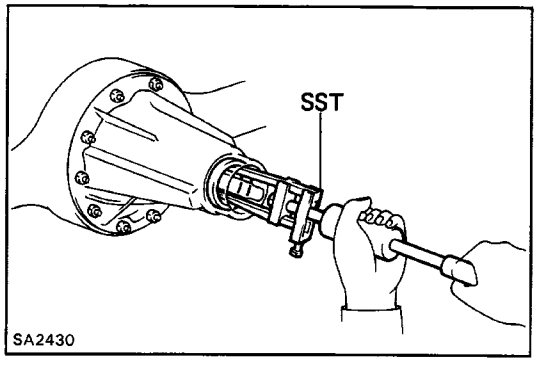
(a) Using SST, remove the oil seal.
SST 09308–10010

(b) Remove the oil slinger.



4. REMOVE REAR BEARING

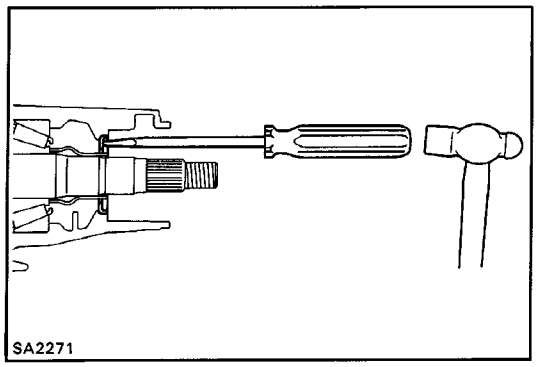
Using SST, remove the rear bearing.
SST 09556–22010



5. REMOVE BEARING OUTER RACE

Using SST, remove the bearing outer race.
SST 09308–00010

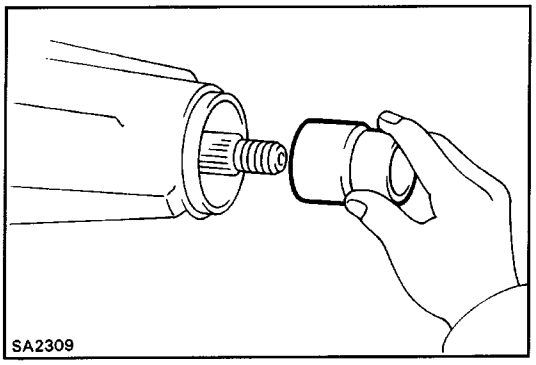
NOTICE: Do not scratch the taper surface of the outer race.



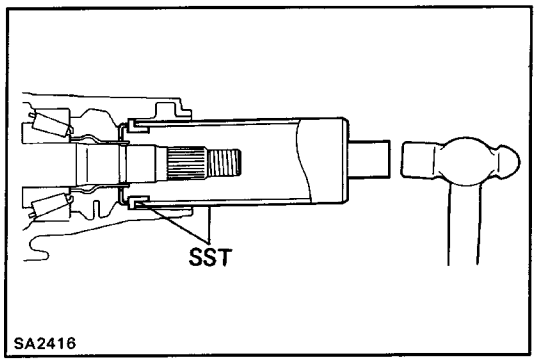
6. REMOVE OIL STORAGE RING

Using a screwdriver, bend the oil storage ring and drive it out.

7. REMOVE BEARING SPACER

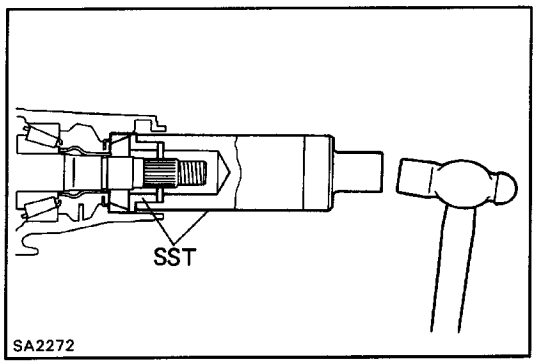


8. INSTALL NEW BEARING SPACER



9. INSTALL NEW OIL STORAGE RING

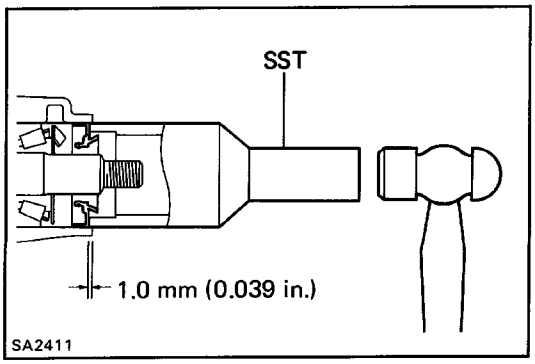
Using SST, drive in a new oil storage ring.
SST 09316–60010 (09316–00010, 09316–00020)



10. INSTALL BEARING OUTER RACE

Using SST, drive in the bearing outer race.
SST 09316–60010 (09316–00010, 09316–00020)

11. INSTALL REAR BEARING



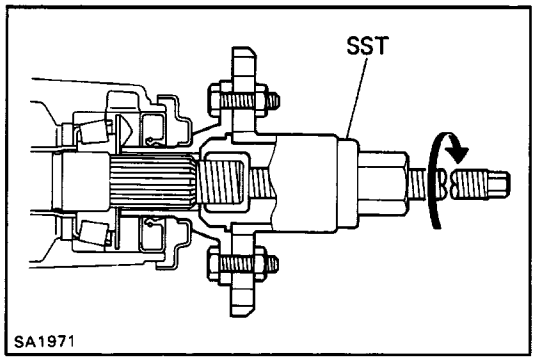
12. INSTALL OIL SLINGER AND NEW OIL SEAL

(a) Install the oil slinger facing as shown.

(b) Using SST, drive in a new oil seal as shown.
SST 09214–76011

Oil seal drive in depth: 1.0 mm (0.039 in.)

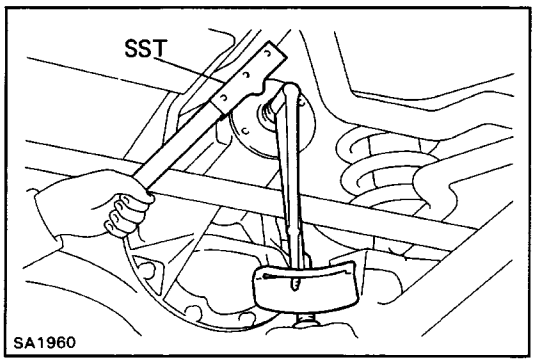
(c) Coat the lip of the oil seal with MP grease.



13. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange on the drive pinion.
SST 09557–22022 (09557–22050)

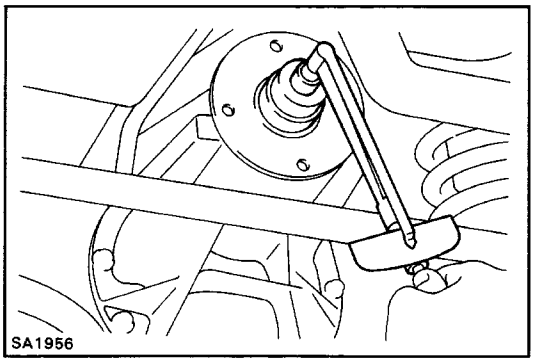
(b) Place the plate washer on the companion flange.



(c) Apply a light coat of gear oil on the threads of a new companion flange nut.

(d) Using SST to hold the flange, torque the nut.
SST 09330–00021

Torque: 196 N–m (2,000 kgf–cm, 145 ft–lbf)



14. CHECK DRIVE PINION PRELOAD

Using a torque meter, measure the preload of the back–lash between the drive pinion and ring gear.

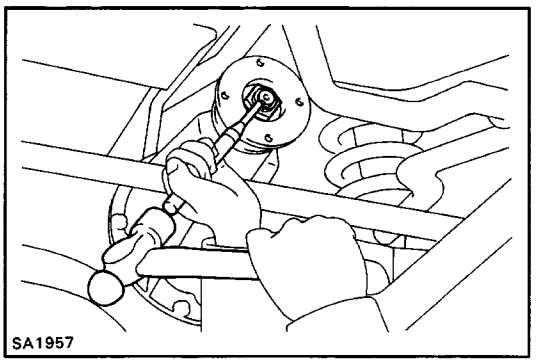
Preload (at starting):
New bearing
0.9 – 1.6 N–m
(10 – 16 kgf–cm, 8.7 – 13.9 in.–lbf)
Reused bearing
0.5 – 0.8 N–m (5 – 8 kgf–cm, 4.3 – 6.9 in.–lbf)

- If the preload is greater than specification, replace the bearing spacer.
- If the preload is less than specification, retighten the nut 13 N–m (130 kgf–cm, 9 ft–lbf) a little at a time until the specified preload is reached.

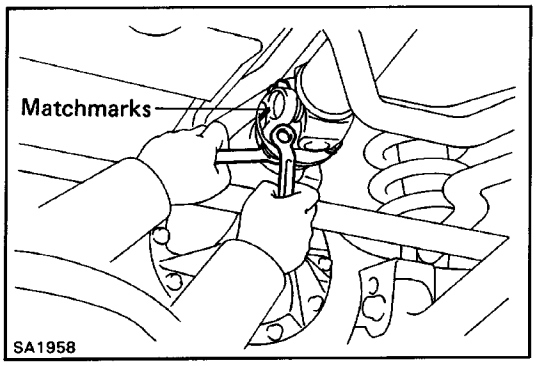
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

Maximum torque: 343 N–m (3,500 kgf–cm, 253 ft–lbf)

If everything is normal, coat the threads with gear oil, then repeat the above operation.



15. STAKE DRIVE PINION NUT

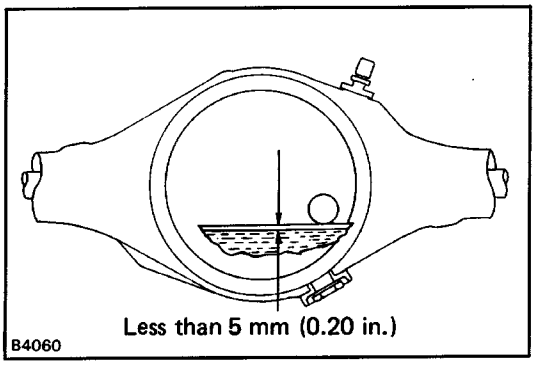


16. CONNECT FRONT PROPELLER SHAFT

(a) Align the matchmarks on the flanges and connect the flanges with four bolts, spring washers and nuts.

(b) Torque the bolts and nuts.

Torque: 74 N–m (750 kgf–cm, 54 ft–lbf)



17. CHECK DIFFERENTIAL OIL LEVEL

Fill with hypoil gear oil if necessary.

Oil type: Hypoid gear oil API GL–5

Recommended oil viscosity:

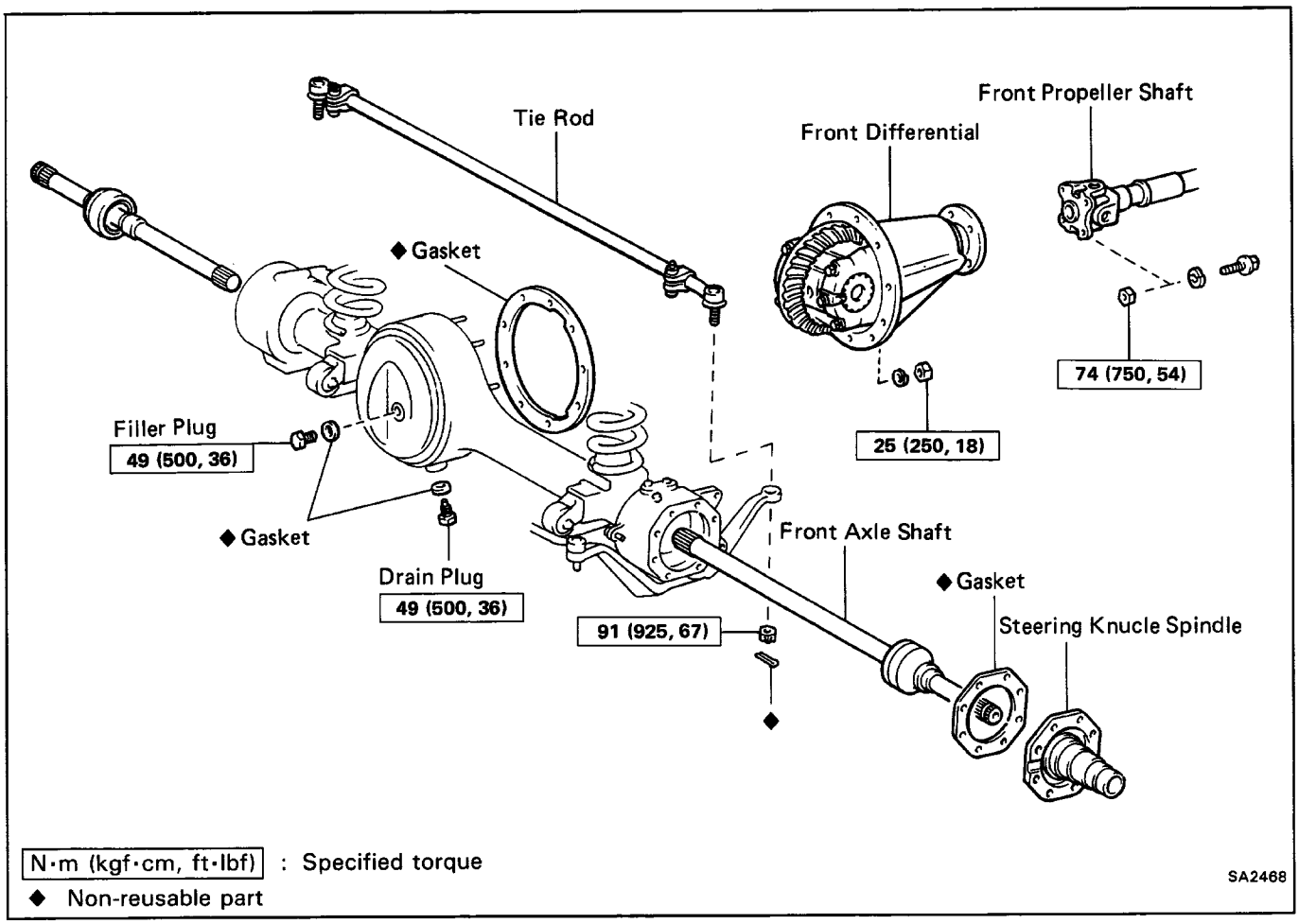
Above – 18˚C (0˚F) SAE 90

Below – 18˚C (0˚F) SAE 80W or 80W–90

Capacity: 2.8 liters (2.9 US qts, 2.4 Imp. qts)

Removal and Installation of Front Differential

COMPONENTS



REMOVAL OF FRONT DIFFERENTIAL

1. REMOVE DRAIN PLUG AND DRAIN DIFFERENTIAL OIL

2. REMOVE FRONT AXLE SHAFTS

(See steps 1 to 5 on page SA–15)

3. REMOVE TIE ROD

(See step 6 on page SA–15)

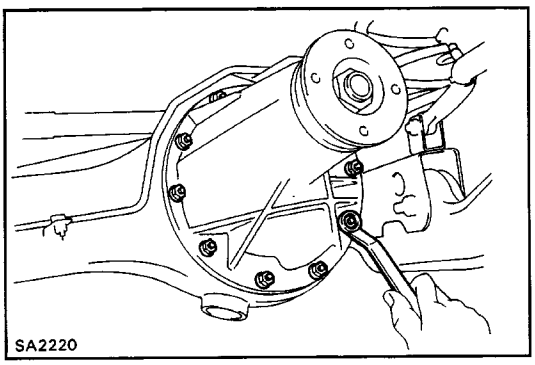
4. DISCONNECT FRONT PRORELLER SHAFT

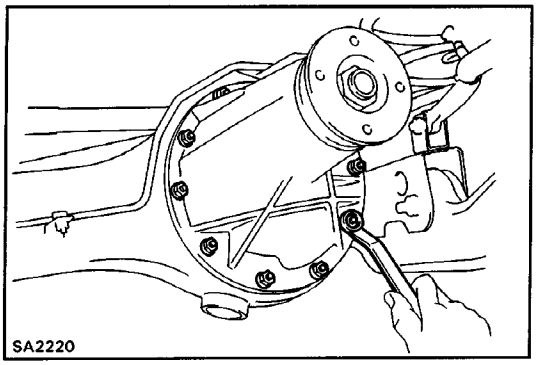
(See step 1 on page SA–23)

5. REMOVE DIFFERENTIAL CARRIER ASSEMBLY

Remove the ten nuts and the differential carrier assembly.

NOTICE: Do not scratch the installation surface.

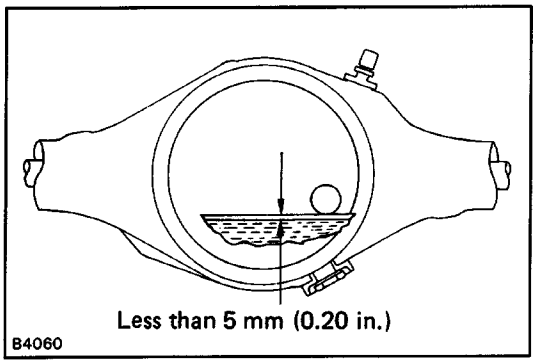




INSTALLATION OF FRONT DIFFERENTIAL
(See page SA–28)
1. INSTALL NEW GASKET
2. INSTALL DIFFERENTIAL CARRIER ASSEMBLY
Install the differential carrier assembly in the axle and install the 10 nuts. Torque the nuts.

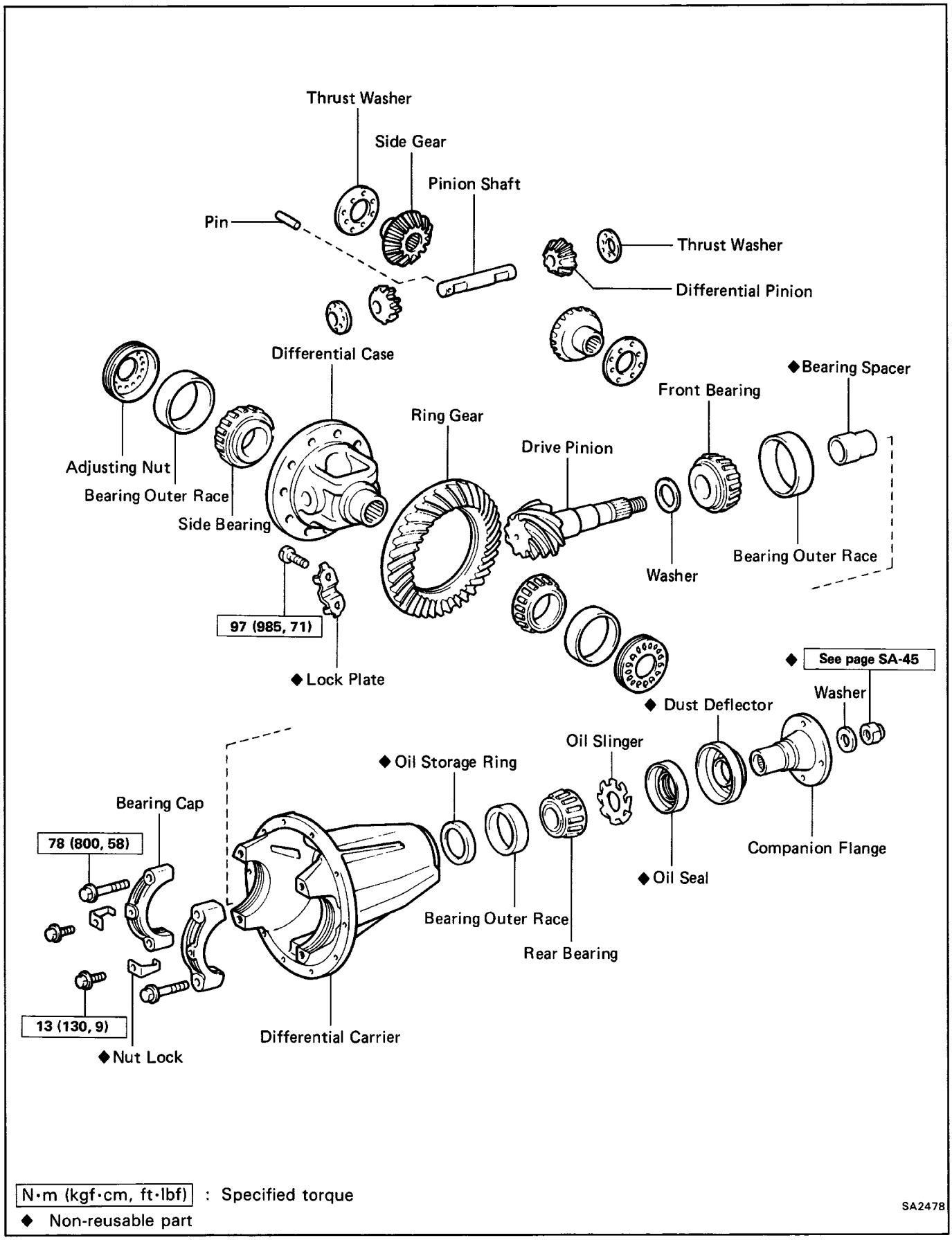
Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)

3. CONNECT FRONT PROPELLER SHAFT
(See step 16 on page SA–27)
4. INSTALL TIE ROD
(See step 8 on page SA–20)
5. INSTALL FRONT AXLE SHAFTS
(See steps 10 to 13 on page SA–20)
6. INSTALL DRAIN PLUG
7. FILL DIFFERENTIAL WITH GEAR OIL
Fill with hypoid gear oil.



Oil type: Hypoid gear oil API GL–5
Recommended oil viscosity:
Above – 18˚C (0˚F) SAE 90
Below – 18˚C (0˚F) SAE 80W or 80W–90
Capacity: 2.8 liters (2.9 US qts, 2.4 Imp. qts)

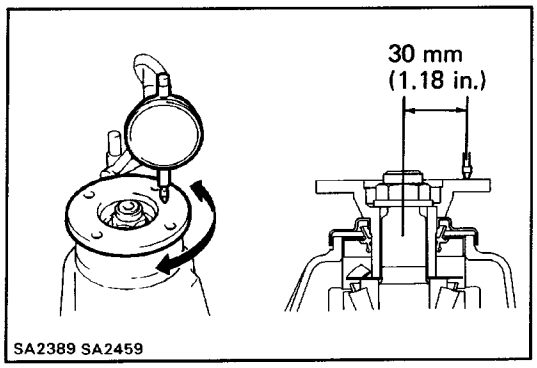
Differential Carrier
COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

SA2478

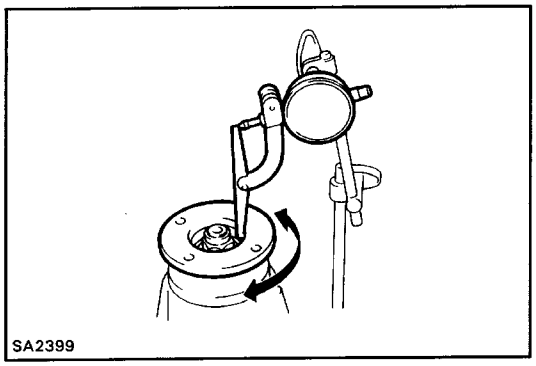
INSPECTION OF DIFFERENTIAL CARRIER



1. CHECK RUNOUT OF COMPANION FLANGE

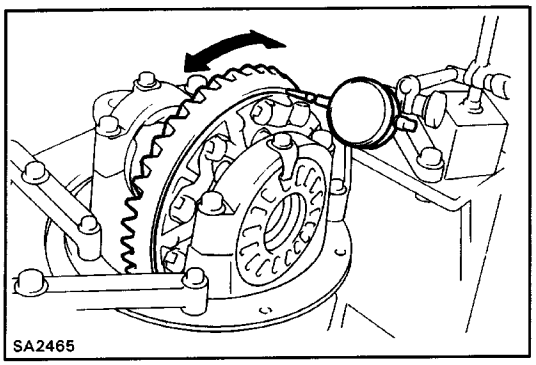
Using a dial indicator, measure the vertical and lateral runout of the companion flange.

Maximum vertical runout: 0.10 mm (0.0039 in.)



Maximum lateral runout: 0.10 mm (0.0039 in.)

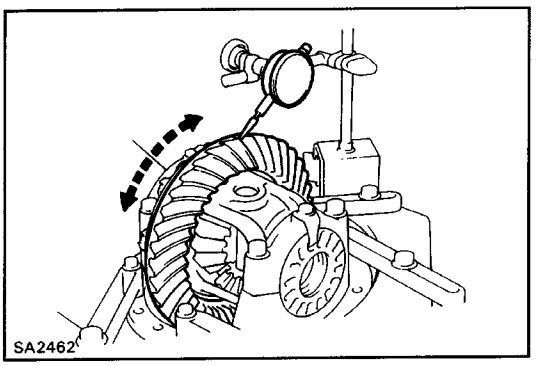
If the runout is greater than the maximum, replace the companion flange.



2. CHECK RING GEAR RUNOUT

If the runout is greater than maximum, replace the ring gear.

Maximum runout: 0.10 mm (0.0039 in.)

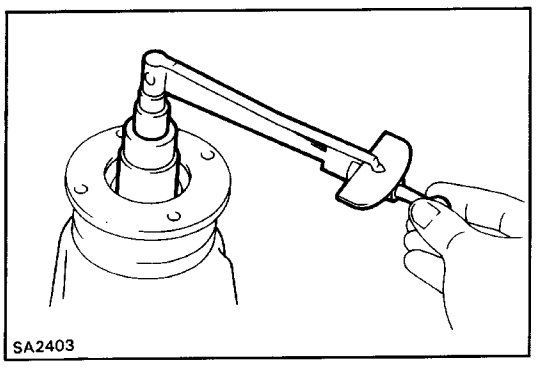


3. CHECK RING GEAR BACKLASH

If the backlash is not within specification, adjust the side bearing preload or repair as necessary.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

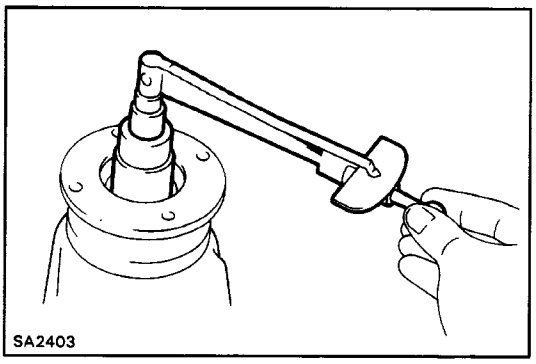
HINT: Perform the measurements at three or more posi–tions around the circumference of the ring gear.



4. MEASURE DRIVE PINION PRELOAD

Measure the drive pinion preload using the backlash of the drive pinion and ring gear.

Preload (at starting): 0.5 – 0.8 N–m
(5 – 8 kgf–cm, 4.3 – 6.9 in.–lbf)

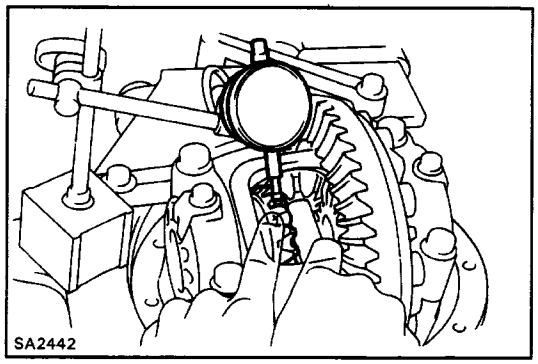


5. CHECK TOTAL PRELOAD

Using a torque meter, measure the total preload.

Total preload: In addition to drive pinion preload
0.4 – 0.6 N–m (4 – 6 kgf–cm, 3.5 – 5.2 in.–lbf).

If necessary, disassemble and inspect a differential.



6. CHECK SIDE GEAR BACKLASH

Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

If the backlash is out of specification, install the correct thrust washers. (See page SA–38)

7. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

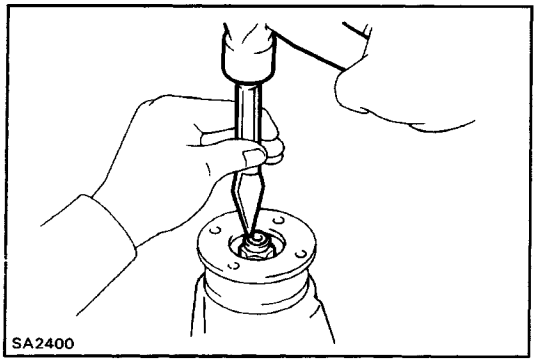
(See step 13 on page SA–43)

DISASSEMBLY OF DIFFERENTIAL CARRIER

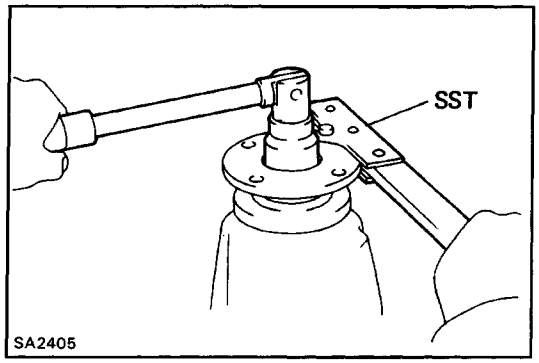
(See page SA–30)

1. REMOVE COMPANION FLANGE

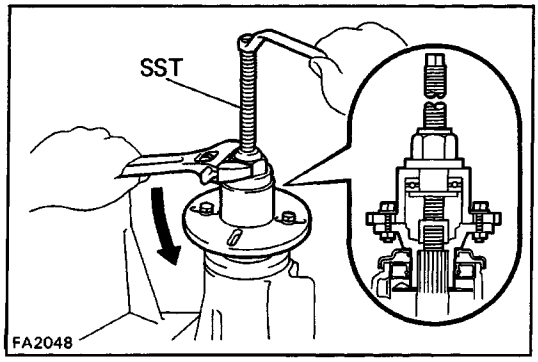
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut and plate washer.
SST 09330–00021



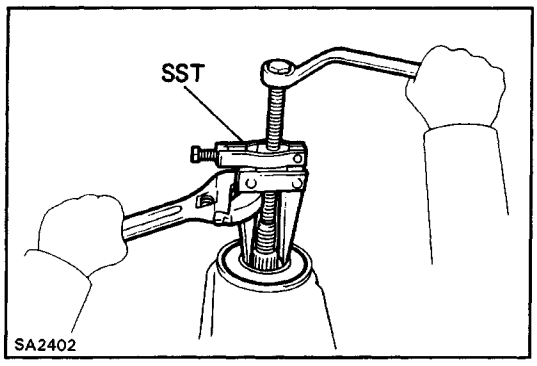
(c) Using SST, remove the companion flange.
SST 09557–22022 (09557–22050)



2. REMOVE REAR OIL SEAL AND OIL SLINGER

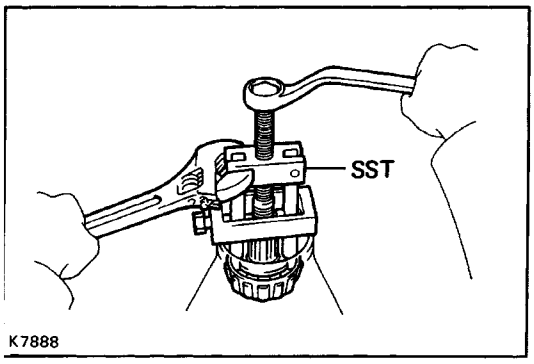
(a) Using SST, remove the oil seal from the housing.
SST 09308–10010

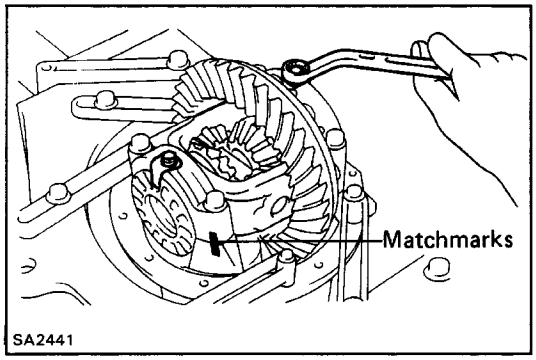
(b) Remove the oil slinger.



3. REMOVE REAR BEARING

Using SST, remove the bearing from the housing.
SST 09556–22010

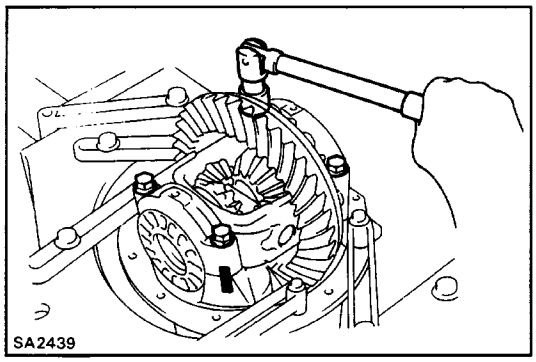




4. REMOVE DIFFERENTIAL CASE

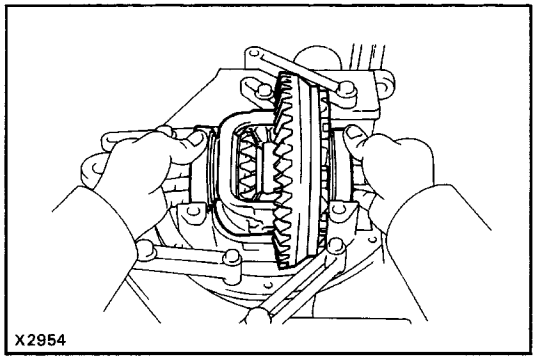
(a) Place matchmarks on the bearing cap and differen–tial carrier.

(b) Remove the two adjusting nut locks.

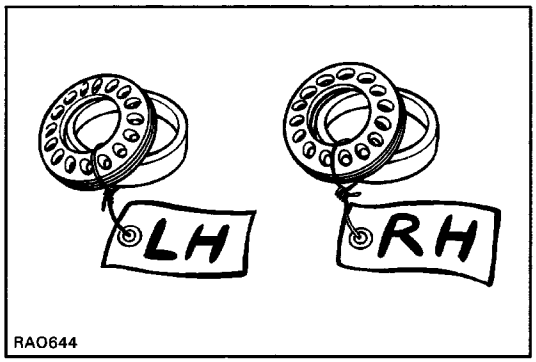


(c) Remove the four bolts and the two bearing caps.

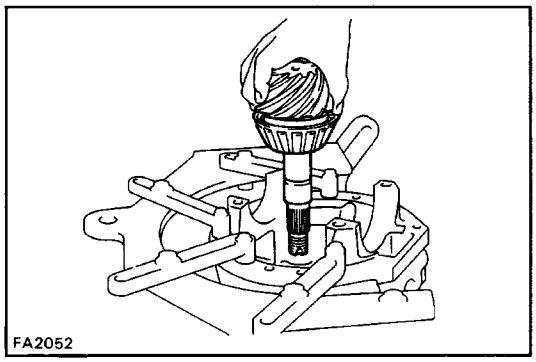
(d) Remove the two adjusting nuts.



(e) Remove the differential case with the side bearing outer races from the differential carrier.



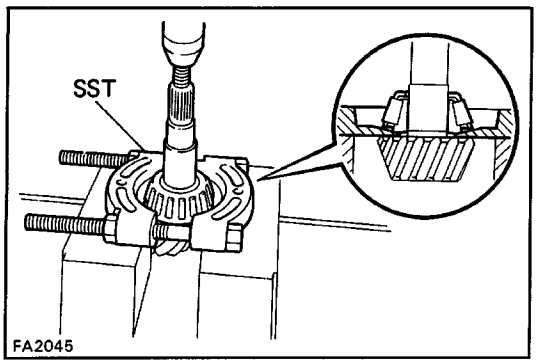
HINT: Tag the disassembled parts to show the location for reassemble.



5. REMOVE DRIVE PINION AND BEARING SPACER

(a) Remove the drive pinion with the front bearing.

(b) Remove the bearing spacer.

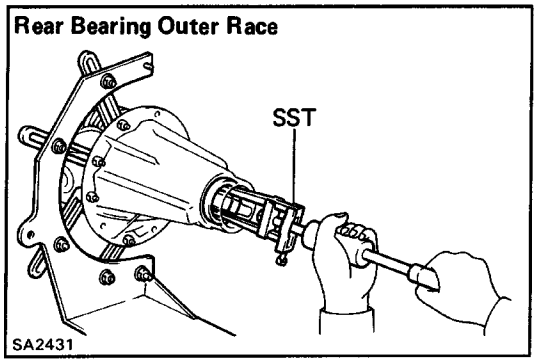


6. REMOVE DRIVE PINION FRONT BEARING

(a) Using SST and a press, remove the bearing from the drive pinion.
SST 09950–00020

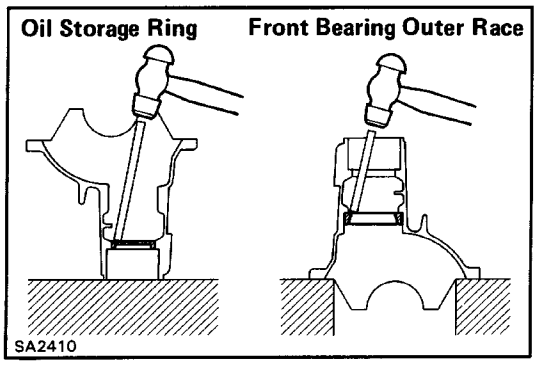
HINT: If the drive pinion or ring gear are damaged replace them as a set.

(b) Remove the plate washer from the drive pinion.



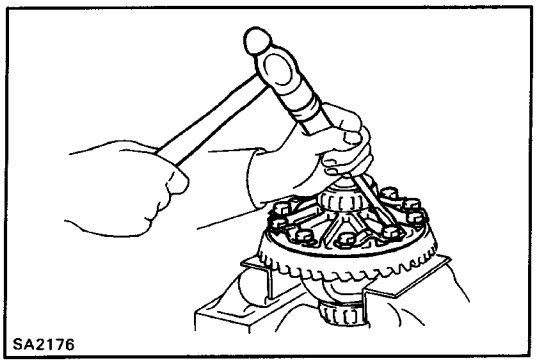
7. REMOVE FRONT, REAR BEARING OUTER RACES AND OIL STORAGE RING

(a) Using SST, remove the bearing outer race.
SST 09308–00010



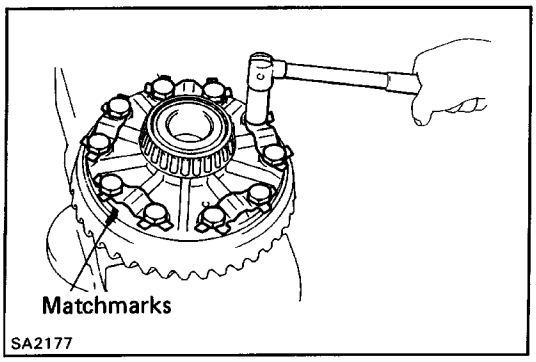
(b) Using a hammer and brass bar, drive out the oil storage ring and outer race from the carrier.

HINT: Do not remove the oil storage ring unless replacing it with a new one.



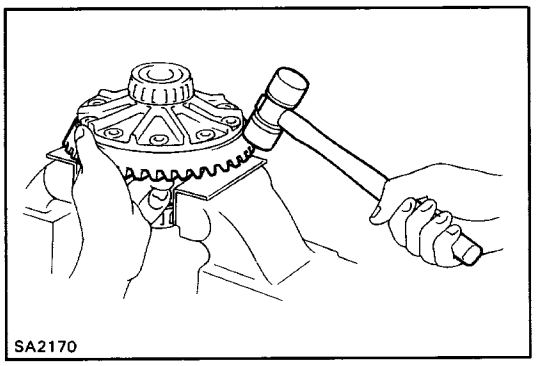
8. REMOVE RING GEAR

(a) Using a screwdriver, unstake the lock plates.



(b) Place matchmarks on the ring gear and differential case.

(c) Remove the ten bolts and five lock plates.



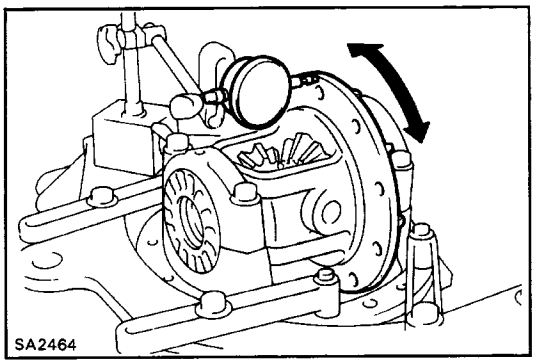
(d) Using a plastic or copper hammer, tap on the ring gear to separate it from the differential case.

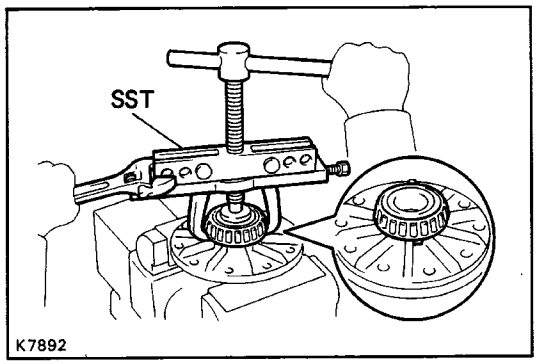
9. CHECK DIFFERENTIAL CASE RUNOUT

(a) Place the bearing outer races on their respective bearings. Check that the left and right outer races are not interchanged.
(b) Install the differential case in the differential carrier.
(c) When there is no play left in the side bearings, install the adjusting nuts.
(d) Align the matchmarks on the bearing cap and differ–ential carrier.
(e) Install and uniformly tighten the four bearing cap bolts in several passes.
(f) Using a dial indicator, measure the differential case runout.

Maximum runout: 0.07 mm (0.0028 in.)

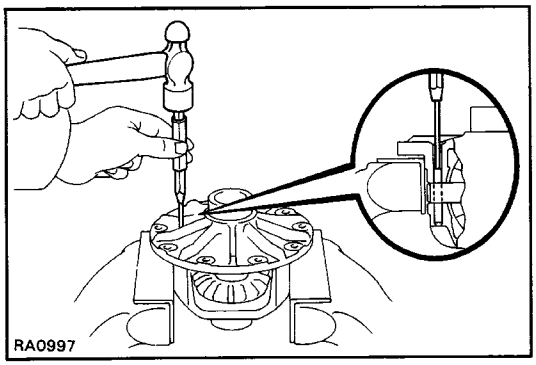
(g) Remove the differential case.
(See step 4 on page SA–34)





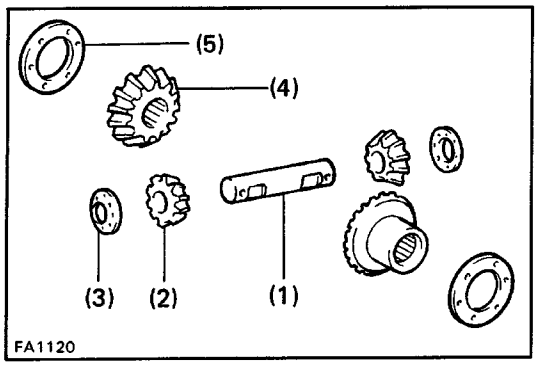
10. REMOVE SIDE BEARING

Using SST, remove the side bearing from the differential case.
SST 09950–20017
HINT: Fix the claws of SST to the notch in the differen–tial case.



11. DISASSEMBLE DIFFERENTIAL CASE

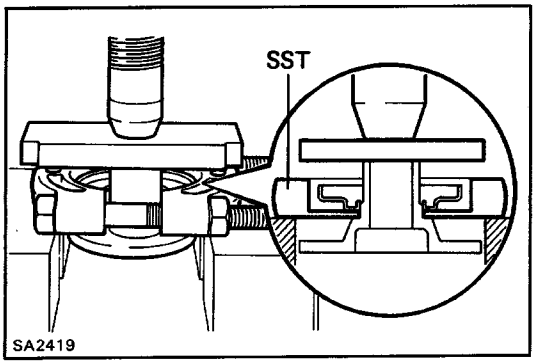
(a) Using a hammer and punch, drive out the straight pin.



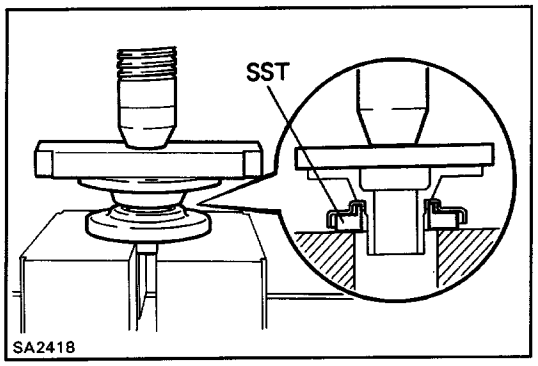
(b) Remove following parts from the differential case:
(1) Pinion shaft
(2) Two differential pinions
(3) Two pinion thrust washers
(4) Two side gears
(5) Two side gear thrust washers

REPLACEMENT OF DUST DEFLECTOR

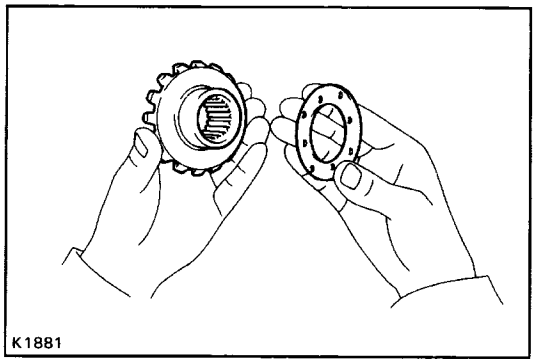
REPLACE COMPANION FLANGE DUST DEFLECTOR



(a) Using SST and a press, remove the dust deflector.
SST 09950–00020



(b) Using SST and a press, install a new dust deflector.
SST 09726–40010



ASSEMBLY OF DIFFERENTIAL CARRIER

(See page SA–30)

1. ASSEMBLE DIFFERENTIAL CASE

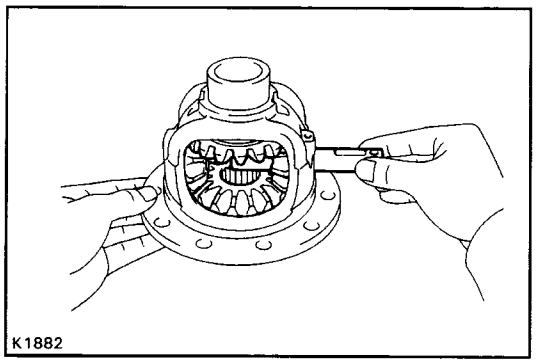
(a) Install the proper thrust washers and side gears.

Using the below table, select thrust washers which will ensure that the backlash is within specification.

Try to select washers of the same size for both sides.

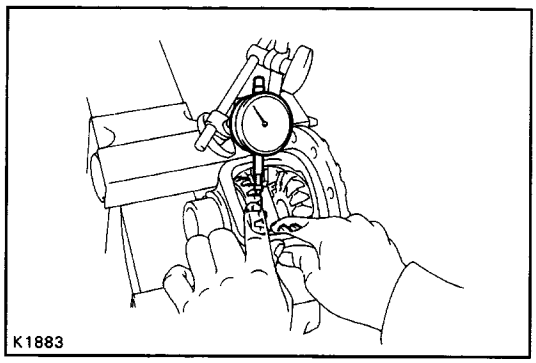
Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

Thrust washer thickness mm (in.)
1.58 – 1.62 (0.0622 – 0.0638)
1.68 – 1.72 (0.0661 – 0.0677)
1.78 – 1.82 (0.0701 – 0.0717)



(b) Install thrust washers and side gears in the differential case.

HINT: Align the hole for the pinion shaft with the case hole.

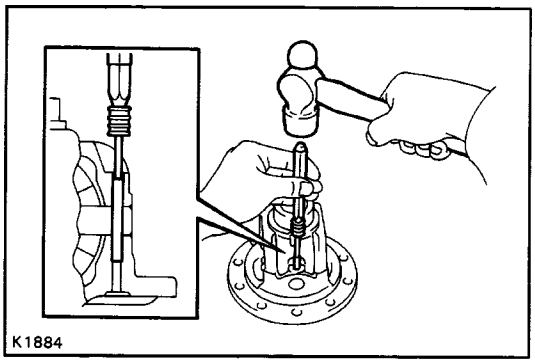


(c) Check the side gear backlash.

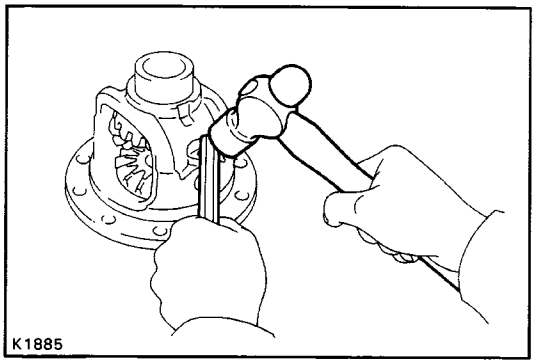
Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

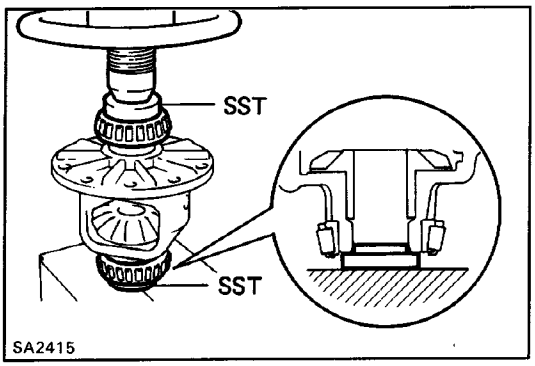
If the backlash is not within specification, install a thrust washer of different thickness.



(d) Using a hammer and punch, install the straight pin through the case and hole of the pinion shaft.



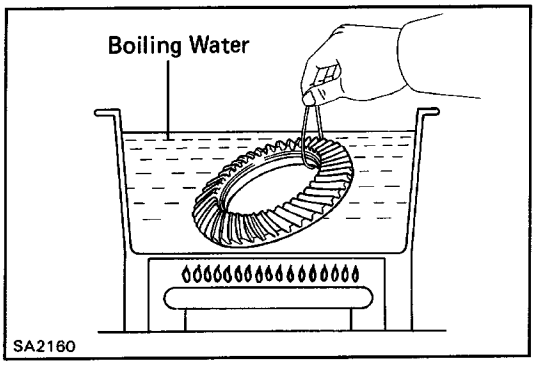
(e) Stake the differential case.



2. INSTALL SIDE BEARINGS

Using SST and a press, install the two side bearings on the differential case.

SST 09608–30012 (09808–00060, 09608–04060)

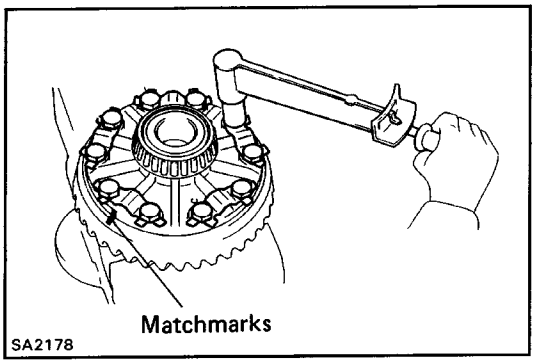


3. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surfaces of the differential case and ring gear.

(b) Heat the ring gear in boiling water.

(c) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differ–ential case.



HINT: Align the matchmarks on the ring gear and the differential case.

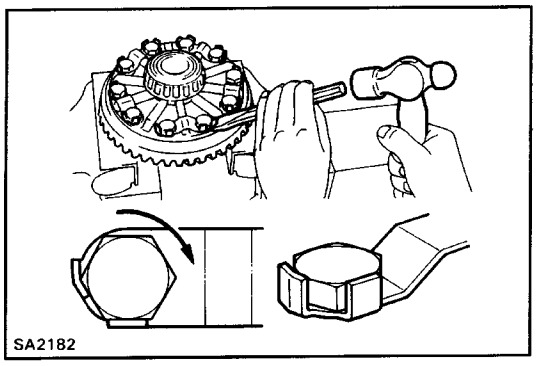
(d) Temporarily install five new lock plates and the ten bolts so that the bolt holes in the ring gear and dif–ferential case are not misaligned.

NOTICE: The ring gear set bolts should not tight until the ring gear has cooled sufficiently.

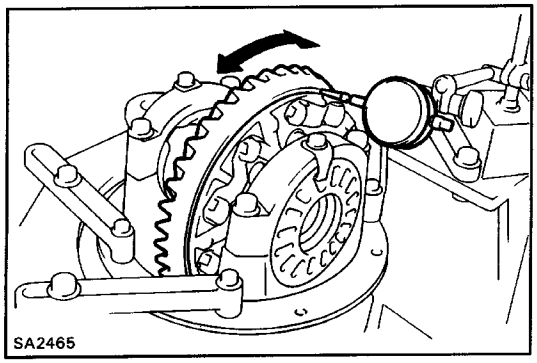
(e) After the ring gear has cooled sufficiently, torque the ring gear set bolts.

Torque: 97 N–m (985 kgf–cm, 71 ft–lbf)

(f) Using a hammer and drift punch, stake the lock plates.



HINT: Stake one claw flush with the flat surface of the nut. For the claw contacting the protruding portion of the nut, stake the half on the tightening side.



4. CHECK RING GEAR RUNOUT

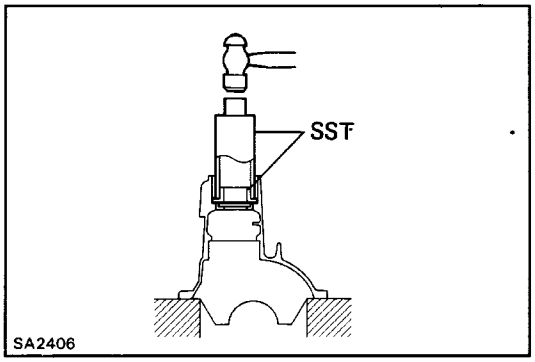
(a) Install the differential case onto the carrier.

(b) Install bearing caps. (See step 11 on page SA–41)

(c) Using a dial indicator, measure the runout of ring gear.

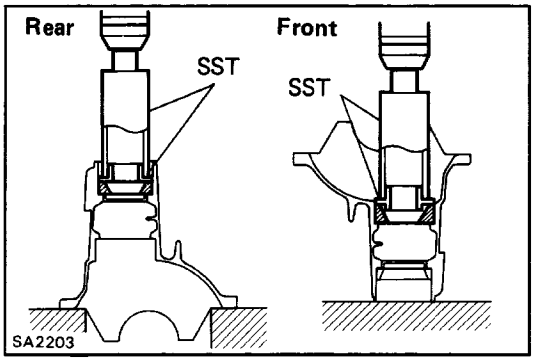
Maximum runout: 0.10 mm (0.0039 in.)

(d) Remove the differential case.
(See step 4 on page SA–34)



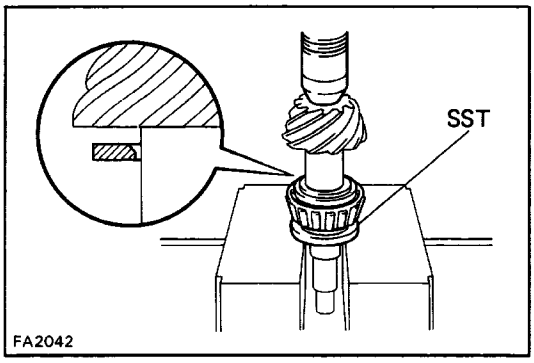
5. INSTALL OIL STORAGE RING

Using SST and a hammer, install a new oil storage ring.
SST 09316–60010 (09316–00010, 09316–00020)



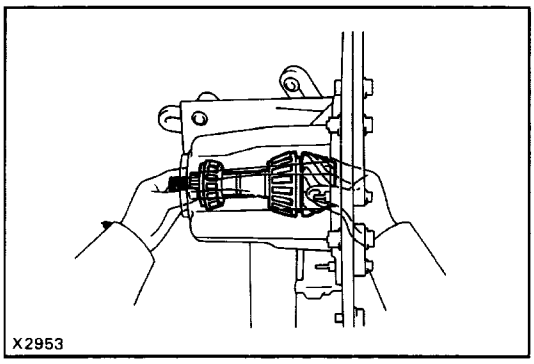
6. INSTALL DRIVE PINION FRONT AND REAR BEARING OUTER RACES

Using SST and a press, install the outer races.
SST 09316–60010
Rear (09316–00010, 09316–00020)
Front (09316–00010, 09316–00050)



7. INSTALL DRIVE PINION FRONT BEARING

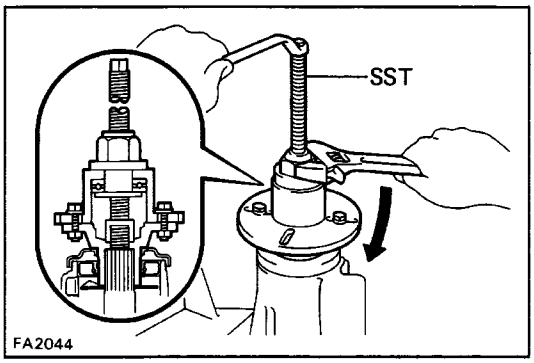
(a) Install the washer on the drive pinion with the chamfered end facing the pinion gear.
(b) Using SST, press in the front bearing onto the drive pinion.
SST 09506–30012



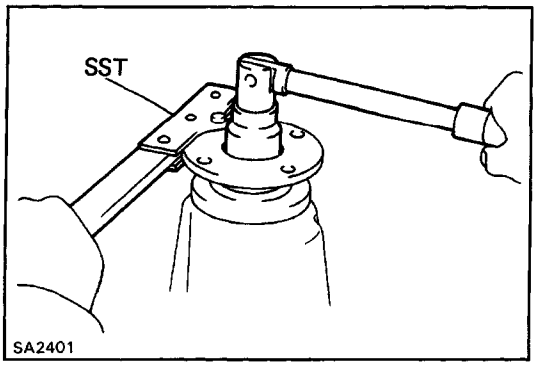
8. TEMPORARILY ADJUST DRIVE PINION PRELOAD

(a) Install the drive pinion, rear bearing and oil slinger.

HINT: Assemble the spacer and oil seal after adjusting the gear contact pattern.



(b) Using SST, install the companion flange.
SST 09557–22022 (09557–22050)



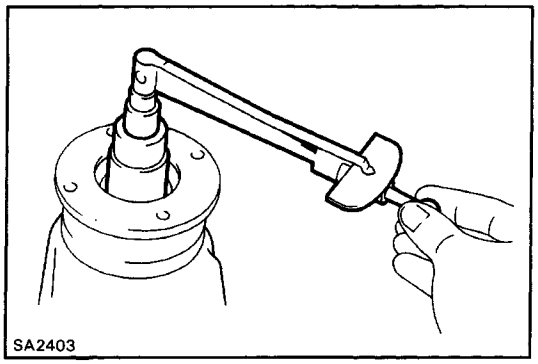
(c) Adjust the drive pinion preload by tightening the companion flange nut.

HINT: Using SST to hold the flange, tighten the nut.

SST 09330–00021

NOTICE:

- **Coat the nut and the screw position of the drive pinion with gear oil.**
- **As there is no spacer, tighten the nut a little at a time, being careful not to overtighten it.**



(d) Using a torque meter, measure the preload.

Preload (at starting):

New bearing

0.9 – 1.6 N–m

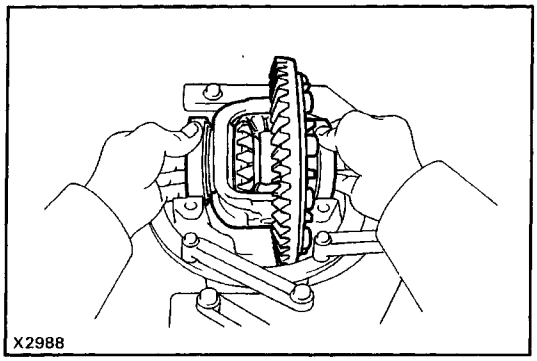
(10 – 16 kgf–cm, 8.7 – 13.9 in.–lbf)

Reused bearing

0.5 – 0.8 N–m

(5 – 8 kgf–cm, 4.3 – 6.9 in.–lbf)

HINT: Measure the preload after first turning the bearing clockwise and counterclockwise several times to snug down the bearing.

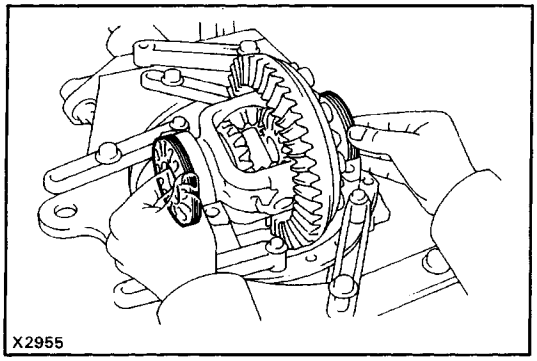


9. INSTALL DIFFERENTIAL CASE IN CARRIER

(a) Place the bearing outer races on their respective bearings. Make sure that the left and right outer races are not interchanged.

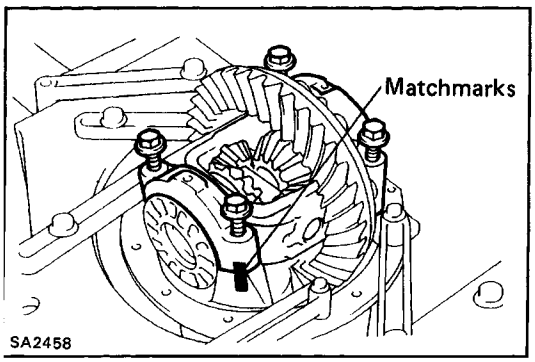
(b) Install the case in the carrier.

HINT: Make sure that there is backlash between the ring gear and drive pinion.



10. INSTALL ADJUSTING NUTS

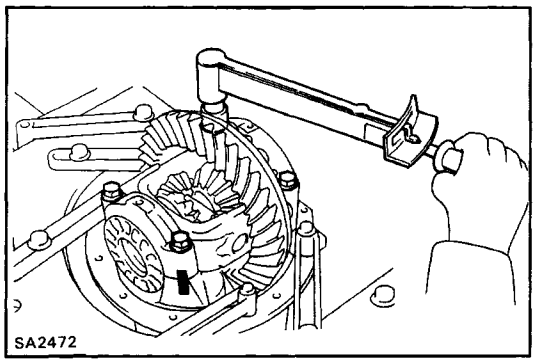
Install the adjusting nuts on the carrier, making sure that the nuts are threaded properly.



11. INSTALL BEARING CAPS

Align the matchmarks on the cap and carrier. Screw in the two bearing cap bolts two or three turns and press down the bearing cap by hand.

HINT: If the bearing cap does not fit tightly on the carrier, the adjusting nuts are not threaded properly. Reinstall the adjusting nuts if necessary.

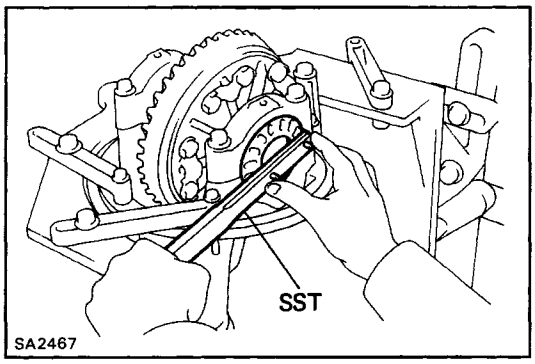


12. ADJUST SIDE BEARING PRELOAD

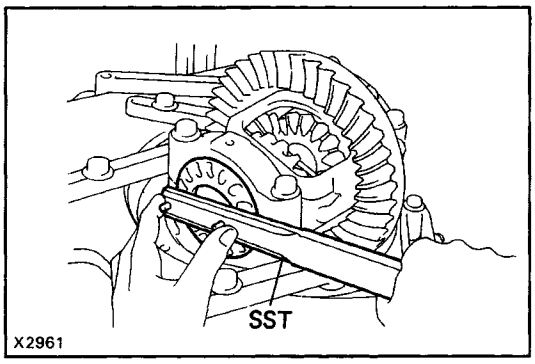
(a) Tighten the four bearing cap bolts to the specified torque, then loosen them to the point where they can be turned by SST.
SST 09504–00011

Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)

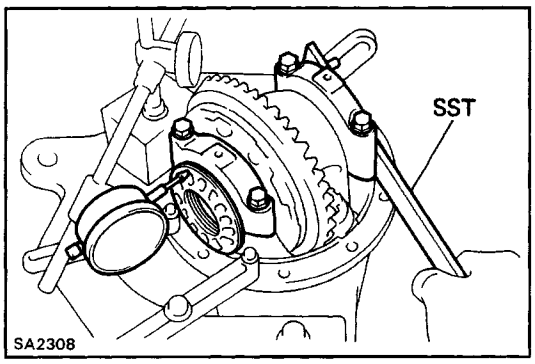
(b) Fully tighten the four bearing cap bolts by hand.



(c) Using SST, tighten the adjusting nut on the ring gear side until the ring gear has a backlash of about 0.2 mm (0.008 in.).
SST 09 504–00011

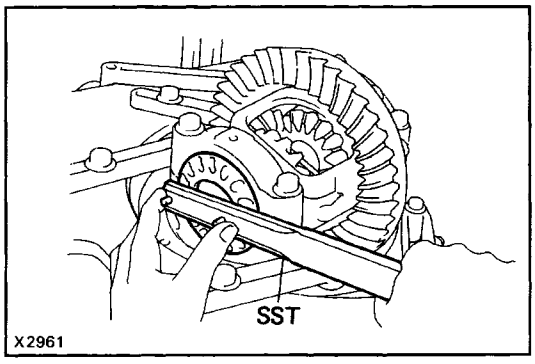


(d) While turning the ring gear, use SST to fully tighten the adjusting nut on the drive pinion side.
After the bearings are settled, loosen the adjusting nut on the drive pinion side.
SST 09504–00011

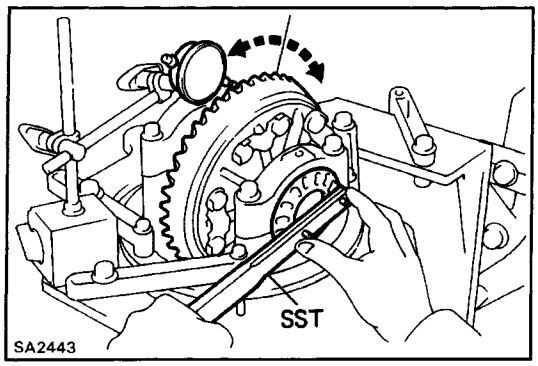


(e) Place a dial indicator on the top of the adjusting nut on the ring gear side.

(f) Adjust the side bearing for zero preload by tightening the other adjusting nut until the pointer on the indicator begins to move.



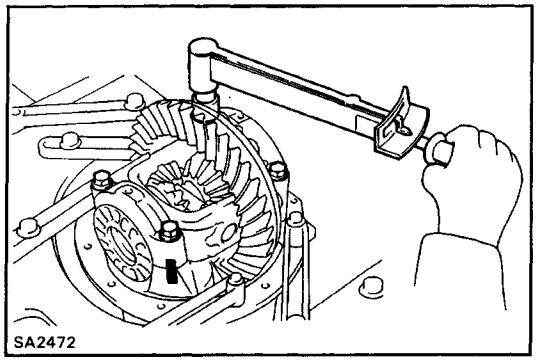
(g) Tighten the adjusting nut 1 – 1 $^{1}/_{2}$ notches from the zero preload position.



(h) Using a dial indicator, adjust the ring gear backlash until it is within specification.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

HINT: The backlash is adjusted by turning the left and right adjusting nuts equal amounts. For example, loosen the nut on the left side one notch and tighten the nut on the right side one notch.

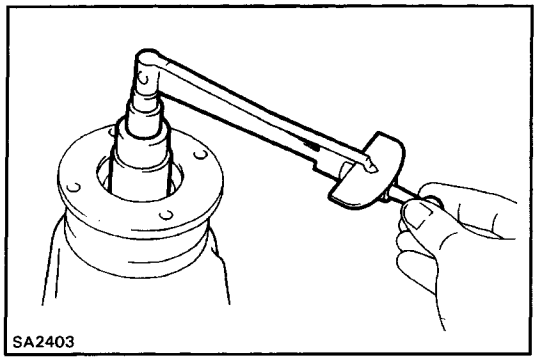


(i) Torque the bearing cap bolts.

Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)

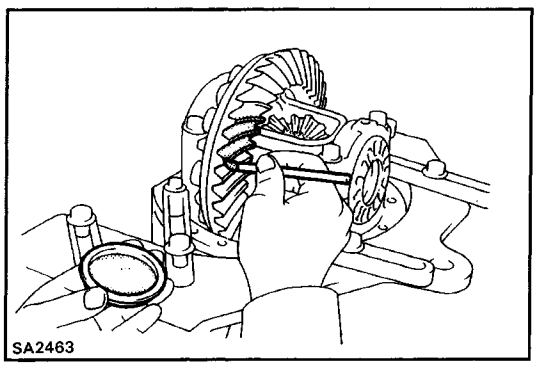
(j) Recheck the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)



(k) Using a torque meter, measure the total preload.

Total preload (at starting):
Add drive pinion preload
0.4 – 0.6 N–m
(4 – 6 kgf–cm, 3.5 – 5.2 in.–lbf)

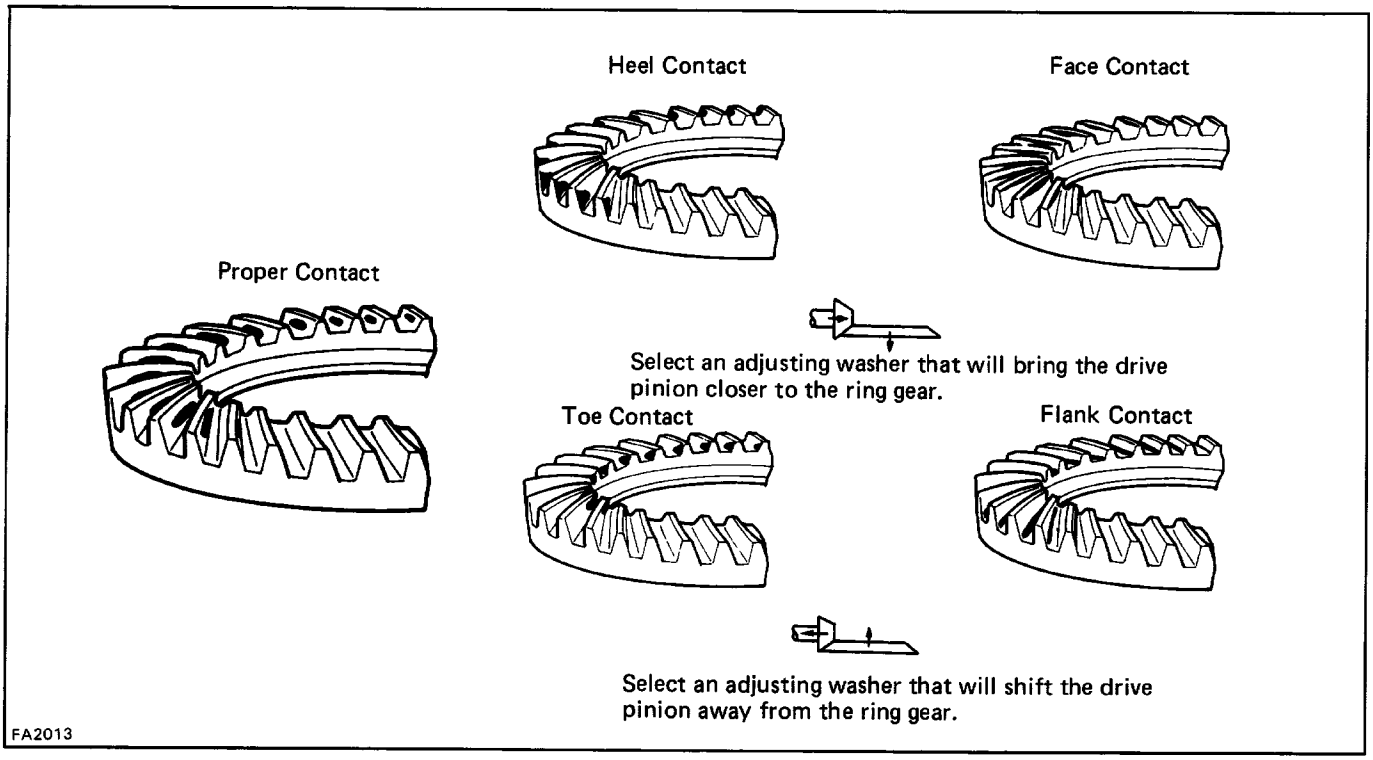


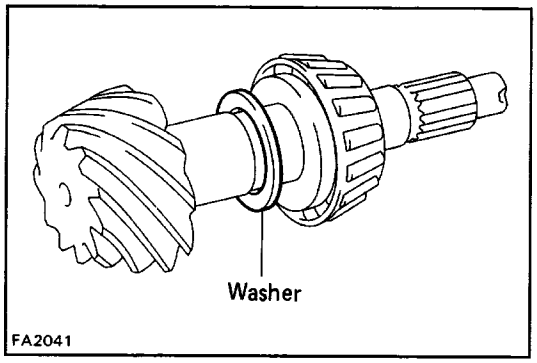
13. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead.

(b) Hold the companion flange firmly and rotate the ring gear in both directions.

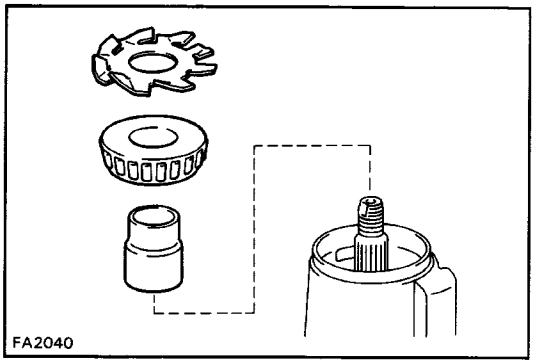
(c) Inspect the tooth pattern.





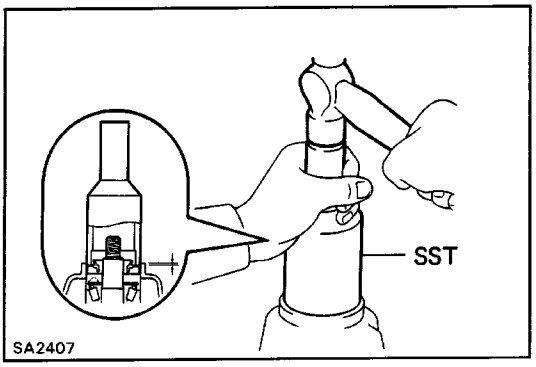
If the teeth are not contacting properly, use the following chart to select a proper washer for correction.
HINT: In the case of face contact or flank contact, it may be possible to make the adjustment within the back–lash specification limits.

Washer thickness			mm (in.)
1.70	(0.0669)	2.03	(0.0799)
1.73	(0.0681)	2.06	(0.0811)
1.76	(0.0693)	2.09	(0.0823)
1.79	(0.0705)	2.12	(0.0835)
1.82	(0.0717)	2.15	(0.0846)
1.85	(0.0728)	2.18	(0.0858)
1.88	(0.0740)	2.21	(0.0870)
1.91	(0.0752)	2.24	(0.0882)
1.94	(0.0764)	2.27	(0.0894)
1.97	(0.0776)	2.30	(0.0906)
2.00	(0.0787)	2.33	(0.0917)



14. INSTALL NEW BEARING SPACER

(a) Remove the companion flange.
(See step 1 on page SA–33)
(b) Remove the oil slinger and rear bearing.
(See steps 2, 3 on page SA–33)
(c) Install a new bearing spacer.
(d) Install the rear bearing and oil slinger.

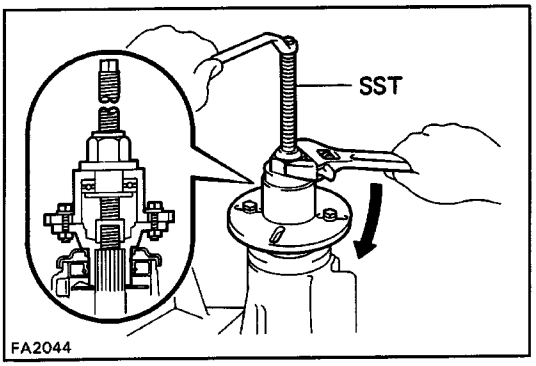


15. INSTALL NEW OIL SEAL

(a) Using SST and a hammer, install a new oil seal.
SST 09214–76011

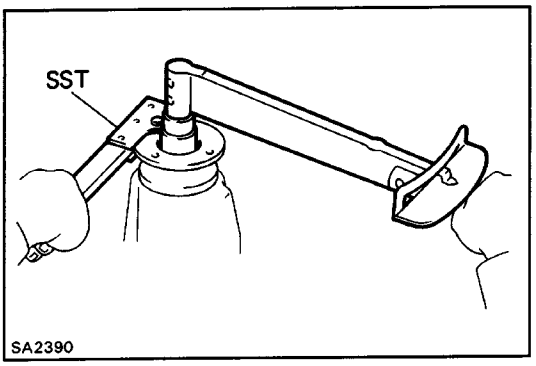
Oil seal drive in depth: 1.0 mm (0.039 in.)

(b) Coat the lip of oil seal with MP grease.



16. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange.
SST 09557–22022 (09557–22050)

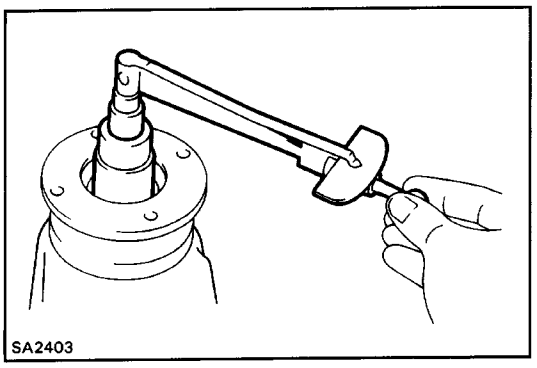


(b) Install the washer and a new nut.

HINT: Coat the threads of nut with gear oil.

(e) Using SST to hold the flange, tighten the nut.
SST 09330–00021

Torque: 196 N–m (2,000 kgf–cm, 145 ft–lbf)



17. ADJUST DRIVE PINION PRELOAD

Using a torque meter, measure the preload of the back–lash between the drive pinion and ring gear.

Preload (at starting):
New bearing
0.9 – 1.6 N–m
(10 – 16 kgf–cm, 8.7 – 13.9 in.–lbf)
Reused bearing
0.5 – 0.8 N–m
(5 – 8 kgf–cm, 4.3 – 6.9 in.–lbf)

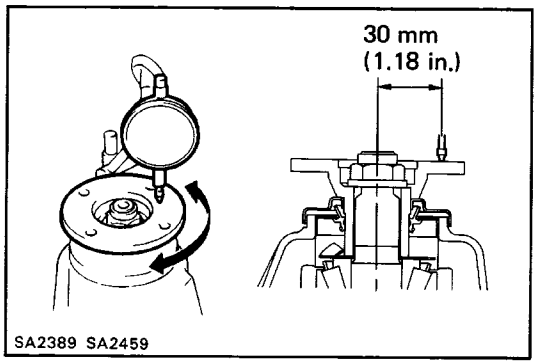
- If the preload is greater than specification, replace the bearing spacer.
- If the preload is less than specification, retighten the nut 13 N–m (130 kgf–cm, 9 ft–lbf) a little at a time until the specified preload is reached.

If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

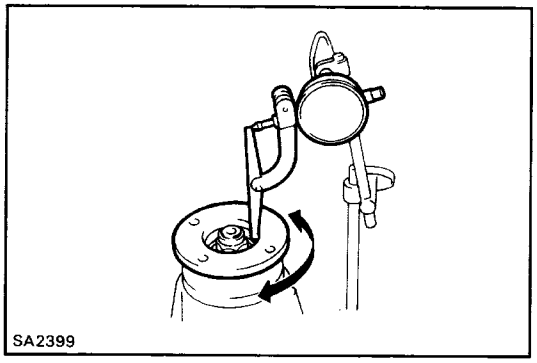
Maximum torque: 343 N–m (3,500 kgf–cm, 253 ft–lbf)

If everything is normal, coat the threads with gear oil, then repeat the above operation.

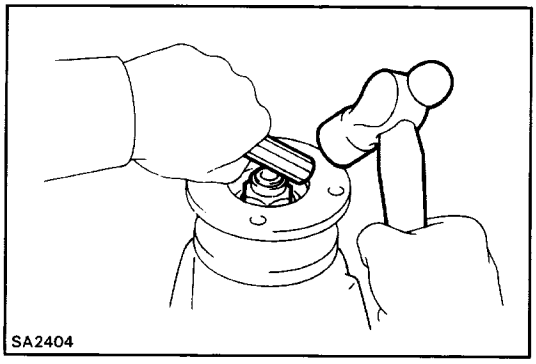
18. RECHECK RING GEAR BACKLASH
(See step 3 on page SA–31)
19. RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION
(See step 13 on page SA–43)



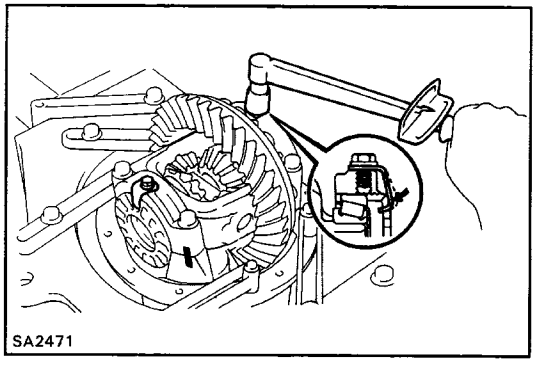
20. CHECK RUNOUT OF COMPANION FLANGE
Using a dial indicator, measure the lateral and radial runout of the companion flange.
Maximum vertical runout: 0.10 mm (0.0039 in.)



Maximum lateral runout: 0.10 mm (0.0039 in.)
If the runout is greater than the maximum, inspect the bearing.



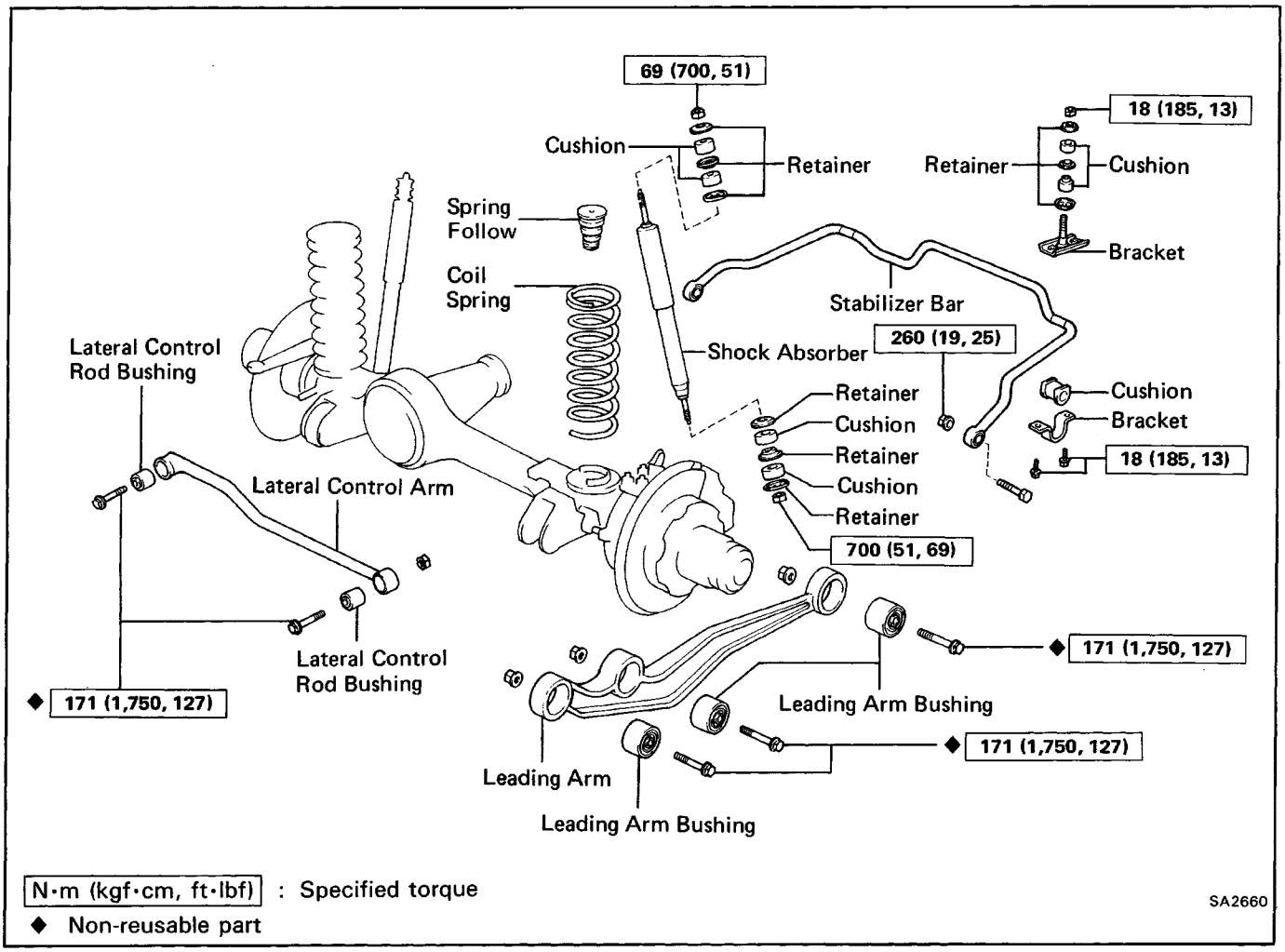
21. STAKE DRIVE PINION NUT

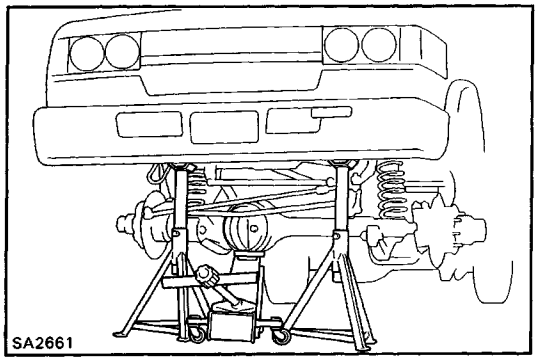


22. INSTALL ADJUSTING NUT LOCKS
(a) Install new two nut locks on the bearing caps.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
(b) After tightening bolts, bend the nut locks.

FRONT SUSPENSION

COMPONENTS



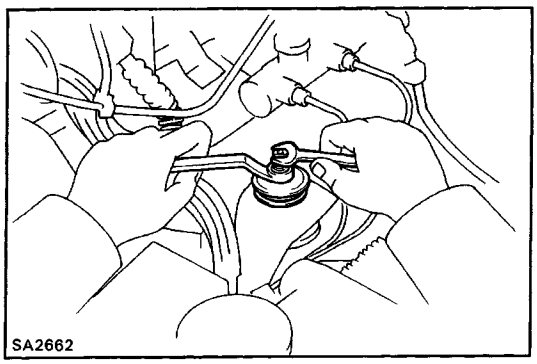


Coil Spring and Shock Absorber

REMOVAL OF COIL SPRING AND SHOCK ABSORBER

1. JACK UP AND SUPPORT BODY

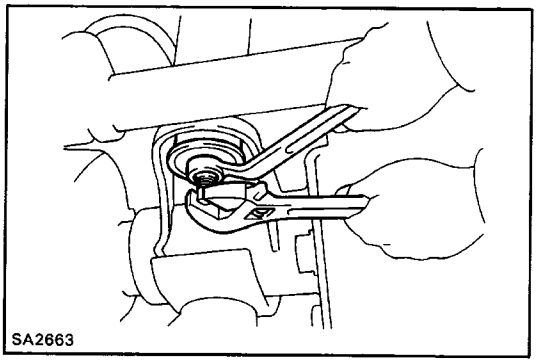
Jack up and support the body on stands.



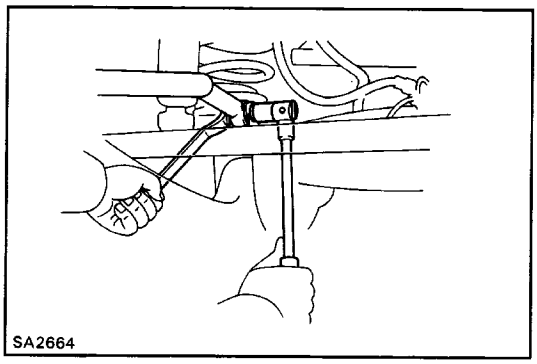
2. REMOVE FRONT SHOCK ABSORBER

(a) Jack up and support the axle housing.

(b) Hold the piston rod, and remove the upper mounting nut.

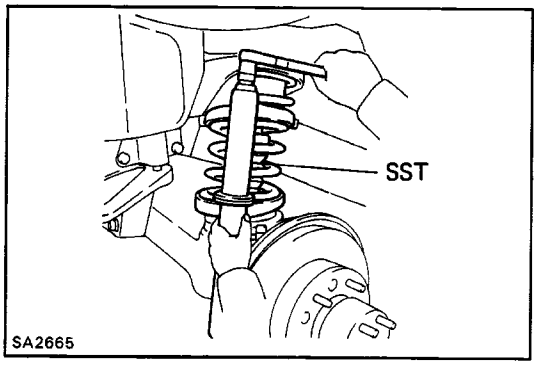


(c) Hold the shock absorber, and remove the lower mounting nut, shock absorber, cushions and the retainer.



3. DISCONNECT STABILIZER BAR

Remove the bolt and nut, and disconnect the stabilizer bar with the cushion and bracket.

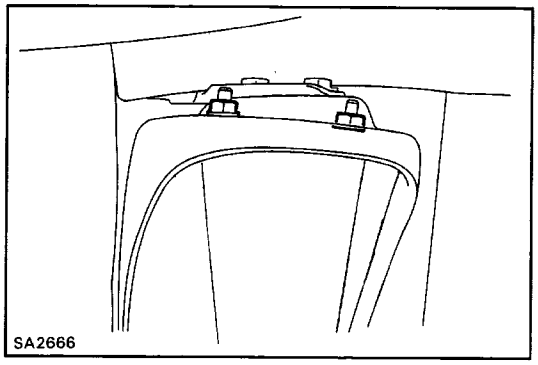


4. REMOVE COIL SPRING

(a) Jack down and support axle housing.

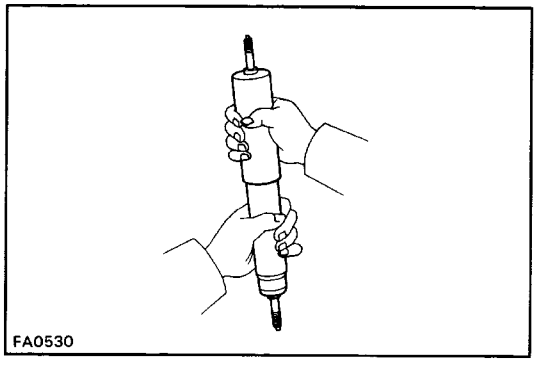
(b) Using SST, compress the coil spring.
SST 09727–30020

(c) Remove the coil spring.



5. REMOVE SPRING FOLLOW

Remove the two nuts and the spring follow.



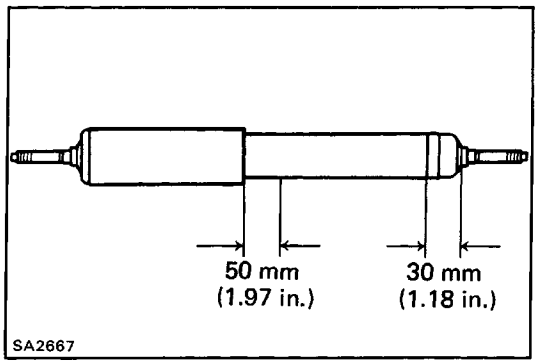
INSPECTION OF FRONT SHOCK ABSORBER

1. INSPECT OPERATION OF SHOCK ABSORBER

(a) While pushing the shock absorber, check that the pull throughout the stroke is even, and there is no abnormal resistance or noise.

(b) Push the shock absorber in fully and release it. Check that it returns at a contact speed throughout.

HINT: This information will be engraved on the exterior of the outer shell.

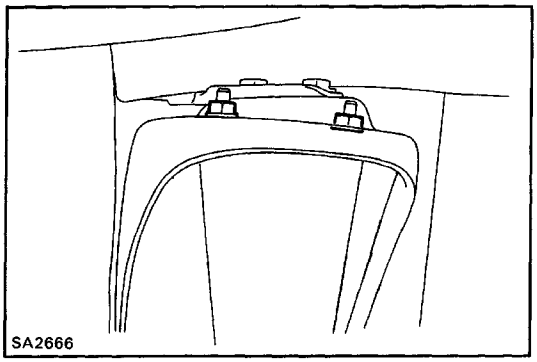


2. DISCARD SHOCK ABSORBER

Before discarding the shock absorber, drill a hole 2 – 3 mm (0.079 – 0.118 in.) in diameter at the location shown in the illustration to the gas inside.

NOTICE:

- **When drilling, chips may fly out, so work carefully.**
- **The gas is colorless, and non–poisonous.**

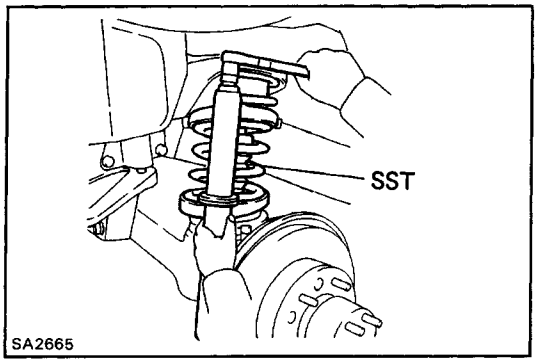


INSTALLATION OF COIL SPRING AND SHOCK ABSORBER

(See page SA–47)

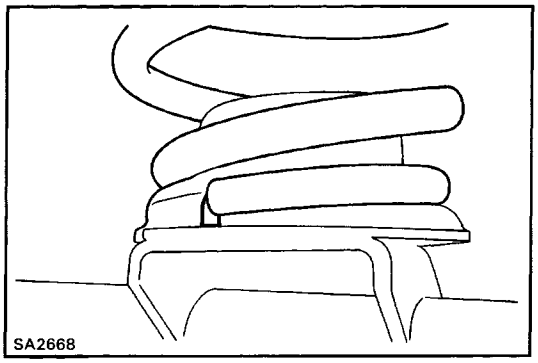
1. INSTALL SPRING FOLLOW

Install the spring follow to the body with the two nuts.

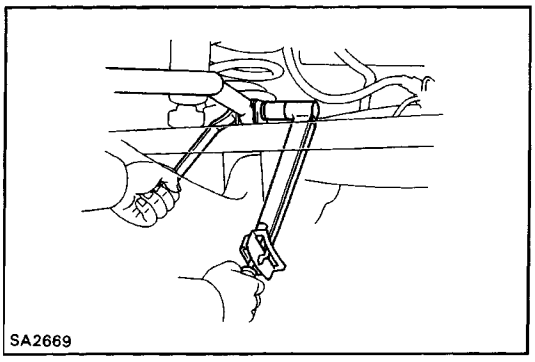


2. INSTALL COIL SPRING

(a) Using SST, compress the coil spring.
SST 09727–30020



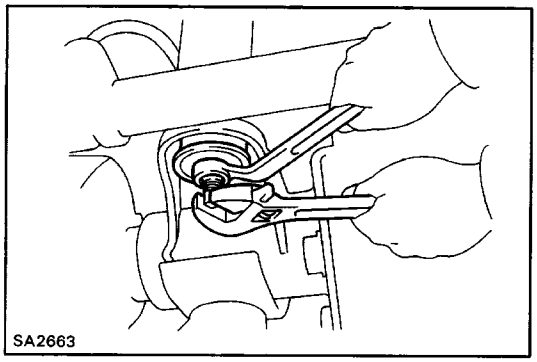
(b) Align the coil spring end with the lower seat and install.



3. CONNECT STABILIZER BAR

(a) Jack up and support axle housing.
(b) Connect the stabilizer bar to the axle housing with the bolt and nut.

Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)

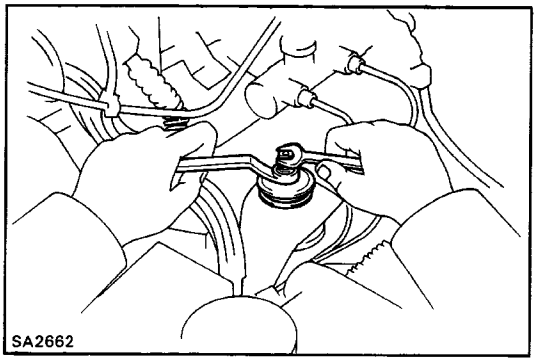


4. INSTALL SHOCK ABSORBER

(a) Install the retainers, cushions and the shock absorber.

(b) Hold the shock absorber to the axle housing with the lower mounting nut.

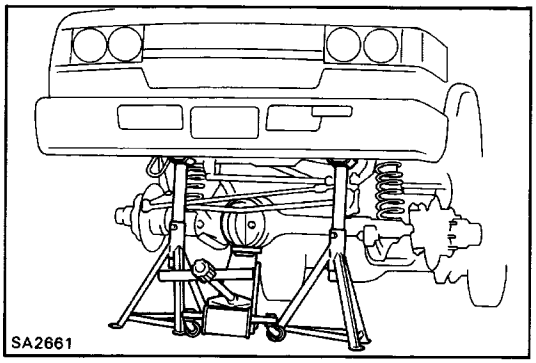
Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)



(c) Install the cushion and the retainers.

(d) Hold the piston rod to the body with the upper mounting nut.

Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)

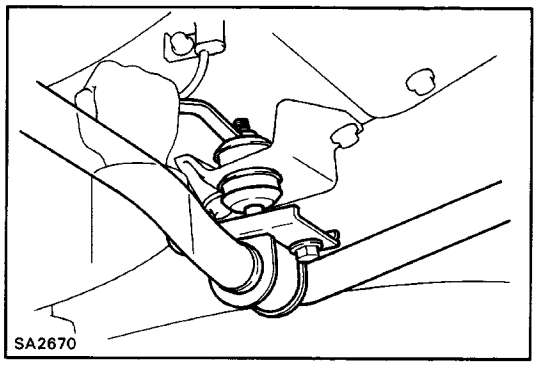


Stabilizer Bar

REMOVAL OF STABILIZER BAR

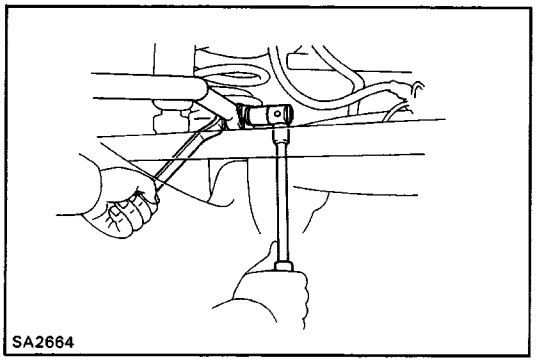
(See page SA–47)

1. JACK UP AND SUPPORT VEHICLE WITH FRAME

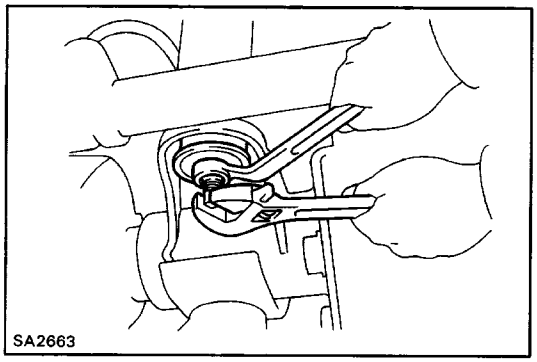


2. REMOVE STABILIZER BAR

(a) Remove the nut and disconnect the stabilizer bar with the bracket and cushion from the frame.



(b) Remove the bolt and nut, and remove the stabilizer bar from the axle housing.

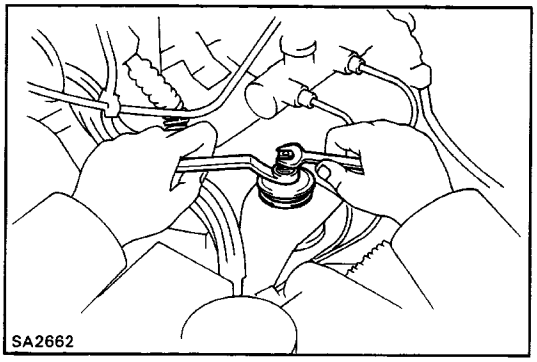


4. INSTALL SHOCK ABSORBER

(a) Install the retainers, cushions and the shock absorber.

(b) Hold the shock absorber to the axle housing with the lower mounting nut.

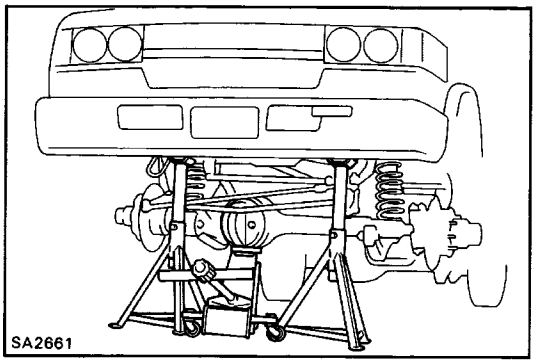
Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)



(c) Install the cushion and the retainers.

(d) Hold the piston rod to the body with the upper mounting nut.

Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)

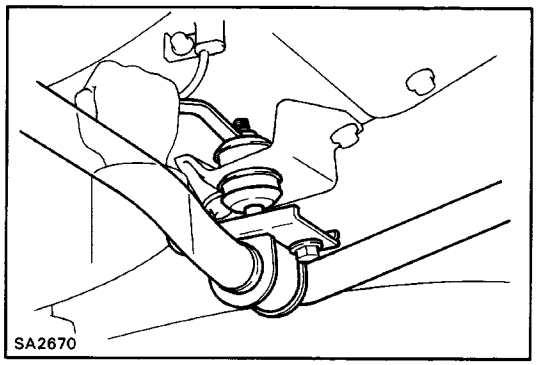


Stabilizer Bar

REMOVAL OF STABILIZER BAR

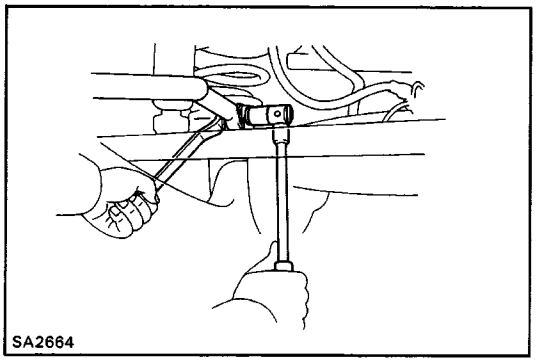
(See page SA–47)

1. JACK UP AND SUPPORT VEHICLE WITH FRAME

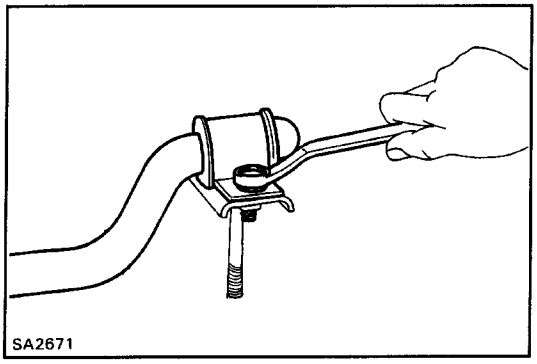


2. REMOVE STABILIZER BAR

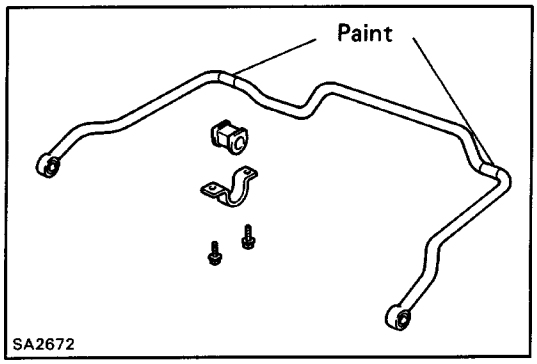
(a) Remove the nut and disconnect the stabilizer bar with the bracket and cushion from the frame.



(b) Remove the bolt and nut, and remove the stabilizer bar from the axle housing.



(c) Remove the two bolts, bracket and cushion from the stabilizer bar.

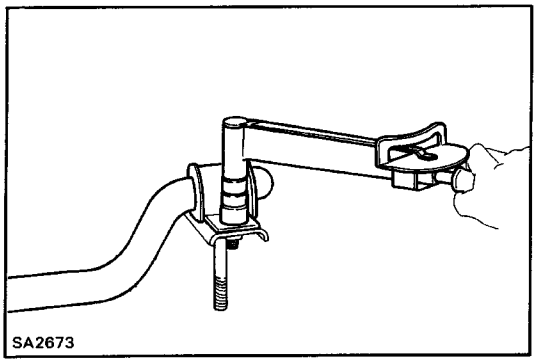


INSTALLATION OF STABILIZER BAR

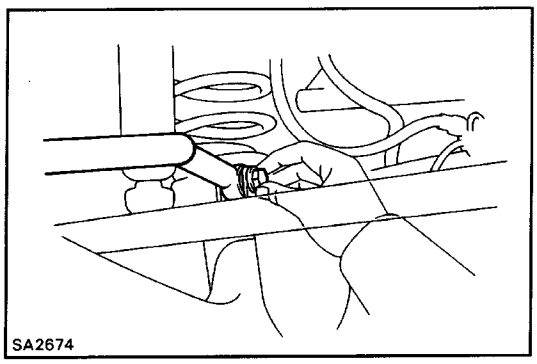
(See page SA–47)

1. INSTALL STABILIZER BAR

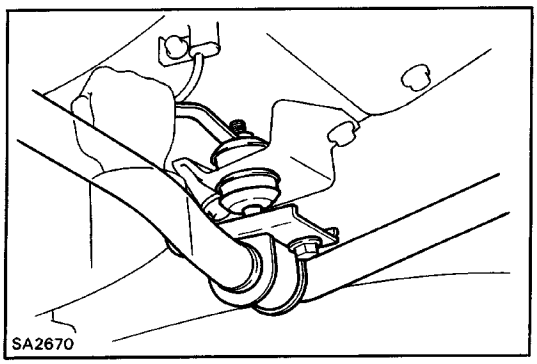
(a) Install the cushions on the lines painted on the stabilizer bar and install the brackets onto cushions.



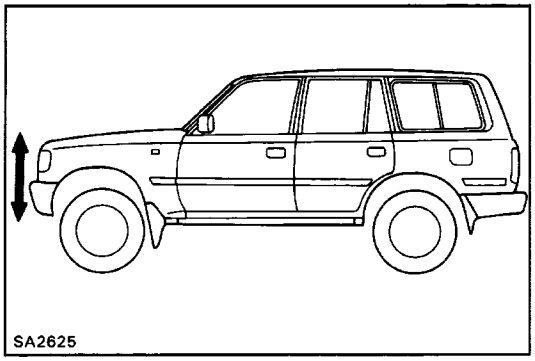
(b) Install the two bolts and the bracket to stabilizer bar.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



(c) Temporarily install the stabilizer bar with bracket and cushion to the axle housing with the bolt and nut.

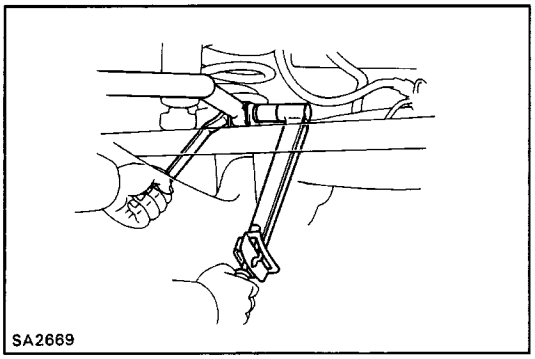


(d) Temporarily connect the cushions, retainers and nut to the bracket the frame.



2. STABILIZE SUSPENSION

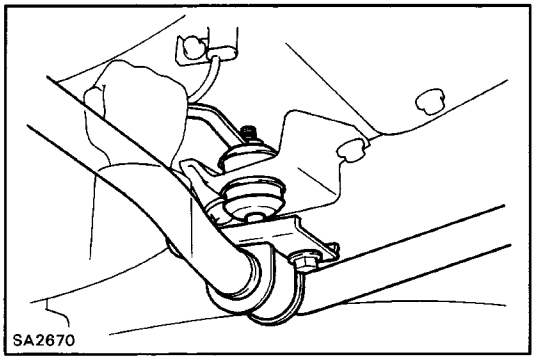
Bounce the vehicle up and down to stabilize the suspen–sion.



3. TORQUE STABILIZER MOUNTING BOLT AND NUT

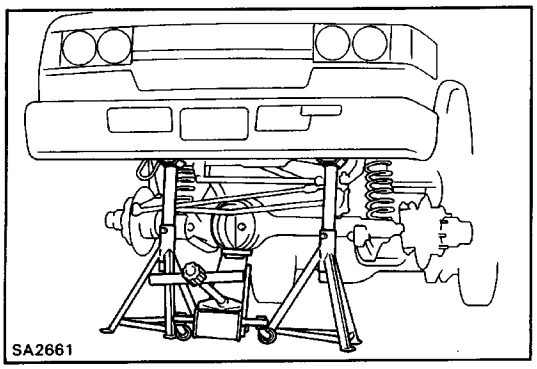
(a) Torque the bolt and nut.

Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)



(b) Torque the nut.

Torque: 25 N–m (260 kgf –cm, 19 ft–lbf)



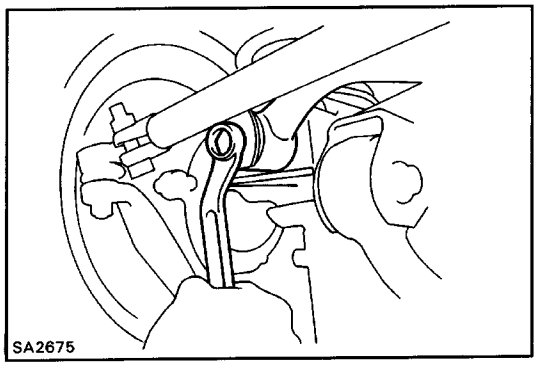
Lateral Control Rod

(See page SA–47)

REMOVAL OF LATERAL CONTROL ROD

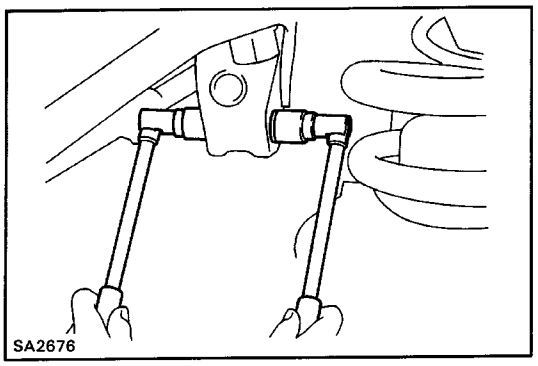
1. JACK UP AND SUPPORT BODY

Jack up and support the body on the stands.



2. DISCONNECT LATERAL CONTROL ROD FROM AXLE HOUSING

Remove the nut, and disconnect the lateral control rod from the front axle housing.



3. DISCONNECT LATERAL CONTROL ROD FROM FRAME

Remove the bolt, nut and the lateral control rod.

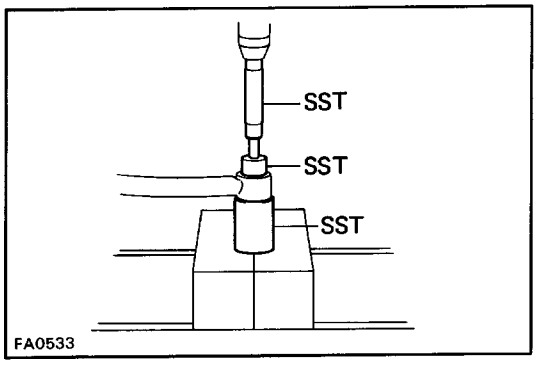
REPLACEMENT OF LATERAL CONTROL ROD BUSHING

1. REMOVE BUSHING

Using SST and a press, press out the bushing from the lateral control rod.

SST 09710–22041

(09710–02020, 09710–02050, 09710–02070)

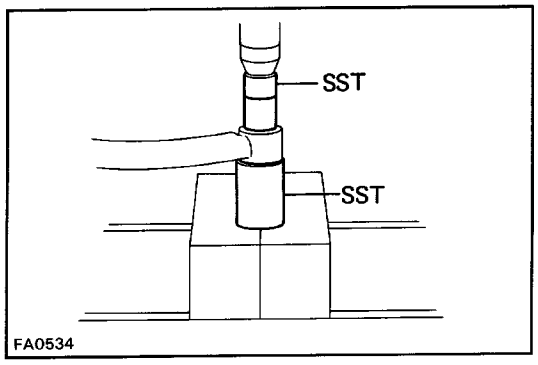


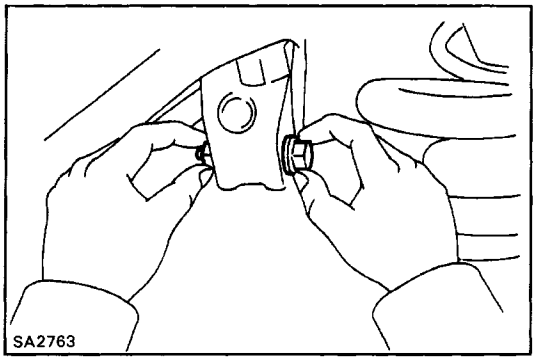
2. INSTALL BUSHING

Using SST and a press, press a new bushing into the lateral control rod.

SST 09710–22041 (09710–02050, 09710–02070)

HINT: Do not lubricant when pressing in the bushing.



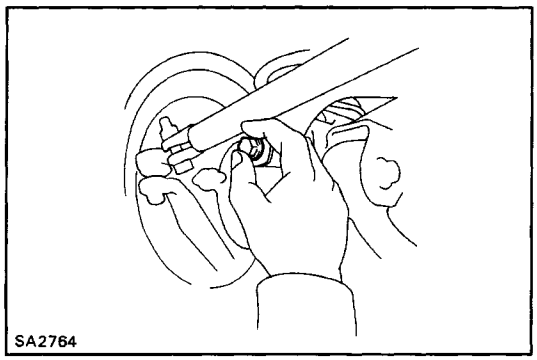


INSTALLATION OF LATERAL CONTROL ROD

(See page SA–47)

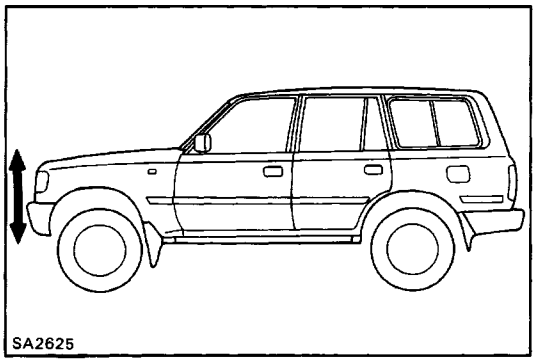
1. INSTALL LATERAL CONTROL ROD TO FRAME

Temporarily install the lateral control rod to the frame with the bolt and nut.



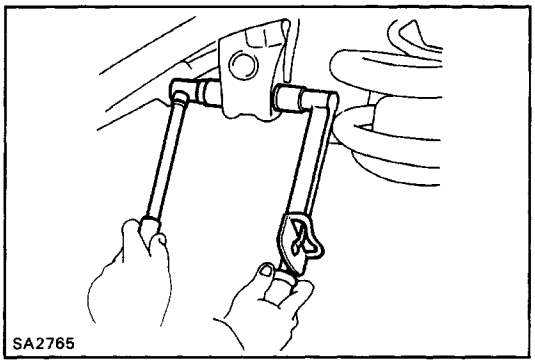
2. CONNECT LATERAL CONTROL ROD TO AXLE HOUSING

Temporarily connect the lateral control rod to the axle housing with the bolt.



3. STABILIZE SUSPENSION

Bounce the vehicle up and down stabilize the suspension.



4. TORQUE BOLTS AND NUT

(a) Jack up the axle housing.

(b) Torque the bolts and nut.

Torque:

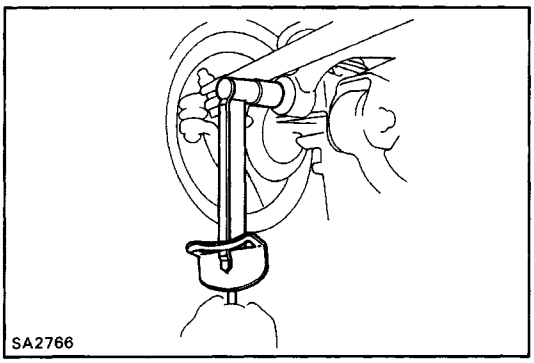
Body side

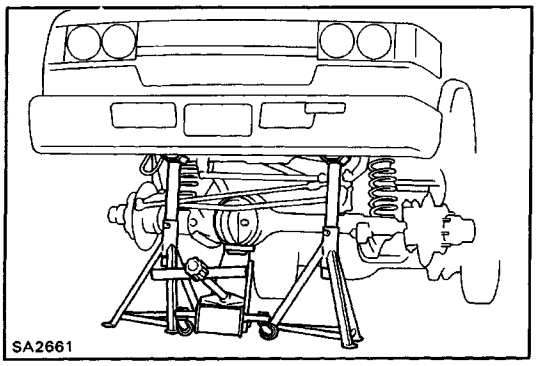
171 N–m (1,750 kgf–cm, 127 ft–lbf)

Axle housing side

171 N–m (1,750 kgf–cm, 127 ft–lbf)

HINT: When tightening the lateral control rod set nut and bolt, lower the vehicle load until the lateral control rod is horizontal.





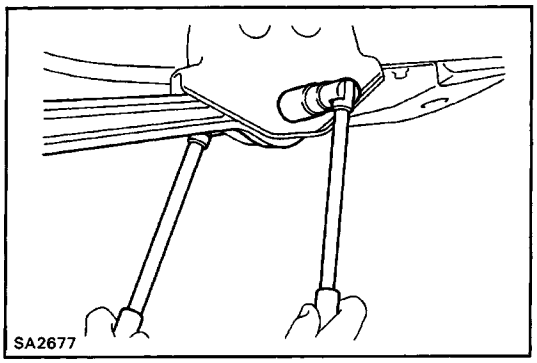
Leading Arm

(See page SA–47)

REMOVAL LEADING ARM

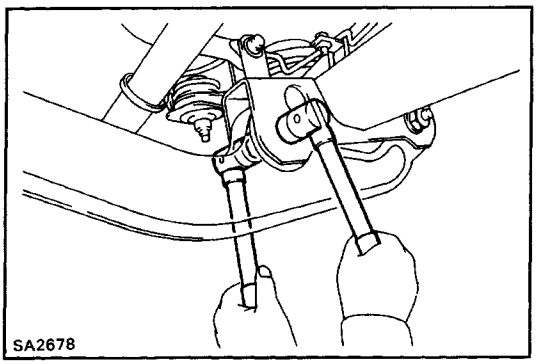
1. JACK UP VEHICLE

Jack up the and support the frame with stands.
Hold the front axle housing with a jack.



2. REMOVE LEADING ARM

(a) Remove the bolt and nut from the leading arm to the frame side.

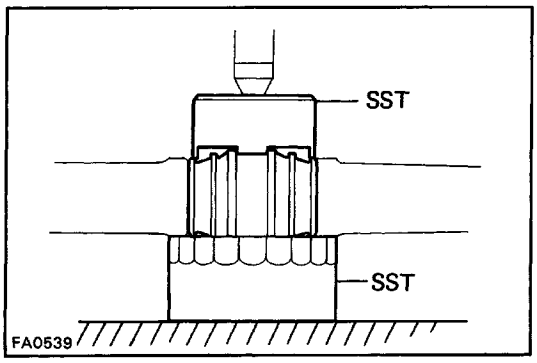


(b) Remove the two bolts and nuts from the leading arm axle housing side.

REPLACEMENT OF LEADING ARM BUSHING

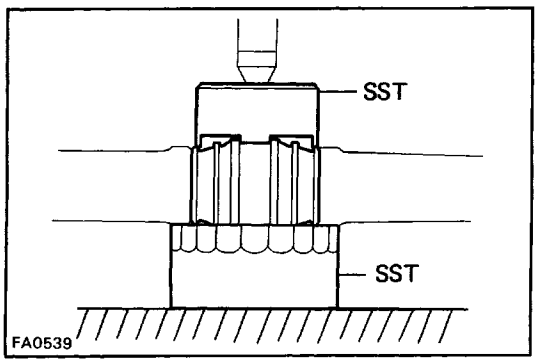
1. REMOVE BUSHINGS

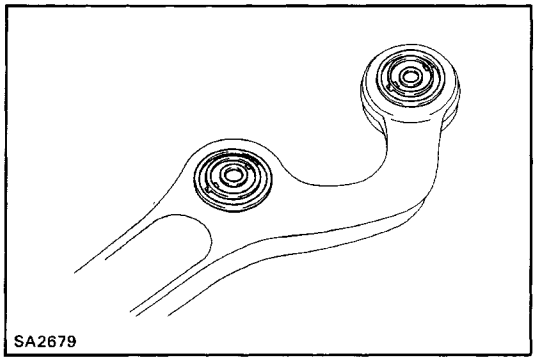
Using SST and a press, press out the bushings from the leading arm.
SST 09228–22020, 09710–30030 (09710–03180)



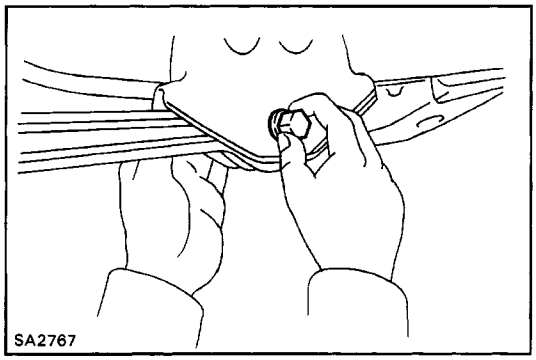
2. INSTALL BUSHINGS

Using SST and press, press a new bushing into the lead–ing arm.
SST 09228–22020, 09710–30030 (09710–03180)





HINT: When assembling the bushing, assemble it so its holes are horizontally.

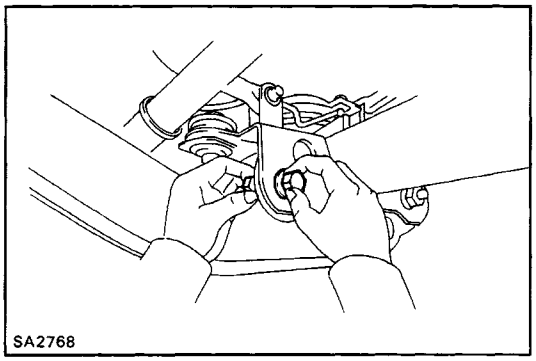


INSTALLATION OF LEADING ARM

(See page SA–47)

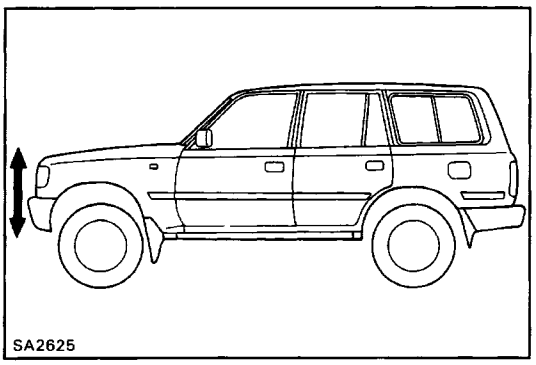
1. INSTALL LEADING ARM TO FRAME

Temporarily install the leading arm to the body with a new bolt and nut.



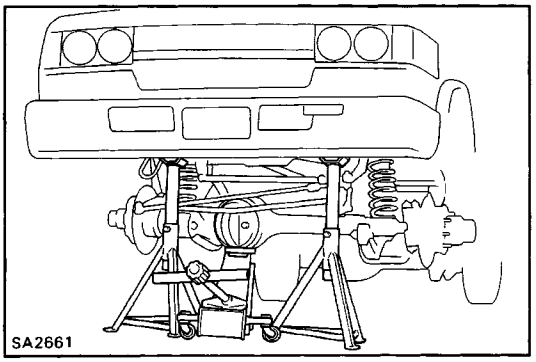
2. INSTALL LEADING ARM TO AXLE HOUSING

Temporarily connect the leading arm to the axle housing with new two bolts and nuts.



3. STABILIZE SUSPENSION

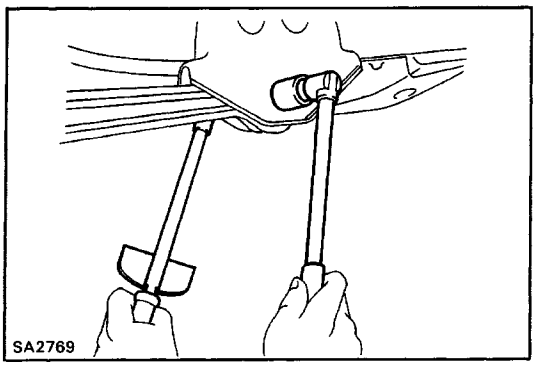
Bounce the vehicle up and down to stabilize the suspen–sion

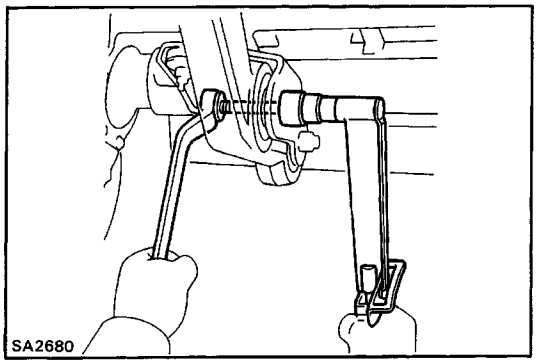


4. TORQUE NUTS

(a) Jack up the axle housing.

HINT: For safety, place stands under either side of the vehicle’s frame.





(b) Torque the nut.

Torque:

Body side

171 N–m (1,750 kgf–cm, 127 ft–lbf)

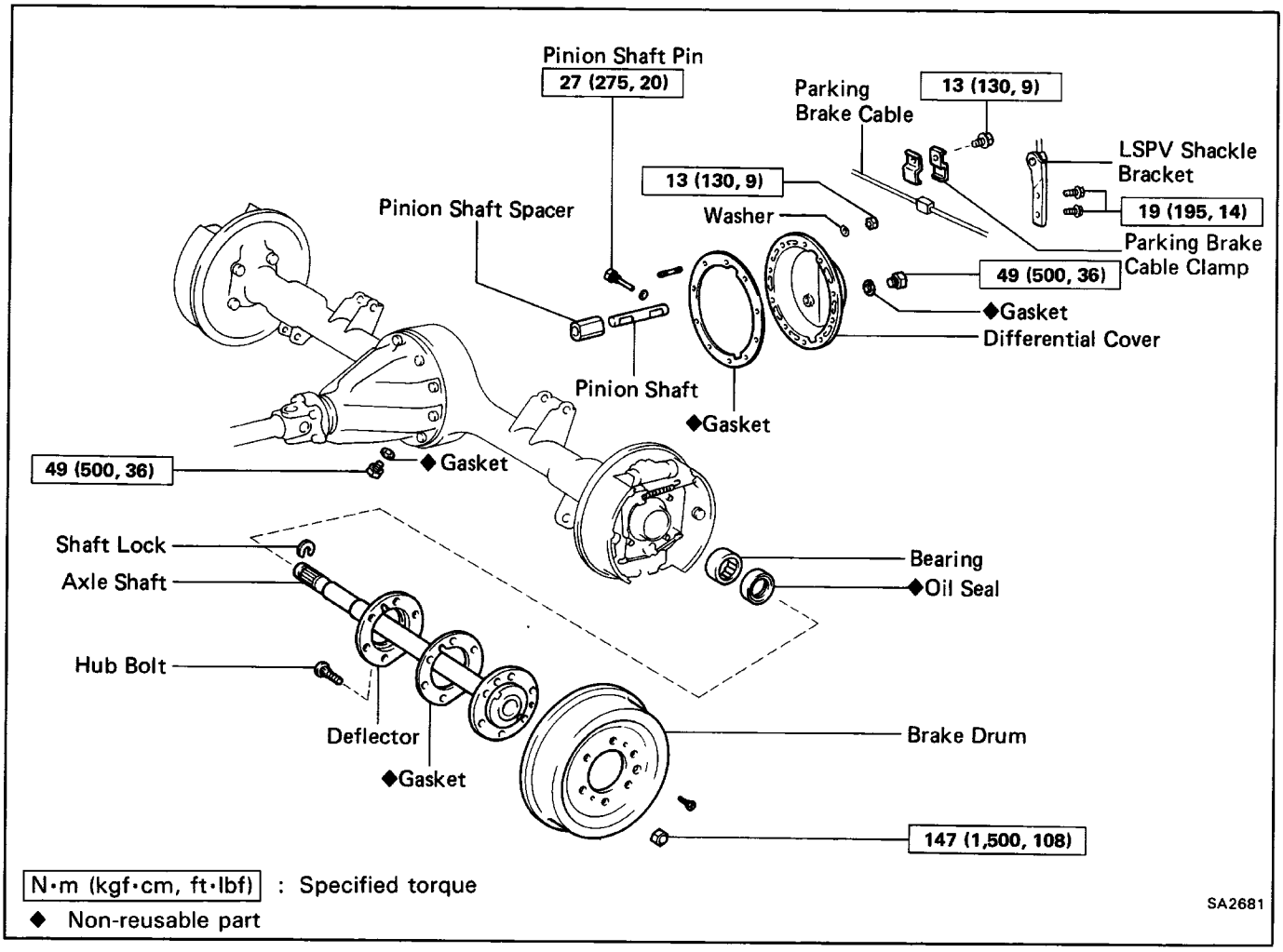
Axle housing side

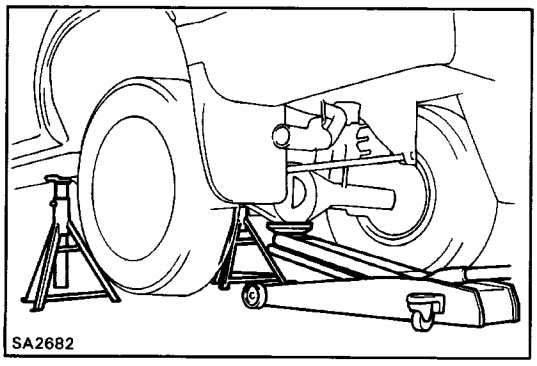
171 N–m (1,750 kgf–cm, 127 ft–lbf)

HINT: When tightening the nuts, tighten with the vehi–cle's fully weight applied to the axle housing.

REAR AXLE SHAFT

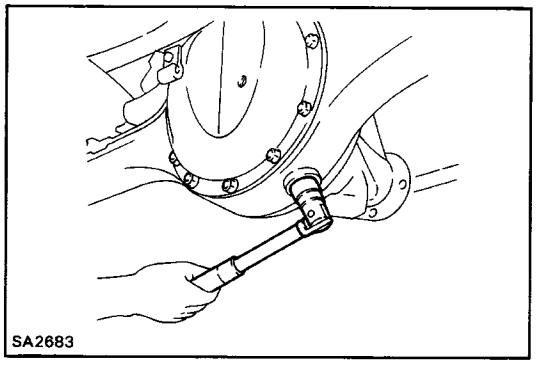
COMPONENTS



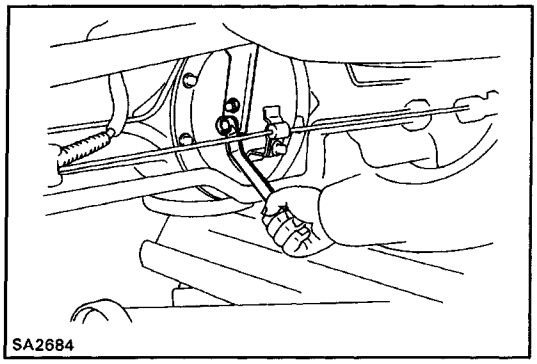


REMOVAL OF REAR AXLE SHAFT

1. JACK UP AND SUPPORT VEHICLE
2. REMOVE REAR WHEEL AND BRAKE DRUM

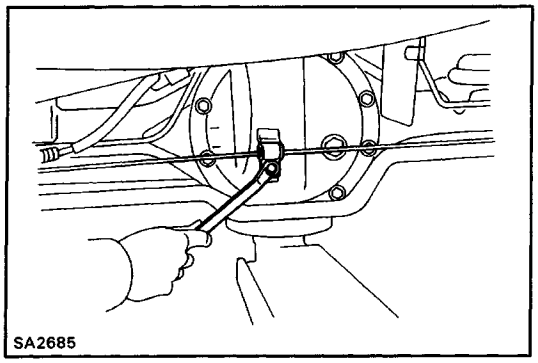


3. REMOVE DRAIN PLUG AND DRAIN DIFFERENTIAL OIL



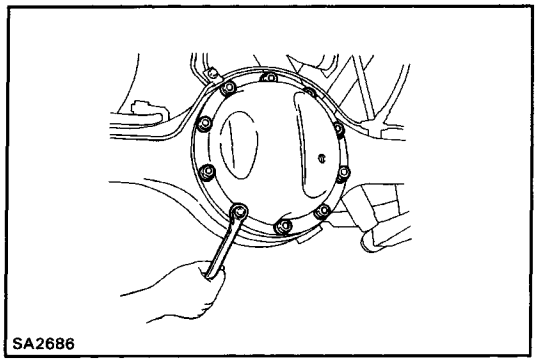
4. REMOVE LSPV SHACKLE BRACKET

Remove the bolts and the shackle bracket from the differ–ential cover.



5. REMOVE PARKING BRAKE CABLE CLAMP

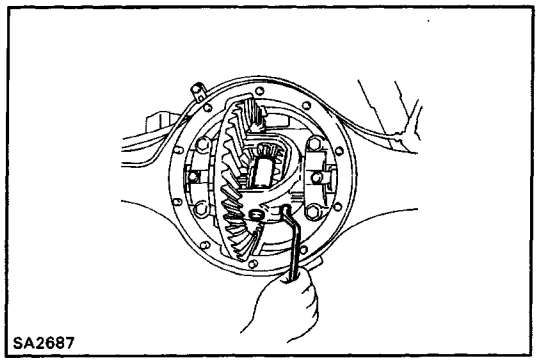
Remove the bolt and the clamp from the differential cover.



6. REMOVE DIFFERENTIAL COVER

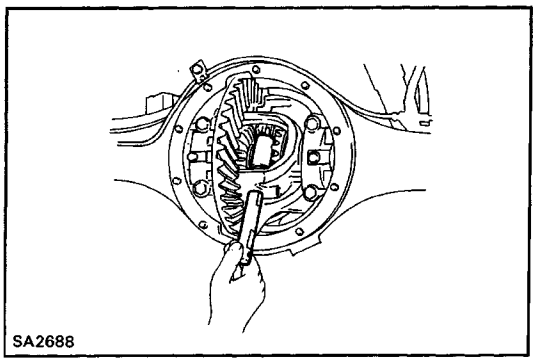
(a) Remove the ten nuts and washers from the differen–tial.

(b) Remove the differential cover with gasket from the differential.



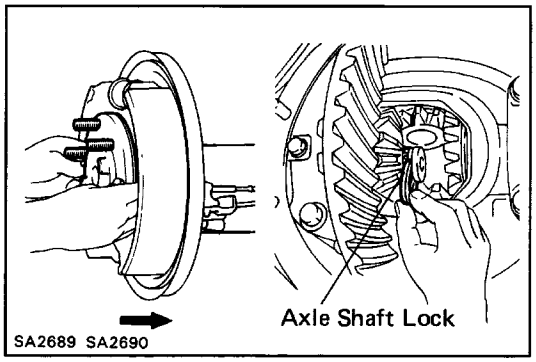
7. REMOVE PINION SHAFT AND SPACER

(a) Remove the pinion shaft pin from the differential.



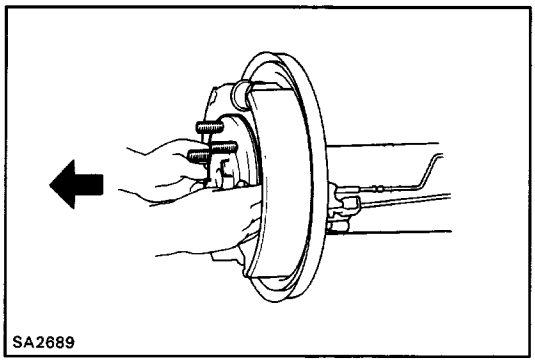
(b) Remove the pinion shaft and spacer.

HINT: When the pinion shaft is removed, the pinion gear and washer will come off also.



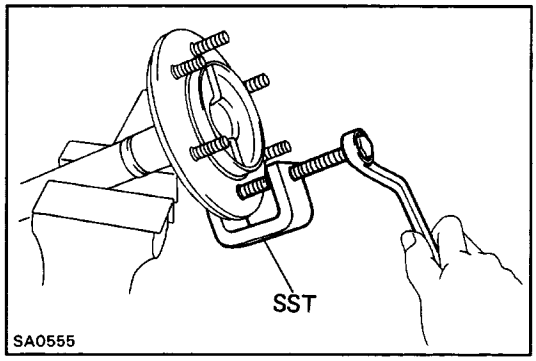
8. REMOVE AXLE SHAFT LOCK

Push the axle shaft to the differential side and remove the axle shaft lock.



9. REMOVE AXLE SHAFT

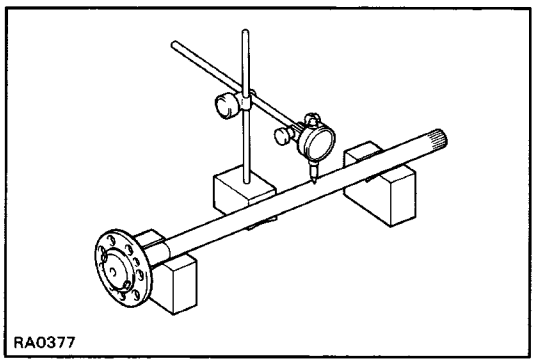
NOTICE: When pulling out the axle shaft, be careful not to damage the oil seal.



10. REMOVE OIL DEFLECTOR

Using SST, remove the hub bolts, oil deflector and gas–ket.

SST 09650–17011



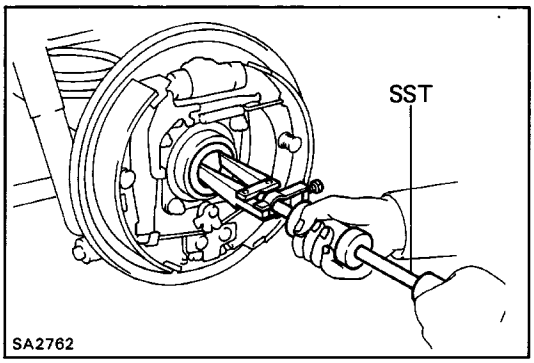
INSPECTION AND REPLACEMENT OF REAR AXLE SHAFT COMPONENTS

1. INSPECT REAR AXLE SHAFT

(a) Check for wear or damage.

(b) Check the runout of axle shaft.

Maximum runout: 0.8 mm (0.031 in.)



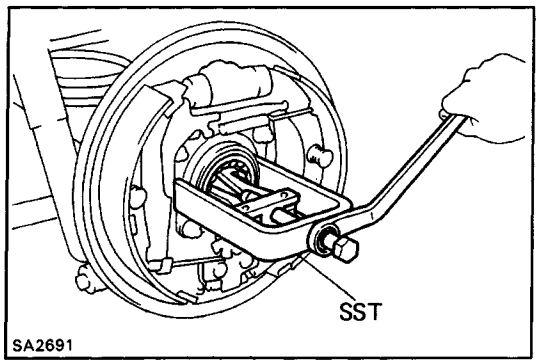
2. INSPECT OIL SEAL AND BEARING FOR WEAR OR DAM–AGE

If the oil seal and bearing is damaged or worn, replace it.

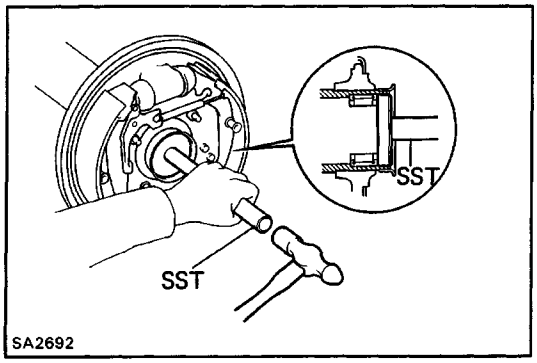
3. REPLACE OIL SEAL AND BEARING

(a) Using SST, remove the oil seal.

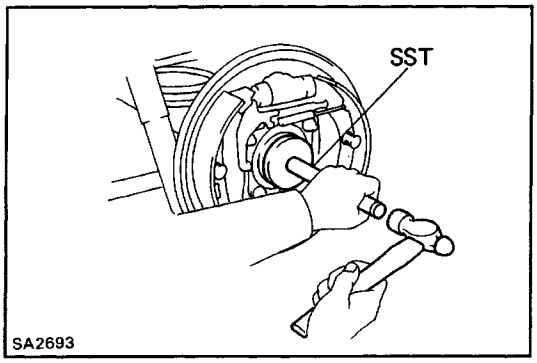
SST 09308–00010



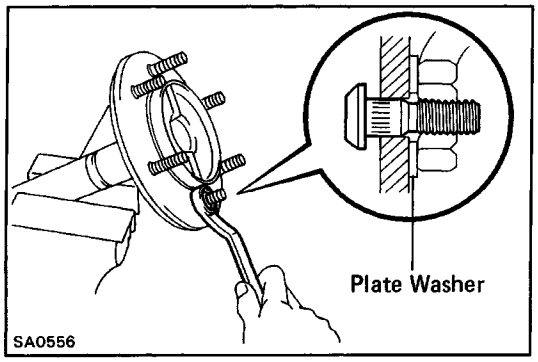
(b) Using SST, remove the bearing.
SST 09514–35011



(c) Apply MP grease to the bearing.
(d) Using SST, drive in a new bearing.
SST 09608–20012 (09608–03020, 09608–03060)



(e) Using SST, drive in a new oil seal.
SST 09608–20012 (09608–03020, 09608–03090)
(f) Apply MP grease to the oil seal lip.

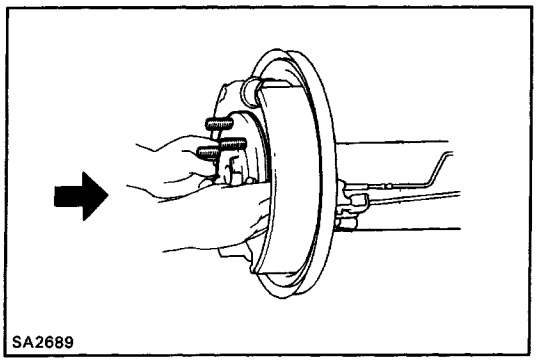


INSTALLATION OF REAR AXLE SHAFT

(See page SA–58)

1. INSTALL OIL DEFLECTOR

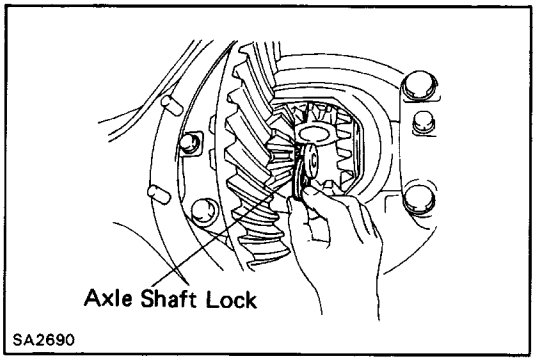
(a) Install a new gasket and the oil deflector.
(b) Install the plate washer on the hub bolt as shown in the illustration then tighten the nut to install the hub bolts.



2. INSTALL REAR AXLE SHAFT IN AXLE HOUSING

Install the axle shaft into the housing.

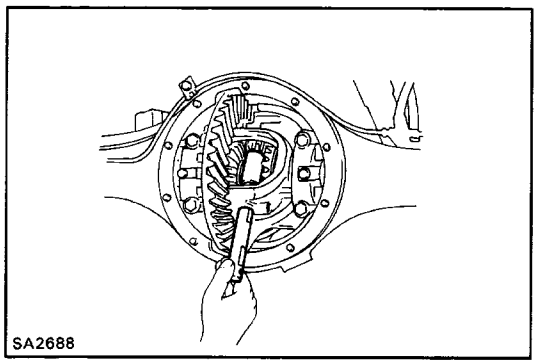
NOTICE: When inserting the axle shaft, be careful not to damage the oil seal.



3. INSTALL AXLE SHAFT LOCK

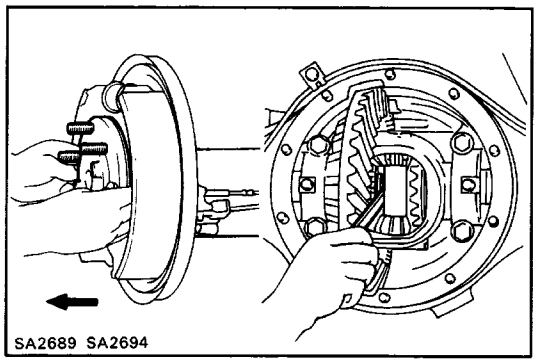
(a) Install the axle shaft lock to axle shaft.

(b) Pull the axle shaft fully toward the outer side of the vehicle.



4. INSTALL PINION SHAFT AND PINION SPACER

(a) Install the spacer and the pinion shaft to the differential.



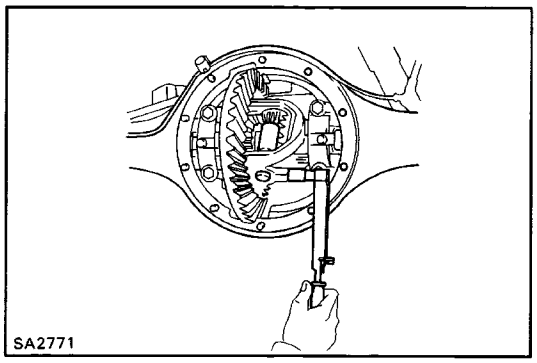
(b) Measure the thrust clearance between the axle shaft and spacer.

Maximum clearance: 0.5 mm (0.0020 in.)

If necessary, select the spacer.

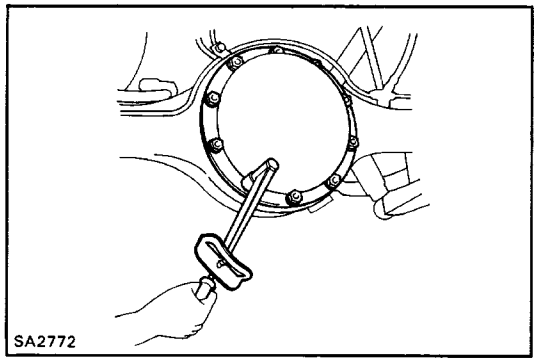
Spacer thickness

Thickness mm (in.)
29.0 (1.142)
29.4 (1.157)
29.8 (1.173)
30.2 (1.189)
30.6 (1.205)



(c) Install the pinion shaft pin.

Torque: 27 N–m (275 kgf–cm, 20 ft–lbf)

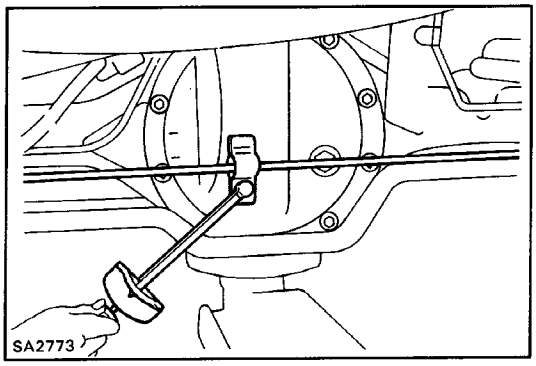


5. INSTALL DIFFERENTIAL COVER

(a) Install a new gasket and differential cover to the axle housing.

(b) Install the ten washers and nuts.

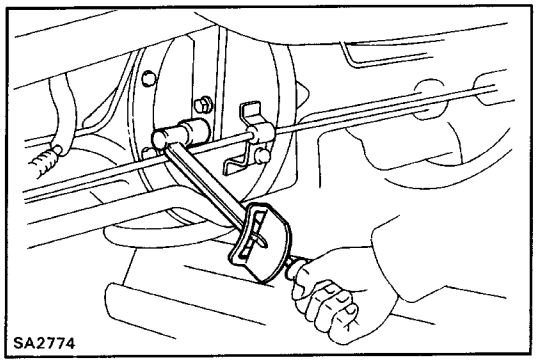
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



6. INSTALL PARKING BRAKE CABLE CLAMP

Install the clamp with the parking brake cable to the differential cover with the bolt.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

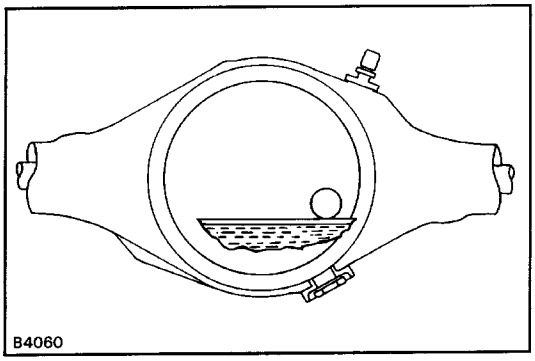


7. INSTALL LSPV SHACKLE BRACKET

Install the shackle bracket to differential cover with the bolts.

Torque: 13 N–m (13 kgf–cm, 9 ft–lbf)

8. INSTALL BRAKE DRUM AND WHEEL



9. FILL DIFFERENTIAL WITH GEAR OIL

Oil type: Hypoid gear oil

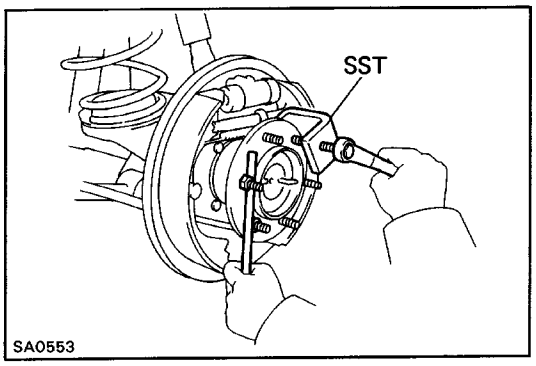
Viscosity:

Above – 18˚C (0˚F) SAE90

Below – 18˚C (0˚F) SAE80W or 80W–90

Capacity: 2.8 liters (2.9 US qts, 2.4 Imp.qts)

10. LOWER VEHICLE



REPLACEMENT OF HUB BOLT

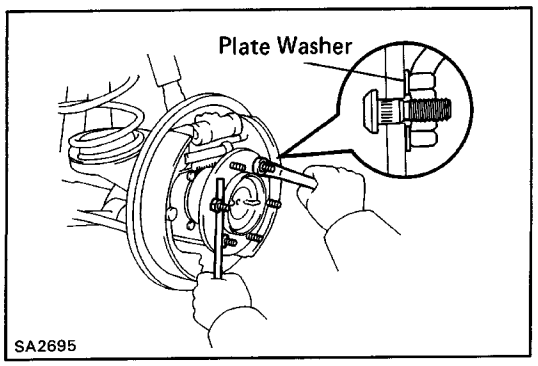
1. JACK UP AND SUPPORT VEHICLE

2. REMOVE WHEEL AND BRAKE DRUM

3. REMOVE HUB BOLT

Using SST, remove the hub bolt.

SST 09650–17011



4. INSTALL HUB BOLT

Hold the axle shaft, using plate washer and nut, install a new hub bolt.

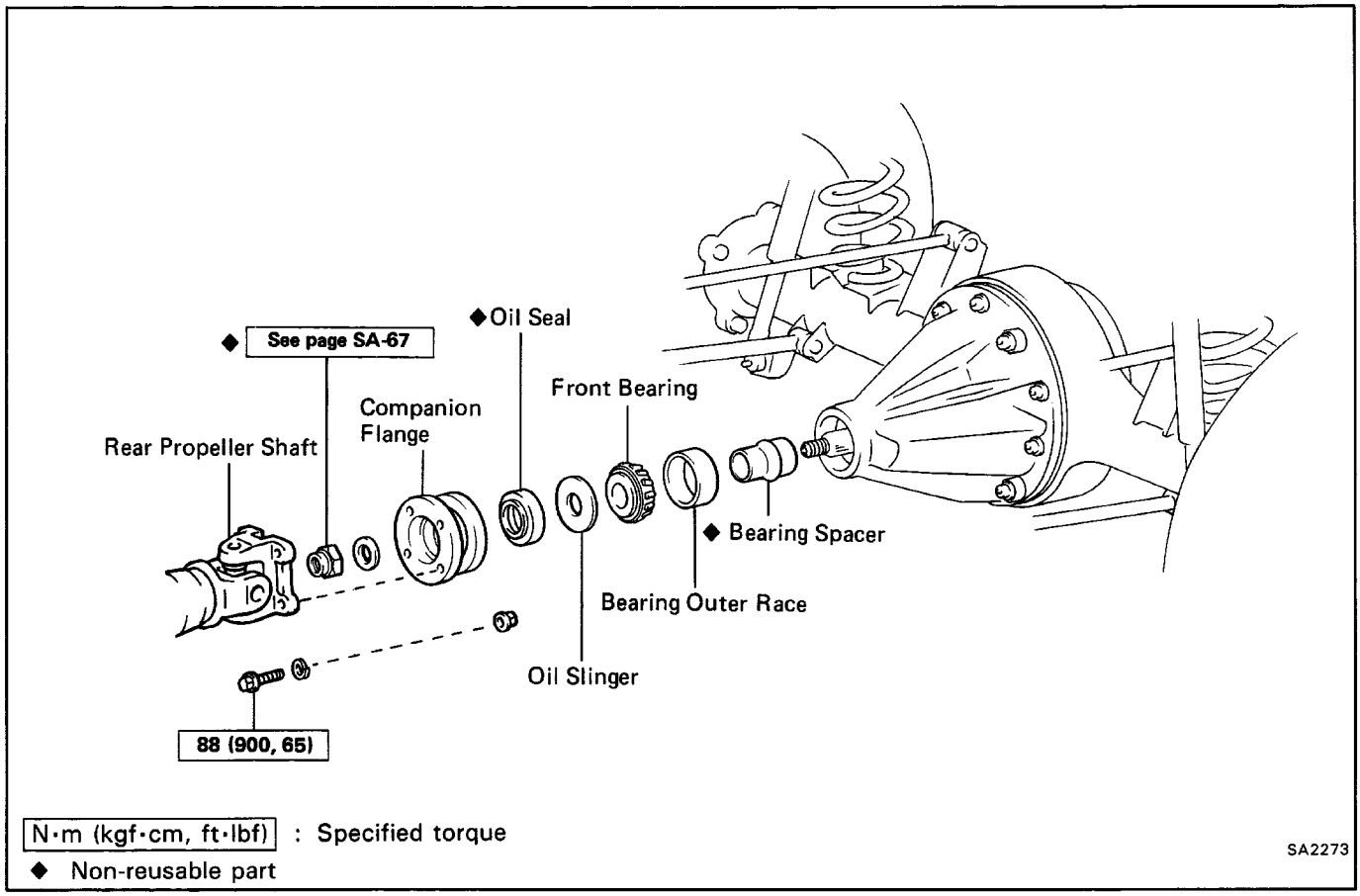
5. INSTALL BRAKE DRUM AND WHEEL

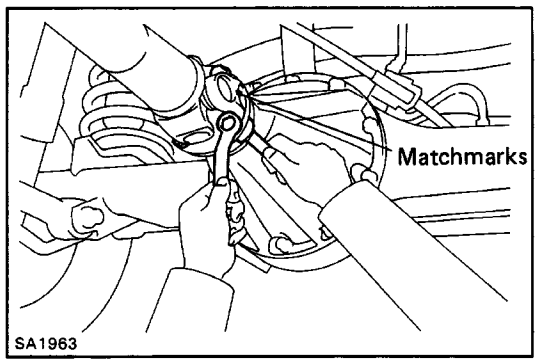
6. LOWER VEHICLE

REAR DIFFERENTIAL

On–Vehicle Replacement of Oil Seal

COMPONENTS

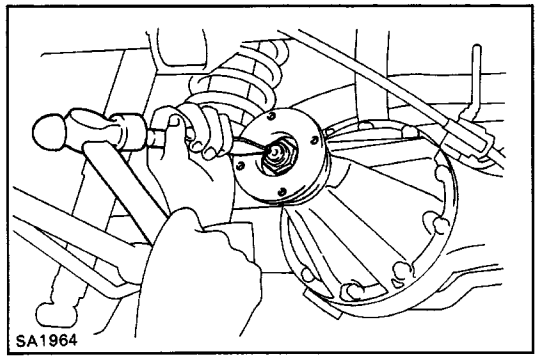




1. DISCONNECT REAR PROPELLER SHAFT

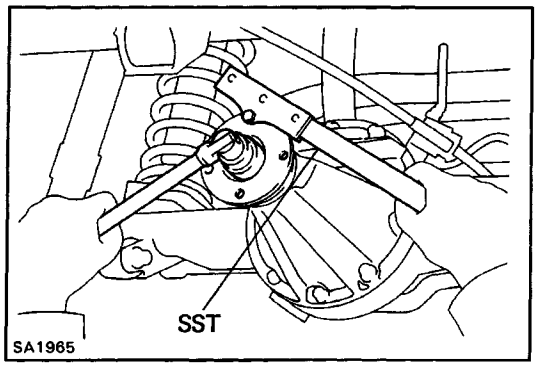
(a) Place matchmarks on the flanges.

(b) Remove the four bolts and nuts.

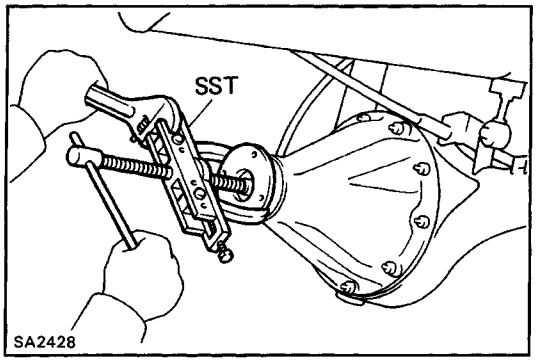


2. REMOVE COMPANION FLANGE

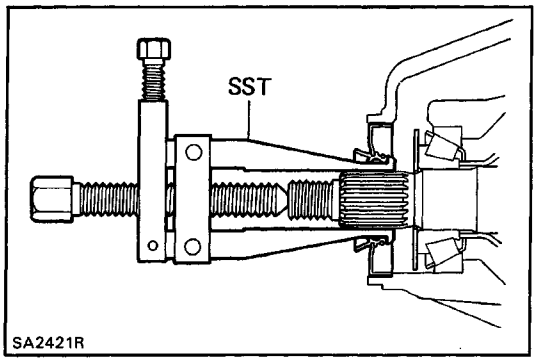
(a) Using a chisel and hammer, loosen the staked part of nut.



(b) Using SST to hold the flange, remove the nut and plate washer.
SST 09330–00021



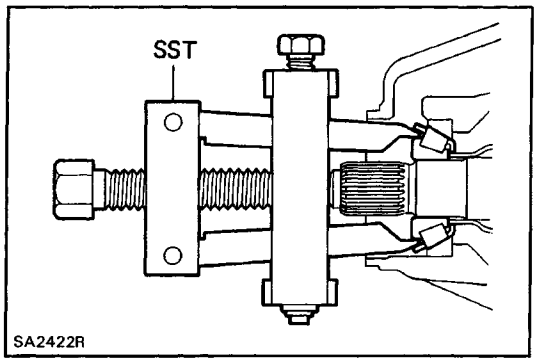
(c) Using SST, remove the companion flange.
SST 09950–20017



3. REMOVE OIL SEAL AND OIL SLINGER

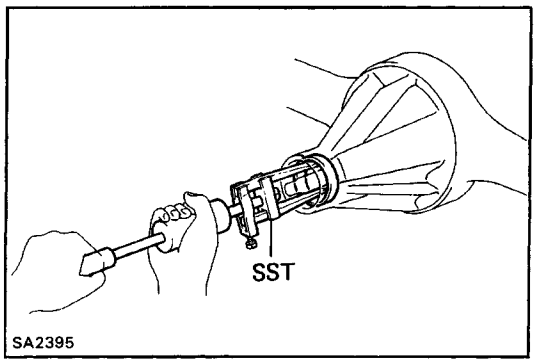
(a) Using SST, remove the oil seal.
SST 09308–10010

(b) Remove the oil slinger.



4. REMOVE FRONT BEARING

Using SST, remove the front bearing.
SST 09556–22010

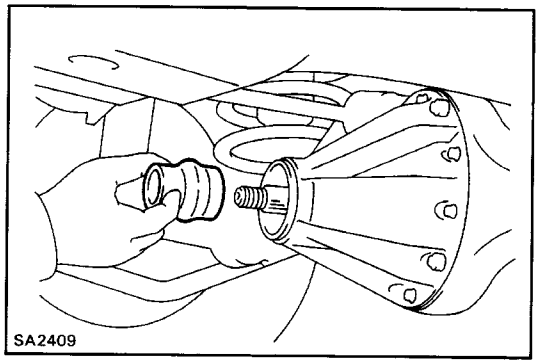


5. REMOVE BEARING OUTER RACE

Using SST, remove the bearing outer race.
SST 09308–00010

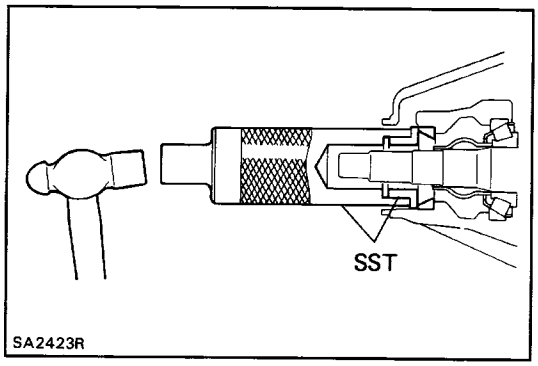
NOTICE: Do not scratch the taper surface of the outer race.

6. REMOVE BEARING SPACER



7. INSTALL NEW BEARING SPACER

Install a new spacer into the differential.

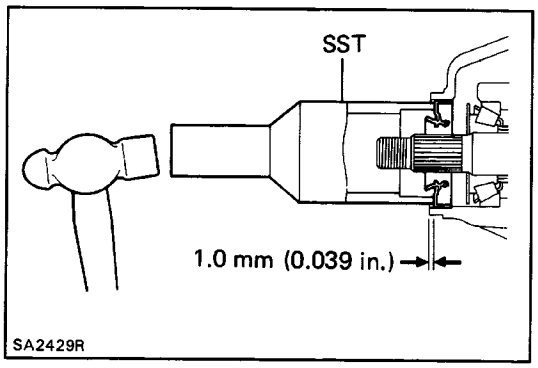


8. INSTALL BEARING OUTER RACE

Using SST, drive in the bearing outer race.

SST 09316–60010 (09316–00010, 09316–00020)

9. INSTALL FRONT BEARING



10. INSTALL OIL SLINGER AND NEW OIL SEAL

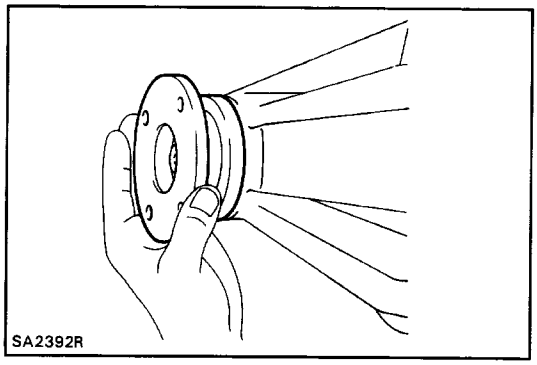
(a) Install the oil slinger facing as shown.

(b) Using SST, drive in a new oil seal as shown.

SST 09214–76011

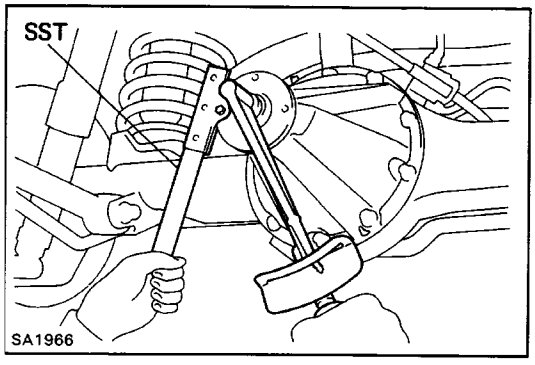
Oil seal drive in depth: 1.0 mm (0.039 in.)

(c) Coat the lip of the oil seal with MP grease.



11. INSTALL COMPANION FLANGE

(a) Install the companion flange and plate washer.

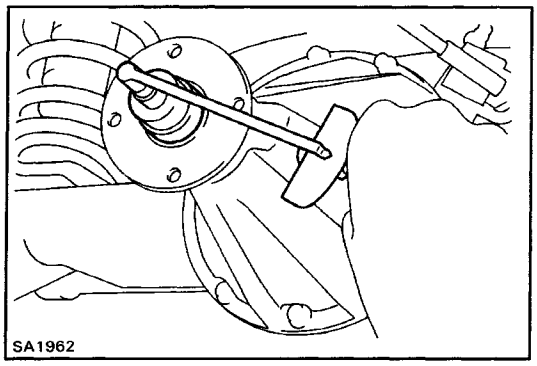


(b) Apply a light coat of gear oil on the threads of a new companion flange nut.

(c) Using SST to hold the flange, torque the nut.

SST 09330–00021

Torque: 245 N–m (2,500 kgf–cm, 181 ft–lbf)



12. CHECK DRIVE PINION PRELOAD

Using a torque meter, measure the preload of the back–lash between the drive pinion and ring gear.

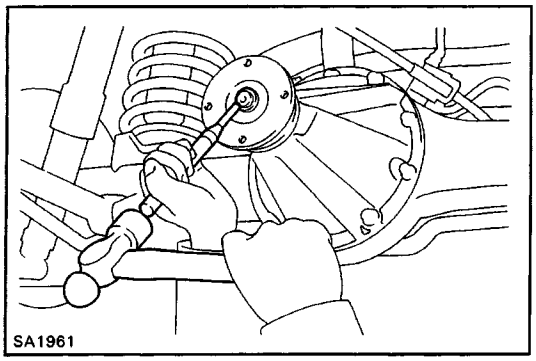
Preload (at starting):
New bearing
1.3 – 2.0 N–m
(13 – 20 kgf–cm, 11.3 – 17.4 in.–lbf)
Reused bearing
0.7 – 1.0 N–m
(7 – 10 kgf–cm, 6.1 – 8.7 in.–lbf)

- If preload is greater than specification, replace the bearing spacer.
- If preload is less than specification, retighten the nut 13 N–m (130 kgf–cm, 9 ft–lbf) at a time until the spec–ified preload is reached.

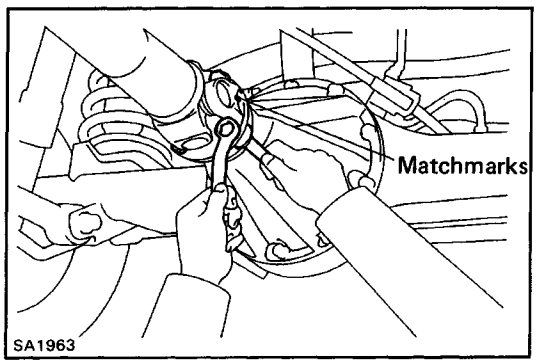
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

Maximum torque: 441 N–m (4,500 kgf–cm, 325 ft–lbf)

If everything is normal, coat the threads with gear oil, then repeat the above operation.



13. STRIKE DRIVE PINION NUT

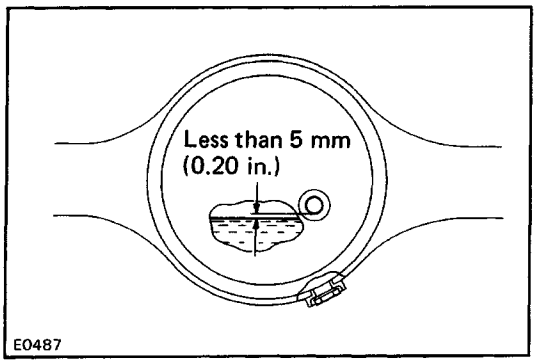


14. CONNECT REAR PROPELLER SHAFT

(a) Align the matchmarks on the flanges and connect the flanges with four bolts, spring washers and nuts.

(b) Torque the bolts and nuts.

Torque: 88 N–m (900 kgf–cm, 65 ft–lbf)



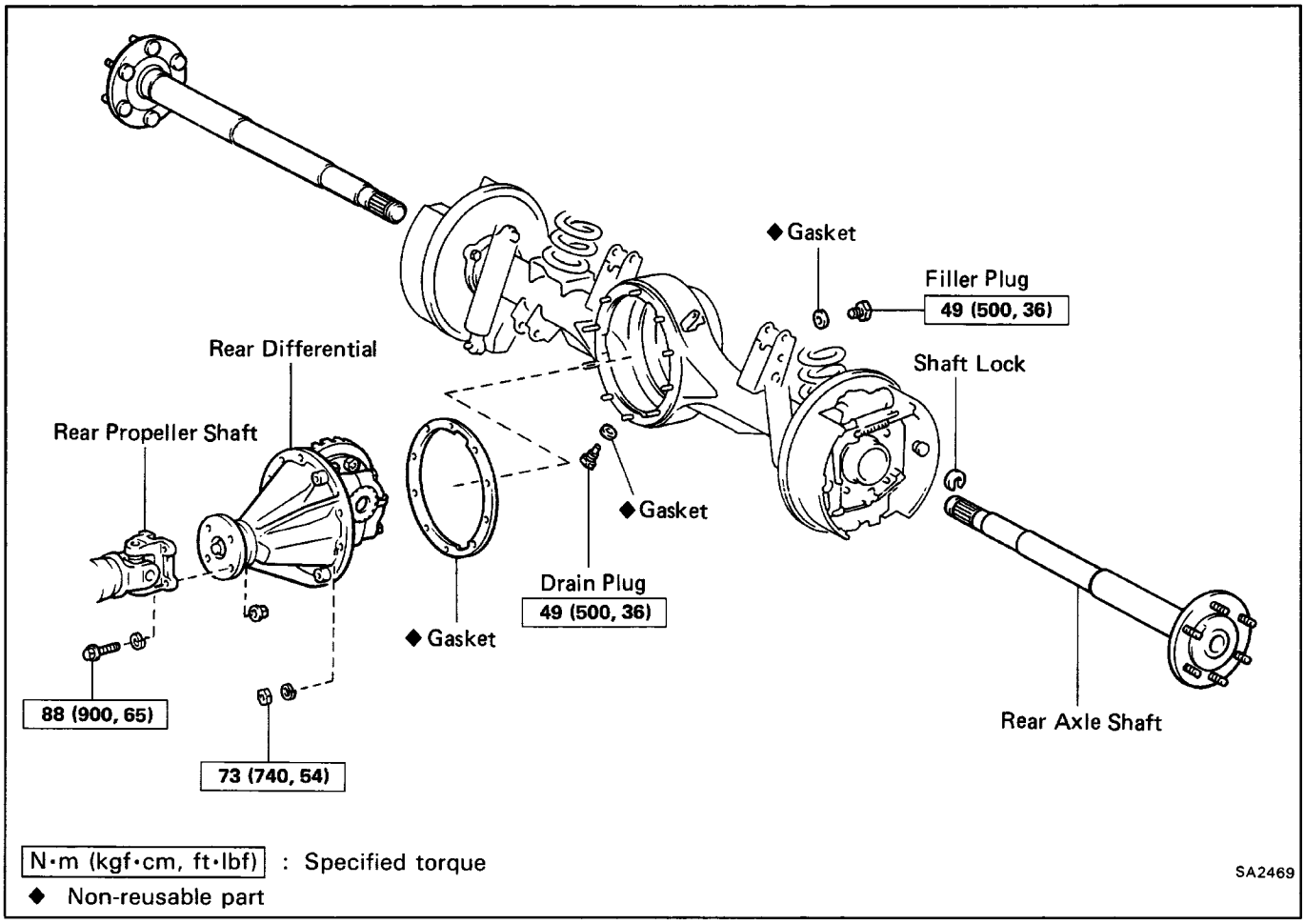
15. CHECK DIFFERENTIAL OIL LEVEL

Fill with hypoid gear oil if necessary.

Oil type: Hypoid gear oil API GL–5
Recommended oil viscosity:
Above – 18˚C (0˚F) SAE 90
Below – 18˚C (0˚F) SAE 80W or 80W–90
Capacity: 2.8 liters (2.9 US qts, 2.4 Imp. qts)

Removal and Installation of Rear Differential

COMPONENTS



REMOVAL OF REAR DIFFERENTIAL

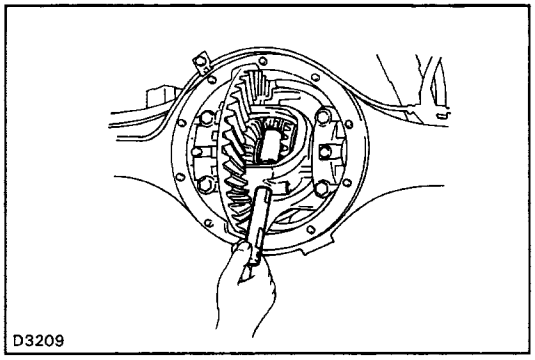
1. REMOVE DRAIN PLUG AND DRAIN DIFFERENTIAL OIL

2. REMOVE REAR AXLE SHAFTS

(See steps 1 to 9 on pages SA–58 to SA–60)

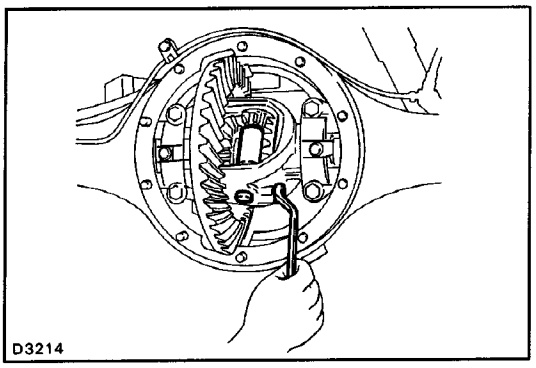
3. DISCONNECT REAR PROPELLER SHAFT

(See step 1 on page SA–64)

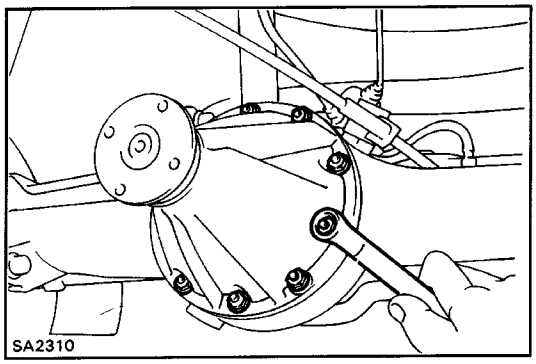


4. INSTALL PINION SHAFT AND PINION SPACER

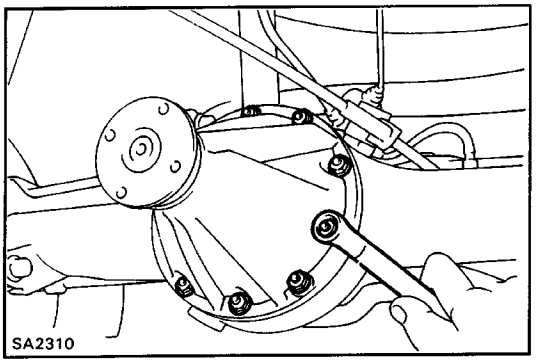
(a) Install the spacer and pinion shaft to the differential.



(b) Install the pinion shaft pin.
Torque: 27 N–m (275 kgf–cm, 20 ft–lbf)



5. REMOVE DIFFERENTIAL CARRIER ASSEMBLY
NOTICE: Do not scratch the installation surface.



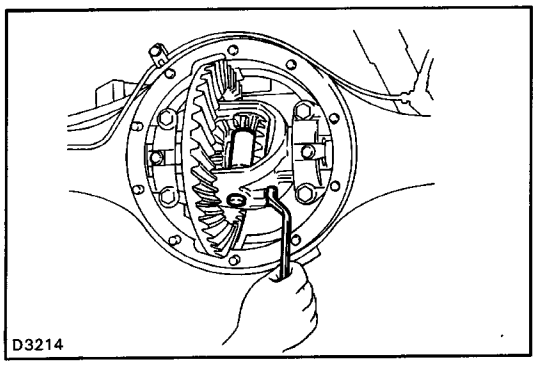
INSTALLATION OF REAR DIFFERENTIAL

(See page SA–68)

1. INSTALL NEW GASKET

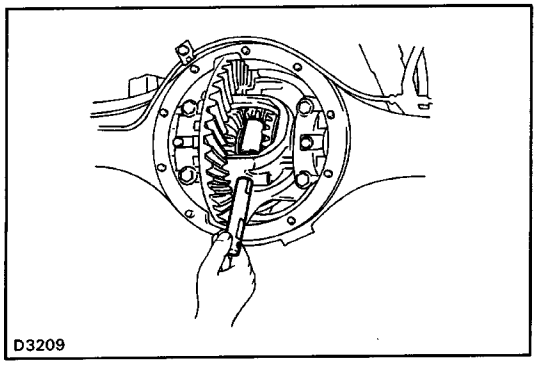
2. INSTALL DIFFERENTIAL CARRIER ASSEMBLY

Install the differential carrier assembly in the axle and in–stall the 10 nuts. Torque the nuts.
Torque: 73 N–m (740 kgf–cm, 54 ft–lbf)



3. REMOVE PINION SHAFT AND PINION SPACER

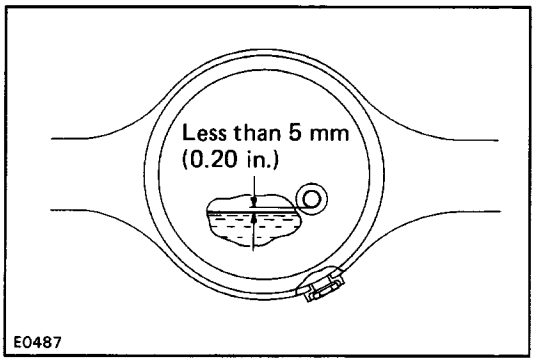
(a) Remove the pinion shaft pin from the differential.



(b) Remove the pinion shaft and spacer.

HINT: When the pinion shaft is removed, the pinion gear and thrust washer will come off also.

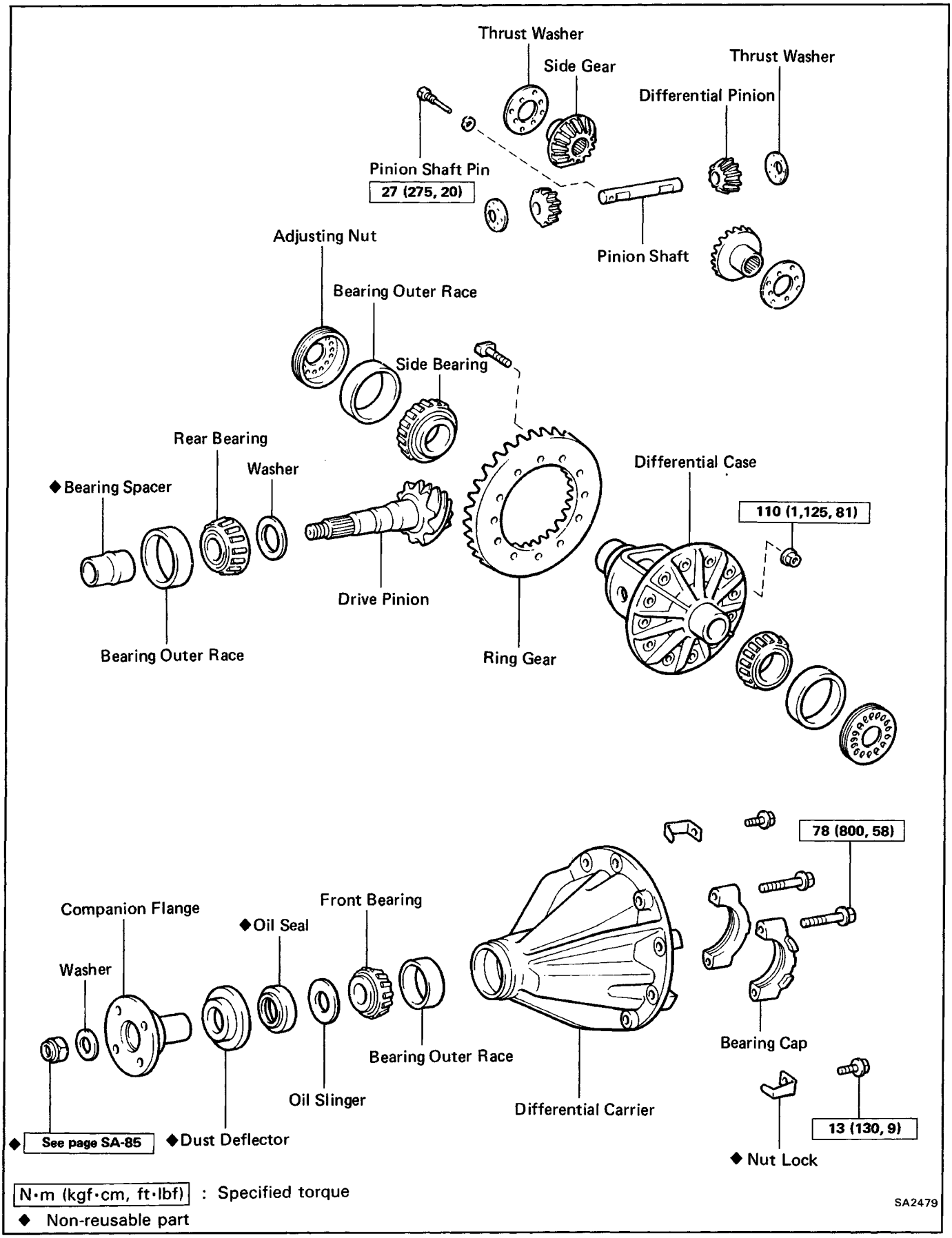
4. CONNECT REAR PROPELLER SHAFT
(See step 14 on page SA–67)
5. INSTALL REAR AXLE SHAFTS
(See steps 2 to 8 on pages SA–61 to SA–63)
6. INSTALL DRAIN PLUG



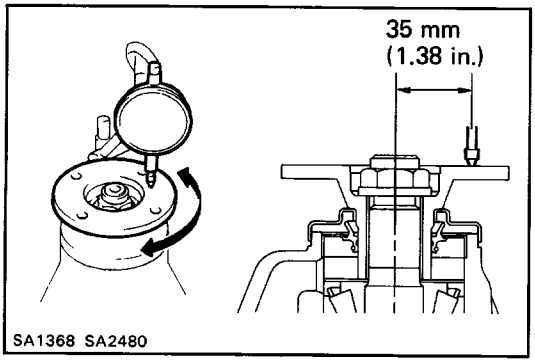
7. FILL DIFFERENTIAL WITH GEAR OIL
Fill with hypoid gear oil.

Oil type: Hypoid gear oil API GL–5
Viscosity: Above – 18˚C (0˚F) SAE 90
Below – 18˚C (0˚F) SAE 80W or 80W–90
Capacity: 2.8 liters (2.9 US qts, 2.4 Imp. qts)

Differential Carrier
COMPONENTS



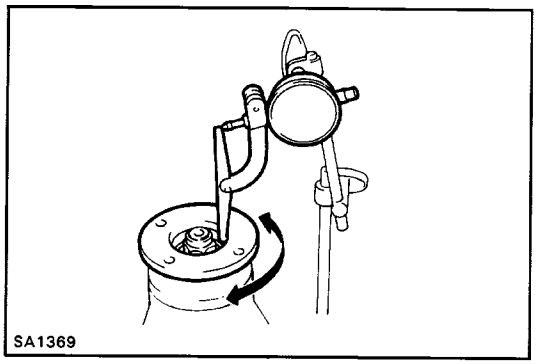
INSPECTION OF DIFFERENTIAL CARRIER



1. CHECK RUNOUT OF COMPANION FLANGE

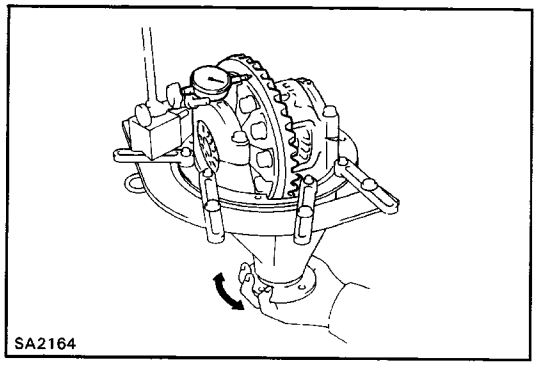
Using a dial indicator, measure the vertical and lateral runout of the companion flange.

Maximum vertical runout: 0.10 mm (0.0039 in.)



Maximum lateral runout: 0.10 mm (0.0039 in.)

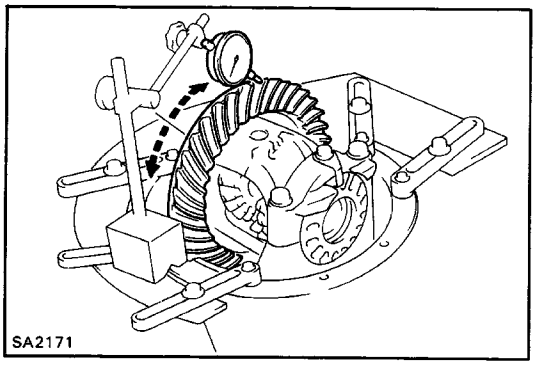
If the runout is greater than the maximum, replace the companion flange.



2. CHECK RING GEAR RUNOUT

If the runout greater than maximum, replace the ring gear.

Maximum runout: 0.10 mm (0.0039 in.)

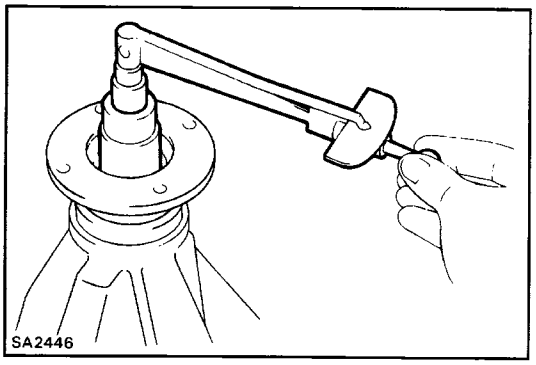


3. CHECK RING GEAR BACKLASH

If the backlash is not within specification, adjust the side bearing preload or repair as necessary.

Backlash: 0.15 – 0.20 mm (0.0059 – 0.0079 in.)

HINT: Perform the measurements at three or more posi–tions around the circumference of the ring gear.



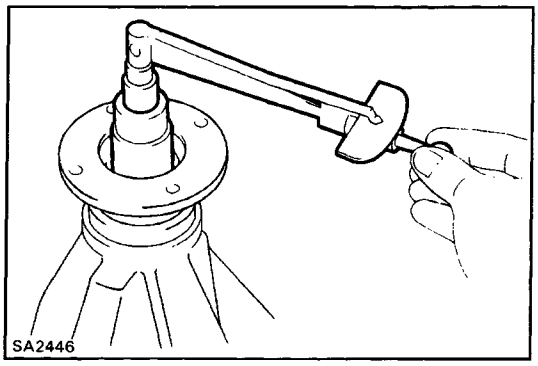
4. MEASURE DRIVE PINION PRELOAD

Measure the drive pinion preload using the backlash of the drive pinion and ring gear.

Preload (at starting):

0.7 – 1.0 N–m

(7 – 1.0 kgf–cm, 6.1 – 8.7 in.–lbf)

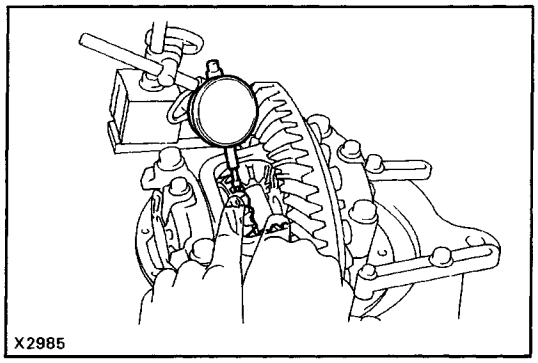


5. CHECK TOTAL PRELOAD

Using a torque meter, measure the total preload.

Total preload: In addition to drive pinion preload
0.4 – 0.6 N–m (4 – 6 kgf–cm, 3.5 – 4.2 in.–lbf)

If necessary, disassemble and inspect a differential.



6. CHECK SIDE GEAR BACKLASH

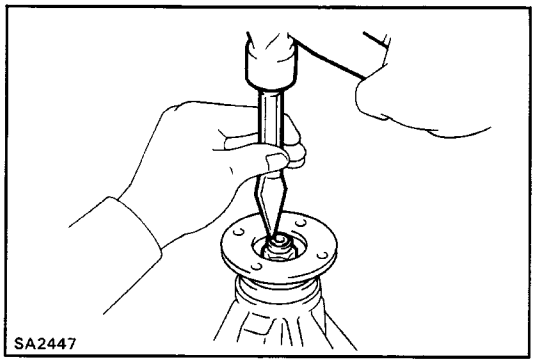
Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash: 0.02 – 0.20 mm
(0.0008 – 0.0079 in.)

If the backlash is out of specification, install the correct thrust washers. (See page SA–78)

7. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(See step 12 on page SA–83)

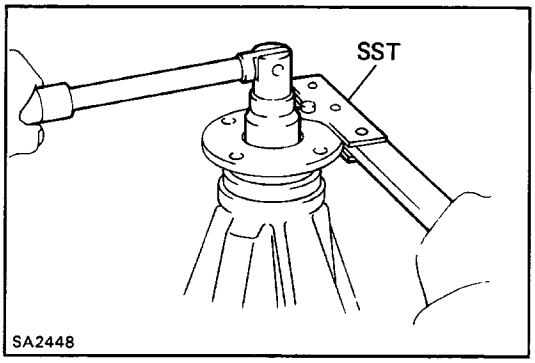


DISASSEMBLY OF DIFFERENTIAL CARRIER

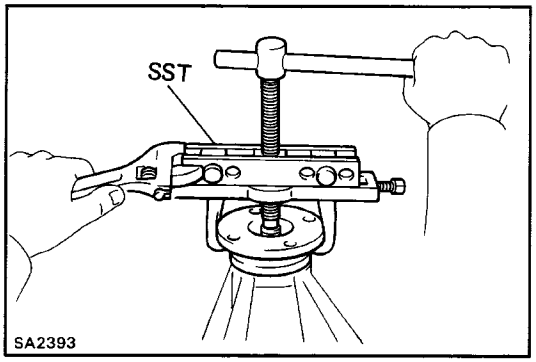
(See page SA–71)

1. REMOVE COMPANION FLANGE

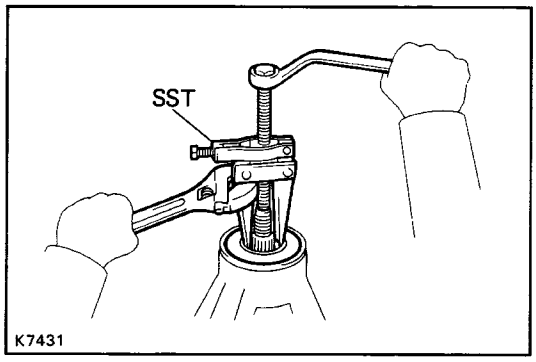
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut and plate washer.
SST 09330–00021



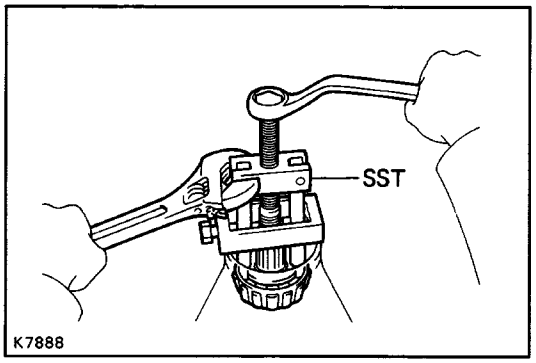
(c) Using SST, remove the companion flange.
SST 09950–20017



2. REMOVE FRONT OIL SEAL AND OIL SLINGER

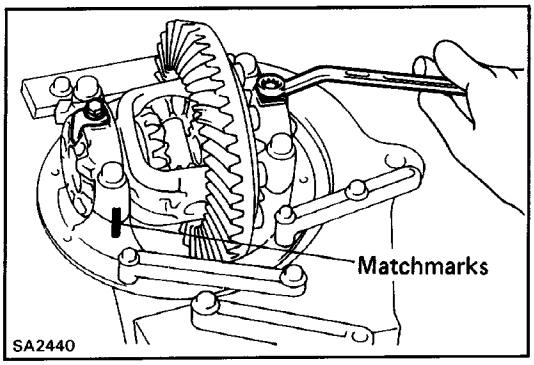
(a) Using SST, remove the oil seal from the housing.
SST 09308–10010

(b) Remove the oil slinger.



3. REMOVE FRONT BEARING

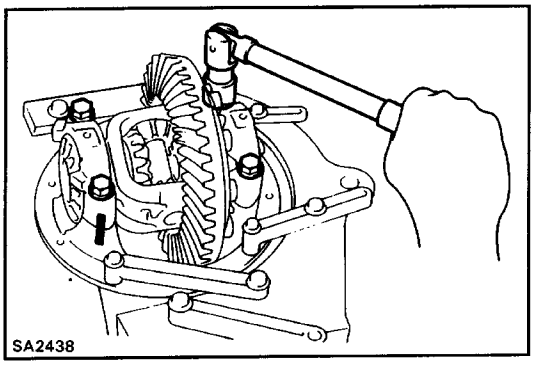
Using SST, remove the bearing from the housing.
SST 09556–22010



4. REMOVE DIFFERENTIAL CASE

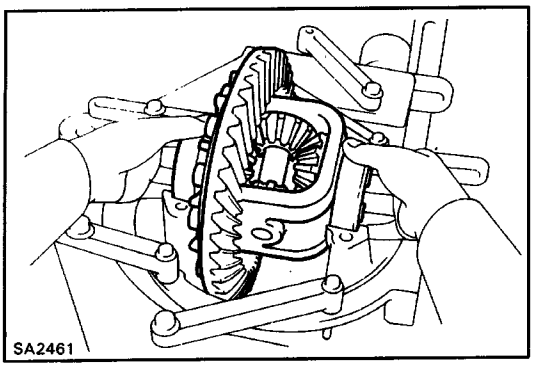
(a) Place matchmarks on the bearing cap and differen–tial carrier.

(b) Remove the two adjusting nut locks.

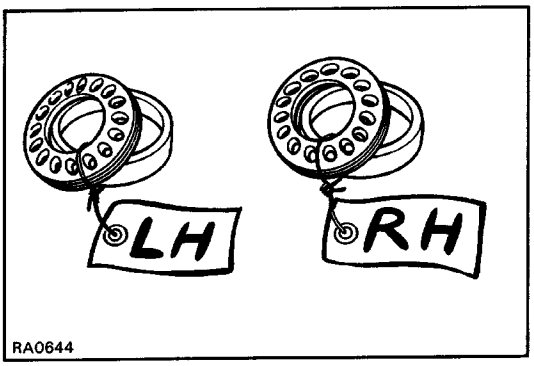


(c) Remove the four bolts and the two bearing caps.

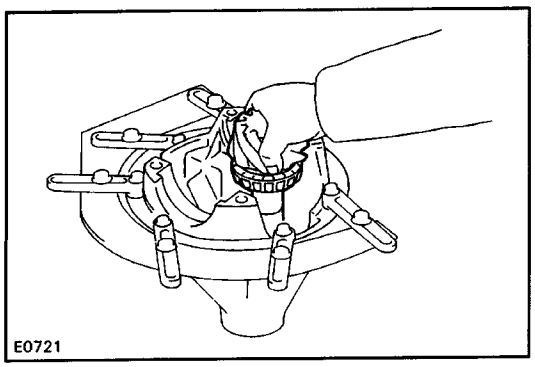
(d) Remove the two adjusting nuts.



(e) Remove the differential case with the side bearing outer races from the differential carrier.



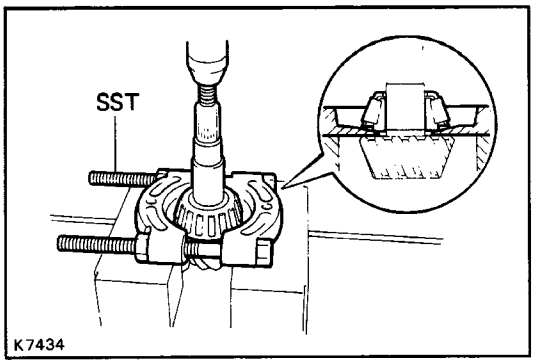
HINT: Tag the disassembled parts to show the location for reassembly.



5. REMOVE DRIVE PINION AND BEARING SPACER

(a) Remove the drive pinion with the rear bearing.

(b) Remove the bearing spacer.

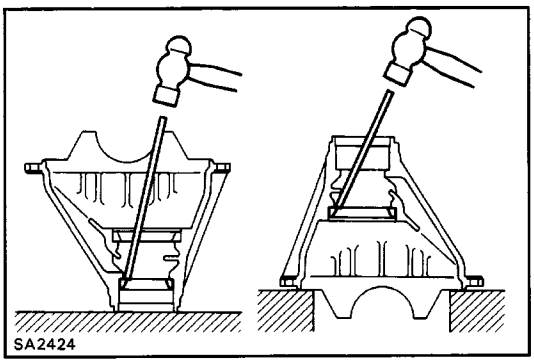


6. REMOVE DRIVE PINION REAR BEARING

(a) Using SST, press out the rear bearing from the drive pinion.
SST 09950–00020

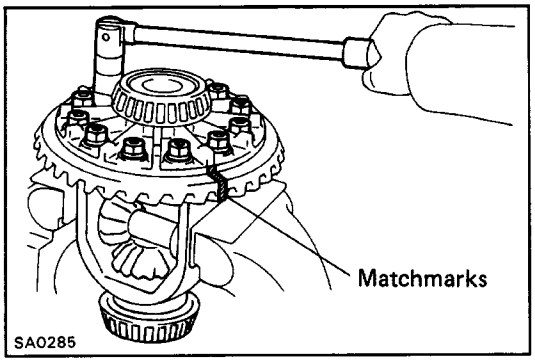
HINT: If the drive pinion or ring gear are damaged replace them as a set.

(b) Remove the plate washer from the drive pinion.



7. REMOVE FRONT AND REAR BEARING OUTER RACE

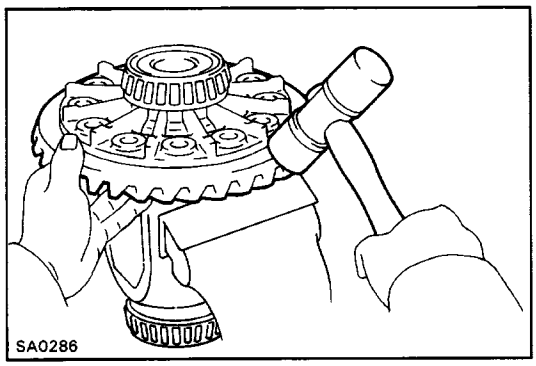
Using a hammer and brass bar, drive out the outer race from the carrier.



8. REMOVE RING GEAR

(a) Place matchmarks on the ring gear and differential case.

(b) Remove the twelve nuts and twelve bolts.



(c) Using a plastic hammer or copper hammer, tap on the ring gear to separate it from differential case.

9. CHECK DIFFERENTIAL CASE RUNOUT

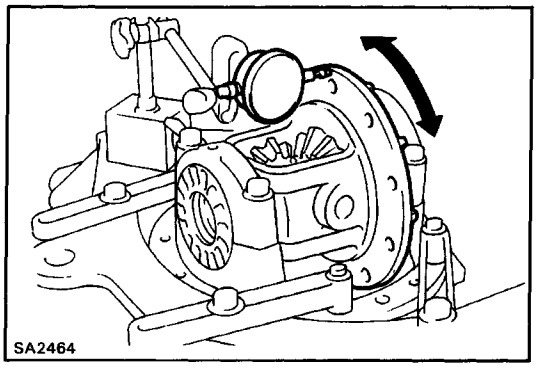
(a) Place the bearing outer races on their respective bearings. Check that the left and right outer races are not interchanged.

(b) Install the differential case in the differential carrier.

(c) When there is no play left in the side bearings, install the adjusting nuts.

(d) Align the matchmarks on the bearing cap and differential carrier.

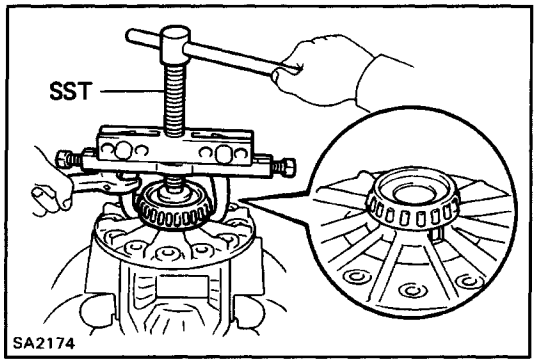
(e) Install and uniformly tighten the four bearing cap bolts in several passes.



(f) Using a dial indicator, measure the differential case runout.

Maximum runout: 0.07 mm (0.0028 in.)

(g) Remove the differential case.
(See step 4 on page SA–75).

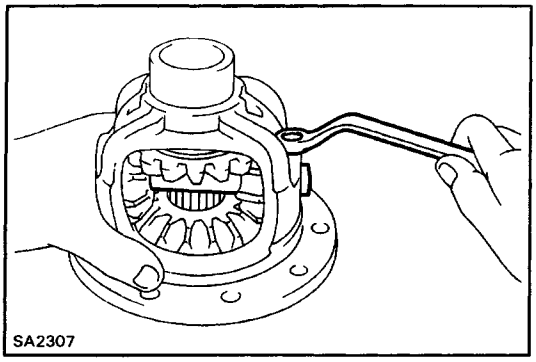


10. REMOVE SIDE BEARINGS

Using SST, remove the side bearing from the differential case.

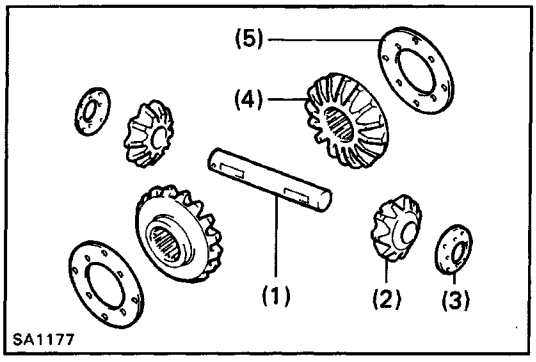
SST 09950–20017

HINT: Fix the claws of SST to the notch in the differen–tial case.

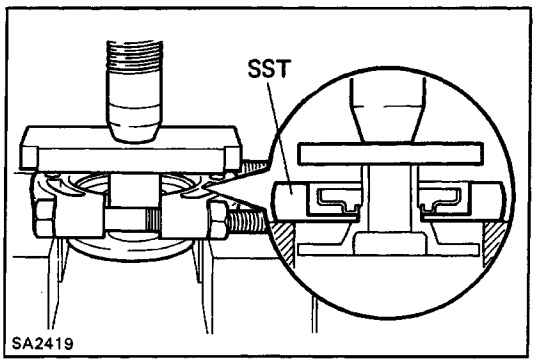


11. DISASSEMBLE DIFFERENTIAL CASE

(a) Remove the pinion shaft pin.



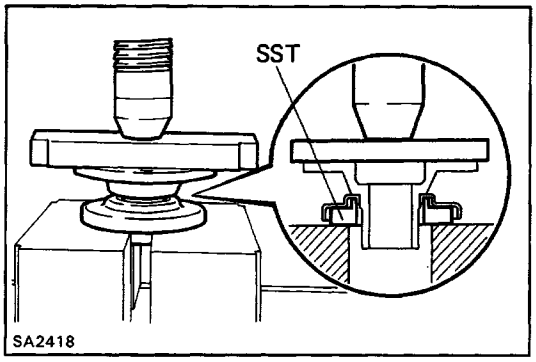
(b) Remove following parts from the differential case:
(1) Pinion shaft
(2) Two differential pinions
(3) Two pinion thrust washers
(4) Two side gears
(5) Two side gear thrust washers



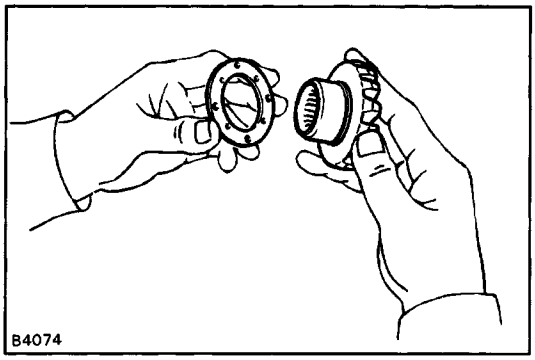
REPLACEMENT OF DUST DEFLECTOR

REPLACE COMPANION FLANGE DUST DEFLECTOR

(a) Using SST and a press, remove the dust deflector.
SST 09950–00020



(b) Using SST and a press, install a new dust deflector.
SST 09726–40010



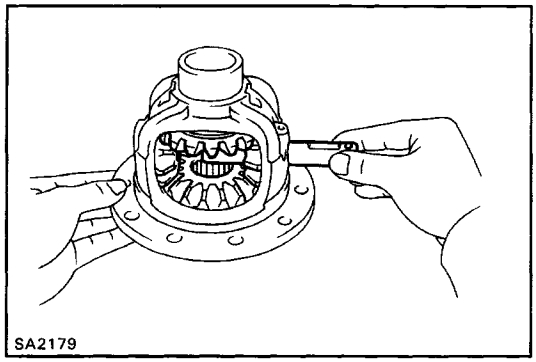
ASSEMBLY OF DIFFERENTIAL CARRIER

(See page SA–71)

1. ASSEMBLE DIFFERENTIAL CASE

(a) Install the proper thrust washers and side gears.
Using the below table, select thrust washers which will ensure that the backlash is within specification.
Try to select washers of the same size for both sides.

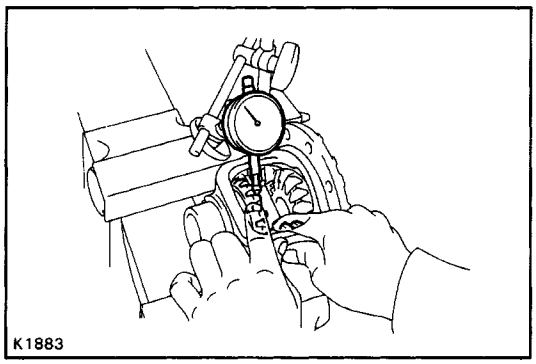
Standard backlash: 0.02 – 0.20 mm
(0.008 – 0.0079 in.)



Thrust washer thickness mm (in.)
1.55 – 1.65 (0.0610 – 0.0650)
1.70 – 1.80 (0.0669 – 0.0709)
1.85 – 1.95 (0.0728 – 0.0768)
2.00 – 2.10 (0.0787 – 0.0827)

(b) Install thrust washers and side gears in the differen–tial case.

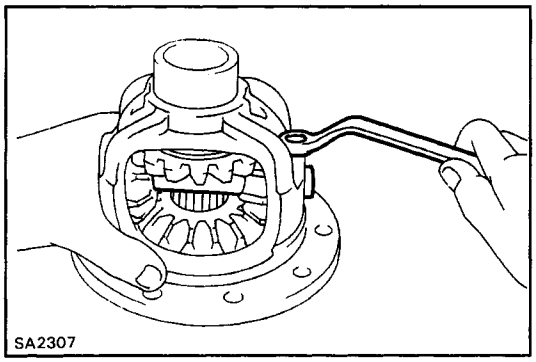
HINT: Align the hole for the pinion shaft with the case hose.



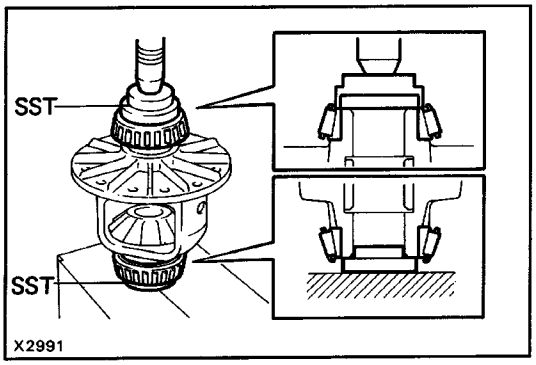
(c) Check the side gear backlash.
Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash: 0.02 – 0.20 mm
(0.008 – 0.0079 in.)

If the backlash is not within specification, install a thrust washer of different thickness.



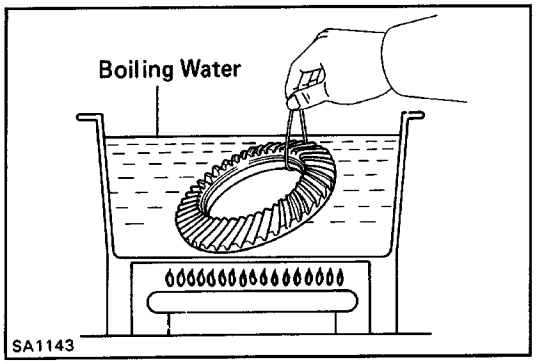
(d) Install the pinion shaft pin.
Torque: 27 N–m (275 kgf–cm, 20 ft–lbf)



2. INSTALL SIDE BEARINGS

Using SST and a press, install the two side bearings on the differential case.

SST 09315–00021 and 09550–10012 (09558–10010)



3. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surfaces of the differential case and ring gear.

(b) Heat the ring gear in boiling water.

(c) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differ–ential case.

HINT: Align the matchmarks on the ring gear and the differential case.

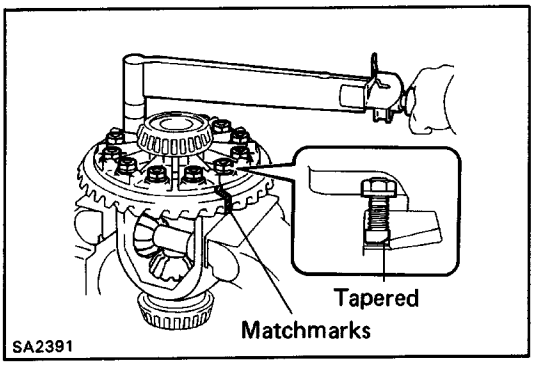
(d) Temporarily install the twelve bolts and twelve nuts so that the bolt boles in the ring gear and differential case are not misaligned.

NOTICE:

- **Install the bolts so that the tapered part of the bolt is on the ring gear side.**
- **The ring gear set nuts should not tighten until the ring gear has cooled sufficiently.**

(e) After the ring gear has cooled sufficiently, torque the ring gear set nuts.

Torque: 110 N–m (1,125 kgf–cm, 81 ft–lbf)



4. INSPECT RING GEAR RUNOUT

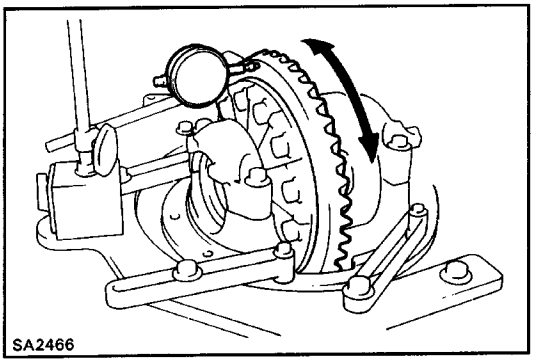
(a) Install the differential case onto the carrier.

(b) Install bearing caps. (See step 10 on page SA–81)

(c) Using a dial indicator, measure the runout of ring gear.

Maximum runout: 0.10 mm (0.0039 in.)

(d) Remove the differential case.
(See step 4 on page SA–75)



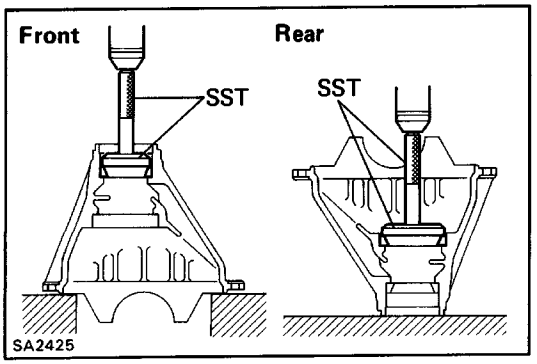
5. INSTALL DRIVE PINION BEARING OUTER RACES

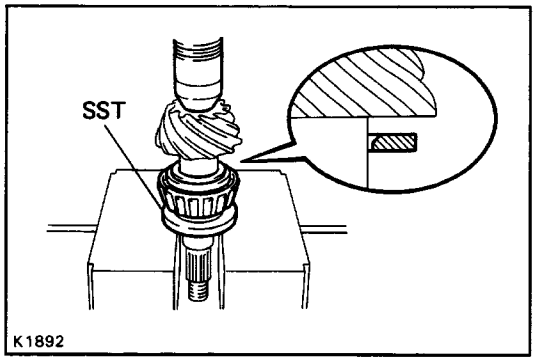
Using SST and a press, install the outer races.

SST 09608–35014

Front (09608–06020, 09608–06110)

Rear (09608–06020, 09608–06180)





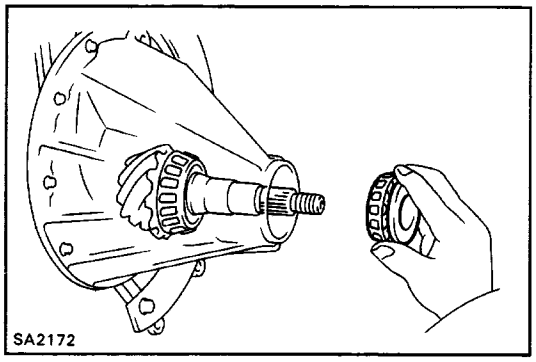
6. INSTALL DRIVE PINION REAR BEARING

(a) Install the plate washer on the drive pinion with the chamfered end facing the pinion gear.

HINT: First fit a washer with the same thickness as the washer which was removed, then after checking the tooth contact pattern, replace the washer with one of a different thickness if necessary.

(b) Using SST and a press, install the rear bearing to the drive pinion.

SST 09 506–3 5010

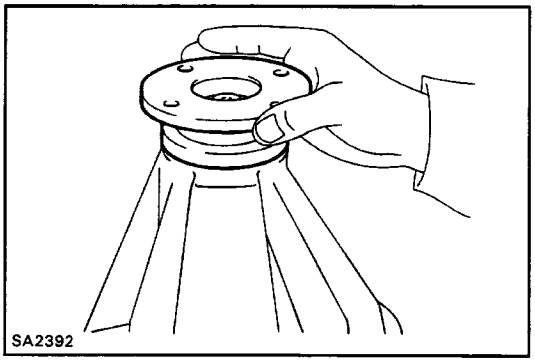


7. TEMPORARILY ADJUST DRIVE PINION PRELOAD

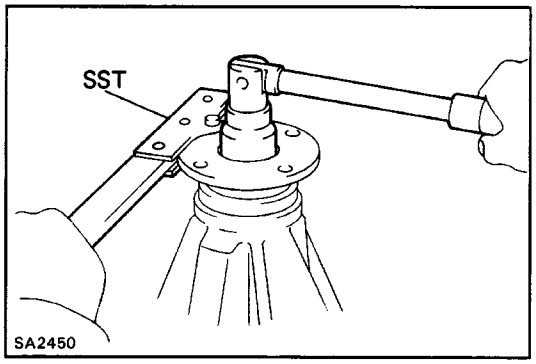
(a) Install the drive pinion and front bearing.

HINT: Assemble the spacer and oil seal after adjusting the tooth contact pattern.

(b) Install the oil slinger.



(c) Install the companion flange and plate washer.



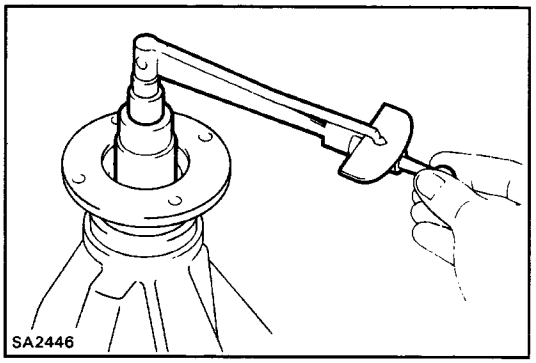
(d) Adjust the drive pinion preload by tighten the com–panion flange nut.

HINT: Using SST to hold the flange, tighten the nut.

SST 09330–00021

NOTICE:

- **Coat the nut and the screw portion of the drive pinion with gear oil.**
- **As there is no spacer, tighten the nut a little at a time, being careful not to overtighten it.**



(e) Using a torque meter, measure the preload.

Preload (at starting):

New bearing

1.3–2.0 N–m

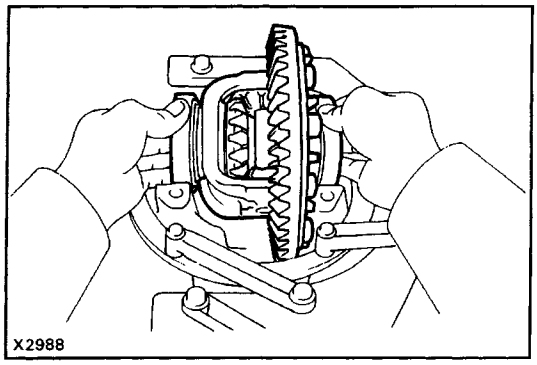
(13 – 20 kgf –cm, 11.3 – 17.4 in.–lbf)

Reused bearing

0.7 – 1.0 N–m

(7 – 10 kgf–cm, 6.1 – 8.7 in.–lbf)

HINT: Measure the preload after first turning the bear–ing clockwise and counterclockwise several times to snug down the bearing.

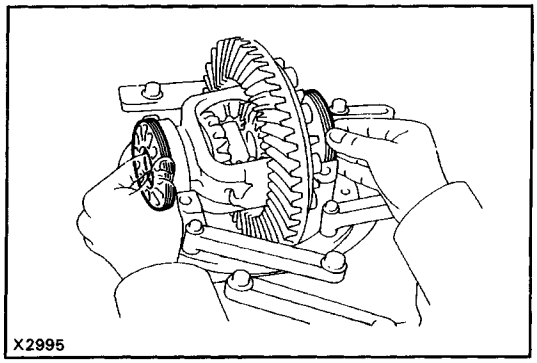


8. INSTALL DIFFERENTIAL CASE IN CARRIER

(a) Place the bearing outer races on their respective bearings. Make sure that the left and right outer races are not interchanges.

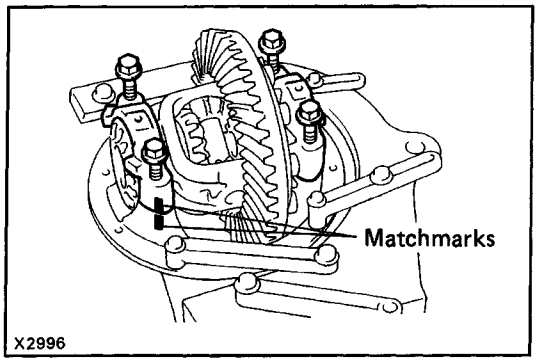
(b) Install the case in the carrier.

HINT: Make sure that there is backlash between the ring gear and drive pinion.



9. INSTALL ADJUSTING NUTS

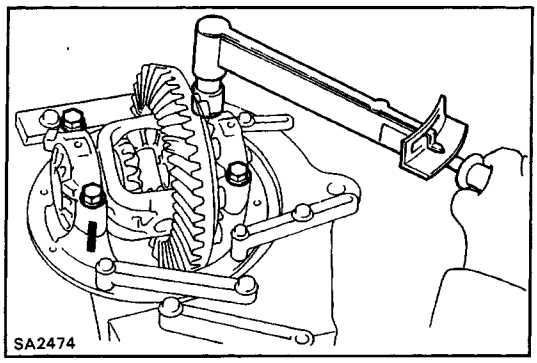
Install the adjusting nuts on the carrier, making sure that the nuts are threaded properly.



10. INSTALL BEARING CAPS

Align the matchmarks on the cap and carrier. Screw in the two bearing cap bolts two or three turns and press down the bearing cap by hand.

HINT: If the bearing cap does not fit tightly on the carrier, the adjusting nuts are not threaded properly. Reinstall the adjusting nuts if necessary.

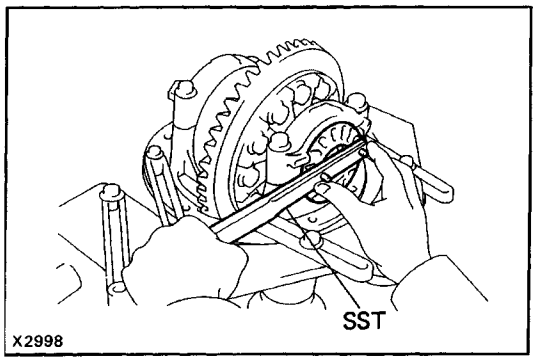


11. ADJUST SIDE BEARING PRELOAD

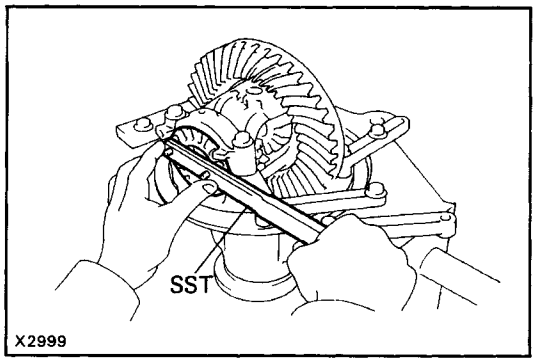
(a) Tighten the four bearing cap bolts to the specified torque, then loosen them to the point where they can be turned by SST.
SST 09 504–00011

Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)

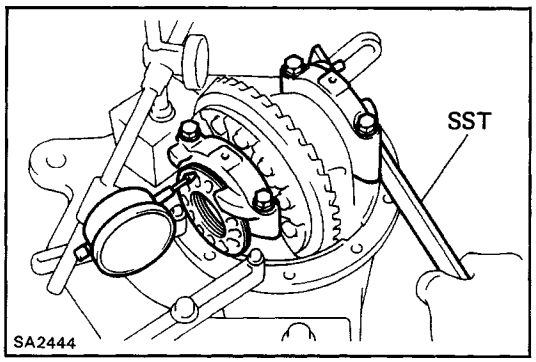
(b) Fully tighten the four bearing cap bolts by hand.



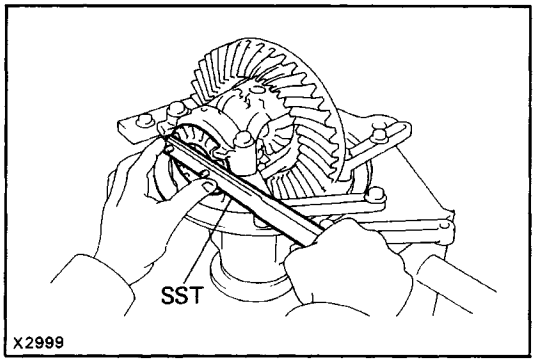
(c) Using SST, tighten the adjusting nut on the ring gear side until the ring gear has a backlash of about 0.2 mm (0.008 in.).
SST 09504–00011



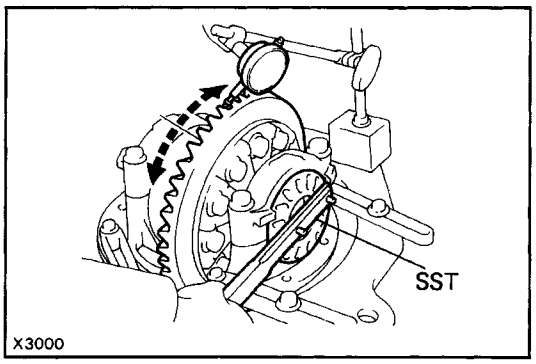
(d) While turning the ring gear, use SST to fully tighten the adjusting nut on the drive pinion side.
After the bearings are settled, loosen the adjusting nut on the drive pinion side.
SST 09504–00011



(e) Place a dial indicator on the top of the adjusting nut on the ring gear side.
(f) Adjust the side bearing for zero preload by tightening the other adjusting nut until the pointer on the indicator begins to move.

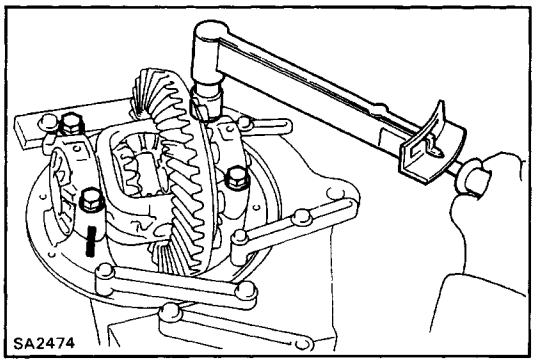


(g) Tighten the adjusting nut 1 – 1 $^{1}/_{2}$ notches from the zero preload position.

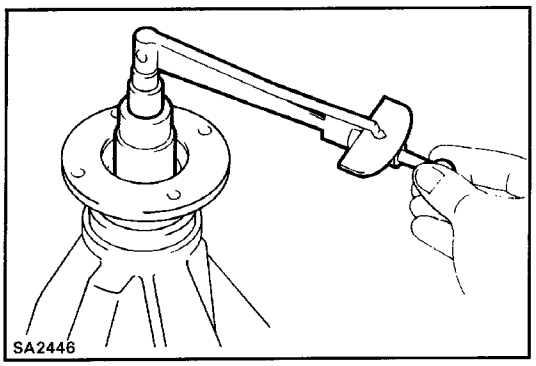


(h) Using a dial indicator, adjust the ring gear backlash until it is within specification.
Backlash: 0.15 – 0.20 mm (0.0059 – 0.0079 in.)

HINT: The backlash is adjusted by turning the left and right adjusting nuts equal amounts. For example, loosen the nut on the left side one notch and tighten the nut on the right side one notch.

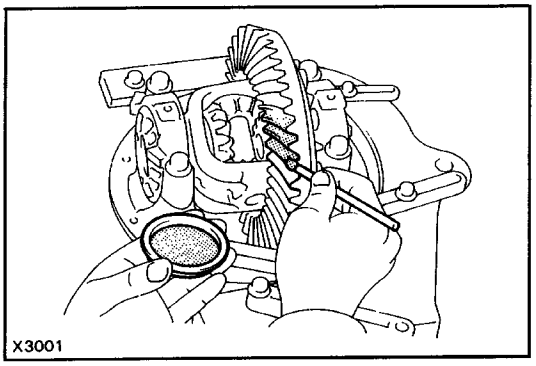


(i) Torque the bearing cap bolts.
Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)
(j) Recheck the ring gear backlash.
Backlash: 0.15 – 0.20 mm (0.0059 – 0.0079 in.)


SA2446

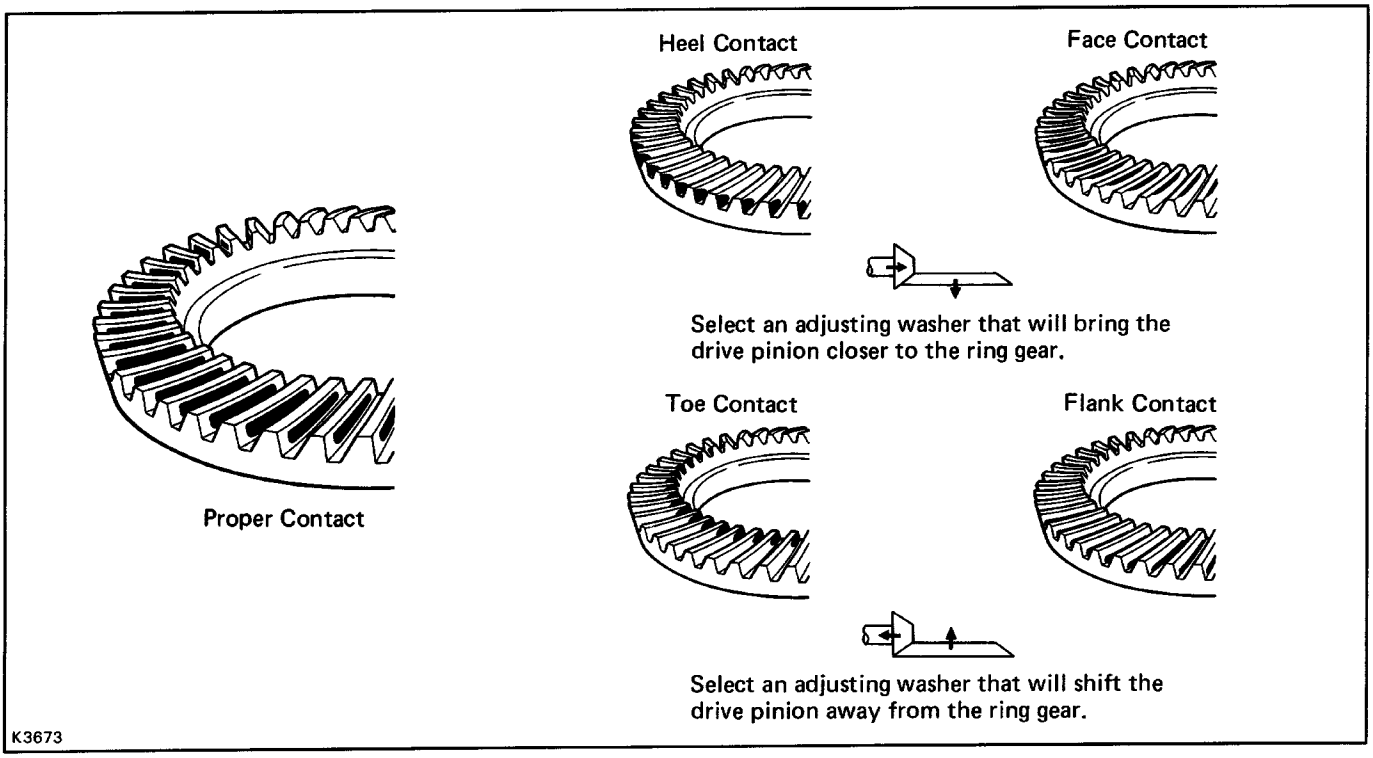
(k) Using a torque meter, measure the total preload.

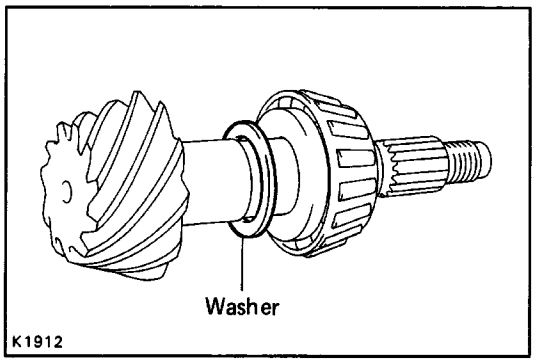
Total preload (at starting):
Add drive pinion preload
0.4 – 0.6 N–m
(4 – 6 kgf–cm, 3.5 – 5.2 in.–lbf)


X3001

12. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

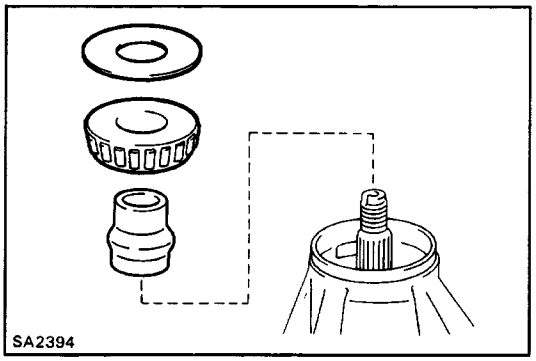
(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead.
(b) Hold the companion flange firmly and rotate the ring gear in both directions.
(c) Inspect the tooth pattern.





If the teeth are not contacting properly, use the following chart to select a proper washer for correction.
HINT: In the case of face contact or flank contact, it may be possible to may the adjustment within the back–lash specification limits.

Washer thickness			mm (in.)
1.05	(0.0413)	1.35	(0.0531)
1.10	(0.0433)	1.40	(0.0551)
1.15	(0.0453)	1.45	(0.0571)
1.20	(0.0472)	1.50	(0.0591)
1.25	(0.0492)	1.55	(0.0610)
1.30	(0.0512)		

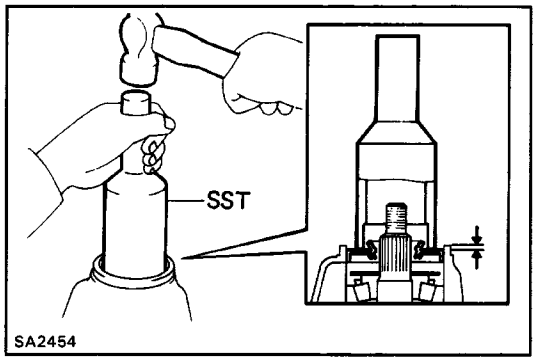


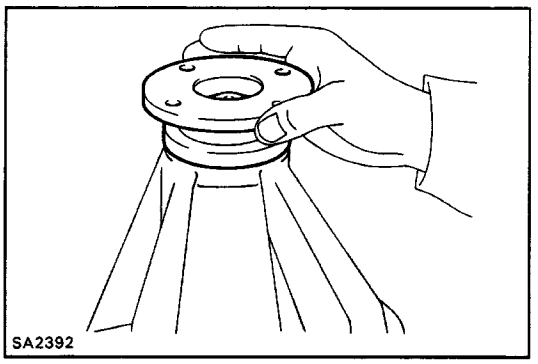
13. INSTALL NEW BEARING SPACER

(a) Remove the companion flange.
(See step 1 on page SA–74)
(b) Remove the oil slinger and front bearing.
(See steps 2, 3 on page SA–74)
(c) Install a new bearing spacer.
(d) Install the front bearing and oil slinger.

14. INSTALL NEW OIL SEAL

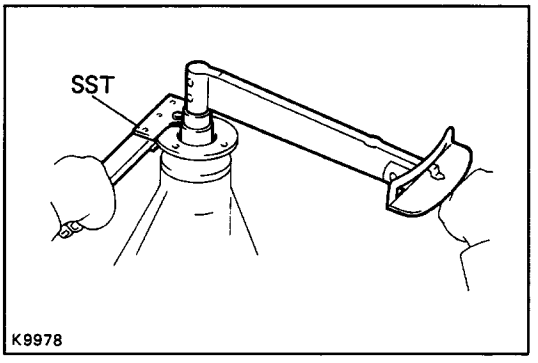
(a) Using SST and a hammer, install a new oil seal.
SST 09214–76011
Oil seal drive in depth: 1.0 mm (0.039 in.)
(b) Coat the lip of oil seal with MP grease.



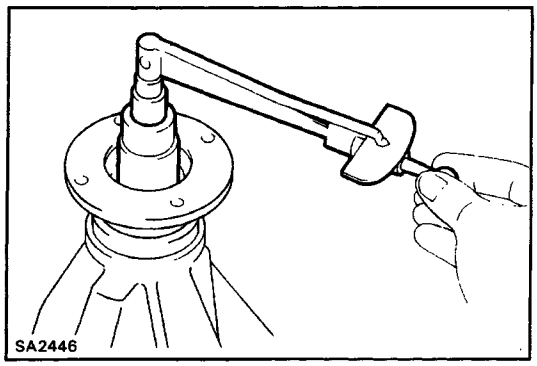


15. INSTALL COMPANION FLANGE

(a) Install the companion flange.



(b) Install the plate washer and a new nut.
HINT: Coat the threads of nut with gear oil.
(c) Using SST to hold the flange, tighten the nut.
SST 09330–00021
Torque: 245 N–m (2,500 kgf–cm, 181 ft–lbf)



16. ADJUST DRIVE PINION PRELOAD

Using a torque meter, measure the preload of the back–lash between the drive pinion and ring gear.

Preload (at starting):
New bearing
1.3 – 2.0 N–m
(13 – 20 kgf–cm, 11.3 – 17.4 in.–lbf)
Reused bearing
0.7 – 1.0 N–m
(7 – 10 kgf–cm, 6.1 – 8.7 in.–lbf)

- If the preload is greater than specification, replace the bearing spacer.
- If the preload is less than specification, retighten the nut 13 N–m (130 kgf–cm, 9 ft–lbf) a little at a time until the specified preload is reached.

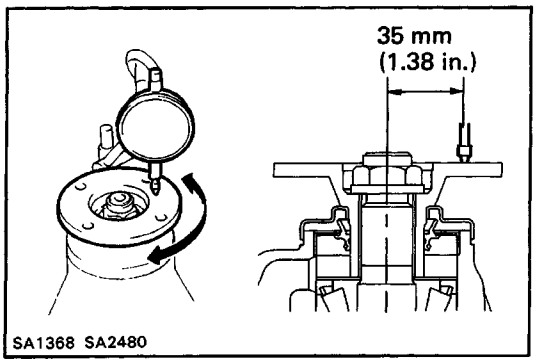
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the¿ preload procedure. Do not back off the pinion nut to reduce the preload.

Maximum torque: 441 N–m (4,500 kgf–cm, 326 ft–lbf)

If everything is normal, coat the threads with gear oil, then repeat the above operation.

17. RECHECK RING GEAR BACKLASH
(See step 3 on page SA–72)

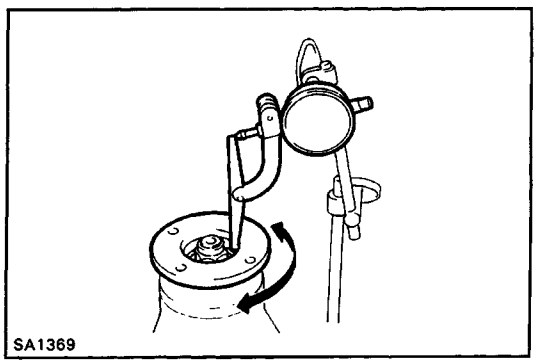
18. RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION
(See step 12 on page SA–83)



19. CHECK RUNOUT OF COMPANION FLANGE

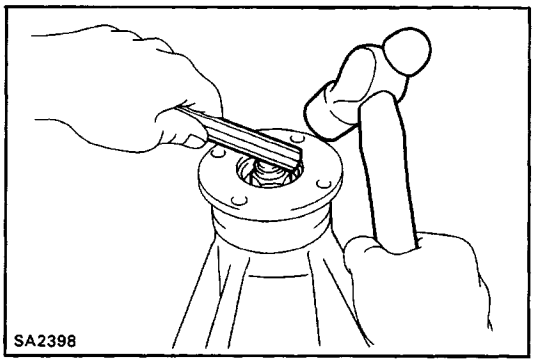
Using a dial indicator, measure the lateral and radial runout of the companion flange.

Maximum vertical runout: 0.10 mm (0.0039 in.)

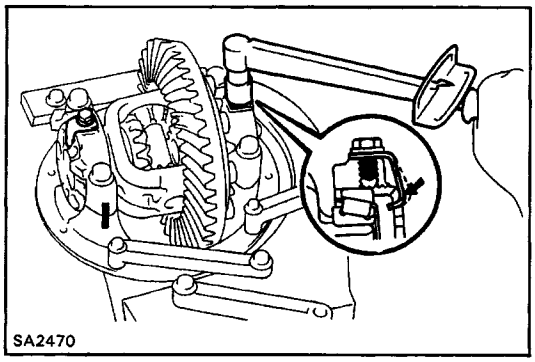


Maximum lateral runout: 0.10 mm (0.0039 in.)

If the runout is greater than the maximum, inspect the bearing.



20. STAKE DRIVE PINION NUT



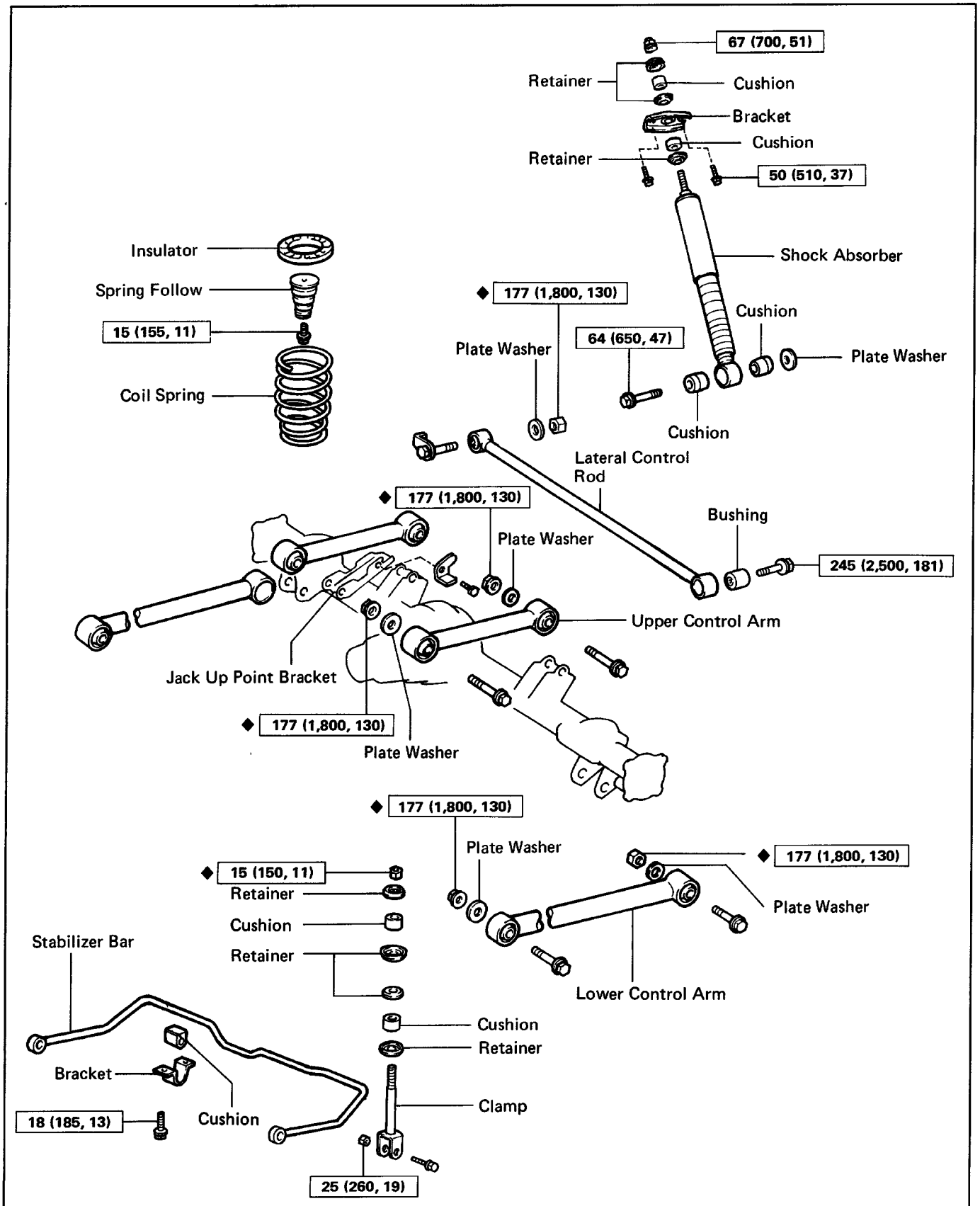
21. INSTALL ADJUSTING NUT LOCKS

(a) Install two new nut locks on the bearing caps.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

(b) After tightening bolts, bend the nut locks.

REAR SUSPENSION

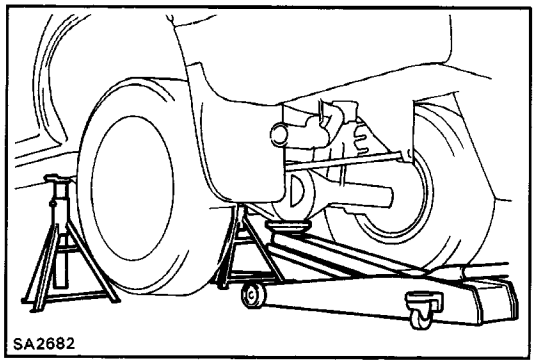
COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

SA2696


SA2682

Coil Spring and Shock Absorber

(See page SA–87)

REMOVAL OF COIL SPRING AND REAR SHOCK ABSORBER

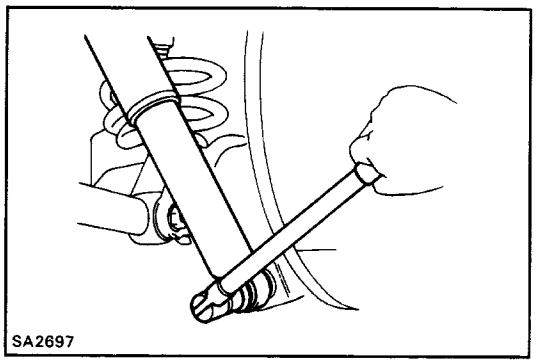
1. JACK UP AND SUPPORT VEHICLE

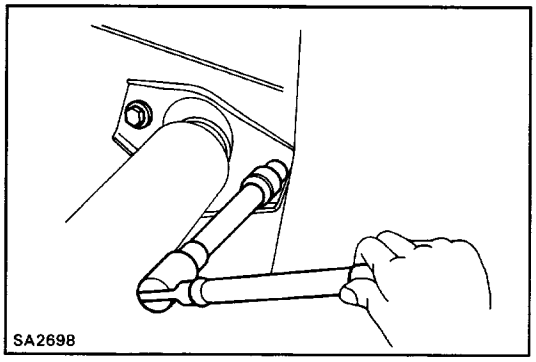
Jack up the rear axle housing and support the frame with stands. Hold the rear axle housing with a jack.

2. REMOVE WHEEL

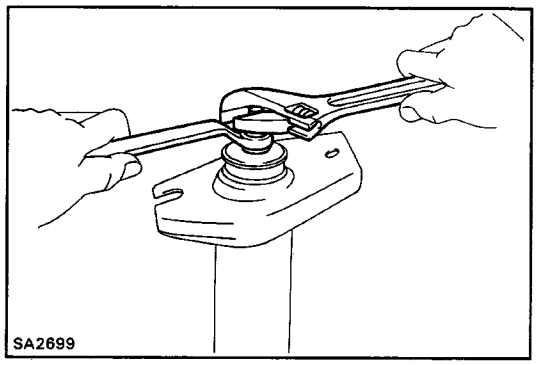
3. DISCONNECT REAR SHOCK ABSORBER

(a) Remove the bolt holding the shock absorber from the rear axle housing and disconnect the shock absorber.


SA2697

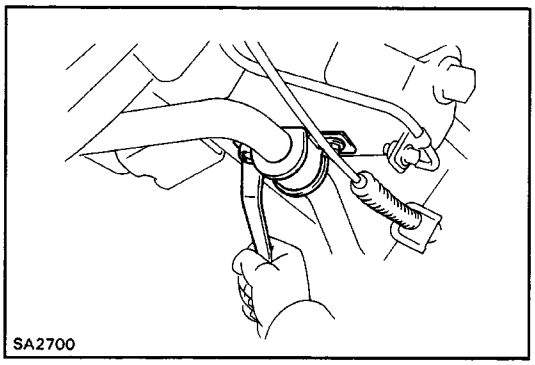

SA2698

(b) If replacing the shock absorber, remove the nut holding the shock absorber from the frame, and remove the shock absorber.


SA2699

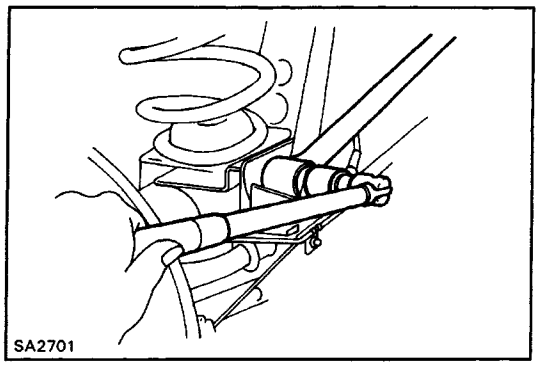
(c) Hold the piston rod, and remove the nut.

(d) Remove the retainers, cushions and bracket.


SA2700

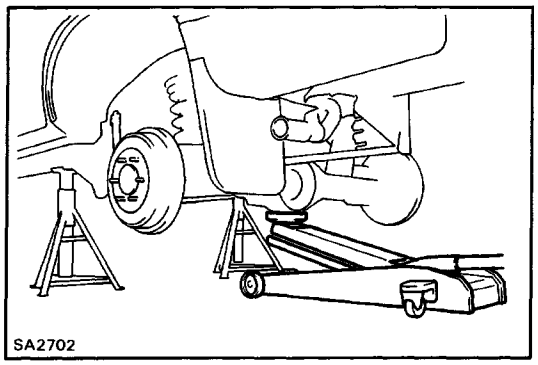
4. DISCONNECT STABILIZER BAR BRACKETS

Remove the two bolts holding the stabilizer bar bracket from the rear axle housing.



5. DISCONNECT LATERAL CONTROL ROD

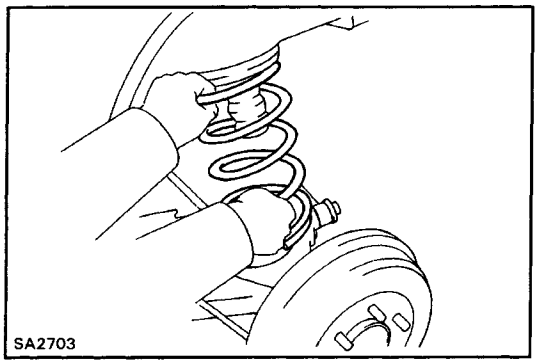
Remove the bolt and disconnect the lateral control rod from axle housing.



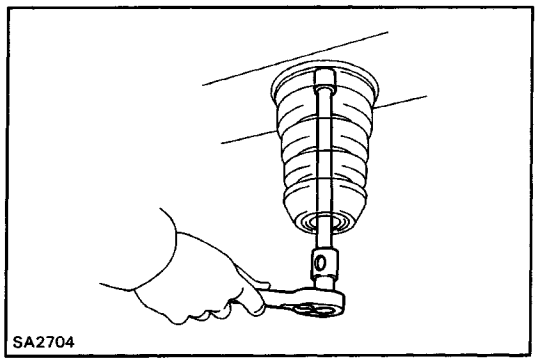
6. REMOVE COIL SPRING

(a) Begin to lower the rear axle housing.

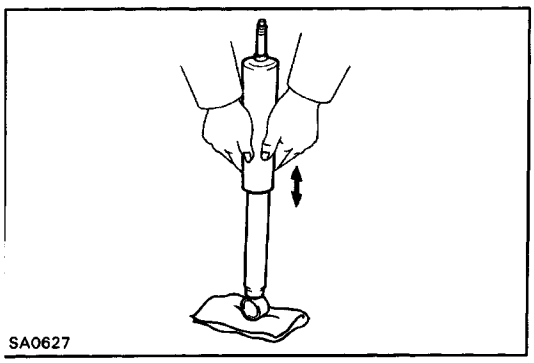
HINT: Be careful not to snap the brake line and parking brake cable.



(b), While lowering the rear axle housing, remove the coil spring and upper insulators.



(c) Remove the bolt and the spring follow from the frame.

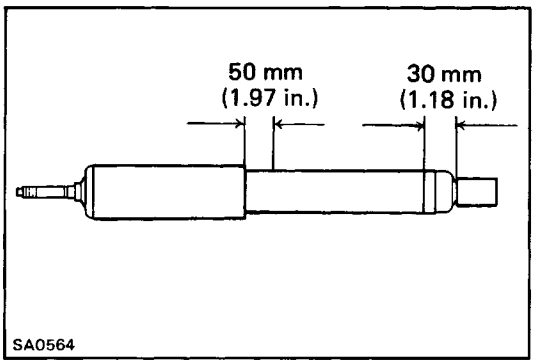


INSPECTION OF REAR SHOCK ABSORBER

1. INSPECT OPERATION OF SHOCK ABSORBER

(a) While pushing the shock absorber, check that the pull throughout the stroke is even, and there is no abnormal resistance or noise.

(b) Push the shock absorber in fully and release it. Check that it returns at a constant speed through–out.

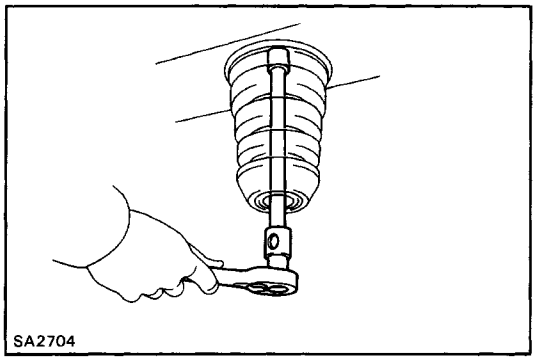


2. DISCARD SHOCK ABSORBER

Before discarding the shock absorber, drill a hole 2 – 3 mm (0.079 – 0.118 in.) in diameter at the location shown in the illustration to release the gas inside.

NOTICE:

- **When drilling, chips may fly out, work carefully.**
- **The gas is colorless, odorless, and non–poisonous.**



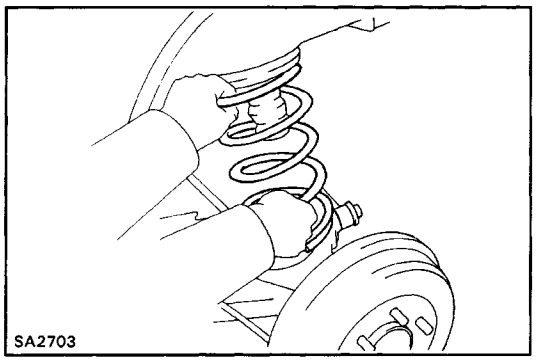
INSTALLATION OF COIL SPRING AND REAR SHOCK ABSORBER

(See page SA–87)

1. INSTALL SPRING FOLLOW

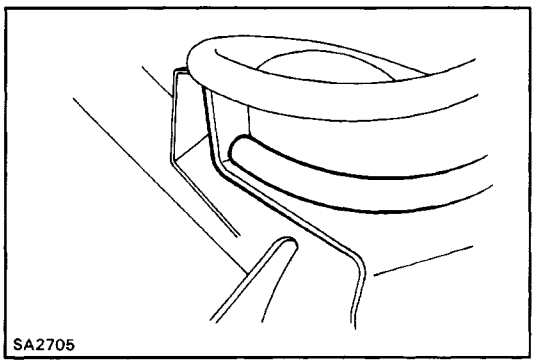
Install the spring follow to the frame with the bolt.

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)



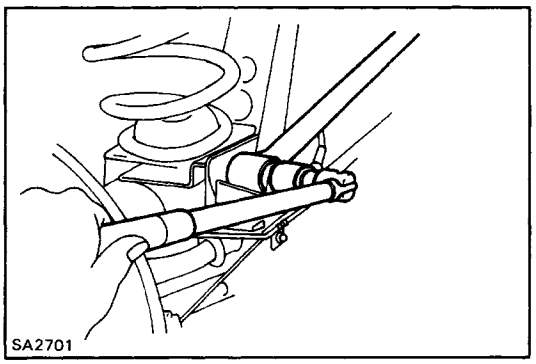
2. INSTALL COIL SPRING

3. JACK UP REAR AXLE HOUSING



4. CHECK POSITION OF COIL SPRING END

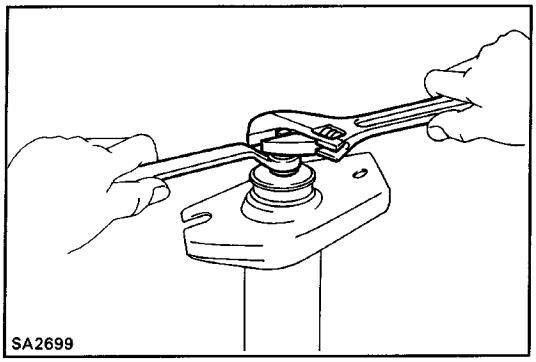
Check that the coil spring end is installed correctly.
If the coil spring end is not in correct position, reinstall the coil spring.



5. TEMPORARILY CONNECT LATERAL CONTROL ROD

Temporarily connect the lateral control rod to the axle housing with the bolt, washer and bushing.
HINT:

- Insert the bolt from the front of the vehicle (shock absorber side.)
- Do not tighten the nut.

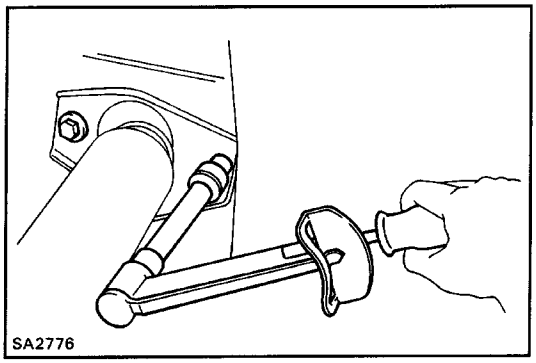


6. INSTALL SHOCK ABSORBER

(a) Hold the piston rod, and remove the nut.

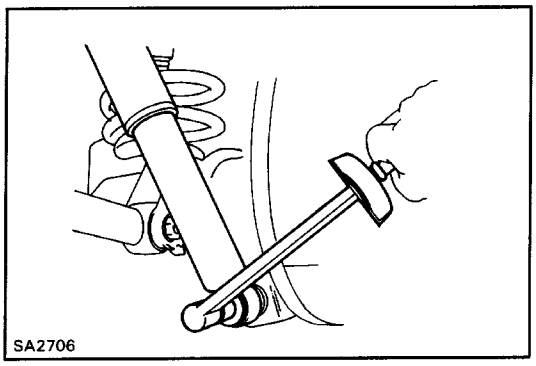
(b) Install the retainers, cushions and bracket to shock absorber with the nut.

Torque: 67 N–m (700 kgf–cm, 51 ft–lbf)



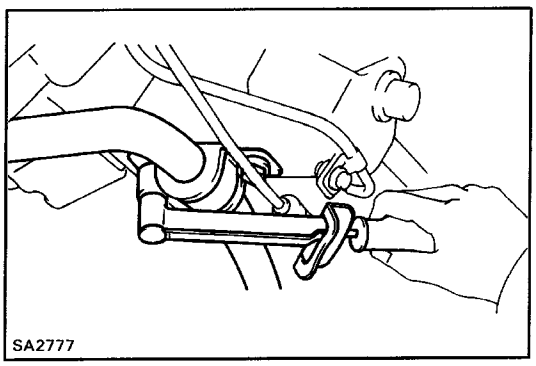
(c) Install the shock absorber with bracket to the frame with the two bolts.

Torque: 50 N–m (510 kgf–cm, 37 ft–lbf)



(d) Connect the shock absorber with cushions and re–tainer to the axle housing with bolt.

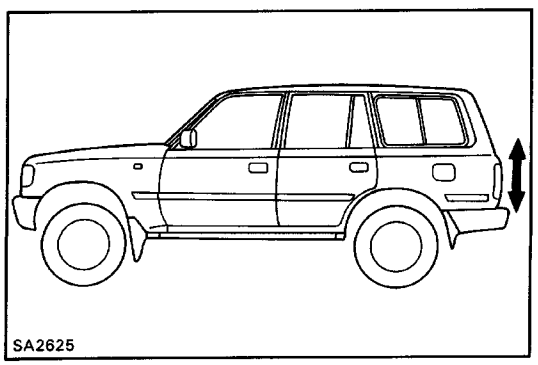
Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)



7. INSTALL STABILIZER BAR BRACKETS TO REAR AXLE SHAFT

Install the stabilizer bar with bracket to the axle housing with the two bolts.

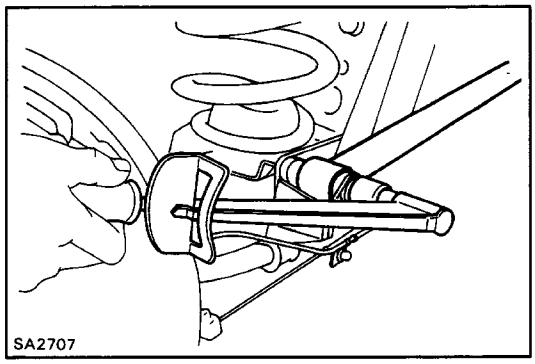
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



8. INSTALL WHEEL AND LOWER VEHICLE

9. STABILIZE SUSPENSION

Bounce the vehicle up and down to stabilize the suspen–sion.

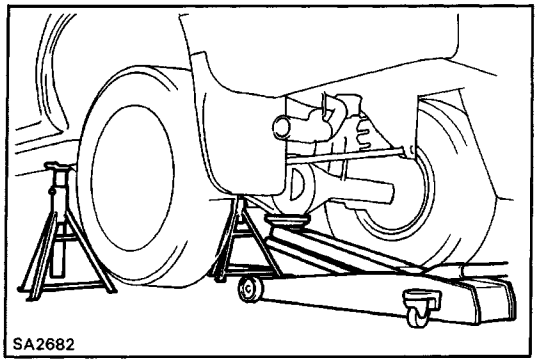


10. TIGHTEN LATERAL CONTROL ROD NUT

(a) Jack up the rear axle housing and support it with stands.

(b) Torque the lateral control rod nut.

Torque: 177 N–m (2,500 kgf–cm, 130 ft–lbf)



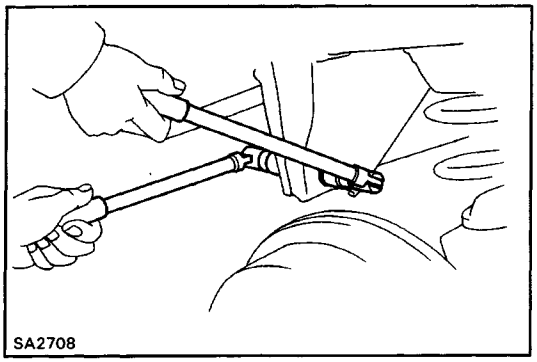
Lateral Control Rod

(See page SA–87)

REMOVAL OF LATERAL CONTROL ROD

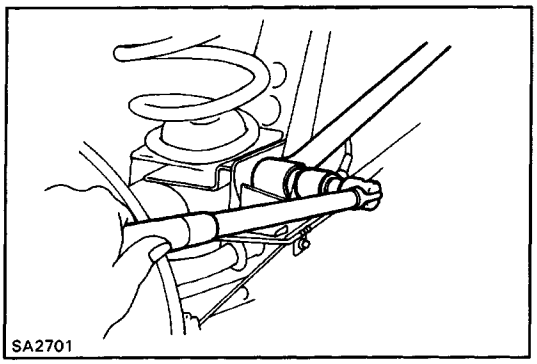
1. JACK UP AND SUPPORT VEHICLE

Jack up the rear axle housing and support the frame with stands. Hold the rear axle housing with a jack.

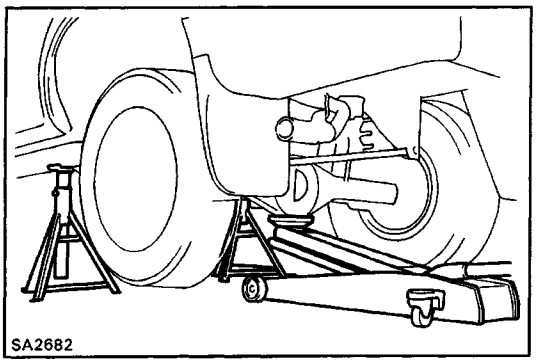


2. REMOVE LATERAL CONTROL ROD

(a) Remove the bolt and nut holding the lateral control rod from the frame and disconnect the lateral con–trol rod.



(b) Remove the nut holding the lateral control rod from the rear axle housing, and remove the lateral con-trol rod.

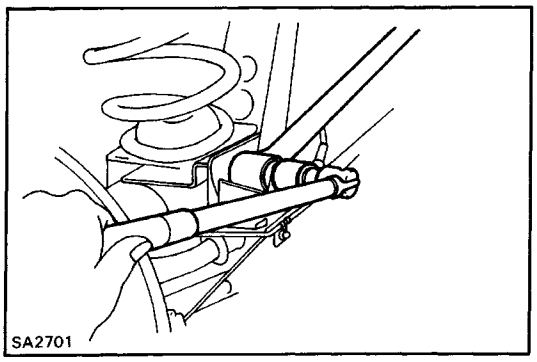


INSTALLATION OF LATERAL CONTROL ROD

(See page SA–87)

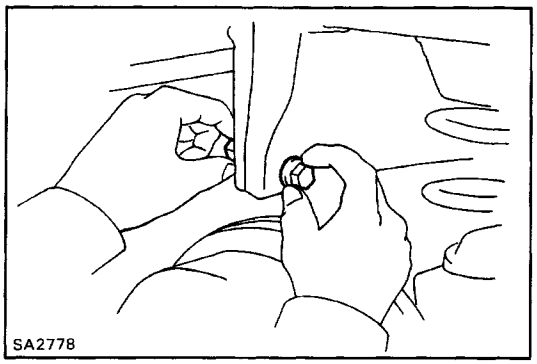
1. INSTALL LATERAL CONTROL ROD

(a) Raise the axle housing until the frame is free from the stands.



(b) In this order, temporarily install the bushing, lateral control rod, bushing, plate washer and nut on the rear axle housing.

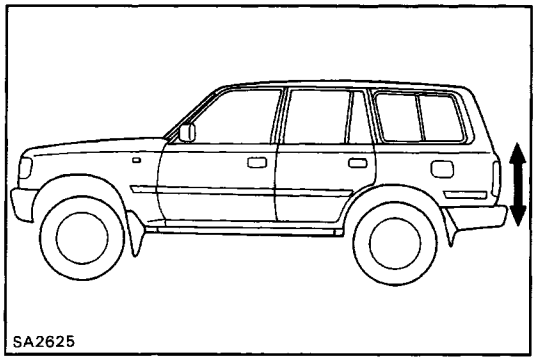
HINT: Do not tighten the nut.



(c) Temporarily install the lateral control rod to the frame with the bolt, plate washer and nut.

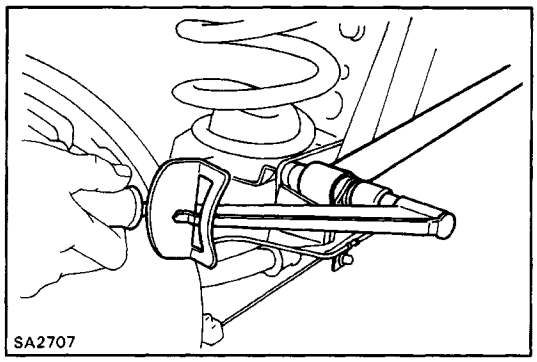
HINT:

- Install the bolt from the front of the vehicle (shock absorber side).
- Do not tighten the nut.



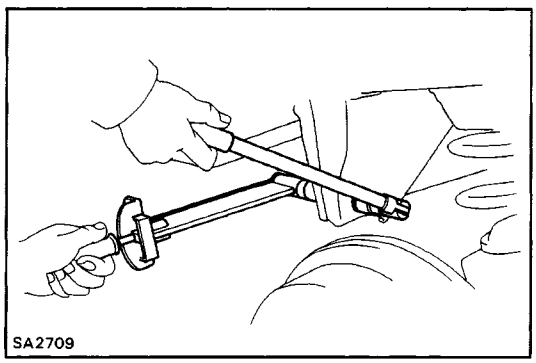
2. STABILIZE SUSPENSION

Bounce the vehicle up and down to stabilize the suspension.



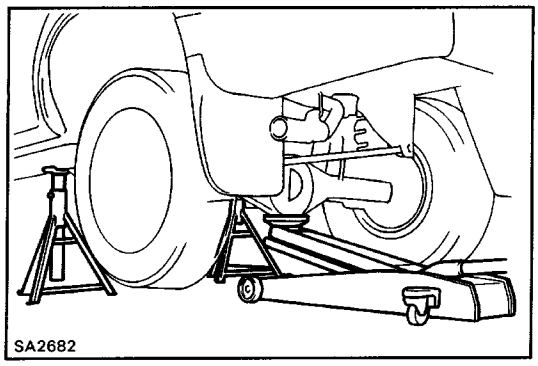
3. TIGHTEN NUT HOLDING LATERAL CONTROL ROD TO REAR AXLE HOUSING

Torque: 245 N–m (2,500 kgf–cm, 181 ft–lbf)



4. TIGHTEN NUT HOLDING LATERAL CONTROL ROD TO FRAME

Torque: 177 N–m (1,800 kgf–cm, 130 ft–lbf)


SA2682

Upper and Lower Control Arms

(See page SA–87)

REMOVAL OF UPPER AND LOWER CONTROL ARMS

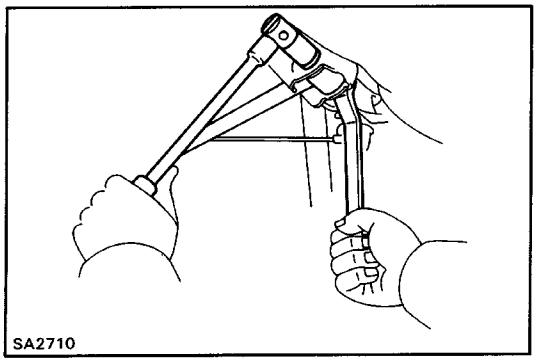
1. JACK UP SUPPORT VEHICLE

Jack up the rear axle housing and support the frame with stands.

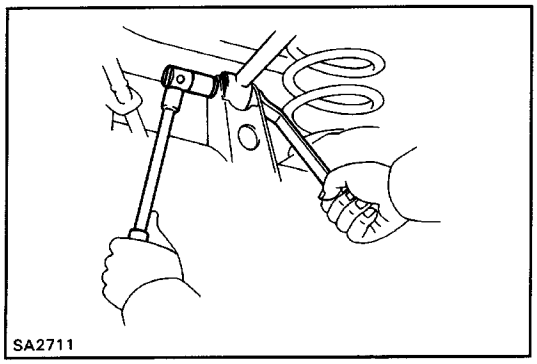
Hold the rear axle housing with a jack.

2. REMOVE UPPER CONTROL ARM

(a) Remove the bolt and nut holding the upper control arm from the frame.

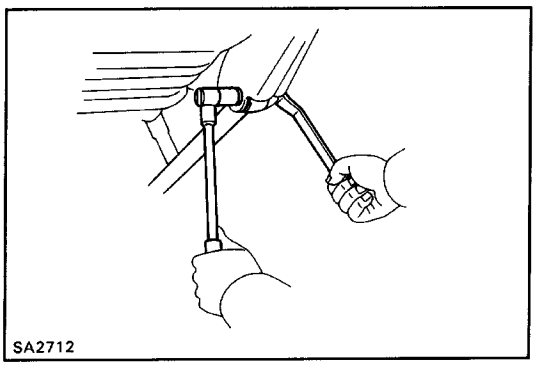

SA2710

(b) Remove the bolt, plate washer and nut holding the upper control arm from the rear axle housing, and remove the upper control arm.

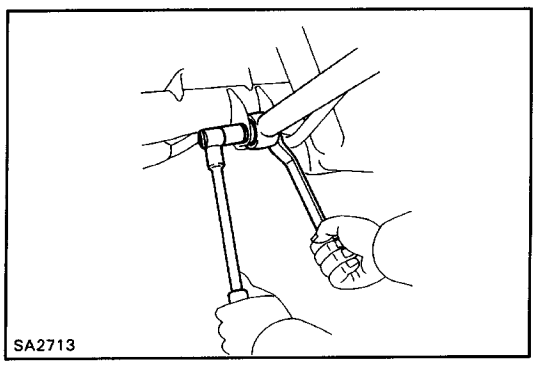

SA2711

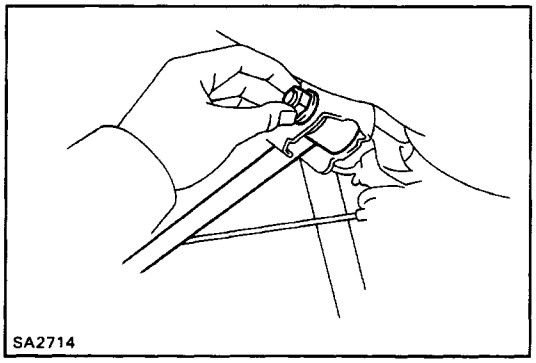
3. REMOVE LOWER CONTROL ARM

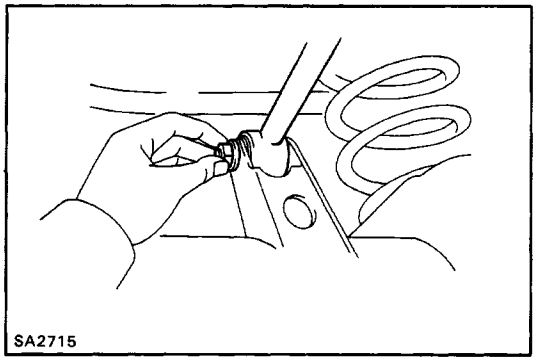
(a) Remove the bolt and nut holding the lower control arm from the frame.


SA2712

(b) Remove the bolt, plate washer and nut holding the lower control arm from the rear axle housing, and remove the lower control arm.


SA2713


SA2714


SA2715

INSTALLATION OF UPPER AND LOWER CONTROL ARMS

(See page SA–87)

1. INSTALL UPPER CONTROL ARM

(a) Temporarily install the upper control arm on the frame with the bolt and nut.

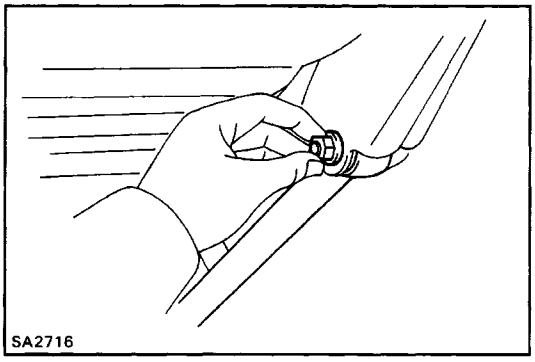
HINT:

- Install the bolt from the outside of the vehicle.
- Do not tighten the nut.

(b) Temporarily install the upper control arm on the rear axle housing with the bolt, plate washer and nut.

HINT:

- Install the bolt from the outside of the vehicle.
- Do not tighten the nut.

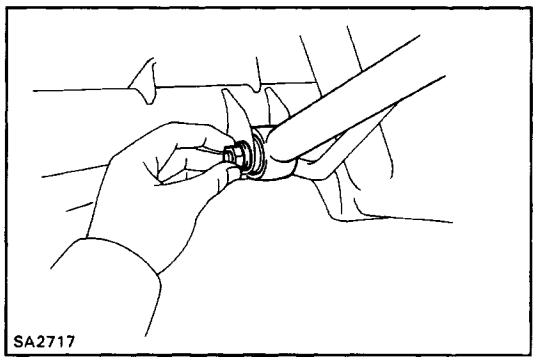

SA2716

2. INSTALL LOWER CONTROL ARM

(a) Temporarily install the lower control arm on the frame with the bolt and nut.

HINT:

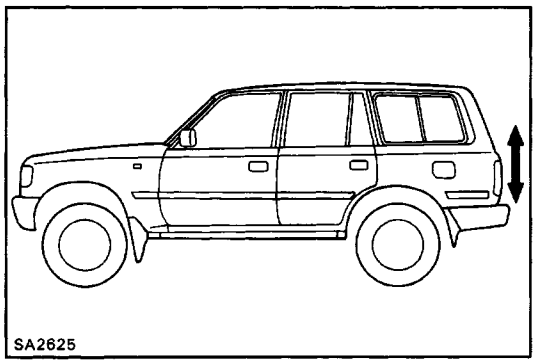
- Install the bolt from the outside of the vehicle.
- Do not tighten the nut.


SA2717

(b) Temporarily install the lower control arm on the rear axle housing with the bolt, plate washer and nut.

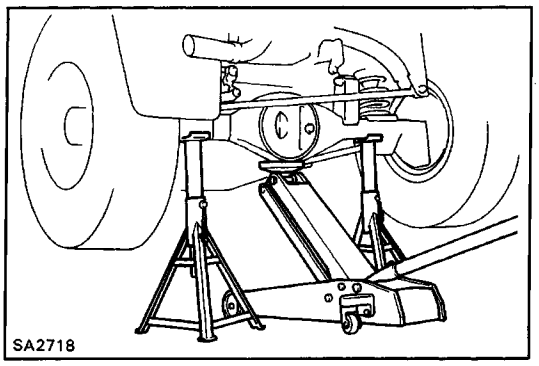
HINT:

- Install the bolt from the outside of the vehicle.
- Do not tighten the nut.


SA2625

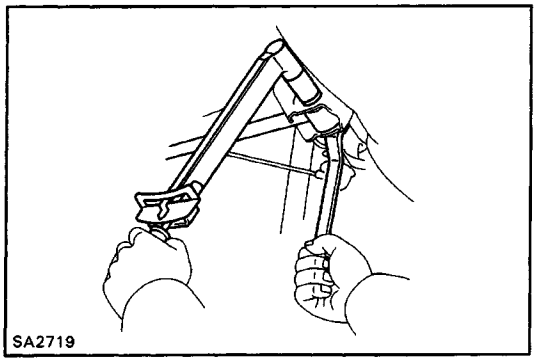
3. STABILIZE SUSPENSION

Bounce the vehicle up and down to stabilize the suspen–sion.



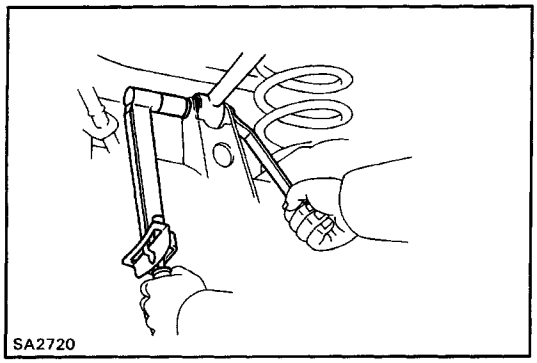
4. JACK UP VEHICLE

Jack up the rear axle housing and support axle housing with stands.



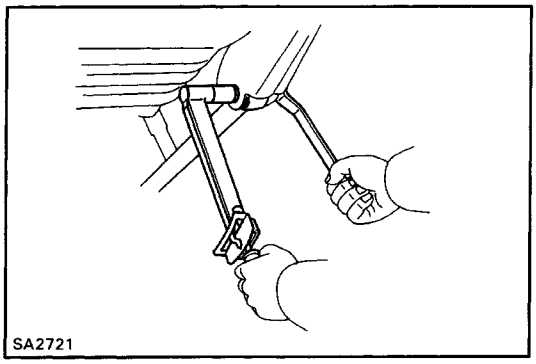
5. TORQUE BOLT HOLDING UPPER CONTROL ARM TO FRAME

Torque: 177 N–m (1,800 kgf–cm, 130 ft–lbf)



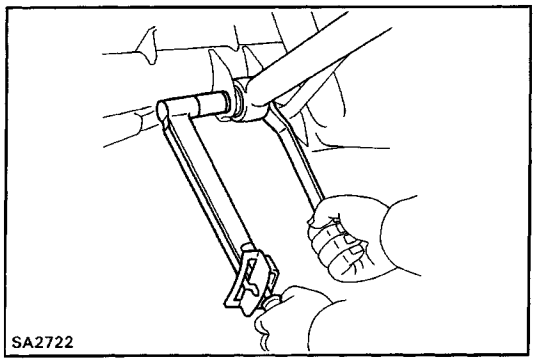
6. TORQUE BOLT AND NUT HOLDING UPPER CONTROL ARM TO REAR AXLE HOUSING

Torque: 177 N–m (1,800 kgf–cm, 130 ft–lbf)



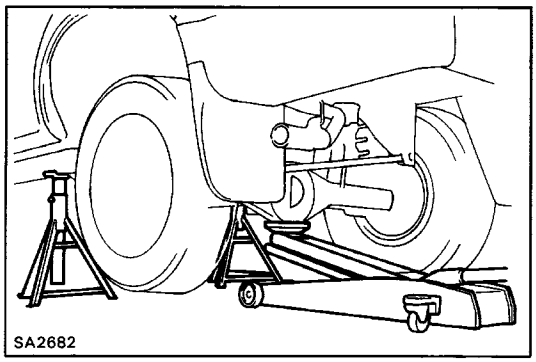
7. TORQUE BOLT AND NUT HOLDING LOWER CONTROL ARM TO FRAME

Torque: 177 N–m (1,800 kgf–cm, 130 ft–lbf)



8. TORQUE BOLT AND NUT HOLDING LOWER CONTROL ARM TO REAR AXLE HOUSING

Torque: 177 N–m (1,800 kgf–cm, 130 ft–lbf)



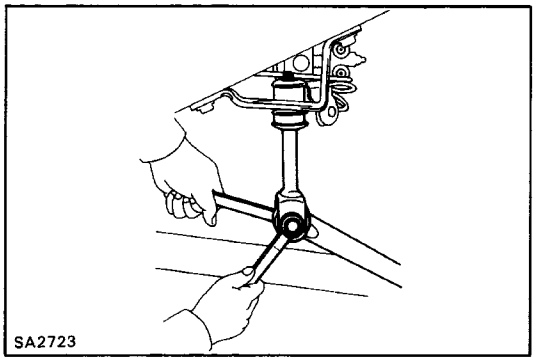
Stabilizer Bar

(See page SA–87)

REMOVAL OF STABILIZER BAR

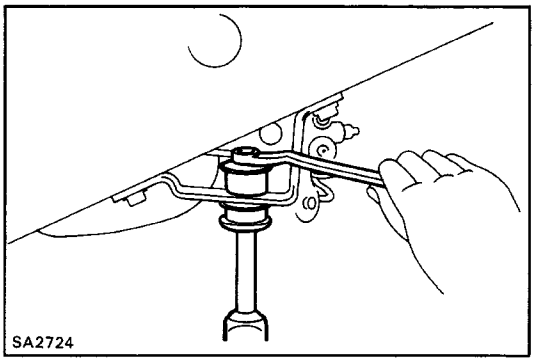
1. JACK UP AND SUPPORT BODY

Jack up and support the body on the stands.



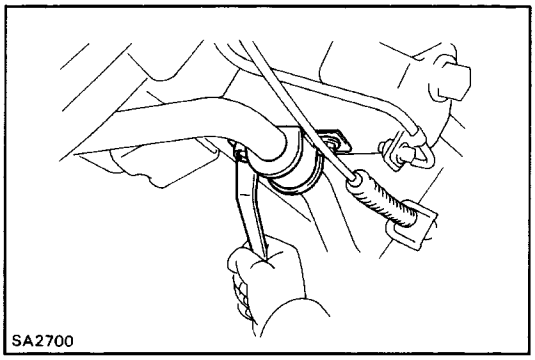
2. REMOVE STABILIZER BAR

(a) Loosen the bolt and nut.

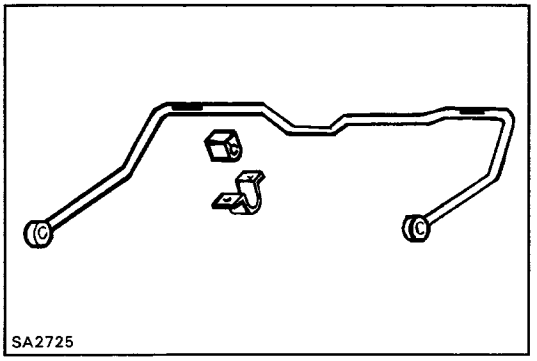


(b) Remove the nut, retainers and cushions, and disconnect the stabilizer bar with the clamp from the frame.

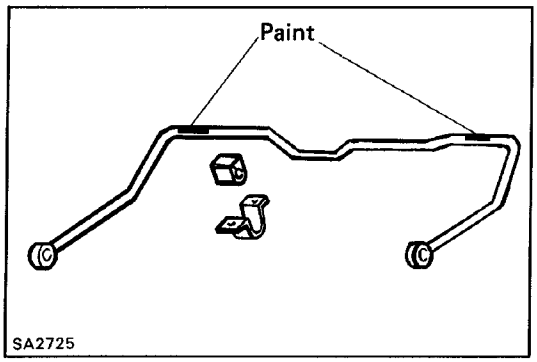
(c) Remove the bolt, nut and clamp from the stabilizer bar.



(e) Remove the two bolts and stabilizer bar from the axle housing with the bracket.



(d) Remove the bracket and cushions from the stabilizer bar.

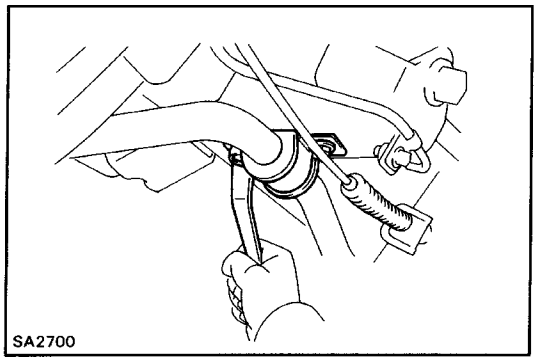


INSTALLATION OF STABILIZER BAR

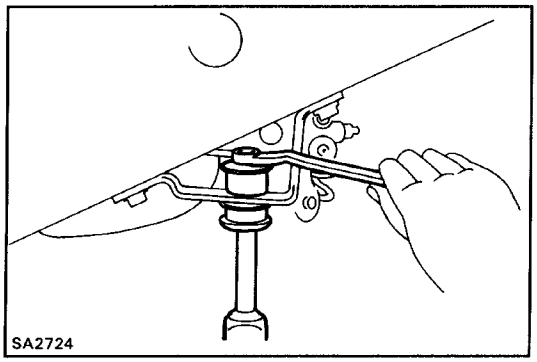
(See page SA–87)

1. INSTALL STABILIZER BAR

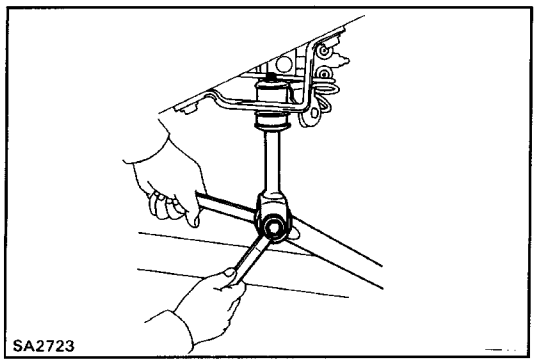
(a) Install the cushions and brackets touching the line painted on the stabilizer– bar.



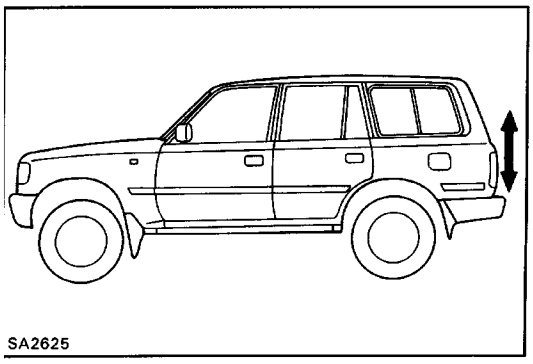
(b) Temporarily install the stabilizer bar with bracket to the axle housing with the two bolts.



(c) Temporarily install the clamp to the frame with re–tainers, cushions and nut.

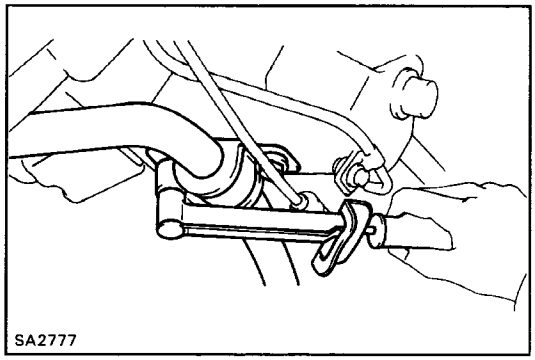


(d) Temporarily install the stabilizer bar to the clamp with bolt and nut.



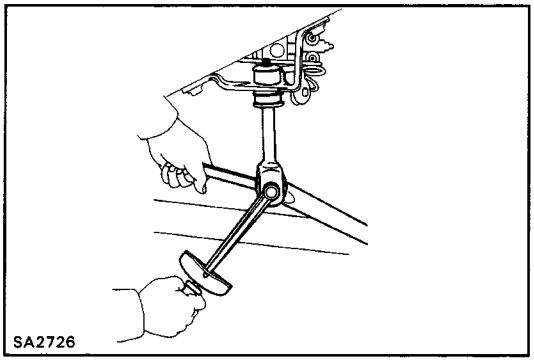
2. STABILIZE SUSPENSION

Bounce the vehicle up and down to stabilize the suspen–sion.

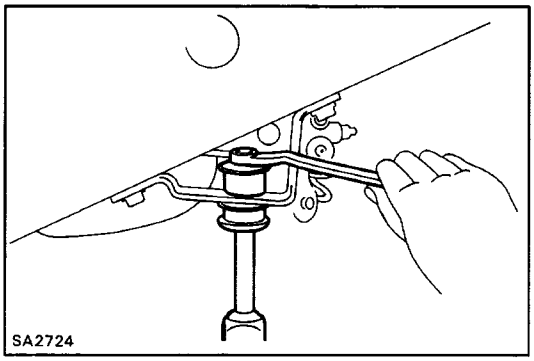


3. TORQUE BRACKET AND CLAMP

(a) Torque the two bolts.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



(b) Torque the bolt and nut.
Torque: 25 N–m (250 kgf–cm, 19 ft–lbf)



(c) Torque the nut.
Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)

BRAKE SYSTEM

PRECAUTIONS

1. Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts of the same part number or equivalent.

2. It is very important to keep parts and the area clean when repairing the brake system.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Low or spongy pedal	Linings worn	Replace brake shoes	BR–19, BR–26
	Leak in brake system	Repair leak	
	Master cylinder faulty	Repair or replace master cylinder	BR–9
	Air in brake system	Bleed brake system	BR–7
	Wheel cylinder faulty	Repair wheel cylinder	BR–26
	Piston seals worn or damaged	Repair brake cylinder	BR–19
	Rear brake automatic adjuster faulty	Repair or replace adjuster	BR–26
Brakes drag	Parking brake out of adjustment	Adjust parking brake	BR–8
	Binding parking brake wire	Repair as necessary	
	Booster push rod out of adjustment	Adjust push rod	BR–17
	Tension or return spring faulty	Replace spring	BR–26
	Brake line restricted	Repair as necessary	
	Lining cracked or distorted	Replace shoe	BR–26
	Wheel cylinder or caliper piston sticking	Repair as necessary	BR–21, BR–26
	Adjuster broken	Replace adjuster	BR–26
	Master cylinder faulty	Repair or replace master cylinder	BR–9
Brakes pull	Tires improperly inflated	Inflate tires to proper pressure	
	Oil or grease on shoes or pads	Check for cause. Replace shoes or pads	BR–19 BR–26
	Brake shoes distorted, linings worn or glazed	Replace brake shoes	BR–26
	Brake pads distorted, worn or glazed	Replace pads	BR–19
	Drum or disc out of round	Replace drum or disc	BR–21, BR–26
	Tension or return spring faulty	Replace spring	BR–26
	Wheel cylinder faulty	Repair wheel cylinder	BR–26
	Piston frozen in brake cylinder	Repair brake cylinder	BR–21
	Brake pad sticking	Replace pads	BR–19

PRECAUTIONS

1. Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts of the same part number or equivalent.

2. It is very important to keep parts and the area clean when repairing the brake system.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Low or spongy pedal	Linings worn	Replace brake shoes	BR–19, BR–26
	Leak in brake system	Repair leak	
	Master cylinder faulty	Repair or replace master cylinder	BR–9
	Air in brake system	Bleed brake system	BR–7
	Wheel cylinder faulty	Repair wheel cylinder	BR–26
	Piston seals worn or damaged	Repair brake cylinder	BR–19
	Rear brake automatic adjuster faulty	Repair or replace adjuster	BR–26
Brakes drag	Parking brake out of adjustment	Adjust parking brake	BR–8
	Binding parking brake wire	Repair as necessary	
	Booster push rod out of adjustment	Adjust push rod	BR–17
	Tension or return spring faulty	Replace spring	BR–26
	Brake line restricted	Repair as necessary	
	Lining cracked or distorted	Replace shoe	BR–26
	Wheel cylinder or caliper piston sticking	Repair as necessary	BR–21, BR–26
	Adjuster broken	Replace adjuster	BR–26
	Master cylinder faulty	Repair or replace master cylinder	BR–9
Brakes pull	Tires improperly inflated	Inflate tires to proper pressure	
	Oil or grease on shoes or pads	Check for cause. Replace shoes or pads	BR–19 BR–26
	Brake shoes distorted, linings worn or glazed	Replace brake shoes	BR–26
	Brake pads distorted, worn or glazed	Replace pads	BR–19
	Drum or disc out of round	Replace drum or disc	BR–21, BR–26
	Tension or return spring faulty	Replace spring	BR–26
	Wheel cylinder faulty	Repair wheel cylinder	BR–26
	Piston frozen in brake cylinder	Repair brake cylinder	BR–21
	Brake pad sticking	Replace pads	BR–19

TROUBLESHOOTING (Cont'd)

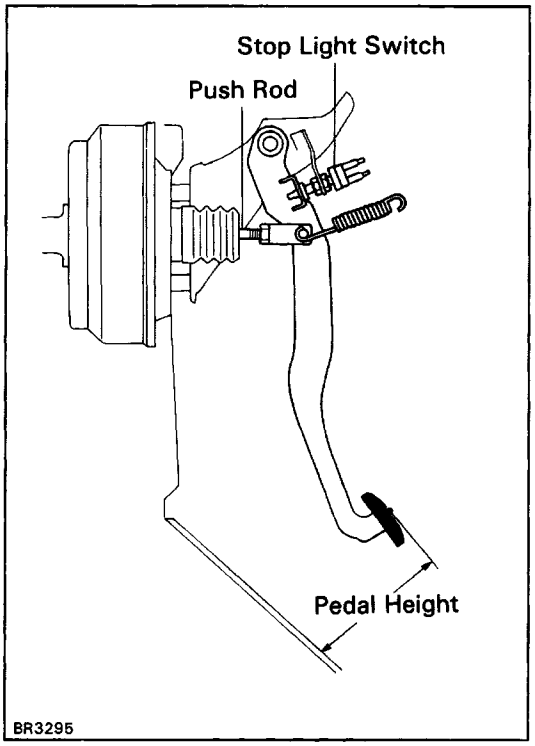
Problem	Possible cause	Remedy	Page
Hard pedal but brakes inefficient	Oil or grease on linings	Check for cause. Replace shoes or pads	BR–19, BR–26
	Brake shoes distorted, linings worn or glazed, drums worn	Replace brake shoes	BR–26
	Brake pads distorted, worn or glazed	Replace pads	BR–19
	Piston frozen in brake cylinder	Repair cylinder	BR–21
	Brake booster faulty	Repair booster	BR–16
	Vacuum leaks	Repair as necessary	
	Brake line restricted	Repair as necessary	
Snapping or clicking noise when brakes are applied	(Drum brake)		
	Brake shoes binding at backing plate ledges	Lubricate	BR–26
	Backing plate ledges worn	Replace and lubricate ledges	BR–26
	Loose or missing shoe hold–down spring	Replace shoe hold–down spring	BR–26
	Loose set bolt at backing plate	Tighten	BR–26
	(Disc brake)		
	Loose or missing pad support plate	Replace pad support plate	BR–19
	Loose installation bolt	Tighten	BR–19
	Wear on slide bushing	Replace slide bushing	BR–19
Scraping or grinding noise when brakes are applied	Worn brake linings or pads	Replace or refinish drums or ro–tors if heavily scored	BR–26
	Caliper to wheel or rotor interference	Replace as required	BR–21
	Dust cover to rotor or backing plate to drum interference	Correct or replace	BR–21, BR–26
	Other brake system components faulty	Repair or replace as necessary	
	Tires rubbing against chassis and/or body	Repair as necessary	

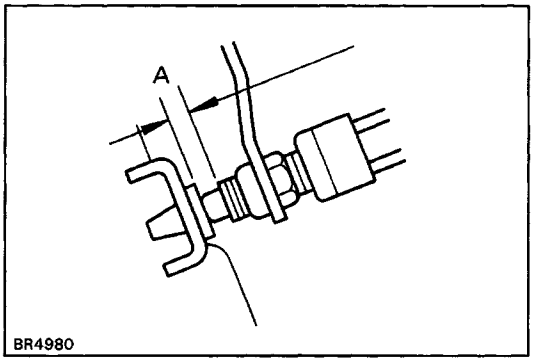
TROUBLESHOOTING (Cont'd)

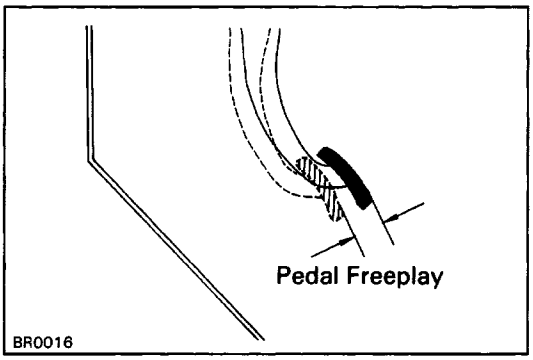
Problem	Possible cause	Remedy	Page
Squeaking, squealing groaning or chattering noise when brakes are applied HINT: Brake friction–materials inherently generate noise and heat in order to dissi–pate energy. As a re–sult, occasional squeal is normal and is aggra–vated by severe envi–ronmental conditions such as cold, heat, wetness, snow,salt, mud, etc. This occa–sional squeal is not a functional problem and does not indicate any loss of brake effective–ness	Brake drums and linings, rotors and pads worn or scored	Inspect, repair or replace	BR–21, BR–26
	Dirty, greased, contaminated or glazed linings or pads	Clean or replace	
	Improper linings or pads using	Inspect for correct usage or re–place	
	Maladjustment of brake pedal or booster push rod	Inspect and adjust	BR–6
	(Disc brake) Missing or damaged brake pad anti–squeal shim	Replace	BR–19
	Pad wear and pad wear indicator making contact with the rotor	Replace	BR–19
	Burred or rusted calipers	Clean or deburr	BR–19
	(Drum brake) Weak damaged or incorrect shoe hold–down springs, loose or damaged shoe hold–down spring pins and springs and grooved backing plate ledges	Inspect, repair or replace	BR–19, BR–26
Squealing and squeak–ing noise when brakes are not applied	Maladjustment of brake pedal or booster push rod	Inspect and adjust or booster push rod	BR–6
	Poor return of brake booster or master cylinder or brake cylinder	Inspect, repair or replace	BR–9, BR–16 BR–21, BR–26
	(Disc brake) Rusted or stuck piston	Inspect and lubricate as neces–sary	BR–19
	Improper positioning of pad in caliper	Reinstall correctly	BR–19
	Rotor rubbing against caliper housing	Inspect and replace	BR–21
	Improper installation of disc brake pad support plate	Reinstall correctly	BR–21
	Pad wear and pad wear indicator making contact with the rotor	Replace	BR–19
	(Drum brake) Weak, damaged or incorrect shoe hold–down springs	Replace	BR–26
	Grooved backing plate ledges	Replace	BR–26
	Bent or warped backing plate causing interference with drum	Repair or replace	
	Improper machining of drum causing in–terference with backing plate or shoe	Replace drum	BR–26
	Other brake system components: Loose or extra parts in brakes Rear drum adjustment too tight causing lining to glaze Worn, damaged or in–sufficiently lubricated wheel bearings	Inspect, repair or replace as nec–essary	BR–26

TROUBLESHOOTING (Cont'd)

Problem	Possible cause	Remedy	Page
Groaning, clicking or rattling noise when brakes are not applied	Stones or foreign material trapped inside wheel covers	Remove foreign material	
	Loose wheel nuts	Tighten to correct torque Replace if stud holes are elon–gated	
	Maladjustment of brake pedal or booster push rod	Inspect and adjust	BR–6, BR–17
	Worn, damaged or dry wheel bearings (Disc brake)	Inspect and lubricate or replace	
	Loose or missing anti–rattle spring or pad support plate or crimping on outer pad	Inspect, repair or replace	BR–21
	Failure of shim		
	Wear on slide bushing	Inspect, replace if necessary	BR–21
	Loose installation bolt	Inspect, replace if necessary	BR–21
	Poor return of piston	Inspect, tighten if necessary	BR–21
	(Drum brake)	Inspect, repair or replace	BR–21
	Loose or extra parts	Inspect and repair	BR–26







CHECKS AND ADJUSTMENTS

CHECK AND ADJUSTMENT OF BRAKE PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT

Pedal height from asphalt sheet: 161 – 171 mm (6.34 – 6.73 in.)

If incorrect, adjust the pedal height.

2. IF NECESSARY, ADJUST PEDAL HEIGHT

(a) Disconnect the connector from the stop light switch.

(b) Loosen the stop light switch lock nut and remove the stop light switch.

(c) Loosen the push rod lock nut.

(d) Adjust the pedal height by turning the pedal push rod.

(e) Tighten the push rod lock nut.

Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)

(f) Install the stop light switch and turn it until it lightly contacts the pedal stopper.

(g) Return the stop light switch one turn.

(h) Check that the clearance (A) between stop light switch and pedal.

Clearance: 0.5 – 2.4 mm (0.02 – 0.09 in.)

(i) Tighten the stop light switch lock nut.

(j) Connect the connector to the stop light switch.

(k) Check that the stop lights come on when the brake pedal is depressed, and go off when the brake pedal is released.

(l) After adjusting the pedal height, check the pedal freeplay

HINT: If clearance (A) between the stop light switch and the brake pedal stopper has been adjusted correctly, the pedal freeplay will meet the specifications.

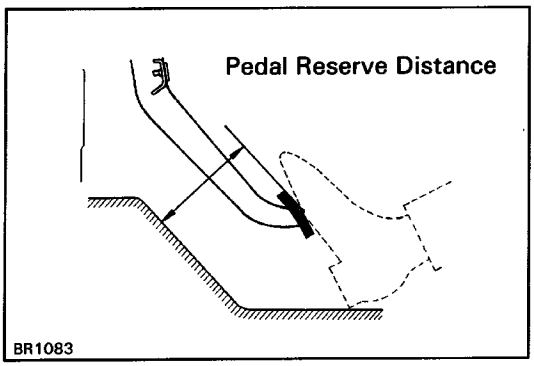
3. CHECK THAT PEDAL FREEPLAY IS CORRECT, AS SHOWN

(a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.

(b) Push in the pedal by hand until the beginning of the resistance is felt, then measure the distance, as shown.

Pedal freeplay: 3 – 6 mm (0.12 – 0.24 in.)

If incorrect, check the stop light switch clearance. And if the clearance is OK, then troubleshoot the brake system.



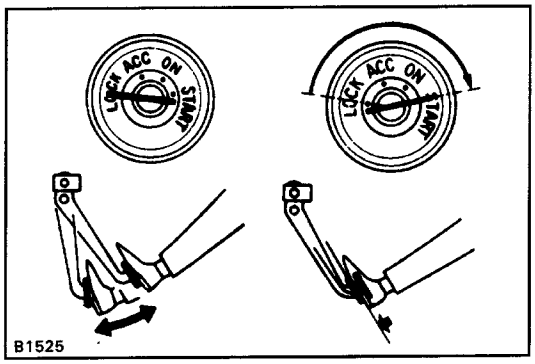
5. CHECK THAT PEDAL RESERVE DISTANCE IS CORRECT

Release the parking brake lever.

With engine running, depress the pedal and measure the pedal reserve distance, as shown.

Pedal reserve distance from asphalt sheet at 490 N (50 kgf, 110 lbf): More than 59 mm (2.32 in.)

If incorrect, troubleshoot the brake system.



OPERATIONAL TEST OF BRAKE BOOSTER

HINT: If the booster leaks or lacks of vacuum, repair before testing.

1. OPERATING CHECK

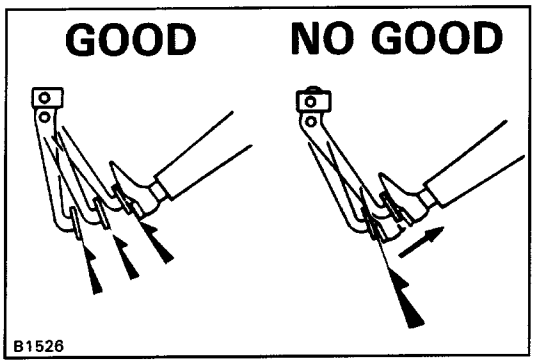
(a) Depress the brake pedal several times with the engine off, and check that there is no change in the pedal reserve distance.

(b) Depress the brake pedal and start the engine. If the pedal goes down slightly, operation is normal.

2. AIR TIGHTNESS CHECK

(a) Start the engine and stop it after one or two minutes. Depress the brake pedal several times slowly. If the pedal goes down the farthest the first time, but gradually rises after the second or third time, the booster is air tight.

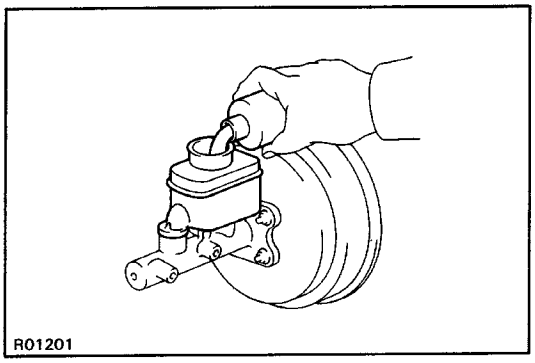
(b) Depress the brake pedal while the engine is running, and stop it with the pedal depressed. If there is no change in pedal reserve travel after holding the pedal for thirty seconds, the booster is air tight.



BLEEDING OF BRAKE SYSTEM

HINT: If any work is done on the brake system or if air is suspected in the brake lines, bleed the system of air.

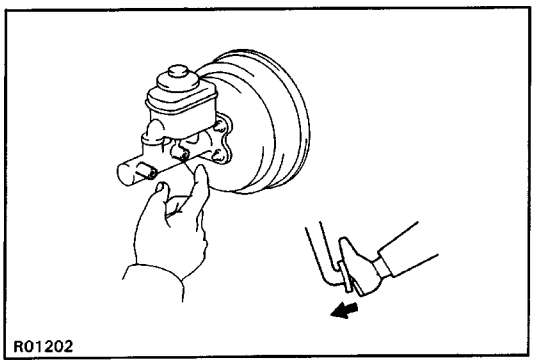
NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.



1. FILL BRAKE RESERVOIR WITH BRAKE FLUID

Check the reservoir after bleeding each wheel. Add fluid, if necessary.

Fluid type: SAE J1703 or FMVSS NO.116 DOT3



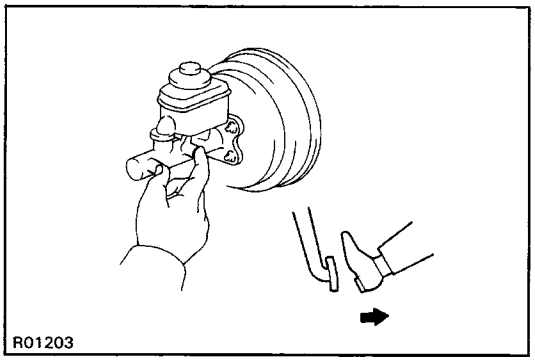
2. BLEED MASTER CYLINDER

HINT: If the master cylinder was disassembled or if the reservoir becomes empty, bleed the air from the master cylinder.

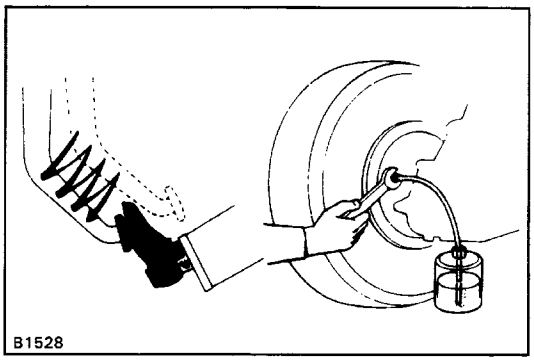
(a) Disconnect the brake tubes from the master cylinder.

Use a container to catch the brake fluid.

(b) Slowly depress the brake pedal and hold it.



(c) Block off the outlet holes with your fingers, and release the brake pedal.
(d) Repeat (b) and (c) three or four times.
(e) Connect the brake tubes to the master cylinder.



3. CONNECT VINYL TUBE TO WHEEL CYLINDER BLEEDER PLUG

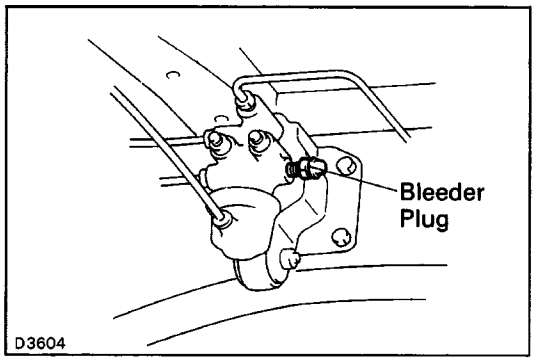
Insert other end of the tube in a half–full container of brake fluid.

HINT: Begin air bleeding from the wheel cylinder with the longest hydraulic line.

4. BLEED AIR FROM BRAKE LINE

(a) Slowly pump the brake pedal several times.
(b) While an assistant press on the pedal, loosen the bleeder plug until fluid starts to run out. Then close the bleeder plug.
(c) Repeat this procedure until there are no more air bubbles in the fluid.

Bleeder plug tightening torque:
11 N–m (110 kgf–cm, 8 ft–lbf)



5. REPEAT PROCEDURE FOR EACH WHEEL

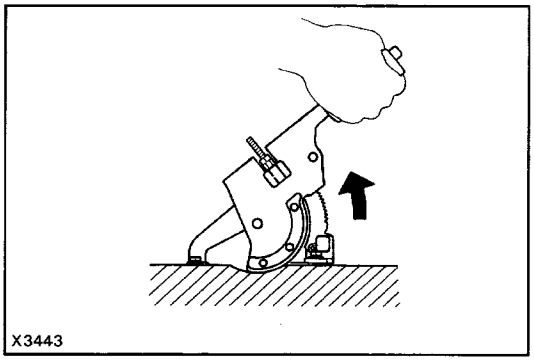
6. BLEED LOAD SENSING PROPORTIONING AND BYPASS VALVE

CHECK AND ADJUSTMENT OF PARKING BRAKE

1. CHECK THAT PARKING BRAKE LEVER TRAVEL IS CORRECT

Pull the parking brake lever all the way up, and count the number of clicks.

Parking brake lever travel at 196 N
(20 kgf, 44.1 lbf): 7 – 9 clicks



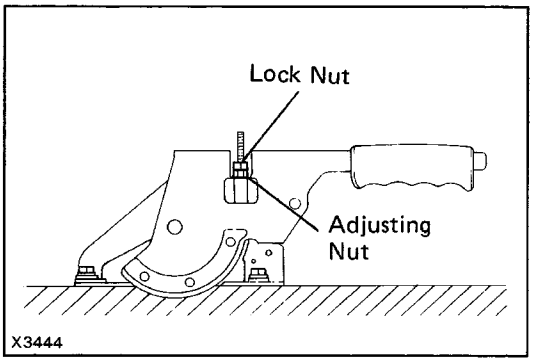
2. IF NECESSARY, ADJUST PARKING BRAKE LEVER TRAVEL .

HINT: Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted.
For shoe clearance adjustment, see step 8 on page BR–34.

(a) Remove the parking brake lever cover.
(b) Loosen the lock nut and turn the adjusting nut until the lever travel is correct.
(c) Tighten the lock nut.

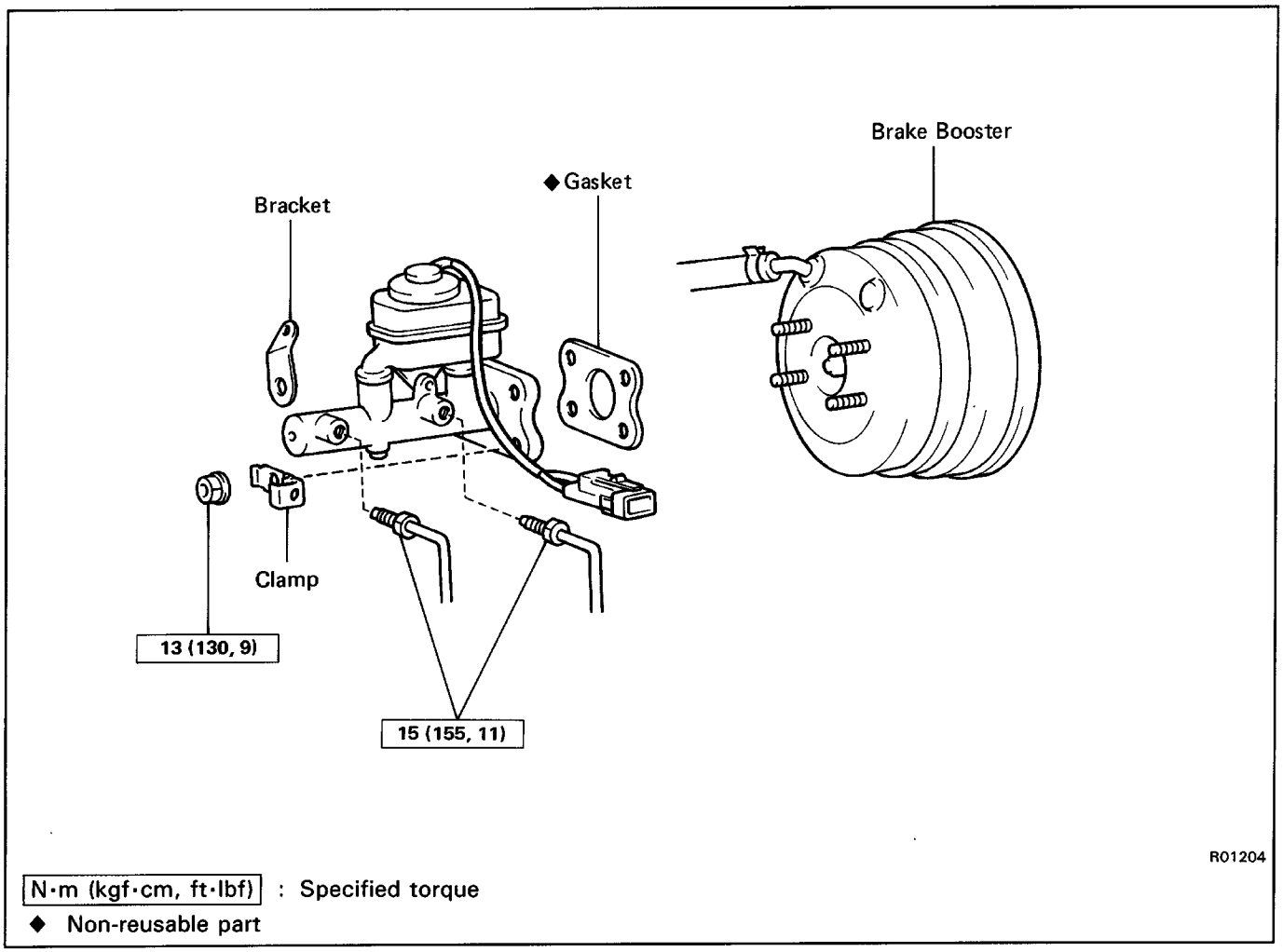
Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

(d) Install the parking brake lever cover.



MASTER CYLINDER

REMOVAL OF MASTER CYLINDER

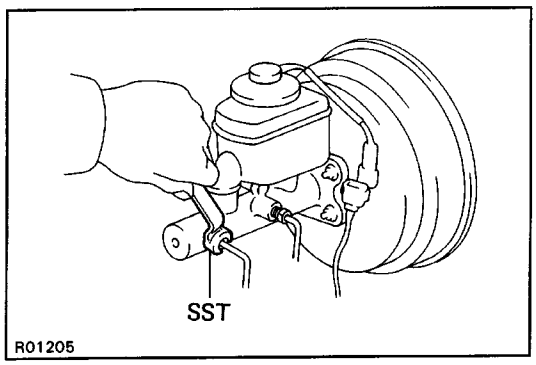


N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

1. DISCONNECT LEVEL WARNING SWITCH CONNECTOR

2. TAKE OUT FLUID WITH SYRINGE

NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.



3. DISCONNECT TWO BRAKE TUBES

Using SST, disconnect the two brake tubes from the master cylinder.

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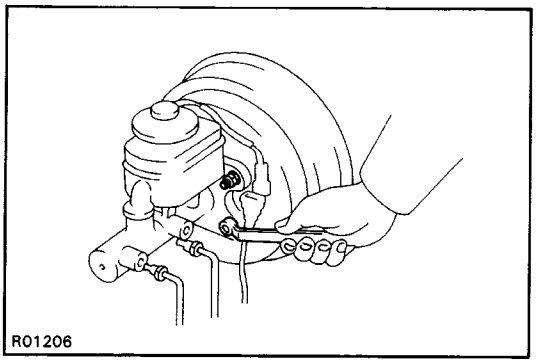
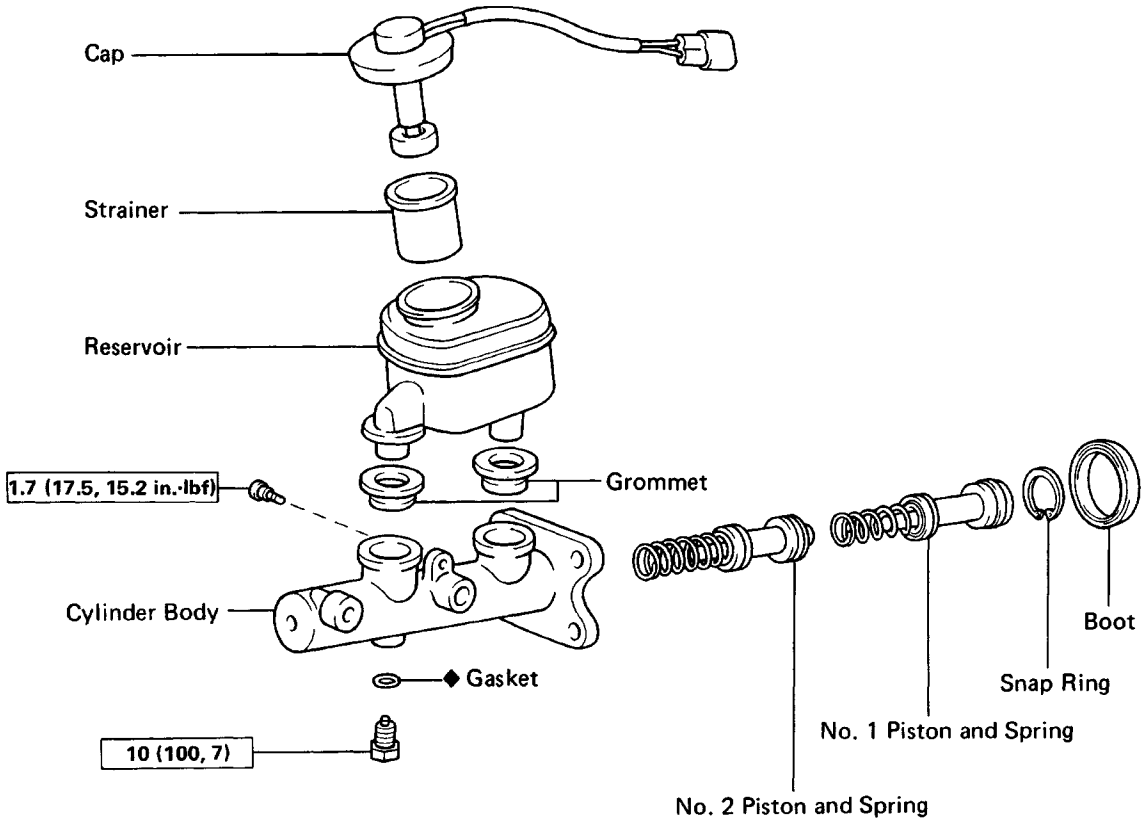


4. REMOVE MASTER CYLINDER

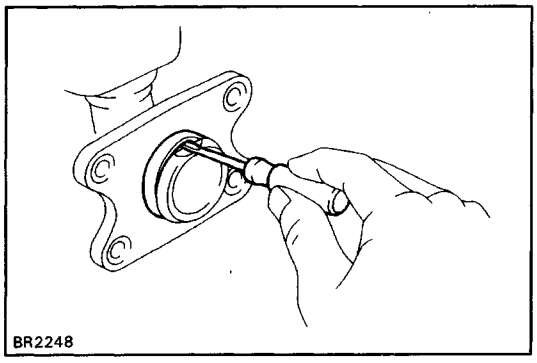
(a) Remove the four nuts.

(b) Remove the master cylinder, clamp and gasket from the brake booster.

COMPONENTS



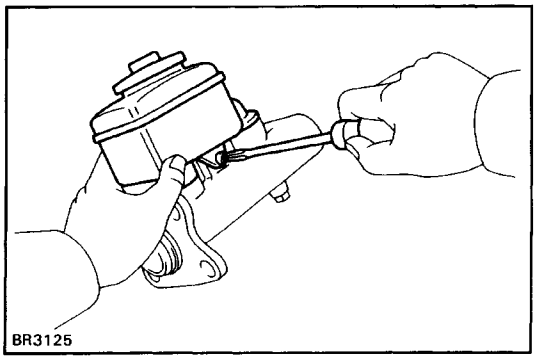
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part



DISASSEMBLY OF MASTER CYLINDER

1. REMOVE MASTER CYLINDER BOOT

Using a screwdriver, remove the master cylinder boot.

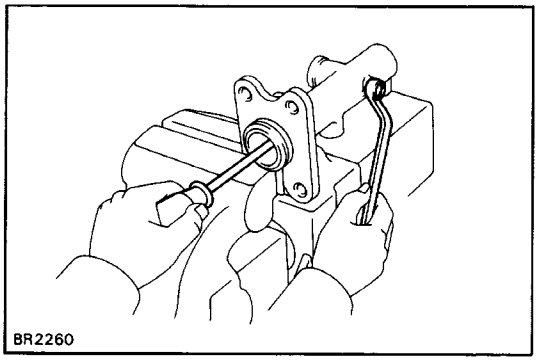


2. REMOVE RESERVOIR

(a) Remove the set screw and pull out the reservoir.
(b) Remove the cap and strainer from the reservoir.

3. REMOVE TWO GROMMETS

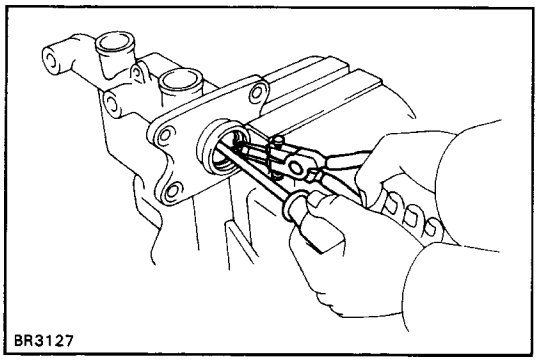
4. PLACE CYLINDER IN VISE



5. REMOVE PISTON STOPPER BOLT

Using a screwdriver, push the pistons in all the way and remove the piston stopper bolt and gasket.

HINT: Tape the screwdriver tip before use.

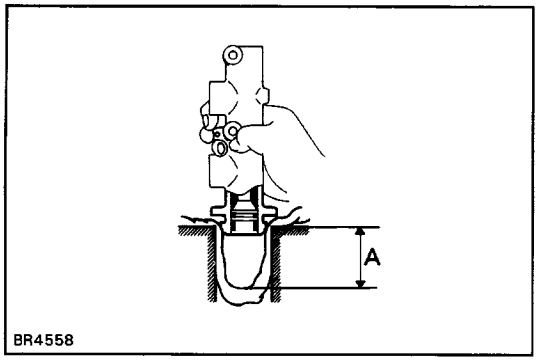


6. REMOVE TWO PISTONS AND SPRINGS

(a) Push in the piston with a screwdriver and remove the snap ring with snap ring pliers.

(b) Remove the No. 1 piston and spring by hand, pulling straight out, not at and angle.

NOTICE: If pulled out at an angle, there is possibility of damaging the cylinder bore.



(c) Place a rag and two wooden blocks on the work table and lightly tap the cylinder flange against the block edges until the piston drops out of cylinder.

HINT: Make sure the distance (A) from the rag to the top of the wood is at least 100 mm (3.94 in.).

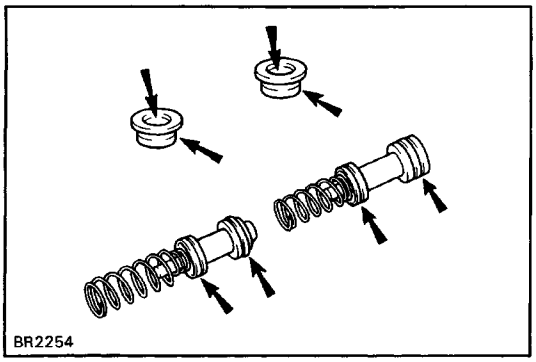
INSPECTION OF MASTER CYLINDER COMPONENTS

HINT: Clean the disassembled parts with compressed air.

1. INSPECT CYLINDER BORE FOR RUST OR SCORING

2. INSPECT CYLINDER FOR WEAR OR DAMAGE

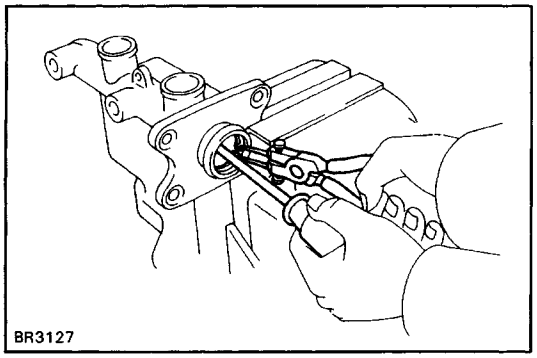
If necessary, clean or replace the cylinder.



ASSEMBLY OF MASTER CYLINDER

(See page BR–11)

1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO RUBBER PARTS INDICATED BY ARROWS



2. INSTALL TWO SPRINGS AND PISTONS

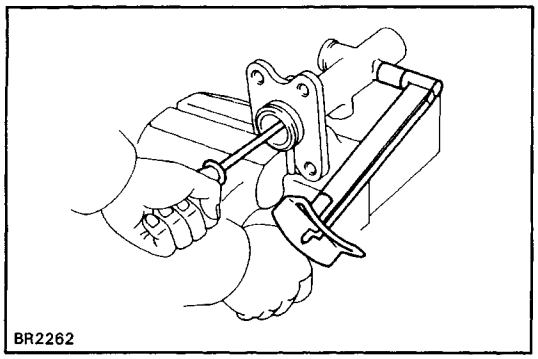
NOTICE: Be careful not to damage the rubber lips on the pistons.

(a) Install the two springs and pistons straight in, not at an angle.

NOTICE: If install at an angle, there is possibility of damaging the cylinder bore.

(b) Push in the piston with a screwdriver and install the snap ring with snap ring pliers.

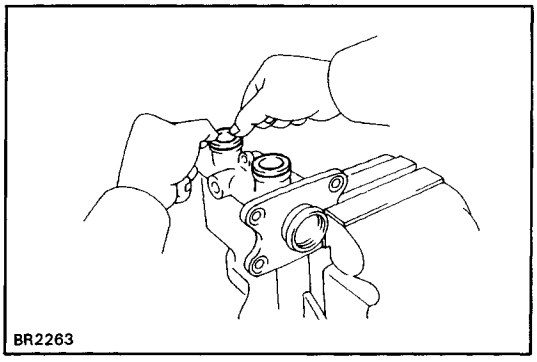
HINT: Tape the screwdriver tip before use.



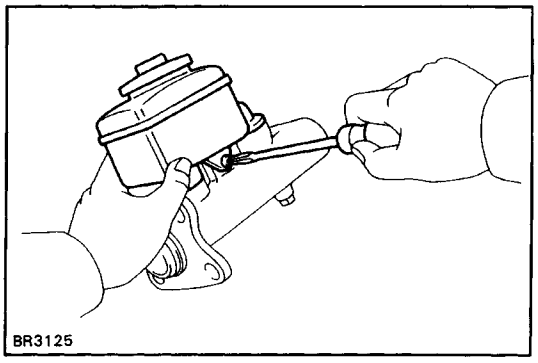
3. INSTALL PISTON STOPPER BOLT

Using a screwdriver, push the piston in all the way and install the piston stopper bolt over the gasket. Torque the bolt.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



4. INSTALL TWO GROMMETS



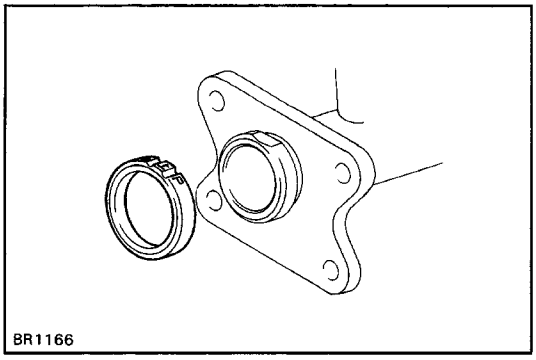
5. INSTALL RESERVOIR

(a) Install the cap and strainer to the reservoir.

(b) Push the reservoir onto the cylinder.

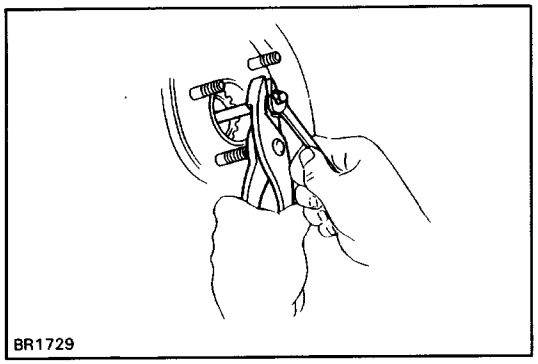
(c) Install the set screw while pushing on the reservoir.

Torque: 1.7 N–m (17.5 kgf–cm, 15.2 in.–lbf)



6. INSTALL MASTER CYLINDER BOOT

Facing the up mark on the master cylinder boot upwards, install the cylinder boot to the master cylinder.

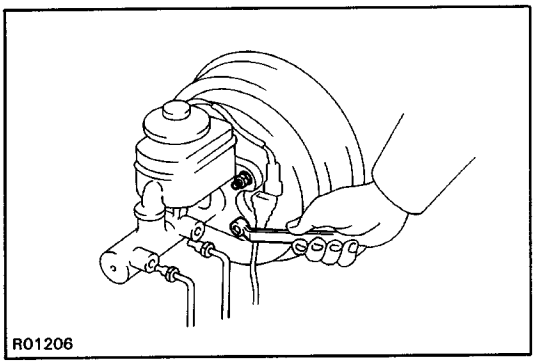


INSTALLATION OF MASTER CYLINDER

(See page BR–17)

1. ADJUST LENGTH OF BRAKE BOOSTER PUSH ROD BEFORE INSTALLING MASTER CYLINDER

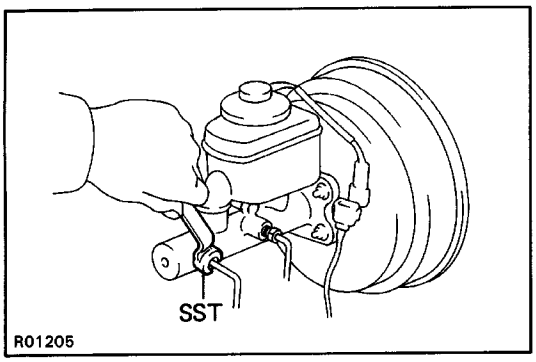
(See page BR–17)



2. INSTALL MASTER CYLINDER

Install the master cylinder and gasket on the brake booster with four nuts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



3. CONNECT TWO BRAKE TUBES

Using SST, connect the brake tubes to the master cylin–der. Torque the union nuts.

SST 09751–36011

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

4. CONNECT LEVEL WARNING SWITCH CONNECTOR

5. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See page BR–7)

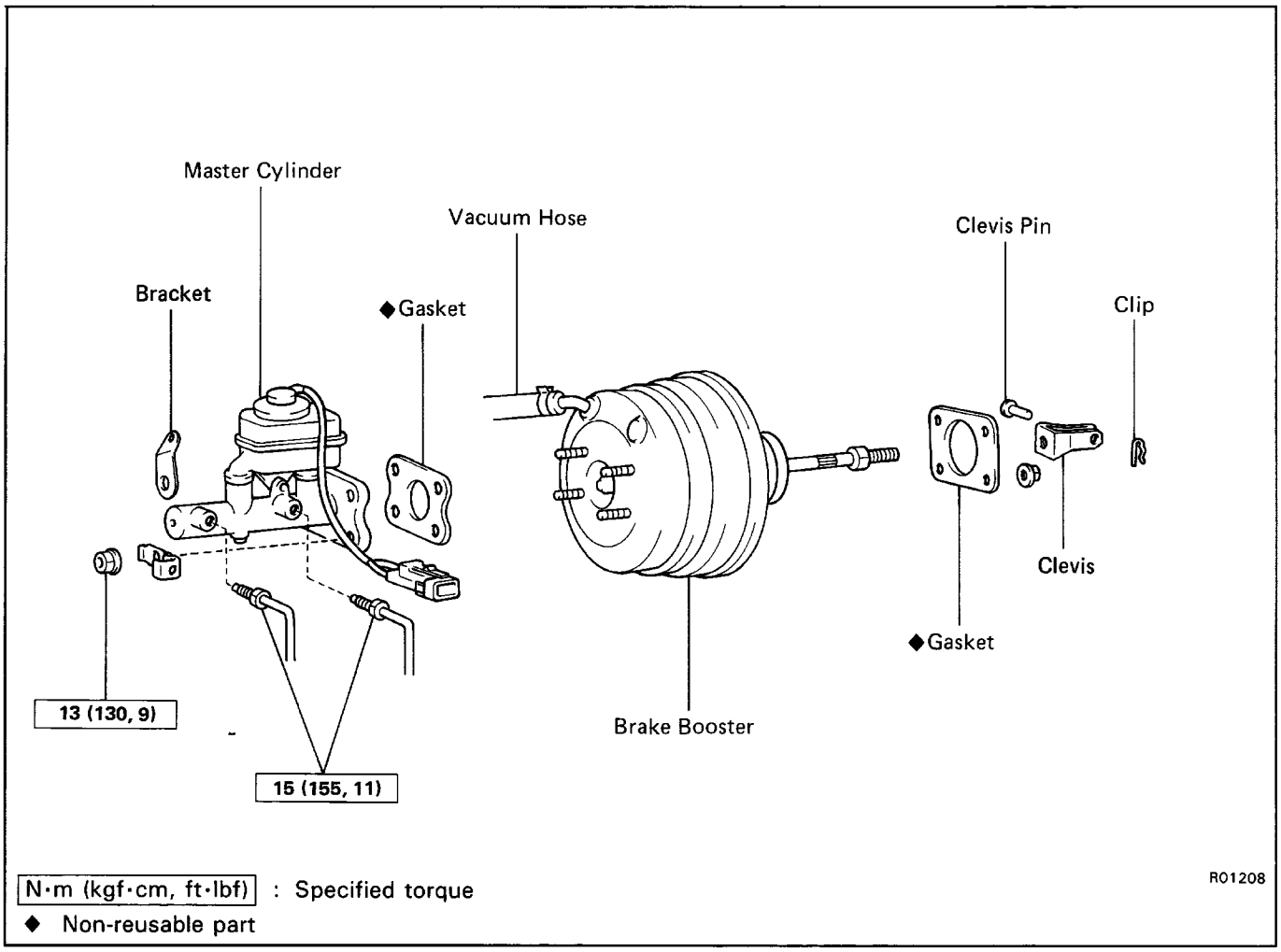
6. CHECK FOR FLUID LEAKAGE

7. CHECK AND ADJUST BRAKE PEDAL

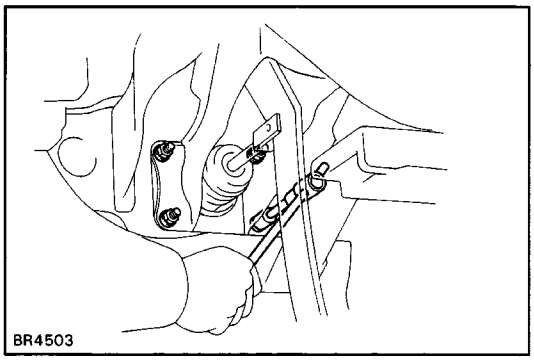
(See page BR–6)

BRAKE BOOSTER

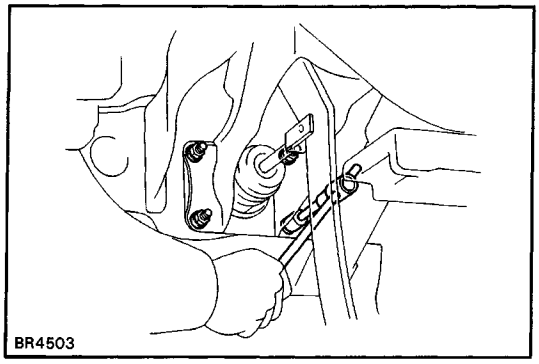
COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part



1. REMOVE MASTER CYLINDER
(See page BR–9)
2. DISCONNECT VACUUM HOSE FROM BRAKE BOOSTER
3. REMOVE PEDAL RETURN SPRING
4. REMOVE CLIP AND CLEVIS PIN
5. REMOVE BRAKE BOOSTER
Remove the four nuts, and pull out the brake booster with gasket.



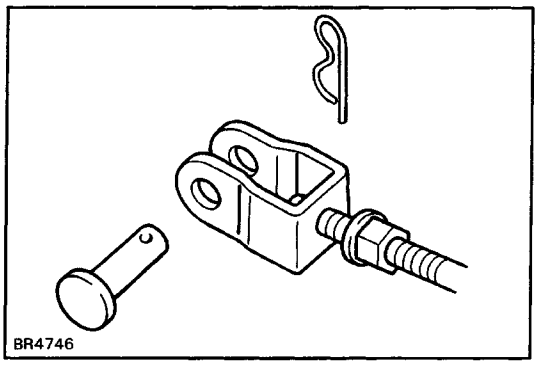
INSTALLATION OF BRAKE BOOSTER

(See page BR–16)

1. INSTALL BRAKE BOOSTER

Install the brake booster, and torque the four nuts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

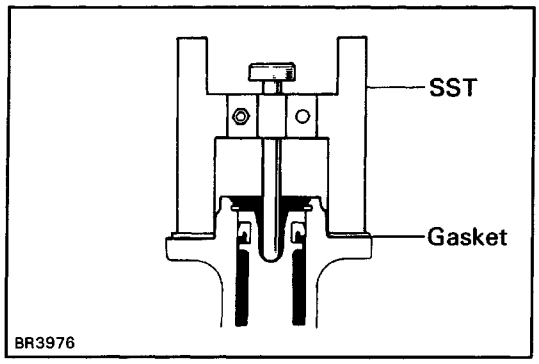


2. CONNECT CLEVIS TO BRAKE PEDAL

(a) Install the clevis pin to the clevis through the brake pedal.

(b) Secure the pin with a clip.

3. INSTALL PEDAL RETURN SPRING

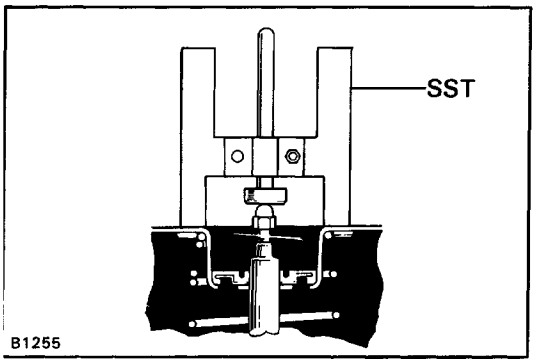


4. ADJUST LENGTH OF BOOSTER PUSH ROD

(a) Install the gasket on the master cylinder.

(b) Set the SST on the gasket, and lower the pin until its tip slightly touches the piston.

SST 09737–00010

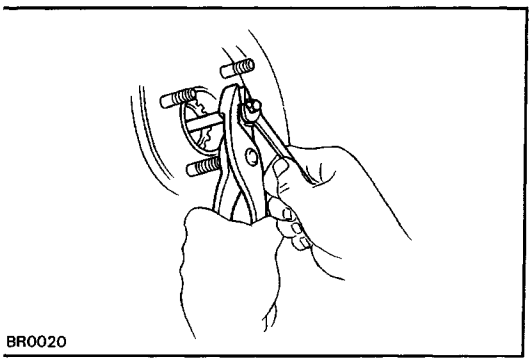


(c) Turn SST upside down, and position it on the booster.

SST 09737–00010

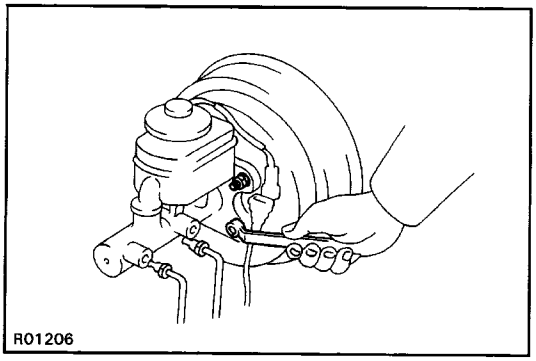
(d) Measure for clearance between the booster push rod and pin head (SST).

Clearance: 0 mm (0 in.)



(e) Adjust the booster push rod length until the push rod lightly touches the pin head.

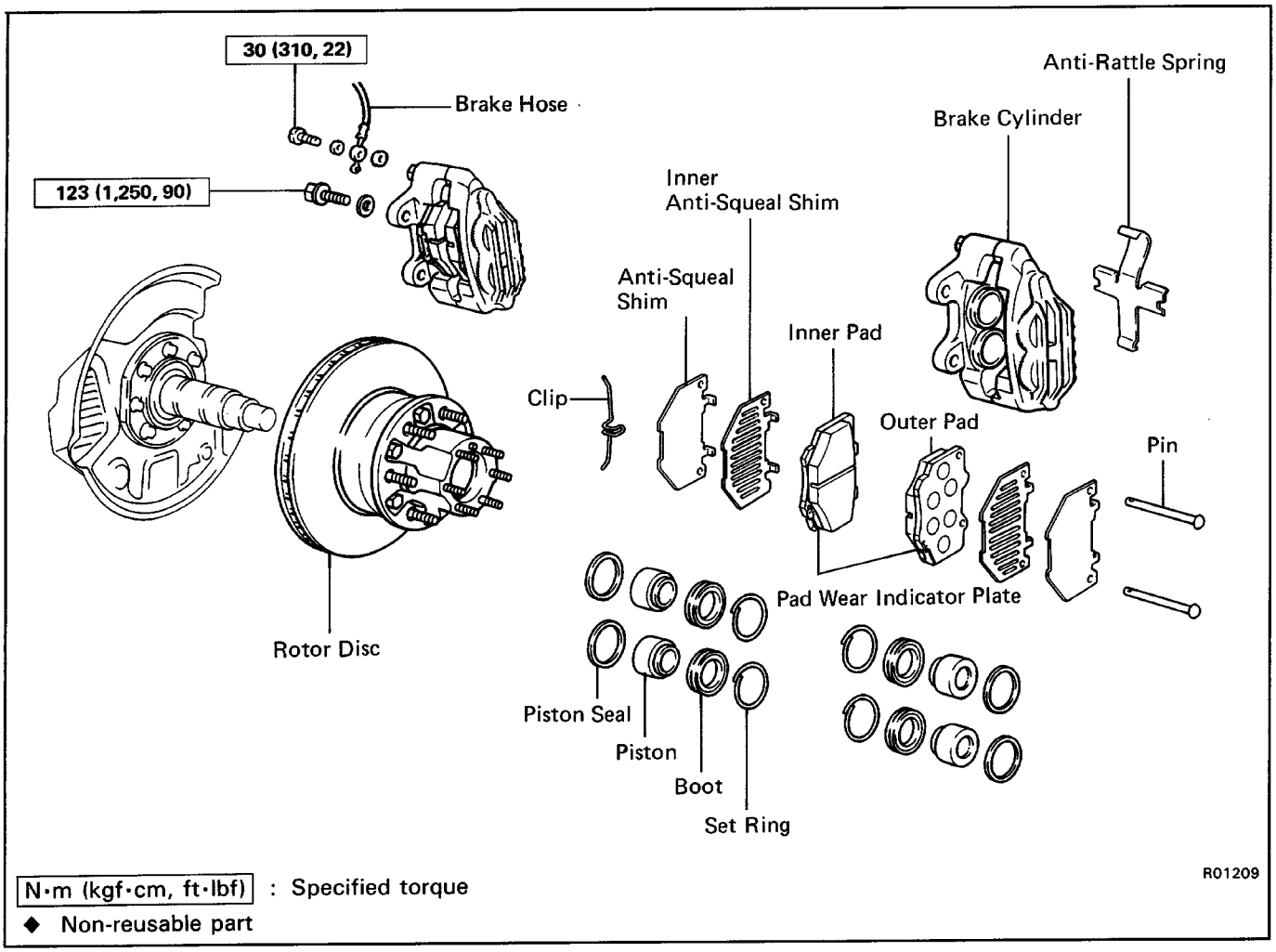
HINT: When adjusting the push rod, depress the brake pedal so that the push rod sticks out.



5. INSTALL MASTER CYLINDER
   (See page BR–9)
6. CONNECT HOSE TO BRAKE BOOSTER
7. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
   (See page BR–7)
8. CHECK FOR FLUID LEAKAGE
9. CHECK AND ADJUST BRAKE PEDAL
   (See page BR–6)
10. PERFORM OPERATIONAL CHECK
    (See page BR–7)

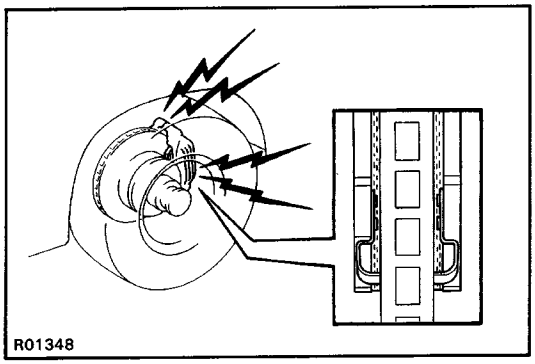
FRONT BRAKE

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

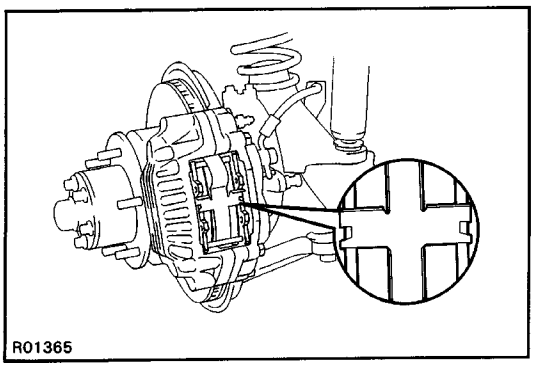
◆ Non-reusable part



REPLACEMENT OF BRAKE PADS

HINT: If a squealing noise occurs from the brakes while driving, check the pad wear indicator plate. If the pad wear indicator plate contacts the rotor disc, the brake pads should be replaced.

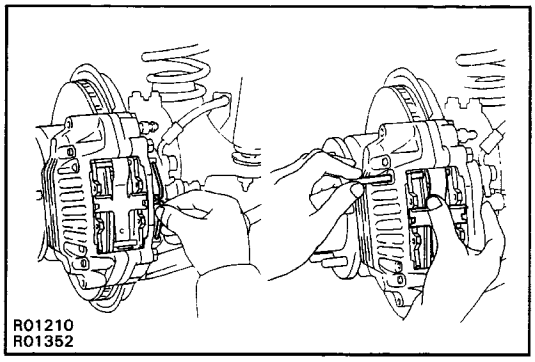
1. REMOVE FRONT WHEEL



2. INSPECT PAD LINING THICKNESS

Check the pad thickness and replace pads if not within specification.

Minimum thickness: 4.0 mm (0.157 in.)



3. REMOVE FOLLOWING PARTS

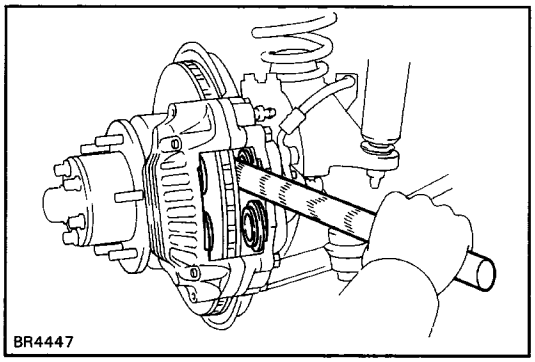
(a) Clip
(b) Two pins
(c) Anti–rattle spring
(d) Two pads
(e) Four anti–squeal shims

4. CHECK ROTOR DISC THICKNESS

(See step 2 on page BR–23)

5. CHECK ROTOR DISC RUNOUT

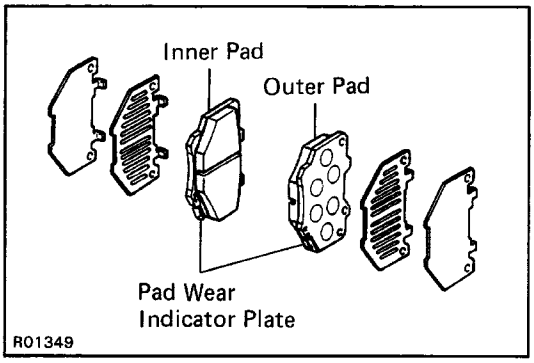
(See step 3 on page BR–23)



6. INSTALL NEW PADS

(a) Draw out a small amount of brake fluid from the res–ervoir.
(b) Press in the pistons with a hammer handle or an equivalent.

HINT: Always change the pads on one wheel at a time as there is possibility of the opposite piston flying out.

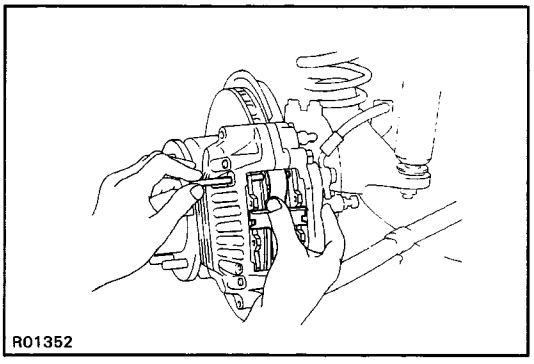


(c) Install the four anti–squeal shims to new pads as shown.

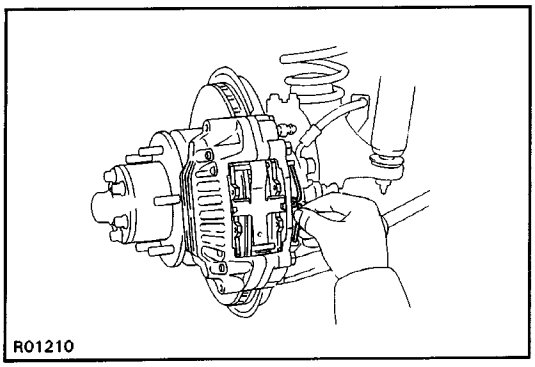
HINT: Apply disc brake grease to both sides of the inner anti–squeal shims.

(d) Install the two pads as shown in the illustration.

NOTICE: Do not allow oil or grease to get on the rub–bing face.

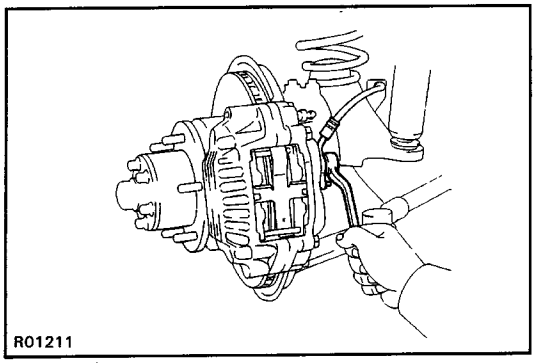


7. INSTALL ANTI–RATTLE SPRING AND TWO PINS



8. INSTALL CLIP

9. INSTALL FRONT WHEEL



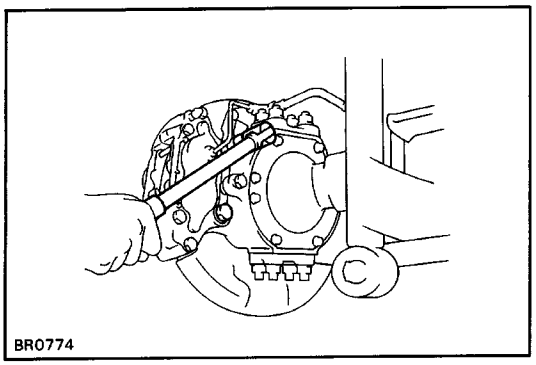
REMOVAL OF CYLINDER

(See page BR–19)

1. REMOVE FRONT WHEEL

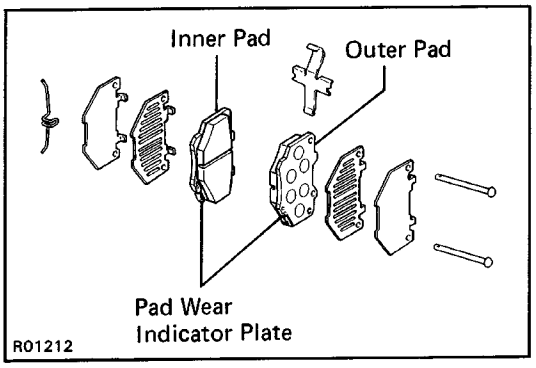
2. DISCONNECT BRAKE LINE

Disconnect the brake hose. Use a container to catch the brake fluid.



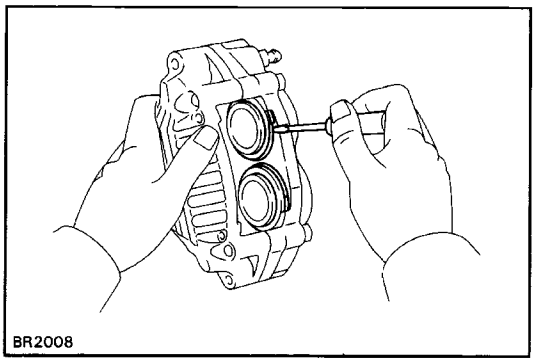
3. REMOVE CYLINDER

Remove the two mounting bolts and remove the cylinder.



4. REMOVE FOLLOWING PARTS

(a) clip
(b) Two pins
(c) Anti–rattle spring
(d) Two pads
(e) Four anti–squeal shims

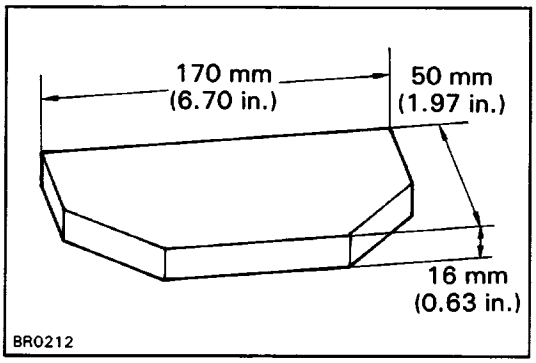


DISASSEMBLY OF CYLINDER

(See page BR–19)

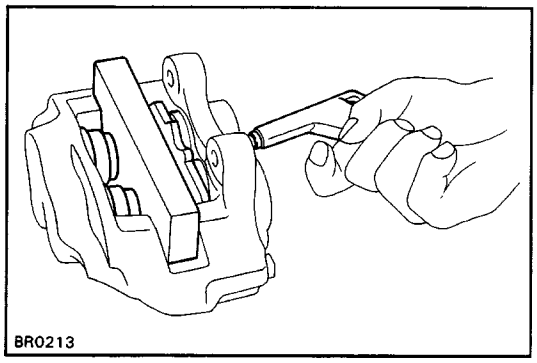
1. REMOVE CYLINDER BOOT SET RINGS AND BOOTS

Using a screwdriver, remove the four cylinder boot set rings and four boots.



2. REMOVE PISTONS FROM CYLINDER

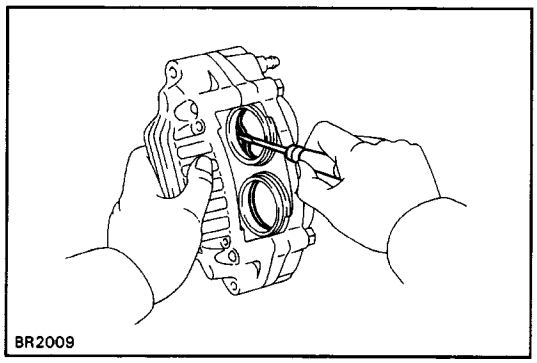
(a) Prepare the wooden plate as shown in the illustration to hold the pistons.



(b) Place the plate between the pistons and insert a pad at one side.

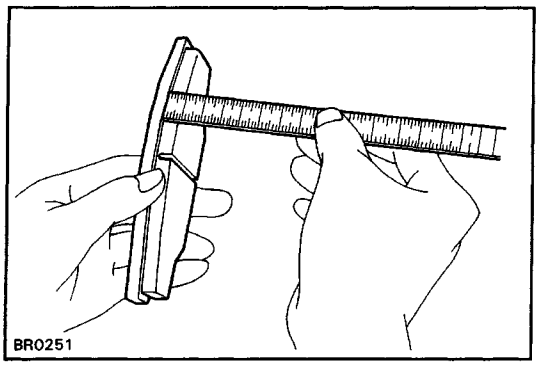
(c) Use compressed air to remove the pistons alternately from the cylinder.

NOTICE: Do not place your fingers in front of the pistons when using compressed air.



3. REMOVE PISTON SEALS

Using a screwdriver, remove the four seals from the cylinder.



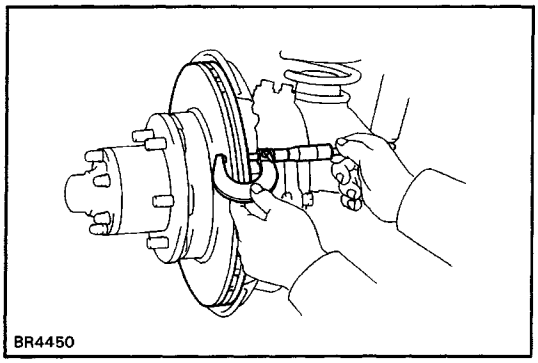
INSPECTION AND REPAIR OF FRONT BRAKE COMPONENTS

1. MEASURE PAD LINING THICKNESS

Minimum thickness: 4.0 mm (0.157 in.)

Standard thickness: 9.5 mm (0.374 in.)

Replace the pads if the thickness is less than the mini–mum (the 5.0 mm slit is no longer visible) or if it shows sign of uneven wear.

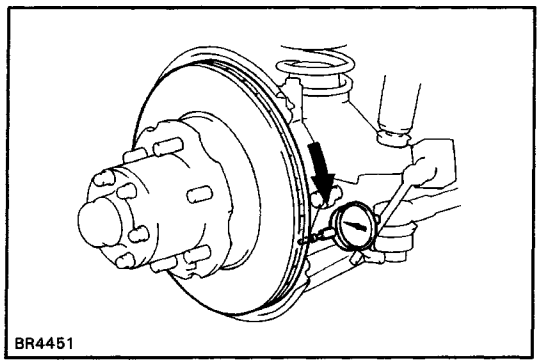


2. MEASURE ROTOR DISC THICKNESS

Minimum thickness: 23.0 mm (0.906 in.)

Standard thickness: 25.0 mm (0.984 in.)

If the disc is scored or worn, or if thickness is less than minimum, repair or replace the disc.



3. MEASURE ROTOR DISC RUNOUT

Measure the rotor disc runout at 10 mm (0.39 in.) from the outer edge of the rotor disc.

Maximum disc runout: 0.15 mm (0.0059 in.)

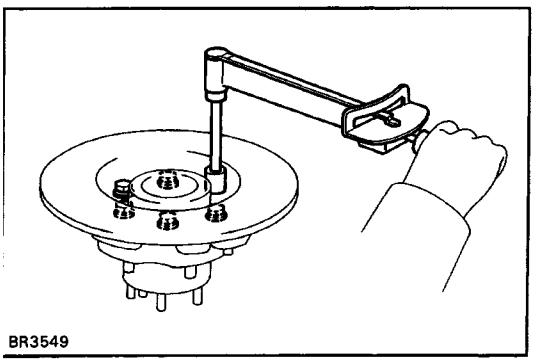
If the runout is greater than maximum, replace the rotor disc.

HINT: Before measuring the runout, confirm that the front bearing play is within specification.

4. IF NECESSARY, REPLACE ROTOR DISC

(a) Remove the front axle hub.

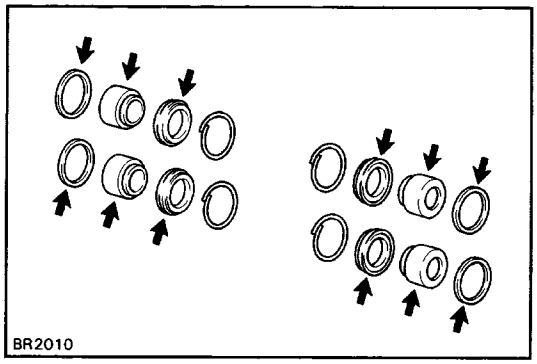
(b) Remove the disc from the axle hub.



(c) Install a new rotor disc and torque the bolts.

Torque: 74 N–m (750 kgf–cm, 54 ft–lbf)

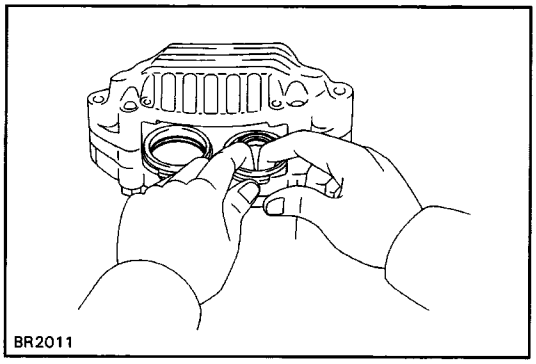
(d) Install the axle hub and adjust the front bearing pre–load.



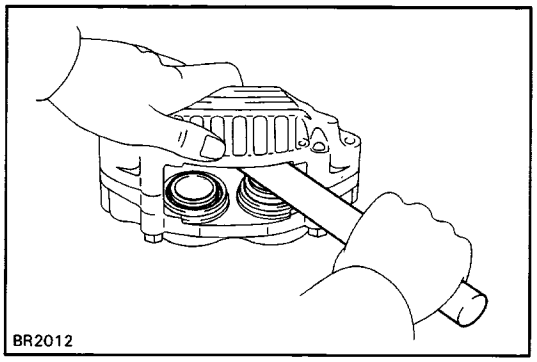
ASSEMBLY OF CYLINDER

(See page BR–19)

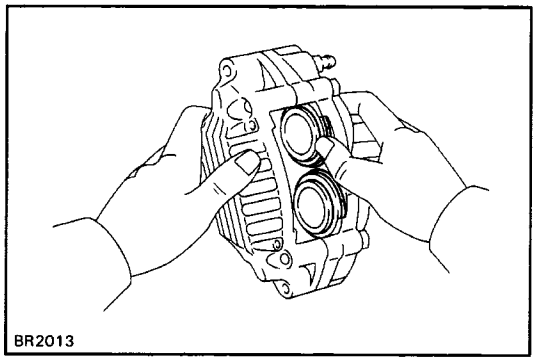
1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED BY ARROWS



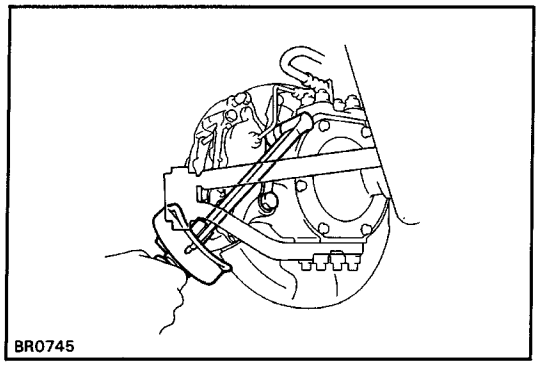
2. INSTALL PISTON SEALS INTO CYLINDER



3. INSTALL PISTONS INTO CYLINDER



4. INSTALL CYLINDER BOOTS AND SET RINGS INTO CYLINDER



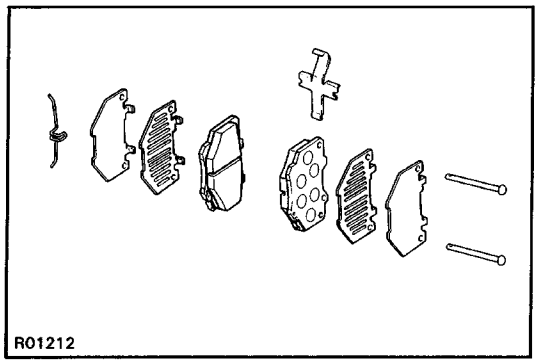
INSTALLATION OF CYLINDER

(See page BR–19)

1. INSTALL CYLINDER

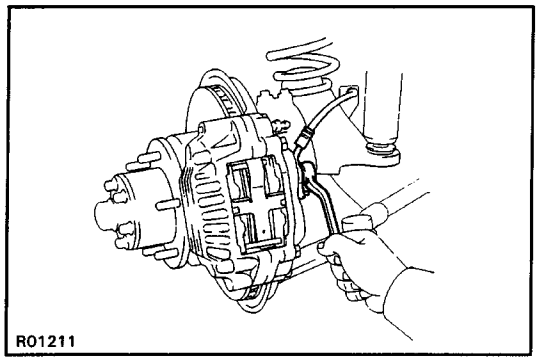
Install the brake cylinder, and torque the two mounting bolts.

Torque: 123 N–m (1,250 kgf–cm, 90 ft–lbf)



2. INSTALL PADS

(See steps 6 to 9 on pages BR–20 and BR–21)



3. INSTALL BRAKE HOSE TO BRAKE CYLINDER

Torque: 30 N–m (310 kgf–cm, 22 ft–lbf)

4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

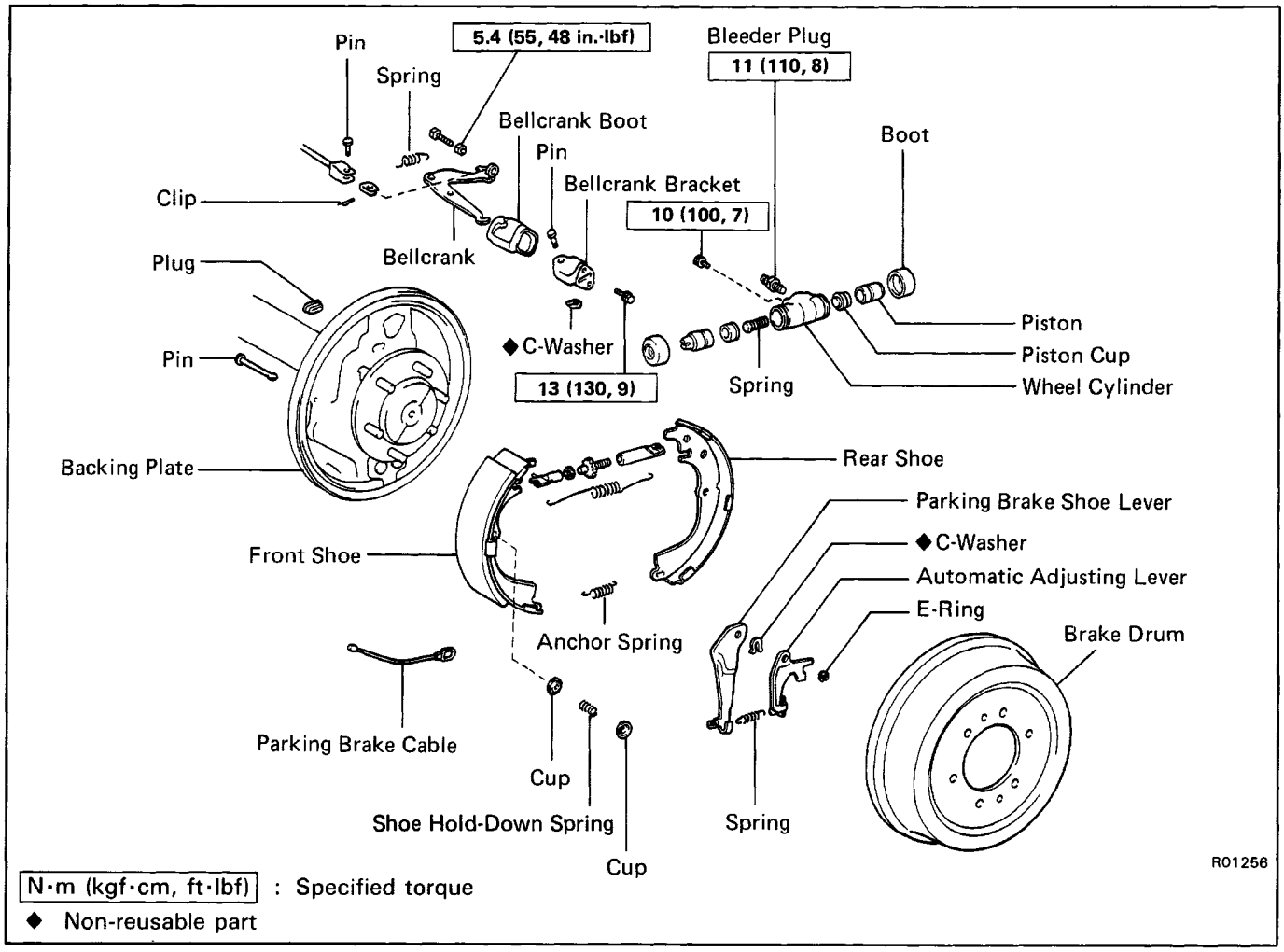
(See page BR–7)

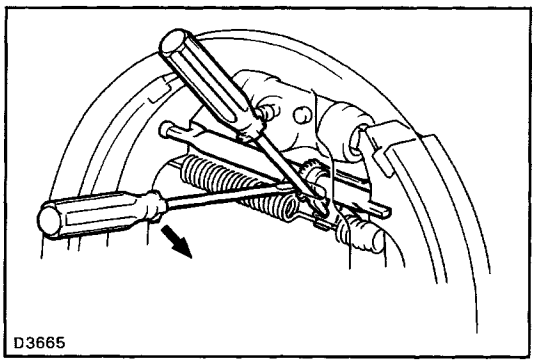
5. CHECK FOR FLUID LEAKAGE

6. INSTALL FRONT WHEEL

REAR BRAKE

COMPONENTS





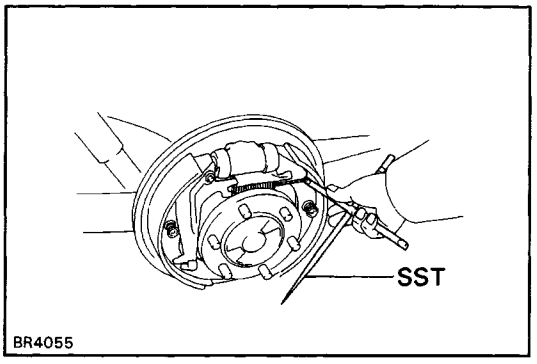
REMOVAL OF REAR BRAKE

1. REMOVE REAR WHEEL AND BRAKE DRUM

HINT: If the brake drum cannot be removed easily, perform the following steps.

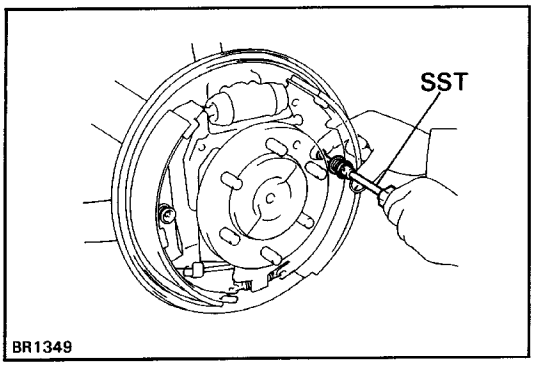
(a) Insert a screwdriver through the hole in the backing plate, and hold the automatic adjusting lever away from the adjusting bolt.

(b) Using another screwdriver, reduce the brake shoe adjustment by turning the adjusting bolt clockwise.

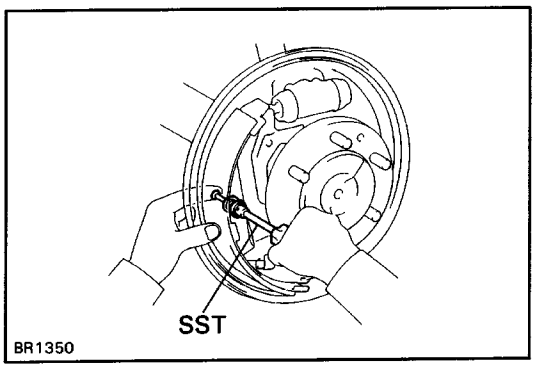


2. REMOVE REAR SHOE

(a) Using SST, remove the return spring.
SST 09703–30010

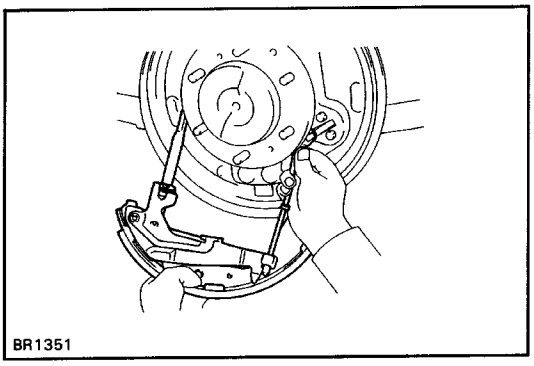


(b) Using SST, remove the two cups, shoe hold–down spring and a pin.
SST 09718–00010
(c) Remove the rear brake shoe and anchor spring.

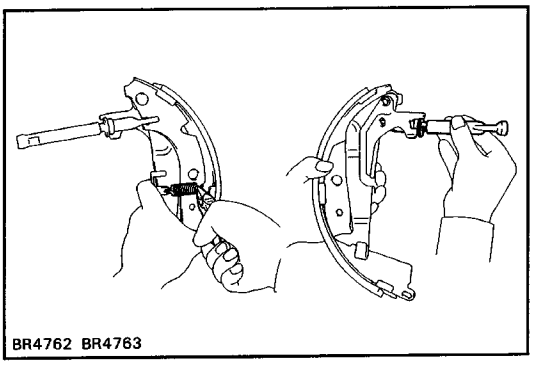


3. REMOVE FRONT SHOE

(a) Using SST, remove the two cups, shoe hold–down spring and a pin.
SST 09718–00010

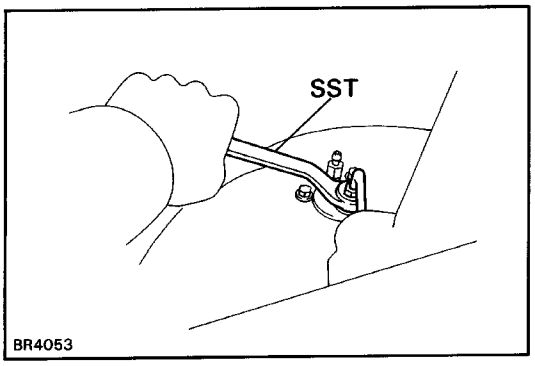


(b) Disconnect the parking brake cable from the parking brake bellcrank.
(c) Remove the front shoe with adjuster.
(d) Disconnect the parking brake cable from the front shoe.



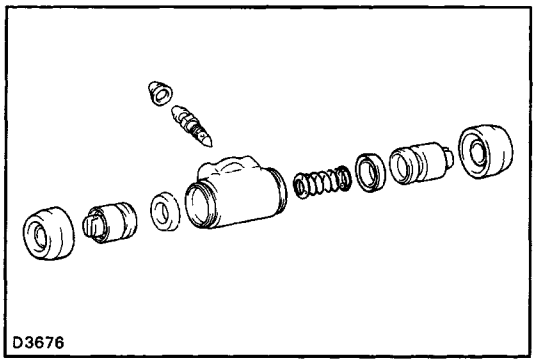
4. REMOVE ADJUSTER FROM FRONT SHOE

(a) Remove the adjusting lever spring.
(b) Remove the adjuster.



5. IF NECESSARY, REMOVE WHEEL CYLINDER

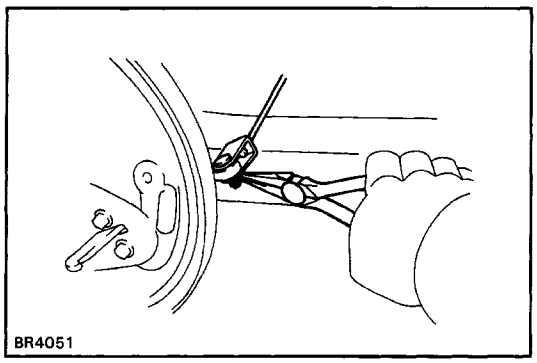
(a) Using SST, disconnect the brake tube.
SST 09751–36011
(b) Remove the two bolts and the wheel cylinder.



6. DISASSEMBLE WHEEL CYLINDER

Remove the following parts from the wheel cylinder.

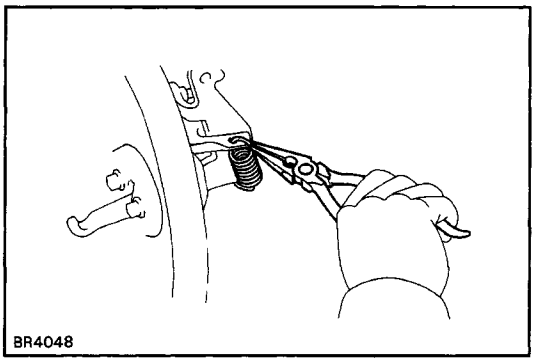
- Two boots
- Two pistons
- Two piston cups
- Spring



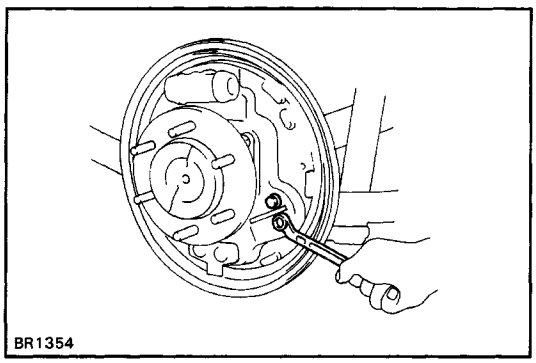
7. IF NECESSARY, REMOVE AND DISASSEMBLE PARKING BRAKE BELLCRANK ASSEMBLY

(a) Remove the clip.

(b) Remove the pin and wave washer, then disconnect the parking brake cable.

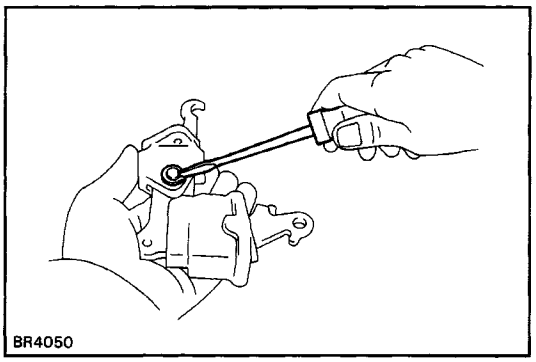


(c) Remove the two tension springs.



(d) Remove the two bolts and parking brake bellcrank assembly.

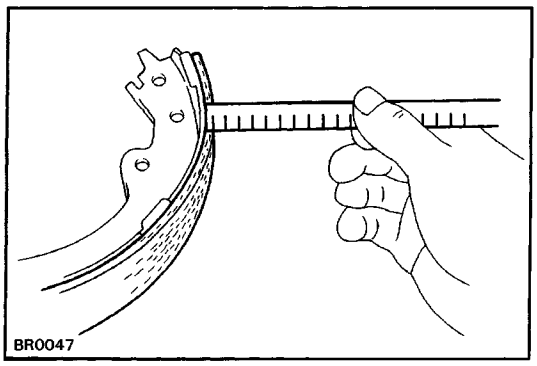
(e) Remove the boot from the parking brake bellcrank assembly.



(f) Using a screwdriver, remove the C–washer and pin.

(g) Remove the parking brake bellcrank from the crank bracket.

(h) Remove the boot.



INSPECTION OF REAR BRAKE COMPONENTS

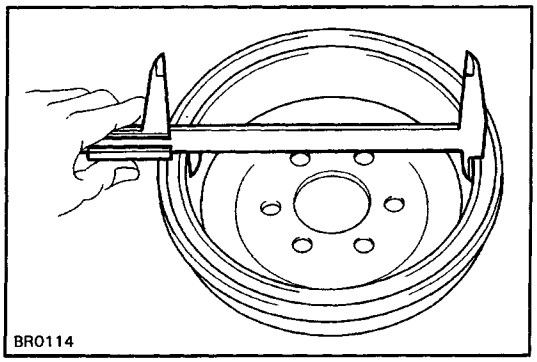
1. MEASURE BRAKE SHOE LINING THICKNESS

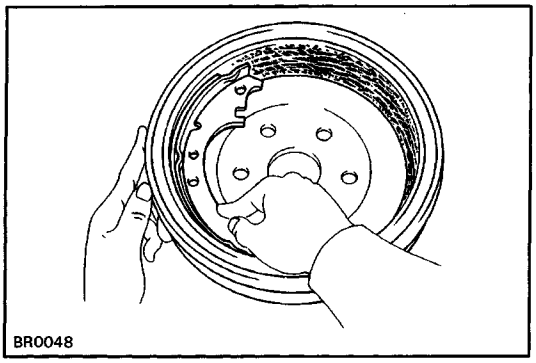
Minimum thickness: 1.5 mm (0.059 in.)
Standard thickness: 6.5 mm (0.265 in.)
If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.
HINT: If any of the brake shoes have to be replaced, replace all of the brake shoes in order to maintain even braking.

2. MEASURE BRAKE DRUM INSIDE DIAMETER

Maximum inside diameter: 297 mm (11.693 in.)
Standard inside diameter: 295 mm (17.614 in.)

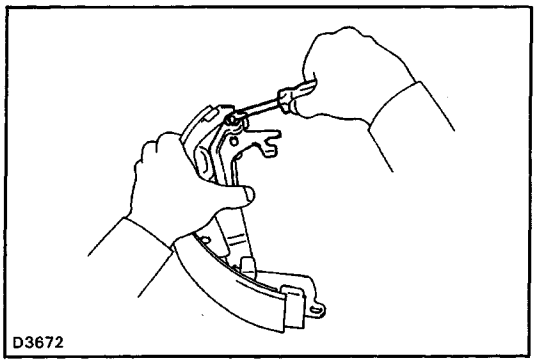
If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.





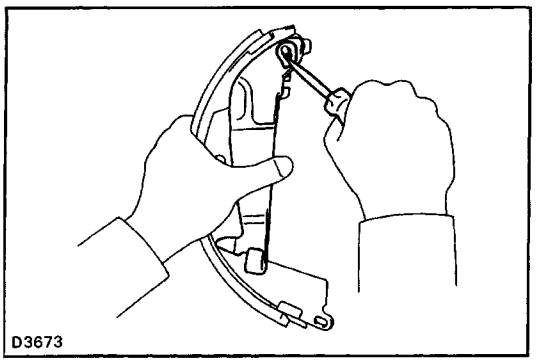
3. INSPECT BRAKE LINING AND DRUM FOR PROPER CONTACT

If the contact between the brake lining and drum is improper, repair the lining with a brake shoe grinder, or replace the brake shoe assembly.

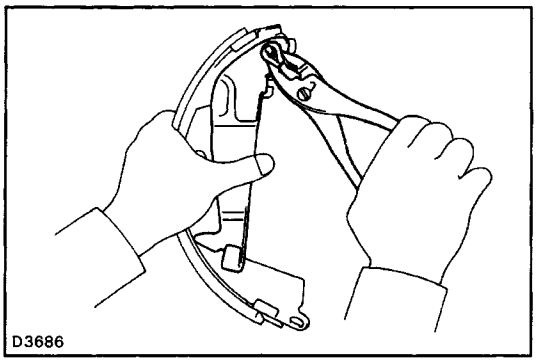


4. IF NECESSARY, REPLACE BRAKE SHOES

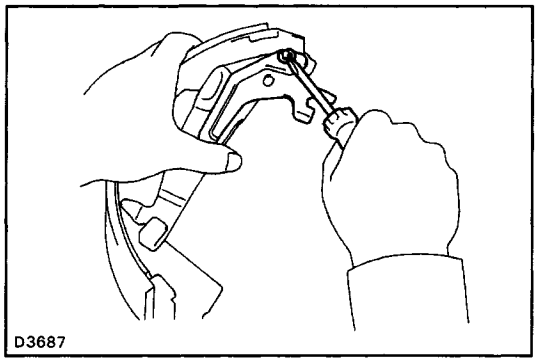
(a) Using a screwdriver, remove the automatic adjusting lever from the front shoe.



(b) Using a screwdriver, remove the parking brake shoe lever from the front shoe.



(c) Using pliers, install the parking brake shoe lever with a new C–washer.



(d) Install the automatic adjusting lever with a new E–ring.

5. INSPECT WHEEL CYLINDER FOR CORROSION OR DAMAGE

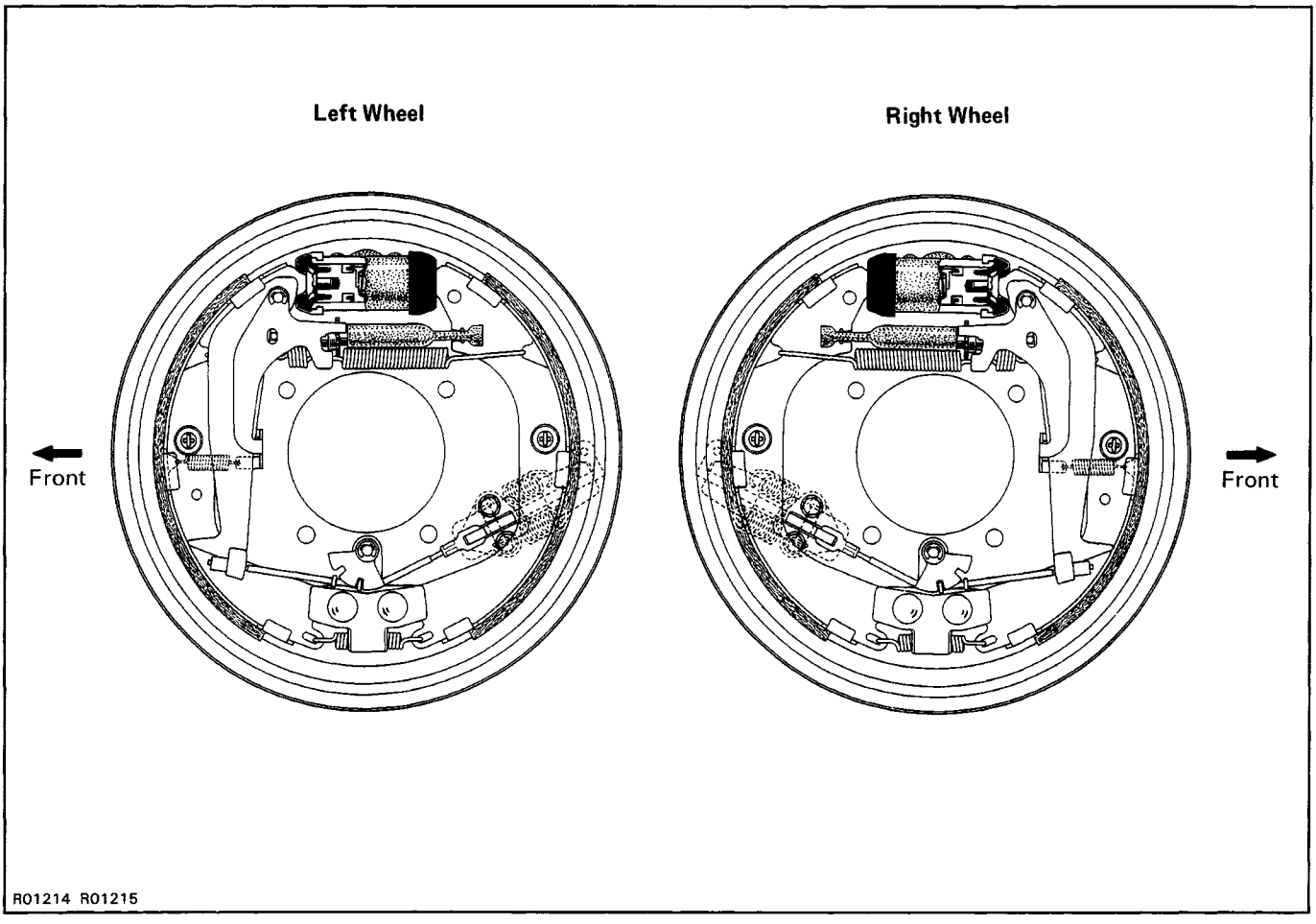
6. INSPECT BACKING PLATE FOR WEAR OR DAMAGE

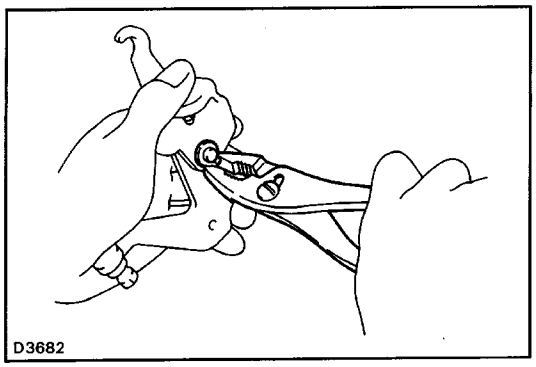
7. INSPECT BELLCRANK PARTS FOR BENDING, WEAR OR DAMAGE

ASSEMBLY OF REAR BRAKE

(See page BR–26)

HINT: Assemble the parts in the correct direction as shown.

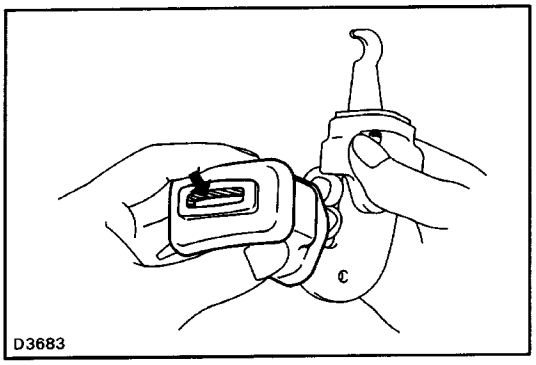




1. IF NECESSARY, ASSEMBLE AND INSTALL PARKING BRAKE BELLCRANK ASSEMBLY

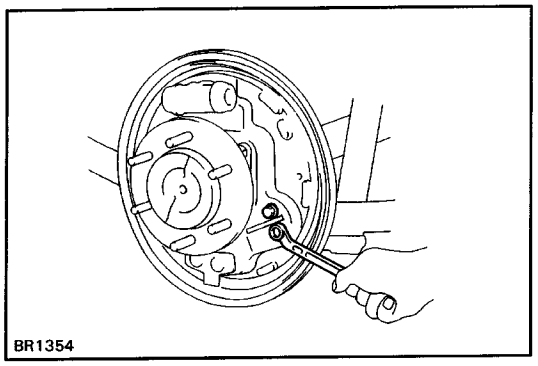
(a) Install the parking brake bellcrank to the crank bracket.

(b) Install the pin and secure it with a new C–washer.



(c) Apply lithium soap base glycol grease to the boot.

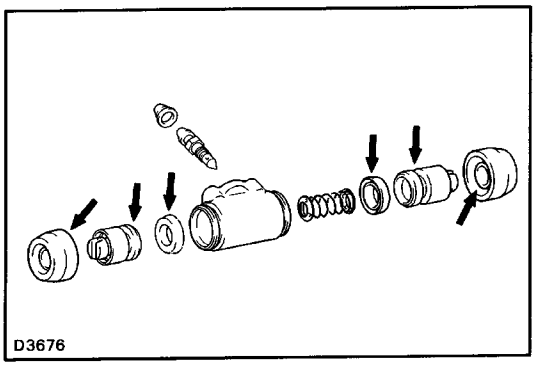
(d) Install the boot to the parking brake bellcrank.



(e) Install the parking brake bellcrank assembly on the backing plate with two bolts.

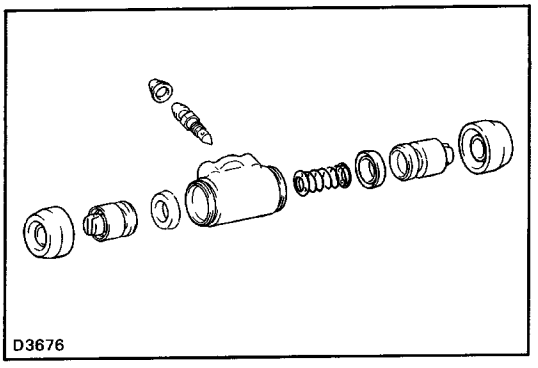
(f) Torque the bolts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



2. IF NECESSARY, ASSEMBLE AND INSTALL WHEEL CYLINDER

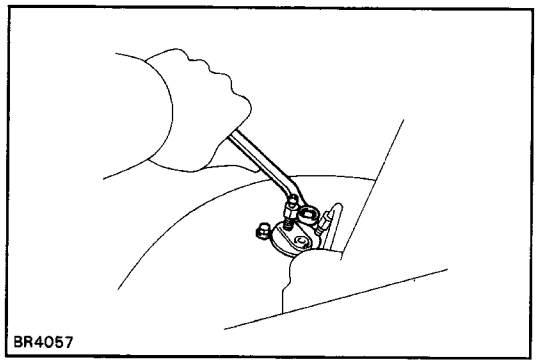
(a) Apply lithium soap base glycol grease to the boots, piston cups and pistons.



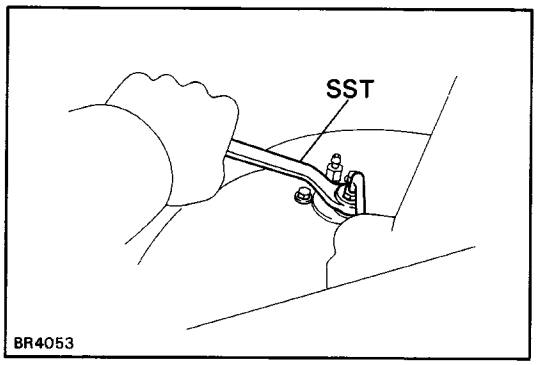
(b) Install the spring and two piston cups in the wheel cylinder.

HINT: Make sure the flanges of the cups are pointed inward.

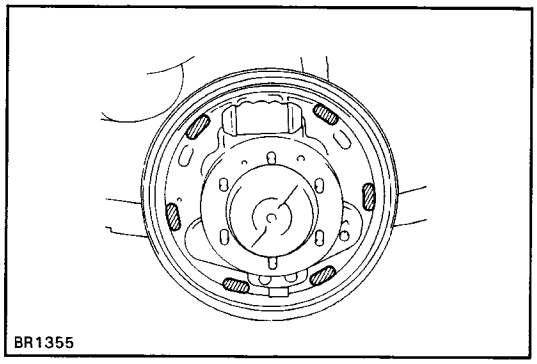
(c) Install the two pistons, boots into the cylinder.



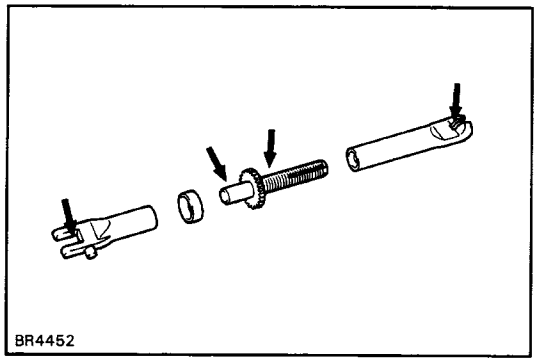
(d) Install the wheel cylinder on the backing plate with two bolts.
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



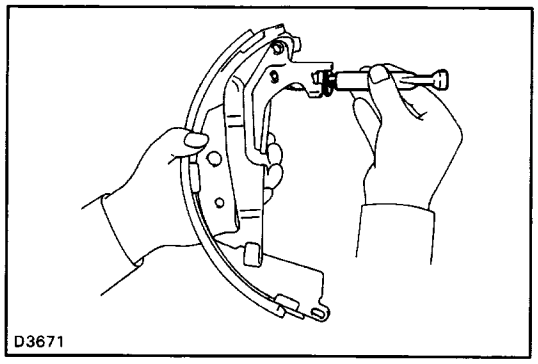
(e) Using SST, connect the brake tube.
SST 09751–36011
Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)



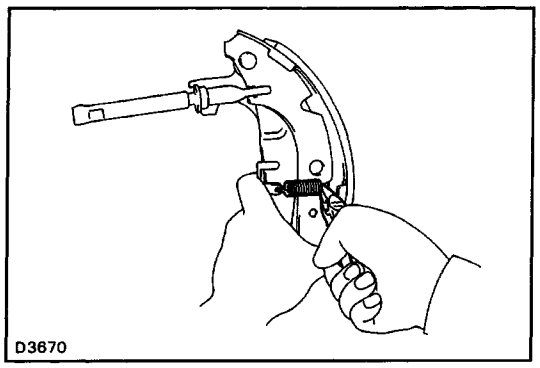
3. APPLY HIGH TEMPERATURE GREASE TO BACKING PLATE AS SHOWN
Apply high temperature grease to the sliding surfaces of the shoe.



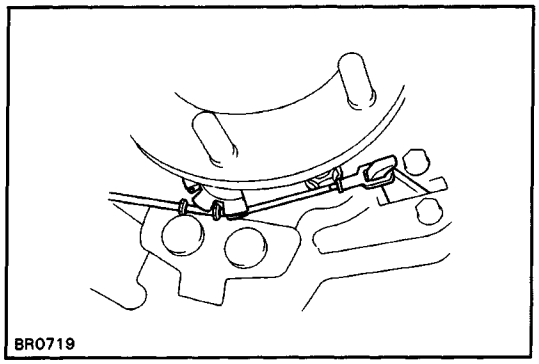
4. APPLY HIGH TEMPERATURE GREASE TO ADJUSTER
Apply high temperature grease to the adjuster bolt threads and ends.



5. INSTALL ADJUSTER TO FRONT SHOE
(a) Install the adjuster to the adjusting lever.



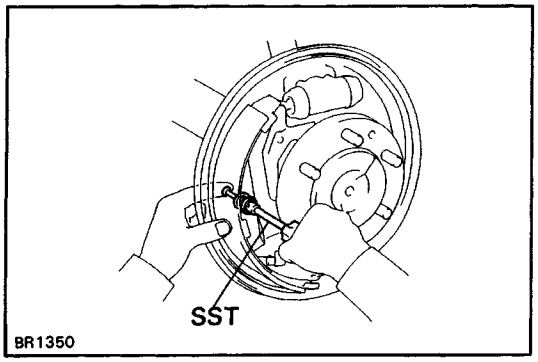
(b) Install the adjusting lever spring.



6. INSTALL FRONT SHOE

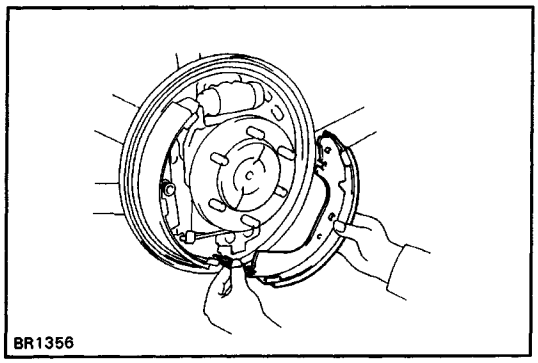
(a) Install the parking brake cable to the parking brake shoe lever.

(b) Install the parking brake cable to the bellcrank as shown.



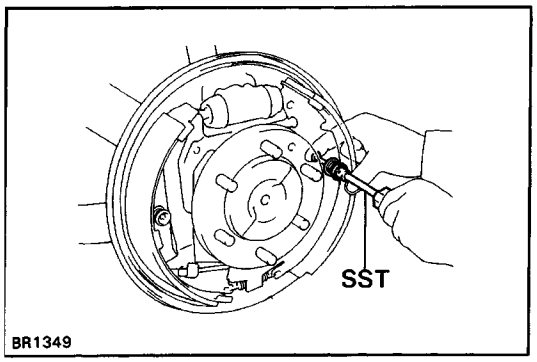
(c) Set the front shoe in place with the end of the shoe inserted in the piston.

(d) Using SST, install the shoe hold–down spring, two cups and a pin.
SST 09718–00010



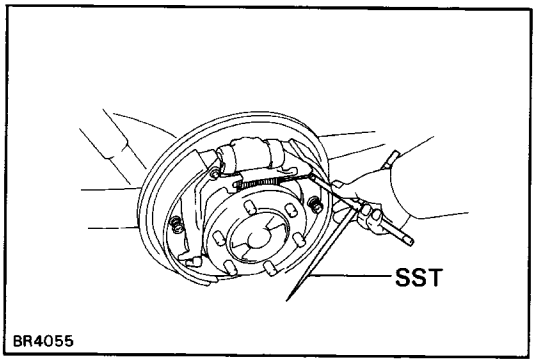
7. INSTALL REAR SHOE

(a) Install the anchor spring between the front shoe and rear shoe.

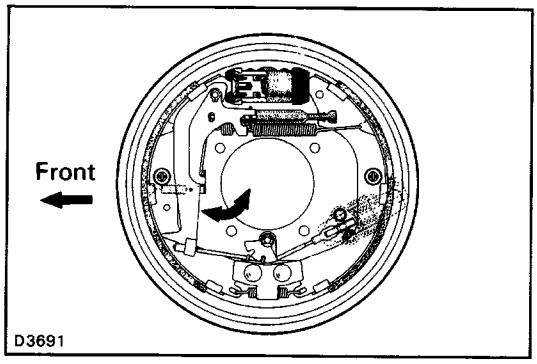


(b) Set the rear shoe in place with the end of the shoe inserted in the piston.

(c) Using SST, install the shoe hold–down spring, two cups and a pin.
SST 09718–00010



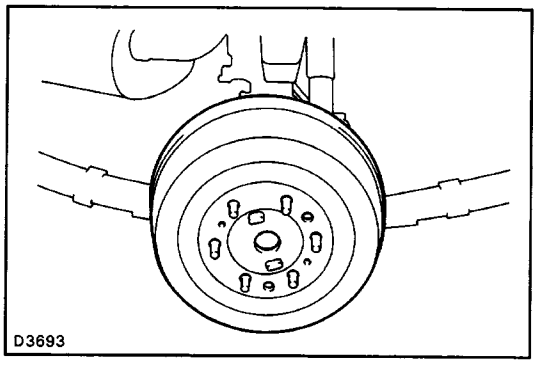
(d) Using SST, install the return spring.
SST 09703–30010



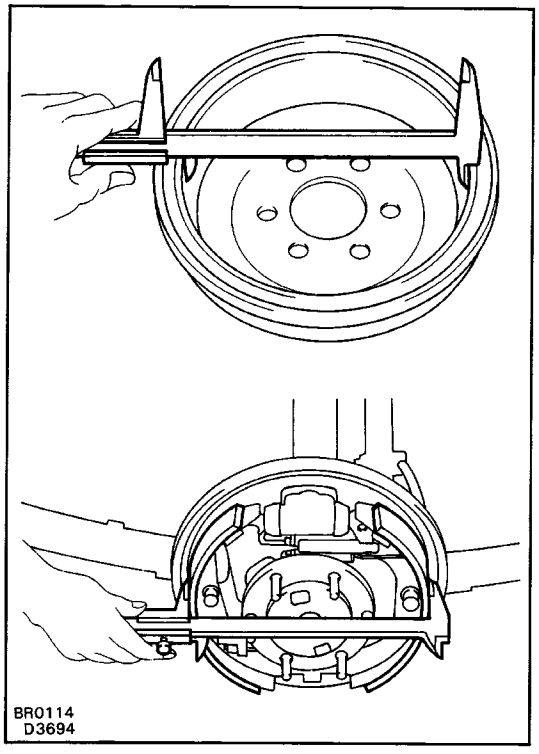
8. CHECK OPERATION OF AUTOMATIC ADJUSTER MECHANISM

(a) Pull the parking brake cable backward as shown, and release. Check that the adjusting bolt turns.

If the bolt does not turn, check for incorrect installation of the rear brakes.



(b) Adjust the adjuster to the shortest possible length.
(c) Install the drum.
(d) Connect the parking brake cable to the bellcrank assembly with the pin, wave washer and clip.
(e) Pull the parking brake lever all the way up and down until a clicking sound can no longer be heard.

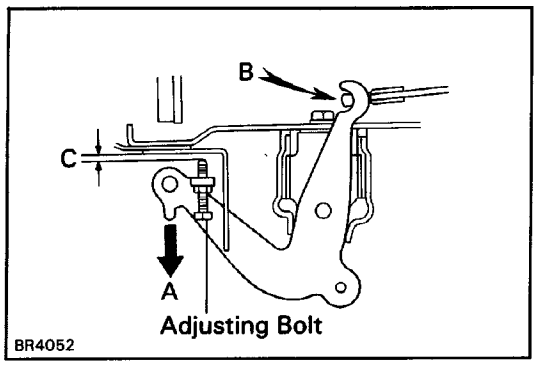


9. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

(a) Remove the brake drum.
(b) Measure the brake drum inside diameter and diameter of the brake shoes. Check that the difference between the diameter is correct shoe clearance.

Shoe clearance: 0.6 mm (0.024 in.)

If incorrect, check the parking brake system.

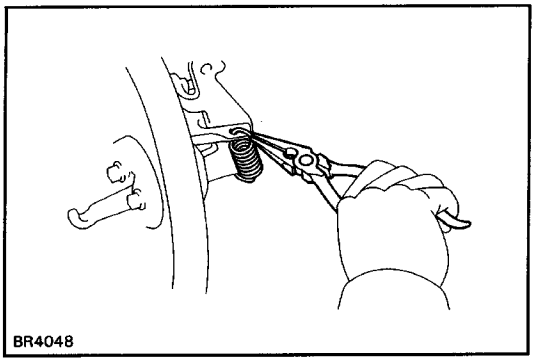


10. IF NECESSARY, ADJUST BELL CRANK

(a) Lightly pull bellcrank in direction A until there is no slack at part B.

(b) In this condition, turn the adjusting bolt so that dimension C will be 0.4 – 0.8 mm (0.016 – 0.031 in.).

(c) Lock the adjust bolt with the lock nut.



(d) Connect the No. 2 parking brake cable to the bell–crank.

(e) Install the two tension springs.

11. INSTALL BRAKE DRUM AND REAR WHEEL

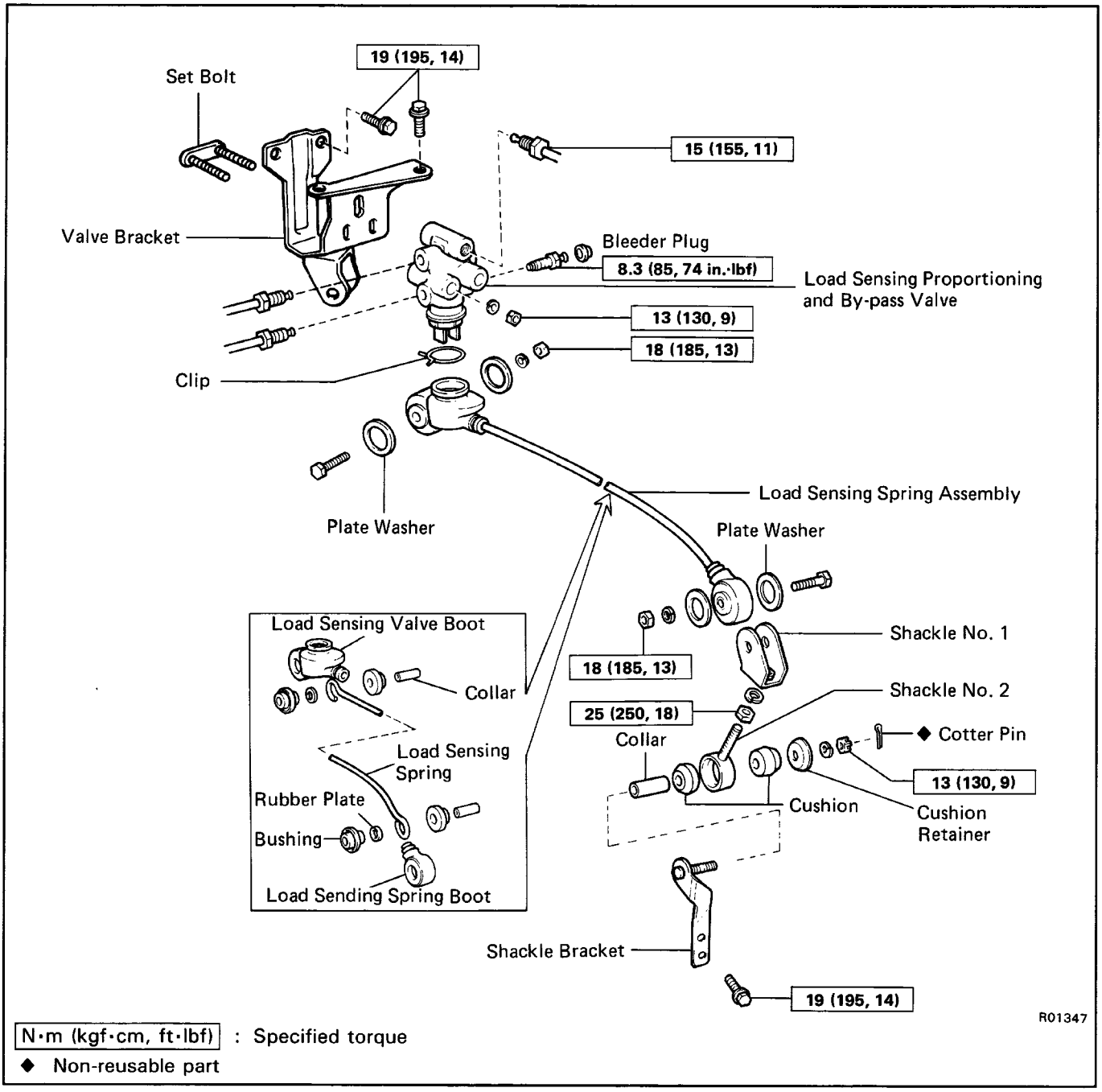
12. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See page BR–7)

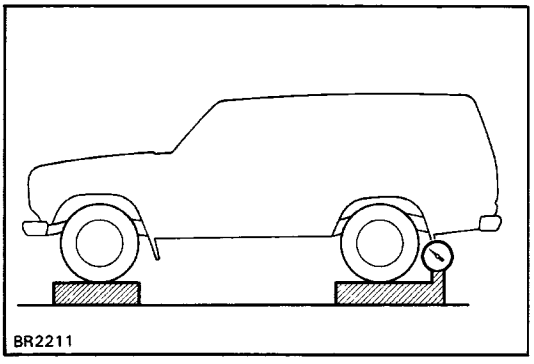
13. CHECK FOR FLUID LEAKAGE

LOAD SENSING PROPORTIONING AND BY–PASS VALVE (LSP & BV)

COMPONENTS



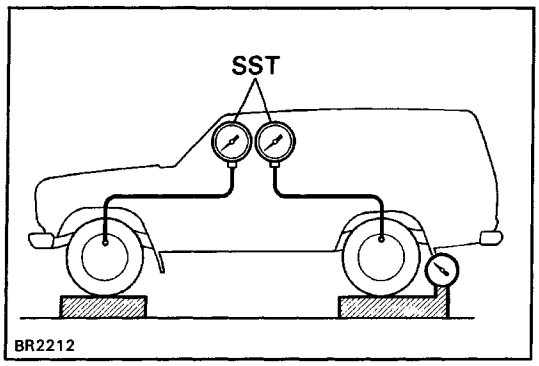
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part



CHECK AND ADJUSTMENT OF FLUID PRESSURE

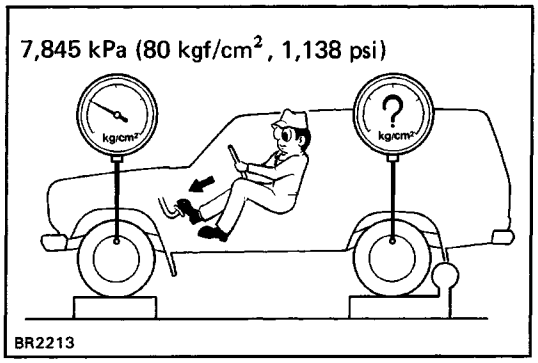
1. SET REAR AXLE LOAD

Rear axle load (include vehicle weight):
1,150 kg (2,535 lb)



2. INSTALL LSPV GAUGE (SST) AND BLEED AIR

SST 09709–29017

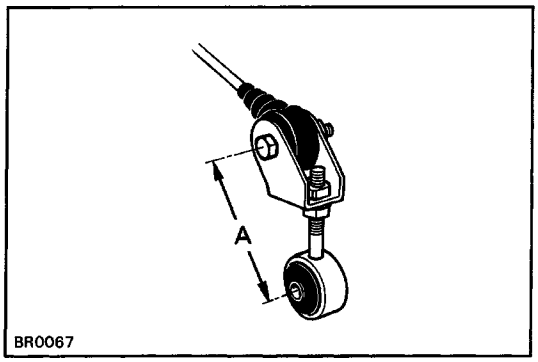


3. RAISE FRONT BRAKE PRESSURE TO 7,845 kPa (80 kgf/cm², 1,138 psi) AND CHECK REAR BRAKE PRESSURE

Rear brake pressure:

4,413 ± 588 kPa (45 ± 6 kgf/cm², 640 ± 85 psi)

HINT: The brake pedal should not be depressed twice and/or returned while setting to the specified pressure. Read the value of rear brake pressure two seconds after adjusting the specified fluid pressure.



4. IF NECESSARY, ADJUST FLUID PRESSURE

(a) Disconnect the No. 2 shackle from the shackle bracket.

(b) Adjust the length of the No. 2 shackle by turning it.

Low pressure – Lengthen A

High pressure – Shorten A

Initial set: 90 mm (3.54 in.)

Adjusting range: 84 – 96 mm (3.31 – 3.78 in.)

HINT: One turn of the No. 2 shackle changes the fluid pressure about following specification.

98.1 kPa (1.0 kgf/cm², 14.2 psi)

(c) In the event pressure cannot be adjusted by the No. 2 shackle, raise or lower the valve body.

Low pressure – Lower

High pressure – Raise

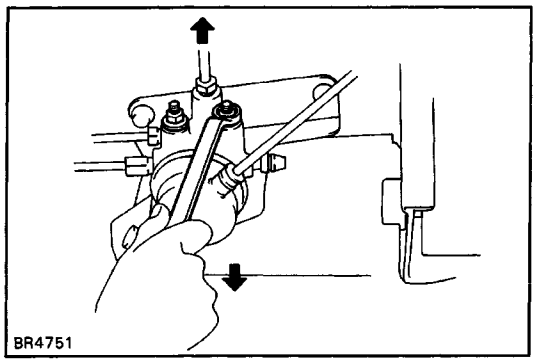
(d) Torque the nuts.

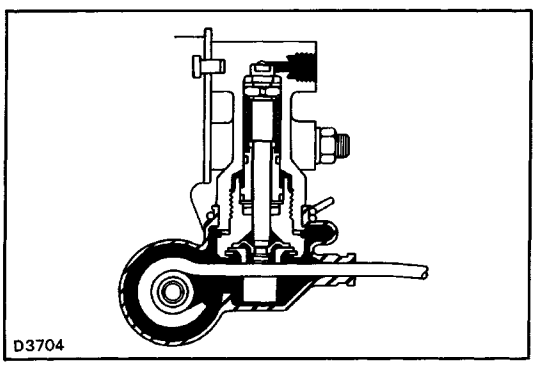
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

(e) Adjust the length of the No. 2 shackle again.

If it cannot be adjusted, inspect the valve housing.

(f) Connect the No. 2 shackle to the shakle bracket.

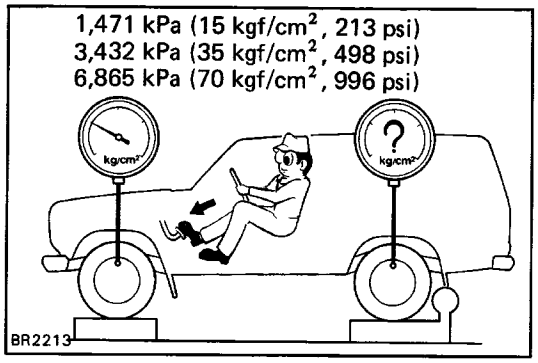




5. IF NECESSARY, CHECK VALVE BODY

(a) Assemble the valve body in the upper most position.

HINT: When the brakes are applied, the piston will move down about 1 mm (0.04 in.). Even at this time, the piston should not make contact with or move the load sensing spring.

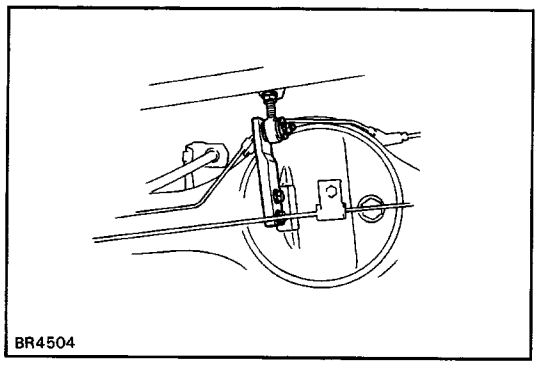


(b) In this position, check the rear brake pressure.

kPa (kgf/cm^2, psi)

Front brake pressure	Rear brake pressure
1,471 (15, 213)	1,471 (15, 213)
3,432 (35, 498)	1,765 – 2,157 (18–22,256–313)
6,865 (70, 996)	2,481 – 3,168 (25.3 – 32.3, 360 – 459)

If the measured value is not within standard, replace the valve body.



REMOVAL OF LSP & BV

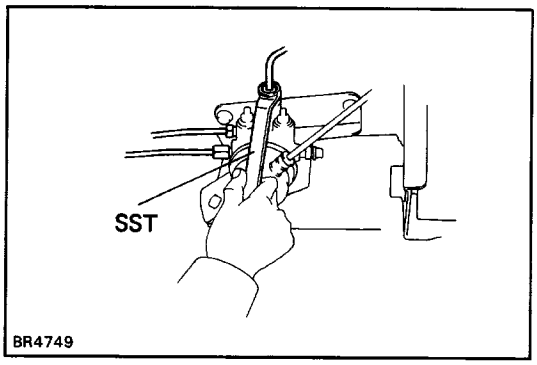
(See page BR–36)

1. DISCONNECT SHACKLE NO. 2 FROM BRACKET

(a) Remove the cotter pin.

(b) Remove the nut and disconnect the shackle No. 2 from the bracket.

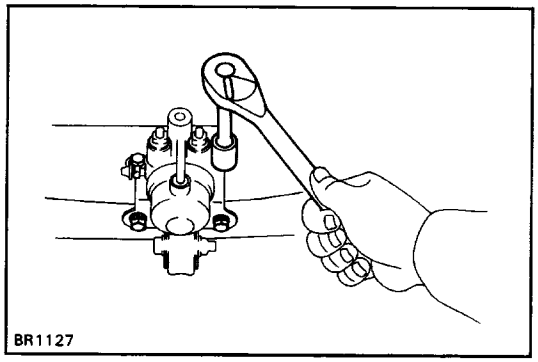
(c) Remove the two retainers, two bushings and collar.



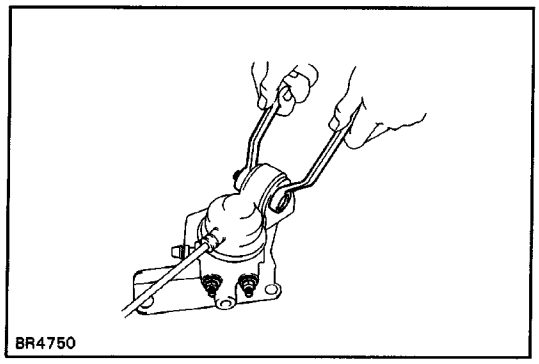
2. REMOVE LSP & BV ASSEMBLY

(a) Using SST, disconnect the brake tubes from the valve body.

SST 09751–36011



(b) Remove the valve bracket mounting bolts and nut, then remove the LSP & BV assembly.

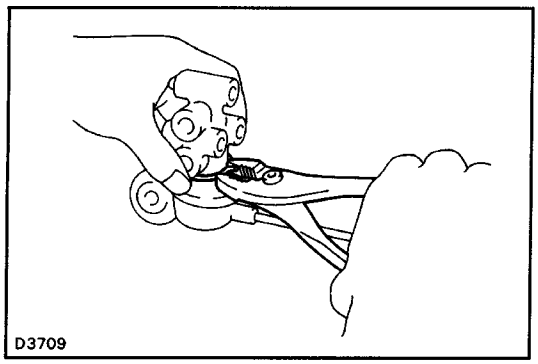


DISASSEMBLY OF LSP & BV ASSEMBLY

1. REMOVE VALVE BRACKET

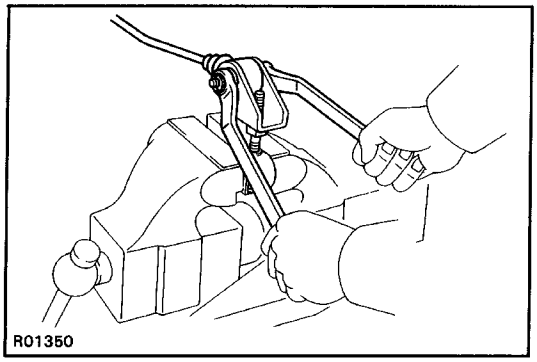
(a) Remove the nut and bolt as shown.

(b) Remove the two nuts, and remove the bracket and set plate from the valve body.



2. DISCONNECT SPRING FROM VALVE

Using pliers, remove the clip, and remove the spring from the valve.

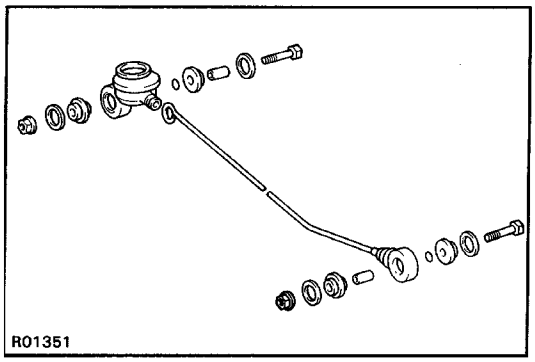


3. REMOVE SHACKLE NO. 1 AND NO. 2

(a) Remove the bolt and nut, then remove the following parts.

- Load sensing spring
- Two plate washers

(b) Loosen the lock nut, and remove the shackle No. 1 from the shackle No. 2.



4. DISASSEMBLE LOAD SENSING SPRING

Disassemble the following parts.

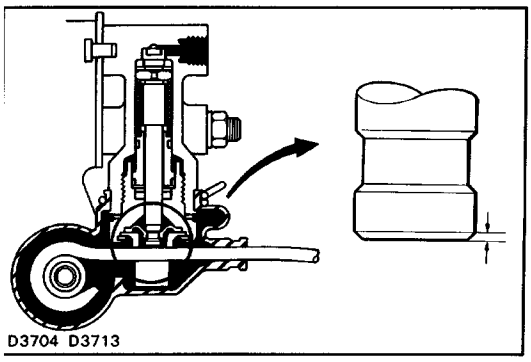
(a) Bushings

(b) Collars

(c) Rubber plates

(d) Load sensing valve boot

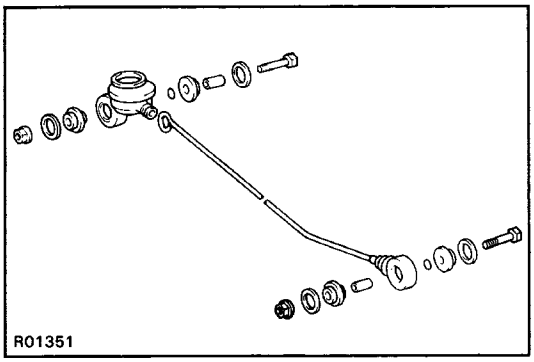
(e) Load sensing spring boot



INSPECTION OF LSP & BV

INSPECT VALVE PISTON PIN AND LOAD SENSING SPRING CONTACT SURFACE FOR WEAR

Wear limit: 0.7 mm (0.028 in.)



ASSEMBLY OF LSP & BV ASSEMBLY

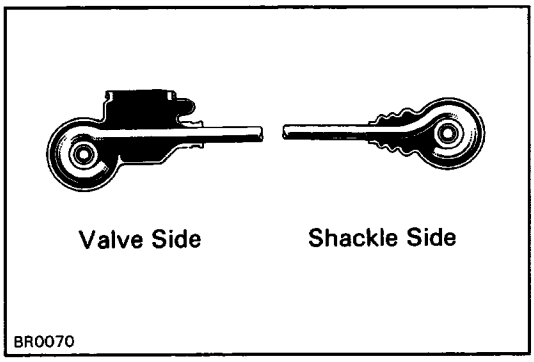
(See page BR–36)

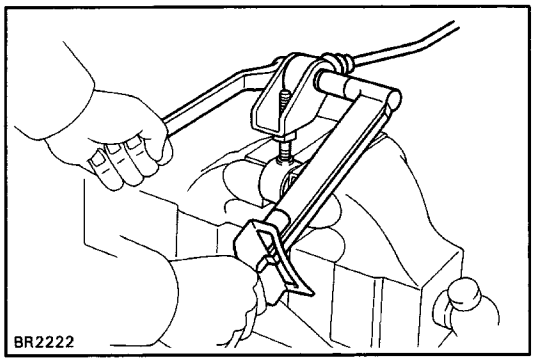
1. ASSEMBLE FOLLOWING PARTS TO LOAD SENSING SPRING

(a) Load sensing valve boot
(b) Load sensing spring boot
(e) Collars
(d) Rubber plates
(e) Bushings

HINT:

- Apply lithium soap base glycol grease to all rubbing areas.
- Do not mistake the valve side for the shackle side of the load sensing spring.

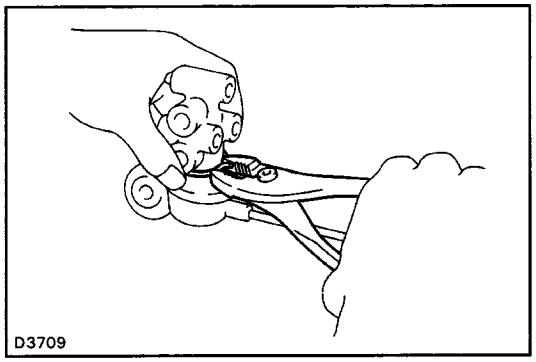




2. INSTALL SHACKLE NO. 1 AND NO. 2 TO LOAD SENSING SPRING

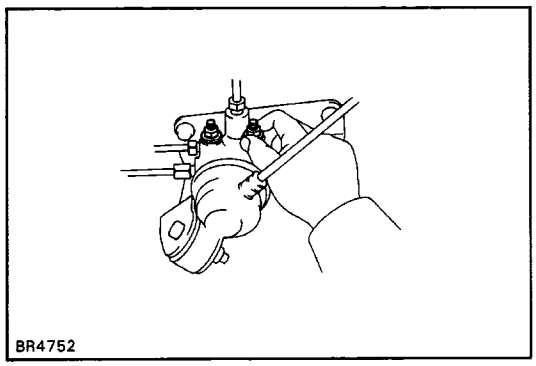
(a) Install the lock nut and shackle No. 1 to the shackle No. 2.
(b) Install the shackle to the load sensing spring through the two plate washers.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



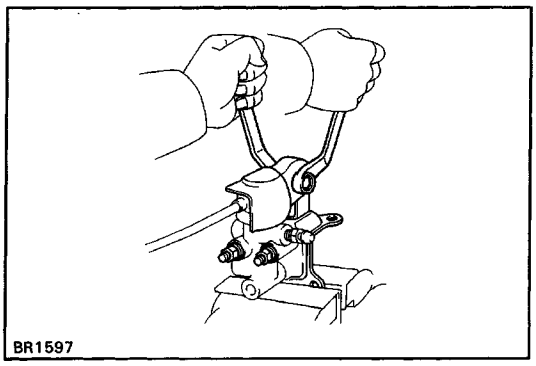
3. INSTALL LOAD SENSING SPRING TO VALVE BODY

Install the load sensing spring assembly to the load sensing valve with a clip.

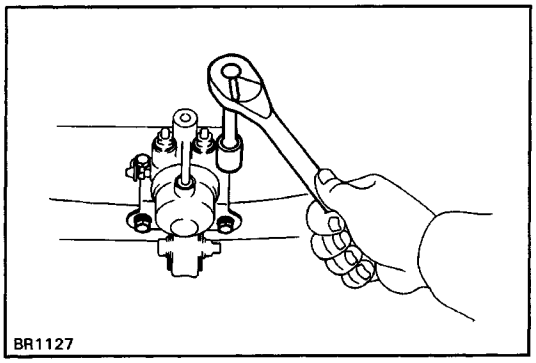


4. INSTALL VALVE BRACKET

(a) Install the set plate to the valve assembly through the valve bracket and temporarily tighten the two valve body mounting nuts.


BR1597

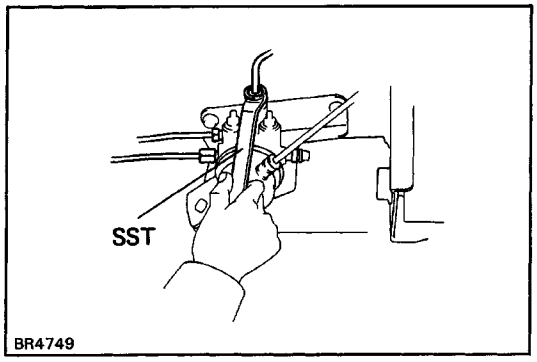
(b) Torque the bolt and nut of load sensing spring boot through the two plate washers.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)


BR1127

INSTALLATION OF LSP & BV

1. INSTALL LSP & BV ASSEMBLY

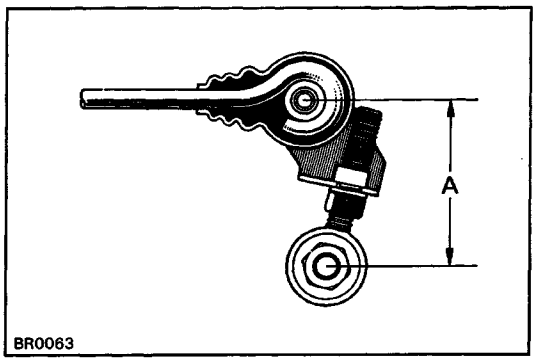
Install the LSP & BV assembly to the frame with four bolts.
Torque: 19 N–m (795 kgf–cm, 14 ft–lbf)



BR4749

2. CONNECT BRAKE TUBES

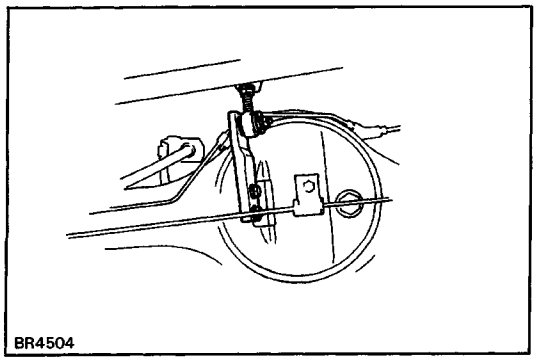
Using SST, connect the brake tubes.
SST 09751–36011
Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)



BR0063

3. CONNECT SHACKLE NO. 2 TO BRACKET

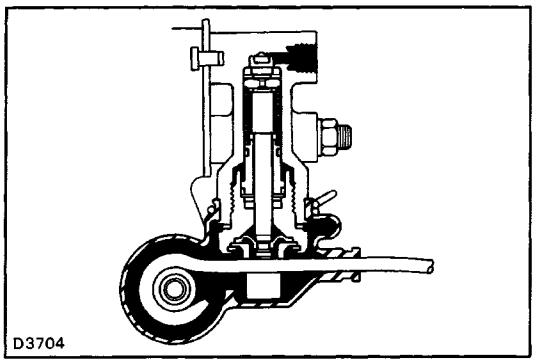
(a) Set the dimension A by turning the shackle No. 2.
Initial set: 90 mm (3.54 in.)
(b) Tighten the lock nut.
Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)


BR4504

(c) Install the two bushings and a collar to the load sensing spring shackle.
(d) Install the load sensing spring to the shackle bracket with the two retainer and a nut.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
(e) Install the new cotter pin.

4. SET REAR AXLE LOAD

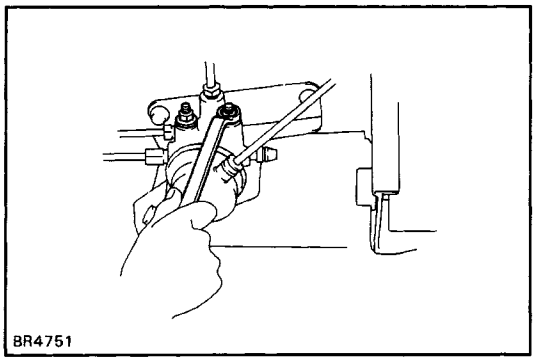
(See page BR–36)



5. SET VALVE BODY

(a) When pulling down the load sensing spring, confirm that the valve piston moves down smoothly.

(b) Position the valve body so that the valve piston lightly contacts the load sensing spring.



(c) Tighten the valve body mounting nuts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

6. BLEED BRAKE SYSTEM
(See page BR–7)

7. CHECK FOR FLUID LEAKAGE

8. CHECK AND ADJUST LSP & BV FLUID PRESSURE
(See page BR–37)

STEERING

PRECAUTION

Care must be taken to replace parts properly because they may affect the performance of the steering system and result in a driving hazard.

TROUBLESHOOTING

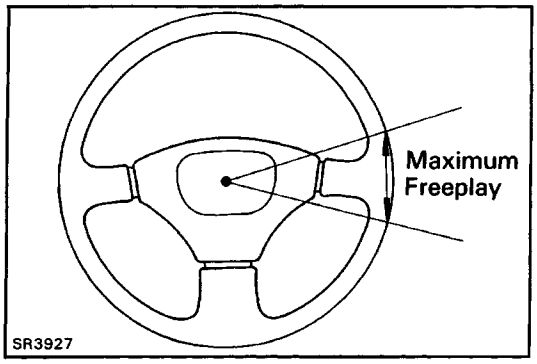
Problem	Possible cause	Remedy	Page
Hard steering	Tires improperly inflated	Inflate tires to proper pressure	A–20
	Insufficient lubricant	Lubricate suspension	
	Excessive caster	Check front wheel alignment	SA–3
	Steering system joints worn	Replace steering system joints	SR–32
	Steering column binding	Inspect steering column	SR–4
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–32
	Power steering belt loose	Adjust belt	SR–19
	Fluid level in reservoir low	Check reservoir	SR–20
	Power steering unit faulty	Check power steering unit	SR–24 SR–32
Poor return	Tires improperly inflated	Inflate tires to proper pressure	A–20
	Insufficient lubricant	Lubricate suspension	
	Wheel alignment incorrect	Check front wheel alignment	SA–3
	Steering column binding	Inspect steering column	SR–4
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–32
Excessive play	Front wheel bearing worn	Replace front wheel bearing	SA–6
	Main shaft yoke or intermediate shaft yoke worn	Replace main shaft or interme–diate shaft	SR–4
	Steering system joints worn	Replace steering system joints	SR–32
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–32
Abnormal noise	Steering linkage loose	Tighten steering linkage	SR–42
	Steering system joints worn	Replace steering system joints	SR–32
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–32

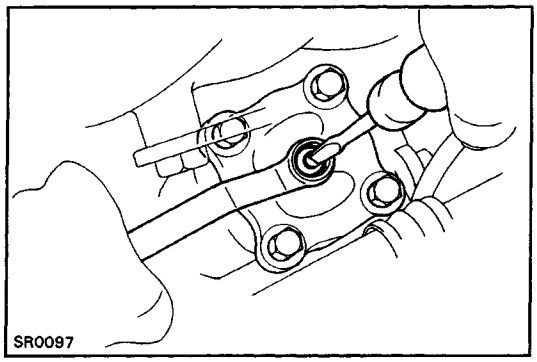
PRECAUTION

Care must be taken to replace parts properly because they may affect the performance of the steering system and result in a driving hazard.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Hard steering	Tires improperly inflated	Inflate tires to proper pressure	A–20
	Insufficient lubricant	Lubricate suspension	
	Excessive caster	Check front wheel alignment	SA–3
	Steering system joints worn	Replace steering system joints	SR–32
	Steering column binding	Inspect steering column	SR–4
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–32
	Power steering belt loose	Adjust belt	SR–19
	Fluid level in reservoir low	Check reservoir	SR–20
	Power steering unit faulty	Check power steering unit	SR–24 SR–32
Poor return	Tires improperly inflated	Inflate tires to proper pressure	A–20
	Insufficient lubricant	Lubricate suspension	
	Wheel alignment incorrect	Check front wheel alignment	SA–3
	Steering column binding	Inspect steering column	SR–4
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–32
Excessive play	Front wheel bearing worn	Replace front wheel bearing	SA–6
	Main shaft yoke or intermediate shaft yoke worn	Replace main shaft or interme–diate shaft	SR–4
	Steering system joints worn	Replace steering system joints	SR–32
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–32
Abnormal noise	Steering linkage loose	Tighten steering linkage	SR–42
	Steering system joints worn	Replace steering system joints	SR–32
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR–32





ON–VEHICLE INSPECTION

STEERING WHEEL FREEPLAY

1. CHECK THAT STEERING WHEEL FREEPLAY IS CORRECT

With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure. Freeplay should not exceed the maximum limit.

Maximum play: 40 mm (1.58 in.)

If incorrect, adjust or repair as required.

2. POINT WHEELS STRAIGHT AHEAD

3. ADJUST STEERING GEAR HOUSING

(a) Loosen the lock nut.

(b) Turn the adjusting screw clockwise to decrease wheel freeplay and counterclockwise to increase it.

HINT: Turn the adjusting screw in small increments and check the wheel freeplay between each adjustment.

4. CHECK THAT STEERING DOES NOT BIND

Turn the steering wheel half way around in both directions.

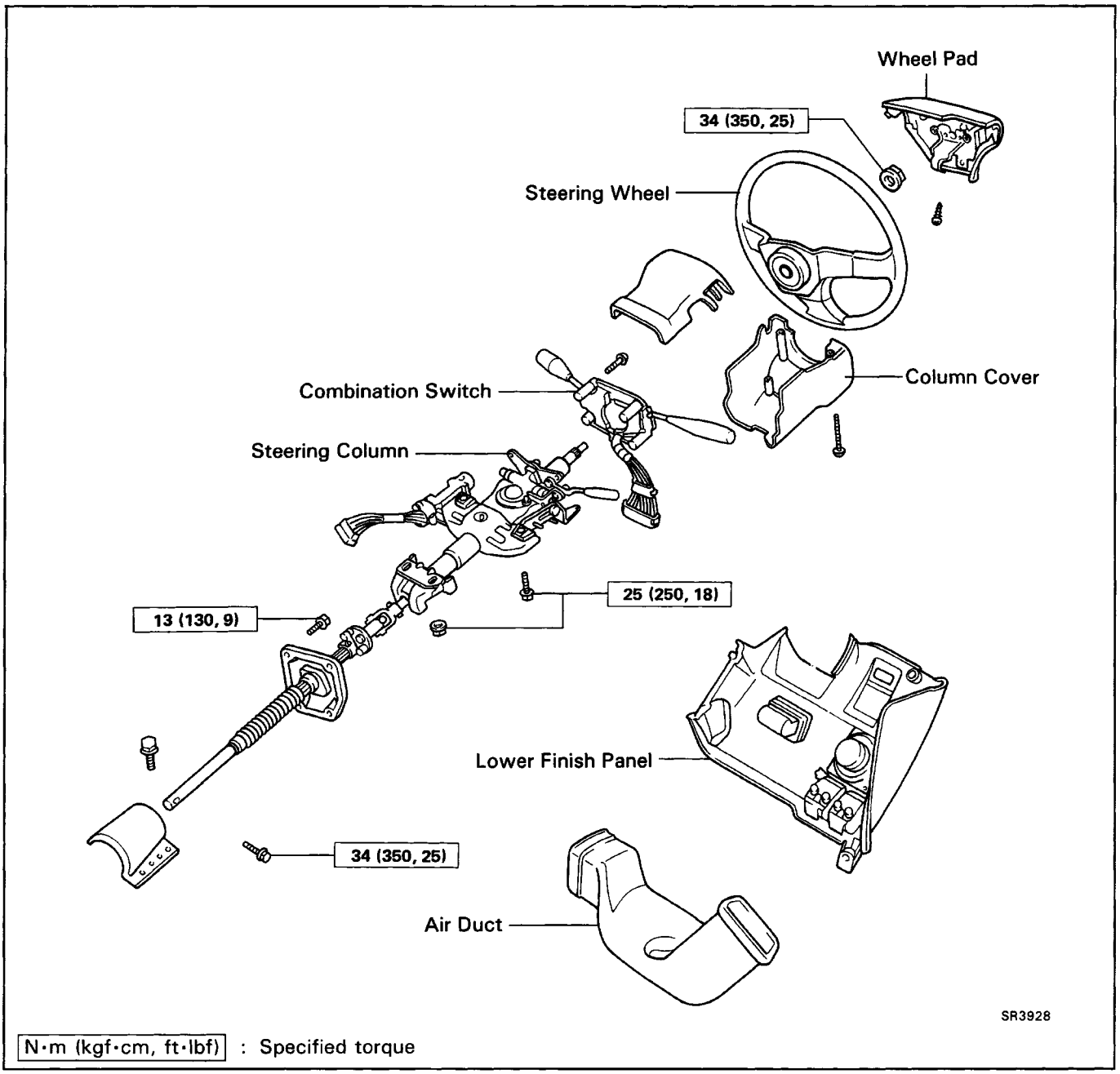
Check that the freeplay is correct and steering is smooth and without rough spots.

5. HOLD ADJUSTING SCREW AND TIGHTEN LOCK NUT

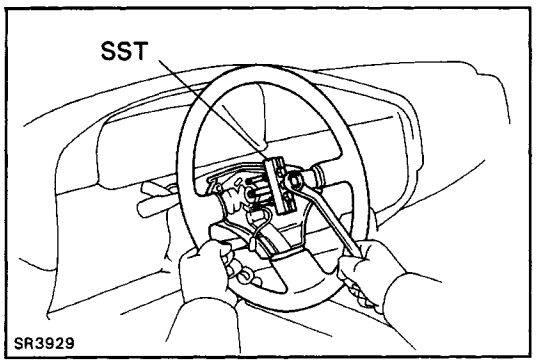
STEERING COLUMN

REMOVAL AND INSTALLATION OF STEERING COLUMN

Remove and install the parts as shown.



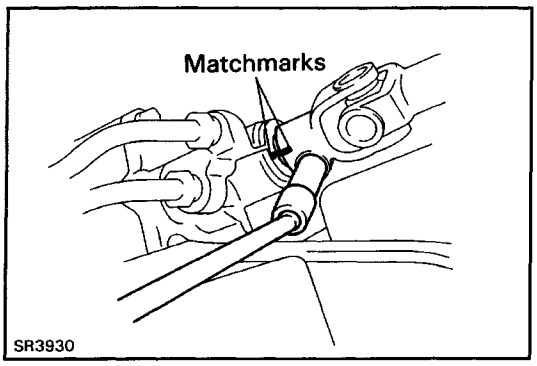
N·m (kgf·cm, ft·lbf) : Specified torque



(MAIN POINT OF REMOVAL)

1. REMOVE STEERING WHEEL

Using SST, remove the steering wheel.
SST 09609–20011

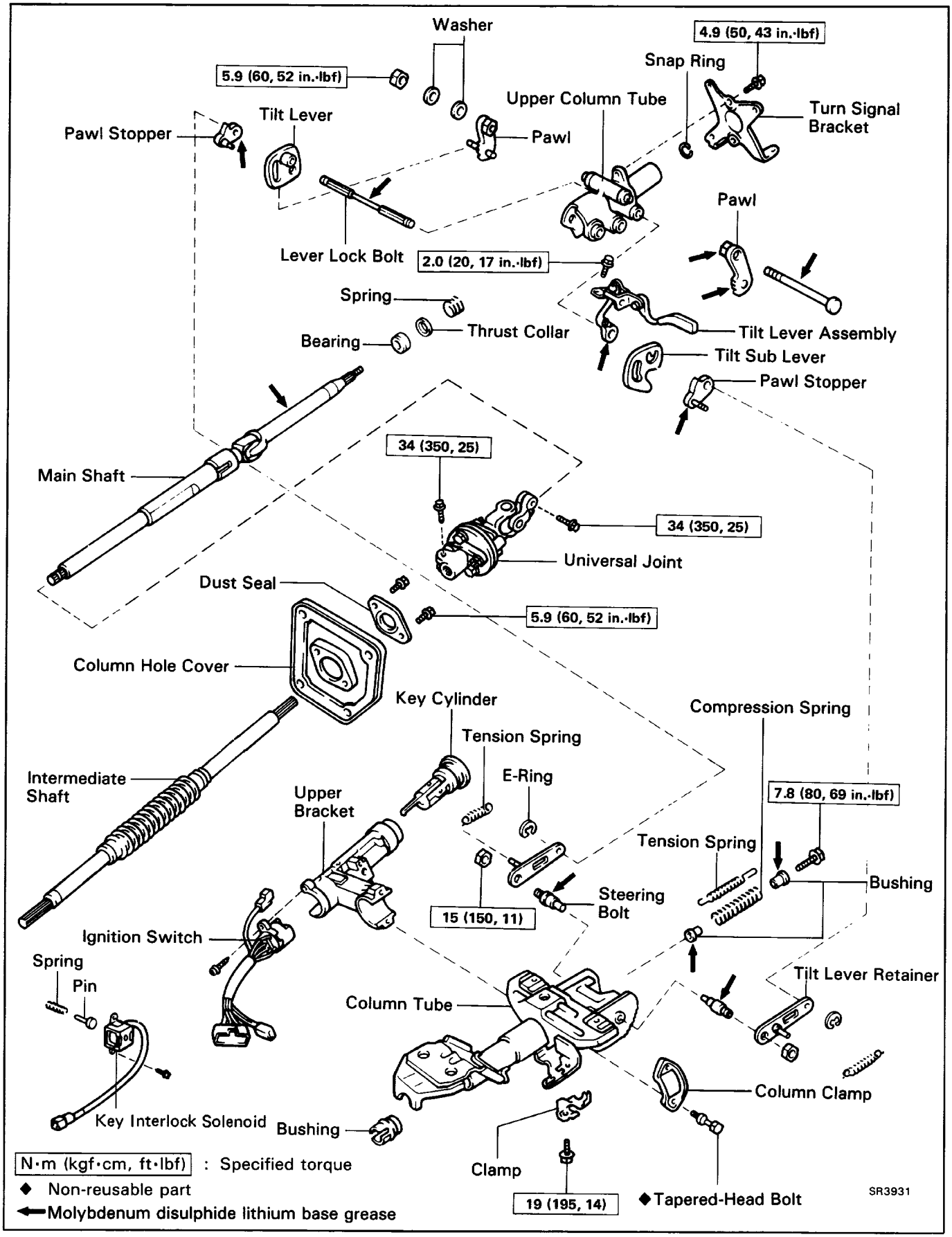


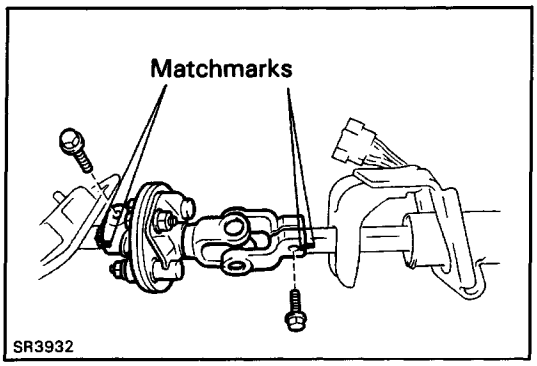
2. DISCONNECT MAIN SHAFT

(a) Place matchmarks on the worm shaft and main shaft.

(b) Disconnect the main shaft from the worm shaft.

Tilt Steering Column
COMPONENTS





DISASSEMBLY OF STEERING COLUMN

(See page SR–6)

1. DISCONNECT UNIVERSAL JOINT

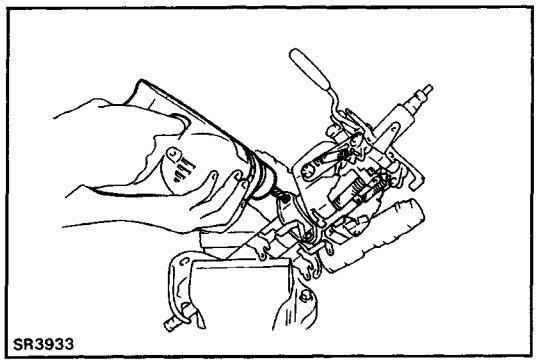
Place matchmarks on the universal joint and the shaft, then remove the bolt and the universal joint.

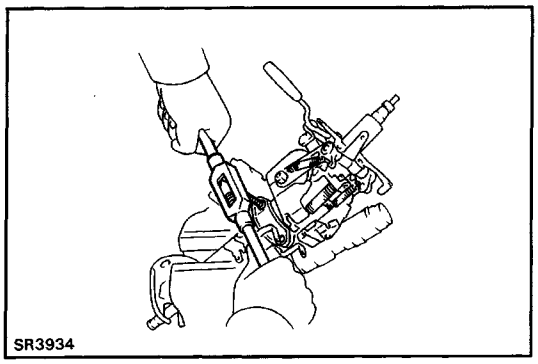
2. REMOVE COLUMN HOLE COVER

(a) Place matchmarks on the flexible coupling and the shaft, then remove the bolt and the shaft.
(b) Remove two bolts and the dust seal.
(c) Remove the column hole cover.

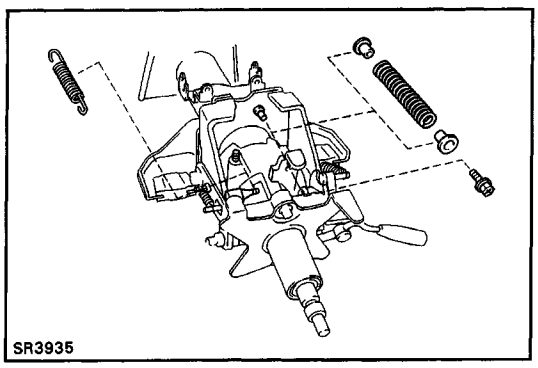
3. REMOVE UPPER BRACKET

(a) Using a centering punch, mark the center of the tapered–head bolt.
(b) Using a 3 – 4 mm (0.12 – 0.16 in.) drill, drill into the tapered–head bolt.



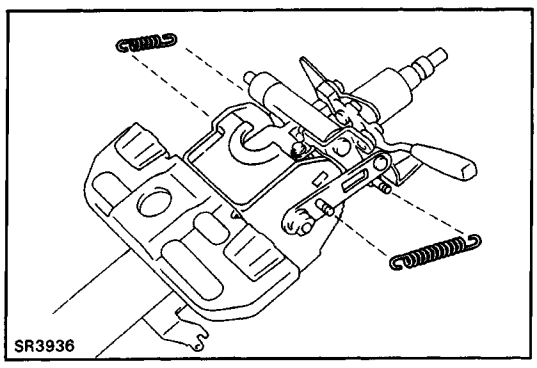


(c) Using a screw extractor, remove the tapered–head bolt.
(d) Remove the two bolts, and separate the upper bracket and the column tube.

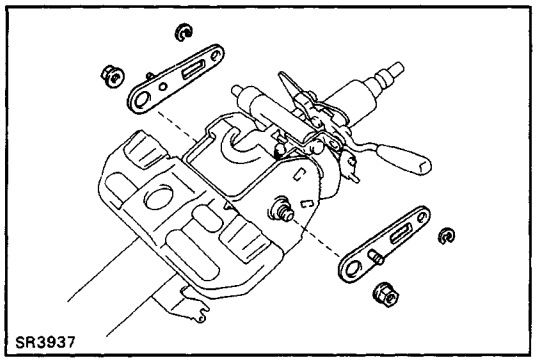


4. REMOVE COMPRESSION SPRING AND TENSION SPRING

(a) Remove the wire harness clamp.
(b) Remove the bolt with the compression spring.
(c) Remove the bushings from the spring.
(d) Remove the tension spring.

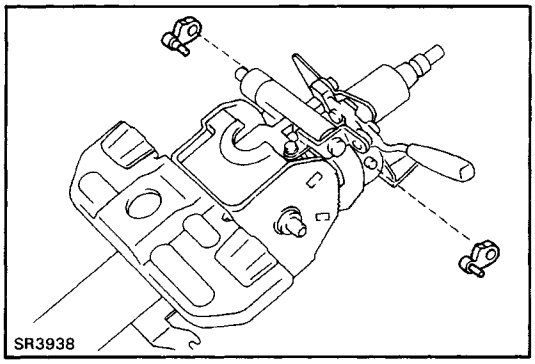


5. REMOVE TWO TENSION SPRINGS

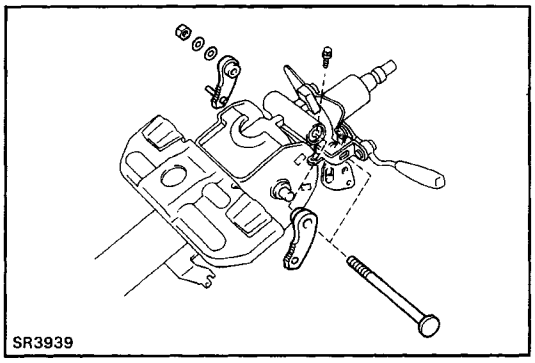


6. REMOVE TWO TILT LEVER RETAINERS

(a) Remove the E–rings from the retainers.
(b) Remove the retainers with the nuts.

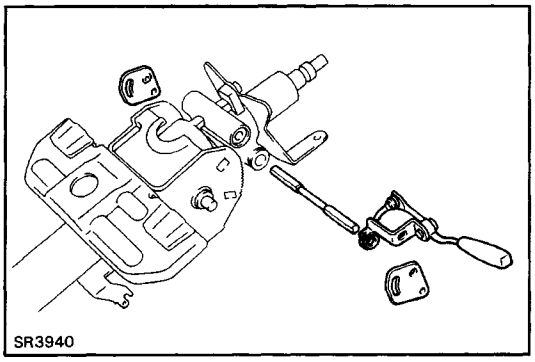


7. REMOVE TWO PAWL STOPPERS

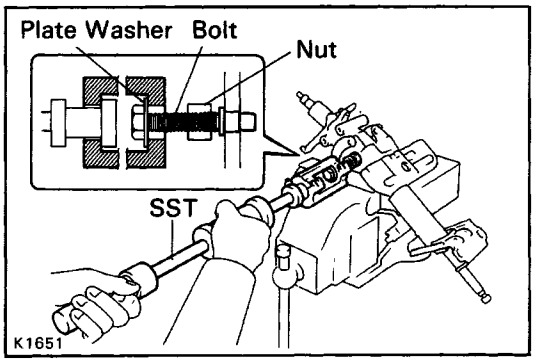


8. REMOVE TWO TILT PAWLS

(a) Remove the nut and bolt.
(b) Remove the bolt from the tilt lever assembly.
(c) Remove the two pawls with the collars.

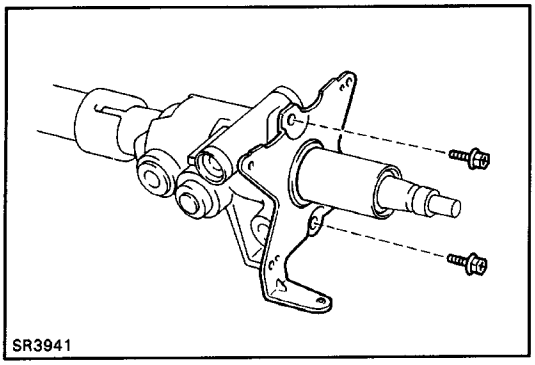


9. REMOVE TILT LEVER ASSEMBLY, TILT LEVER, TILT SUB LEVER AND LEVER LOCK BOLT

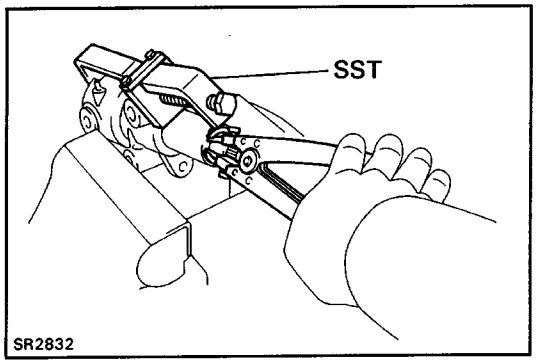


10. REMOVE COLUMN TUBE

(a) Set SST, the nut (10 mm nominal diameter, 1.25 mm pitch), plate washer (3^ mm outer diameter) and bolt (10 mm nominal diameter, 1.25 mm pitch, 50 mm length) as shown. And then remove the two bolts.
SST 09910–00015 (09911–00011, 09912–00010)
(Reference) Nut 90170–10004
Plate washer 90201–10201
Bolt 91111–51050
(b) Remove the column tube from the upper column tube.
(c) Remove the stopper.

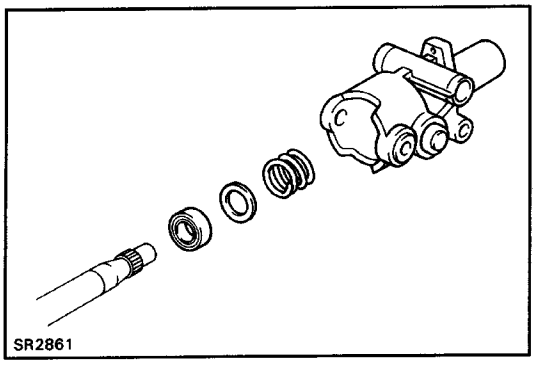


11. REMOVE TURN SIGNAL BRACKET

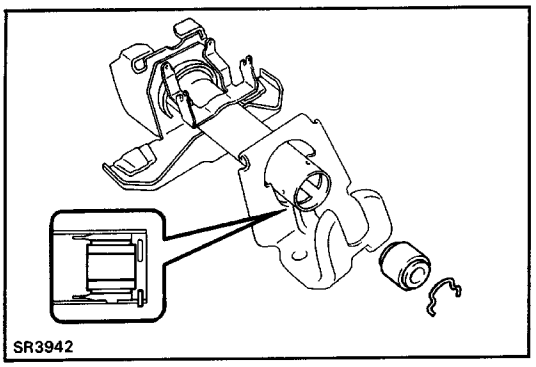


12. REMOVE MAIN SHAFT

(a) Using SST to hold the main shaft, remove the snap ring with snap ring pliers.
SST 09950–20017

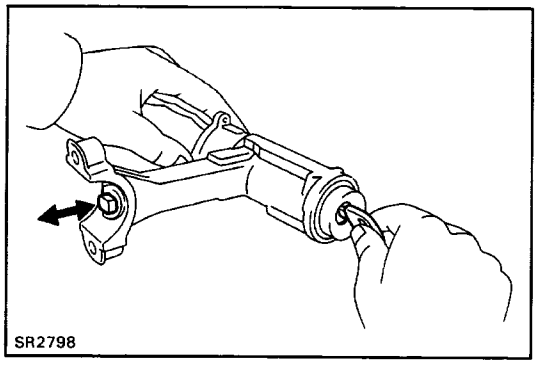


(b) Remove the main shaft from the upper column tube.
(c) Remove the spring, thrust collar and bearing.



13. REMOVE MAIN SHAFT COLLAR

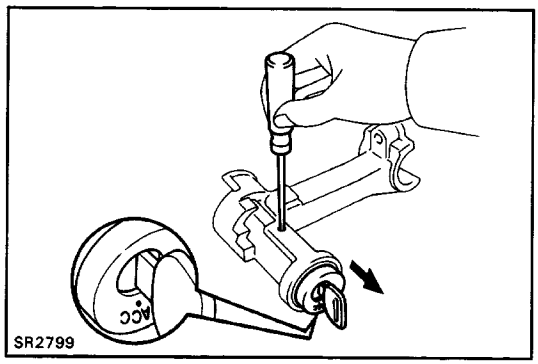
(a) Remove the snap ring from the lower column tube.
(b) Remove the main shaft collar.



INSPECTION AND REPLACEMENT OF STEERING COLUMN

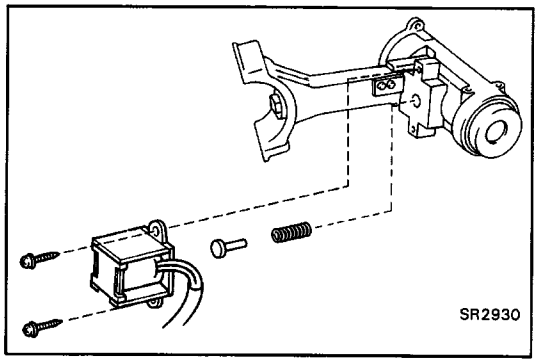
1. INSPECT KEY CYLINDER

Check that the steering lock mechanism operates prop–erly.



2. IF NECESSARY, REPLACE KEY CYLINDER

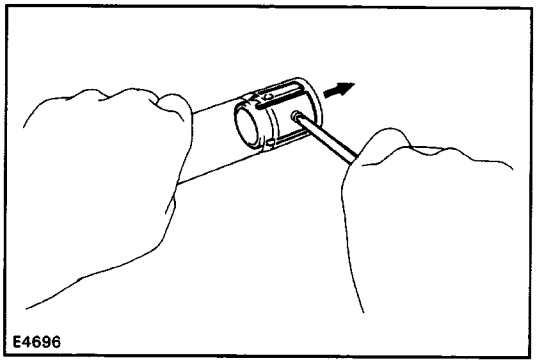
(a) Place the ignition key at the ACC position.
(b) Push down the stop key with a thin rod, and pull out the key cylinder.
(c) Make sure that the ignition key at the ACC position.
(d) Install a new key cylinder.



3. INSPECT KEY INTERLOCK SOLENOID
(See page AT–157)

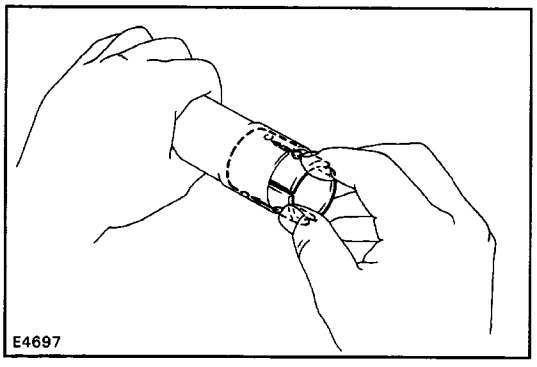
4. IF NECESSARY, REPLACE KEY INTERLOCK SOLENOID

(a) Remove the two screws.
(b) Remove the solenoid, spring and lock pin.
(c) Install the solenoid with the spring and lock pin, and install the two screws.



5. IF NECESSARY, REPLACE MAIN SHAFT BUSHING

(a) Using a screwdriver, remove the bushing.

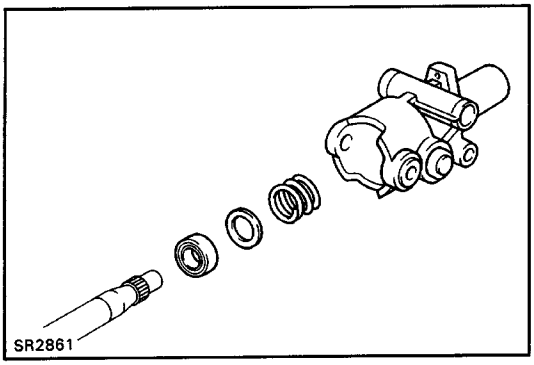


(b) Align the holes of the tube and the projections of a new bushing, and install the bushing in the column tube.

ASSEMBLY OF TILT STEERING COLUMN

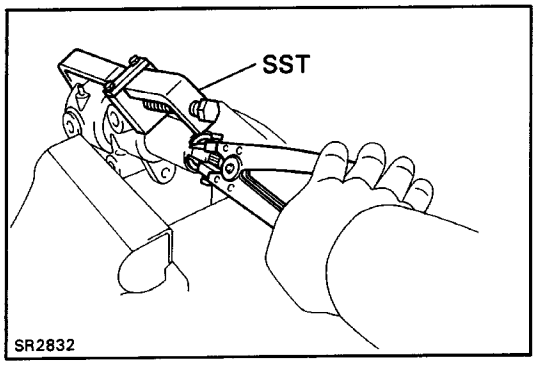
(See page SR–6)

1. COAT MOLYBDENUM DISULPHID LITHIUM BASE GREASE ON FOLLOWING PARTS (See page SR–6)

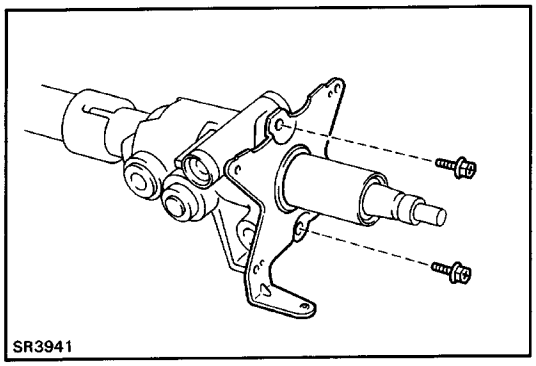


2. INSTALL MAIN SHAFT

(a) Install the main shaft with the bearing, collar and spring.



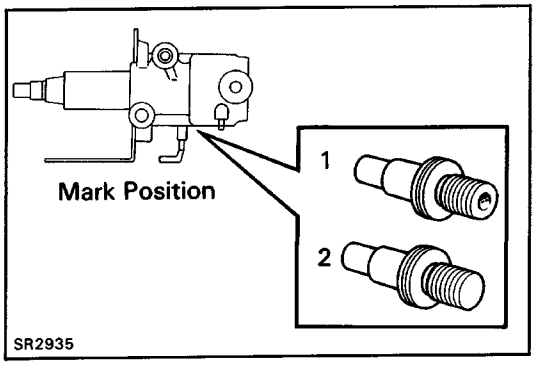
(b) Using SST to hold the main shaft, install the snap ring with a snap ring pliers.
SST 09950–20017



3. INSTALL TURN SIGNAL BRACKET

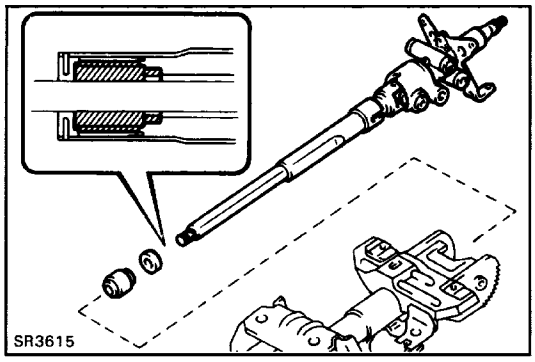
Install the two bolts.

Torque: 4.9 N–m (50 kgf–cm, 43 in.–lbf)



4. SELECT STEERING BOLT AND UPPER COLUMN TUBE

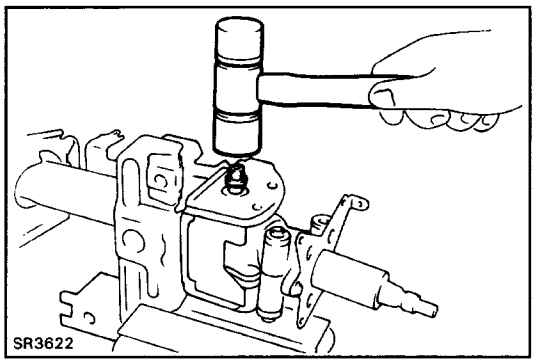
Select the bolt with center hole when the upper column tube mark is 1, and select the bolt without hole when the mark is 2.



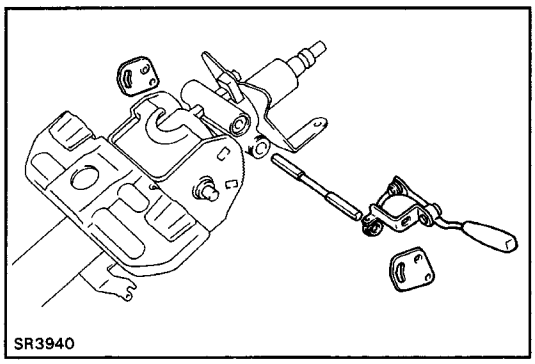
5. INSTALL MAIN SHAFT WITH COLUMN TUBE

(a) Install the stopper and main shaft collar to the main shaft as shown.

(b) Install the main shaft to the column tube.



(c) Using a plastic hammer, drive in the steering bolts.

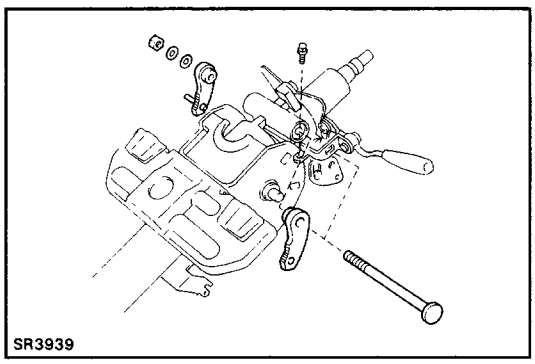


6. INSTALL TILT LEVER LOCK BOLT, TILT LEVER ASSEMBLY, TILT LEVER AND TILT SUB LEVER

(a) Install the tilt lever lock bolt to the upper column tube.

(b) Install the tilt lever assembly.

(c) Install the tilt lever and the tilt sub lever.

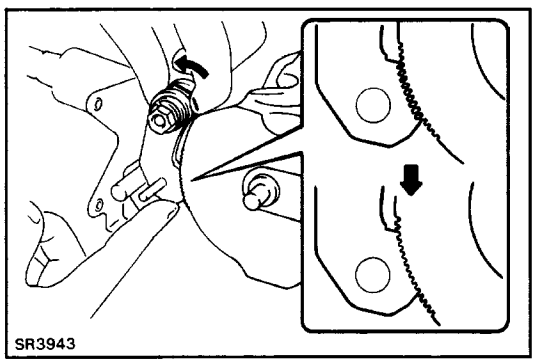


7. INSTALL TWO TILT PAWLS

(a) Temporarily install the tilt pawls.

(b) Install the bolt.

Torque: 2.0 N–m (20 kgf–cm, 17 in.–lbf)



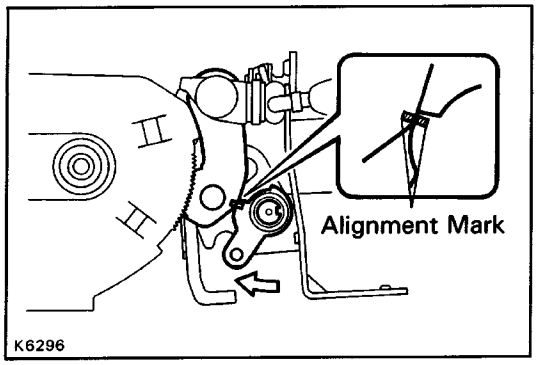
8. ENGAGE AND ADJUST TILT PAWL

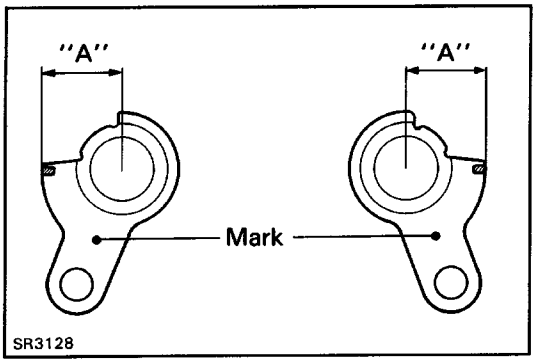
(a) Engage the tilt sub lever side pawl to the center of the ratchet.

(b) While turning the tilt lever side collar, engage the tilt lever side pawl to the ratchet completely.

(c) Tighten the nut.

Torque: 5.9 N–m (60 kgf–cm, 52 in.–lbf)





9. SELECT PAWL STOPPERS

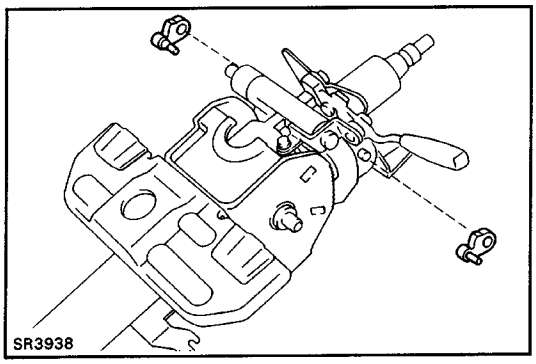
(a) With the tilt pawl and ratchet engaged, install two pawl stoppers.

(b) Check that the alignment marks on the stopper and pawl align when the stopper is rotated to the pawl side.

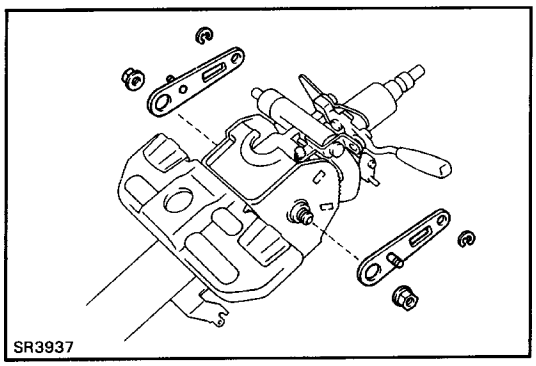
(c) If the alignment marks do not align, select pawl stoppers according to the following table.

Tilt lever side	Tilt sub lever side	Dimension "A" mm (in.)
1	A	12.65 – 12.75 (0.4980 – 0.5020)
2	B	12.55 – 12.65 (0.4941 – 0.4980)
3	C	12.45 – 12.55 (0.4902 – 0.4941)
4	D	12.35 – 12.45 (0.4862 – 0.4902)
5	E	12.25 – 12.35 (0.4823 – 0.4862)

(d) After selecting the stoppers, check that on both sides the pawl and ratchet are fully engaged.



10. INSTALL TWO TILT PAWL STOPPERS

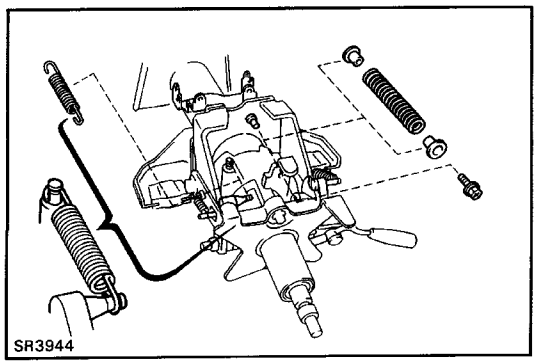


11. INSTALL TWO TILT LEVER RETAINERS

(a) Install the two tilt lever retainers and torque the nuts.

Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)

(b) Install the E–rings.



12. INSTALL COMPRESSION SPRING AND TENSION SPRING

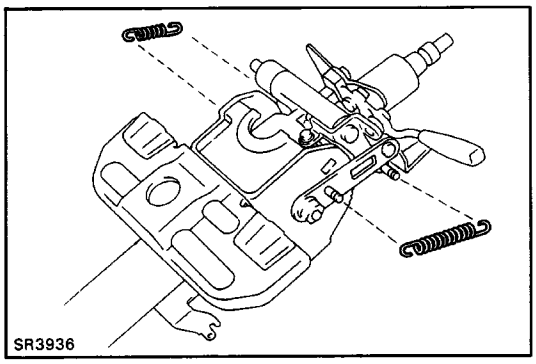
(a) Install the bushings to the compression spring.

(b) Install the spring and bolt.

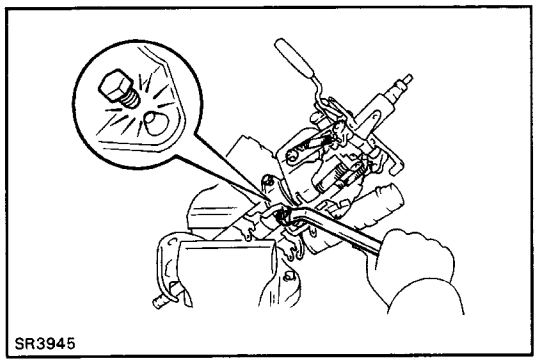
Torque: 7.8 N–m (80 kgf–cm, 69 in.–lbf)

(c) Install the tension spring.

(d) Install the wire harness clamp.



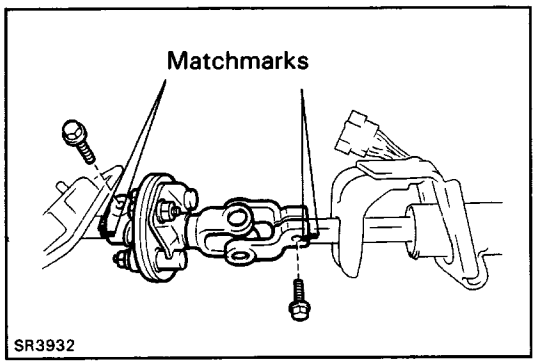
13. INSTALL TWO TENSION SPRINGS



14. INSTALL UPPER BRACKET

(a) Install the upper bracket with two new tapered–head bolts.

(b) Tighten the tapered–head bolts until the bolt heads break off.



15. INSTALL COLUMN HOLE COVER

(a) Install the column hole cover.

(b) Install two bolts and the dust seal.

Torque: 5.9 N–m (60 kgf–cm, 52 in.–lbf)

(c) Align the matchmarks on the shaft and flexible coupling, then torque the bolt.

Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)

16. CONNECT UNIVERSAL JOINT

Align the matchmarks on the universal joint and the shaft, the torque the bolt.

Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)

17. CHECK OPERATION OF TILT STEERING LEVER AND SUPPORT

(a) Check that there is no axial play at the end of the main shaft.

(b) With the main shaft in the neutral position, raise the tilt lever and check that the main shaft rises to the uppermost position.

(c) Lower the main shaft, and check that it locks in the lowermost position.

POWER STEERING

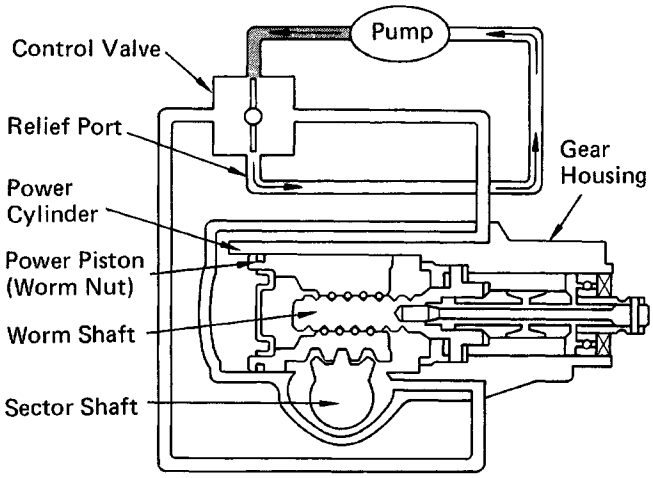
Description

PRINCIPLES OF POWER STEERING

Power steering is one type of a hydraulic device for utilizing engine power as a steering effort. Conse–quently, the engine is used to drive a pump to develop fluid pressure, and this pressure acts on a piston within the power cylinder so that the pinion assists the rack effort. The amount of this assistance depends on the extent of pressure acting on the piston. Therefore, if more steering force is required, the pressure must be raised. The variation in the fluid pressure is accomplished by a control valve which is linked to the steering main shaft.

- **NEUTRAL (STRAIGHT–AHEAD) POSITION**

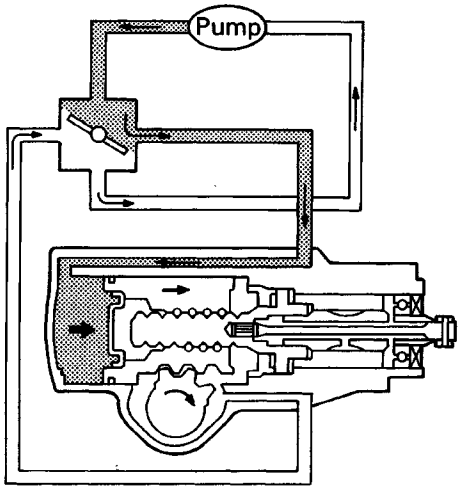
Fluid from the pump is sent to the control valve. If the control valve is in the neutral position, all the fluid will flow pass through the control valve into the relief port and back to the pump. At this time, hardly any pressure is created and because the pressure on the cylinder piston is equal on both sides, the piston will not move in either direction.



SR2452

- **WHEN TURNING**

When the steering main shaft is turned in either direction, the control valve also moves, closing one of the fluid passages. The other passage then opens wider, causing a change in fluid flow vol–ume and, at the same time, pressure is created. Consequently, a pressure difference occurs be–tween both sides of the piston and the piston moves in the direction of the lower pressure so that the fluid in that cylinder is forced back to the pump through the control valve.



SR2453

SERVICE HINT

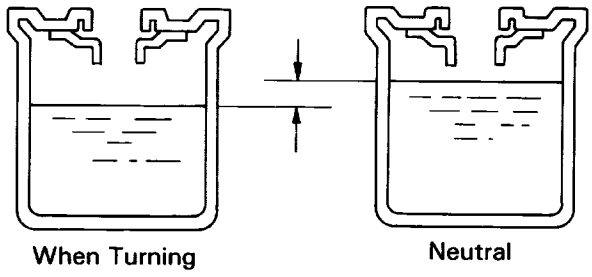
Troubles with the power steering system are usually concerned with hard steering due to the fact that there is no assist. In such case, before attempting to make repairs, it is necessary to determine whether the trouble lies with the pump or with the gear housing. To do this, an on–vehicle inspection can be made by using a pressure gauge.

ON–VEHICLE INSPECTION

Power steering is a hydraulic device and any problems are normally due to insufficient fluid pressure acting on the piston. This could be caused by either the pump not producing the specified fluid pressure or the control valve in the gear housing not functioning properly so that the proper amount of fluid pressure can be obtained.

If the fault lies with the pump, the same symptoms will generally occur whether the steering wheel is turned fully to the right or left. On the other hand, if the fault lies with the control valve, there will generally be a difference between the amount of assist when the steering wheel is turned to the left and right, causing harder steering. However, if the piston seal of the power cylinder is worn, there will be a loss of fluid pressure whether the steering wheel is turned to the right or left and symptoms will be the same for both.

Before performing an on–vehicle inspection, a check must first be made to confirm that the power steering system is completely free of any air. If there is any air in the system, the volume of this air will change when the fluid pressure is raised, causing a fluctuation in the fluid pressure so that the power steering will not function properly. To determine if there is any air in the system, check to see if there is a change of fluid level in the reservoir tank when the steering wheel is turned fully to the right or left.



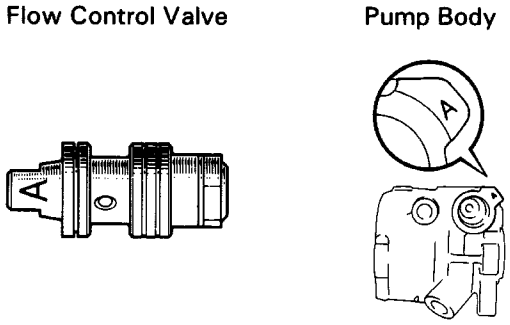
SR2392 SR2393

Also, air in the system will sometimes result in an abnormal noise occurring from the pump or gear housing when the steering wheel is fully turned in either direction. This on–vehicle inspection must always be performed to insure that the power steering system is working properly after overhauling or repairing the pump or gear housing.

VANE PUMP

The main component parts of the vane pump, such as the cam ring, rotor, vanes and flow control valve are highly precision parts and must be handled carefully. Also, because this pump produces a very high fluid pressure, O–rings are used for sealing each part. When reassembling the pump, always use new O–rings. In the flow control valve, there is a relief valve which controls the maximum pressure of the pump. The amount of this maximum pressure is very important; if it is too low, there will be insufficient power steering assist and if too high, it will have and adverse effect on the pressure hoses, oil seals, etc. If the maximum pressure is either too high or too low due to a faulty relief valve, do not disassemble or adjust the relief valve, but replace the flow control valve as an assembly.

The clearance between the flow control valve and pump body installation hole is very important. When replacing the flow control valve, be sure to do so with one having the same mark in order to insure the proper clearance.



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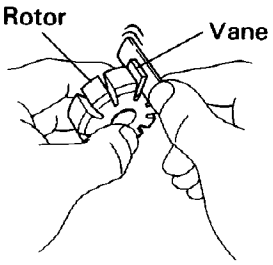
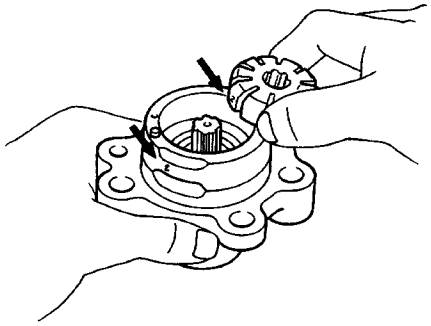
The function parts of the pump which produce fluid pressure are the cam ring, rotor and vanes, and these should be checked to wear. If the clearance between each is not within standard when ressembling, any worn parts should be replaced. In this case, the replaced cam ring and rotor should be of the same length (have the same mark), and the vanes should be replaced with those having a length corresponding to that mark, otherwise the proper thrust clearance cannot be obtained. If there is too much thrust clearance, there will be insufficient fluid pressure at low speeds. If there is too little thrust clearance, it may result seizure of the vanes.



SR2397

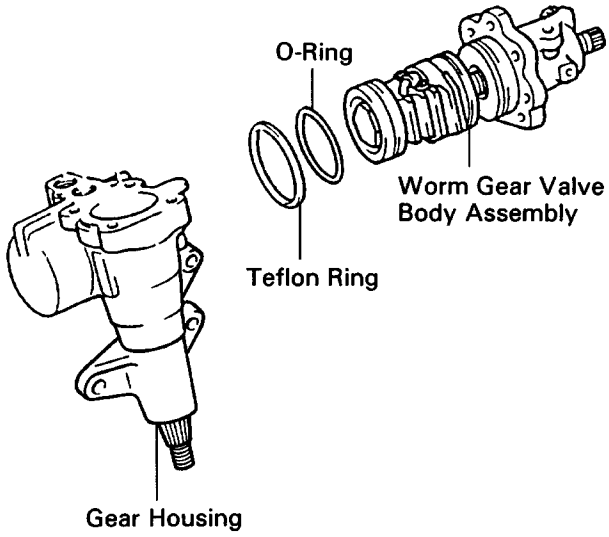


SR2398

GEAR HOUSING

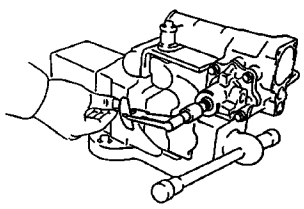
Because of the high pressure, even the slightest scratch will cause fluid leakage, resulting in an inoperative power steering system.

Teflon rings are used for the cross shaft, piston and control valve. These teflon rings are highly durable against wear, but if it is necessary to replace them, be careful not to stretch the new ones. After installing a teflon ring into its groove, snug it down into the groove before assembly of the cylinder or housing to prevent possible damage.



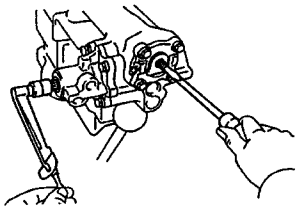
SR3616

As with the recirculating ball type steering, preload is very important. If the preload is not correct, it could result in such trouble as steering wheel play or lack of durability so always make sure that it is correct.



Check the worm gear preload

SR2455



Adjust total preload

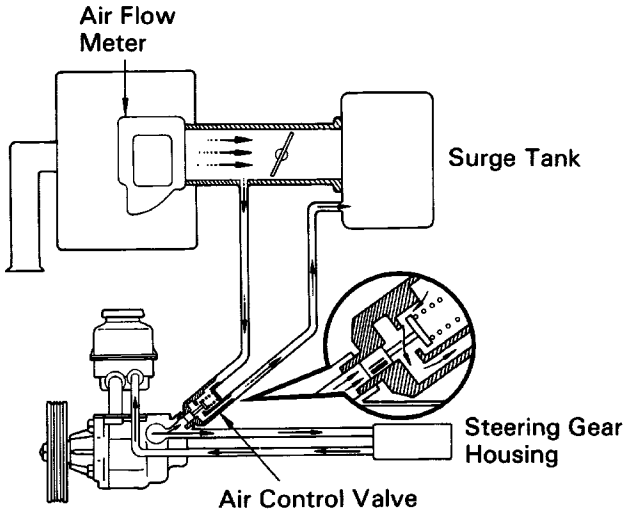
SR2456

IDLE–UP DEVICE

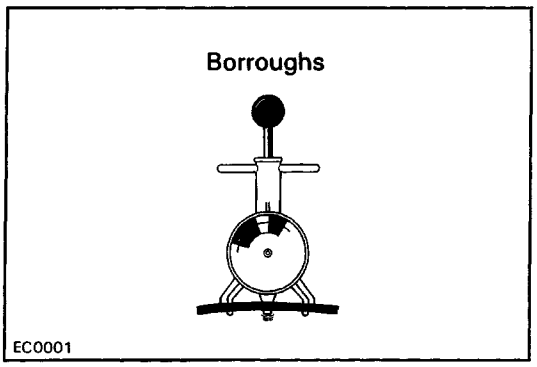
The pump produces the maximum fluid pressure when the steering wheel is turned fully to the right or left and, at this time, there is a maximum load on the pump which causes a decrease in engine idle rpm. To solve this problem, some vehicles are equipped with an idle–up device which acts to raise the engine idle rpm whenever there is a heavy load on the pump.

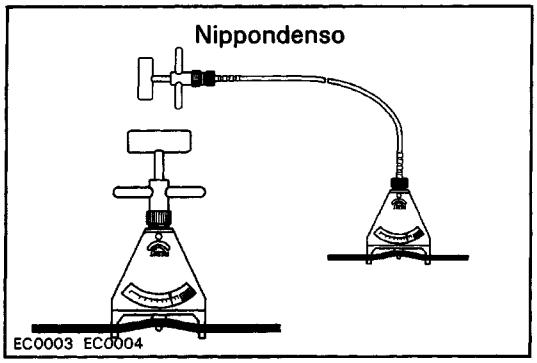
EFI ENGINES

On EFI engines, when the piston of the air control valve is pushed by fluid pressure, the air valve opens and the volume of air by–passing the throttle valve is increased to regulate engine rpm.



The idle–up device functions to raise engine idle rpm when pump fluid pressure acts on the air control valve, installed to the pump body, to control the flow of air.





On–Vehicle Inspection

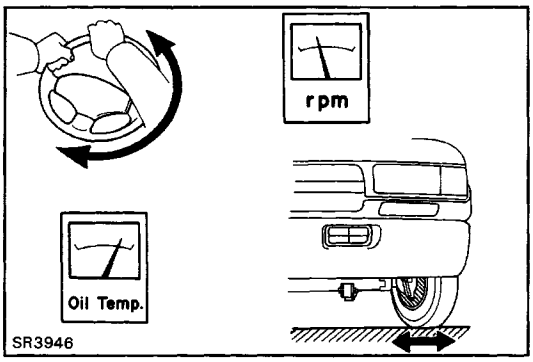
CHECK DRIVE BELT TENSION

Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:
Nippondenso BTG–20 (95506–00020) or
Borroughs No. BT–33–73F
Drive belt tension:
New belt
441 – 667 N (45 – 68 kgf, 100 – 150 lbf)
Used belt
265 – 441 N (27 – 45 kgf, 60 – 100 lbf)

HINT:

- ”New belt” refers to a belt which has been less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.



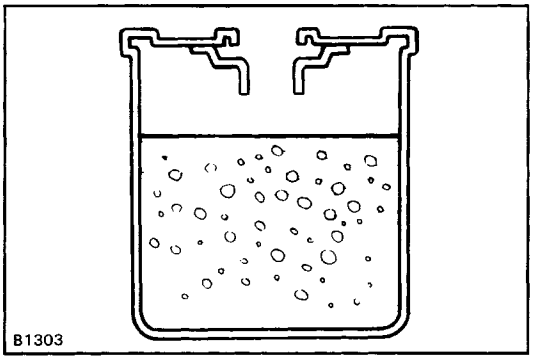
FLUID LEVEL CHECK

1. KEEP VEHICLE LEVEL

2. BOOST FLUID TEMPERATURE

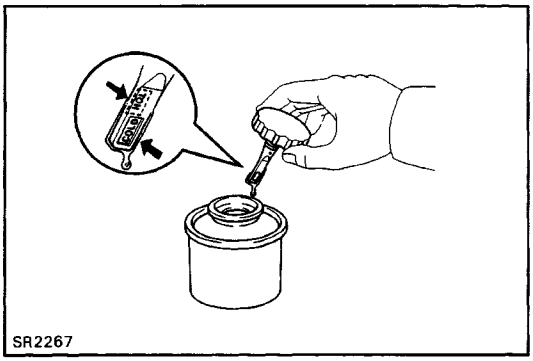
with the engine idling at 1,000 rpm or less, turn the steering wheel from lock to lock several times to boost fluid temperature.

Fluid temperature: 80˚C (176˚F)



3. CHECK FOR FOAMING OR EMULSIFICATION

HINT: Foaming and emulsification indicate either the existence of air in the system or that the fluid level is too low.

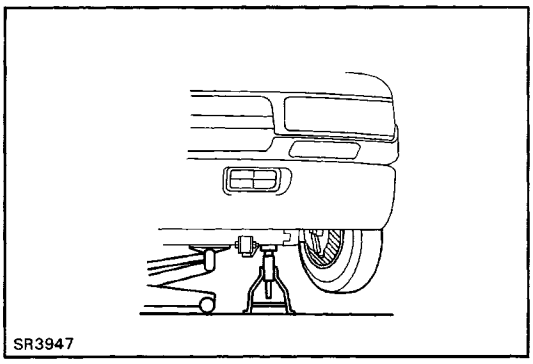


4. CHECK FLUID LEVEL IN RESERVOIR

Check the fluid level and add fluid if necessary.

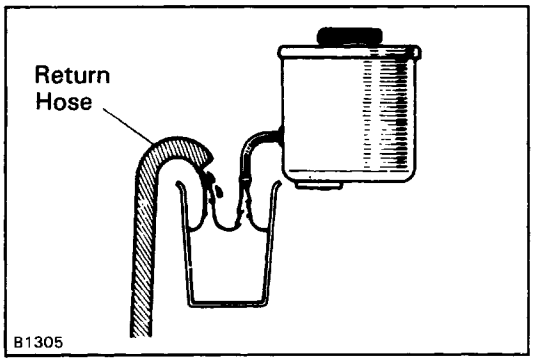
Fluid: ATF DEXRON® II

HINT: Check that the fluid level is within the HOT LEVEL of the dipstick. If the fluid is cold, check that it is within the COLD LEVEL of the dipstick.

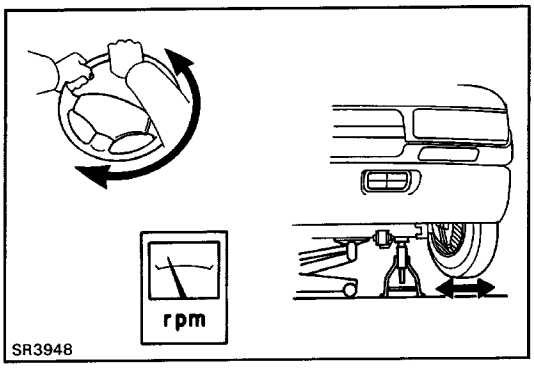


REPLACEMENT OF POWER STEERING FLUID

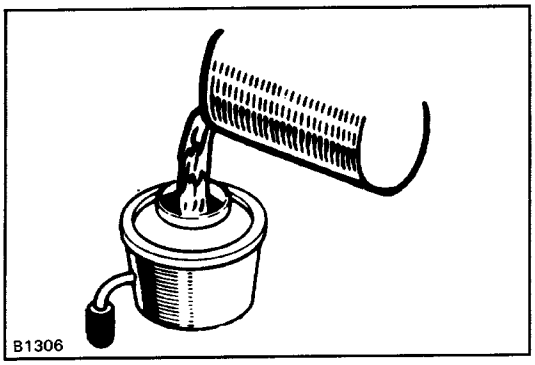
1. JACK UP FRONT OF VEHICLE AND SUPPORT IT WITH STANDS



2. REMOVE FLUID RETURN HOSE FROM RESERVOIR TANK AND DRAIN FLUID INTO CONTAINER

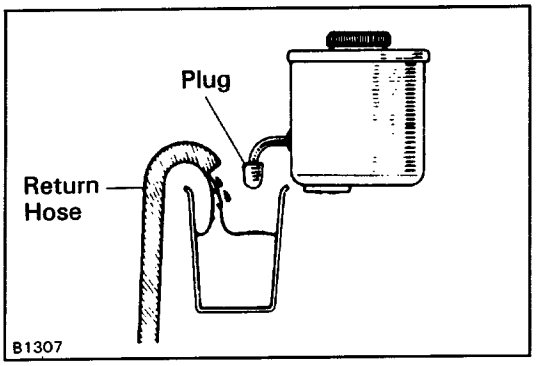


3. TURN STEERING WHEEL FROM LOCK TO LOCK WHILE DRAINING FLUID



4. FILL RESERVOIR TANK WITH FRESH FLUID

Fluid : ATF DEXRON® II



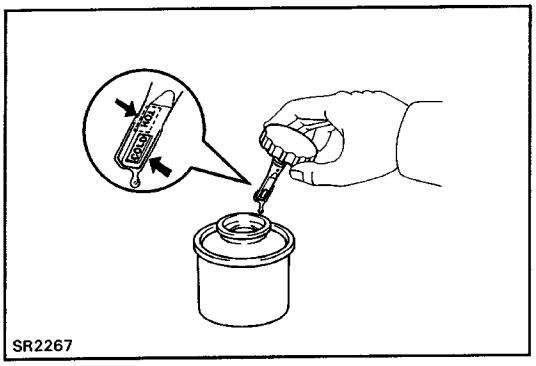
5. START ENGINE AND RUN IT AT 1,000 RPM

After 1 or 2 seconds, fluid will begin to discharge from the return hose. Stop the engine immediately at this time.

NOTICE: Take care that some fluid remains left in the reservoir tank.

6. REPEAT STEPS 4 AND 5 FOUR OR FIVE TIMES UNTIL THERE IS NO MORE AIR IN FLUID

7. CONNECT RETURN HOSE TO RESERVOIR TANK



8. BLEED POWER STEERING SYSTEM

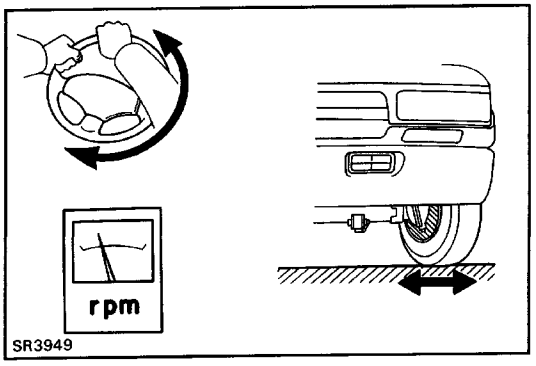
BLEEDING OF POWER STEERING SYSTEM

1. CHECK FLUID LEVEL IN RESERVOIR TANK

Check the fluid level and add fluid if necessary.

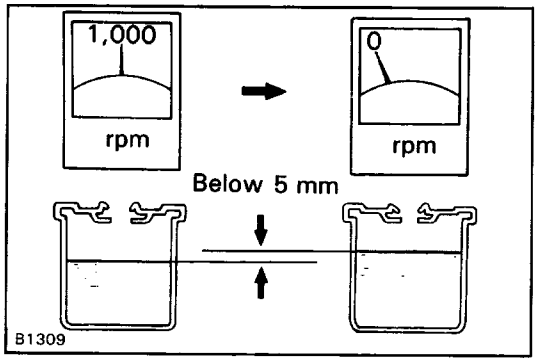
Fluid: ATF DEXRON® II

HINT: Check that the fluid level is within the HOT LEVEL of the dipstick. If the fluid is cold, check that it is within the COLD LEVEL of the dipstick.



2. START ENGINE AND TURN STEERING WHEEL FROM LOCK TO LOCK THREE OR FOUR TIMES

With the engine speed below 1,000 rpm, turn the steering wheel to left or right full lock and keep it there for 2 – 3 seconds, then turn the wheel to the reverse full lock and keep it there for 2 – 3 seconds.



3. CHECK THAT FLUID IN RESERVOIR IS NOT FOAMY OR CLOUDY AND DOES NOT RISE OVER MAXIMUM WHEN ENGINE IS STOPPED

Measure the fluid level with the engine running. Stop the engine and measure the fluid level.

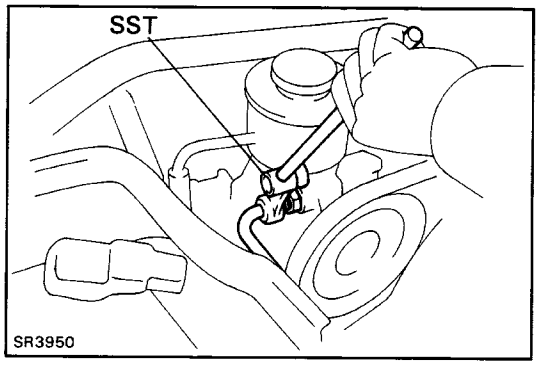
Maximum rise: 5 mm (0.20 in.)

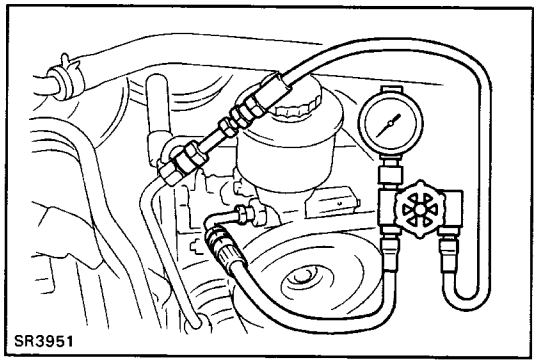
If a problem is found, repeat steps 4 and 5 on page SR–21. Repair the PS if the problem persists.

OIL PRESSURE CHECK

1. CONNECT PRESSURE GAUGE

(a) Using SST, disconnect the pressure line joint.
SST 09631–22020

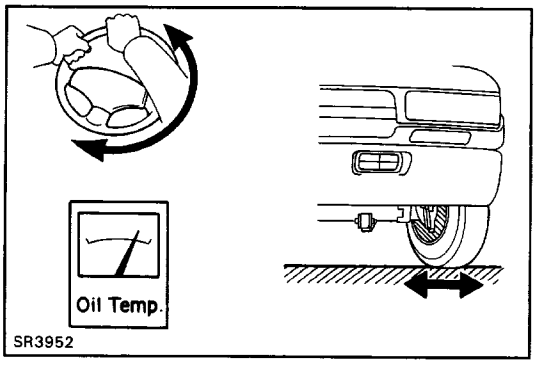




(b) Connect the gauge side of the pressure gauge to the PS pump side and the valve side to the pressure line side.

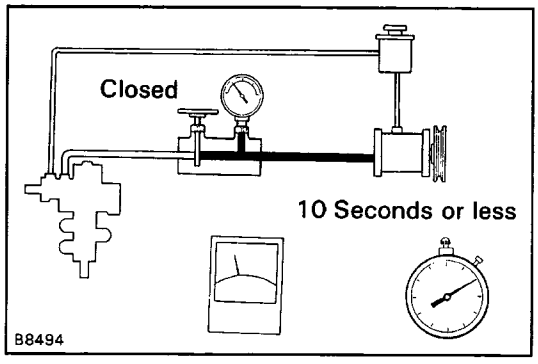
(c) Bleed the system. Start the engine and turn the steering wheel from lock to lock two or three times.

(d) Check that the fluid level is correct.



2. CHECK THAT FLUID TEMPERATURE IS AT LEAST 80°C (176°F)

3. START ENGINE AND RUN IT AT IDLE



4. CHECK FLUID PRESSURE READING WITH VALVE CLOSED

Close the pressure gauge valve and observe the reading on the gauge.

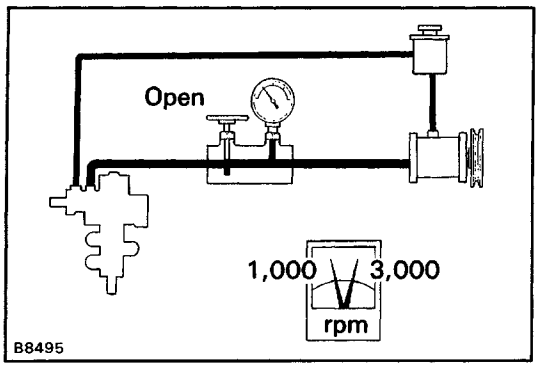
Minimum pressure:

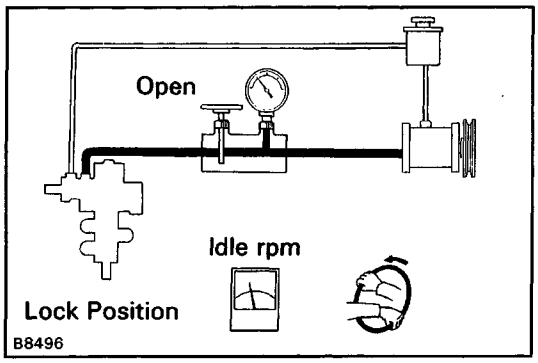
7,845 kPa (80 kgf/cm^2, 1,138 psi)

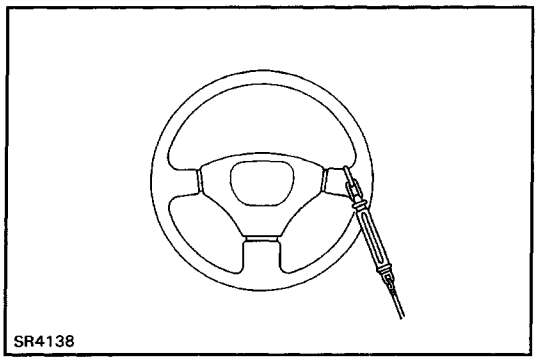
NOTICE:

- **Do not keep the valve closed for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**

If pressure is low, repair or replace the PS pump.







5. OPEN VALVE FULLY

6. CHECK AND RECORD PRESSURE READING AT 1,000 RPM

7. CHECK AND RECORD PRESSURE READING AT 3,000 RPM

Check that there is 490 kPa (5 kgf/cm^2, 71 psi) or less difference in pressure between the 1,000 rpm and 3,000 rpm checks.

If the difference is excessive, repair or replace the flow control valve of the PS pump.

8. CHECK PRESSURE READING WITH STEERING WHEEL TURNED TO FULL LOCK

Be sure the pressure gauge valve is fully opened and the engine idling.

Minimum pressure:

7,845 kPa (80 kgf/cm^2, 1,138 psi)

NOTICE:

- **Do not maintain lock position for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**

If pressure is low, the gear housing has an internal leak and must be repaired or replaced.

9. MEASURE STEERING EFFORT

(a) Center the steering wheel and run the engine at idle.

(b) Using a spring scale, measure the steering effort in both directions.

Maximum steering effort: 39 N (4.4 kgf, 8.8 lbf)

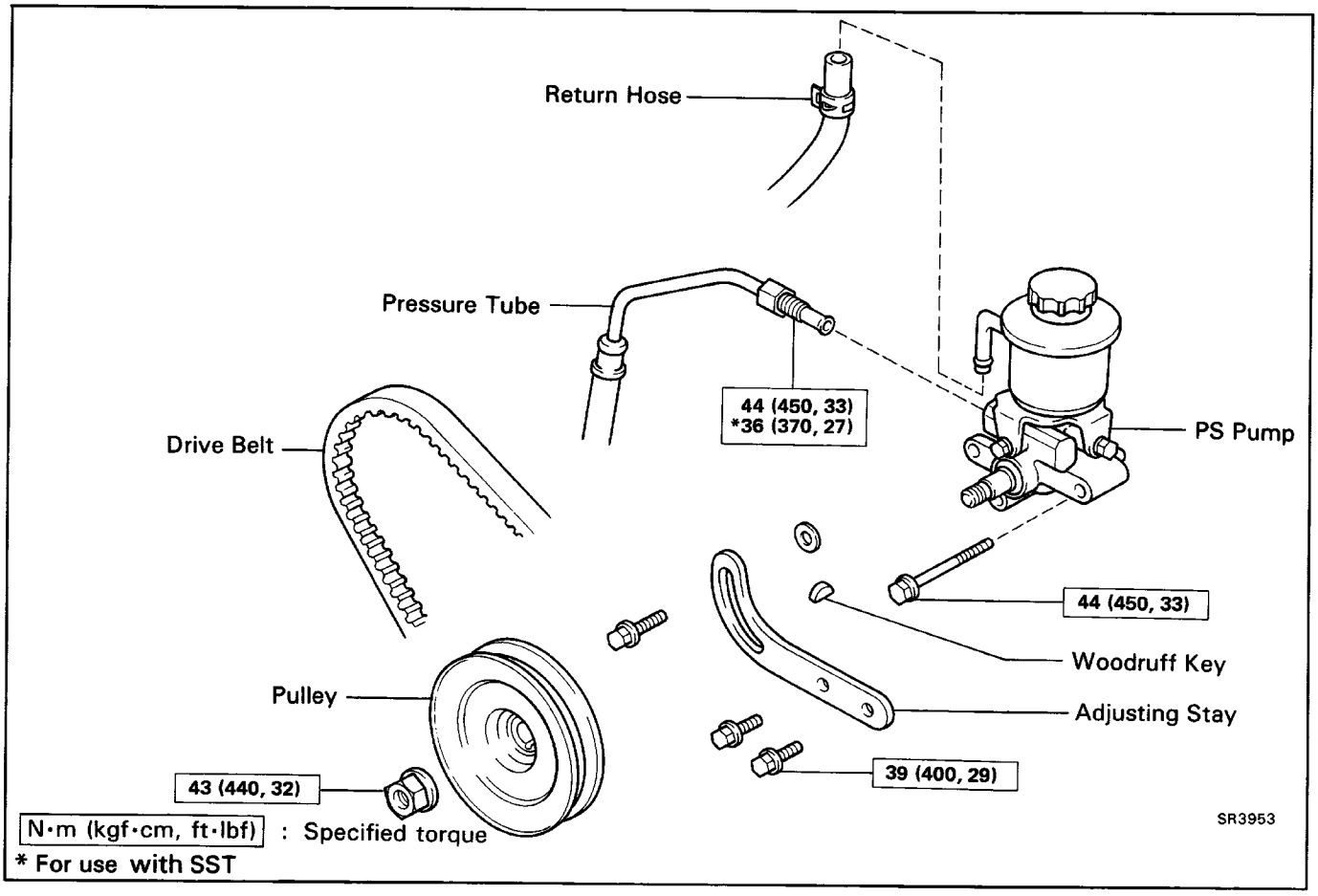
If steering effort is excessive, repair the power steering unit.

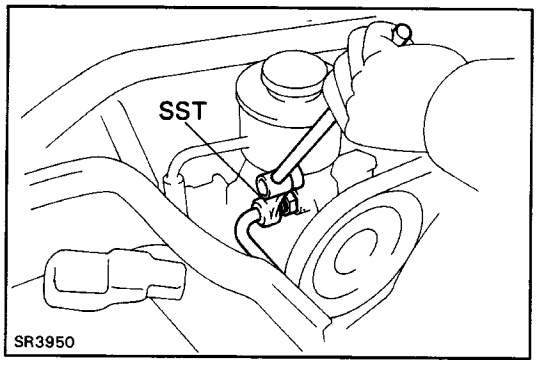
HINT: Be sure to consider tire type, pressure and con–tact surface before making your diagnosis.

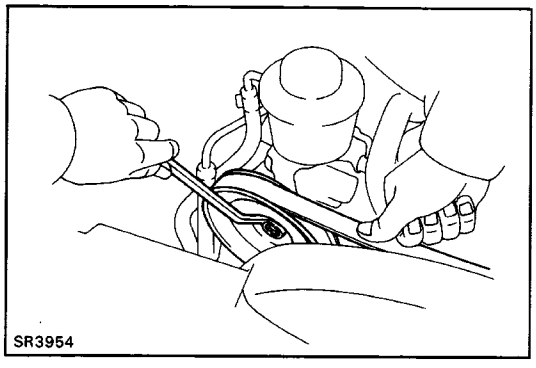
Power Steering Pump

REMOVAL AND INSTALLATION OF POWER STEERING PUMP

Remove and install the parts as shown.







(MAIN POINT OF REMOVAL AND INSTALLATION)

1. DISCONNECT AND CONNECT PRESSURE TUBE

Using SST, disconnect and connect the pressure tube from/to the PS pump.

SST 09631–22020

Torque: 36 N–m (370 kgf–cm, 27 ft–lbf)

HINT: Use a torque wrench with a fulcrum length of 300 mm (11.81 in.).

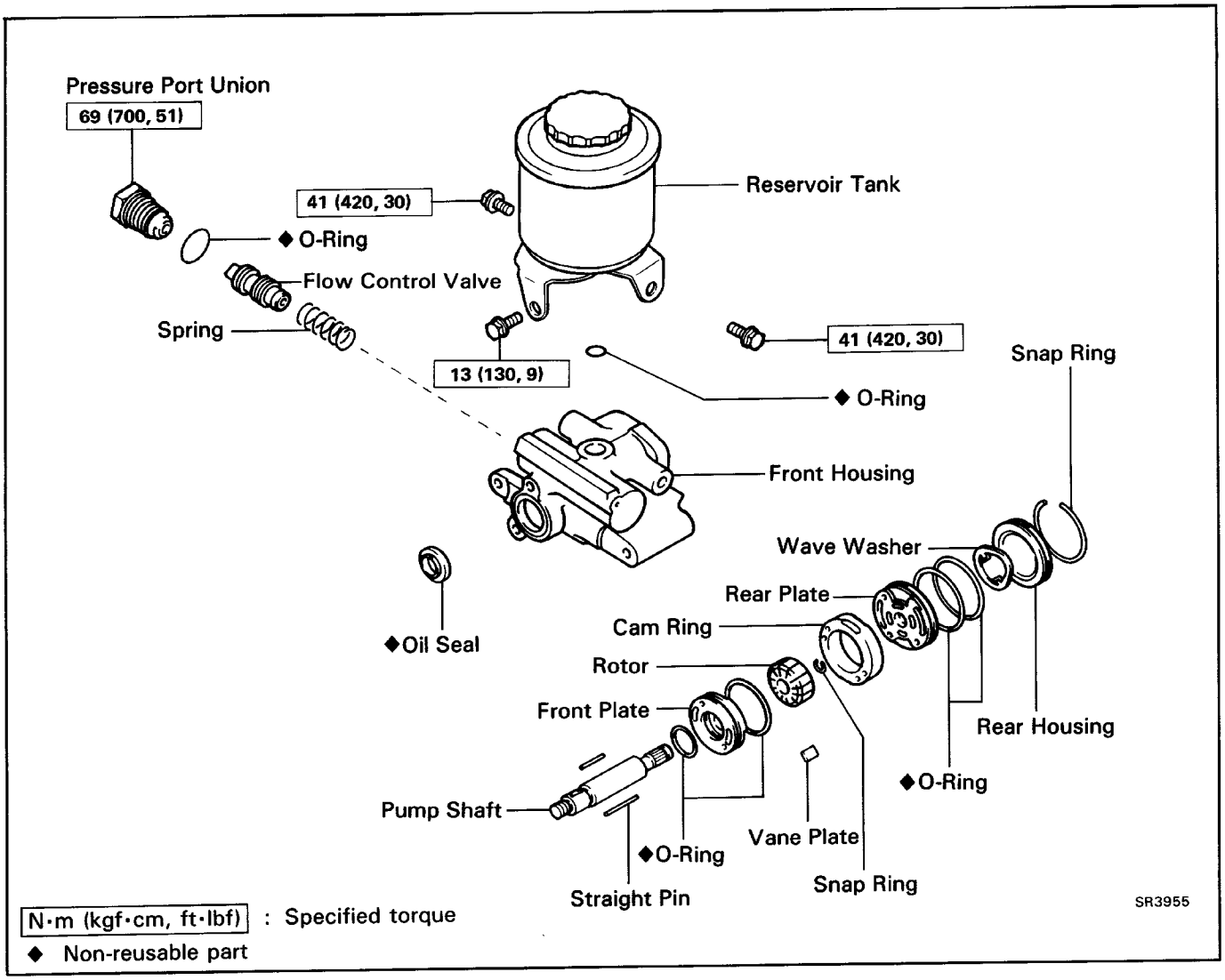
2. LOOSEN PULLEY NUT

Push on the drive belt with your hand to hold the pulley in place and loosen the pulley nut.

3. ADJUST DRIVE BELT TENSION AFTER INSTALLING PS PUMP

(See page SR–19)

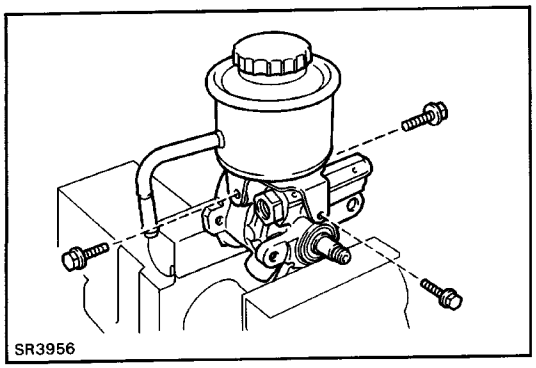
COMPONENTS



DISASSEMBLY OF POWER STEERING PUMP

1. CLAMP PS PUMP IN VISE

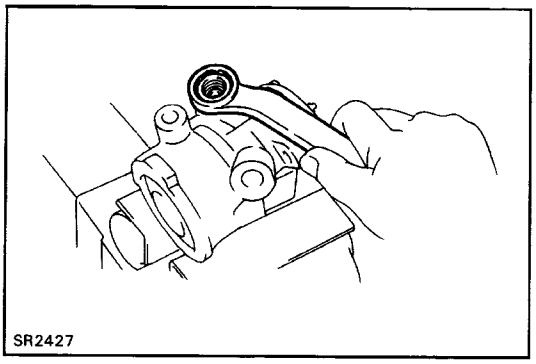
NOTICE: Do not tighten the vise too tight.



2. REMOVE RESERVOIR TANK

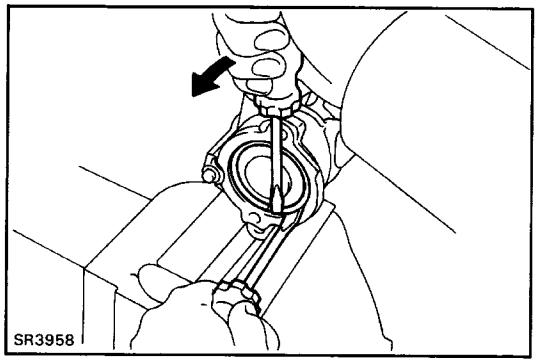
(a) Remove the three bolts and reservoir tank.

(b) Remove the O–ring from the reservoir tank.



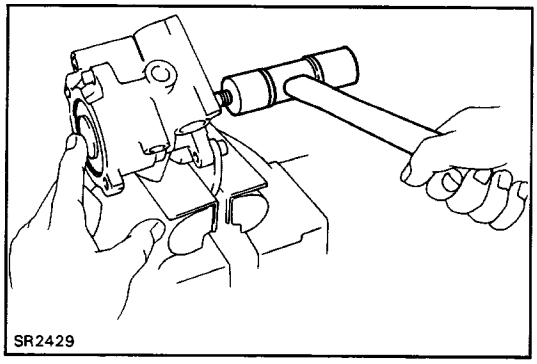
3. REMOVE PRESSURE PORT UNION AND FLOW CONTROL VALVE

(a) Remove the pressure port union.
(b) Remove the O–ring from the pressure port union.
(c) Remove the flow control valve and spring.

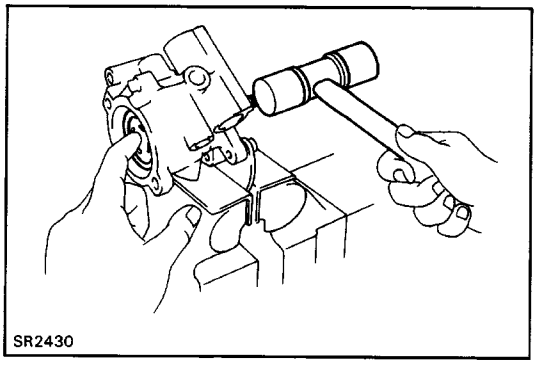


4. REMOVE REAR HOUSING

(a) Using two screwdrivers, remove the snap ring.

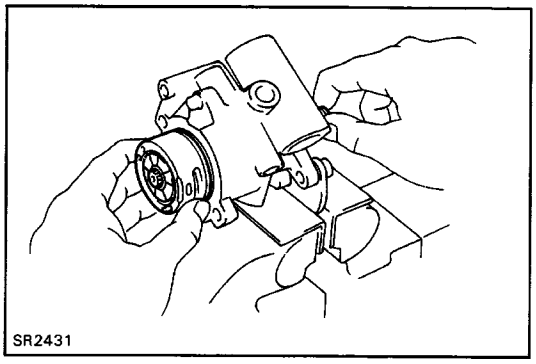


(b) Using a plastic hammer, tap out the rear housing and wave washer.
(c) Remove the O–ring from the rear housing.



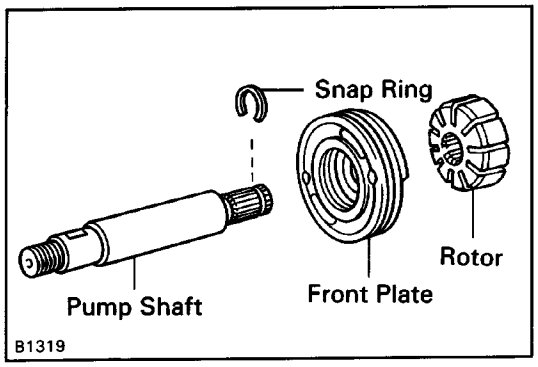
5. REMOVE REAR PLATE

(a) Using a plastic hammer, tap the shaft end and remove the rear plate.
(b) Remove the O–ring from the rear plate.



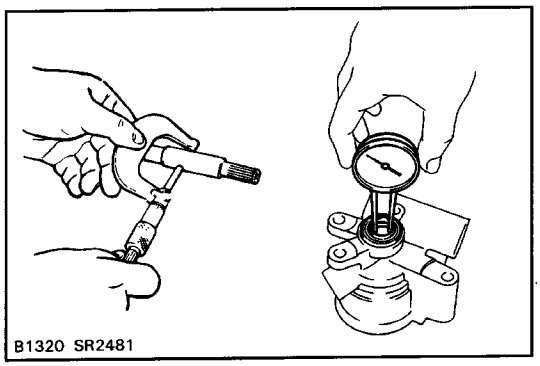
6. REMOVE PUMP SHAFT, CAM RING AND VANE PLATES

(a) Remove the pump shaft with the camring,vane plates from the front housing.
(b) Remove the cam ring and ten vane plates from the pump shaft.
(c) Remove the longer straight pin from the front housing.



7. REMOVE ROTOR AND FRONT PLATE

(a) Using a screwdriver, remove the snap ring.
(b) Remove the rotor and front plate from the pump shaft.
(c) Remove the two O–rings from the front plate.
(d) Remove the straight pin from the front plate.



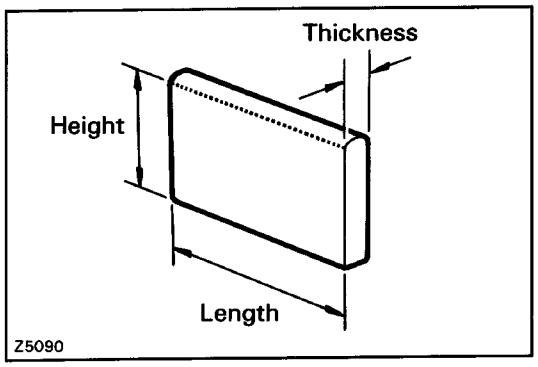
INSPECTION OF POWER STEERING PUMP

1. CHECK OIL CLEARANCE OF SHAFT AND BUSHING

Using a micrometer and calipers, check the oil clearance.

Standard clearance: 0.01 – 0.03 mm
(0.0004 – 0.0012 in.)
Maximum clearance: 0.07 mm (0.0028 in.)

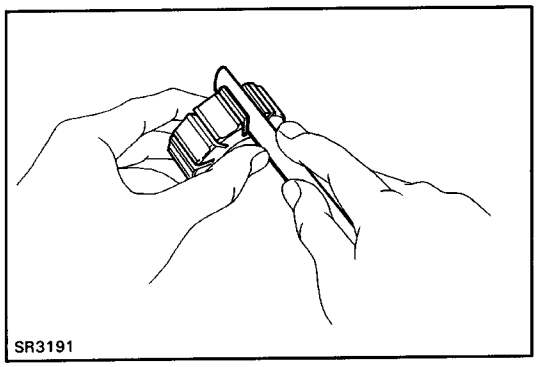
If more than maximum, replace the entire PS pump.



2. INSPECT ROTOR AND VANE PLATES

(a) Using a micrometer, measure the height, thickness and length of the vane plate.

Minimum height: 8.1 mm (0.319 in.)
Minimum thickness: 1.797 mm (0.0707 in.)
Minimum length: 14.988 mm (0.5901 in.)



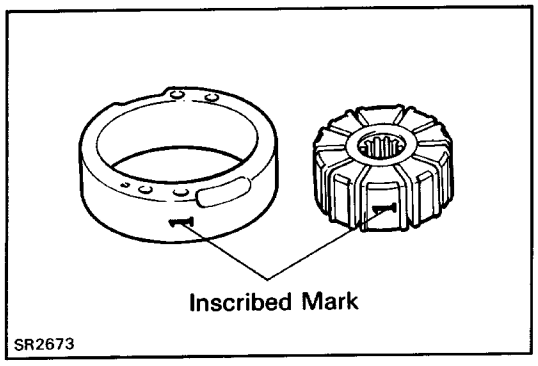
(b) Using a feeler gauge, measure the clearance between the rotor groove and vane plate.

Maximum clearance: 0.028 mm (0.0011 in.)

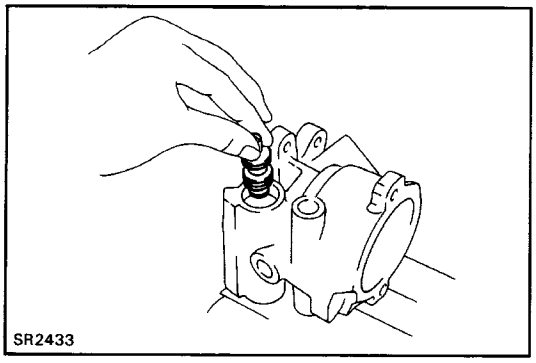
If more than maximum, replace the pump plate and/or rotor with one having the same mark stamped on the cam ring.

Inscribed mark: 1, 2, 3, 4 or None

HINT: There are five vane lengths with the following rotor and cam ring marks:

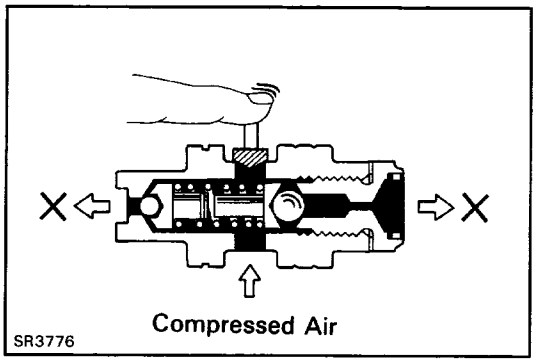


Rotor and cam ring mark	Vane length mm (in.)
None	14.996 – 14.998 (0.59039 – 0.59047)
1	14.994 – 14.996 (0.59032 – 0.59039)
2	14.992 – 14.994 (0.59024 – 0.59032)
3	14.990 – 14.992 (0.59016 – 0.59024)
4	14.988 – 14.990 (0.59008 – 0.59016)


SR2433

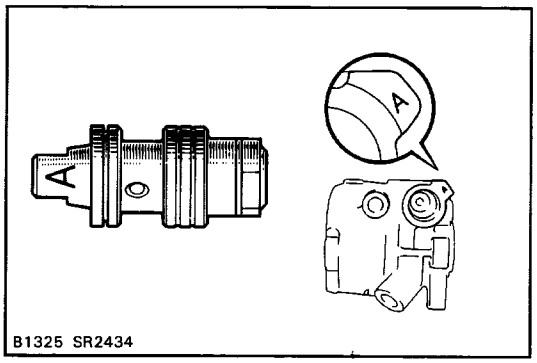
3. INSPECT FLOW CONTROL VALVE

(a) Coat the valve with power steering fluid and check that it falls smoothly into the valve hole by its own weight.



SR3776

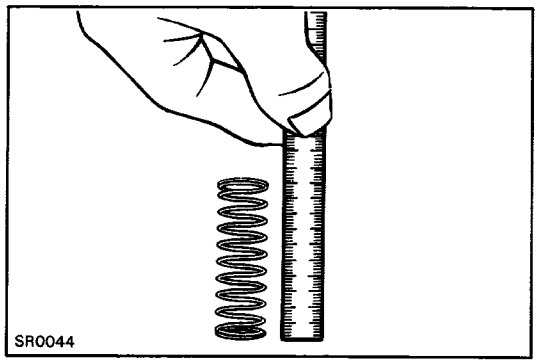
(b) Check the flow control valve for leakage.
Close one of the holes and apply compressed air [392 – 490 kPa (4 – 5 kgf/cm^2, 57 – 71 psi)] into the opposite side, and confirm that air does not come out from the end hole.



B1325 SR2434

If necessary, replace the valve with one having the same letter as inscribed on the front housing.

Inscribed mark: A, B, C, D, E or F

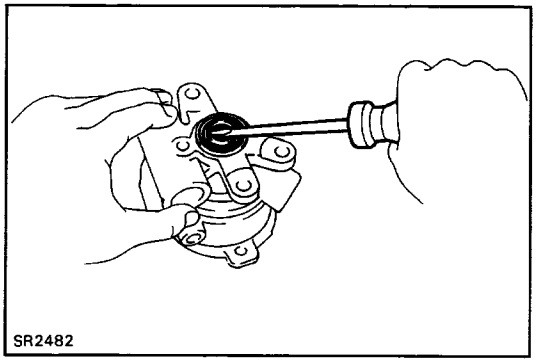

SR0044

4. INSPECT FLOW CONTROL SPRING

Using a scale, measure the free length of the spring.

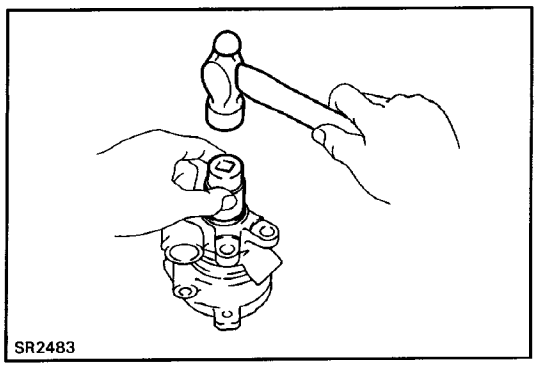
Spring length: 35 – 37 mm (1.38 – 1.46 in.)

If not within specification, replace the spring.


SR2482

5. IF NECESSARY, REPLACE OIL SEAL

(a) Using a screwdriver, pry out the oil seal.

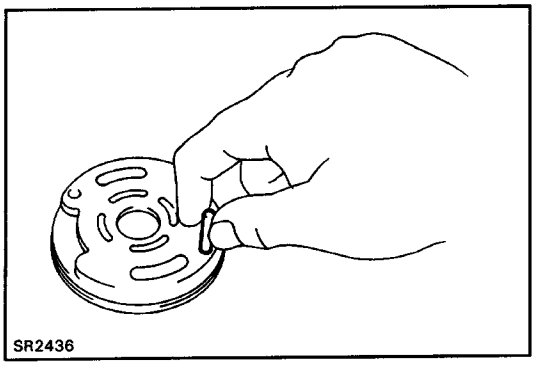


(b) Using a socket wrench and hammer, drive in a new oil seal.

ASSEMBLY OF POWER STEERING PUMP

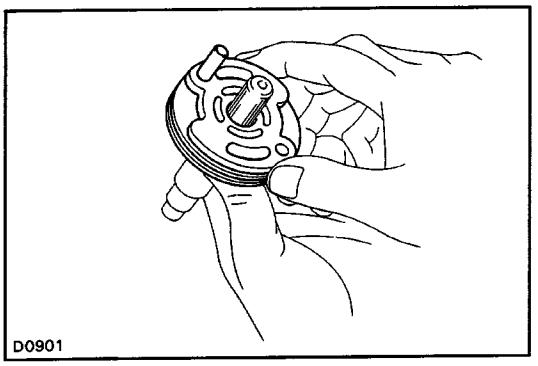
(See page SR–25)

1. COAT ALL SLIDING SURFACES WITH POWER STEERING FLUID BEFORE ASSEMBLY



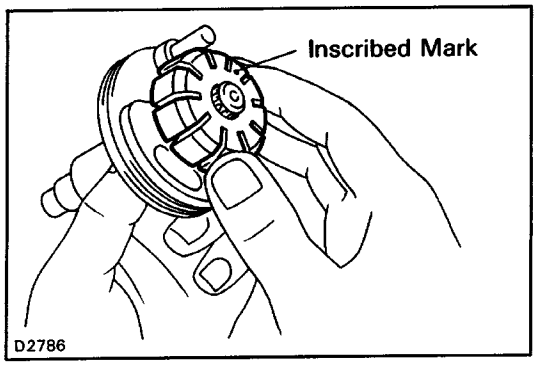
2. INSTALL FRONT PLATE AND ROTOR TO PUMP SHAFT

(a) Install the shorter straight pin to the front plate.



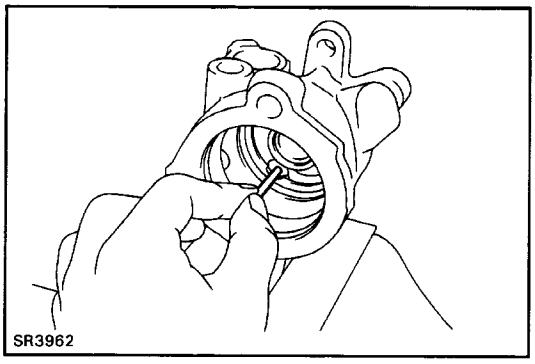
(b) Install two new O–rings to the front plate.

(c) Install the front plate to the pump shaft.



(d) Install the rotor to the pump shaft with the inscribed mark facing outward.

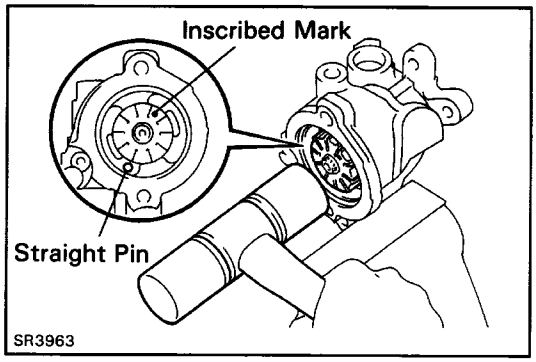
(e) Install the snap ring.



3. INSTALL PUMP SHAFT TO FRONT HOUSING

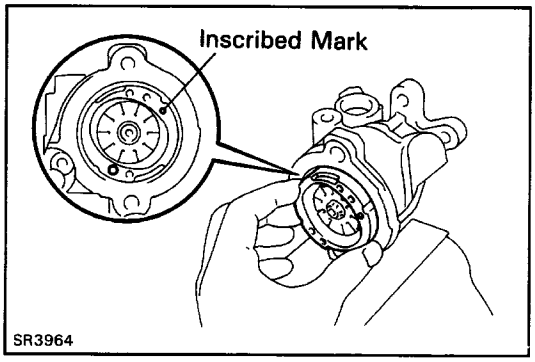
(a) Coat the oil seal lip with MP grease.

(b) Install the longer straight pin to the front housing.



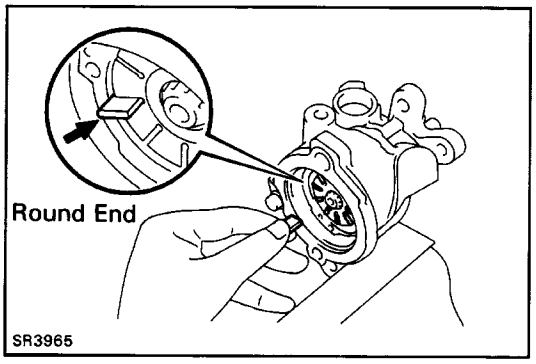
(c) Align the hole of the front plate and straight pin and tap in the pump shaft with a plastic hammer.

HINT: Be careful not to damage the oil seal and 0–rings.



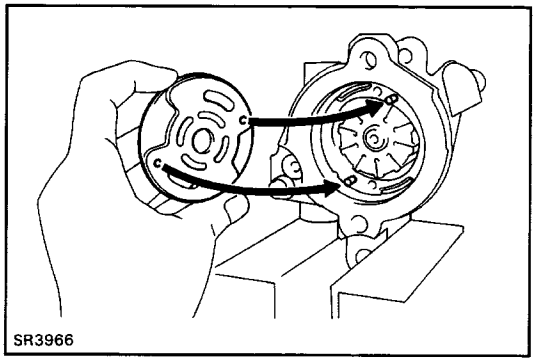
4. INSTALL CAM RING

Align the oval hole of the cam ring and longer straight pin, and install the cam ring with the inscribed mark facing outward.



5. INSTALL VANE PLATES

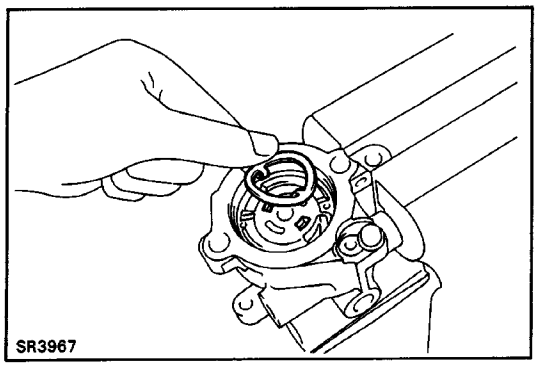
Install the ten vane plates with the round end facing outward.



6. INSTALL REAR PLATE

(a) Install a new O–ring to the rear plate.

(b) Align the holes of the rear plate with the pins, and install the plate.

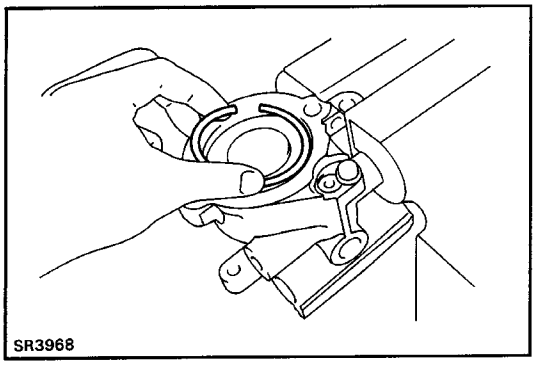

SR3967

7. INSTALL REAR HOUSING

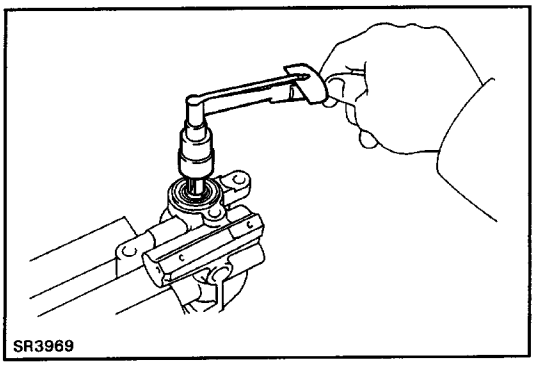
(a) Install the wave washer.

(b) Install a new O–ring to the rear housing.

(c) Using a plastic hammer, tap in the rear housing.


SR3968

(d) Install the snap ring.


SR3969

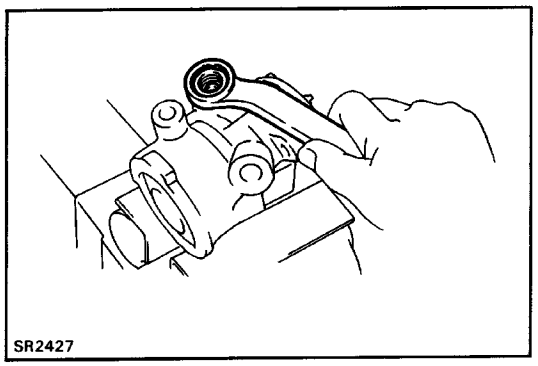
8. CHECK PUMP SHAFT PRELOAD

(a) Check that the shaft rotates smoothly without ab–normal noise.

(b) Temporarily install the pulley nut and check the ro–tating torque.

Rotating torque:

0.3 N–m (2.8 kgf–cm, 2.4 in.–lbf) or less


SR2427

9. INSTALL SPRING, FLOW CONTROL VALVE AND PRES–SURE PORT UNION

(a) Install the spring and the valve into the housing.

(b) Install a new O–ring in the groove of the pressure port union.

(c) Install and torque the pressure port union.

Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)

10. INSTALL RESERVOIR TANK

(a) Install a new O–ring to the reservoir tank.

(b) Install the reservoir tank to the housing and torque the three bolts.

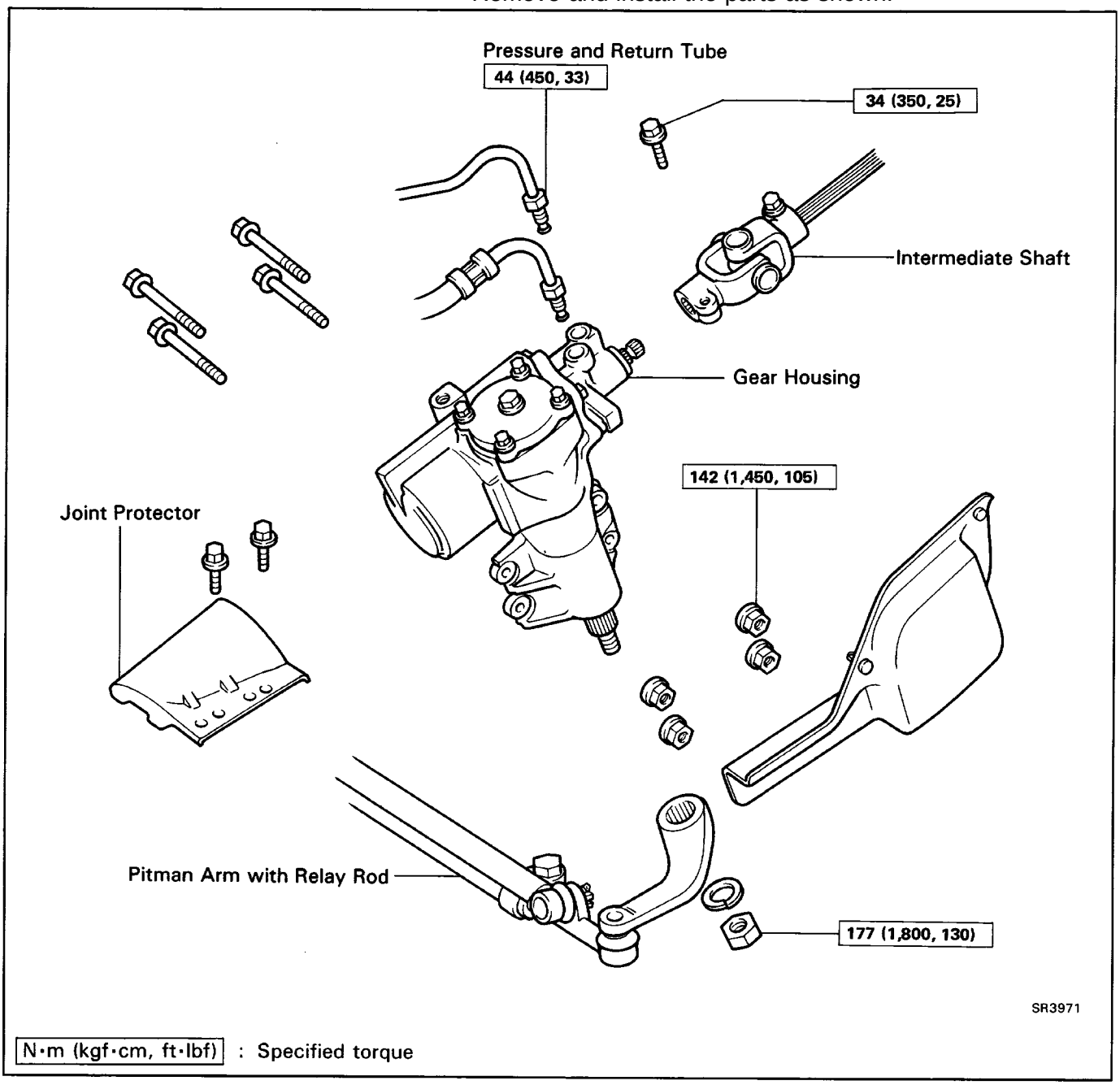
Torque: 12 mm bolt 13 N–m (130 kgf–cm, 9 ft–lbf)

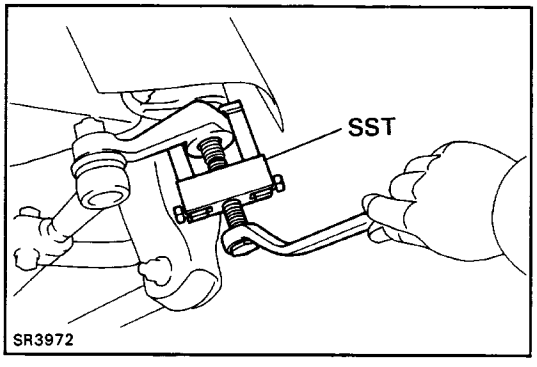
14 mm bolt 41 N–m (420 kgf–cm, 30 ft–lbf)

Gear Housing

REMOVAL AND INSTALLATION OF GEAR HOUSING

Remove and install the parts as shown.





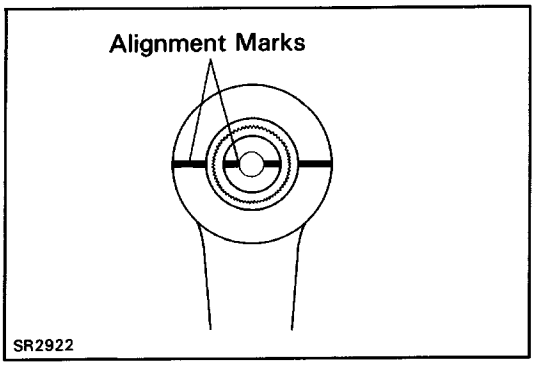
(MAIN POINTS OF REMOVAL AND INSTALLATION)

1. DISCONNECT PITMAN ARM

(a) Loosen the pitman arm nut.

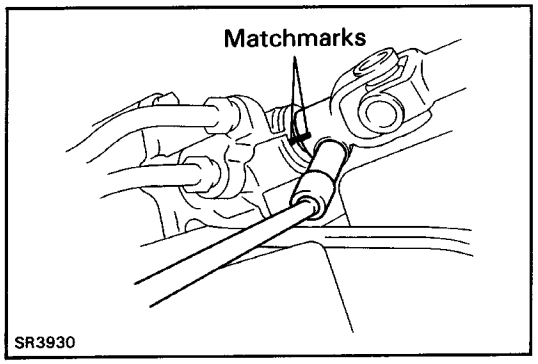
(b) Using SST, disconnect the pitman arm from the sec–tor shaft.
SST 09628–62011

(c) Remove the nut, the spring washer and the arm.



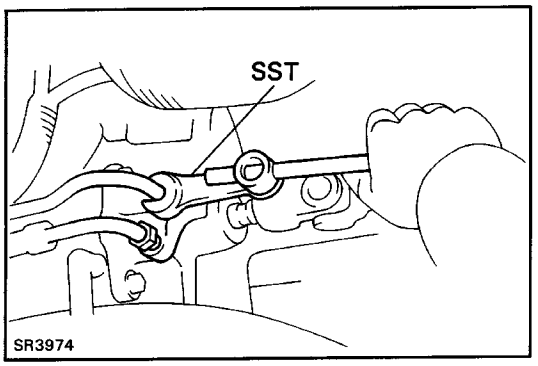
(d) When connecting the pitman arm, align alignment marks on the pitman arm and the sector shaft, and install the spring washer and nut.

Torque: 177 N–m (1,800 kgf–cm, 130 ft–lbf)



2. DISCONNECT UNIVERSAL JOINT FROM GEAR HOUSING

(a) Loosen the universal joint upper bolt.
(b) Remove the universal joint lower bolt.
(c) Slide the joint backward to disconnect the joint from the worm shaft.

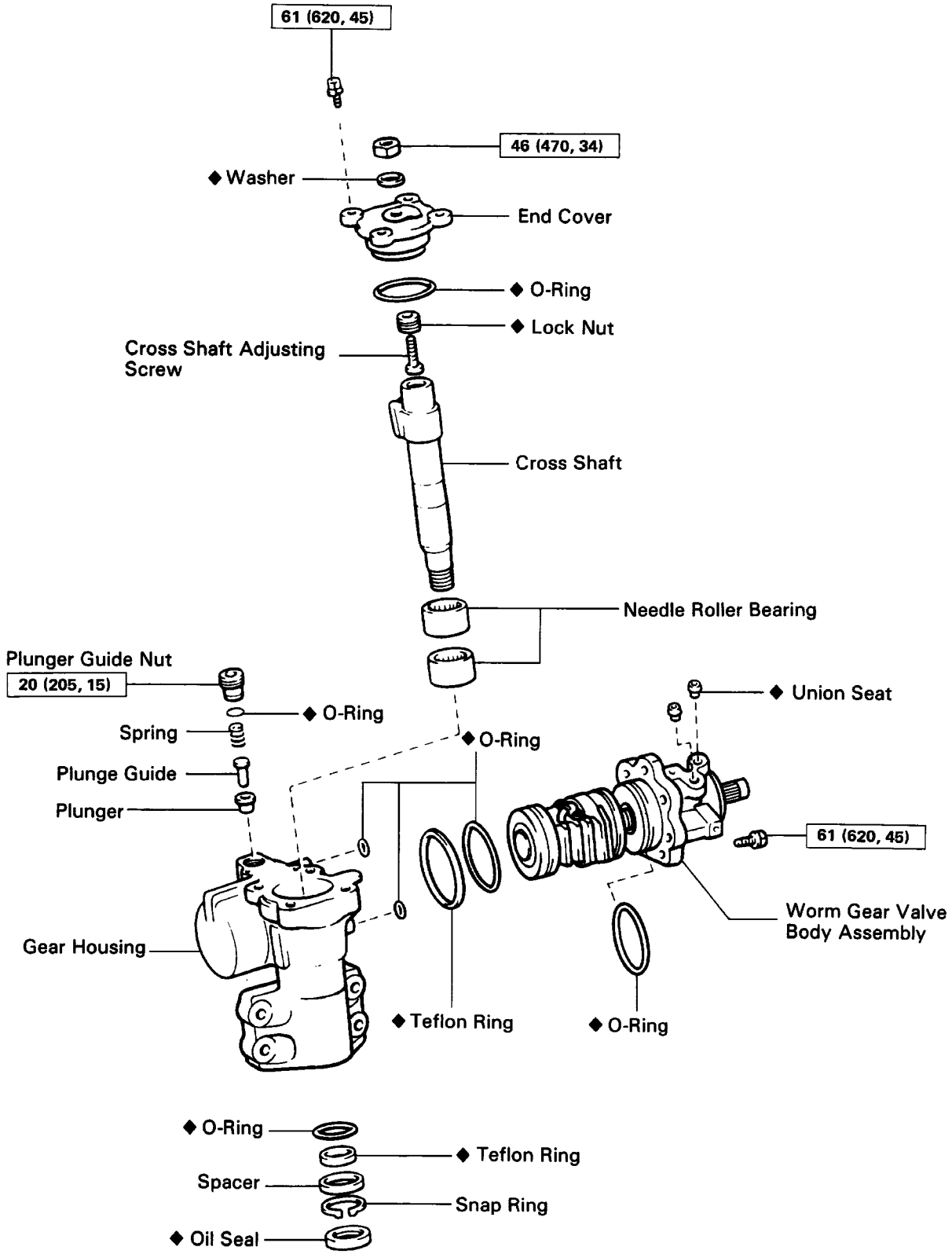


3. DISCONNECT PRESSURE AND RETURN TUBES

Using SST, disconnect the pressure and return tubes from the gear housing.

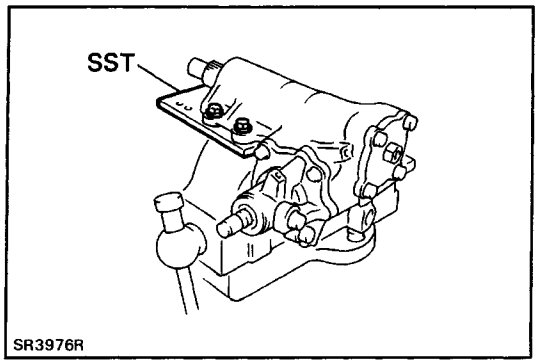
SST 09631–22022

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

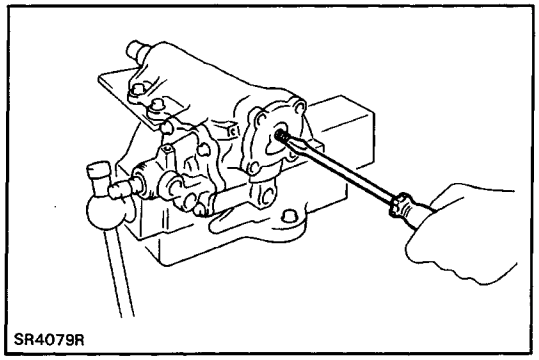


DISASSEMBLY OF GEAR HOUSING

(See page SR–34)

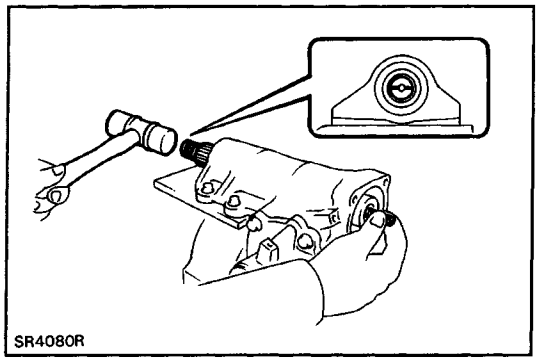
1. MOUNT HOUSING ON STAND

Mount the gear housing on SST and clamp SST in a vise.
SST 09630–00012 (09631–00140)



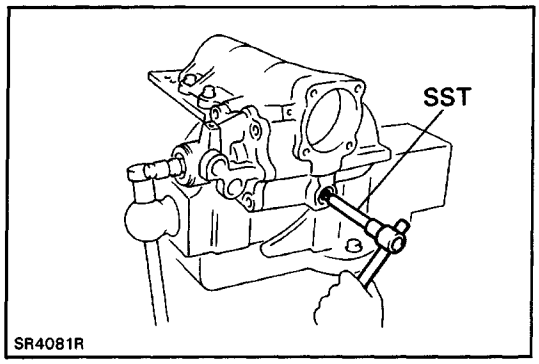
2. REMOVE END COVER

(a) Remove the adjusting screw lock nut.
(b) Remove the four bolts.
(c) Screw in the adjusting screw until the cover comes off .



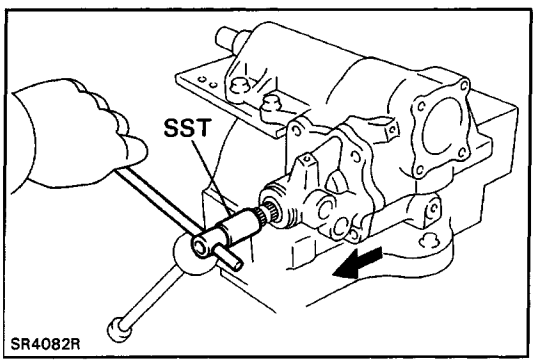
3. REMOVE CROSS SHAFT

Using a plastic hammer, tap on the cross shaft end and pull out the shaft.



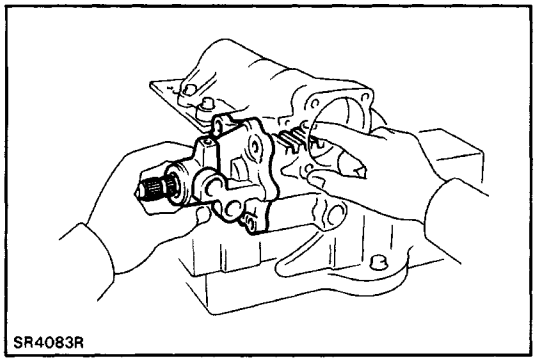
4. REMOVE PLUNGER GUIDE NUT

(a) Using SST, remove the plunger guide nut.
SST 09043–38100
(b) Remove the spring, plunger and plunger guide.
(c) Remove the O–ring.



5. REMOVE WORM GEAR VALVE BODY ASSEMBLY

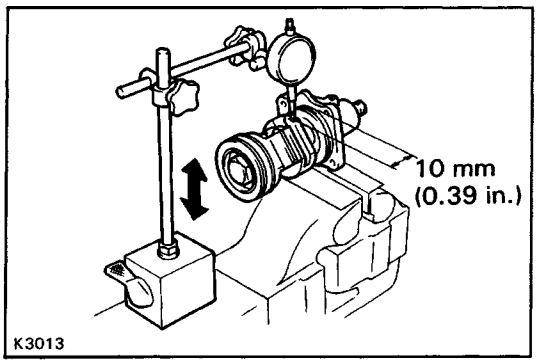
(a) Remove the four cap bolts from the housing.
(b) Using SST, turn the shaft clockwise to disconnect the worm gear valve body assembly from gear housing.
SST 09616–00010



(c) Hold the power piston nut with your thumb so it cannot move, then withdraw the valve body and power piston assembly.

NOTICE: Ensure that the power piston. nut does not come off the worm shaft.

(d) Remove the O–ring.



INSPECTION AND REPLACEMENT OF GEAR HOUSING

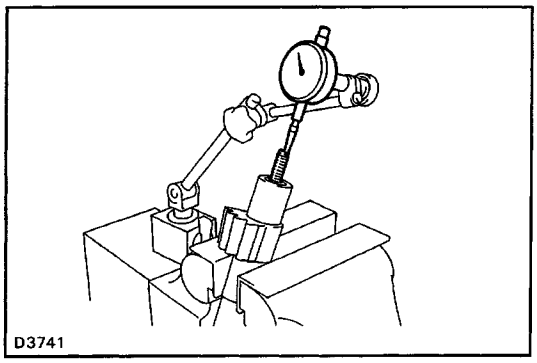
1. CHECK BALL CLEARANCE

(a) Mount the valve body in a vise.

(b) Using a dial indicator, check the ball clearance.
Move the worm gear up and down.

Maximum ball clearance: 0.15 mm (0.0059 in.)

If clearance is excessive, the power control valve assembly must be replaced.



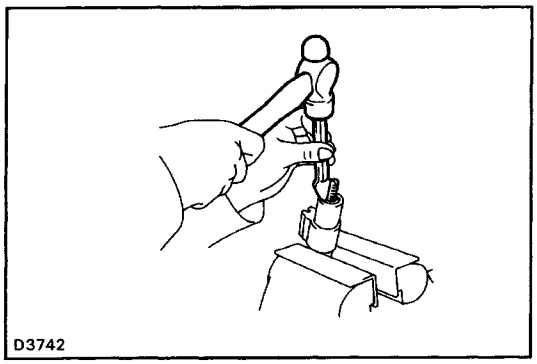
2. INSPECT CROSS SHAFT ADJUSTING SCREW THRUST CLEARANCE

(a) Clamp the cross shaft in a vise.

(b) Using a dial indicator, measure the thrust clearance.

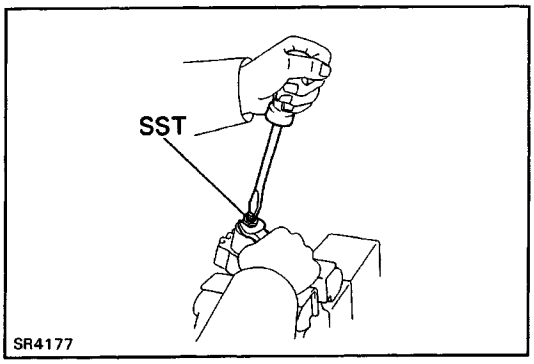
Thrust clearance: 0.03 – 0.05 mm
(0.0012 – 0.0020 in.)

If thrust clearance is not correct, adjust the thrust clearance.



3. IF NECESSARY, ADJUST THRUST CLEARANCE

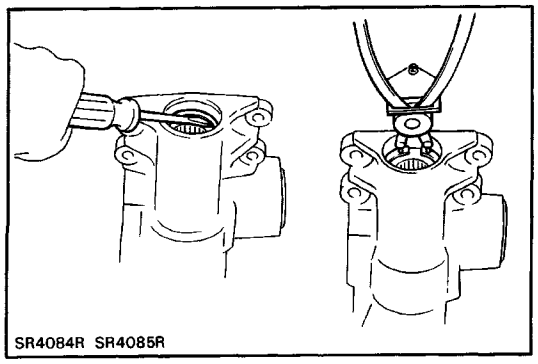
(a) Using a chisel and hammer, remove the lock nut stake.



(b) Using SST, remove the lock nut.
SST 09630–00012 (09631–00050)

(c) Adjust the adjusting screw for correct thrust clearance and tighten a new lock nut.

(d) Stake the lock nut.

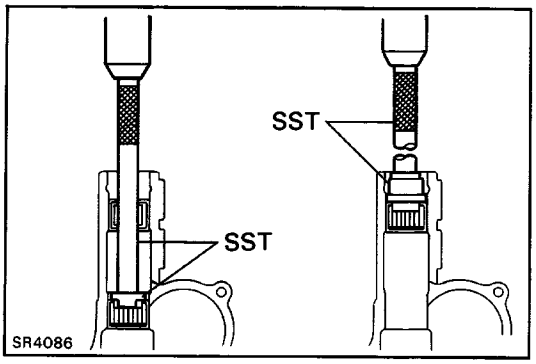


4. IF NECESSARY, REPLACE NEEDLE ROLLER BEARING

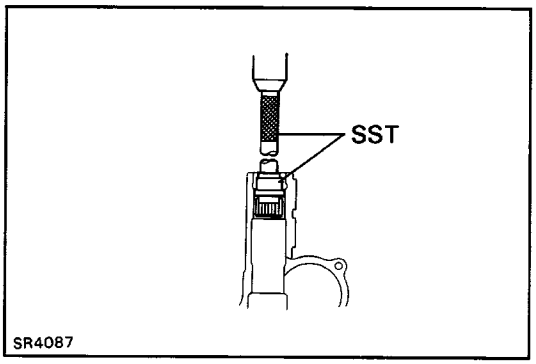
(a) Using a screwdriver, pry out the oil seal.

(b) Using snap ring pliers, remove the snap ring.

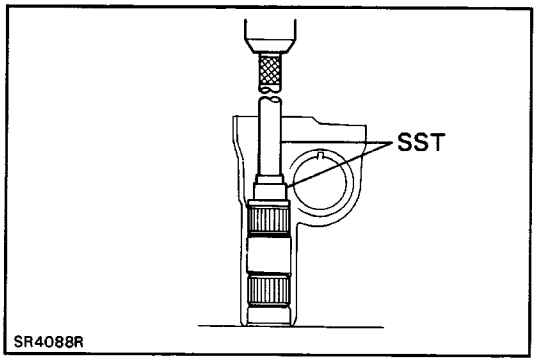
(c) Remove the metal spacer, teflon ring and O–ring.



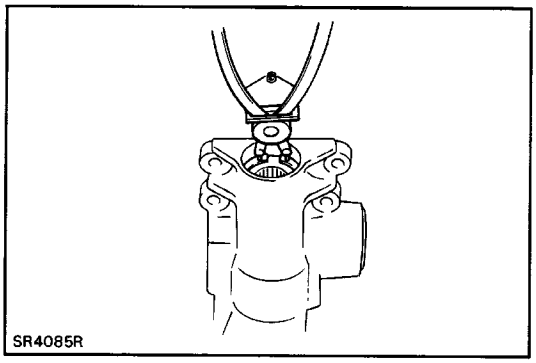
(d) Using SST, press out the upper bearing.
SST 09630–00012 (09631–00020, 09631–00070)
(e) Using SST, press out the lower bearing.
SST 09630–00012 (09631–00020, 09631–00090)



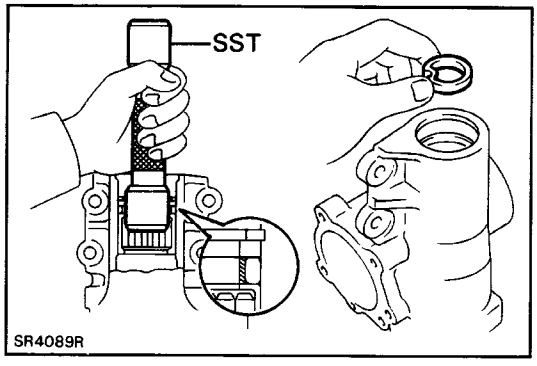
(f) Using SST, press in a new lower bearing.
SST 09630–00012 (09631–00020, 09631–00090)
HINT: Install the lower bearing so that it is positioned 23.1 mm (0.909 in.) away from the housing inner end surface.



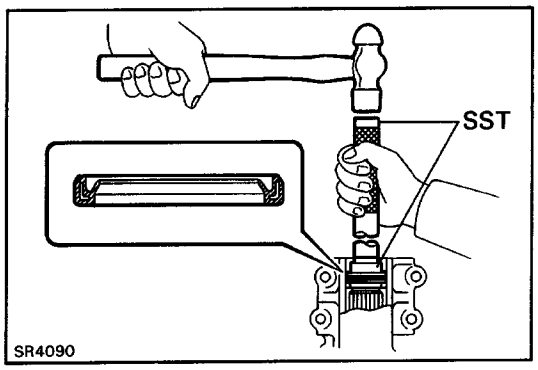
(g) Using SST, press in a new upper bearing.
SST 09630–00012 (09631–00020, 09631–00090)
HINT: The bearing's top end should be installed so that it aligns with the housing end surface.
(h) Install a new O–ring and metal spacer.



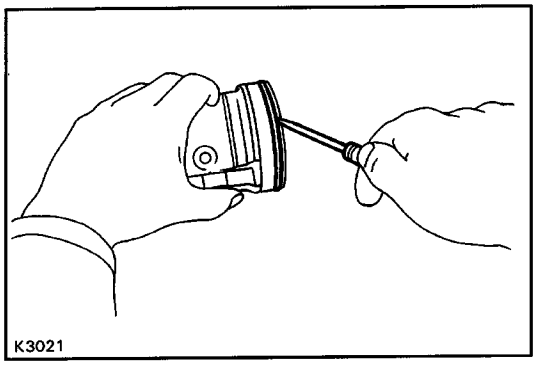
(i) Using snap ring pliers, install the snap ring.



(j) Form a teflon ring into a heart shape and install it with hand.
(k) Using SST, form the teflon ring.
NOTICE: The teflon ring must be squeezed before inserting the sector shaft or damage will result.
SST 09630–00012 (09631–00120)



(l) Using SST, drive a new oil seal into the gear housing.
SST 09630–00012 (09631–00020, 09631–00090)



5. IF NECESSARY, REPLACE CONTROL VALVE TEFLON RING

(a) Using a screwdriver, remove the teflon ring and O–ring.

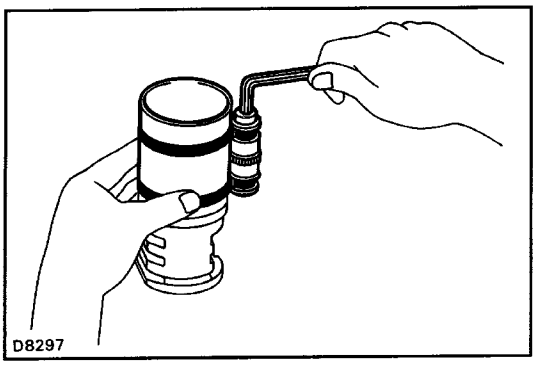
NOTICE: Be careful not to damage the control valve.

(b) Install a new O–ring.

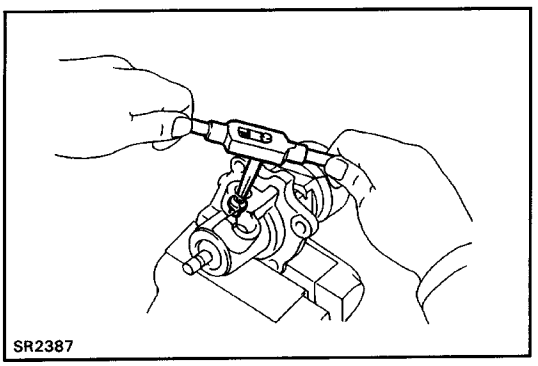
(c) Expand a new teflon ring with your fingers.

NOTICE: Be careful not to over–expand the teflon ring.

(d) Install a new teflon ring.

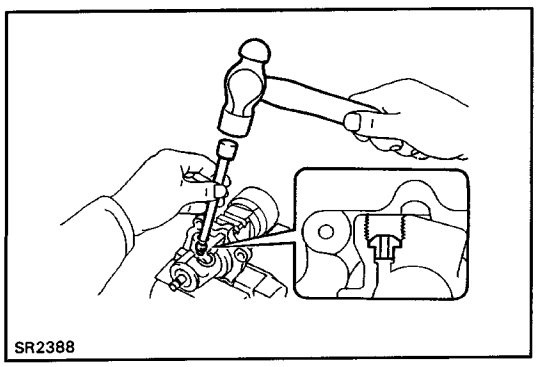


(e) Coat the teflon ring with power steering fluid and snug it down with piston ring compressor for 5 – 7 minutes.

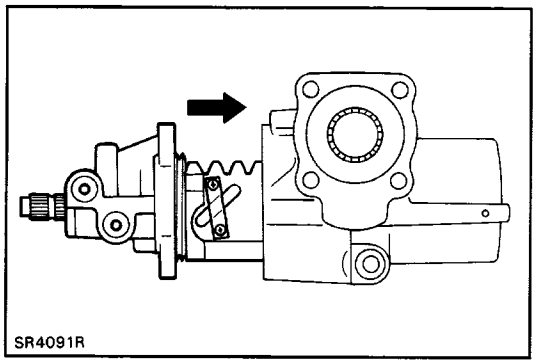


6. IF NECESSARY, REPLACE UNION SEAT

(a) Using a screw extractor, remove the union seat.



(b) Using a plastic hammer and extension bar, tap in a new union seat.


SR4091R

ASSEMBLY OF GEAR HOUSING

(See page SR–34)

1. INSTALL WORM GEAR VALVE BODY ASSEMBLY

(a) Install the three O–rings to the gear housing and valve body.

(b) Mount the gear housing on SST and clamp SST in vise.

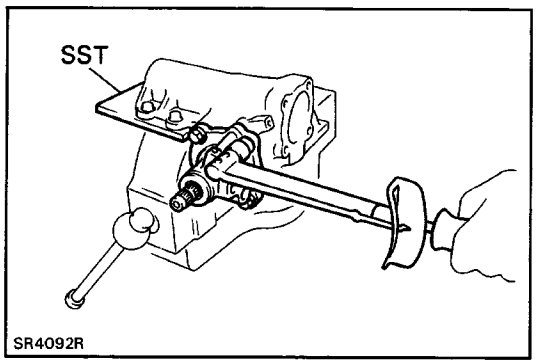
SST 09630–00012 (09631–00140)

(c) Install the worm gear valve body assembly to the gear housing as shown.

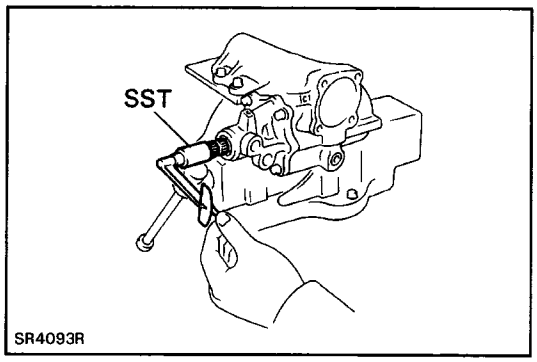
(d) Install and torque the four bolts.

Torque: 61 N–m (620 kgf–cm, 45 ft–lbf)

NOTICE: Be careful not to damage the teflon ring.



SR4092R



SR4093R

(e) Using SST, check the worm gear preload.

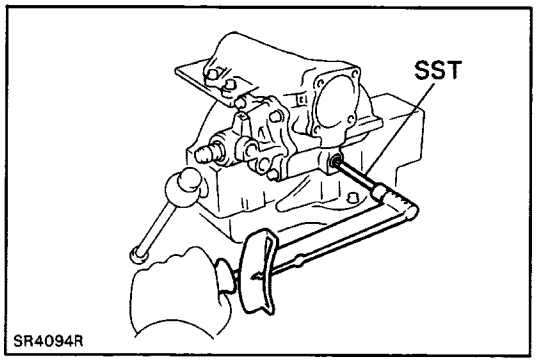
SST 09616–00010

Preload: (at starting)

0.3 – 0.5 N–m (3 – 5.5 kgf–cm, 2.6 – 4.8–lbf)

HINT: Hold the power piston nut to prevent it from turning.

If preload is not correct, replace the worm gear assembly.



SR4094R

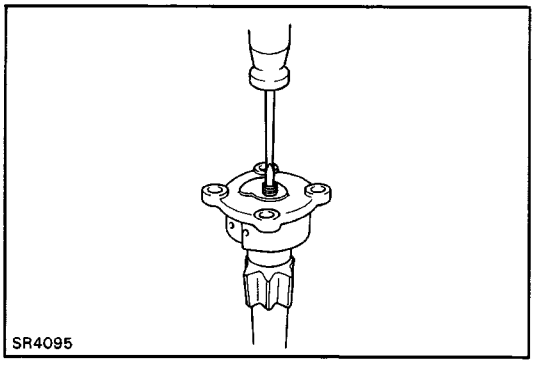
2. INSTALL PLUNGER GUIDE NUT

(a) Install the plunger, plunger guide and spring.

(b) Install a new O–ring to the plunger guide nut and install the plunger guide nut with SST.

SST 09043–38100

Torque: 20 N–m (205 kgf–cm, 15 ft–lbf)

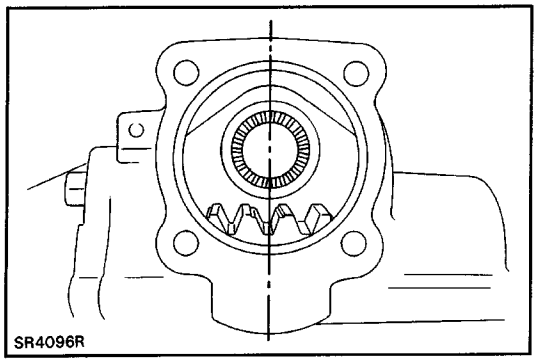

SR4095

3. INSTALL CROSS SHAFT AND END COVER

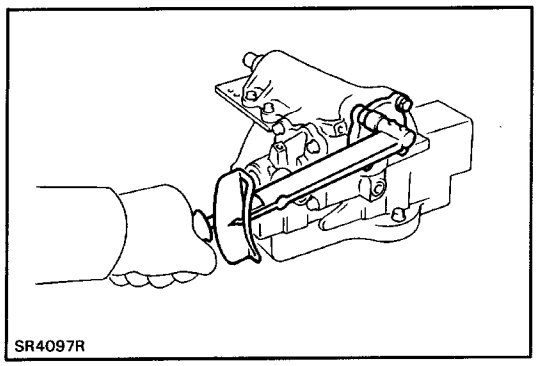
(a) Install a new O–ring on the end cover.

(b) Using a screwdriver, assemble the cross shaft to the end cover.

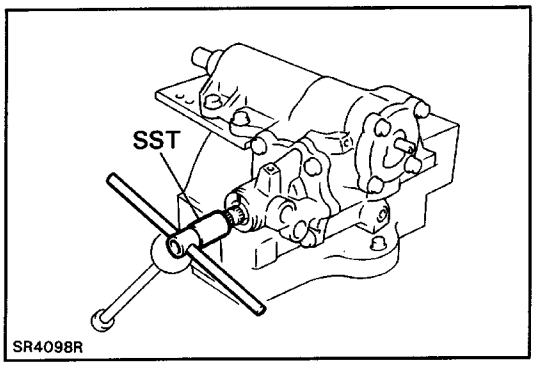
HINT: Fully loosen the adjusting screw.



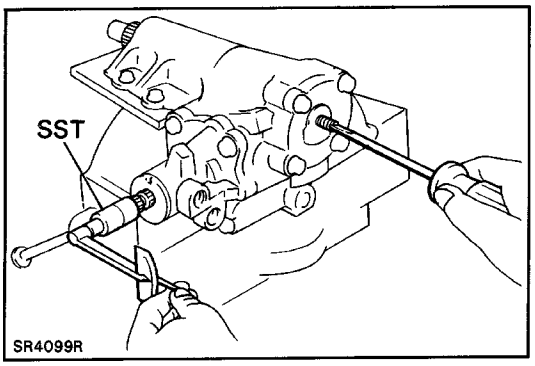
(c) Set the worm gear at the center of the gear housing.
(d) Install and push the cross shaft into the gear housing so that the center teeth mesh together.



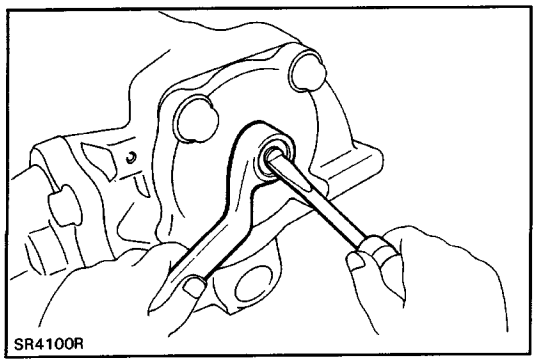
(e) Install the four cap bolts. Torque the bolts in a diagonal pattern.
Torque: 61 N–m (620 kgf–cm, 45 ft–lbf)



4. DETERMINE CENTER POSITION OF GEAR HOUSING
(a) Using SST, turn the worm shaft so full lock in both directions and determine the exact center.
SST 09616–00010
(b) Place matchmarks on the worm shaft and housing to show neutral position.



5. ADJUST CROSS SHAFT ADJUSTING SCREW
(a) Install SST with a torque meter on the worm shaft.
SST 09616–00010
(b) Turn the adjusting screw while measuring the preload until it is correct.
Total preload: (at starting)
0.74 – 1.08 N–m
(7.5 – 11 kgf –cm, 6.5 – 9.6 in.–lbf)

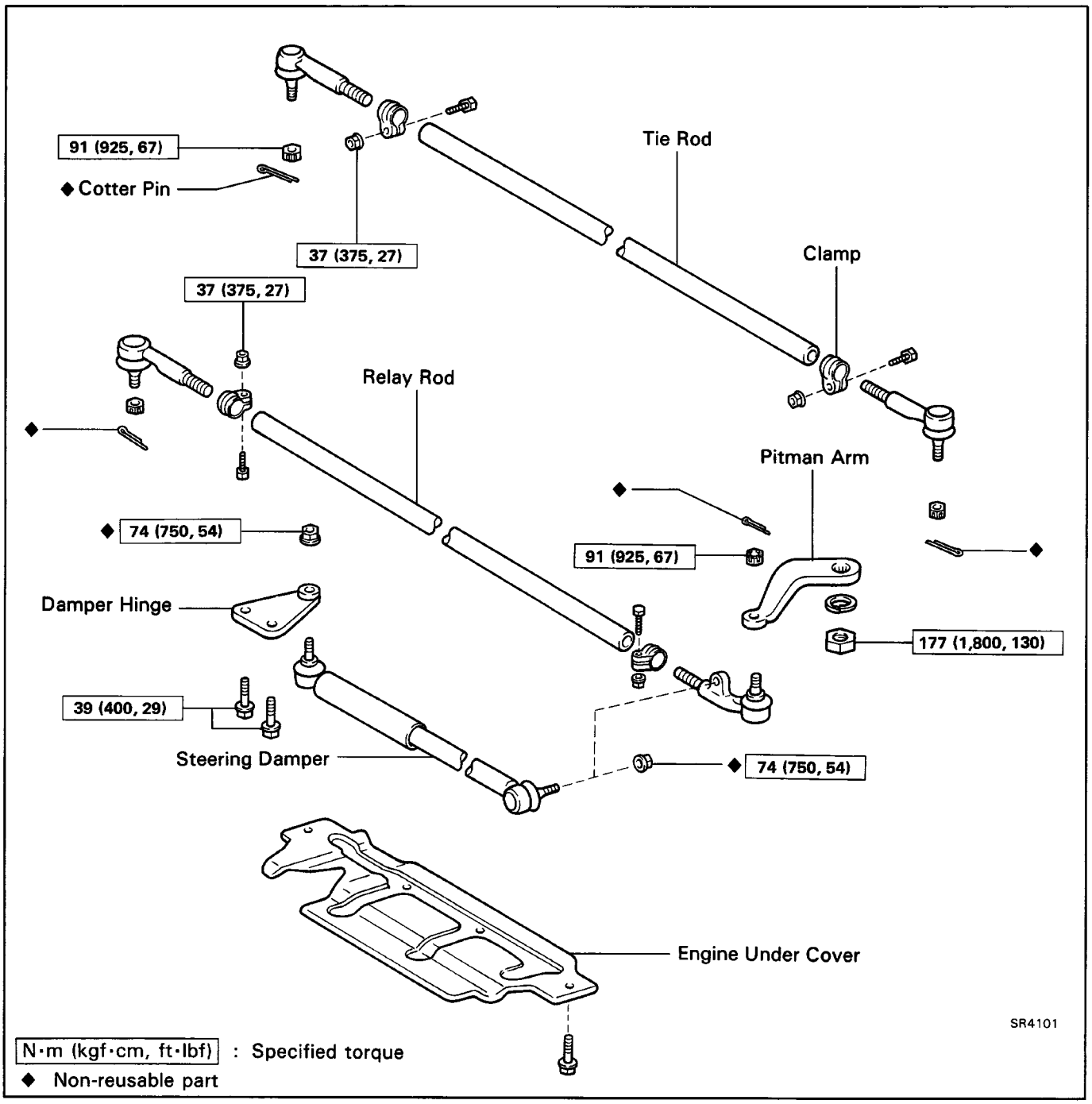


6. INSTALL NEW WASHER
7. INSTALL AND TIGHTEN LOCK NUT
Torque the lock nut while holding the adjusting screw.
Torque: 46 N–m (470 kgf–cm, 34 ft–lbf)
8. CHECK TOTAL PRELOAD

STEERING LINKAGE

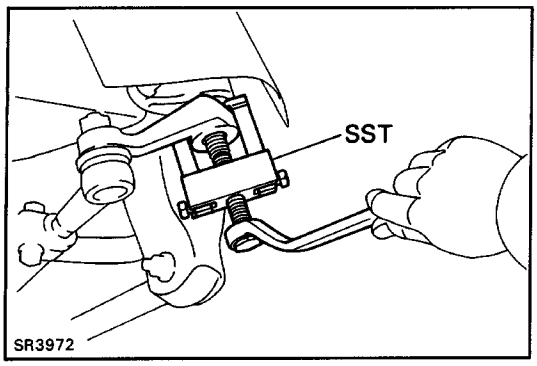
REMOVAL AND INSTALLATION OF STEERING LINKAGE

Remove and install the parts as shown.



HINT:

- When connecting the ball stud to the arm or rod, remove the grease on the joint surfaces.
- After torquing the ball stud nut to specified torque, advance the nut just enough to insert the cotter pin.
- After installing any of the steering linkage components, check the front wheel alignment.
(See page SA–3)

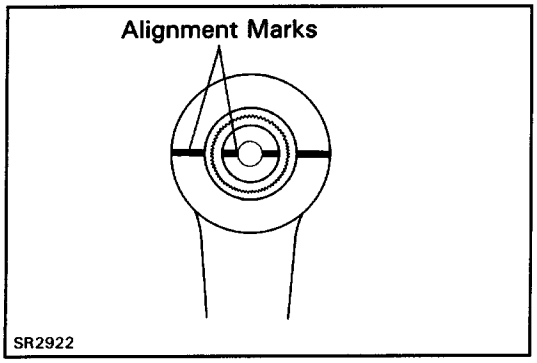


(MAIN POINTS OF REMOVAL AND INSTALLATION)

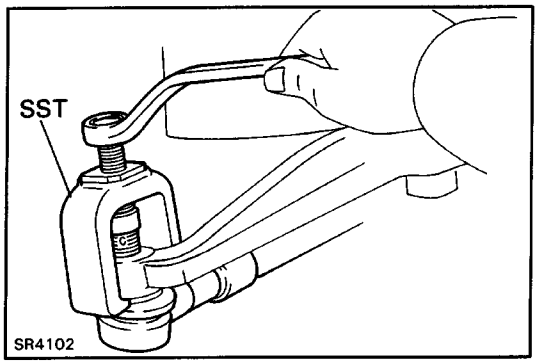
1. DISCONNECT AND CONNECT PITMAN ARM FROM/TO SECTOR SHAFT

(a) Loosen the pitman arm nut.

(b) Using SST, disconnect pitman arm from sector shaft.
SST 09628–62011

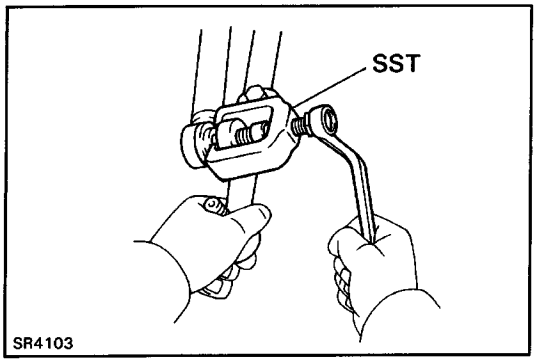


(c) When connecting, align the alignment marks on the pitman arm and the sector shaft, and install the spring washer and nut.



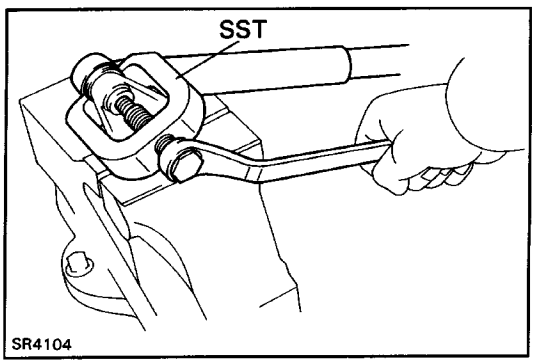
2. DISCONNECT RELAY ROD FROM PITMAN ARM

Using SST, disconnect the pitman arm from the relay rod.
SST 09611–22012



3. DISCONNECT STEERING DAMPER FROM RELAY ROD

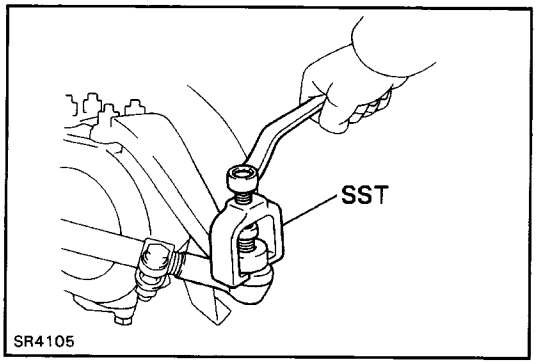
Using SST, disconnect the steering damper from the relay rod.
SST 09611–22012



4. DISCONNECT STEERING DAMPER FROM DAMPER HINGE

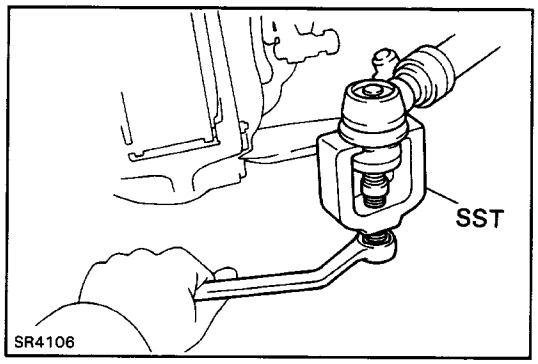
(a) Remove the damper with hinge.

(b) Using SST, disconnect the damper from the hinge.
SST 09610–55012



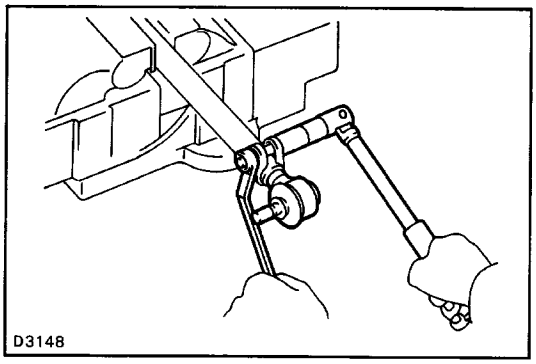
5. DISCONNECT RELAY ROD FROM KNUCKLE ARM

Using SST, disconnect relay rod from knuckle arm.
SST 09611–22012



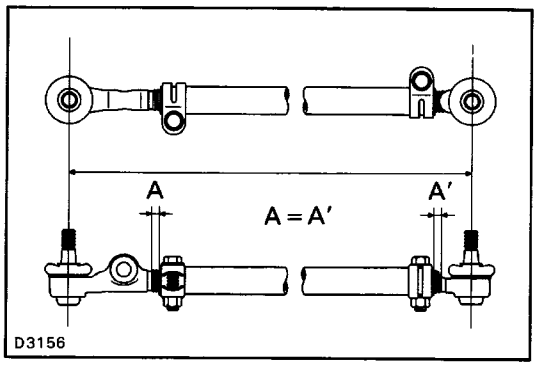
6. DISCONNECT TIE ROD FROM KNUCKLE ARM

Using SST, disconnect tie rod from knuckle arm.
SST 09611–22012



7. IF NECESSARY, REPLACE TIE OR RELAY ROD END

(a) Loosen the tie or relay rod end clamp and remove the tie rod end.

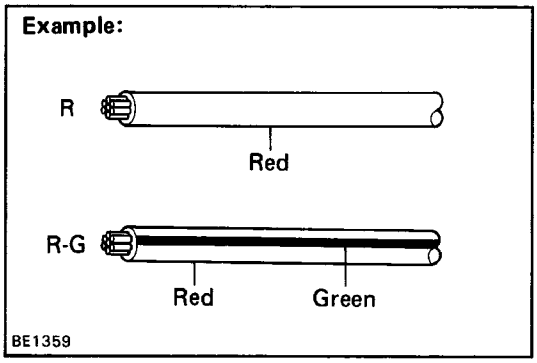


(b) Turn the rod ends equal amounts into the rod tube. Tie rods should be approximately 1,207 mm (47.51 in.). Relay rods should be approximately 1,076 mm (42.34 in.).

(c) The remaining length of threads on both tie rod ends should be equal.

(d) Temporarily tighten the tie rod end clamp.

BODY ELECTRICAL SYSTEM



GENERAL INFORMATION

Wiring Color Code

Wire colors are indicated by an alphabetical code.

B = Black	L = Blue	R = Red
BR = Brown	LG = Light Green	V = Violet
G = Green	O = Orange	W = White
GR = Gray	P = Pink	Y = Yellow

The first letter indicates the basic wire color and the second letter indicated the color of the stripe.

Connector

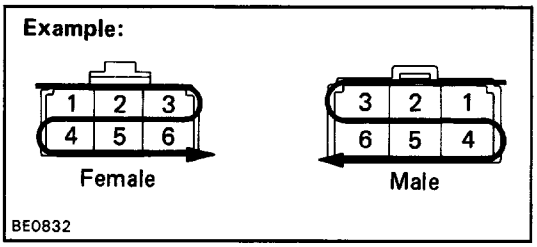
1. PIN NUMBER OF FEMALE CONNECTOR

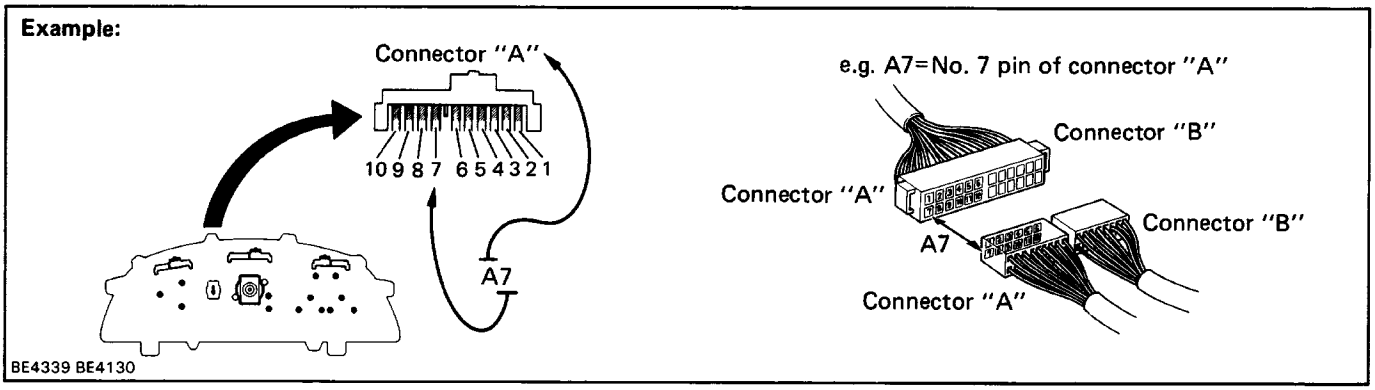
Numbered in order from upper left to lower right.

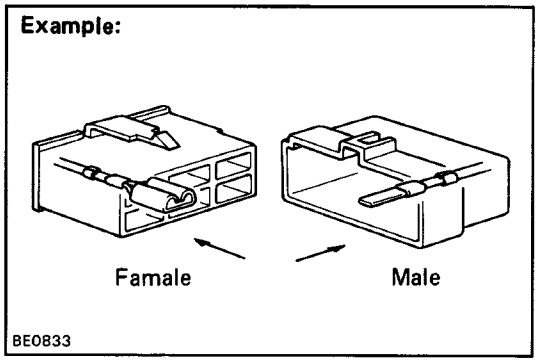
2. PIN NUMBER OF MALE CONNECTOR

Numbered in order from upper right to lower left.

HINT: When connectors with different or the same number of terminals are used with the same parts, each connector name (letter of the alphabet) and pin number is specified.







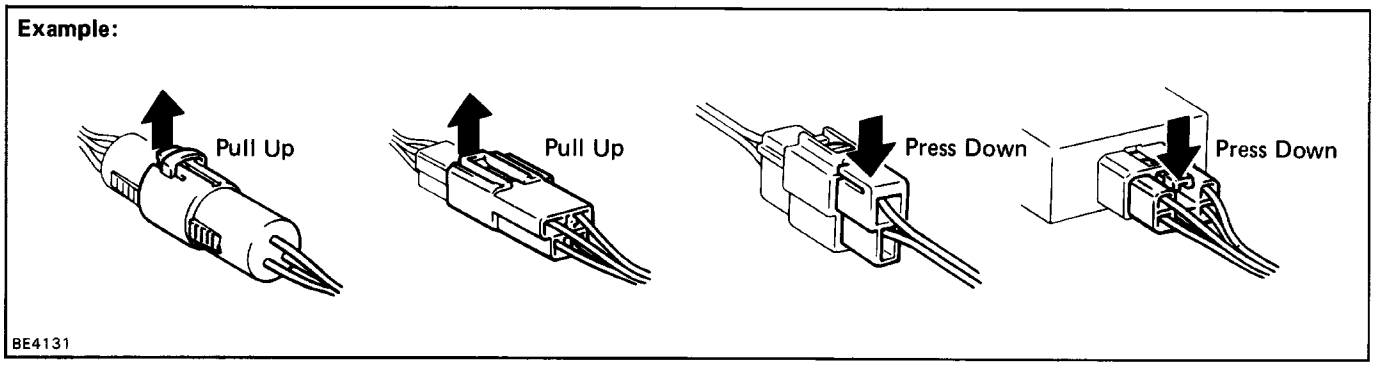
3. DISTINCTION OF MALE AND FEMALE CONNECTORS

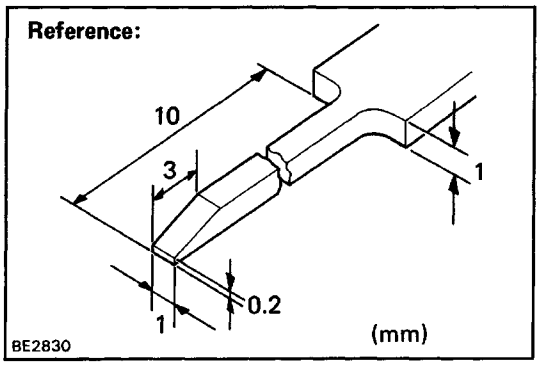
Male and female connectors are distinguished by shape of their internal pins.

(a) All connectors are shown from the open end, and the lock is on top.

(b) To pull apart the connectors, pull on the connector itself, not the wires.

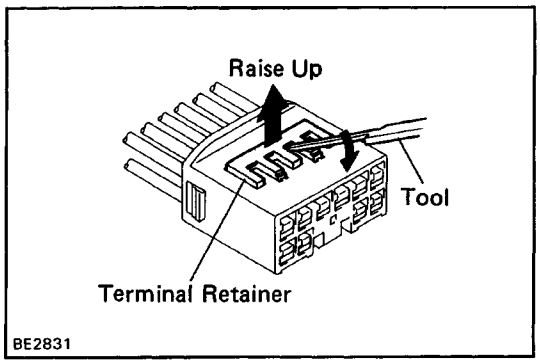
HINT: Check to see what kind of connector you are disconnecting before pulling apart.





How to Replace Terminal
(with Terminal Retainer Type)

HINT: To remove the terminal for this type of connec–tor, please construct and use the special tool or like ob–ject shown on the left.



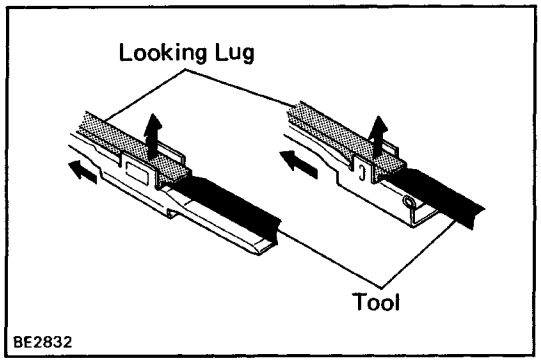
1. DISCONNECT CONNECTOR

Disconnect the connector according to the instructions on BE–2.

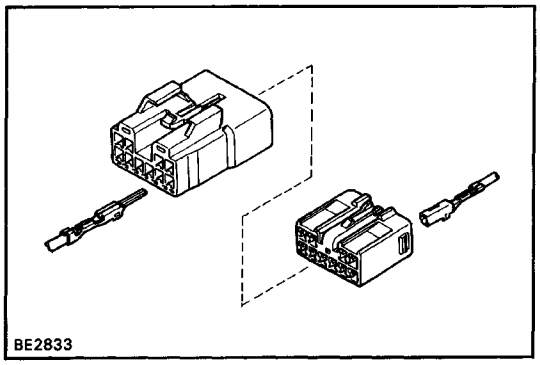
2. DISCONNECT TERMINAL FROM CONNECTOR

(a) Using the special tool, raise the retainer up to the tem–porary lock position.

HINT: The needle insertion position varies according to the connector's shape (number of terminals, etc.), so check the position before inserting it.



(b) Using the special tool, release the locking lug and pull the terminal out from rear.

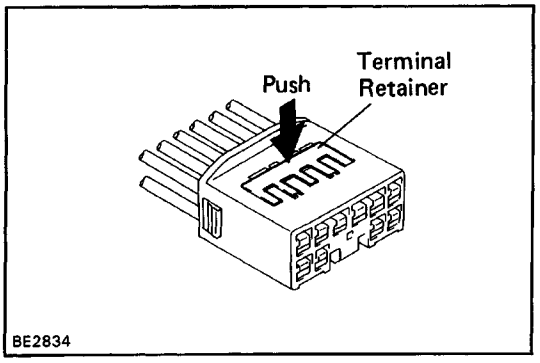


3. INSTALL TERMINAL TO CONNECTOR

(a) Insert the terminal.

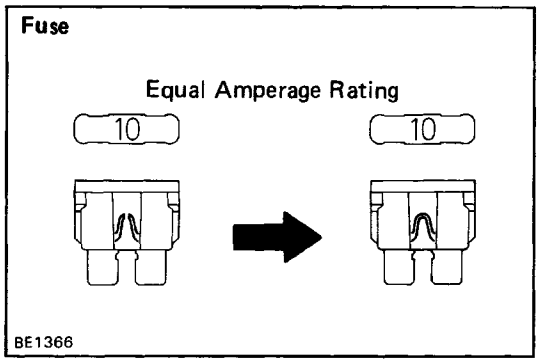
HINT:

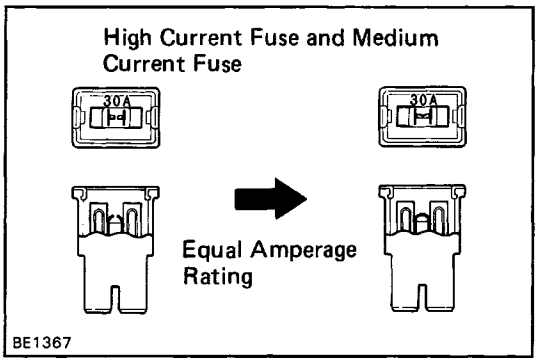
1. Make sure the terminal is positioned correctly.
2. Insert the terminal until the locking lug locks firmly.
3. Insert the terminal with retainer in the temporary lock position.

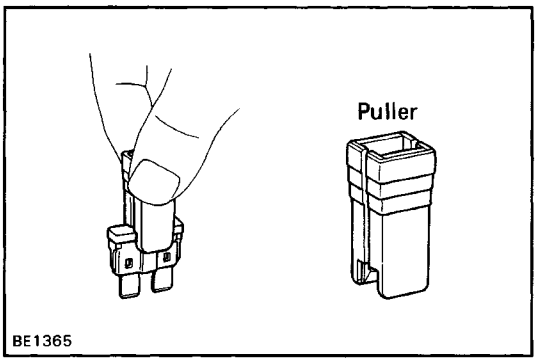


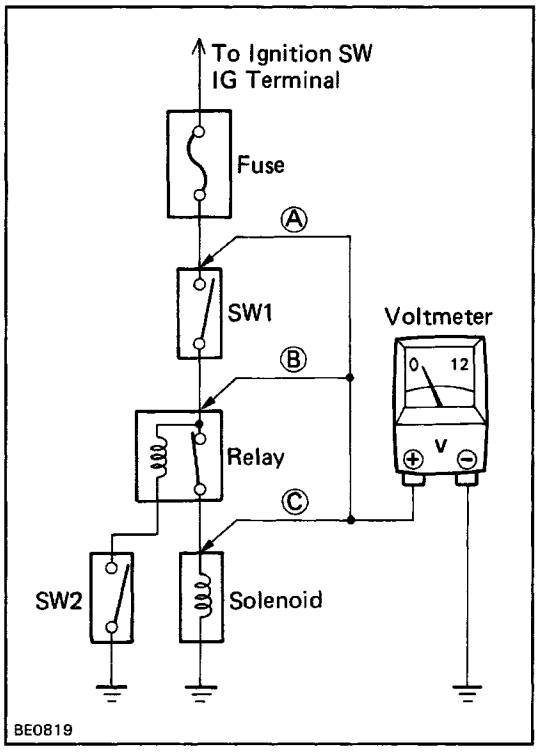
(b) Push the retainer in as far as the full lock position.

4. CONNECT CONNECTOR









Replacement of High Current Fuse and Medium Current Fuse and Fuse

HINT: If replacing the fuse, be sure to replace it with a fuse with an equal amperage rating.

NOTICE:

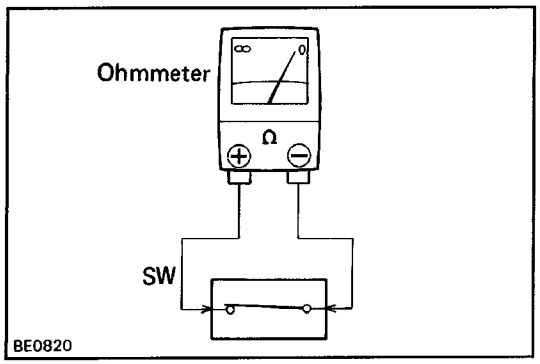
1. **Turn off all electrical components and the ignition switch before replacing a fuse or fusible link. Do not exceed the fuse or fusible link amperage rating.**
2. **Always use a fuse puller for removing and inserting a fuse. Remove and insert straight in and out without twisting. Twisting could force open the terminals too much, resulting in a bad connection.**

If a fuse or fusible link continues to blow, a short circuit is indicated. The system must be checked by a qualified technician.

Check for Voltage

(a) Establish conditions in which voltage is present at the check point.
Example:
(A) – Ignition switch on
(B) – Ignition switch and switch 1 (SW1) on.
(C) – Ignition switch, switch 1 (SW1) and relay on (switch 2 (SW2) off).

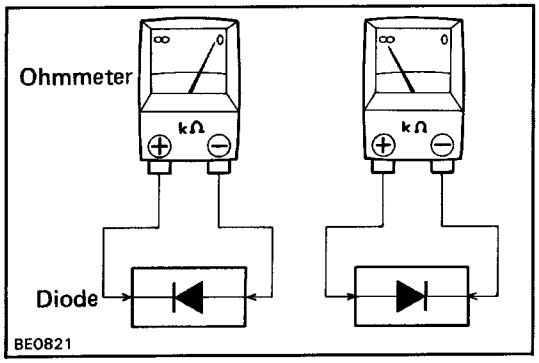
(b) Using a voltmeter, connect the negative (–) lead to a good ground point or negative (–) battery terminal and the positive (+) lead to the connector or compo–nent terminal. This check can be done with a test bulb instead of a voltmeter.



Check for Continuity and Resistance

(a) Disconnect the battery terminal or wire so there is no voltage between the check points.

(b) Contact the two leads of an ohmmeter to each of the check points.

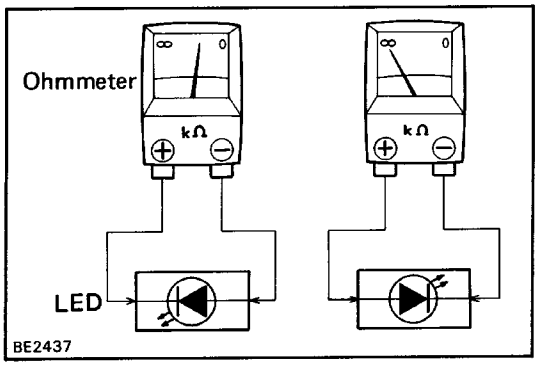


If the circuit has diodes, reverse the two leads and check again.

When contacting the negative (–) lead to the diode positive (+) side and the positive (+) lead to the negative (–) side, there should be continuity.

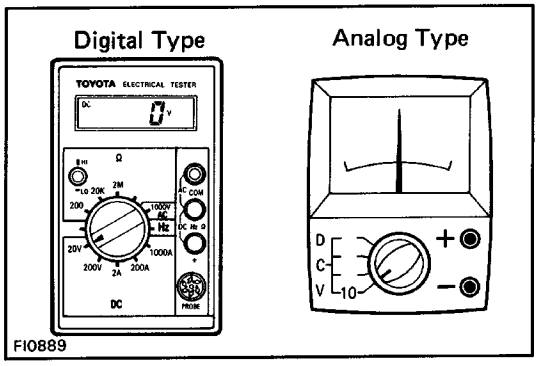
When contacting the two leads in reverse, there should be on continuity.

HINT: Specifications may vary depending on the type of tester, so refer to the tester's instruction manual before performing the inspection.

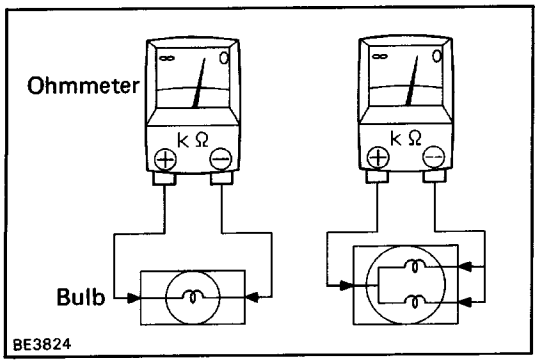


Check LED (Light Emitting Diode) in the same manner as that for diodes.

- Use a tester with a power source of 3V or greater to overcome the circuit resistance.
- If a suitable tester is not available, apply battery voltage and check that the LED that the LED lights up.



(c) Use a volt/ohmmeter with high impedance (10 k/V minimum) for troubleshooting of the electrical circuit.



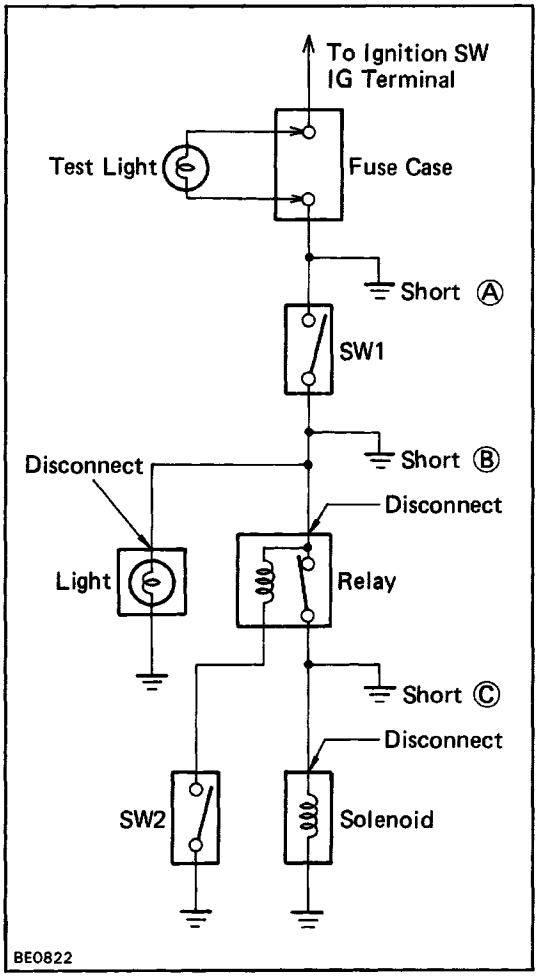
Check the Bulb

(a) Remove the bulb.

(b) There should be continuity between the respective terminals of the bulb together with a certain amount of resistance.

(c) Apply the two leads of the ohmmeter to each of the terminals.

(d) Apply battery voltage and check that the bulb light up.



Check for Short Circuit

(a) Remove the blown fuse and eliminate all loads from the fuse.

(b) Connect a test bulb in place of the fuse.

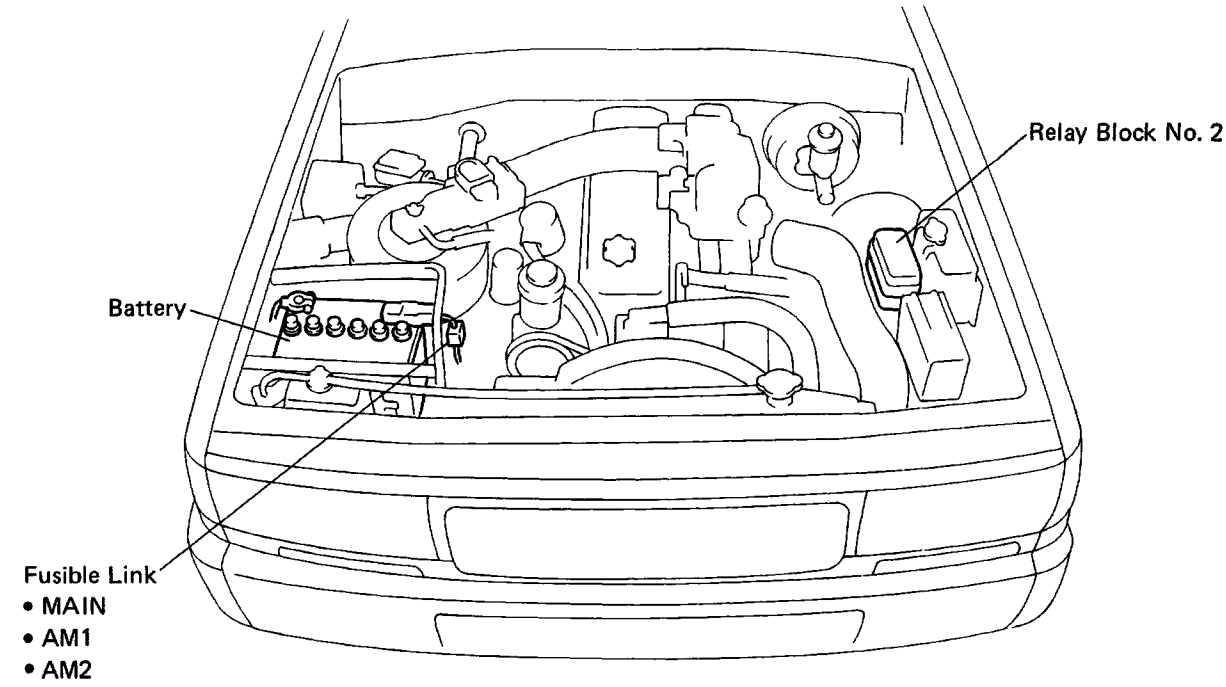
(c) Establish conditions in which the test bulb comes on.
Example:
(A) – Ignition switch on.
(B) – Ignition switch and switch 1 (SW1) on.
(C) – Ignition switch, switch 1 (SW1) and relay on (connect the relay) and switch 2 (SW2) off (or disconnect switch 2 (SW2)).

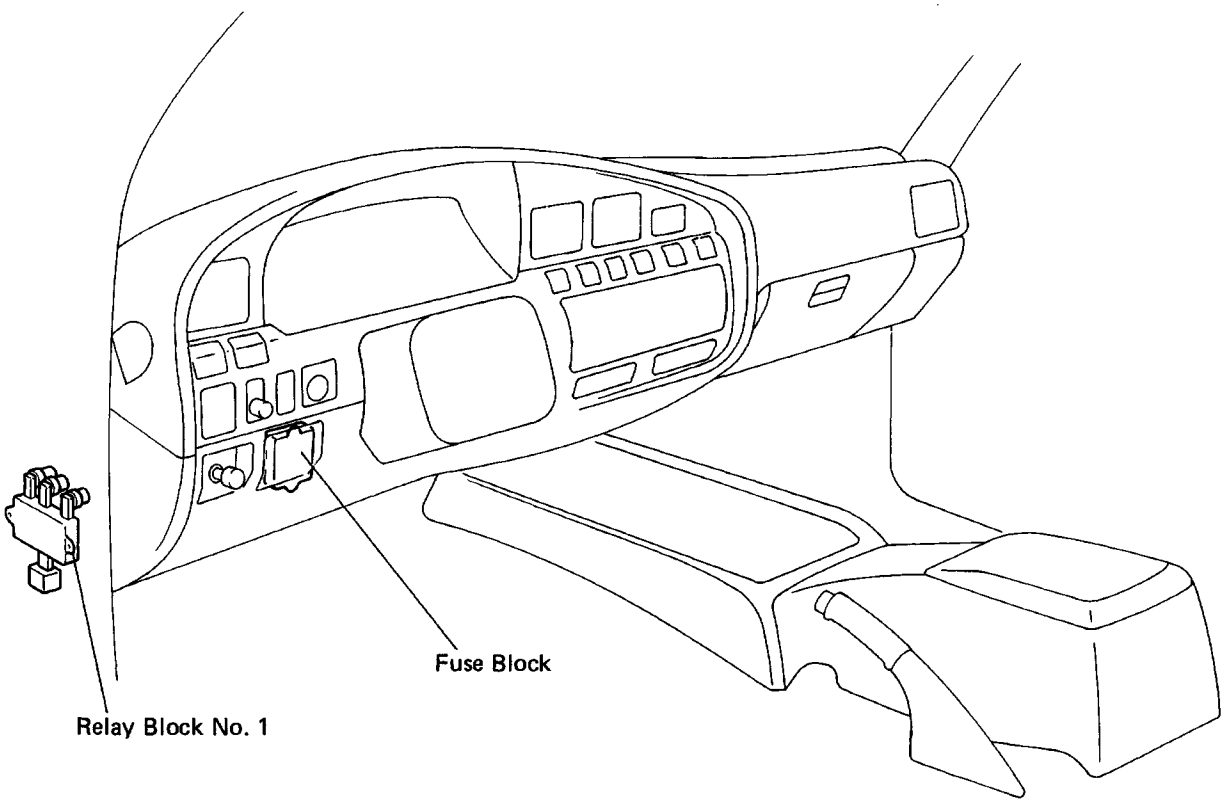
(d) Disconnect and reconnect the connectors while watching the test bulb.
The short lies between the connector where the test bulb stays lit and the connector where the bulb goes out.

(e) Find the exact location of the short by lightly shaking the problem wire along the body.

POWER SOURCE

Parts Location

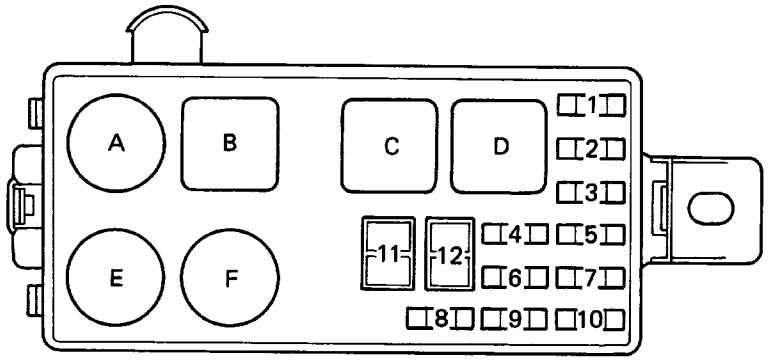




BE5072
BE5073

Parts Location (Cont'd)

Relay Block No. 2 (Engine Roomy



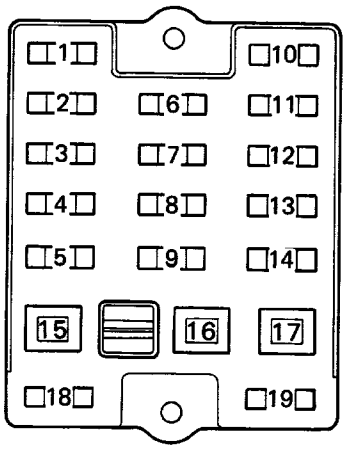
Fuse and High Current Fuses

1.	HEAD (RH)	15A	7.	HAZ-HORN	15A
2.	HEAD (LH)	15A	8.	–	
3.	–		9.	–	
4.	CHARGE	7.5A	10.	DOME	10A
5.	–		11.	AM1	50A
6.	EFI	15A	12.	–	

Relays

A. EFI Main Relay
B. Charge Light Relay
C. Headlight Control Relay
D. –
E. Horn Relay
F. –

Fuse Block (Instrument Panel)



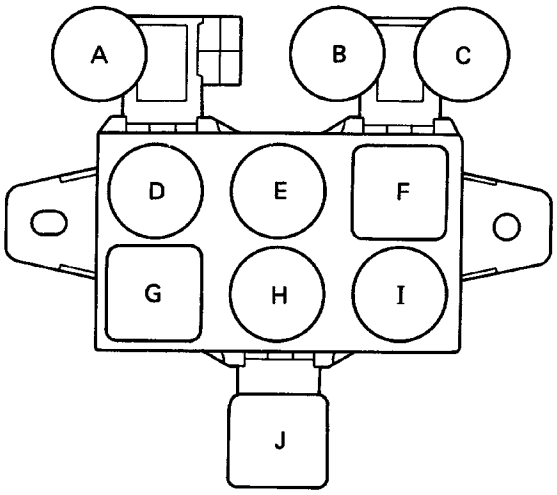
Fuse and Medium Current Fuse

1.	CIG	15A	10.	ECU-B	10A
2.	TAIL	15A	11.	REAR-HTR	20A
3.	–		12.	IGN	7.5A
4.	STOP	10A	13.	A/C	10A
5.	DEFOG	20A	14.	DIFF	20A
6.	WIPER	20A	15.	–	
7.	GAUGE	10A	16.	HEATER	30A
8.	TURN	7.5A	17.	POWER	30A
9.	ECU-IG	15A	18.	Spear	
			19.	Spear	

BE4989
BE4988

Parts Location (Cont'd)

Relay Block No. 1 (Cowl Side)

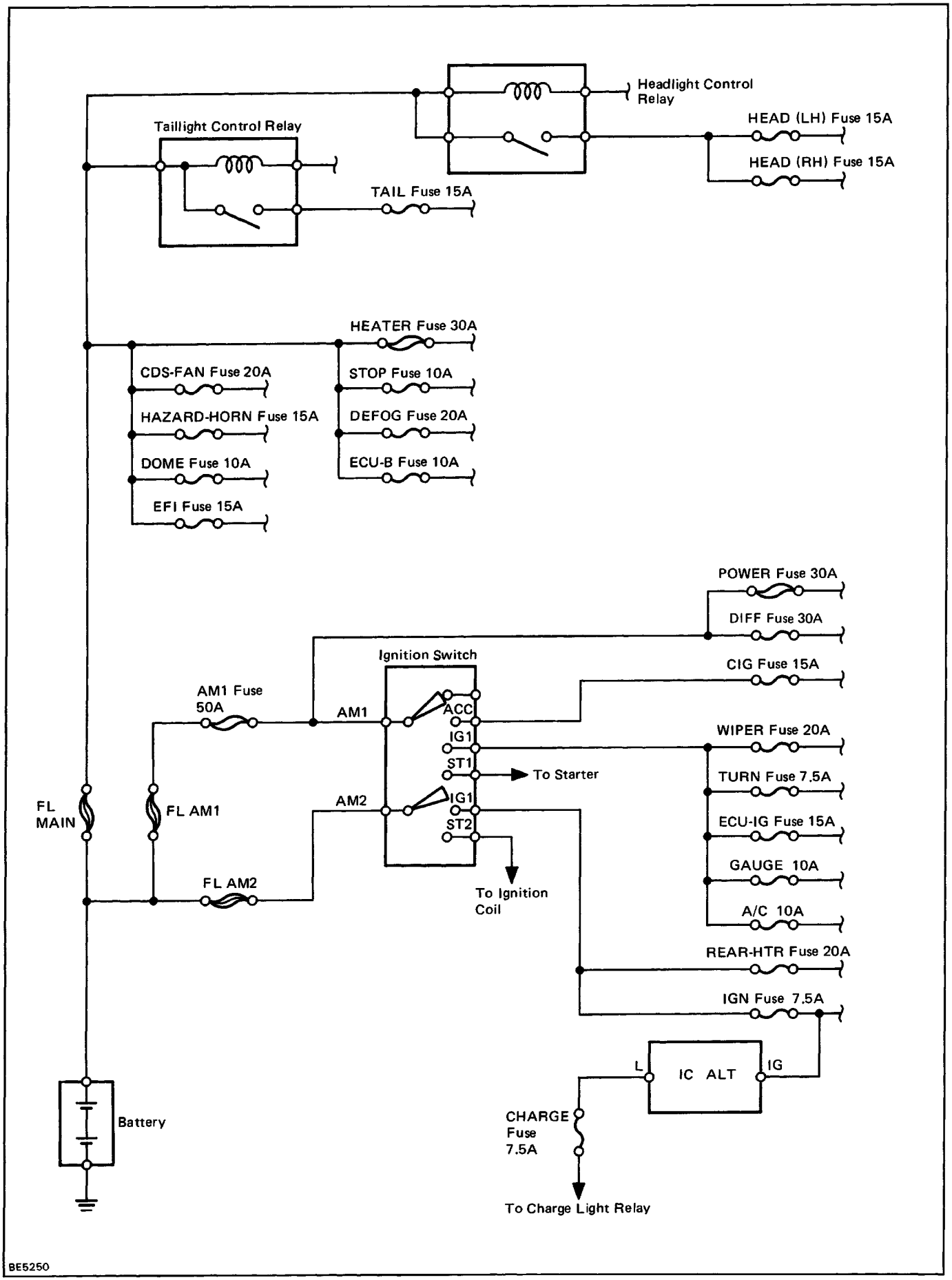


Relay

A. Cooling Fan Relay
B. Blower Hi Relay
C. –
D. Defogger Relay
E. Power Main Relay
F. Turn Signal Flasher
G. Heater Relay
H. Taillight Control Relay
I. –
J. Circuit Opening Relay

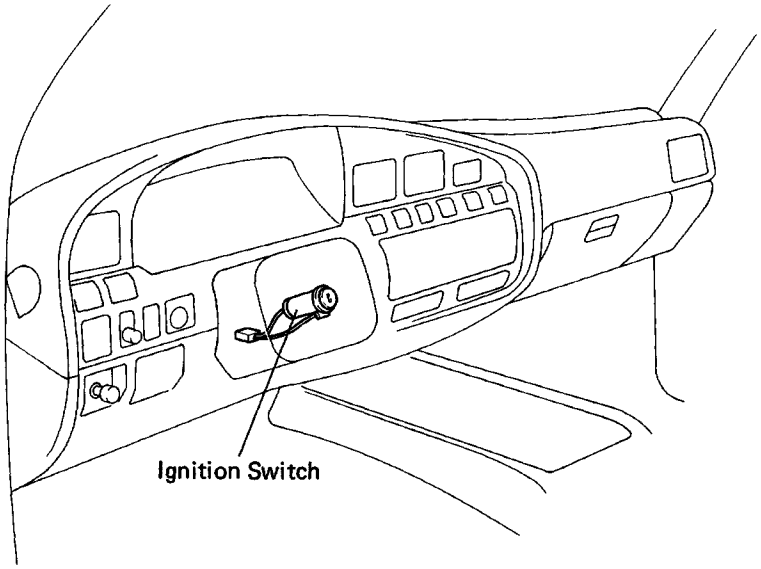
BE4987

Wiring Diagram



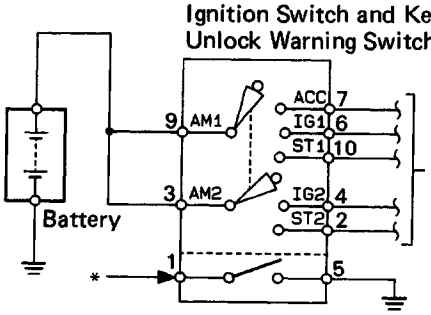
IGNITION SWITCH

Parts Location



BE5075

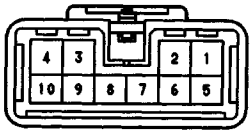
Wiring and Connector Diagrams



*: From Door Lock Control Relay and Seat Belt Warning Relay

Refer to BE–10.

Ignition Switch



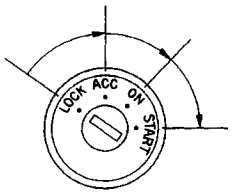
BE4996 e-10-2-B

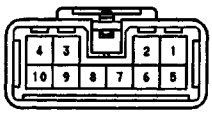
The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

Parts Inspection

Ignition System

INSPECT SWITCH (Ignition Switch/Continuity)





BE3582 e-10-2-B

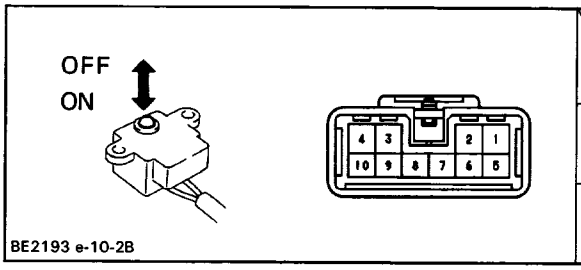
Terminal / Switch position	2	3	4	6	7	9	10
LOCK							
ACC					○—○		
ON		○—○		○—○	○—○		
START	○—○	○—○	○—○	○—○		○—○	○—○

If continuity is not as specified, replace the switch.

Key Confine Prevention System

1. INSPECT SWITCHES

(Key Unlock Warning Switch/Continuity)



Terminal / Switch position	1	5
OFF (Ignition Key removed)		
ON (Ignition Key set)	○———	———○

(Door Courtesy Switch/Continuity)

See Step 2 on page BE–44.

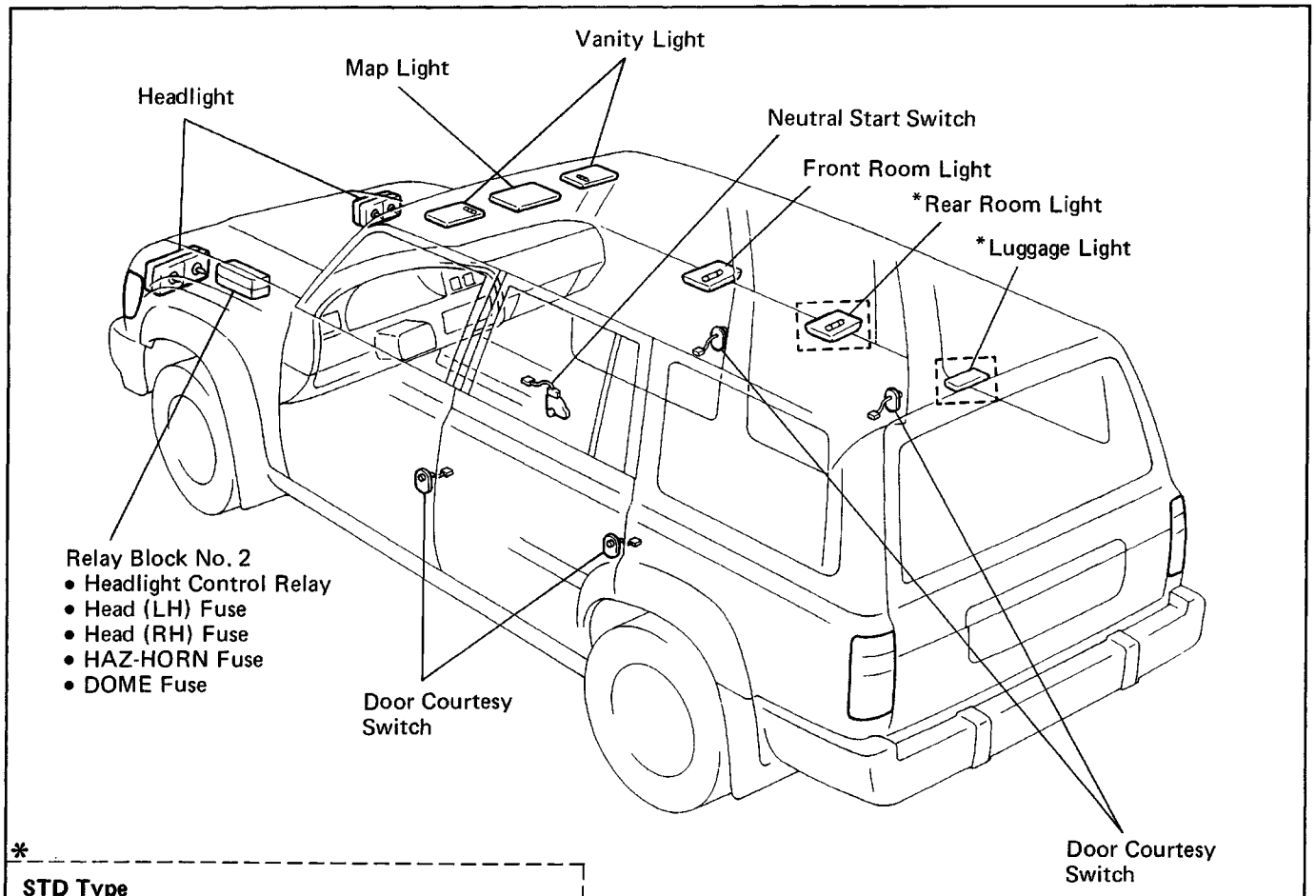
If continuity is not as specified, replace the switch.

2. INSPECT RELAY

See seat belt warning relay on page BE–44.

LIGHTING SYSTEM

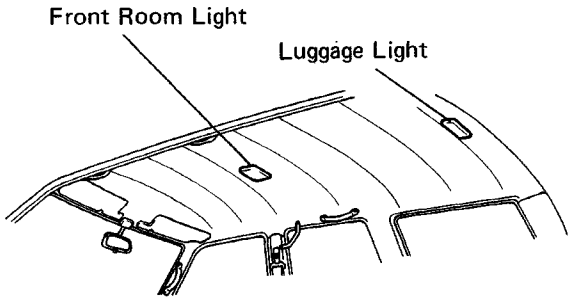
Parts Location



N03152

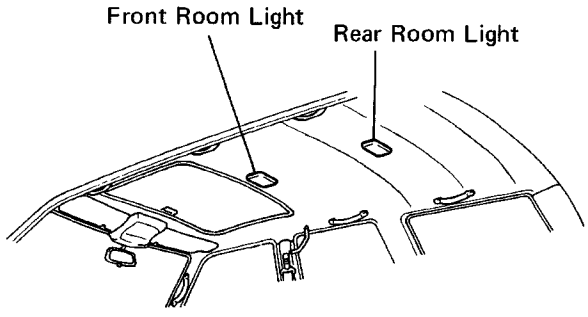
*

STD Type

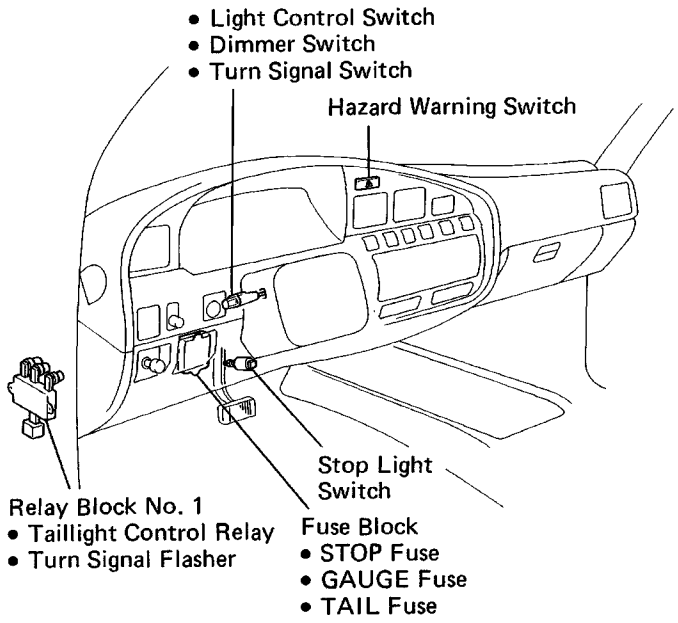


N03150

w/ No. 2 Rear Seat

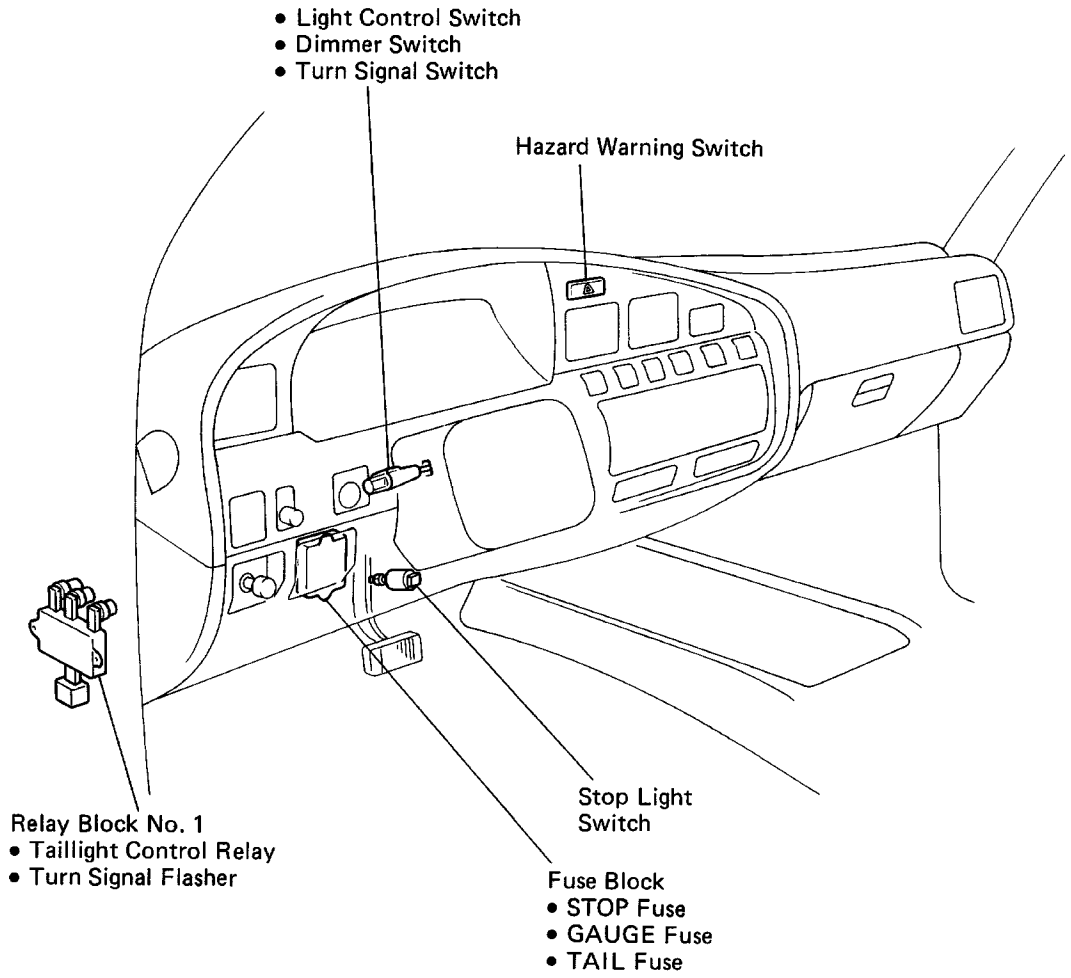


N03151



BE5218

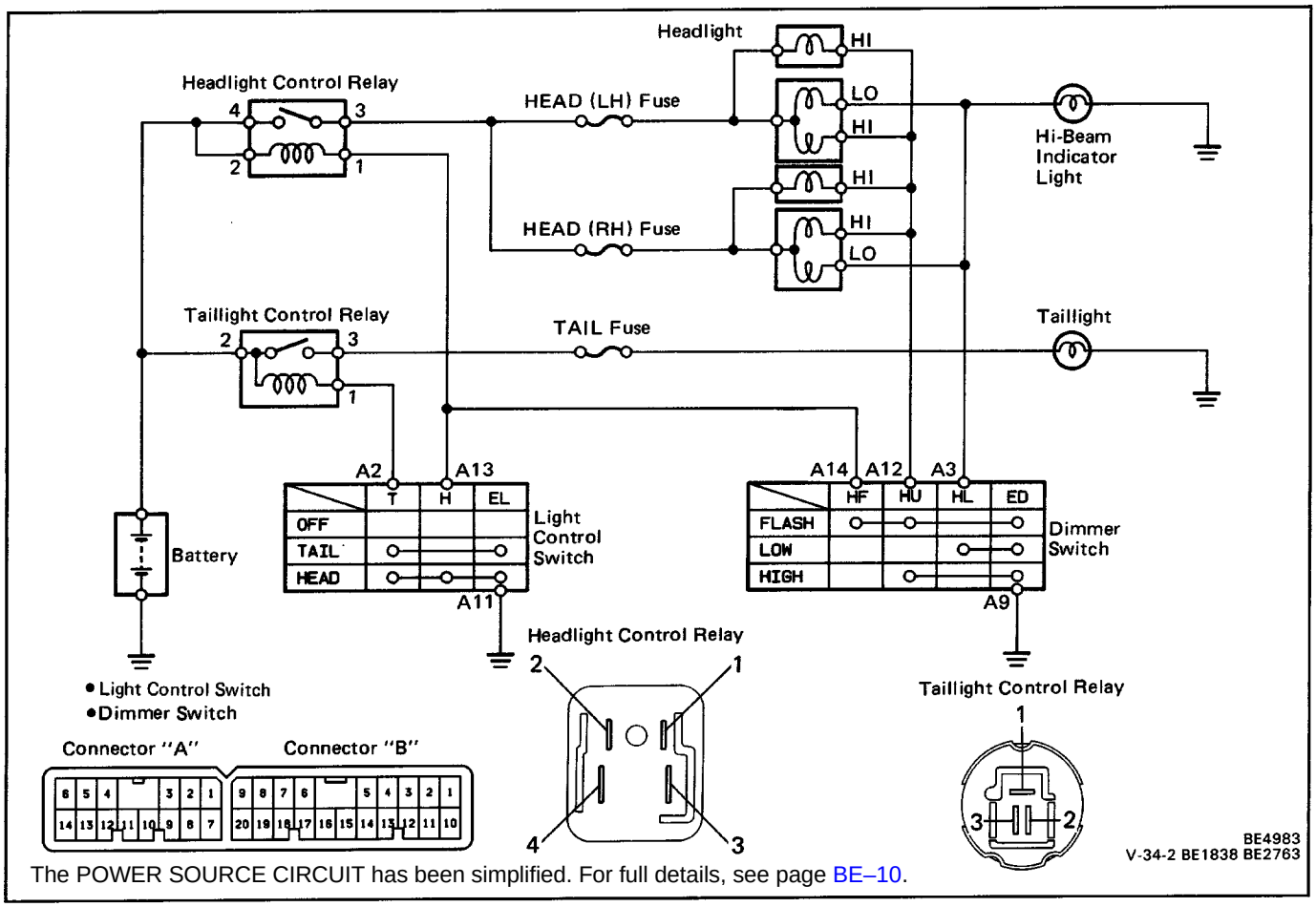
Parts Location (Cont'd)



BE5218

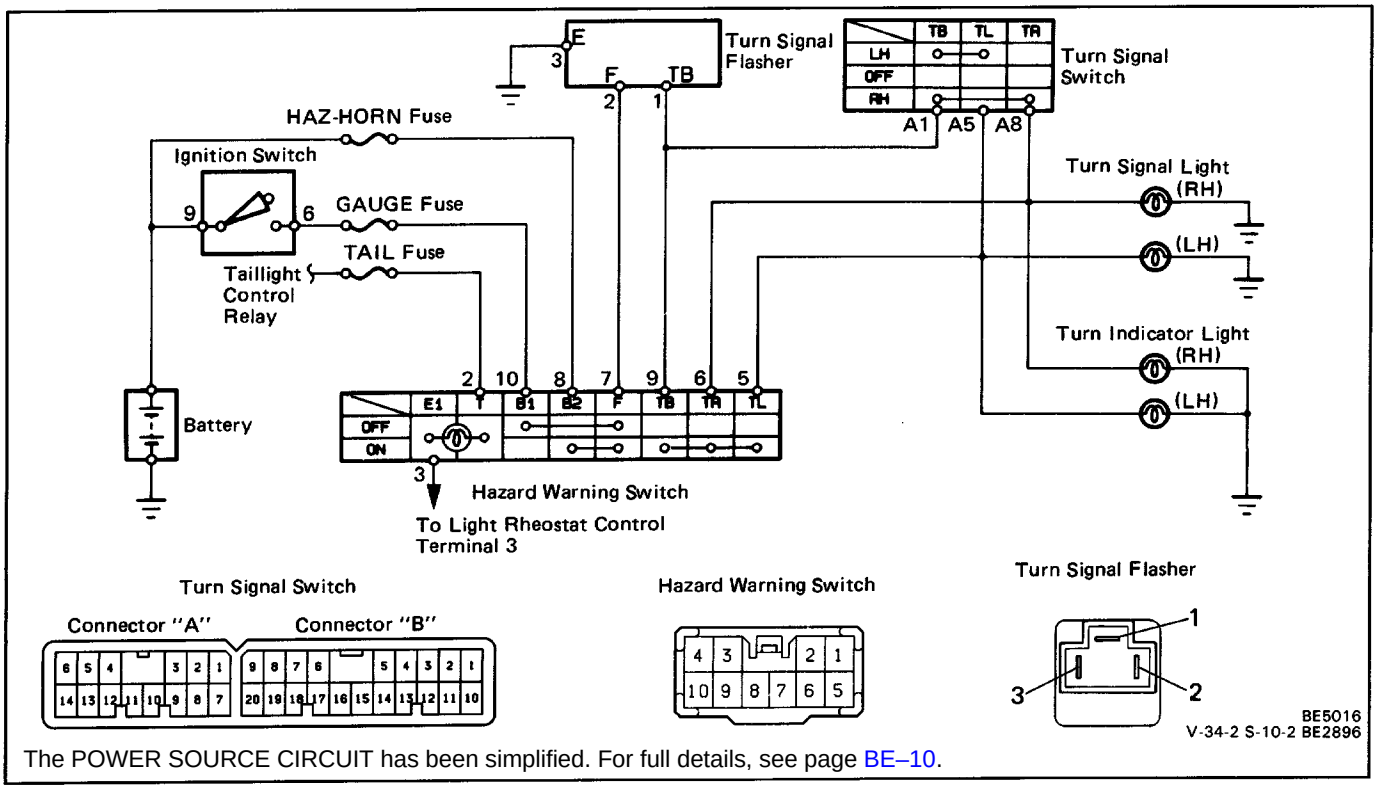
Wiring and Connector Diagrams

(Headlight and Taillight System)



The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

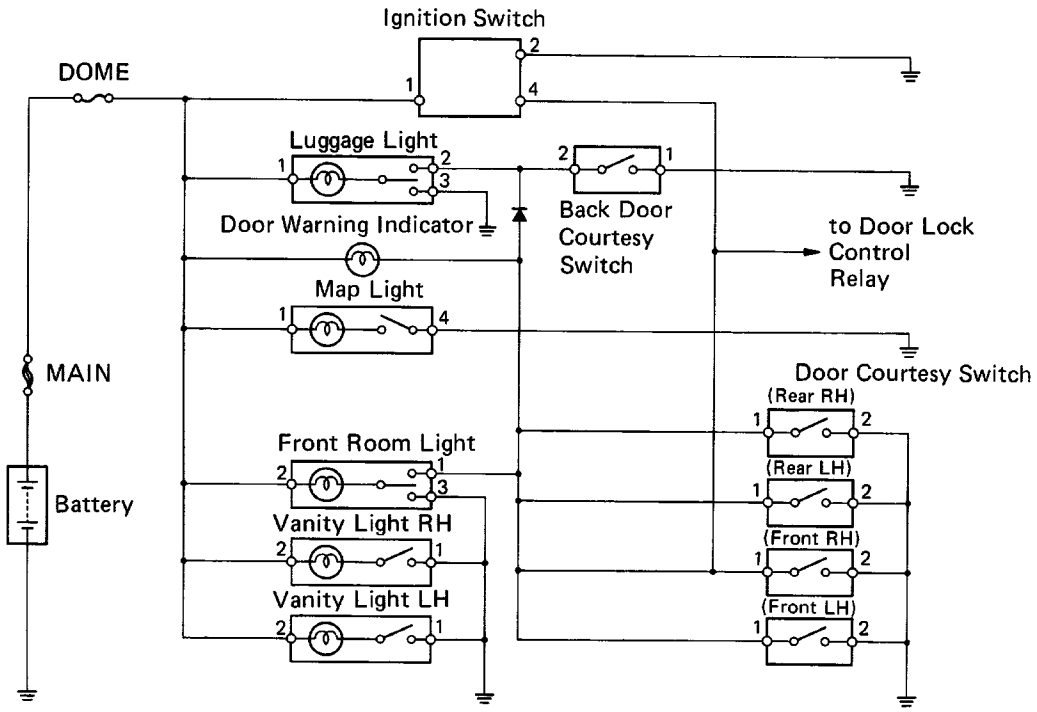
(Turn Signal and Hazard Warning System)



The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

(Interior Light System)

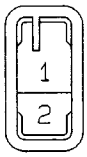
(STD)



Door Courtesy Switch

Map Light

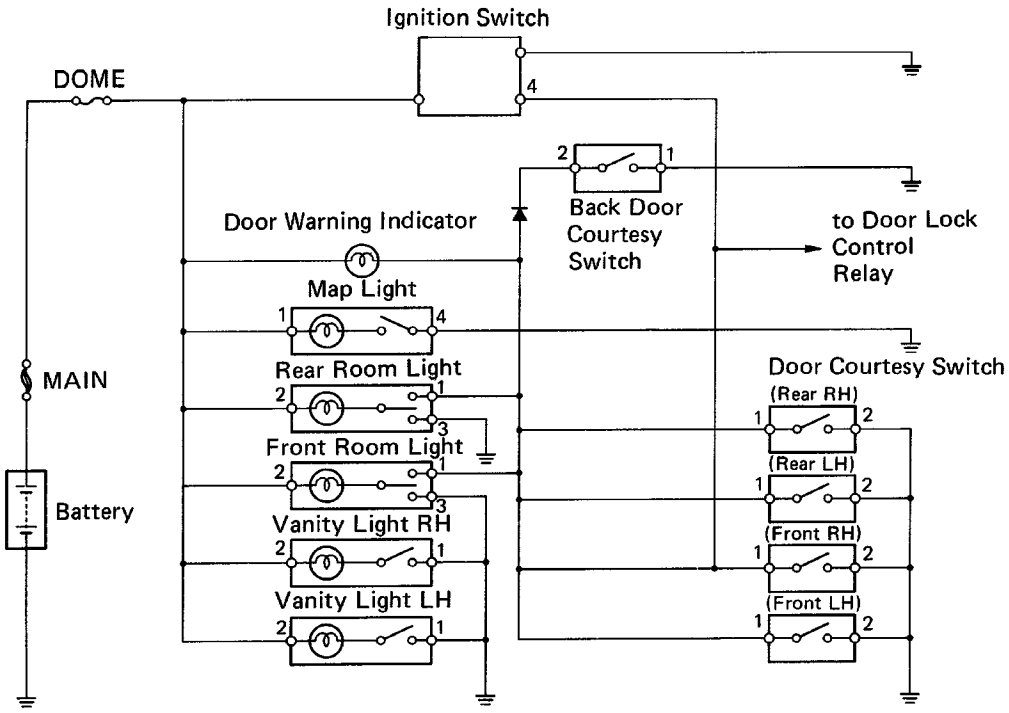
Room Light



N03153
S-1-1-B S-6-2-B BE4123

The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

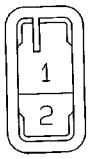
(With No. 2 Rear Seat)



Door Courtesy Switch

Map Light

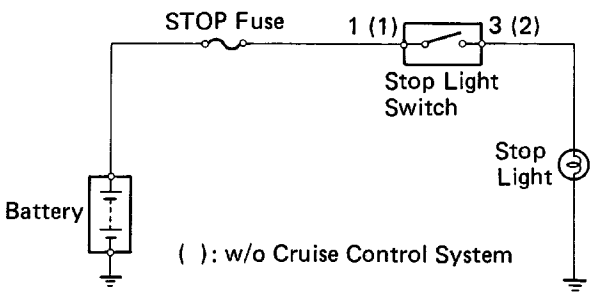
Room Light

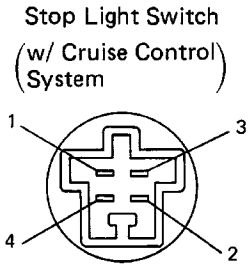


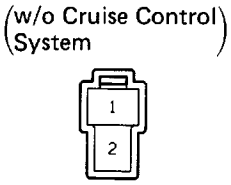
N03154
S-1-1-B S-6-2-B BE4123

The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

(Stop Light System)



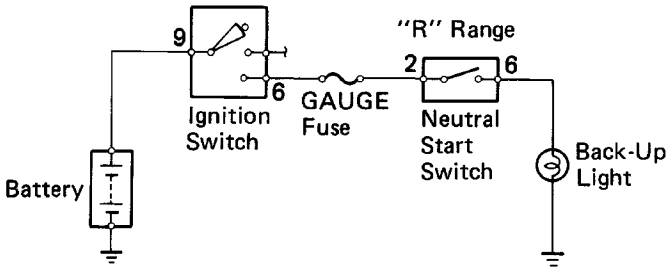


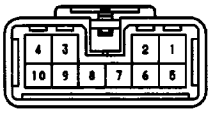


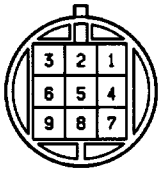
BE4985 BE5756 H-2-2

The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

(Back–Up Light System)







BE4984 e-10-2B 1H-9-2

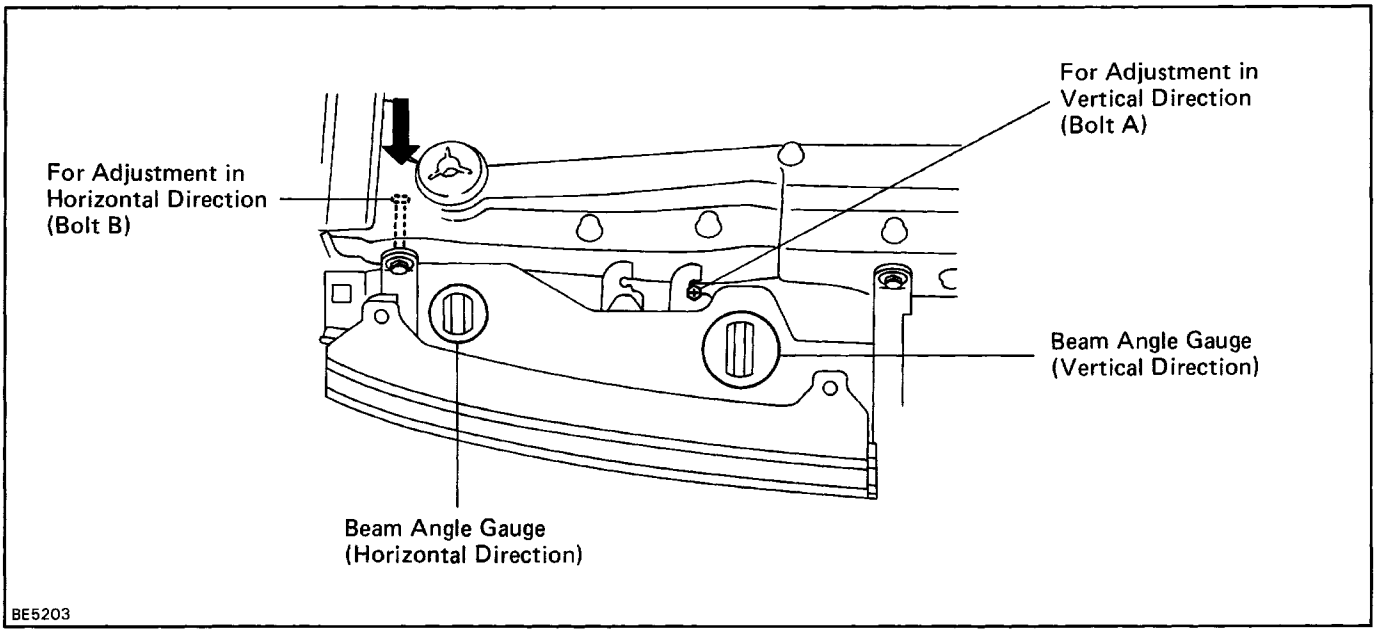
The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

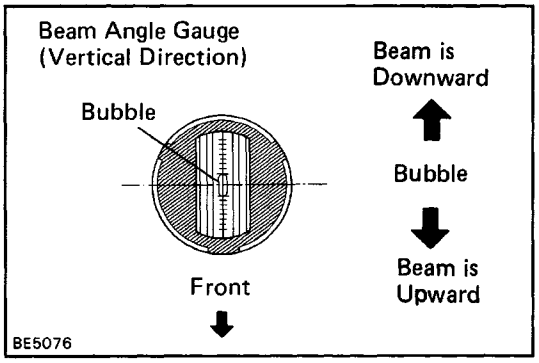
Troubleshooting

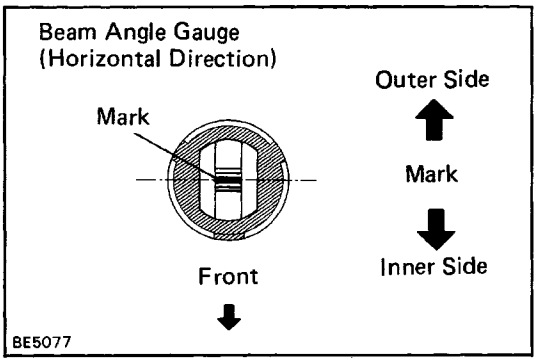
Problem	Possible cause	Remedy	Page
Only one light does not light up	Light bulb burned out Socket, wire or ground faulty	Replace bulb Repair as necessary	
Headlight do not light up	HEAD fuse blown Headlight control relay faulty Light control switch faulty Dimmer switch faulty Wiring or ground faulty	Replace fuse and check for short Check relay Check switch Check switch Repair as necessary	BE–4, BE–6 BE–23 BE–23 BE–23
Head beam headlights or headlight flashers do not operate	Light control switch faulty Dimmer switch faulty Wiring or ground faulty	Check switch Check switch Repair as necessary	BE–23 BE–23
Tail, parking and license light do not light up	TAIL fuse blown Taillight control relay faulty Light control switch faulty Wiring or ground faulty	Replace fuse and check for short Check Relay Check switch Repair as necessary	BE–4, BE–6 BE–23 BE–23
Stop lights do not light up	STOP fuse blown Stop light switch faulty Wiring or ground faulty	Replace fuse and check for short Adjust or replace switch Repair as necessary	BE–4 BE–24, BR–6
Stop lights stay on	Stop light switch faulty	Adjust or replace switch	BE–24, BR–6
Combination meter lights do not light up (taillights light up)	Light control rheostat faulty Wiring or ground faulty	Check rheostat Repair as necessary	BE–46
Turn signal does not flash on one side	Turn signal switch faulty Wiring or ground faulty	Check switch Repair as necessary	BE–23
Turn signals do not operate	TURN fuse blown Turn signal flasher faulty Turn signal switch faulty Hazard switch faulty Wiring or ground faulty	Replace fuse and check for short Check flasher Check switch Check switch Repair as necessary	BE–4, BE–6 BE–24 BE–23 BE–24
Hazard warning lights do not operate	HAZ–HORN fuse blown Turn signal flasher faulty Turn signal switch faulty Hazard switch faulty Wiring or ground faulty	Replace fuse and check for short Check flasher Check switch Check switch Repair as necessary	BE–4, BE–6 BE–24 BE–23 BE–24
Back–up light do not light up	GAUGE fuse blown Neutral start switch faulty Wiring or ground faulty	Replace fuse and check for short Check switch Repair as necessary	BE–4, BE–6 AT–25

Parts Adjustment

Adjustment of Headlight Aim







1. INSPECT HEADLIGHT AIM

Check the following items before inspection.

- Be sure that the body around the headlight is not deformed.
- Park the vehicle on a level spot.
- The driver gets into the driver's seat and puts the vehi–cle in a state ready for driving (with a full tank).
- Bounce the vehicle several times.

(Vertical Direction)

Check that the bubble of the gauge does not deviate from the center of the gauge.

(Horizontal Direction)

Check that the red mark does not deviate for the center of the gauge.

If the error is over the valve specified, adjust headlight aim.

2. ADJUST HEADLIGHT AIM

(Vertical Direction)

Turn the bolt A and adjust the bubble of angle gauge to center of the gauge.

HINT: The beam angle will change about 0˚11' with one mark.

(Horizontal Direction)

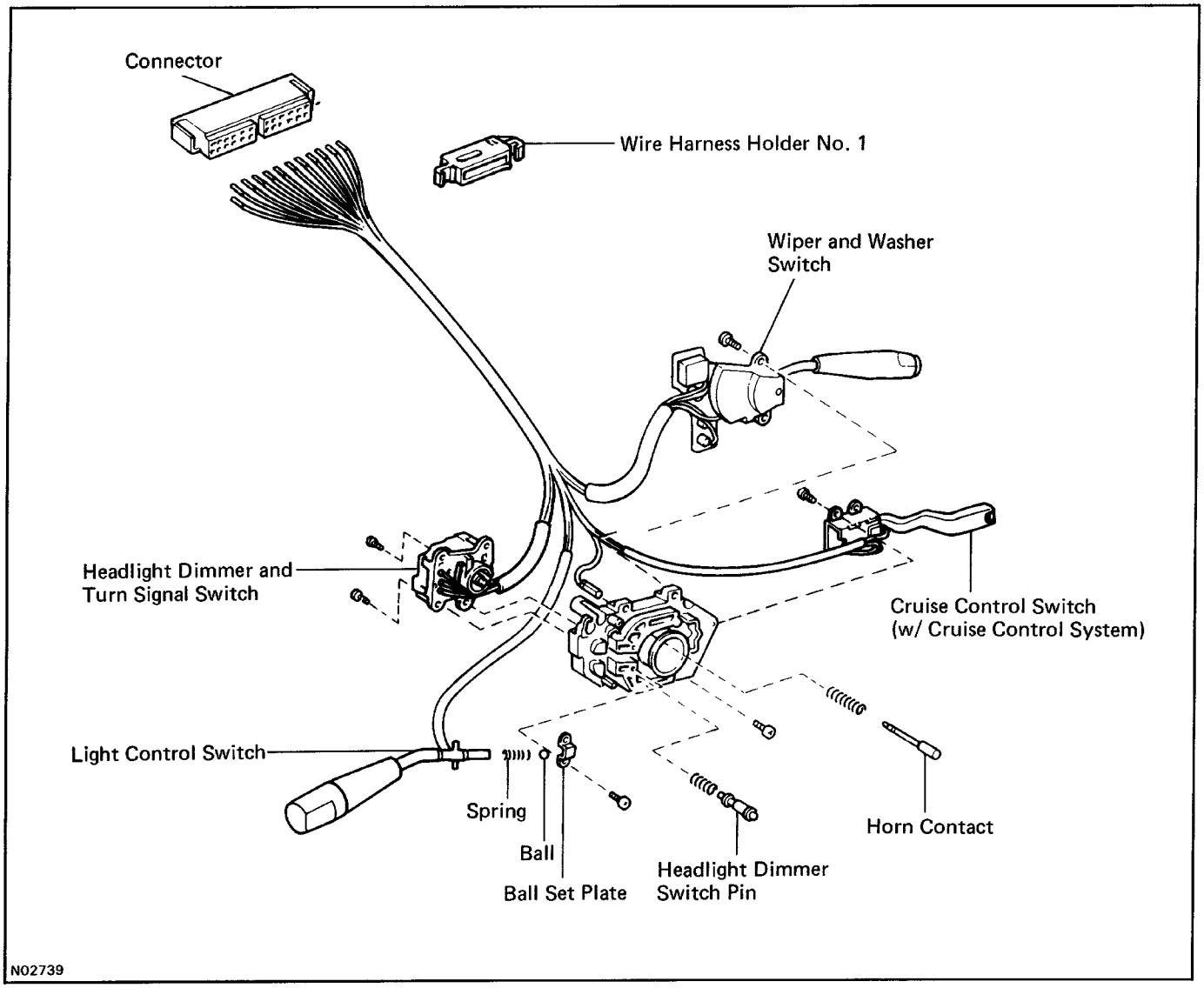
Turn the bolt B and adjust the mark of angle gauge to Center of the gauge.

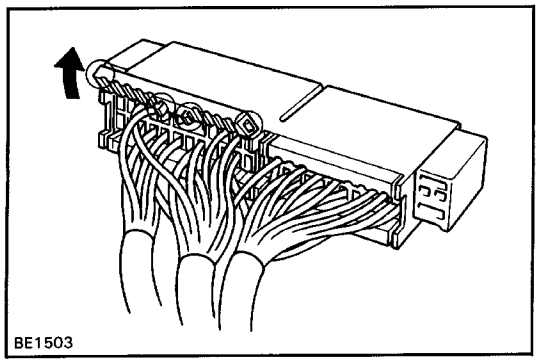
HINT: The beam angle will change about 0˚23' with one mark.

NOTICE: The beam angle gauge should only be used when the headlights are correctly installed on the body.

Parts Replacement

Components





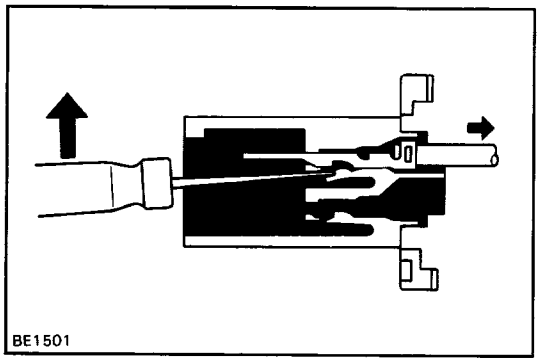
Disassembly of Combination Switch

1. REMOVE WIRE HARNESS CLAMP FROM WIRE HARNESS

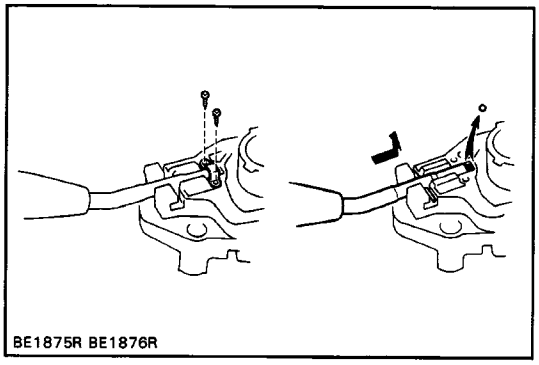
Pry loose two locking lugs and remove the clamp from the wire harness.

2. REMOVE TERMINALS FROM CONNECTOR

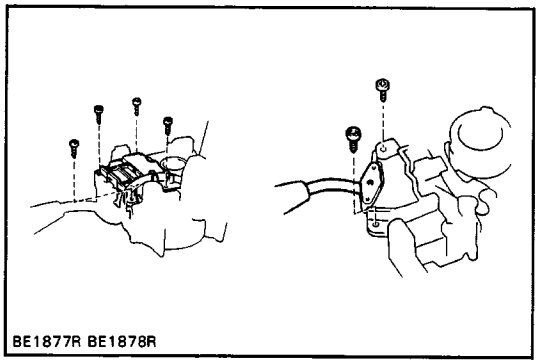
(a) Release four tabs and open the terminal cover.



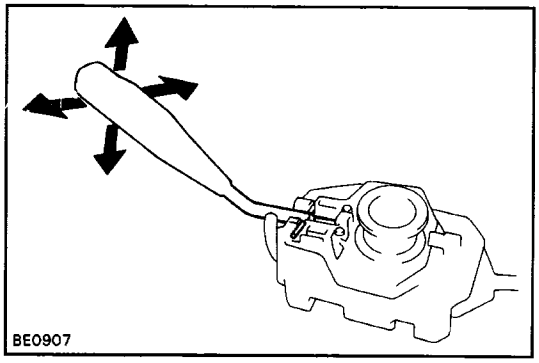
(b) From the open end, insert a miniature screwdriver between the locking lug and terminal.
(c) Pry down the locking lug with the screwdriver and pull the terminal out from the rear.



3. REMOVE LIGHT CONTROL SWITCH
(a) Remove two screws and the ball set plate from the switch body.
(b) Remove the ball and slide out the switch from the switch body with the spring.

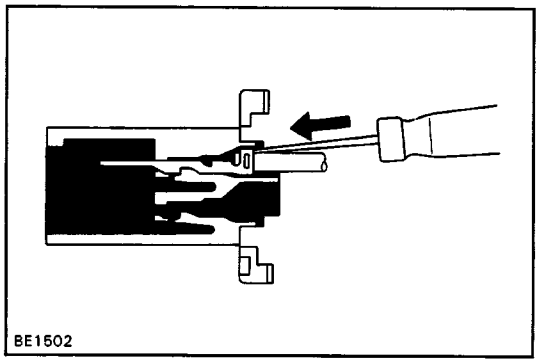


4. REMOVE HEADLIGHT DIMMER AND TURN SIGNAL SWITCH
Remove four screws and the switch from the switch body.
5. REMOVE WIPER AND WASHER SWITCH
Remove two screws and the switch from the switch body.

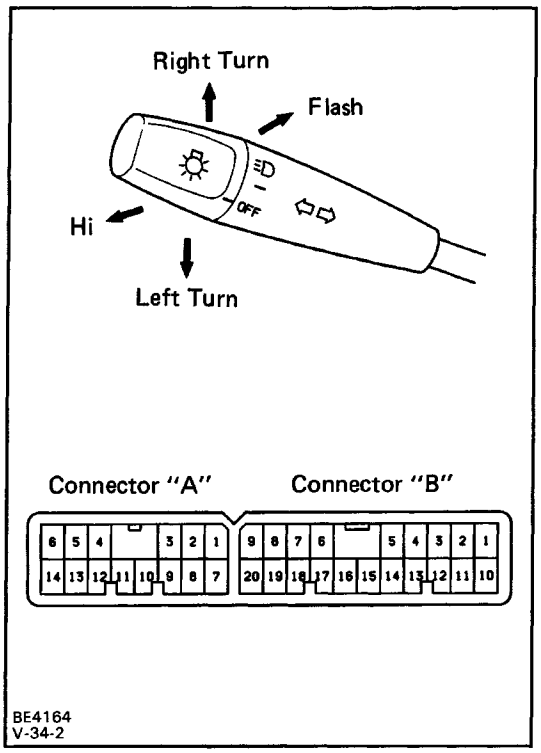


Assembly of Combination Switch

INSTALL PARTS OF COMBINATION SWITCH IN REVERSE SEQUENCE OF REMOVAL
HINT:
- After installing the switch to the switch body, insert that the switch operates in smoothly.



- Push in the terminal until it is securely locked in the connector lug.



Parts Inspection

Headlight and Taillight System

1. INSPECT COMBINATION SWITCH

(Light Control Switch/Continuity)

Terminal (Color) / Switch position	A2 (W)	A11 (W)	A13 (R)
OFF			
TAIL	○—○		
HEAD	○—○	○—○	

(Headlight Dimmer and Turn Signal Switch/Continuity)

Headlight Dimmer Switch

Terminal (Color) / Switch position	A3 (R–G)	A9 (W–B)	A12 (R–Y)	A14 (R–W)
Flash		○—○	○—○	○—○
Low beam	○—○	○—○		
High beam		○—○	○—○	

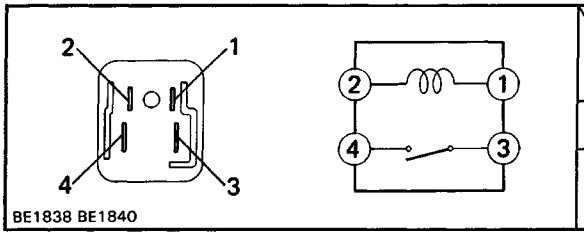
Turn Signal Switch

Terminal (Color) / Switch position	A1 (G –W)	A5 (G–B)	A8 (G–Y)
Left turn	○—○	○—○	
Neutral			
Right turn	○—○		○—○

If continuity is not as specified, replace the switch.

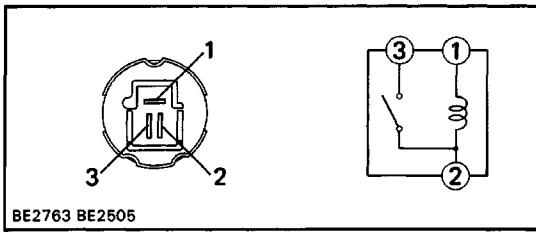
2. INSPECT RELAY

(Headlight Control Relay/Continuity)



Terminal / Condition	1	2	3	4
Constant	○—∿∿—○			
Apply battery voltage to terminals 1 and 2.			○—○	

(Taillight Control Relay/Continuity)



Terminal / Condition	1	2	3
Constant	○—∿∿—○		
Apply battery voltage to terminals 1 and 2.		○—○	

If continuity is not as specified, replace the relay.

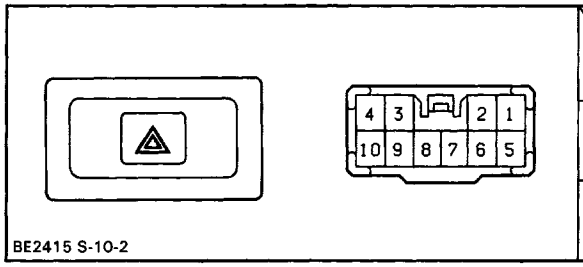
Turn Signal and Hazard Warning System

1. INSPECT SWITCHES

(Turn Signal Switch/Continuity)

See Headlight dimmer and Turn Signal Switch on page BE–23.

(Hazard Warning Switch/Continuity)



Terminal / Switch position	4	5	6	7	8	9	10	Illumination 2	Illumination 3
OFF				○	—	—	○	○	○
ON	○	○	○	○	—	○			

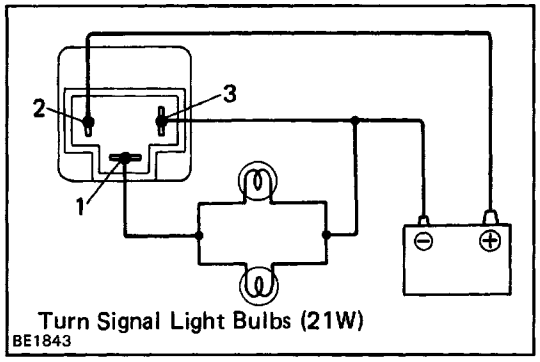
If continuity is not as specified, replace the switch.

2. INSPECT TURN SIGNAL FLASHER

(Operation)

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 3.

(b) Connect the two turn signal light bulbs parallel to each other to terminals 1 and 3, check that the bulbs flash.



HINT: The turn signal lights should flash 60 to 120 times per minute.

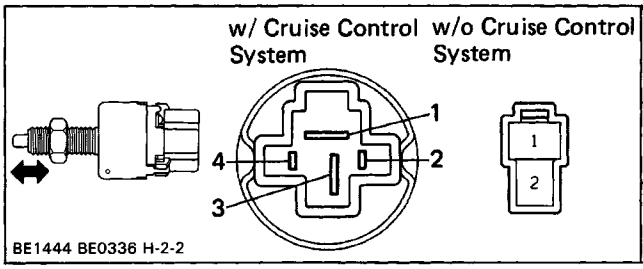
If one of the front or rear turn signal lights has an open circuit, the number of flash rate will be more than 140 per minute.

If operation is not as specified, replace the flasher.

Stop Light System

INSPECT SWITCH

(Stop Light Switch /Continuity)



Terminals / Switch position	1(1)	2	3(2)	4
Switch pin free (Brake pedal depressed)	○		○	
Switch pin pushed in (Brake pedal released)		○		○

( ): w/o Cruise Control System

If continuity is not as specified, replace the switch.

Back–up Light System

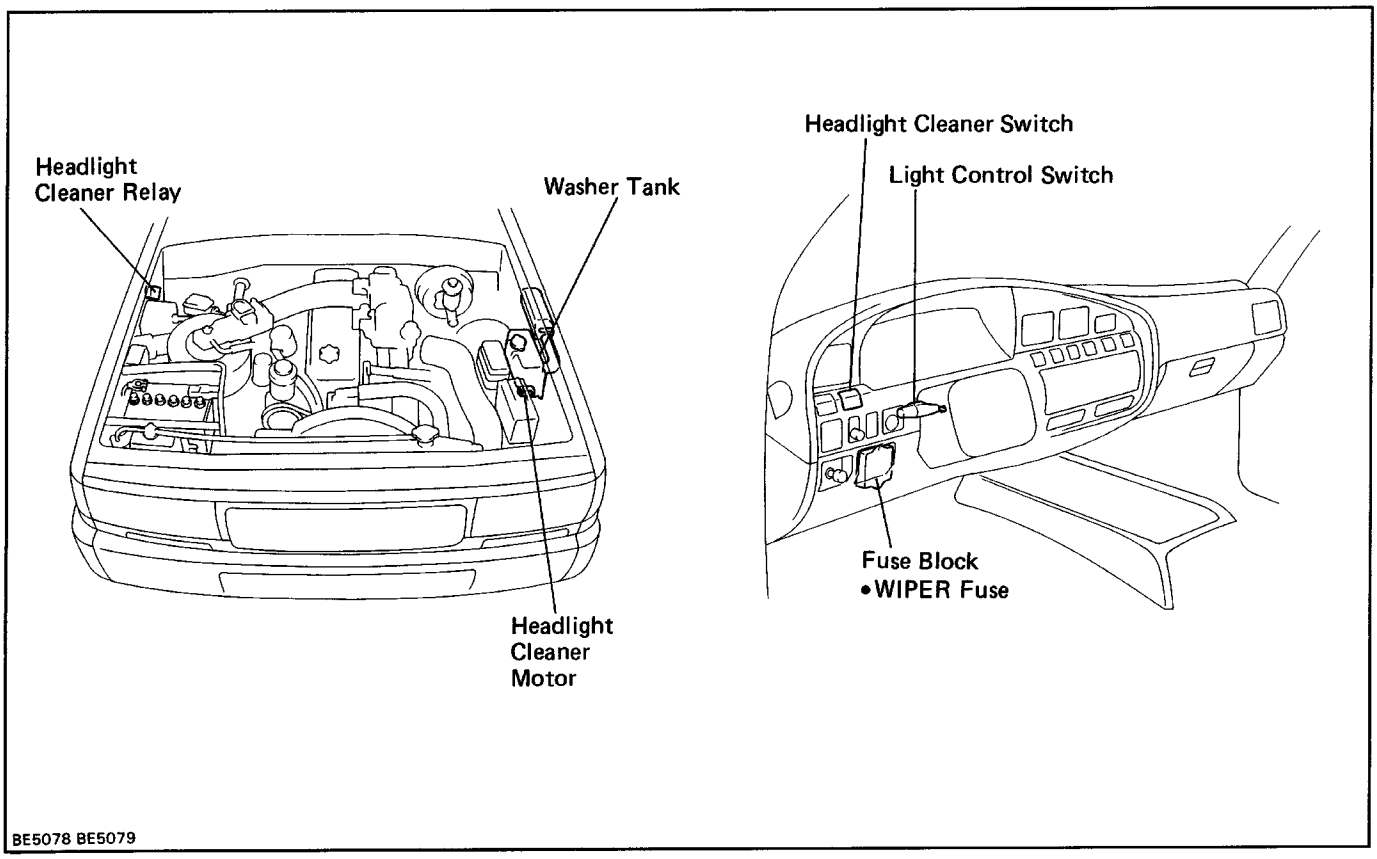
INSPECT SWITCH

(Neutral Start Switch)

See page AT–25.

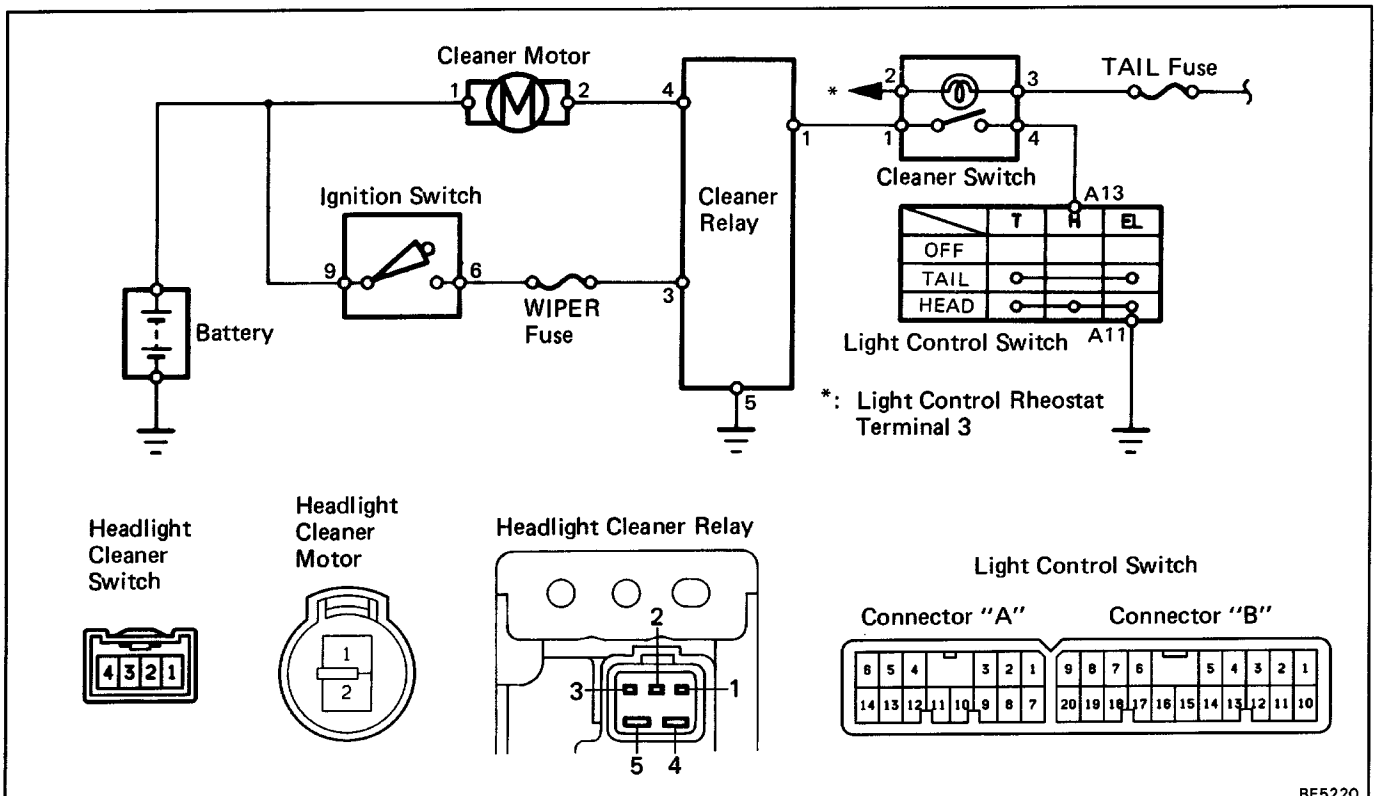
HEADLIGHT CLEANER SYSTEM

Parts Location



BE5078 BE5079

Wiring and Connector Diagrams



BE5220
S-4-2-C IC-2-2 BE0234 V-34-2

The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

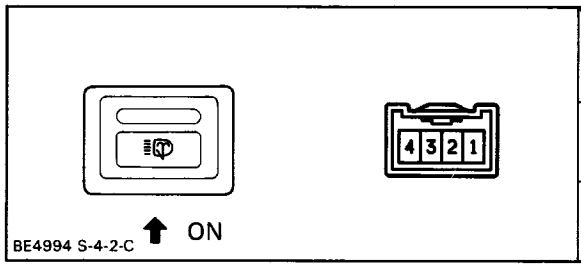
Troubleshooting

Problem	Possible cause	Remedy	Page
Headlight cleaner do not operate	WIPER fuse blown Cleaner hose or nozzle clogged Cleaner motor faulty Cleaner switch faulty Cleaner relay faulty Wiring or ground faulty	Replace fuse and check for short Repair as necessary Check motor Check switch Check relay Repair as necessary	BE–4, BE–6 BE–26 BE–26 BE–26

Parts Inspection

1. INSPECT SWITCH

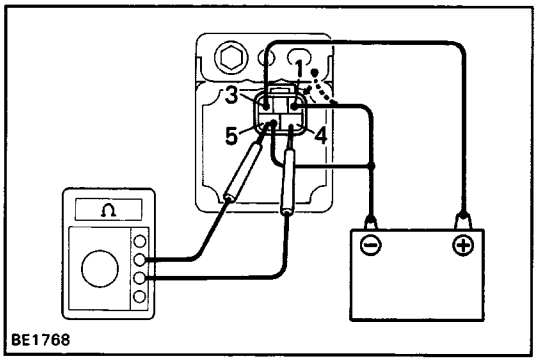
(Continuity)



Terminal / Switch position	1	4	Illumination 2	Illumination 3
OFF				
ON	○	○	○	○

If continuity is not as specified, replace the switch.

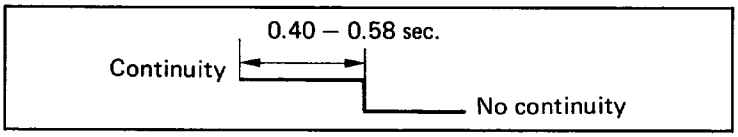
2. INSPECT HEADLIGHT CLEANER RELAY



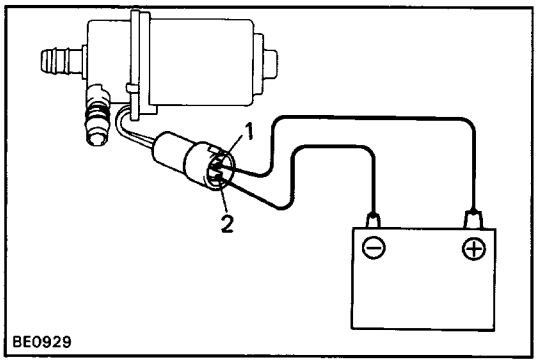
(a) Check that there is no continuity between terminals 4 and 5.

(b) Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 5.

(c) Connect the negative (–) lead from the battery to terminal 1, check that there is continuity between terminals 4 and 5 for 0.40 – 0.58 sec., then there is no continuity.



If operation is not as specified, replace the relay.



3. INSPECT HEADLIGHT CLEANER MOTOR

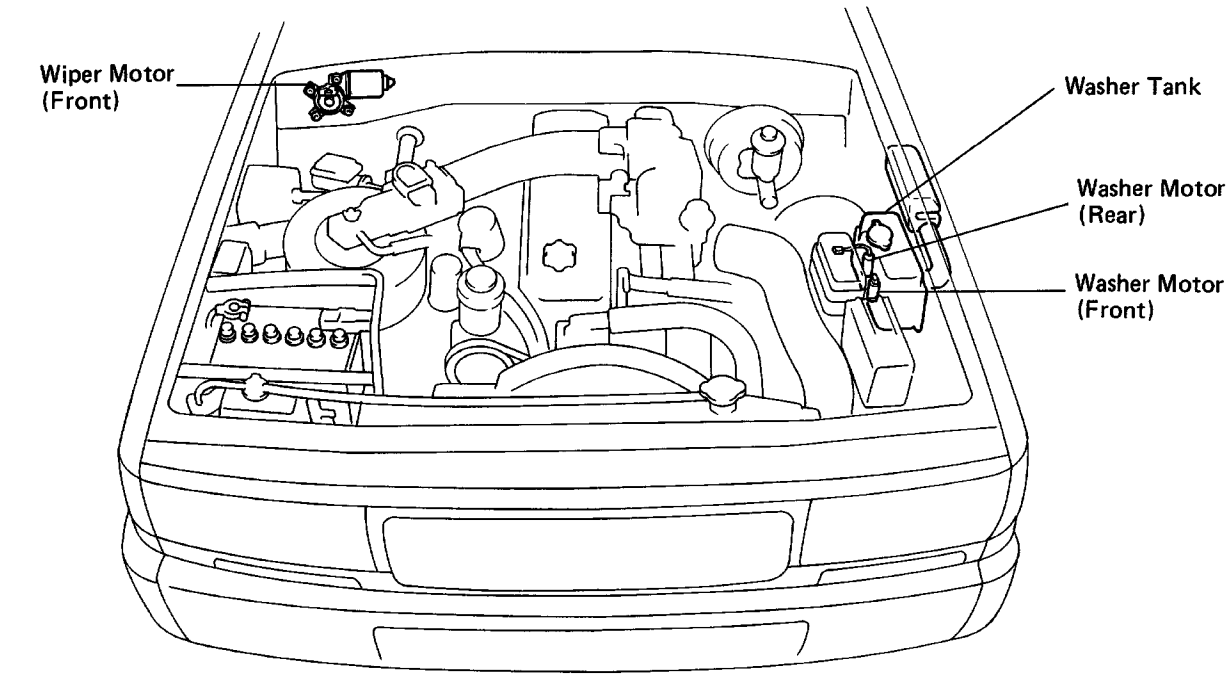
Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, check that the motor operates.

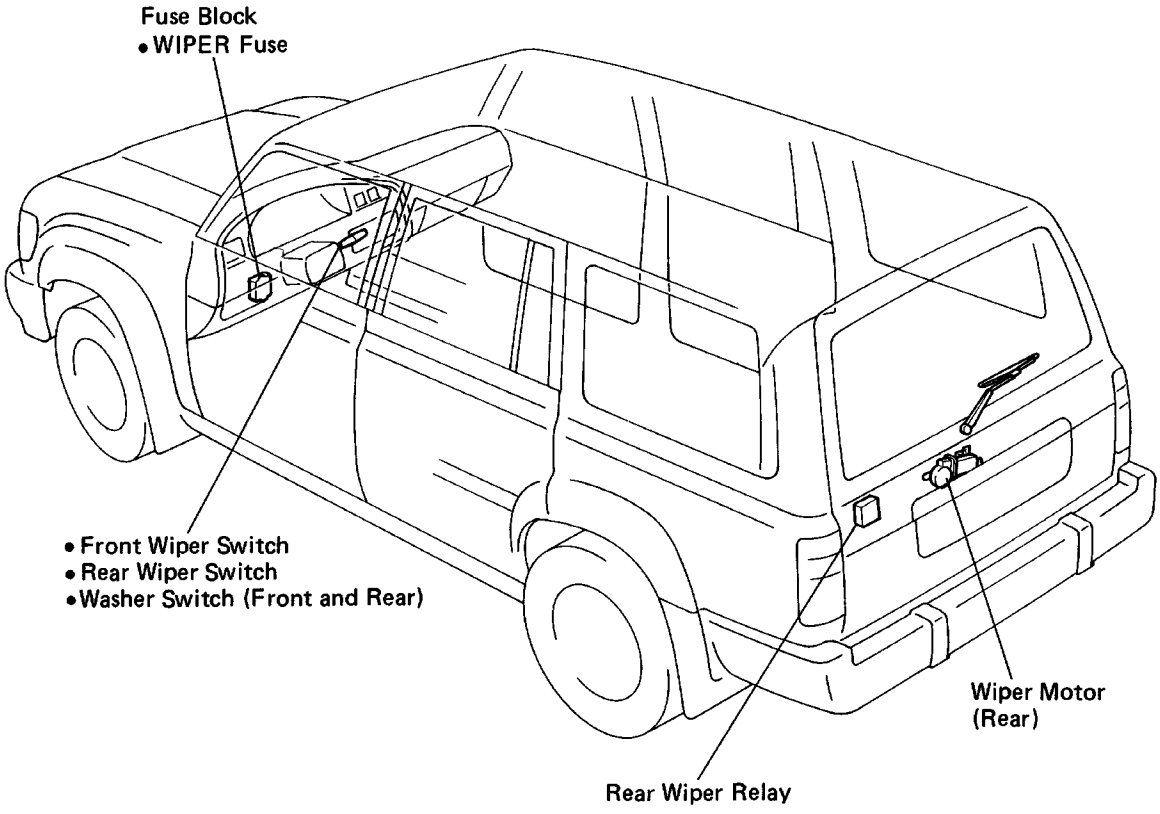
NOTICE: These test must be performed quickly (within 3 – 5 seconds) to prevent the coil from burning out.

If operation is not as specified, replace the motor.

WIPER AND WASHER SYSTEM

Parts Location

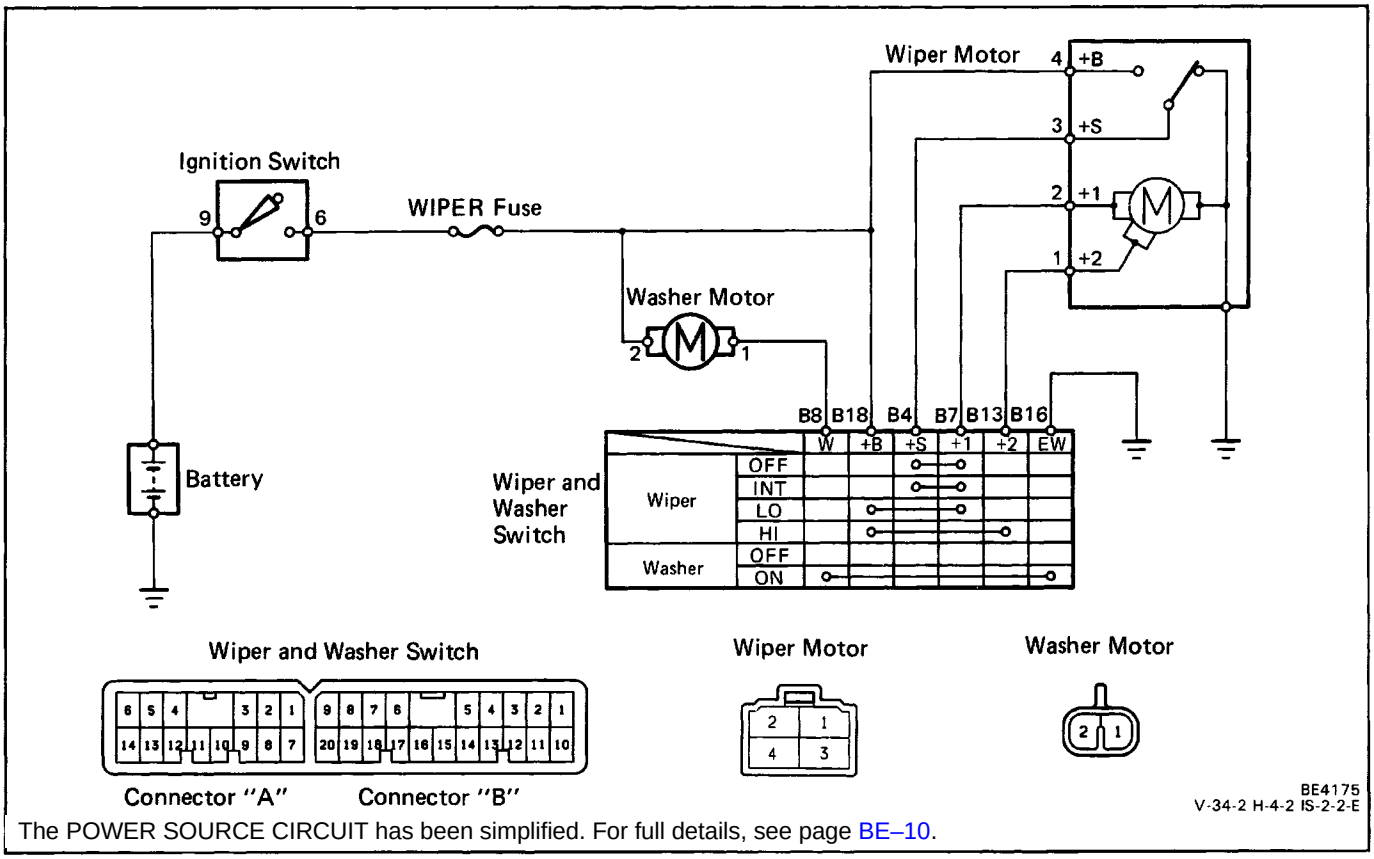




BE5081
BE5080

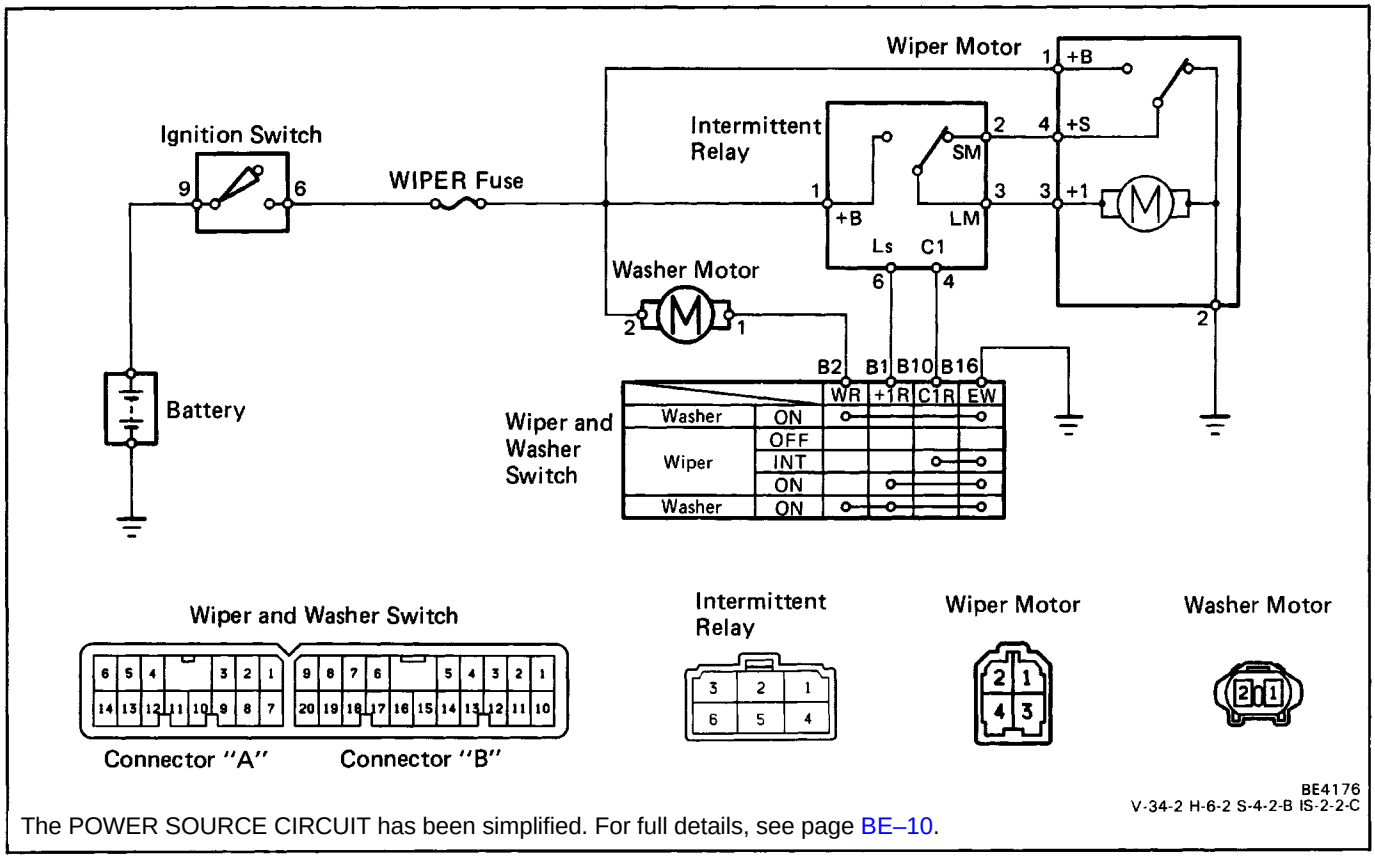
Wiring and Connector Diagrams

(Front)



The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

(Rear)



The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

Troubleshooting

Problem	Possible cause	Remedy	Page	
			Front	Rear
Wiper do not operate or return to off position	WIPER fuse blown Wiper motor faulty Wiper switch faulty Wiring or ground faulty	Replace fuse and check for short Check motor Check switch Repair as necessary	BE–4, BE–6 BE–31 BE–29	BE–4, BE–6 BE–31 BE–29
Wiper do not operate in Mist position	Wiper switch faulty Wiper motor faulty Wiring or ground faulty	Check switch Check motor Repair as necessary	BE–29 BE–31	– – –
Wiper do not operate in Inter–mittent (INT) position	Wiper relay faulty Wiper switch faulty Wiper motor faulty Wiring or ground faulty	Check relay Check switch Check motor Repair as necessary	BE–30 BE–29 BE–31	BE–30 BE–29 BE–31
Washer do not operate	Washer hose or nozzle clogged Washer motor faulty Washer switch faulty Wiring or ground faulty	Repair as necessary Check motor Check switch Repair as necessary	BE–33 BE–29	BE–33 BE–29

Parts Replacement

See Parts Replacement of Combination Switch on page BE–21.

Parts Inspection

Wiper System

1. INSPECTION SWITCHES

(Front Wiper and Washer Switch/Continuity)

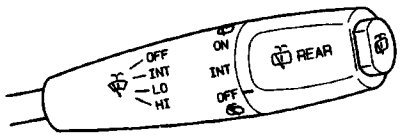
Terminal (Color) / Switch position		B4 (L–R)	B7 (L–B)	B8 (L)	B12 (Y–B)	B13 (L–O)	B16 (B)	B18 (L–W)
Wiper	OFF	○	○					
	INT	○	○					
	LO		○					○
	HI					○		○
Washer	OFF							
	ON			○			○	

(Rear Wiper and Washer Switch/Continuity)

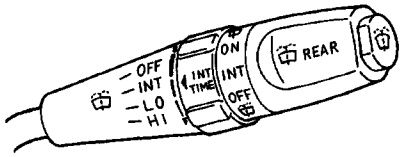
Terminal (Color) / Switch position		B1 (G)	B2 (V)	B10 (O)	B16 (B)
Washer	ON		○		○
Wiper	OFF				
	INT			○	○
	ON	○			○
Washer	ON	○	○		○

If continuity is not as specified, replace the switch.

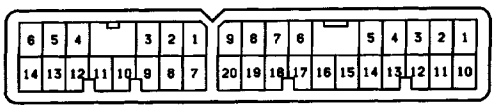
(Wiper with Intermitten)



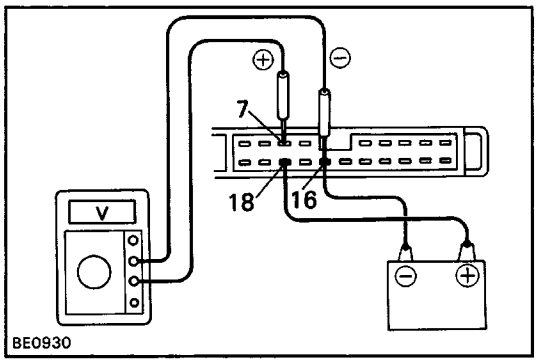
(Wiper with Intermitten and time adjuster)

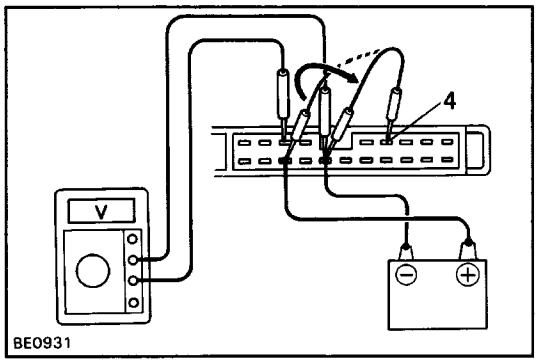


Connector "A" Connector "B"



BE4178
N03146
V-34-2





2. INSPECT FRONT WIPER RELAY

(Operation at Intermittent)

(a) Turn the wiper switch to INT position.

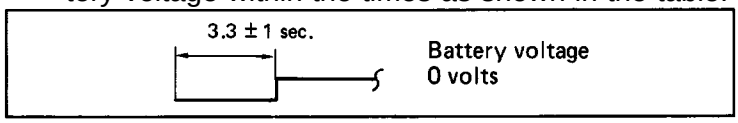
(b) Turn the intermittent time control switch to FAST po–sition.

(c) Connect the positive (+) lead from the battery to ter–minal B18 and the negative (–) lead to terminal B16.

(d) Connect the positive (+) lead from the voltmeter to terminal B7 and the negative (–) lead to terminal B16, check that the meter needle indicates battery voltage.

(e) After connecting terminal B4 to terminal B18, con–nect to terminal B16.

Then, check that the voltage rises from 0 volt to bat–tery voltage within the times as shown in the table.



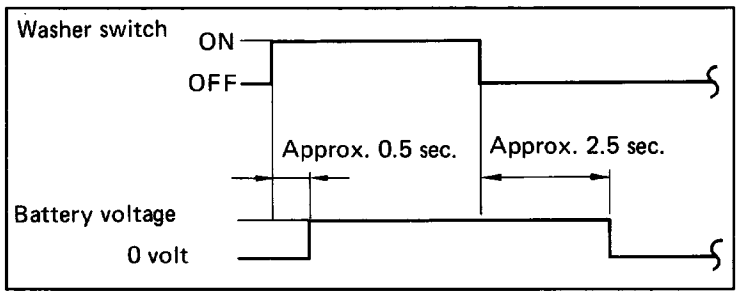
If operation is not as specified, replace the switch.

(Operation as Washer Linked)

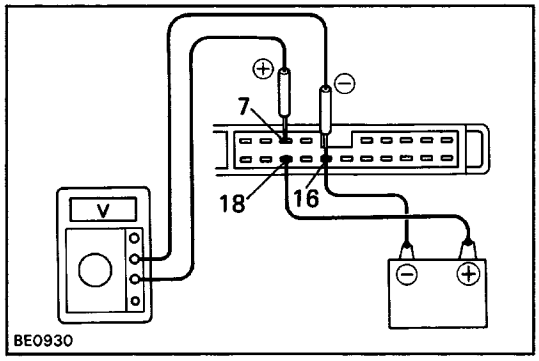
(a) Connect the positive (+) lead from the battery to ter–minal B18 and the negative (–) lead to terminal B16.

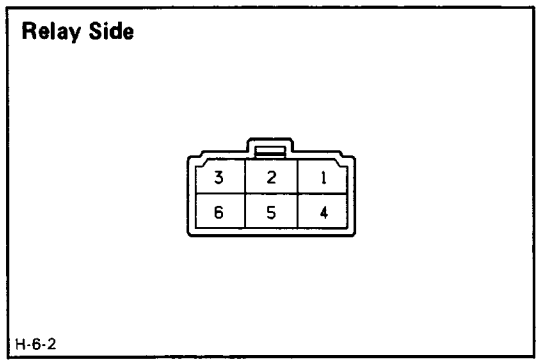
(b) Connect the positive (+) lead from the voltmeter to terminal B7 and the negative (–) lead to terminal B16.

(c) Push in the washer switch. Check that the voltage changes as shown in the table.



If operation is not as specified, replace the switch.





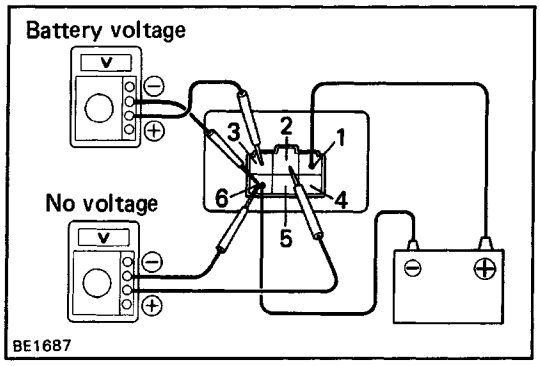
3. INSPECT REAR WIPER RELAY

(Continuity)

(a) Check that there is no continuity between terminals 1 and 3.

(b) Check that there is continuity between terminals 2 and 3.

If continuity is not as specified, replace the relay.



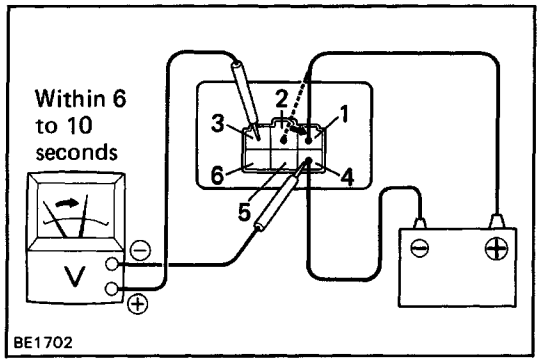
(Operation)

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 6.

(b) Connect the positive (+) lead from the voltmeter to terminal 2 and the negative (–) lead to terminal 6, check that the meter needle indicates to 0 volts.

(c) Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (–) lead to terminal 6, check that the meter needle indicates to battery boltage.

If operation is not as specified, replace the relay.



(Intermittent Operation)

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 4.

(b) Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (–) lead to terminal 4.

(c) After disconnecting the positive (+) lead from terminal 2, connect it to terminal 1, and then, check that the meter needle rises from 0 volts to battery voltage within 6 to 10 seconds.

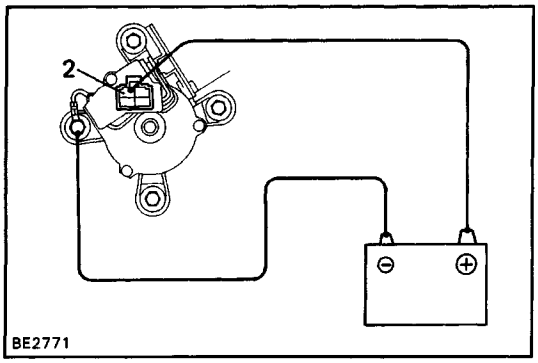
If operation is not as specified, replace the relay.

3. INSPECT MOTOR

(Front Motor/Operation at Low Speed)

Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to the motor body, check that the motor operates as low speed.

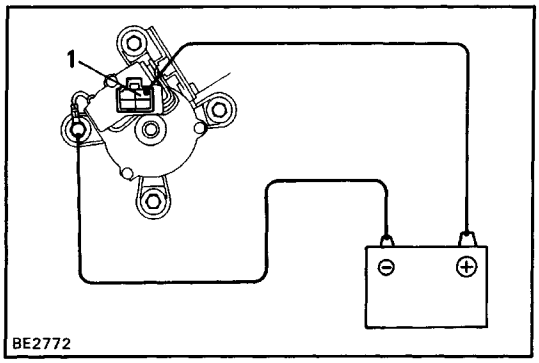
If operation is not as specified, replace the motor.



(Front Motor/Operation at High Speed)

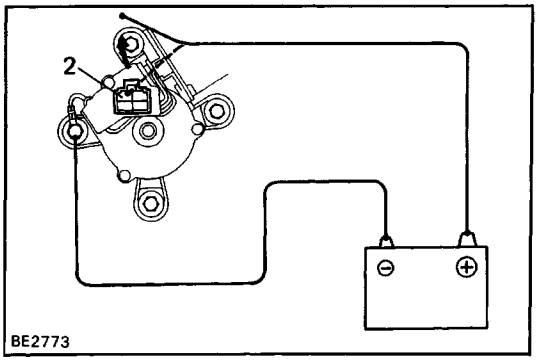
Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to the motor body, check that the motor operation at high speed.

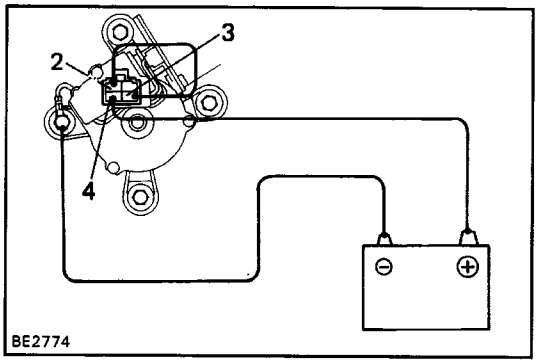
If operation is not as specified, replace the motor.



(Front Motor/Operation, Stopping at Stop Position)

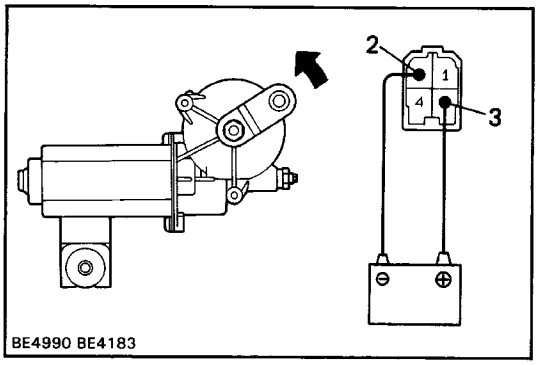
(a) Operate the motor at low speed and stop the motor operation anywhere except at the stop position by disconnecting positive (+) lead from terminal 2.





(b) Connect terminals 2 and 3.
(c) Connect the positive (+) lead from the battery to terminal 4 and the negative (–) lead to the motor body, check that the motor stops running at the stop position after the motor operates again.

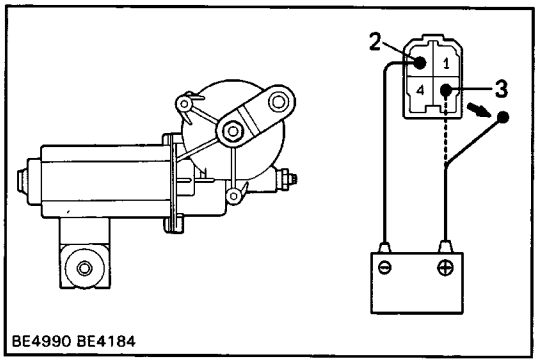
If operation is not as specified, replace the motor.



(Rear Motor/Operation at Low Speed)

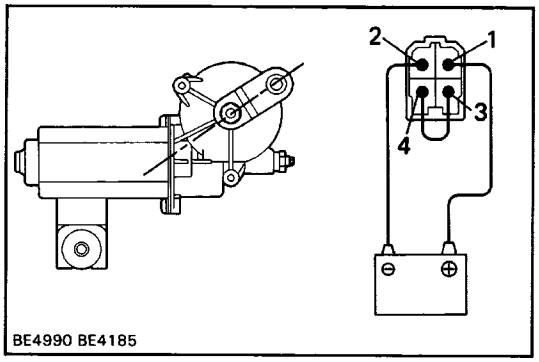
Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 2, check that the motor operates as low speed.

If operation is not at specified, replace the motor.



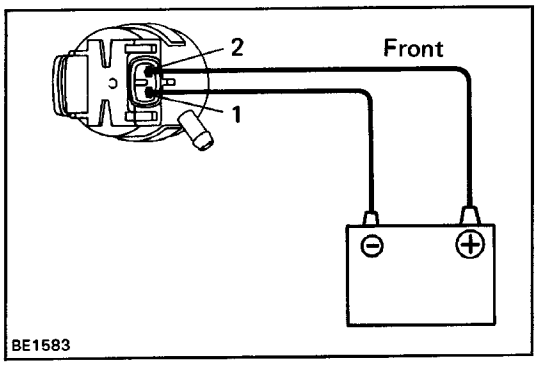
(Rear Motor/Operation, Stopping at Stop Position)

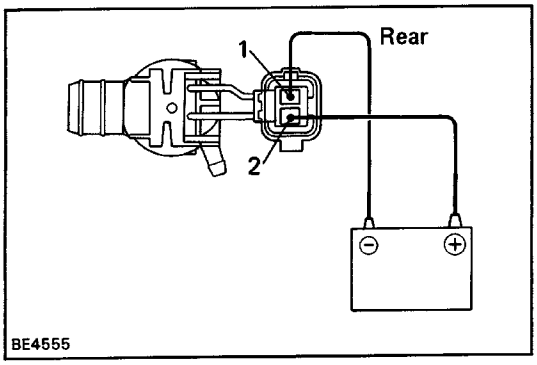
(a) Operate the motor at low speed and stop the motor operation anywhere except at the stop position by disconnecting positive (+) lead from terminal 3.



(b) Connect terminals 3 and 4.
(c) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, check that the motor stops running at the stop position after the motor operates again.

If operation is not as specified, replace the motor.





Washer System

1. INSPECT WASHER SWITCH (Washer Switch)

See Wiper and Washer Switch on page BE–29.

2. INSPECT WASHER MOTOR

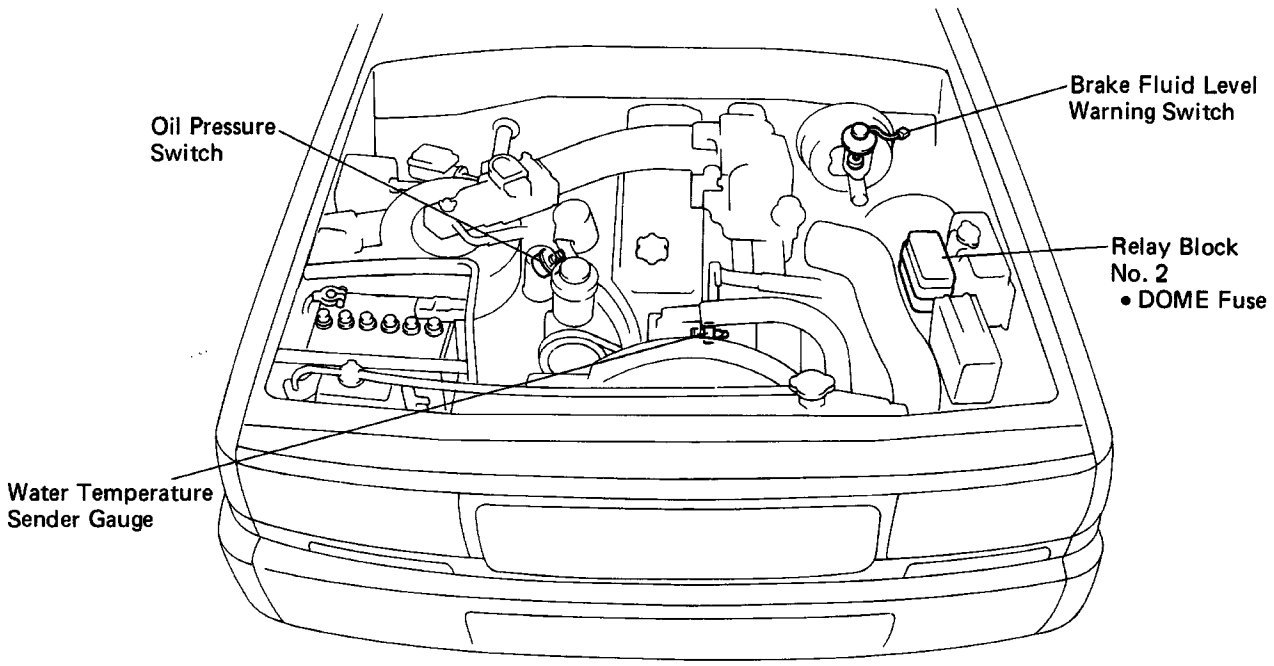
Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, check that the motor operates.

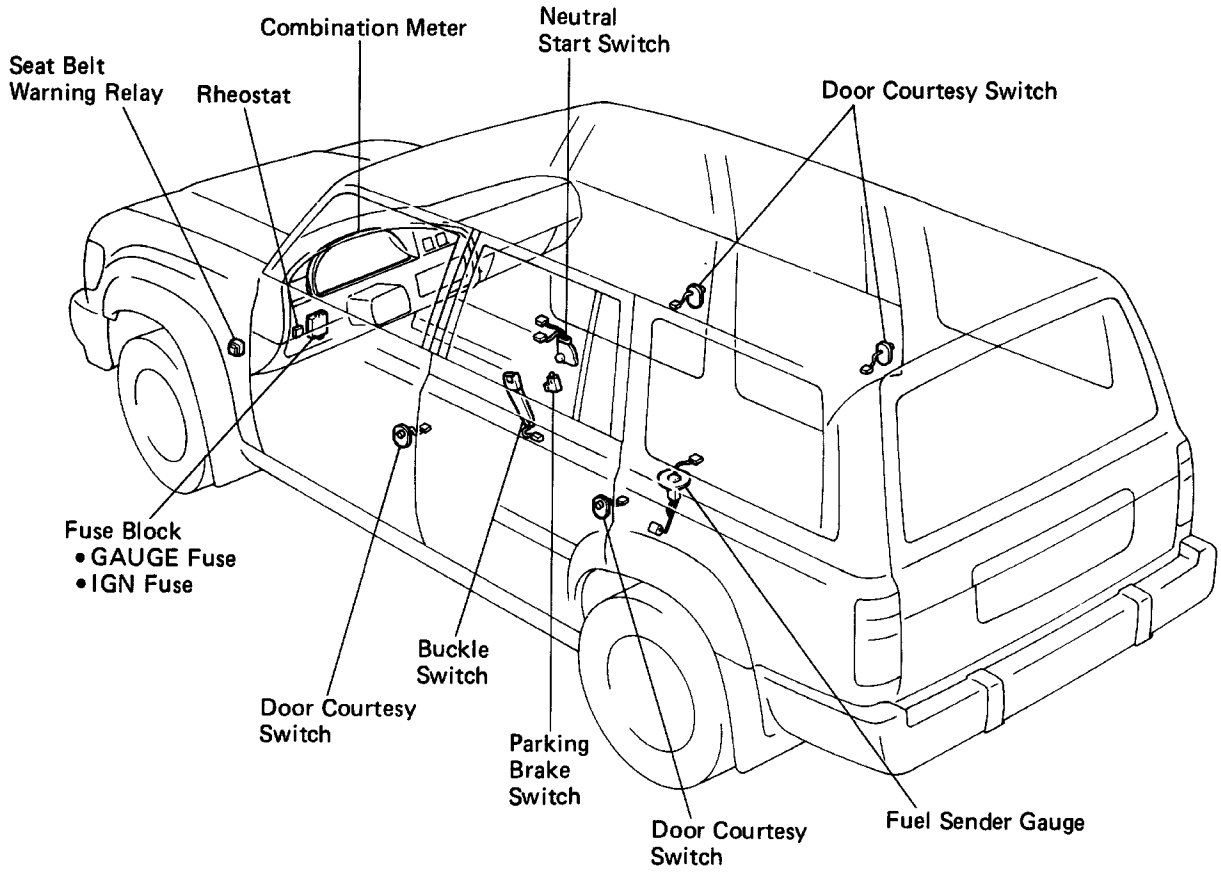
NOTICE: These tests must be performed quickly (within 20 seconds) to prevent the coil from burning out.

If operation is not as specified, replace the motor.

COMBINATION METER

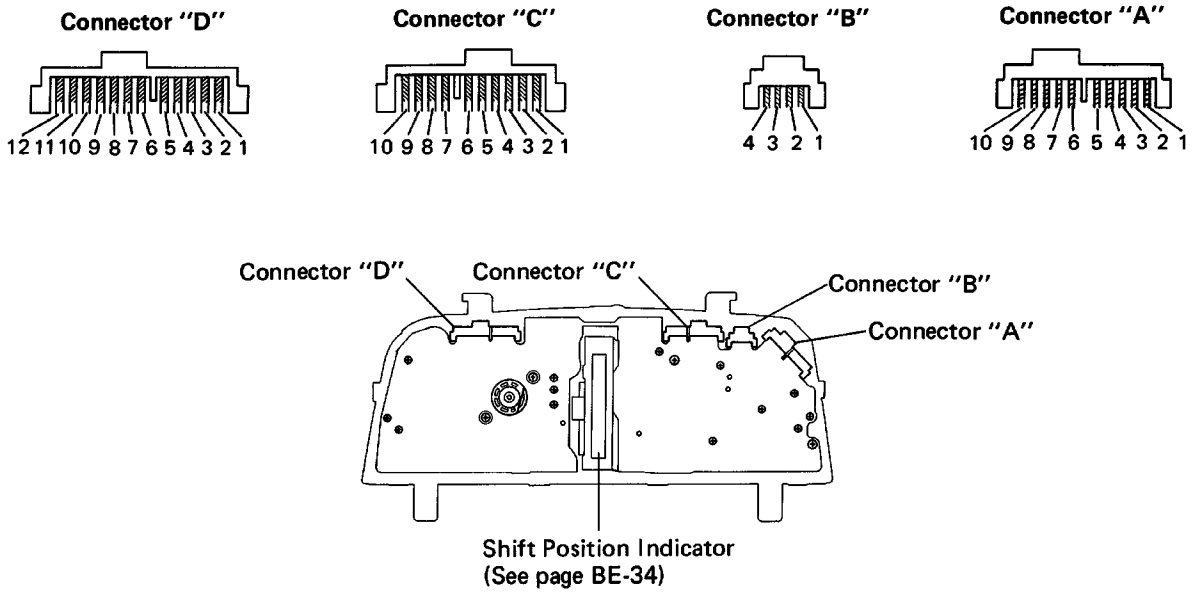
Parts Location



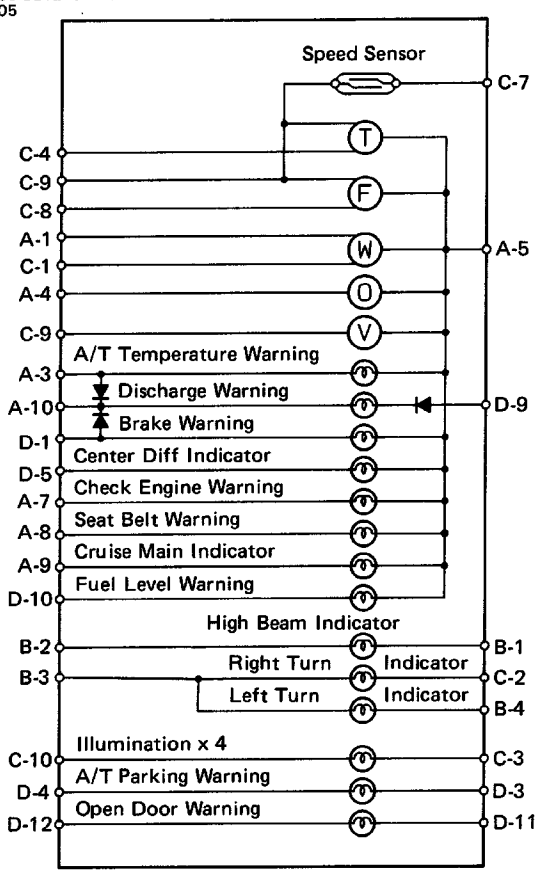


BE5082
BE5221

Meter Circuit
(Combination Meter)



BE1266 BE1270 BE5017 BE2576 BE5005

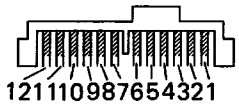


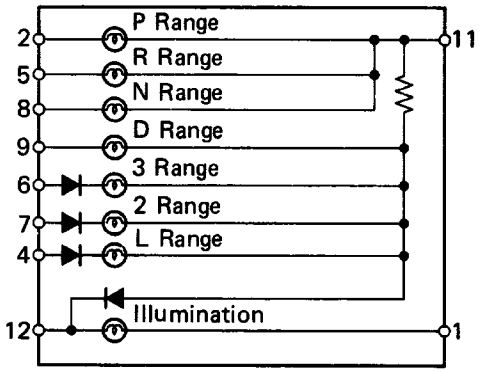
Ⓣ: Tachometer Ⓥ : Voltmeter
Ⓕ: Fuel Gauge Ⓦ : Water temperature Gauge
Ⓞ: Oil Pressure Gauge

BE5268

No.		Wiring connector side
A	1	Ground
	3	A/T fluid temperature sensor
	4	Oil pressure sender gauge
	5	GAUGE fuse
	7	EFI ECU
	8	Seat belt warning relay
	9	Cruise control ECU
	10	Charge light relay
B	1	Headlight LO–beam
	2	Ground
	3	Ground
	4	Turn signal switch (Left)
C	1	Water temperature sender gauge
	2	Turn signal switch (Right)
	3	TAIL fuse
	4	Igniter
	7	Speed control unit
	8	Fuel sender gauge
	9	Ground
	10	Rheostat
D	1	Brake fluid level warning switch and parking brake switch
	3	Neutral start switch
	4	Neutral position switch
	5	Center diff. lock switch
	9	IGN fuse
	10	Fuel level warning switch
	11	DOME fuse
	12	Door courtesy switch

(Shift Position Indicator)





BE1267
BE4981

No.	Wiring connector side
1	Light control rheostat –terminal A
2	Neutral start switch–terminal 6
4	Neutral start switch–terminal 8
5	Neutral start switch–terminal 1
6	Neutral start switch–terminal 4
7	Neutral start switch –terminal 3
8	Neutral start switch –terminal 5
9	Neutral start switch–terminal 7
11	Ground
12	TAIL fuse

Troubleshooting

Problem	Possible cause	Remedy	Page
Combination meter do not operate	GAUGE fuse blown Wiring or ground faulty	Replace fuse and check for short Repair as necessary	BE–4, BE–6
Speedometer does not operate	Speedometer cable faulty Speedometer faulty	Check cable Check speedometer	BE–38
Tachometer does not operate	Tachometer faulty Igniter faulty Wiring or ground faulty	Check tachometer Check igniter Repair as necessary	BE–38
Fuel gauge does not operate	Receiver gauge faulty Sender gauge faulty Wiring or ground faulty	Check gauge Check gauge Repair as necessary	BE–38 BE–39
Fuel level warning light does not light up	Bulb burned out Warning switch faulty Wiring or ground faulty	Replace bulb Check switch Repair as necessary	BE–40
Water temperature gauge does not operate	Receiver gauge faulty Sender gauge faulty Wiring or ground faulty	Check gauge Check gauge Repair as necessary	BE–40 BE–40
Oil pressure gauge does not operate	Receiver gauge faulty Sender gauge faulty Wiring or ground faulty	Check gauge Check gauge Repair as necessary	BE–41 BE–41
Voltmeter does not operate	Receiver gauge faulty Wiring or ground faulty	Check gauge Repair as necessary	BE–42
Breake warning light does not light up	Bulb burned out Level Warning switch faulty Parking brake switch faulty Wiring or ground faulty	Replace bulb Check switch Check switch Repair as necessary	BE–42 BE–42
Seat belt warning light does not light up	Bulb burned out Warning switch faulty Warning relay faulty Wiring or ground faulty	Replace bulb Check switch Check relay Repair as necessary	BE–44 BE–44
Open door warning light does not light up	Bulb burned out Courtesy switch faulty Wiring or ground faulty	Replace bulb Check switch Repair as necessary	BE–43
Meter illumination control system does not operate	Bulb burned out Rheostat faulty Wiring or ground faulty	Replace bulb Check rheostat Repair as necessary	BE–45
Shift position indicator light does not light up	Bulb burned out Neutral start switch faulty Wiring or ground faulty	Replace bulb Check switch Repair as necessary	AT–26

Parts Inspection

Speedometer System

(mph)

Standard indication	Allowable range
20	18.5 – 21.5
40	38 – 41.5
60	58 – 62
80	78 – 82.5
100	98 – 103

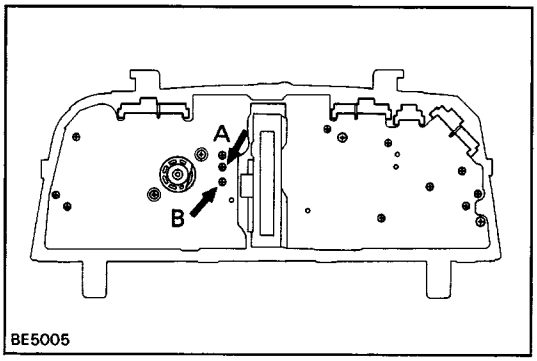
1. INSPECT SPEEDOMETER (ON–VEHICLE)

(a) Using a speedometer tester, inspect the speedometer for allowable indication error and check the operation of the odometer.

HINT: Tire wear and tire over or under inflation will increase the indication error.

(b) Check the speedometer for pointer vibration and abnormal noise.

HINT: Pointer vibration can be caused by a loose speedometer cable.



2. INSPECT SPEED SENSOR

Check that there is continuity between terminals A and B four times per each revolution of the speedometer shaft.
If operation is not as specified, replace the speedometer.

Tachometer System

DC 13.5V 20˚C (68˚F) rpm

Standard indication	Allowable range
700	610 – 750
1,000	900 – 1,100
2,000	1,875 – 2,125
3,000	2,850 – 3,150
4,000	3,850 – 4,150
5,000	4,850 – 5,150

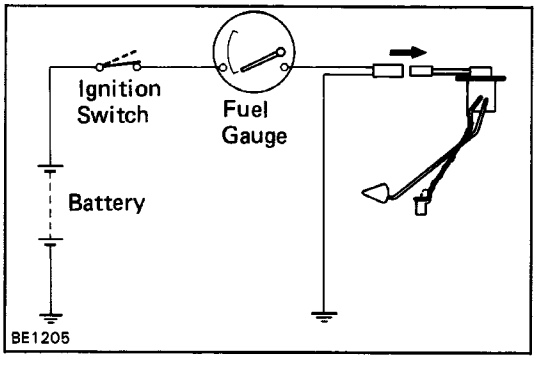
1. INSPECT TACHOMETER (ON–VEHICLE)

(a) Connect a tune–up test tachometer, and start the engine.

NOTICE:

- **Reversing the connection of the tachometer will damage the transistors and diodes inside.**
- **when removing or installing the tachometer, be careful not to drop or subject it to heavy shocks.**

(b) Compare the tester and tachometer indications.
If error is excessive, replace the tachometer.



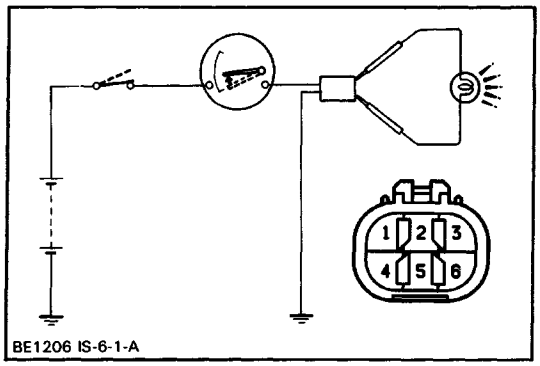
Fuel Gauge System

1. INSPECT RECEIVER GAUGE

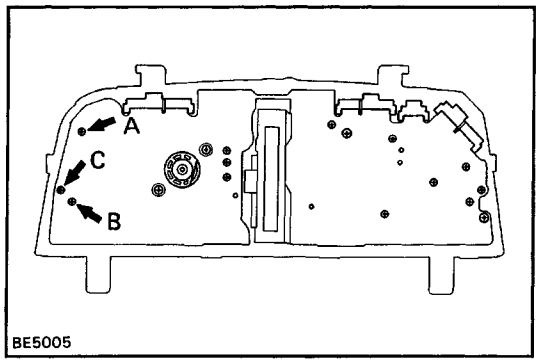
(Operation)

(a) Disconnect the connector from the sender gauge.

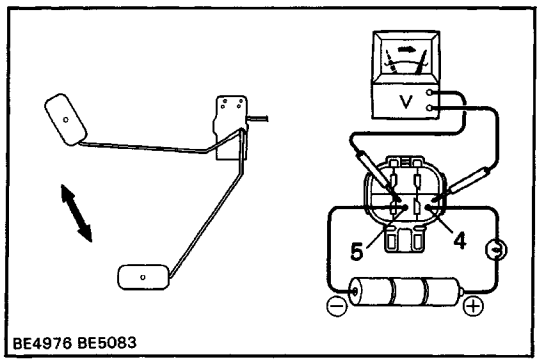
(b) Turn the ignition switch ON, check that the receiver gauge needle indicates EMPTY.



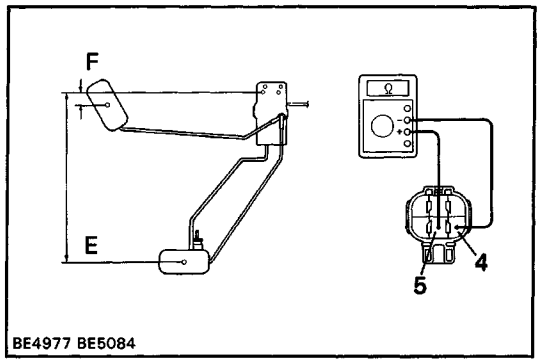
BE1206 IS-6-1-A



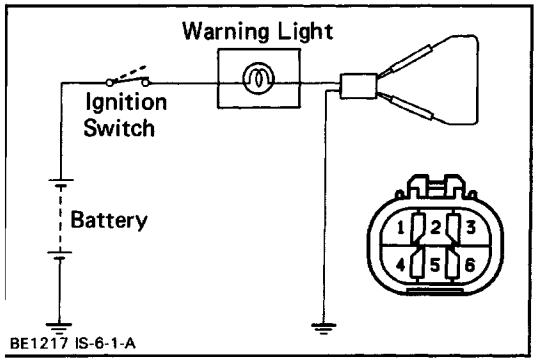
BE5005



BE4976 BE5083



BE4977 BE5084



BE1217 IS-6-1-A

(c) Connect terminals 4 and 5 on the wire harness side connector through a 3.4 watts test bulb.
(d) Turn the ignition switch ON, check that the bulb lights up and the receiver gauge needle moves towards the full side.

HINT: Because of the silicon oil in the gauge, it will take a short time for needle to stabilize.

If operation is not as specified, inspect the receiver gauge resistance.

(Resistance)

Measure the resistance between terminals.

Between terminals	Resistance (Ω)
A–B	85.5 – 105.5
A–C	126 – 150
C –B	*90 – 110
* : Include voltmeter resistance.	

If resistance value is not as specified, replace the receiver gauge.

2. INSPECT SENDER GAUGE

(Operation)

(a) Connect a series of three 1.5 volts dry cell batteries.
(b) Connect the positive (+) lead from the dry cell bat–teries to terminal 4 through a 3.4 watts test bulb and the negative (–) lead to terminal 5.
(c) Connect the positive (+) lead from the voltmeter to terminal 4 and the negative (–) lead to terminal 5.
(d) Check that the voltage rises as the float is moved from the full to empty position.

(Resistance)

Measure the resistance between terminals 4 and 5.

Float position mm (in.)	Resistance (Ω)
F approx. 15 (0.59) E approx. 200 (7.87)	approx. 3 approx. 110

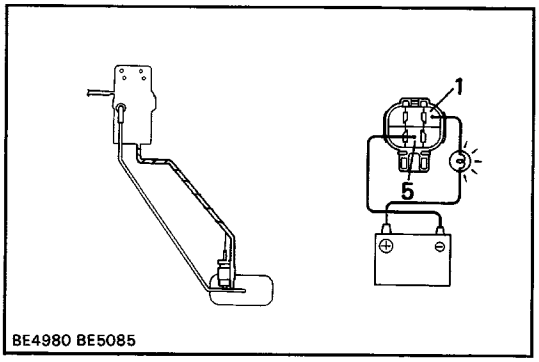
If resistance value is not as specified, replace the sender gauge.

Fuel Level Warning System

1. INSPECT WARNING LIGHT

(a) Disconnect the connector from the sender gauge.
(b) Connect terminals 1 and 5 on the wire harness side connector.
(c) Turn the ignition switch ON, check that the warning light lights up.

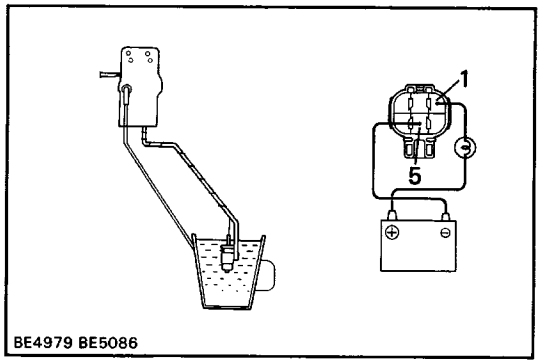
If the warning light does not light up, test the bulb.



2. INSPECT WARNING SWITCH

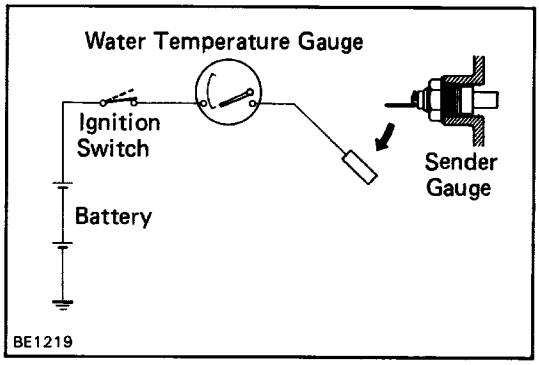
(a) Apply battery voltage between terminals 1 and 5 through a 3.4 watts test bulb, check that the bulb lights up.

HINT: It will take a short time for the bulb to light up.



(b) Submerge the switch in fuel, check that the bulb goes out.

If operation is not as specified, replace the sender gauge.



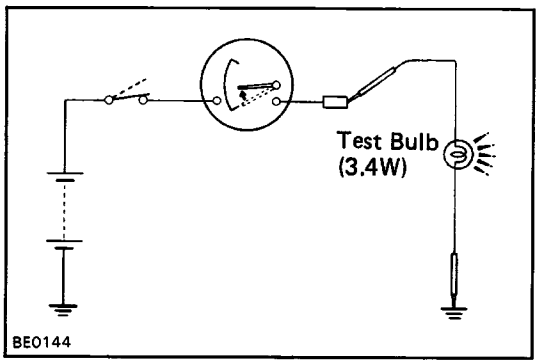
Water Temperature Gauge System

INSPECT RECEIVER GAUGE

(Operation)

(a) Disconnect the connector from the sender gauge.

(b) Turn the ignition switch ON, check that the receiver gauge needle indicates COOL.



(c) Ground terminal on the wire harness side connector through a 3.4 watts test bulb.

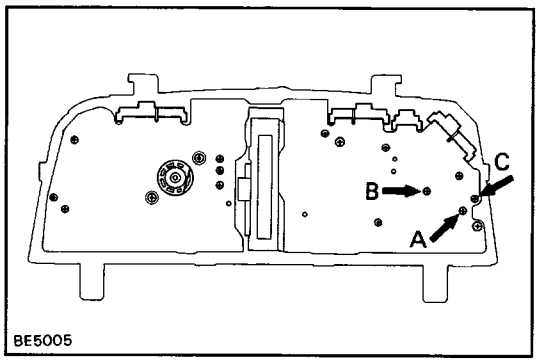
(d) Turn the ignition switch ON, check that the bulb lights up and the receiver gauge needle moves to the hot side.

If operation is as specified, replace the sender gauge. Then recheck the system.

If operation is not as specified, measure the receiver gauge resistance.

(Resistance)

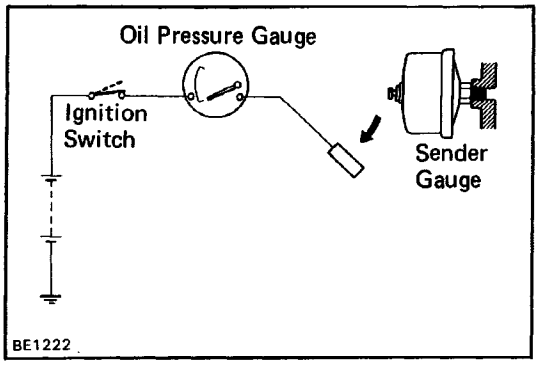
Measure the resistance between terminals.



Between terminals	Resistance (Ω)
A – B	71 – 79
A–C	117 – 141
C – A	185 – 215

HINT: Connect the test leads so that the current from the ohmmeter can flow according to the above order. This cir–cuit include the diode.

If resistance value is not as specified, replace the receiver gauge.



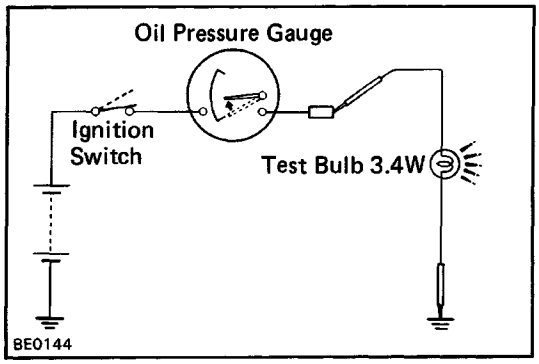
Oil Pressure Gauge System

1. INSPECT RECEIVER GAUGE

(Operation)

(a) Disconnect the connector from the sender gauge.

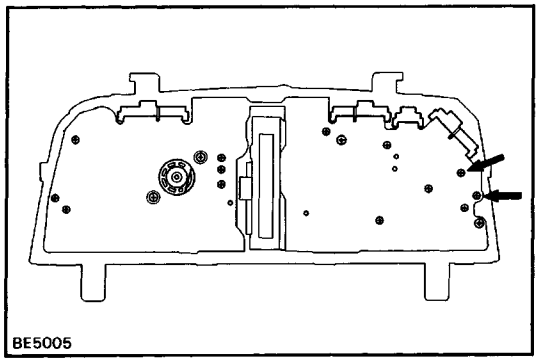
(b) Turn the ignition switch ON, check that the receiver gauge needle indicates LOW.



(c) Ground terminal on the wire harness side through a 3.4 W test bulb.

(d) Turn the ignition switch ON, check that the bulb lights up and the receiver gauge needle, moves to the high side.

If operation is not as specified, measure the receiver gauge resistance.

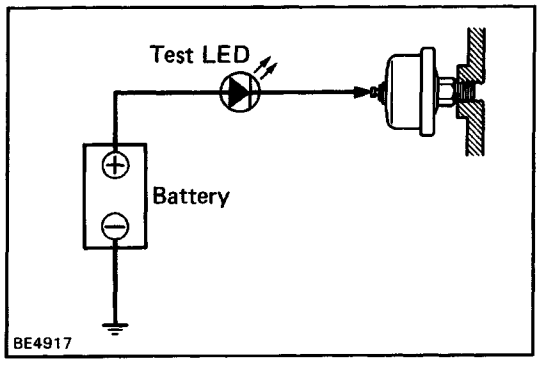


(Resistance)

Measure the receiver gauge resistance between terminals.

Resistance: 22 – 28Ω

If resistance value is not as specified, replace the receiver gauge.



2. INSPECT SENDER GAUGE

(a) Disconnect the connector from the sender gauge.

(b) Apply battery voltage to the sender gauge terminal through a test LED.

(c) Check that the bulb does not light when the engine is stopped.

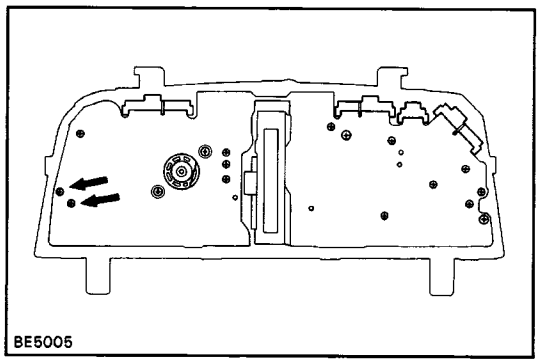
(d) Check that the LED flashes when the engine is running. The number of flashed should vary with engine speed .

If operation is not as specified, replace the sender gauge.

Voltmeter System

INSPECT VOLTMETER (ON–VEHICLE)

Compare the tester and voltmeter indications.
If error is excessive, replace the voltmeter.

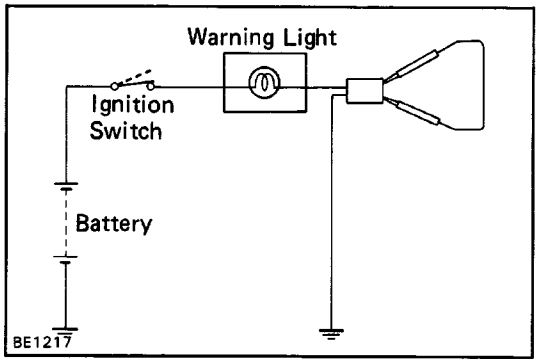


(Resistance)

Measure the receiver gauge resistance between terminals.

Resistance: 90 – 110Ω

If resistance value is not as specified, replace the receiver gauge.
HINT: This resistance include fuel receiver gauge resistance.

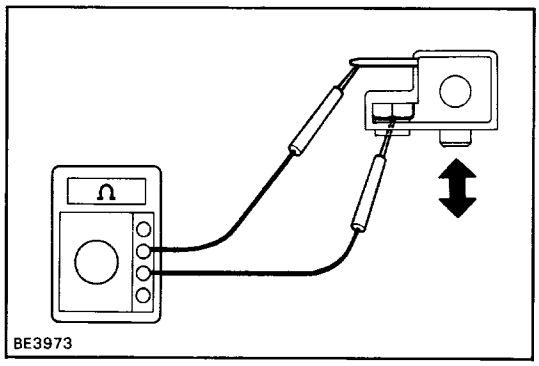


Brake Warning System

1. INSPECT WARNING LIGHT

(a) Disconnect the connectors from the level warning switch, parking brake switch.
(b) Connect terminals on the wire harness side connector of the level warning switch connector.
(c) Turn the ignition switch ON, check that the warning light lights up.

If the warning light does not light up, test the bulb.

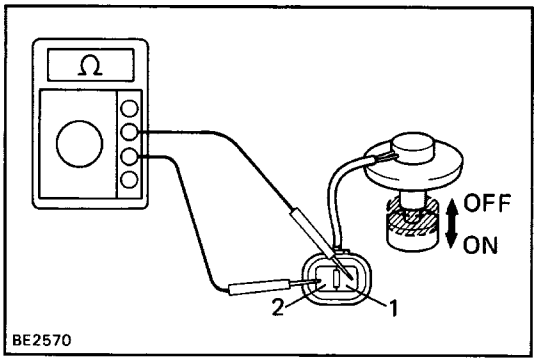


2. INSPECT SWITCHES

(Parking Brake Switch)

(a) Check that there is continuity between terminal and the switch set nut with switch pin released. (parking brake lever pulled up)
(b) Check that there is no continuity between terminal and the switch set nut with switch pin pushed in. (parking brake lever released)

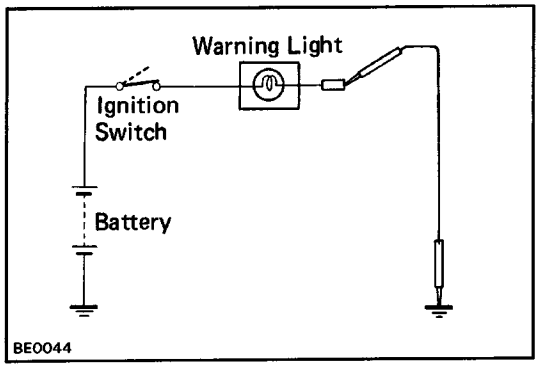
If operation is not as specified, replace the switch.



(Brake Fluid Level Warning Switch)

(a) Check that there is no continuity between terminals with the switch OFF (float up).
(b) Check that there is continuity between terminals with the switch ON (float down).

If operation is not as specified, replace the switch.



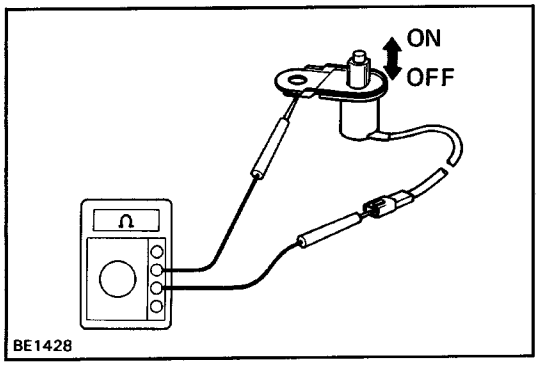
Open Door Warning System

1. INSPECT WARNING LIGHT

(a) Disconnect the connector from the door courtesy switch and ground terminal on the wire harness side connector.

(b) Turn the ignition switch ON, check that the warning light lights up.

If the warning light does not light up, test the bulb.



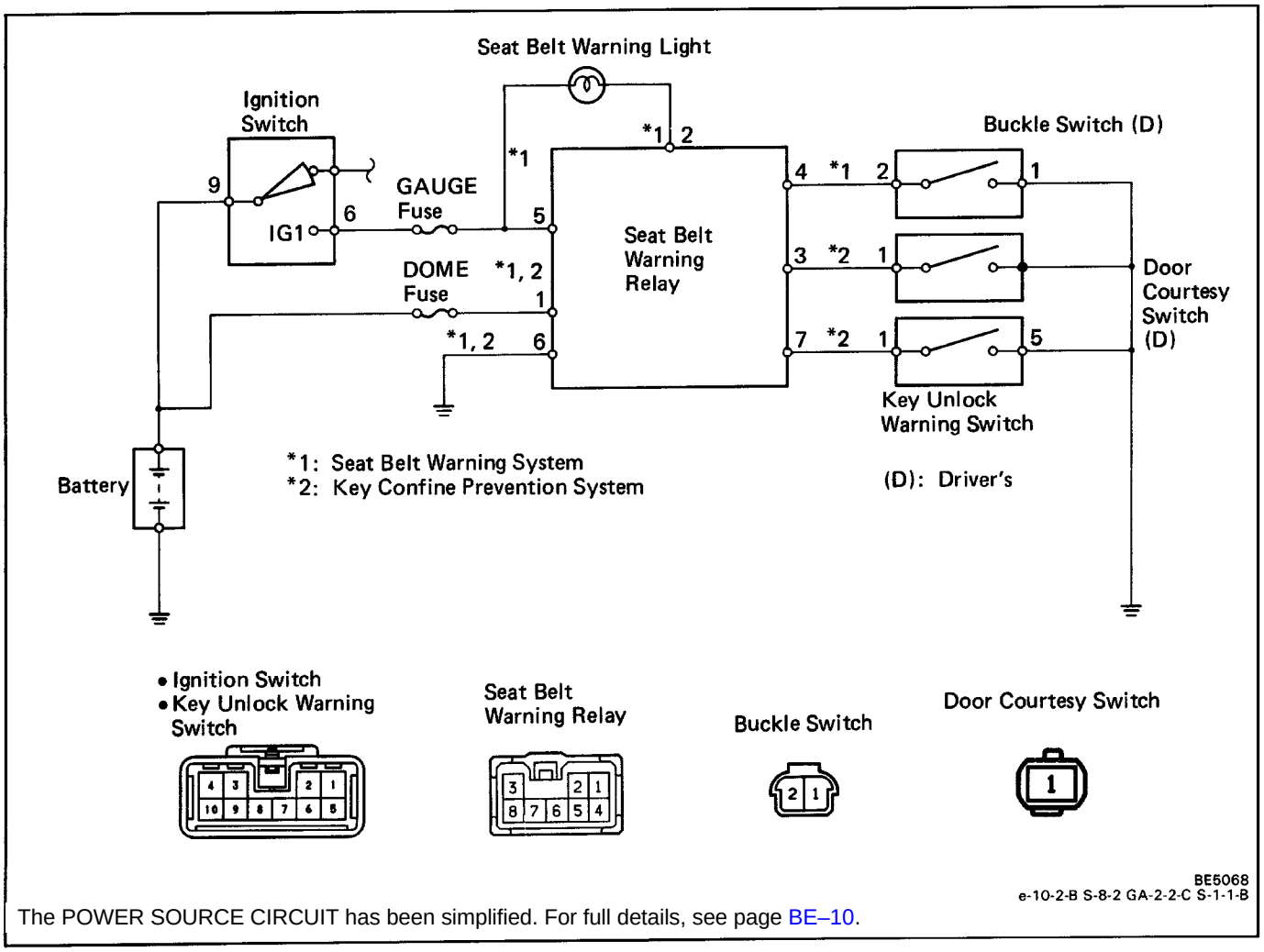
2. INSPECT COURTESY SWITCH

(a) Check that there is continuity between terminal and the switch body with the ON (switch pin released:opened door).

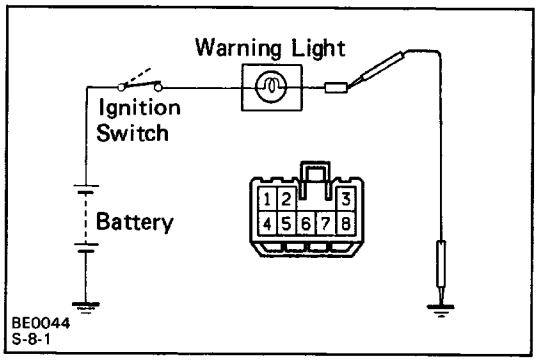
(b) Check that there is no continuity between terminal and the switch body with the OFF (switch pin pushed in:closed door).

If operation is not as specified, replace the switch.

Seat Belt Warning System (Wiring Diagram)



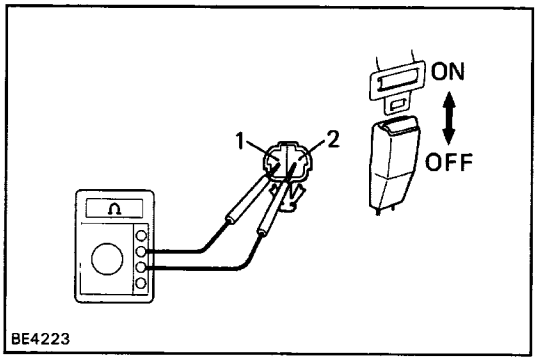
The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.



1. INSPECT WARNING LIGHT

(a) Disconnect the connector from the seat belt warning relay.
(b) Ground terminal 2 on the wire harness side connector.
(c) Turn the ignition switch ON, check that the warning light lights up.

If the warning light does not light, test the bulb.



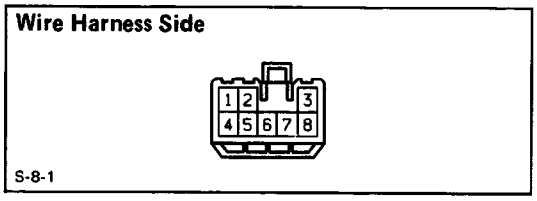
2. INSPECT SWITCHES

(Buckle Switch)

(a) Check that there is no continuity between terminals with the switch ON (belt unfastened).
(b) Check that there is continuity between terminals with the switch OFF (belt fastened).

If operation is not as specified, replace the seat belt inner.

(Courtesy Switch)
See page BE–43.
(Key Unlock Warning Switch)
See page BE–12.



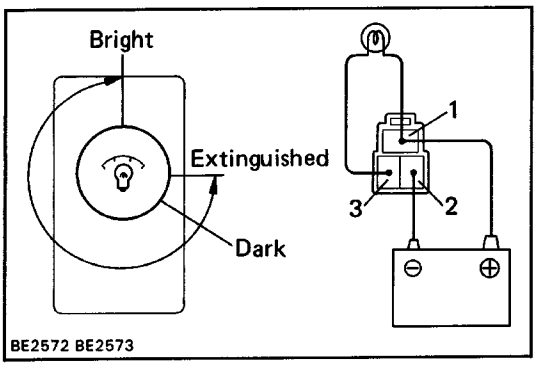
3. INSPECT SEAT BELT WARNING RELAY

(Relay Circuit)

Disconnect the connector from the relay and inspect the connector on the wire harness side as shown in the chart.

Check for	Tester connection	Condition		Specified value
Voltage	5 – Ground	Ignition switch position	ON	Battery voltage
			LOCK or ACC	No voltage
	1 – Ground	Constant		Battery voltage
Continuity	3 – Ground	Driver's door	Open	Continuity
			Close	No continuity
	4 – Ground	Driver's seat belt	Fasten	Continuity
			Unfasten	No continuity
	7 – Ground	Ignition key	Set	Continuity
			Remove	No continuity
	6 – Ground	Constant		Continuity

If circuit is as specified, try another relay.
If the circuit is not as specified, refer to BE–44 wiring diagram and inspect the circuits connected to other parts.



Meter Illumination Control System

INSPECT LIGHT CONTROL RHEOSTAT

(a) Connect terminals 1 and 3 through a 3.4 watts test bulb.

(b) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2.

(c) Turn the rheostat knob to fully counterclockwise, check that the test bulb goes out.

(d) Gradually turn the rheostat knob to clockwise, check that the test bulb brightness changes from dark to bright.

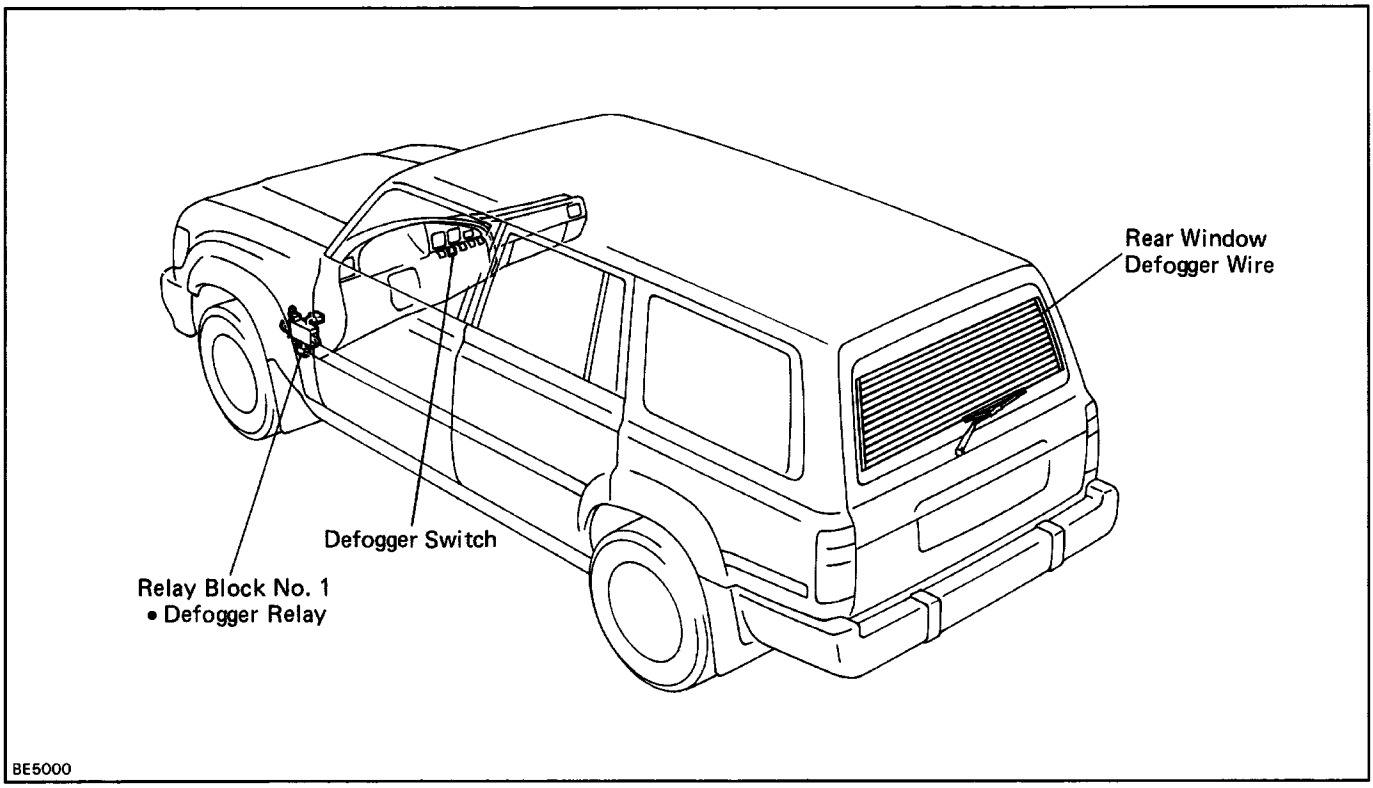
If operation is not as specified, replace the rheostat.

HINT: Illumination lights with adjustable brightness.

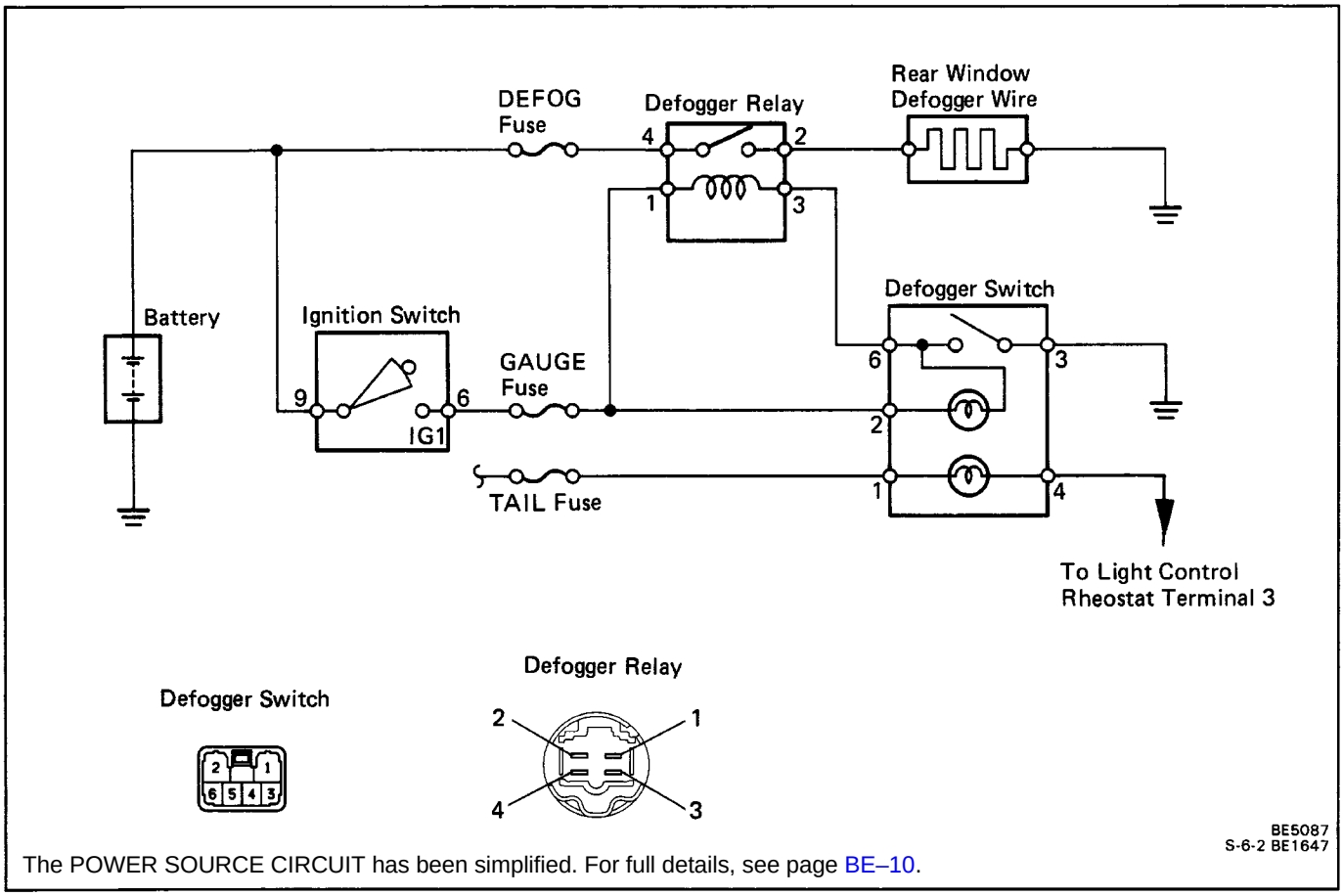
- Cigarette Lighter
- Ash Receptacle
- Antenna Switch
- Defogger Switch
- Headlight Cleaner Switch
- Audio
- A/C Control Assembly
- Center Diff. Lock Switch
- Hazard Warning Light Switch
- Shift Lever

DEFOGGER SYSTEM

Parts Location



Wiring and Connector Diagrams



The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

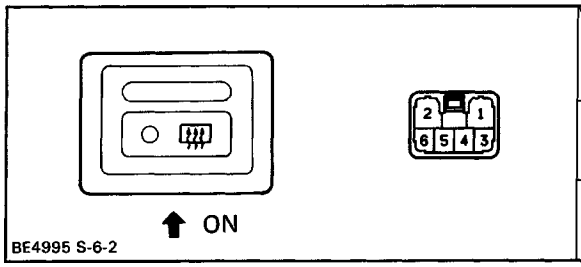
Troubleshooting

Problem	Possible cause	Remedy	Page
Rear window defogger system do not operate	DEFOG fuse blown GAUGE fuse blown Defogger switch faulty Defogger relay faulty Defogger wire broken Wiring or ground faulty	Replace fuse and check for short Replace fuse and check for short Check switch Check relay Check wires Repair as necessary	BE–4, BE–6 BE–4, BE–6 BE–44 BE–44 BE–44

Parts Inspection

1. INSPECT DEFOGGER SWITCH

(Continuity)



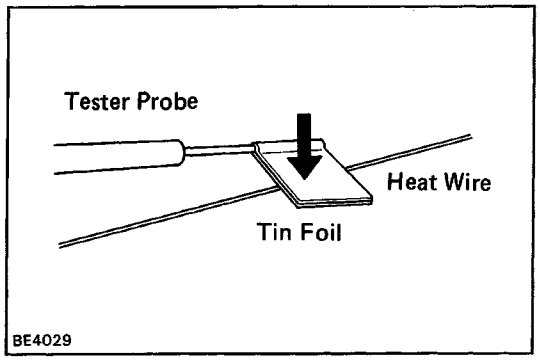
Terminal / Switch position	2	3	6	Illumination 1	Illumination 4
OFF					
ON	○	●	○	○	○

If continuity is not as specified, check the bulb or replace the switch.

2. INSPECT DEFOGGER RELAY

See Power main relay on Page BE–56.

3. INSPECT DEFOGGER WIRES

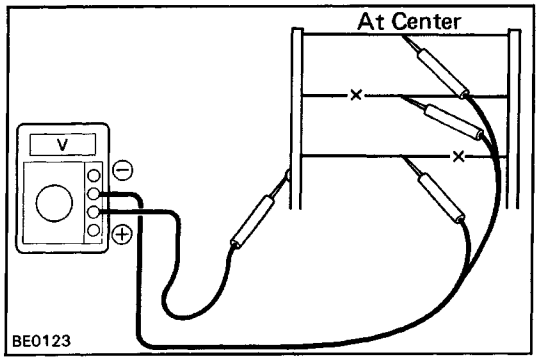


NOTICE:

- **When cleaning the glass, use a soft, dry cloth and wipe the glass in the direction of the wire. Take care not to damage the wires.**
- **Do not use detergents or glass cleaners with abrasive ingredients.**
- **When measuring voltage, wind a piece of tin foil around the top of the negative (–) probe and press the foil against the wire with your finger as shown.**

(Wire Breakage)

(a) Turn the ignition switch ON.
(b) Push in the defogger switch.
(c) Inspect the voltage at the center of each heat wire as shown.



Voltage	Criteria
approx. 5V	Okey (No break in wire)
approx. 1 0V or 0V	Broken wire

HINT: If there is 10V, the wire is broken between the center of the wire and positive (+) end. If there is no voltage, the wire is broken between the center of the wire and ground.

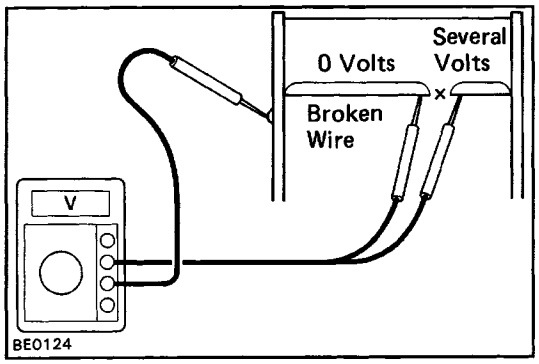
(Wire Breakage Point)

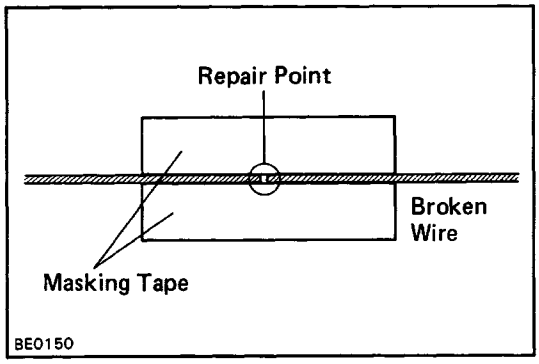
(a) Place the boltmeter positive (+) lead against the defogger positive (+) terminal.

(b) Place the boltmeter negative (–) lead with the foil strip against the heat wire at the positive (+) terminal end and slide it toward the negative (–) terminal end.

(c) The point where the voltmeter deflects from zero to several volts is the place where the heat wire is broken.

HINT: If the heat wire is not broken, the voltmeter indicates 0 volts at the positive (+) end of the heat wire but gradually increases to about 12 volts as the meter probe is moved to the other end.

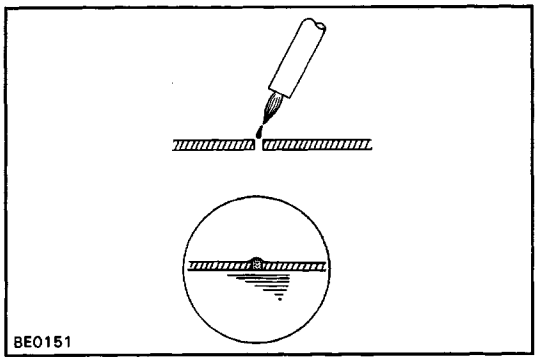




4. REPAIR DEFOGGER WIRES

(a) Clean the broken wire tips with a grease, wax and silicone remover.

(b) Place the masking tape along both sides of the wire to be repaired.



(c) Thoroughly mix the repair agent (Dupont paste No.4817 or equivalent).

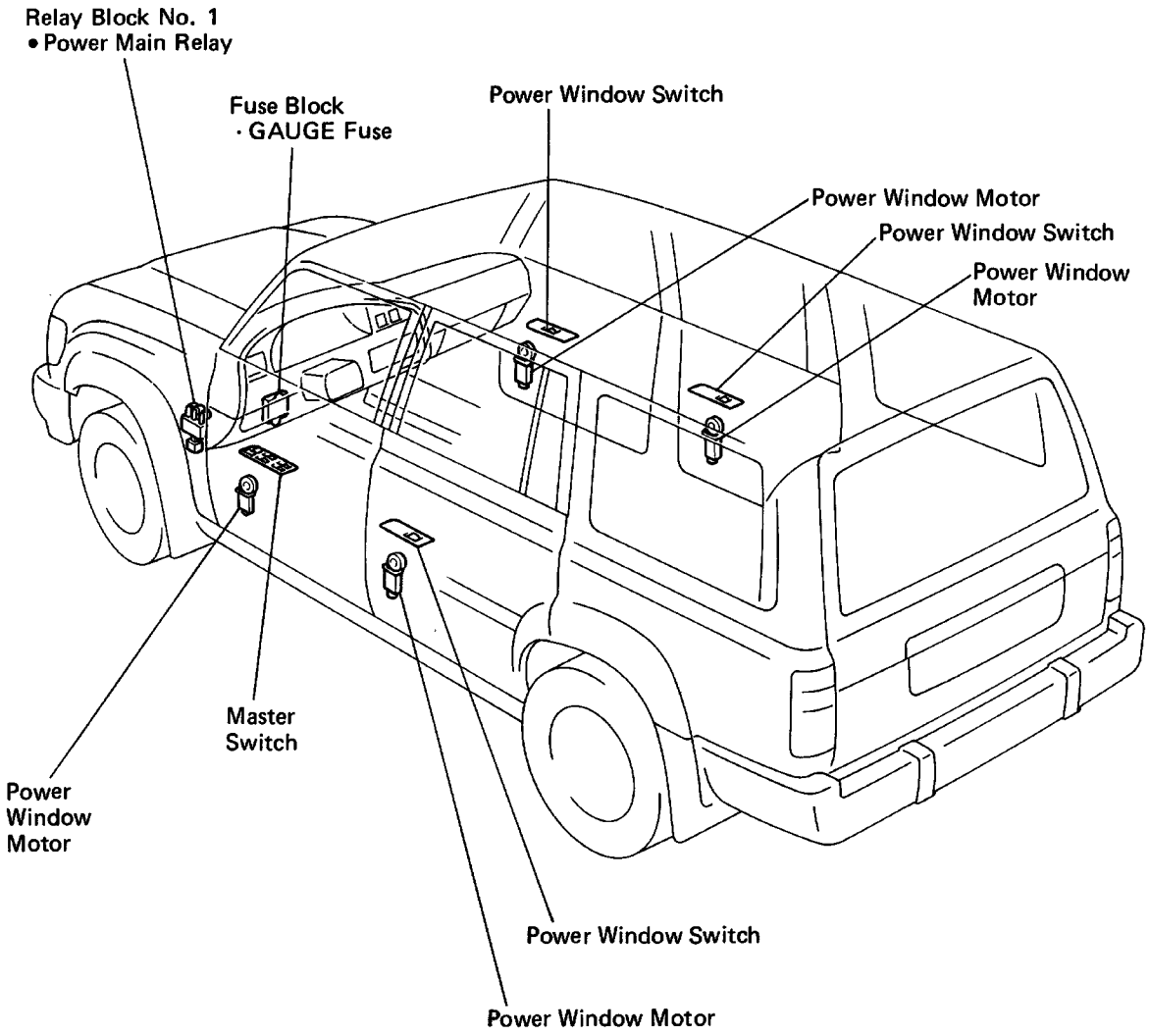
(d) Using a fine tip brush, apply a small amount to the wire.

(e) After a few minutes, remove the masking tape.

(f) Allow the repair to stand at least 24 hours.

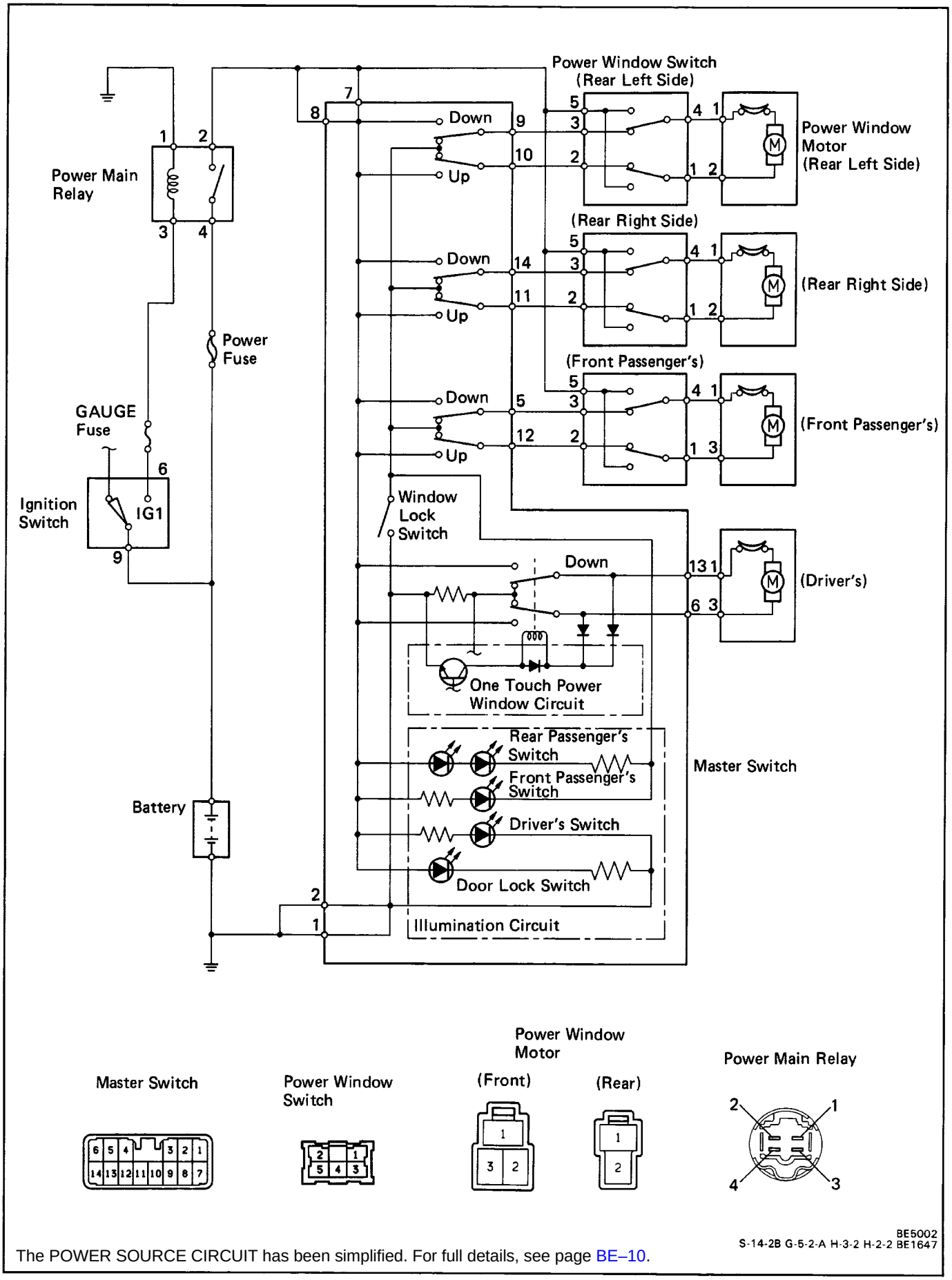
POWER WINDOW CONTROL SYSTEM

Parts Location



BE5088

Wiring and Connector Diagrams



BE5002
S-14-2B G-5-2-A H-3-2 H-2-2 BE1647

The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

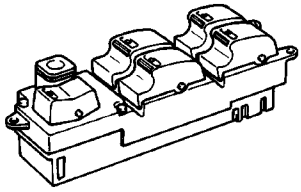
Troubleshooting

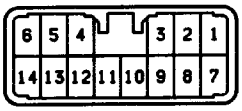
Problem	Possible cause	Remedy	Page
Power window does not operate at all	GAUGE fuse blown POWER fuse blown Power main relay faulty Wiring or ground faulty	Replace fuse and check for short Replace fuse and check for short Check relay Repair as necessary	BE–4, BE–6 BE–4, BE–6 BE–56
One–touch power window does not operate	Power window master switch faulty	Check Switch	BE–51
Only one window does not operate	Power window switch faulty Power window motor faulty Wiring Faulty	Check switch Check motor Repair as necessary	BE–53 BE–53

Parts Inspection

1. INSPECT SWITCHES

(Master Switch/Continuity)

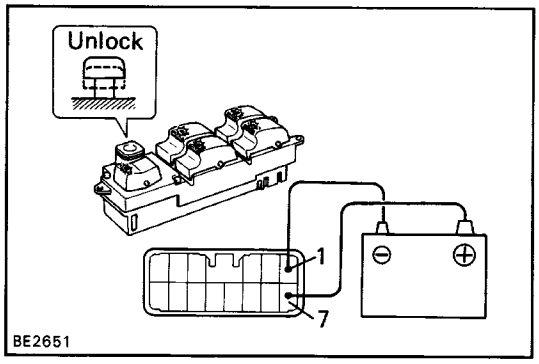




BE2594 S-14-2B

Window operation		Front								Rear							
		Driver's				Passenger's				Left				Right			
Terminal / Switch position		1 and 2	6	7 and 8	13	1 and 2	5	7 and 8	12	1 and 2	7 and 8	9	10	1 and 2	7 and 8	11	14
Window unlock	UP	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	OFF	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	DOWN	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Window lock	UP	○	○	○	○			○	○		○	○	○		○	○	
	OFF	○	○	○	○		○	○	○			○	○			○	○
	DOWN	○	○	○	○		○	○			○	○			○		○

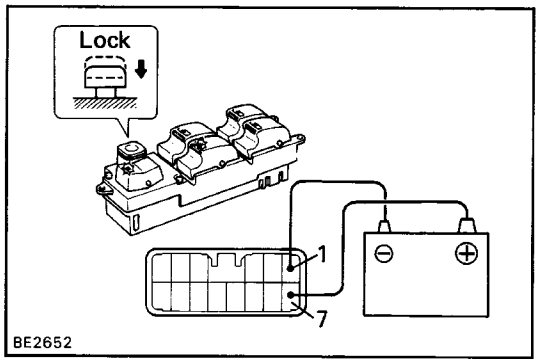
If continuity is not as specified, replace the master switch.



(Master Switch: Illumination)

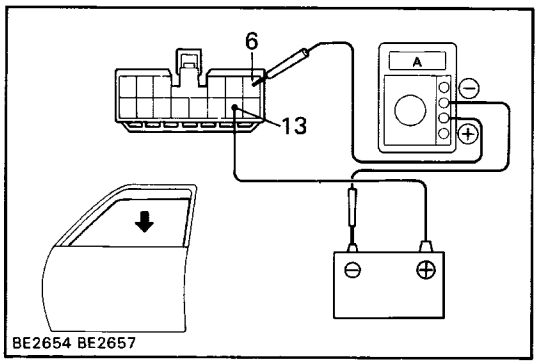
(a) Set the window lock switch to the unlock position.

(b) Connect the positive (+) lead from the battery to terminal 7 and the negative (–) lead to terminal 1, check that all the illuminations light up.



(c) Set the window lock switch to the lock position, check that all the passenger's power window switch illuminations go out.

If operation is not as specified, replace the master switch.



(Master Switch: One Touch Power Window System/ Current of Circuit)

Inspection using an ammeter.

(a) Disconnect the connector from the master switch.

(b) Connect the positive (+) lead from the ammeter to terminal 6 on the wire harness side connector and the negative (–) lead to negative terminal of the battery.

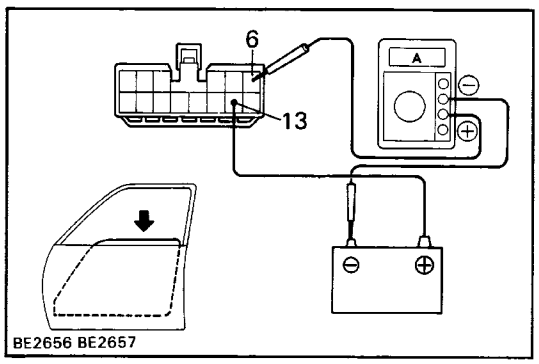
(c) Connect the positive (+) lead from the battery to terminal 13 on the wire harness side connector.

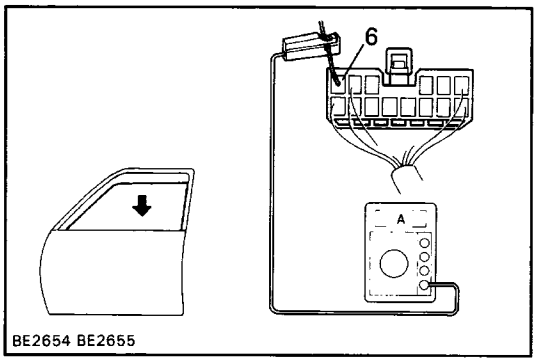
(d) As the window goes down, check that the current flows approximately 7 amperes.

(e) Check that the current increases approximately 14.5 amperes or more when the window stops going down.

HINT: The circuit breaker opens some 4 – 40 seconds after the window stops going down, so that check must be made before the circuit breaker operates.

If the operation is as specified, replace the master switch.





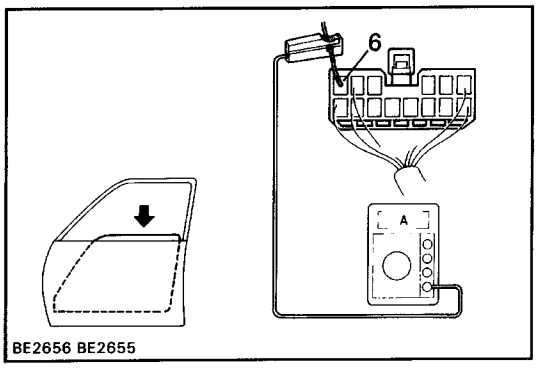
Inspection using an ammeter with a current–measuring probe.

(a) Remove the master switch with connector connected.

(b) Attach a current–measuring probe to terminal 6 of the wire harness.

(c) Turn the ignition switch ON and set the power wind switch in the down position.

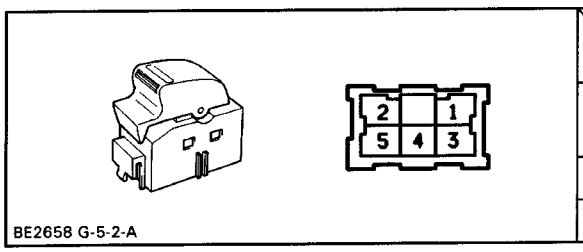
(d) As the window goes down, check that the current flows approximately 7 amperes.



(e) Check that the current increases approximately 14.5 amperes or more when the window stops going down.

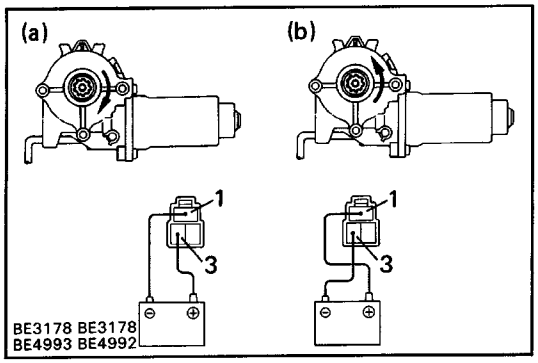
HINT: The circuit breaker opens some 4 – 40 seconds after the window stops going down, so that check must be made before the circuit breaker operates.
If operation is as specified, replace the master switch.

(Power Window Switch/Continuity)



Switch position \ Terminal	1	2	3	4	5
UP	○			○	○
OFF	○	○	○	○	
DOWN	○	○		○	○

If continuity is not as specified, replace the switch.



2. INSPECT POWER WINDOW MOTOR

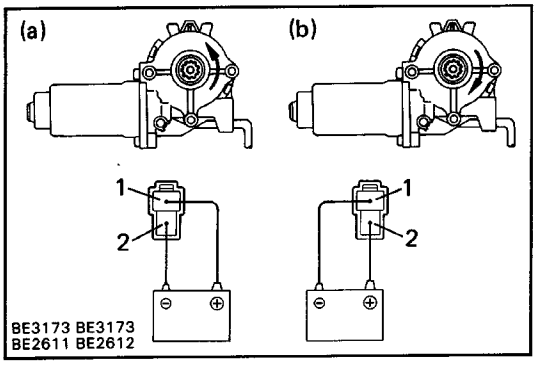
(Left Side Door Motor/Motor Operation)

Front Door:

(a) Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 1, check that the motor turns clockwise.

(b) Reverse the polarity, check that the motor turns counterclockwise.

If operation is not as specified, replace the motor.

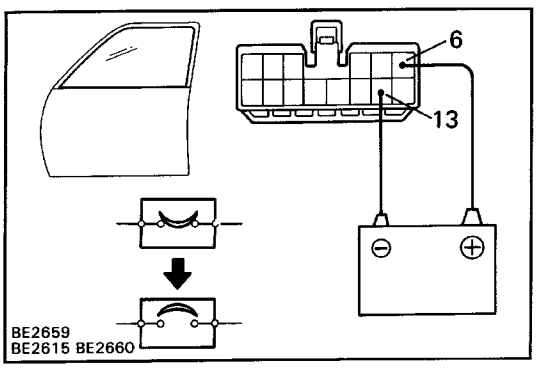


Rear Door:

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, check that the motor turns counterclockwise.

(b) Reverse the polarity, check that the motor turns clockwise.

If operation is not as specified, replace the motor.



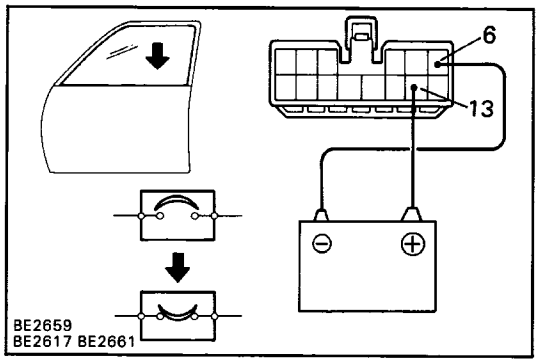
(Left Side Motor/Circuit Breaker Operation)

Driver's Door:

(a) Disconnect the connector from the master switch.

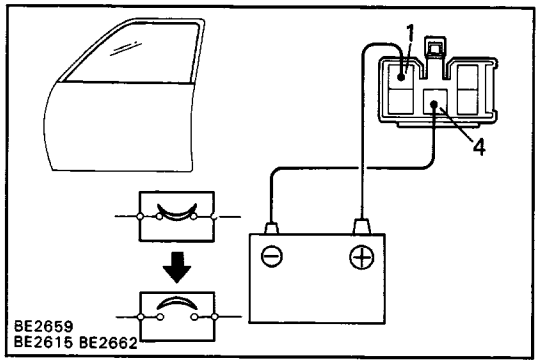
(b) Connect the positive (+) lead from the battery to terminal 6 and the negative (–) lead to terminal 13 on the wire harness side connector and raise the window to full closed position.

(c) Continue to apply voltage, check that there is a circuit breaker operation noise within approximately 4 to 40 seconds.



(d) Reverse the polarity, check that the window begins to descend within approximately 60 seconds.

If operation is not as specified, replace the motor.



Passenger's Door:

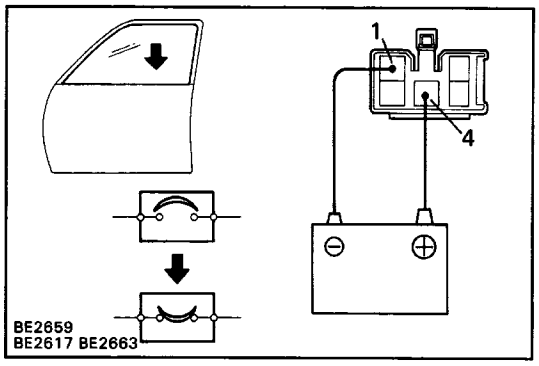
(a) Disconnect the connector from the power window switch.

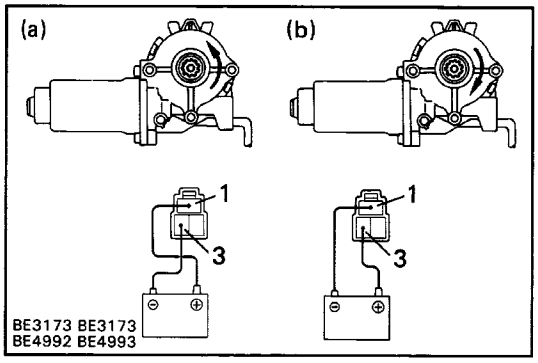
(b) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 4 on the wire harness side connector, and raise the window to full closed position.

(c) Continue to apply voltage, check that there is a circuit breaker operation noise within approximately 4 to 40 seconds.

(d) Reverse the polarity, check that the window begins to descend within approximately 60 seconds.

If operation is not as specified, replace the motor.



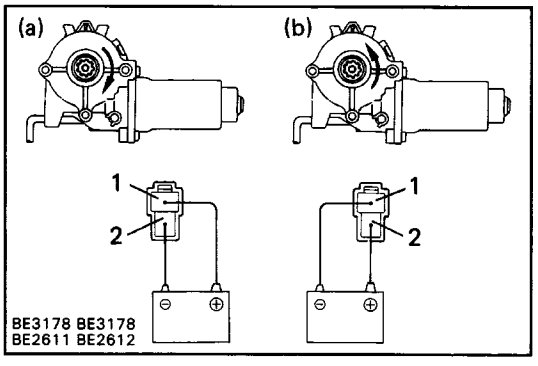


(Right Side Door Motor/Motor Operation)

Front Door:

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 3, check that the motor turns clockwise.

(b) Reverse the polarity, check that the motor turns counterclockwise.



Rear Door:

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, check that the motor turns counterclockwise.

(b) Reverse the polarity, check that the motor turns clockwise.

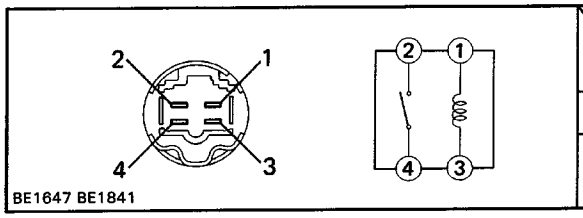
If operation is not as specified, replace the motor.

(Right Side Door Motor/Circuit Breaker Operation)

See Step of Left Side Motor on page BE–54.

3. INSPECT POWER MAIN RELAY

(Continuity)

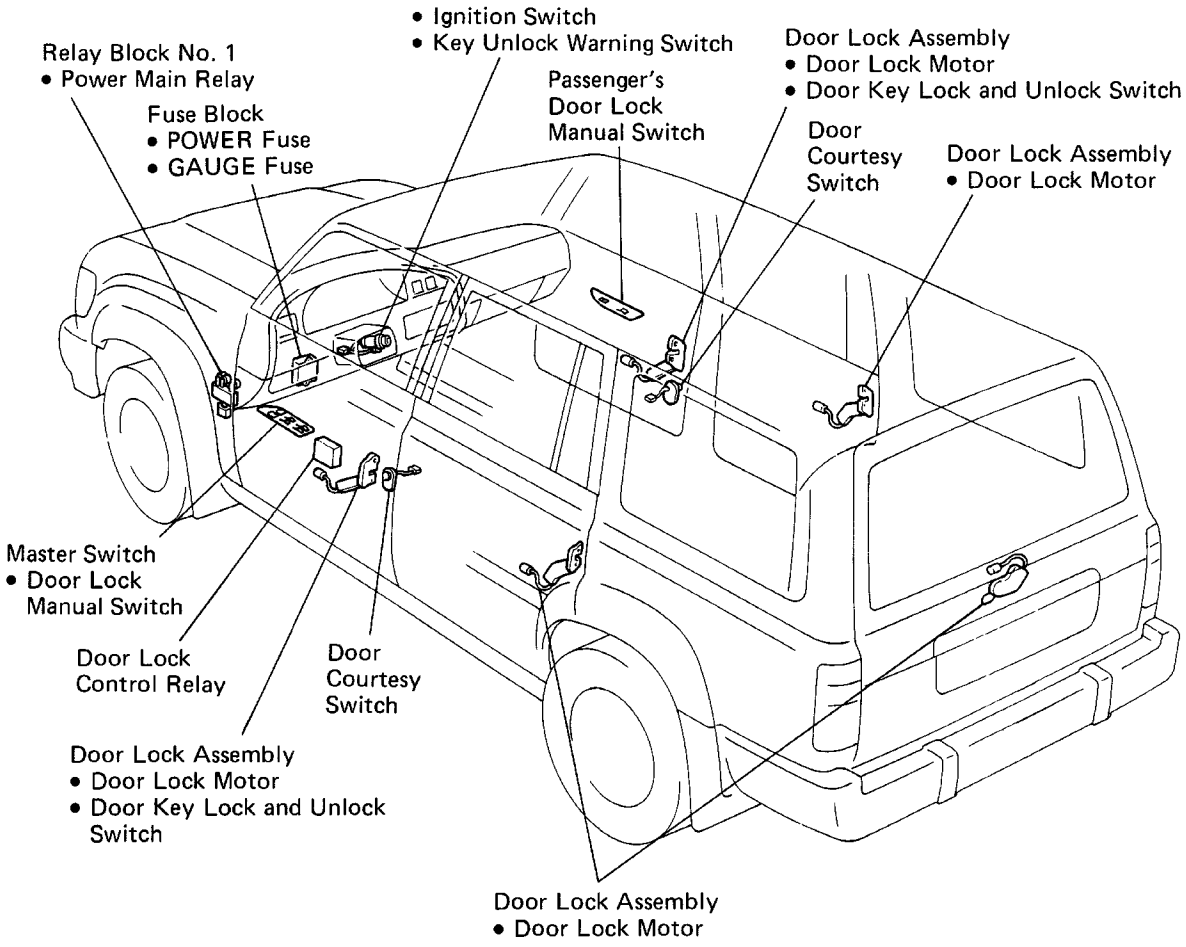


Terminal / Condition	1	2	3	4
Constant	○	∿∿∿	○	
Apply battery voltage to terminals 1 and 3.		○		○

If continuity is not as specified, replace the relay.

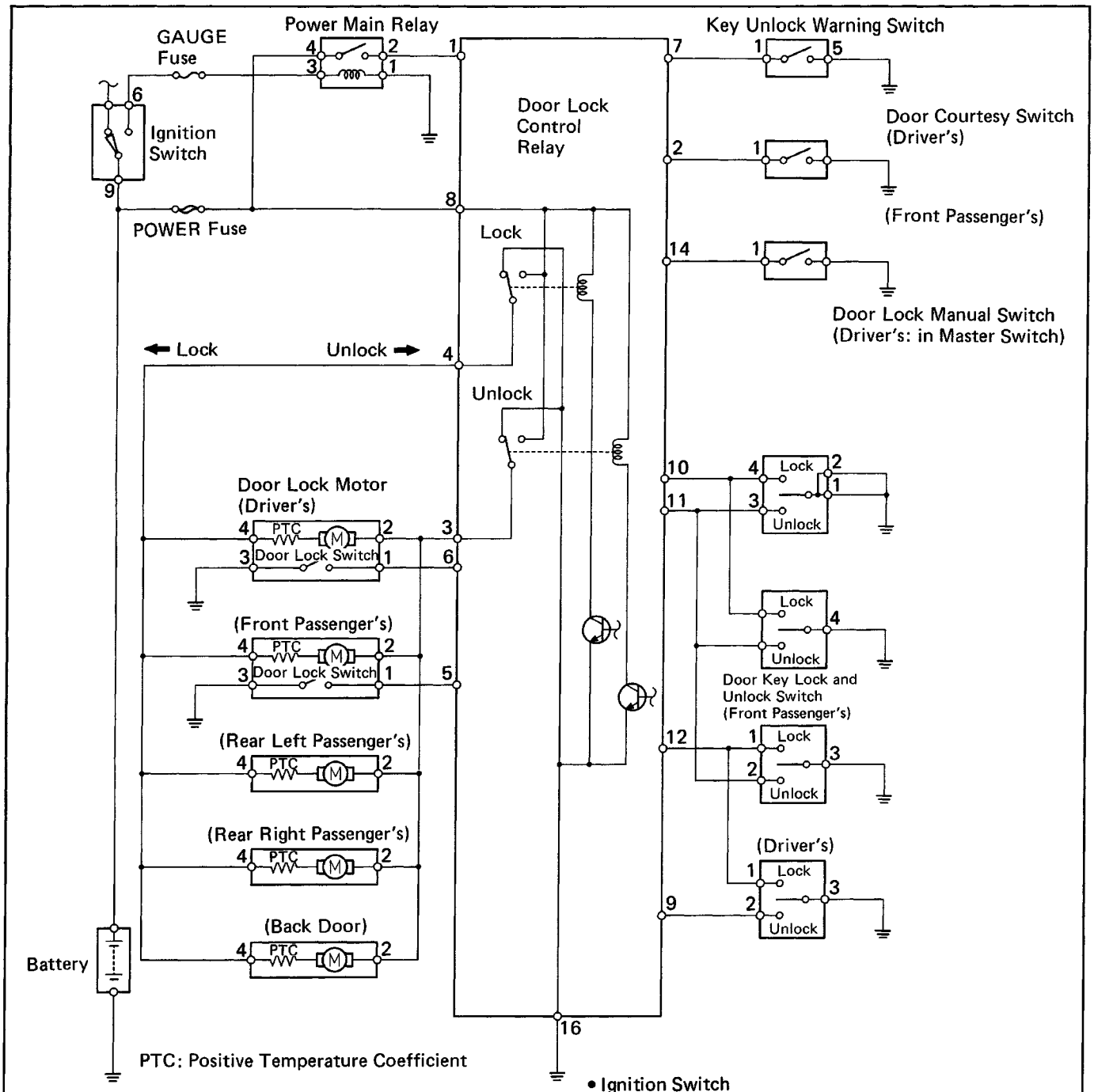
POWER DOOR LOCK CONTROL SYSTEM

Parts Location

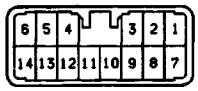


N03149

Wiring and Connector Diagrams

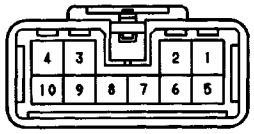


Door Lock Manual Switch (Driver's: in Master Switch)

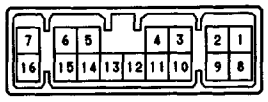


Door Key Lock and Unlock Switch

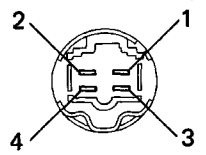
• Ignition Switch
• Key Unlock Warning Switch



Door Lock Control Relay



Power Main Relay



Door Lock Motor

Door Courtesy Switch

Passenger Side Door Lock Control Switch

N03148
S-14-2-B IU-3-2 e-10-2-B S-16-2-A
BE1647 IS-4-2-B S-1-1-B S-4-2-C

The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

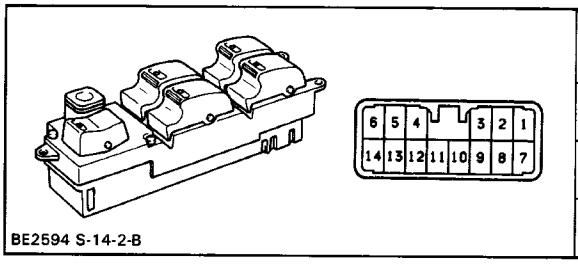
Troubleshooting

Problem	Possible cause	Remedy	Page
Door lock system does not operate at all	POWER fuse blown Door lock motor faulty Door lock control relay faulty Wiring or ground faulty Power main relay fault	Replace fuse and check for short Check motor Check relay Repair as necessary Check relay	BE–4, BE–6 BE–59 BE–61 BE–60
Door lock system does not operate by manual switch	Door lock manual switch faulty Door lock control relay faulty Wiring faulty	Check switch Check relay Repair as necessary	BE–58 BE–61
Door lock system does not operate by door key	Door key lock and unlock switch faulty Door lock control relay faulty Wiring faulty Door lock link disconnected	Check switch Check relay Repair as necessary Connect link	BE–58 BE–61
Fault in key confine prevention operation	Door lock control relay faulty Key unlock warning switch faulty Door courtesy switch faulty wiring faulty	Check relay Check switch Check switch Repair as necessary	BE–61 BE–58 BE–58

Parts Inspection

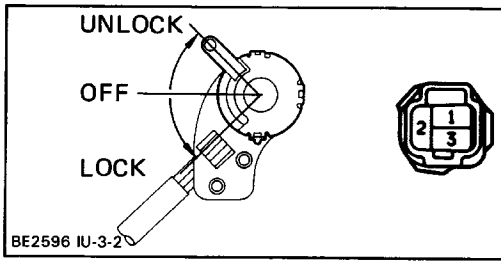
1. INSPECT SWITCHES

(Master Switch: Driver's Door Lock Manual Switch/ Continuity)



Terminal / Switch position	1 and 2	3	4
LOCK	○——	——	——○
OFF			
UNLOCK	○——	——○	

(Door Key Lock and Unlock Switch/Continuity)



Terminal / Switch position	1	2	3
LOCK	○——	——	——○
OFF			
UNLOCK		○——	——○

If continuity is not as specified, replace the switch.

HINT: Door key lock and unlock switch is built into the front door lock assembly.

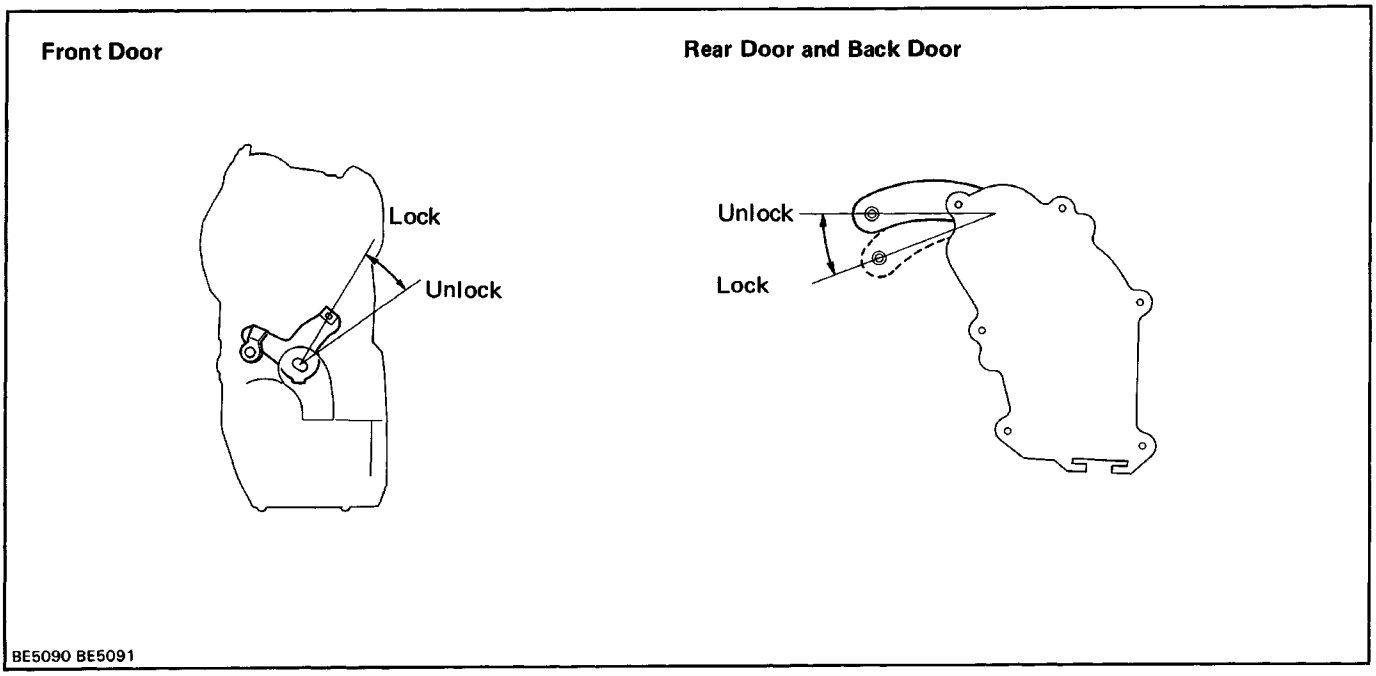
(Key Unlock Warning Switch/Continuity)

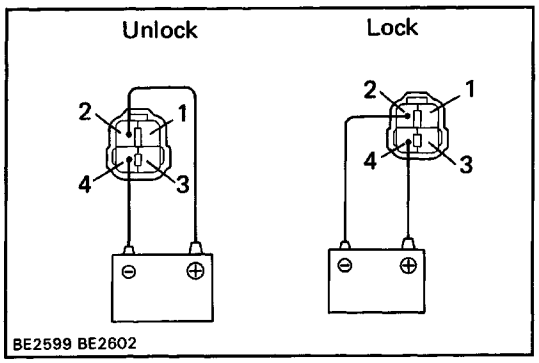
See Step 1 of Key Confine Prevention System on page BE–12.

(Door Courtesy Switch/Continuity)

See Step 2 of Open Door Warning System on page BE–43.

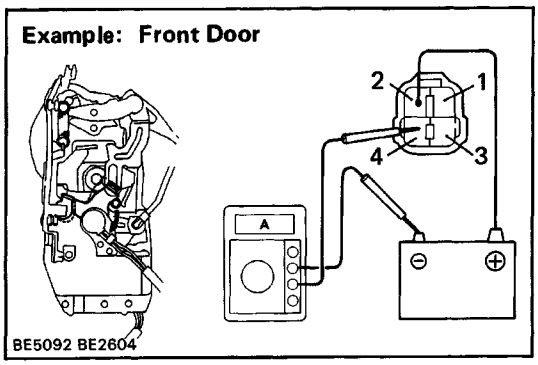
2. INSPECT DOOR LOCK MOTOR (Motor Operation)





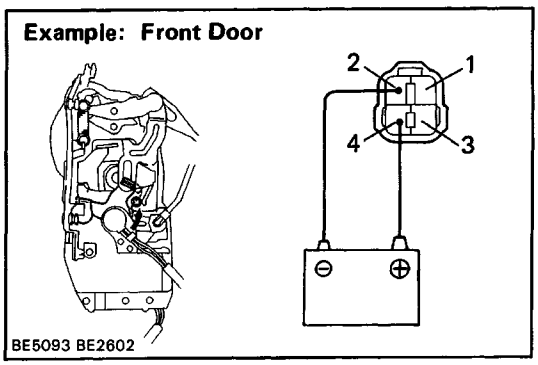
(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 4, check that the door lock link moves to UNLOCK position.
(b) Remove the polarity, check that the door lock link move to LOCK position.

If operation is not as specified, replace the door lock assembly.



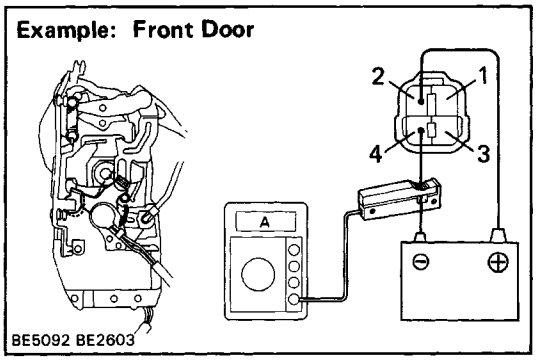
(PTC Thermistor Operation)
Inspection using an ammeter.

(a) Connect the positive (+) lead from the battery to terminal 2.
(b) Connect the positive (+) lead from the ammeter to terminal 4 and the negative (–) lead to battery negative (–) terminal, check that the current changes from approximately 3.2 ampere to less than 0.5 ampere with 20 to 70 seconds.



(c) Disconnect the leads from terminals.
(d) Approximately 60 seconds later, connect the positive (+) lead from the battery to terminal 4 and the negative (–) lead to terminal 2 check that the door lock moves to LOCK position.

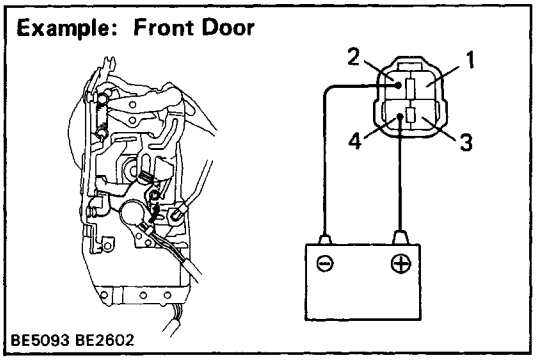
If operation is not as specified, replace the door lock assembly.



Inspection using an ammeter with a current–measuring probe.

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 4.

(b) Attach a current–measuring probe to either the positive (+) lead or the negative (–) lead, check that the current changes from approximately 3.2 ampere to less than 0.5 ampere within 20 to 70 seconds.

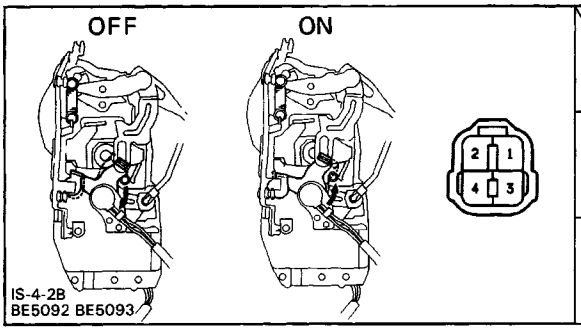


(c) Disconnect the leads from terminals.

(d) Approximately 60 seconds later, reverse the polarity, check that the door lock moves to LOCK position.

If operation is not as specified, replace the door lock assembly.

(Door Lock Switch /Continuity)

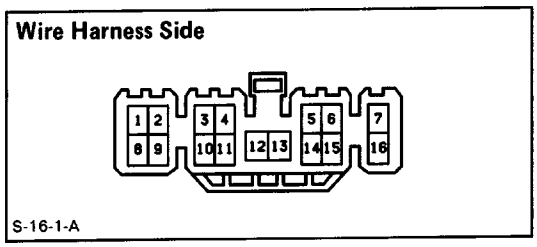


Terminal / Switch position	1	3
OFF (Door lock set to LOCK)		
ON (Door lock set to UNLOCK)	○——	——○

If continuity is not as specified, replace the door lock assembly.

3. INSPECT POWER MAIN RELAY

See power main relay on page BE–55.

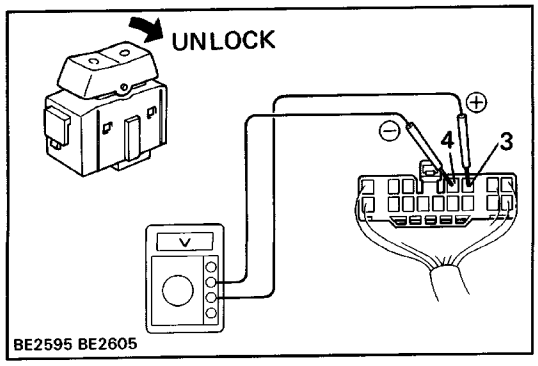


4. INSPECT DOOR LOCK CONTROL RELAY (Relay Circuit)

Disconnect the connector from the relay and inspect the connector on the wire harness side as shown in the chart.

Check for	Tester connection	Condition		Specified value
Continuity	2–Ground	Driver's door courtesy switch position	OFF (Door closed)	No continuity
			ON (Door opened)	Continuity
	5–Ground	Passenger's door lock switch position	OFF (Door locked)	No continuity
			ON (Door unlocked)	Continuity
	6–Ground	Driver's door lock switch position	OFF (Door locked)	No continuity
			ON (Door unlocked)	Continuity
	7–Ground	Key unlock warning switch position	OFF (Ignition key removed)	No continuity
			ON (Ignition key set)	Continuity
	9–Ground	Door key lock and unlock switch position	OFF or Lock (Door key free or turned to lock)	No continuity
			Unlock (Door key turned to unlock)	Continuity
	10–Ground	Door lock manual switch position	OFF or Unlock	No continuity
			Lock	Continuity
	1 1 –Ground	Door lock manual switch position	OFF or Lock	No continuity
			Unlock	Continuity
	12–Ground	Door key lock and unlock switch position	OFF or Unlock (Door key free or turned to unlock)	No continuity
			Lock (Door key turned to lock)	Continuity
	14–Ground	Passenger's door cour–tesy switch position	OFF (Door closed)	No continuity
			ON (Door opened)	Continuity
	16–Ground	Constant		Continuity
Voltage	1–Ground	Ignition switch position	LOCK	No voltage
			ACC or ON	Battery voltage
	8–Ground	Constant		Battery voltage

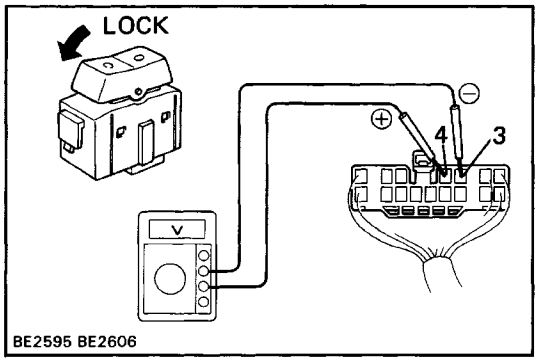
If circuit is as specified, inspect the door lock signal.
If the circuit is not as specified, refer to BE–57 wiring dia–gram and inspect the circuits connected to other parts.



(Door Lock Signal)

HINT: When the relay circuit is as specified, inspect the door lock signal.

(a) Connect the connector to the relay.
(b) Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (–) lead to terminal 4.
(c) Set the door lock manual switch to UNLOCK, check that the voltage rises from 0 volts to battery voltage for approximately 0.2 seconds.

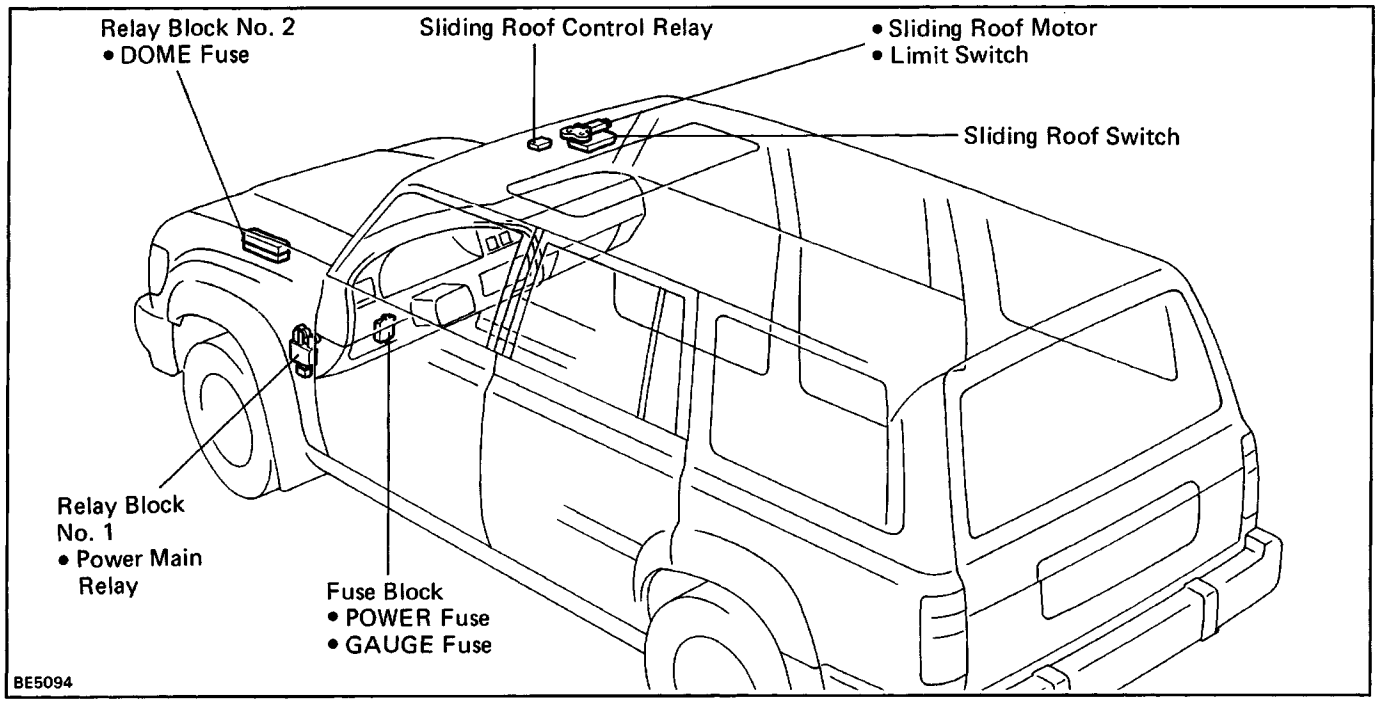


(d) Reverse the polarity of the voltmeter leads.
(e) Set the door lock manual switch to LOCK, check that the voltage rises from 0 volts to battery voltage for approximately 0.2 seconds.

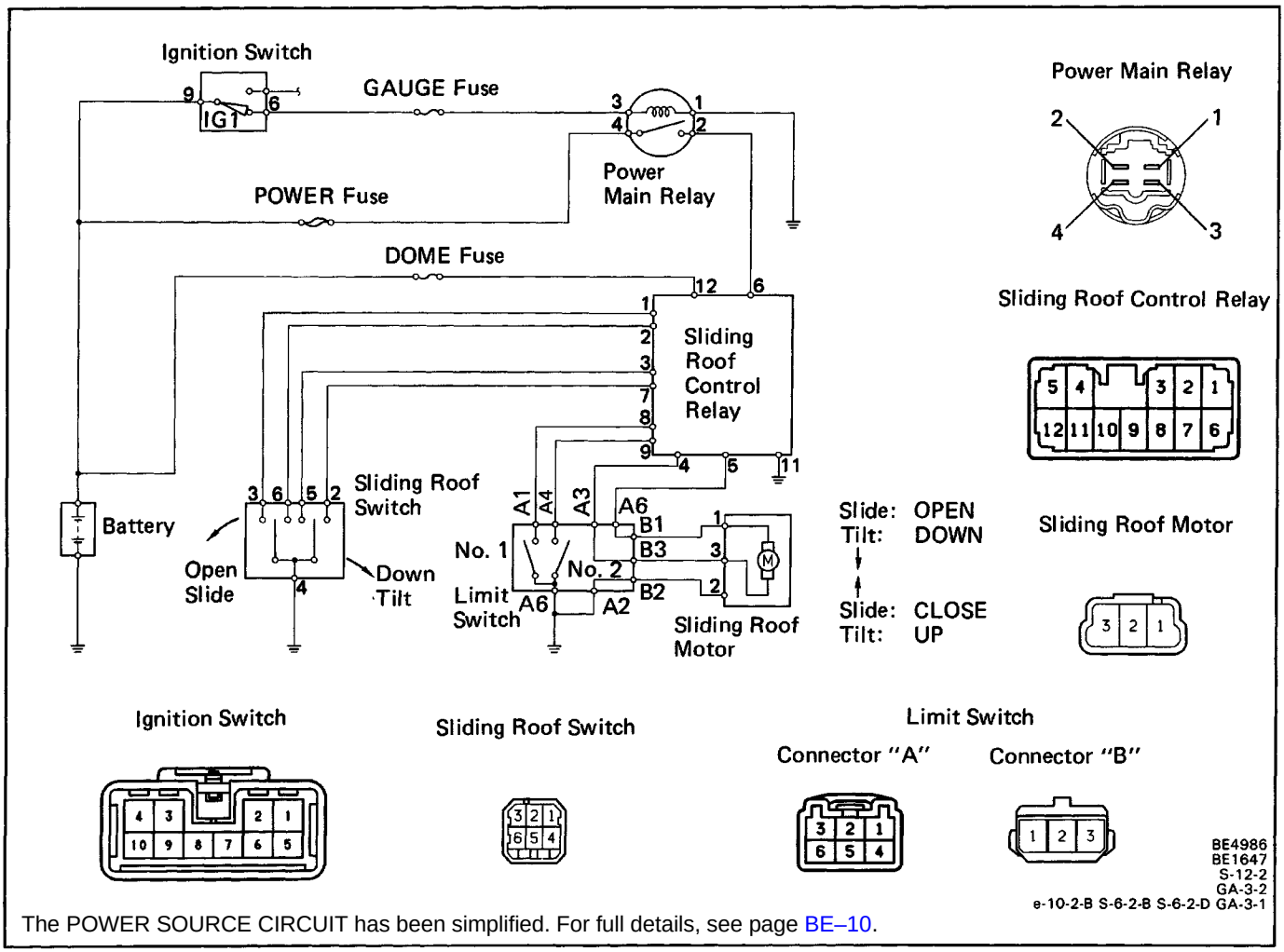
If operation is not as specified, replace the relay.

SLIDING ROOF SYSTEM

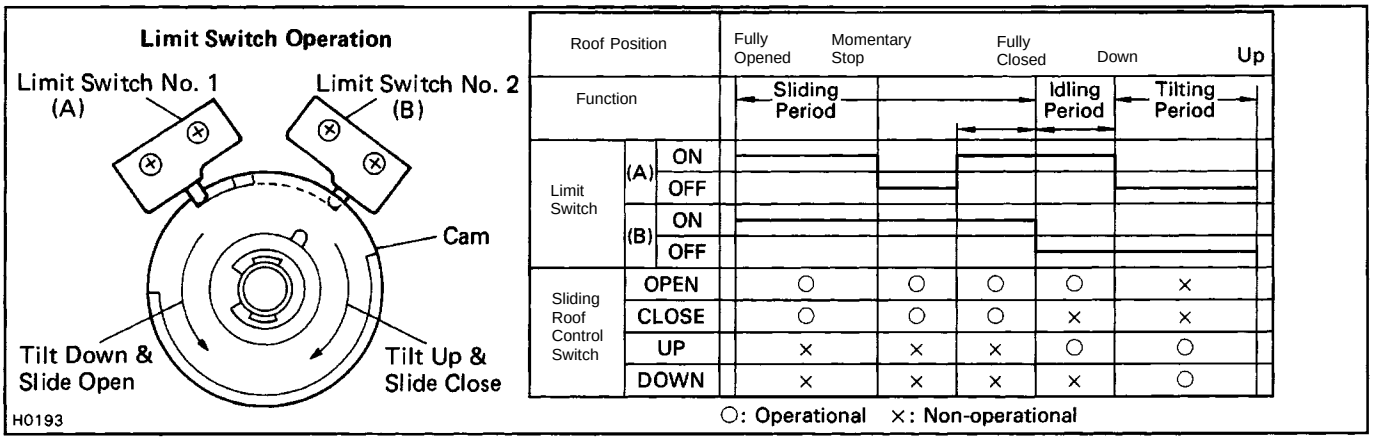
Parts Location



Wiring and Connector Diagrams



The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.



Roof Position			Fully Opened	Momentary Stop		Fully Closed	Down	Up
Function			Sliding Period			Idling Period	Tilting Period	
Limit Switch	(A)	ON						
		OFF						
	(B)	ON						
		OFF						
Sliding Roof Control Switch	OPEN		○	○	○	○	×	
	CLOSE		○	○	○	×	×	
	UP		×	×	×	○	○	
	DOWN		×	×	×	×	○	

○: Operational ×: Non-operational

System Description

Standby Operation

- Current flows from the DOME fuse to terminal 12 of the Sliding Roof Relay. (hereafter called relay)
- When the ignition switch is on, the current flows from the POWER fuse to terminal 6 of the relay.

Operation

1. OPEN operation

When the switch on the ”OPEN” side of the control switch is pushed, continuity is produced between terminal 1 of the relay and body ground. Then, the relay operates, the current flows through terminal 6 of the relay → terminal 5 → terminal 1 of the sliding roof motor → terminal 3 → terminal 4 of the relay → terminal 11 → the body ground, and the motor starts to run in order to open the sliding roof.

2. CLOSE operation

When the switch on the ”CLOSE” side of the control switch is pushed, continuity is produced between terminal 2 of the relay and body ground. Then, the relay operates, the current flows through terminal 6 of the relay → terminal 4 → terminal 3 of the sliding roof motor → terminal 1 → terminal 5 of the relay → terminal 11 → the body ground, and the motor starts to run in order to close the sliding roof.

Momentary Stop

When the sliding roof reaches about 100 mm (3.94 in.) short of the fully closed position, limit switch A is turned from ON to OFF, so there is no continuity between terminal 8 of the relay and the body ground. As a result, because the relay ceases to operate, the moon roof stops at that position. Release the control switch, then press the ”CLOSE” side of the control switch again.

Then the sliding will then roof move to fully closed position.

3. Tilt up operation (Fully close position)

When the switch on the ”UP” side of the control switch is pushed, continuity is produced between terminal 3 of the relay and body ground. Then, the relay operates, the current flows through terminal 6 of the relay → terminal 4 → terminal 3 of the sliding roof motor → terminal 1 → terminal 5 of the relay → terminal 11 → the body ground, and the motor starts to run in order to tilt up sliding roof.

4. Tilt Down operation (Fully close position)

When the switch on the ”DOWN” side of the control switch is pushed, continuity is produced between terminal 7 of the relay and body ground. Then the relay operates, the current flows through terminal 6 of the relay → terminal 5 → terminal 1 of the sliding roof motor → terminal 3 → terminal 4 of the relay → terminal 11 → the body ground, and the motor starts to run in order to tilt down the sliding roof.

5. Warning Buzzer Operation

When the ignition switch is turned to LOCK position while the sliding roof is still in ”Tilt up” position, a buzzer sounds to warn the driver that the sliding roof is in ”Tilt up” position.

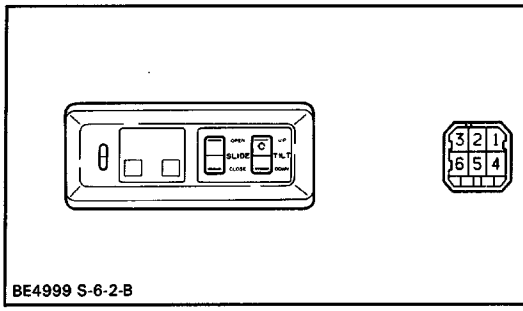
Troubleshooting

Problem	Possible cause	Remedy	Page
Sliding roof does not operate	GAUGE fuse blown	Replace fuse and check for short	BE–4, BE–6
	POWER fuse blown	Replace fuse and check for short	BE–4, BE–6
	Power main relay faulty	Check relay	BE–67
	Control switch faulty	Check switch	BE–65
	Limit switch faulty	Check switch	BE–65
	Sliding roof motor faulty	Check motor	BE–65
	Sliding roof control relay faulty	Check relay	BE–66
	Wiring faulty	Repair as necessary	

Parts Inspection

1. INSPECT SWITCHES

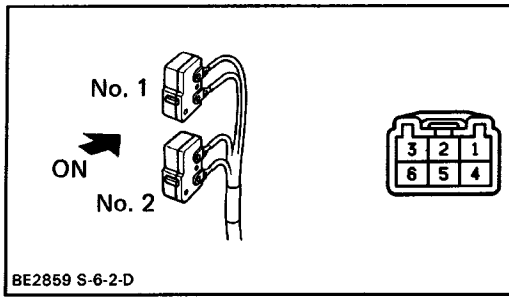
(Control Switch/Continuity)



Switch position		2	3	4	5	6
SLIDE	OPEN		○	○		
	OFF					
	CLOSE			○		○
TILT	DOWN	○		○		
	OFF					
	UP			○	○	

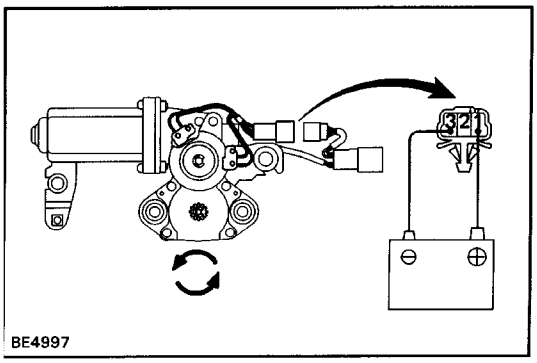
If continuity is not as specified, replace the switch.

(Limit Switch/Continuity)



Switch position		1	4	5
Limit switch No. 1	OFF (SW pin released)			
	ON (SW pin pushed in)	○		○
Limit switch No. 2	OFF (SW pin released)			
	ON (SW pin pushed in)		○	○

If continuity is not as specified, replace the switch.



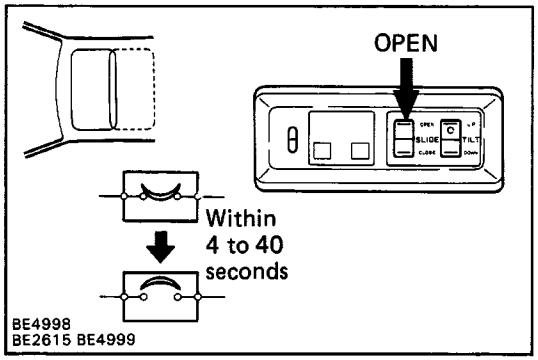
2. INSPECT SLIDING ROOF MOTOR

(Motor Operation)

(a) Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 1, check that the motor turns to clockwise.

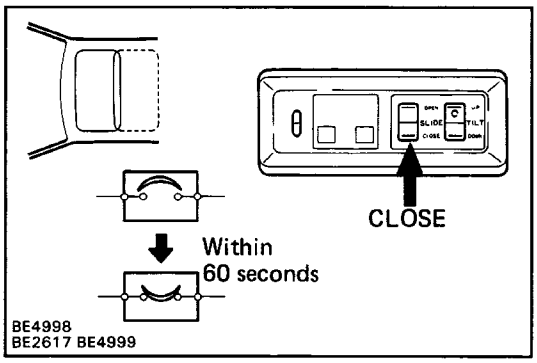
(b) Reverse the polarity, check that the motor turns to clockwise.

If operation is not as specified, replace the motor.

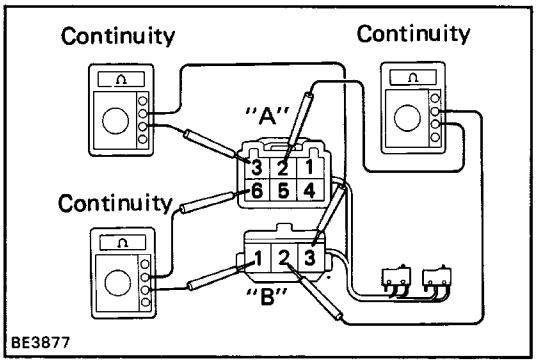


(Circuit Breaker Operation)

(a) With the sliding roof in the fully opened position, hold the sliding roof switch in "OPEN" position and check that there is a circuit breaker operation noise within 4 to 40 seconds.



(b) With the sliding roof in fully opened position, hold the sliding roof switch in "CLOSE" position and check that the sliding roof begins to close within 60 seconds. If operation is not as specified, replace the motor.



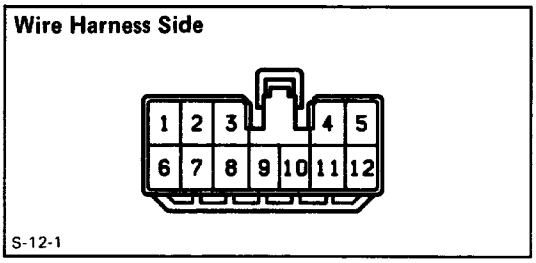
(Motor Wire Circuit)

(a) Check that there is continuity between terminals A2 and B2.

(b) Check that there is continuity between terminals A3 and B3.

(c) Check that there is continuity between terminals A6 and B1.

If continuity is not as specified, replace the switch.



3. INSPECT SLIDING ROOF CONTROL RELAY

(Relay Circuit)

Disconnect the connector from the relay and inspect the connector on the wire harness side as shown in the chart.

Check for	Tester connection	Condition		Specified value
Continuity	1 – Ground	Sliding roof control switch position (SLIDE)	OFF or CLOSE	No continuity
			OPEN	Continuity
	2 – Ground	Sliding roof control switch position (SLIDE)	OFF or OPEN	No continuity
			CLOSE	Continuity
	3 – Ground	Sliding roof control switch position (TILT)	OFF or DOWN	No continuity
			UP	Continuity
	4 – Ground	Constant		No continuity
	4 – 5	Constant		*Continuity
* : There is resistance because this circuit is include motor.				

Check for	Tester connection	Condition		Specified value
Continuity	9 – Ground	Limit switch No.2 (B) position	OFF [Roof tilt–up]	Continuity
			ON [Roof open]	No continuity
	7 – Ground	Control switch position (Tilt)	UP or OFF	No continuity
			DOWN	Continuity
	8 – Ground	Limit switch No. 1 (A) position	OFF [Roof tilt–up]	No continuity
			ON [Roof open]	Continuity
	11 – Ground	Constant		Continuity
Voltage	12 – Ground	Constant		Battery voltage
	6 – Ground	Ignition switch position	LOCK or ACC	No voltage
			ON	Battery voltage

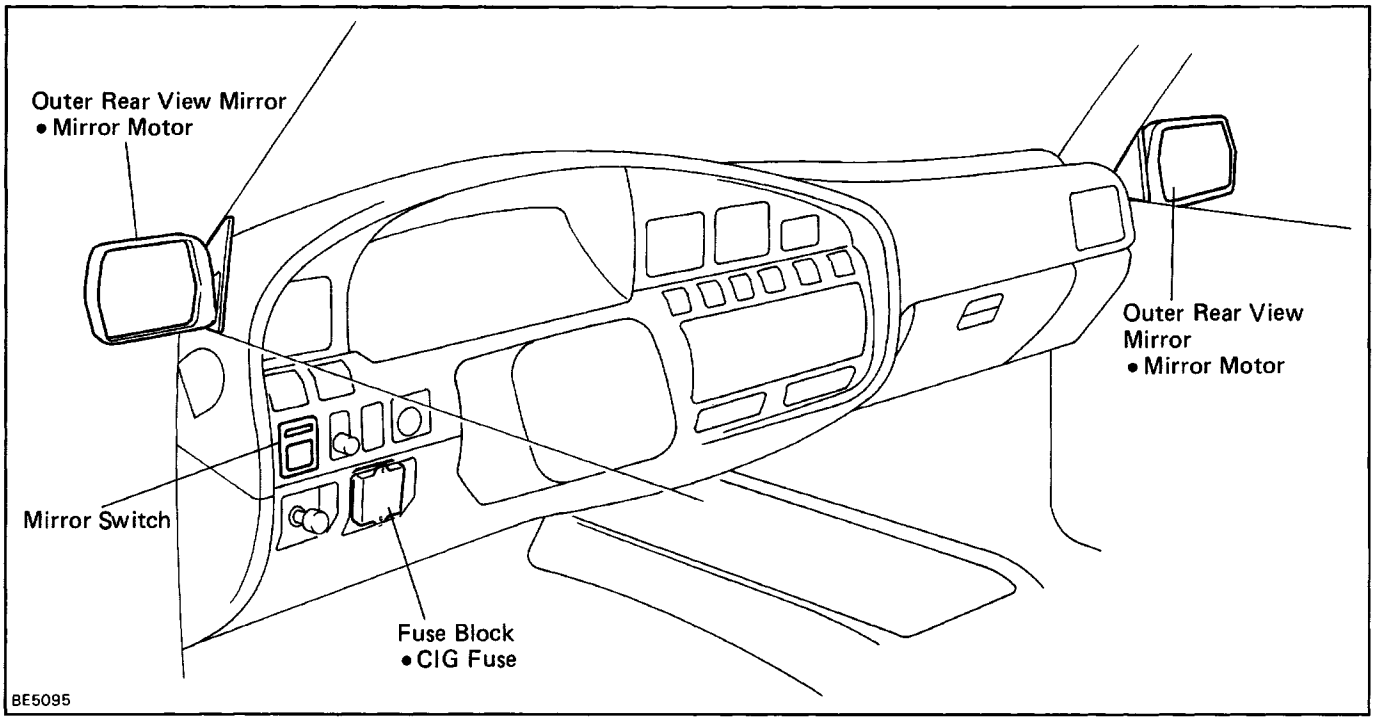
If circuit is as specified, replace the relay.
If circuit is not as specified, refer to BE–63 wiring diagram and inspect the circuits connected to other parts.

4. INSPECT POWER MAIN RELAY

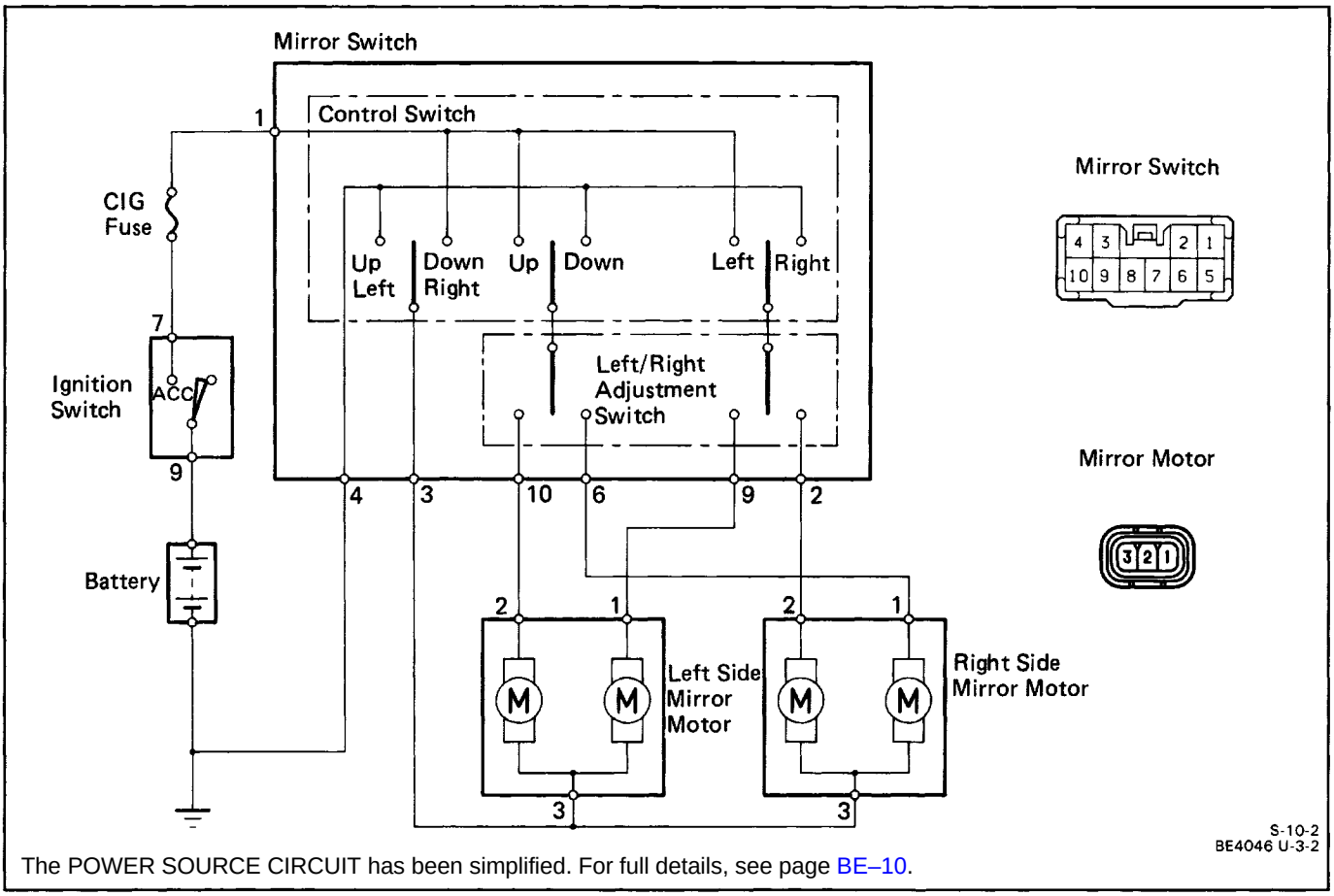
See power main relay on page BE–55.

POWER MIRROR CONTROL SYSTEM

Parts Location



Wiring and Connector Diagrams



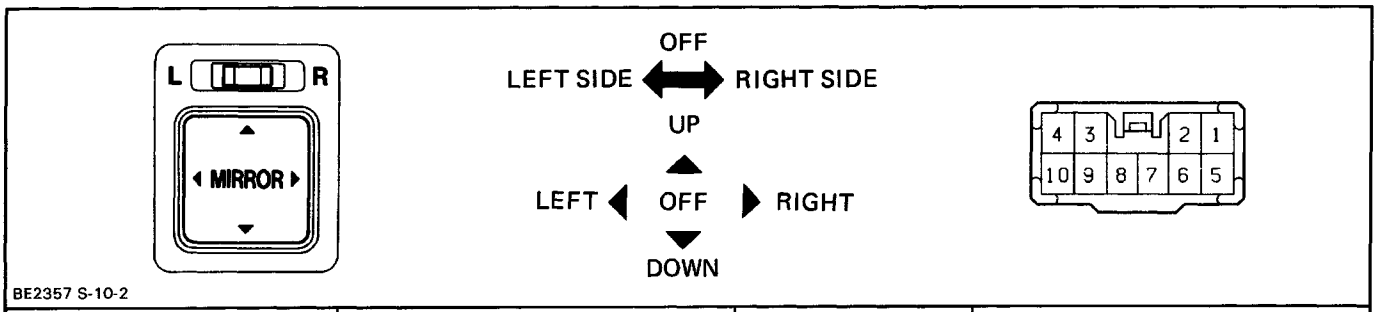
The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

Troubleshooting

Problem	Possible cause	Remedy	Page
Remote control mirror system does not operate	CIG fuse faulty Mirror switch faulty Mirror motor faulty Wiring or ground fault	Replace fuse and check for short Check switch Check motor Repair as necessary	BE–4, BE–6 BE–69 BE–69

Parts Inspection

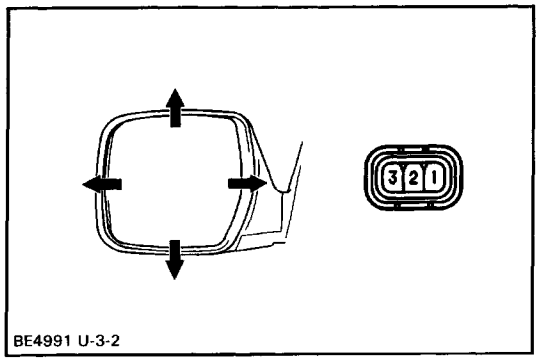
1. INSPECT MIRROR SWITCH (Continuity)



Left/Right adjustment switch position	LEFT SIDE					OFF			RIGHT SIDE				
Terminal / Control switch position	1	3	4	9	10	1	3	4	1	2	3	4	6
OFF													
UP	○	○	○		○		○	○	○		○	○	○
DOWN	○	○	○		○	○	○		○		○	○	○
LEFT	○	○	○	○			○	○	○		○	○	
RIGHT	○	○	○	○		○	○		○	○		○	

If continuity is not as specified, replace switch.

2. INSPECT MIRROR MOTOR



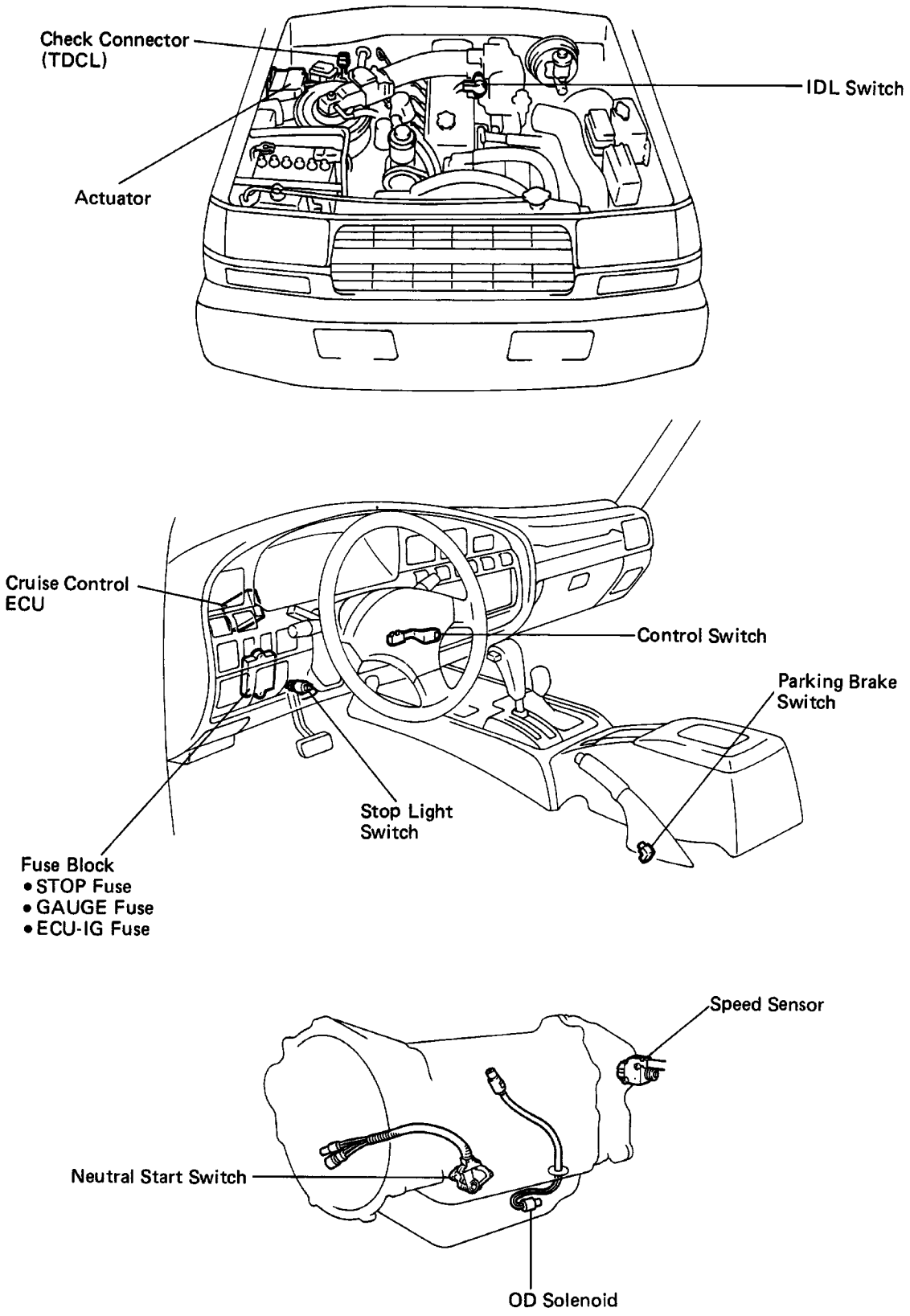
Connect the positive (+) lead from the battery to terminal in column ”A” and the negative (–) lead to terminal in column “B”, check that the mirror operates in column ”C”.

A (+)	B (–)	C (Operation)
2	3	Mirror turns upward (⬆)
3	2	Mirror turns downward (⬇)
1	3	Mirror turns to left side (⬅)
3	1	Mirror turns to right side (➡)

If operation is not as specified, replace the mirror assembly.

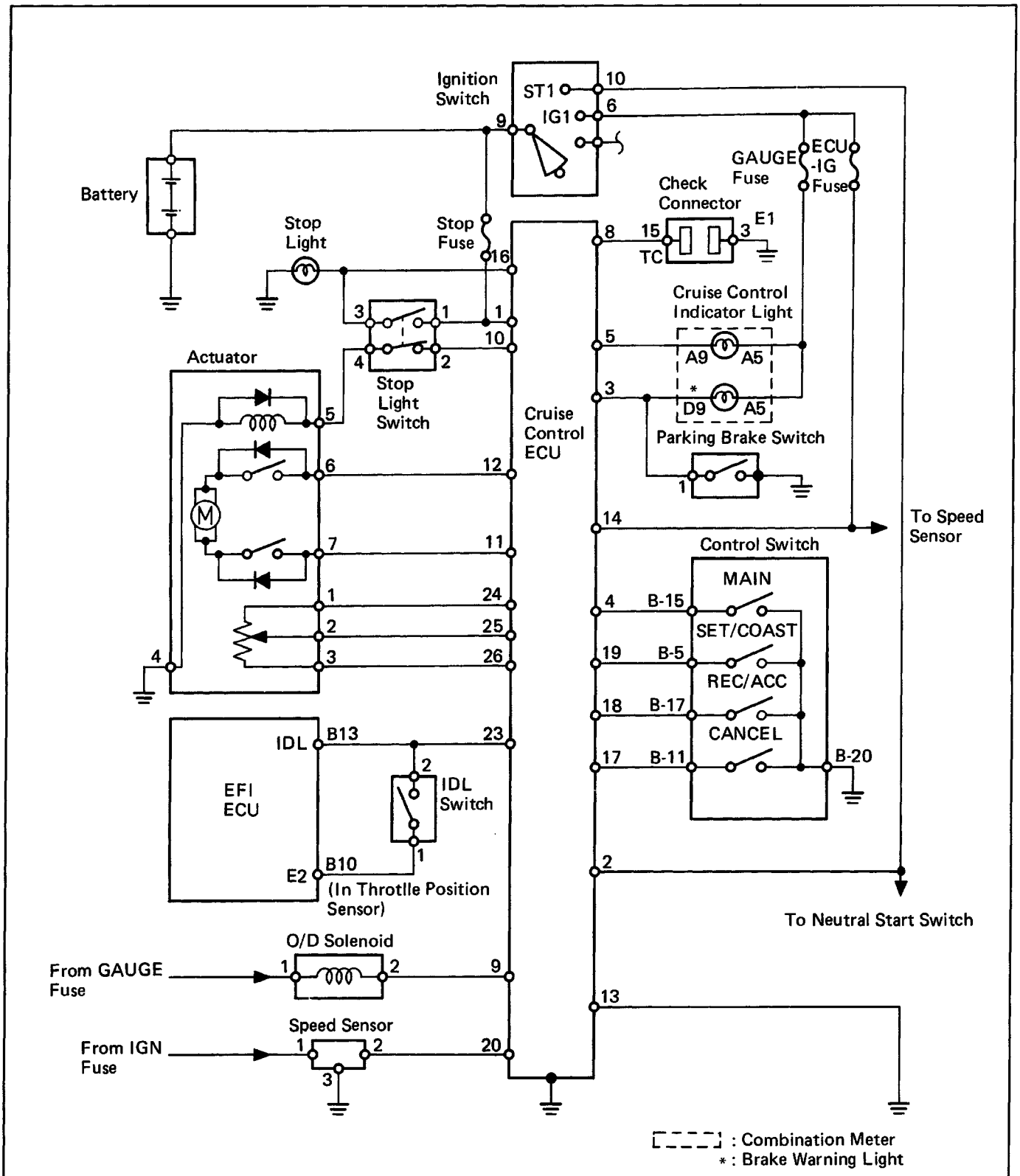
CRUISE CONTROL SYSTEM

Parts Location



BE5096
BE5097
BE5098

Wiring Diagram

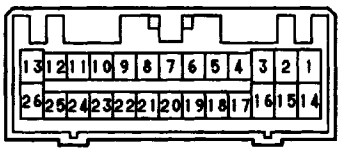


BE5004

The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE–10.

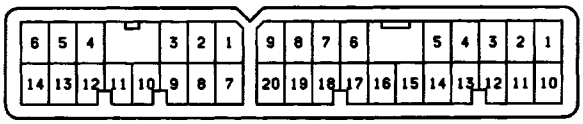
Connector Diagrams

Cruise Control ECU

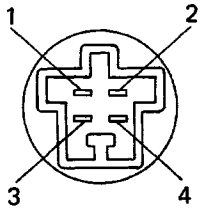


Control Switch

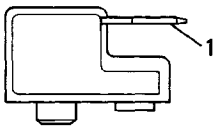
Connector "A" Connector "B"



Stop Light Switch



Parking Brake Switch

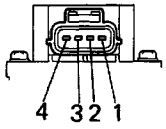


Speed Sensor

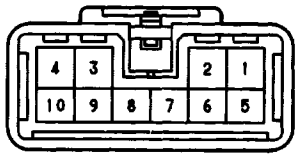
Actuator

O/D Solenoid

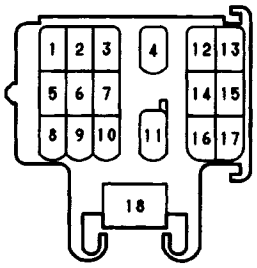
Throttle Position Sensor



Ignition Switch

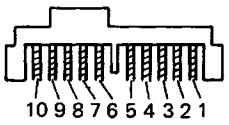


Check Connector
(TDCL)



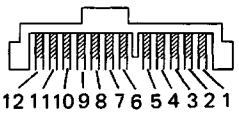
Combination Meter
(Cruise Control Indicator)

Connector "A"



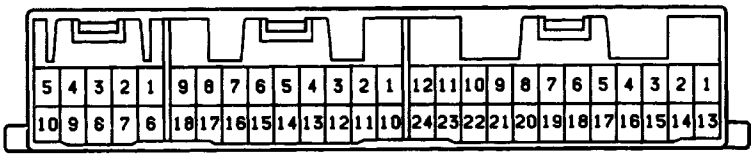
(Brake Warning)

Connector "D"



EFI ECU

Connector "C" Connector "B" Connector "A"



Vd-26-2-B V-34-2
BE5756 BE1412 IS-3-2-A
Ie-7-2 IS-3-2-A AC2241
e-10-2-B SH-18-1 BE2576
R-52-2 BE1266

System Description

- When the ignition switch is turned ON, current flows from the battery to terminal 14 of the cruise control (CC) ECU.
- Terminal 13 of the CC ECU is always grounded.

Basic Operation

HINT: For all explanations below, the ignition switch is in the ON position.

1. MAIN SWITCH OPERATION

When the main switch is pushed ON, current flows from terminal 4 of the CC ECU → terminal B–15 of the control switch → terminal B–20 of switch → ground.

As a result, the CC ECU is on standby and terminal 5 of the CC ECU is grounded. Therefore the CC indicator lights up.

2. CONTROL SWITCH OPERATION

The control switch controls the SET, COAST, RESUME, ACCEL and CANCEL functions. When the con–trol switch is turned to each position, current flows from terminals 19, 18 or 17 of the CC ECU → ter–minals B–5, B–11 or B–17 of the control switch → terminal B–20 of the switch → ground.

In the way, the CC ECU detects each position the control switch is turned to, and starts operation.

HINT: The SET function is detected by the CC ECU when the control switch released from SET/COAST.

3. SPEED CONTROL OPERATION

When the vehicle speed is set by the control switch, the ECU sends signal from terminal 10 → terminal 2 of the stop light switch → terminal 4 of the switch → terminal 5 of the actuator → (safety magnetic clutch) → terminal 4 of the actuator → ground.

At the same time, the CC ECU sends the signal from terminal 24 → terminal 1 of the actuator → (posi–tion sensor) → terminal 3 of the actuator → terminal 26 of the CC ECU. When the occurs, the position sensor sends the position of the actuator arm as a signal (voltage) from terminal 2 of the actuator to terminal 25 of the CC ECU.

When the actual vehicle speed drops below the set speed, the CC ECU sends a signal (voltage) from terminal 12 → terminal 6 of actuator → (motor) – terminal 7 of actuator → terminal 11 of CC ECU.

This causes the motor to rotate the actuator arm in the throttle opening direction, increasing the vehi–cle speed. Then, when the arm reaches the prescribed angle, the CC ECU detects this at terminal 25 and stops the signal from terminal 12.

When the actual vehicle speed rises above the set speed, the CC ECU sends a signal from terminal 11, turning the motor in the opposite direction so that the vehicle speed is reduced.

4. MANUAL CANCEL OPERATION

The CC system has the following methods of cancellation:

- **Speed Control Switch (CANCEL)**
  When the control switch is turned to CANCEL position.
- **Parking Brake Switch**
  When the parking brake lever is pulled, the parking brake switch is turned ON and sends cancellation signal (ground voltage) to terminal 3 of the CC ECU.
- **Neutral Start Switch**
  When the shift lever is set to ”N” or ”P” range, the neutral start switch is turned ON and sends a cancellation signal (ground voltage) to terminal 2 of the CC ECU.
- **Stop Light Switch**
  When the brake pedal is depressed, SW B of the stop light switch is turned OFF, the safety magnetic clutch (in actuator) is released, and SW A of the stop light switch is turned ON and sends a cancella–tion signal (battery voltage) to terminal 16 of the CC ECU. .

When the CC ECU detects any of the above signals, it stops output of signals to the actuator, and can–cels cruise control.

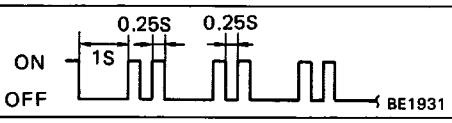
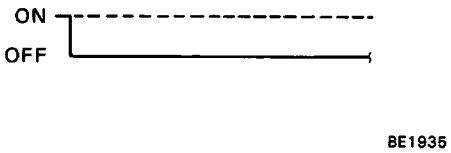
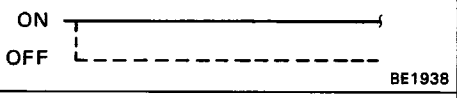
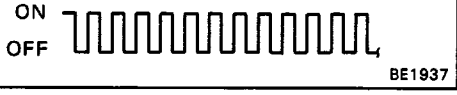
Diagnosis System

Output of Diagnostic Code

READ DIAGNOSTIC CODE

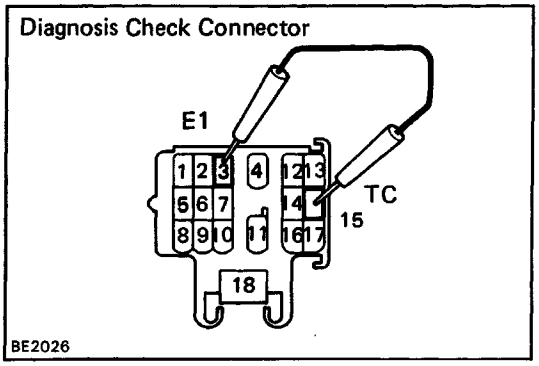
(Type A)

(a) Turn the ignition switch on.
(b) Turn the control switch to SET/COAST position, and keep it there.
(c) Push the main switch ON.
(d) Check that the indicator light "CRUISE" lights–up in the combination meter.
(e) Turn the SET/COAST switch off.
(f) Meet the conditions listed in the table below.
(g) Read the diagnosis code on the cruise control ingica–tor light.

No.	Conditions	Indication code	Diagnosis
1	Turn the control switch to SET/COAST position.		SET/COAST circuit is normal.
2	Turn the control switch to RES/ACC position.		RES/ACC circuit is normal.
3	Each cancel switch is turned ON. • Control switch (to CANCEL) • Stop light switch • Parking brake switch • Neutral start switch (to N or P range)		Each cancel switch is normal.
4	Drive at approx. 40 km/h (25 mph) or below.		Speed sensor circuit is normal.
	Drive at approx. 40 km/h (25 mph) or over.		Speed sensor circuit is normal.

HINT:

- Indication codes appear in order from No. 1.
- If there is no indication code, perform troubleshooting and inspection. (See page BE–77)
- Indication is stopped when the MAIN switch is repushed.



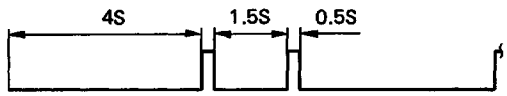
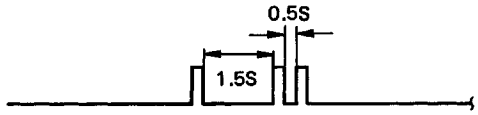
(Type B)

(a) If while driving with the cruise control on, the system is canceled by a malfunction in either the actuator, speed sensor or speed control switch circuit, the cruise control indicator light "CRUISE" will blink 5 times.

(b) While stopped, connect terminals 3 and 15 of the check connector.

HINT: If the ignition switch is turned off, the diagnostic code will be erased from the computer memory.

(c) Read the diagnostic code on the indicator light "CRUISE".

Indication code		Diagnosis
		Normal.
11		Excessive current flowed to motor or safety magnetic clutch drive circuit.
12		Open circuit in safety magnetic clutch circuit.
13		• Position sensor circuit abnormal. • Open circuit in motor.
21		Vehicle speed signal not sent for 140 msec. or longer.
23		*Vehicle speed has decreased by 16 km/h (10 mph) or more from the set speed during cruising.
31		RESUME/ACCEL switch is ON always when MAIN switch is pushed ON.
33		SET/COAST switch signal and RES/ACC switch signal turned on simultaneously.

CONTINUED ON NEXT PAGE

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Indication code		Diagnosis
41	 BE4345	ECU malfunction.
* If the set speed can be maintained when the speed control switch is again set at SET/COAST, there is no malfunction.		

HINT:

- Indication codes appear in order from No. 11
- If there is no indication code, perform troubleshooting and inspection. (See page BE–77)

Troubleshooting

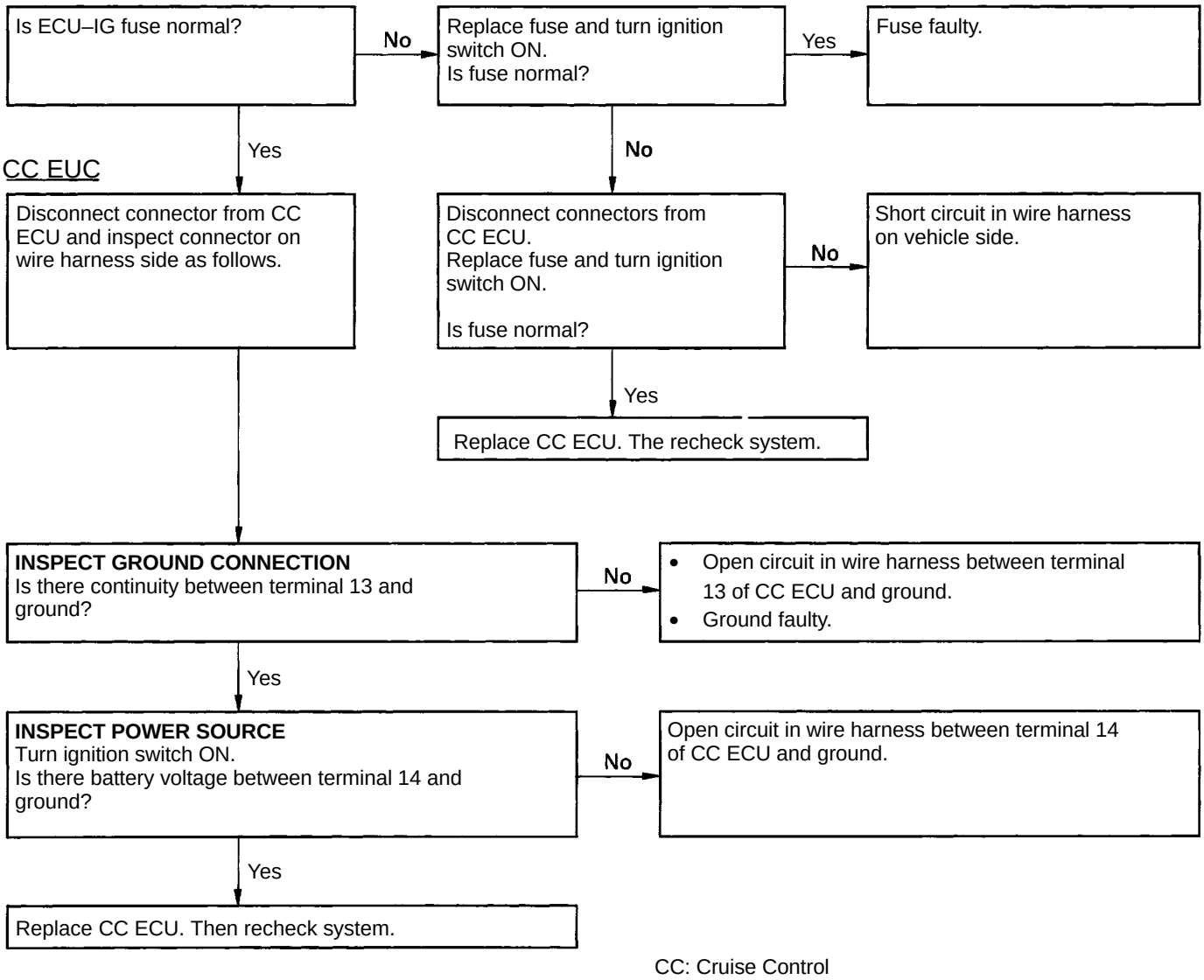
You will find the source of the trouble more easily by properly using the table shown below. In this table, the numbers indicate the order of priority of the causes of trouble. Check each part in the order shown.

Chart No.					C	D	D	F	H,I	G	E	I	J		
Inspection Item				CC ECU	Actuator	Main Switch (in Control Switch)	Control Switch	Stop Light Switch	Neutral Start Switch	Parking Brake Switch	Speed Sensor, or Speedometer Cable	O/D Solenoid	Throttle Position Sensor (IDL)	Speed Control Cable, Control Link	Other Parts
Diagnosis Code / Problem	Type B	Type A													
• "CRUISE" indicator light blinks 5 times. • Cruise control system does not set. • Cruise control system does not operate.	11			2	1										
	12			3	1			2							
	13			2	1										
	21			2							1				
	23				3						2			1	
	31			2			1								
	33			2			1								
	41			1											
	Normal	4	OK	8	7	1	2	3	4	5				6	9*
			NG	2							1				
Set speed deviates on high or low side.				4	3						1			2	
Large speed increase or speed drop when control switch turned to SET.				3	2								1		
Vehicle speed fluctuates when speed control switch turned to SET.				4	3						1			2	
Set speed does not cancel when brake pedal depressed.		3	OK	3	1			2							
			NG	2				1							
Set speed does not cancel when parking brake lever pulled.		3	OK	2	1										
			NG	2						1					
Set speed does not cancel when shifted to "N" range.		3	OK	2	1										
			NG	2					1						
Vehicle speed does not decrease when speed control switch turned to COAST.		1	OK	4	1						3			2	
			NG	2			1								
Vehicle speed does not accelerate when speed control switch turned to ACCEL.		2	OK		1						3	4	5	2	
			NG	2			1								
Vehicle speed does not return to memorized speed when control switch turned on RESUME.		2	OK	4	1						3			2	
			NG	2			1								
Set speed does not cancel when speed control switch turned to CANCEL.		3	OK	2	1										
			NG	2			1								
Speed can be set below about 40 km/h (25 mph).		4	OK	2	1										
			NG	2							1				
Cruise control will not disengage even at about 40 km/h (25 mph).		4	OK	2	1										
			NG	2							1				
Acceleration response in sluggish when speed control switch turned to "ACCEL" or "RESUME".				6	3		1					4	5	2	

* : Inspect wire harness.

A POWER SOURCE CIRCUIT

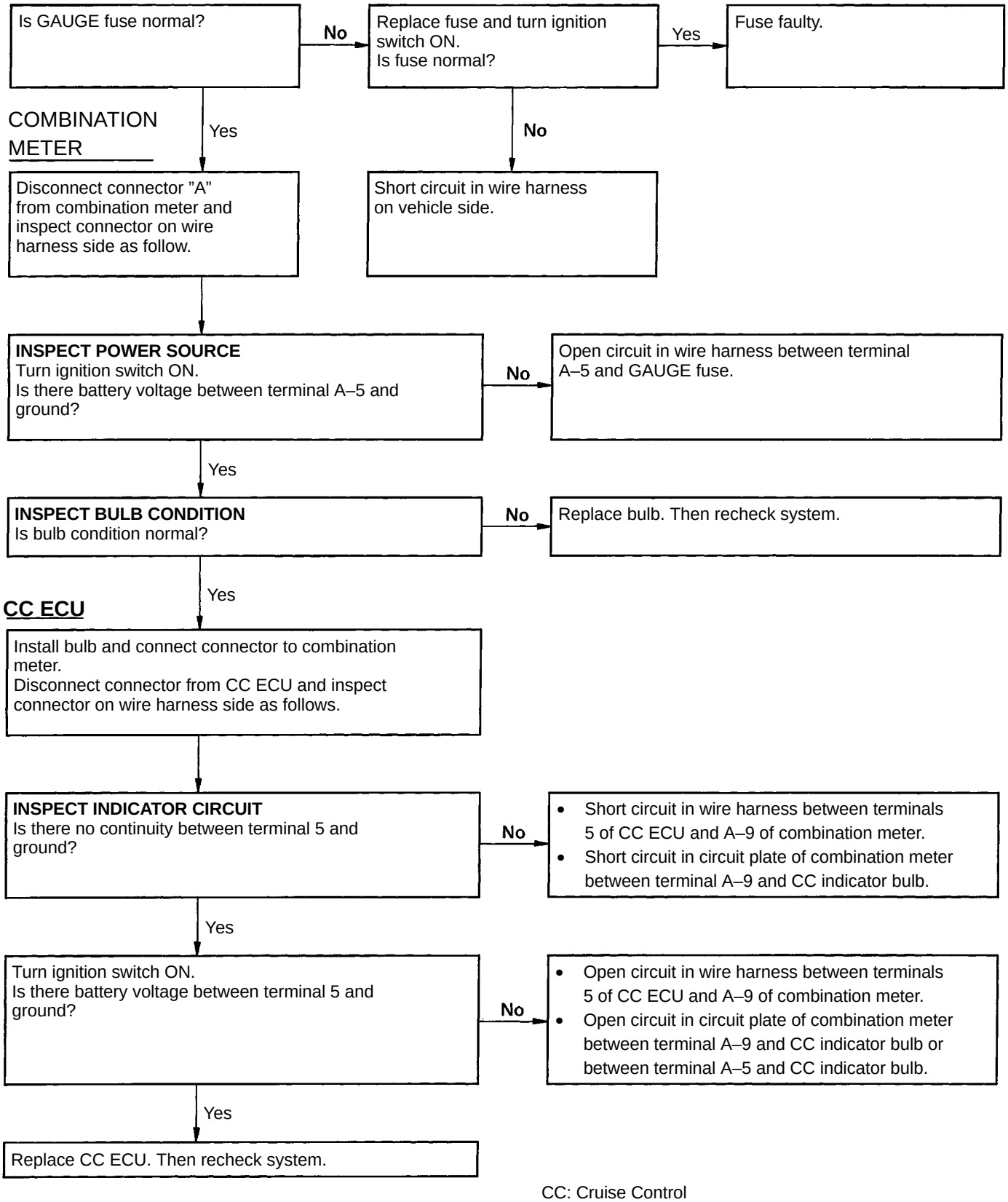
HINT: While carrying out the following inspection, make certain that the connectors and terminals are properly connected.



CC: Cruise Control

B CRUISE CONTROL INDICATOR CIRCUIT

HINT: while carrying out the following inspection, make certain that the connectors and terminals are properly connected.



CC: Cruise Control

C ACTUATOR CIRCUIT

HINT: While carrying out the following inspection, make certain that the connectors and terminals are properly connected.

ACTUATOR

Disconnect connector from actuator and inspect connector on wire harness side as follows.

INSPECT GROUND CONNECTION
Is there continuity between terminal 4 and ground?

No → • Open circuit in wire harness between terminal 4 of actuator and ground.
• Ground faulty.

Yes

INSPECT ACTUATOR (See page BE–88)
Is actuator operation normal?

No → Replace actuator. Then recheck system.

Yes

STOP LIGHT SWITCH

INSPECT STOP LIGHT SWITCH INSTALLATION
Is stop light switch installed properly?

No → Reinstall stop light switch properly. Then recheck system.

Yes

Connect connector to actuator.
Disconnect connector from stop light switch and inspect connector on wire harness side as follows.

INSPECT SAFETY MAGNETIC CLUTCH CIRCUIT
Is there approx. 38.5Ω between terminal 4 and ground?

No → Open or short circuit in wire harness between terminals 4 of stop light and 5 of actuator.

Yes

INSPECT STOP LIGHT SWITCH (See page BE–91)
Is stop light switch operation normal?

No → Replace stop light switch. Then recheck system.

Yes

CONTINUED ON NEXT PAGE

CC: Cruise Control

CONTINUED FROM PREVIOUS PAGE

CC ECU

Connect connector to stop light switch.
Disconnect connectors from CC ECU and inspect connectors on wire harness side as follows.

INSPECT SAFETY MAGNETIC CLUTCH CIRCUIT
Is there approx. 38.5Ω between terminal 10 and ground?

No → Open or short circuit in wire harness between terminals 10 of CC ECU and 5 of actuator.

Yes

INSPECT MOTOR CIRCUIT
Is there no continuity between terminal 12 and ground?

No → Short circuit in wire harness between terminals 12 of CC ECU and 6 of actuator.

Yes

Is there no continuity between terminal 11 and ground?

No → Short circuit in wire harness between terminals 11 of CC ECU and 7 of actuator.

Yes

Is there continuity between terminals 12 and 11 with actuator arm in a position except max. open or max. close?

No → Open circuit in wire harness between terminals 12 of CC ECU and 6 of actuator or between terminals 11 of CC ECU and 7 of actuator.

Yes

INSPECT POSITION SENSOR CIRCUIT
Is there no continuity between terminal 24 and ground?

No → Short circuit in wire harness between terminals 24 of CC ECU and 1 of actuator.

Yes

Is there approx. 2 kΩ between terminals 24 and 26?

No →
- Open circuit in wire harness between terminals 26 of CC ECU and 3 of actuator.
- Open circuit in wire harness between terminals 24 of CC ECU and 1 of actuator.

Yes

Does resistance change even between terminals 26 and 25?

No → Open or short circuit in wire harness between terminals 25 of CC ECU and 2 of actuator.

Yes

Replace CC ECU. Then recheck system.

CC: Cruise Control

D CONTROL SWITCH CIRCUIT

HINT: While carrying out the following inspection, make certain that the connectors and terminals are properly connected.

CONTROL SWITCH

Disconnect connector from control switch and inspect connector on wire harness side as follows.

INSPECT GROUND CONNECTION
Is there continuity between terminal B–20 and ground?

No →
- Open circuit in wire harness between terminal B–20 of control switch and ground.
- Ground faulty.

Yes

INSPECT CONTROL SWITCH (See page BE–87)
Is control switch operation normal?

No → Replace control switch. Then recheck system.

Yes

CC ECU

Connect connector to control switch.
Disconnect connectors from CC ECU and inspect connectors on wire harness side as follows.

INSPECT MAIN SWITCH CIRCUIT
Is there no continuity between terminal 4 and ground with main switch OFF?

No → Short circuit in wire harness between terminals 4 of CC ECU and B–15 of control switch.

Yes

Is there continuity between terminal 4 and ground with main switch ON?

No → Open circuit in wire harness between terminals 4 of CC ECU and B–15 of control switch.

Yes

INSPECT CONTROL SWITCH CIRCUIT
Is there no continuity between terminal 19 or 18 or 17 and ground with control switch OFF?

No → Short circuit in wire harness between terminals 19, 18, 17 of CC ECU and B–5, B–17, B–11 of control switch.

Yes

Is there continuity as shown in table below between terminal XX and ground when control switch is turned to each position?

Position	Terminal XX
RES/ACC	18
SET/COAST	19
CANCEL	17

No → Open circuit in wire harness between terminals XX of CC ECU and YY of control switch.

Terminal XX	Terminal YY
19	B–5
18	B–17
17	B–1 1

Yes

Replace CC ECU. Then recheck system.

CC: Cruise Control

E SPEED SENSOR CIRCUIT

HINT: While carrying out the following inspection, make certain that the connectors and terminals are properly connected.

SPEED SENSOR

Disconnect connector from speed sensor and inspect connector on wire harness side as follows.

INSPECT GROUND CONNECTION
Is there continuity between terminal 3 and ground?

No → • Open circuit in wire harness between terminal 3 of speed sensor and ground.
• Ground faulty.

Yes

INSPECT SPEED SENSOR (See page BE–87)
Is speed sensor operation normal?

No → Replace speed sensor. Then recheck system.

Yes

CC ECU

Connect connector to speed sensor.
Disconnect connector from CC ECU and inspect connector on wire harness side as follows.

INSPECT SPEED SENSOR CIRCUIT
Is there continuity repeatedly between terminal 20 and ground?

No → • Open or short circuit in wire harness between terminals 20 of CC ECU and 2 of speed sensor.

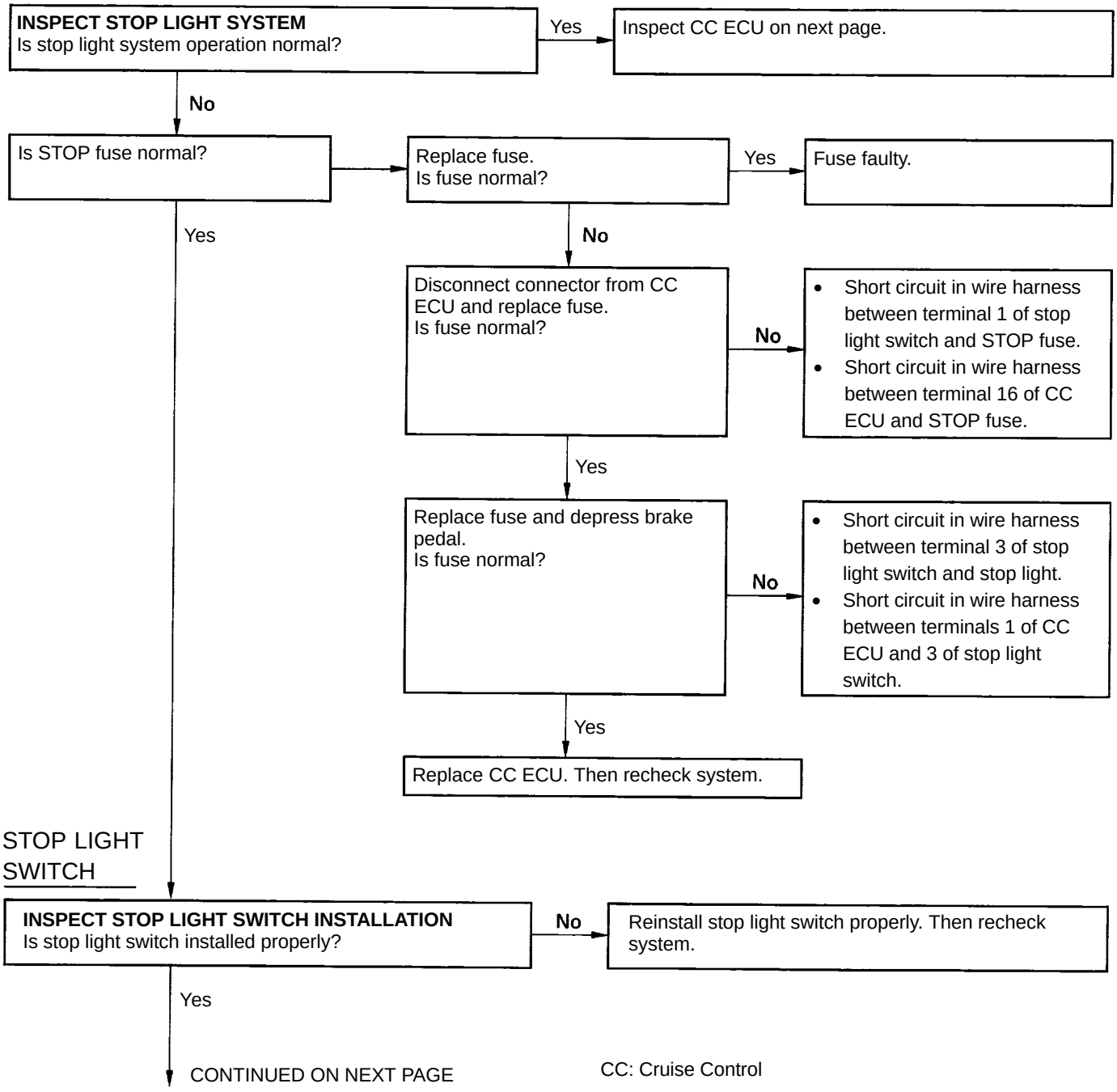
Yes

Replace CC ECU. Then recheck system.

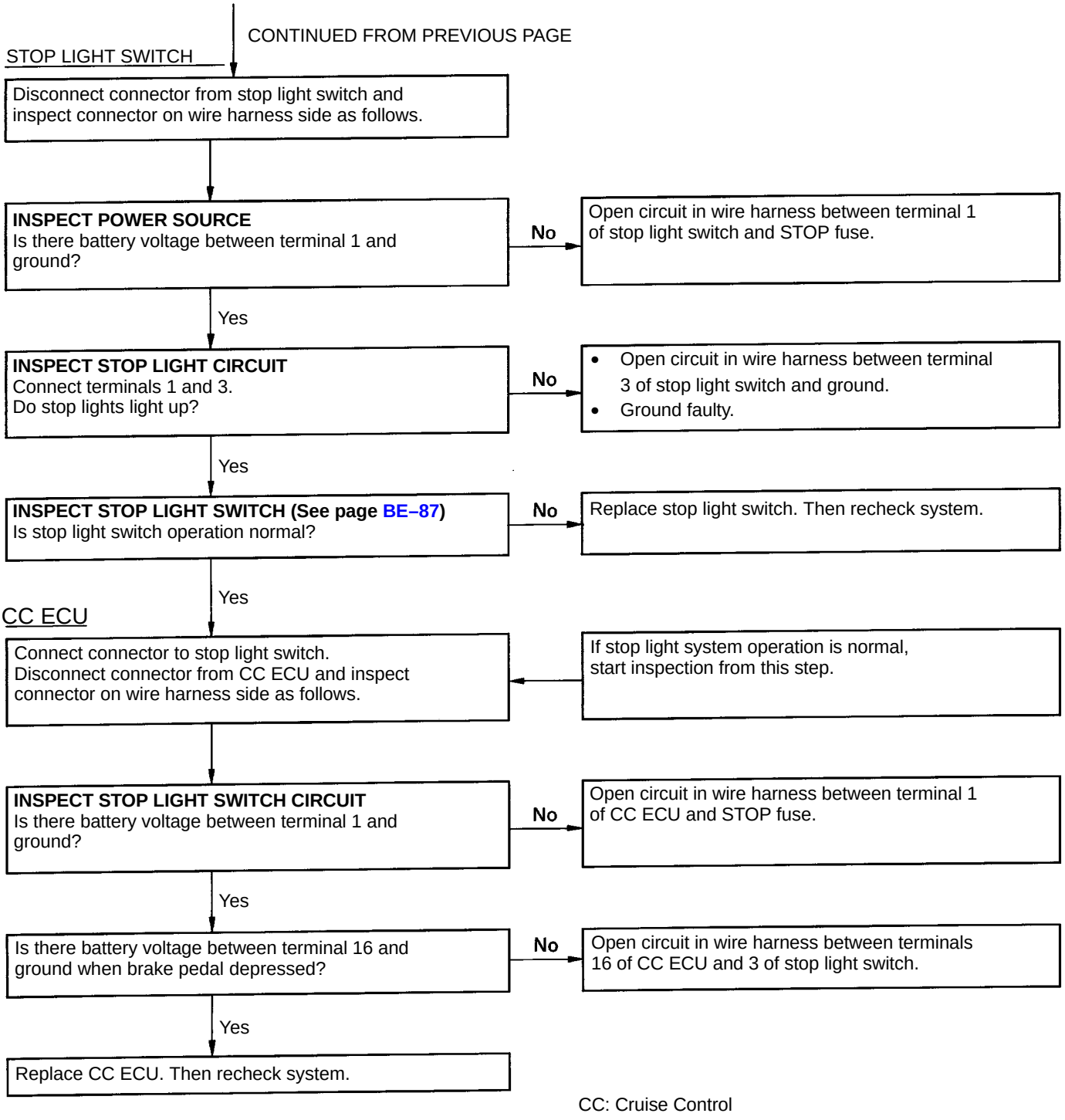
CC: Cruise Control

F STOP LIGHT SWITCH CIRCUIT

HINT: While carrying out the following inspection, make certain that the connectors and terminals are properly connected.



CC: Cruise Control



CC: Cruise Control

G PARKING BRAKE SWITCH CIRCUIT

HINT: While carrying out the following inspection, make certain that the connectors and terminals are properly connected.

INSPECT PARKING BRAKE SWITCH
(See page BE–87)
Is parking brake switch operation normal?

No → Replace parking brake switch. Then recheck system.

Yes

CC ECU

Connect connector to parking brake switch.
Disconnect connector from CC ECU and inspect connector on wire harness side as follows.

INSPECT PARKING BRAKE SWITCH CIRCUIT
Is there continuity between terminal 3 and ground when parking brake lever is pulled?

No → Short circuit in wire harness between terminal 3 of CC ECU and parking brake switch.

Yes

Is there no continuity between terminal 3 and ground when parking brake lever is released?

No → Open circuit in wire harness between terminal 3 of CC ECU and parking brake switch.

Yes

Replace CC ECU. Then recheck system.

CC: Cruise Control

H NEUTRAL START SWITCH CIRCUIT

HINT: While carrying out the following inspection, make certain that the connectors and terminals are properly connected.

INSPECT STARTING SYSTEM
Is starting system normal?

No → Repair starting system. Then rechek system.

Yes

CC ECU

Disconnect conncetor from CC ECU and inspect connector on wire harness side as follows.

INSPECT NEUTRAL START SWITCH CIRCUIT
Is there continuity between terminal 2 and ground when shift lever is shifted to P or ^I range?

No → Open circuit in wire harness between terminals 2 of CC ECU and neutral start switch.

Yes

Is there no continuity between terminal 2 and ground when shift lever is shifted to L, 2, 3, or R range?

No → Short circuit in wire harness between terminals 2 of CC ECU and neutral start switch.

Yes

Replace CC ECU. Then recheck system.

CC: Cruise Control

I O/D SOLENOID CIRCUIT

HINT: While carrying out the following inspection, make certain that the connectors and terminals are properly connected.

INSPECT ECT SYSTEM
Is ECT system normal?

No → Repair ECT system. Then recheck system.

Yes

CC ECU

Disconnect connector from CC ECU and inspect connector on wire harness side as follows.

INSPECT O/D SOLENOID CIRCUIT
Is there battery voltage between terminal 9 and ground when ignition switch turned to ON?

No → Open or short circuit in wire harness between terminal 9 of CC ECU and O/D solenoid.

Yes

O/D
~~SOLENOID~~

INSPECT O/D SOLENOID OPERATION
(See page AT–25)
Is operation normal?

No → Replace solenoid. Then recheck system.

Yes

Replace CC ECU. Then recheck system.

CC: Cruise Control

J IDL SIGNAL CIRCUIT

HINT: While carrying out the following inspection, make certain that the connectors and terminals are properly connected.

THROTTLE POSITION SENSOR

INSPECT THROTTLE POSITION SENSOR ADJUSTMENT (See pages FI–68, FI–69)
Is throttle position sensor adjustment normal?

No → Adjust position sensor position. Then recheck system.

Yes

INSPECT THROTTLE POSITION SENSOR (See pages FI–68, FI–69)
Is throttle postion sensor operation normal?

No → Replace throttle position sensor. Then recheck system.

Yes

CC ECU

Connect connector to throttle position sensor.
Disconnect connector from CC ECU and inspect connector on wire harness side as follows.

INSPECT IDL SIGNAL CIRCUIT
Is there continuity between terminal 23 and ground when acceleration pedal is released?

No → Open circuit in wire harness between terminals 23 of CC ECU and 2 of throttle position sensor.

Yes

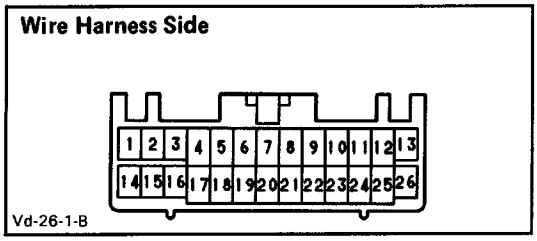
Is there no continuity between terminal 23 and ground when acceleration pedal is depressed?

No → Short circuit in wire harness between terminals 23 of CC ECU and 2 of throttle position sensor.

Yes

Replace CC ECU. Then recheck system.

CC: Cruise Control



Cruise Control ECU Circuit

INSPECT ECU CIRCUIT

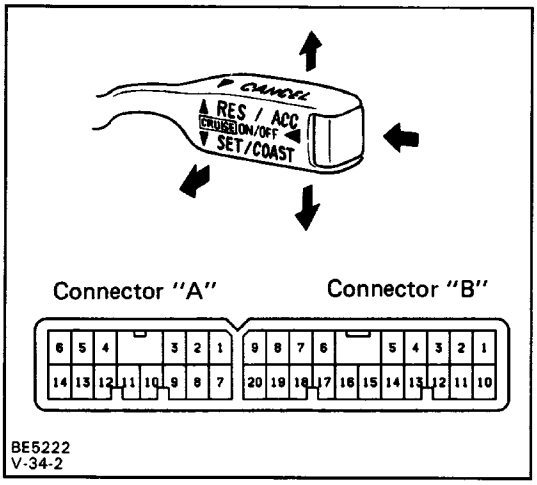
Disconnect connector and inspect connector on wire harness side as shown in the chart.

Check for	Measured item	Tester connection	Condition		Specified value
Continuity	Neutral start switch	2 – ground	Shift lever position	N or P	Continuity
				L, 2,D or R	No continuity
	Parking brake switch	3 – ground	Parking brake lever position	released	No continuity
				pulled	Continuity
	Control switch	4 – ground	Main switch position	OFF	No continuity
				ON	Continuity
	Ground connection	13 – ground	Constant		Continuity
	Control switch	18 – ground	Control switch position	RES/ACC	Continuity
		19 – ground	Control switch position	SET/COAST	Continuity
		17 – ground	Control switch position	CANCEL	Continuity
	Actuator (motor)	*11 – 12	Actuator arm position	max. OPEN	(12 – 11) Continuity
				max. CLOSE	(11 – 12) Continuity
				any position except above position	(12 – 11) Continuity
	TDCL circuit	8 – ground	Constant		No continuity
			Terminals Te and E 1 connected		Continuity
	Throttle position sensor (IDL)	23 – ground	Acceleration pedal position	released	Continuity
				depressed	No continuity
	Speed sensor	20 – ground	With ignition switch ON, speedometer shaft or speed sensor shaft turned.		Continuity No continuity
Resistance	Actuator (position sensor)	24 – 26	Constant		Approx. 2 kΩ
		24 – 2 5	Actuator arm turned		Resistance change even
	Actuator (Safety magnetic clutch)	10 – ground	Brake pedal position	released	Approx. 38.5Ω
				depressed	No continuity
Voltage	Power source	14 – ground	Ignition switch position	LOCK or ACC	No voltage
				ON	Battery voltage
	STOP fuse	1 – ground	Constant		Battery voltage
	Stop light	16 – ground	Brake pedal position	released	No voltage
				depressed	Battery voltage
	O/D solenoid	9 – ground	Ignition switch position	LOCK or ACC	No voltage
				ON	Battery voltage

*: This circuit include the diode.

If circuit is as specified, try another ECU.

If circuit is not as specified, refer to BE–71 wiring diagram and inspect the circuits connected to other parts.



Parts Inspection

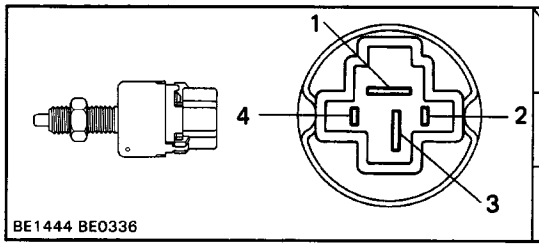
1. INSPECT SWITCHES

(Control Switch/Continuity)

Switch position		B20	B11	B5	B17	B15
Main	ON	○				○
Main	OFF					
Control	RES/ACC	○			○	
Control	SET/COAST	○		○		
Control	CANCEL	○	○			

If continuity is not as specified, replace the control switch.

Stop Light Switch/Continuity)



Switch position	1	2	3	4
Switch pin free (Brake pedal depressed)	○		○	
Switch pin pushed in (Brake pedal released)		○		○

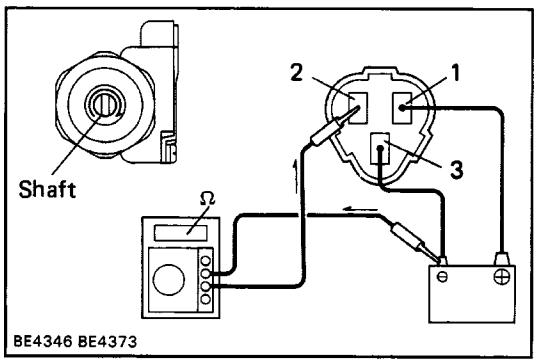
If continuity is not as specified, replace the stop light switch .

(Neutral Start Switch)

See page AT–25.

(Parking Brake Switch)

See page BE–42.



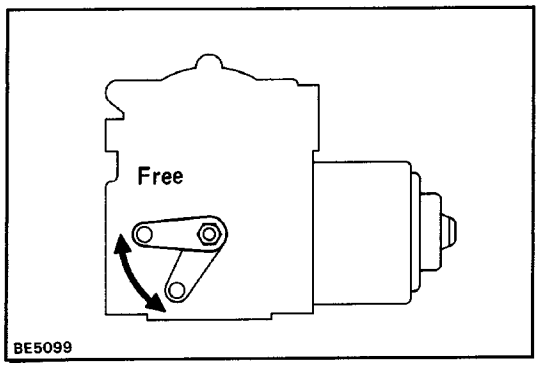
2. INSPECT SPEED SENSOR

(a) Connect the positive (+) lead from the battery to ter–minal 1 and the negative (–) lead to terminal 3.

(b) Check that there is continuity between terminal 2 and the battery negative (–) terminal four times per each revolution of the shaft.

HINT: Connect the test leads so that the current from the ohmmeter can flow from terminal 2 to battery negative (–) terminal.

If operation is not as specified, replace the speed sensor.

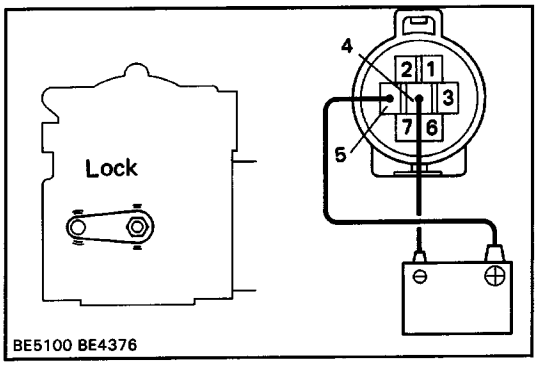


3. INSPECT ACTUATOR

(Motor Type)

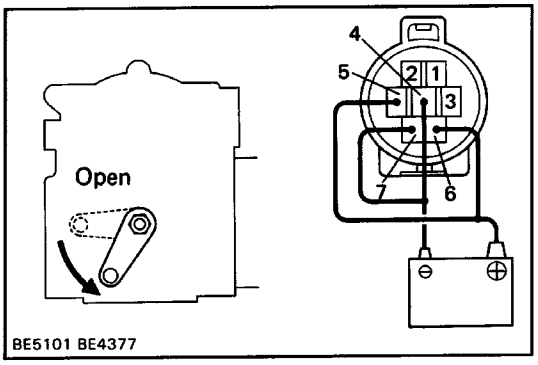
Safety Magnet Clutch

(a) Check that the arm moves smoothly by hand.



(b) Connect the positive (+) lead from the battery to terminal 5 and the negative (–) lead to terminal 4. (Safety magnet clutch turned ON)

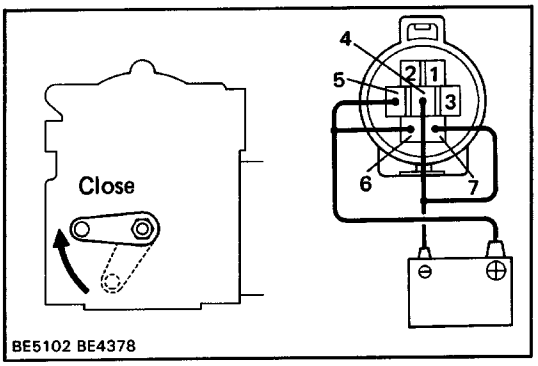
(c) Check that the arm does not move by hand.
If operation is not as specified, replace the motor.



Motor

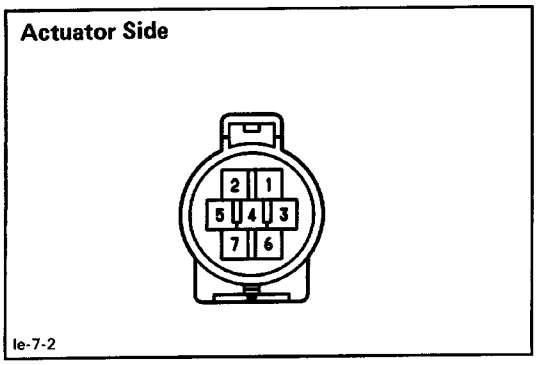
(a) With the safety magnetic clutch ON, connect the positive (+) lead from the battery to terminal 6 and the negative (–) lead to teminal 7, check that the arm moves to the open side.

(b) When the arm reached to the open position, check that the motor operation stops.



(c) With the safety magnetic clutch ON, connect the positive (+) lead from the battery to terminal 7 and the negative (–) lead to terminal 6, check that the arm moves to the close side.

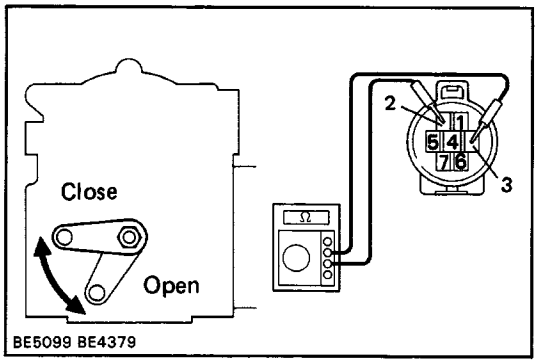
(d) When the arm reaches to the closed position, check that the motor operation stops.



Position Sensor

(a) Measure the resistance between terminals 1 and 3.

Resistance: Approx. 2 kΩ

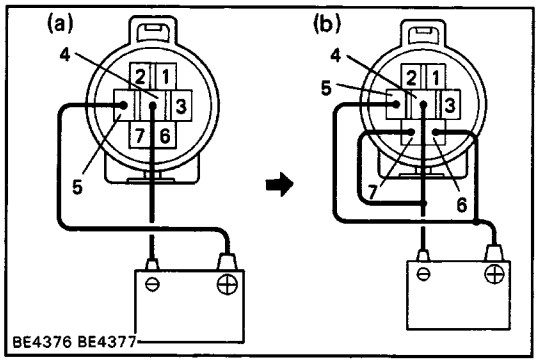


(b) When the arm is moving from the closed to open position, check that resistance between terminals 2 and 3 increases from approx. 0.5 to 1.7 kΩ.

If operation is not as specified, replace the motor.

4. INSPECT THROTTLE POSITION SWITCH

(See pages FI–68, FI–69)



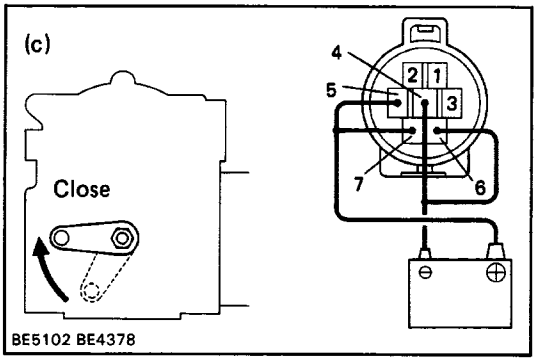
Adjustment of Control Link Assembly

ADJUST CONTROL LINK ASSEMBLY

(a) Connect the positive (+) lead from the battery to terminal 5 and the negative (–) lead to terminal 4 of the actuator.
(Safety magnet clutch turned ON)

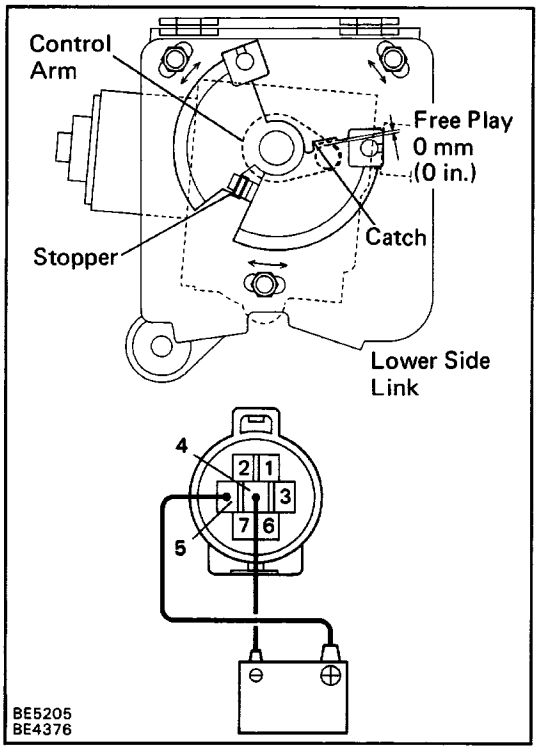
NOTICE: Keep the safety magnet clutch ON until adjustment of control link assembly is completed.

(b) With the safety magnetic clutch ON, connect the positive (+) lead from the battery to terminal 6 and the negative (–) lead to terminal 7.
(Arm moves to the open side.)



(c) With the safety magnetic clutch ON, connect the positive (+) lead from the battery to terminal 7 and the negative (–) lead to terminal 6.
(Arm moves to the close side.)

(d) Install the control link assembly to the actuator.



(e) Rotate the control link assembly so that the catch of the control link assembly's lower side link comes in contact with the actuator control arm (Free play 0)

Free play: 0 mm (0 in.)

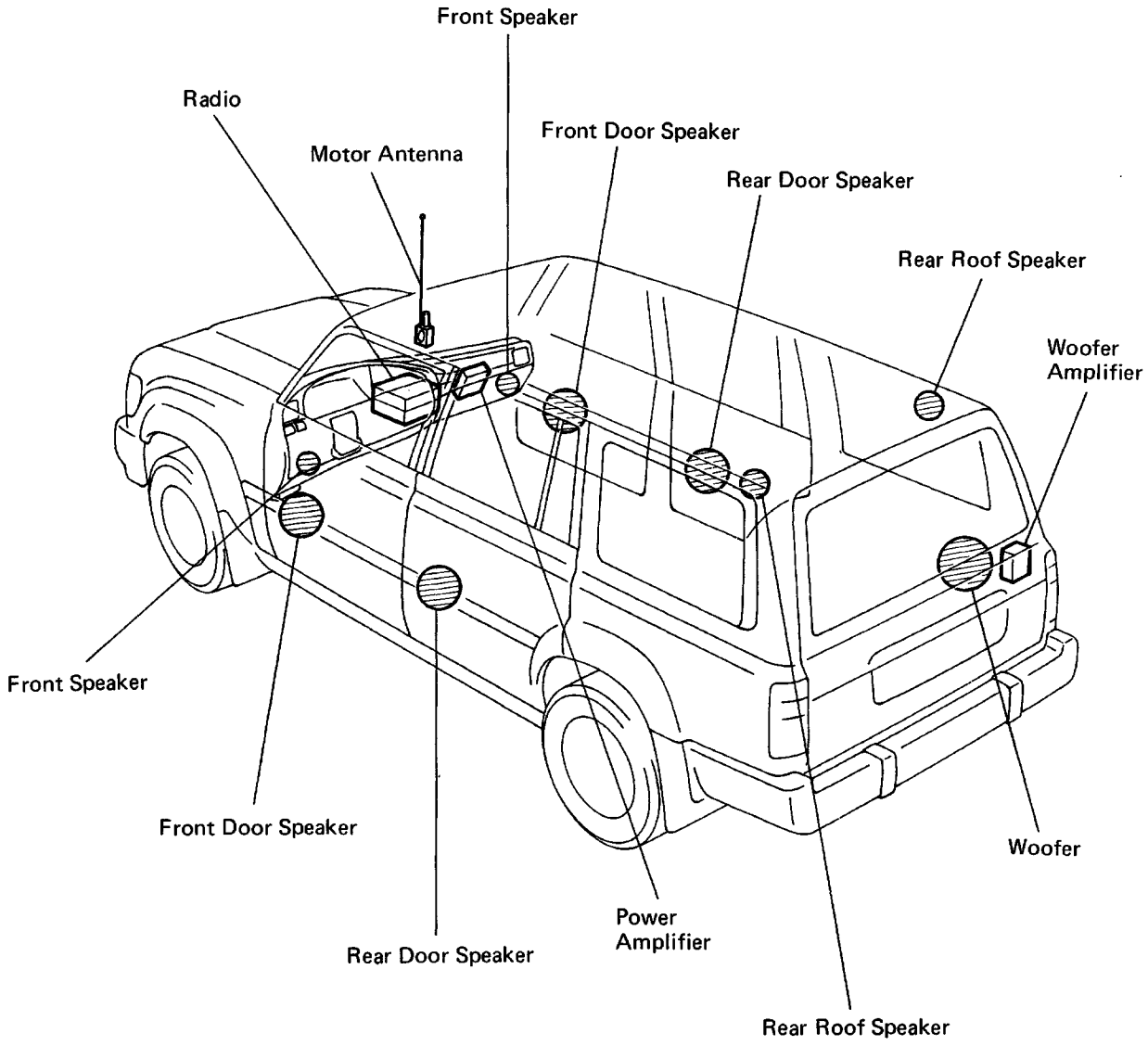
NOTICE: Rotate the lower side link to the right until it touches the stopper.

(f) In condition (d), install and torque the three nuts.

(g) Disconnect lead wire from the actuator.

AUDIO SYSTEM

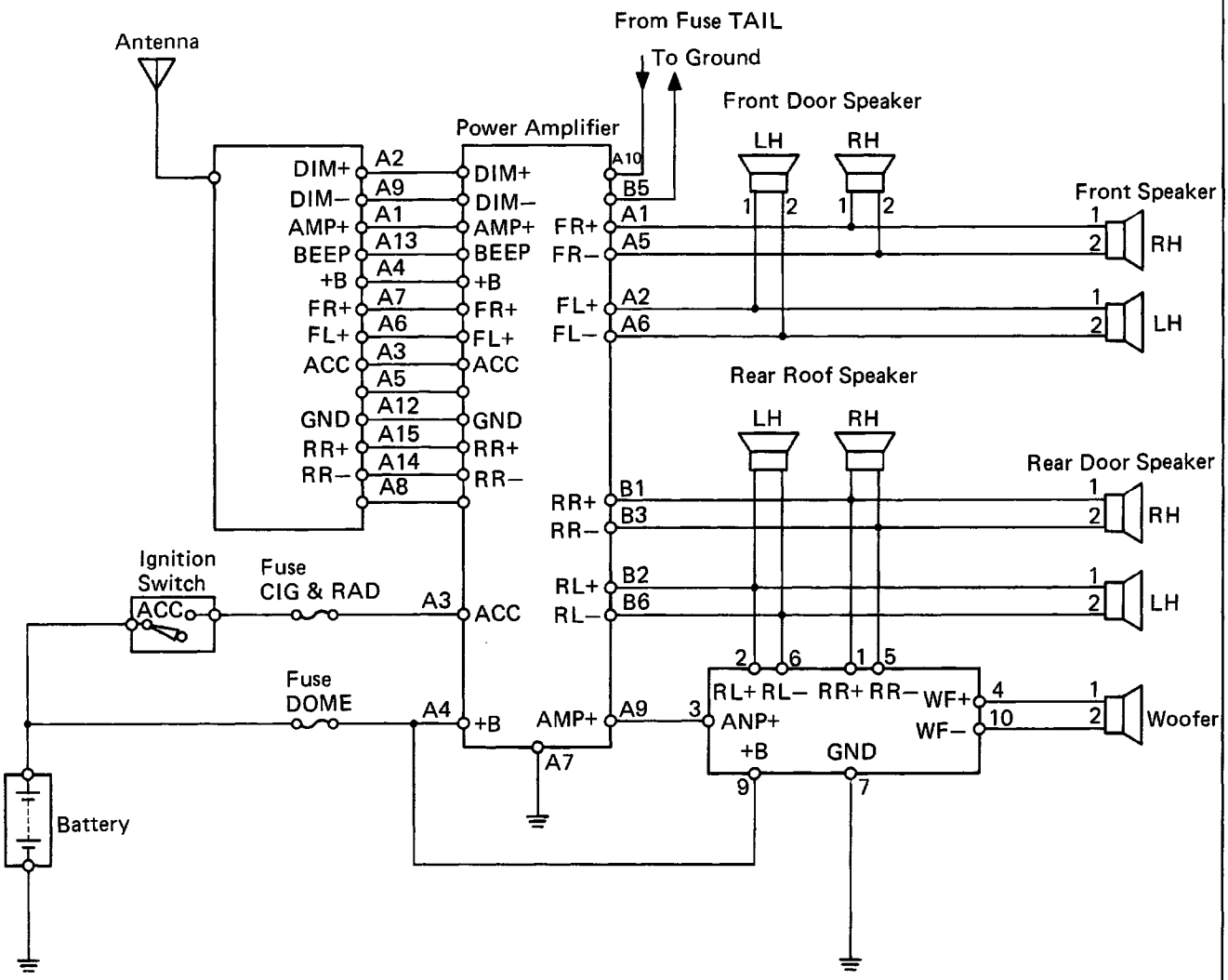
Parts Location



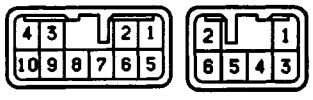
BE5048

Wiring and Connector Diagrams

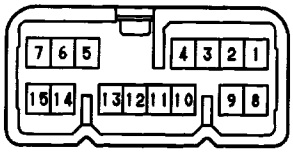
Radio – Tape Player, 9 Speaker
Radio – Tape Player, 9 Speaker + CD Player **Symbol P**



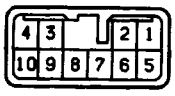
Power Amplifier
Connector "A" Connector "B"



Radio Receiver



Woofer Amplifier



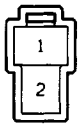
Front Speaker

Front Door Speaker

Rear Door Speaker

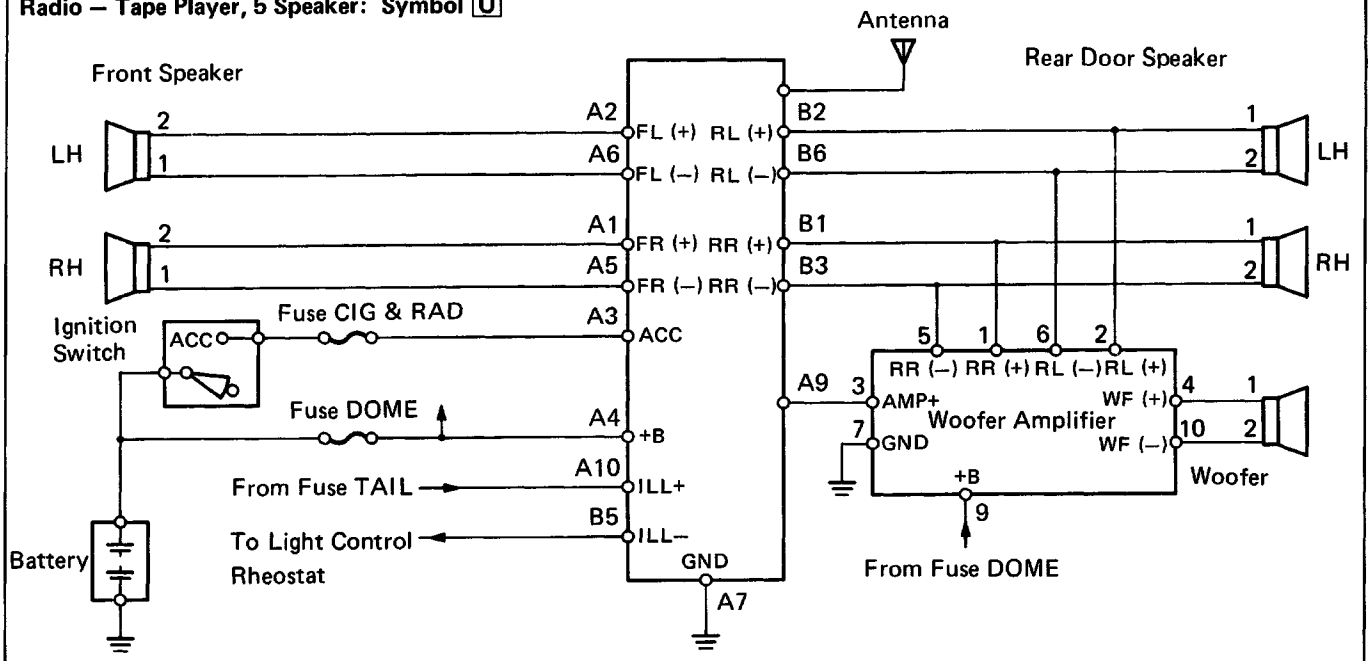
Rear Roof Speaker

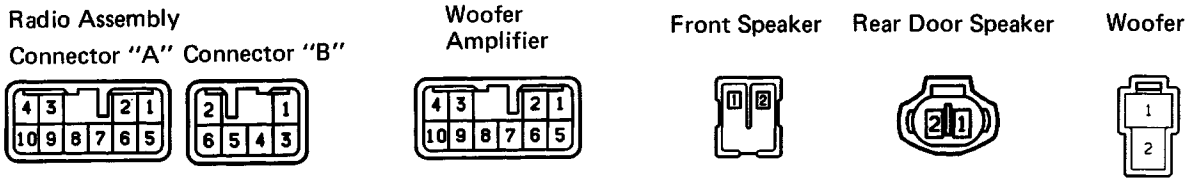
Woofer



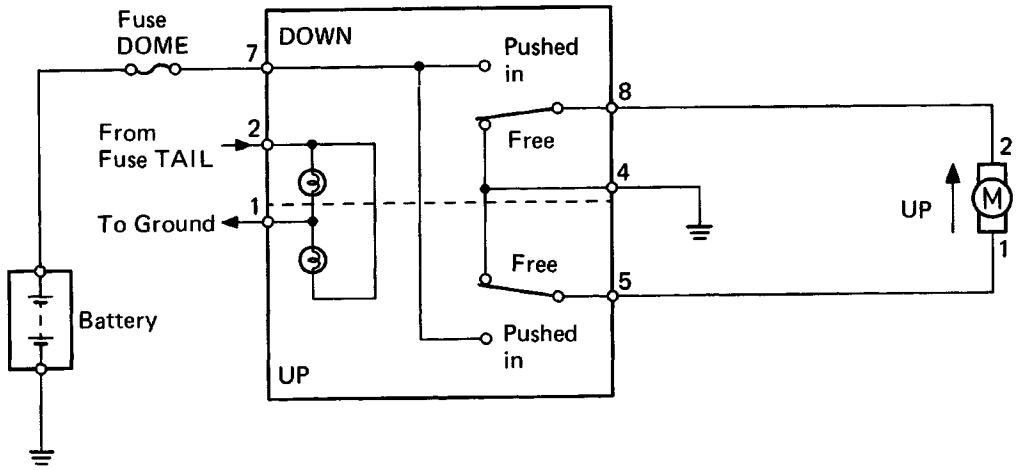
N03147
S-10-2-A S-6-2-E H-15-2-A S-10-2-A
T-2-2 IS-2-2-B IS-2-2-B GA-2-2-C H-2-2

Radio, 5 Speaker: Symbol R
Radio – Tape Player, 5 Speaker: Symbol U





Motor Antenna



BE5069
S-10-2-A S-6-2-E S-10-2-A T-2-2 IS-2-2-B H-2-2
BE5074
S-8-2 H-2-2

System Description

RADIO WAVE BAND

The radio wave bands used in radio broadcasting are as follows:

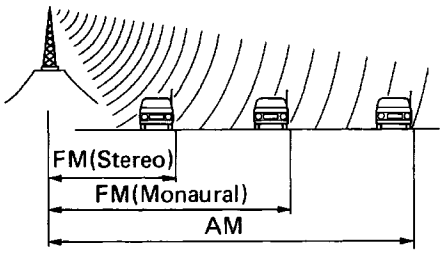
Frequency	30 kHz	300 kHz	3 MHz	30 MHz	300 MHz
Designation	LF	MF	HF	VHF	
Radio wave	LW ⟷	AM(MW) ⟷	SW ⟷	FM (UKW)	
Modulation method	Amplitude modulation			Frequency modulation	

LF: Low Frequency MF: Medium Frequency HF: High Frequency VHF: Very High Frequency

SERVICE AREA

There is great difference in the size of the service area for AM, FM monaural, and FM stereo broadcasting. Thus it may happen that FM broadcast cannot be received even though AM comes in very clearly.

Not only does FM stereo have the smallest service area, but it also picks up static and other types of interference (”noise”) the most easily.



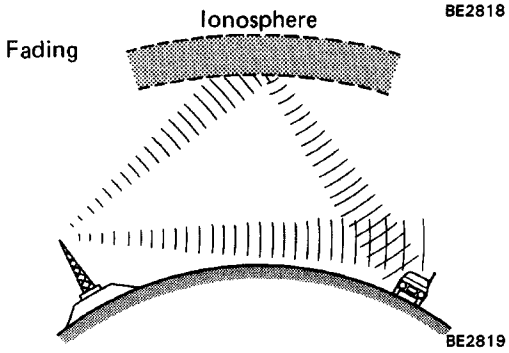
BE2818

RECEPTION PROBLEMS

Besides the problem of static, there are also the problems called ”fading”, ”multipath”, and ”fade out”. These pro–blems are caused not by electrical noise but by the nature of the radio waves themselves.

Fading

Basides electrical interference, AM broadcasts are also susceptible to other types of interference, especially at night. This is because AM radio waves bounce off the ionosphere at night. These radio waves then interfere with the signals from the same transmitter that reach the vehicle’s antenna directly. This type of interference is call–ed ”fading”.

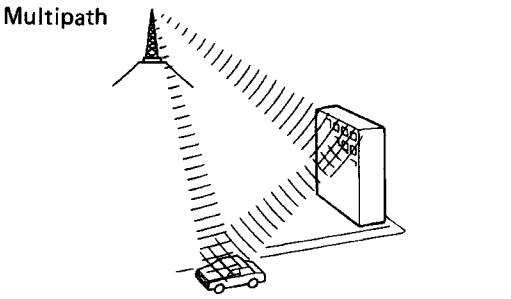


BE2819

Multipath

One type of interference caused by the bouncing of radio waves off of obstructions is called ”multipath”.

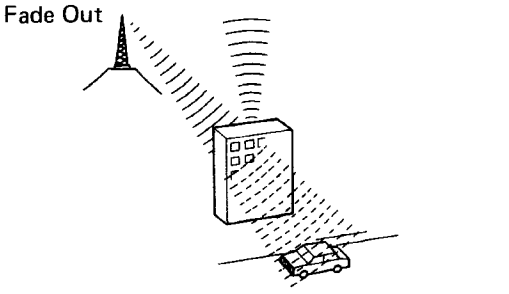
Multipath occurs when a signal from the broadcast transmitter antenna bounces off of buildings and moun–tains and interferes with the signal that is received direct–ly.



BE2820

Fade Out

Because FM radio waves are of higher frequencies than AM radio waves, they bounce off of buildings, mountains, and other obstructions. For this reason, FM signals often seem to gradually disappear or fade away as the vehicle goes behind a building or other obstruction. This is called ”fade out”.



BE2821

ADJUST ANTENNA TRIMMER

EX. Electronic Tuning Radio)

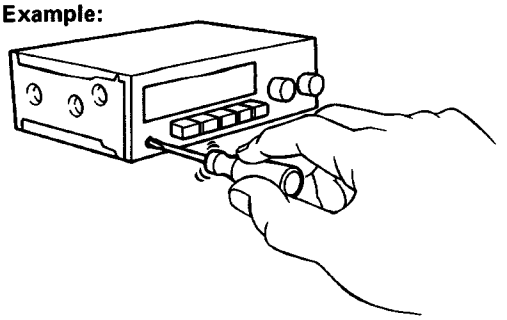
(a) Fully lengthen antenna.

(b) with volume and tone at maximum, turn the dial to around 1,400 kHz where there is no reception.

(c) Adjust the trimmer to where static is loudest.

HINT: The position of the antenna trimmer may very according to the type of radio, but is always on the front side.

Example:



BE0183

COMPACT DISC PLAYER

Compact Disc (hereafter called "'CD") players use a laser beam pick–up to read the digital signals recorded on the CD and reproduce analog signals of the music, etc. There are 4.7 in. (12 cm) and 3.2 in. (8 cm) CD available.

HINT: Never attempt to disassemble or oil any part of the player unit. Do not insert any object other than a disc into the slot.

NOTICE: CD players use invisible laser beam which could cause hazardous radiation explosure if directed. Be sure to operate the player correctly as instructed.

MAINTENANCE

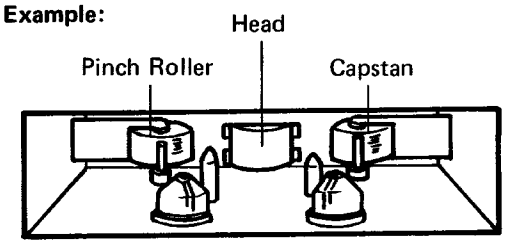
(Tape Player)

Head Cleaning

(a) Raise the cassette door with your finger.
Next using a pencil or like object, push in the guide.

(b) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, pinch rollers and capstans.

Example:



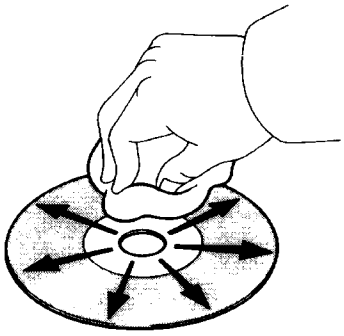
CO192

(CD Player)

Disc Cleaning

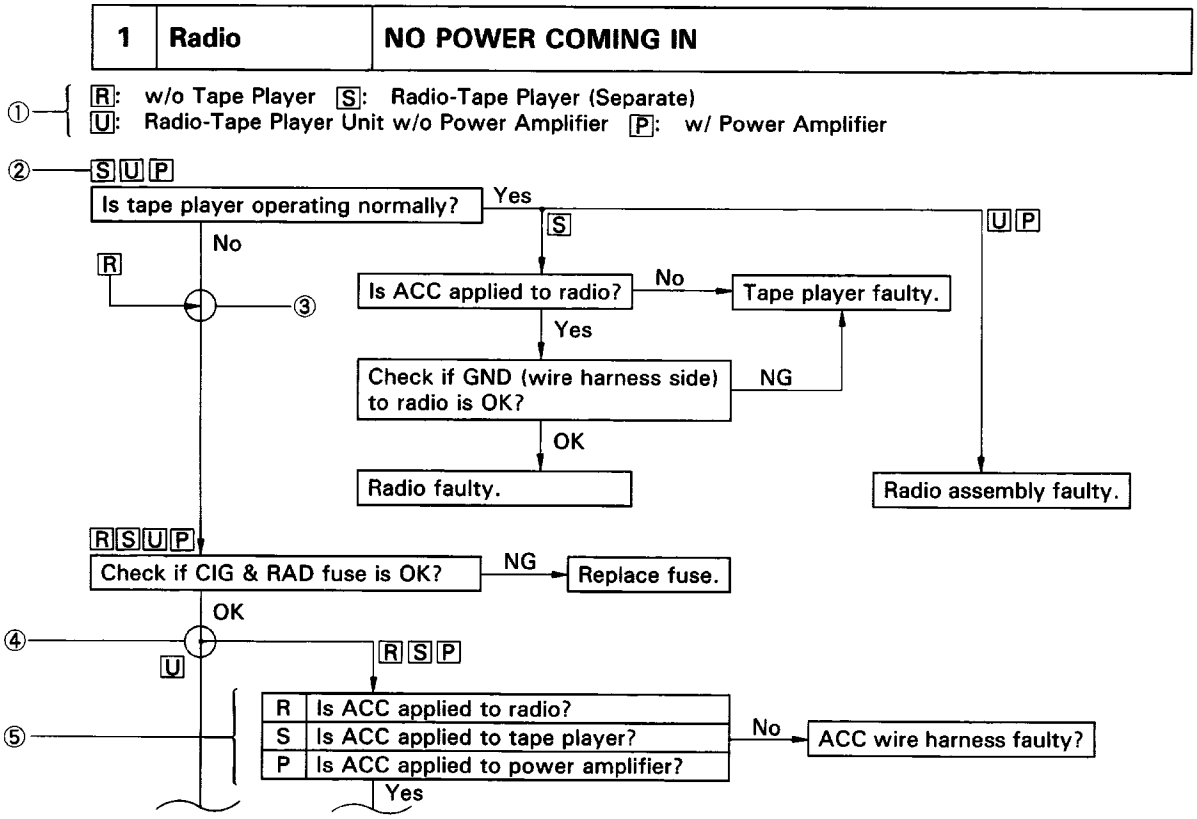
If the Disc gets dirty, clean the Disc by wiping the surfaces from the center to outside in the radial directions with a soft cloth.

NOTICE: Do not use a conventional record cleaner or anti–static record preservative.



BE4331

HOW TO USE DIAGNOSTIC CHART



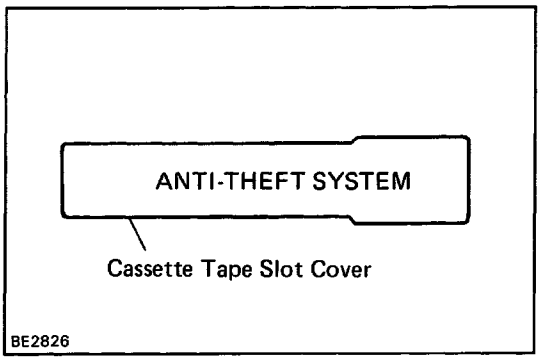
① Audio system type and symbol used.
HINT: Confirm the applicable type of audio system.

② Symbol for type of audio system the question applies to.
HINT: If the audio system type is not applicable, proceed to next question below.

③ Junction without black circle.
HINT: Proceed to next question below.

④ Junction with black circle.
HINT: Proceed to question for applicable audio system type.

⑤ HINT: Select question for applicable audio system type.



ANTI–THEFT SYSTEM

The anti–theft system is only provided for audio systems equipped with an Acoustic Flavor function.

HINT: The words ”ANTI–THEFT SYSTEM” are displayed on the cassette tape slot cover.
For operation instructions for the anti–theft system, please consult the audio system section in the Owner’s Manual.

1. SETTING SYSTEM

The system is in operation once the customer has pushed the required buttons and entered the customer–selected 3–digit ID number.
(Refer to the Owner’s Manual ”SETTING THE ANTI–THEFT SYSTEM”).
HINT:

- When the audio system is shipped the ID number has not been input, so the anti–theft system is not in operation.
- If the ID number has not been input, the audio system remains the same as a normal audio system.

2. ANTI–THEFT SYSTEM OPERATION

If the normal electrical power source (connector or battery terminal) is cut off, the audio system becomes inoperable, even if the power supply resumes.

3. CANCELLING SYSTEM

The ID number chosen by the customer is input to cancel the anti–theft system.
(Refer to the Owner’s Manual, ”IF THE SYSTEM IS ACTIVATED”)
HINT: To change or cancel the ID number, please refer to the Owner’s Manual, ”CANCELLING THE SYSTEM”.

Troubleshooting

NOTICE: When replacing the internal mechanism (computer part) of the audio system, be careful that no part of your body or clothing comes in contact with the terminals of the leads from the IC, etc. of the replacement part (spare part).

HINT: This inspection procedure is a simple troubleshooting which should be carried out on the vehicle during system operation and was prepared on the assumption of system component troubles (execpt for the wires and connectors, etc.).

Always inspect the trouble taking the following items into consideration.

- Open or short circuit of the wire harness
- Connector or terminal connection fault
- For audio systems with anti–theft system, troubleshooting items marked (*) indicate that "Troubleshooting for ANTI–THEFT SYSTEM" should be carried out first.

Problem		No.
Radio	No power coming in.	*1
	Power coming in, but radio not operating.	*2
	Noise present, but AM – FM not operating.	3
	Either speaker does not work.	4
	Either AM or FM does not work.	5
	Reception poor (Volume faint).	5
	Few preset tuning bands.	5
	Sound quality poor.	6
	Cannot set station select button.	7
	Preset memory disappears.	7
Tape Player	Cassette tape cannot be inserted.	8
	Cassette tape inserts, but no power.	*9
	Power coming in, but tape player not operating.	10
	Either speaker does not work.	11
	Sound quality poor (Volume faint).	12
	Tape jammed, malfunction with tape speed or auto–reverse.	13
	APS, SKIP, RPT buttons not operating.	14
	Cassette tape will not eject.	*15
CD Player	CD cannot be inserted.	16
	CD inserts but no power.	17
	Power coming in, but CD player not operating.	18
	Sound jumps.	19
	Sound quality poor (Volume faint).	20
	Either speaker does not work.	21
	CD will not eject.	22
Antenna	Antenna – related.	23
Noise	Noise produced by vibration or shock while driving.	24
	Noise produced when engine starts.	25

Troubleshooting for ANTI–THEFT SYSTEM

Turn ignition key from LOCK position to ACC position.

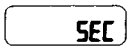
Display "A" showing?
- No → Radio switch turned ON.
  - Display "B" showing?
    - No → ID number not input. (Display D)
      - Refer to each malfunction item.
    - Yes → While holding the 1, 4 and 6 buttons in. Push and hold the "PWR VOL" knob. Check display.
      - Display "B" → Go to No. 1.
      - Display "E" → ANTI–THEFT SYSTEM operating condition. (ID number input error 5 times) Take to designated radio service station.
- Yes → ID number is set.

"SEC" display disappears after 1 second.
- Yes → Normal operation when radio switch turned ON.
  - Yes → Forgot to press switch.
  - No → Cancel ID number, refer to each malfunction item.
- No → ANTI–THEFT SYSTEM operating condition. (ID number input error 4 times or less)

Input ID number, check display.
- Display "D" → ANTI–THEFT SYSTEM cancelled. Check audio system again.
  - OK → ID number not input, or else input error.
  - NG → Cancel ID number, refer to each malfunction item.
- Display "A" or "B" → ANTI–THEFT SYSTEM not cancelled. ID number input 5 times or more?
  - Yes → Take to designated radio service station.
  - No → Input ID number, check display.
- After 2 seconds Display "C" "A" → ANTI–THEFT SYSTEM not cancelled. ID number input 5 times or more?
  - Yes → Take to designated radio service station.
  - No → Input ID number, check display.

(Liquid Crystal Display (LCD) for Audio System)

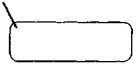
Display "A"



BE2814

Display "B"

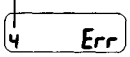
Blank, No. Illumination



BE2815

Display "C"

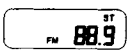
Error Times



BE2816

Display "D" Examply:

Radio Display



BE2817

Display "E"

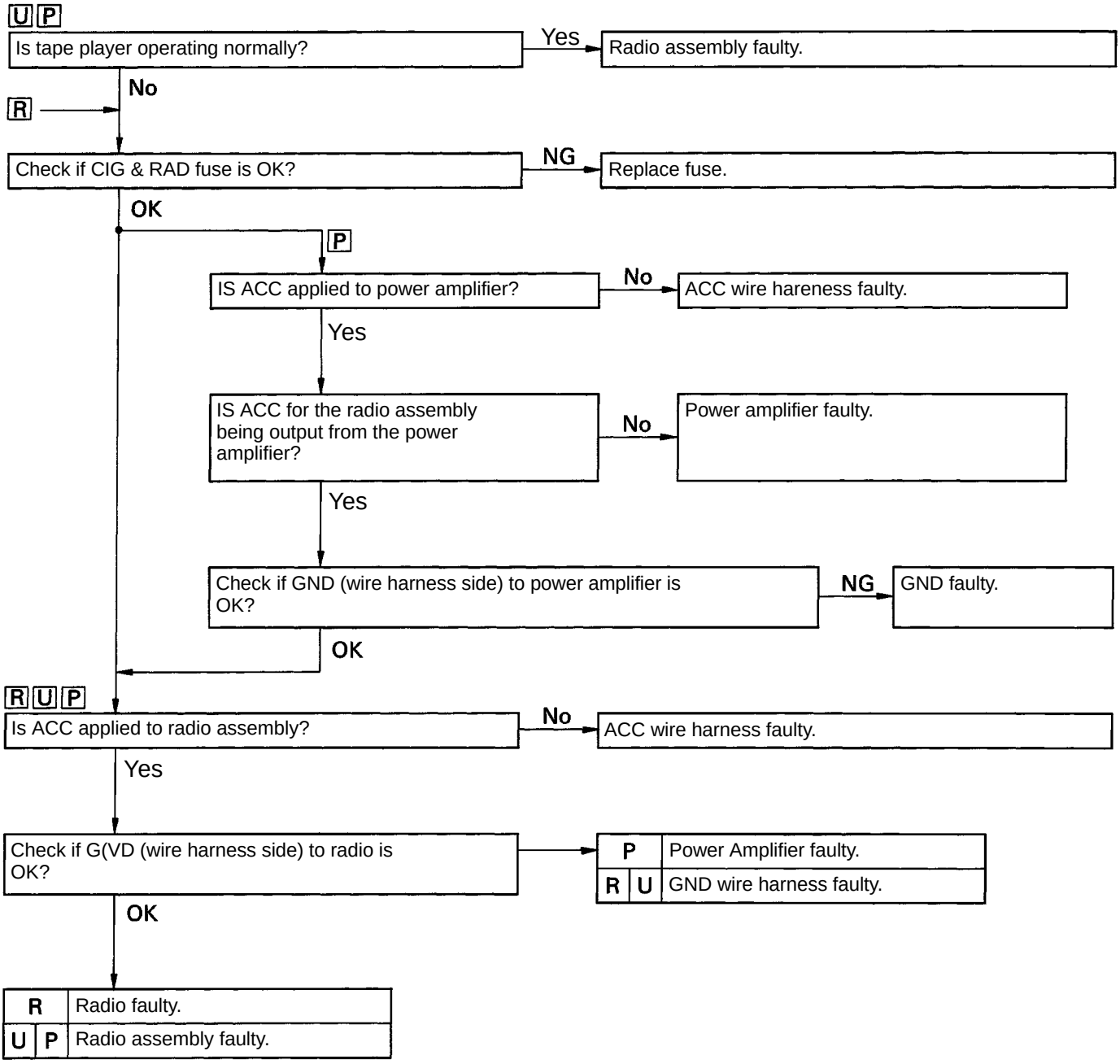
BE3923

HINT:

- Refer to Owner's Manual for operation details of ANTI–THEFT SYSTEM.
- when the ID number has been cancelled, reset the same number after completing the operation, or inform the customer that it has been cancelled.

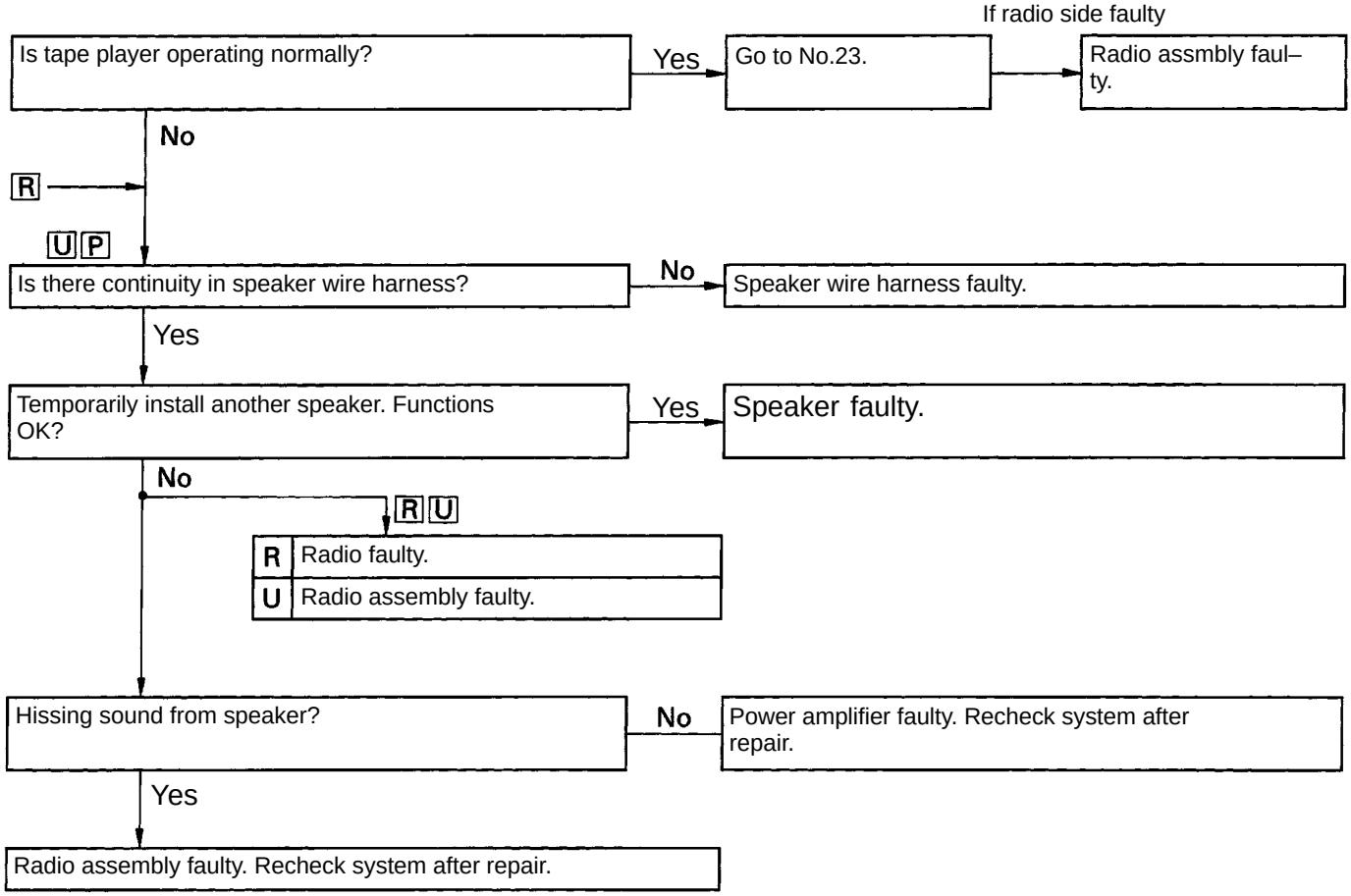
1	Radio	NO POWER COMING IN

[R] : Radio, 5 Speaker [U] : Radio–Tape Player, 5 Speaker
[P] Radio–Tape Player, 9 Speaker



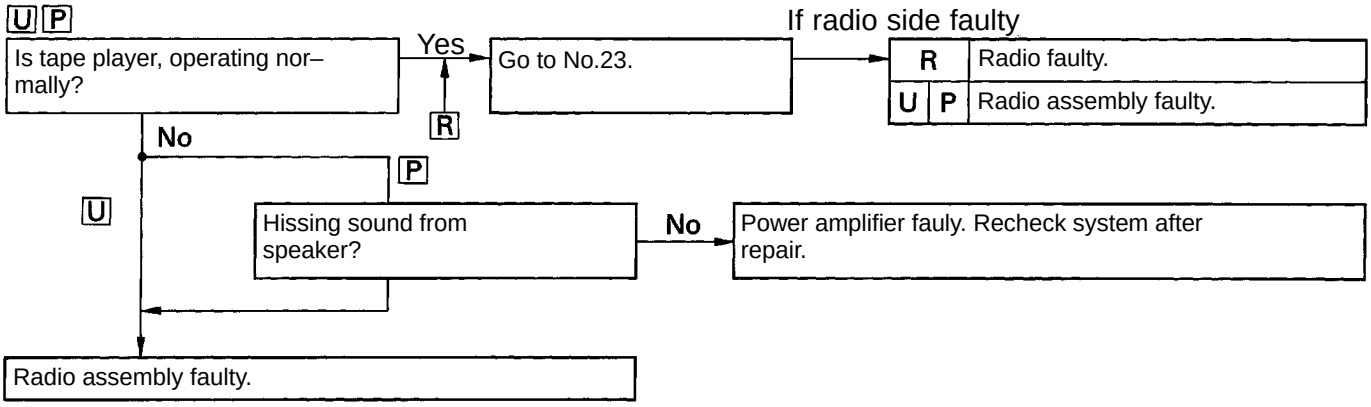
2 Radio — POWER COMING IN, BUT RADIO NOT OPERATING

[R] : Radio, 5 Speaker [U] : Radio–Tape Player, 5 Speaker
[P] : Radio–Tape Player, 9 Speaker



3 Radio — NOISE PRESENT, BUT AM–FM NOT OPERATING

[R] : Radio, 5 Speaker [U] : Radio–Tape Player, 5 Speaker
[P] Radio–Tape Player, 9 Speaker



4	Radio	EITHER SPEAKER DOES NOT WORK

[R] : Radio, 5 Speaker [U] : Radio –Tape Player, 5 Speaker
[P] : Radio–Tape Player, 9 Speaker
[U][P]

Is tape player operating normally?
→ Radio assembly faulty.

No

[R] →

Is hiss produced by non–functioning speaker?
Yes →

R	Radio faulty
U	Radio assembly faulty.
P	Radio assembly faulty. Recheck system after repair.

No

Is there continuity in speaker wire harness?
No → Speaker wire harness faulty.

Yes

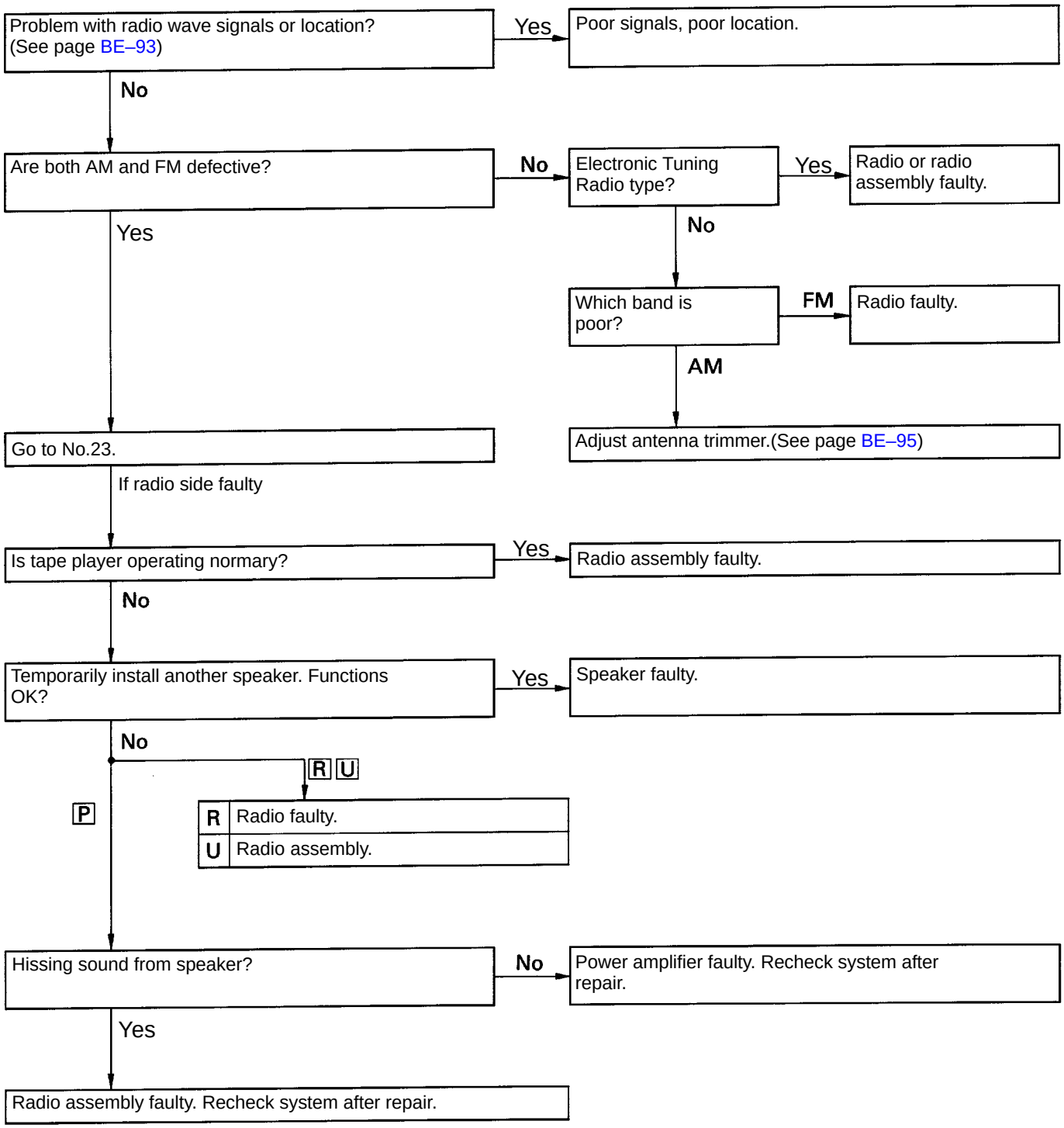
Temporarily install another speaker. Functions OK?
Yes → Speaker faulty.

No

R	Radio faulty
U	Radio assembly faulty.
P	Power amplifier faulty. Recheck system after repair.

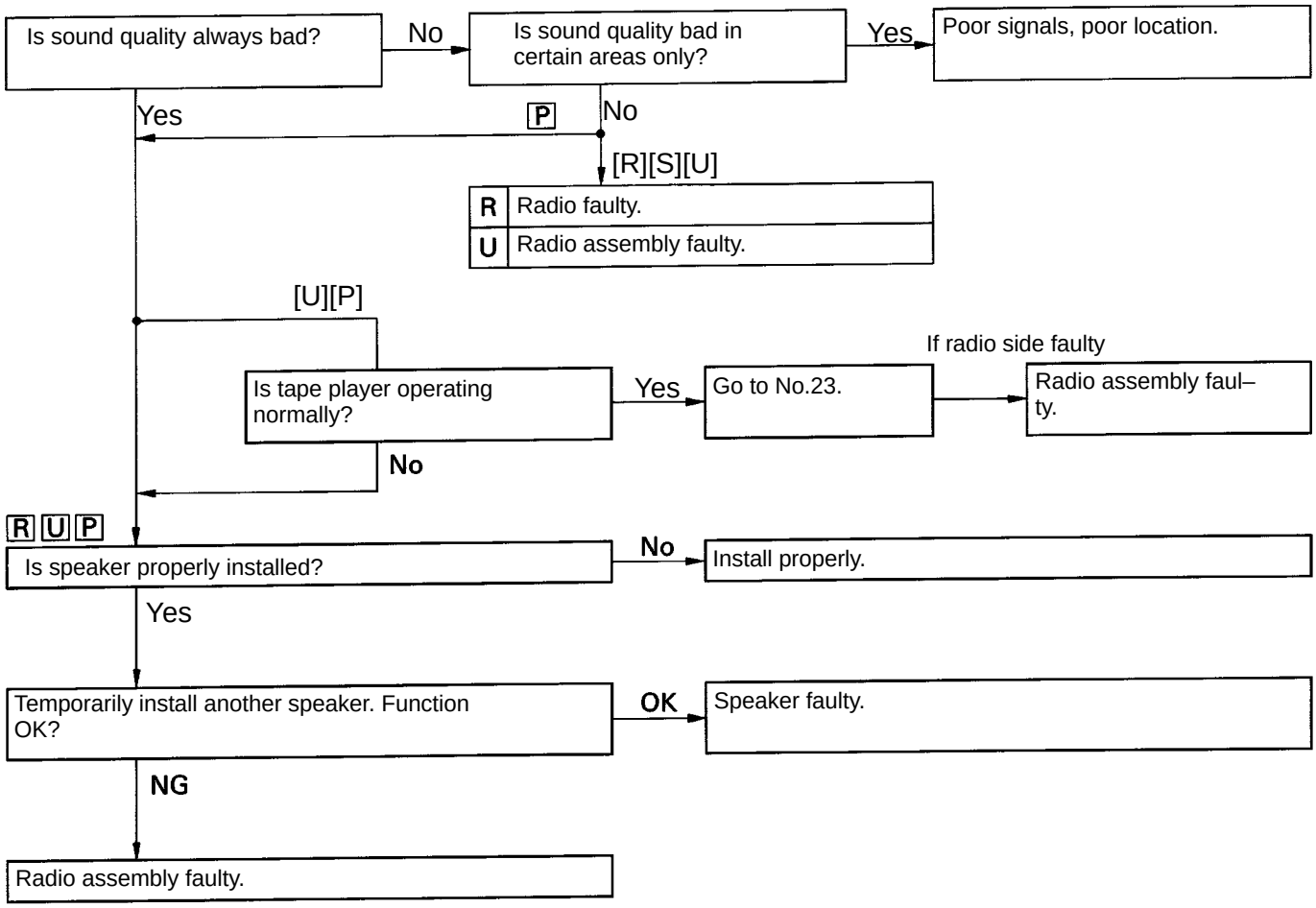
5	Radio	EITHER AM OR FM DOES NOT WORK, RECEPTION POOR (VOLUME FAINT), FEW PRESET TUNING BANDS

[R] : Radio, 5 Speaker [U] : Radio – Tape Player, 5 Speaker
[P] : Radio –Tape Player, 9 Speaker



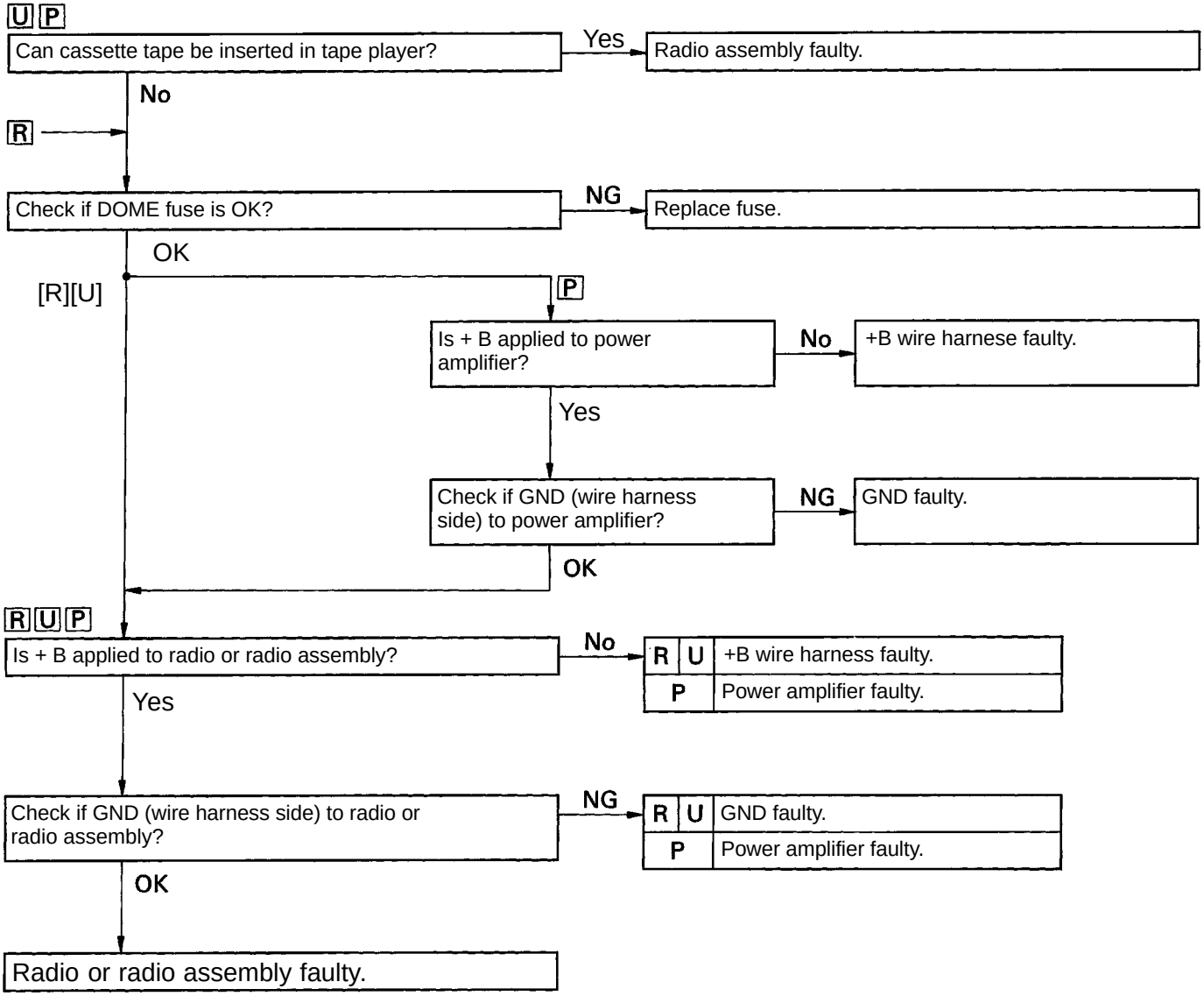
6 Radio — SOUND QUALITY POOR

[R] : Radio, 5 Speaker [U] : Radio–Tape Player, 5 Speaker
[P] : Radio–Tape Player, 9 Speaker



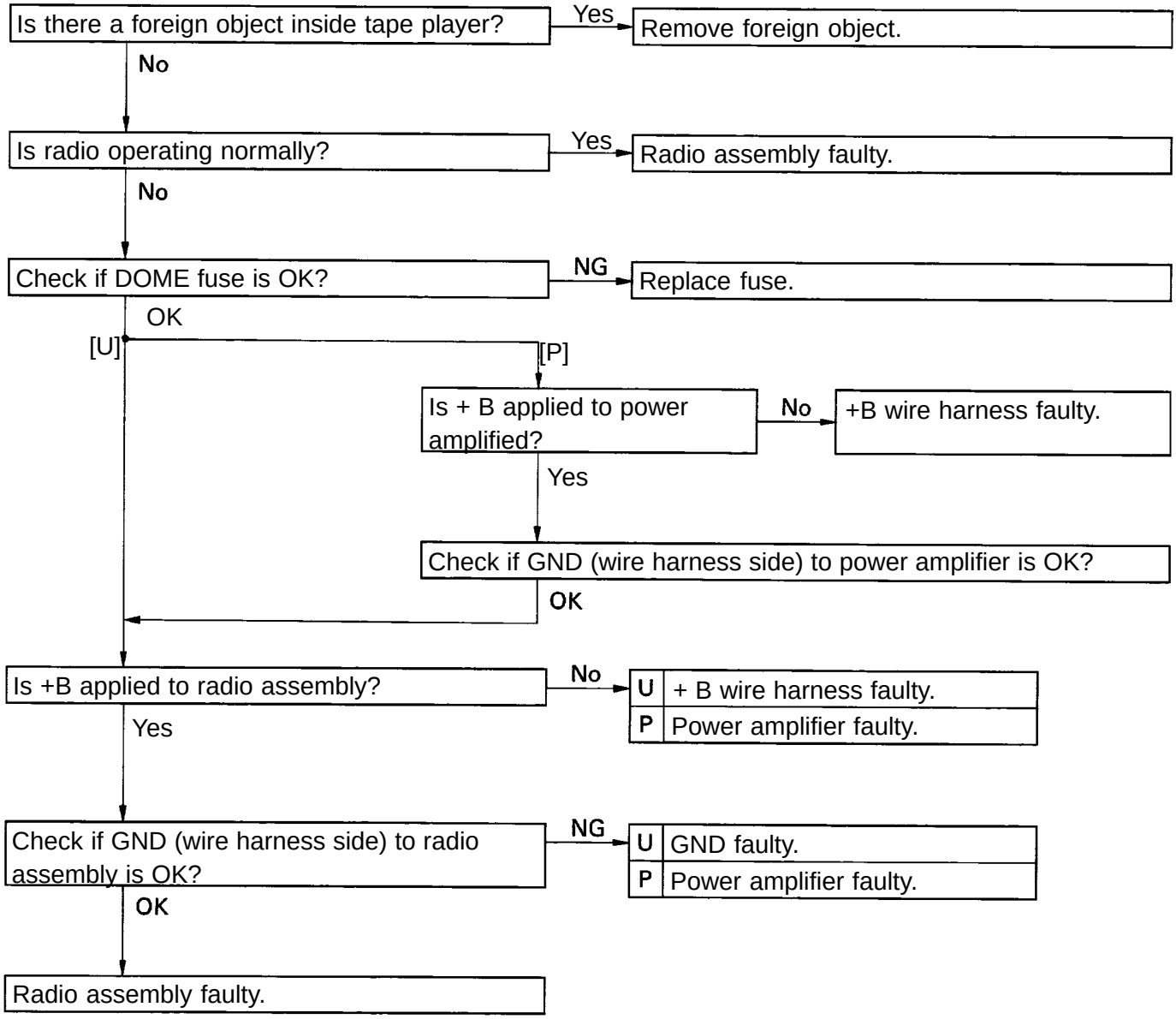
7	Radio	CANNOT SET STATION SELECT BUTTON, PRESET MEMORY DISAPPEARS

[R] : Radio, 5 Speaker [U] : Radio–Tape Player, 5 Speaker
[P] Radio–Tape Player, 9 Speaker



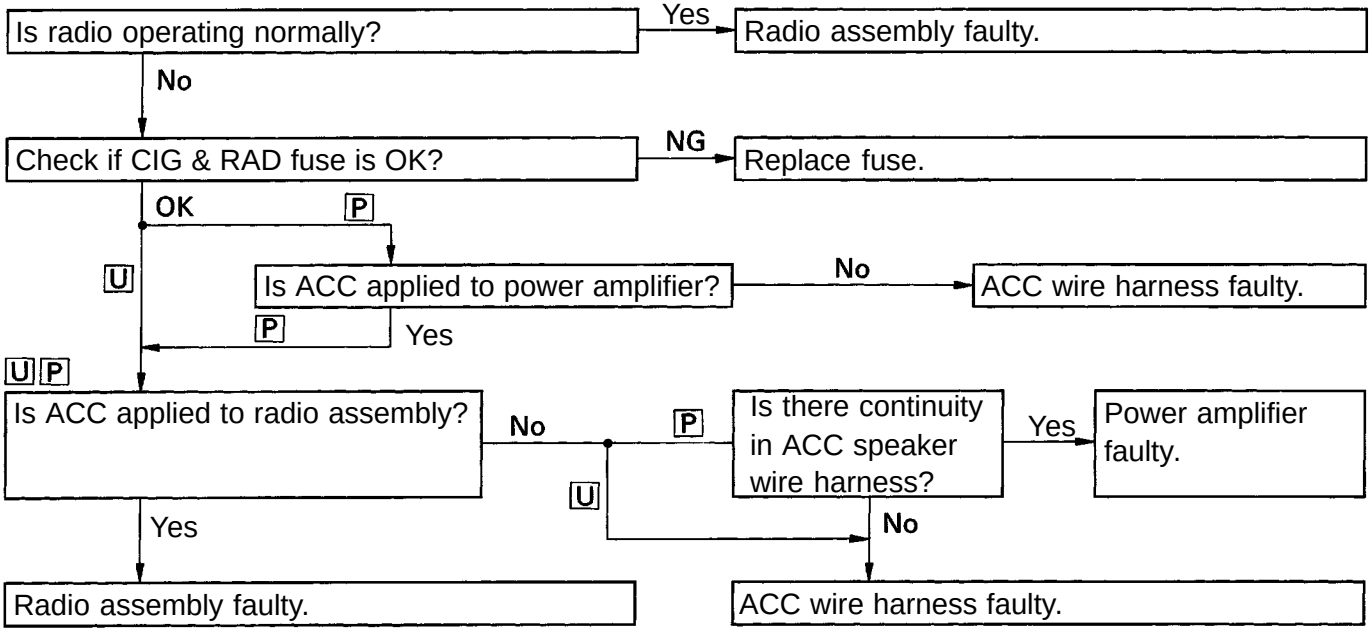
8 Tape Player CASSETTE TAPE CANNOT BE INSERTED

[U] : Radio–Tape Player, 5 Speaker
[P] : Radio–Tape Player, 9 Speaker



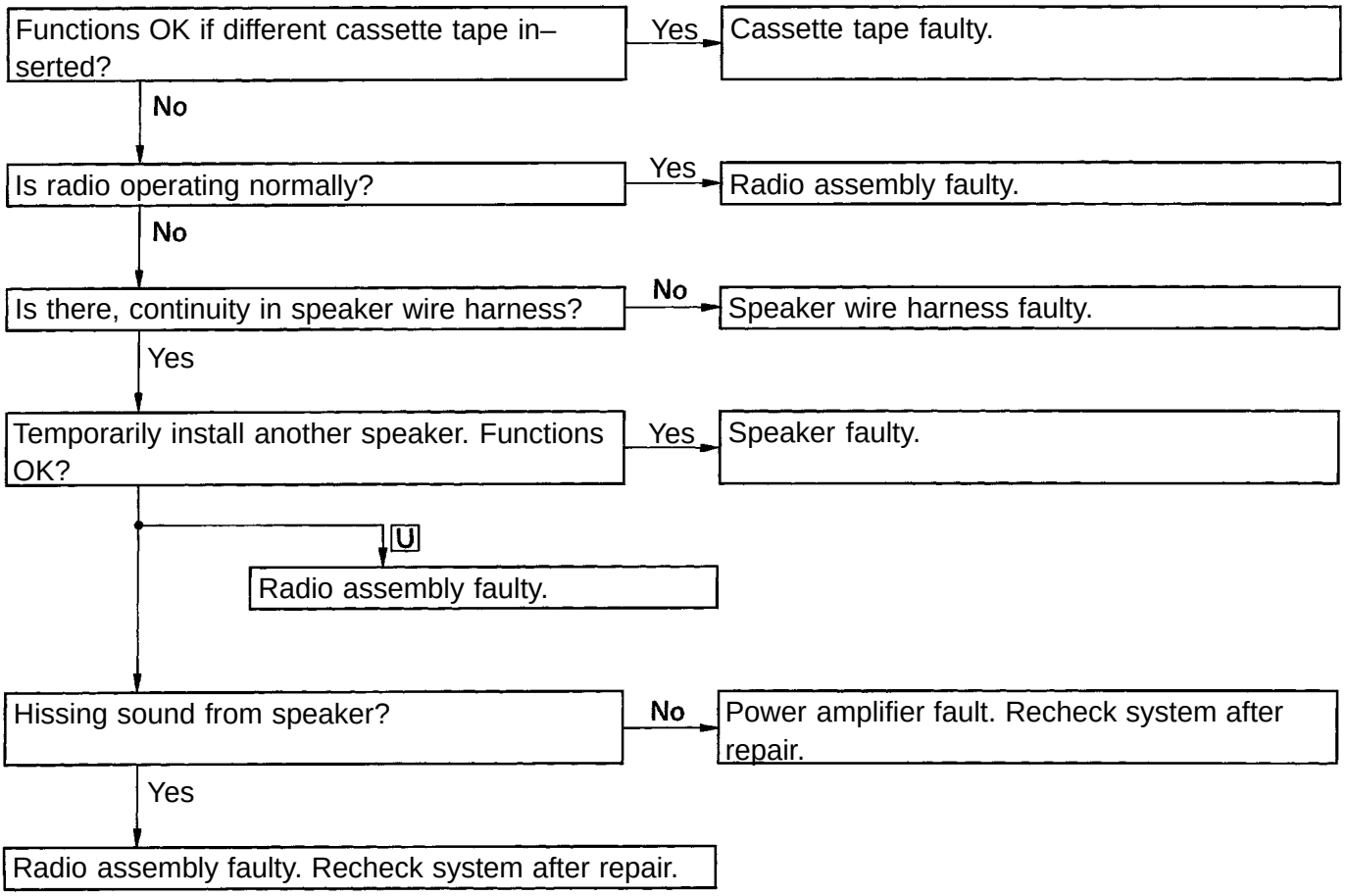
9 Tape Player — CASSETTE TAPE INSERTS, BUT NO POWER

[U] : Radio–Tape Player, 5 Speaker
[P] : Radio–Tape Player, 9 Speaker



10 Tape Player — POWER COMING IN, BUT TAPE PLAYER NOT OPERATING

[U] : Radio–Tape Player, 5 Speaker
[P] : Radio–Tape Player, 9 Speaker



11 Tape Player — EITHER SPEAKER DOES NOT WORK

[U] : Radio–Tape Player, 5 Speaker
[P] : Radio–Tape Player, 9 Speaker

- Is radio operating normally?
  - Yes → Radio assembly faulty.
  - No ↓
- Is hiss produced by non–functioning Speaker?
  - Yes → U: Radio assembly faulty.
  - Yes → P: Radio assembly faulty. Recheck system after repair.
  - No ↓
- Is there continuity in speaker wire harness?
  - No → Speaker wire harness faulty.
  - Yes ↓
- Temporarily install another speaker. Functions OK?
  - OK → Speaker faulty.
  - NG ↓
- U: Radio assembly faulty.
- P: Radio assembly faulty. Recheck system after repair.

12 Tape Player — SOUND QUALITY POOR (VOLUME FAINT)

[U] : Radio–Tape Player, 5 Speaker
[P] : Radio–Tape Player, 9 Speaker

- Functions OK if different cassette tape inserted?
  - Yes → Cassette tape faulty.
  - No ↓
- Operates normally after cleaning the heads? (See page BE–94)
  - Yes → Head dirty.
  - No ↓
- Is radio operating normally?
  - Yes → Radio assembly faulty.
  - No ↓
- Is speaker properly installed?
  - No → Install properly.
  - Yes ↓
- Temporarily install another speaker. Functions OK?
  - Yes → Speaker faulty.
  - No ↓
- U: Radio assembly faulty.
- P: Radio assembly faulty. Recheck system after repair.

13 Tape Player — TAPE JAMMED, MALFUNCTION WITH TAPE SPEED OR AUTO–REVERSE

Functions OK if different tape (less than 120 mins.) is inserted?
- Yes → Cassette tape faulty.
- No ↓

Is there a foreign object, inside tape player?
- Yes → Remove foreign object.
- No ↓

Operates normally after cleaning the heads? (See page BE–94)
- Yes → Head dirty.
- No ↓

Radio assmbly faulty.

14 Tape Player — APS, SKIP, RPT BUTTONS NOT OPERATING

Functions OK if different cassette tape inserted?
- No → Radio assembly fault^.
- Yes ↓

Cassette tape faulty. (Less than 3 secs. of silence between songs (APS, RPT). Less than 15 secs. of silence (SKIP).)

15 Tape Player — CASSETTE TAPE WILL NOT EJECT

Radio, 5 Speaker [U] : Radio–Tape Player, 5 Speaker
Radio–Tape Player, 9 Speaker

Is tape player operating normally?
- No → Cassette tape jammed.
- Yes ↓

Is radio operating normally?
- Yes → Radio assembly faulty.
- No ↓

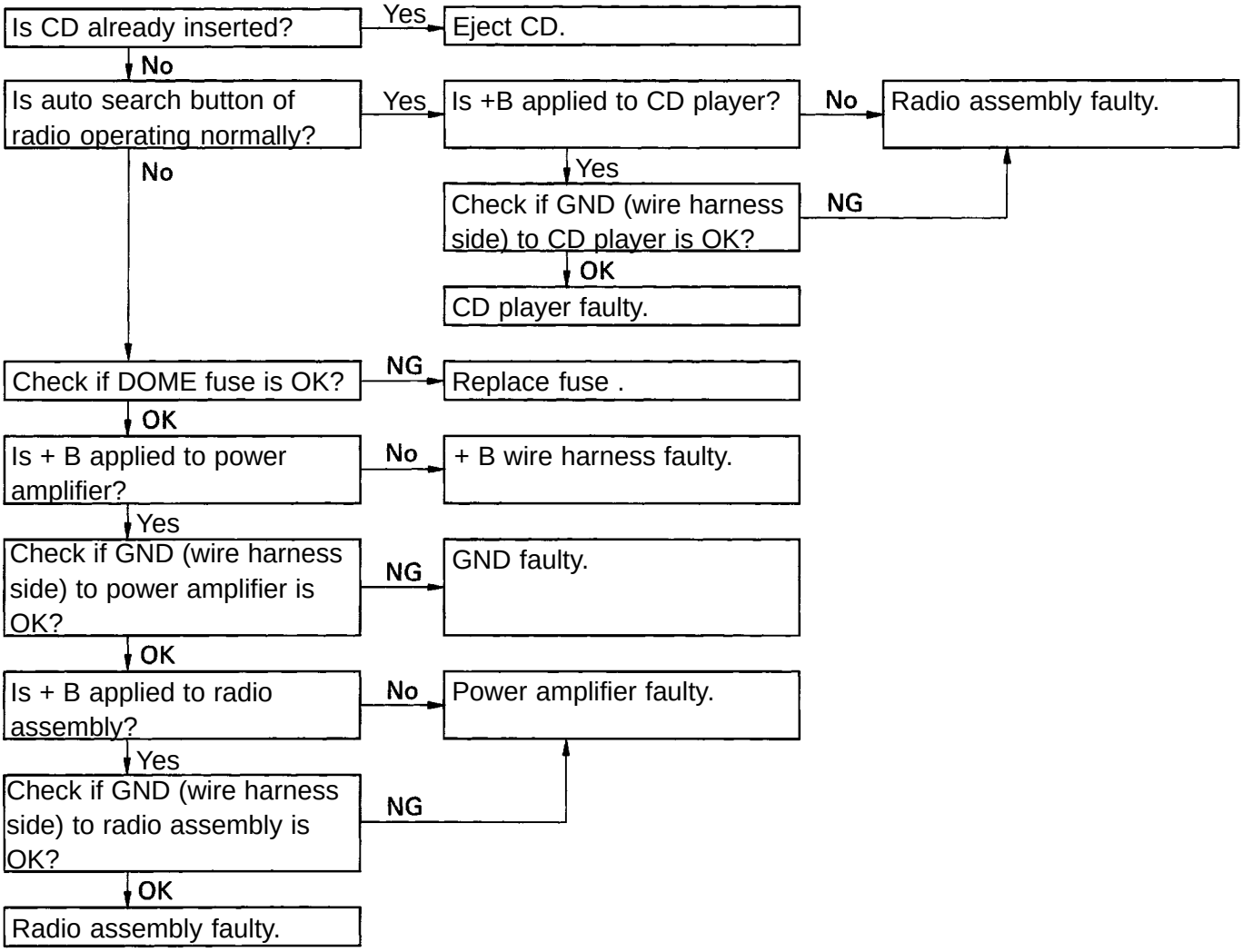
Check if DOME fuse is OK?
- NG → Replace fuse.
- OK ↓

[U] [P] Is +B applied to power amplifier?
- No → + B wire harness faulty.
- Yes ↓

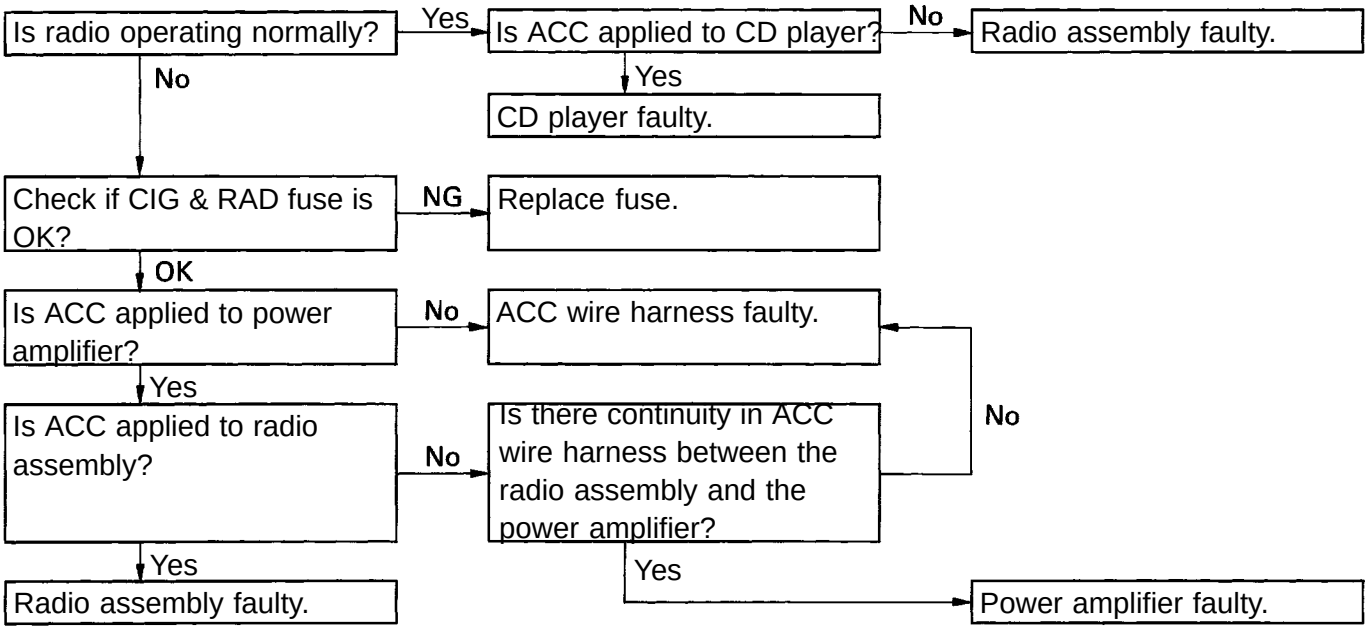
Is +B applied to radio assembly?
- No → Is there continuity in + B wire harness between power amplifier and radio assembly?
  - Yes → Power amplifier faulty.
  - No → +B wire harness faulty.
- [U] No → +B wire harness faulty.
- Yes ↓

Radio assembly faulty.

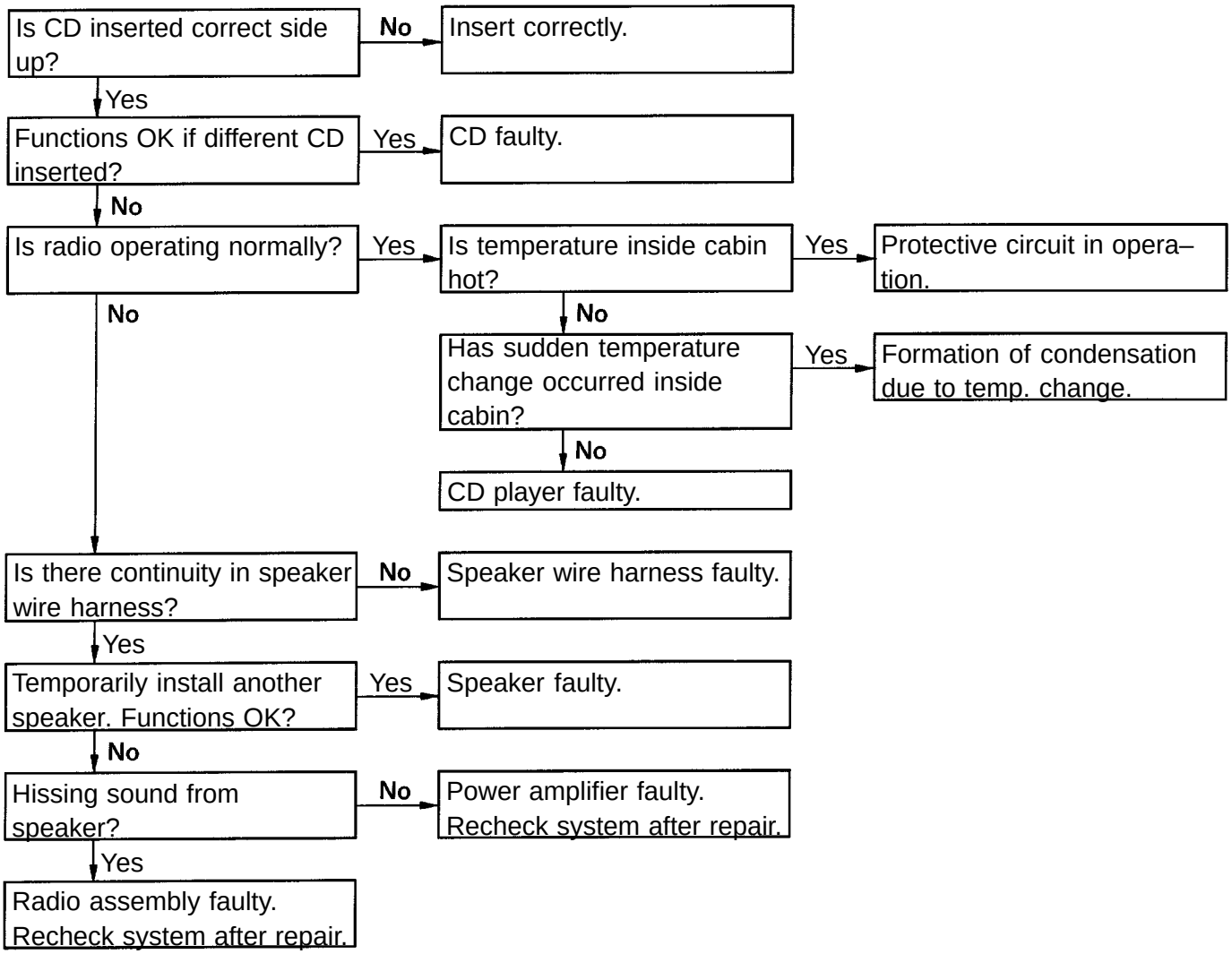
16 CD Player — CD CANNOT BE INSERTED



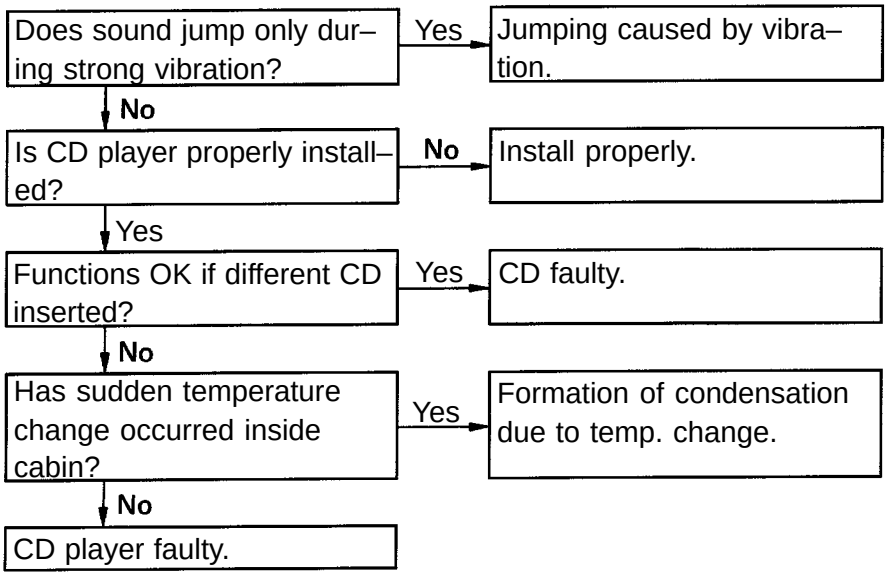
17 CD Player — CD INSERTS, BUT NO POWER



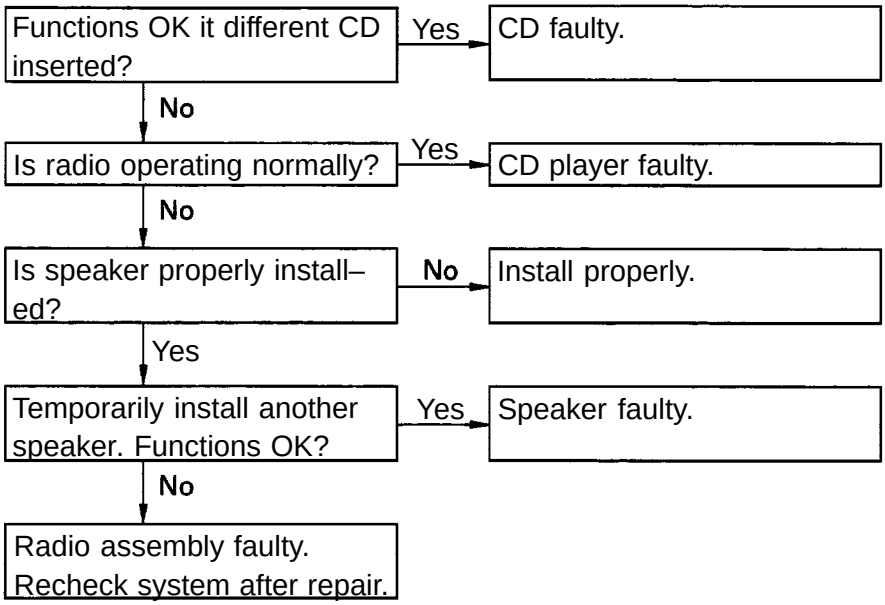
18 CD Player — POWER COMING IN, BUT CD PLAYER NOT OPERATING



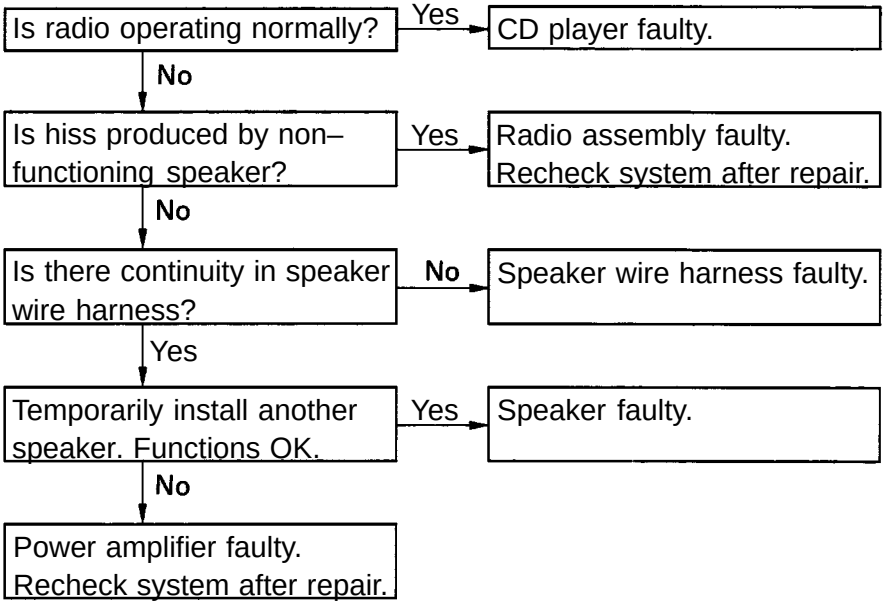
19 CD Player — SOUND JUMPS



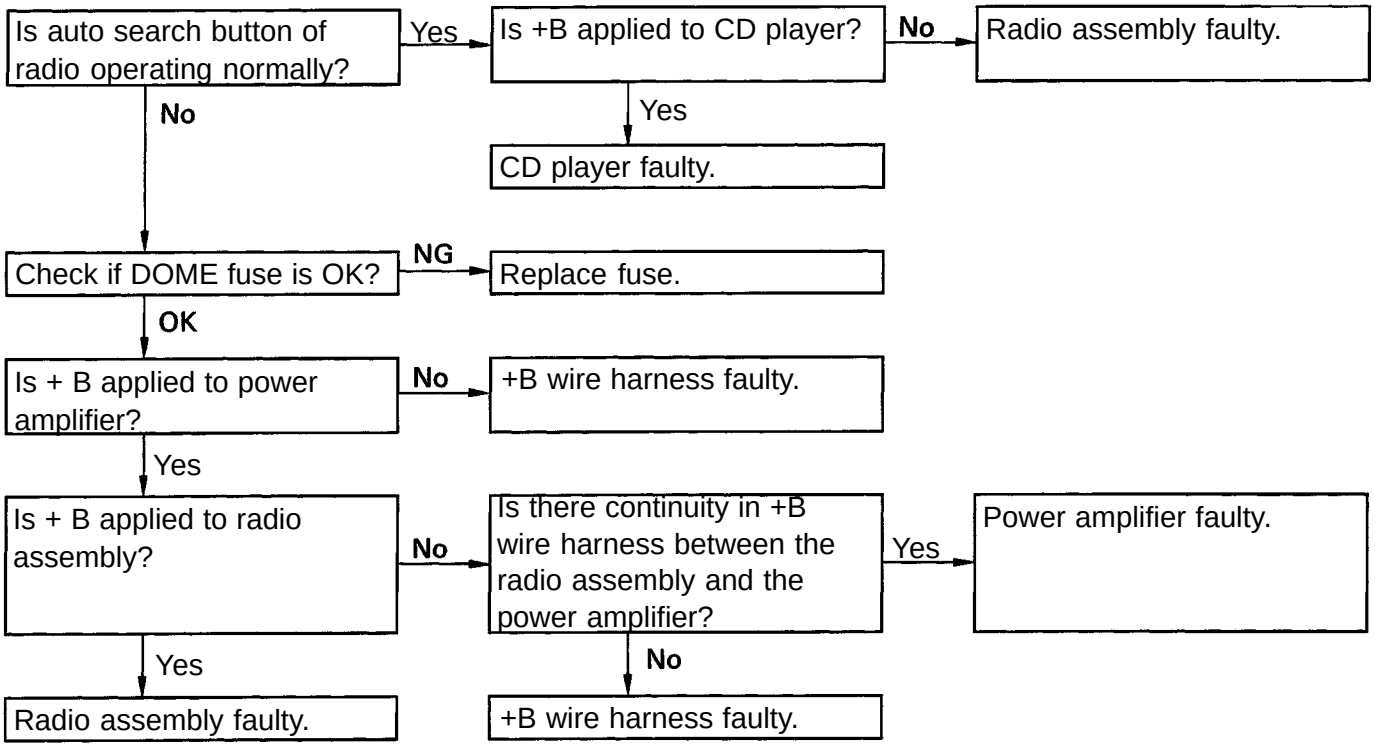
20 CD Player — SOUND QUALITY POOR (VOLUME FAINT)



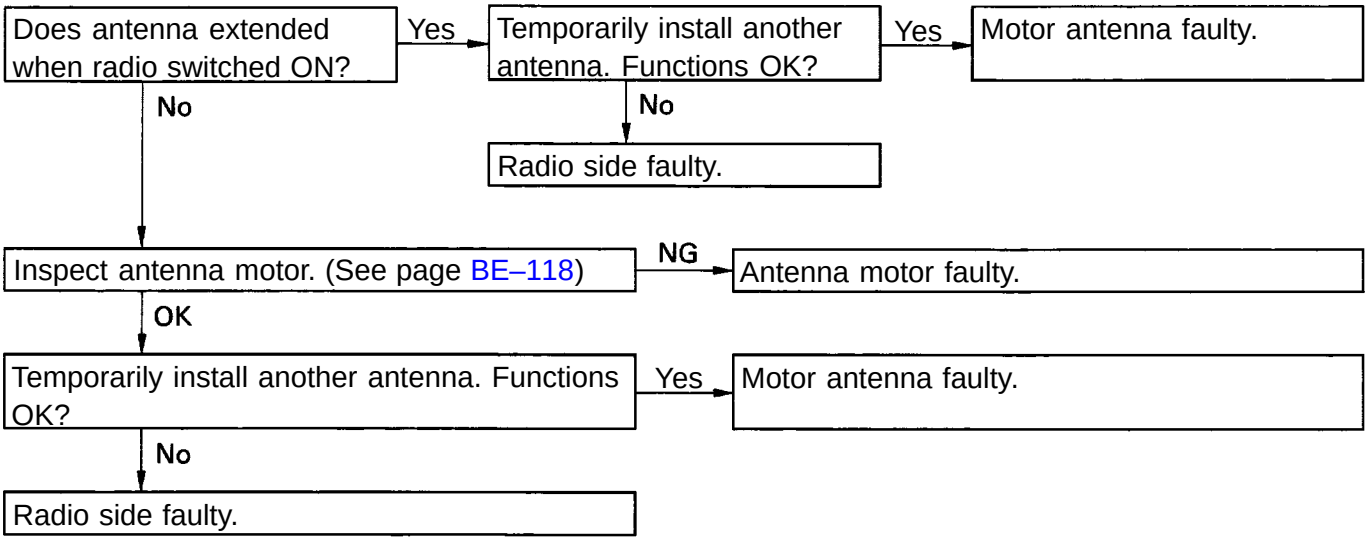
21 CD Player — EITHER SPEAKER DOES NOT WORK



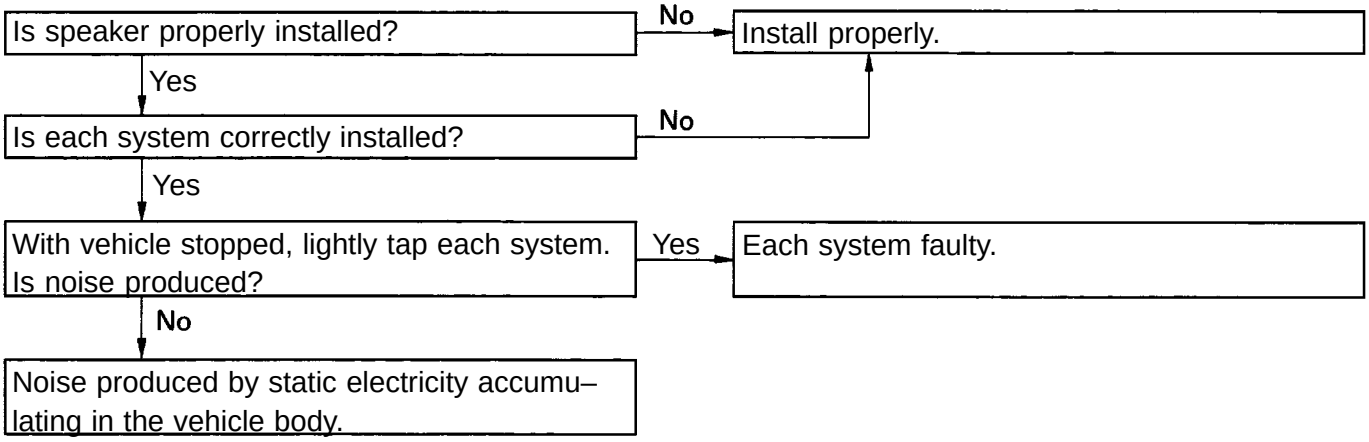
22	CD Player	CD WILL NOT EJECT



23	Antenna	ANTENNA–RELATED



24	Noise	NOISE PRODUCED BY VIBRATION OR SHOCK WHILE DRIVING



25	Noise	NOISE PRODUCED WHEN ENGINE STARTS

Whistling noise which becomes high–pitched when accelerator strongly depressed, disap–pears shorty after engine stops.
- Yes → Alternator noise.
- No ↓

Whining noise occurs when A/C is operating.
- Yes → A/C noise.
- No ↓

Scratching noise occurs during sudden accel–eration, driving on rough roads or when ignition switch is turned on.
- Yes → Fuel gauge noise.
- No ↓

Clicking sound heard when horn button is press–ed, then released. Whirring/grating sound when pushed continuously
- Yes → Horn noise.
- No ↓

Murmuring sound, stops when engine stops.
- Yes → Ignition noise.
- No ↓

Tick–tock noise, occurs in co–ordination with blinking of flasher.
- Yes → Turn signal noise.
- No ↓

Noise occurs during window washer operation.
- Yes → Washer noise.
- No ↓

Scratching noise occurs while engine is runn–ing, continues a while even after engine stops.
- Yes → Water temp. gauge noise.
- No ↓

Scraping noise in time with wiper beat.
- Yes → Wiper noise.
- No ↓

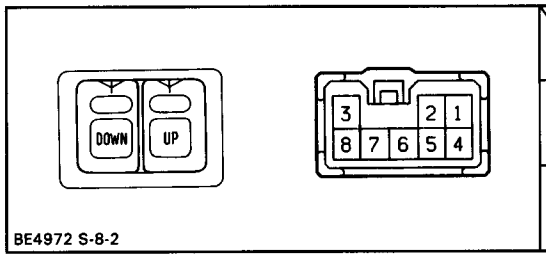
Other type of noise.

Parts Inspection

(with Motor Antenna)

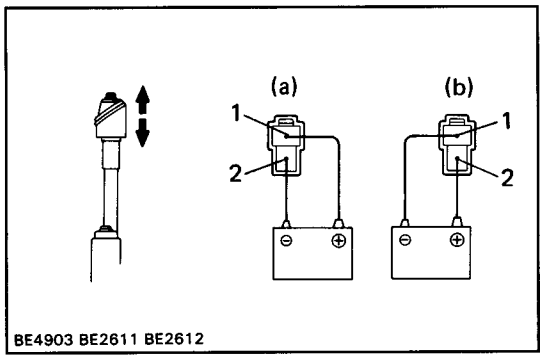
1. INSPECT ANTENNA SWITCH

(Except Radio–Linked Type/Continuity)



Switch position		Terminal 4	5	7	8	Illumination 1	2
UP Button	Free	○——	——○			○—⊗—○	
	Pushed in		○——	——○			
DOWN Button	Free	○——	——	——	——○	○—⊗—○	
	Pushed in			○——	——○		

If continuity is not as specified, replace the switch.

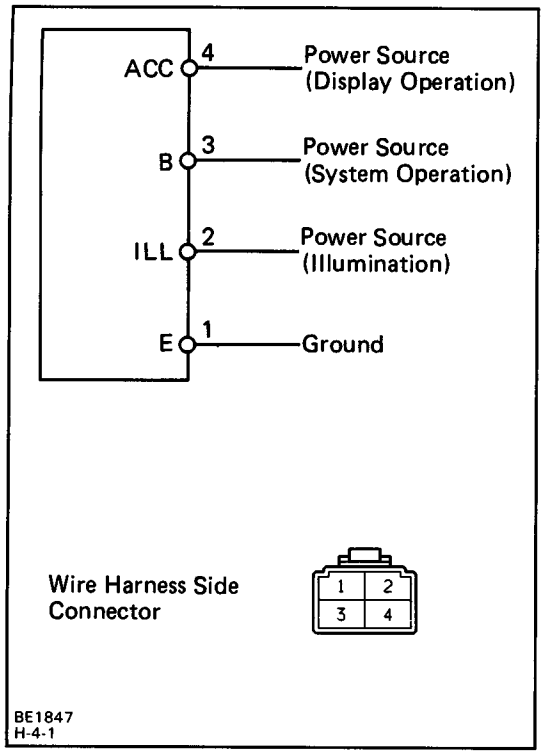


2. INSPECT ANTENNA MOTOR

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, check that the motor turns (moves upward.)

(b) Then, reverse the polarity, check that the motor turns the opposite way (moves downward.)

If operation is not as specified, replace the motor.



CLOCK

Troubleshooting

As shown in the illustration, those are clock circuit and connector diagrams. Inspect each terminal for applicable trouble.

Terminal		Condition	Specified value
1	E	Constant	Continuity
2	ILL	Turn light control switch ON	Battery Voltage
3	B	Constant	
4	ACC	Turn ignition switch ON	

Allowable error: + 1.5 seconds/day

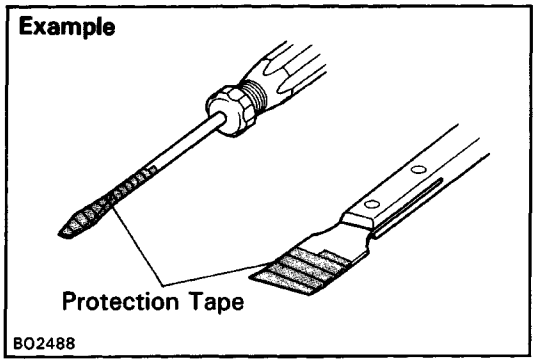
BODY

GENERAL INFORMATION

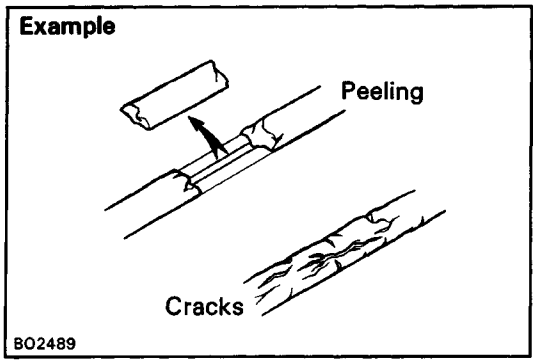
If there is a possibility that the body and/ or parts may be dam–aged, first remove the danger before performing repair opera–tions.

Example:

1. Apply protection tape to the body adjacent to the body part when removeding and installing.



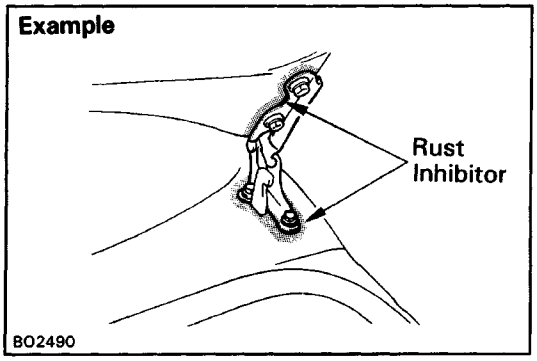
2. When prying off the body parts with a screwdriver or scraper etc., be sure to apply protection tape to the tip or blade to prevent damage to the paint film or body part.



If anti–rust agents are damaged while repairing other parts, be sure to repair the anti–rust agent.

Example:

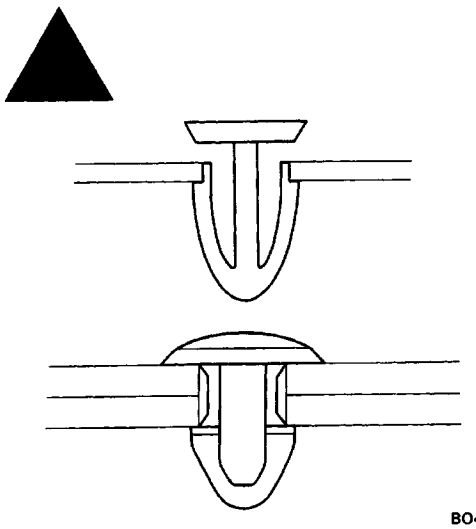
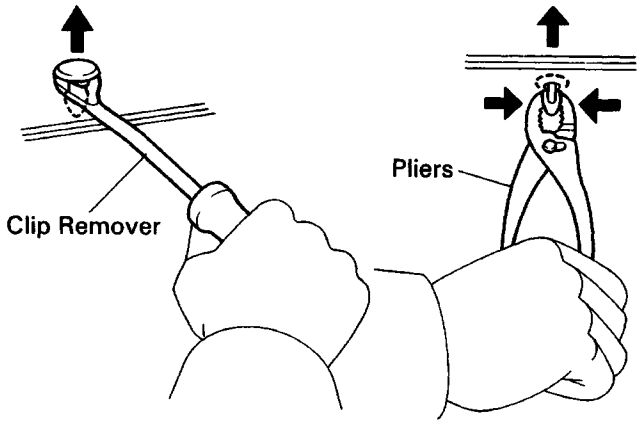
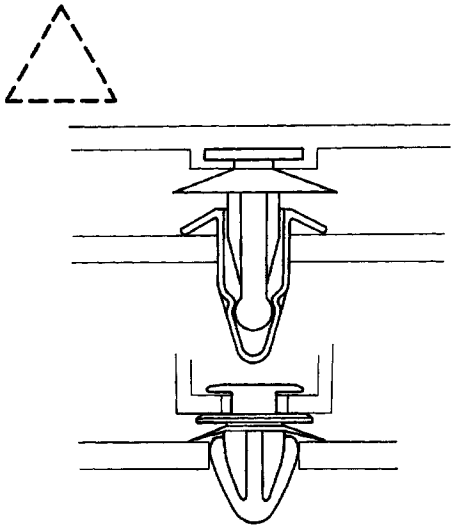
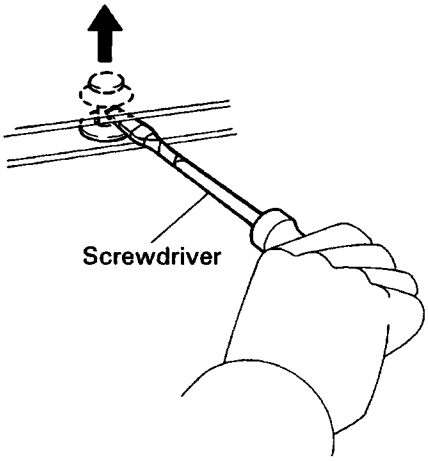
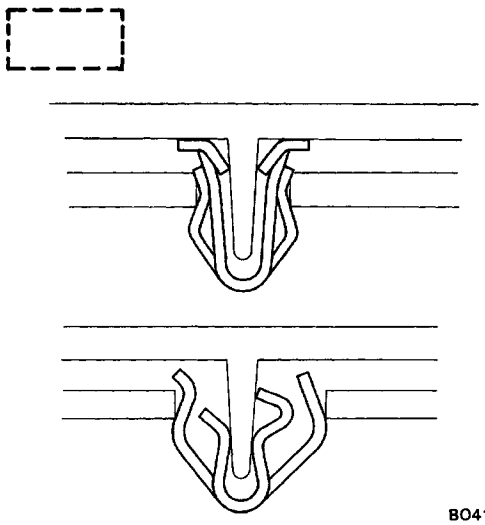
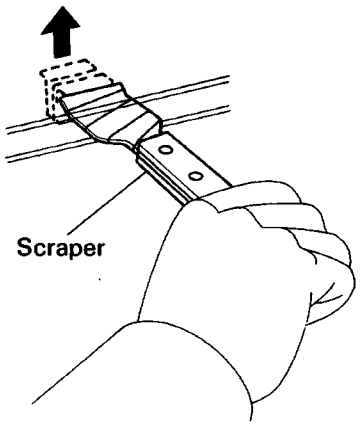
1. If body sealer, paint film or undercoat are damaged by peeling, cracks, etc., be sure to repair each with an anti–rust agent.



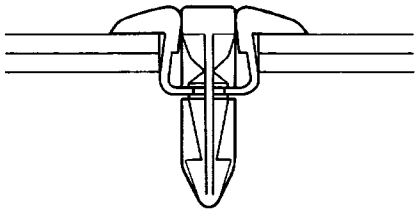
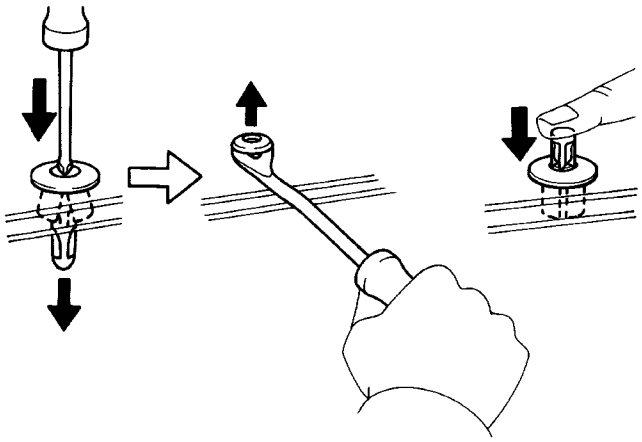
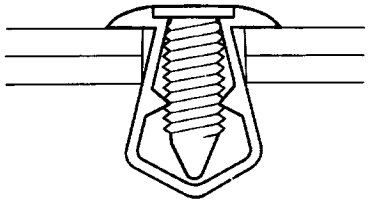
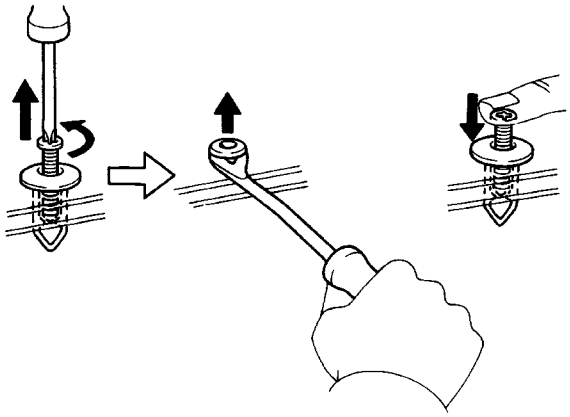
2. If a hinge or exterior body panel is loosened or removed, be sure to apply rust inhibitor after repairs.

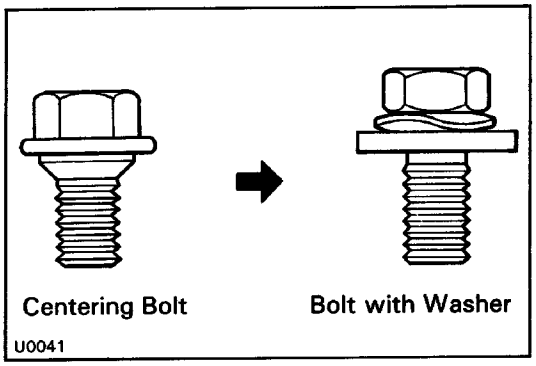
CLIPS

The removal and installation methods of typical clips used in body parts are shown in the table below.
HINT: If the clip is damaged during the operation, always replace it with a new clip.

Shape (Example)	Removal/installation
 BO4116	 BO4117
 BO4118	 BO4119
 BO4120	 BO4121

CLIPS (Cont'd)

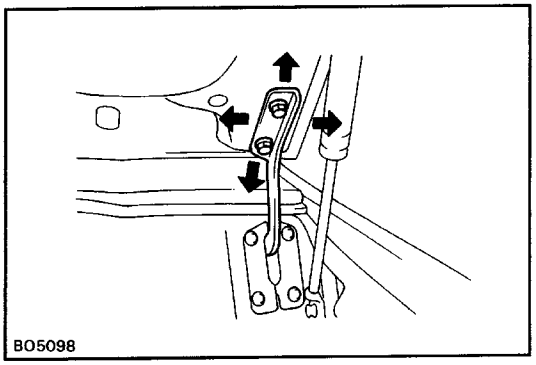
Shape (Example)	Removal /installation
 BO4122	Removal Installation  BO4123
 BO4124	Removal Installation  BO4125



HOOD

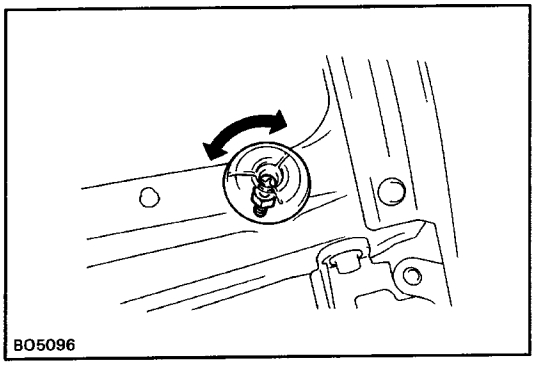
ADJUSTMENT OF HOOD

HINT: Since the centering bolt is used as the hood hinge and lock set bolt, the hood and lock cannot be adjusted with it on. Substitute the bolt with washer for the centering bolt.



1. ADJUST HOOD IN FORWARD/REARWARD AND LEFT/RIGHT DIRECTIONS

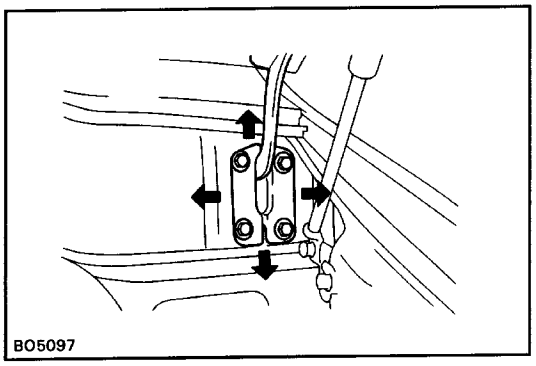
Adjust the hood by loosening the hood side hinge bolts.



2. ADJUST FRONT EDGE OF HOOD IN VERTICAL DIRECTION

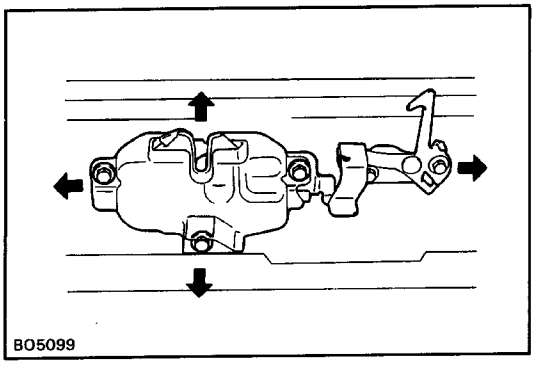
(a) Loosen the lock nut.

(b) Adjust the hood by turning the hood cushions.



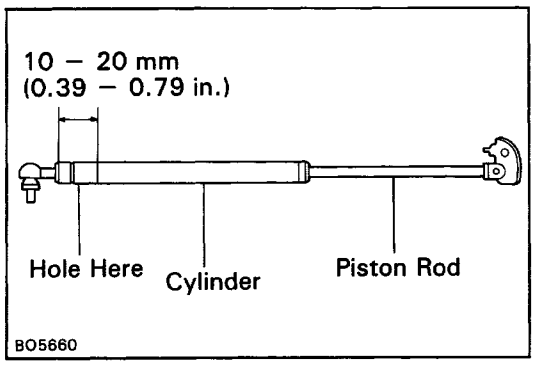
3. ADJUST REAR EDGE OF HOOD IN VERTICAL DIRECTION

Adjust the hood by loosening the body side hinge bolts.



4. ADJUST HOOD LOCK

Adjust the hood lock by loosening the mounting bolts.



Hood Damper Stay

NOTICE: Handling the damper.

(a) Do not disassemble the damper because the cylinder is filled with pressurized gas.

(b) If the damper is to be replaced, drill a 2.0 – 3.0 mm (0.079 – 0.118 in.) hole in the bottom of the removed damper cylinder to completely release the high–pressure gas before disposing of it.

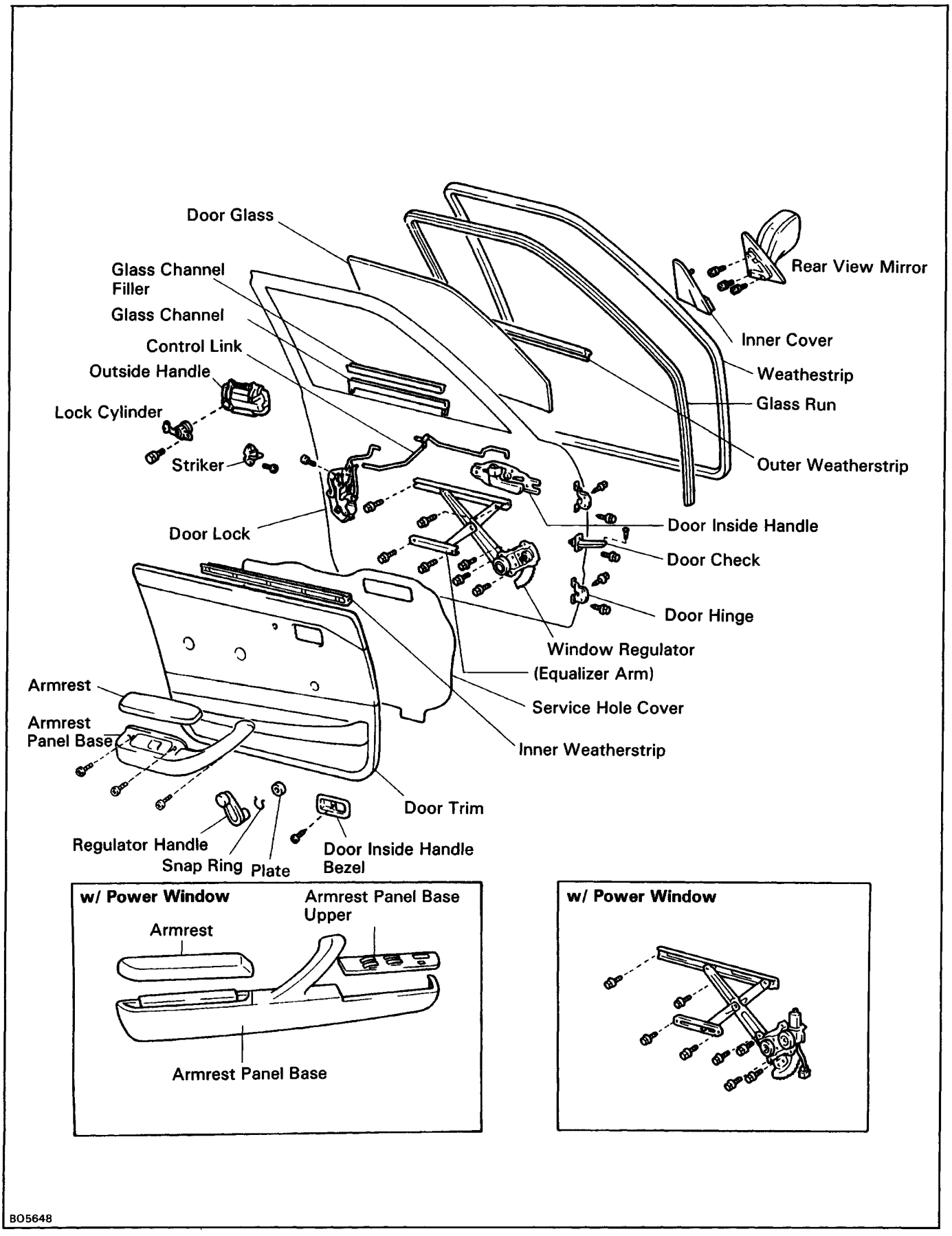
(c) When drilling, chips may fly out so work carefully.

(d) The gas is colorless, odorless and non–toxic.

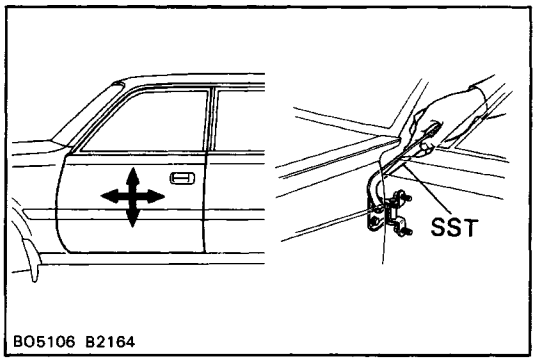
(e) When working, handle the damper carefully. Never score or scratch the exposed part of the piston rod, and never allow paint or oil to get on it.

(f) Do not turn the piston rod and cylinder with the damper fully extended.

FRONT DOOR
COMPONENTS



BO5648

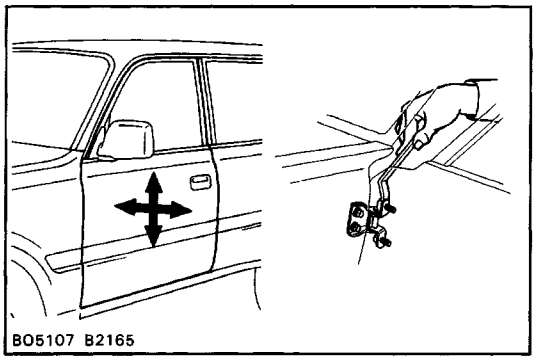


ADJUSTMENT OF FRONT DOOR

1. ADJUST DOOR IN FORWARD/REARWARD AND VERTI–CAL DIRECTIONS

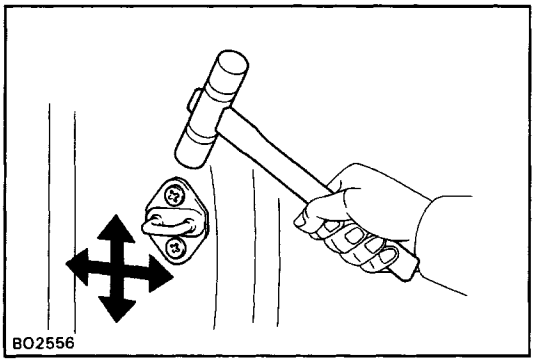
Using SST, adjust the door by loosening the body side hinge bolts.

SST 09812–00010



2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

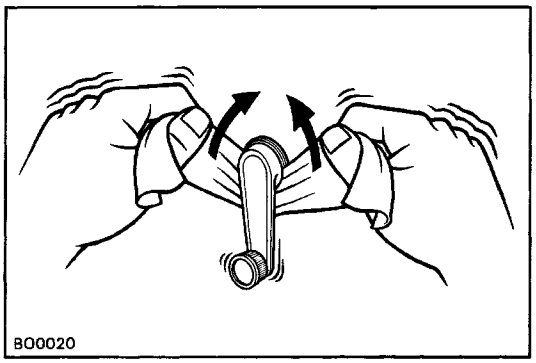
Adjust the door by loosening the door side hinge bolts.



3. ADJUST DOOR LOCK STRIKER

(a) Check that the door fit and door lock linkages are adjusted correctly.

(b) Adjust the striker position by slightly loosening the striker mounting screws, and hitting the striker with a hammer. Tighten the striker mounting screws again.



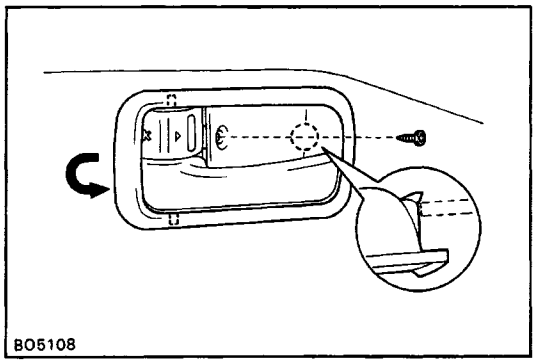
DISASSEMBLY OF FRONT DOOR

(See page BO–7)

1. (w/o Power Window)

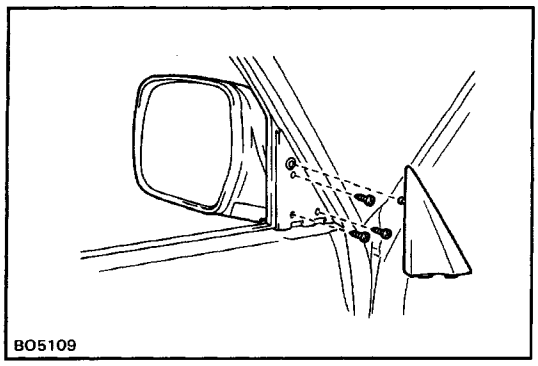
REMOVE REGULATOR HANDLE

Pull off the snap ring with a shop rag and remove the reg–ulator handle and plate.



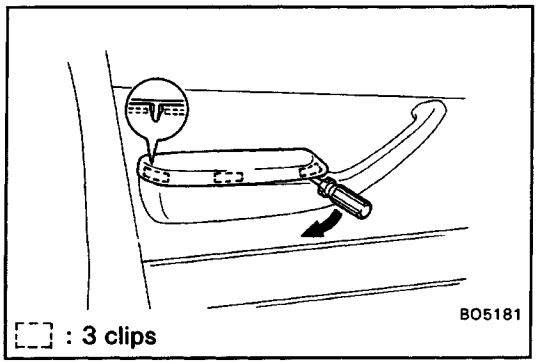
2. REMOVE DOOR INSIDE HANDLE BEZEL

Remove the screw and pull the inside handle bezel.



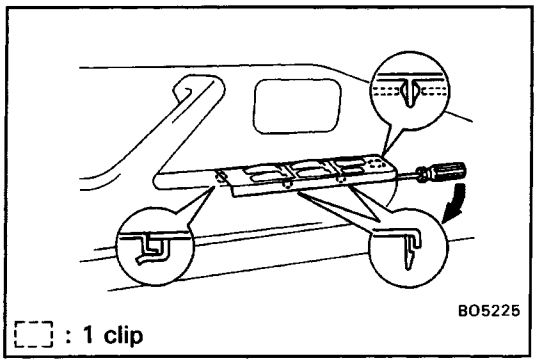
3. REMOVE REAR VIEW MIRROR

(a) Remove the cover.
(b) (w/ Remote Control Mirror)
Disconnect the connector from the mirror.
(c) Remove three screws and the rear view mirror.



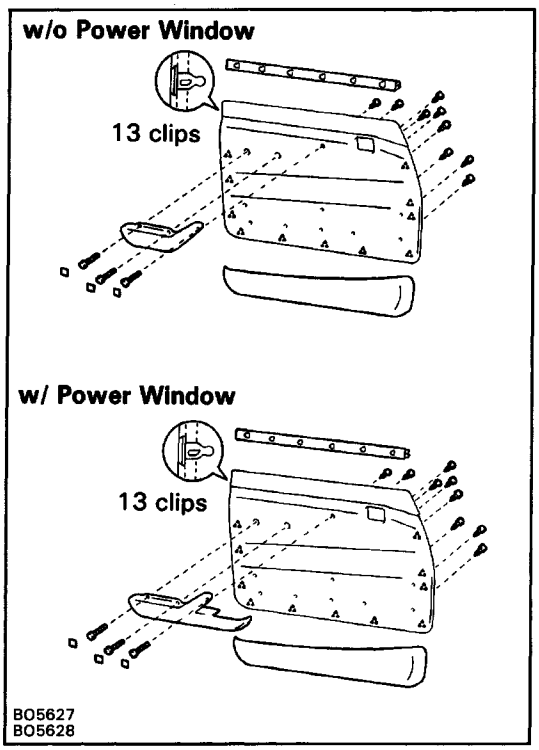
4. REMOVE ARMREST PANEL BASE

(a) Insert the screwdriver between the armrest and the armrest panel base to pry out.
HINT: Tape the screwdriver tip before use.
(b) Remove the armrest.



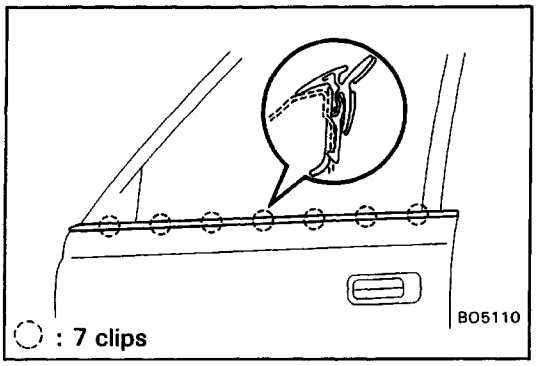
5. (w/ Power Window)
REMOVE ARMREST PANEL BASE UPPER

(a) Insert the screwdriver between the armrest panel base and the armrest panel base upper to pry out.
HINT: Tape the screwdriver tip before use.
(b) Slide the armrest panel base upper forward to remove it, then disconnect the connectors.



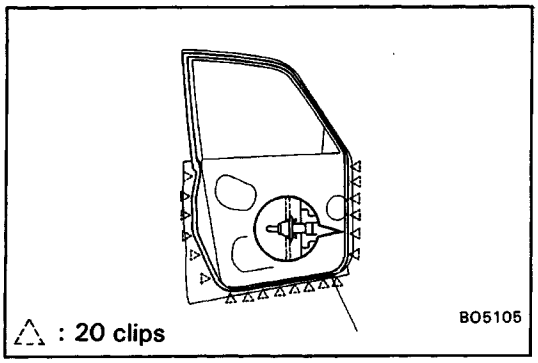
6. REMOVE DOOR TRIM

(a) Remove three screws from the inside door panel.
(b) Insert a screwdriver between the retainers and the door trim to pry it loose.
HINT: Tape the screwdriver tip before use.
(c) Remove the door trim.
(d) (w/o Power Window)
Remove three screws and the armrest base from the door trim.
(w/ Power Window)
Remove eleven screws and the armrest base from the door trim.
(e) Remove the inner weatherstrip from the door trim.
(f) Remove eight screws and the door pocket from the door trim.



7. REMOVE DOOR BELT MOULDING

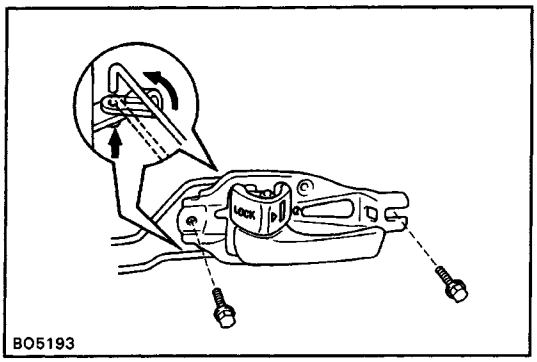
Pry out the clips from the edge of the panel, and remove the moulding.



8. REMOVE DOOR WEATHERSTRIP

While pulling the weatherstrip by hand, remove twenty clips using a clip remover.

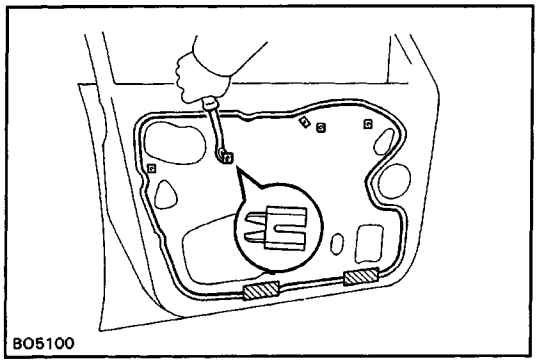
HINT: Do not pull strongly on the weatherstrip as it may tear.



9. REMOVE DOOR INSIDE HANDLE

(a) Remove two bolts.

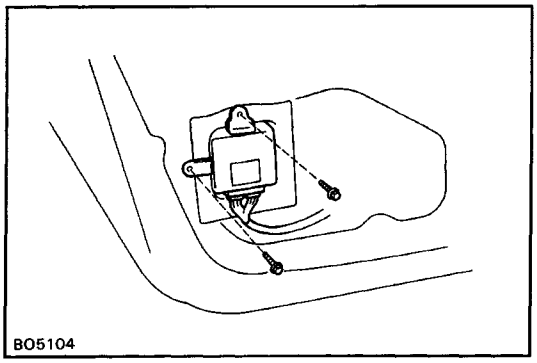
(b) Disconnect two links from the inside handle.



10. REMOVE SERVICE HOLE COVER

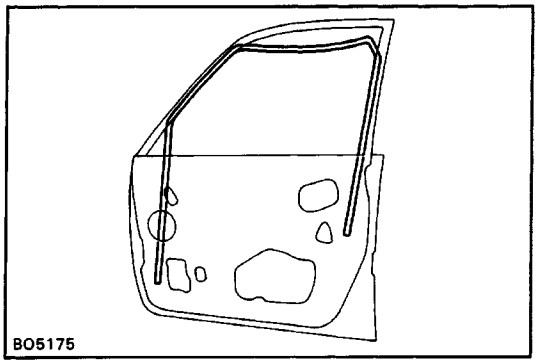
(a) Using the clip remover, remove five screw grom–mets.

(b) Remove service hole cover.



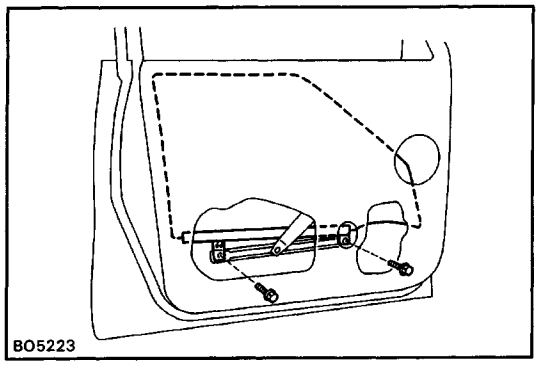
11. (w/ Power Door Lock)
REMOVE DOOR LOCK CONTROL RELAY

Remove two bolts and the relay, then disconnect the connector.



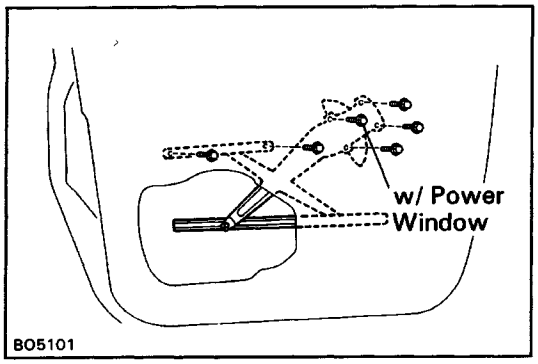
12. REMOVE DOOR GLASS RUN

Pull out the glass run from the door frame.



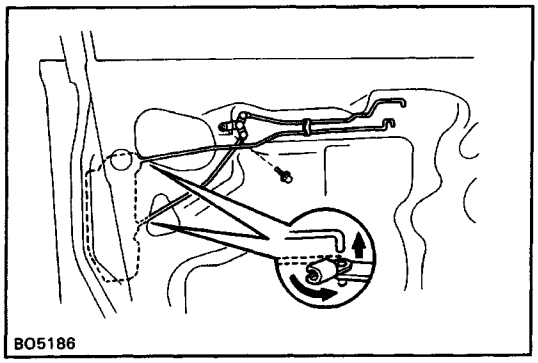
13. REMOVE DOOR GLASS

(a) Remove two glass mounting bolts.
(b) Remove the door glass by pulling it up ward.



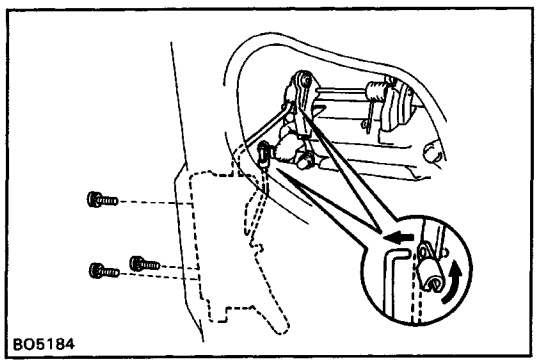
14. REMOVE WINDOW REGULATOR

(a) (w/ Power Window)
Disconnect the connector.
(b) Remove two equalizer arm bracket mounting bolts.
(c) (w/ Power Window)
Remove four regulator mounting bolts.
(w/o Power Window)
Remove three regulator mounting bolts.
(d) Remove the regulator through the service hole.



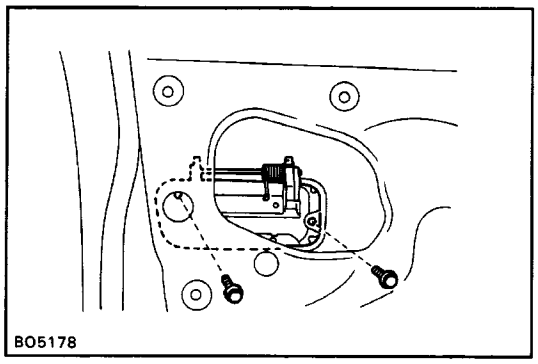
15. REMOVE LOCKING AND OPENING CONTROL LINK

(a) Remove a bolt and the locking link.
(b) Disconnect two links from the door lock.



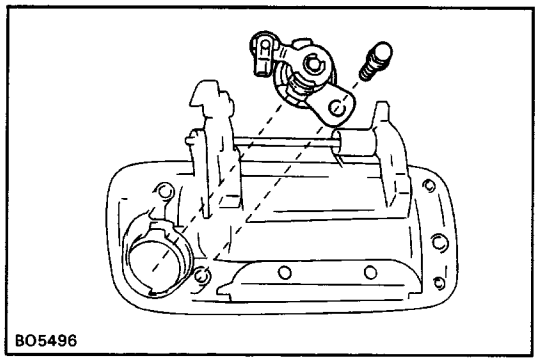
16. REMOVE DOOR LOCK

(a) Disconnect two links from outside handle and the door lock cylinder.
(b) (w/ Power Door Lock)
Disconnect the connector.
(c) Remove three screws.
(d) Remove the door lock through the service hole.



17. REMOVE OUTSIDE HANDLE WITH DOOR LOCK CYLINDER

Remove two bolts and the outside handle with the lock cylinder.



18. REMOVE DOOR LOCK CYLINDER

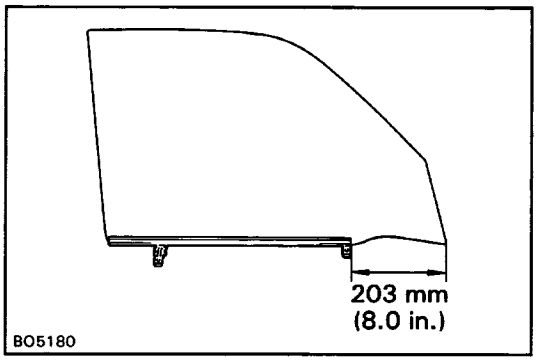
(a) Remove the bolt from the outside handle.

(b) Turn the lock cylinder clock wise until it stops turning, then pull the lock cylinder straight out.

19. (w/ Speaker)

REMOVE SPEAKER

Remove three screws and the speaker, then disconnect the connector.

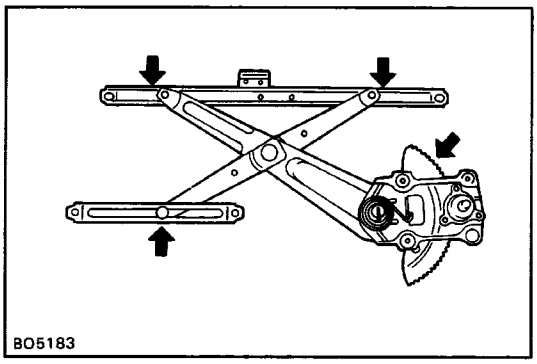


REPLACEMENT OF GLASS

1. REMOVE GLASS CHANNEL WITH SCREWDRIVER OR LIKE OBJECT

2. APPLY SOAPY WATER TO INSIDE OF WEATHERSTRIP

3. INSTALL CHANNEL BY TAPPING IT WITH PLASTIC HAMMER



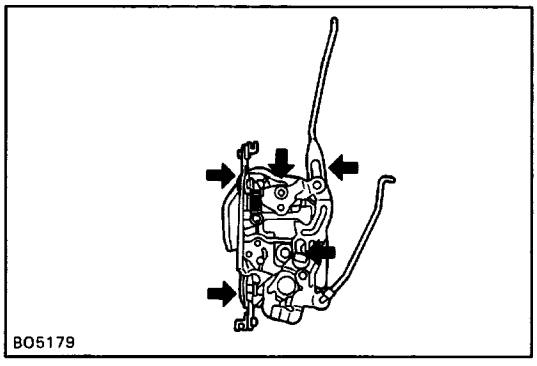
ASSEMBLY OF FRONT DOOR

(See page BO–7)

1. BEFORE INSTALLING PARTS, COAT THEM WITH MP GREASE

(a) Apply MP grease to the sliding surface and gears of the window regulator.

NOTICE: Do not apply MP grease to the spring of the window regulator.

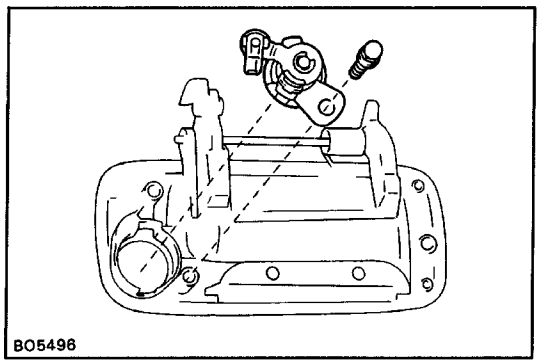


(b) Apply MP grease to the sliding surface of the door lock.

2. (w/ Speaker)

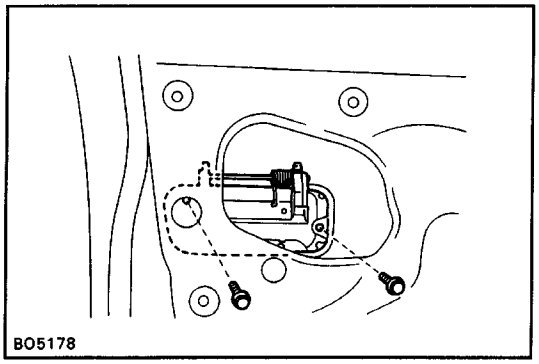
INSTALL SPEAKER

Connect the connector and install speaker with three screws.



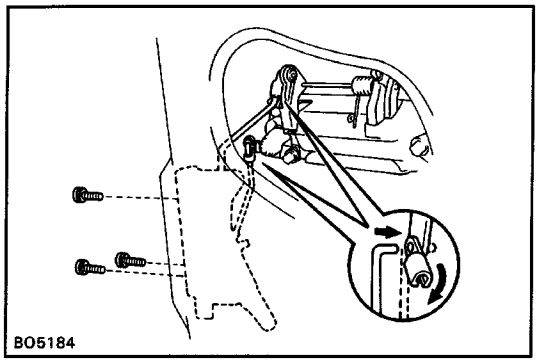
3. INSTALL DOOR LOCK CYLINDER

Install the lock cylinder to the outside handle, turn the lock cylinder anti–clockwise until it stops with the bolt.



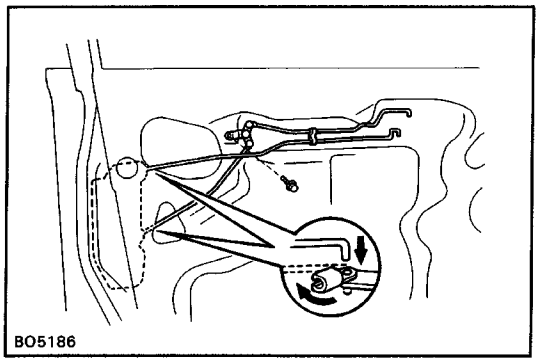
4. INSTALL OUTSIDE HANDLE WITH DOOR LOCK CYLINDER

Install the outside handle with door lock cylinder with two bolts.



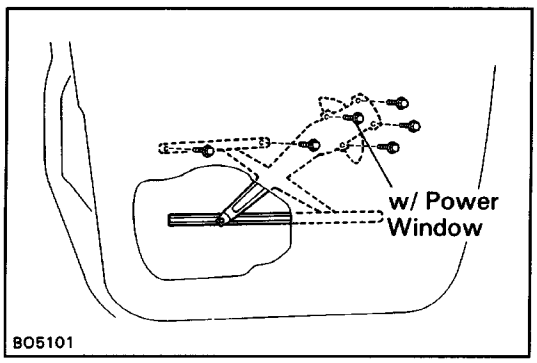
5. INSTALL DOOR LOCK

(a) Install the door lock with three screws.
(b) (w/ Power Door Lock)
Connect the connector.
(c) Connect two links to the outside handle and the door lock cylinder.



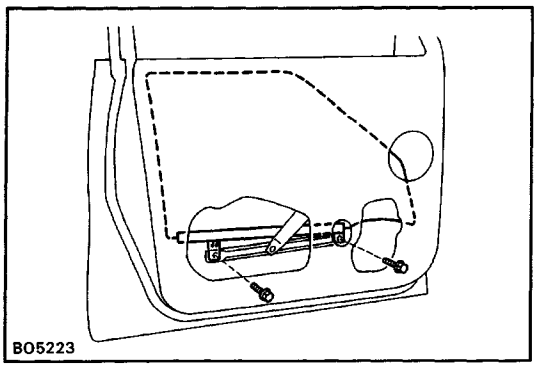
6. INSTALL LOCKING AND OPENING CONTROL LINK

(a) Connect two links to the door lock.
(b) Install the locking link with the bolt.



7. INSTALL WINDOW REGULATOR

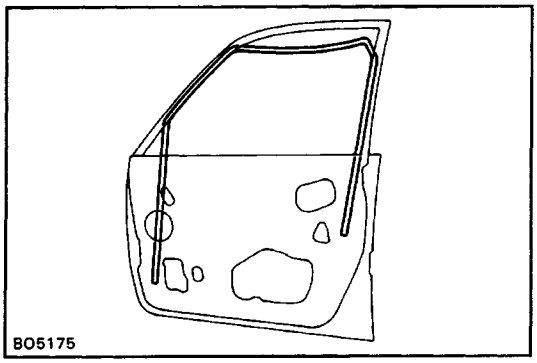
(a) Place the regulator through the service hole.
(b) (w/ Power Window)
Install four regulator mounting bolts.
(w/o Power Window)
Install three regulator mounting bolts.
(c) Temporarily tighten two equalizer arm bracket bolts.
(d) (w/ Power Window)
Connect the connector.



8. INSTALL DOOR GLASS

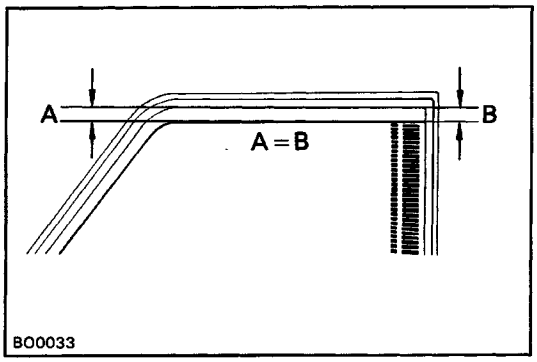
(a) Insert the glass to the glass guides.

(b) Install the glass to the regulator with two mounting bolts.



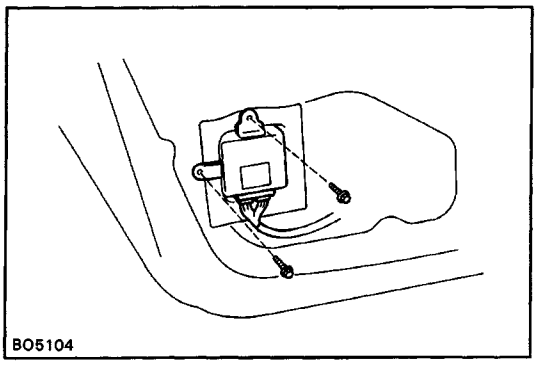
9. INSTALL DOOR GLASS RUN

Install the glass run to the door frame.



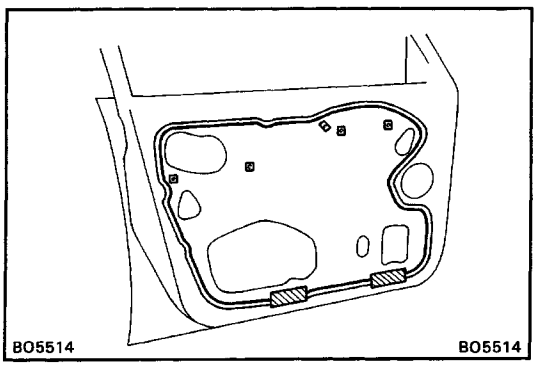
10. ADJUST DOOR GLASS

Adjust the equalizer arm up to down and tighten if where dimensions A and B, as shown are equal.



11. (w/ Power Door Lock)
INSTALL DOOR LOCK CONTROL RELAY

Install the relay with two bolts, then connect the connec–tor.



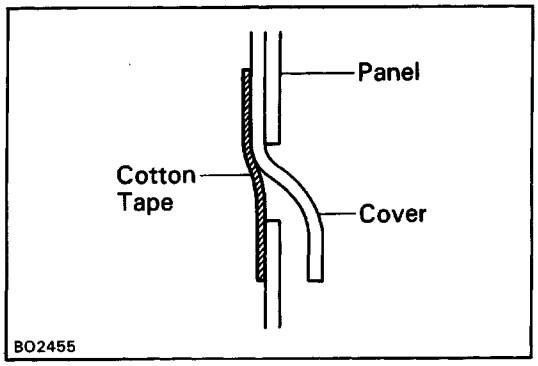
12. INSTALL SERVICE HOLE COVER

(a) Seal the service hole cover with adhesive.

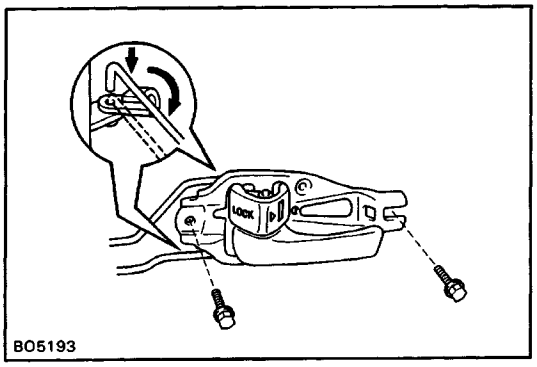
HINT: Bring out the link through the service hole cover.

(b) Insert the lower edge of the cover into the panel slit.

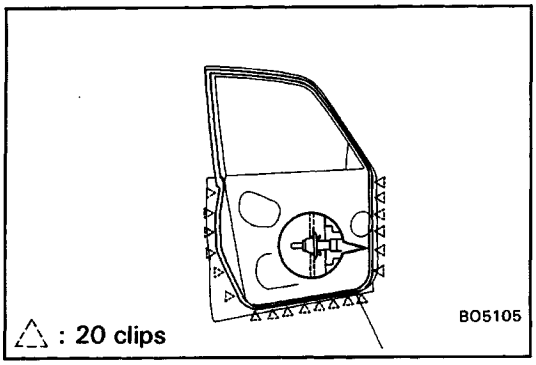
(c) Install five screw grommets.



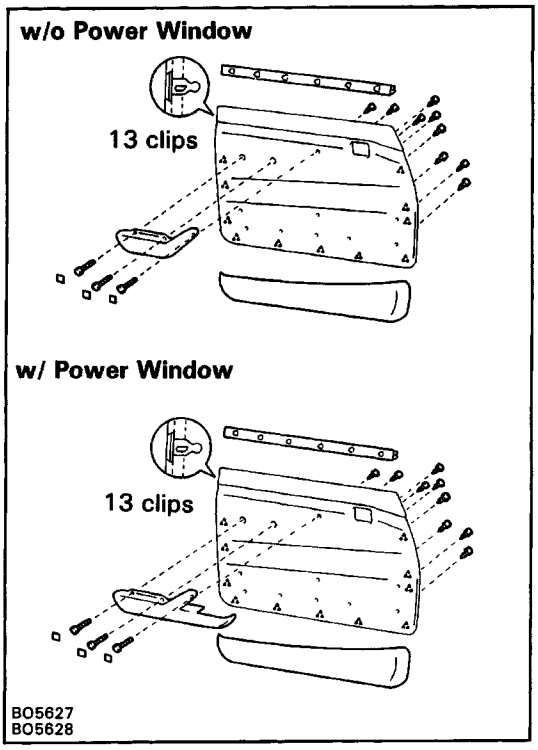
(d) Seal the panel slit with cotton tape.
NOTICE: Do not block the trim clip sealing with the tape.



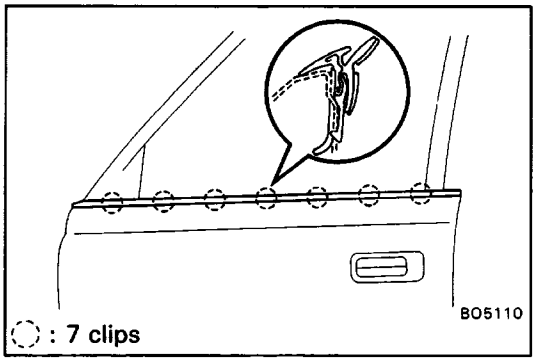
13. INSTALL DOOR INSIDE HANDLE
(a) Connect two links to the inside handle.
(b) Install the inside handle with two bolts.



14. INSTALL DOOR WEATHERSTRIP
Install the weatherstrip with clips to the panel.

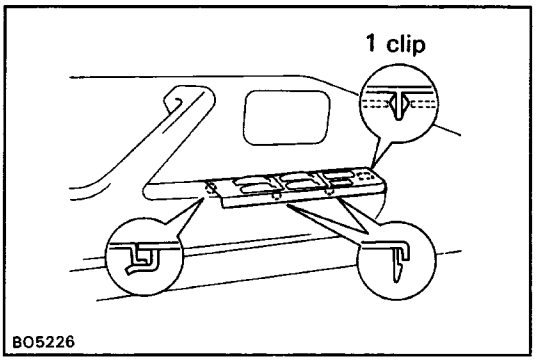


15. INSTALL DOOR TRIM
(a) Install the door pocket with eight screws to the door trim.
(b) Install the inner weatherstrip to the door trim.
(c) (w/o Power Window)
Install the armrest base with three screws to the door trim.
(w/ Power Window)
Install the armrest base with eleven screws to the door trim.
(d) Install the door trim with retainers to the inside door panel by tapping.
(e) Install the armrest with the three screws to the inside door panel.



16. INSTALL DOOR BELT MOULDING

Insert the claw of the clips into the upper panel slit and push the moulding onto the panel.

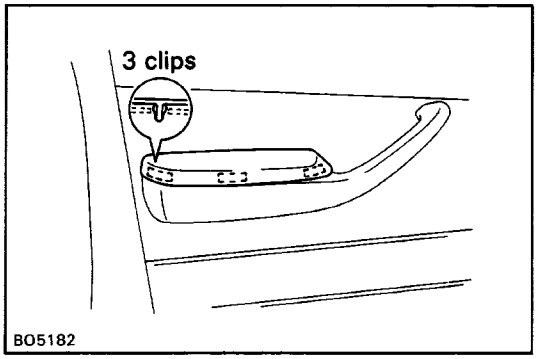


17. (w/ Power Window)

INSTALL ARMREST PANEL BASE UPPER

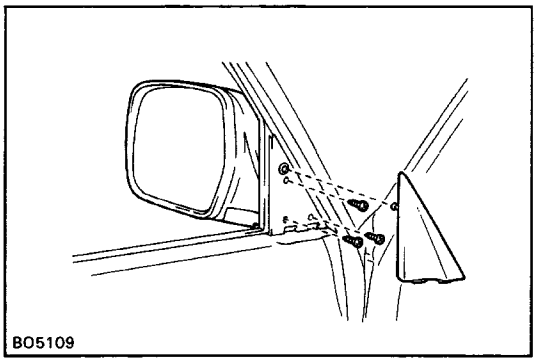
(a) Connect the connector.

(b) Slide the panel rearward and tap the panel to install it.



18. INSTALL ARMREST

Install the armrest to the armrest panel base by tapping.

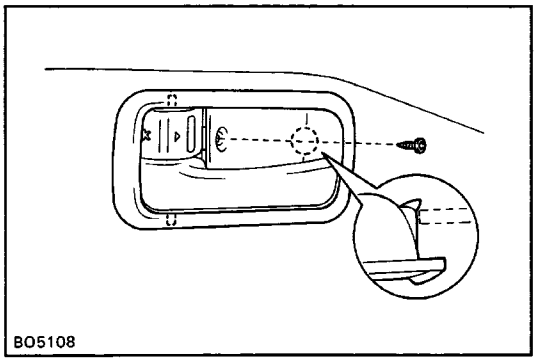


19. INSTALL REAR VIEW MIRROR

(a) Install the rear view mirror with three screws.

(b) (w/ Remote Control Mirror)
Connect the connector.

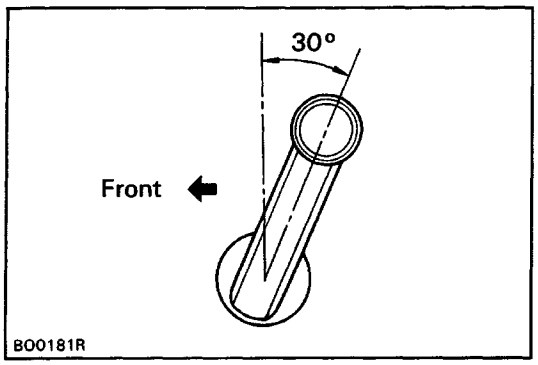
(c) Install the cover.



20. INSTALL DOOR INSIDE HANDLE BEZEL

(a) Push in the bezel to install it.

(b) Install the screw.



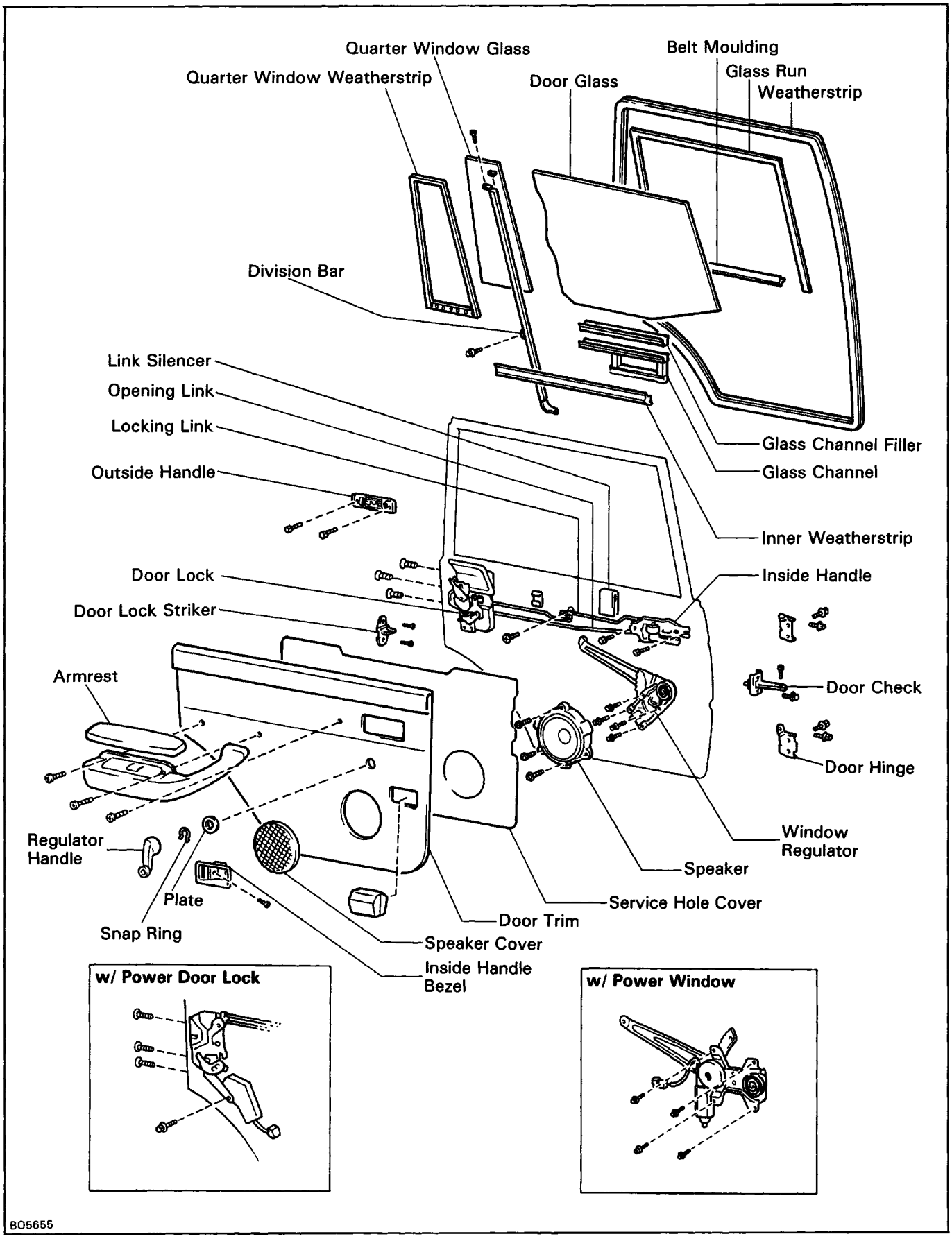
21. (w/o Power Window)

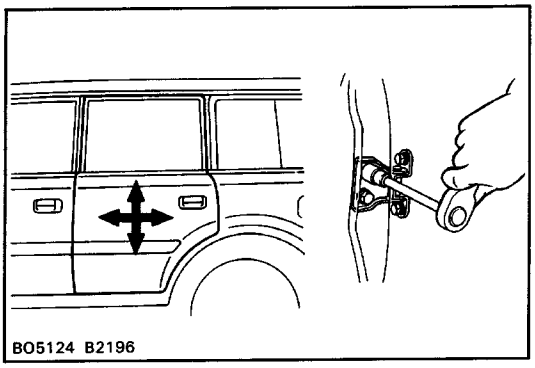
INSTALL REGULATOR HANDLE

With door window fully closed, install the plate and the regulator handle with snap ring as shown.

REAR DOOR

COMPONENT

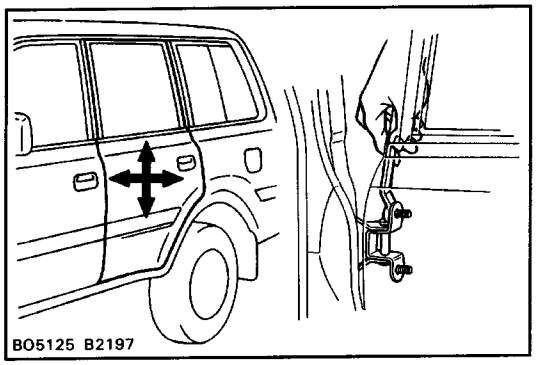




ADJUSTMENT OF REAR DOOR

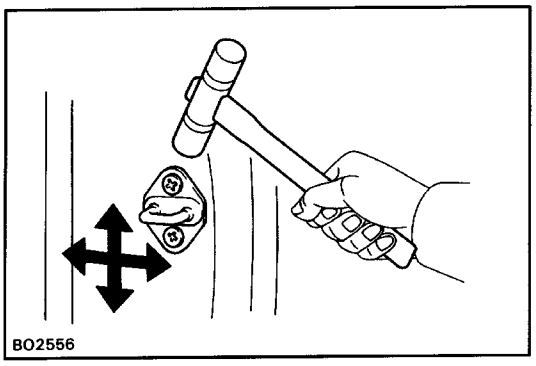
1. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

Adjust the door by loosening the body side hinge bolts.



2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

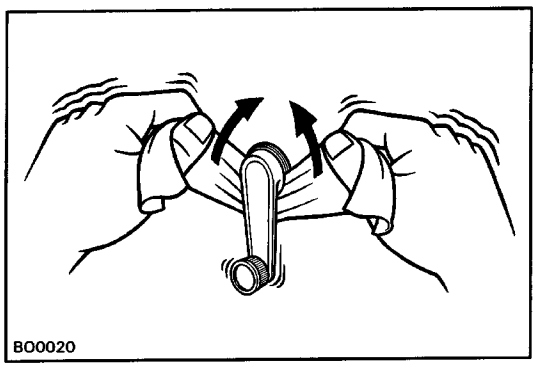
Adjust the door by loosening the door side hinge bolts.



3. ADJUST DOOR LOCK STRIKER

(a) Check that the door fit and door lock linkages are adjusted correctly.

(b) Adjust the striker position by slightly loosening the striker mounting screws, and hitting the striker with a hammer. Tighten the striker mounting screws again.

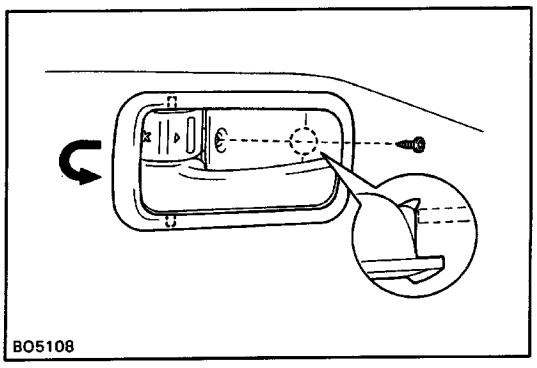


DISASSEMBLY OF REAR DOOR

1. (w/o Power Window)

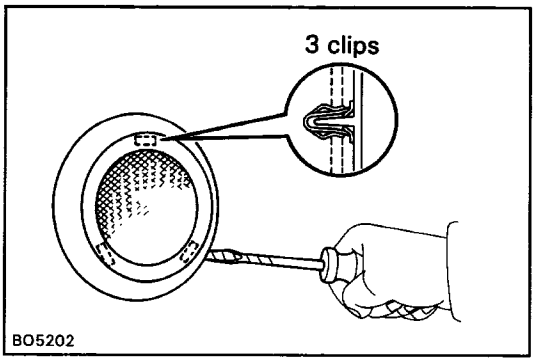
REMOVE REGULATOR HANDLE

Pull off the snap ring with a shop rag and remove the regulator handle and plate.



2. REMOVE DOOR INSIDE HANDLE BEZEL

Remove the screw and pull the inside handle bezel.



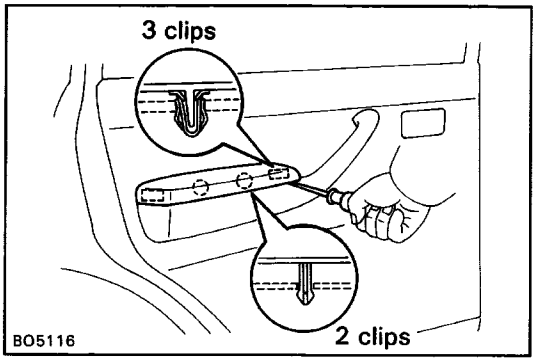
3. (w/ Speaker)

REMOVE SPEAKER COVER

(a) Insert the screwdriver between the door trim and the speaker cover to pry out.

HINT: Tape the screwdriver tip before use.

(b) Remove the speaker cover.

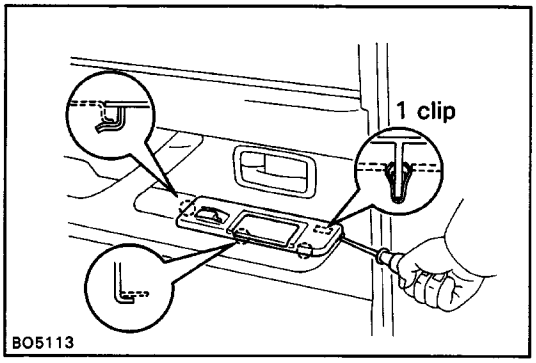


4. REMOVE ARMREST

(a) Insert the screwdriver between the armrest and the armrest panel base to pry out.

HINT: Tape the screwdriver tip before use.

(b) Remove the armrest.



5. (w/ Power Window)

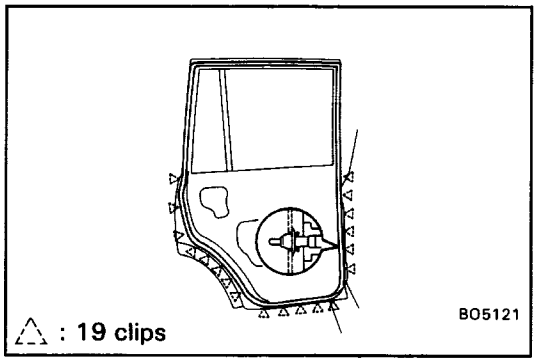
REMOVE ARMREST PANEL BASE UPPER

(a) Remove the ash try.

(b) Insert the screwdriver between the armrest panel base and the armrest panel base upper to pry out.

HINT: Tape the screwdriver tip before use.

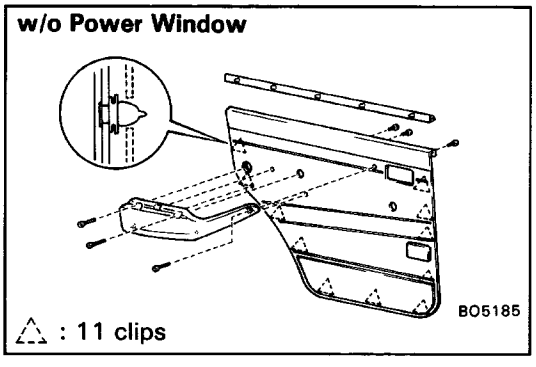
(c) Slide the armrest panel base upper forward to remove it, then disconnect the connector.



6. REMOVE DOOR WEATHERSTRIP

while pulling the weatherstrip by hand, remove nineteen clips using a clip remover.

HINT: Do not pull strongly on the weatherstrip as it may tear.

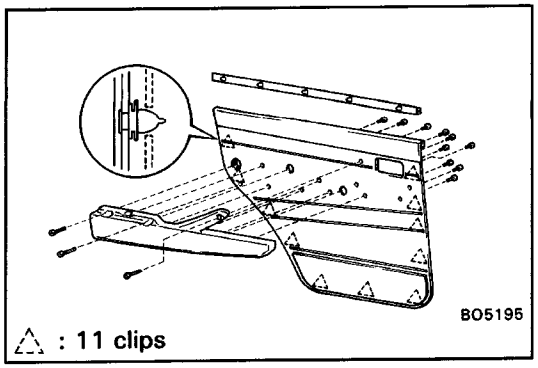


7. REMOVE DOOR TRIM

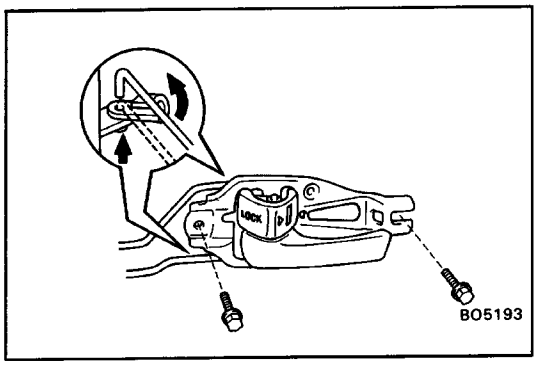
(a) Remove three screws from the inner door panel.

(b) Insert the screwdriver between the trim and the door panel to pry out, and the trim by pull it upward.

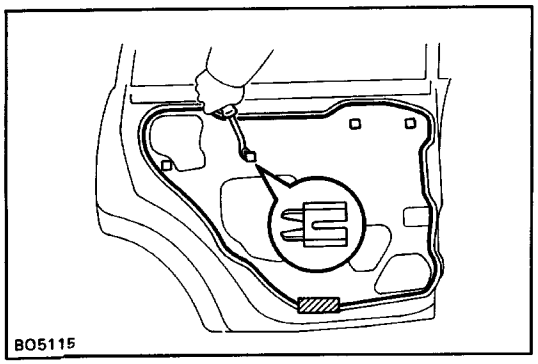
(c) Remove the inner weatherstrip from the door trim.



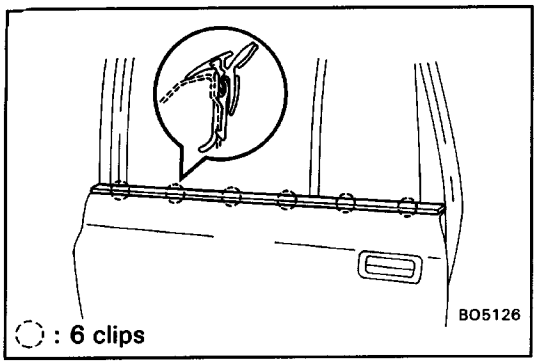
(d) (w/o Power Window)
Remove three screws and the armrest panel base from the door trim.
(w/ Power Window)
Remove eleven screws and the armrest panel base
from the door trim.



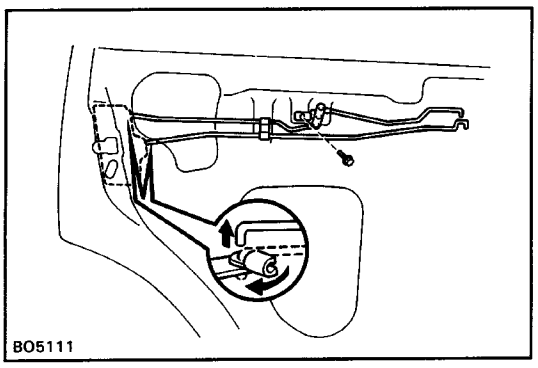
8. REMOVE DOOR INSIDE HANDLE
(a) Remove two bolts.
(b) Disconnect two links from the inside handle.



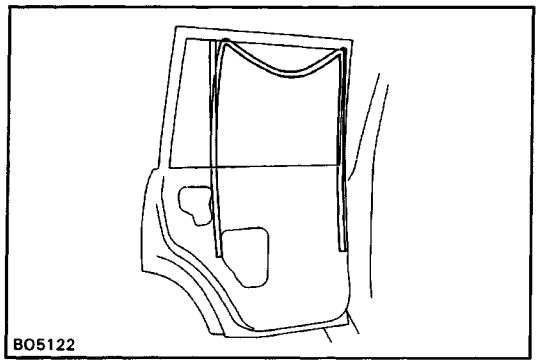
9. REMOVE SERVICE HOLE COVER
(a) Using the clip remover, remove five screw grom–mets.
(b) Remove service hole cover.



10. REMOVE DOOR BELT MOULDING
Pry out the clips from the edge of the panel, and remove the moulding.

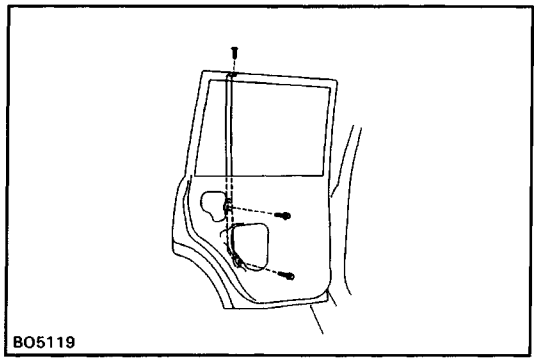


11. REMOVE LOCKING LINK AND DOOR OPENING LINK
Remove the bolt and disconnect two links.



12. REMOVE DOOR GLASS RUN

Pull out the glass run from the door frame.

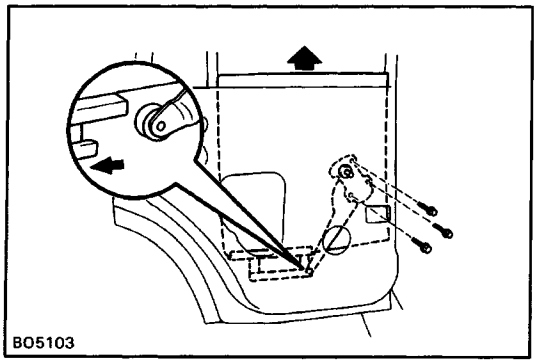


13. REMOVE DEVISION BAR

(a) Remove the screw from the door frame.
(b) Remove two bolts from the door panel.
(c) Pull out the devision bar from the door panel.

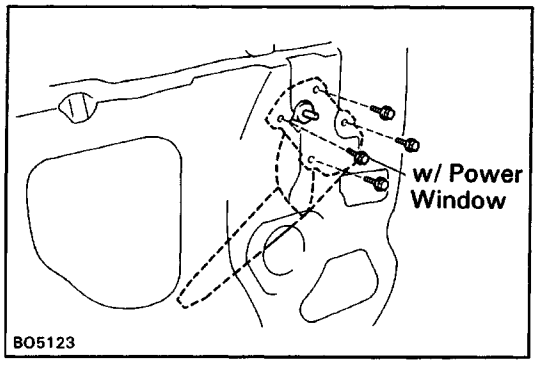
14. REMOVE QUARTER WINDOW GLASS WITH WEATHERSTRIP

Remove the quarter window glass together with the weatherstrip by pulling it forward.



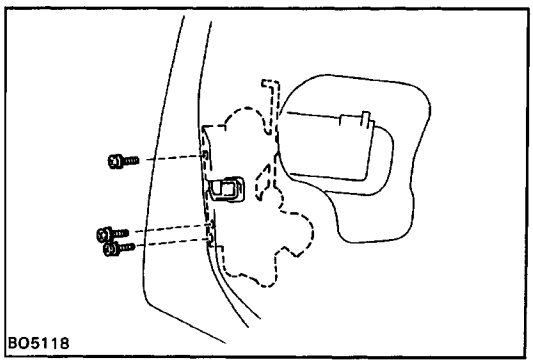
15. REMOVE DOOR GLASS

(a) Remove the glass mounting nuts.
(b) Remove the door glass by pulling it upward.



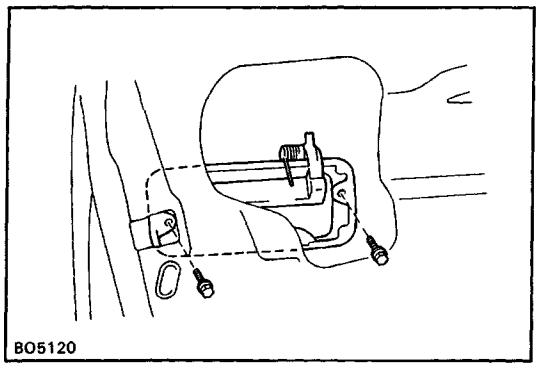
16. REMOVE WINDOW REGULATOR

(a) (w/ Power Window)
Disconnect the connector.
(b) (w/ Power Window)
Remove four regulator mounting bolts.
(w/o Power Window)
Remove three regulator mounting bolts.
(c) Remove the regulator through the service hole.



17. REMOVE DOOR LOCK

(a) Remove the link from outside handle.
(b) (w/ Power Door Lock)
Disconnect the connectors.
(c) Remove three screws and the door lock.



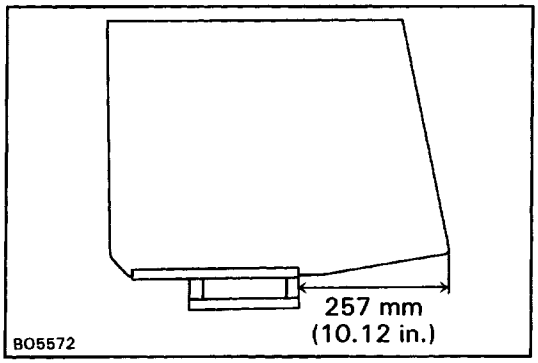
18. REMOVE OUTSIDE HANDLE

Remove two bolts and the outside handle.

19. (w/ Speaker)

REMOVE SPEAKER

Remove three screws and speaker, then disconnect the connector.

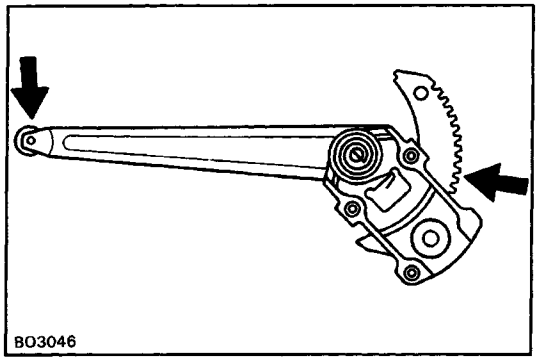


REPLACEMENT OF GLASS

1. REMOVE GLASS CHANNEL WITH SCREWDRIVER OR LIKE OBJECT

2. APPLY SOAPY WATER TO INSIDE OF WEATHERSTRIP

3. INSTALL CHANNEL BY TAPPING IT WITH PLASTIC HAMMER



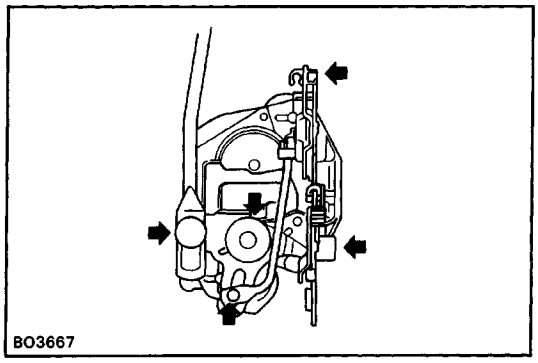
ASSEMBLY OF REAR DOOR

(See page BO–18)

1. BEFORE INSTALLING PARTS COAT THEM WITH MP GREASE

(a) Apply MP grease to the sliding surface and gears of the window regulator.

NOTICE: Do not apply MP grease to the spring of the window regulator.

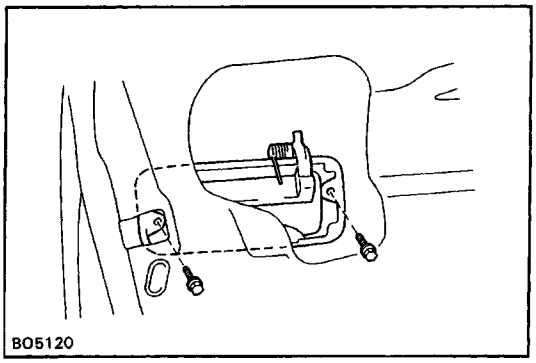


(b) Apply MP grease to the sliding surface of the door lock.

2. (w/ Speaker)

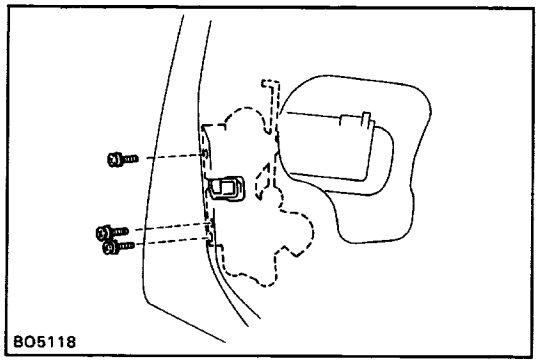
INSTALL SPEAKER

Connect the connector and install speaker with three screws.



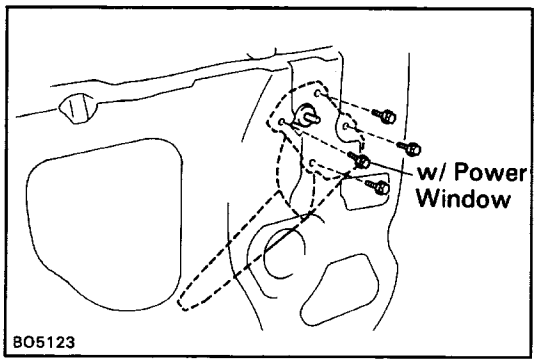
3. INSTALL OUTSIDE HANDLE

Install outside handle with two bolts.



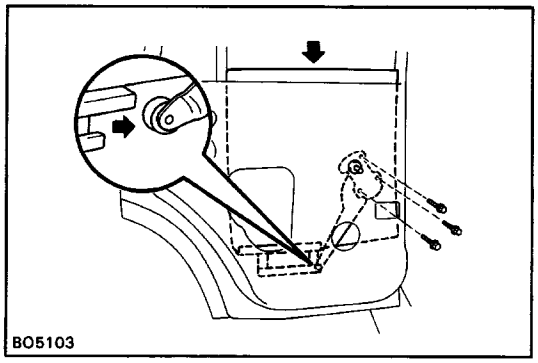
4. INSTALL DOOR LOCK

(a) Install the door lock with three screws.
(b) (w/ Power Door Lock)
Connect the connector.
(c) Connect the link to the outside handle.



5. INSTALL WINDOW REGULATOR

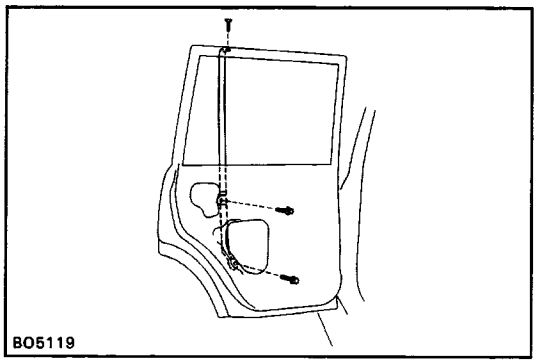
(a) Place the regulator through the service hole.
(b) (w/ Power Window)
Install four regulator mounting bolts.
(w/o Power Window)
Install three regulator mounting bolts.
(c) (w/ Power Window)
Connect the connector.



6. INSTALL DOOR GLASS

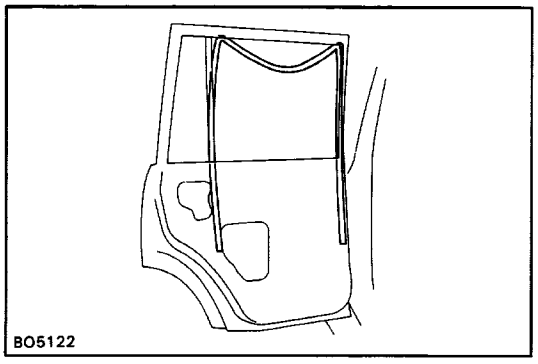
(a) Place the glass in the door cavity.
(b) Attach the glass to the window regulator arm.

7. INSTALL QUARTER WINDOW GLASS WITH WEATHERSTRIP



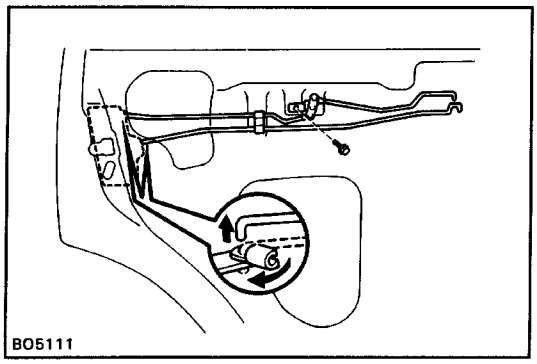
8. INSTALL DEVISION BAR

Install devision bar with the screw and two bolts.



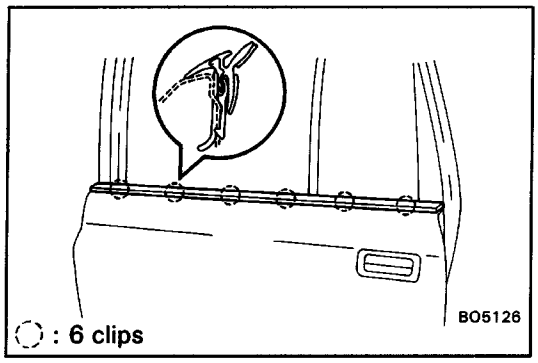
9. INSTALL DOOR GLASS RUN

Install the glass run to the door frame.



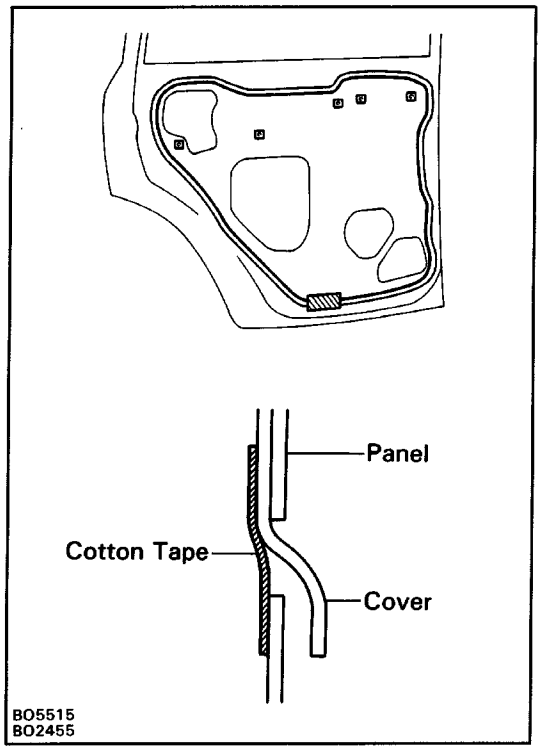
10. INSTALL LOCKING LINK AND DOOR OPENING LINK

Connect two links and install the bolt.



11. INSTALL DOOR BELT MOULDING

Insert the claw of the clips into the upper panel slit and push the moulding onto the panel.



12. INSTALL SERVICE HOLE COVER

(a) Seal the service hole cover with adhesive.

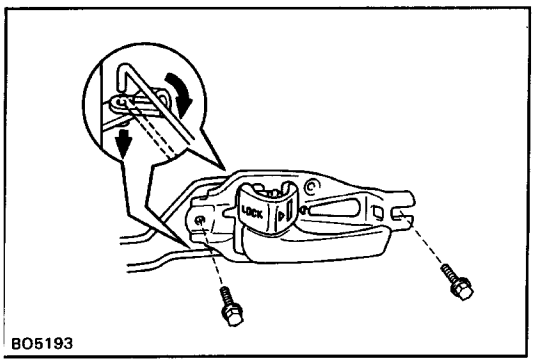
HINT: Bring out the link through the service hole cover.

(b) Insert the lower edge of the service hole cover into the panel slit.

(c) Install five screw grommets.

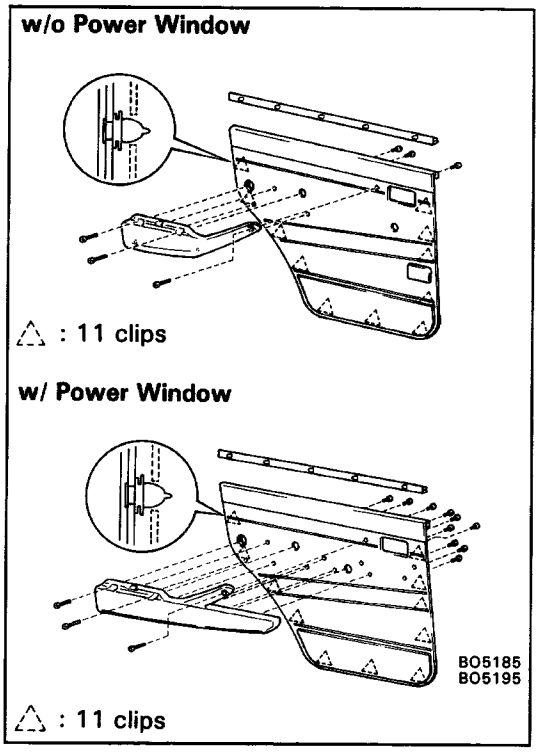
(d) Seal the panel slit with the cotton tape.

NOTICE: Do not block the trim clip sealing with the tape.



13. INSTALL DOOR INSIDE HANDLE

Connect two links to the inside handle and install two bolts.



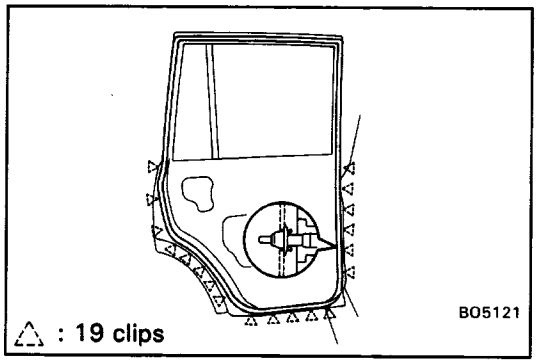
14. INSTALL DOOR TRIM

(a) (w/o Power Window)
Install the armrest panel base with three screws to the door trim.
(w/ Power Window)
Install the armrest panel base with eleven screws to the door trim.

(b) Install the inner weatherstrip to the door trim.

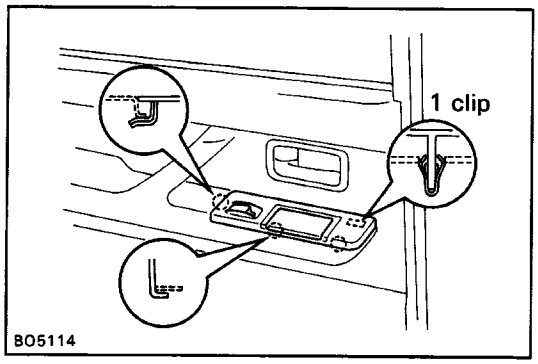
(c) Install the upper edge of the trim from above, tap the trim by hand and fix it in place with the retainers.

(d) Install the armrest with three screws to the door panel.



15. INSTALL DOOR WEATHERSTRIP

Install the weatherstrip with clips to the panel.

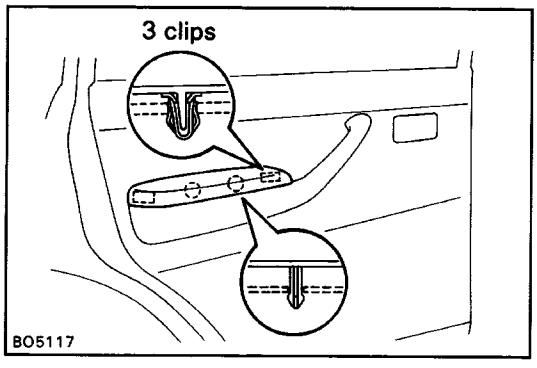


16. (w/ Power Window)
INSTALL ARMREST PANEL BASE UPPER

(a) Connect the connector.

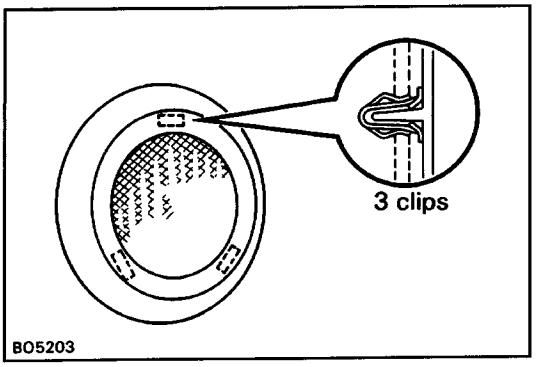
(b) Slide the armrest panel base upper rearward and tap the panel to install it.

(c) Install the ash tray.



17. INSTALL ARMREST

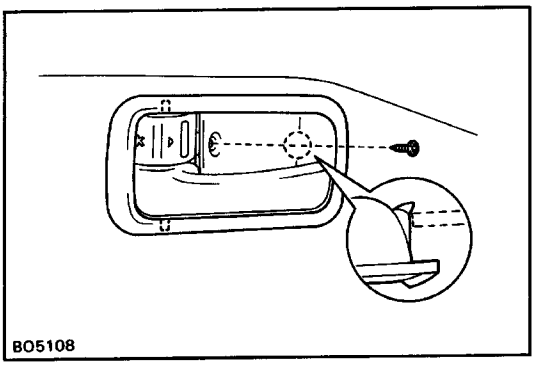
Install the armrest to the armrest panel base by tapping.



18. (w/ Speaker)

INSTALL SPEAKER COVER

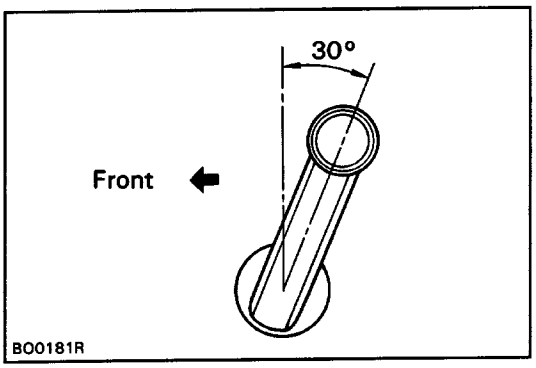
Install the speaker cover to the door panel.



19. INSTALL DOOR INSIDE HANDLE BEZEL

(a) Push in the bezel to install it.

(b) Install the screw.



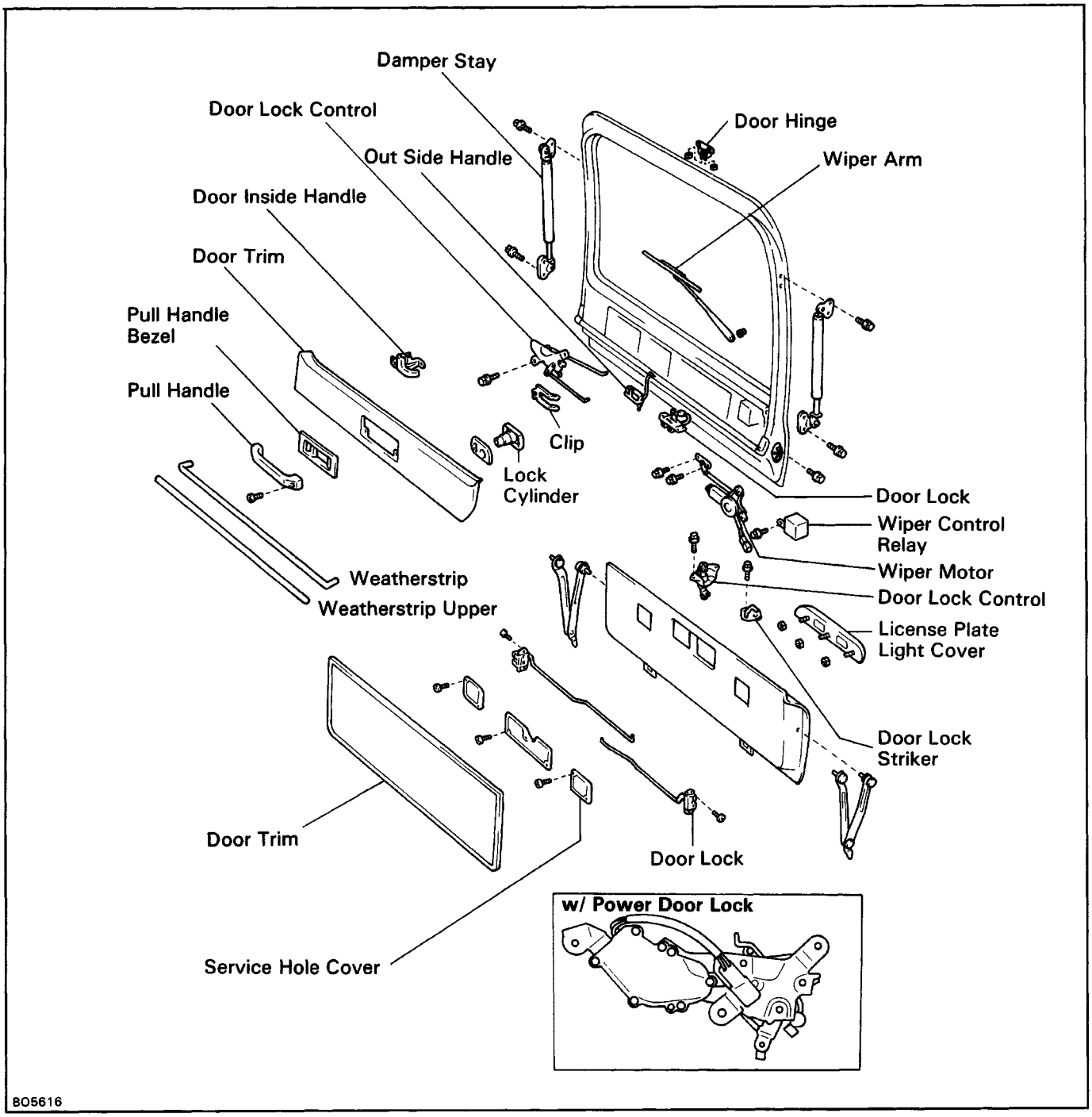
20. (w/o Power Window)

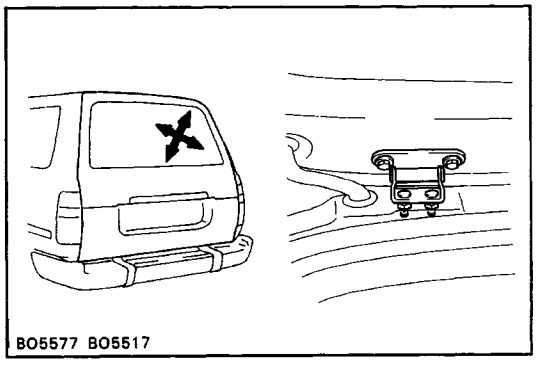
INSTALL REGULATOR HANDLE

With door window fully closed, install the plate and reg–ulator handle with the snap ring as shown.

BACK DOOR

COMPONENTS



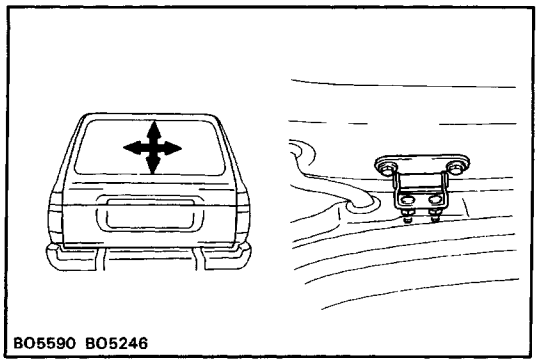


Upper Back Door

ADJUSTMENT OF UPPER BACK DOOR

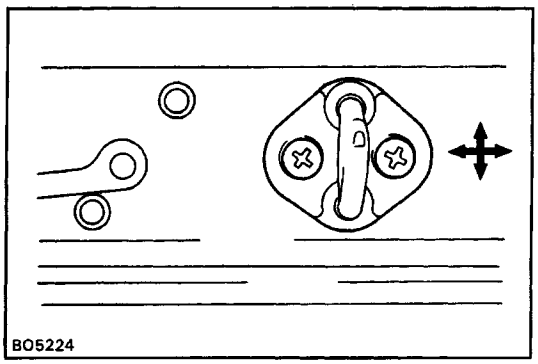
1. ADJUST DOOR IN FORWARD/REARWARD AND LEFT/RIGHT DIRECTIONS

Adjust the door by loosening the door side hinge bolts.



2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

Adjust the door by loosening the body side hinge bolts.



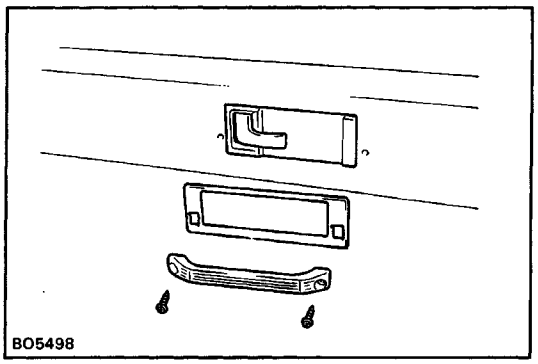
3. ADJUST DOOR LOCK STRIKER

(a) Check that the door fit and door lock linkages are adjusted correctly.

(b) Adjust the striker position by slightly loosening the striker mounting screws, and hitting the striker with a hammer. Tighten the striker mounting screw again.

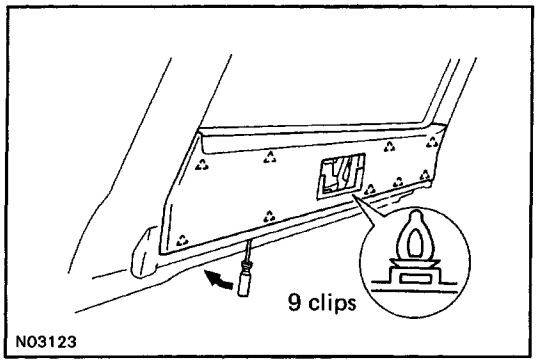
DISASSEMBLY OF UPPER BACK DOOR

(See page BO–28)



1. REMOVE PULL HANDLE AND PULL HANDLE BEZEL

Remove two screws and pull handle, then remove the bezel.

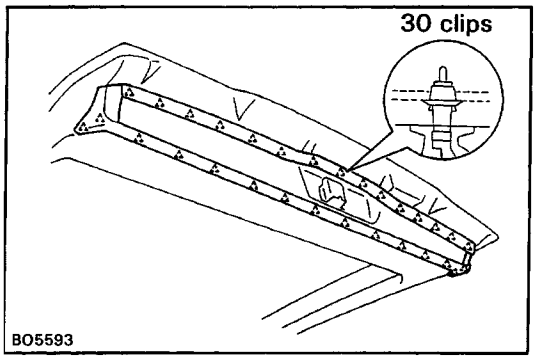


2: REMOVE DOOR TRIM

(a) Insert a screwdriver, between the retainers and the door trim to pry it loose.

HINT: Tape the screwdriver tip before use.

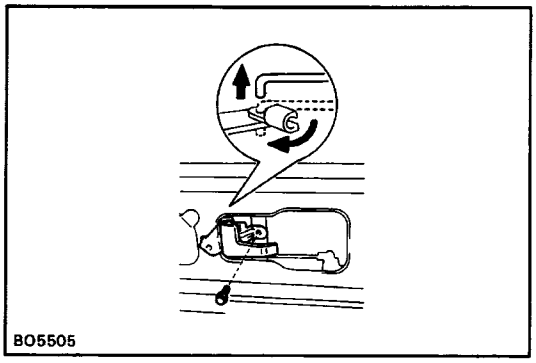
(b) Remove the door trim.



3. REMOVE DOOR WEATHERSTRIP AND WEATHERSTRIP UPPER

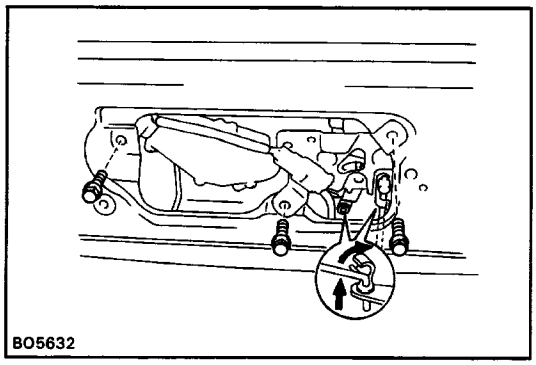
While pulling the weatherstrips by hand, remove the clips using the clip remover.

HINT: Do not pull strongly on the weatherstrips as it may tear.



4. REMOVE DOOR INSIDE HANDLE

Remove a bolt and the handle, then disconnect the link.



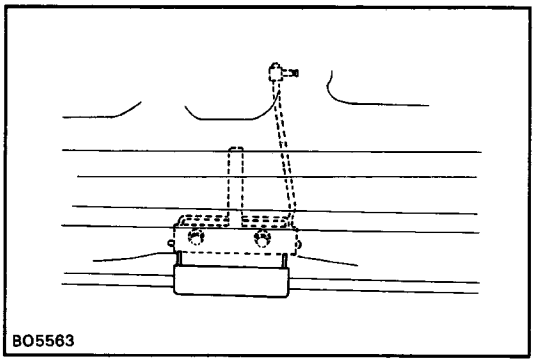
5. REMOVE DOOR LOCK CONTROL

(w/o Power Door Lock)

Remove two bolts and the lock control, then disconnect two links.

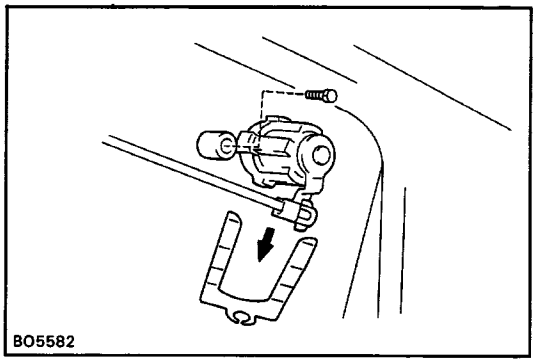
(w/ Power Door Lock)

Remove three bolts and the lock control, then disconnect two links and the connector.



6. REMOVE OUTSIDE HANDLE

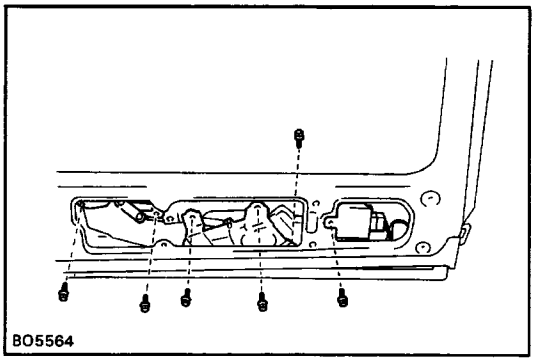
Remove two bolts and the outside handle.



7. REMOVE DOOR LOCK CYLINDER

(a) Disconnect the link from the cylinder.

(b) Remove retainer from the cylinder.



8. (w/ Rear Wiper)

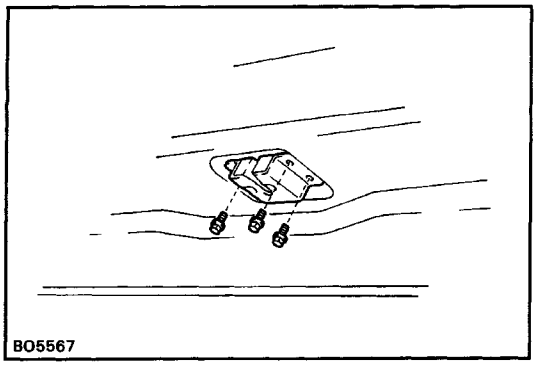
REMOVE WIPER ARM, MOTOR AND REAR WIPER CONTROL RELAY

(a) Open the cap.

(b) Remove the nut and the wiper arm.

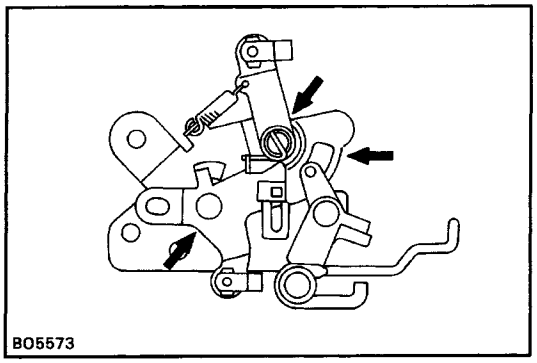
(c) Remove five bolts and the motor, then disconnect the connector.

(d) Remove the bolts and the rear wiper control relay, then disconnect the connector.



9. REMOVE DOOR LOCK

Remove three bolts and the door lock, then disconnect the connector.

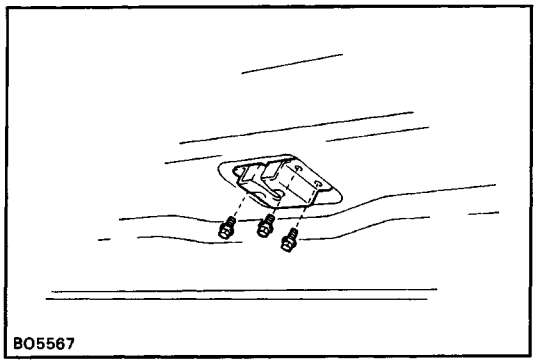


ASSEMBLY OF UPPER BACK DOOR

(See page BO–29)

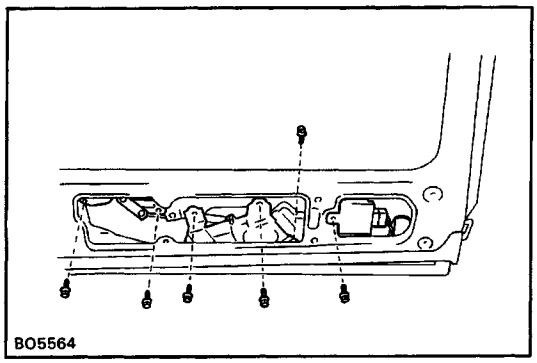
1. APPLY MP GREASE TO LOCK CONTROL

Apply IMP grease to the sliding surface of the lock control.



2. INSTALL DOOR LOCK

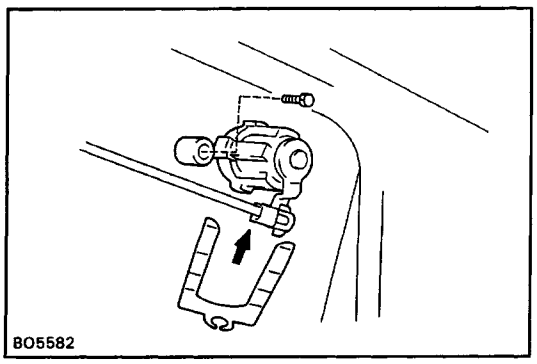
Install the door lock with three bolts, then connect the connector.



3. (w/ Rear Wiper)

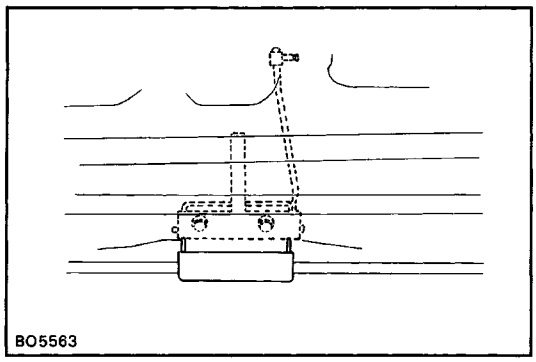
INSTALL WIPER ARM, MOTOR AND REAR WIPER CONTROL RELAY

(a) Connect the connector, then install the rear wiper control relay with the bolt.
(b) Connect the connector.
(c) Install the motor with five bolts.
(d) Install the wiper arm with the nut.



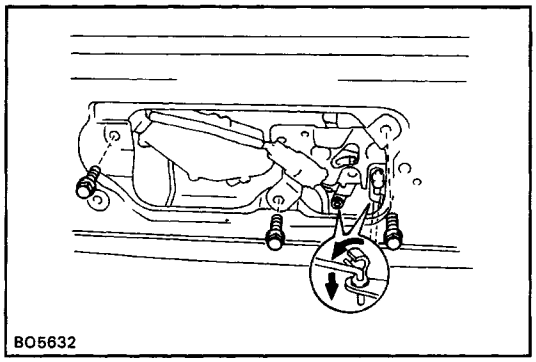
4. INSTALL DOOR LOCK CYLINDER

(a) Install the cylinder with retainer.
(b) Connect the link to the cylinder.



5. INSTALL OUTSIDE HANDLE

Install the outside handle and the handle with two bolts.



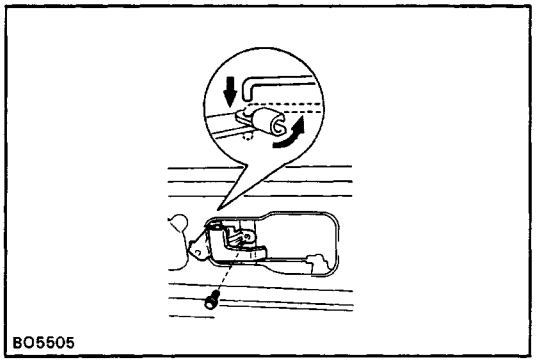
6. INSTALL DOOR LOCK CONTROL

(w/o Power Door Lock)

Install the lock control with two bolts, then connect two links.

(w/ Power Door Lock)

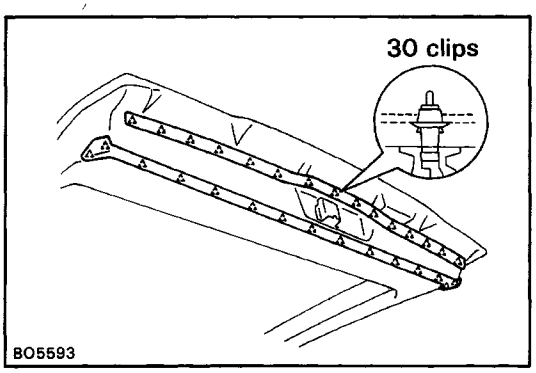
Install the lock control with three bolts, then connect two links and the connector.



7. INSTALL DOOR INSIDE HANDLE

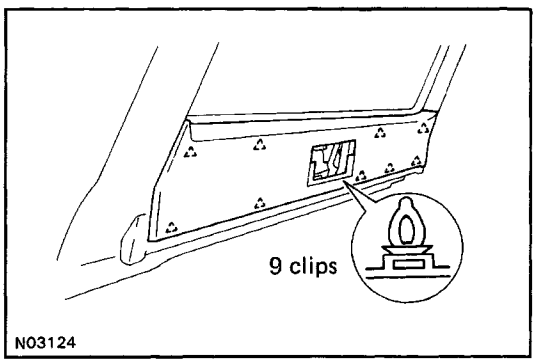
(a) Connect the link.

(b) Install the handle with the bolt.



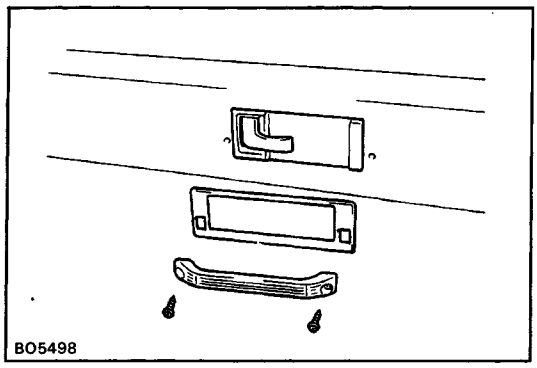
8. INSTALL DOOR WEATHERSTRIP AND WEATHERSTRIP UPPER

Install the weatherstrips with clips to the door.



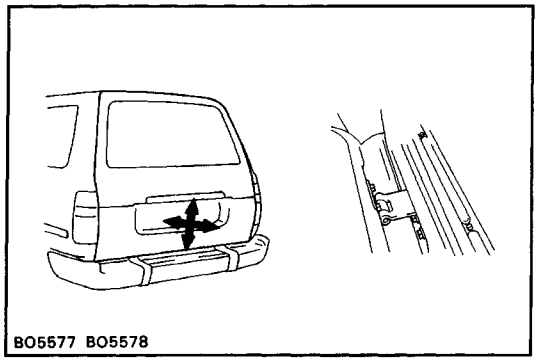
9. INSTALL DOOR TRIM

Install the door trim with retainers to the door panel by tapping.


BO5498

10. INSTALL PULL HANDLE AND PULL HANDLE BEZEL

Install the bezel and the pull handle with two screws.

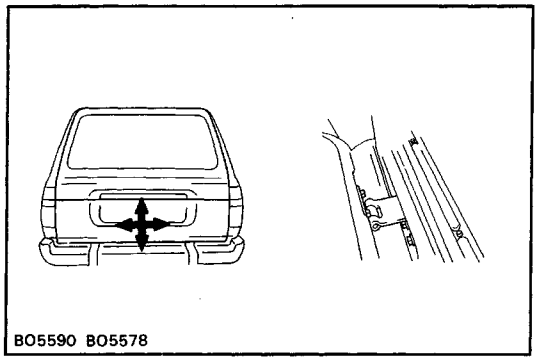

BO5577 BO5578

Lower Back Door

ADJUSTMENT OF LOWER BACK DOOR

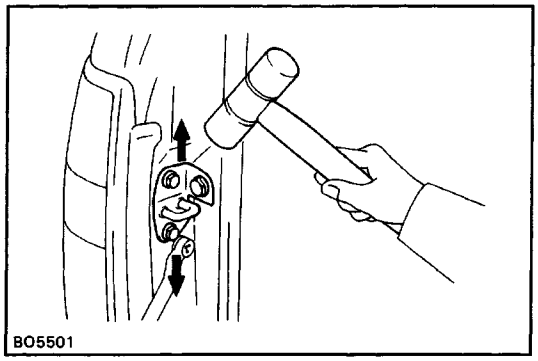
1. ADJUST DOOR IN FORWARD/REARWARD AND LEFT/RIGHT DIRECTIONS

Adjust the door by loosening the door side hinge bolts.


BO5590 BO5578

2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

Adjust the door by loosening the body side hinge bolts.


BO5501

3. ADJUST DOOR LOCK STRIKER

(a) Check that the door fit and door lock linkages are adjusted correctly.

(b) Adjust the striker position by slightly loosening the striker mounting screws, and hitting the striker with a hammer.

(c) Tighten the striker mounting screws again.

DISASSEMBLY OF BACK DOOR

(See page BO–28)

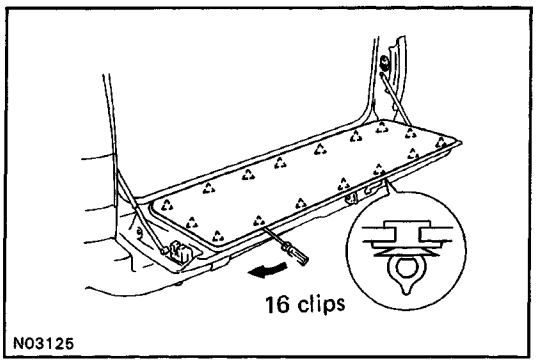
1. REMOVE DOOR TRIM

(a) Insert a screwdriver, between the retainers and the door trim to pry it loose.

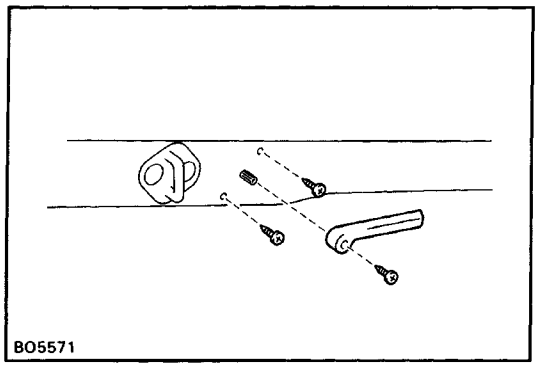
HINT: Tape the screwdriver tip before use.

(b) Remove the door trim.

2. REMOVE SERVICE HOLE COVER

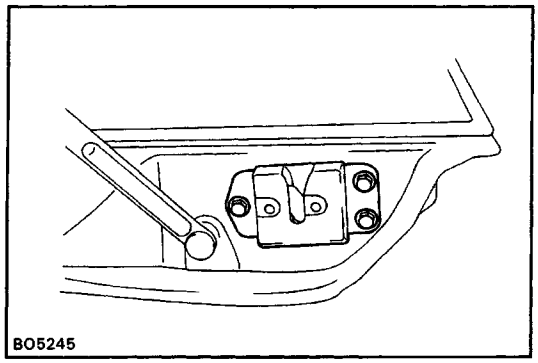


N03125



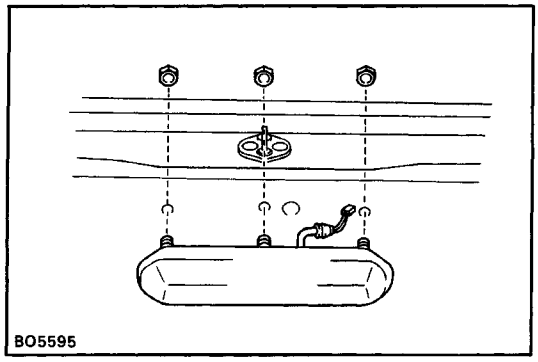
3. REMOVE DOOR LOCK CONTROL

(a) Disconnect two links from the door lock control.
(b) Remove the screw and the inside handle.
(c) Remove two screws, bush and the door lock control.



4. REMOVE DOOR LOCK

Remove three bolts and the door lock.



5. REMOVE LICENSE PLATE LIGHT COVER

Remove three nuts and the light cover, then disconnect the connector.

ASSEMBLY OF LOWER BACK DOOR

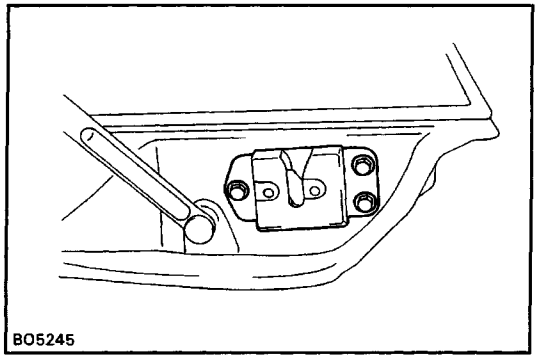
(See page BO–28)

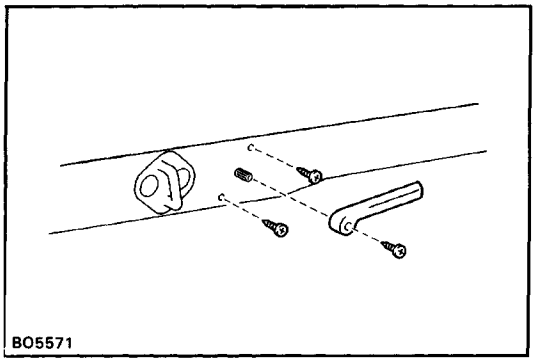
1. INSTALL LICENSE PLATE LIGHT COVER

Connect the connector and install the light cover with three nuts.

2. INSTALL DOOR LOCK

Install the door lock with three bolts.

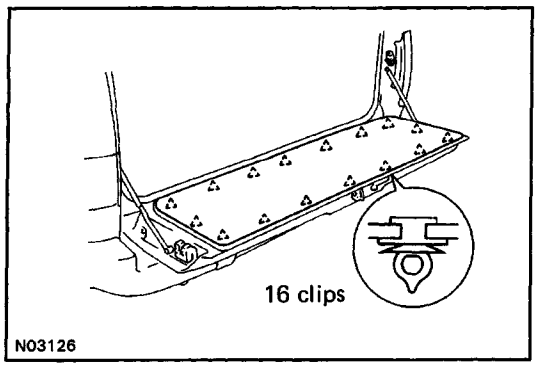




3. INSTALL DOOR LOCK CONTROL

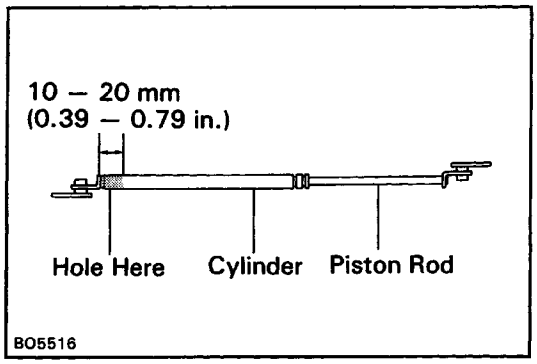
(a) Install the door lock control with two screws.
(b) Install the bush and the inside handle with the screw.
(c) Connect two links to the door lock control.

4. INSTALL SERVICE HOLE COVER



5. INSTALL DOOR TRIM

Install the door trim with clips to the inside door panel by tapping.



Back Door Damper Stay

CAUTION: Handling the damper.

(a) Do not disassemble the damper because the cylinder is filled with pressurized gas.

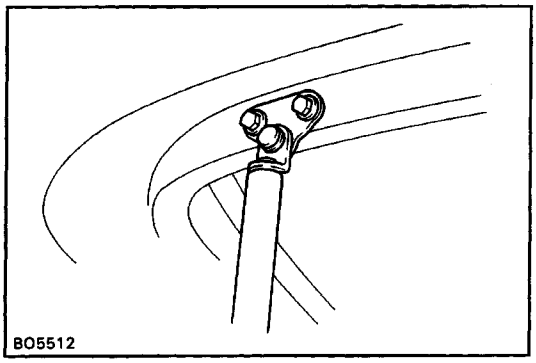
(b) If the damper is to be replaced, drill a 2.0 – 3.0 mm (0.079 – 0.178 in.) hole in the bottom of the re–moved damper cylinder to completely release the high–pressure gas before disposing of it.

(c) When drilling, chips may fly out so work carefully.

(d) The gas is colorless, odorless and non–toxic.

(e) When working, handle the damper carefully. Never score or scratch the exposed part of the piston rod, and never allow paint or oil to get on it.

(f) Do not turn the piston rod and cylinder with the damper fully extended.



REMOVAL OF DAMPER STAY

REMOVE DAMPER STAY

(a) Remove two bolt and the damper stay upper end from back door.

(b) Remove two bolts and the damper stay lower end from body.

INSTALLATION OF DAMPER STAY

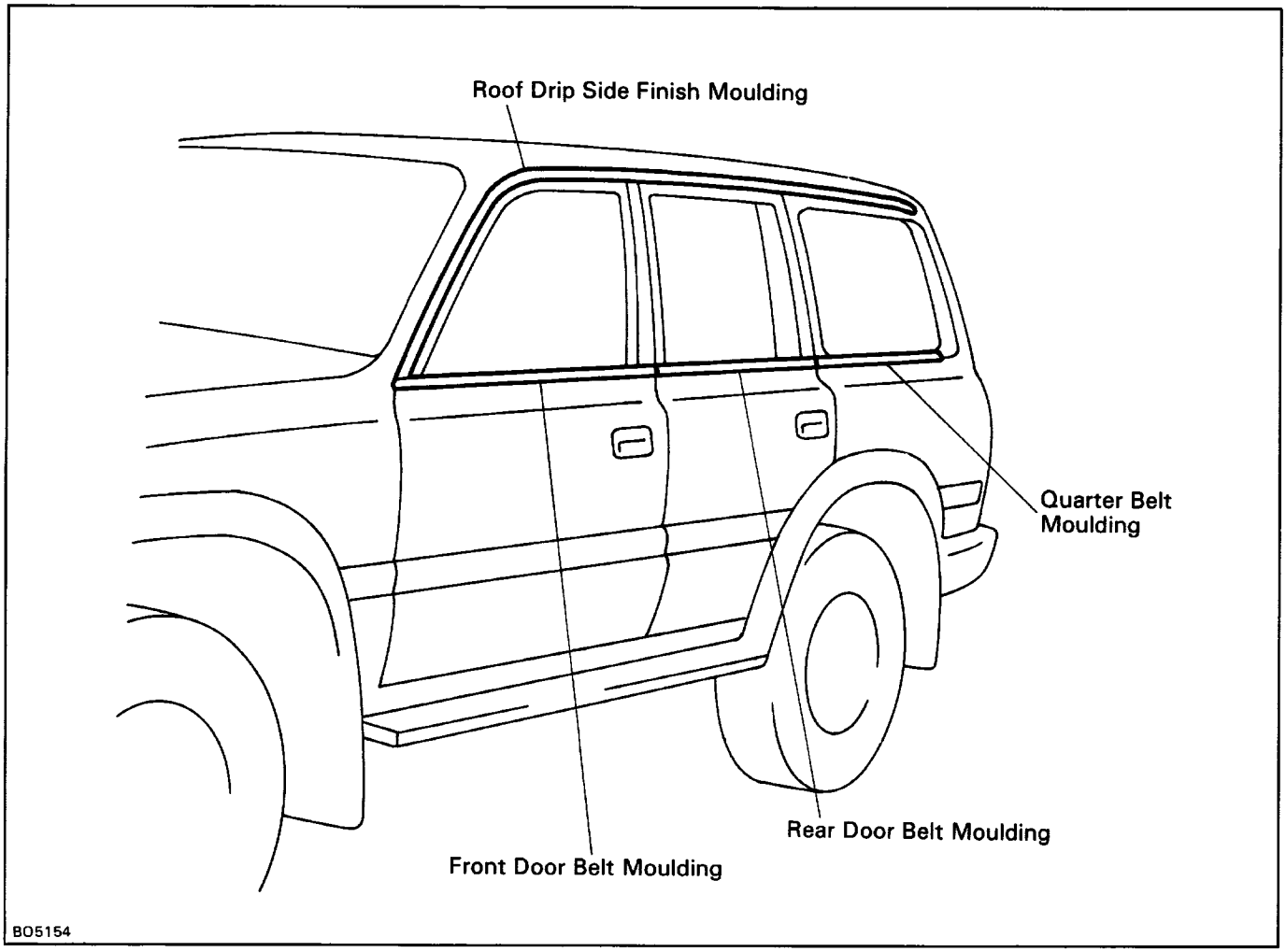
INSTALL DAMPER STAY

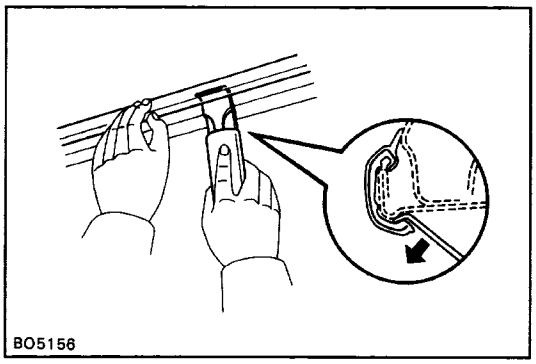
(a) Install damper stay upper end to back door with two bolts.

(b) Install damper stay lower end to body with two bolts.

Body Outside Moulding

COMPONENTS





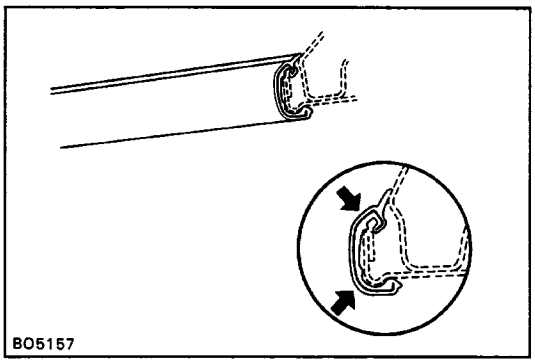
Roof Drip Side Finish Moulding

REMOVAL OF ROOF DRIP SIDE FINISH MOULDING

REMOVE ROOF DRIP MOULDING

Using SST, pull off the roof drip moulding from front ends.

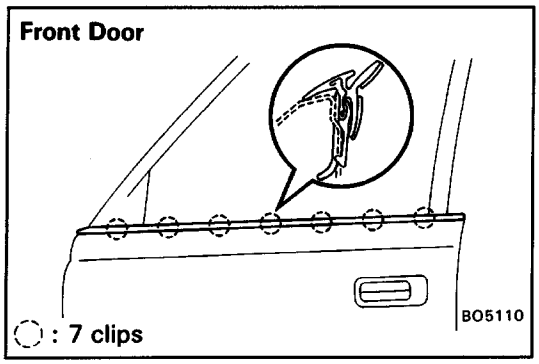
SST 09806–30010



INSTALLATION OF ROOF DRIP SIDE FINISH MOULDING

INSTALL ROOF DRIP MOULDING

Attach the upper edge of the moulding to the body flange. Tap on the moulding by hand.

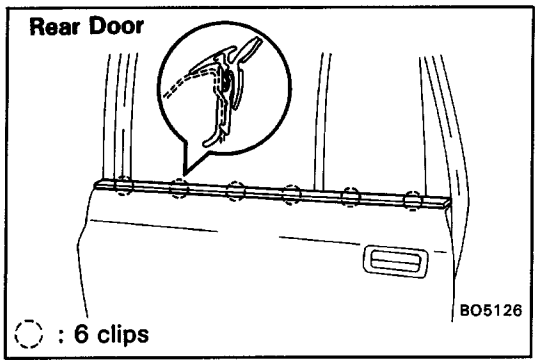


Door Belt Moulding

REMOVAL OF DOOR BELT MOULDING

1. REMOVE FRONT DOOR BELT MOULDING

(See step 7 on page BO–10)



2. REMOVE REAR DOOR BELT MOULDING

(See step 10 on page BO–21)

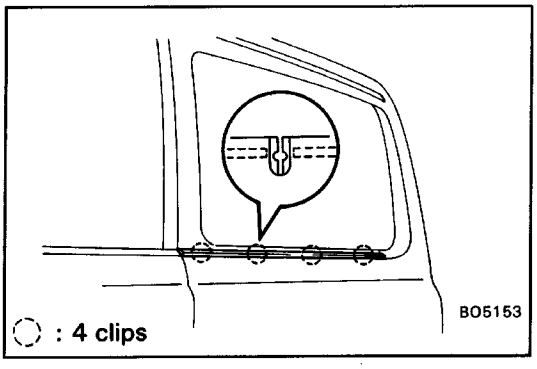
INSTALLATION OF DOOR BELT MOULDING

1. INSTALL FRONT DOOR BELT MOULDING

(See step 16 on page BO–16)

2. INSTALL REAR DOOR BELT MOULDING

(See step 11 on page BO–25)



Quarter Belt Moulding

REMOVAL OF QUARTER BELT MOULDING

REMOVE QUARTER BELT MOULDING

Pry out the clips from the edge of the panel, and remove the moulding.

INSTALLATION OF QUARTER BELT MOULDING

INSTALL QUARTER BELT MOULDING

Insert the claw of the clips into the upper panel slit and push the moulding onto the panel.

Side Protection Moulding

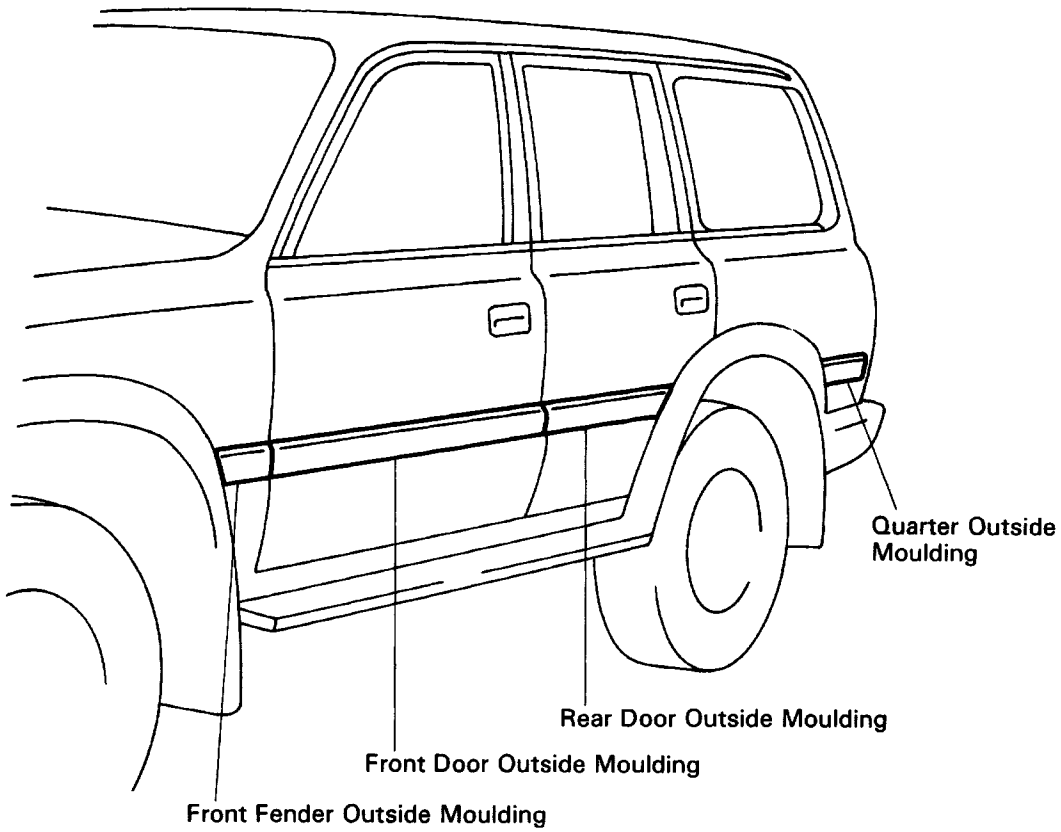
PREPARE ITEMS LISTED

Part No.	Part name	Quantity
08850–00051	Adhesive (Super special) 20 g (0.71 oz.)	1
	Cleaner (for cleaning body and removing body oil stains) Heat light	

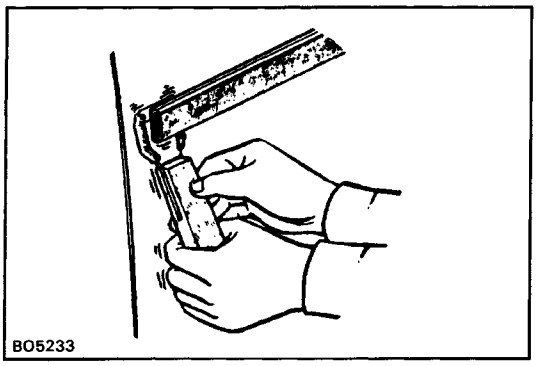
Precautions for storing moulding material:

- Store in cool place, avoiding direct sunlight, high tem–perature and dust.
- The moulding is of polyvinyl chloride, so do not allow it to come in contact with thinner or other solvent, open flame, or boiling water.
- The storage time for the moulding and adhesive are limited to about 9 months.

COMPONENTS



BO5155



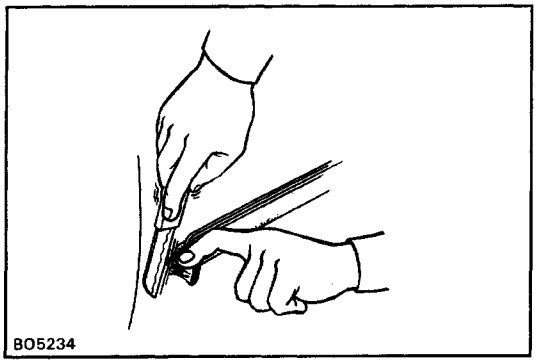
REMOVAL OF SIDE PROTECTION MOULDING

(See page BO–38)

1. REMOVE ENDS OF MOULDING

Using a scraper, pry the moulding loose about 30 mm (1.18 in.) from the ends.

HINT: Tape the scraper tip before use.



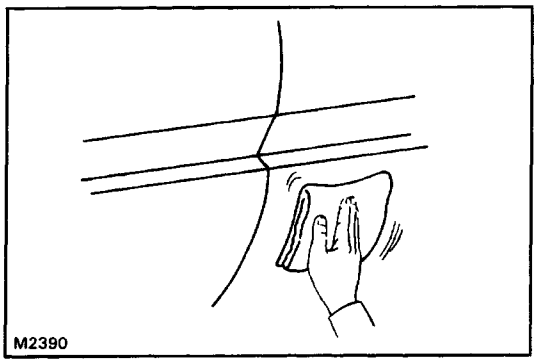
2. REMOVE MOULDING AND ADHESIVE

(a) Pull off the moulding by cutting the adhesive with a knife.

(b) Scrape off adhesive from the body with a cutter or sandpaper.

NOTICE:

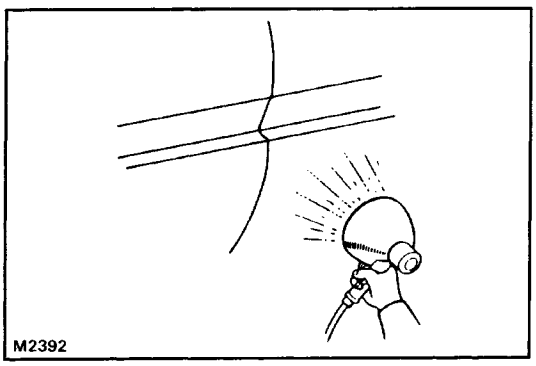
- **Remember that 30 – 80 mm (1.18 – 3.15 in.) of the ends of the moulding are glued tightly with a strong adhesive.**
- **Do not reuse moulding.**



INSTALLATION OF SIDE PROTECTION MOULDING

1. CLEAN MOULDING MOUNTING SURFACE

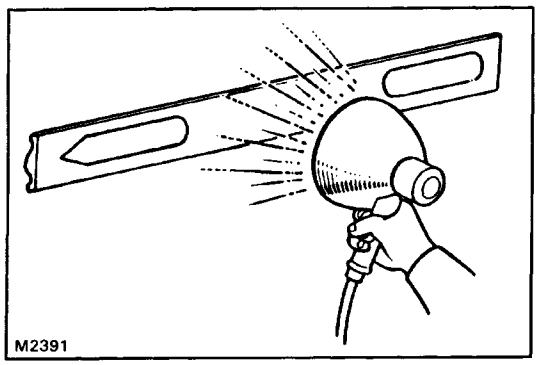
Wipe off stains with cleaner.



2. HEAT BODY MOUNTING SURFACE

Using a heat light, heat the body mounting surface to 30 – 50˚C (86 – 122˚F)

NOTICE: When the moulding is installed, the tempera–ture of the mounting surface should be 20˚C (68˚F) or higher.

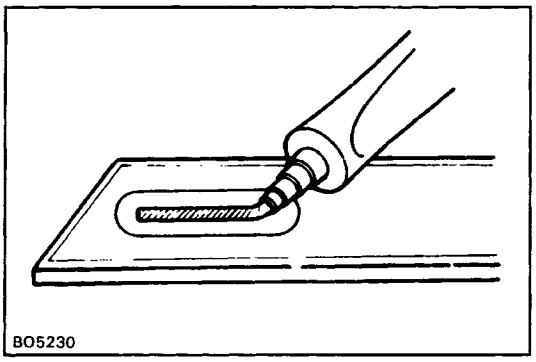


3. HEAT MOULDING

Using a heat light, heat the moulding to 30 – 60˚C (86 – 140˚F)

NOTICE: Do not heat moulding excessively.

The temperature should not be higher than 80˚C (176˚F).



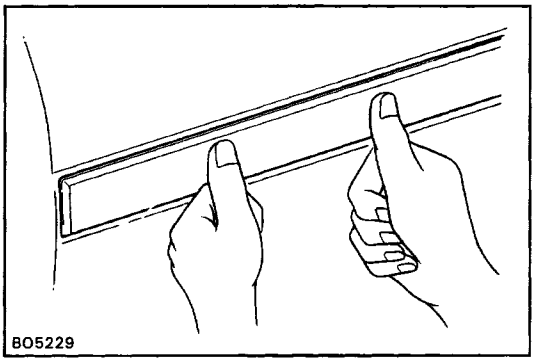
4. APPLY ADHESIVE TO MOULDING

Apply adhesive to both punched out ends of the moulding.

NOTICE: Install the moulding within 7 minutes after applying the adhesive.

5. LIFT MOULDING RELEASE SHEET FROM FACE OF MOULDING

NOTICE: When the moulding release sheet is removed, be sure that no dirt or dust can get onto the uncovered area.



6. INSTALL MOULDING

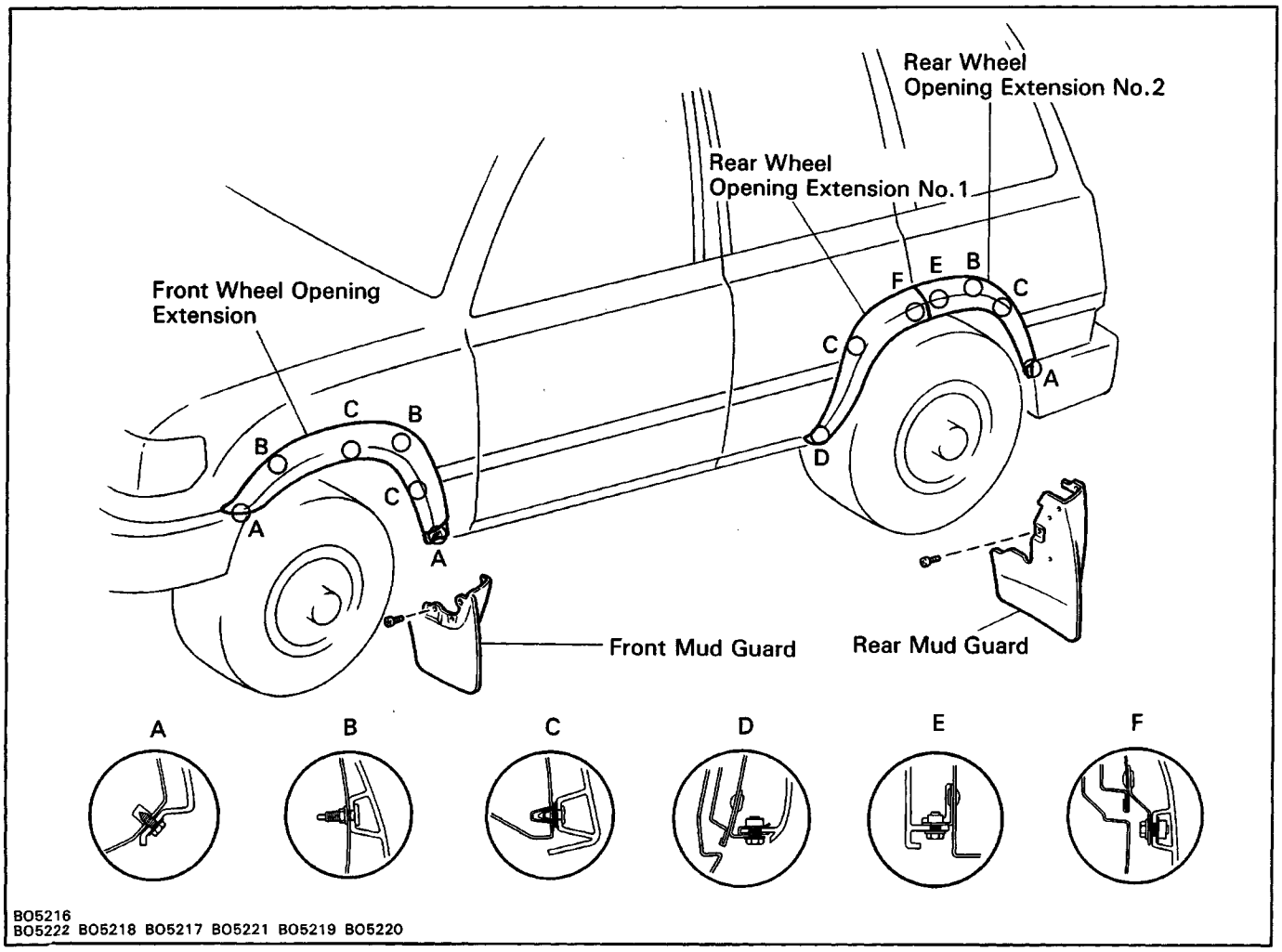
Align the bosses on the moulding with the body holes, and push the moulding to the body.

NOTICE:

- **Be sure that the body and moulding are heated to the proper temperature.**
- **Do not depress the adhesive–coated parts excessively just hold them down with your thumb.**
- **Scrape off any overflowing adhesive with a plastic spatula and clean the surface with a dry rag.**
- **After installation, do not wash the vehicle for 24 hours.**

Wheel Opening Extension

COMPONENTS



BO5216
BO5222 BO5218 BO5217 BO5221 BO5219 BO5220

REMOVAL OF FRONT WHEEL OPENING ETENSION

1. REMOVE FRONT MUD GUARD

Remove six screws and the mud guard.

2. REMOVE FRONT WHEEL OPENING EXTENSION

(a) Remove two bolts and two nuts.

(b) Remove the extension by pulling.

REMOVAL OF REAR WHEEL OPENING EXTENSION NO. 1

REMOVE REAR WHEEL OPENING EXTENSION

(a) Remove two bolts.

(b) Remove the extension by pulling.

REMOVAL OF REAR WHEEL OPENING EXTENSION NO.2

(See page BO–41)

1. REMOVE REAR MUD GUARD

Remove eight screws and the mud guard.

2. REMOVE REAR WHEEL OPENING EXTENSION NO.2

(a) Remove two bolts and the nut.

(b) Remove the extension by pullings.

INSTALL OF FRONT WHEEL OPENING EXTENSION

(See page BO–41)

1. INSTALL FRONT WHEEL OPENING EXTENSION

(a) Tap the extension to install it.

(b) Install two bolts and two nuts.

2. INSTALL FRONT MUD GUARD

Install the mud guard with six screws.

INSTALL OF REAR WHEEL OPENING EXTENSION

(See page BO–41)

INSTALL REAR WHEEL OPENING EXTENSION NO. 1

(a) Tap the extension to install it.

(b) Install two bolts.

INSTALL OF REAR WHEEL OPENING EXTENSION NO.2

(See page BO–41)

1. INSTALL REAR WHEEL OPENING EXTENSION NO.2

(a) Tap the extension to install it.

(b) Install two bolt, and the nut.

2. INSTALL THE MUD GUARD

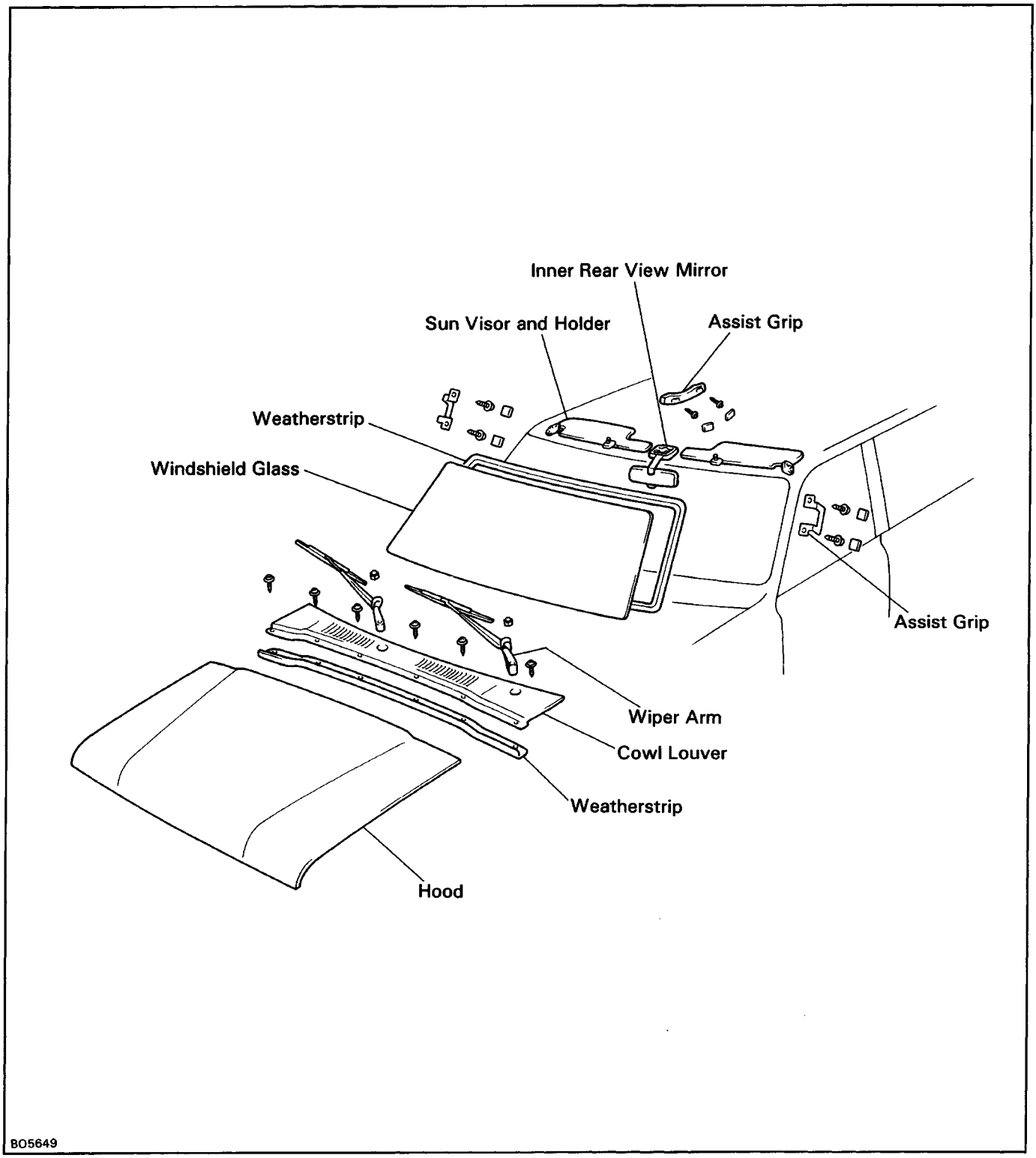
Install the mud guard with eight screws.

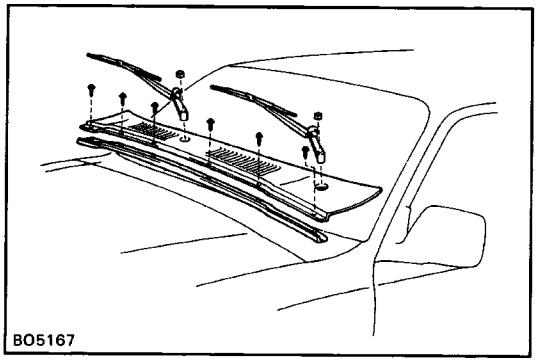
WINDSHIELD

PREPARE ITEMS LISTED

Part name and No.	Contents of set
Auto glass sealer (08833–00030 or equivalent)	
Materials required	Cleaner (for cleaning adhering surfaces)

COMPONENTS





REMOVAL OF WINDSHIELD

(See page BO–43)

1. REMOVE FRONT HOOD

2. REMOVE WIPER ARMS

(a) Open two caps.

(b) Remove two nuts and wiper arms.

3. REMOVE COWL LOUVER

Remove six screws, cowl louver and weatherstrip.

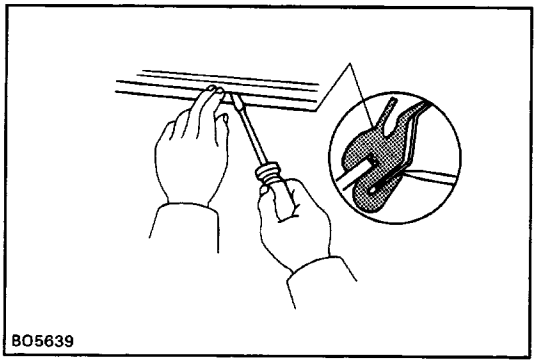
4. REMOVE FOLLOWING PARTS:

- Inner rear view mirror
- Sun visors and holders
- Assist grips

5. (w/ Windshield Moulding)

REMOVE WINDSHIELD MOULDING

(See page BO–36)



6. REMOVE WINDSHIELD GLASS

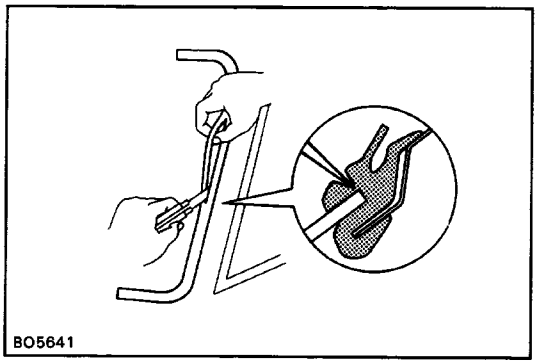
If reusing the weatherstrip:

(a) Using a screwdriver, loosen the weatherstrip from the body.

NOTICE: Be careful not to damage the body

(b) Pry the lip of the weatherstrip, outward from the interior part of the body flange.

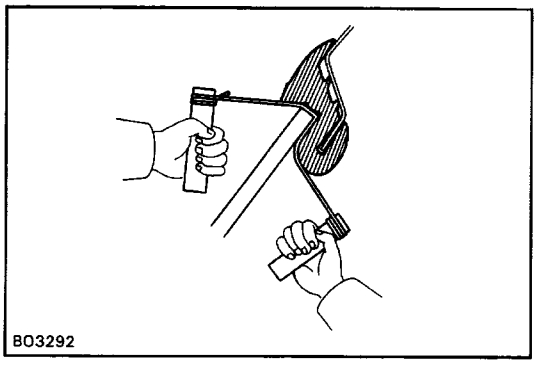
(c) Pull the glass outwards and remove it with the weatherstrip.



If using a new weatherstrip

(a) From the outside of the vehicle, cut off the weatherstrip lip with a knife.

HINT: Do not damage the body and the glass.

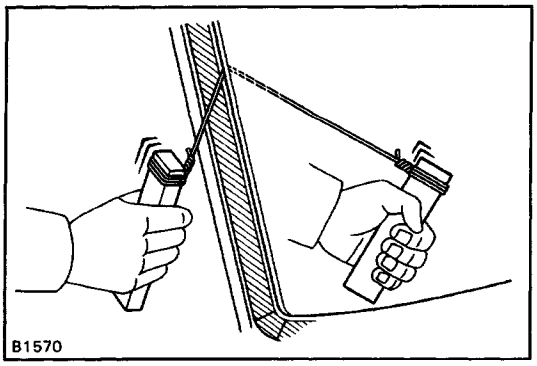


(b) Push piano wire through from the interior.

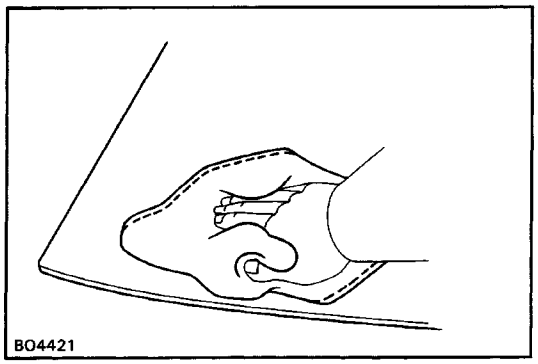
(c) Tie both wire ends to the wooden blocks or equivalent.

NOTICE: When separating, take care not to damage the paint or interior ornaments.

To prevent scratching the safety pad when removing the windshield, place a plastic sheet between the piano wire and safety pad.



(d) Cut the adhesive by pulling the piano wire around it.
(e) Remove the glass.

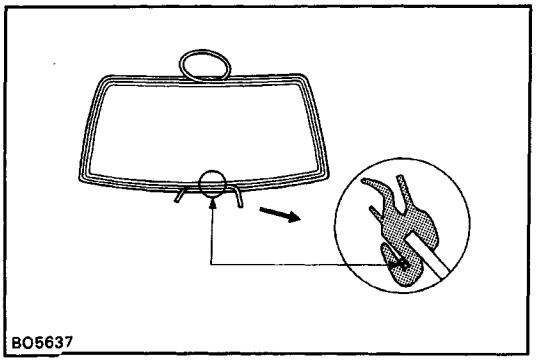


INSTALLATION OF WINDSHIELD

(See page BO–43)

1. CLEAN BODY AND GLASS

Using cleaner, clean the weatherstrip contacting surface of the body and the glass.

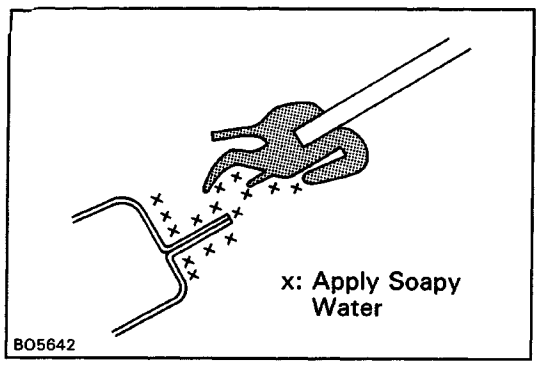


2. INSTALL WEATHERSTRIP ON GLASS

(a) Attach the weatherstrip to the glass.

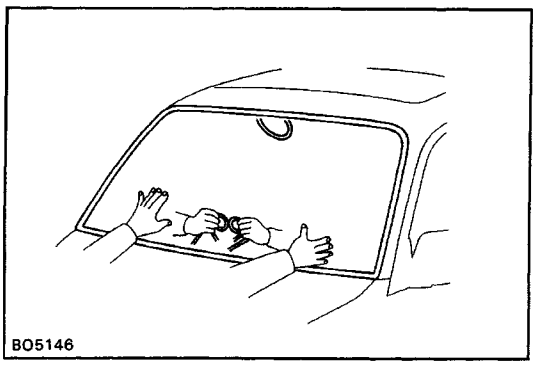
NOTICE: If the weatherstrip has hardened, it way develop water leaks. Use a new one if possible.

(b) Apply a working cord along the weatherstrip groove as shown.



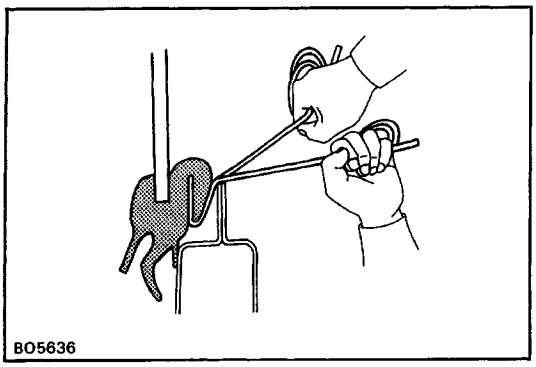
3. INSTALL GLASS

(a) Apply soapy water to the contact surface of the weatherstrip lip and to the body flange.

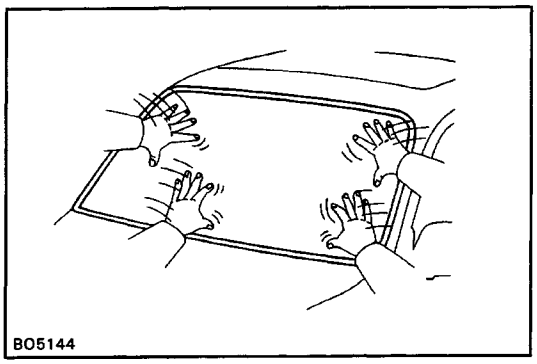


HINT: Begin installation in the middle of the lower part of the glass.

(b) Hold the glass in position on the body.

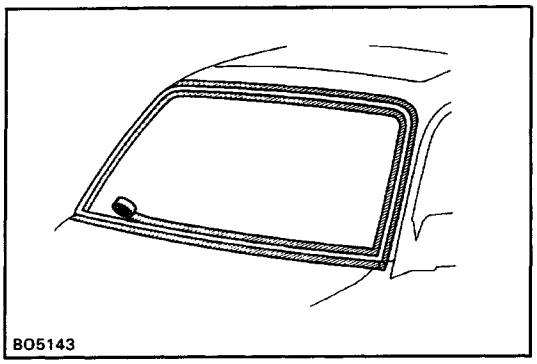


(c) From the inside, pull on one cord at an angle so it pulls the lip over the flange. From the outside, press the glass along the weatherstrip until the glass is installed.



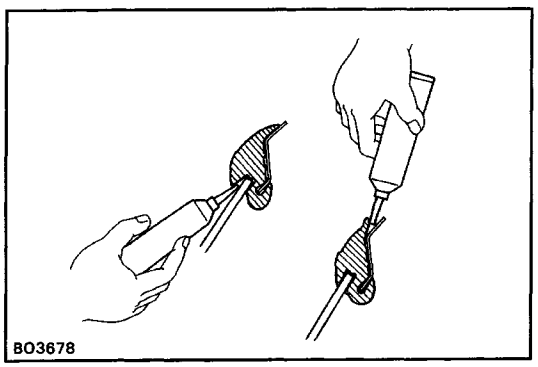
4. SNUG DOWN GLASS

To snug down the glass, tap from the outside with your open hand.



5. APPLY ADHESIVE

(a) Put masking tape around the weatherstrip to protect the paint and the glass.



(b) Apply auto glass sealer to the weatherstrip lip as shown.

Part. No.08833–00030 or equivalent

6. CLEANING SEALER SURFACE

(a) After auto glass sealer dry, remove the masking tape.

HINT: The auto glass sealer will harden in about 15 hours.

(b) Clean off the sealer oozing out from the masking tape with a clean rag saturated in cleaner.

7. INSPECT FOR LEAKS AND REPAIR

(a) Perform a leak test.

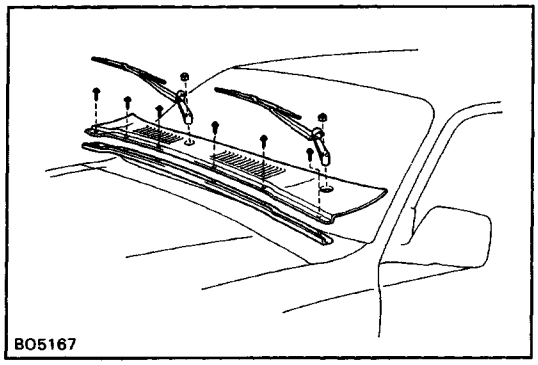
(b) Seal any leaks with auto glass sealer.
Part No.08833–00030

8. (w/ Windshield Mouldings)

INSTALL WINDSHIELD MOULDINGS
(See page BO–36)

9. INSTALL COWL LOUVERS

Install the weatherstrip, the cowl louver with sixs screws.



10. INSTALL WIPER ARMS

(a) Install wiper arms with two nuts.

(b) Close two caps

11. INSTALL HOOD

12. ADJUST HOOD

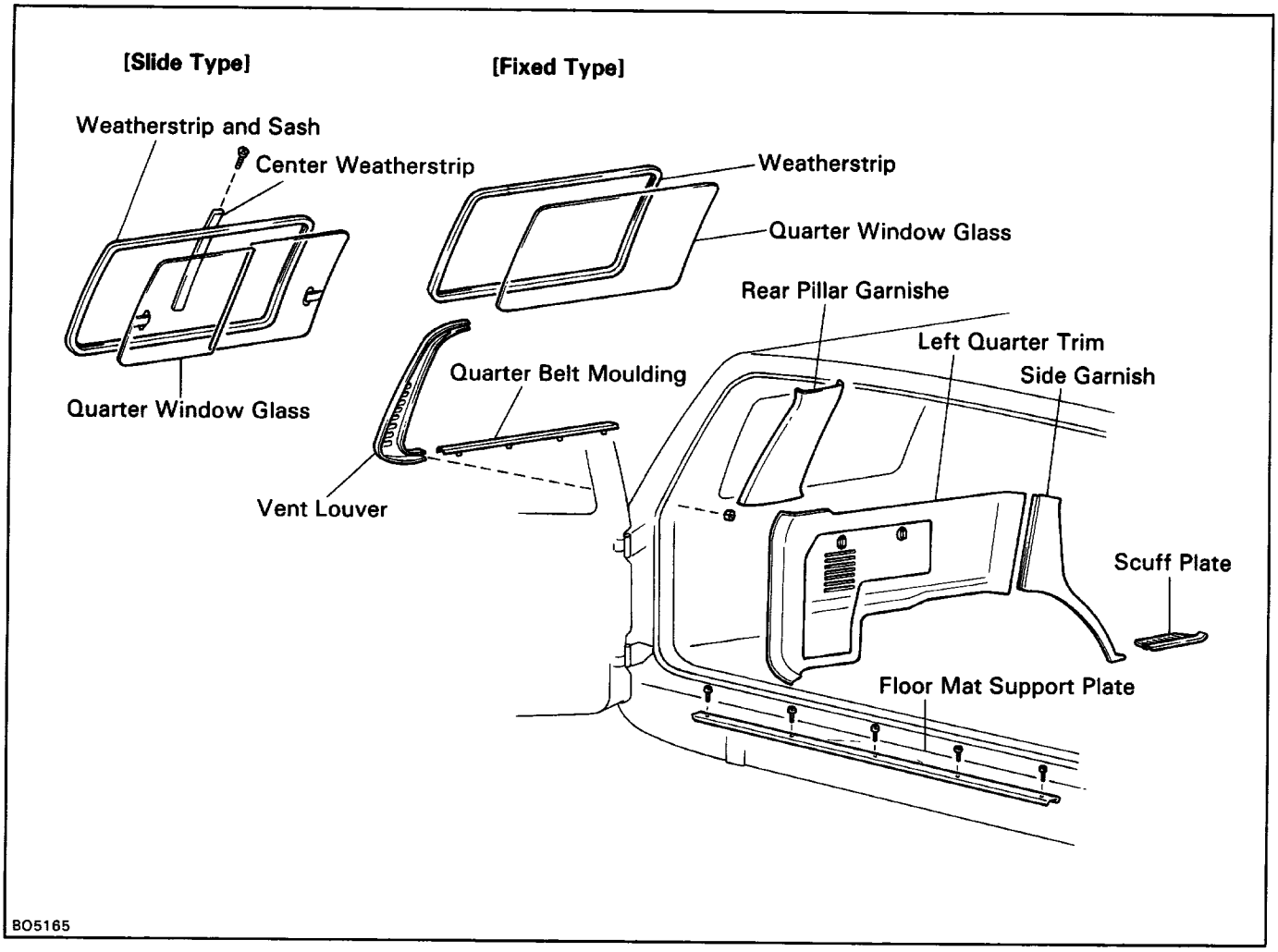
(See page BO–5)

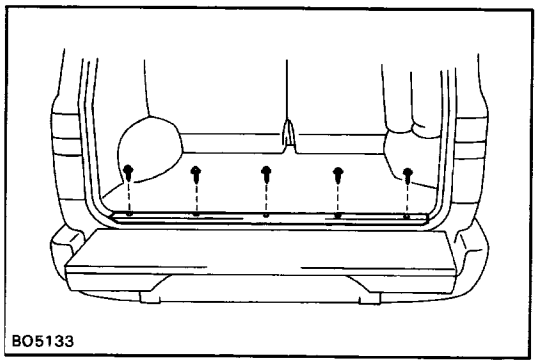
13. INSTALL FOLLOWING PARTS

- Sun visors and holders.
- Inner rear view mirror.
- Assist grips.

QUARTER WINDOW GLASS

COMPONENTS

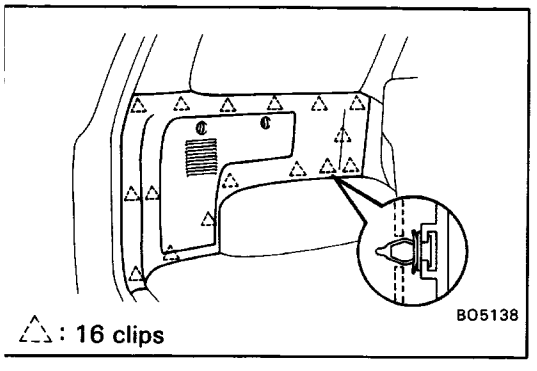




REMOVAL OF QUARTER WINDOW GLASS

1. REMOVE FLOOR MAT SUPPORT PLATE

Remove five screws and the plate.

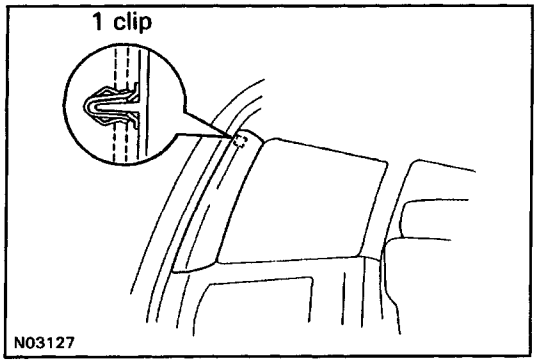


2. REMOVE QUARTER TRIM

(a) Insert a screwdriver between the retainers and quarter trim to pry it loose.

HINT: Tape the screwdriver tip before use.

(b) Remove quarter trim.

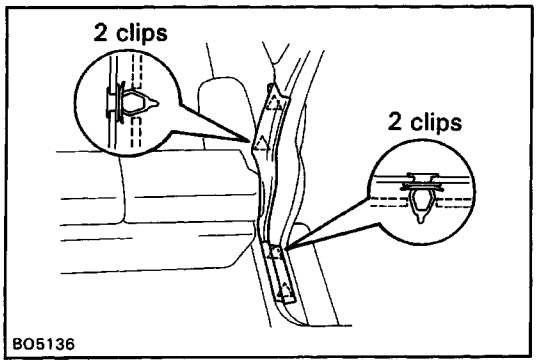


3. REMOVE REAR PILLAR GARNISHE

(a) Insert a screwdriver between the retainers and quarter trim to pry it loose.

HINT: Tape the screwdriver tip before use.

(b) Remove the garnish.

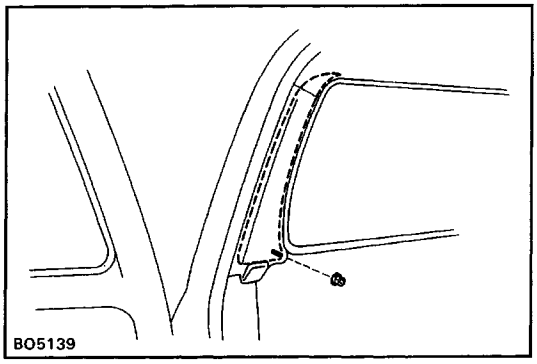


4. REMOVE REAR SEAT SIDE GARNISHES AND SCUFF PLATE

(a) Insert a screwdriver between the retainers and the body to pry it loose.

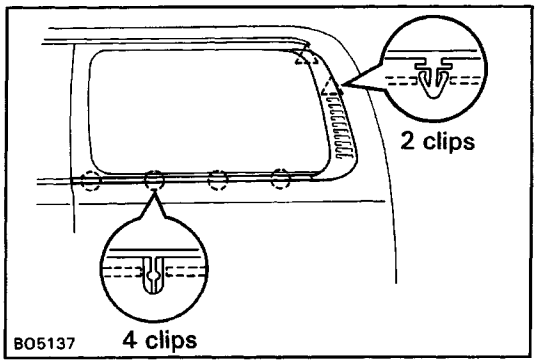
HINT: Tape the screwdriver tip before use.

(b) Pull out the side garnish.



5. REMOVE VENT LOUVER AND QUARTER BELT MOULDING

(a) Remove a nut from the vent louver.

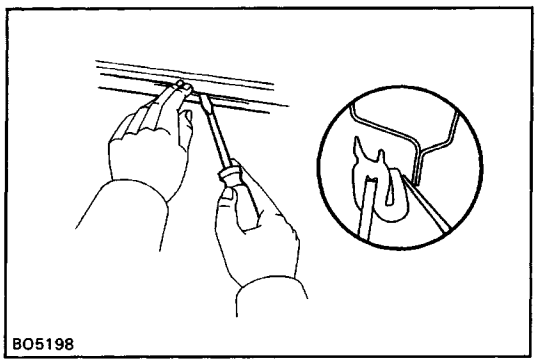


(b) Insert a screwdriver between the retainers and body to pry it loose.

HINT: Tape the screwdriver tip before use.

(c) Pull out the vent louver.

(d) Pull out the clips from the edge of the panel, and remove the moulding.



6. REMOVE QUARTER WINDOW GLASS

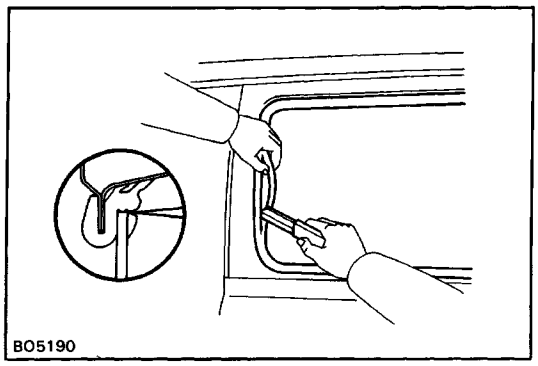
If reusing the weatherstrip:

(a) Using a screw driver loosen the weatherstrip from the body.

NOTICE: Be careful not to damage the body.

(b) Pry the lip of the weatherstrip outward from the interior part of the body flange.

(c) Pull the glass outwards and remove it with the weatherstrip.



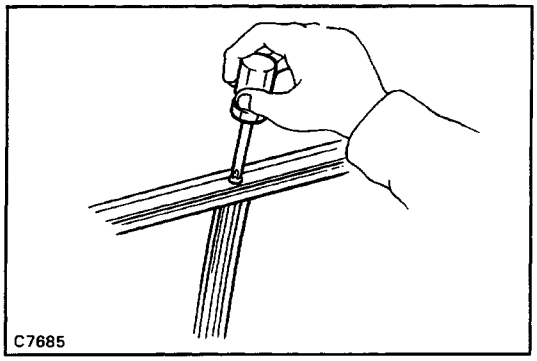
If using a new weatherstrip:

(a) From outside of the vehicle, cut off the weatherstrip lip with a knife.

HINT: Do not damage the body and the glass.

(b) Push the glass outwards and remove the glass.

(c) Remove the remaining weatherstrip.



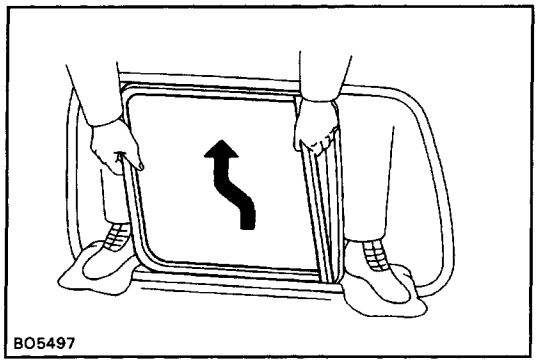
DISASSEMBLY OF QUARTER WINDOW GLASS

(See page BO–48)

(Slide Type)

1. REMOVE CENTER WEATHERSTRIP

Remove the screw and the weatherstrip.

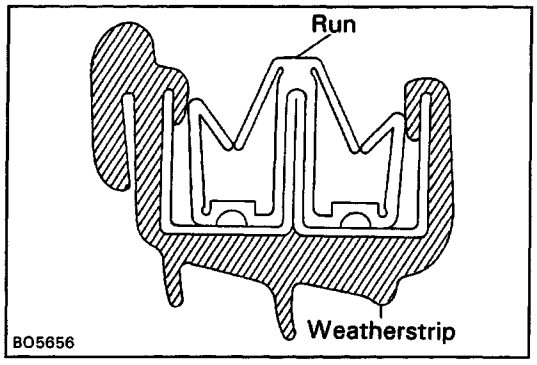


2. REMOVE QUARTER WINDOW GLASS

Pull up on the sash and remove the two glasses.

3. REMOVE QUARTER WINDOW GLASS RUN FROM THE SASH

4. REMOVE QUARTER WINDOW WEATHERSTRIP FROM THE SASH



ASSEMBLY OF QUARTER WINDOW GLASS

(See page BO–48)

(Slide Type)

1. INSTALL QUARTER WINDOW. WEATHERSTRIP ON SASH AS SHOWN

NOTICE: If the weatherstrip has hardened, it may develop leaks.

Use a new one if possible.

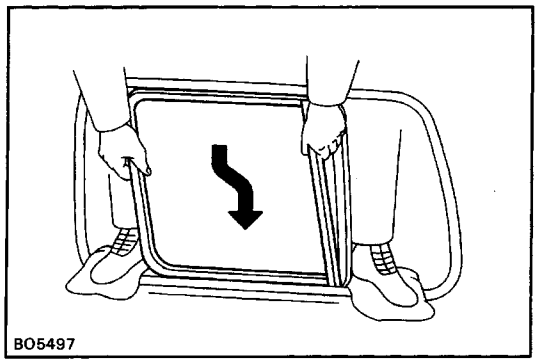
2. INSTALL QUARTER WINDOW GLASS RUN AS SHOWN

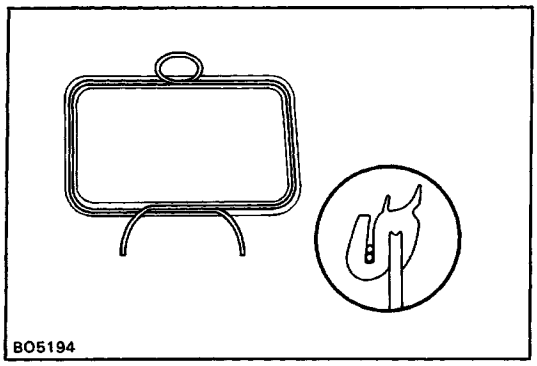
3. INSTALL QUARTER WINDOW GLASS

Pull up on the sash and install the two glasses.

4. INSTALL CENTER WEATHERSTRIP

Install the weatherstrip with the screw.





INSTALLATION OF QUATER WINDOW GLASS

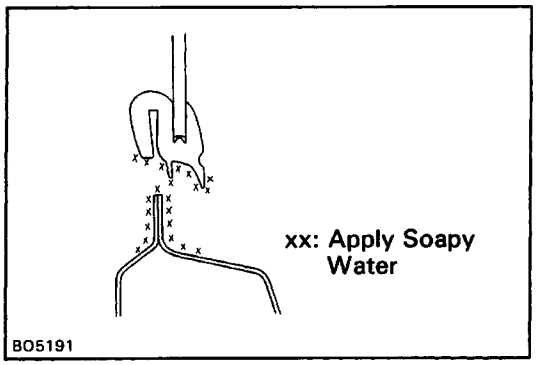
(See page BO–48)

1. INSTALL WEATHERSTRIP ON GLASS

(a) Attach the weatherstrip to the glass.

NOTICE: If the weatherstrip has hardened, it may develop leaks. Use a new one if possible.

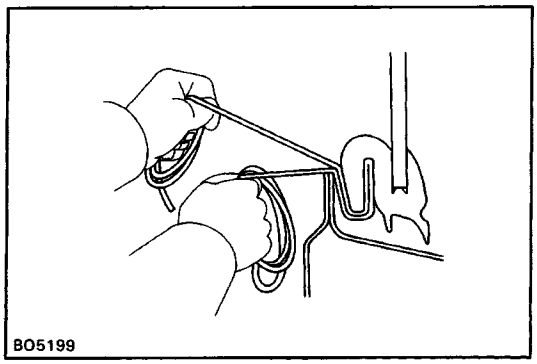
(b) Insert a cord into the groove of the weatherstrip all the way around with the ends overlapping.



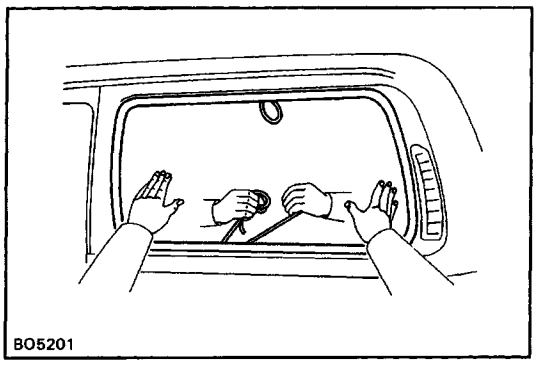
2. INSTALL QUARTER WINDOW GLASS

(a) Apply soapy water to the contact surface of the weatherstrip lip and to the body flange.

HINT: Begin installation in the middle of the lower part of the quarter window glass.



(b) Hold the glass in position on the body.



(c) From the inside, pull on one cord at an angle so it pulls the lip over the flange. From the outside, press the glass along the weatherstrip until the glass is installed.

3. SNUG DOWN GLASS

To snug down the glass, tap from the outside with your open hand.

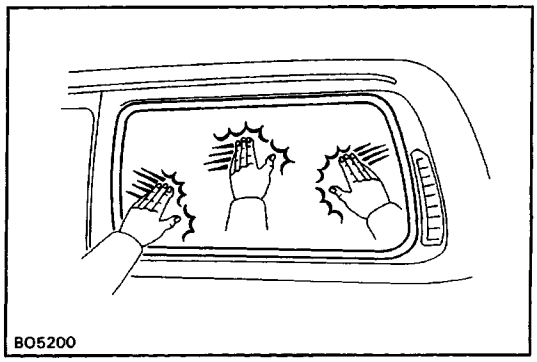
4. INSPECT FOR LEAKS AND REPAIR

(a) Perform a leak test.

(b) Seal any leak with auto glass sealer.

5. INSTALL FOLLOWING PARTS:

- Pillar garnishes
- Quarter trim
- Floor mat support plate
- Side garnishes and scuff plate

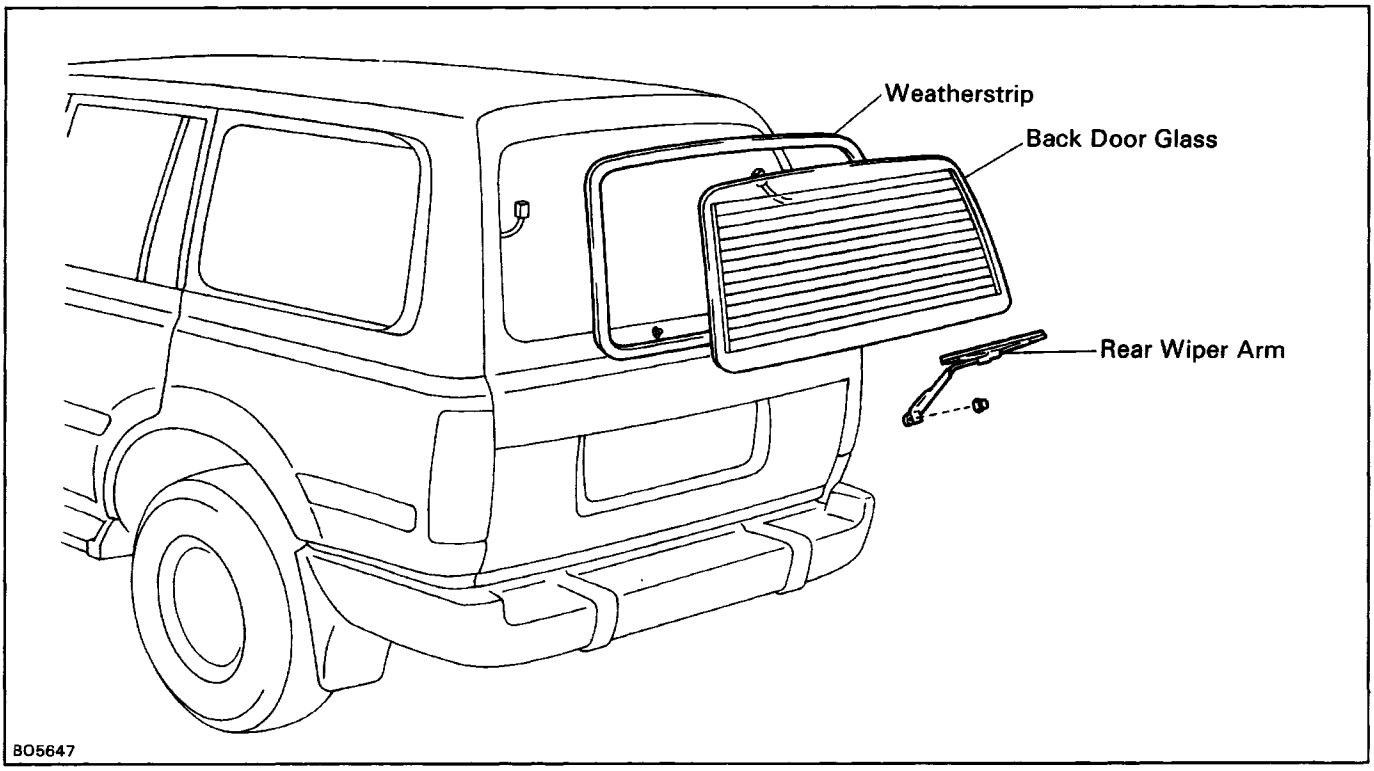


BACK DOOR GLASS

PREPARE ITEMS LISTED

Part name and No.	Contents of set
Auto glass sealer (08833–00030 or equivalent)	
Materials required	Cleaner (for cleaning adhering surfaces)

COMPONENTS



REMOVAL OF BACK DOOR GLASS

1. REMOVE REAR WIPER ARM

2. (w/ Defogger)

REMOVE DEFOGGER CONNECTOR

Disconnect the connector from the glass.

3. REMOVE BACK DOOR GLASS

HINT: Remove the glass in the same manner as the windshield.

(See step 6 on page BO–44)

INSTALLATION OF BACK DOOR GLASS

1. CLEAN BODY AND GLASS

(See step 1 on page BO–45)

2. INSTALL WEATHERSTRIP ON GLASS

(See step 2 on page BO–45)

3. INSTALL BACK DOOR GLASS

HINT: Install the glass in the same manner as the wind–shield.

(See step 3 on page BO–45)

4. SNUG DOWN GLASS

(See step 4 on page BO–46)

5. APPLY ADHESIVE

(See step 5 on page BO–46)

6. CLEANING SEALER SURFACE

(See step 6 on page BO–46)

7. INSPECT FOR LEAKS AND REPAIR

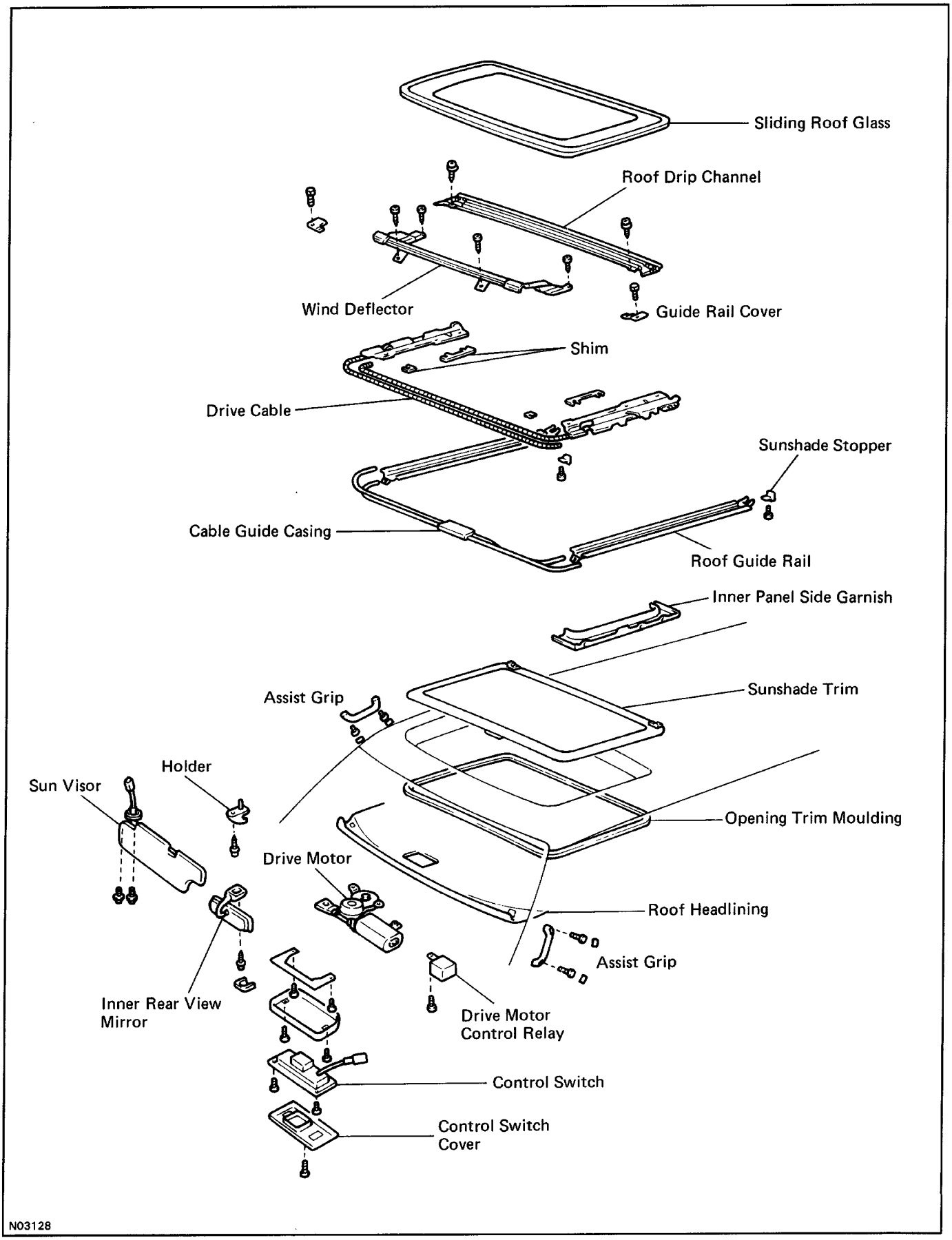
8. (w/ Defogger)

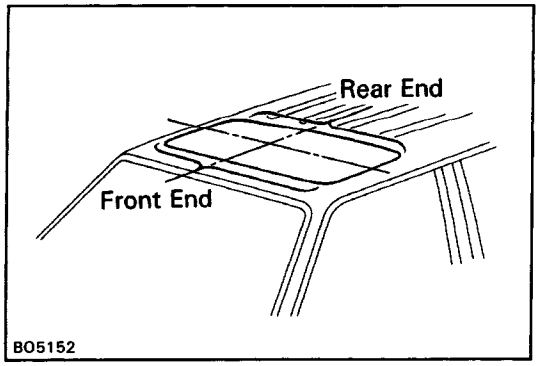
INSTALL DEFOGGER CONNECTOR

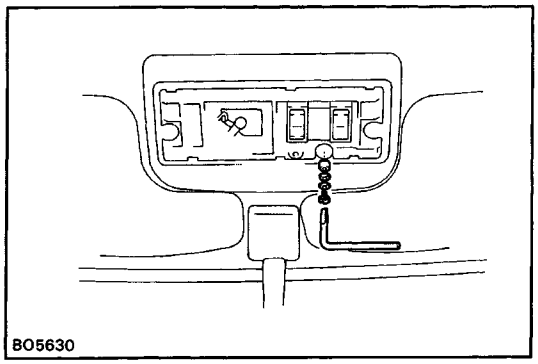
Connect the connector to the glass.

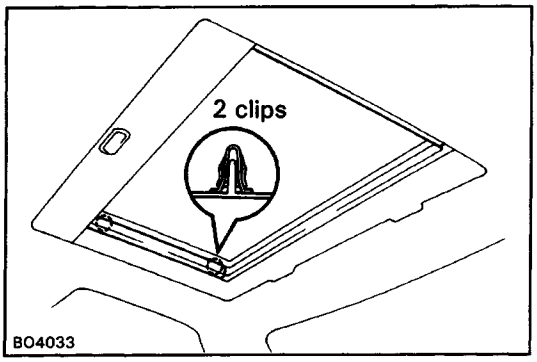
9. INSTALL REAR WIPER ARM

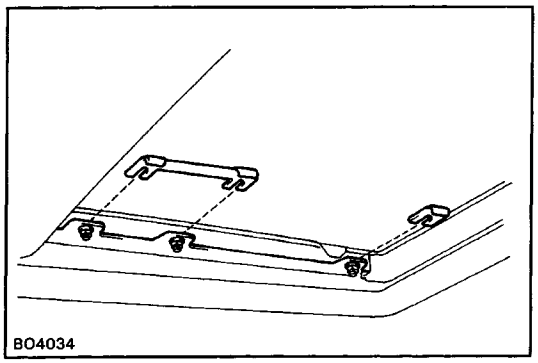
MOON ROOF
COMPONENTS

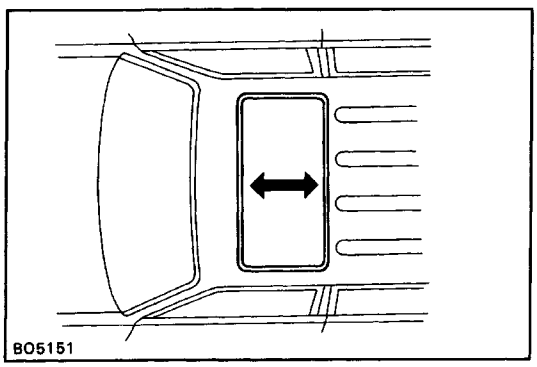












ON–VEHICLE INSPECTION

INSPECT SLIDING ROOF PANEL ALIGNMENT

(a) Start the engine and check the operation time of the sliding roof.

Operation time: Approx. 5 sec.

(b) Check for abnormal noise or binding during operation.

(c) With the sliding roof fully closed, check for water leakage.

(d) Check for a difference in level between the sliding roof glass and roof panel.

Front side: 1.9 + 2.0 mm (0.075 + 0.079 in.)
–1.0 –0.039

Rear side: 1.9 + 2.0 mm (0.075 + 0.079 in.)
–1.0 –0.039

If the sliding roof does not operate:

(e) Remove the control switch cover.

(f) Remove the large screw inside.

NOTICE: Be careful not to lose the spring washer or shim.

(g) Manually operate the moon roof by inserting a special crank–shaped screwdriver into the hole and turning the drive shaft.

ADJUSTMENT OF SLIDING ROOF

1. REMOVE SLIDING ROOF GARNISHES

Before making adjustments, remove the left and right sliding roof garnishes.

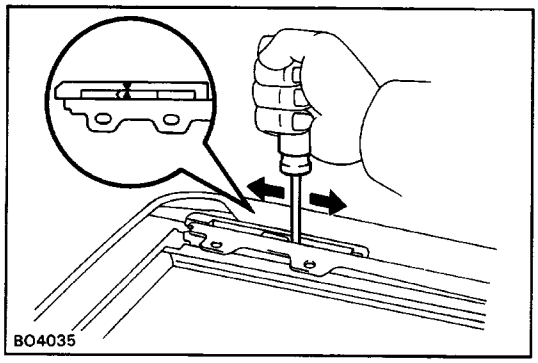
HINT: After adjustment, reinstall the sliding roof garnishes.

2. TO ADJUST LEVEL DIFFERENCE

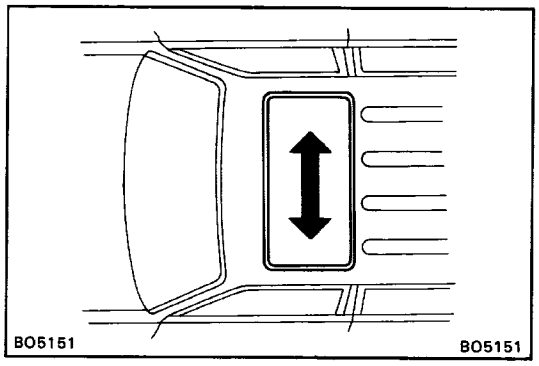
Adjust by increasing or decreasing the number of shims between the bracket and sliding roof.

3. TO ADJUST FORWARD OR REARWARD

(a) Adjust by loosening the sliding roof installation nuts, and move the sliding roof bracket forward and backward.

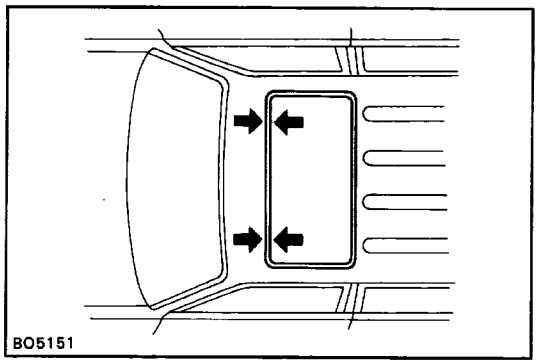


(b) When the front or rear alignment is not correct, remove the glass and adjust the drive rail.
(c) Using a screwdriver, slide the link forward or backward to align the two marks as shown.
(d) Slide the bracket to the forefront with your hand.

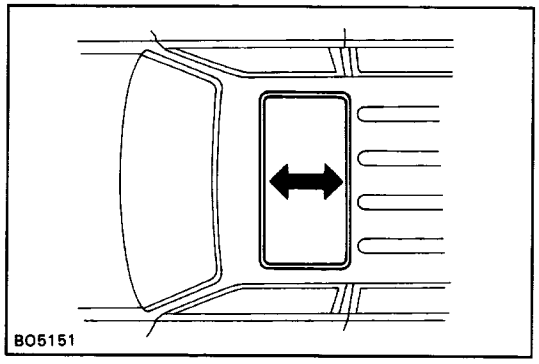


4. TO ADJUST RIGHT OR LEFT

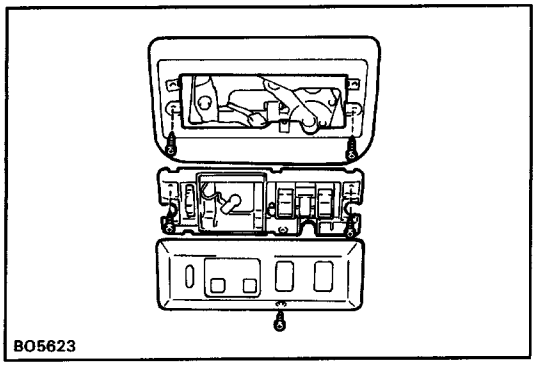
Adjust by loosening the sliding roof rear shoe installation nuts, and move the sliding roof to the right and left.



5. TO ADJUST CLEARANCE
(Difference in left and right clearance)



Adjust by loosening the sliding roof installation nuts and readjust the sliding roof to the proper position.


BO5623

REMOVAL OF MOON ROOF

(See page BO–54)

1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL

2. REMOVE CONTROL SWITCH

(a) Remove the screw and the switch cover.

(b) Remove two screws and the switch body, then disconnect the connector.

(c) Remove two screws and the braket.

3. REMOVE FOLLOWING PARTS:

- Assist grip
- Sun visor and holders
- Inner rear view mirror
- Opening trim moulding

4. PULL DOWN FRONT SLIDE OF ROOF HEADLINING

Pull down the headlining by hand

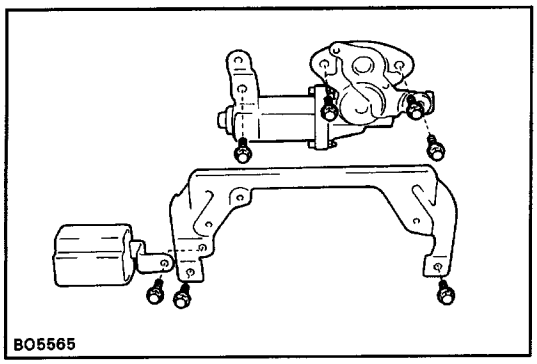
NOTICE: Do not damage the roof headlining

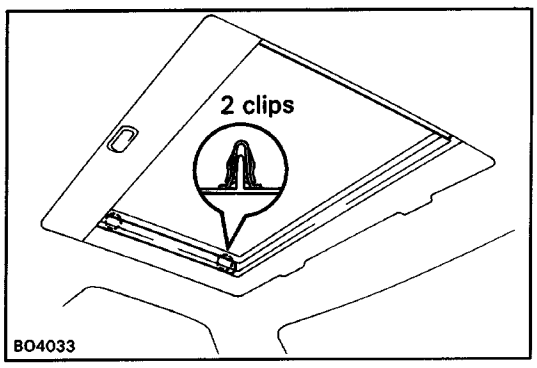
5. REMOVE DRIVE GEAR ASSEMBLY

(a) Remove the bolt and the moon roof control relay, then disconnect the connector.

(b) Remove two bolts and the braket.

(c) Remove four bolts and the gear assembly, then disconnect the connector.


BO5565

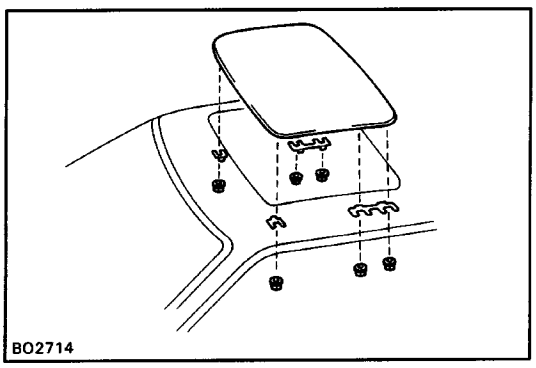


BO4033

6. REMOVE SLIDING ROOF GARNISHES

Using a screwdriver, pry loose two clips and remove the inner panel side garnish.

HINT: Tape the screwdriver tip before use.

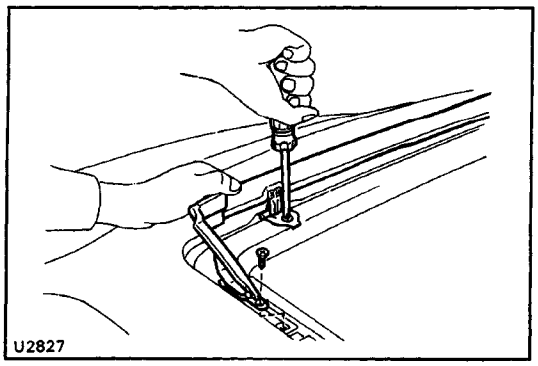

BO2714

7. REMOVE SLIDING ROOF GLASS

(a) Remove six nuts and shims.

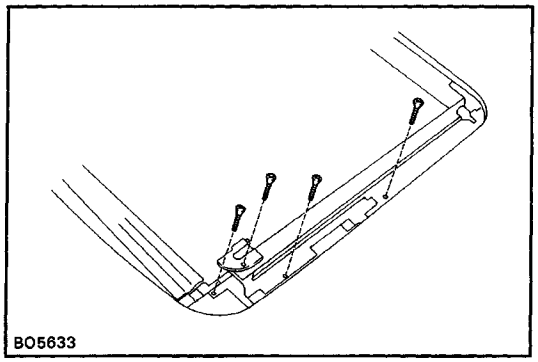
HINT: Make sure of the number of shims.

(b) Pull the glass upward to remove it.



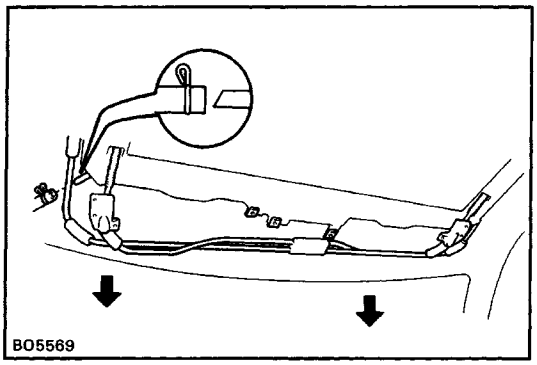
8. REMOVE WIND DEFLECTOR

Remove four screws and the wind deflector.



9. REMOVE CABLE GUIDE CASING

(a) Remove the screw and the guide rail cover.
(b) Remove three screws from the drive rail.
(c) Slide the drive cable forward.

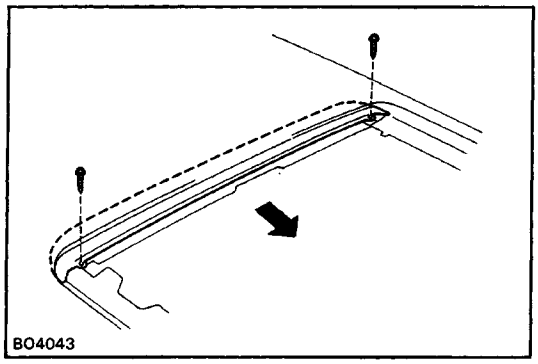


(d) Disconnect front side of the drain hose.

HINT: Disconnect the drain hose from the sliding roof housing side.

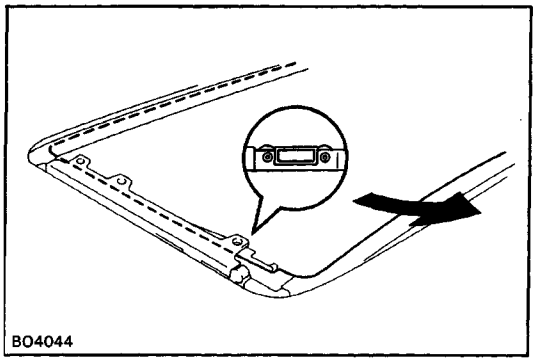
(e) Remove the cable guide casing gradually from both sides.

NOTICE: Be careful that the oily cable doesn't fall off.



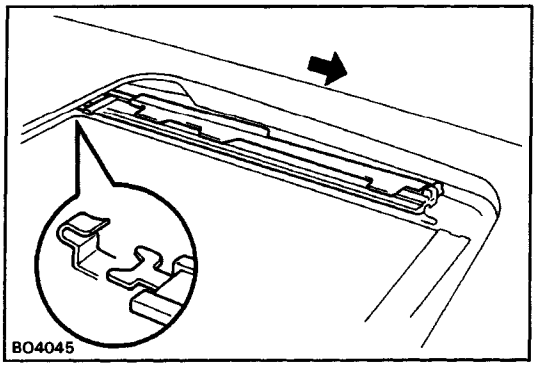
10. REMOVE ROOF DRIP CHANNEL

(a) Remove two screws.
(b) Pull the channel forward to remove it.



11. REMOVE SUNSHADE TRIM

While raising the drive rail, pull the trim forward to remove it.



12. REMOVE DRIVE RAIL

(a) Slide the drive cable forward.

(b) Slide the rail forward and disconnect the clamp, then remove it.

INSTALLATION OF MOON ROOF

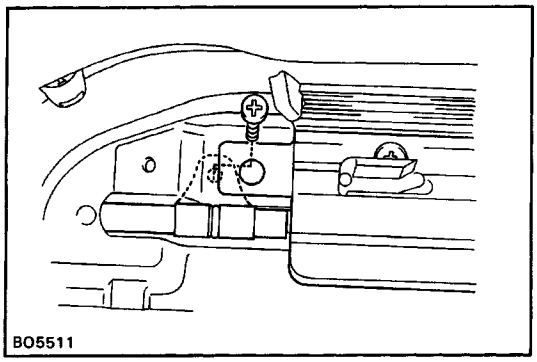
(See page BO–54)

1. INSTALL FOLLOWING PARTS:

(a) Drive rail

(b) Sunshade trim

(c) Roof drip channel



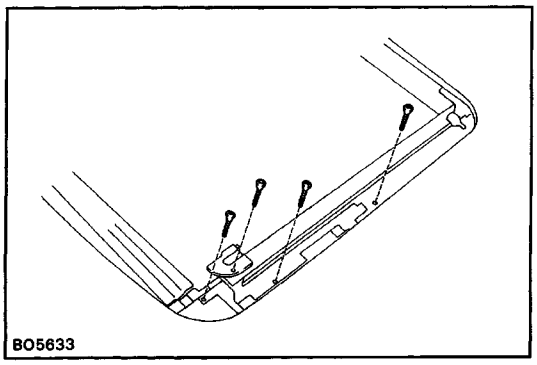
2. INSTALL CABLE GUIDE CASING

(a) Insert the cable to the casing and install the cable guide casing gradually to both sides.

(b) Insert the casing to the drive rail as shown.

(c) Connect the front side of drain hose.

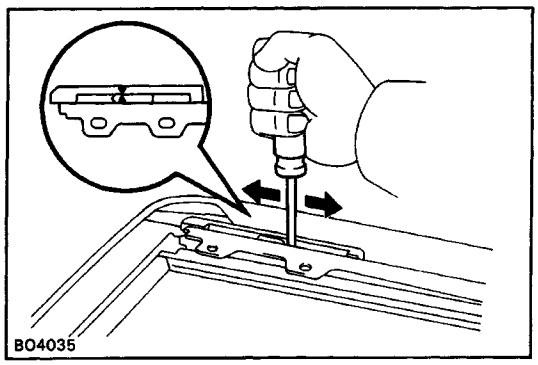
HINT: Place the knobs of clips to upper side.



(d) Install three screws to the drive rail.

(e) Install the screw to the guide rail cover.

3. INSTALL WIND DEFLECTOR

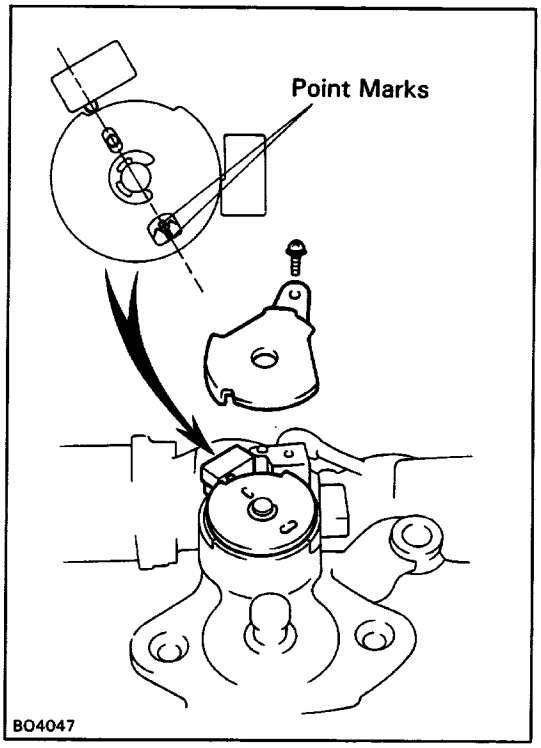


4. ADJUST DRIVE RAIL

HINT: Adjust the drive rail to a closed and tilted down position.

(a) Using a screwdriver, slide the link forward or backward to align the two marks as shown.

(b) Slide the bracket to the forefront with your hand.

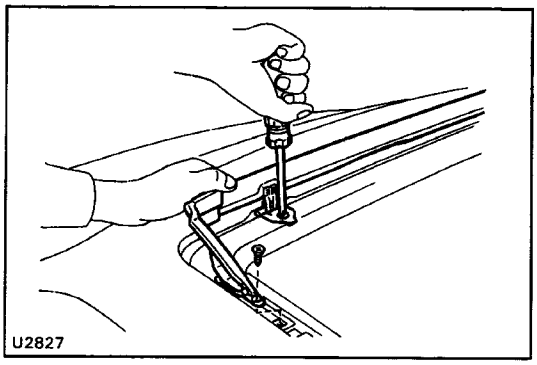


5. ADJUST AND INSTALL DRIVE GEAR ASSEMBLY

(a) Remove the screw and cam plate cover.
(b) Remove the large screw, washers and shims.
(e) Turn the drive shaft by screwdriver to align the housing and gear point mark as shown.
(d) Install cam plate cover with the screw.
(e) Install the drive gear assembly with four bolts.
(f) Connect the connectors.

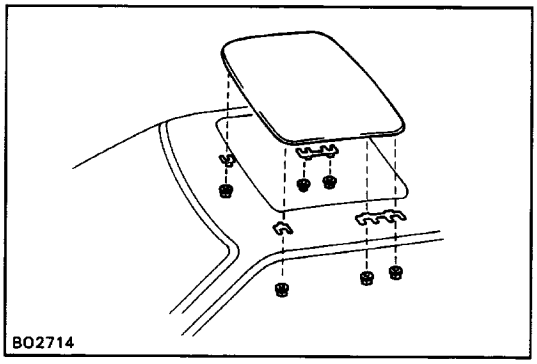
6. INSTALL THE MOON ROOF CONTROL RELAY AND BRACKET

(a) Install the bracket with two bolts.
(b) Install the moon roof control relay with the bolt, then connect the connector.



7. INSTALL WIND DEFLECTOR

Install the wind deflector with four screws.



8. INSTALL SLIDING GLASS

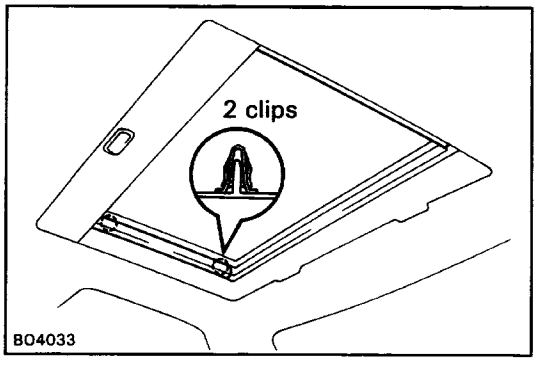
HINT:

- Confirm that the lip part of the weatherstrip housing is not twisted.
- Confirm that the clearance between the left and right of the sliding roof glass and roof panel are equal.

Install six nuts and shims.

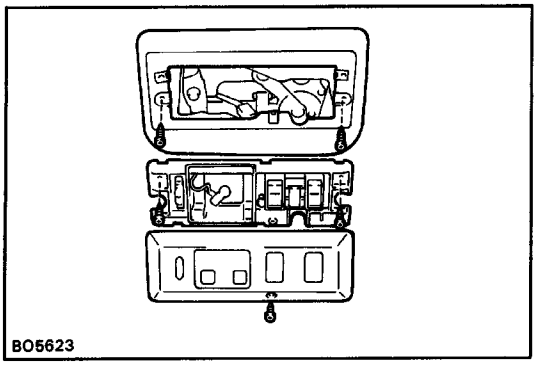
9. INSPECT SLIDING ROOF GLASS ALIGNMENT

(See page BO–55)



10. INSTALL SLIDING ROOF GARNISHES

Install the inner panel side garnish with retainers to the sliding roof glass by tapping.



11. INSTALL CONTROL SWITCH

(a) Install the bracket with two screws.

(b) Install the switch body with two screws, then connect the connector.

(c) Install the switch cover with the screw.

12. INSTALL FOLLOWING PARTS:

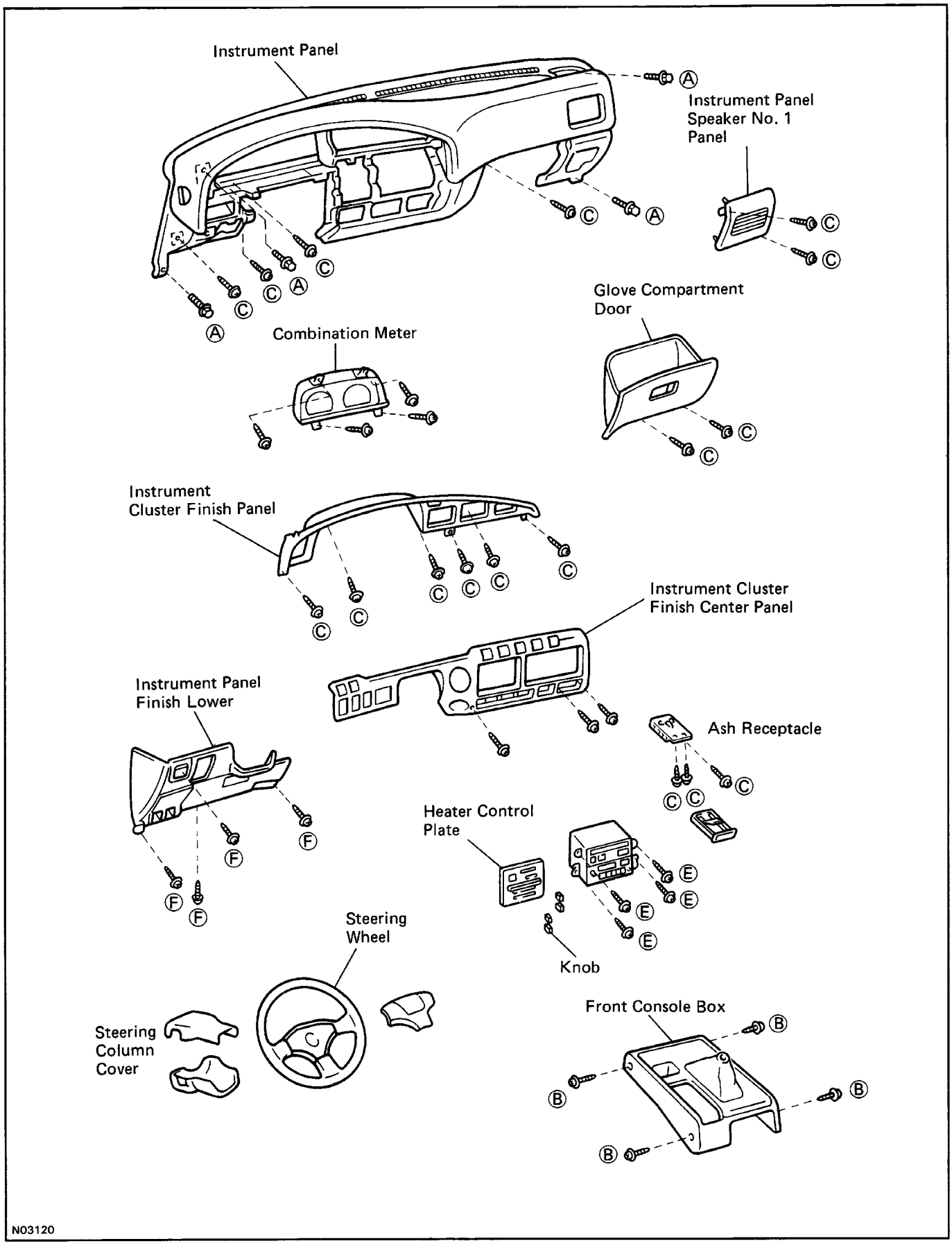
- Assist grip
- Sun visors and holders
- Inner rear view mirror
- Opening trim moulding

13. CONNECT BATTERY CABLE TO NEGATIVE TERMINAL

14. CHECK OPERATION TO THE MOON ROOF

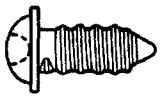
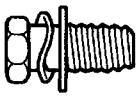
INSTRUMENT PANEL

COMPONENTS



HINT: Screw sizes in the previous illustration are indicated according to the code below.

mm (in.)

Code	Shape	Size	Code	Shape	Size	Code	Shape	Size
Ⓐ		ϕ = 6 (0.24) L = 25 (0.98)	Ⓑ		ϕ = 5 (0.20) L = 25 (0.98)	Ⓒ		ϕ = 5.22 (0.2055) L = 14 (0.55)
Ⓓ		ϕ = 8 (0.31) L = 30 (1.18)	Ⓔ		ϕ = 5 (0.20) L = 16 (0.62)	Ⓕ		ϕ = 5.22 (0.2055) L = 18 (0.71)

BO5644

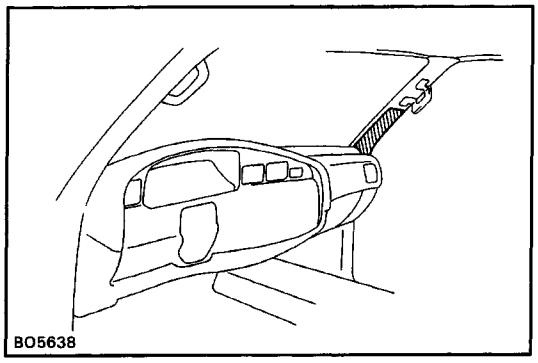
REMOVAL OF INSTRUMENT PANEL

(See page BO–62)

1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL

2. REMOVE STEERING WHEEL

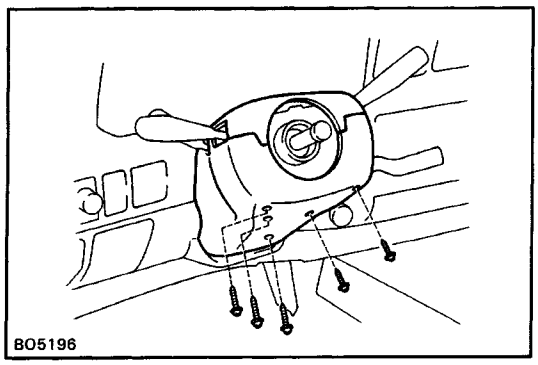
(See page SR–4)



BO5638

3. APPLY PROTECTION TAPE

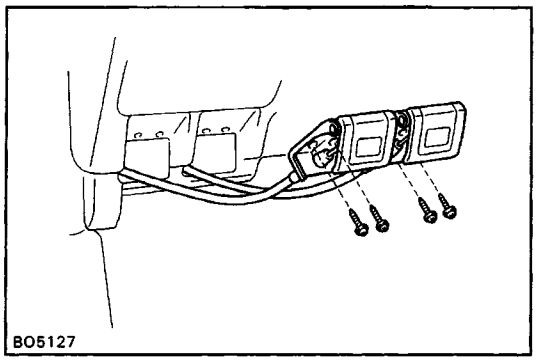
Before removing the instrument panel, apply protection tape to the pillars.



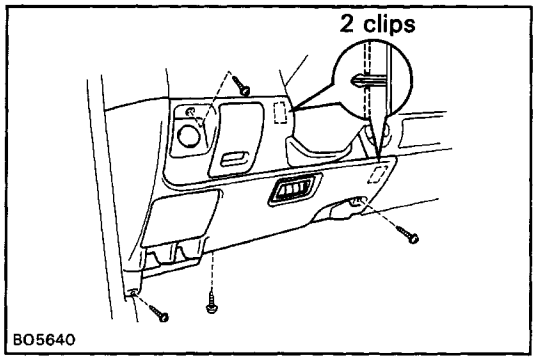
BO5196

4. REMOVE STEERING COLUMN COVER

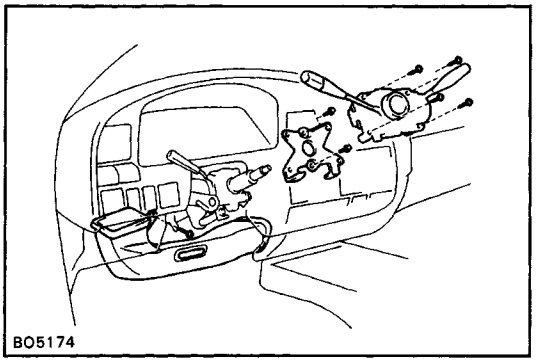
Remove five screws and column covers.



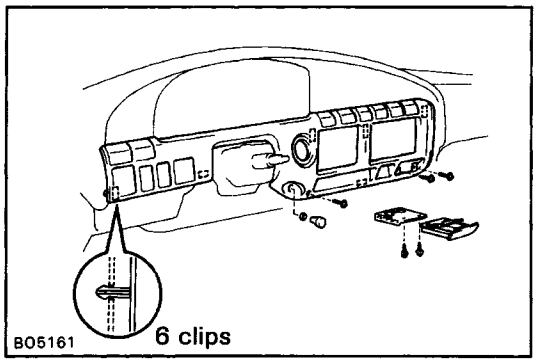
5. REMOVE ENGINE HOOD AND FUEL LID RELEASE LEVER
Remove four screws and the levers.



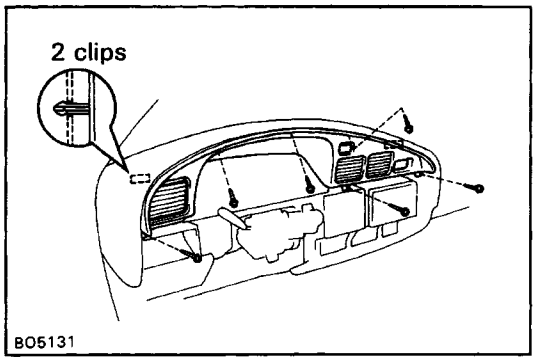
6. REMOVE LOWER FINISH PANEL
Remove four screws and the panel.



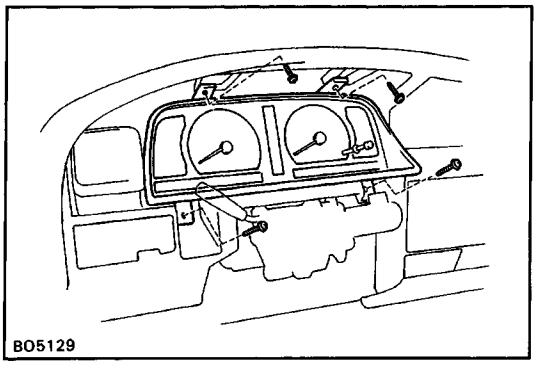
7. REMOVE DUCT HEATER TO REGISTER NO.2
Remove the screw and the duct.
8. REMOVE COMBINATION SWITCH
Remove four screws and the combination switch, then disconnect the connectors.
9. REMOVE TURN SIGNAL BRACKET
Remove two bolts and the bracket.



10. REMOVE INSTRUMENT CLUSTER FINISH CENTER PANEL
(a) (w/ Manual choke)
Remove the choke knob by pulling.
(b) Remove the ashtray.
(c) Remove three screws and the ash receptacle.
(d) Remove the instrument claster finish center panel then disconnect the connectors.



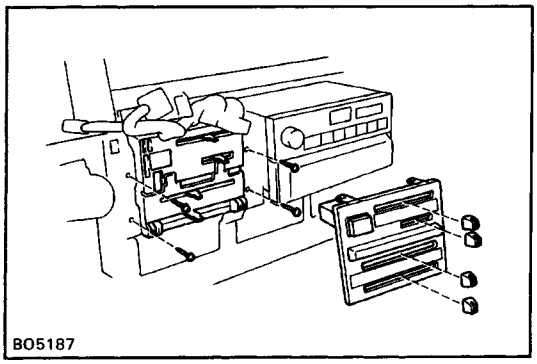
11. REMOVE INSTRUMENT CLUSTER FINISH PANEL
Remove six screws and the instrument cluster finish panel.



12. REMOVE COMBINATION METER

(a) Remove four screws.

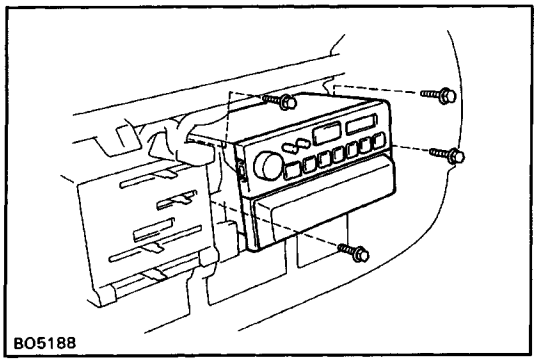
(b) Disconnect the connectors and the speed meter cable, and remove the meter.



13. REMOVE HEATER CONTROL UNIT

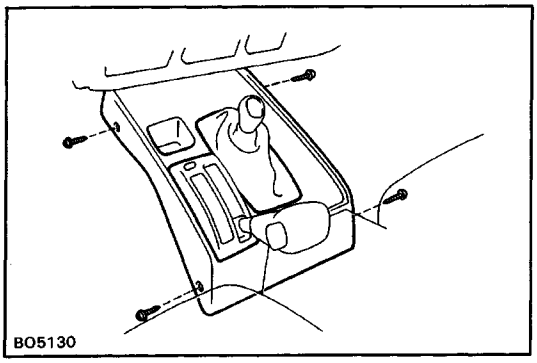
(a) Remove four knobs and the name plate.

(b) Remove four screws and hang the heater control unit.



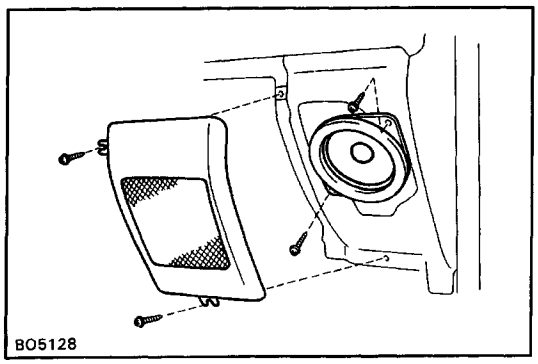
14. REMOVE RADIO

Remove four bolts and the radio then disconnect the connectors.



15. REMOVE FRONT CONSOLE BOX

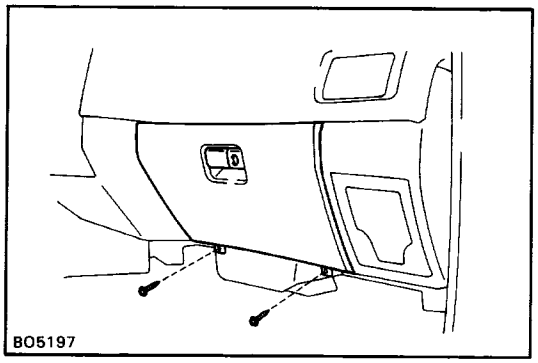
Remove four screws and the console box.



16. REMOVE INSTRUMENT PANEL SPEAKER

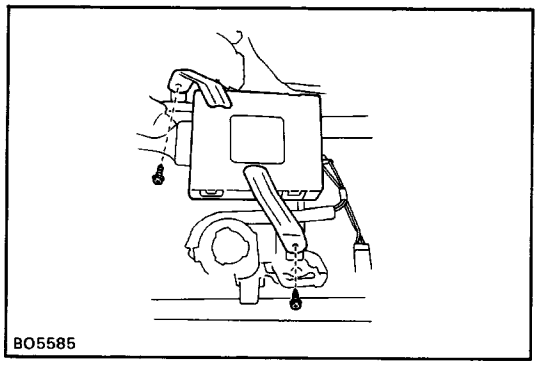
(a) Remove two screws and the speaker No. 1 panel.

(b) Remove two screws and speaker, then disconnect the connector.



17. REMOVE GLOVE COMPARTMENT DOOR

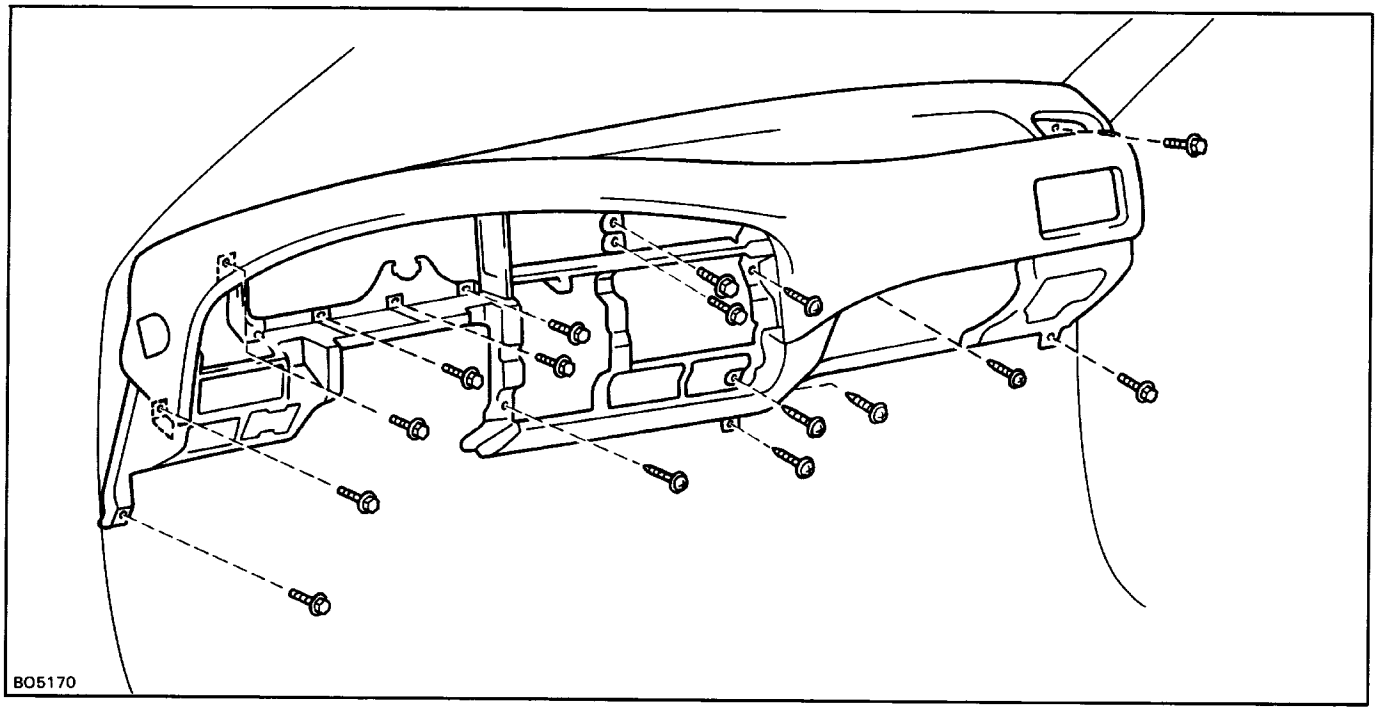
Remove two screws and the compartment door.



18. REMOVE ENGINE ECU

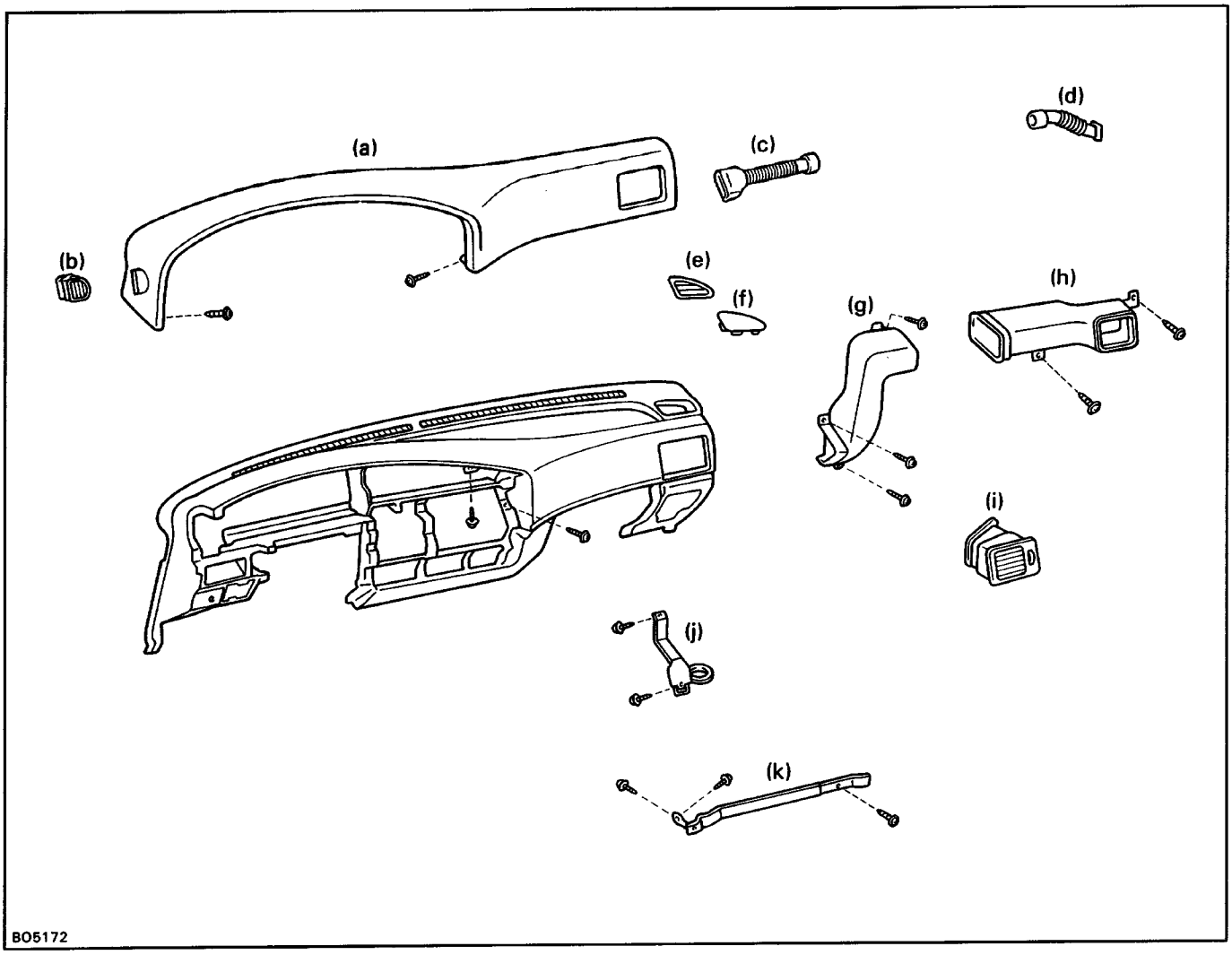
Remove two screws and the ECU, then disconnect the connector.

19. REMOVE INSTRUMENT PANEL



Remove ten bolts, six screws and the instrument panel.

20. REMOVE FOLLOWING PARTS FROM INSTRUMENT PANEL



(a) Safety Pad
(b) Side Defroster No.1 Nozzle
(c) Side Defroster Nozzle No.1 Duct
(d) Side Defroster Nozzle No.2 Duct
(e) Side Defroster No.2 Nozzle
(f) Defroster Nozzle Plate
(g) No.4 Heater Register Duct
(h) No.5 Heater Register Duct
(i) Instrument Panel No.2 Register
(j) Glove Compartment Door Lock Striker Plate
(k) Glove Compartment Door Reinforcement

INSTALLATION OF INSTRUMENT PANEL

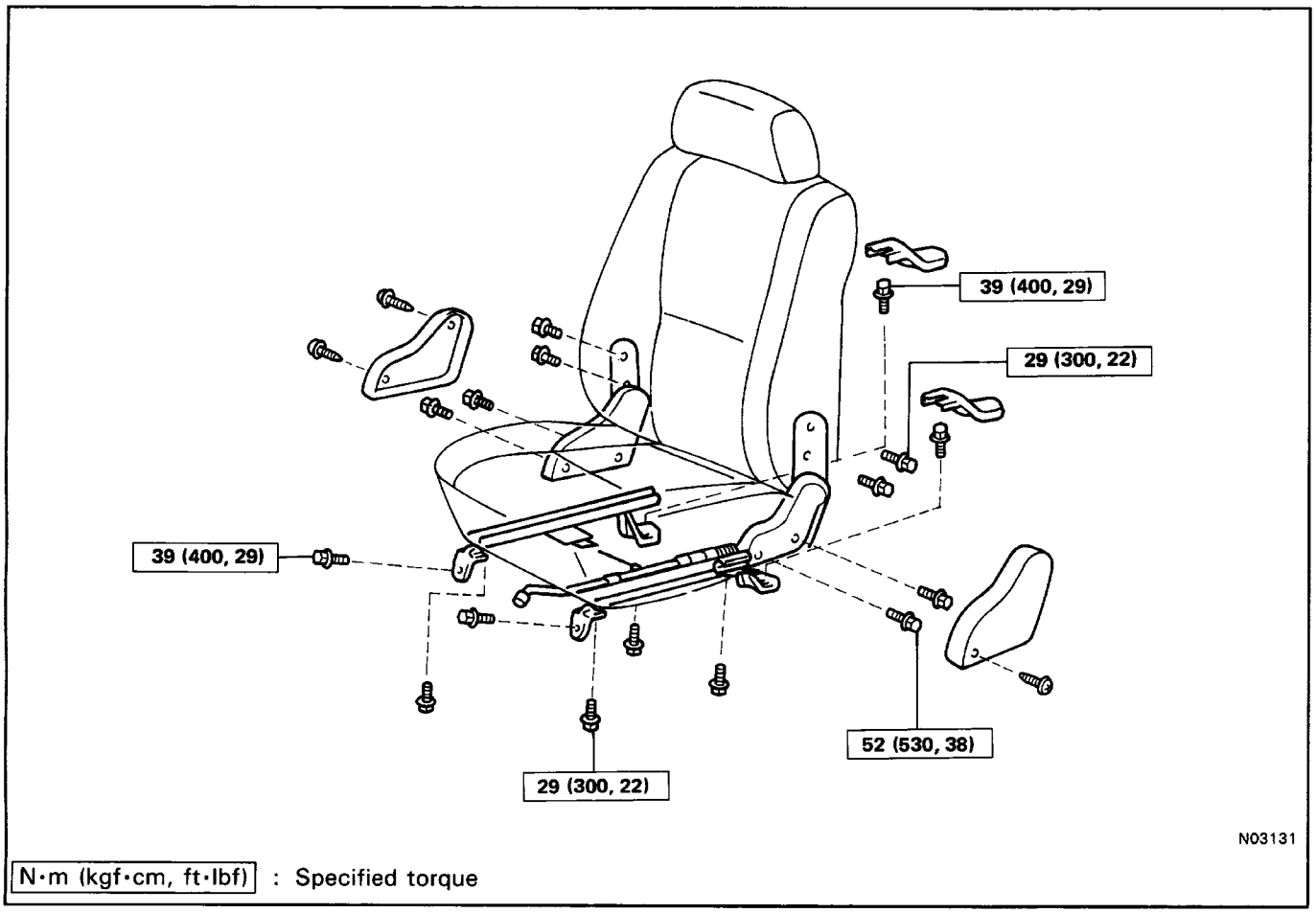
(See page BO–62)

INSTALL INSTRUMENT PANEL PARTS FOLLOWING REMOVAL SEQUENCE IN REVERSE

SEAT

Front Seat

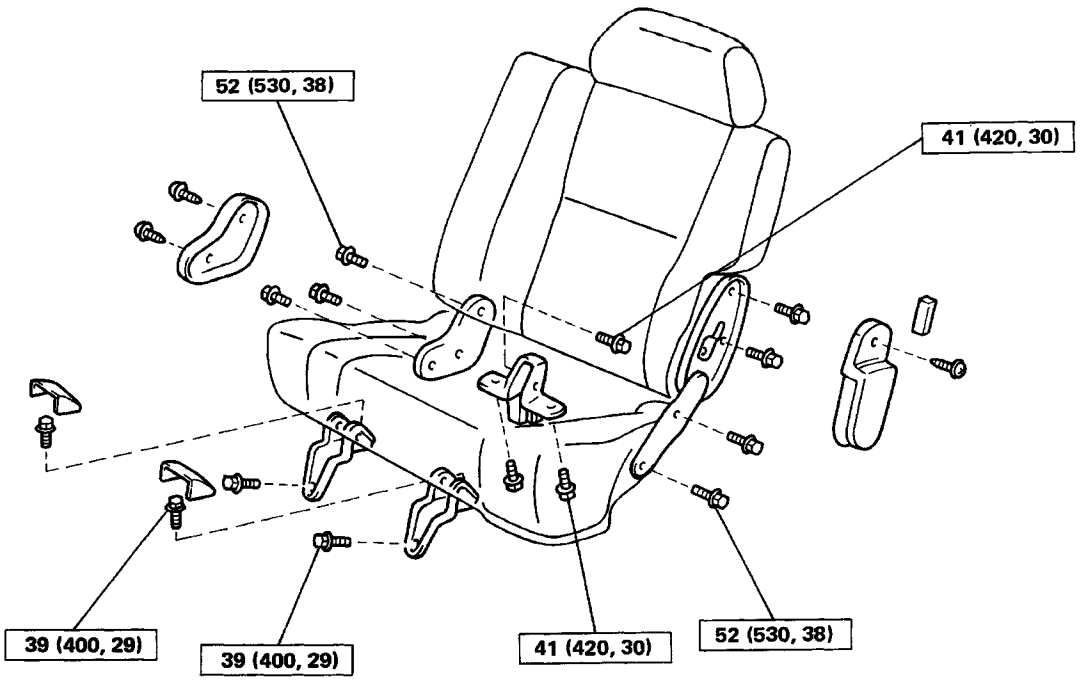
COMPONENTS

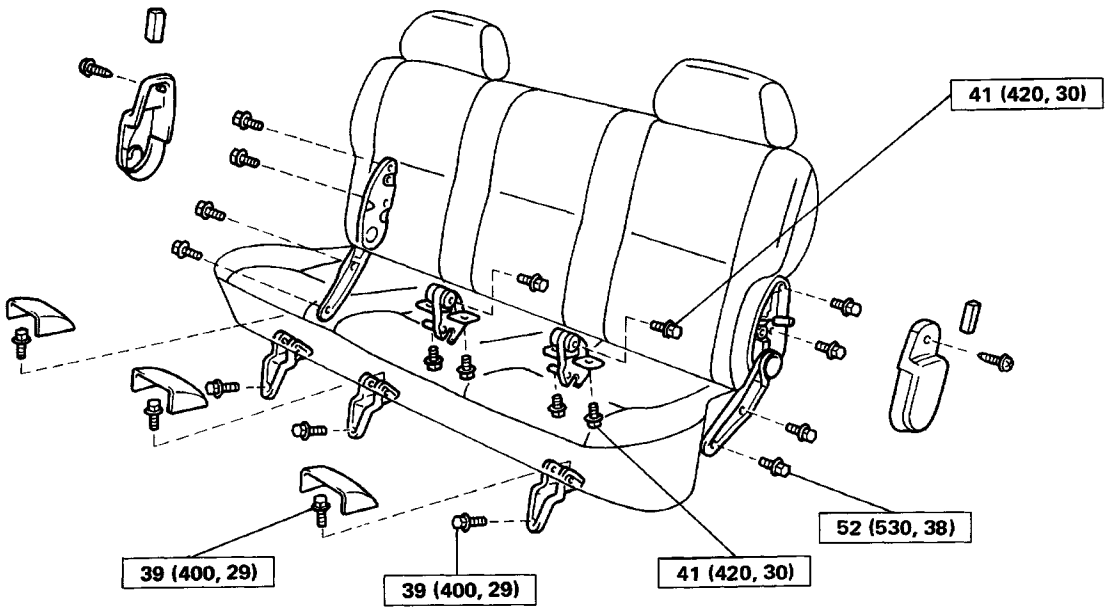


N·m (kgf·cm, ft·lbf) : Specified torque

Second Seat

COMPONENTS



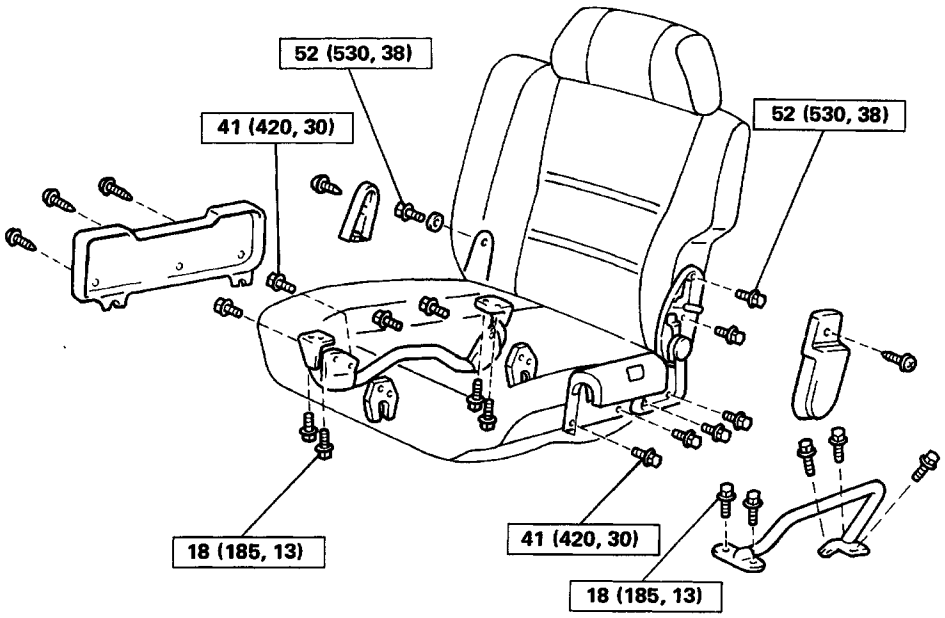


N03132
N03133

N·m (kgf·cm, ft·lbf) : Specified torque

Third Seat

COMPONENTS



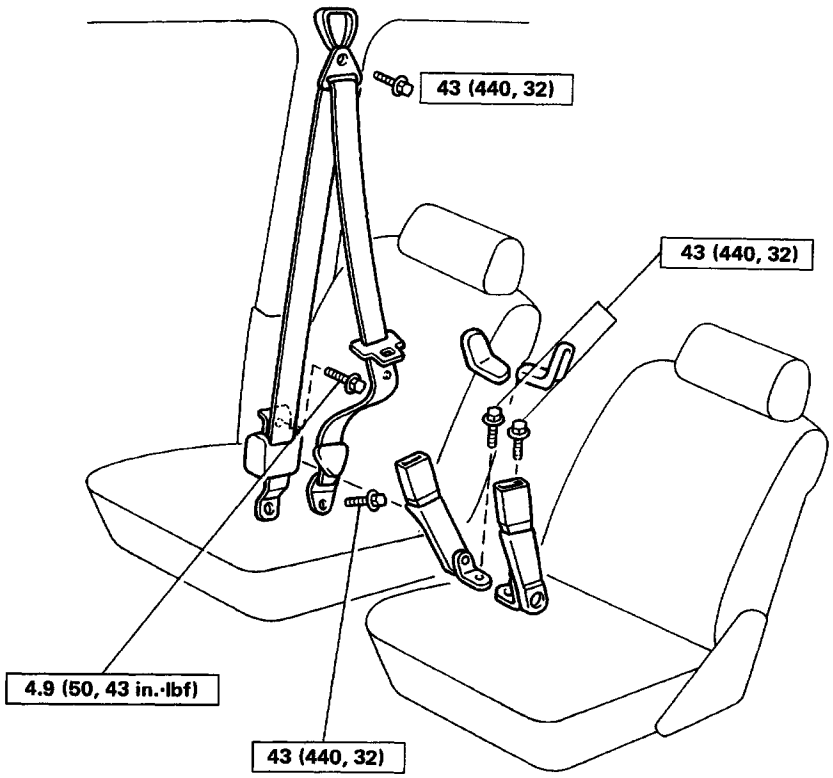
N03134

N·m (kgf·cm, ft·lbf) : Specified torque

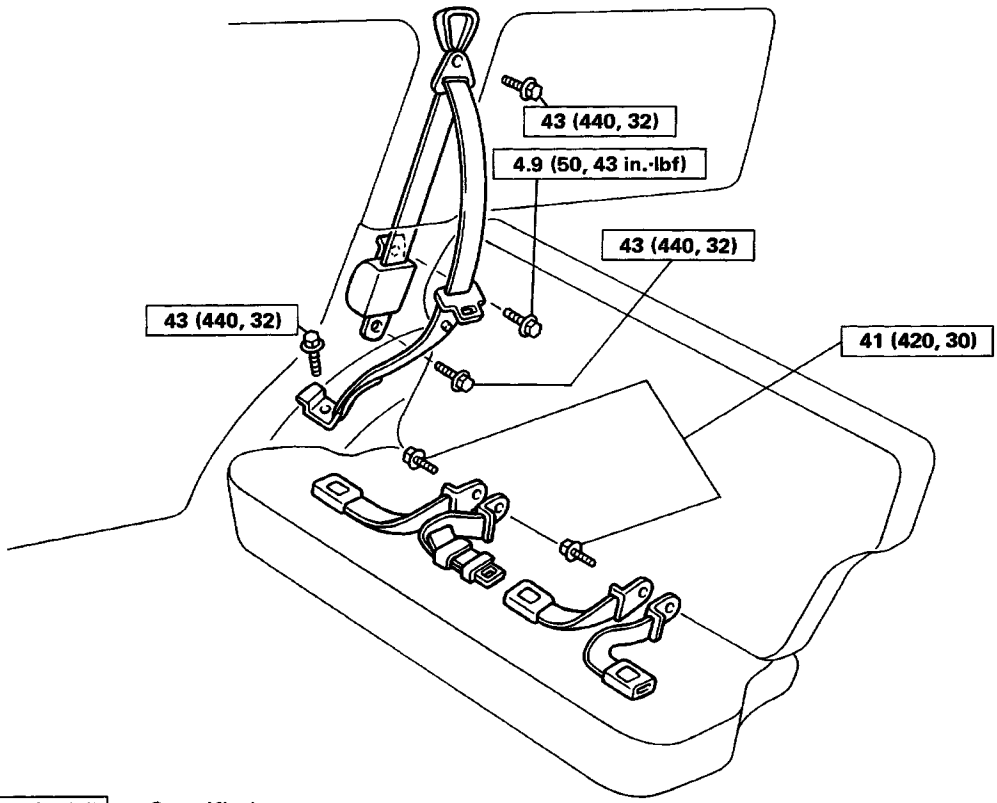
SEAT BELTS

COMPONENTS

Front Seat Belt



Second Seat Belt

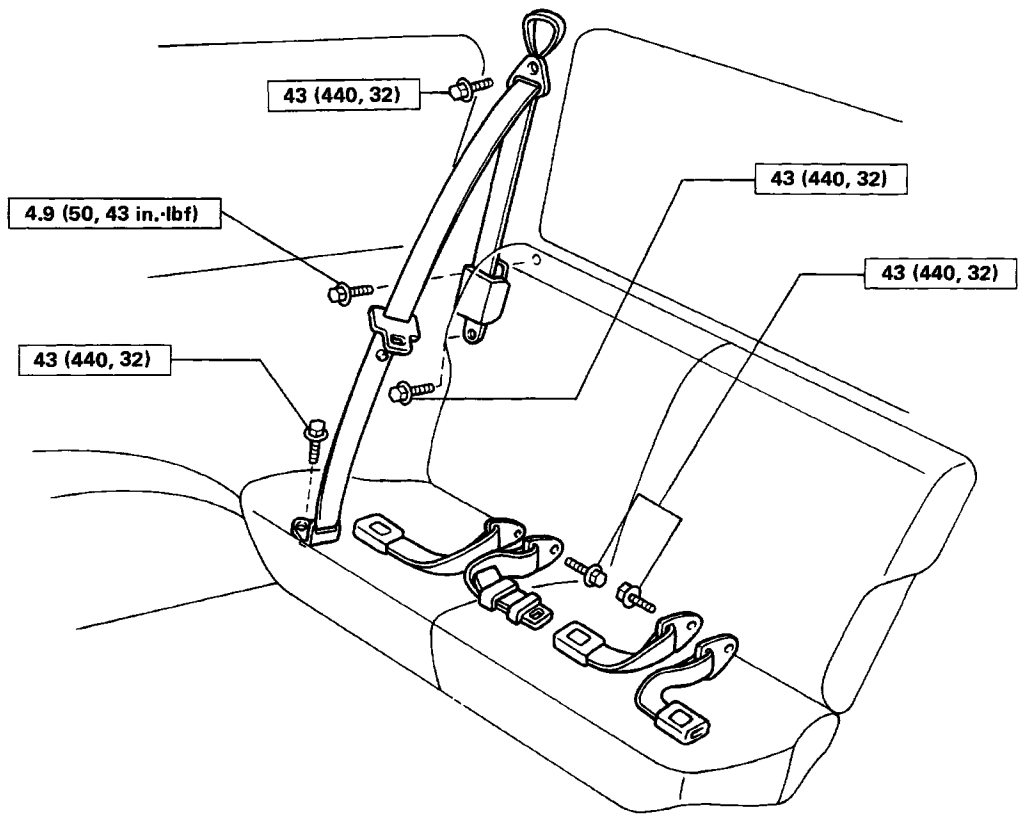


N03129
BO5643

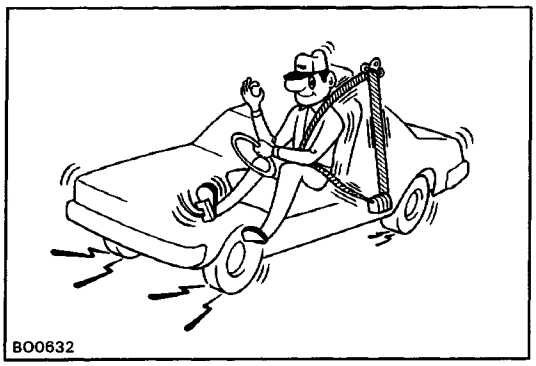
N·m (kgf·cm, ft·lbf) : Specified torque

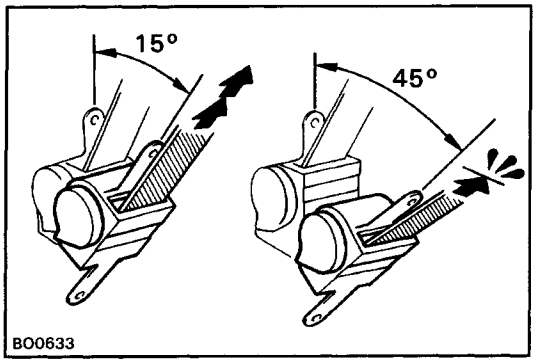
COMPONENTS (Cont'd)

Third Seat Belt

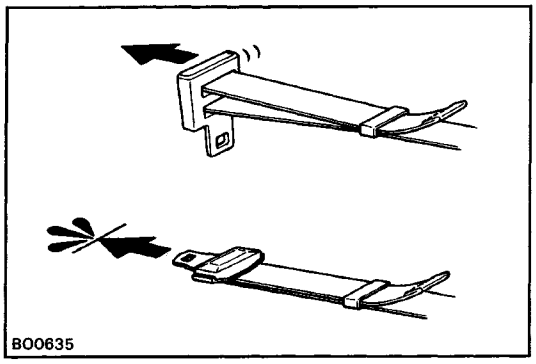


N·m (kgf·cm, ft·lbf) : Specified torque


BO0632



BO0633


BO0635

SEAT BELT

[Emergency Locking Retractor (ELR) Type]

1. RUNNING TEST (IN SAFETY AREA)

(a) Fasten the seat belt.
(b) Drive the car at 10 mph (16 km/h) and make a very hard stop.
(c) Check that the seat belt is locked and cannot be extended at this time.

HINT: Conduct this test in safe area. If the belt does not lock, remove the belt mechanism assembly and conduct the following static check. Also, whenever installing a new belt assembly, verify the proper operation before installation.

2. STATIC TEST

(a) Remove the locking retractor assembly.
(b) Tilt the retractor slowly.
(c) Verify that the belt can be pulled out at a tilt of 15 degrees or less, and cannot be pulled out at over 45 degrees of tilt.

If a problem is found, replace the assembly.

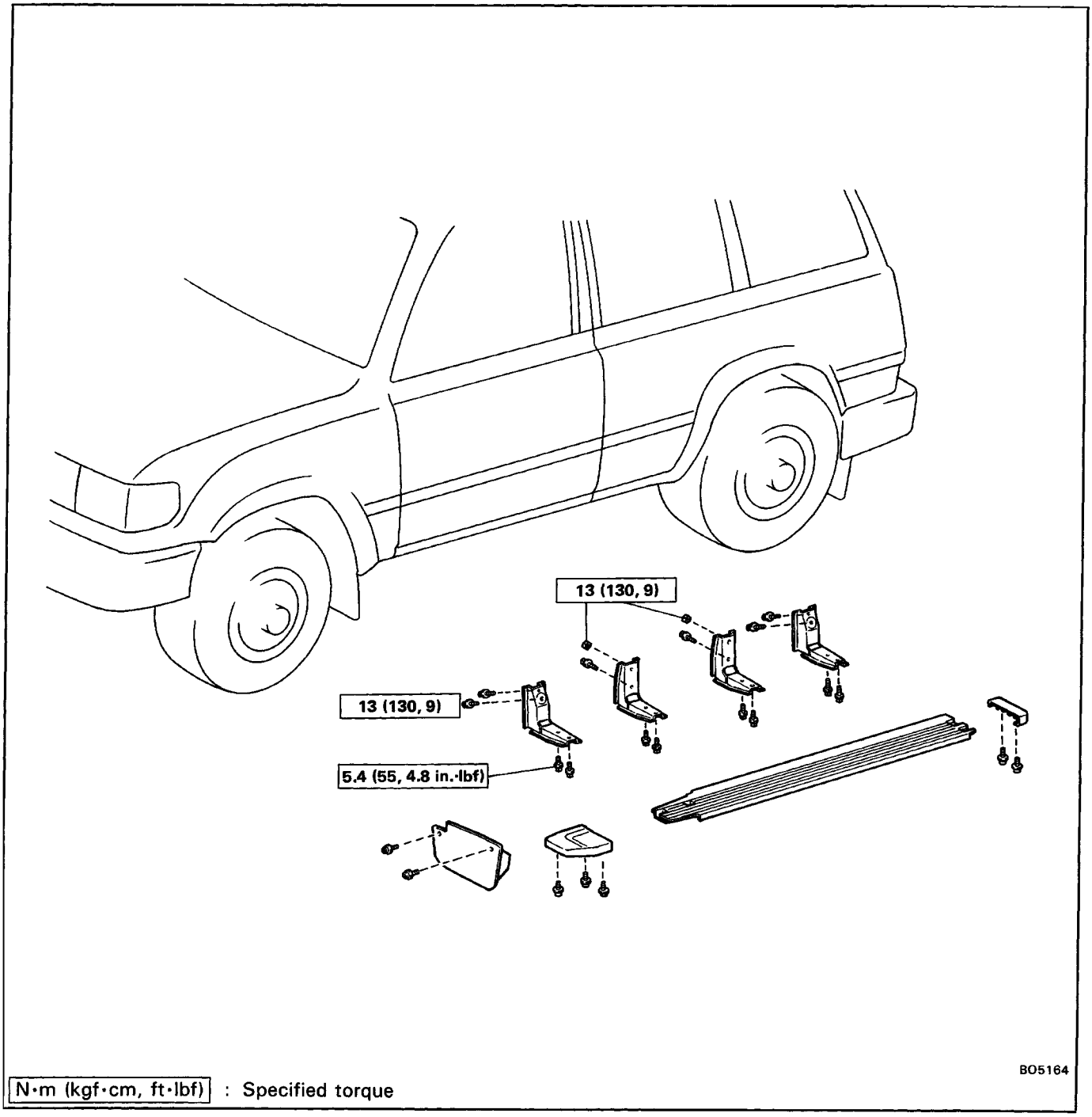
(Manual Type)

TESTING

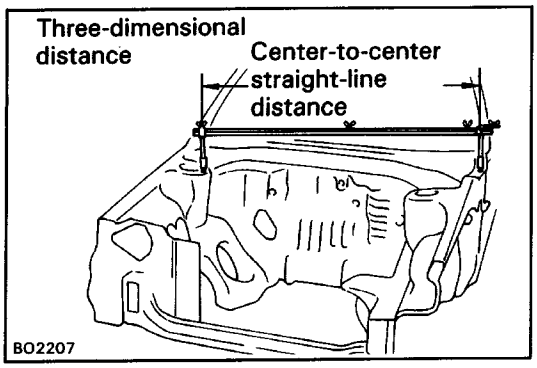
(a) Adjust the belt to the proper length.
(b) Apply a firm load to the belt.
(c) Verify that the belt does not extend.

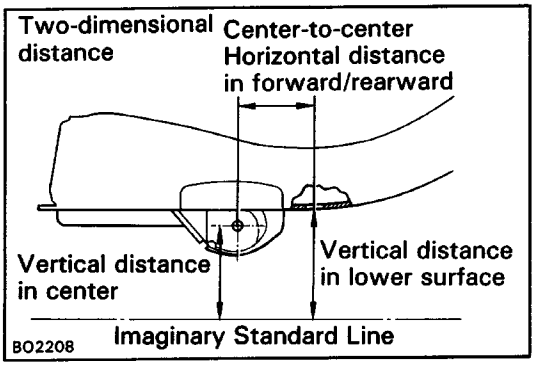
SIDE STEP

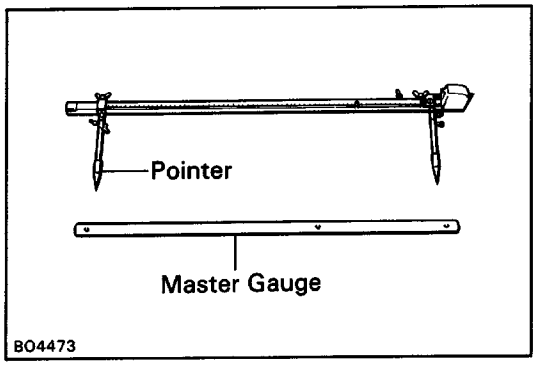
COMPONENTS

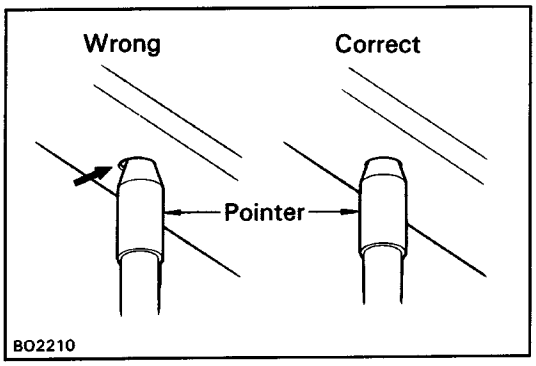


N·m (kgf·cm, ft·lbf) : Specified torque









BODY DIMENSIONS

General Information

1. BASIC DIMENSIONS

(a) There are two types of dimensions in the diagram.
(Three–dimensional distance)

- Straight–line distance between the centers of two measuring points.

(Two–dimensional distance)

- Horizontal distance in forward/rearward between the centers of two measuring points.
- The height from an imaginary standard line.

(b) In cases in which only one dimension is given, left and right are symmetrical.

(c) The dimensions in the following drawing indicate actual distance. Therefore, please use the dimensions as a reference.

2. MEASURING

(a) Basically, all measurements are to be done with a tracking gauge. For portions where it is not possible to use a tracking gauge, a tape measure should be used.

(b) Use only a tracking gauge that has no looseness in the body, measuring plate, or pointers.

HINT:

1. The height of the left and right pointers must be equal.
2. Always calibrate the tracking gauge before measuring or after adjusting the pointer height.
3. Take care not to drop the tracking gauge or otherwise shock it.
4. Confirm that the pointers are securely in the holes.

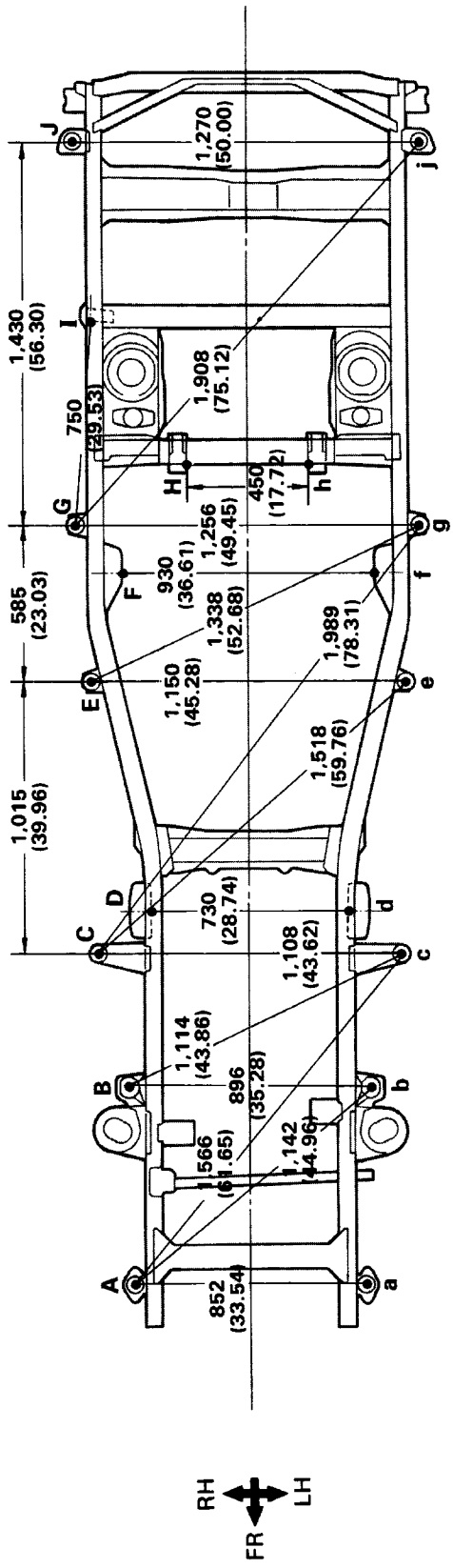
(c) When using a tape measure, avoid twists and bends in the tape.

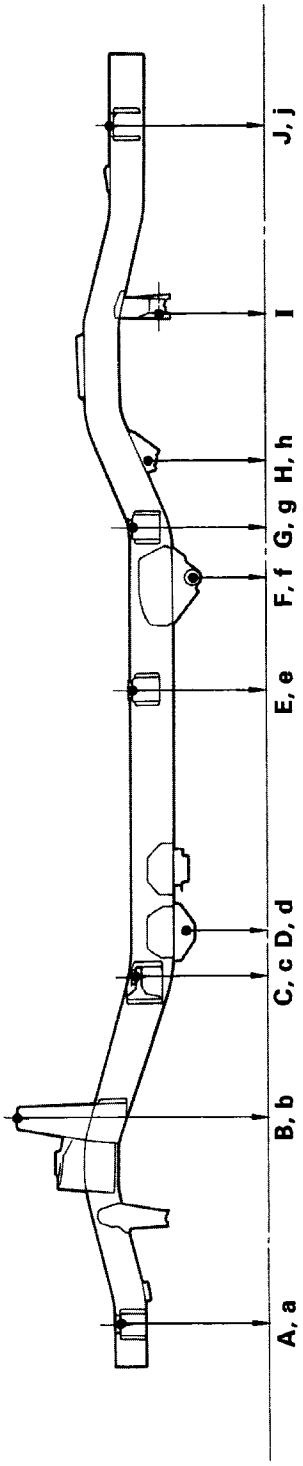
(d) When tracking a diagonal measurement from the front spring support inner hole to the suspension member upper rear installation hole, measure along the front spring support panel surface.

Frame Dimensions

THREE-DIMENSIONAL DISTANCE

mm (in.)



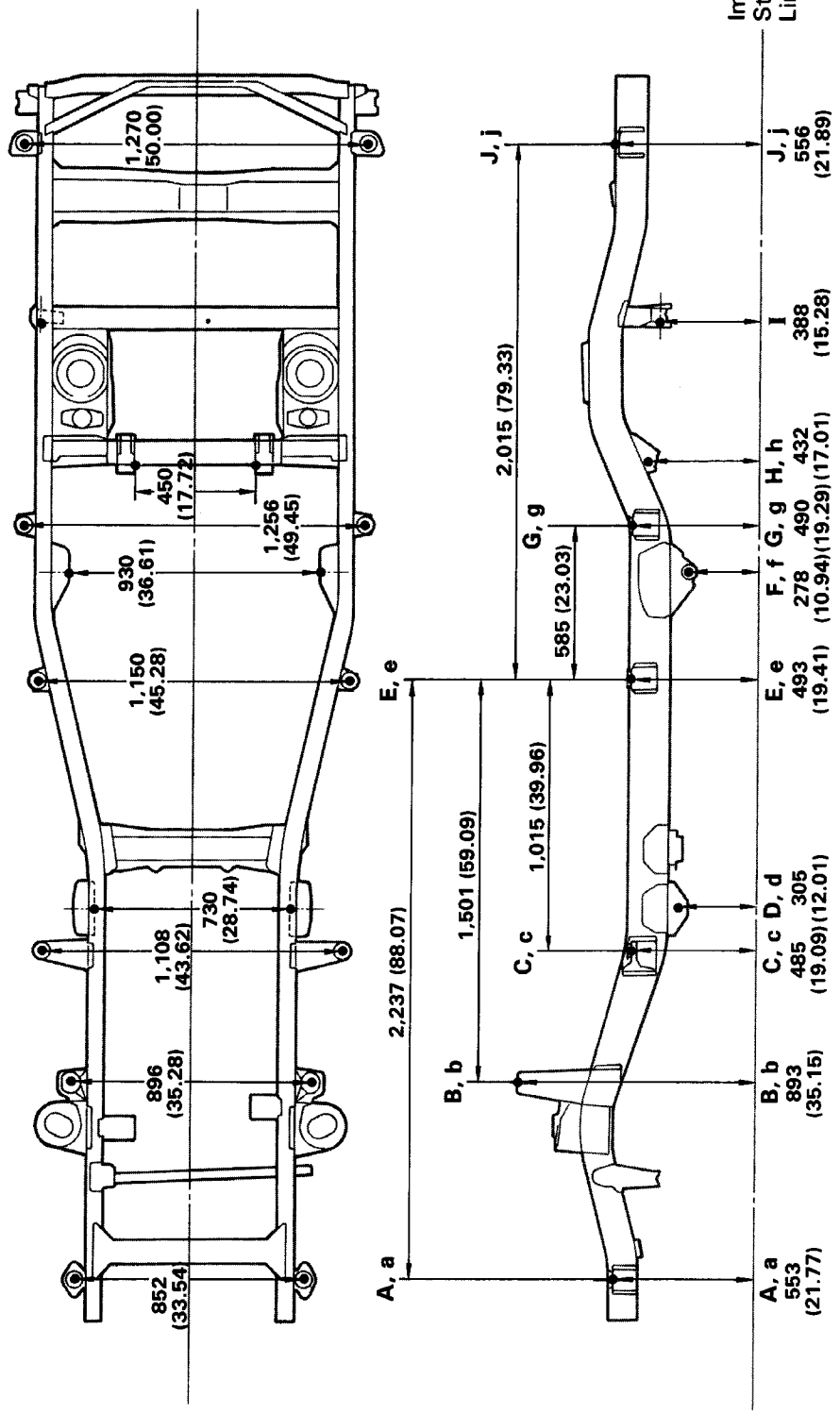


Symbol	Name	Hole dia.
A,a	Body mounting hole	60 (2.36)
B,b	Shock absorber installation hole	24 (0.94)
C,c	Body mounting hole	28 (1.10)
D,d	Leading arm installation hole	18.5 (0.728)
E,e	Body mounting hole	24 (0.94)

Symbol	Name	Hole dia.
F,f	Lower control link installation hole	18.5 (0.73)
G,g	Body mounting hole	24 (0.94)
H,h	Upper control arm installation hole	18.5 (0.728)
I	Lateral control rod installation hole	18.5 (0.73)
J,j	Body mounting hole	60 (2.36)

BO5177

TWO-DIMENSIONAL DISTANCE



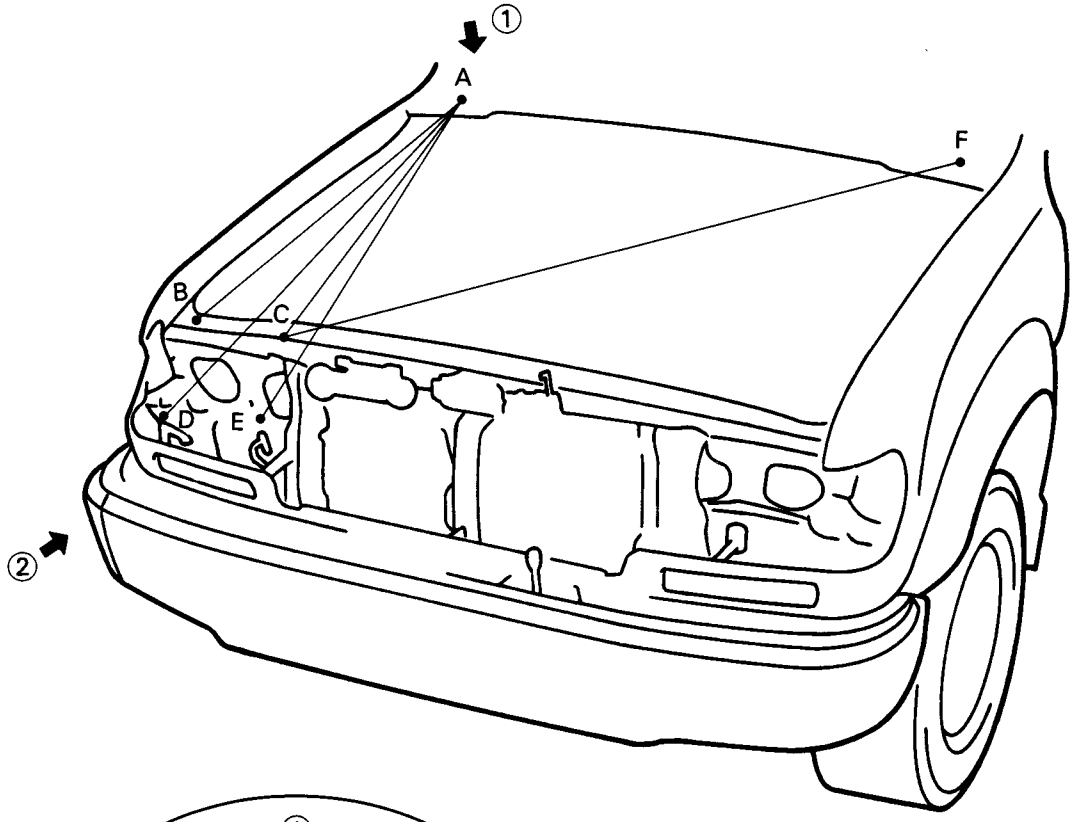
mm (in.)

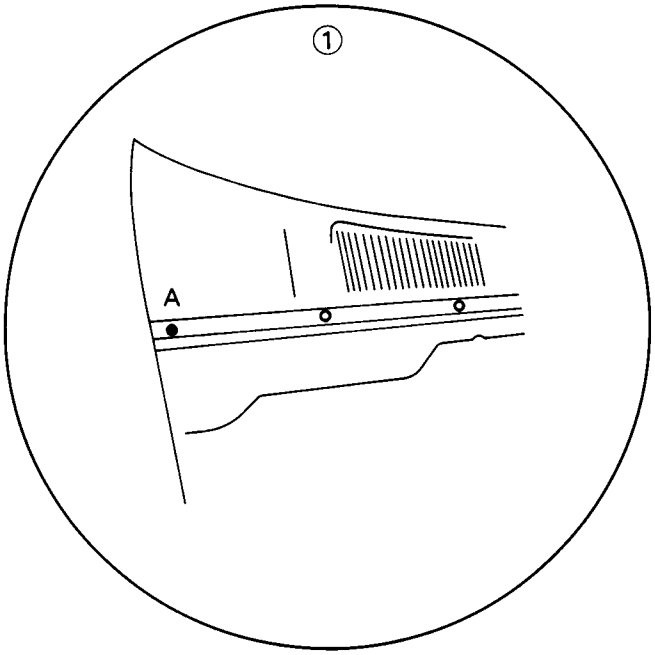
Symbol	Name	Hole dia.
A,a	Body mounting hole	60 (2.36)
B,b	Shock absorber installation hole	24 (0.94)
C,c	Body mounting hole	28 (1.10)
D,d	Leading arm installation hole	18.5 (0.728)
E,e	Body mounting hole	24 (0.94)

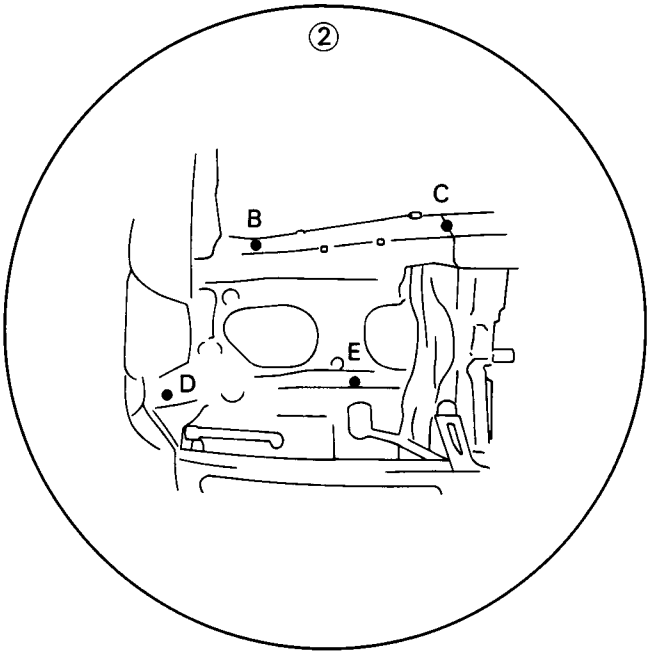
Symbol	Name	Hole dia.
F,f	Lower control link installation hole	18.5 (0.73)
G,g	Body mounting hole	24 (0.94)
H,h	Upper control arm installation hole	18.5 (0.728)
I	Lateral control rod installation hole	18.5 (0.73)
J,j	Body mounting hole	60 (2.36)

BO5177

Engine compartment







Point	Distance mm (in.)
A – B	1,054 (41.50)
A – C	1,075 (42.32)
A – D	1,060 (41.73)
A – E	1,079 (42.48)
C – F	1,567 (61.69)

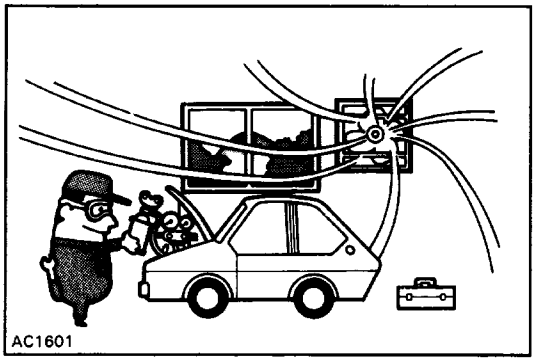
BO5584
BO5591 BO5583

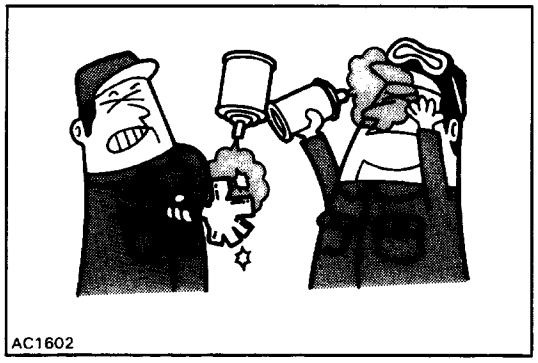
AIR CONDITIONING SYSTEM

GENERAL INFORMATION

ELECTRICAL PARTS

Before removing and inspecting the electrical parts, set the ignition switch to the LOCK position and disconnect the negative (–) terminal cable from the battery.


AC1601


AC1602

REFRIGERATION SYSTEM

1. WHEN HANDLING REFRIGERANT (R–12), FOLLOWING PRECAUTIONS MUST BE OBSERVED;

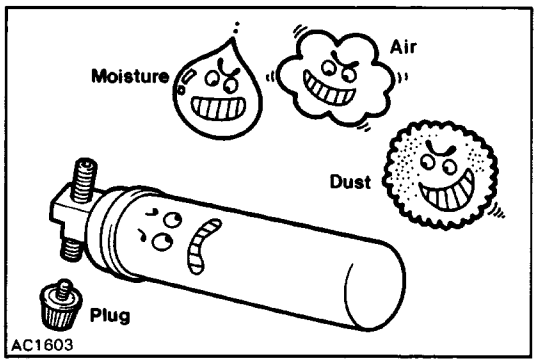
(a) Do not handle refrigerant in an enclosed area or near an open flame.

(b) Always wear eye protection.

(c) Be careful that liquid refrigerant does not get in your eyes or on your skin.

If liquid refrigerant gets in your eyes or on your skin;

- Do not rub.
- Wash the area with lots of cool water.
- Apply clean petroleum jelly to the skin.
- Go immediately to a physician or hospital for professional treatment.
- Do not attempt to treat yourself.



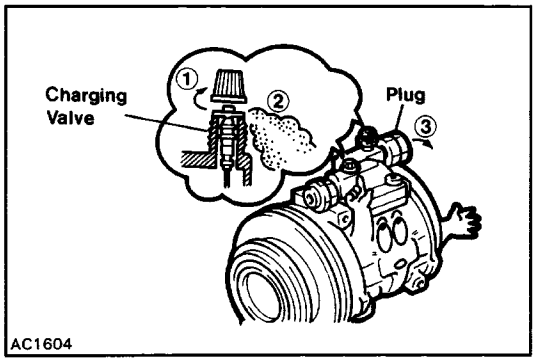
AC1603

2. WHEN REPLACING PARTS IN REFRIGERANT LINE;

(a) Discharge the refrigerant in the line slowly before replacement.

(b) Insert a plug immediately in disconnected parts to prevent the entry of moisture and dust.

(c) Do not leave a new condenser or receiver, etc., lying around with the plug removed.



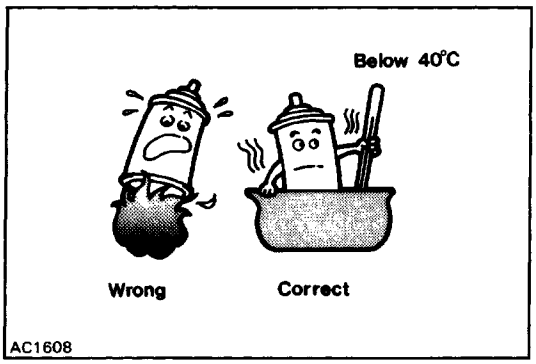
AC1604

(d) Discharge the refrigerant from the charging valve before installing a new compressor.

If the refrigerant is not discharged first, compressor oil will spray out with the refrigerant gas when the plug is removed.

(e) Do not use a torch for tube bending or lengthening operations.

If tubes are heated with a torch, a layer of oxidation forms inside the tube, causing the same kind of trouble as an accumulation of dust.



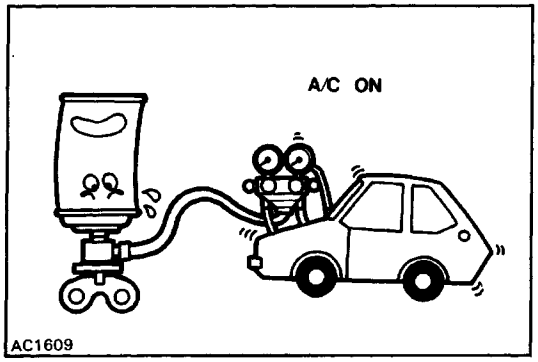
3. WHEN HANDLING REFRIGERANT CONTAINER (SERVICE CAN);

(a) The container must never be heated.

(b) Containers must be kept below 40°C (104°F)

(c) If warming a service can with hot water, be careful that the valve on top of the service can is never immersed in the water, as the water may permeate the refrigerant cycle.

(d) Empty service cans must never be re–used.



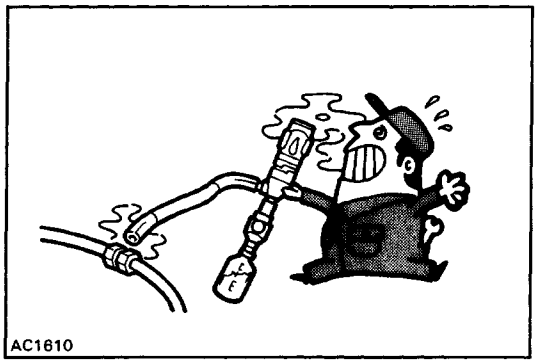
4. WHEN A/C IS ON AND REFRIGERANT GAS IS BEING REPLENISHED;

(a) If there is not enough refrigerant gas in the refrigerant cycle, oil lubrication will be insufficient and compressor burnout may occur, so take care to avoid this.

(b) If the valve on the high pressure side is opened, refrigerant flows in the reverse direction and could cause the service can to rupture, so open and close the valve on the low pressure side only.

(c) If the service can is inverted and refrigerant is loaded in a liquid state, the liquid is compressed and causes the compressor to break down, so the refrigerant must be in a gaseous state.

(d) Be careful not to load too much refrigerant gas, as this causes trouble such as inadequate cooling, poor fuel economy, engine overheating, etc.



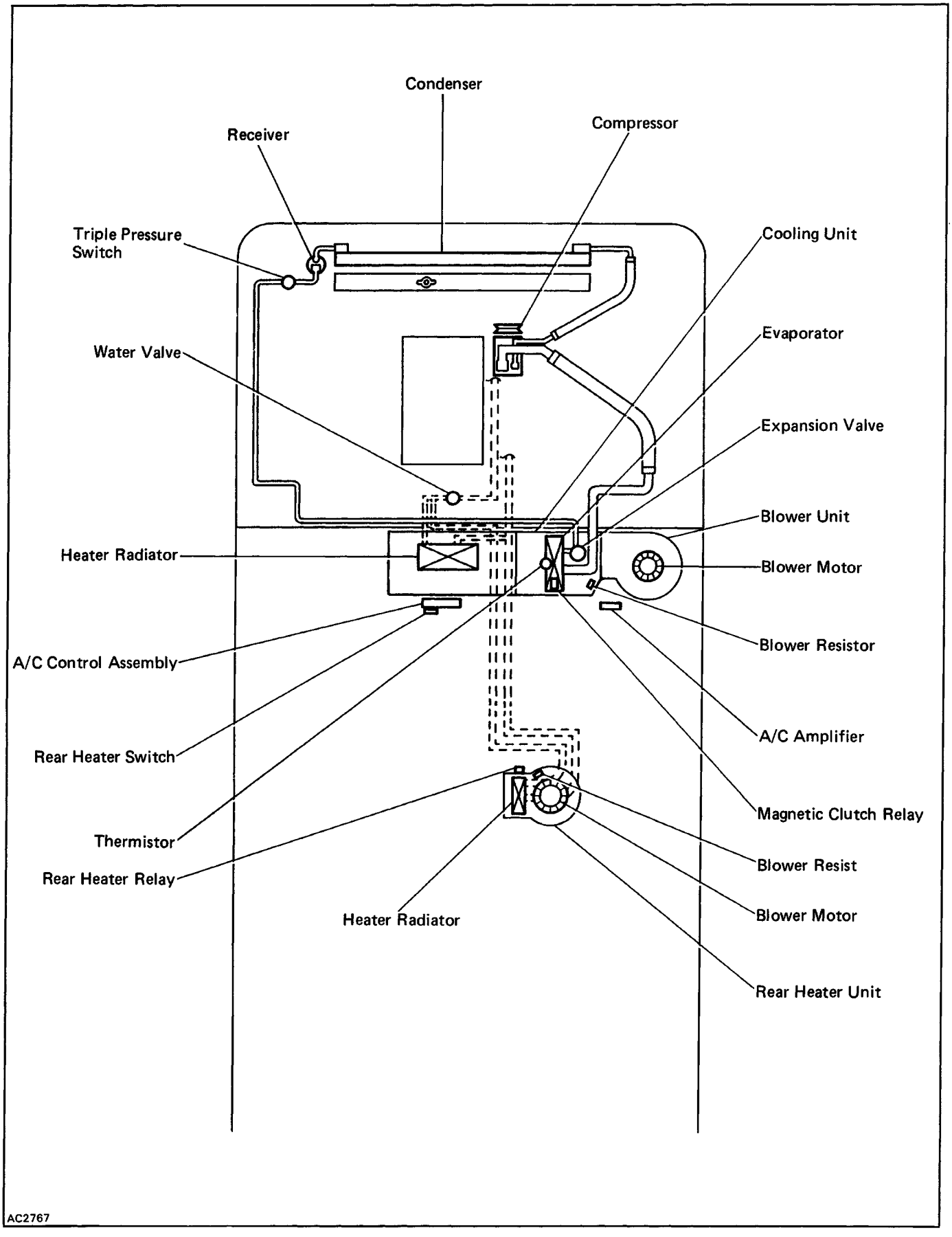
5. WHEN USING GAS–CYLINDER TYPE GAS LEAK TESTER;

(a) As a naked flame is used, first make sure that there are no flammable substances nearby before using it.

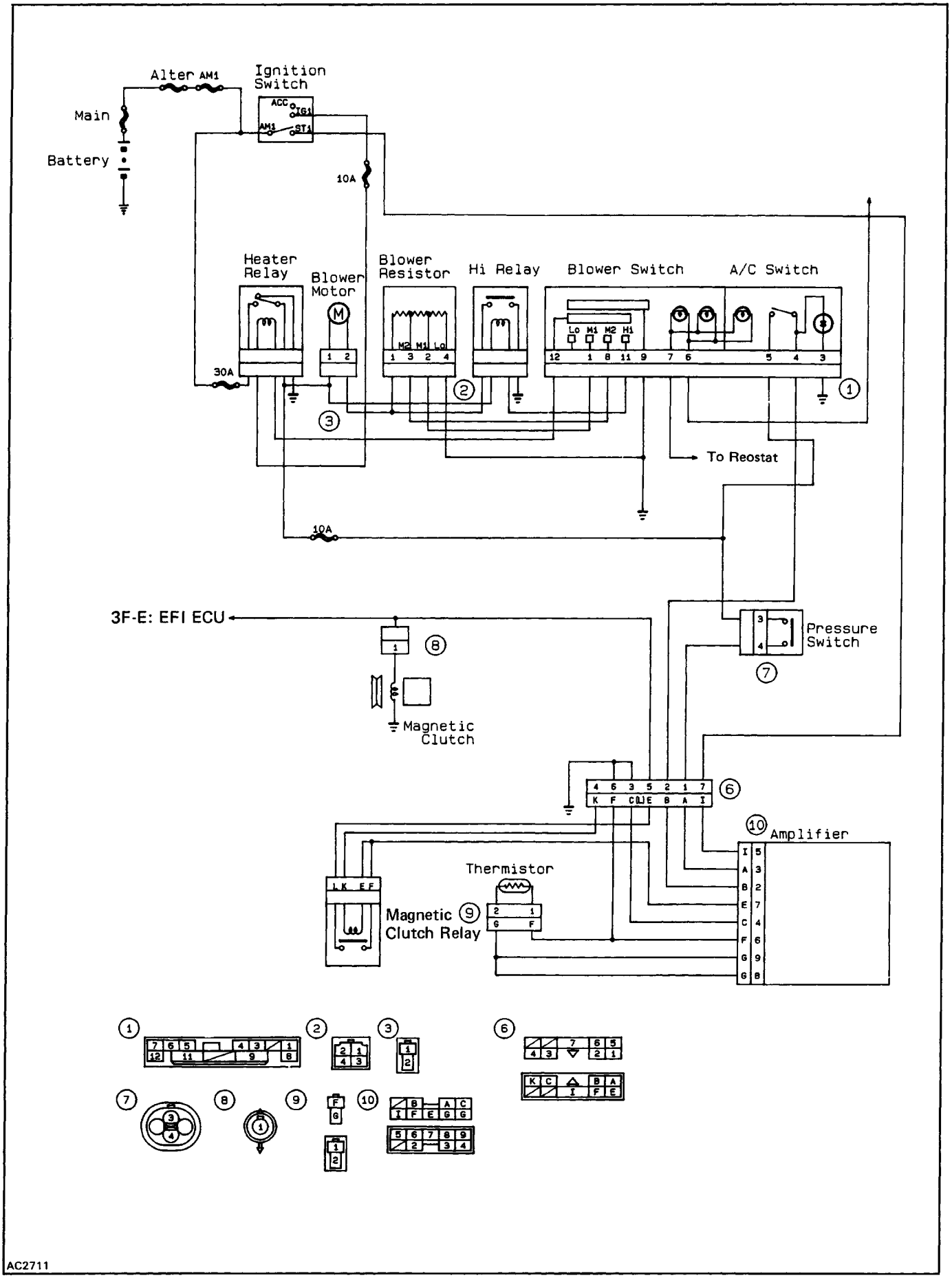
(b) Be careful, as a poisonous gas is produced when refrigerant gas comes in contact with heated parts.

DESCRIPTION

PARTS LOCATION

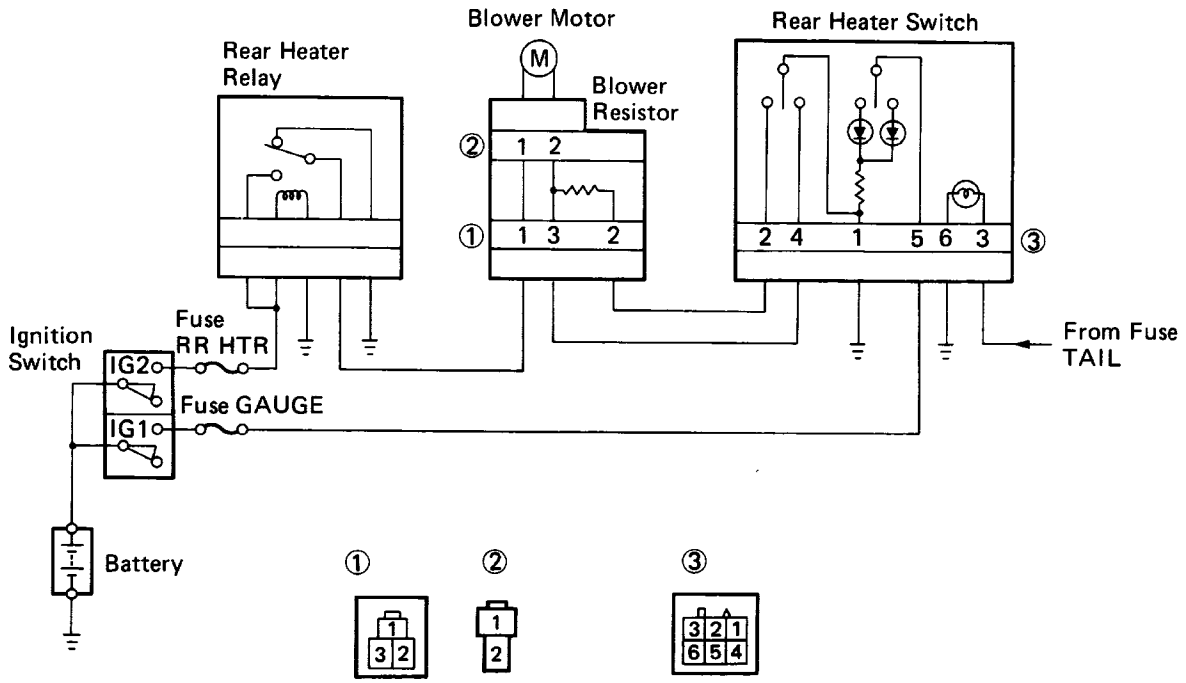


ELECTRICAL WIRING DIAGRAM



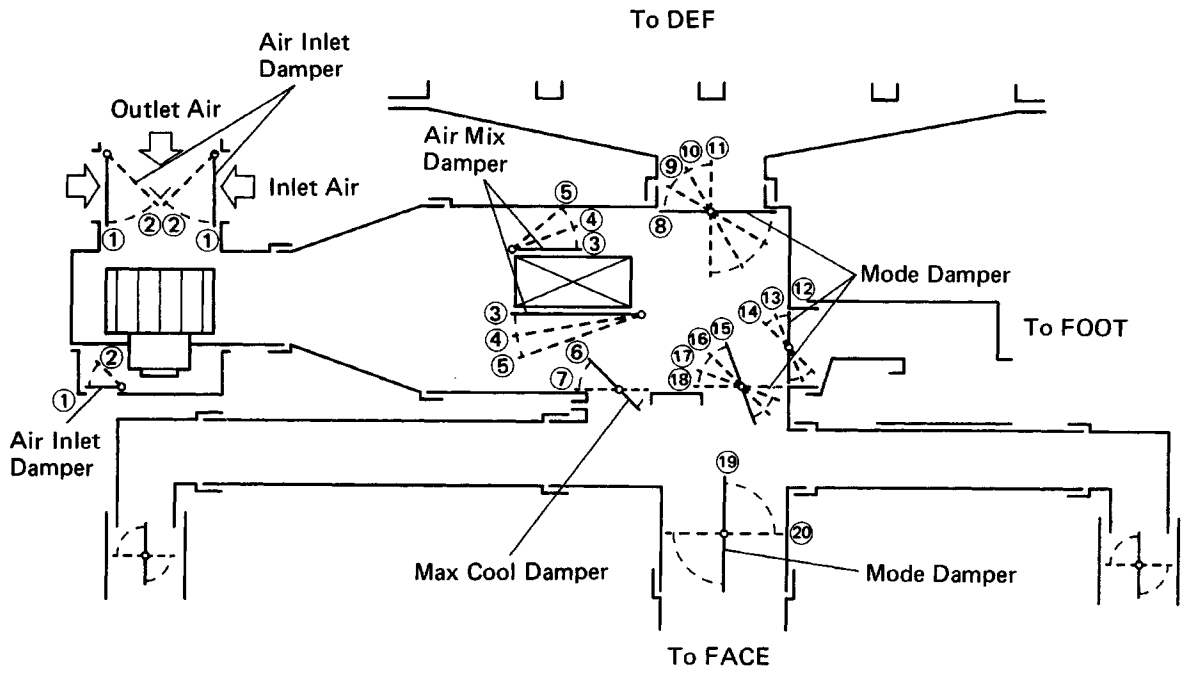
AC2711

REAR HEATER



AC2661

DAMPERS POSITION



A/C control lever	A/C control lever position	Dampers position	Air flow vents			
			FACE		FOOT	DEF
			Center	Side		
Air Inlet Control Lever	Fresh	①				
	Recirc	②				
Temperature Control Lever	Warm ⇕ Cool	⑤ ⇕ ④ ⑦ ⇕ ⇕ ③ ⑥				
Mode Control Lever	Def.	⑪ ⑫ ⑰ ⑳		○		◯
	Foot/Def.	⑩ ⑰ ⑳ ⑬		○	○	○
	Foot	⑨ ⑬ ⑰ ⑳		○	◯	○
	Bi-Level	⑧ ⑬ ⑯ ⑲	○	○	○	
	Face	⑧ ⑫ ⑮ ⑲	◯	◯		

The size of circle (O) indicates the proportion of the air flow volume.

TROUBLESHOOTING

You will find the cause of trouble more easily by properly using the table shown below. In this table, the numbers indicate the order of priority of the causes of trouble. Check each part in the order shown. If nec–essary, replace the part.

See page / Parts Name / Trouble	Inspect volume of refrigerant (AC–13)	Inspect refrigeration system with manifold gauge set (AC–11)	Inspect drive belt tension (AC–15)	Fusible link (AC–5)	Circuit breaker (AC–5)	Fuse (AC–5)	Triple pressure switch (AC–35)	Thermistor (AC–30)	Heater relay (AC–36)	Magnetic clutch relay (AC–37)	Blower resistor (AC–36)	Blower motor (AC–35)	A/C control assembly (AC–32)	A/C amplifier (AC–37)	Compressor (AC–17)
No blower operation				1	2				3		6	5	4		
No blower control											2		1		
No air flow mode control													1		
No air inlet control													1		
Insufficient flow of cool air									1		3	2			
Insufficient flow of warm air									1		3	2			
No cool air comes out	3	4	5			1	6	12		2			10	11	8
Cool air comes out intermittently	1	2	3					5						4	
Cool air comes out only at high engine speed	2	3	1												5
Insufficient cooling	1	2	3					10						9	8
No warm air comes out													2		
Air temp. control not functioning													2		

Condenser	Evaporator	Expansion valve	Magnetic clutch	Receiver	Water valve	Heater radiator	Wiring or wiring connection
AC–25	AC–29	AC–30	AC–17	AC–24	AC–34	–	AC–5
							7
							3
	4						5
						4	5
			7		9		13
		6					7
4							
4	11	12	7	5	6		
					1		
					1		3

PREPARATION

SPECIAL TOOLS AND EQUIPMENT

Tool	SST No.	Use
Ohmmeter	—	To diagnosis electrical system
Voltage meter	—	To diagnosis electrical system
Air conditioner service tool set	07110–58011	To evacuate and charge system
Hexagon wrench set	07110–61050	To remove service valve and front housing
Magnetic clutch remover	07112–66040	To remove pressure plate
Magnetic clutch stopper	07112–76060	To remove pressure plate
Snap ring pliers	07114–84020	To remove magnetic clutch

SSM (SPECIAL SERVICE MATERIALS)

Part Name	Part No.	Use etc.
ND OIL6, SUNISO No.5GS or equivalent	07117–68040 —	Compressor

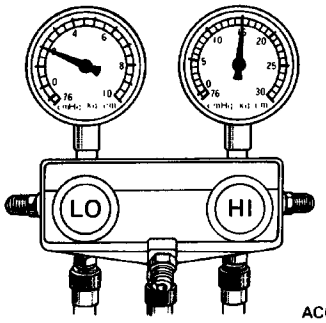
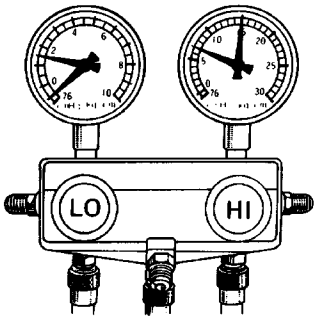
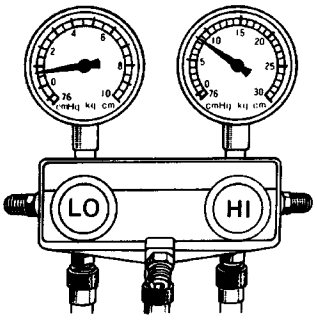
REFRIGERATION SYSTEM

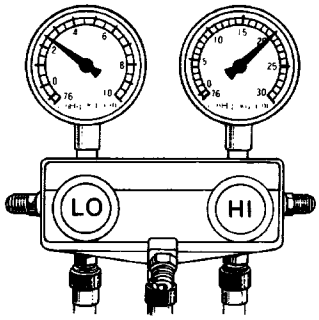
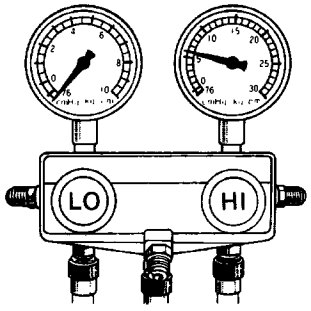
INSPECTION OF REFRIGERATION SYSTEM WITH MANIFOLD GAUGE SET

This is a method in which the trouble is located by using a manifold gauge set. (See "Installation of Manifold Set" on page AC–14.) Read the manifold gauge pressure when the following conditions are established:

(a) Temperature at the air inlet with the switch set at RECIRC is 30 – 35˚C (86 – 95˚F)
(b) Engine running at 2,000 rpm
(e) Blower fan speed control switch set at high speed
(d) Temperature control switch set at max cool side

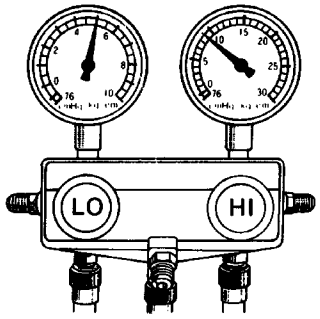
HINT: It should be noted that the gauge indications may vary slightly due to ambient temperature conditions.

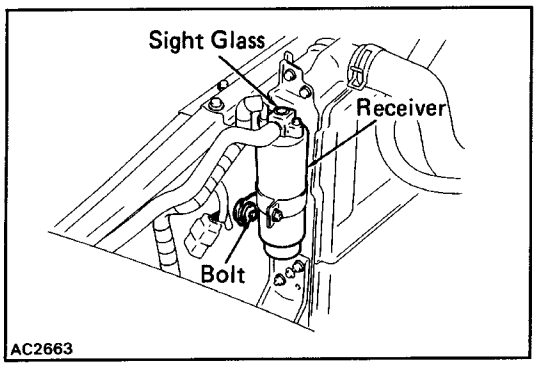
No.	Gauge reading kPa (kgf/cm^2, psi)	Condition	Probable cause	Remedy
1	LO: 147 – 196 (1.5 – 2.0, 21 – 28) HI: 1,422 – 1,471 (14.5 – 15.0, 206 – 213)  AC0067	Normal cooling	Normally functioning system	
2	During operation, pressure at low pressure side sometimes becomes a vacuum and sometimes normal  AC0068	Periodically cools and then fails to cool	Moisture present in refrigeration system	(1) Replace receiver (2) Remove moisture in system through repeatedly evacuating air (3) Charge with refrigerant to proper amount
3	Pressure low at both low and high pressure sides  AC0069	• Insufficient cooling • Bubbles seen in sight glass	Insufficient refrigerant	(1) Using gas leak tester, check for leakage (2) Charge refrigerant to proper amount
		• Insufficient cooling • Frost on tubes from receiver to unit	Refrigerant flow obstructed by dirt in receiver	Replace receiver

No.	Gauge reading kPa (kgf/cm^2, psi)	Condition	Probable cause	Remedy
4	Pressure too high at both low and high pressure side  AC0070	Insufficient cooling	Insufficient cooling of condenser	(1) Clean condenser (2) Check fan motor operation
5			Refrigerant over charged	Check amount of re–frigerant HINT: Vent out refrig–erant throuh gauge manifold low pressure side by gradually open–ing valve
6			Air present in system	(1) Replace receiver (2) Check compressor oil to see if dirty or insufficient (3) Evacuate air and charge with new refrigerant
7		• Insufficient cooling • Frost or large amount of dew on piping at low pres–sure side	Expansion valve im–properly mounted, heat sensing tube defective (Opens too wide)	(1) Check heat sens–ing tube installa–tion condition (2) If (1) is normal, check expansion valve (3) Replace if defec–tive
8	Vacuum indicated at low pressure side, very low pressure indicated at high pressure  AC0156	• Does not cool (Cools from time to time in some cases) • Frost or dew seen on piping before and after receiver or ex–pansion valve	Refrigerant does not circulate	Alow to stand for some time and then restart operation to de–termine if trouble is caused by moisture or dirt If caused by moisture refer to procedures step 2 on page AC–11 If caused by dirt, re–move expansion valve and clean off dirt by blowing with air. If not able to remove dirt, replace valve Evacuate air and charge with new refrig–erant to proper amount For gas leakage from heat sensing tube, re–place expansion valve

HINT at No.6

These gauge indications are shown when the refrigeration system has been opened and the refrigerant charged without evacuating air.

No.	Gauge reading kPa (kgf/cm^2, psi)	Condition	Probable cause	Remedy
9	Pressure too high at low pressure side, pressure too low at high pressure side  AC0157	Does not cool	Insufficient compres–sion	Repair or replace com–pressor



AC2663

INSPECTION OF REFRIGERANT VOLUME

1. RUN ENGINE AT APPROX. 1,500 RPM

2. OPERATE A/C AT MAXIMUM COOLING FOR A FEW MINUTES

3. INSPECT AMOUNT OF REFRIGERANT

Observe the sight glass on the liquid tube.

Item	Symptom	Amount of refrigerant	Remedy
1	Bubbles present in sight glass	Insufficient *	Check for gas leakage with gas leak tester
2	No bubbles present in sight glass	None, sufficient or too much	Refer to items 3 and 4
3	No temperature difference be–tween compressor inlet and out–let	Empty or nearly empty	Evacuate and charge system. Then check for gas leakage with gas leak tester
4	Temperature between compres–sor inlet and outlet is noticeably different	Proper or too much	Refer to items 5 and 6
5	Immediately after air conditioner is turned off, refrigerant in sight glass stays clear	Too much	Discharge excess refrigerant to specified amount
6	When air conditioner is turned off, refrigerant foams and then stays clear	Proper	Refer to items 3 and 4

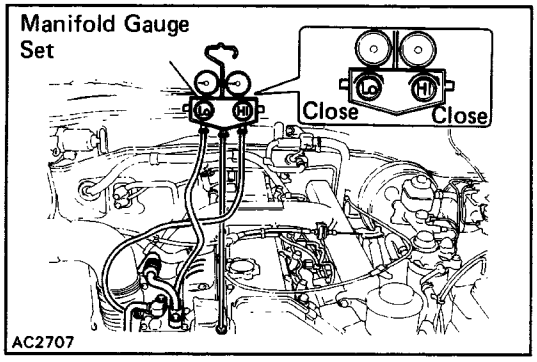
Bubbles in the sight glass with ambient temperatures higher can be considered normal if cooling is sufficient.

DISCHARGING OF REFRIGERANT IN REFRIGERATION SYSTEM

(See Air Conditioning Fundamentals and Repairs Pub. No. 36950E)

EVACUATING OF AIR IN REFRIGERATION SYSTEM AND CHARGING WITH REFRIGERANT

(See Air Conditioning Fundamentals and Repairs Pub. No. 36950E)



INSTALLATION OF MANIFOLD GAUGE SET

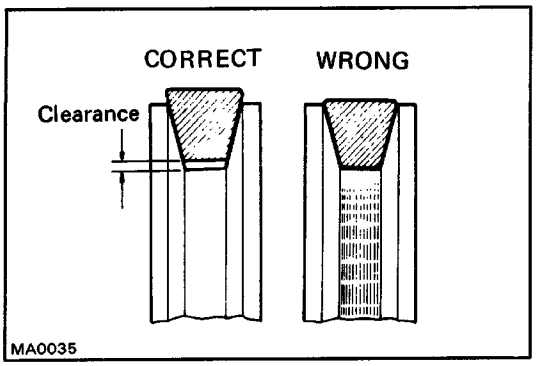
1. CLOSE BOTH HIGH AND LOW HAND VALVES

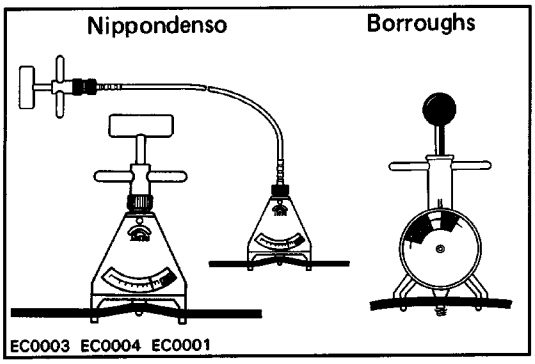
2. CONNECT CHARGING HOSES TO CHARGING VALVES

(a) Connect the low pressure hose to the low pressure charging valve and the high pressure hose to the high pressure charging valve.

(b) Tighten the hose nuts by hand.

NOTICE: Do not apply compressor oil to the seats of the connection.





DRIVE BELT

INSPECTION OF DRIVE BELT TENSION

1. MAKE SURE THAT DRIVE BELT IS INSTALLED CORRECTLY

Visually check the belt for cracks, oiliness or wear.
Check that the belt does not touch the bottom of the pul–ley groove.

2. INSPECT DRIVE BELT TENSION

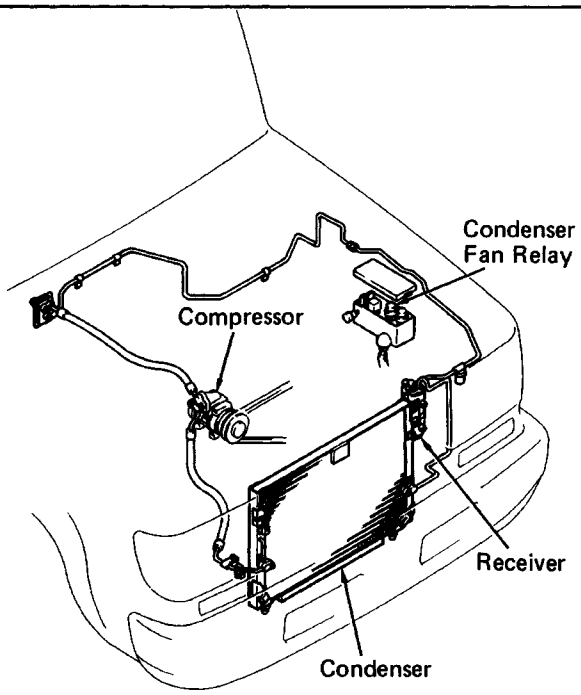
Using a belt tension gauge, check the drive belt tension.
Belt tension gauge:
Nippondenso BTG–20 (95506–00020) or
Borroughs No.BT–33–73F

Drive belt tension:
New belt 100 – 150 lbf
Used belt 60 – 100 lbf

NOTE:

- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves.

REFRIGERATION LINES TIGHTENING



AC2665

Specified Torque: N·m (kgf·cm, ft·lbf)

0.31 in. Tube		14 (140, 10)
0.50 in. Tube		23 (230, 17)
0.62 in. Tube		32 (330, 24)
Bolted Type	For Compressor	25 (250, 18)
	For Condenser	13 (130, 9)
	For Receiver	5.4 (55, 48 in.·lbf)

ON–VEHICLE INSPECTION

1. INSPECT HOSE AND TUBE CONNECTIONS FOR LOOSENESS

2. INSPECT HOSES AND TUBES FOR LEAKAGE

Using a gas leak tester, check for leakage of refrigerant.

REPLACEMENT OF REFRIGERANT LINES

1. DISCHARGE REFRIGERANT IN REFRIGERATION SYSTEM

See page AC–10.

2. REPLACE FAULTY TUBE OR HOSE

HINT: Cap the open fittings immediately to keep moisture or dirt out of the system.

3. TORQUE CONNECTIONS TO SPECIFIED TORQUE

NOTICE: Connections should not be torqued tighter than the specified torque.

4. EVACUATE AIR IN REFRIGERATION SYSTEM AND CHARGE WITH REFRIGERANT

Specified amount: 900 ± 50 g (31.74 ± 1.76 oz)

5. INSPECT FOR LEAKAGE OF REFRIGERANT

Using a gas leak tester, check for leakage of refrigerant.

6. INSPECT AIR CONDITIONER OPERATION

COMPRESSOR

ON–VEHICLE INSPECTION

(Magnetic Clutch)

INSPECT MAGNETIC CLUTCH FOR FOLLOWING

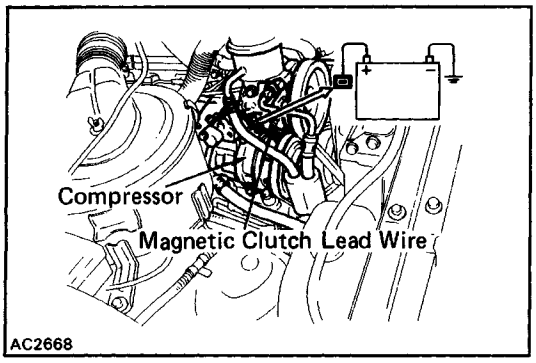
(a) Inspect the pressure plate and the rotor for signs of oil.

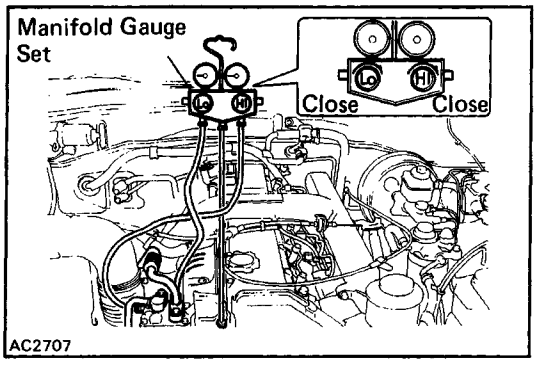
(b) Check the clutch bearings for noise and grease leakage.

(e) Connect the positive (+) lead from the battery to the terminal on the magnetic clutch connector and the negative (–) lead to the body ground.

(d) Check that the magnetic clutch is energized.

If the magnetic clutch is not energized, replace the magnetic clutch.





(Compressor)

1. INSTALL MANIFOLD GAUGE SET

See page AC–14

2. RUN ENGINE AT APPROX. 2,000 RPM

3. INSPECT COMPRESSOR FOR FOLLOWING

(a) High pressure gauge reading is not lower and low pressure gauge reading is not higher than normal.

(b) Check that the metallic sound.

(e) Check that the leakage from shaft seal.

If defects are found, replace the compressor.

4. EVACUATE AIR IN REFRIGERATION SYSTEM AND CHARGE WITH REFRIGERANT

Specified amount: 900 ± 50 g (31.74 ± 1.76 oz)

5. INSPECT FOR LEAKAGE OF REFRIGERANT

Using a gas leak tester, check for leakage of refrigerant.

6. INSPECT AIR CONDITIONER OPERATION

COMPRESSOR

ON–VEHICLE INSPECTION

(Magnetic Clutch)

INSPECT MAGNETIC CLUTCH FOR FOLLOWING

(a) Inspect the pressure plate and the rotor for signs of oil.

(b) Check the clutch bearings for noise and grease leakage.

(e) Connect the positive (+) lead from the battery to the terminal on the magnetic clutch connector and the negative (–) lead to the body ground.

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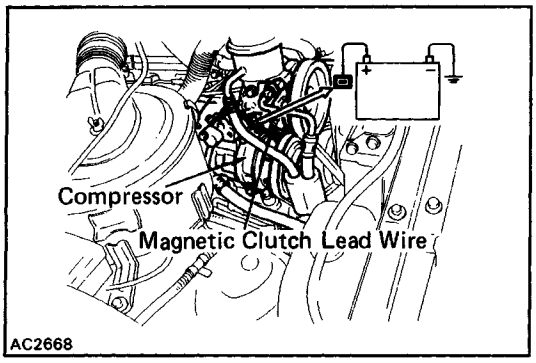
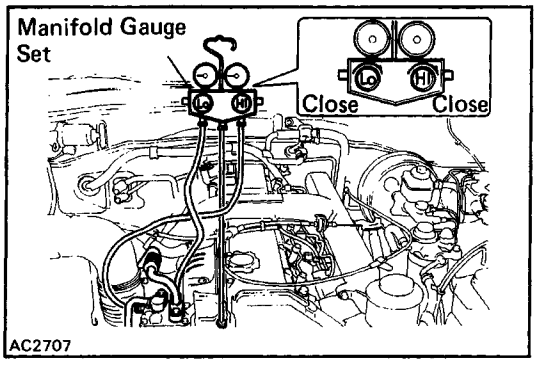
If the magnetic clutch is not energized, replace the magnetic clutch.





(Compressor)

1. INSTALL MANIFOLD GAUGE SET

See page AC–14

2. RUN ENGINE AT APPROX. 2,000 RPM

3. INSPECT COMPRESSOR FOR FOLLOWING

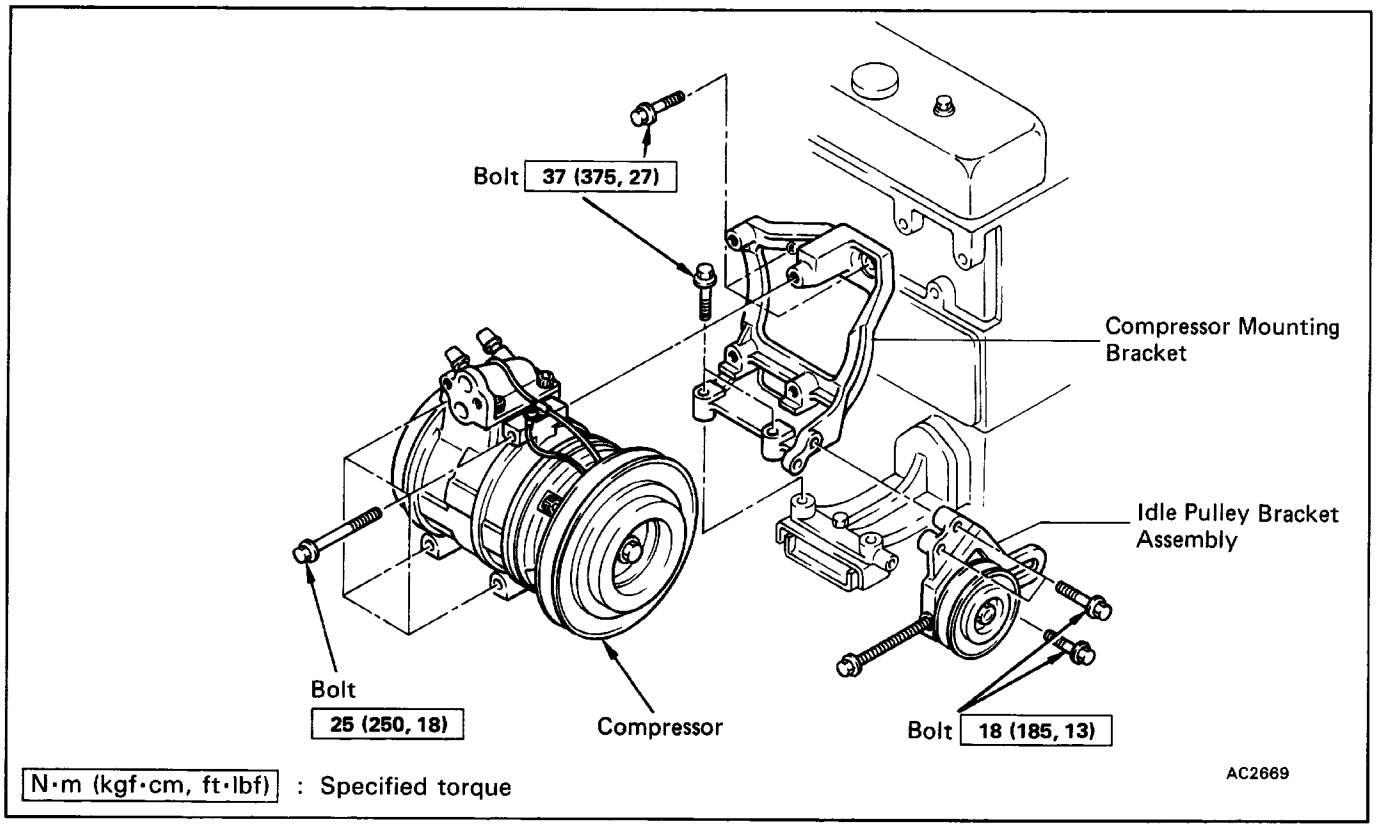
(a) High pressure gauge reading is not lower and low pressure gauge reading is not higher than normal.

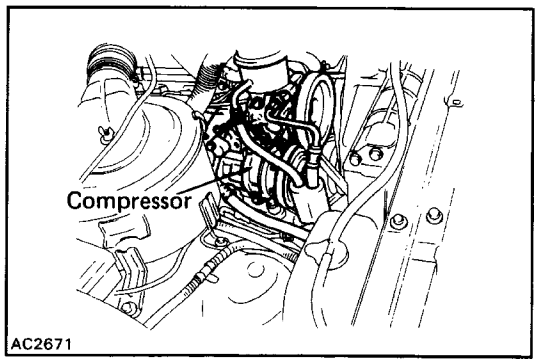
(b) Check that the metallic sound.

(e) Check that the leakage from shaft seal.

If defects are found, replace the compressor.

REMOVAL OF COMPRESSOR





1. RUN ENGINE AT IDLE SPEED WITH A/C ON FOR TEN MINUTES

2. STOP ENGINE

3. DISCONNECT NEGATIVE CABLE FROM BATTERY

4. REMOVE UNDER COVER

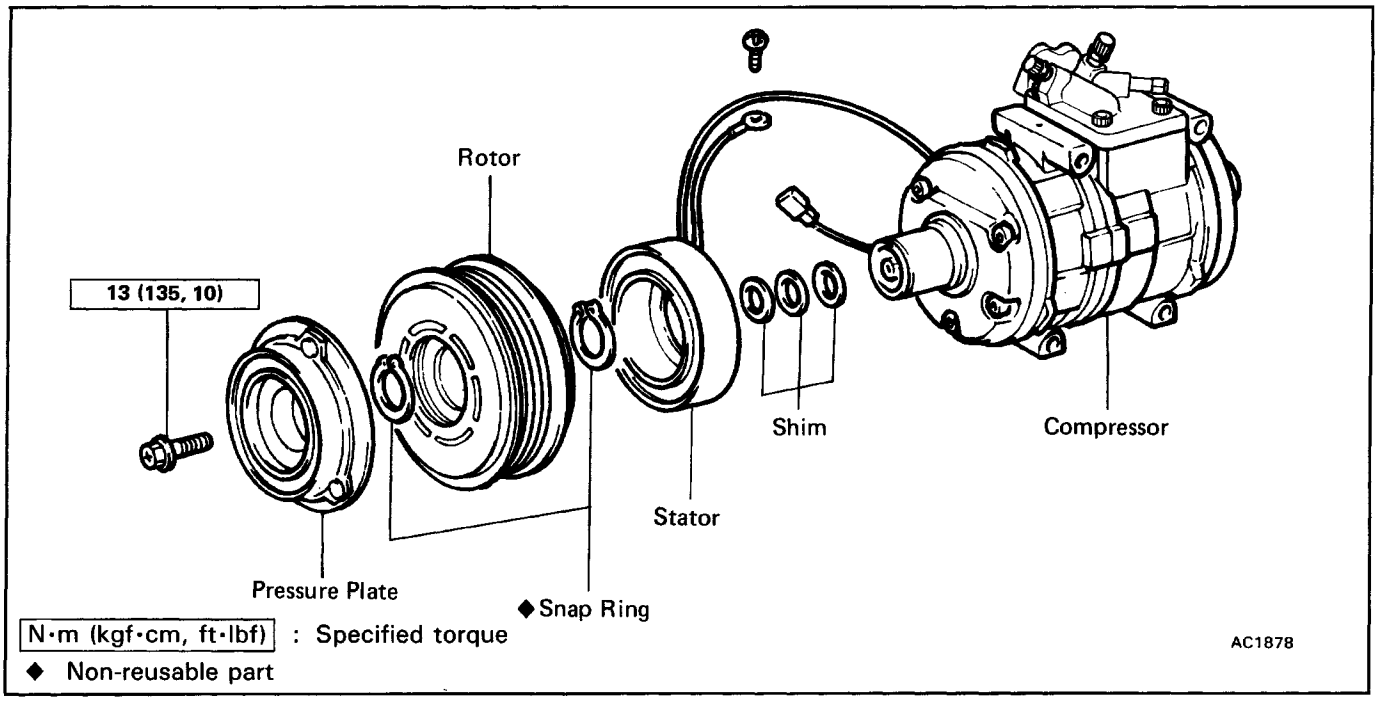
5. DISCONNECT CONNECTOR FROM MAGNETIC CLUTCH

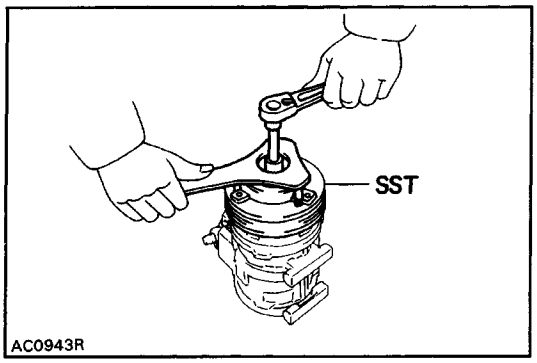
6. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

7. DISCONNECT TWO HOSES FROM COMPRESSOR SERVICE VALVES

Cap the open fitting immediately to keep moisture and dust out of the system.

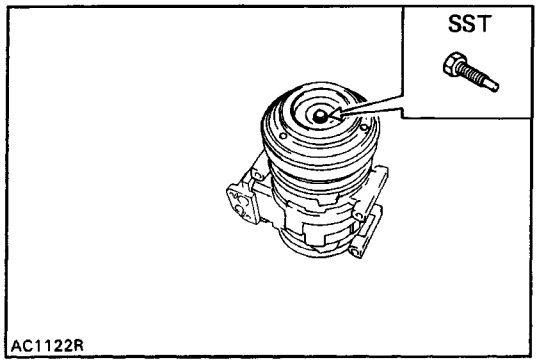
DISASSEMBLY OF MAGNETIC CLUTCH



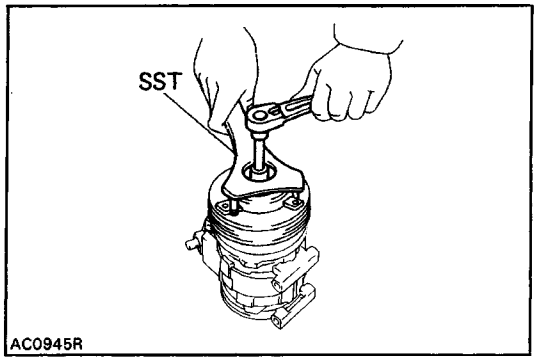


1. REMOVE PRESSURE PLATE

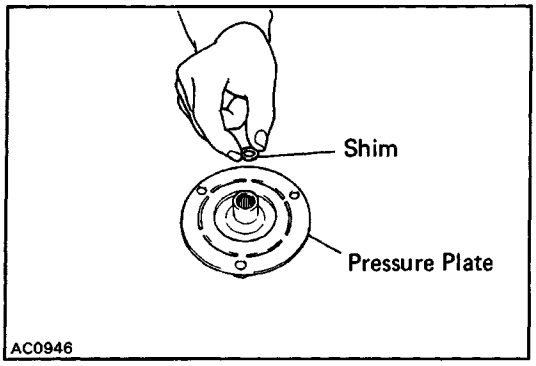
(a) Using SST and a socket, remove the shaft bolt.
SST 07112–76060



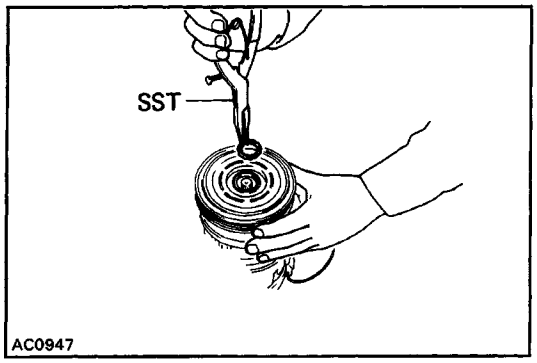
(b) Install SST to the pressure plate.
SST 07112–66040



(c) Using SST and a socket, remove the pressure plate.
SST 07112–76060

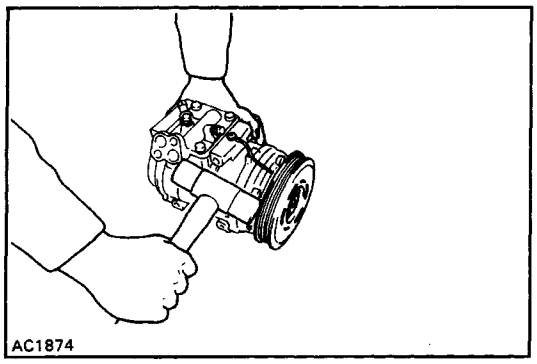


(d) Remove the shims from the pressure plate.

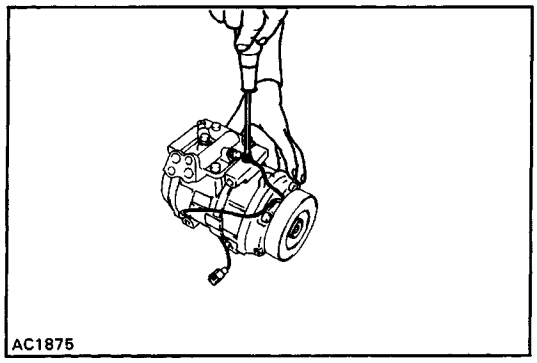


2. REMOVE ROTOR

(a) Using SST, remove the snap ring.
SST 07114 – 84020
CAUTION: Do not spread the point of SST widely.
Maximum Width:
23.1 mm (0.909 in.)

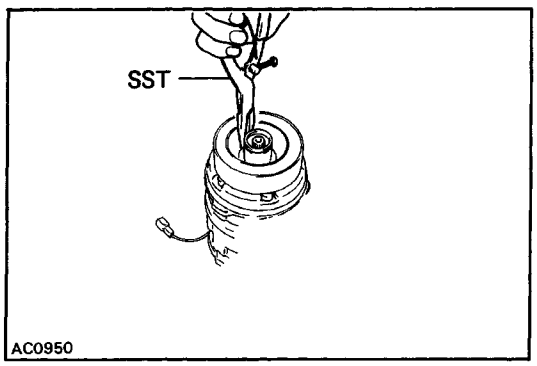


(b) Using a plastic hammer, tap the rotor off the shaft.
NOTICE: Be careful not to damage the pulley when tapping on the rotor.

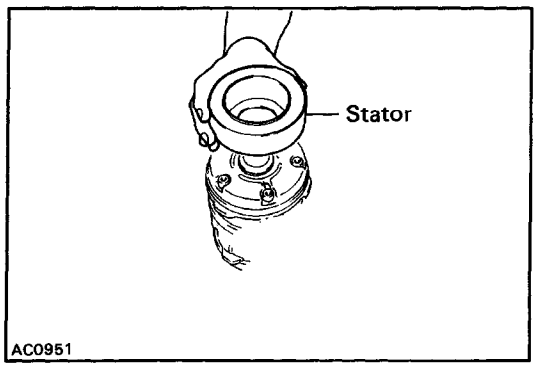


3. REMOVE STATOR

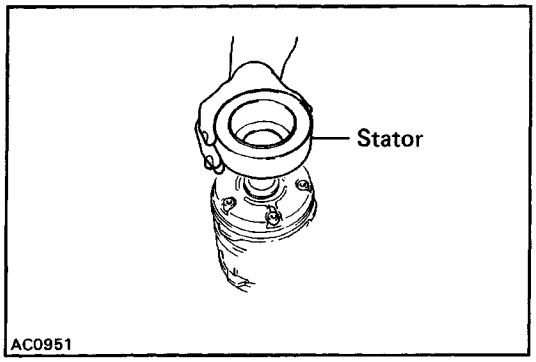
(a) Disconnect the stator lead wire from the compressor housing.



(b) Using SST, remove the snap ring.
SST 07114–84020



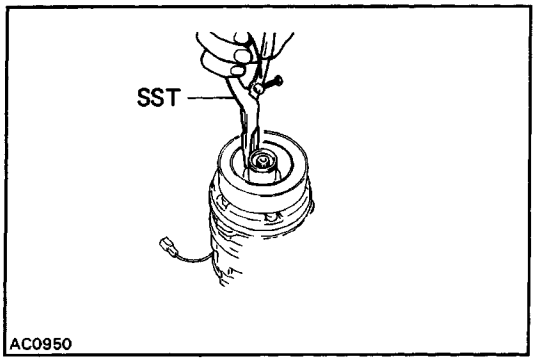
(c) Remove the stator.



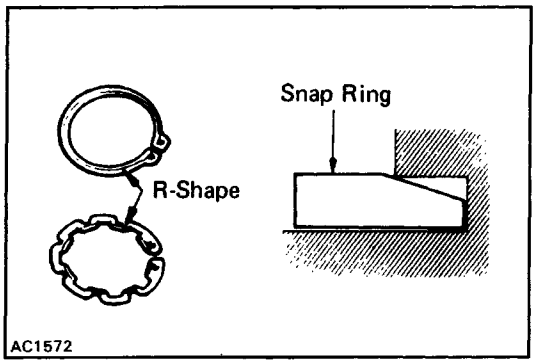
ASSEMBLY OF MAGNETIC CLUTCH

1. INSTALL STATOR

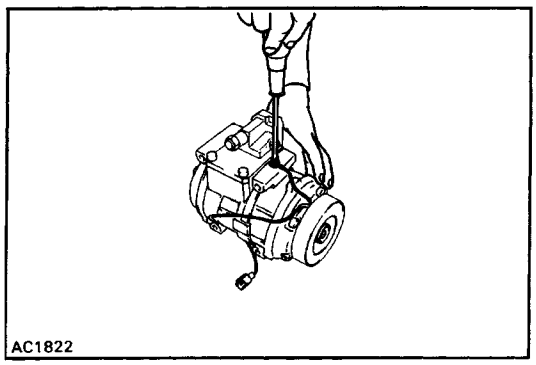
(a) Install the stator on the compressor.



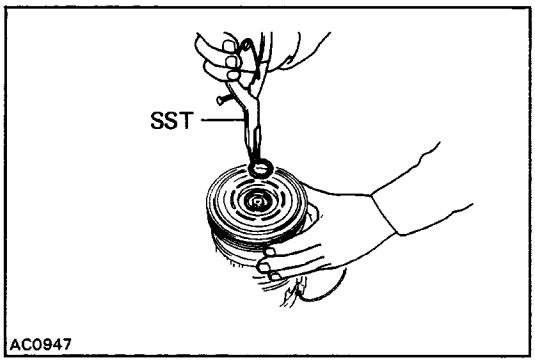
(b) Using a SST, install the new snap ring.
SST 07114–84020



NOTICE: The snap ring should be installed so that its beveled side faces up.



(c) Using a SST and torque wrench, fasten the magnetic clutch lead wire to the cylinder block.
Torque: 3.4 N–m (35 kgf–cm, 30 in.–lbf)
SST 07110–61050



2. INSTALL ROTOR

(a) Install the rotor on the compressor shaft.

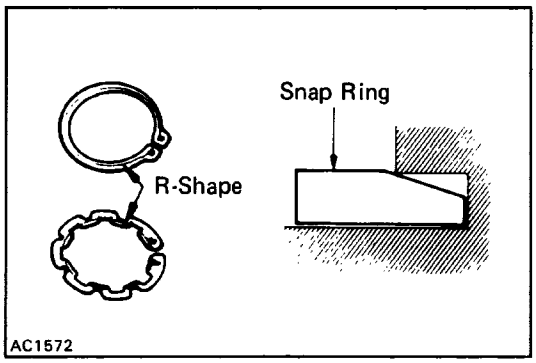
(b) Using a SST, install the new snap ring.

SST 07114–84020

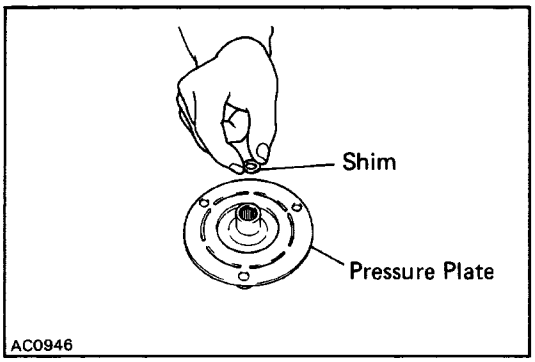
CAUTION: Do not spread the point of SST widely.

Maximum Width:

23.1 mm (0.909 in.)

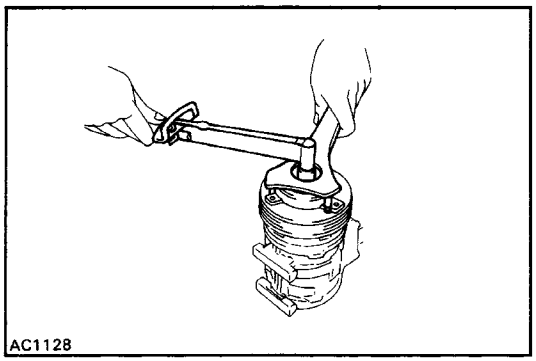


NOTICE: The snap ring should be installed so that its beveled side faces up.



3. INSTALL PRESSURE PLATE

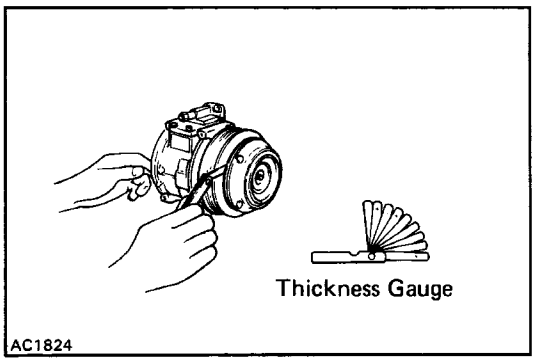
(a) Put the shims on the pressure plate.



(b) Using a SST and torque wrench, install the shaft bolt.

SST 07112–76060

Torque: 13 N–m (135 kgf–cm, 10 ft–lbf)



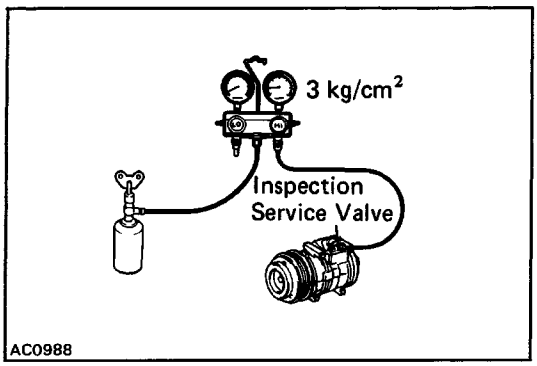
4. CHECK CLEARANCE OF MAGNETIC CLUTCH

Check the clearance between the pressure plate and rotor using thickness gauge.

Standard clearance: 0.5 ± 0.15 mm

(0.020 ± 0.0059 in.)

If the clearance is not within tolerance, charge the number of shims to obtain the standard clearance.



PERFORMANCE TEST OF COMPRESSOR

1. PERFORM GAS LEAKAGE TEST

(a) Install the inspection service valve on the service valve.

HINT: Use only a TOYOTA supplied inspection service valve to perform the gas leakage test.
Part No. Suction side 88376–17020
Discharge side 88376–22020

(b) Charge the compressor with refrigerant through the charge valve until the pressure is 294 kPa (3 kgf/cm^2, 43 psi)

(c) Using a gas leak tester, check the compressor for leaks.

If leaks are found, check and replace the compressor.

2. EVACUATE COMPRESSOR AND CHARGE WITH REFRIG–ERANT

Make sure the caps are tight and the compressor is free from moisture and contamination.
HINT: When storing a compressor for an extended pe–riod, charge the compressor with refrigerant or dry nitro–gen gas to prevent corrosion.

INSTALLATION OF COMPRESSOR

(See page AC–18)

1. INSTALL COMPRESSOR WITH FOUR MOUNTING BOLTS

Torque: 23 N–m (250 kgf–cm, 18 ft–lbf)

2. INSTALL DRIVE BELT

(See page AC–15)

3. CONNECT TWO HOSES TO COMPRESSOR SERVICE VALVES

Discharge line

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)

Suction line

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)

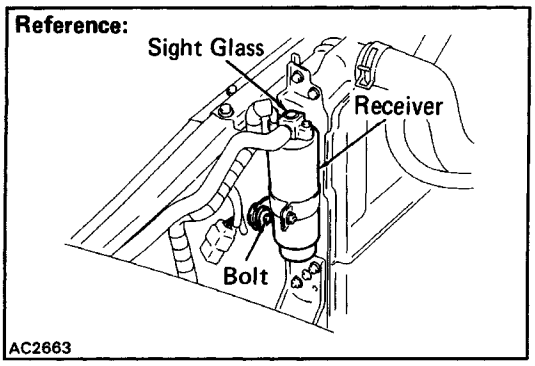
4. CONNECT CLUTCH LEAD WIRE TO WIRING HARNESS

5. CONNECT NEGATIVE CABLE TO BATTERY

6. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

7. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE

Specified amount: 900 ± 50 g (31.74 ± 1.76 oz)



RECEIVER

ON–VEHICLE INSPECTION

INSPECT SIGHT GLASS, FUSIBLE PLUG AND FITTINGS FOR LEAKAGE

Use a gas leak tester. Repair as necessary.

REMOVAL OF RECEIVER

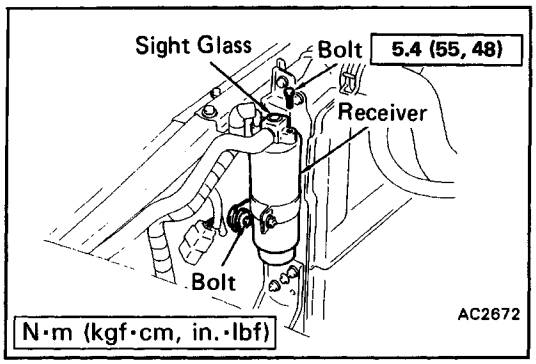
1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

2. REMOVE BATTERY

3. DISCONNECT TWO LIQUID TUBES FROM RECEIVER

HINT: Cap the open fittings immediately to keep mois–ture out of the system

4. REMOVE RECEIVER FROM RECEIVER HOLDER



INSTALLATION OF RECEIVER

1. INSTALL RECEIVER IN RECEIVER HOLDER

HINT: Do not remove the blind plugs until ready for con–nection.

2. CONNECT TWO LIQUID TUBES TO RECEIVER

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

3. INSTALL BATTERY

4. IF RECEIVER WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR

Add 20 cc (0.7 fl.oz.)

Compressor oil: ND OIL 6,

SUNISO No.5GS or equivalent

5. EVACUATE AIR FROM REFRIGERATION SYSTEM

6. CHARGE SYSTEM WITH REFRIGERANT AND INSPECT FOR LEAKAGE OF REFRIGERANT

Specified amount: 900 ± 50 g (31.74 ± 1.76 oz)

CONDENSER

ON–VEHICLE INSPECTION

1. INSPECT CONDENSER FINS FOR BLOCKAGE OR DAMAGE

If the fins are clogged, wash them with water and dry with compressed air.

NOTICE: Be careful not to damage the fins.

If the fins are bent, straighten them with a screwdriver or pliers.

2. INSPECT CONDENSER FITTINGS FOR LEAKAGE

Repair as necessary.

REMOVAL OF CONDENSER

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

2. DISCONNECT NEGATIVE CABLE FROM BATTERY

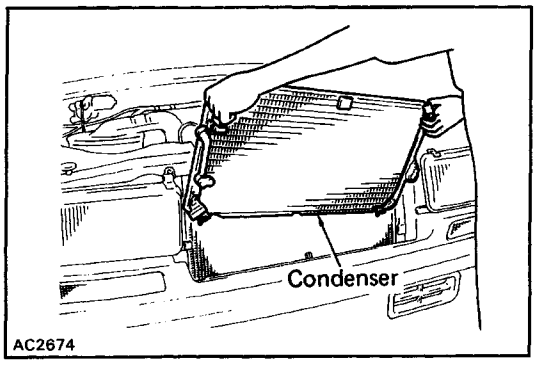
3. REMOVE FOLLOWING COMPONENTS

(a) Hood lock brace

(b) Center brace

4. DISCONNECT DISCHARGE HOSE AND LIQUID TUBE

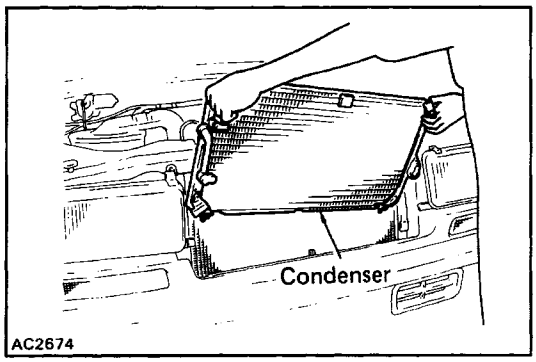
HINT: Cap the open fittings immediately to keep moisture out of system.



5. REMOVE CONDENSER

(a) Remove two bolts.

(b) Pull out the condenser between the radiator and the body.



INSPECTION OF CONDENSER

1. INSTALL CONDENSER

Put in the condenser between the radiator and the body. Then, tighten two bolts.

2. CONNECT DISCHARGE HOSE AND LIQUID TUBE

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

3. INSTALL FOLLOWING COMPONENTS

(a) Center brace

(b) Hood lock brace

4. IF CONDENSER WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR

Add 40 – 50 cc (1.4 – 1.7 fl.oz.)

Compressor oil: ND OIL 6,

SUNISO No.5GS or equivalent

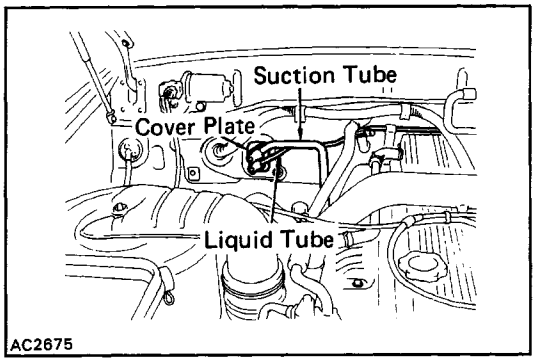
5. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

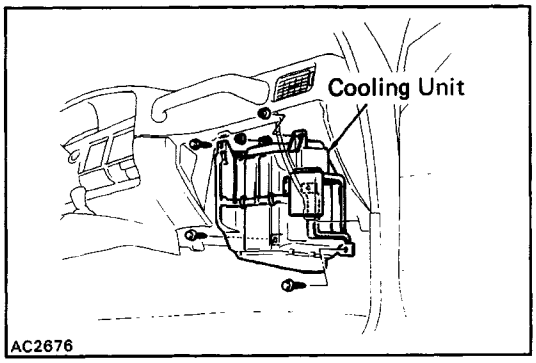
6. CHARGE SYSTEM WITH REFRIGERANT AND INSPECT FOR LEAKAGE OF REFRIGERANT

Specified amount: 900 ± 50 g (31.74 ± 1.76 oz)

COOLING UNIT

REMOVAL OF COOLING UNIT





1. DISCONNECT NEGATIVE CABLE FROM BATTERY

2. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

3. DISCONNECT SUCTION TUBE FROM COOLING UNIT OUTLET FITTING

4. DISCONNECT LIQUID TUBE FROM COOLING UNIT INLET FITTING

HINT: Cap the open fittings immediately to keep moisture out of the system.

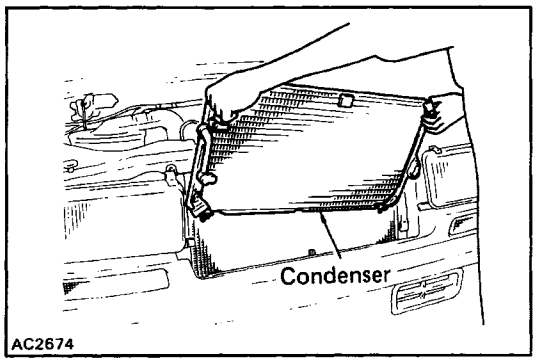
5. REMOVE COVER PLATE FROM INLET AND OUTLET FITTINGS

6. REMOVE GLOVE BOX

7. DISCONNECT CONNECTORS

8. REMOVE COOLING UNIT

Remove the three nuts and four bolts.



INSPECTION OF CONDENSER

1. INSTALL CONDENSER

Put in the condenser between the radiator and the body. Then, tighten two bolts.

2. CONNECT DISCHARGE HOSE AND LIQUID TUBE

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

3. INSTALL FOLLOWING COMPONENTS

(a) Center brace

(b) Hood lock brace

4. IF CONDENSER WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR

Add 40 – 50 cc (1.4 – 1.7 fl.oz.)

Compressor oil: ND OIL 6,

SUNISO No.5GS or equivalent

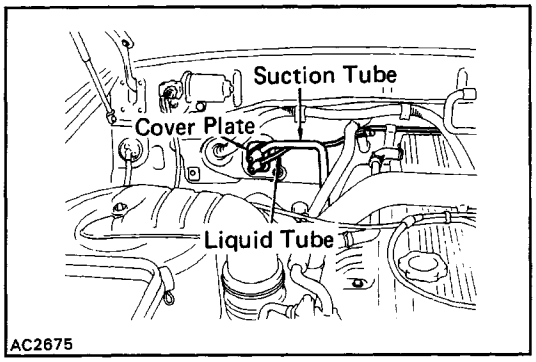
5. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

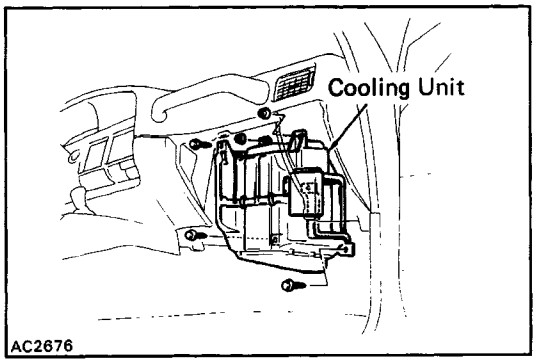
6. CHARGE SYSTEM WITH REFRIGERANT AND INSPECT FOR LEAKAGE OF REFRIGERANT

Specified amount: 900 ± 50 g (31.74 ± 1.76 oz)

COOLING UNIT

REMOVAL OF COOLING UNIT





1. DISCONNECT NEGATIVE CABLE FROM BATTERY

2. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

3. DISCONNECT SUCTION TUBE FROM COOLING UNIT OUTLET FITTING

4. DISCONNECT LIQUID TUBE FROM COOLING UNIT INLET FITTING

HINT: Cap the open fittings immediately to keep moisture out of the system.

5. REMOVE COVER PLATE FROM INLET AND OUTLET FITTINGS

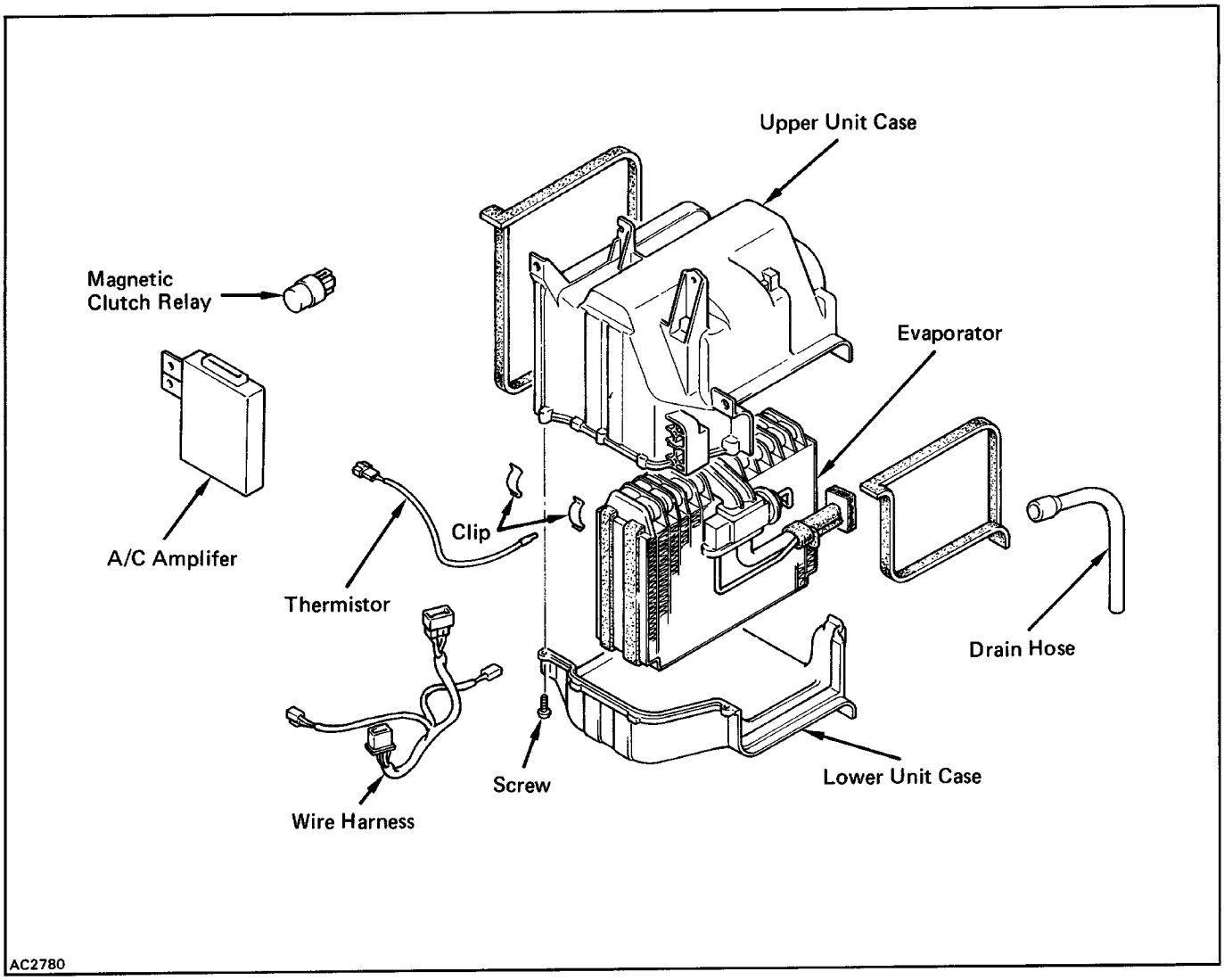
6. REMOVE GLOVE BOX

7. DISCONNECT CONNECTORS

8. REMOVE COOLING UNIT

Remove the three nuts and four bolts.

DISASSEMBLY OF COOLING UNIT



1. REMOVE MAGNETIC CLUTCH RELAY

2. REMOVE REAR COOLER RELAY

3. REMOVE A/C AMPLIFIER

4. REMOVE LOWER AND UPPER CASE

(a) Remove connector of thermistor from unit case.

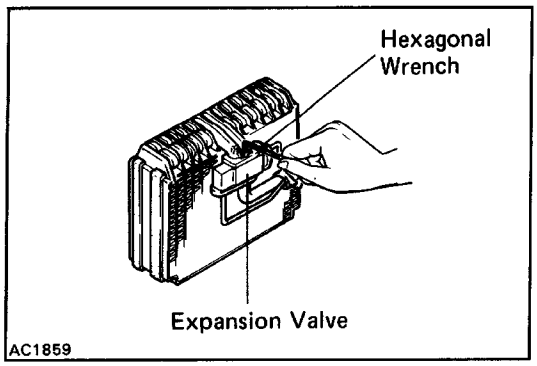
(b) Remove three clips.

(c) Remove four screws.

(d) Remove upper unit case.

(e) Remove thermistor with thermistor holder.

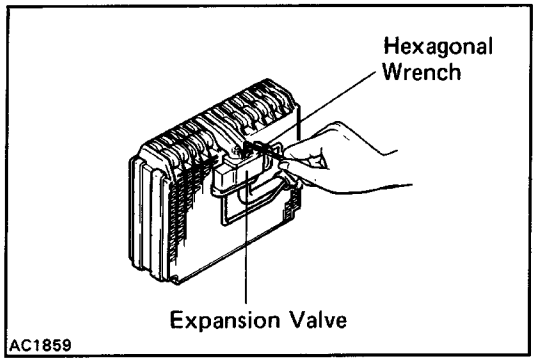
(f) Remove lower unit case.



5. REMOVE EXPANSION VALVE

(a) Remove the packing and heat sensing tube from suction and liquid tubes.

(b) Remove the expansion valve from the evaporator.



ASSEMBLY OF COOLING UNIT

INSTALL COMPONENTS ON EVAPORATOR

(a) Connect the expansion valve, suction and liquid tubes to the evaporator. Torque the bolt.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

HINT: Be sure that the O–rings are positioned on the tube fitting.

(b) Install the holder to the suction and liquid tubes with heat sensing tube.

(c) Install the lower unit case to the evaporator.

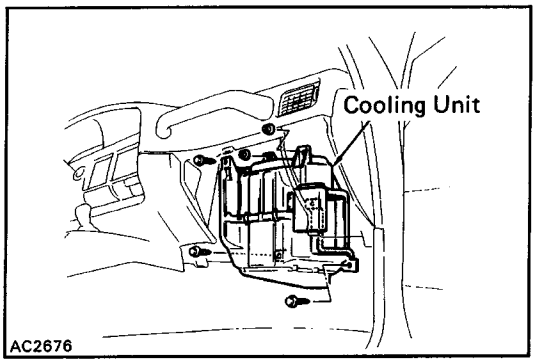
(d) Install the thermistor to the evaporator.

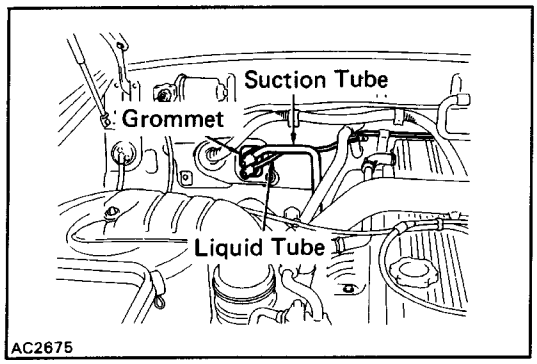
(e) Install the upper unit case.

(f) Install the four screws.

(g) Install three clips.

(h) Install the connector of thermistor.





INSTALLATION OF COOLING UNIT

1. INSTALL COOLING UNIT

Install the cooling unit with three screws and two nuts.

2. CONNECT CONNECTOR OF THERMISTOR

3. INSTALL EFI ECU

4. INSTALL GLOVE BOX COVER AND REINFORCEMENT

5. INSTALL GLOVE BOX AND UNDER COVER

6. INSTALL GROMMETS ON INLET AND OUTLET FITTINGS

7. CONNECT LIQUID TUBE TO COOLING UNIT INLET FITTING

Torque the bolt.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

8. CONNECT SUCTION TUBE TO COOLING UNIT OUTLET FITTING

Torque the nut.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

9. IF EVAPORATOR WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR

Add 40 – 50 cc (1.4 – 1.7 fl.oz.)

Compressor oil: ND OIL 6,

SUNISO No.5GS or equivalent

10. INSTALL CHARCOAL CANISTER WITH BRACKET

11. CONNECT NEGATIVE CABLE TO BATTERY

12. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

13. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE

Specified amount: 900 ± 50 g (31.74 ± 1.76 oz)

EVAPORATOR

REMOVAL OF EVAPORATOR

See Disassembly of Cooling Unit on page AC–27.

INSPECTION OF EVAPORATOR

1. INSPECT EVAPORATOR FINS FOR BLOCKAGE

If the fins are clogged, clean them with compressed air.

NOTICE: Never use water to clean the evaporator.

2. INSPECT FITTINGS FOR CRACKS OR SCRATCHES

Repair as necessary.

INSTALLATION OF EVAPORATOR

See Assembly of Cooling Unit on page AC–28.

9. IF EVAPORATOR WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR

Add 40 – 50 cc (1.4 – 1.7 fl.oz.)

Compressor oil: ND OIL 6,

SUNISO No.5GS or equivalent

10. INSTALL CHARCOAL CANISTER WITH BRACKET

11. CONNECT NEGATIVE CABLE TO BATTERY

12. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

13. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE

Specified amount: 900 ± 50 g (31.74 ± 1.76 oz)

EVAPORATOR

REMOVAL OF EVAPORATOR

See Disassembly of Cooling Unit on page AC–27.

INSPECTION OF EVAPORATOR

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If the fins are clogged, clean them with compressed air.

NOTICE: Never use water to clean the evaporator.

2. INSPECT FITTINGS FOR CRACKS OR SCRATCHES

Repair as necessary.

INSTALLATION OF EVAPORATOR

See Assembly of Cooling Unit on page AC–28.

EXPANSION VALVE

ON–VEHICLE INSPECTION

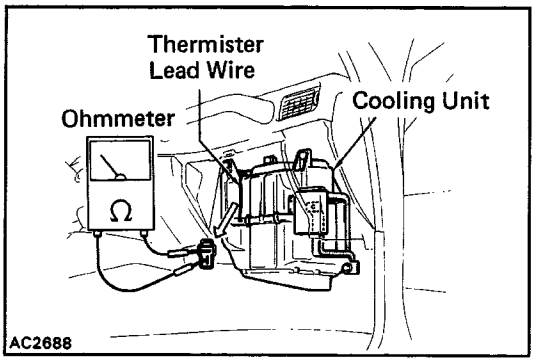
1. INSPECT REFRIGERANT VOLUME
See page AC–13.
2. INSTALL MANIFOLD GAUGE SET
See page AC–14.
3. TURN FRONT A/C SWITCH ON AND BLOWER SWITCH TO HI POSITION
4. RUN ENGINE AT APPROX. 2,000 RPM FOR AT LEAST FIVE MINUTES
5. INSPECT EXPANSION VALVE
If the expansion valve is clogged, the low pressure reading will drop to 0 N–m (0 kgf–cm, 0 ft–lbf), otherwise it is OK.

REMOVAL OF EXPANSION VALVE

See Disassembly of Front Cooling Unit on page AC–27.

INSTALLATION OF EXPANSION VALVE

See Assembly of Front Cooling Unit on page AC–28.



THERMISTOR

ON–VEHICLE INSPECTION

1. DISCONNECT NEGATIVE BATTERY CABLE
2. REMOVE GLOVE BOX
3. CHECK RESISTANCE OF THERMISTOR
Measure the resistance between terminals.
Standard resistance: 1,500 Ω at 25˚C (77˚F)
If resistance value is not as specified, replace the ther–mistor.

REMOVAL OF THERMISTOR

See Disassembly of Cooling Unit on page AC–27.

EXPANSION VALVE

ON–VEHICLE INSPECTION

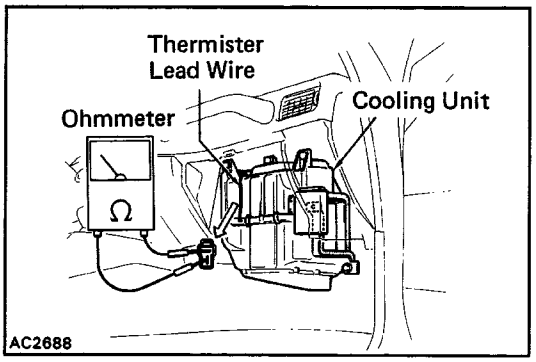
1. INSPECT REFRIGERANT VOLUME
See page AC–13.
2. INSTALL MANIFOLD GAUGE SET
See page AC–14.
3. TURN FRONT A/C SWITCH ON AND BLOWER SWITCH TO HI POSITION
4. RUN ENGINE AT APPROX. 2,000 RPM FOR AT LEAST FIVE MINUTES
5. INSPECT EXPANSION VALVE
If the expansion valve is clogged, the low pressure reading will drop to 0 N–m (0 kgf–cm, 0 ft–lbf), otherwise it is OK.

REMOVAL OF EXPANSION VALVE

See Disassembly of Front Cooling Unit on page AC–27.

INSTALLATION OF EXPANSION VALVE

See Assembly of Front Cooling Unit on page AC–28.



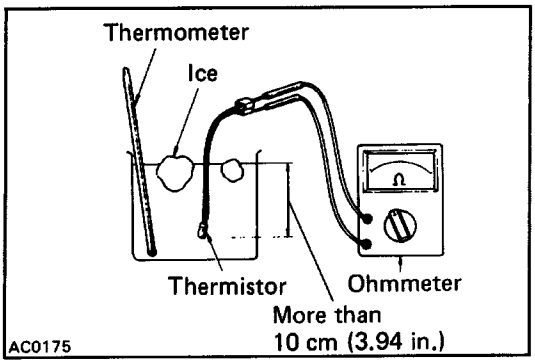
THERMISTOR

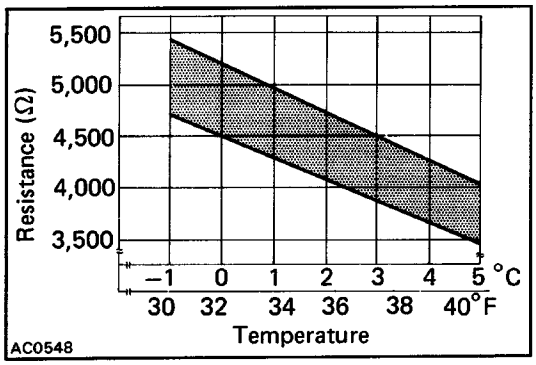
ON–VEHICLE INSPECTION

1. DISCONNECT NEGATIVE BATTERY CABLE
2. REMOVE GLOVE BOX
3. CHECK RESISTANCE OF THERMISTOR
Measure the resistance between terminals.
Standard resistance: 1,500 Ω at 25˚C (77˚F)
If resistance value is not as specified, replace the ther–mistor.

REMOVAL OF THERMISTOR

See Disassembly of Cooling Unit on page AC–27.





INSPECTION OF THERMISTOR

INSPECT THERMISTOR OPERATION

(a) Place the thermistor in cold water. While varying the temperature of the water, measure the resistance at the connector and at the same time, measure the temperature of the water with a thermometer.

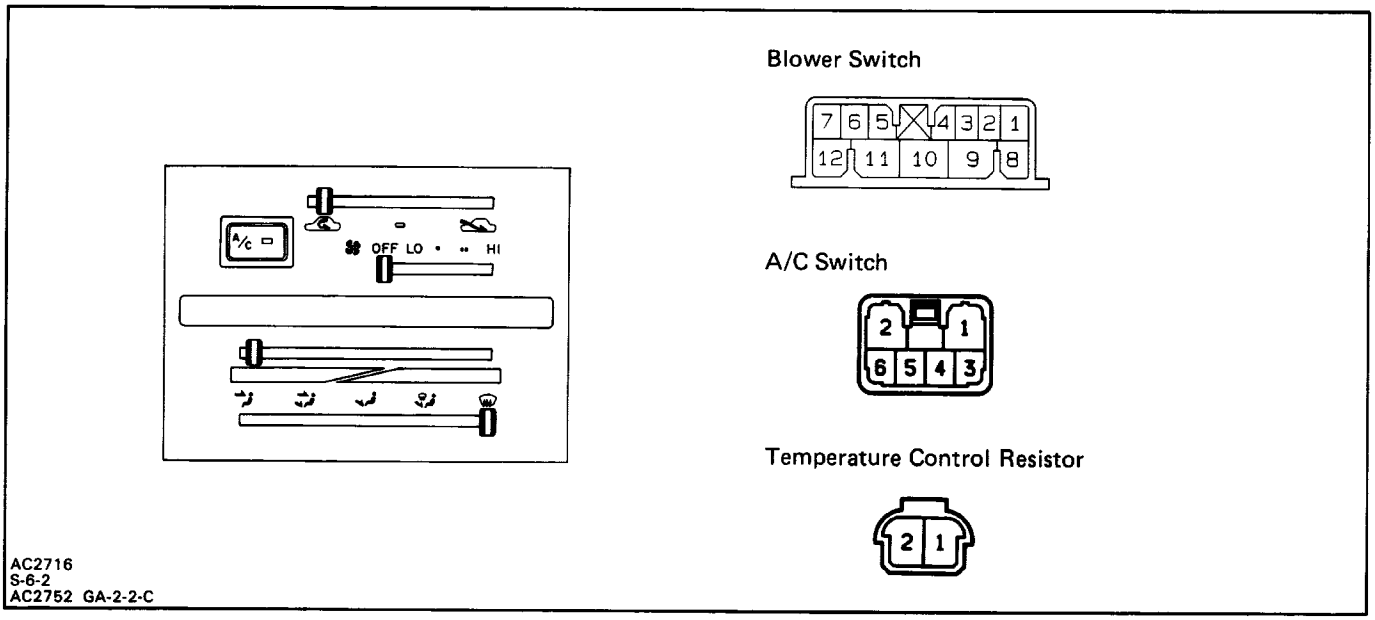
(b) Compare the two readings on the chart.

If the intersection is not between the two lines, replace the thermistor.

INSTALLATION OF THERMISTOR

See Assembly of Cooling Unit on page AC–28.

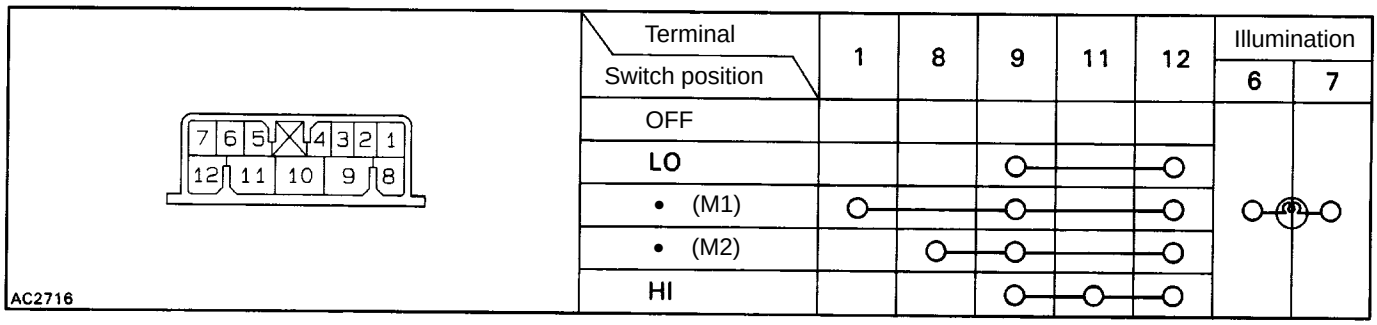
A C CONTROL ASSEMBLY



Blower Switch

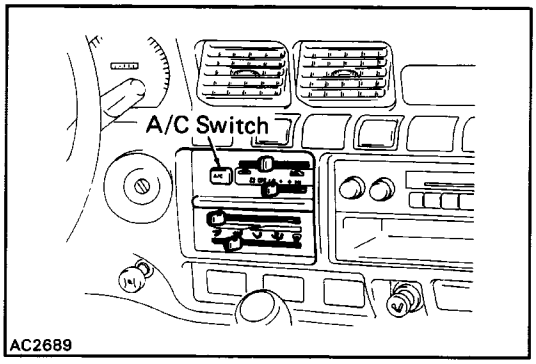
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY



Terminal / Switch position	1	8	9	11	12	Illumination 6	Illumination 7
OFF							
LO			○		○		
• (M1)	○		○		○		
• (M2)		○	○		○		
HI			○	○	○		

If continuity is not as specified, replace the switch.



A/C Switch

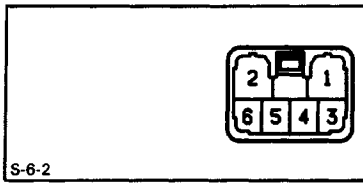
REMOVAL OF SWITCH

1. DISCONNECT NEGATIVE CABLE FROM BATTERY

2. REMOVE A/C SWITCH

INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY



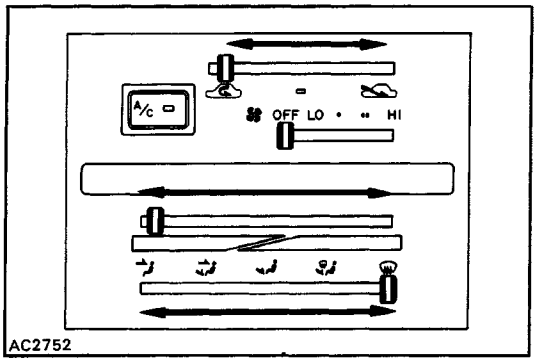
Terminal / Switch position	2	3
OFF		
ON	○——	——○

If continuity is not as specified, replace the switch.

INSTALLATION OF SWITCH

1. INSTALL A/C SWITCH

2. CONNECT NEGATIVE CABLE TO BATTERY

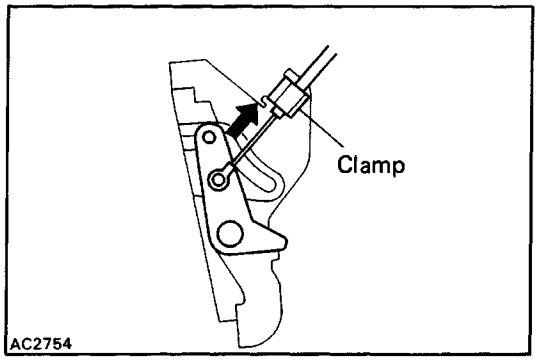


A/C Control Levers

INSPECTION OF A/C CONTROL LEVERS

INSPECT A/C CONTROL LEVERS OPERATION

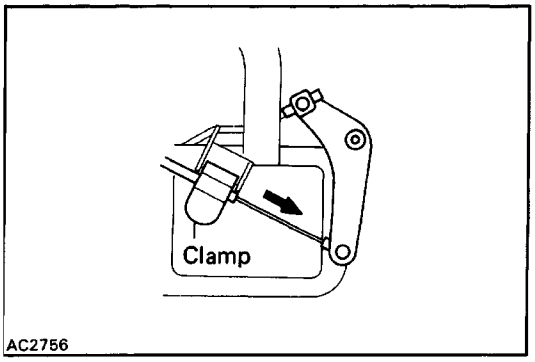
Move the control levers left and right, and check for stiff–ness and binding through the full range of the levers.



ADJUSTMENT OF A/C CONTROL CABLES

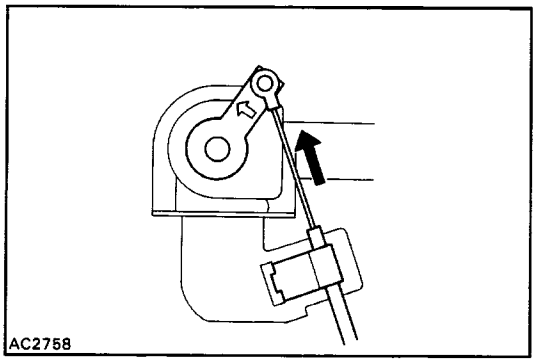
1. ADJUST AIR INLET DAMPER CONTROL CABLE

Set the air inlet damper and the control lever to ”FRESH” position, install the control cable and lock the clamp.



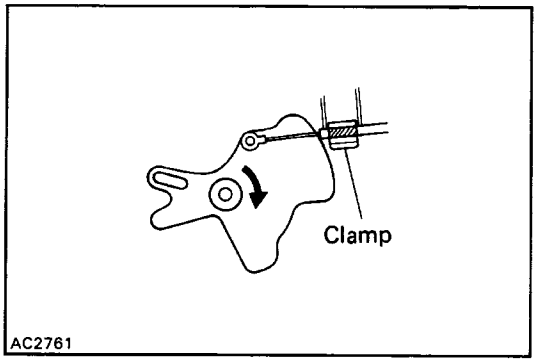
2. ADJUST AIR MIX DAMPER CONTROL CABLE

Set the air mix damper and the control lever to ”COOL” position, install the control cable and lock the clamp.



3. ADJUST WATER VALVE CONTROL CABLE

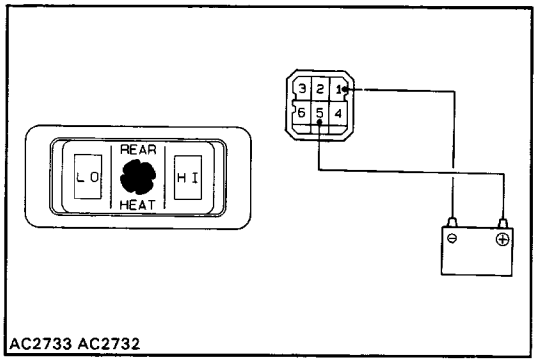
Set the water valve and the control lever to "COOL" position, install the control cable and lock the clamp.



4. ADJUST MODE DAMPER CONTROL CABLE

(a) Set the mode damper and the control lever to "DEF" position.

(b) Clamp the white section of the control cable and install the cable to damper control lever.



REAR HEATER SWITCH

INSPECTION OF SWITCH

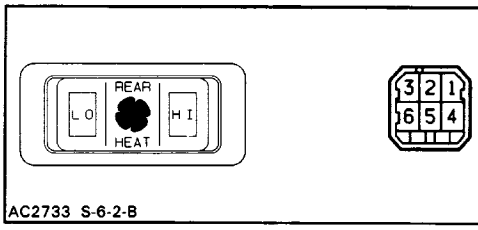
1. INSPECT INDICATOR

(a) Connect the positive (+) lead from the battery to terminal 5 and the negative (–) lead to terminal 1.

(b) Push each of the rear heater switch knob in and check that their indicators light up.

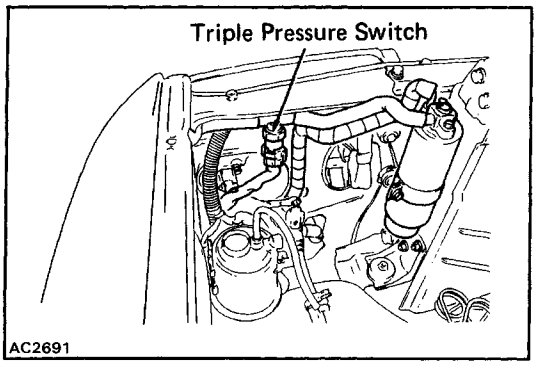
If indicator operation is not as specified, replace the switch.

2. INSPECT SWITCH CONTINUITY



Terminal / Switch position	1	2	4	5	Illumination 3	Illumination 6
HI	○		○			
OFF					○	○
LO	○	○				

If continuity is not as specified, replace the switch.



TRIPLE PRESSURE SWITCH

ON–VEHICLE INSPECTION

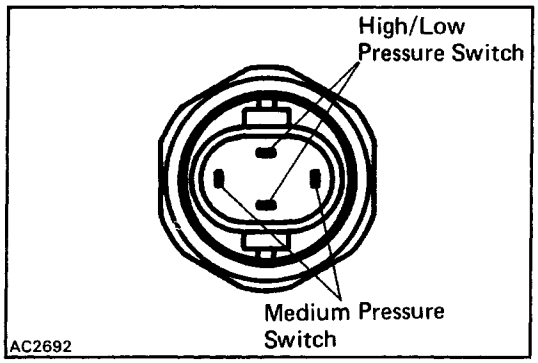
1. DISCONNECT CONNECTOR OF PRESSURE SWITCH

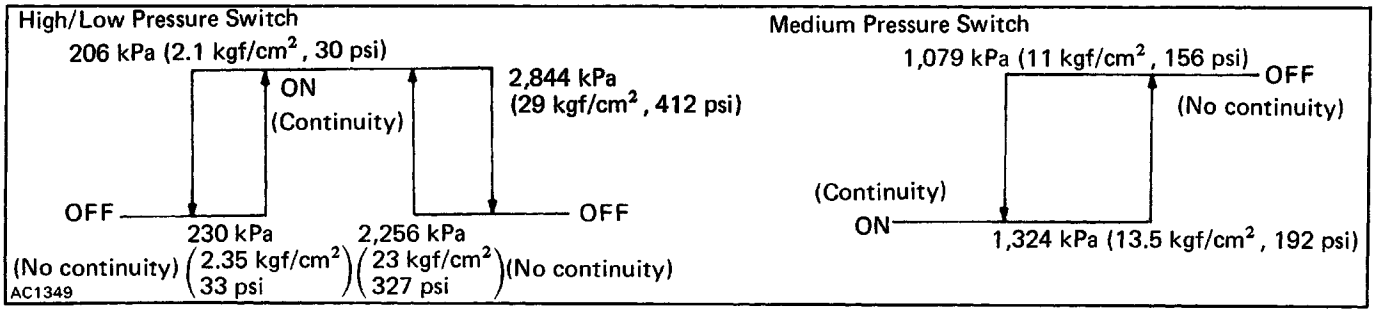
2. INSPECT PRESSURE SWITCH

(a) Install the manifold gauge set.

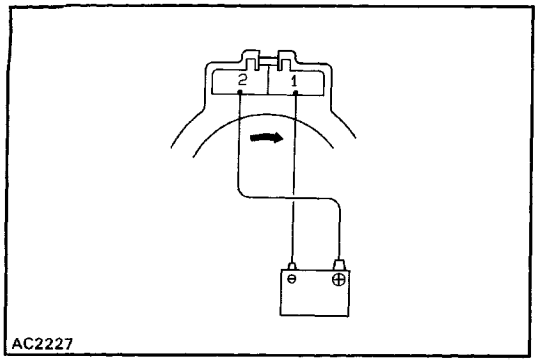
(b) Observe the gauge reading.

(c) Check the continuity between the two terminals of the pressure switch shown in the below.





If defective, replace the pressure switch.



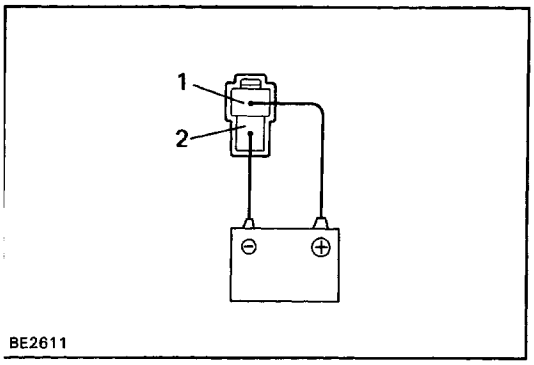
BLOWER MOTORS

Front A/C Blower Motor

INSPECTION OF BLOWER MOTOR

INSPECT BLOWER MOTOR OPERATION

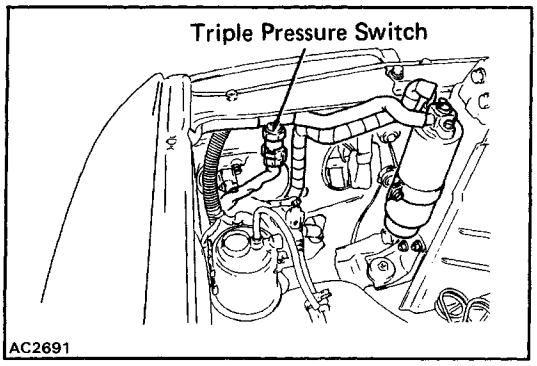
Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, then check that the motor operation is smooth.



Rear Heater Blower Motor

INSPECTION OF BLOWER MOTOR

Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, then check that the motor operation is smooth.



TRIPLE PRESSURE SWITCH

ON–VEHICLE INSPECTION

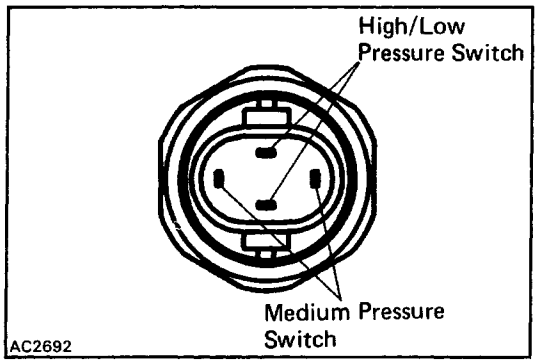
1. DISCONNECT CONNECTOR OF PRESSURE SWITCH

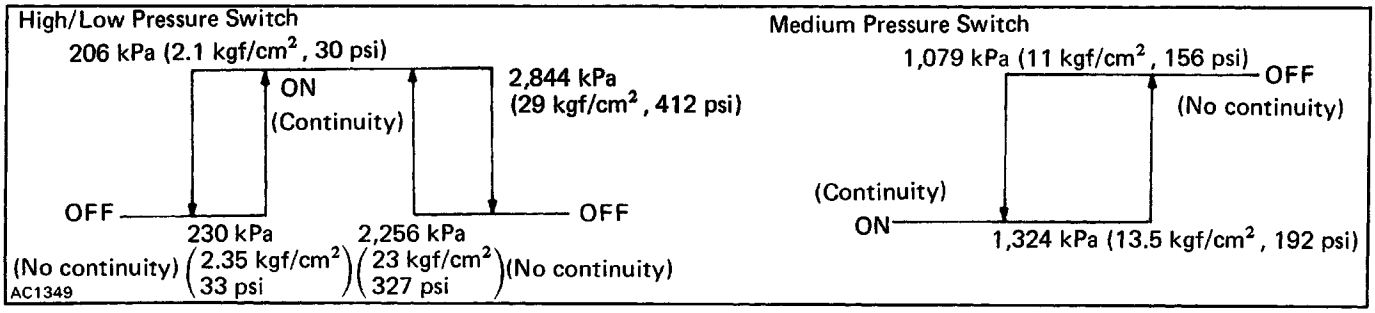
2. INSPECT PRESSURE SWITCH

(a) Install the manifold gauge set.

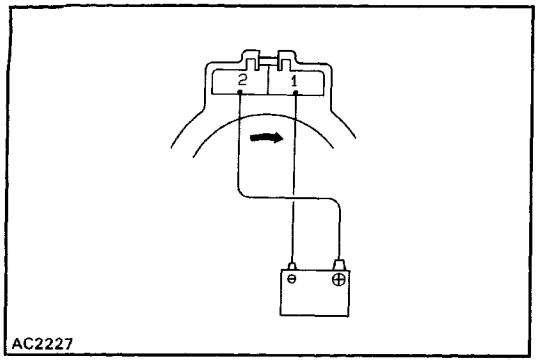
(b) Observe the gauge reading.

(c) Check the continuity between the two terminals of the pressure switch shown in the below.





If defective, replace the pressure switch.



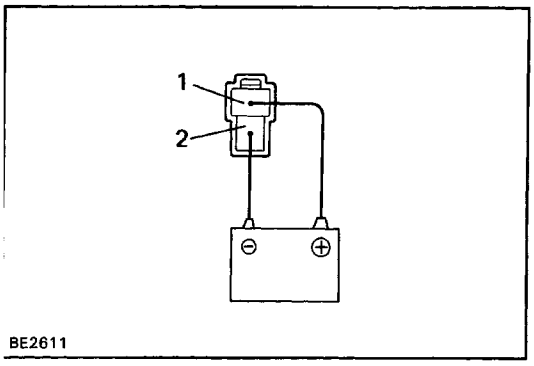
BLOWER MOTORS

Front A/C Blower Motor

INSPECTION OF BLOWER MOTOR

INSPECT BLOWER MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, then check that the motor operation is smooth.



Rear Heater Blower Motor

INSPECTION OF BLOWER MOTOR

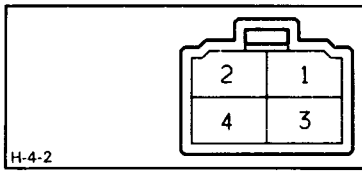
Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, then check that the motor operation is smooth.

BLOWER RESISTORS

Front A/C Blower Resistor

INSPECTION OF BLOWER RESISTOR

INSPECT BLOWER RESISTOR CONTINUITY



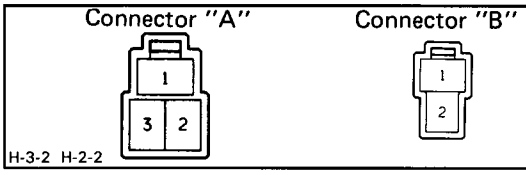
Terminal / Condition	1	3	2	4
Constant	○—/\/\—○—/\/\—○—/\/\—○			

If continuity is not as specified, replace the blower resistor.

Rear Heater Blower Resistor

INSPECTION OF BLOWER RESISTOR

INSPECT BLOWER RESISTOR CONTINUITY



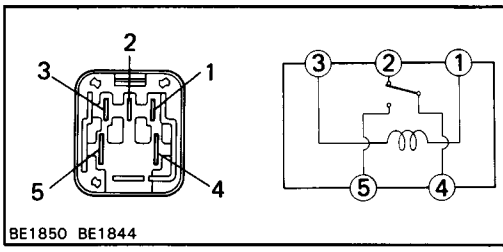
Terminal / Condition	A-1	A-2	A-3	B-1	B-2
Constant	○————	○—/\/\—○		————○	○

If continuity is not as specified, replace the blower resistor.

HEATER RELAY

INSPECTION OF RELAY

INSPECT RELAY CONTINUITY



Terminal / Condition	1	2	3	4	5
Constant	○—∿∿∿—○	○————			
Apply battery voltage to terminals 1 and 3.				○—○	

If continuity is not as specified, replace the relay.

REAR HEATER RELAY

INSPECTION OF RELAY

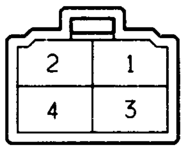
Check the relay the same way as for the heater relay on page AC–36.

BLOWER RESISTORS

Front A/C Blower Resistor

INSPECTION OF BLOWER RESISTOR

INSPECT BLOWER RESISTOR CONTINUITY



H-4-2

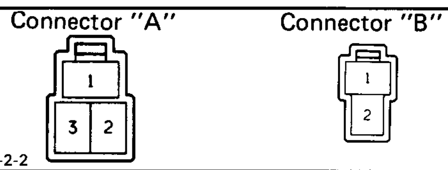
Terminal / Condition	1	3	2	4
Constant	○–/\/\/–	○–/\/\/–	○–/\/\/–	○

If continuity is not as specified, replace the blower resistor.

Rear Heater Blower Resistor

INSPECTION OF BLOWER RESISTOR

INSPECT BLOWER RESISTOR CONTINUITY



H-3-2 H-2-2

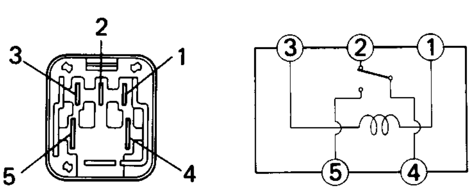
Terminal / Condition	A-1	A-2	A-3	B-1	B-2
Constant	○———	————	————	○	
		○–/\/\/–	○———	————	○

If continuity is not as specified, replace the blower resistor.

HEATER RELAY

INSPECTION OF RELAY

INSPECT RELAY CONTINUITY



BE1850 BE1844

Terminal / Condition	1	2	3	4	5
Constant	○———	–(coil)–	○		
		○———	————	○	
Apply battery voltage to terminals 1 and 3.				○———	○

If continuity is not as specified, replace the relay.

REAR HEATER RELAY

INSPECTION OF RELAY

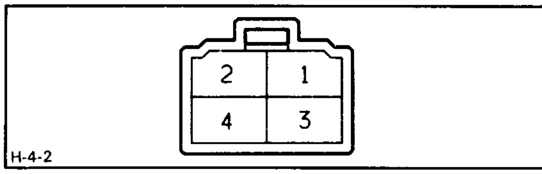
Check the relay the same way as for the heater relay on page AC–36.

BLOWER RESISTORS

Front A/C Blower Resistor

INSPECTION OF BLOWER RESISTOR

INSPECT BLOWER RESISTOR CONTINUITY



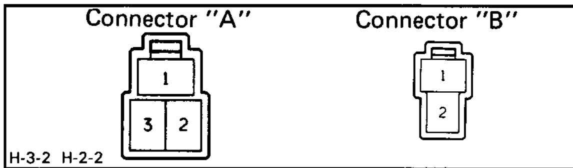
Terminal / Condition	1	3	2	4
Constant	○—ʌʌʌ—	○—ʌʌʌ—	○—ʌʌʌ—	○

If continuity is not as specified, replace the blower resistor.

Rear Heater Blower Resistor

INSPECTION OF BLOWER RESISTOR

INSPECT BLOWER RESISTOR CONTINUITY



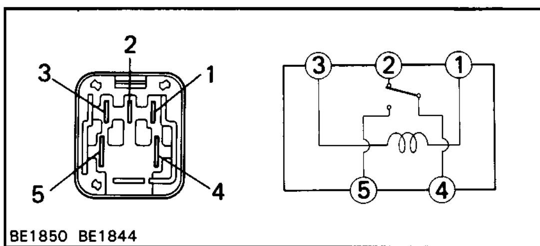
Terminal / Condition	A-1	A-2	A-3	B-1	B-2
Constant	○———	———	———	○	
		○—ʌʌʌ—	○———	———	○

If continuity is not as specified, replace the blower resistor.

HEATER RELAY

INSPECTION OF RELAY

INSPECT RELAY CONTINUITY



Terminal / Condition	1	2	3	4	5
Constant	○———	(coil)	○		
		○———	———	○	
Apply battery voltage to terminals 1 and 3.				○———	○

If continuity is not as specified, replace the relay.

REAR HEATER RELAY

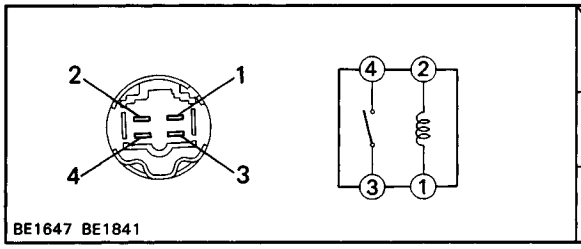
INSPECTION OF RELAY

Check the relay the same way as for the heater relay on page AC–36.

MAGNETIC CLUTCH RELAY

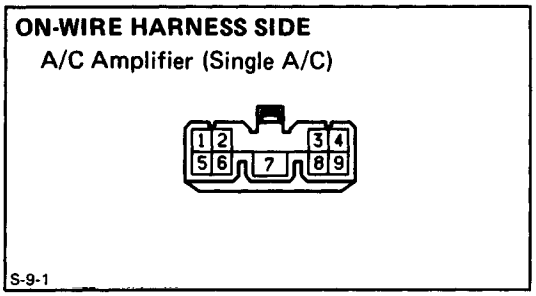
INSPECTION OF RELAY

INSPECT RELAY CONTINUITY



Terminal / Condition	1	2	3	4
Constant	○—∿∿∿—○			
Apply battery voltage to terminals 1 and 3.			○——○	

If continuity is not as specified, replace the relay.



A C AMPLIFIER

INSPECTION OF AMPLIFIER

INSPECT AMPLIFIER CIRCUIT

Disconnect the amplifier and inspect the connector on the wire harness side as shown in the chart below.

Test conditions:

(1) Ignition switch: ON
(2) Temperature control lever: MAX COOL
(3) Blower switch: HI

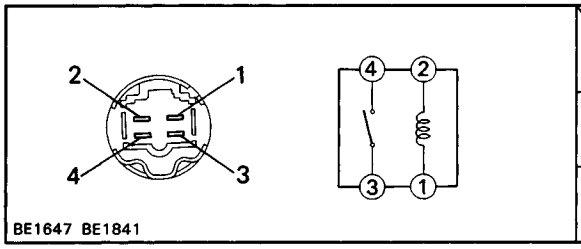
Check for	Tester connection	Condition	Specified value
Continuity	6 — Ground	Constant	Continuity
	8 — 9	Constant	Continuity
Voltage	2 — 6	Turn A/C switch on.	Battery voltage
		Turn A/C switch off.	No voltage
	3 — 6	Turn A/C switch on.	Battery voltage
		Turn A/C switch off.	No voltage
	5 — 6	Start the engine.	Approx. 10 to 14 V
		Stop the engine.	No voltage
Resistance	9 — 6	Constant	Approx. 1.5 kΩ at 25°C (77°F)

If circuit is as specified, replace the amplifier.

MAGNETIC CLUTCH RELAY

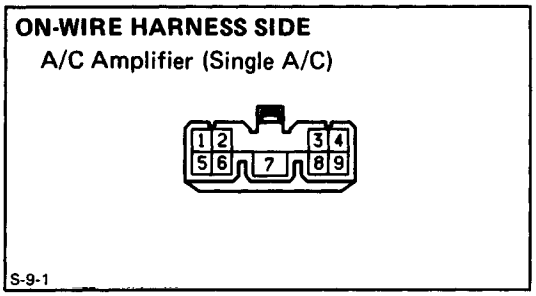
INSPECTION OF RELAY

INSPECT RELAY CONTINUITY



Terminal / Condition	1	2	3	4
Constant	○—∿∿∿—○			
Apply battery voltage to terminals 1 and 3.			○——○	

If continuity is not as specified, replace the relay.



A C AMPLIFIER

INSPECTION OF AMPLIFIER

INSPECT AMPLIFIER CIRCUIT

Disconnect the amplifier and inspect the connector on the wire harness side as shown in the chart below.

Test conditions:

(1) Ignition switch: ON
(2) Temperature control lever: MAX COOL
(3) Blower switch: HI

Check for	Tester connection	Condition	Specified value
Continuity	6 — Ground	Constant	Continuity
	8 — 9	Constant	Continuity
Voltage	2 — 6	Turn A/C switch on.	Battery voltage
		Turn A/C switch off.	No voltage
	3 — 6	Turn A/C switch on.	Battery voltage
		Turn A/C switch off.	No voltage
	5 — 6	Start the engine.	Approx. 10 to 14 V
		Stop the engine.	No voltage
Resistance	9 — 6	Constant	Approx. 1.5 kΩ at 25°C (77°F)

If circuit is as specified, replace the amplifier.

SERVICE SPECIFICATIONS

MAINTENANCE

Engine

Drive belt tension w/ Borroughs drive belt tension gauge No.BT–33–73F or Nippondenso BTG–20 (95506–00020)					
Alternator	New belt		145 ± 25 lbf		
	Used belt		100 ± 20 lbf		
PS pump	New belt		145 ± 25 lbf		
(Air pump)	Used belt		100 ± 20 lbf		
A/C compressor	New belt		125 ± 25 lbf		
	Used belt		80 ± 20 lbf		
Engine oil capacity	Drain and refill				
	w/ Oil filter change		7.8 liters	8.2 US qts	7.0 Imp. qts
	w/o Oil filter change		7.0 liters	7.4 US qts	6.2 Imp. qts
Coolant capacity	w / Front heater		17.5 liters	18.5 US qts	15.4 Imp. qts
	w / Front and rear heaters		19.5 liters	20.6 US qts	17.2 Imp. qts
Spark plug	Type	ND	W16EXR-U11		
		NGK	BPR5EY11		
	Gap	STD	1.1 mm	0.043 in.	
Firing order			1 – 5 – 3 – 6 – 2 – 4		
Valve clearance (Hot)		Intake	0.20 mm	0.008 in.	
		Exhaust	0.35 mm	0.014 in.	

Chassis

Front and brake				
Pad thickness	Limit	4.0 mm	0.158 in.	
Disc thickness	Limit	23.0 mm	0.906 in.	
Disc runout	Limit	0.15 mm	0.0059 in.	
Rear brake				
Lining thickness	Limit	1.5 mm	0.059 in.	
Drum inner diameter	Limit	297.0 mm	11.693 in.	
Front axle and suspension				
Wheel bearing friction preload (starting)		27 – 56 N	2.8 – 5.7 kgf	6.2 – 12.6 lbf
Steering wheel freeplay	Maximum	40 mm	1.57 in.	
Torque specifications				
Seat mounting bolts		37 N·m	380 kgf·cm	27 ft·lbf

ENGINE MECHANICAL

Specifications

Idle speed			650 rpm	
Intake manifold vacuum	at Idle speed		420 mmHg (16.54 in.Hg, 56.0 kPa) or more	
Compression pressure	at 250 rpm	STD	1,030 kPa (10.5 kgf/cm², 149 psi) or more	
		Limit	785 kPa	8.0 kgf/cm² 114 psi
	Difference of pressure between each cylinder		49 kPa (0.5 kgf/cm², 7 psi) or less	
Cylinder head	Cylinder block surface warpage	Limit	0.15 mm	0.0059 in.
	Manifold surface warpage	Limit	0.10 mm	0.0039 in.
	Valve seat Refacing angle	Intake	25°, 45°, 70°	
		Exhaust	45°, 65°	
	Contacting angle		45°	
	Contacting width	Intake	1.1 – 1.7 mm	0.043 – 0.067 in.
		Exhaust	1.4 – 2.0 mm	0.055 – 0.079 in.
Valve guide bushing	Inside diameter		8.010 – 8.030 mm	0.3154 – 0.3161 in.
	Outside diameter	STD	14.028 – 14.041 mm	0.5523 – 0.5528 in.
		O/S 0.05	14.078 – 14.091 mm	0.5543 – 0.5548 in.
Valve	Overall length	STD Intake	124.8 mm	4.913 in.
		Exhaust	128.0 mm	5.039 in.
		Limit Intake	124.3 mm	4.894 in.
		Exhaust	127.5 mm	5.020 in.
	Face angle	IN & EX	44.5°	
	Stem diameter	Intake	7.970 – 7.985 mm	0.3138 – 0.3144 in.
		Exhaust	7.960 – 7.975 mm	0.3134 – 0.3140 in.
	Stem oil clearance	STD Intake	0.025 – 0.060 mm	0.0010 – 0.0024 in.
		Exhaust	0.035 – 0.070 mm	0.0014 – 0.0028 in.
		Limit Intake	0.10 mm	0.0039 in.
		Exhaust	0.12 mm	0.0047 in.
	Margin thickness	STD Intake	1.5 – 2.1 mm	0.059 – 0.083 in.
		Exhaust	1.7 – 2.3 mm	0.067 – 0.091 in.
		Limit Intake	1.0 mm	0.039 in.
		Exhaust	1.2 mm	0.047 in.
Valve spring	Squareness	Limit	1.8 mm	0.071 in.
	Free length	STD	51.5 mm	2.028 in.
		Limit	50.0 mm	1.967 in.
	Installed tension at 43.0 mm (1.693 in.)			
		STD	319 N 32.5 kgf	71.6 lbf
		Limit	265 N 27 kgf	59.5 lbf
Valve rocker arm and shaft	Rocker arm inside diameter	STD	18.49 – 18.515 mm	0.7281 – 0.7289 in.
	Shaft diameter	STD	18.464 – 18.485 mm	0.7269 – 0.7278 in.
	Rocker arm oil clearance	STD	0.009 – 0.051 mm	0.0004 – 0.0020 in.
		Limit	0.08 mm	0.0031 in.
Push rod	Circle runout	Limit	1.0 mm	0.039 in.

Specifications (Cont'd)

Manifold	Warpage		Limit	0.50 mm	0.0197 in.
Air intake chamber	Warpage			0.2 mm	0.008 in.
Timing gear	Backlash		STD	0.100 – 0.183 mm	0.0039 – 0.0072 in.
			Limit	0.25 mm	0.0098 in.
Camshaft and bearing	Circle runout	Limit		0.30 mm	0.0118 in.
	Cam lobe height	STD	IN	38.36 – 38.46 mm	1.5102 – 1.5142 in.
			EX	38.25 – 38.35 mm	1.5059 – 1.5098 in.
		Limit	IN	38.0 mm	1.496 in.
			EX	37.9 mm	1.492 in.
	Journal diameter	STD	No.1	47.955 – 47.975 mm	1.8880 – 1.888 in.
			No.2	46.455 – 46.475 mm	1.8289 – 1.8297 in.
			No.3	44.955 – 44.975 mm	1.7699 – 1.7707 in.
			No.4	43.455 – 43.475 mm	1.7108 – 1.7116 in.
		U/S 0.25	No.1	47.715 – 47.725 mm	1.8785 – 1.8789 in.
			No.2	46.215 – 46.225 mm	1.8195 – 1.8199 in.
			No.3	44.715 – 44.725 mm	1.7604 – 1.7608 in.
			No.4	43.215 – 43.225 mm	1.7014 – 1.7018 in.
		U/S 0.50	No.1	47.465 – 47.475 mm	1.8687 – 1.8691 in.
			No.2	45.965 – 45.975 mm	1.8096 – 1.8888 in.
			No.3	44.465 – 44.475 mm	1.7506 – 1.7510 in.
			No.4	42.965 – 42.975 mm	1.6915 – 1.6919 in.
	Bearing inside diameter	STD	No.1	48.000 – 48.030 mm	1.8898 – 1.8909 in.
			No.2	46.500 – 46.530 mm	1.8307 – 1.8319 in.
			No.3	45.000 – 45.030 mm	1.7717 – 1.7728 in.
			No.4	43.500 – 43.530 mm	1.7126 – 1.7138 in.
		U/S 0.25	No.1	47.750 – 47.825 mm	1.8799 – 1.8829 in.
			No.2	46.250 – 46.325 mm	1.8209 – 1.8238 in.
			No.3	44.750 – 44.820 mm	1.7618 – 1.7646 in.
			No.4	43.250 – 43.320 mm	1.7028 – 1.7055 in.
		U/S 0.50	No.1	47.500 – 47.575 mm	1.8701 – 1.8730 in.
			No.2	46.000 – 46.075 mm	1.8110 – 1.8140 in.
			No.3	44.500 – 44.570 mm	1.7520 – 1.7547 in.
			No.4	43.000 – 43.070 mm	1.6929 – 1.6957 in.
	Journal oil clearance				
	STD	STD		0.025 – 0.075 mm	0.0010 – 0.0030 in.
		U/S 0.25 and 0.50			
		No.1 and No.2		0.025 – 0.110 mm	0.0010 – 0.0043 in.
		No.3 and No.4		0.025 – 0.105 mm	0.0010 – 0.0041 in.
	Limit	STD		0.10 mm	0.0039 in.
		U/S 0.25 and 0.50		0.15 mm	0.0059 in.
	Thrust clearance	STD		0.200 – 0.290 mm	0.0079 – 0.0114 in.
		Limit		0.33 mm	0.0130 in.

Specifications (Cont'd)

Valve lifter	Lifter diameter	STD		21.387 – 21.404 mm	0.8420 – 0.8427 in.
		O/S 0.05		21.437 – 21.454 mm	0.8440 – 0.8446 in.
	Cylinder block lifter bore diameter			21.417 – 21.443 mm	0.8432 – 0.8442 in.
	Lifter oil clearance		STD	0.013 – 0.056 mm	0.0005 – 0.0022 in.
			Limit	0.10 mm	0.0039 in.
Cylinder block	Warpage		Limit	0.15 mm	0.0059 in.
	Cylinder bore diameter	STD	Mark "1"	94.000 – 94.010 mm	3.7008 – 3.7012 in.
			Mark "2"	94.010 – 94.020 mm	3.7012 – 3.7016 in.
			Mark "3"	94.020 – 94.030 mm	3.7016 – 3.7020 in.
			Limit	94.23 mm	3.7098 in.
		O/S 0.50	Limit	94.73 mm	3.7295 in.
		O/S 1.00	Limit	95.23 mm	3.7492 in.
		O/S 1.50	Limit	95.73 mm	3.7689 in.
Piston and piston ring	Piston diameter	STD	Mark "1"	93.963 – 93.973 mm	3.6993 – 3.6997 in.
			Mark "2"	93.973 – 93.983 mm	3.6997 – 3.7001 in.
			Mark "3"	93.983 – 93.993 mm	3.7001 – 3.7005 in.
		O/S 0.50		94.463 – 94.493 mm	3.7190 – 3.7202 in.
		O/S 1.00		94.963 – 94.993 mm	3.7387 – 3.7399 in.
		O/S 1.50		95.463 – 95.493 mm	3.7584 – 3.7596 in.
	Piston oil clearance			0.027 – 0.047 mm	0.0011 – 0.0019 in.
	Piston ring groove clearance				
		No.1		0.030 – 0.070 mm	0.0012 – 0.0028 in.
		No.2		0.050 – 0.090 mm	0.0020 – 0.0035 in.
	Piston ring end gap	STD	No.1	0.200 – 0.420 mm	0.0079 – 0.0165 in.
			No.2	0.500 – 0.720 mm	0.0197 – 0.0283 in.
			Oil	0.200 – 0.820 mm	0.0079 – 0.0323 in.
		Limit	No.1	1.02 mm	0.0402 in.
			No.2	1.32 mm	0.0520 in.
			Oil	1.42 mm	0.0559 in.
Connecting rod and piston pin	Thrust clearance	STD		0.160 – 0.300 mm	0.0063 – 0.0118 in.
		Limit		0.40 mm	0.0156 in.
	Connecting rod bearing center wall thickness				
		STD	Mark A	1.484 – 1.488 mm	0.0584 – 0.0586 in.
			Mark B	1.488 – 1.492 mm	0.0586 – 0.0587 in.
			Mark C	1.492 – 1.496 mm	0.0587 – 0.0589 in.
	Connecting rod oil clearance				
	STD	STD		0.020 – 0.050 mm	0.0008 – 0.0020 in.
		U/S 0.25 and 0.50		0.019 – 0.063 mm	0.0007 – 0.0025 in.
	Limit			0.10 mm	0.0039 in.
	Bend per 100 mm (3.94 in.)				
		Limit		0.05 mm	0.0020 in.
	Twist per 100 mm (3.94 in.)				
		Limit		0.15 mm	0.0059 in.
	Bushing inside diameter			22.012 – 22.27 mm	0.8666 – 0.8672 in.
	Piston pin diameter			22.004 – 22.019 mm	0.8663 – 0.8669 in.

Specifications (Cont'd)

Connecting rod and piston pin (cont'd)	Piston pin to bushing oil clearance				
		STD		0.005 – 0.011 mm	0.0002 – 0.0004 in.
		Limit		0.03 mm	0.0012 in.
Crankshaft and bearing	Thrust clearance	STD		0.015 – 0.204 mm	0.0006 – 0.0080 in.
		Limit		0.30 mm	0.0118 in.
	Thrust washer thickness	STD		2.430 – 2.480 mm	0.0957 – 0.0976 in.
		O/S 0.125		2.493 – 2.543 mm	0.0981 – 0.1001 in.
		O/S 0.250		2.555 – 2.605 mm	0.1006 – 0.1026 in.
	Main journal oil clearance				
	STD	STD		0.016 – 0.056 mm	0.0006 – 0.0022 in.
		U/S 0.25 and 0.50		0.021 – 0.067 mm	0.0008 – 0.0026 in.
	Limit			0.10 mm	0.0039 in.
	Main journal diameter	STD	No.1	66.972 – 66.996 mm	2.6367 – 2.6376 in.
			No.2	68.472 – 68.496 mm	2.6957 – 2.6967 in.
			No.3	69.972 – 69.996 mm	2.7548 – 2.7557 in.
			No.4	71.472 – 71.496 mm	2.8139 – 2.8148 in.
		U/S 0.25	No.1	66.745 – 66.755 mm	2.6278 – 2.6281 in.
			No.2	68.245 – 68.255 mm	2.6868 – 2.6872 in.
			No.3	69.745 – 69.755 mm	2.7459 – 2.7463 in.
			No.4	71.245 – 71.255 mm	2.8049 – 2.8053 in.
		U/S 0.50	No.1	66.495 – 66.505 mm	2.6179 – 2.6183 in.
			No.2	67.995 – 68.005 mm	2.6770 – 2.6774 in.
			No.3	69.495 – 69.505 mm	2.7360 – 2.7364 in.
			No.4	70.995 – 71.005 mm	2.7951 – 2.7955 in.
	Main bearing center wall thickness				
		STD	Mark T1	2.493 – 2.497 mm	0.0981 – 0.0983 in.
			Mark T2	2.497 – 2.501 mm	0.0983 – 0.0985 in.
			Mark T3	2.501 – 2.505 mm	0.0985 – 0.0986 in.
			Mark T4	2.505 – 2.509 mm	0.0986 – 0.0988 in.
			Mark T5	2.509 – 2.513 mm	0.0988 – 0.0989 in.
	Crank pin diameter		STD	52.988 – 53.000 mm	2.0861 – 2.0866 in.
			U/S 0.25	52.701 – 52.711 mm	2.0748 – 2.0752 in.
			U/S 0.50	52.451 – 52.461 mm	2.0650 – 2.0654 in.
	Circle runout		Limit	0.12 mm	0.0048 in.
	Taper and out-of-round				
	Main journal and crank pin		Limit	0.02 mm	0.0008 in.

Torque Specifications

Part tightened		N·m	kgf·cm	ft·lbf
Cylinder head x Cylinder block		123	1,250	90
Valve rocker support x Cylinder head				
	12 mm bolt head	24	240	17
	14 mm bolt head and.nut	33	340	25
Manifold x Cylinder head	14 mm bolt head	50	510	37
	17 mm bolt head	69	700	51
	Nut	56	570	41
Cylinder head cover x Cylinder head		8.8	90	78 in.·lbf
Intake manifold x Intake manifold stay		29	300	22
Cylinder block x Intake manifold stay		29	300	22
Air injection manifold x Cylinder head		21	210	15
Exhaust manifold x Exhaust pipe		62	630	46
Water outlet housing x Cylinder head		25	250	18
Camshaft thrust washer x Cylinder block		12	120	9
Timing gear cover x Front end plate or cylinder block				
	10 mm bolt head	4.9	50	43 in.·lbf
	14 mm bolt head	25	250	18
Crankshaft pulley x Crankshaft		343	3,500	253
PS pulley x Crankshaft pulley		18	185	13
Push rod cover x Cylinder block		3.9	40	35 in.·lbf
Main bearing cap x Cylinder block				
	19 mm bolt head	135	1,375	99
	17 mm bolt head	115	1,175	85
Connecting rod cap x Connecting rod		59	600	43
Front end plate x Cylinder block				
	Screw	25	250	18
	Bolt	30	310	22
Drive plate x Crankshaft		87	890	64

EFI SYSTEM

Specifications

Fuel pressure regulator	Fuel pressure at No vacuum	255 – 314 kPa (2.6 – 3.2 kgf/cm², 37 – 46 psi)
Cold start injector	Resistance Fuel leakage	2 – 4 Ω One drop or less per minute
Injector	Resistance Injection volume Difference between each injector Fuel leakage	Approx. 13.8 Ω 47 – 59 cm³ (2.9 – 3.6 cu in.) per 15 sec. 5 cm³ (0.31 cu in.) or less One drop or less per minute

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Cylinder head x Cylinder block	123	1,250	90
Valve rocker support x Cylinder head			
12 mm bolt head	24	240	17
14 mm bolt head and.nut	33	340	25
Manifold x Cylinder head 14 mm bolt head	50	510	37
17 mm bolt head	69	700	51
Nut	56	570	41
Cylinder head cover x Cylinder head	8.8	90	78 in.·lbf
Intake manifold x Intake manifold stay	29	300	22
Cylinder block x Intake manifold stay	29	300	22
Air injection manifold x Cylinder head	21	210	15
Exhaust manifold x Exhaust pipe	62	630	46
Water outlet housing x Cylinder head	25	250	18
Camshaft thrust washer x Cylinder block	12	120	9
Timing gear cover x Front end plate or cylinder block			
10 mm bolt head	4.9	50	43 in.·lbf
14 mm bolt head	25	250	18
Crankshaft pulley x Crankshaft	343	3,500	253
PS pulley x Crankshaft pulley	18	185	13
Push rod cover x Cylinder block	3.9	40	35 in.·lbf
Main bearing cap x Cylinder block			
19 mm bolt head	135	1,375	99
17 mm bolt head	115	1,175	85
Connecting rod cap x Connecting rod	59	600	43
Front end plate x Cylinder block			
Screw	25	250	18
Bolt	30	310	22
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EFI SYSTEM

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Specifications (Cont'd)

Throttle position sensor	Clearance between stop screw and lever		Between terminals	Resistance
	0 mm	0 in.	VTA – E2	0.3 – 6.3 kΩ
	0.77 mm	0.0303 in.	IDL – E2	Less than 2.3 kΩ
	1.09 mm	0.0429 in.	IDL – E2	Infinity
	Throttle valve fully opened position		VTA – E2	3.5 – 10.3 kΩ
	—		VC – E2	4.25 – 8.25 kΩ
ISC valve	Resistance	B1 – S1 or S3	10 – 30 Ω	
		B2 – S2 or S4	10 – 30 Ω	
Cold start injector time switch	Resistance	STA – E1 below 15°C (59°F)	30 – 50 Ω	
		STA – E1 above 30°C (86°F)	70 – 90 Ω	
		STA – Ground	30 – 90 Ω	
Air flow meter	Resistance	E2 – VS	200 – 600 Ω (Measuring plate fully closed)	
			20 – 1,200 Ω (Measuring plate fully open)	
		E2 – VC	200 – 400 Ω	
		E1 – FC	Infinity (Measuring plate fully closed)	
			Zero (Other than closed position)	
		E2 – THA at –20°C (–4°F)	10 – 20 kΩ	
		at 0°C (32°F)	4 – 7 kΩ	
		at 20°C (68°F)	2 – 3 kΩ	
		at 40°C (104°F)	0.9 – 1.3 kΩ	
		at 60°C (140°F)	0.4 – 0.7 kΩ	
Water temp. sensor	Resistance	at –20°C (–4°F)	10 – 20 kΩ	
		at 0°C (32°F)	4 – 7 kΩ	
		at 20°C (68°F)	2 – 3 kΩ	
		at 40°C (104°F)	0.9 – 1.3 kΩ	
		at 60°C (140°F)	0.4 – 0.7 kΩ	
		at 80°C (176°F)	0.2 – 0.4 kΩ	
Oxygen sensor	Heater resistance		5.1 – 6.3 Ω	
EGR gas temp. sensor (Calif. only)	Resistance	at 50°C (112°F)	69.40 – 88.50 kΩ	
		at 100°C (212°F)	11.89 – 14.37 kΩ	
		at 150°C (302°F)	2.79 – 3.59 kΩ	

Specifications (Cont'd)

ECU	HINT: • Perform all voltage and resistance measurements with the computer connected. • Verify that the battery voltage is 11 V or above with the ignition switch ON.			
	Voltage			
	Terminals	Condition		STD voltage (V)
	BATT – E1 (E11)	—		10 – 14
	IG SW – E1 (E11)	Ignition switch ON		10 – 14
	M-REL – E1 (E11)	Ignition switch ON		10 – 14
	+B (+B1) – E1 (E11)	Ignition switch ON		10 – 14
	IDL – E2	Ignition switch ON	Throttle valve open	4 – 6
	VC – E2		—	4 – 6
	VTA – E2		Throttle valve fully closed	0.1 – 1.0
			Throttle valve fully open	3 – 5
	VC – E2	Ignition switch ON	—	4 – 6
	VS – E2		Measuring plate fully closed	4 – 5
			Measuring plate fully open	0.02 – 0.08
		Idling		2 – 4
		3,000 rpm		0.3 – 1.0
	THA – E2	Ignition switch ON	Intake air temperature 20°C (68°F)	1 – 3
	THW – E2	Ignition switch ON	Coolant temperature 80°C (176°F)	0.1 – 1.0
	No.10 – E01 No.20 – E02	Ignition switch ON		10 – 14
	STA – E1 (E11)	Cranking		6 – 14
	ISC1 ISC4 – E1 (E11)	Ignition switch ON		10 – 14
	IGT – E1 (E11)	Idling		0.7 – 1.0
	W – E1 (E11)	No trouble ("CHECK" engine warning light off) and engine running		10 – 14
	A/C – E1 (E11)	Air conditioning ON		10 – 14
	T – E1 (E11)	Ignition switch ON	Check connector TE1 – E1 not connect	4 – 6
			Check connector TE1 – E1 connect	0
	NSW – E1 (E11)	Ignition switch ON	Shift position P or N range	0
			Ex. P or N range	10 – 14
	4WD – E1 (E11)	Ignition switch ON	Center difflock switch OFF	0
			Center difflock switch OFF	0
	STP – E1 (E11)	Ignition switch ON	Stop light switch ON	10 – 14
			Stop light switch OFF	0

Specifications (Cont'd)

ECU (Cant'd)	Resistance		
	Terminals	Condition	**Resistance (Ω)**
	IDL – E2	Throttle valve fully open	**Infinity**
		Throttle valve fully closed	**Less than 2,300**
	VTA – E2	Throttle valve fully open	**3,500 – 10,300**
		Throttle valve fully closed	**300 – 6,300**
	VC – E2	Air flow meter connector disconnected	**4,250 – 8,250**
	VC – E2	Throttle position sensor connector disconnected	**200 – 400**
	VS – E2	Measuring plate fully closed	**200 – 600**
		Measuring plate fully open	**20 – 1,200**
	THA – E2	Intake air temperature 20°C (68°F)	**2,000 – 3,000**
	THW – E2	Coolant temperature 80°C (176°F)	**200 – 400**
	G1 – G⊖	—	**140 – 180**
	NE – G⊖		**140 – 180**
	ISC1, ISC2 ISC3, ISC4 – +B	—	**10 – 30**
Fuel cut rpm	Fuel cut rpm Fuel return rpm	**1,300 rpm** **1,000 rpm**	

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Cold start injector pipe x Cold start injector	19	195	14
Cold start injector pipe x Delivery pipe	19	195	14
Cold start injector clamp bolt	12	120	9
Fuel pump bracket x Fuel tank	3.9	40	35 in.·lbf
Pressure regulator x Delivery pipe	5.4	55	48 in.·lbf
Fuel return pipe x Pressure regulator	19	195	14
Delivery pipe x Intake manifold	13	130	9
Pulsation damper x Delivery pipe	29	300	22
Air intake chamber x Intake manifold	25	250	18
Intake chamber stay mount bolt	12	120	9
EGR pipe union nut	64	650	47
Throttle body x Air intake chamber	12	120	9
ISC valve x Air intake chamber	12	120	9

COOLING SYSTEM

Specifications

Engine coolant capacity			See page A–2
Thermostat	Valve opening temperature Valve lift at 100°C (212°F)		86 – 90°C 187 – 194°F 10 mm (0.39 in.) or more
Radiator	Relief valve opening pressure	STD	74 – 103 kPa (0.75 – 1.05 kgf/cm², 10.7 – 14.9 psi)
		Limit	59 kPa 0.6 kgf/cm² 8.5 psi

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Drain plug	44	450	33
Water pump x Cylinder block	37	380	27
Water outlet x Water outlet housing	18	185	13

LUBRICATION SYSTEM

Specifications

Engine oil capacity			See page A–2
Oil pressure		at Idle	29 kPa (0.3 kgf/cm², 4.3 psi) or more
		at 4,000 rpm	245 – 490 kPa (2.5 – 5.0 kgf/cm², 36 – 71 psi)
Oil pump	Body clearance	STD	0.095 – 0.175 mm 0.0037 – 0.0069 in.
		Limit	0.20 mm 0.0079 in.
	Gear side clearance	STD	0.030 – 0.090 mm 0.0012 – 0.0035 in.
		Limit	0.15 mm 0.0059 in.
	Gear backlash	STD	0.500 – 0.600 mm 0.0197 – 0.0236 in.
		Limit	0.95 mm 0.0374 in.

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Engine oil drain plug	39	400	29
Oil pump strainer x Oil pump body	10	100	7
Relief valve plug x Oil pump strainer	44	450	33
Oil pump x Cylinder block	18	180	13
Oil outlet pipe	44	450	33
Oil pan x Cylinder block	7.8	80	69 in.·lbf
Oil filter bracket x Cylinder block	18	185	13
Relief valve x Oil filter bracket	25	250	18
Oil cooler	64	650	47

COOLING SYSTEM

Specifications

Engine coolant capacity			See page A–2
Thermostat	Valve opening temperature Valve lift at 100°C (212°F)		86 – 90°C 187 – 194°F 10 mm (0.39 in.) or more
Radiator	Relief valve opening pressure	STD Limit	74 – 103 kPa (0.75 – 1.05 kgf/cm², 10.7 – 14.9 psi) 59 kPa 0.6 kgf/cm² 8.5 psi

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Drain plug	44	450	33
Water pump x Cylinder block	37	380	27
Water outlet x Water outlet housing	18	185	13

LUBRICATION SYSTEM

Specifications

Engine oil capacity			See page A–2
Oil pressure		at Idle at 4,000 rpm	29 kPa (0.3 kgf/cm², 4.3 psi) or more 245 – 490 kPa (2.5 – 5.0 kgf/cm², 36 – 71 psi)
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	Gear side clearance	STD Limit	0.030 – 0.090 mm 0.0012 – 0.0035 in. 0.15 mm 0.0059 in.
	Gear backlash	STD Limit	0.500 – 0.600 mm 0.0197 – 0.0236 in. 0.95 mm 0.0374 in.

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Engine oil drain plug	39	400	29
Oil pump strainer x Oil pump body	10	100	7
Relief valve plug x Oil pump strainer	44	450	33
Oil pump x Cylinder block	18	180	13
Oil outlet pipe	44	450	33
Oil pan x Cylinder block	7.8	80	69 in.·lbf
Oil filter bracket x Cylinder block	18	185	13
Relief valve x Oil filter bracket	25	250	18
Oil cooler	64	650	47

IGNITION SYSTEM

Ignition timing			7° BTDC @ idle (Check connector TE1 and E1 connected)
Firing order			1 – 5 – 3 – 6 – 2 – 4
High–tension cord	Resistance	Limit	25 kΩ per cord
Spark plug	Type	ND NGK	W16EXR-U11 BPR5EY11
	Correct electrode gap		1.1 mm 0.043 in.
Ignition coil	Primary coil resistance at cold Secondary coil resistance at cold		0.30 – 0.60 Ω 9.0 – 15.0 kΩ
Distributor	Air gap G and N E pickups Pickup coil resistance G and NE pickups (cold)		0.2 – 0.4 mm 0.008 – 0.016 in. 185 – 265 Ω

STARTING SYSTEM

Starter	Rated voltage and output power No–load characteristic			12 V 1.0 kW 90 A or less at 11.5 V 3,000 rpm or more
			Ampere rpm	
	Commutator	outer diameter	STD	30 mm 1.18 in.
			Limit	29 mm 1.14 in.
		Under cut depth	STD	0.6 mm 0.024 in.
			Limit	0.2 mm 0.008 in.
		Circle runout	Limit	0.05 mm 0.0020 in.
	Brush	Length	STD	13.5 mm 0.531 in.
			Limit	8.5 mm 0.335 in.
	Spring installed load			18 – 24 N 1.79 – 2.41 kgf 3.9 – 5.3 lbf

CHARGING SYSTEM

Drive belt tension				See page A-2
Battery specific gravity	when fully charged at 20°C (68°F)			1.25 – 1.27
Alternator	Rated output Rotor coil resistance Slip ring diameter			12 V 80 A 2.8 – 3.0 Ω
			STD	32.3 – 32.5 mm 1.272 – 1.280 in.
			Limit	32.1 mm 1.264 in.
	Brush exposed length		STD	20.0 mm 0.789 in.
			Limit	5.5 mm 0.217 in.
Alternator regulator	Regulating voltage	at 25°C (77°F)		13.8 – 14.4 V

IGNITION SYSTEM

Ignition timing			7° BTDC @ idle (Check connector TE1 and E1 connected)
Firing order			1 – 5 – 3 – 6 – 2 – 4
High–tension cord	Resistance	Limit	25 kΩ per cord
Spark plug	Type	ND NGK	W16EXR-U11 BPR5EY11
	Correct electrode gap		1.1 mm 0.043 in.
Ignition coil	Primary coil resistance at cold Secondary coil resistance at cold		0.30 – 0.60 Ω 9.0 – 15.0 kΩ
Distributor	Air gap G and N E pickups Pickup coil resistance G and NE pickups (cold)		0.2 – 0.4 mm 0.008 – 0.016 in. 185 – 265 Ω

STARTING SYSTEM

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			Limit	29 mm 1.14 in.
		Under cut depth	STD	0.6 mm 0.024 in.
			Limit	0.2 mm 0.008 in.
		Circle runout	Limit	0.05 mm 0.0020 in.
	Brush	Length	STD	13.5 mm 0.531 in.
			Limit	8.5 mm 0.335 in.
	Spring installed load			18 – 24 N 1.79 – 2.41 kgf 3.9 – 5.3 lbf

CHARGING SYSTEM

Drive belt tension				See page A-2
Battery specific gravity	when fully charged at 20°C (68°F)			1.25 – 1.27
Alternator	Rated output Rotor coil resistance Slip ring diameter			12 V 80 A 2.8 – 3.0 Ω
			STD	32.3 – 32.5 mm 1.272 – 1.280 in.
			Limit	32.1 mm 1.264 in.
	Brush exposed length		STD	20.0 mm 0.789 in.
			Limit	5.5 mm 0.217 in.
Alternator regulator	Regulating voltage	at 25°C (77°F)		13.8 – 14.4 V

IGNITION SYSTEM

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Spark plug	Type	ND NGK	W16EXR-U11 BPR5EY11
	Correct electrode gap		1.1 mm 0.043 in.
Ignition coil	Primary coil resistance at cold Secondary coil resistance at cold		0.30 – 0.60 Ω 9.0 – 15.0 kΩ
Distributor	Air gap G and N E pickups Pickup coil resistance G and NE pickups (cold)		0.2 – 0.4 mm 0.008 – 0.016 in. 185 – 265 Ω

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	Commutator	outer diameter	STD Limit	30 mm 1.18 in. 29 mm 1.14 in.
		Under cut depth	STD Limit	0.6 mm 0.024 in. 0.2 mm 0.008 in.
		Circle runout	Limit	0.05 mm 0.0020 in.
	Brush	Length	STD Limit	13.5 mm 0.531 in. 8.5 mm 0.335 in.
	Spring installed load			18 – 24 N 1.79 – 2.41 kgf 3.9 – 5.3 lbf

CHARGING SYSTEM

Drive belt tension				See page A-2
Battery specific gravity	when fully charged at 20°C (68°F)			1.25 – 1.27
Alternator	Rated output Rotor coil resistance Slip ring diameter			12 V 80 A 2.8 – 3.0 Ω 32.3 – 32.5 mm 1.272 – 1.280 in.
			Limit	32.1 mm 1.264 in.
	Brush exposed length		STD Limit	20.0 mm 0.789 in. 5.5 mm 0.217 in.
Alternator regulator	Regulating voltage	at 25°C (77°F)		13.8 – 14.4 V

AUTOMATIC TRANSMISSION

Specifications

Engine stall revolution		1,950 ± 150 rpm		
Engine idle speed	N range	650 rpm		
Time lag	N range → D range	Less than 0.7 seconds		
	N range → R range	Less than 1.2 seconds		
Line pressure (wheel locked)				
Engine idling	D range	363 – 422 kPa	3.7 – 4.3 kgf/cm²	53 – 61 psi
	R range	441 – 539 kPa	4.5 – 5.5 kgf/cm²	64 – 78 psi
At stall	D range	1,089 – 1,334 kPa	11.1 – 13.6 kgf/cm²	158 – 193 psi
	R range	1,373 – 1,667 kPa	14.0 – 17.0 kgf/cm²	199 – 242 psi
Governor pressure				
Output shaft rpm	(Vehicle speed reference)			
1,000	(approx. 32 km/h, 20 mph)	78 – 118 kPa	0.8 – 1.2 kgf/cm²	11 – 17 psi
1,800	(approx. 57 km/h, 35 mph)	186 – 255 kPa	1.9 – 2.6 kgf/cm²	27 – 37 psi
3,500	(approx. 111 km/h, 69 mph)	547 – 618 kPa	5.6 – 6.3 kgf/cm²	80 – 90 psi
Throttle cable adjustment				
Throttle valve fully closed		Between boot end face and inner cable stopper		
		0.5 – 1.5 mm	0.020 – 0.059 in.	
Throttle valve fully opened		32 – 34 mm	1.26 – 1.34 in.	
Torque converter installation		15.7 mm (0.618 in.) or more		
Torque converter runout	Limit	0.30 mm	0.0118 in.	
Drive plate runout	Limit	0.20 mm	0.0079 in.	

Shift point schedule kmlh (mph)	D range (throttle valve fully open)						(fully closed)		2 range	L range
	1 → 2	2 → 3	3 → O/D	O/D → 3	3 → 2	2 → 1	Lock-up ON	Lock-up OFF	3 → 2	2 → 1
Tire size: P235/75R 15	33–46 (21–27)	75–88 (47–55)	110–123 (68–76)	101–114 (63–71)	66–78 (41–48)	28–41 (17–25)	71–82 (44–51)	65–76 (40–47)	77–90 (48–56)	36–48 (22–30)
Tire size: 31 X 10.5 R15	36–50 (22–31)	81–95 (50–59)	118–132 (73–82)	109–123 (68–76)	71–84 (44–52)	31–44 (19–27)	76–88 (47–55)	70–82 (43–51)	83–97 (52–60)	38–52 (24–32)

Torque Specifications

Part tightened		N·m	kgf·cm	ft·lbf
Engine x Transmission	14 mm head bolt	37	380	27
	17 mm head bolt	72	730	53
Torque converter x Drive plate		28	290	21
Frame crossmember set bolt		61	620	45
Frame crossmember set nut		59	600	43
Oil cooler pipe union nut		34	350	25
Propeller shaft x Transfer		88	900	65
Propeller shaft x Differential		88	900	65
Valve body x Transmission case		10	100	7

TRANSFER

Specifications

Input gear snap ring	Mark		
	A	2.0 mm	0.0787 in.
	B	2.1 mm	0.0827 in.
	C	2.2 mm	0.0866 in.
	D	2.3 mm	0.0906 in.
	E	2.4 mm	0.0945 in.
	F	2.5 mm	0.0984 in.
	G	2.6 mm	0.1024 in.
	H	2.7 mm	0.1063 in.
	J	2.8 mm	0.1102 in.
Input shaft rear ball bearing snap ring	Mark		
	A	2.0 mm	0.0787 in.
	B	2.1 mm	0.0827 in.
	C	2.2 mm	0.0866 in.
	D	2.3 mm	0.0906 in.
	E	2.4 mm	0.0945 in.
Idle low gear thrust clearance	STD	0.125 – 0.275 mm	0.0049 – 0.0108 in.
	Limit	0.275 mm	0.0108 in.
Idle low gear oil clearance	STD	0.015 – 0.068 mm	0.0006 – 0.0027 in.
	Limit	0.068 mm	0.0027 in.
High speed gear thrust clearance	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
High speed gear oil clearance	Limit	0.25 mm	0.0098 in.
	STD	0.015 – 0.071 mm	0.0006 – 0.0028 in.
	Limit	0.071 mm	0.0028 in.
Center differential backlash adjusting shim		1.70 mm	0.0669 in.
		1.85 mm	0.0728 in.
		2.00 mm	0.0787 in.
		2.15 mm	0.0846 in.
		2.30 mm	0.0906 in.
		2.45 mm	0.0965 in.
		2.60 mm	0.1024 in.
		2.75 mm	0.1083 in.
		2.90 mm	0.1142 in.
		3.05 mm	0.1201 in.
Center differential backlash	Limit	0.05 mm	0.0020 in.
Oil pump driven rotor body clearance	STD	0.08 – 0.17 mm	0.0031 – 0.0067 in.
	Limit	0.17 mm	0.0067 in.
Oil pump driven rotor body tip clearance	STD	0.05 – 0.15 mm	0.0020 – 0.0059 in.
	Limit	0.15 mm	0.0059 in.
Oil pump side clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in.
	Limit	0.05 mm	0.0020 in.

Specifications (Cont'd)

Front drive gear piece snap ring	Mark		
	A	2.00 mm	0.0787 in.
	B	2.10 mm	0.0827 in.
	C	2.20 mm	0.0866 in.
	D	2.30 mm	0.0906 in.
	E	2.40 mm	0.0945 in.
	F	2.50 mm	0.0984 in.
	G	2.60 mm	0.1024 in.
	H	2.70 mm	0.1063 in.
	J	2.80 mm	0.1102 in.
	K	1.80 mm	0.0709 in.
	L	1.90 mm	0.0748 in.
Rear output shaft adjusting shim			
Idler gear side	Mark		
	B	0.30 mm	0.0118 in.
	C	0.45 mm	0.0177 in.
	D	2.40 mm	0.0945 in.
	E	2.60 mm	0.1024 in.
	F	2.80 mm	0.1102 in.
	G	3.00 mm	0.1181 in.
	H	3.20 mm	0.1260 in.
	J	3.40 mm	0.1339 in.
	K	3.60 mm	0.1417 in.
	L	3.80 mm	0.1496 in.
	M	0.55 mm	0.0216 in.
Output shaft side	Mark		
	B	0.30 mm	0.0118 in.
	C	0.45 mm	0.0177 in.
	D	1.00 mm	0.0394 in.
	E	1.20 mm	0.0472 in.
	F	1.40 mm	0.0551 in.
	G	1.60 mm	0.0630 in.
	H	1.80 mm	0.0709 in.
	J	2.00 mm	0.0787 in.
	K	2.20 mm	0.0866 in.
	L	2.40 mm	0.0945 in.
	M	2.60 mm	0.1024 in.
	N	0.55 mm	0.0216 in.

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Oil pump plate x Rear extension housing	4.9	50	43 in.·lbf
Screw plug x Rear extension housing	29	300	22
Oil pump cover x Rear extension housing	4.9	50	43 in.·lbf
Lever lock pin	12	120	9
Oil strainer x Rear case	4.9	50	43 in.·lbf
Case cover x Rear case	37	380	27
Rear extension housing x Rear case	37	380	27
Front extension housing x Front case	37	380	27
4WD Indicator switch x Front extension housing	37	380	27
Screw plug x Front case	19	190	14
Motor actuator x Front case	12	120	9
Differential front case x Differential rear case	98	1,000	72
(temporarily tighen)	88	900	65
Front case x Rear case	37	380	27

PROPELLER SHAFT

Specifications

Propeller shaft runout		Limit	0.8 mm	0.031 in.
Spider bearing axial play			Less than 0.05 mm (0.0020 in.)	
Snap ring thickness	Color	Mark		
Front propeller shaft	None	1	2.100 – 2.150 mm	0.0827 – 0.0846 in.
	None	2	2.150 – 2.200 mm	0.0846 – 0.0866 in.
	None	3	2.200 – 2.250 mm	0.0866 – 0.0886 in.
	Brown	None	2.250 – 2.300 mm	0.0886 – 0.0906 in.
	Blue	None	2.300 – 2.350 mm	0.0906 – 0.0925 in.
	None	6	2.350 – 2.400 mm	0.0925 – 0.0945 in.
	None	7	2.400 – 2.450 mm	0.0945 – 0.0965 in.
	None	8	2.450 – 2.500 mm	0.0965 – 0.0984 in.
Rear propeller shaft	None		2.00 mm	0.0787 in.
	Brown		2.03 mm	0.0799 in.
	Blue		2.06 mm	0.0811 in.
	None		2.09 mm	0.0823 in.

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Front propeller shaft x Front differential	74	750	54
Front propeller shaft x Transfer	74	750	54
Rear propeller shaft x Rear differential	88	900	65
Rear propeller shaft x Transfer	88	900	65

SUSPENSION AND AXLE

Specifications

Cold tire inflation pressure kPa (kgf/cm^2, psi)		Tire size	Front	Rear
	STD seat	R235/75R 15 Ex. Load	200 (2.0, 29)	200 (2.0, 29)
		31 x 10.50R 15LT (C)	210 (2.1, 30)	210 (2.1, 30)
	w/3rd seat	R235/75R 15 Ex. Load	200 (2.0, 29)	240 (2.5, 35)
		31 x 10.50R 15LT (C)	210 (2.1, 30)	275 (2.75, 39)
Follow spring and bumper stopper clearance	A: Follow spring clearance (Front)		A	B
	B: Bumper stopper clearance (Rear)		25 mm (0.98 in.)	45 mm (1.77 in.)
Front wheel alignment	Camber	Inspection standard Left–right error	1° ± 45′ 30′ or less	
	Steering axis inclination	Inspection standard Left–right error	13°30′ ± 45′ 30′ or less	
	Caster	Inspection standard P235/75R 15 31 x 10.50 or 15 Left–right error	3°00′ ± 1° 1°40′ ± 1° 30′ or less	
	Toe–in	Inspection STD	Adjustment STD	
		2±2 mm (0.08 ± 0.08 in.)	1 ± 2 mm (0.04 ± 0.08 in.)	
	Wheel angle	Max.	Inside wheel	35°00′ $^{+0°}_{-3°}$
			Outside wheel	30°00′
	Side slip (Reference only)		Less than 3.0 mm/m (0.118 in./3.3 ft)	

Disc wheel lateral runout	Limit	1.2 mm	0.047 in.
Wheel bearing preload (starting) (rotating load at hub bolt)		27 – 56 N	2.8 – 5.7 kgf	6.2 – 12.6 lbf
Steering knuckle bearing preload (rotating load at knuckle end, before installing dust seal)		25 – 44 N	2.5 – 4.4 kgf	5.5 – 9.9 lbf

Specifications (Cont'd)

Front differen–tial	Drive pinion bearing preload at starting	
	New bearing	0.9 – 1.6 N·m 10 – 16 kgf·cm 8.7 – 13.9 in.·lbf
	Reused bearing	0.5 – 0.8 N·m 5 – 8 kgf·cm 4.3 – 6.9 in.·lbf
	Total preload at starting	Add drive pinion bearing preload
	New and reused bearing	0.4 – 0.6 N·m 4 – 6 kgf·cm 3.5 – 5.2 in.·lbf
	Drive pinion to ring gear backlash	0.13 – 0.18 mm 0.0051 – 0.0071 in.
	Pinion gear to side gear backlash	0.05 – 0.20 mm 0.0020 – 0.0079 in.
	Ring gear runout Limit	0.10 mm 0.0039 in.
	Companion flange runout Limit	
	Radial	0.10 mm 0.0039 in.
	Lateral	0.10 mm 0.0039 in.
	Oil seal drive in depth	1.0 mm 0.039 in.
	Side gear thrust washer thickness	1.58 – 1.62 mm 0.0622 – 0.0638 in.
		1.68 – 1.72 mm 0.0661 – 0.0677 in.
		1.78 – 1.82 mm 0.0701 – 0.0717 in.
	Drive pinion adjusting plate washer thickness	1.70 mm 0.0669 in.
		1.73 mm 0.0681 in.
		1.76 mm 0.0693 in.
		1.79 mm 0.0705 in.
		1.82 mm 0.0717 in.
		1.85 mm 0.0728 in.
		1.88 mm 0.0740 in.
		1.91 mm 0.0752 in.
		1.94 mm 0.0764 in.
		1.97 mm 0.0776 in.
		2.00 mm 0.0787 in.
		2.03 mm 0.0799 in.
		2.06 mm 0.0811 in.
		2.09 mm 0.0823 in.
		2.12 mm 0.0835 in.
		2.15 mm 0.0846 in.
		2.18 mm 0.0858 in.
		2.21 mm 0.0870 in.
		2.24 mm 0.0882 in.
		2.27 mm 0.0894 in.
		2.30 mm 0.0906 in.
		2.33 mm 0.0917 in.

Specifications (Cont'd)

Rear differential	Drive pinion bearing preload	at starting	
	New bearing		1.3 – 2.0 N·m 13 – 20 kgf·cm 11.3 – 17.4 in.·lbf
	Reused bearing		0.7 – 1.0 N·m 7 – 10 kgf·cm 6.1 – 8.7 in.·lbf
	Total preload	at starting	Add drive pinion bearing preload
	New and reused bearing		0.4 – 0.6 N·m 4 – 6 kgf·cm 3.5 – 5.2 in.·lbf
	Drive pinion to ring gear backlash		0.15 – 0.20 mm 0.0059 – 0.0079 in.
	Pinion gear to side gear backlash		0.02 – 0.20 mm 0.0008 – 0.0079 in.
	Ring gear runout	Limit	0.10 mm 0.0039 in.
	Companion flange runout	Limit	
		Radial	0.10 mm 0.0039 in.
		Lateral	0.10 mm 0.0039 in.
	Oil seal drive in depth		1.0 mm 0.039 in.
	Side gear thrust washer thickness		1.55 – 1.65 mm 0.0610 – 0.0650 in.
			1.70 – 1.80 mm 0.0669 – 0.0709 in.
			1.85 – 1.95 mm 0.0728 – 0.0768 in.
			2.00 – 2.10 mm 0.0787 – 0.0827 in.
	Drive pinion adjusting plate washer thickness		1.05 mm 0.0413 in.
			1.10 mm 0.0433 in.
			1.15 mm 0.0453 in.
			1.20 mm 0.0472 in.
			1.25 mm 0.0492 in.
			1.30 mm 0.0512 in.
			1.35 mm 0.0531 in.
			1.40 mm 0.0551 in.
			1.45 mm 0.0571 in.
			1.50 mm 0.0591 in.
			1.55 mm 0.0610 in.
Rear axle shaft	Maximum runout		0.8 mm 0.031 in.

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
FRONT AXLE AND SUSPENSION			
Front axle hub x Rotor disc	74	750	54
Front axle hub bearing lock nut	64	650	47
Flange x Axle hub	35	360	26
Disc brake cylinder x Axle carrier	123	1,250	90
Disc brake cylinder x Brake tube	15	155	11
Knuckle arm x Steering knuckle	96	980	71
Third arm x Steering knuckle	96	980	71
Bearing cap x Steering knuckle	96	980	71
knuckle arm x Tie rod	91	925	67
Oil seal set retainer x Steering knuckle	5.4	55	48 in.·lbf
Steering knuckle x Knuckle spindle	47	475	34

Torque Specifications (Cont'd)

Part tightened	N·m	kgf·cm	ft·lbf
FRONT AXLE AND SUSPENSION (Cont'd)			
Propeller shaft x Companion flange	74	750	54
Side bearing cap x Differential carrier	78	800	58
Ring gear x Differential case	97	985	71
Drive pinion x Companion flange	196 – 343	2,000 – 3,500	145 – 253
Differential carrier x Axle housing	25	250	18
Adjusting nut lock x Bearing cap	13	130	9
Spring follow x Frame	9.2	94	82 in.·lbf
Stabilizer bar x Axle housing	25	260	19
Shock absorber x Axle housing	69	700	51
Shock absorber x Body	69	700	51
Stabilizer bracket x Bracket	18	185	13
Stabilizer bracket x Frame	18	185	13
Lateral control rod x Frame	172	1,750	127
Lateral control rod x Body	172	1,750	127
Leading arm x Body	172	1,750	127
Leading arm x Axle housing	172	1,750	127
Hub nut	147	1,500	108
REAR AXLE AND SUSPENSION			
Pinion shaft x Differential case	27	275	20
Differential cover x Axle housing	13	130	9
Parking brake cable clamp x Differential cover	13	130	9
Propeller shaft x Companion flange	88	900	65
Side bearing cap x Differential carrier	78	800	58
Ring gear x Differential case	110	1,125	81
Drive pinion x Companion flange	245 – 441	2,500 – 4,500	181 – 325
Differential carrier x Axle housing	75	740	54
Adjusting nut lock x Bearing cap	13	130	9
LSPV shackle bracket x Differential cover	19	195	14
Spring follow x Frame	15	155	11
Lateral control rod x Axle housing	245	2,500	181
Shock absorber x Bracket	69	700	51
Shock absorber bracket x Frame	50	510	37
Shock absorber x Axle housing	64	650	47
Stabilizer bar bracket x Axle housing	18	185	13
Lateral control x Frame	177	1,800	130
Upper control rod x Frame	177	1,800	130
Upper control rod x Axle housing	177	1,800	130
Stabilizer bar clamp x Frame	15	150	11
Stabilizer bar x Clamp	25	260	19
Hub nut	147	1,500	108
Lower control arm x Frame	177	1,800	130
Lower control arm x Axle housing	177	1,800	130

BRAKE SYSTEM

Specifications

Brake pedal	Pedal height (from asphalt sheet)		161 – 171 mm	6.34 – 6.73 in.
	Pedal freeplay		3 – 6 mm	0.12 – 0.24 in.
	Stop light switch to pedal clearance		0.5 – 2.4 mm	0.02 – 0.09 in.
	Pedal reserve distance at 490 N (50 kgf, 110 lbf)		More than 59 mm (2.32 in.)	
Brake booster	Booster push rod to piston clearance at Idling vacuum		0.1 – 0.5 mm	0.004 – 0.020 in.
	w/ SST		0 mm	0 in.
Front brake	Pad thickness	STD	9.5 mm	0.374 in.
		Limit	4.0 mm	0.157 in.
	Disc thickness	STD	25.0 mm	0.984 in.
		Limit	23.0 mm	0.906 in.
	Disc runout	Limit	0.15 mm	0.0059 in.
Rear brake	Drum inside diameter	STD	295.0 mm	11.614 in.
		Limit	297.0 mm	11.693 in.
	Lining thickness	STD	6.5 mm	0.256 in.
		Limit	1.5 mm	0.059 in.
	Drum to shoe clearance		0.6 mm	0.024 in.
Parking brake	Lever travel at 196 N (20 kgf, 44.1 lbf)		7 – 9 clicks	

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Bleeder plug	11	110	8
Piston stopper bolt x Master cylinder	10	100	7
Reservoir set bolt x Master cylinder	1.7	17.5	15.2 in.·lbf
Master cylinder x Brake booster	13	130	9
Brake tube union nut	15	155	11
Brake booster x Pedal bracket	13	130	9
Brake booster clevis lock nut	25	260	19
Front disc x Front axle hub	74	750	54
Front disc brake cylinder x Brake hose	30	310	22
Front disc brake cylinder x Steering knuckle	123	1,250	90
Drum brake backing plate x Rear axle housing	123	1,250	90
Parking brake bellcrank bracket x Backing plate	13	130	9
Rear brake wheel cylinder x Backing plate	10	100	7
LSPV x Valve bracket	13	130	9
Load sensing spring x No.1 shackle	18	185	13
Load sensing spring x Valve bracket	18	185	13
LSPV shackle bracket x Rear axle housing	19	195	14
LSPV shackle lock nut	25	250	18
LSPV No.2 shackle x Shackle bracket	13	130	9

STEERING

Specifications

Steering column	Steering wheel freeplay	Maximum	40 mm	1.58 in.	
	Pawl stopper	Mark			
		1 or A	12.65 – 12.75 mm	0.4980 – 0.5020 in.	
		2 or B	12.55 – 12.65 mm	0.4941 – 0.4980 in.	
		3 or C	12.45 – 12.55 mm	0.4902 – 0.4941 in.	
		4 or D	12.35 – 12.45 mm	0.4862 – 0.4902 in.	
		5 or E	12.25 – 12.35 mm	0.4823 – 0.4862 in.	
Power steering	Drive belt tension	New belt	441 – 667 N	45 – 68 kgf	100 – 150 lbf
		Used belt	265 – 441 N	27 – 45 kgf	60 – 100 lbf
	Maximum rise of oil level		5 mm	0.20 in.	
	Oil pressure at idle speed	Minimum	7,845 kPa	80 kgf/cm^2	1,138 psi
	Steering effort	Maximum	39 N	4 kgf	8.8 lbf
	Rotor shaft bushing oil clearance	STD	0.01 – 0.03 mm	0.0004 – 0.0012 in.	
		Maximum	0.07 mm	0.0028 in.	
	Vane plate to rotor groove clearance				
		Maximum	0.028 mm	0.0011 in.	
	Vane plate	Minimum height	8.1 mm	0.319 in.	
		Minimum thickness	1.797 mm	0.0707 in.	
		Minimum length	14.988 mm	0.5901 in.	
	Vane plate length				
	Rotor and cam ring mark				
		None	14.996 – 14.998 mm	0.59039 – 0.59047 in.	
		1	14.994 – 14.996 mm	0.59032 – 0.59039 in.	
		2	14.992 – 14.994 mm	0.59024 – 0.59032 in.	
		3	14.990 – 14.992 mm	0.59016 – 0.59024 in.	
		4	14.988 – 14.990 mm	0.59008 – 0.59016 in.	
	Flow control valve spring length		35 – 37 mm	1.38 – 1.46 in.	
	Pump rotating torque		0.3 N·m (2.8 kgf·cm, 2.4 in.·lbf) or less		
	Steering rack runout	Maximum	0.15 mm	0.0059 in.	
	Cross shaft adjusting screw thrust clearance		0.03 – 0.05 mm	0.0012 – 0.0020 in.	
	Worm gear preload	at Starting	0.3 – 0.5 N·m	3 – 5.5 kgf·cm	2.6 – 4.8 in.·lbf
	Total preload	at Starting	0.7 – 1.1 N·m	7.5 – 11 kgf·cm	6.5 – 9.5 in.·lbf

Torque Specifications

	Part tightened		N·m	kgf·cm	ft·lbf
Steering column	Steering wheel set nut		34	350	25
	Column tube x Body		25	250	18
	Breakaway bracket x Body		25	260	19
	Column hole cover x Body		13	130	9
	Main shaft x Intermediate shaft		34	350	25
	Intermediate shaft x Worm shaft		34	350	25
	Turn signal bracket x Upper column tube		4.9	50	43 in.·lbf
	Tilt pawl set nut		5.9	60	52 in.·lbf
	Compression spring set bolt		7.8	80	69 in.·lbf
	Tilt lever retainer set nut		15	150	11
	Dust seal x Column hole cover		5.9	60	52 in.·lbf
	Clamp x Column tube		19	195	14
Power steering (PS pump)	Pressure tube x PS pump		36	370	27
	PS pump x Bracket		44	450	33
	PS pump x Adjusting stay		39	400	29
	Adjusting stay x Bracket		39	400	29
	Pulley set nut		43	440	32
	Reservoir set bolt	12 mm bolt	13	130	9
		14 mm bolt	41	420	30
	Pressure port union		69	700	51
Power steering (Gear housing)	Pressure and return tube		44	450	33
	Universal joint		34	350	25
	Gear housing x Body		142	1,450	105
	Gear housing x Pitman arm		177	1,800	130
	Cross shaft adjusting screw set nut		46	470	34
	Cross shaft end cover lock bolt		61	620	45
	Plunger guide nut		20	205	15
	Worm gear valve body set bolt		61	620	45
Steering linkage	Pitman arm x Relay rod		91	925	67
	Relay rod x Steering damper		74	750	54
	Steering damper x Damper hinge		74	750	54
	Damper hinge x Body		39	400	29
	Relay rod x Knuckle arm		91	925	67
	Tie rod x Knuckle arm		91	925	67
	Tie or relay rod clamp		37	375	27

BODY

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
SEAT			
Front Seat			
Seat adjuster x Body	39	400	29
Second Seat			
Seat hinge x Body	39	400	29
Reclining seat adjuster x Seat cusion	52	530	38
Seat inner support x Seat cusion	41	420	30
Thrid Seat			
Inner leg x Seat cusion	18	185	13
Striker bar x Body	18	185	13
Outer lock x Seat cusion	39	400	29
Seat adjuster x Seat back	52	530	38
SEAT BELT			
Seat belt anchor x Body	43	440	32
SIDE STEP			
Step x Bracket	5.4	55	48 in.·lbf
Bracket x Body	13	130	9

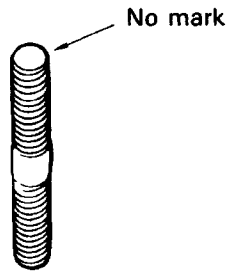
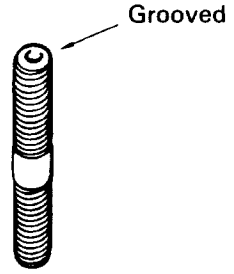
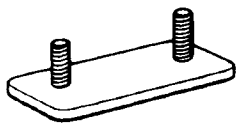
LUBRICANT

Item	Capacity			Classification
	Liters	US qts	Imp. qts	
Engine oil Dry fill	8.0	8.5	7.0	API grade SG, multigrade viscosity oil
Drain and refill w/ Oil filter change	7.8	8.2	6.9	
w/o Oil filter change	7.0	7.4	6.2	
Automatic transmission fluid Dry fill				ATF DEXRON˚ II
w/ Oil cooler	15.4	16.3	13.6	
w/o Oil cooler	15.0	15.9	13.2	
Drain and refill	6.0	6.3	5.3	
Transfer oil	1.3	1.4	1.1	API GL–4 or GL–5, SAE 75W–90
Differential oil Front	2.8	2.9	2.4	API GL–5 hypoid gear oil Above–18˚C (0˚F) SAE 90 Below–18˚C (0˚F) SAE 80W or SAE 80W–90
Rear	2.8	2.9	2.4	
Power steering fluid Gear box	0.51	0.13	0.11	ATF DEXRON ® II
Total	0.75	0.20	0.17	
Chassis grease Propeller shaft	–			Lithium base, NLGI No.2
Wheel bearing grease	–			Lithium base, multipurpose NLGI No.2
Brake fluid	–			SAE J 1703 or FMVSS No. 116 DOT3

STANDARD BOLT TORQUE SPECIFICATIONS

STANDARD BOLT TORQUE SPECIFICATIONS

HOW TO DETERMINE BOLT STRENGTH

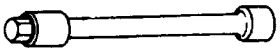
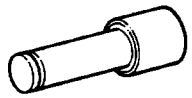
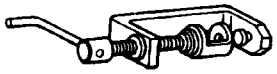
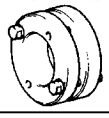
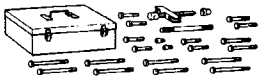
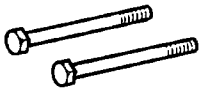
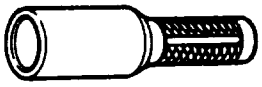
	Mark	Class		Mark	Class
Hexagon head bolt	 Bolt head No. 4– 5– 6– 7– 8– 9– 10– 11–	4T 5T 6T 7T 8T 9T 10T 11T	Stud bolt	 No mark	4T
	 No mark	4T		 Grooved	6T
Hexagon flange bolt w/ washer hexagon bolt	 No mark	4T			
Hexagon head bolt	 Two protruding lines	5T			
Hexagon flange bolt w/ washer hexagon bolt	 Two protruding lines	6T	Welded bolt		4T
Hexagon head bolt	 Three protruding lines	7T			
Hexagon head bolt	 Four protruding lines	8T			

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N·m	**kgf·cm**	**ft·lbf**	**N·m**	**kgf·cm**	**ft·lbf**
4T	6	1	5	55	48 in.·lbf	6	60	52 in.·lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	—	—	—
5T	6	1	6.5	65	56 in.·lbf	7.5	75	65 in.·lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	—	—	—
6T	6	1	8	80	69 in.·lbf	9	90	78 in.·lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	—	—	—
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	—	—	—
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

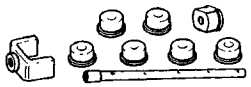
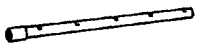
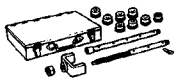
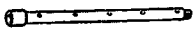
SST AND SSM

SST (SPECIAL SERVICE TOOLS)

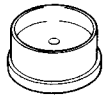
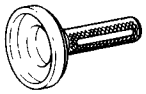
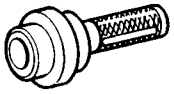
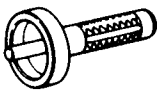
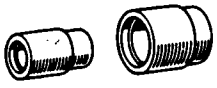
Section / Part Name / Part No. / Illustration			EM	EC	FI	CO	LU	IG	ST	CH	AT	TF	PR	SA		BR	SR	BO
														Front	Rear			
	09032-00100	Oil Pan Seal Cutter									●							
	09043-38100	Hexagon 10 mm Wrench															●	
	09201-31010	Valve Stem Oil Seal Replacer	●															
	09201-60011	Valve Guide Bushing Remover & Replace¿	●															
	09202-43013	Valve Spring Compressor	●															
	09213-58011	Crankshaft Pulley Holding Tool	●															
	09213-60017	Crankshaft Pulley & Gear Puller Set	●															
	(09213-00020)	(Body with Bolt)	●															
	(09213-00030)	(Handle)	●															
	(09213-00090)	(Bolt Set)	●															
	09214-60010	Crankshaft Pulley & Gear Replacer	●															
	09214-76011	Crankshaft Pulley Replacer												*1 ●	*1 ●			

Remark:
*1 Differential oil seal

SST (SPECIAL SERVICE TOOLS) (Cont'd)

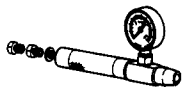
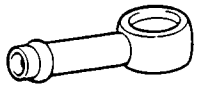
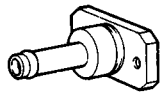
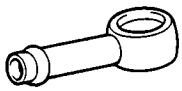
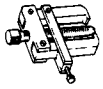
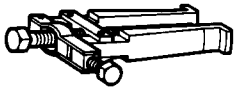
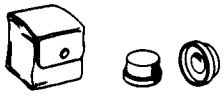
Section / Part Name / Part No. / Illustration			EM	EC	FI	CO	LU	IG	ST	CH	AT	TF	PR	SA		BR	SR	BO
														Front	Rear			
	09215-00012	Camshaft Bearing Remover & Replacer Set "B"	●															
	(09215-00020)	(Gate "B")	●															
	(09215-00030)	(Shaft "B")	●															
	(09215-00410)	Camshaft Bearing Remover & Replacer	●															
	(09215-00420)	Camshaft Bearing Remover & Replacer	●															
	09215-00100	Camshaft Bearing Remover & Replacer Set "A"	●															
	(09215-00130)	(Bolt)	●															
	(09215-00140)	(Nut)	●															
	(09215-00150)	(Shaft "A")	●															
	(09215-00160)	(Pin)	●															
	(09215-00210)	(Remover & Replacer)	●															
	(09215-00240)	(Remover & Replacer)	●															

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	EC	FI	CO	LU	IG	ST	CH	AT	TF	PR	SA Front	SA Rear	BR	SR	BO
	(09215-00270)	(Remover & Replacer)	●															
	09222-30010	Connecting Rod Bushing Remover & Replacer	●															
	09223-15020	Oil Seal and Bearing Replacer										*1 ●						
	09223-41020	Crankshaft Rear Oil Seal Replacer										*1 ●						
	09223-50010	Crankshaft Front Oil Seal Replacer	●															
	09223-60010	Crankshaft Rear Oil Seal Replacer	●															
	09228-22020	Oil Filter Wrench												●				
	09228-44011	Oil Filter Wrench					●											
	09236-00101	Water Pump Overhaul Tool Set				●												
	(09237-00010)	(Water Pump Bearing Remover & Replacer)				●												
	(09237-00050)	(Shaft "B"1)				●												
	09238-47012	Water Pump Bearing Remover & Replacer	●															

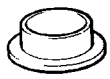
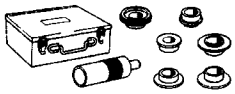
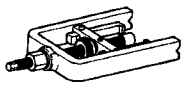
Remark:
1* Front extension housing dust deflectors

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	EC	FI	CO	LU	IG	ST	CH	AT	TF	PR	SA Front	SA Rear	BR	SR	BO
	09258-14010	Air Pump Tester		●														
	09268-41045	Injection Measuring Tool Set			●													
	(09268-41080)	(No. 6 Union)			●													
	(09268-41090)	(No. 7 Union)			●													
	(90405-09015)	(No. 1 Union)			●													
	09268-45012	EFI Fuel Pressure Gauge			●													
	09285-76010	Injection Pump Camshaft Bearing Cone Replacer							*1 ●									
	09286-46011	Injection Pump Spline Shaft Puller							*2 ●	*3 ●								
	09308-00010	Oil Seal Puller												*4 ●	*4 ●			
	09308-10010	Oil Seal Puller	●											●	●			
	09315-00021	Clutch Release Bearing Remover & Replacer													*5 ●			
	09316-12010	Transfer Bearing Replacer										●						

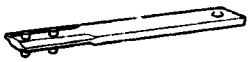
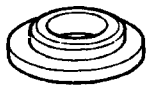
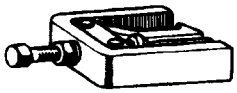
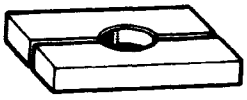
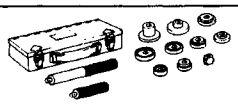
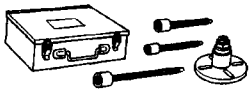
Remarks:
* 1 Armature rear bearing
* 2 Armature bearing
* 3 Rotor rear bearing
* 4 Drive pinion bearing outer race
* 5 Differential case side bearing

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	EC	FI	CO	LU	IG	ST	CH	AT	TF	PR	SA		BR	SR	BO
														Front	Rear			
	09316-20011	Transfer Bearing Replacer										●						
	09316-60010	Transmission & Transfer Bearing Replacer										●		●	●			
	(09316-00010)	(Replacer Pipe)										●		*1 ●	*2 ●			
	(09316-00020)	(Replacer "A")										●		*1 ●	*2 ●			
	(09316-00030)	(Replacer "B")										●						
	(09316-00040)	(Replacer "C")										●						
	(09316-00050)	(Replacer "D")												*2 ●				
	(09316-00060)	(Replacer "E")										●						
	(09316-00070)	(Replacer "F")										●						
	09325-12010	Transmission Oil Plug										*3 ●						
	09330-00021	Companion Flange Holding Tool	*4 ●											●	●			
	09332-25010	Universal Joint Bearing Remover & Replacer											●					

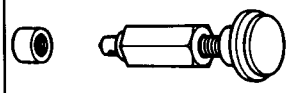
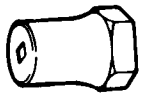
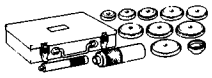
Remarks:
* 1 Drive pinion bearing outer race and oil storagering
* 2 Drive pinion bearing outer race
* 3 Rear output shaft
* 4 Crankshaft

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	EC	FI	CO	LU	IG	ST	CH	AT	TF	PR	SA		BR	SR	BO
														Front	Rear			
	09504-00011	Differential Side Bearing Adjusting Nut Wrench												●	●			
	09506-30012	Differential Drive Pinion Bearing Cone Replacer												●				
	09506-35010	Differential Drive Pinion Rear Bearing Replacer													●			
	09514-35011	Rear Wheel Bearing Puller													●			
	09527-20011	Rear Axle Shaft Bearing Remover										*1 ●						
	09550-10012	Replacer Set "B"													●			
	(09558-10010)	Rear Axle Shaft Oil Seal Replacer													*2 ●			
	09555-55010	Differential Drive Pinion Bearing Replacer										*3 ●						
	09556-22010	Drive Pinion Front Bearing Remover												●	●			
	09557-22022	Companion Flange Remover & Replacer												●				
	(09557-22050)	(No. 3 Bolt)												●				
	09605-60010	Steering Knuckle Bearing Cup Replacer												●				

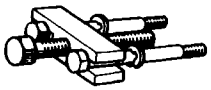
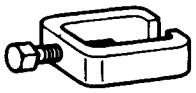
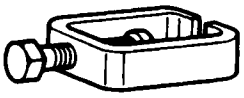
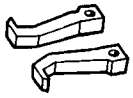
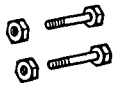
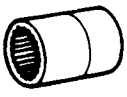
Remarks:
*1 Front ball bearing
*2 Differential case side bearing
*3 High speed output gear bushing and clutch hub

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	EC	FI	CO	LU	IG	ST	CH	AT	TF	PR	SA Front	SA Rear	BR	SR	BO
	09606-60020	Steering Knuckle Bearing Cup Remover												●				
	09607-60020	Front Wheel Adjusting Nut Wrench												●				
	09608-20012	Front Hub & Drive Pinion Bearing Tool Set										●			●			
	(09608-00030)	(Replacer)										●						
	(09608-03020)	(Handle)										●			●			
	(09608-03060)	(Replacer)													●			
	(09608-03090)	(Replacer)													●			
	09608-30012	Front Hub & Drive Pinion Bearing Tool Set												●				
	(09608-00060)	(Drive Pinion Front Bearing Cup Replacer)												*1 ●				
	(09608-04060)	(Front Hub Outer Bearing Cup Replacer)												*1 ●				
	09608-35014	Axle Hub & Drive Pinion Bearing Tool Set												●	●			
	(09608-06020)	(Handle)												●	●			

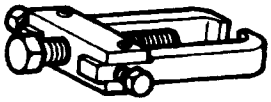
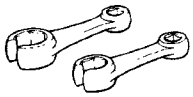
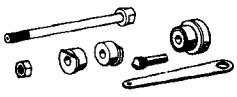
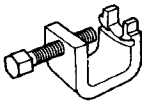
Remark:
* 1 Differential case side bearing

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration		EM	EC	FI	CO	LU	IG	ST	CH	AT	TF	PR	SA		BR	SR	BO
													Front	Rear			
	(09608-06110)	(Front Hub Inner & Drive Pinion Front Bearing Cup Replacer)												●			
	(09608-06150)	(Rear Hub Outer Bearing Cup Replacer)											●				
	(09608-06180)	(Drive Pinion Rear Bearing Cup Replacer)												●			
	(09608-06200)	Rear Axle Bearing Replacer											●				
	(09608-06210)	Rear Axle Bearing Replacer											●				
	09609-20011	Steering Wheel Puller														●	
	09610-55012	Pitman Arm Puller														●	
	09611-22012	Tie Rod End Puller											●			●	
	09612-65014	Steering Worm Bearing Puller											●				
	(09612-01010)	(Claw "A")											*1 ●				
	(09612-01050)	(Hanger Pin with Nut)											*1 ●				
	09616-00010	Steering Worm Bearing Adjusting Socket														●	

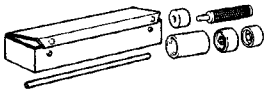
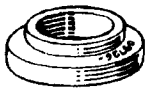
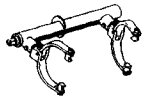
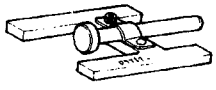
Remark:
* 1 Knuckle spindle bushing

SST (SPECIAL SERVICE TOOLS) (Cont'd)

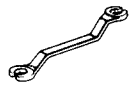
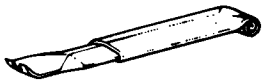
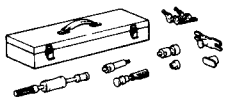
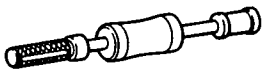
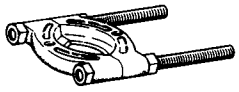
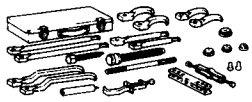
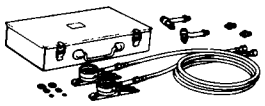
Section / Part Name / Part No. / Illustration			EM	EC	FI	CO	LU	IG	ST	CH	AT	TF	PR	SA Front	SA Rear	BR	SR	BO
	09618-60010	Front Axle & Drive Shaft Bearing Replacer												●				
	09628-62011	Ball Joint Puller															●	
	09630-00012	Power Steering Gear Housing Overhaul Tool Set															●	
	(09631-00020)	(Handle)															●	
	(09631-00050)	(No. 3 Wrench)															●	
	(09631-00070)	(Bearing Remover & Replacer)															●	
	(09631-00090)	(Replacer)															●	
	(09631-00120)	(Teflon Ring Former)															●	
	(09631-00140)	(Overhaul Stand)															●	
	09631-22020	Power Steering Hose Nut 14 x 17 mm Wrench Set			*1 ●												●	
	09634-60013	Steering Knuckle Centering Gauge												●				
	09650-17011	Hub Bolt Remover													●			

Remark:
* 1 Fuel line flare nut

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	EC	FI	CO	LU	IG	ST	CH	AT	TF	PR	SA		BR	SR	BO
														Front	Rear			
	09703-30010	Brake Shoe Return Spring Tool														●		
	09709-29017	LSPV Gauge Set														●		
	09710-22041	Rear Suspension Bushing Tool Set												●				
	(09710-02020)	(Handle)												●				
	(09710-02050)	(Base)												●				
	(09710-02070)	Bushing Remover & Replacer												●				
	09710-30030	Rear Suspension Bushing Tool Set												●				
	(09710-03180)	(Replacer)												●				
	09718-00010	Shoe Hold Down Spring Driver														●		
	09726-40010	Lower Control Shaft Bearing Replacer												●	●			
	09727-30020	Coil Spring Compressor												●				
	09737-00010	Brake Booster Push Rod Gauge														●		

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Part Name / Part No. / Illustration			EM	EC	FI	CO	LU	IG	ST	CH	AT	TF	PR	SA		BR	SR	BO
														Front	Rear			
	09751-36011	Brake Tube Union Nut 10 X 12 mm Wrench												●		●		
	09806-30010	Windshield Moulding Remover																●
	09812-00010	Door Hinge Set Bolt Wrench																●
	09842-30050	Wire "A" EFI Inspection			●													
	09842-30070	Wire "F" EFI Inspection			●													
	09843-18020	Diagnosis Check Wire			●			●			●							
	09910-00015	Puller Set															●	
	(09911-00011)	(Puller Clamp)															●	
	(09912-00010)	(Puller Slide Hammer)															●	
	09950-00020	Bearing Remover										●		●	●			
	09950-20017	Universal Puller										●		●	●		●	
	09992-00094	Automatic Transmission Oil Pressure Gauge Set									●							

NOTE: For reference to SSTs for the Air Conditioning System see page AC–10.

SSM (SPECIAL SERVICE MATERIALS)

Part Name	Part No.	Sec.	Use etc.
Seal packing or equivalent	08826-00080	EM	Main bearing caps No. 1 and No. 4
Seal packing 1281, Three bond 1281 or equivalent	08826-00090	AT	Transmission oil pan
		TF	Front case Rear case Case cover Front extension housing Motor actuator
Adhesive 1324, Three bond 1324 or equivalent	08833-00070	EM	Drive plate mount bolt
Adhesive 1344, Three bond 1344, Loctite 242 or equivalent	08833-00080	EM	Timing gear cover
		TF	Screw plug Rear case set bolt Case cover set bolt
Dupont paste No. 4817	—	BE	Rear window defogger wire
Three cement black	08833-00030	BO	Windshield glass
Adhesive (Super special)	08850-00051	BO	Side protection moulding

NOTE: For reference to SSMs for the Air Conditioning System see page AC–10.

INTRODUCTION

HOW TO USE THIS MANUAL

INDEX

An INDEX is provided on the first page of each section to guide you to the item to be repaired. To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

GENERAL DESCRIPTION

At the beginning of each section, a General Description is given that pertains to all repair operations contained in that section.

Read these precautions before starting any repair task.

TROUBLESHOOTING

TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause.

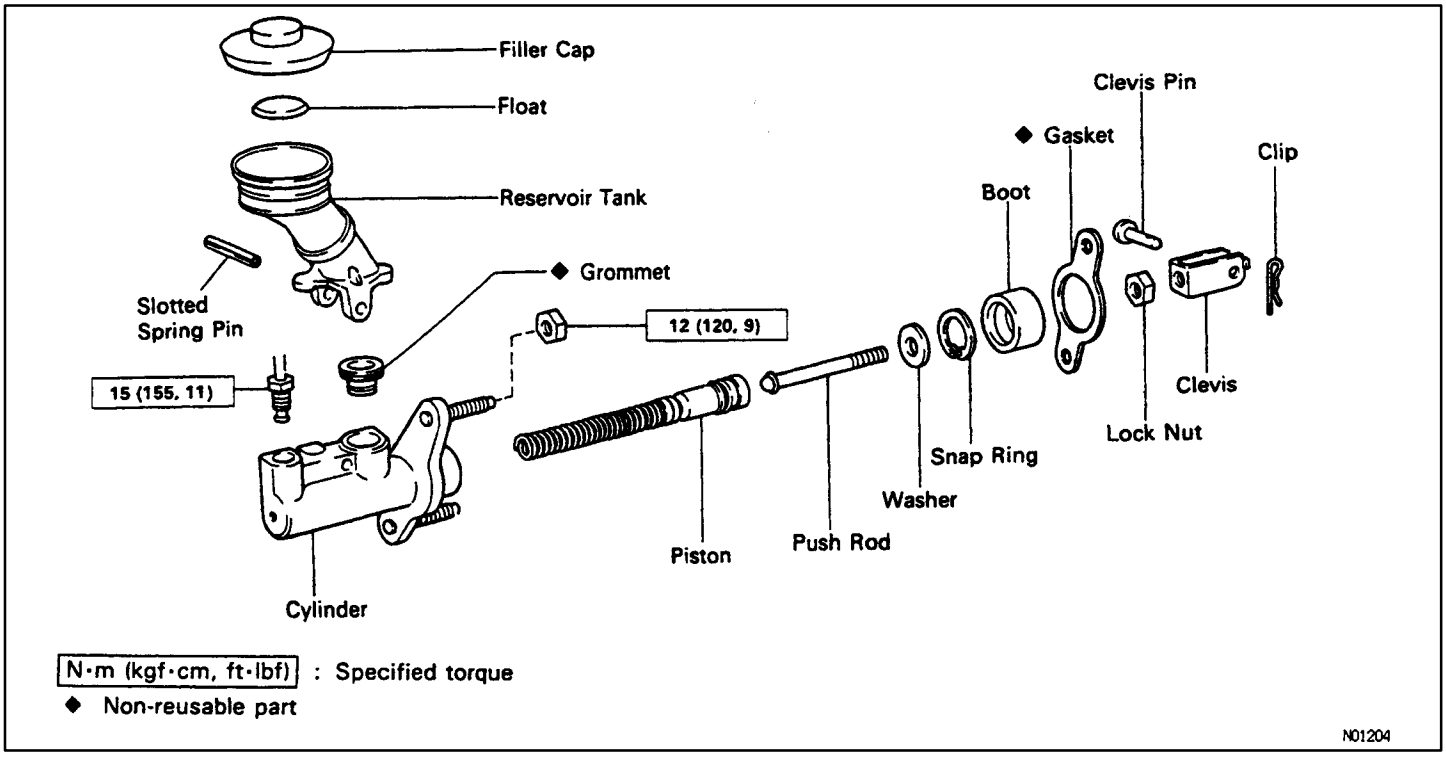
PREPARATION

Preparation lists the SST (Special Service Tools), recommended tools, equipment, lubricant and SSM (Special Service Materials) which should be prepared before beginning the operation and explains the purpose of each one.

REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.

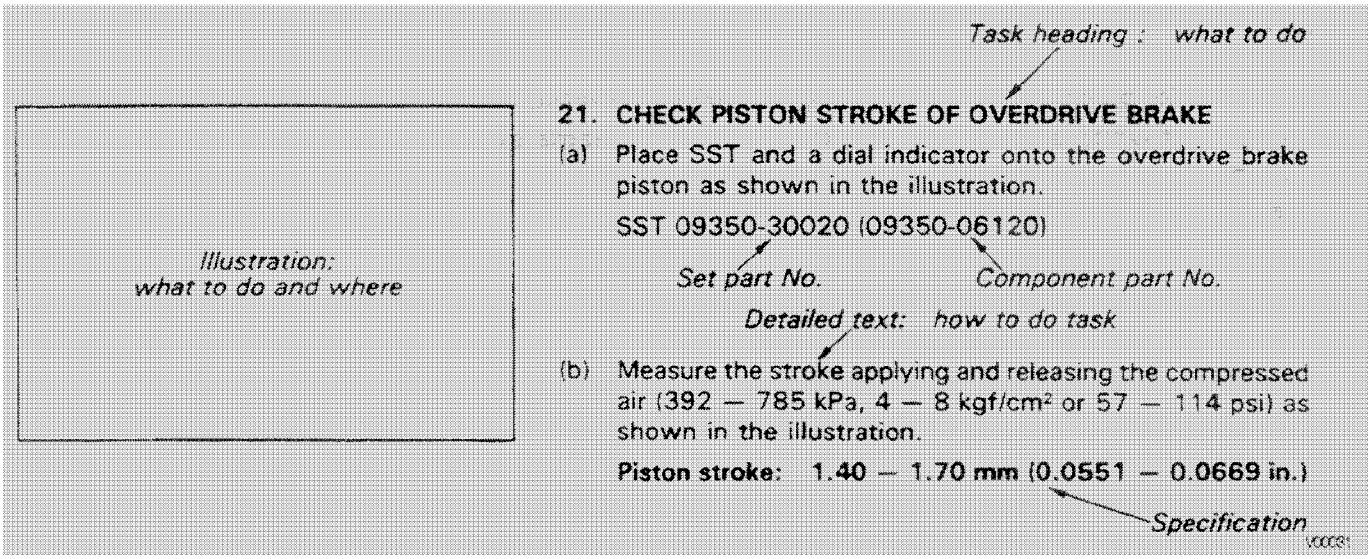
Example:



The procedures are presented in a step–by–step format:

- The illustration shows what to do and where to do it.
- The task heading tells what to do.
- The detailed text tells how to perform the task and gives other information such as specifications and warnings.

Example:



This format provides the experienced technician with a FAST TRACK to the information needed. The upper case task heading can be read at a glance when necessary, and the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

REFERENCES

References have been kept to a minimum. However, when they are required you are given the page to refer to.

SPECIFICATIONS

Specifications are presented in bold type throughout the text where needed. You never have to leave the procedure to look up your specifications. They are also found at the end of each section, for quick reference.

CAUTIONS, NOTICES, HINTS:

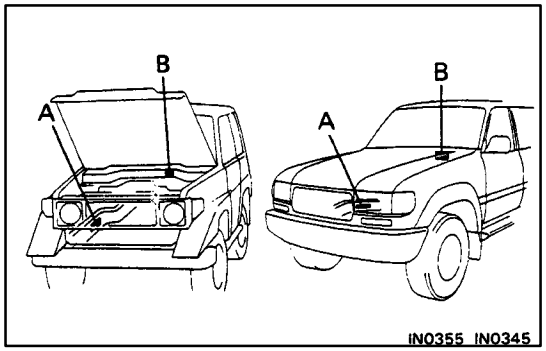
- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- HINTS are separated from the text but do not appear in bold. They provide additional information to help you perform the repair efficiently.

SI UNIT

The UNITS given in this manual are primarily expressed according to the SI UNIT(International System of Unit), and alternately expressed in the metric system and in the English System.

Example:

Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)



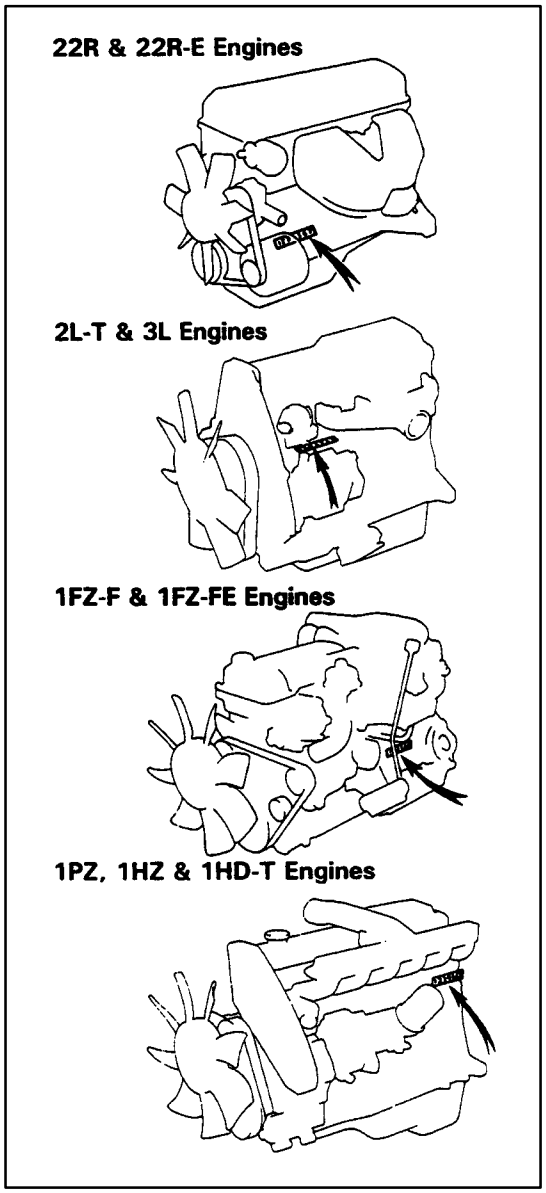
IDENTIFICATION INFORMATION

VEHICLE IDENTIFICATION NUMBER

The vehicle identification number is stamped on the outer surface of the front right side frame. This number is also stamped on the manufacturer's name plate.

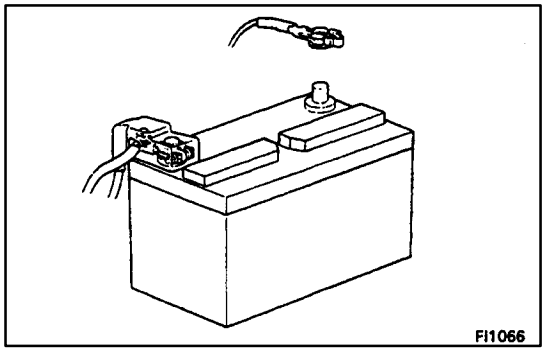
A: Vehicle Identification Number

B: Manufacturer's Name Plate



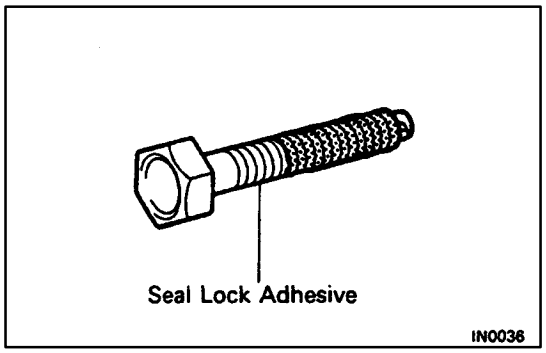
ENGINE SERIAL NUMBER

The engine serial number is stamped on the right side of the cylinder block.


FI1066

GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in the appropriate order to facilitate reassembly.
3. Observe the following:
   (a) Before performing electrical work, disconnect the negative cable from the battery terminal.
   (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (–) terminal which is grounded to the vehicle body.
   (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable straight up without twisting or prying it.
   (d) Clean the battery terminal posts and cable terminals with a clean shop rag. Do not scrape them with a file or other abrasive objects.
   (e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installation. Do not use a hammer to tap the terminal onto the post.
   (f) Be sure the cover for the positive (+) terminal is properly in place.
4. Check hose and wiring connectors to make sure that they are secure and correct.
5. Non–reusable parts
   (a) Always replace cotter pins, gaskets, O–rings and oil seals etc. with new ones.
   (b) Non–reusable parts are indicated in the component illustrations by the "◆" symbol.

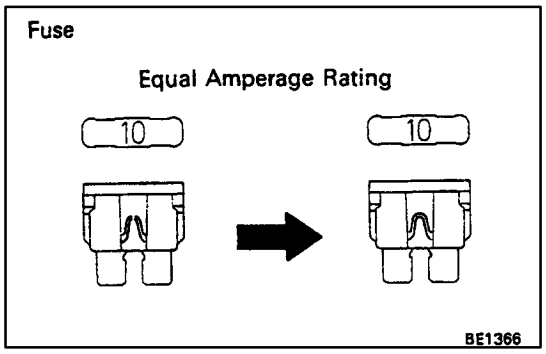


IN0036

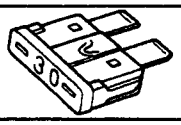
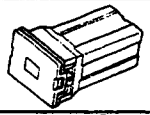
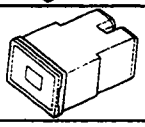
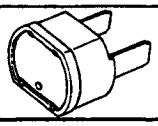
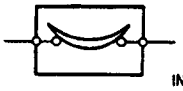
6. Precoated parts
   Precoated parts are bolts and nuts, etc. that are coated with a seal lock adhesive at the factory.
   (a) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.

(b) When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply the specified seal lock adhesive to the bolt, nut or threads.
(c) Precoated parts are indicated in the component illustrations by the "★" symbol.

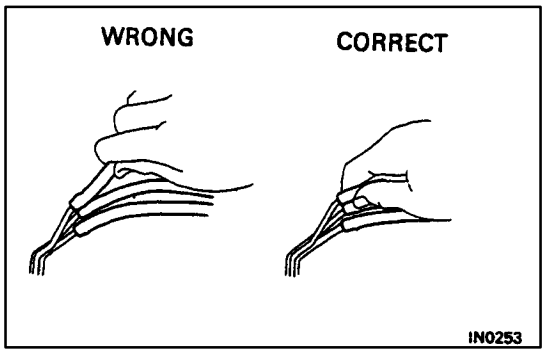
7. When necessary, use a sealer on gaskets to prevent leaks.
8. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.
9. Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found in the preparation part at the front of each section in this manual.



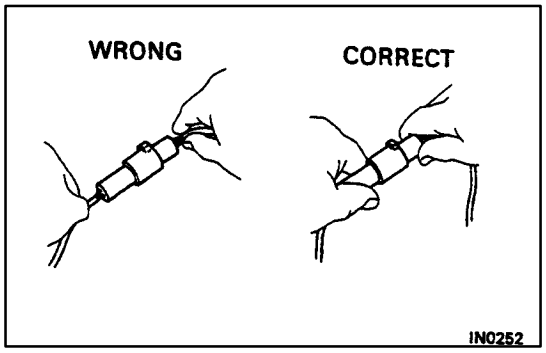
10. When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the rating or use one with a lower rating.

Illustration	Symbol	Part Name	Abbreviation
 BE5594	 IN0365	FUSE	FUSE
 BE5595	 IN0366	MEDIUM CURRENT FUSE	M–FUSE
 BE5596	 IN0367	HIGH CURRENT FUSE	H–FUSE
 BE5597	 IN0367	FUSIBLE LINK	FL
 BE5598	 IN0368	CIRCUIT BREAKER	CB

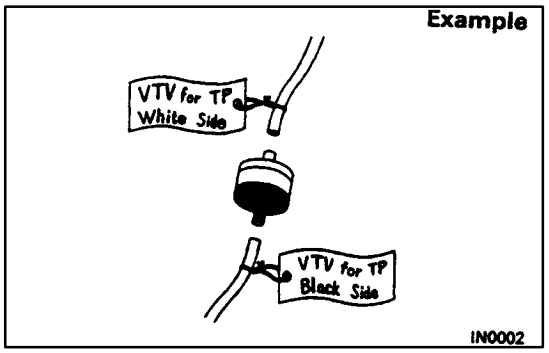
11. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations (See pages IN–16 to IN–18).
    (a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels at the opposite end in order to ensure safety.
    (b) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on a vehicle raised on a jack alone, even for a small job that can be finished quickly.
12. Observe the following precautions to avoid damage to the parts:
    (a) Do not open the cover or case of the ECU unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)



    (b) To disconnect vacuum hoses, pull on the end, not the middle of the hose.
    (c) To pull apart electrical connectors, pull on the connector itself, not the wires.
    (d) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.
    (e) When steam cleaning an engine, protect the distributor, air filter, and VCV from water.
    (f) Never use an impact wrench to remove or install temperature switches or temperature sensors.
    (g) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
    (h) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step–down adapter instead. Once the hose has been stretched, it may leak.



13. Tag hoses before disconnecting them:
    (a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
    (b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.



PRECAUTION

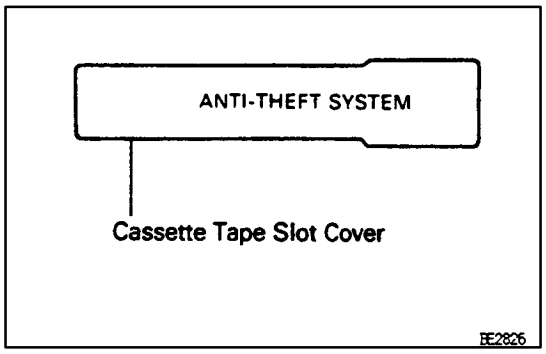
FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

CAUTION: If large amounts of unburned gasoline flow into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

1. **Use only unleaded gasoline.**
2. **Avoid prolonged idling.**
   Avoid running the engine at idle speed for more than 20 minutes.
3. **Avoid spark jump test.**

(a) Perform spark jump test only when absolutely necessary. Perform this test as rapidly as possible.
(b) While testing, never race the engine.

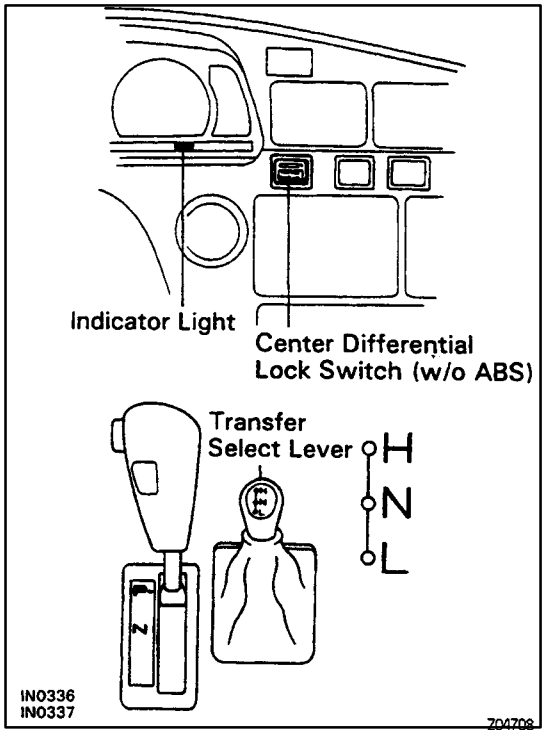
4. **Avoid prolonged engine compression measurement.**
   Engine compression tests must be done as rapidly as possible.
5. **Do not run engine when fuel tank is nearly empty.**
   This may cause the engine to misfire and create an extra load on the converter.
6. **Avoid coasting with ignition turned off and prolonged braking.**
7. **Do not dispose of used catalyst along with parts contaminated with gasoline or oil.**



FOR VEHICLES WITH AN AUDIO SYSTEM WITH BUILT–IN ANTI–THEFT SYSTEM

Audio System displaying the sign ”ANTI–THEFT SYSTEM” shown on the left has a built–in anti–theft system which makes the audio system soundless if stolen.

If the power source for the audio system is cut even once, the anti–theft system operates so that even if the power source is reconnected, the audio system will not produce any sound unless the ID number selected by the customer is input again. Accordingly, when performing repairs on vehicles equipped with this system, before disconnecting the battery terminals or removing the audio system the customer should be asked for the ID number so that the technician can input the ID number afterwards, or else a request made to the customer to input the ID number. For the method to input the ID number or cancel the anti–theft system, refer to the Owner’s Manual.



WHEN SERVICING FULL–TIME 4WD VEHICLES

The full–time 4WD Land Cruiser Station Wagon is equipped with the mechanical lock type center differential system. When carrying out any kind of servicing or testing on a full–time 4WD in which the front or rear wheels are made to rotate (braking test, speedometer test, on–vehicle wheel balancing, etc.), or when towing the vehicle, be sure to observe the precautions given below. If incorrect preparations or test procedures are used, the test cannot be successfully carried out, and may be dangerous as well. Therefore, before beginning any such servicing or test, be sure to check the following items:

(1) Center differential lock type
(2) (w/o ABS)
Center differential mode position (FREE or LOCK)
(3) Whether wheels should be touching ground or jacked up
(4) Transmission gear position
(5) Transfer gear position (H or L)
(6) Maximum testing vehicle speed
(7) Maximum testing time

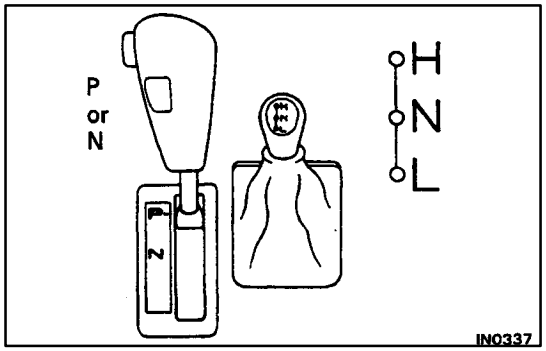
Also be sure to observe the following cautions:

(1) Never accelerate or decelerate the vehicle suddenly.
(2) Observe the other cautions given for each individual test.

Before Beginning Test

During tests with a brake tester or chassis dynamometer, such as braking force tests or speedometer tests, if only the front or rear wheels are to be rotated, it is necessary to set the position of the center differential to the FREE position or to the LOCK position depending on the type of test being performed.

(1) (w/o ABS)
Select the position of the center differential by pushing the center differential lock switch with the transfer select lever to ”H” position.
(2) After selecting the position, confirm the operation of indicator light.



HINT:

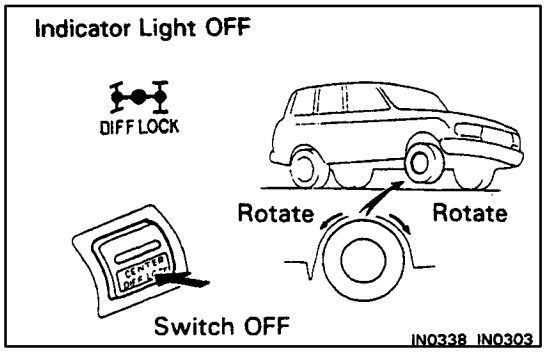
- (w/o ABS)
  Move the vehicle backward or forward slightly if the indicator light does not operate correctly when the center differential lock switch is turned ON or OFF.
- When the transfer select lever is put in ”L” position, the center differential is put in LOCK condition regardless of the position of the center differential lock switch.
- Transfer H ↔ L Gear Shifting Procedure:
  When shifting, always put the shift lever of the automatic transmission in P or N range. In other ranges, the gears of the transfer clash, and switching cannot occur.

(w/o ABS)

CAUTIONS WHEN CENTER DIFFERENTIAL CONTROL SWITCH IS TURNED ON

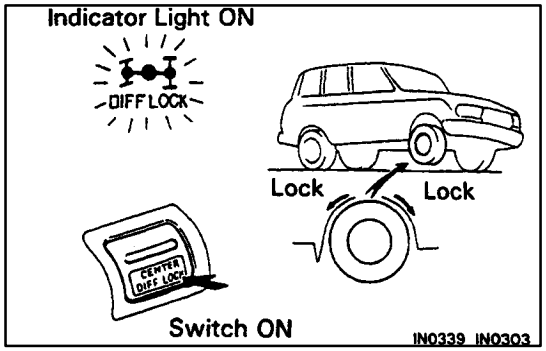
- Operate the switch only when all four wheels are stopped or when driving with the wheels in a straight line.
- Never operate the switch under the following conditions.

(1) When any tire is slipping.
(2) When any tire is spinning freely.
(3) When swerving or cornering.



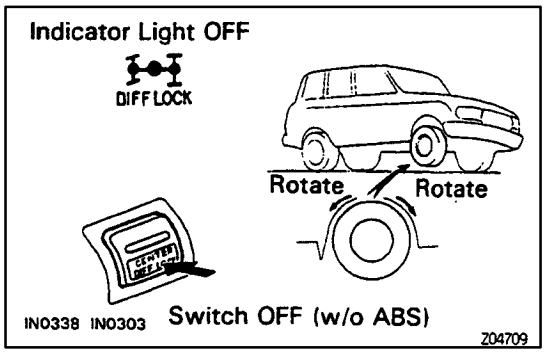
FREE Position

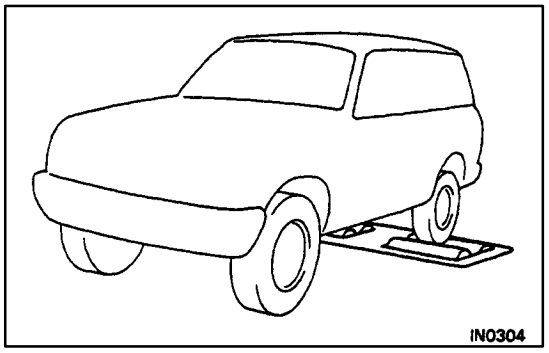
Center Differential Lock		Transfer Select Lever	Wheel
Control Switch	Indicator Light		
OFF	OFF	H	A lifted wheel can be rotated even if only one wheel is lifted up, as long as transmission is in N range.



LOCK Position

Center Differential Lock		Transfer Select Lever	Wheel
Control Switch	Indicator Light		
ON	ON	H	A lifted wheel can be rotated even if only one wheel is lifted up, even if transmission is in N range
OFF	ON	L	





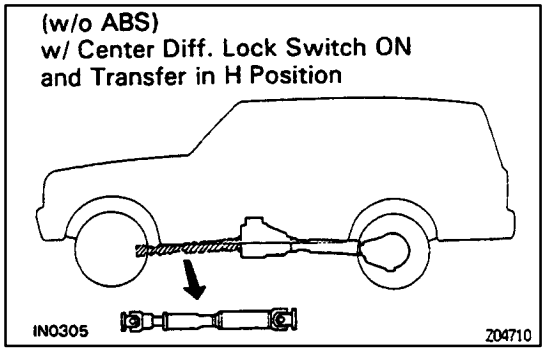
Braking Force Test (Vehicle Speed: Below 0.5 km/h or 0.3 mph)

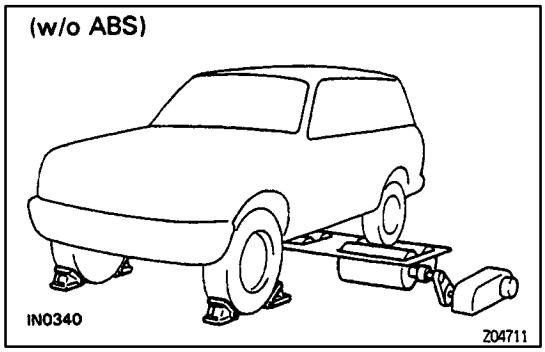
When performing low–speed type brake tester measurements, observe the following instructions.

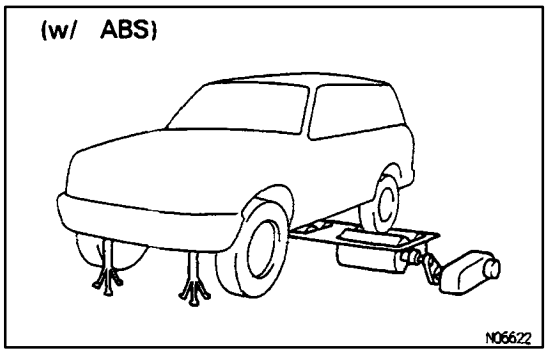
(1) Put the center differential in FREE position.
- Shift the transfer select lever to H position.
- (w/o ABS)

  Turn the center differential lock switch to OFF and check that the center differential lock indicator light goes off.

(2) Shift the transmission shift lever to N range.
(3) Idle the engine, operate the brake booster and perform the test.







Speedometer Test or Other Tests (Using Speedometer Tester or Chassis Dynamometer)

(1) (w/o ABS)
Remove the front propeller shaft, put the center differential in LOCK position, then put the rear wheels on the tester roller and perform the test.

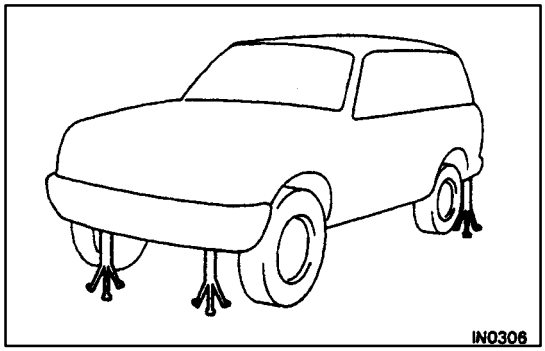
(2) (w/ ABS)
Shift the transfer select lever to H position, jack up the front wheels, then put the rear wheels on the tester roller and perform the test.

(3) When performing tests, observe the following precautions.

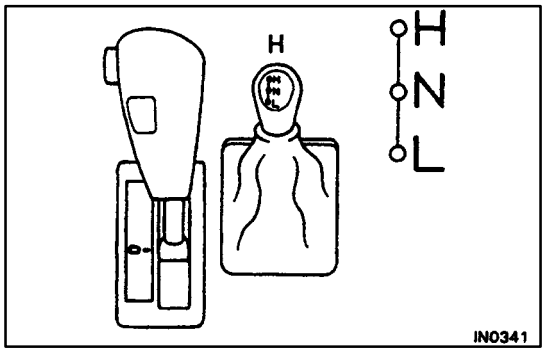
- (w/o ABS)
  Check that the center differential is securely in LOCK condition.
- Confirm that the vehicle is securely immobilised.
- Never operate the brakes suddenly, suddenly drive the wheels, or suddenly decelerate.

On–Vehicle Wheel Balancing

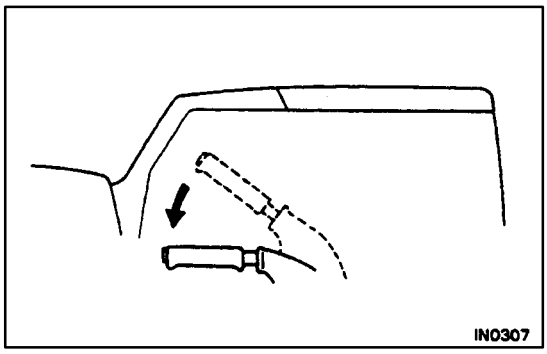
When doing on–vehicle wheel balancing on a fulltime 4WD vehicle, to prevent the wheels from rotating at different speeds or in different directions from each other (which could lead to damage to the center differential or transfer gears), always be sure to observe the following precautions:



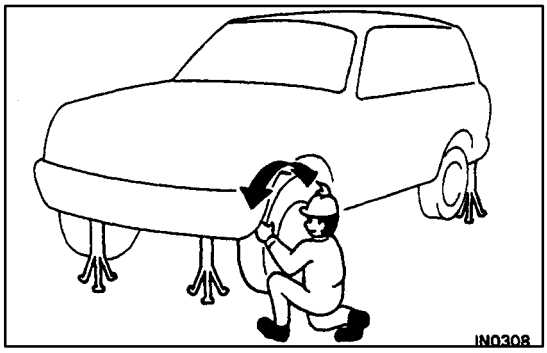
(1) All four wheels should be jacked up, clearing the ground completely.



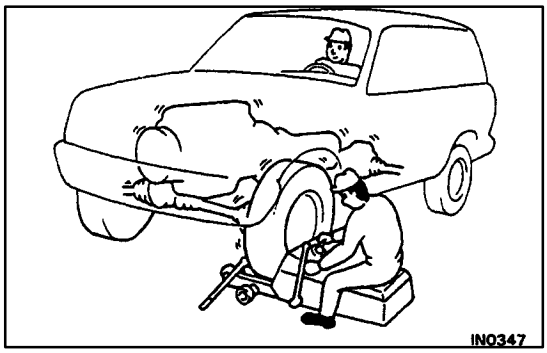
(2) (w/o ABS)
The center differential should be in the LOCK position with the transfer gear in H position.
(3) (w/ ABS)
Shift the transfer select lever to H position.



(4) The parking brake lever should be fully released.



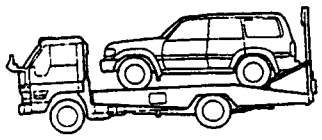
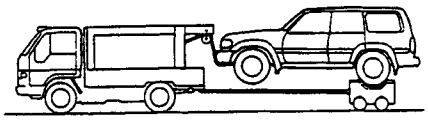
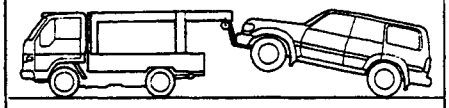
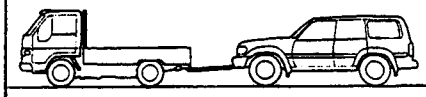
(5) None of the brakes should be allowed to drag.



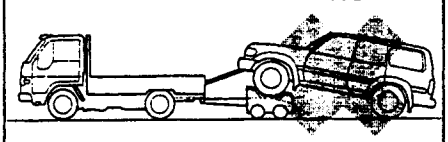
(6) The wheels should be driven with both the engine and the wheel balancer.
HINT: When doing this, be careful of the other wheels, which will rotate at the same time.
(7) Avoid sudden acceleration, deceleration and braking.
(8) Carry out the wheel balancing with the transmission in ”D” or ”3” range.

WHEN TOWING FULL–TIME 4WD VEHICLES

1. Use one of the methods shown below to tow the vehicle.
2. When there is trouble with the chassis and drive train, use method (1) (flat bed truck) or method (2) (sling type tow truck with dollies)
3. Recommended Methods: No. (1), (2) or (3)
   Emergency Method: No. (4)

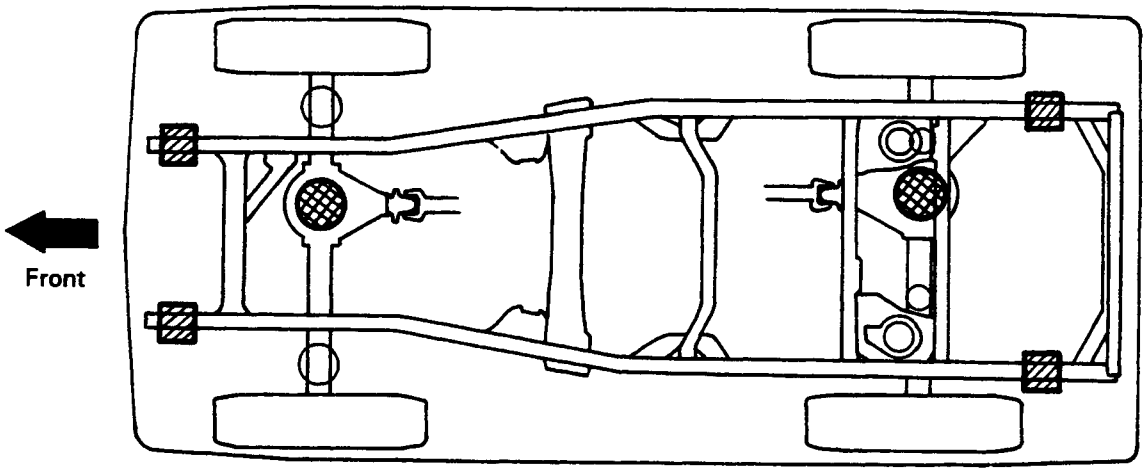
Condition / Towing Method	Parking Brake	Transmission Shift Lever Position	Transfer Shift Lever Position	(w/o ABS) Center Differential Lock Swtich	Center Differential
(1) Flat Bed Truck  IN0309	Applied	"P" Range	"H" Position	OFF	FREE (Normal Driving)
(2) Sling–Type Tow Truck with Dollies  IN0310					
(3) Sling–Type Tow Truck (Front wheels must be able to rotate freely)  IN0311	Released	"N" Range	"N" Position	OFF	↑
(5) Towing with Rope  IN0312	Released	"N" Range	"N" Position	OFF	↑
HINT: Do not tow the vehicle at a speed faster than 45 km/h (30 mph) or a distance greater than 80 km (50 miles).					

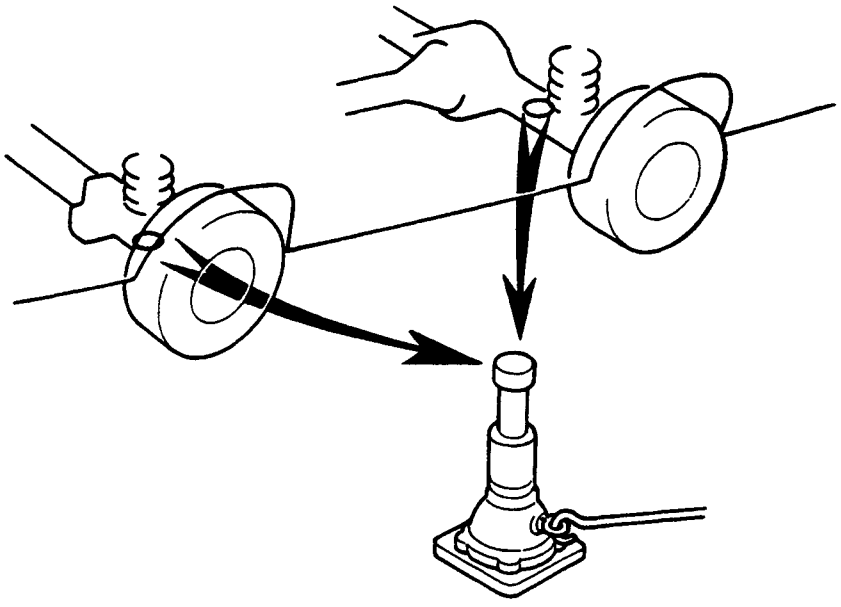
HINT: Do not use any towing methods other than those shown above.
For example, the towing method shown below is dangerous, so do not use it.

NO  IN0313	**During towing with this towing method, there is a danger of the drive train heating up and causing breakdown, or of the front wheels flying off the dolly.**

VEHICLE LIFT AND SUPPORT LOCATIONS
Hardtop & Canvas Top

Coil Spring Type (LJ and RJ series)





JACK POSITION

Front ..... Under the front differential
Rear ..... Under the rear differential

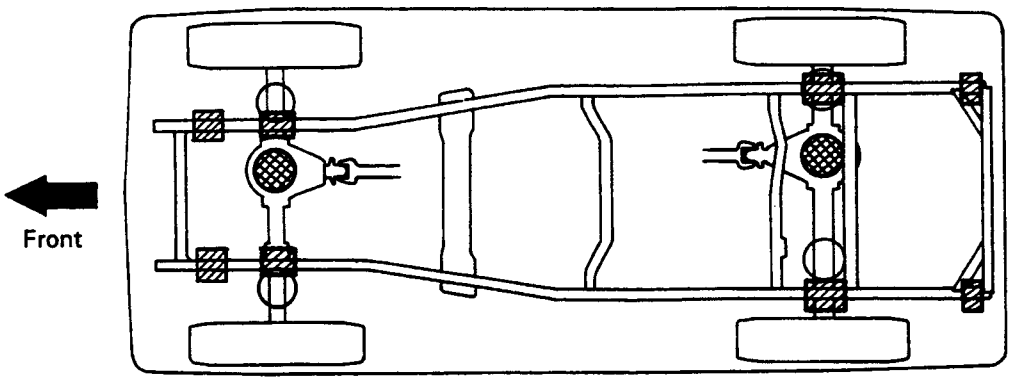
SUPPORT POSITION

Safety stand .....

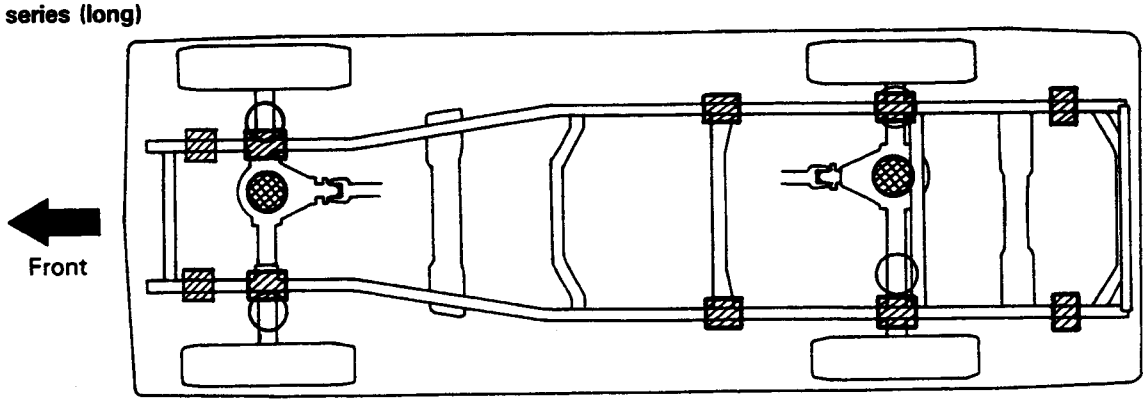
SCREW TYPE JACK POSITION .....

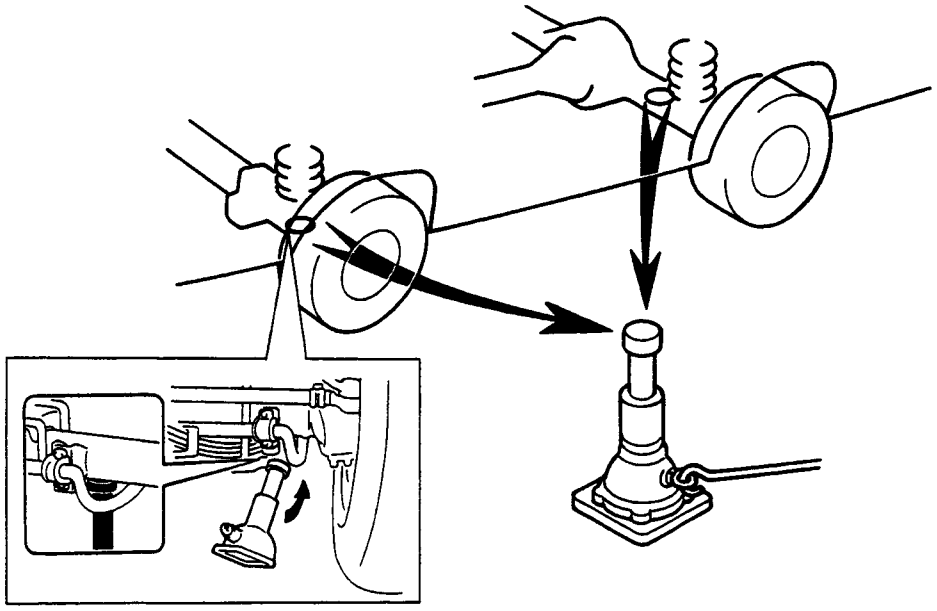
IN0040
IN0352

Leaf Spring Type (PZJ, HZJ and FZJ series)
70 series (short) and 73 series (middle)



75 series (long)





JACK POSITION ●

Front ..... Under the front differential
Rear ..... Under the rear differential

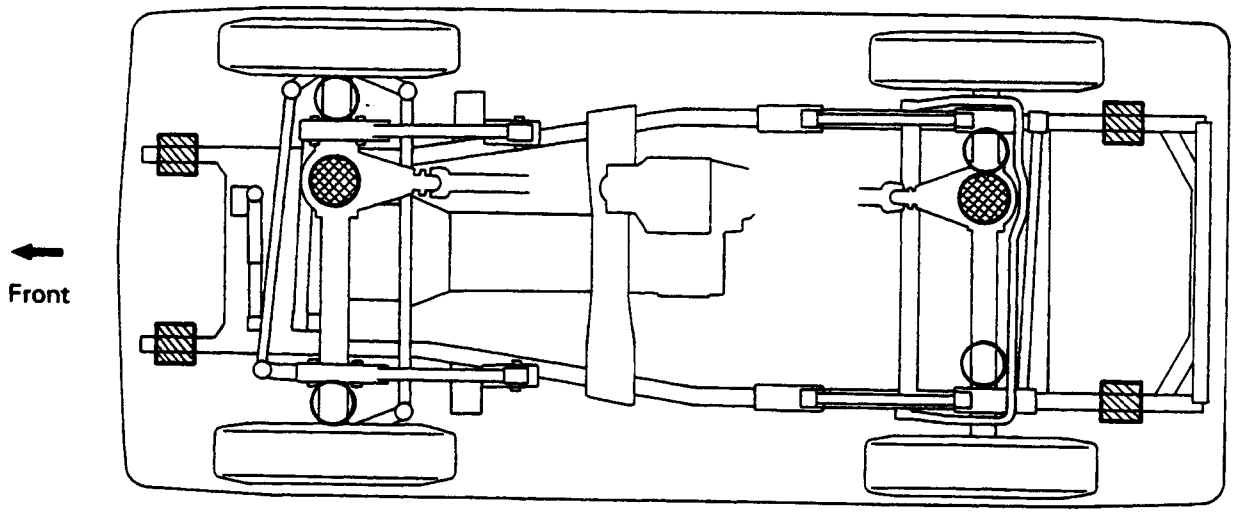
SUPPORT POSITION

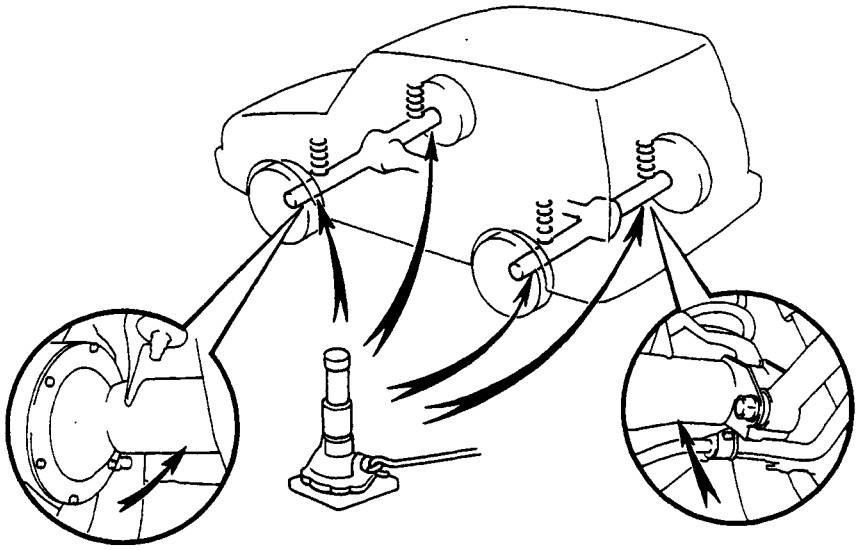
Safety stand ..... ▨

SCREW TYPE JACK POSITION ..... ○

IN0043
IN0044
IN0352 IN0346

VEHICLE LIFT AND SUPPORT LOCATIONS
Station Wagon





JACK POSITION ●
Front ..... Under the front differential
Rear ..... Under the rear differential

SCREW TYPE JACK POSITION ○

SUPPORT POSITION
Safety stand ..... ▨

IN0314
IN0342

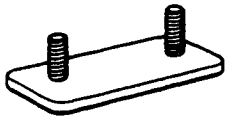
ABBREVIATIONS USED IN THIS MANUAL

ABS	Anti–Lock Brake System
A/C	Air Conditioner
A/T	Automatic Transmission
CB	Circuit Breaker
CCS	Cruise Control System
CD	Compact Disc
ECU	Electronic Control Unit
EFI	Electronic Fuel Injection
ELR	Emergency Locking Retractor
Ex.	Except
FIPG	Formed on Place Gasket
FL	Fusible Link
IG	Ignition
LED	Light Emitting Diode
LH	Left–Hand
LHD	Left–Hand Drive
LSD	Limited Slip Differential
M/T	Manual Transmission
MP	Multipurpose
PTO	Power Take–Off
RH	Right–Hand
RHD	Right–Hand Drive
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
SW	Switch
VSV	Vacuum Switching Valve
w/	With
w/o	Without
2WD	Two Wheel Drive Vehicles (4 X 2)
4WD	Four Wheel Drive Vehicles (4 X 4)

STANDARD BOLT TORQUE SPECIFICATIONS

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class
Hexagon head bolt	 Bolt head No. 4– 5– 6– 7– 8– 9– 10– 11–	4T 5T 6T 7T 8T 9T 10T 11T
	 No mark	4T
Hexagon flange bolt w/ washer hexagon bolt	 No mark	4T
Hexagon head bolt	 Two protruding lines	5T
Hexagon flange bolt w/ washer hexagon bolt	 Two protruding lines	6T
Hexagon head bolt	 Three protruding lines	7T
Hexagon head bolt	 Four protruding lines	8T

	Mark	Class
Stud bolt	 No mark	4T
	 Grooved	6T
Welded bolt		4T

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N·m	kgf·cm	ft·lbf	N·m	kgf·cm	ft·lbf
4T	6	1	5	55	48 in.·lbf	6	60	52 in.·lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	–	–	–
5T	6	1	6.5	65	56 in.·lbf	7.5	75	65 in.·lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	–	–	–
6T	6	1	8	80	69 in.·lbf	9	90	78 in.·lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	–	–	–
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	–	–	–
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

CLUTCH

REFER TO FOLLOWING REPAIR MANUALS:

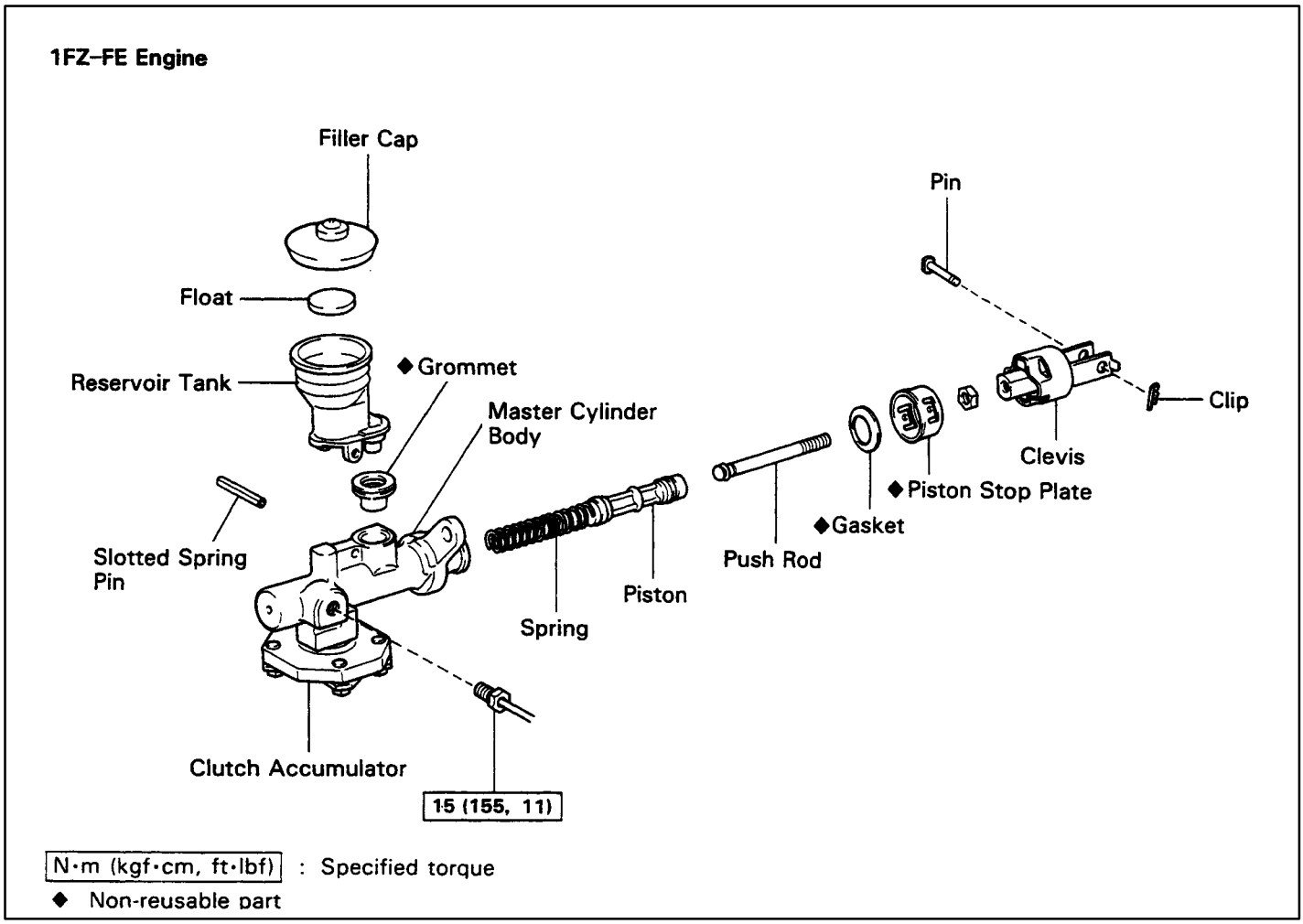
Manual Name	Pub. No.
• Land Cruiser (Station Wagon) Chassis and Body Repair Manual	RM184E
• Land Cruiser (Hardtop, Canvas Top and Station Wagon) Chassis and Body Repair Manual Supplement	RM290E

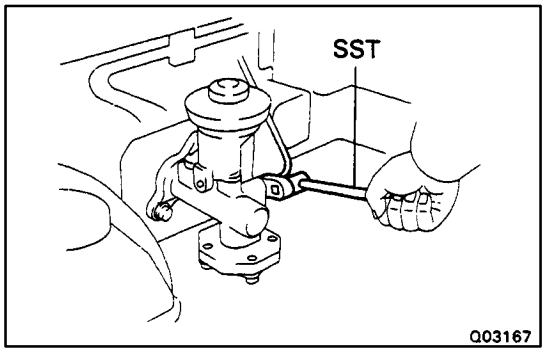
NOTE: The following pages contain only the points which differ from the above listed manuals.

(STATION WAGON)

CLUTCH MASTER CYLINDER

COMPONENTS

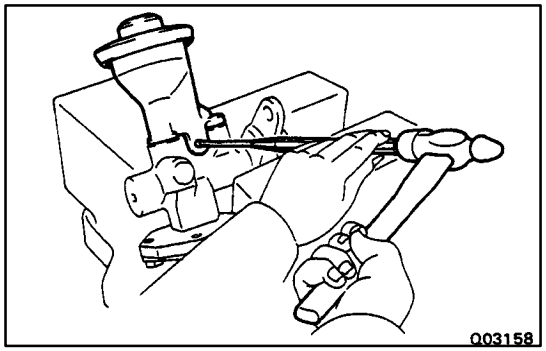




CLUTCH MASTER CYLINDER REMOVAL

REMOVE MASTER CYLINDER

(a) Draw out fluid with syringe.
(b) Using SST, disconnect the clutch tube.
SST 09023–00100
(c) Remove the clip, clevis pin and return spring.
(d) Remove the nut from the room side.
(e) Remove the nut from the engine room side.
(f) Pull out the master cylinder.

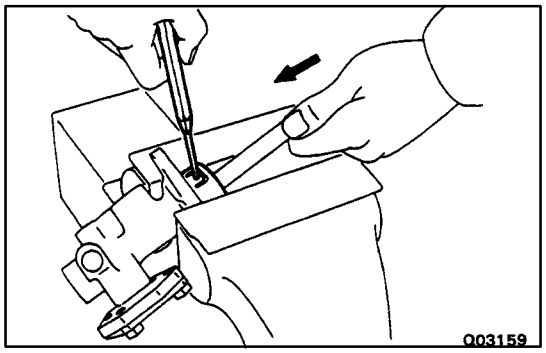


MASTER CYLINDER DISASSEMBLY

1. REMOVE RESERVOIR TANK

(a) Using a pin punch and a hammer, drive out the slotted spring pin.

(b) Remove reservoir tank and grommet.



2. REMOVE PUSH ROD

(a) Using a pin punch, loosen the staked part of the plate.

(b) Remove the piston stop plate, gasket and the push rod.

3. REMOVE PISTON

MASTER CYLINDER INSPECTION

HINT: Clean the disassembled parts with compressed air.

1. INSPECT MASTER CYLINDER BORE FOR SCORING OR CORROSION

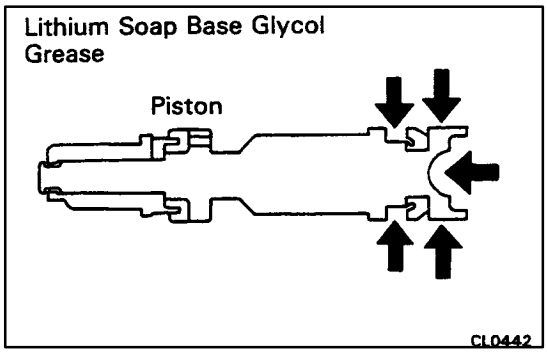
If a problem is found, clean or replace the cylinder.

2. INSPECT PISTON AND CUPS FOR WEAR, SCORING, CRACKS OR SWELLING

If either one requires replacement, use the parts from the cylinder kit.

3. INSPECT PUSH ROD FOR WEAR OR DAMAGE

If necessary, replace the push rod.

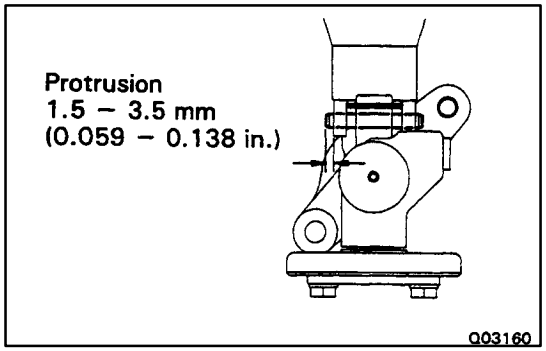


MASTER CYLINDER ASSEMBLY

1. COAT PARTS WITH LITHIUM SOAP BASE GLYCOL GREASE AS SHOWN

2. INSERT PISTON INTO CYLINDER

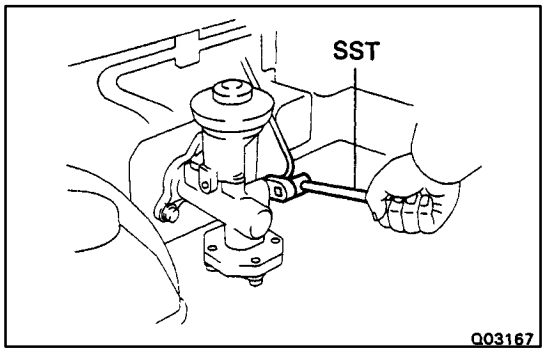
3. INSTALL PUSH ROD ASSEMBLY WITH NEW STOP PLATE AND NEW GASKET



4. INSTALL RESERVOIR TANK

(a) Install reservoir tank and new grommet.

(b) Using a pin punch and a hammer, drive in the slotted spring pin.



MASTER CYLINDER INSTALLATION

1. INSTALL MASTER CYLINDER

Install the mounting nut, and torque them.

Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

2. CONNECT CLUTCH LINE UNION

Using SST, connect the union.

SST 09023–00100

3. CONNECT PUSH ROD AND INSTALL PIN

Install the clip in the push rod pin.

4. BLEED SYSTEM AND ADJUST CLUTCH PEDAL

MANUAL TRANSMISSION

REFER TO FOLLOWING REPAIR MANUALS:

Manual Name	Pub. No.
• Land Cruiser (Hardtop and Canvas Top) Chassis and Body Repair Manual	RM183E
• Land Cruiser (Station Wagon) Chassis and Body Repair Manual	RM184E
• Land Cruiser (Hardtop, Canvas Top and Station Wagon) Chassis and Body Repair Manual Supplement	RM290E

NOTE: The following pages contain only the points which differ from the above listed manuals.

DESCRIPTION

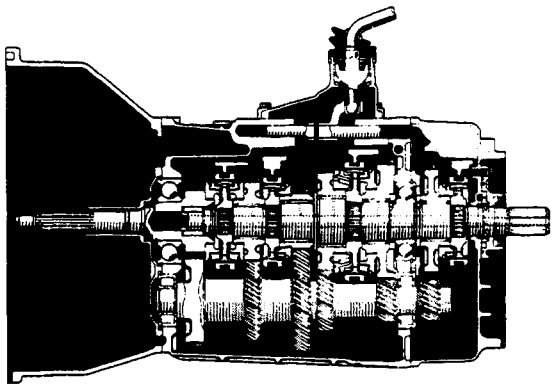
PRECAUTIONS

When working with FIPG material, you must be observe the following.

- Using a razor blade and gasket scraper, remove all the old sealant (FIPG) material from the gasket surfaces.
- Throughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non–residue solvent.
- Apply the sealant in approx. 1 mm (0.04 in.) bead along the sealing surface.
- Parts must be assembled within 10 minutes of application. Otherwise, the sealant (FIPG) material must be removed and reapplied.

DESCRIPTION

- Transmission type H150F and H151F are constant mesh synchronizers for forward gears, and a sliding mesh reverse gear.
- A triple–cone type synchromesh mechanism is used in the second gear to improve the shift feeling characteristics. This helps to reduce the shifting effort, provide smoothly shifting.
- The input shaft is composed of the 1st and 2nd speed gears and the reverse drive gear, and the output shaft is composed of the drive gear (for use with the ring gear).

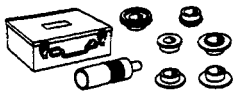
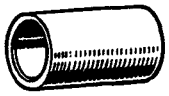
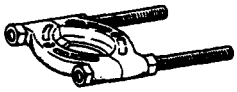


Q03143

Type of Transmission		H150F	H151F
Type of Engine		1FZ–F, 1FZ–FE	
Gear Ratio	1st	4.529	4.081
	2nd	2.464	2.294
	3rd	1.490	←
	4th	1.000	←
	5th	0.881	←
	Reverse	4.313	←
Oil Capacity		2.7 liters (2.6 US qts, 3.1 Imp. qts)	
Oiil Viscosity		SAE 75W–90	
Oil Grade		API GL–4 OR GL–5	

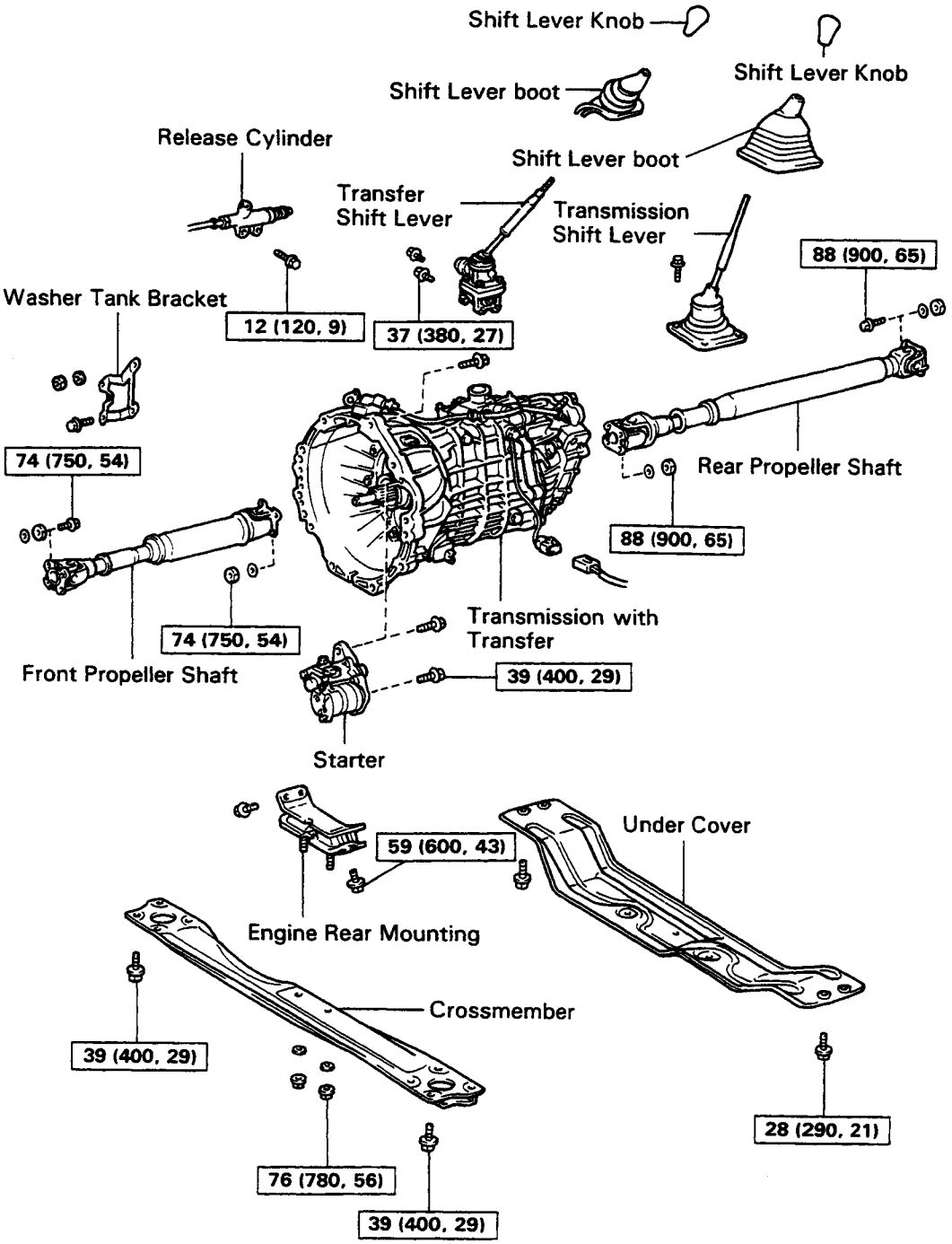
PREPARATION

SST (SPECIAL SERVICE TOOLS)

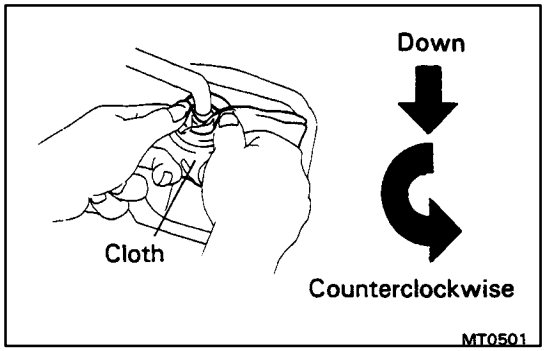
	**09316–60010**	Transmission & Transfer Bearing Replacer	
	**(09316–00010)**	Replacer Pipe	
	**09523–36010**	Rear Axle Hub Guide Tool	Output shaft rear ball bearing
	**09555–55010**	Differential Drive Pinion Bearing Replacer	
	**09950–00020**	Bearing Remover	

TRANSMISSION REMOVAL AND INSTALLATION

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque



TRANSMISSION REMOVAL

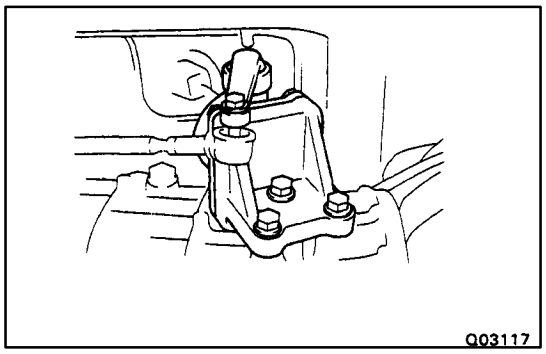
1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL

2. REMOVE TRANSMISSION SHIFT LEVER FROM INSIDE OF VEHICLE

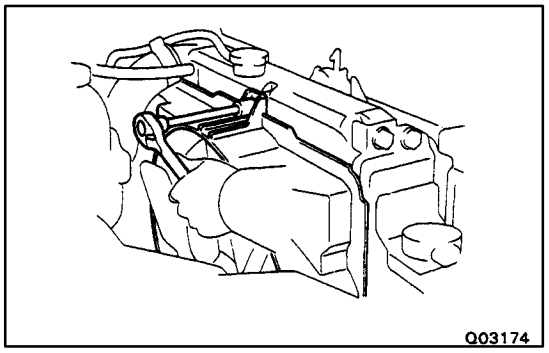
(a) Remove the transmission shift lever knob.
(b) Remove the four screws and remove the shift lever boot retainer.
(c) Pull up the shift lever boot.
(d) Cover the shift lever cap with cloth.
(e) Then, pressing down on the shift lever cap, rotate it countercrockwise to remove.
(f) Remove the shift lever.

3. REMOVE TRANSFER SHIFT LEVER

(a) Remove the transfer shift lever knob.
(b) Remove the four screws and remove the boot.



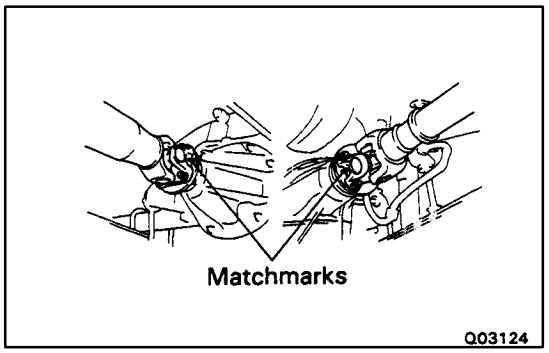
(c) Remove the nut and washer and the link.
(d) Remove the three bolts and the transfer shift lever.



4. LOOSEN FAN SHROUD OF COOLING FAN TO AVOID DAMAGE TO FAN

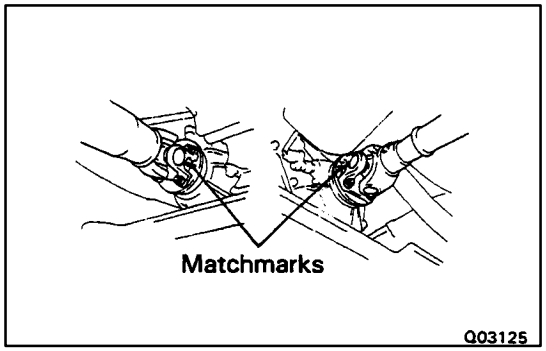
5. RAISE VEHICLE AND DRAIN TRANSMISSION OIL
NOTICE: Be sure the vehicle is securely supported.

6. REMOVE TRANSFER UNDER COVER



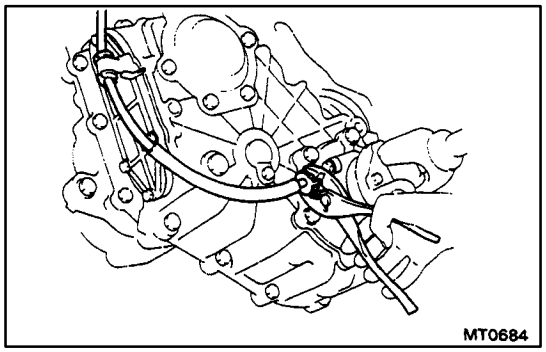
7. DISCONNECT FRONT AND REAR PROPELLER SHAFT FLANGES FROM COMPANION FLANGE ON DIFFERENTIAL

(a) Put matchmarks on the flanges.
(b) Remove the four bolts and nuts.



8. DISCONNECT FRONT AND REAR PROPELLER SHAFT FLANGES FROM COMPANION FLANGE ON TRANSFER

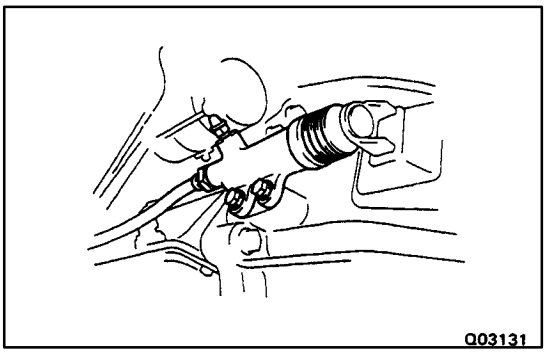
(a) Put matchmarks on the flange.
(b) Remove the four nuts.
(c) Remove the propeller shaft.



9. REMOVE SPEEDOMETER CABLE

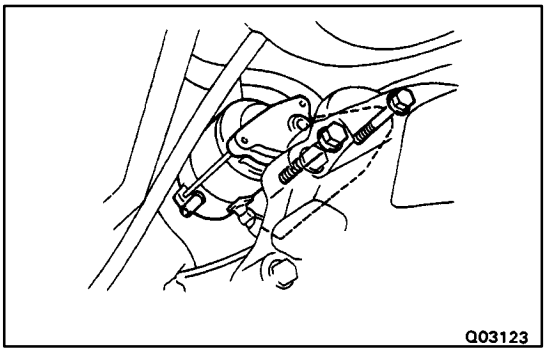
Using pliers, remove the speedometer cable.

10. DISCONNECT BACK–UP LIGHT SWITCH CONNECTOR



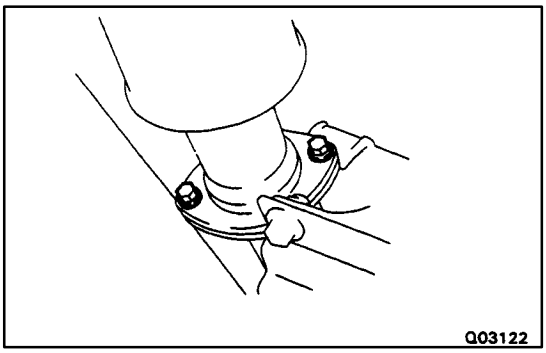
11. REMOVE CLUTCH RELEASE CYLINDER

Remove the two bolts and release cylinder.



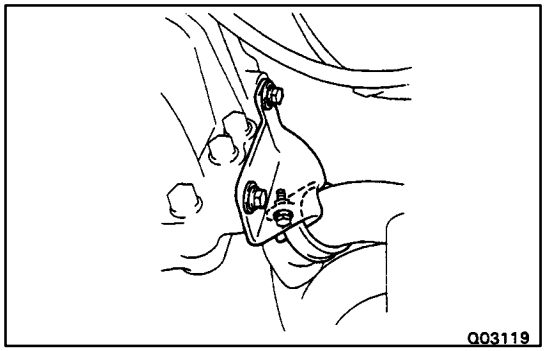
12. REMOVE STARTER

(a) Disconnect the connector and wire from the starter.
(b) Remove the two bolts and starter.

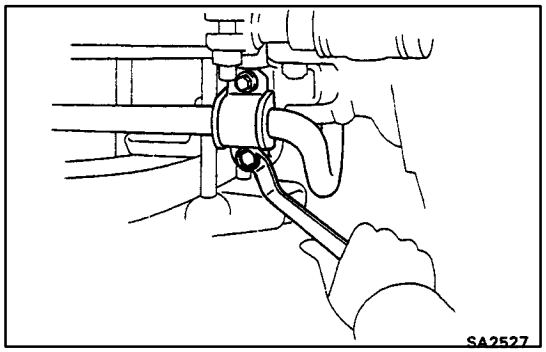


13. REMOVE FRONT EXHAUST PIPE

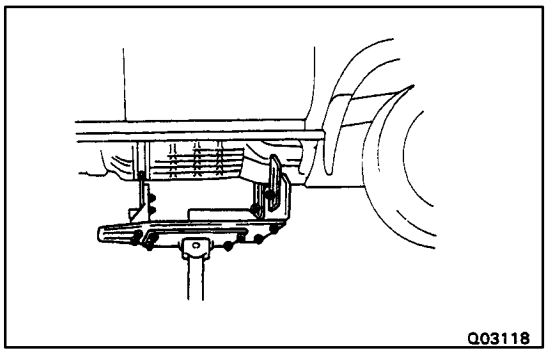
(a) Disconnect the oxygen sensor connector.
(b) Remove the two bolts, bracket and a gasket.



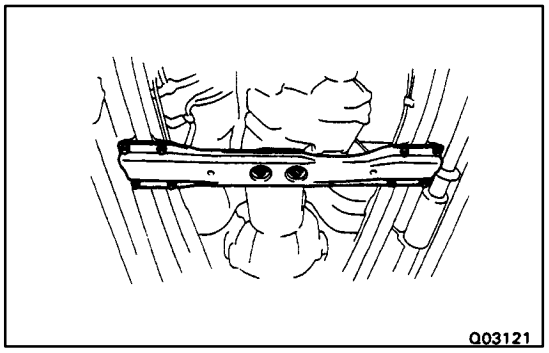
(c) Remove the exhaust pipe clamp from the bracket.
(d) Remove the two bolts and exhaust pipe bracket from the clutch housing.



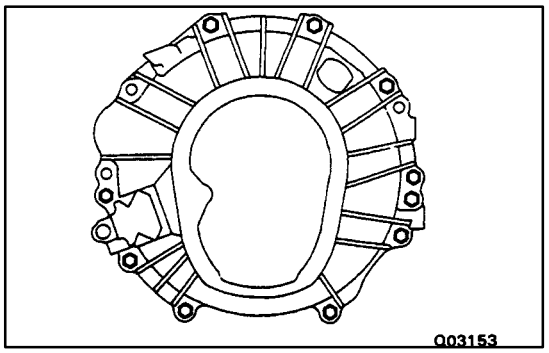
14. REMOVE STABILIZER BRAKET SET BOLTS
Remove four stabilizer bracket set bolts.



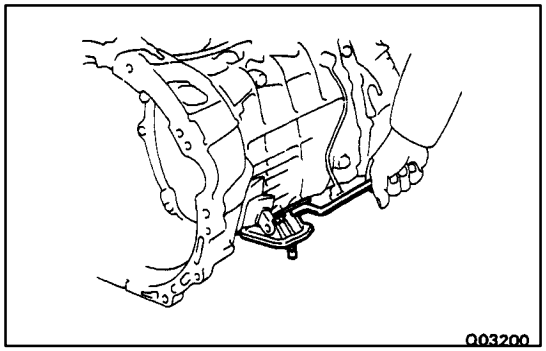
15. SUPPORT TRANSMISSION
Remove the transmission enough to remove the weight from the rear support.



16. REMOVE CROSSMEMBER
(a) Raise the transmission slightly with a jack.
(b) Remove the eight bolts, two nuts and crossmember.

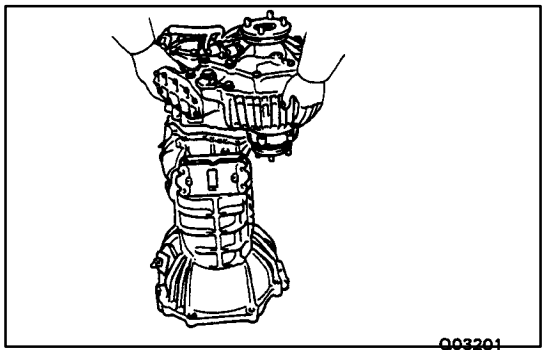


17. REMOVE TRANSMISSION
(a) Remove the transmission mounting bolts from the engine.
(b) Pull out the transmission down and toward the rear.



18. REMOVE ENGINE REAR MOUNTING

Remove the four bolts and engine rear mounting from the transmission.

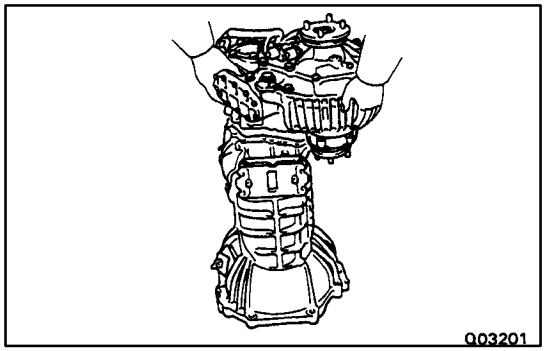


19. REMOVE TRANSFER FROM TRANSMISSION

(a) Remove the transfer adaptor rear mounting bolts.

(b) Pull the transfer straight up and remove it from the transmission.

HINT: Take care not to damage the adaptor rear oil seal with the transfer input gear spline.



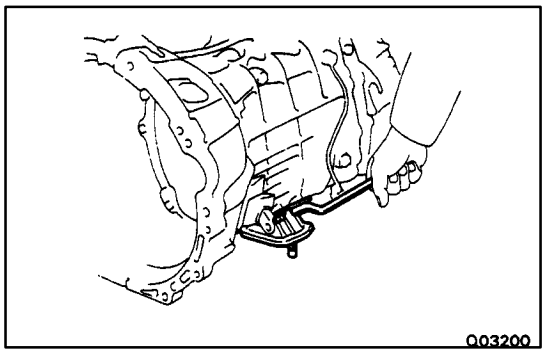
TRANSMISSION INSTALLATION
(See page MT–4)

1. INSTALL TRANSFER TO TRANSMISSION

(a) Apply MP grease to the adaptor oil seal.

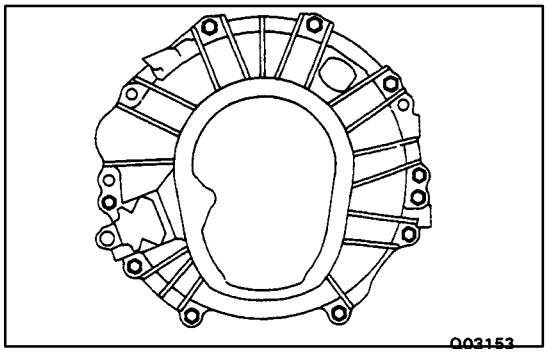
(b) Install the transfer to the transmission.
HINT: Take care not to damage the oil seal by the input gear spline when installing the transfer.

(c) Install and torque the bolts.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)



2. INSTALL ENGINE REAR MOUNTING

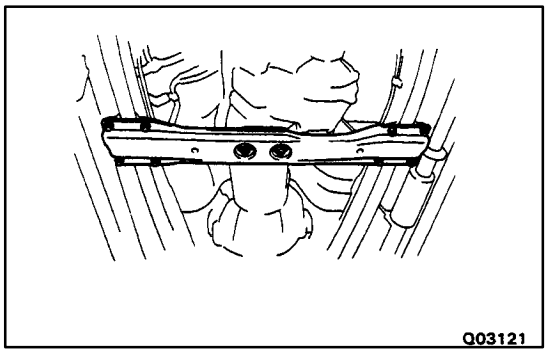
Install the engine rear mounting and torque the four bolts.
Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)



3. INSTALL TRANSMISSION TO ENGINE

(a) Align the input shaft spline with the clutch disc and install the transmission to the engine.

(b) Install and torque the ten bolts.
Torque: 72 N·m (730 kgf·cm, 53 ft·lbf)

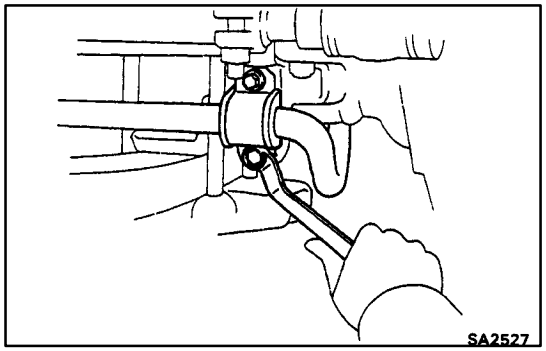


4. INSTALL CROSSMEMBER

(a) Raise the transmission slightly with a jack.

(b) Install the crossmember with eight bolts and two nuts.
Torque: BOLT 39 N·m (400 kgf·cm, 29 ft·lbf)
NUT 76 N·m (780 kgf·cm, 56 ft·lbf)

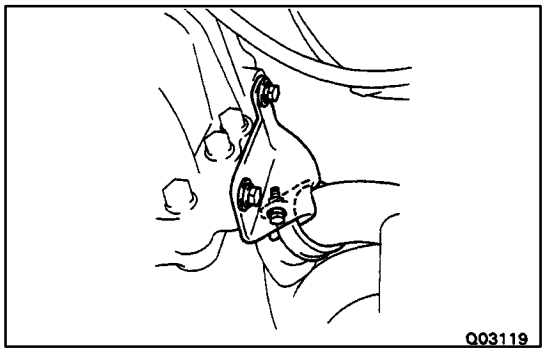
(c) Remove the jack.



5. INSTALL STABILIZER BRACKET SET BOLTS

Install the stabilizer bracket with four bolts.

Torque: 28 N·m (290 kgf·cm, 21 ft·lbf)



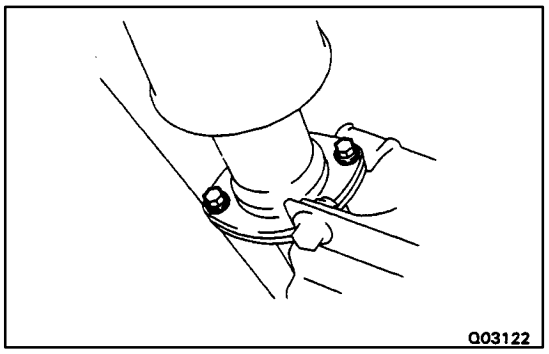
6. INSTALL FRONT EXHAUST PIPE

(a) Install the exhaust pipe bracket and two bolts to the clutch housing.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Install the exhaust pipe clamp.

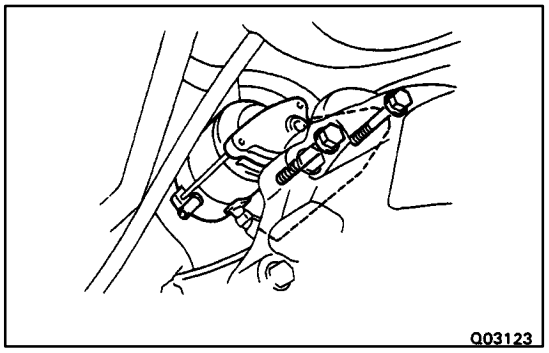
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)



(c) Install a new gasket, bracket and torque the two bolts.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(d) Connect the oxygen sensor connector.

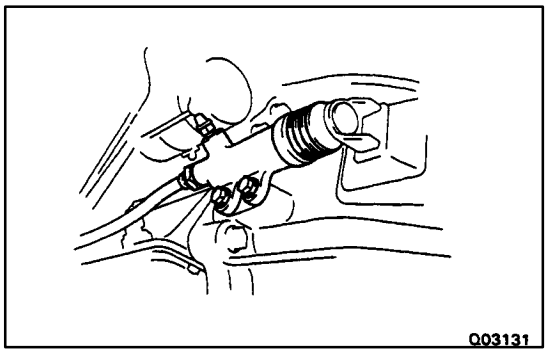


7. INSTALL STARTER

(a) Install the starter with two bolts.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

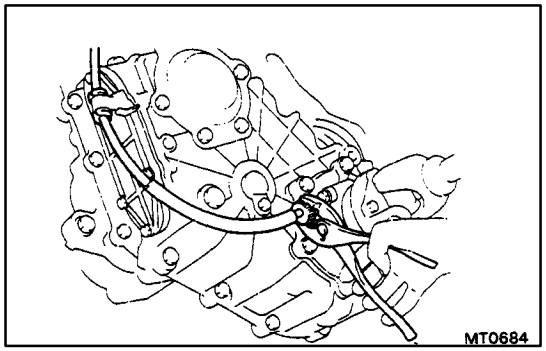
(b) Connect the connector and wire to the starter.



8. INSTALL CLUTCH RELEASE CYLINDER

Install the clutch release cylinder with two bolts.

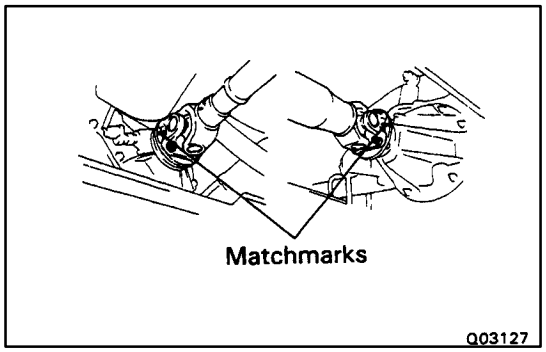
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)



9. INSTALL SPEEDOMETER CABLE

Using pliers, install the speedometer cable.

10. CONNECT BACK–UP LIGHT SWITCH CONNECTOR



11. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON TRANSFER

(a) Align the matchmarks on the flanges and connect the flanges with four nuts.

(b) Torque the nuts.

Torque:

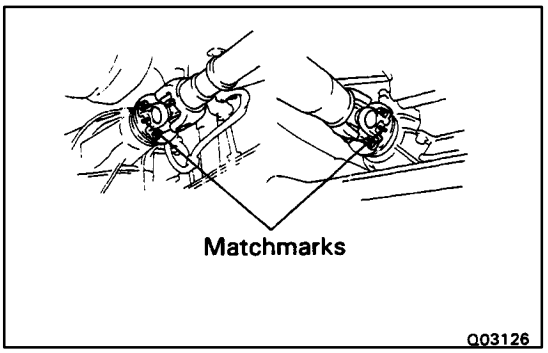
Front Propeller Shaft

74 N·m (750 kgf·cm, 54 ft·lb)

Rear Propeller Shaft

88 N·m (900 kgf·cm, 65 ft·lb)

HINT: When installing the washers, put them properly in place.



12. CONNECT PROPELLER SHAFT FLANGE ON DIFFERENTIAL

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

(b) Torque the bolts and nuts.

Torque:

Front Propeller Shaft

74 N·m (750 kgf·cm, 54 ft·lb)

Rear Propeller Shaft

88 N·m (900 kgf·cm, 65 ft·lb)

HINT: When installing the washers, put them properly in place.

13. INSTALL TRANSFER UNDER COVER

14. FILL TRANSMISSION WITH GEAR OIL

Oil grade:

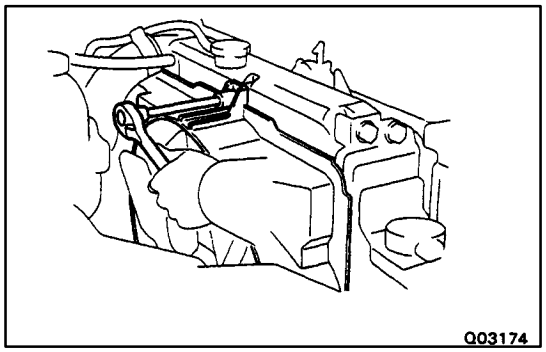
API GL–4 or GL–5

Viscosity:

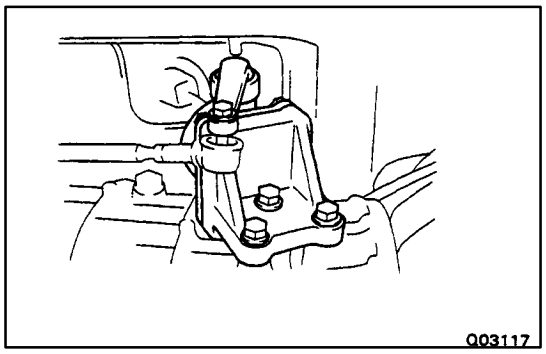
SAE 75W–90

Capacity:

2.7 liters (2.6 US qts, 3.1 lmp.qts)

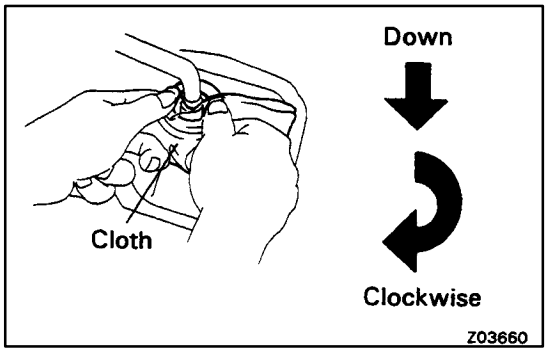


15. TIGHTEN FAN SHROUD



16. INSTALL TRANSFER SHIFT LEVER

(a) Install the link with the washer and nut.
(b) Install the transfer shift lever and the three bolts.
(c) Install the boot and four screws.
(d) Install the transfer shift lever knob.



17. INSTALL TRANSMISSION SHIFT LEVER

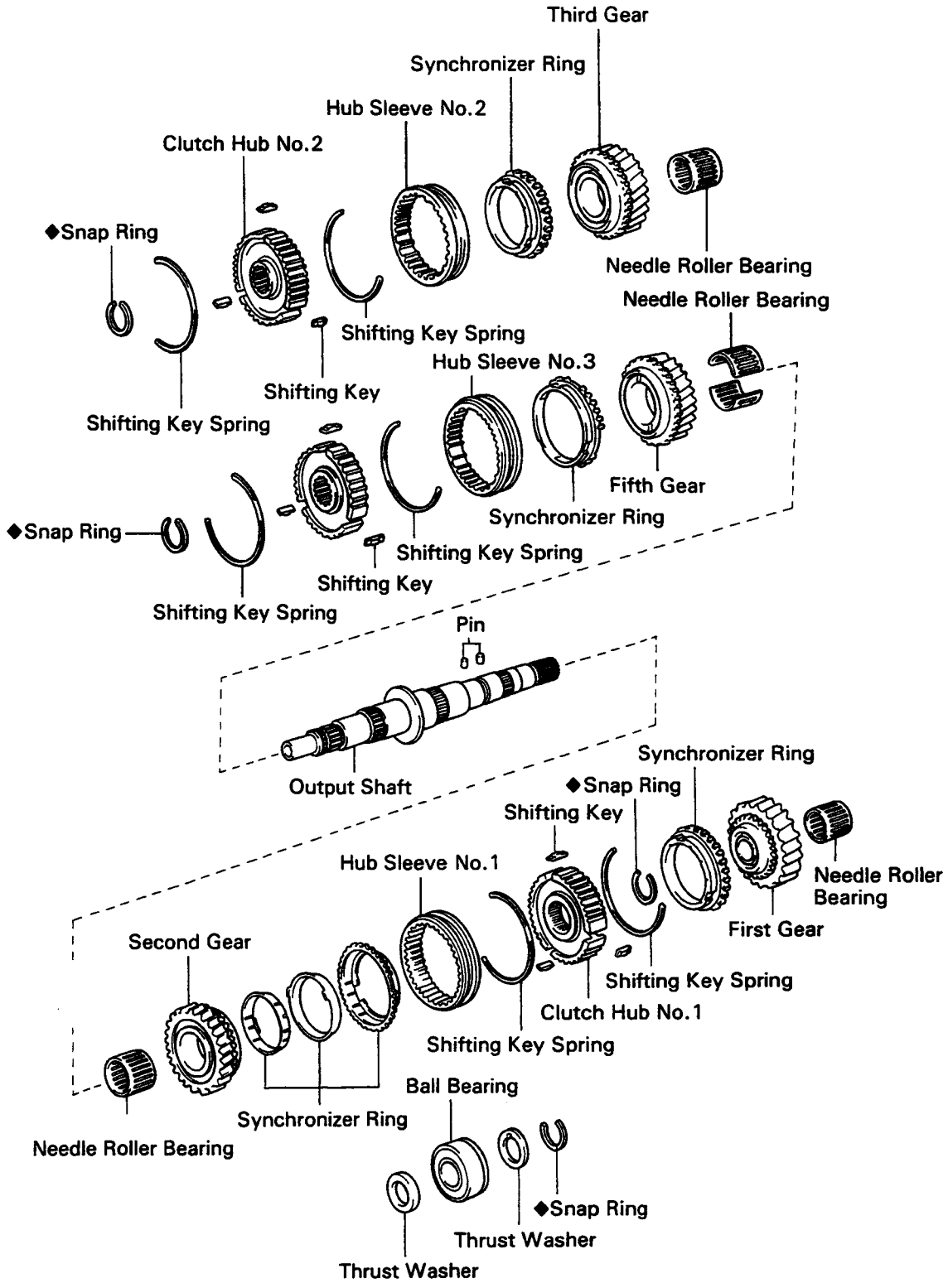
(a) Apply MP grease to the transmission shift lever.
(b) Align the groove of the shift lever cap and the pin part of the case cover.
(c) Cover the shift lever cap with a cloth.
(d) Then, pressing down on the shift lever cap, rotate it clockwise to install.
(e) Install the shift lever boot.
(f) Install the transmission shift lever knob.

18. INSTALL NEGATIVE BATTERY CABLE

19. PERFORM ROAD TEST

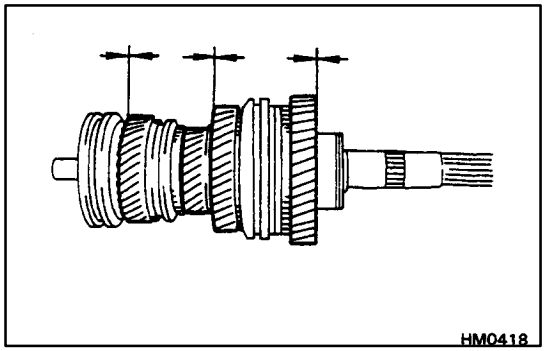
Check for abnormal noise and smooth shifting.

OUTPUT SHAFT
COMPONENTS



Q03128

◆ Non-reusable part


HM0418

OUTPUT SHAFT DISASSEMBLY

1. INSPECT EACH GEAR THRUST CLEARANCE

Measure the thrust clearance of each gear.

Standard clearance:

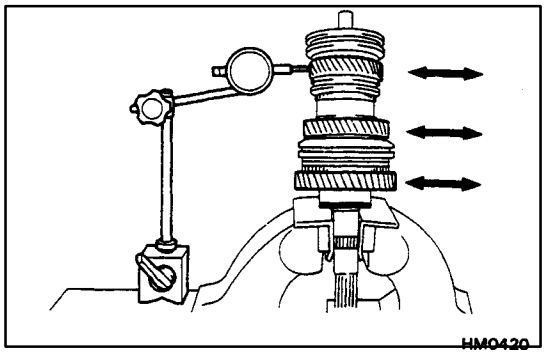
1st and 3rd gear 0.1–0.45 mm (0.0039–0.0177 in.)

2nd and 5th gear 0.1–0.35 mm (0.0039–0.0138 in.)

Maximum clearance:

1st and 3rd gear 0.45 mm (0.0177 in.)

2nd and 5th gear 0.35 mm (0.0138 in.)


HM0420

2. INSPECT EACH GEAR OIL CLEARANCE

Using a dial indicator, measure the oil clearance of each gear.

Standard clearance:

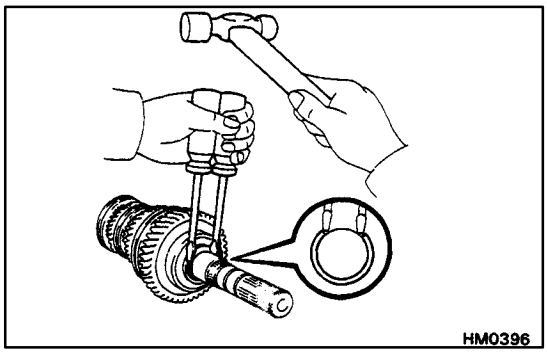
1st and 3rd gear 0.020–0.073 mm (0.0008–0.0029 in.)

2nd and 5th gear 0.015–0.068 mm (0.0006–0.0027 in.)

Maximum clearance:

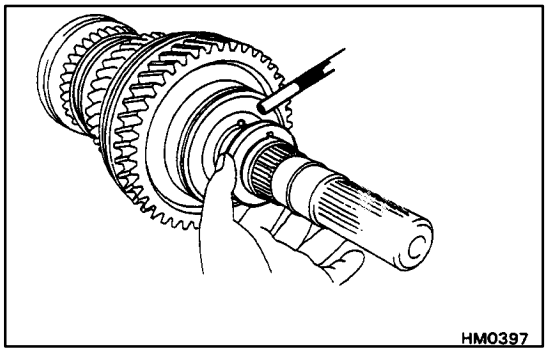
1st and 3rd gear 0.073 mm (0.0029 in.)

2nd and 5th gear 0.068 mm (0.0027 in.)

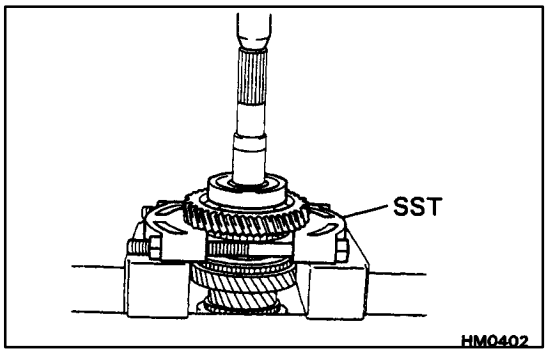

HM0396

3. REMOVE BALL BEARING AND FIRST GEAR

(a) Using two screwdrivers and a hammer, drive out the snap ring.


HM0397

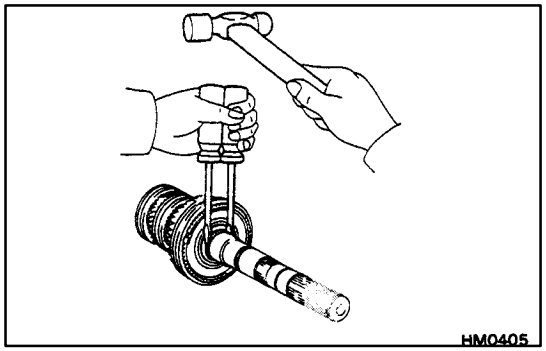
(b) Remove the thrust washer and pin.



HM0402

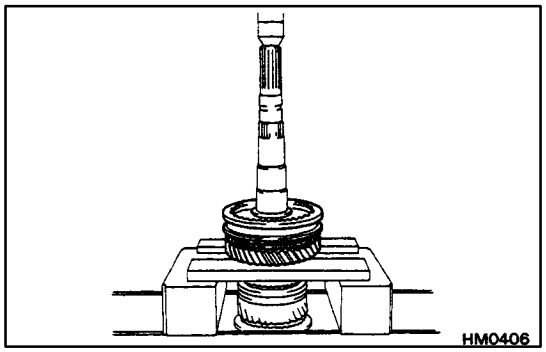
(c) Using SST and a press, remove the ball bearing, thrust washer, first gear and synchronizer rings.
SST 09555–55010

(d) Remove the pin and needle roller bearing.



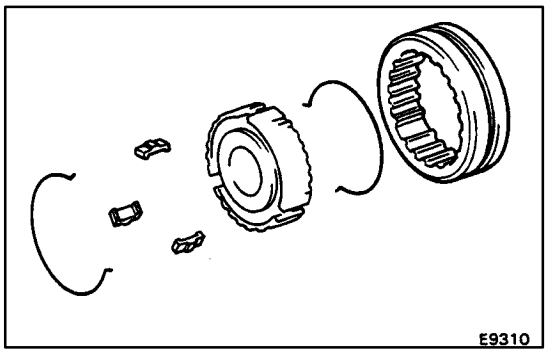
4. REMOVE HUB SLEEVE NO.1 ASSEMBLY, SYNCHRONIZER RING, SECOND GEAR AND NEEDLE ROLLER BEARING

(a) Using two screwdrivers and a hammer, drive out the snap ring.



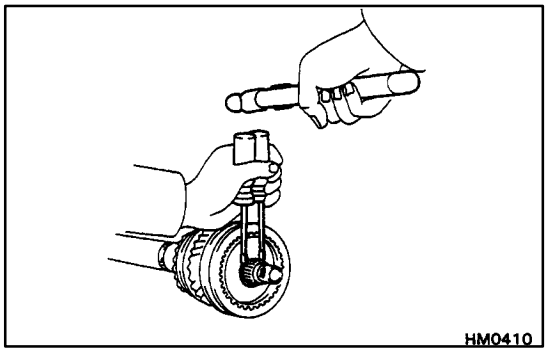
(b) Using a press, remove the hub sleeve No.1 assembly, synchronizer rings, and second gear.

(c) Remove the needle roller bearing.



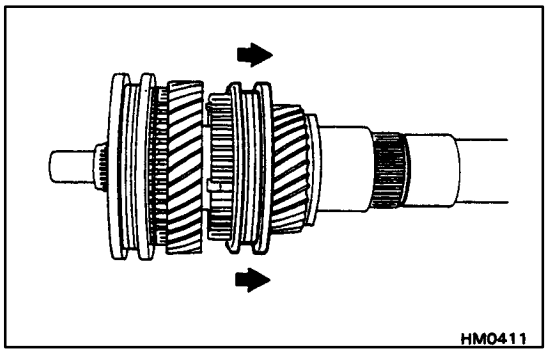
5. REMOVE HUB SLEEVE NO.1, SHIFTING KEYS AND SPRING FROM CLUTCH HUB NO.1

Using a screwdriver, remove the three shifting keys and two springs from the clutch hub No.1.

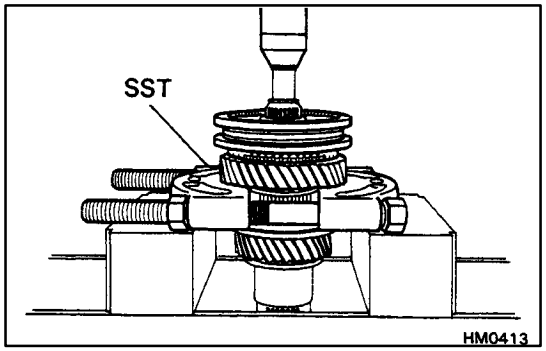


6. REMOVE HUB SLEEVE NO.2 ASSEMBLY, SYNCHRONIZER RINGS, THIRD GEAR AND NEEDLE ROLLER BEARING

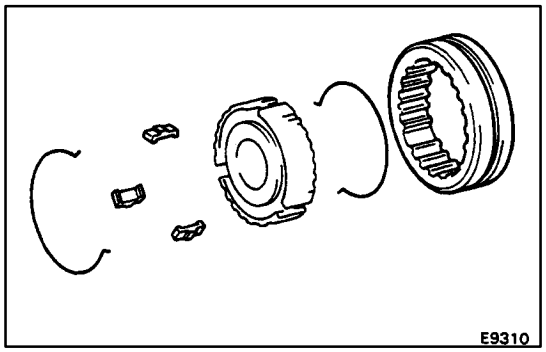
(a) Remove two screwdrivers and a hammer, drive out the snap ring.



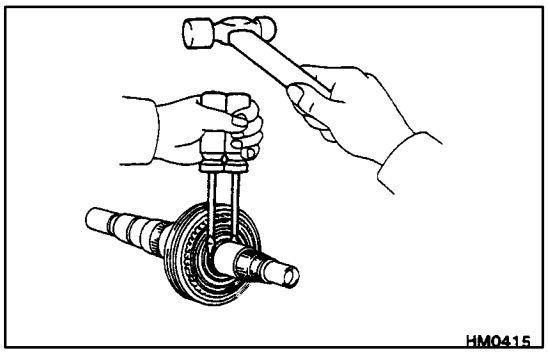
(b) Shift hub sleeve No.3 onto the fifth gear.



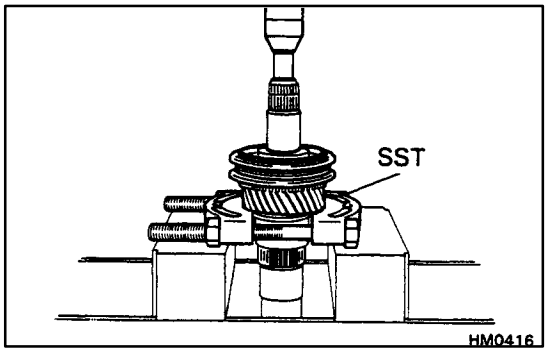
(c) Using SST and a press, remove the hub sleeve No.2 assembly, synchronizer ring and third gear.
SST 09555–55010
(d) Remove the needle roller bearing.



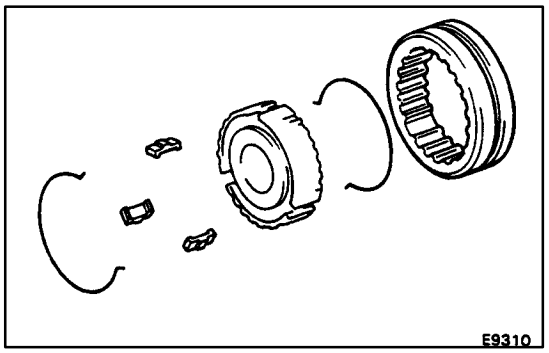
7. REMOVE HUB SLEEVE NO.2, SHIFTING KEYS AND SPRINGS FROM CLUTCH HUB NO.2
Using a screwdriver, remove the three shifting keys and two springs from the clutch hub No.2.



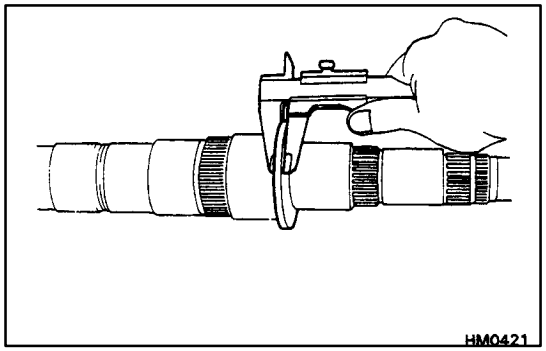
8. REMOVE HUB SLEEVE NO.3 ASSEMBLY, SYNCHRONIZER RING, FIFTH GEAR AND NEEDLE ROLLER BEARING
(a) Using two screwdriver, and a hammer, drive out the snap ring.



(b) Using SST and a press, remove the hub sleeve No.3 assembly and synchronizer ring.
SST 09950–00020
(c) Remove the needle roller bearing.



9. REMOVE HUB SLEEVE NO.3 SHIFTING KEYS AND SPRINGS FROM CLUTCH HUB NO.3
Using a screwdriver, remove the three shifting keys and two springs from the clutch hub No.3.


HM0421

OUTPUT SHAFT ASSEMBLY INSPECTION

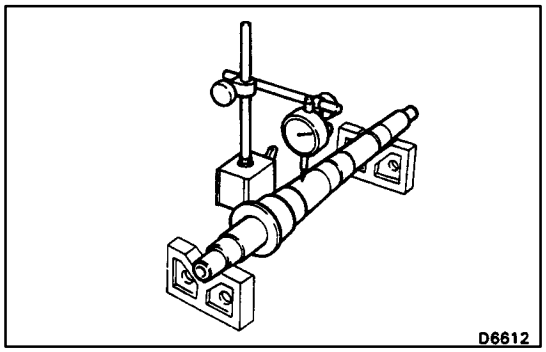
INSPECT OUTPUT SHAFT

(a) Using calipers, measure the output shaft flange thickness.

Minimum thickness:

4.725 mm (0.1860 in.)

If the thickness is less than the minimum, replace the output shaft.

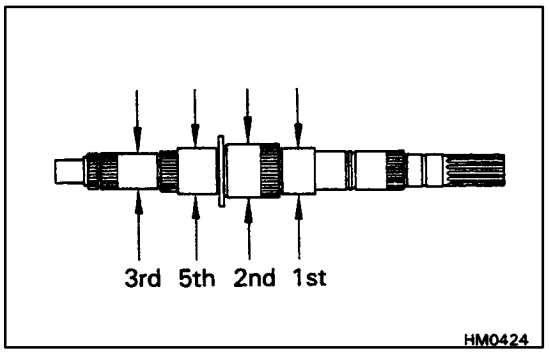

D6612

(b) Using a dial indicator, check the shaft runout.

Maximum runout:

0.03 mm (0.0020 in.)

If the run out exceeds the maximum, replace the output shaft.



HM0424

(c) Using a micrometer, measure the outer diameter of the output shaft journal.

Minimum outer diameter:

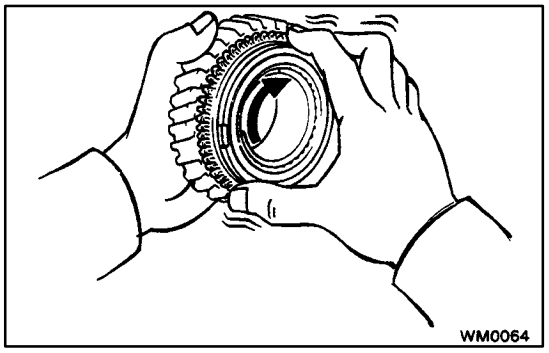
1st 49.979 mm (1.9677 in.)

2nd 57.984 mm (2.2828 in.)

3rd 37.979 mm (1.4952 in.)

5rh 45.984 mm (1.8104 in.)

If the outer diameter is less than the minimum, replace the output shaft.


WM0064

OUTPUT SHAFT COMPONENT PARTS INSPECTION

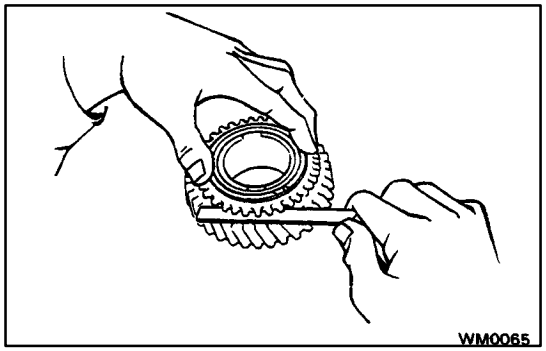
1. INSPECT SYNCHRONIZER RINGS FOR 1st AND 3rd GEAR

(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone and check that the ring is locked. If the braking effect is insufficient, lightly rub the synchronizer ring and gear cone by applying a small amount of fine lapping compound.

NOTICE:

- **Wash off completely the fine lapping compound after rubbing.**
- **Check again the braking effect of the synchronizer ring.**



(c) Using a feeler gauge, measure the clearance between the synchronizer ring back and the gear spline end.

Minimum clearance:

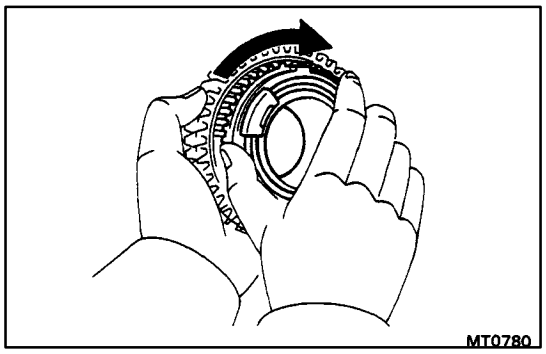
1st gear 1.1 mm (0.0433 in.)

3rd gear 0.8 mm (0.0315 in.)

HINT:

- When replacing either a synchronizer ring or gear, apply a small amount of fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear together.
- When replacing both the synchronizer ring and gear, there is no need to apply any compound or to rub them together.

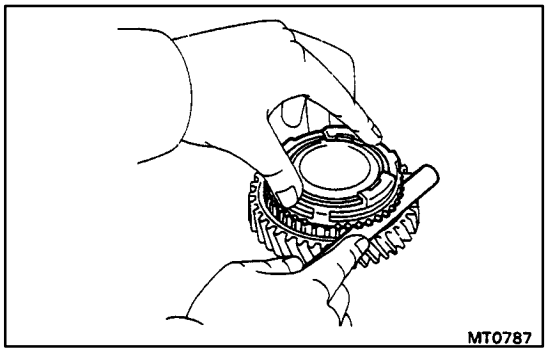
NOTICE: Wash off completely the fine lapping compound after rubbing.



2. INSPECT SYNCHRONIZER RING FOR 2nd GEAR

(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer direction while pushing it to the gear cone and check that the ring is locked. If the braking effect is insufficient, replace the synchronizer ring.

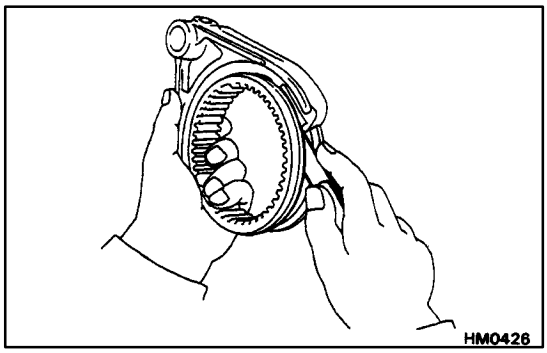


(c) Measure the clearance between the synchronizer ring back and gear spline end.

Minimum clearance:

0.85 mm (0.0335 in.)

If the clearance is less than the limit, replace the synchronizer ring.



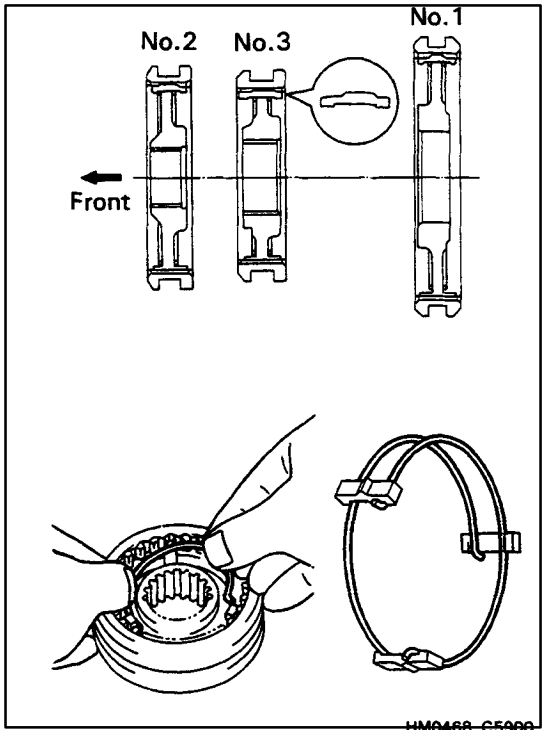
3. INSPECT CLEARNACE OF SHIFT FORKS AND HUB SLEEVES

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance:

0.35 mm (0.0138 in.)

If the clearance exceeds the maximum, replace the shift fork or hub sleeve.

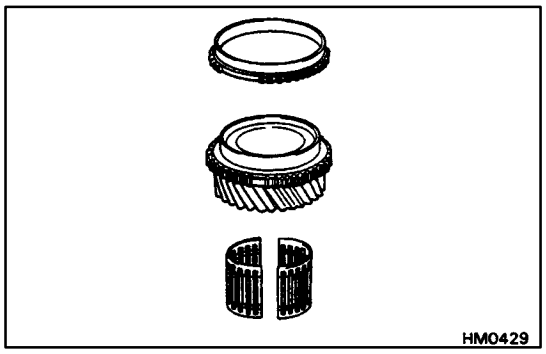


OUTPUT SHAFT ASSEMBLY

1. INSTALL CLUTCH HUB NO.1, NO.2 AND NO.3 INTO HUB SLEEVE

(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the springs under the shifting keys.
NOTICE: Install the key springs positioned so that their end gaps are not in line.

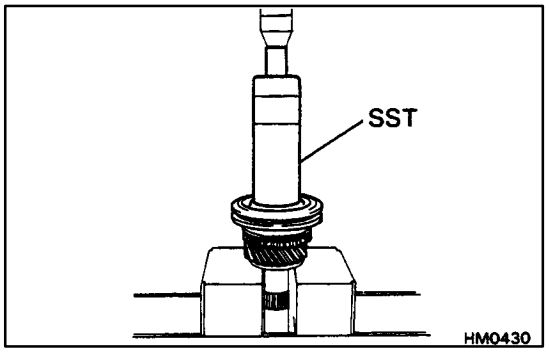


2. INSTALL FIFTH GEAR AND HUB SLEEVE NO.3 ASSEMBLY ON OUTPUT SHAFT

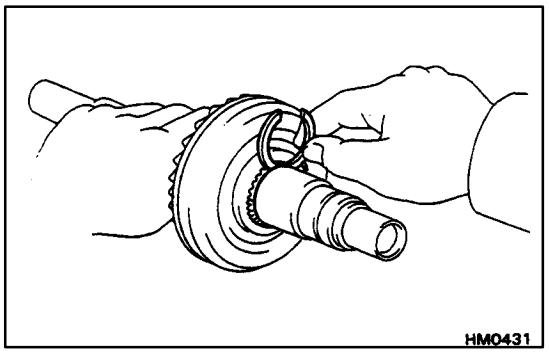
(a) Apply gear oil to the shaft and needle roller bearing.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Install the needle roller bearing in the fifth gear.



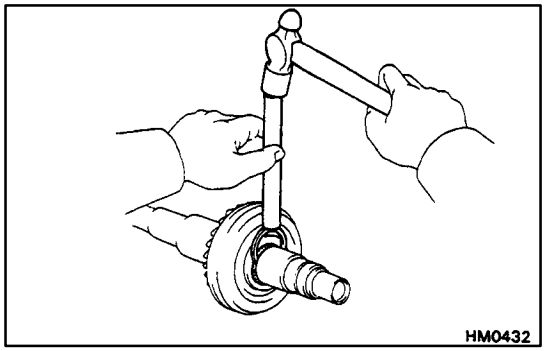
(d) Using SST and a press, install the fifth gear and hub sleeve No.3.
SST 09316–60010 (09316–00010)



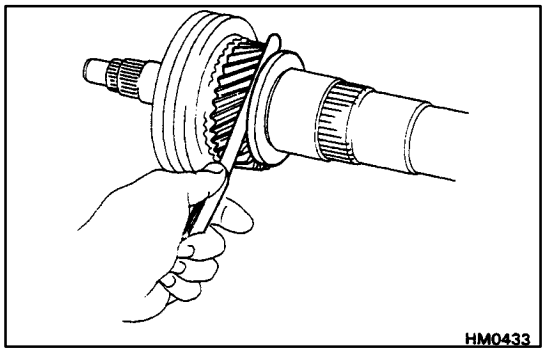
3. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	2.40–2.45 (0.0945–0.0965)
B	2.45–2.50 (0.0965–0.0984)
C	2.50–2.55 (0.0984–0.1004)
D	2.55–2.60 (0.1004–0.1024)
E	2.60–2.65 (0.1024–0.1044)
F	2.65–2.70 (0.1044–0.1063)



(b) Using a brass bar and hammer, drive in the snap ring.

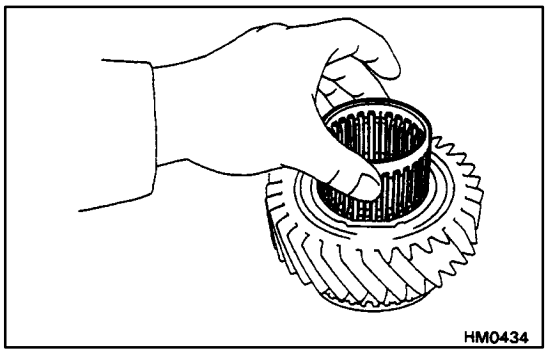


4. INSPECT FIFTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the fifth gear thrust clearance.

Standard clearance:

0.1–0.35 mm (0.0039–0.0138 in.)

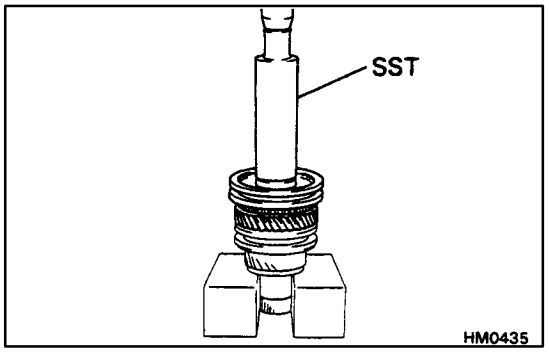


5. INSTALL THIRD GEAR AND HUB SLEEVE NO.2 ASSEMBLY

(a) Apply gear oil to the shaft and needle roller bearing.

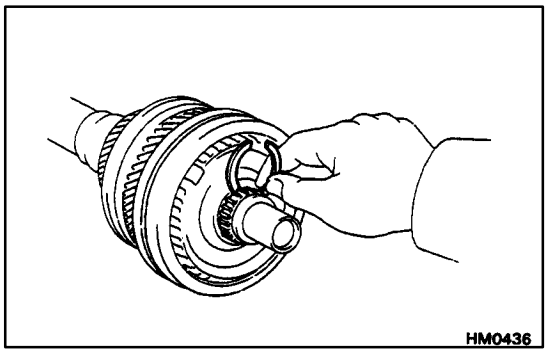
(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Install the needle roller bearing in the third gear.



(d) Using SST and a press, install the third gear and hub sleeve No.2.

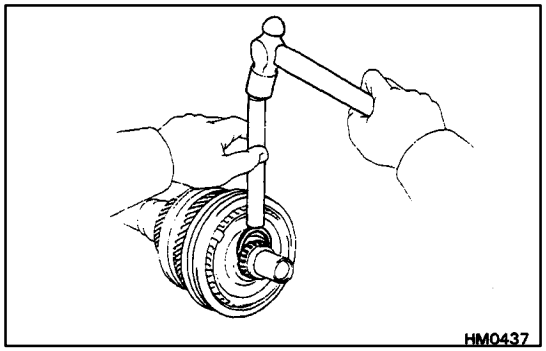
SST 09316–60010 (09316–00010)



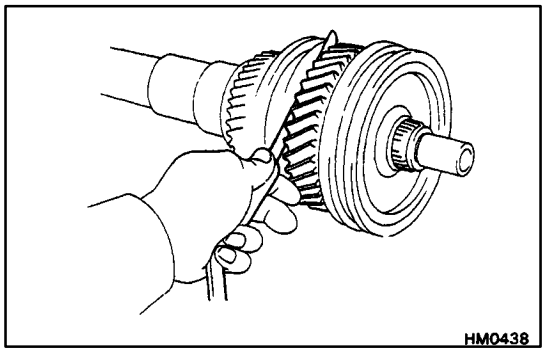
6. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
4	1.90–1.95 (0.0748–0.0768)
5	1.95–2.00 (0.0768–0.0787)
6	2.00–2.05 (0.0787–0.0807)
7	2.05–2.10 (0.0807–0.0827)
8	2.10–2.15 (0.0827–0.0847)
9	2.15–2.20 (0.0847–0.0866)



(b) Using a brass bar and hammer, drive in a new snap ring.

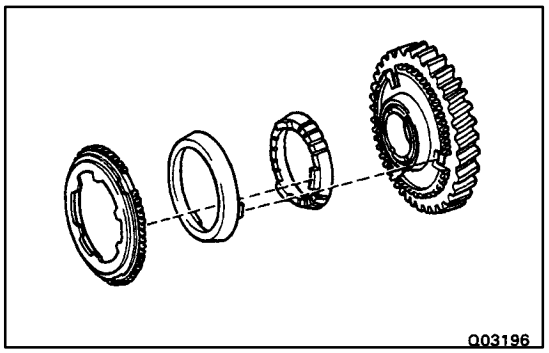


7. INSPECT THIRD GEAR THRUST CLEARANCE

Using a feeler gauge, measure the third gear thrust clearance.

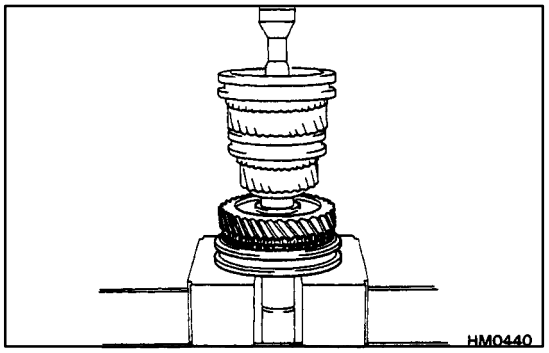
Standard clearance:

0.1–0.45 mm (0.0039–0.0138 in.)

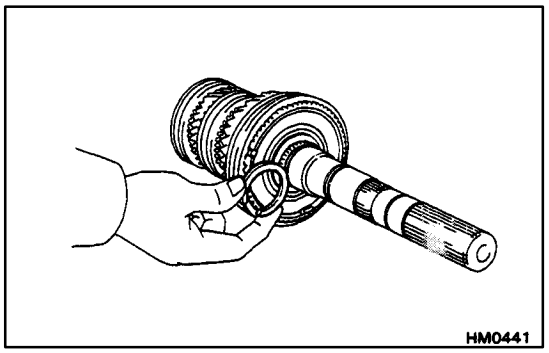


8. INSTALL SECOND GEAR AND HUB SLEEVE NO.1 ASSEMBLY

(a) Place the synchronizer rings on the 2nd gear.



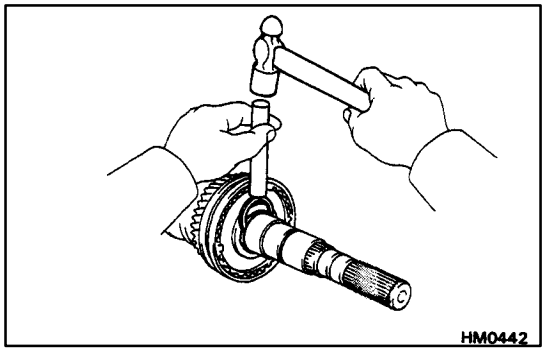
(b) Apply gear oil to the shaft and needle roller bearing.
(c) Install the needle roller bearing in the second gear.
(d) Using a press, install the second gear and hub sleeve No.1 assembly.



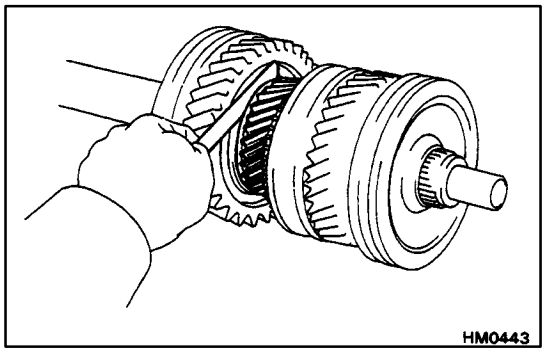
9. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	2.90–2.95 (0.1142–0.1162)
B	2.95–3.00 (0.1162–0.1181)
C	3.00–3.05 (0.1181–0.1201)
D	3.05–3.10 (0.1201–0.1220)
E	3.10–3.15 (0.1220–0.1240)
F	3.15–3.20 (0.1240–0.1260)



(b) Using a brass bar and hammer, drive in a new snap ring.

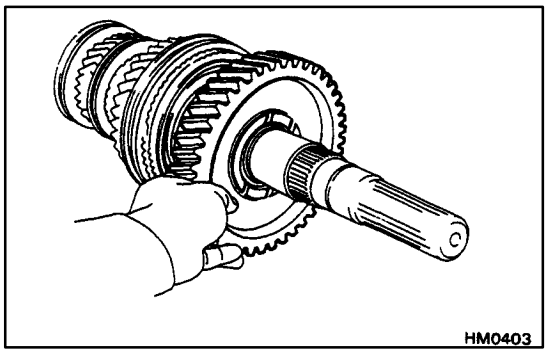


10. INSPECT SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the second gear thrust clearance.

Standard clearance:

0.1–0.35 mm (0.0039–0.0138 in.)

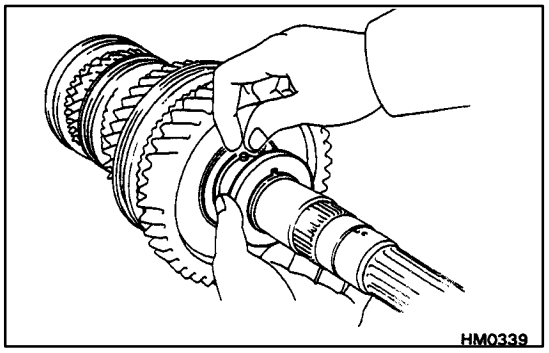


11. INSTALL FIRST GEAR

(a) Apply gear oil to the shaft and needle roller bearing.

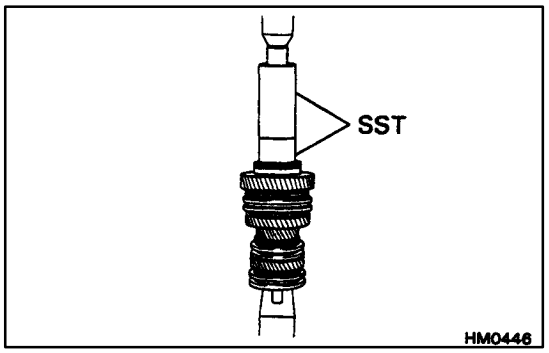
(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Install the needle roller bearing in the first gear.

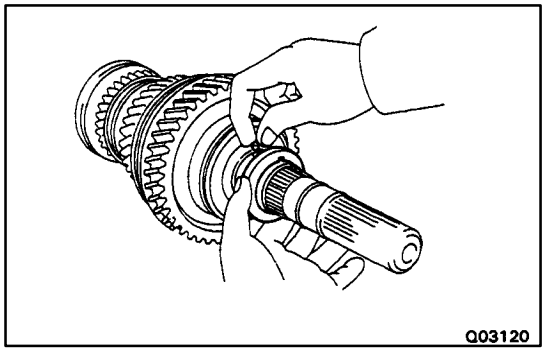


12. INSTALL BALL BEARING

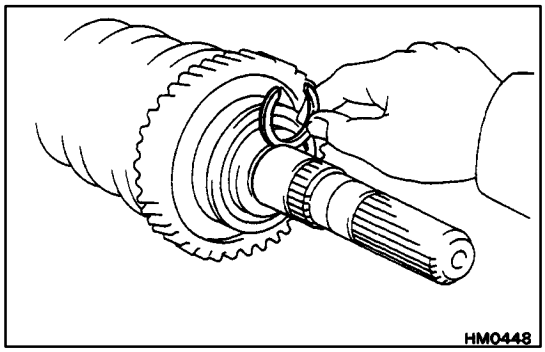
(a) Install the pin and thrust washer.



(b) Using SST and a press, install the ball bearing.
SST 09316–60010 (09316–00010), 09523–36010



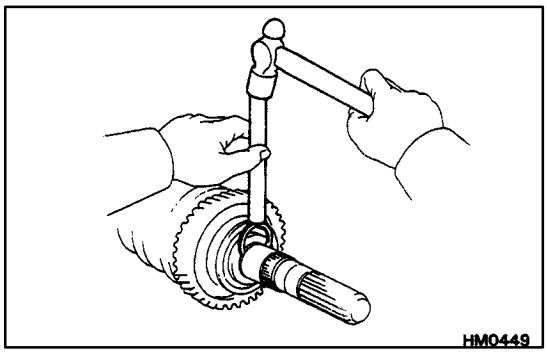
(c) Install the pin and thrust washer.



13. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	2.40–2.45 (0.0945–0.0965)
B	2.45–2.50 (0.0965–0.0984)
C	2.50–2.55 (0.0984–0.1004)
D	2.55–2.60 (0.1004–0.1024)
E	2.60–2.65 (0.1024–0.1044)
F	2.65–2.70 (0.1044–0.1063)
G	2.70–2.75 (0.1063–0.1083)
H	2.75–2.80 (0.1083–0.1102)



(b) Using a brass bar and a hammer, drive in a new snap ring.

SERVICE SPECIFICATIONS

SERVICE DATA

Output shaft 1st gear journal diameter			
	Limit	49.979 mm	1.9177 in.
Output shaft 2nd gear journal diameter			
	Limit	57.984 mm	2.2828 in.
Output shaft 3rd gear journal diameter			
	Limit	37.979 mm	1.4952 in.
Output shaft 5th gear journal diameter			
	Limit	45.984 mm	1.8104 in.
Output shaft Frange thickness			
	Limit	4.725 mm	0.1860 in.
Output shaft Runout			
	Limit	0.03 mm	0.0012 in.
Gear thrust clearance 1st and 3rd			
	STD	0.1–0.45 mm	0.0039–0.0177 in.
Gear thrust clearance 2nd and 5th			
	STD	0.1–0.35 mm	0.0039–0.0138 in.
Gear oil clearance 1st and 3rd			
	STD	0.020–0.073 mm	0.0008–0.0029 in.
Gear oil clearance 2nd and 5th			
	STD	0.015–0.068 mm	0.0006–0.0027 in.
Synchronizer ring for 1st gear clearance			
	Limit	1.1 mm	0.04331 in.
Synchronizer ring for 2nd gear clearance			
	Limit	0.85 mm	0.0335 in.
Synchronizer ring for 3rd gear clearance			
	Limit	0.8 mm	0.0315 in.
Output shaft snap ring thickness			
No.3 Hub sleeve	Mark A	2.40–2.45 mm	0.0945–0.0965 in.
No.3 Hub sleeve	Mark B	2.45–2.50 mm	0.0965–0.0984 in.
No.3 Hub sleeve	Mark C	2.50–2.55 mm	0.0984–0.1004 in.
No.3 Hub sleeve	Mark D	2.55–2.60 mm	0.1004–0.1024 in.
No.3 Hub sleeve	Mark E	2.60–2.65 mm	0.1024–0.1044 in.
No.3 Hub sleeve	Mark F	2.65–2.70 mm	0.1044–0.1063 in.
No.2 Hub sleeve	Mark 4	1.90–1.95 mm	0.0748–0.0768 in.
No.2 Hub sleeve	Mark 5	1.95–2.00 mm	0.0768–0.0787 in.
No.2 Hub sleeve	Mark 6	2.00–2.05 mm	0.0787–0.0807 in.
No.2 Hub sleeve	Mark 7	2.05–2.10 mm	0.0807–0.0827 in.
No.2 Hub sleeve	Mark 8	2.10–2.15 mm	0.0827–0.0847 in.
No.2 Hub sleeve	Mark 9	2.15–2.20 mm	0.0847–0.0866 in.
No.1 Hub sleeve	Mark A	2.90–2.95 mm	0.1142–0.1162 in.
No.1 Hub sleeve	Mark B	2.95–3.00 mm	0.1162–0.1181 in.
No.1 Hub sleeve	Mark C	3.00–3.05 mm	0.1181–0.1201 in.
No.1 Hub sleeve	Mark D	3.05–3.10 mm	0.1201–0.1220 in.
No.1 Hub sleeve	Mark E	3.10–3.15 mm	0.1220–0.1240 in.
No.1 Hub sleeve	Mark F	3.15–3.20 mm	0.1240–0.1260 in.
Rear bearing	Mark A	2.40–2.45 mm	0.0945–0.0965 in.
Rear bearing	Mark B	2.45–2.50 mm	0.0965–0.0984 in.
Rear bearing	Mark C	2.50–2.55 mm	0.0984–0.1004 in.
Rear bearing	Mark D	2.55–2.60 mm	0.1004–0.1024 in.
Rear bearing	Mark E	2.60–2.65 mm	0.1024–0.1044 in.
Rear bearing	Mark F	2.65–2.70 mm	0.1044–0.1063 in.
Rear bearing	Mark G	2.70–2.75 mm	0.1063–0.1083 in.
Rear bearing	Mark H	2.75–2.80 mm	0.1083–0.1102 in.

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Transfer X Transmission	69	700	51
Engine rear mounting X Transfer adapter	59	600	43
Transmission X Engine	72	730	53
Crossmember X Body	39	400	29
Crossmember X Engine rest mounting	76	780	56
Stabilizer bracket X Axle housing	28	290	21
Exhaust pipe bracket X Clutch housing	39	400	29
Exhaust pipe clamp	19	195	14
Exhaust center pipe	39	400	29
Transmission X Starter	39	400	29
Clutch release cylinder set bolt	12	120	9
Shift lever control retainer X Transmission case	17	170	12
Front propeller shaft X Front differential	74	750	54
Front propeller shaft X Transfer	74	750	54
Rear propeller shaft X Rear differential	88	900	65
Rear propeller shaft X Transfer	88	900	65

DESCRIPTION

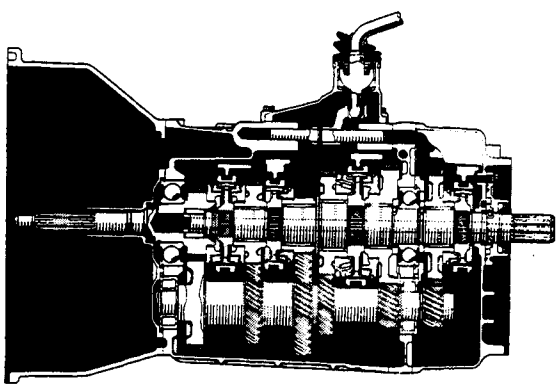
PRECAUTIONS

When working with FIPG material, you must be observe the following.

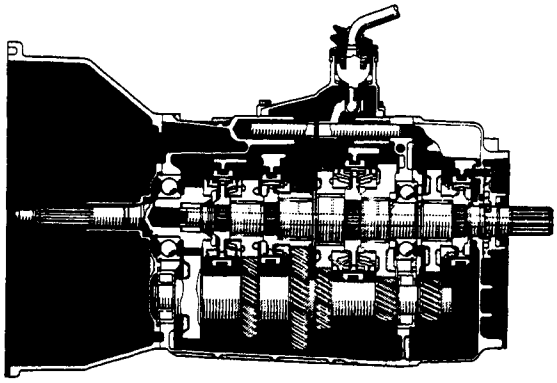
- Using a razor blade and gasket scraper, remove all the old sealant (FIPG) material from the gasket surfaces.
- Throughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non–residue solvent.
- Apply the sealant in approx. 1 mm (0.04 in.) bead along the sealing surface.
- Parts must be assembled within 10 minutes of application. Otherwise, the sealant (FIPG) material must be removed and reapplied.

DESCRIPTION

- Transmission type H150F and H151F are constant mesh synchronizers for forward gears, and a sliding mesh reverse gear.
- (H150F) A triple–cone type synchromesh mechanism is used in the second gear to improve the shift feeling characteristics. This helps to reduce the shifting effort, provide smoothly shifting.
- (H151F) A triple–cone type synchromesh mechanism is used in the first, second and third gears to improve the shift feeling characteristics. This helps to reduce the shifting effort, provide smoothly shifting.
- The input shaft is composed of the 1st and 2nd speed gears and the reverse drive gear, and the output shaft is composed of the drive gear (for use with the ring gear).



Q03143

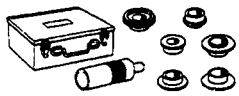
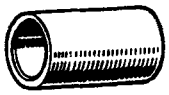
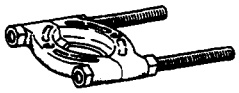


Q03145

Type of Transmission		H150F	H151F
Type of Engine		1HZ	1HD–T, 1FZ–F, 1FZ–FE
Gear Ratio	1st	4.529	4.081
	2nd	2.464	2.294
	3rd	1.490	←
	4th	1.000	←
	5th	0.881	←
	Reverse	4.313	←
Oil Capacity		2.7 liters (2.6 US qts, 3.1 Imp. qts)	
Oiil Viscosity		SAE 75W–90	
Oil Grade		API GL–4 OR GL–5	

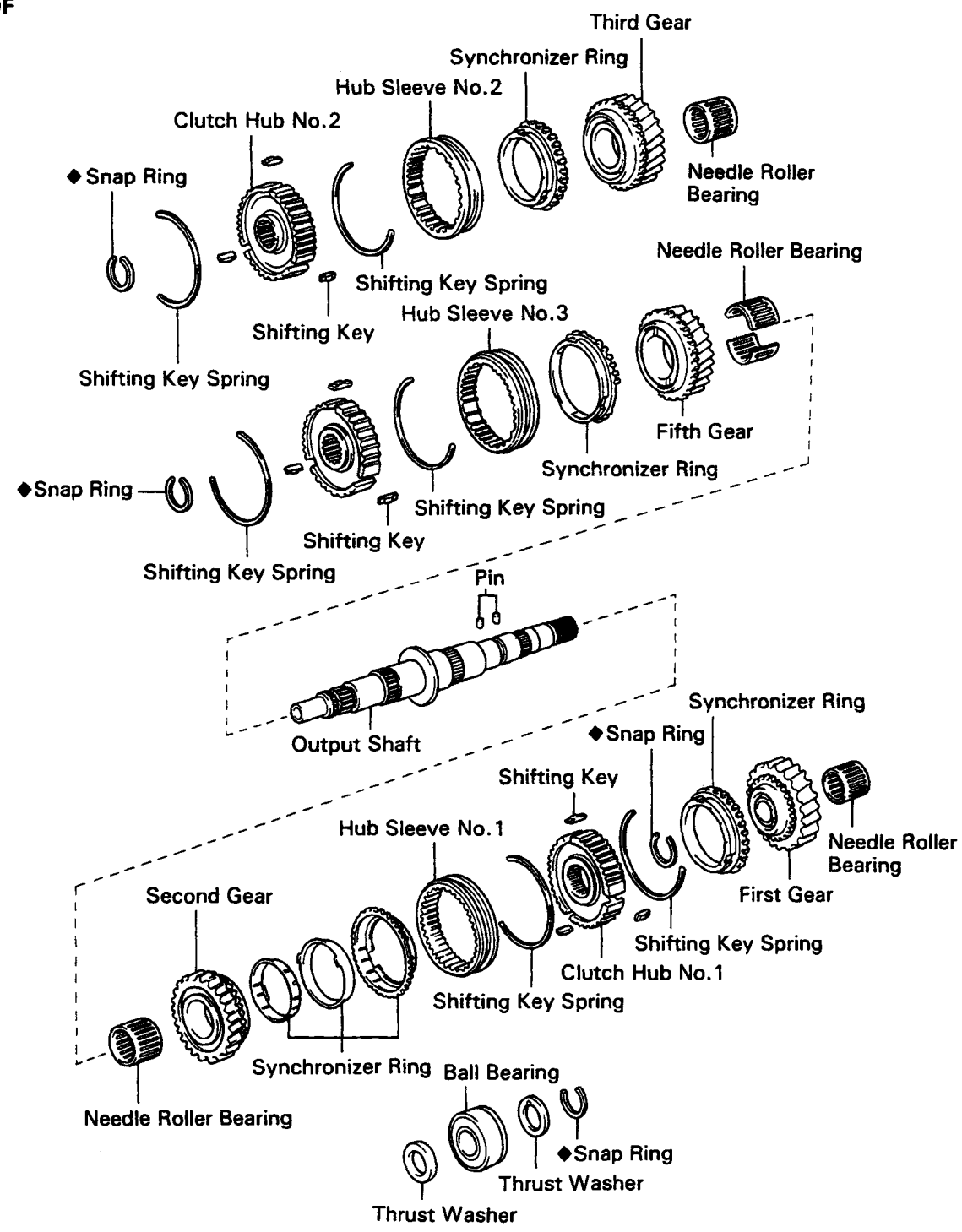
PREPARATION

SST (SPECIAL SERVICE TOOLS)

	**09316–60010**	Transmission & Transfer Bearing Replacer	
	**(09316–00010)**	Replacer Pipe	
	**09523–36010**	Rear Axle Hub Guide Tool	Output shaft rear ball bearing
	**09555–55010**	Differential Drive Pinion Bearing Replacer	
	**09950–00020**	Bearing Remover	

OUTPUT SHAFT
COMPONENTS

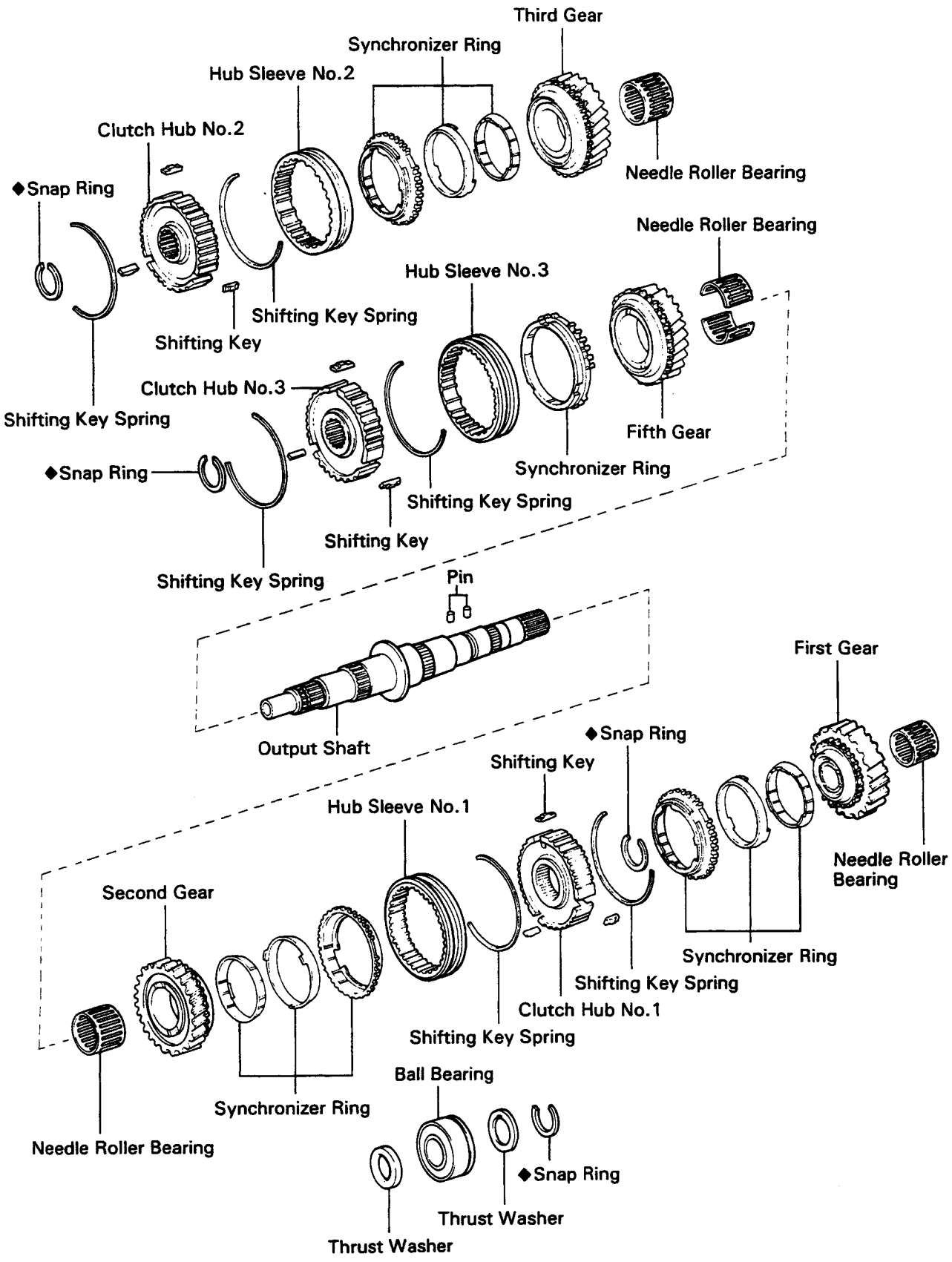
H150F



◆ Non-reusable part

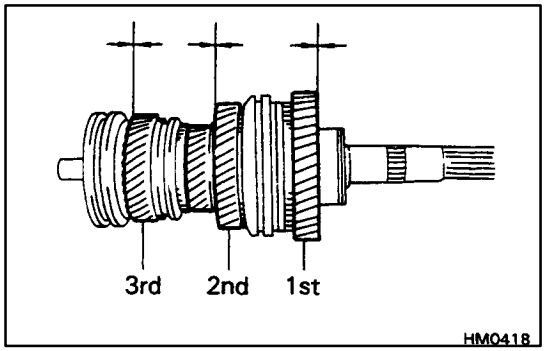
Q03128

H151F



◆ Non-reusable part

HM0527



OUTPUT SHAFT DISASSEMBLY

1. INSPECT EACH GEAR THRUST CLEARANCE

Measure the thrust clearance of each gear.

Standard clearance:

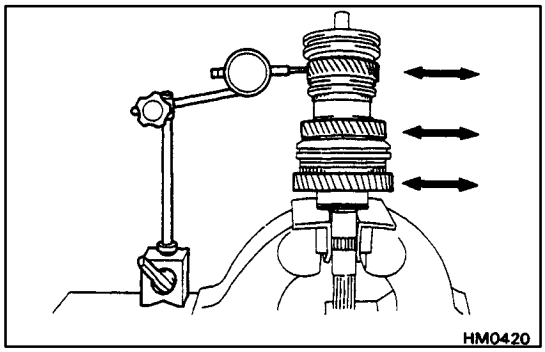
1st and 3rd gear 0.1–0.45 mm (0.0039–0.0177 in.)

2nd and 5th gear 0.1–0.35 mm (0.0039–0.0138 in.)

Maximum clearance:

1st and 3rd gear 0.45 mm (0.0177 in.)

2nd and 5th gear 0.35 mm (0.0138 in.)



2. INSPECT EACH GEAR OIL CLEARANCE

Using a dial indicator, measure the oil clearance of each gear.

Standard clearance:

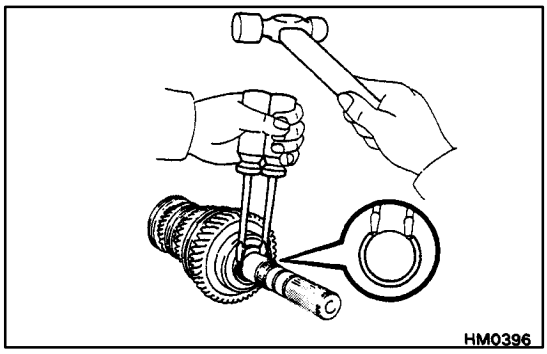
1st and 3rd gear 0.020–0.073 mm (0.0008–0.0029 in.)

2nd and 5th gear 0.015–0.068 mm (0.0006–0.0027 in.)

Maximum clearance:

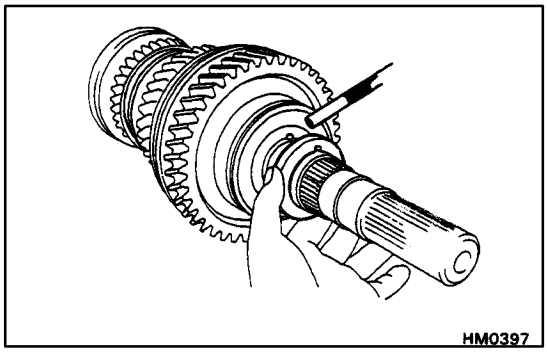
1st and 3rd gear 0.073 mm (0.0029 in.)

2nd and 5th gear 0.068 mm (0.0027 in.)

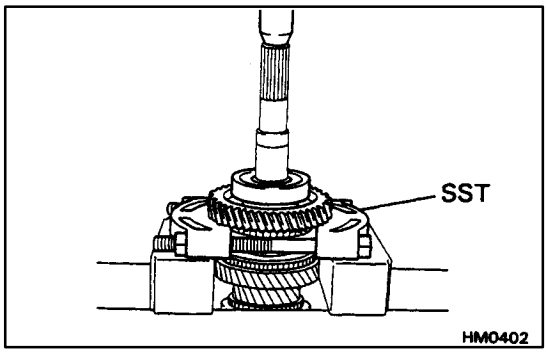


3. REMOVE BALL BEARING AND FIRST GEAR

(a) Using two screwdrivers and a hammer, drive out the snap ring.



(b) Remove the thrust washer and pin.



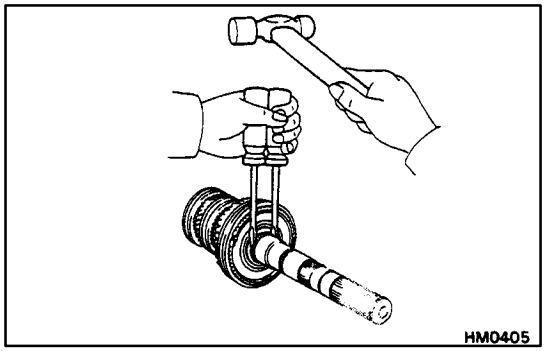
(c) Using SST and a press, remove the ball bearing, thrust washer, first gear and synchronizer ring.

H150F–Single Synchronizer ring

H151F–Triple Synchronizer rings

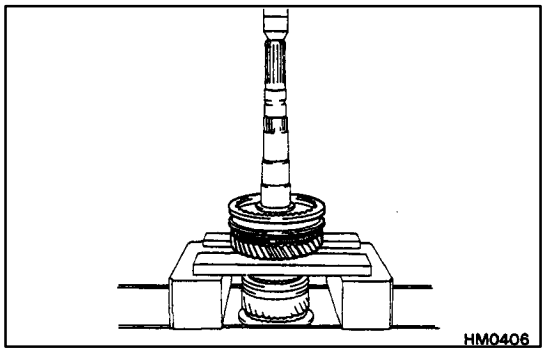
SST 09555–55010

(d) Remove the pin and needle roller bearing.



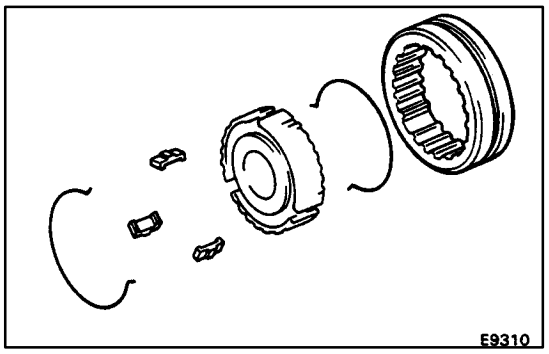
4. REMOVE HUB SLEEVE NO.1 ASSEMBLY, SYNCHRONIZER RING, SECOND GEAR AND NEEDLE ROLLER BEARING

(a) Using two screwdrivers and a hammer, drive out the snap ring.



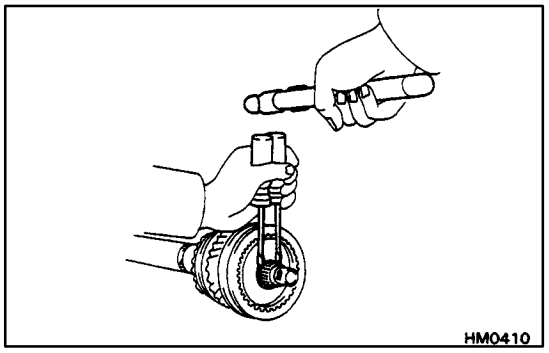
(b) Using a press, remove the hub sleeve No.1 assembly, synchronizer rings, and second gear.

(c) Remove the needle roller bearing.



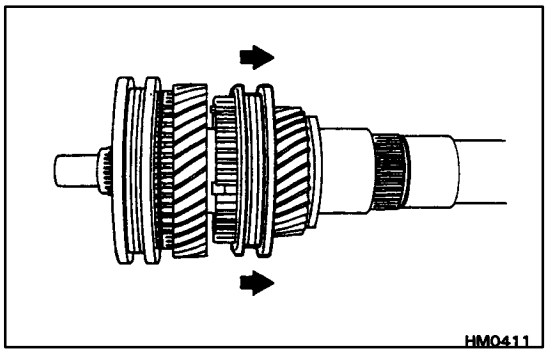
5. REMOVE HUB SLEEVE NO.1, SHIFTING KEYS AND SPRINGS FROM CLUTCH HUB NO.1

Using a screwdriver, remove the three shifting keys and two springs from the clutch hub No.1.

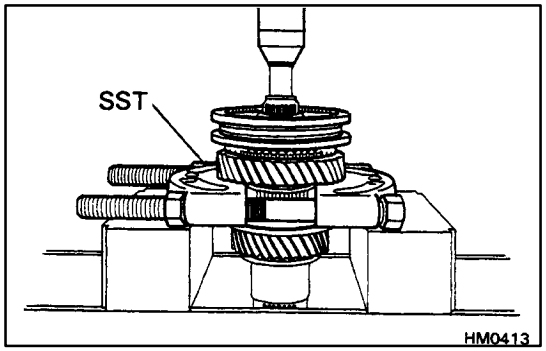


6. REMOVE HUB SLEEVE NO.2 ASSEMBLY, SYNCHRONIZER RING, THIRD GEAR AND NEEDLE ROLLER BEARING

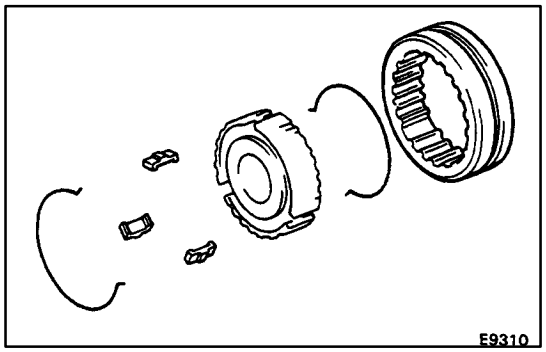
(a) Remove two screwdrivers and a hammer, drive out the snap ring.



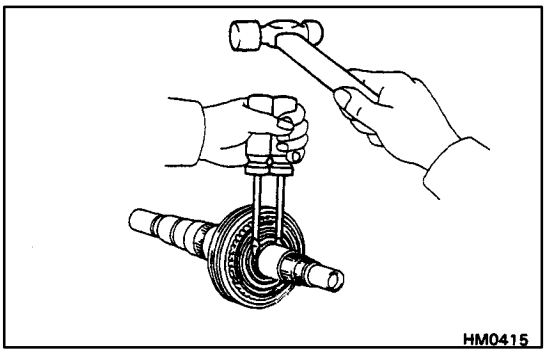
(b) Shift hub sleeve No.3 onto the fifth gear.



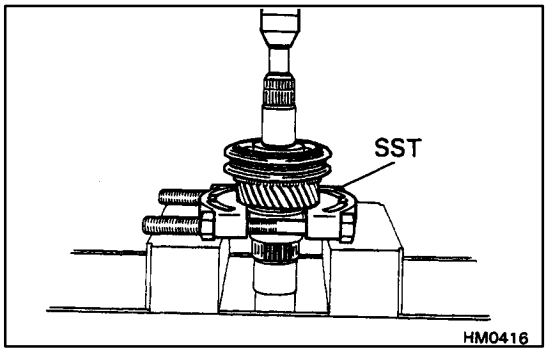
(c) Using SST and a press, remove the hub sleeve No.2 assembly, synchronizer ring and third gear.
H150F–Single Synchronizer ring
H151F–Triple Synchronizer rings
SST 09555–55010
(d) Remove the needle roller bearing.



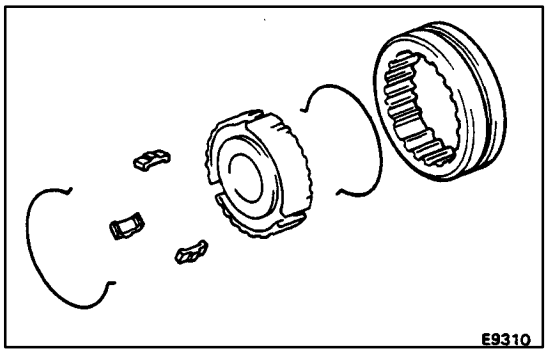
7. REMOVE HUB SLEEVE NO.2, SHIFTING KEYS AND SPRINGS FROM CLUTCH HUB NO.2
Using a screwdriver, remove the three shifting keys and two springs from the clutch hub No.2.



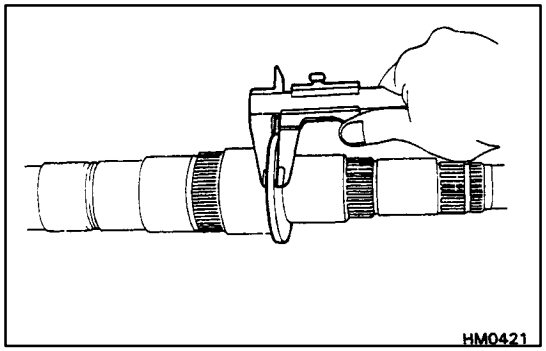
8. REMOVE HUB SLEEVE NO.3 ASSEMBLY, SYNCHRONIZER RING, FIFTH GEAR AND NEEDLE ROLLER BEARING
(a) Using two screwdriver, and a hammer, drive out the snap ring.



(b) Using SST and a press, remove the hub sleeve No.3 assembly and synchronizer ring.
SST 09950–00020
(c) Remove the needle roller bearing.



9. REMOVE HUB SLEEVE NO.3 SHIFTING KEYS AND SPRINGS FROM CLUTCH HUB NO.3
Using a screwdriver, remove the three shifting keys and two springs from the clutch hub No.3.



OUTPUT SHAFT ASSEMBLY INSPECTION

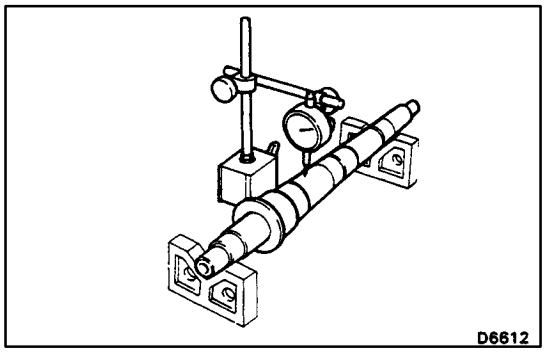
1. INSPECT OUTPUT SHAFT

(a) Using calipers, measure the output shaft flange thickness.

Minimum thickness:

4.725 mm (0.1860 in.)

If the thickness is less than the minimum, replace the output shaft.

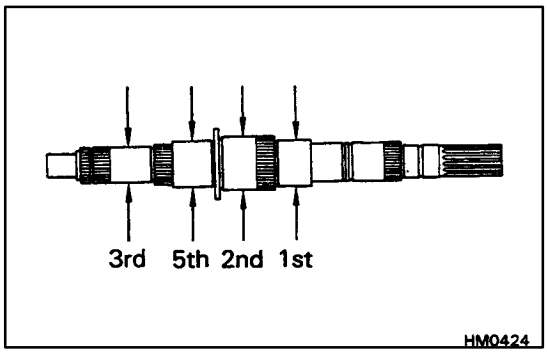


(b) Using a dial indicator, check the shaft runout.

Maximum runout:

0.03 mm (0.0020 in.)

If the runout exceeds the maximum, replace the output shaft.



(c) Using a micrometer, measure the outer diameter of the output shaft journal.

Minimum outer diameter:

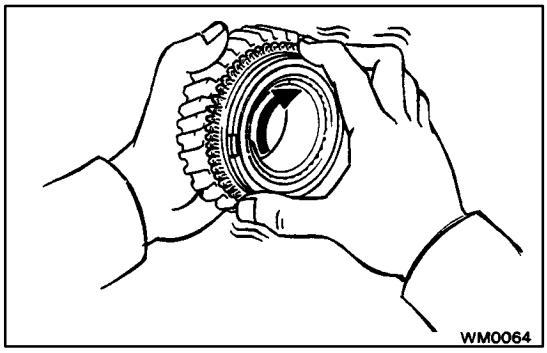
1st 49.979 mm (1.9677 in.)

2nd 57.984 mm (2.2828 in.)

3rd 37.979 mm (1.4952 in.)

5th 45.984 mm (1.8104 in.)

If the outer diameter is less than the minimum, replace the output shaft.



2. INSPECT SYNCHRONIZER RINGS

H150F–FOR FIRST, THIRD AND FIFTH GEARS

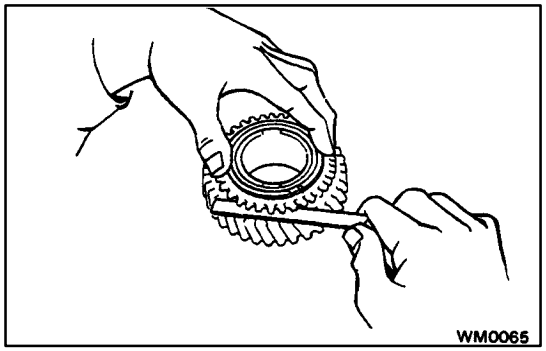
H151F–FOR FIFTH GEARS

(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone and check that the ring is locked. If the braking effect is insufficient, lightly rub the synchronizer ring and gear cone by applying a small amount of fine lapping compound.

NOTICE:

- **Wash off completely the fine lapping compound after rubbing.**
- **Check again the braking effect of the synchronizer ring.**



(c) Using a feeler gauge, measure the clearance between the synchronizer ring back and the gear spline end.

Minimum clearance:

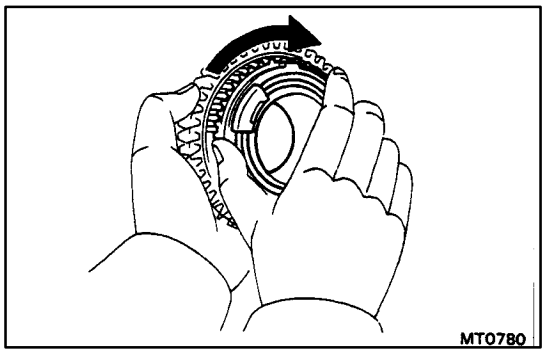
1st gear 1.1 mm (0.0433 in.)

3rd and 5th gear 0.8 mm (0.0315 in.)

HINT:

- When replacing either a synchronizer ring or gear, apply a small amount of fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear together.
- When replacing both the synchronizer ring and gear, there is no need to apply any compound or to rub them together.

NOTICE: Wash off completely the fine lapping compound after rubbing.



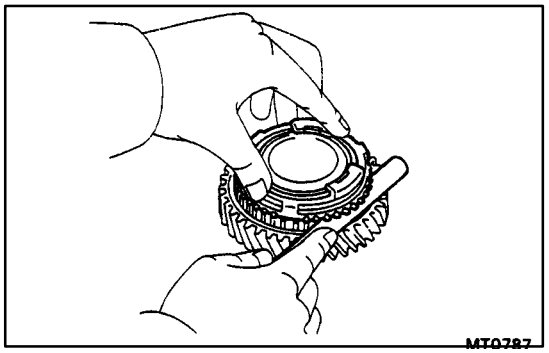
3. INSPECT SYNCHRONIZER RING

H150F–FOR SECOND GEARS

H151F–FOR FIRST SECOND AND THIRD GEARS

(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer direction while pushing it to the gear cone and check that the ring is locked. If the braking effect is insufficient, replace the synchronizer ring.



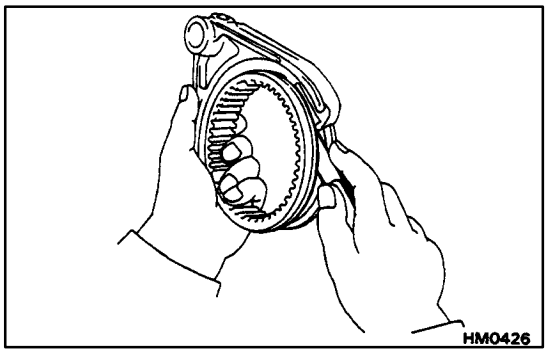
(c) Measure the clearance between the synchronizer ring back and gear spline end.

Minimum clearance:

1st and 2nd gear 0.85 mm (0.0335 in.)

3rd gear 0.75 mm (0.0295 in.)

If the clearance is less than the limit, replace the synchronizer ring.



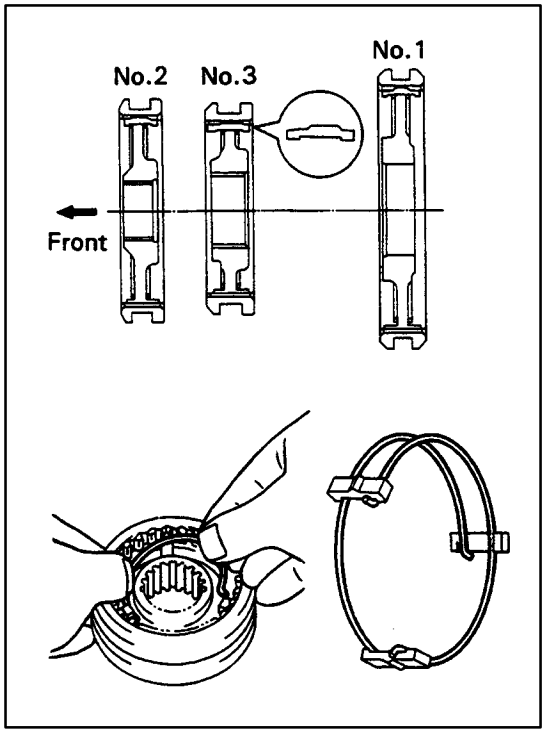
4. INSPECT CLEARANCE OF SHIFT FORKS AND HUB SLEEVES

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance:

0.35 mm (0.0138 in.)

If the clearance exceeds the maximum, replace the shift fork or hub sleeve.



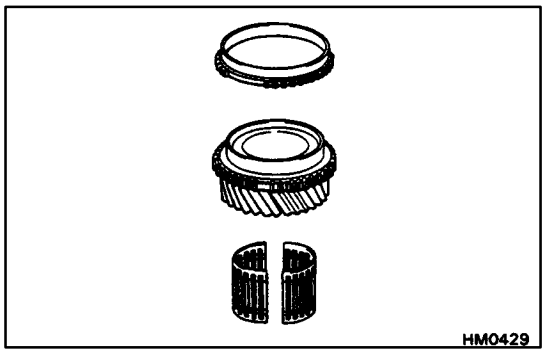
OUTPUT SHAFT ASSEMBLY

1. INSTALL CLUTCH HUB NO.1, NO.2 AND NO.3 INTO HUB SLEEVE

(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the springs under the shifting keys.

NOTICE: Install the key springs positioned so that their end gaps are not in line.

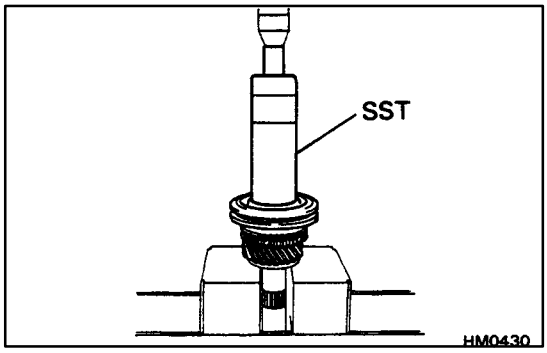


2. INSTALL FIFTH GEAR AND HUB SLEEVE NO.3 ASSEMBLY ON OUTPUT SHAFT

(a) Apply gear oil to the shaft and needle roller bearing.

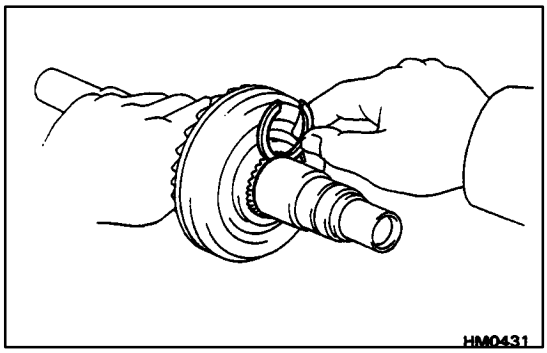
(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Install the needle roller bearing in the fifth gear.



(d) Using SST and a press, install the fifth gear and hub sleeve No.3.

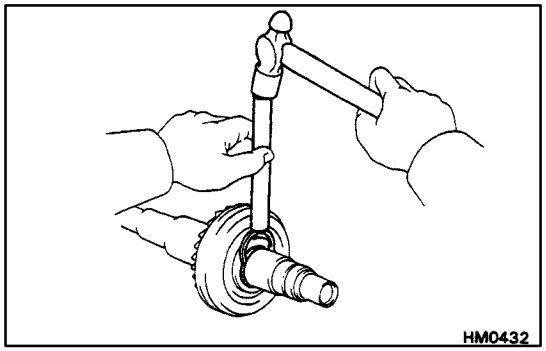
SST 09316–60010 (09316–00010)



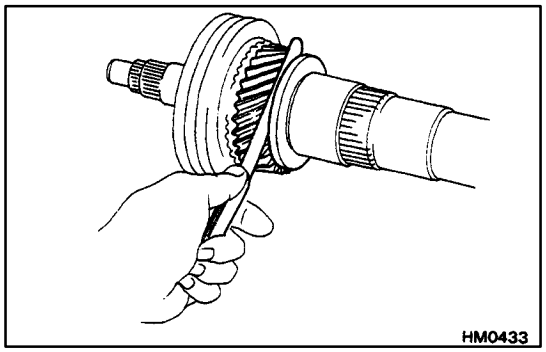
3. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	2.40–2.45 (0.0945–0.0965)
B	2.45–2.50 (0.0965–0.0984)
C	2.50–2.55 (0.0984–0.1004)
D	2.55–2.60 (0.1004–0.1024)
E	2.60–2.65 (0.1024–0.1044)
F	2.65–2.70 (0.1044–0.1063)



(b) Using a brass bar and hammer, drive in the snap ring.

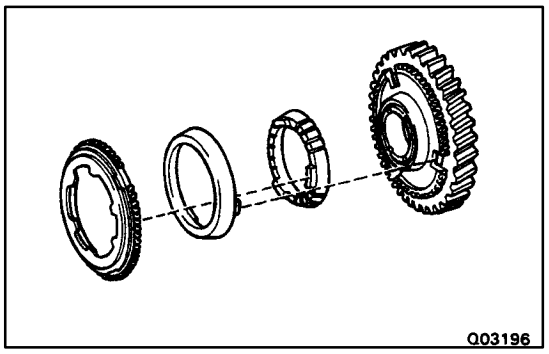


4. INSPECT FIFTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the fifth gear thrust clearance.

Standard clearance:

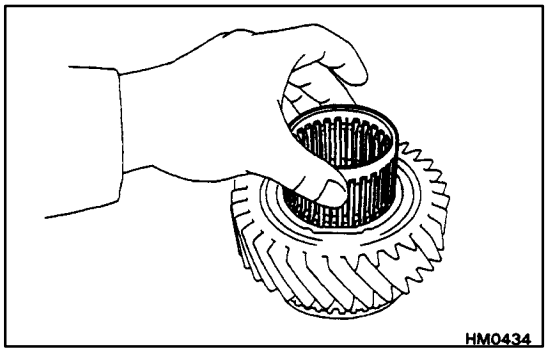
0.1–0.35 mm (0.0039–0.0138 in.)



5. INSTALL THIRD GEAR AND HUB SLEEVE NO.2 ASSEMBLY

(H151F)

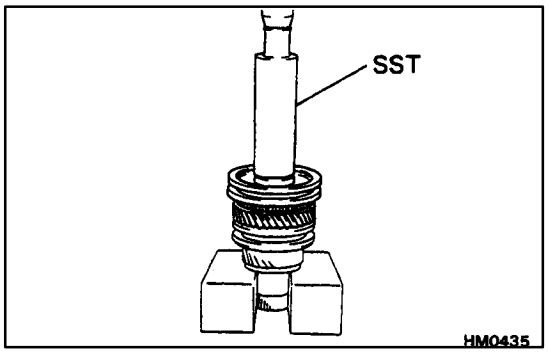
(a) Place the synchronizer rings on the 3rd gear.



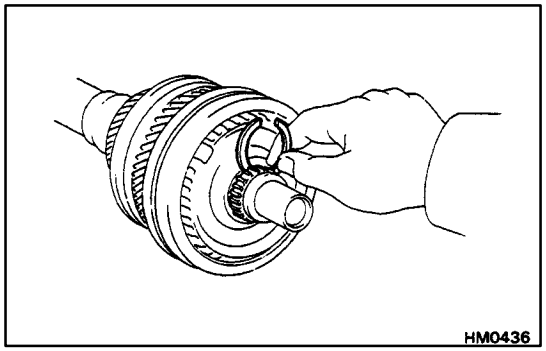
(b) Apply gear oil to the shaft and needle roller bearing.
(H150F)

(c) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(d) Install the needle roller bearing in the third gear.



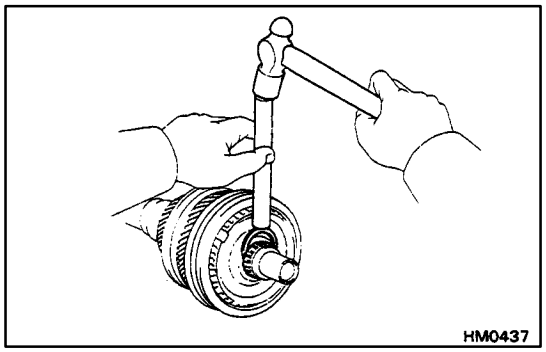
(e) Using SST and a press, install the third gear and hub sleeve No.2.
SST 09316–60010 (09316–00010)



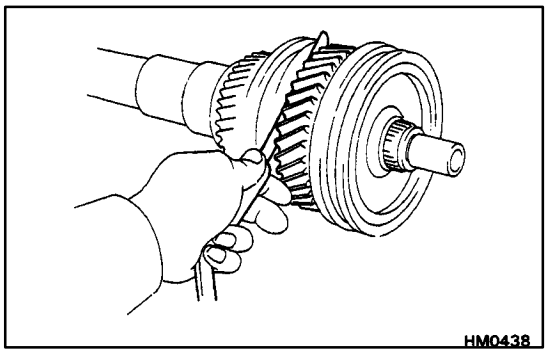
6. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
4	1.90–1.95 (0.0748–0.0768)
5	1.95–2.00 (0.0768–0.0787)
6	2.00–2.05 (0.0787–0.0807)
7	2.05–2.10 (0.0807–0.0827)
8	2.10–2.15 (0.0827–0.0847)
9	2.15–2.20 (0.0847–0.0866)



(b) Using a brass bar and a hammer, drive in a new snap ring.

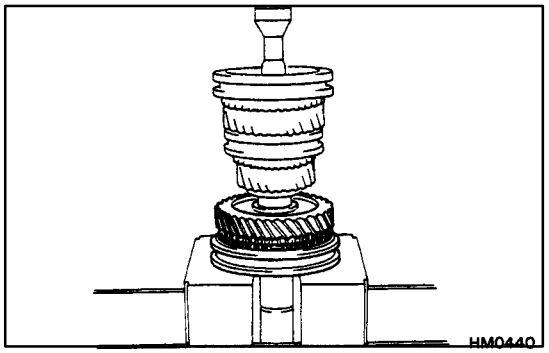


7. MEASURE THIRD GEAR THRUST CLEARANCE

Using a feeler gauge, measure the third gear thrust clearance.

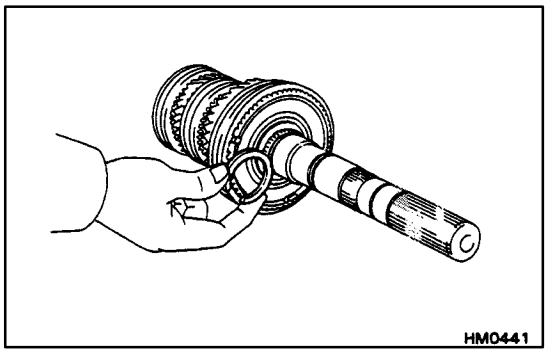
Standard clearance:

0.1–0.45 mm (0.0039–0.0138 in.)



8. INSTALL SECOND GEAR AND HUB SLEEVE NO.1 ASSEMBLY

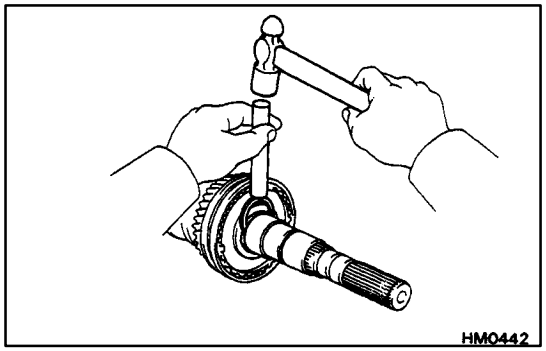
(a) Apply gear oil to the shaft and needle roller bearing.
(b) Place the synchronizer rings on the gear and align the ring slots with the shifting keys.
(c) Install the needle roller bearing in the second gear.
(d) Using a press, install the second gear and hub sleeve No.1 assembly.



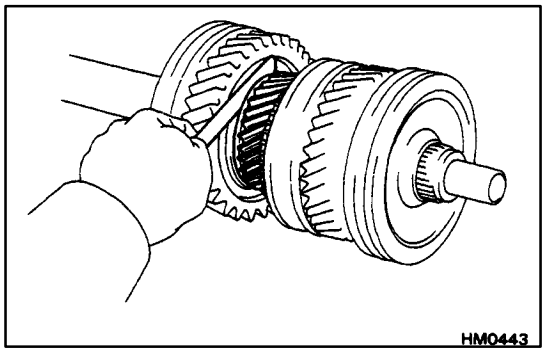
9. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	2.90–2.95 (0.1142–0.1162)
B	2.95–3.00 (0.1162–0.1181)
C	3.00–3.05 (0.1181–0.1201)
D	3.05–3.10 (0.1201–0.1220)
E	3.10–3.15 (0.1220–0.1240)
F	3.15–3.20 (0.1240–0.1260)



(b) Using a brass bar and a hammer, drive in a new snap ring.

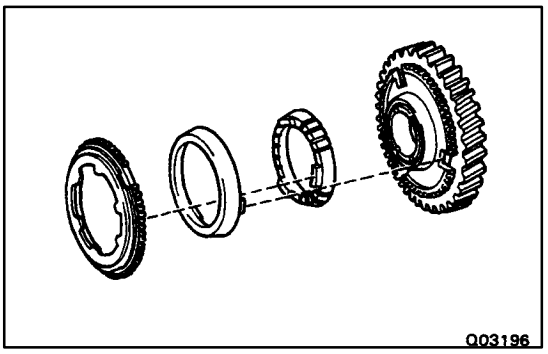


10. INSPECT SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the second gear thrust clearance.

Standard clearance:

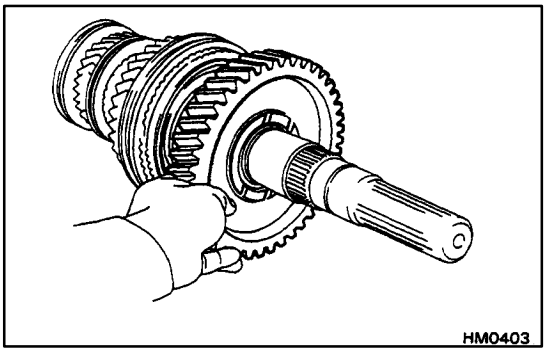
0.1–0.35 mm (0.0039–0.0138 in.)



11. INSTALL FIRST GEAR

(H151F)

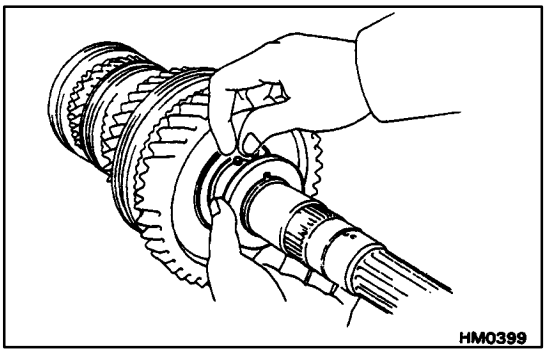
(a) Place the synchronizer rings on the 1st gear.



(b) Apply gear oil to the shaft and needle roller bearing.
(H150F)

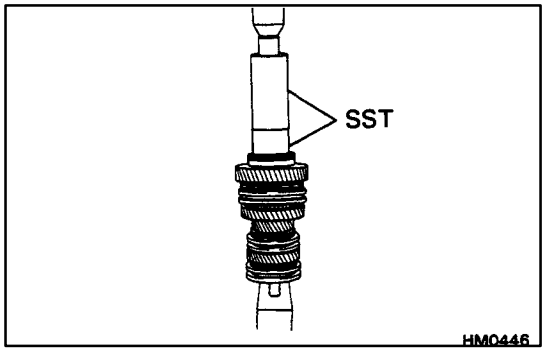
(c) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(d) Install the needle roller bearing in the first gear.

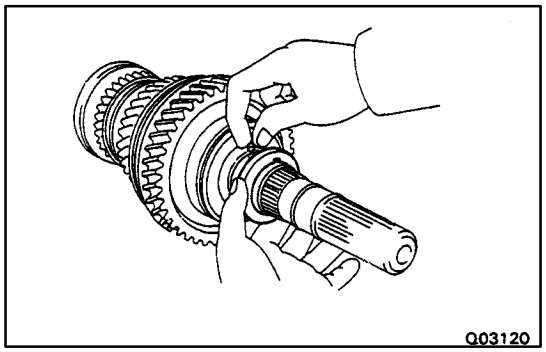


12. INSTALL BALL BEARING

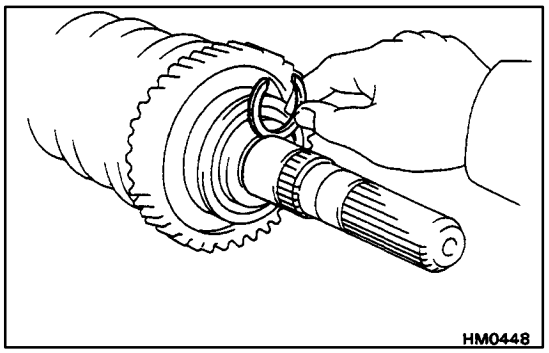
(a) Install the pin and thrust washer.



(b) Using SST and a press, install the ball bearing.
SST 09316–60010 (09316–00010), 09523–36010



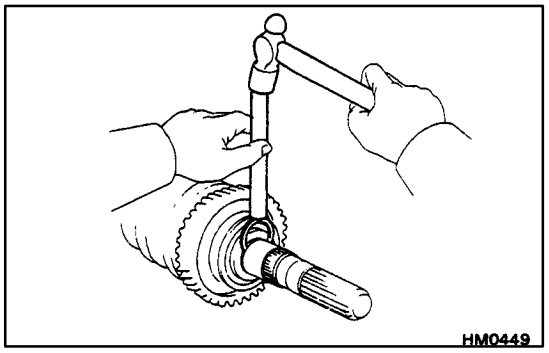
(c) Install the pin and thrust washer.



13. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	2.40–2.45 (0.0945–0.0965)
B	2.45–2.50 (0.0965–0.0984)
C	2.50–2.55 (0.0984–0.1004)
D	2.55–2.60 (0.1004–0.1024)
E	2.60–2.65 (0.1024–0.1044)
F	2.65–2.70 (0.1044–0.1063)
G	2.70–2.75 (0.1063–0.1083)
H	2.75–2.80 (0.1083–0.1102)



(b) Using a brass bar and a hammer, drive in a new snap ring.

SERVICE SPECIFICATIONS

SERVICE DATA

Output shaft 1st gear journal diameter	Limit	49.979 mm	1.9677 in.
Output shaft 2nd gear journal diameter	Limit	57.984 mm	2.2828 in.
Output shaft 3rd gear journal diameter	Limit	37.979 mm	1.4952 in.
Output shaft 5th gear journal diameter	Limit	45.984 mm	1.8104 in.
Output shaft Frange thickness	Limit	4.725 mm	0.1860 in.
Output shaft Runout	Limit	0.05 mm	0.0020 in.
Gear thrust clearance 1st and 3rd	STD	0.1–0.45 mm	0.0039–0.0177 in.
Gear thrust clearance 2nd and 5th	STD	0.1–0.35 mm	0.0039–0.0138 in.
Gear oil clearance 1st and 3rd	STD	0.020–0.073 mm	0.0008–0.0029 in.
Gear oil clearance 2nd and 5th	STD	0.015–0.068 mm	0.0006–0.0027 in.
Synchronizer ring for 1st gear clearance			
(H150F)			
	Limit	1.1 mm	0.0433 in.
Synchronizer ring for 2nd gear clearance			
(H150F)			
	Limit	0.85 mm	0.0335 in.
Synchronizer ring for 3rd gear clearance			
(H150F)			
	Limit	0.8 mm	0.0315 in.
Synchronizer ring for 1st and 2nd gear clearance			
(H151F)			
	Limit	0.85 mm	0.0335 in.
Synchronizer ring for 3rd gear clearance			
(H151F)			
	Limit	0.75 mm	0.0295 in.
Output shaft snap ring thickness			
No.3 Hub sleeve	Mark A	2.40–2.45 mm	0.0945–0.0965 in.
No.3 Hub sleeve	Mark B	2.45–2.50 mm	0.0965–0.0984 in.
No.3 Hub sleeve	Mark C	2.50–2.55 mm	0.0984–0.1004 in.
No.3 Hub sleeve	Mark D	2.55–2.60 mm	0.1004–0.1024 in.
No.3 Hub sleeve	Mark E	2.60–2.65 mm	0.1024–0.1044 in.
No.3 Hub sleeve	Mark F	2.65–2.70 mm	0.1044–0.1063 in.
No.2 Hub sleeve	Mark 4	1.90–1.95 mm	0.0748–0.0768 in.
No.2 Hub sleeve	Mark 5	1.95–2.00 mm	0.0768–0.0787 in.
No.2 Hub sleeve	Mark 6	2.00–2.05 mm	0.0787–0.0807 in.
No.2 Hub sleeve	Mark 7	2.05–2.10 mm	0.0807–0.0827 in.
No.2 Hub sleeve	Mark 8	2.10–2.15 mm	0.0827–0.0847 in.
No.2 Hub sleeve	Mark 9	2.15–2.20 mm	0.0847–0.0866 in.
No.1 Hub sleeve	Mark A	2.90–2.95 mm	0.1142–0.1162 in.
No.1 Hub sleeve	Mark B	2.95–3.00 mm	0.1162–0.1181 in.
No.1 Hub sleeve	Mark C	3.00–3.05 mm	0.1181–0.1201 in.
No.1 Hub sleeve	Mark D	3.05–3.10 mm	0.1201–0.1220 in.
No.1 Hub sleeve	Mark E	3.10–3.15 mm	0.1220–0.1240 in.
No.1 Hub sleeve	Mark F	3.15–3.20 mm	0.1240–0.1260 in.

Output shaft snap ring thickness			
Rear bearing	Mark A	2.40–2.45 mm	0.0945–0.0965 in.
Rear bearing	Mark B	2.45–2.50 mm	0.0965–0.0984 in.
Rear bearing	Mark C	2.50–2.55 mm	0.0984–0.1004 in.
Rear bearing	Mark D	2.55–2.60 mm	0.1004–0.1024 in.
Rear bearing	Mark E	2.60–2.65 mm	0.1024–0.1044 in.
Rear bearing	Mark F	2.65–2.70 mm	0.1044–0.1063 in.
Rear bearing	Mark G	2.70–2.75 mm	0.1063–0.1083 in.
Rear bearing	Mark H	2.75–2.80 mm	0.1083–0.1102 in.

AUTOMATIC TRANSMISSION

REFER TO LAND CRUISER (STATION WAGON) REPAIR MANUAL FOR CHASSIS AND BODY (Pub. No. RM184E)

NOTE: The following pages contain only the points which differ from the above listed manual.

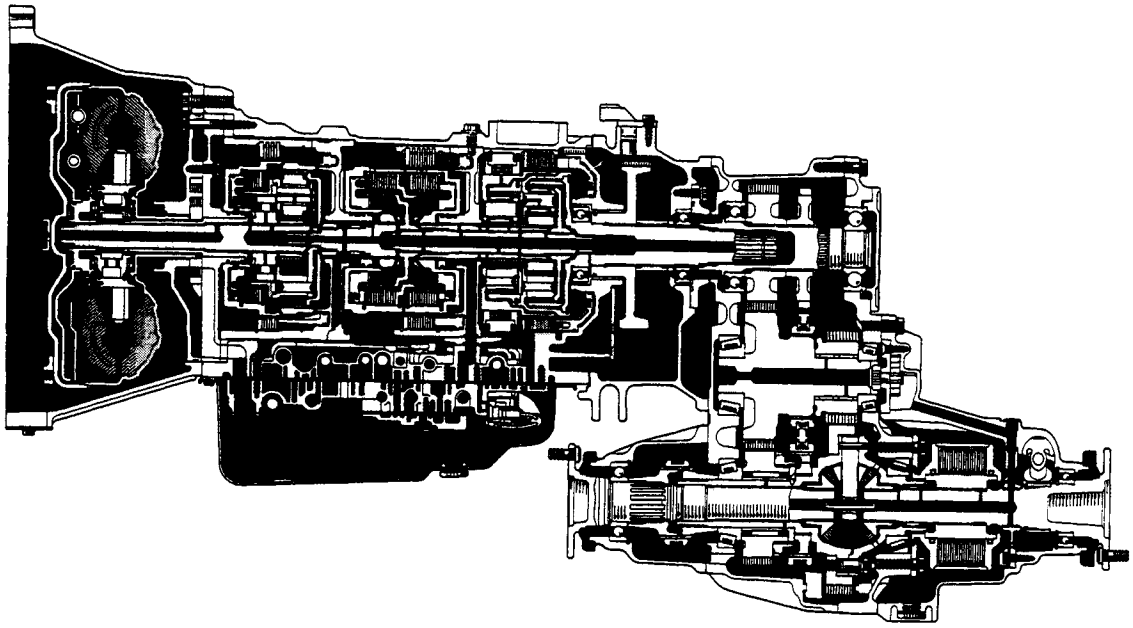
(STATION WAGON)

DESCRIPTION

GENERAL DESCRIPTION

The A442F automatic transmission is a four–speed automatic transmission with a four–speed transfer, developed with the aim of producing an easy–driving 4WD vehicle. A lock–up mechanism is built into the torque converter.

The A442F transmission is mainly composed of the torque converter, the overdrive (hereafter called O/D) planetary gear unit, 3–speed planetary gear unit, 4–speed transfer, hydraulic control system and an electronic control system.



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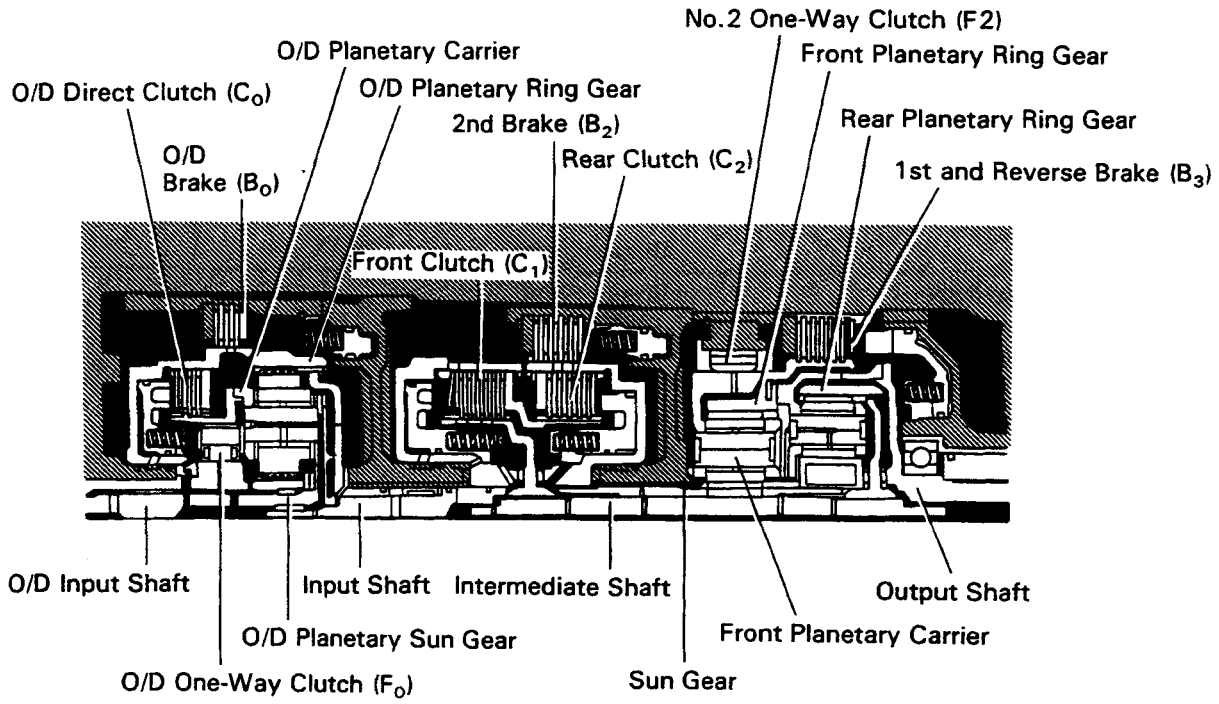
GENERAL SPECIFICATIONS

Type of Transmission		A442F	←
Type of Engine		1FZ–FE	1HD–T
Torque Converter Stall Torque Ratio		1.8 : 1	2.0 : 1
Lock–up Mechanism		Equipped	←
Gear Ratio	1st Gear	2.950	←
	2nd Gear	1.530	←
	3rd Gear	1.000	←
	O/D Gear	0.765	←
	Reverse Gear	2.678	←
Number of Discs and Plates	(Disc and Plate)		
	Front Clutch (C_1)	6/6	7/7
	Rear Clutch (C_2)	5/5	←
	O/D Direct Clutch (C_0)	3/3	←
	2nd Brake (B_1)	5/5	←
	1st and Reverse Brake (B_2)	6/6	←
	O/D Brake (B_0)	3/3	←
ATF Type		ATF DEXRON® II	←
Capacity (US pts, lmp. qts)	Total		
	w/ Oil Cooler	15.4 (16.3, 13.6)	←
	w/o Oil Cooler	15.0 (15.9, 13.2)	←
	Drain & Refill	6.0 (6.3, 5.3)	←

OPERATION

OPERATION



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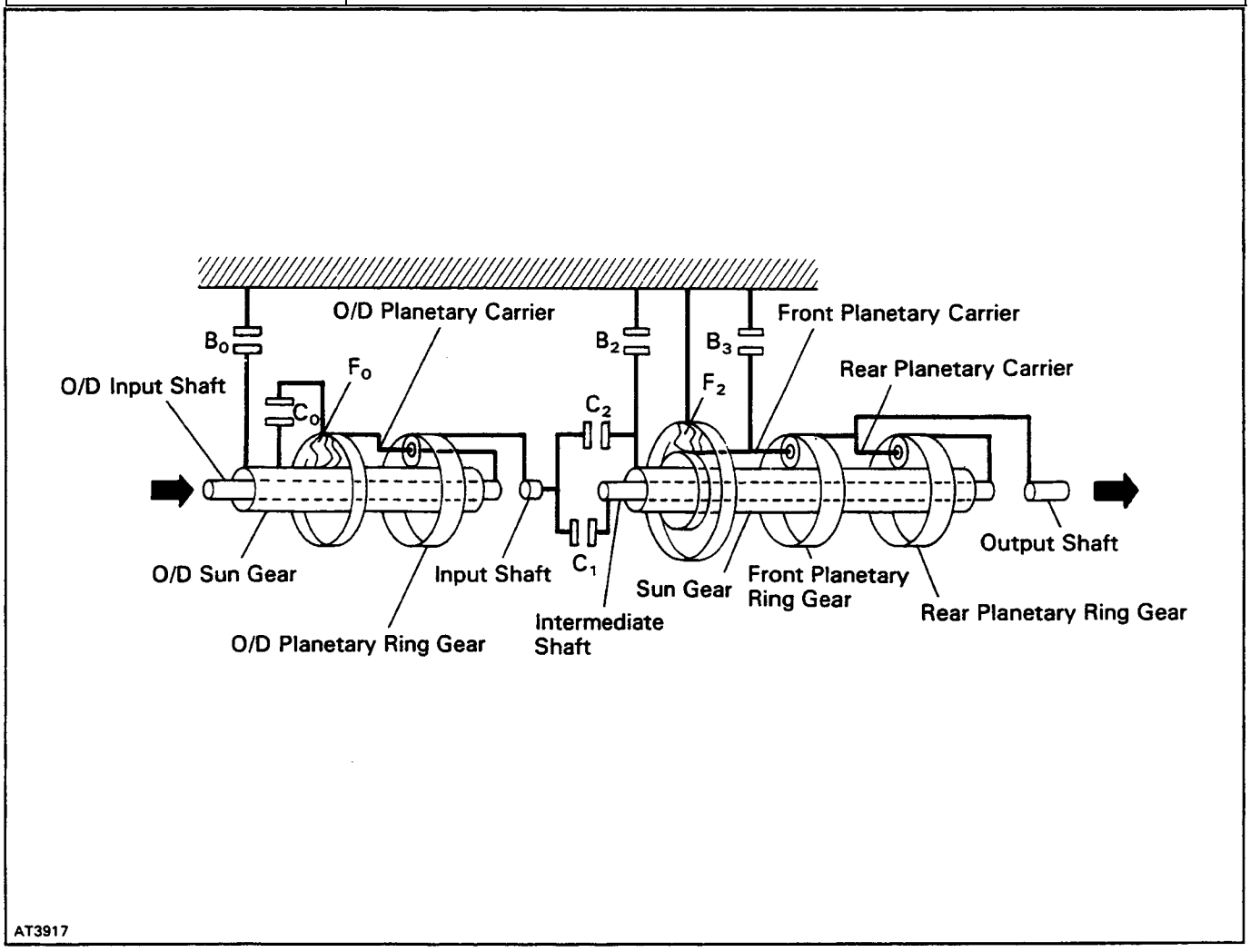
○....Operating

Shift Lever Position	Gear Position	C_0	C_1	C_2	B_0	B_2	B_3	F_0	F_2
P	Parking	○						○	
R	Reverse	○		○			○	○	
N	Neutral	○						○	
D	1st	○	○					○	○
	2nd		○			○		○	
	3rd	○	○	○				○	
	O/D		○	○	○				
2	2nd	○	○			○		○	
1	1st	○	○				○	○	○

V01579

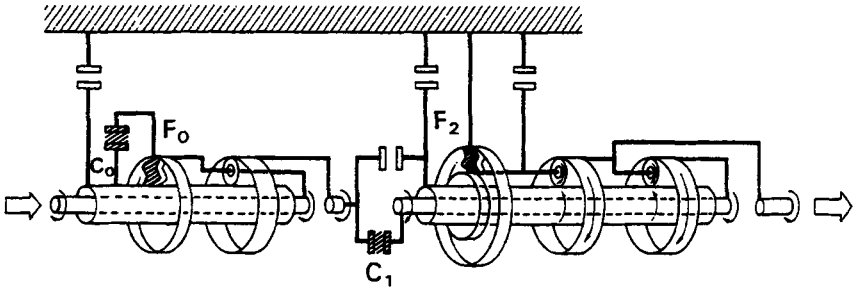
1. FUNCTION OF COMPONENTS

COMPONENT	FUNCTION
O/D Direct Clutch (C_0)	Connects overdrive sun gear and overdrive carrier
O/D Brake (B_0)	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One–way Clutch (F_0)	When transmission is being driven by engine, connects overdrive sun gear and overdrive carrier
Front Clutch (C_1)	Connects input shaft and intermediate shaft
Rear Clutch (C_2)	Connects input shaft and front & rear planetary sun gear
2nd Brake (B_1)	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise
1st & Reverse Brake (B_2)	Prevents front planetary carrier from turning either clockwise or counterclockwise
No. 2 One–way Clutch (F_2)	Prevents front planetary carrier from turning counterclockwise



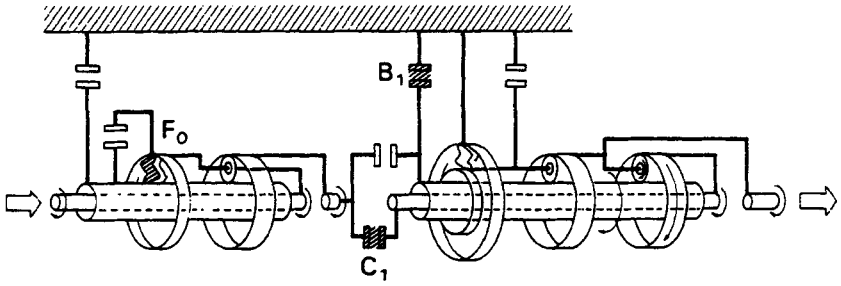
The conditions of operation for each gear position are shown on the following illustration:

D Range 1st Gear



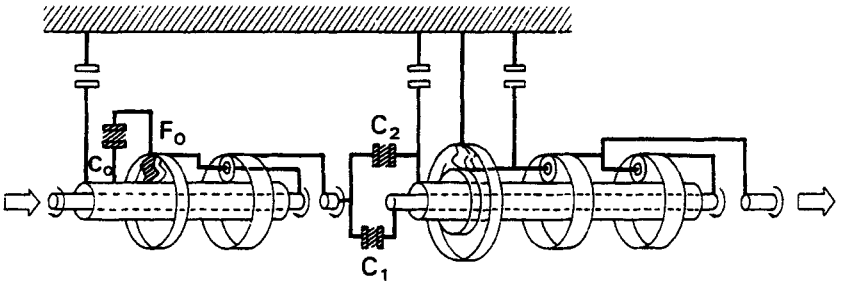
AT5949

D Range 2nd Gear



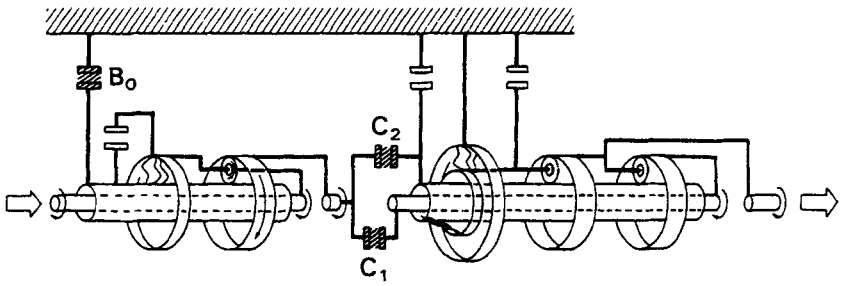
AT5950

D Range 3rd Gear



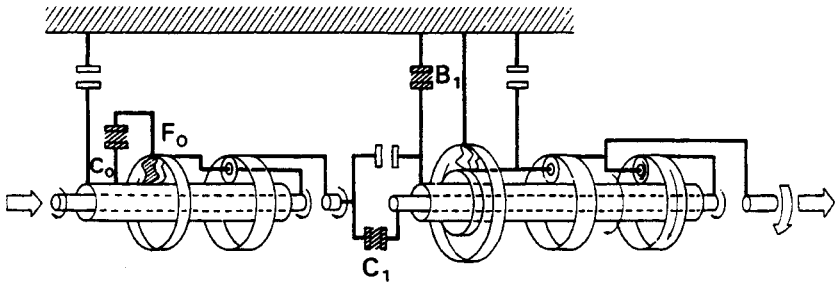
AT5951

D Range O/D



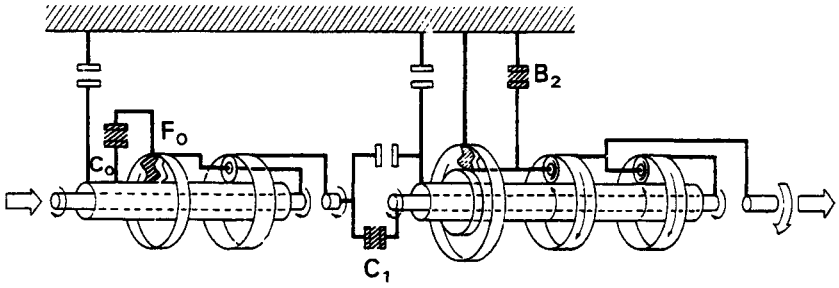
AT5952

2 Range 2nd Gear



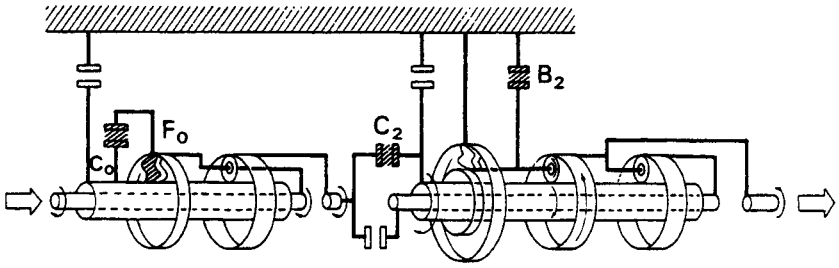
AT5953

L Range 1st Gear



AT5954

R Range Reverse Gear



AT5955

2. HYDRAULIC CONTROL SYSTEM

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, the accumulators, the clutches and brakes, as well as the fluid passages which connect all of these components.

Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter, clutches and brakes in accordance with the vehicle driving condition.

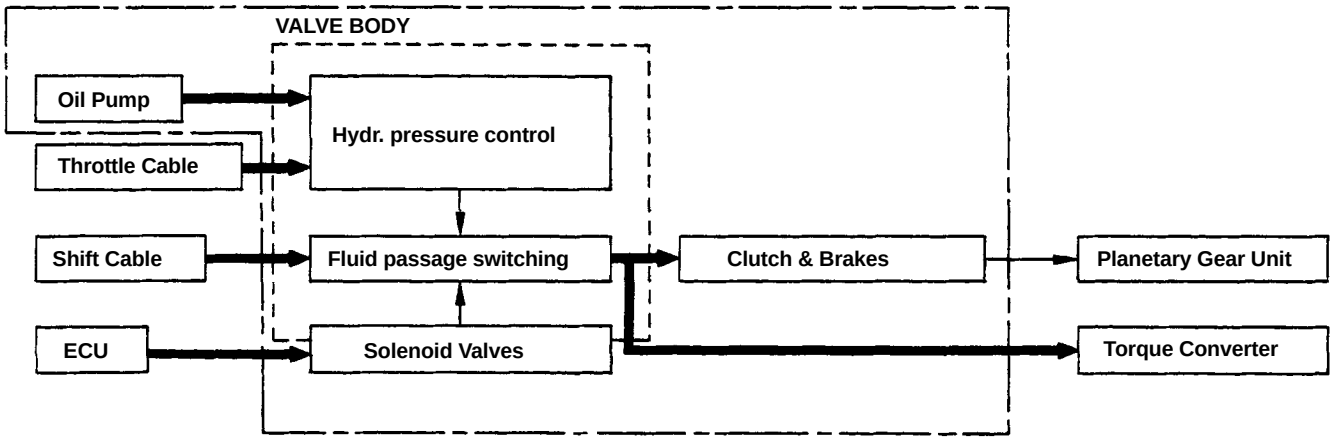
There are four solenoid valves on the valve body.

These solenoid valves are turned on and off by signals from ECU to operate the shift valves.

These shift valves then switch the fluid passages so that fluid goes to the torque converter and planetary gear units.

(Except for the solenoid valves, the hydraulic control system of the electronically controlled transmission (hereafter called ECT) is basically the same as that of the fully hydraulic controlled automatic transmission.)

HYDRAULIC CONTROL SYSTEM



3. ELECTRONIC CONTROL SYSTEM

The electronic control system for the A442F automatic transmission provide extremely precise control of the gear shift timing and lock–up timing in response to driving conditions as sensed by various sensors located throughout the vehicle and in response to the engine's running condition.

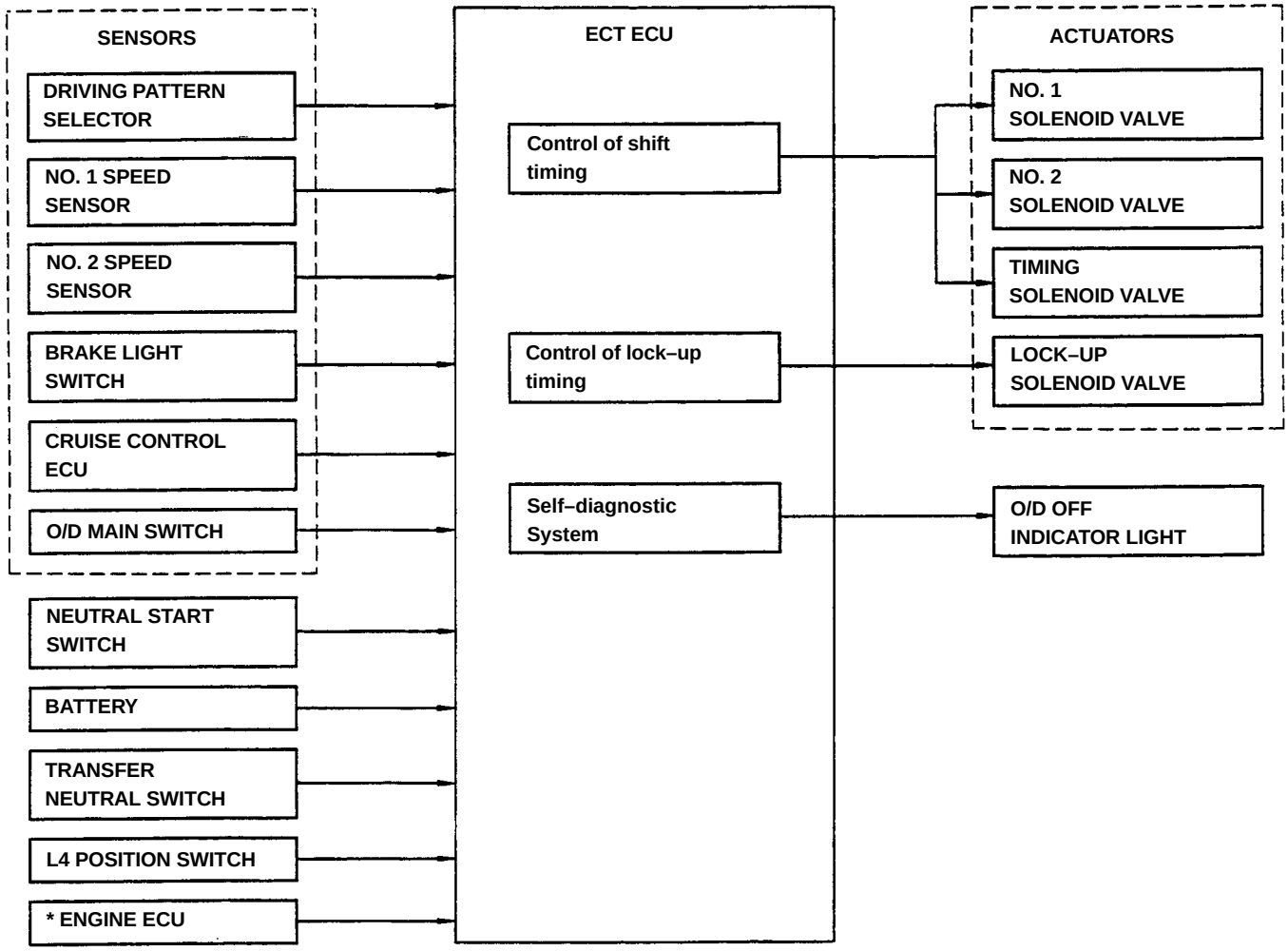
At the same time, the ECT ECU control reduces vehicle squat when the vehicle starts out and gear shift shock.

The electronic control system for controlling the shift timing and the operation of the lock–up clutch is composed of the following three parts:

(a) Sensors: These sense the vehicle speed and throttle position and send this data to the ECT ECU in the form of electronic signals.

(b) ECT ECU: This determines the shift and lock–up timing based upon the signals from the sensors.

(c) Actuators: Solenoid valves divert hydraulic pressure from one circuit of the hydraulic control unit to another thus controlling shifting and lock–up timing.



*** : 1FZ–FE engine only**

4. FUNCTION OF TCM

- **Control of Shift Timing**

The ECU has programmed into its memory the optimum shift pattern for each shift lever position (D, 2, L ranges) and driving mode (Normal or Power).

Based on the appropriate shift pattern, the ECU turns No.1, No.2 and timing solenoid valves on or off in accordance with the vehicle speed signal from the speed sensor and the throttle opening signal from the throttle position sensor. In this manner, the ECU operates each shift valve, opening or closing the fluid passages to the clutches and brakes to permit up–shift or down–shift of the transmission.

HINT: The electronic control system provides shift timing and lock–up control only while the vehicle is traveling forward. In REVERSE, and NEUTRAL, the transmission is mechanically, not electronically controlled.

- **Control of Overdrive**

Driving in overdrive is possible if the O/D main switch is on and the shift lever is in the D range. However, when the vehicle is being driven using the cruise control system (CCS), if the actual vehicle speed drops to about 4 km/h (2 mph) below the set speed while the vehicle is running in overdrive, the CCS ECU sends a signal to the ECT ECU to release the overdrive and prevent the transmission from shifting back into overdrive until the actual vehicle speed reaches the speed set in the CCS memory.

On this model, if the coolant temperature falls below 55˚C (131˚F), the engine ECU sends a signal to the ECT ECU, preventing the transmission from up–shifting into overdrive.

- **Control of Lock–Up System**

The ECT ECU has programmed in its memory a lock–up clutch operation pattern for each driving mode (Normal or Power). Based on this lock–up pattern, the ECU turns lock–up solenoid valve on or off in accordance with the vehicle speed signals received from the speed sensor and the throttle opening signals from the the throttle position sensor.

Depending on whether lock–up solenoid valve is on or off, the lock–up relay valve performs changeover of the fluid passages for the converter pressure acting on the torque converter to engage or disengage the lock–up clutch.

(Mandatory Cancellation of Lock–Up System)

If any of the following conditions exist, the ECU turns off lock–up solenoid valve to disengage the lock–up clutch.

(1) The brake light switch comes on (during braking).
(2) The IDL points of the throttle position sensor close (throttle valve fully closed.).
(3) The vehicle speed drops 4 km/h (2 mph) or more below the set speed while the cruise control system is operating.
(4) The coolant temperature falls below 70˚C (158˚F).

The purpose of (1) and (2) above is to prevent the engine from stalling if the rear wheels lock up.

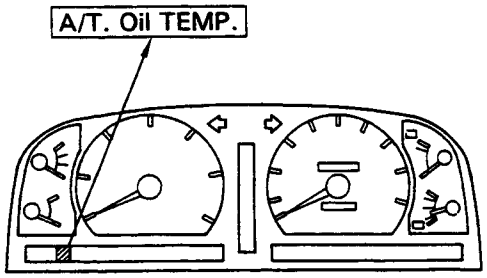
The purpose of (3) is to cause the torque converter operate to obtain torque multiplication.

The purpose of (4) is both to improve general driveability, and to speed up transmission warm–up.

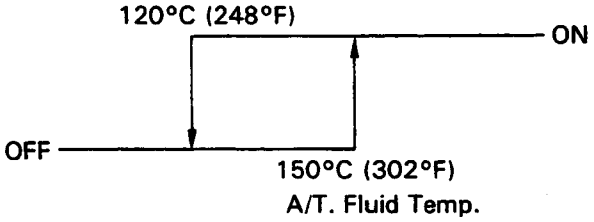
Also, while the lock–up system is in operation, the ECU will temporarily turn it off during up–shift or down–shift in order to decrease shifting shock.

5. A/T. FLUID TEMPERATURE WARNING SYSTEM

The ECT ECU detects the A/T fluid temperature by means of a fluid temperature sensor fitted to the union. The A/T fluid may become extremely when the vehicle is under and extreme load, as when driving on sand or climbing uphill. Should the fluid temperature increase above 150˚C (302˚F), the ECT ECU lights the warning light located in the combination meter. The light goes off when temperature falls below 120˚C (248˚F).



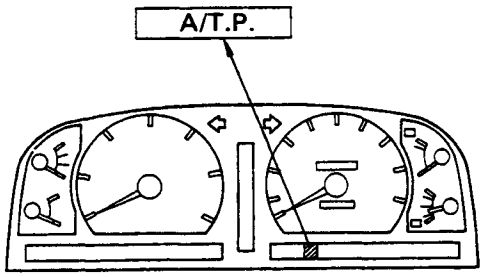
AT6023



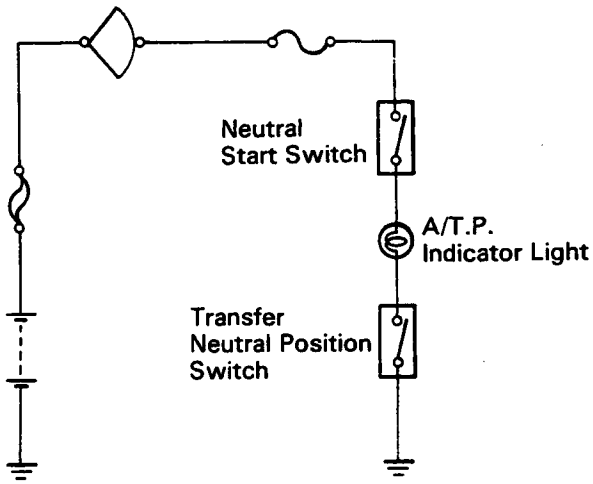
V01585

6. A/T. P. (Automatic Transmission Parking) INDICATOR

The propeller shaft and wheels are free even when the transmission shift lever is set to ”P” as long as the transfer shift lever is in ”neutral” position. The A/T.P. indicator lights up to warn the driver that the propeller shaft and wheels are not locked. If the A/T.P. indicator light goes on, the transfer shift lever should be shifted to out of ”N” position.



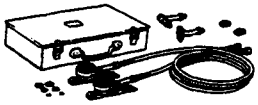
AT6024



AT3920

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	**09032–00100** Oil Pan Seal Cutter	
	**09350–30020** TOYOTA Automatic Transmission Tool Set	
	**(09351–32010)** One–Way Clutch Test Tool	
	**(09351–32020)** Stator Stopper	
	**09843–18020** Diagnostic Check Wiring	
	**09992–00094** Automatic Transmission Oil Pressure Gauge Set	

EQUIPMENT

Ohmmeter	
Voltmeter	
Torque wrench	
Dial indicator with magnetic base	Check drive plate runout.
Vernier calipers	Check torque converter Installation.
Straight edge	Check torque converter Installation.

LUBRICANT

Item	Capacity	Classification
Automatic transmission fluid Dry fill w/ Oil cooler w/o Oil cooler Drain and refill	 15.4 liter (16.3 US qts, 13.6 lmp.qts) 15.0 liter (15.9 US qts, 13.2 lmp.qts) 6.0 liters (6.3 US qts, 5.3 lmp.qts)	 ATF DEXRON® II

SSM (SPECIAL SERVICE MATERIALS)

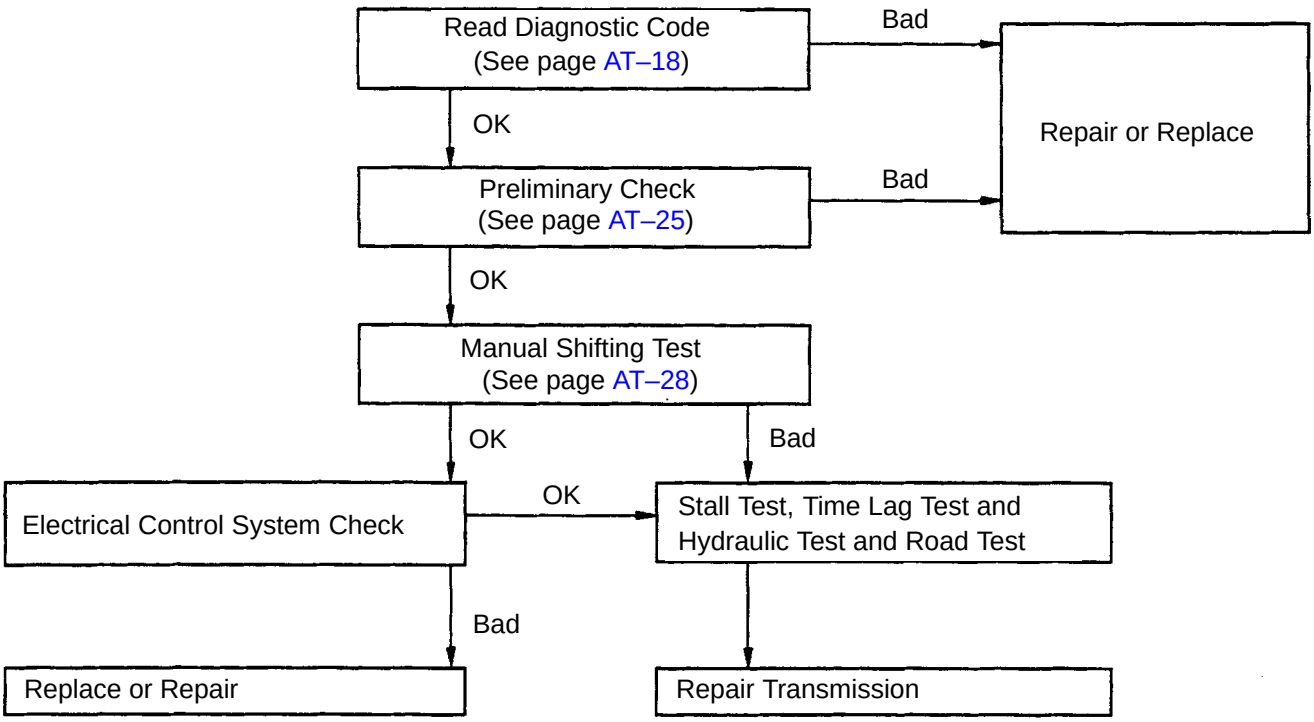
08826–00090	Seal Packing 1281, Three bond 1281 or equivalent	Oil pan

TROUBLESHOOTING

Trouble occurring in the ECT can stem from one of three sources: the engine, the ECT electronic control unit or the transmission itself. Before troubleshooting, determine in which these three sources the problem lies, and begin troubleshooting with the simplest operation, gradually working up in order or difficulty.

BASIC TROUBLESHOOTING

Before troubleshooting an ECT, first determine whether the problem is electrical or mechanical. To do this, just refer to the basic troubleshooting flow–chart provided below.
If the cause is already known, using the basic troubleshooting chart below a long with the general troubleshooting chart on the following pages should speed the procedure.

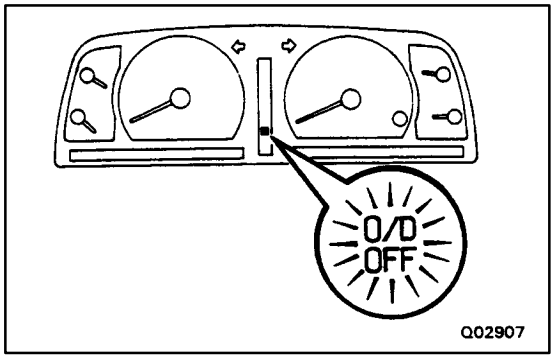


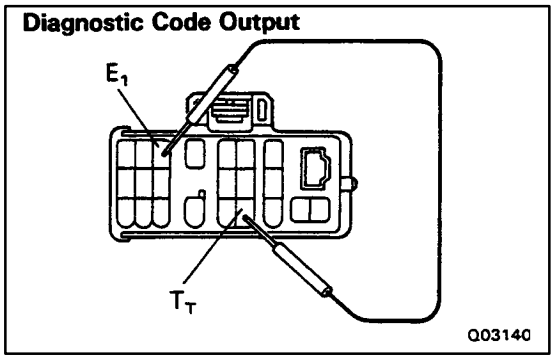
NOTICE: Refer to A442F Automatic Transmission Repair Manual (Pub. No. RM314E) when ★ mark appears in the column for page numbers.

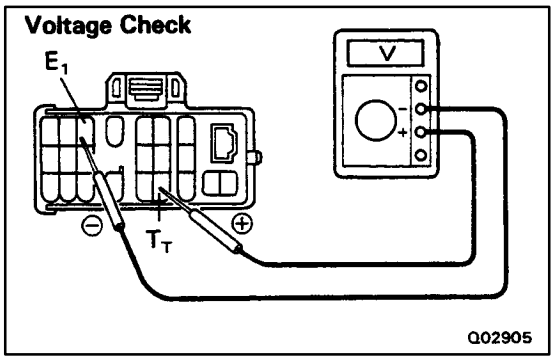
Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated Torque converter faulty Transmission faulty	Replace fluid Replace torque converter Disassemble and inspect Transmission	AT–25 AT–76 ★
Vehicle does not move in any forward range or reverse	Manual linkage out of adjustment Valve body or primary regulator faulty Parking lock pawl faulty Torque converter faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust linkage Inspect valve body Inspect parking lock pawl Replace torque converter Replace drive plate Clean screen Disassemble and inspect transmission	AT–26 ★ ★ AT–76 AT–76 ★ ★
Shift lever position incorrect	Manual linkage out of adjustment Manual valve and lever faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–26 ★ ★
Harsh engagement into any drive position	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassemble and inspect transmission	AT–26 ★ ★ ★
Delayed 1–2, 2–3 or 3–O/D up–shift, or downshift from O/D–3 or 3–2 and shifts back to O/D or 3	Electronic control faulty Valve body faulty Solenoid valve faulty	Inspect electronic control Inspect valve body Inspect solenoid valve	AT–29 ★ AT–40
Slips on 1–2, 2–3 or 3–O/D up–shift, or shps or shudders on acceleration	Manual linkage out of adjustment Throttle cable out of adjustment Valve body faulty Solenoid valve faulty Transmission faulty	Adjust linkage Adjust throttle cable Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–26 AT–26 ★ AT–40 ★
Drag, binding or tie–up on 1–2, 2–3 or 3–O/D up–shift	Manual linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–26 ★ ★

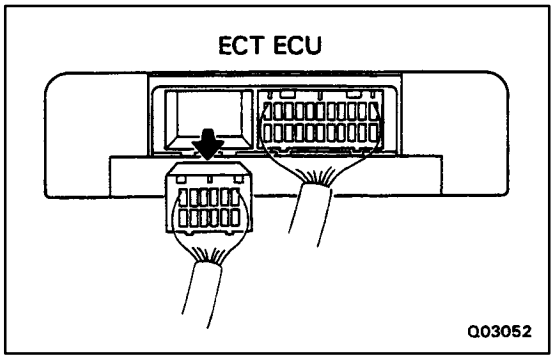
NOTICE: Refer to A442F Automatic Transmission Repair Manual (Pub. No. RM314E) when ★ mark appears in the column for page numbers.

Problem	Possible cause	Remedy	Page
No lock–up in 3rd or O/D	Electronic control faulty Valve body faulty Solenoid valve faulty Transmission faulty	Inspect electronic control Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–29 ★ AT–40 ★
Harsh down–shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator pistons Inspect valve body Disassemble and inspect transmission	AT–26 AT–26 ★ ★ ★
No down–shift when coasting	Valve body faulty Solenoid valve faulty Electronic control faulty	Inspect valve body Inspect solenoid valve Inspect electronic control	★ AT–40 AT–29
Down–shift occurs too quickly or too late while coasting	Throttle cable faulty Valve body faulty Transmission faulty Solenoid valve faulty Electronic control faulty	Inspect throttle cable Inspect valve body Disassemble and inspect transmission Inspect solenoid valve Inspect electronic control	AT–26 ★ ★ AT–40 AT–29
No O/D–3, 3–2 or 2–1 kick–down	Solenoid valve faulty Electronic control faulty Valve body faulty	Inspect solenoid valve Inspect electronic control Inspect valve body	AT–40 AT–29 ★
No engine braking 2 or L range	Solenoid valve faulty Electronic control faulty Valve body faulty Transmission faulty	Inspect solenoid valve Inspect electronic control Inspect valve body Disassemble and inspect transmission	AT–40 AT–29 ★ ★
Vehicle does not hold in P	Manual linkage out of adjustment Parking lock pawl cam and spring faulty	Adjust linkage Inspect cam and spring	AT–26 AT–26









DIAGNOSIS SYSTEM

DESCRIPTION

1. A self–diagnosis function is built into the electrical control system. Warning is indicated by the overdrive OFF indicator light.
   HINT: Warning and diagnostic codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light is lit continuously and will not blink.

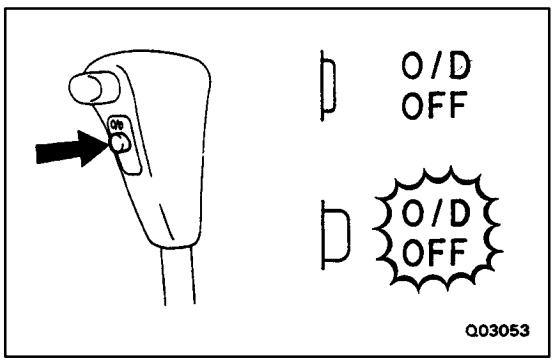
(a) If a malfunction occurs within the speed sensors (No.1 or 2), throttle sensor or engine speed signal, the overdrive OFF indicator light will blink to warn the driver.
However, there will be no warning of a malfunction with lock–up solenoid.

(b) The diagnostic code can be read by the number of blinks of the overdrive OFF indicator light when terminals T_T and E_1 are connected. (See page AT–20)

(c) The throttle position sensor or brake signal are not indicated, but inspection can be made by checking the voltage at terminal T_T of the check connector.

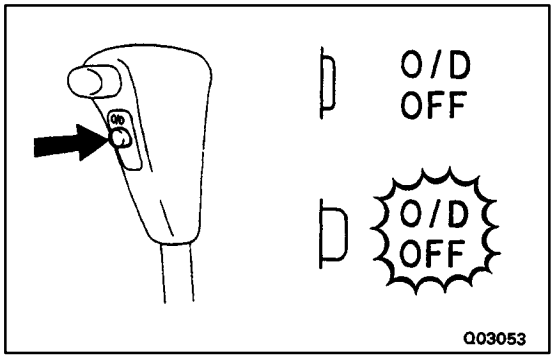
(d) The signals to each gear can be checked by measuring the voltage at terminal T_T of the check connector while driving.

2. The diagnostic code is retained in memory by the ECT ECU and due to back–up voltage, is not canceled out when the engine is turned off. Consequently, after repair, it is necessary to turn the ignition switch off and remove the DOME fuse (10 A) or disconnect the ECT ECU connector to cancel out the diagnostic code. (See page AT–20)
   HINT:
   - Low battery voltage will cause faulty operation of the diagnosis system. Therefore, always check the battery first.
   - Use a voltmeter and ohmmeter that have an impedance of at least 10 kΩ/V.



CHECK ”O/D OFF” INDICATOR LIGHT

1. Turn the ignition switch ON.
2. The ”O/D OFF” light will come on when the O/D switch is placed at OFF.
3. When the O/D switch is set to ON, the ”O/D OFF” light should go out.
   If the ”O/D OFF” light flashes when the O/D switch is set to ON, the electronic control system is faulty.

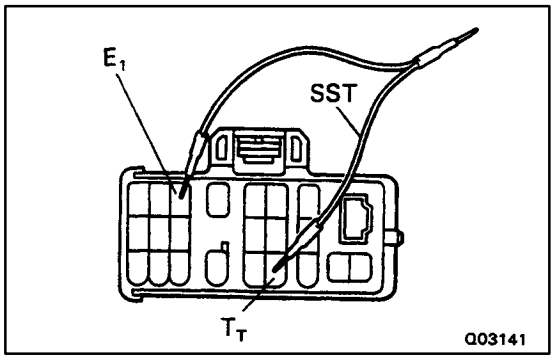


READ DIAGNOSTIC CODE

1. TURN IGNITION SWITCH AND O/D SWITCH TO ON

Do not start the engine.

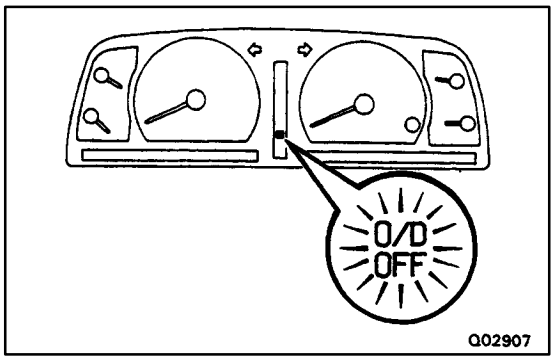
HINT: Warning and diagnostic codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light will light continuously and will not blink.



2. CONNECT T_T AND E_1 TERMINALS OF CHECK CONNECTOR

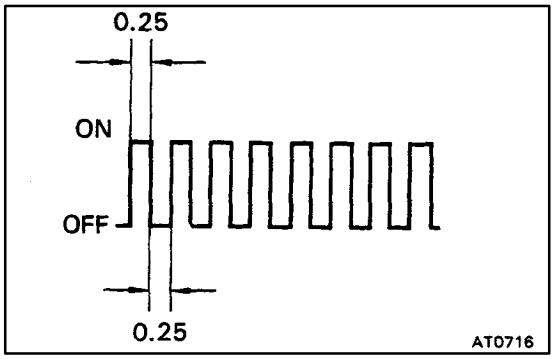
Using SST, connect terminals T_T and E_1 of the check connector.

SST 09843–18020



3. READ DIAGNOSTIC CODE

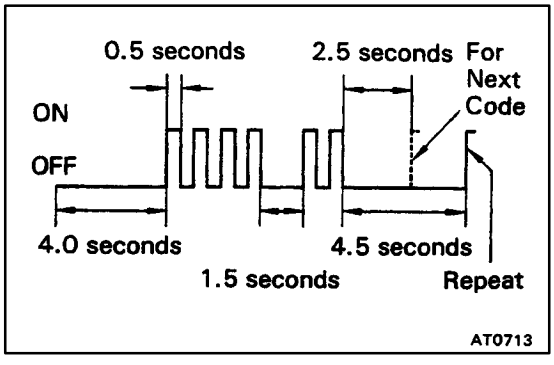
Read the diagnostic code as indicated by the number of times the O/D OFF light flashes.



(Diagnostic Code Indication)

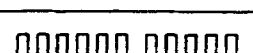
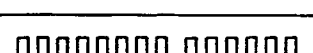
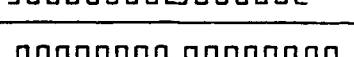
- If the system is operating normally, the light will flash 2 times par second.
- In the event of a malfunction, the light will flash 1 time par second. The number of blinks will equal the first number and, after 1.5 seconds pause, the second number of the two digit diagnostic code. If there are two or more codes, there will be a 2.5 seconds pause between each.

HINT: In the event of several trouble codes occurring simultaneously, indication will began from the smaller value and continue to the larger.



4. REMOVE SST

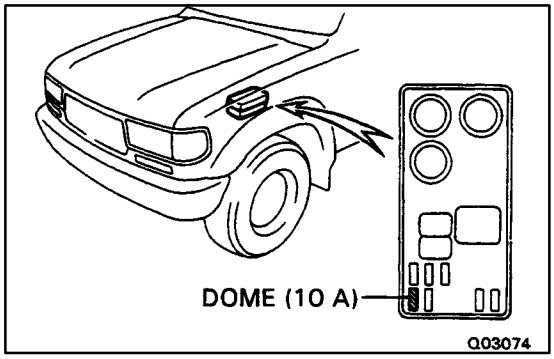
DIAGNOSTIC CODES

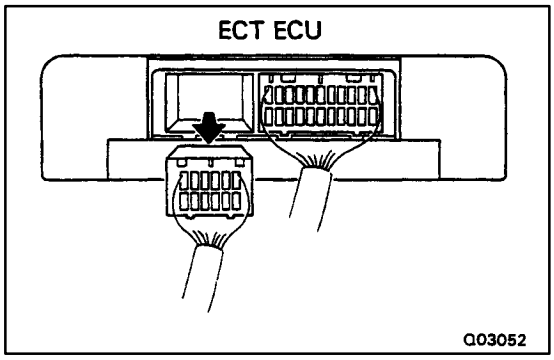
Code No.	Light Pattern	Diagnosis System
–		Normal
41		Severed throttle position sensor or short circuit– severed wire harness or short circuit
42		Defective No. 1 speed sensor (in combination meter)– severed wire harness or short circuit
61		Defective No. 2 speed sensor (in ATM)– severed wire harness or short circuit
62		Severed No. 1 solenoid or short circuit– severed wire harness or short circuit
63		Severed No. 2 solenoid or short circuit– severed wire harness or short circuit
64		Severed lock–up solenoid or short circuit– severed wire harness or short circuit
65		Severed timing solenoid or short circuit– severed wire harness or short circuit
86		Severed engine speed sensor or short circuit– severed wire harness or short circuit
*88		Severed engine ECU and ECT ECU or short circuit– severed wire harness or short circuit

* : 1FZ–FE engine only

Q03076

HINT: If codes 62, 63, 64, or 65 appear, there is an electrical malfunction in the solenoid. Causes due to mechanical failure, such as a stuck valve, will not appear.





CANCEL OUT DIAGNOSTIC CODE

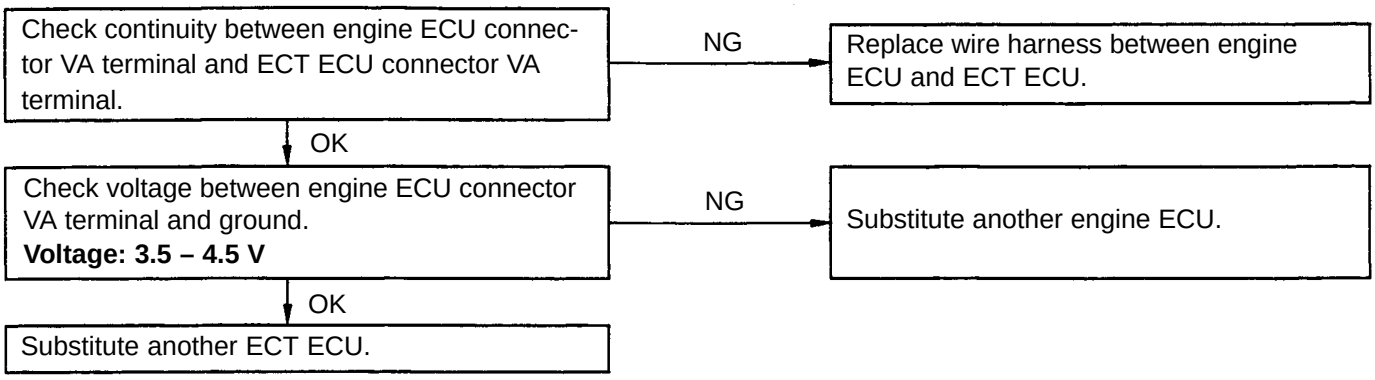
1. After repair of the trouble area, the diagnostic code retained in memory by the ECT ECU must be canceled by removing the DOME fuse (10 A) for 10 seconds or more, depending on ambient temperature (the lower the termperature, the longer the fuse must be left out) with the ignition switch OFF.
   HINT:
   - Cancellation can be also done by removing the battery negative (–) terminal, but in this case other memory systems will be also canceled out.
   - The diagnostic code can be also canceled out by disconnecting the ECT ECU connector.
   - If the diagnostic trouble is not canceled out, it will be retained by the ECT ECU and appear along with a new code in event of future trouble.
2. After cancellation, perform a road test to confirm that a ”normal code” is now read on the O/D OFF light.

TROUBLESHOOTING FLOW–CHART

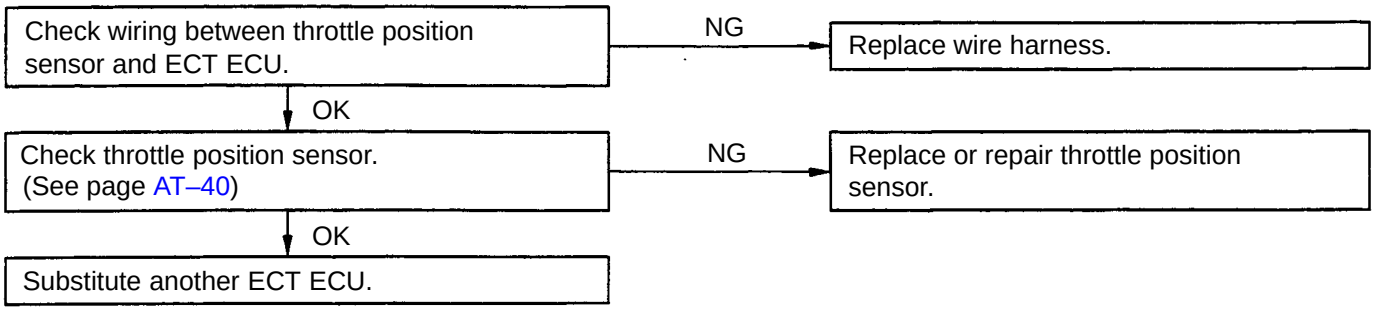
HINT:

- If diagnostic code Nos.41, 42, 61, 62, 63, 64, 65, 86, 88 (1FZ–FE engine only) and are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver. However, an impact or shock may cause the blinking to stop; but the code will still be retained in the ECT ECU memory until canceled out.
- There is no warning for diagnostic code No.64 and 65.
- In the event of a simultaneous malfunction of both No.1 and No.2 speed sensors, no diagnostic code will appear and the fail–safe system will not function. However, when driving in the D range, the transmission will not up–shift from first gear, regardless of the vehicle speed.

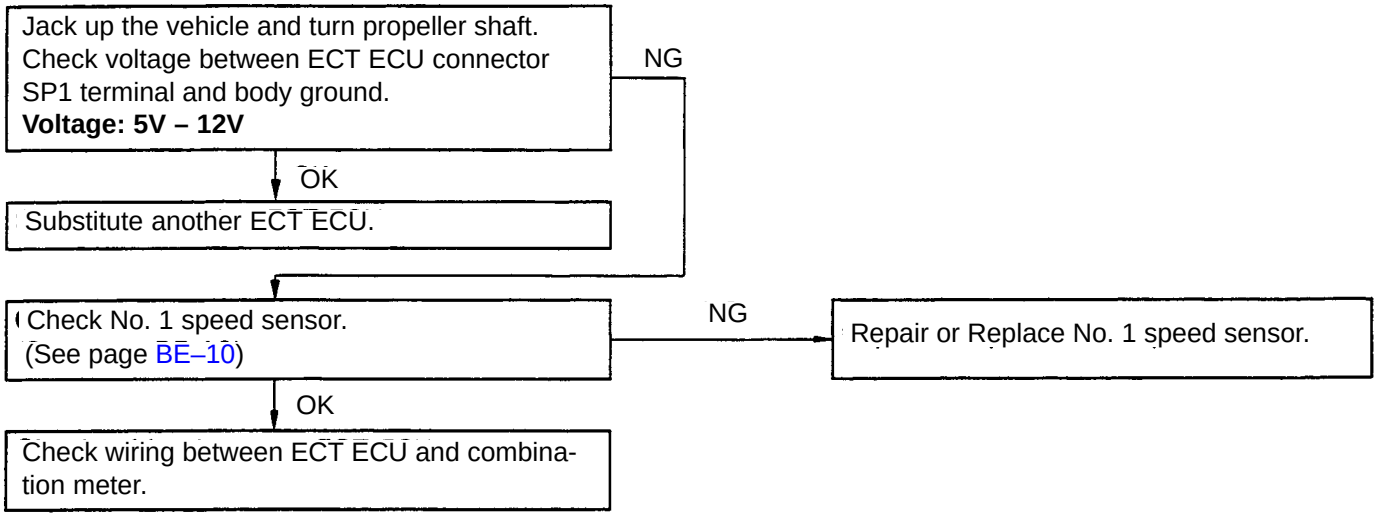
Diagnostic Code 41 (Throttle position sensor circuitry) (1FZ–FE engine)



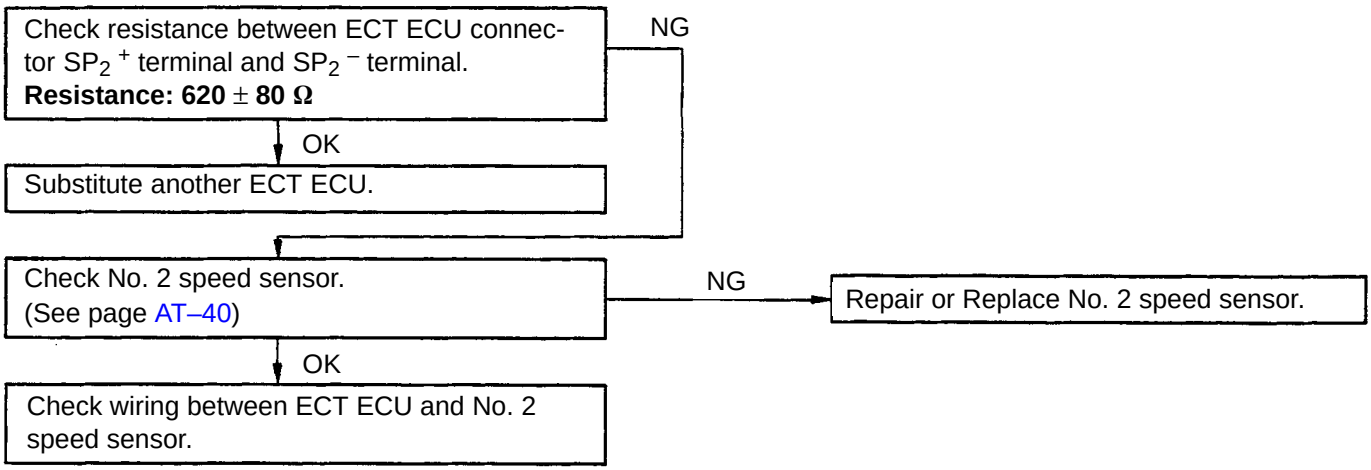
Diagnostic trouble Code 41 (Throttle position sensor circuitry) (1HD–T engine)



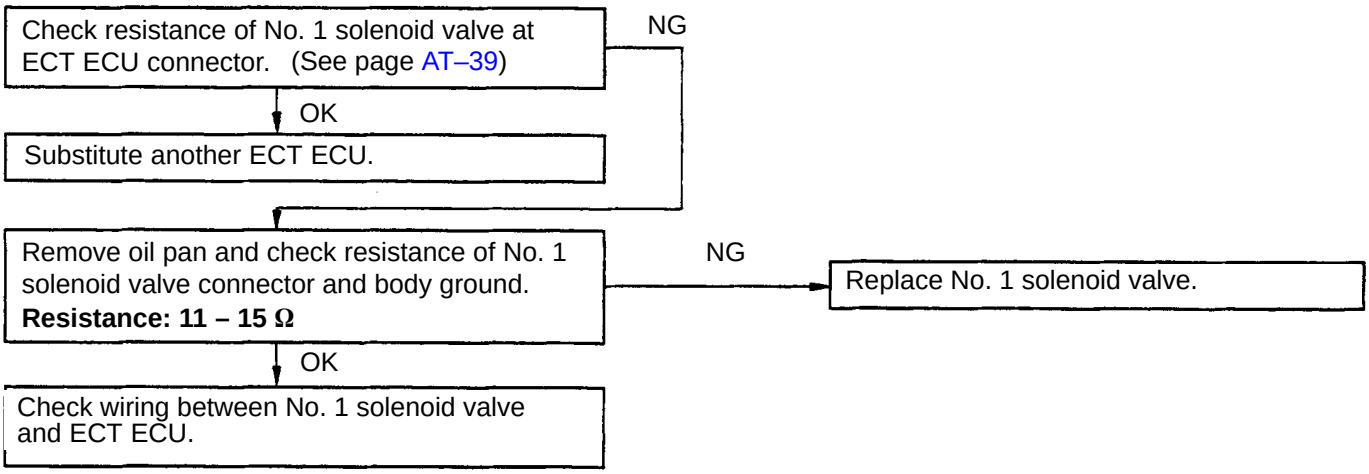
Diagnostic Code 42 (No. 1 speed sensor circuitry)



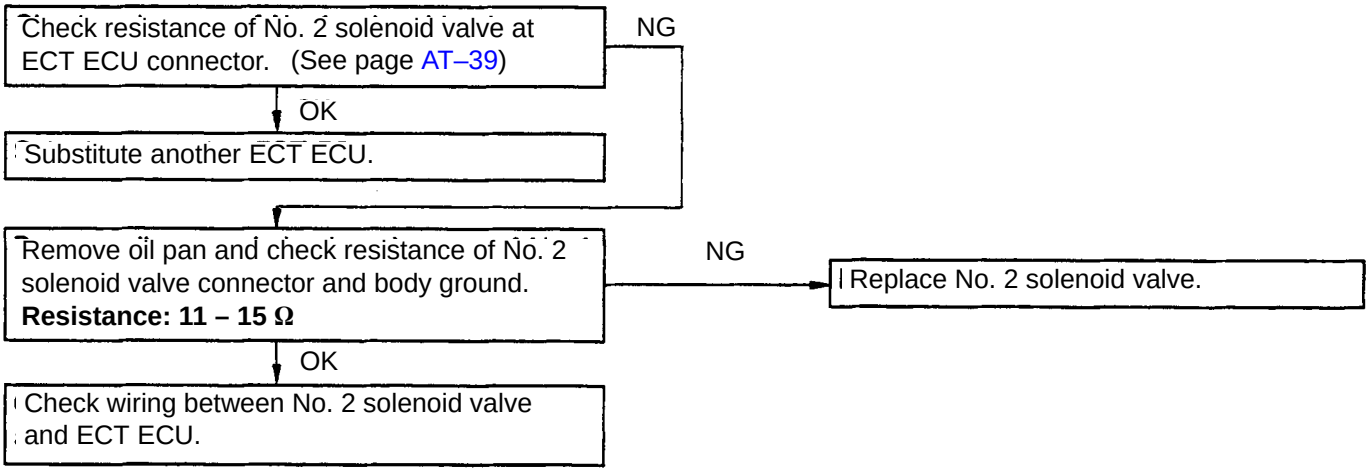
Diagnostic Code 61 (No.2 speed sensor circuitry)



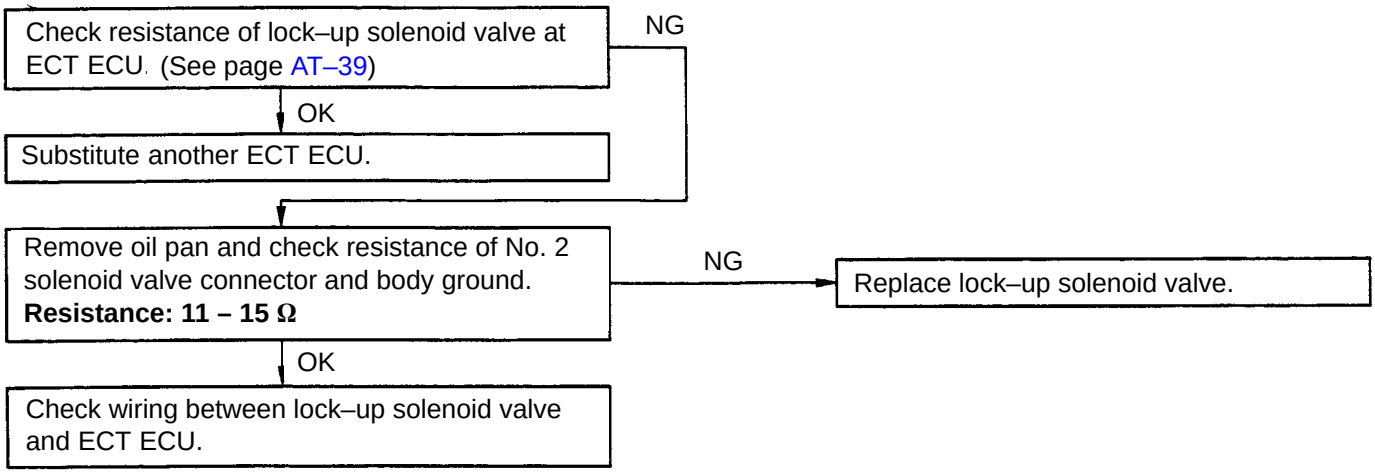
Diagnostic Code 62 (No.1 solenoid valve circuitry)



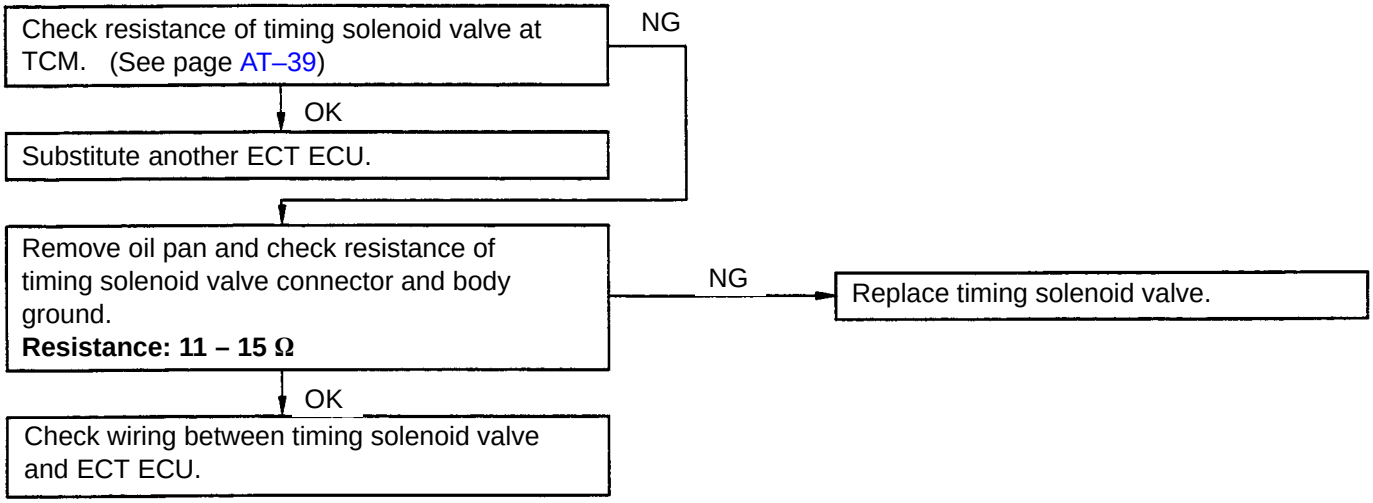
Diagnostic Code 63 (No. 2 solenoid valve circuitry)



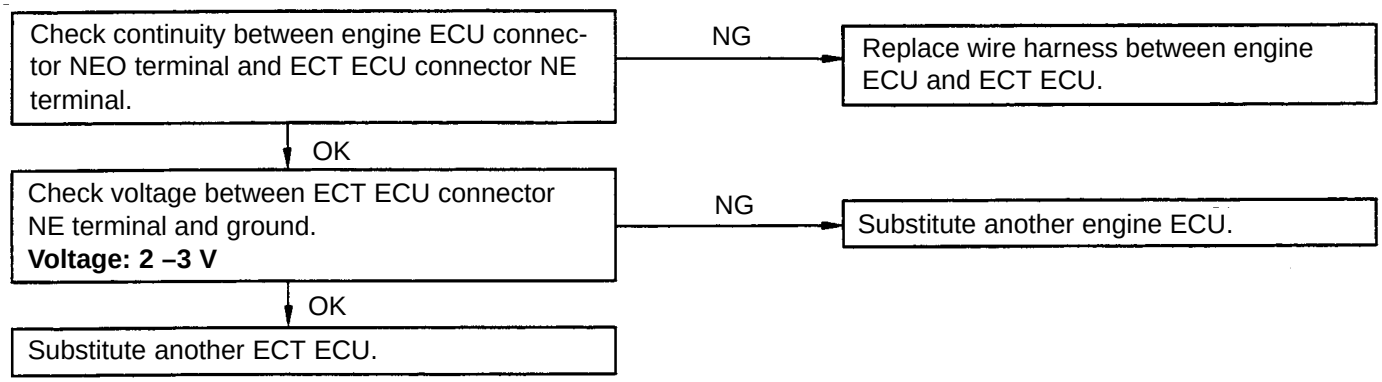
Diagnostic Code 64 (Lock–up solenoid valve circuitry)



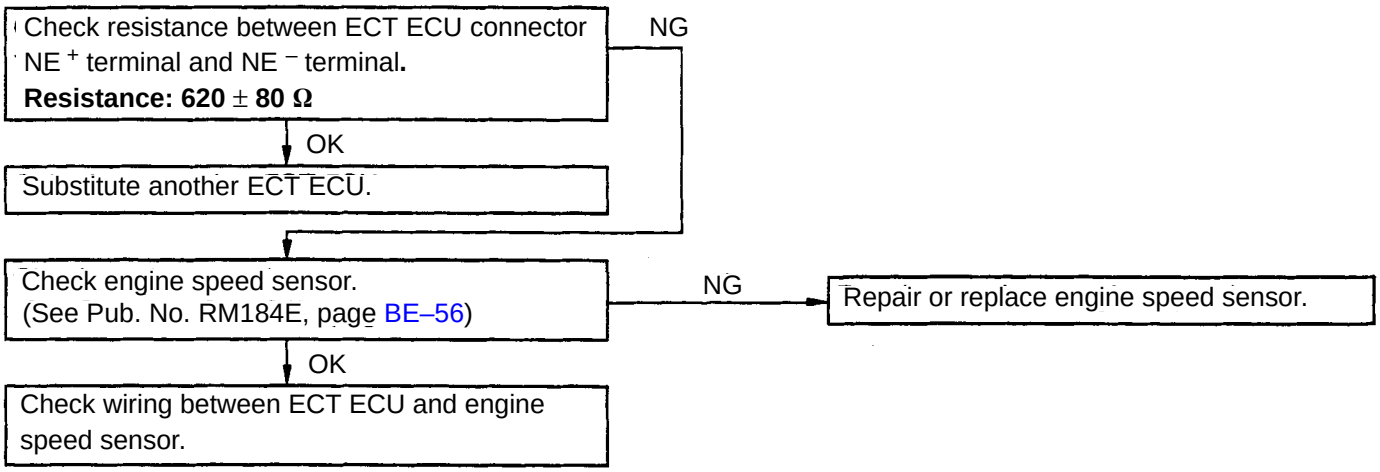
Diagnostic Code 65 (Timing solenoid valve circuitry)



Diagnostic Code 86 (Engine speed sensor circuitry) (1FZ–FE engine)

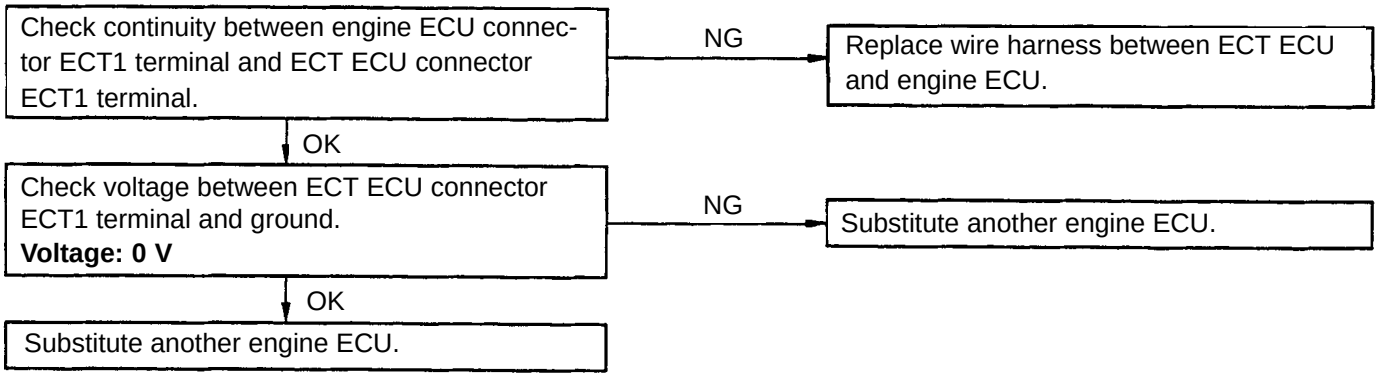


Diagnostic Code 86 (Engine speed sensor circuitry) (1HD–T engine)

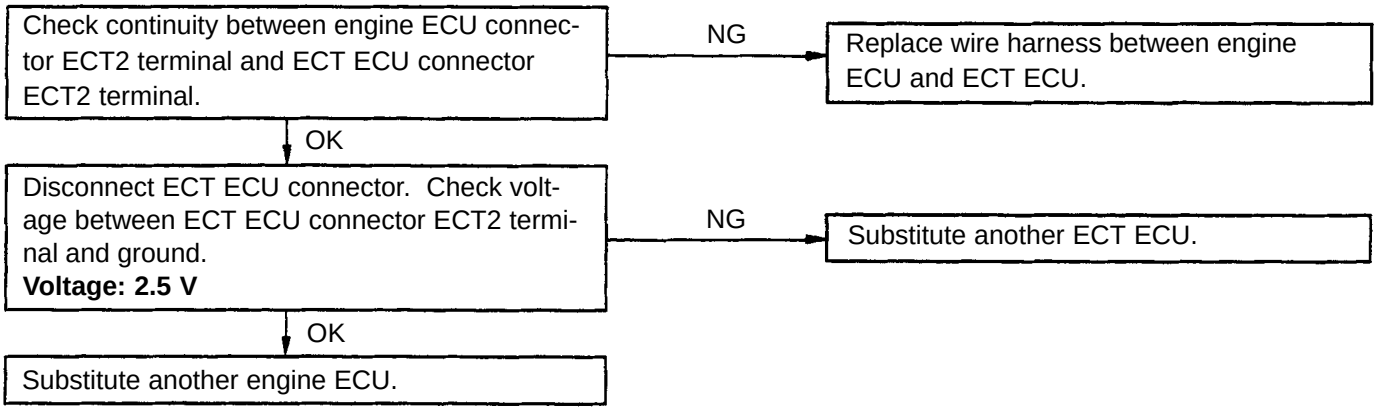


(1FZ–FE engine only)
Diagnostic Code 88 (Timing retard demand signal and fail safe signal circuitry)

(Timing retard demand signal)



(Fail safe signal)



PRELIMINARY CHECK

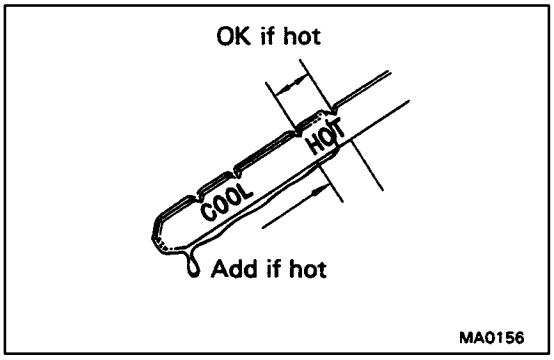
1. CHECK FLUID LEVEL

HINT:

- The vehicle must have driven so that the engine and transmission are at normal operating temperature.

(Fluid temperature: 70–80˚C or 158–176˚F)

- Only use the COOL range on the dipstick as a rough reference when the fluid is replaced or the engine does not run.



(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L range and return to P range.

(c) Pull out the transmission dipstick and wipe it clean.

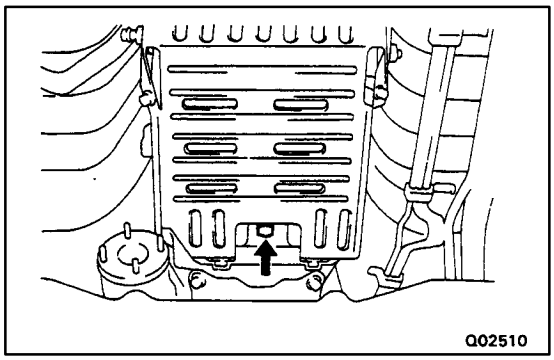
(d) Push it back fully into the tube.

(e) Pull it out and check that the fluid level is on the HOT range. If the level is at the low side, add fluid.

Fluid type:

ATF DEXRON® II

NOTICE: Do not overfill.



2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it in the following procedure.

(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.

Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

(c) With the engine OFF, add new fluid through the oil filler tube.

Fluid type:

ATF DEXRON® II

Capacity:

Total

(w/o Oil cooler)

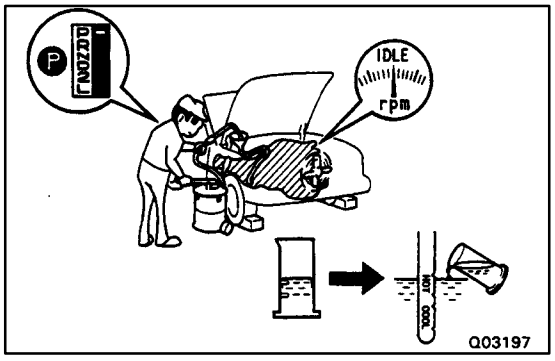
15.4 litters (16.3 US qts, 13.6 lmp.qts)

(w/o Oil cooler)

15.0 liters (15.9 US qts, 13.2 lmp.qts)

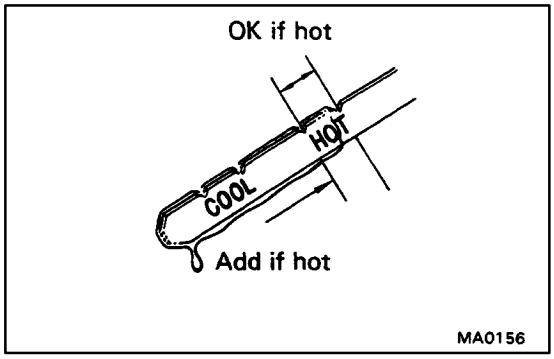
Drain and refill

6.0 litters (6.3 US qts, 5.3 lmp.qts)

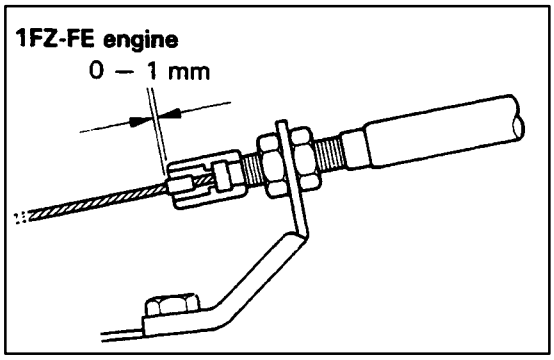


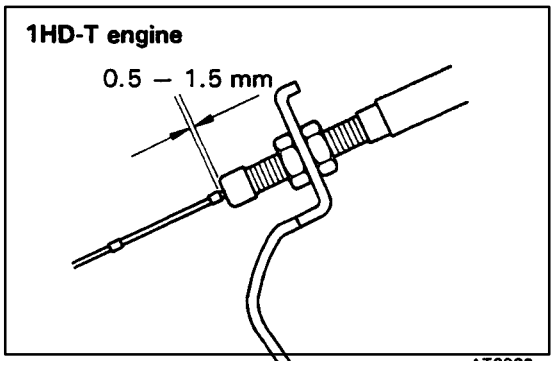
(d) Start the engine and shift the shift lever into all positions from P to L range and then shift into P range.

(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.



(f) Check the fluid level with the normal operating temperature (70–80˚C or 158–176˚F) and add as necessary.
NOTICE: Do not overfill.

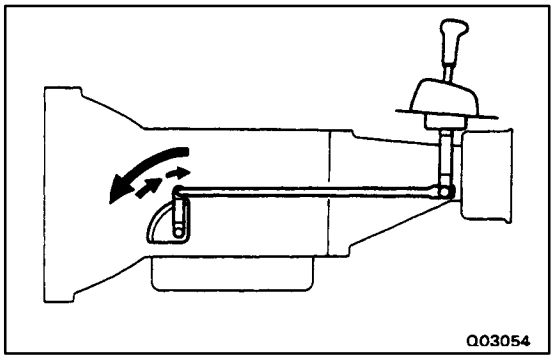




3. INSPECT THROTTLE CABLE

(a) Check that the throttle cable is installed correctly and not bent.

(b) With the throttle valve fully closed, measure the distance between the end of the boot and stopper on the cable.
Standard distance:
(1FZ–FE engine) 0–1 mm (0–0.04 in.)
(1HD–T engine) 0.5–1.5 mm (0.020–0.059 in.)
If the distance is not standard, adjust the cable by the adjusting nuts.



4. INSPECT TRANSMISSION SHIFT LEVER RANGE

When shifting the shift lever from the N range to other ranges, check that the lever can be shifted smoothly and accurately to each range and that the position indicator correctly indicates the position.
If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(a) Loosen the nut on the control rod.

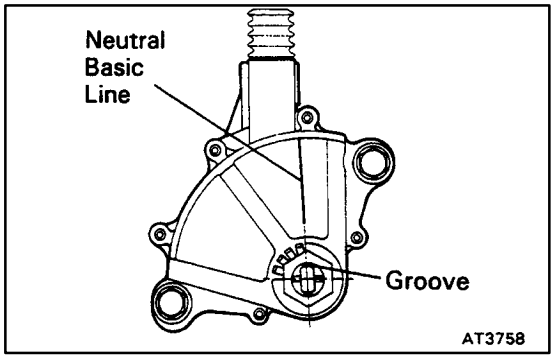
(b) Push the control shaft lever fully toward the rear of the vehicle.

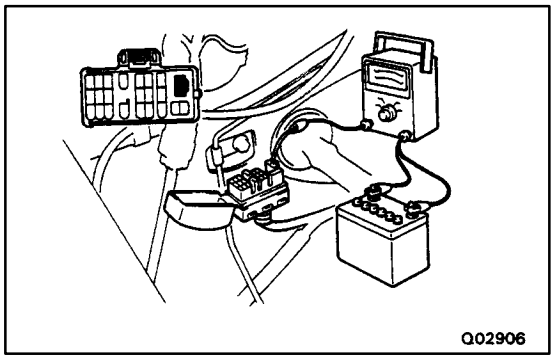
(c) Return the control shaft lever two notches to N range.

(d) Set the shift lever to N range.

(e) While holding the shift lever lightly toward the R range side, tighten the control rod nut.

(f) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D range and reverse when shifting it to the R range.





5. INSPECT NEUTRAL START SWITCH

Check that the engine can be started with the shift lever only in the N or P range, but not in other ranges.

If not as started above, carry out the following adjustment procedures.

(a) Loosen the neutral start switch bolts and set the shift lever to the N range.

(b) Align the groove and neutral basic line.

(c) Hold in position and tighten the bolts.

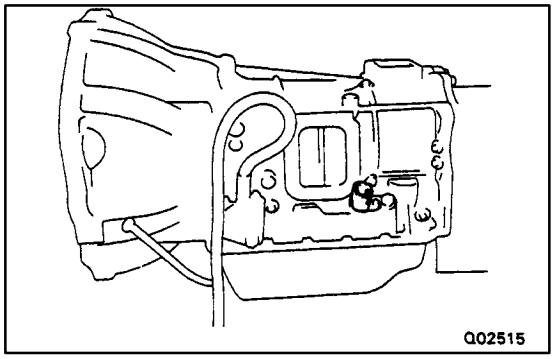
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

6. INSPECT IDLE SPEED (N RANGE)

Connect tachometer test probe to the check connector terminal IG ⊖, inspect the idle speed.

Idle speed:

650 rpm



MANUAL SHIFTING TEST

HINT: With this test, it can be determine whether the trouble lies within the electrical circuit or is a mechanical problem in the transmission.

1. **DISCONNECT SOLENOID WIRE**
2. **INSPECT MANUAL DRIVING OPERATION**

Check that the shift and gear position correspond with the table below.

HINT: If the L, 2 and D range gear position are difficult to distinguish, perform the following road test.

- While driving, shift through the L, 2 and D ranges. Check that the gear change corresponds to the shift position.
- If any abnormality is found in the above test, the problem lies in transmission ifself.

3. **CONNECT SOLENOID WIRE**
4. **CANCEL OUT DIAGNOSTIC CODE**

(See page AT–20)

REFERENCE: Possible gear position in accordance with solenoid operating conditions.

Range	NORMAL			NO. 1 SOLENOID MALFUNCTIONING			NO. 2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position
	No. 1	No. 2		No. 1	No. 2		No. 1	No. 2		No. 1	No. 2	
D Range	ON	OFF	1st	x	ON (OFF)	3rd (O/D)	ON	x	1st	x	x	O/D
	ON	ON	2nd	x	ON	3rd	OFF (ON)	x	O/D (1st)	x	x	O/D
	OFF	ON	3rd	x	ON	3rd	OFF	x	O/D	x	x	O/D
	OFF	OFF	O/D	x	OFF	O/D	OFF	x	O/D	x	x	O/D
2 Range	ON	OFF	1st	x	ON (OFF)	3rd (O/D)	ON	x	1st	x	x	3rd
	ON	ON	2nd	x	ON	3rd	OFF (ON)	x	3rd (1st)	x	x	3rd
	OFF	ON	3rd	x	ON	3rd	OFF	x	3rd	x	x	3rd
L Range	ON	OFF	1st	x	OFF	1st	ON	x	1st	x	x	1st
	ON	ON	2nd	x	ON	2nd	ON	x	1st	x	x	1st

( ) : No fail–safe function x : Malfunctions

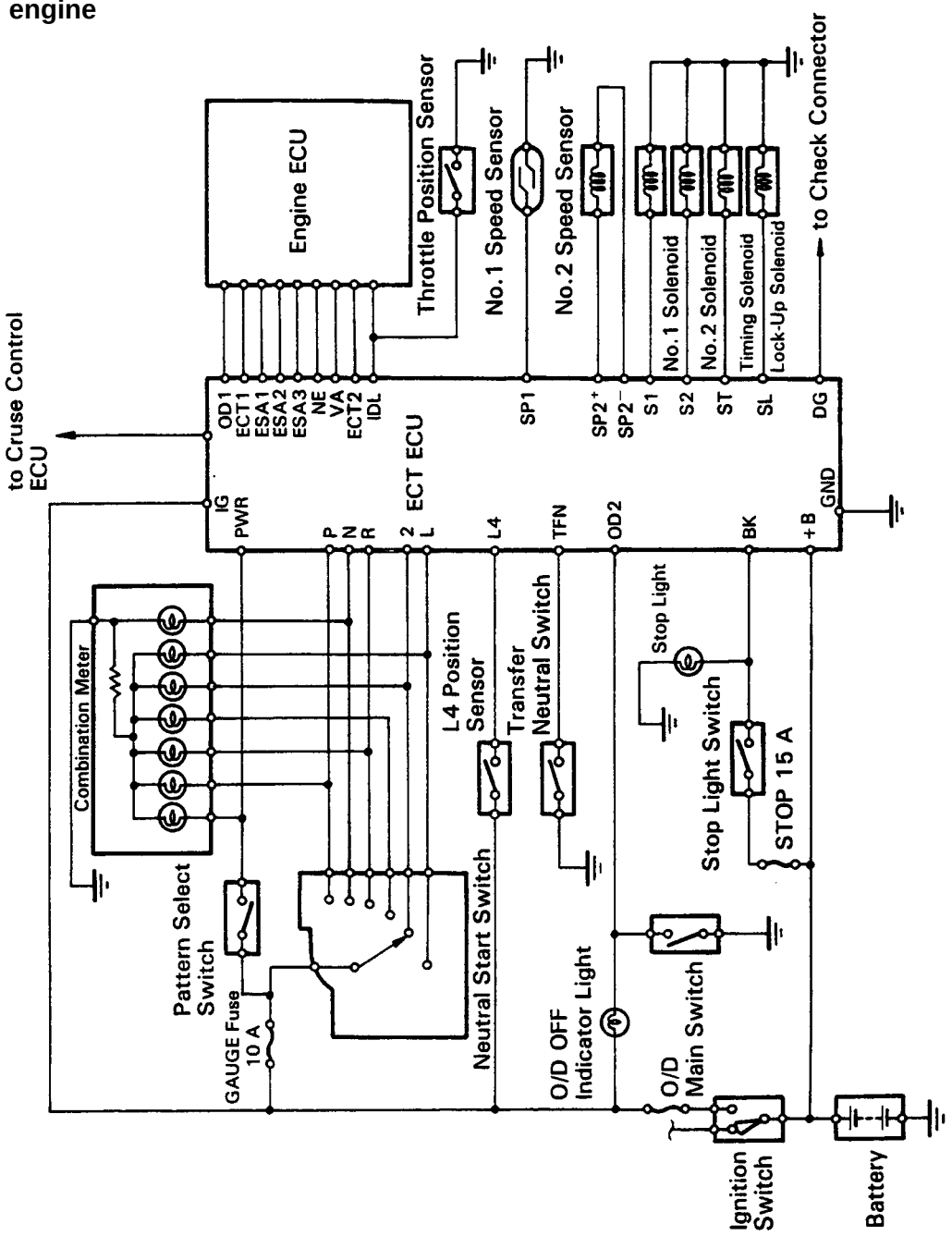
ELECTRONIC CONTROL SYSTEM

PRECAUTION

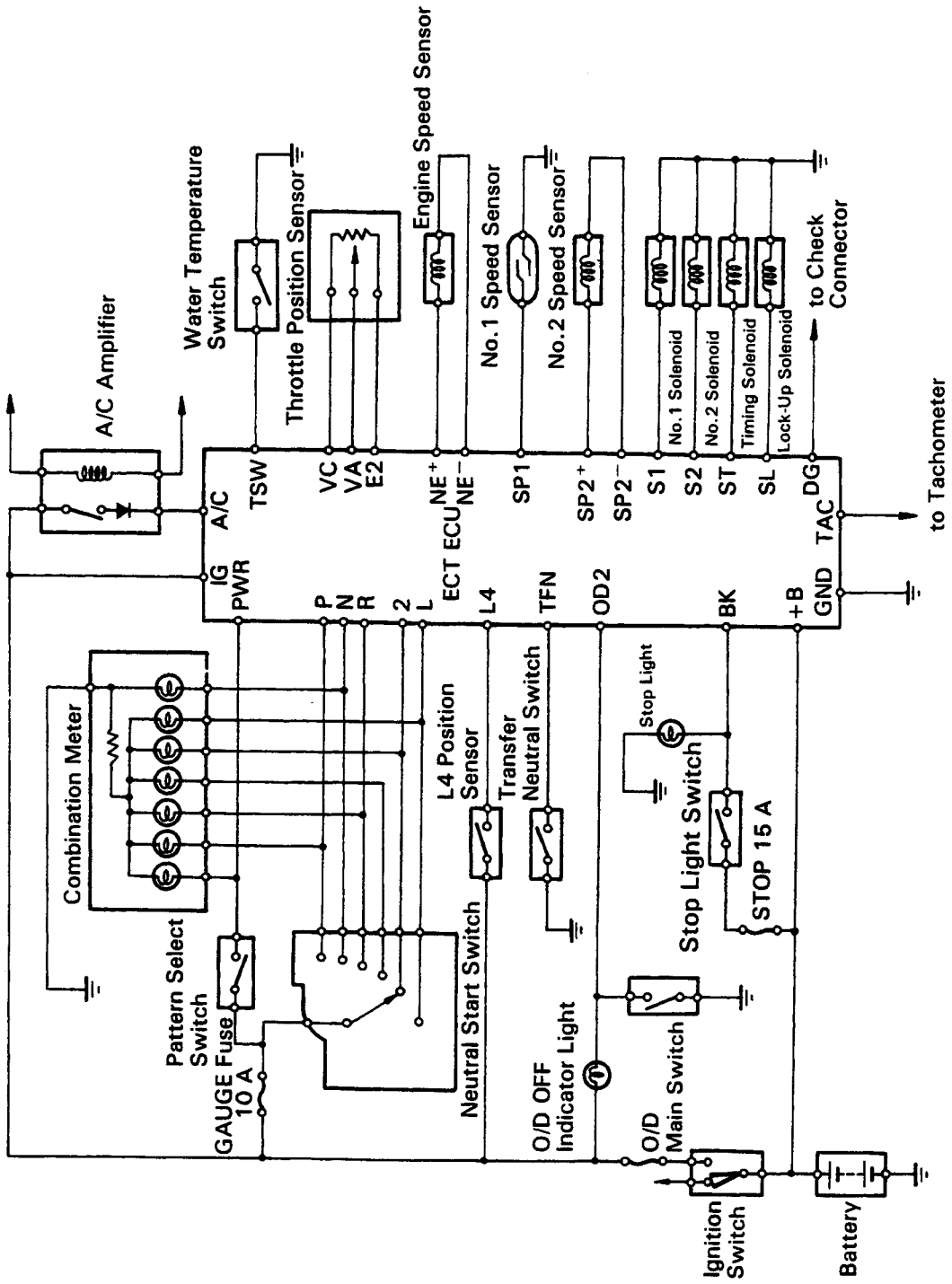
Do not open the cover or the case of the TCM and various computer unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

ELECTRONIC CONTROL CIRCUIT

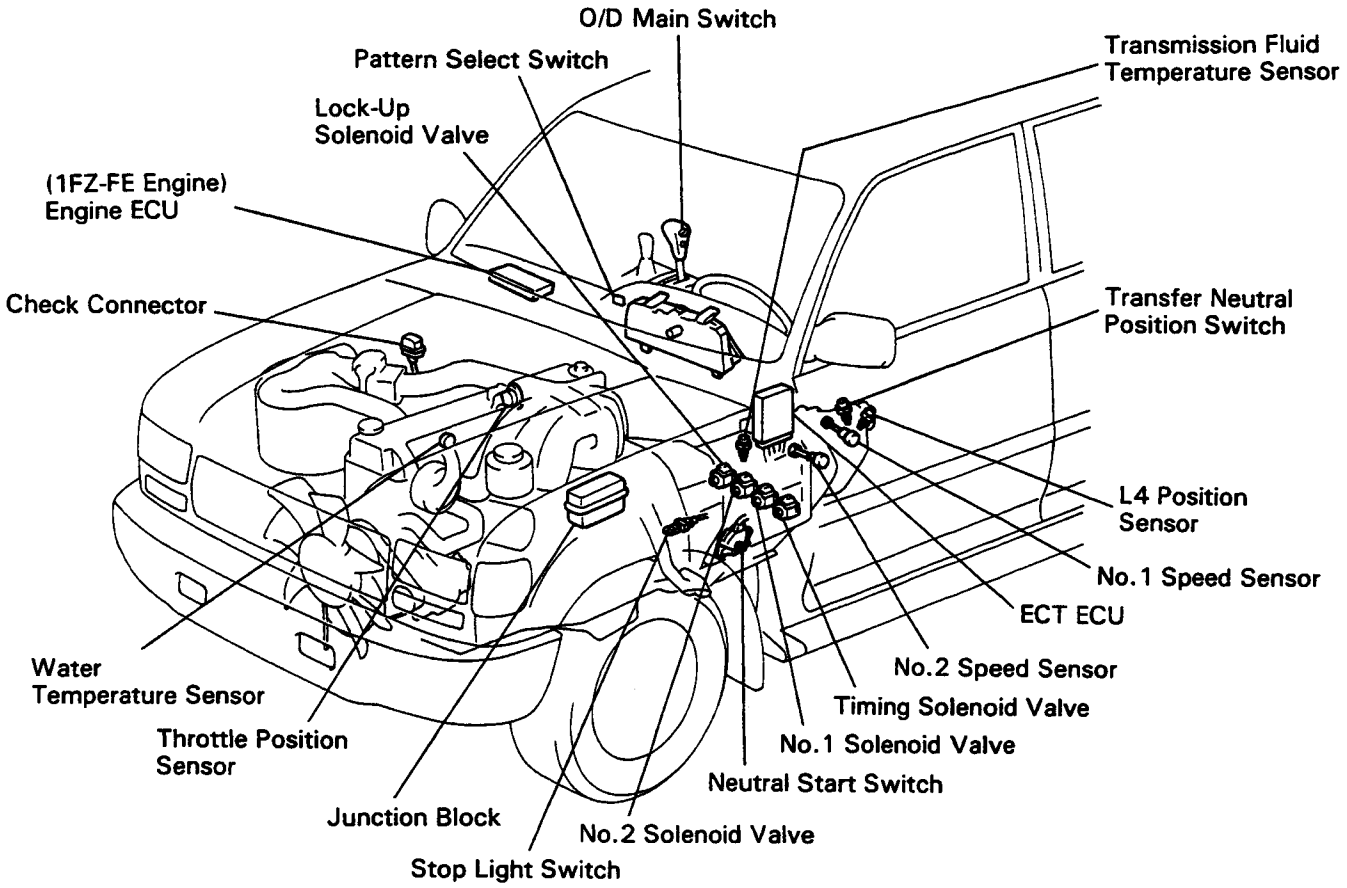
1FZ–FE engine



1HD–T engine

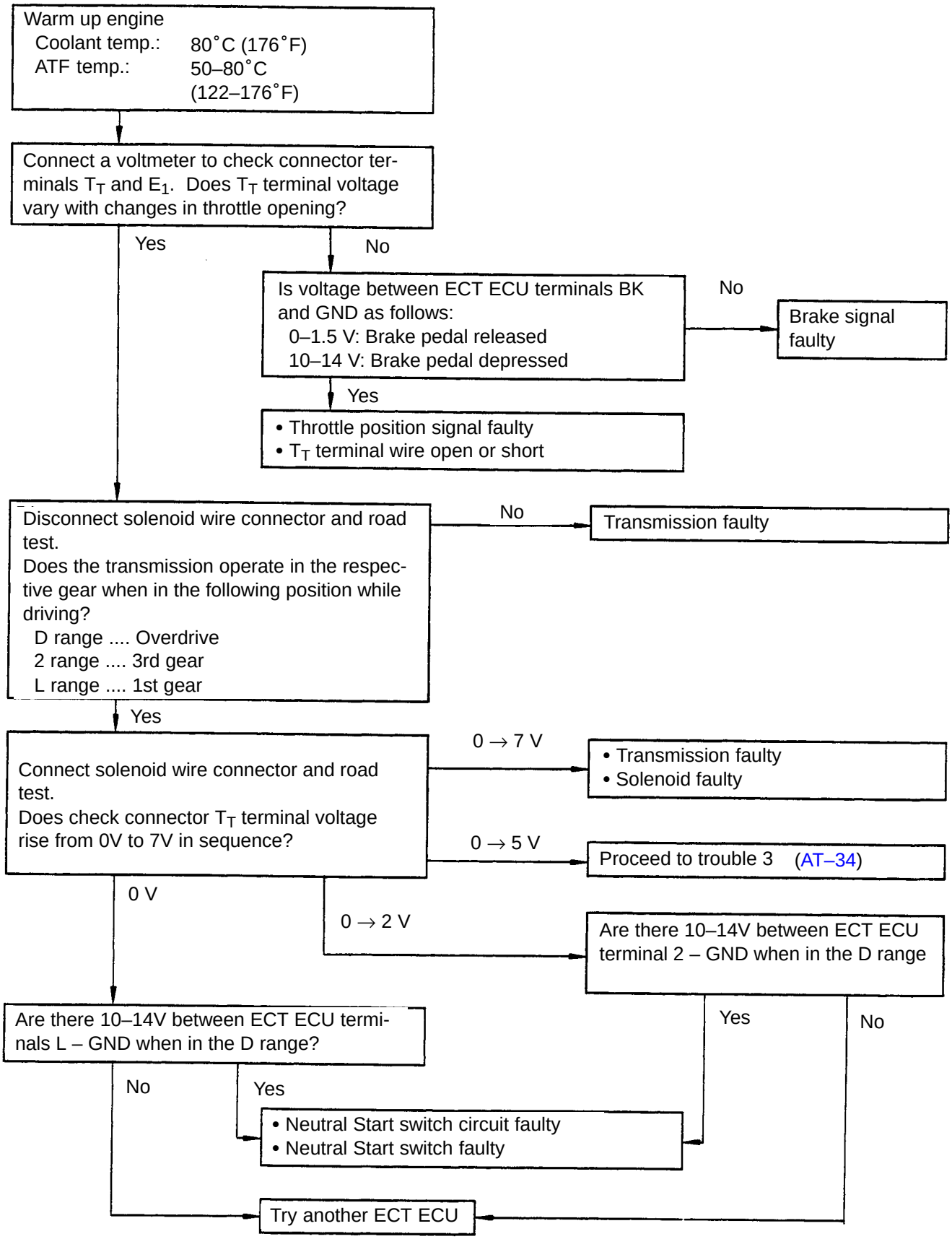

A/C Amplifier
Water Temperature Switch
Throttle Position Sensor
Engine Speed Sensor
No.1 Speed Sensor
No.2 Speed Sensor
No.1 Solenoid
No.2 Solenoid
Timing Solenoid
Lock-Up Solenoid
to Check Connector
to Tachometer
A/C
TSW
VC
VA
E2
NE+
NE–
SP1
SP2+
SP2–
S1
S2
ST
SL
DG
TAC
IG PWR
P
N
R
2
L
ECT ECU
L4
TFN
OD2
BK
+B
GND
Combination Meter
L4 Position Sensor
Transfer Neutral Switch
Stop Light
Stop Light Switch
STOP 15 A
Pattern Select Switch
GAUGE Fuse 10 A
Neutral Start Switch
O/D OFF Indicator Light
O/D Main Switch
Ignition Switch
Battery
Q03193

ELECTRONIC CONTROL COMPONENTS

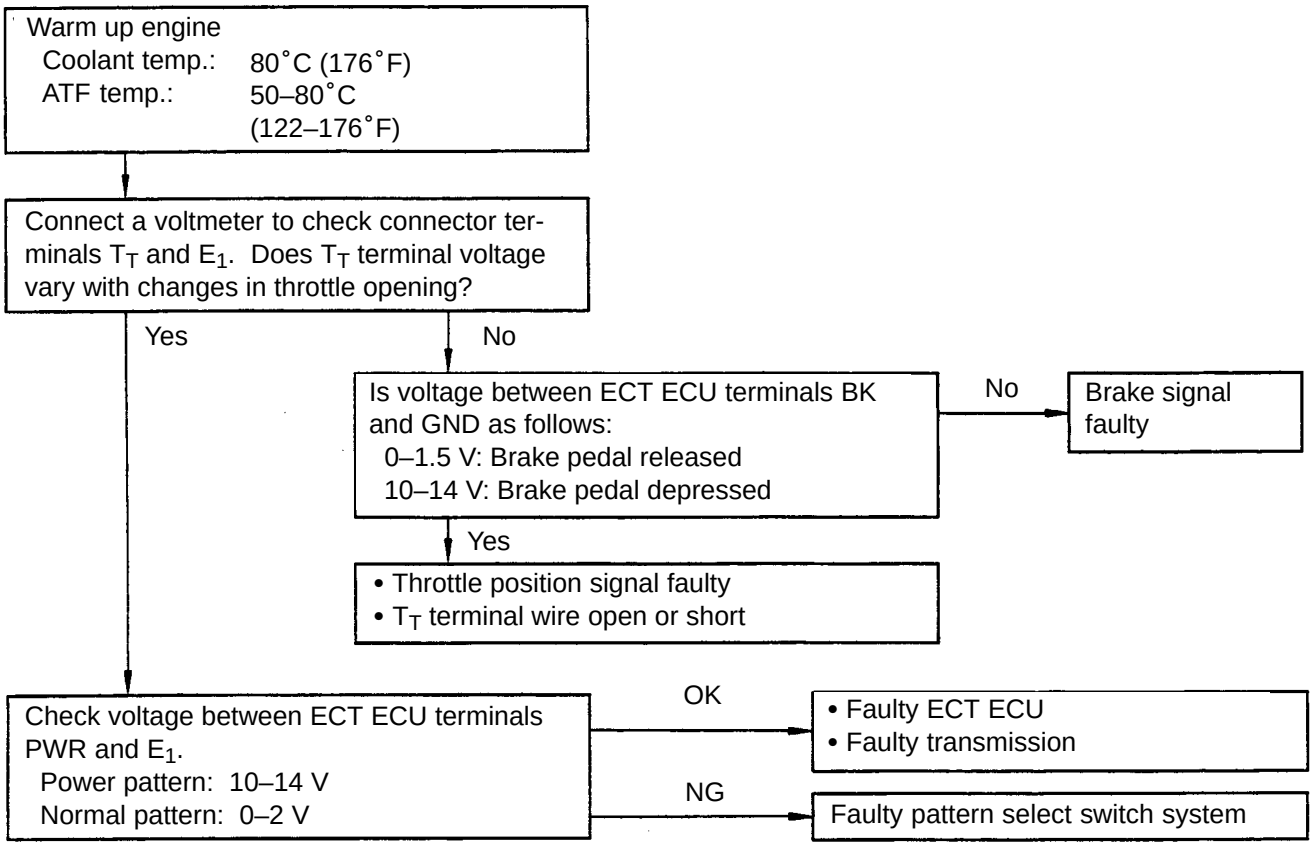


TROUBLESHOOTING FLOW–CHART

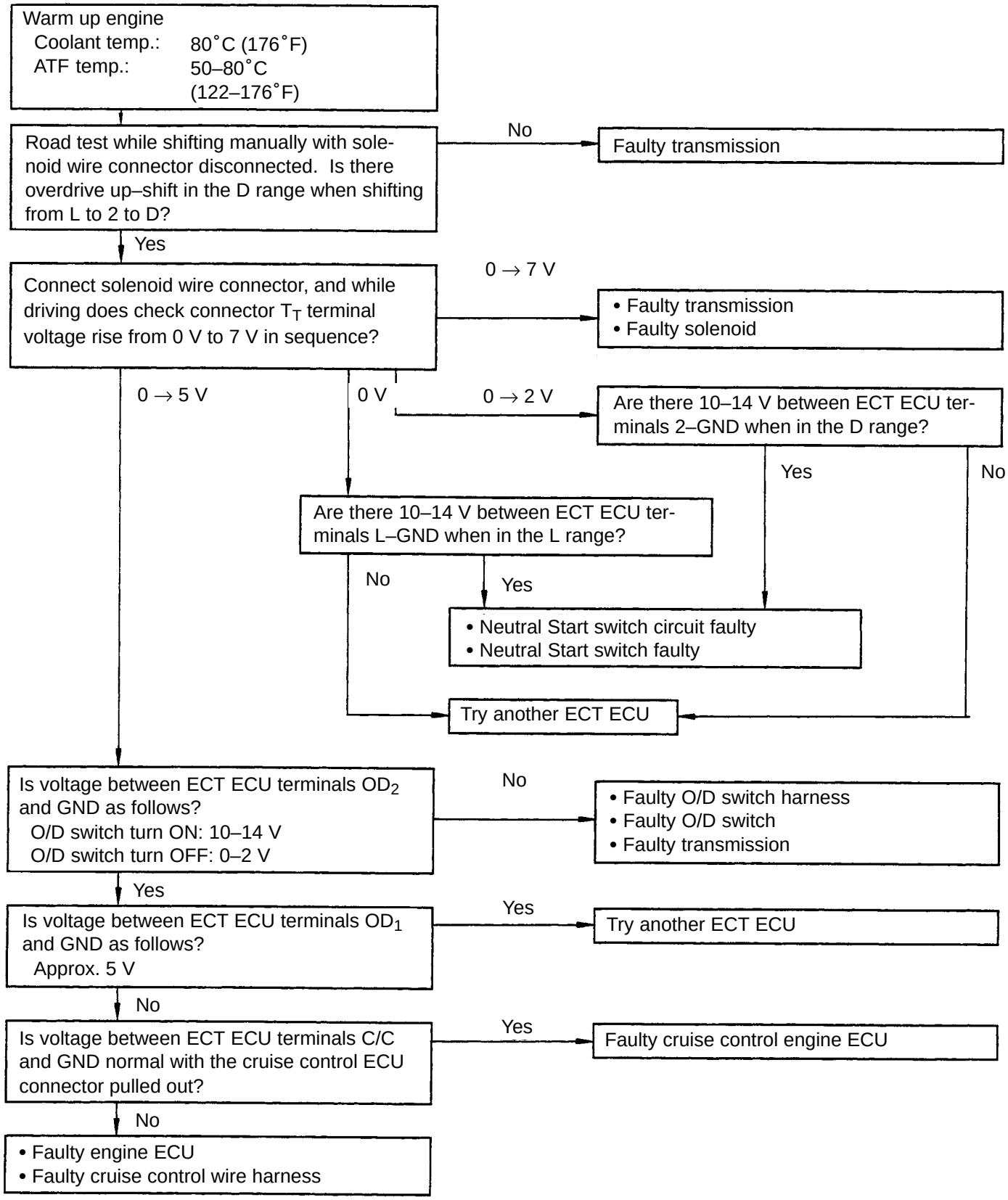
Trouble No.1 No Shifting



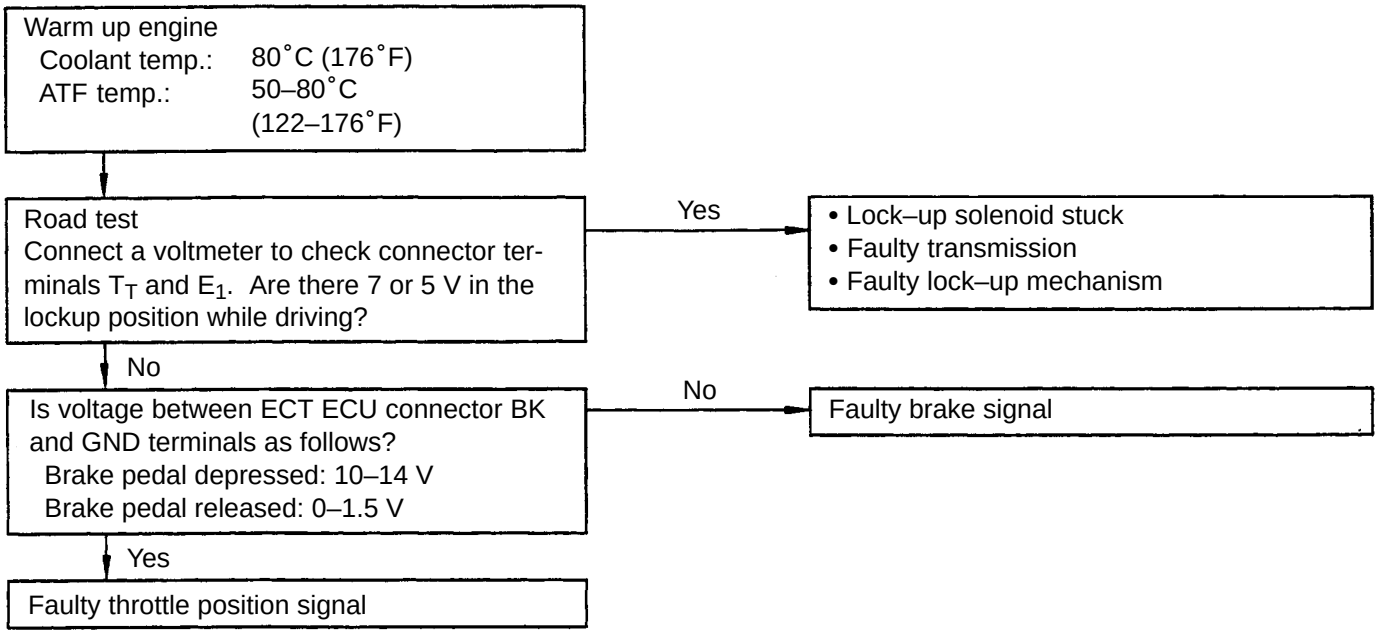
Trouble No.2 Shift point too high or too low

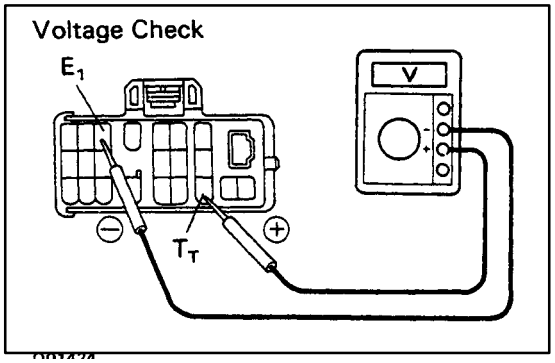


Trouble No.3 No up–shift to overdrive (After warm–up)



Trouble No.4 No lock–up (After warm–up)



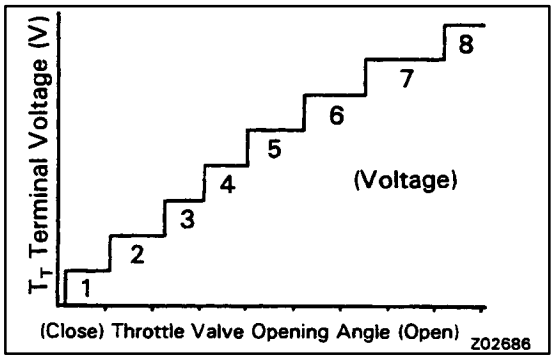


T_T TERMINAL VOLTAGE INSPECTION

1. INSPECT THROTTLE POSITION SENSOR SIGNAL

(a) Turn the ignition switch to ON. Do not start the engine.

(b) Connect a voltmeter to check connector terminals T_T and E_1.



(c) While slowly depressing the accelerator pedal, check that T_T terminal voltage rises in sequence.

If the voltage does not change in proportion to the throttle opening angle, there is a malfunction in the throttle position sensor or circuit.

2. INSPECT BRAKE SIGNAL

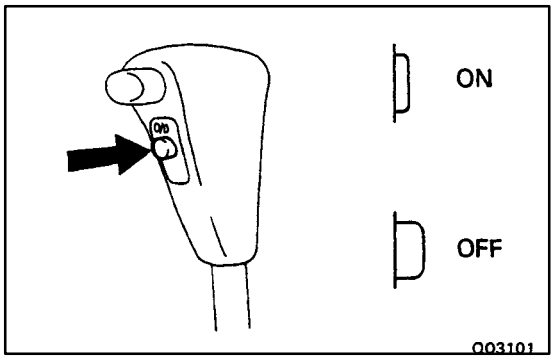
(a) Depress the accelerator pedal until the T_T terminal indicates 8 V.

(b) Depress the brake pedal and check the voltage reading from the T_T terminal.

Brake pedal depressed ..... 0 V

Brake pedal released ..... 8 V

If not as indicated, there is a malfunction in either the stop light switch or circuit.



3. INSPECT EACH UP–SHIFT POSITION

(a) Warm up the engine.

Coolant temperature:

80˚C (176˚F)

(b) Turn the O/D switch to ”ON”.

(c) Place the pattern select switch in ”Normal” and the shift lever into the D range.

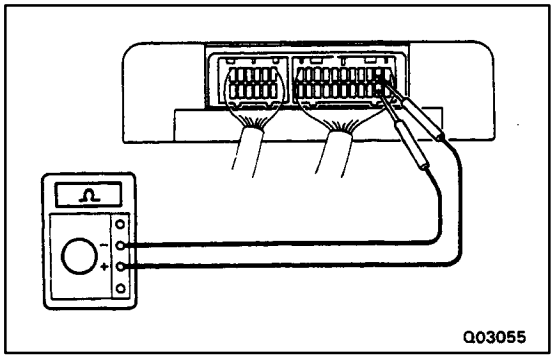
(d) During a road test (about 10 km/h or 6 mph) check that voltage at the T_T terminal is as indicated below for each up–shift position.

If the voltage rises from 0 V to 7 V in the sequence shown, the control system is okay.

The chart on the left shows the voltmeter reading and corresponding gears.

HINT: Determine the gear position by a light shock or change in engine rpm when shifting. The lock–up clutch will turn ON only infrequently during normal 2nd and 3rd gear operation. To trigger this action, press the accelerator pedal to 50% or more of its stroke. At more than 50%, the voltage may change in the sequence 2V–4V –6V–7V.

T_T Terminal (V)	Gear Position
0	1st
2	2nd
4	3rd
5	3rd Lock–up
6	O/D
7	O/D Lock–up



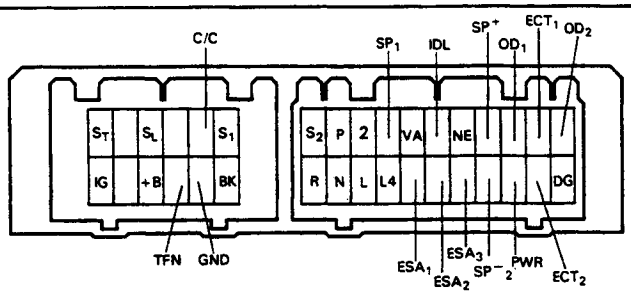
ELECTRONIC CONTROL COMPONENTS INSPECTION

1. INSPECT VOLTAGE OF ECT ECU

(a) Turn on the ignition switch.

(b) Measure the voltage at each terminal.

(1FZ–FE Engine)

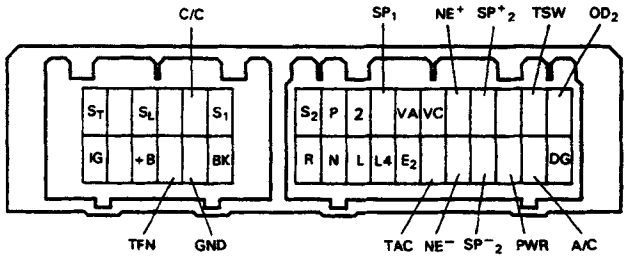


Q03115

Terminal	Measuring condition		Voltage (V)
S1 – GND	Stop vehicle	N range	9 – 14
		D range	9 – 14
S2 – GND	Stop vehicle		0 – 1.5
SL – GND	Stop vehicle		0 – 1.5
ST – GND	Stop vehicle		0 – 1.5
BK – GND	Brake pedal is depressed		7.5 – 14
	Brake pedal is released		0 – 1.5
TFN – GND	Transfer position is N range		0 – 3
	Transfer position is except N range		9 – 14
+ B – GND	Stop engine and ignition switch ON		9 – 14
IG – GND	Stop engine and ignition switch ON		9 – 14
OD_2 – GND	O/D main switch turned ON		9 – 14
	O/D main switch turned OFF		0 – 3
C/C – GND	Stop engine and ignition switch ON		9 – 14
ECT1 – GND	Stop engine and ignition switch ON		9 – 14
OD1 – GND	Water temperature 55°C (131°F) more than		9 – 14
	Water temperature 55°C (131°F) or less		0 – 3
$SP2^+$ – $SP2^-$	Vehicle moving		Pulse generation
SP1 – GND	Vehicle moving		Pulse generation
NE – GND	Engine idling speed		Pulse generation
IDL – GND	Throttle valve fully closed		0 – 3
	Throttle valve fully open		9 – 14
VA – GND	Throttle valve fully closed		3.5 – 4.5
	Throttle valve fully open		2.5 – 3.5

Terminal	Measuring condition	Voltage (V)
2–GND	2 range	7.5–14
	Except 2 range	0–1.5
P–GND	P range	7.5–14
	Except P range	0–1.5
L–GND	L range	7.5–14
	Except L range	0–1.5
N–GND	N range	7.5–14
	Except N range	0–1.5
R–GND	R range	7.5–14
	Except R range	0–1.5
DG–GND	Engine stop and place ignition key at ON position	0–1.5
ECT2–GND	Engine coolant temperature 80˚C (176˚F) more than	2–3
PWR–GND	PWR pattern	7.5–14
	NORM pattern	0–1.5
ESA1–GND	Engine idling speed (Engine start after 10 second)	4.5–5.5
ESA2–GND	Engine idling speed (Engine start after 10 second)	4.5–5.5
ESA3–GND	Engine idling speed (Engine start after 10 second)	4.5–5.5
L4–GND	Transfer position is L4 position	7.5–14
	Transfer position is except L4 position	0–15

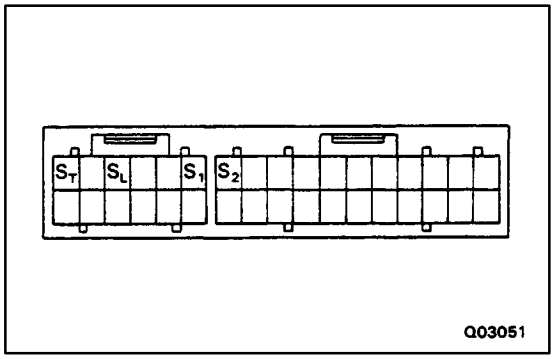
(1HD-T Engine)



Q03115

Terminal	Measuring condition		Voltage (V)
S1 – GND	Stop vehicle	N range	9 – 14
		D range	9 – 14
S2 – GND	Stop vehicle		0 – 1.5
SL – GND	Stop vehicle		0 – 1.5
ST – GND	Stop vehicle		0 – 1.5
BK – GND	Brake pedal is depressed		7.5 – 14
	Brake pedal is released		0 – 1.5
TFN – GND	Transfer position is N range		0 – 3
	Transfer position is except N range		9 – 14
+ B – GND	Stop engine and ignition switch ON		9 – 14
IG – GND	Stop engine and ignition switch ON		9 – 14
OD_2 – GND	O/D main switch turned ON		9 – 14
	O/D main switch turned OFF		0 – 3

Terminal	Measuring condition	Voltage (V)
2–GND	2 range	7.5–14
	Except 2 range	0–1.5
P–GND	P range	7.5–14
	Except P range	0–1.5
L–GND	L range	7.5–14
	Except L range	0–1.5
N–GND	N range	7.5–14
	Except N range	0–1.5
R–GND	R range	7.5–14
	Except R range	0–1.5
DG–GND	Engine stop and place ignition key at ON position	0–1.5
VC–GND	Ignition switch ON	4.5–5.5
TAC–GND	Engine idling speed	Pulse generation
TSW–GND	Water temperature 55˚C (131˚F) more than	9–14
	Water temperature 43˚C (109˚F) or less	0–3
SP2 + – SP2 –	Vehicle moving	Pulse generation
SP1–GND	Vehicle moving	Pulse generation
NE + – NE –	Engine idling speed	Pulse generation
A/C–GND	A/C control switch ON (Engine idling speed)	7.5–14
	A/C control switch OFF	0–1.5
VA–GND	Throttle valve fully closed (Warm up engine and A/C control switch OFF)	2.8–33
	Throttle valve fully open (Warm up engine and A/C control switch OFF)	0.3–0.8
PWR–GND	PWR pattern	7.5–14
	NORM pattern	0–1.5
L4–GND	Transfer position is L4 range	7.5–14
	Transfer position is except L4 range	0–15



2. INSPECT SOLENOID

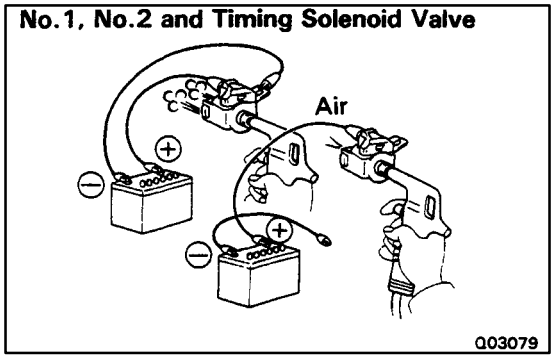
(a) Disconnect the connector from ECT ECU.

(b) Measure the resistance between S_1, S_2, S_L, S_T and ground.

Resistance:

11–15 Ω

(c) Apply battery voltage to each terminal. Check that an operation noise can be heard from the solenoid.

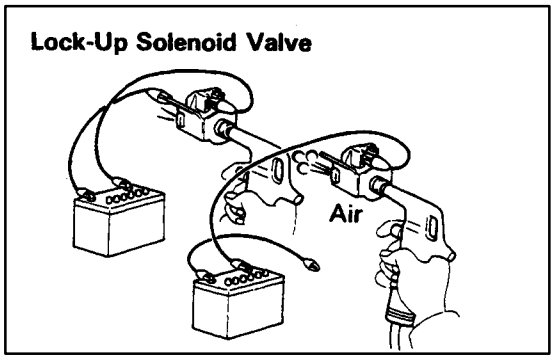


3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

(a) Check No.1, No.2 and timing solenoid valves.

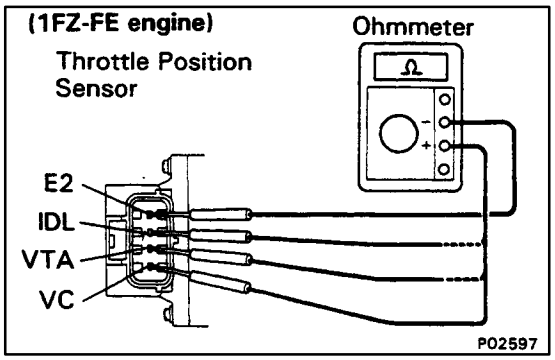
- Check that the solenoid valves do not leak when low–pressure compressed air is applied.
- When supply battery voltage to the solenoids, check that the solenoid valves open.

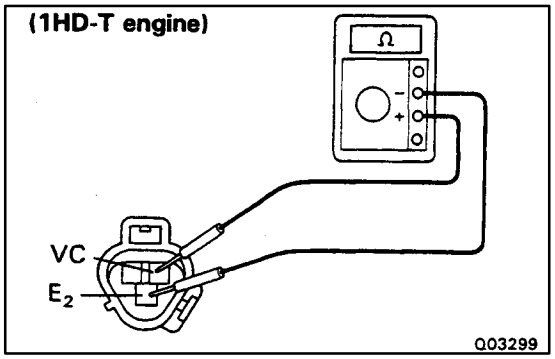


(b) Check the lock–up solenoid valve.

- Apply 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve opens.
- When supply battery voltage to the solenoid, check that the solenoid valve does not leak the air.

If malfunction is found during voltage inspection (step 1.), inspect the components listed below.





4. INSPECT THROTTLE POSITION SENSOR

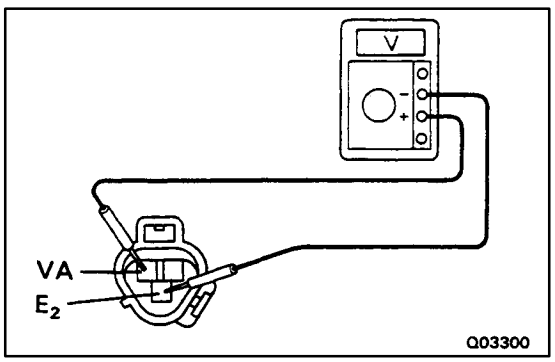
(a) Using an ohmmeter, check the resistance between terminals.

(1FZ–FE)

Terminal	Throttle valve condition	Resistance (kΩ)
IDL–E_2	Fully closed	2.3 kΩ or less
	Open	Infinity
VC–E_2	–	2.5–5.9
VTA–E_2	Fully closed	0.2–5.7
	Fully open	2.0–10.2

(1HD–T)

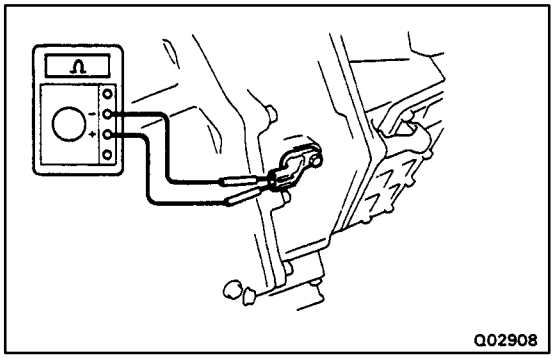
Terminal	Throttle valve condition	Resistance (kΩ)
VC–E	Fully open	1.84–3.42



(b) (1HD–T engine)

When supply 5V to the between VC terminal and E_2 terminal, using a voltmeter, check the voltage between terminals.

Terminal	Throttle valve condition	Resistance (kΩ)
VA–E	Fully open	0.96



5. INSPECT NO.2 SPEED SENSOR

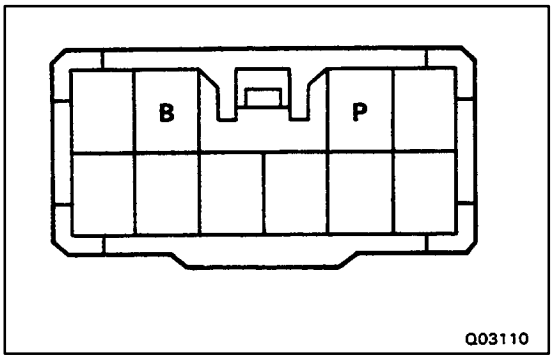
(a) Jack up the rear wheel on one side.

(b) Connect an ohmmeter between the terminals.

(c) Spin the wheel and check that the meter needle defects from 0 to ∞ Ω.

6. INSPECT NO.1 SPEED SENSOR

(See page BE–10)

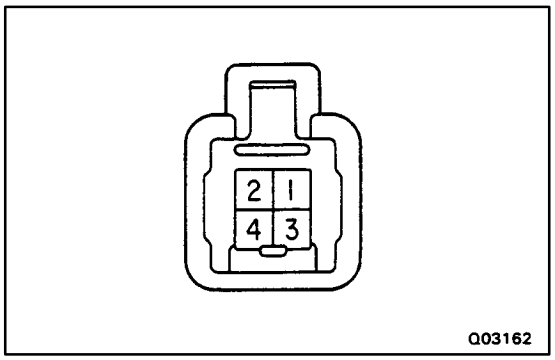


7. INSPECT PATTERN SELECT SWITCH

Using an ohmmeter, check the continuity of terminals for each switch position.

HINT: As there are diodes inside, be careful of the tester probe polarity.

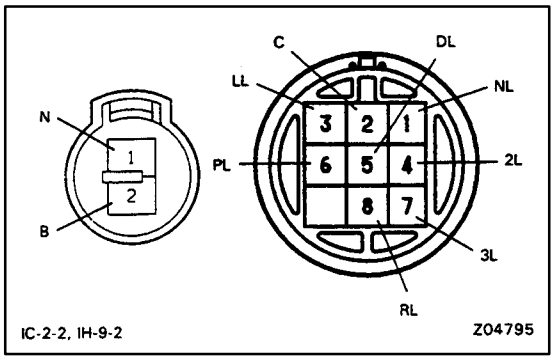
Pattern \ Terminal	B	P
PWR	○——	——○
NORM		



8. INSPECT O/D SWITCH

Using an ohmmeter, check the continuity of the terminals for each switch position.

SW position \ Terminal	2	4
ON		
OFF	○——	——○

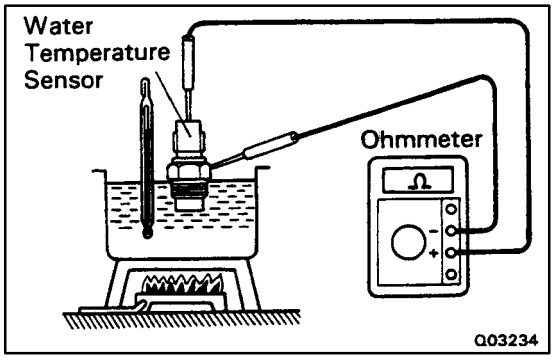


9. INSPECT NEUTRAL START SWITCH

Check that there is continuity between terminals.

○—○ : Continuity

Shift range \ Terminal	B	N	C	PL	RL	NL	DL	3I	2L
P	○—○		○—○						
R			○——	——	○				
N	○—○		○——	——	——	——○			
D			○——	——	——	——	——○		
2			○——	——	——	——	——	——○	
L			○——	——	——	——	——	——	——○



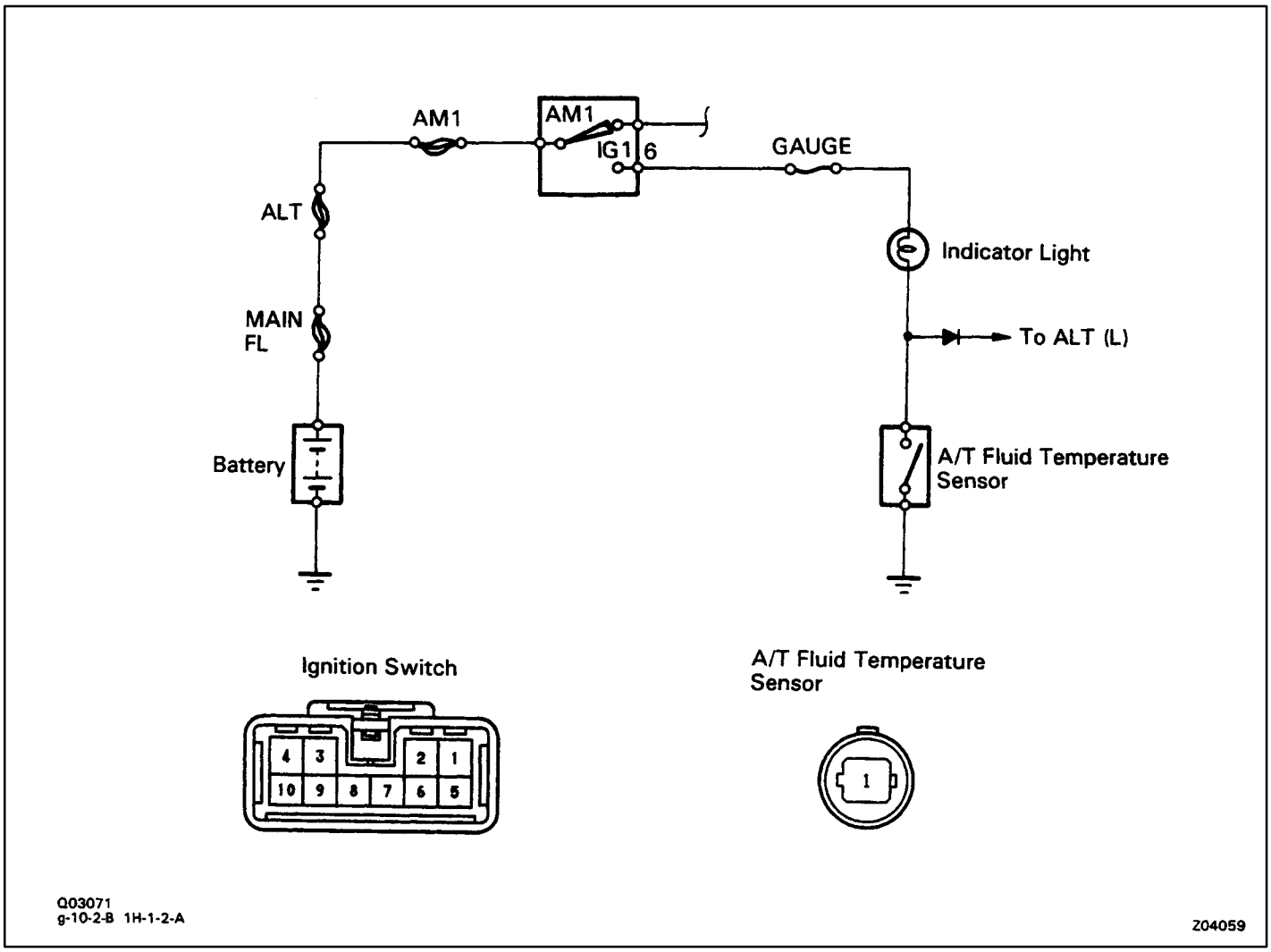
10. (1HD–T engine)

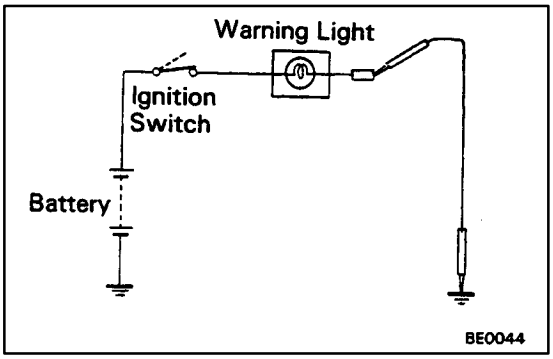
INSPECT WATER TEMPERATURE SWITCH

Check that there is continuity at the temperature of 45°C –55°C (113°F–131°F).

If continuity is not as specified, replace the switch.

A/T FLUID TEMPERATURE WARNING SYSTEM CIRCUIT

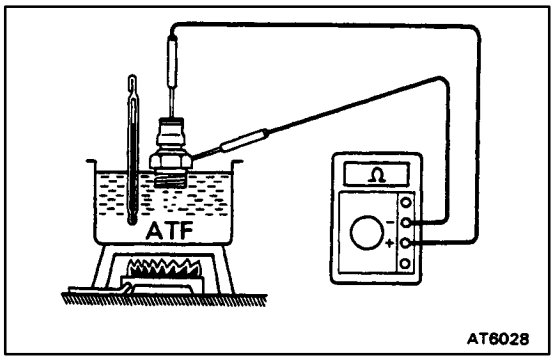




11. INSPECT A/T FLUID TEMPERATURE WARNING LIGHT

(a) Disconnect the connector from the temperature sensor. Connecct terminal of the wire harness side connector and body ground.

(b) Turn the ignition switch ON, check that the light go on. If warning light does not light, test the bulb.



12. INSPECT A/T FLUID TEMPERATURE SENSOR

Check that there is continuity at the temperature of 145˚C–155˚C (325˚F–343˚F).

If continuity is not as specified, replace the sensor.

STALL TEST

The objective of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R ranges.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80˚C, or 122–176˚F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area, which provides good traction.**
- **The stall test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE STALL SPEED

(a) Warm up the transmission fluid.
(b) Check the front and rear wheels.
(c) Connect a tachometer to the engine.
(d) Fully apply the parking brake.
(e) Keep your left foot pressed firmly on the brake pedal.
(f) Start the engine.
(g) Shift into the D range. Step all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the engine speed reaches specified stall speed.

Stall speed:

(1FZ–FE engine) 2,150 ± 150 rpm
(1HD–T engine) 1,950 ± 150 rpm

(h) Perform the same test in R range.

EVALUATION

(a) If the stall speed is the same for both positions but lower than specified value:
- Engine output may be insufficient
- Stator one–way clutch is not operating properly

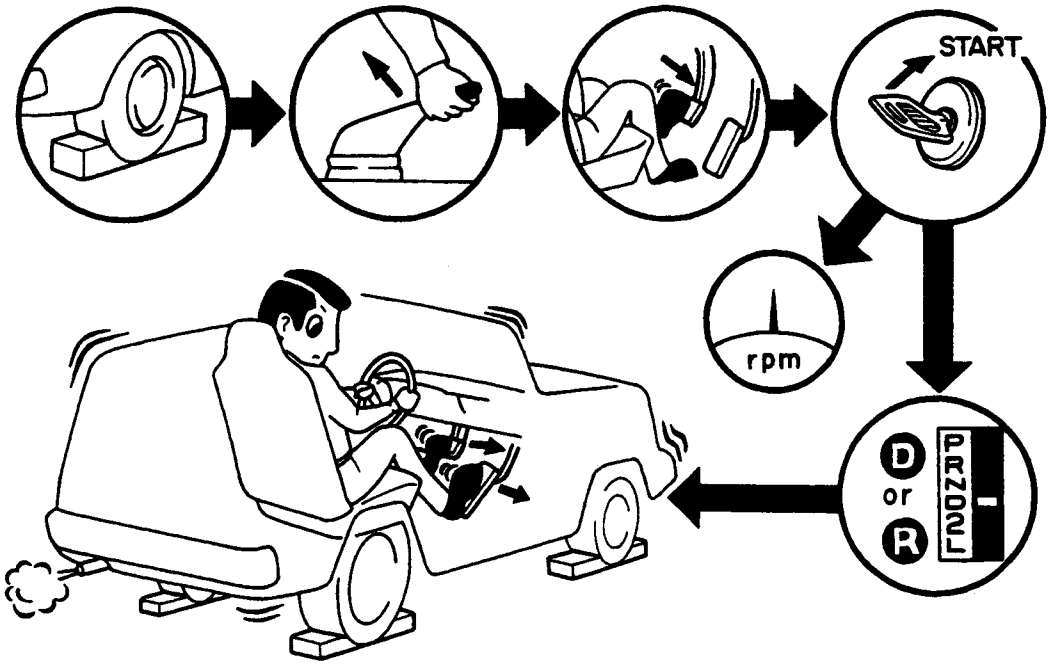
HINT: If more than 600 rpm below the specified value, the torque converter clutch could be faulty.

(b) If the stall speed in D range is higher than specified:
- Line pressure too low
- Forward clutch slipping
- No.2 one–way clutch not operating properly
- O/D one–way clutch not operating properly

(c) If the stall speed in R range is higher than specified:
- Line pressure too low
- Direct clutch slipping
- First and reverse brake slipping
- O/D one–way clutch not operating properly

(d) If the stall speed in both R and D ranges are higher than specified:
- Line pressure too low
- Improper fluid level
- O/D one–way clutch not operating properly

STALL TEST



TIME LAG TEST

When the shift lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, forward clutch, direct clutch and first and reverse brake.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80˚C or 122–176˚F).**
- **Be sure to allow one minute interval between tests.**
- **Make three measurements and take the average value.**

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Start the engine and check the idle speed.

Idle speed:

650 rpm (N range)

(c) Shift the shift lever from N to D range. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag:

Less than 1.0 seconds

(d) In same manner, measure the time lag for N → R.

Time lag:

Less than 1.5 seconds

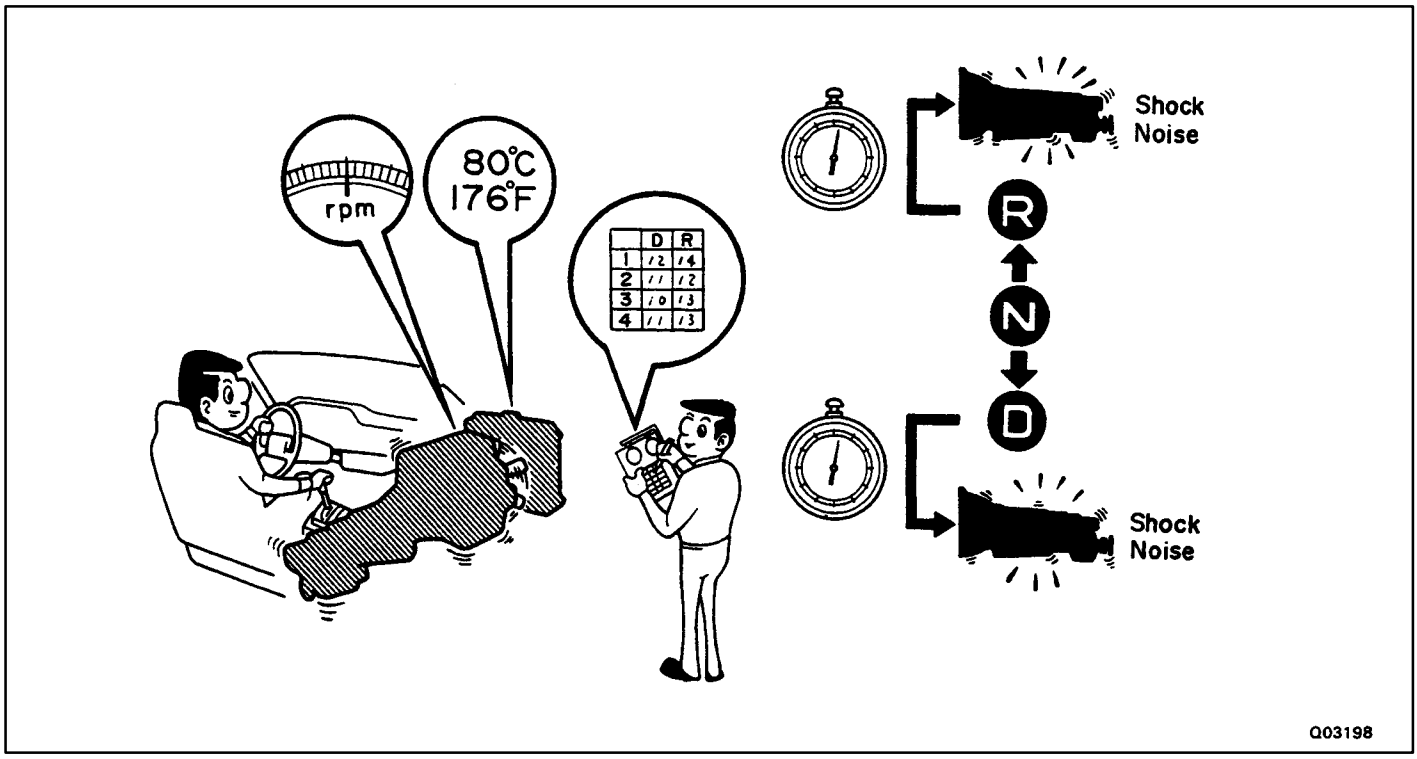
EVALUATION

(a) If N → D time lag is longer than specified:

- Line pressure too low
- Forward clutch worn
- O/D one–way clutch not operating properly

(b) If N → R time lag is longer than specified:

- Line pressure too low
- Direct clutch worn
- First and reverse brake worn
- O/D one–way clutch not operating properly


rpm
80°C
176°F
D R
1 12 14
2 11 12
3 10 13
4 11 13
Shock
Noise
R
N
D
Shock
Noise
Q03198

HYDRAULIC TEST

PREPARATION

(a) Warm up the transmission fluid.

(b) Remove the transmission case test plug and connect the hydraulic pressure gauge.
SST 09992–00094 (Oil pressure gauge)

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80˚C or 122–176˚F).**
- **The line pressure test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE LINE PRESSURE

(a) Fully apply the parking brake and chock the four wheels.

(b) Start the engine and check idling rpm.

(c) Keep your left foot pressed firmly on the brake pedal and shift into D range.

(d) Measure the line pressure when the engine is idling.

(e) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the engine speed reaches specified stall speed.

(f) In the same manner, perform the test in R range.

(1FZ–FE engine) kPa (kgf/cm^2, psi)

D range		R range	
Idling	**Stall**	**Idling**	**Stall**
461–520 (4.7–5.3, 68–77)	971–1,226 (9.9–12.5, 144–181)	657–843 (6.7–8.6, 97–125)	1,648–1,853 (16.8–18.9, 244–274)

(1HD–T engine)

D range		R range	
Idling	**Stall**	**Idling**	**Stall**
431–510 (4.4–5.2, 63–74)	971–1,226 (9.9–12.5, 141–178)	637–843 (6.5–8.6, 92–122)	1,608–1,853 (16.4–18.9, 233–269)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and perform a retest.

EVALUATION

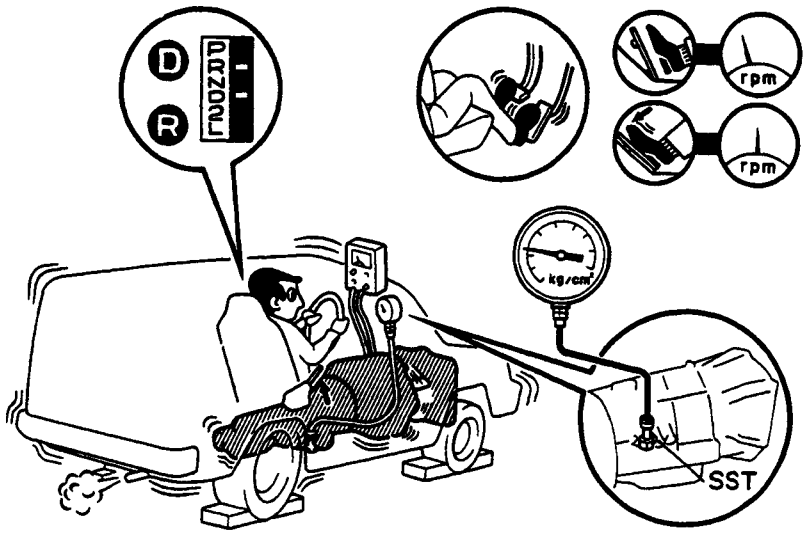
(a) If the measured values at all positions are higher than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective

(b) If the measured values at all positions are lower than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective

(c) If pressure is low in the D range only:
- D range circuit fluid leakage
- Forward clutch defective

(d) If pressure is low in the R range only:
- R range circuit fluid leakage
- Direct clutch defective
- First and reverse brake defective

HYDRAULIC TEST



Q03199

ROAD TEST

NOTICE: Perform the test at normal operating fluid temperature (50–80˚C or 122–176˚F).

1. D RANGE TEST IN NORM AND PWR PATTERN RANGES

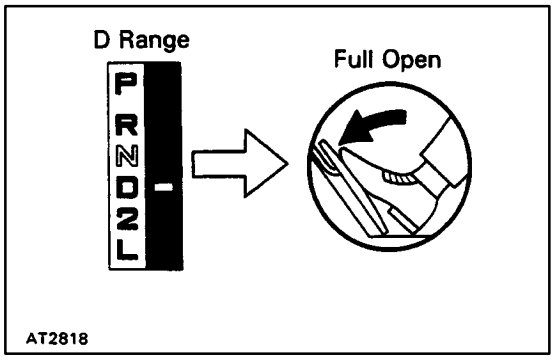
Shift into the D range and hold the accelerator pedal constant at the full throttle valve opening position.

Check the following:

(a) 1–2, 2–3 and 3–O/D up–shifts should take place, and shift points should conform to those shown in the automatic shift schedule.

Conduct a test under both Normal and Power patterns.

HINT: There is no O/D up–shift or lock–up when the coolant temperature is below 55˚C (131˚F).



EVALUATION

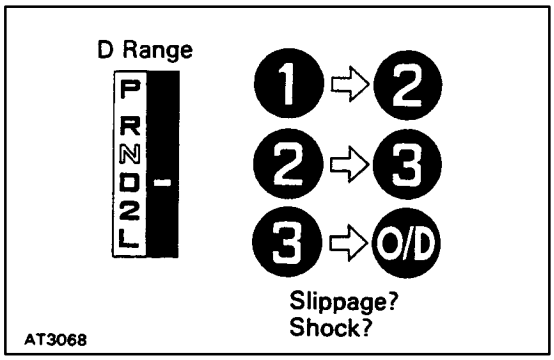
(1) If there is no 1 → 2 up–shift:
- No.2 solenoid is stuck.
- 1–2 shift valve is stuck.

(2) If there is no 2 → 3 up–shift:
- No.1 solenoid is stuck.
- 2–3 shift valve is stuck.

(3) If there is no 3 → O/D up–shift:
- 3–4 shift valve is stuck.

(4) If the shift point is defective:
- Throttle valve, 1–2 shift valve, 2–3 shift valve, 3 –4 shift valve etc., are defective.

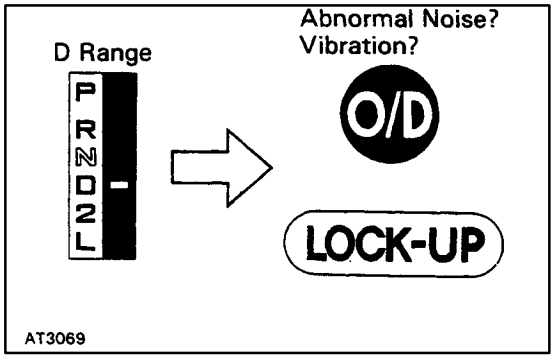
(5) If the lock–up is defective:
- Lock–up solenoid is stuck.
- Lock–up relay valve is stuck.



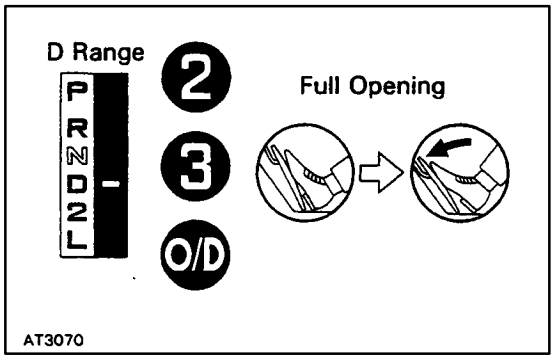
(b) In the same manner, check the shock and slip at the 1 → 2, 2 → 3, and 3 → O/D up–shifts.

EVALUATION

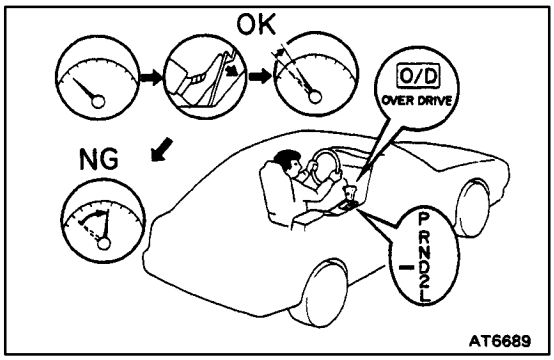
If the shock is excessive:
- Line pressure is too high.
- Accumulator is defective.
- Check ball is defective.



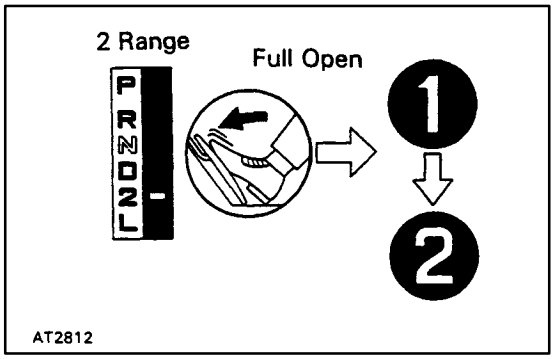
(c) Run at the D Range lock–up or O/D gear and check for abnormal noise and vibration.
HINT: The check for the cause of abnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in the propeller shaft, differential, torque converter, etc.



(d) While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick–downs conform to those indicated on the automatic shift schedule.
(e) Check for abnormal shock and slip at kick–down.



(f) Check for the lock–up mechanism.
(1) Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 95 km/h (59 mph).
(2) Lightly depress the accelerator pedal and check that the engine rpm does not change abruptly.
If there is a big jump in engine rpm, there is no lock–up.



2. 2 RANGE TEST

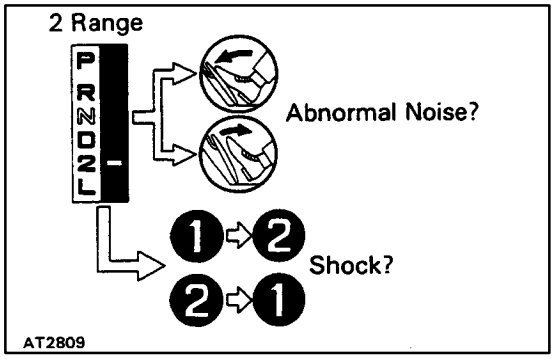
Shift into the 2 range and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check on the following points.

(a) Check to see that the 1 → 2 up–shift takes place and that the shift point conforms to it shown on the automatic shift schedule.
HINT: There is no O/D up–shift and lock–up in the 2 position.
(b) While running in the 2 range and 2nd gear, release the acclerator pedal and check the engine braking effect.

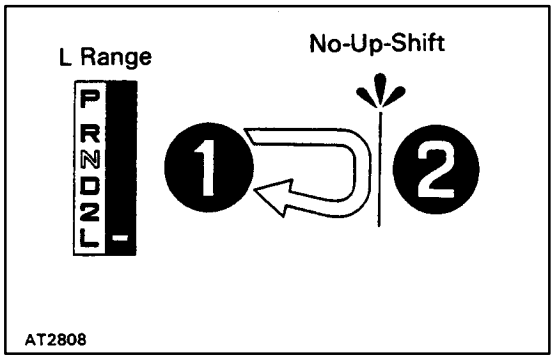
EVALUATION

If there is no engine braking effect:

- Second coast brake is defective.

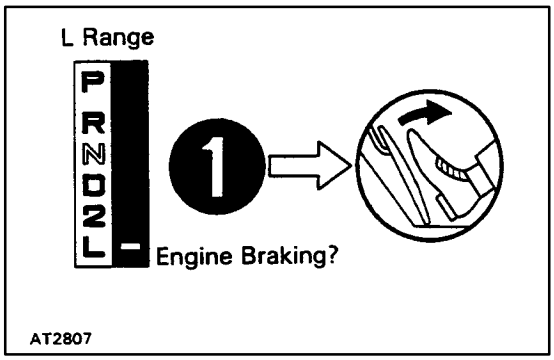


(c) Check for abnormal noise at acceleration and deceleration, and for shock at up–shift and down–shift.



3. L RANGE TEST

(a) While running in the L range, check to see that there is no up–shift to 2nd gear.

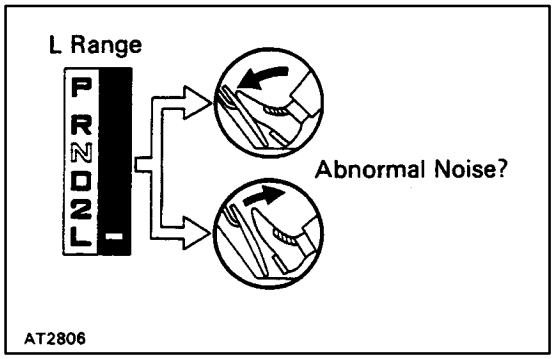


(b) While running in the L range, release the accelerator pedal and check the engine braking effect.

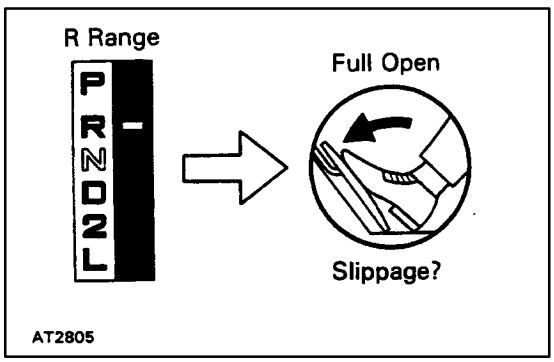
EVALUATION

If there is no engine braking effect:

- First and reverse brake is defective.

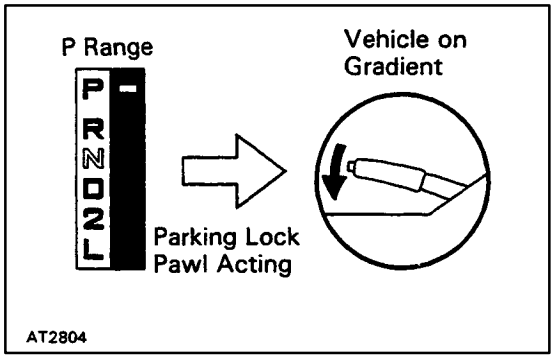


(c) Check for abnormal noise during acceleration and deceleration.



4. R RANGE TEST

Shift into the R range and, while starting at full throttle, check for slipping.



5. P RANGE TEST

Stop the vehicle on a gradient (more than 5˚) and after shifting into the P range, release the parking brake. Then check to see that the parking lock pawl holds the vehicle in place.

AUTOMATIC SHIFT SCHEDULE

Engine: 1FZ–FE

Tire size: 7.50R16–6

km/h (mph)

Throttle valve opening		100 %			5 %		100 %		
Gear position		1 → 2	2 → 3	3 → O/D	Lock–up ON	Lock–up OFF	O/D → 3	3 → 2	2 → 1
D position	Normal mode	53–60 (33–37)	108–122 (67–76)	153–170 (95–106)	61–69 (38–43)	55–63 (34–39)	147–163 (91–101)	99–109 (62–68)	42–49 (26–30)
	Power mode	53–60 (33–37)	108–122 (67–76)	153–170 (95–106)	89–99 (55–62)	73–80 (45–50)	147–163 (91–101)	99–109 (62–68)	42–49 (26–30)
2 position	Normal mode Power mode	–	–	–	–	–	–	118–132 (73–82)	–
L position	Normal mode Power mode	–	–	–	–	–	–	–	60–68 (37–42)

Engine: 1FZ–FE

Tire size: 245/85–R16

km/h (mph)

Throttle valve opening		100 %			5 %		100 %		
Gear position		1 → 2	2 → 3	3 → O/D	Lock–up ON	Lock–up OFF	O/D → 3	3 → 2	2 → 1
D position	Normal mode	56–62 (35–39)	114–125 (71–78)	161–174 (100–108)	64–70 (40–43)	58–64 (36–40)	154–167 (96–103)	105–112 (65–70)	44–48 (27–30)
	Power mode	56–62 (35–39)	114–125 (71–78)	161–174 (100–108)	93–100 (58–62)	73–80 (45–50)	154–167 (96–103)	105–112 (65–70)	44–48 (27–30)
2 position	Normal mode Power mode	–	–	–	–	–	–	124–135 (77–84)	–
L position	Normal mode Power mode	–	–	–	–	–	–	–	63–69 (39–43)

Engine: 1FZ–FE

Tire size: 215/80–R16

km/h (mph)

Throttle valve opening		100 %			5 %		100 %		
Gear position		1 → 2	2 → 3	3 → O/D	Lock–up ON	Lock–up OFF	O/D → 3	3 → 2	2 → 1
D position	Normal mode	49–54 (30–34)	101–111 (63–69)	143–153 (89–95)	63–69 (39–43)	57–63 (35–39)	137–147 (85–91)	93–99 (58–62)	40–45 (25–28)
	Power mode	49–54 (30–34)	101–111 (63–69)	143–153 (89–95)	83–89 (52–55)	72–78 (45–48)	137–147 (85–91)	93–99 (58–62)	40–45 (25–28)
2 position	Normal mode Power mode	–	–	–	–	–	–	110–119 (68–74)	–
L position	Normal mode Power mode	–	–	–	–	–	–	–	56–61 (34–38)

Engine: 1FZ–FE
Tire size: 275/70–R16

km/h (mph)

Throttle valve opening		100 %			5 %		100 %		
Gear position		1 → 2	2 → 3	3 → O/D	Lock–up ON	Lock–up OFF	O/D → 3	3 → 2	2 → 1
D position	Normal mode	52–58 (32–36)	106–117 (66–73)	152–163 (94–101)	60–66 (37–41)	55–60 (34–37)	145–156 (90–97)	98–104 (61–65)	42–47 (26–29)
	Power mode	52–58 (32–36)	106–117 (66–73)	152–163 (94–101)	88–94 (55–58)	68–74 (42–46)	145–156 (90–97)	98–104 (61–65)	42–47 (26–29)
2 position	Normal mode Power mode	–	–	–	–	–	–	116–127 (72–79)	–
L position	Normal mode Power mode	–	–	–	–	–	–	–	59–65 (37–40)

Engine: 1HD–T
Tire size: 7.50R16–6

km/h (mph)

Throttle valve opening		100 %			5 %		100 %		
Gear position		1 → 2	2 → 3	3 → O/D	Lock–up ON	Lock–up OFF	O/D → 3	3 → 2	2 → 1
D position	Normal mode	41–47 (25–29)	81–90 (50–56)	122–136 (76–85)	56–64 (35–40))	50–58 (31–36)	115–129 (71–80)	75–82 (47–51)	33–39 (21–24)
	Power mode	41–47 (25–29)	81–90 (50–56)	122–136 (76–85)	78–87 (48–54)	72–80 (45–50)	115–129 (71–80)	75–82 (47–51)	34–41 (21–25)
2 position	Normal mode Power mode	–	–	–	–	–	–	89–98 (55–61)	–
L position	Normal mode Power mode	–	–	–	–	–	–	–	38–45 (24–28)

Engine: 1HD–T
Tire size: 245/85–R16

km/h (mph)

Throttle valve opening		100 %			5 %		100 %		
Gear position		1 → 2	2 → 3	3 → O/D	Lock–up ON	Lock–up OFF	O/D → 3	3 → 2	2 → 1
D position	Normal mode	43–49 (27–30)	85–92 (53–57)	129–140 (80–87)	59–65 (37–40)	53–59 (33–36)	121–132 (75–82)	75–82 (47–51)	34–40 (21–25)
	Power mode	43–49 (27–30)	85–92 (53–57)	129–140 (80–87)	82–89 (51–55)	75–82 (47–51)	121–132 (75–82)	75–82 (47–51)	36–42 (22–26)
2 position	Normal mode Power mode	–	–	–	–	–	–	93–100 (58–62)	–
L position	Normal mode Power mode	–	–	–	–	–	–	–	40–46 (25–29)

Engine: 1HD–T
Tire size: 215/80–R16

km/h (mph)

Throttle valve opening		100 %			5 %		100 %		
Gear position		1 → 2	2 → 3	3 → O/D	Lock–up ON	Lock–up OFF	O/D → 3	3 → 2	2 → 1
D position	Normal mode	37–42 (23–26)	76–81 (47–50)	113–123 (70–76)	53–58 (33–36)	47–52 (29–32)	108–117 (67–73)	67–72 (42–44)	30–35 (19–22)
	Power mode	37–42 (23–26)	76–81 (47–50)	113–123 (70–76)	73–79 (45–49)	66–72 (41–45)	108–117 (67–73)	67–72 (42–44)	32–37 (20–23)
2 position	Normal mode	—	—	—	—	—	—	83–89 (52–55)	—
	Power mode								
L position	Normal mode	—	—	—	—	—	—	—	35–40 (22–25)
	Power mode								

Engine: 1HD–T
Tire size: 275/70–R16

km/h (mph)

Throttle valve opening		100 %			5 %		100 %		
Gear position		1 → 2	2 → 3	3 → O/D	Lock–up ON	Lock–up OFF	O/D → 3	3 → 2	2 → 1
D position	Normal mode	41–46 (25–29)	80–86 (50–53)	120–131 (75–81)	56–61 (35–38)	50–55 (31–34)	114–124 (71–77)	70–76 (43–47)	32–37 (20–23)
	Power mode	41–46 (25–29)	80–86 (50–53)	120–131 (75–81)	77–83 (48–52)	70–76 (43–47)	114–124 (71–77)	70–76 (43–47)	34–39 (21–24)
2 position	Normal mode	—	—	—	—	—	—	88–94 (55–58)	—
	Power mode								
L position	Normal mode	—	—	—	—	—	—	—	38–43 (24–27)
	Power mode								

TROUBLESHOOTING MATRIX CHART

You will find the troubles easier using the table will shown below. In this table, each number shows the priority of cause in troubles. Check each part in order. If necessary, replace these parts.

(ON–VEHICLE)

See Page		★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	AT–57	★	★	★
Parts Name / Trouble		1–2 shift valve	2–3 shift valve	3–4 shift valve	Low coast modulator valve	Reverse control valve	Manual valve	No. 1 solenoid	No. 2 solenoid	Timing solenoid	Lock–up solenoid	C_0 exhaust valve	B_0 accumulator	C_1 accumulator	B_1 accumulator	C_2 accumulator	2–3 shift timing valve	modulator valve	Accumulator control valve	Lock–up signal valve	Lock–up control valve	OFF–vehicle repair matrix chart	ECT ECU	Throttle cable	Check ball
Does not move in any forward range																						1			
Does not move in reverse range						3		2	2													4	1		
Does not move in any range							2															3	1		
No up–shift	1st → 2nd	3							2													4	1		
	2nd → 3rd		3					2														4	1		
	3rd → O/D			3					2													4	1		
No down–shift	O/D → 3rd			3					2													4	1		
	3rd → 2nd		3					2														4	1		
	2nd → 1st	3							2			4											1		
Shift point too high or too low																							1	2	
Harsh engagement	"N" → "R"															1						3			
	"N" → "D"													1					2			3			
	"N" → "D", "N" → "R"																		3			2		1	
	1st → 2nd														4				5			6	1	2	3
	2nd → 3rd									3						5	4		6			7	1	2	
	3rd → O/D												4						5			6	1	2	3
	1st → 2nd → 3rd → O/D																		2			3		1	
	O/D → 3rd																					4	1	2	3
	3rd → 2nd									3					6		5		7			8	1	2	4
Slip	Forward & Reverse																					1			
	"R" range																					1			
	1st																					1			
	2nd																					1			
	3rd																					1			
	O/D																					1			
No engine braking	1st ("L" range)				4				2	3								5				6	1		
	2nd ("2" range)																					1			
No kick–down		4	4	4				3	3														1	2	
Poor acceleration									2			3										4	1		
No lock–up											2									3	4	5	1		

Remark ★ : Refer to A442F Automatic Transmission Repair Manual. (Pub. No. RM314E)

(OFF–VEHICLE)

See Page / Parts Name / Trouble		AT–76	★	★	★	★	★	★	★	★	★	AT–56	★	★
		Torque converter	Oil Pump	O/D Brake (B_0)	2nd Brake (B_1)	1st and reverse brake (B_2)	O/D direct clutch (C_0)	Front clutch (C_1)	Rear clutch (C_2)	O/D one–way clutch (F_0)	No. 2 one–way clutch (F_2)	ON–Vehicle matrix chart	Front planetary gear	Rear planetary gear
Does not move in any forward range								1						
Does not move in reverse range						3			2			1		
Does not move in any range		1	3				2			4			5	6
No up–shift	1st → 2nd				2						3	1		
	2nd → 3rd						2	3				1		
	3rd → O/D			2								1		
No down–shift	O/D → 3rd						2			3		1		
	3rd → 2nd					2						1		
	2nd → 1st						2				3	1		
Shift point too high or too low												1		
Harsh engagement	"N" → "R"					3			2			1		
	"N" → "D"							2			3	1		
	"N" → "D", "N" → "R"						2			3		1		
	1st → 2nd				2							1		
	2nd → 3rd						3		2			1		
	3rd → O/D			2								1		
	1st → 2nd → 3rd → O/D							2				1		
	O/D → 3rd						2			3		1		
	3rd → 2nd				2							1		
Slip	Forward & Reverse	2	3							4		1		
	"R" range					2			1					
	1st							1			2			
	2nd							2						
	3rd							2	3					
	O/D			3				1	2					
No engine braking	1st ("L" range)					2						1		
	2nd ("2" range)						2					1		
No kick–down												1		
Poor acceleration		2					3					1		
No lock–up		2										1		

Remark ★: Refer to A442F Automatic Transmission Repair Manual. (Pub. No. RM314E)

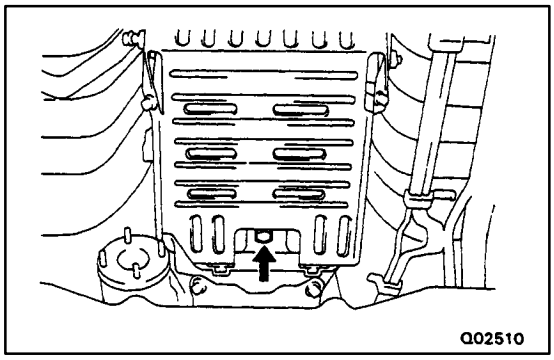
VALVE BODY

VALVE BODY REMOVAL

1. REMOVE TRANSMISSION AND TRANSFER UNDER COVER

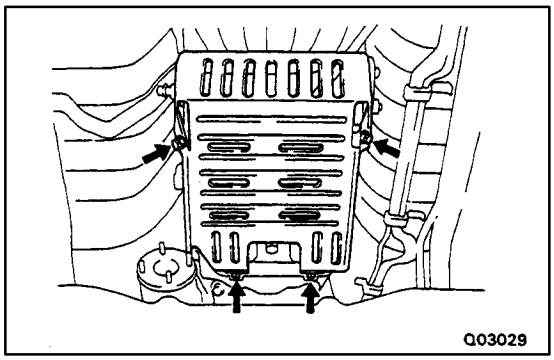
2. CLEAN TRANSMISSION EXTERIOR

To prevent contamination, clean the exterior transmission.



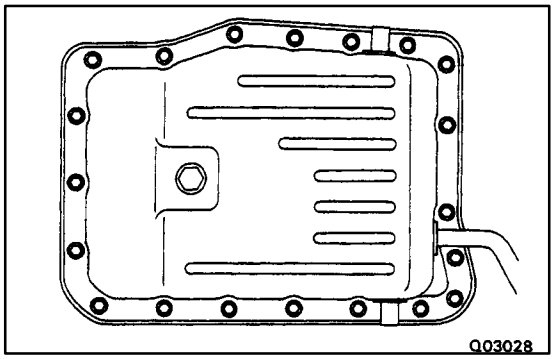
3. DRAIN TRANSMISSION FLUID

Remove the drain plug and drain fluid into a suitable container.



4. REMOVE OIL PAN PROTECTOR

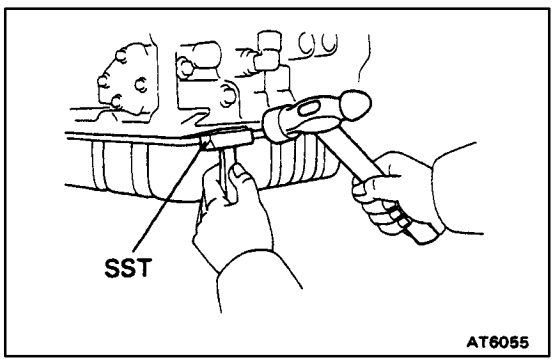
Remove the four bolts and the oil pan protector.



5. REMOVE OIL PAN AND GASKET

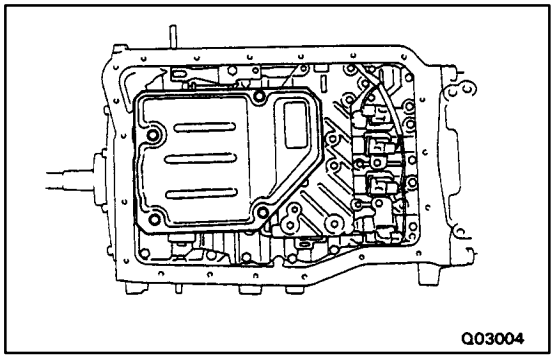
NOTICE: Some fluid will remain in the oil pan. Be careful not to damage the filler tube.

(a) Remove the twenty bolts.



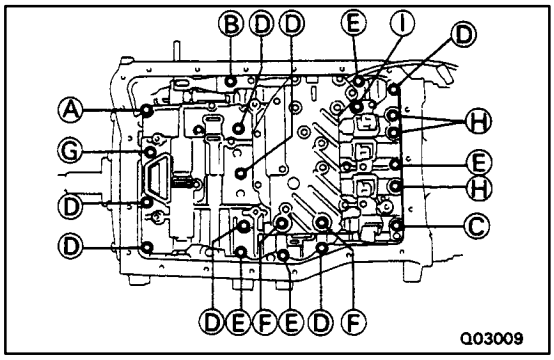
(b) Install the blade off SST between the transmission and oil pan, cut–off applied sealer.
SST 09302–00100

NOTICE: Be careful not to damage the oil pan flange.



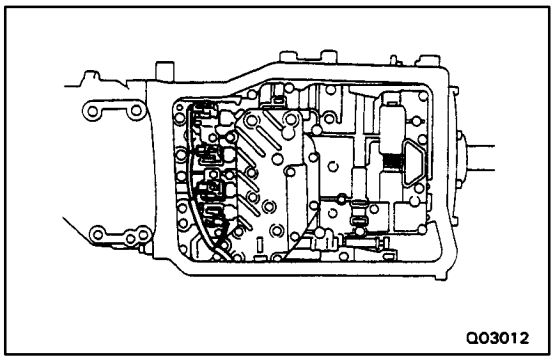
6. REMOVE OIL STRAINER

Remove the four bolts and oil strainer.

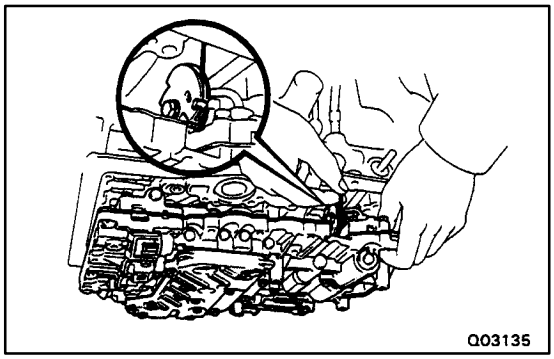


7. REMOVE VALVE BODY

(a) Remove the twenty–one bolts.

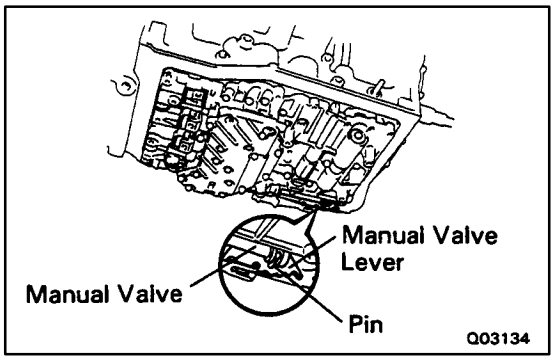


(b) Disconnect the four connectors from the solenoids.



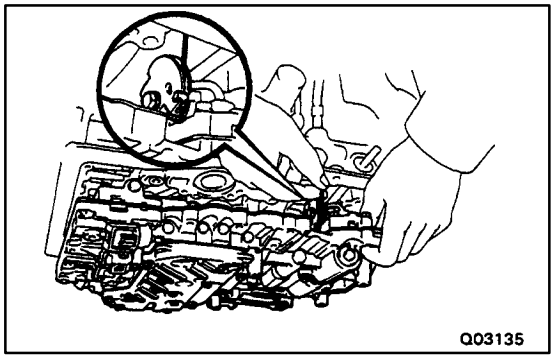
(c) Remove the throttle cable the cam and remove the valve body.

VALVE BODY INSTALLATION

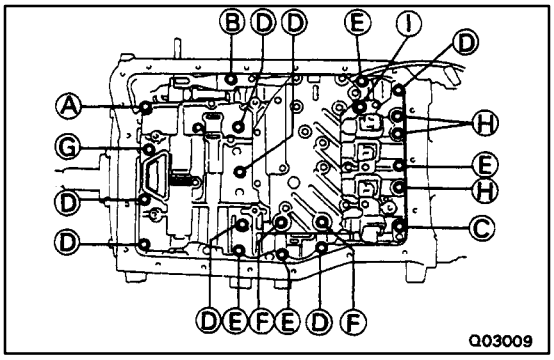


1. INSTALL VALVE BODY

(a) Align the groove of the manual valve with the pin of the manual valve lever.



(b) Connect the throttle cable to the cam.

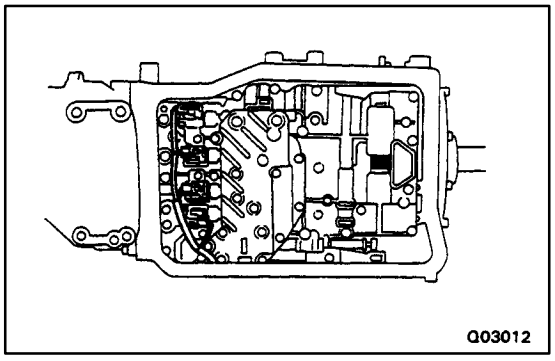


(c) Install the other bolts.
HINT: Each bolt length is indicated below.
Bolt length:

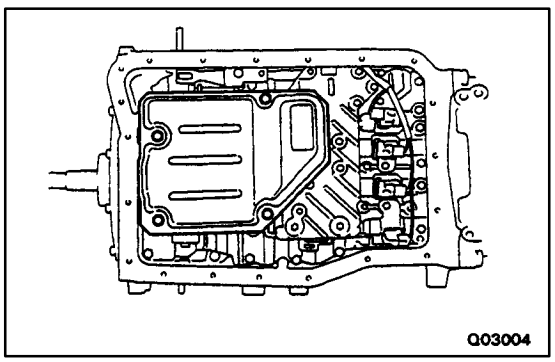
A 41 mm (1.61 in.)
B 45 mm (1.77 in.)
C 22 mm (0.87 in.)
D 32 mm (1.26 in.)
E 28 mm (1.10 in.)
F 52 mm (2.05 in.)
G 40 mm (1.57 in.)
H 22 mm (0.87 in.)
I 42 mm (1.65 in.)

(d) Check that the manual valve lever contacts the center of the roller at the tip of the detente spring.

(e) Tighten the bolts.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)



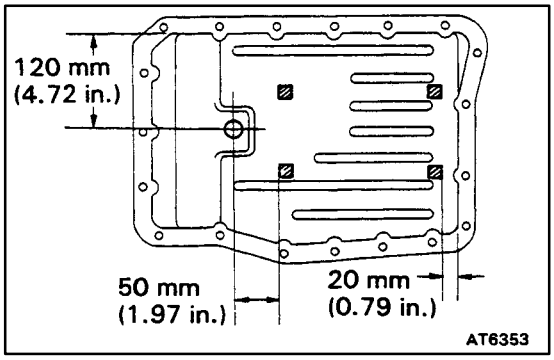
2. CONNECT FOUR SOLENOID CONNECTORS



3. INSTALL OIL STRAINER

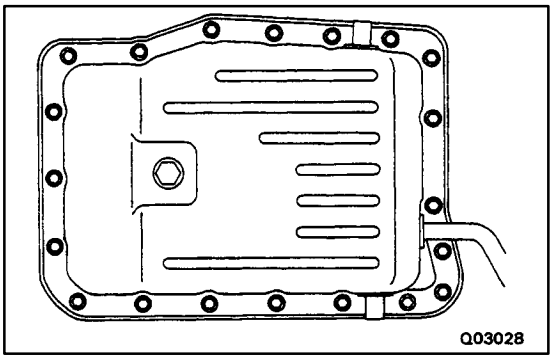
Install a new gasket and the oil strainer with the four bolts.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)
Bolt length:

16 mm (0.63 in.)



4. INSTALL MAGNETS IN PAN

Install the two magnets in the oil pan as shown in the illustration.



5. INSTALL OIL PAN

(a) Remove any packing material and be careful not to drop oil on the contacting surface of the transmission case and oil pan.

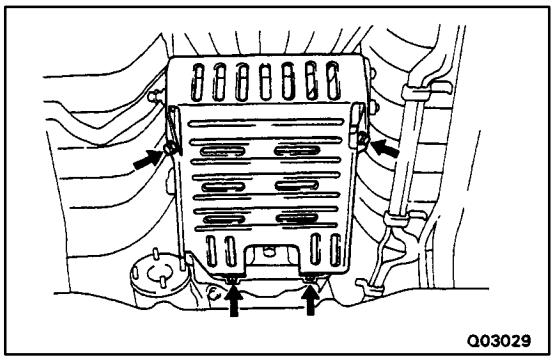
(b) Apply seal packing to the oil pan.

Seal packing:

Part No. 08826–00090, THREE BOND 1281B or equivalent

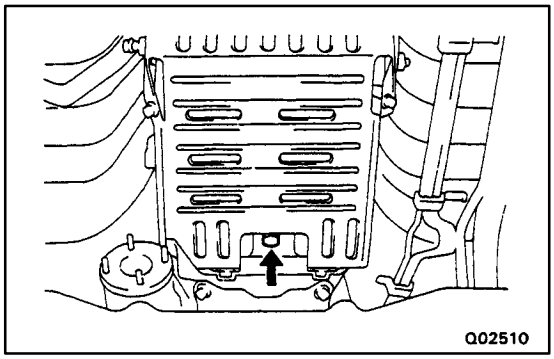
(c) Install and tighten the twenty bolts.

Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)



6. INSTALL OIL PAN PROTECTOR

Install the protector with the four bolts.



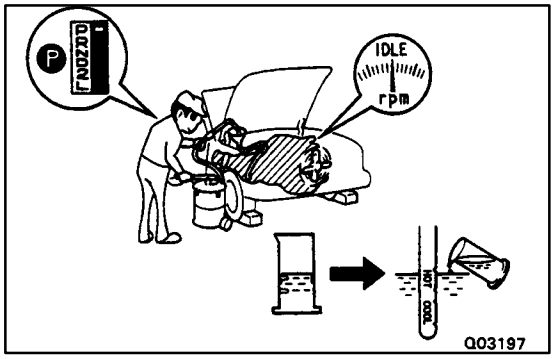
7. INSTALL DRAIN PLUG

(a) Install the drain plug with a new gasket.

(b) Torque the drain plug.

Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

8. INSTALL TRANSMISSION UNDER COVER AND TRANSFER UNDER COVER



9. FILL TRANSMISSION WITH ATF

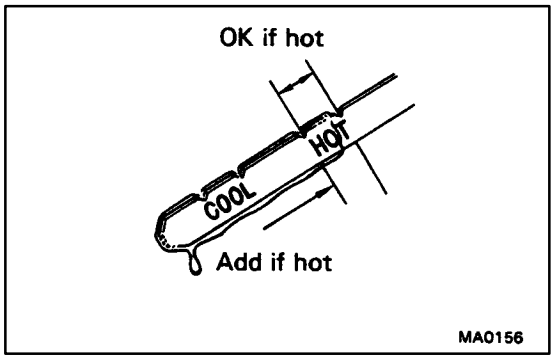
Capacity:

6.0 liters (6.3 US qts, 5.3 lmp.qts)

NOTICE: Do not overfill.

Fluid type:

ATF DEXRON® II



10. CHECK FLUID LEVEL

(See page AT–25)

THROTTLE CABLE

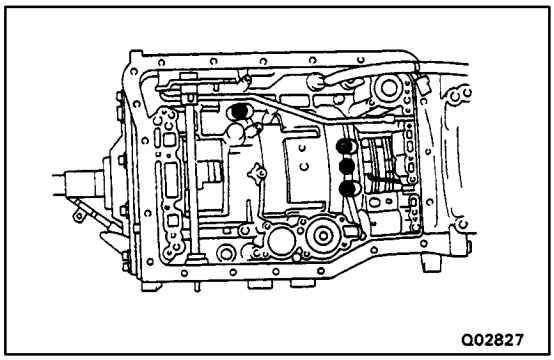
THROTTLE CABLE REMOVAL

1. REMOVE FRONT PROPELLER SHAFT
(See Pub No. RM184E, page PR–3)

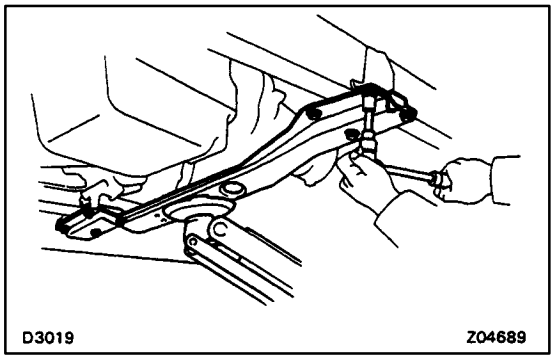
2. DISCONNECT THROTTLE CABLE

(a) Disconnect the cable housing from the bracket.
(b) Disconnect the cable from the throttle linkage.
(c) Disconnect the cable from the torque converter housing.

3. REMOVE VALVE BODY
(See page AT–58)



4. REMOVE FOUR CENTER SUPPORT APPLY GASKETS

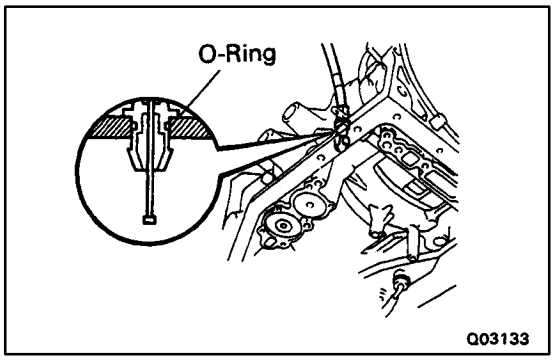


5. REMOVE FRAME CROSSMEMBER SET BOLTS

(a) Support the frame crossmember with a jack.
(b) Remove the eight set bolts.

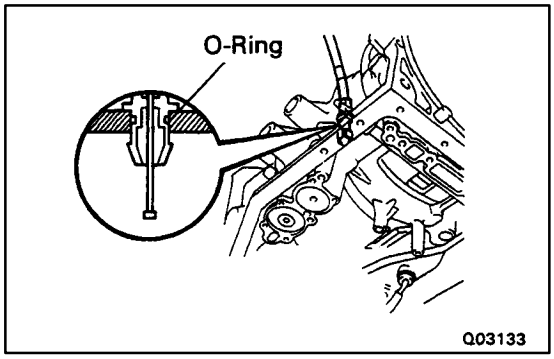
6. REMOVE THROTTLE CABLE CLAMP

(a) Lower the jack.
(b) Remove the cable clamp from the transmission housing.



7. REMOVE THROTTLE CABLE

Using 10 mm socket driver, remove the throttle cable by pushing the retainer portion of the throttle cable.



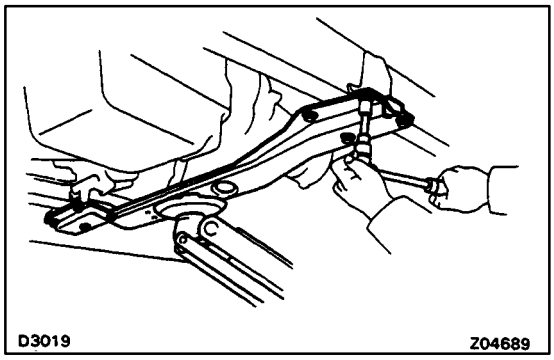
THROTTLE CABLE INSTALLATION

1. INSTALL CABLE IN TRANSMISSION CASE

(a) Coat a new O–ring with ATF, and install it to the cable.

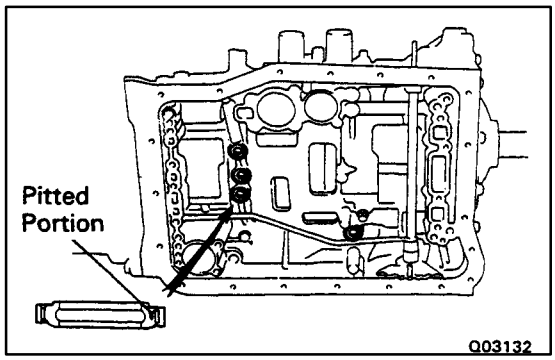
(b) Install the cable to the transmission case.

2. INSTALL THROTTLE CABLE CLAMP TO TRANSMISSION HOUSING



3. INSTALL FRAME CROSSMEMBER SET BOLTS

Torque: 61 N·m (620 kgf·cm, 45 ft·lbf)



4. INSTALL FOUR CENTER SUPPORT APPLY GASKET

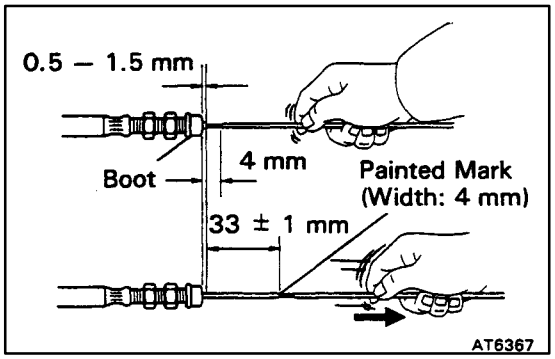
Install new four gaskets, facing the pitted side toward the transmission case.

5. INSTALL VALVE BODY

(See page AT–59)

6. INSTALL FRONT PROPELLER SHAFT

(See Pub No. RM 184E, page PR–8)



7. IF THROTTLE CABLE IS NEW, PAINT MARK ON INNER CABLE

HINT: New cable do not have a cable stopper installed. Therefore to mark adjustment possible, paint a mark as described below.

(a) Connect the throttle cable to the throttle cam of valve body.

(b) Pull the inner cable lightly until resistance is felt, and hold it.

(c) Paint a mark as shown, about 4 mm (0.16 in.) in width.

(d) Pull the inner cable fully, measure the cable stroke.

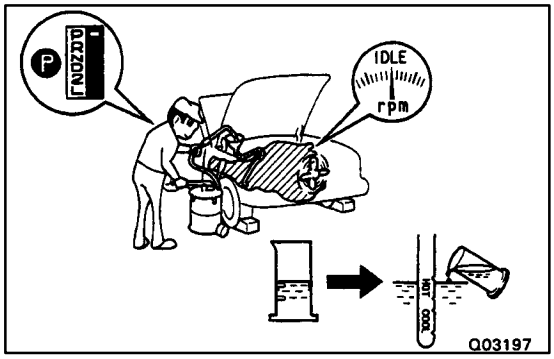
Cable stroke:

33 ± 1 mm (1.30 ± 0.04 in.)

8. CONNECT THROTTLE CABLE

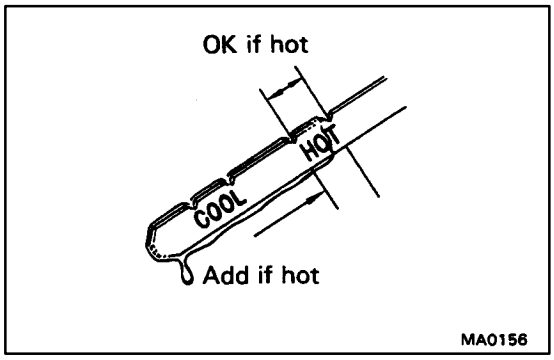
(a) Connect the cable to the throttle linkage.

(b) Connect the cable housing to the bracket on the valve cover.



9. ADJUST THROTTLE CABLE
(See page AT–26)

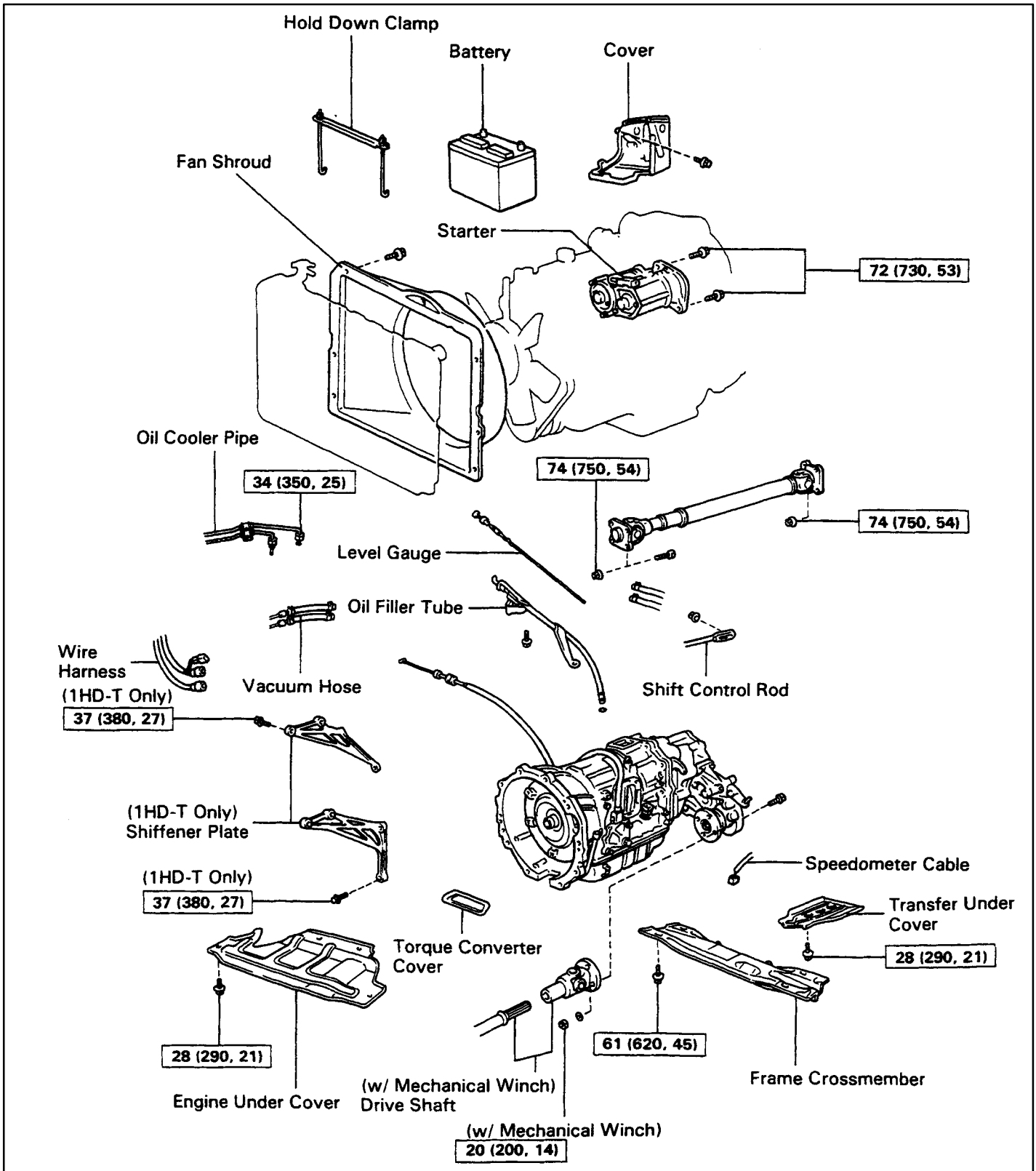
10. FILL TRANSMISSION WITH ATF
Capacity:
6.0 liters (6.3 US qts, 5.3 lmp.qts)
NOTICE: Do not overfill.
Fluid type:
ATF DEXRON® II



11. CHECK FLUID LEVEL
(See page AT–25)

ASSEMBLY REMOVAL AND INSTALLATION

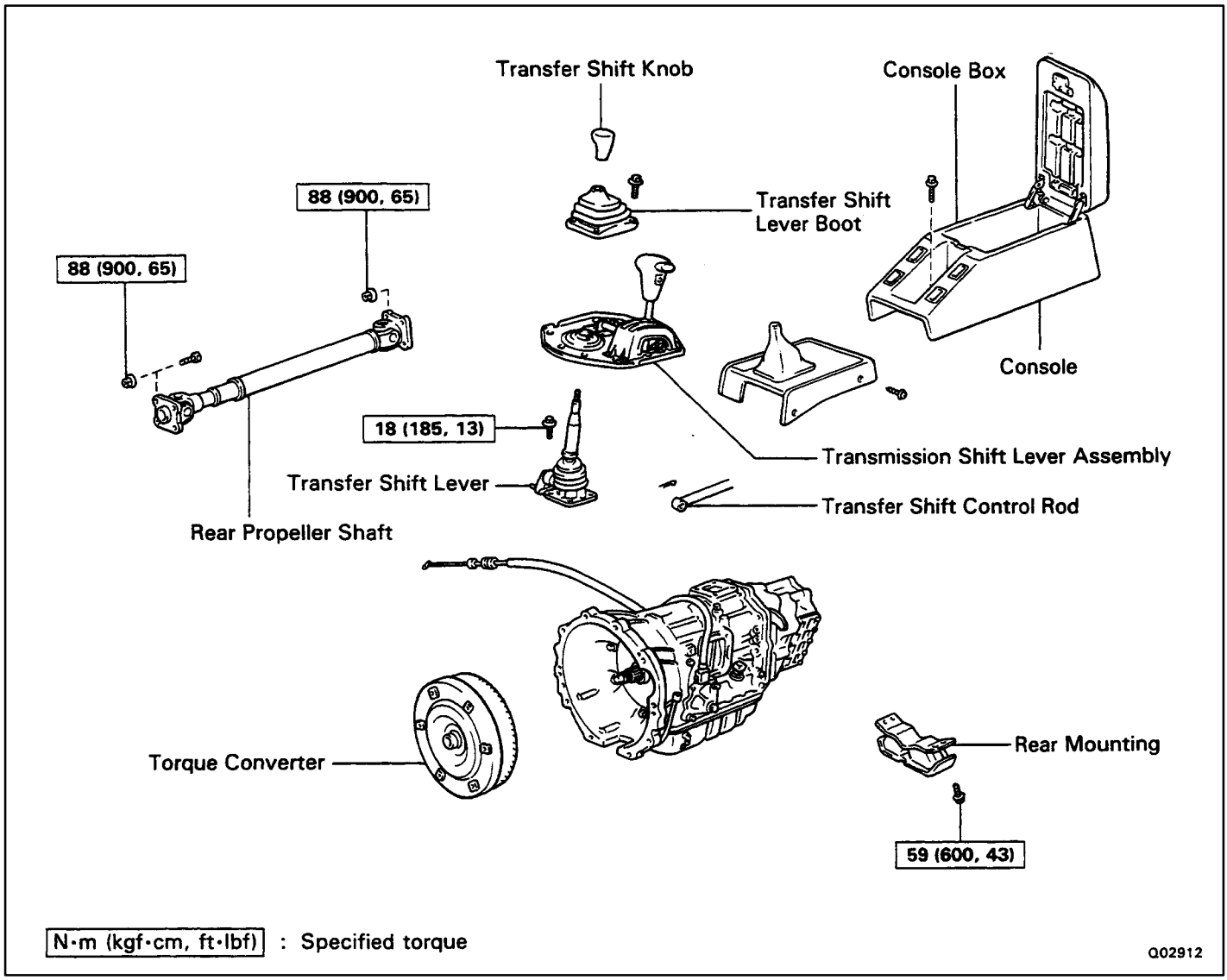
COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

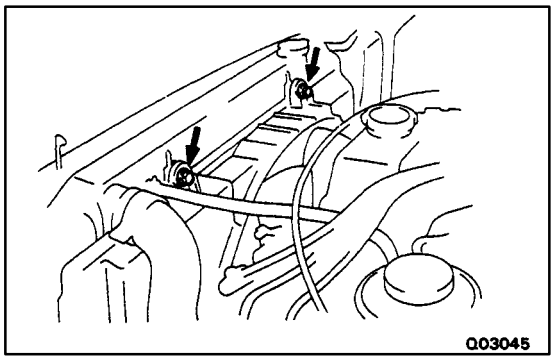
◆ Non-reusable part

Q03192

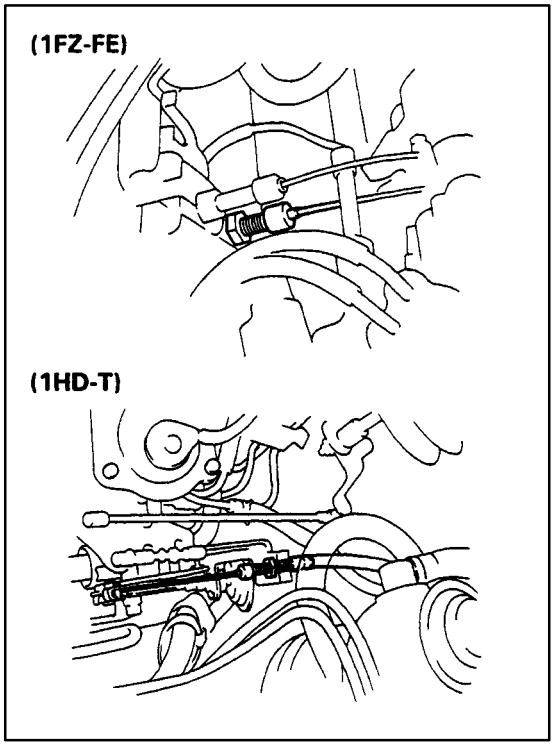


TRANSMISSION REMOVAL

1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL
2. REMOVE BATTERY AND COVER



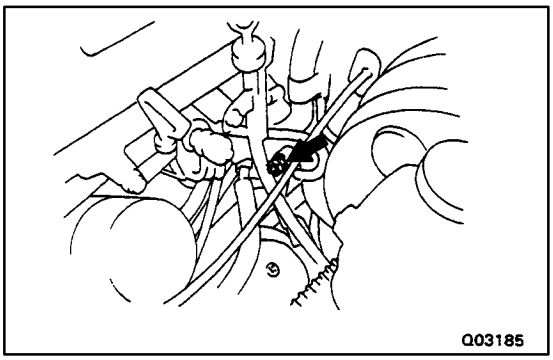
3. LOOSEN FAN SHROUD OF COOLING FAN TO AVOID DAMAGE TO FAN



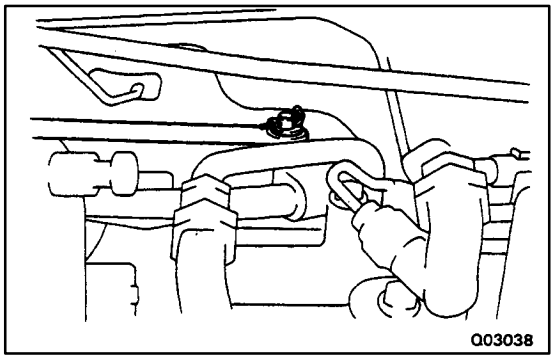
4. DISCONNECT THROTTLE CABLE

(a) Loosen the adjusting nut and disconnect the cable housing from the bracket.

(b) Disconnect the cable from the linkage.

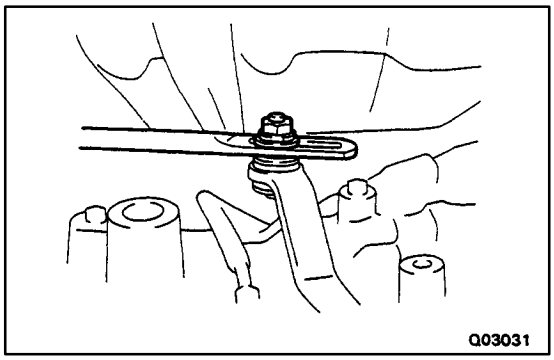


5. (1HD–T)
REMOVE STARTER MOUNTING BOLT

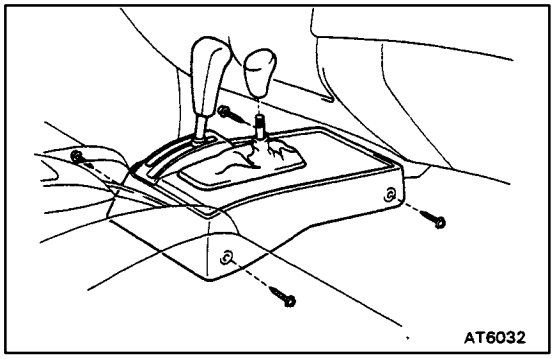


6. REMOVE TRANSMISSION SELECT LEVER AND TRANSFER SHIFT LEVER

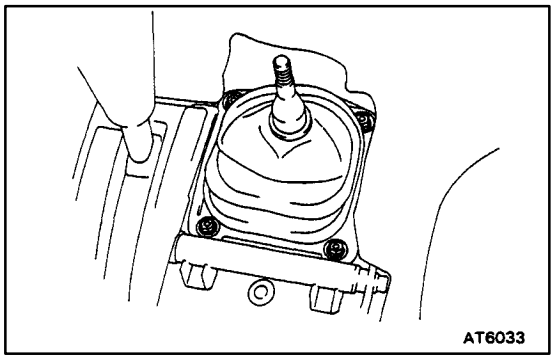
(a) Remove the clip, washer and wave washer, and disconnect the link.



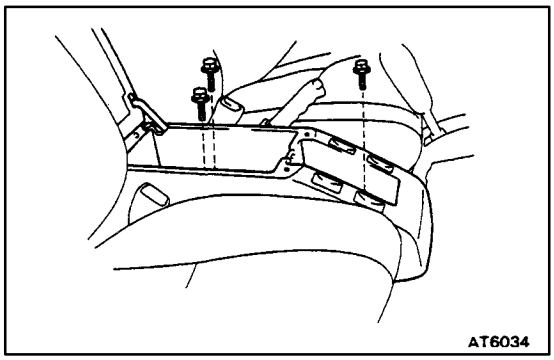
(b) Remove the nut and washer, disconnect the link.



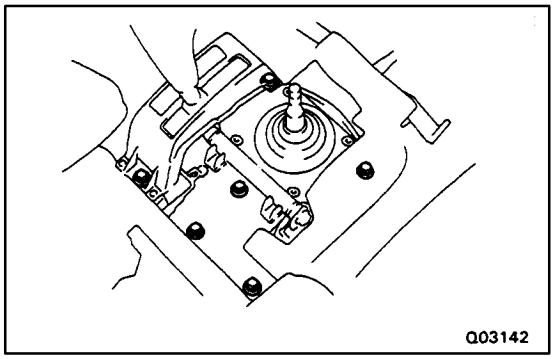
(c) Remove the transfer shift lever knob.
(d) Remove the four screws and the console.



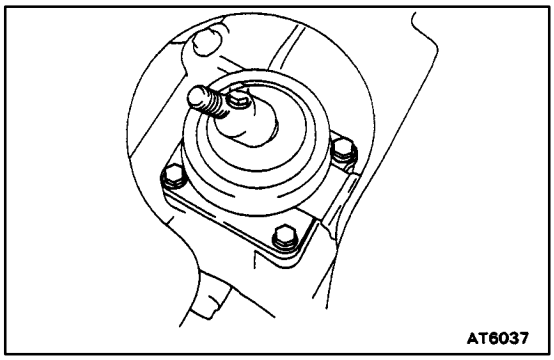
(e) Remove the four bolts and transfer shift lever bolt.



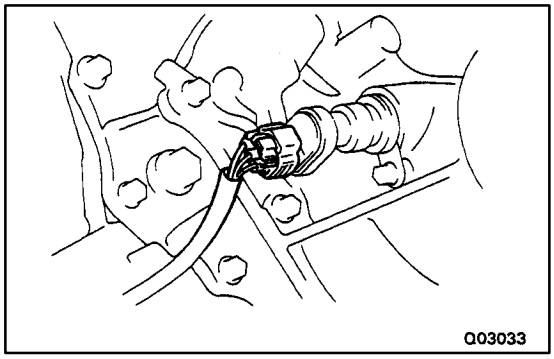
(f) Remove the three bolts and the console box.



(g) Remove the six bolts and the transmission shift lever assembly.

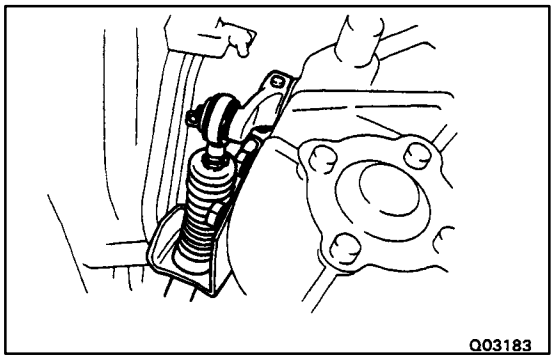


(h) Remove the four screws and the transfer shift lever.



7. REMOVE NO.1 SPEED SENSOR CONNECTOR

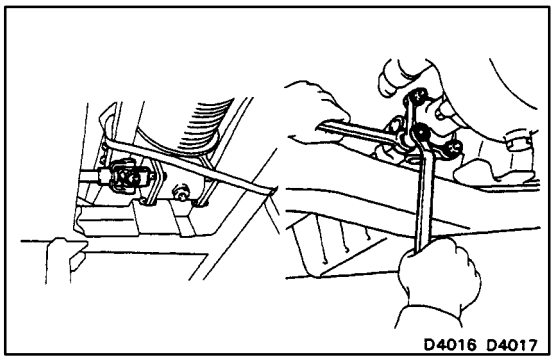
8. REMOVE FRONT AND REAR PROPELLER SHAFTS (See Pub: No. RM 184E, page PR–3)



9. (w/ MECHAICAL WINCH) REMOVE POWER TAKE OF SHIFT CABLE

(a) Pull out the pin and disconnect the cable.

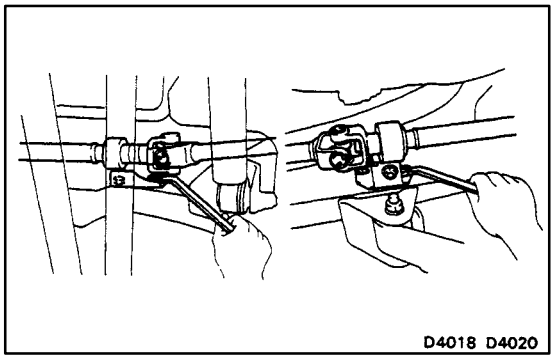
(b) Remove the two bolts and the cable bracket.



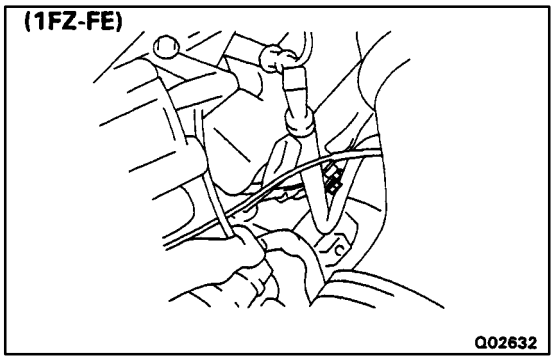
(c) Remove the engine under cover.

(d) Place matchmarks on the yoke and flange.

(e) Remove the bolts and nuts, disconnect the drive shaft from the PTO.



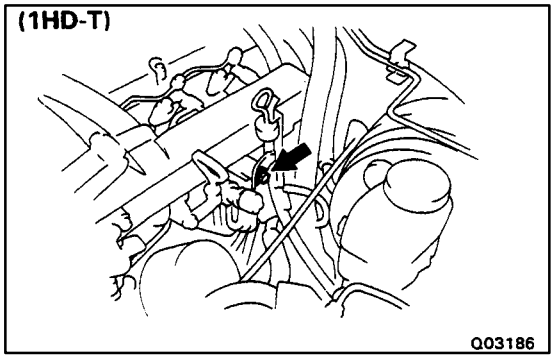
(f) Remove the front and rear bracket set bolts, and then remove the drive shaft.



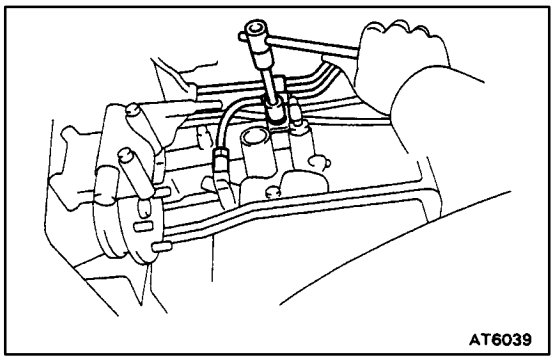
10. REMOVE OIL FILLER TUBE

(a) Remove the level gauge.

(b) Remove the bolt.

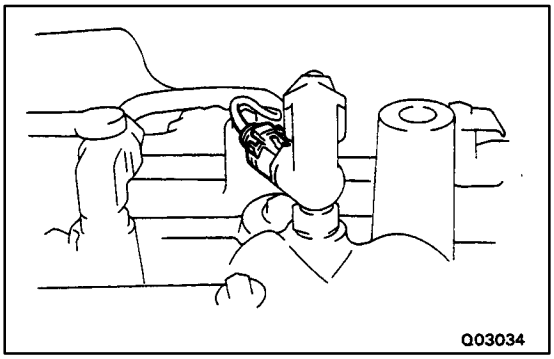


(c) Remove the bolt and the filler tube.

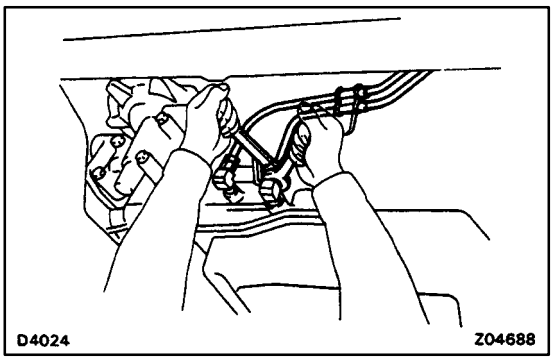


11. DISCONNECT TWO OIL COOLER TUBES

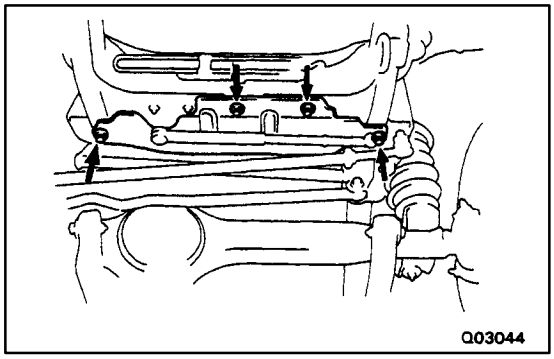
(a) Remove the bolt and clamp.



(b) Disconnect the temperature sensor connector.

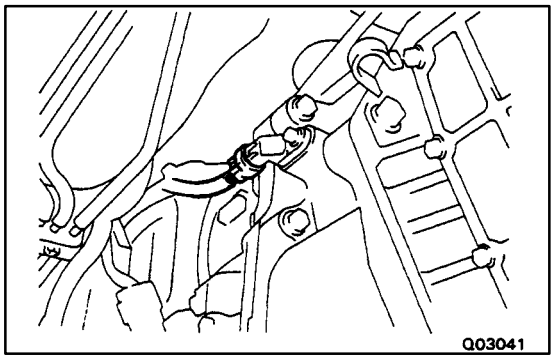


(c) Disconnect the two oil cooler tubes.

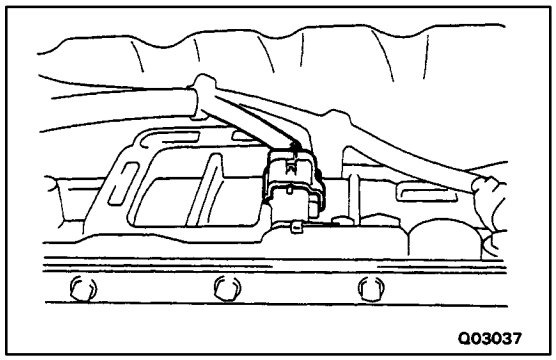


12. REMOVE ENGINE UNDER COVER

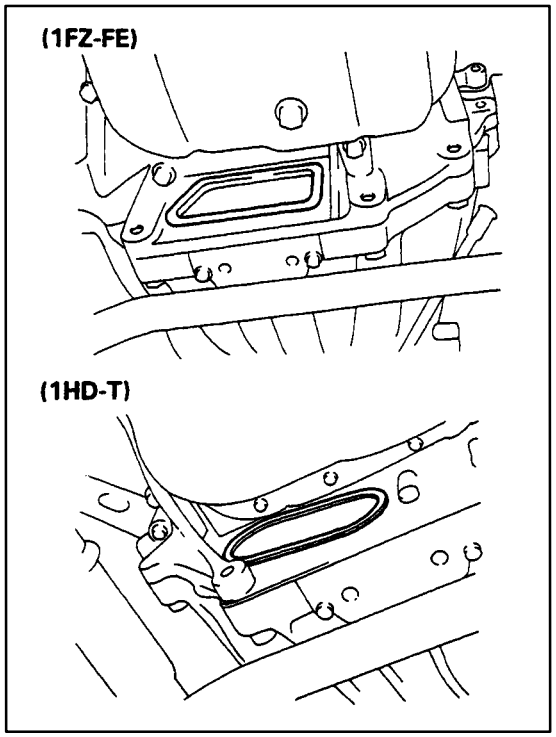
Remove the four bolts and the cover.



13. DISCONNECT NO.2 SPEED SENSOR CONNECTOR

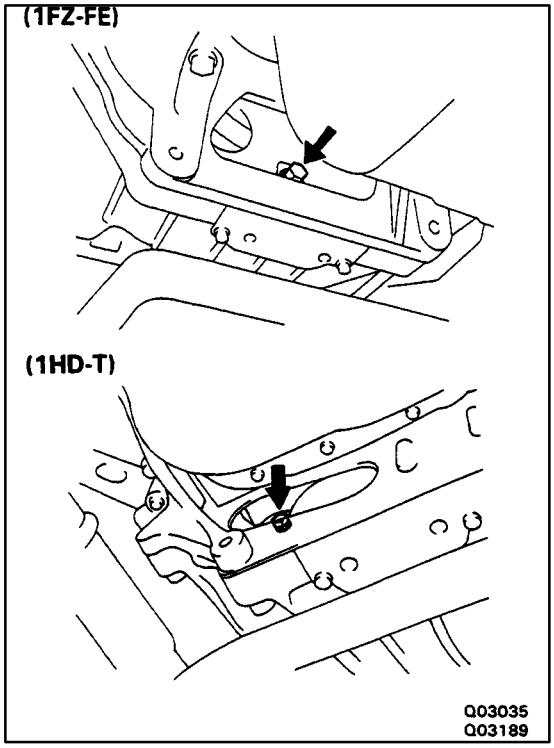


14. DISCONNECT SOLENOID CONNECTOR

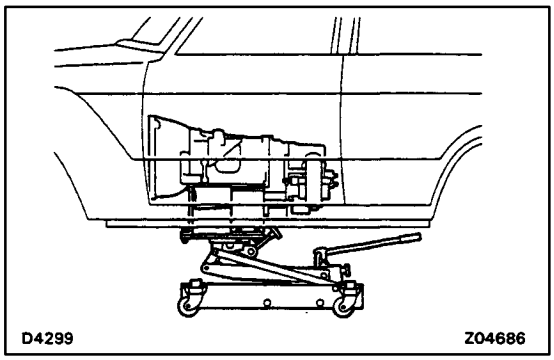


15. REMOVE SIX TORQUE CONVERTER MOUNTING BOLTS

(a) Remove the converter hole plug.

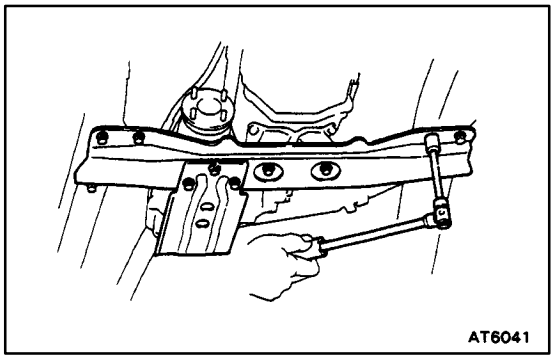


(b) Turn the crankshaft to gain access to each bolt. Remove the six bolt.

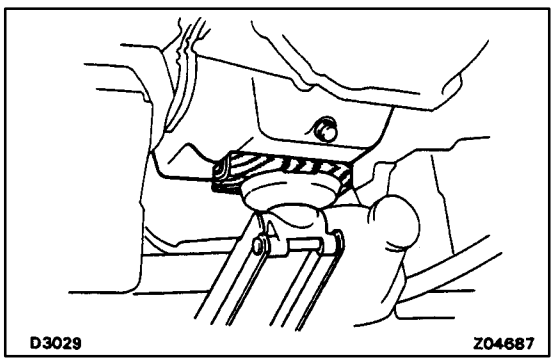


16. REMOVE CROSSMEMBER

(a) Support the transmission with the transmission jack.



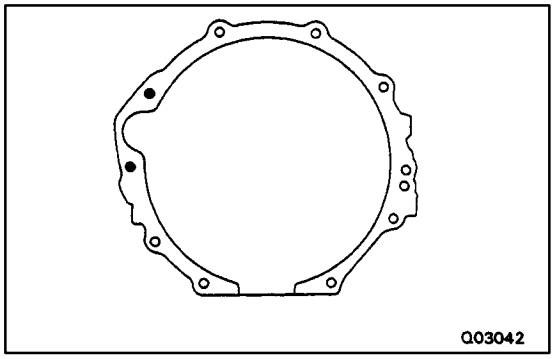
(b) Remove the eight bolts and then remove the frame crossmember.



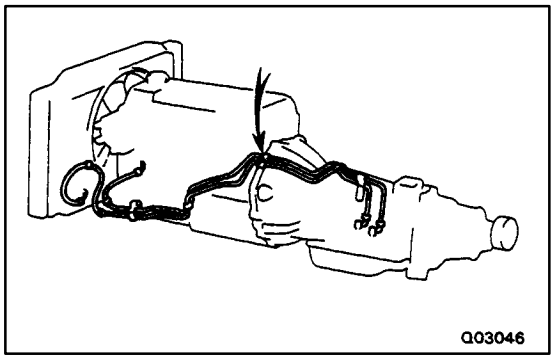
17. REMOVE TRANSMISSION ASSEMBLY

(a) Be sure to out a wooden block or equivalent between the jack and oil pan to prevent damage. Support the oil pan with a jack.

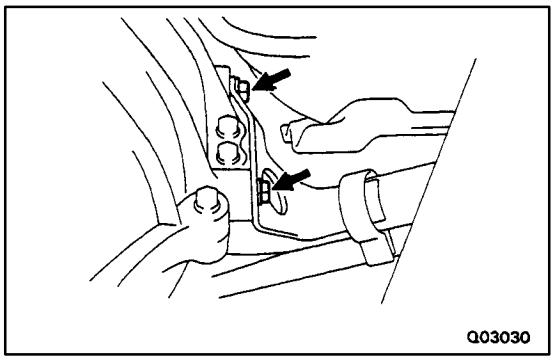
(b) Lower the rear end of transmission.



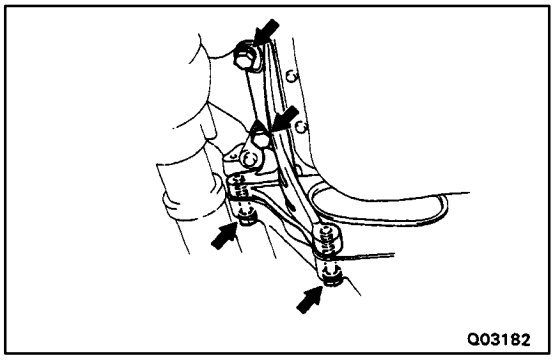
(c) (1FZ–FE)
Remove the nut and disconnect the connectors from the starter.
(d) (1FZ–FE)
Remove the two bolts and the starter.



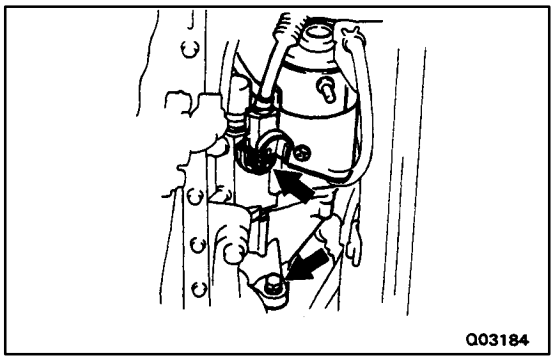
(e) Disconnect the neutral start switch connectors.
(f) Remove the bolt and disconnect the oil cooler tube clamp from the converter housing.
(g) Disconnect the connectors from the transfer.
(h) Remove the clamp and disconnect the wire harness from the transmission and transfer.



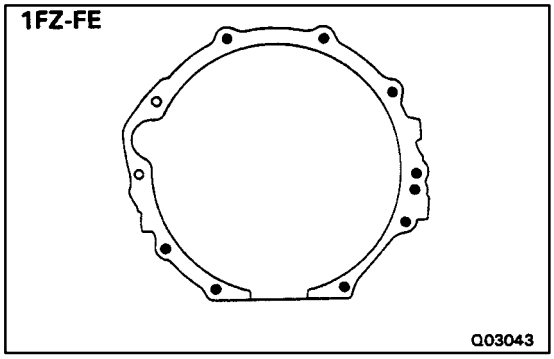
(i) Remove the two bolts and disconnect the exhaust pipe bracket from the converter housing.



(j) (1HD–T)
Remove the four bolts and the stiffener plate.



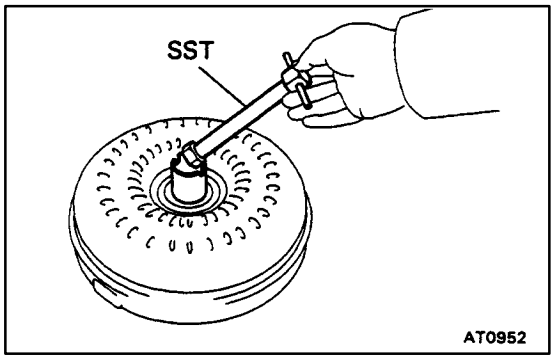
(k) (1HD–T)
Remove the nut and disconnect the connectors from the starter.
(l) (1HD–T)
Remove the nut and the starter.



(m) Remove the bolts and the transmission.

TORQUE CONVERTER CLEANING

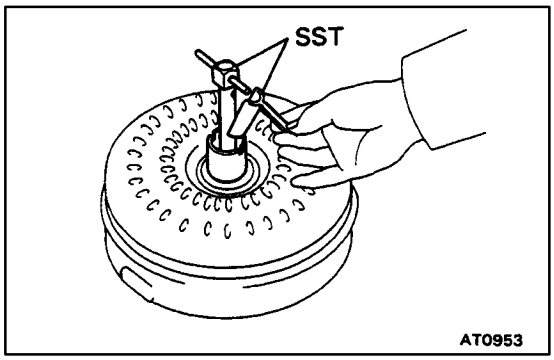
If the transmission is contaminated, the torque converter and transmission cooler should be thoroughly flashed with ATF.



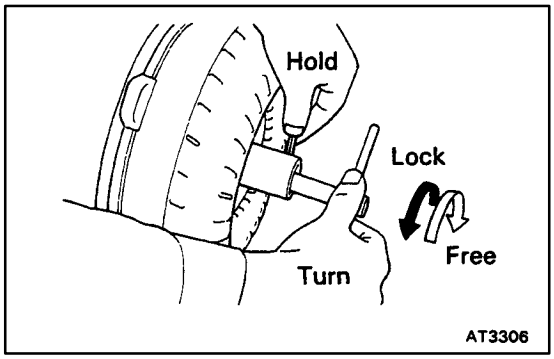
TORQUE CONVERTER AND DRIVE PLATE INSPECTION

1. INSPECT ONE–WAY CLUTCH

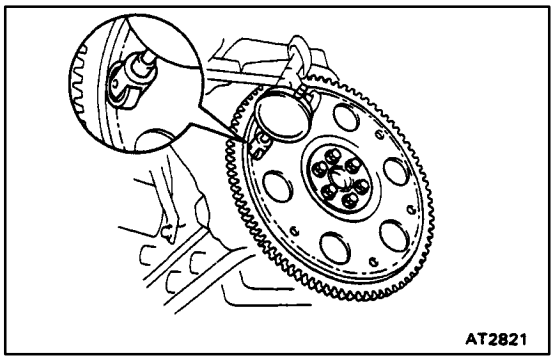
(a) Install SST in the inner race of one–way clutch.
SST 09350–30020 (09351–32010)



(b) Install SST so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–30020 (09351–32010)

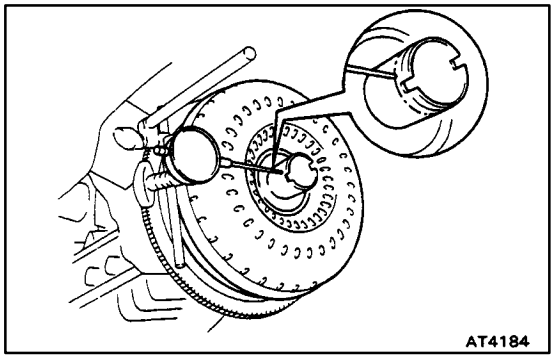


(c) With the torque converter made stand, the clutch should lock when turned counterclockwise, and rotate freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch. Replace the converter if the clutch still fails the test.



2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

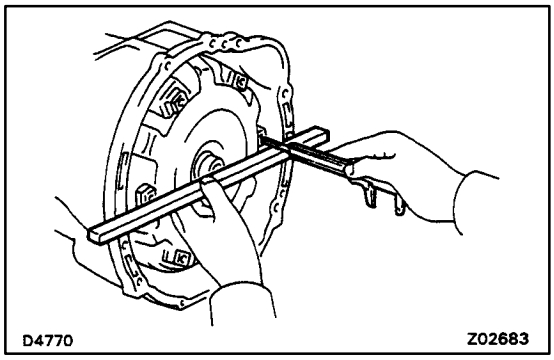
Set up a dial indicator and measure the drive plate runout. If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of spacers and tighten the bolts.
Torque: 83 N·m (850 kgf·cm, 61 ft·lbf)



3. MEASURE TORQUE CONVERTER SLEEVE RUNOUT

(a) Temporarily mount the torque converter to the drive plate. Set up a dial indicator.
If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected, replace the torque converter.
HINT: Mark the position of the converter to ensure correct installation.

(b) Remove the torque converter.



TRANSMISSION INSTALLATION

1. INSTALL TORQUE CONVERTER IN TRANSMISSION

If the torque converter clutch has been drained and washed, refill with new ATF.

Fluid type:

AFT DEXRON® II

2. CHECK TORQUE CONVERTER INSTALLATION

Using calipers and a straight edge, measure from the installed surface to the front surface of the transmission.

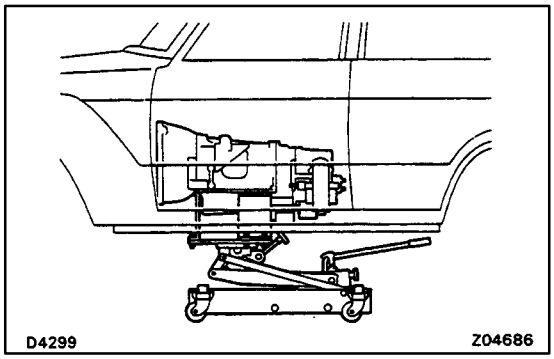
Correct distance:

(1FZ–FE)

More than 37.2 mm (1.465 in.)

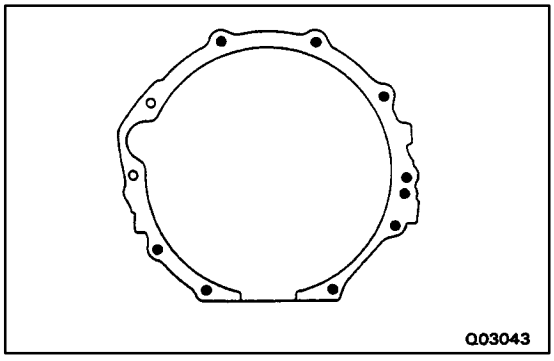
(1HD–T)

More than 43.8 mm (1.724 in.)



3. PLACE TRANSMISSION AT INSTALLATION POSITION

Jack up and push the transmission fully into position.

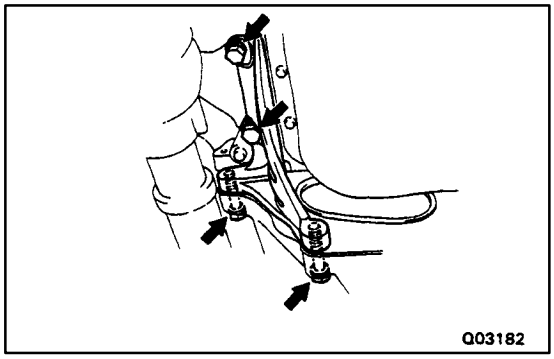


4. INSTALL TRANSMISSION BOLTS

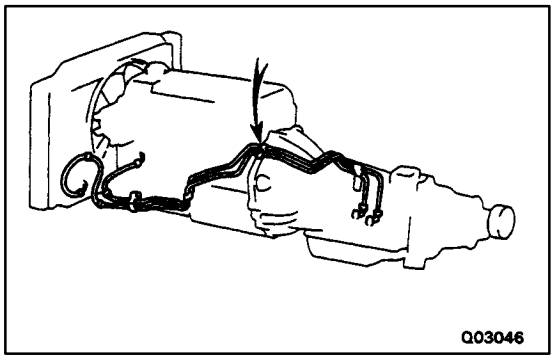
(a) Install the transmission with the bolts.
Torque: 72 N·m (730 kgf·cm, 53 ft·lbf)

(b) Connect the wire harness to the transmission and transfer with the clamp.

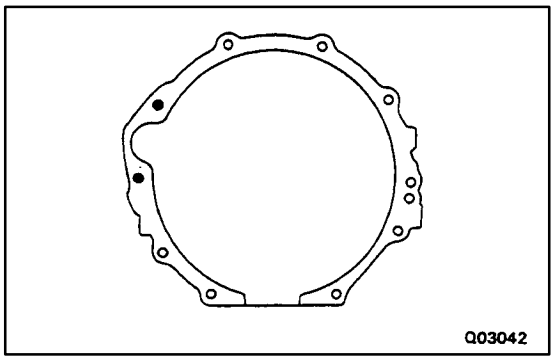
(c) Connect the connectors to the transfer.



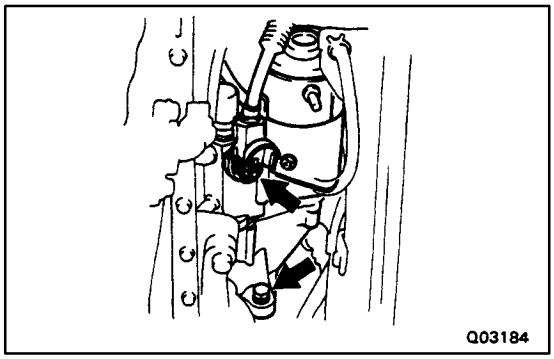
(d) (1HD–T)
Install the left and right stiffener plates with the eight bolt.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)



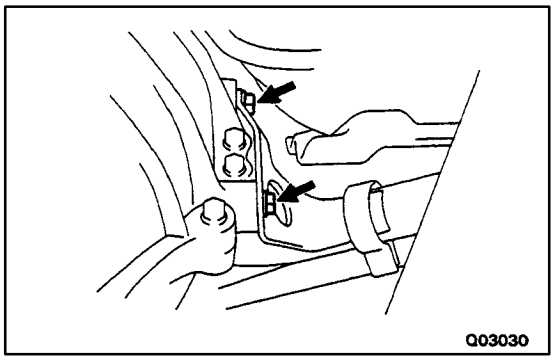
(e) Connect the oil cooler tube clamp to the converter housing with the bolt.
(f) Connect the park/neutral position switch.



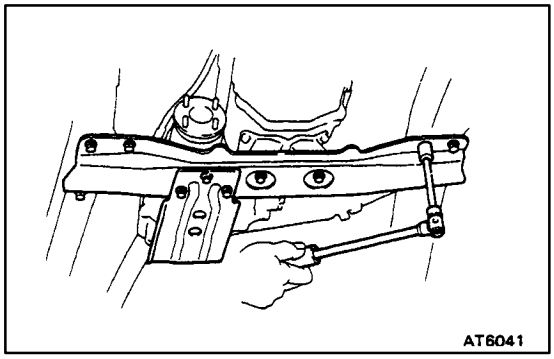
(g) (1FZ–FE)
Install the starter with the two bolts.
Torque: 72 N·m (730 kgf·cm, 53 ft·lbf)
(h) (1FZ–FE)
Connect the connectors.
(i) Install the nut.



(j) (1HD–T)
Install the starter with the bolt.
Torque: 72 N·m (730 kgf·cm, 53 ft·lbf)
(k) (1HD–T)
Connect the connectors.
(l) (1HD–T)
Install the nut.



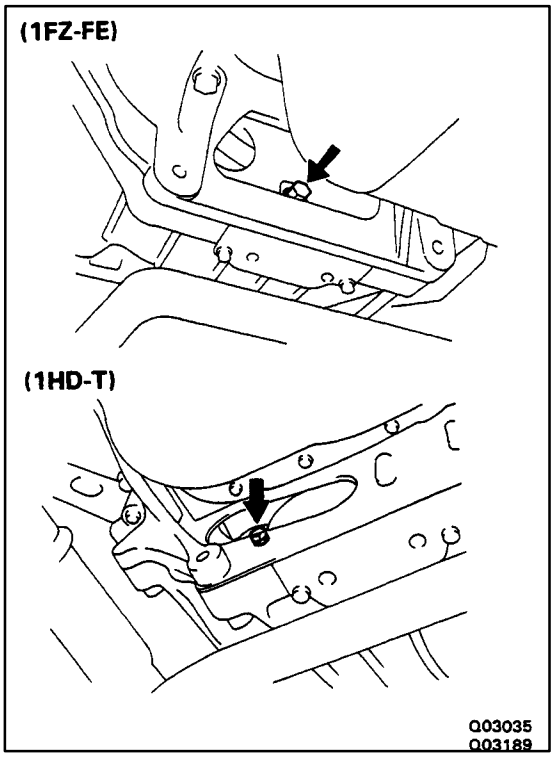
(m) Connect the exhaust pipe bracket to the converter housing with the two bolts.



5. INSTALL CROSSMEMBER

Install the crossmember with eight bolts and two nuts.

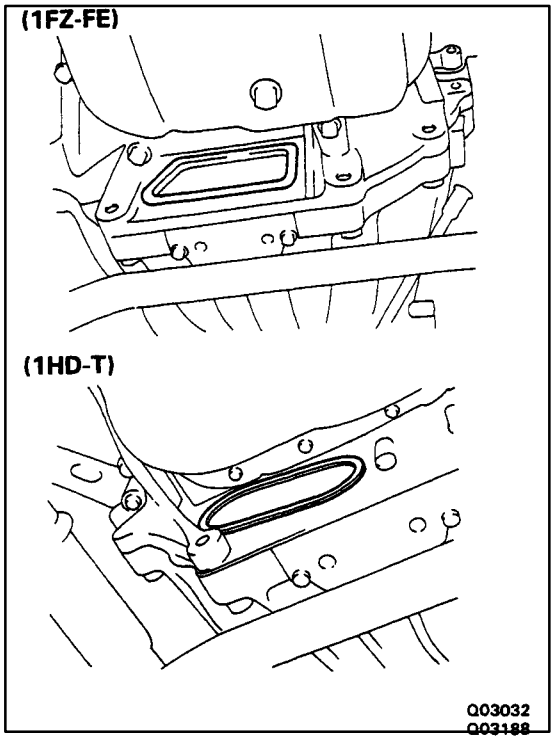
Torque: 61 N·m (620 kgf·cm, 45 ft·lbf)



6. INSTALL TORQUE CONVERTER MOUNTING BOLTS

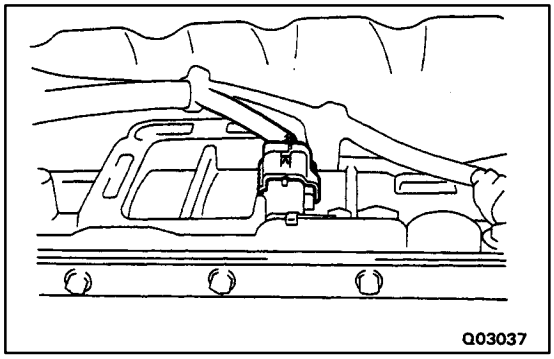
(a) Install the six bolts while turning the crankshaft.

Torque: 55 N·m (550 kgf·cm, 40 ft·lbf)

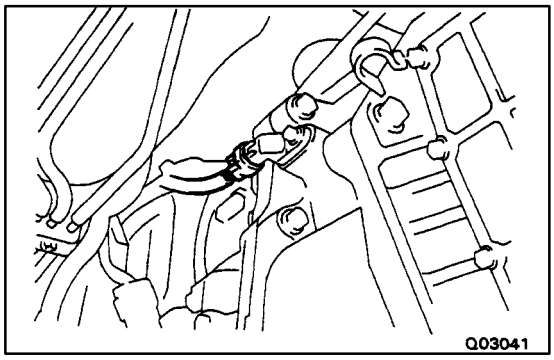


(b) Seal the converter hole plug with adhesive.

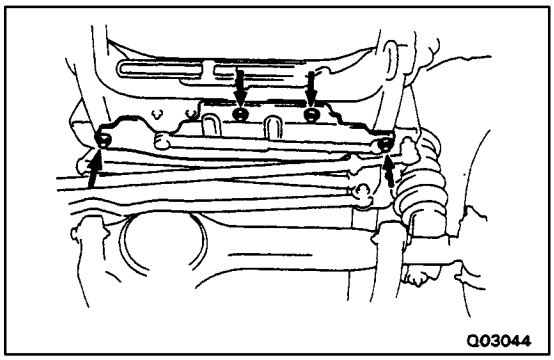
(c) Install the converter hole plug.



7. CONNECT SOLENOID CONNECTOR



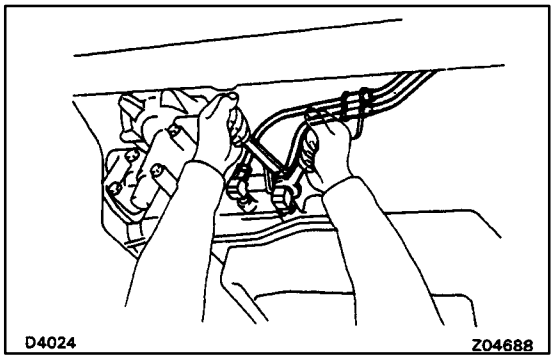
8. CONNECT NO.2 SPEED SENSOR CONNECTOR



9. INSTALL ENGINE UNDER COVER

Install the cover with the four bolts.

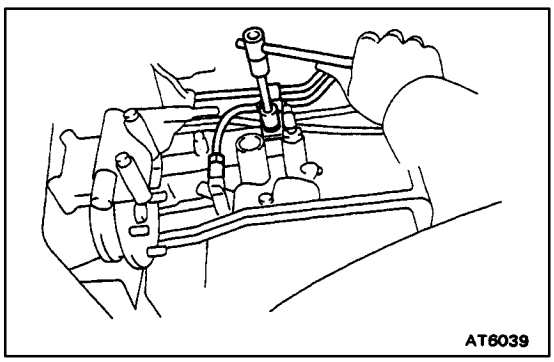
Torque: 28 N·m (290 kgf·cm, 21 ft·lbf)



10. CONNECT TWO OIL COOLER TUBES

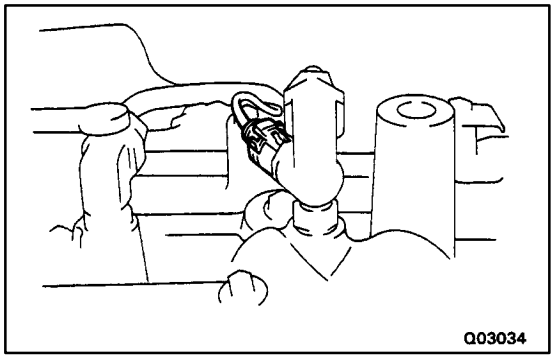
(a) Connect the two oil cooler tubes.

Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)



(b) Install the cooler tube clamp.

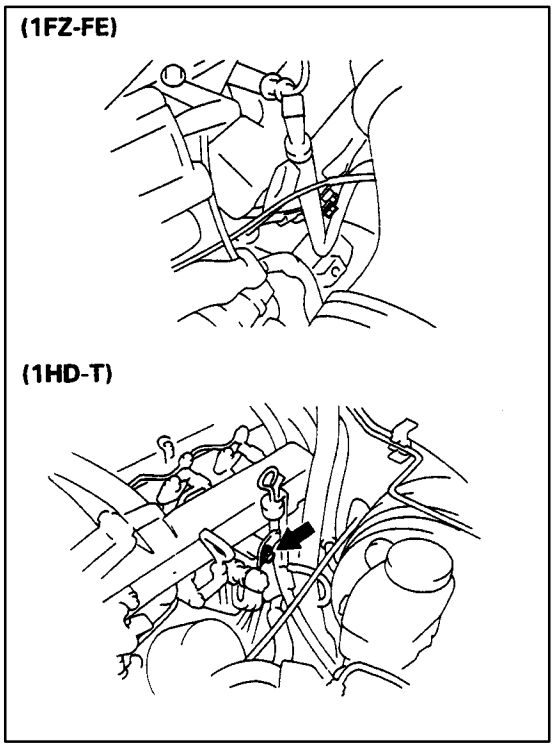
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)



(c) Connect the oil temperature sensor connector.

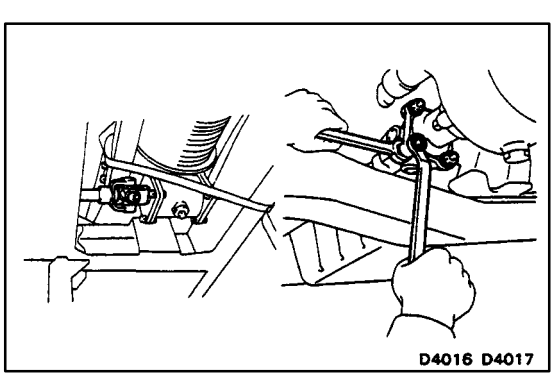
11. REMOVE OIL FILLER TUBE

(a) Install the filler tubes with the bolt.



(b) Install the bolt.

(c) Install the level gauge.



12. (w/ MECHANICAL WINCH)
INSTALL POWER TAKE–OFF DRIVE SHAFT

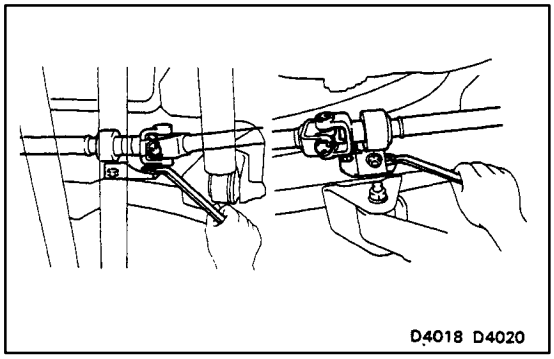
(a) Align the matchmarks on the joint flange yoke and drive shaft.

(b) Install the drive shaft.

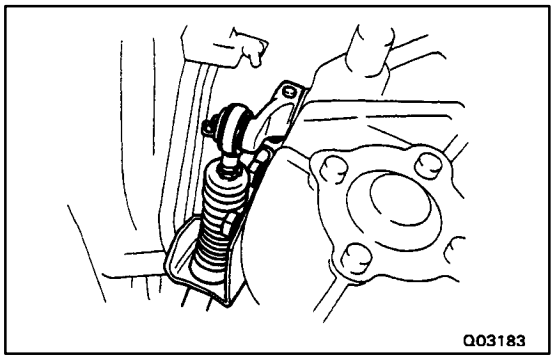
(c) Align the matchmarks on the drive shaft and PTO.

(d) Torque the nuts.

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)



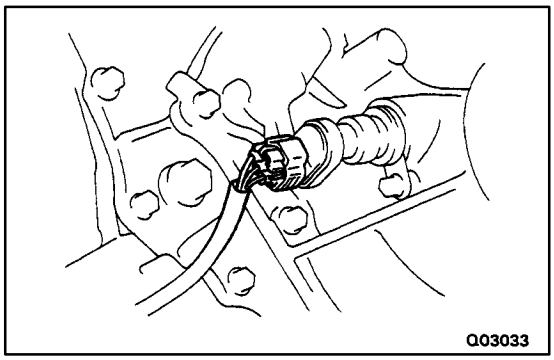
(e) Install the front and rear bracket.



13. (w/ MECHANICAL WINCH) INSTALL POWER TAKE–OFF SHIFT CABLE

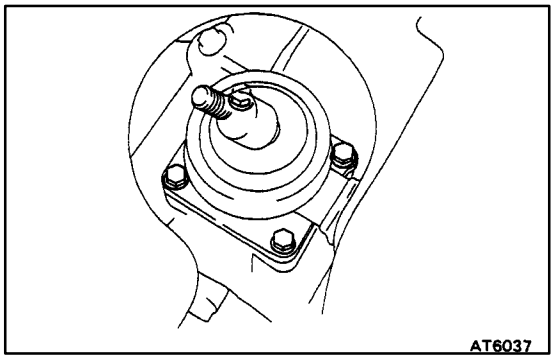
(a) Install the two bolts and the cable bracket.

(b) Connect the cable and insert the pin.



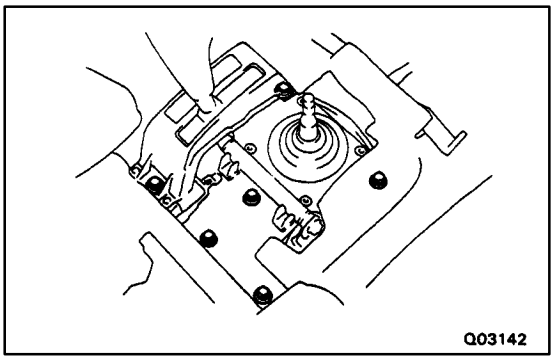
14. CONNECT NO.1 SPEED SENSOR CONNECTOR

15. INSTALL FRONT AND REAR PROPELLER SHAFTS (See Pub. No. RM184E, page PR–8)

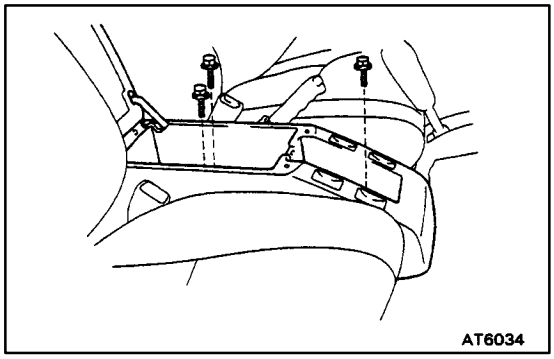


16. INSTALL TRANSMISSION SELECT LEVER AND TRANSFER SHIFT LEVER

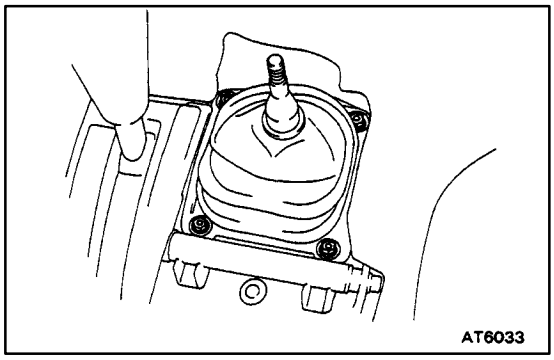
(a) Remove the four bolts and the transfer shift lever.



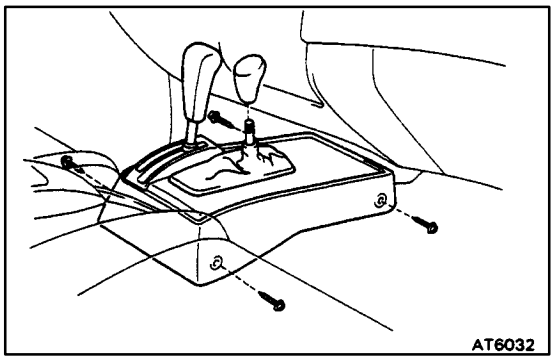
(b) Install the transmission shift lever assembly with the six bolts.



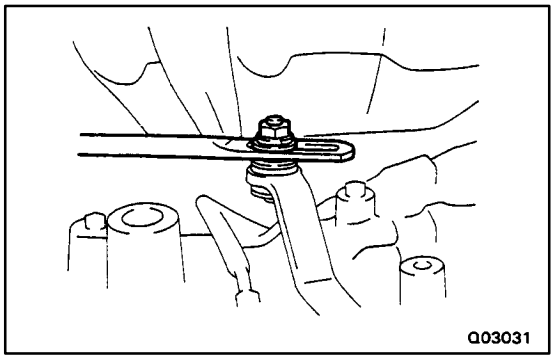
(c) Install the console box with the three bolts.



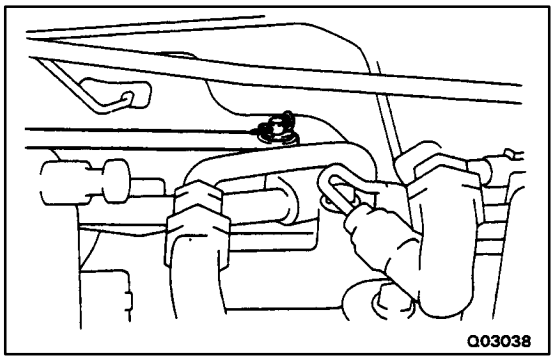
(d) Install the transfer shift lever boot with the four bolts.



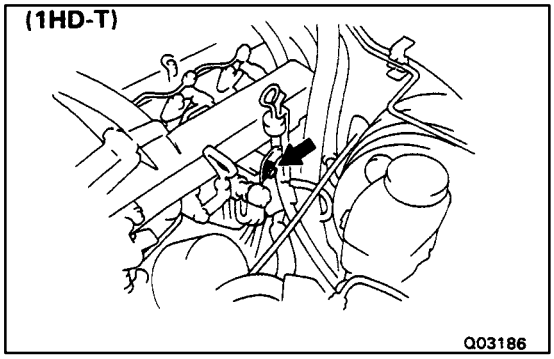
(e) Install the four screws and the console.
(f) Install the transfer shift lever knob.



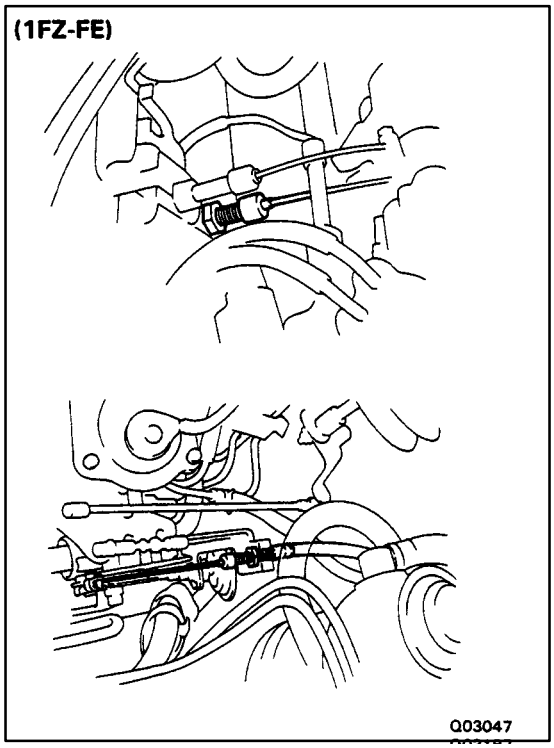
(g) Connect the link with the washer and nut.



(h) Connect the link with the wave washer, washer and clip.



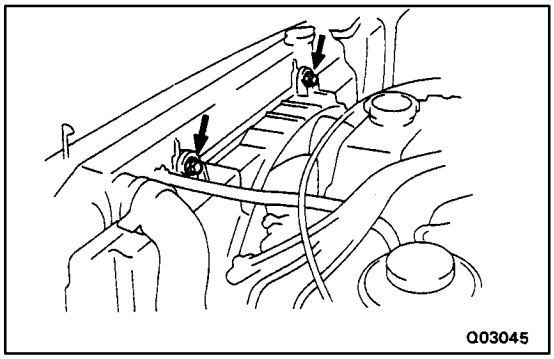
17. (1HD–T)
INSTALL STARTER MOUNT BOLT



18. CONNECT THROTTLE CABLE

(a) Connect the cable from the throttle linkage.

(b) Tighten the adjusting nuts and connect the cable housing to the bracket.

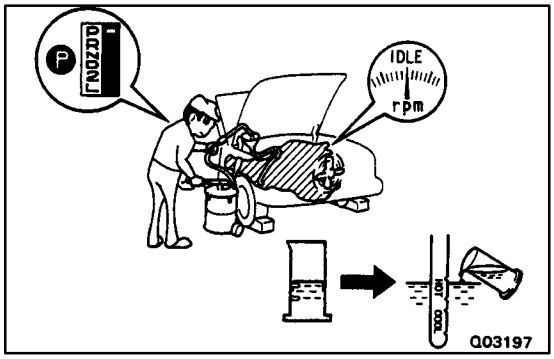


19. TIGHTEN FAN SHROUD OF COOLING FAN TO AVOID DAMAGE TO FAN

20. INSTALL BATTERY AND COVER

21. CONNECT BATTERY CABLE FROM NEGATIVE TERMINAL

22. ADJUST SHIFT CONTROL ROD
(See page AT–26)



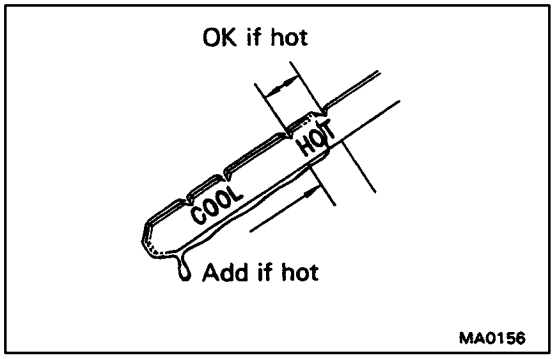
23. FILL SHIFT CONTROL ROD

Fluid type:

ATF DEXRON® II

Capacity:

6.0 liters (6.3 US qts, 5.3 Imp.qts)



24. CHECK FLUID LEVEL
(See page AT–25)

SERVICE SPECIFICATIONS

SERVICE DATA

Engine idle speed		N range	650 rpm		
Time lag	N range →	D range	Less than 1.0 seconds		
	N range →	R range	Less than 1.5 seconds		
Line pressure (wheel locked)					
Engine idling	(1FZ–FE)	D range	461–520 kPa	4.7–5.3 kgf/cm^2	68–77 psi
		R range	657–843 kPa	6.7–8.6 kgf/cm^2	97–125 psi
	(1HD–T)	D range	431–510 kPa	4.4–5.2 kgf/cm^2	63–74 psi
		R range	637–843 kPa	6.5–8.6 kgf/cm^2	92–122 psi
At stall	(1FZ–FE)	D range	971–1,226 kPa	9.9–12.5 kgf/cm^2	144–181 psi
		R range	1,648–1,853 kPa	16.8–18.9 kgf/cm^2	244–274 psi
	(1HD–T)	D range	971–1,226 kPa	9.9–12.5 kgf/cm^2	144–181 psi
		R range	1,608–1,853 kPa	16.4–18.9 kgf/cm^2	233–274 psi
Throttle cable adjustment					
Throttle valve fully closed			Between boot end and inner cable stopper		
		(1FA–FE)	0–1 mm		0–0.04 in.
		(1HD–T)	0.5–34 mm		0.020–0.059 in.
Throttle valve fully opened			32–34 mm		1.26–1.34 in.
Torque convertor correct distance		(1FA–FE)	37.2 mm (1.465 in.) or more		
		(1HD–T)	43.8 mm (1.724 in.)		
Torque convertor sleeve runout		Limit	0.30 mm		0.0118 in.
Drive plate runout		Limit	0.20 mm		0.0079 in.

Shift point schedule km/h (mph)

		Throttle valve opening		100 %			5 %		100 %		
Engine	Tire size	Gear range		1 → 2	2 → 3	3 → O/D	lock–up ON	lock–up OFF	O/D → 3	3 → 2	2 → 1
1FZ–FE	7.50R16–6	D range	Normal mode	53–60 (33–37)	108–122 (67–76)	153–170 (95–106)	61–69 (38–43)	55–63 (34–39)	147–163 (91–101)	99–109 (62–68)	42–49 (26–30)
			Power mode	53–60 (33–37)	108–122 (67–76)	153–170 (95–106)	89–99 (55–62)	73–80 (45–50)	147–163 (91–101)	99–109 (62–68)	42–49 (26–30)
		2 range	Normal mode Power mode	–	–	–	–	–	–	118–132 (73–82)	–
		L range	Normal mode Power mode	–	–	–	–	–	–	–	60–68 (37–42)
	245/85–R16	D range	Normal mode	56–62 (35–39)	114–125 (71–78)	161–174 (100–108)	64–70 (40–43)	58–64 (36–40)	154–167 (96–103)	105–112 (65–70)	44–48 (27–30)
			Power mode	56–62 (35–39)	114–125 (71–78)	161–174 (100–108)	93–100 (58–62)	73–80 (45–50)	154–167 (96–103)	105–112 (65–70)	44–48 (27–30)
		2 range	Normal mode Power mode	–	–	–	–	–	–	125–135 (77–84)	–
		L range	Normal mode Power mode	–	–	–	–	–	–	–	63–69 (39–43)
	215/80–R16	D range	Normal mode	49–54 (30–34)	101–111 (63–69)	143–153 (89–95)	63–69 (39–43)	57–63 (35–39)	137–147 (85–91)	93–99 (58–62)	40–45 (25–28)
			Power mode	49–54 (30–34)	101–111 (63–69)	143–153 (89–95)	83–89 (52–55)	72–78 (45–48)	137–147 (85–91)	93–99 (58–62)	40–45 (25–28)
		2 range	Normal mode Power mode	–	–	–	–	–	–	110–119 (68–74)	–
		L range	Normal mode Power mode	–	–	–	–	–	–	–	56–61 (34–38)
	275/70–R16	D range	Normal mode	52–58 (32–36)	106–117 (66–73)	152–163 (94–101)	60–66 (37–41)	55–60 (34–37)	145–156 (90–97)	98–104 (61–65)	42–47 (26–29)
			Power mode	52–58 (32–36)	106–117 (66–73)	152–163 (94–101)	88–94 (55–58)	68–74 (42–46)	145–156 (90–97)	98–104 (61–65)	42–47 (26–29)
		2 range	Normal mode Power mode	–	–	–	–	–	–	116–127 (72–79)	–
		L range	Normal mode Power mode	–	–	–	–	–	–	–	59–65 (37–40)

		Throttle valve opening		100 %			5 %		100 %		
Engine	Tire size	Gear range		1 → 2	2 → 3	3 → O/D	lock–up ON	lock–up OFF	O/D → 3	3 → 2	2 → 1
1HD–T	7.50R16–6	D range	Normal mode	41–47 (25–29)	81–90 (50–56)	122–136 (76–85)	56–64 (35–40)	50–58 (31–36)	115–129 (71–80)	75–82 (47–51)	33–39 (21–24)
			Power mode	41–47 (25–29)	81–90 (50–56)	122–136 (76–85)	78–87 (48–54)	72–80 (45–50)	115–129 (71–80)	75–82 (47–51)	34–41 (21–25)
		2 range	Normal mode Power mode	–	–	–	–	–	–	89–98 (55–61)	–
		L range	Normal mode Power mode	–	–	–	–	–	–	–	38–45 (24–28)
	245/85–R16	D range	Normal mode	43–49 (27–30)	85–92 (53–57)	129–140 (80–87)	59–65 (37–40)	53–59 (33–36)	121–132 (75–82)	75–82 (47–51)	34–40 (21–25)
			Power mode	43–49 (27–30)	85–92 (53–57)	129–140 (80–87)	82–89 (51–55)	75–82 (47–51)	121–132 (75–82)	75–82 (47–51)	36–42 (22–26)
		2 range	Normal mode Power mode	–	–	–	–	–	–	93–100 (58–62)	–
		L range	Normal mode Power mode	–	–	–	–	–	–	–	40–46 (25–29)
	215/80–R16	D range	Normal mode	37–42 (23–26)	76–81 (47–50)	113–123 (70–76)	53–58 (33–36)	47–52 (29–32)	108–117 (67–73)	67–72 (42–44)	30–35 (19–22)
			Power mode	37–42 (23–26)	76–81 (47–50)	113–123 (70–76)	73–79 (45–49)	66–72 (41–45)	108–117 (67–73)	67–72 (42–44)	32–37 (20–23)
		2 range	Normal mode Power mode	–	–	–	–	–	–	83–89 (52–55)	–
		L range	Normal mode Power mode	–	–	–	–	–	–	–	35–40 (22–25)
	275/70–R16	D range	Normal mode	41–46 (25–29)	80–86 (50–53)	120–131 (75–81)	56–61 (35–38)	50–55 (31–34)	114–124 (71–77)	70–76 (43–47)	32–37 (20–23)
			Power mode	41–46 (25–29)	80–86 (50–53)	120–131 (75–81)	77–83 (48–52)	70–76 (43–47)	114–124 (71–77)	70–76 (43–47)	34–39 (21–24)
		2 range	Normal mode Power mode	–	–	–	–	–	–	88–94 (55–58)	–
		L range	Normal mode Power mode	–	–	–	–	–	–	–	38–43 (24–27)

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Engine X Transmission	14 mm (0.55 in.) head bolt	37	380	27
Engine X Transmission	17 mm (0.67 in.) head bolt	72	730	53
Torque converter X Drive plate		55	550	40
Frame crossmember set bolt		61	620	45
Frame crossmember set nut		59	600	43
Oil cooler pipe union nut		34	350	25
Oil cooler pipe tube clamp X Transmission		10	100	7
Front differential X Front propeller shaft		74	750	54
Transfer X Front propeller shaft		74	750	54
Transfer X Rear propeller shaft		88	900	65
Rear differential X Rear propeller shaft		88	900	65
Crank shaft X Drive plate		100	1,000	72
Engine under cover X Frame		28	290	21
Transfer shift lever X Transmission		18	185	13
Oil pan set bolt		6.9	70	61 in.·lbf
Drain plug		27	280	20
Valve body X Transmission case		10	100	7
Transfer under cover X Frame		28	290	21

TRANSFER

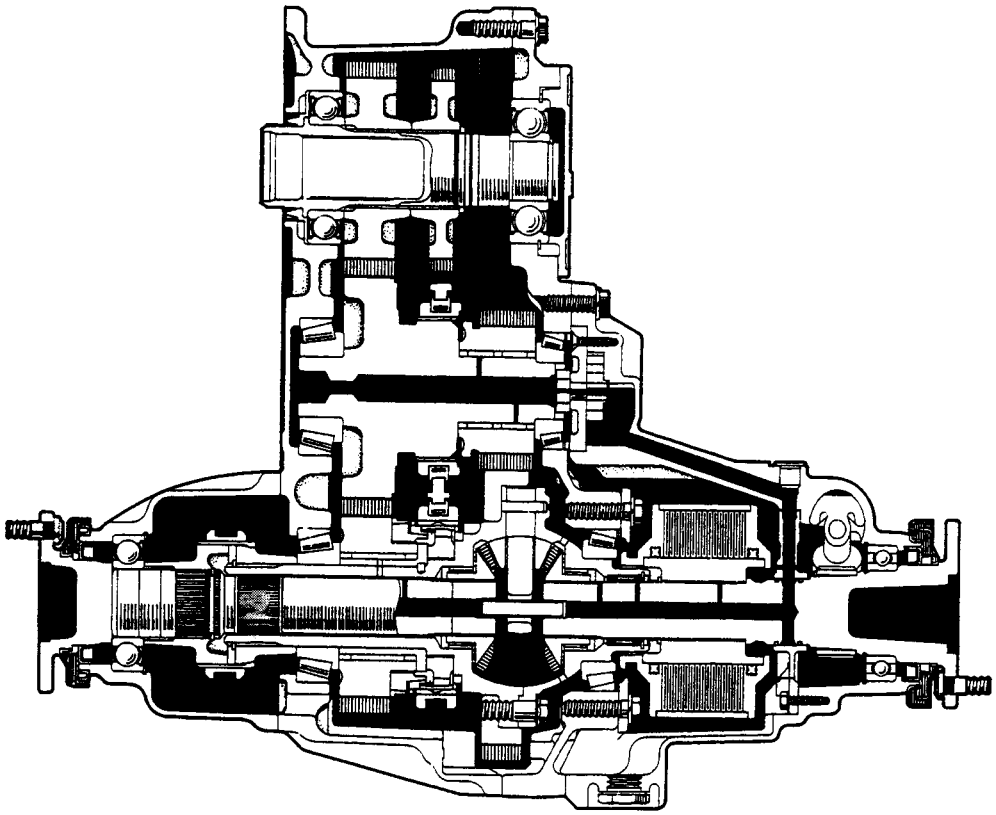
REFER TO LAND CRUISER (STATION WAGON) REPAIR MANUAL FOR CHASSIS AND BODY (Pub. No. RM184E)

NOTE: The following pages contain only the points which differ from the above listed manual.

(HF2AV FOR STATION WAGON WITH ABS)

DESCRIPTION

The transfer transmits the drive force from the transmission to the front and rear wheels.
The specifications and cross–section diagrams are as shown.



HF2AV TRANSFER

V01733

Specifications

Type of Transfer		HF2AV	
Type of Transmission		H150F	H151F, A442F
Type of Engine		1HZ	1FZ–FE, 1HD–T
Gear Ratio	High Speed Range	1.000	
	Low Speed Range	2.488	
Oil Capacity Liters (US qts. Imp. qts.)	w/o PTO	1.7 (1.8, 1.5)	
	w/ PTO	1.8 (1.9, 1.6)	
Type of Oil		API GL–4 or GL–5 SAE 75W–90	

PRECAUTIONS

When working with FIPG material, you must be observe the following.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non–residue solvent.
- Apply the seal packing in approx. 1 mm (0.04 in.) bead along the sealing surface.
- Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Hard to shift or will not shift	Transfer faulty	Disassemble and inspect transfer	TR–4 TR–49
Transfer jumps out of gear	Transfer faulty	Disassemble and inspect transfer	TR–4
Noise	Transfer faulty Wrong oil grade Oil level low	Disassembly and inspect transfer Replace oil Add oil	TR–4 TR–2 TR–2
Oil leakage	Oil level too high Oil seal, O–ring or gasket worn or damaged	Drain oil Replace oil seal, O–ring or gasket	TR–2 TR–4
Tight corner braking	Center differential or transfer faulty	Replace center differential or transfer	RM184E MT–5

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TROUBLESHOOTING

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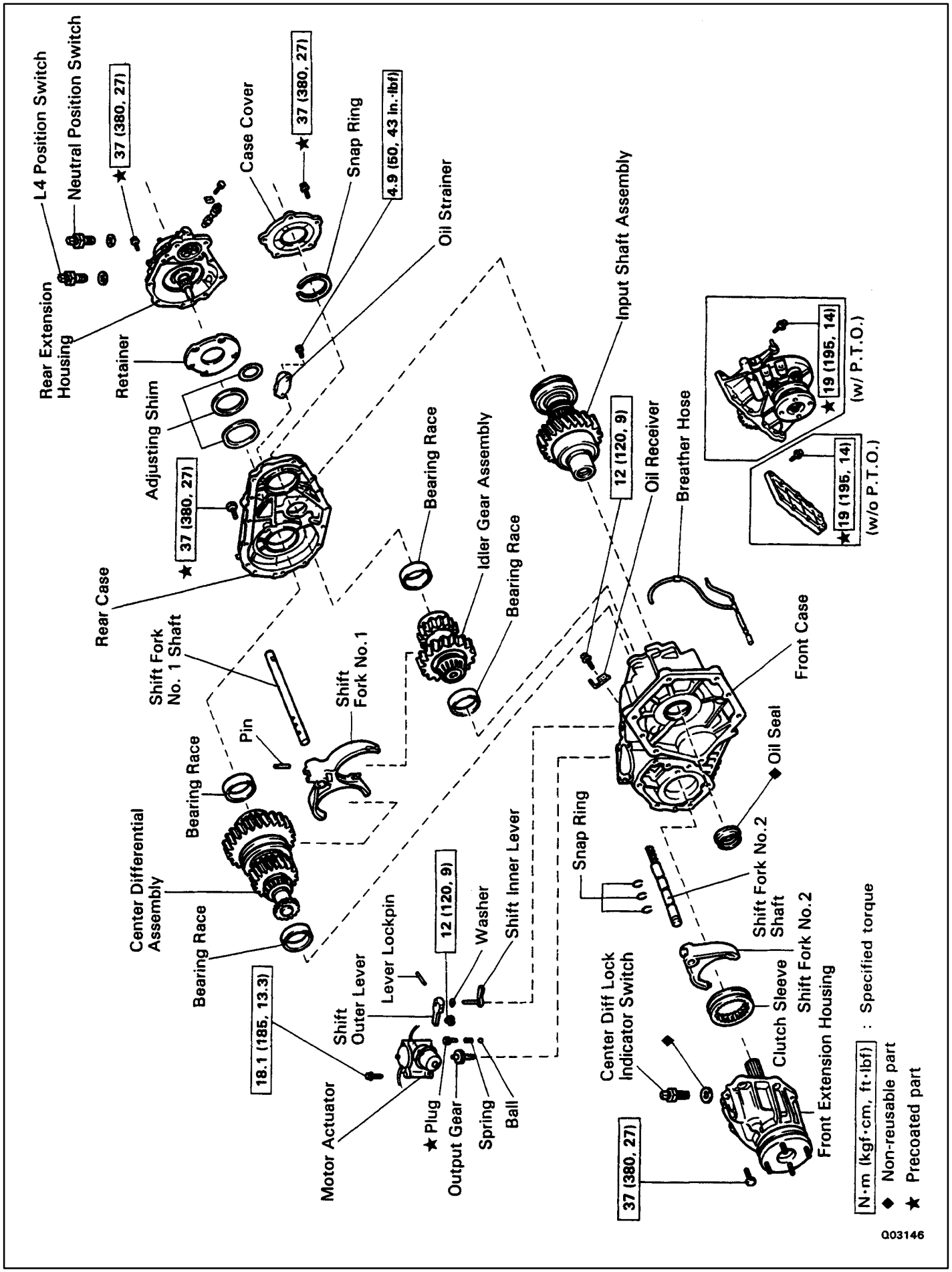
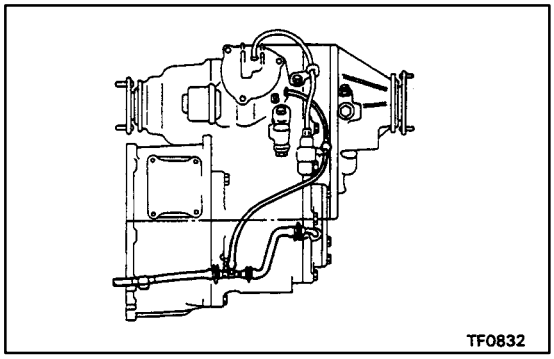
Tight corner braking	Center differential or transfer faulty	Replace center differential or transfer	RM184E MT–5

COMPONENTS

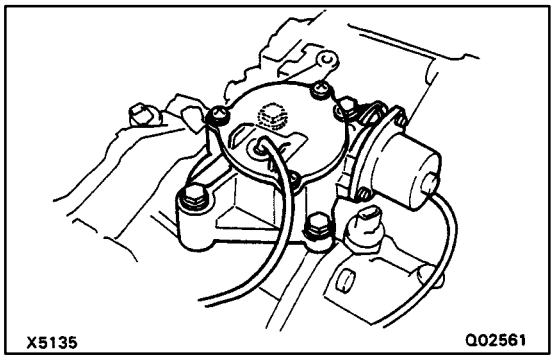

L4 Position Switch
Neutral Position Switch
37 (380, 27)
Case Cover
37 (380, 27)
Snap Ring
4.9 (50, 43 in.·lbf)
Oil Strainer
Rear Extension Housing
Retainer
Adjusting Shim
37 (380, 27)
Rear Case
Bearing Race
Idler Gear Assembly
Bearing Race
Input Shaft Assembly
12 (120, 9)
Oil Receiver
Breather Hose
19 (195, 14)
(w/ P.T.O.)
19 (195, 14)
(w/o P.T.O.)
Front Case
Shift Fork No. 1 Shaft
Pin
Shift Fork No.1
Bearing Race
Center Differential Assembly
Bearing Race
Oil Seal
Snap Ring
Shift Fork No.2 Shaft
Shift Fork No.2
Shift Inner Lever
Washer
12 (120, 9)
Lever Lockpin
Shift Outer Lever
18.1 (185, 13.3)
Motor Actuator
Plug
Output Gear
Spring
Ball
Center Diff Lock Indicator Switch
Clutch Sleeve
Front Extension Housing
37 (380, 27)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
★ Precoated part
Q03146



TRANSFER DISASSEMBLY

(See page TR–4)

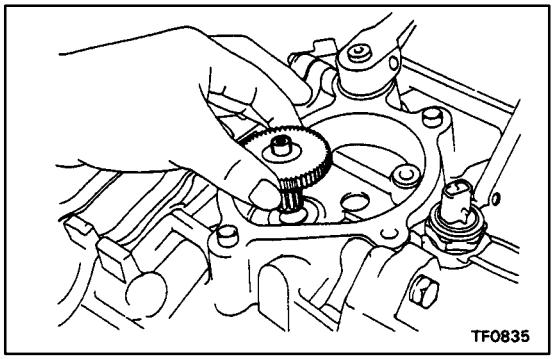
1. REMOVE BREATHER HOSE



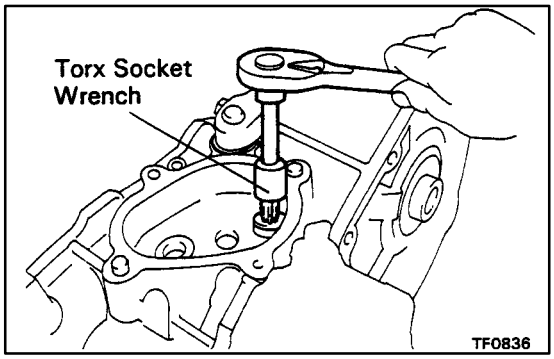
2. REMOVE MOTOR ACTUATOR

Remove the four bolts and motor actuator.

HINT: Remove the motor actuator in differential lock condition.

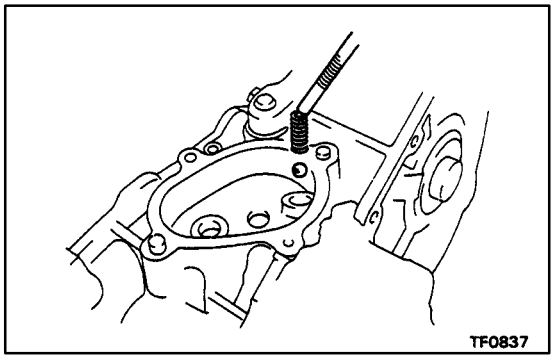


3. REMOVE OUTPUT GEAR

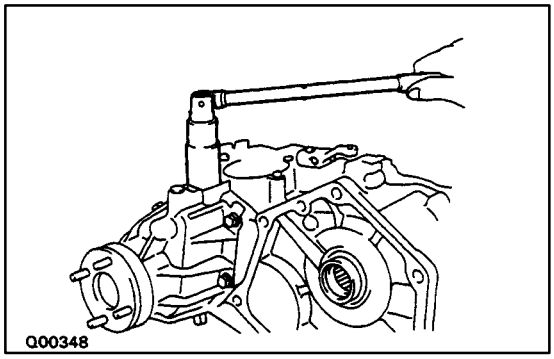


4. REMOVE SCREW PLUG, SPRING AND BALL

(a) Using a torx socket wrench, remove the screw plug.
(Torx socket wrench T40 09042–00020)

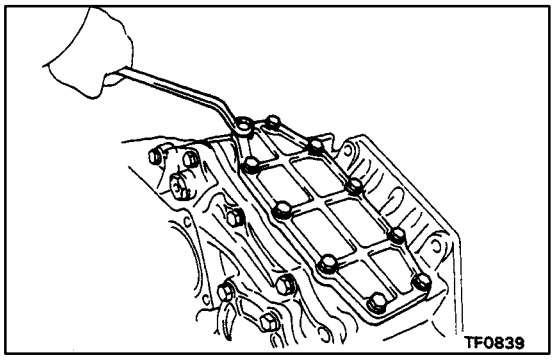


(b) Using a magnetic finger, remove the spring and ball.



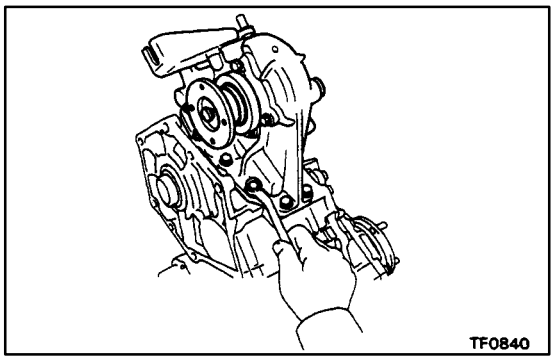
5. REMOVE TRANSFER INDICATOR SWITCHES

Remove the Center Diff Lock indicator switch, L4 position switch and neutral position switch.



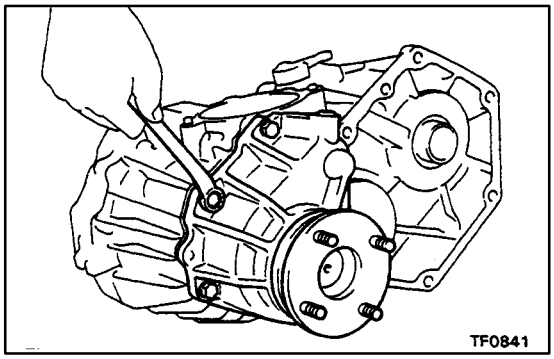
6. (w/o POWER TAKE–OFF)
REMOVE POWER TAKE–OFF COVER

Remove the ten bolts, power take–off cover and gasket.



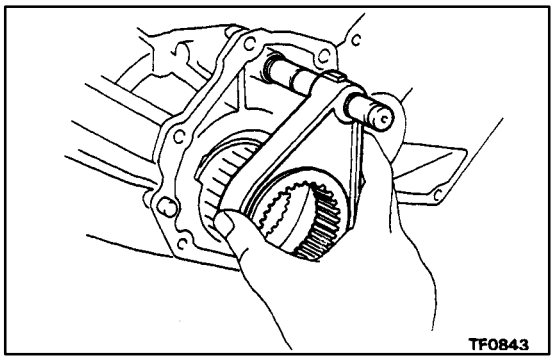
7. (w/ POWER TAKE–OFF)
REMOVE POWER TAKE–OFF CASE

Remove the ten bolts, power take–off case and gasket.

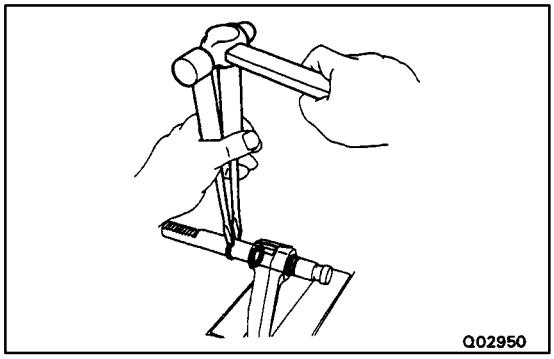


8. REMOVE FRONT EXTENSION HOUSING

(a) Remove the six bolts.
(b) If necessary, tap the front extension housing with a plastic hammer.



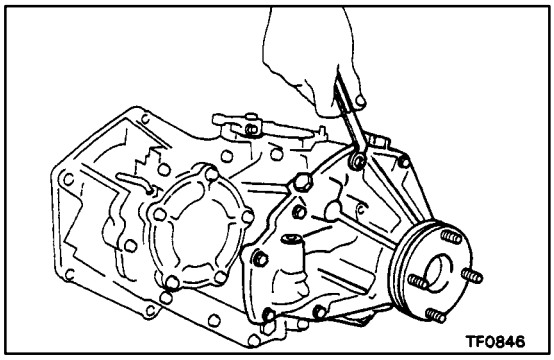
9. REMOVE CLUTCH SLEEVE, SHIFT FORK NO.2 AND FORK SHAFT



10. SEPARATE SHIFT FORK NO.2 AND FORK SHAFT

(a) Using two screwdrivers and a hammer, tap out the three snap rings.

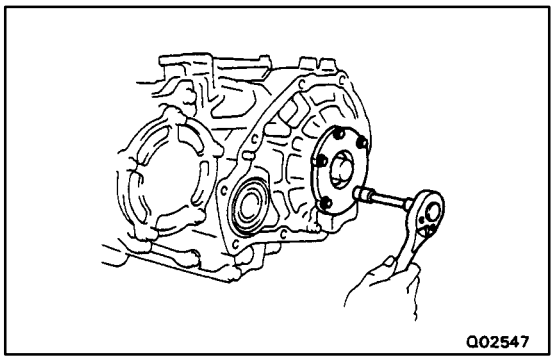
(b) Separate the shift fork No.2 and fork shaft.



11. REMOVE REAR EXTENSION HOUSING

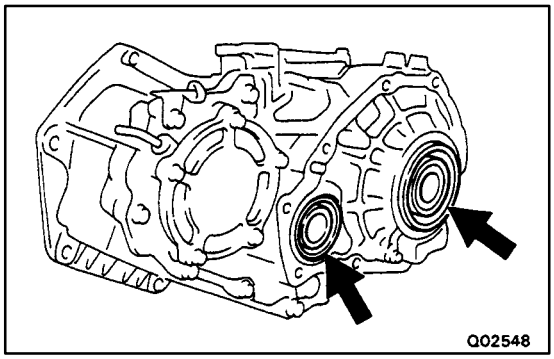
Remove the nine bolts and rear extension housing.

HINT: If necessary, tap the rear extension housing with a plastic hammer.

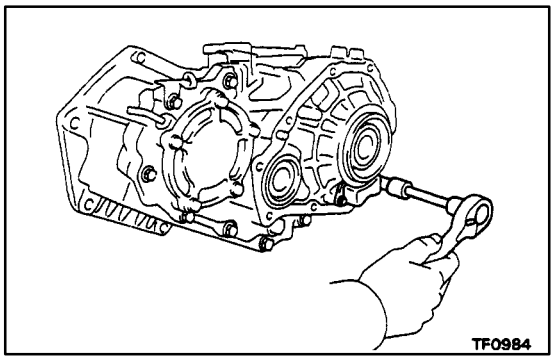


12. REMOVE RETAINER

Remove the five bolts and retainer.

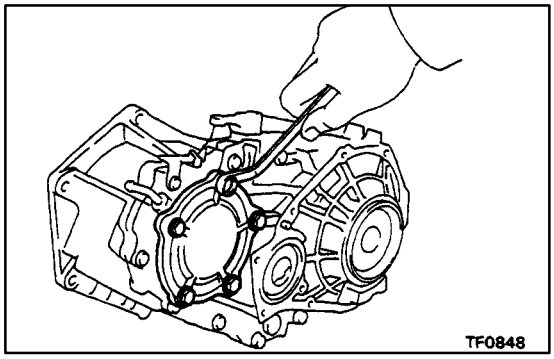


13. REMOVE ADJUSTING SHIMS



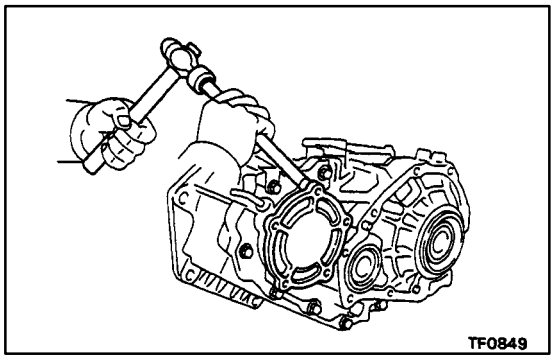
14. REMOVE OIL STRAINER FROM REAR CASE

Remove the two set bolts and oil strainer.

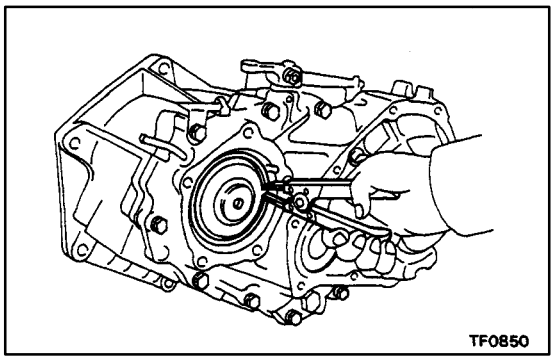


15. REMOVE CASE COVER

(a) Remove the five bolts.

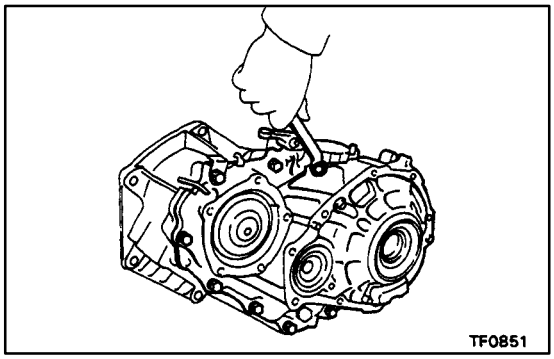


(b) Using a brass bar and hammer, tap the case cover and remove it.

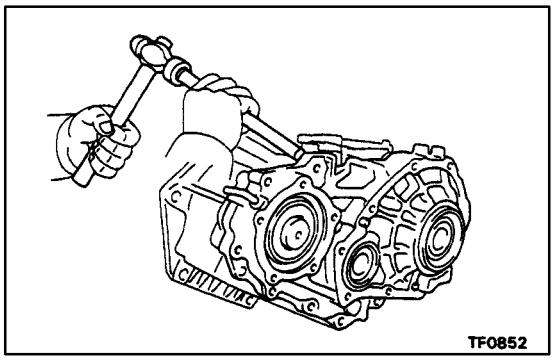


16. SEPARATE FRONT CASE AND REAR CASE

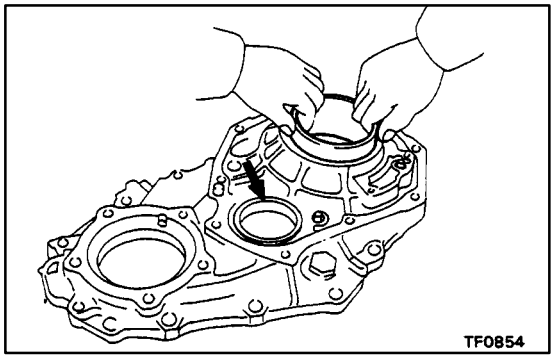
(a) Using snap ring pliers, remove the snap ring.



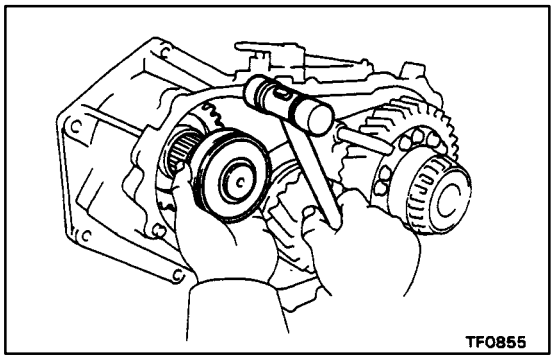
(b) Remove the eight bolts.



(c) Using a brass bar and hammer, tap the rear case and separate it.

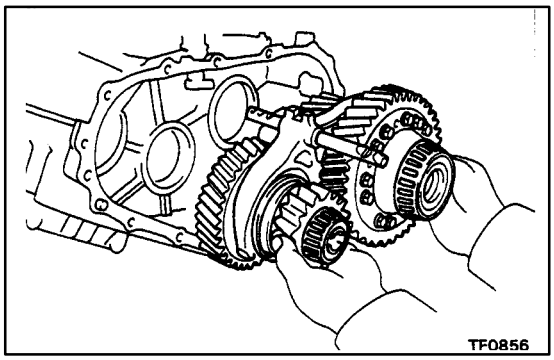


17. REMOVE TWO BEARING RACES FROM REAR CASE

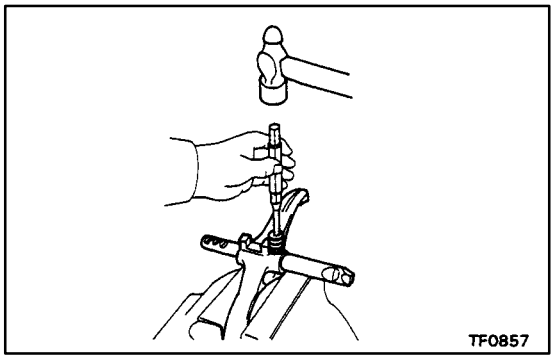


18. REMOVE INPUT SHAFT ASSEMBLY

Using a plastic hammer, remove the input shaft assembly.



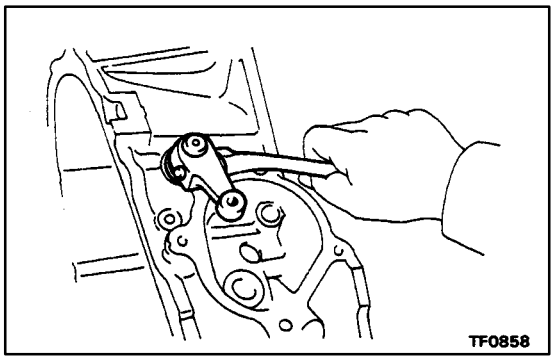
19. REMOVE IDLE GEAR ASSEMBLY, CENTER DIFFERENTIAL ASSEMBLY AND HIGH AND LOW SHIFT FORK ASSEMBLY



20. SEPARATE SHIFT FORK NO.1 AND FORK SHAFT

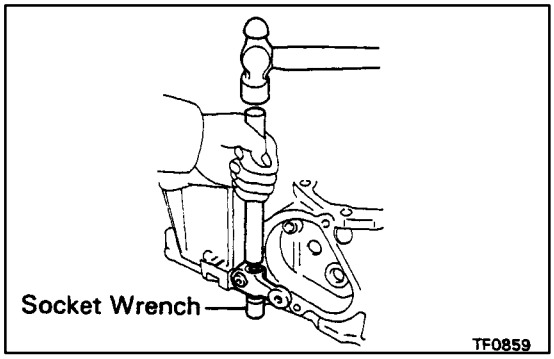
(a) Using a pin punch and hammer, drive out the slotted spring pin.

(b) Separate the shift fork No. 1 and fork shaft.

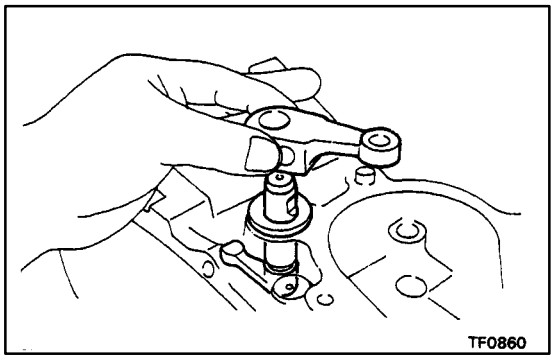


21. REMOVE SHIFT OUTER LEVER AND INNER LEVER

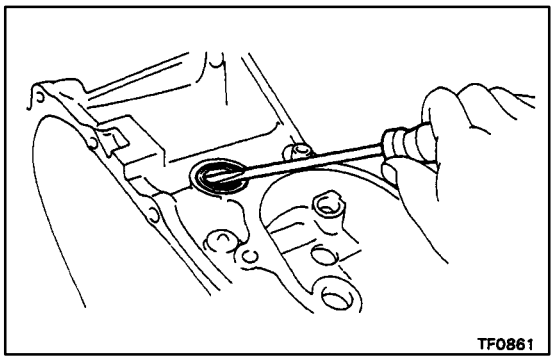
(a) Remove the nut and washer.



(b) Using a brass bar, hammer and socket wrench, tap out the lever lock pin.

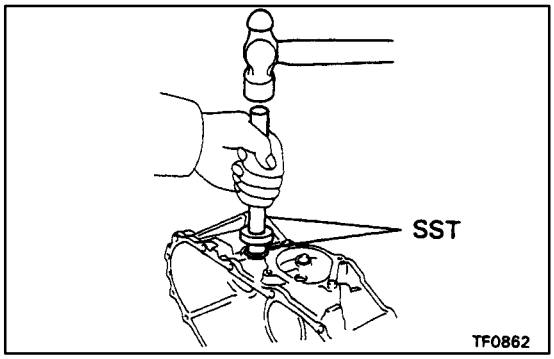


(c) Remove the shift outer lever and inner lever.

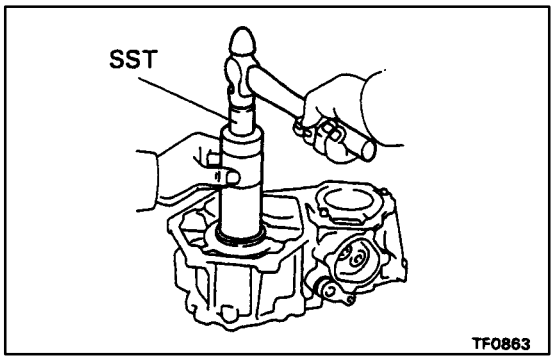


22. IF NECESSARY, REPLACE SHIFT LEVER OIL SEAL

(a) Using a screwdriver, pry out the oil seal.

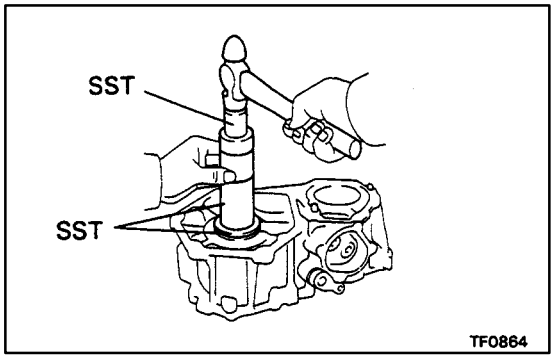


(b) Using SST and a hammer, drive in a new oil seal.
SST 09608–20012 (09608–00080, 09608–03020)

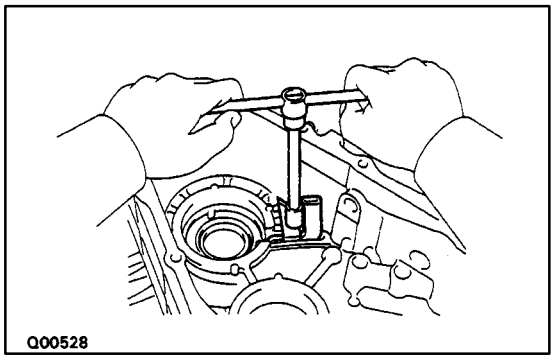


23. IF NECESSARY, REPLACE INPUT SHAFT OIL SEAL

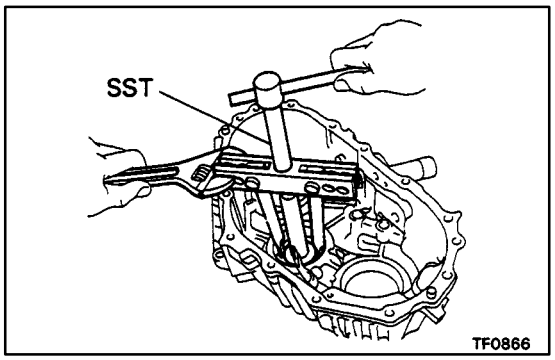
(a) Using SST and a hammer, drive out the oil seal.
SST 09316–60010 (09316–00010)



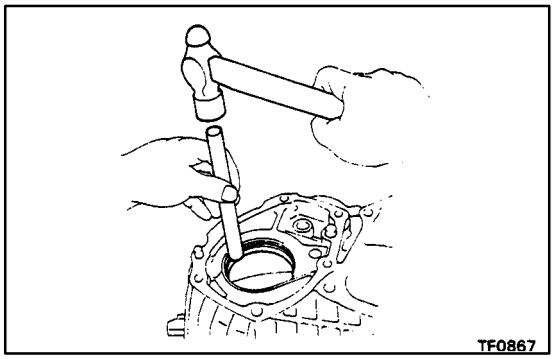
(b) Using SST and a hammer, drive in a new oil seal.
SST 09316–60010 (09316–00010, 09316–00030)



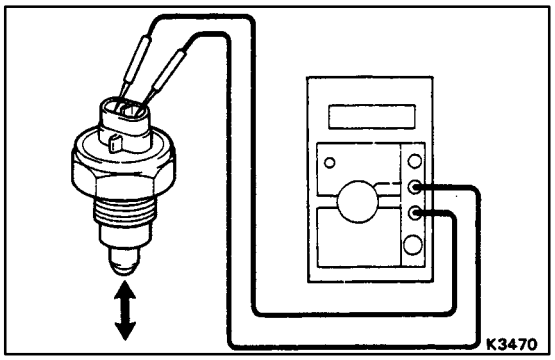
24. REMOVE OIL RECEIVER FROM FRONT CASE
Remove the set bolt and oil receiver.



25. REMOVE TWO BEARING RACES FROM FRONT CASE
(a) Using SST, remove the bearing race.
SST 09950–20017



(b) Using a brass bar and hammer, remove the bearing race.

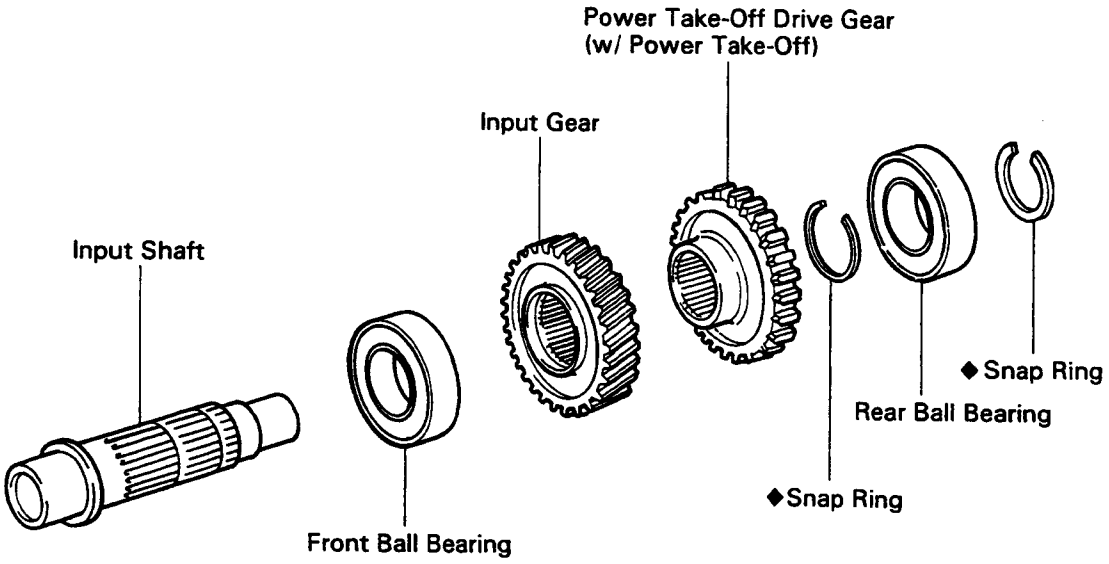


26. INSPECTION OF TRANSFER INDICATOR SWITCHES
Check that there is continuity between terminals as shown.

Switch Position	Specified
Push	Continuity
Free	No continuity

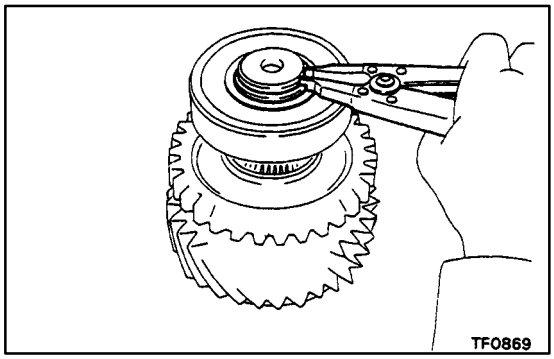
If continuity is not as specified, replace the switch.

COMPONENT PARTS
Input Shaft Assembly
COMPONENTS



◆ Non-reusable part

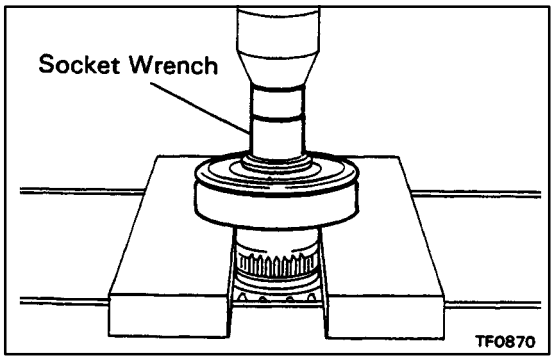
TF0868



DISASSEMBLY OF INPUT SHAFT ASSEMBLY

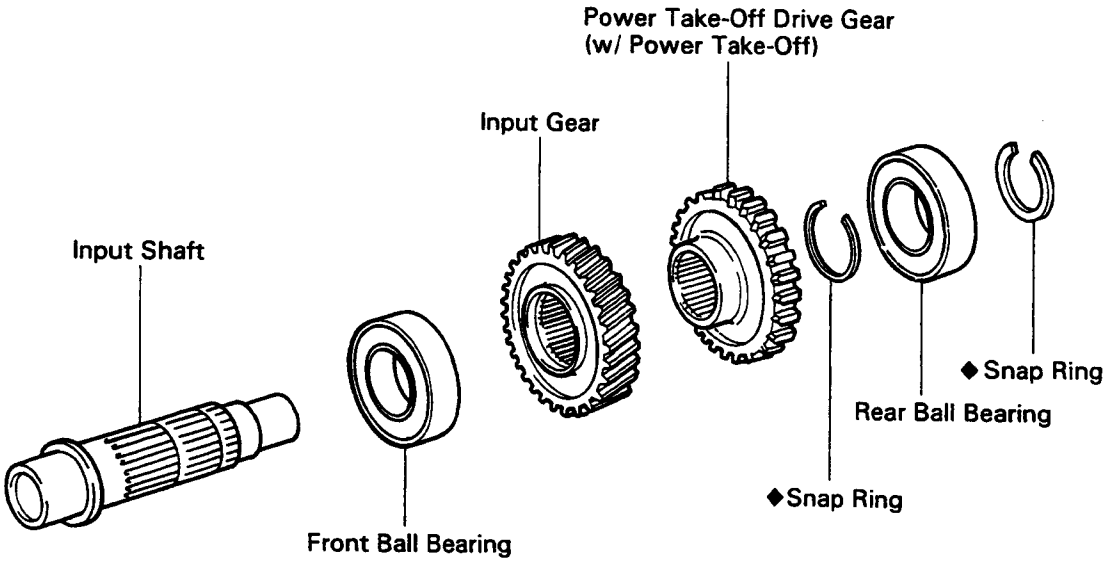
1. REMOVE REAR BALL BEARING

(a) Using snap ring pliers, remove the snap ring.



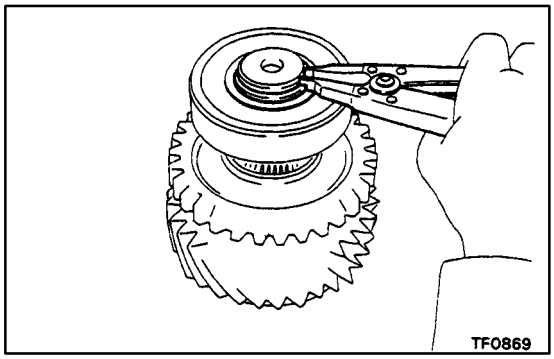
(b) Using a press and socket wrench, remove the rear ball bearing.

COMPONENT PARTS
Input Shaft Assembly
COMPONENTS



◆ Non-reusable part

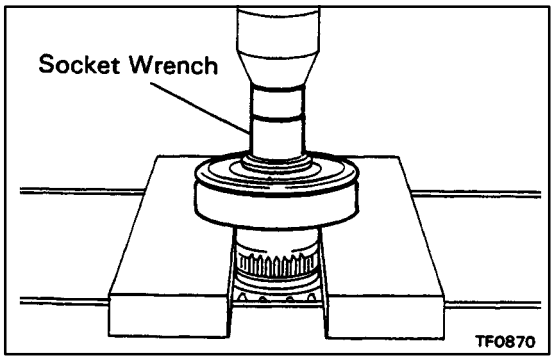
TF0868



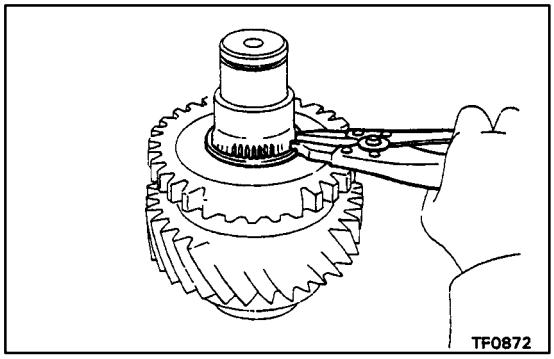
DISASSEMBLY OF INPUT SHAFT ASSEMBLY

1. REMOVE REAR BALL BEARING

(a) Using snap ring pliers, remove the snap ring.

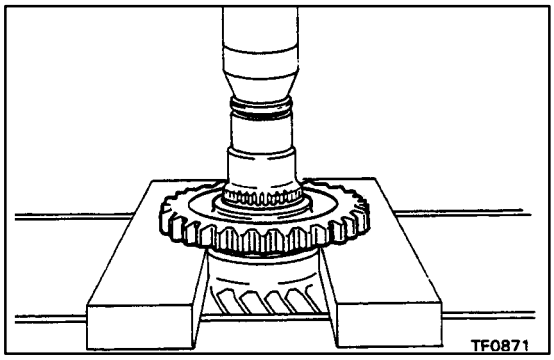


(b) Using a press and socket wrench, remove the rear ball bearing.

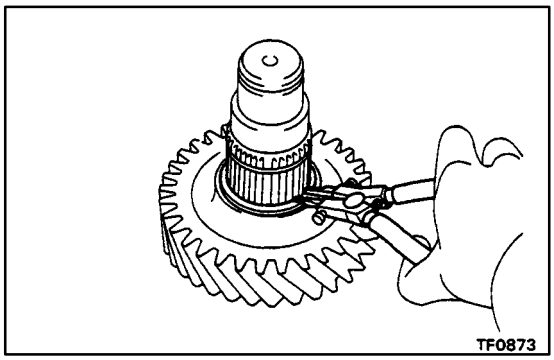


2. (w/ POWER TAKE–OFF)
REMOVE POWER TAKE–OFF DRIVE GEAR

(a) Using snap ring pliers, remove the snap ring.

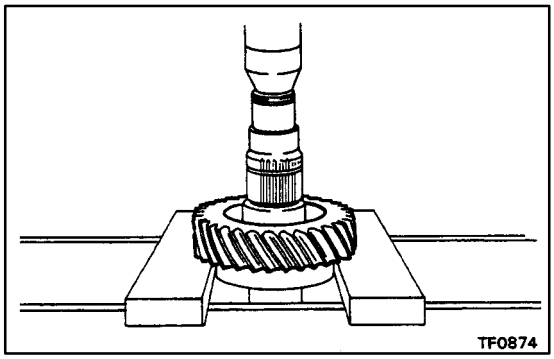


(b) Using a press, remove the power take–off drive gear.

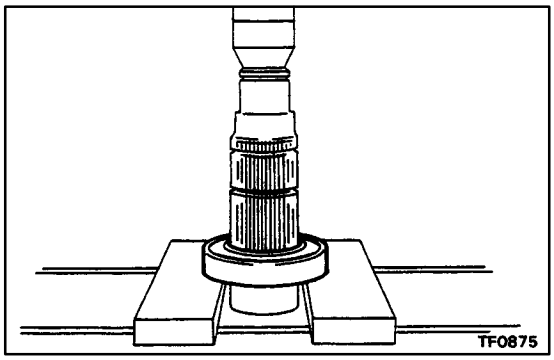


3. REMOVE INPUT GEAR

(a) (w/o Power take–off)
Using snap ring pliers, remove the snap ring.

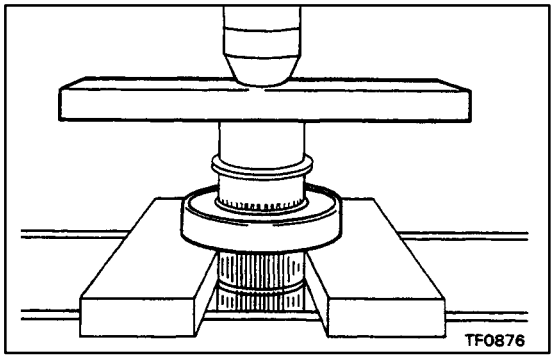


(b) Using a press, remove the input gear.



4. REMOVE FRONT BALL BEARING

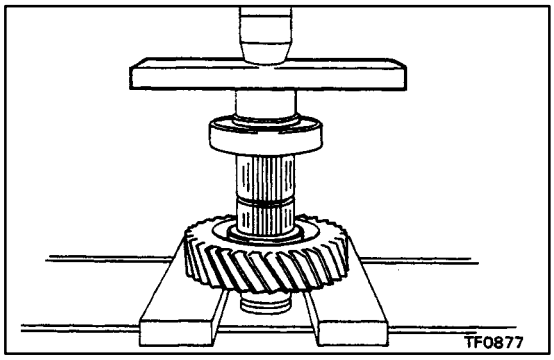
Using a press, remove the front ball bearing.



ASSEMBLY OF INPUT SHAFT ASSEMBLY

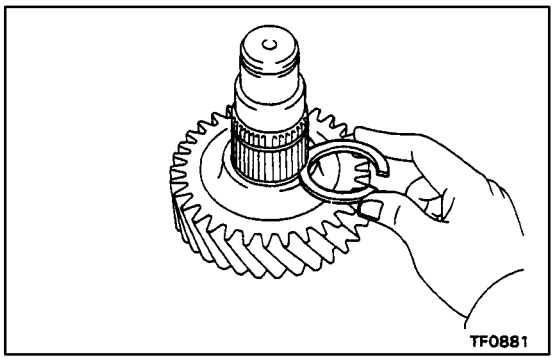
1. INSTALL FRONT BALL BEARING

Using a press, install the front ball bearing.



2. INSTALL INPUT GEAR

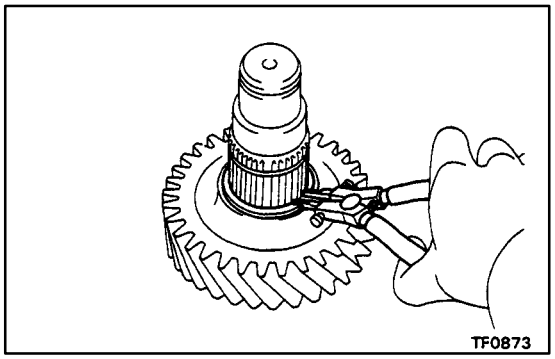
(a) Using a press, install the input gear.

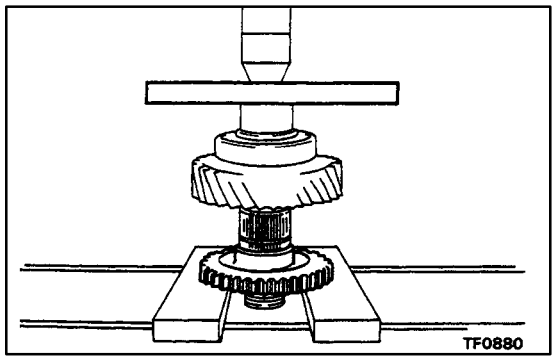


(b) (w/o Power take–off)

Select a snap ring that will allow minimum axial play and install it on the shaft.

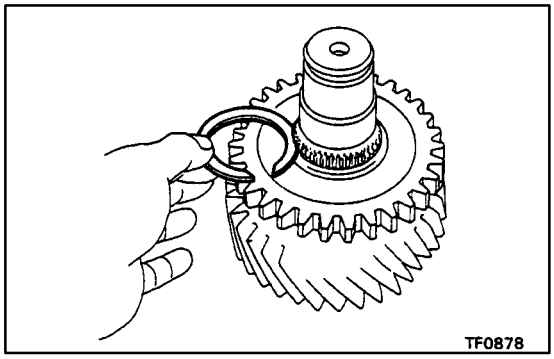
Mark	Thickness mm (in.)
A	2.0 (0.0787)
B	2.1 (0.0827)
C	2.2 (0.0866)
D	2.3 (0.0906)
E	2.4 (0.0945)
F	2.5 (0.0984)
G	2.6 (0.1024)
H	2.7 (0.1063)
J	2.8 (0.1102)





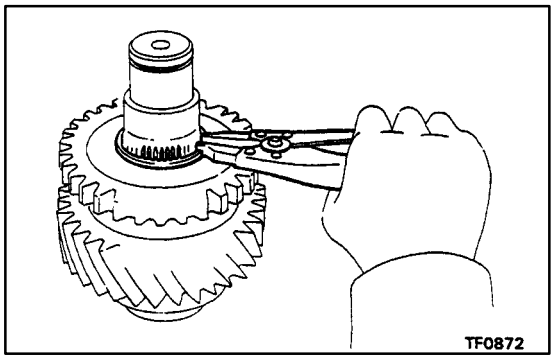
3. (w/ POWER TAKE–OFF)
INSTALL POWER TAKE–OFF GEAR

(a) Using a press, install the power take–off gear.



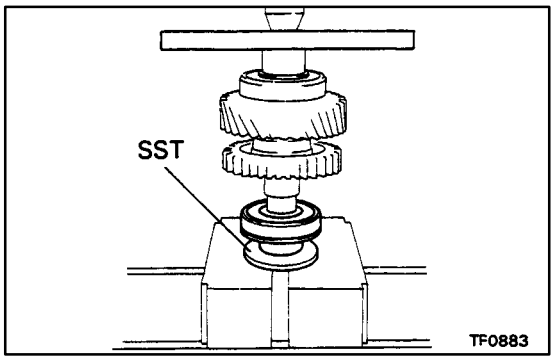
(b) Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness mm (in.)
A	2.0 (0.0787)
B	2.1 (0.0827)
C	2.2 (0.0866)
D	2.3 (0.0906)
E	2.4 (0.0945)
F	2.5 (0.0984)
G	2.6 (0.1024)
H	2.7 (0.1063)
J	2.8 (0.1102)



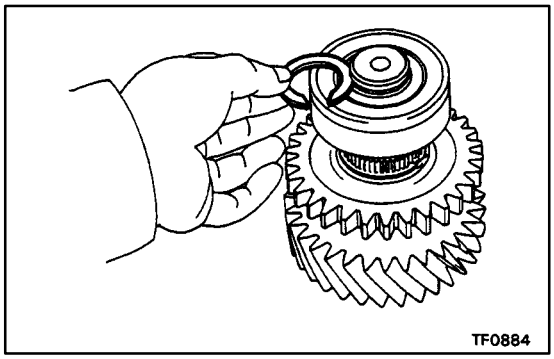
4. INSTALL REAR BALL BEARING

(a) Using SST and a press, install the rear ball bearing.
SST 09316–60010 (09316–00030)

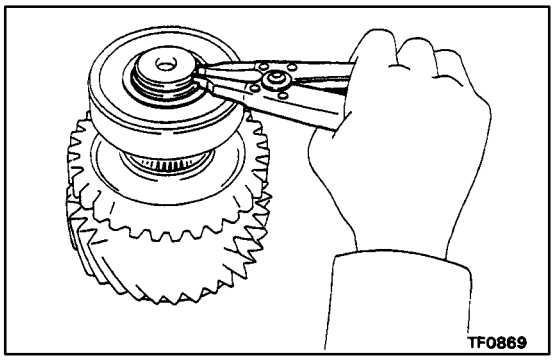


(b) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	2.0 (0.0787)
B	2.1 (0.0827)
C	2.2 (0.0866)
D	2.3 (0.0906)
E	2.4 (0.0945)

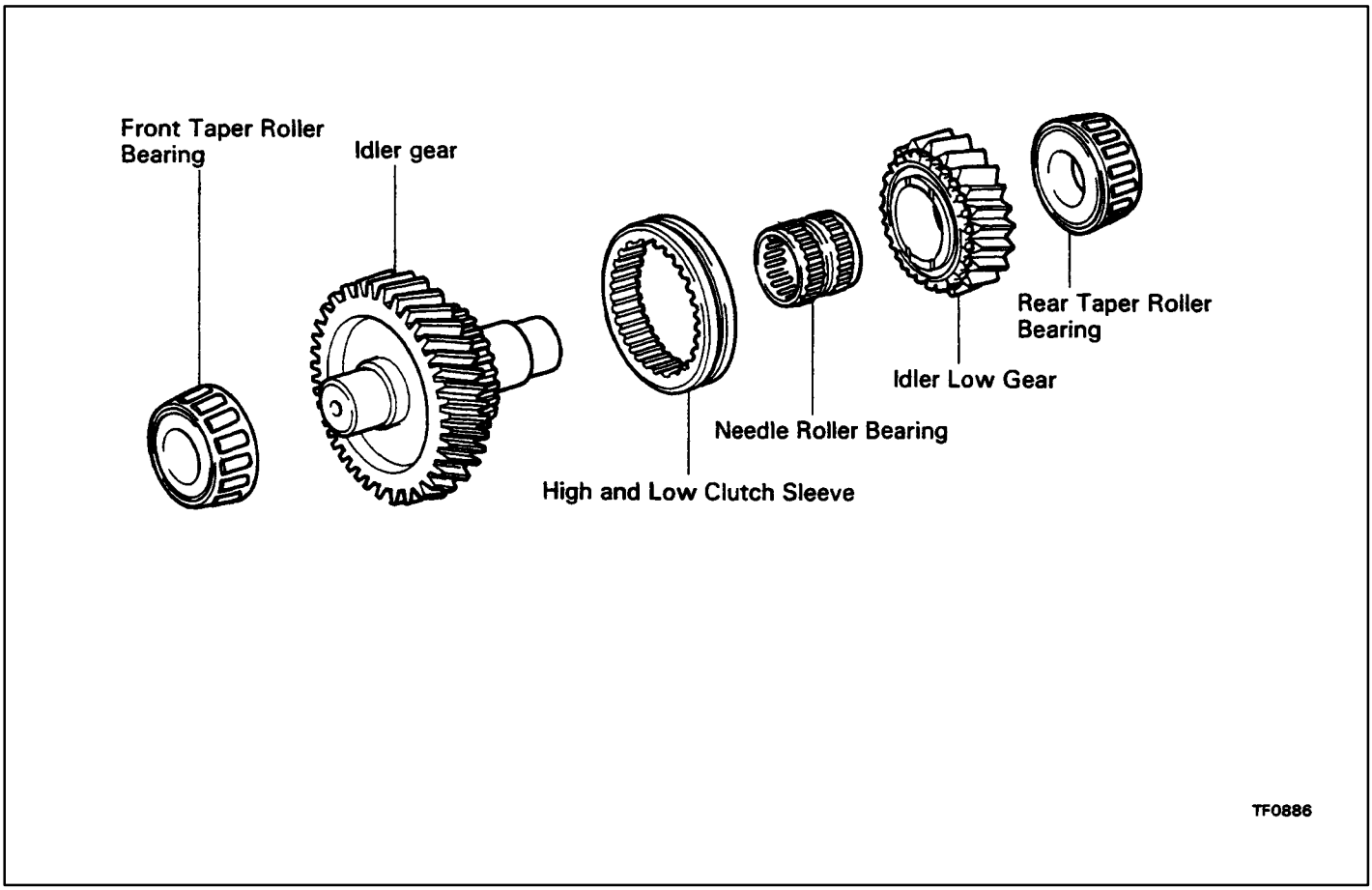


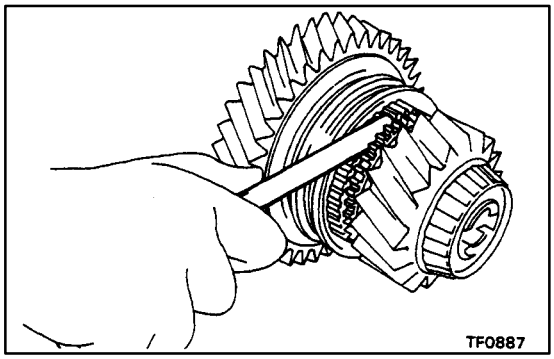
(c) Using snap ring pliers, install the snap ring.

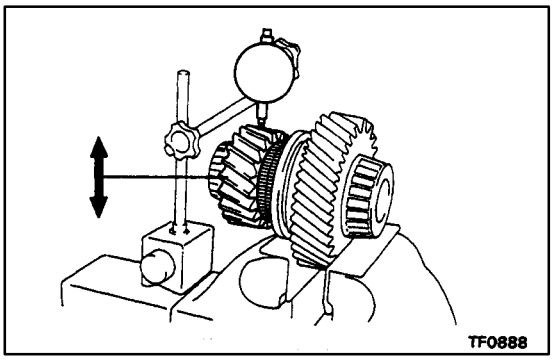


Idler Gear Assembly

COMPONENTS







DISASSEMBLY OF IDLER GEAR ASSEMBLY

1. CHECK OIL CLEARANCE AND THRUST CLEARANCE OF IDLER LOW GEAR

(a) Using a feeler gauge, measure the idler low gear thrust clearance.

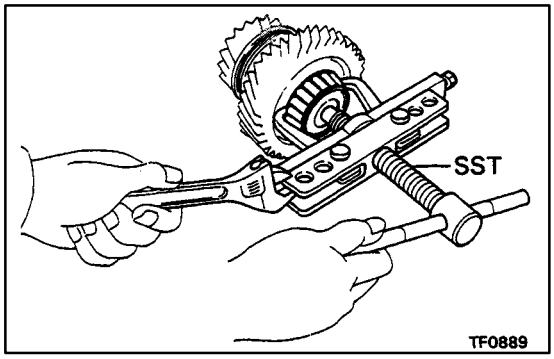
Standard clearance: 0.125–0.275 mm (0.0049–0.0108 in.)

Maximum clearance: 0.275 mm (0.0108 in.)

(b) Using a dial indicator, measure the idler low gear oil clearance.

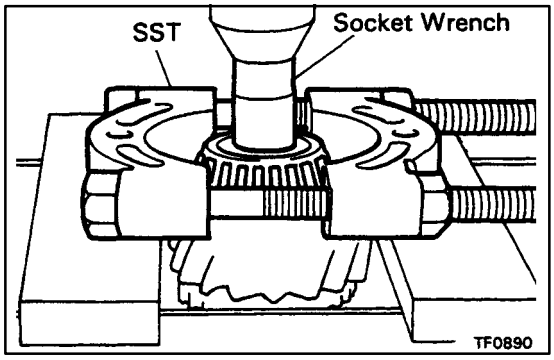
Standard clearance: 0.015–0.068 mm (0.0006–0.0027 in.)

Maximum clearance: 0.068 mm (0.0027 in.)



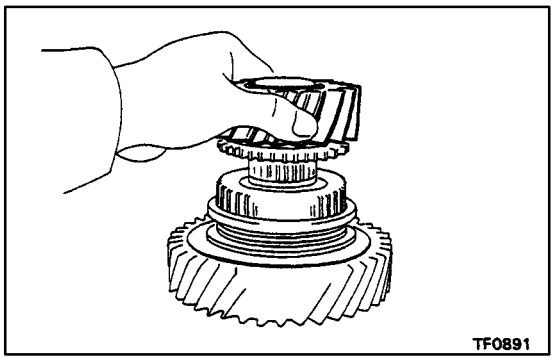
2. REMOVE FRONT TAPER ROLLER BEARING

Using SST, remove the front taper roller bearing.
SST 09950–20017

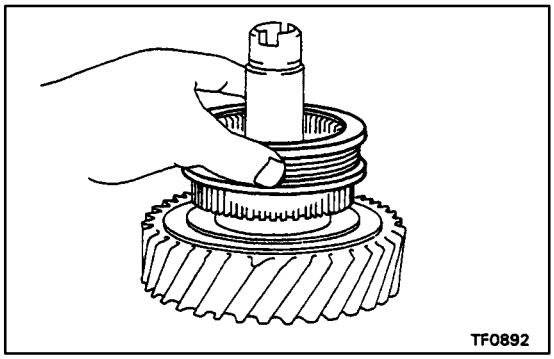


3. REMOVE REAR TAPER ROLLER BEARING

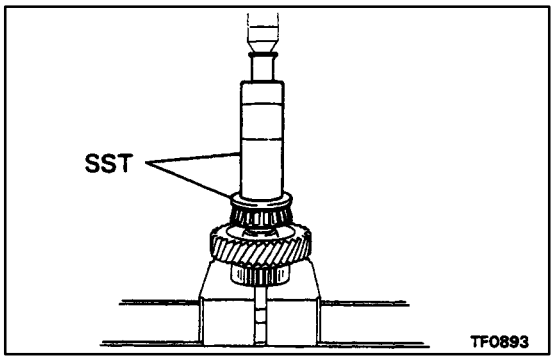
Using SST, press and socket wrench, remove the rear taper roller bearing.
SST 09950–00020



4. REMOVE IDLER LOW GEAR AND NEEDLE ROLLER BEARING



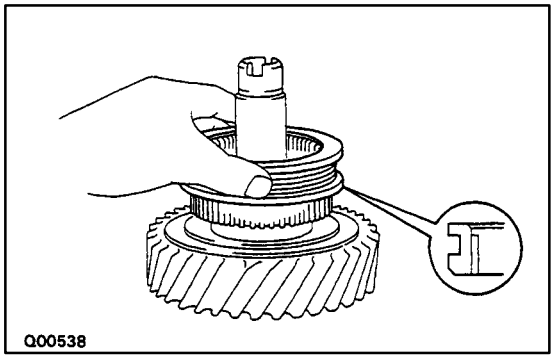
5. REMOVE HIGH AND LOW CLUTCH SLEEVE



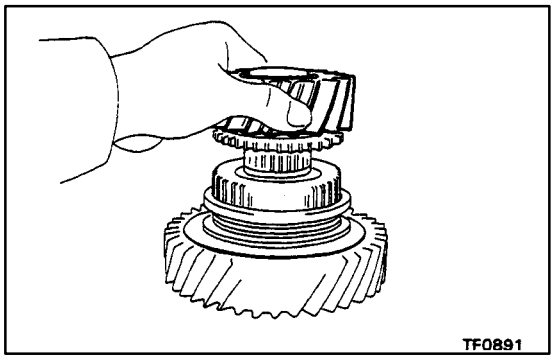
ASSEMBLY OF IDLER GEAR ASSEMBLY

1. INSTALL FRONT TAPER ROLLER BEARING

Using SST and a press, install the front taper roller bearing.
SST 09316–60010 (09316–00010, 09316–00030)



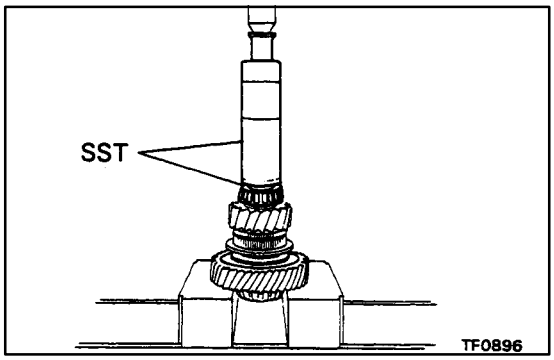
2. INSTALL HIGH AND LOW CLUTCH SLEEVE



3. INSTALL NEEDLE ROLLER BEARING AND IDLER LOW GEAR

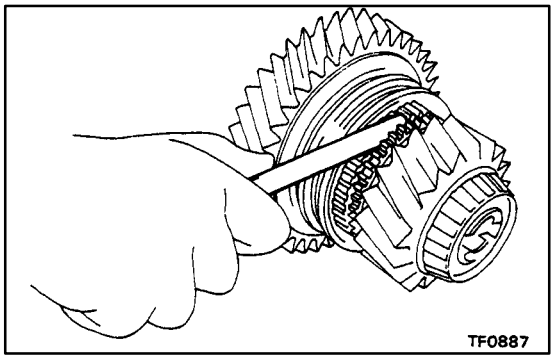
(a) Apply gear oil to the needle roller bearing.

(b) Install the needle roller bearing and idler low gear.



4. INSTALL REAR TAPER ROLLER BEARING

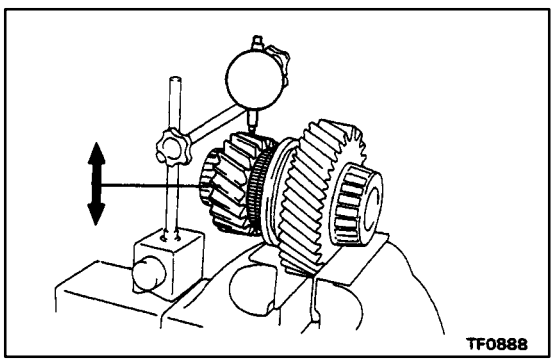
Using SST and a press, install the rear taper roller bearing.
SST 09316–60010 (09316–00010, 09316–00070)



5. MEASURE OIL CLEARANCE AND THRUST CLEARANCE OF IDLE LOW GEAR

(a) Using a feeler gauge, measure the idler low gear thrust clearance.

Standard clearance: 0.125–0.275 mm (0.0049–0.0108 in.)
Maximum clearance: 0.275 mm (0.0108 in.)

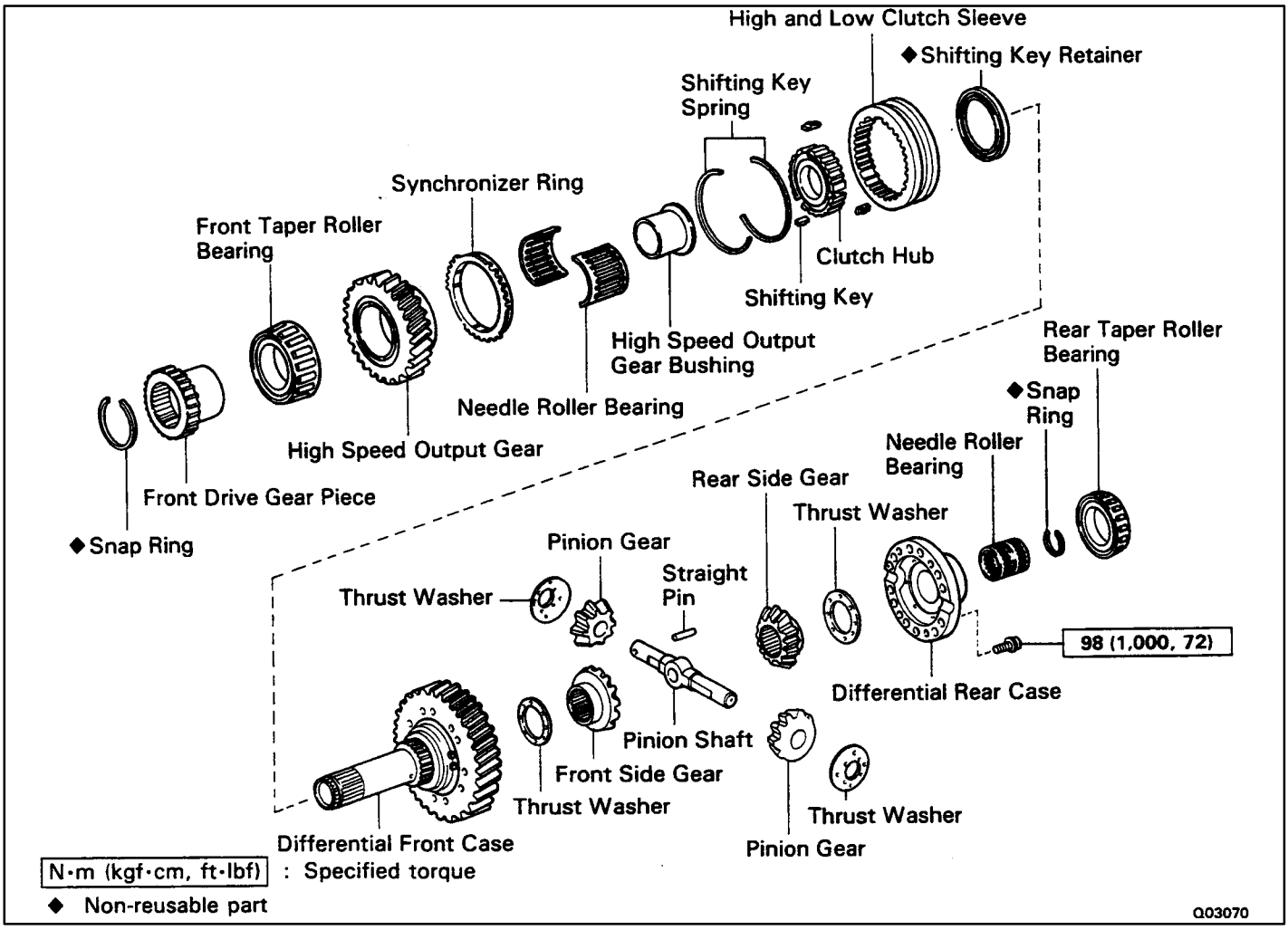


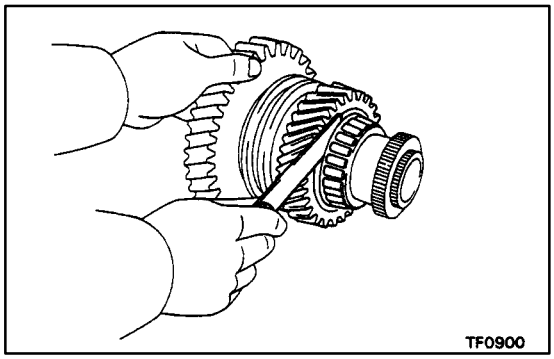
(b) Using a dial indicator, measure the idler low gear oil clearance.

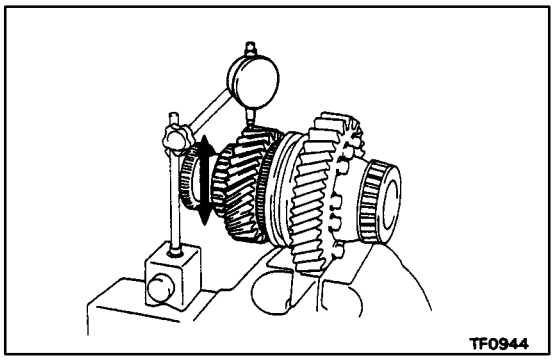
Standard clearance: 0.015–0.068 mm (0.0006–0.0027 in.)
Maximum clearance: 0.068 mm (0.0027 in.)

Center Differential Assembly

COMPONENTS







DISASSEMBLY OF CENTER DIFFERENTIAL ASSEMBLY

1. CHECK OIL CLEARANCE AND THRUST CLEARANCE OF HIGH SPEED GEAR

(a) Using a feeler gauge, measure the high speed gear thrust clearance.

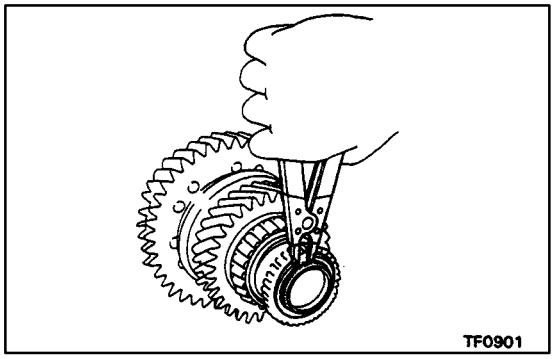
Standard clearance: 0.10–0.25 mm (0.0039–0.0098 in.)

Maximum clearance: 0.25 mm (0.0098 in.)

(b) Using a dial indicator, measure the high speed gear oil clearance.

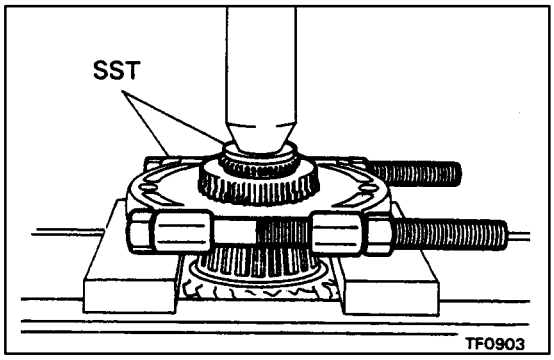
Standard clearance: 0.015–0.071 mm (0.0006–0.0028 in.)

Maximum clearance: 0.071 mm (0.0028 in.)

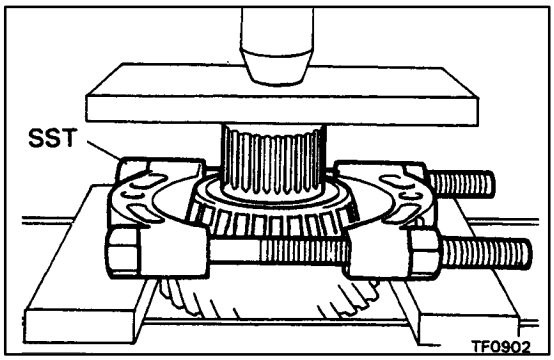


2. REMOVE FRONT DRIVE GEAR PIECE

(a) Using snap ring pliers, remove the snap ring.

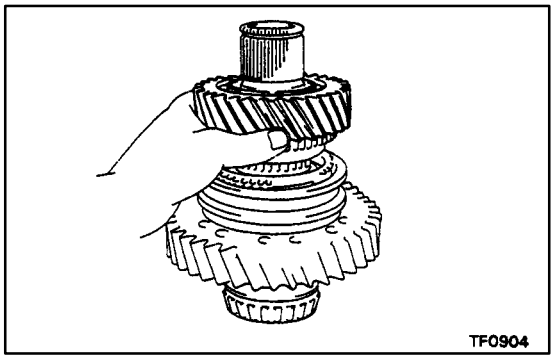


(b) Using SST and a press, remove the front drive gear piece.
SST 09950–20017, 09950–00020
NOTICE: Be careful do not drop the center differential assembly.

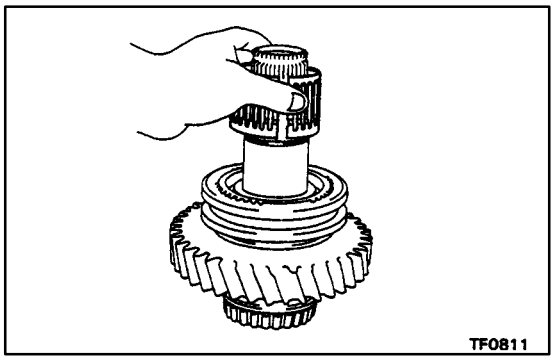


3. REMOVE FRONT TAPER ROLLER BEARING

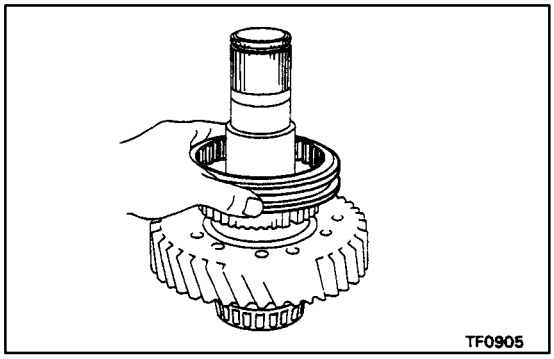
Using SST and a press, remove the front taper roller bearing.
SST 09950–00020



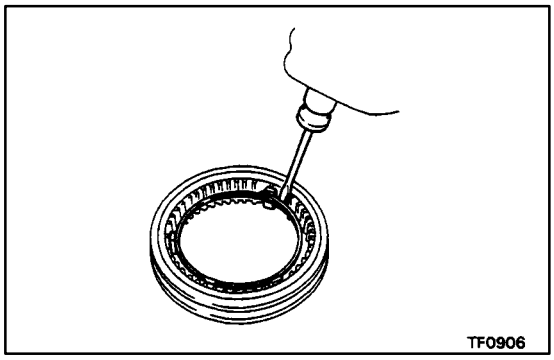
4. REMOVE HIGH SPEED OUTPUT GEAR AND SYNCHRONIZER RING



5. REMOVE NEEDLE ROLLER BEARING

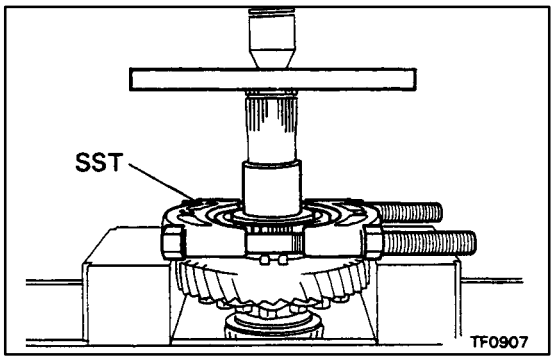


6. REMOVE HIGH AND LOW CLUTCH SLEEVE ASSEMBLY



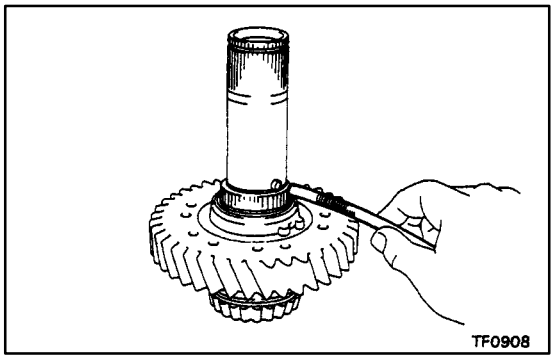
7. REMOVE HIGH AND LOW CLUTCH SLEEVE SHIFTING KEYS AND SPRINGS

Using a screwdriver, remove the two shifting key springs and shifting keys.

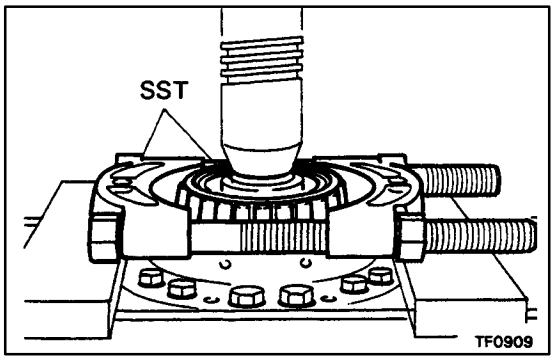


8. REMOVE HIGH SPEED OUTPUT GEAR BUSHING, CLUTCH HUB AND SHIFTING KEY RETAINER

(a) Using SST and a press, remove the high speed output gear bushing, clutch hub and shifting key retainer.
SST 09555–55010



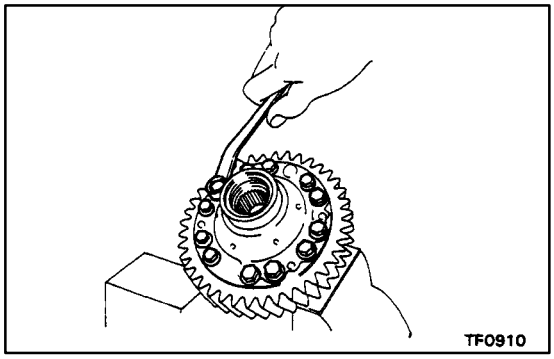
(b) Using a magnetic finger, remove the two straight pins.



9. REMOVE REAR TAPER ROLLER BEARING

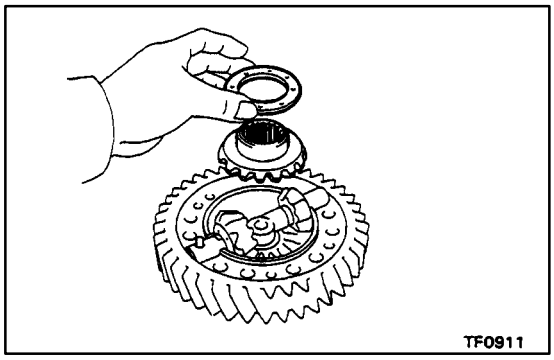
Using SST and a press, remove the rear taper roller bearing.
SST 09950–00020, 09950–20017 (09958–30010)

10. REMOVE SNAP RING AND NEEDLE ROLLER BEARING

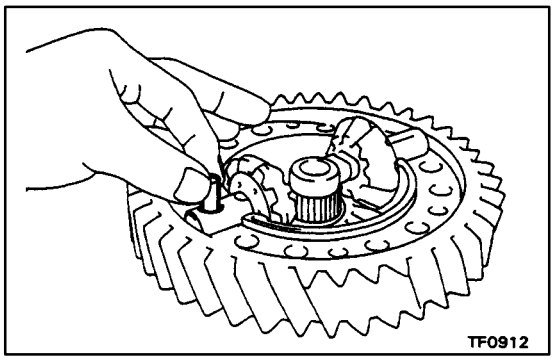


11. REMOVE DIFFERENTIAL REAR CASE

Remove the twelve bolts and differential rear case.

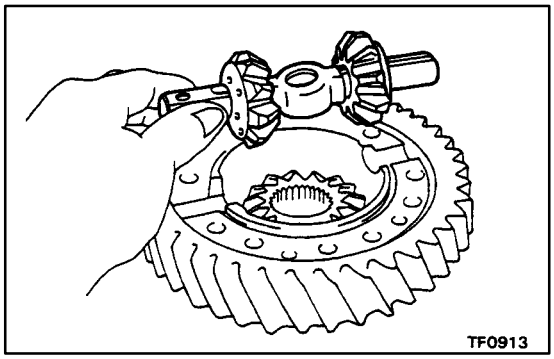


12. REMOVE REAR SIDE GEAR AND THRUST WASHER

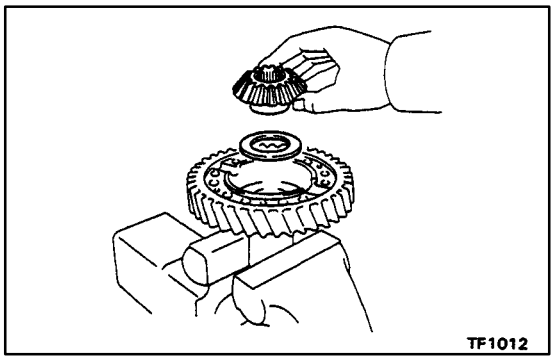


13. REMOVE PINION SHAFT, PINION GEAR AND THRUST WASHER

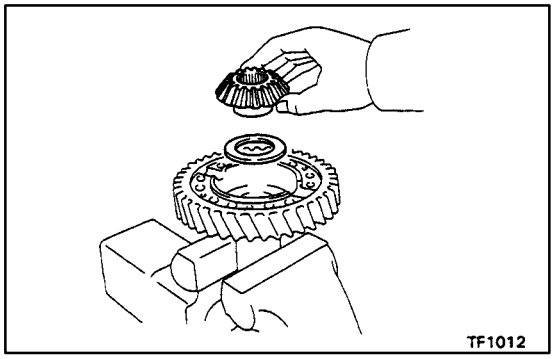
(a) Remove the straight pin.



(b) Remove the pinion shaft, pinion gear and thrust washer.



(c) Remove the front side gear and thrust washer.

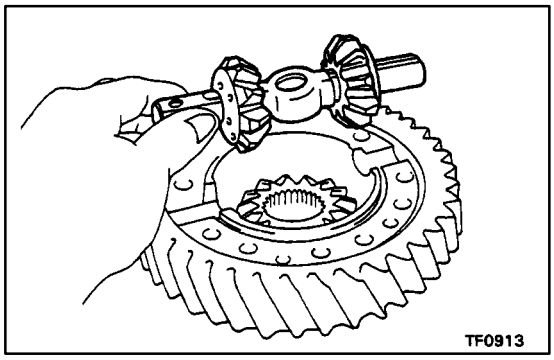


ASSEMBLY OF CENTER DIFFERENTIAL ASSEMBLY

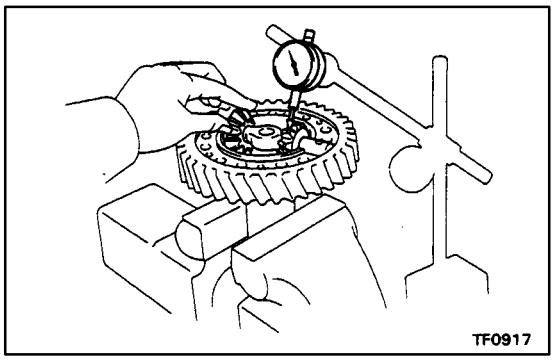
1. INSTALL PINION SHAFT, PINION GEAR AND THRUST WASHER

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

(a) Install the front side gear and thrust washer to the differential front case.



(b) Install the two pinion gears and thrust washers to the differential front case.



(c) Using a dial indicator, measure the front case backlash.

HINT: Push the pinion shaft.

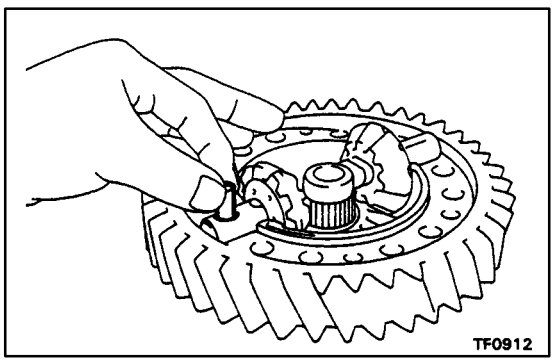
Minimum backlash: 0.05 mm (0.0020 in.)

If the backlash is not within specification, replace the thrust washer with one of the correct size and reinstall the thrust washer.

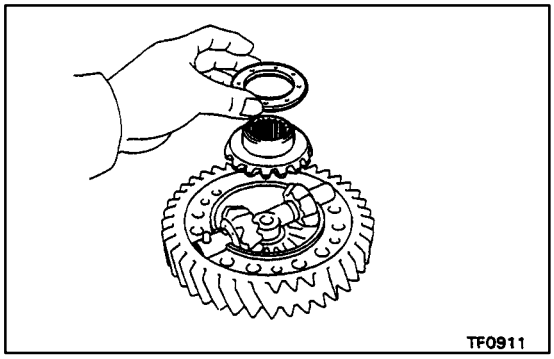
Thickness mm (in.)
1.70 (0.0669)
1.85 (0.0728)
2.00 (0.0787)
2.15 (0.0846)
2.30 (0.0906)
2.45 (0.0965)
2.60 (0.1024)
2.75 (0.1083)
2.90 (0.1142)
3.05 (0.1201)

(d) Measure the rear case backlash.

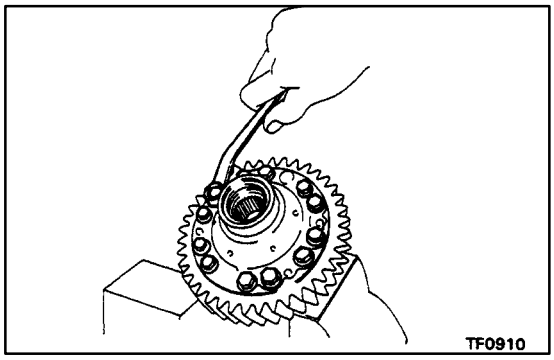
(See steps (a) to (c))



2. INSTALL STRAIGHT PIN

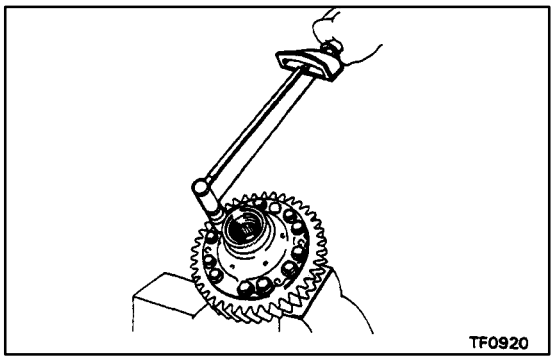


3. INSTALL REAR SIDE GEAR AND THRUST WASHER



4. INSTALL DIFFERENTIAL REAR CASE

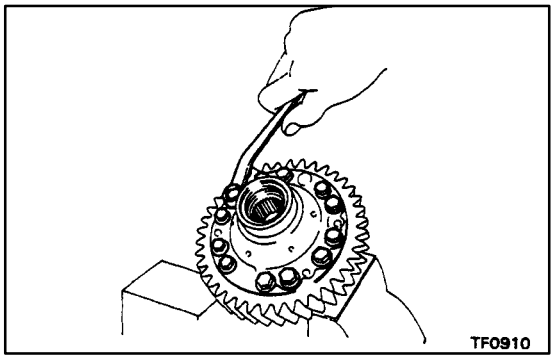
Temporary install the differential rear case and set bolts.



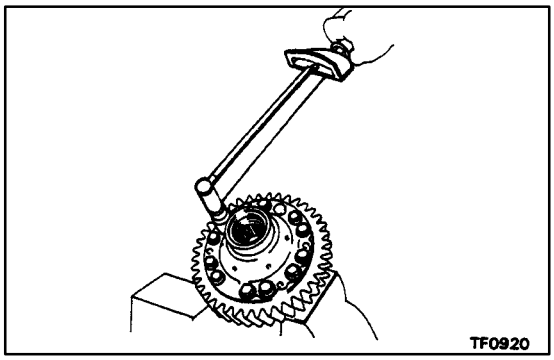
5. TORQUE REAR CASE SET BOLTS

(a) Torque the rear case set bolts.

Torque: 88 N·m (900 kgf·cm, 65 ft·lbf)



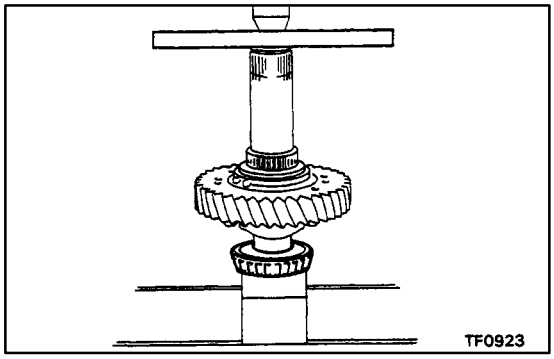
(b) Loosen the rear case set bolts.



(c) Retorque the rear case set bolts.

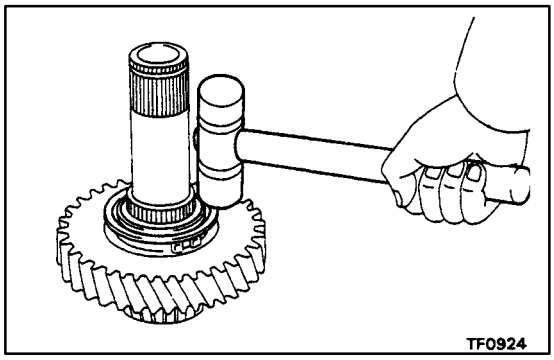
Torque: 98 N·m (1000 kgf·cm, 72 ft·lbf)

6. INSTALL NEEDLE ROLLER BEARING AND SNAP RING



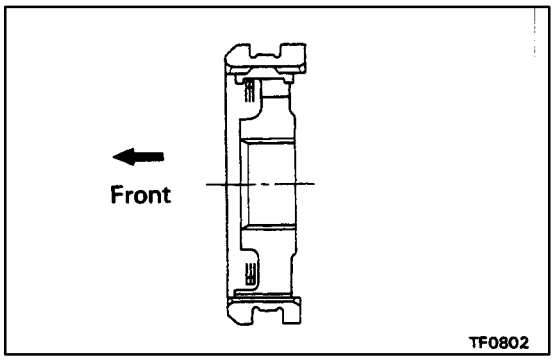
7. INSTALL REAR TAPER ROLLER BEARING

Using a press, install the rear taper roller bearing.



8. INSTALL SHIFTING KEY RETAINER

Using a plastic hammer, tap in the shifting key retainer.

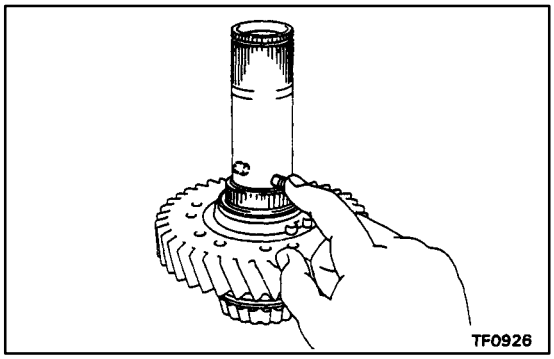


9. INSERT CLUTCH HUB INTO HIGH AND LOW CLUTCH SLEEVE

(a) Install the clutch hub and shifting keys to the high and low clutch sleeve.

(b) Install the shifting key springs.

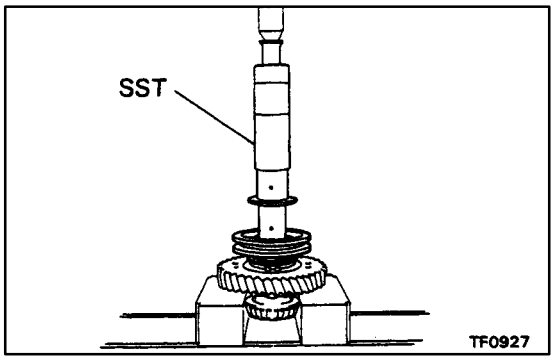
NOTICE: Install the key springs positioned so that their end gaps are not in line.



10. INSTALL HIGH AND LOW CLUTCH SLEEVE ASSEMBLY AND HIGH SPEED OUTPUT GEAR BUSHING

(a) Apply MP grease to the straight pin.

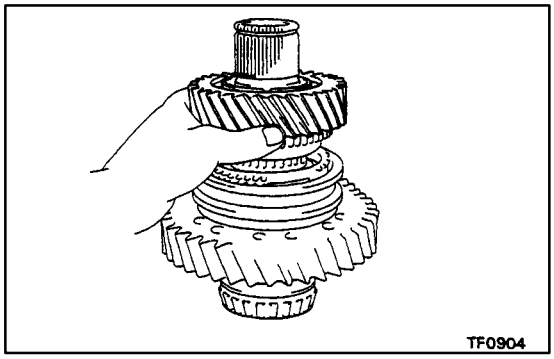
(b) Install the two straight pins.



(c) Using SST and a press, install the clutch sleeve assembly and high speed output gear bushing.

SST 09316–60010 (09316–00010)

NOTICE: Before pressing, align the holes on the bushing and shaft so that the pin on the shaft aligned with the cutting portion of the bushing.

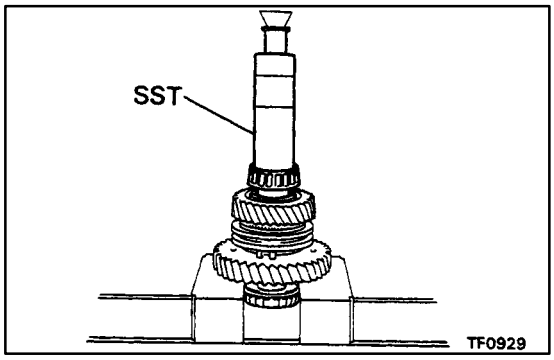


11. INSTALL HIGH SPEED OUTPUT GEAR AND NEEDLE ROLLER BEARING

(a) Apply gear oil to the needle roller bearing.

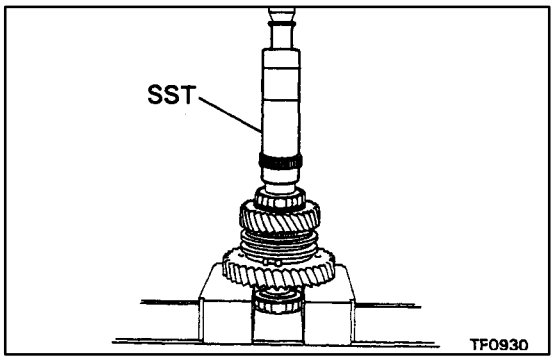
(b) Place the synchronizer ring on the gear and install the high speed output gear and needle roller bearing.

NOTICE: Align the ring slots with the shifting keys.



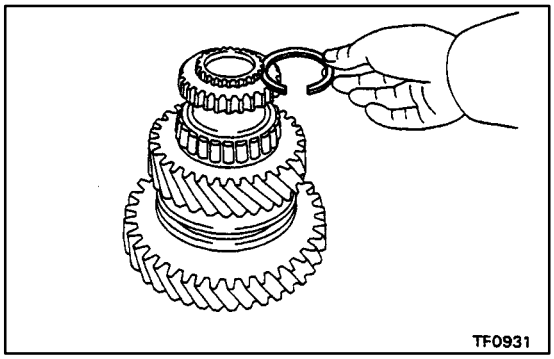
12. INSTALL FRONT TAPER ROLLER BEARING

Using SST and a press, install the front taper roller bearing.
SST 09316–60010 (09316–00010)



13. INSTALL FRONT DRIVE GEAR PIECE

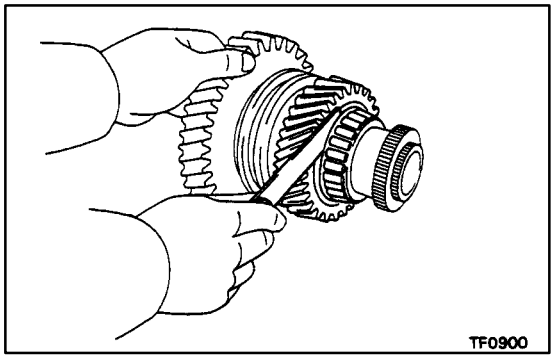
Using SST and a press, install the front drive gear piece.
SST 09316–60010 (09316–00010)



14. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness mm (in.)
A	2.00 (0.0787)
B	2.10 (0.0827)
C	2.20 (0.0866)
D	2.30 (0.0906)
E	2.40 (0.0945)
F	2.50 (0.0984)
G	2.60 (0.1024)
H	2.70 (0.1063)
J	2.80 (0.1102)
K	1.80 (0.0709)
L	1.90 (0.0748)

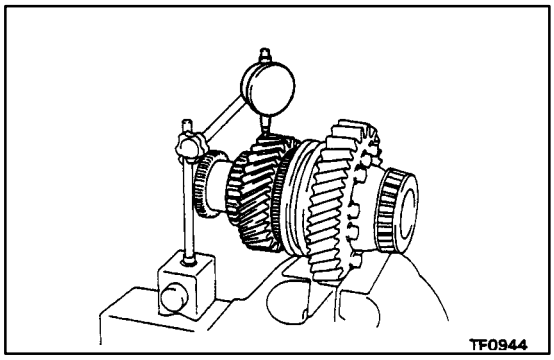


15. MEASURE OIL CLEARANCE AND THRUST CLEARANCE OF HIGH SPEED OUTPUT GEAR

(a) Using a feeler gauge, measure the high speed gear thrust clearance.

Standard clearance: 0.10–0.25 mm (0.0039–0.0098 in.)

Maximum clearance: 0.25 mm (0.0098 in.)



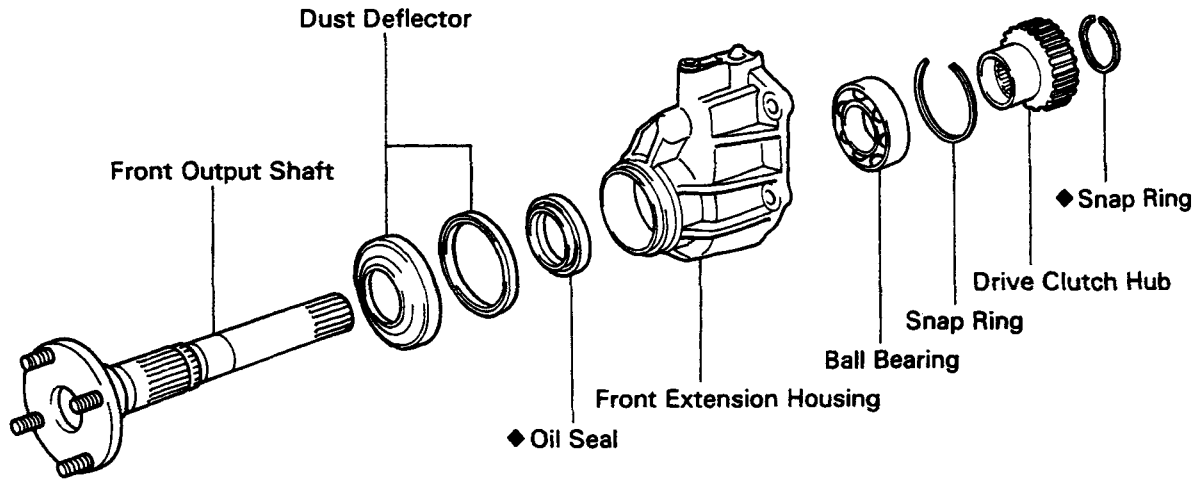
(b) Using a dial indicator, measure the high speed gear oil clearance.

Standard clearance: 0.015–0.071 mm (0.0006–0.0028 in.)

Maximum clearance: 0.071 mm (0.0028 in.)

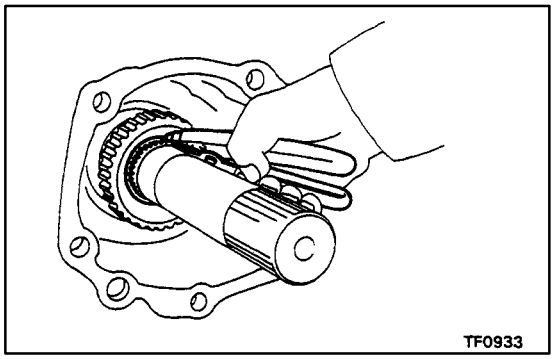
Front Extension Housing Assembly

COMPONENTS



◆ Non-reusable part

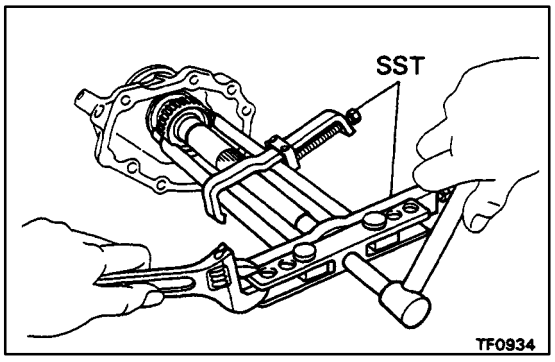
TF0932



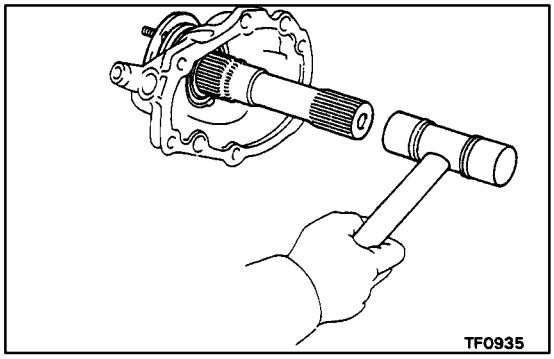
DISASSEMBLY OF FRONT EXTENSION HOUSING ASSEMBLY

1. REMOVE DRIVE CLUTCH HUB

(a) Using snap ring pliers, remove the snap ring.

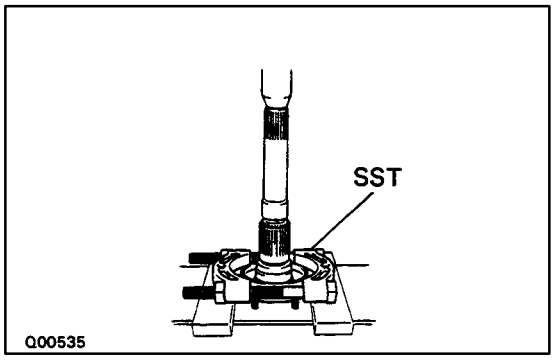


(b) Using SST, remove the drive clutch hub.
SST 09950–20017



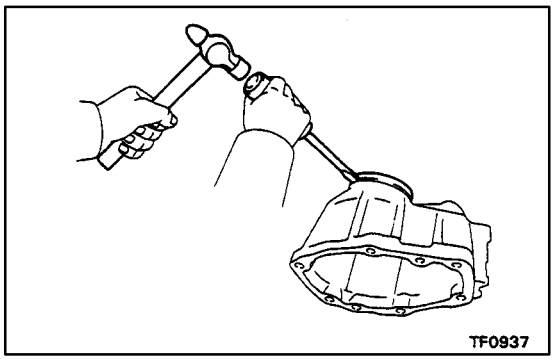
2. REMOVE FRONT OUTPUT SHAFT

Using a plastic hammer, drive out the front output shaft.

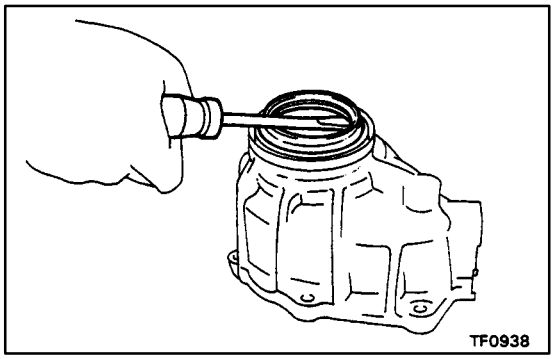


3. REMOVE DUST DEFLECTORS

(a) Using SST and a press, remove the dust deflector.
SST 09950–00020

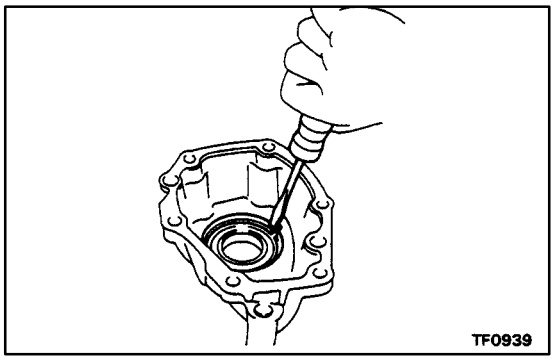


(b) Using a screwdriver and hammer, tap the dust deflector and remove it.



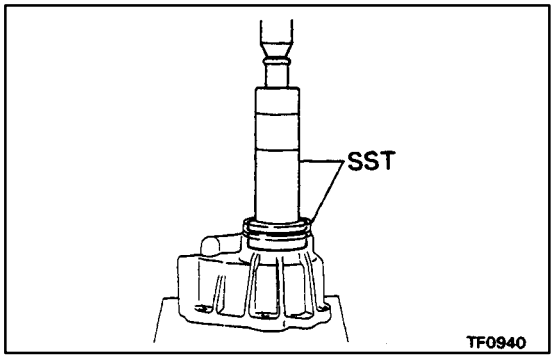
4. REMOVE OIL SEAL

Using a screwdriver, pry out the oil seal.

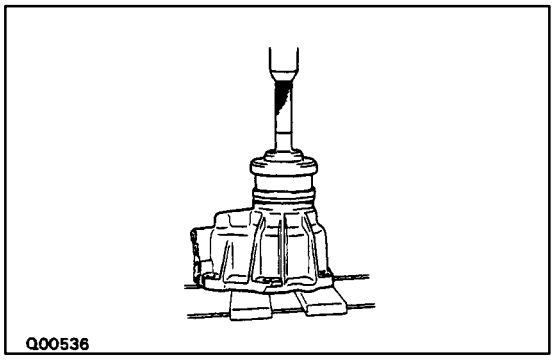


5. REMOVE BALL BEARING

(a) Using a screwdriver, remove the snap ring.



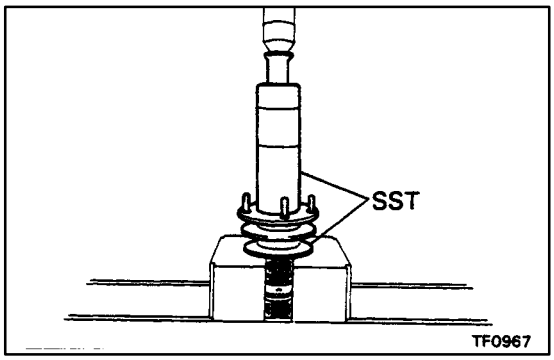
(b) Using SST and a press, remove the ball bearing.
SST 09316–60010 (09316–00010, 09316–00070)



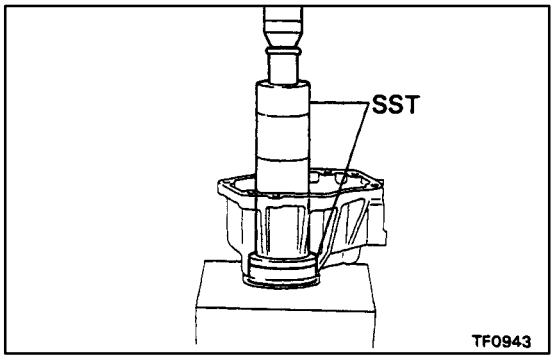
ASSEMBLY OF FRONT EXTENSION HOUSING ASSEMBLY

1. INSTALL DUST DEFLECTORS

(a) Using SST and a press, install the dust deflector.
SST 09223–41020, 09223–15020

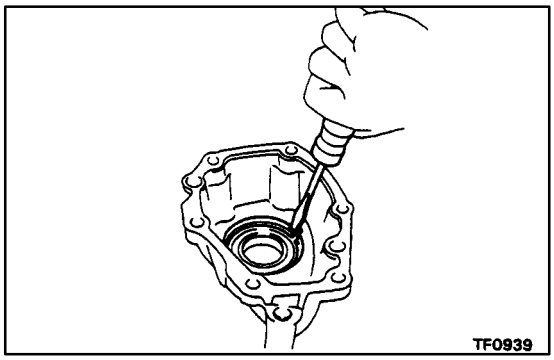


(b) Using SST and a press, install the dust deflector.
SST 09316–60010 (09316–00010),
09316–20011

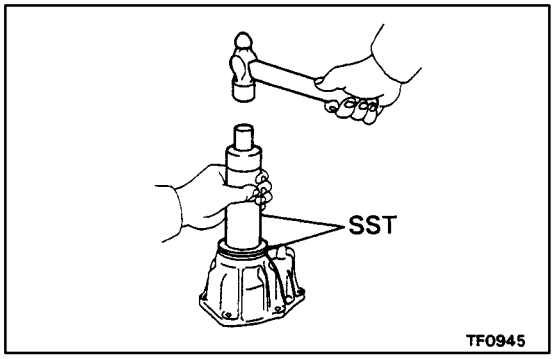


2. INSTALL BALL BEARING

(a) Using SST and a press, install the ball bearing.
SST 09316–60010 (09316–00010, 09316–00030)



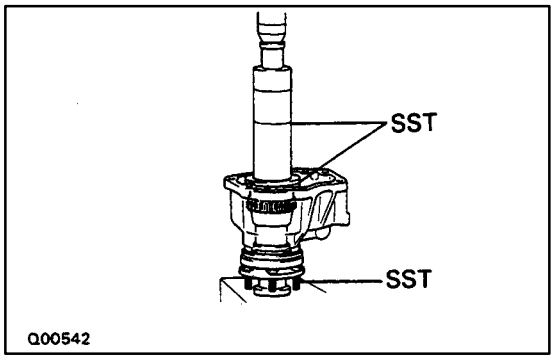
(b) Using a screwdriver, install the snap ring.



3. INSTALL OIL SEAL

Using SST and a hammer, drive in a new oil seal.

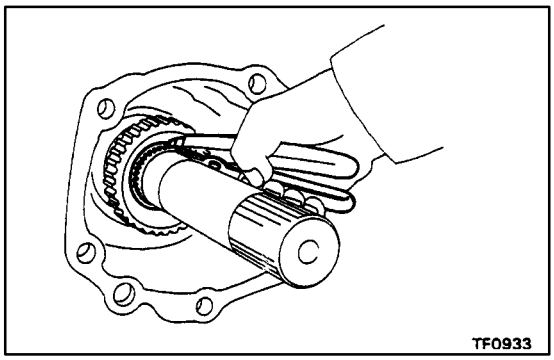
SST 09316–60010 (09316–00010, 09316–00060)



4. INSTALL FRONT OUTPUT SHAFT AND DRIVE CLUTCH HUB

(a) Using SST and press, install the front output shaft and drive clutch hub.

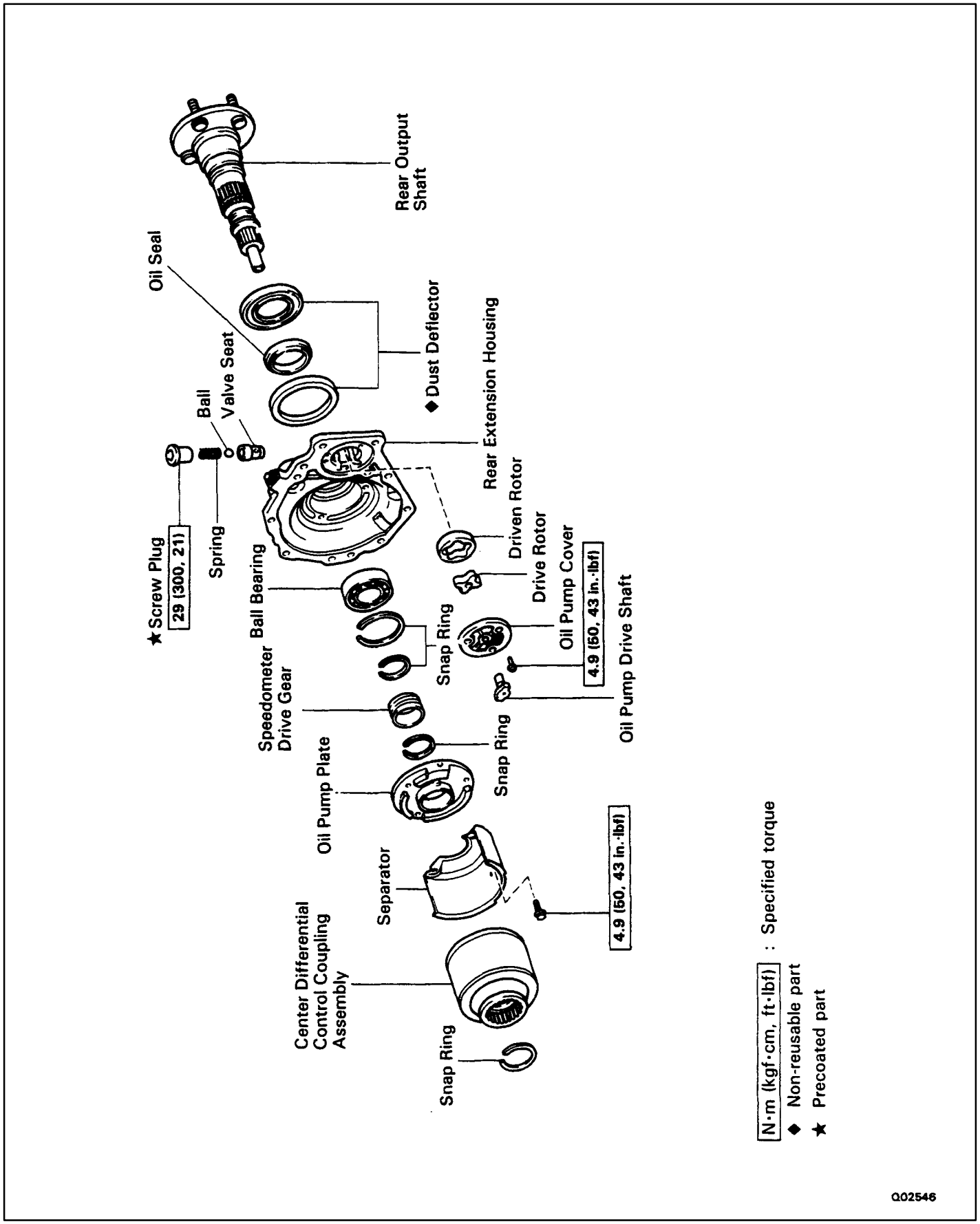
SST 09316–20011, 09316–60010 (09316–00010, 09316–00040, 09316–00070)

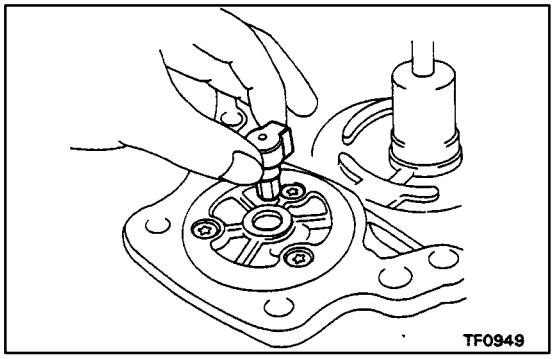


(b) Using snap ring pliers, install the new snap ring.

Rear Extension Housing Assembly

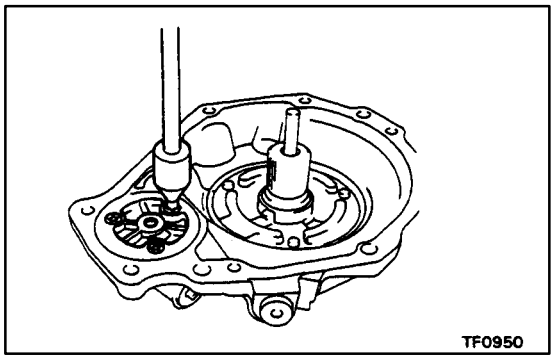
COMPONENTS





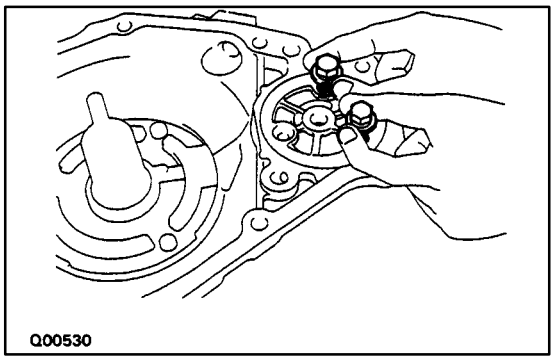
DISASSEMBLY OF REAR EXTENSION HOUSING ASSEMBLY

1. REMOVE OIL PUMP DRIVE SHAFT



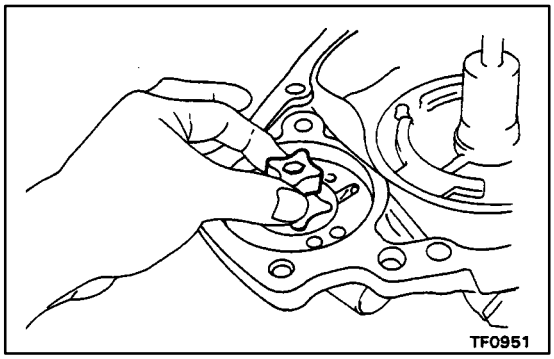
2. REMOVE OIL PUMP COVER

(a) Using a torx socket wrench, remove the three screws. (Torx socket wrench T30 09042–00010)

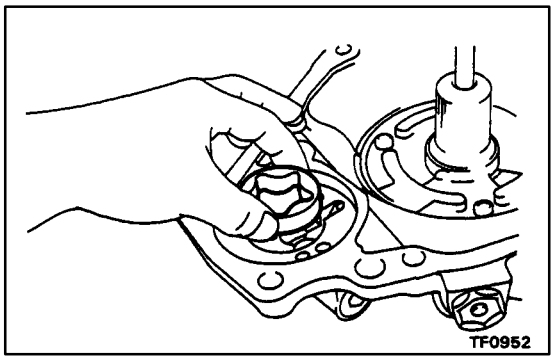


(b) Install two suitable bolts to the pump cover.

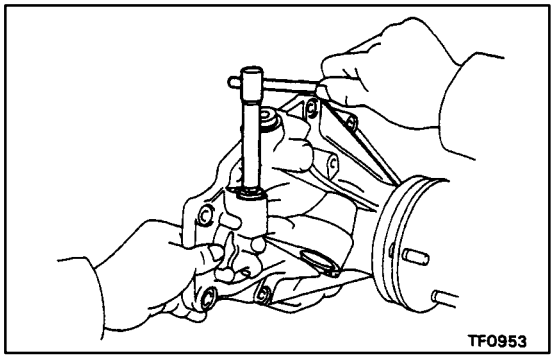
(c) Remove the pump cover from rear extension housing.



3. REMOVE DRIVE ROTOR

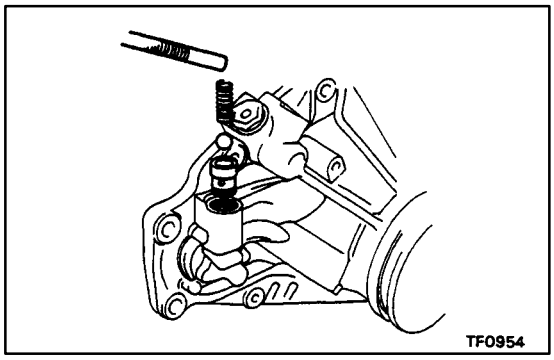


4. REMOVE DRIVEN ROTOR

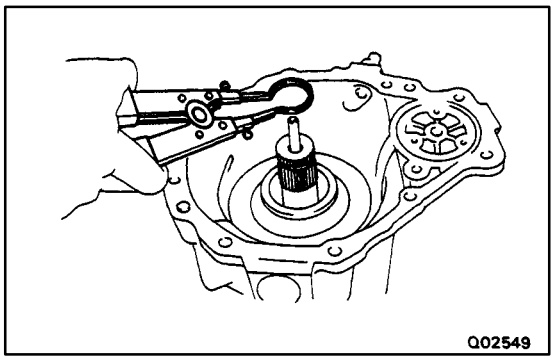


5. REMOVE SCREW PLUG, SPRING, BALL AND VALVE SEAT

(a) Using a hexagon wrench, remove the screw plug.



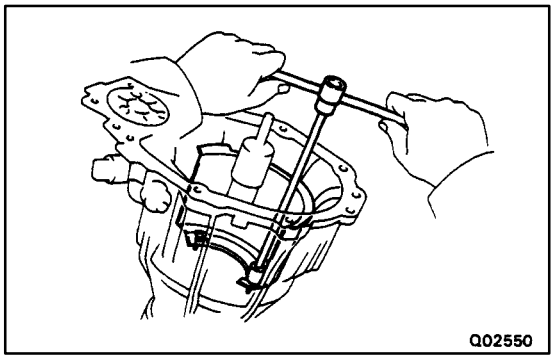
(b) Using a magnetic finger, remove the spring, ball and valve seat.



6. REMOVE CENTER DIFFERENTIAL CONTROL COUPLING ASSEMBLY

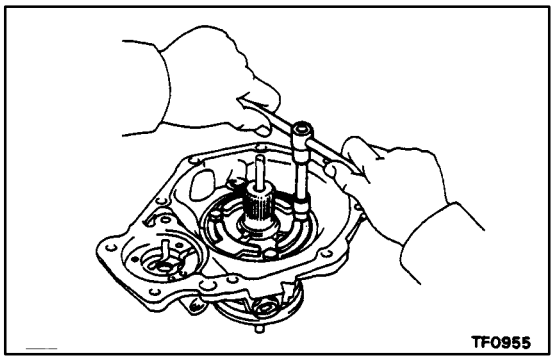
(a) Using snap ring pliers, remove the snap ring.

(b) Remove the coupling assembly.



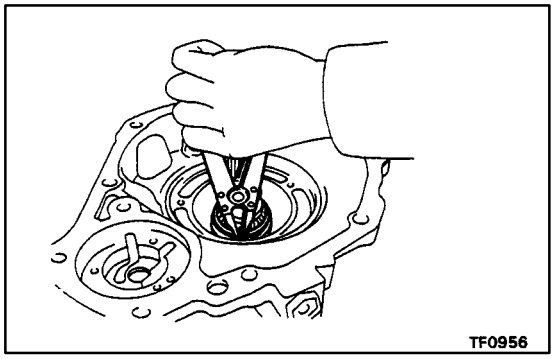
7. REMOVE SEPARATOR

Remove the two bolts and the separator.



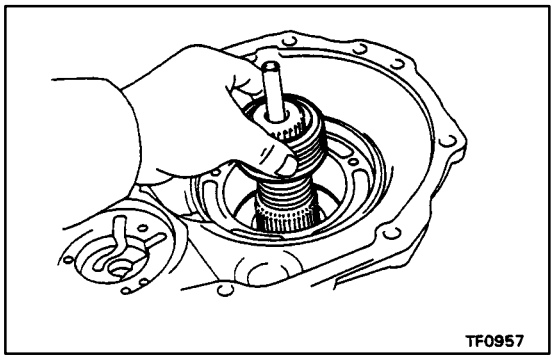
8. REMOVE OIL PUMP PLATE

Remove the bolt and the oil pump plate.

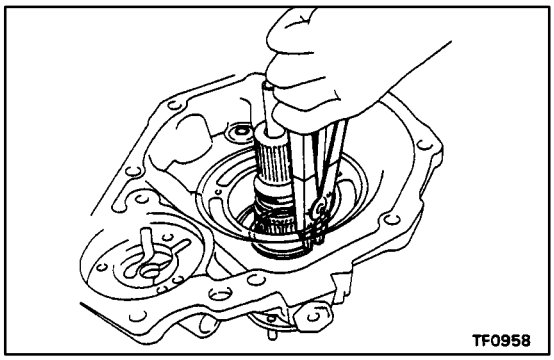


9. REMOVE SPEED METER DRIVE GEAR

(a) Using snap ring pliers, remove the snap ring.

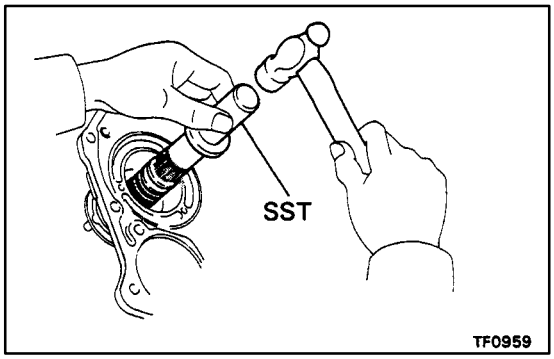


(b) Remove the speedometer drive gear.

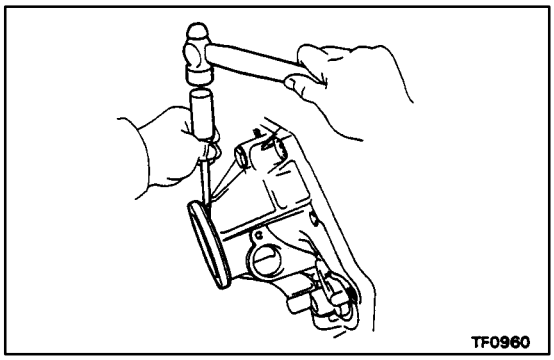


10. REMOVE REAR OUTPUT SHAFT

(a) Using snap ring pliers, remove the snap ring.

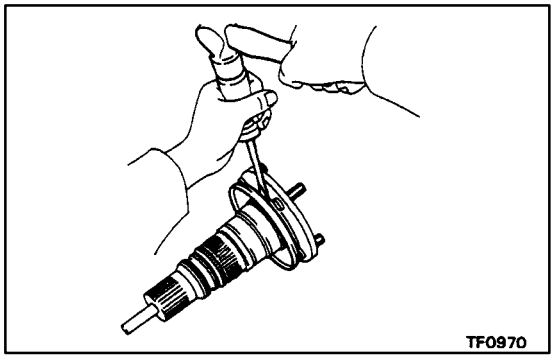


(b) Using SST and a hammer, remove the rear output shaft.
SST 09325–12010

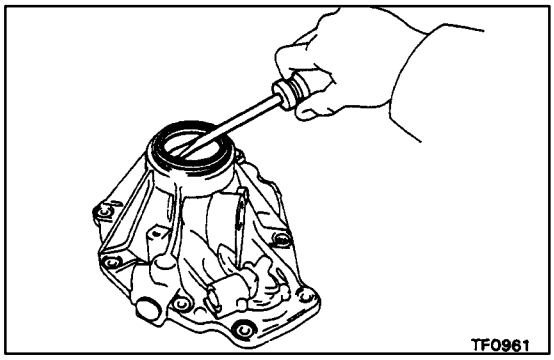


11. REMOVE DUST DEFLECTORS

(a) Using a screwdriver and hammer, remove the rear extension housing dust deflectors.

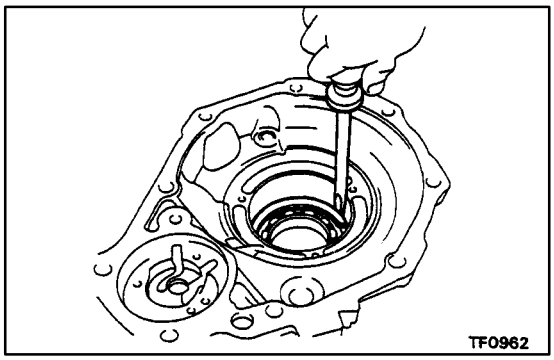


(b) Using a screwdriver and hammer, remove the rear output shaft dust deflector.



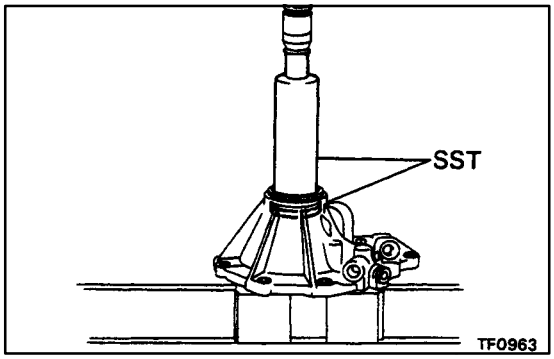
12. REMOVE OIL SEAL

Using a screwdriver, pry out the oil seal.

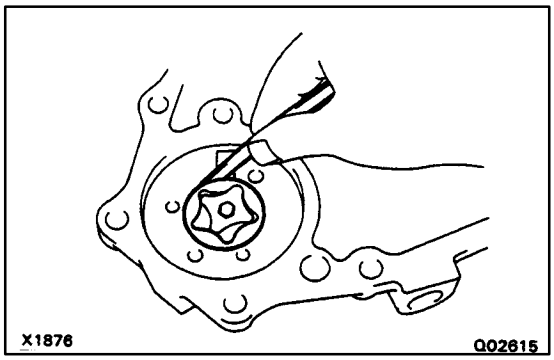


13. REMOVE BALL BEARING

(a) Using a screwdriver, remove the snap ring.



(b) Using SST and a press, remove the ball bearing.
SST 09316–60010 (09316–00010, 09316–00020)



INSPECTION OF OIL PUMP

1. CHECK BODY CLEARANCE OF DRIVEN ROTOR

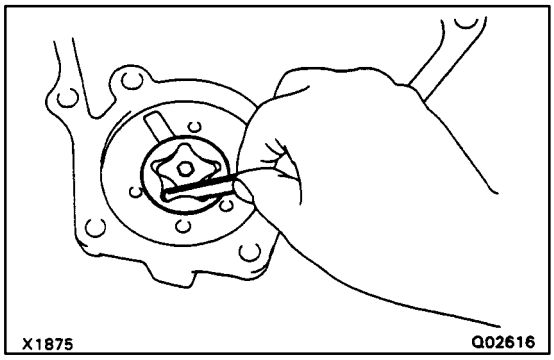
Install the drive rotor to the driven rotor.

Using a feeler gauge, measure body clearance between drive rotor and extension housing.

Standard body clearance: 0.08–0.17 mm (0.0031–0.0067 in.)

Maximum body clearance: 0.17 mm (0.0067 in.)

If the body clearance is greater than the maximum, replace the drive rotor or driven rotor.



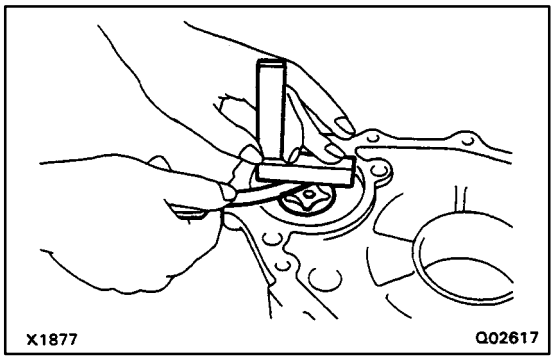
2. CHECK TIP CLEARANCE OF DRIVEN ROTOR

Using a feeler gauge, measure tip clearance between drive rotor and driven rotor.

Standard tip clearance: 0.05–0.15 mm (0.0020–0.0059 in.)

Maximum tip clearance: 0.15 mm (0.0059 in.)

If the tip clearance is greater than the maximum, replace the drive rotor or driven rotor.



3. CHECK SIDE CLEARANCE OF OIL PUMP

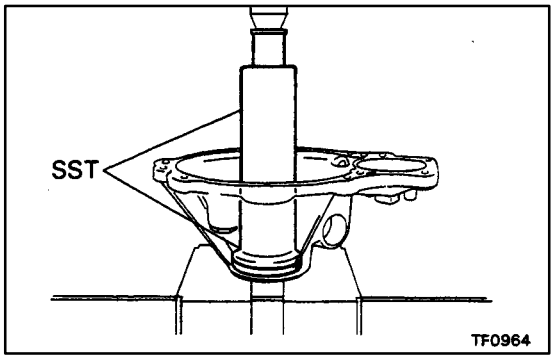
Using a steel straight edge and a feeler gauge, measure the side clearance of oil pump.

Standard side clearance: 0.03–0.10 mm (0.0012–0.0039 in.)

Maximum side clearance: 0.10 mm (0.0039 in.)

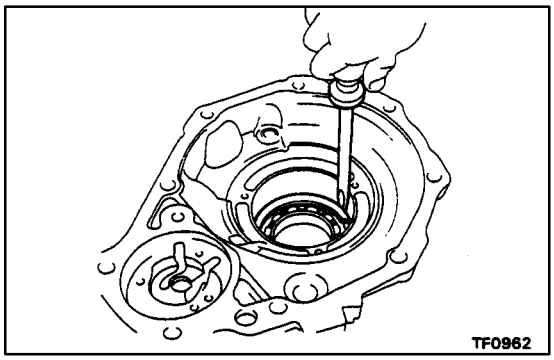
If the side clearance greater than the maximum, replace the drive rotor or driven rotor.

ASSEMBLY OF REAR EXTENSION HOUSING ASSEMBLY

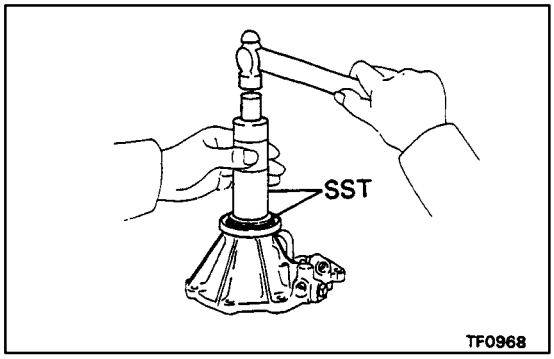


1. INSTALL BALL BEARING

(a) Using SST and a press, install the ball bearing.
SST 09316–60010 (09316–00010, 09316–00030)

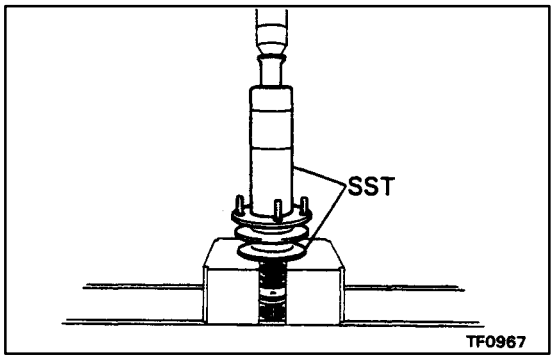


(b) Using a screwdriver, install the snap ring.

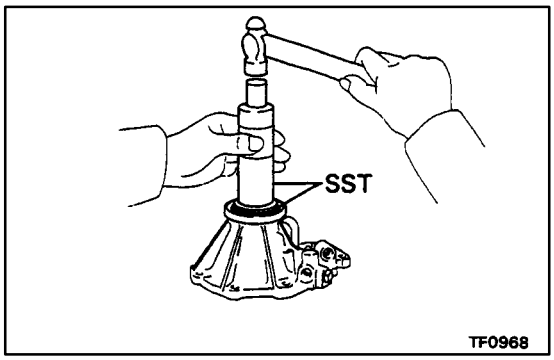


2. INSTALL DUST DEFLECTORS

(a) Using SST and a hammer, install a new rear extension housing dust deflector.
SST 09316–60010 (09316–00010, 09316–00040)

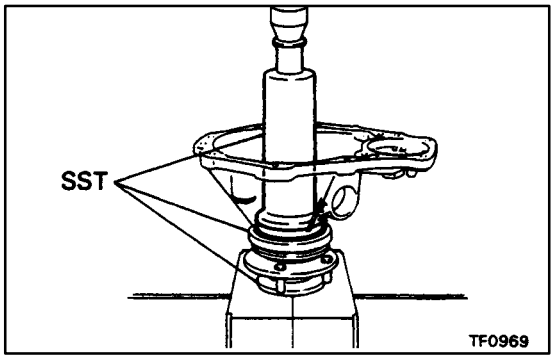


(b) Using SST and a press, install a new rear extension housing dust deflector.
SST 09316–20011, 09316–60010,
(09316–00010)



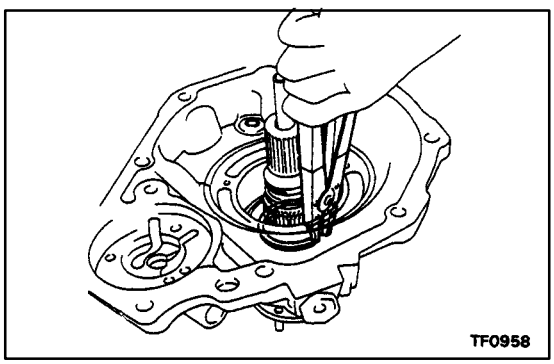
3. INSTALL OIL SEAL

Using SST and a hammer, drive in a new oil seal.
SST 09316–60010 (09316–00010, 09316–00030)

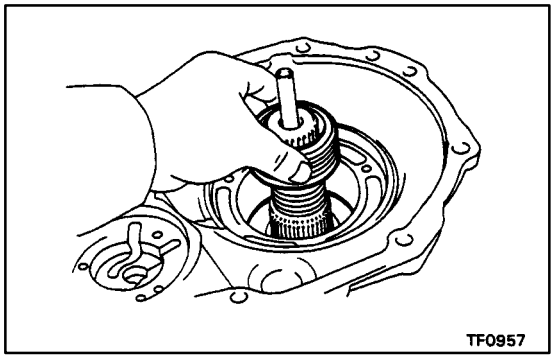


4. INSTALL REAR OUTPUT SHAFT

(a) Using SST and a press, install the rear output shaft.
SST 09316–60010 (09316–00010, 09316–00030)
09316–20011

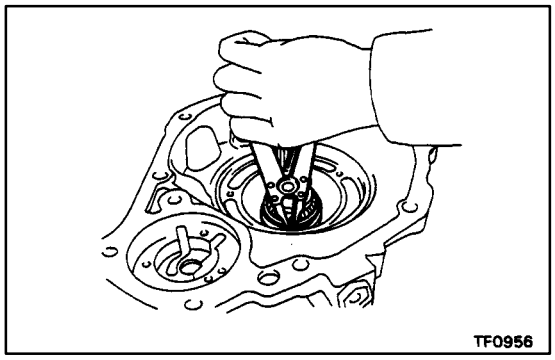


(b) Using snap ring pliers, install the snap ring.

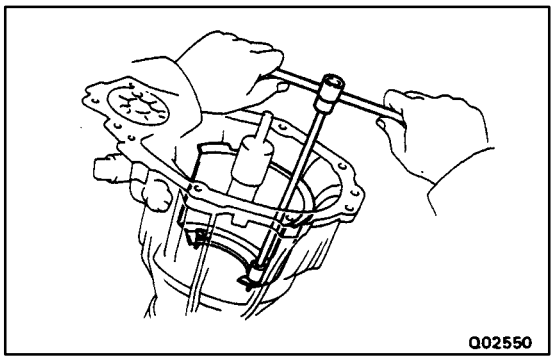


5. INSTALL SPEEDOMETER DRIVE GEAR

(a) Install the speedometer drive gear.

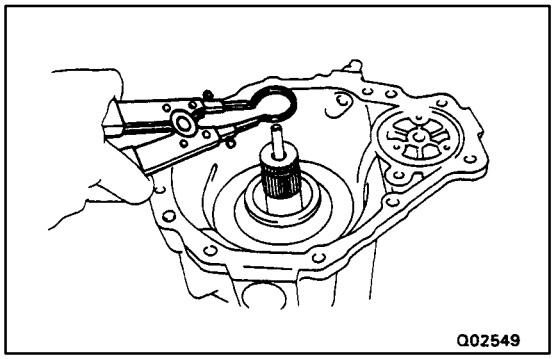


(b) Using snap ring pliers, install the snap ring.



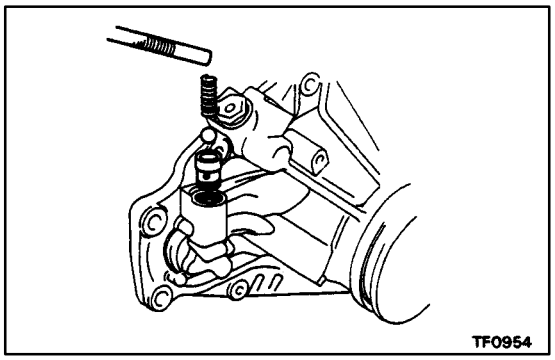
6. INSTALL OIL PUMP PLATE SEPARATOR

(a) Install the oil pump plate.
(b) Install the separator.
(c) Install and torque the three bolts.
Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)



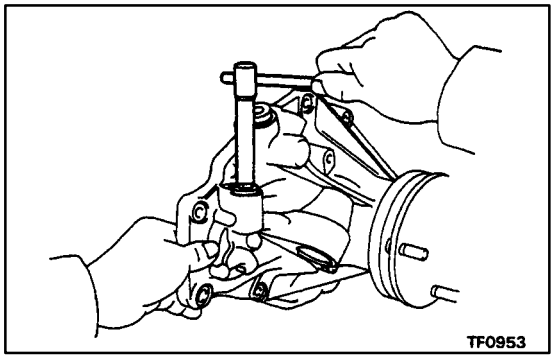
7. INSTALL CENTER DIFFERENTIAL CONTROL COUPLING ASSEMBLY

(a) Install the coupling assembly.
(b) Using snap ring pliers, install the snap ring.



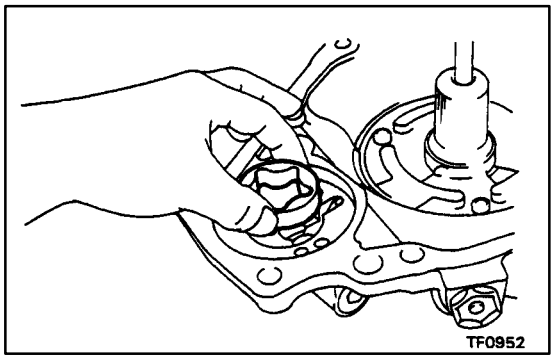
8. INSTALL VALVE SEAT, BALL, SPRING AND SCREW PLUG

(a) Apply gear oil to the ball.
(b) Install the valve seat, ball and spring.



(c) Apply liquid sealer to the screw plug.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

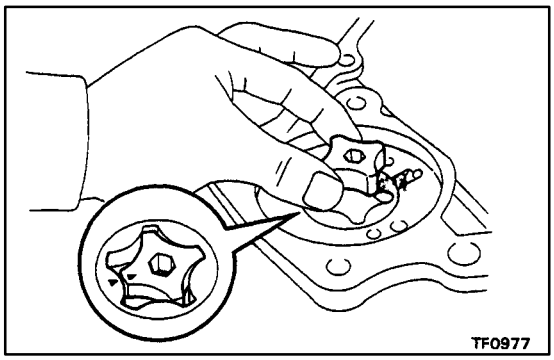
(d) Using a hexagon wrench, install and torque the screw plug.
Torque: 29 N·m (300 kgf·cm, 21 ft·lbf)



9. INSTALL DRIVEN ROTOR

(a) Apply gear oil to the driven rotor.

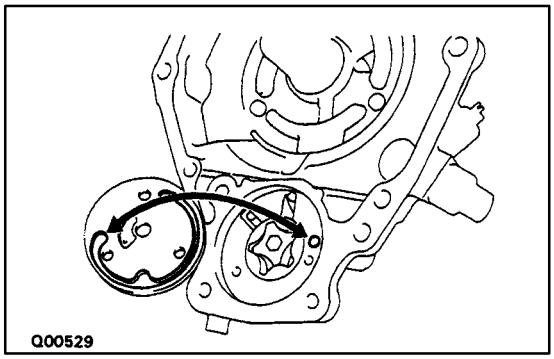
(b) Install the driven rotor.



10. INSTALL DRIVE ROTOR

(a) Apply gear oil to the drive rotor.

(b) Install the drive rotor.
HINT: Align the alignment marks.



11. INSTALL OIL PUMP COVER

(a) Install the oil pump cover.

(b) Using a torx socket wrench, install and torque the three screws.
(Torx socket wrench T30 09042–00010)
Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)
NOTICE: Align the oil hole of the rear extension housing and oil groove end of the oil pump cover.