

REPAIR MANUAL SUPPLEMENT **FOR CHASSIS & BODY** 

# LAND CRUISER

(Hardtop/Canvas Top/Station Wagon)

RJ7\_ series

PZJ7 \_ series

LJ7\_ series

PZJ/\_ series HZJ7\_, 80 series

FZJ7\_, 80 series HDJ 80 series

Aug., 1992

#### CAUTION

This manual does not include all the necessary items about repair and service, this manual is made for the purpose of the use for the persons who have special techniques and certifications. In the cases that non-specialized or uncertified technicians perform repair or service only using this manual or without proper equipment or tool, that may cause severe injury to you or other people around and also cause damage to your customer's vehicle.

In order to prevent dangerous operation and damages to your customer's vehicle, be sure to follow the instruction shown below.

- Must read this manual thoroughly. It is especially important to have good understanding all the contents written in the PRECAUTION of "IN" section.
- The service method written in this manual is very effective to perform repair and service. When performing the operations following the procedures using this manual, be sure to use tools specified and recommended. If using non-specified or recommended tools and service method, be sure to confirm safety of the technicians and any possibility of causing personal injury or damage to the customer's vehicle before starting the operation.
- If part replacement is necessary, must replace the part with the same part number or equivalent part. Do not replace it with inferior quality.
- It is important to note that this manual contains various "Cautions" and "Notices" that must be carefully observed in order to reduce the risk of personal injury during service or repair, or the possibility that improper service or repair may damage the vehicle or render it unsafe. It is also important to understand that these "Cautions" and "Notices" are not exhaustive, because it is important to warn of all the possible hazardous consequences that might result from failure to follow these instructions.

#### **FOREWORD**

This supplement has been prepared to provide information covering general service repairs for the chassis and body of the TOYOTA LAND CRUISER (Hardtop, Canvas Top and Station Wagon) which underwent changes in August, 1992.

Applicable models:

Hardtop & Canvas Top RJ70, 73, 77 series

LJ70, 72, 73, 77, 79 series

FZJ7O, 73, 75 series PZJ70, 73, 75 series HZJ7O, 73, 75 series

Station Wagon

FZJ8O series HZJ80 series HDJ80 series

For the service specifications and repair procedures of the above model other than those listed in this supplement, refer to the following manuals.

Manual Name	Pub. No.
<ul> <li>Land Cruiser (Hardtop and Canvas Top) Chassis and Body Repair Manual</li> </ul>	RM183E
<ul> <li>Land Cruiser (Station Wagon)</li> <li>Chassis and Body Repair Manual</li> </ul>	RM184E
<ul> <li>Land Cruiser (4-Door Hardtop) Chassis and Body Repair Manual Supplement</li> </ul>	RM192E
<ul> <li>Land Cruiser (Hardtop/Canvas Top/Station Wagon) Chassis and Body Repair Manual Supplement</li> </ul>	RM290E
<ul> <li>21R, 22R Engine Repair Manual</li> </ul>	RM053E
22R-E Engine Repair Manual Supplement	RM138E
2L, 3L Engine Repair Manual	RM123E
• 2L-T, 3L Engine Repair Manual Supplement	RM169E
• 1FZ-F, 1FZ-FE Engine Repair Manual	RM321E
• 1PZ, 1HZ, 1HD-T Engine Repair Manual	RM172E
<ul> <li>A441L, A440F, A442F Automatic Transmission Repair Manual</li> </ul>	RM188E
<ul> <li>A442F Automatic Transmission Repair Manual</li> </ul>	RM314E
<ul> <li>Land Cruiser Hardtop/Canvas Top Electrical Wiring Diagram</li> </ul>	EWD168F
<ul> <li>Land Cruiser Station Wagon Electrical Wiring Diagram</li> </ul>	EWD169F

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 $A)|\inf_{a,b} formatjon in this manua| is based on the latest product information at the time of publication. However, specifications and procedures are subject to change without notice,$ 

**INTRODUCTION** 

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MANUAL TRANSMISSION MI

**AUTOMATIC TRANSMISSION AT** 

TRANSFER TR

PROPELLER SHAFT P

SUSPENSION AND AXLE S

BRAKE SYSTEM

**BODY ELECTRICAL SYSTEM** 

AIR CONDITIONING SYSTEM

ELECTRICAL WIRING DIAGRAMS EWD

### **INTRODUCTION**

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IN

#### HOW TO USE THIS MANUAL

#### **INDEX**

IN002-09

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.

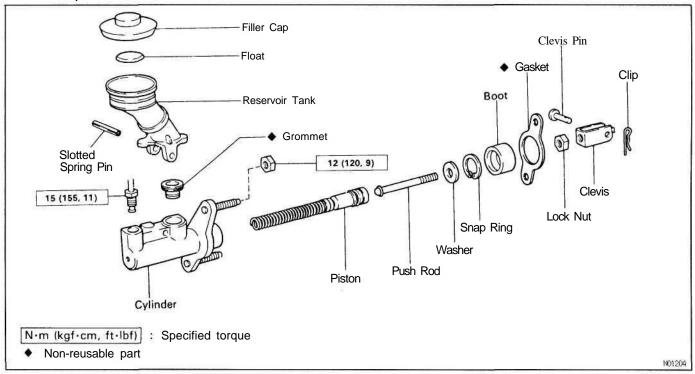
#### **PREPARATION**

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:

Illustration: what to do and where Task heading: what to do

#### 21. CHECK PISTON STROKE OF OVERDRIVE BRAKE

(a) Place SST and a dial indicator onto the overdrive brake piston as shown in the illustration.

SST 09350-30020 (09350-06120)

Set part No.

Component part No.

Detailed text: how to do task

Measure the stroke applying and releasing the compressed air (392 - 785 kPa, 4 - 8 kgf/cm<sup>2</sup> or 57 - 114 psi) as shown in the illustration.

Piston stroke: 1.40 - 1.70 mm (0.0551 - 0.0669 in.)

Specification vccoal

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.

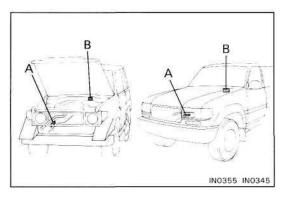
#### **CAUTIONS, NOTICES, HINTS:**

- 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 Nm (310 kgf-cm, 22 ftlbf)



# 22R & 22R-E Engines 2L-T & 3L Engines 1FZ-F & 1FZ-FE Engines 1PZ, 1HZ & 1HD-T Engines IN0007 IN0209 P03780 IN0294

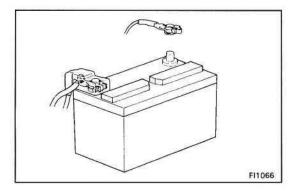
# IDENTIFICATION INFORMATION VEHICLE IDENTIFICATION NUMBER

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**

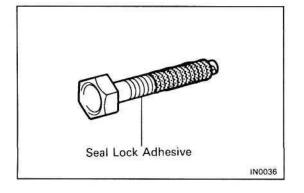
The engine serial number is stamped on the right side of the cylinder block.



#### **GENERAL REPAIR INSTRUCTIONS**

INOO5-09

- 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.

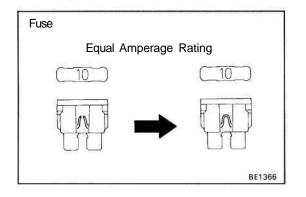


6. Precoated parts

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.

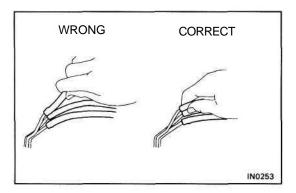
- (b) When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply the specified seal lock adhesive to the bolt, nut or threads.
- (c) Precoated parts are indicated in the component illustrations by the "^k" symbol.
- 7. When necessary, use a sealer on gaskets to prevent 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.

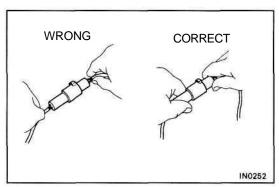


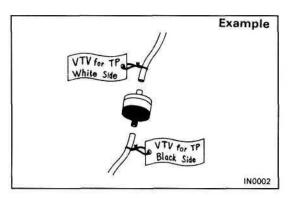
 When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the rating or use one with a lower rating.

Illustration		Symbol	Part Name	Abbreviation
OF CONTRACTOR OF THE PARTY OF T	BE5594		FUSE	FUSE
	BE5595		MEDIUM CURRENT FUSE	M-FUSE
	BE5596		HIGH CURRENT FUSE	H-FUSE
	BE5597		FUSIBLE LINK	FL
	BE5598	IN0368	CIRCUIT BREAKER	СВ

- 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 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.
- 1 2. 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

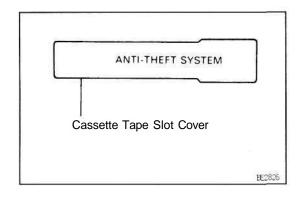
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CAUTION: If large amounts of unburned gasoline flow into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

- 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.
- 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.

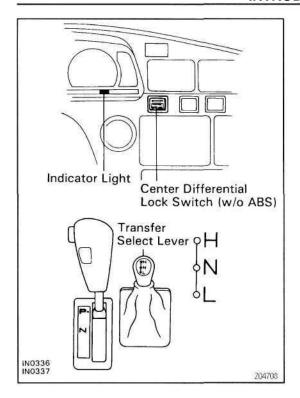


# FOR VEHICLES WITH AN AUDIO SYSTEM WITH BUILT-IN ANTI-THEFT SYSTEM

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

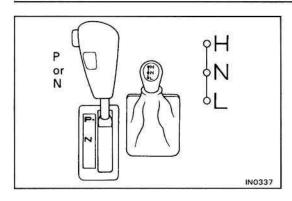
Also be sure to observe the following cautions:

- 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.



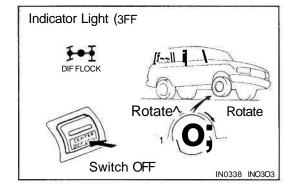
#### HINT:

- (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 swi tching cannot occur.

#### (w/o ABS)

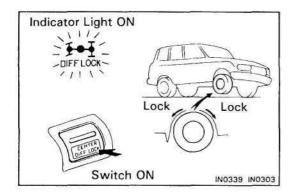
### CAUTIONS WHEN CENTER DIFFERENTIAL CONTROL SWITCH IS TURNED ON

- 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

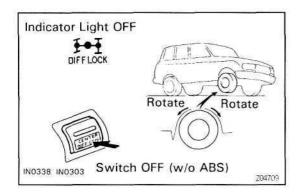
	Center Differential Lock		Whool	
Control Switch	Indicator Light	Select Lever	Wheel	
OFF	OFF	Н	A lifted wheel can be rotated even if only one wheel is lifted up, as long as transmission is in N range.	

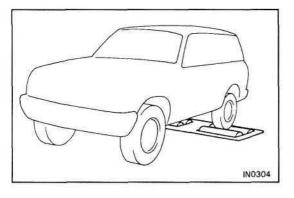


#### LOCK Position

Center Differential Lock		Transfer	W/bool		
Control Switch	Indicator Light	Select Lever	Wheel		
ON	ON	Н	A lifted wheel cannot be tated if only one wheel is lift		
OFF	ON	L	up, even if transmission is in range.		

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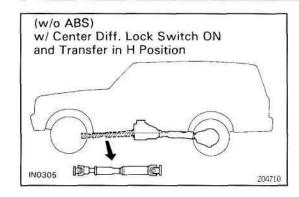


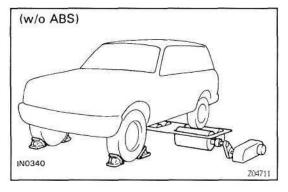


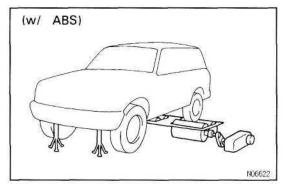
## Braking Force Test (Vehicle Speed: Below 0.5 km/h or 0.3 mph)

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)

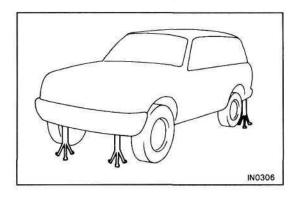
(1) (w/o ABS)

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.

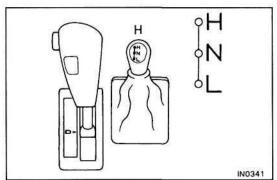
- (2) (w/ABS)
  - Shift the transfer select lever to H position, jack up the front wheels, then put the rear wheels on the tester roller and perform the test.
- (3) When performing tests, observe the following precautions.
- (w/o ABS)
   Check that the center differential is securely in LOCK condition.
- 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:

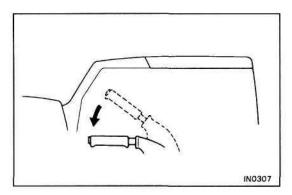


(1) All four wheels should be jacked up, clearing the ground completely.

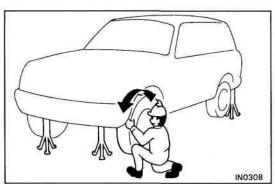


- (2) (w/o ABS)

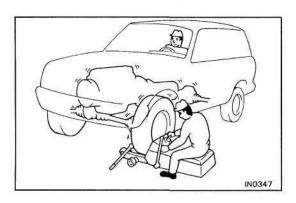
  The center differential should be in the LOCK position with the transfer gear in H position.
- (3) (w/ABS)
  Shift the transfer select lever to H position.



(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

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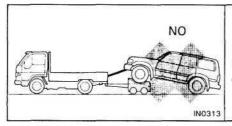
- 1. Use one of the methods shown below to tow the vehicle.
- 2. When there is trouble with the chassis and drive train, use method ① (flat bed truck) or method ② (sling type tow truck with dollies)
- 3. Recommended Methods: No. 1, 2 or 3

Emergency Method: No. 4

Condition Towing Method	Parking Brake	Transmission Shift Lever Position	Transfer Shift Lever Position	(w/o ABS) Center Differential Lock Switch	Center Differential
1) Flat Bed Truck  IN0309  2) Sling-Type Tow Truck with Dollies	Applied	"P" Range	"H" Position	OFF	FREE ( Normal ) Driving )
IN0310					
3 Sling-Type Tow Truck (Front wheels must be able to rotate freely)	Released	" N " Range	"N" Position	OFF	Ť
4 Towing with Rope	Released	" N " Range	"N" Position	OFF	1
IN0312	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).				

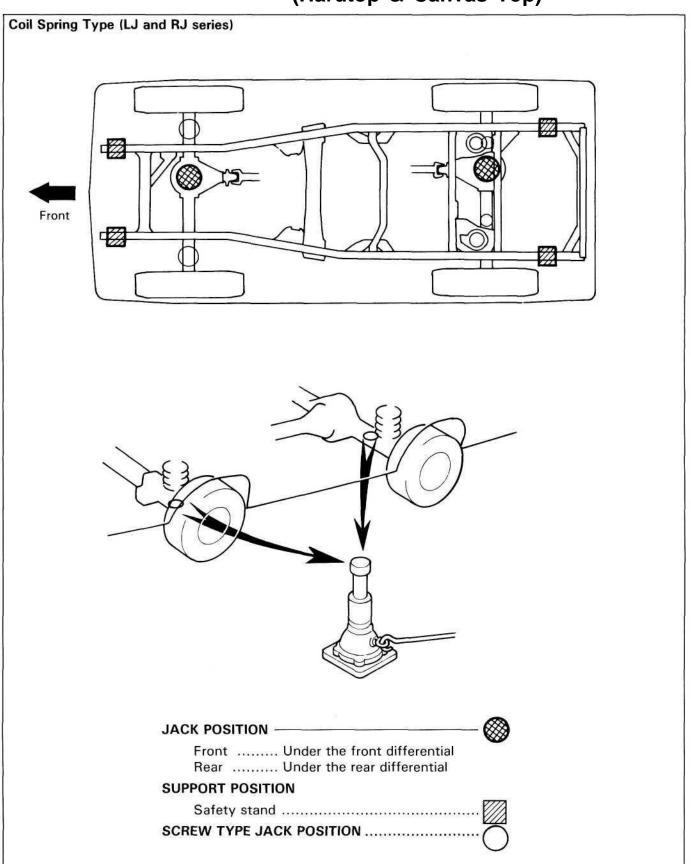
HINT: Do not use any towing methods other than those shown above.

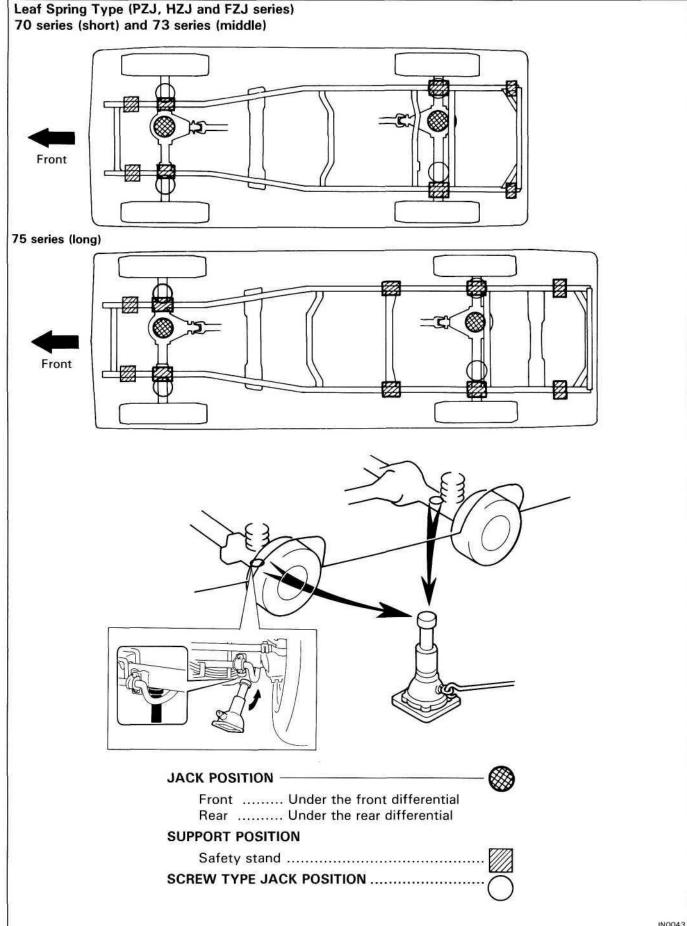
For example, the towing method shown below is dangerous, so do not use it.



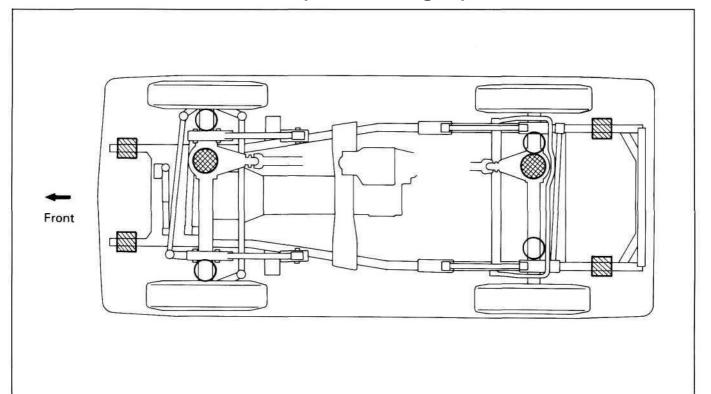
During towing with this towing method, there is a danger of the drive train heating up and causing breakdown, or of the front wheels flying off the dolly.

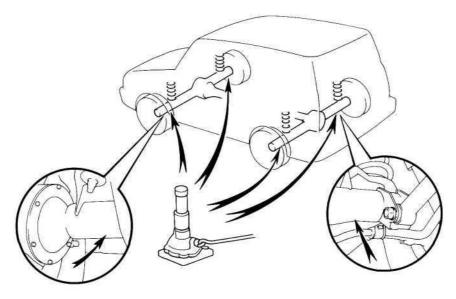
# VEHICLE LIFT AND SUPPORT LOCATIONS (Hardtop & Canvas Top)





# VEHICLE LIFT AND SUPPORT LOCATIONS (Station Wagon)





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

SUPPORT POSITION

Safety stand ......

#### 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

N008-01

#### HOW TO DETERMINE BOLT STRENGTH

	ı	Mark	Class		Mark	Class
Hexagon head bolt	4	4- 5- Bolt 6- head No. 7- 8- 9- 10- 11-	4T 5T 6T 7T 8T 9T 10T	Stud bolt	No mark	<b>4</b> T
	0	No mark	<b>4</b> T			
Hexagon flange bolt w/ washer hexagon bolt		No mark	4Т		Grooved	<b>6</b> T
Hexagon head bolt		Two protruding lines	<b>5</b> T			61
Hexagon flange bolt w/ washer hexagon bolt		Two protruding lines	6Т	Welded bolt		
Hexagon head bolt		Three protruding lines	7T			4T
Hexagon head bolt	000	Four protruding lines	8T			

#### SPECIFIED TORQUE FOR STANDARD BOLTS

	Diameter	Dital				d torque		
Class Diameter mm			m Hexagon nead boit Hexagon flange bo					
	20.27.000	5000000 	N·m	kgf∙cm	ft·lbf	N-m	kgf-cm	ft·lbf
	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
4T	12	1.25	47	480	35	53	540	39
1	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	-	\$ <u>==</u> \$(	
	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
5T	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	100	_	=
	6	1	8	80	69 in.·lbf	9	90	78 in.·lbf
	8	1.25	19	195	14	21	210	15
192000	10	1.25	39	400	29	44	440	32
6T	12	1.25	71	730	53	80	810	59
4	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127		-	5355600 
	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
1935 <b>—</b> 80	10	1.25	52	530	38	58	590	43
7T	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	_	· · · · · · · · · · · · · · · · · · ·	9 <del>-1</del> 9
	8	1.25	29	300	22	33	330	24
8T	10	1.25	61	620	45	68	690	50
S7-22.	12	1.25	110	1,100	80	120	1,250	90
	8	1.25	34	340	25	37	380	27
9T	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
- S S	8	1.25	38	390	28	42	430	31
10T	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
	8	1.25	42	430	31	47	480	35
11T	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

#### CI

### **CLUTCH**

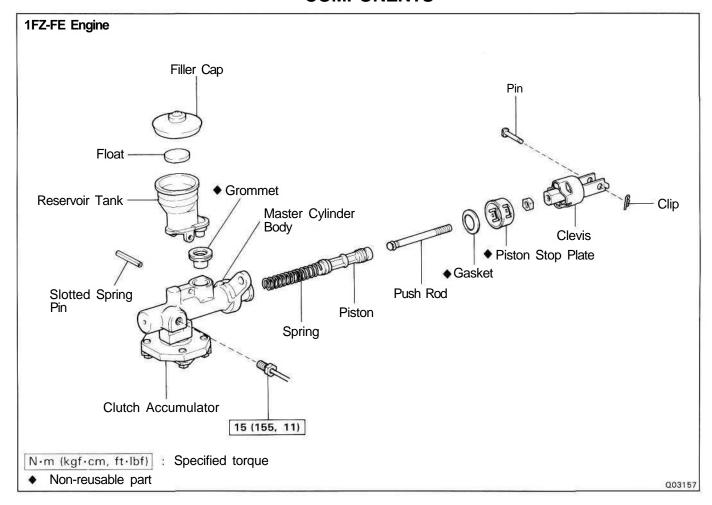
#### REFER TO FOLLOWING REPAIR MANUALS:

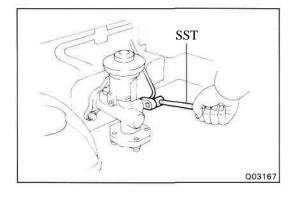
Manual Name	Pub. No.
<ul> <li>Land Cruiser (Station Wagon) Chassis and Body Repair Manual</li> </ul>	RM184E
<ul> <li>Land Cruiser (Hardtop, Canvas Top and Station Wagon)</li> <li>Chassis and Body Repair</li> <li>Manual Supplement</li> </ul>	RM290E

NOTE: The following pages contain only the points which differ from the above listed manuals.

#### 

# CLUTCH MASTER CYLINDER COMPONENTS

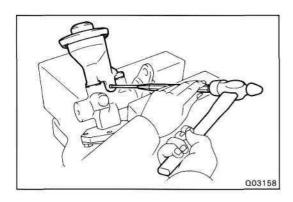


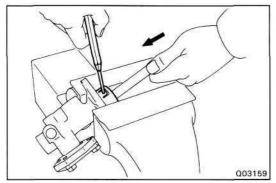


#### **CLUTCH MASTER CYLINDER REMOVAL**

#### **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

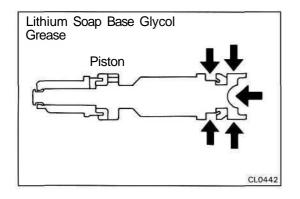
If a problem is found, clean or replace the cylinder.

2. INSPECT PISTON AND CUPS FOR WEAR, SCORING, CRACKS OR SWELLING

If either one requires replacement, use the parts from the cylinder kit.

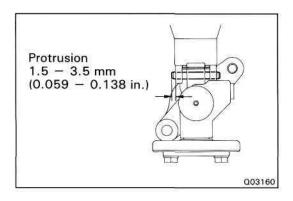
3. INSPECT PUSH ROD FOR WEAR OR DAMAGE

If necessary, replace the push rod.



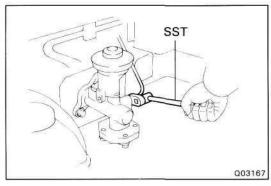
#### MASTER CYLINDER ASSEMBLY

- 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

INSTALL MASTER CYLINDER
 Install the mounting nut, and torque them.

Torque: 7.8 Nm (80 kgfcm, 69 in. lb)

2. CONNECT CLUTCH LINE UNION Using SST, connect the union. SST 09023-00100

- 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.	
<ul> <li>Land Cruiser (Hardtop and Canvas Top) Chassis and Body Repair Man- ual</li> </ul>	RM183E	
<ul> <li>Land Cruiser (Station Wagon) Chassis and Body Repair Manual</li> </ul>	RM184E	
<ul> <li>Land Cruiser (Hardtop, Canvas Top and Station Wagon) Chassis and Body Repair Manual Supplement</li> </ul>	RM290E	



NOTE: The following pages contain only the points which differ from the above listed manuals.

#### (HARDTOP & CANVAS TOP)

DESCRIPTION	MT-2
PREPARATION	MT-3
TRANSMISSION REMOVAL AND	
INSTALLATION	MT-4
OUTPUTSHAFT	MT-13
SERVICE SPECIFICATIONS	MT-24
(STATION WAGON)	
DESCRIPTION	MT-26
PREPARATION	MT-27
OUTPUTSHAFT	MT-28
SERVICE SPECIFICATIONS	MT-40

#### **DESCRIPTION**

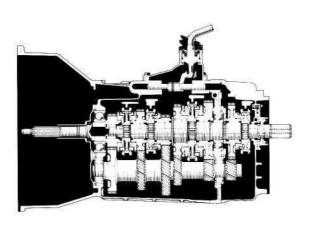
#### **PRECAUTIONS**

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	
	1st	4.529	4.081
Gear Ratio	2nd	2.464	2.294
	3rd	1.490	+
	4th	1.000	←
	5th	0.881	<b>←</b>
	Reverse	4.313	←
Oil Capacity		2.7 liters (2.6 US	qts, 3.1 lmp. qts)
Oil Vicosity		SAE 75W-90	
Oil Grade		API GL-4 or GL-5	

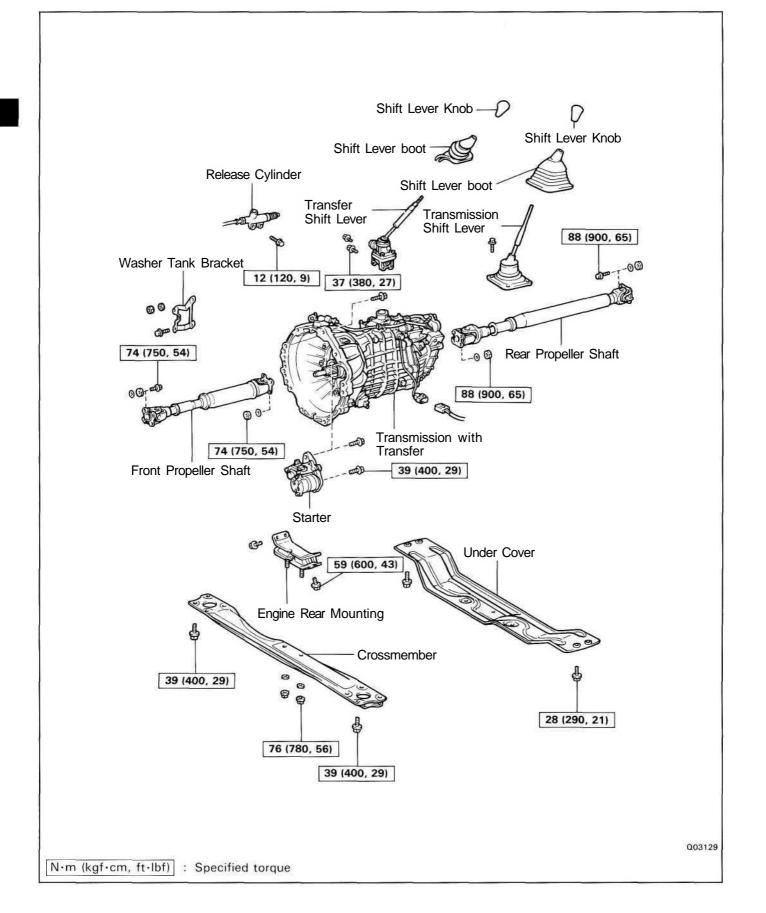
### **PREPARATION**

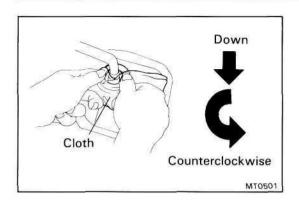
### SST (SPECIAL SERVICE TOOLS)

	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	
<b>6 1 1 1 1 1 1 1 1 1 1</b>	09950-00020	Bearing Remover	

# TRANSMISSION REMOVAL AND INSTALLATION

#### **COMPONENTS**



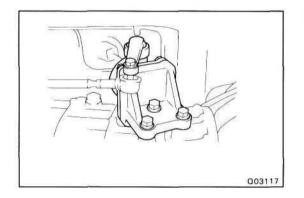


#### TRANSMISSION REMOVAL

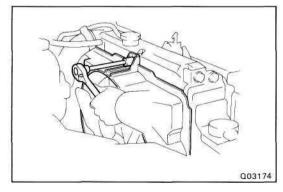
- 1. DISCONNECT BATTERY CABLE FROM NEGATIVE TER-MINAL
- 2. REMOVE TRANSMISSION SHIFT LEVER FROM INSIDE OF VEHICLE
- (a) Remove the transmission shift lever knob.
- (b) Remove the four screws and remove the shift lever boot retainer.
- (c) Pull up the shift lever boot.
- (d) Cover the shift lever cap 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

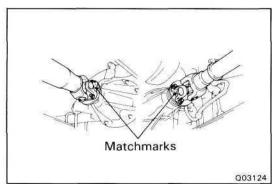
- (a) Remove the transfer shift lever knob.
- (b) Remove the four screws and remove the boot.



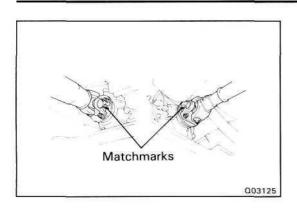
- (c) Remove the nut and washer and the link.
- (d) Remove the three bolts and the transfer shift lever.



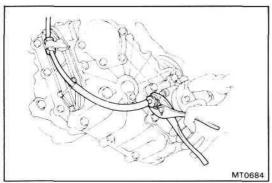
- 4. LOOSEN FAN SHROUD OF COOLING FAN TO AVOID DAMAGE TO FAN
- RAISE VEHICLE AND DRAIN TRANSMISSION OIL NOTICE: Be sure the vehicle is securely supported.
- 6. REMOVE TRANSFER UNDER COVER



- 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.



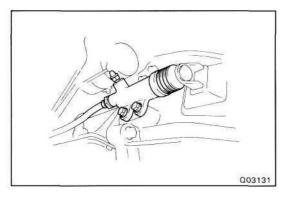
- 8. DISCONNECT FRONT AND REAR PROPELLER SHAFT FLANGES FROM COMPANION FLANGE ON TRANSFER
- (a) Put matchmarks on the flange.
- (b) Remove the four nuts.
- (c) Remove the propeller shaft.



9. REMOVE SPEEDOMETER CABLE

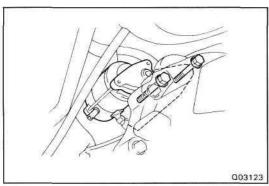
Using pliers, remove the speedometer cable.

10. DISCONNECT BACK-UP LIGHT SWITCH CONNECTOR



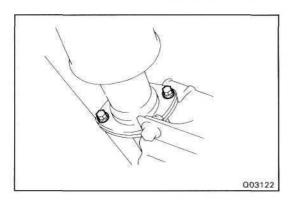
#### 11. REMOVE CLUTCH RELEASE CYLINDER

Remove the two bolts and release cylinder.



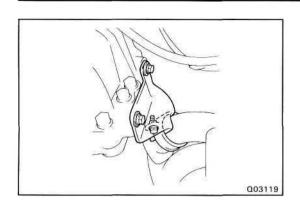
#### 12. REMOVE STARTER

- (a) Disconnect the connector and wire from the starter.
- (b) Remove the two bolts and starter.

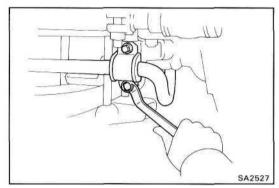


#### 13. REMOVE FRONT EXHAUST PIPE

- (a) Disconnect the oxygen sensor connector.
- (b) Remove the two bolts, bracket and a gasket.

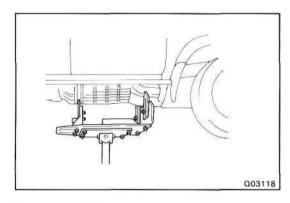


- (c) Remove the exhaust pipe clamp from the bracket.
- (d) Remove the two bolts and exhaust pipe bracket from the clutch housing.



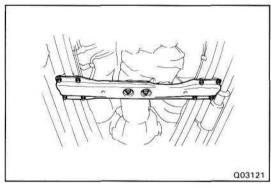
#### 14. REMOVE STABILIZER BRAKET SET BOLTS

Remove four stabilizer bracket set bolts.



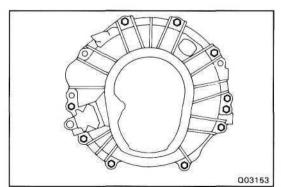
#### 15. SUPPORT TRANSMISSION

Remove the transmission enough to remove the weight from the rear support.



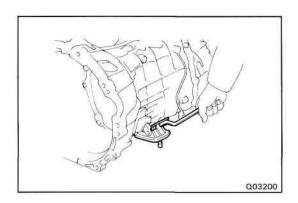
#### 16. REMOVE CROSSMEMBER

- (a) Raise the transmission slightly with a jack.
- (b) Remove the eight bolts, two nuts and crossmember.



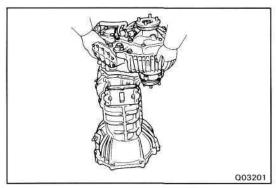
#### 17. REMOVE TRANSMISSION

- (a) Remove the transmission mounting bolts from the engine.
- (b) Pull out the transmission down and toward the rear.



# 18. REMOVE ENGINE REAR MOUNTING

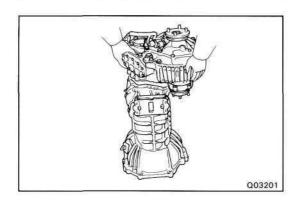
Remove the four bolts and engine rear mounting from the transmission.



# 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.

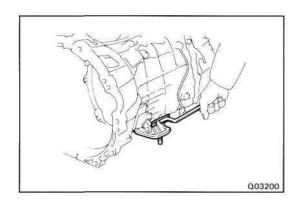


# TRANSMISSION INSTALLATION (See page MT-4)

# 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.

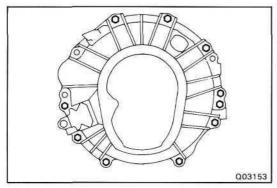
Torque: 37 N-m (380 kgf-cm, 27 ft-lbf)



# 2. INSTALL ENGINE REAR MOUNTING

Install the engine rear mounting and torque the four bolts.

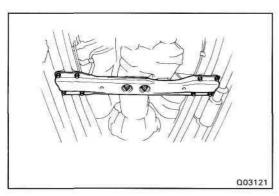
Torque: 59 N-m (600 kgf-cm, 43 ft-lbf)



# 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)

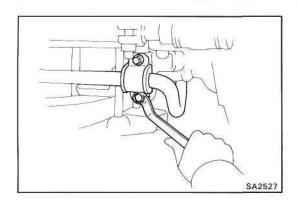


# 4. INSTALL CROSSMEMBER

- (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)

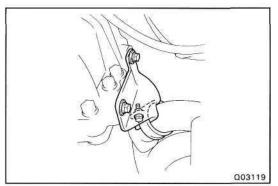
(c) Remove the jack.



# 5. INSTALL STABILIZER BRACKET SET BOLTS

Install the stabirizer bracket with four bolts.

Torque: 28 Nm (290 kgfcm, 21 ftlbf)



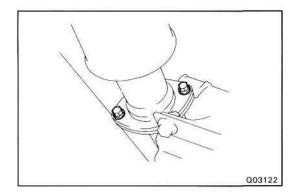
# 6. INSTALL FRONT EXHAUST PIPE

(a) Install the exhaust pipe bracket and two bolts to the clutch housing.

Torque: 39 Nm (400 kgfcm, 29 ftlbf)

(b) Install the exhaust pipe clamp.

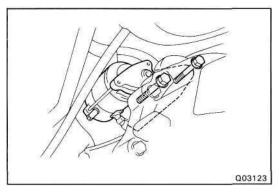
Torque: 19 Nm (195 kgfcm, 14 ftlbf)



(c) Install a new gasket, bracket and torque the two bolts.

Torque: 39 Nm (400 kgfcm, 29 ftlbf)

(d) Connect the oxygen sensor connector.

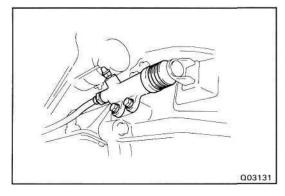


# 7. INSTALL STARTER

(a) Install the starter with two bolts.

Torque: 39 Nm (400 kgfcm, 29 ftlbf)

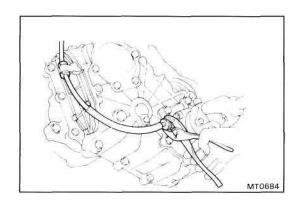
(b) Connect the connector and wire to the starter.



# 8. INSTALL CLUTCH RELEASE CYLINDER

Install the clutch release cylinder with two bolts.

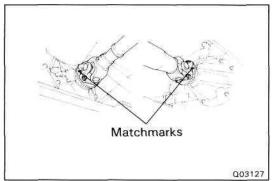
Torque: 12 Nm (120 kgfcm, 9 ftlbf)

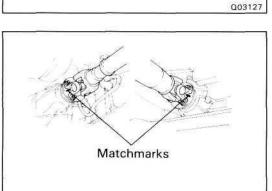


# 9. INSTALL SPEEDOMETER CABLE

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 Nm (750 kgf-cm, 54 ft-lb) Rear Propeller Shaft 88 Nm (900 kgfcm, 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:

003126

Front Propeller Shaft 74 Nm (750 kgfcm, 54 ft-lb) Rear Propeller Shaft 88 Nm (900 kgfcm, 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:

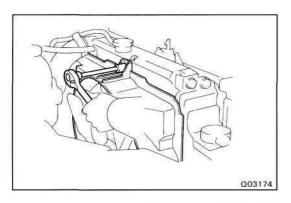
API GL - 4 or GL - 5

Viscosity:

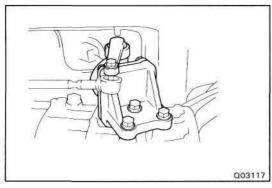
SAE 75W - 90

Capacity:

2.7 liters (2.6 US qts, 3.1 Imp.qts)

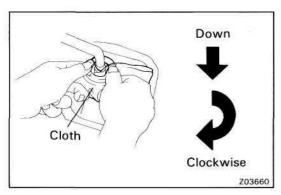


# 15. TIGHTEN FAN SHROUD



# 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

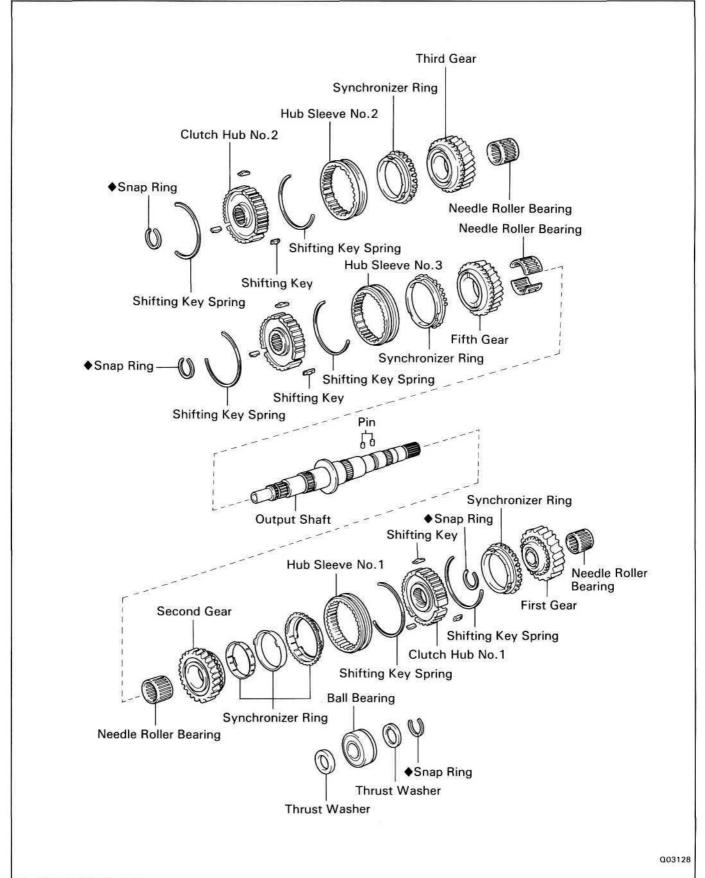
- (a) Apply MP grease to the transmission shift lever.
- (b) Align the groove of the shift lever cap and the pin part of the case cover.
- (c) Cover the shift lever cap with a cloth.
- (d) Then, pressing down on the shift lever cap, rotate it clockwise to install.
- (e) Install the shift lever boot.
- (f) Install the transmission shift lever knob.

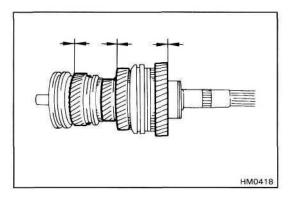
# 18. INSTALL NEGATIVE BATTERY CABLE

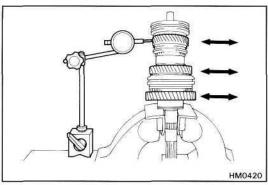
# 19. PERFORM ROAD TEST

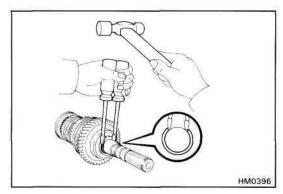
Check for abnormal noise and smooth shifting.

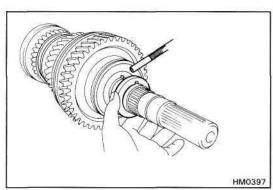
# OUTPUT SHAFT COMPONENTS

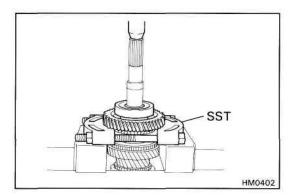












# **OUTPUT SHAFT DISASSEMBLY**

# 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 clearnace:

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.)

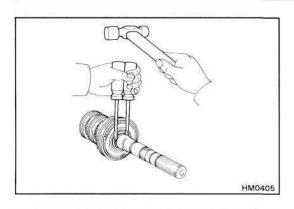
# 3. REMOVE BALL BEARING AND FIRST GEAR

(a) Using two screwdrivers and a hammer, drive out the snap ring.

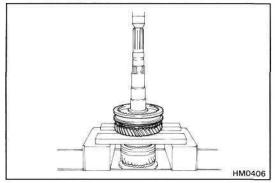
(b) Remove the thrust washer and pin.

- (c) Using SST and a press, remove the ball bearing, thrust washer, first gear and synchronizer rings.
- (d) Remove the pin and needle roller bearing.

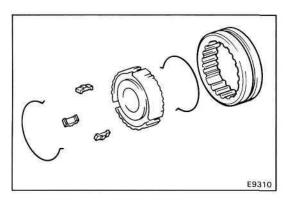
SST 09555-55010



- 4. REMOVE HUB SLEEVE NO.1 ASSEMBLY, SYNCHRO-NIZER RING, SECOND GEAR AND NEEDLE ROLLER BEARING
- (a) Using two screwdrivers and a hammer, drive out the snap ring.

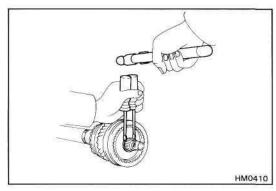


- (b) Using a press, remove the hub sleeve No.1 assembly, synchronizer rings, and second gear.
- (c) Remove the needle roller bearing.

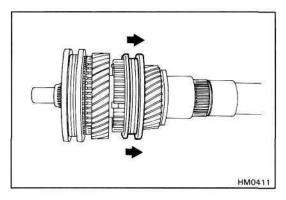


5. REMOVE HUB SLEEVE NO.1, SHIFTING KEYS AND SPRING FROM CLUTCH HUB NO.1

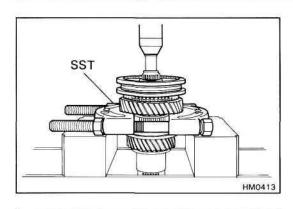
Using a screwdriver, remove the three shifting keys and two springs from the clutch hub No.1.



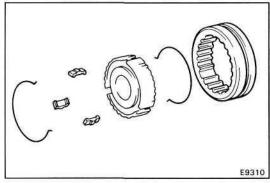
- 6. REMOVE HUB SLEEVE NO.2 ASSEMBLY, SYNCHRO-NIZER RINGS, THIRD GEAR AND NEEDLE ROLLER BEAR-ING
- (a) Remove two screwdrivers and a hammer, drive out the snap ring.



(b) Shift hub sleeve No.3 onto the fifth gear.

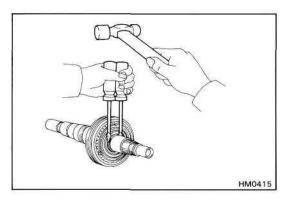


- (c) Using SST and a press, remove the hub sleeve No.2 assembly, synchronizer ring and third gear. SST 09555-55010
- (d) Remove the needle roller bearing.

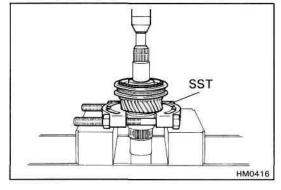


7. REMOVE HUB SLEEVE NO.2, SHIFTING KEYS AND SPRINGS FROM CLUTCH HUB NO.2

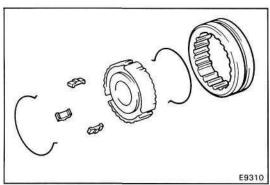
Using a screwdriver, remove the three shifting keys and two springs from the clutch hub No.2.



- 8. REMOVE HUB SLEEVE NO.3 ASSEMBLY, SYNCHRO-NIZER RING, FIFTH GEAR AND NEEDLE ROLLER BEAR-ING
- (a) Using two screwdriver, and a hammer, drive out the snap

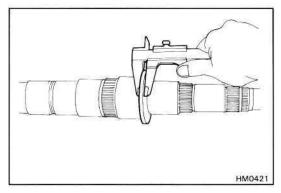


- (b) Using SST and a press, remove the hub sleeve No.3 assembly and synchronizer ring.
  - SST 09950-00020
- (c) Remove the needle roller bearing.

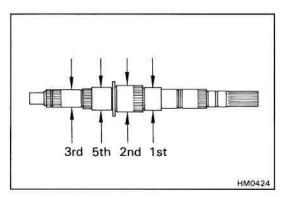


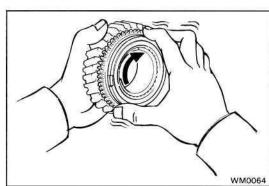
9. REMOVE HUB SLEEVE NO.3 SHIFTING KEYS AND SPRINGS FROM CLUTCH HUB NO.3

Using a screwdriver, remove the three shifting keys and two springs from the clutch hub No.3.



# D6612





# **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.

(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.

(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.)

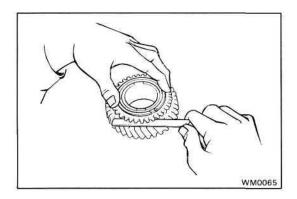
If the outer diameter is less than the minimum, replace the output shaft.

# 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.

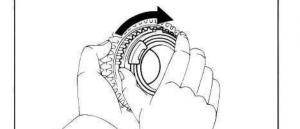
# Minimum clearance:

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.

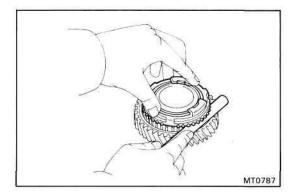
NOTICE: Wash off completely the fine lapping compound after rubbing.



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# 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.

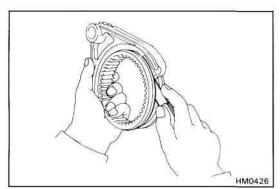


(c) Measure the clearance between the synchronizer ring back and gear spline end.

# Minimum clearance:

0.85 mm (0.0335 in.)

If the clearance is less than the limit, replace the synchronizer ring.



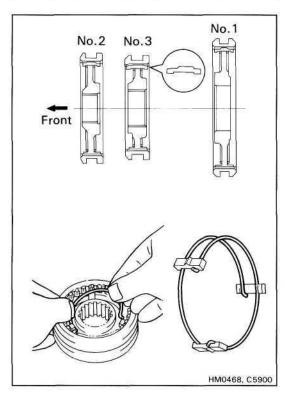
# 3. INSPECT CLEARNACE OF SHIFT FORKS AND HUB SLEEVES

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.

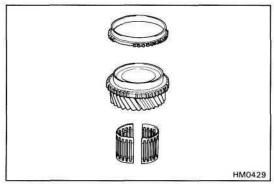


# **OUTPUT SHAFT ASSEMBLY**

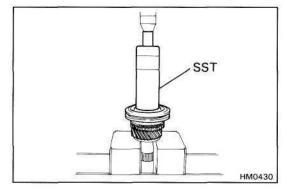
- 1. INSTALL CLUTCH HUB NO.1, NO.2 AND NO.3 INTO HUB SLEEVE
- (a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the springs under the shifting keys.

NOTICE: Install the key springs positioned so that their end gaps are not in line.

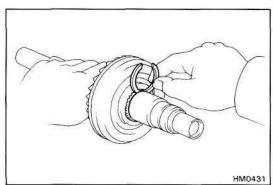


- 2. INSTALL FIFTH GEAR AND HUB SLEEVE NO.3 ASSEMBLY ON OUTPUT SHAFT
- (a) Apply gear oil to the shaft and needle roller bearing.
- (b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.
- (c) Install the needle roller bearing in the fifth gear.



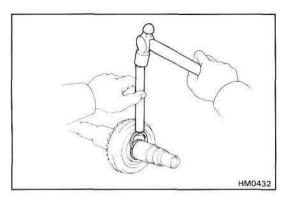
(d) Using SST and a press, install the fifth gear and hub sleeve No.3.

SST 09316-60010 (09316-00010)

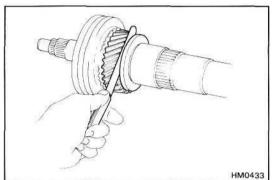


# 3. INSTALL SNAP RING

Mark	Thickness mm (in.)		
Α	2.40 - 2.45 (0.0945 - 0.0965)		
В	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.

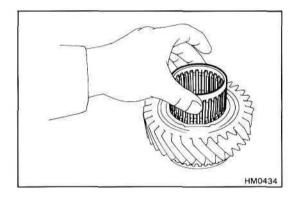


# 4. INSPECT FIFTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the fifth gear thrust clearance.

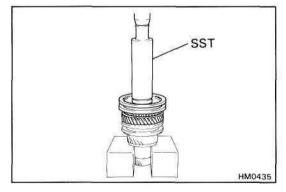
# Standard clearance:

0.1 - 0.35 mm (0.0039 - 0.0138 in.)



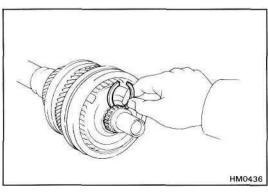
# 5. INSTALL THIRD GEAR AND HUB SLEEVE NO.2 ASSEMBLY

- (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.



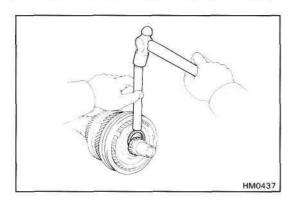
(d) Using SST and a press, install the third gear and hub sleeve No.2.

SST 09316-60010 (09316-00010)

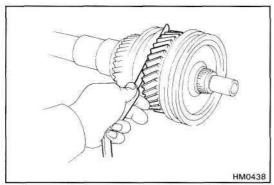


# 6. INSTALL SNAP RING

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.

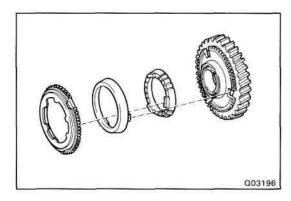


### 7. INSPECT THIRD GEAR THRUST CLEARANCE

Using a feeler gauge, measure the third gear thrust clearance.

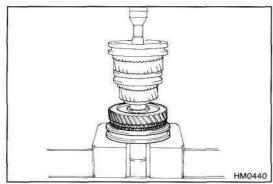
### Standard clearance:

0.1 - 0.45 mm (0.0039 - 0.0138 in.)

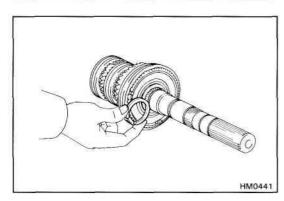


# 8. INSTALL SECOND GEAR AND HUB SLEEVE NO.1 AS-SEMBLY

(a) Place the synchronizer rings on the 2nd gear.

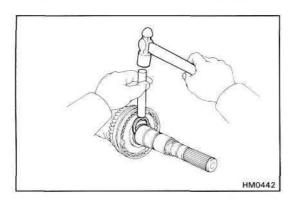


- (b) Apply gear oil to the shaft and needle roller bearing.
- (c) Install the needle roller bearing in the second gear.
- (d) Using a press, install the second gear and hub sleeve No.1 assembly.

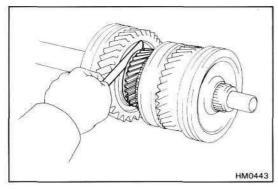


# 9. INSTALL SNAP RING

Mark	Thickness mm (in.)	
Α	2.90 - 2.95 (0.1142 - 0.1162)	
В	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.

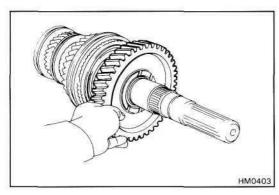


# 10. INSPECT SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the second gear thrust clearance.

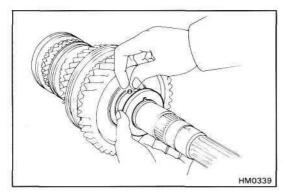
# Standard clearance:

0.1 - 0.35 mm (0.0039 - 0.0138 in.)



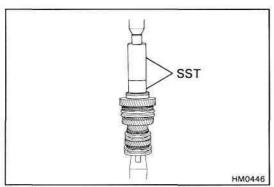
# 11. INSTALL FIRST GEAR

- (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.

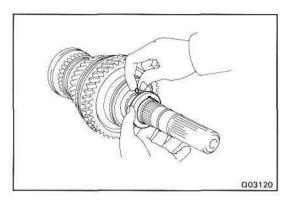


# 12. INSTALL BALL BEARING

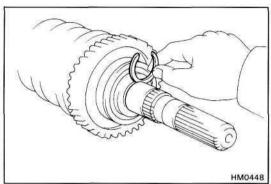
(a) Install the pin and thrust washer.

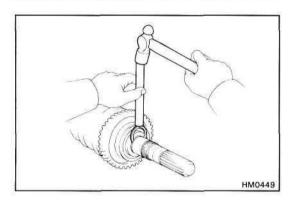


(b) Using SST and a press, install the ball bearing. SST 09316-60010 (09316-00010), 09523-36010



(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.)		
Α	2.40 - 2.45 (0.0945 - 0.0965)		
В	2.45 - 2.50 (0.0965 - 0.0984)		
С	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)		
Н	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		F.	
	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.
	Mulk II	2.70 2.00 11111	5.1000 0.1102 III.

# 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
Stabirizer 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**

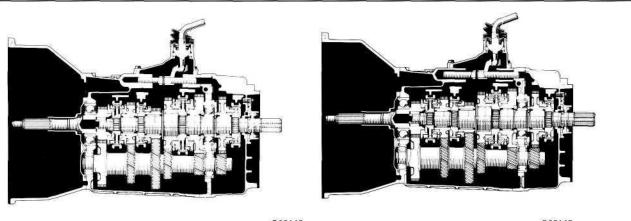
# **PRECAUTIONS**

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.
- (H1 50F) 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.
- (H1 51F) 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

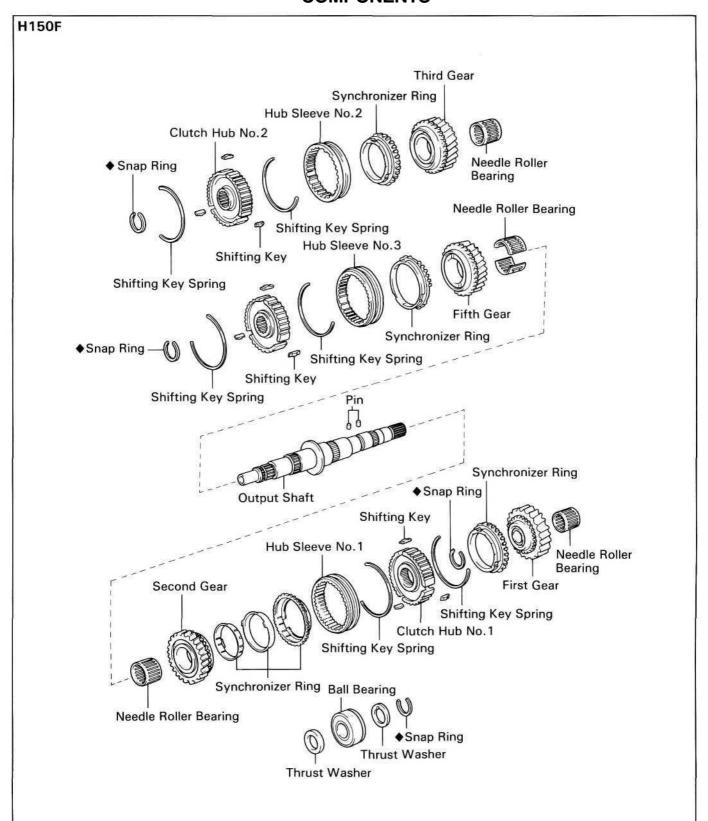
Type of Tr	ansmission	H150F	H151F	
Type of	f Engine	1HZ	1HD-T, 1FZ-F, 1FZ-FE	
	1st	4.529	4.081	
	2nd	2.464	2.294	
C D ::	3rd	1.490	←	
Gear Ratio	4th	1.000	<b>←</b>	
	5th	0.881	<b>←</b>	
	Reverse	4.313	←	
Oil Capacity		2.7 liters (2.6	US qts, 3.1 Imp.qts)	
Oil Vicosity		SAE	75W — 90	
Oil Grade		API GL-4 or GL-5		

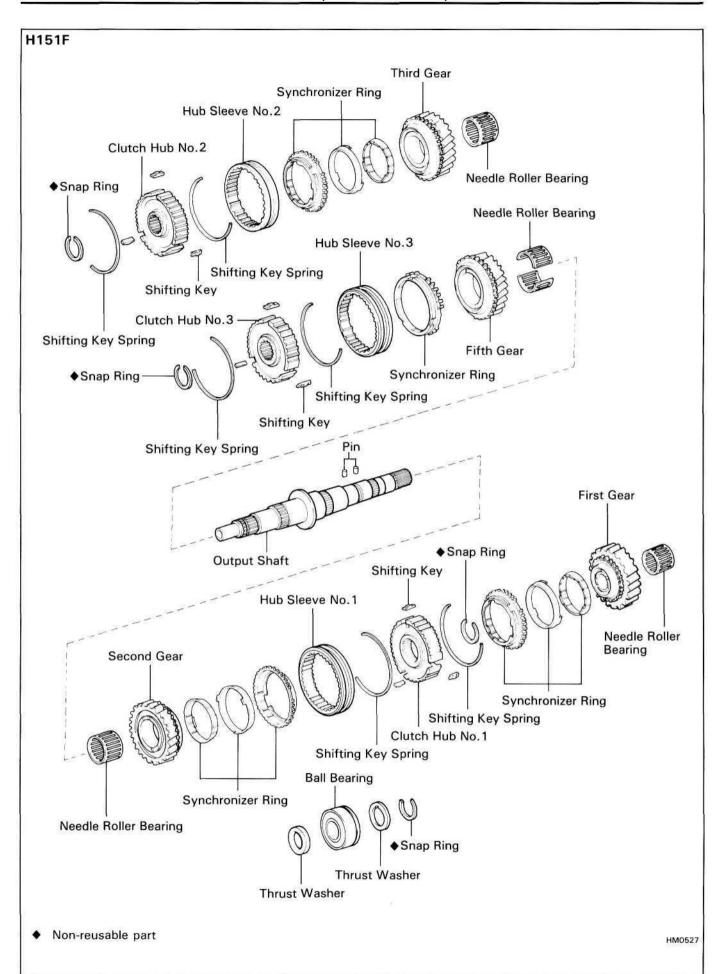
# **PREPARATION**

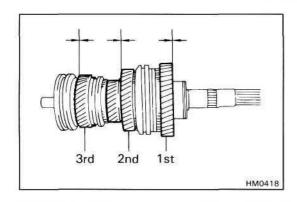
# SST (SPECIAL SERVICE TOOLS)

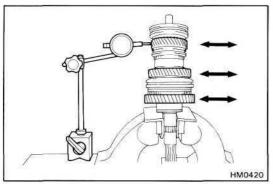
	09316-60010	Transmission & Transfer Bearing Replacer	
	(09316-00010)	Replacer Pipe	
	09523-36010	Rear Axle Hub Guide Tool	Output shaft rear ball bearing
	09555-55010	Differential Drive Pinion Bearing Replacer	
OF COMPANY OF THE PARK OF THE	09950-00020	Bearing Remover	

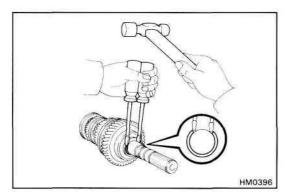
# OUTPUT SHAFT COMPONENTS

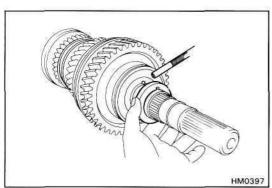


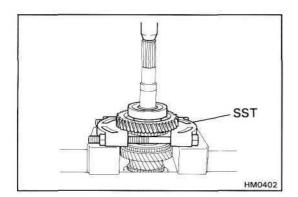












# **OUTPUT SHAFT DISASSEMBLY**

### 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:

1 st 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.

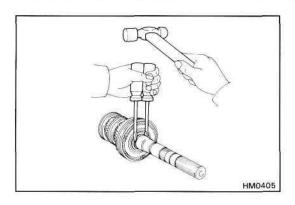
(c) Using SST and a press, remove the ball bearing, thrust washer, first gear and synchronizer ring.

H150F — Single Synchronizer ring

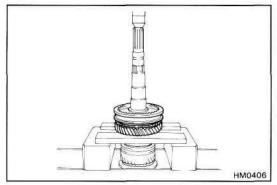
H1 51F — Triple Synchronizer rings

SST 09555-55010

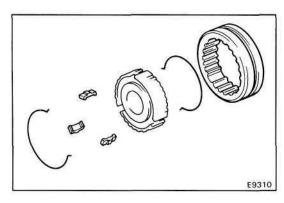
(d) Remove the pin and needle roller bearing.



- 4. REMOVE HUB SLEEVE NO.1 ASSEMBLY, SYNCHRO-NIZER RING. SECOND GEAR AND NEEDLE ROLLER BEARING
- (a) Using two screwdrivers and a hammer, drive out the snap ring.

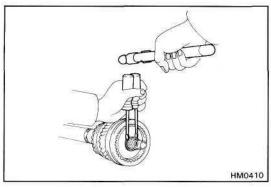


- (b) Using a press, remove the hub sleeve No.1 assembly, synchronizer rings, and second gear.
- (c) Remove the needle roller bearing.

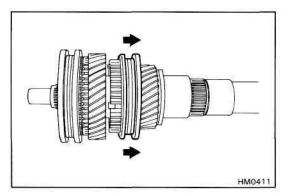


5. REMOVE HUB SLEEVE NO.1, SHIFTING KEYS AND SPRINGS FROM CLUTCH HUB NO.1

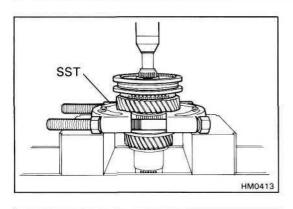
Using a screwdriver, remove the three shifting keys and two springs from the clutch hub No.1.



- 6. REMOVE HUB SLEEVE NO.2 ASSEMBLY, SYNCHRO-NIZER RING, THIRD GEAR AND NEEDLE ROLLER BEAR-ING
- (a) Remove two screwdrivers and a hammer, drive out the snap ring.



(b) Shift hub sleeve No.3 onto the fifth gear.



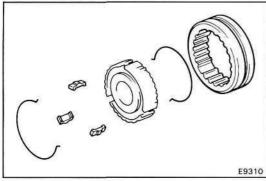
(c) Using SST and a press, remove the hub sleeve No.2 assembly, synchronizer ring and third gear.

H15OF — Single Synchronizer ring

H151F — Triple Synchronizer rings

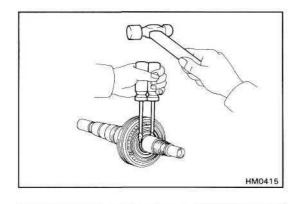
SST 09555-55010

(d) Remove the needle roller bearing.

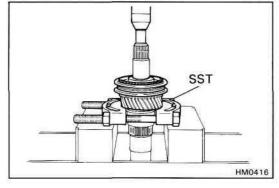


7. REMOVE HUB SLEEVE NO.2, SHIFTING KEYS AND SPRINGS FROM CLUTCH HUB NO.2

Using a screwdriver, remove the three shifting keys and two springs from the clutch hub No.2.



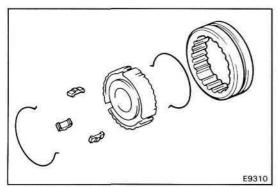
- 8. REMOVE HUB SLEEVE NO.3 ASSEMBLY, SYNCHRO-NIZER RING, FIFTH GEAR AND NEEDLE ROLLER BEAR-ING
- (a) Using two screwdriver, and a hammer, drive out the snap



(b) Using SST and a press, remove the hub sleeve No.3 assembly and synchronizer ring.

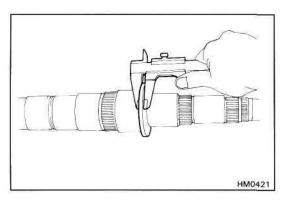
SST 09950-00020

(c) Remove the needle roller bearing.

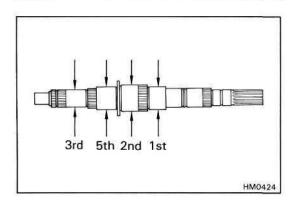


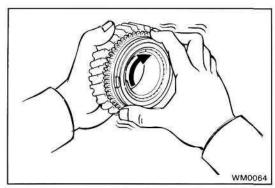
9. REMOVE HUB SLEEVE NO.3 SHIFTING KEYS AND SPRINGS FROM CLUTCH HUB NO.3

Using a screwdriver, remove the three shifting keys and two springs from the clutch hub No.3.



# D6612





# **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

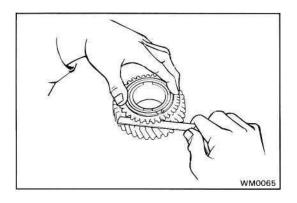
H150F - FOR FIRST, THIRD AND FIFTH GEARS

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.

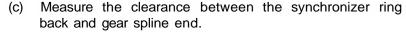
NOTICE: Wash off completely the fine lapping compound after rubbing.



H150F - FOR SECOND GEARS

H1 51F - FOR FIRST SECOND AND THIRD GEARS

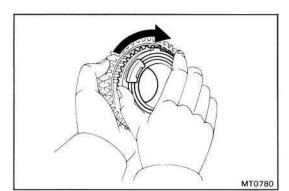
- (a) Check for wear or damage.
- (b) Check the braking effect of the synchronizer direction while pushing it to the gear cone and check that the ring is locked. If the braking effect is insufficient, replace the synchronizer ring.

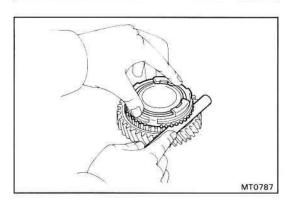


# Minimum clearance:

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.





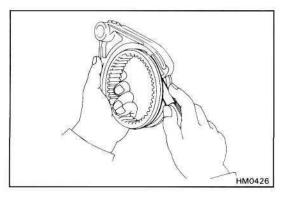
# 4. INSPECT CLEARANCE OF SHIFT FORKS AND HUB SLEEVES

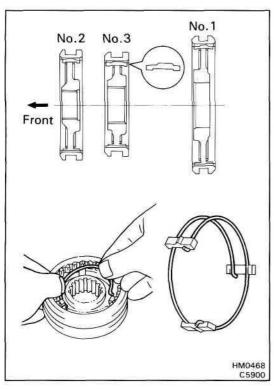
Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

# Maximum clearance:

0.35 mm (0.0138 in.)

If the clearance exceeds the maximum, replace the shift fork or hub sleeve.

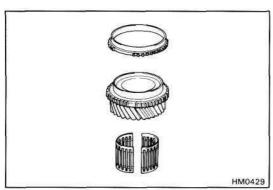




# **OUTPUT SHAFT ASSEMBLY**

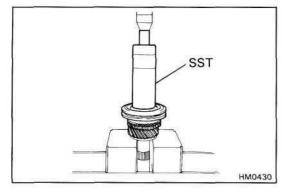
- 1. INSTALL CLUTCH HUB NO.1, NO.2 AND NO.3 INTO HUB SLEEVE
- (a) Install the clutch hub and shifting keys to the hub sleeve.
- (b) Install the springs under the shifting keys.

NOTICE: Install the key springs positioned so that their end gaps are not in line.



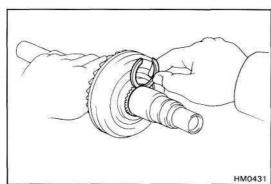
# 2. INSTALL FIFTH GEAR AND HUB SLEEVE NO.3 ASSEMBLY ON OUTPUT SHAFT

- (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.



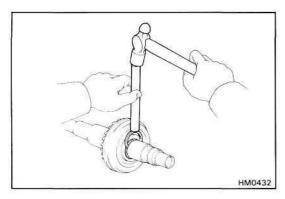
(d) Using SST and a press, install the fifth gear and hub sleeve No.3.

SST 09316-60010 (09316-00010)

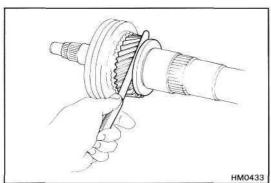


# 3. INSTALL SNAP RING

Mark	Thickness mm (in.)	
Α	2.40 - 2.45 (0.0945 - 0.0965)	
В	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.

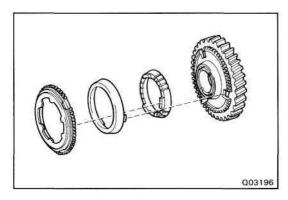


# 4. INSPECT FIFTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the fifth gear thrust clearance.

### Standard clearance:

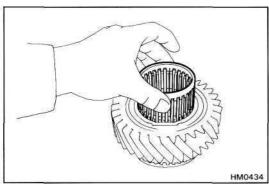
0.1 - 0.35 mm (0.0039 - 0.0138 in.)



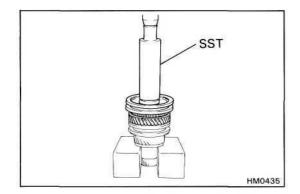
# 5. INSTALL THIRD GEAR AND HUB SLEEVE NO.2 ASSEMBLY

(H151F)

a) Place the synchronizer rings on the 3rd gear.

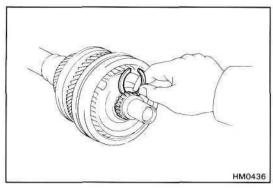


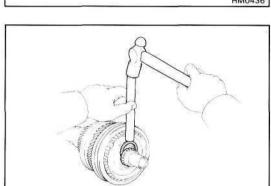
- (b) Apply gear oil to the shaft and needle roller bearing. (H150F)
- (c) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.
- (d) Install the needle roller bearing in the third gear.



(e) Using SST and a press, install the third gear and hub sleeve No.2.

SST 09316-60010 (09316-00010)





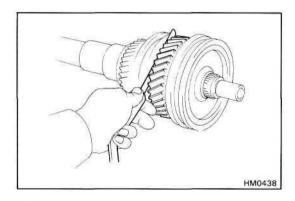
HM0437

# 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.

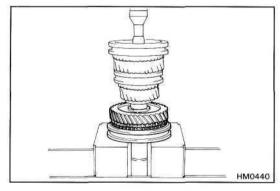


# 7. MEASURE THIRD GEAR THRUST CLEARANCE

Using a feeler gauge, measure the third gear thrust clearance.

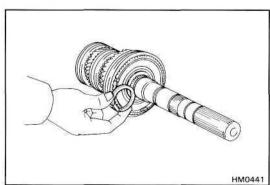
# Standard clearance:

0.1 - 0.45 mm (0.0039 - 0.0138 in.)



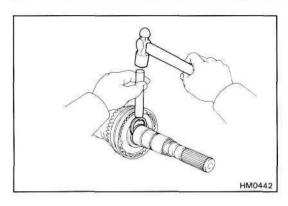
# 8. INSTALL SECOND GEAR AND HUB SLEEVE NO.1 ASSEMBLY

- (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.

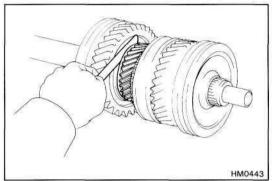


# 9. INSTALL SNAP RING

Mark	Thickness mm (in.)		Thickness mm (in.)	
Α	2.90 - 2.95 (0.1142 - 0.1162)			
В	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.

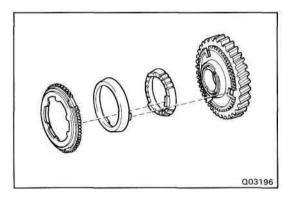


# 10. INSPECT SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the second gear thrust clearance.

# Standard clearance:

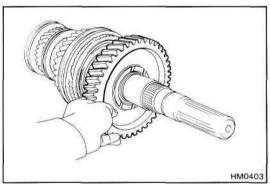
0.1 - 0.35 mm (0.0039 - 0.0138 in.)



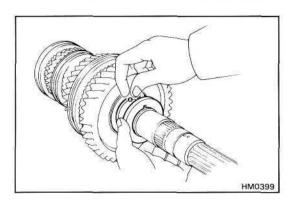
# 11. INSTALL FIRST GEAR

(H151F)

(a) Place the synchronizer rings on the 1st gear.

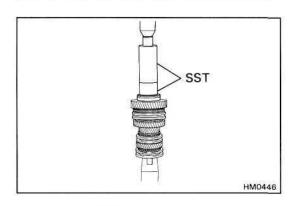


- (b) Apply gear oil to the shaft and needle roller bearing. (H150F)
- (c) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.
- (d) Install the needle roller bearing in the first gear.

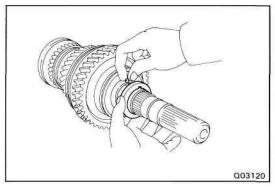


# 12. INSTALL BALL BEARING

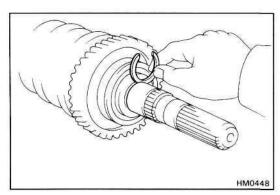
(a) Install the pin and thrust washer.



(b) Using SST and a press, install the ball bearing.  ${\tt SST~09316-60010~(09316-00010)}\,,\,\,09523-36010$ 



(c) Install the pin and thrust washer.

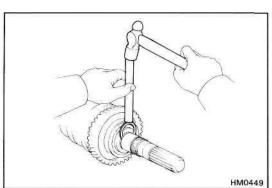


# 13. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)		
Α	2.40 - 2.45 (0.0945 - 0.0965)		
В	2.45 - 2.50 (0.0965 - 0.0984)		
С	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)		
Н	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	Old Control of the Co	Section of the sectio	A 100000000 TOURS AND MIN 10000000
(H150F)			
	Limit	0.85 mm	0.0335 in.
Synchronizer ring for 3rd gear clearance			
(H150F)			
10 - 11 - 10 - 10 - 10 - 10 - 10 - 10 -	Limit	0.8 mm	0.0315 in.
Synchronizer ring for 1st and 2nd gear c	learance		53:50 (350.245) (3522-50000)
(H151F)			
	Limit	0.85 mm	0.0335 in.
Synchronizer ring for 3rd gear clearance	11 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 -		terbela and the appropriate resources of the
(H151F)		<u> </u>	
\$540000000000	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	21.0	Tanana was a succession of the	
	Mark C	2.50 — 2.55 mm	0.0984 - 0.1004 in.
No.3 Hub sleeve	Mark D	2.50 — 2.55 mm 2.55 — 2.60 mm	0.0984 — 0.1004 in. 0.1004 — 0.1024 in.
	Mark D	2.55 — 2.60 mm	0.1004 — 0.1024 in.
No.3 Hub sleeve	Mark D Mark E	2.55 — 2.60 mm 2.60 — 2.65 mm	
No.3 Hub sleeve No.3 Hub sleeve	Mark D	2.55 — 2.60 mm	0.1004 — 0.1024 in. 0.1024 — 0.1044 in.
No.3 Hub sleeve No.3 Hub sleeve No.2 Hub sleeve	Mark D Mark E Mark F	2.55 — 2.60 mm 2.60 — 2.65 mm 2.65 — 2.70 mm	0.1004 - 0.1024 in. $0.1024 - 0.1044$ in. $0.1044 - 0.1063$ in.
No.3 Hub sleeve No.3 Hub sleeve No.2 Hub sleeve No.2 Hub sleeve	Mark D Mark E Mark F Mark 4	2.55 - 2.60 mm 2.60 - 2.65 mm 2.65 - 2.70 mm 1.90 - 1.95 mm	0.1004 - 0.1024 in. 0.1024 - 0.1044 in. 0.1044 - 0.1063 in. 0.0748 - 0.0768 in.
No.3 Hub sleeve No.3 Hub sleeve No.2 Hub sleeve No.2 Hub sleeve No.2 Hub sleeve	Mark D Mark E Mark F Mark 4 Mark 5	2.55 — 2.60 mm 2.60 — 2.65 mm 2.65 — 2.70 mm 1.90 — 1.95 mm 1.95 — 2.00 mm	0.1004 — 0.1024 in. 0.1024 — 0.1044 in. 0.1044 — 0.1063 in. 0.0748 — 0.0768 in. 0.0768 — 0.0787 in.
No.3 Hub sleeve No.3 Hub sleeve No.2 Hub sleeve No.2 Hub sleeve No.2 Hub sleeve No.2 Hub sleeve	Mark D Mark E Mark F Mark 4 Mark 5 Mark 6	2.55 — 2.60 mm 2.60 — 2.65 mm 2.65 — 2.70 mm 1.90 — 1.95 mm 1.95 — 2.00 mm 2.00 — 2.05 mm	0.1004 — 0.1024 in. 0.1024 — 0.1044 in. 0.1044 — 0.1063 in. 0.0748 — 0.0768 in. 0.0768 — 0.0787 in. 0.0787 — 0.0807 in.
No.3 Hub sleeve No.3 Hub sleeve No.2 Hub sleeve	Mark D Mark E Mark F Mark 4 Mark 5 Mark 6 Mark 7	2.55 — 2.60 mm 2.60 — 2.65 mm 2.65 — 2.70 mm 1.90 — 1.95 mm 1.95 — 2.00 mm 2.00 — 2.05 mm 2.05 — 2.10 mm	0.1004 - 0.1024 in. 0.1024 - 0.1044 in. 0.1044 - 0.1063 in. 0.0748 - 0.0768 in. 0.0768 - 0.0787 in. 0.0787 - 0.0807 in. 0.0807 - 0.0827 in.
No.3 Hub sleeve No.3 Hub sleeve No.2 Hub sleeve	Mark D Mark E Mark F Mark 4 Mark 5 Mark 6 Mark 7 Mark 8 Mark 9	2.55 — 2.60 mm 2.60 — 2.65 mm 2.65 — 2.70 mm 1.90 — 1.95 mm 1.95 — 2.00 mm 2.00 — 2.05 mm 2.05 — 2.10 mm 2.10 — 2.15 mm	0.1004 - 0.1024 in. 0.1024 - 0.1044 in. 0.1044 - 0.1063 in. 0.0748 - 0.0768 in. 0.0768 - 0.0787 in. 0.0787 - 0.0807 in. 0.0807 - 0.0827 in. 0.0827 - 0.0847 in. 0.0847 - 0.0866 in.
No.3 Hub sleeve No.3 Hub sleeve No.2 Hub sleeve No.1 Hub sleeve	Mark D Mark E Mark F Mark 4 Mark 5 Mark 6 Mark 7 Mark 8 Mark 9 Mark A	2.55 — 2.60 mm 2.60 — 2.65 mm 2.65 — 2.70 mm 1.90 — 1.95 mm 1.95 — 2.00 mm 2.00 — 2.05 mm 2.05 — 2.10 mm 2.10 — 2.15 mm 2.15 — 2.20 mm 2.90 — 2.95 mm	0.1004 — 0.1024 in.  0.1024 — 0.1044 in.  0.1044 — 0.1063 in.  0.0748 — 0.0768 in.  0.0768 — 0.0787 in.  0.0787 — 0.0807 in.  0.0807 — 0.0827 in.  0.0827 — 0.0847 in.  0.0847 — 0.0866 in.  0.1142 — 0.1162 in.
No.3 Hub sleeve No.3 Hub sleeve No.2 Hub sleeve No.1 Hub sleeve No.1 Hub sleeve No.1 Hub sleeve	Mark D Mark E Mark F Mark 4 Mark 5 Mark 6 Mark 7 Mark 8 Mark 9 Mark A Mark B	2.55 — 2.60 mm 2.60 — 2.65 mm 2.65 — 2.70 mm 1.90 — 1.95 mm 1.95 — 2.00 mm 2.00 — 2.05 mm 2.05 — 2.10 mm 2.10 — 2.15 mm 2.15 — 2.20 mm 2.90 — 2.95 mm 2.90 — 2.95 mm	0.1004 - 0.1024 in.  0.1024 - 0.1044 in.  0.1044 - 0.1063 in.  0.0748 - 0.0768 in.  0.0768 - 0.0787 in.  0.0787 - 0.0807 in.  0.0807 - 0.0827 in.  0.0827 - 0.0847 in.  0.0847 - 0.0866 in.  0.1142 - 0.1162 in.  0.1162 - 0.1181 in.
No.3 Hub sleeve No.3 Hub sleeve No.2 Hub sleeve No.1 Hub sleeve	Mark D Mark E Mark F Mark 4 Mark 5 Mark 6 Mark 7 Mark 8 Mark 9 Mark A Mark B Mark C	2.55 — 2.60 mm 2.60 — 2.65 mm 2.65 — 2.70 mm 1.90 — 1.95 mm 1.95 — 2.00 mm 2.00 — 2.05 mm 2.05 — 2.10 mm 2.10 — 2.15 mm 2.15 — 2.20 mm 2.90 — 2.95 mm 2.95 — 3.00 mm 3.00 — 3.05 mm	0.1004 - 0.1024 in.  0.1024 - 0.1044 in.  0.1044 - 0.1063 in.  0.0748 - 0.0768 in.  0.0768 - 0.0787 in.  0.0787 - 0.0807 in.  0.0807 - 0.0827 in.  0.0827 - 0.0847 in.  0.0847 - 0.0866 in.  0.1142 - 0.1162 in.  0.1162 - 0.1181 in.  0.1181 - 0.1201 in.
No.3 Hub sleeve No.3 Hub sleeve No.3 Hub sleeve No.2 Hub sleeve No.1 Hub sleeve	Mark D Mark E Mark F Mark 4 Mark 5 Mark 6 Mark 7 Mark 8 Mark 9 Mark A Mark B	2.55 — 2.60 mm 2.60 — 2.65 mm 2.65 — 2.70 mm 1.90 — 1.95 mm 1.95 — 2.00 mm 2.00 — 2.05 mm 2.05 — 2.10 mm 2.10 — 2.15 mm 2.15 — 2.20 mm 2.90 — 2.95 mm 2.90 — 2.95 mm	0.1004 — 0.1024 in.  0.1024 — 0.1044 in.  0.1044 — 0.1063 in.  0.0748 — 0.0768 in.  0.0768 — 0.0787 in.  0.0787 — 0.0807 in.  0.0807 — 0.0827 in.  0.0827 — 0.0847 in.  0.0847 — 0.0866 in.  0.1142 — 0.1162 in.  0.1162 — 0.1181 in.

Output shaft snap ring t	hickness		
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	.AT-2
OPERATION	.AT-4
PREPARATION	AT-12
TROUBLESHOOTING	.AT-14
VALVE BODY	AT-58
THROTTLE CABLE	AT-63
ASSEMBLY REMOVAL AND	
INSTALLATION	AT-66
SERVICE SPECIFICATIONS	AT-86

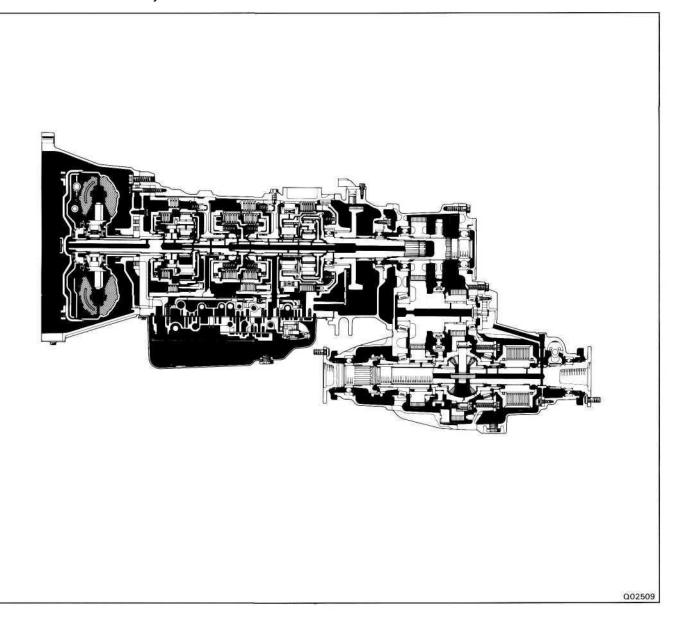


# **DESCRIPTION**

# **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.

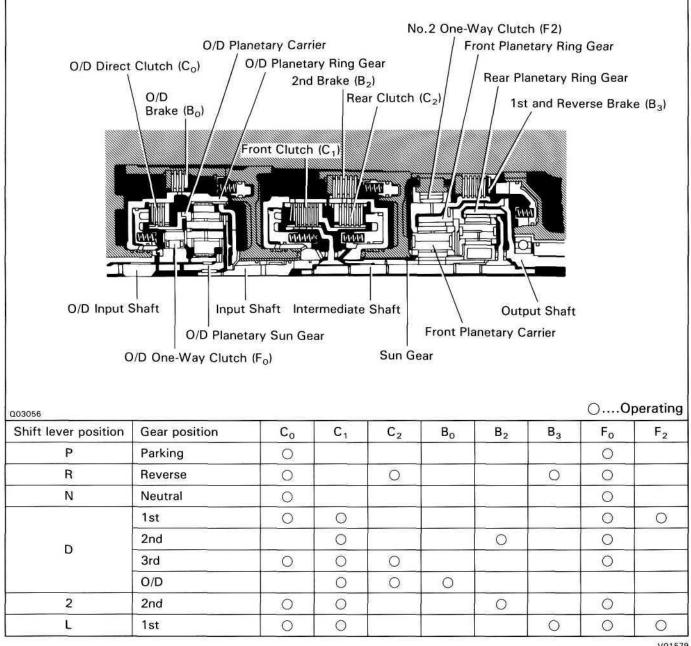


#### **GENERAL SPECIFICATIONS**

Type of Transmission		A442F	<del>-</del>
Type of Engine		1FZ-FE	1HD-T
Torque Converter Stall Torque Rati	0	1.8 : 1	2.0 : 1
Lock-up Mechanism		Equipped	←
Gear Ratio	1st Gear	2.950	+
	2nd Gear	1.530	←:
	3rd Gear	1.000	← 2
	O/D Gear	0.765	←
	Reverse Gear	2.678	<b>←</b>
Number of Discs and Plates	(Disc and Plate)		
	Front Clutch (C <sub>1</sub> )	6/6	7/7
	Rear Clutch (C <sub>2</sub> )	5/5	←
	O/D Direct Clutch (Co)	3/3	←
	2nd Brake (B <sub>1</sub> )	5/5	←
2 88	st and Reverse Brake (B <sub>2</sub> )	6/6	←
	O/D Brake (B <sub>o</sub> )	3/3	←
ATF Type	9	ATF DEXRON® II	<b>.</b>
Capacity (US pts, Imp. qts)	Total		
	w/ Oil Cooler	15.4 (16.3, 13.6)	€-0
	w/o Oil Cooler	15.0 (15.9, 13.2)	←
	Drain & Refill	6.0 (6.3, 5.3)	←

#### **OPERATION**

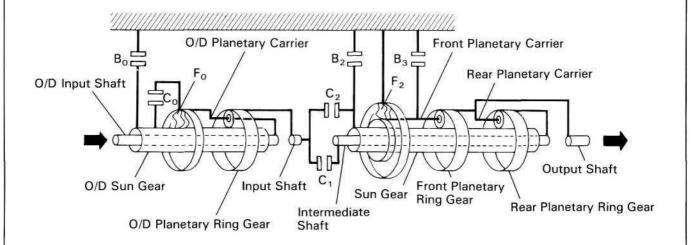
#### **OPERATION**



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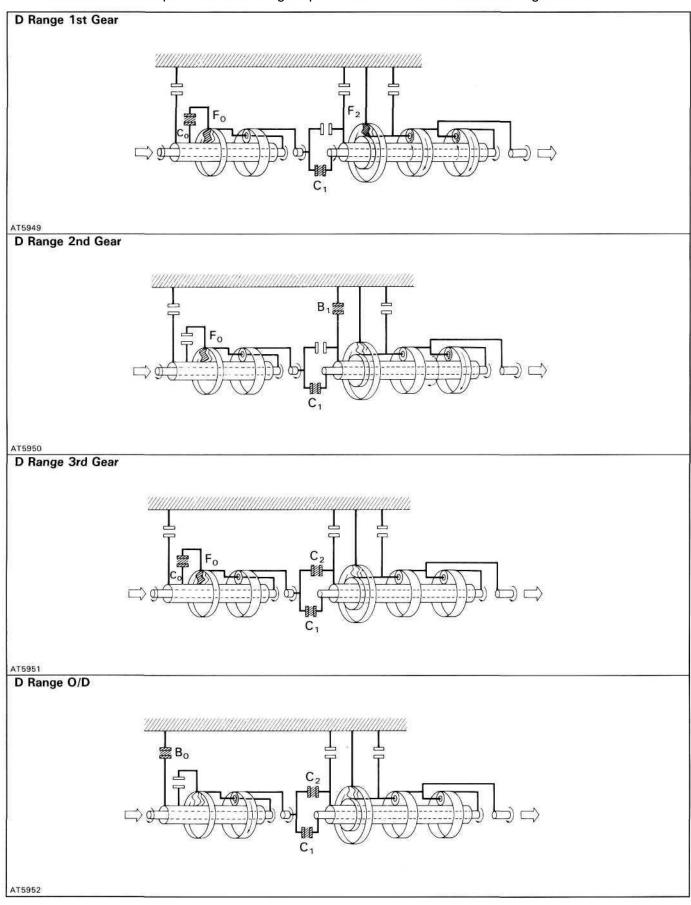
#### 1. FUNCTION OF COMPONENTS

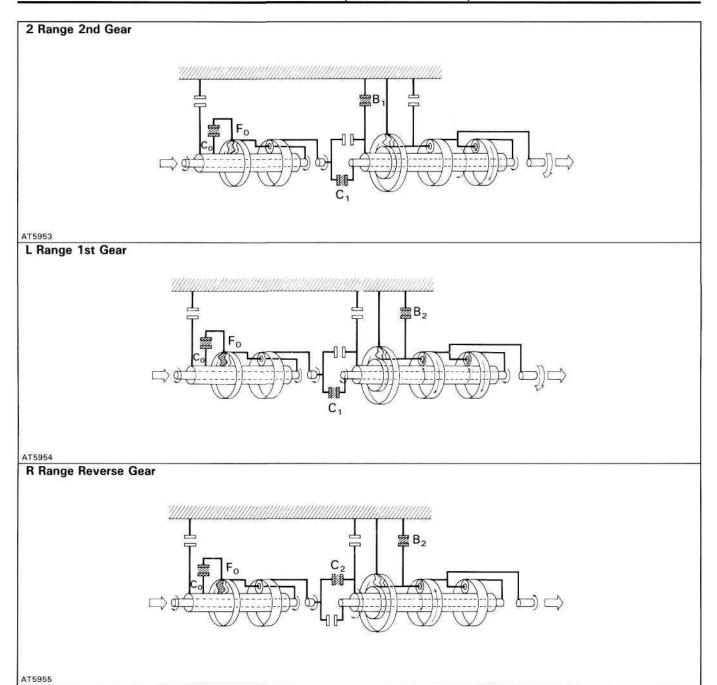
COMPONENT	FUNCTION
O/D Direct Clutch (Co)	Connects overdrive sun gear and overdrive carrier
O/D Brake (B <sub>o</sub> )	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One-Way Clutch (F <sub>o</sub> )	When transmission is being driven by engine, connects overdrive sun gear and overdrive carrier
Front Clutch (C <sub>1</sub> )	Connects input shaft and intermediate shaft
Rear Clutch (C <sub>2</sub> )	Connects input shaft and front & rear planetary sun gear
2nd Brake (B <sub>1</sub> )	Prevents front & rear planetary sun gear from turning either clockwise or counter- clockwise
1st & Reverse Brake (B <sub>2</sub> )	Prevents front planetary carrier from turning either clockwise or counterclockwise
No.2 One-Way Clutch (F <sub>2</sub> )	Prevents front planetary carrier from turning counterclockwise



AT3917

The conditions of operation for each gear position are shown on the following illustration:





#### 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.

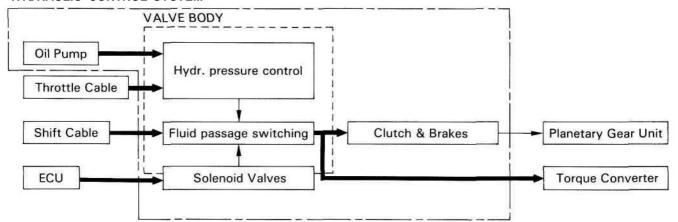
There are four solenoid valves on the valve body.

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



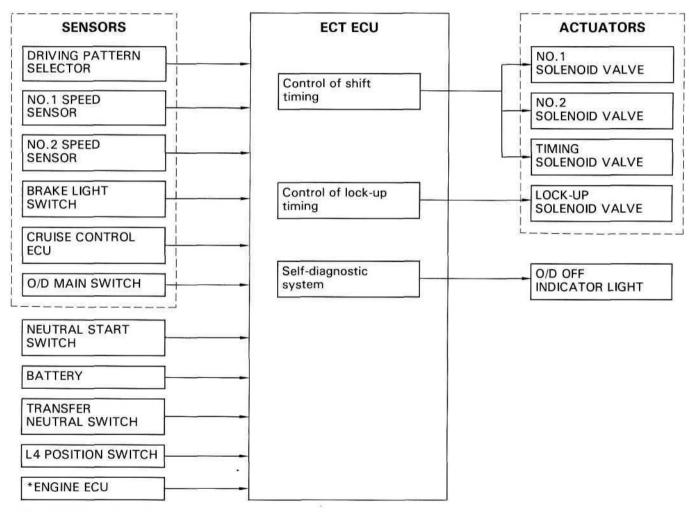
#### 3. ELECTRONIC CONTROL SYSTEM

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 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 (1 58°F).

The purpose of (1) and (2) above is to prevent the engine from stalling if the rear wheels lock up.

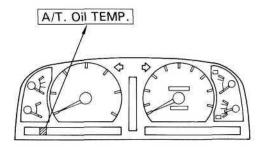
The purpose of (3) is to cause the torque converter operate to obtain torque multiplication.

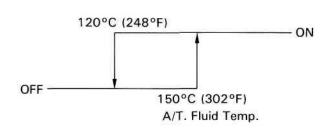
The purpose of (4) is both to improve general driveability, and to speed up transmission warm-up.

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).



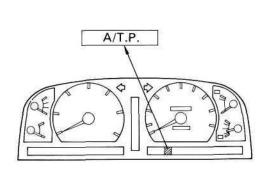


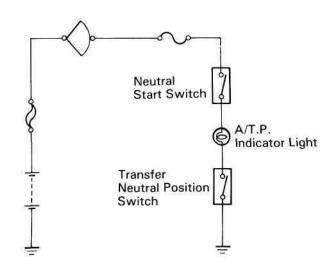
AT6023

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#### 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.





#### **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	Diagnosis Check Wiring	
09992-00094	Automatic Transmission Oil Pressure Gauge Set	

#### **EQUIPMENT**

Ohmmeter	
Voltmeter	
Torque wrench	
Dial indicator with magneticbase	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	15.4 liter (16.3 US qts, 13.6 lmp.qts)	ATF DEXRON® II		
w/o Oil cooler	15.0 liter (15.9 US qts, 13.2 lmp.qts)			
Drain and refill	6.0 liters (6.3 US qts, 5.3 lmp.qts)			

#### SSM (SPECIAL SERVICE MATERIALS)

08826-00090	Seal Packing 1281, Three bond 1281 or equivalent	Oil pan	

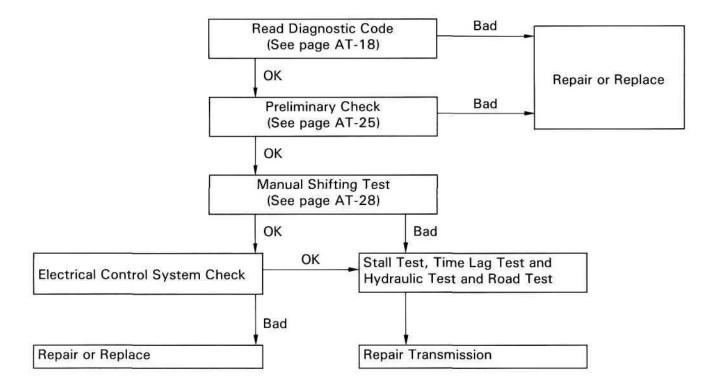
#### **TROUBLESHOOTING**

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.

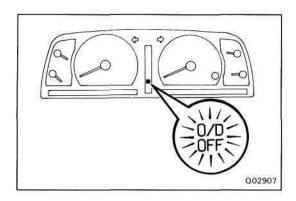


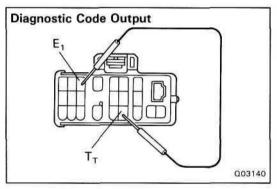
NOTICE: Refer to A442F Automatic Transmission Repair Manual (Pub. No. RM314E) when  $\star$  mark appears in the column for page numbers.

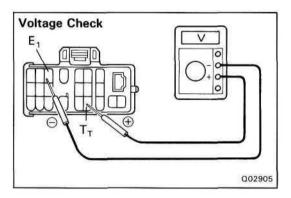
Problem	Possible cause	Remedy	Page
Fluid discolored or	Fluid contaminated	Replace fluid	AT-25
smells burnt	Torque converter faulty	Replace torque converter	AT-76
	Transmission faulty	Disassemble and inspect transmission	*
Vehicle does not	Manual linkage out of adjustment	Adjust linkage	AT-26
move in any for-	Valve body or primary regulator faulty	Inspect valve body	*
ward range or re- verse	Parking lock pawl faulty	Inspect parking lock pawl	*
	Torque converter faulty	Replace torque converter	AT-76
	Converter drive plate broken	Replace drive plate	AT-76
	Oil pump intake screen blocked	Clean screen	*
	Transmission faulty	Disassemble and inspect transmssion	*
Shift lever position	Manual linkage out of adjustment	Adjust linkage	AT-26
incorrect	Manual valve and lever faulty	Inspect valve body	*
	Transmission faulty	Disassemble and inspect transmission	*
Harsh engagement	Throttle cable out of adjustment	Adjust throttle cable	AT-26
into any drive posi-	Valve body or primary regulator faulty	Inspect valve body	*
tion	Accumulator pistons faulty	Inspect accumulator pistons	*
	Transmission faulty	Disassemble and inspect transmission	*
Delayed 1 – 2,	Electronic control faulty	Inspect electronic control	AT-29
2 - 3 or 3 - 0/D	Valve body faulty	Inspect valve body	*
up-shift, or down- shift from O/D — 3 or 3 — 2 and shifts back to O/D or 3	Solenoid valve faulty	Inspect solenoid valve	AT-40
Slips on $1-2$ ,	Manual linkage out of adjustment	Adjust linkage	AT-26
2 - 3 or 3 - O/D	Throttle cable out of adjustment	Adjust throttle cable	AT-26
up-shift, or shps or shudders on accel-	Valve body faulty	Inspect valve body	*
eration	Solenoid valve faulty	Inspect solenoid valve	AT-40
	Transmission faulty	Disassemble and inspect transmission	*
Drag, binding or	Manual linkage out of adjustment	Adjust linkage	AT-26
tie-up on 1 — 2,	Valve body faulty	Inspect valve body	*
2 - 3 or $3 - O/D$ up-shift	Transmission faulty	Disassemble and inspect transmission	*

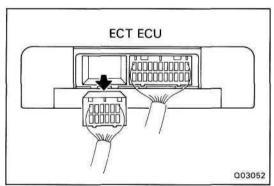
NOTICE: Refer to A442F Automatic Transmission Repair Manual (Pub. No. RM314E) when  $\star$  mark appears in the column for page numbers.

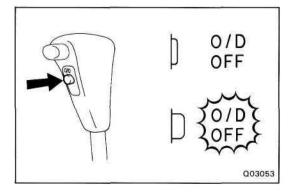
Problem	Possible cause	Remedy	Page
No lock-up in 3rd	Electronic control faulty	Inspect electronic control	AT-29
or O/D	Valve body faulty	Inspect valve body	*
	Solenoid valve faulty	Inspect solenoid valve	AT-40
	Transmission faulty	Disassemble and inspect transmission	*
Harsh down-shift	Throttle cable out of adjustment	Adjust throttle cable	AT-26
	Throttle cable and cam faulty	Inspect throttle cable and cam	AT-26
	Accumulator pistons faulty	Inspect accumulator pistons	*
	Valve body faulty	Inspect valve body	*
	Transmission faulty	Disassemble and inspect transmission	*
No down-shift when	Valve body faulty	Inspect valve body	*
coasting	Solenoid valve faulty	Inspect solenoid valve	AT-40
	Electronic control faulty	Inspect electronic control	AT-29
Down-shift occurs	Throttle cable faulty	Inspect throttle cable	AT-26
too quickly or too	Valve body faulty	Inspect valve body	*
late while coasting	Transmission faulty	Disassemble and inspect transmission	*
	Solenoid valve faulty	Inspect solenoid valve	AT-40
	Electronic control faulty	Inspect electronic control	AT-29
No O/D - 3, 3 - 2	Solenoid valve faulty	Inspect solenoid valve	AT-40
or 2 — 1 kick-down	Electronic control faulty	Inspect eletronic control	AT-29
	Valve body faulty	Inspect valve body	*
No engine braking 2	Solenoid valve faulty	Inspect solenoid valve	AT-40
or L range	Electronic control faulty	Inspect electronic control	AT-29
	Valve body faulty	Inspect valve body	*
	Transmission faulty	Disassemble and inspect transmission	*
Vehicle does not	Manual linkage out of adjustment	Adjust linkage	AT-26
hold in P	Parking lock pawl cam and spring faulty	Inspect cam and spring	AT-26











#### **DIAGNOSIS SYSTEM**

#### DESCRIPTION

 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 ET 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  $T_{\mathsf{T}}$  of the check connector while driving.
- 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)

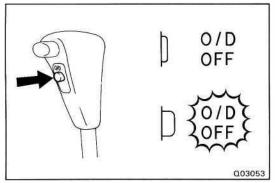
#### HINT:

- 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

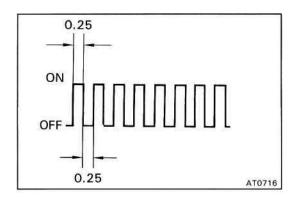
- 1. Turn the ignition switch ON.
- 2. The "O/D OFF" light will come on when the O/D switch is placed at OFF.
- When the O/D switch is set to ON, the "O/D OFF" light should go out.

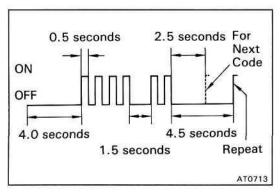
If the "O/D OFF" light flashes when the O/D switch is set to ON, the electronic control system is faulty.



# SST Q03141

# Q02907





#### READ DIAGNOSTIC CODE

#### 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 TT AND E, TERMINALS OF CHECK CONNEC-

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.

#### REMOVE SST

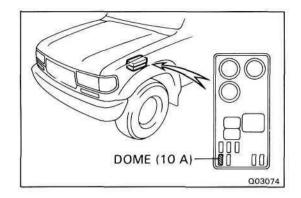
#### **DIAGNOSTIC CODES**

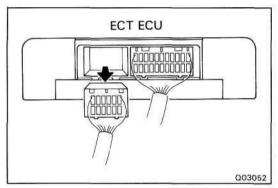
Code No.	Light Pattern	Diagnosis System
_		Normal
41	MM .	Severed throttle position sensor or short circuit—severed wire harness or short circuit
42	שתרשת	Defective No. 1 speed sensor (in combination meter) — severed wire harness or short circuit
61		Defective No. 2 speed sensor (in ATM)— severed wire harness or short circuit
62	www	Severed No. 1 solenoid or short circuit— severed wire harness or short circuit
63	wwww	Severed No. 2 solenoid or short circuit— severed wire harness or short circuit
64	wwww	Severed lock-up solenoid or short circuit— severed wire harness or short circuit
65	wwww	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	JUMMULMMML	Severed engine ECU and ECT ECU or short circuit— severed wire harness or short circuit

\*: 1FZ-FE engine only

003076

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

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:

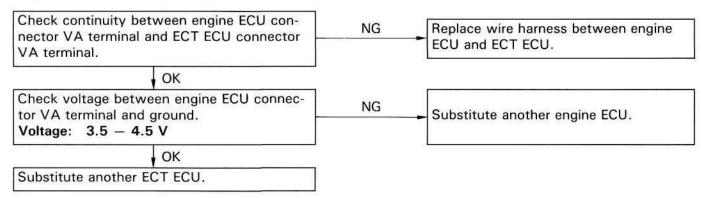
- Cancellation can be also done by removing the battery negative (—) terminal, but in this case other memory systems will be also canceled out.
- The diagnostic code can be also canceled out by disconnecting the ECT ECU connector.
- If the diagnostic trouble is not canceled out, it will be retained by 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 0/D OFF light.

#### TROUBLESHOOTING FLOW-CHART

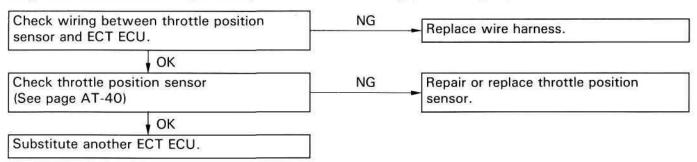
#### HINT:

- 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.

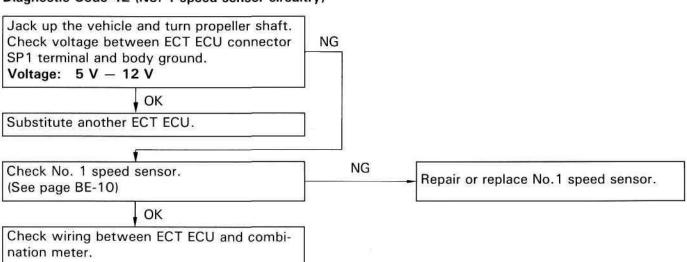
#### Diagnostic Code 41 (Throttle position sensor circuitry) (1FZ-FE engine)

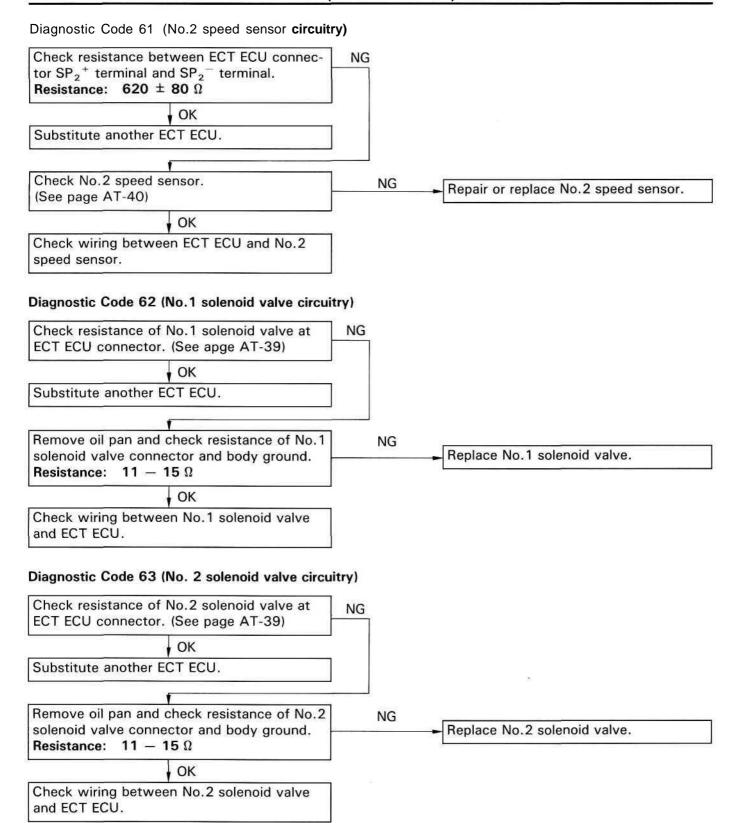


#### Diagnostic trouble Code 41 (Throttle position sensor circuitry) (1HD-T engine)



#### Diagnostic Code 42 (No. 1 speed sensor circuitry)

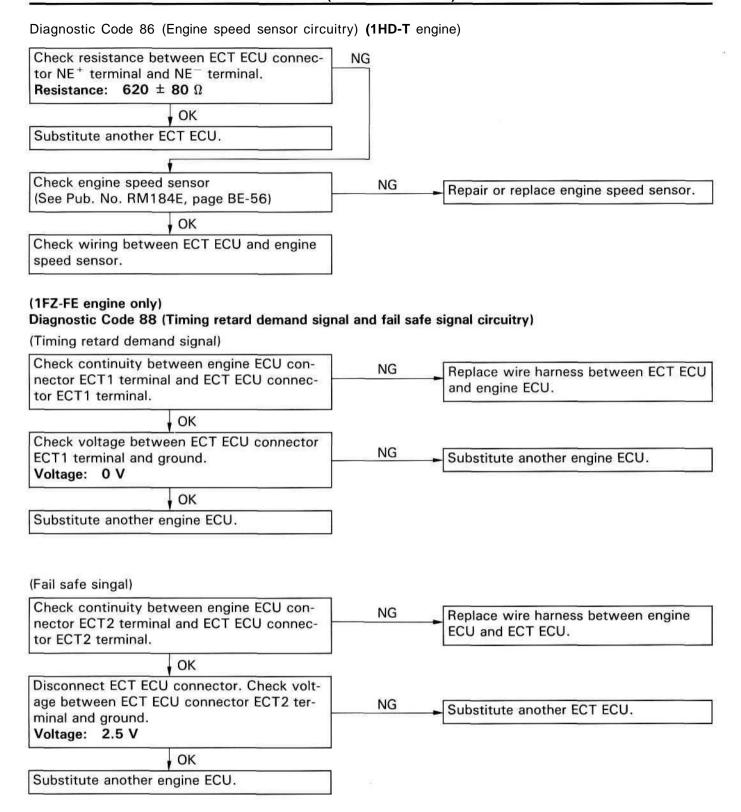




#### Diagnostic Code 64 (Lock-up solenoid valve circuitry) Check resistance of lock-up solenoid valve at NG ECT ECU. (See page AT-39) Substitute another ECT ECU. Remove oil pan and check resistance of No.2 NG solenoid valve connector and body ground. Replace lock-up solenoid valve. Resistance: $11 - 15 \Omega$ OK Check wiring between lock-up solenoid valve and ECT ECU. Diagnostic Code 65 (Timing solenoid valve circuitry) Check resistance of timing solenoid valve at NG TCM. (See page AT-39) OK Substitute another ECT ECU. Remove oil pan and check resistance of timing solenoid valve connector and body NG Replace timing solenoid ground. Resistance: $11 - 15 \Omega$ OK Check wiring between timing solenoid valve and ECT ECU. Diagnostic Code 86 (Engine speed sensor circuitry) (1FZ-FE engine) Check continuity between engine ECU con-NG Replace wire harness between engine nector NEO terminal and ECT ECU connector ECU and ECT ECU. NE terminal. OK Check voltage between ECT ECU connector NG NE terminal and ground. Substitute another engine ECU. Voltage: 2 - 3 V

OK

Substitute another ECT ECU.



#### 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 1 58 - 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)

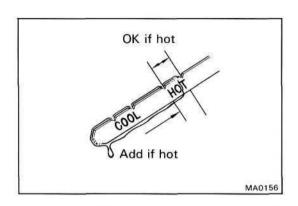
(w/o Oil cooler)

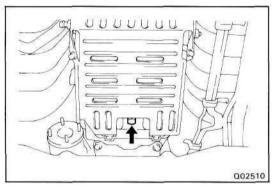
15.0 liters (15.9 US qts, 13.2 lmp.qts)

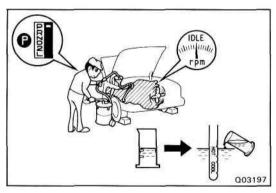
Drain and refill

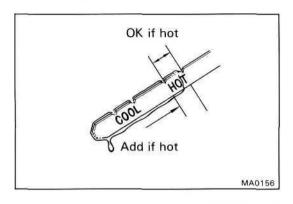
6.0 litters (6.3 US qts, 5.3 lmp.qts)

- (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.



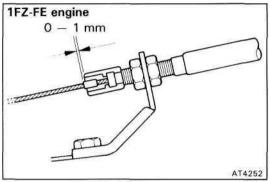






(f) Check the fluid level with the normal operating temperature (70 — 80°C or 158 — 176°F) and add as necessary.

NOTICE: Do not overfill.



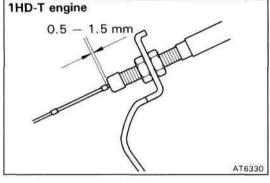
#### 3. INSPECT THROTTLE CABLE

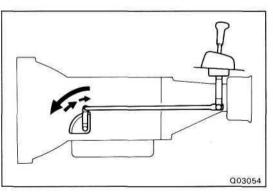
- (a) Check that the throttle cable is installed correctly and not bent.
- (b) With the throttle valve fully closed, measure the distance between the end of the boot and stopper on the cable.

#### 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.



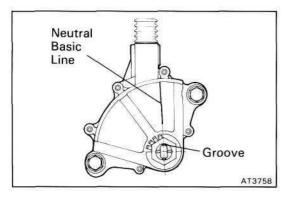


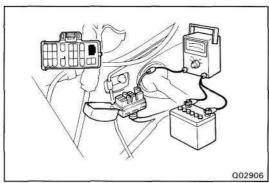
#### 4. INSPECT TRANSMISSION SHIFT LEVER RANGE

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 SWTICH

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.

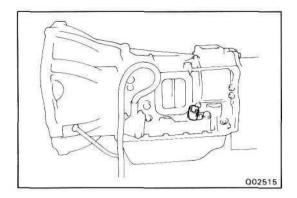
Torque: 13 Nm (130 kgfcm, 9 ftlbf)

#### 6. INSPECT IDLE SPEED (N RANGE)

Connect tachometer test probe to the check connector terminal  $IG \bigcirc$ , 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)

REFERANCE: Possible gear position in accordance with solenoid operating conditions.

	NORMAL Solenoid Valve Gear		NO.1 SOLENOID MALFUNCTIONING		NO.2 SOLENOID MALFUNCTIONING		BOTH SOLENOIDS MALFUNCTIONING					
			Gear	Solenoid Valve		Gear	Solenoid Valve		alve Gear	Solenoid Valve		Gear
Range	No.1	No.2	Position	No.1	No.2	Position	No.1	No.2	Position	No.1	No.2	Position
	ON	OFF	1st	x	ON (OFF)	3rd (O/D)	ON	x	1st	x	x	O/D
D range	ON	ON	2nd	x	ON	3rd	OFF (ON)	x	O/D (1st)	x	x	O/D
	OFF	ON	3rd	x	ON	3rd	OFF	×	O/D	х	×	O/D
	OFF	OFF	O/D	x	OFF	O/D	OFF	×	O/D	х	×	O/D
	ON	OFF	1st	×	ON (OFF)	3rd (O/D)	ON	х	1st	x	×	3rd
2 range	ON	ON	2nd	×	ON	3rd	OFF (ON)	х	3rd (1st)	x	х	3rd
	OFF	ON	3rd	×	ON	3rd	OFF	x	3rd	х	x	3rd
F 02-5-0	ON	OFF	1st	x	OFF	1st	ON	х	1st	x	x	1st
L range	ON	ON	2nd	х	ON	2nd	ON	x	1st	х	×	1st

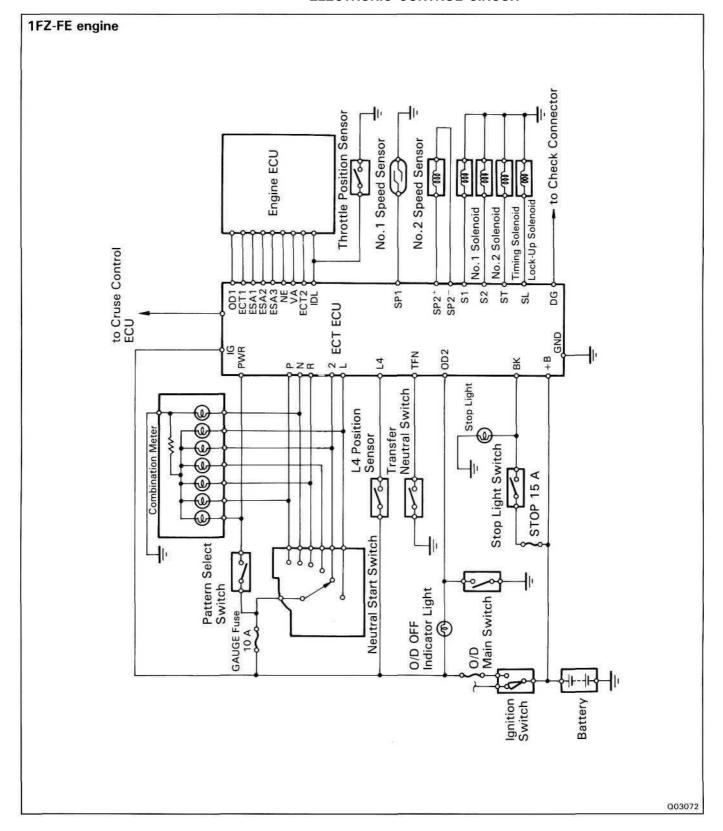
( ): No fail-safe function x: Malfunctions

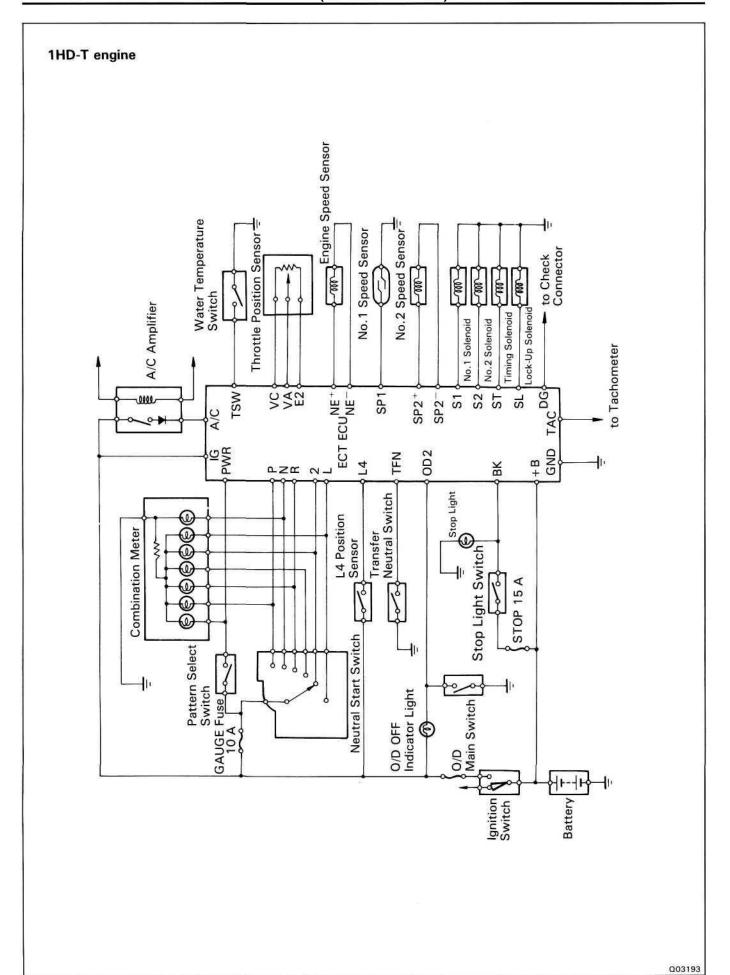
#### **ELECTRONIC CONTROL SYSTEM**

#### **PRECAUTION**

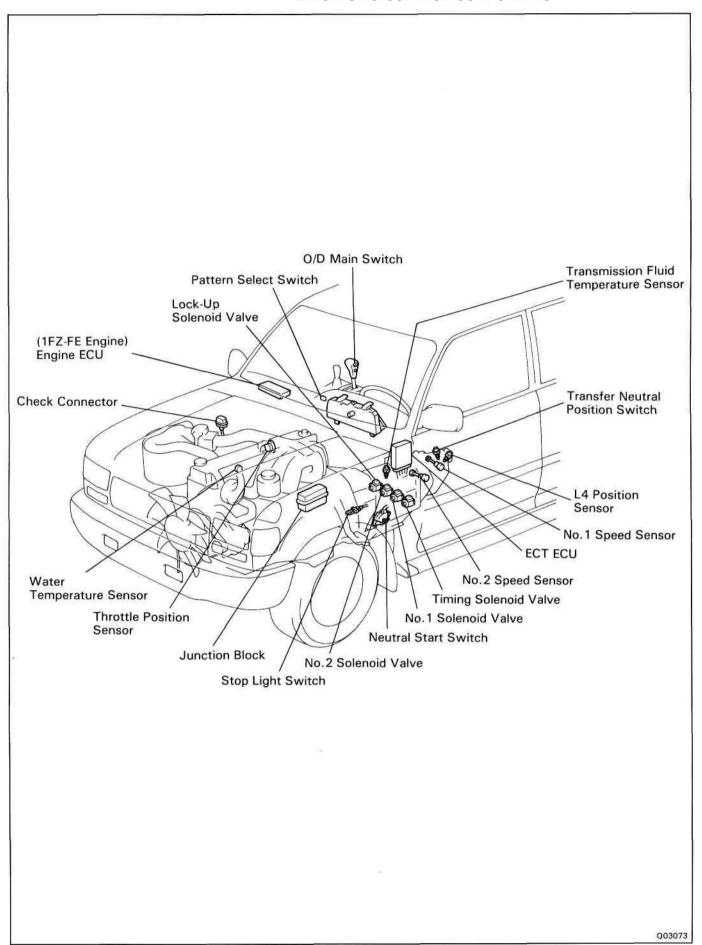
Do not open the cover or the case of the TCM and various computer unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

#### **ELECTRONIC CONTROL CIRCUIT**



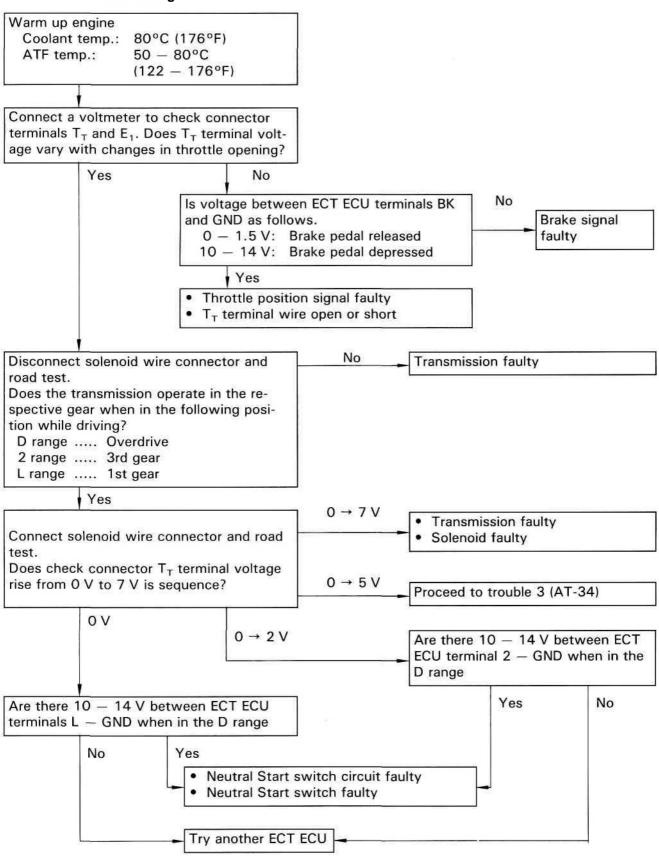


#### **ELECTRONIC CONTROL COMPONENTS**

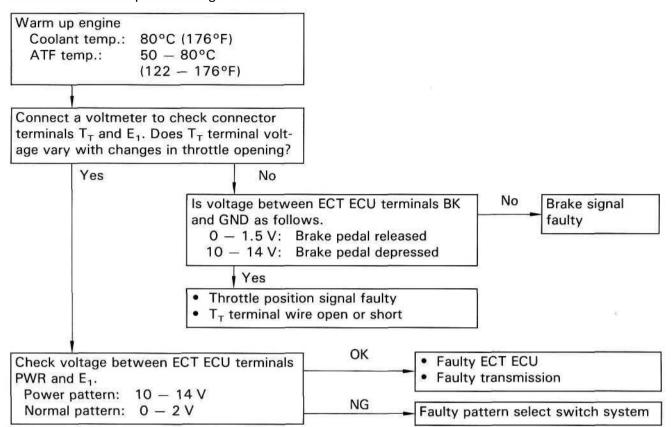


#### TROUBLESHOOTING FLOW - CHART

#### Trouble No. 1 No Shifting

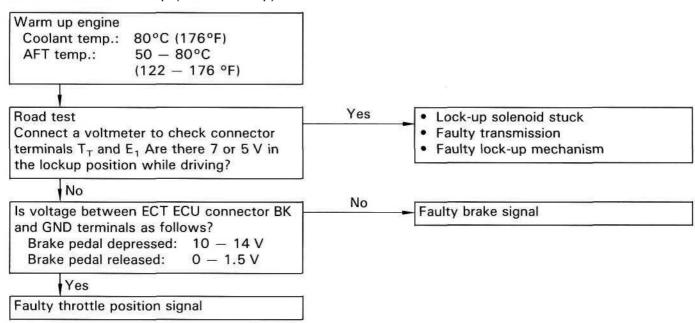


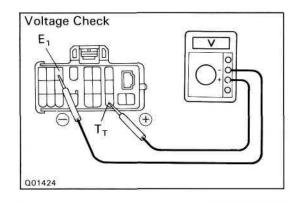
Trouble No.2 Shift point too high or too low



Trouble No.3 No up-shift to overdrive (After warm-up) Warm up engine Coolant temp.: 80°C (176°F) ATF temp.:  $50 - 80^{\circ}C$ (122 - 176 °F) No Road test while shifting manually with sole-Faulty transmission noid wire connector disconnected. Is there overdrive up-shift in the D range when shifting from L to 2 to D? Yes  $0 \rightarrow 7 V$ Connect solenoid wire connector, and while driving does check connector T<sub>T</sub> ter- Faulty transmission minal voltage rise from 0 V to 7 V in se- Faulty solenoid quence? 0 → 5 V 0 V  $0 \rightarrow 2 V$ Are there 10 - 14 V between ECT ECU terminals 2 - GND when in the D range No Yes Are there 10 - 14 V between ECT ECU terminals L - GND when in the L range No Yes Neutral Start switch circuit faulty Neutral Start switch faulty Try another ECT ECU Is voltage between ECT ECU terminals OD2 No Faulty O/D switch harness and GND as follows? Faulty O/D switch O/D switch turn ON: 10 - 14 V Faulty transmission O/D switch turn OFF: 0 - 2 V Yes Yes Is voltage between ECT ECU terminals OD, Try another ECT ECU and GND as follows? Approx. 5 V No Is voltage between ECT ECU terminals C/C Yes Faulty cruise control engine ECU and GND normal with the cruise control ECU connector pulled out? No Faulty engine ECU Faulty cruise control wire harness

#### Trouble No.4 No lock-up (After warm-up)





## 

#### T<sub>T</sub> 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
- (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.



(a) Warm up the engine.

Coolant temperature:

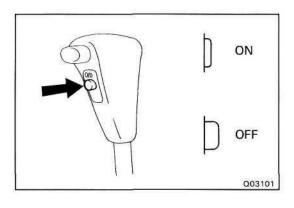
80°C (176 °F)

- (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.

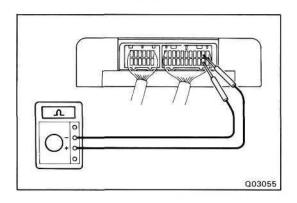
If the voltage rises from 0 V to 7 V in the sequence shown, the control system is okay.

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 2 V — 4 V - 6 V - 7 V.



T <sub>T</sub> Terminal (V)	Gear Position		
0	1st		
2	2nd		
4	3rd		
5	3rd Lock-up		
6	O/D		
7	O/D Lock-up		

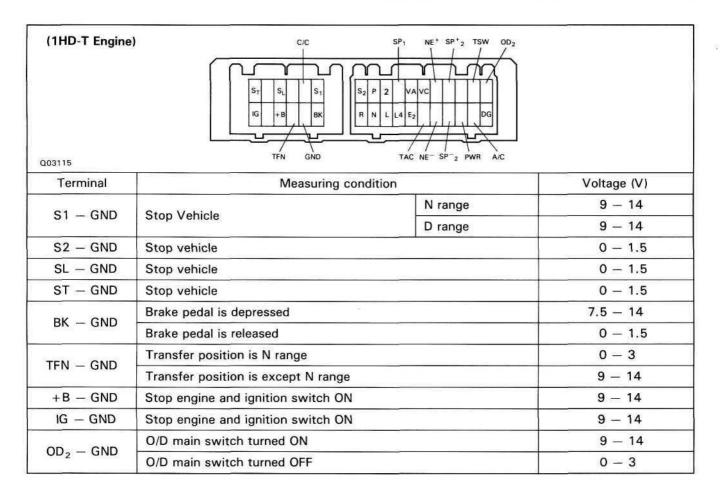


### ELECTRONIC CONTROL COMPONENETS INSPECTION

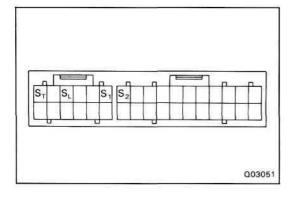
- 1. INSPECT VOLTAGE OF ECT ECU
- (a) Turn on the ignition switch.
- (b) Measure the voltage at each terminal.

(1FZ-FE Engine)	SP1 IDL  ST SL S1 S2 P 2 VA N  IG +B BK R N L L4	DG	
Q03115 Terminal	Measuring condition	2	Voltage (V)
		N range	9 – 14
S1 — GND	Stop Vehicle	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
DIK OND	Brake pedal is depressed	7.5 — 14	
BK — GND	Brake pedal is released		0 - 1.5
TEN CND	Transfer position is N range	0 - 3	
TFN — GND	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
OD <sub>2</sub> = GND	O/D main switch turned OFF	0 - 3	
$\mathrm{C/C}-\mathrm{GND}$	Stop engine and ignition switch ON		9 – 14
ECT1 — GND	Stop engine and ignition switch ON		9 — 14
OD1 – GND	Water termperature 55°C (131°F) more than		9 — 14
ODT - GND	Water termperature 55°C (131°F) or less		0 - 3
$\mathrm{SP2^+} - \mathrm{SP2^-}$	Vehicle moving		Pulse generation
SP1 — GND	Vehicle moving		Pulse generation
NE — GND	Engine idling speed	2	Pulse generation
IDL — GND	Throttle valve fully closed		0 – 3
IDE - GIVD	Throttle valve fully open		9 – 14
VA — GND	Throttle valve fully closed		3.5 - 4.5
VA GIVE	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



Terminal	Measuring condition	Voltage (V)
2 – GND	2 range	7.5 — 14
Z — GND	Except 2 range	0 - 1.5
D CND	P range	7.5 — 14
P — GND	Except P range	0 — 1.5
I CND	L range	7.5 — 14
L — GND	Except L range	0 — 1.5
N CND	N range	7.5 — 14
N — GND	Except N range	0 - 1.5
D CND	R range	7.5 — 14
R – GND	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
TOW OND	Water temperature 55°C (131°F) more than	9 – 14
TSW — GND	Water temperature 43°C (109°F) or less	0 - 3
SP2+ - SP2-	Vehicle moving	Pulse generation
SP1 - GND	Vehicle moving	Pulse generation
$NE^+ - NE^-$	Enigne idling speed	Pulse generation
A/C — GND	A/C control switch ON (Engine idling speed)	7.5 — 14
A/C — GND	A/C control switch OFF	0 - 1.5
VA CNB	Throttle valve fully closed (Warm up engine and A/C control switch OFF)	2.8 - 33
VA — GND	Throttle valve fully open (Warm up engine and A/C control switch OFF)	0.3 - 0.8
DIA/D CAID	PWR pattern	7.5 – 14
PWR — GND	NORM pattern	0 - 1.5
14 015	Transfer position is L4 range	7.5 — 14
L4 — GND	Transfer position is except L4 range	0 - 15



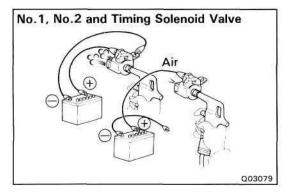
# 2. INSPECT SOLENOID

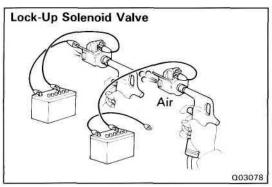
- (a) Disconnect the connector from ECT ECU.
- (b) Measure the resistance between  $S_1$ ,  $S_2$ ,  $S_L$ ,  $S_T$  and ground.

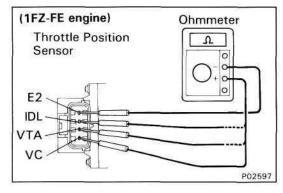
# Resistance:

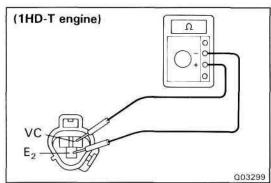
# 11-15 Ω

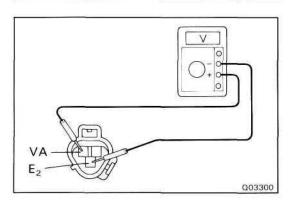
(c) Apply battery voltage to each terminal. Check that an operation noise can be heard from the solenoid.











# 3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with sloenoid operation.

- (a) Check No.1, No.2 and timing solenoid valves.
  - Check that the solenoid valves do not leak when lowpressure 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<sup>2</sup>, 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)		
IDI E	Fully closed	2.3 kΩ or less		
IDL – E <sub>2</sub> –	Open	Infinity		
VC - E <sub>2</sub>	<del></del>	2.5 - 5.9		
V/TA F	Fully closed	0.2 - 5.7		
VTA - E <sub>2</sub>	Fully open	2.0 - 10.2		

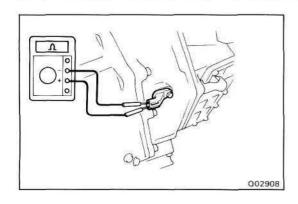
(1HD-T)

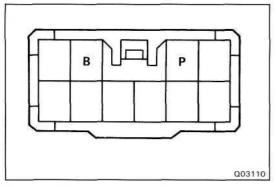
Terminal	Throttle valve condition	Resistance (kΩ)
VC - E <sub>2</sub>	Fully open	1.84 — 3.42

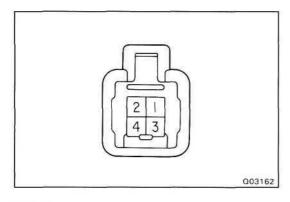
# (b) (1HD-T engine)

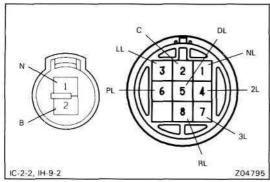
When supply 5V to the between VC terminal and E<sub>2</sub> terminal, using a voltmeter, check the voltage between terminals.

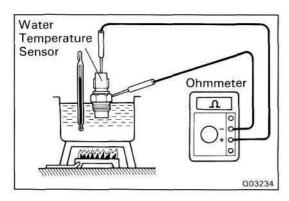
Terminal	Throttle valve condition	Voltage (V)
VA - E <sub>2</sub>	Fully open	0.96











## 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  $\infty$   $\Omega$ .

# 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.

Terminal Pattern	В	Р
PWR	0-	o
NORM		

V02104

# 8. INSPECT O/D SWITCH

Using an ohmmeter, check the continuity of the terminals for each switch position.

2	4
0-	
	2

# 9. INSPECT NEUTRAL START SWITCH

Check that there is continuity between terminals.

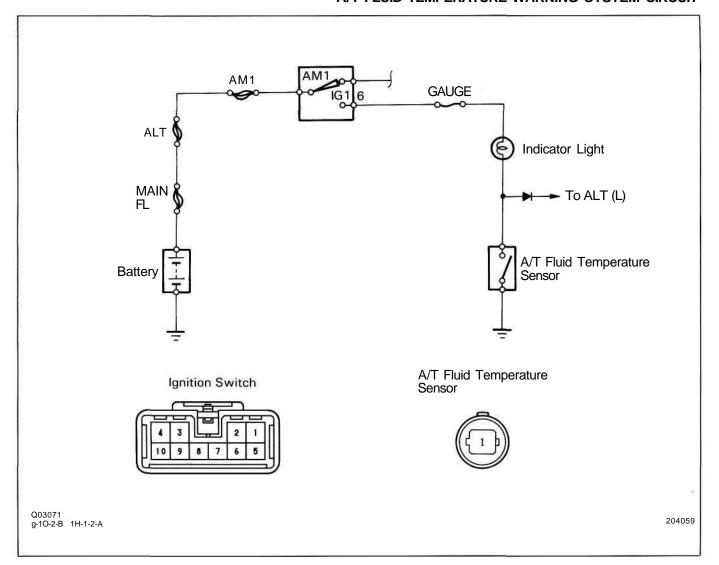
	_				C	)—C	:	Cont	inuit
Terminal Shift range	В	N	С	PL	RL	NL	DL	31	2L
Р	0-	-0	0-	-0				5.	
R			0-		-0				
N	0-	0	0-			-0			
D			0-				0		
2			0					-0	
L			0			1			-0

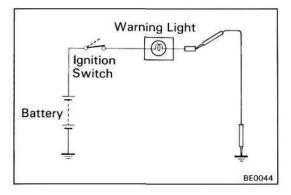
# 10. (1HD-T engine) INSPECT WATER TEMPERATURE SWITCH

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.

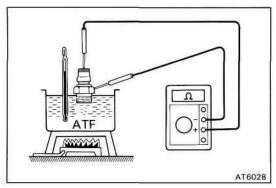
# A/T FLUID TEMPERATURE WARNING SYSTEM CIRCUIT





# 11. INSPECT A/T FLUID TEMPERATURE WARNING LIGHT

- (a) Disconnect the connector from the temperature sensor. Connect 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 \pm 150rpm
(1HD-T engine) 1,950 \pm 150rpm
```

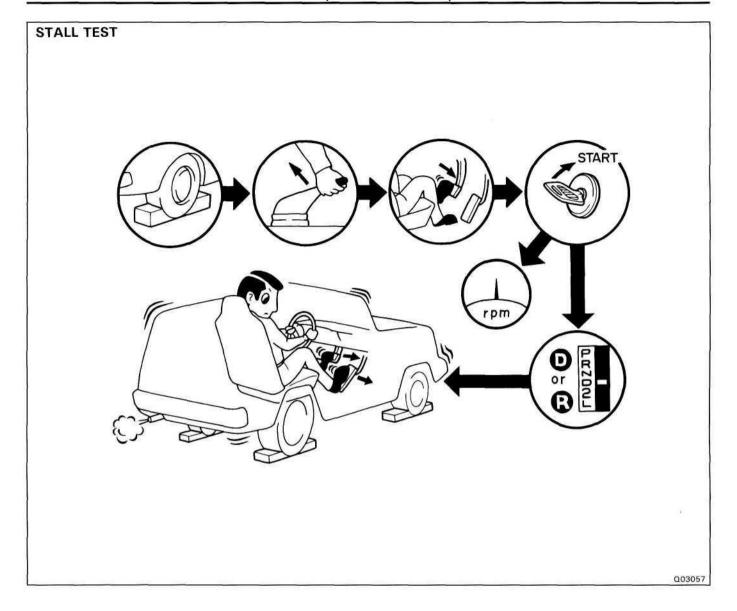
(h) Perform the same test in R range.

# **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



# 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

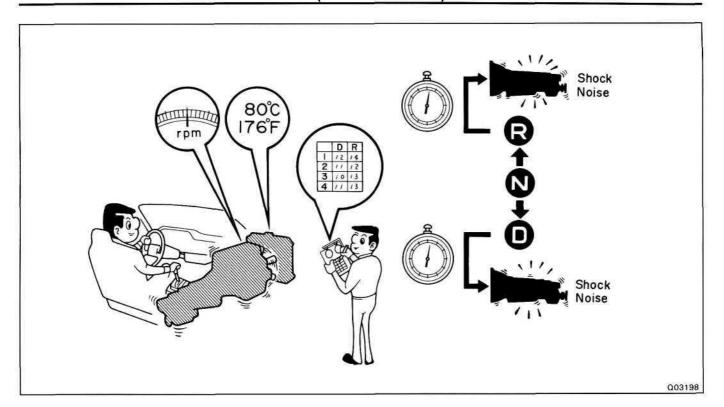
(d) In same manner, measure the time lag for  $N \rightarrow R$ .

# 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



# 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<sup>2</sup>, psi)

D r	ange	R range			
Idling	Idling Stall Idling		Stall		
461 - 520	971 — 1,226	657 — 843	1,648 — 1,853		
(4.7 - 5.3, 68 - 77)	(9.9 - 12.5, 144 - 181)	(6.7 - 8.6, 97 - 125)	(16.8-18.9, 244-274)		

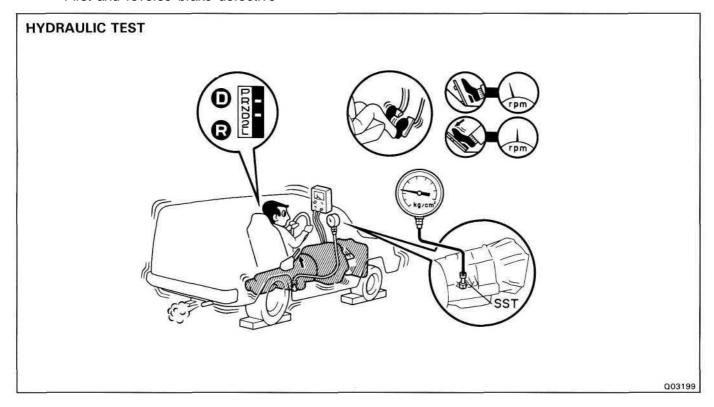
(1HD-T engine)

D r	ange	R range			
Idling	Idling Stall		Stall Idling		Stall
431 - 510	971 — 1,226	637 — 843	1,608 - 1,853		
(4.4 - 5.2, 63 - 74)	(9.9 - 12.5, 141 - 178)	(6.5 - 8.6, 92 - 122)	(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 defetive
  - · 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



# 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:

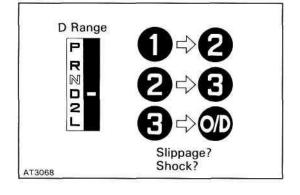
(a) 1 — 2, 2 — 3 and 3 — O/D up-shifts should take place, and shift points should conform to those shown in the automatic shift schedule.

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).



- (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  $2 \rightarrow 3$  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.



D Range

P

R

D

AT2818

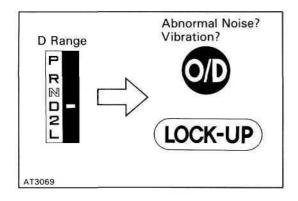
Full Open

(b) In the same manner, check the shock and slip at the 1  $\rightarrow$  2, 2  $\rightarrow$  3, and 3  $\rightarrow$  O/D up-shifts.

### **EVALUATION**

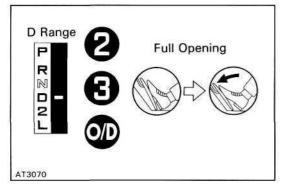
If the shock is excessive:

- · Line pressure is too high.
- Accumulator is defective.
- · Check ball is defective.

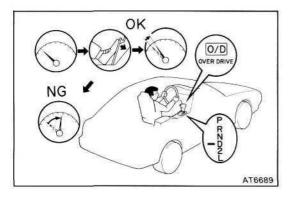


(c) Run at the D Range lock-up or O/D gear and check for abnormal noise and vibration.

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.

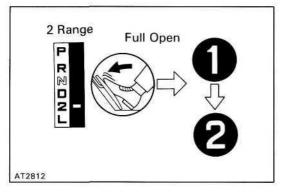


- (d) While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick-down vehicle speed limits for  $2 \rightarrow 1, 3 \rightarrow 2$  and O/D  $\rightarrow 3$  kick-downs conform to those indicated on the automatic shift schedule.
- (e) Check for abnormal shock and slip at 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.

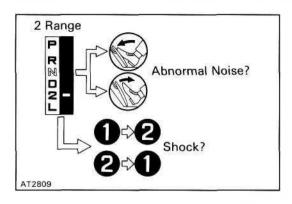
HINT: There is no O/D upshift and lock-up in the 2 position.

(b) While running in the 2 range and 2nd gear, release the acclerator pedal and check the engine braking effect.

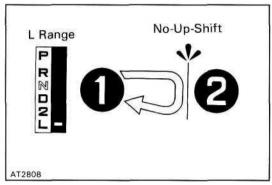
# **EVALUATION**

If there is no engine braking effect:

· Second coast brake is defective.

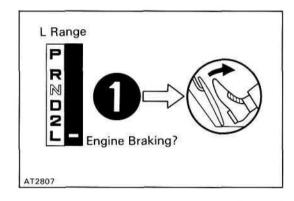


(c) Check for abnormal noise at acceleration and deceleration, and for shock at up-shift and down-shift.



### 3. L RANGE TEST

(a) While running in the L range, check to see that there is no up-shift to 2nd gear.

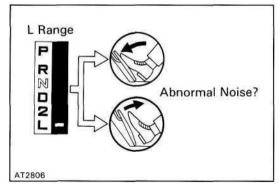


(b) While running in the L range, release the accelerator pedal and check the engine braking effect.

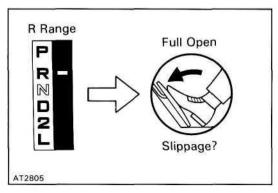
# **EVALUATION**

If there is no engine braking effect:

First and reverse brake is defective.

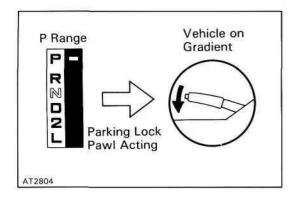


(c) Check for abnormal noise during acceleration and deceleration.



### 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 val	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)		153-170 (95-106)		55-63 (34-39)	147—163 (91—101)	( 원립하는 - 역/급하다	42-49 (26-30)		
	Power mode	53-60 (33-37)		153-170 (95-106)		73-80 (45-50)	147-163 (91-101)		42-49 (26-30)		
2 position	Normal mode Power mode	=	_	-	-	-	-	118-132 (73-82)	=		
L position	Normal mode Power mode	-	-	a <del>x −</del> c:	-	1 <del>-</del> 2	-	_	60-68 (37-42)		

Engine: 1FZ-FE

Tire size: 245/85-R16 km/h (mph)

Throttle valve opening  Gear position			100 %			5 %		100 %		
		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)		161-174 (100-108)		58-64 (36-40)	154-167 (96-103)	105-112 (65-70)	44-48 (27-30)	
	Power mode	56-62 (35-39)		161-174 (100-108)		73-80 (45-50)	154-167 (96-103)	105-112 (65-70)	44-48 (27-30)	
2 position	Normal mode Power mode	-	-	10-2	-	_	-	124-135 (77-84)	5—	
L position	Normal mode Power mode	=	-	_	==	_	-	-	63-69 (39-43)	

Engine: 1FZ-FE

Tire size: 215/80-R16 km/h (mph)

Throttle valve opening  Gear position			100 %			5 %		100 %		
		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)	250	
L position	Normal mode Power mode	-	_	-	-		_	-	56-61 (34-38)	

Engine: 1FZ-FE

Tire size: 275/70-R16 km/h (mph)

Throttle val	ve 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				
Diri	Normal mode	52-58 (32-36)	11.00	152-163 (94-101)		55-60 (34-37)	145-156 (90-97)	98-104 (61-65)	42-47 (26-29)				
D position	Power mode	52-58 (32-36)		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		SE-38	=	-	=	116-127 (72-79)	-					
L position	Normal mode Power mode	_	-	-	<del>=-</del> 2:	2 <del></del>	-	11=	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	Normal mode (25-29) (50-56) (76-		122-136 (76-85)	56-64 (35-40)	50-58 (31-36)	115-129 (71-80)	75-82 (47-51)	33-39 (21-24)					
D position	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	Normal mode		=	-	_	-	89-98 (55-61)	_				
L position	Normal mode Power mode		**	-	2	-	-	I	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				
Danish	Normal mode (27-30) (53-57) (		129-140 (80-87)		53-59 (33-36)	121-132 (75-82)	75-82 (47-51)	34-40 (21-25)					
D position	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	_	-	-	<del>-</del>	s=	-	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	0/D → 3	3 → 2	2 → 1				
D	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)				
D position	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 Power mode	<u></u> n	_	_	_	7=0	<u>~</u>	83-89 (52-55)	<u> </u>				
L position	Normal mode Power mode		_	8-0	হল:	-		i <del></del> i	35-40 (22-25)				

Engine: **1HD-T Tire** size: 275/70-R16

km/h (mph)

Throttle valve opening  Gear position			100 %		5	%	100 %						
		1 → 2	2 → 3	3 → O/D	Lock-up ON	Lock-up OFF	O/D → 3	3 → 2	2 → 1				
D	Normal mode	nal mode 41-46 (25-29)		120-131 (75-81)	56-61 (35-38)	50-55 (31-34)	114-124 (71-77)	70-76 (43-47)	32-37 (20-23)				
D position	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 Power mode	( <del></del> )	-	-	-	-	-	88-94 (55-58)	-				
L position	Normal mode Power mode			-	200	_	_	_	38-43 (24-27)				

# 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)

s	ee Page	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	AT-57	*	*	*
Parts Name		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 <sub>o</sub> exhaust valve	B <sub>o</sub> accumulator	C <sub>1</sub> accumulator	B <sub>1</sub> accumulator	C <sub>2</sub> accumulator	2-3 shift timing valve	Modulator valve	Accumulator control valve	Lock-up signal valve	Lock-up control valve	OFF-vehicle repairmatrix chart	ECT ECU	Throttle cable	Check ball
Does not move in any forward range																						1		VC-7	
Does not move	Does not move in any forward range Does not move in reverse range					3		2	2								2					4	1		
Does not move	Trouble  Tr						2															3	1		
	T	3							2													4	1		
No up-shift			3					2														4	1		
ADDRESS DOMO TRANSPOLVERS	CONTRACTOR CONTRACTOR		397	3					2													4	1	ž.	8 -
				3					2													4	1		
Does not move in Does not move in Does not move in No up-shift	3rd → 2nd		3					2														4	1		
	2nd → 1st	3							2			4	8 8										1		
Shift point too h	igh or too low																- 8						1	2	
	"N" → "R"															1			2			3			
	"N" → "D"				4 10					. 8				1			0		2			3			(E. )
	"N"→ "D", "N" → "R"								f2 32								J. 5		3		82 - 03	2		1	50: 3)
	1st → 2nd														4				5			6	1	2	3
	2nd → 3rd	П			1					3						5	4		6			7	1	2	
engagement	3rd → O/D												4						5			6	1	2	3
	1st → 2nd → 3rd → O/D												-				9 8		2			3		1	.n :
	O/D → 3rd																					4	1	2	3
	3rd → 2nd									3					6		5		7			8	1	2	4
	Forward & Reverse				i e																	1			
	"R" range				\$#											5						1			
	1st																					1			
Slip	2nd																					1			
	3rd				î î	83			3 3											- 15		1			
	O/D																					1		50	
No engine	1st ("L" range)			L 8	4				2	3		0	8				Ý 10	5				6	1		
braking	2nd ("2" range)																					1			
No kick-down	1,000,000	4	4	4				3	3														1	2	
Poor acceleratio	n								2			3	1									4	1		
No lock-up											2						- 4			3	4	5	1		

Remark ★: Refer to A442F Automatic Transmission Repair Manual. (Pub. No. RM314E)

(OFF - VEHICLE)

s	See Page	AT-76	*	*	*	*	*	*	*	*	*	AT-56	*	*
Parts Name Trouble			Oil pump	O/D brake (B <sub>o</sub> )	2nd brake (B <sub>1</sub> )	1st and reverse brake (B <sub>2</sub> )	O/D direct clutch (Co)	Front clutch (C <sub>1</sub> )	Rear clutch (C <sub>2</sub> )	O/D one-way clutch (F <sub>o</sub> )	No.2 one-way clutch (F2)	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
	1st → 2nd				2						3	1		
No up-shift	2nd → 3rd						2	3				1		
	3rd → O/D			2								1		
	O/D → 3rd						2			3		1		
No down-shift	3rd → 2nd					2						1		
	2nd → 1st						2				3	1		
Shift point too h	· ·											1		
	"N" → "R"					3		- 5	2			1		
	"N" → "D"							2			3	1		
	"N"→ "D", "N" → "R"						2			3		1		
11	1st → 2nd				2							1		las -
Harsh engagement	2nd → 3rd						3		2			1		
	3rd → O/D			2								1		1.258
	1st $\rightarrow$ 2nd $\rightarrow$ 3rd $\rightarrow$ 0/D						V.	2				1		
	O/D → 3rd						2			3		1		
	3rd → 2nd				2							1		
	Forward & Reverse	2	3							4		1		
	"R" range					2			1					
Clin	1st							1			2			
Slip	2nd							2						G = 1
	3rd							2	3	1				
	O/D			3				1	2					
No engine	1st ("L" range)					2						1		
braking	2nd ("2" range)		2				2					1		
No kick-down												1		
Poor acceleratio	n	2	51 8				3		1 2			1		
No lock-up	2				8						1			

Remark ★: Refer to A442F Automatic Transmission Repair Manual. (Pub. No. RM314E)

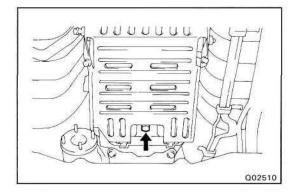
# **VALVE BODY**

# VALVE BODY REMOVAL

1. REMOVE TRANSMISSION AND TRANSFER UNDER COVER

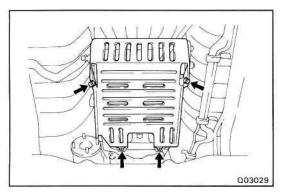
#### 2. CLEAN TRANSMISSION EXTERIOR

To prevent contamination, clean the exterior transmission.



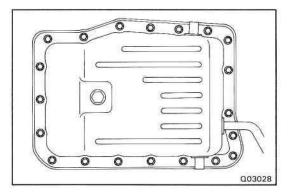
### 3. DRAIN TRANSMISSION FLUID

Remove the drain plug and drain fluid into a suitable container.



# 4. REMOVE OIL PAN PROTECTOR

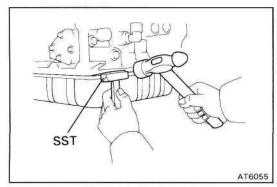
Remove the four bolts and the oil pan protector.



# 5. REMOVE OIL PAN AND GASKET

NOTICE: Some fluid will remain in the oil pan. Be careful not to damage the filler tube.

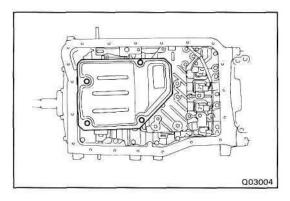
(a) Remove the twenty bolts.



(b) Install the blade off SST between the transmission and oil pan, cut-off applied sealer.

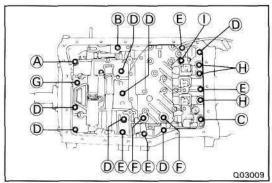
SST 09302-00100

NOTICE: Be careful not to damage the oil pan flange.



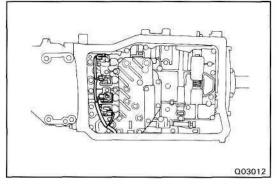
# 6. REMOVE OIL STRAINER

Remove the four bolts and oil strainer.

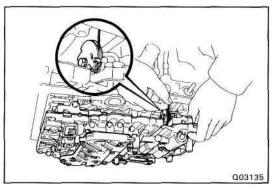


# 7. REMOVE VALVE BODY

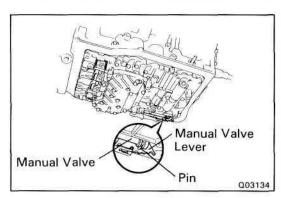
(a) Remove the twenty-one bolts.



(b) Disconnect the four connectors from the solenoids.

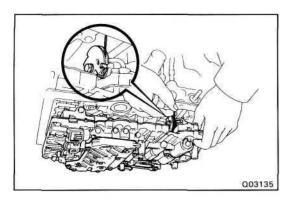


(c) Remove the throttle cable the cam and remove the valve body.

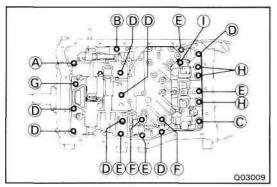


# **VALVE BODY INSTALLATION**

- 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.)

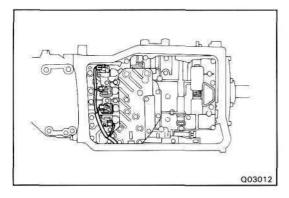
G 40 mm (1.57 in.)

H 22 mm (0.87 in.)

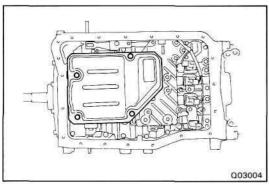
I 42 mm (1.65 in.)

- (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 Nm (100 kgf-cm, 7 ft-lbf)



### 2. CONNECT FOUR SOLENOID CONNECTORS



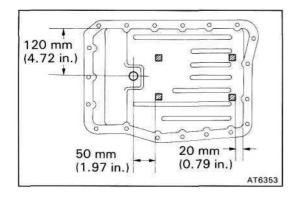
# 3. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with the four bolts.

Torque: 10 Nm (100 kgf-cm, 7 ft-lbf)

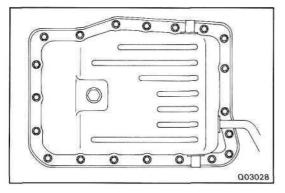
**Bolt length:** 

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

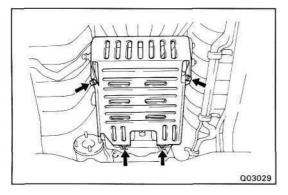
- (a) Remove any packing material and be careful not to drop oil on the contacting surface of the transmission case and oil pan.
- (b) Apply seal packing to the oil pan.

# Seal packing:

Part No. 08826-00090, THREE BOND 1281B or equivalent

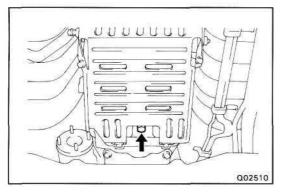
(c) Install and tighten the twenty bolts.

Torque: 6.9 N-m (70 kgfcm, 61 in.lbf)



### 6. INSTALL OIL PAN PROTECTOR

Install the protector with the four bolts.

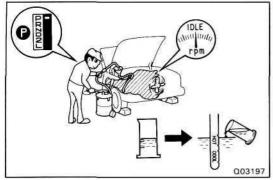


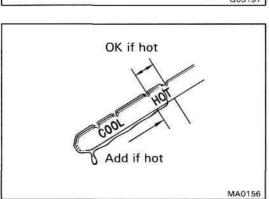
# 7. INSTALL DRAIN PLUG

- (a) Install the drain plug with a new gasket.
- (b) Torque the drain plug.

Torque: 27 Nm (280 kgfcm, 20 ftlbf)

8. INSTALL TRANSMISSION UNDER COVER AND TRANS-FER UNDER COVER





9. FILL TRANSMISSION WITH ATF

Capacity:

6.0 liters (6.3 US qts, 5.3 Imp.qts)

NOTICE: Do not overfill.

Fluid type:

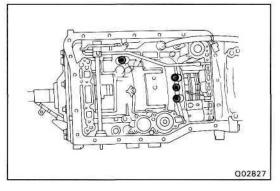
ATF DEXRON® II

10. CHECK FLUID LEVEL (See page AT-25)

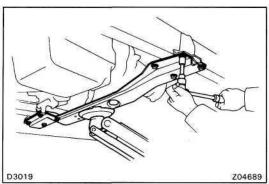
# THROTTLE CABLE

# 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

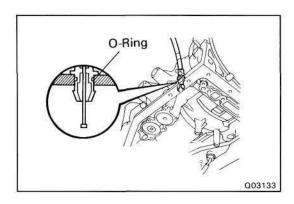


### 5. REMOVE FRAME CROSSMEMBER SET BOLTS

- (a) Support the frame crossmember with a jack.
- (b) Remove the eight set bolts.

# 6. REMOVE THROTTLE CABLE CLAMP

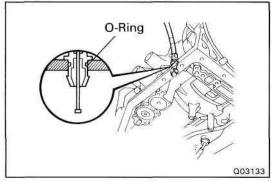
- (a) Lower the jack.
- (b) Remove the cable clamp from the transmission housing.



# 7. REMOVE THROTTLE CABLE

Using 10 mm socket driver, remove the throttle cable by pushing the retainer portion of the throttle cable.

D3019

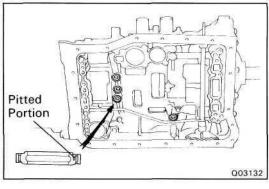


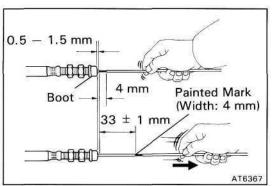
# 003133

Z04689

# 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 Nm (620 kgfcm, 45 ftlbf)





# 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. RM184E. 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.

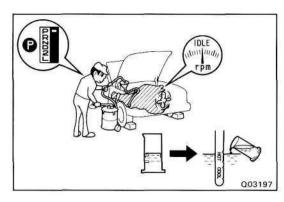
- (a) Connect the throttle cable to the throttle cam of valve body.
- (b) Pull the inner cable lightly until resistance is felt, and hold it.
- (c) Paint a mark as shown, about 4 mm (0.16 in.) in width.
- (d) Pull the inner cable fully, measure the cable stroke.

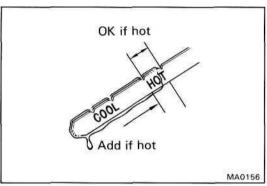
# Cable stroke:

 $33 \pm 1 \text{ mm } (1.30 \pm 0.04 \text{ in.})$ 

# 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 Imp.qts)

NOTICE: Do not overfill.

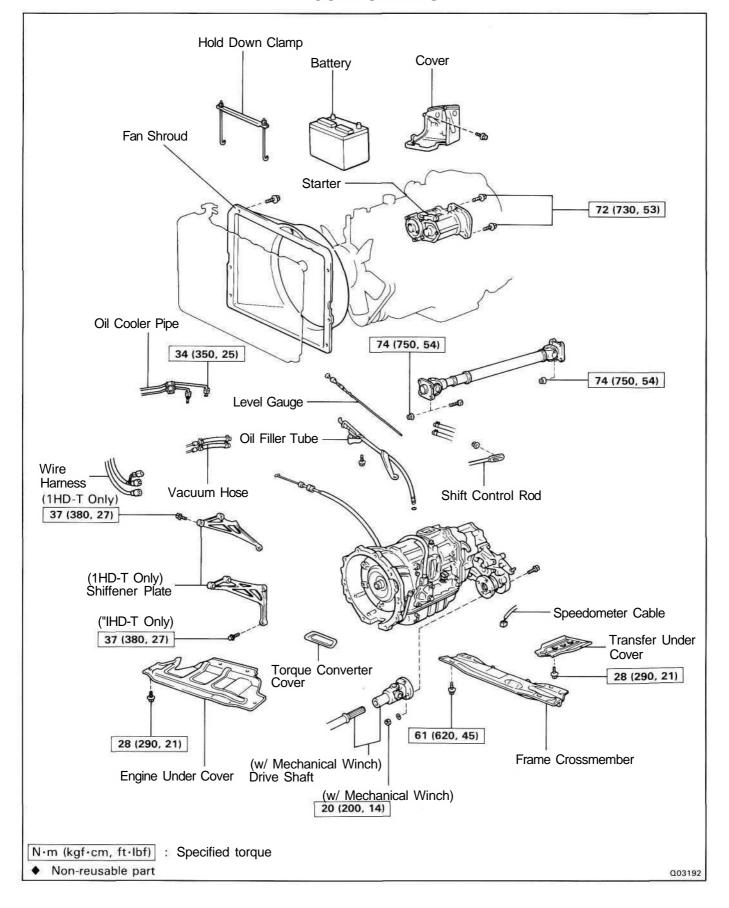
Fluid type:

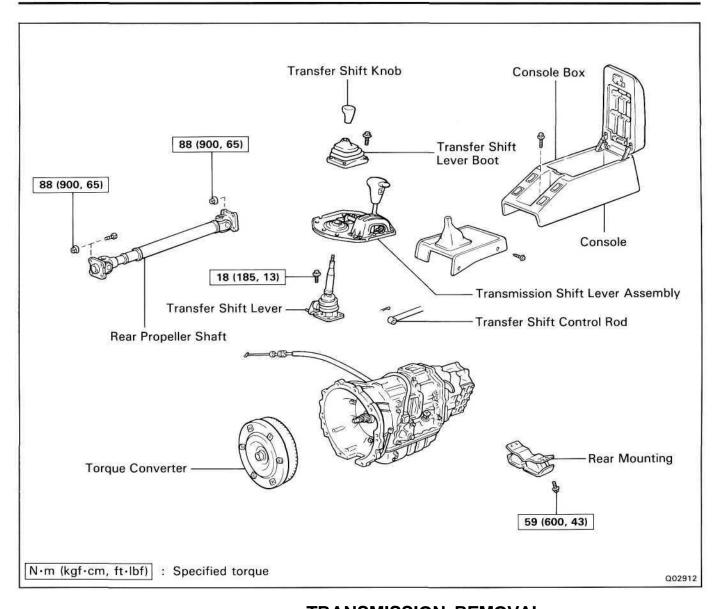
ATF DEXRON® H

11. CHECK FLUID LEVEL (See page AT-25)

# ASSEMBLY REMOVEAL AND INSTALLATION

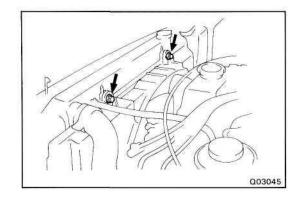
# **COMPONENTS**



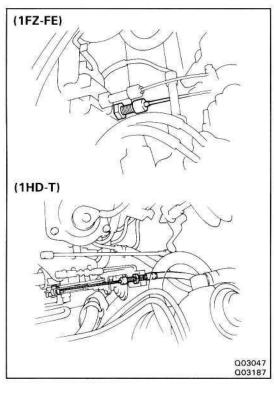


# TRANSMISSION REMOVAL

- 1. DISCONNECT BATTERY CABLE FROM NEGATIVE TER-MINAL
- 2. REMOVE BATTERY AND COVER

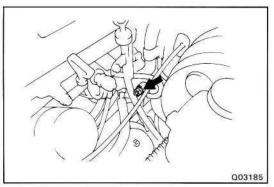


3. LOOSEN FAN SHROUD OF COOLING FAN TO AVOID DAMAGE TO FAN

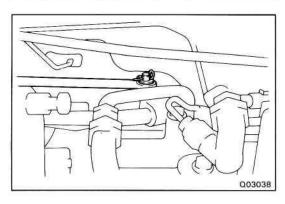


# 4. DISCONNECT THROTTLE CABLE

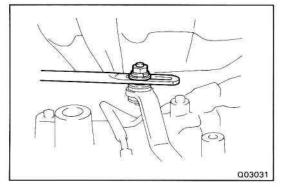
- (a) Loosen the adjusting nut and disconnect the cable housing from the bracket.
- (b) Disconnect the cable from the linkage.



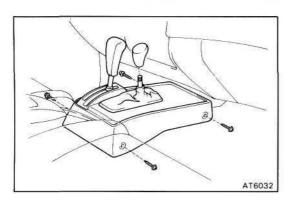
5. (1HD-T)
REMOVE STARTER MOUNTING BOLT



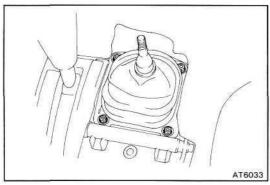
- 6. REMOVE TRANSMISSION SELECT LEVER AND TRANSFER SHIFT LEVER
- (a) Remove the clip, washer and wave washer, and disconnect the link.



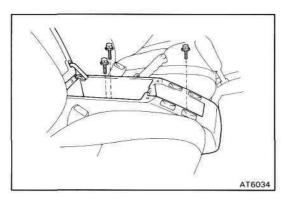
(b) Remove the nut and washer, disconnect the link.



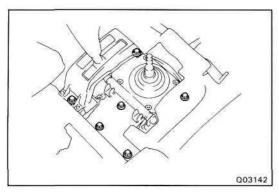
- (c) Remove the transfer shift lever knob.
- (d) Remove the four screws and the console.

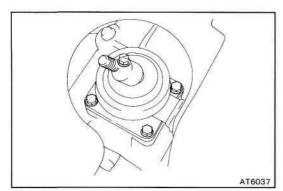


(e) Remove the four bolts and transfer shift lever bolt.

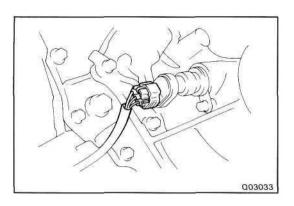


(f) Remove the three bolts and the console box.

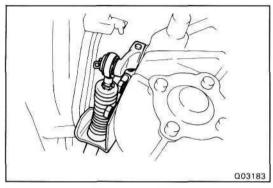




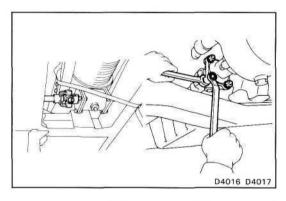
(h) Remove the four screws and the transfer shift lever.



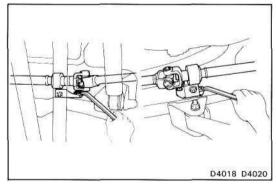
- 7. REMOVE NO.1 SPEED SENSOR CONNECTOR
- 8. REMOVE FRONT AND REAR PROPELLER SHAFTS (See Pub. No. RM184E, page PR-3)



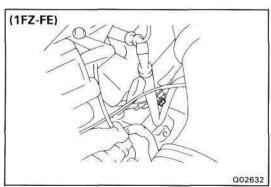
- (w/ MECHAICAL WINCH)
   REMOVE POWER TAKE OF SHIFT CABLE
- (a) Pull out the pin and disconnect the cable.
- (b) Remove the two bolts and the cable bracket.



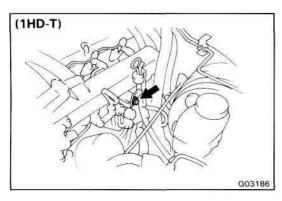
- (c) Remove the engine under cover.
- (d) Place matchmarks on the yoke and flange.
- (e) Remove the bolts and nuts, disconnect the drive shaft from the PTO.

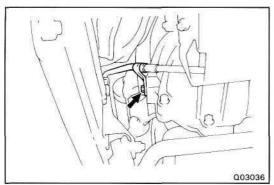


(f) Remove the front and rear bracket set bolts, and then remove the drive shaft.

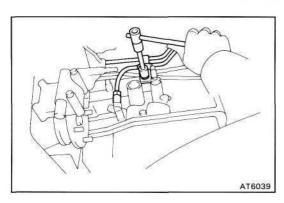


- 10. REMOVE OIL FILLER TUBE
- (a) Remove the level gauge.
- (b) Remove the bolt.



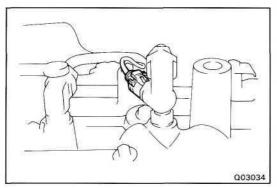


(c) Remove the bolt and the filler tube.

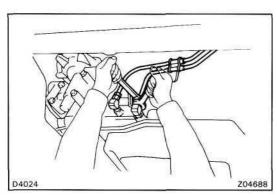


# 11. DISCONNECT TWO OIL COOLER TUBES

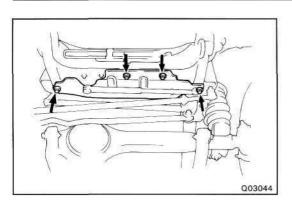
(a) Remove the bolt and clamp.



(b) Disconnect the temperature sensor connector.

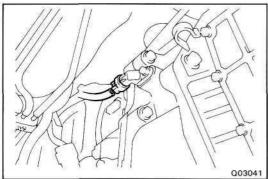


(c) Disconnect the two oil cooler tubes.

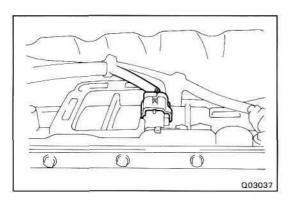


# 12. REMOVE ENGINE UNDER COVER

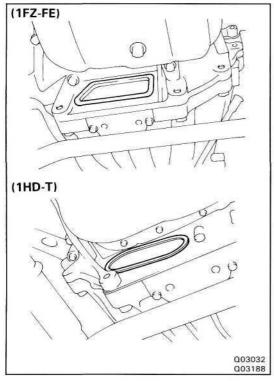
Remove the four bolts and the cover.



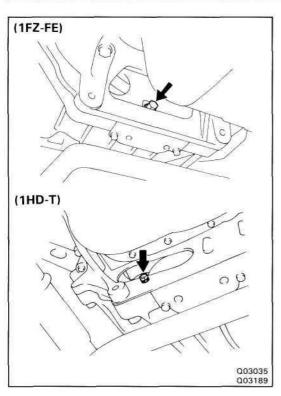
13. DISCONNECT NO.2 SPEED SENSOR CONNECTOR



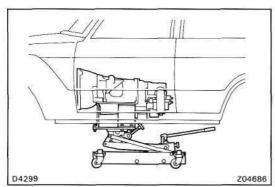
14. DISCONNECT SOLENOID CONNECTOR



- 15. REMOVE SIX TORQUE CONVERTER MOUNTING BOLTS
- (a) Remove the converter hole plug.

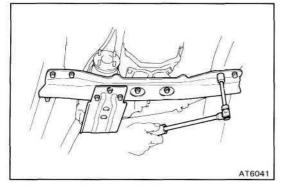


(b) Turn the crankshaft to gain access to each bolt. Remove the six bolt.

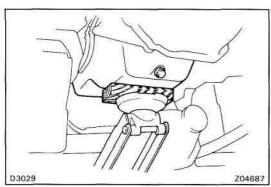


# 16. REMOVE CROSSMEMBER

(a) Support the transmission with the transmission jack.

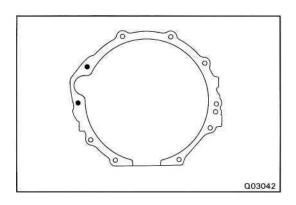


(b) Remove the eight bolts and then remove the frame crossmember.



# 17. REMOVE TRANSMISSION ASSEMBLY

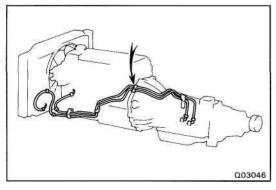
- (a) Be sure to out a wooden block or equivalent between the jack and oil pan to prevent damage. Support the oil pan with a jack.
- (b) Lower the rear end of transmission.



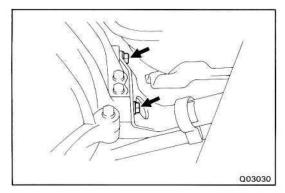
- (0 (1FZ-FE)

  Remove the nut and disconnect the connectors from the starter.
- (d) (1FZ-FE)

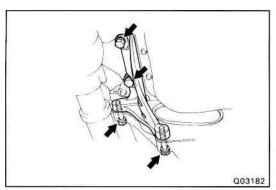
  Remove the two bolts and the starter.



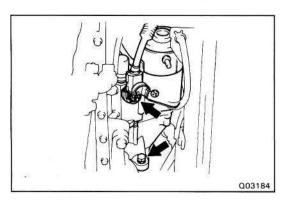
- (e) Disconnect the neutral start switch connectors.
- (f) Remove the bolt and disconnect the oil cooler tube clamp from the converter housing.
- (g) Disconnect the connectors from the transfer.
- (h) Remove the clamp and disconnect the wire harness from the transmission and transfer.



(i) Remove the two bolts and disconnect the exhaust pipe bracket from the converter housing.

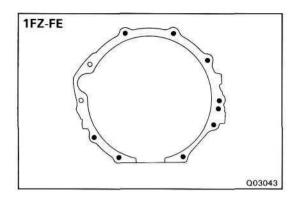


(j) (1HD-T) Remove the four bolts and the stiffener plate.



- (k) (1HD-T) Remove the nut and disconnect the connectors from the starter.
- (I) (1HD-T)

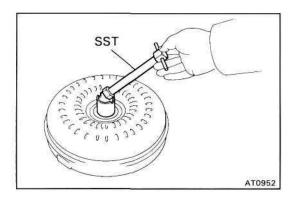
  Remove the nut and the starter.



(m) Remove the bolts and the transmission.

#### TORQUE CONVERTER CLEANING

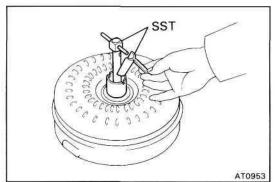
If the transmission is contaminated, the torque converter and transmission cooler should be thoroughly flashed with ATF.



## TORQUE CONVERTER AND DRIVE PLATE INSPECTION

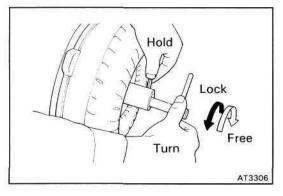
#### 1. INSPECT ONE-WAY CLUTCH

(a) Install SST in the inner race of one-way clutch. SST 09350-30020 (09351-32010)



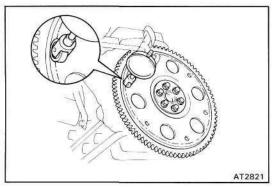
(b) Install SST so that it fits in the notch of the converter hub and outer race of the one-way clutch.

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.

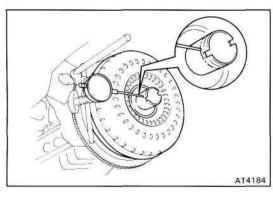
If necessary, clean the converter and retest the clutch. Replace the converter if the clutch still fails the test.

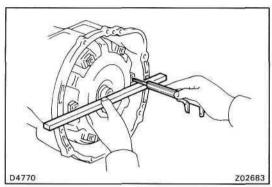


## 2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

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 Nm (850 kgfcm, 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:

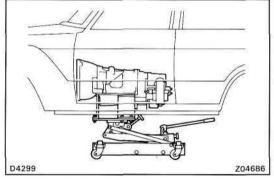
AFT DEXRON®n

#### 2. CHECK TORQUE CONVERTER INSTALLATION

Using calipers and a straight edge, measure from the installed surface to the front surface of the transmission.

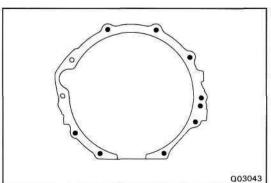
#### Correct distance:

(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.

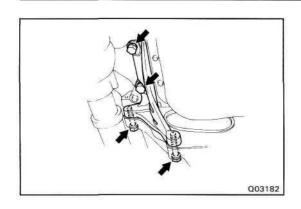


#### 4. INSTALL TRANSMISSION BOLTS

(a) Install the transmission with the bolts.

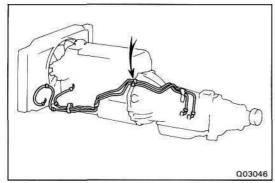
Torque: 72 N-m (730 kgfcm, 53 ftlbf)

- (b) Connect the wire harness to the transmission and transfer with the clamp.
- (c) Connect the connectors to the transfer.

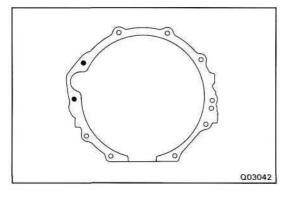


(d) (1HD-T)
Install the left and right stiffener plates with the eight bolt.

Torque: 37 Nm (380 kgf-cm, 27 ftlbf)



- (e) Connect the oil cooler tube clamp to the converter housing with the bolt.
- (f) Connect the park/neutral position switch.



(g) (1FZ-FE)

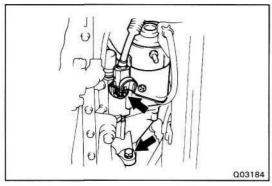
Install the starter with the two bolts.

Torque: 72 Nm (730 kgf-cm, 53 ftlbf)

(h) (1FZ-FE)

Connect the connectors.

(i) Install the nut.



(j) (1HD-T)

Install the starter with the bolt.

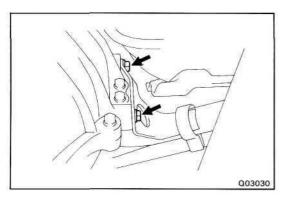
Torque: 72 N-m (730 kgf-cm, 53 ft-lbf)

(k) (1HD-T)

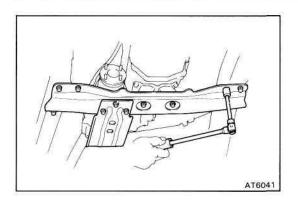
Connect the connectors.

(I) (1HD-T)

Install the nut.



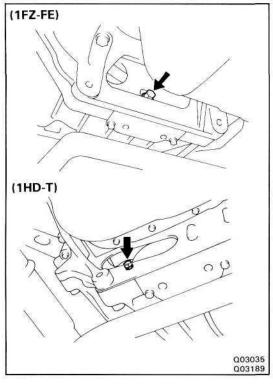
(m) Connect the exhaust pipe bracket to the converter housing with the two bolts.



#### 5. INSTAL CROSSMEMBER

Install the crossmember with eight bolts and two nuts.

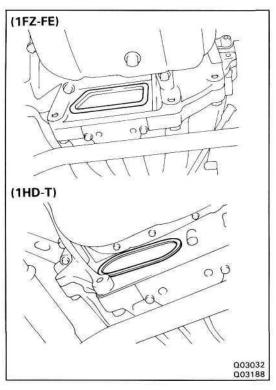
Torque: 61 N-m (620 kgf-cm, 45 ft-lbf)



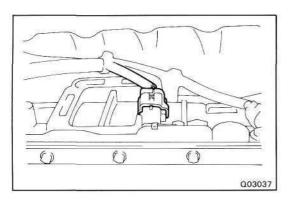
#### 6. INSTALL TORQUE CONVERTER MOUNTING BOLTS

(a) Install the six bolts while turning the crankshaft.

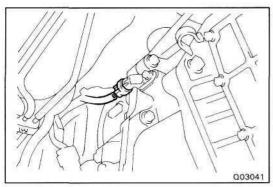
Torque: 55 N-m (550 kgf-cm, 40 ft-lbf)



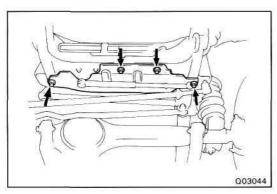
- (b) Seal the converter hole plug with adhesive.
- (c) Install the converter hole plug.



#### 7. CONNECT SOLENOID CONNECTOR

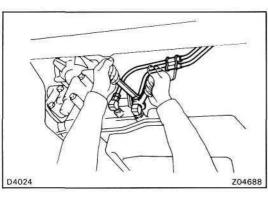


#### 8. CONNECT NO.2 SPEED SENSOR CONNECTOR



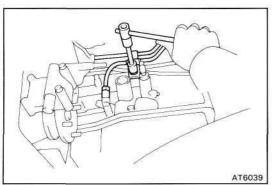
Install the cover with the four bolts.

Torque: 28 Nm (290 kgf-cm, 21 ftlbf)



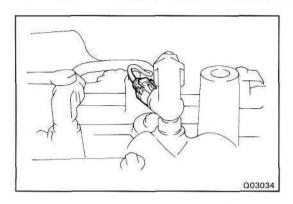
10. CONNECT TWO OIL COOLER TUBES

(a) Connect the two oil cooler tubes.Torque: 34 Nm (350 kgf-cm, 25 ftlbf)

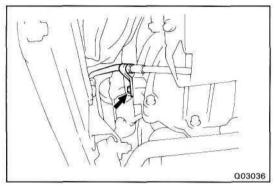


(b) Install the cooler tube clamp.

Torque: 10 Nm (100 kgf-cm. 7 ft-lbf)

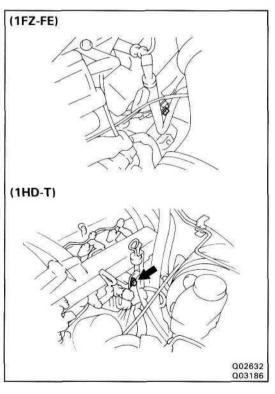


(c) Connect the oil temperature sensor connector.

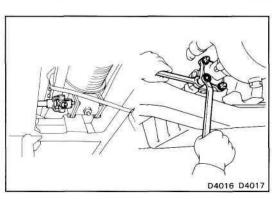


#### 11. REMOVE OIL FILLER TUBE

(a) Install the filler tubes with the bolt.



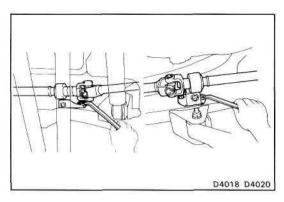
- (b) Install the bolt.
- (c) Install the level gauge.



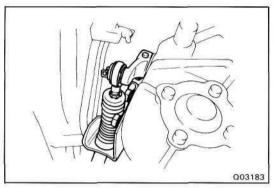
## 12. (w/ MECHANICAL WINCH) INSTALL POWER TAKE-OFF DRIVE SHAFT

- (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.

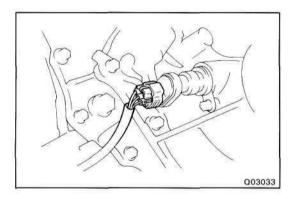
Torque: 20 Nm (200 kgfcm, 14 ft-lbf)



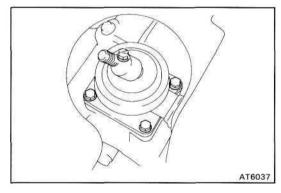
(e) Install the front and rear bracket.



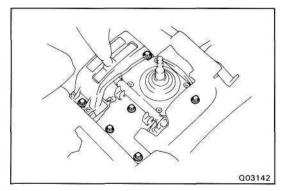
- 13. (w/MECHANICAL WINCH)
  INSTALL POWER TAKE-OFF SHIFT CABLE
- (a) Install the two bolts and the cable bracket.
- (b) Connect the cable and insert the pin.



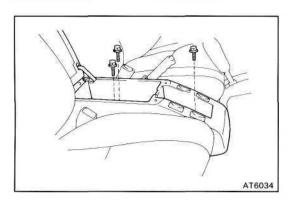
- 14. CONNECT NO.1 SPEED SENSOR CONNECTOR
- 15. INSTALL FRONT AND REAR PROPELLER SHAFTS (See Pub. No. RM184E, page PR-8)



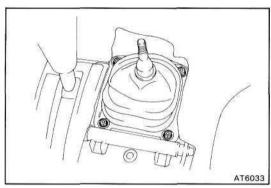
- 16. INSTALL TRANSMISSION SELECT LEVER AND TRANSFER SHIFT LEVER
- (a) Remove the four bolts and the transfer shift lever.



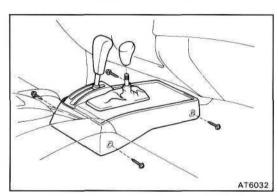
(b) Install the transmission shift lever assembly with the six bolts.



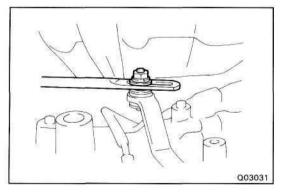
(c) Install the console box with the three bolts.



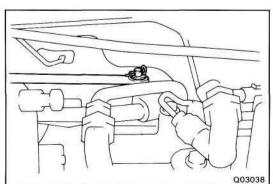
(d) Install the transfer shift lever boot with the four bolts.



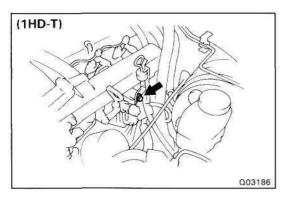
- (e) Install the four screws and the console.
- (f) Install the transfer shift lever knob.



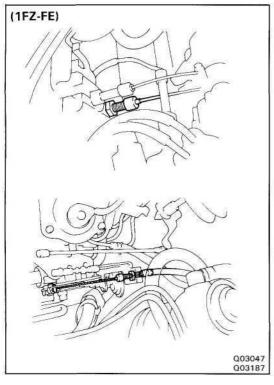
(g) Connect the link with the washer and nut.



(h) Connect the link with the wave washer, washer and clip.

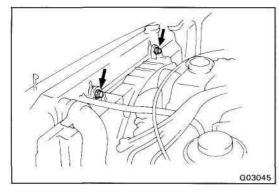


17. (1HD-T)
INSTALL STARTER MOUNT BOLT

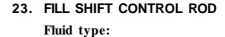


#### 18. CONNECT THROTTLE CABLE

- (a) Connect the cable from the throttle linkage.
- (b) Tighten the adjusting nuts and connect the cable housing to the bracket.



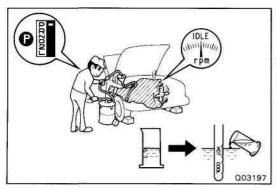
- 19. TIGHTEN FAN SHROUD OF COOLING FAN TO AVOID DAMAGE TO FAN
- 20. INSTALL BATTERY AND COVER
- 21. CONNECT BATTERY CABLE FROM NEGATIVE TERMINAL
- 22. ADJUST SHIFT CONTROL ROD (See page AT-26)

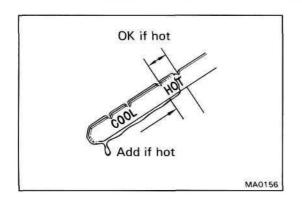


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Capacity:

6.0 liters (6.3 US qts, 5.3 Imp.qts)





24. CHECK FLUID LEVEL (See page AT-25)

## SERVICE SPECIFICATIONS SERVICE DATE

Engine stall revolution		1FZ-FE 1HD-T	2,150 ± 150 rpm 1,950 ± 150 rpm				
Engine idle speed		N range	650 rpm				
Time lag	N rand	ie → D range	Less than 1.0 seconds				
	2000	ie → R range	Less than 1.5 seconds				
Line pressure (wheel locked)	11071110001000	AR SULPARISHES					
Engine idling	(1FZ-FE)	D range	461 — 520 kPa	4.7 - 5.3 kgf/cm <sup>2</sup>	68 - 77 psi		
3	38/2/03/75/37 (07/50)	R range	657 — 843 kPa	6.7 - 8.6 kgf/cm <sup>2</sup>	97 - 125 psi		
	(1HD-T)	D range	431 — 510 kPa	4.4 - 5.2 kgf/cm <sup>2</sup>	63 - 74 psi		
	100000000000000000000000000000000000000	R range	637 — 843 kPa	6.5 - 8.6 kgf/cm <sup>2</sup>	92 - 122 psi		
At stall	(1FZ-FE)	D range	971 — 1,226 kPa	9.9 - 12.5 kgf/cm <sup>2</sup>	144 - 181 psi		
to atom at an		R range	1,648 — 1,853 kPa	16.8 - 18.9 kgf/cm <sup>2</sup>	244 - 274 psi		
	(1HD-T)	D range	971 — 1,226 kPa	9.9 - 12.5 kgf/cm <sup>2</sup>	144 - 181 psi		
	(Caleares san	R range	1,608 — 1,853 kPa	16.4 - 18.9 kgf/cm <sup>2</sup>	233 - 274 psi		
Throttle cable adjustment							
Throttle valve fully closed			Between boot end and inner cable stopper				
9		(1FZ-FE)	0 - 1 mm	0 — 0.04 in.			
		(1HD-T)	0.5 — 1.5 mm	0.020 - 0.059	in.		
Throttle valve fully opened			32 - 34 mm	1.26 - 1.34 in.			
Torque convertor correct distance (1FZ-FE)		37.2 mm (1.465 in.) or					
university <b>2.</b> Province and the reservation is the control of the		(1HD-T)	43.8 mm (1.724 in.)	CO DEPARTMENT			
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 %	0
Engine	Tire size	Ge	ear range	1 → 2	2 → 3	3 → O/D	Lock-up ON	Lock-up OFF	O/D → 3	3 → 2	2 → 1
		Б	Normal mode	53-60 (33-37)		153-170 (95-106)		55-63 (34-39)	147-163 (91-101)		42-49 (26-30
	7.50016.6	D range	Power mode	53-60 (33-37)		153-170 (95-106)		73-80 (45-50)	147—163 (91—101)		42-49 (26-30
	7.50R16-6	2 range	Normal mode Power mode	=	-	=	=		755	118-132 (73-82)	
	· ·	L range	Normal mode Power mode	( <del>-</del> -):	-	=	=	-	-	:=:	60-68 (37-42
		D range	Normal mode	56-62 (35-39)		161-174 (100-108)		58-64 (36-40)	154-167 (96-103)	105-112 (65-70)	44-48 (27-30
		D range	Power mode	56-62 (35-39)		161 – 174 (100 – 108)		73-80 (45-50)	154-167 (96-103)	105-112 (65-70)	44-48 (27-30
245/85-R16	2 range	Normal mode Power mode	-	_	22	_	_	=	124-135 (77-84)	-	
		L range	Normal mode Power mode		_	22		_	120	-	63-69 (39-43
	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	
	215/80-R16	Diange	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
675.70.040		Normal mode	Normal mode	52-58 (32-36)		152-163 (94-101)		55-60 (34-37)	145-156 (90-97)	98-104 (61-65)	42-47 (26-29
	275/70-R16	D range	Power mode	52-58 (32-36)		152-163 (94-101)		68-74 (42-46)	145-156 (90-97)	98-104 (61-65)	42-47 (26-29
	2/3//U-N16	2 range	Normal mode Power mode	-	-	22	3_3	=	24	116-127 (72-79)	
		L range	Normal mode Power mode	24	_	<u> 675</u>	~	=	122		59-65 (37-40

		Throttle	valve opening		100 %		5	%		100 %		
Engine	Tire size	Ge	ear range	1 → 2	2 → 3	3 → O/D	Lock-up ON	Lock-up OFF	O/D → 3	3 → 2	2 → 1	
		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	
	7.50R16-6	Dirange	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	
	7.508 10-0	2 range	Normal mode Power mode	=	8 <del></del> 8	-		a <del></del> -:	-	89-98 (55-61)	-	
		L range	Normal mode Power mode	-	1 <del></del> >1	-	-	-	-	100	38-45 (24-28	
		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	
		245/85-R16	Diange	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
1HD-T	245/65-N 10	2 range	Normal mode Power mode	<u> 25.</u>	5_8	-	22	9 <u>—</u> 5	_	93-100 (58-62)	121	
		L range	Normal mode Power mode		( <u>12</u> -1/2		2	-	=	22	40-46 (25-29	
	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		
	215/80-R16 -	D range	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	-		-	-	8—8	-	83-89 (52-55)	<del></del>	
		L range	Normal mode Power mode	-	-	-	ı	1 <del>-</del> 1	-	I	35-40 (22-25	
			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	
	275/70-R16-	D range	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	
	2/3//0-110	2 range	Normal mode Power mode	22	7 <u>—</u> 7	_		V <u>—</u> 1	72	88-94 (55-58)	-	
		L range	Normal mode Power mode	<b>2</b>	-	\ <del>-</del> ≅	8	= :	<u>_</u>	=	38-43 (24-27	

#### TORQUE SPECIFICATION

Part tightened	N·m	kgf∙cm	ft·lbf
Engine × Transmission 14 mm (0.55 in.) head bolt	37	380	27
Engine × Transmission 17 mm (0.67 in.) head bolt	72	730	53
Torque converter × 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 × Transmission	10	100	7
Front differentail × Front propeller shaft	74	750	54
Transfer × Front propeller shaft	74	750	54
Transfer × Rear propeller shaft	88	900	65
Rear differentail × Rear propeller shaft	88	900	65
Crank shaft × Drive plate	100	1,000	72
Engine under cover × Frame	28	290	21
Transfer shift lever × Transmission	18	185	13
Oil pan set bolt	6.9	70	61 in.·lbf
Drain plug	27	280	20
Vaive body × Transmission case	10	100	7
Transfer under cover × 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.

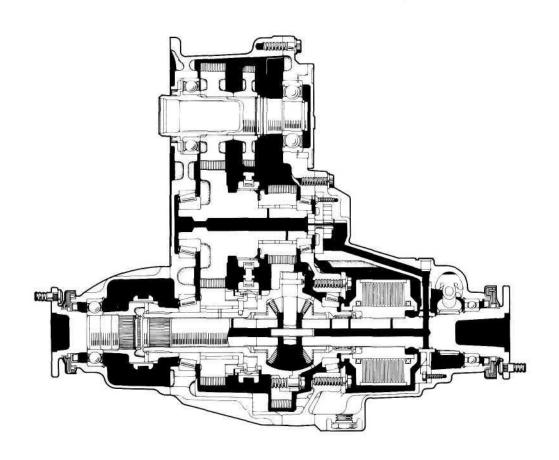
#### (HF2AV FOR STATION WAGON WITH ABS)

DESCRIPTION	TR-2
PRECAUTIONS	TR-3
TROUBLESHOOTING	TR-3
COMPONENTS	TR-4
TRANSFER DISASSEMBLY	TR-5
COMPONENT PARTS	TR-12
Input Shaft Assembly	TR-12
Idler Gear Assembly	TR-16
Center Differential Assembly	TR-19
Front Extension Housing Assembly	TR-28
Rear Extension Housing Assembly	TR-32
TRANSFER ASSEMBLY	TR-41
MOTOR SHIFT CONTROL SYSTEM	TR-49
SERVICE SPECIFICATIONS	TR-51



#### **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			H	IF2AV		
Type of Transmission		sion	H150F H151F, A442			
Type of Engine			1HZ 1FZ-FE, 1HD-T			
Gear	High Speed Range		1.000			
Ratio	Ratio Low Speed Range		2.488			
Oil Capa		w/o PTO	1.7	(1.8, 1.5)		
Liters (US qts. Imp. qts.) w/ PTO		w/ PTO	1.8 (1.9, 1.6)			
Type of Oil			API GL-4 or GL-5 SAE 75W-90			

#### **PRECAUTIONS**

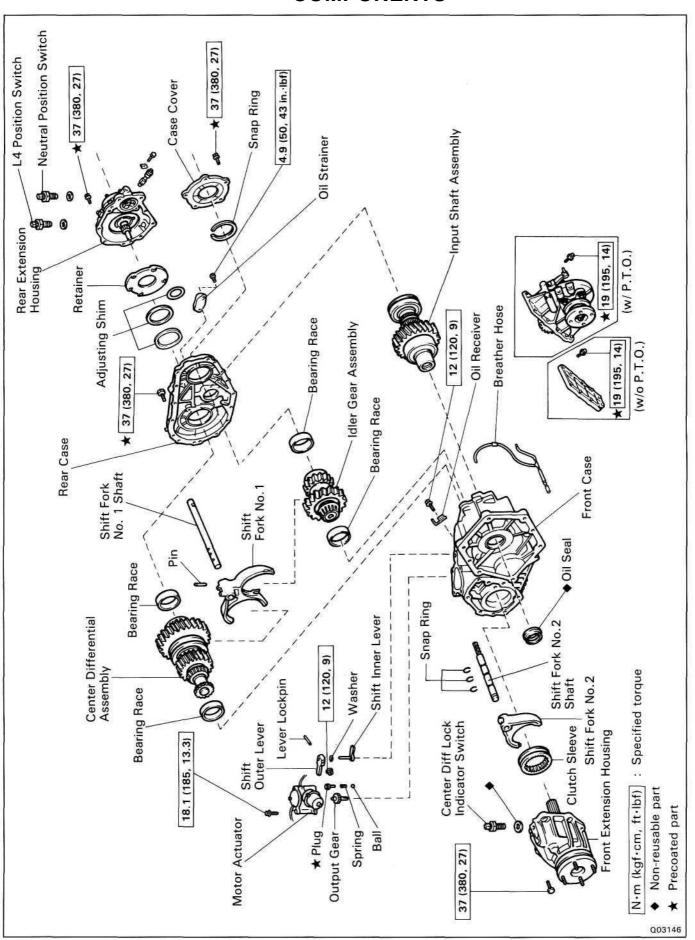
When working with FIPG material, you must be observe the following.

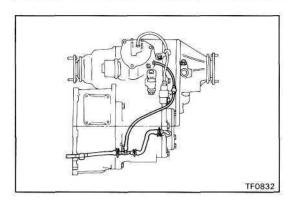
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non-residue solvent.
- Apply the seal packing in approx. 1 mm (0.04 in.) bead along the 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	Disassembly and inspect transfer	TR-4
	Wrong oil grade	Replace oil	TR-2
	Oil level low	Add oil	TR-2
Oil leakage	Oil level too high	Drain oil	TR-2
	Oil seal, O-ring or gasket worn or damaged	Replace oil seal, O-ring or gasket	TR-4
Tight corner braking	Center differential or transfer faulty	Replace center differential or transfer	RM184E MT-5

#### **COMPONENTS**

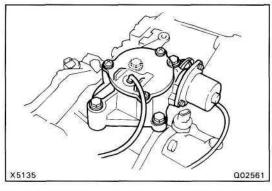




#### TRANSFER DISASSEMBLY

(See page TR-4)

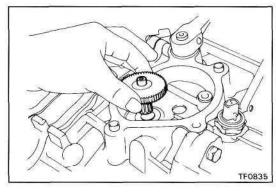
1. REMOVE BREATHER HOSE



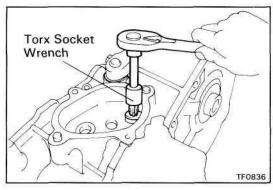
#### 2. REMOVE MOTOR ACTUATOR

Remove the four bolts and motor actuator.

HINT: Remove the motor actuator in differential lock condition.

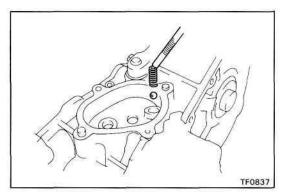


#### 3. REMOVE OUTPUT GEAR

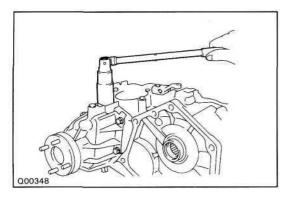


#### 4. REMOVE SCREW PLUG, SPRING AND BALL

(a) Using a torx socket wrench, remove the screw plug. (Torx socket wrench T40 09042-00020)

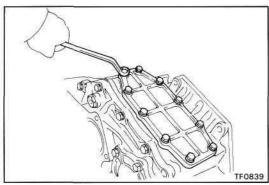


(b) Using a magnetic finger, remove the spring and ball.



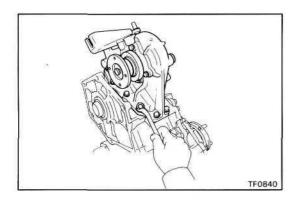
#### 5. REMOVE TRANSFER INDICATOR SWITCHES

Remove the Center Diff Lock indicator switch, L4 position switch and neutral position switch.



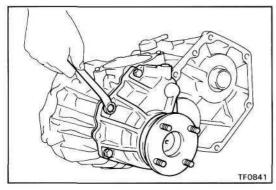
## 6. (w/o POWER TAKE-OFF) REMOVE POWER TAKE-OFF COVER

Remove the ten bolts, power take-off cover and gasket.



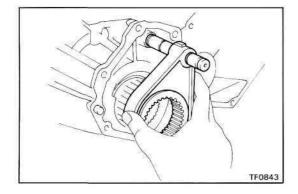
## 7. (w/ POWER TAKE-OFF) REMOVE POWER TAKE-OFF CASE

Remove the ten bolts, power take-off case and gasket.

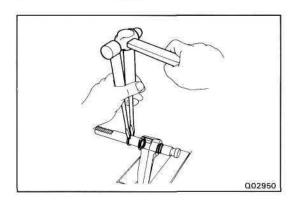


#### 8. REMOVE FRONT EXTENSION HOUSING

- (a) Remove the six bolts.
- (b) If necessary, tap the front extension housing with a plastic hammer.

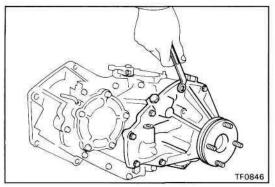


## 9. REMOVE CLUTCH SLEEVE, SHIFT FORK NO.2 AND FORK SHAFT



#### 10. SEPARATE SHIFT FORK NO.2 AND FORK SHAFT

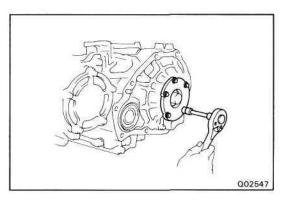
- (a) Using two screwdrivers and a hammer, tap out the three snap rings.
- (b) Separate the shift fork No.2 and fork shaft.



#### 11. REMOVE REAR EXTENSION HOUSING

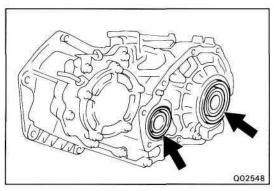
Remove the nine bolts and rear extension housing.

HINT: If necessary, tap the rear extension housing with a plastic hammer.

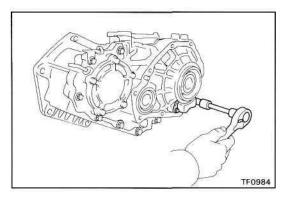


#### 12. REMOVE RETAINER

Remove the five bolts and retainer.

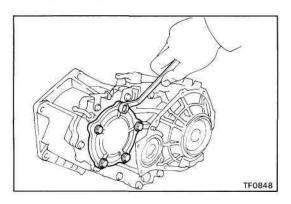


#### 13. REMOVE ADJUSTING SHIMS



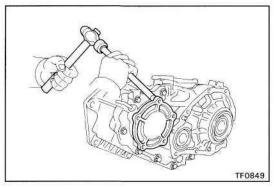
#### 14. REMOVE OIL STRAINER FROM REAR CASE

Remove the two set bolts and oil strainer.

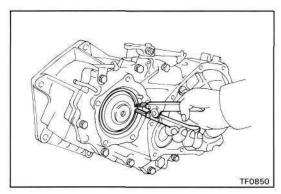


#### 15. REMOVE CASE COVER

(a) Remove the five bolts.

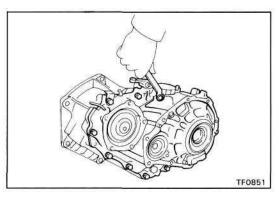


(b) Using a brass bar and hammer, tap the case cover and remove it.

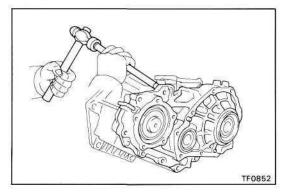


#### 16. SEPARATE FRONT CASE AND REAR CASE

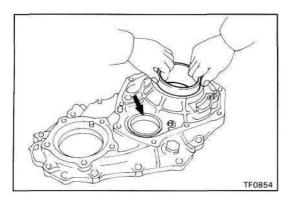
(a) Using snap ring pliers, remove the snap ring.



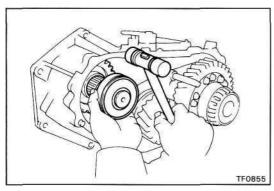
(b) Remove the eight bolts.



(c) Using a brass bar and hammer, tap the rear case and separate it.

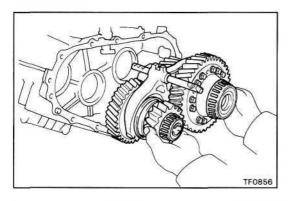


#### 17. REMOVE TWO BEARING RACES FROM REAR CASE

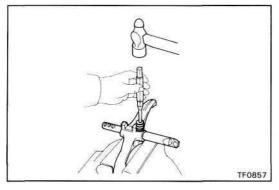


#### 18. REMOVE INPUT SHAFT ASSEMBLY

Using a plastic hammer, remove the input shaft assembly.

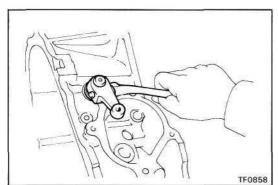


19. REMOVE IDLE GEAR ASSEMBLY, CENTER DIFFERENTIAL ASSEMBLY AND HIGH AND LOW SHIFT FORK ASSEMBLY



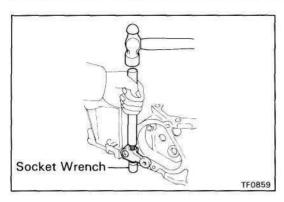
#### 20. SEPARATE SHIFT FORK NO.1 AND FORK SHAFT

- (a) Using a pin punch and hammer, drive out the slotted spring pin.
- (b) Separate the shift fork No.1 and fork shaft.

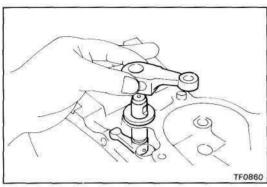


#### 21. REMOVE SHIFT OUTER LEVER AND INNER LEVER

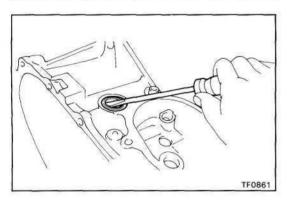
(a) Remove the nut and washer.



(b) Using a brass bar, hammer and socket wrench, tap out the lever lock pin.

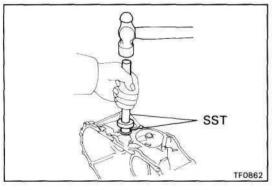


(c) Remove the shift outer lever and inner lever.

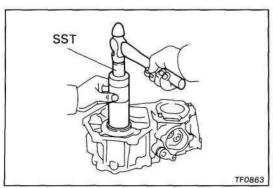


#### 22. IF NECESSARY, REPLACE SHIFT LEVER OIL SEAL

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

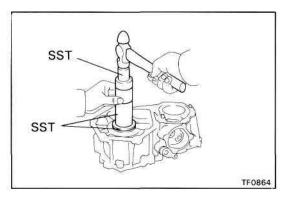


(b) Using SST and a hammer, drive in a new oil seal. SST 09608-20012 (09608-00080, 09608-03020)

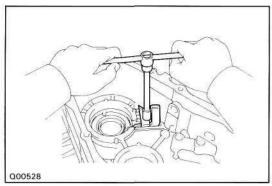


#### 23. IF NECESSARY, REPLACE INPUT SHAFT OIL SEAL

(a) Using SST and a hammer, drive out the oil seal. SST 09316-60010 (09316-00010)

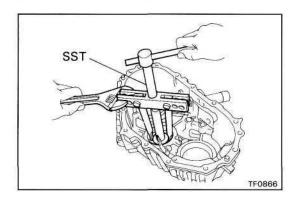


(b) Using SST and a hammer, drive in a new oil seal. SST 09316-60010 (09316-00010, 09316-00030)



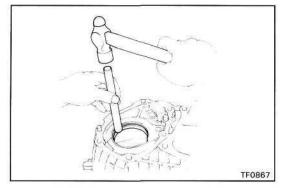
#### 24. REMOVE OIL RECEIVER FROM FRONT CASE

Remove the set bolt and oil receiver.

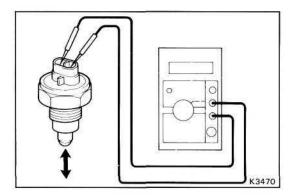


#### 25. REMOVE TWO BEARING RACES FROM FRONT CASE

(a) Using SST, remove the bearing race. SST 09950-20017



(b) Using a brass bar and hammer, remove the bearing race.



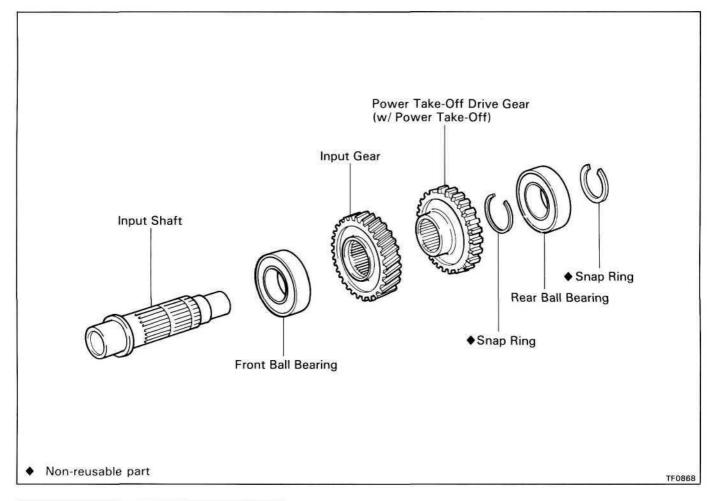
#### 26. INSPECTION OF TRANSFER INDICATOR SWITCHES

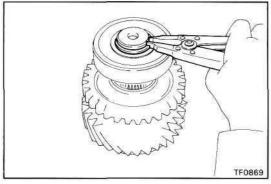
Check that there is continuity between terminals as shown.

Switch Position	Specified
Push	Continuity
Free	No continuity

If continuity is not as specified, replace the switch.

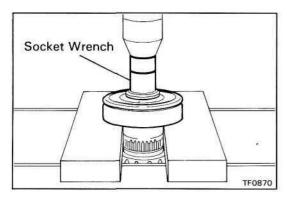
# COMPONENT PARTS Input Shaft Assembly COMPONENTS



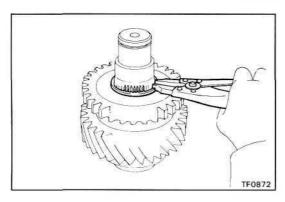


#### DISASSEMBLY OF INPUT SHAFT ASSEMBLY

- 1. REMOVE REAR BALL BEARING
- (a) Using snap ring pliers, remove the snap ring.

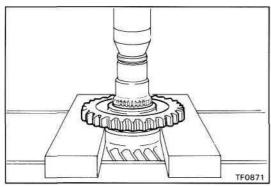


(b) Using a press and socket wrench, remove the rear ball bearing.

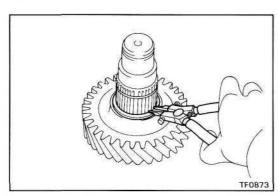


## 2. (w/ POWER TAKE-OFF) REMOVE POWER TAKE-OFF DRIVE GEAR

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

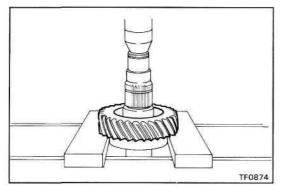


(b) Using a press, remove the power take-off drive gear.

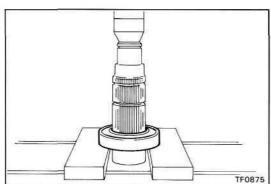


#### 3. REMOVE INPUT GEAR

(a) (w/o Power take-off)Using snap ring pliers, remove the snap ring.

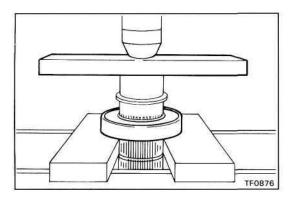


(b) Using a press, remove the input gear.



#### 4. REMOVE FRONT BALL BEARING

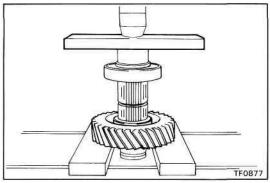
Using a press, remove the front ball bearing.



#### **ASSEMBLY OF INPUT SHAFT ASSEMBLY**

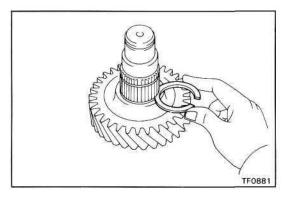
1. INSTALL FRONT BALL BEARING

Using a press, install the front ball bearing.



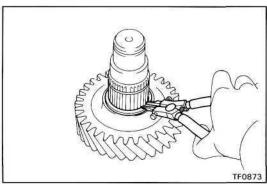
#### 2. INSTALL INPUT GEAR

(a) Using a press, install the input gear.

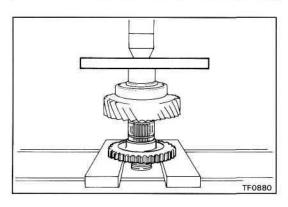


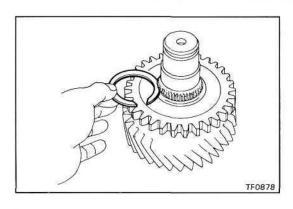
(b) (w/o Power take-off)Select a snap ring that will allow minimum axial play and install it on the shaft.

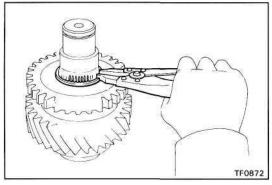
Mark	Thickness mm (in.)			
Α	2.0 (0.0787)			
В	2.1 (0.0827)			
С	2.2 (0.0866)			
D	2.3 (0.0906)			
E	2.4 (0.0945)			
F	2.5 (0.0984)			
G	2.6 (0.1024)			
н	H 2.7 (0.1063)			
J	2.8 (0.1102)			



- 3. (w/ POWER TAKE-OFF)
  INSTALL POWER TAKE-OFF GEAR
- (a) Using a press, install the power take-off gear.

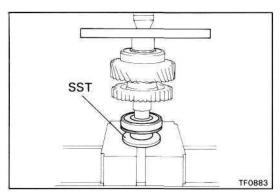






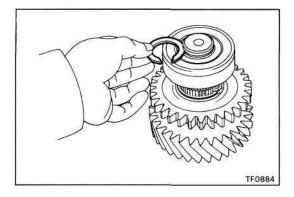
(b) Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness mm (in.)
Α	2.0 (0.0787)
В	2.1 (0.0827)
С	2.2 (0.0866)
D	2.3 (0.0906)
E	2.4 (0.0945)
F	2.5 (0.0984)
G	2.6 (0.1024)
н	2.7 (0.1063)
J	2.8 (0.1102)



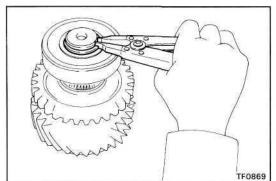
#### 4. INSTALL REAR BALL BEARING

(a) Using SST and a press, install the rear ball bearing. SST 09316-60010 (09316-00030)



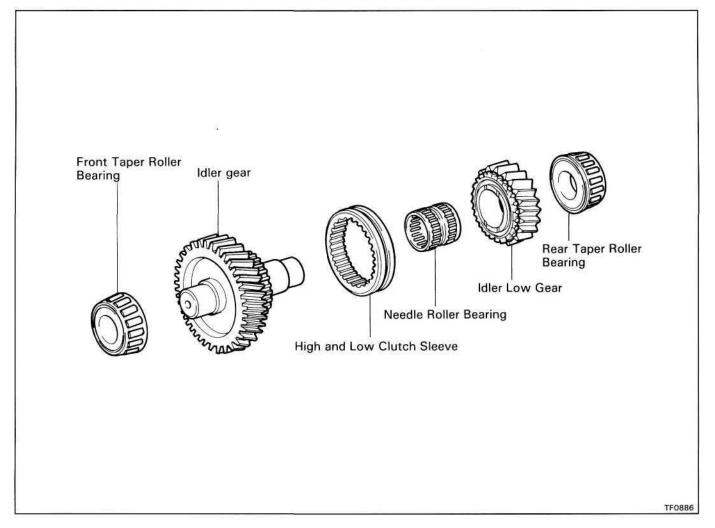
(b) Select a snap ring that will allow minimum axial play.

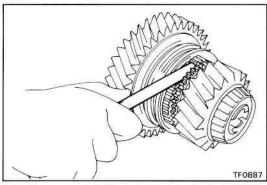
Mark	Thickness mm (in.)
А	2.0 (0.0787)
В	2.1 (0.0827)
С	2.2 (0.0866)
D	2.3 (0.0906)
E	2.4 (0.0945)

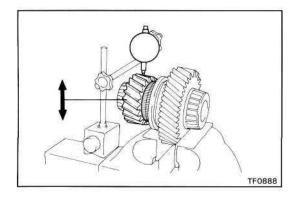


(c) Using snap ring pliers, install the snap ring.

## 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.)

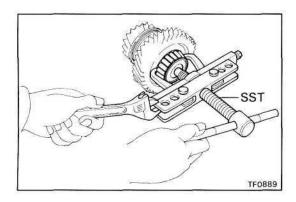
Maximum clearance: 0.275 mm (0.0108 in.)

(b) Using a dial indicator, measure the idler low gear oil clearance.

Standard clearance: 0.015 — 0.068 mm

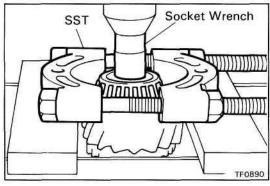
(0.0006 - 0.0027 in.)

Maximum clearance: 0.068 mm (0.0027 in.)



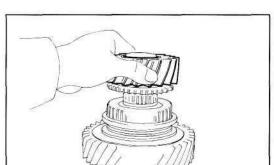
#### 2. REMOVE FRONT TAPER ROLLER BEARING

Using SST, remove the front taper roller bearing. SST 09950-20017



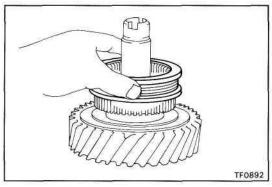
#### 3. REMOVE REAR TAPER ROLLER BEARING

Using SST, press and socket wrench, remove the rear taper roller bearing. SST 09950-00020

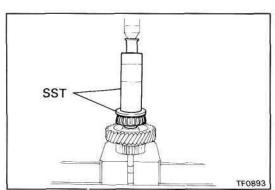


TF0891

4. REMOVE IDLER LOW GEAR AND NEEDLE ROLLER BEAR-ING



#### 5. REMOVE HIGH AND LOW CLUTCH SLEEVE

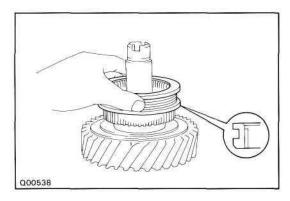


#### ASSEMBLY OF IDLER GEAR ASSEMBLY

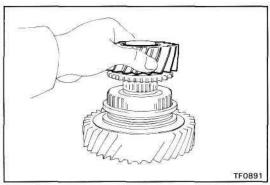
1. INSTALL FRONT TAPER ROLLER BEARING

Using SST and a press, install the front taper roller bearing.

SST 09316-60010 (09316-00010, 09316-00030)

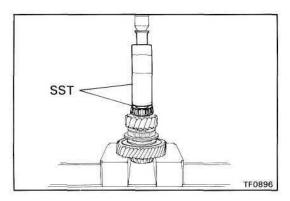


#### 2. INSTALL HIGH AND LOW CLUTCH SLEEVE



### 3. INSTALL NEEDLE ROLLER BEARING AND IDLER LOW GEAR

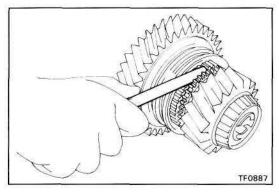
- (a) Apply gear oil to the needle roller bearing.
- (b) Install the needle roller bearing and idler low gear.



#### 4. INSTALL REAR TAPER ROLLER BEARING

Using SST and a press, install the rear taper roller bearing.

SST 09316-60010 (09316-00010, 09316-00070)



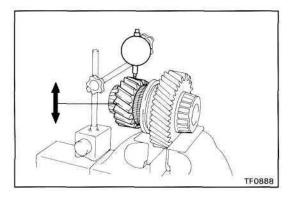
## 5. MEASURE OIL CLEARANCE AND THRUST CLEARANCE OF IDLE LOW GEAR

(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.)



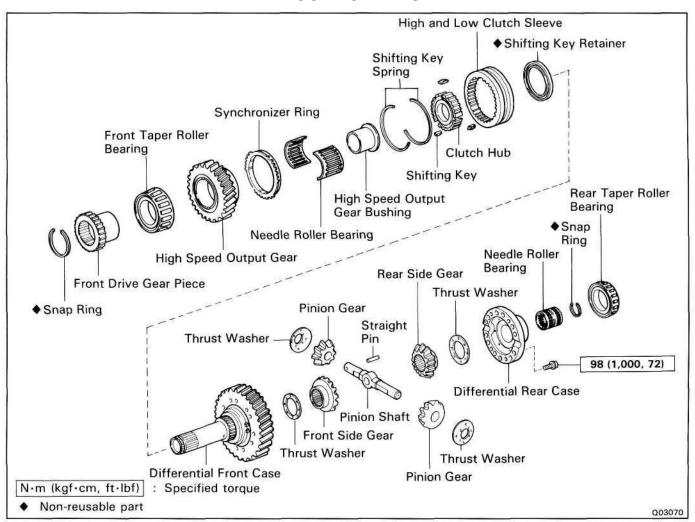
(b) Using a dial indicator, measure the idler low gear oil clearance.

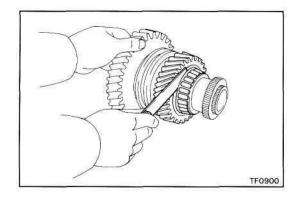
Standard clearance: 0.015 — 0.068 mm

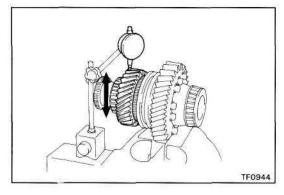
(0.0006 - 0.0027 in.)

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.)

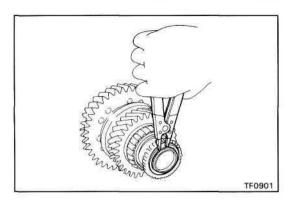
Maximum clearance: 0.25 mm (0.0098 in.)

(b) Using a dial indicator, measure the high speed gear oil clearance.

Standard clearance: 0.015 — 0.071 mm

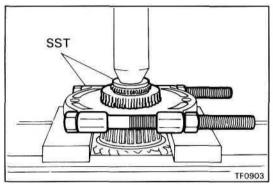
(0.0006 - 0.0028 in.)

Maximum clearance: 0.071 mm (0.0028 in.)



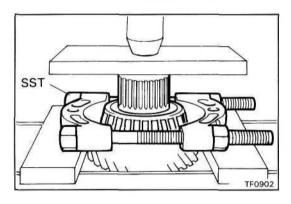
#### 2. REMOVE FRONT DRIVE GEAR PIECE

(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

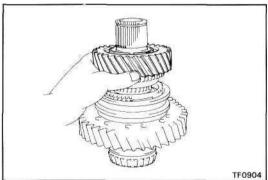
NOTICE: Be careful do not drop the center differential assembly.



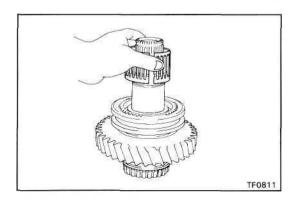
#### 3. REMOVE FRONT TAPER ROLLER BEARING

Using SST and a press, remove the front taper roller bearing.

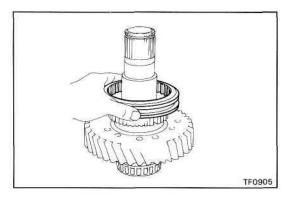
SST 09950-00020



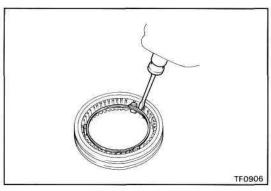
4. REMOVE HIGH SPEED OUTPUT GEAR AND SYNCHRONIZER RING



5. REMOVE NEEDLE ROLLER BEARING

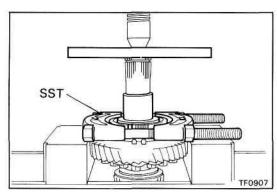


#### 6. REMOVE HIGH AND LOW CLUTCH SLEEVE ASSEMBLY



## 7. REMOVE HIGH AND LOW CLUTCH SLEEVE SHIFTING KEYS AND SPRINGS

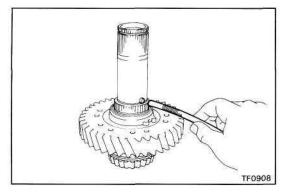
Using a screwdriver, remove the two shifting key springs and shifting keys.



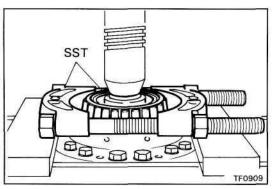
## 8. REMOVE HIGH SPEED OUTPUT GEAR BUSHING, CLUTCH HUB AND SHIFTING KEY RETAINER

(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.

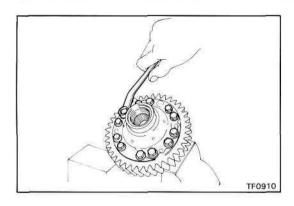


#### REMOVE REAR TAPER ROLLER BEARING

Using SST and a press, remove the rear taper roller bearing.

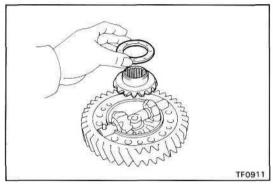
SST 09950-00020, 09950-20017 (09958-30010)

10. REMOVE SNAP RING AND NEEDLE ROLLER BEARING

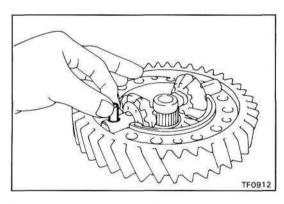


#### 11. REMOVE DIFFERENTIAL REAR CASE

Remove the twelve bolts and differential rear case.

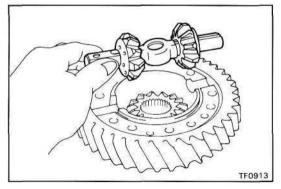


#### 12. REMOVE REAR SIDE GEAR AND THRUST WASHER

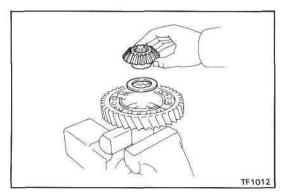


## 13. REMOVE PINION SHAFT, PINION GEAR AND THRUST WASHER

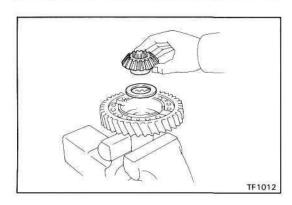
(a) Remove the straight pin.



(b) Remove the pinion shaft, pinion gear and thrust washer.



(c) Remove the front side gear and thrust washer.



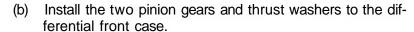
# TF0913

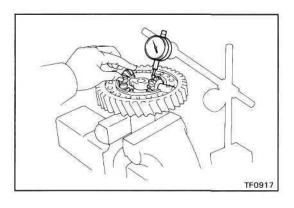


1. INSTALL PINION SHAFT, PINION GEAR AND THRUST WASHER

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

 Install the front side gear and thrust washer to the differential front case.





(c) Using a dial indicator, measure the front case backlash.

HINT: Push the pinion shaft.

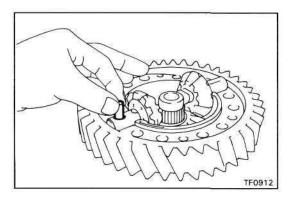
Minimum backlash: 0.05 mm (0.0020 in.)

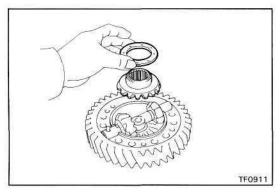
If the backlash is not within specification, replace the thrust washer with one of the correct size and reinstall the thrust washer.

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)	

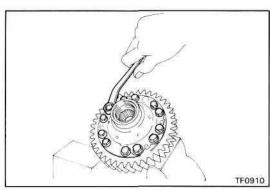
(d) Measure the rear case backlash. (See steps (a) to (c))





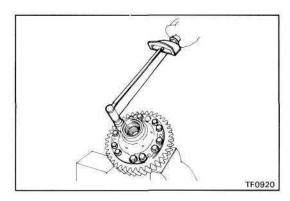


3. INSTALL REAR SIDE GEAR AND THRUST WASHER



4. INSTALL DIFFERENTIAL REAR CASE

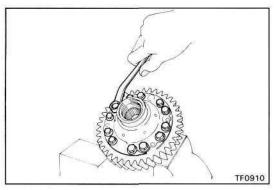
Temporary install the differential rear case and set bolts.



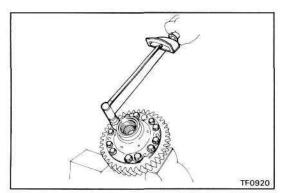
5. TORQUE REAR CASE SET BOLTS

(a) Torque the rear case set bolts.

Torque: 88 N-m (900 kgf-cm, 65 ftlbf)



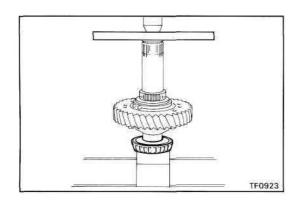
(b) Loosen the rear case set bolts.



(c) Retorque the rear case set bolts.

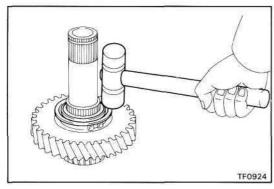
Torque: 98 N-m (1000 kgf-cm, 72 ft-lbf)

6. INSTALL NEEDLE ROLLER BEARING AND SNAP RING



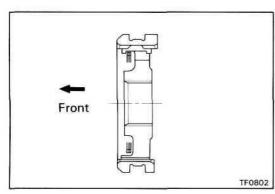
# 7. INSTALL REAR TAPER ROLLER BEARING

Using a press, install the rear taper roller bearing.



## 8. INSTALL SHIFTING KEY RETAINER

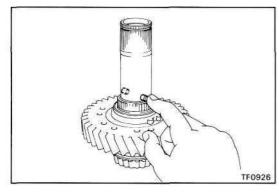
Using a plastic hammer, tap in the shifting key retainer.



# 9. INSERT CLUTCH HUB INTO HIGH AND LOW CLUTCH SLEEVE

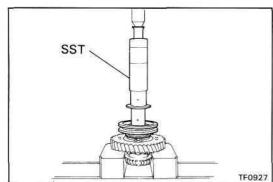
- (a) Install the clutch hub and shifting keys to the high and low clutch sleeve.
- (b) Install the shifting key springs.

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

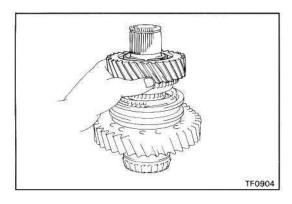
- (a) Apply MP grease to the straight pin.
- (b) Install the two straight pins.



(c) Using SST and a press, install the clutch sleeve assembly and high speed output gear bushing.

SST 09316-60010 (09316-00010)

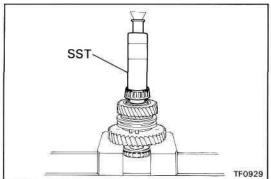
NOTICE: Before pressing, align the holes on the bushing and shaft so that the pin on the shaft aligned with the cutting portion of the bushing.



# 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.

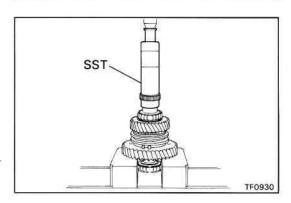
NOTICE: Align the ring slots with the shifting keys.



# 12. INSTALL FRONT TAPER ROLLER BEARING

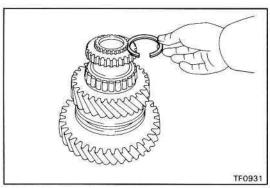
Using SST and a press, install the front taper roller bearing.

SST 09316-60010 (09316-00010)



## 13. INSTALL FRONT DRIVE GEAR PIECE

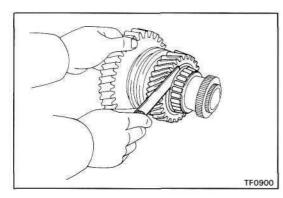
Using SST and a press, install the front drive gear piece. SST 09316-60010 (09316-00010)

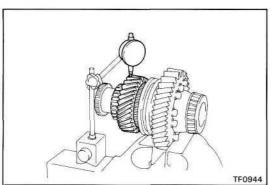


## 14. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness mm (in.)
Α	2.00 (0.0787)
В	2.10 (0.0827)
С	2.20 (0.0866)
D	2.30 (0.0906)
E	2.40 (0.0945)
F	2.50 (0.0984)
G	2.60 (0.1024)
н	2.70 (0.1063)
J	2.80 (0.1102)
к	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.)

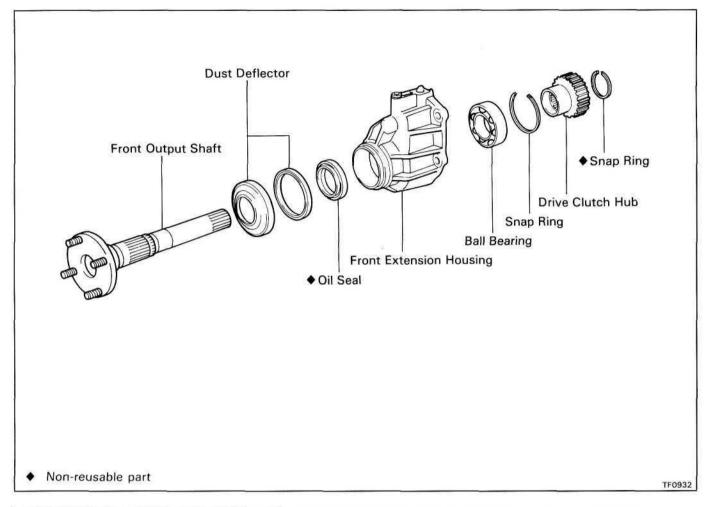
(b) Using a dial indicator, measure the high speed gear oil clearance.

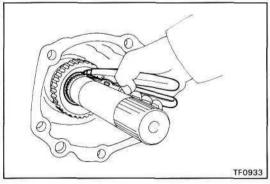
Standard clearance: 0.015 — 0.071 mm

(0.0006 - 0.0028 in.)

Maximum clearance: 0.071 mm (0.0028 in.)

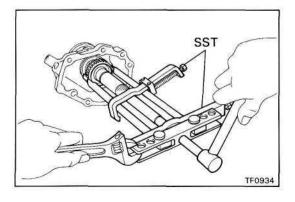
# Front Extension Housing Assembly COMPONENTS



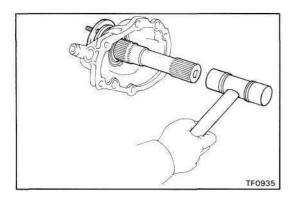


# DISASSEMBLY OF FRONT EXTENSION HOUSING ASSEMBLY

- 1. REMOVE DRIVE CLUTCH HUB
- (a) Using snap ring pliers, remove the snap ring.

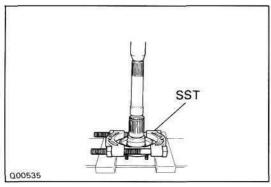


(b) Using SST, remove the drive clutch hub. SST 09950-2001 7



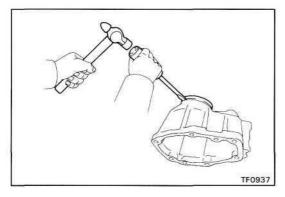
# 2. REMOVE FRONT OUTPUT SHAFT

Using a plastic hammer, drive out the front output shaft.

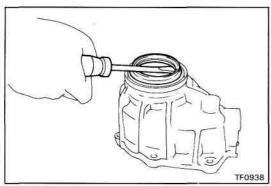


# 3. REMOVE DUST DEFLECTORS

(a) Using SST and a press, remove the dust deflector. SST 09950-00020

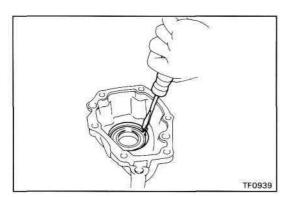


(b) Using a screwdriver and hammer, tap the dust deflector and remove it.



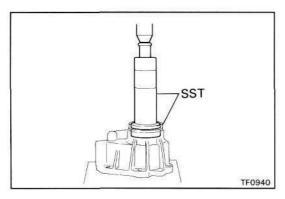
# 4. REMOVE OIL SEAL

Using a screwdriver, pry out the oil seal.

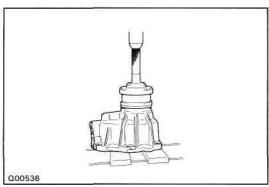


# 5. REMOVE BALL BEARING

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

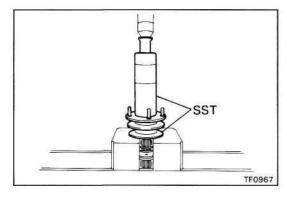


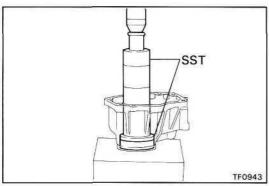
(b) Using SST and a press, remove the ball bearing. SST 09316-60010 (09316-00010, 09316-00070)



# ASSEMBLY OF FRONT EXTENSION HOUSING ASSEMBLY

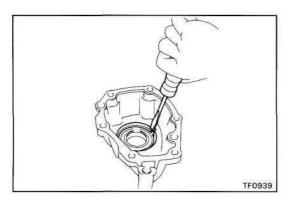
- 1. INSTALL DUST DEFLECTORS
- (a) Using SST and a press, install the dust deflector. SST 09223-41020, 09223-1 5020



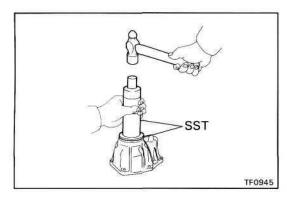


# 2. INSTALL BALL BEARING

(a) Using SST and a press, install the ball bearing.SST 09316-60010 (09316-00010, 09316-00030)

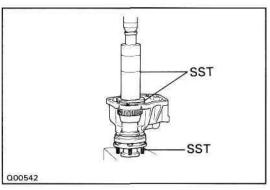


(b) Using a screwdriver, install the snap ring.



# 3. INSTALL OIL SEAL

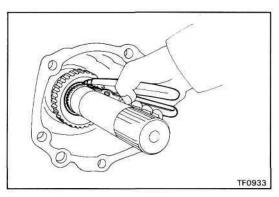
Using SST and a hammer, drive in a new oil seal. SST 09316-60010 (09316-00010, 09316-00060)



# 4. INSTALL FRONT OUTPUT SHAFT AND DRIVE CLUTCH HUB

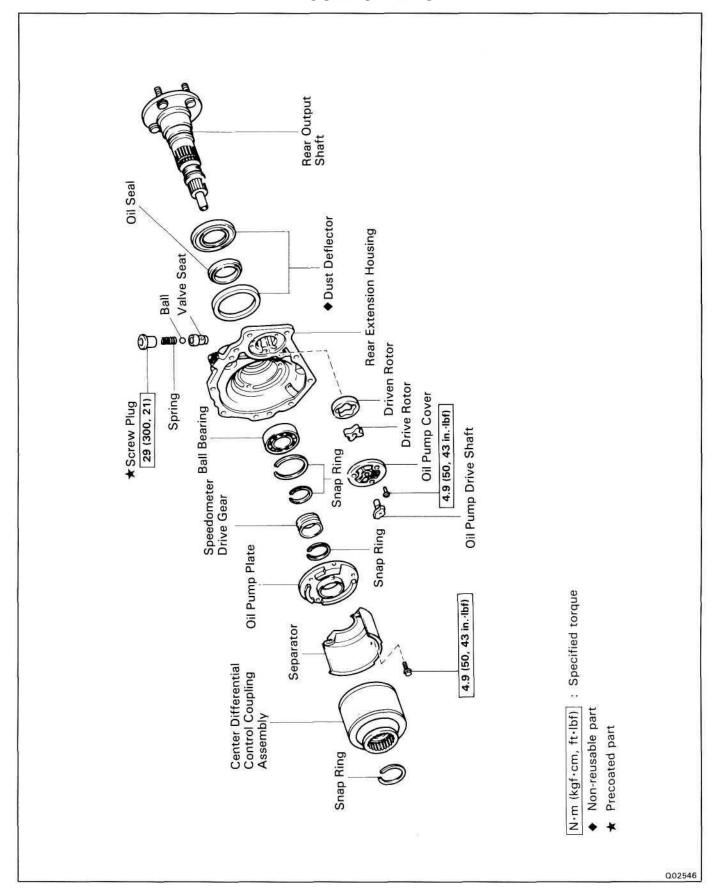
(a) Using SST and press, install the front output shaft and drive clutch hub.

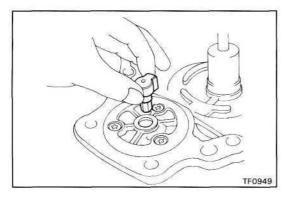
SST 09316-20011, 09316-60010 (09316-00010, 09316-00040, 09316-00070)



(b) Using snap ring pliers, install the new snap ring.

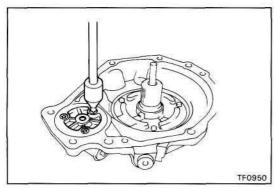
# Rear Extension Housing Assembly COMPONENTS





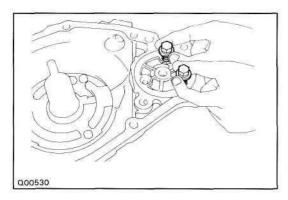
# DISASSEMBLY OF REAR EXTENSION HOUSING ASSEMBLY

1. REMOVE OIL PUMP DRIVE SHAFT

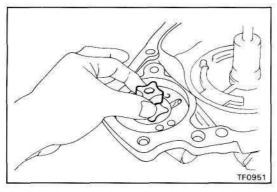


# 2. REMOVE OIL PUMP COVER

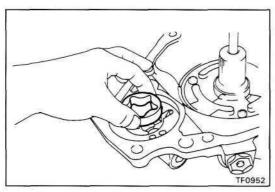
(a) Using a torx socket wrench, remove the three screws. (Torx socket wrench T30 09042-00010)



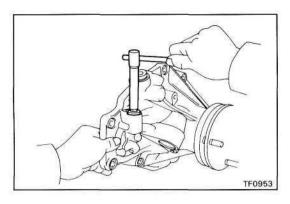
- (b) Install two suitable bolts to the pump cover.
- (c) Remove the pump cover from rear extension housing.



# 3. REMOVE DRIVE ROTOR

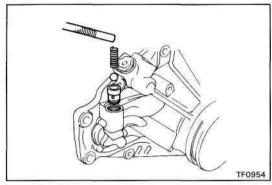


# 4. REMOVE DRIVEN ROTOR

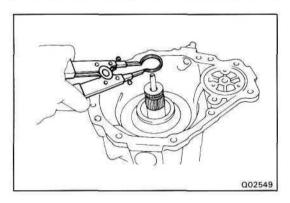


# 5. REMOVE SCREW PLUG, SPRING, BALL AND VALVE SEAT

(a) Using a hexagon wrench, remove the screw plug.

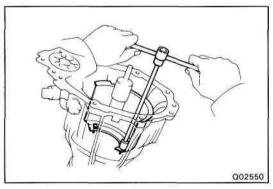


(b) Using a magnetic finger, remove the spring, ball and valve seat.



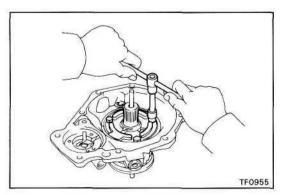
# 6. REMOVE CENTER DIFFERENTIAL CONTROL COUPLING ASSEMBLY

- (a) Using snap ring pliers, remove the snap ring.
- (b) Remove the coupling assembly.



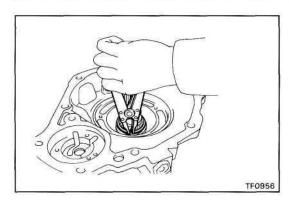
# 7. REMOVE SEPARATOR

Remove the two bolts and the separator.



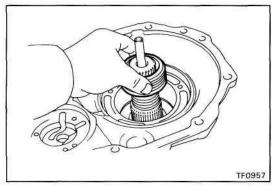
# 8. REMOVE OIL PUMP PLATE

Remove the bolt and the oil pump plate.

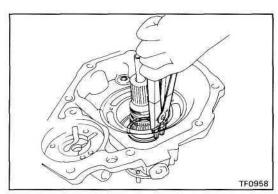


# 9. REMOVE SPEED METER DRIVE GEAR

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

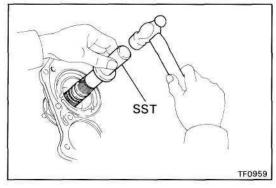


(b) Remove the speedometer drive gear.

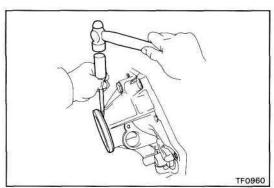


# 10. REMOVE REAR OUTPUT SHAFT

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

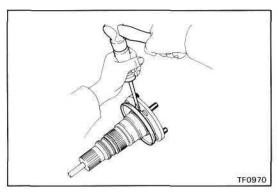


(b) Using SST and a hammer, remove the rear output shaft. SST 09325-12010

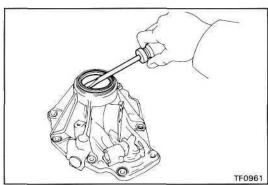


# 11. REMOVE DUST DEFLECTORS

(a) Using a screwdriver and hammer, remove the rear extension housing dust deflectors.

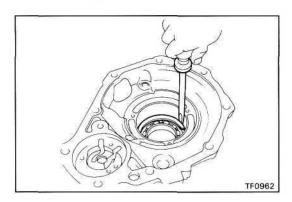


(b) Using a screwdriver and hammer, remove the rear output shaft dust deflector.



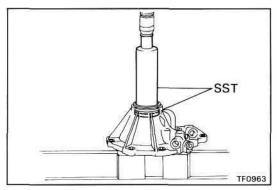
# 12. REMOVE OIL SEAL

Using a screwdriver, pry out the oil seal.

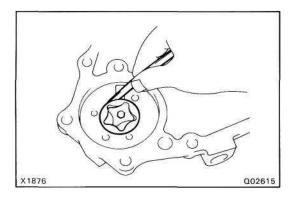


# 13. REMOVE BALL BEARING

(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

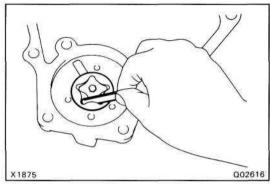
Install the drive rotor to the driven rotor. Using a feeler gauge, measure body clearance between drive rotor and extension housing.

Standard body clearance: 0.08 — 0.17 mm

(0.0031 - 0.0067 in.)

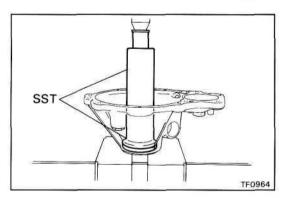
Maximum body clearance: 0.17 mm (0.0067 in.)

If the body clearance is greater than the maximum, replace the drive rotor or driven rotor.

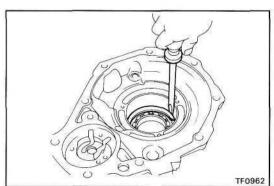


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## 2. CHECK TIP CLEARANCE OF DRIVEN ROTOR

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.)

 $\ensuremath{\text{\textbf{If}}}$  the side clearance greater than the maximum, replace

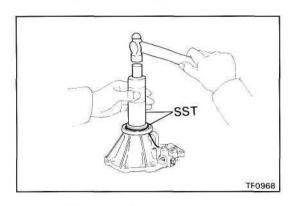
the drive rotor or driven rotor.

# 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)

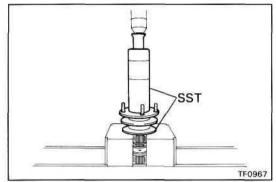
(b) Using a screwdriver, install the snap ring.



## 2. INSTALL DUST DEFLECTORS

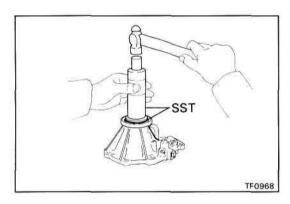
(a) Using SST and a hammer, install a new rear extension housing dust deflector.

SST 09316-60010 (09316-00010, 09316-00040)



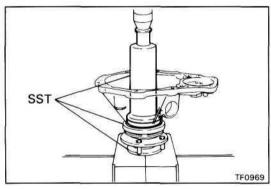
(b) Using SST and a press, install a new rear extension housing dust deflector.

SST 0931 6-20011, 0931 6-60010, (09316-00010)



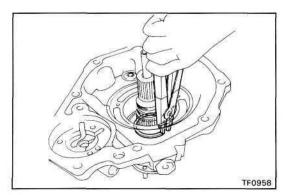
# 3. INSTALL OIL SEAL

Using SST and a hammer, drive in a new oil seal. SST 09316-60010 (09316-00010, 09316-00030)

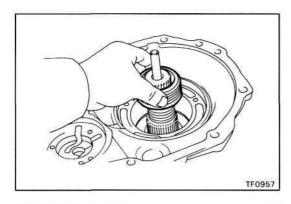


# 4. INSTALL REAR OUTPUT SHAFT

(a) Using SST and a press, install the rear output shaft. SST 09316-60010 (09316-00010, 09316-00030) 09316-20011

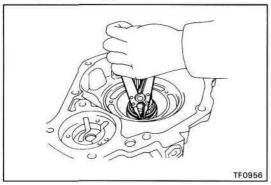


(b) Using snap ring pliers, install the snap ring.

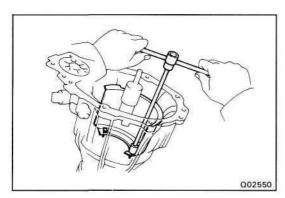


# 5. INSTALL SPEEDOMETER DRIVE GEAR

(a) Install the speedometer drive gear.



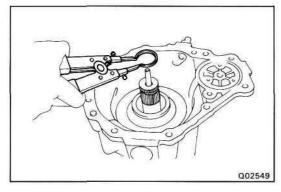
(b) Using snap ring pliers, install the snap ring.



# 6. INSTALL OIL PUMP PLATE SEPARATOR

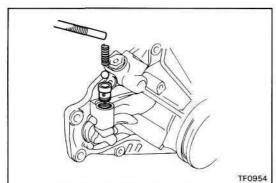
- (a) Install the oil pump plate.
- (b) Install the separator.
- (c) Install and torque the three bolts.

Torque: 4.9 Nm (50 kgfcm, 43 in.lbf)



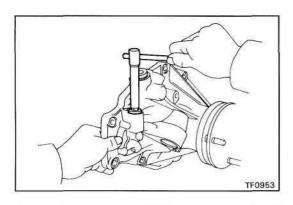
# 7. INSTALL CENTER DIFFERENTIAL CONTROL COUPLING ASSEMBLY

- (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.

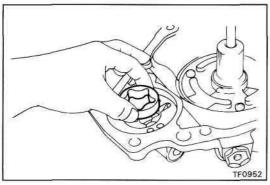


(c) Apply liquid sealer to the screw plug.

Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

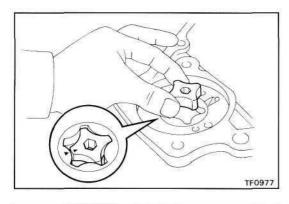
(d) Using a hexagon wrench, install and torque the screw plug.

Torque: 29 N-m (300 kgfcm, 21 ft-lbf)



# 9. INSTALL DRIVEN ROTOR

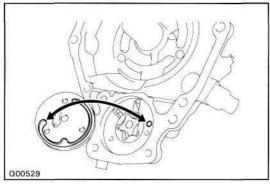
- (a) Apply gear oil to the driven rotor.
- (b) Install the driven rotor.



# 10. INSTALL DRIVE ROTOR

- (a) Apply gear oil to the drive rotor.
- (b) Install the drive rotor.

HINT: Align the alignment marks.



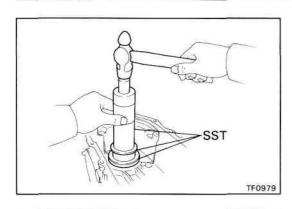
# 11. INSTALL OIL PUMP COVER

- (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 kgfcm, 43 in.lbf)

NOTICE: Align the oil hole of the rear extension housing and oil groove end of the oil pump cover.

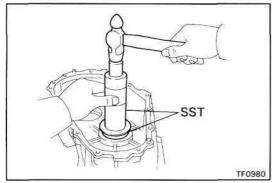


# TRANSFER ASSEMBLY

## 1. INSTALL TWO BEARING RACES TO FRONT CASE

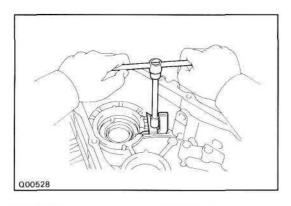
(a) Using SST and a hammer, install the center differential bearing race.

SST 09316-60010 (09316-00010, 09316-00030) 09316-20011



(b) Using SST and a hammer, install the idle gear bearing

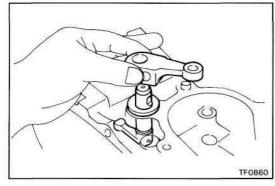
SST 0931 6-60010 (0931 6-00010, 09316-00040)



## 2. INSTALL OIL RECEIVER TO FRONT CASE

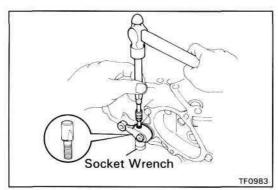
- (a) Install the oil receiver.
- (b) Install and torque the bolt.

Torque: 11.7 Nm (120 kgf·cm, 8.6 ft-lbf)

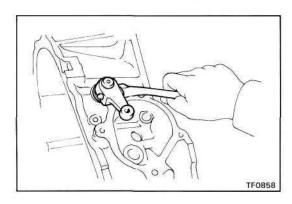


# 3. INSTALL SHIFT OUTER LEVER AND INNER LEVER

(a) Install the shift outer lever and inner lever.

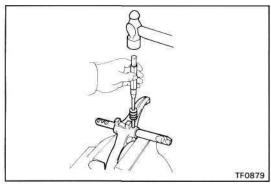


(b) Using a pin punch, hammer and socket wrench, install the lever lock pin.



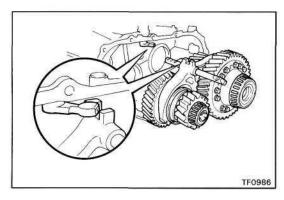
(c) Install the washer and nut.

Torque: 12 Nm (120 kgf-cm, 9 ft-lbf)

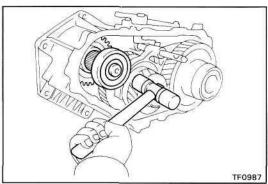


4. ASSEMBLE SHIFT FORK NO.1 AND FORK SHAFT

Using a pin punch and a hammer, drive in the slotted spring pin.

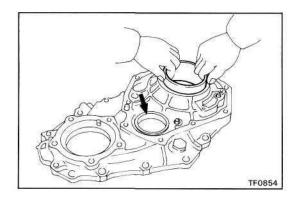


5. INSTALL IDLE GEAR ASSEMBLY, CENTER DIFFEREN-TIAL ASSEMBLY AND HIGH AND LOW SHIFT FORK AS-SEMBLY TO FRONT CASE

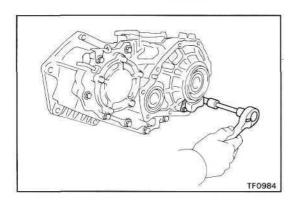


6. INSTALL INPUT SHAFT ASSEMBLY

Using a plastic hammer, tap in the input shaft.



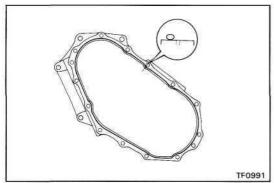
7. INSTALL TWO BEARING RACES TO REAR CASE



# 8. INSTALL OIL STRAINER TO REAR CASE

- (a) Install the oil strainer.
- (b) Install and torque the bolts.

Torque: 4.9 Nm (50 kgfcm, 43 in.-lbf)

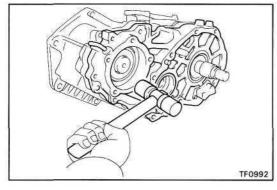


## 9. ASSEMBLE FRONT CASE AND REAR CASE

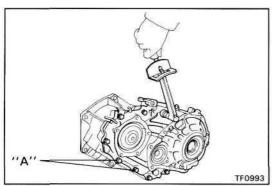
- (a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the front case.
- (b) Apply seal packing to the front case as shown.

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.

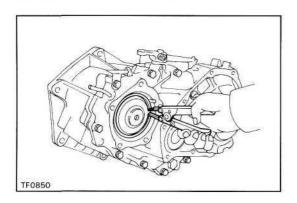


(d) Apply liquid sealer to the "A" bolt threads.

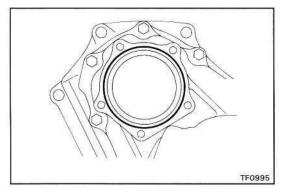
Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

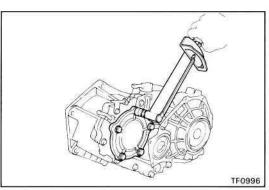
(e) Install and torque the eight bolts.

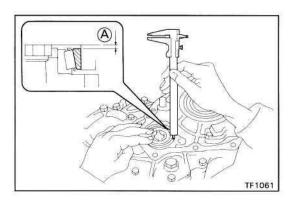
Torque: 37 Nm (380 kgfcm, 27 ft-lbf)

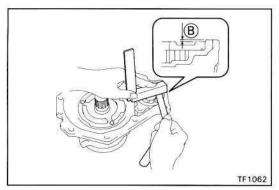


(f) Using snap ring pliers, install the snap ring.









## 10. INSTALL CASE COVER

- Remove any packing material and be careful not to drop oil on the contacting surfaces of the rear case.
- 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.

- Install the case cover. (c)
- (d) Apply liquid sealer to the bolt threads.

# Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

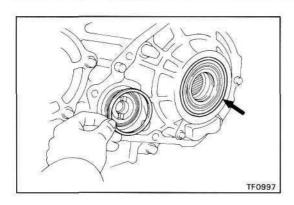
Install and torque the five bolts.

Torque: 37 Nm (380 kgfcm, 27 ftlbf)

# 11. SELECT ADJUSTING SHIMS FOR IDLER GEAR REAR TAPER ROLLER BEARING

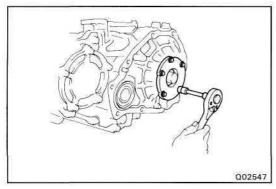
- (a) Using a vernier calipers, measure dimension (A). HINT: Lightly hold down the bearing outer race in the thrust direction to eliminate any looseness before making the measurement.
- (b) Using a steel straight edge and feeler gauge, measure the clearance of dimension (B).
- Calculate the required thickness of the adjusting shim. Thickness: Dimension (A) + Dimension (B) + (0.03 — 0.08 mm)
- 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.)
2	0.30 (0.0118)	8	3.20 (0.1260)
3	0.45 (0.0177)	9	3.40 (0.1339)
4	2.40 (0.0945)	10	3.60 (0.1417)
5	2.60 (0.1024)	11	3.80 (0.1496)
6	2.80 (0.1102)	12	4.00 (0.1575)
7	3.00 (0.1181)	13	0.55 (0.0216)



# 12. INSTALL ADJUSTING SHIMS TO IDLER GEAR AND OUTPUT SHAFT TAPER ROLLER BEARINGS

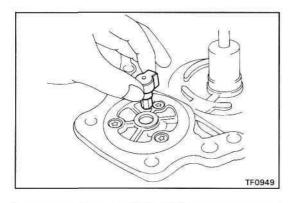
- (a) Apply MP grease to the adjusting shims.
- (b) Install the adjusting shims to bearing outer races.HINT: Install the thinner shim on the bearing outer race side.



## 13. INSTALL RETAINER

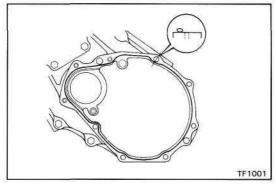
Install the retainer with the five bolts.

Torque: 39.2 Nm (400 kgf-cm, 28 ft-lbf)



## 14. INSTALL REAR EXTENSION HOUSING

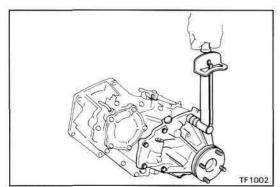
(a) Install the oil pump drive shaft.



- (b) Remove any packing material and be careful not drop oil on the contacting surfaces of the rear case.
- (c) Apply seal packing to the rear case as shown.

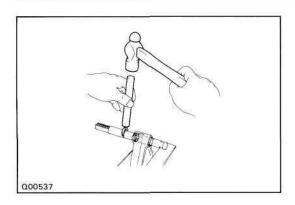
Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT: Install the rear extension housing as soon as the seal packing is applied.



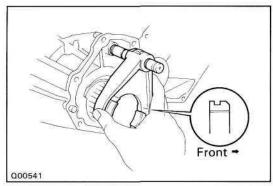
- (d) Install the rear extension housing.
- (e) Install and torque the nine bolts.

Torque: 37 Nm (380 kgf-cm, 27 ft-lbf)

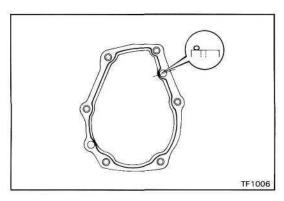


## 15. ASSEMBLE SHIFT FORK NO.2 AND FORK SHAFT

- (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

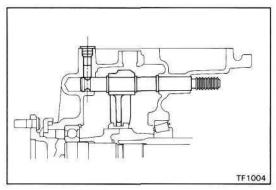


## 17. INSTALL FRONT EXTENSION HOUSING

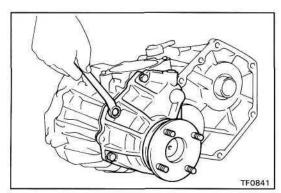
- (a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the front case.
- (b) Apply seal packing to the front case as shown.

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.

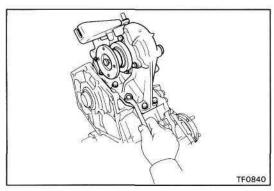


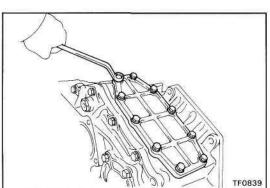
(c) Set the clutch sleeve in 4WD condition in differential lock condition, install the front extension housing.

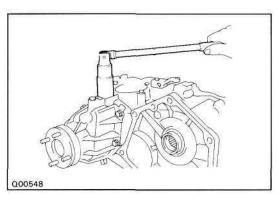


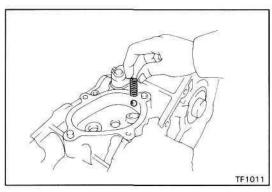
(d) Install and torque the six bolts.

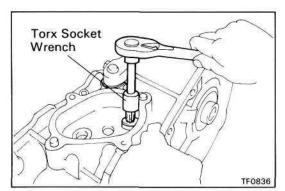
Torque: 37 Nm (380 kgfcm, 27 ft-lbf)











# 18. (w/POWER TAKE-OFF) INSTALL POWER TAKE-OFF CASE

- (a) Install the power take-off case and a new gasket.
- (b) Apply liquid sealer to the bolt threads.

Sealant: Part No. 08833-00080, THREE BOND 1344. LOCTITE 242 or equivalent

(c) Install and torque the ten bolts.

Torque: 19 Nm (195 kgf-cm, 14 ft-lbf)

# 19. (w/o POWER TAKE-OFF) INSTALL POWER TAKE-OFF COVER

- (a) Install the power take-off cover and a new gasket.
- (b) Apply liquid sealer to the bolt threads.

Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Install and torque the ten bolts.

Torque: 19 Nm (195 kgf-cm, 14 ft-lbf)

## 20. INSTALL TRANSFER INDICATOR SWITCHES

Install and torque the Center Diff Lock indicator switch, L4 position switch and neutral position switch.

Torque: 37 Nm (380 kgf-cm, 27 ft-lbf)

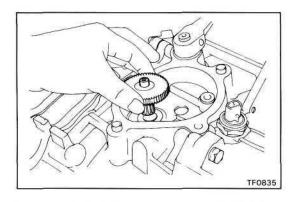
## 21. INSTALL BALL, SPRING AND SCREW PLUG

(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)

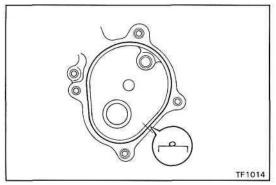
Torque: 19 Nm (190 kgf-cm, 14 ft-lbf)



## 22. INSTALL OUTPUT GEAR

- (a) Apply gear oil to the output gear.
- (b) Install the output gear.

NOTICE: Do not turn the output gear.

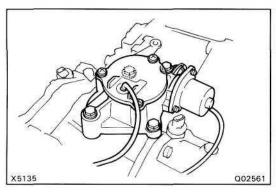


## 23. INSTALL MOTOR ACTUATOR

- (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.

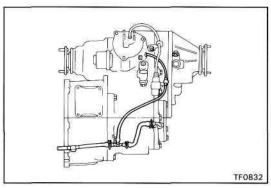


(c) Install the motor actuator.

HINT: Set the motor actuator in differential lock condition.

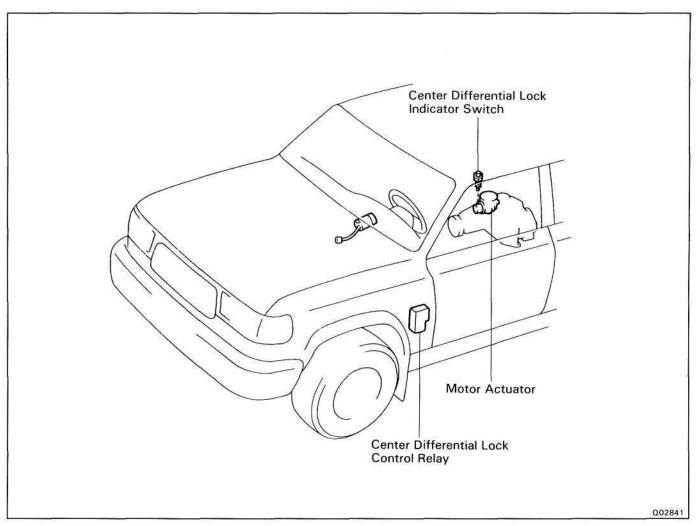
(d) Install and torque the four bolts.

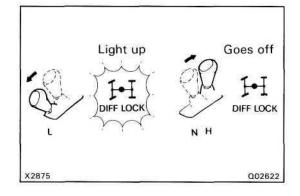
Torque: 18.1 N-m (185 kgfcm, 13.3 ft-lbf)



# 24. INSTALL BREATHER HOSE

# MOTOR SHIFT CONTROL SYSTEM PARTS LOCATION

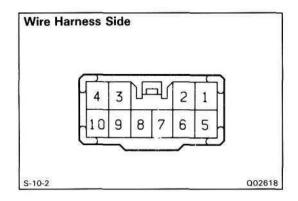




# SYSTEM INSPECTION

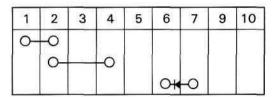
# INSPECT SHIFT LEVER POSITION

- (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.



# PARTS INSPECTION

- INSPECT CENTER DIFFERENTIAL LOCK CONTROL RE-LAY
- (a) Check that there is continuity between terminals as shown in the chart.



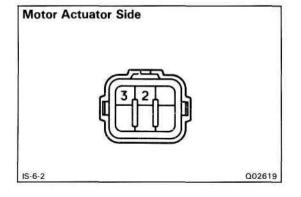
HINT: There is a diode between terminals 6 and 7. If the circuit shown no continuity, change the positive (+) and negative (—) probes and recheck the circuit.

(b) Apply battery voltage between terminals and check that there is continuity between terminals as shown in the chart.

Bat	ninal tery tage	1	2	3	4	5	6	7	8	9	10
$\oplus$	Θ										
6	5	0-0	*0	-0		i i					
7	2									0-)	<del>(</del> -0
9	10		0-	0- ×	00						

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 — 100 fi

(b) Using an ohmmeter, measure the resistance between terminals 2 or 3 and body ground.

Standard resistance: More than 0.5 0

If resistance value is not as specified, replace the motor actuator.

# SERVICE SPECIFICATIONS SERVICE DATA

Input gear snap ring	Mark		
	Α	2.00 mm	0.0787 in.
	В	2.10 mm	0.0827 in.
	С	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.
	Н	2.70 mm	0.1063 in.
	J	2.80 mm	0.1102 in.
Input shaft rear ball bearing snap ring	Mark		
	Α	2.00 mm	0.0787 in.
	В	2.10 mm	0.0827 in.
	С	2.20 mm	0.0866 in.
	D	2.30 mm	0.0906 in.
	E	2.40 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.
	Limit	0.25 mm	0.0098 in.
High speed gear oil clearance	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	0.03 - 0.1 mm	0.0012 - 0.0039 in.
	Limit	0.10 mm	0.0039 in.
Front drive gear piece snap ring	Mark		
	Α	2.00 mm	0.0787 in.
	В	2.10 mm	0.0827 in.
	С	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.
	Н	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			
ldler gear side	Mark		
	2	0.30 mm	0.0118 in.
	3	0.45 mm	0.0177 in.
	4	2.40 mm	0.0945 in.
	5	2.60 mm	0.1024 in.
	6	2.80 mm	0.1102 in.
	7	3.00 mm	0.1181 in.
	8	3.20 mm	0.1260 in.
	9	3.40 mm	0.1339 in.
	10	3.60 mm	0.1417 in.
	11	3.80 mm	0.1496 in.
	12	4.00 mm	0.1575 in.
	13	0.55 mm	0.0216 in.

# **TORQUE SPECIFICATIONS**

Part tightened	N·m	kgf⋅cm	ft·lbf
Oil pump plate × Rear extension housing	4.9	50	43 in.·lbf
Screw plug × Rear extension housing	29	300	22
Oil pump cover × Rear extension housing	4.9	50	43 in.·lbf
Lever lock pin	12	120	9
Oil strainer × Rear case	4.9	50	43 in.·lbf
Case cover × Rear case	37	380	27
Rear extension housing × Rear case	37	380	27
Front extension housing × Front case	37	380	27
Center Diff Lock Indicator switch × Front extension housing	37	380	27
Screw plug × Front case	19	190	14
Motor actuator × Front case	18.1	185	13.3
Differential front case × Differential rear case	98	1,000	72
(temporarily tighten)	88	900	65
Front case × Rear case	37	380	27
Rear case × Bearing retainer	39.2	400	28

# PROPELLER SHAFT

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)

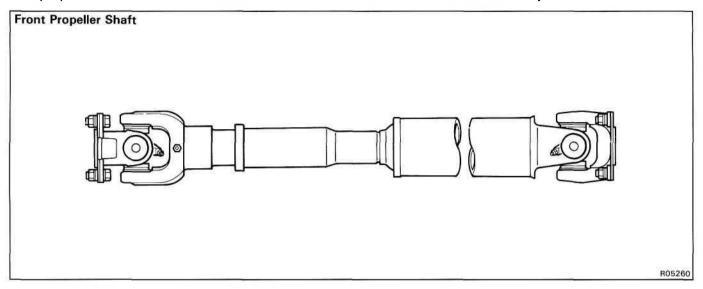
DESCRIPTION	 PR-2
PROPELLER SHAFT	 PR-3



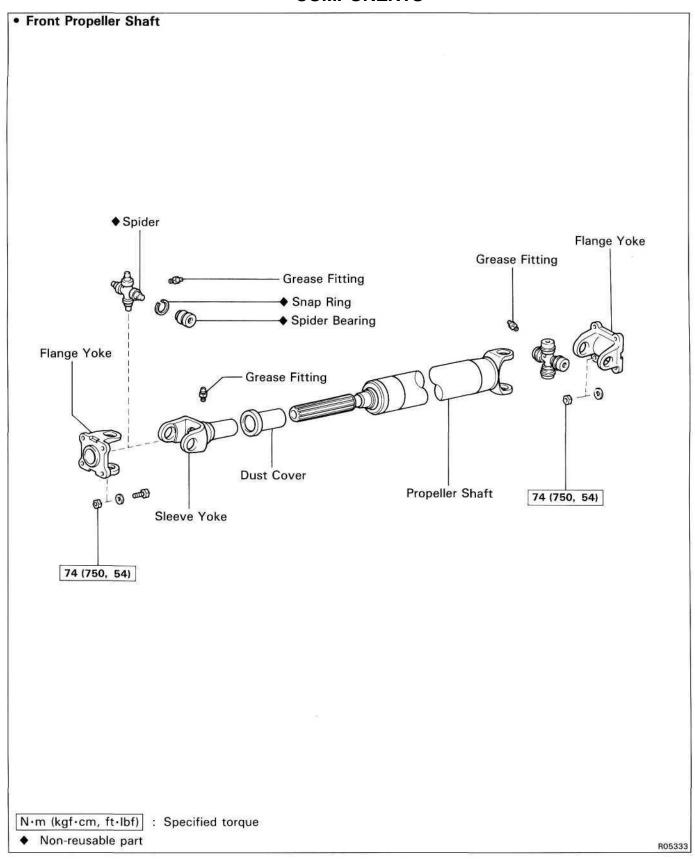
# **DESCRIPTION**

# **DESCRIPTION**

The propeller shaft is connected to the front differential and the transfer via two joints.

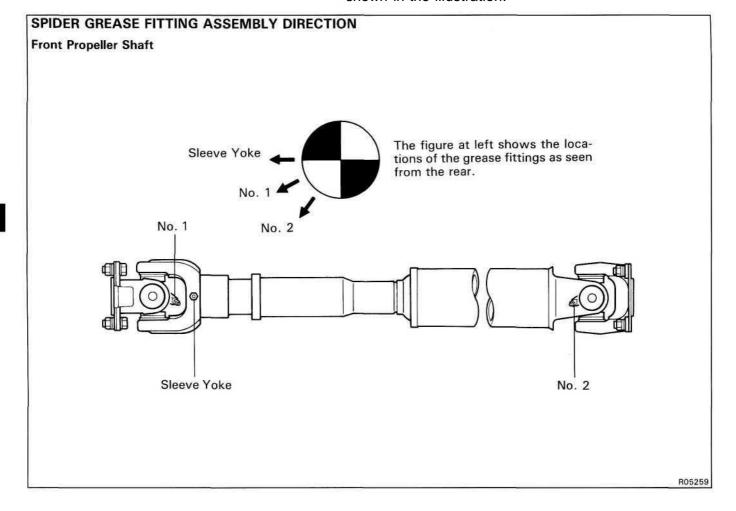


# PROPELLER SHAFT COMPONENTS



# PROPELLER SHAFT ASSEMBLY

HINT: When replacing the spider, be sure that the grease fitting assembly hole is facing in the direction shown in the illustration.



# SUSPENSION AND AXLE

# REFER TO FOLLOWING REPAIR MANUALS:

Manual Name	Pub. No.
<ul> <li>Land Cruiser (Hardtop and Canvas Top) Chassis and Body Repair Manual</li> </ul>	RM183E
<ul> <li>Land Cruiser (Station Wagon) Chassis and Body Repair Manual</li> </ul>	RM184E
<ul> <li>Land Cruiser (Hardtop, Canvas Top and Station Wagon) Chassis and Body Repair Manual Supplement</li> </ul>	RM290E

NOTE: The following pages contain only the points which differ from the above listed manuals.

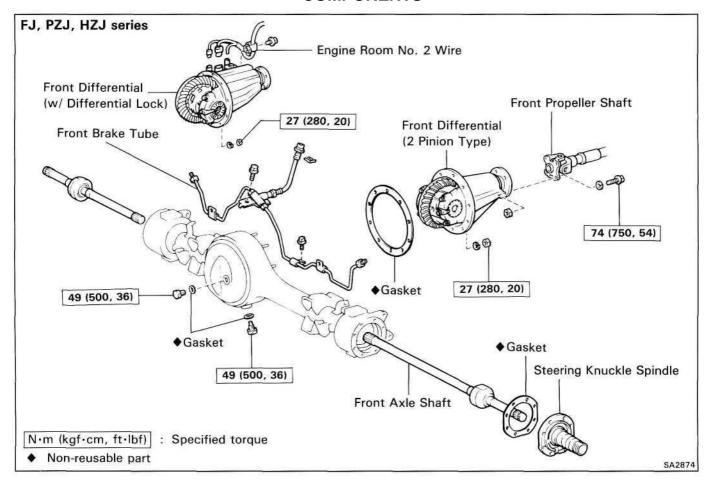
# SA

(HARDTOP & CANVAS TOP)	
FRONT DIFFERENTIAL	SA-2
ASSEMBLY REMOVAL AND INSTALLATION	.SA-2
(STATION WAGON)	
WHEEL ALIGNMENT	SA-3
PRIMARY INSPECTION	SA-3
FRONT WHEEL ALIGNMENT	SA-4
FRONT DIFFERENTIAL	SA-6
ASSEMBLY REMOVAL	
AND INSTALLATION	SA-6
SERVICE SPECIFICATIONS	SA-7

# FRONT DIFFERENTIAL

# ASSEMBLY REMOVAL AND INSTALLATION

**COMPONENTS** 



# WHEEL ALIGNMENT PRIMARY INSPECTION

- 1. MAKE FOLLOW CHECKS AND CORRECT ANY PROBLEMS
- (a) Check the tires for wear and proper inflation.

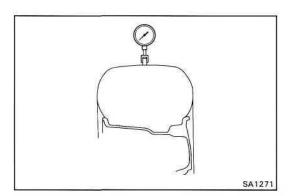
Cold tire inflation pressure: See page SA-7



Tire runout:

3.0 mm (0.118 in.) or less

- (c) Check the wheel bearings for looseness.
- (d) Check the suspension for looseness.
- (e) Check the steering linkage for looseness.
- (f) Check that the absorbers work properly by using the standard bounce test.



# 2. MEASURE FOLLOW SPRING CLEARANCE AND BUMPER STOPPER CLEARANCE

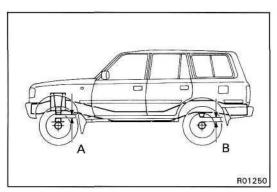
A: Follow spring clearance (Front)

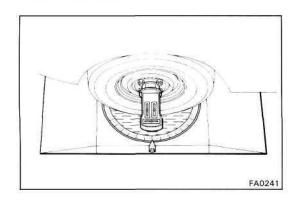
B: Bumper stopper clearance (Rear)

	Α	В
For Europe	39 mm (1.54 in.)	117 mm (4.61 in.)
For Australia*	52 mm (2.01 in.)	105 mm (4.13 in.)
For Middle East	38 mm (1.50 in.)	92 mm (3.62 in.)
Others	38 mm (1.50 in.)	118 mm (4.66 in.)

<sup>\*:</sup> w/o Australia option

If the clearance of the vehicle is not standard, try to level the vehicle by rocking it down.

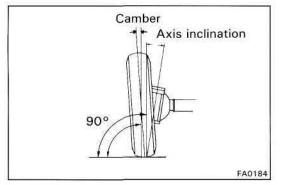




### FRONT WHEEL ALIGNMENT

#### 1. INSTALL WHEEL ALIGNMENT EQUIPMENT

Follow the specific instructions of the equipment manufacturer.



#### 2. INSPECT CAMBER AND STEERING AXIS INCLINATION

Camber:

$$1^{\circ}00' \pm 45' (1.00^{\circ} \pm 0.75^{\circ})$$

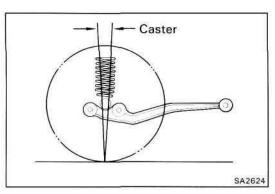
Cross camber:

30' or less (0.50° or less)

Steering axis inclination:

$$13^{\circ}00' \pm 45' (13.00^{\circ} \pm 0.75^{\circ})$$

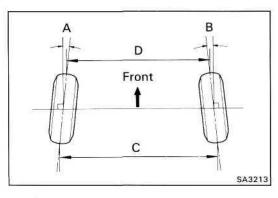
If the steering axis inclination is not as specified after camber have been correctly adjusted, recheck the steering knuckle and front wheel for bending or looseness.



#### 3. INSPECT CASTER

$$3^{\circ}00' \pm 1^{\circ} (3.00^{\circ} \pm 1^{\circ})$$

If caster is not as specified, inspect and replace damaged or worn parts.



# 4. INSPECT TOE-IN

Toe-in (total):

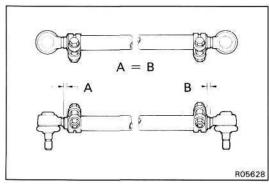
Tire type	A + B	C - D
Bias tire	$0^{\circ}24' \pm 0^{\circ}12'$ (0.4° ± 0.2°)	4 ± 2 mm (0.16 ± 0.08 in.)
Radial tire	$0^{\circ}12' \pm 0^{\circ}12'$ $(0.2^{\circ} \pm 0.2^{\circ})$	2 ± 2 mm (0.08 ± 0.08 in.)

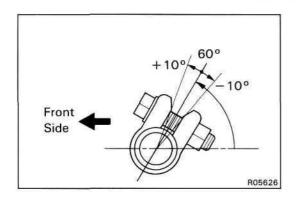
If toe-in is not specification, adjust by tie rod.



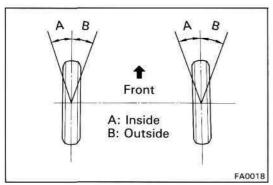
- (a) Loosen the clamp bolts and nuts.
- (b) Adjust toe-in to the correct value by turning the tie rod.
- (c) Insure that the lengths of the tie rod ends are the same.
- (d) Torque the tie rod clamp bolts and nuts.

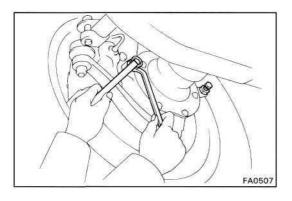
Torque: 37 Nm (375 kgf-cm, 27 ftlbf)





HINT: The clamps opening must be positioned at the rear of the tie rod and face within  $60^{\circ} \pm 10^{\circ}$  from the verticle axis.





#### 6. INSPECT WHEEL ANGLE

Remove the caps of the knuckle stopper bolts and check the steering angles.

#### Wheel angle:

	Wheel angle (Max.)		
Inside wheel	w/ Power steering	35° +0°	
	w/o Power steering	32° +0°	
Outside wheel (reference)	w/ Power steering	31°	
	w/ Power steering	29°	

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 the standard value, adjust the wheel angle with the knuckle stopped bolts.

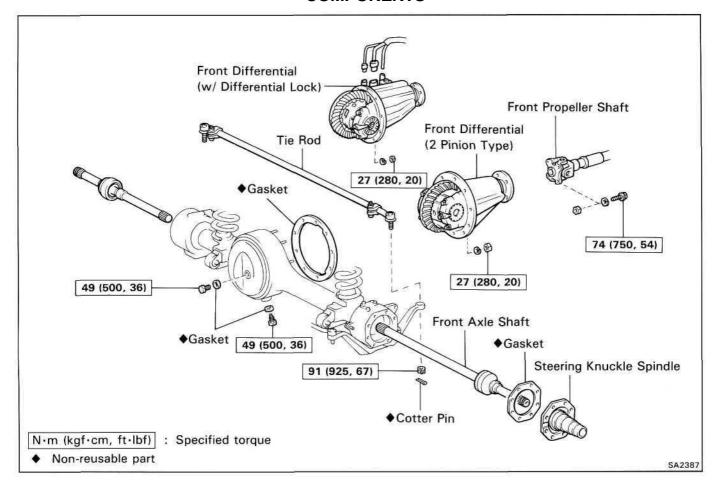
### Torque: 44 N-m (450 kgfcm, 33 ft-lbf)

If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.

## FRONT DIFFERENTIAL

# ASSEMBLY REMOVAL AND INSTALLATION

**COMPONENTS** 



# **SERVICE SPECIFICATIONS**

# SERVICE DATA (STATION WAGON)

Cold tire infla-	Moving condition	Ti	re size	Engine	Pressure	kPa (	kgf/cm <sup>2</sup> or bar, psi)
tion pressure	WidVillg Collation	3.3	ie size	(Grade)	Front		Rear
(For Europe)	For all loads including	215	/80R16	1HZ, 1HD- (All grade)		5)	300 (3.0, 44)
full	full rated loads		/70R16	1FZ, 1HD- (GX, VX)	T 220		220 (2.2, 32)
				1HZ	210		220
				(Standard		O)	(2.2, 32)
	Optional inflation for reduced	215	/00D16	1HZ	220		240
l l	loads	215	/80R16	(GX)	(2.2, 3	2)	(2.4, 35)
	(2 front passengers + 2 rear			1HD-T	230		240
	(passengers + 200 kg [440 lb.])			(GX, VX)		3)	(2.4, 35)
		275	/70R16	1FZ, 1HD-	THE PERSON NAMED IN COLUMN	2%	220
- As so works on the				(GX, VX)			(2.2, 32)
Cold tire infla-	Moving condition		Tire s	size		kPa (	kgf/cm² or bar, psi)
(For				Front		Rear	
Australia)		7.5	OR16-6P	RLT	260	٠.	350
Australia	For all loads including		N 818		(2.6, 38)		(3.5, 51)
	full rated loads	27!	5/70R16		220	21	220
				(2.2, 3)	۷)	(2.2, 32)	
	Optional inflation for reduced loads	7.50R16-6PRLT 275/70R16		(2.4, 3	5)	(3.2, 46)	
	(2 front passengers + 2 rear			220	J)	220	
	passengers + 200 kg [440 lb.]				(2.2, 3	2)	(2.2, 32)
Cold tire infla-				Pr		1 100.00	kgf/cm <sup>2</sup> or bar, psi)
tion pressure	Tire size	D. H.		ront			
(Others)	7.50-16-6PRLT			(2.0, 29)		300 (3.0, 44)	
	7.50R16-6PRLT			(2.5, 36)		325 (3.25, 47)	
	245/85R16	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		CONFORMAL ESPORANCE AND		260 (2.6, 38)	
	275/70R16			(2.2, 32)		220 (2.2, 32)	
Follow spring	CONTRACTS OF MAKES TO PROCEED TO				A		В
and bumper		For Europe		ре	39 mm (1.54 in.)		117 mm (4.61 in.)
stopper	A: Follow spring clearance (Fron	200	For Aus				105 mm (4.13 in.
clearance	B: Bumper stopper clearance (Re	ear)	For Mide	OT DESCRIPTION	38 mm (1.50		92 mm (3.62 in.
	*: w/o Australia op				38 mm (1.50 in.) 118 mm (4.66 in		
Front wheel	Camber	Inspe	ection sta	ndard	The state of the s		00° ± 0.75°)
alignment		C25/20-28/00-	right erro	March Street	30' or less	7,00	
	Steering axis inclination	77.5	ection sta	702 500		-	13.00° ± 0.75°)
			right erro		30' or less		
	Caster	Inspe	ection sta	indard	3°00′ ± 1	° (3.0	00° ± 1°)
		Left-	right erro	r	30' or less	(0.50	o or less)
	Toe-in Bias tire			$0^{\circ}24' \pm 0^{\circ}12' (0.4^{\circ} \pm 0.2^{\circ})$			
	Radial tire				$(4 \text{ mm} \pm 2 \text{ mm}, 0.16 \text{ in}, \pm 0.08 \text{ in})$		
				dial tire		$0^{\circ}12' \pm 0^{\circ}12' (0.2^{\circ} \pm 0.2^{\circ})$	
					The second second second	$0.12 \pm 0.12 = 0.2$ (2 mm ± 2 mm, 0.08 in. ± 0.08	
	Wheel angle (Max)				Inside wheel		Outside wheel
		w/ P	ower stee	ering	35°00′ +0° 32°00′ +0° 32°00′ -3°		31° (reference)
		w/o Power steering		32°00′ +0°	- 1	29°00' (reference)	

# TORQUE SPECIFICATIONS (HARDTOP & CANVAS TOP)

Part tightened	N⋅m	kgf⋅cm	ft-lbf
Front differential × Front axle housing	27	280	20
Front differential × Front propeller shaft	74	750	50
Front differential filler plug	49	500	36
Front differential drain plug	49	500	36

# (STATION WAGON)

Part tightened	N⋅m	kgf⋅cm	ft·lbf
Tie rod end clamp bolt	37	375	27
Steering knuckle stopper bolt lock nut	44	450	33
Front differential × Front axle housing	27	280	20
Front differential × Front propeller shaft	74	750	50
Front differential filler plug	49	500	36
Front differential drain plug	49	500	36

# $\mathsf{BR}$

# **BRAKE SYSTEM**

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.

BR-2
BR-4
BR-6
BR-13
BR-20
BR-20
.BR-24
BR-34
BR-38
.BR-40
.BR-45
BR-46
.BR-51
.BR-55
BR-57

## **PREPARATION**

# **SST (SPECIAL SERVICE TOOLS)**

09023-00100 Union Nut Wrench 10 mm	
<b>09709-29017</b> LSPV Gauge Set	
09737-00010 Brake Booster Push Rod Gauge	
09751-36011 Brake Tube Union Nut 10 x 12 mm Wrench	n
09843-18020 Diagnosis Check Wire	w/ABS
09990-00150 ABS Actuator Checker and Sub-ha	arness w/ABS
09990-00163 ABS Actuator Checker Sheet "A"	w/ ABS
09990-00200 ABS Actuator Checker Sub-harnes	s "C" w/ ABS
09990-00210 ABS Actuator Checker Sub-harnes	s "E" w/ABS

## **RECOMMENDED TOOLS**

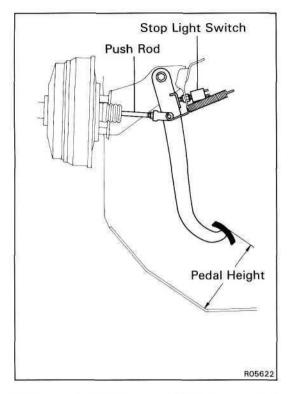
	09082-00015 TOYOTA Electrical Tester	
PRE	09905-00013 Snap Ring Pillers	

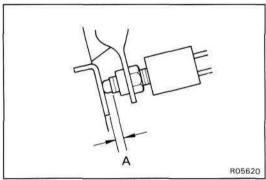
## **EQUIPMENT**

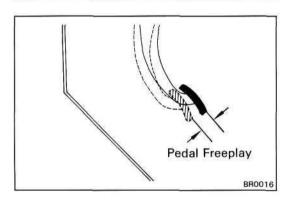
Torque wrench				

## **LUBRICANT**

Item	Capacity	Classification
Brake fluid	_	SAE J17O3 or FMVSS No.116 DOT 3







# CHECK AND ADJUSTMENT BRAKE PEDAL CHECK AND ADJUSTMENT

 CHECK THAT PEDAL HEIGHT IS CORRECT, AS SHOWN Pedal height from asphalt sheet:

167.5 - 177.5 mm (6.59 - 6.99 in.)

If the pedal height is incorrect, adjust it.

#### 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 Nm (260 kgfcm, 19 ftlbf)

- (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 clearance (A) between the stop light switch and pedal.

#### Clearance:

**0.5** - **2.4** mm (0.02 - 0.09 in.)

- (i) Tighten the stop light switch lock nut.
- (i) 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.
- (I) 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

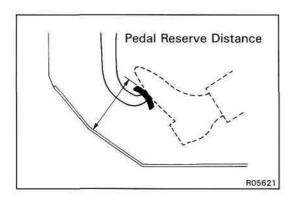
- (a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.
- (b) Push in the pedal by hand until the beginning of the resistance is felt, then measure the distance, as shown.

#### Pedal freeplay:

3 - 6 mm (0.12 - 0.24 in.)

HINT: The freeplay to the first point of resistance is due to the play between the clevis and pin. It is 3-6 mm (0.12 - 0.24 in.) on the pedal.

If incorrect, check the stop light switch clearance. And if the clearance is OK, then troubleshoot the brake system.



# 4. CHECK THAT PEDAL RESERVE DISTANCE IS CORRECT, AS SHOWN

Release the parking brake.

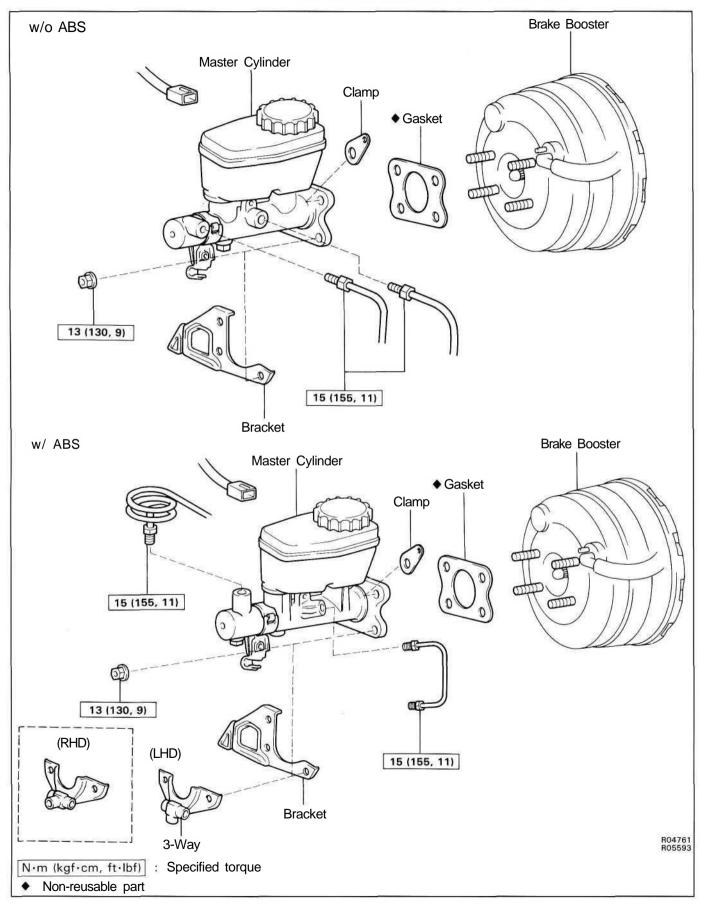
With the engine running, depress the pedal and measure the pedal reserve distance, as shown.

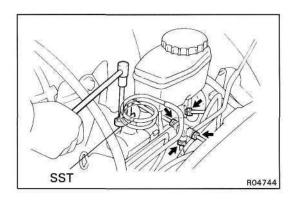
Pedal reserve distance from asphalt sheet at 490 N (50 kgf, 110.2 lbf):

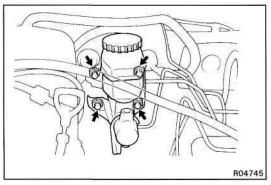
More than 68 mm (2.68 in.)

If the reserve distance is incorrect, troubleshoot the brake system.

# MASTER CYLINDER MASTER CYLINDER REMOVAL







#### 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.

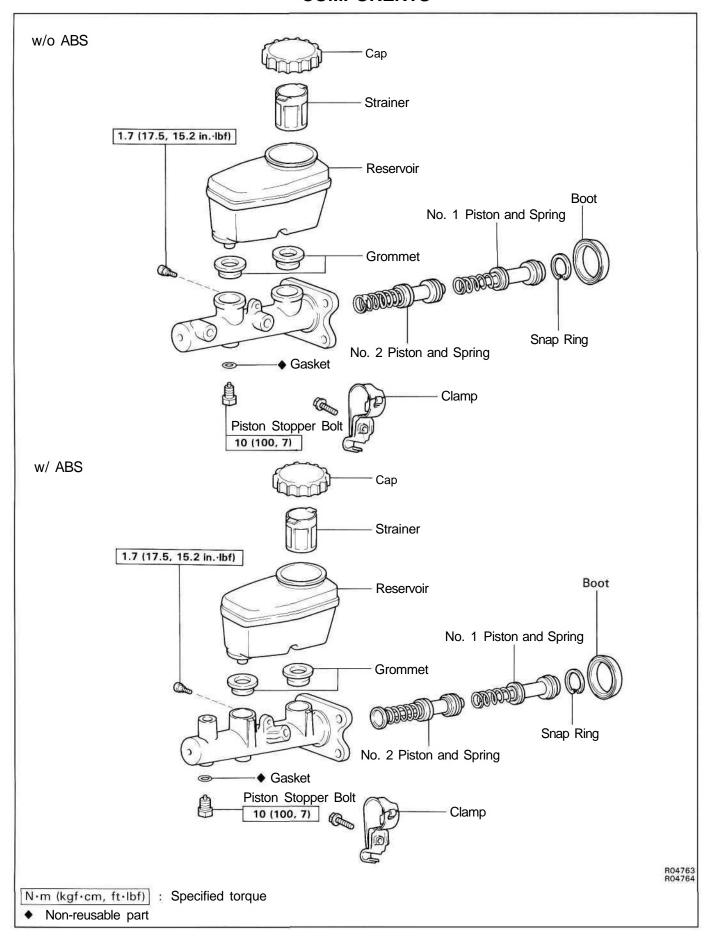
#### 3. DISCONNECT BRAKE LINES

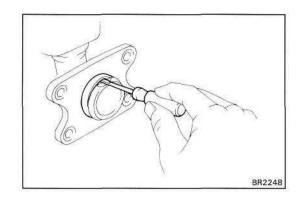
Using SST, disconnect brake lines from the master cylinder. SST 09023-00100

#### 4. REMOVE MASTER CYLINDER

- (a) Remove the mounting nuts.
- (b) (w/ ABS)Remove the 3-way, clamp and the bracket.(w/o ABS)Remove the clamp and the bracket.
- (c) Pull out the master cylinder and gasket.

## **COMPONENTS**

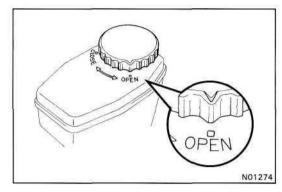




## MASTER CYLINDER DISASSEMBLY

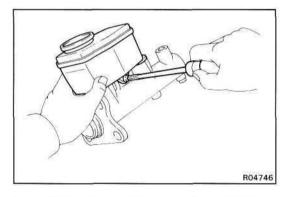
#### 1. REMOVE MASTER CYLINDER BOOT

Using a screwdriver, remove the master cylinder boot.



#### 2. REMOVE RESERVOIR CAP AND STRAINER

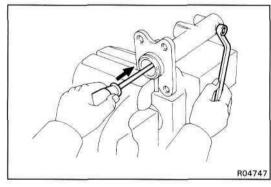
- (a) Turn the reservoir cap to the "OPEN" side and remove it.
- (b) Remove the strainer.



#### 3. REMOVE RESERVOIR

Remove the set screw and pull out the reservoir.

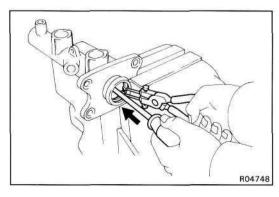
- 4. REMOVE TWO GROMMETS
- 5. PLACE CYLINDER IN VISE



#### 6. REMOVE NO.2 PISTON STOPPER BOLT

Using a screwdriver, push the pistons in all the way and remove the No.2 piston stopper bolt and gasket.

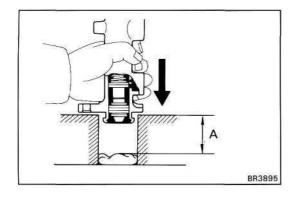
HINT: Tape the screwdriver tip before use.



#### 7. REMOVE TWO PISTONS

- (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 an angle.

NOTICE: If pulled out at an angle, there is a possibility that the cylinder bore could be damaged.



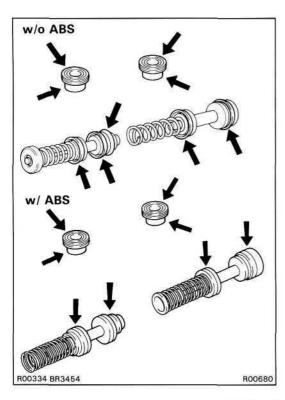
(c) Place a rag and two wooden blocks on the work table and lightly tap the cylinder flange against the blocks until the piston drops out of the cylinder.

HINT: Make sure the distance (A) from the rag to the top of the blocks is at least 100 mm (3.94 in.).

#### MASTER CYLINDER INSPECTION

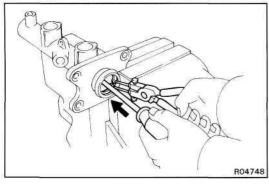
HINT: Clean the disassembled parts with compressed air

- 1. INSPECT CYLINDER BORE FOR RUST OR SCORING
- 2. INSPECT CYLINDER FOR WEAR OR DAMAGE
  If necessary, clean or replace the cylinder.



#### MASTER CYLINDER ASSEMBLY

1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO RUB-BER PARTS INDICATED BY ARROWS



2. INSTALL TWO PISTONS

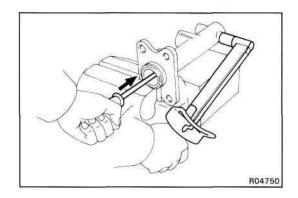
NOTICE: Be careful not to damage the rubber lips on the pistons.

(a) Install the two springs and pistons straight in, not at an angle.

NOTICE: If insert at an angle, there is a possibility of damaging the cylinder bore.

(b) Push in the piston with a screwdriver and install the snap ring with snap ring pliers.

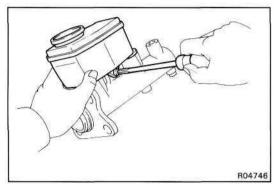
HINT: Tape the screwdriver tip before use.



#### 3. INSTALL NO.2 PISTON STOPPER BOLT

Using a screwdriver, push the piston in all the way and install the No.2 piston stopper bolt over a new gasket.

Torque: 10 Nm (100 kgfcm, 7 ftlbf)

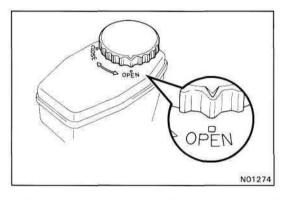


#### 4. INSTALL TWO GROMMETS

#### 5. INSTALL RESERVOIR

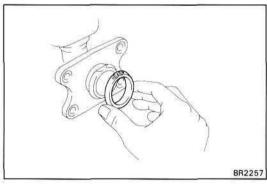
- (a) Install the strainer to the reservoir.
- (b) Push the reservoir onto the cylinder.
- (c) Install the set screw while pushing on the reservoir.

Torque: 1.7 Nm (17.5 kgfcm, 15.2 in.lbf)



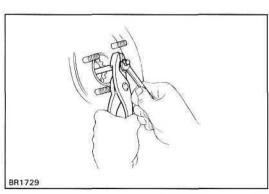
#### 6. INSTALL RESERVOIR CAP

- (a) Align the matchmark on the reservoir cap with the matchmark on the "OPEN" side of reservoir.
- (b) Push down on the reservoir cap and turn it clockwise until it locks.
- (c) Check that the matchmark on the reservoir cap is now aligned with the matchmark on the "CLOSE" side of the reservoir.



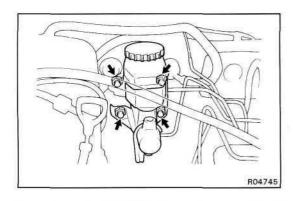
#### 7. INSTALL MASTER CYLINDER BOOT

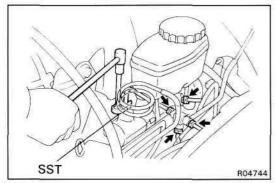
With the UP mark on the master cylinder boot facing upwards, install the cylinder boot on the master cylinder.



#### MASTER CYLINDER INSTALLATION

1. ADJUST LENGTH OF BRAKE BOOSTER PUSH ROD BEFORE INSTALLING MASTER CYLINDER (See pub. No. RM184E, page BR-26)





#### 2. INSTALL MASTER CYLINDER

(a) (w/ ABS)

Install the master cylinder, gasket, 3-way, clamp and bracket on the brake booster with the four nuts.

(w/o ABS)

Install the master cylinder, gasket, clamp and bracket on the brake booster with the four nuts.

(b) Tighten the mounting nuts.

Torque: 13 Nm (130 kgfcm, 9 ftlbf)

#### 3. CONNECT BRAKE LINES

Using SST, connect the brake lines to the master cylinder. Torque the union nuts.

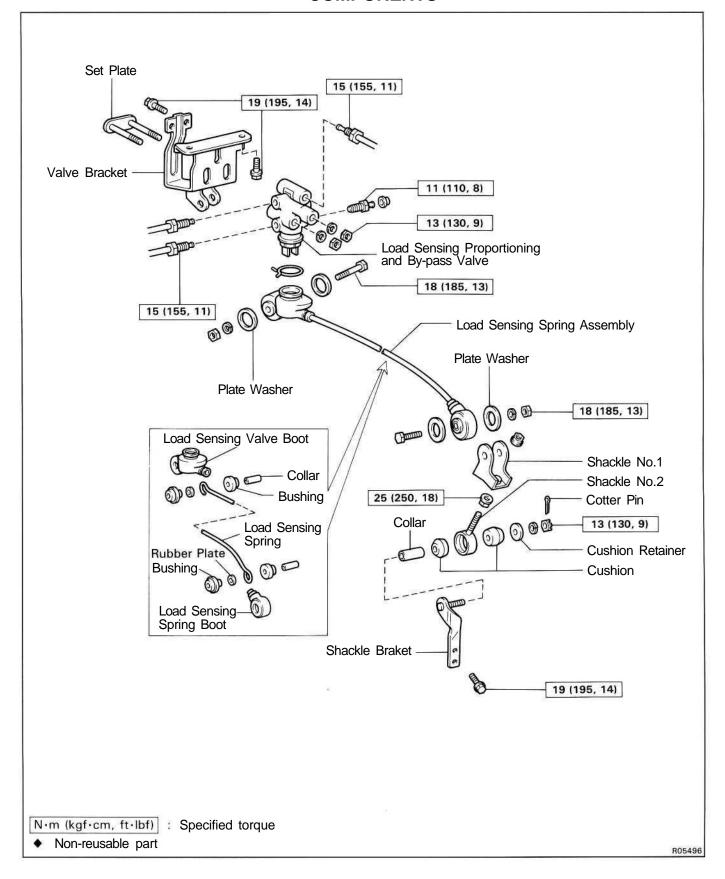
SST 09023-00100

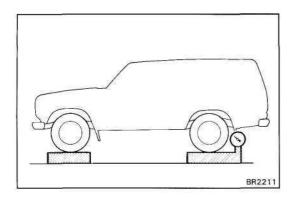
Torque: 15 Nm (155 kgfcm, 11 ftlbf)

- 4. CONNECT LEVEL WARNING SWITCH CONNECTOR
- 5. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM (See pub No. RM184E, page BR-7)
- 6. CHECK FOR LEAKS
- 7. CHECK AND ADJUST BRAKE PEDAL (See page BR-4)

# LOAD SENSING PROPORTIONING AND BY-PASS VALVE (LSP & BV)

### **COMPONENTS**

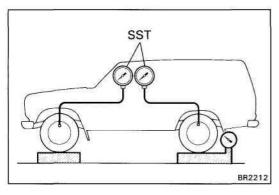




### FLUID PRESSURE CHECK AND ADJUSTMENT

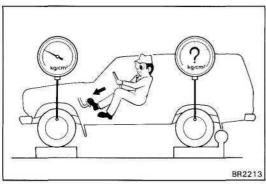
SET REAR AXLE LOAD

Rear axle load (include vehicle weight): 1,330 kg (2,932 lb)



INSTALL LSPV GAUGE (SST) AND BLEED AIR

SST 09709-29017

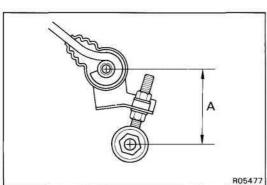


RAISE FRONT BRAKE PRESSURE TO 7,845 kPa (80 kgf/cm<sup>2</sup>, 1,138 psi) AND CHECK REAR BRAKE **PRESSURE** 

Rear brake pressure:

 $5,984 \pm 589 \text{ kPa}$  (61 ± 6 kgf/cm<sup>2</sup>, 869 ± 86 psi)

HINT: The brake pedal should not be depressed twice and/or returned while setting to the specified pressure. Read the value of rear pressure two seconds after adjusting the specified fluid pressure.



- IF NECESSARY, ADJUST FLUID PRESSURE
- Disconnect the No.2 shackle from the shackle bracket.
- Adjust the length of the No.2 shackle turning it.

Low pressure — Lengthen A

High pressure — Shorten A

Initial set:

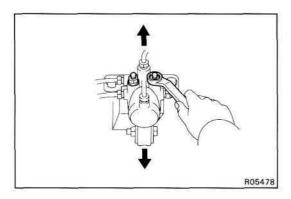
90 mm (3.54 in.)

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/cm<sup>2</sup>, 14.2 psi)



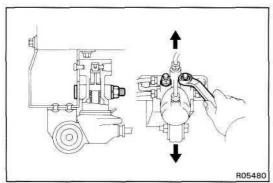
(c) In event the pressure cannot be adjusted by No.2 shackle, raise or lower the valve body.

Low pressure — Lower High pressure — Raise

(d) Torque the nuts.

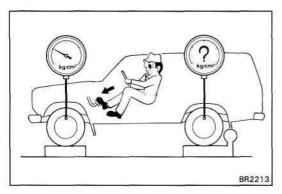
Torque: 13 N-m (130 kgf-cm, 9 ftlbf)

(e) Adjust the length of the No.2 shackle again.If it cannot be adjusted, inspect the valve housing.



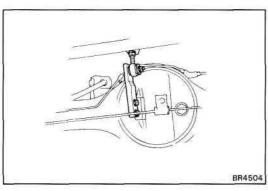
#### 5. IF NECESSARY, CHECK VALVE BODY

(a) Assemble the valve body in the uppermost position. HINT: When the brakes are applied, the piston will move down about 1 mm (0.039 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.

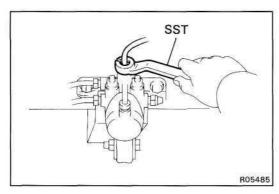
Front brake pressure kPa (kgf/cm², psi)	Rear brake pressure kPa (kgf/cm², psi)	
3,434 (35, 498)	3,434 (35, 498)	
5,396 (55, 783)	3,630 - 4,218 (37 - 43, 527 - 612)	
9,810 (100, 1,424)	4,513 - 5,494 (46 - 56,655 - 797)	



#### LSP & BV REMOVAL

#### 1. DISCONNECT SHACKLE NO.2 FROM BRACKET

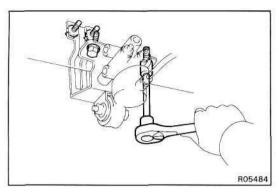
- (a) Remove the cotter pin.
- (b) Remove the nut and disconnect the shackle No.2 from the bracket.
- (c) Remove the retainer, two cushions and collar.



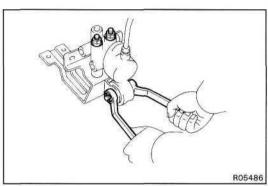
#### 2. REMOVE LSP & BV ASSEMBLY

(a) Using SST, disconnect the brake lines from the valve body.

SST 09751-36011



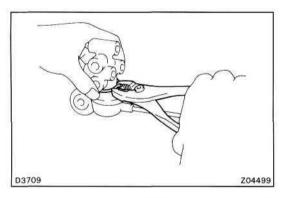
(b) Remove the valve bracket and mounting bolts, then remove the LSP & BV assembly.



#### LSP & BV ASSEMBLY DISASSEMBLY

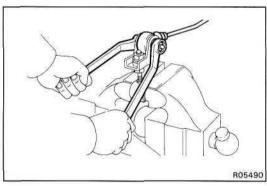
#### 1. REMOVE VALVE BRACKET

- (a) Remove the nut and bolt as shown.
- (b) Remove the two nuts, and remove the bracket and two bolts from the valve body.



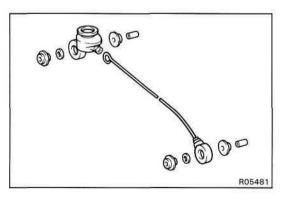
#### 2. DISCONNECT SPRING FROM VALVE

Using pliers, remove the clip, and remove the spring from the valve.



#### 3. REMOVE SHACKLE NO.1 AND NO.2

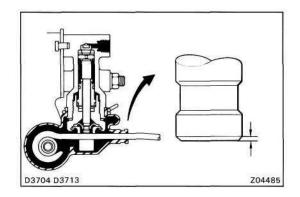
- (a) Remove the bolt and nut, then remove the following parts:
  - · Load sensing spring
  - Two plate washers
- (b) Loosen the two nuts, and remove the shackle No.1 from the shackle No.2.



#### 4. DISASSEMBLY LOAD SENSING SPRING

Disassembly the following parts:

- (a) Bushings
- (b) Collars
- (c) Rubber plates
- (d) Load sensing valve boot
- (e) Load sensing spring boot

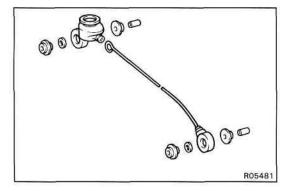


#### LSP & BV INSPECTION

INSPECT VALVE PISTON PIN AND LOAD SENSING SPRING CONTACT SURFACE FOR WEAR

Wear limit:

0.7 mm (0.028 in.)

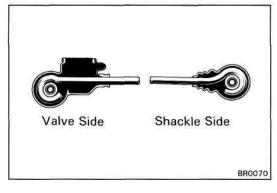


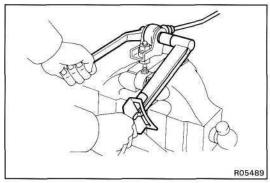
### LSP & BV ASSEMBLY

- ASSEMBLE FOLLOWING PARTS TO LOAD SENSING SPRING:
- (a) Load sensing valve boot
- (b) Load sensing spring boot
- (c) Bushings
- (d) Rubber plates
- (e) Collars

HINT: Apply lithium soap base glycol grease to all rubbing areas.

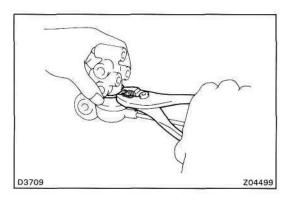
Do not mistake the valve side for the shackle side of the load sensing spring.





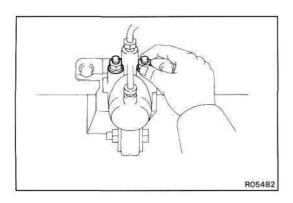
- 2. INSTALL SHACKLE NO. 1 AND NO.2 TO LOAD SENSING SPRING
- (a) Install the lock nut and shackle No. 1 to the shackle No.2.
- (b) Install and torque the bolt and nut as shown in illustration.

Torque: 18 Nm (185 kgf-cm, 13 ftlbf)



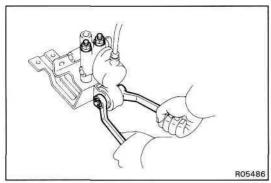
3. INSTALL LOAD SENSING SPRING TO VALVE BODY

Install the load sensing spring assembly to the load sensing valve with the clip.



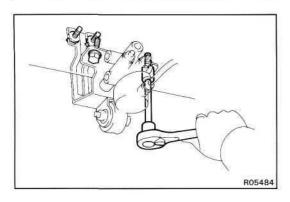
#### 4. INSTALL VALVE BRACKET

(a) Install the two set bolts to the valve assembly through the valve bracket and temporarily tighten the two valve body mounting nuts.



(b) Torque the bolt and nut through the two plate washers.

Torque: 18 Nm (185 kgfcm, 13 ftlbf)

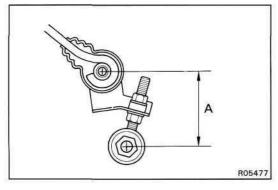


#### LSP & BV INSTALLATION

1. INSTALL LSP & BV ASSEMBLY

Install the LSP & BV assembly to the frame with the four bolts.

Torque: 19 Nm (195 kgfcm, 14 ftlbf)



#### 2. CONNECT SHACKLE NO.2 TO BRACKET

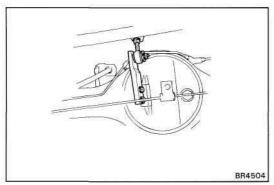
(a) Set the dimension A by turning shackle No.2.

Initial set:

90 mm (3.54 in.)

(b) Tighten the lock nut.

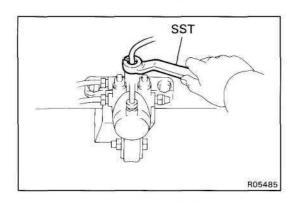
Torque: 25 Nm (250 kgfcm, 18 ftlbf)



- (c) Install the two bushings and collar to the load sensing spring shackle.
- (d) Install the load sensing spring to the shackle bracket with a retainer and nut.

Torque: 13 Nm (130 kgfcm, 9 ftlbf)

(e) Install a new cotter pin.



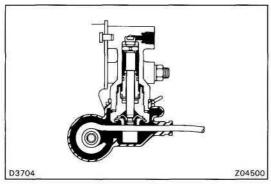
#### 3. CONNECT BRAKE LINES

Using SST, connect the brake lines.

SST 09751-36011

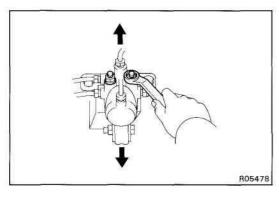
Torque: 15 Nm (155 kgfcm, 11 ft-lbf)

4. SET REAR AXLE LOAD (See page BR-16)



#### 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 Nm (130 kgfcm, 9 ft-lbf)

- 6. BLEED BRAKE SYSTEM (See pub No. RM184E, page BR-7)
- 7. CHECK FLUID LEAKAGE
- 8. CHECK AND ADJUST LSP & BV FLUID PRESSURE (See page BR-16)

# **ANTI-LOCK BRAKE SYSTEM (ABS)**

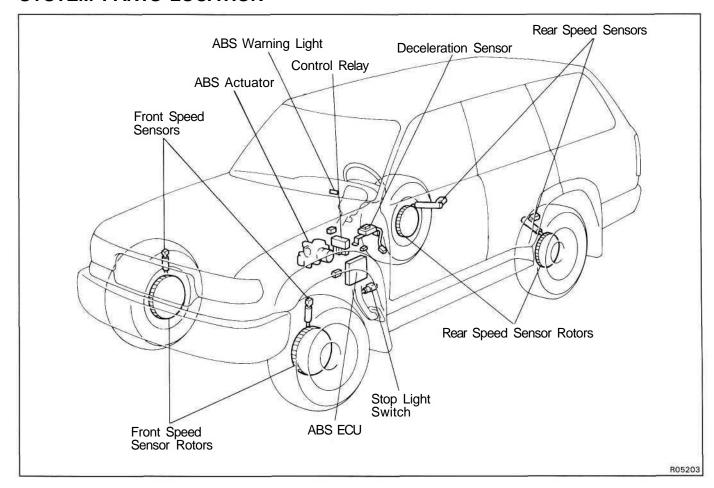
### DESCRIPTION

- The ABS is a brake system which controls the brake cylinder hydraulic pressure of all four wheels during sudden braking and braking on slippery road surfaces, preventing the wheels from locking. This ABS provides the following benefits:
  - (1) Enables steering round an obstacle with a greater degree of certainty even when panic braking.
  - (2) Enables stopping in a panic brake while keeping the effect upon stability and steerability to a minimum, even on curves.
- The function of the ABS is to help maintain directional stability and vehicle steerability on most road conditions. However, the system cannot prevent the vehicle from skidding if the cornering speed limit is exceeded.
- The ABS has a longitudinal deceleration sensor to match braking characteristics to the full-time four wheel drive.
- In case a malfunction occurs, a diagnosis function and fail-safe system have been adopted for the ABS to increase serviceability.
- When the center differential is locked, the ABS does not operate, so the ABS warning light lights up to indicate this.

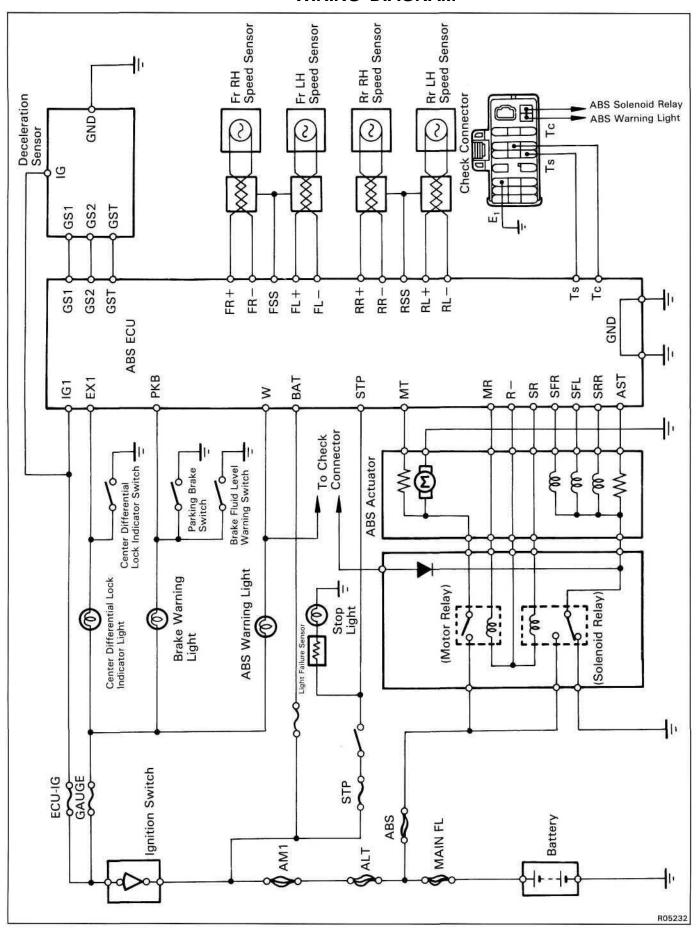
## **COMPONENTS FUNCTION**

Component	Function	
Front Speed Sensor	Detect the wheel speed of each of the left and right front wheels.	
Rear Speed Sensor	Detect the wheel speed of each of the left and right rear wheels.	
ABS Warning Light	Lights up to alert the driver when trouble has occurred in the Anti- Lock Brake System and when the center differential is locked.	
Actuator	Controls the brake fluid pressure to each disc brake cylinder through signals from the ECU.	
ABS ECU	From the wheel speed signals from each sensor, it calculates acceleration, deceleration and slip values and sends signals to the actuator to control brake fluid pressure.	
Deceleration Sensor	Detect the deceleration speed of the vehicle and sends a signal accordingly to the ABS ECU.	

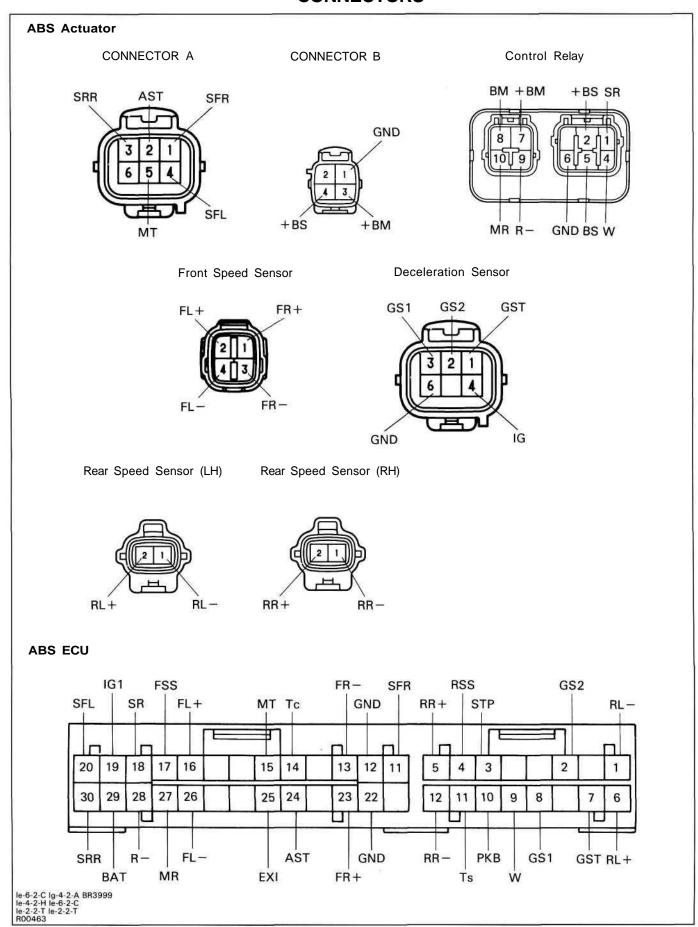
## **SYSTEM PARTS LOCATION**

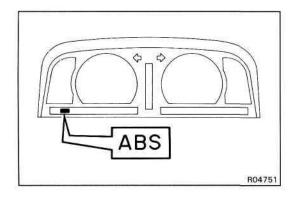


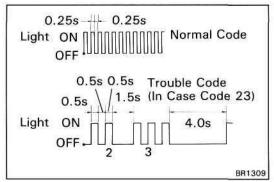
## **WIRING DIAGRAM**



## **CONNECTORS**







# DIAGNOSIS SYSTEM DESCRIPTION

If a malfunction occurs, the system will identify the problem and the ECU will store the codes for the trouble items.

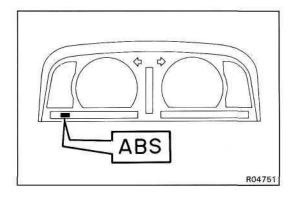
At the same time, the system informs the driver of a malfunction via the "ABS" warning light in the combination meter.

By turning on the ignition switch, disconnecting the short pin of the check connector and use SST to connect Tc and Ei of the check connector, the trouble can be identified by the number of blinks (diagnostic code) of the warning light.

In the event of two codes, that having the smallest numbered code will be identified first.

HINT: The warning light does not show the diagnostic codes while the vehicle is running.

When the transfer is in L (center differential lock) position, the ABS does not operate and the ABS warning light stays on.



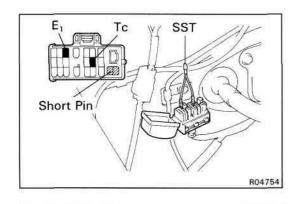
#### **DIAGNOSIS SYSTEM INSPECTION**

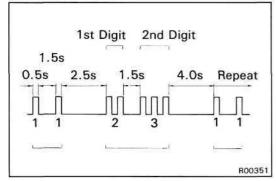
INSPECT BATTERY VOLTAGE
 Inspect that the battery voltage is about 1 2 V.

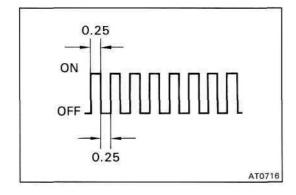
#### 2. CHECK THAT WARNING LIGHT TURNS ON

- (a) Confirm that the center differential is free.
- (b) Turn the ignition switch on.
- (c) Check that the "ABS" warning light turns on for 3 seconds.

If not, inspect and repair or replace the fuse, bulb and wire harness.







#### 3. READ DIAGNOSTIC CODE

- (a) Turn the ignition switch on.
- (b) Using SST, connect terminals Tc and E<sub>1</sub> of the check connector.

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- (c) Pull out the short pin from the terminals WA and WB of the check connector in the engine room.
- (d) In event of a malfunction, 4 seconds later the warning light will begin to blink. Read the number of blinks. (See page BR-26)

HINT: The first number of blinks will equal the first digit of a two digit diagnostic code. After a 1.5 second pause, the 2nd number of blinks will equal the 2nd number of a two digit code. If there are two or more codes, there will be a 2.5 second pause between each, and indication will begin after 4.0 second pause from the smaller value and continue in order to larger.

- (e) If the system is operating normally (no malfunction), the warning light will blink once every 0.5 seconds.
- (f) Repair the system.
- (g) After the malfunctioning components has been repaired, clear the diagnostic codes stored in the ECU. (See page BR-27)

HINT: If you disconnect the battery cable while repairing, all diagnostic codes in the ECU will erased.

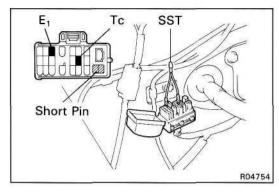
(h) Remove the SST from terminals Tc and Ei of the check connector.

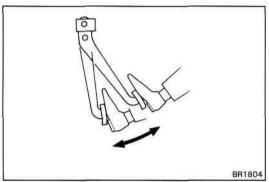
SST 09843-18020

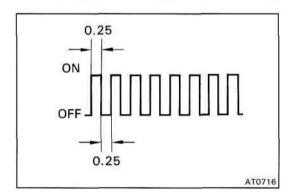
- (i) Install the short pin to the terminals WA and WB.
- (j) Turn the ignition switch on, and check that the "ABS" warning light goes off after the warning light goes on for 3 seconds.

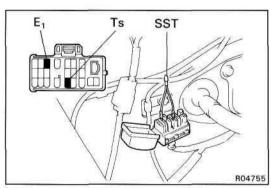
## DIAGNOSTIC CODE

11 ONF	Light Pattern	Diagnosis	Trouble Part
10000000000000000000000000000000000000	_023	Open circuit in solenoid relay circuit	Actuator inside wire harness     Solenoid relay     Mire harness and connector
10000000000000000000000000000000000000	. 255	Short circuit in solenoid relay circuit	of solenoid relay circuit (Include AST circuit)
70000000000000000000000000000000000000	_ PE	Open circuit in pump motor relay circuit	Actuator inside wire harness     Pump motor relay
100	L R05039	Short circuit in pump motor relay circuit	of pump motor relay circuit (include MT circuit)
700	_ SA	Open or short circuit in 3 position solenoid of front right wheel	
700	3 377	Open or short circuit in 3 position solenoid of front left wheel	<ul> <li>Actuator solenoid</li> <li>Wire harness and connector of actuator solenoid circuit</li> </ul>
TOTOLOL ROSO39  TOTOLOLOL ROSO39  TOTOLOLOLOL ROSO39  TOTOLOLOLOLOLOLOROS39  TOTOLOLOLOLOLOLOROS39  TOTOLOLOLOLOLOLOLOROS39  TOTOLOLOLOLOLOLOLOLOROS39  TOTOLOLOLOLOLOLOLOLOLOLOLOLOLOLOLOLOLO		Open or short circuit in 3 position solenoid of rear wheel	
700039 7000 100039 7000 100039 7000 100039 7000 100039 7000 100039 7000 100039 7000 100039 7000 100039 7000 100039		Front right wheel speed sensor signal malfunction	
100 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100033 100		Front left wheel speed sensor signal malfunction	
100033 1000033 1000033 10000033 10000033 100000033 100000033 100000033 10000033 10000033 10000033 10000033 10000033 10000033 10000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033 1000033	J R05039	Rear right wheel speed sensor signal malfunction	Speed sensor     Sensor rotor
TULL TULL ROSO33  ROSO33		Rear left wheel speed sensor signal malfunction	<ul> <li>Wire harness and connector of speed sensor</li> </ul>
10000000000000000000000000000000000000		Open circuit in front left or rear right wheel speed sensor	
TULL REGGSS  TULL TULL RGGGSS  TULL TULL RGGGSS  TULL TULL RGGGSS  RGGGSS  RGGGSS  RGGGSS  RGGGSS	128	Open circuit in front right or rear left wheel speed sensor	
TUTUL TUTL ROE039  TUTUL LUTUL ROE039  ROE039  ROE039	R05039	Abnormally high or low battery voltage	Battery     Voltage regulator
TULL TULL ROS039  ROS039  TULL LULL LUS SAN SAN SAN SAN SAN SAN SAN SAN SAN SA	JULI ROSSO39	Malfunction in deceleration sensor	<ul> <li>Deceleration sensor</li> <li>Deceleration sensor installation</li> </ul>
MOUNT TO		Open or short circuit in deceleration sensor	<ul> <li>Wire harness and connector of deceleration sensor</li> </ul>
JULULUL JL ROE039		Open or short circuit in center differential lock indicator	<ul> <li>Center differential lock</li> <li>Center differential lock indicator light</li> <li>Center differential lock indicator switch</li> <li>Wire harness and connector of center differential lock</li> </ul>
		Pump motor of actuator locked or open circuit in pump motor circuit in actuator	<ul> <li>Pump motor, relay and battery</li> <li>Wire harness, connector and ground bolts or actuator pump motor circuit (Include MT circuit)</li> </ul>
Always on Malfunction in E		Malfunction in ECU	• ECU









## DIAGNOSTIC CODES CLEARING

#### **CLEAR DIAGNOSTIC CODES**

- (a) Confirm that the center differential is free.
- (b) Turn the ignition switch on.
- (c) Using SST, connect terminals Tc and E<sub>1</sub> of the check connector.

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HINT: Keep the vehicle stopped vehicle speed 0 km/h (0 mph).

(d) Clear the diagnostic codes stored in ECU by depressing the brake pedal 8 or more times within 3 seconds.

(e) Check that the warning light shows the normal code.

(f) Remove the SST from terminals Tc and Ei of the check connector.

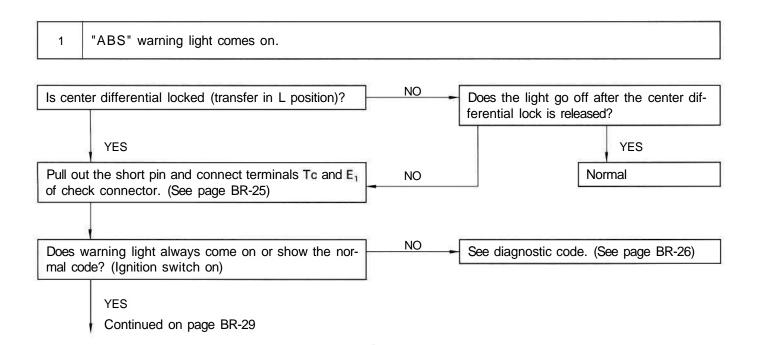
SST 09843-18020

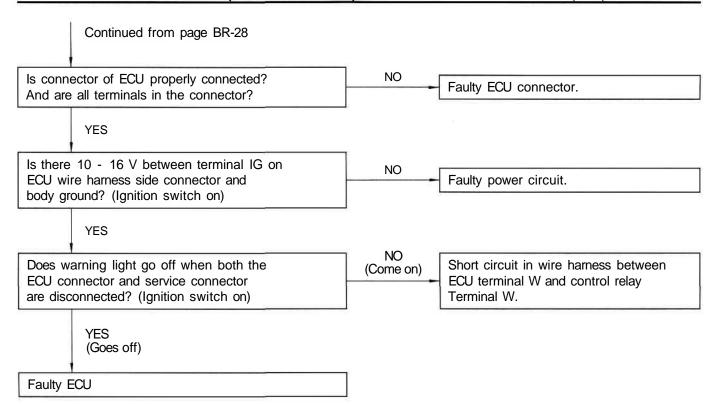
(g) Check that the warning light goes off.

### **TROUBLESHOOTING**

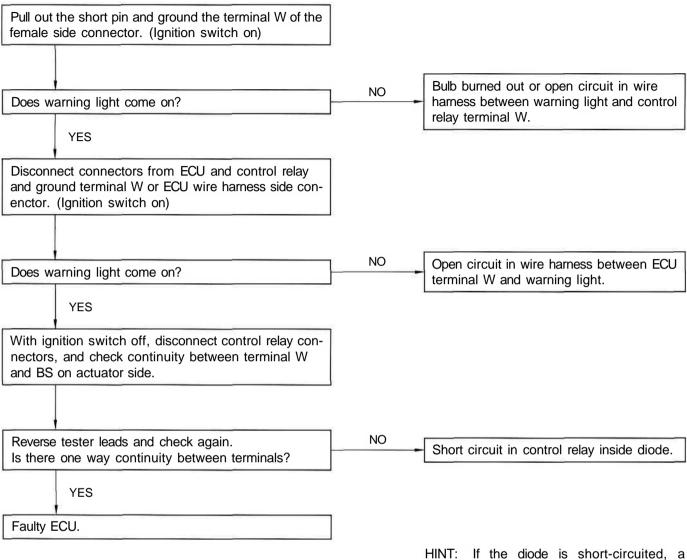
Problem		No.
"ABS" warning light	Always comes on after ignition switch is turned on.	1
	Does not come on for 3 seconds after ignition switch on.	2
	Goes on and off.	3
	Comes on while running.	1
	Does not light up when the transfer is in L (center differential lock) position.	6
Brake condition	Brakes pull.*	4
	Braking inefficient.*	4
	ABS operates at ordinary braking.	4
	ABS operates just before stopping at ordinary braking.	4
	Brake pedal pulsates abnormally while ABS is operating.	4
	Skidding noise occurs while ABS operating. (ABS operates inefficiently)	5
	When the transfer is in L (center differential lock) position, the ABS operates.	6

<sup>\*</sup> Also check the parts of the brake system (brake cylinders, pads, hydraulic lines, etc.) not specifically part of the ABS.



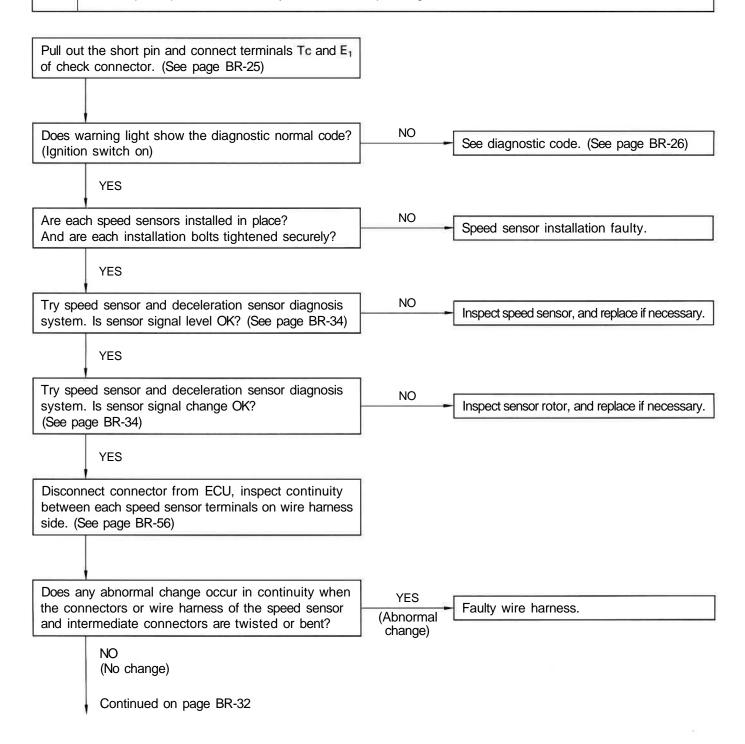


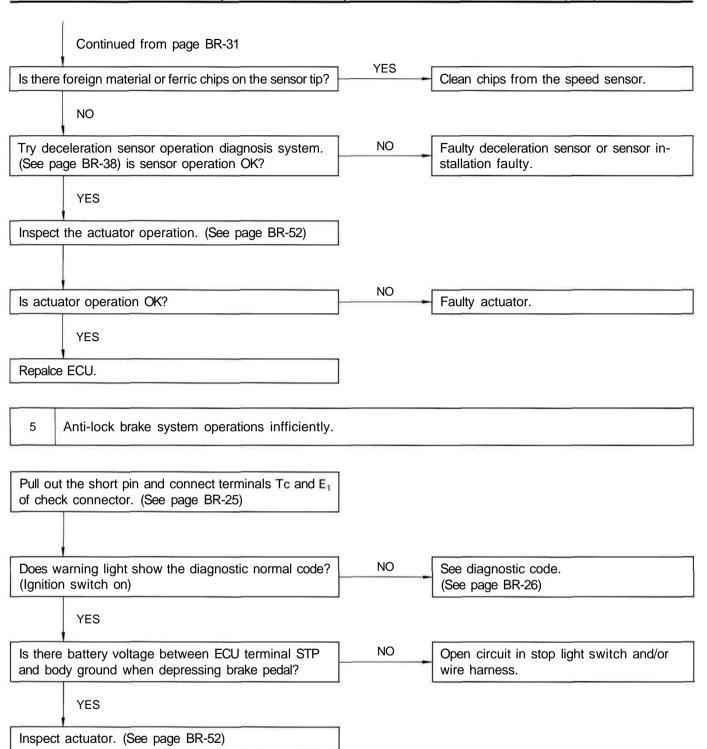
2 "ABS" warning light does not come on for 3 seconds after ignition switch on.



malfunction at ECU terminal W will occur. When inspecting the terminal, connect the ECU connector, and disconnect actuator connectors and check connector. Then turn the ignition switch on, and check that the warning light goes on. If it does, the ECU terminal is OK.

- 3 "ABS" warning light comes on and off.
  - Check for short circuit in wire harness between terminal Tc and E1 of check connector.
    - Brakes pull.
    - Braking inefficient.
  - 4 ABS operates at ordinary braking.
    - ABS operates just before stopping at ordinary braking.
    - Brake pedal pulsates abnormally while ABS is operating.





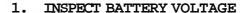
 Does not light up when the transfer is in L position. 6 • When the transfer is in L position, the ABS operates. NO When the transfer is in L position, does the center dif-· Open circuit in center differential lock inferential lock indicator light come on? dicator switch or wire harness. Faulty center differential lock. YES When the ECU connector is disconnected, is there con-NO tinuity between the body and terminal EX1 on the vehi-Open circuit in wire harness. cle wire harness side? YES Replace ECU.

# SPEED SENSOR AND DECELERATION SENSOR DIAGNOSIS SYSTEM

#### **DIAGNOSIS SYSTEM INSPECTION**

#### **PRECAUTION**

While checking the speed sensor diagnosis system, ABS does not operate and brake system operates as normal brake system.



Inspect that the battery voltage is about 12 V.

#### 2. CHECK THAT WARNING LIGHT TURNS ON

- (a) Turn the ignition switch on.
- (b) Check that the "ABS" warning light turns on for 3 seconds.
  If not, inspect and repair or replace the fuse, bulb and wire harness.
- (c) Check that the "ABS" warning light turns off.
- (d) Turn the ignition switch off.

#### 3. PERFORM FOLLOWING STEPS

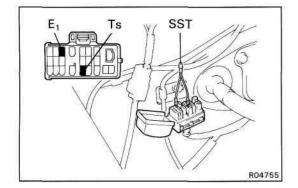
(a) Using SST, connect terminals Ts and E<sub>1</sub> of the check connector in engine room.

SST 09843-18020

(b) Start the engine.

R04751

R05599

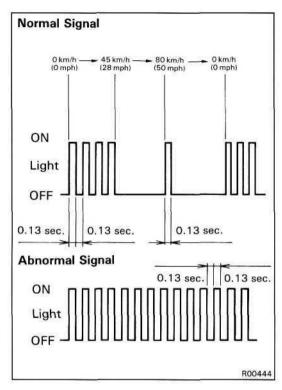


0.12s 3s 0.12s (c) Check that the warning light blinks about 4 times every 1 second as shown.

# 0.12s 0.12s 0.12s

#### 4. INSPECT DECELERATION SENSOR OPERATION

- (a) Drive the vehicle straight ahead at about 20 km/h (1 2.4 mph) or more, depress the brake pedal a little strong.
- (b) Check that the warning light turns on while braking.

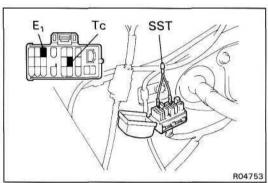


#### 5. INSPECT SPEED SENSOR SIGNAL CHANGE

- (a) Drive the faster than 45 km/h (28 mph) for several seconds.
- (b) Check the warning light signal.If the warning light signal is abnormal, perform the steps 6 and 7.

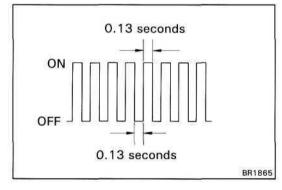
#### HINT:

- If the deceleration sensor operation in step 4 does not occur, an abnormal signal is output.
- The high-speed check is possible at 80 km/h (50 mph) or highter.



#### 6. READ DIAGNOSTIC CODE

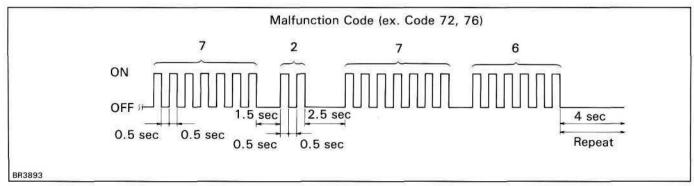
- (a) Stop the vehicle, and warning light will being to blink.
- (b) Using SST, connect the terminals Tc and  $E_1$  of check connector.



(c) Read the number of blinks of the ABS warning light. (See page BR-37)

HINT: If normal, the warning light blinks about 4 times every 1 second.

If two or more malfunctions are indicated at the same time, the smallest numbered code will be displayed first.



#### 7. REPAIR MALFUNCTIONING PARTS

Repair or replace the malfunctioning parts.

HINT: When repairing or replacing parts, turn the ignition switch to OFF.

#### 8. REMOVE SST

Remove the SST from terminals Tc, Ts and  $E_1$  of the check connector.

SST 09843-18020

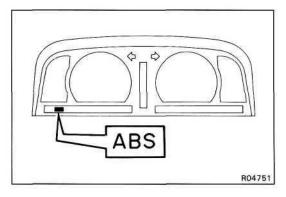
### DIAGNOSTIC CODE

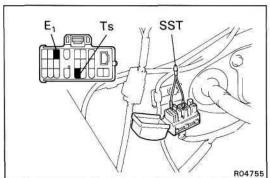
Code No.	Light Pattern	Diagnosis	Malfunctioning Part
	ON MUMMMMMM OFF MAISON	All speed sensors and sensor rotors are normal	
71		Low voltage of front right speed sensor signal	<ul><li>Front right speed sensor</li><li>Sensor installation</li></ul>
72		Low voltage of front left speed sensor signal	<ul> <li>Front left speed sensor</li> <li>Sensor installation</li> </ul>
73		Low voltage of rear right speed sensor signal	<ul> <li>Rear right speed sensor</li> <li>Sensor installation</li> </ul>
74		Low voltage of rear left speed sensor signal	<ul> <li>Rear left speed sensor</li> <li>Sensor installation</li> </ul>
75		Abnormal change of front right speed sensor signal	• Front right sensor rotor
92		Abnormal change of front left speed sensor signal	• Front left sensor rotor
77		Abnormal change of rear right speed sensor signal	Rear right sensor rotor
78		Abnormal change of rear left speed sensor signal	Rear left sensor rotor
79	THE THE STATE OF T	Deceleration sensor is faulty	Deceleration sensor     Sensor installation

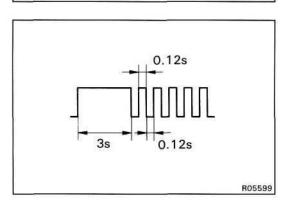
# DECELERATION SENSOR OPERATION DIAGNOSIS SYSTEM

#### **PRECAUTION**

While checking the deceleration sensor operating diagnosis system, the Anti-lock Brake System does not work and brake system works as normal brake system.







## DIAGNOSIS SYSTEM INSPECTION

INSPECT BATTERY VOLTAGE
 Inspect that the battery voltage is about 12 V.

#### 2. CHECK THAT WARNING LIGHT TURNS ON

- (a) Turn the ignition switch to ON.
- (b) Check that the "ABS" warning light turns on for about 3 seconds.

If not, inspect and repair or replace the fuse, bulb and wire harness.

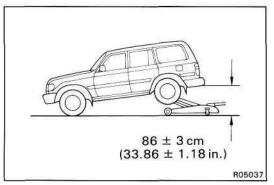
- (c) Check that the "ABS" warning light turns off.
- (d) Turn the ignition switch to OFF.

#### 3. PERFORM FOLLOWING STEPS

(a) Using SST, connect the terminal Ts to E<sub>1</sub> of the check connector.

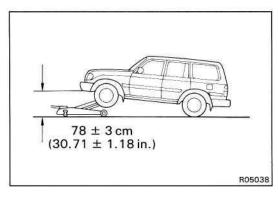
SST 09843-18020

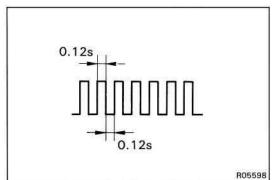
(b) Check that the warning light blinks about 4 time every 1 second when 3 seconds after the engine is started.



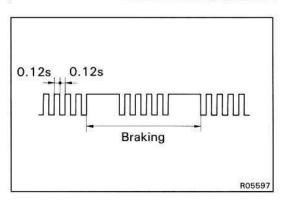
#### 4. INSPECT SENSOR DETECTION POINT

- (a) Jack up the rear side of the vehicle slowly as shown.
  - HINT: When measuring the height, measure at the center of the lower body of the vehicle.
- (b) Check that the warning light does not turn on. If the warning light turns on, inspect the deceleration sensor installation. And if the sensor installation is OK, replace the deceleration sensor.
- (c) Jack down the vehicle slowly.





0.12s
0.12s
0.12s



- (d) Jack up the front side of the vehicle slowly as shown.
  HINT: When measuring the height, measure at the center of the lower body of the vehicle.
- (e) Check that the warning light does not turn on. If the warning light turns on, inspect the deceleration sensor installation. And if the sensor installation is OK, replace the deceleration sensor.
- (f) Jack down the vehicle slowly.

#### 5. INSPECT SENSOR OPERATION

- (a) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, lightly depress the brake pedal.
- (b) Check that there is no change in the warning light pattern.
- (c) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, depress the brake pedal a little strong.
- (d) Check that the warning light turns on while braking.

- (e) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, depress the brake pedal strongly.
- (f) Check that the warning light pattern changes while braking as shown.

If the operation is not as specified, inspect the deceleration sensor installation. And if the sensor installation is OK, replace the deceleration sensor.

#### 6. PERFORM FOLLOWING STEPS

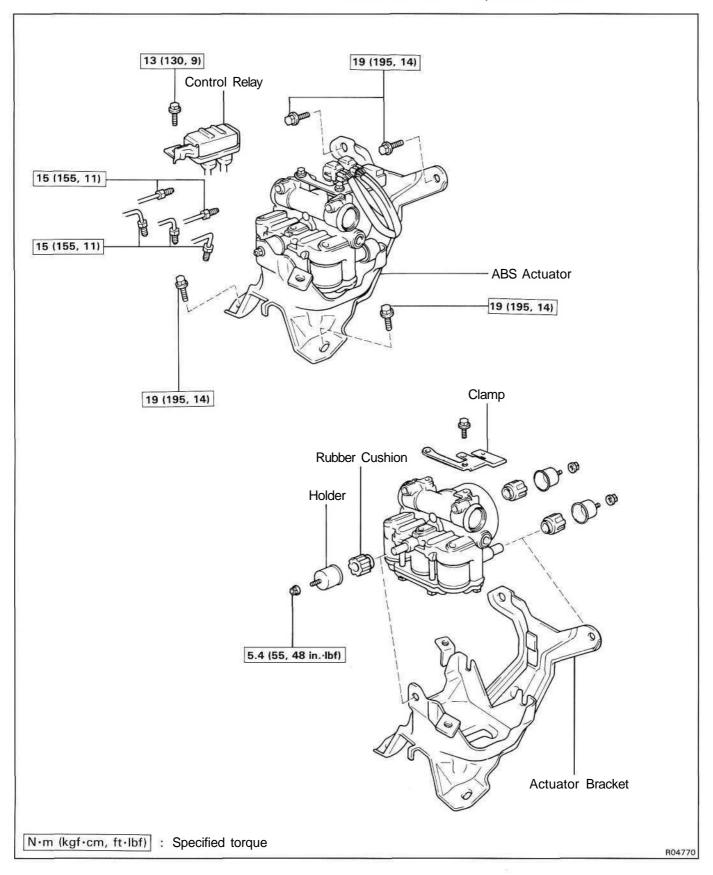
- (a) Stop the vehicle and turn the ignition switch to OFF.
- (b) Remove SST from the terminals Ts and E<sub>1</sub> of the check connector.

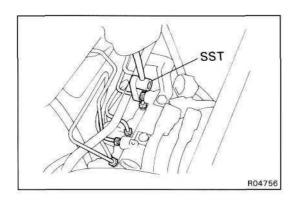
SST 09843-18020

#### **ABS ACTUATOR**

# ABS ACTUATOR REMOVAL AND INSTALLATION

Remove and install the parts as shown.





## MAIN POINTS OF REMOVAL AND INSTALLATION

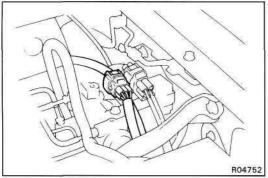
1. DISCONNECT AND CONNECT BRAKE LINES

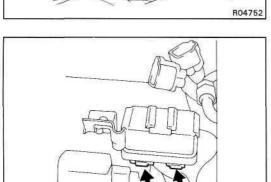
Using SST, disconnect and connect the brake lines from/to the ABS actuator.

SST 09023-00100

Torque: 15 Nm (155 kgfcm, 11 ftlbf)

2. BLEED BRAKE SYSTEM (See pub No.RM184E, page BR-7)





R05331

#### ABS ACTUATOR INSPECTION

INSPECT BATTERY VOLTAGE

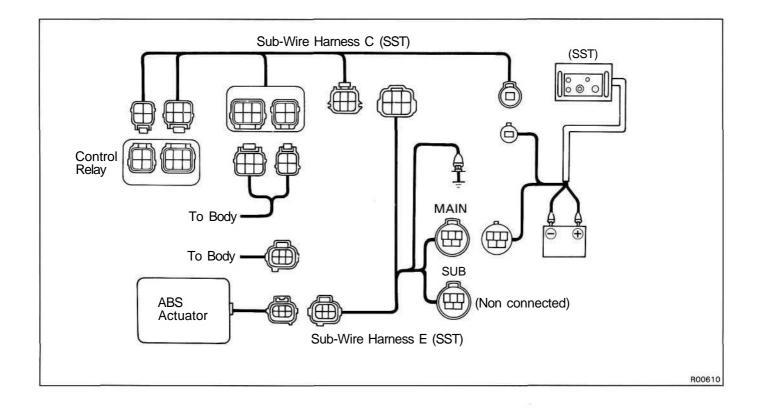
Battery voltage:

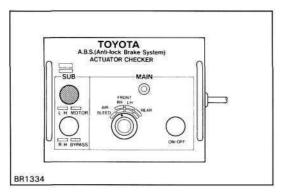
10 - 14.5 V

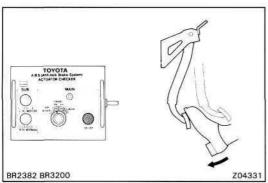
- **DISCONNECT CONNECTORS** 2.
- (a) Disconnect the connector from the actuator.
- Remove the control relay from the actuator bracket.
- Disconnect the two connectors from the control relay. (c)

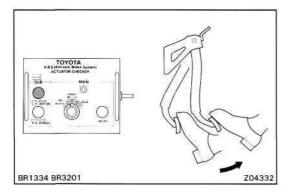
#### 3. CONNECT ACTUATOR CHECKER (SST) TO ACTUATOR

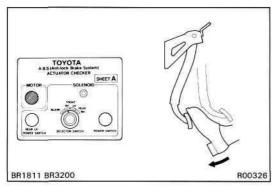
- Connect the actuator checker (SST) to the actuator, control relay and body side wire harness through the subwire harness C and E (SST) as shown.
  - SST 09990-00150, 09990-00200, 09990-00210
- (b) Connect the red cable of the checker to the battery positive (+) terminal and black cable to the negative (—) terminal. Connect the black cable of the sub-wire harness to the battery negative (—) terminal or body ground.

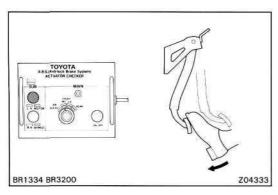












#### 4. INSPECT BRAKE ACTUATOR OPERATION

- (a) Start the engine, and run it at idle.
- (b) Turn the selector switch of the actuator checker to "FRONT RH" position.
- (c) Push and hold in the MOTOR SWITCH for a few seconds.
- (d) Depress the brake pedal and hold it until the step (g) is completed.
- (e) Push the POWER SWITCH, and check that the brake pedal does not go down.

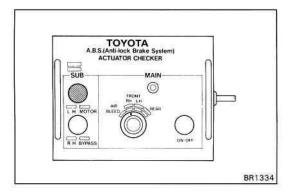
NOTICE: Do not keep the POWER SWITCH pushed down for more than 10 seconds.

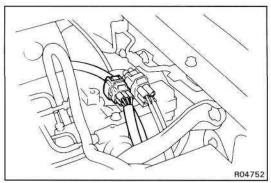
- (f) Release the switch, and check that the pedal goes down.
- (g) Push and hold in the SUB MOTOR switch for a few seconds, and check that the pedal returns.
- (h) Release the brake pedal.

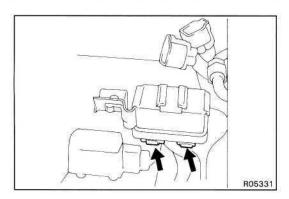
- (i) Push and hold in the SUB MOTOR switch for a few seconds.
- (j) Depress the brake pedal and hold it for about 1 5 seconds. As you hold the pedal down, push the MOTOR SWITCH for a few seconds. Check that the brake pedal does not pulsate.
- (k) Release the brake pedal.

#### 5. INSPECT FOR OTHER WHEELS

- (a) Turn the selector switch to "FRONT LH" position.
- (b) Repeating (c) to (j) of the step 4, check the actuator operation similarly.
- (c) Similarly, inspect "REAR" position.







#### 6. PUSH SUB MOTOR SWITCH

- (a) Push and hold in the SUB MOTOR switch for a few seconds.
- (b) Stop the engine.

## 7. DISCONNECT ACTUATOR CHECKER (SST) FROM ACTUATOR

Disconnect the actuator checker (SST) and sub-wire harness (SST) from the actuator, control relay and body side wire harness.

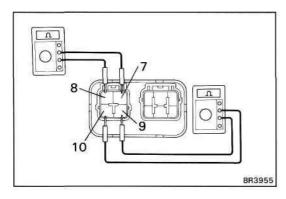
SST 09990-00150, 09990-00200, 09990-00210

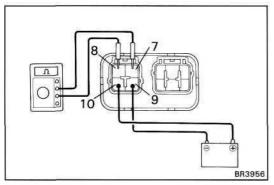
#### 8. CONNECT CONNECTORS

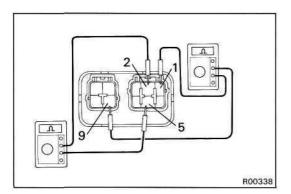
(a) Connect the two connectors to the control relay.

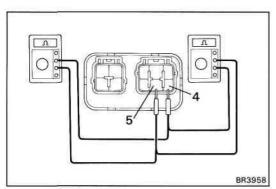
- (b) Connect the connector to the actuator.
- (c) Install the control relay to the actuator bracket.

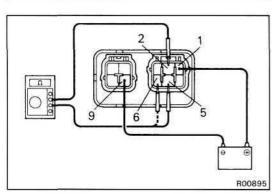
## 9. CLEAR DIAGNOSTIC CODES (See page BR-27)











# CONTROL RELAY INSPECTION

#### 1. INSPECT CONTINUITY OF MOTOR RELAY CIRCUIT

- (a) Check that there is continuity between terminals 9 and 10.
- (b) Check that there is no continuity between terminals 7 and 8.If continuity is not as specified, replace the relay.

#### 2. INSPECT OPERATION OF MOTOR RELAY CIRCUIT

- (a) Connect the positive (+) lead from the battery to terminal 10 and negative (—) lead to terminal 9.
- (b) Check that there is continuity between terminals 7 and 8. If operation is not as specified, replace the relay.

#### 3. INSPECT CONTINUITY OF SOLENOID RELAY CIRCUIT

- (a) Check that there is continuity between terminals 1 and 9.
- (b) Check that there is no continuity between terminals 2 and 5.

- (c) Connect the positive lead from the ohmmeter to terminal 5 and connect negative lead to terminal 4.
- (d) Check that there is continuity between terminals.
- (e) Connect the two leads in reverse, and check that there is no continuity between terminals.

If continuity is not as specified, replace the relay.

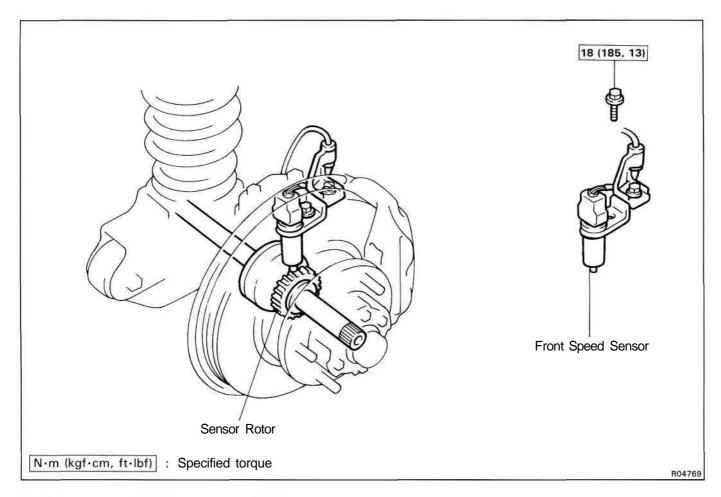
HINT: For the different type ohmmeter, there is no continuity for step (d), and there is continuity for step (e).

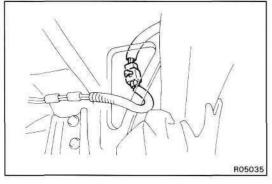
#### 4. INSPECT OPERATION OF SOLENOID RELAY CIRCUIT

- (a) Connect the positive (+) lead from the battery to terminal 1 and negative (—) lead to terminal 9.
- (b) Check that there is continuity between terminals 2 and 5.
- (c) Check that there is no continuity between terminals 2 and 6.

If operation is not as specified, repalce the relay.

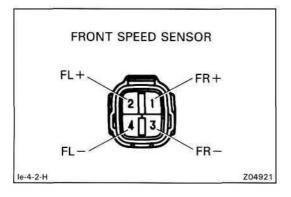
# FRONT SPEED SENSOR COMPONENTS





#### FRONT SPEED SENSOR INSPECTION

- 1. INSPECT SPEED SENSOR
- (a) Disconnect the speed sensor connector.

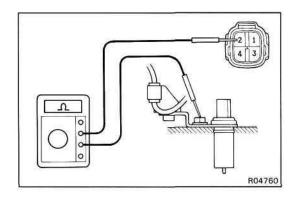


(b) Measure the resistance between terminals FR+, FR— and FL+, FL-.

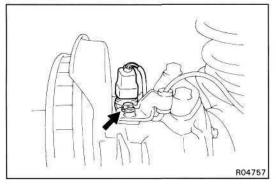
#### Resistance:

0.87 - 1.27 kQ

If resistance value is not as specified, replace the sensor.



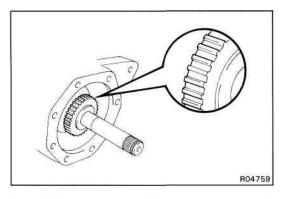
- (c) Check that there is no continuity between each terminal and sensor body.If there is continuity, replace the sensor.
- (d) Connect the speed sensor connector.



#### 2. INSPECT SENSOR INSTALLATION

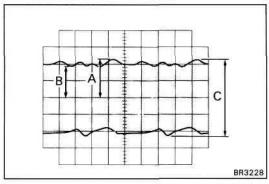
Check that the sensor installation bolt is tightened properly. If not, tighten the bolt.

Torque: 18 Nm (184 kgf-cm, 13 ft-lbf)



#### 3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

- (a) Remove the axle hub with disc. (See pub No. RM184E, page SA-16)
- (b) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth.
- (c) Install the axle hub with disc. (See pub No. RM184E, page SA-19)

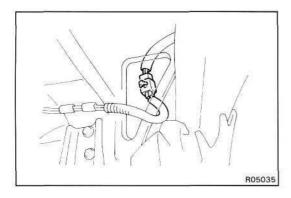


# FRONT SPEED SENSOR AND SENSOR ROTOR SERRATIONS INSPECTION (REFERENCE)

#### INSPECT FRONT SPEED SENSOR AND SENSOR ROTOR SER-RATIONS BY USING AN OSCILLOSCOPE

- (a) Connect an oscilloscope to the speed sensor connector.
- (b) Run the vehicle at 20 km/h (12.4 mph), and inspect speed sensor output wave.
- (c) Check that C is 0.5 V or more.If not as specified, replace the speed sensor.
- (d) Check that B is 50 % or more of A.

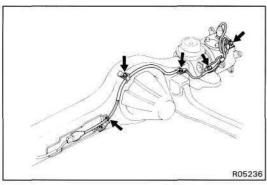
  If not as specified, replace the sensor rotor.



#### FRONT SPEED SENSOR REMOVAL

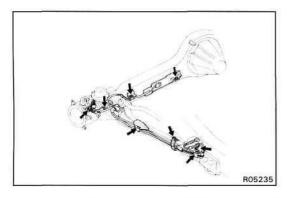
HINT: When replacing the sensor or sensor harness, replace the sensor and sensor harness together as a set. Disconnect the speed sensor connector.

1. DISCONNECT SPEED SENSOR CONNECTOR

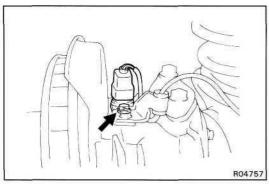


#### 2. REMOVE SPEED SENSOR

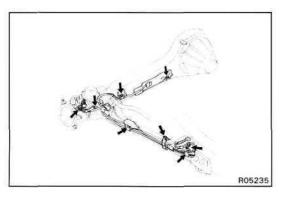
(a) Remove the four clamp bolts holding the sensor harness RH from the axle housing.



(b) Remove the eight clamp bolts holding the sensor harness LH from the axle housing and leading arm.



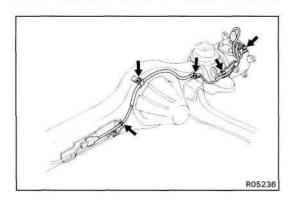
(c) Remove the speed sensor LH and RH from the steering knuckle.



#### FRONT SPEED SENSOR INSTALLATION

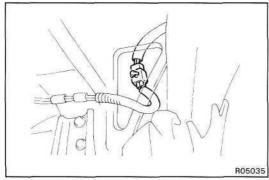
- 1. INSTALL SPEED SENSOR WIRE HARNESS
- (a) Install the sensor harness LH with the clamps and bolts in place.

Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)



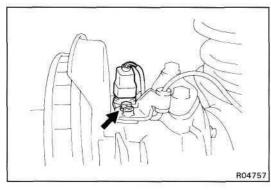
(b) Install the sensor harness RH with the clamps and bolts in place.

Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)



(c) Connect the speed sensor connector.

Torque: 18 N-m (185 kgfcm, 13 ft-lbf)



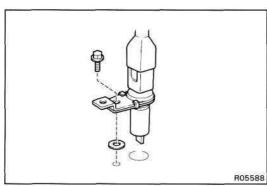
#### 2. INSTALL SPEED SENSOR

HINT: When replacing the sensor, adjust the air gap.

(a) Install the speed sensor LH and RH to the steering knuckle.

Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)

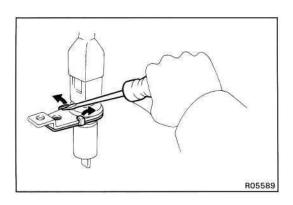
(b) Connect the connector.



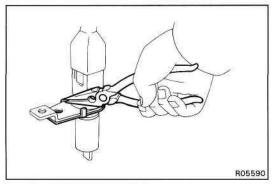
## FRONT SPEED SENSOR AIR GAP ADJUSTMENT

#### FRONT SPEED SENSOR AIR GAP ADJUSTMENT

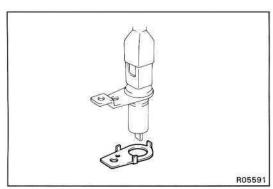
- (a) Install the speed sensor and 0.2 mm spacer to the steering knuckle.
- (b) Try speed sensor and deceleration sensor diagnosis system.
- (c) If diagnosis code 71 or 72 is not displayed, remove the 0.2 mm spacer and install the speed sensor to the steering knuckle.



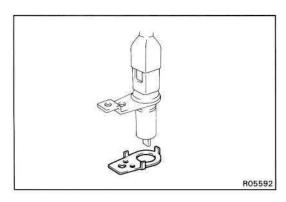
- (d) If diagnosis code 71 or 72 is displayed, replace the 0.5 mm spacer inserted in the speed sensor with a 0.35 mm spacer.
  - (1) Using a screwdriver to remove the 0.5 mm spacer.



- (2) Using needle-nose pliers to install the 0.35 mm spacer.
- (e) Repeating (a) and (b) to the step 1.
- (f) If diagnosis code 71 or 72 is not displayed, remove the 0.2 mm spacer and install the speed sensor to the steering knuckle.

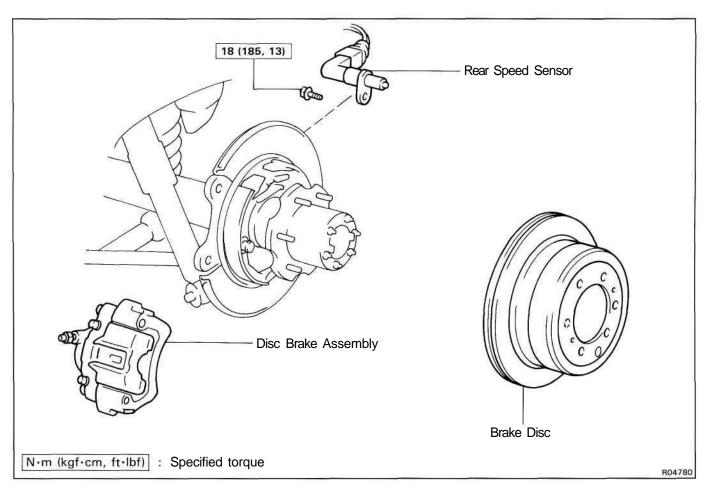


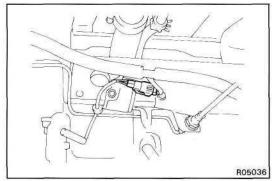
- (g) If diagnosis code 71 or 72 is displayed, replace the 0.35 mm spacer with a 0.25 mm spacer.
- (h) Repeating (a) and (b) to the step 1.
- If diagnosis code 71 or 72 is not displayed, remove the 0.2 mm spacer and install the speed sensor to the steering knuckle.



(j) If diagnosis code 71 or 72 is displayed, replace the 0.25 mm spacer with a 0.1 5 mm spacer and install the speed sensor to the steeing knuckle without using the 0.2 mm spacer.

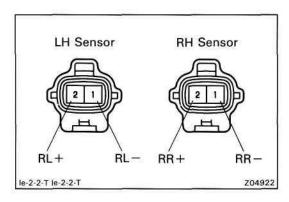
# REAR SPEED SENSOR COMPONENTS





#### REAR SPEED SENSOR INSPECTION

- 1. INSPECT SPEED SENSOR
- (a) Disconnect the speed sensor connector.

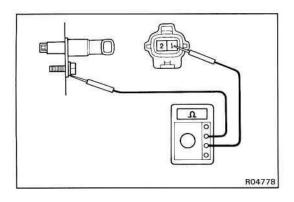


(b) Measure the resistance between terminals.

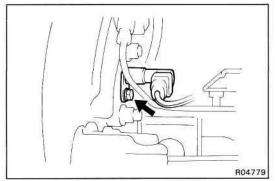
#### Resistance:

0.7 - 1.1 kQ

If resistance value is not as specified, replace the sensor.



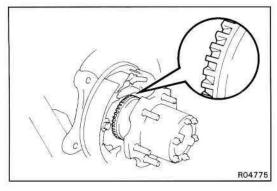
- (c) Check that there is no continuity between each terminal and sensor body.If there is continuity, replace the sensor.
- (d) Connect the speed sensor connector.



#### 2. INSPECT SENSOR INSTALLATION

Check that the sensor installation bolt is tightened properly. If not, tighten the bolt.

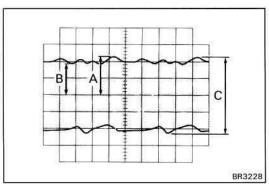
Torque: 18 N-m (185 kgf-cm, 13 ftlbf)



#### 3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

- (a) Remove the brake disc.(See pub No. RM184E, page BR-57)
- (b) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth.
- (c) Install the brake disc.(See pub No. RM184E, page BR-64)

NOTICE: To prevent damage to the serrations, do not strike the axle hub.



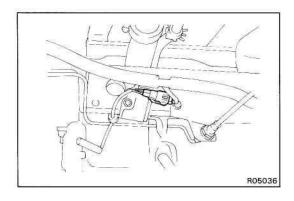
# REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS INSPECTION (REFERENCE)

### INSPECT REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS BY USING AN OSCILLOSCOPE

- (a) Connect an oscilloscope to the speed sensor connector.
- (b) Run the vehicle at 20 km/h (12.4 mph), and inspect speed sensor output wave.
- (c) Check that C is 0.5 V or more.

  If not as specified, replace the speed sensor.
- (d) Check that B is 50 % or more of A.

  If not as specified, replace the rear axle hub.

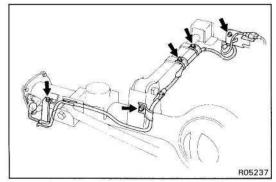


#### **REAR SPEED SENSOR REMOVAL**

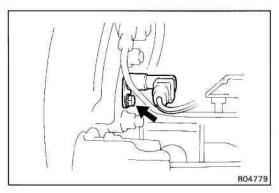
HINT: When replacing the sensor or sensor harness, replace the sensor and sensor harness together as a set.

#### 1. DISCONNECT SPEED SENSOR CONNECTOR

(a) Disconnect the speed sensor connector.

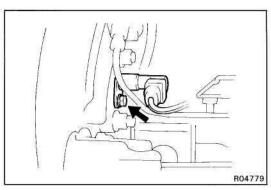


(b) Remove the five clamp bolts holding the sensor wire harness from the suspension arm and frame.



#### 2. REMOVE SPEED SENSOR

Remove the speed sensor from the axle end.

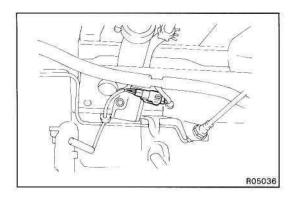


#### REAR SPEED SENSOR INSTALLATION

1. INSTALL SPEED SENSOR

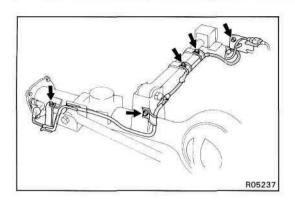
Install the speed sensor to the axle end.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

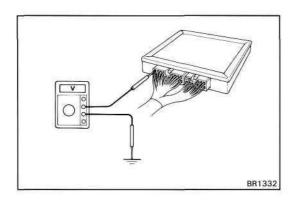


#### 2. CONNECT SPEED SENSOR CONNECTOR

(a) Connect the speed sensor connector.



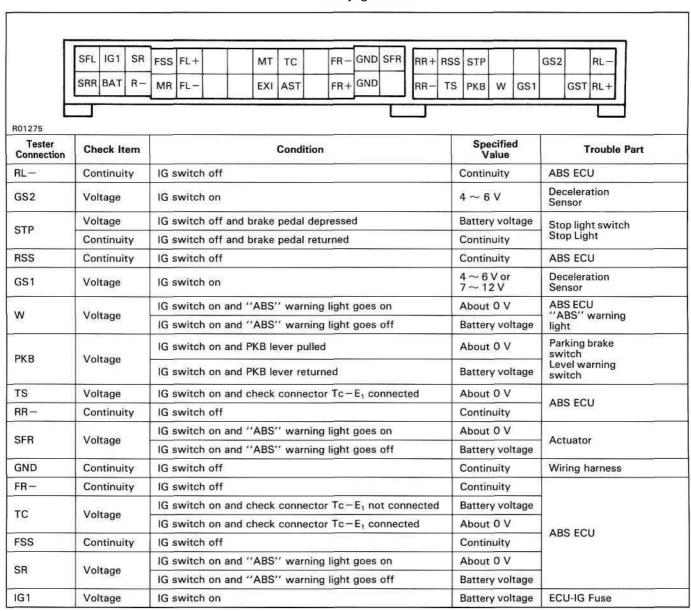
- (b) Install the sensor harness with the clamps and bolts in place.
- 3. INSPECT SPEED SENSOR AND DECELERATION SENSOR DIAGNOSIS SYSTEM



# ANTI-LOCK BRAKE SYSTEM CIRCUIT

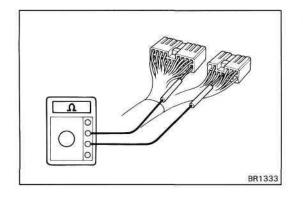
#### SYSTEM CIRCUIT INSPECTION

- 1. INSPECT SYSTEM CIRCUIT WITH CONNECTOR CON-NECTED
- (a) Remove the ABS ECU.
- (b) Using a voltmeter with high impedance (10 kfl/V minimum), measure the voltage at each terminal and body ground.



Tester Connection	Check Item	Condition	Specified Value	Trouble Part	
CEL	Maleana	IG switch on and "ABS" warning light goes on	About 0 V		
SFL Voltage		IG switch on and "ABS" warning light goes off	Battery voltage	*************	
107		IG switch on and "ABS" warning light goes on	About 0 V	Actuator	
AST	Voltage	IG switch on and "ABS" warning light goes off	Battery voltage		
EXI	Voltage	IG switch on and center differential lock indicator light goes off	Battery voltage	GAUGE Fuse	
FL-	Continuity	IG switch off	Continuity	ARC FOLL	
R- Continuity		IG switch off	Continuity	ABS ECU	
BAT	Voltage IG switch off Battery voltage		DOME Fuse		
CDD	Valence	IG switch on and "ABS" warning light goes on	About 0 V	A	
SRR	Voltage	IG switch on and "ABS" warning light goes off	Battery voltage	Actuator	

If the circuit is not as specified, check and repair or replace the trouble part shown in the table above.



## 2. INSPECT SYSTEM CIRCUIT WITH CONNECTOR DISCONNECTED

(a) Disconnect the connectors from the ECU, inspect at the wire harness side connector.

Tester Connection	Check Item	Specified Value	Trouble Part	Tester Connection	Check Item	Specified Value	Trouble Part
RR+↔RR-	Resistance	*0.7 ~1.1 kΩ	Rear RH speed sensor	SFL↔AST	Resistance	*About 6 Ω	Actuator
RL+↔RL-	Resistance	*0.7 ~1.1 kΩ	Rear LH speed sensor	FR+↔FR-	Resistance	*0.87 ~1.27 kΩ	Front RH speed sensor
SFR↔AST	Resistance	*About 6 Ω	Actuator	AST → Body ground	Resistance	*About 5 Ω	Actuator
MT↔ Body ground	Continuity	Continuity	Actuator	MR++R-	Resistance	*55.8 ~68.2 Ω	Control relay
FL+↔FL-	Resistance	*0.87 ~1.27 kΩ	Front LH speed sensor	SRR↔AST	Resistance	*About 6 Ω	Actuator
SR↔R-	Resistance		Control relay				

\*: 20°C (68°F)

If the circuit is not as specified, check and repair or replace the trouble part shown in the table above.

(b) Connect the connectors, and install the ECU in place.

# SERVICE SPECIFICATIONS SERVICE DATA

Brake pedal height from asphalt sheet	167.5 - 177.5 mm (6.59 - 6.99 in.)
Brake pedal freeplay	3 - 6 mm (0.12 - 0.24 in.)
Brake pedal reserve distance at 490 N (50 kgf, 110.2 lbf)	More than 59 mm (2.32 in.)
Brake booster push rod to piston clearance (W/SST)	0 mm (0 in.)

#### TORQUE SPECIFICATIONS

Part tightened	N⋅m	kgf⋅cm	ft·lbf
Master cylinder × Piston stopper bolts	10	100	7
Master cylinder × Reservoir	1.7	17.5	15.2 inlbf
Master cylinder × Brake booster	13	130	9
Brake tube union nut	15	155	11
LSP & BV Bracket × Frame	19	195	14
LSP & BV × LSP & BV Bracket	13	130	9
LSP & BV Spring × LSP & BV Bracket	18	185	13
LSP & BV Spring × Shackle No. 1	18	185	13
LSP & BV Shackle lock nut	25	250	18
LSP & BV Shackle × Shackle bracket	13	130	9
LSP & BV Shackle bracket × Rear axle housing	19	195	14
ABS actuator bracket × Body	19	195	14
Front speed sensor installation bolt	18	185	13
Rear speed sensor installation bolt	18	185	13

## **BODY ELECTRICAL SYSTEM**

#### REFER TO FOLLOWING REPAIR MANUALS:

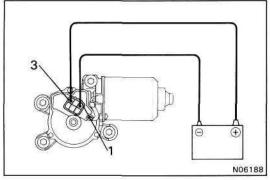
Manual Name	Pub. No.
<ul> <li>Land Cruiser (Hardtop and Canvas Top) Chassis and Body Repair Manual</li> </ul>	RM183E
<ul> <li>Land Cruiser (Station Wagon) Chassis and Body Repair Manual</li> </ul>	RM184E
<ul> <li>Land Cruiser (Hardtop, Can- vas Top and Station Wagon)</li> <li>Chassis and Body Repair</li> <li>Manual Supplement</li> </ul>	RM290E

NOTE: The following pages contain only the points which differ from the above listed manuals.

## (HARDTOP, CANVAS TOP & STATION WAGON)

WIPER AND WASHER SYSTEM	.BE-2
COMBINATION METER	BE-3
POWER SEAT CONTROL SYSTEM	.BE-2
CRUISE CONTROL SYSTEM	BE-29
EXTRA (SUB) TANK SYSTEM	.BE-50
SATELLITE NAVIGATION SYSTEM	BE-59





# NO6188

#### WIPER AND WASHER SYSTEM

## FRONT WIPER MOTOR INSPECTION

#### OPERATION AT LOW SPEED

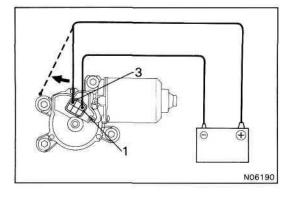
Connect the positive (+) lead from the battery to terminal 3 and negative (—) lead to terminal 1, check that the motor operates at low speed.

If operation is not as specified, replace the motor.

#### OPERATION AT HIGH SPEED

Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1, check that the moor operates at high speed.

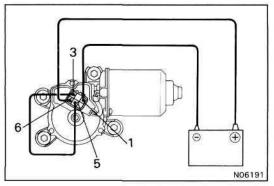
If operation is not as specified, replace the motor.



N06189

#### OPERATION, STOPPING AT STOP POSITION

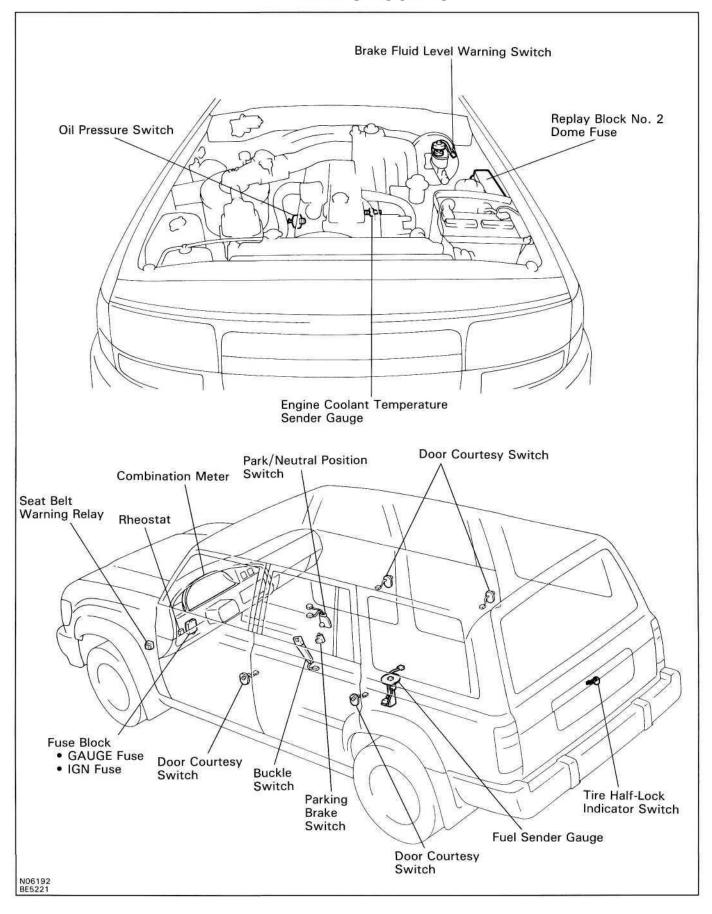
(a) Operate the motor at low speed and stop the motor operation anywhere except at the stop position by disconnecting positive (+) lead from terminal 3.



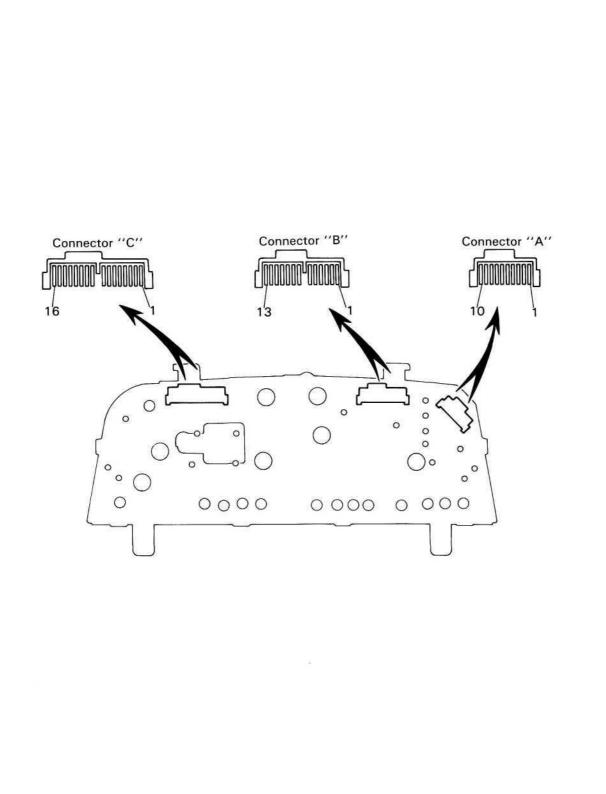
- (b) Connect terminal 3 and 5.
- (c) Connect the positive (+) lead from the battery to terminal 6 and the negative (—) lead to the terminal 1, check that the motor stops running at the stop position after the motor operates again.

If operation is not as specified, replace the motor.

# COMBINATION METER PARTS LOCATION

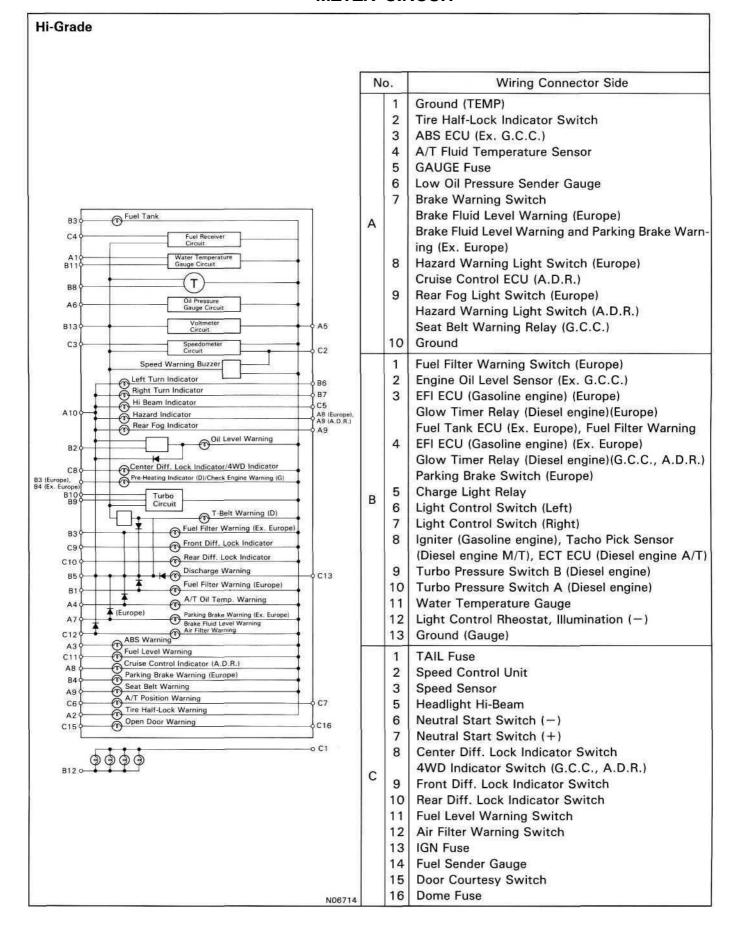


#### **METER CIRCUIT**

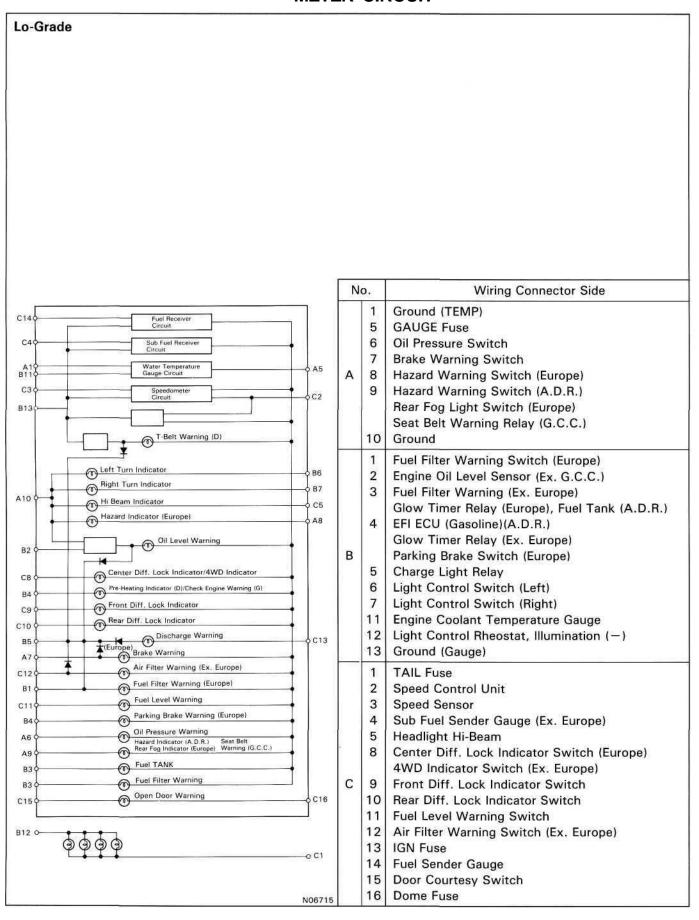


N06193

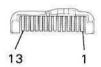
#### **METER CIRCUIT**

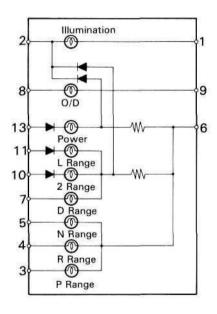


#### **METER CIRCUIT**



#### SHIFT POSITION INDICATOR





No.	Wiring Connector Side	
1	Ground	
2	TAIL Fuse	
3	Neutral Start Switch "P"	
4	Neutral Start Switch "R"	
5	Neutral Start Switch "N"	
6	Ground	
7	Neutral Start Switch "D"	
8	GAUGE Fuse	
9	O/D Switch	1
10	Neutral Start Switch "N"	
11	Neutral Start Switch "L"	į.
13	ECT SELECT Switch	

N03970 N06733

#### **TROUBLESHOOTING**

The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

Trouble	Part name	See page
Combination meter do not operate.	GAUGE Fuse     Wire Harness	-
Speedometer does not operate.	1. Speed Sensor	BE-10
Tachometer does not operate.	Tachometer     Igniter (Tacho pick sensor, ECT ECU)     Wire Harness	BE-11 - -
Fuel gauge does not operate.	<ol> <li>Receiver Gauge</li> <li>Sender Gauge</li> <li>Wire Harness</li> </ol>	BE-11 BE-12 —
Fuel level warning light does not light up.	<ol> <li>Bulb</li> <li>Fuel Level Warning Switch</li> <li>Wire Harness</li> </ol>	— ВЕ-12 —
Water temperature gauge does not operate.	<ol> <li>Receiver Gauge</li> <li>Sender Gauge</li> <li>Wire Harness</li> </ol>	BE-13 BE-13 —
Oil pressure gauge does not operate.	<ol> <li>Receiver Gauge</li> <li>Sender Gauge</li> <li>Wire Harness</li> </ol>	BE-15 BE-15 —
Voltmeter does not operate.	Receiver Gauge     Wire Harness	BE-14 -
Brake warning light does not light up.	<ol> <li>Bulb</li> <li>Brake Fluid Level Warning Switch</li> <li>Parking Brake Switch</li> <li>Wire Harness</li> </ol>	– ВЕ-16 ВЕ-16 –
Seat belt warning light does not light up.	<ol> <li>Bulb</li> <li>Seat Belt Warning Switch</li> <li>Seat Belt Warning Relay</li> <li>Wire Harness</li> </ol>	– BE-17 BE-17 –
Open door warning light does not light up.	Bulb     Door Courtesy Switch     Wire Harness	– BE-16 –
Tire half-lock warning light does not light up.	Bulb     Tire Half-Lock Indicator Switch     Wire Harness	– BE-18 –

Trouble	Part name	See page
ABS warning light does not light up.	<ol> <li>Bulb</li> <li>ABS ECU</li> <li>Wire Harness</li> </ol>	=
Meter illumination control system does not operate.	Bulb     Light Control Rheostat     Wire Harness	– ВЕ-19 –
Shift position indicator light does not light up.	Bulb     Neutral Position Switch     Wire Harness	
Engine oil level warning light does not light up.	Bulb     Engine Oil Level Sensor     Wire Harness	BE-19

#### (km/h) A.D.R., General

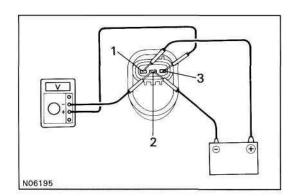
Standard ndication	Allowable range
40	36 - 44
60	54 - 66
80	72 - 88
100	90 - 110
120	108 - 132
140	126 - 154
160	144 - 176

#### (km/h) Europe, G.C.C.

Standard indication	Allowable range
20	20 - 26
40	40 - 48
60	60 - 70
80	80 - 92
100	100 - 114
120	120 - 136
140	140 - 158
160	160 - 180

### (mph) General, Europe

Standard ndication	Allowable range
20	20 - 24.5
40	40 - 46.5
60	60 - 68.5
80	80 - 90.5
100	100 - 112.5



# SPEEDOMETER SYSTEM

## **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.

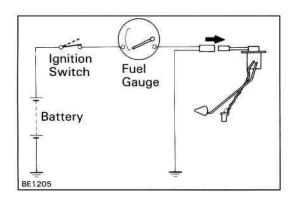
#### SPEED SENSOR INSPECTION

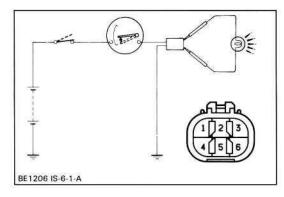
- (a) Connect the positive (+) lead from battery to terminal 1 and negative (—) lead to terminal 2.
- (b) Connect the positive (+) lead from tester to terminal 3 and negative (—) lead to terminal 2.
- (c) Revolve shaft.
- (d) Check that there is voltage changer from approx. 0 V to 11 V or more between terminal 3 and 2.

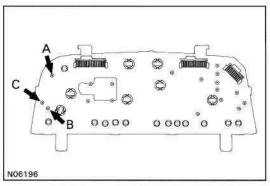
HINT: The voltage change should be 20 times per each revolution of the speed sensor shaft.

If operation is not as specified, replace the sensor.

DC 13.5 V 2	0°C (68°F) rpm
Standard Indication	Allowable range
700	630 - 770
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







# TACHOMETER SYSTEM

# TACHOMETER INSPECTION 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**

#### **FUEL RECEIVER GAUGE INSPECTION**

#### **OPERATION**

- (a) Disconnect the connector from the sender gauge.
- (b) Turn the ignition switch ON, check that the receiver gauge needle indicates EMPTY.
- (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.

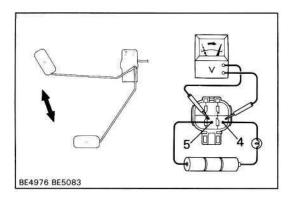
If operation is not as specified, inspect the receiver gauge resistance.

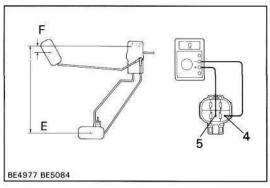
#### **RESISTANCE**

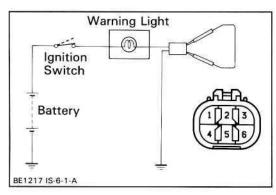
Measure the resistance between terminals.

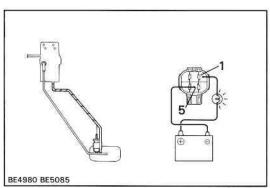
Between terminals	Resistance ( $\Omega$ )
A - B	85.5 — 105.5
A - C	126 - 150
C - B	*90 - 110

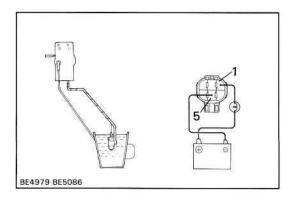
If resistance value is not as specified, replace the receiver gauge.











#### **FUEL SENDER GAUGE INSPECTION**

#### **OPERATION**

- (a) Connect a series of three 1.5 volts dry cell batteries.
- (b) Connect the positive (+) lead from the dry cell batteries 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 $(\Omega)$	
F approx. 15 (0.59)	approx. 3	
E approx. 200 (7.87)	approx. 110	

If resistance value is not as specified, replace the sender gauge.

# **FUEL LEVEL WARNING SYSTEM**

### **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.

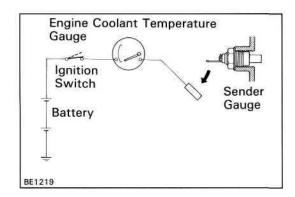
If the warning light does not light up, test the bulb.

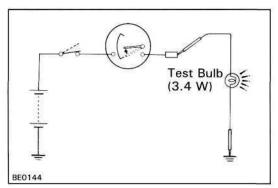
### **INSPECT WARNING SWITCH**

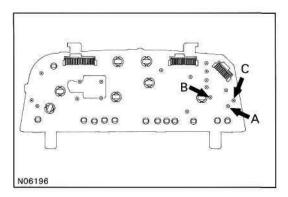
(a) Apply battery voltage between terminals 1 and 5 through a 3.4 watts test bulb, check that the bulb lights up.

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 specified, replace the sender gauge.







## WATER TEMPERATURE GAUGE SYSTEM

# **WATER TEMPERATURE RECEIVER GAUGE INSPECTION**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 ( $\Omega$ )
A - B	71 - 79
A - C	117 - 141
B - C	185 - 215

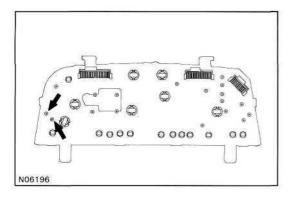
HINT: Connect the test leads so that the current from the ohmmeter can flow according to the above order. This circuit include the diode.

If resistance value is not as specified, replace the receiver gauge.

# **VOLTMETER SYSTEM**

# **INSPECT VOLTMETER (ON-VEHICLE)**

Compare the tester and voltmeter indications. If error is excessive, replace the voltmeter.



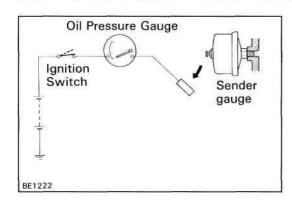
# RESISTANCE

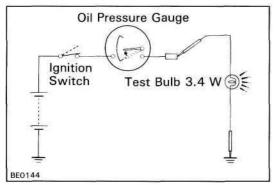
Measure the receiver gauge resistance between terminals.

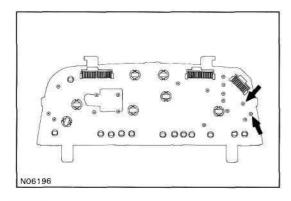
Resistance: 90 - 110 Q

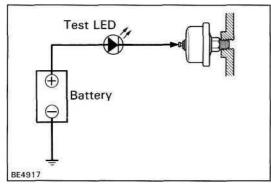
If resistance value is not as specified, replace the receiver gauge.

HINT: This resistance include fuel receiver gauge resistance.









# OIL PRESSURE GAUGE SYSTEM

# **OIL PRESSURE RECEIVER GAUGE INSPECTION**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**

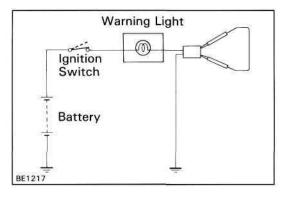
Measure the receiver gauge resistance between terminals.

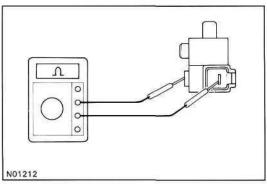
Resistance: 22 - 28 Q

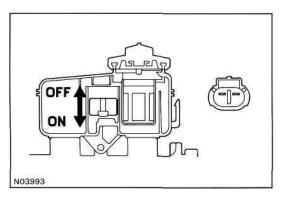
If resistance value is not as specified, replace the receiver gauge.

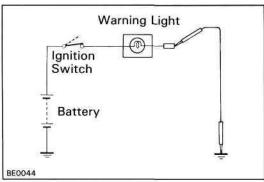
# OIL PRESSURE SENDER GAUGE INSPECTION INSPECT SENDER GAUGE

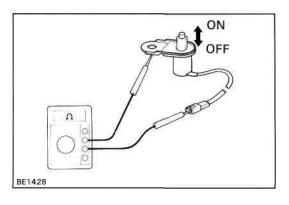
- (a) Disconnect the connector from the sender gauge.
- (b) Apply battery voltage to the sender gauge terminal through a test LED.
- (c) Check that the bulb does not light when the engine is stopped.
- (d) Check that the LED flashes when the engine is running. The number of flashed should vary with engine speed.
  - If operation is not as specified, replace the sender gauge.











# **BRAKE WARNING SYSTEM**

# BRAKE WARNING LIGHT INSPECTION 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.

# PARKING BRAKE SWITCH INSPECTION INSPECT 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 INSPECTION INSPECT SWITCH

- (a) Remove the reservoir tank cap and strainer.
- (b) Disconnect the connector.
- (c) Check that there is no continuity between terminals with the switch OFF (float up).
- (d) Use syphon, etc. to take fluid out of the reservoir tank.
- (e) Check that there is continuity between terminals with the switch ON (float down).
- (f) Pour the fluid back in the reservoir tank.If operation is not as specified, replace the switch.

## OPEN DOOR WARNING SYSTEM

# OPEN DOOR WARNING INSPECTION INSPECT WARNING LIGHT

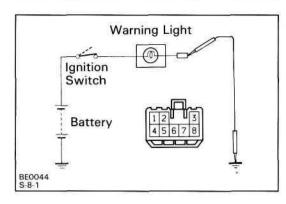
- (a) Disconnect the connector form the door courtesy switch and ground terminal on the wire harness side connector.
- (b) Turn the ignition switch ON, check that the warning light lights up.

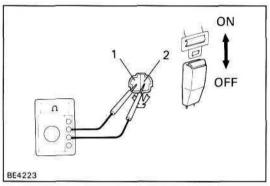
If the warning light does not light up, test the bulb.

# DOOR COURTESY SWITCH INSPECTION 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

# SEAT BELT WARNING INSPECTION 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.

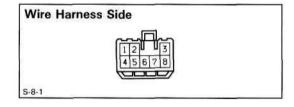
# SEAT BELT BUCKLE SWITCH INSPECTION INSPECT SWITCH

- (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.

# DOOR COURTESY SWITCH

DOOR COURTESY SWITCH INSPECTION See page BE-16



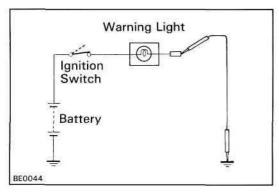
# SEAT BELT WARNING RELAY INSPECTION RELAY CIRCUIT

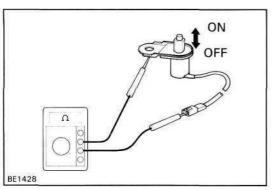
Disconnect the connector from the relay and inspect the connector on the wire harness side as shown in the chart.

Check for	Tester connection		Condition	Specified value
	5 - Ground	Ignition switch	ON	Battery voltage
		position	LOCK or ACC	No voltage
	1 - Ground	Constant		Battery voltage

Continuity 3 - Ground	Driver's door Ope	Open	Continuity	
300			Close	No continuity
	4 - Ground Driver's seat belt	Fasten	Continuity	
			Unfasten	No continuity
	7 - Ground Ignition key	Ignition key	Set	Continuity
		Remove	No continuity	
	6 - Ground	Constant	Constant	

If circuit is as specified, try another relay.





# TIRE HALF-LOCK WARNING SYSTEM

# TIRE HALF-LOCK WARNING INSPECTION INSPECT WARNING LIGHT

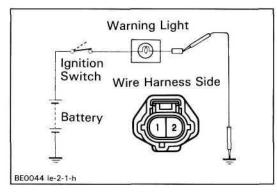
- (a) Disconnect the connector from the door courtesy switch and ground terminal on the wire harness side connector.
- (b) Turn the ignition switch ON, check that the warning light lights up.

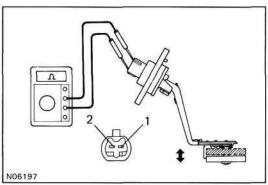
If the warning light does not light up, test the bulb.

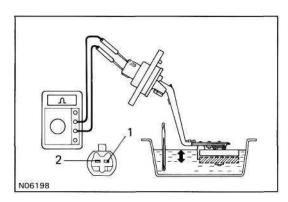
# TIRE HALF-LOCK INDICATOR SWITCH INSPECTION INSPECT SWITCH

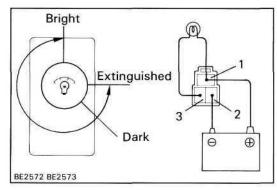
- (a) Check that there is continuity between terminal and the switch body with the ON (switch pin released: opened door).
- (b) Check that there is no continuity between terminal and the switch body with the OFF (switch pin pushed in: closed door).

If operation is not as specified, replace the switch.









# **ENGINE OIL LEVEL WARNING SYSTEM**

### **INSPECT WARNING LIGHT**

- (a) Disconnect the connector from the engine oil level sensor.
- (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 up, test the bulb.

#### INSPECT ENGINE OIL LEVEL SENSOR

(a) Check that there is continuity between terminals with the switch each position.

- (b) Heat the switch to above 60°C (140°F) in an oil bath.
- (c) Check that there is continuity between terminals with the switch ON (float up).
- (d) Check that there is no continuity between terminals with the switch OFF (float down).

If operation is not as specified, replace the sensor.

# METER ILLUMINATION CONTROL SYSTEM

# INSPECT LIGHT CONTROL RHEOSTAT

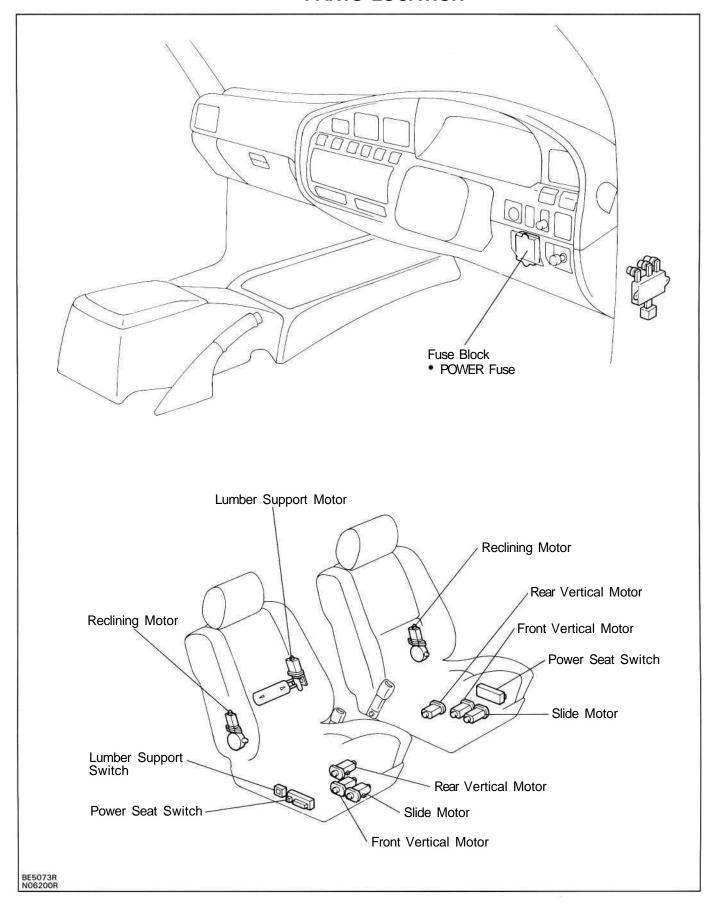
- (a) Connect terminals 1 and 3 through a 3.4 watts test bulb.
- (b) Connect the positive (+) lead from the battery to terminal 1 and the negative (—) lead to terminal 2.
- (c) Turn the rheostat knob to fully counterclockwise, check that the test bulb goes out.
- (d) Gradually turn the rheostat knob 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

# POWER SEAT CONTROL SYSTEM PARTS LOCATION



# **TROUBLESHOOTING**

The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

Trouble	Part name	See page
Power seat does not operate. (Door lock does not operate.)	1. FL AM1 2. POWER Fuse 3. Wire Harness 4. Power Seat Switch (D) 5. Power Seat Switch (P)	- - - BE-23 BE-24
Power seat does not operate. (Door lock is normal.)	1. POWER Fuse 2. Wire Harness 3. Power Seat Switch (D) 4. Power Seat Switch (P)	– BE-23 BE-24
Driver's seat does not operate.	Power Seat Switch (D)     Wire Harness	BE-23
Passenger's seat does not operate.	Power Seat Switch (P)     Wire Harness	BE-24 —
"Slide operation" does not operate.	Power Seat Switch (D)     Power Seat Switch (P)     Wire Harness	BE-23 BE-24 —
"Front vertical operation" does not operate.	1. Power Seat Switch (D) 2. Power Seat Switch (P) 3. Wire Harness 4. Slide Motor (D, P)	BE-23 BE-24 — BE-25
"Rear vertical operation" does not operate.	1. Power Seat Switch (D) 2. Power Seat Switch (P) 3. Wire Harness 4. Front Vertical Motor (D, P)	BE-23 BE-24 — BE-25
"Reclining operation" does not operate.	1. Power Seat Switch (D) 2. Power Seat Switch (P) 3. Wire Harness 4. Reclining Motor (D, P)	BE-23 BE-24 — BE-26
"Lumber support operation" does not operate.	Lumber Support Switch (D)     Wire Harness     Lumber Support Motor (D)	BE-23 — BE-28

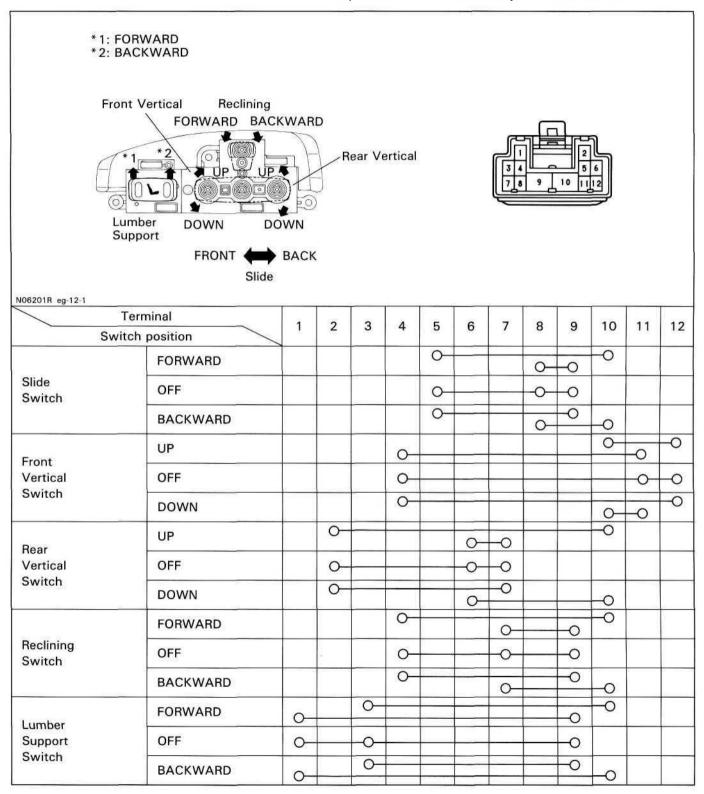
(D): Driver's Seat(P): Passenger's Seat

# POWER SEAT SWITCH

### POWER SEAT SWITCH INSPECTION

(DRIVER'S SIDE)
CONTINUITY

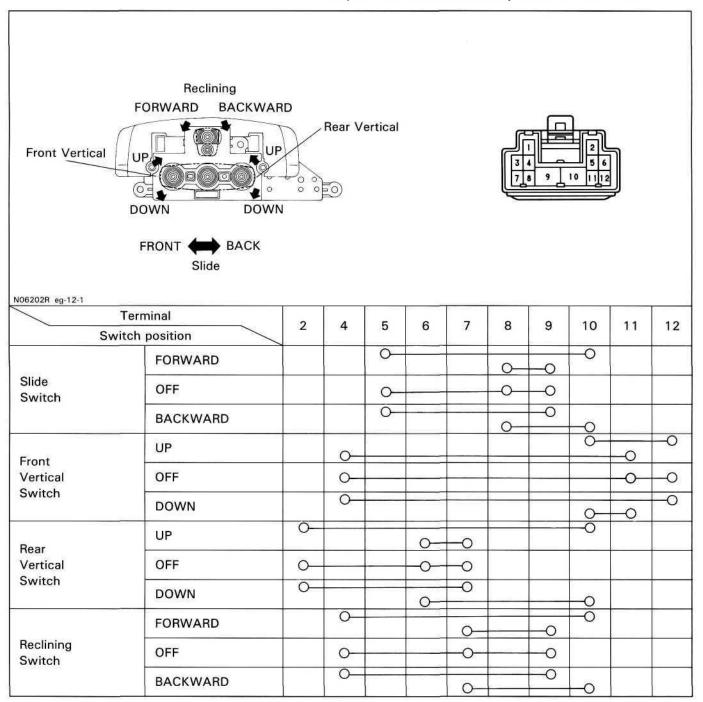
Inspect the switch continuity between terminals.



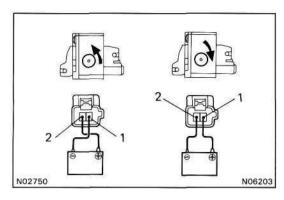
If continuity is not as specified, replace the switch.

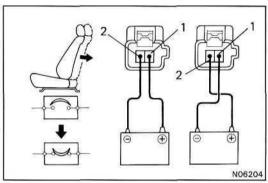
# (PASSENGER'S SIDE) CONTINUITY

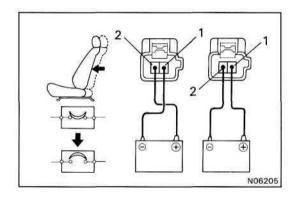
Inspect the switch continuity between terminals.

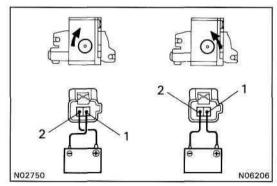


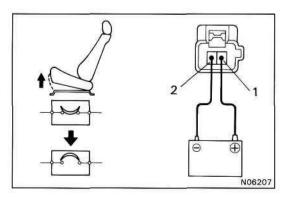
If continuity is not as specified, replace the switch.











# **POWER SEAT MOTOR**

# SLIDE MOTOR INSPECTION MOTOR OPERATION

- (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.

#### **CIRCUIT BREAKER OPERATION**

- (a) Connect the positive (+) lead and the negative (—) lead from the battery to slide motor connector (illustrated terminals), and slide the seat to front end position.
- (b) Continue to apply voltage, check that there is a circuit breaker operation noise within 4 to 60 seconds.
- (c) Reverse the polarity, check that the seat begins to move backwards within approximately 60 seconds.

If operation is not as specified, replace the motor.

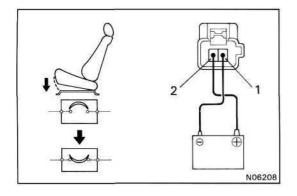
# FRONT VERTICAL MOTOR INSPECTION MOTOR OPERATION

- (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.

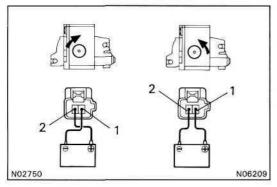
### CIRCUIT BREAKER OPERATION

- (a) Connect the positive (+) lead and the negative (—) lead from the battery to the front vertical motor connector (illustrated terminals), and move the front edge of seat cushion to the highest position.
- (b) Continue to apply voltage, check that there is a circuit breaker operation noise within 4 to 60 seconds.



(c) Reverse the polarity, check that the seat cushion begins to descend within approximately 60 seconds.

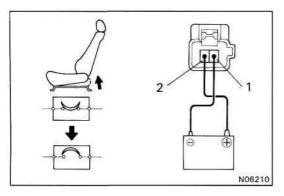
If operation is not as specified, replace the motor.



# REAR VERTICAL MOTOR INSPECTION MOTOR OPERATION

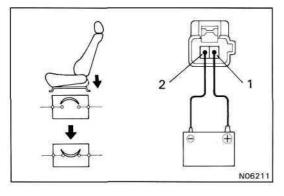
- (a) Connect the positive (+) lead from the battery to terminal 2 and the negative (—) lead to terminal 1, check that the motor turns counterclockwise.
- (b) Reverse the polarity, check that the motor turns clockwise.

If operation is not as specified, replace the motor.

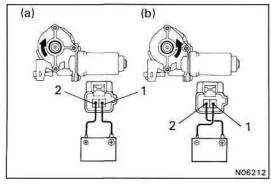


#### **CIRCUIT BREAKER OPERATION**

- (a) Connect the positive (+) lead and the negative (—) lead from the battery to the rear vertical motor connector (illustrated terminals), and move the front edge of seat cushion to the highest position.
- (b) Continue to apply voltage, check that there is a circuit breaker operation noise within 4 to 60 seconds.



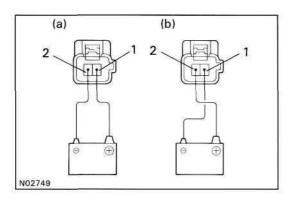
- (c) Reverse the polarity, check that the seat cushion begins to descend within approximately 60 seconds.
  - If operation is not as specified, replace the motor.



# RECLINING MOTOR INSPECTION MOTOR OPERATION DRIVER'S SEAT

- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (—) lead to terminal 2, check that the motor turns clockwise.
- (b) Reverse the polarity, check that the motor turns counterclockwise.

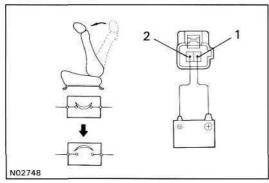
If operation is not as specified, replace the motor.



#### MOTOR OPERATION PASSENGER'S SEAT

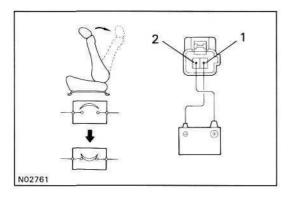
- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (—) lead to terminal 2, check that the motor turns counterclockwise.
- (b) Reverse the polarity, check that the motor turns clockwise.

If operation is not as specified, replace the motor.

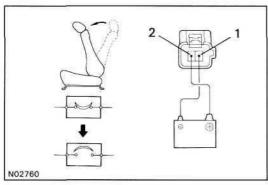


#### CIRCUIT BREAKER OPERATION DRIVER'S SEAT

 ca) Connect the positive (+) lead from terminal 1 and negative (—) lead to terminal 2.
 Check that the seat back reclines to the most forward position.

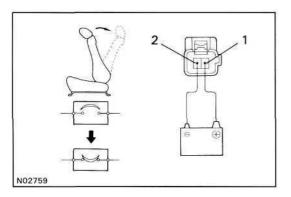


- (b) Continue to apply voltage, check that there is a circuit breaker operation noise within 4 to 40 seconds.
- (c) Reverse the polarity, check that the seat starts to fall backwards within approximately 60 seconds.If operation is not as specified, replace the motor.

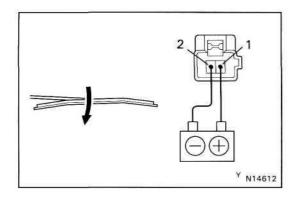


#### CIRCUIT BREAKER OPERATION PASSENGER'S SEAT

- (a) Connect the positive (+) lead from the battery to terminal 2 and the negative (—) lead to terminal 1 on the seat wire harness side connector, and recline the seat back to the most forward position.
- (b) Continue to apply voltage, check that there is a circuit breaker operation noise within 4 to 40 seconds.

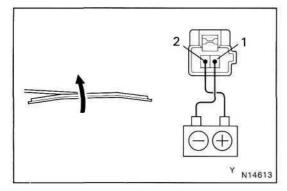


(c) Reverse the polarity, check that the seat back starts to fall backwards within approximately 60 seconds.If operation is not as specified, replace the motor.



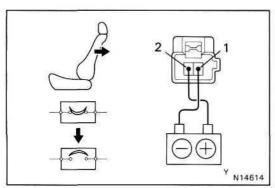
# LUMBAR SUPPORT MOTOR INSPECTION MOTOR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (—) lead to terminal 2, check that the lumbar support moves release side.



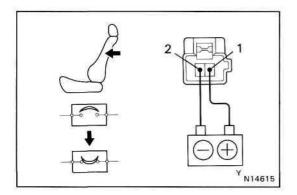
(b) Reverse the polarity, check that the lumbar support moves forward.

If operation is not as specified, replace the motor.



#### **CIRCUIT BREAKER OPERATION**

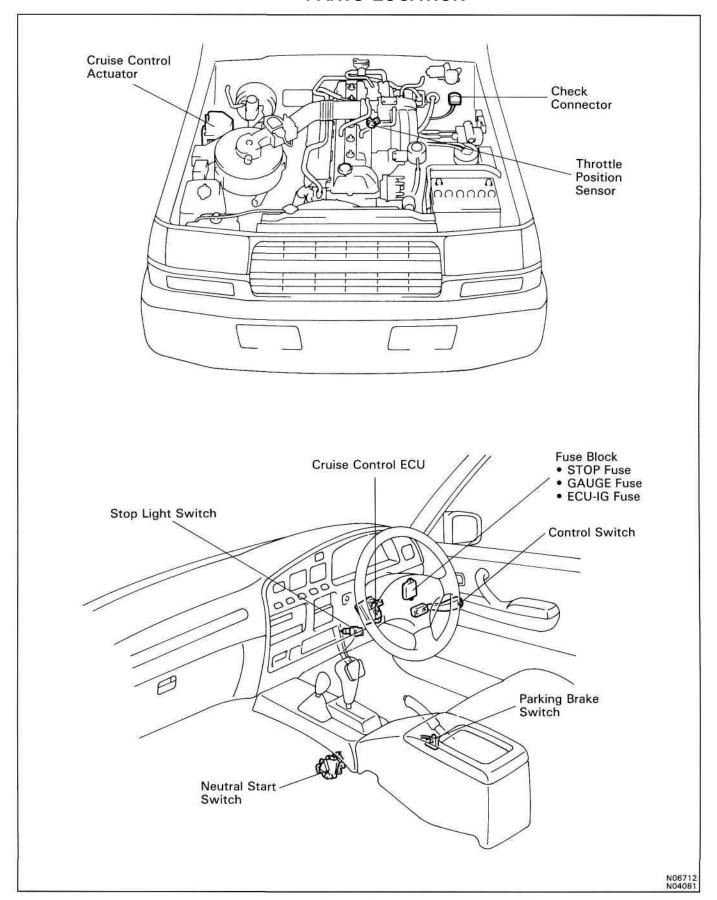
- (a) Connect the positive (+) lead from the battery to terminal 2 and the negative (—) lead to terminal 1 on the lumbar support motor connector and move the lumbar support to front end position.
- (b) Continue to apply voltage, check that there is a circuit breaker operation noise within 4 to 60 seconds.



(c) Reverse the polarity, check that the lumbar support begins to move release side within approximately 60 seconds.

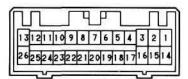
If operation is not as specified, replace the motor.

# CRUISE CONTROL SYSTEM PARTS LOCATION



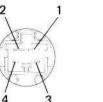
# **CONNECTOR DIAGRAMS**

Cruise Control ECU



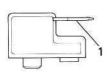
Control Switch (in Combination Switch)

Stop Light Switch





Parking Brake Switch



Speed Sensor



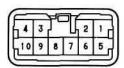
Actuator



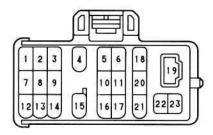
Throttle Position Sensor (1FZ-FE)



Ignition Switch

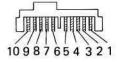


Check Connector (TDCL)

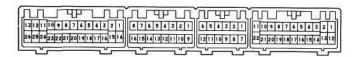


Combination Meter (Cruise Control Indicator) (Brake Warning)

Connector "A"



**EFI ECU** 



# SYSTEM DESCRIPTION

- When the ignition switch is turned ON, current flows from the battery to terminal 14 of the cruise control (CC FCU
- 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  $\rightarrow$  terminal B-1 5 of the control switch  $\rightarrow$  terminal B-20 of the switch  $\rightarrow$  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 control switch is turned to each position, current flows from terminals 18 of the CC ECU  $\rightarrow$  terminals B-5 of the control switch  $\rightarrow$  terminal B-20 of the switch  $\rightarrow$  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  $10 \rightarrow$  terminal 2 of the stop light switch  $\rightarrow$  terminal 4 of the switch  $\rightarrow$  terminal 5 of the actuator  $\rightarrow$  (magnetic clutch)  $\rightarrow$  terminal 4 of the actuator  $\rightarrow$  ground.

At the same time, the CC ECU sends the signal from terminal  $24 \rightarrow$  terminal 1 of the actuator  $\rightarrow$  (position sensor)  $\rightarrow$  terminal 3 of the actuator  $\rightarrow$  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  $12 \rightarrow$  terminal 6 of actuator  $\rightarrow$  (motor)  $\rightarrow$  terminal 7 of actuator  $\rightarrow$  terminal 11 of CC ECU. This causes the motor to rotate the actuator arm in the throttle opening direction, increasing the vehicle speed. Then, when the arm reaches the prescribed angle, the CC ECU detects this at terminal 25 and stops the signal from 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 a cancellation signal (ground voltage) to terminal 3 of the CC ECU.

### Neutral Start Switch (A/T)

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 magnetic clutch (in actuator) is released, and SW A of the stop light switch is turned ON and sends a cancellation 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 cancels cruise control.

# **DIAGNOSIS SYSTEM**

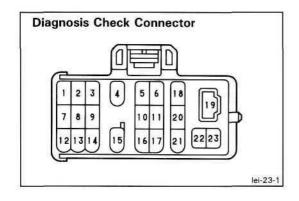
# Output of Diagnostic Code READ DIAGNOSTIC CODE (Type A)

- (a) Turn the ignition switch on.
- (b) Turn the control switch to SET or RESUME position and keep it there.
- (c) After pushing the main switch ON, keep the SET or RESUME switch ON for 3 seconds.
- (d) Check that the "CRUISE" indicator light 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 indicator light.

No.	Conditions	Indication code	Diagnosis
1	Turn the control switch to SET/COAST position.	0.25S 0.25S ON 1S 1S BE1931	SET/COAST circuit is normal.
2	Turn the control switch to RES/ACC position.	ON OFF BE1932	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)	ON	Each cancel switch is normal.
4	Drive at approx. 40 km/h (25 mph) or below.	ON	Speed sensor circuit is normal.
4	Drive at approx. 40 km/h (25 mph) or over.	ON OFF BE1937	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-34)
- 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  $E_1$  (3) and Tc (11) 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".

Code No.	CRUISE MAIN Indicator Light Blinking Pattern	Diagnosis
_	ON OFF OFF	Normal
11	ON OFF OFF	Duty ratio of 100 % output to motor acceleration side.     Overcurrent in motor circuit.
12	ON OFF OFF	Overcurrent in magnet clutch circuit.     Open in magnet clutch circuit.
13	ON OFF BE3931	<ul> <li>Open in actuator motor circuit.</li> <li>Position sensor detects abnormal voltage.</li> <li>Position sensor signal value does not change when the motor operates.</li> </ul>
21	ON OFF	Vehicle speed signal not sent for 140 msec.     or longer
*23	ON OFF	Actual vehicle speed has dropped by 16 km/h (10 mph) or more below the set speed.
32	ON OFF	Short in control switch circuit.
34	ON OFF	Voltage abnormality in control switch.

HINT: When two or more codes are indicated, the lowest numbered code will be displayed first.

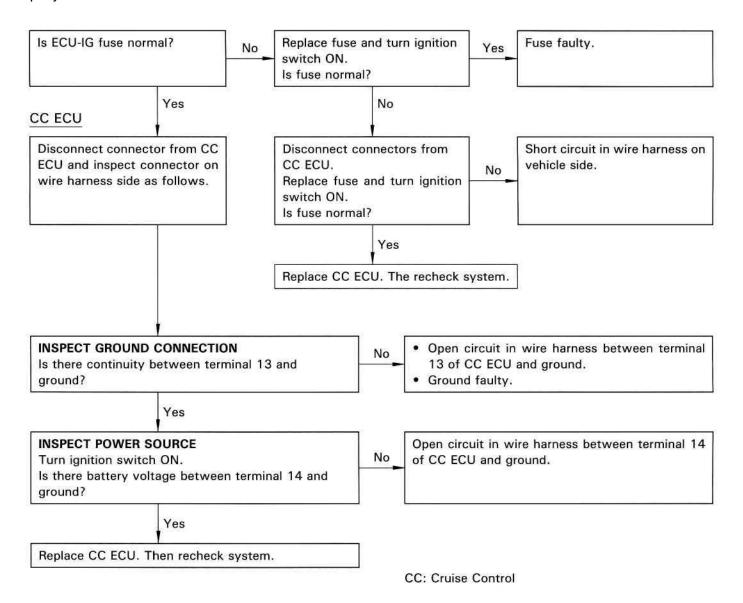
(\*) When the vehicle speed is reduced on uphill roads, the speed can be set again and driving continued. (This is not a malfunction.)

# **TROUBLESHOOTING**

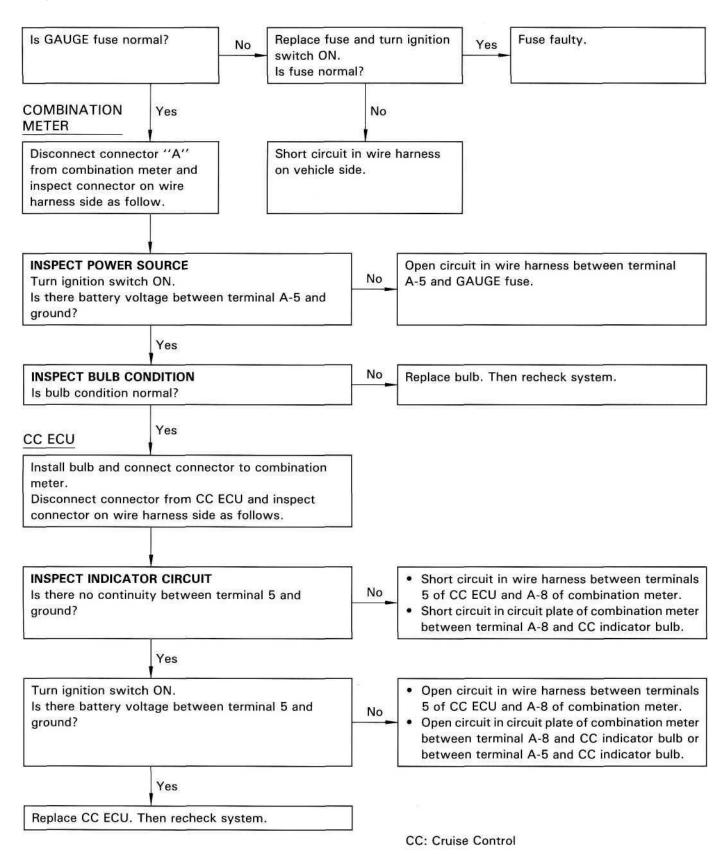
You will find the source of the trouble more easily by properly using the table shown below. In this table, the numbers indicate the order of priority of the causes of trouble. Check each part in the order shown.

Chart No.					D	С	С	F	Н	G	Е	1		
Diagnosis Code Problem	Type B	Tvi	pe A	CC ECU	Actuator	Main Switch (in Control Switch)	Control Switch	Stop Light Switch	Neutral Start Switch	Parking Brake Switch	Speed Sensor	Throttle Position Sensor	Speed Control Cable and Control Link	Wire Harness
1100.011	11	.,,	,,,,	2	1			-				1		3
	12	_		3	1			2						4
	13	-		2	1									3
<ul> <li>"CRUISE" indicator light blinks 5 times.</li> <li>Cruise control system does not set.</li> <li>Cruise control system does not operate.</li> </ul>	21			2							1			3
	23			4	3	1			1		2		1	
	32			2			1							3
	34			2			1							3
	41			1										
	Normal	4	ОК	8	7	1	2	3	4	5			6	9
			NG	2				5			1			) (1 8 <u>2</u>
Set speed deviates on high or low side.				4	3						1		2	
Large speed increase or speed drop when the speed control switch turned to SET.				4	3							2	1	
Vehicle speed fluctuates when speed control switch turned to SET.				4	3		9				1		2	
Set speed does not cancel when brake pedal depressed.		3	OK NG	1 2				1						
Set Speed does not cancel when parking brake lever pulled.		3	OK NG	1 2						1				
Set speed does not cancel when shifted to "N" range.			ОК	1						-				
		3	NG	2				7	1					: 3
Vehicle speed does not decrease when speed control switch turned to COAST.		1	ОК	4	1						3		2	0
			NG	2			1							
Vehicle speed does not accelerate when speed control switch turned to ACCEL.		2	OK	4	1		4				3		2	
Vehicle speed does not return to			NG	2	1		1				0		2	
memorized speed when control switch turned on RESUME.		2	OK NG	2	1		1	9			3		2	
			OK	1		-	1					-		
Set speed does not cancel when speed control switch turned to CANCEL.		3	NG	2			1					-		-
Speed can be set below about 40 km/h (25 mph).		4	OK	1			-	0				-		
			NG	2			1				1			_
Cruise control will not disengage even at about 40 km/h (25 mph).		4	ОК	1				is —						-
			NG	3					0 3		1		2	
Acceleration response is sluggish when speed control switch turned to "ACCEL" or "RESUME".			1	4	3		1				2		1	

# A POWER SOURCE CIRCUIT



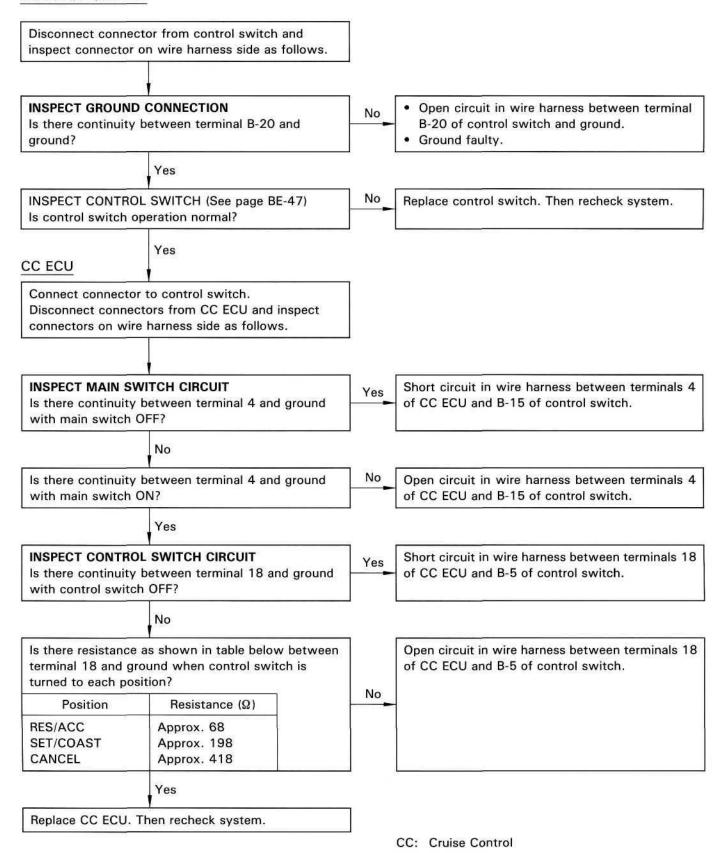
# B | CRUISE CONTROL INDICATOR CIRCUIT



# C | CONTROL SWITCH CIRCUIT

HINT: While carrying out the following inspection, make certain that the connectors and terminals are properly connected.

### CONTROL SWITCH

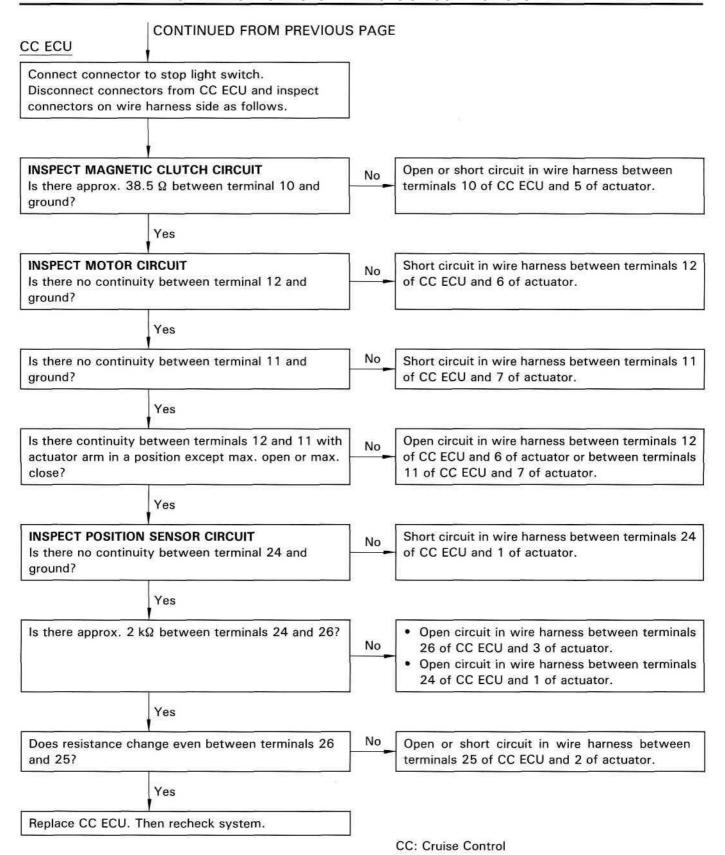


# D ACTUATOR CIRCUIT

HINT: While carrying out the following inspection, make certain that connectors and terminals are properly connected.

### **ACTUATOR**

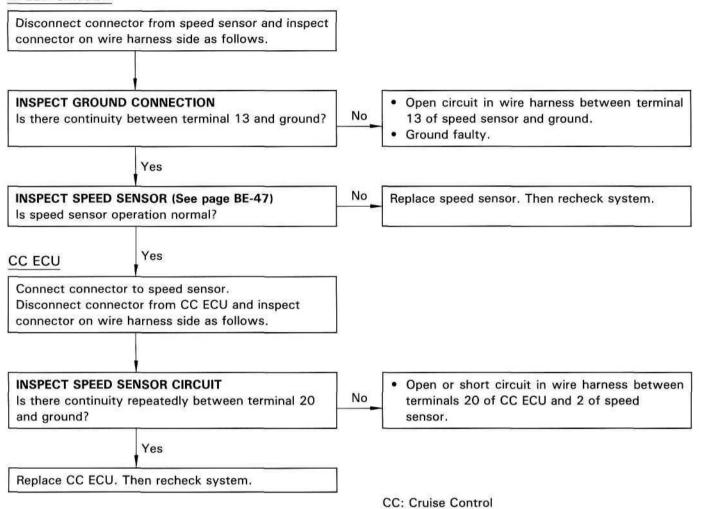




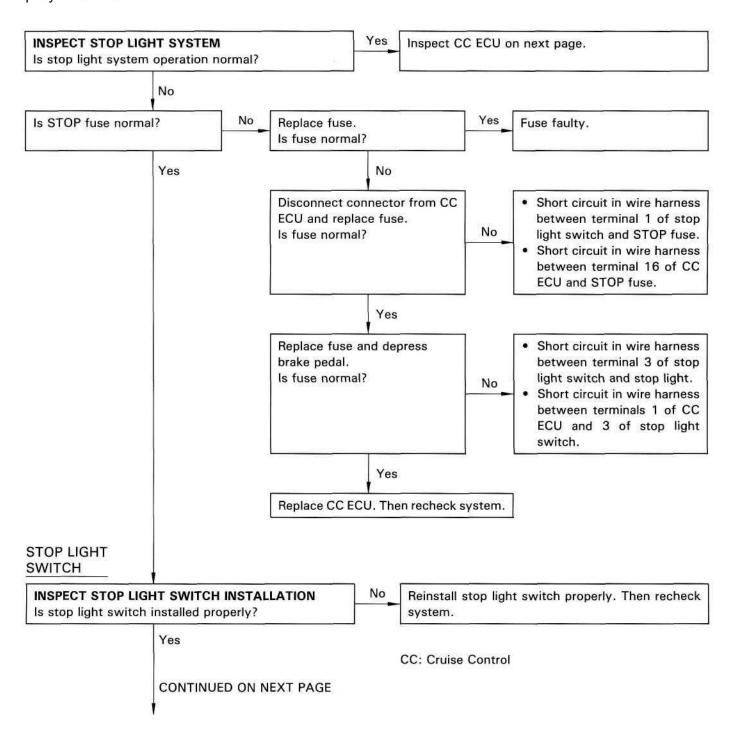
# E SPEED SENSOR CIRCUIT

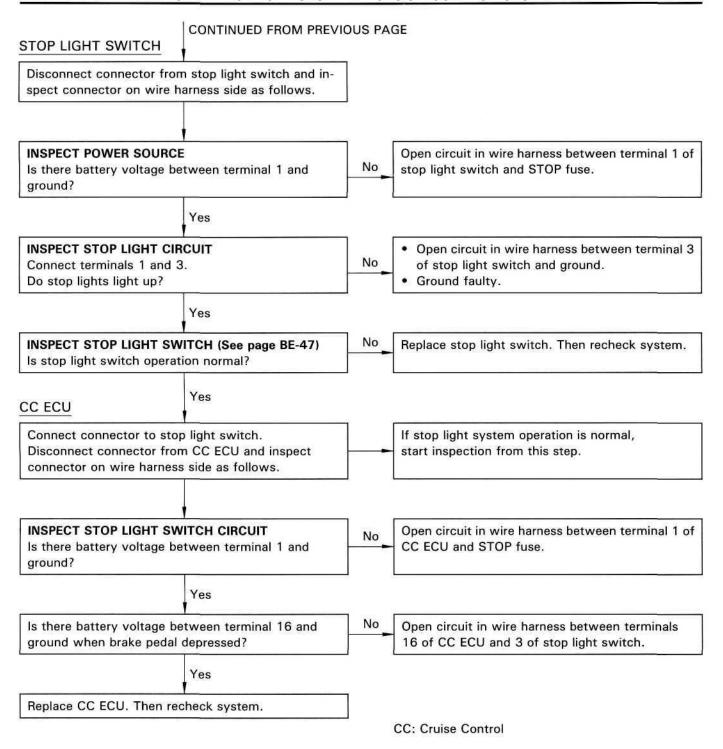
HINT: While carrying out the following inspection, make certain that the connectors and terminals are properly connected.

### SPEED SENSOR

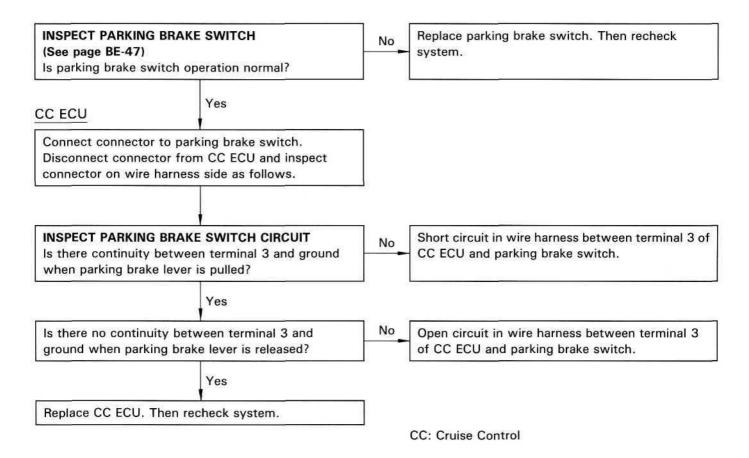


# F STOP LIGHT SWITCH CIRCUIT



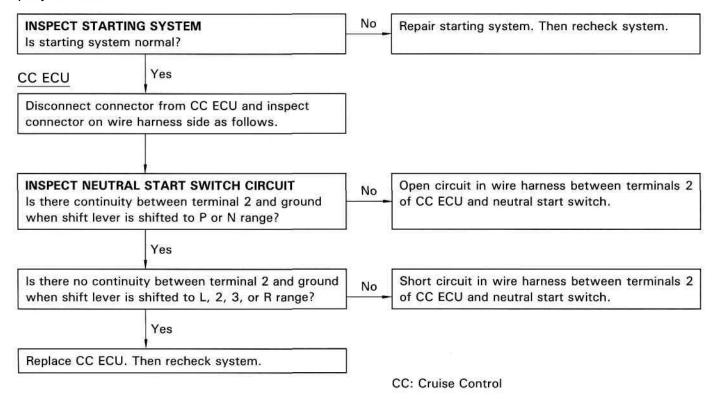


# **G** PARKING BRAKE SWITCH CIRCUIT

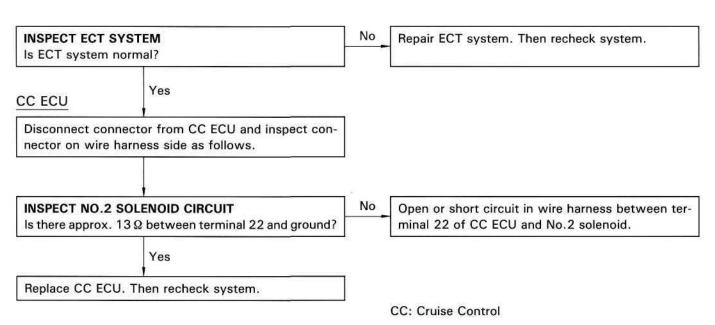


# H NEUTRAL START SWITCH CIRCUIT

HINT: While carrying out the following inspection, make certain that the connectors and terminals are properly connected.



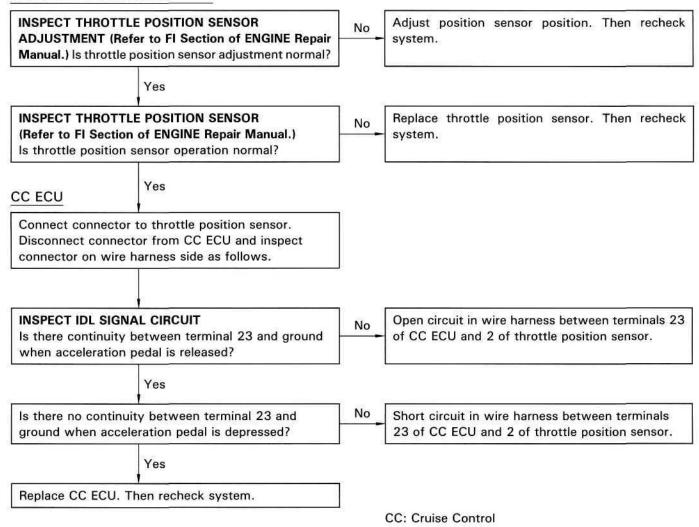
# I | ECT SOLENOID No.2 CIRCUIT (with A/T)

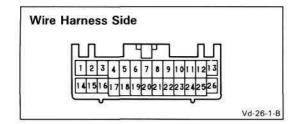


# J IDL SIGNAL CIRCUIT (w/ 1FZ-FE Engine)

HINT: While carrying out the following inspection, make certain that the connectors and terminals are properly connected.

### THROTTLE POSITION SENSOR





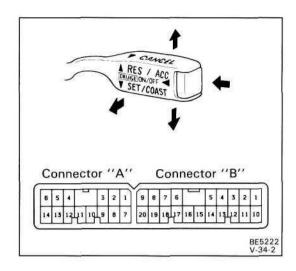
# **Cruise Control ECU Circuit**

# **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 posi	tion	N or P		Continuity
		1 32			L, 2, D	or R	No continuity
	Parking brake	3 - ground	Parking brake I	ever position	release	d	No continuity
	switch				pulled		Continuity
	Control switch	4 - ground	Main switch po	sition	OFF		No continuity
					ON		Continuity
	Ground connection	13 — ground	Constant				Continuity
	Actuator (motor)	*11 - 12	Actuator arm	max. OPEN		(12 →	1) Continuity
			position	max. CLOSI	E	(11 → 1	2) Continuity
				any position above positi		(12 → 1	1) Continuity
	TDCL circuit	8 - ground	Constant				No continuity
			Terminals Tc a	nd E1 connec	ted		Continuity
	Throttle position	23 - ground	Acceleration pe	edal position	release	d	Continuity
	sensor (IDL: 1FZ-FE Engine)				depress	sed	No continuity
	Speed sensor	20 - ground	With ignition sw speed sensor sh		edomete	shaft or	Continuity
Resistance	Actuator	24 - 26	Constant				Approx. 2 kΩ
	(position sensor)	24 - 25	Actuator arm t	urned		Resistar	nce change ever
	Actuator	10 - ground	Brake pedal po	sition	release	d	Approx. 38.5 Ω
	(magnetic clutch)				depress	sed	No continuity
	Control switch	18 - ground	Control switch	position	OFF		No continuity
					RES/AC	cc	Approx. 68 Ω
					SET/CC	AST	Approx. 198 Ω
					CANCE	L	Approx. 418 Ω
	ECT No.2 solenoid valve (A/T)	22 - ground	Constant	===			Approx. 13 Ω
Voltage	Power source	14 - ground	Ignition switch	position	LOCK o	or ACC	No voltage
					ON		Battery voltage
	STOP fuse	1 — ground	Constant				Battery voltage
	Stop light	16 - ground	Brake pedal po	sition	release	d	No voltage
					depress	sed	Battery voltage

recheck system.



# **CONTROL SWITCH INSPECTION**

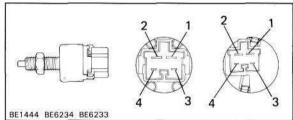
#### **INSPECT SWITCH**

S	Terminal witch position	B20	B11	В5	B17	B15
Ë	ON	0-				0
Main	OFF					
Ю	RES/ACC	0				
Control	SET/COAST	0-		0		
ပိ	CANCEL	0—				

If the continuity is not as specified, replace the control switch.

# STOP LIGHT SWITCH INSPECTION

#### **INSPECT SWITCH**



Terminal	4	2	w/ (	CCS
Switch position	,		3	4
Switch pin free (Brake pedal depressed)	0	-0		
Switch pin pushed in (Brake pedal released)			0—	0

If continuity is not as specified, replace the stop light switch.

# **NEUTRAL START SWITCH INSPECTION**

See page AT section

# THROTTLE POSITION SWITCH INSPECTION

(Refer to FI section of Engine Repair Manual)

# PARKING BRAKE SWITCH INSPECTION

#### **INSPECT 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.

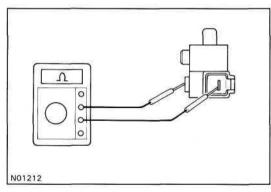
# SPEED SENSOR INSPECTION

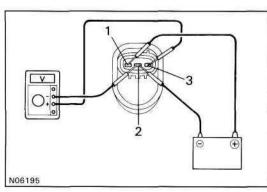
#### **INSPECT SENSOR**

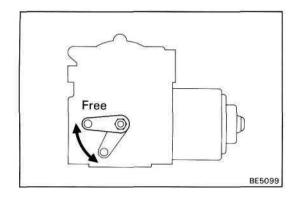
- (a) Connect the positive (+) lead from battery to terminal 1 and negative (—) lead to terminal 2.
- (b) Connect the positive (+) lead from tester to terminal 3 and negative (—) lead to terminal 2.
- (c) Revolve shaft.
- d) Check that there is voltage changer from approx. 0 V to 11 V or more between terminal 3 and 2.

HINT: The voltage change should be 20 times per each revolution of the speed sensor shaft.

If operation is not as specified, replace the sensor.





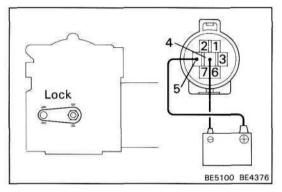


# CRUISE CONTROL ACTUATOR INSPECTION

#### **INSPECT ACTUATOR**

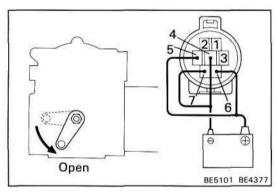
# (Magnet Clutch)

(a) Check that the arm moves smoothly by hand.



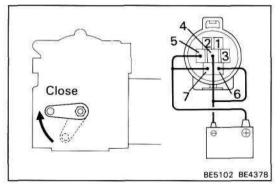
- (b) Connect the positive (+) lead from the battery to terminal 5 and the negative (—) lead to terminal 4. (magnet clutch turned ON)
- (c) Check that the arm does not move by hand.

  If operation is not as specified, replace the motor.

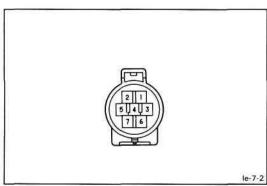


# (Motor)

- (a) With the magnetic clutch ON, connect the positive (+) lead from the battery to terminal 6 and the negative (—) lead to terminal 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.



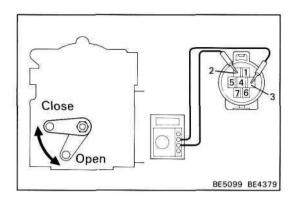
- (c) With the magnetic clutch ON, connect the positive (+) lead from the battery to terminal 7 and the negative (—) lead to terminal 6, check that the arm moves to the close side.
- (d) When the arm reaches to the closed position, check that the motor operation stops.



#### (Position Sensor)

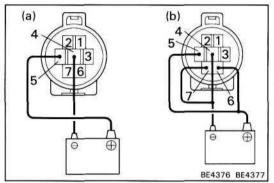
(a) Measure the resistance between terminals 1 and 3.

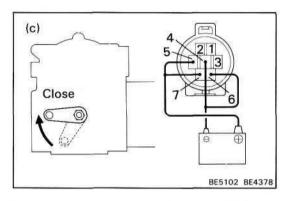
Resistance: Approx. 2 kfl

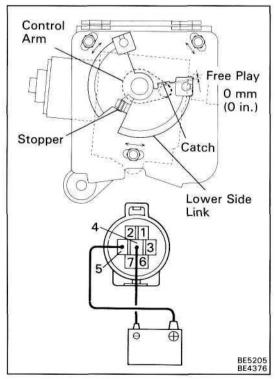


(b) When the arm is moving from the closed to open position, check that resistance between terminals 2 and 3 increases from approx. 0.5 to 1.7 k $\Omega$ .

If operation is not as specified, replace the motor.







# CONTROL LINK ASSEMBLY ADJUSTMENT

#### 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.

(magnet clutch turned ON)

NOTICE: Keep the magnet clutch ON until adjustment of control link assembly is completed.

- (b) With the 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 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.

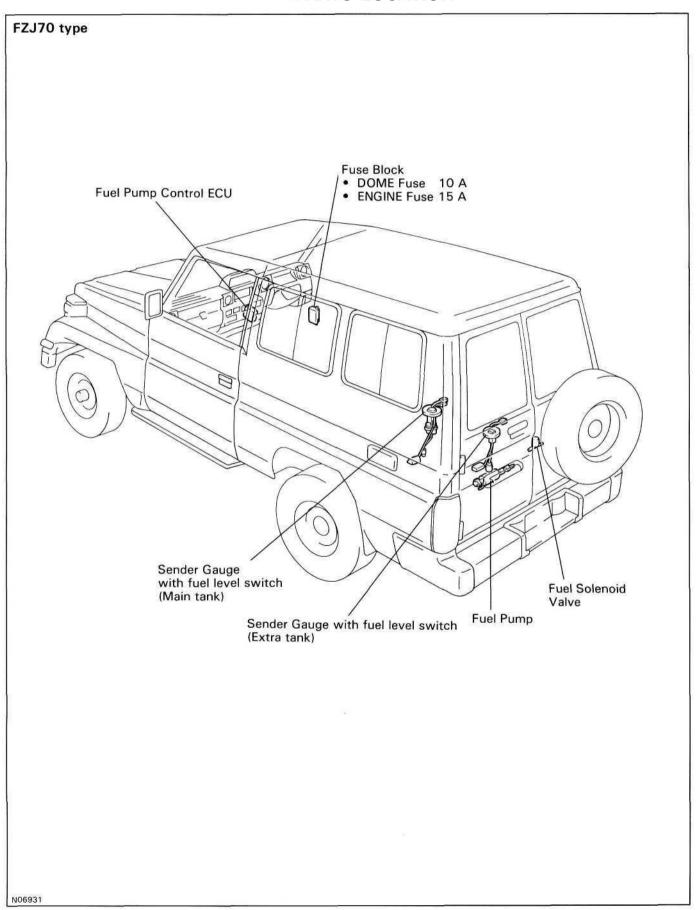
(e) Rotate the control link assembly so that the catch of the control link assembly's lower side link comes in contact with the actuator control arm (Free play 0).

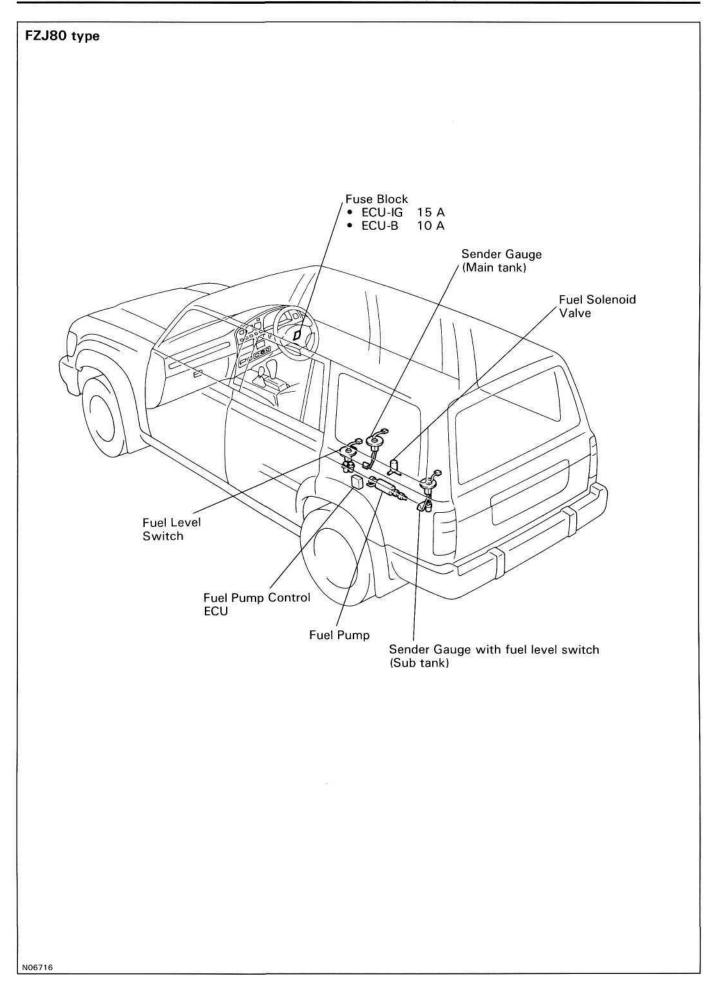
Free play: 0 mm (0 in.)

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.

# EXTRA (SUB) TANK SYSTEM PARTS LOCATION



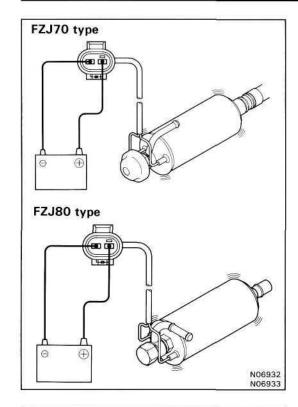


# **TROUBLESHOOTING**

First use the diagnosis system to check for malfunctions. Repair any malfunctions found. Then check for malfunction in the parts shown in the table below.

The most likely causes of malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

Trouble	Part name	See page
EXTRA (SUB) TANK system does not operate	1. Fuse /FZJ70 type  • DOME FUSE • ENGINE Fuse	_
	FZJ80 type  • ECU-IG Fuse  • ECU-B Fuse	
	2. Fuel Pump	BE-53
	3. Sub Fuel Switch	BE-53
	4. Fuel Solenoid Valve	BE-55
	<ol><li>Fuel Level Switch (Main tank or Extra (sub) tank)</li></ol>	BE-54
	6. Sender Gauge	BE-54
	7. Fuel Pump Control ECU	BE-56
	8. Wire Harness	_



# **FUEL PUMP**

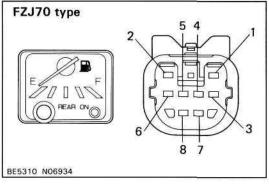
#### INSPECT FUEL PUMP OPERATION

Connect the positive (+) lead from the battery to terminal 1 of the connector, and the negative (—) lead to terminal 2. Check that the fuel pump operates.

#### NOTICE:

- These tests must be performed quickly (within 10 seconds) to prevent the coil from burning out.
- Keep the fuel pump as far away from the battery as possible.
- · Always perform switching at the battery side.

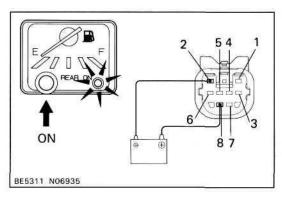
If operation is not as specified, replace the fuel pump.



# SUB FUEL SWITCH

#### INSPECT SUB FUEL SWITCH

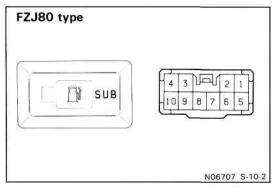
Terminal	4	7	Illumi	nation
SW Position	4	,	1	3
OFF			0 (	
ON	0		0 -6	0



#### **INSPECT INDICATOR LIGHT**

- (a) Connect the positive (+) lead from the battery to terminal 8 and the negative (—) lead to terminal 2.
- (b) Set the switch ON, check that the indicator light lights up.

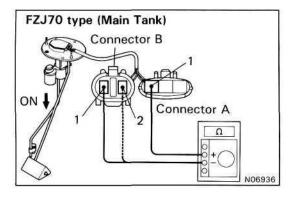
If the indicator light does not light up, replace the accessory meter.

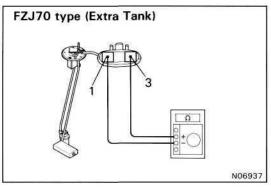


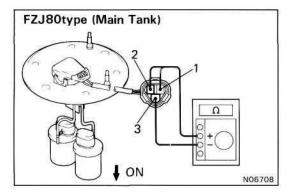
# INSPECT SUB FUEL SWITCH

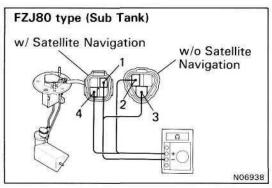
Terminal	•	0		Illumir	nation	
SW Position	6	9	1	2	3	4
OFF			0 6	0	0 @	9 0
ON	0_	_0	0-70	0	0-40	90

If continuity is not as specified, check the bulb or replace the switch.









# **FUEL LEVEL SWITCH**

# **INSPECT FUEL LEVEL SWITCH**

(Continuity)

FZJ7O type (Main Tank)

Terminal	Connector A	Conne	ctor B
Switch Position	1	1	2
ON (Float down)	0	<u> </u>	o
OFF (Float up)			

# FZJ7O type (Extra Tank)

Terminal Switch position	1	3
ON (Float down)	0-	
OFF (Float up)		

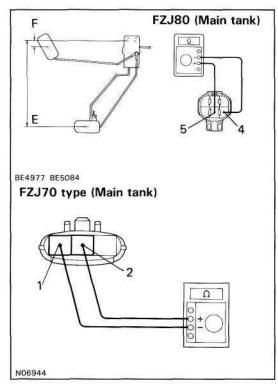
# FZJ80 type (Main Tank)

Terminal Switch position	1	2	3
ON (Float down)	0	0	00
OFF (Float up)			

# FZJ80 type (Sub Tank)

Terminal	w/ Satellite	Navigation	w/o Satellite	e Navigation
Switch position	1	4	2	3
ON (Float down)	0-	-0	0-	
OFF (Float up)	-			

If continuity is not as specified, replace the switch.



# **FUEL SENDER GAUGE**

# **INSPECT FUEL SENDER GAUGE**

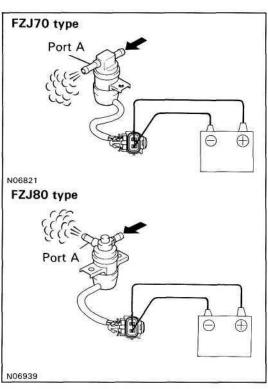
Measure the resistance.

FZJ8O type (Main tank)

Float position mm (in.)	Resistance (Ω)
F approx. 15 (0.59)	approx. 3
E approx. 200 (7.87)	approx. 110

# FZJ7O type (Main tank)

Float position mm (in.)	Resistance (Ω)
F approx. 39 (1.54)	approx. 3
E approx. 303 (11.93)	approx. 110

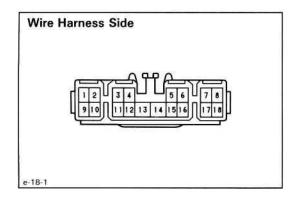


# **FUEL SOLENOID VALVE**

# INSPECT FUEL SOLENOID VALVE

- 1. Check that air flows out port A when battery voltage is applied across the terminals.
- 2. Check that air does not flow out port A when battery voltage is not applied across the terminal.

Replace the valve if either test is not successful.



# **FUEL PUMP CONTROL ECU**

# FUEL PUMP CONTROL ECU INSPECTION

# **ECU CIRCUIT**

Disconnect the connector from the ECU and inspect the connector on the wire harness side as shown in the chart.

Check for	Tester Connection	Condition		Specified value
	3 — Ground 11 — Ground	Main Tank Fuel Level	Full	No Continuity
			Below 3/4	Continuity
	6 — Ground	Constant		Continuity
	7 — Ground	Sub-Fuel Switch	OFF	No Continuity
			ON (Pushed)	Continuity
C!:	12 0		Empty	Continuity
Continuity	13 — Ground	Sub Tank Fuel Level	above 1/4	No Continuity
	15 6	Constant Terminals T <sub>C</sub> and E <sub>1</sub> connected		No Continuity
	15 — Ground			Continuity
	16 — Ground	Constant		Continuity
	17 — Ground	Constant		Continuity
	18 — Ground	Constant		Continuity
	2 — Ground	Constant		Battery Voltage
	4 — Ground	Ignition Switch Position	Lock or ACC	No Voltage
	5 — Ground		ON	Battery Voltage
	10 — Ground Ignition Switch Positio	latinia Control Desiries	Lock or ACC	No Voltage
		Ignition Switch Position	ON	Battery Voltage
	- Carolind	Ignition Switch: ON and Main Tank Fuel Level	Full	Below 1V
			Below 1/4	Above 3 V
	14 — Ground Ignition Switch Position	ON	Approx 1 V	
		ON (Engine running)	Battery Voltage	

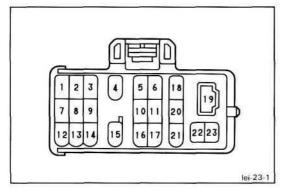
If circuit is as specified, try other ECU.



# **DIAGNOSIS SYSTEM**

#### **READ DIAGNOSTIC CODE**

When there is a malfunction in the extra (sub) tank system, the warning light light up.



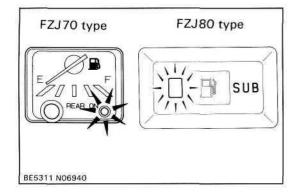
# **OUTPUT OF DIAGNOSTIC CODE**

- 1. Turn the ignition switch ON.
- 2. Connect terminals  $T_c$  and  $E_n$  of the check connector.
- 3. Read the diagnostic code from the warning light.

	Indication Code	Diagnosis
	0.26 S + 0.26 S	Normal
2	0.52 \$ 0.52 \$ 4.5 \$ N06746	<ul><li>Fuel level switch malfunction (Main tank)</li><li>Open in switch circuit</li></ul>
3		Main tank sender gauge malfunction
4		<ul><li>Fuel pump malfunction</li><li>Open or short in pump circuit</li></ul>
5		<ul><li>Fuel solenoid valve malfunction</li><li>Open or short in solenoid valve circuit</li></ul>

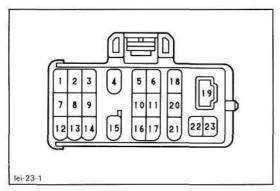
#### Diagnostic code clearance

- After completing repairs the diagnostic code retained in memory can be cleared by removing the battery terminal (—) for 10 seconds or more, with the ignition switch off.
- 2. Check that the normal code is displayed after connecting the battery terminal (—).



# **READ TEST CODE**

The indicator light outputs the indication codes shown below in conformity with signals input or output by the extra (sub) tank system.

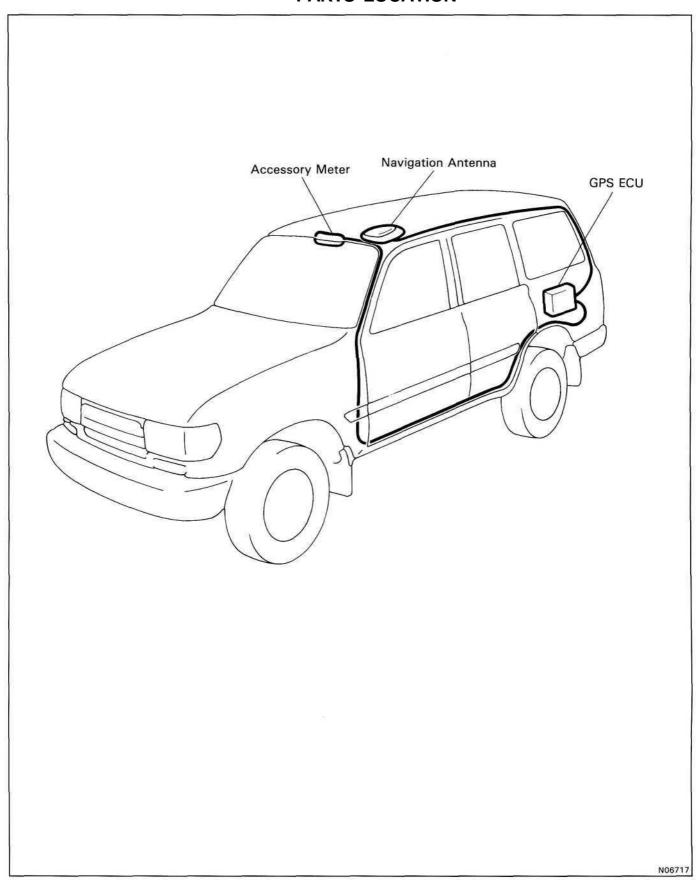


#### **OUT PUT OF TEST CODE**

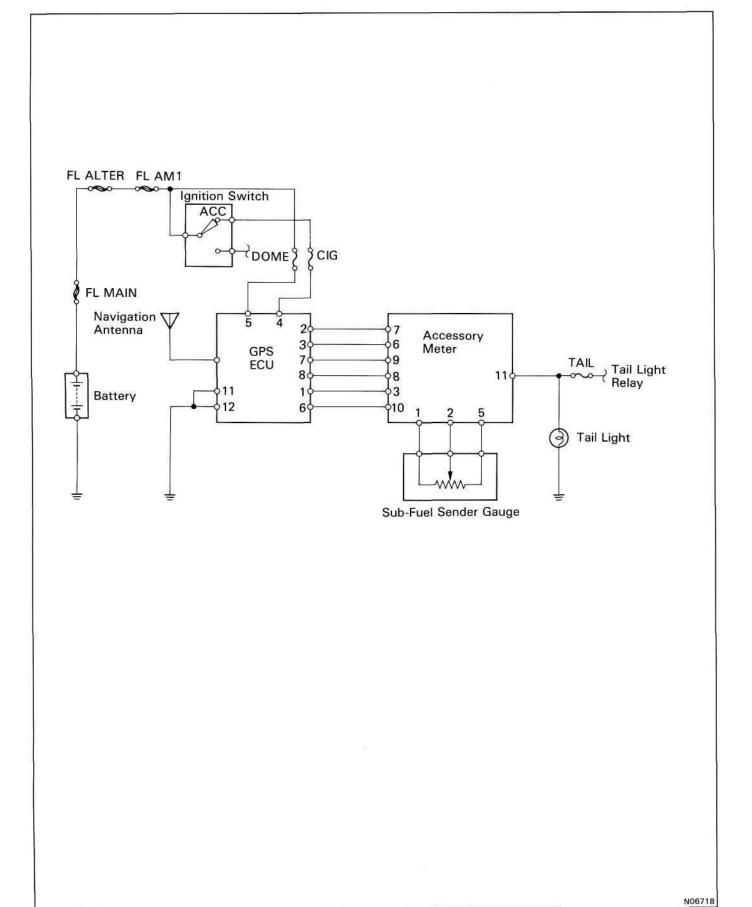
- 1. Turn the ignition switch ON.
- 2. Connect terminals  $T_c$  and  $E_n$  of the check connector.
- 3. Read the test code from the indicator light.

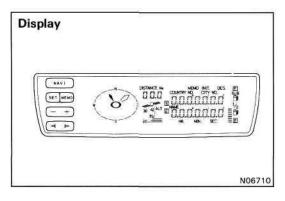
*	Indication code	Condition indicated by signal input/output
2	0.52 S 0.52 S 4.5 S	Fuel level switch signal open or (Main tank) fuel level high.
3		Fuel sender gauge signal open or fuel level high.
4		Open or short in fuel pump circuit.
5		Open or short in fuel solenoid valve circuit.
6		Fuel level switch open or fuel level high.     (Extra or sub tank)
_		Condition other than the above.

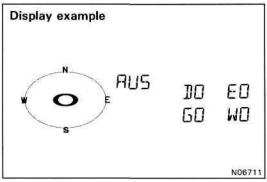
# SATELLITE NAVIGATION SYSTEM PARTS LOCATION



# **WIRING DIAGRAMS**







# **DIAGNOSIS SYSTEM**

# OUTPUT OF DIAGNOSTIC CODE READ DIAGNOSTIC CODE

# DO THE FOLLOWING STEPS TO READ DIAGNOSTIC CODE

- (a) Turn the ignition switch ACC or ON.
- (b) Push "NAVI" or "SET".
- (c) Push "NAVI" and "SET" simultaneously for 5 seconds.
- (d) Display the condition of each system on the screen.
  If a malfunction code is displayed, check it again using other parts.

Display	Diagnosis
D <sub>o</sub> E <sub>o</sub> G <sub>o</sub> W <sub>o</sub>	Normal
D <sub>1</sub>	Display malfunction
E <sub>1</sub>	GPS ECU malfunction
G <sub>1</sub>	GPS antenna malfunction     Antenna cable faulty
W <sub>1</sub>	Malfunction in wire harness between GPS ECU and display.

# AC

# **AIR CONDITIONING SYSTEM**

#### **REFER TO FOLLOWING REPAIR MANUALS:**

Manual Name	Pub. No.
<ul> <li>Land Cruiser (Hardtop and Canvas Top) Chassis and Body Repair Manual</li> </ul>	RM183E
<ul> <li>Land Cruiser (Station Wagon) Chassis and Body Repair Manual</li> </ul>	RM184E
<ul> <li>Land Cruiser (Hardtop, Canvas Top &amp; Station Wagon) Chassis and Body Supplement Repair Manual</li> </ul>	RM290E

NOTE: The following pages contain only the points which differ from the above listed manuals.

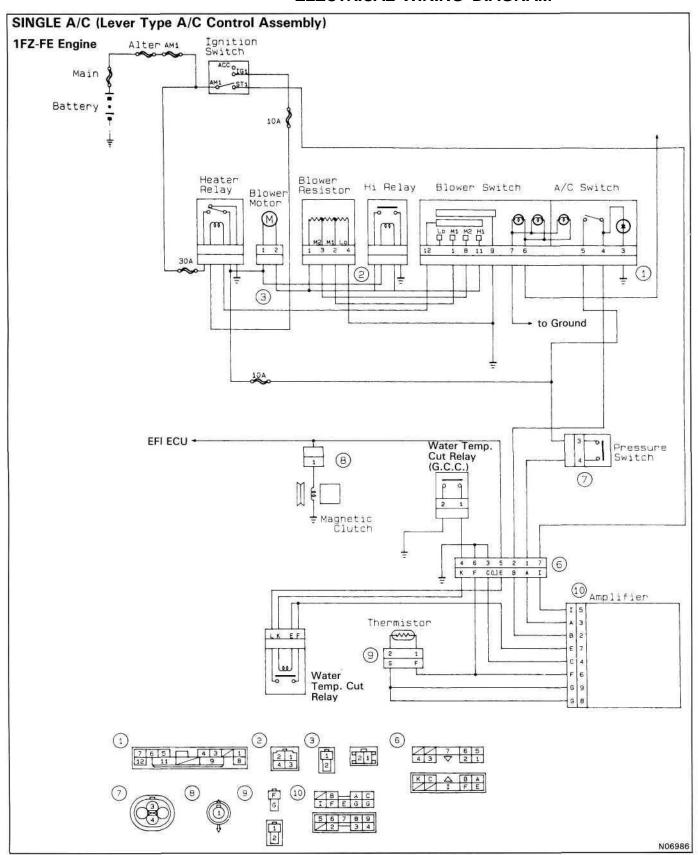
# (HARDTOP & CANVAS TOP)

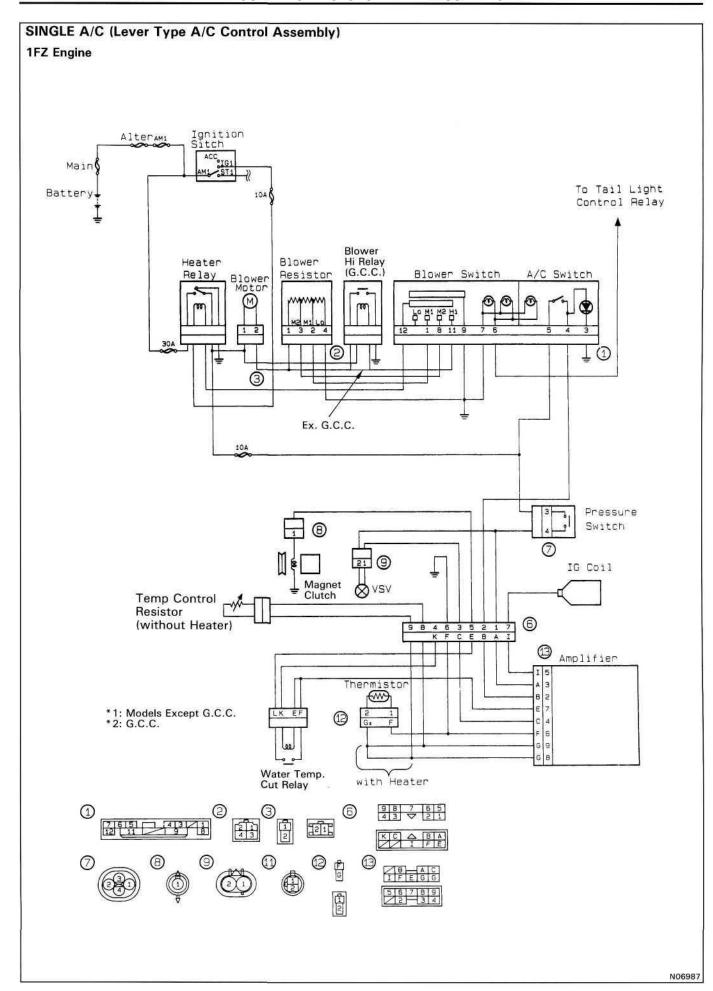
DESCRIPTION	AC-2
DRIVE BELT	AC-10
REFRIGERATION LINES	AC-11
COMPRESSOR	AC-12
COOLING UNIT	AC-14
AIR CONDITIONER AMPLIFIER	AC-15
(STATION WAGON)	
DESCRIPTION	AC-18
DRIVE BELT	AC-22
COMPRESSOR	AC-23
AIR CONDITIONER AMPLIFIER	AC-25

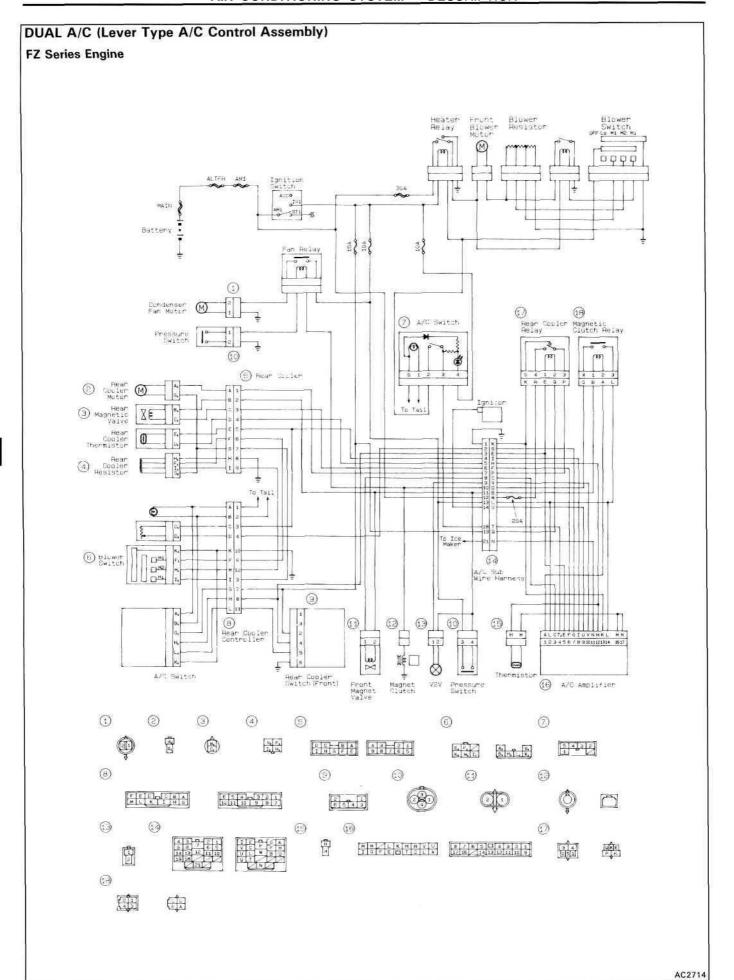
# (Hardtop & Canvas Top)

# **DESCRIPTION**

# **ELECTRICAL WIRING DIAGRAM**

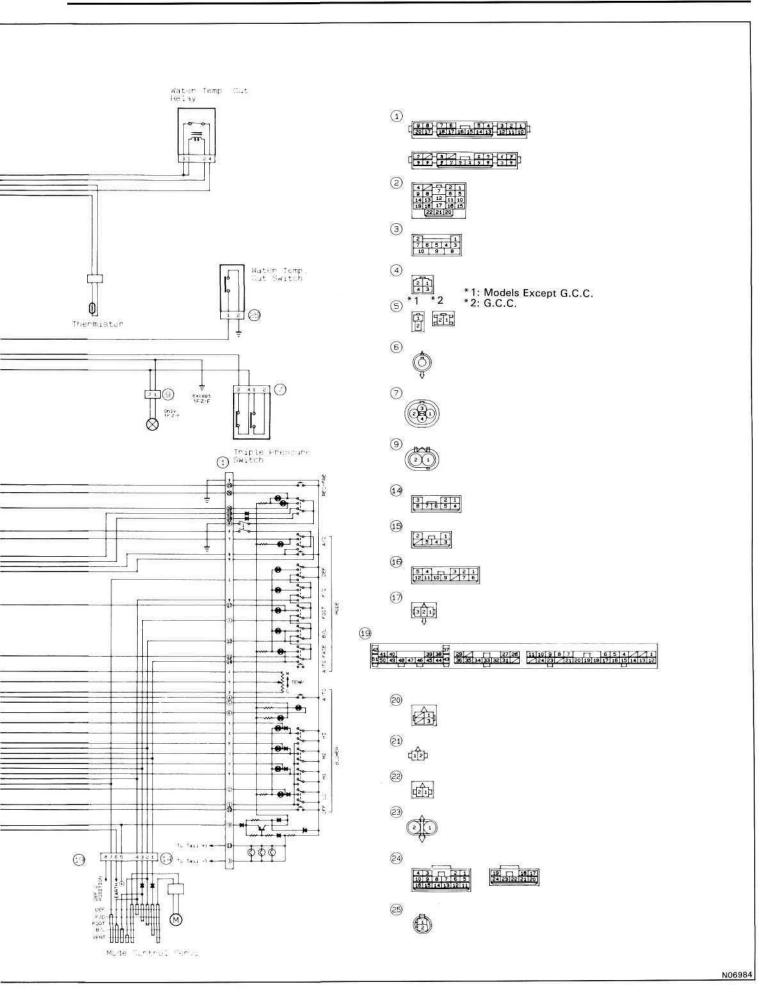






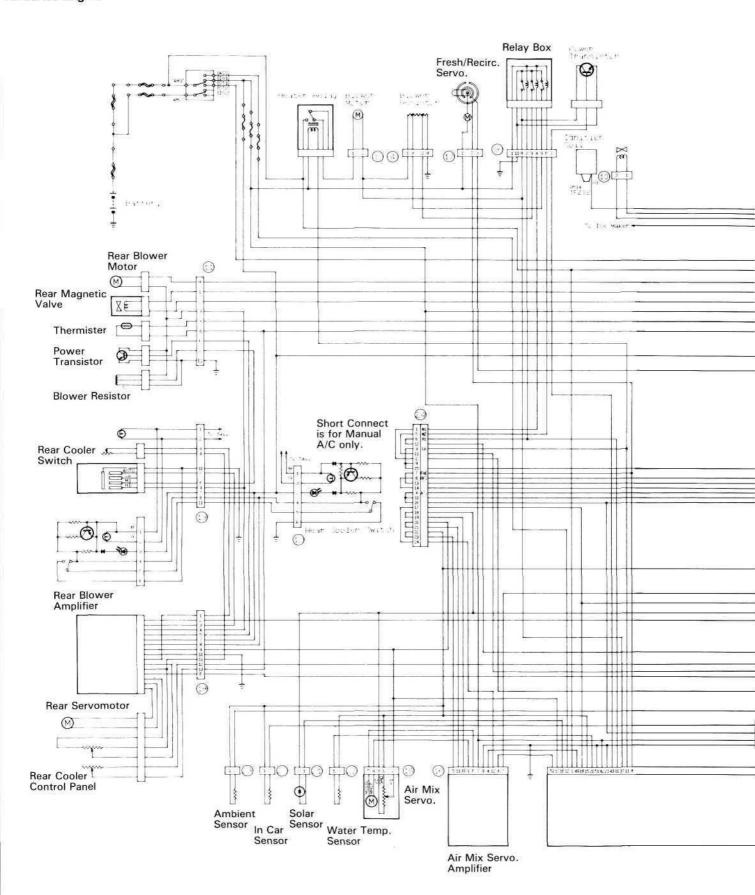
- MEMO -

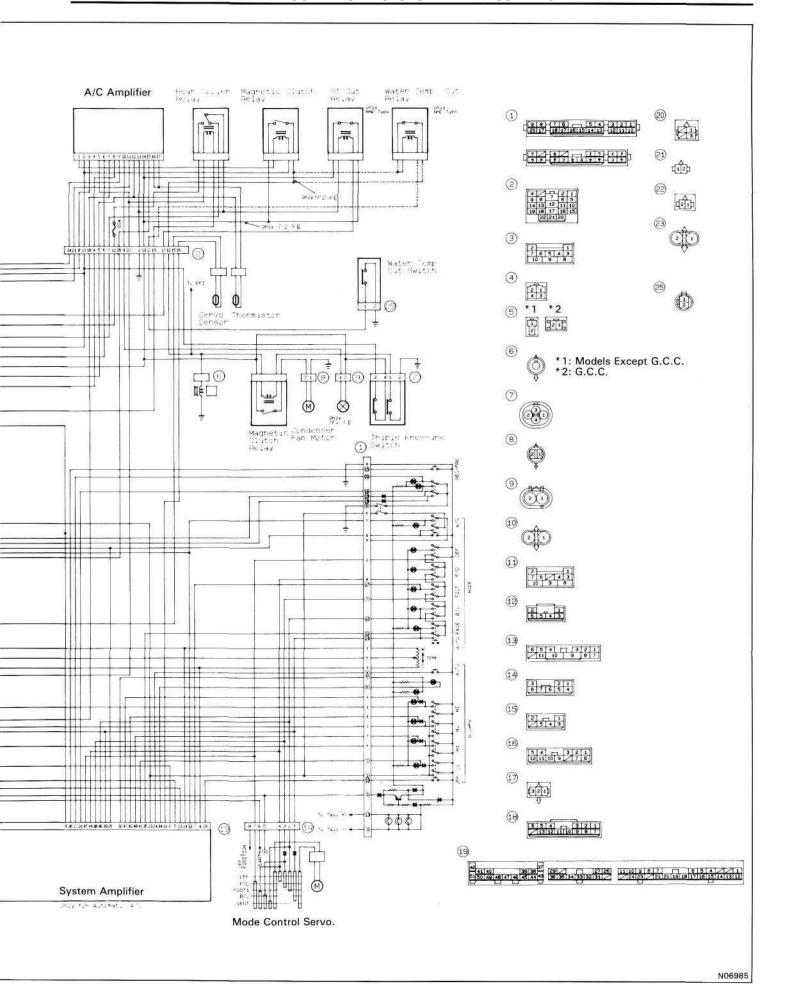
# SINGLE A/C (Push Type A/C Control Assembly) **FZ Series Engine** A/C Amplifier Helay Hux erwest, Nace the Partyle Heater Helay Blower Ignition (1) (1) (1) (1) (1) (1) 귀᠐᠐帰 Only 1FZ-FE E/G To EFI instany 中国 9 Short Connect is for Manual A/C only. 10 (1) 1835 1 F : 9 4 E 3 **曲9 曲9 曲9 曲9** Ambient Sensor water Temp Sensor Air Mix Serva System Amplifier uhly for Automatic a. Air Mix Servo. Amplifier

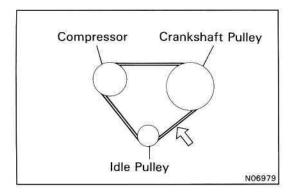


# DUAL A/C (Push Type A/C Control Assembly)

#### **FZ Series Engine**







# **DRIVE BELT**

# **ON-VEHICLE INSPECTION**

INSPECT DRIVE BELT TENSION

Drive belt tension at 10 kg (22.0 lb, 98N): FZ Series Engine

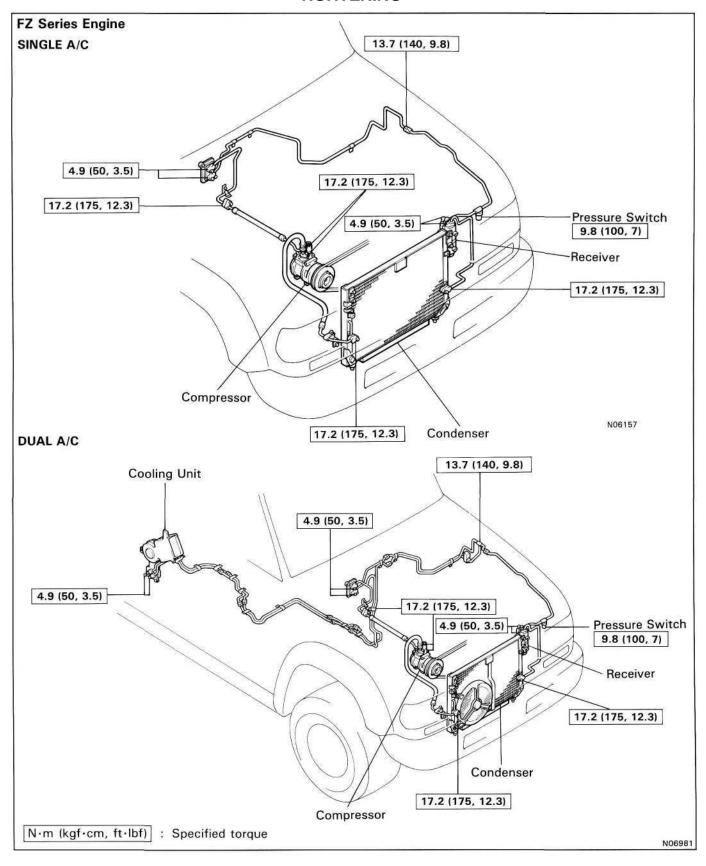
New belt

5 - 7 mm (0.20 - 0.28 in.)

Used belt

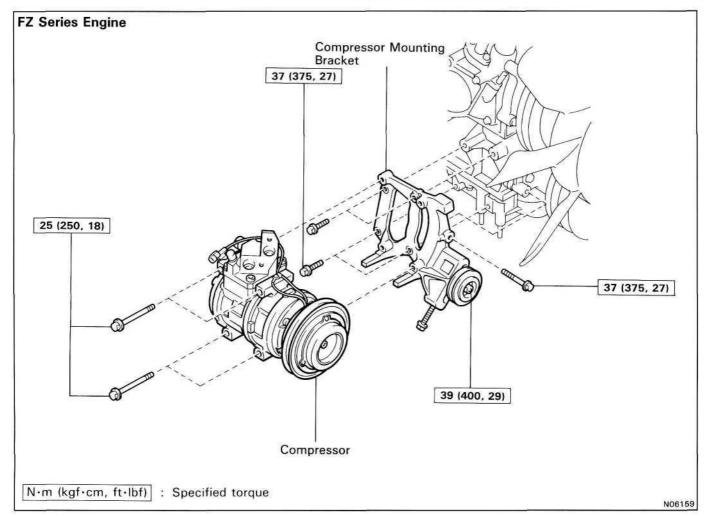
7 - 9.5 mm (0.28 - 0.37 in.)

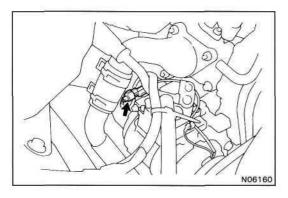
# REFRIGERATION LINES TIGHTENING



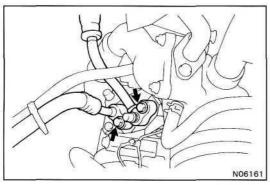
# COMPRESSOR

# **COMPRESSOR REMOVAL**





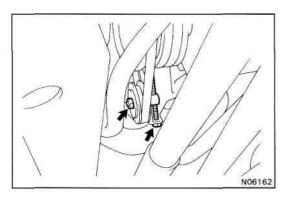
- 1. RUN ENGINE AT IDLE SPEED WITH A/C ON FOR TEN MINUTES
- 2. STOP ENGINE
- 3. DISCONNECT NEGATIVE CABLE FROM BATTERY
- 4. DISCONNECT CONNECTOR FROM MAGNET CLUTCH
- 5. RECOVER REFRIGERANT FROM REFRIGERATION SYSTEM



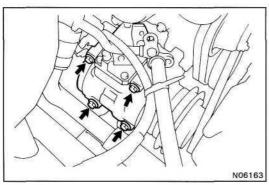
6. DISCONNECT TWO HOSES FROM COMPRESSOR SER-VICE VALVES

Cap the open fittings immediately to keep the moisture and dust out of the system.

7. REMOVE ENGINE UNDER COVER



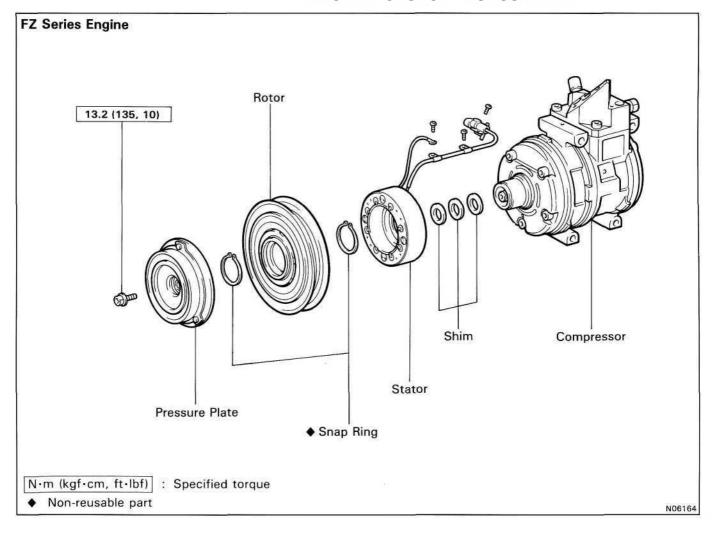
8. LOOSEN IDLE PULLEY LOCK NUT AND COMPRESSOR DRIVE BELT



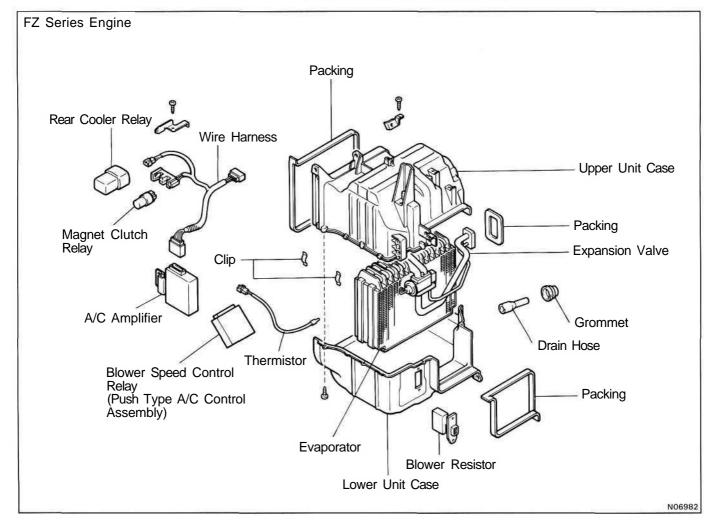
# 9. REMOVE COMPRESSOR

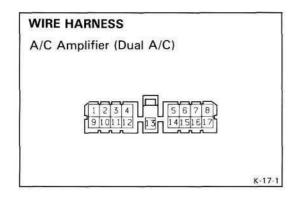
Remove the four bolts and pull the compressor upward.

# **MAGNET CLUTCH DISASSEMBLY**



# COOLING UNIT DISASSEMBLY





# AIR CONDITIONER AMPLIFIER

(Dual A/C : 1FZ-F Engine)

# **INSPECT AMPLIFIER CIRCUIT**

Disconnect the amplifier and inspect the connector on the wire harness side as shown in the chart below.

Test conditions:

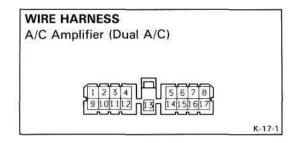
(1) Ignition switch: ON

(2) Temperature control lever: MAX COOL

(3) Blower switch: HI

Check for	Tester connection	Condition	Specified value
Continuity	5 - 13	Turn rear A/C switch on.	Continuity
		Turn rear A/C switch off.	No continuity
	13 - Ground	Constant	Continuity
	16 - 17	Constant	Continuity
Voltage	1 - 13	Turn ignition switch on.	Battery voltage
	W	Turn ignition switch off.	No voltage
	2 - 13	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	3 - 13	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	4 - 13	Turn A/C switch on.	Battery voltage
		Turn A/C switch off.	No voltage
	5 - 13	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	6 - 13	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	9 - 13	Start the engine.	Approx. 10 to 14 V
		Stop the engine.	No voltage
	10 - 13	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	14 - 13	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
Resistance	7 - 8	Variable	Approx. 0 to 3 kΩ
	8 - 12	Constant (thermistor)	Approx. 100 - 4,000 Ω
	16 - 12	Constant (thermistor)	Approx. 100 - 4,000 Ω

If circuit is as specified, replace the amplifier.



(Dual A/C: 1FZ-FE Engine)

# **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	5 - 13	Turn rear A/C switch on.	Continuity
		Turn rear A/C switch off.	No continuity
	13 - Ground	Constant	Continuity
	16 - 17	Constant	Continuity
Voltage	1 - 13	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	2 - 13	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	3 - 13	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	4 - 13	Turn A/C switch on.	Battery voltage
		Turn A/C switch off.	No voltage
	5 - 13	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	6 - 13	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	14 - 13	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
Resistance	7 - 8	Variable	Approx. 0 to 3 kΩ
	8 - 12	Constant (thermistor)	Approx. 100 - 4,000 Ω
	16 - 12	Constant (thermistor)	Approx. 100 - 4,000 Ω

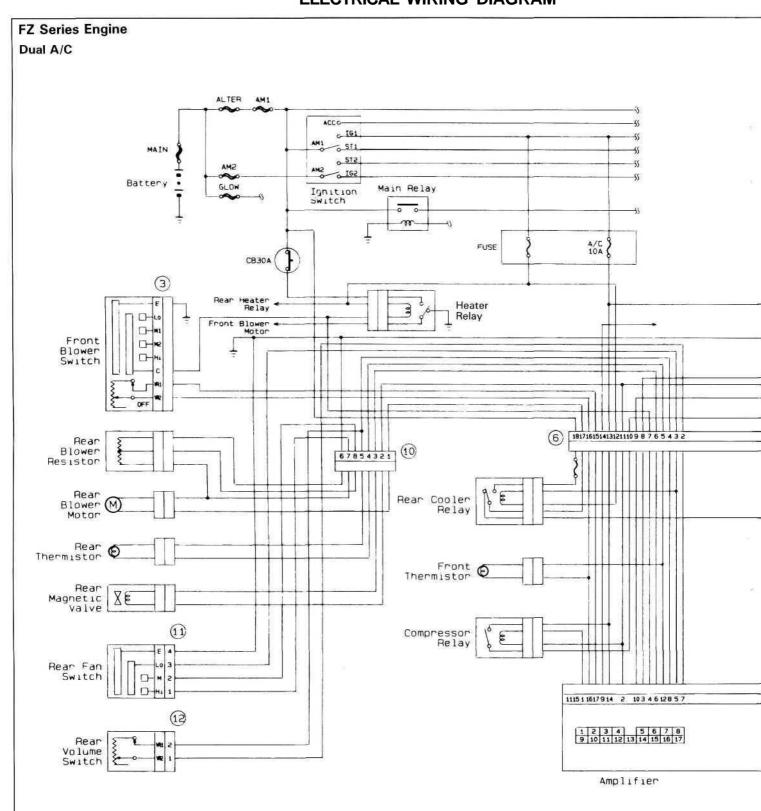
If circuit is as specified, replace the amplifier.

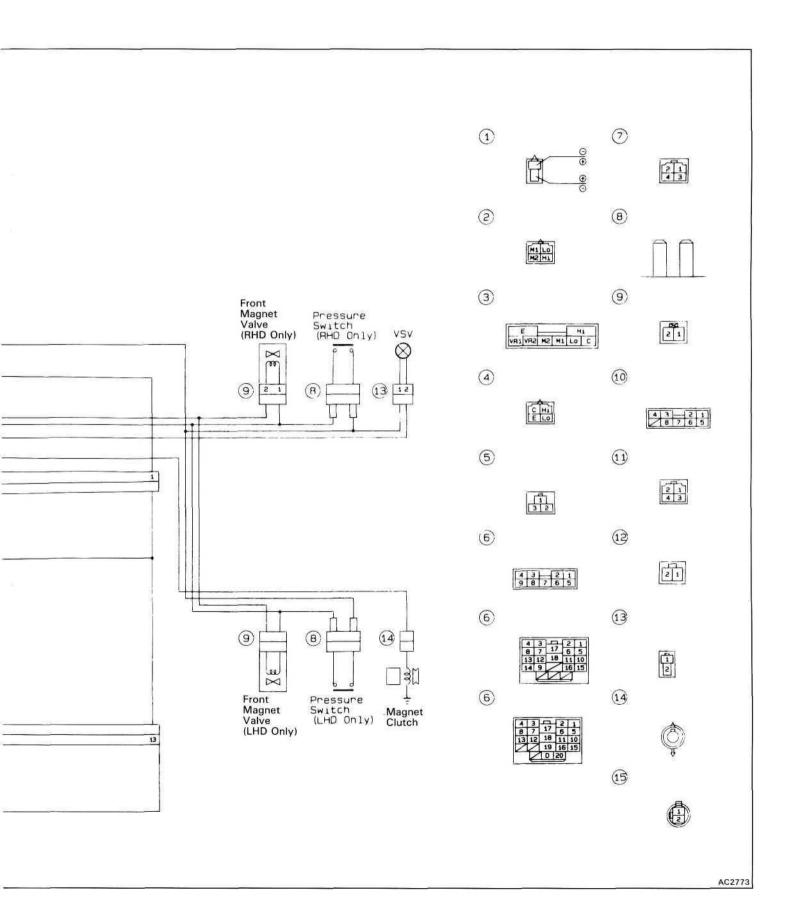
- MEMO -

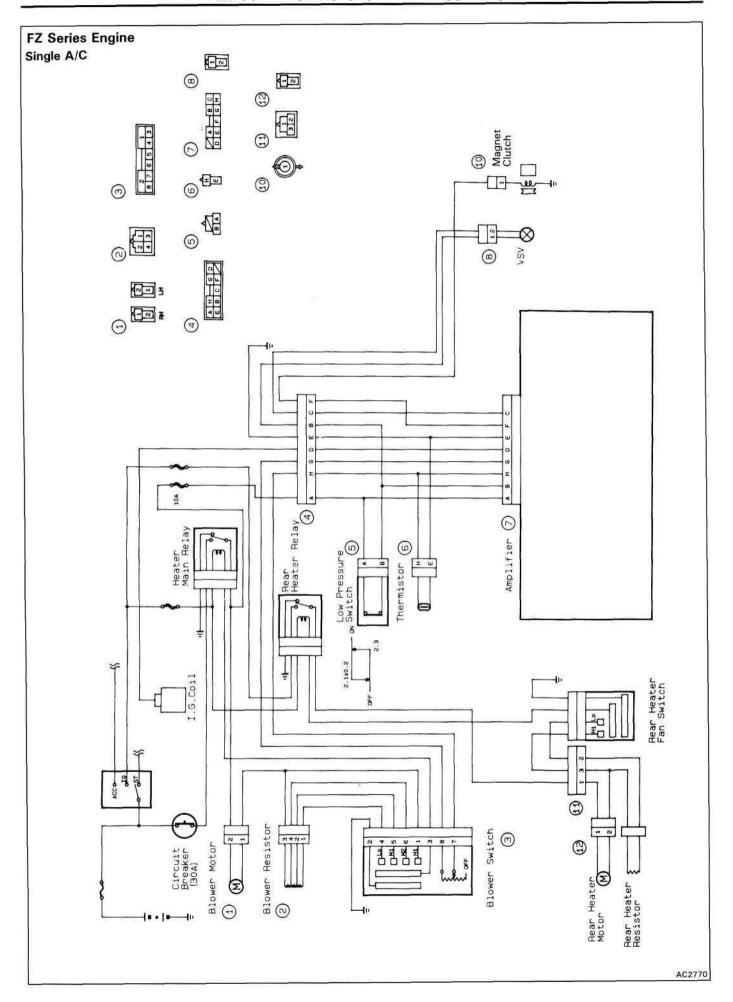
# (Station Wagon)

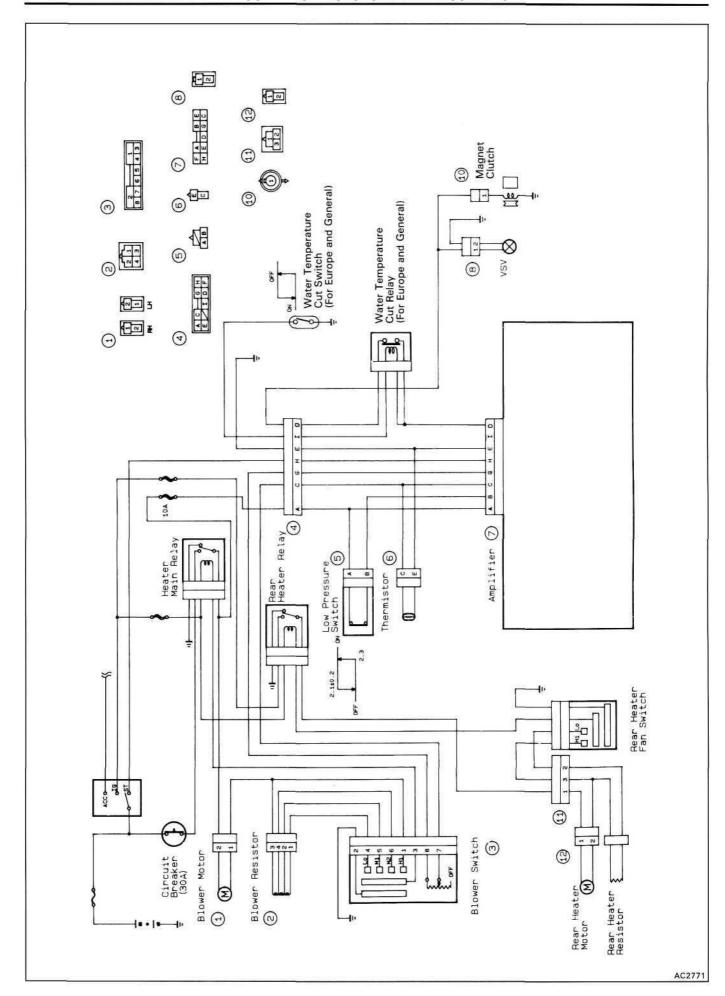
# **DESCRIPTION**

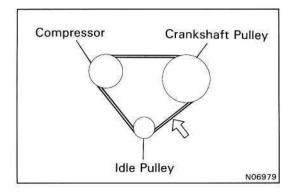
# **ELECTRICAL WIRING DIAGRAM**

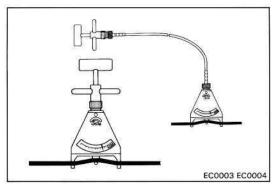












## **DRIVE BELT**

## **ON-VEHICLE INSPECTION**

#### INSPECT DRIVE BELT TENSION

Drive belt tension at 10 kg (22.0 lb, 98 N): FZ Series Engine

New belt

5 - 7 mm (0.20 - 0.28 in.)

**Used belt** 

7 - 7.5 mm (0.28 - 0.37 in.)

## (Reference)

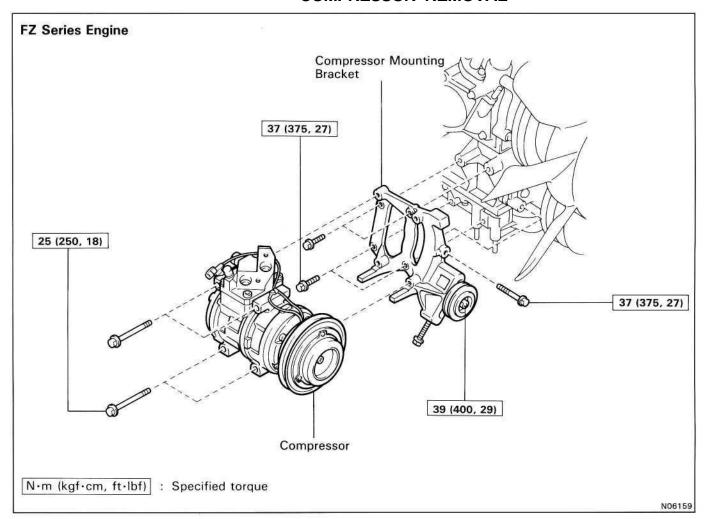
Using SST, check the drive belt tension. SST 09216-00020 and 09216-00030

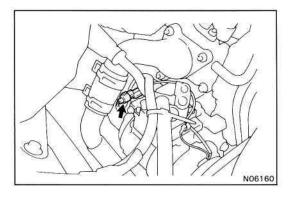
New belt: 40 - 60 kg

Used belt: 20 - 40 kg

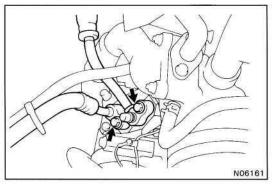
# **COMPRESSOR**

## **COMPRESSOR REMOVAL**





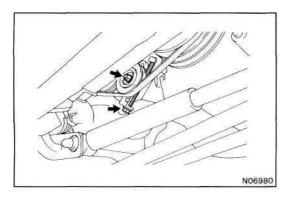
- 1. RUN ENGINE AT IDLE SPEED WITH A/C ON FOR TEN MINUTES
- 2. STOP ENGINE
- 3. DISCONNECT NEGATIVE CABLE FROM BATTERY
- 4. DISCONNECT CONNECTOR FROM MAGNET CLUTCH
- 5. RECOVER REFRIGERANT FROM REFRIGERATION SYSTEM



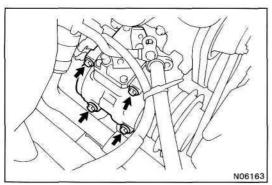
6. DISCONNECT TWO HOSES FROM COMPRESSOR SER-VICE VALVES

Cap the open fittings immediately to keep the moisture and dust out of the system.

7. REMOVE ENGINE UNDER COVER



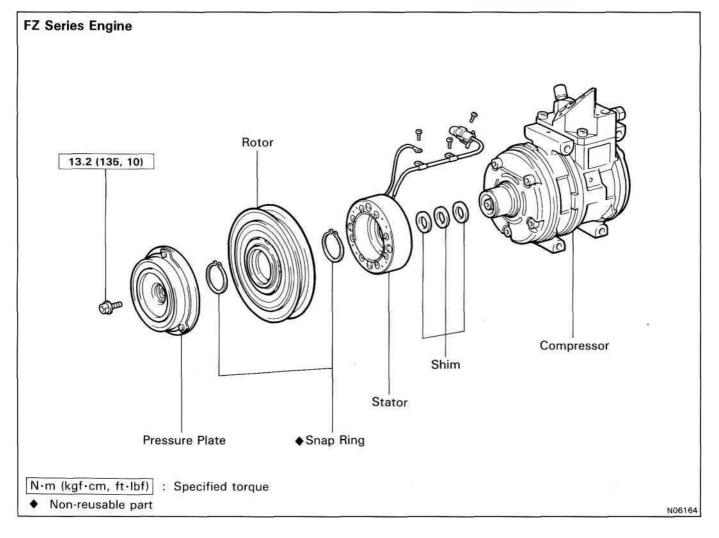
8. LOOSEN IDLE PULLEY LOCK NUT AND COMPRESSOR DRIVE BELT

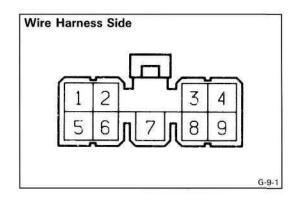


9. REMOVE COMPRESSOR

Remove the four bolts and pull the compressor upward.

## **MAGNET CLUTCH DISASSEMBLY**





# AIR CONDITIONER 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: ON

(2) Temperature control lever: MAX. COOL

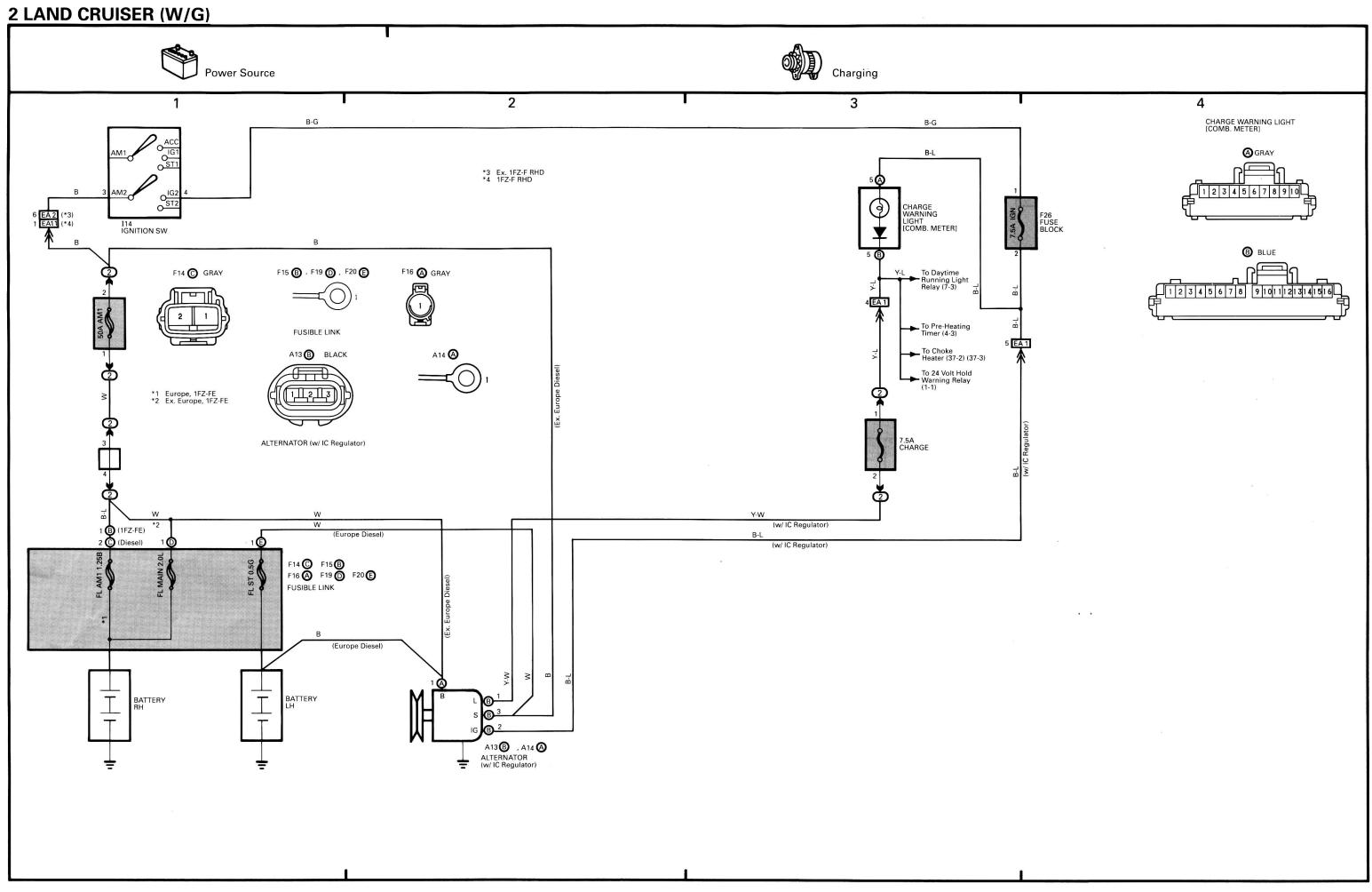
(3) Blower switch: HI

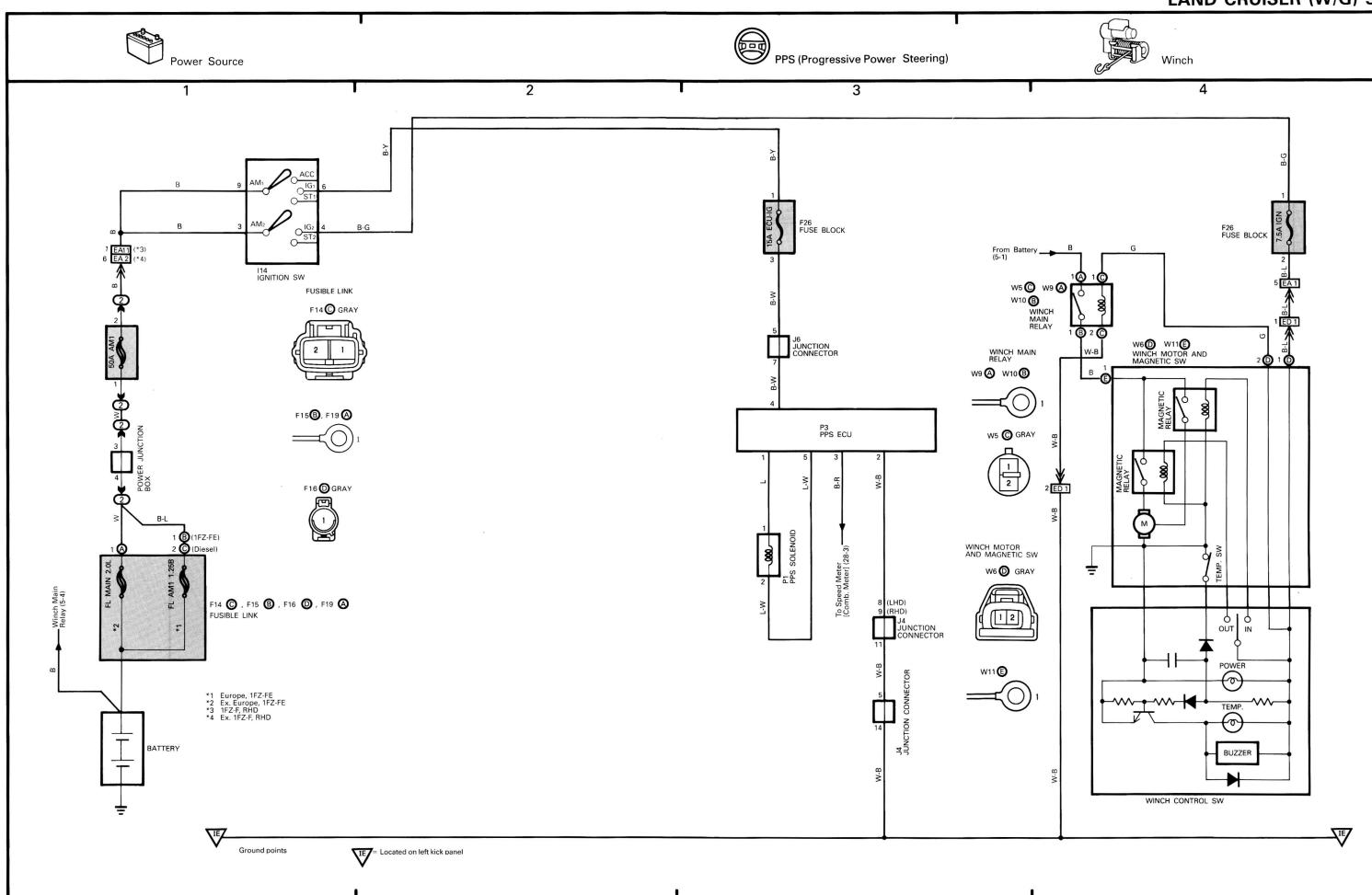
#### **FZ Series Engine**

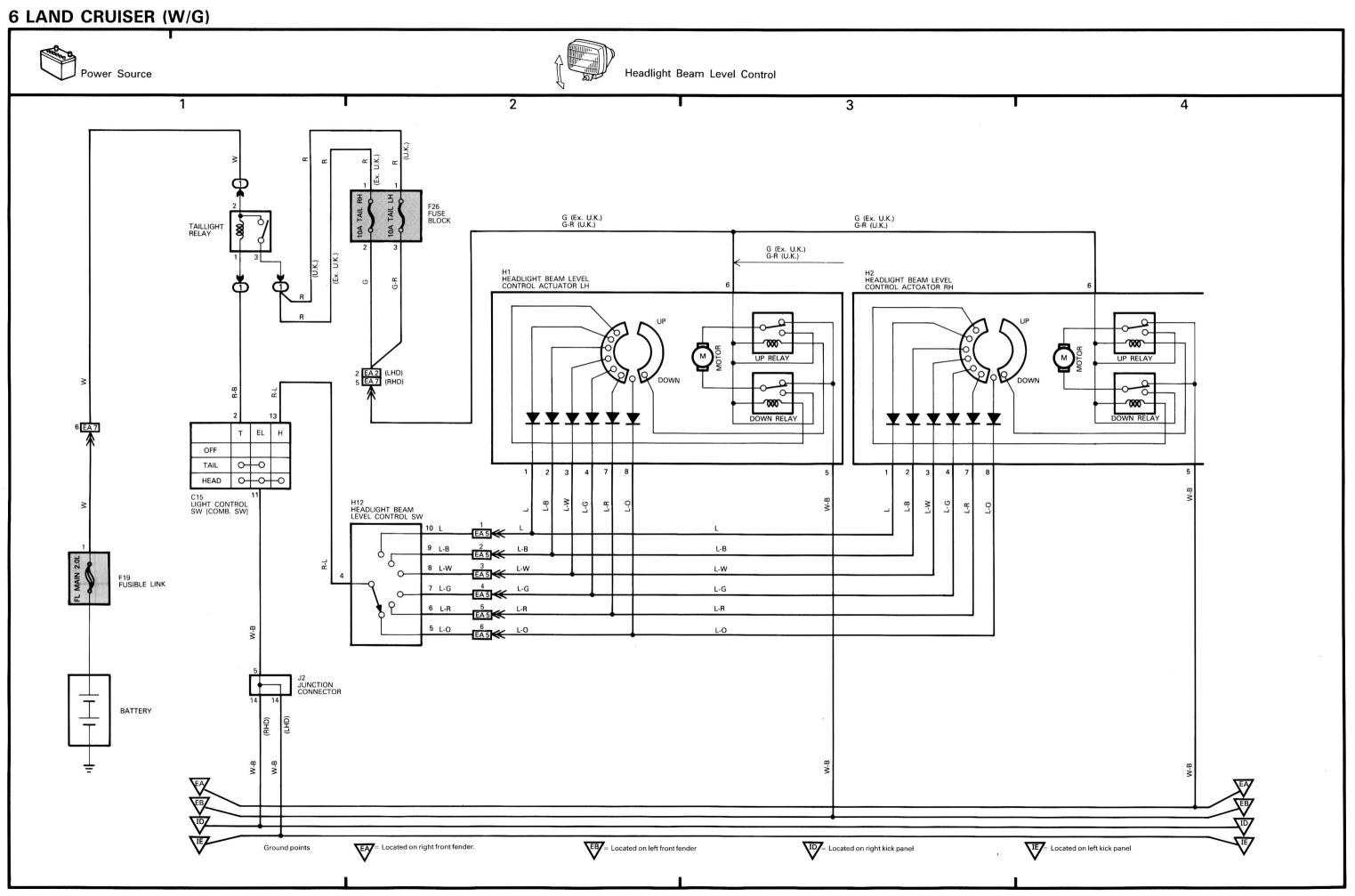
Check for	Tester connection	Condition	Specified value	
Voltage	2 - 6	Turn A/C switch on	No voltage	
		Turn A/C switch off	Battery voltage	
	3 - 6	Turn A/C switch on	No voltage	
		Turn A/C switch off	Battery voltage	
	5 - 6	Start engine	Approx. 10 to 14 V	
		Stop engine	No voltage	
Resistance	3 - 4	Constant Approx. 40 Ω at 25°		
	6 - 7	Constant	Approx. 3.8 Ω	
	8 - 9	Max. cool	Apporx. O Ω	
		Min. cool	Apporx. 3 kΩ	
	6 - 9	Constant	Approx. 1.5 kΩ at 25°C (77°F)	

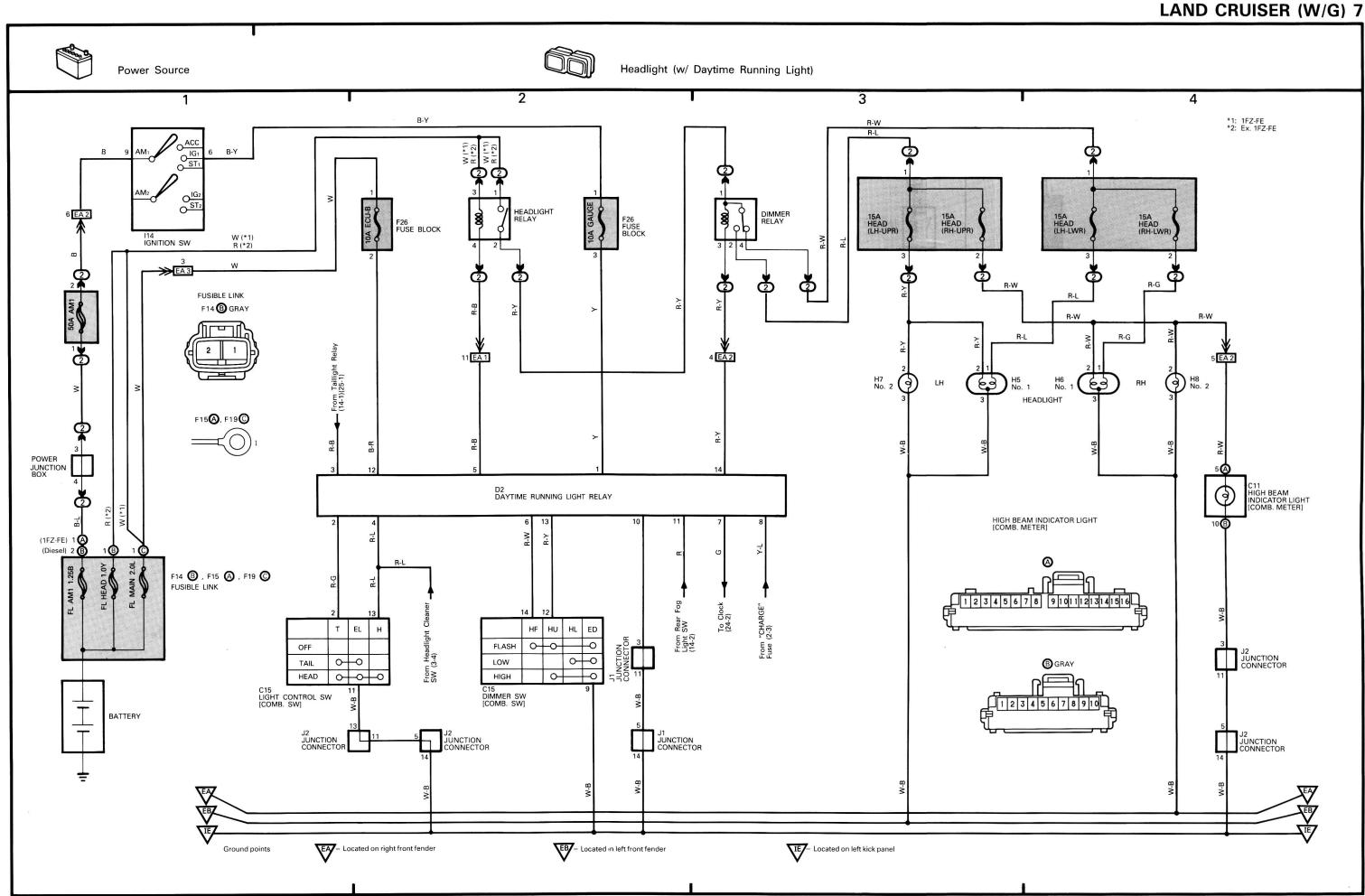
If circuit is as specified, replace the amplifier.

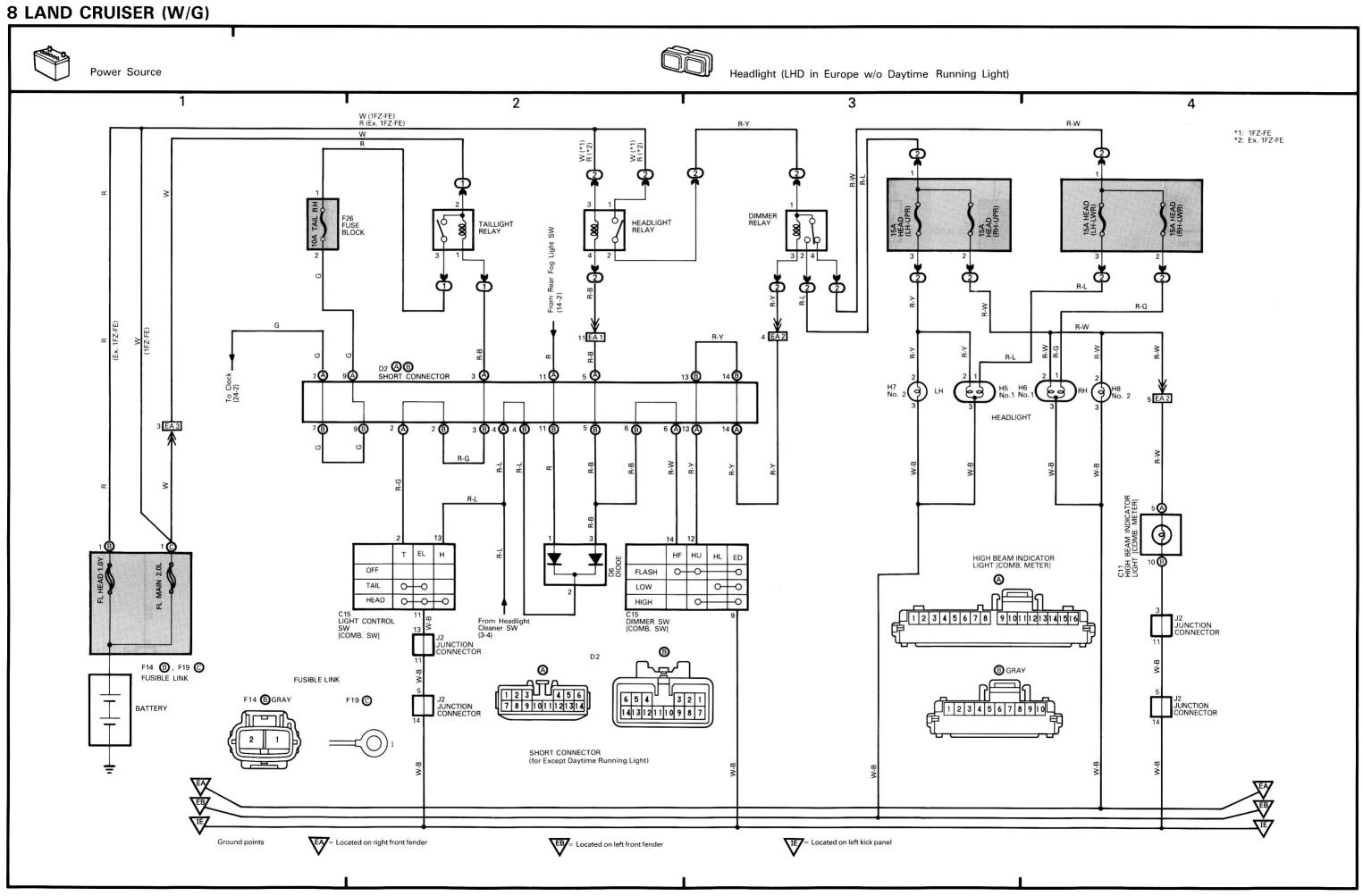
(Education No. 1 to 45							
SYSTEMS		LOCATION	SYSTEMS		LOCATION		
ABS (Anti-Lock Brake System)	"Care	41-3	Light Auto Turn Off		40-4		
Accessory Meter	<b>₹</b> -□-1	20-3	Light Reminder		24-3		
Air Conditioner, Cooler and Heater		30-4 (Push SW Type) 34-4 (Manual Dual A/C Type) 36-4 (Manual Single A/C Lever SW Type)	Moon Roof		19-2		
Auto Antenna	اً	13-2 (Australia) 13-4 (Ex. Australia)	Power Seat		19-3		
Automatic Transmission Indicator	PRNDZL	21-2	Power Source		$1\sim$ 30, 34, 36 $\sim$ 41-1		
Back-Up Light	100	21-3	Power Window		15-3		
Charging		2-3	PPS (Progressive Power Steering)		5-3		
Cigarette Lighter	<b>©</b>	24-3	Radio and Player		26-3 (w/o CD Player) 26-5 (w/ CD Player)		
Clock		24-2	Rear Air Conditioner		33-3 (Auto) 35-4 (Manual)		
Combination Meter		28-4	Rear Fog Light	OF	14-3		
Condenser Fan		34-2	Rear Window Defogger		18-2		
Cool/Ice Box		33-6	Rear Wiper and Washer		17-3 (1HZ, 1HD-T) 38-4 (1FZ-FE, 1FZ-F)		
Cruise Control	40sm	23-3	Remote Control Mirror		20-2		
ECT (Electronic Controlled Transmission)	ECT	39-3	Satellite Navigation	Q	3-2 (Australia)		
Emission Control		37-2 (1FZ-FLHD) 37-3 (1FZ-FRHD)	Seat Belt Warning		21-4		
Engine Control		27-4	Seat Heater		18-4		
Front Wiper and Washer		17-2 (1HZ, 1HD-T) 38-2 (1FZ-FE, 1FZ-F)	Starting		1-3		
Fuel Heater		19-5	Stop Light	STOP I	24-4		
Fuel Tank Changeover		29-6	Sub Fuel Tank	Am.	40-2 (1FZ-FE)		
Glow Plug	1	4-3	Taillight and Illumination		25-4		
Headlight Beam Level Control		6-3	Theft Deterrent and Door Lock		16-3		
Headlight Cleaner		3-4	Turn Signal and Hazard Warning Light		12-2		
Headlight		7-2 (w/ Daytime Running Light! 8-2 (LHD in Europe w/o Daytime Running Light! 9-2 (U.K.) 10-2 (Ex. LHD in Europe)	Winch	)	5-4		
Horn	<b>O</b>	12-4	4WD		22-3		
Ignition		37-4 (1FZ-F)	12-24 Volt Switchover System	+ + +	1-2		
Interior Light		11-3	Connector Joining Wire Hai and Wire Harness	rness	42, 43		

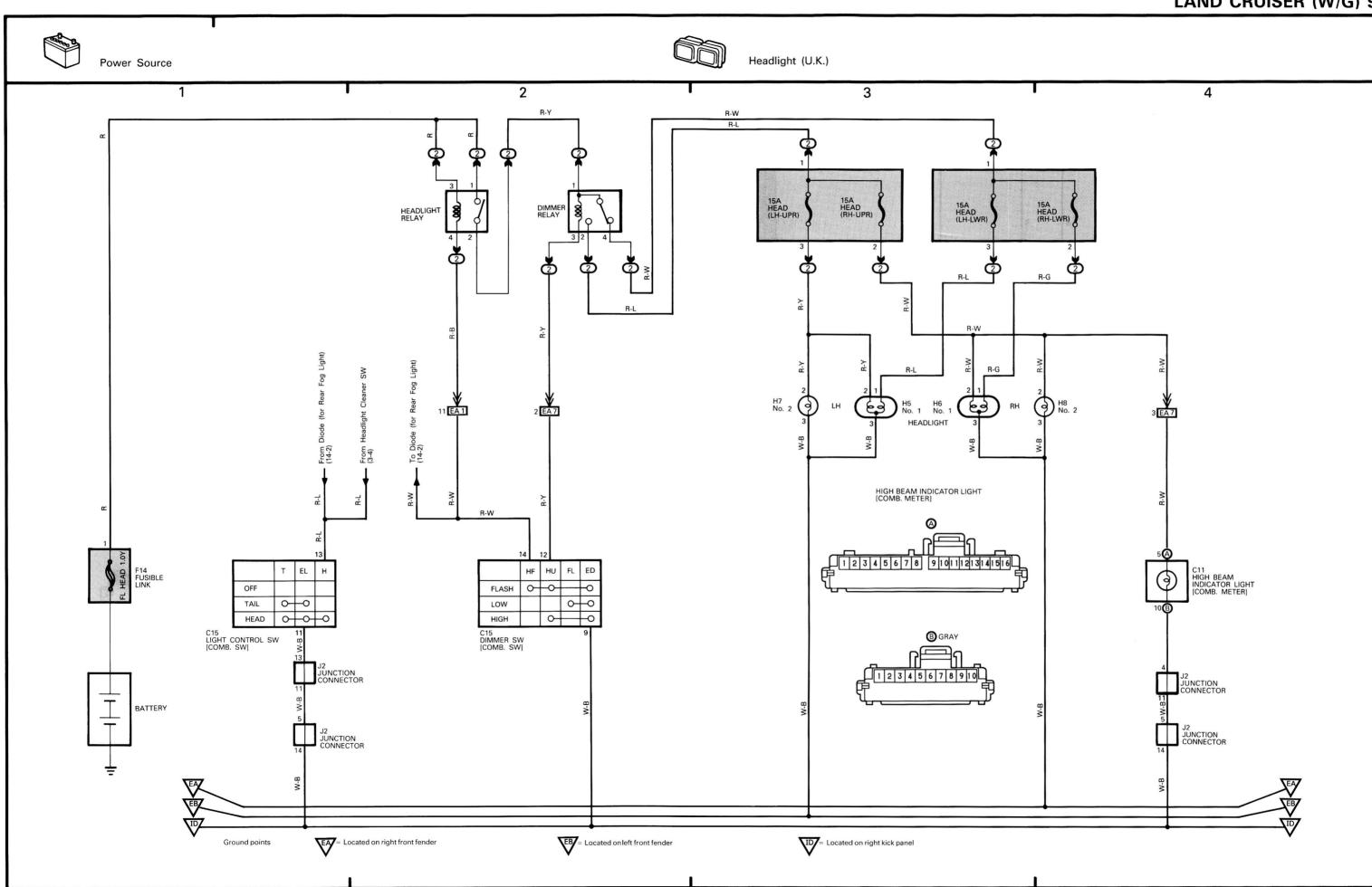


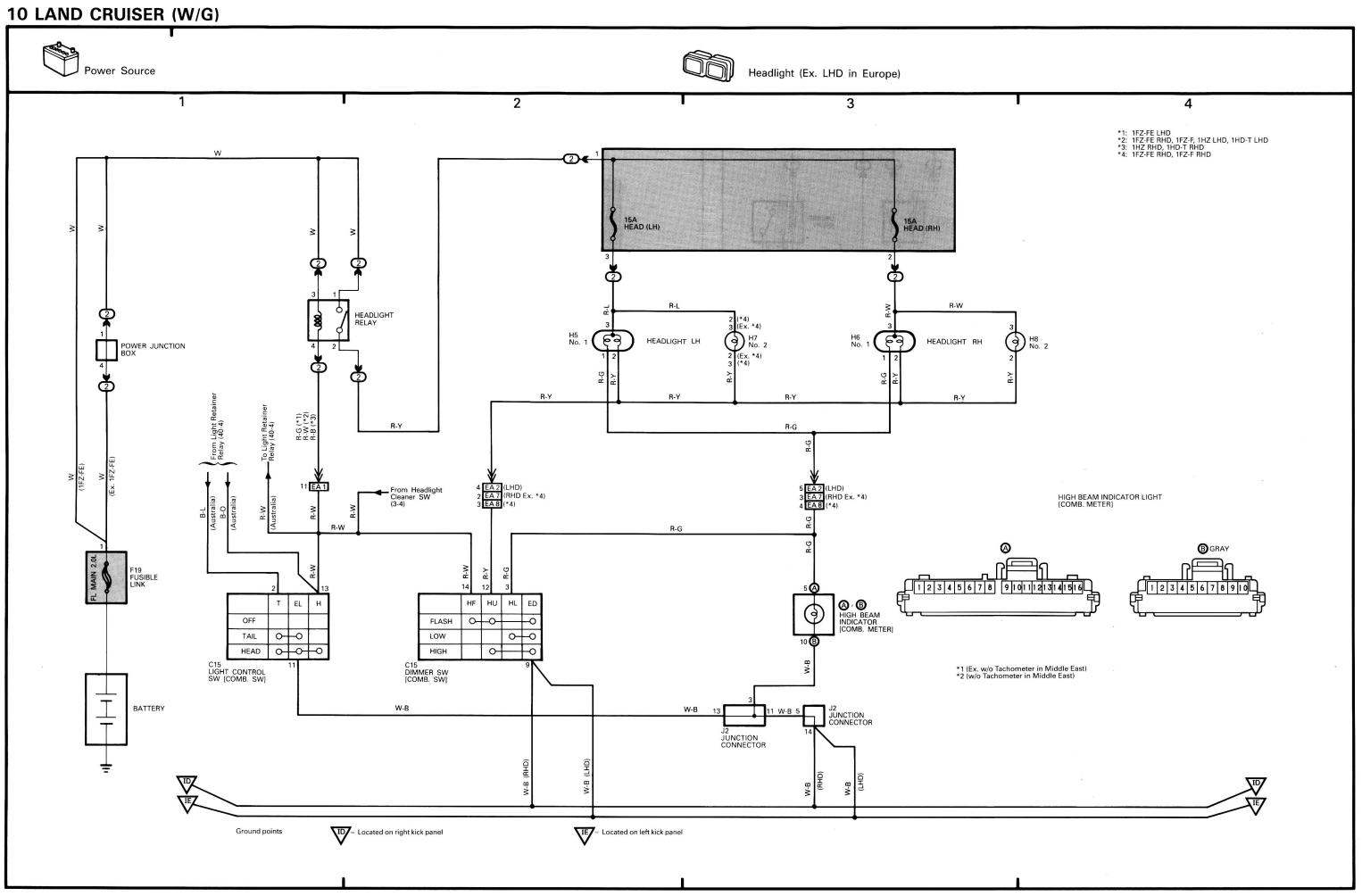


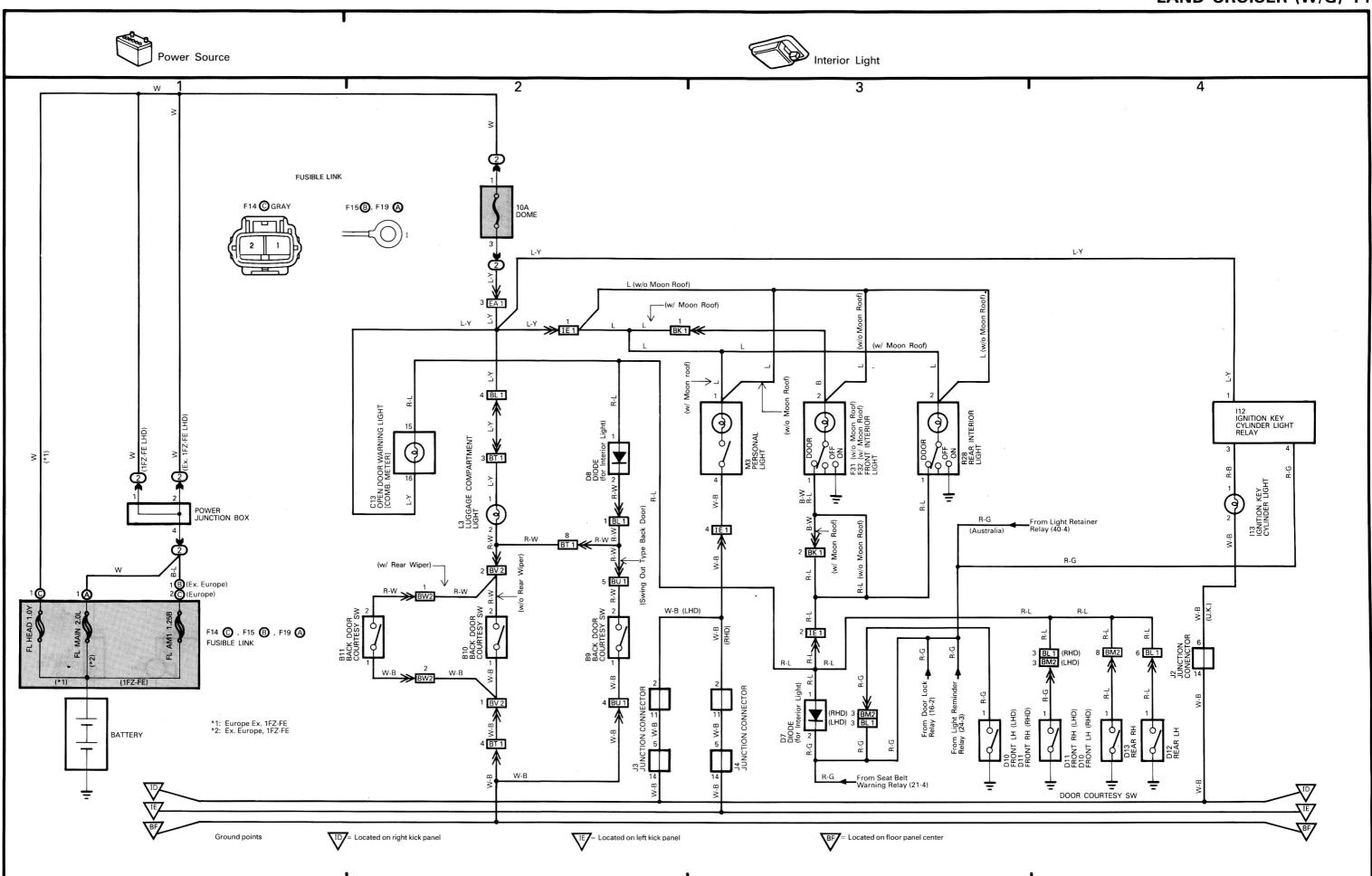


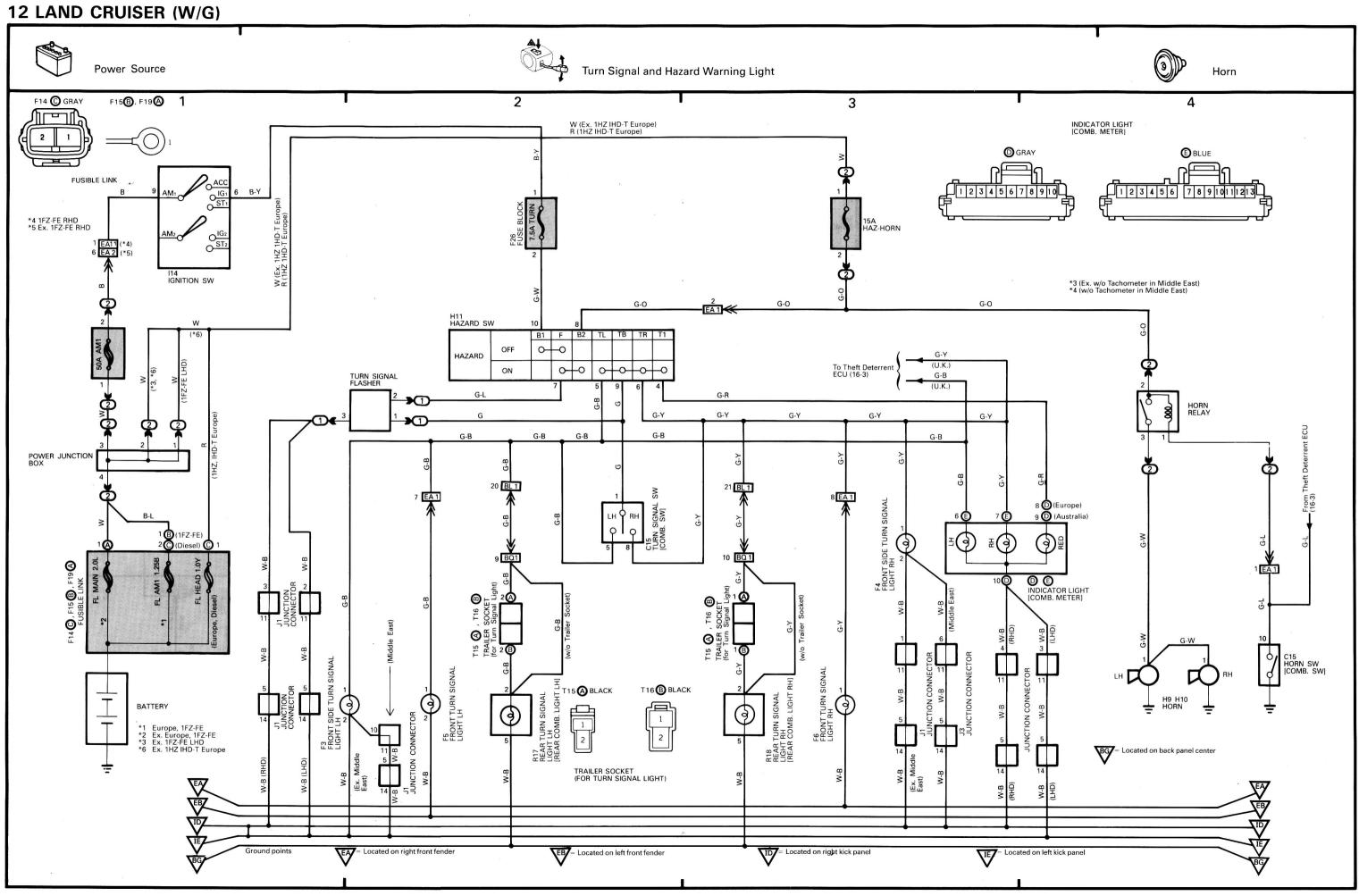


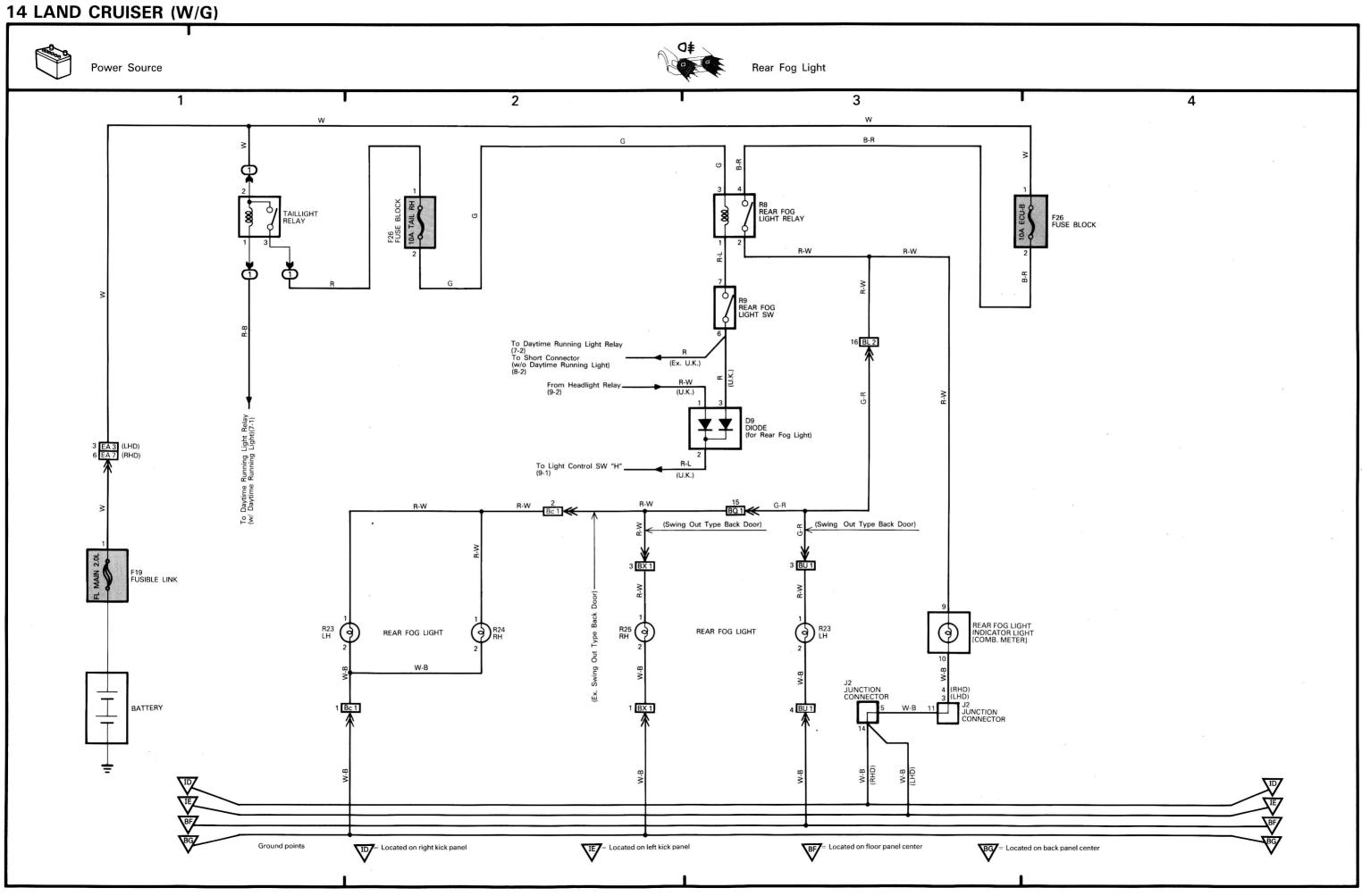


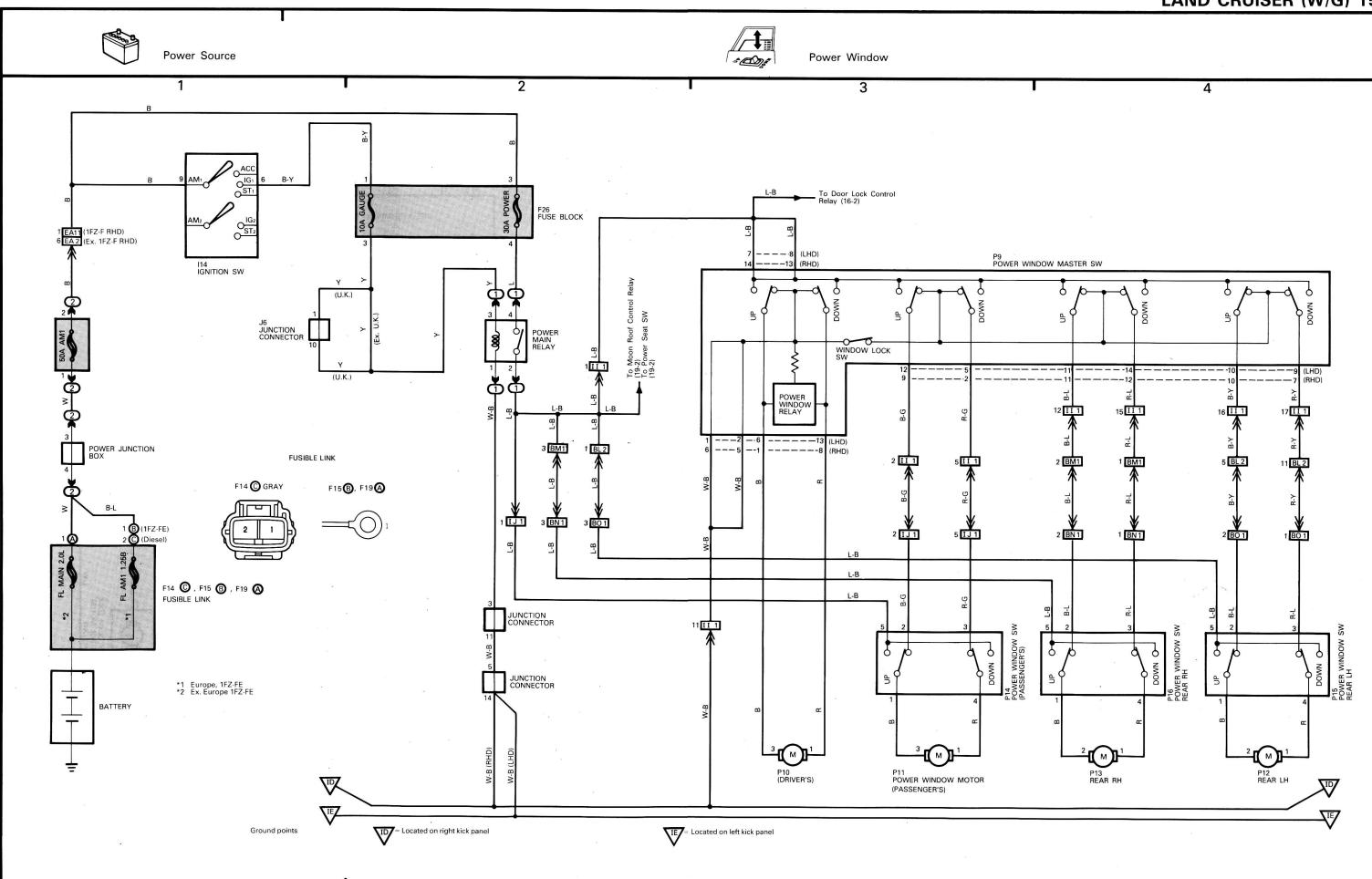


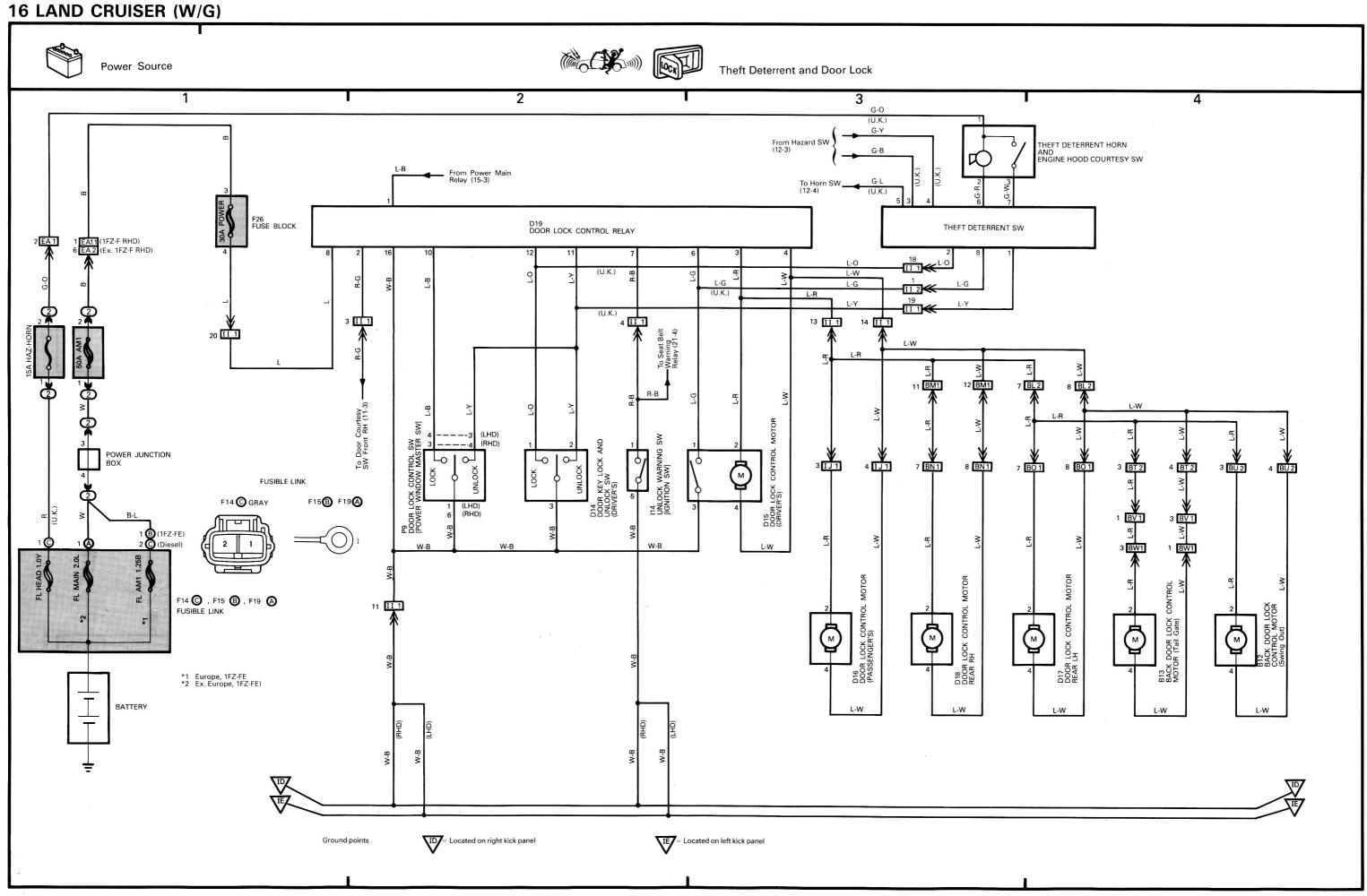


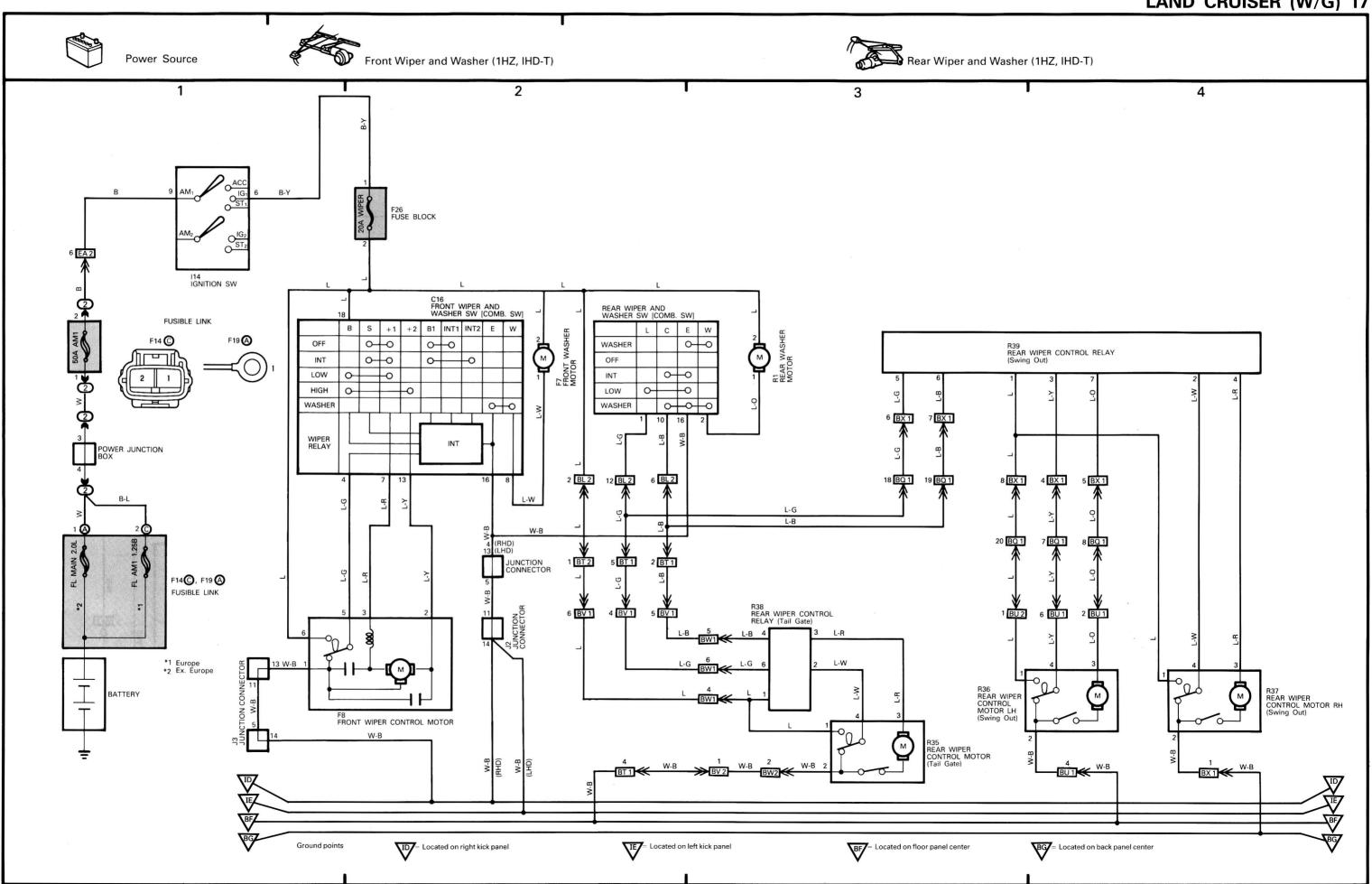


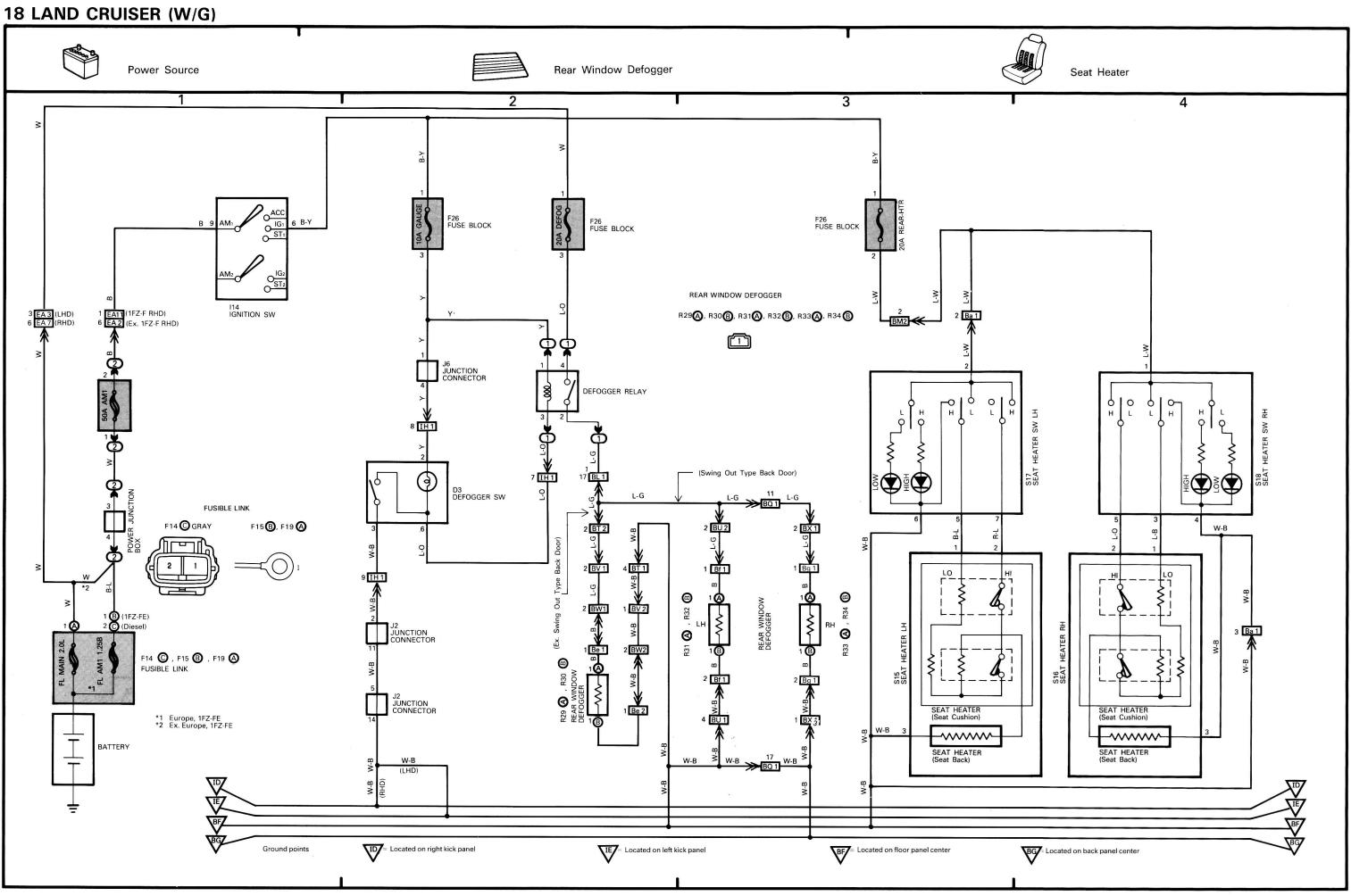


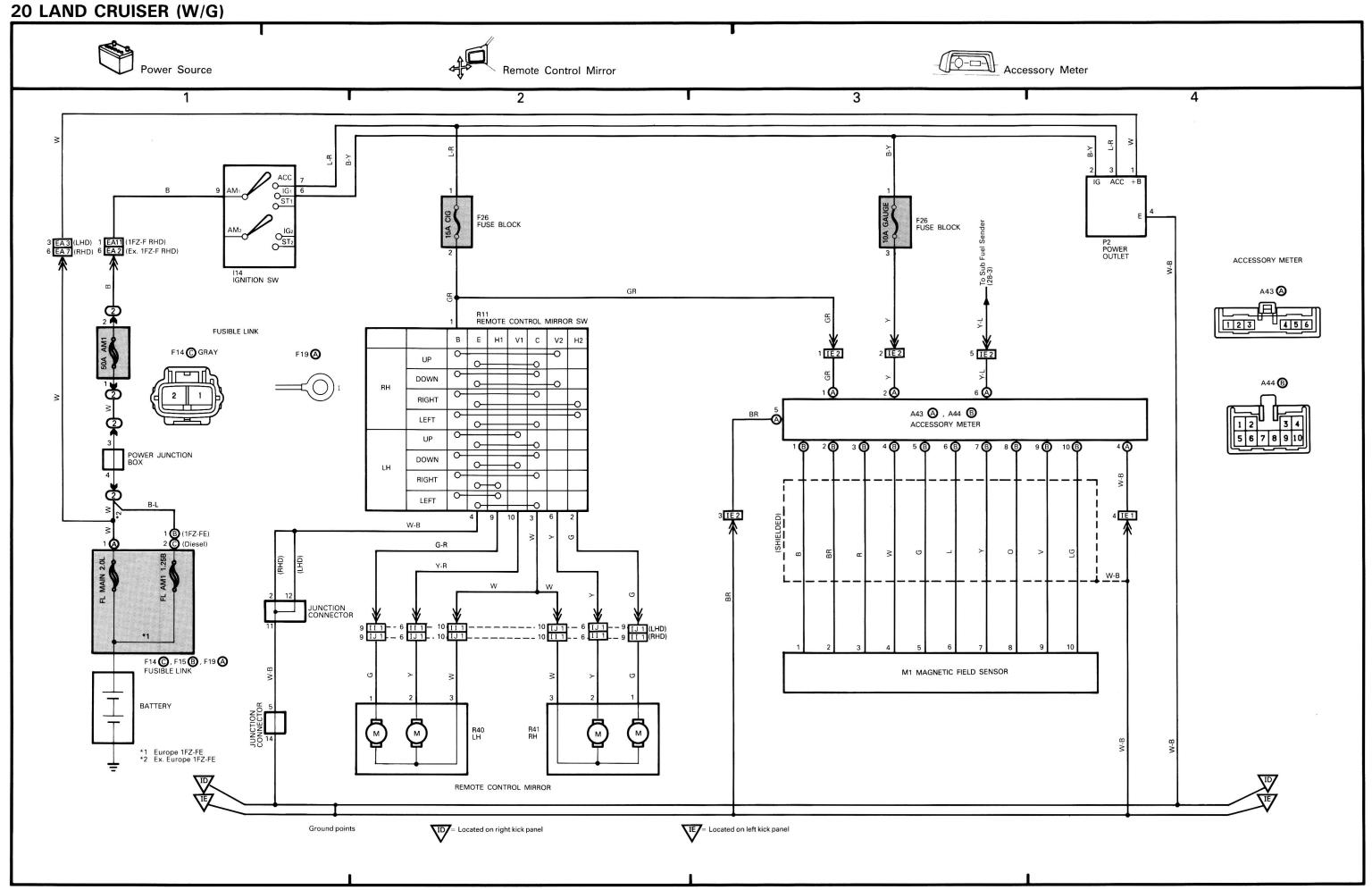


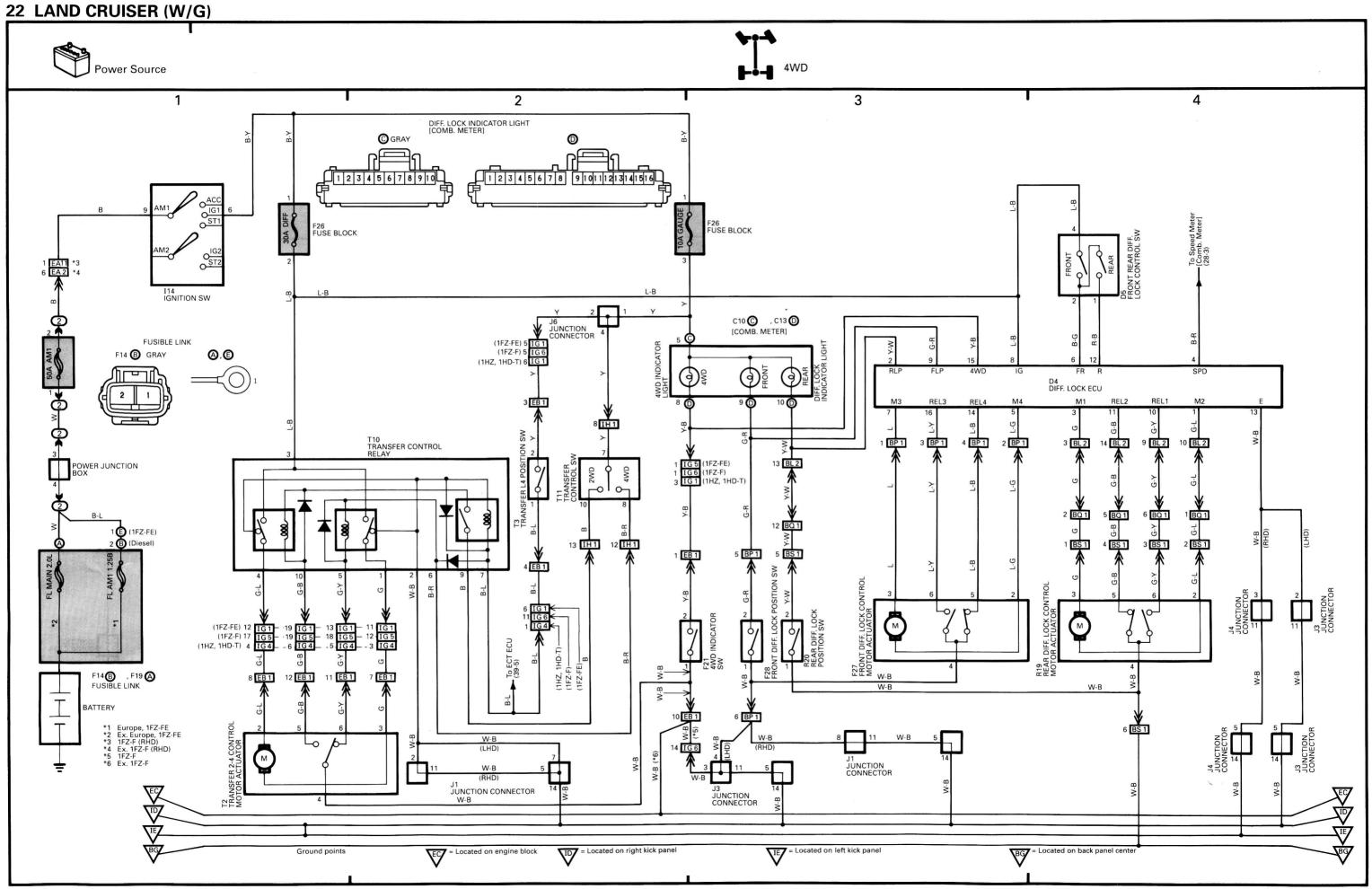


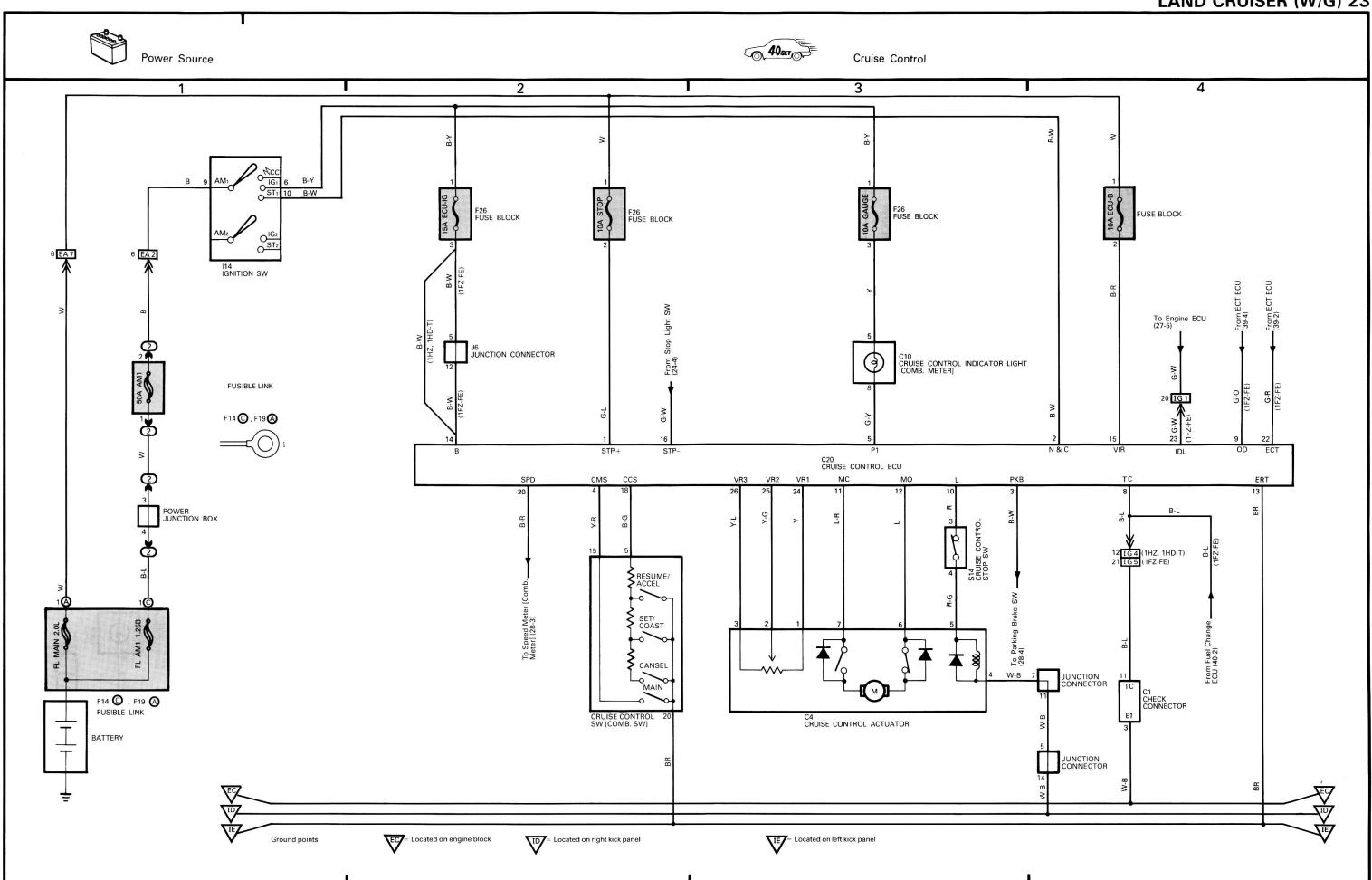


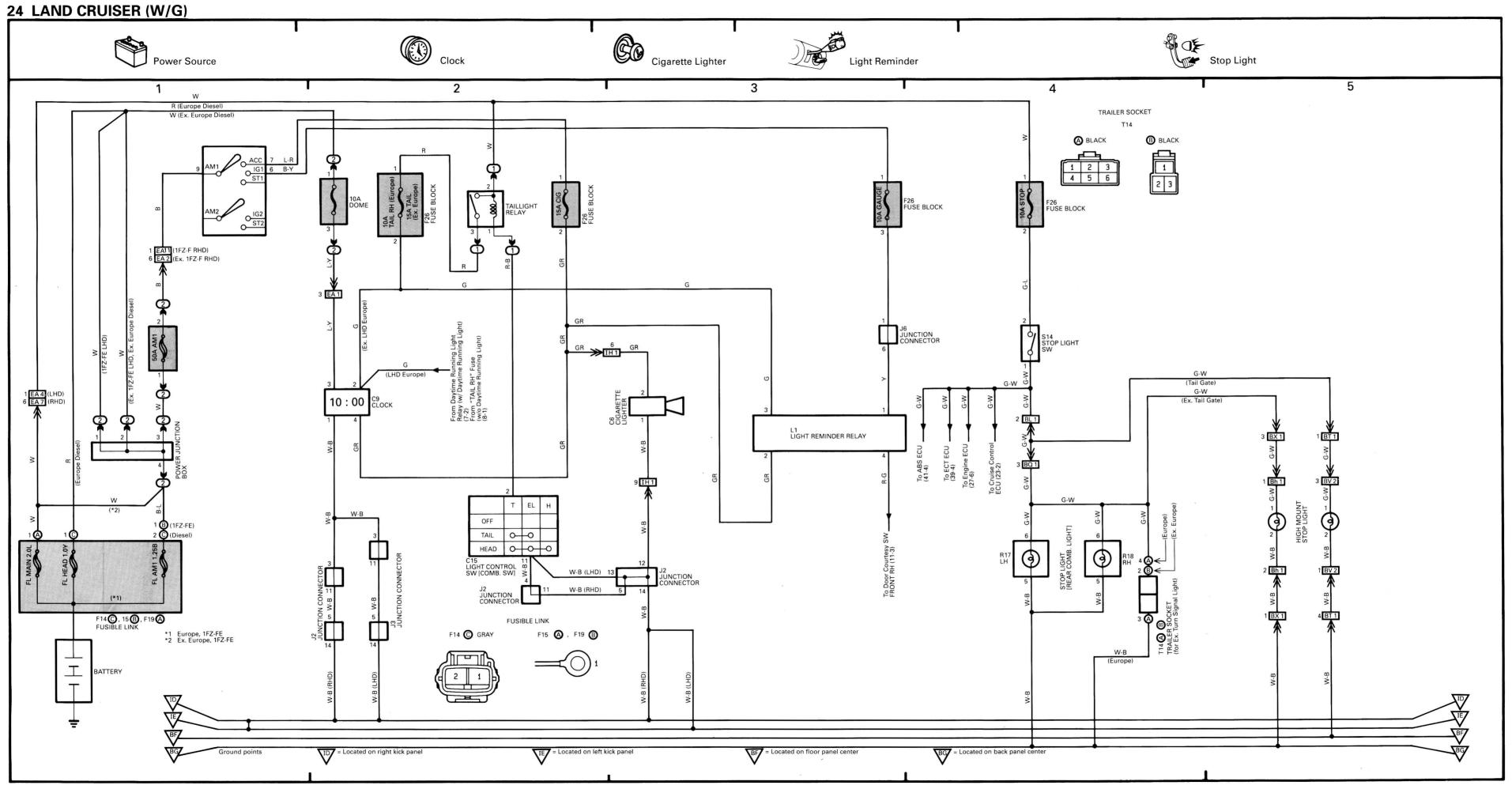


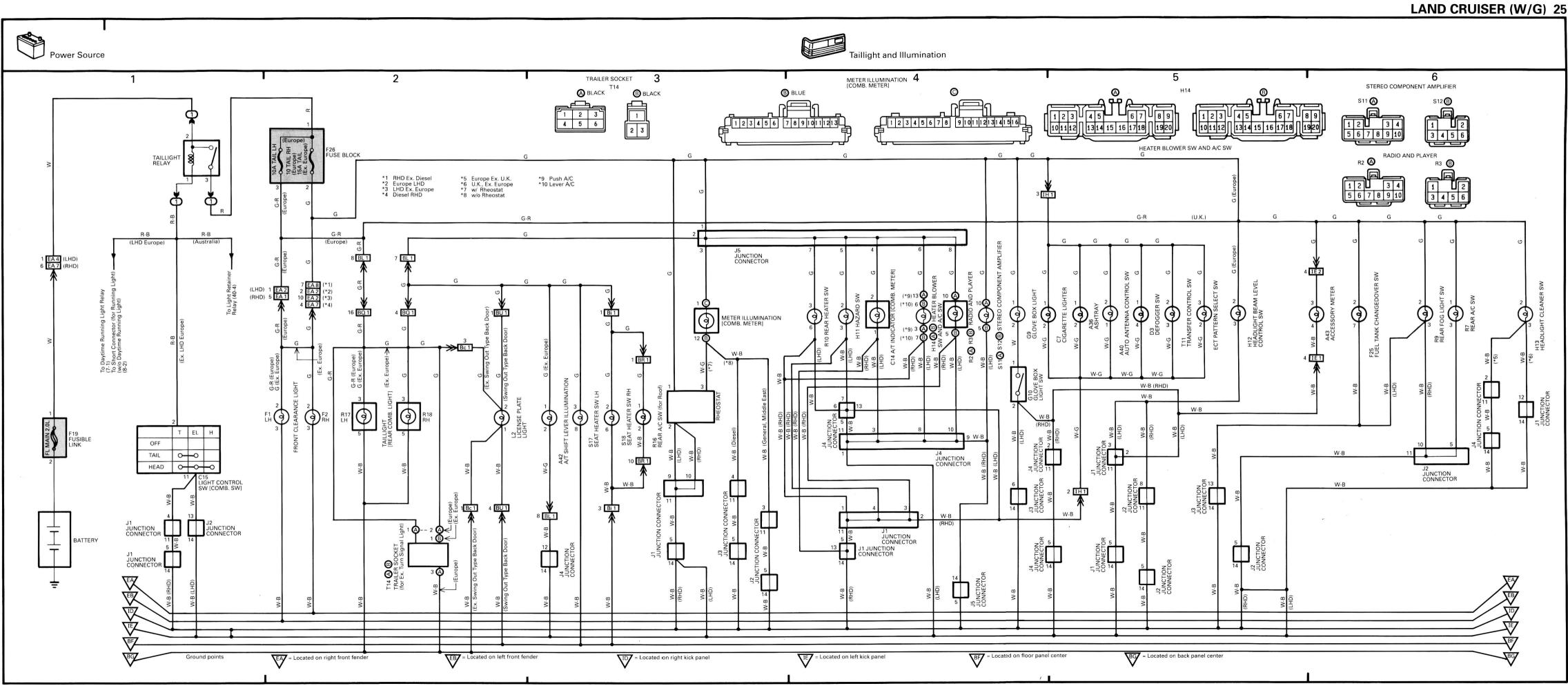


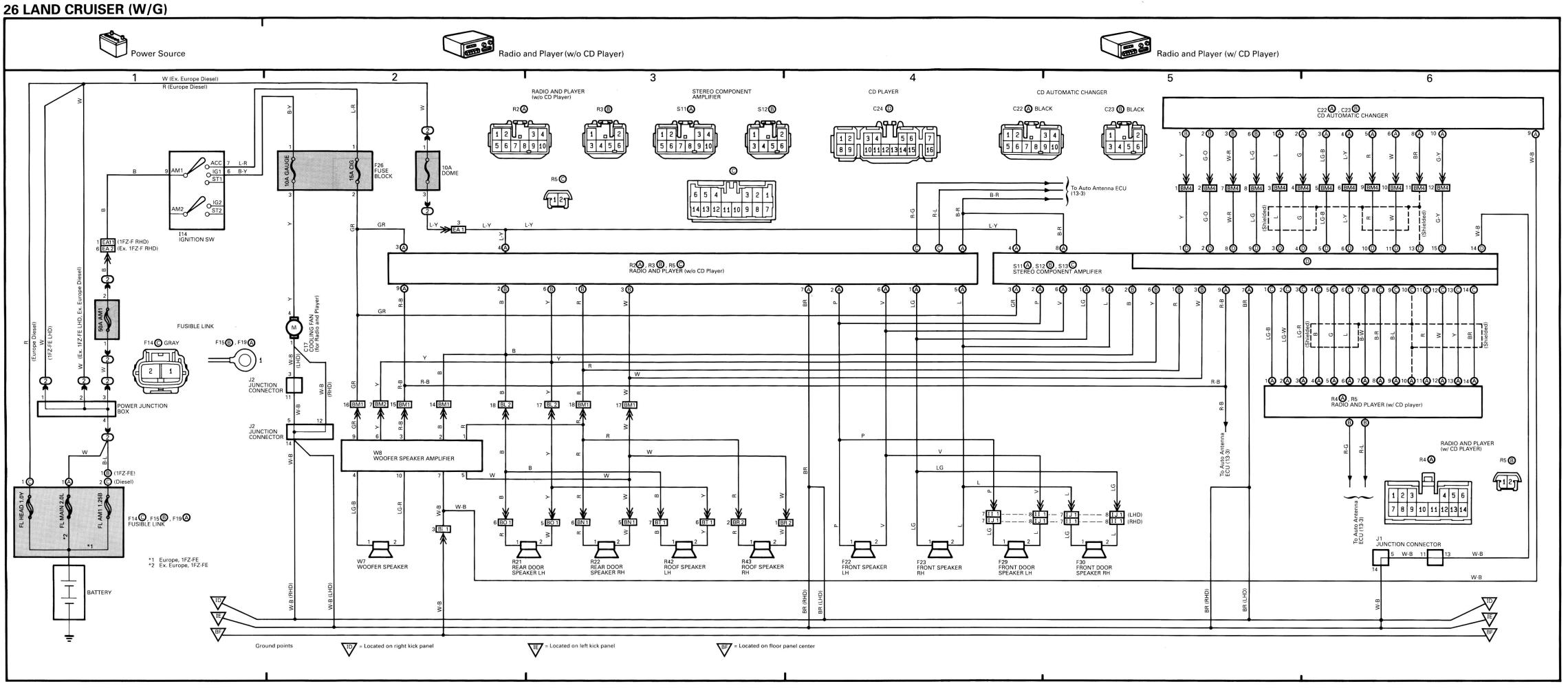


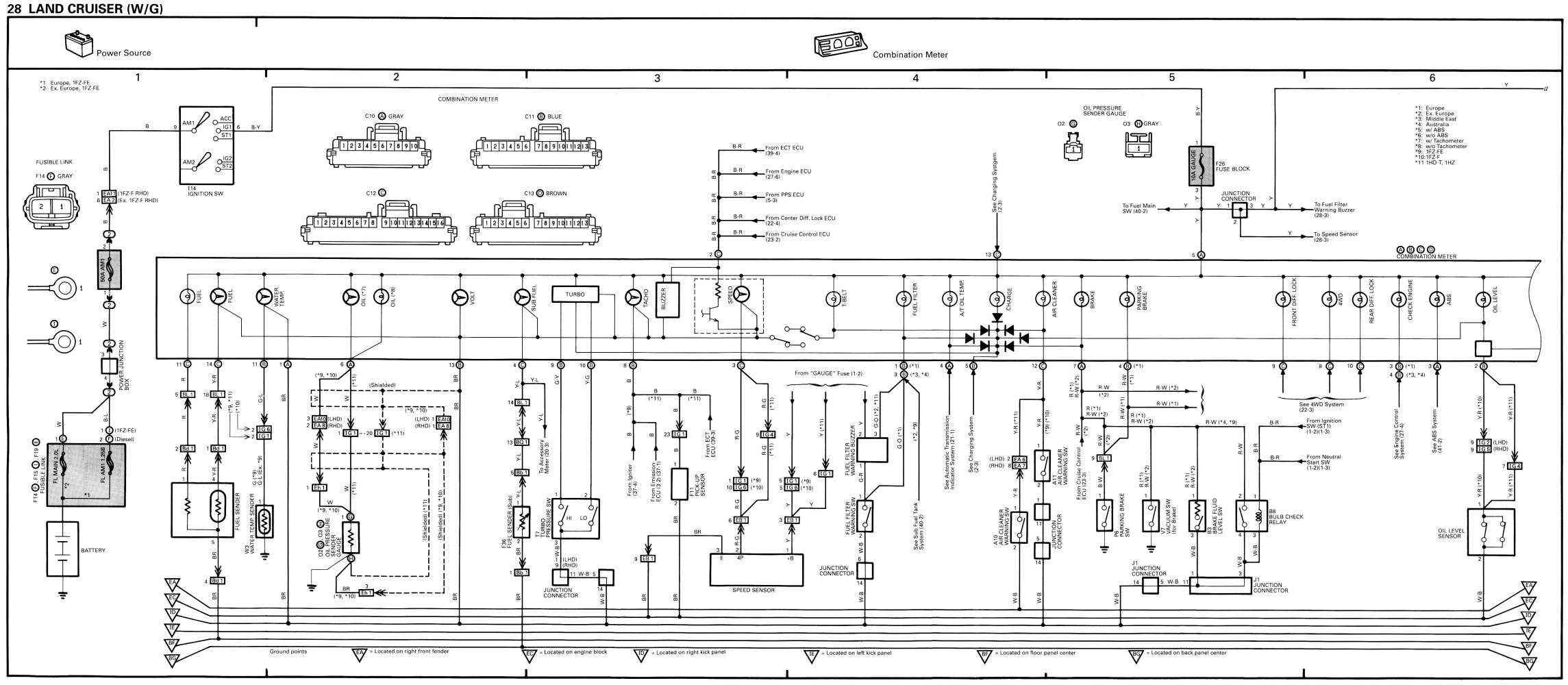


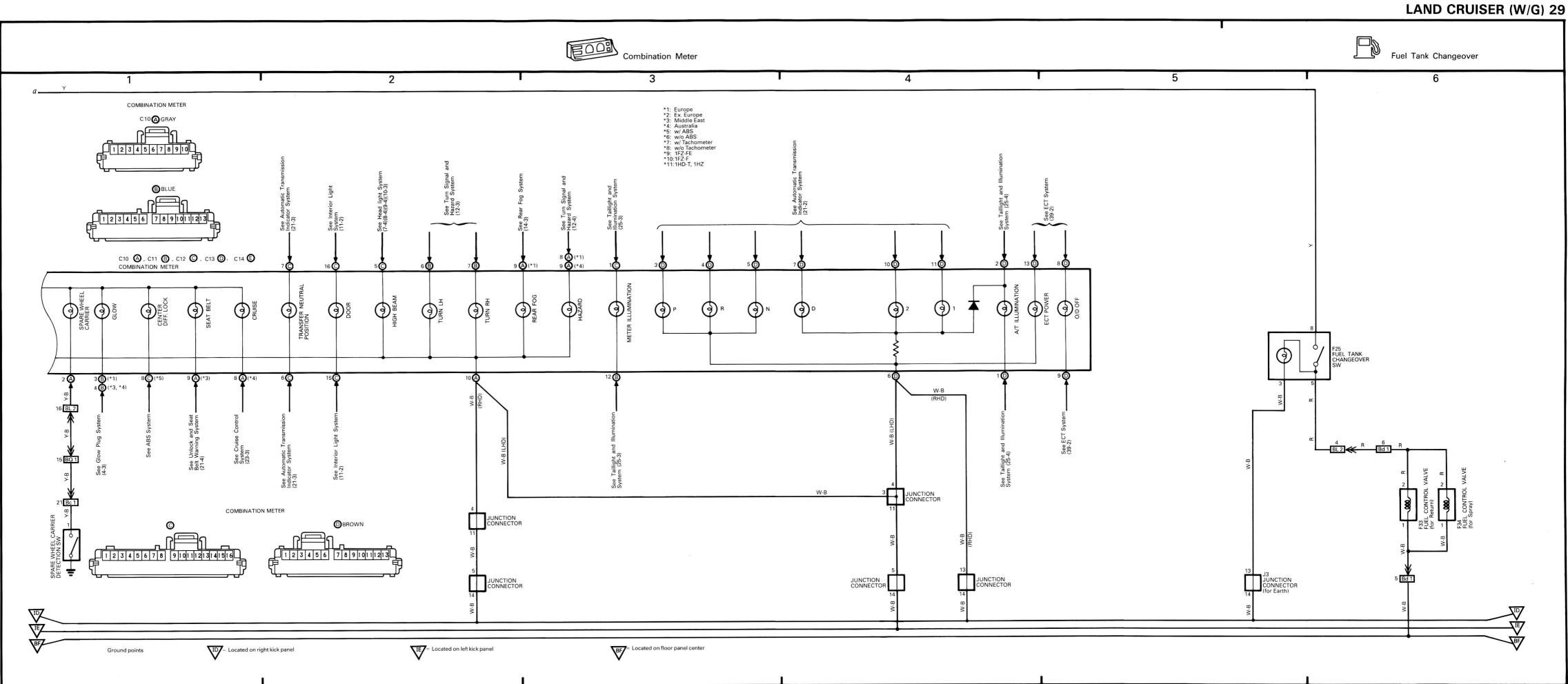


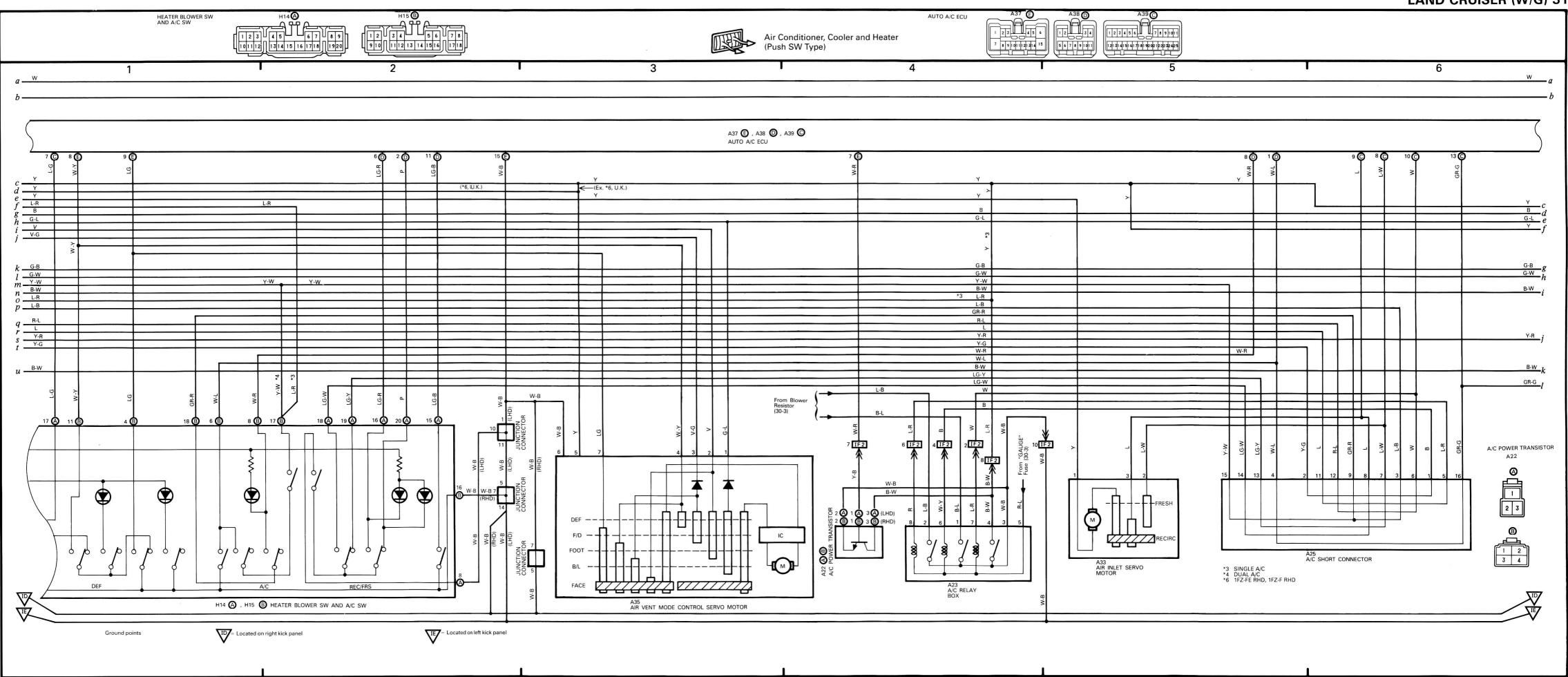


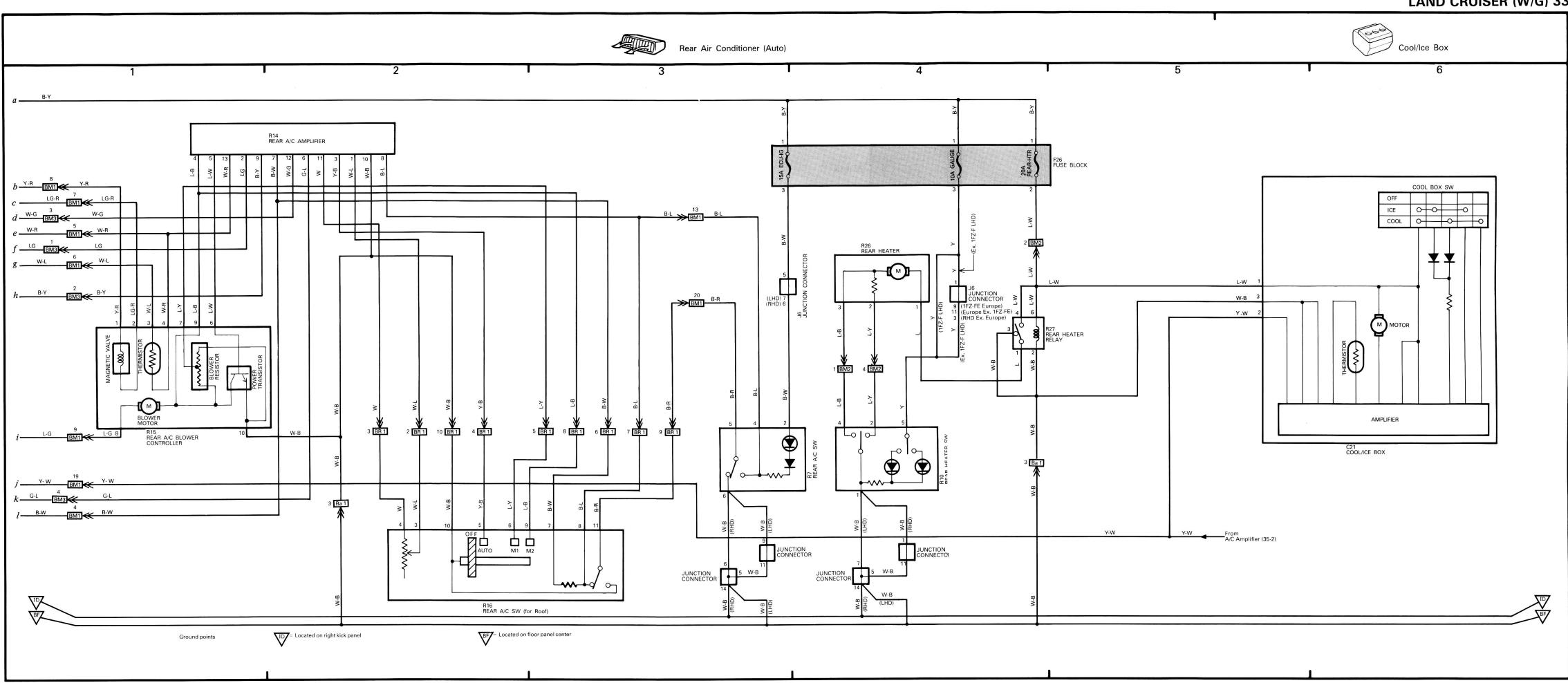


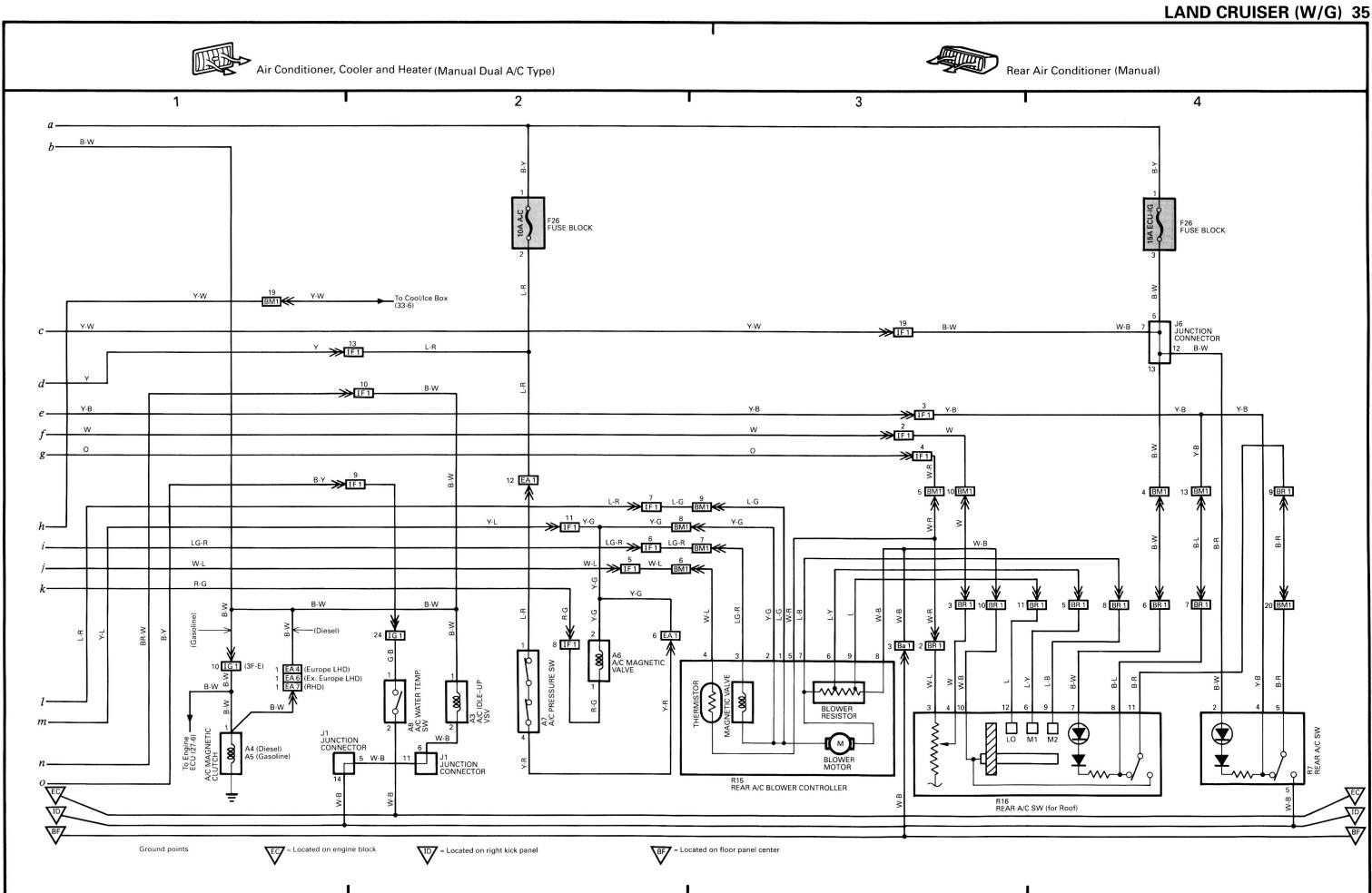


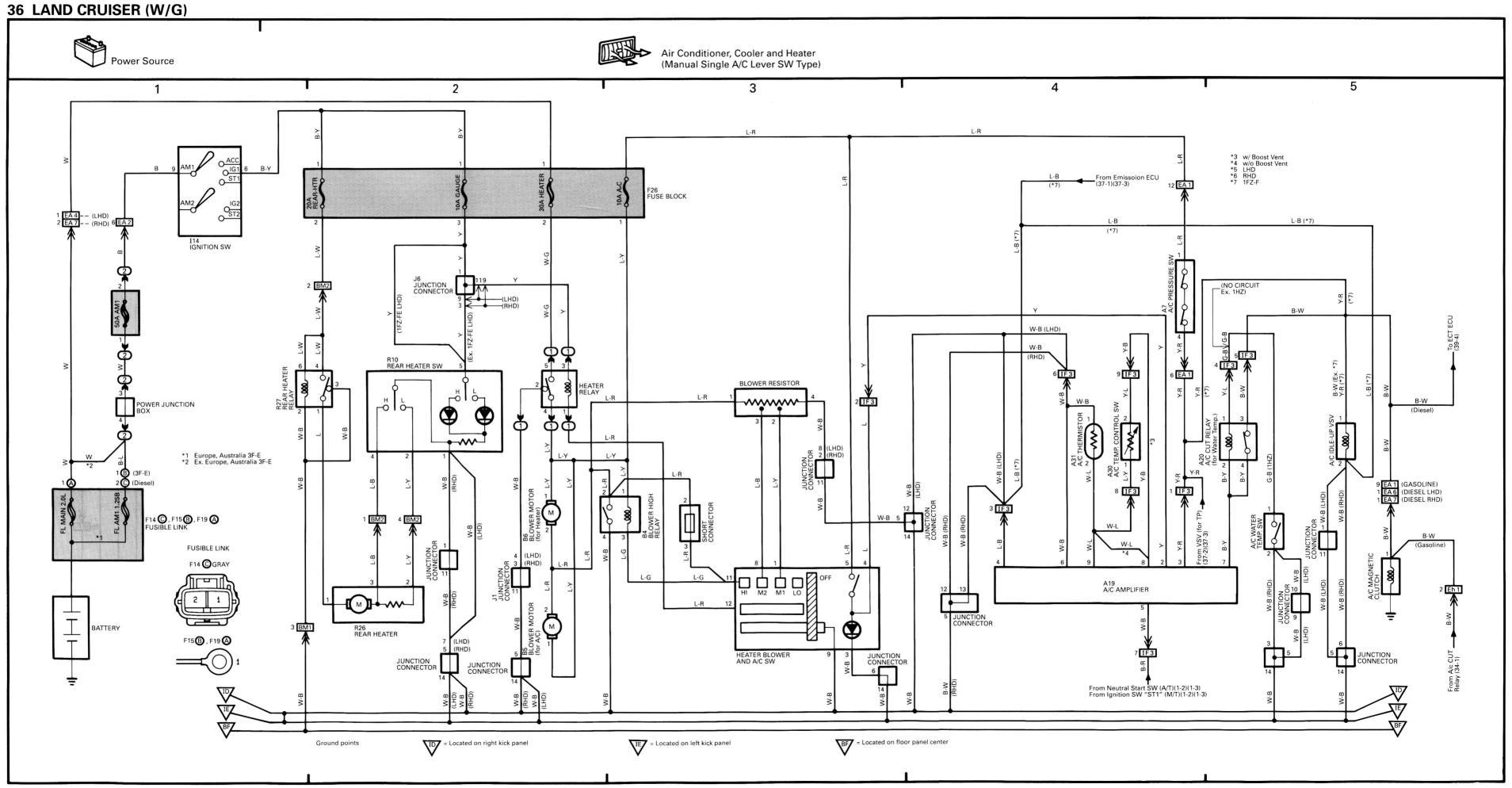


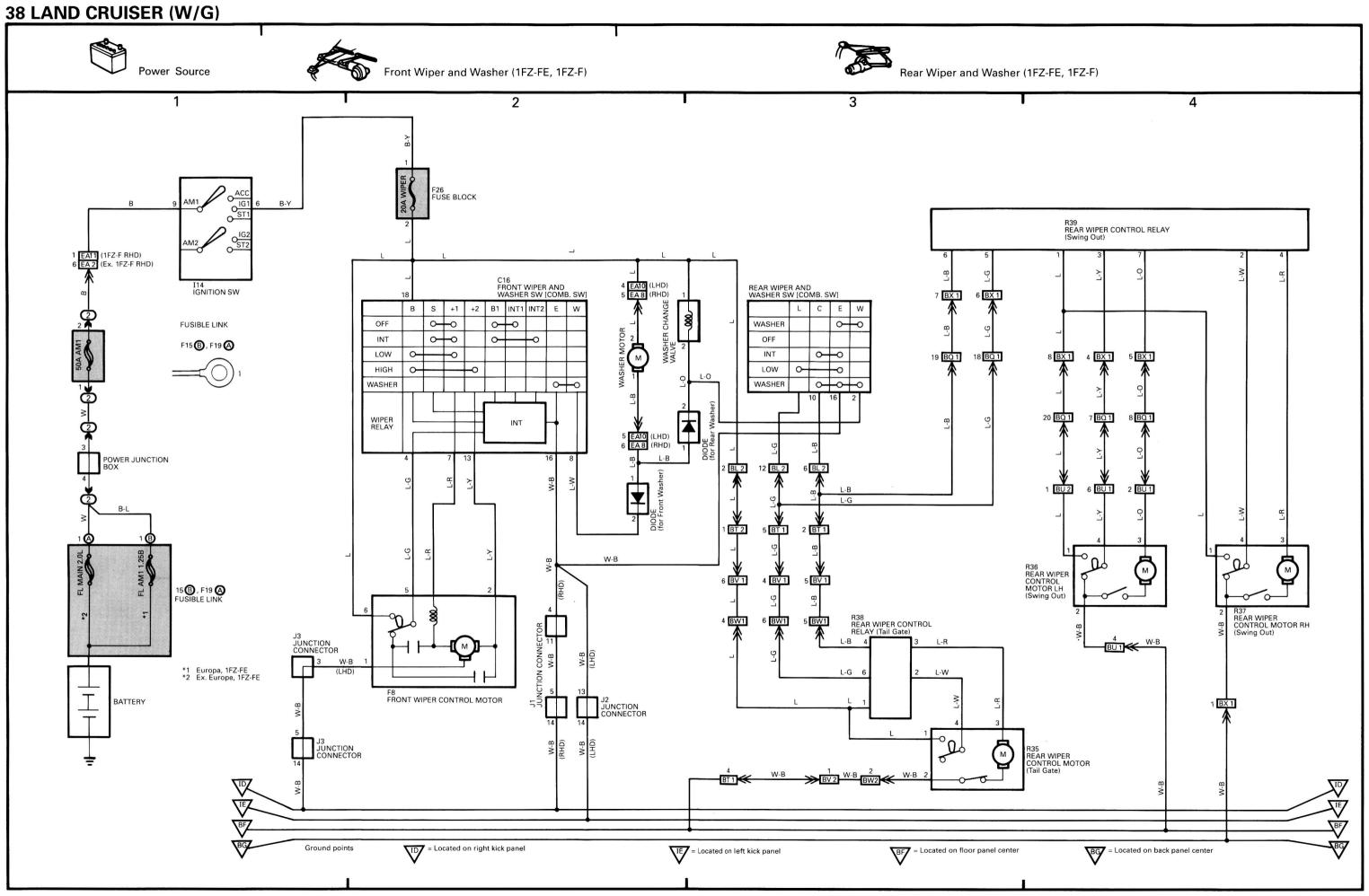


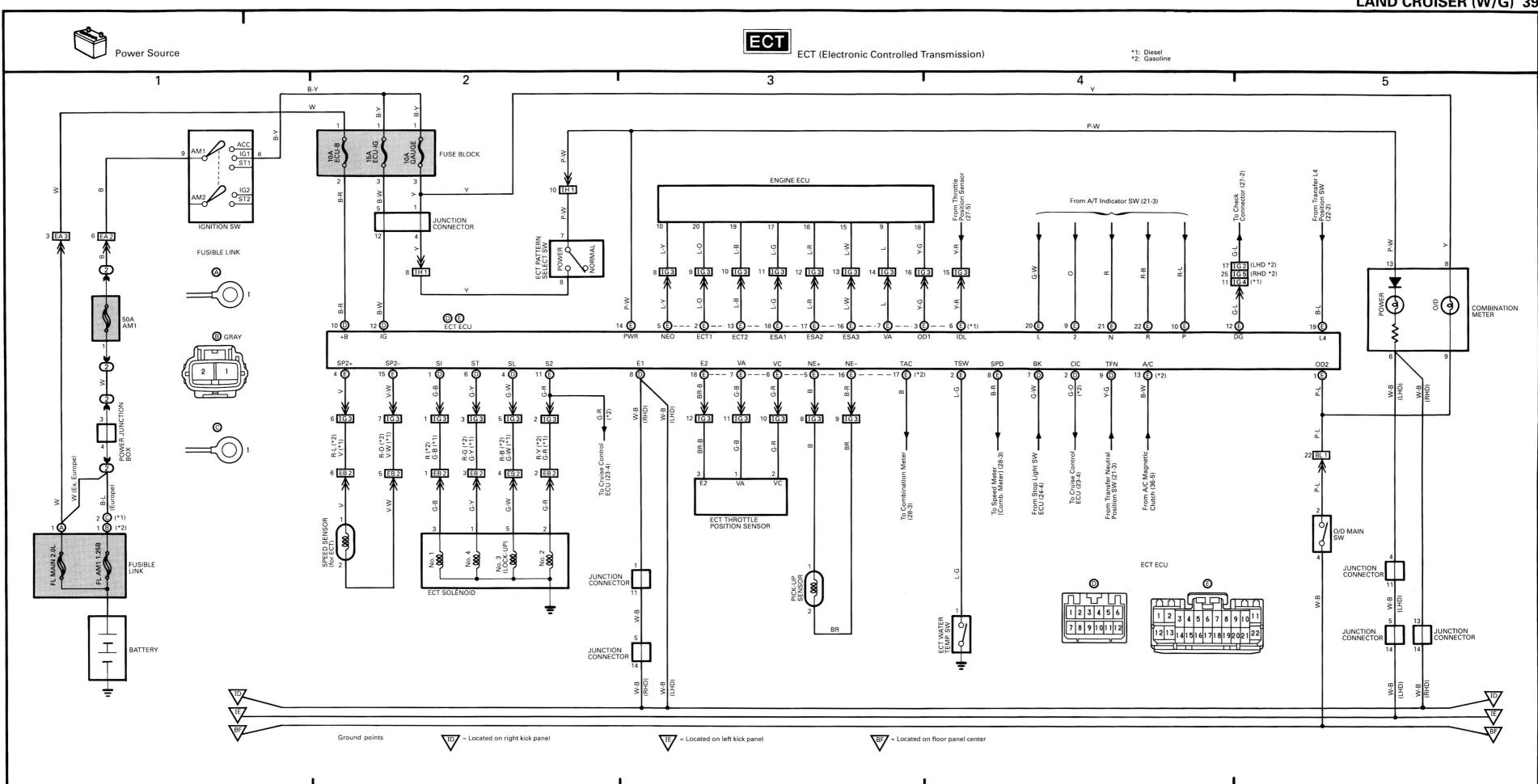


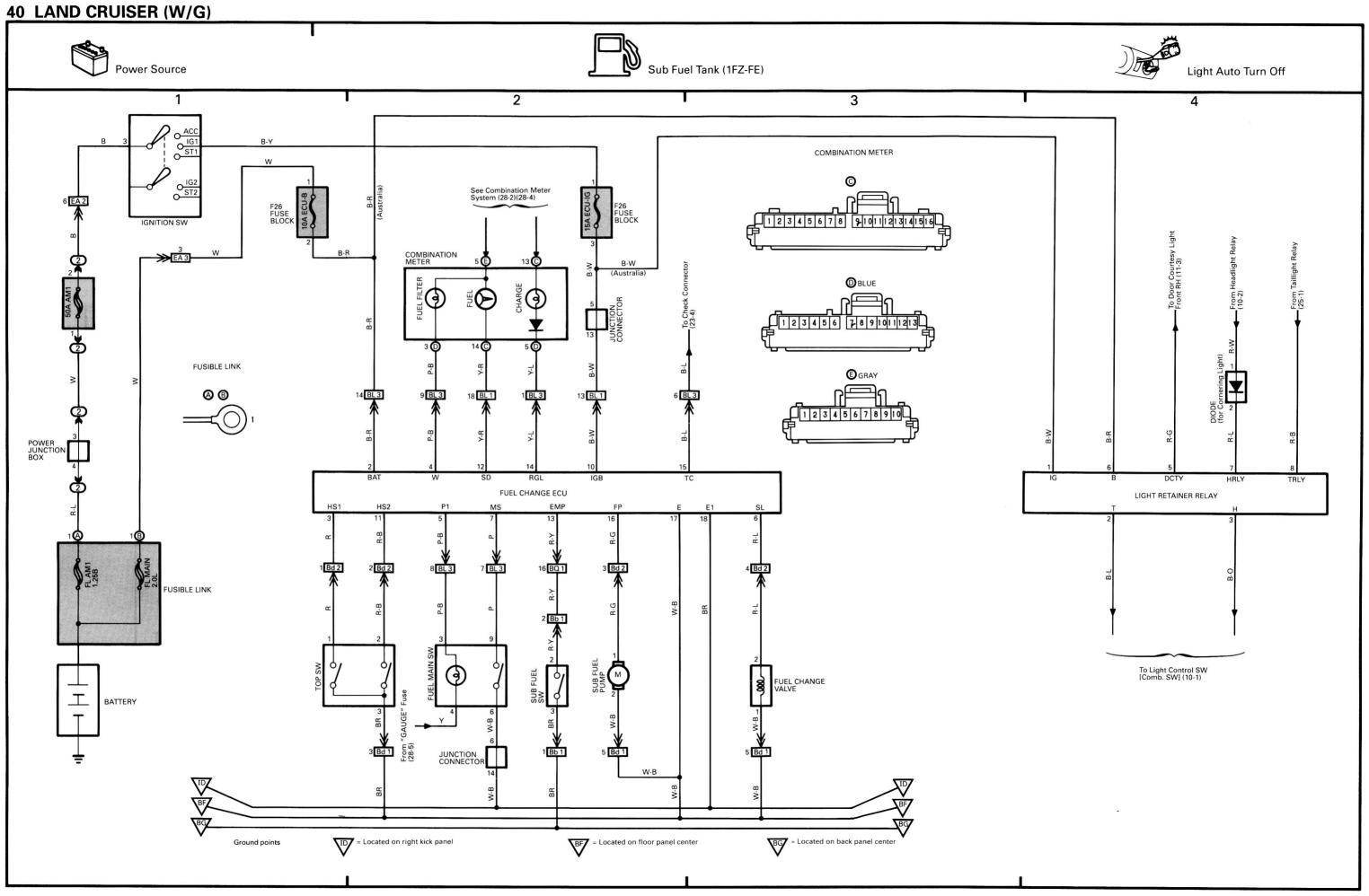


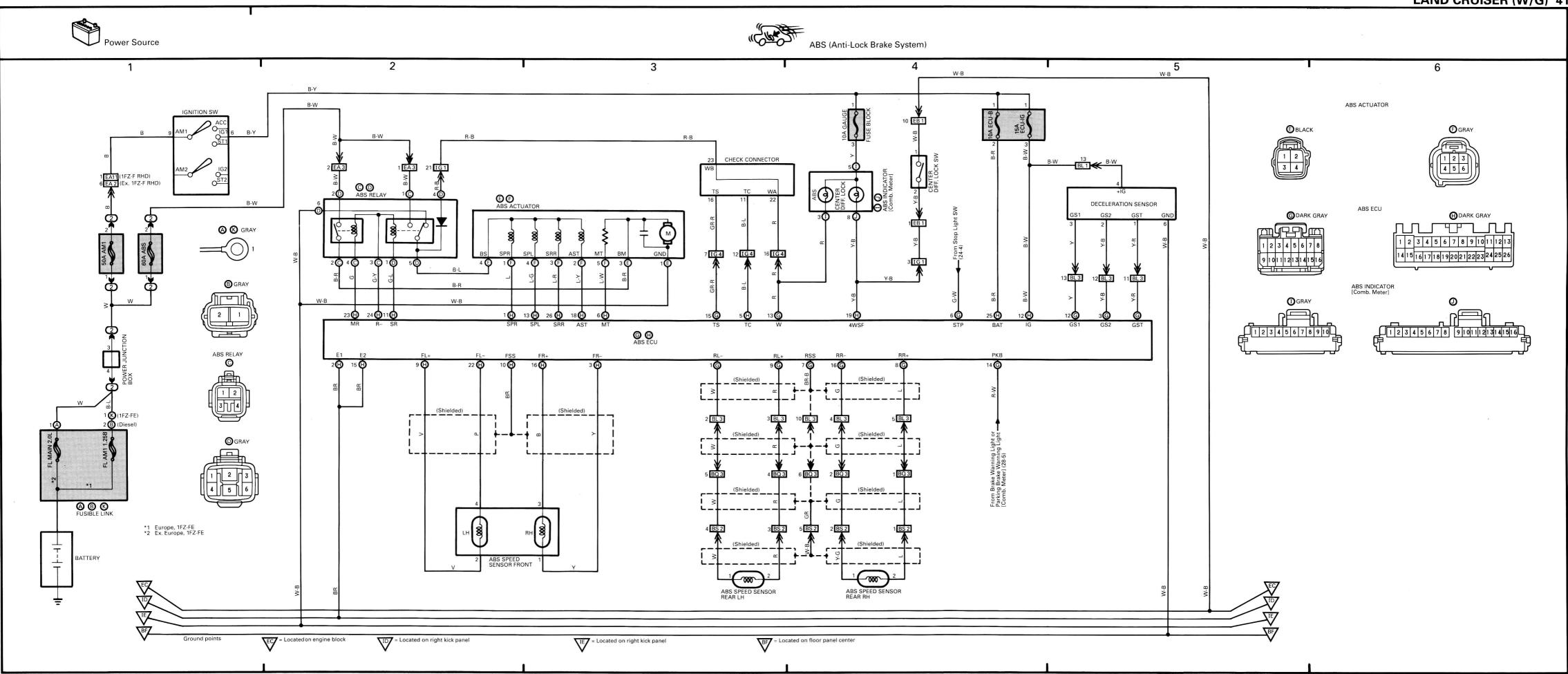












42 LAND CRUISER (W/G)

3 **Connector Joining Wire Harness and Wire Harness** (E Group: Engine Compartment Area) (I Group: Instrument Panel and Surounding Area) EA 2 GRAY EA3 GRAY EA 1 GRAY EA 4 GRAY IE2 IE1 IF1

