FOREWORD

This manual contains maintenance and repair procedures for Nissan 200SX, model S13 series.

In order to assure your safety and the efficient functioning of the vehicle, this manual should be read thoroughly. It is especially important that the PRECAUTIONS in the GI section be completely understood before starting any repair task.

All information in this manual is based on the latest product information at the time of publication. The right is reserved to make changes in specifications and methods at any time without notice.

IMPORTANT SAFETY NOTICE

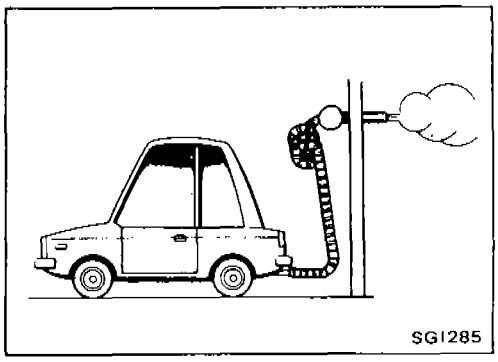
The proper performance of service is essential for both the safety of the technician and the efficient functioning of the vehicle.
The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately.
Service varies with the procedures used, the skills of the technician and the tools and parts available. Accordingly, anyone using service procedures, tools or parts which are not specifically recommended by NISSAN must first completely satisfy himself that neither his safety nor the vehicle's safety will be jeopardized by the service method selected.

NISSAN MOTOR CO., LTD.
Overseas Service Department
Tokyo, Japan

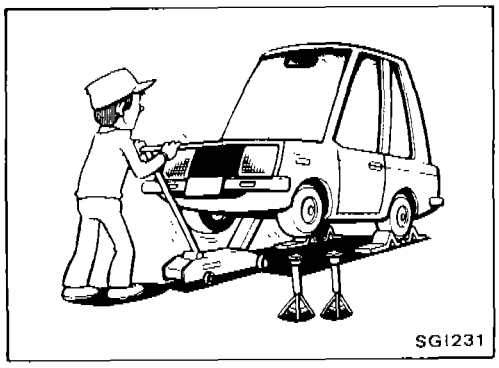
SECTION GI

CONTENTS

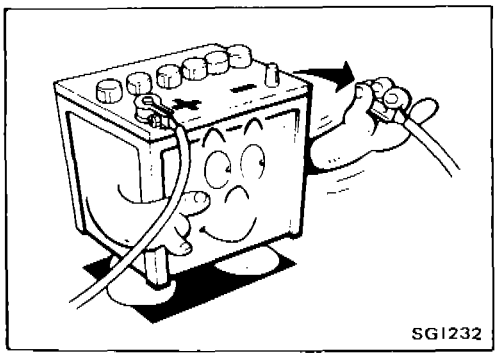
Observe the following precautions to ensure safe and proper servicing. These precautions are not described in each individual section.


SGI285

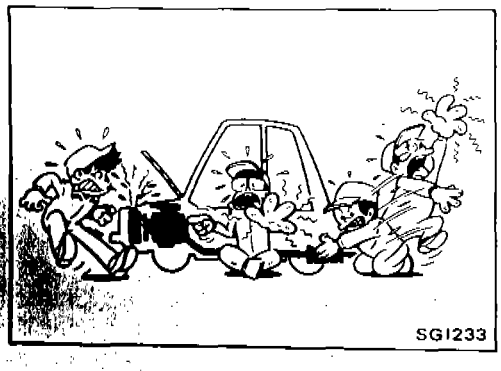
1. Do not operate the engine for an extended period of time without proper exhaust ventilation.
   Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When working in a pit or other enclosed area, be sure to properly ventilate the area before working with hazardous materials.
   Do not smoke while working on the vehicle.


SGI231

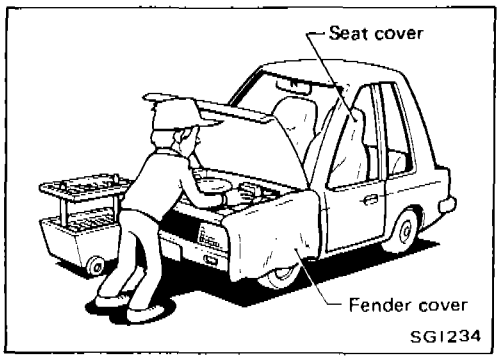
2. Before jacking up the vehicle, apply wheel chocks or other tire blocks to the wheels to prevent the vehicle from moving. After jacking up the vehicle, support the vehicle weight with safety stands at the points designated for proper lifting and towing before working on the vehicle.
   These operations should be done on a level surface.
3. When removing a heavy component such as the engine or transaxle/transmission, be careful not to lose your balance and drop them. Also, do not allow them to strike adjacent parts, especially the brake tubes and master cylinder.


SGI232

4. Before starting repairs which do not require battery power, always turn off the ignition switch, then disconnect the ground cable from the battery to prevent accidental short circuit.

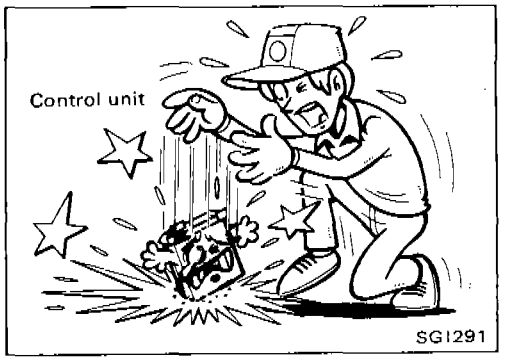

SGI233

5. To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe and muffler. Do not remove the radiator cap when the engine is hot.



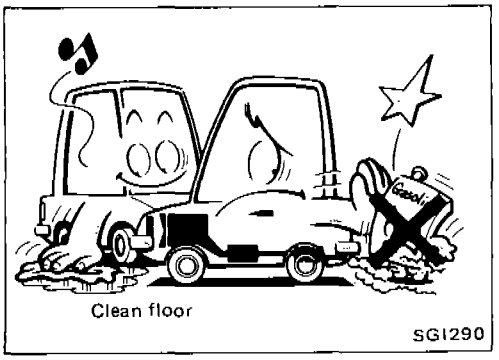
6. Before servicing the vehicle, protect fenders, upholstery and carpeting with appropriate covers.
   Take caution that keys, buckles or buttons on your person do not scratch the paint.

7. Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.
8. Replace oil seals, gaskets, packings, O-rings, locking washers, cotter pins, self-locking nuts, etc. with new ones.
9. Replace inner and outer races of tapered roller bearings and needle bearings as a set.
10. Arrange the disassembled parts in accordance with their assembled locations and sequence.
11. Do not touch the terminals of electrical components which use microcomputers (such as electronic control units).
    Static electricity may damage internal electronic components.
12. After disconnecting vacuum or air hoses, attach a tag to indicate the proper connection.
13. Use only the lubricants specified in MA section.
14. Use approved bonding agent, sealants or their equivalents when required.
15. Use tools and recommended special tools where specified for safe and efficient service repairs.
16. When repairing the fuel, oil, water, vacuum or exhaust systems, check all affected lines for leaks.
17. Dispose of drained oil or the solvent used for cleaning parts in an appropriate manner.



Precautions for E.F.I. or E.C.C.S. Engine

1. Before connecting or disconnecting E.F.I. or E.C.C.S. harness connector to or from any E.F.I. or E.C.C.S. control unit, be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal.
   Otherwise, there may be damage to control unit.
2. Before disconnecting pressurized fuel line from fuel pump to injectors, be sure to release fuel pressure to eliminate danger.
3. Be careful not to jar components such as control unit and air flow meter.



Precautions for Catalyst

If a large amount of unburned fuel flows into the converter, the converter temperature will be excessively high. To prevent this, follow the procedure below:

1. Use unleaded gasoline only. Leaded gasoline will seriously damage the catalytic converter.
2. When checking for ignition spark or measuring engine compression, make tests quickly and only when necessary.
3. Do not run engine when the fuel tank level is low, otherwise the engine may misfire causing damage to the converter.
4. Do not place the vehicle on inflammable material. Keep inflammable material off the exhaust pipe.

8. The **UNITS** given in this manual are primarily expressed as the SI UNIT (International System of Unit), and alternatively expressed in the metric system and in the yard/pound system.

   "**Example**"

   Tightening torque

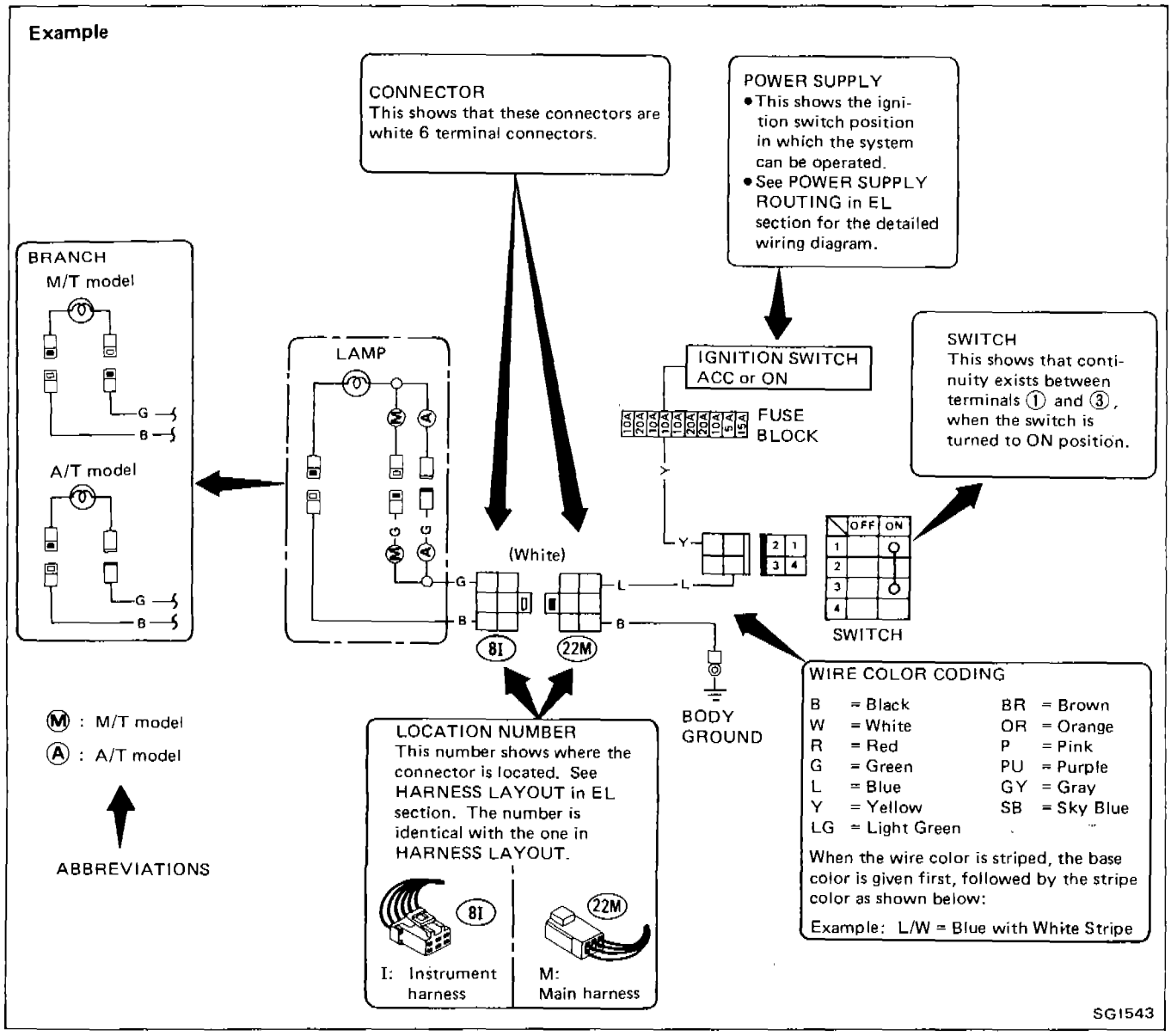
   59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)

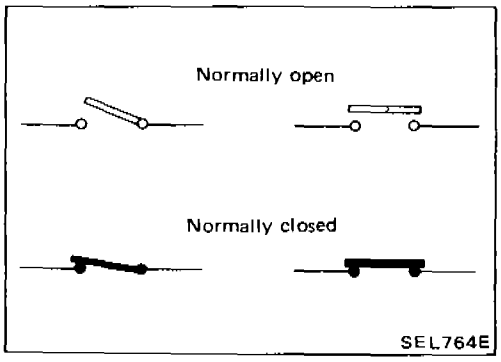
9. **TROUBLE DIAGNOSES** are included in sections dealing with complicated components.
10. **SERVICE DATA AND SPECIFICATIONS** are contained at the end of each section for quick reference of data.
11. The captions **WARNING** and **CAUTION** warn you of steps that must be followed to prevent personal injury and/or damage to some part of the vehicle.

- **WARNING** indicates the possibility of personal injury if instructions are not followed.
- **CAUTION** indicates the possibility of component damage if instructions are not followed.
- **BOLD TYPED STATEMENTS** except **WARNING** and **CAUTION** give you helpful information.

WIRING DIAGRAM

Symbols used in WIRING DIAGRAM are shown below:





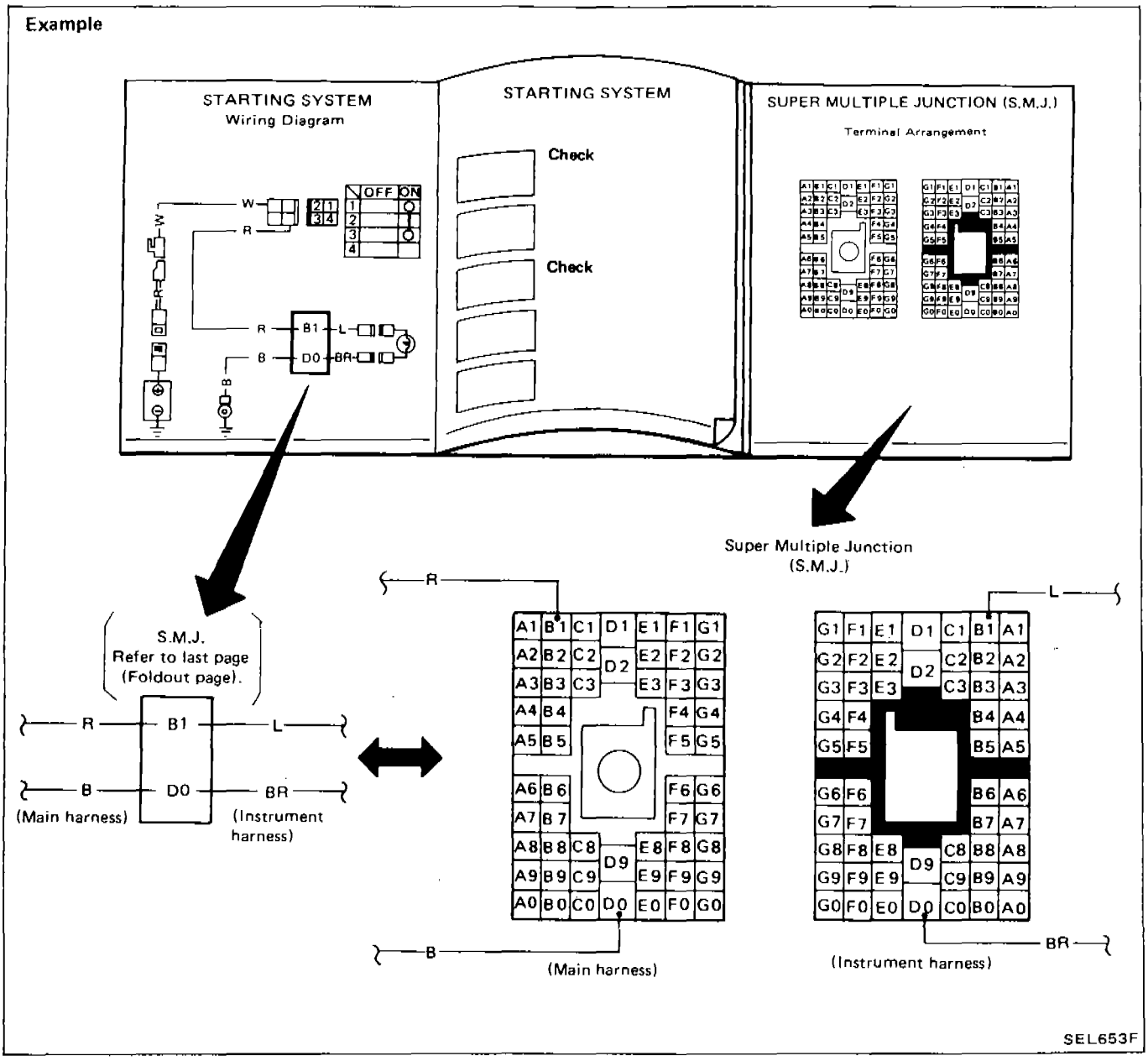
SWITCH POSITIONS

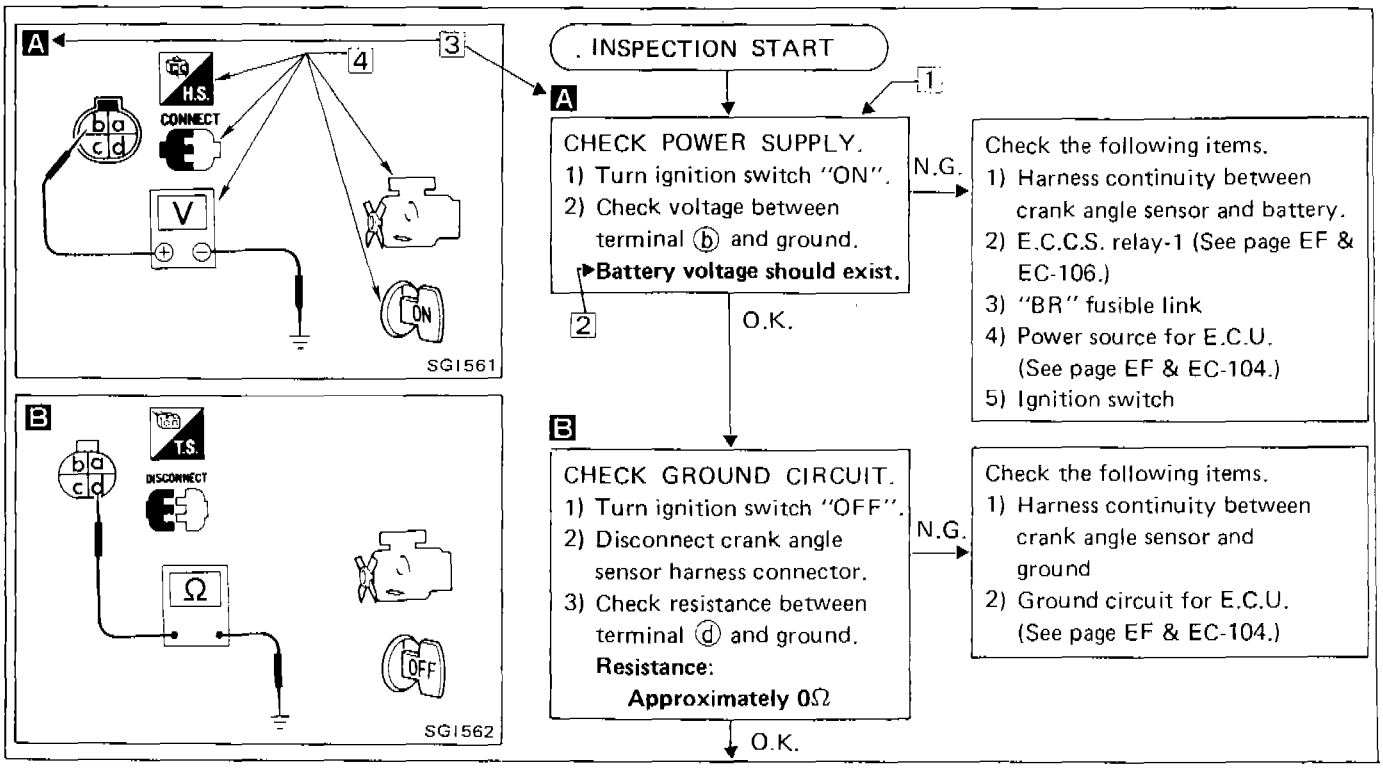
Wiring diagram switches are shown with the vehicle in the following condition.

- Ignition switch "OFF".
- Doors, hood and trunk lid/back door closed.
- Pedals are not depressed and parking brake is released.

SUPER MULTIPLE JUNCTION (S.M.J.)

- The "S.M.J." indicated in wiring diagrams is shown in a simplified form. The terminal arrangement should therefore be referred to in the foldout at the end of the Service Manual.
- The foldout should be spread to read the entire wiring diagram.





NOTICE

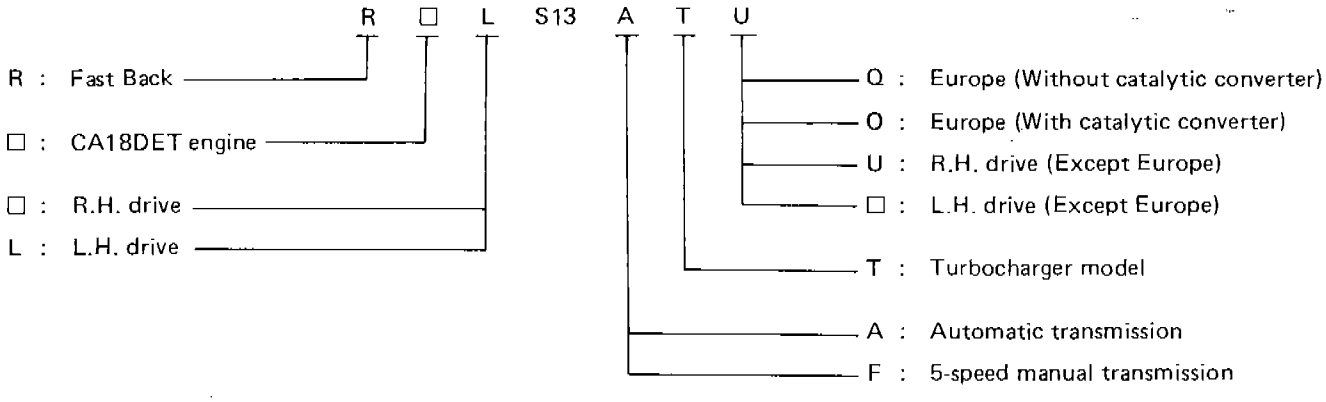
The flow chart indicates work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

1) **Use the flow chart after locating probable causes of a problem following the "Preliminary Check" or the "Symptom Chart".**
2) **After repairs, recheck that the problem has been completely eliminated.**
3) **Refer to Component Parts Location and Harness Layout for the Systems described in each section for identification/location of components and harness connectors.**
4) **Refer to the Circuit Diagram for Quick Pinpoint Check. If you must perform circuit continuity between harness connectors more detail, such as in case of sub-harness is used, refer to Wiring Diagram and Harness Layout in EL section for identification of harness connectors.**
5) **When checking circuit continuity, ignition switch should be "OFF".**
6) **Before checking voltage at connectors, check battery voltage.**
7) **After accomplishing the Diagnostic Procedures and Electrical Components Inspection, make sure that all harness connectors are reconnected as it was.**

Model Variation

Destination	Body	Model			Engine	Transmission	Differential carrier
		L.H. drive		R.H. drive			
		With catalytic converter	Without catalytic converter				
Europe	Fast Back	–	–	RS13FTQ	CA18DET	FS5W71C	R200
		–	–	RS13ATQ		RE4R01A	
		RLS13FTQ	–	–		FS5W71C	
		RLS13ATQ	–	–		RE4R01A	
		–	RLS13FTQ	–		FS5W71C	
		–	RLS13ATQ	–		RE4R01A	
Except Europe		–		RS13FTU		FS5W71C	
		–		RS13ATU		RE4R01A	
		–	RLS13FT	–		FS5W71C	
		–	RLS13AT	–		RE4R01A	

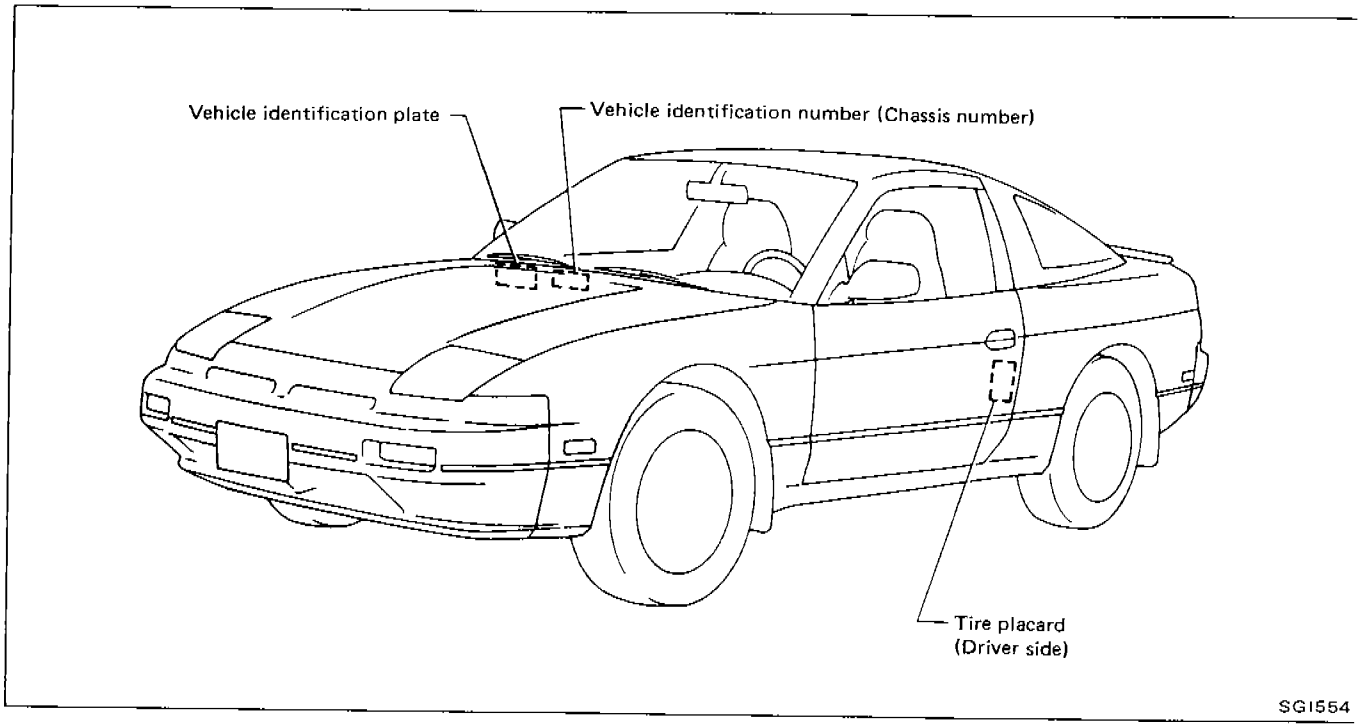
Prefix and suffix designations



□ : means no indication.

Key

Identification Number



VEHICLE IDENTIFICATION NUMBER (Chassis number)

Prefix and suffix designations

(For Europe)

JN1 0 R S13 U 0 000030

JN1 : Nissan

O : Stopgap (no meaning)

R : Fast Back

Vehicle serial number

O : Stopgap (no meaning)

U : For Europe

Model

(Except for Europe)

R □ S13 – 000001

R : Fast Back

□ : CA18DET engine

Vehicle serial number

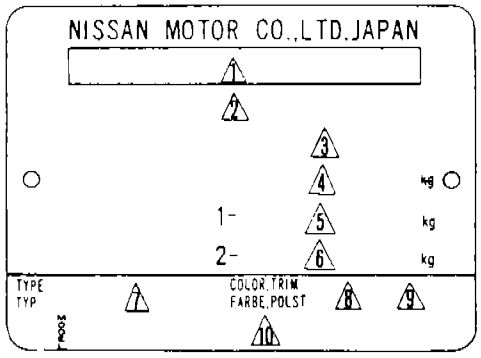
Model

□ : means no indication.

Identification Number (Cont'd)

IDENTIFICATION PLATE

Europe



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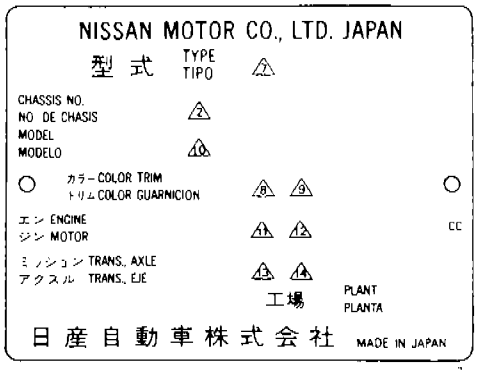
Except Europe

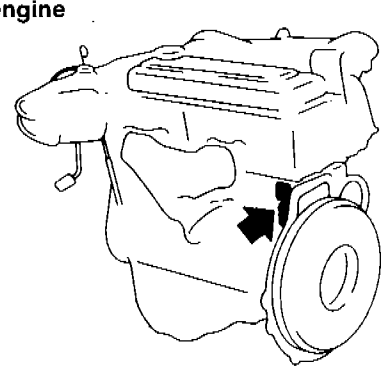


SGI316

1 Type approval number
2 Vehicle identification number (Chassis number)
3 Gross vehicle weight
4 Gross combination weight Gross vehicle weight + Gross trailing capacity (Weight)
5 Gross axle weight (Front)
6 Gross axle weight (Rear)
7 Type
8 Body color code
9 Trim color code
10 Model
11 Engine model
12 Engine displacement
13 Transmission model
14 Axle model

ENGINE SERIAL NUMBER

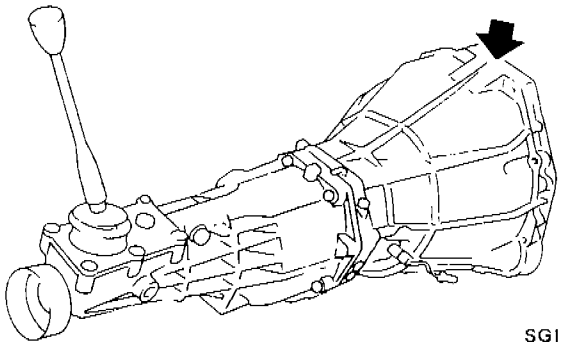
CA18DET engine



SGI555

MANUAL TRANSMISSION NUMBER

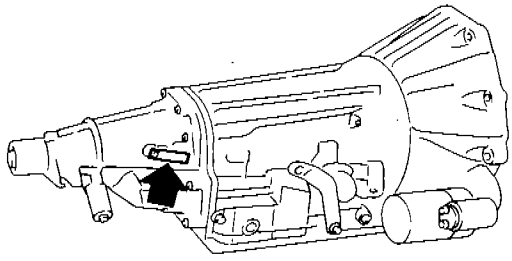
FS5W71C



SGI556

AUTOMATIC TRANSMISSION NUMBER

RE4R01A



SGI557

Dimensions

Unit: mm (in)

	Europe	Except Europe
Overall length	4,535 (178.5)	4,520 (178.0)
Overall width	1,690 (66.5)	1,690 (66.5)
Overall height	1,290 (50.8)	1,290 (50.8)
Front tread	1,465 (57.7)	1,465 (57.7)
Rear tread	1,465 (57.7)	1,460 (57.5)
Wheelbase	2,475 (97.4)	2,475 (97.4)

Wheels and Tires

Road wheel	Steel	6-JJx15
	Aluminum	6-JJx15*1
	Offset mm (in)	40 (1.57)
Tire size	Conventional	195/60R15 86H
		195/60R15 87V*2
	Spare	T125/70D15*2

*1: Option
*2: Europe

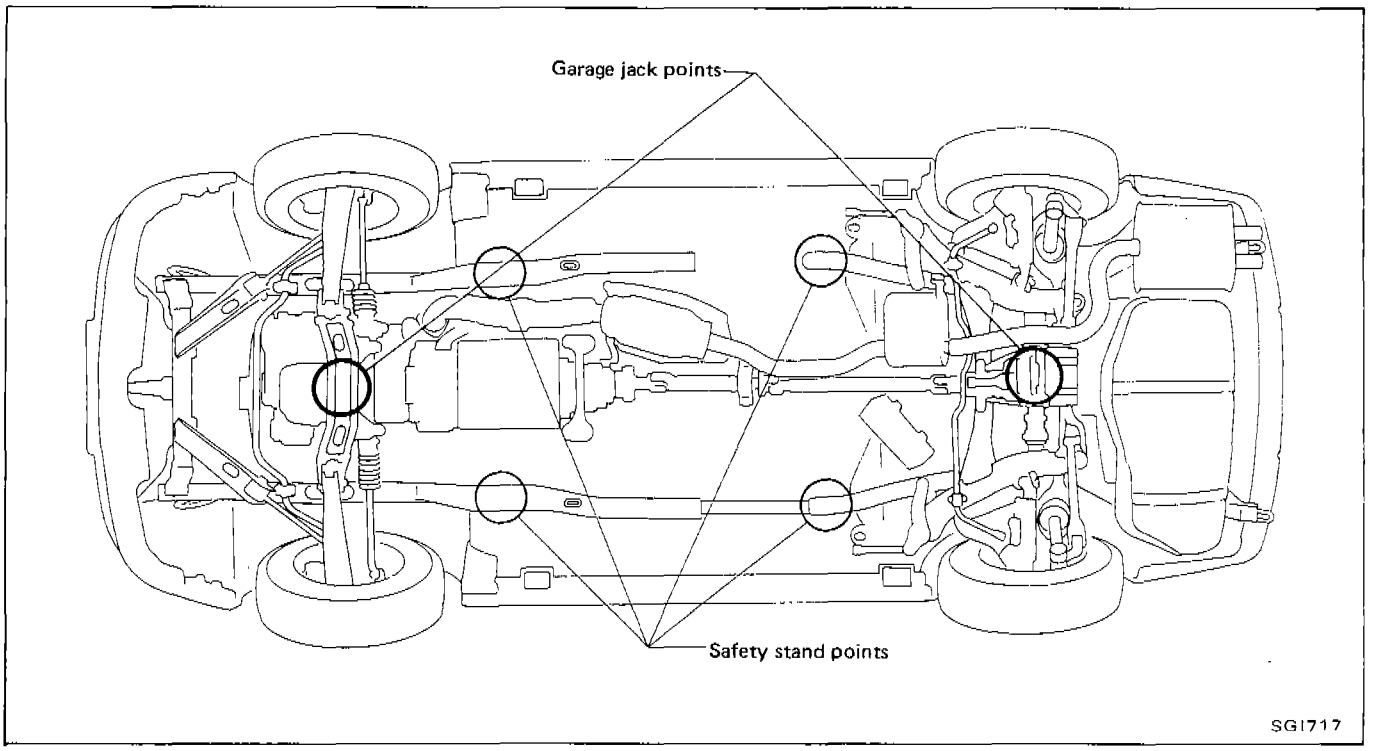
Garage Jack and Safety Stand

WARNING:

- **Never get under the vehicle while it is supported only by the jack. Always use safety stands to support the frame when you have to get under the vehicle.**
- **Place wheel chocks at the front wheels when the rear wheels are raised and place wheel chocks at the rear wheels when the front wheels are raised.**

CAUTION:

Place a wooden or rubber block between safety stand and vehicle body when the supporting body is flat.

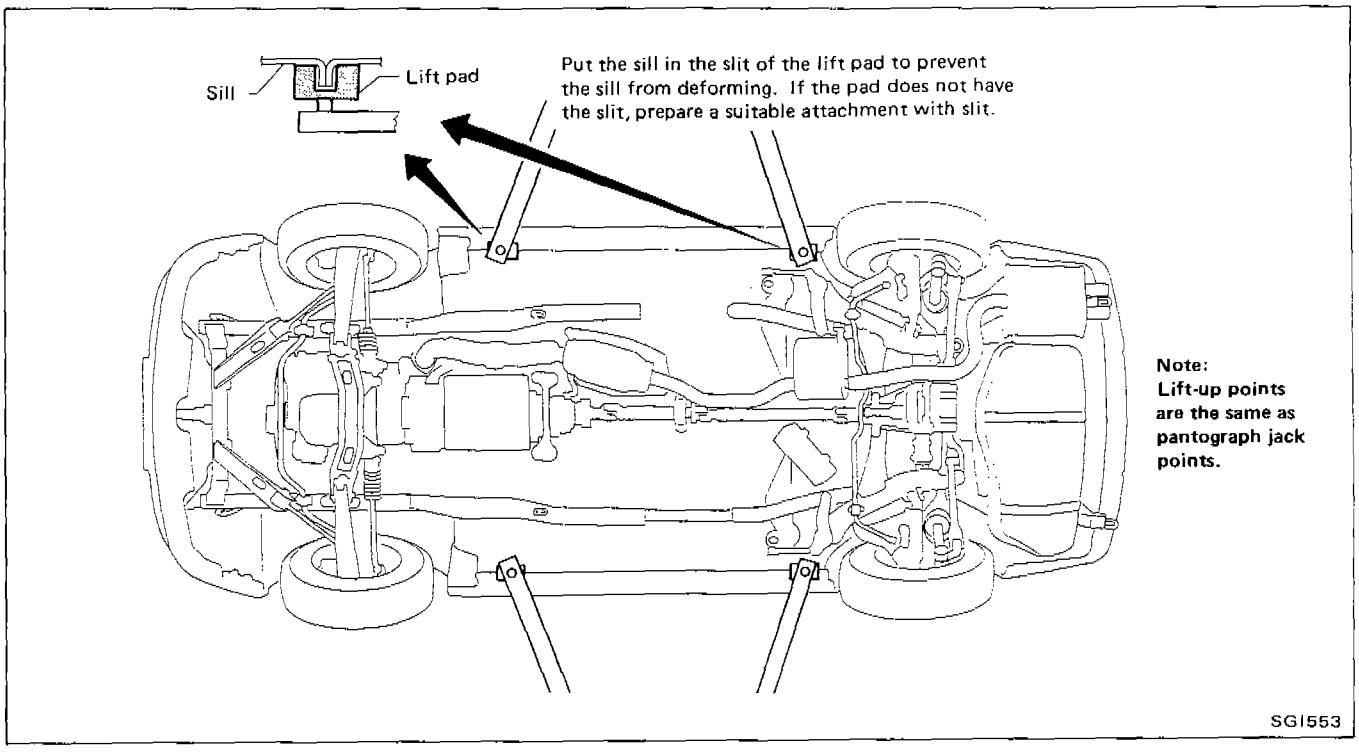


2-pole Lift

WARNING:

When lifting the vehicle, open the lift arms as wide as possible and ensure that the front and rear of the vehicle are well balanced.

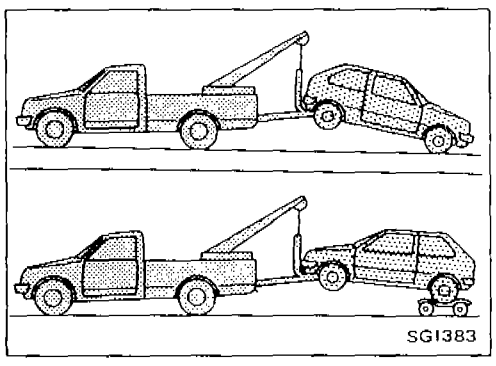
When setting the lift arm, do not allow the arm to contact the brake tubes and fuel lines.



Tow Truck Towing

CAUTION:

- **All applicable local laws regarding the towing operation must be obeyed.**
- **It is necessary to use proper towing equipment to avoid possible damage to the vehicle during a towing operation.**
- **When towing with the rear wheels on the ground, release the parking brake and move the gearshift lever to neutral ("N" position).**



NISSAN recommends that vehicle be towed with the driving (rear) wheels off the ground as illustrated.

Tow Truck Towing (Cont'd)

TOWING AN AUTOMATIC TRANSMISSION MODEL WITH FOUR WHEELS ON GROUND OR TOWING WITH FRONT WHEELS RAISED (With rear wheels on ground)

Observe the following restricted towing speeds and distances.

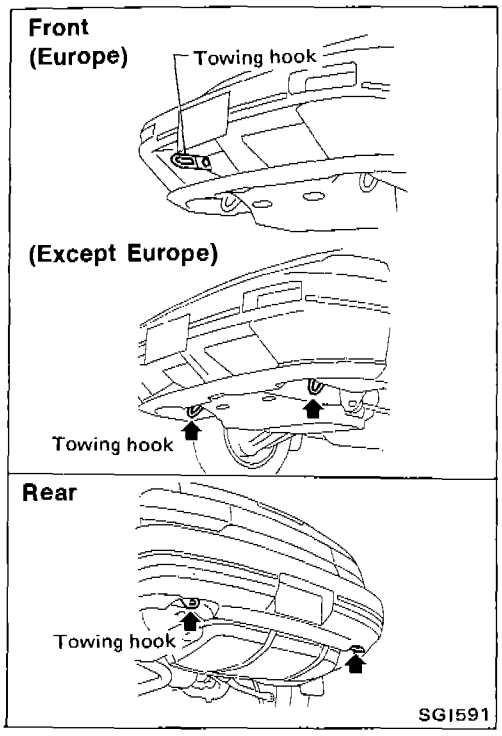
Speed:

Below 50 km/h (30 MPH)

Distance:

Less than 65 km (40 miles)

If the speed or distance must necessarily be greater, remove the propeller shaft beforehand to prevent damage to the transmission.



TOWING POINT

Always pull the cable straight out from the vehicle. Never pull on the hook at a sideways angle.

AUTOMATIC TRANSMISSION

SECTION AT

CONTENTS

AT

When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

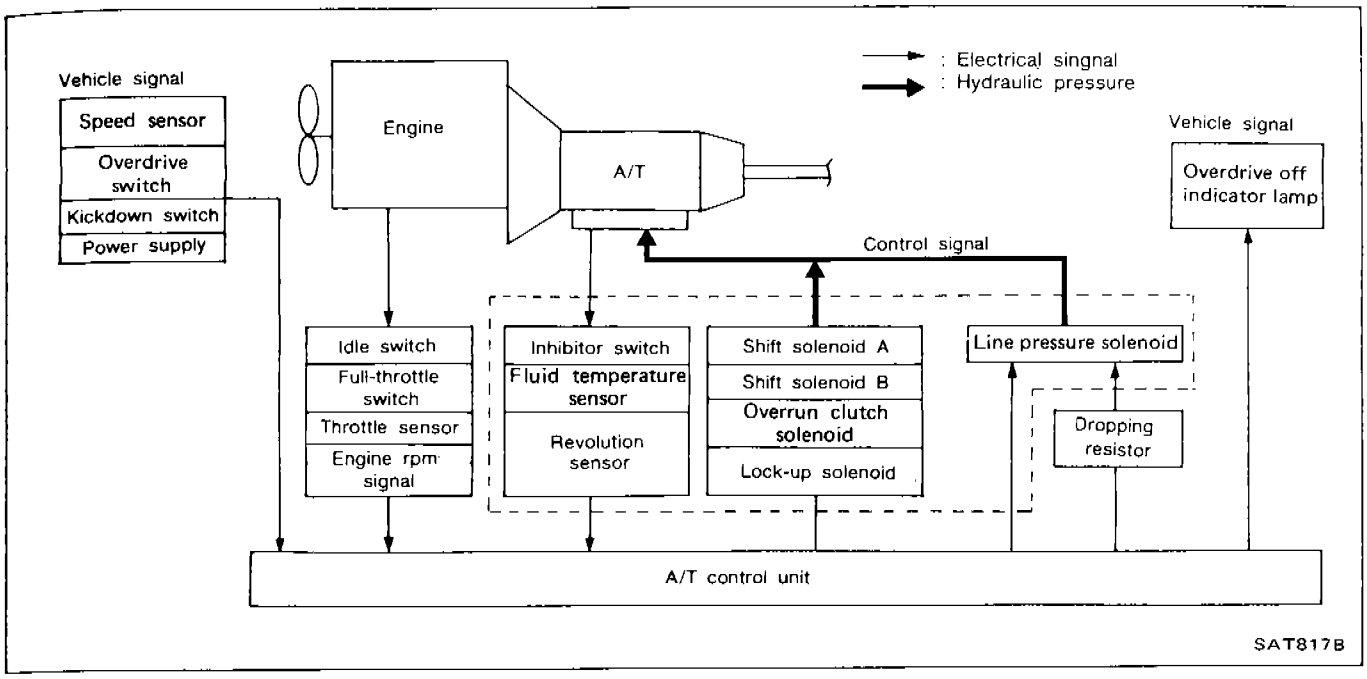
When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

Service Notice

- Before proceeding with disassembly, thoroughly clean the outside of the transmission. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transmission.
- When disassembling parts, place them in order in a parts rack so that they can be put back into the unit in their proper positions.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transmission is disassembled.
- It is very important to perform functional tests whenever they are indicated.
- The valve body contains precision parts and requires extreme care when parts are removed and serviced. Place removed parts in order on a parts rack so they can be put back in the valve body in the same positions and sequences. Care will also prevent springs and small parts from becoming scattered or lost.
- Properly installed valves, sleeves, plugs, etc. will slide along their bores in the valve body under their own weight.
- Before assembly, apply a coat of recommended A.T.F. to all parts. Petroleum jelly may be applied to O-rings and seals and used to hold small bearings and washers in place during reassembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- After overhaul, refill the transmission with new A.T.F.

A/T CONTROL DIAGRAM

Electrical Control Chart



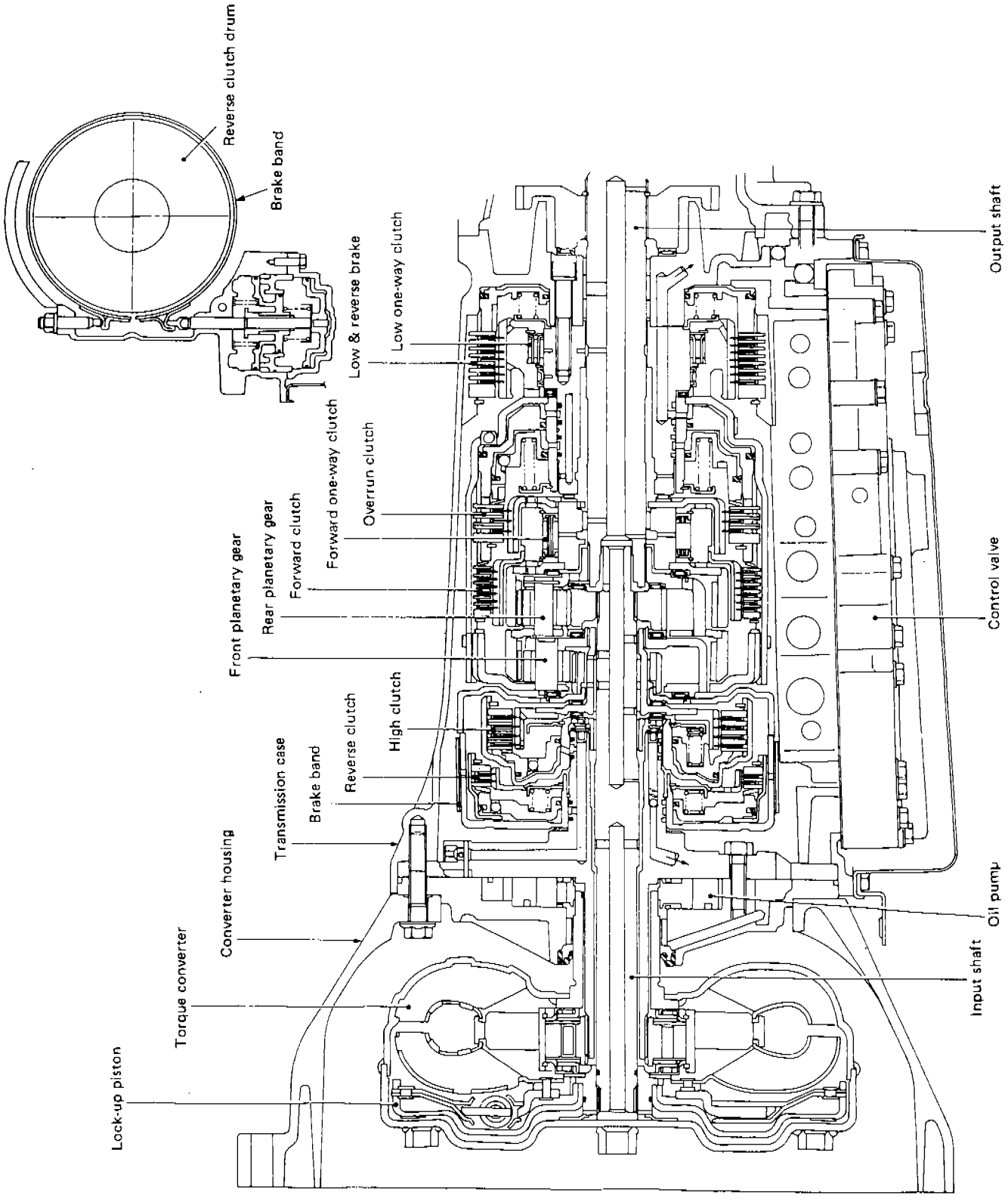
Mechnical Operation

Shift position		Reverse clutch	High clutch	Forward clutch	Overrun clutch	Band servo 2nd apply	Band servo 3rd release	Band servo 4th apply	Forward one-way clutch	Low one-way clutch	Low & reverse brake	Lock-up	Remarks
P													PARK
R		○									○		REVERSE
N													NEUTRAL
D *4	1st			○	⊗				●	●			Automatic shift 1 ↔ 2 ↔ 3 ↔ 4
	2nd			○	*1 ◎	○			●				
	3rd		○	○	◎	*2 ⊗	⊗		●				
	4th		○	⊗		*3 ⊗	⊗	○				○	
2	1st			○	⊗				●	●			Automatic shift 1 ↔ 2
	2nd			○	◎	○			●				
1	1st			○	○				●		○		Locks (held stationary) in 1st speed 1 ← 2
	2nd			○	○	○			●				

*1. Operates when overdrive switch is set in "OFF" position.
*2. Oil pressure is applied to both 2nd "apply" side and 3rd "release" side of band servo piston. However, because oil pressure area on the "release" side is greater than that on the "apply" side, brake band does not contract.
*3. Oil pressure is applied to 4th "apply" side in condition *2 above, and brake band contracts.
*4. A/T will not shift to 4th when overdrive switch is set in "OFF" position.

○ : Operates.
◎ : Operates when throttle opening is less than 1/16. Engine brake activates.
● : Operates during "progressive" acceleration.
⊗ : Operates but does not affect power transmission.
⊗ : Operates when throttle opening is less than 1/16 but does not affect engine brake.

Cross-Sectional View



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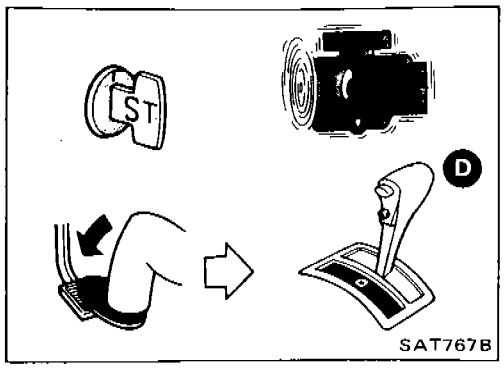
NOTE

Contents

Contents (Cont'd)



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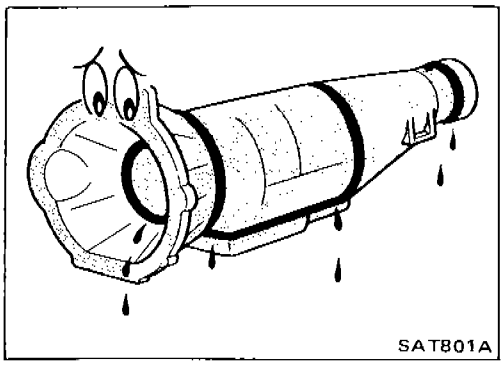
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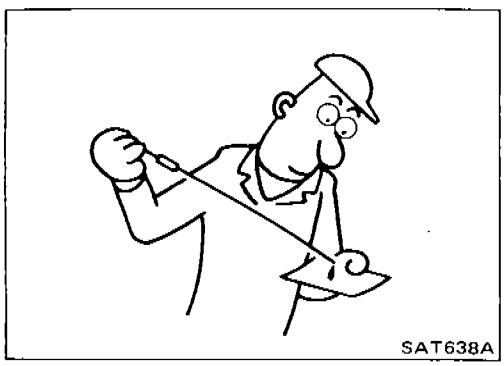

SAT638A

Preliminary Check

A/T FLUID CHECK

Fluid leakage check

1. Clean area suspected of leaking, — for example, mating surface of converter housing and transmission case.
2. Start engine, apply foot brake. place selector lever in "D" range and wait a few minutes.
3. Stop engine.

4. Check for fresh leakage.

Fluid condition check

Fluid color	Suspected problem
Dark or black with burned odor	Wear of frictional material
Milky pink	Water contamination — Road water entering through filler tube or breather
Varnished fluid, light to dark brown and tacky	Oxidation — Over or under filling — Overheating

Fluid level check
Refer to section MA.

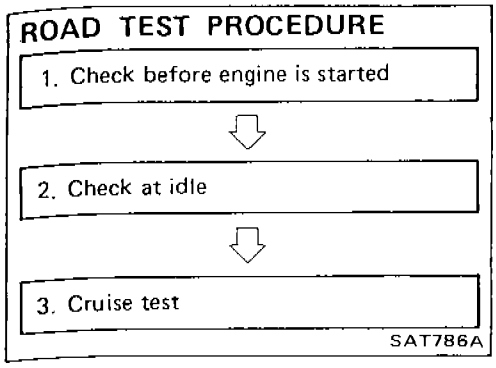
Preliminary Check (Cont'd)

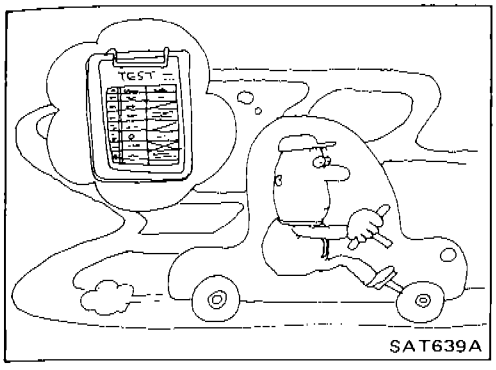
ROAD TESTING

Description

- The purpose of this road test is to determine overall performance of automatic transmission and analyze causes of problems.
- The road test consists of the following three parts:

1. Check before engine is started
2. Check at idle
3. Cruise test



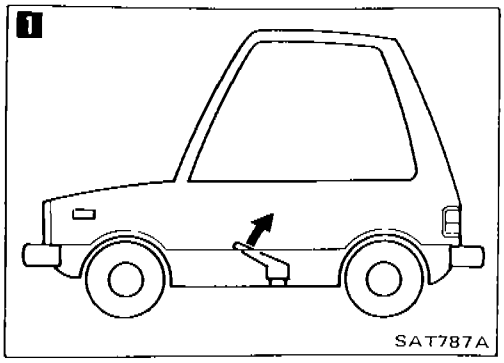


- Before road test, familiarize yourself with all test procedures and items to check.
- Conduct tests on all items. Troubleshoot items which check out No Good after road test. Refer to "Self-diagnosis" and "Diagnostic Procedure".

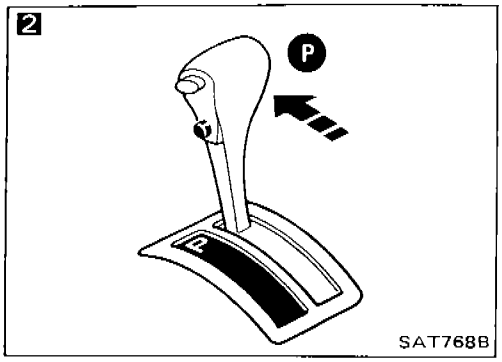
Preliminary Check (Cont'd)

1. Check before engine is started

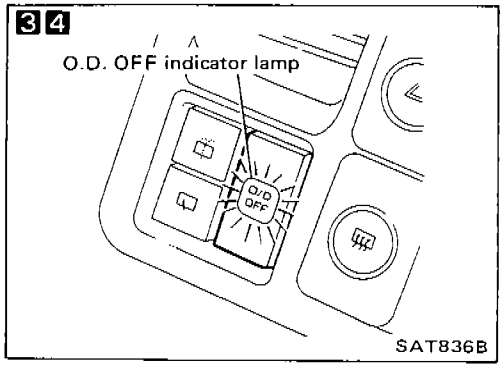
1



2

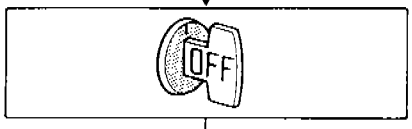


3 4



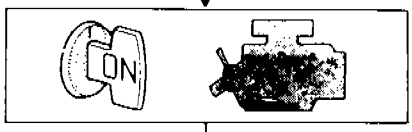
1

Park vehicle on flat surface.



2

Move selector lever to "P" range.



3

Does O.D. OFF indicator lamp come on for about 2 seconds?

No → Go to Diagnostic Procedure 1.

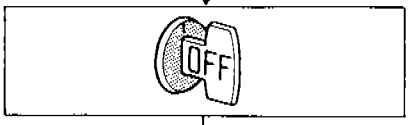
Yes

4

Does O.D. OFF indicator lamp flicker for about 8 seconds?

Yes → Perform self-diagnosis. – Refer to SELF-DIAGNOSIS PROCEDURE.

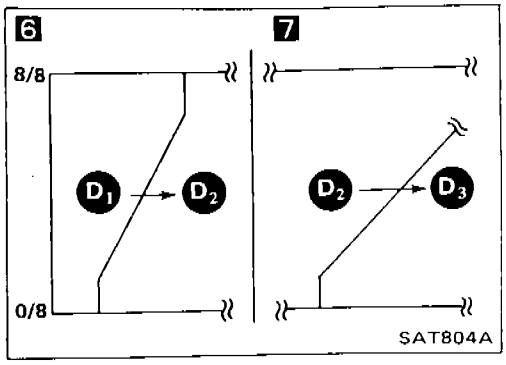
No

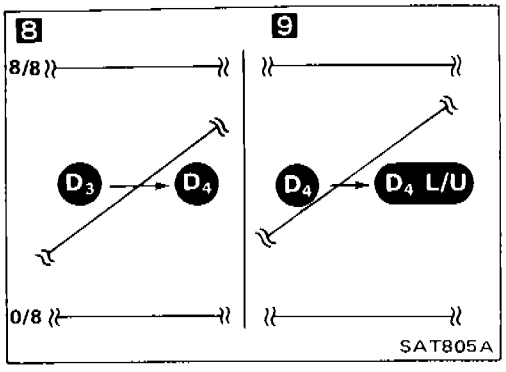


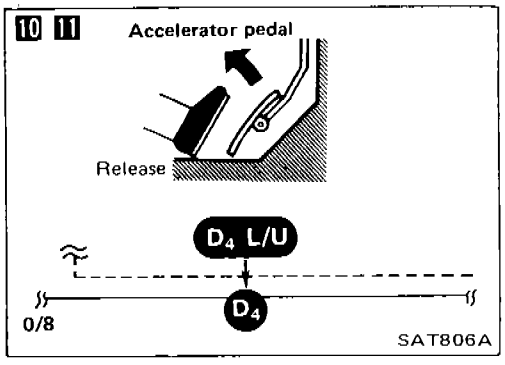
Perform self-diagnosis. – Refer to SELF-DIAGNOSIS PROCEDURE and note N.G. items.

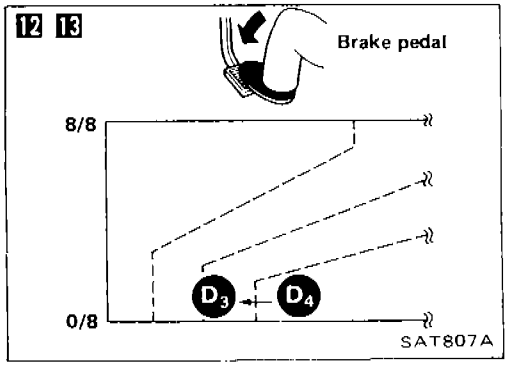
Go to "ROAD TESTING – 2. Check at idle".

Preliminary Check (Cont'd)









(A)

6 Does A/T shift from D_1 to D_2 at the specified speed?
Specified speed when shifting from D_1 to D_2:
Refer to Shift schedule.
- No → Go to Diagnostic Procedure 9.
- Yes ↓

7 Does A/T shift from D_2 to D_3 at the specified speed?
Specified speed when shifting from D_2 to D_3:
Refer to Shift schedule.
- No → Go to Diagnostic Procedure 10.
- Yes ↓

8 Does A/T shift from D_3 to D_4 at the specified speed?
Specified speed when shifting from D_3 to D_4:
Refer to Shift schedule.
- No → Go to Diagnostic Procedure 11.
- Yes ↓

9 Does A/T perform lock-up at the specified speed?
Specified speed when lock-up occurs:
Refer to Shift schedule.
- No → Go to Diagnostic Procedure 12.
- Yes ↓

Does A/T hold lock-up condition for more than 30 seconds?
- No → Go to Diagnostic Procedure 13.
- Yes ↓

10 Release accelerator pedal. ↓

11 Is lock-up released when accelerator pedal is released?
- No → Go to Diagnostic Procedure 14.
- Yes ↓

12 Decelerate vehicle by applying foot brake lightly. ↓

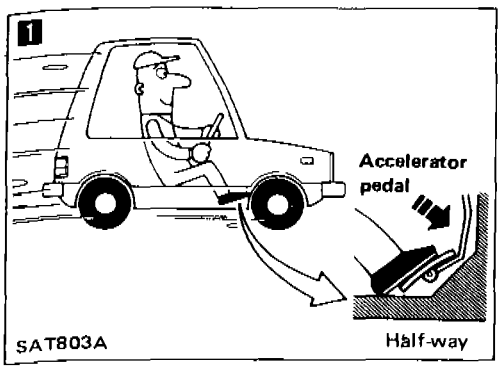
13 Does engine speed return to idle smoothly when A/T is shifted from D_4 to D_3?
- No → Go to Diagnostic Procedure 15.
- Yes ↓

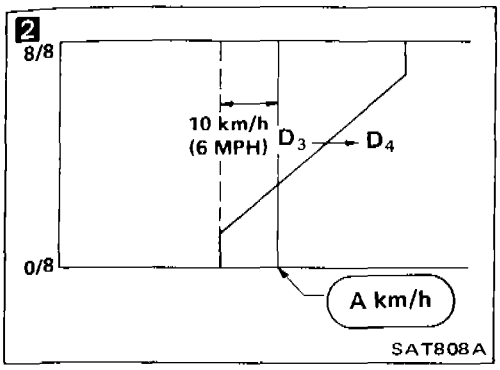
Stop vehicle. ↓

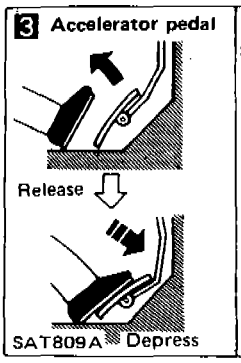
Go to "Cruise test – Part 2".

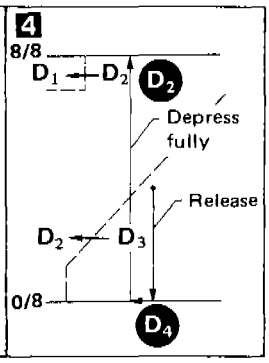
Preliminary Check (Cont'd)

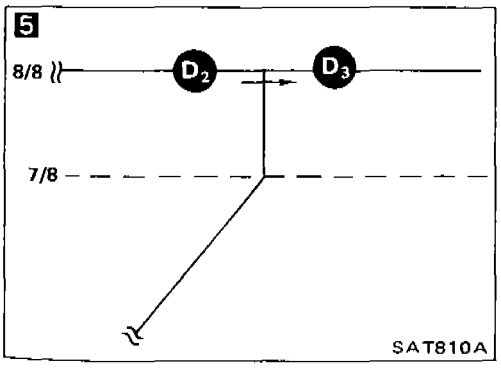
Cruise test – Part 2

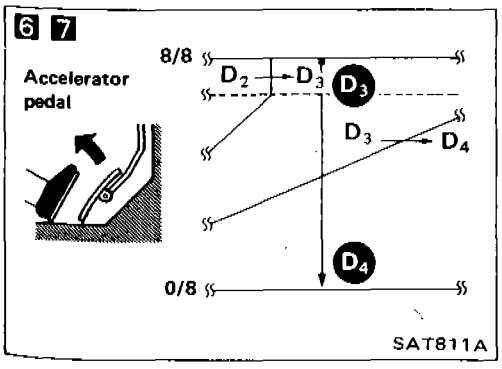












Confirm overdrive switch is in "ON" position.

↓

Confirm selector lever is in "D" range.

↓

1 Accelerate vehicle by half throttle again.

↓

Does vehicle start from D_1? — No → Go to Diagnostic Procedure 16.

Yes ↓

2 Accelerate vehicle to A km/h as shown in illustration.

↓

3 Release accelerator pedal and then quickly depress it fully.

↓

4 Does A/T shift from D_4 to D_2 as soon as accelerator pedal is depressed fully? — No → Go to Diagnostic Procedure 9.

Yes ↓

5 Does A/T shift from D_2 to D_3 at the specified speed? — No → Go to Diagnostic Procedure 10.

Specified speed when shifting from D_2 to D_3:
Refer to Shift schedule.

Yes ↓

6 Release accelerator pedal after shifting from D_2 to D_3.

↓

7 Does A/T shift from D_3 to D_4 and does vehicle decelerate by engine brake? — No → Go to Diagnostic Procedure 11.

Yes ↓

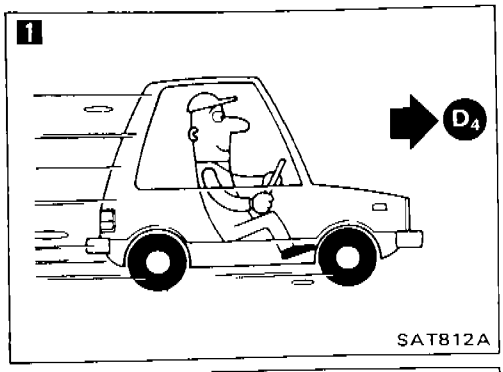
Stop vehicle.

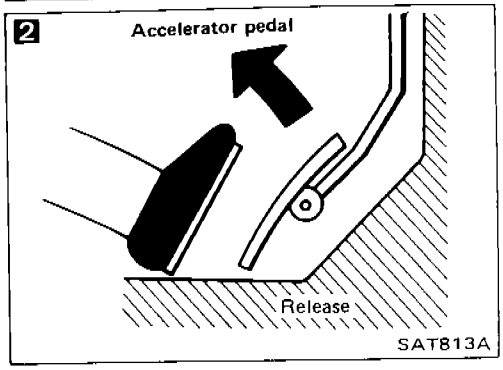
↓

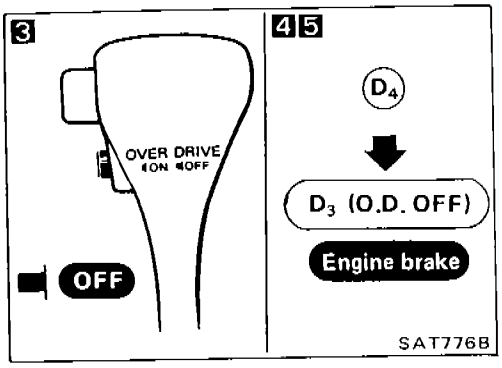
Go to "Cruise test – Part 3".

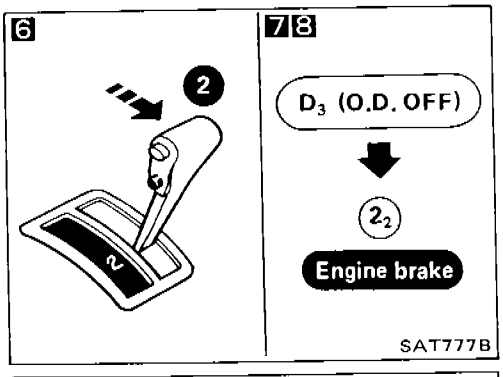
Preliminary Check (Cont'd)

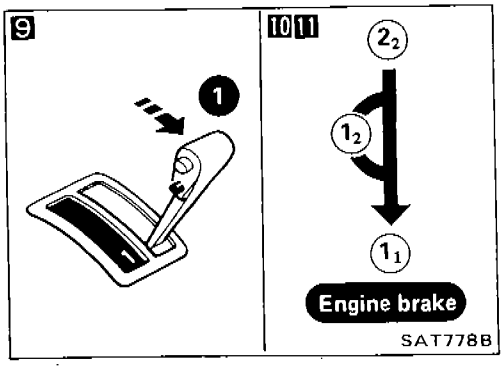
Cruise test — Part 3











Confirm overdrive switch is in "ON" position.

↓

Confirm selector lever is in "D" range.

↓

1 Accelerator vehicle using half-throttle to D_4.

↓

2 Release accelerator pedal.

↓

3 Set overdrive switch in "OFF" position while driving in D_4 range.

↓

4 Does A/T shift from D_4 to D_3? — No → Go to Diagnostic Procedure 17.

↓ Yes

5 Does vehicle decelerate by engine brake? — No → Go to Diagnostic Procedure 15.

↓ Yes

6 Move selector lever from "D" to "2" range while driving in D_3.

↓

7 Does A/T shift from D_3 to 2_2? — No → Go to Diagnostic Procedure 18.

↓ Yes

8 Does vehicle decelerate by engine brake? — No → Go to Diagnostic Procedure 15.

↓ Yes

9 Move selector lever from "2" to "1" range while driving in 2_2.

↓

10 Does A/T shift from 2_2 to 1_1 range? — No → Go to Diagnostic Procedure 19.

↓ Yes

11 Does vehicle decelerate by engine brake? — No → Go to Diagnostic Procedure 20.

↓ Yes

Stop vehicle.

↓

Perform self-diagnosis. — Refer to SELF-DIAGNOSIS PROCEDURE.

Preliminary Check (Cont'd)

Vehicle speed when shifting gears

Europe

Throttle position	Vehicle speed km/h (MPH)						
	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	$1_2 \rightarrow 1_1$
Full throttle	58 - 62 (36 - 39)	109 - 115 (68 - 71)	176 - 186 (109 - 116)	170 - 180 (106 - 112)	104 - 110 (65 - 68)	44 - 48 (27 - 30)	53 - 57 (33 - 35)
Half throttle	41 - 45 (25 - 28)	78 - 84 (48 - 52)	125 - 135 (78 - 84)	74 - 84 (46 - 52)	29 - 35 (18 - 22)	10 - 14 (6 - 9)	53 - 57 (33 - 35)

Except Europe

Throttle position	Vehicle speed km/h (MPH)						
	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	$1_2 \rightarrow 1_1$
Full throttle	54 - 58 (34 - 36)	101 - 107 (63 - 66)	164 - 174 (102 - 108)	158 - 168 (98 - 104)	95 - 101 (59 - 63)	44 - 48 (27 - 30)	53 - 57 (33 - 35)
Half throttle	41 - 45 (25 - 28)	73 - 79 (45 - 49)	119 - 129 (74 - 80)	78 - 88 (48 - 55)	34 - 40 (21 - 25)	10 - 14 (6 - 9)	53 - 57 (33 - 35)

Vehicle speed when performing and releasing lock-up

Europe

Throttle position	D_4	
	Vehicle speed km/h (MPH)	
	Lock-up "ON"	Lock-up "OFF"
Full throttle	176 - 186 (109 - 116)	170 - 180 (106 - 112)
Half throttle	126 - 134 (78 - 83)	110 - 118 (68 - 73)

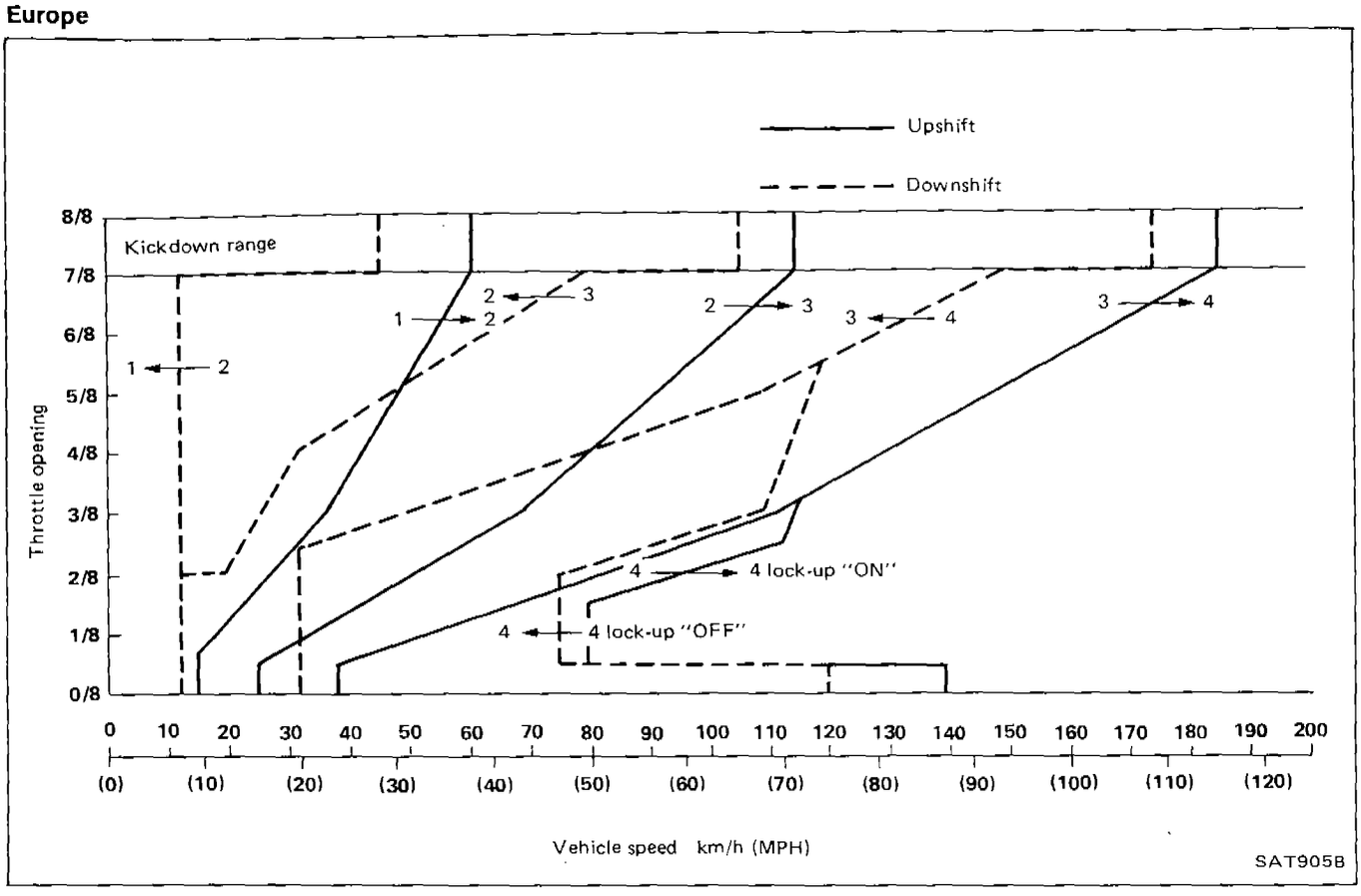
Except Europe

Throttle position	D_4	
	Vehicle speed km/h (MPH)	
	Lock-up "ON"	Lock-up "OFF"
Full throttle	164 - 174 (102 - 108)	158 - 168 (98 - 104)
Half throttle	120 - 128 (75 - 80)	102 - 110 (63 - 68)

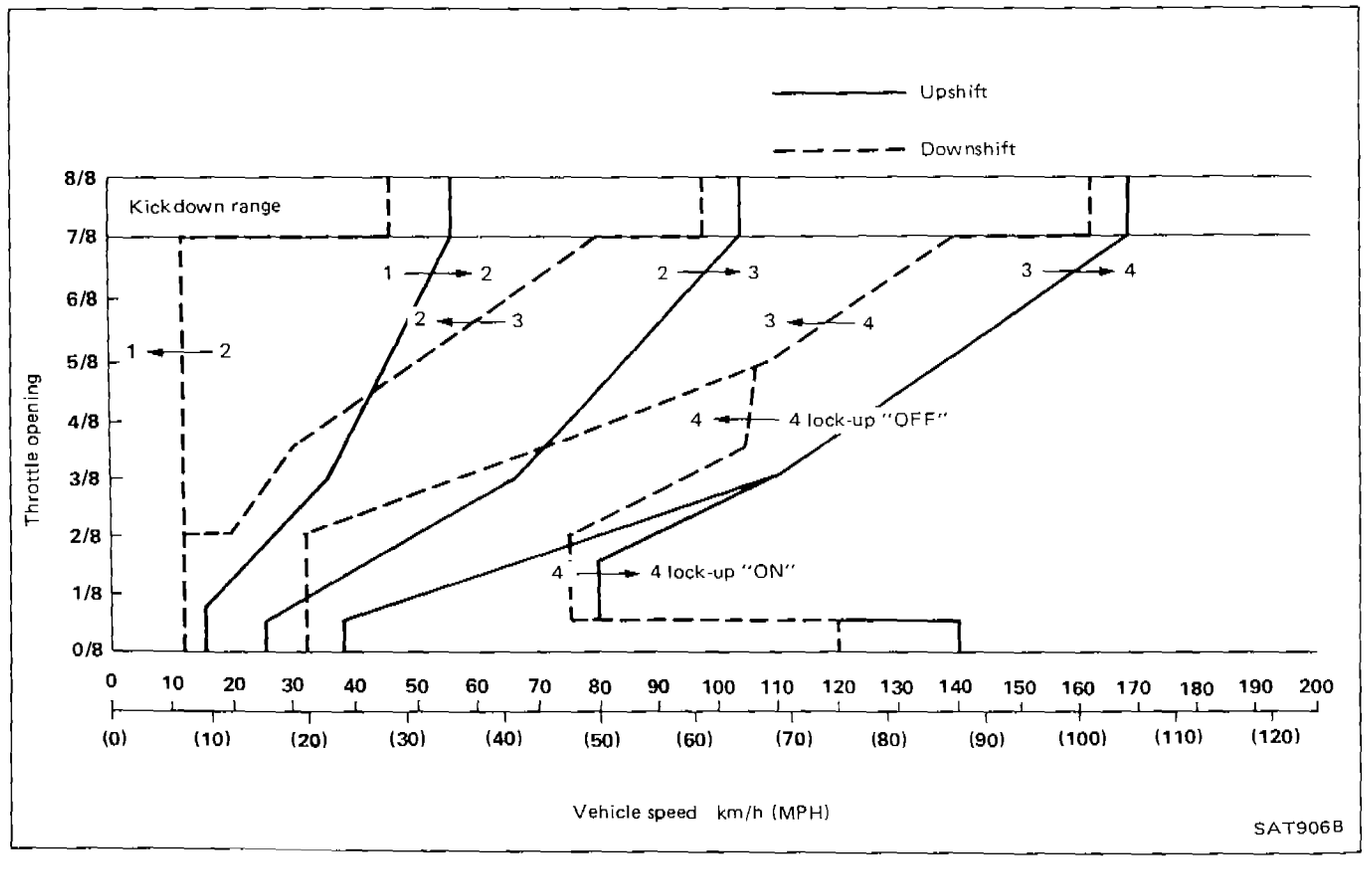
Preliminary Check (Cont'd)

Shift schedule

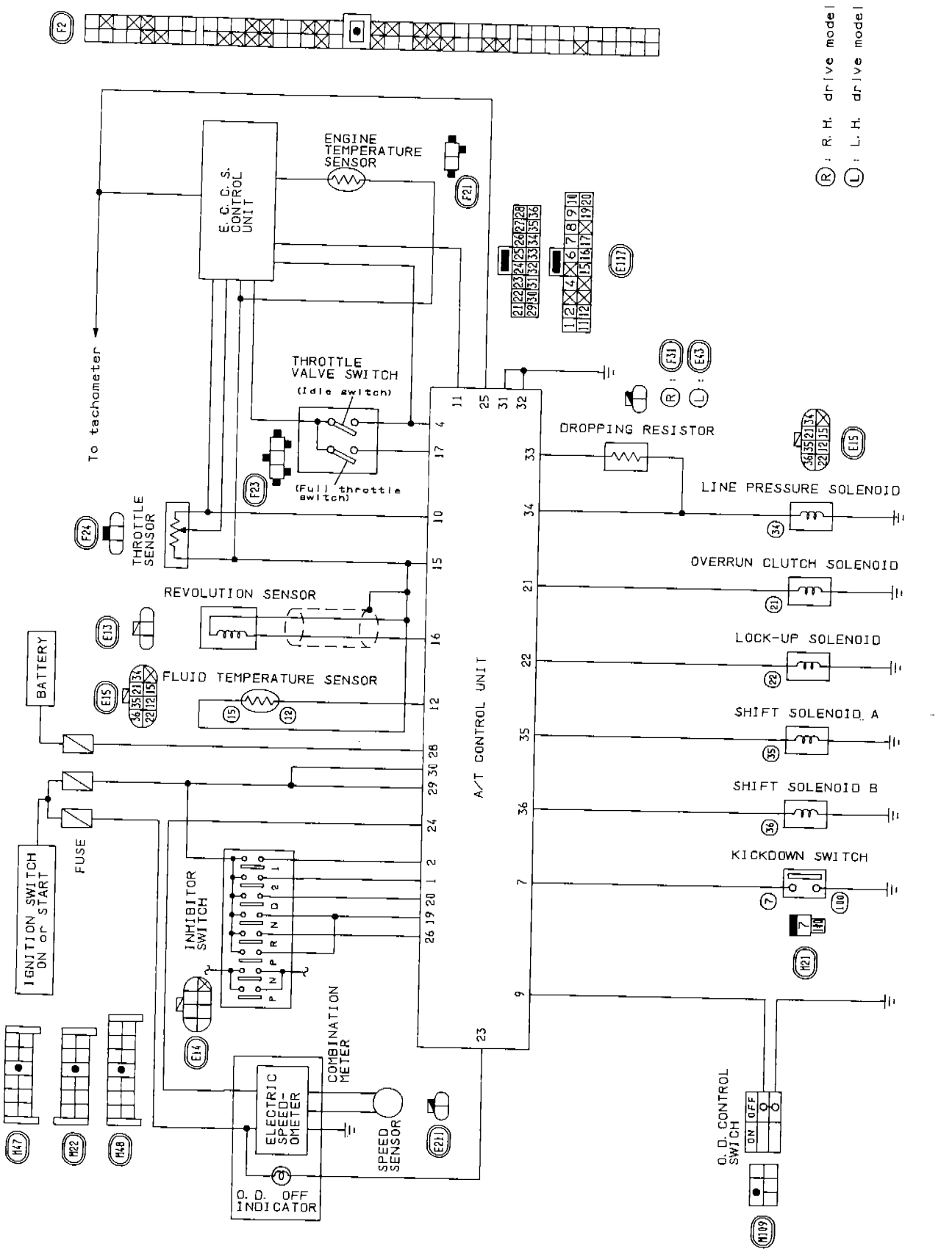
Europe



Except Europe

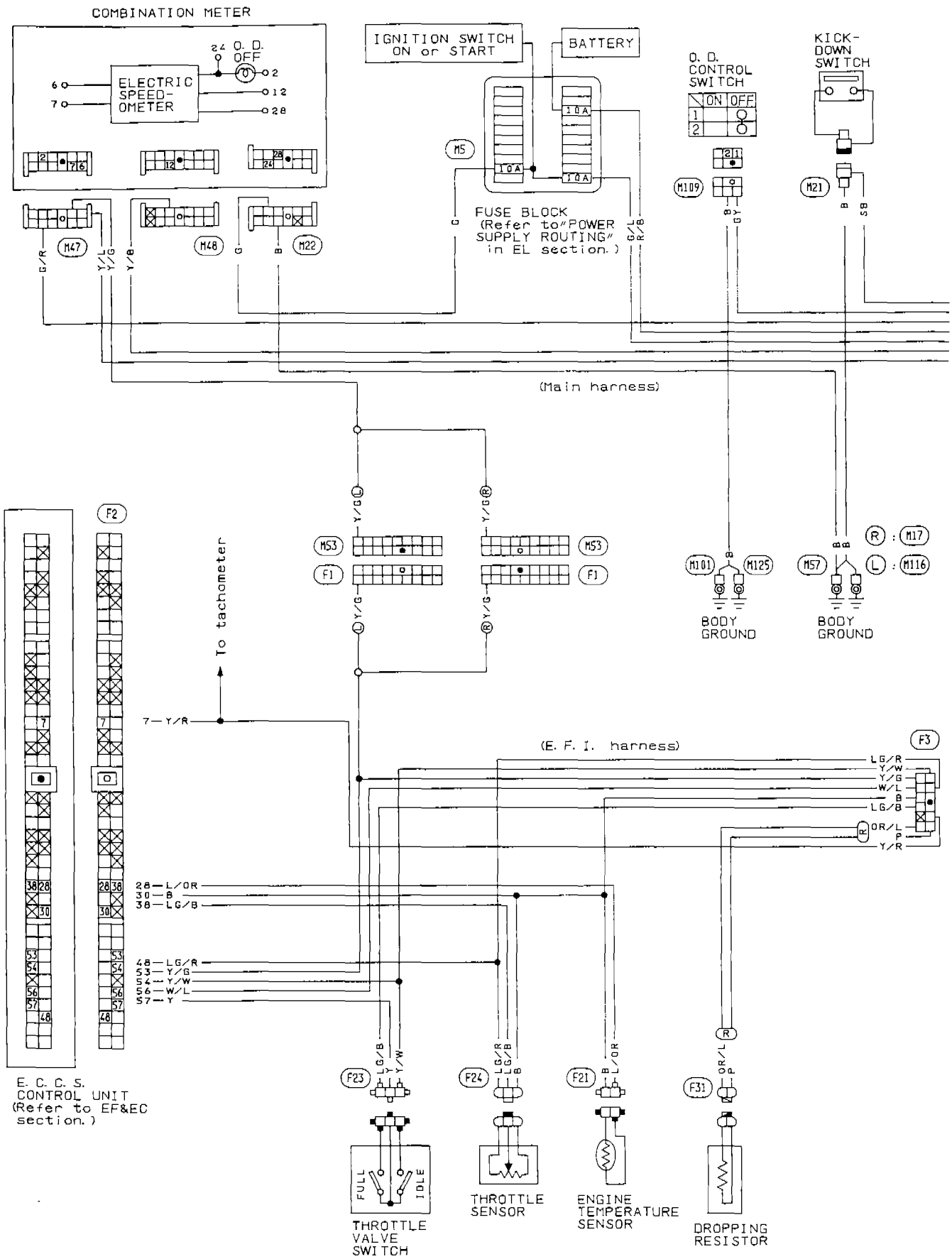


Circuit Diagram for Quick Pinpoint Check

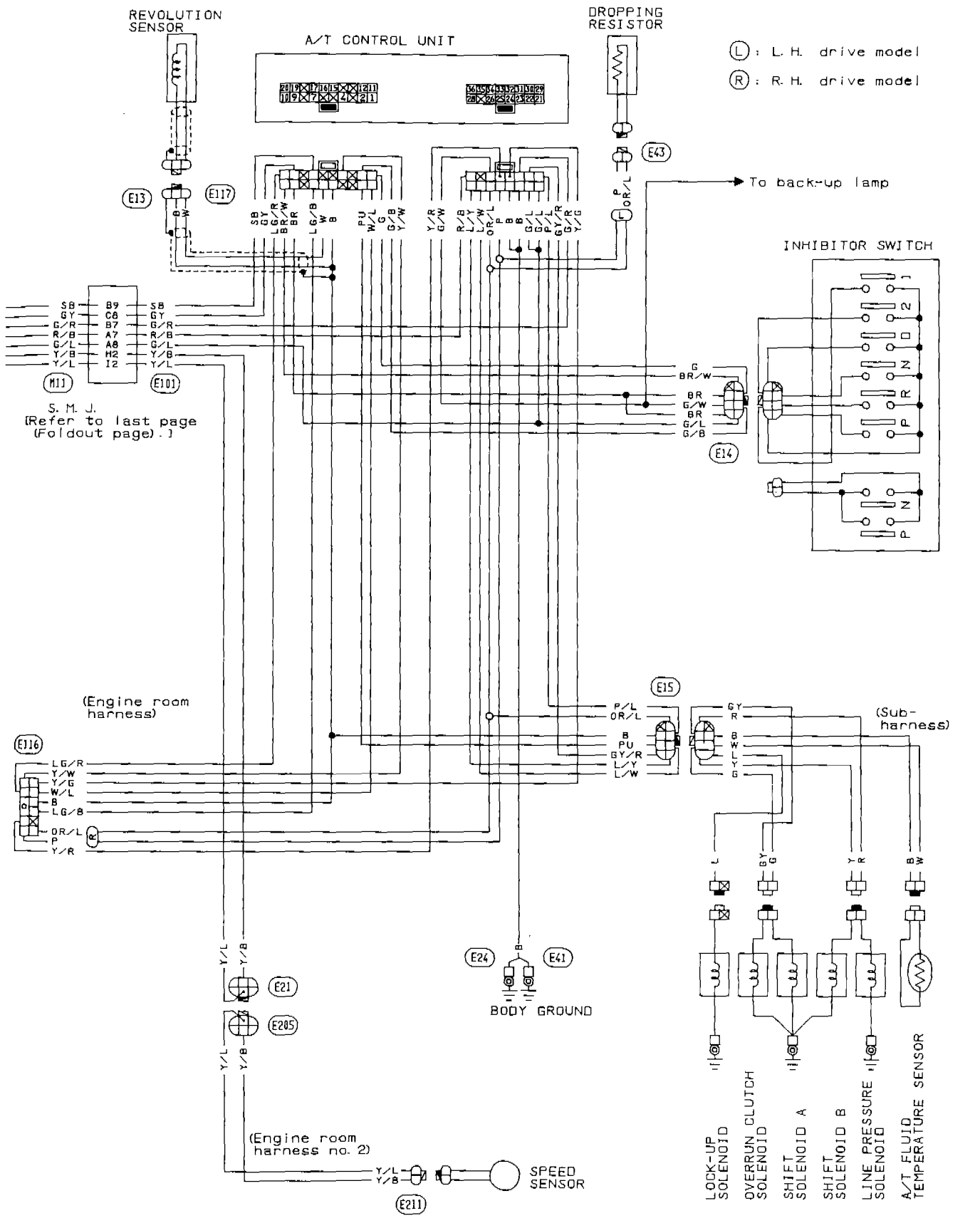


SAT903B

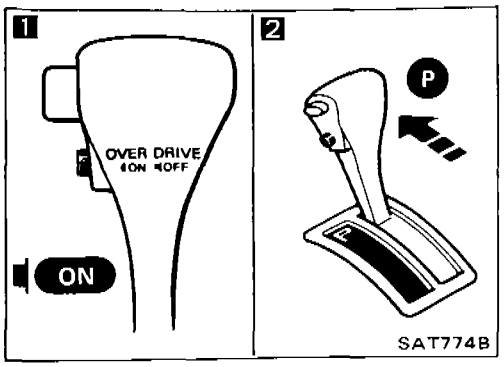
Wiring Diagram

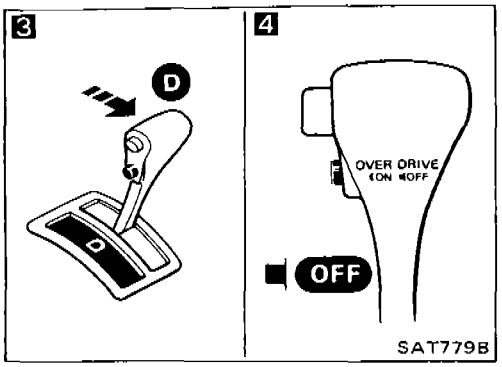


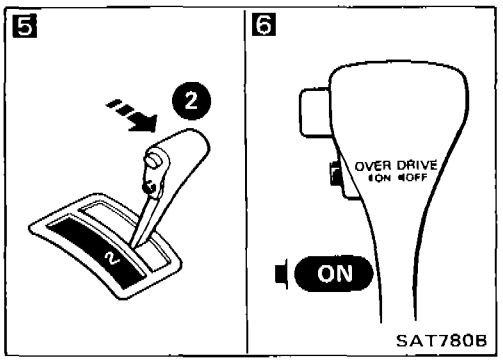
Wiring Diagram (Cont'd)

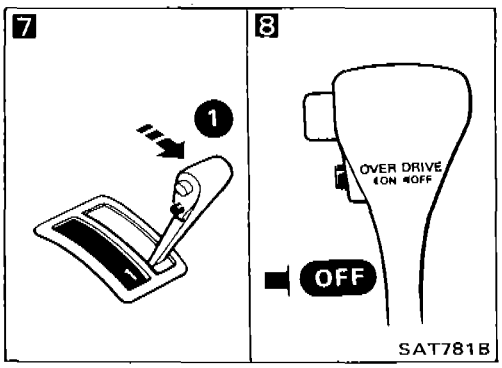


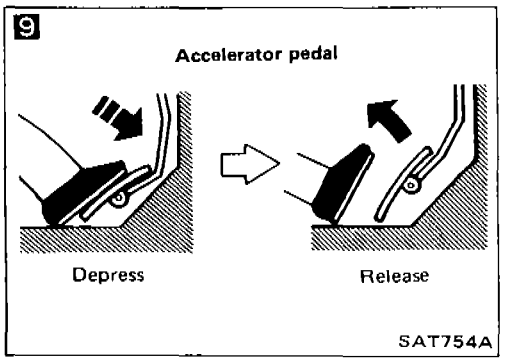
SAT904B











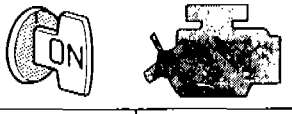
Self-diagnosis

SELF-DIAGNOSTIC PROCEDURE

DIAGNOSIS START

Start engine and warm it up to normal engine operating temperature.

1. Set overdrive switch in "ON" position.
2. Move selector lever to "P" range.

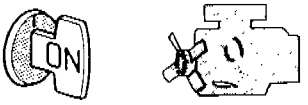


Does O.D. OFF indicator lamp come on for about 2 seconds?

Yes

No → Go to Diagnostic Procedure 1.

3. Move selector lever to "D" range.
4. Set overdrive switch in "OFF" position.



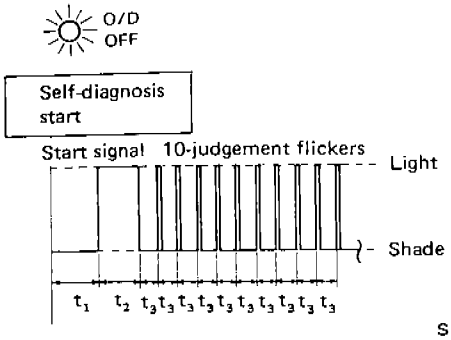
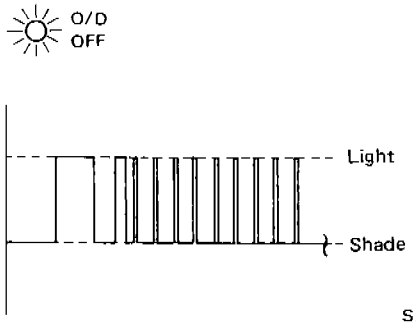
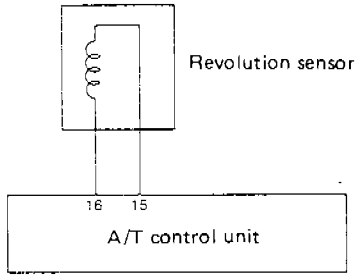
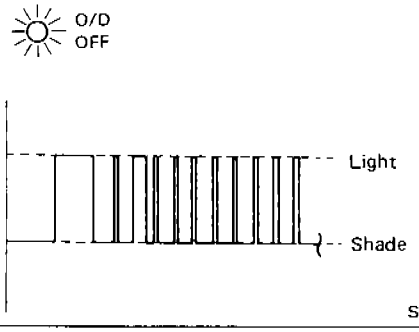
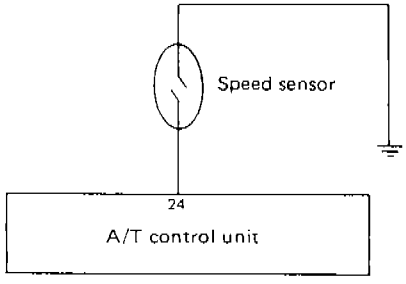
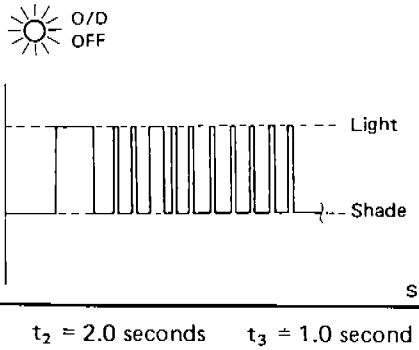
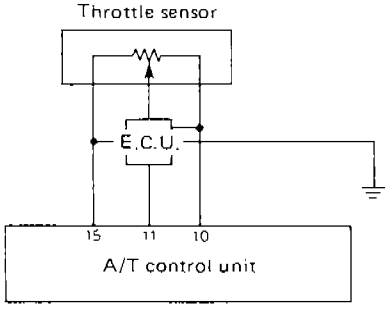
Wait for more than 2 seconds after ignition switch "ON".

5. Move selector lever to "2" range.
6. Set overdrive switch in "ON" position.
7. Move selector lever to "1" range.
8. Set overdrive switch in "OFF" position.
9. Depress accelerator pedal fully and release it.

Ⓐ

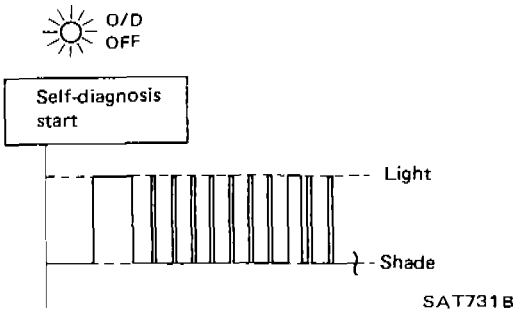
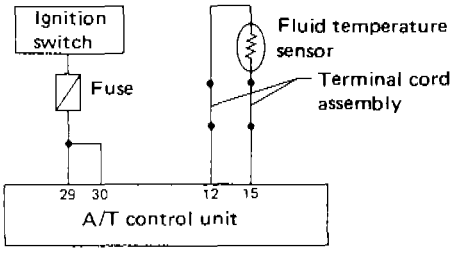
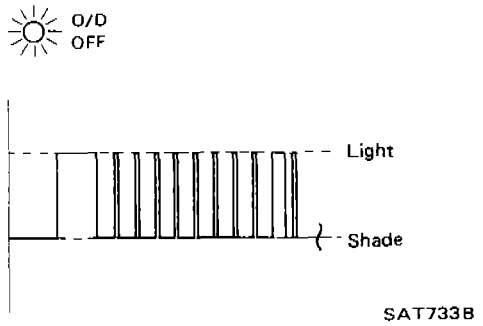
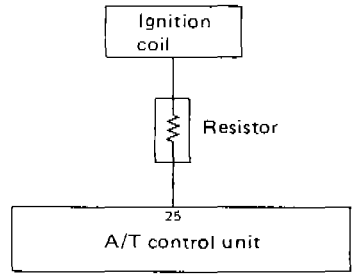
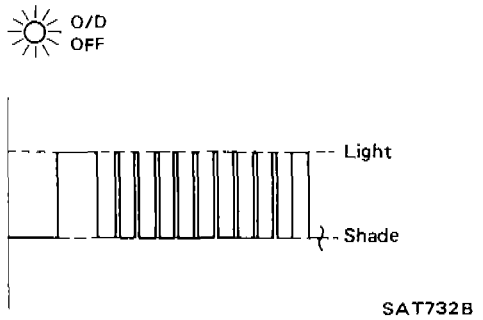
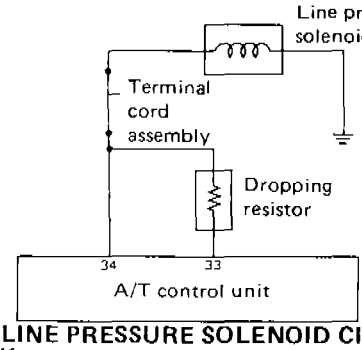
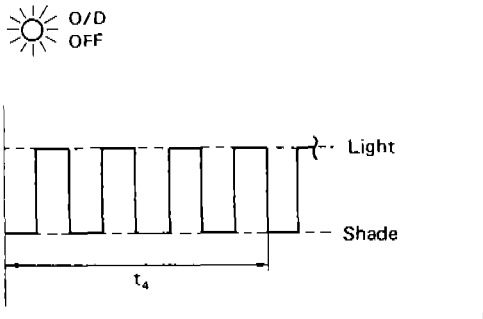
Self-diagnosis (Cont'd)

JUDGEMENT OF SELF-DIAGNOSIS CODE

O.D. OFF indicator lamp:	Damaged circuit
All judgement flickers are same.  SAT723B	All circuits that can be confirmed by self-diagnosis are O.K.
1st judgement flicker is longer than others.  SAT724B	Revolution sensor circuit is short-circuited or disconnected.  ➡ Go to REVOLUTION SENSOR CIRCUIT CHECK. SAT140B
2nd judgement flicker is longer than others.  SAT725B	Speed sensor circuit is short-circuited or disconnected.  ➡ Go to SPEED SENSOR CIRCUIT CHECK. SAT760A
3rd judgement flicker is longer than others.  SAT726B	Throttle sensor circuit is short-circuited or disconnected.  ➡ Go to THROTTLE SENSOR CIRCUIT CHECK. SAT761A

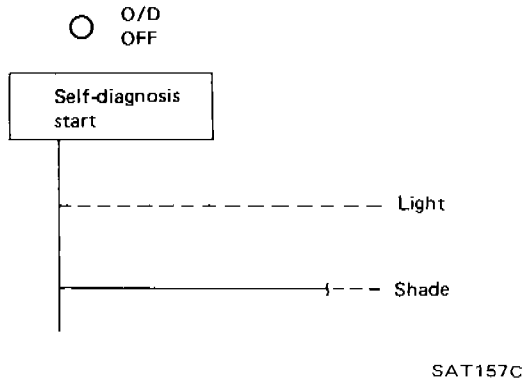
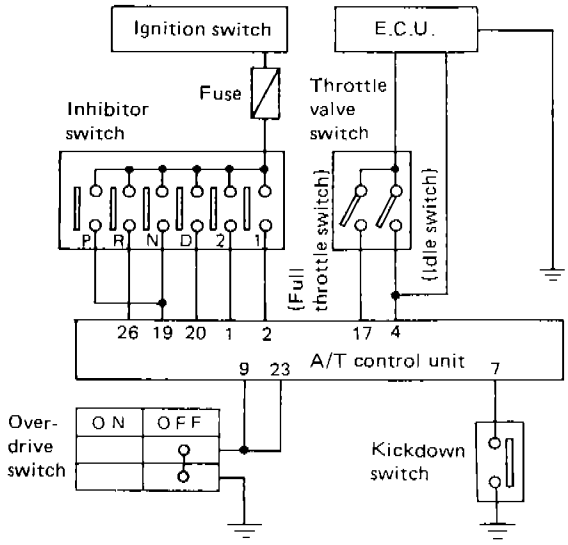
t_1 = 2.5 seconds t_2 = 2.0 seconds t_3 = 1.0 second

Self-diagnosis (Cont'd)

O.D. OFF indicator lamp:	Damaged circuit
8th judgement flicker is longer than others.  SAT731B	Fluid temperature sensor is disconnected or A/T control unit power source circuit is damaged.  ➡ **Go to FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECK.** SAT143B
9th judgement flicker is longer than others.  SAT733B	Engine revolution signal circuit is short-circuited or disconnected.  ➡ **Go to ENGINE REVOLUTION SIGNAL CIRCUIT CHECK.** SAT624B
10th judgement flicker is longer than others.  SAT732B	Line pressure solenoid circuit is short-circuited or disconnected.  ➡ **Go to LINE PRESSURE SOLENOID CIRCUIT CHECK.** SAT776A
Flickers as shown below:  SAT734B	Battery power is low. Battery has been disconnected for a long time. Battery is connected conversely. (When reconnecting A/T control unit connectors. — This is not a problem.)

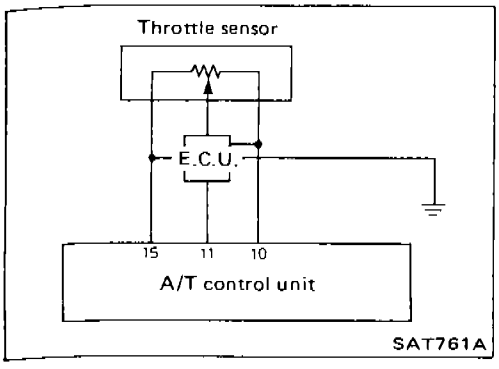
t_4 = 1.0 second

Self-diagnosis (Cont'd)

O.D. OFF indicator lamp:	Damaged circuit
Does not come on.  SAT157C	Inhibitor switch, overdrive switch, kickdown switch or idle switch circuit is disconnected or A/T control unit is damaged.  ➡ **Go to INHIBITOR, OVERDRIVE, KICKDOWN AND IDLE SWITCH CIRCUIT CHECKS.** SAT007C

Self-diagnosis (Cont'd)

THROTTLE SENSOR CIRCUIT CHECK



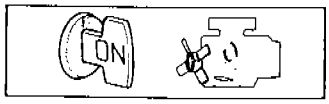
Perform self-diagnosis (Mode III) for engine control.

N.G. → Check throttle sensor circuit for engine control. — Refer to section EF & EC.

O.K.

A

CHECK INPUT SIGNAL.

1. 

2. Check voltage between A/T control unit terminals ⑪ and ⑮ while accelerator pedal is depressed slowly.

Voltage:

Fully-closed throttle:
0.2 - 0.6V

Fully-open throttle:
2.9 - 3.9V

(Voltage rises gradually in response to throttle valve opening.)

N.G. → Check harness continuity between E.C.U. and A/T control unit regarding throttle sensor circuit. (Main harness)

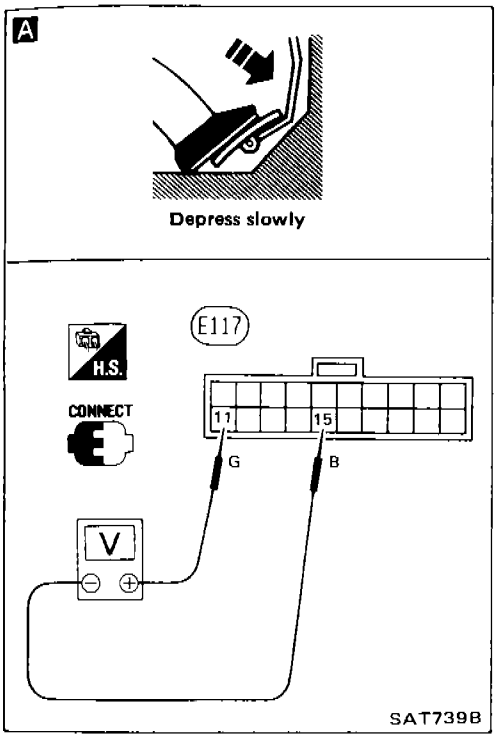
O.K.

Perform self-diagnosis again after driving for a while.

N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

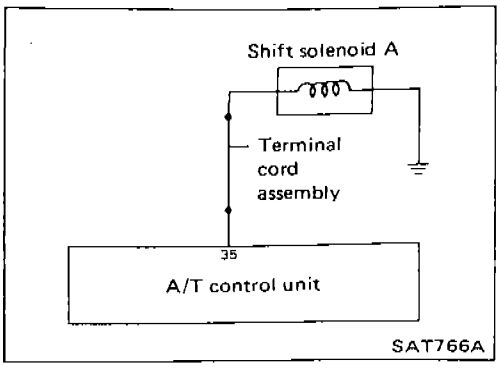
O.K.

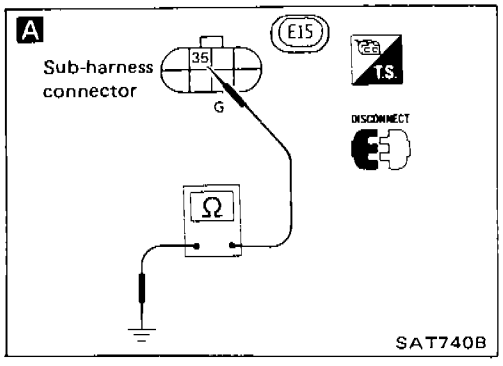
INSPECTION END

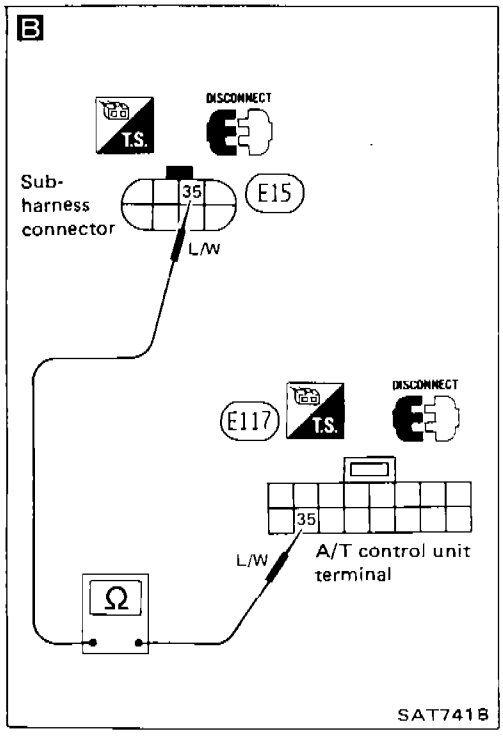


Self-diagnosis (Cont'd)

SHIFT SOLENOID A CIRCUIT CHECK

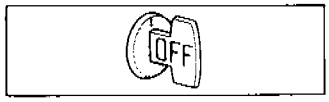






A

CHECK GROUND CIRCUIT.

1. 

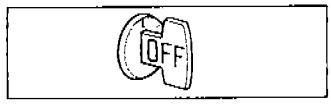
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal (35) and ground.
   Resistance: 20 - 30Ω

N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Shift solenoid A — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.

1. 

2. Disconnect A/T control unit 16-pin connector.
3. Check resistance between terminal (35) and A/T control unit terminal (35).
   Resistance:
   Approximately 0Ω
4. Reinstall any part removed.

N.G. → Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)

O.K. ↓

Perform self-diagnosis after driving for a while.

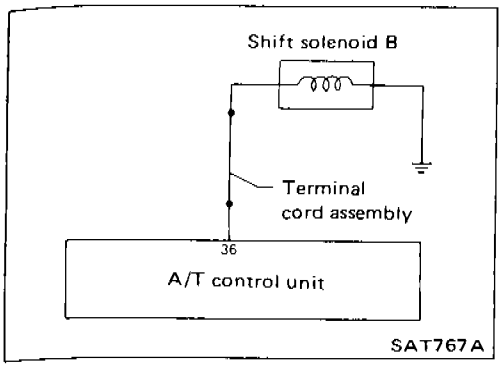
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

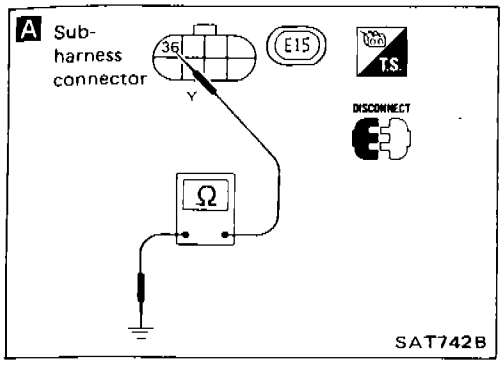
O.K. ↓

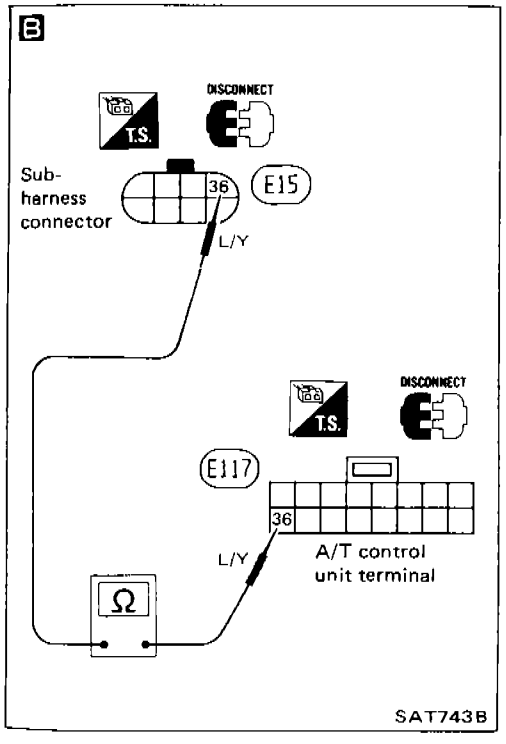
INSPECTION END

Self-diagnosis (Cont'd)

SHIFT SOLENOID B CIRCUIT CHECK

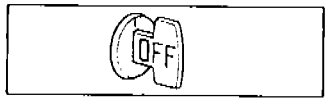






A

CHECK GROUND CIRCUIT.

1. 

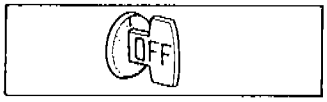
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal (36) and ground.
   Resistance: 20 - 30Ω

N.G. →
1. Remove control valve assembly. – Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
   - Shift solenoid B – Refer to "Electrical Components Inspection".
   - Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.

1. 

2. Disconnect A/T control unit 16-pin connector.
3. Check resistance between terminal (36) and A/T control unit terminal (36).
   Resistance:
   Approximately 0Ω
4. Reinstall any part removed.

N.G. → Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)

O.K. ↓

Perform self-diagnosis after driving for a while.

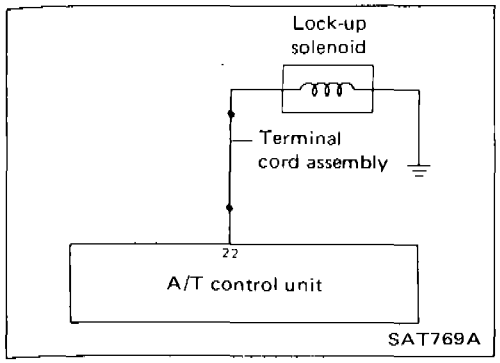
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

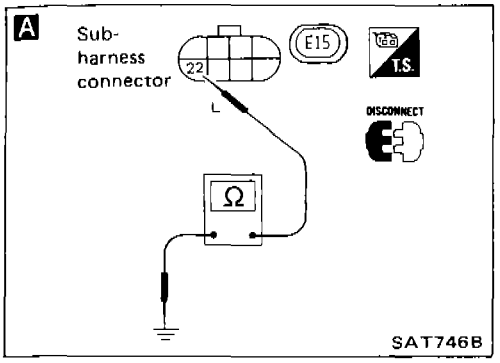
O.K. ↓

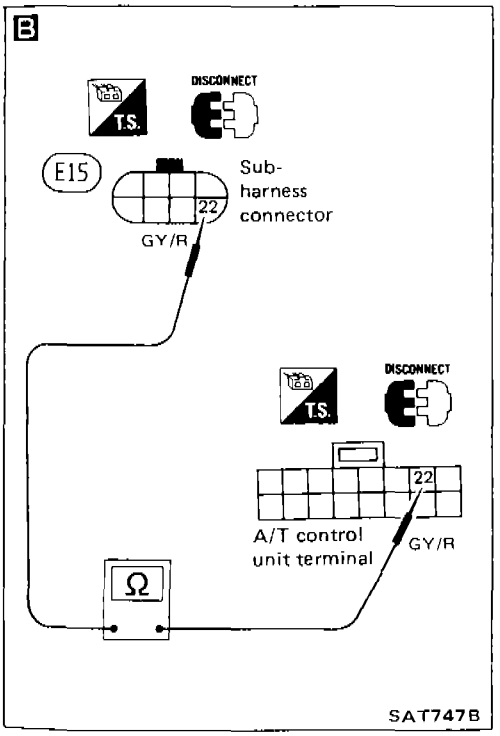
INSPECTION END

Self-diagnosis (Cont'd)

LOCK-UP SOLENOID CIRCUIT CHECK

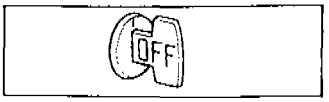






A

CHECK GROUND CIRCUIT.

1. 

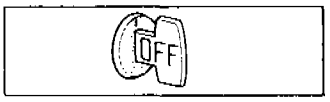
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ㉒ and ground.
   Resistance: 2.5 - 5Ω

N.G. →
1. Remove oil pan. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Lock-up solenoid — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.

1. 

2. Disconnect A/T control unit 16-pin connector.
3. Check resistance between terminal ㉒ and A/T control unit terminal ㉒.
   Resistance:
   Approximately 0Ω
4. Reinstall any part removed.

N.G. → Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)

O.K. ↓

Perform self-diagnosis after driving for a while.

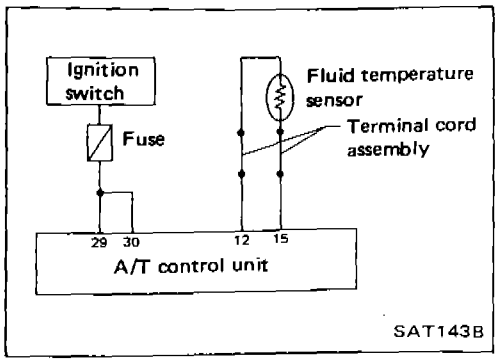
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

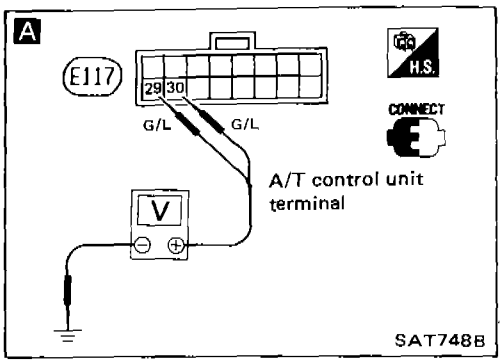
O.K. ↓

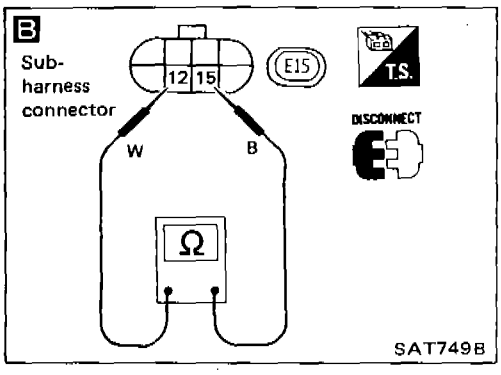
INSPECTION END

Self-diagnosis (Cont'd)

FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECKS







A

CHECK A/T CONTROL UNIT POWER SOURCE.

1. 

2. Check voltage between A/T control unit terminals ㉙, ㉚ and ground.
   Battery voltage should exist.

N.G. →
Check the following items.
- Harness continuity between ignition switch and A/T control unit (Main harness)
- Ignition switch and fuse
  – Refer to section EL.

O.K. ↓

B

CHECK FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY

1. 

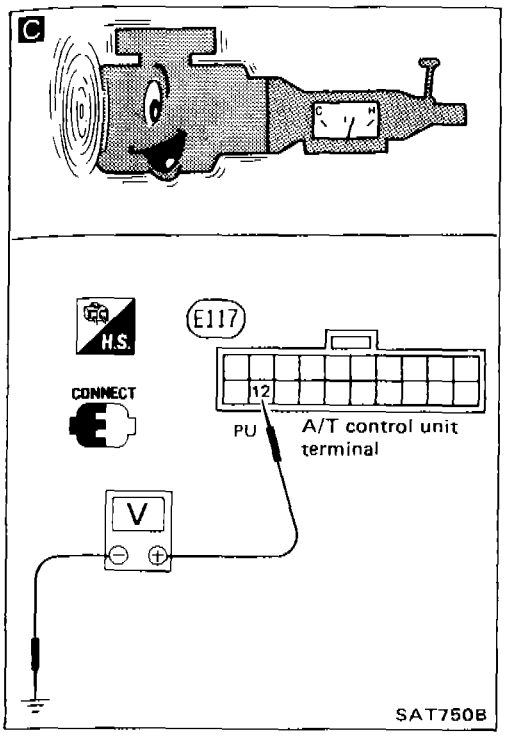
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminals ⑫ and ⑮ when A/T is cold.
   Resistance:
   Cold [20°C (68°F)]
   Approximately 2.5 kΩ
4. Reinstall any part removed.

N.G. →
1. Remove oil pan.
2. Check the following items.
- Fluid temperature sensor
  – Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. ↓

Ⓐ

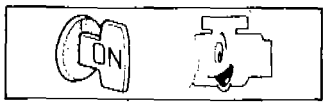
Self-diagnosis (Cont'd)



Ⓐ

C

CHECK INPUT SIGNAL OF FLUID TEMPERATURE SENSOR.

1. 

2. Check voltage between A/T control unit terminal ⑫ and ground while warming up A/T.
   Voltage:
   Cold [20°C (68°F)] → Hot [80°C (176°F)]:
   1.56V → 0.45V

N.G. → Check the following items.
- Harness continuity between A/T control unit and terminal cord assembly (Main harness)

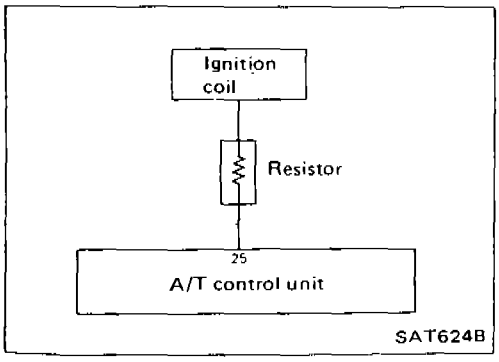
O.K. ↓

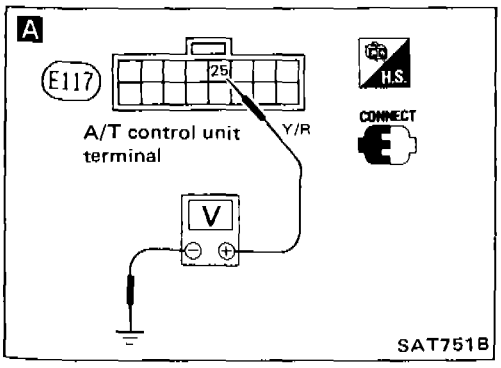
Perform self-diagnosis after driving for a while.

N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END





ENGINE REVOLUTION SIGNAL CIRCUIT CHECK

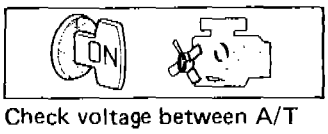
Perform self-diagnosis (Mode III) for engine control. Check ignition signal circuit condition.

N.G. → Check ignition signal circuit for engine control. — Refer to section EF & EC.

O.K. ↓

A

CHECK INPUT SIGNAL.

1. 

2. Check voltage between A/T control unit terminal ㉕ and ground.
   Voltage: 9.5 - 12V

N.G. → Check the following items.
- Harness continuity between A/T control unit and ignition coil.
- Resistor
- Ignition coil — Refer to section EF & EC.

O.K. ↓

Perform self-diagnosis again after driving for a while.

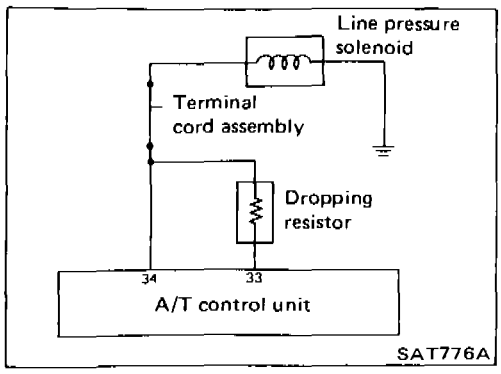
N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

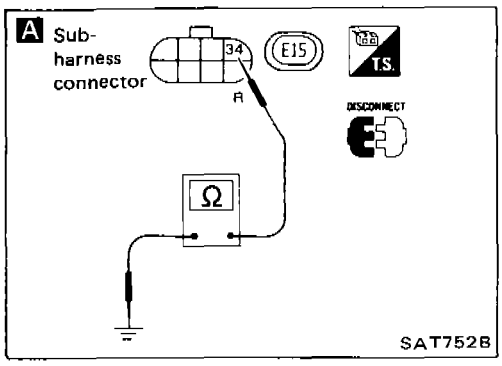
O.K. ↓

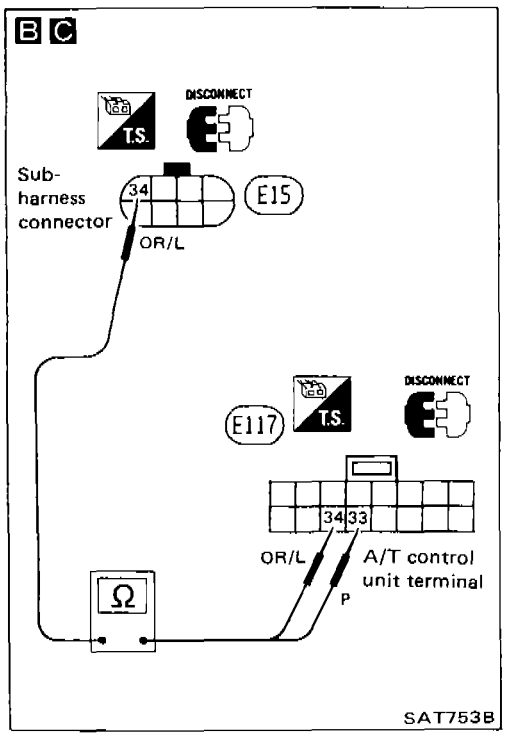
INSPECTION END

Self-diagnosis (Cont'd)

LINE PRESSURE SOLENOID CIRCUIT CHECK

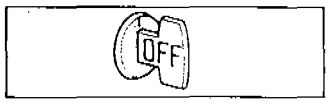






A

CHECK GROUND CIRCUIT.

1. 

2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ㉞ and ground.
   Resistance: 2.5 - 5Ω

N.G. →
1. Remove control valve assembly. – Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Line pressure solenoid – Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.

1. 

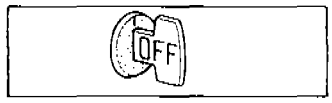
2. Disconnect A/T control unit 16-pin connector.
3. Check resistance between terminal ㉞ and A/T control unit terminal ㉝.
   Resistance: 11.2 - 12.8Ω

N.G. →
Check the following items.
- Dropping resistor – Refer to "Electrical Components Inspection".
- Harness continuity between A/T control unit ㉝ and terminal cord assembly (Main harness)

O.K. ↓

C

CHECK POWER SOURCE CIRCUIT

1. 

2. Check resistance between terminal ㉞ and A/T control unit terminal ㉞.
   Resistance:
   Approximately 0Ω
3. Reinstall any part removed.

N.G. →
Repair or replace harness between A/T control unit ㉞ and terminal cord assembly.

O.K. ↓

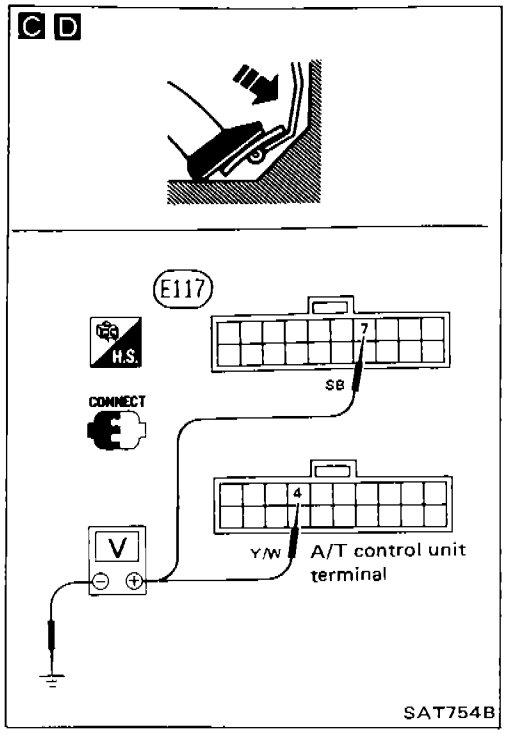
Perform self-diagnosis after driving for a while.

N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

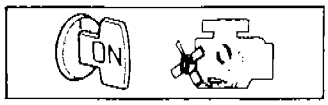
Self-diagnosis (Cont'd)



Ⓐ

C

CHECK KICKDOWN SWITCH CIRCUIT.

1. 

2. Check voltage between A/T control unit terminal ⑦ and ground while depressing accelerator pedal slowly. (after warming up engine)
   Voltage:
   When releasing accelerator pedal: 3 - 8V
   When depressing accelerator pedal fully: 1V or less

N.G. → Check the following items.
- Kickdown switch
- Harness continuity between A/T control unit and kickdown switch (Main harness)
- Harness continuity of ground circuit for kickdown switch

O.K. ↓

D

CHECK IDLE SWITCH CIRCUIT.
- Check voltage between A/T control unit terminal ④ and ground in the same way as kickdown switch circuit.
  Voltage:
  When releasing accelerator pedal: 8 - 15V
  When depressing accelerator pedal fully: 1V or less

N.G. → Perform self-diagnosis (Mode IV) for engine control. Check idle switch circuit.
- O.K. → Check harness continuity between A/T control unit and idle switch. (Main harness)
- N.G. → Check idle switch circuit for engine control. — Refer to section EF & EC.

O.K. ↓

Perform self-diagnosis again after driving for a while.

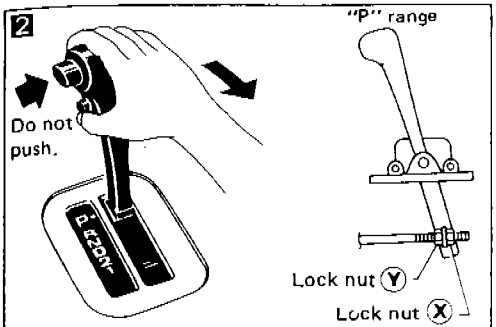
N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

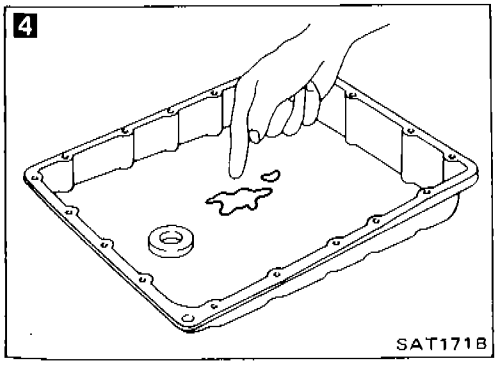
1 O/D OFF

2



3

4



Diagnostic Procedure 4

SYMPTOM: Vehicle moves forward or backward when selecting "N" range.

1 Does self-diagnosis show damage to inhibitor switch after cruise test?

- Yes → Check inhibitor switch circuit. – Refer to "Self-diagnosis".
- No ↓

2 Check manual control linkage. – Refer to "ON-VEHICLE SERVICE".

- N.G. → Adjust manual control linkage. – Refer to "ON-VEHICLE SERVICE".
- O.K. ↓

3 Check A/T fluid level again.

- N.G. → Refill A.T.F.
- O.K. ↓

4 1. Remove oil pan.
2. Check A/T fluid condition.

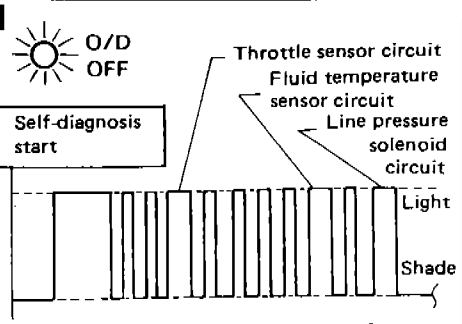
- N.G. → 1. Disassemble A/T. 2. Check the following items.
  - Forward clutch assembly
  - Overrun clutch assembly
  - Reverse clutch assembly
  - Accumulator piston D
- O.K. ↓

Check again.

- N.G. → 1. Perform A/T control unit input/output signal inspection. 2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.
- O.K. ↓

INSPECTION END

1



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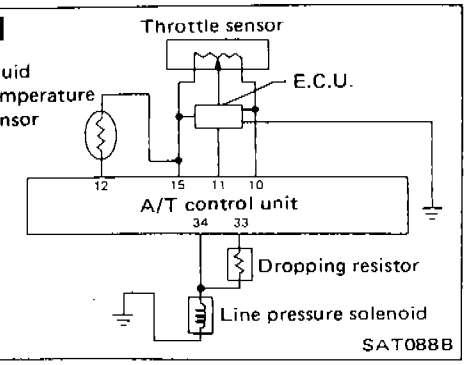

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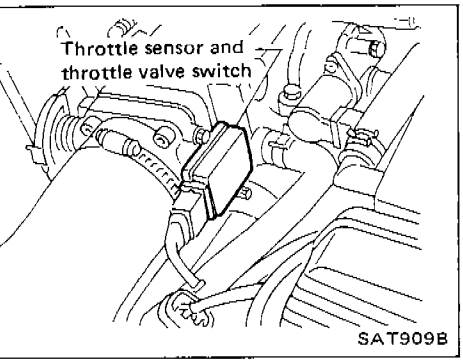

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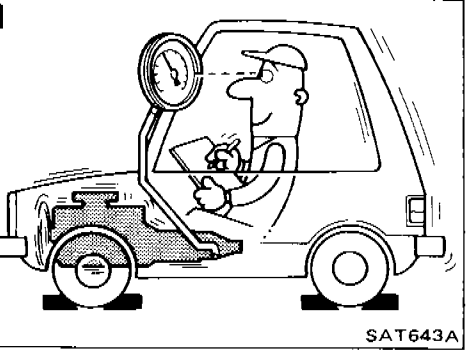


Diagnostic Procedure 5

SYMPTOM: There is large shock when changing from "N" to "R" range.

1 Does self-diagnosis show damage to throttle sensor, line pressure solenoid or fluid temperature sensor circuit?

Yes → **2** Check damaged circuit. — Refer to "Self-diagnosis".

No ↓

3 Check throttle sensor. — Refer to section EF & EC.

N.G. → Repair or replace throttle sensor.

O.K. ↓

4 Check line pressure at idle with selector lever in "D" range. — Refer to "PRESSURE TESTING".

N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Valves to control line pressure (Pressure regulator valve, modifier valve, pilot valve and pilot filter)
- Line pressure solenoid

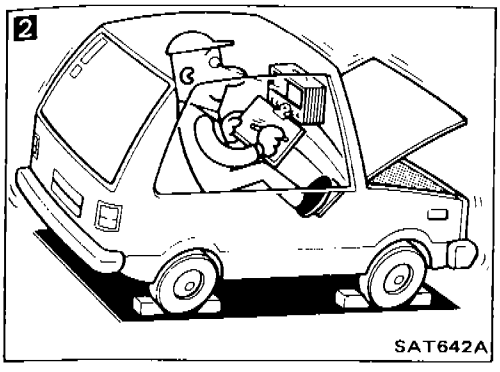
O.K. ↓

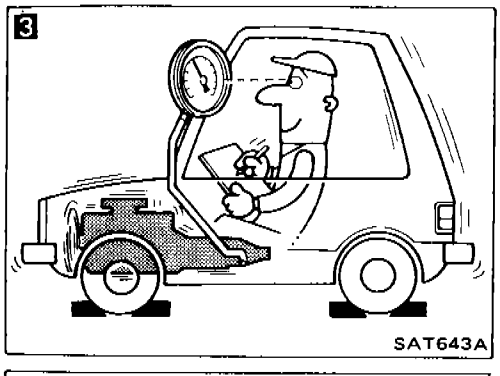
Check again.

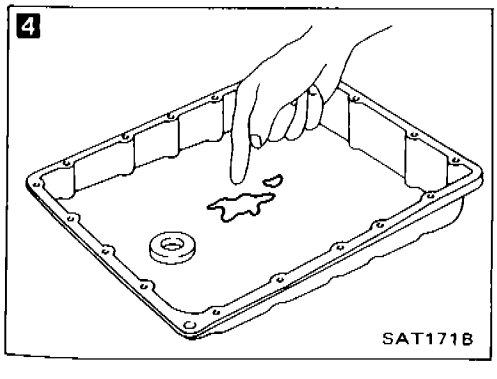
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END







Diagnostic Procedure 6

SYMPTOM: Vehicle does not creep backward when selecting "R" range.

1 Check A/T fluid level again.
- N.G. → Refill A.T.F.
- O.K.

2 Check stall revolution with selector lever in "1" and "R" range.
- N.G. in both "1" and "R" range → 1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE". 2. Check the following items.
  - Valves to control line pressure (Pressure regulator valve, pilot valve and pilot filter)
  - Line pressure solenoid
  - 3. Disassemble A/T. 4. Check the following items.
  - Oil pump assembly
  - Torque converter
  - Reverse clutch assembly
  - High clutch assembly
  - Low & reverse brake assembly
  - Low one-way clutch
- O.K.
- O.K. in "1" range, N.G. in "R" range → same as above

3 Check line pressure at idle with selector lever in "R" range. — Refer to "PRESSURE TESTING".
- N.G. → same as above
- O.K.

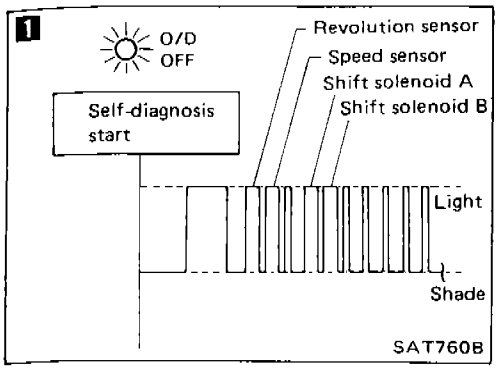
4 1. Remove oil pan. 2. Check fluid condition.
- N.G. → same as above
- O.K.

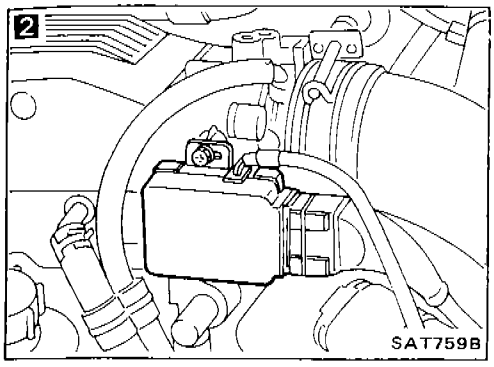
Check again.
- N.G. → 1. Perform A/T control unit input/output signal inspection. 2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.
- O.K.

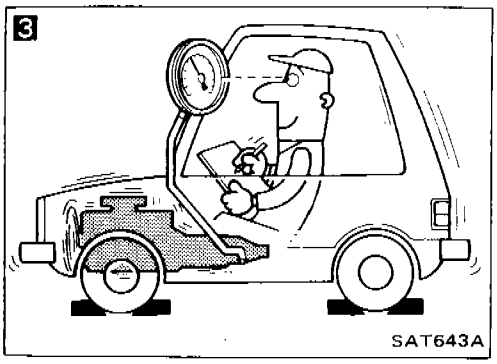
INSPECTION END

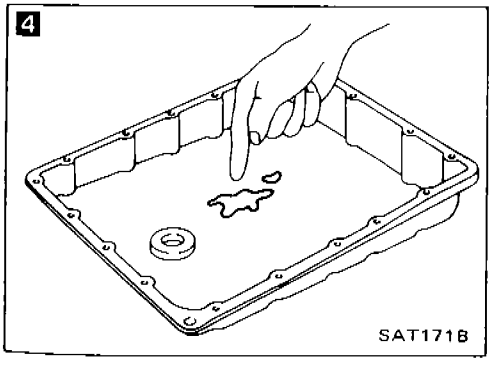
Diagnostic Procedure 8

SYMPTOM: Vehicle cannot be started from D_1 on Cruise test — Part 1.









Is Diagnostic Procedure 7 O.K.? — No → Go to Diagnostic Procedure 7.

Yes ↓

1 Does self-diagnosis show damage to revolution sensor, speed sensor, shift solenoid A or B after cruise test? — Yes → Check damaged circuit. — Refer to "Self-diagnosis".

No ↓

2 Check throttle sensor. — Refer to section EF & EC. — N.G. → Repair or replace throttle sensor.

O.K. ↓

3 Check line pressure at stall point with selector lever in "D" range. — Refer to "PRESSURE TESTING". — N.G. →

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
   - Shift valve A
   - Shift valve B
   - Shift solenoid A
   - Shift solenoid B
   - Pilot valve
   - Pilot filter

↓

4
1. Remove oil pan.
2. Check A/T fluid condition.

O.K. → (Pilot filter)

N.G. →

3. Disassemble A/T.
4. Check the following items.
   - Forward clutch assembly
   - Forward one-way clutch
   - Low one-way clutch
   - High clutch assembly
   - Torque converter
   - Oil pump assembly

O.K. →

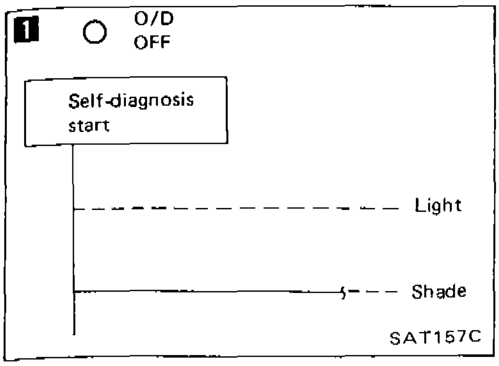
↓

Check again. — N.G. →

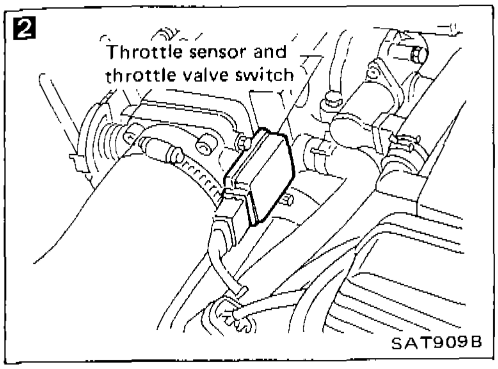
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

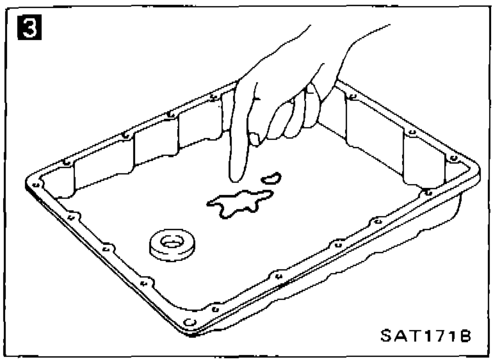
INSPECTION END



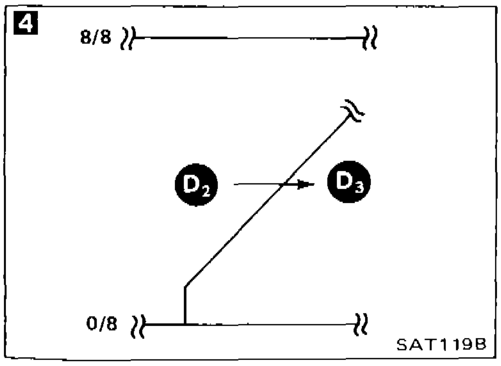
SAT157C



SAT909B



SAT171B



SAT119B

Diagnostic Procedure 10

SYMPTOM: A/T does not shift from D_2 to D_3 at the specified speed.

- Are Diagnostic Procedures 7 and 8 O.K.?
  - No → Go to Diagnostic Procedure 7 or 8.
  - Yes ↓

1

- Does self-diagnosis show damage to inhibitor switch after cruise test?
  - Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".
  - No ↓

2

- Check throttle sensor. — Refer to section EF & EC.
  - N.G. → Repair or replace throttle sensor.
  - O.K. ↓

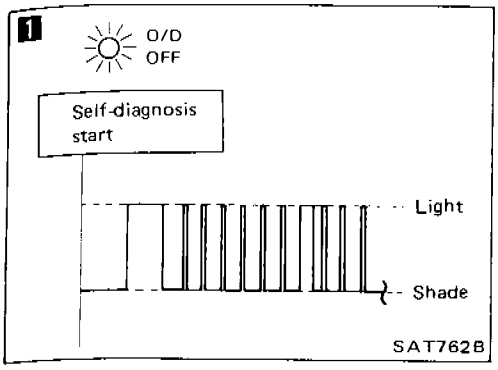
3

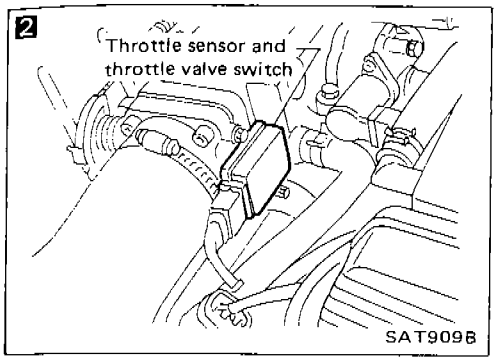
- 1. Remove oil pan.
  2. Check A/T fluid condition.
  - N.G. →
    1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
    2. Check the following items.
       - Shift valve B
       - Shift solenoid B
       - Pilot valve
       - Pilot filter
    3. Disassemble A/T.
    4. Check the following items.
       - Servo piston assembly
       - High clutch assembly
       - Oil pump assembly
  - O.K. → (to 1.–2. above); O.K. ↓

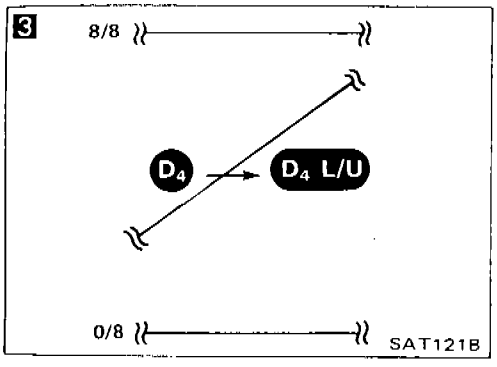
4

- Check again.
  - N.G. →
    1. Perform A/T control unit input/output signal inspection.
    2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.
  - O.K. ↓

INSPECTION END







Diagnostic Procedure 12

SYMPTOM: A/T does not perform lock-up at the specified speed.

1

Does self-diagnosis show damage to lock-up solenoid circuit after cruise test?

Yes → Check lock-up solenoid circuit. – Refer to "Self-diagnosis".

No ↓

2

Check throttle sensor. – Refer to section EF & EC.

N.G. → Repair or replace throttle sensor.

O.K. ↓

1. Remove control valve. – Refer to "ON-VEHICLE SERVICE".
2. Check following items.
- Lock-up control valve
- Shuttle shift valve D
- Torque converter relief valve
- Lock-up solenoid
- Pilot valve
- Pilot filter

N.G. → Repair or replace damaged parts.

O.K. ↓

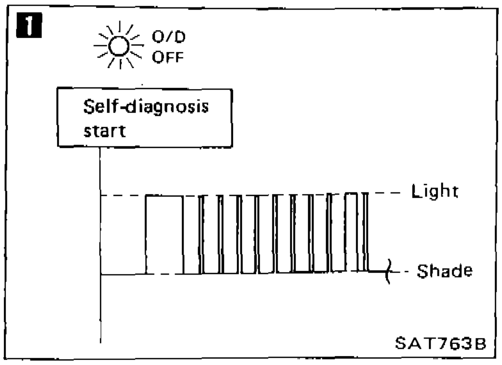
3

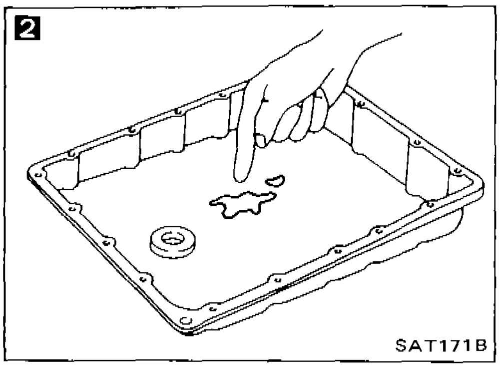
Check again.

N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END





Diagnostic Procedure 13

SYMPTOM: A/T does not hold lock-up condition for more than 30 seconds.

1

Does self-diagnosis show damage to engine revolution signal circuit after cruise test?

- Yes → Check engine revolution signal circuit. — Refer to "Self- diagnosis".
- No ↓

2

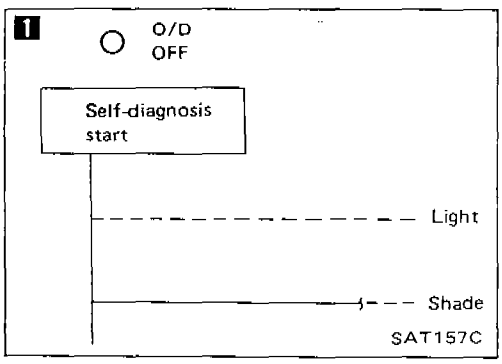
1. Remove oil pan.
2. Check A/T fluid condition.

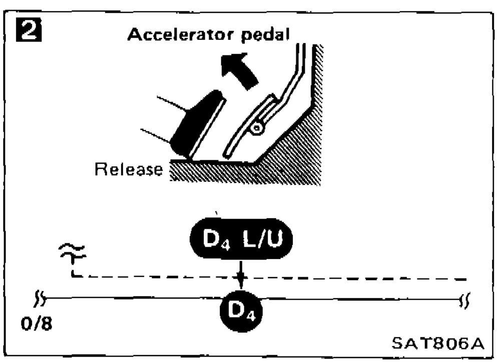
- N.G. →
  1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
  2. Check the following items.
     - Lock-up control valve
     - Pilot valve
     - Pilot filter
  3. Disassemble A/T.
  4. Check torque converter and oil pump assembly.
  - O.K. ↓
- O.K. ↓

Check again.

- N.G. →
  1. Perform A/T control unit input/output signal inspection.
  2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.
- O.K. ↓

INSPECTION END





Diagnostic Procedure 14

SYMPTOM: Lock-up is not released when accelerator pedal is released.

1

Does self-diagnosis show damage to idle switch circuit after cruise test?

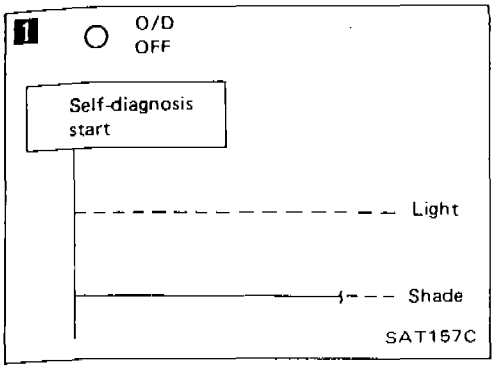
- Yes → Check idle switch circuit. — Refer to "Self-diagnosis".
- No ↓

2

Check again.

- N.G. →
  1. Perform A/T control unit input/output signal inspection.
  2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.
- O.K. ↓

INSPECTION END



Diagnostic Procedure 18

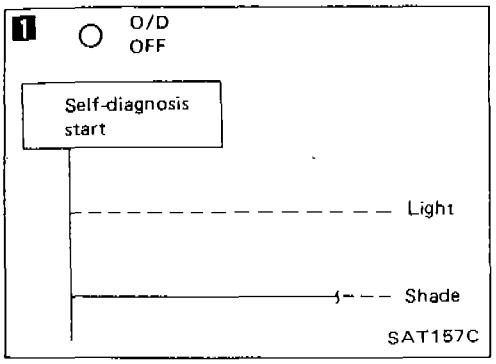
SYMPTOM: A/T does not shift from D_3 to 2_2 when changing selector lever from "D" to "2" range.

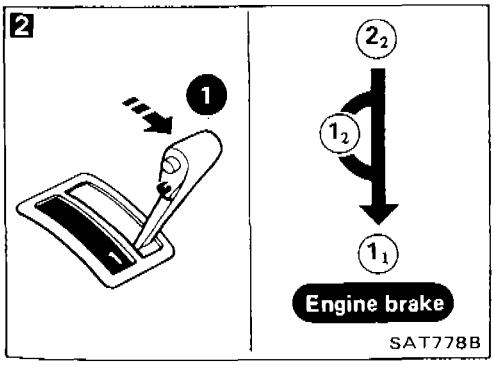
1

Does self-diagnosis show damage to inhibitor switch circuit after cruise test? — Yes → Check inhibitor switch circuit. – Refer to "Self-diagnosis".

No ↓

Go to Diagnostic Procedure 9.





Diagnostic Procedure 19

SYMPTOM: A/T does not shift from 2_2 to 1_1 when changing selector lever from "2" to "1" range.

1

Does self-diagnosis show damage to inhibitor switch after cruise test? — Yes → Check inhibitor switch circuit. – Refer to "Self-diagnosis".

No ↓

2

Check again. — N.G. → 1. Perform A/T control unit input/output signal inspection. 2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

Diagnostic Procedure 20

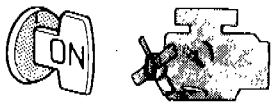
SYMPTOM: Vehicle does not decelerate by engine brake when shifting from 2_2 (1_2) to 1_1.

Is diagnostic procedure 6 O.K.? — No → Go to Diagnostic Procedure 6.

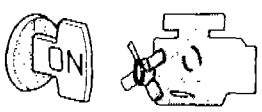
Yes ↓

Go to Diagnostic Procedure 15.

Electrical Components Inspection (Cont'd)

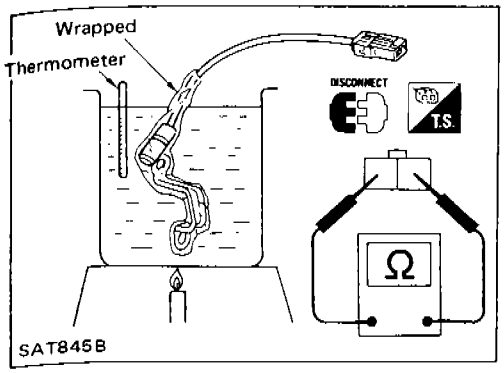
Terminal No.	Item	Condition		Judgement standard
7	Kickdown switch		When releasing accelerator pedal after warming up engine.	3 - 8V
			When depressing accelerator pedal fully after warming up engine.	1V or less
8	–	–	–	–
9	Overdrive switch		When setting overdrive switch in "ON" position.	Battery voltage
			When setting overdrive switch in "OFF" position.	1V or less
10	Throttle sensor (Power source)		–	4.5 - 5.5V
11	Throttle sensor		When depressing accelerator pedal slowly after warming up engine. Voltage rises gradually in response to throttle opening angle.	Fully-closed throttle: 0.2 - 0.6V Fully-open throttle: 2.9 - 3.9V
12	Fluid temperature sensor		When A.T.F. temperature is 20°C (68°F).	1.56V
			When A.T.F. temperature is 80°C (176°F).	0.45V
13	–		–	–
14	–		–	–
15	Throttle sensor (Ground)		–	–
16	Revolution sensor (Measure in AC range)		When vehicle cruises at 30 km/h (19 MPH).	1V or more Voltage rises gradually in response to vehicle speed.
			When vehicle parks.	0V

Electrical Components Inspection (Cont'd)

Terminal No.	Item	Condition		Judgement standard
17	Full throttle switch		When depressing accelerator pedal more than half-way after warming up engine.	8 - 15V
			When releasing accelerator pedal after warming up engine.	1V or less
18	–		–	–
19	Inhibitor "N" and "P" range switch		When setting selector lever to "N" or "P" range.	Battery voltage
			When setting selector lever to other ranges.	1V or less
20	Inhibitor "D" range switch		When setting selector lever to "2" range.	Battery voltage
			When setting selector lever to other ranges.	1V or less
21	Overrun clutch solenoid		When overrun clutch solenoid operates.	Battery voltage
			When overrun clutch solenoid does not operate.	1V or less
22	Lock-up solenoid		When A/T performs lock-up.	8 - 15V
			When A/T does not perform lock-up.	1V or less
23	O.D. OFF indicator lamp		When setting overdrive switch to "ON" position.	Battery voltage
			When setting overdrive switch to "OFF" position.	1V or less
24	Speed sensor		When moving vehicle at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.	Vary from 0 to 5V
25	Engine revolution signal		When engine runs at idle speed.	9.5 - 12V
			When engine runs at 2,500 rpm.	Approximately 10V
26	Inhibitor "R" range switch		When setting selector lever to "R" range.	Battery voltage
			When setting selector lever to other ranges.	1V or less
27	–		–	–

Electrical Components Inspection (Cont'd)

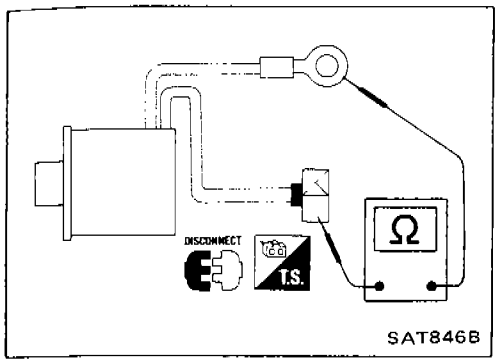
FLUID TEMPERATURE SENSOR



- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals while changing temperature as shown at left.

Temperature °C (°F)	Resistance
20 (68)	Approximately 2.5 kΩ
80 (176)	Approximately 0.3 kΩ

LOCK-UP SOLENOID AND LINE PRESSURE SOLENOID



- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals.

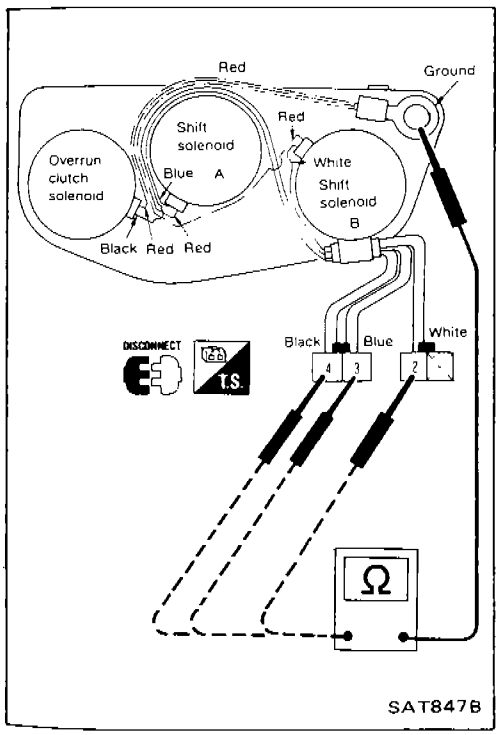
Resistance:

Lock-up solenoid 10 - 16Ω

Line pressure solenoid 2.5 - 5Ω

3-UNIT SOLENOID ASSEMBLY

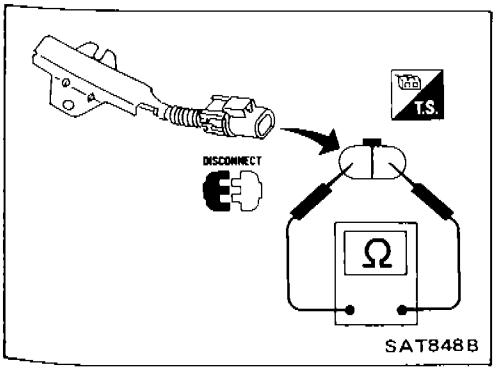
(Shift solenoid A, B and overrun clutch solenoid)



- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between terminals of each solenoid.

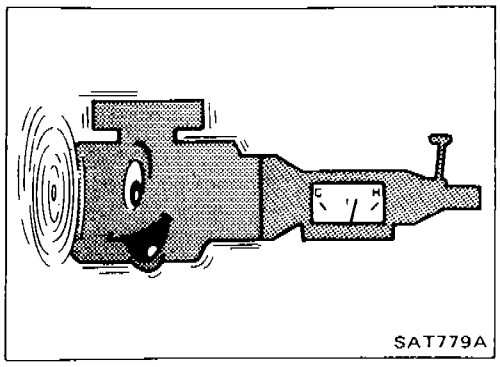
Solenoid	Terminal No.		Resistance
Shift solenoid A	③	Ground terminal	20 - 30Ω
Shift solenoid B	②		
Overrun clutch solenoid	④		

DROPPING RESISTOR



- Check resistance between two terminals.

Resistance: 11.2 - 12.8Ω


SAT779A

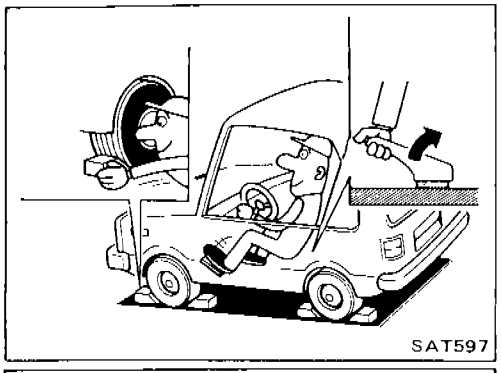
Final Check

STALL TESTING

Stall test procedure

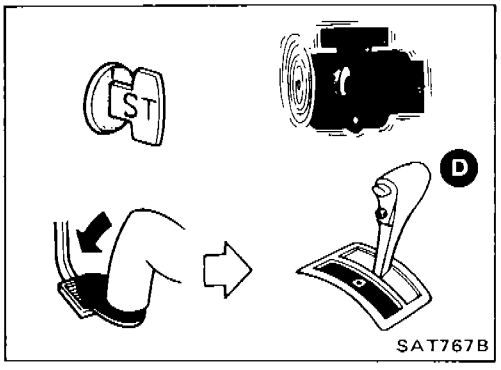
1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

   A.T.F. operating temperature:
   50 - 80°C (122 - 176°F)


SAT597

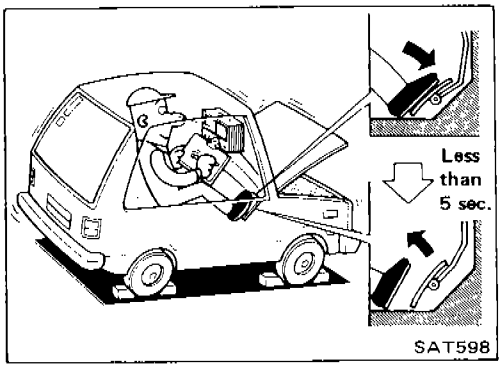
3. Set parking brake and block wheels.
4. Install a tachometer where it can be seen by driver during test.

- **It is good practice to put a mark on point of specified engine rpm on indicator.**



SAT767B

5. Start engine, apply foot brake. and place selector lever in "D" range.

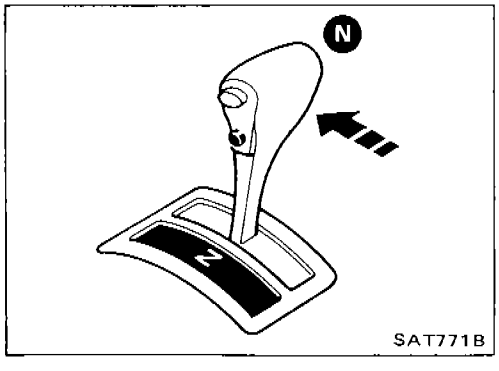


SAT598

6. Accelerate to wide-open throttle gradually while applying foot brake.
7. Quickly note the engine stall revolution and immediately release throttle.

- **During test, never hold throttle wide-open for more than 5 seconds.**

  Stall revolution:
  3,050 - 3,250 rpm



SAT771B

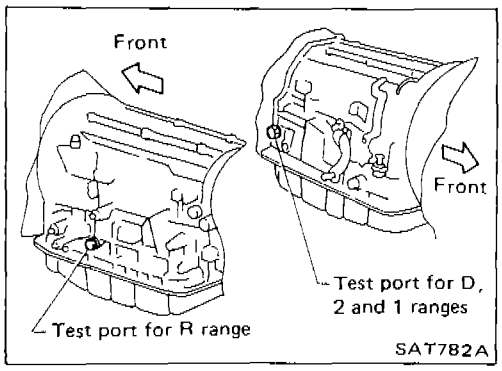
8. Shift selector lever to "N".
9. Cool off A.T.F.

- **Run engine at idle for at least one minute.**

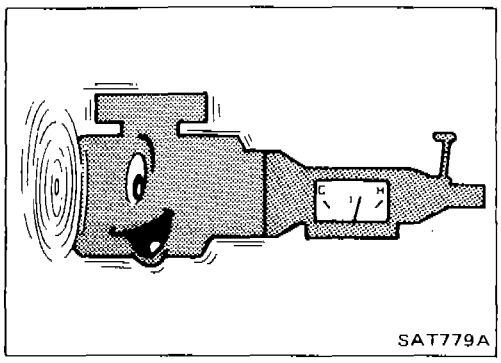
10. Perform stall tests in the same manner as in steps 5 through 9 with selector lever in "2", "1" and "R", respectively.

Final Check (Cont'd)

PRESSURE TESTING



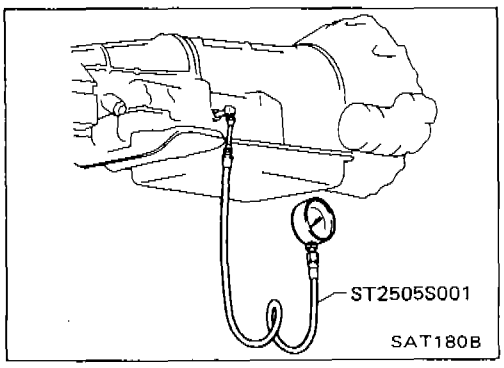
- Location of line pressure test port
- **Line pressure plugs are hexagon headed bolts.**
- **Always replace line pressure plugs as they are self-sealing bolts.**



Line pressure test procedure

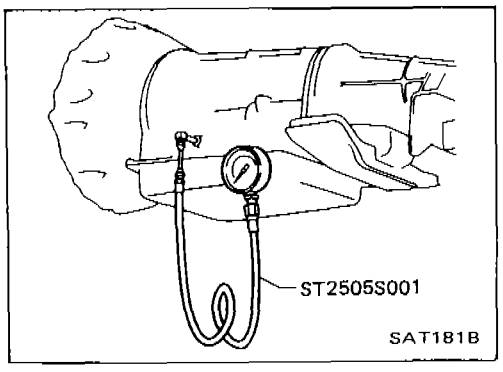
1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

   A.T.F. operating temperature:
   50 - 80°C (122 - 176°F)

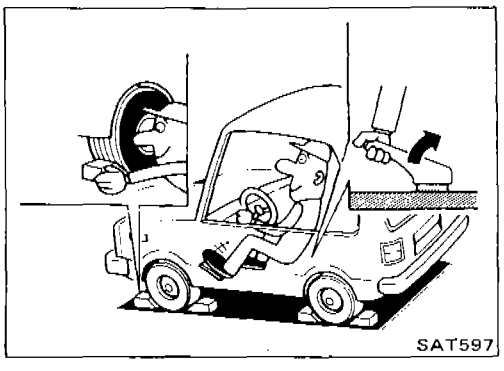


3. Install pressure gauge to line pressure port.

— **D, 2 and 1 ranges** —



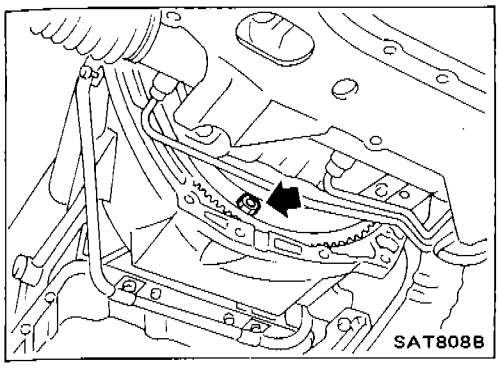
— **R range** —



4. Set parking brake and block wheels.
- **Continue to depress brake pedal fully while line pressure test at stall speed is performed.**

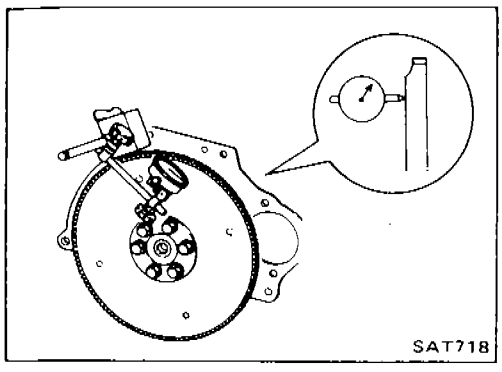
Symptom Chart

Reference page (AT-)		ON vehicle										OFF vehicle					
	Reference page (AT-)	9, 14	66	66	70	67, 96	67	67	7, 67	7	7	80, 91	110, 114	116, 127	116, 124	120	134
Reference page (AT-)	Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transmission must be removed from the vehicle.	Fluid level Control linkage	Inhibitor switch Throttle sensor (Adjustment)	Revolution sensor and speed sensor Engine revolution signal	Engine idling rpm Line pressure	Control valve assembly Shift solenoid A	Shift solenoid B Line pressure solenoid	Lock-up solenoid Overrun clutch solenoid	Fluid temperature sensor Accumulator N-D	Accumulator 1-2 Accumulator 2-3	Accumulator 3-4 (N-R) Ignition switch and starter	Torque converter Oil pump	Reverse clutch High clutch	Forward clutch Forward one-way clutch	Overrun clutch Low one-way clutch	Low & reverse brake Brake band	Parking components
48	Engine does not start in "N", "P" ranges.	2	3								1						
48	Engine starts in range other than "N" and "P".	1	2														
–	Transmission noise in "P" and "N" ranges.	1	3	4 5	2							(7) (6)					
48	Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range.	1															(2)
49	Vehicle runs in "N" range.	1									4		(3)	(2)	(5)		
51	Vehicle will not run in "R" range (but runs in "D", "2" and "1" ranges). Clutch slips. Very poor acceleration.	1			2	4	3						(5) (6)	(7)	(8)	(9)	
–	Vehicle braked when shifting into "R" range.	1 2			3	5	4						(6)	(8)	(9)	(7)	
–	Sharp shock in shifting from "N" to "D" range.		2	5	1 3	7	6		4 8					(9)			
–	Vehicle will not run in "D" and "1" ranges (but runs in "1" and "R" range).	1													(2)		
52	Vehicle will not run in "D", "1", "2" ranges (but runs in "R" range). Clutch slips. Very poor acceleration.	1			2	4	3		5				(6) (7)	(8) (9)	(10)		
–	Clutches or brakes slip somewhat in starting.	1 2	3		4	6	5		7		8	(13) (12)	(10)	(9)		(11)	
–	Excessive creep.				1												
51, 52	No creep at all.	1			2	3						(6) (5)		(4)			
–	Failure to change gear from "D_1" to "D_2".	2	1	5		4 3										(6)	
–	Failure to change gear from "D_2" to "D_3".	2	1	5		4	3						(6)			(7)	
–	Failure to change gear from "D_3" to "D_4".	2	1	4		3			5							(6)	
54, 55, 56	Too high a gear change point from "D_1" to "D_2", from "D_2" to "D_3", from "D_3" to "D_4".		1	2		3	4										
–	Gear change directly from "D_1" to "D_3" occurs.	1								2						(3)	
–	Engine stops when shifting lever into "R", "D", "2" and "1".				1	3		2				4					
–	Too sharp a shock in change from "D_1" to "D_2".		1		2	4			5	3						(6)	
–	Too sharp a shock in change from "D_2" to "D_3".		1		2	4				3			(5)			(6)	



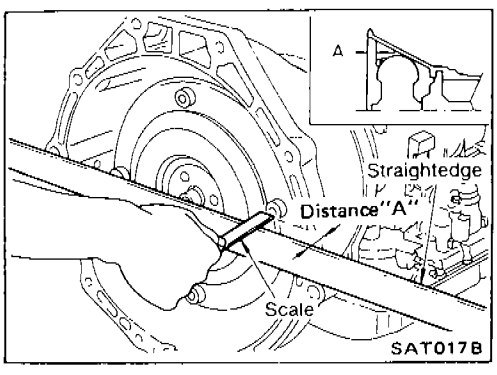
Removal

- Remove fluid charging pipe from A/T assembly.
- Remove bolts securing torque converter to drive plate.
- **Remove those bolts by turning crankshaft.**
- Plug up opening such as oil charging pipe hole, etc.

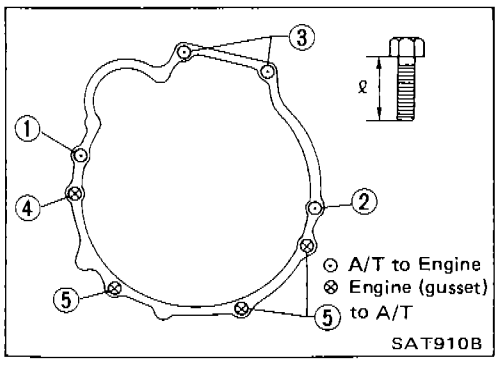


Installation

- Drive plate runout
  Maximum allowable runout:
  0.5 mm (0.020 in)
  If this runout is out of allowance, replace drive plate with ring gear.



- When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly assembled.
  Distance "A":
  23.5 mm (0.925 in) or more
- Install converter to drive plate.
- Reinstall any part removed.
- **After converter is installed to drive plate, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.**



- Tighten bolts securing transmission.

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	Bolt lenght "L" mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	80 (3.15)
2	39 - 49 (4.0 - 5.0, 29 - 36)	75 (2.95)
3	39 - 49 (4.0 - 5.0, 29 - 36)	55 (2.17)
4	29 - 39 (3.0 - 4.0, 22 - 29)	40 (1.57)
5	29 - 39 (3.0 - 4.0, 22 - 29)	25 (0.98)
Gusset to engine	29 - 39 (3.0 - 4.0, 22 - 29)	20 (0.79)

- Reinstall any part removed.
- Check fluid level in transmission.
- Move selector lever through all positions to be sure that transmission operates correctly.
  With parking brake applied, rotate engine at idling. Move selector lever through "N" to "D", to "2", to "1" and to "R". A slight shock should be felt by hand gripping selector each time transmission is shifted.
- Perform road test. — Refer to "ROAD TESTING".

Locations of Needle Bearings, Thrust Washers and Snap Rings

Outer diameter of snap rings

Item number	Outer diameter mm (in)
②	161.0 (6.34)
③	140.1 (5.52)
④	156.4 (6.16)
⑥	142.0 (5.59)
⑦	159.2 (6.27)

Thrust washers

Item number	Color
①	Black
⑤	White

Outer diameter of needle bearings

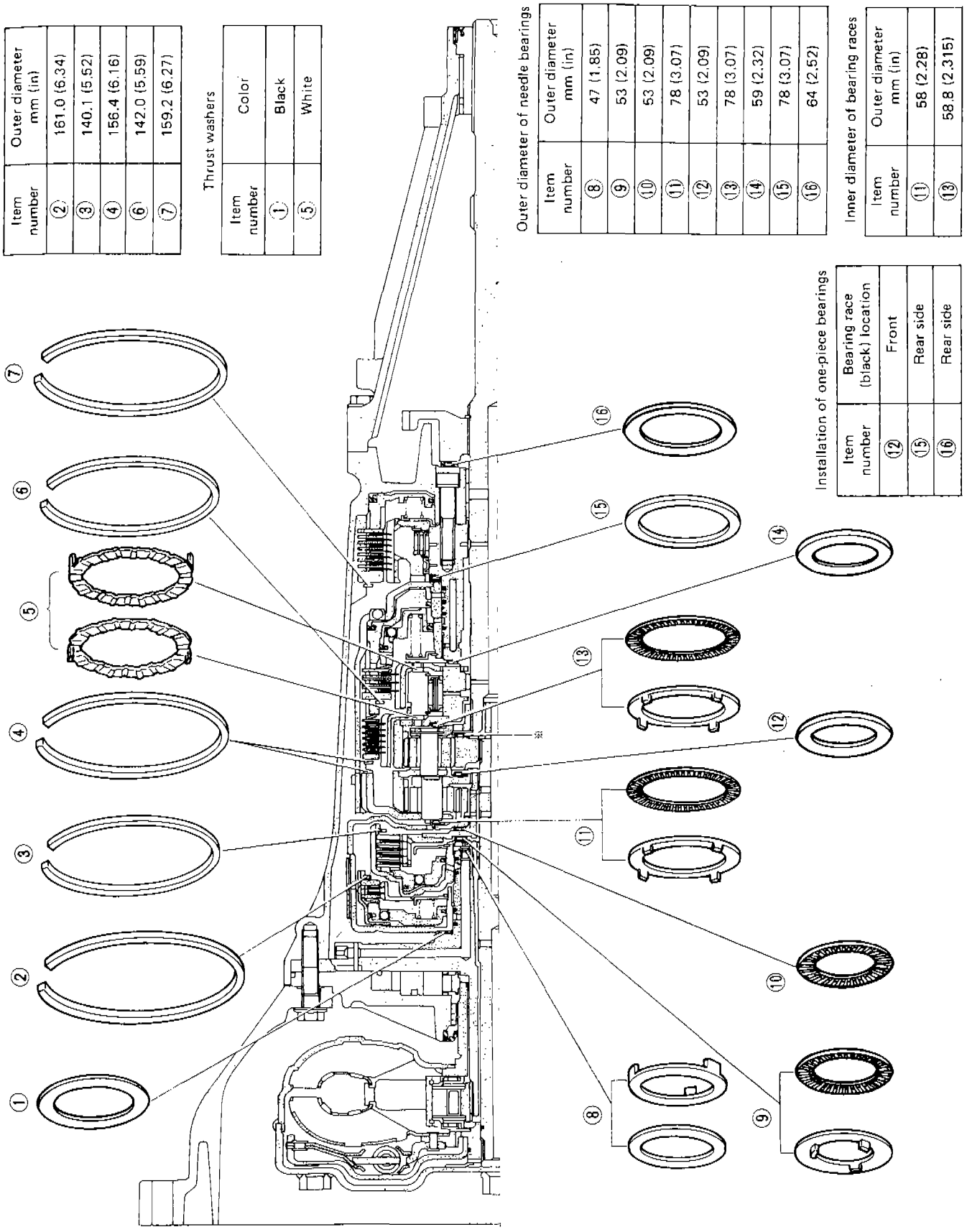
Item number	Outer diameter mm (in)
⑧	47 (1.85)
⑨	53 (2.09)
⑩	53 (2.09)
⑪	78 (3.07)
⑫	53 (2.09)
⑬	78 (3.07)
⑭	59 (2.32)
⑮	78 (3.07)
⑯	64 (2.52)

Inner diameter of bearing races

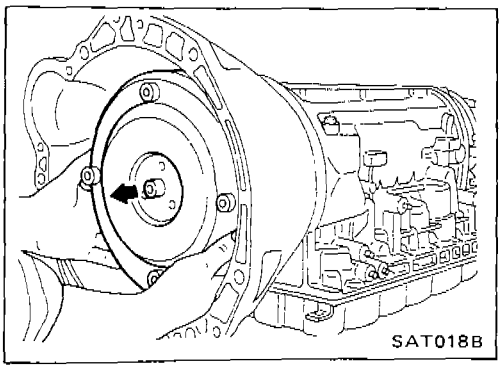
Item number	Outer diameter mm (in)
⑪	58 (2.28)
⑬	58.8 (2.315)

Installation of one-piece bearings

Item number	Bearing race (black) location
⑫	Front
⑮	Rear side
⑯	Rear side

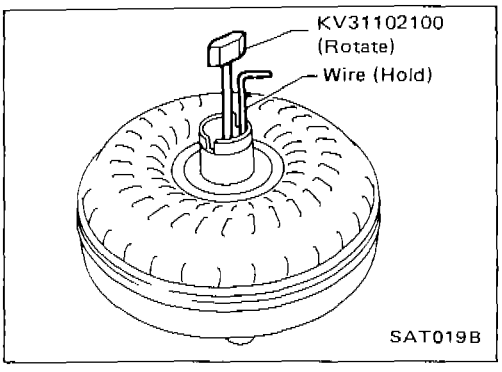


SAT647A


SAT018B

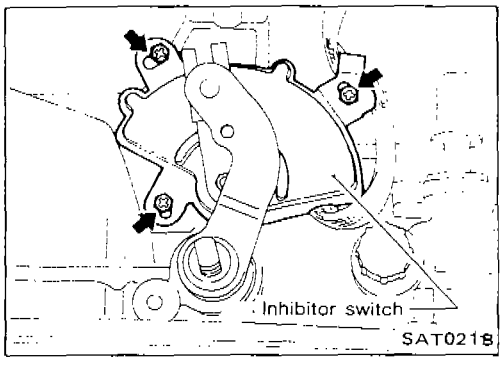
Disassembly

1. Remove torque converter by holding it firmly and turning while pulling straight out.



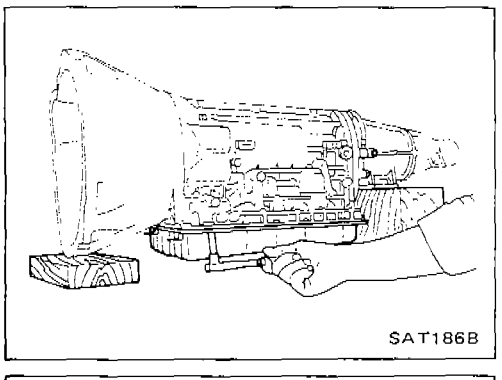
SAT019B

2. Check torque converter one-way clutch.
a. Insert Tool into spline of one-way clutch inner race.
b. Hook bearing support unitized with one-way clutch outer race with suitable wire.
c. Check that one-way clutch inner race rotates only clockwise with Tool while holding bearing support with wire.

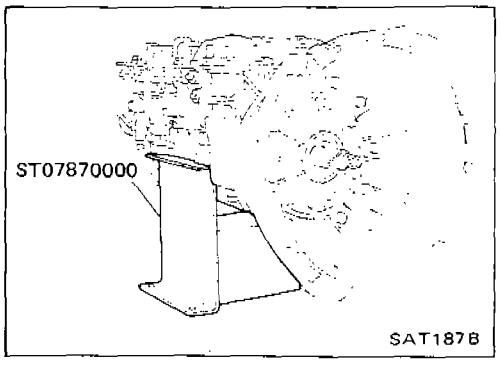


SAT021B

3. Remove inhibitor switch from transmission case.


SAT186B

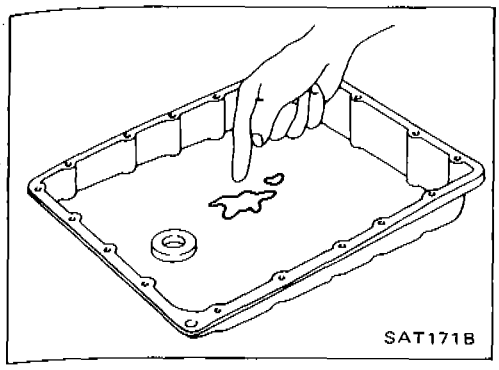
4. Remove oil pan.
a. Drain A.T.F. from rear extension.
b. Raise oil pan by placing wooden blocks under converter housing and rear extension.
c. Separate the oil pan and transmission case.
- **Always place oil pan straight down so that foreign particles inside will not move.**



SAT187B

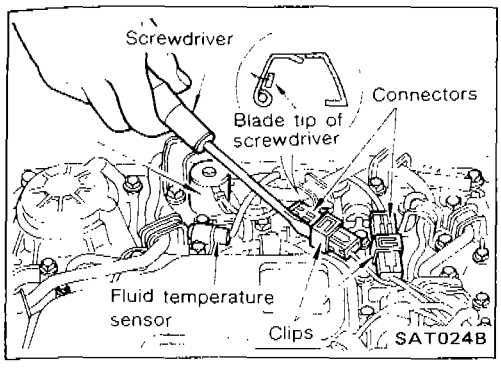
5. Place transmission into Tool with the control valve facing up.

Disassembly (Cont'd)

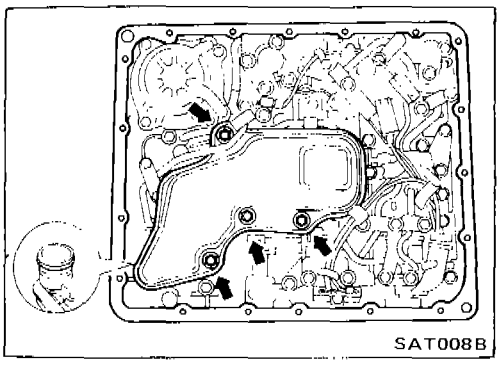


6. Check oil pan and oil strainer for accumulation of foreign particles.
- If materials of clutch facing are found, clutch plates may be worn.
- If metal filings are found, clutch plates, brake bands, etc. may be worn.
- If aluminum filings are found, bushings or aluminum cast parts may be worn.

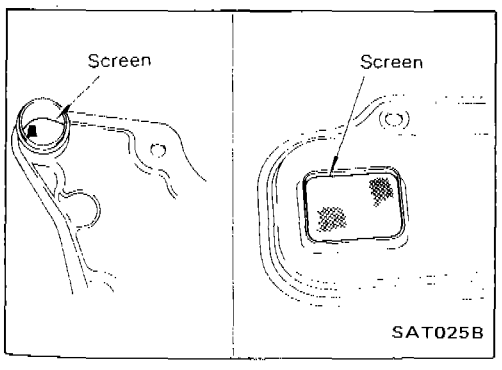
In above cases, replace torque converter and check unit for cause of particle accumulation.



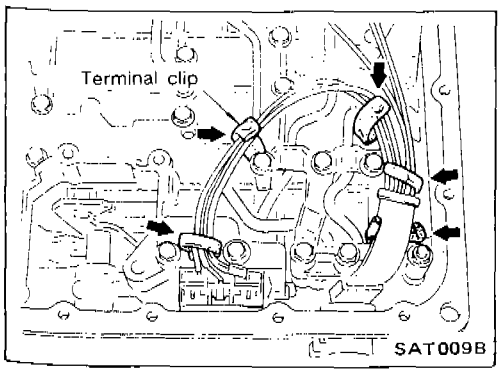
7. Remove lock-up solenoid and fluid temperature sensor connectors.
- **Be careful not to damage connector.**



8. Remove oil strainer.
a. Remove oil strainer from control valve assembly. Then remove O-ring from oil strainer.



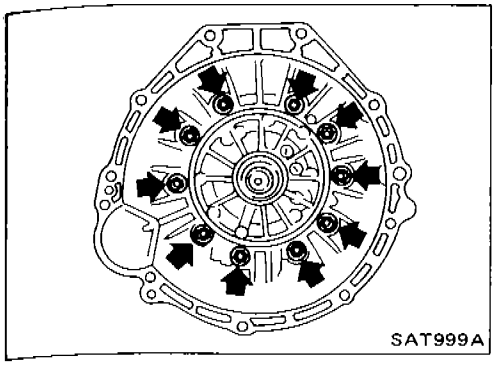
b. Check oil strainer screen for damage.



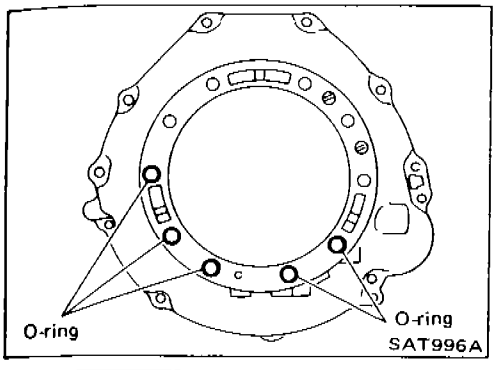
9. Remove control valve assembly.
a. Straighten terminal clips to free terminal cords then remove terminal clips.

Disassembly (Cont'd)

11. Remove converter housing.
a. Remove converter housing from transmission case.

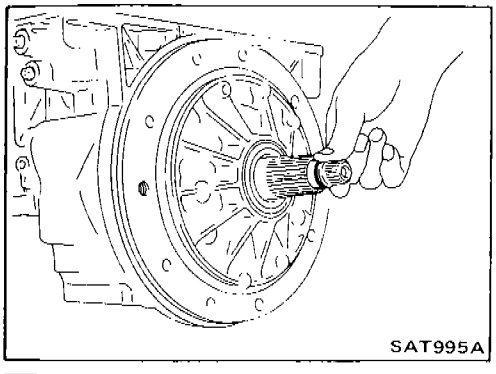

SAT999A

b. Remove O-rings from converter housing.
c. Remove traces of sealant.
- **Be careful not to scratch converter housing.**

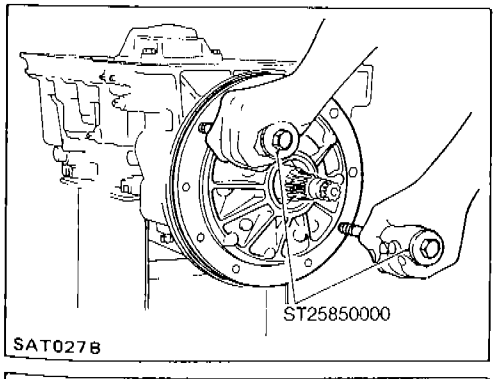


SAT996A

12. Remove O-ring from input shaft.

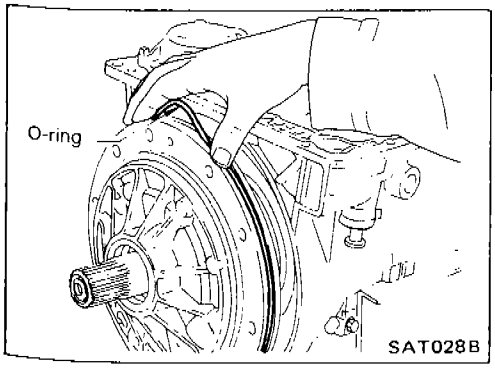

SAT995A

13. Remove oil pump assembly.
a. Attach Tool to oil pump assembly and extract it evenly from transmission case.



SAT027B

b. Remove O-ring from oil pump assembly.
c. Remove traces of sealant from oil pump housing.
- **Be careful not to scratch pump housing.**

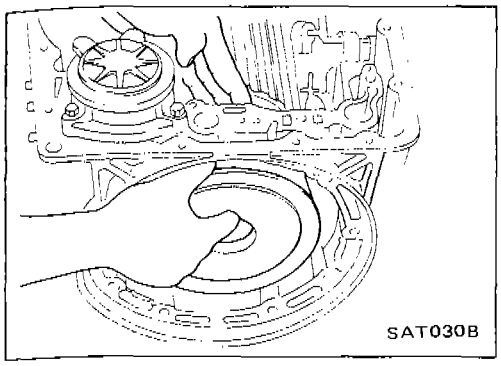


SAT028B

Disassembly (Cont'd)

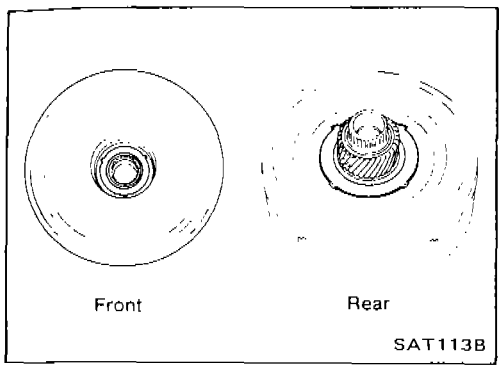
16. Remove front side clutch and gear components.

a. Remove clutch pack (reverse clutch, high clutch and front sun gear) from transmission case.

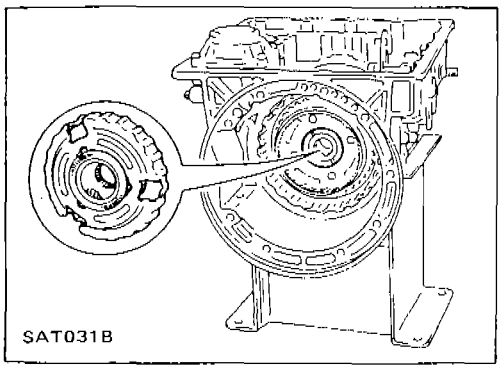


b. Remove front bearing race from clutch pack.

c. Remove rear bearing race from clutch pack.

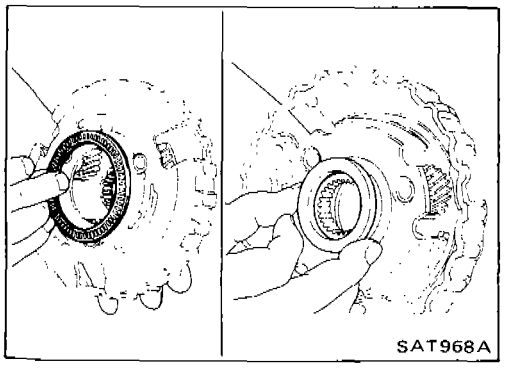


d. Remove front planetary carrier from transmission case.

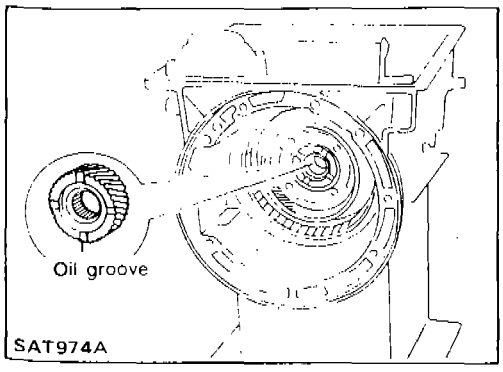


e. Remove front needle bearing from front planetary carrier.

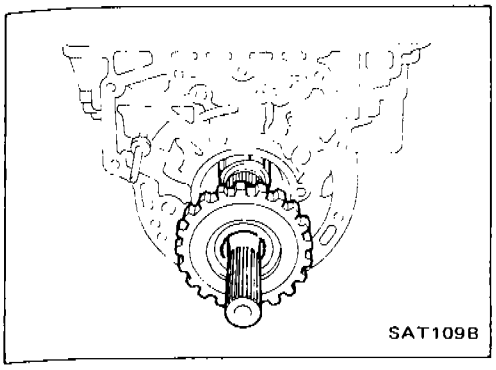
f. Remove rear bearing from front planetary carrier.



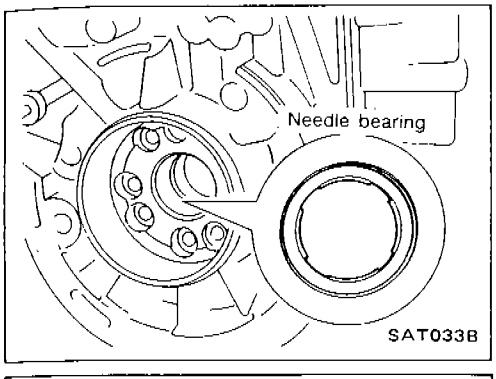
g. Remove rear sun gear from transmission case.



Disassembly (Cont'd)

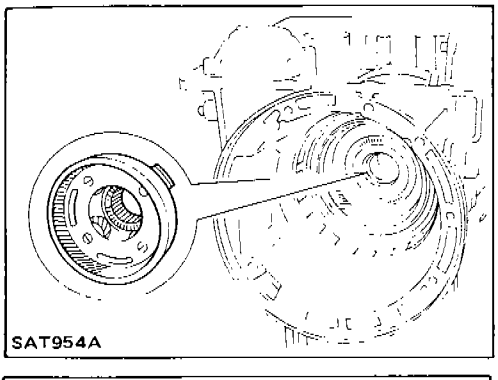

SAT109B

d. Remove output shaft and parking gear as a unit from transmission case.
e. Remove parking gear from output shaft.

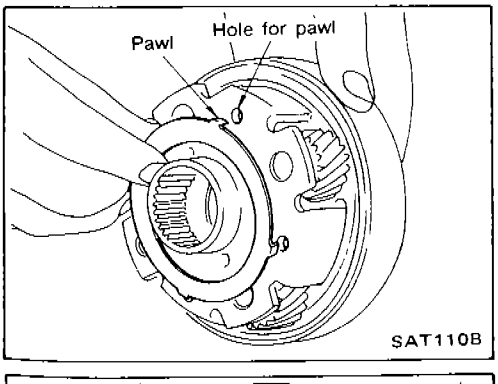


SAT033B

f. Remove needle bearing from transmission case.

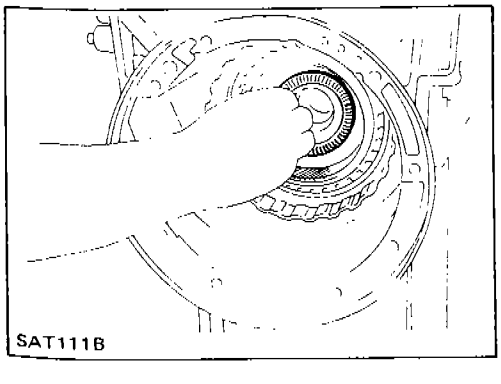

SAT954A

19. Remove rear side clutch and gear components.
a. Remove front internal gear.



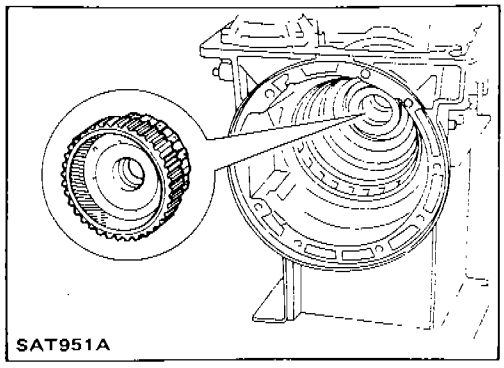
SAT110B

b. Remove bearing race from front internal gear.

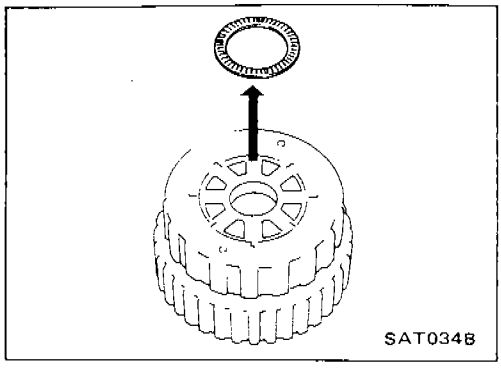

SAT111B

c. Remove needle bearing from rear internal gear.

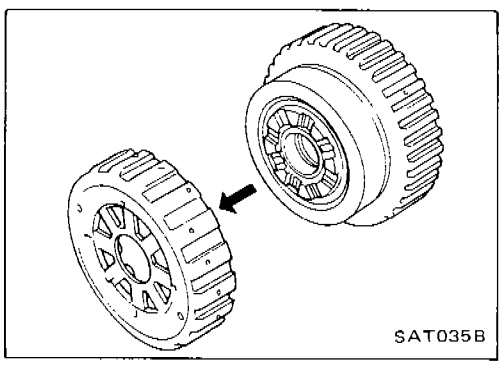
Disassembly (Cont'd)


SAT951A

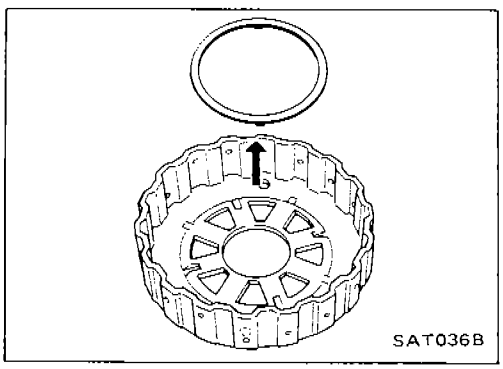
d. Remove rear internal gear, forward clutch hub and overrun clutch hub as a set from transmission case.


SAT034B

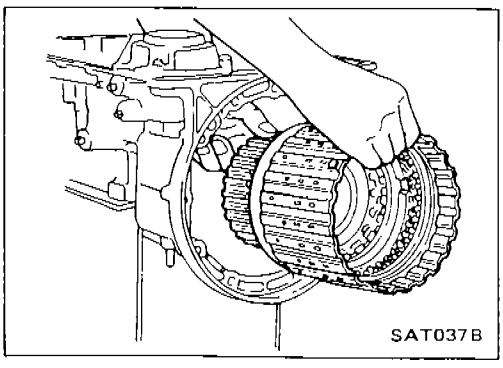
e. Remove needle bearing from overrun clutch hub.


SAT035B

f. Remove overrun clutch hub from rear internal gear and forward clutch hub.

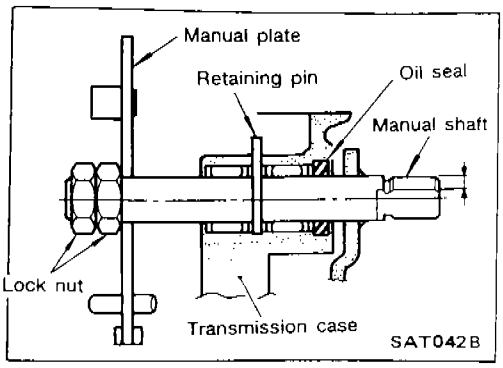

SAT036B

g. Remove thrust washer from overrun clutch hub.

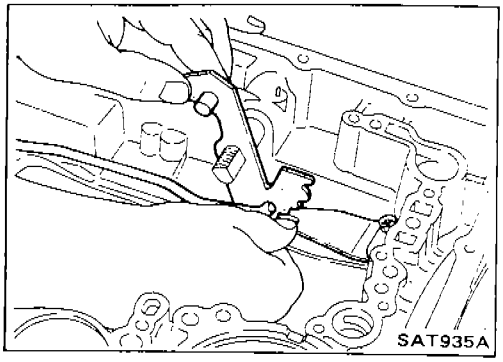

SAT037B

h. Remove forward clutch assembly from transmission case.

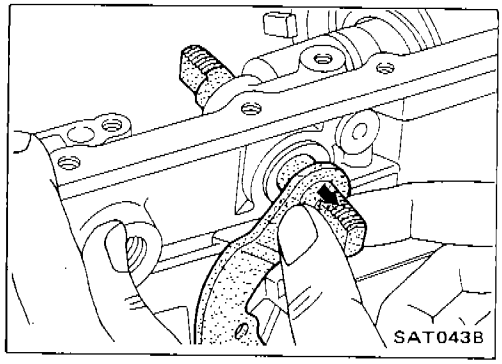
Disassembly (Cont'd)



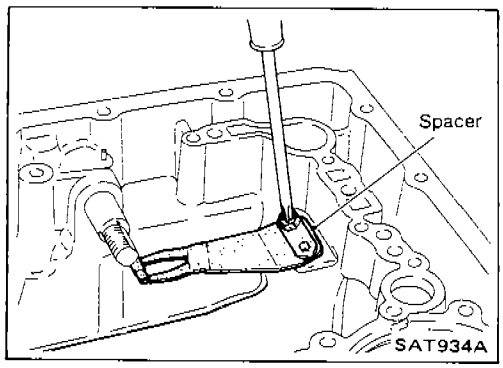
b. Remove retaining pin from transmission case.



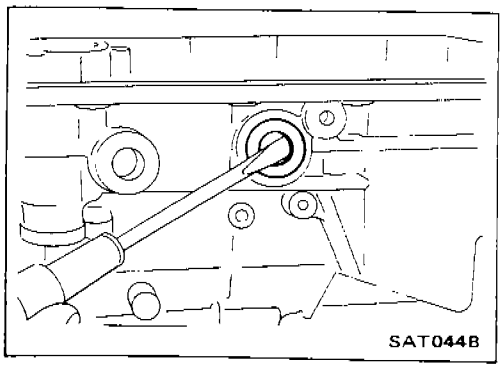
c. While pushing detent spring down, remove manual plate and parking rod from transmission case.



d. Remove manual shaft from transmission case.

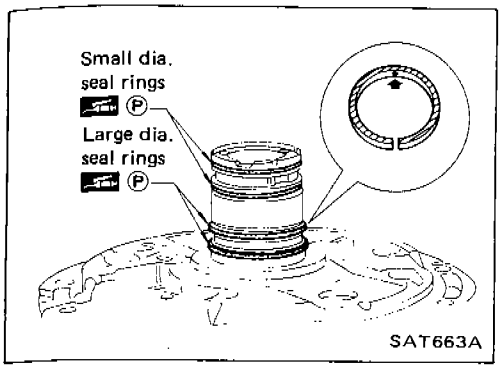


e. Remove spacer and detent spring from transmission case.



f. Remove oil seal from transmission case.

Oil Pump (Cont'd)



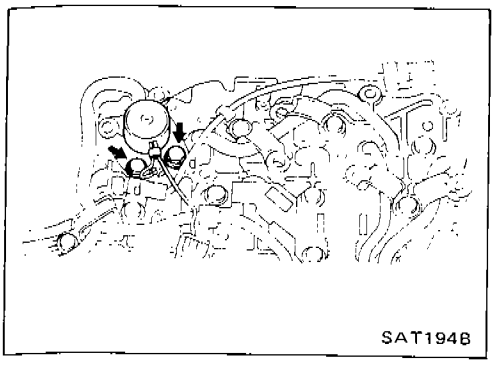
5. Install seal rings carefully after packing ring grooves with petroleum jelly. Press rings down into jelly to a close fit.

- **Seal rings come in two different diameters. Check fit carefully in each groove.**
  Small dia. seal ring:
  No mark
  Large dia. seal ring:
  Yellow mark in area shown by arrow
- **Do not spread gap of seal ring excessively while installing. It may deform ring.**

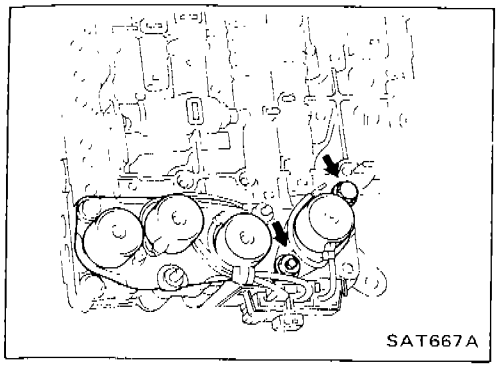
Control Valve Assembly (Cont'd)

DISASSEMBLY

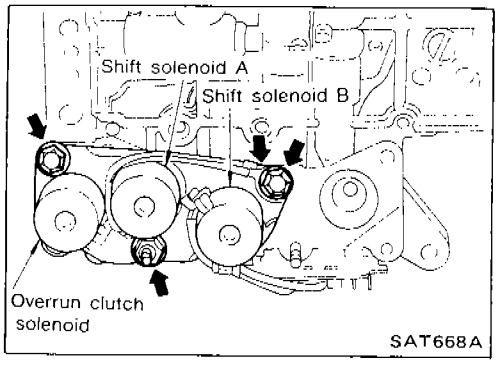
1. Remove solenoids.
a. Remove lock-up solenoid and side plate from lower body.
b. Remove O-ring from solenoid.


SAT194B

c. Remove line pressure solenoid from upper body.
d. Remove O-ring from solenoid.

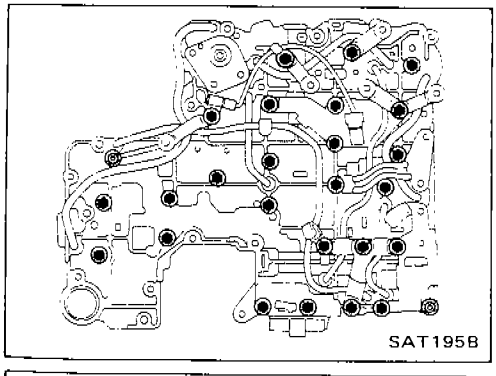

SAT667A

e. Remove 3-unit solenoid assembly from upper body.
f. Remove O-rings from solenoids.



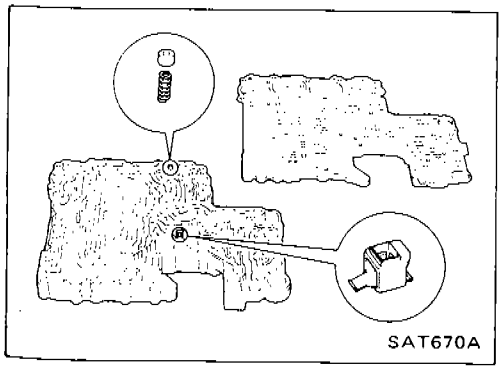
SAT668A

2. Disassemble upper and lower bodies.
a. Place upper body facedown, and remove bolts, reamer bolts and support plates.
b. Remove lower body, separator plate and separate gasket as a unit from upper body.


SAT195B

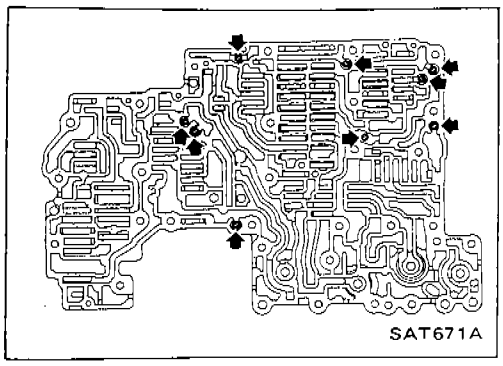
- **Be careful not to drop pilot filter, orifice check valve, spring and steel balls.**

c. Place lower body facedown, and remove separate gasket and separator plate.
d. Remove pilot filter, orifice check valve and orifice check spring.


SAT670A

Control Valve Assembly (Cont'd)

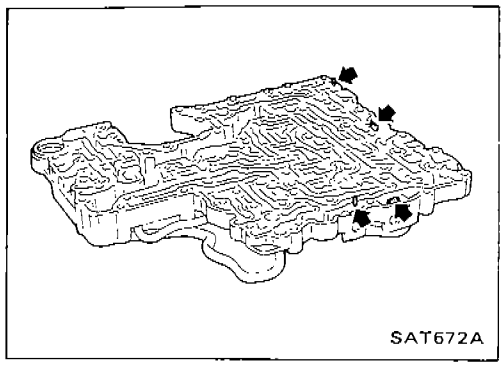
e. Check to see that steel balls are properly positioned in upper body and then remove them from upper body.


SAT671A

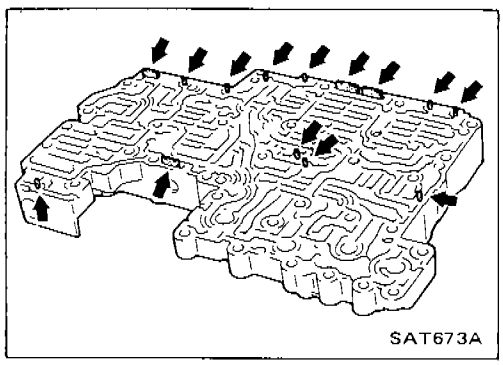
INSPECTION

Lower and upper bodies

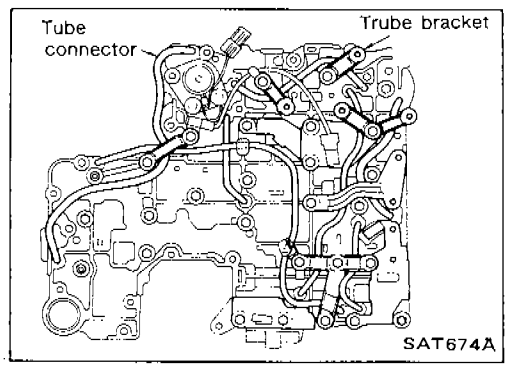
- Check to see that there are pins and retainer plates in lower body.


SAT672A

- Check to see that there are pins and retainer plates in upper body.
- **Be careful not to lose these parts.**


SAT673A

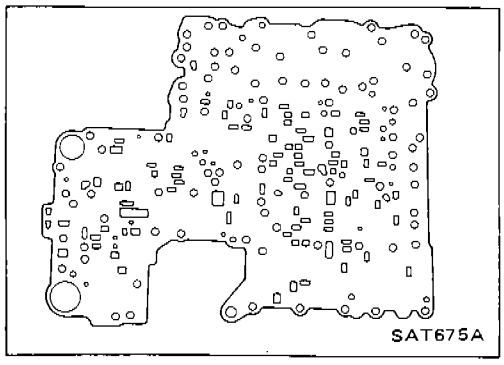
- Check to make sure that oil circuits are clean and free from damage.
- Check tube brackets and tube connectors for damage.



SAT674A

Separator plates

- Check to make sure that separator plate is free of damage and not deformed and oil holes are clean.

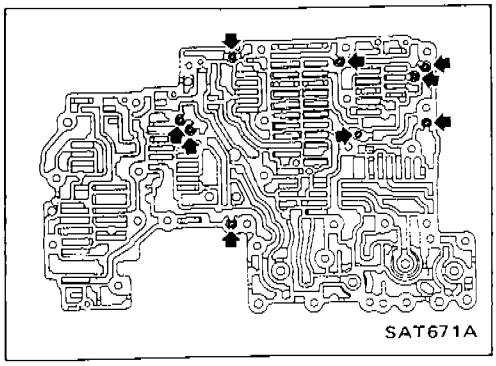

SAT675A

Control Valve Assembly (Cont'd)

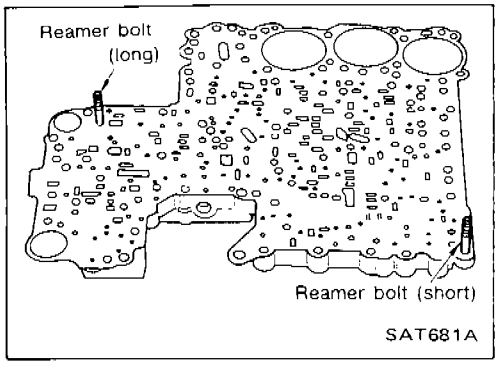
ASSEMBLY

1. Install upper and lower bodies.

a. Place oil circuit of upper body face up. Install steel balls in their proper positions.

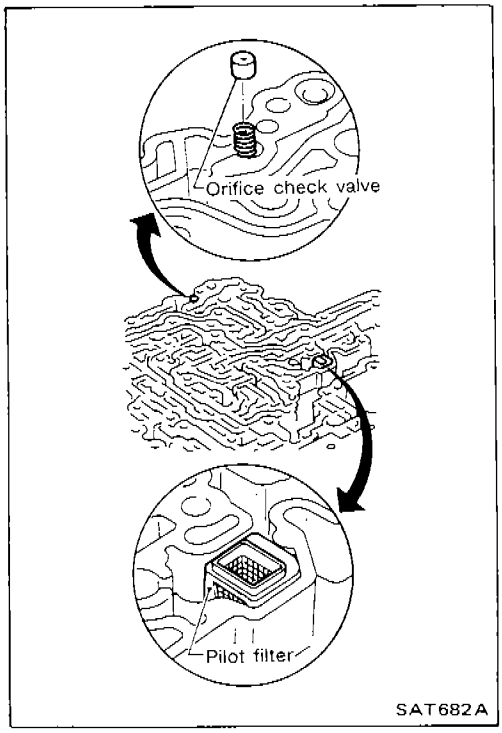

SAT671A

b. Install reamer bolts from bottom of upper body and install separate gaskets.



SAT681A

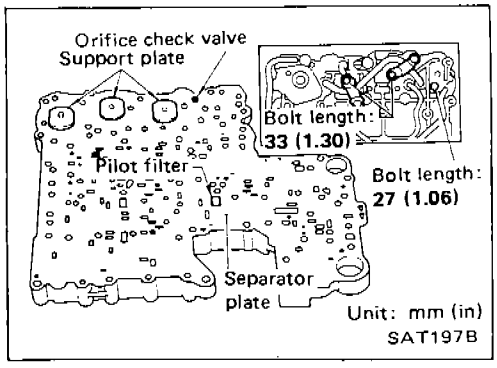
c. Place oil circuit of lower body face up. Install orifice check spring, orifice check valve and pilot filter.



SAT682A

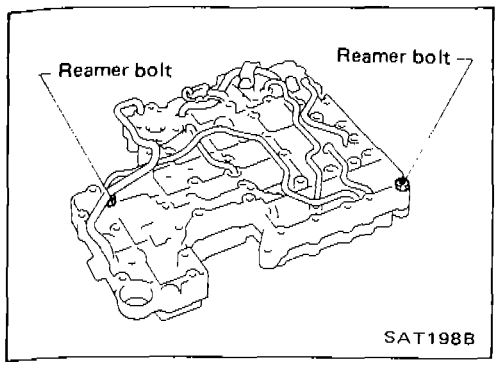
d. Install lower separate gaskets and separator plates on lower body.

e. Install and temporarily tighten support plates, fluid temperature sensor and tube brackets.



SAT197B

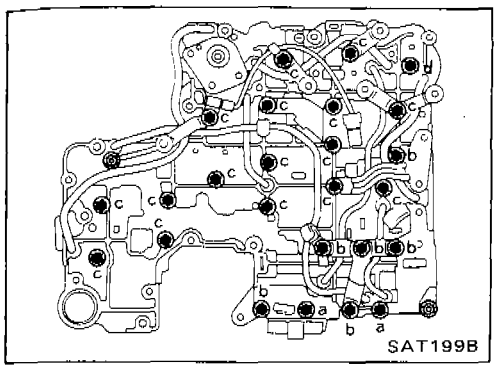
Control Valve Assembly (Cont'd)



SAT198B

f. Temporarily assemble lower and upper bodies, using reamer bolt as a guide.

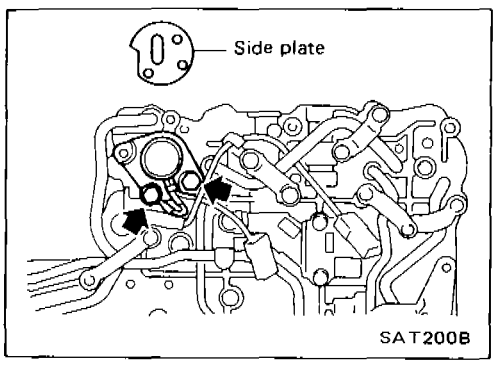
- **Be careful not to dislocate or drop steel balls, orifice check spring, orifice check valve and pilot filter.**


SAT199B

g. Install and temporarily tighten bolts and tube brackets in their proper locations.

Bolt length and location:

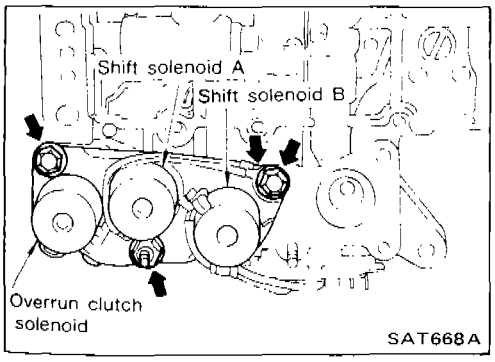
Item \ Bolt symbol	a	b	c	d
Bolt length mm (in)	70 (2.76)	50 (1.97)	33 (1.30)	27 (1.06)



SAT200B

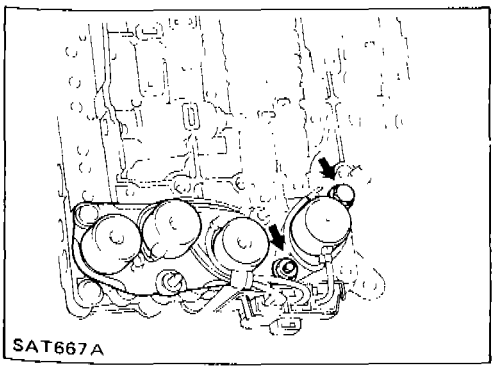
2. Install solenoids.

a. Attach O-ring and install lock-up solenoid and side plates onto lower body.



SAT668A

b. Attach O-rings and install 3-unit solenoids assembly onto upper body.

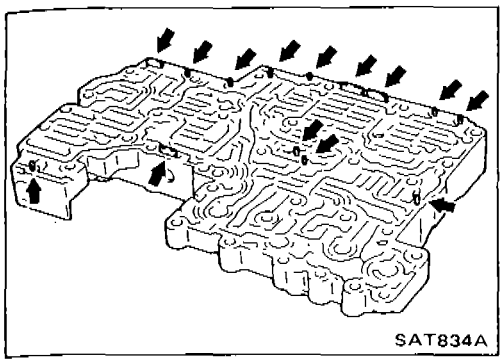

SAT667A

c. Attach O-ring and install line pressure solenoid onto upper body.

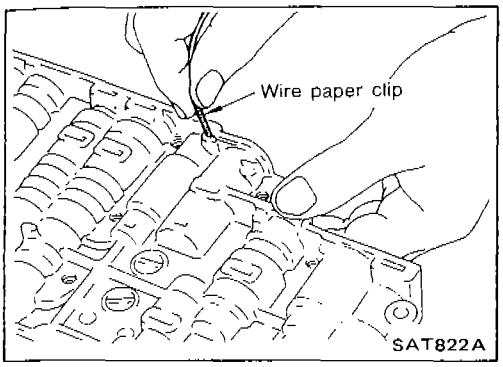
3. Tighten all bolts.

Control Valve Upper Body (Cont'd)

DISASSEMBLY

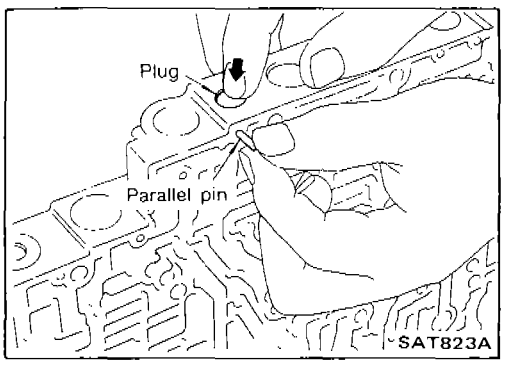

SAT834A

1. Remove valves at parallel pins.
- **Do not use a magnetic hand.**



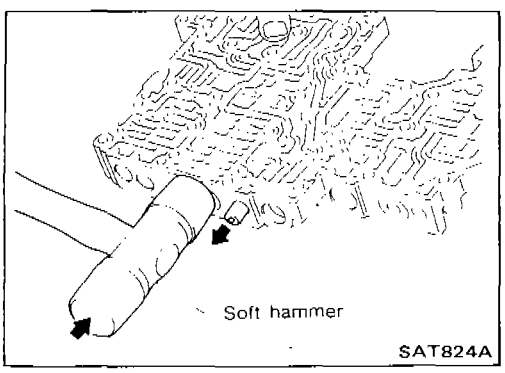
SAT822A

a. Use a wire paper clip to push out parallel pins.



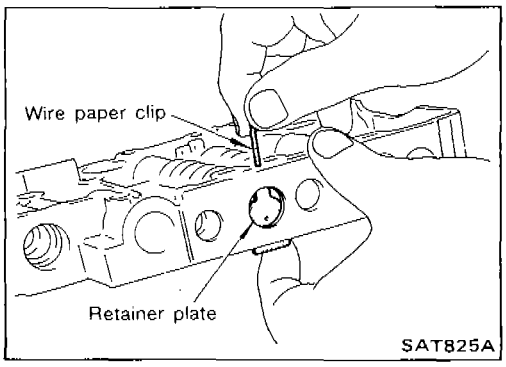
SAT823A

b. Remove parallel pins while pressing their corresponding plugs and sleeves.
- **Remove plug slowly to prevent internal parts from jumping out.**



SAT824A

c. Place mating surface of valve facedown, and remove internal parts.
- **If a valve is hard to remove, place valve body facedown and lightly tap it with a soft hammer.**
- **Be careful not to drop or damage valves and sleeves.**

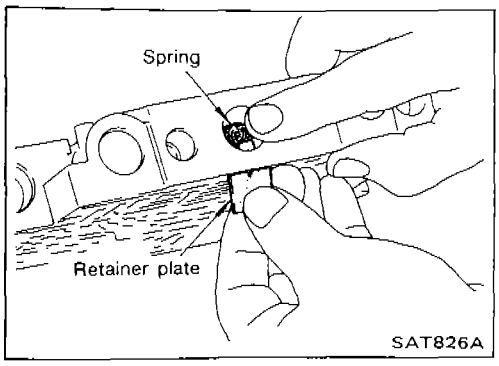


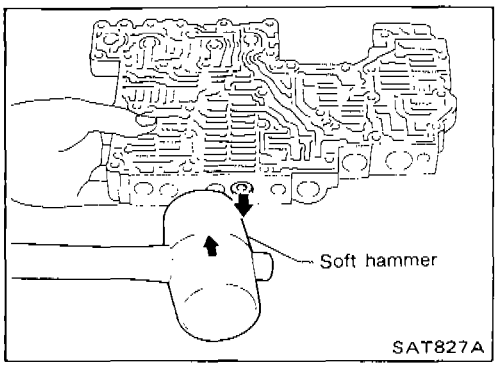
SAT825A

2. Remove valves at retainer plates.
a. Pry out retainer plate with wire paper clip.

Control Valve Upper Body (Cont'd)

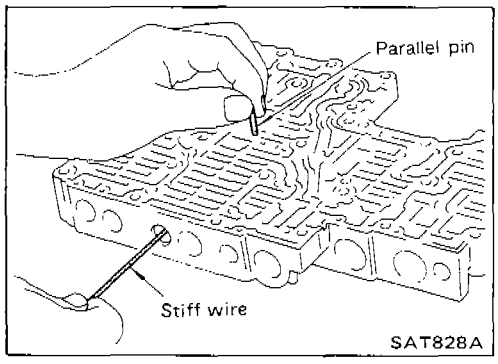
b. Remove retainer plates while holding spring.





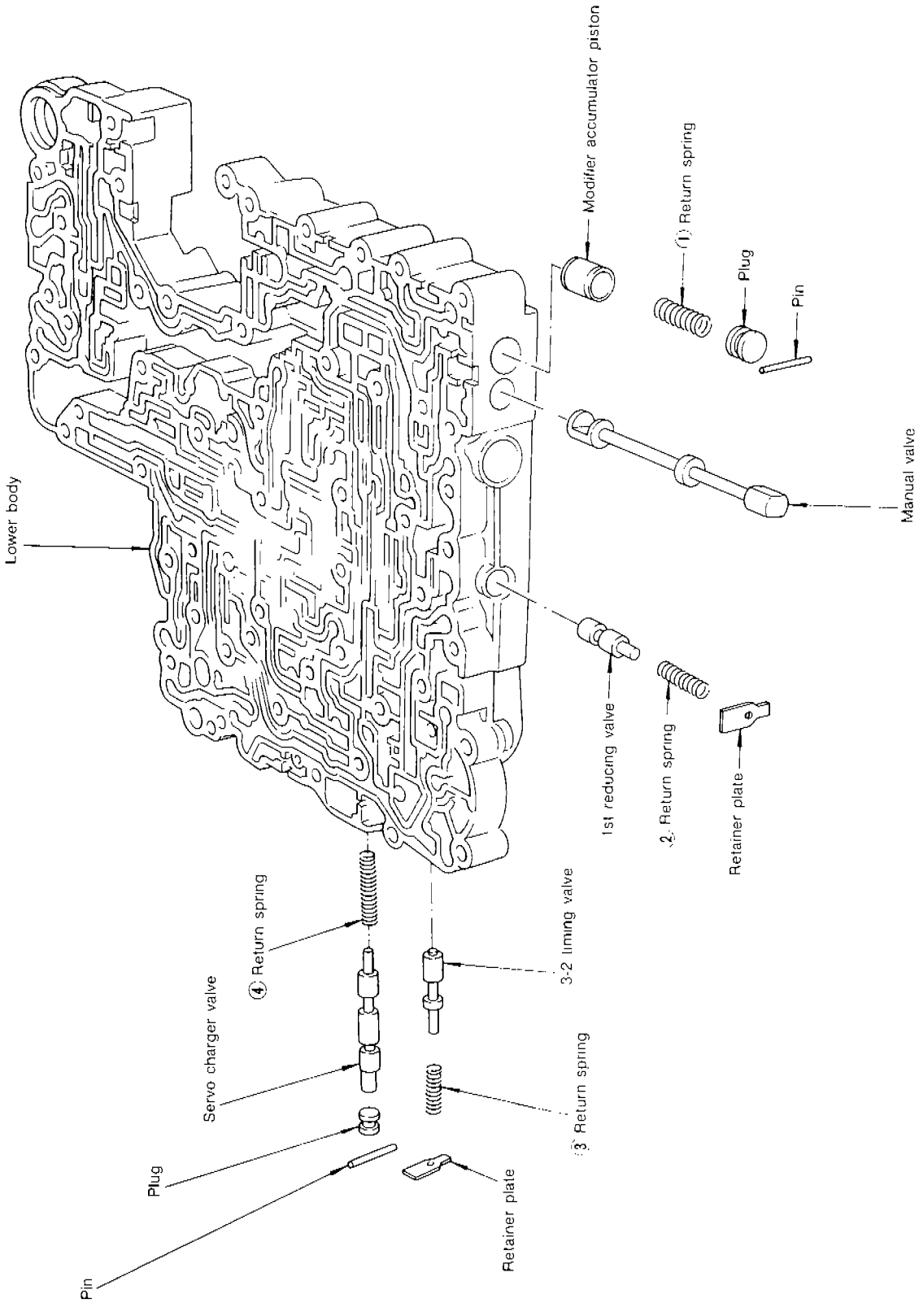
c. Place mating surface of valve facedown, and remove internal parts.

- **If a valve is hard to remove, lightly tap valve body with a soft hammer.**
- **Be careful not to drop or damage valves, sleeves, etc.**



- 4-2 sequence valve and relay valve are located far back in upper body. If they are hard to remove, carefully push them out using stiff wire.
- **Be careful not to scratch sliding surface of valve with wire.**

Control Valve Lower Body

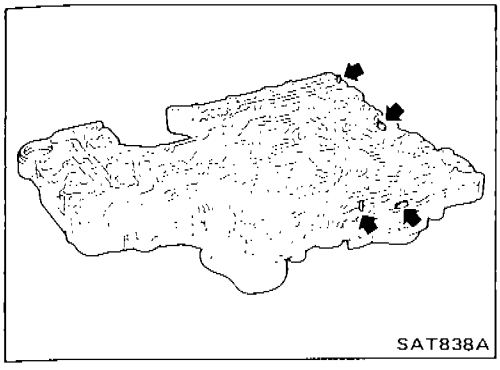


Numbers preceding valve springs correspond with those shown in Spring Chart on page AT-109.

Apply A.T.F. to all components before their installation.

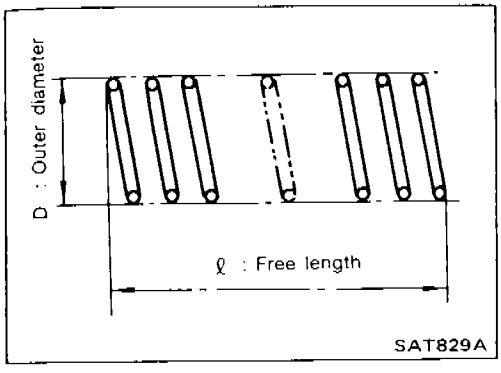
SAT837A

Control Valve Lower Body (Cont'd)


SAT838A

DISASSEMBLY

1. Remove valves at parallel pins.
2. Remove valves at retainer plates.
   For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body.



SAT829A

INSPECTION

Valve springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.
- Numbers of each valve spring listed in table below are the same as those in the figure on AT-108.

Inspection standard:

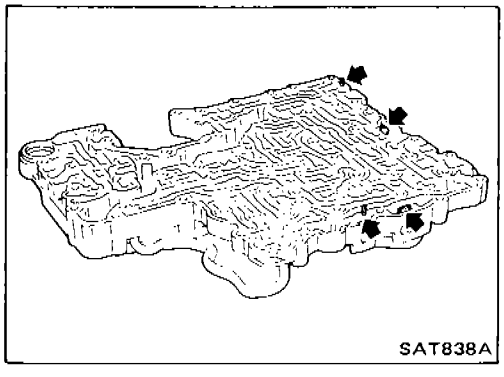
Unit: mm (in)

Parts / Item		Part No.	ℓ	D
①	Modifier accumulator piston spring	31742-41X15	30.5 (1.201)	9.8 (0.386)
②	1st reducing valve spring	31756-41X05	25.4 (1.000)	6.75 (0.2657)
③	3-2 timing valve spring	31742-41X08	20.55 (0.8091)	6.75 (0.2657)
④	Servo charger valve spring	31742-41X06	23.0 (0.906)	6.7 (0.264)

- Replace valve springs if deformed or fatigued.

Control valves

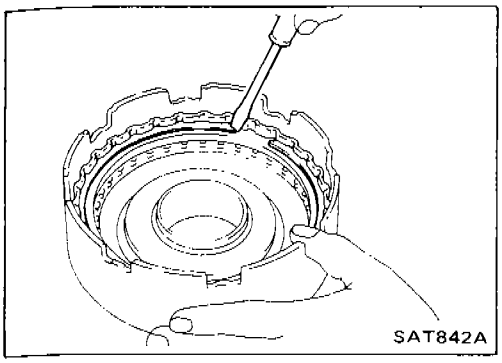
- Check sliding surfaces of control valves, sleeves and plugs for damage.


SAT838A

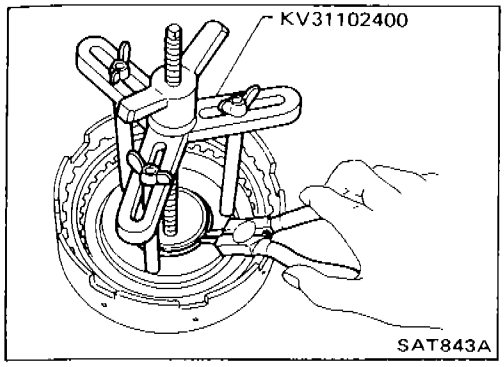
ASSEMBLY

- Install control valves.
  For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body.

Reverse Clutch (Cont'd)

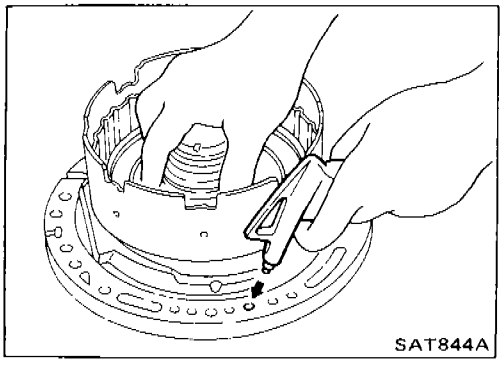


3. Remove drive plates, driven plates, retaining plate, dish plate and snap ring.



4. Remove snap ring from clutch drum while compressing clutch springs.
- **Do not expand snap ring excessively.**

5. Remove spring retainer and return spring.



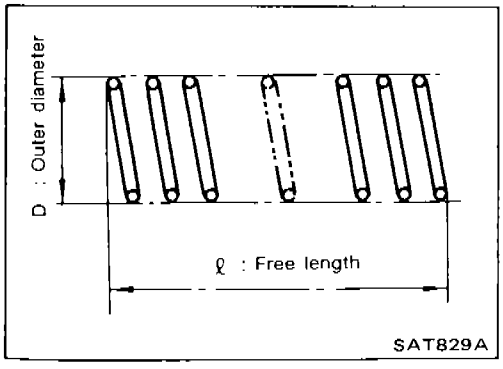
6. Install seal ring onto oil pump cover and install reverse clutch drum. While holding piston, gradually apply compressed air to oil hole until piston is removed.
- **Do not apply compressed air abruptly.**

7. Remove D-ring and oil seal from piston.

INSPECTION

Reverse clutch snap ring and spring retainer

- Check for deformation, fatigue or damage.



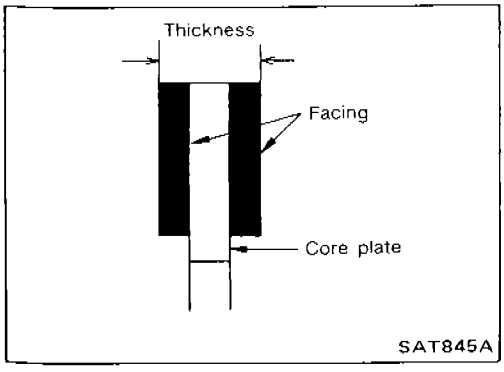
Reverse clutch return springs

- Check for deformation or damage. Also measure free length and outside diameter.

Inspection standard:

Unit: mm (in)

Parts	Part No.	ℓ	D
Spring	30505-41X02	19.69 (0.7752)	11.6 (0.457)



Reverse clutch drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

  Thickness of drive plate:

  Standard value 2.0 mm (0.079 in)

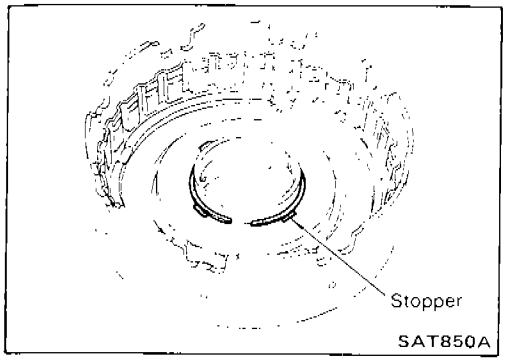
  Wear limit 1.8 mm (0.071 in)

- If not within wear limit, replace.

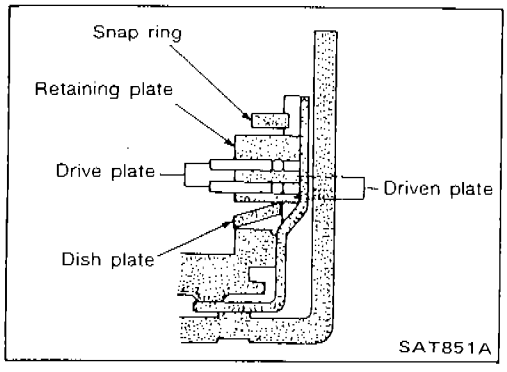
Reverse clutch dish plate

- Check for deformation or damage.

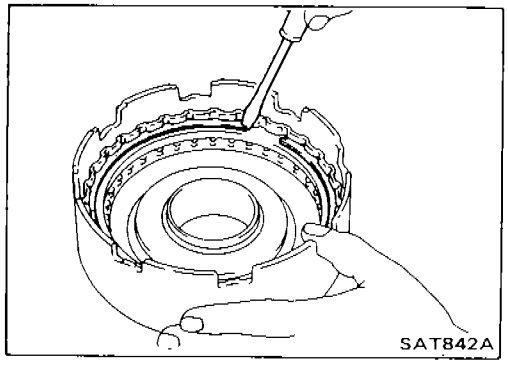
Reverse Clutch (Cont'd)



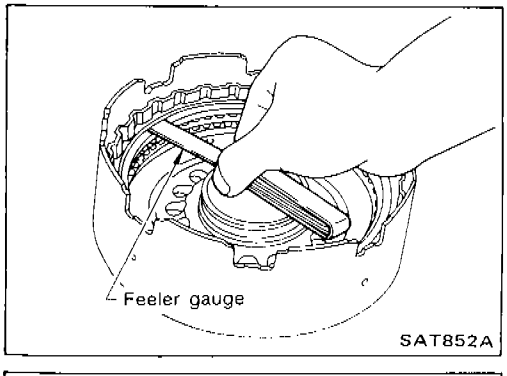
- **Do not align snap ring gap with spring retainer stopper.**



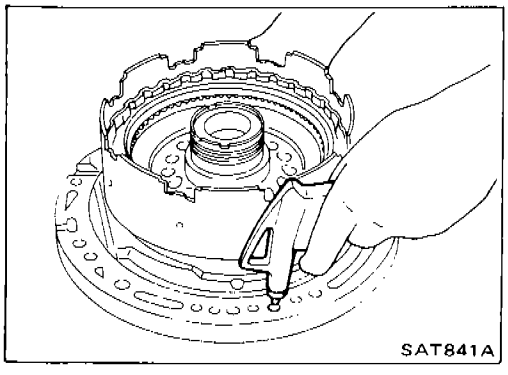
5. Install drive plates, driven plates, retaining plate and dish plate.



6. Install snap ring.



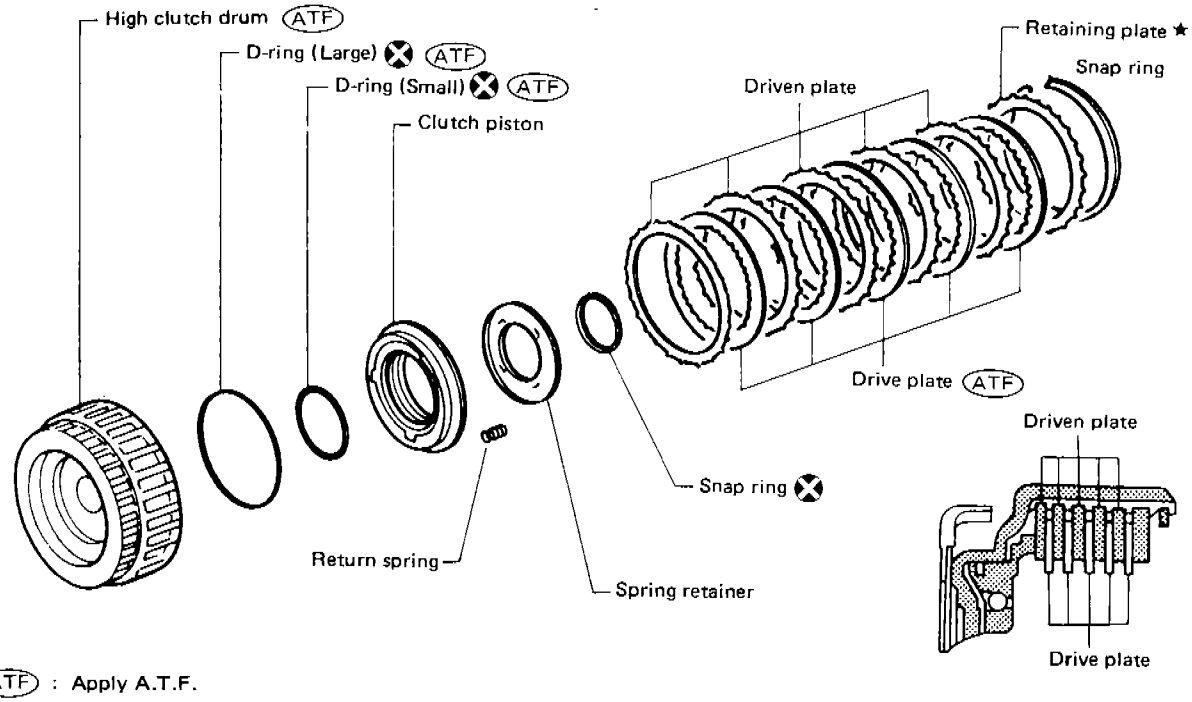
7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
   Specified clearance:
   Standard
   0.5 - 0.8 mm (0.020 - 0.031 in)
   Allowable limit
   1.2 mm (0.047 in)
   Retaining plate:
   Refer to S.D.S.



8. Check operation of reverse clutch.
   Refer to "DISASSEMBLY" of Reverse Clutch.

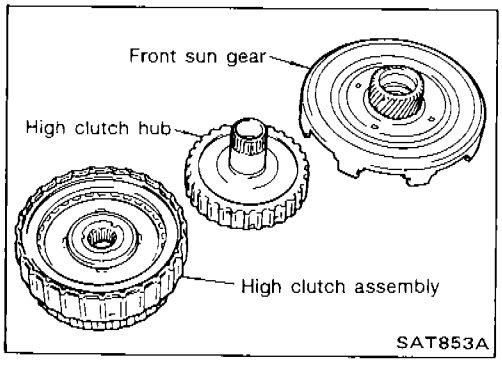
High Clutch

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.



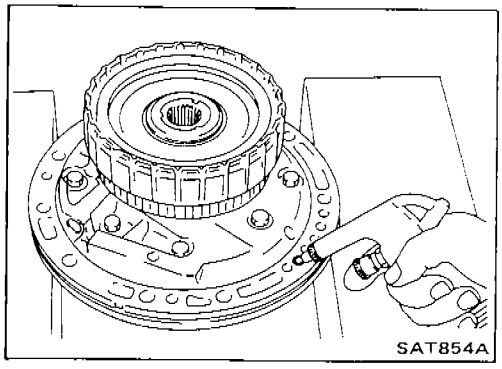
(ATF) : Apply A.T.F.
★ : Select with proper thickness.

SAT913B



SAT853A

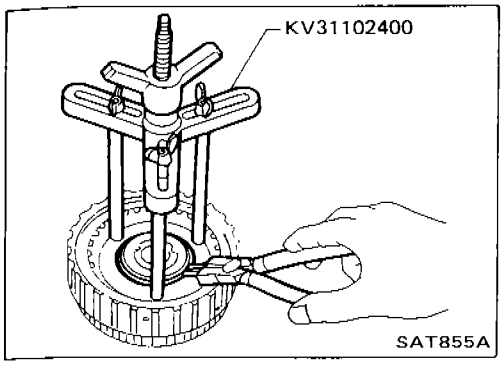
Service procedures for high clutch are essentially the same as those for reverse clutch, with the following exception:



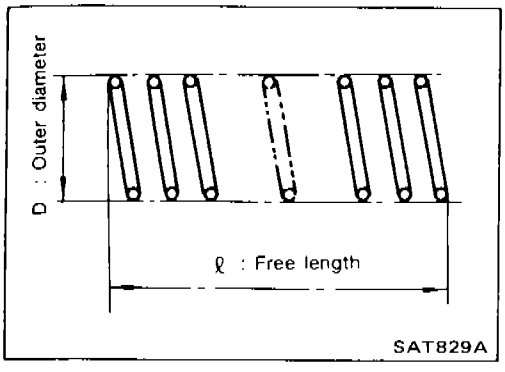
SAT854A

- Check of high clutch operation

High Clutch (Cont'd)



- Removal and installation of return spring

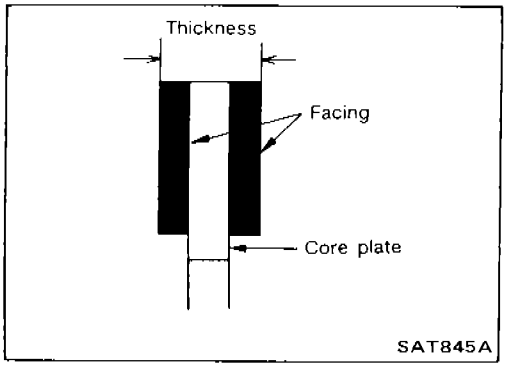


- Inspection of high clutch return springs

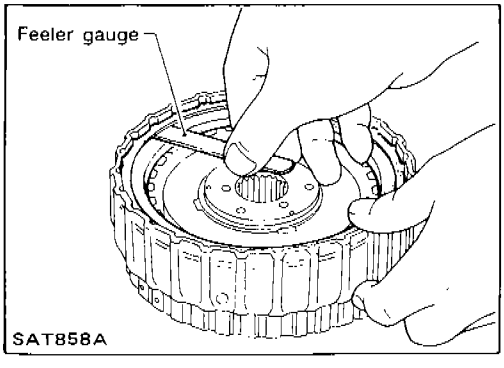
Inspection standard:

Unit: mm (in)

Part No.	ℓ	D
31505-21X03	22.06 (0.8685)	11.6 (0.457)

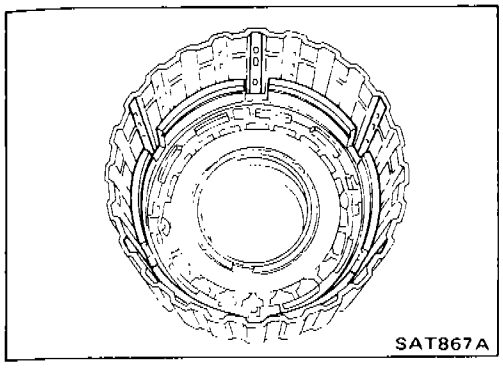


- Inspection of high clutch drive plate
  Thickness of drive plate:
  Standard
  1.6 mm (0.063 in)
  Wear limit
  1.4 mm (0.055 in)

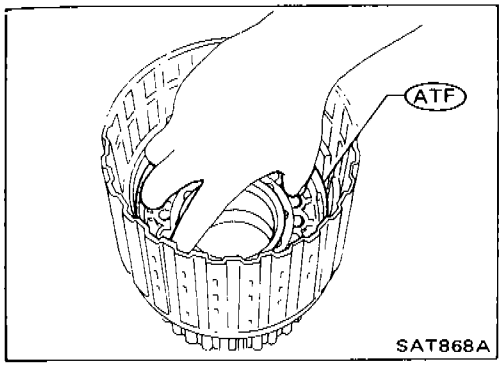


- Measurement of clearance between retaining plate and snap ring
  Specified clearance:
  Standard
  1.8 - 2.2 mm (0.071 - 0.087 in)
  Allowable limit
  3.2 mm (0.126 in)
  Retaining plate:
  Refer to S.D.S.

Forward and Overrun Clutches (Cont'd)

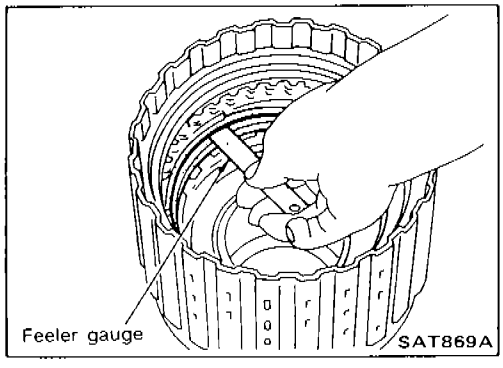

SAT867A

- **Align notch in forward clutch piston with groove in forward clutch drum.**



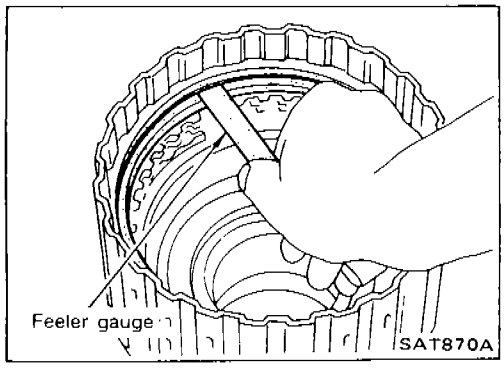
SAT868A

2. Install overrun clutch by turning it slowly and evenly.
- **Apply A.T.F. to inner surface of forward clutch piston.**



SAT869A

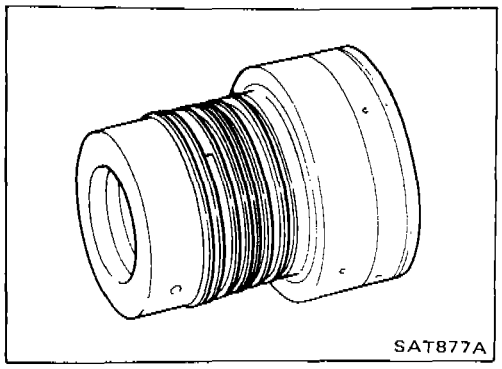
- Measurement of clearance between retaining plate and snap ring of overrun clutch
  Specified clearance:
  Standard
  1.0 - 1.4 mm (0.039 - 0.055 in)
  Allowable limit
  2.0 mm (0.079 in)
  Retaining plate:
  Refer to S.D.S.



SAT870A

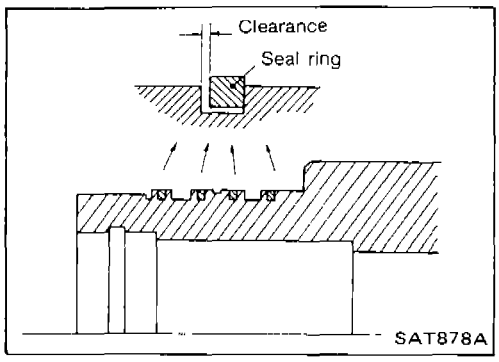
- Measurement of clearance between retaining plate and snap ring of forward clutch
  Specified clearance:
  Standard
  0.45 - 0.85 mm (0.0177 - 0.0335 in)
  Allowable limit
  2.05 mm (0.0807 in)
  Retaining plate:
  Refer to S.D.S.

Low & Reverse Brake (Cont'd)


SAT877A

Low one-way clutch inner race

- Check frictional surface of inner race for wear or damage.



SAT878A

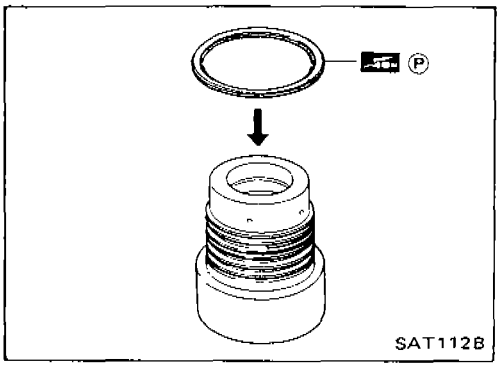
- Install a new seal rings onto low one-way clutch inner race.
- **Be careful not to expand seal ring gap excessively.**
- Measure seal ring-to-groove clearance.

  Inspection standard:

  Standard value 0.10 - 0.25 mm (0.0039 - 0.0098 in)

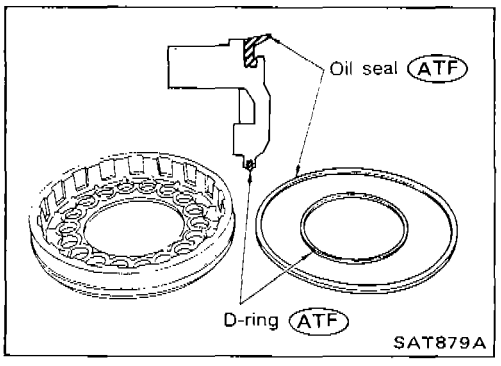
  Allowable limit 0.25 mm (0.0098 in)
- If not within allowable limit, replace low one-way clutch inner race.

ASSEMBLY



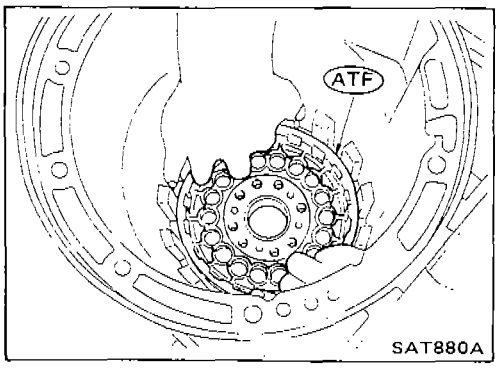
SAT112B

1. Install bearing onto one-way clutch inner race.
- **Pay attention to its direction — Black surface goes to rear side.**
- **Apply petroleum jelly to needle bearing.**



SAT879A

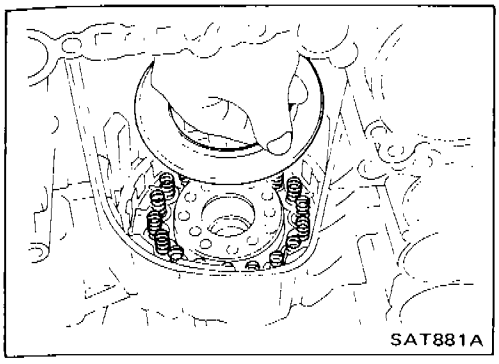
2. Install oil seal and D-ring onto piston.
- **Apply A.T.F. to oil seal and D-ring.**



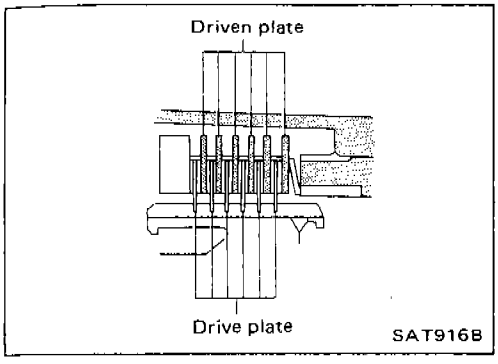
SAT880A

3. Install piston by rotating it slowly and evenly.
- **Apply A.T.F. to inner surface of transmission case.**

Low & Reverse Brake (Cont'd)

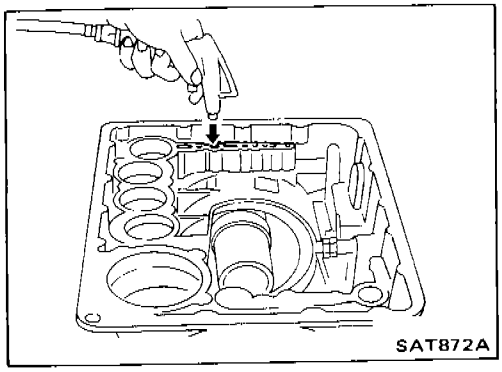

SAT881A

4. Install return springs, spring retainer and low one-way clutch inner race onto transmission case.

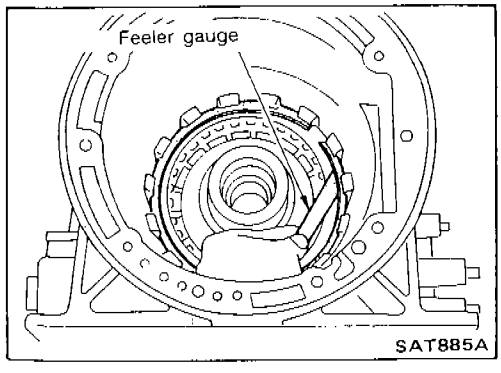


SAT916B

5. Install dish plate, low and reverse brake drive plates, driven plates and retaining plate.
6. Install snap ring on transmission case.


SAT872A

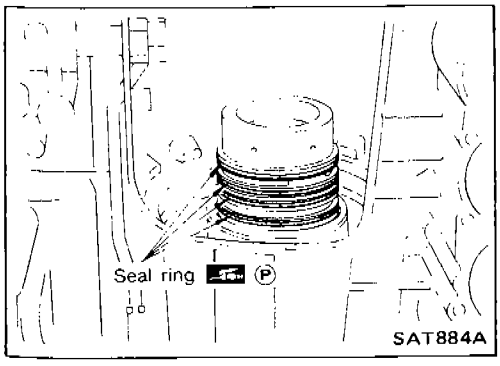
7. Check operation of low and reverse brake clutch piston. Refer to "DISASSEMBLY".



SAT885A

8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

Specified clearance:
Standard
1.1 - 1.5 mm (0.043 - 0.059 in)
Allowable limit
2.5 mm (0.098 in)
Retaining plate:
Refer to S.D.S.

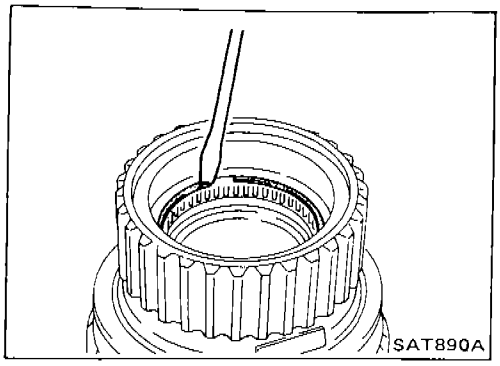


SAT884A

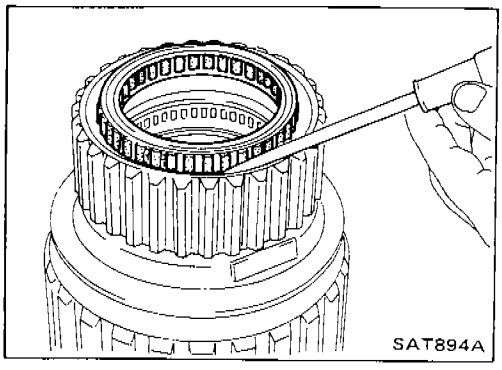
9. Install low one-way clutch inner race seal ring.

- **Apply petroleum jelly to seal ring.**
- **Make sure seal rings are pressed firmly into place and held by petroleum jelly.**

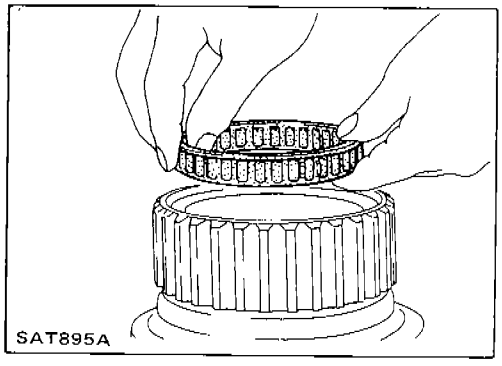
Forward Clutch Drum Assembly (Cont'd)



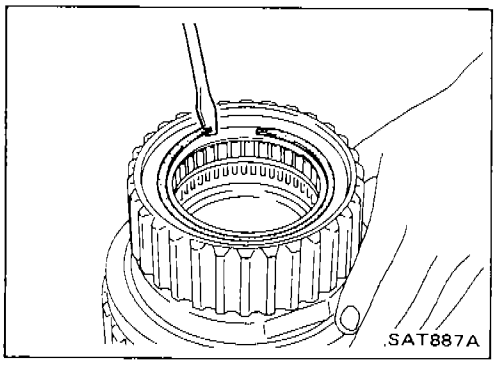
2. Install snap ring onto forward clutch drum.



3. Install low one-way clutch onto forward clutch drum by pushing the roller in evenly.

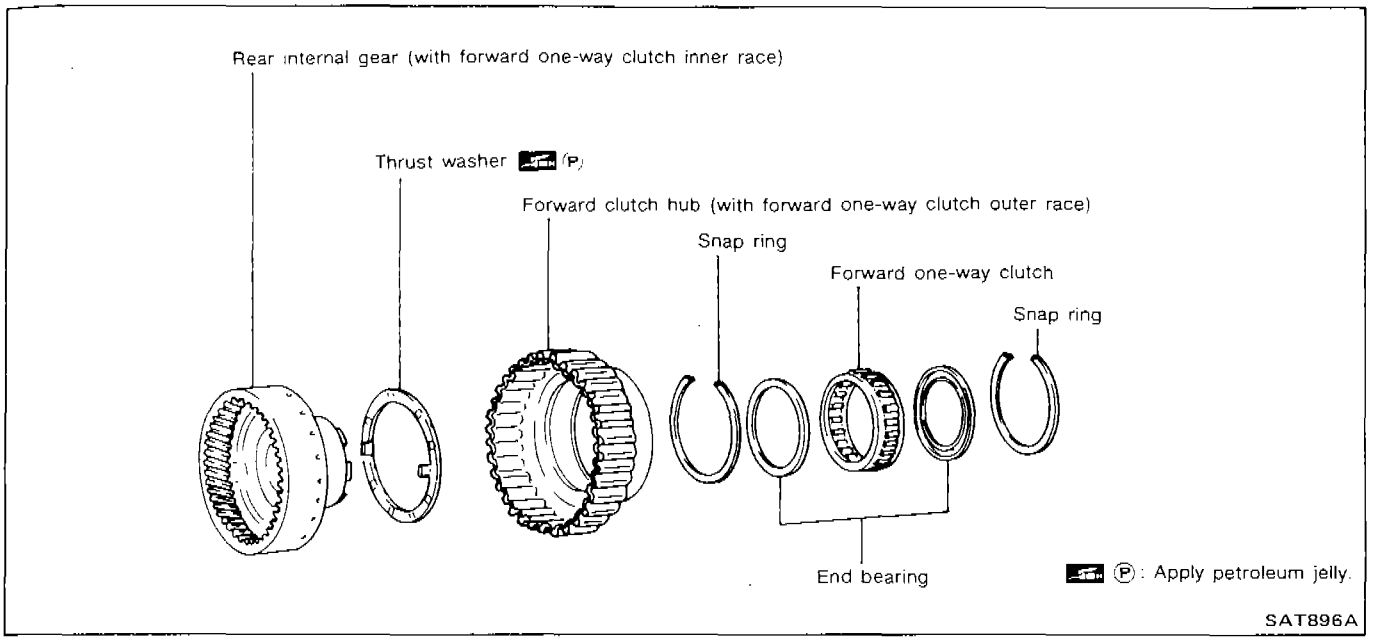


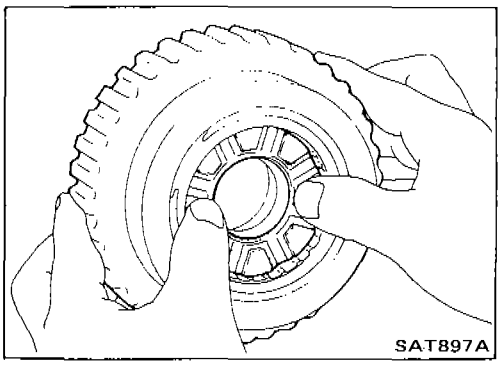
- **Install low one-way clutch with flange facing rearward.**



4. Install side plate onto forward clutch drum.
5. Install snap ring onto forward clutch drum.

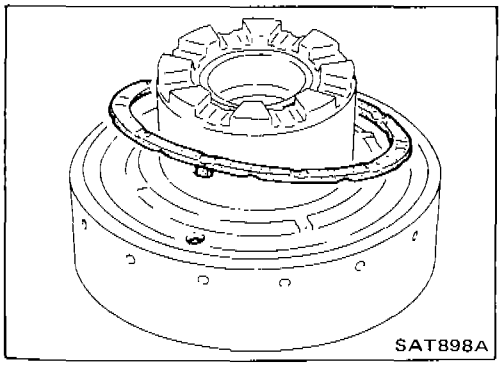
Rear Internal Gear and Forward Clutch Hub



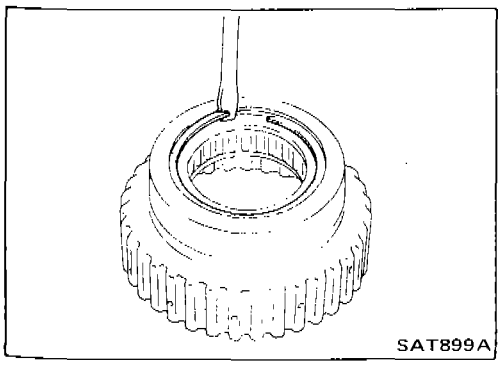


DISASSEMBLY

1. Remove rear internal gear by pushing forward clutch hub forward.

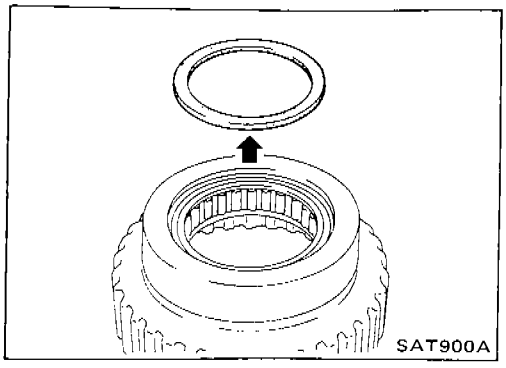


2. Remove thrust washer from rear internal gear.

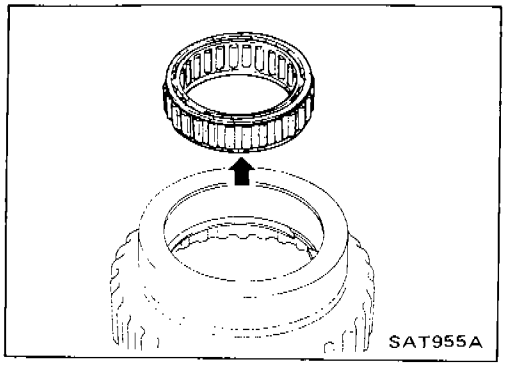


3. Remove snap ring from forward clutch hub.

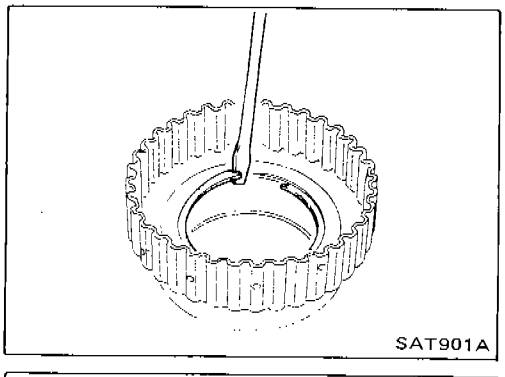
Rear Internal Gear and Forward Clutch Hub (Cont'd)


SAT900A

4. Remove end bearing.


SAT955A

5. Remove forward one-way clutch and end bearing as a unit from forward clutch hub.

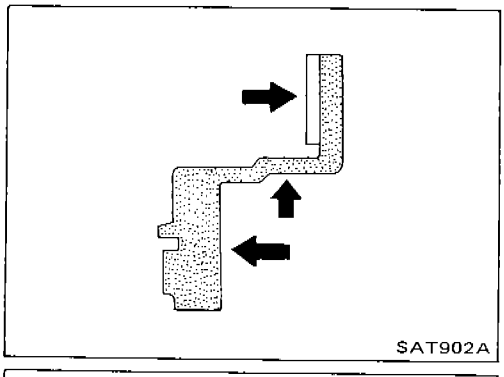

SAT901A

6. Remove snap ring from forward clutch hub.

INSPECTION

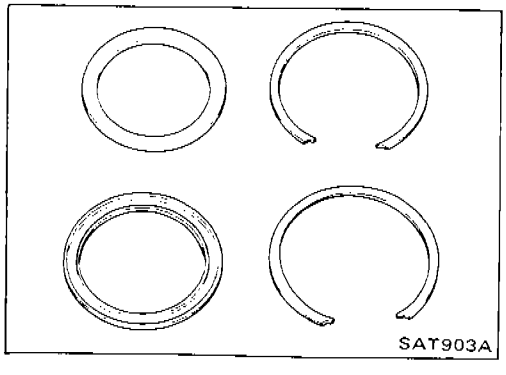
Rear internal gear and forward clutch hub

- Check gear for excessive wear, chips or cracks.
- Check frictional surfaces of forward one-way clutch and thrust washer for wear or damage.
- Check spline for wear or damage.

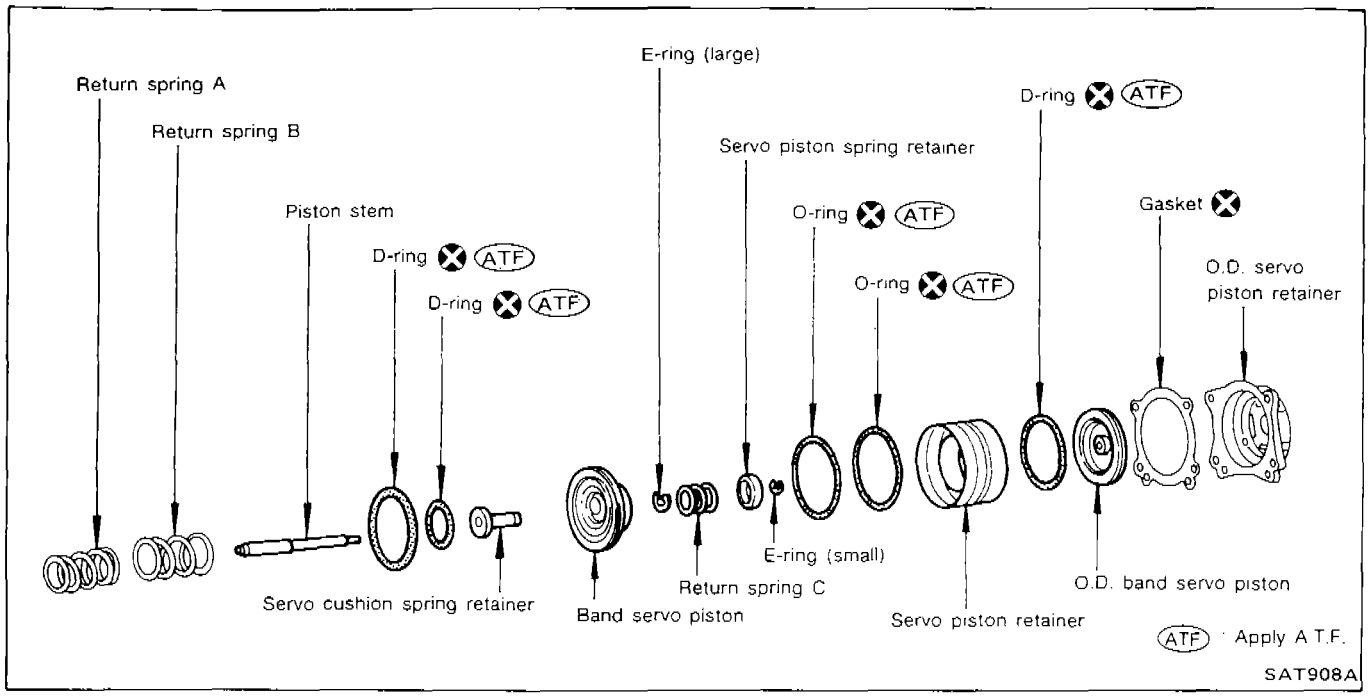

SAT902A

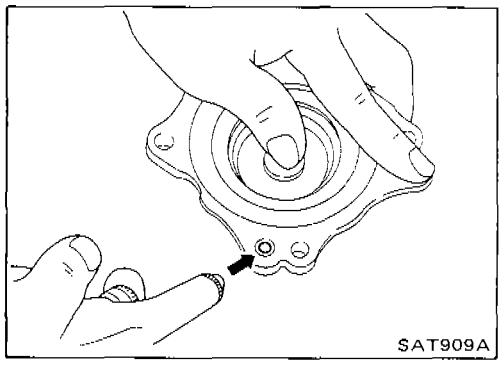
Snap ring and end bearing

- Check for deformation or damage.


SAT903A

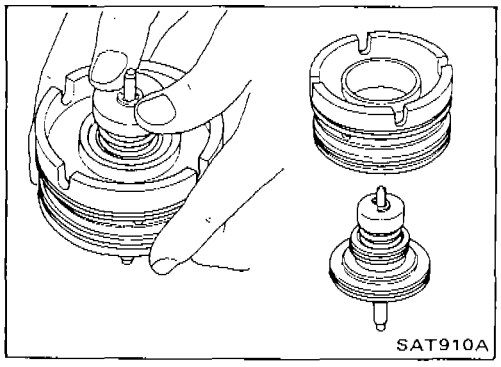
Band Servo Piston Assembly



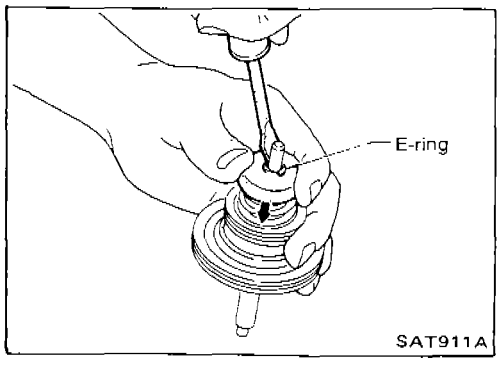


DISASSEMBLY

1. Block one oil hole in O.D. servo piston retainer and the center hole in O.D. band servo piston.
2. Apply compressed air to the other oil hole in piston retainer to remove O.D. band servo piston from retainer.
3. Remove D-ring from O.D. band servo piston.

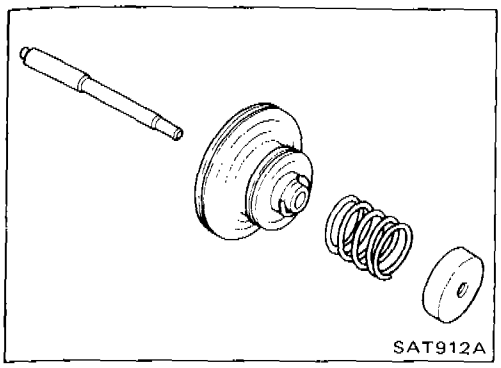


4. Remove band servo piston assembly from servo piston retainer by pushing it forward.

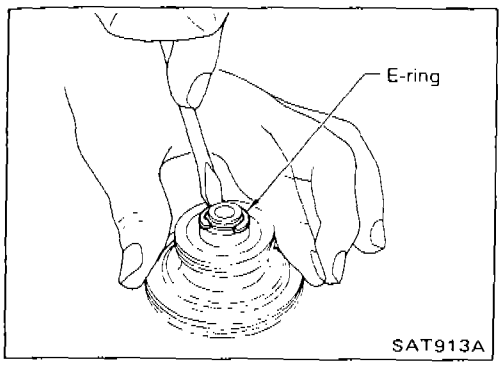


5. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.

Band Servo Piston Assembly (Cont'd)

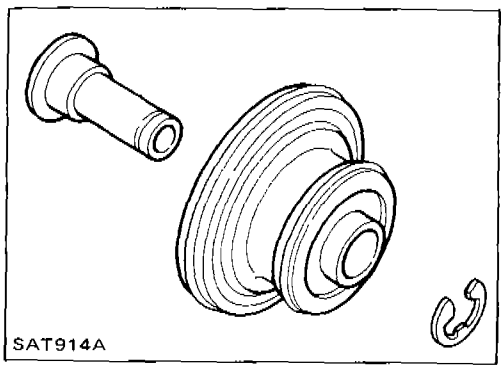

SAT912A

6. Remove servo piston spring retainer, return spring C and piston stem from band servo piston.

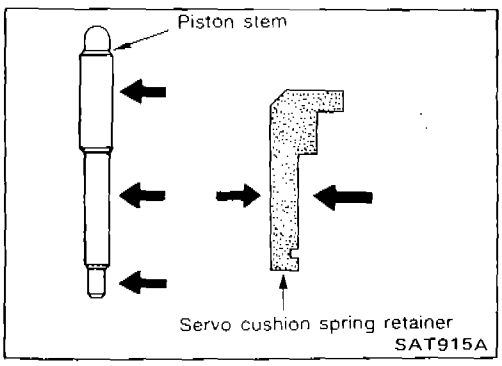


SAT913A

7. Remove E-ring from band servo piston.


SAT914A

8. Remove servo cushion spring retainer from band servo piston.
9. Remove D-rings from band servo piston.
10. Remove O-rings from servo piston retainer.

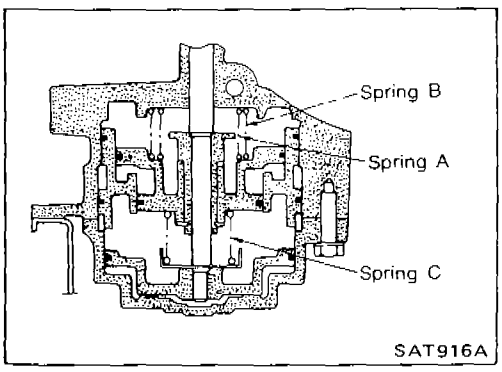


SAT915A

INSPECTION

Pistons, retainers and piston stem

- Check frictional surfaces for abnormal wear or damage.



SAT916A

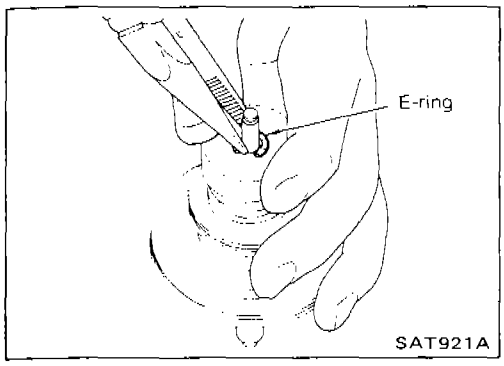
Return springs

- Check for deformation or damage. Measure free length and outer diameter.

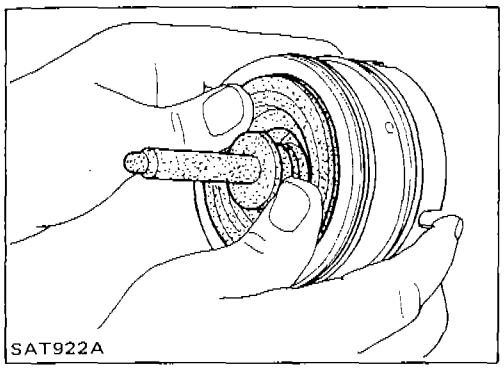
Inspection standard: Unit: mm (in)

Parts	Free length	Outer diameter
Spring A	45.6 (1.795)	34.3 (1.350)
Spring B	53.8 (2.118)	40.3 (1.587)
Spring C	29.0 (1.142)	27.6 (1.087)

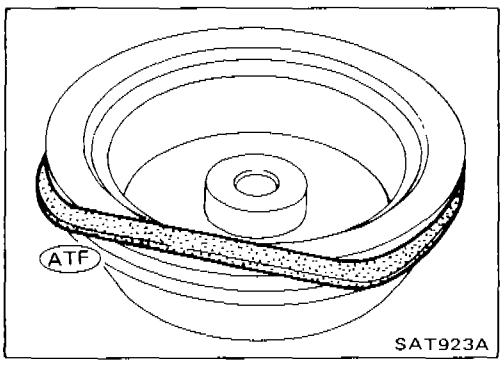
Band Servo Piston Assembly (Cont'd)



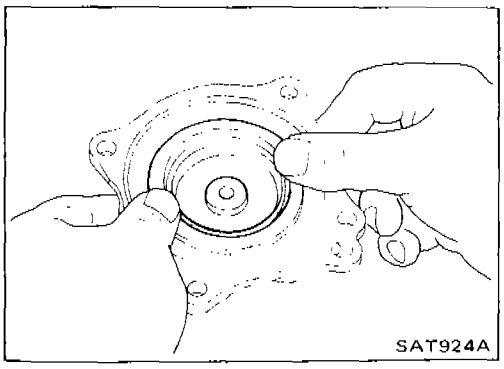
6. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.



7. Install band servo piston assembly onto servo piston retainer by pushing it inward.



8. Install D-ring on O.D. band servo piston.
   - **Apply A.T.F. to D-ring.**



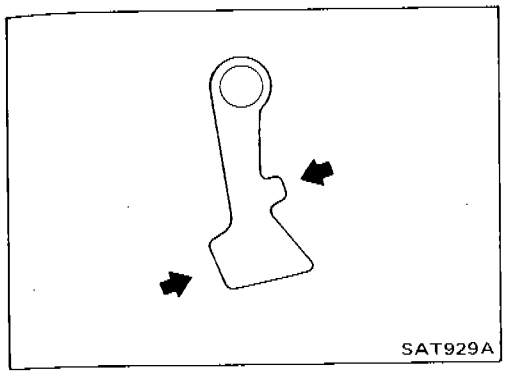
9. Install O.D. band servo piston onto servo piston retainer by pushing it inward.

Parking Pawl Components (Cont'd)

INSPECTION

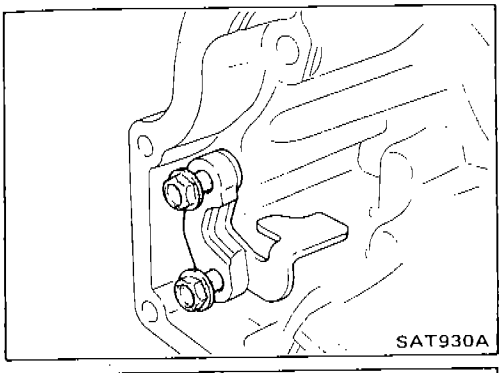
Parking pawl and parking actuator support

- Check contact surface of parking rod for wear.

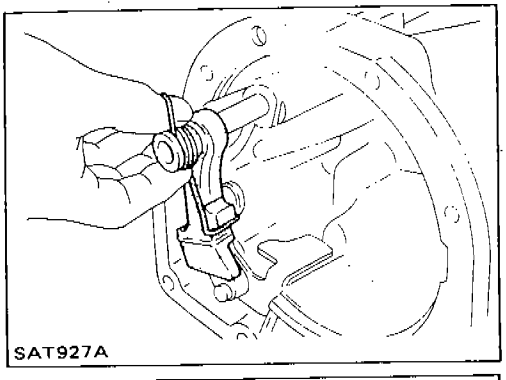

SAT929A

ASSEMBLY

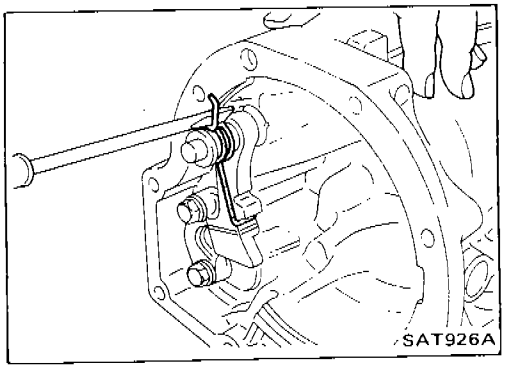
1. Install rod guide and parking actuator support onto rear extension.
2. Insert parking pawl shaft into rear extension.

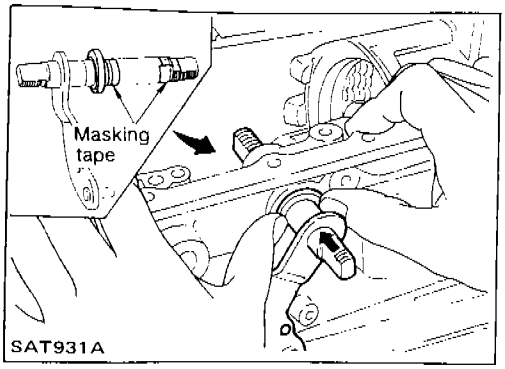

SAT930A

3. Install return spring, pawl spacer and parking pawl onto parking pawl shaft.


SAT927A

4. Bend return spring upward and install it onto rear extension.

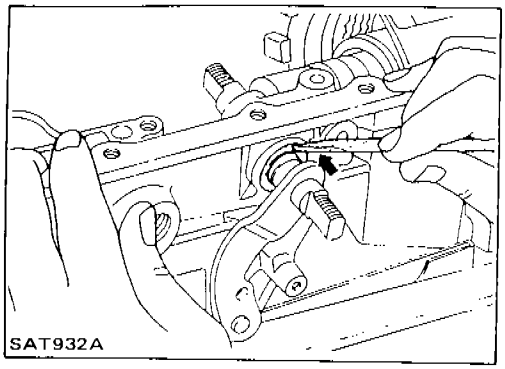

SAT926A



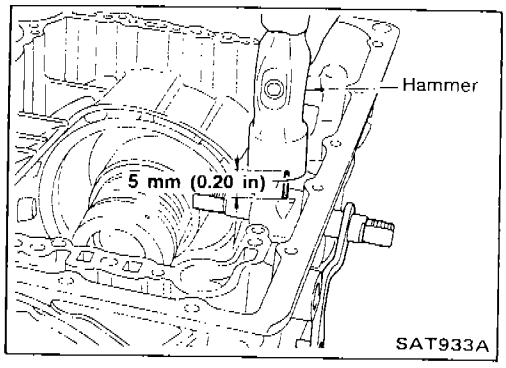
Assembly

1. Install manual shaft components.
a. Install oil seal onto manual shaft.
- **Apply A.T.F. to oil seal.**
- **Wrap threads of manual shaft with masking tape.**

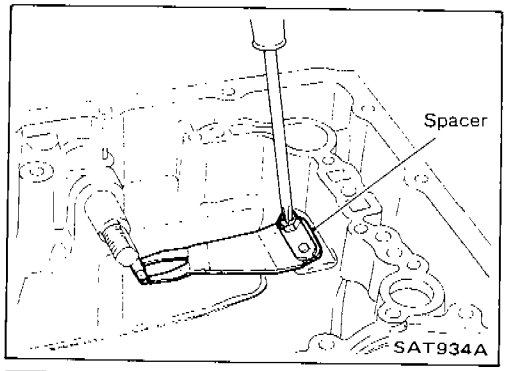
b. Insert manual shaft and oil seal as a unit into transmission case.
c. Remove masking tape.



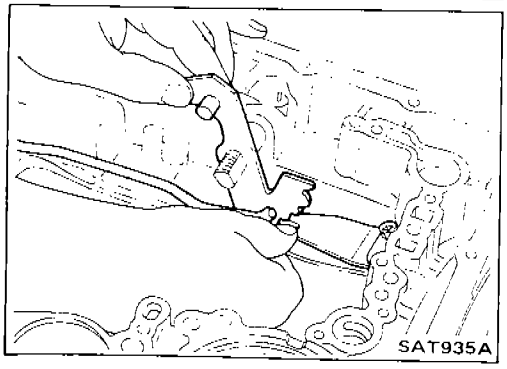
d. Push oil seal evenly and install it onto transmission case.



e. Align groove in shaft with drive pin hole, then drive pin into position as shown in figure at left.

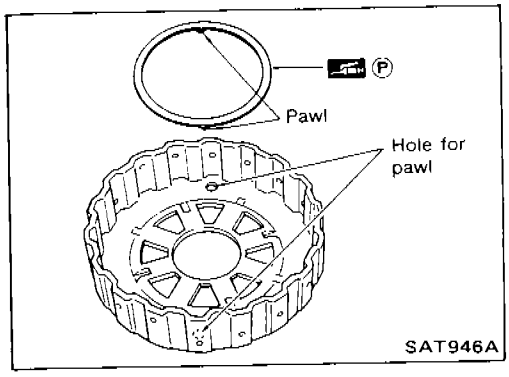


f. Install detent spring and spacer.

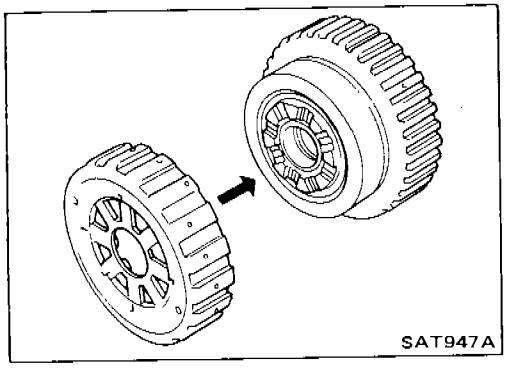


g. While pushing detent spring down, install manual plate onto manual shaft.

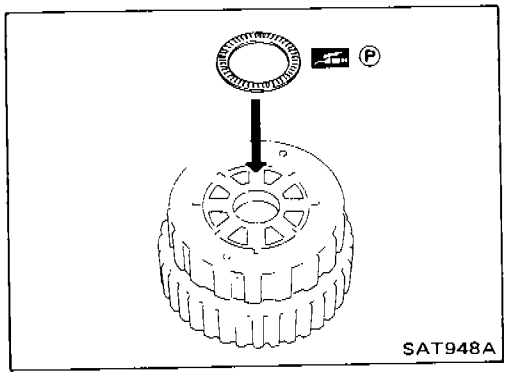
Assembly (Cont'd)



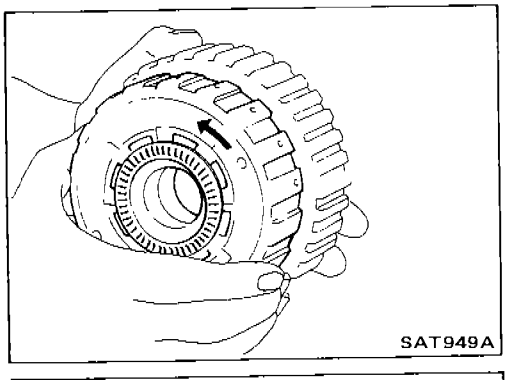
d. Install thrust washer onto front of overrun clutch hub.
- **Apply petroleum jelly to the thrust washer.**
- **Insert pawls of thrust washer securely into holes in overrun clutch hub.**



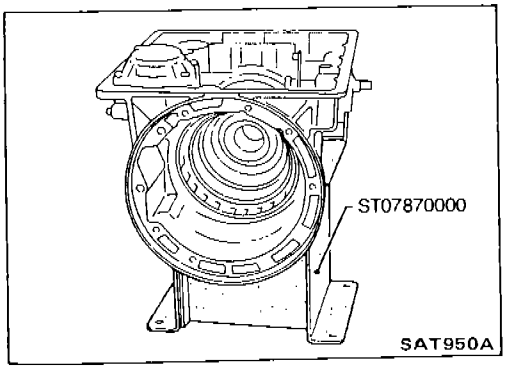
e. Install overrun clutch hub onto rear internal gear assembly.



f. Install needle bearing onto rear of overrun clutch hub.
- **Apply petroleum jelly to needle bearing.**



g. Check that overrun clutch hub rotates as shown while holding forward clutch hub.

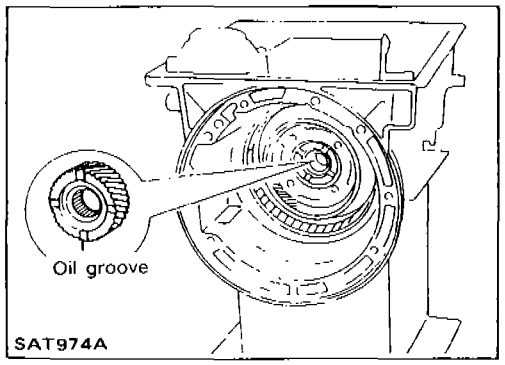


h. Place transmission case into horizontal position.

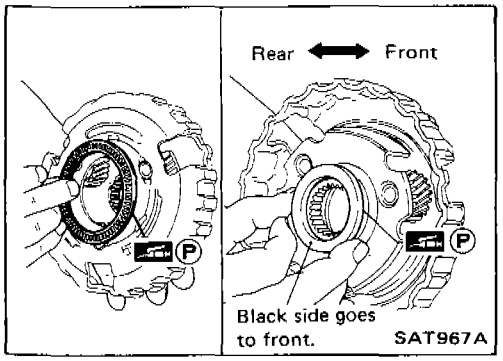
Adjustment

When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

Part name \ Item	Total end play	Reverse clutch end play
Transmission case	●	●
Low one-way clutch inner race	●	●
Overrun clutch hub	●	●
Rear internal gear	●	●
Rear planetary carrier	●	●
Rear sun gear	●	●
Front planetary carrier	●	●
Front sun gear	●	●
High clutch hub	●	●
High clutch drum	●	●
Oil pump cover	●	●
Reverse clutch drum	—	●

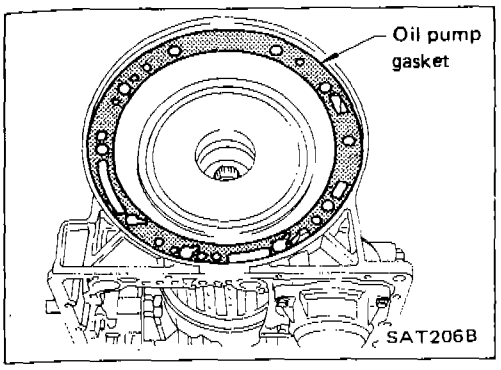


1. Install front side clutch and gear components.
a. Install rear sun gear on transmission case.
● **Pay attention to its direction.**

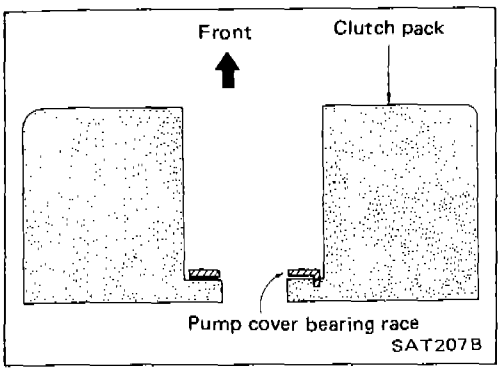


b. Install needle bearing on front of front planetary carrier.
● **Apply petroleum jelly to needle bearing.**
c. Install needle bearing on rear of front planetary carrier.
● **Apply petroleum jelly to bearing.**
● **Pay attention to its direction — Black side goes to front.**

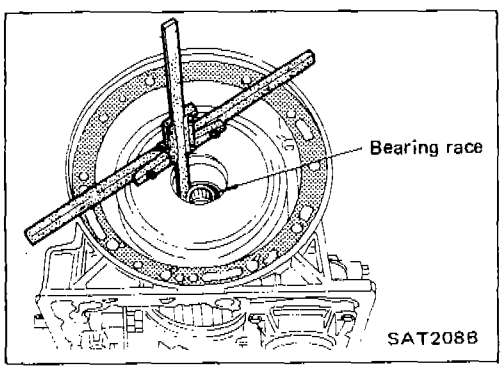
Adjustment (Cont'd)



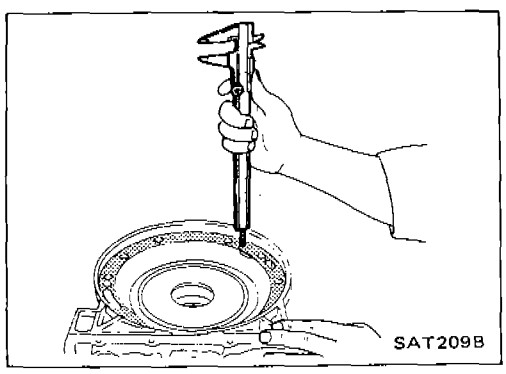
2. Adjust total end play.
a. Install new oil pump gasket on transmission case.



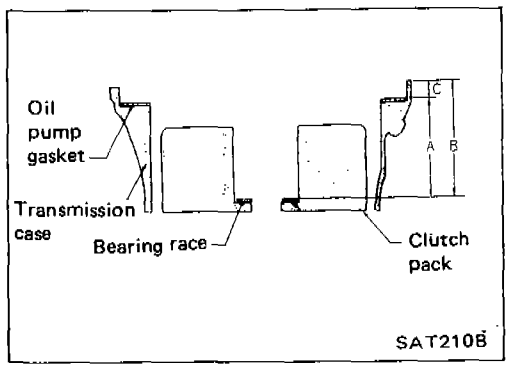
b. Install pump cover bearing race on clutch pack.



c. Measure distance "B" between front end of transmission case and oil pump cover bearing race.

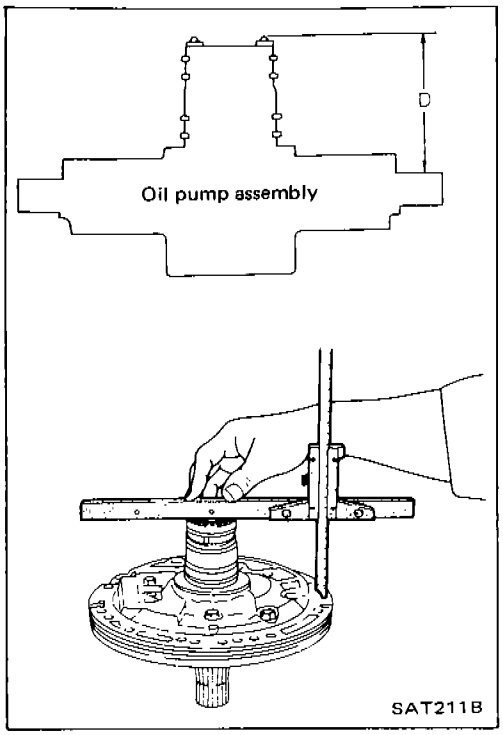


d. Measure distance "C" between front end of transmission case and oil pump gasket.

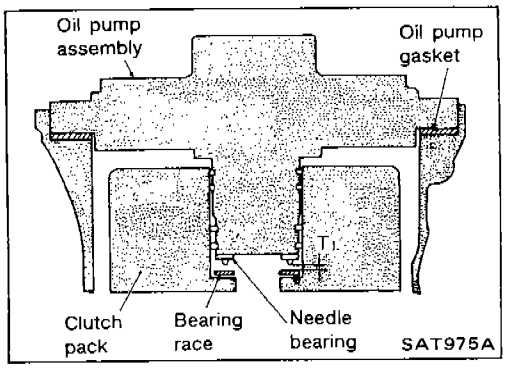


e. Determine dimension "A" by using the following equation.
A = B – C

Adjustment (Cont'd)



f. Install needle bearing on oil pump assembly.
g. Measure distance "D" between needle bearing and machined surface of oil pump cover assembly.



h. Determine total end play "T_1" by using the following equation.

$T_1 = A - D - 0.1$

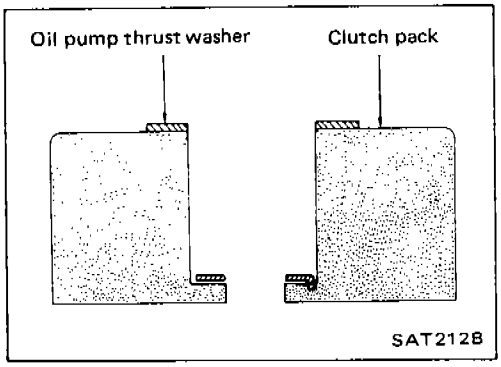
Total end play "T_1":

0.25 - 0.55 mm (0.0098 - 0.0217 in)

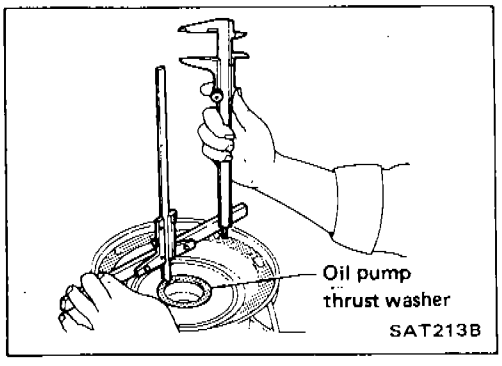
- If end play is out of specification, decrease or increase thickness of oil pump cover bearing race as necessary.

Available oil pump cover bearing race:

Refer to S.D.S.

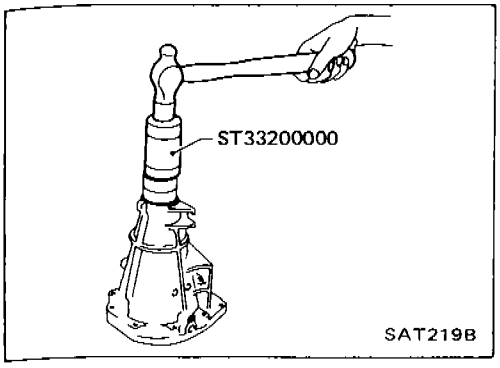


3. Adjust reverse clutch drum end play.
a. Install oil pump thrust washer on clutch pack.

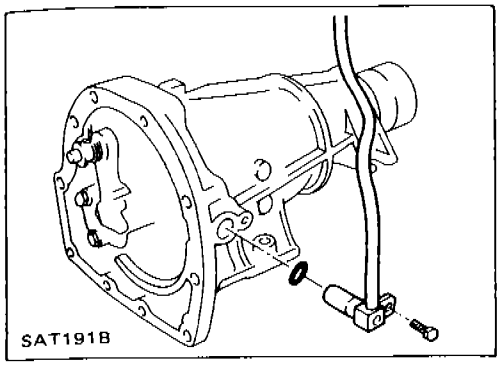


b. Measure distance "F" between front end of transmission case and oil pump thrust washer.
c. Measure distance "G" between front end of transmission case and gasket.

Assembly (Cont'd)

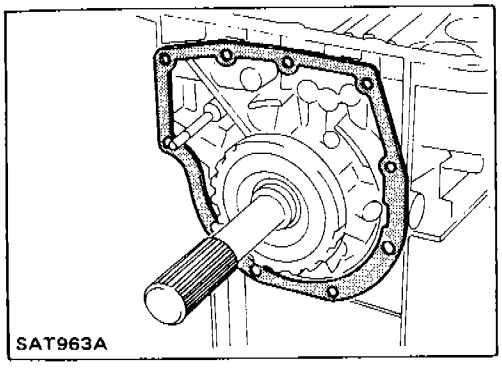


2. Install rear extension.
a. Install oil seal on rear extension.
- **Apply A.T.F. to oil seal.**

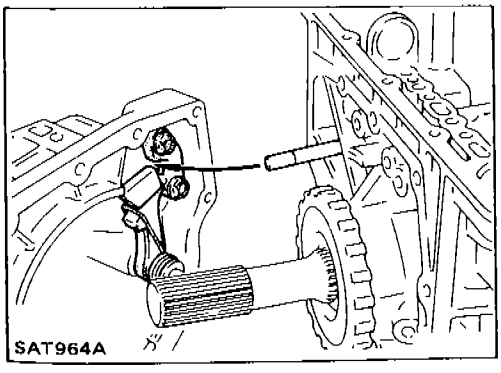


b. Install O-ring on revolution sensor.
- **Apply A.T.F. to O-ring.**

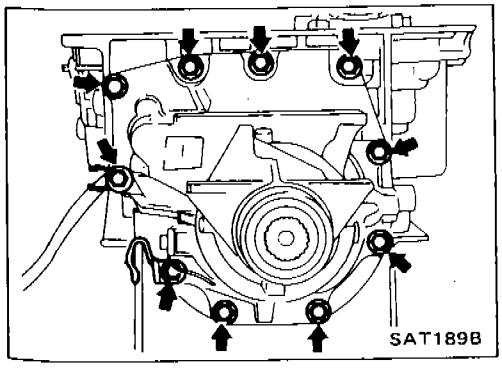
c. Install revolution sensor on rear extension.



d. Install rear extension gasket on transmission case.

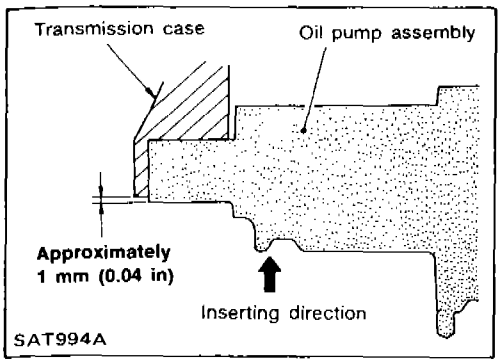


e. Install parking rod on transmission case.

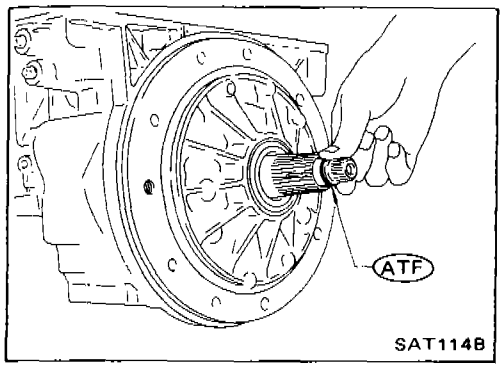


f. Install rear extension on transmission case.

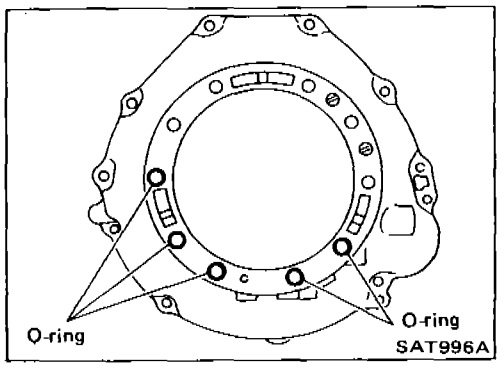
Assembly (Cont'd)



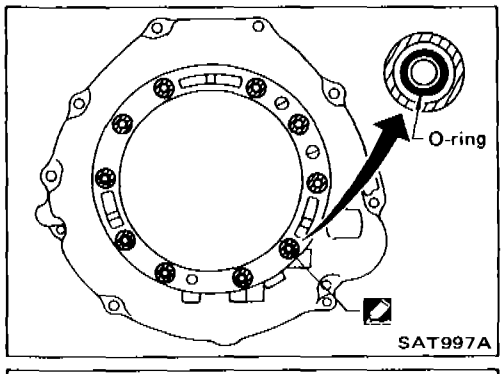
- **Insert oil pump assembly to the specified position in transmission, as shown at left.**



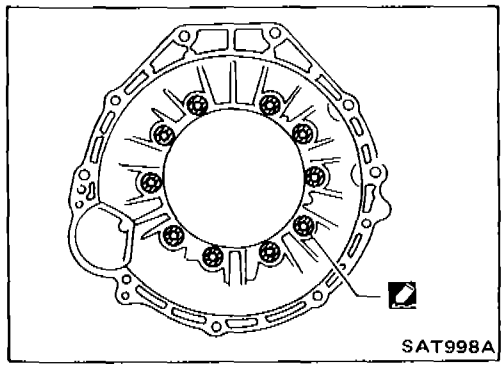
8. Install O-ring on input shaft.
- **Apply A.T.F. to O-rings.**



9. Install converter housing.
a. Install O-rings on converter housing.

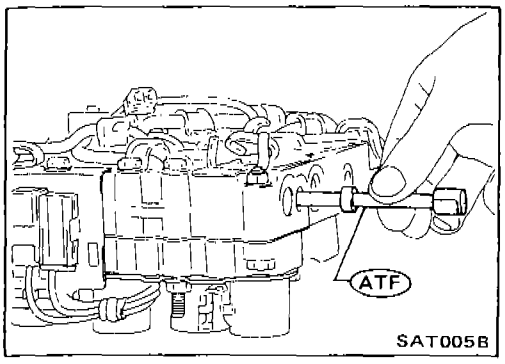


b. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to outer periphery of bolt holes in converter housing.
- **Do not apply too much sealant.**

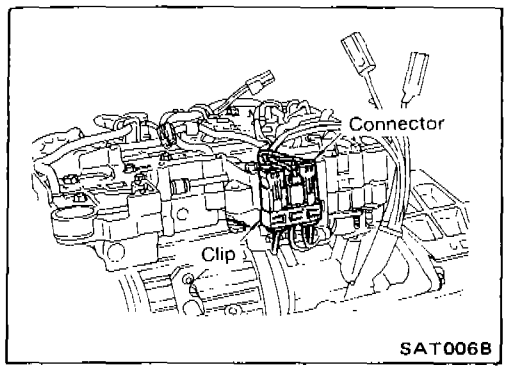


c. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to seating surfaces of bolts that secure front of converter housing.

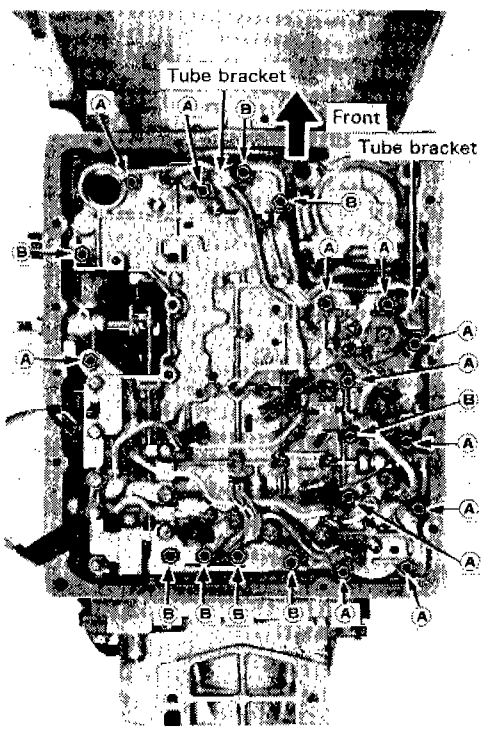
Assembly (Cont'd)



b. Install manual valve on control valve.
- **Apply A.T.F. to manual valve.**

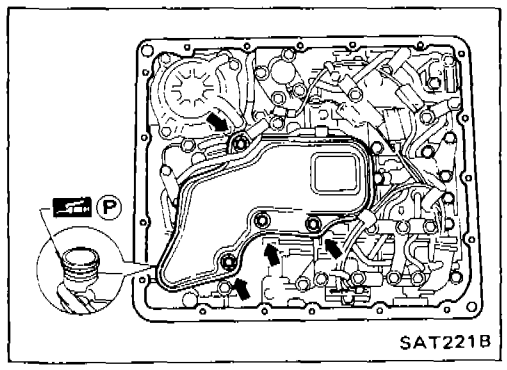


c. Place control valve assembly on transmission case. Connect solenoid connector for upper body.
d. Install connector clip.



e. Install control valve assembly on transmission case.
f. Install connector tube brackets and tighten bolts Ⓐ and Ⓑ.
- **Check that terminal assembly harness does not catch.**

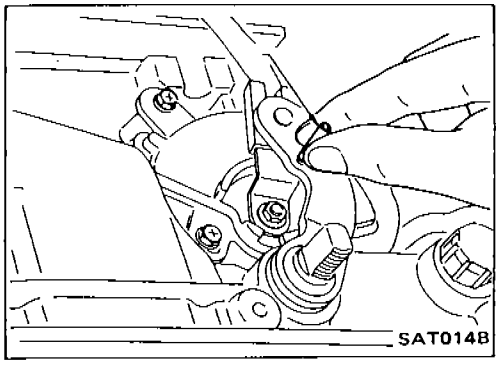
Bolt symbol	ℓ mm (in)
Ⓐ	33 (1.30)
Ⓑ	45 (1.77)



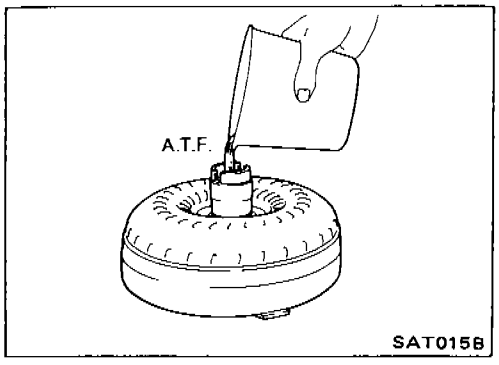
g. Install O-ring on oil strainer.
- **Apply petroleum jelly to O-ring.**

h. Install oil strainer on control valve.

Assembly (Cont'd)



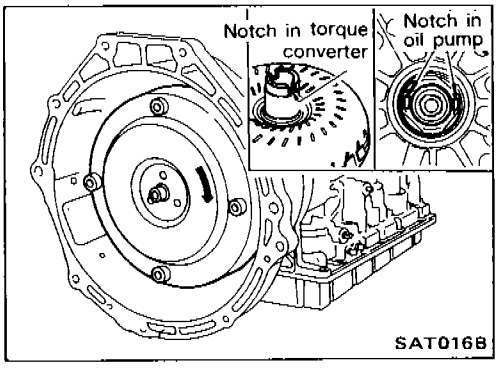
d. Tighten bolts while inserting 4.0 mm (0.157 in) dia. pin vertically into locating holes in inhibitor switch and manual shaft.



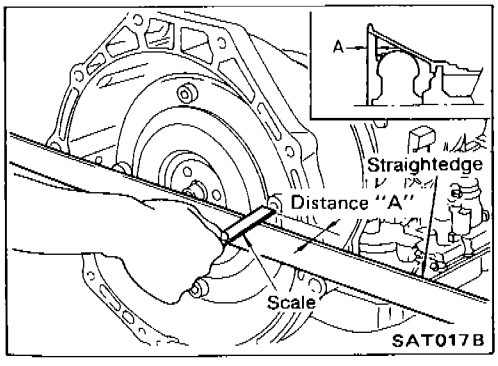
15. Install torque converter.

a. Pour A.T.F. into torque converter.

- **Approximately 2 liters (1-3/4 Imp qt) of fluid are required for a new torque converter.**
- **When reusing old torque converter, add the same amount of fluid as was drained.**



b. Install torque converter while aligning notches and oil pump.



c. Measure distance A to check that torque converter is in proper position.

Distance "A":
23.5 mm (0.925 in) or more

Specifications and Adjustment (Cont'd)

Low & reverse brake Number of drive plates	6	
Number of driven plates	6	
Thickness of drive plate mm (in) Standard Wear limit	2.0 (0.079) 1.8 (0.071)	
Clearance mm (in) Standard Allowable limit	1.1 - 1.5 (0.043 - 0.059) 2.5 (0.098)	
Thickness of retaining plate	Thickness mm (in)	Part number
	8.6 (0.339)	31667-41X03
	8.8 (0.346)	31667-41X04
	9.0 (0.354)	31667-41X05
	9.2 (0.362)	31667-41X06
	9.4 (0.370)	31667-41X09
	9.6 (0.378)	31667-41X10
Brake band Anchor end bolt tightening torque N·m (kg-m, ft-lb)	4 - 6 (0.4 - 0.6, 2.9 - 4.3)	
Number of returning revolutions for anchor end bolt	2.5	

OIL PUMP AND LOW ONE-WAY CLUTCH

Oil pump clearance mm (in) Cam ring — oil pump housing Standard	0.01 - 0.024 (0.0004 - 0.0009)
Rotor, vanes and control piston — oil pump housing Standard	0.03 - 0.044 (0.0012 - 0.0017)
Seal ring clearance mm (in) Standard Allowable limit	0.10 - 0.25 (0.0039 - 0.0098) 0.25 (0.0098)

TOTAL END PLAY

Total end play "T_1"	0.25 - 0.55 mm (0.0098 - 0.0217 in)	
Thickness of oil pump cover bearing race	Thickness mm (in)	Part number
	0.8 (0.031)	31429-21X00
	1.0 (0.039)	31429-21X01
	1.2 (0.047)	31429-21X02
	1.4 (0.055)	31429-21X03
	1.6 (0.063)	31429-21X04
	1.8 (0.071)	31429-21X05
	2.0 (0.079)	31429-21X06

REVERSE CLUTCH DRUM END PLAY

Reverse clutch drum end play "T_2"	0.55 - 0.90 mm (0.0217 - 0.0354 in)	
Thickness of oil pump thrust washer	Thickness mm (in)	Part number
	0.7 (0.028)	31528-21X00
	0.9 (0.035)	31528-21X01
	1.1 (0.043)	31528-21X02
	1.3 (0.051)	31528-21X03
	1.5 (0.059)	31528-21X04
	1.7 (0.067)	31528-21X05
	1.9 (0.075)	31528-21X06

REMOVAL AND INSTALLATION

Manual control linkage Number of returning revolutions for lock nut	1
Lock nut tightening torque	11 - 15 N·m (1.1 - 1.5 kg-m, 8 - 11 ft-lb)
Distance between end of clutch housing and torque converter	26.0 mm (1.024 in) or more
Drive plate runout limit	0.5 mm (0.020 in)

SECTION BF

CONTENTS

When you read wiring diagrams:

- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

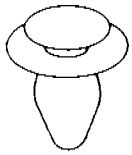
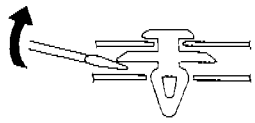
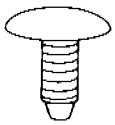
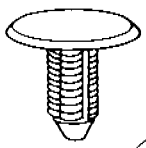
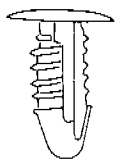
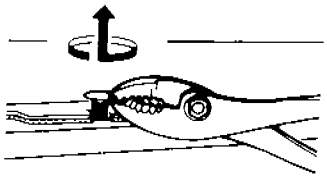
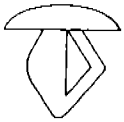
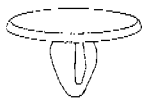
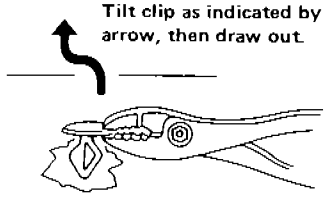
★ **For seat belt, refer to MA section.**

Precautions

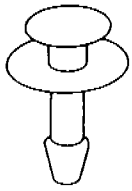
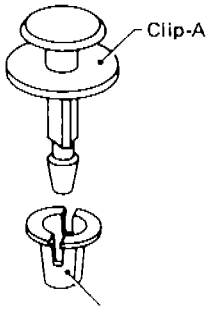
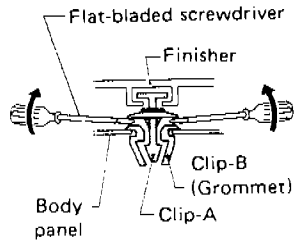
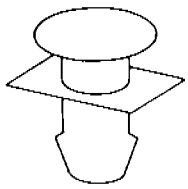
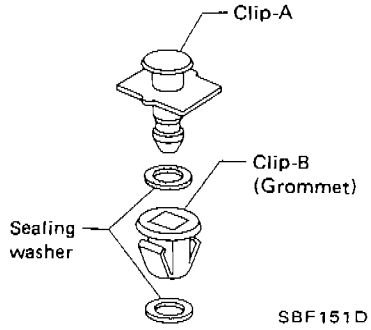
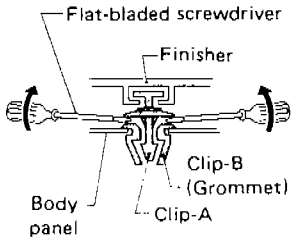
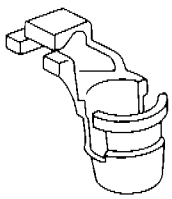
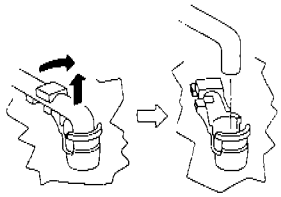
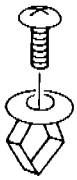
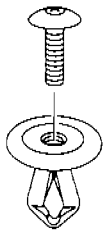
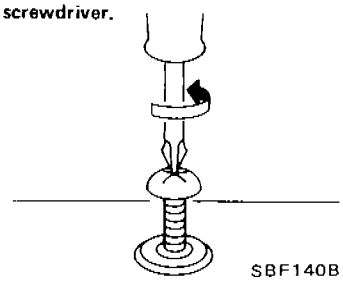
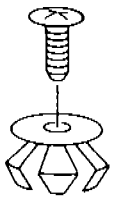
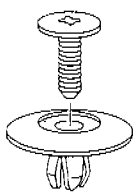
- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removing or installation. Be careful not to soil or damage them.
- Apply sealing compound where necessary when installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.
- When replacing any metal parts (for example body outer panel, members, etc.), be sure to take rust prevention measures.

Clip and Fastener

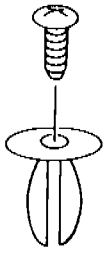
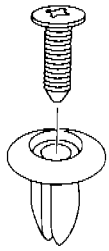
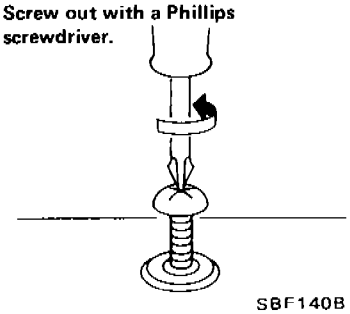
- Clips and fasteners in BF section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

No.	Symbol	Shape	Removal & Installation
C101	 SBF092B	 SBF109B	**Removal:** **Remove by bending up with a flat-bladed screwdriver.**  SBF094B
C102	 SBF113B	 SBF114B  SBF137B	 **Removal:** **Pull up by rotating.** SBF115B
C105	 SBF141B	 SBF142B	**Removal:** **Tilt clip as indicated by arrow, then draw out.**  SBF143B

Clip and Fastener (Cont'd)

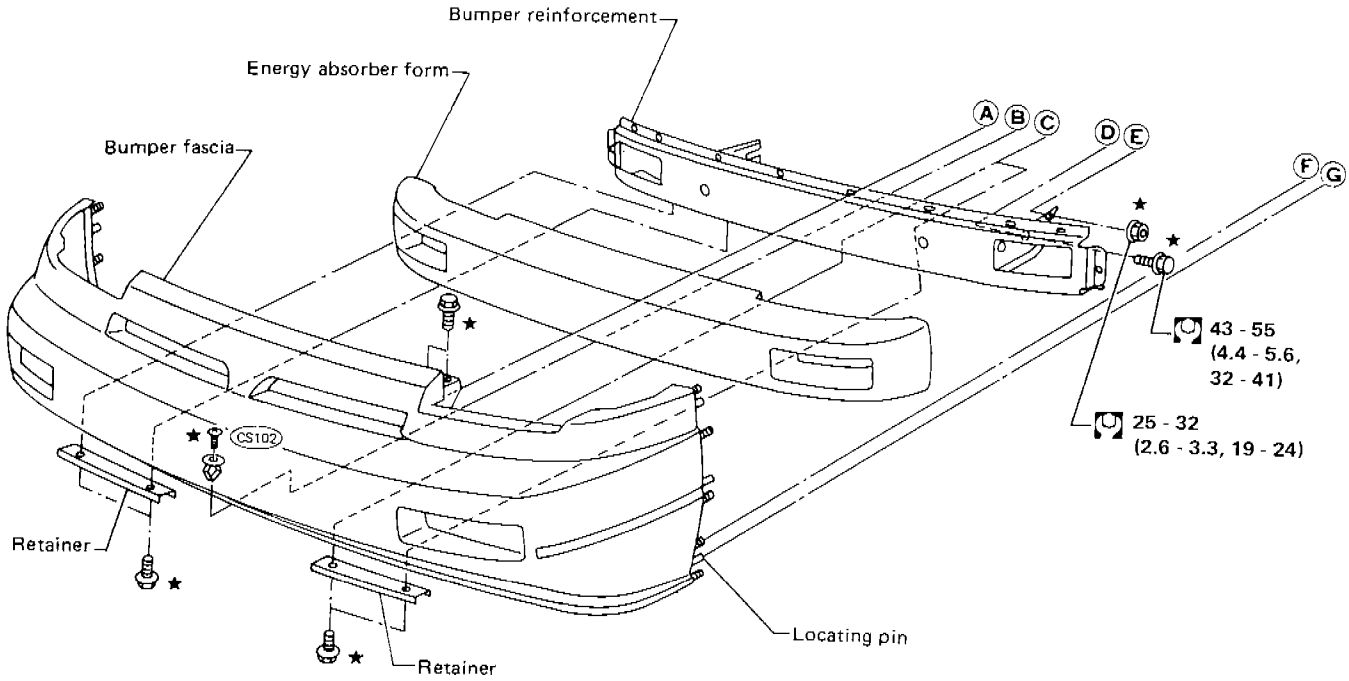
No.	Symbol	Shape	Removal & Installation
CF113	 SBF035C	 SBF036C	**Removal:**  SBF652B
CF118	 SBF150D	 SBF151D	**Removal:**  SBF652B
CR103	 SBF768B		**Removal:** **Holder portion of clip must be spread out to remove rod.**  SBF770B
CS102	 SBF138B	 SBF139B	**Removal:** **Screw out with a Phillips screwdriver.**  SBF140B
CS103	 SBF363B	 SBF364B	

Clip and Fastener (Cont'd)

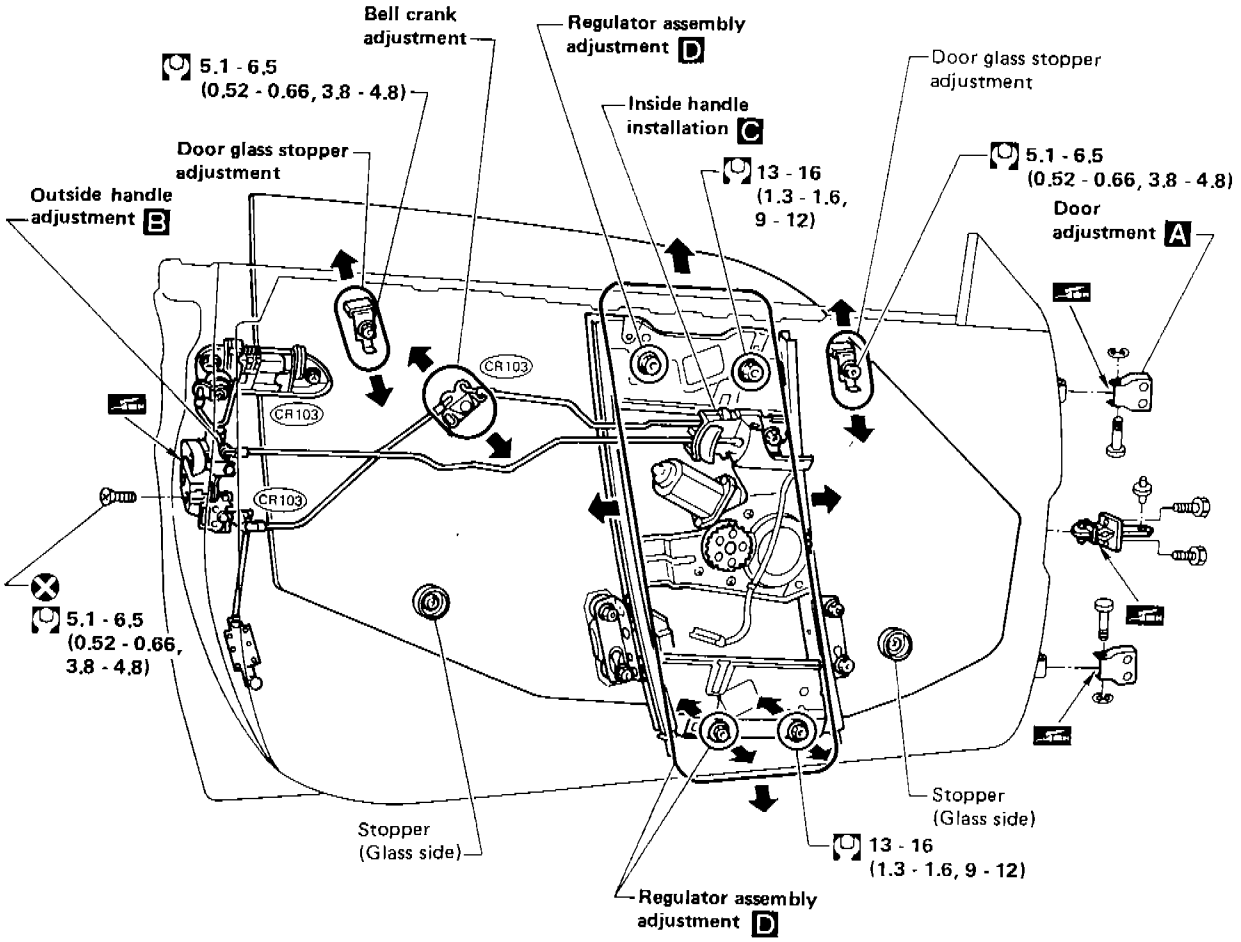
No.	Symbol	Shape	Removal & Installation
CS104	 SBF361B	 SBF362B	**Removal:** **Screw out with a Phillips screwdriver.**  SBF140B

Body Front End

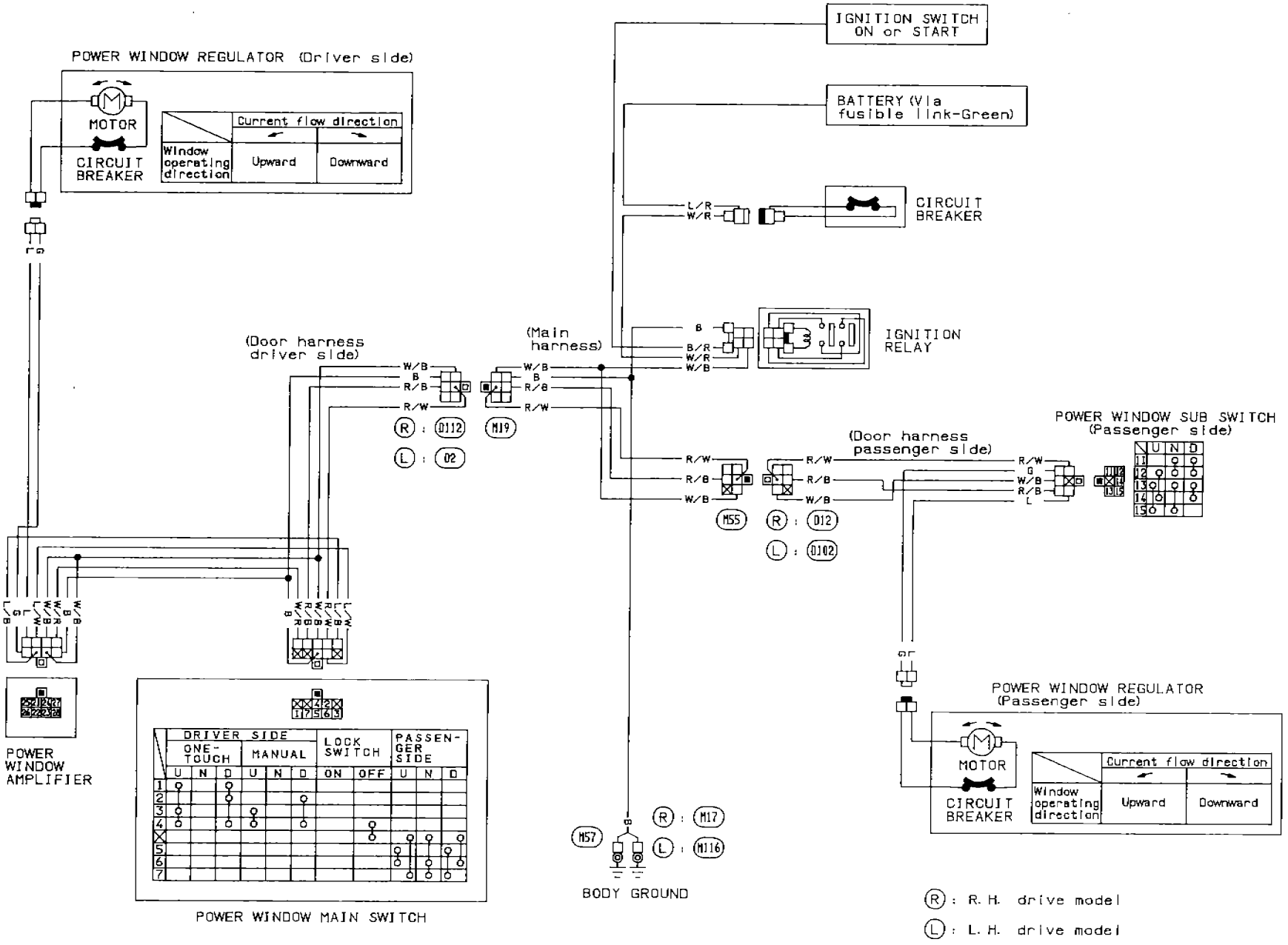
- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood locks engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly.



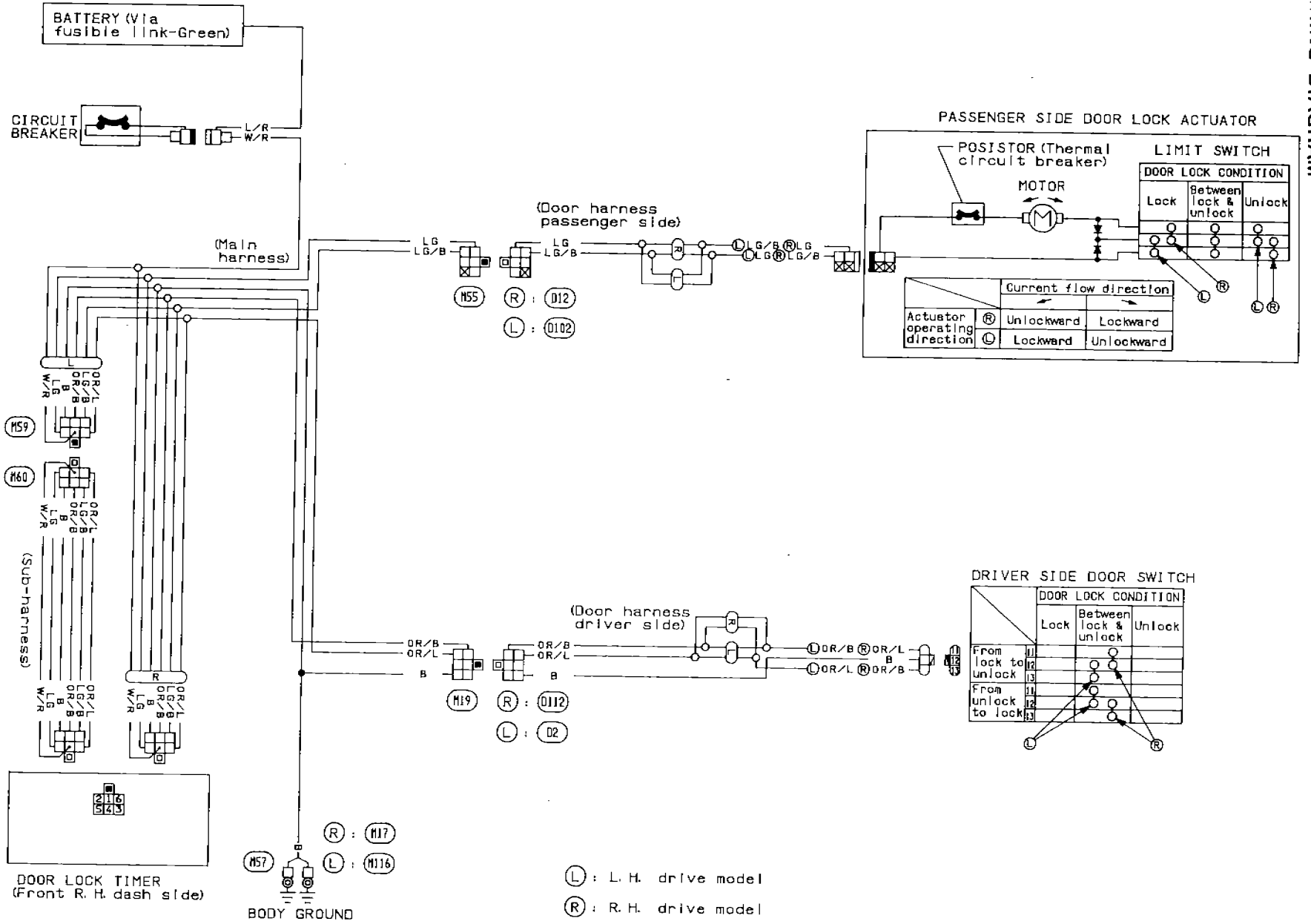
- After adjusting door or door lock, check door lock operation.



: N·m (kg-m, ft-lb)

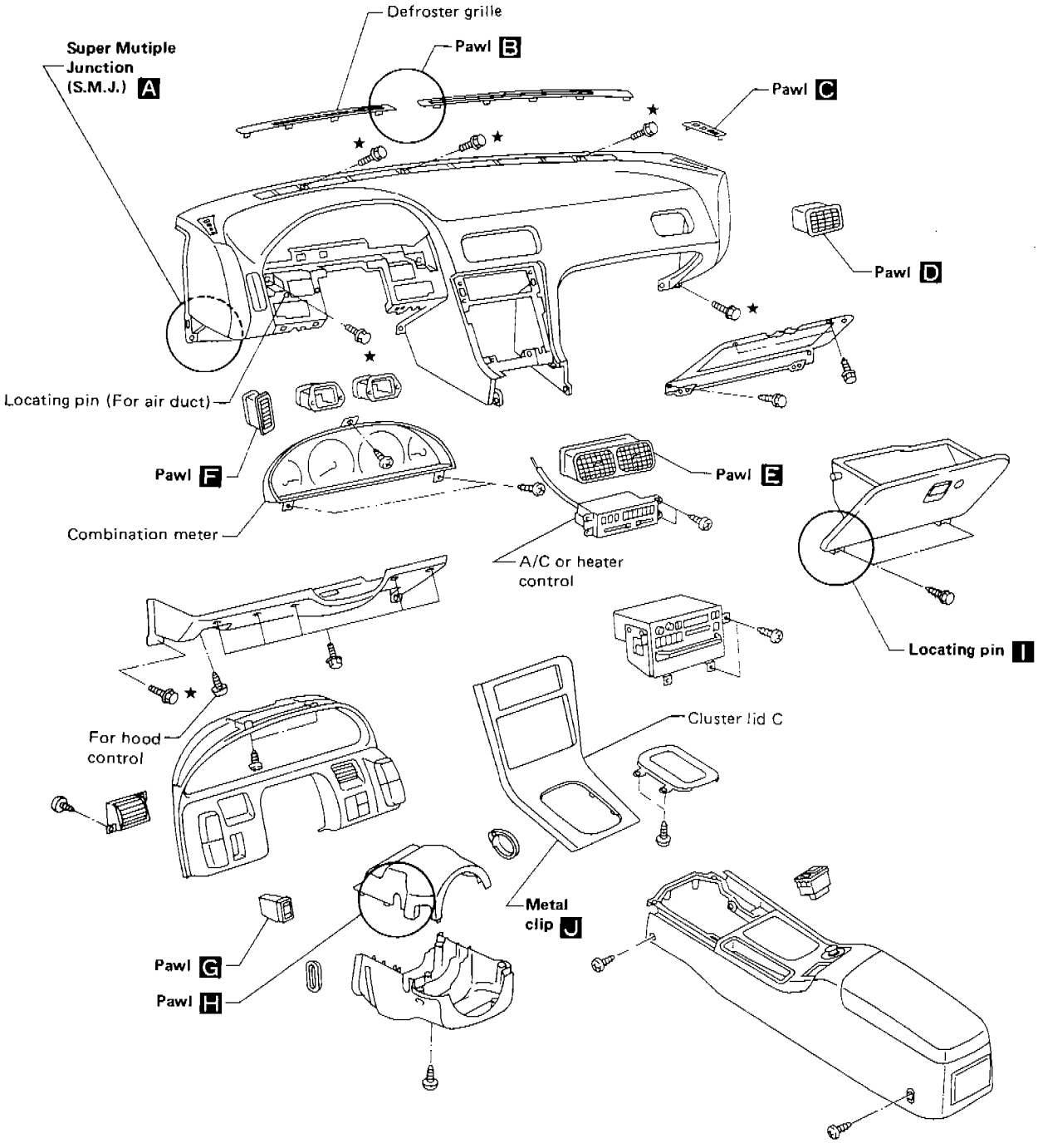

POWER WINDOW REGULATOR (Driver side)
MOTOR
CIRCUIT BREAKER
Current flow direction
Window operating direction
Upward
Downward
IGNITION SWITCH ON or START
BATTERY (Via fusible link-Green)
CIRCUIT BREAKER
L/R
W/R
IGNITION RELAY
(Main harness)
(Door harness driver side)
W/B
B
R/B
R/W
R : D112
L : D2
M19
(Door harness passenger side)
M55
R : D12
L : D102
POWER WINDOW SUB SWITCH (Passenger side)
POWER WINDOW AMPLIFIER
POWER WINDOW MAIN SWITCH
DRIVER SIDE
ONE-TOUCH
MANUAL
LOCK SWITCH
PASSEN-GER SIDE
ON
OFF
M57
R : M17
L : M116
BODY GROUND
POWER WINDOW REGULATOR (Passenger side)
R : R.H. drive model
L : L.H. drive model

SBF431E


BATTERY (Via fusible link-Green)
CIRCUIT BREAKER
L/R
W/R
(Main harness)
(Door harness passenger side)
LG
LG/B
M55
R : D12
L : D102
PASSENGER SIDE DOOR LOCK ACTUATOR
POSISTOR (Thermal circuit breaker)
MOTOR
LIMIT SWITCH
DOOR LOCK CONDITION
Lock
Between lock & unlock
Unlock
Current flow direction
Actuator operating direction
Unlockward
Lockward
M59
M60
(Sub-harness)
(Door harness driver side)
OR/B
OR/L
B
M19
R : D112
L : D2
DRIVER SIDE DOOR SWITCH
From lock to unlock
From unlock to lock
DOOR LOCK TIMER (Front R. H. dash side)
M57
BODY GROUND
R : M17
L : M116
L : L. H. drive model
R : R. H. drive model

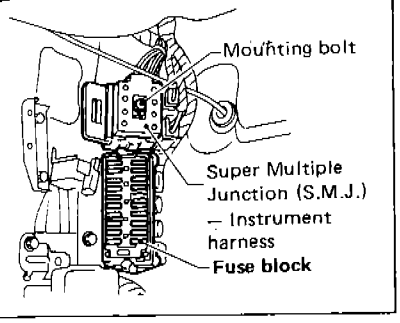
SBF432E

- When removing instrument panel assembly, remove defroster grille, combination meter, A/C or heater control, cluster lid C and S.M.J. first.

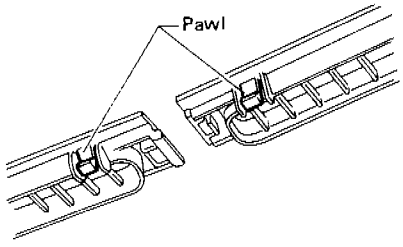


★ : Instrument panel assembly mounting bolts

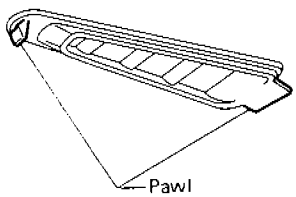
A



B



C



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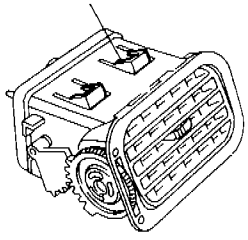

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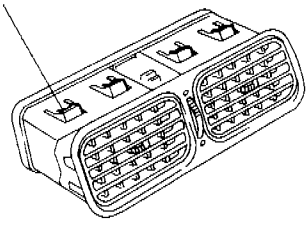

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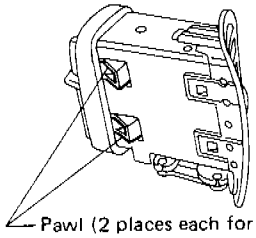

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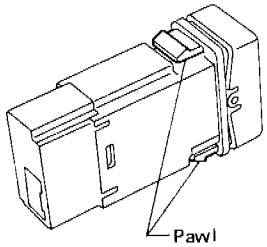

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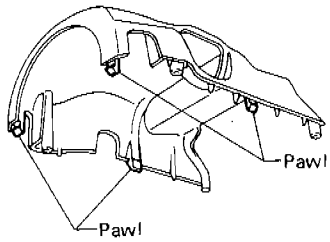

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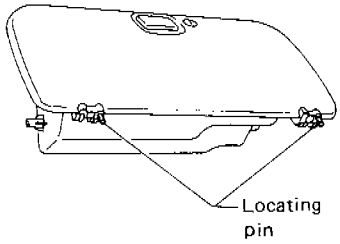

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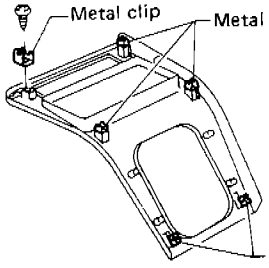
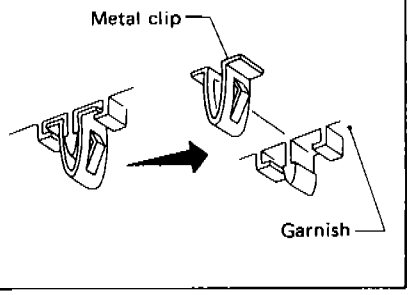


SBF178E

Interior (Cont'd)

A



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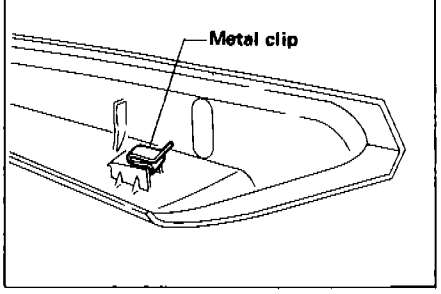

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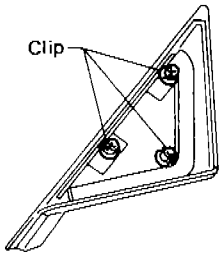

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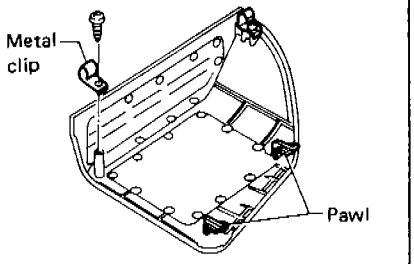
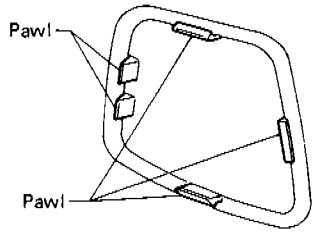


E



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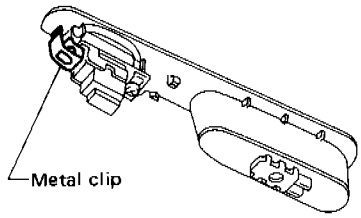

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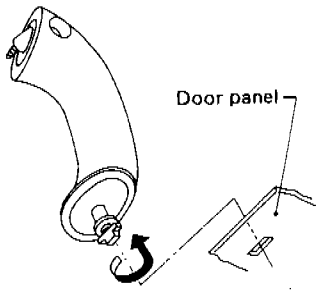
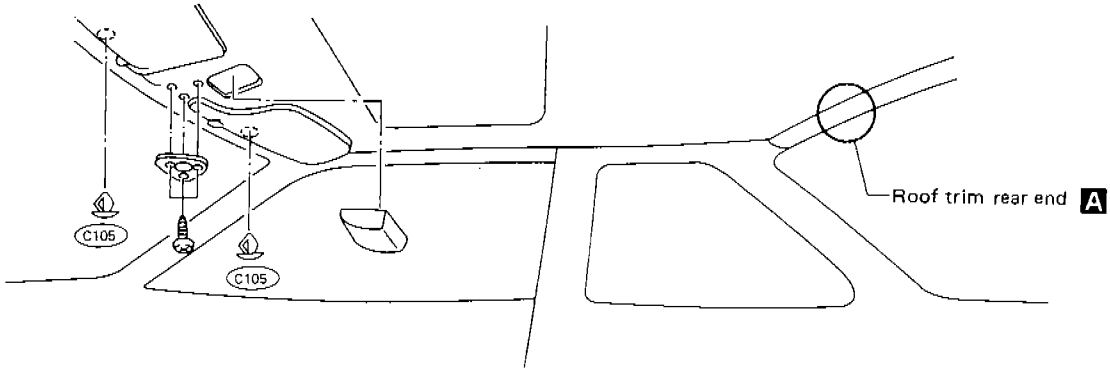
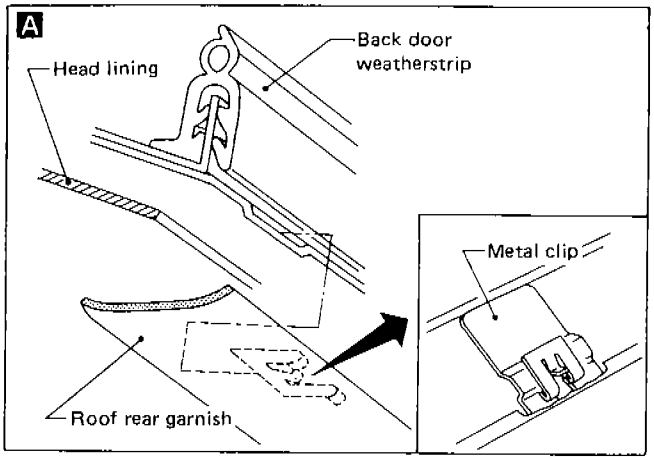


SBF434E

Interior (Cont'd)

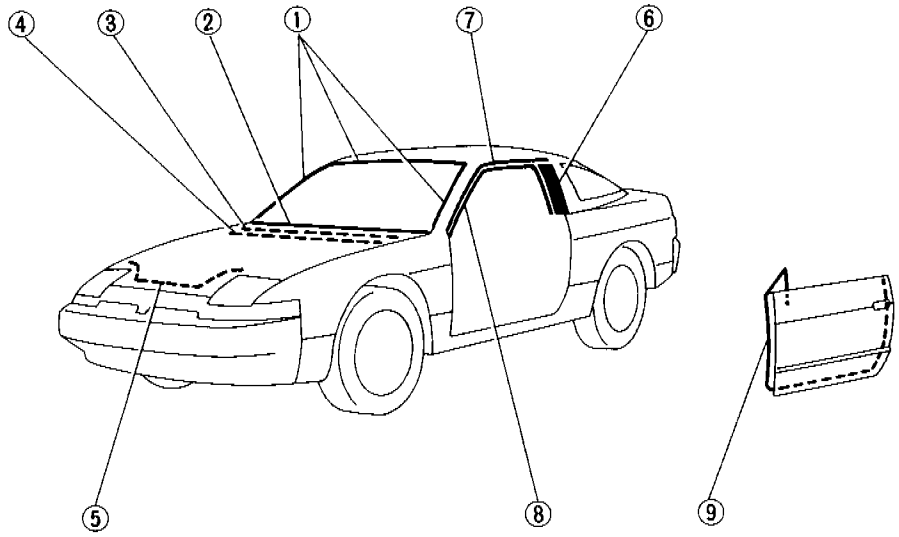
ROOF TRIM

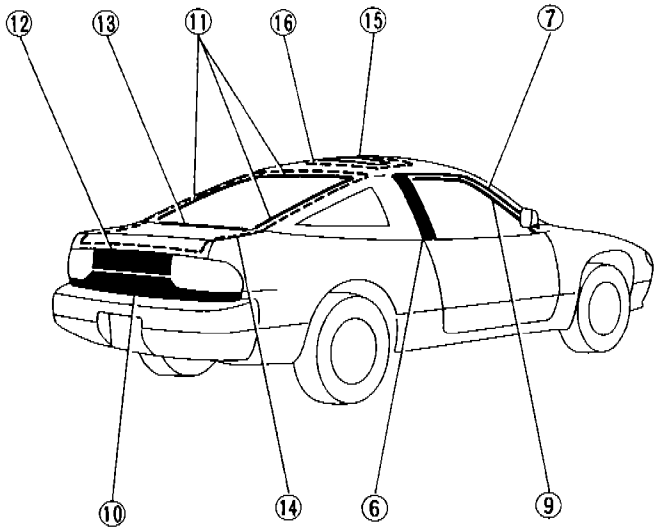




SBF387E

Exterior





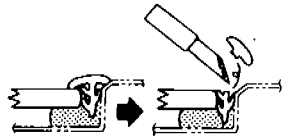
SBF388E

Exterior (Cont'd)

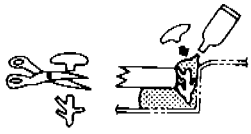
① Windshield upper and side molding

Method 1

Cut off top portion of molding and clean glass and panel surfaces.



Apply sealant to top portion of molding.

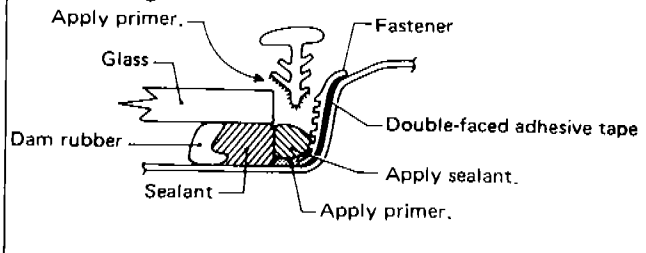


Cut off lower portion of new molding.

Finish well to give it a good appearance.

Method 2

1. Cut off sealant at glass end.
2. Clean the side on which panel was mounted.
3. Set molding fastener and apply sealant & primer to body panel, and apply primer to molding.



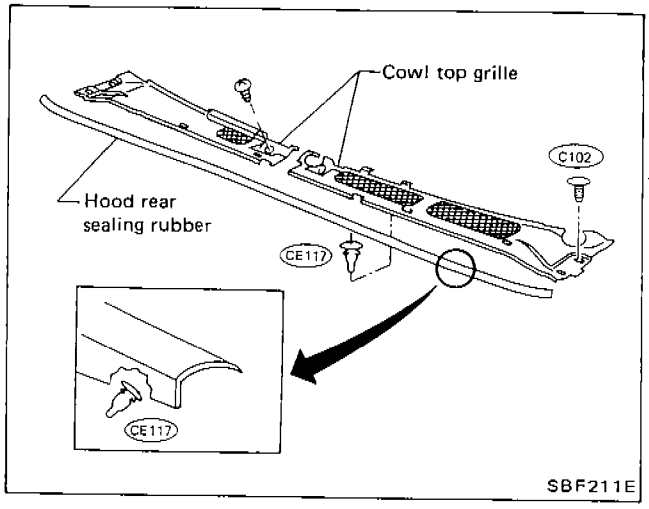
4. Install molding by aligning the molding mark located on center with vehicle center.
   Be sure to install tightly so that there is no gap around the corner.

SBF519B

② Windshield lower molding

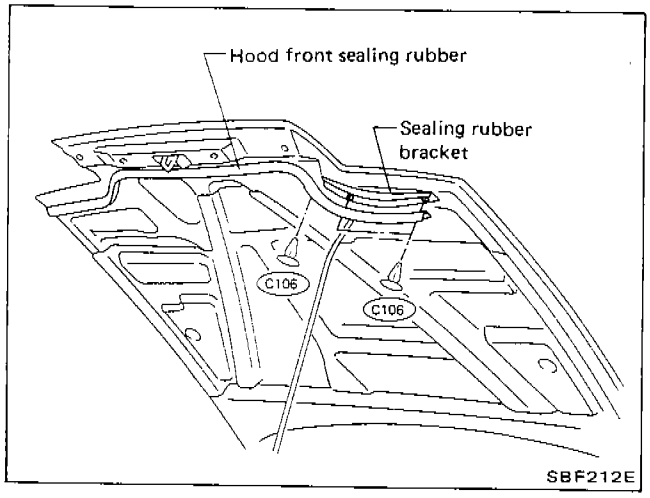
It is mounted with screws.

③, ④ Cowl top grille and hood rear sealing rubber



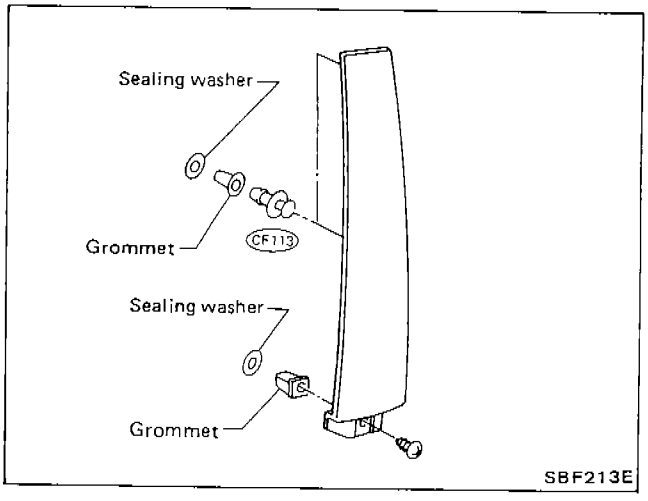
SBF211E

⑤ Hood front sealing rubber



SBF212E

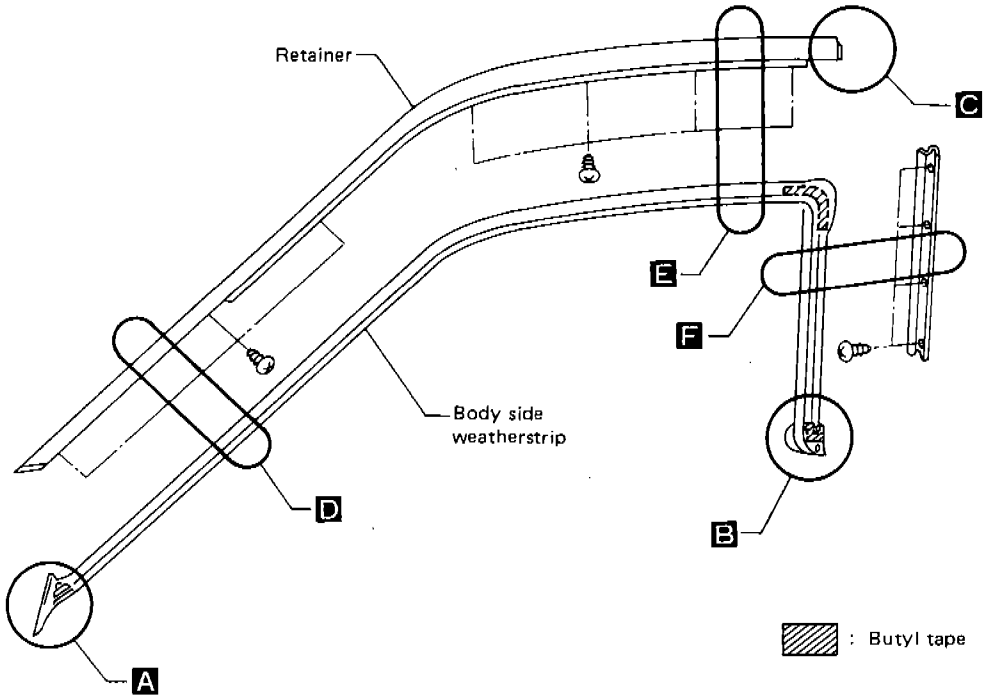
⑥ Center pillar finisher

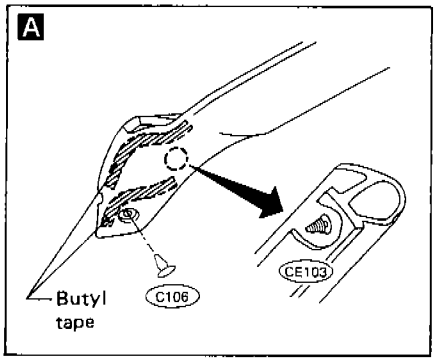


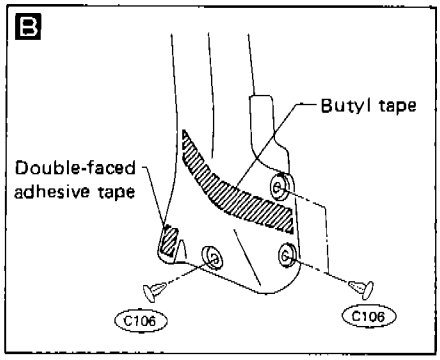
SBF213E

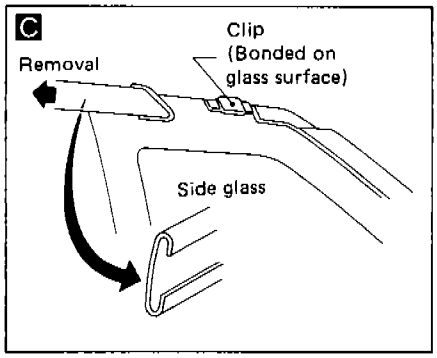
Exterior (Cont'd)

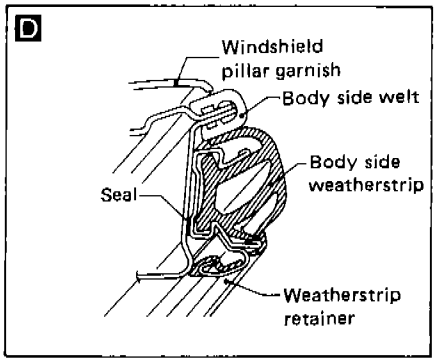
⑦, ⑧ Body side weatherstrip and weatherstrip retainer

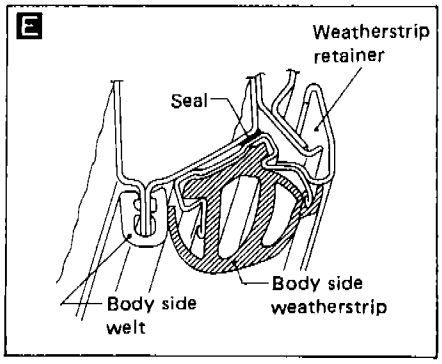


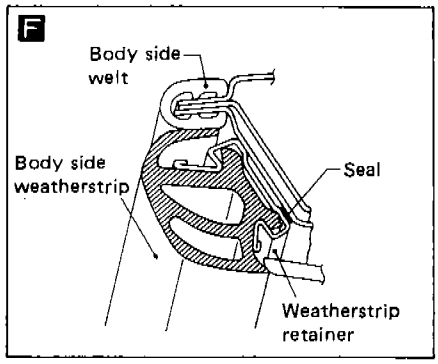






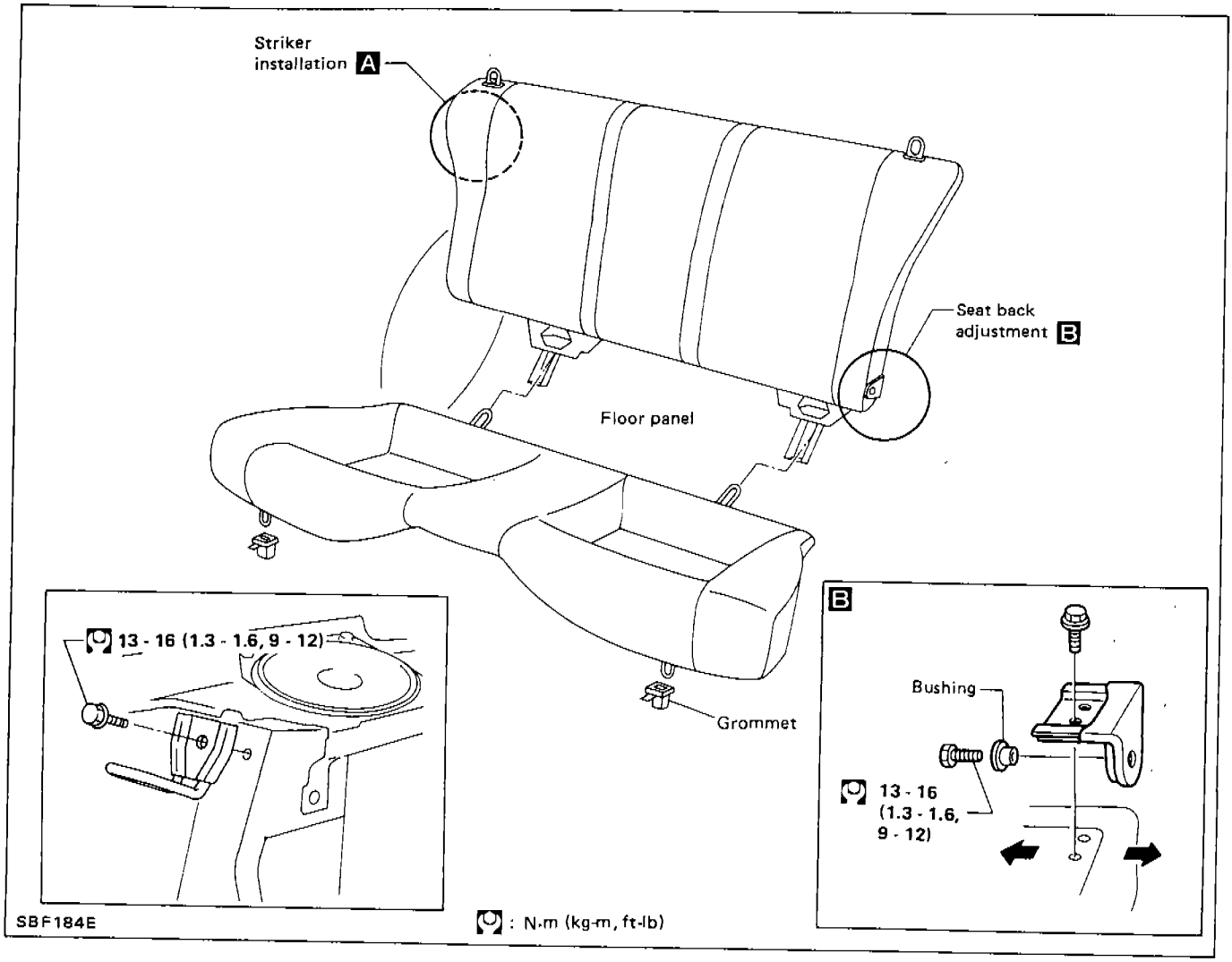


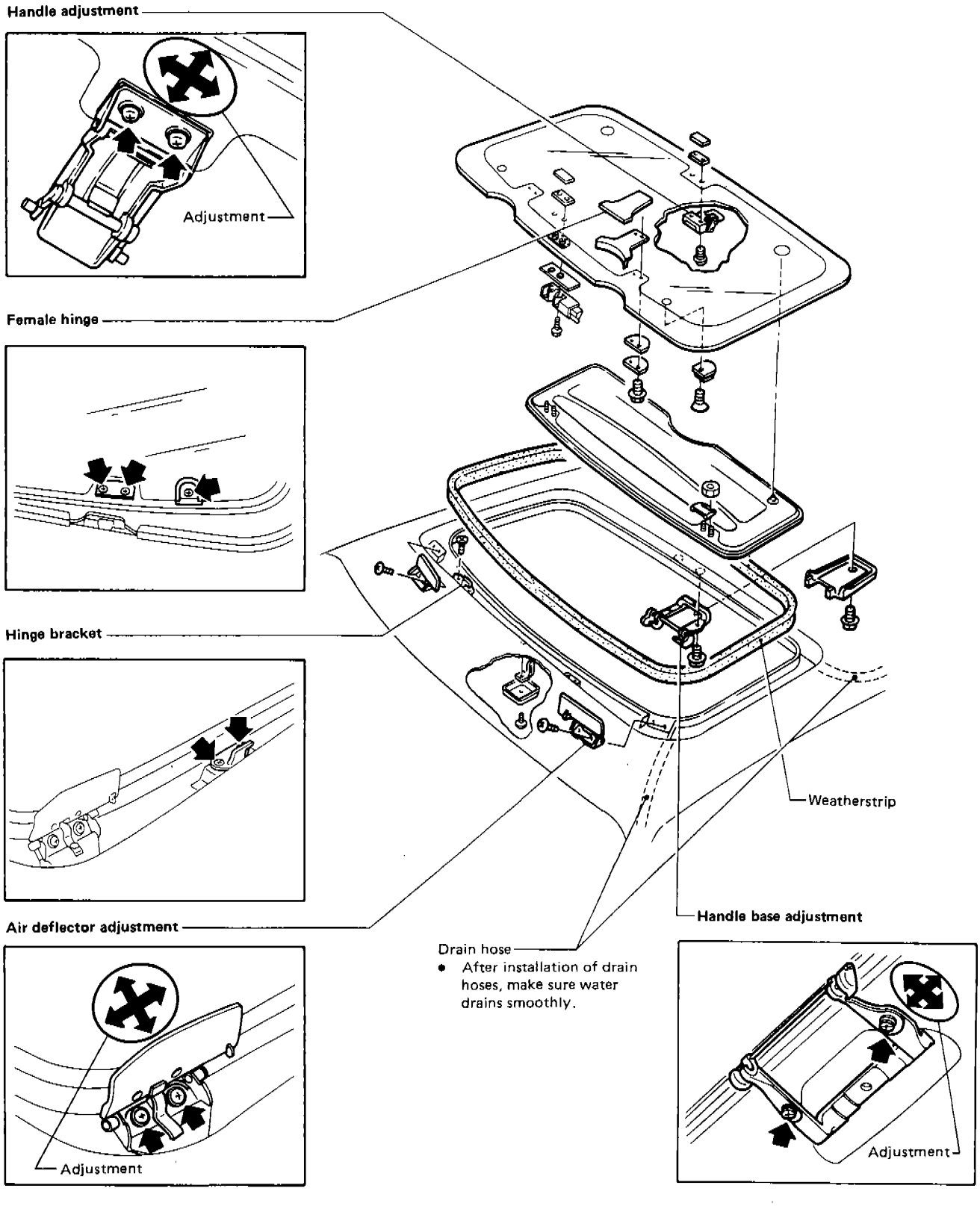




SBF214E

Rear Seat


Striker installation A
Seat back adjustment B
Floor panel
Grommet
13 - 16 (1.3 - 1.6, 9 - 12)
B
Bushing
13 - 16 (1.3 - 1.6, 9 - 12)
SBF184E
: N·m (kg-m, ft-lb)

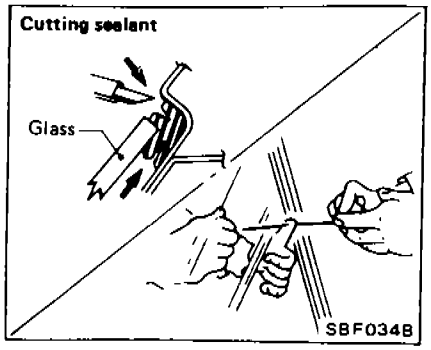

Handle adjustment
Adjustment
Female hinge
Hinge bracket
Air deflector adjustment
Adjustment
Weatherstrip
Handle base adjustment
Drain hose
• After installation of drain hoses, make sure water drains smoothly.
Adjustment

SBF186E

Windshield

REMOVAL

After removing moldings, remove glass.

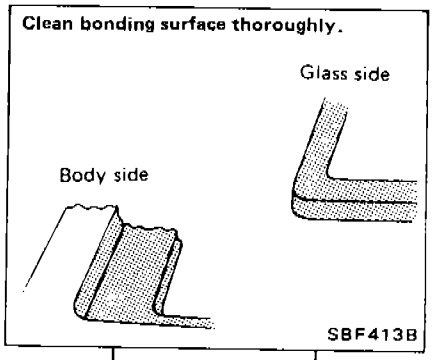


CAUTION:
Be careful not to scratch glass when removing.

INSTALLATION

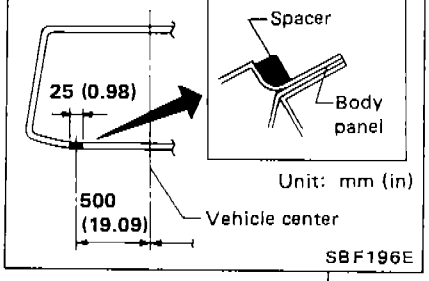
- **Use genuine Nissan Sealant kit or equivalent. Follow instructions furnished with it.**
- **After installation, the vehicle should remain stationary for about 24 hours.**
- **Do not use sealant which is more than 12 months past its production date.**
- **Do not leave cartridge unattended with its cap open.**
- Keep primers and sealant in a cool, dry place. Nissan recommends that they are stored in a refrigerator.
- **Be sure to install moldings.**

WARNING:
Keep heat or open flames away as primers are flammable.

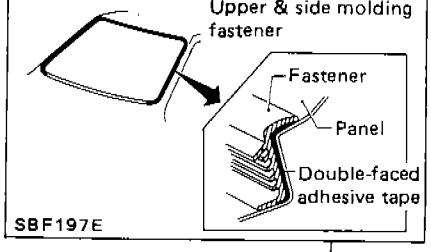


Body side

Install spacers to panel with double-faced tape.

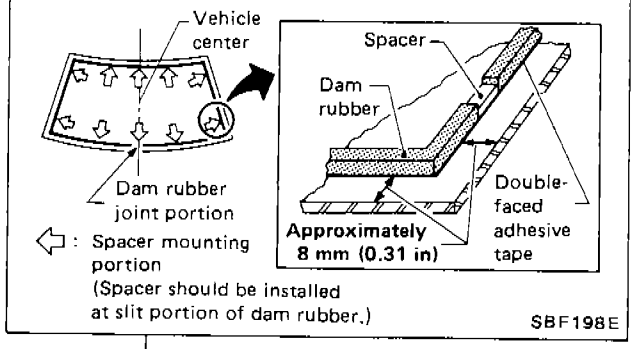


Install molding fastener.
When installing it, heat body panel and fastener to approx. 30 to 40°C (86 to 104°F).

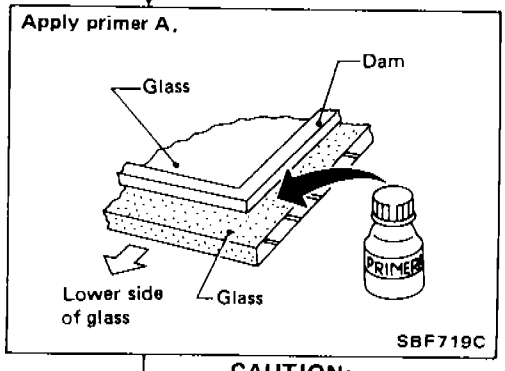


Glass side

Install dam rubber & spacers with double-faced adhesive tape.



Apply primer A.



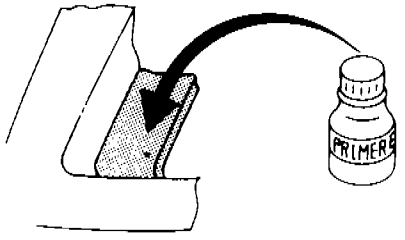
CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

Ⓐ Ⓑ

Windshield (Cont'd)

Ⓐ

Apply primer E.

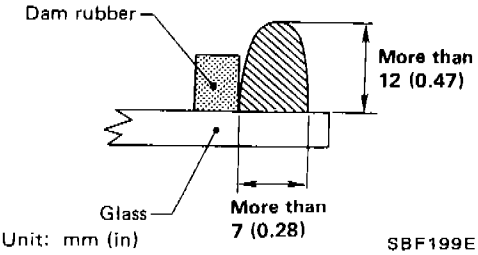


SBF038B

CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

Ⓑ

Apply sealant evenly.



Unit: mm (in)

SBF199E

CAUTION:
Windshield glass should be installed within 15 minutes of applying sealant: sealant starts to harden 15 minutes after it is applied.

Set glass in position and press glass lightly and evenly.

Check for water leakage.

CAUTION:
For sealant drying time, refer to "Drying Time for Sealant".

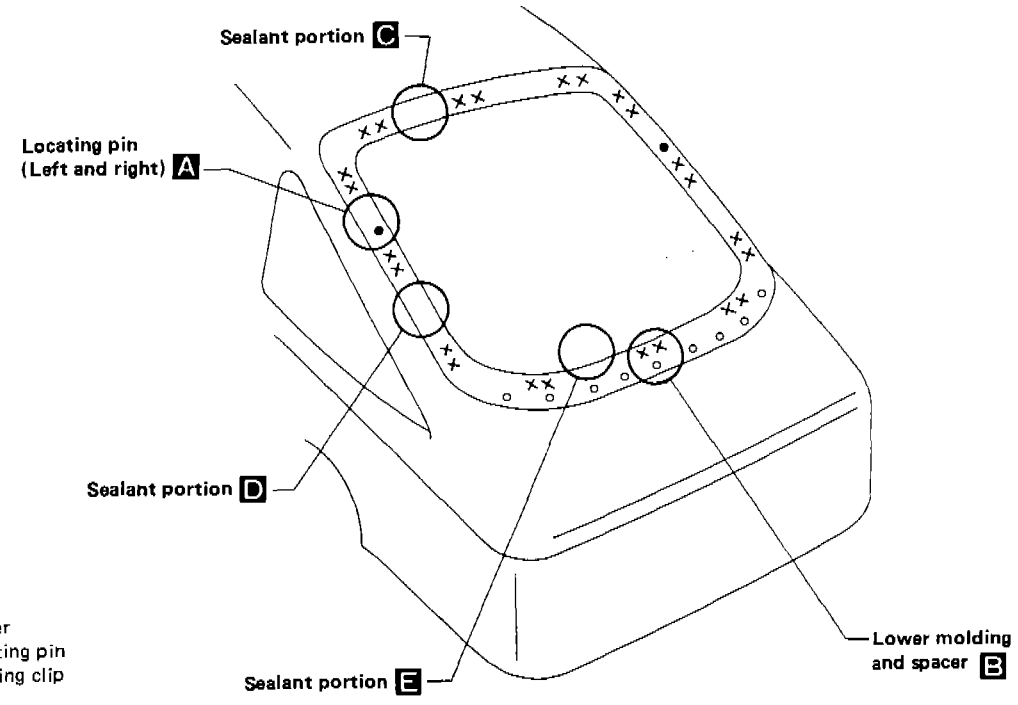
Apply sealant to upper & side molding fixing portion.

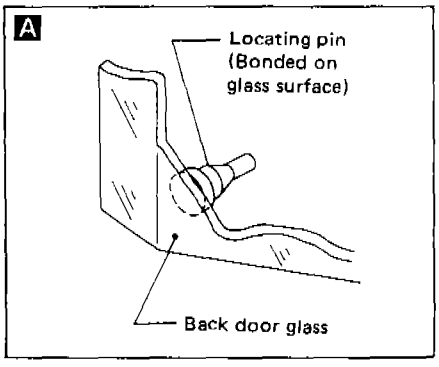
Install moldings.
(For details, refer to "Exterior".)

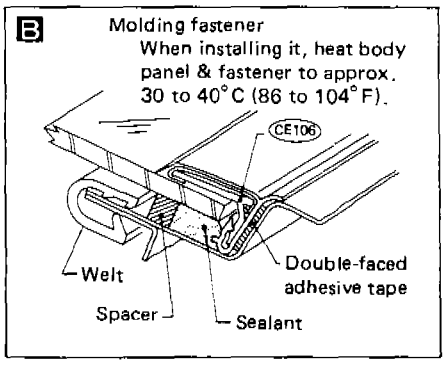
CAUTION:
Molding must be installed securely so that it is in position and leaves no gap.

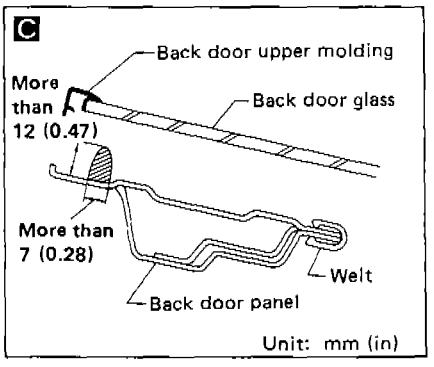
Back Door Window

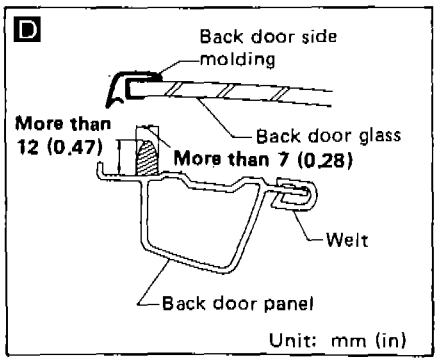
- Construction and removal/reinstallation method of back door window are basically the same as those of windshield.
- Major differences are that sealant & dam rubber are installed to back door panel instead of glass surface. Spacer position is also changed. Moreover, there are locating pins in lower portion of glass. For details, refer to following figure.
- For sealant drying period, refer to "Drying Time for Sealant".
- For details of moldings, refer to "Exterior".

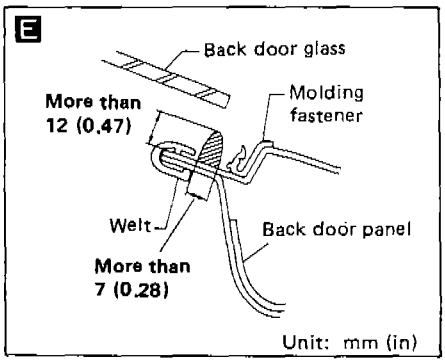




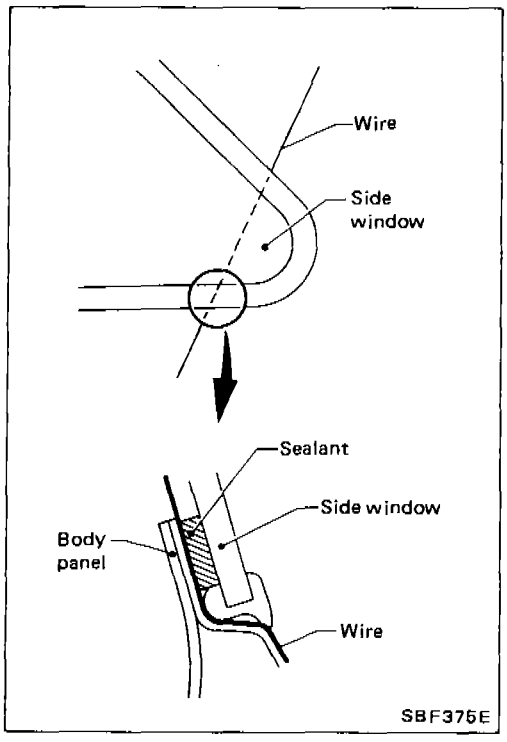








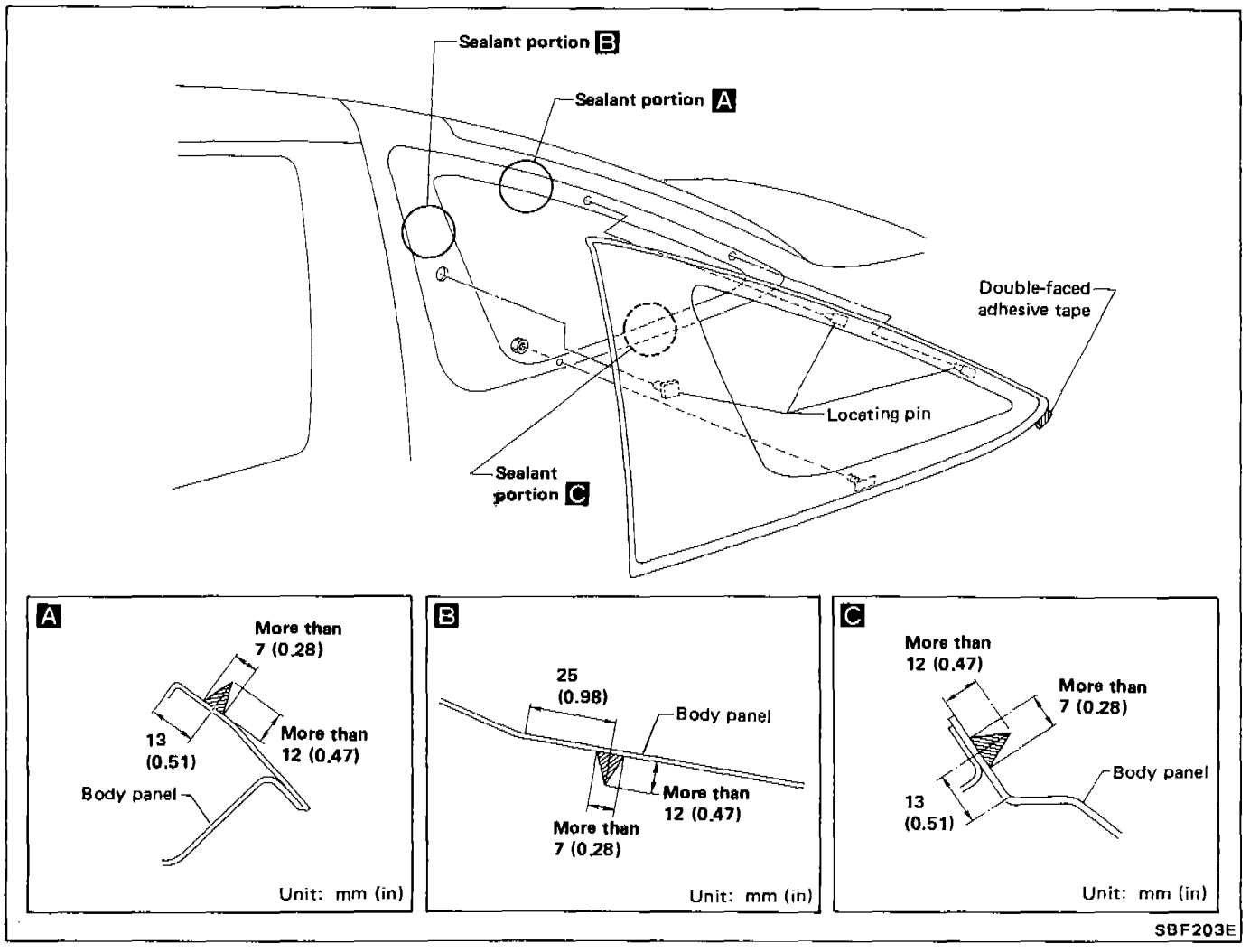
SBF201E



Side Window

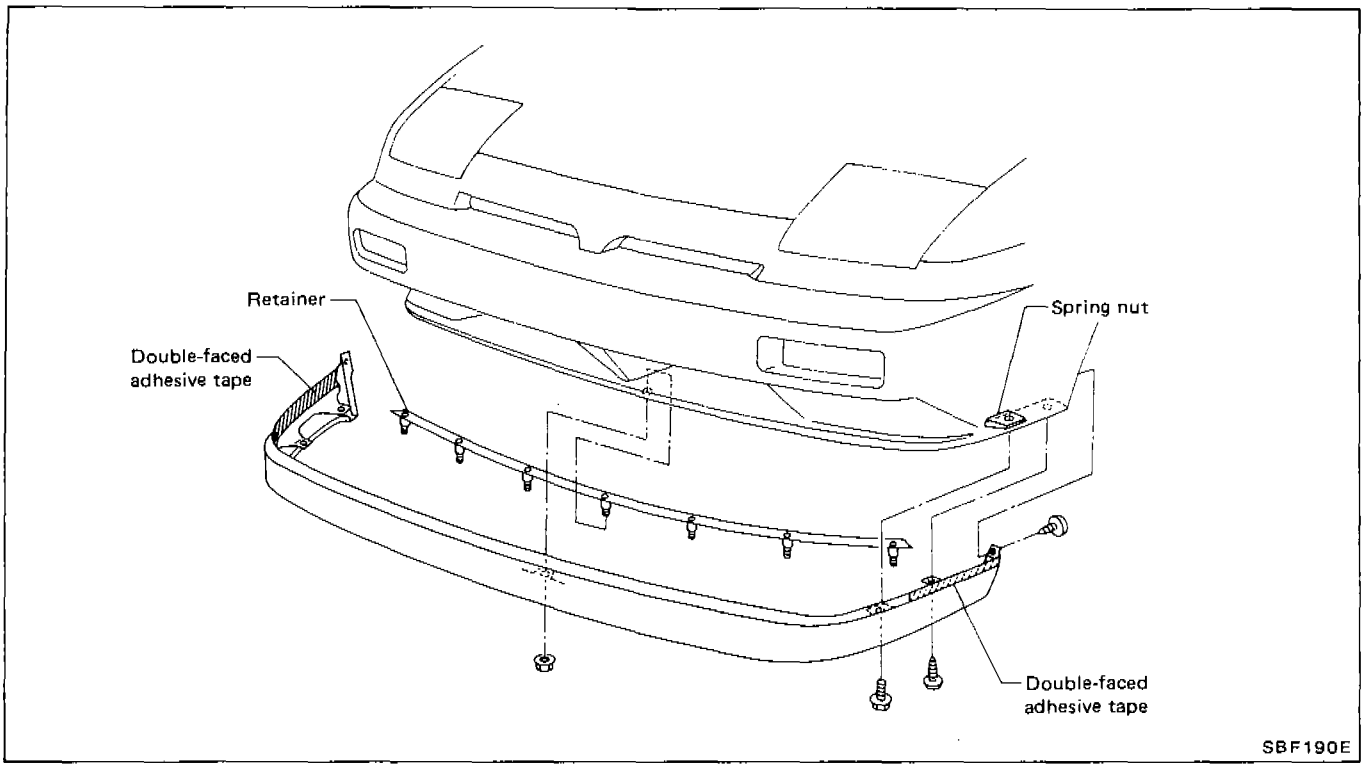
Side window is a molded type. During removal or installation, observe the following instructions.

1. Cut sealant in the same manner as that outlined under "Windshield.".
2. Be careful not to scratch molding when cutting sealant. If molding is scratched, repair.
3. Remove clips and locating pins which have been exposed from vehicle body.

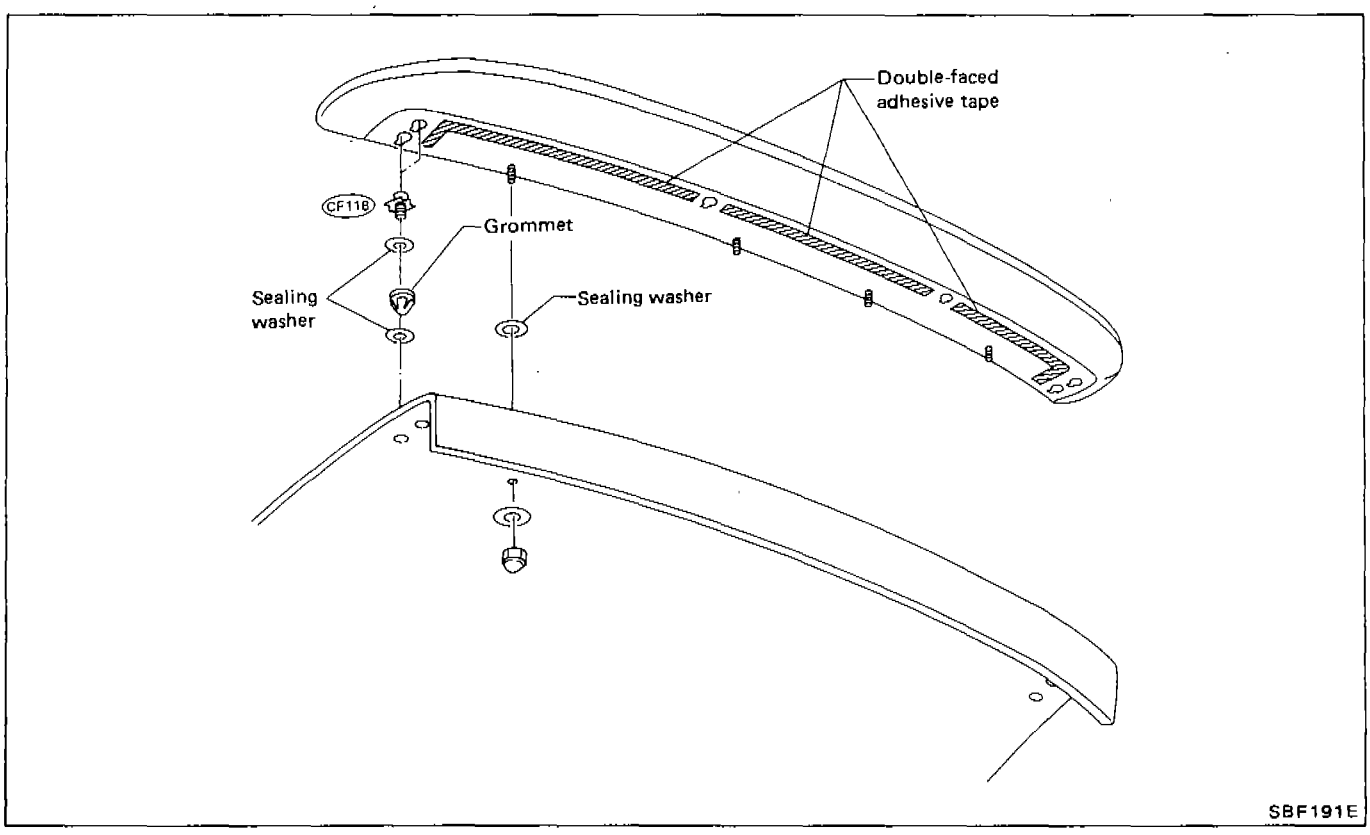


- When installing, make sure that there are not gaps or waves at ends of air spoiler.
- Before installing spoiler, clean and remove oil from surface where spoiler will be mounted.

FRONT AIR SPOILER



REAR AIR SPOILER

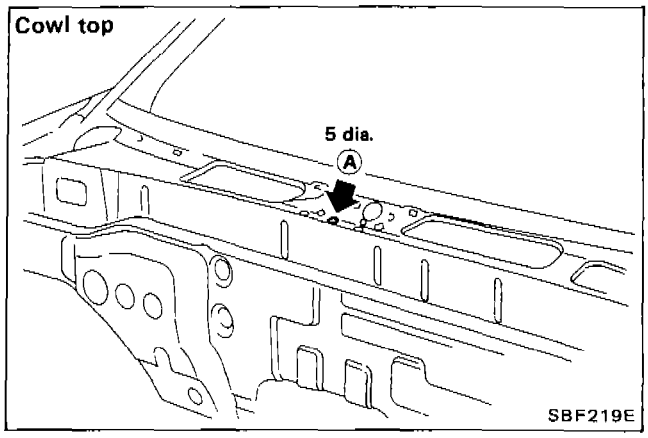


Engine Compartment (Cont'd)

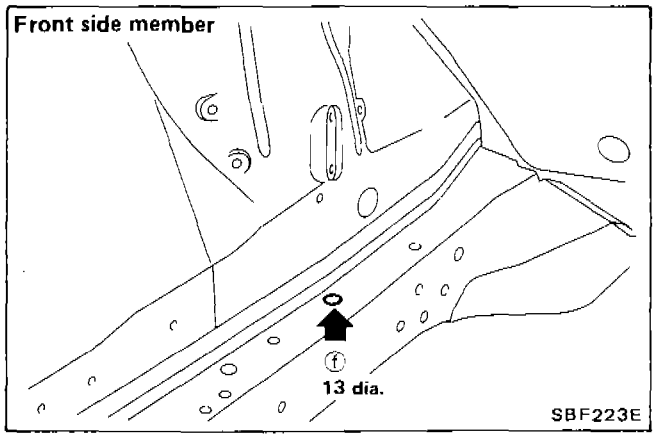
MEASUREMENT POINTS

Unit: mm

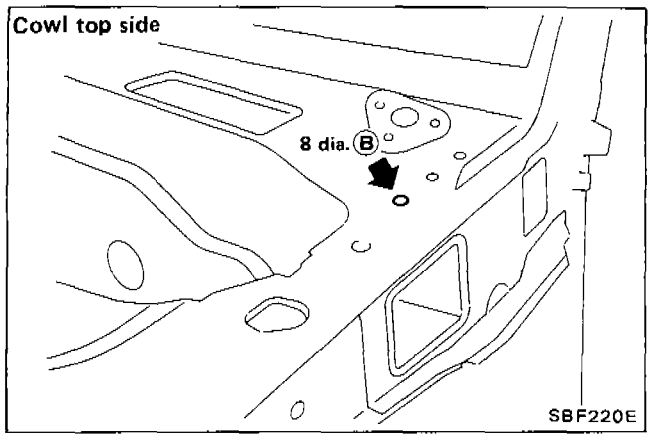
Cowl top



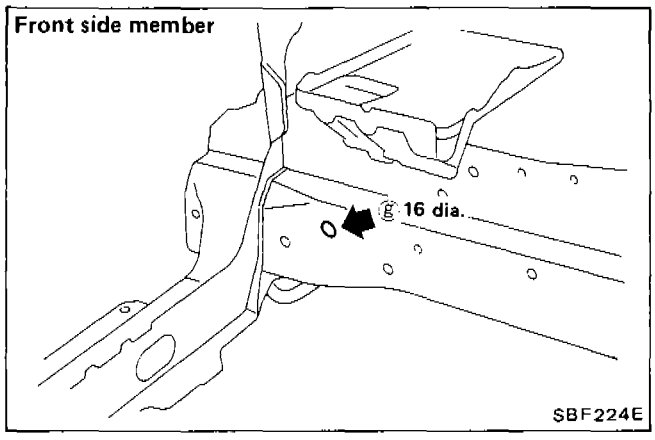
Front side member



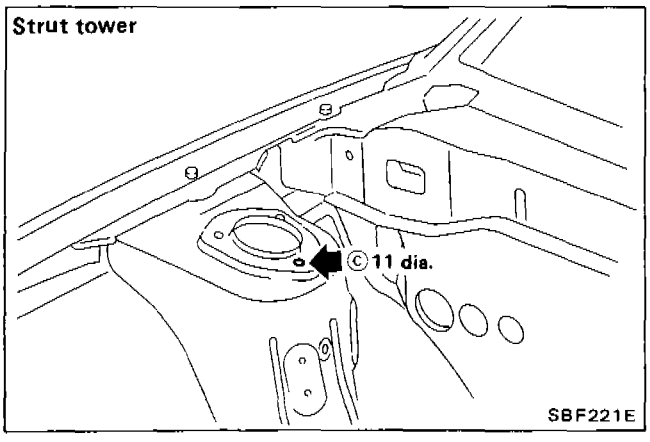
Cowl top side



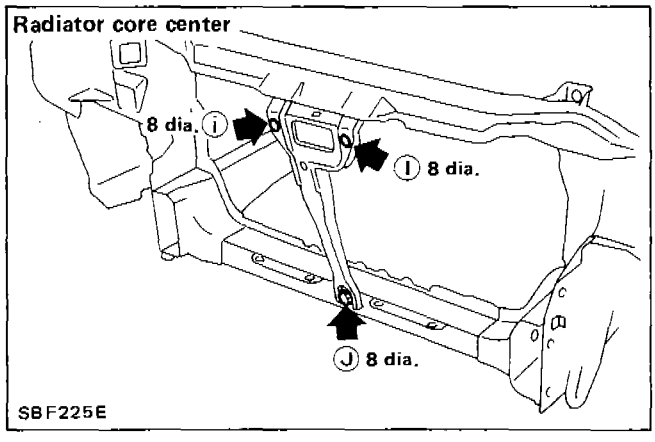
Front side member



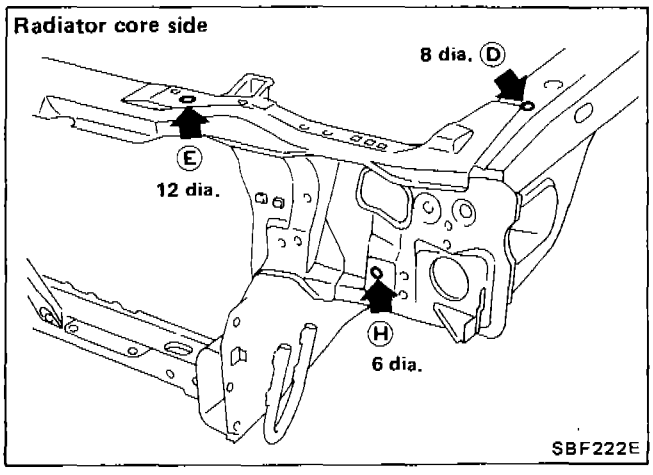
Strut tower



Radiator core center

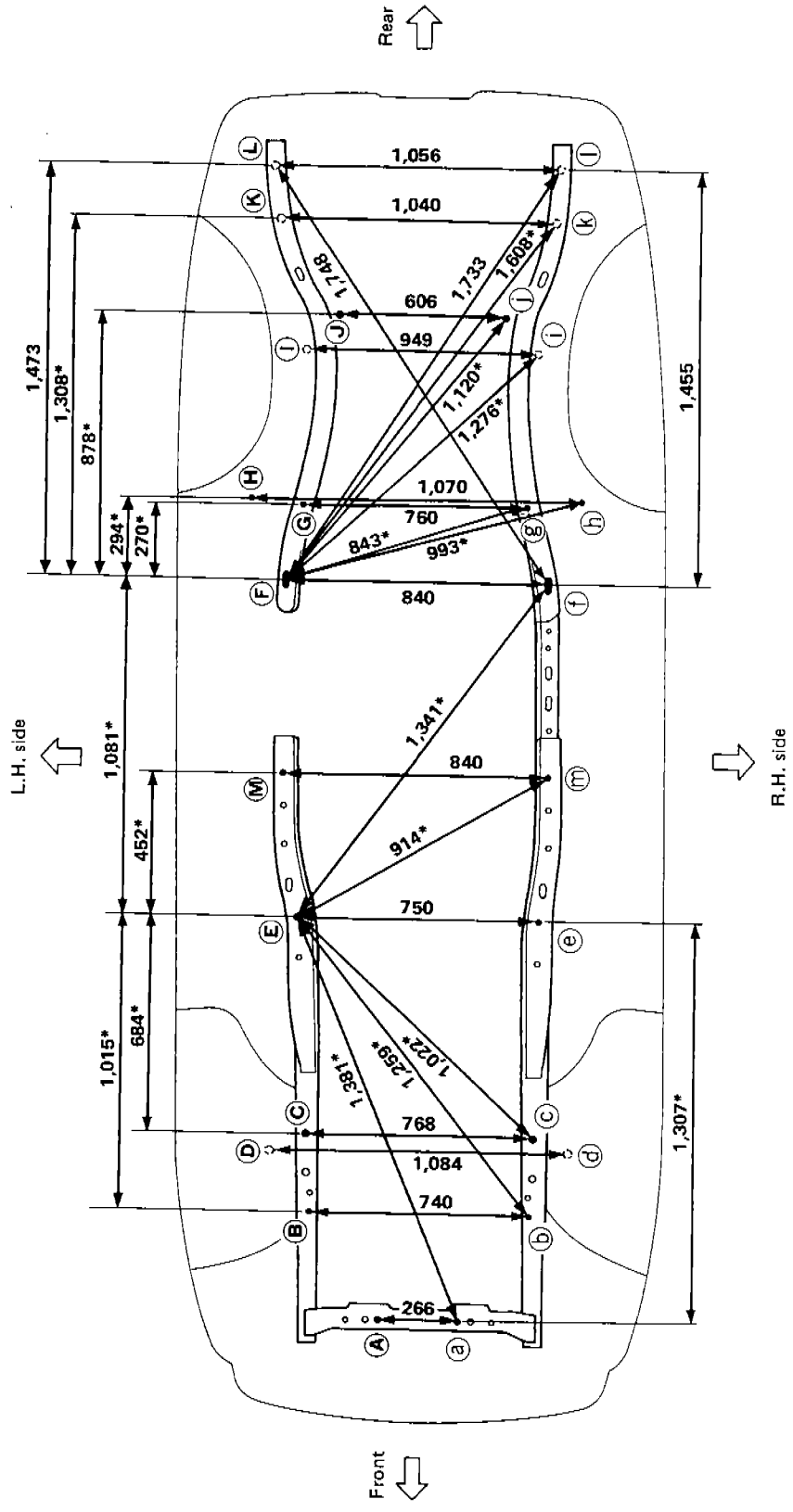


Radiator core side



Underbody

MEASUREMENT



Unit: mm

All dimensions indicated in these figures are actual ones.
(There are no projected dimensions.)

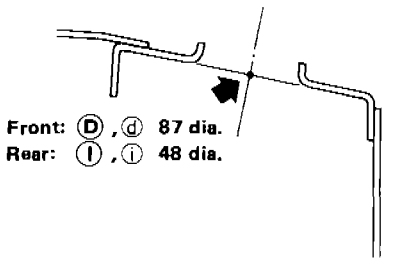
SBF389EA

Underbody (Cont'd)

Unit: mm

Front and rear strut tower centers

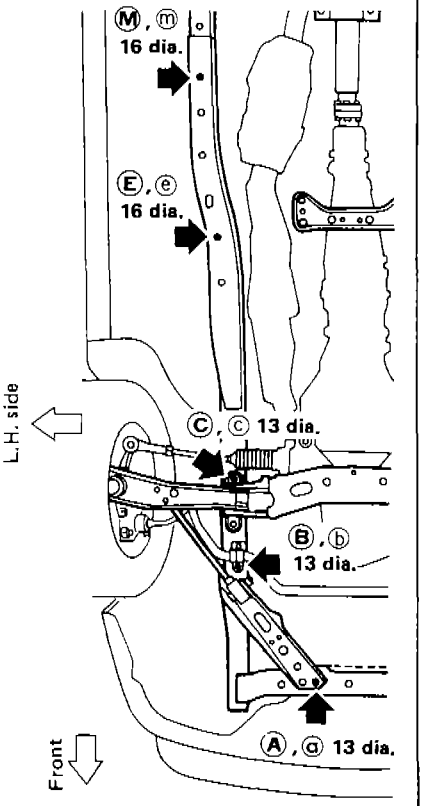
Coordinates:
Ⓓ, ⓓ
X: 542.2
Y: 63.5
Z: 725.7
Ⓘ, ⓘ
X: 474.5
Y: 2,500
Z: 658.9



SBF119C

Front side member and front extension

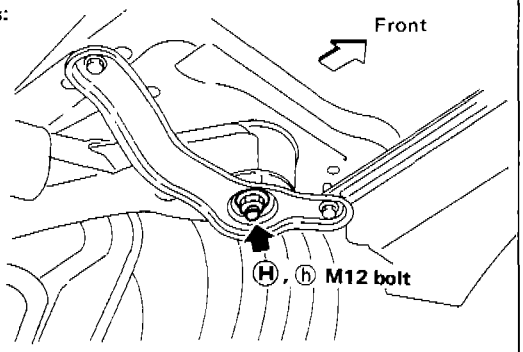
Coordinates:
Ⓐ, ⓐ
X: 132.9
Y: −582
Z: 189
Ⓑ, ⓑ
X: 370
Y: −304
Z: 255
Ⓒ, ⓒ
X: 384.2
Y: 32
Z: 255
Ⓔ, ⓔ
X: 375
Y: 700
Z: 106.2
Ⓜ, ⓜ
X: 420
Y: 1,150
Z: 106.2



SBF271E

Rear suspension member front mounting bolt threaded end

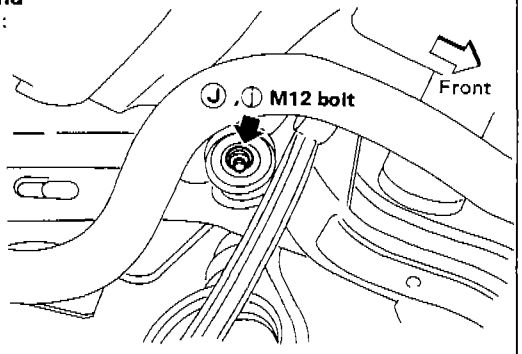
Coordinates:
Ⓗ, ⓗ
X: 535
Y: 2,050
Z: 116.3



SBF226E

Rear suspension member rear mounting bolt threaded end

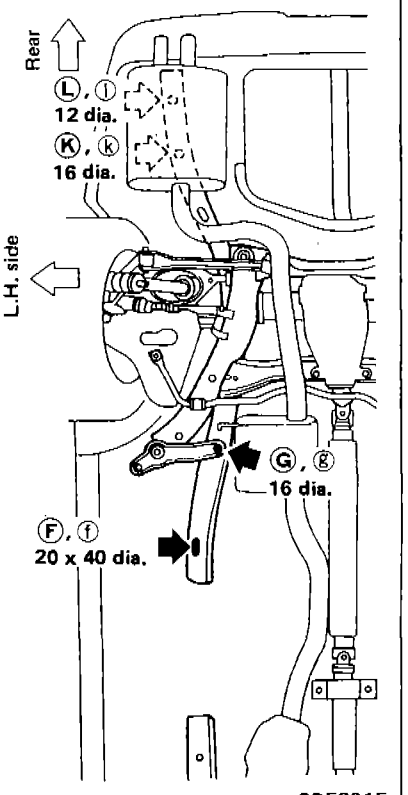
Coordinates:
Ⓙ, ⓙ
X: 303
Y: 2,635
Z: 265.8



SBF227EA

Center side member, rear side member and rear extension

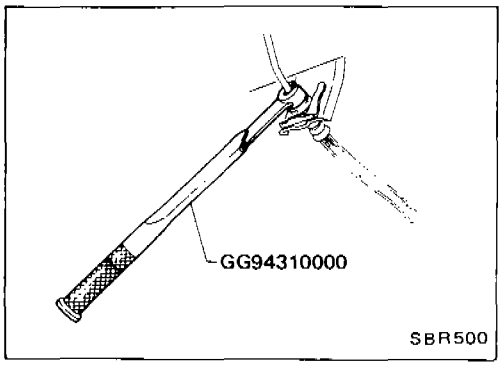
Coordinates:
Ⓕ, ⓕ
X: 420
Y: 1,780
Z: 101.5
Ⓖ, ⓖ
X: 380
Y: 2,030
Z: 195.8
Ⓚ, ⓚ
X: 520
Y: 3,050
Z: 398.8
Ⓛ
X: 528
Y: 3,221
Z: 386
ⓙ
X: 528
Y: 3,200
Z: 400



SBF391E

Precautions

- Recommended fluid is brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- To clean or wash all parts of master cylinder, disc brake caliper and wheel cylinder, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of hydraulic system.



- Use Tool when removing and installing brake tube.

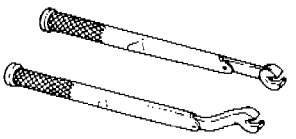
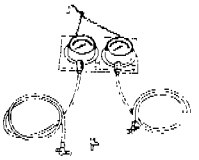
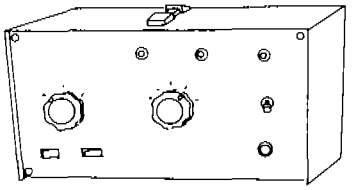
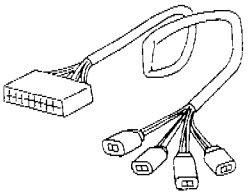
WARNING:

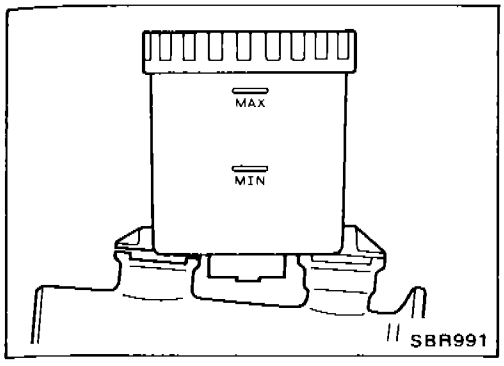
- Clean brake pads and shoes with a waste cloth, then collect dust with a dust collector.

Preparation

SPECIAL SERVICE TOOL

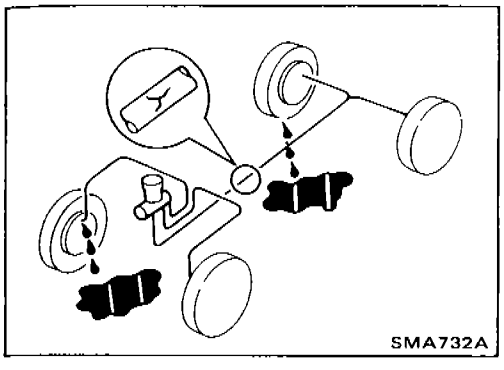
*: Special tool or commercial equivalent

Tool number Tool name	Description	
GG94310000* Flare nut torque wrench		Removing and installing each brake piping
KV991V0010* Brake fluid pressure gauge		Measuring brake fluid pressure
KV999P1000 A.B.S. checker		Checking brake fluid pressure of A.B.S. actuator
KV999P1010 A.B.S. checker adapter harness		Checking brake fluid pressure of A.B.S. actuator



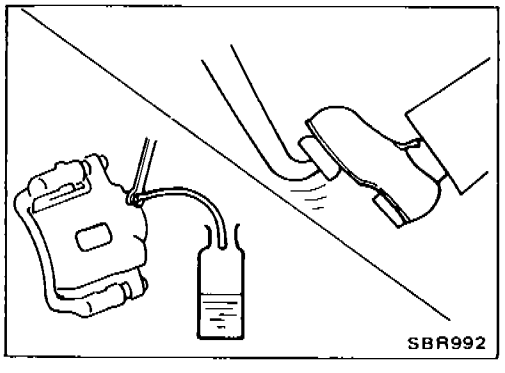
Checking Brake Fluid Level

- Check fluid level in reservoir tank. It should be between Max. and Min. lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.



Checking Brake System

- Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.
  If leakage occurs around joints, retighten or, if necessary, replace damaged parts.
- Check for oil leakage by fully depressing brake pedal.

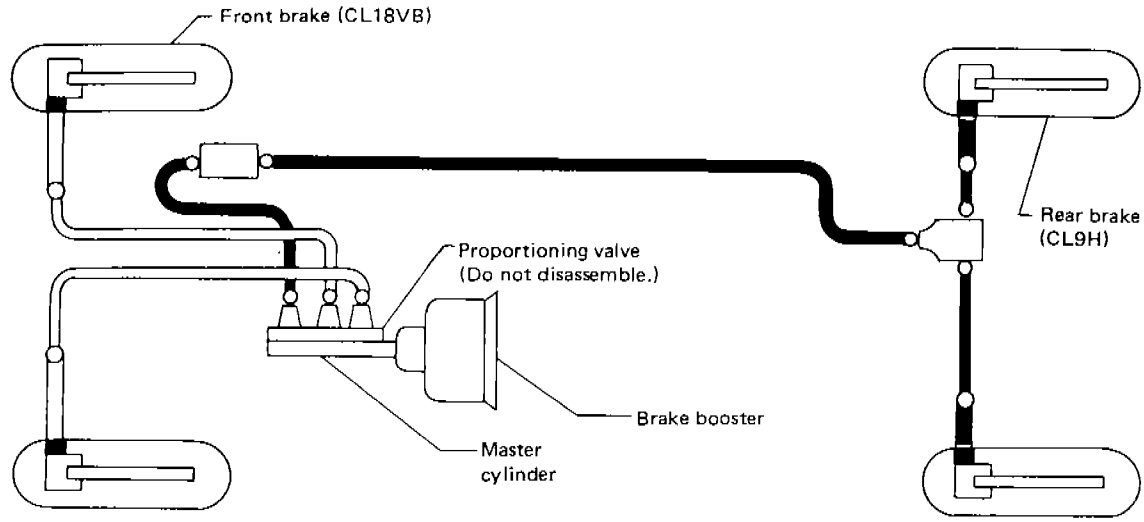


Changing Brake Fluid

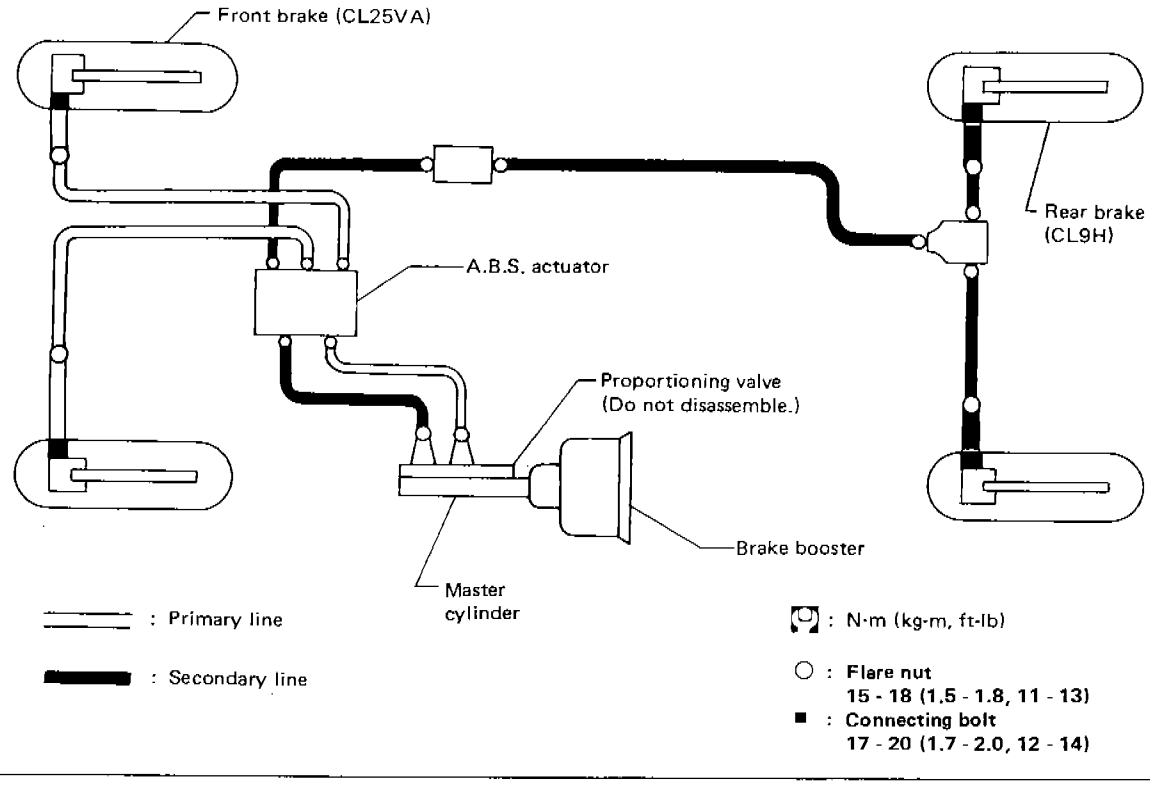
1. Drain brake fluid in each air bleeder valve.
2. Refill until new brake fluid comes out of each air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill brake fluid.
   Refer to Bleeding Procedure.

- **Refill with recommended brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**

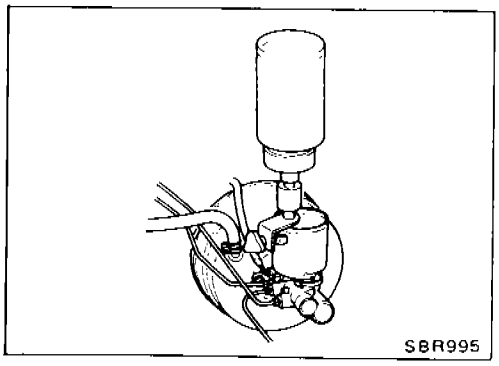
Without Anti-lock Braking System (A.B.S.)



With Anti-lock Braking System (A.B.S.)



SBR501A



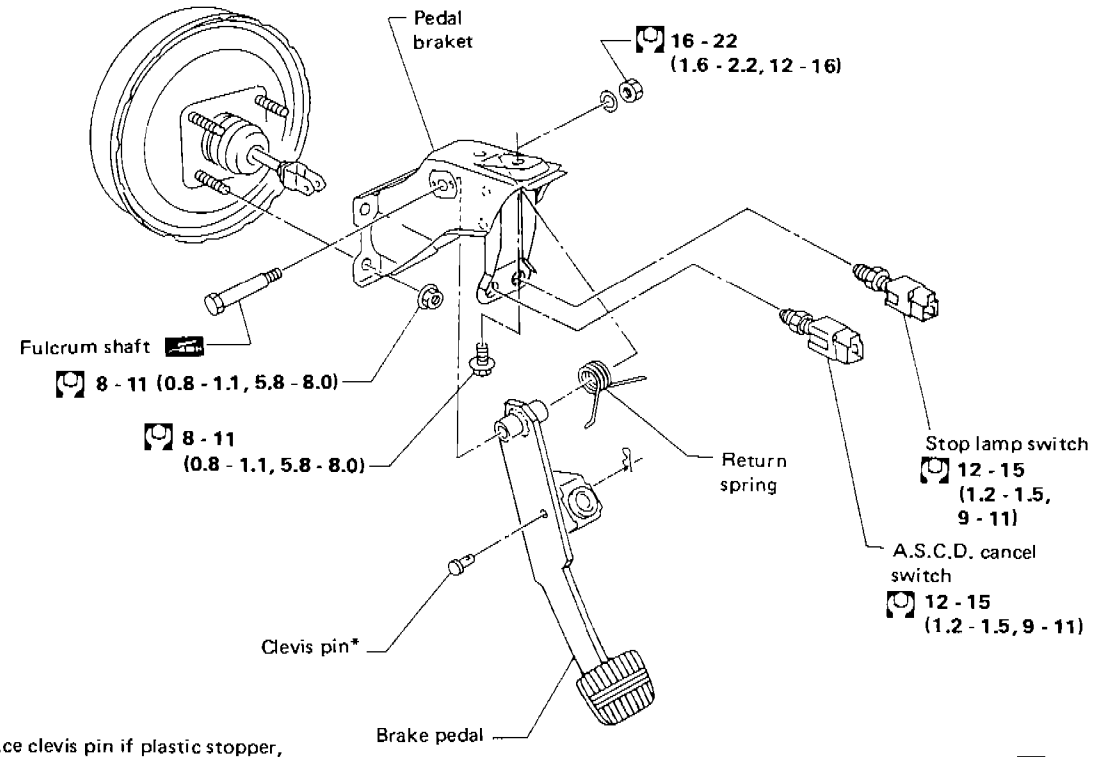
SBR995

Bleeding Procedure

CAUTION:

- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **Fill reservoir with recommended brake fluid. Make sure it is full at all times while bleeding air out of system.**
- **Place a container beneath master cylinder to avoid spillage of brake fluid.**

Removal and Installation



* Replace clevis pin if plastic stopper, which is located at the end of clevis pin, is deformed or damaged.

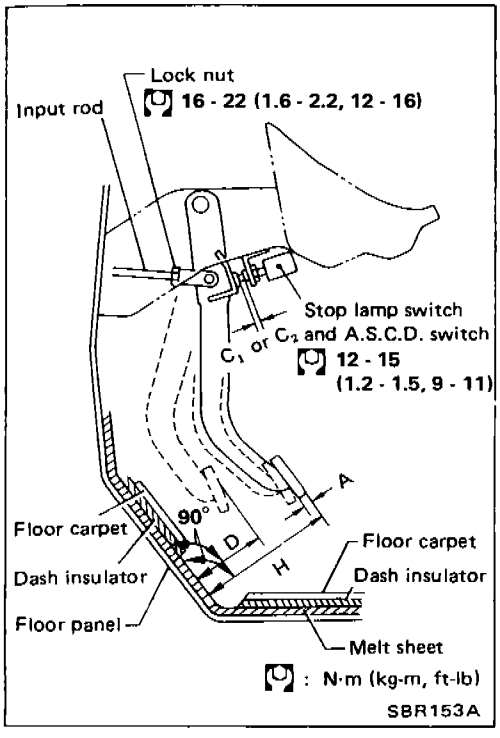
: N·m (kg-m, ft-lb)

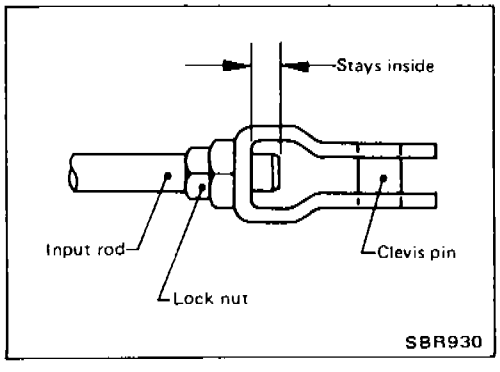
SBR472A

Inspection

Check brake pedal for following items.

- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion





Adjustment

Check brake pedal free height from dash reinforcement panel. Adjust if necessary.

H: **Free height**
Refer to S.D.S.

D: **Depressed height**
Refer to S.D.S.
Under force of 490 N (50 kg, 110 lb) with engine running

C_1: **Clearance between pedal stopper and threaded end of stop lamp switch**
0.3 - 1.0 mm (0.012 - 0.039 in)

C_2: **Clearance between pedal stopper and threaded end of A.S.C.D. switch**
0.3 - 1.0 mm (0.012 - 0.039 in)

A: **Pedal free play**
1 - 3 mm (0.04 - 0.12 in)

1. Adjust pedal free height with brake booster input rod. Then tighten lock nut.

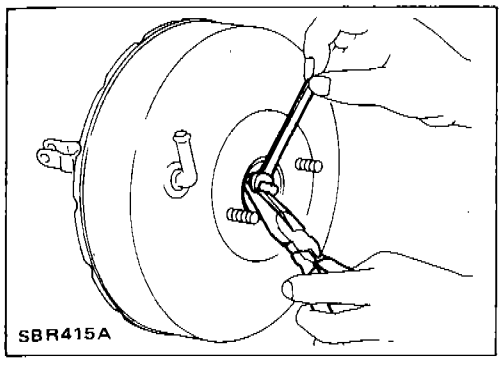
Make sure that tip of input rod stays inside.

2. Adjust clearance "C_1" and "C_2" with stop lamp switch and A.S.C.D. switch respectively. Then tighten lock nuts.
3. Check pedal free play.

Make sure that stop lamp is off when pedal is released.

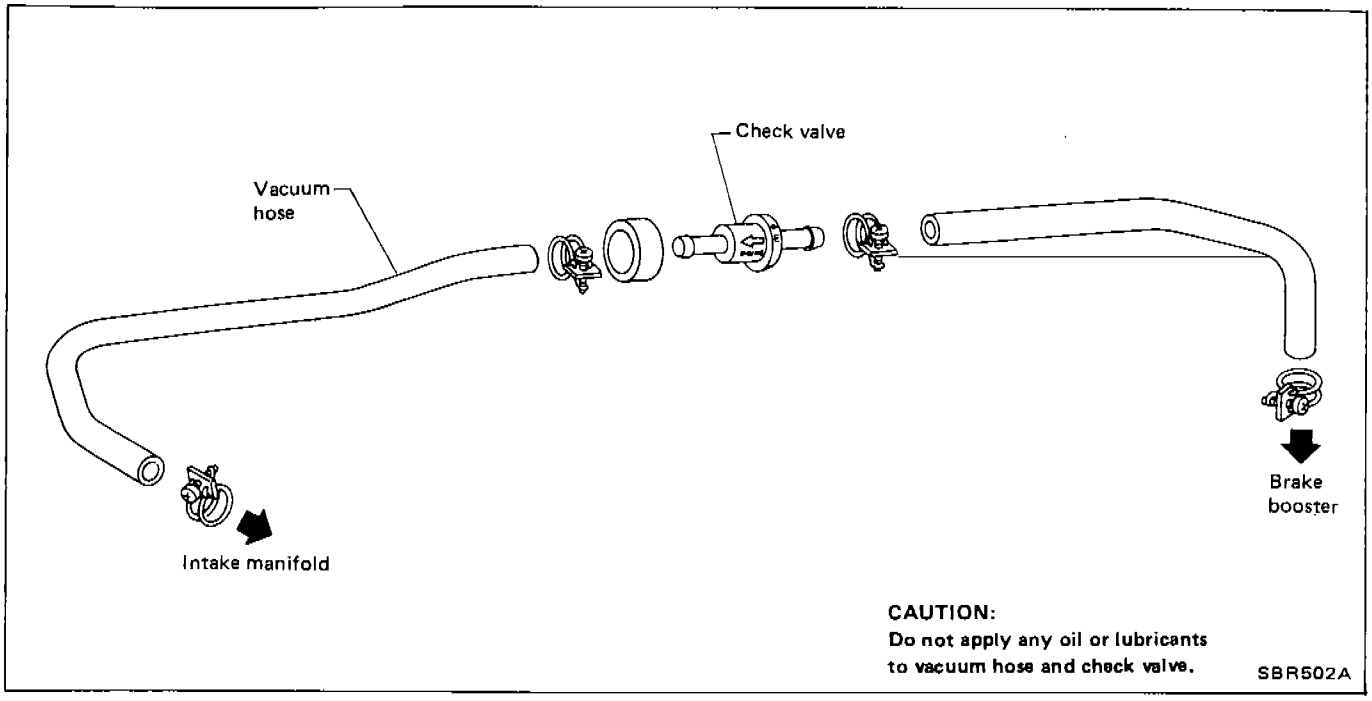
4. Check brake pedal's depressed height while engine is running.
   If depressed height is below specified value, check brake system for leaks, accumulation of air or any damage to components (master cylinder, wheel cylinder, etc.); then make necessary repairs.

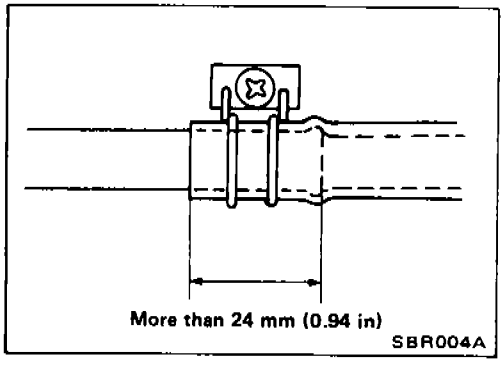
Inspection (Cont'd)


SBR415A

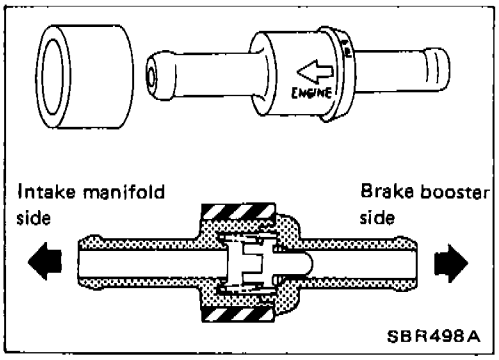
3. Adjust rod length if necessary.
4. If rod length is without specification, replace brake booster.

Removal and Installation

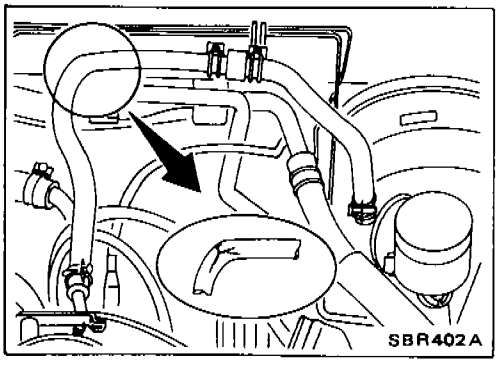




- Insert vacuum tube into vacuum hose more than 24 mm (0.94 in).



- Install check valve, paying attention to its direction.



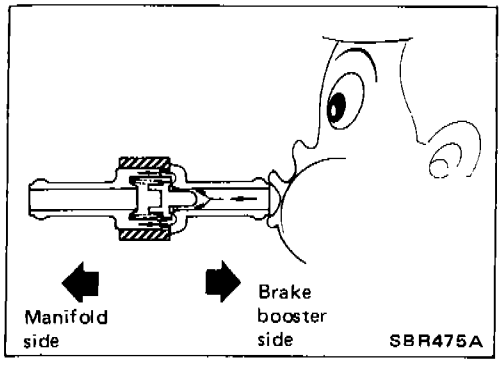
Inspection

HOSES AND CONNECTORS

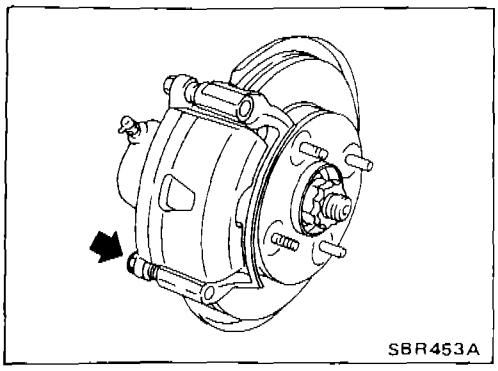
- Check vacuum lines, connections and check valve for airtightness, improper attachment chafing and deterioration.

Inspection (Cont'd)

CHECK VALVE

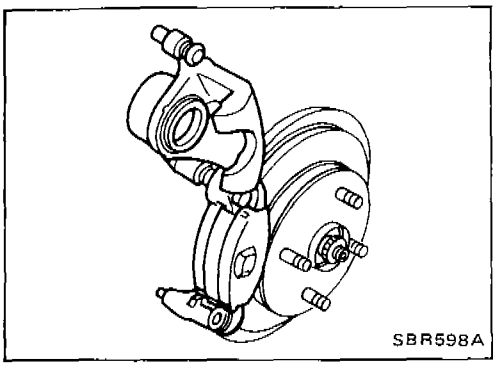


- When pressure is applied to brake booster side of check valve and valve does not open, replace check valve with a new one.


SBR453A

Pad Replacement

1. Remove pin bolt.

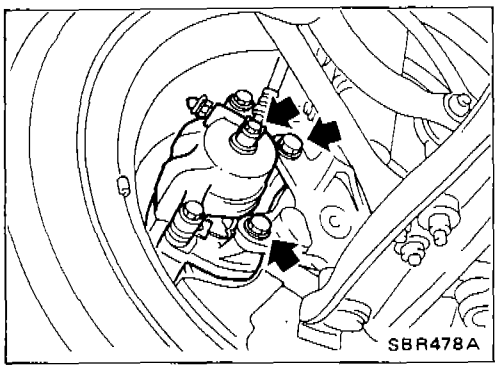

SBR598A

2. Swing cylinder body upward. Then remove pad retainer, and inner and outer shims.

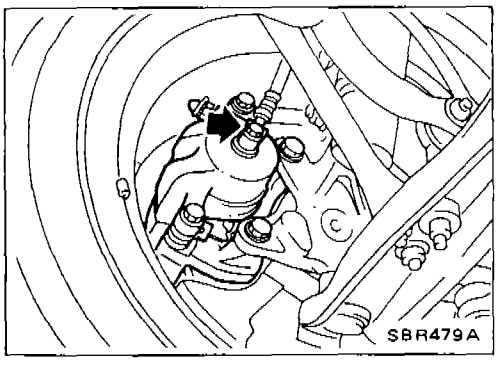
CAUTION:

- **When cylinder body is swung up, do not depress brake pedal because piston will pop out.**
- **Be careful not to damage dust seal or get oil on rotor. Always replace shims when replacing pads.**

Removal and Installation


SBR478A

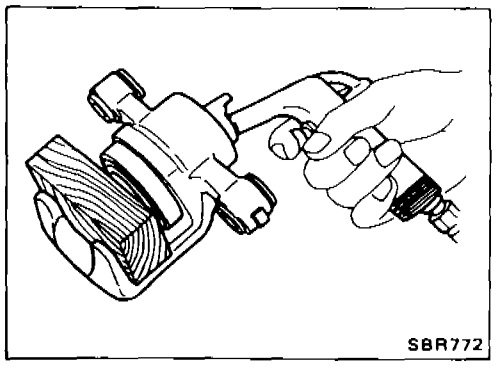
- Remove torque member fixing bolts and union bolt.


SBR479A

- Install brake hose to caliper at protrusions securely.

Disassembly

Push out piston with dust seal using compressed air.


SBR772

Inspection

CYLINDER BODY

- Check inside surface of cylinder for scoring, rust, wear, damage or foreign materials. Replace if any such condition exists.
- Eliminate minor damage from rust or foreign materials by polishing surface with fine emery paper.

CAUTION:
Use brake fluid to clean.

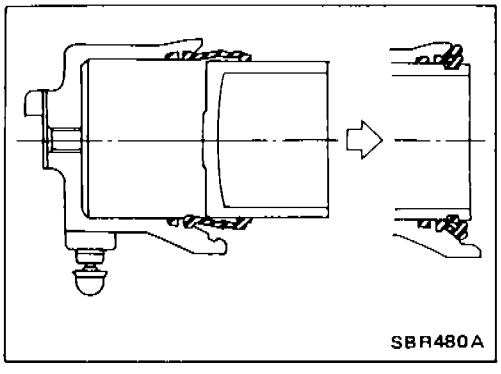
PISTON

Check piston for scoring, rust, wear, damage or foreign materials. Replace if any condition exists.

CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

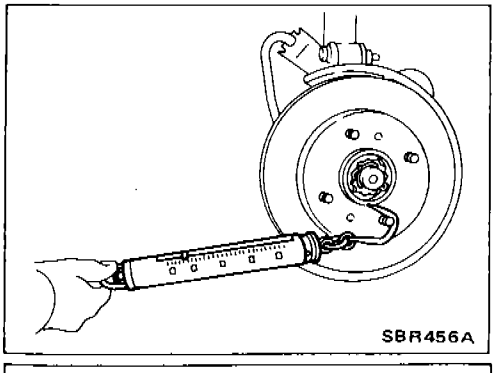
PIN, PIN BOLT AND PIN BOOT

Check for wear, cracks or other damage. Replace if any condition exists.


SBR480A

Assembly

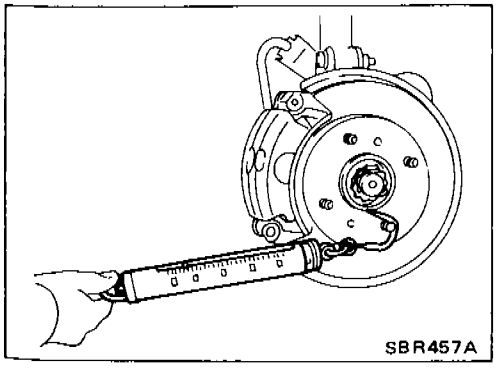
- Place piston boot over rear of piston. Fit piston boot's lip properly in corresponding groove on cylinder body.
- Insert piston into cylinder body and fit boot's lip properly in corresponding groove on piston.


SBR456A

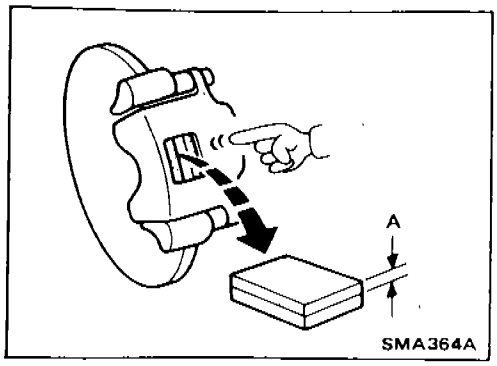
Inspection (On-vehicle)

INSPECTION OF BRAKE DRAG FORCE

1. Swing cylinder body upward.
2. Make sure that wheel bearing is adjusted properly. Refer to section FA.
3. Measure rotating force (F_1).


SBR457A

4. Install caliper with pads to original position.
5. Depress brake pedal for 5 seconds.
6. Release brake pedal and rotate disc rotor 10 revolutions.
7. Measure rotating force (F_2).
8. Calculate brake drag force by subtracting F_1 from F_2.
   Maximum brake drag force ($F_2 - F_1$):
   59.8 N (6.1 kg, 13.5 lb)
   If it is not within specification, check main pins and retainer boots in caliper.



Inspection (On-vehicle) (Cont'd)

DISC PAD

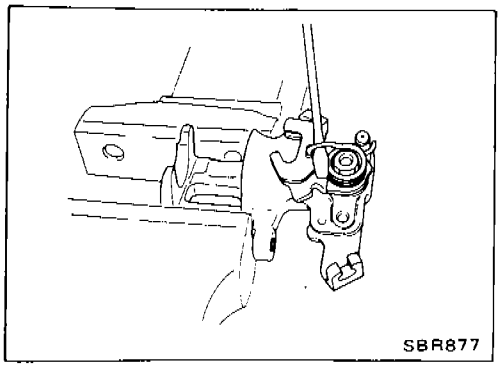
Check disc pad for wear or damage.

CL18VB:

Pad standard thickness (A)
10.0 mm (0.394 in)
Pad wear limit (A)
2.0 mm (0.079 in)

CL25VA:

Pad standard thickness (A)
11.0 mm (0.433 in)
Pad wear limit (A)
2.0 mm (0.079 in)


SBR877

Disassembly (Cont'd)

4. Remove return spring and lever.

Inspection

CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear or other damage.
- Minor damage from rust of foreign materials may be eliminated by polishing surface with a fine emery paper. Replace if necessary.

CAUTION:
Use brake fluid to clean.

TORQUE MEMBER

Check for wear, cracks or other damage. Replace if necessary.

PISTON

Check piston for score, rust, wear or other damage. Replace if necessary.

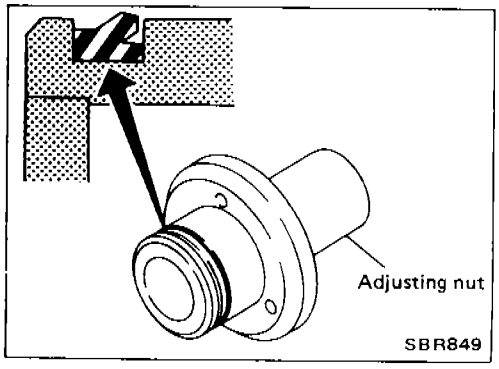
CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface.

PIN AND PIN BOOT

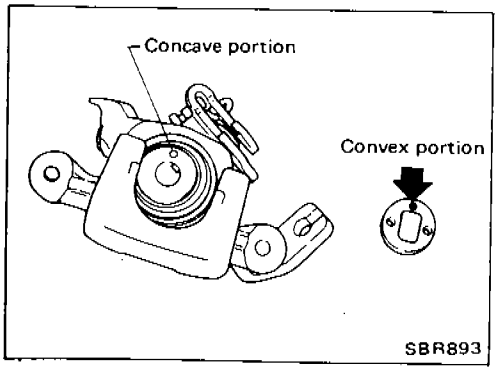
Check for wear, cracks or other damage. Replace if necessary.

Assembly

- Install cup securely in the specified direction.



SBR849



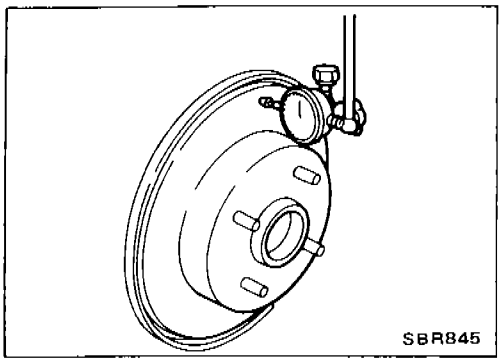
SBR893

- Fit push rod into square hole in key plate. Also match convex portion of key plate with concave portion of cylinder.

Inspection

RUBBING SURFACE

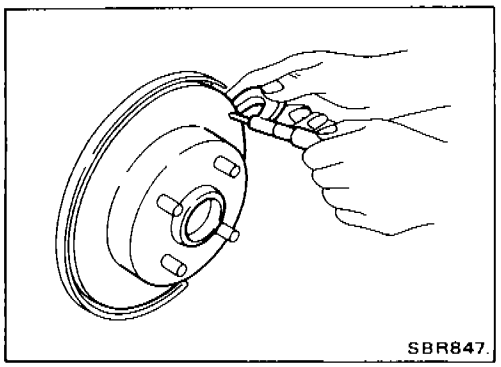
Check rotor for roughness, cracks or chips.



RUNOUT

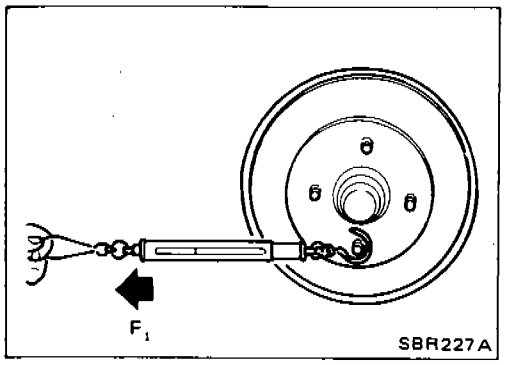
- Check runout using a dial indicator.
- Make sure that axial end play is within the specifications before measuring. Refer to section RA.

Rotor repair limit:
Maximum runout
(Total indicator reading at center of rotor pad contact surface)
0.07 mm (0.0028 in)



THICKNESS

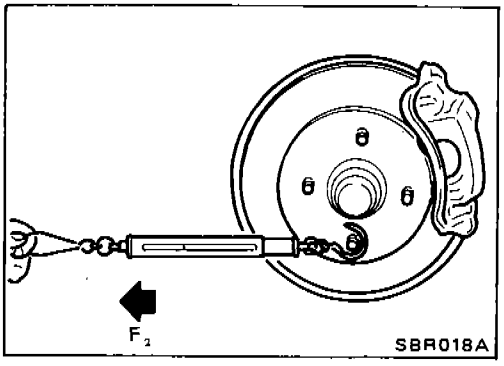
Rotor repair limit:
Minimum thickness
8.0 mm (0.315 in)



Inspection

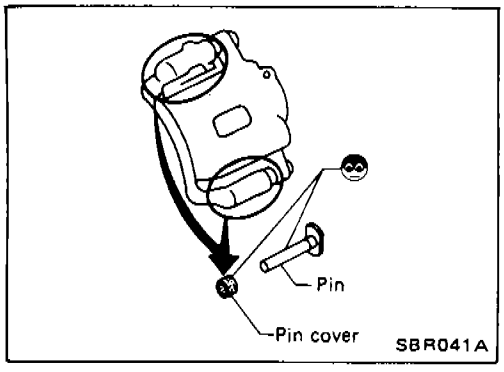
INSPECTION OF BRAKE DRAG FORCE

1. Swing cylinder body upward.
2. Make sure that wheel bearing is adjusted properly. Refer to section RA.
3. Measure rotating force (F_1).



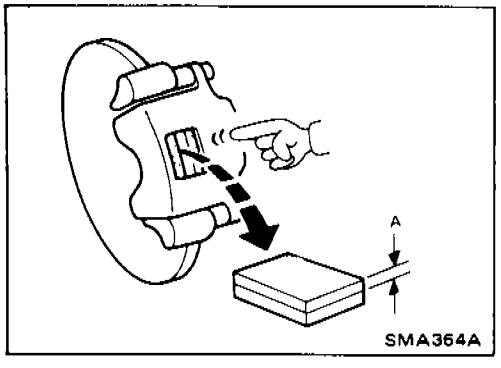
4. Install caliper with pads to original position.
5. Depress brake pedal for 5 seconds.
6. Release brake pedal, rotate disc rotor 10 revolutions.
7. Measure rotating force (F_2).
8. Calculate brake drag force by subtracting F_1 from F_2.

Maximum brake drag force ($F_2 - F_1$):
103.0 N (10.5 kg, 23.2 lb)



If it is not within specification, check pins and pin boots in caliper.

- Make sure that wheel bearing is adjusted properly.
- Disc pads and disc rotor must be dried.



DISC PAD

Check disc pad for wear or damage.

Pad wear limit (A):
2.0 mm (0.079 in)

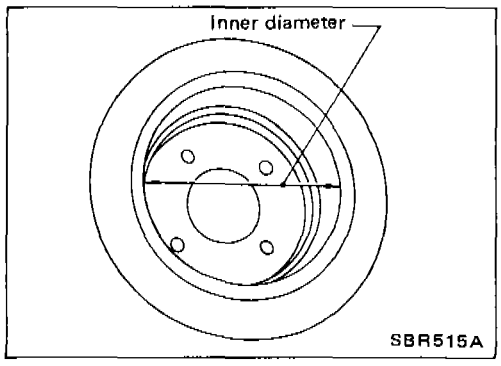
CYLINDER BODY

- Check inside surface of cylinder body for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust of foreign materials may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

CAUTION:
Use brake fluid to clean. Never use mineral oil.

Breaking in Drum and Lining

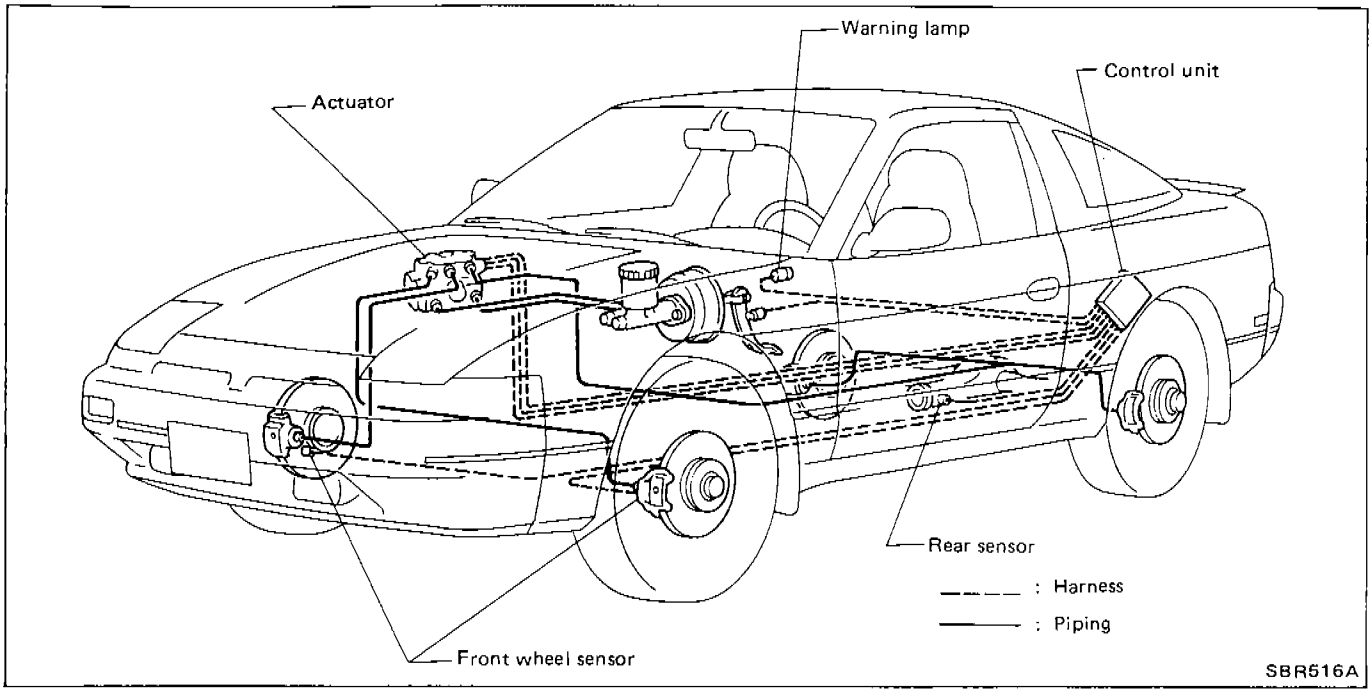
1. Using either low or 2nd transmission speed, drive the unloaded vehicle at approximately 30 km/h (19 MPH) on a safe, level and dry road.
2. Depress the release button of parking brake lever, then pull the lever with a force of 98 N (10 kg, 22 lb).
3. While holding the lever back, continue to drive the vehicle 100 m (328 ft).
4. Repeat steps 1 through 3 two or three times.



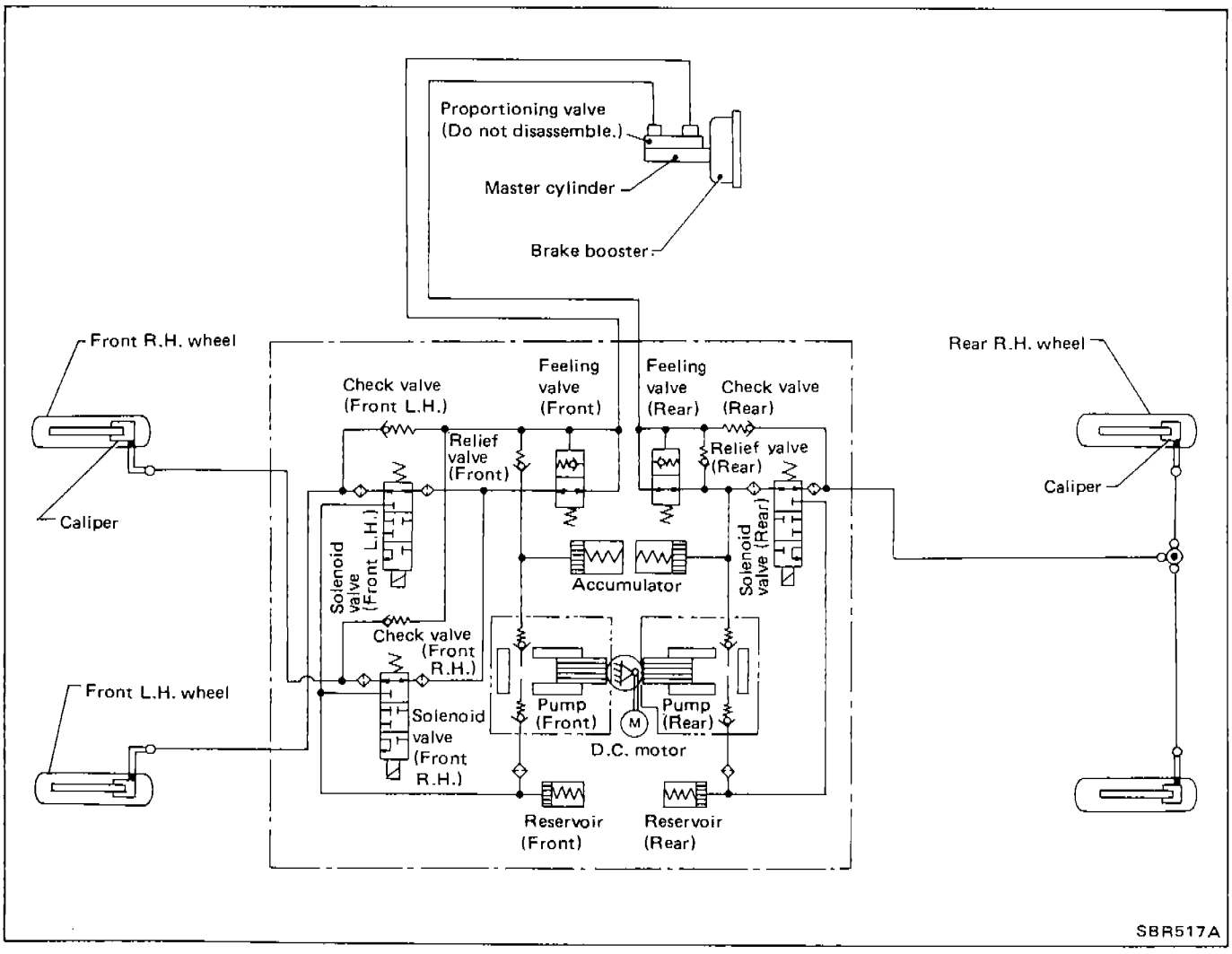
Drum Inspection

Standard inner diameter:
172.0 mm (6.77 in)
Maximum inner diameter:
173.0 mm (6.81 in)
Radial runout (Total indicator reading):
0.07 mm (0.0028 in)

System Components

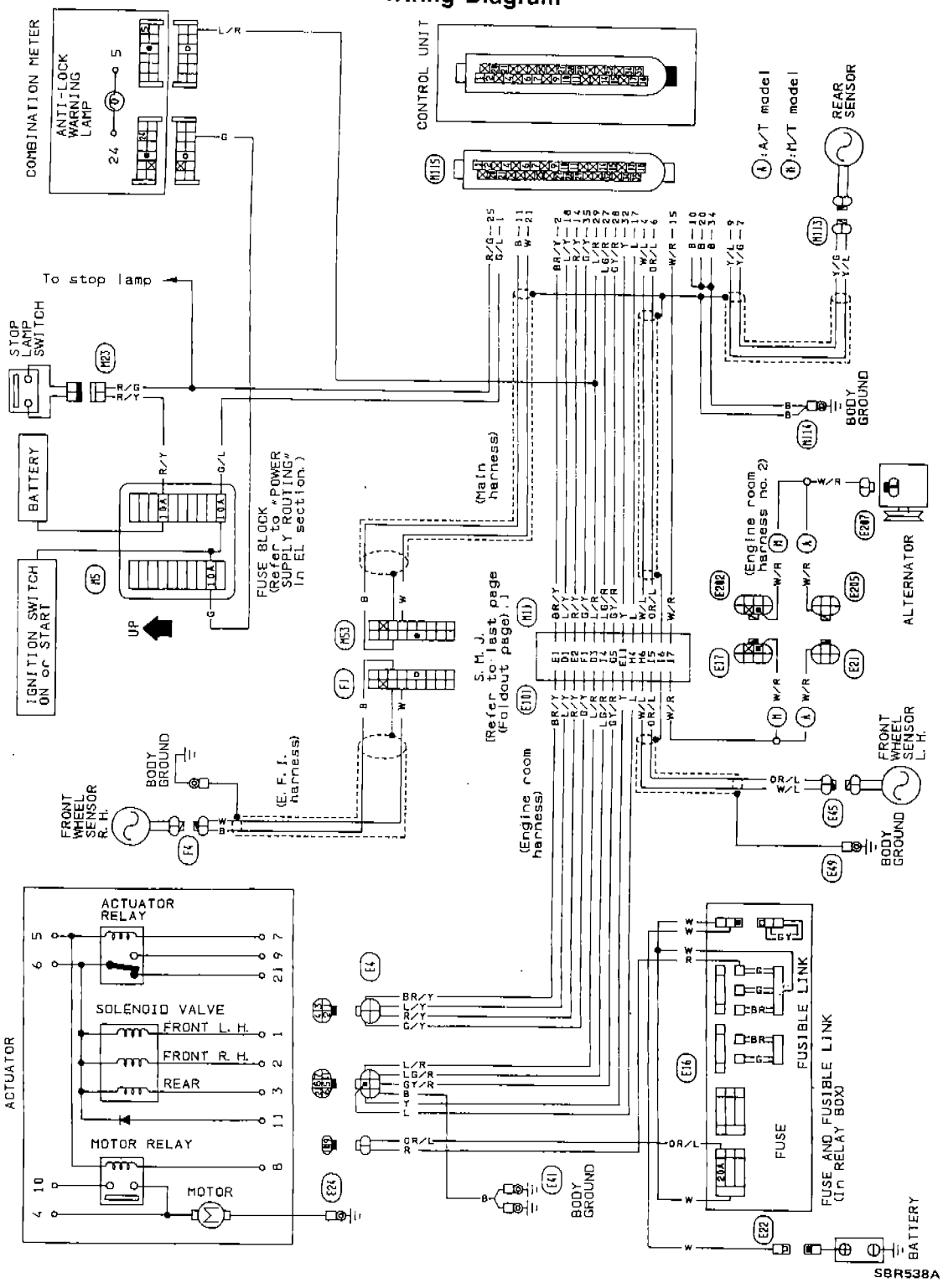


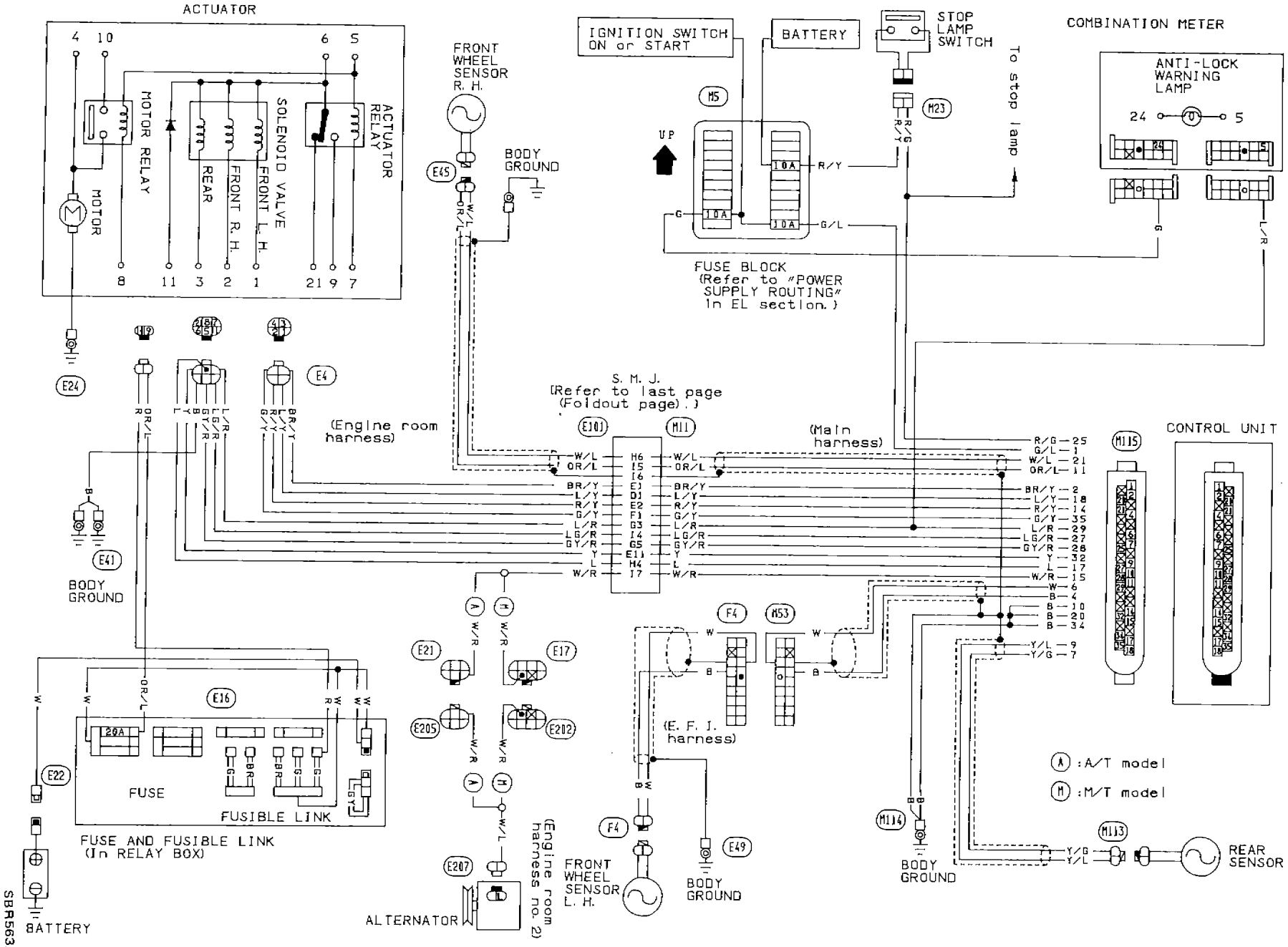
Hydraulic Circuit



L.H.D. MODEL

Wiring Diagram

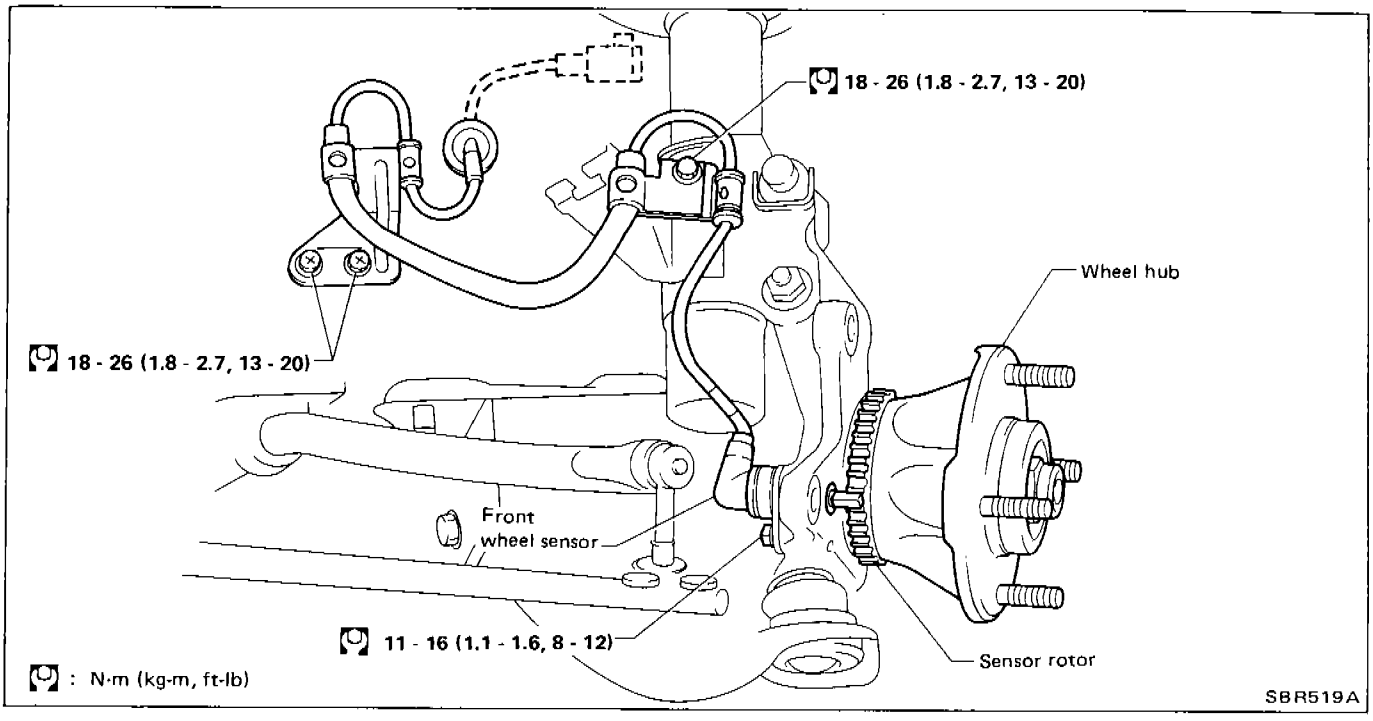



ACTUATOR
MOTOR RELAY
SOLENOID VALVE
ACTUATOR RELAY
MOTOR
REAR
FRONT R. H.
FRONT L. H.
FRONT WHEEL SENSOR R. H.
BODY GROUND
IGNITION SWITCH ON or START
BATTERY
STOP LAMP SWITCH
To stop lamp
COMBINATION METER
ANTI-LOCK WARNING LAMP
FUSE BLOCK (Refer to "POWER SUPPLY ROUTING" in EL section.)
S. M. J. (Refer to last page (Foldout page).)
(Engine room harness)
(Main harness)
CONTROL UNIT
BODY GROUND
FUSE
FUSIBLE LINK
FUSE AND FUSIBLE LINK (In RELAY BOX)
(E. F. I. harness)
FRONT WHEEL SENSOR L. H.
ALTERNATOR
(Engine room harness no. 2)
REAR SENSOR
Ⓐ :A/T model
Ⓜ :M/T model
SBR563A

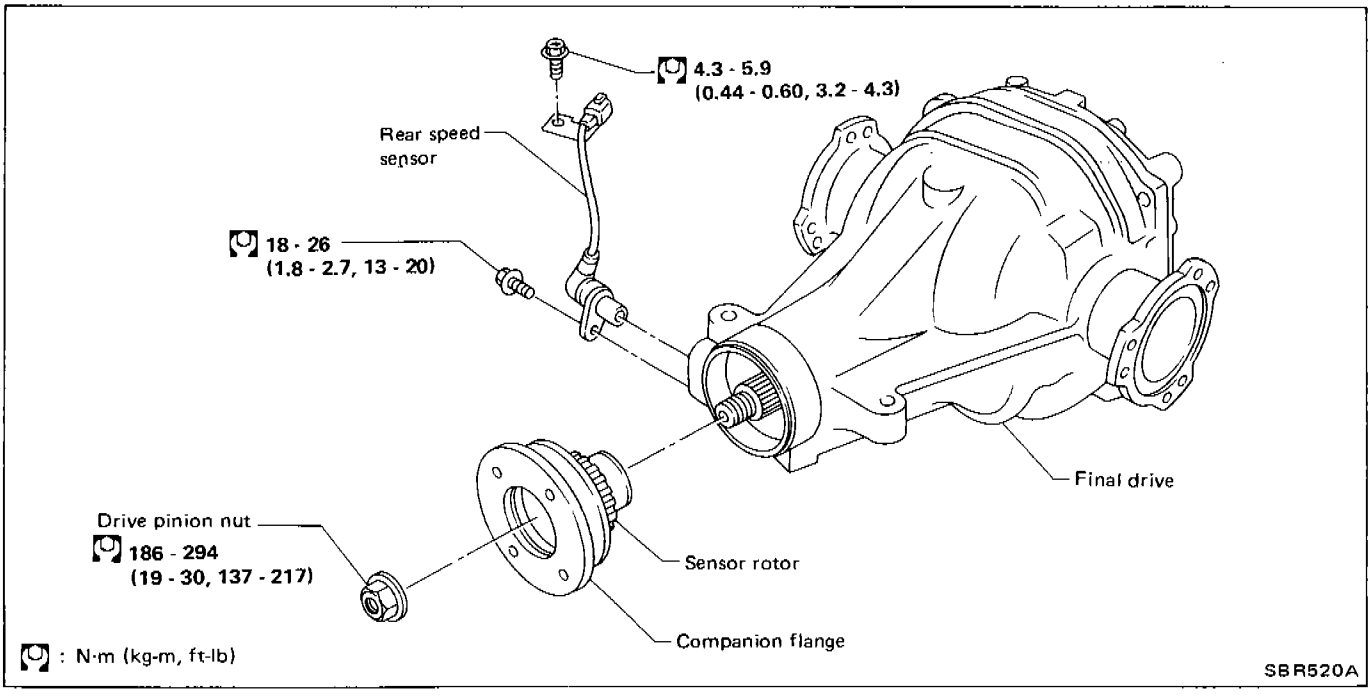
Removal and Installation

CAUTION:
Be careful not to damage sensor edge and sensor rotor teeth.

FRONT WHEEL SENSOR



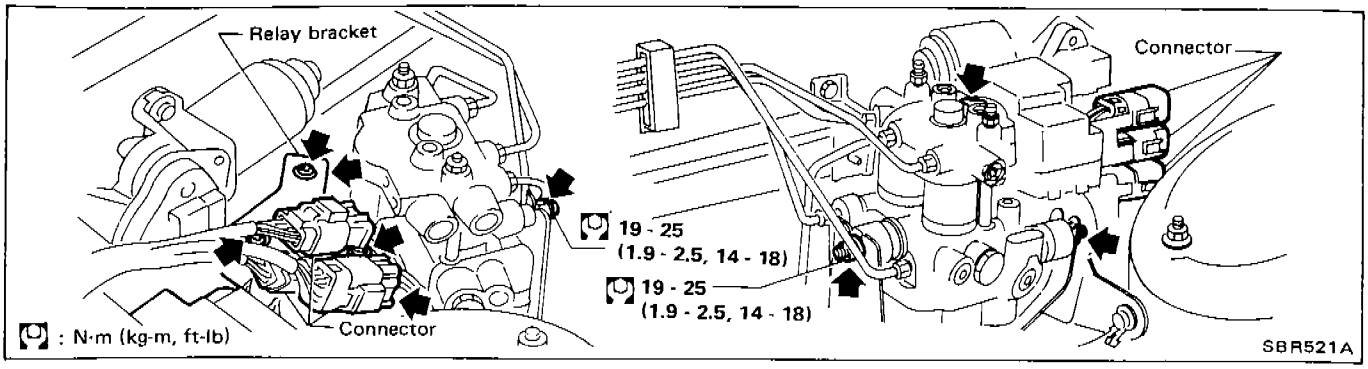
REAR SENSOR



- Remove rear sensor rotor with companion flange after propeller shaft removal.
  Refer to PD section.

Removal and Installation (Cont'd)

ACTUATOR

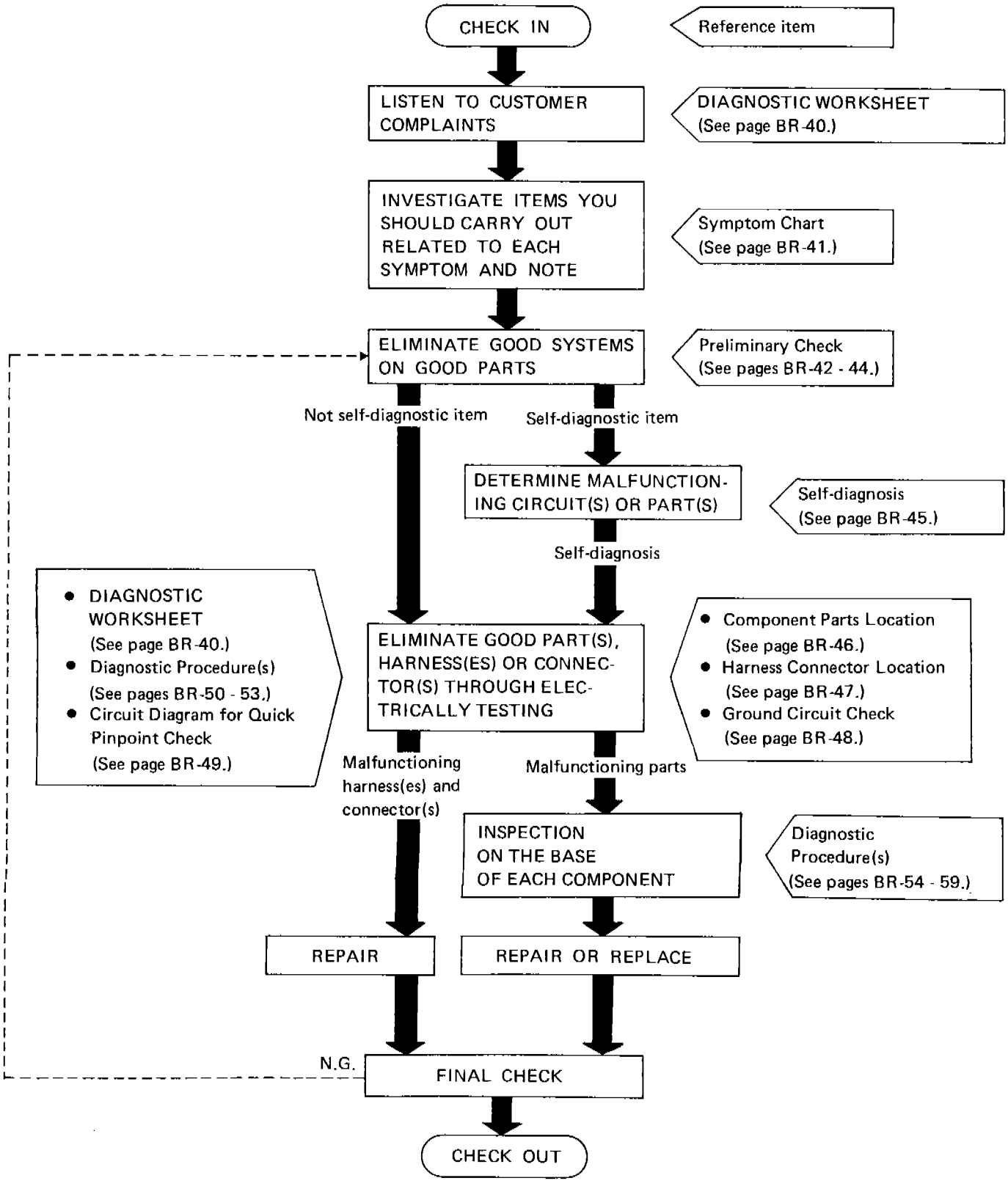


- Disconnect 3 connectors and brake tubes.
- For L.H. only, remove relay bracket 3 screws.
- Remove 3 nuts fixing actuator to bracket.

Contents

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

WORK FLOW



KEY POINTS

WHAT ..... Vehicle model
WHEN ..... Date, Frequencies
WHERE ..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

DIAGNOSTIC WORKSHEET

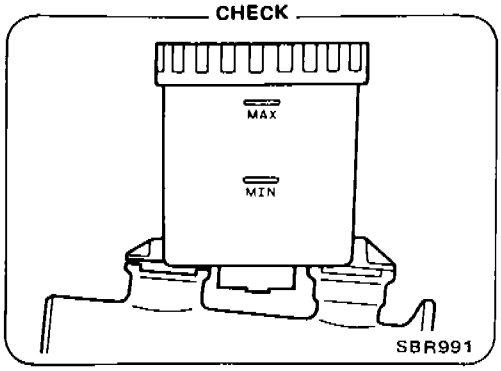
There are many kinds of operating conditions that lead to customer complaints, even if the system is normal.
A good grasp of such conditions can make trouble-shooting faster and more accurate.
In general, feelings for a problem depend on each customer's information. It is therefore important to fully understand the symptoms or under what conditions a customer complains.
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for trouble-shooting.

Worksheet sample

Customer name MR/MS		Model & Year			VIN		
Engine #		Trans.			Mileage		
Incident Date		Manuf. Date			In Service Date		
Symptoms	☐ Pedal vibration and noise	☐ Warning activates	☐ Long stopping distance	☐ Abnormal pedal action	☐ A.B.S. doesn't work	☐ A.B.S. works but warning activates	☐ A.B.S. works frequently
Engine conditions		☐ When starting ☐ After starting ☐ Engine speed: 5,000 rpm or more					
Road conditions		☐ Low friction road (☐ Snow ☐ Gravel ☐ Other) ☐ Protrusion					
Driving conditions		☐ High speed cornering ☐ Vehicle speed: Greater than 10 km/h (6 MPH) ☐ Vehicle speed: 10 km/h (6 MPH) or less ☐ Vehicle is stopped					
Applying brake conditions		☐ Suddenly ☐ Gradually					
Other conditions		☐ Operation of electrical equipment ☐ Large pedal stroke ☐ Operation of clutch					

Preliminary Check 1

CHECK

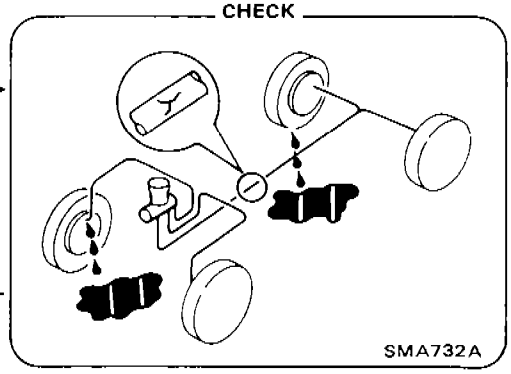


Check brake fluid level in reservoir tank.

N.G. → Fill up brake fluid.

O.K. →

CHECK

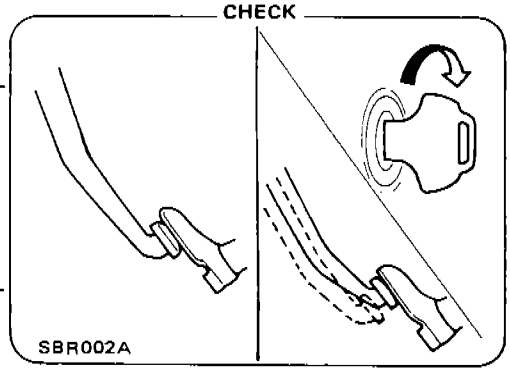


Check brake system.
Refer to CHECK AND ADJUSTMENT.

← N.G. Repair brake system.

O.K. ↓

CHECK

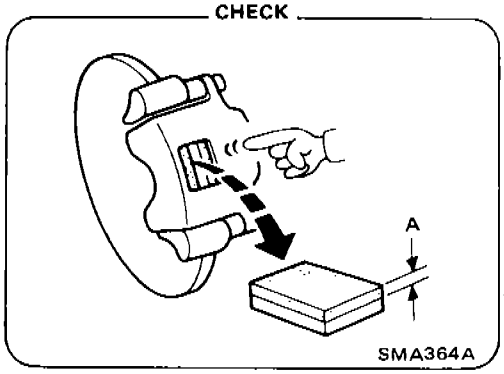


Check brake booster operation and airtightness.
Refer to "Inspection" of BRAKE BOOSTER.

← N.G. Repair or replace booster system.

O.K. ←

CHECK



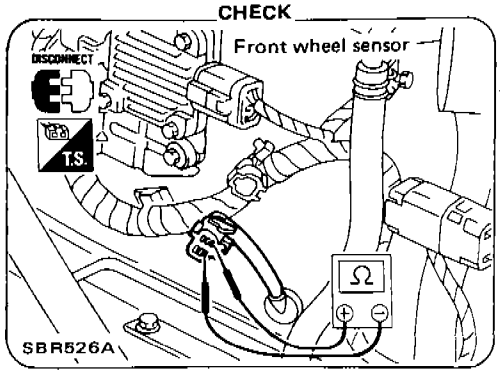
Check brake pads and rotor.
Refer to "Inspection" of FRONT and REAR DISC BRAKE.

N.G. → Replace malfunctioning parts.

Preliminary Check 3, 4

Preliminary Check 3

CHECK



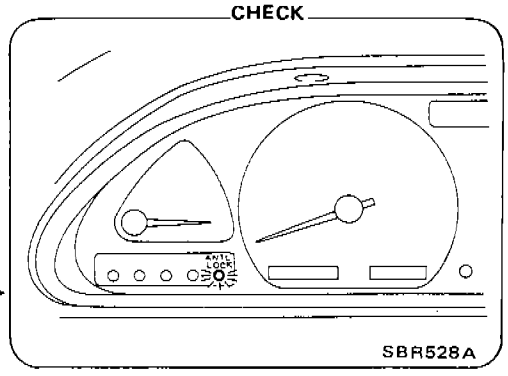
N.G. → Replace.

O.K. →

Measure each sensor resistance.
0.8 - 1.2 kΩ

Preliminary Check 4

CHECK



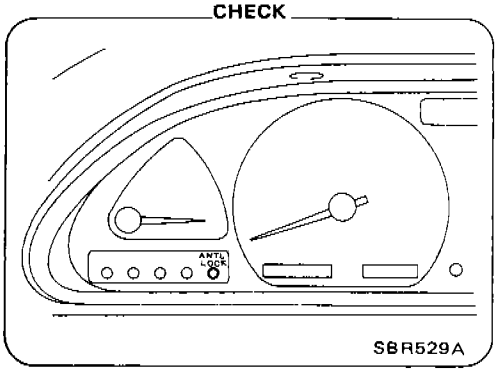
Check warning lamp activation.
When ignition switch is turned on, warning lamp turns on.

O.K. ↓

N.G. ↓

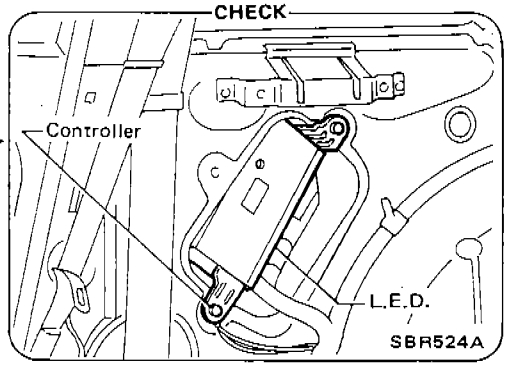
Check fuse.
Check bulb condition and remedy.

CHECK



N.G. →

CHECK



- Keep engine on and running.
- Remove rear side finisher.
  R.H. model: R.H. side
  L.H. model: L.H. side
- Count the number of L.E.D. flashes during 5 to 10 second "OFF" period.

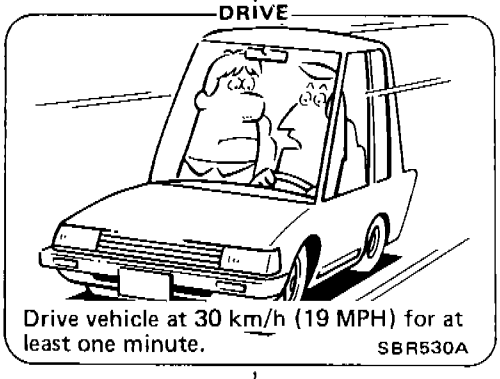
↓

Go to Self-diagnosis.
(See page BR-45.)

Check warning lamp for deactivation.
When engine starts, warning lamp deactivates.

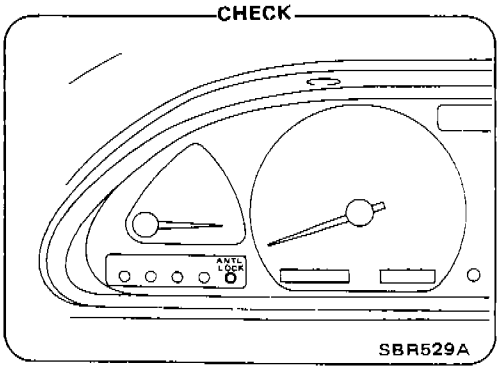
O.K. ↓

DRIVE



↓

CHECK

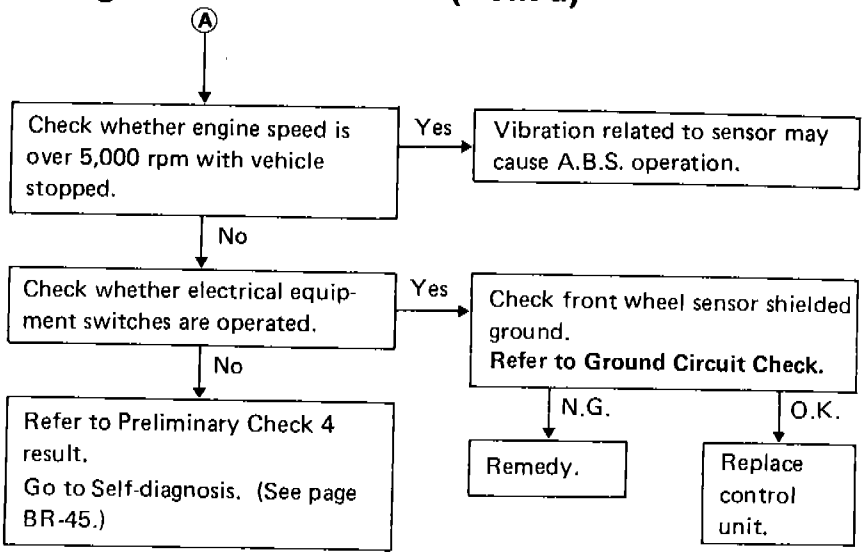


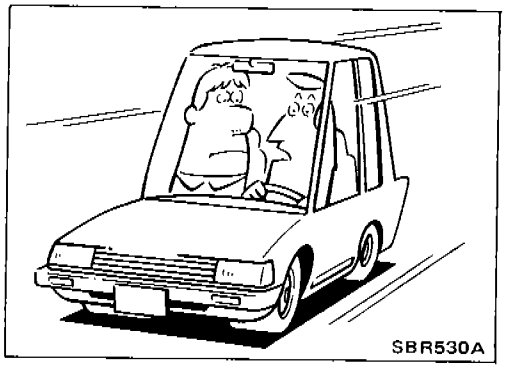
N.G. →

O.K. → If Preliminary Check 2 is not performed and there is abnormal A.B.S. operation, perform Preliminary Check 2.

Ensure warning lamp remains off while driving.

Diagnostic Procedure 1 (Cont'd)

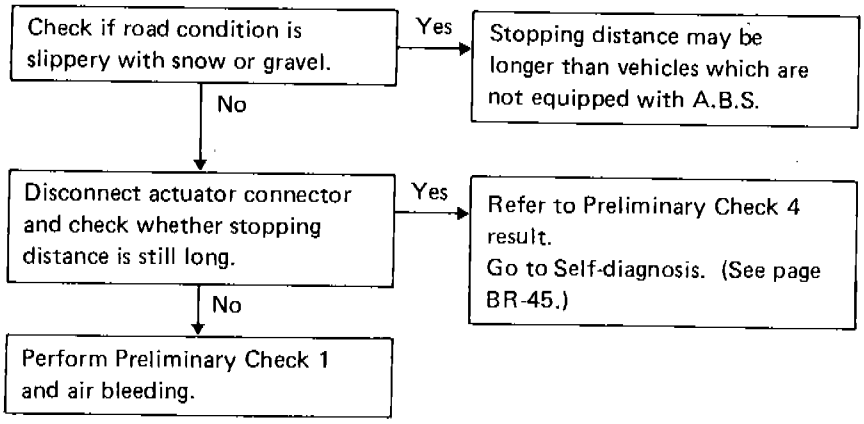


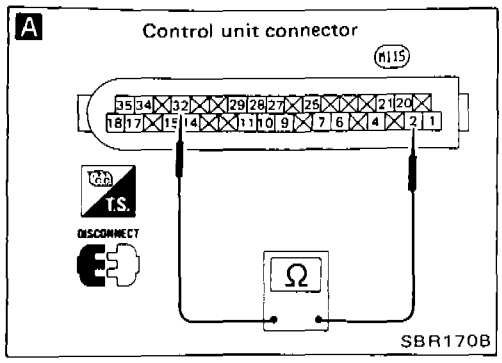


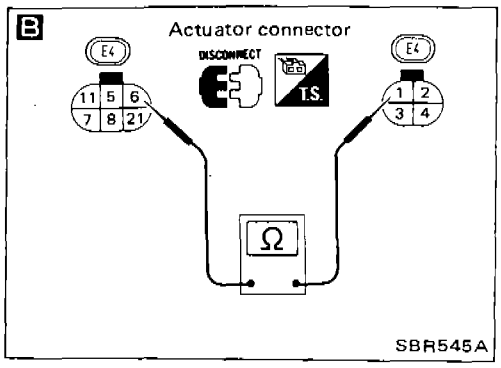
Diagnostic Procedure 2

SYMPTOM: Long stopping distance

Refer to worksheet results.







Diagnostic Procedure 7

ACTUATOR SOLENOID (L.E.D. flashing number 1 - 4)

INSPECTION START
Remove battery negative terminal connector.

A

CHECK SOLENOID VALVE RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals.
Flashing number 1:
Terminals ㉜ and ②
Flashing number 2:
Terminals ㉜ and ㉟
Flashing number 3 or 4:
Terminals ㉜ and ⑱
Resistance: 0.7 - 1.6Ω

O.K. → Replace control unit.

N.G. ↓

B

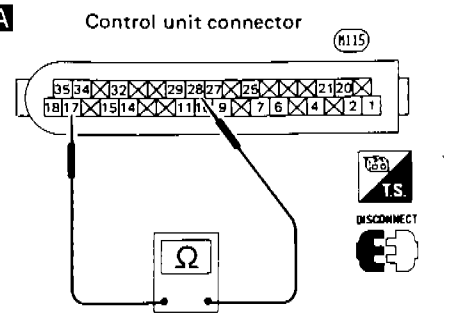
Disconnect actuator connector.
Check resistance between actuator connector (actuator side) terminals.
Flashing number 1:
Terminals ⑥ and ①
Flashing number 2:
Terminals ⑥ and ②
Flashing number 3 or 4:
Terminals ⑥ and ③
Resistance: 0.7 - 1.6Ω

O.K. → Repair harness between actuator connector and control unit connector.

N.G. ↓

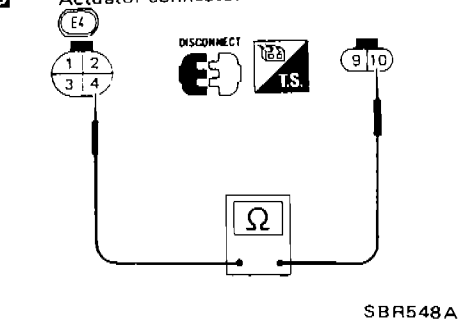
Replace actuator.

A



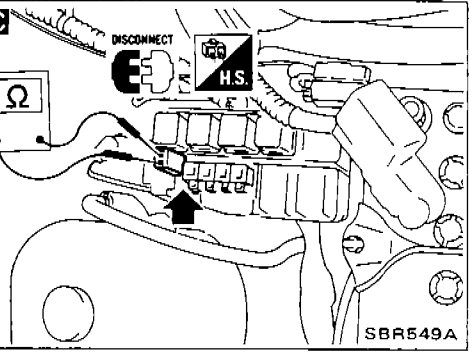
SBR172B

B



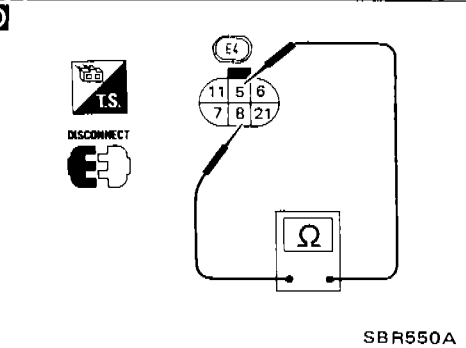
SBR548A

C



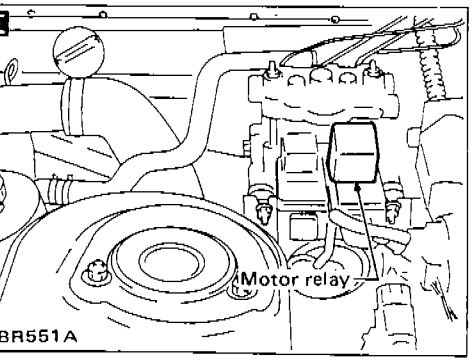
SBR549A

D



SBR550A

E



SBR551A

Diagnostic Procedure 9

ACTUATOR MOTOR RELAY (L.E.D. flashing number 9)

INSPECTION START
Remove battery negative terminal connector.

A

CHECK MOTOR RELAY SOLENOID RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals ⑰ and ㉘.
Resistance: 38 - 45Ω

N.G. → **D**

Disconnect actuator connector.
Check resistance between actuator connector (actuator side) terminals ⑧ and ⑤.
Resistance: 38 - 45Ω

O.K. → Repair harness between actuator and control unit.

N.G. → **E** Replace motor relay.

O.K. ↓

B

CHECK MOTOR RELAY DEACTIVATION.
Disconnect actuator connector.
Check continuity between actuator connector (actuator side) terminals ④ and ⑩.

Yes → **E** Replace motor relay.

No ↓

C

Check if motor's fusible link is blown.
Resistance:
Approximately 0Ω

No → Perform Electrical Components Inspection – ACTUATOR. (See page BR-60.)

O.K. → Replace control unit.

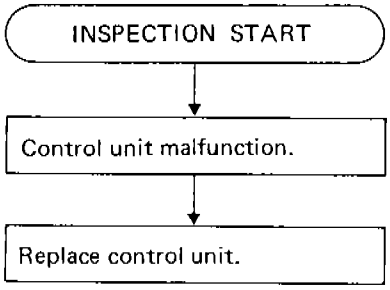
N.G. → Replace actuator.

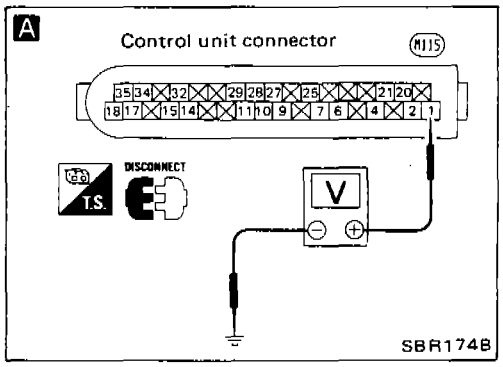
Yes ↓

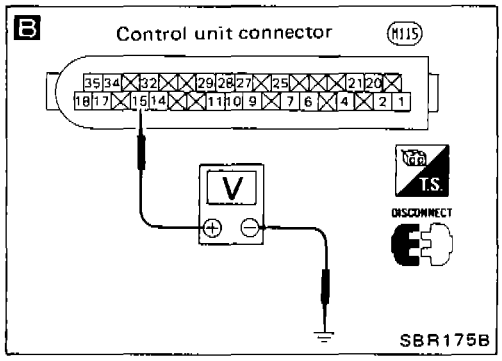
Replace fusible link.

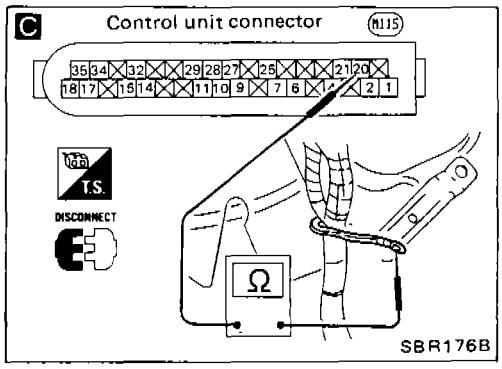
Diagnostic Procedure 11

CONTROL UNIT (L.E.D. flashing number 16)









Diagnostic Procedure 12

CONTROL UNIT OR POWER SUPPLY AND GROUND CIRCUIT (Warning activates but L.E.D. comes off.)

INSPECTION START

A

CHECK CONTROL UNIT POWER SUPPLY.
Disconnect control unit connector.
Check voltage between control unit connector (vehicle side) terminal (1) and body ground with ignition switch turned on.

N.G. → Check if control unit "10A" fuse is blown.
- Yes → Replace fuse.
- No → Repair power supply harness.

O.K. ↓

B

CHECK ALTERNATOR L TERMINAL VOLTAGE.
Disconnect control unit connector.
Check voltage between control unit connector (vehicle side) terminal ⑮ and body ground after engine starting.
Voltage: 6V or more

N.G. → Check if other warnings activate.
- Yes → Repair harness between alternator and control unit.
- No → Malfunctioning alternator.

O.K. ↓

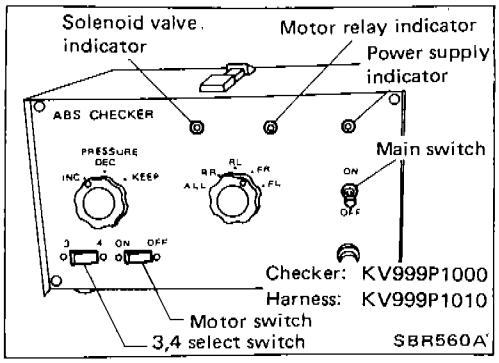
C

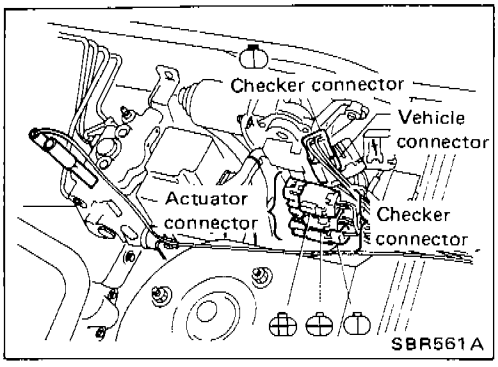
Check continuity between control unit connector (vehicle side) terminal ⑳ and body ground with ignition switch "OFF".

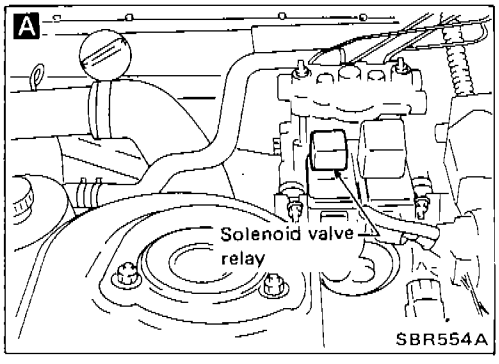
N.G. → Repair ground harness.

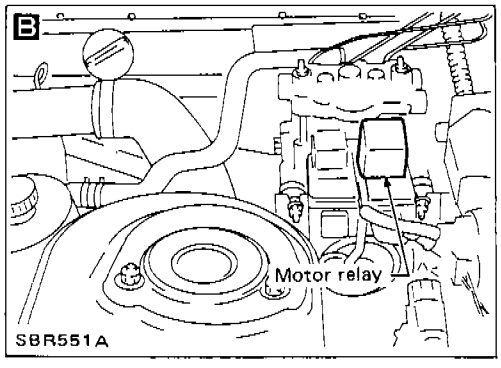
O.K. ↓

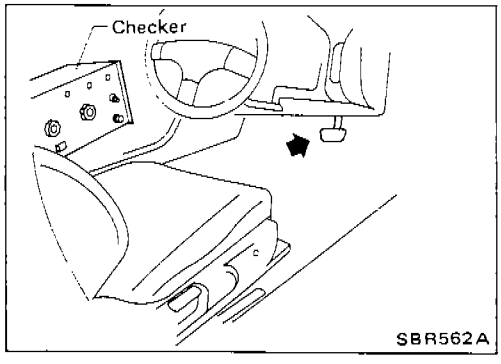
Replace control unit.











Electrical Components Inspection

ACTUATOR (Not self-diagnostic item)

INSPECTION START

Connect A.B.S. checker to actuator connector and vehicle harness with battery terminal connected and all checker switch turning off.
Use harness for 3 channel.
Set select switch to 3 channel.

Turn checker power supply switch on.
Check power supply indicator for coming on.
- No → Replace battery with fully charged new one, if checker connection is correct.
- Yes ↓

Check checker valve relay indicator for coming on.
- No → A Replace solenoid valve relay, if checker connection is correct.
- Yes ↓

Select one valve.
Select pressure decreasing position by switch then turn motor switch on.
Turn motor switch off.
Select pressure increasing position.
Repeat so that all valve will be performed. → A

CAUTION:
Do not hold switch at the pressure decreasing position for more than 5 seconds. Otherwise, solenoid valve may be overheated and damaged.

Check motor relay indicator for coming on while motor switch is turned on.
- No → B Replace motor relay, if checker connection is correct.
- Yes ↓

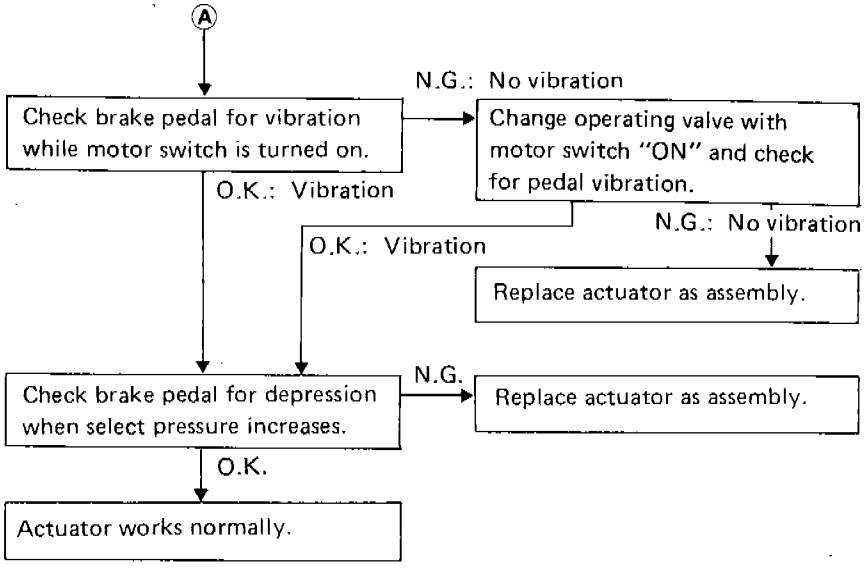
Check motor for operational sound beside the actuator in a quiet place.
- No → Replace actuator as assembly, if Diagnostic Procedures 7 - 12 are already performed and checker connection is correct.
- Yes ↓

Bring checker in the vehicle and depress the brake pedal.
Repeat step A .

Ⓐ

Valve select switch position RR is used for 4 channel checking. In the case of 3 channels, brake pedal vibration or depression will not occur in position RR. It will occur, however, in position RL.

Electrical Components Inspection (Cont'd)



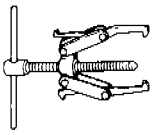
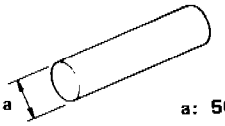
CLUTCH

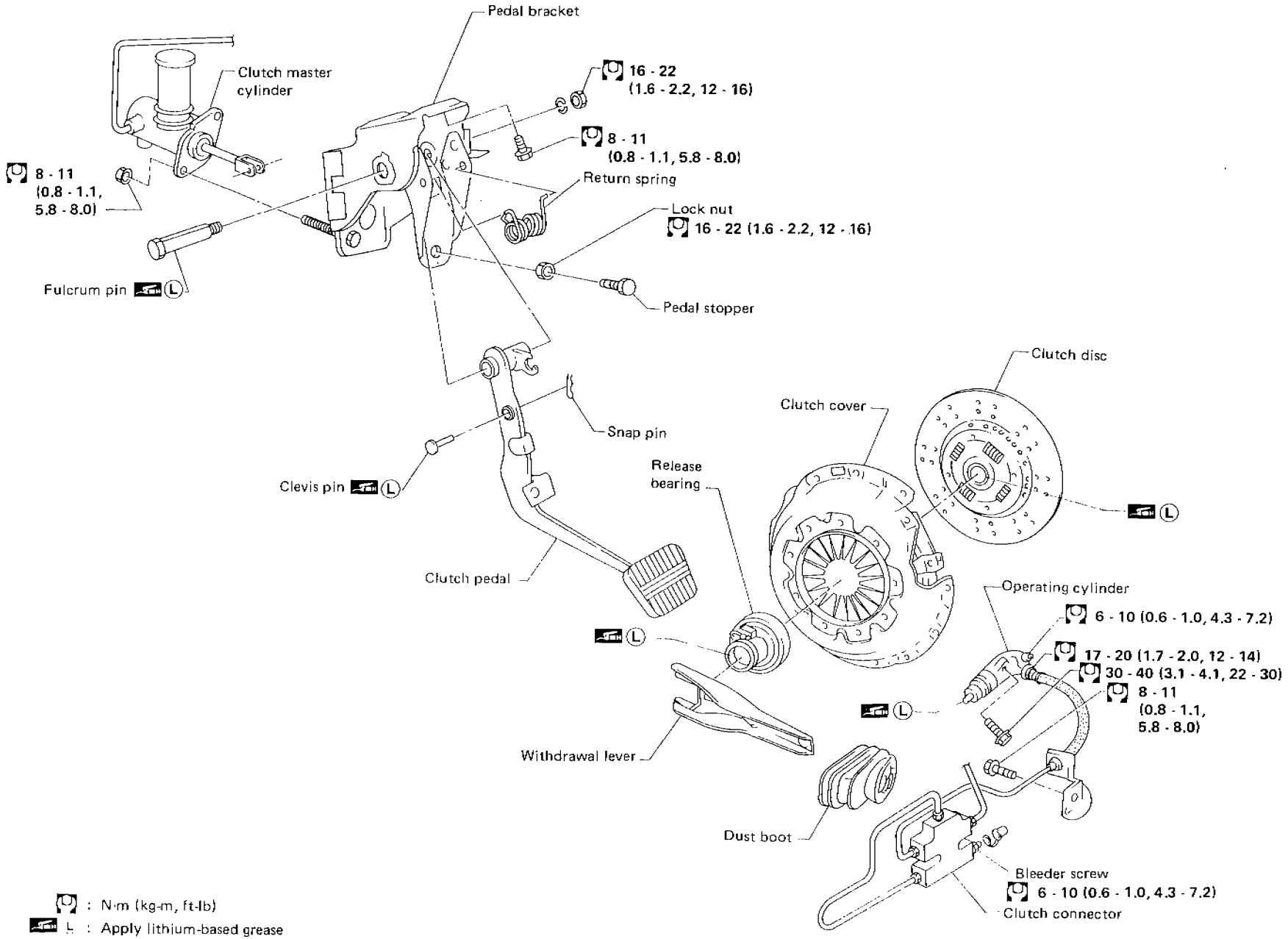
SECTION CL

CONTENTS

Preparation (Cont'd)

COMMERCIAL SERVICE TOOLS

Tool name	Description	
Bearing puller		Removing release bearing
Bearing drift	 a: 50 mm (1.97 in) dia.	Installing release bearing



: N·m (kg-m, ft-lb)

: Apply lithium-based grease including molybdenum disulphide.

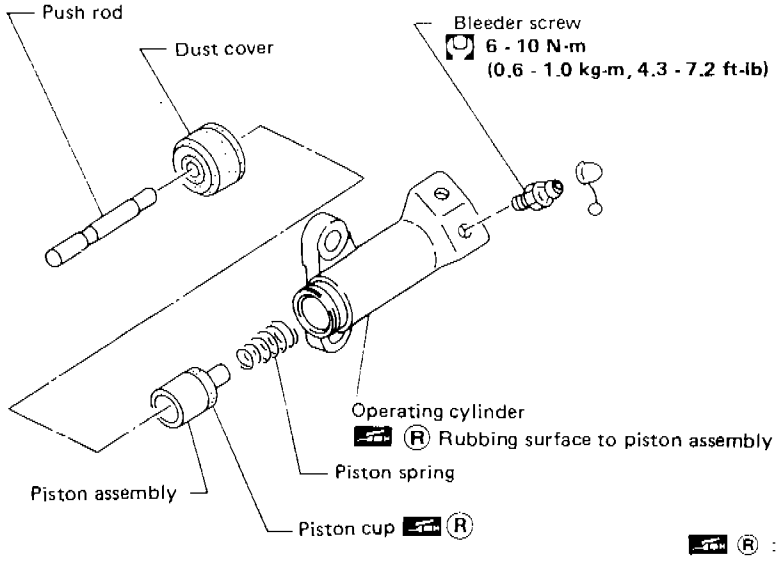
SCL356

Clutch Master Cylinder (Cont'd)

INSPECTION

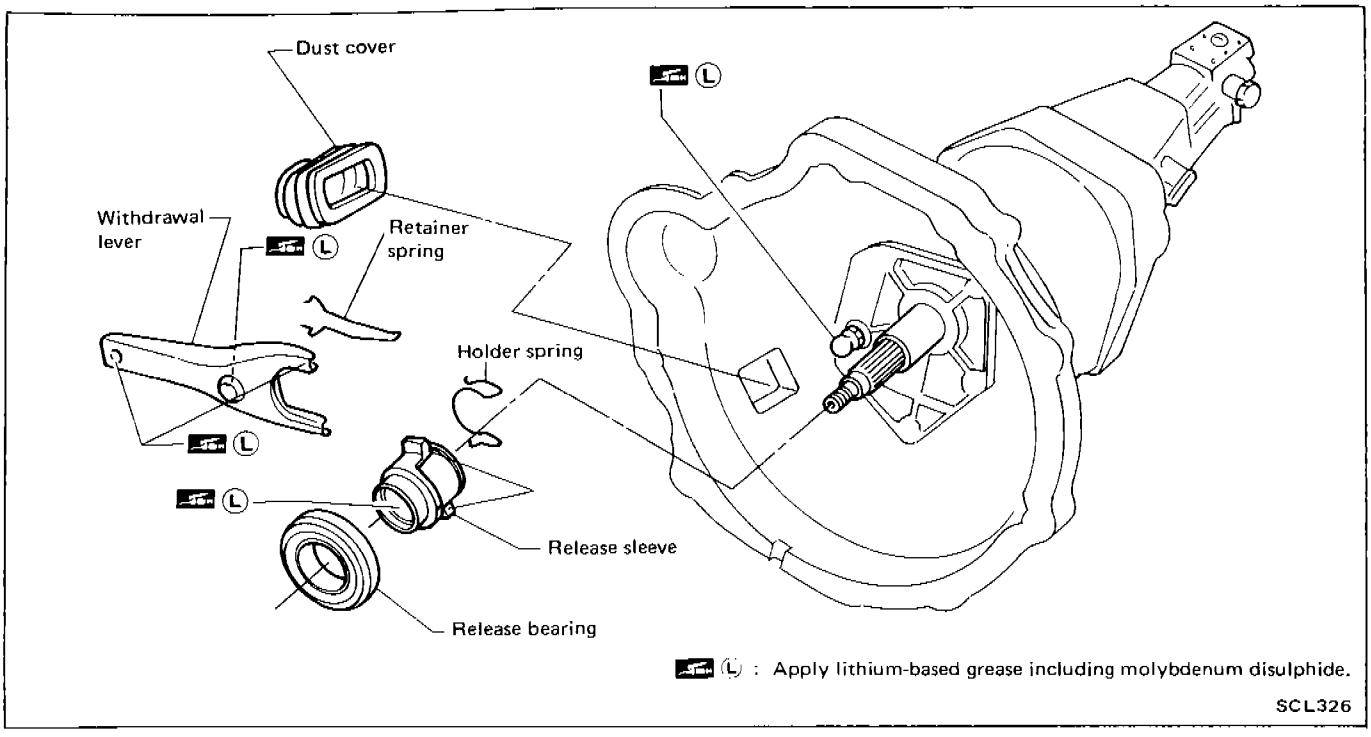
- Check cylinder and piston rubbing surface for uneven wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check return spring for wear or damage. Replace if necessary.
- Check reservoir for deformation or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.

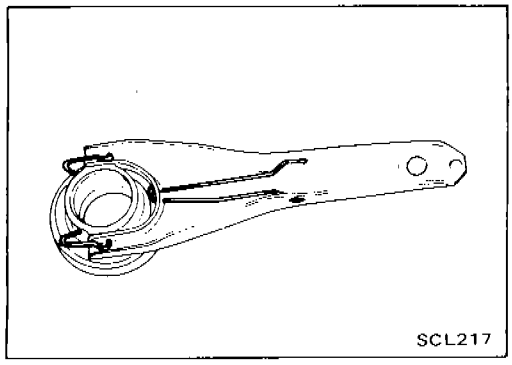
Operating Cylinder



INSPECTION

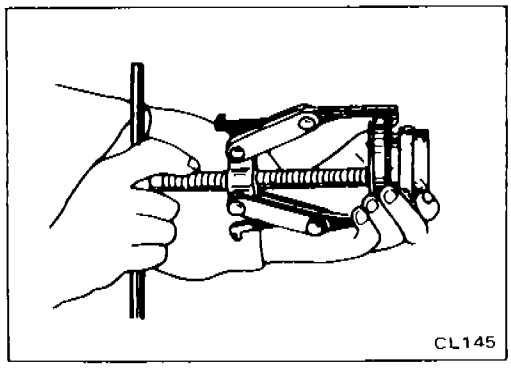
- Check rubbing surface of cylinder for wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check piston spring for wear or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.



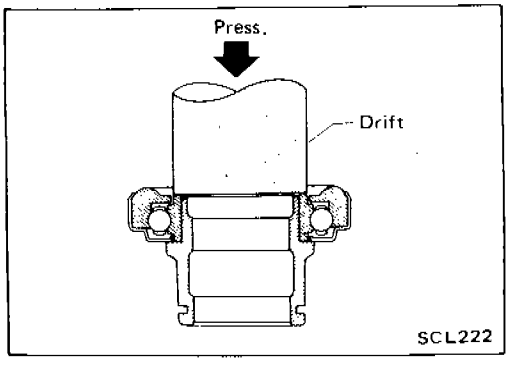


REMOVAL AND INSTALLATION

- Install retainer spring and holder spring.



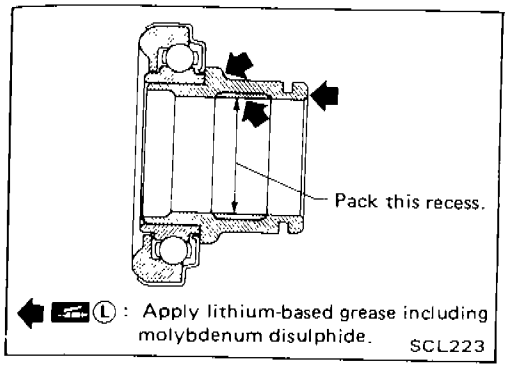
- Remove release bearing.



- Install release bearing with suitable drift.

INSPECTION

- Check release bearing to see that it rolls freely and is free from noise, cracks, pitting or wear. Replace if necessary.
- Check release sleeve and withdrawal lever rubbing surface for wear, rust or damage. Replace if necessary.



LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.

Too much lubricant might damage clutch disc facing.

ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

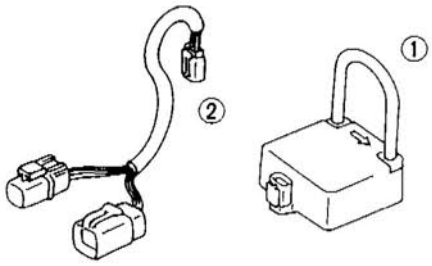
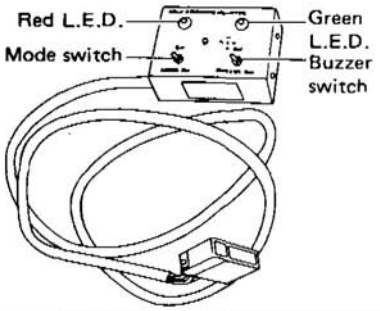
CONTENTS

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

E.C.C.S Wiring Diagram — See pull-out following EL section.

SPECIAL SERVICE TOOLS

Tool number Tool name	Description	
KV109D10S0 Ignition timing adapter coil set ① KV109D0010 Ignition timing adapter coil ② KV109D0015 Adapter harness		Measuring ignition timing
KV109D0020 Checker Box		Reading self-diagnosis indication

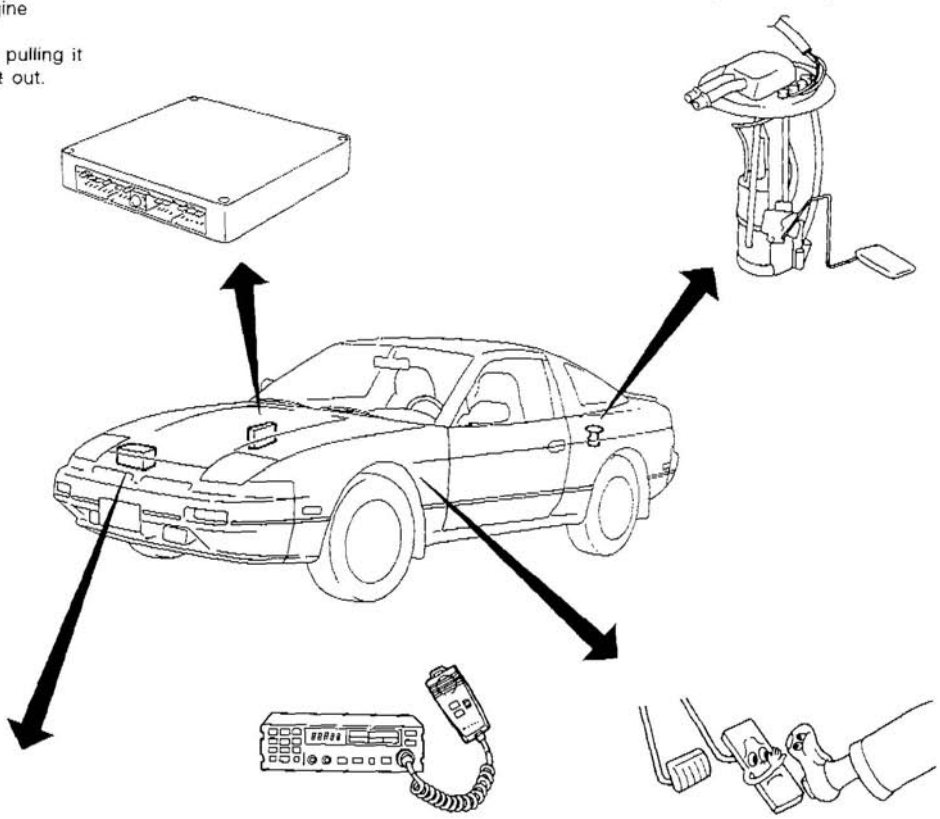
E.C.U.
- Do not disassemble E.C.C.S. control unit. (E.C.U.)
- Do not turn diagnosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ROM value. The E.C.C.S. will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation. (Model with catalyzer)
- Do not apply undue force to mounting bracket.
- Before connecting or disconnecting E.C.U. connector, make sure red and green L.E.D.s are off after turning ignition key off.
- Always install specified E.C.U. on car; otherwise, erroneous engine operation may result.
- Disconnect connector by pulling it (not the harness) straight out.

E.C.C.S. HARNESS HANDLING
- Securely connect E.C.C.S. harness connectors.
  A poor connection can cause extremely high voltage to develop in the coil and condenser, resulting in damage to ICs.
- Keep E.C.C.S. harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an E.C.C.S. system malfunction due to receiving external noise, degraded operation of ICs, etc.
- Keep E.C.C.S. parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.
- Before connecting connector, make sure all pins are straight.

E.C.C.S. PARTS HANDLING
- Handle air flow meter carefully to avoid damage.
- Do not disassemble air flow meter.
- Do not clean air flow meter with detergent.
- Do not shock or jar the crank angle sensor.

INJECTOR
- Do not disconnect injector harness connectors with engine running.
- Do not apply battery power directly to injectors; otherwise injectors will be damaged.

FUEL PUMP
- Do not operate fuel pump when there is no fuel in lines.
- Do not reuse fuel hose clamps.
- Tighten fuel hose clamps to the specified torque.



BATTERY
- Always use a 12 volt battery as power source.
- Do not disconnect battery cables while the engine is running.
- Do not reverse polarity of battery when connecting it. Otherwise, E.C.U. and/or injectors may be burned.

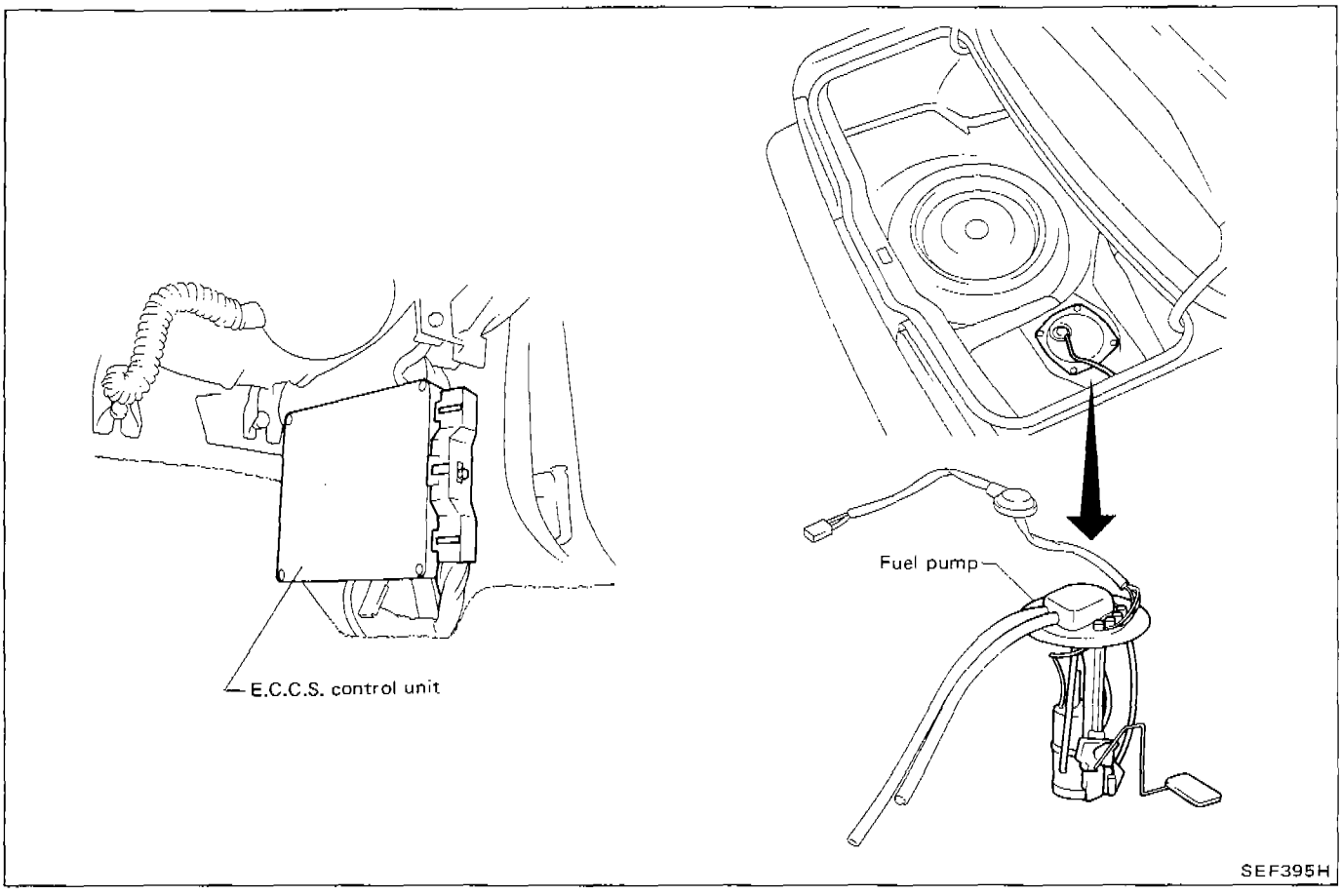
WIRELESS EQUIPMENT
- When installing a C.B. ham radio or a mobile phone, be sure to observe the following, as installation location may affect the electronic control systems.

1) Keep antenna as far as possible away from electronic control units.
2) Keep antenna feeder line more than 20 cm (7.9 in) away from harness of electronic controls.
   Do not let them run parallel for a long distance.
3) Adjust antenna and feeder line so that standing-wave ratio can be kept smaller.
4) Be sure to ground radio to vehicle body.

WHEN STARTING
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

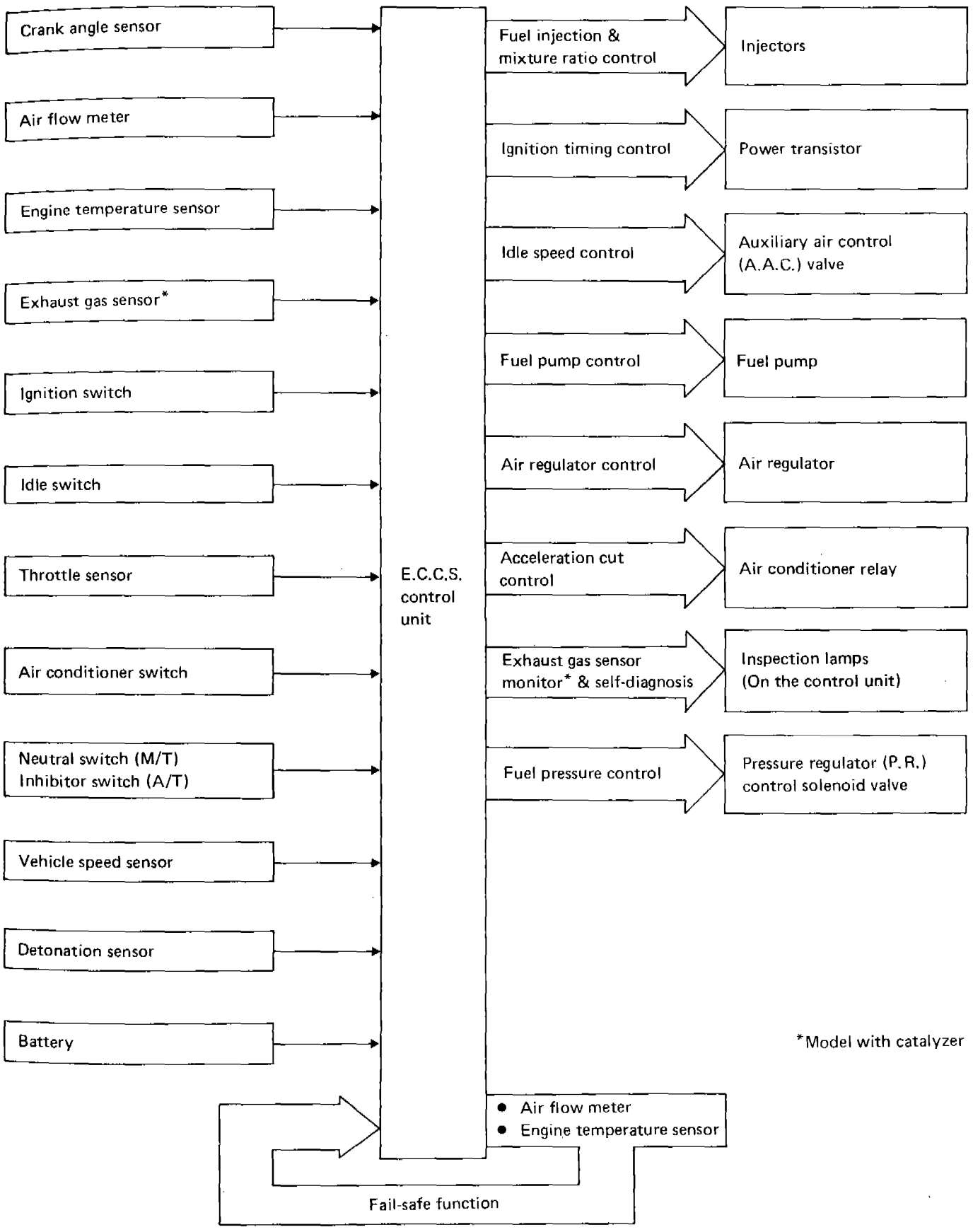
SEF398H

E.C.C.S. Component Parts Location

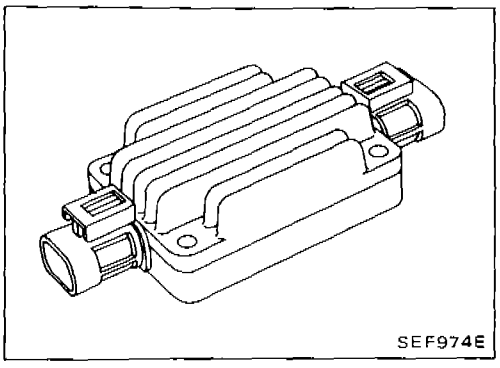


System Chart

E.C.C.S. CONTROL

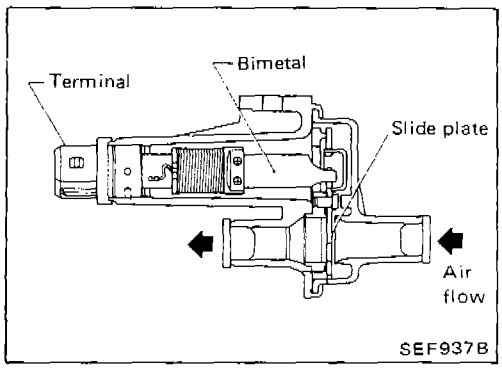


*Model with catalyzer


SEF974E

Power Transistor

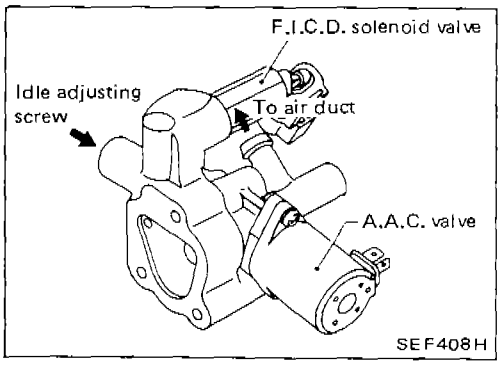
The ignition signal from the E.C.U. is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit.



SEF937B

Air Regulator

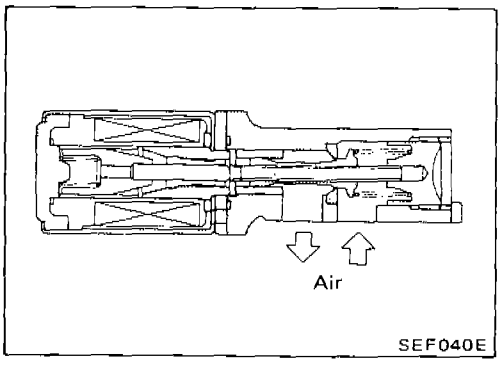
The air regulator provides an air by-pass when the engine is cold for a fast idle during warm-up.
A bimetal, heater and rotary shutter are built into the air regulator. When the bimetal temperature is low, the air by-pass port opens. As the engine starts and electric current flows through a heater, the bimetal begins to turn the shutter to close the by-pass port. The air passage remains closed until the engine stops and the bimetal temperature drops.



SEF408H

Idle Air Adjusting (I.A.A.) Unit

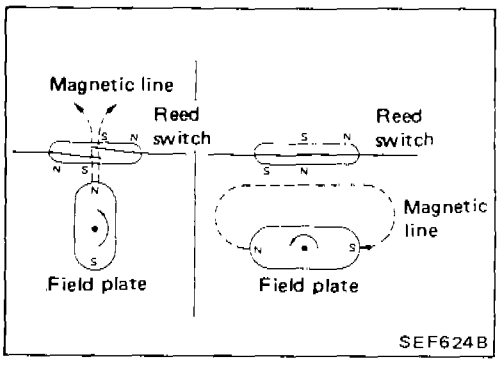
The I.A.A. unit is made up of the A.A.C. valve, F.I.C.D. solenoid valve and idle adjust screw. It receives the signal from the E.C.U. and controls the idle speed at the preset value.
The F.I.C.D. solenoid valve compensates for changes in idle speed caused by the operation of the air compressor.



SEF040E

Auxiliary Air Control (A.A.C.) Valve

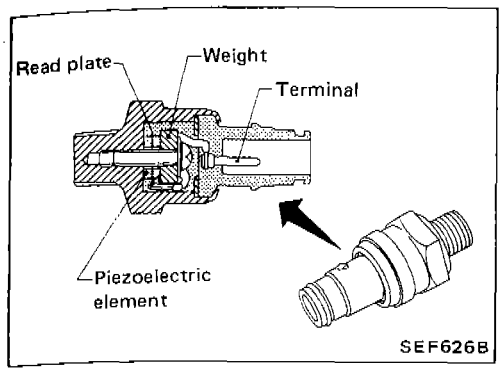
The E.C.U. actuates the A.A.C. valve by an ON/OFF pulse. The longer that ON duty is left on, the larger the amount of air that will flow through the A.A.C. valve.



SEF624B

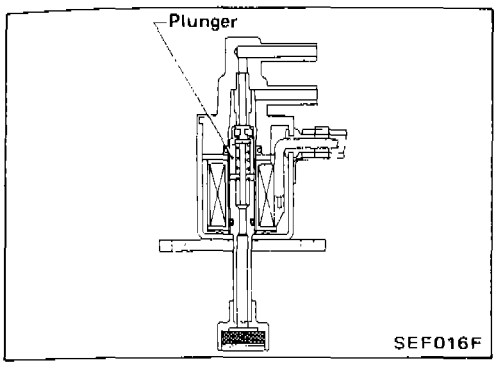
Vehicle Speed Sensor

The vehicle speed sensor provides a vehicle speed signal to the E.C.U.
The speed sensor consists of a reed switch and a speedometer pinion, which are installed in the transmission, and transforms vehicle speed into pulse signals.



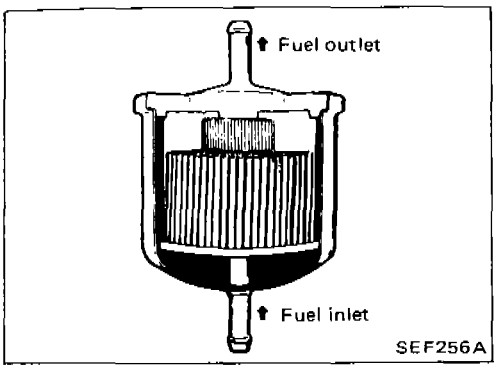
Detonation Sensor

The detonation sensor is attached to the cylinder block and senses engine knocking conditions.
A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is delivered as output.



Pressure Regulator (P.R.) Control Solenoid Valve

The solenoid valve responds to the ON/OFF signal from the E.C.U. When it is off, a vacuum signal from the intake manifold is fed into the pressure regulator. When the control unit sends an ON signal, the coil pulls the plunger downward and cuts the vacuum signal.

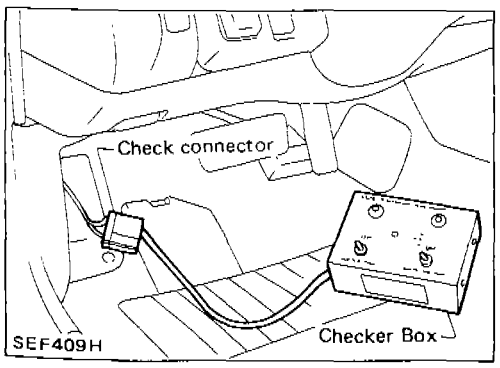


Fuel Filter

The specially designed fuel filter has a metal case in order to withstand high fuel pressure.

Carbon Canister (For catalyzer model)

The carbon canister is filled with active charcoal to absorb evaporative gases produced in the fuel tank. These absorbed gases are then delivered to the intake manifold by manifold vacuum for combustion purposes.

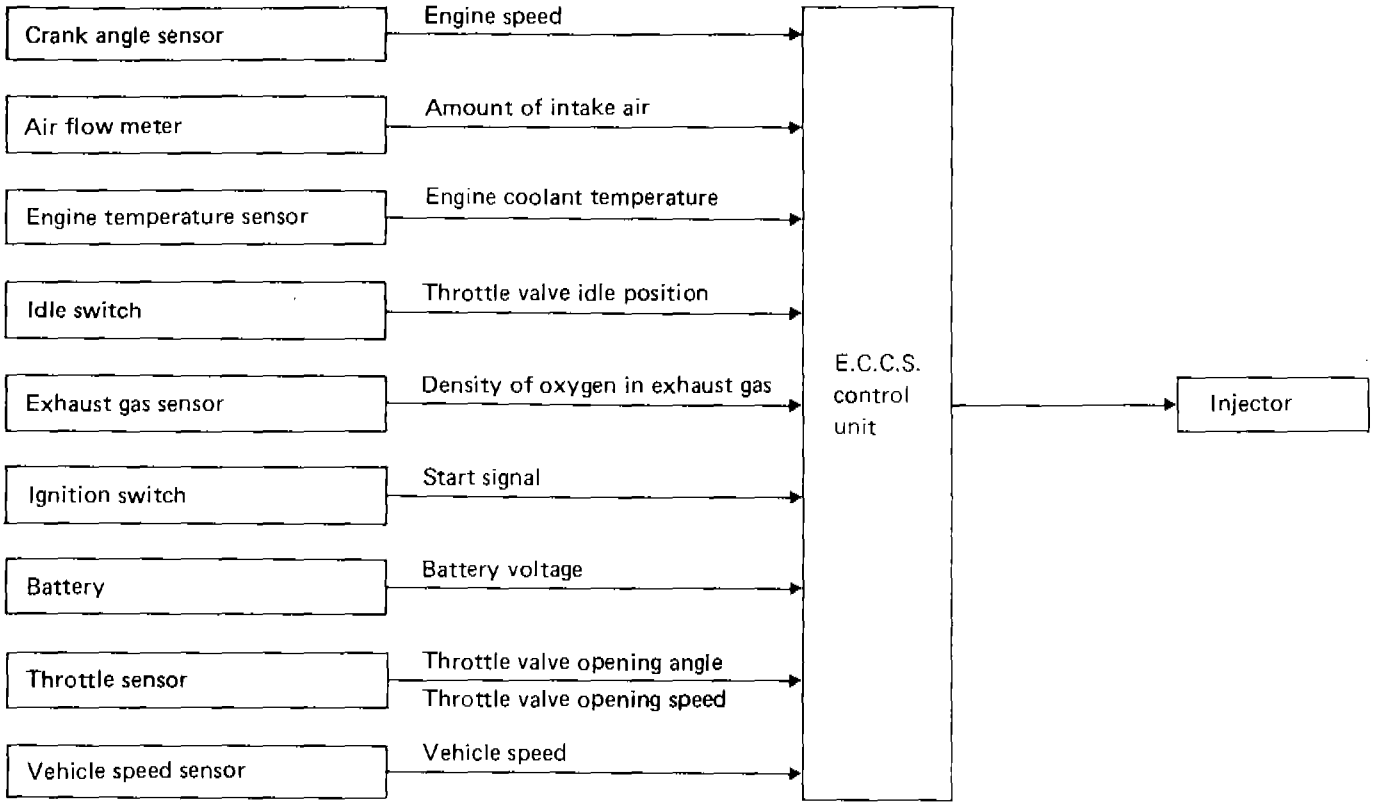


Check Connector for E.C.C.S. Checker Box

The check connector for E.C.C.S. Checker Box is in the vicinity of the fuse box.

Fuel Injection Control

INPUT/OUTPUT SIGNAL LINE



BASIC FUEL INJECTION CONTROL

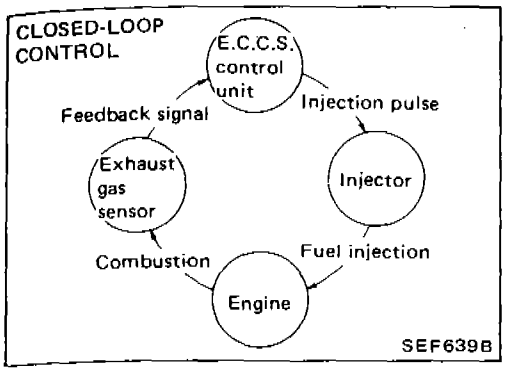
The amount of fuel injected from the fuel injector, or the length of time the valve remains open, is determined by the E.C.U. The basic amount of fuel injected is a program value mapped in the E.C.U. ROM memory. In other words, the program value is preset by engine operating conditions determined by input signals (for engine rpm and air intake) from both the crank angle sensor and the air flow meter.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injection is compensated for to improve engine performance under various operating conditions as listed below:

<Fuel increase>
1) During warm-up
2) When starting the engine
3) During acceleration
4) Hot-engine operation

<Fuel decrease>
1) During deceleration



Fuel Injection Control (Cont'd)

MIXTURE RATIO FEEDBACK CONTROL (For catalyzer model)

Mixture ratio feedback system is designed to precisely control the mixture ratio to the stoichiometric point so that the three-way catalyst can reduce CO, HC and NOx emissions. This system uses an exhaust gas sensor in the exhaust manifold to check the air-fuel ratio. The control unit adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the range of the stoichiometric air-fuel ratio.

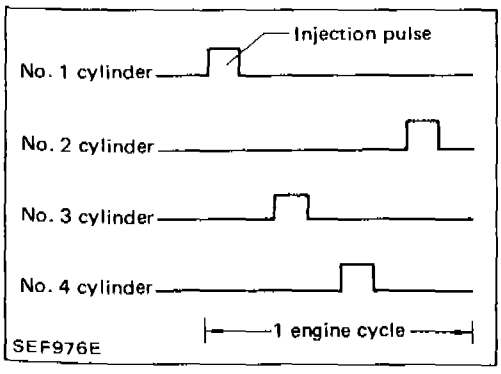
This stage refers to the closed-loop control condition. The open-loop control condition refers to that under which the E.C.U. detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

1) Deceleration
2) High-load, high-speed operation
3) Engine idling
4) Malfunctioning of exhaust gas sensor or its circuit
5) Insufficient activation of exhaust gas sensor at low engine temperature
6) Engine starting

MIXTURE RATIO SELF-LEARNING CONTROL (For catalyzer model)

The air-fuel ratio feedback control system monitors the air-fuel signal transmitted from the exhaust gas sensor. This feedback signal is then sent to the E.C.U. to control the amount of fuel injection to provide a basic air-fuel ratio as close to the theoretical air-fuel ratio as possible. However, the basic air-fuel ratio is not necessarily controlled as originally designed. This is due to manufacturing errors (e.g., air flow meter hot wire) and changes during operation (injector clogging, etc.) of E.C.C.S. parts which directly affect the air-fuel ratio.

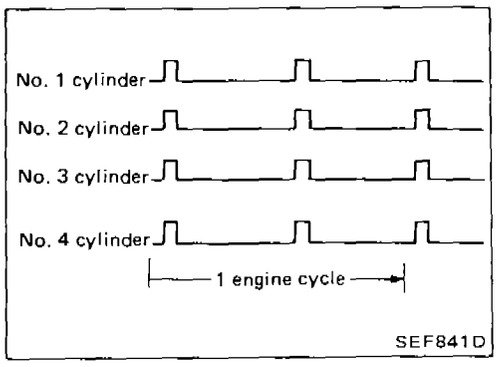
Accordingly, a difference between the basic and theoretical air-fuel ratios is quantitatively monitored in this system. It is then computed in terms of "fuel injection duration" to automatically compensate for the difference between the two ratios.



FUEL INJECTION TIMING

Fuel is injected once a cycle for each cylinder in the firing order.

Fuel Injection Control (Cont'd)



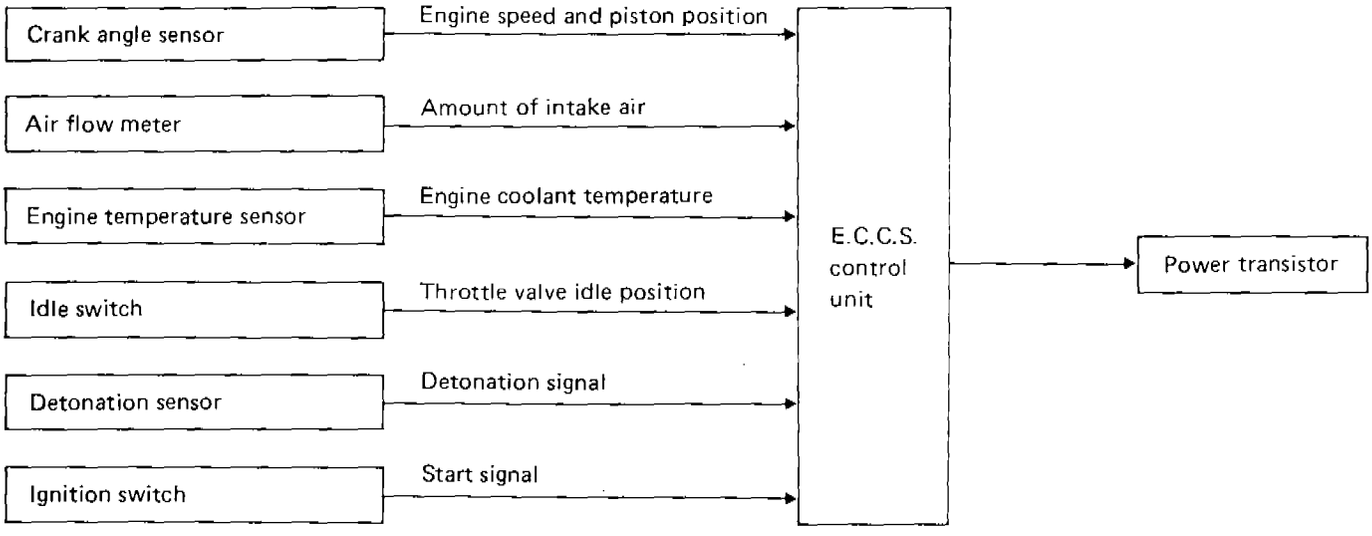
When engine temperature is low, engine starts, or engine load is heavy, fuel is injected into all four cylinders simultaneously twice a cycle.

FUEL SHUT-OFF

Fuel to all cylinders is cut off during deceleration or high-speed operation.

Ignition Timing Control

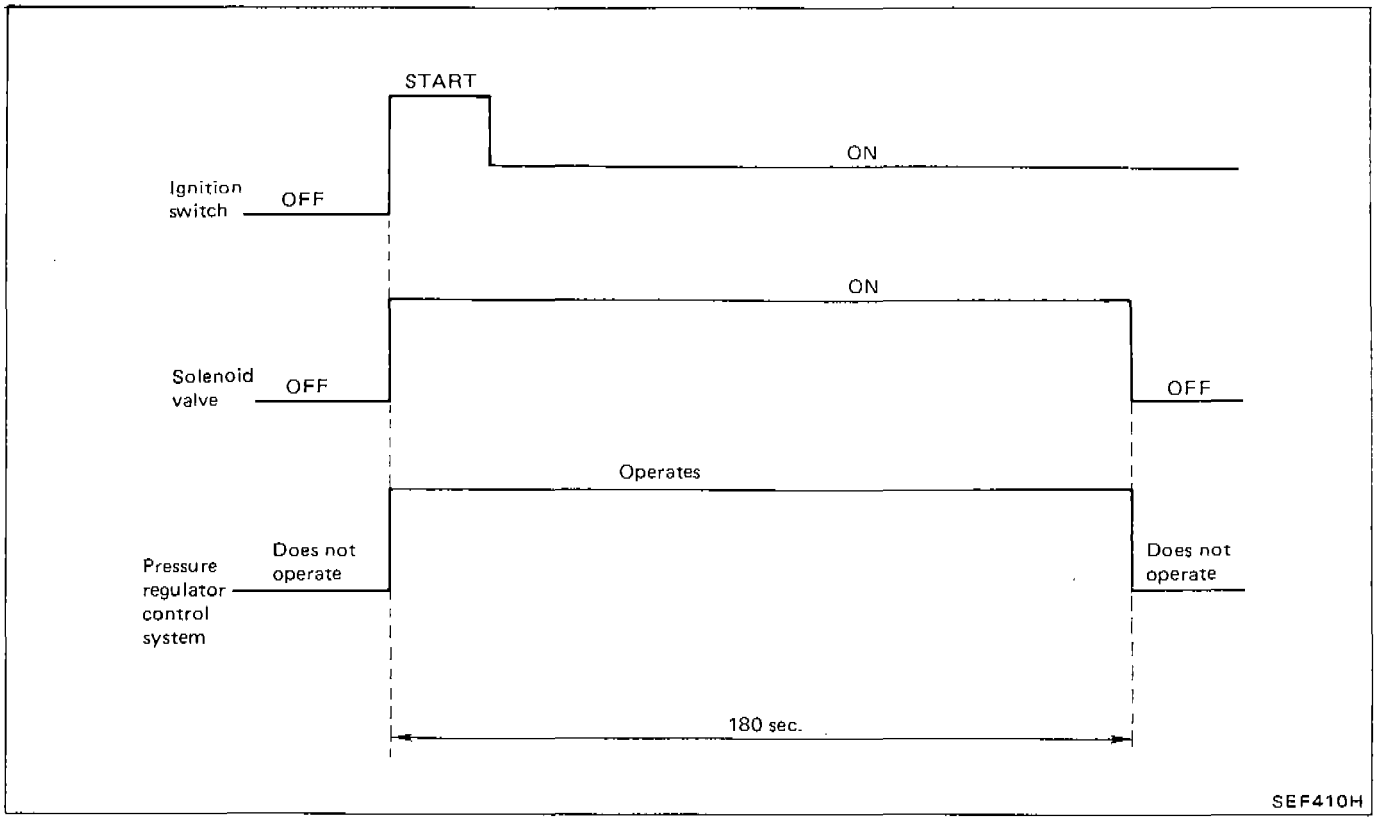
INPUT/OUTPUT SIGNAL LINE



Fuel Pressure Regulator Control (Cont'd)

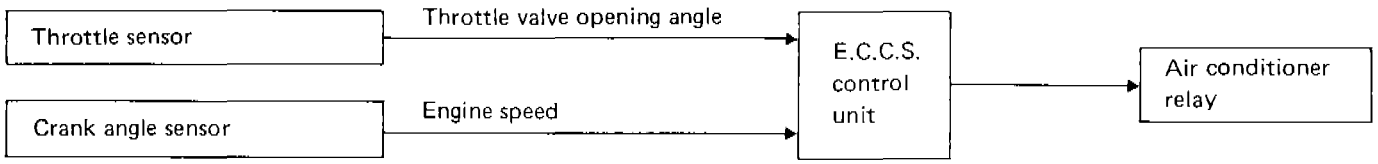
SYSTEM DESCRIPTION

The fuel "pressure-up" control system briefly increases fuel pressure for improved starting performance of a hot engine. Under normal operating conditions, manifold vacuum is applied to the fuel pressure regulator. When starting the engine, however, the E.C.U. allows current to flow through the ON/OFF solenoid valve in the control vacuum line, opening this line to the atmosphere. As a result, atmospheric pressure is applied, throttling the fuel passage to increase fuel pressure.



Acceleration Cut Control

INPUT/OUTPUT SIGNAL LINE

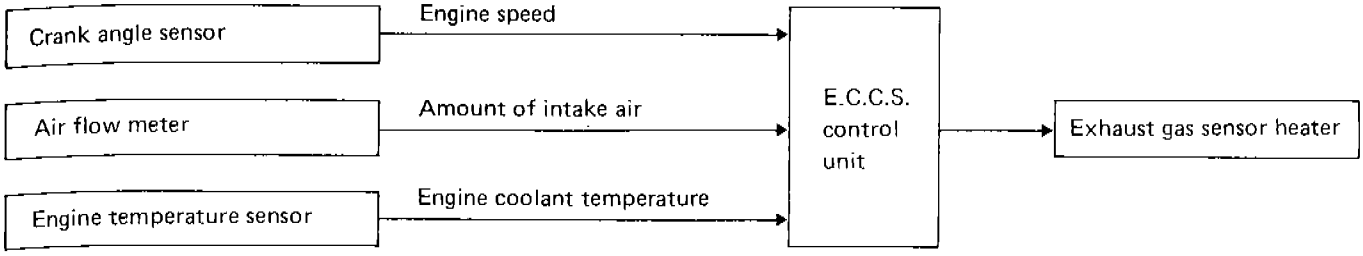


SYSTEM DESCRIPTION

When E.C.U. detects heavy load conditions, air conditioner is turned off for a few seconds.
This system improves acceleration when air conditioner is used.

Exhaust Gas Sensor Heater Control (For catalyzer model)

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The exhaust gas sensor heater helps activate the sensor quickly to stabilize closed-loop control under all operating conditions.

Fail-safe System

AIR FLOW METER MALFUNCTION

If the air flow meter output voltage is above or below the specified value, the E.C.U. senses an air flow meter malfunction. In case of a malfunction, the throttle sensor substitutes for the air flow meter.

Though air flow meter is malfunctioning, it is possible to drive the vehicle and start the engine. But engine speed will not rise more than 2,000 rpm in order to inform the driver of fail-safe system operation while driving.

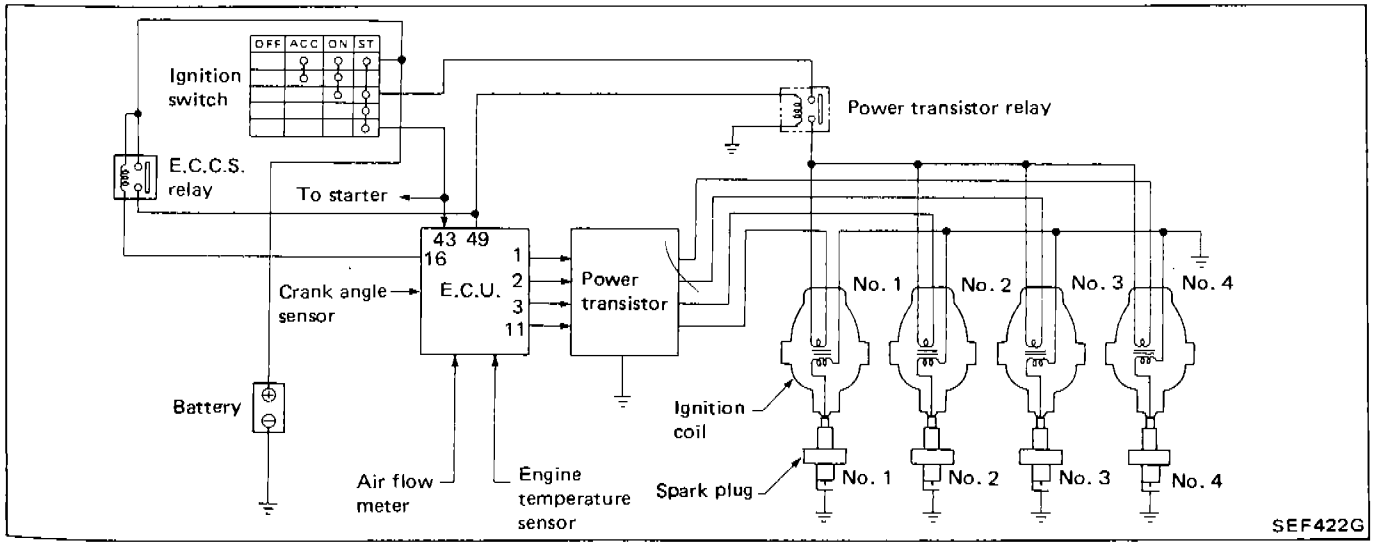
ENGINE TEMPERATURE SENSOR MALFUNCTION

When engine temperature sensor output voltage is below or above the specified value, engine temperature is fixed at the preset value as follows:

Engine condition	Engine temperature preset value °C (°F)
Start	20 (68)
Running	80 (176)

Direct Ignition System

This system has no conventional distributor and high-tension wires. Small, very efficient ignition coils are fitted directly to each spark plug.



Direct Ignition System (Cont'd)

CHECKING IGNITION TIMING AND IDLE SPEED

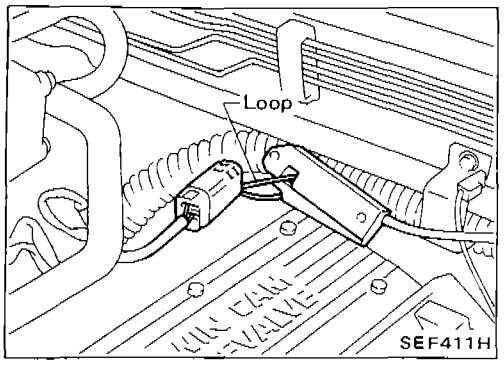
Checking idle speed

Idle speed:

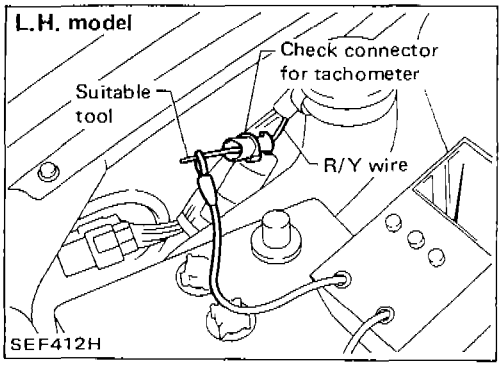
M/T: 850 ± 50 rpm

A/T: 850 ± 50 rpm (in "N" position)

If idle speed is not within specific value, refer to IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION.

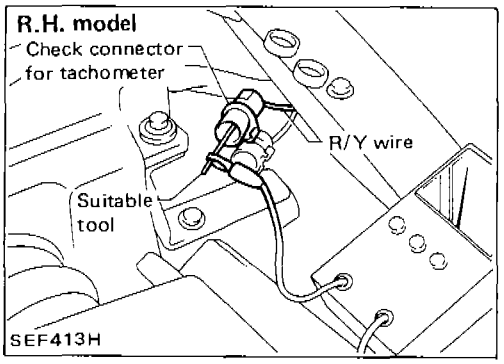


- METHOD A (With pulse type tachometer)
  Clamp loop wire as shown.



- METHOD B (With voltage type tachometer)

1. Disconnect check connector for tachometer.

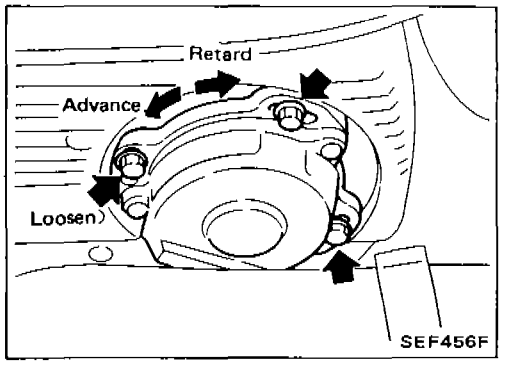


2. Connect tachometer using suitable tool.

Checking ignition timing

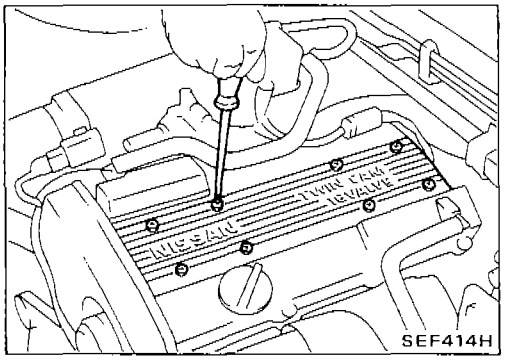
Ignition timing: 15° ± 2° B.T.D.C.

If ignition timing is not within specific value, adjust ignition timing as shown.

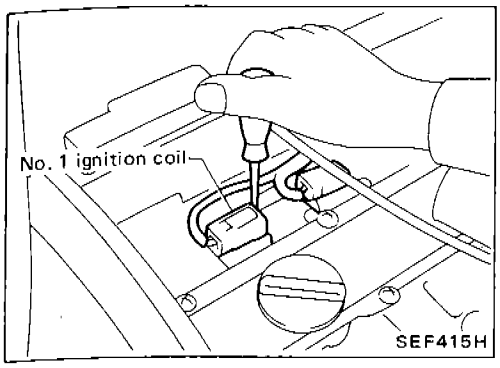


- METHOD A (Without Tool)

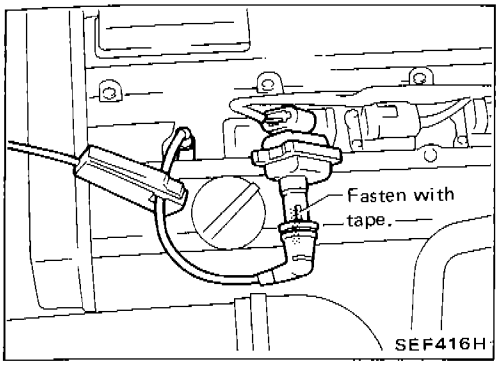
1. Remove ornament cover.



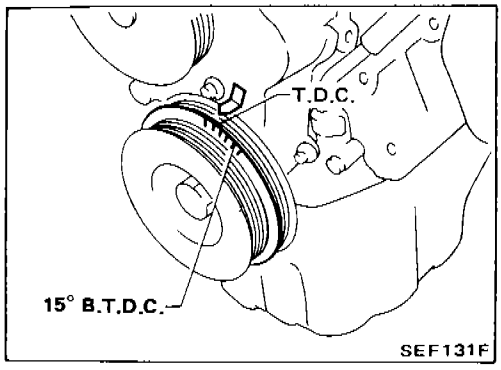
Direct Ignition System (Cont'd)



2. Remove No. 1 ignition coil.

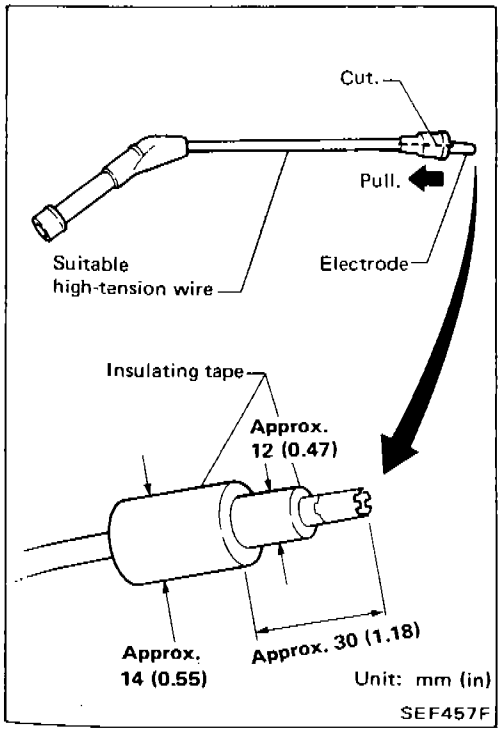


3. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and clamp this wire with timing light clamp.

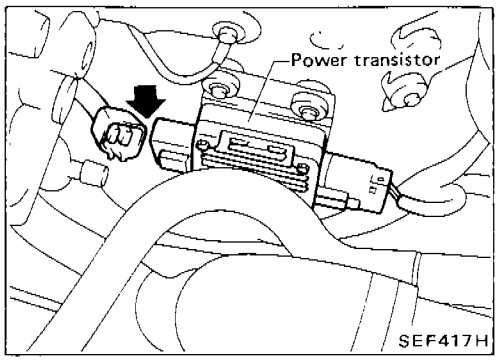


4. Check ignition timing.
5. Install No. 1 ignition coil and ornament cover.

For above procedures, enlarge suitable high-tension wire end with insulating tape as shown.

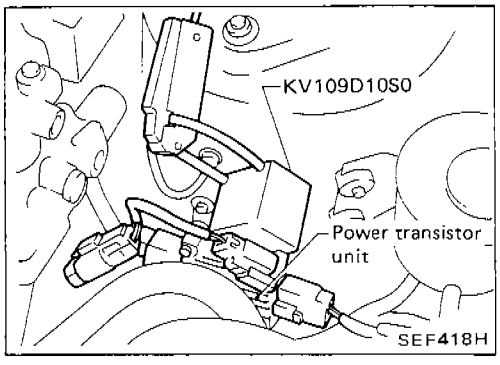


Direct Ignition System (Cont'd)

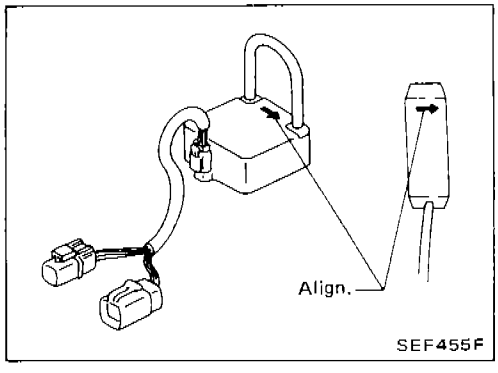


- METHOD B (With Tool KV109D10S0)

1. Disconnect connector of power transistor unit.



2. Connect Tool and clamp wire as shown.



Align direction marks on Tool and timing light clamp if aligning mark is punched.

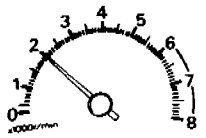
Preparation

Make sure that the following parts are in good condition.

- **Battery**
- **Ignition system**
- **Engine oil and coolant levels**
- **Fuses**
- **E.C.C.S. harness connectors**
- **Vacuum hoses**
- **Air intake system (oil filler cap, oil level gauge, etc.)**
- **Fuel pressure**
- **Engine compression**
- **Throttle valve**
- **Fuel pressure regulator control system**

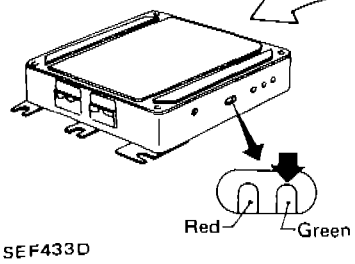
Notice

1. Turn off air conditioner and headlamps.
2. During checking and adjusting, make sure engine is at normal operating temperature.
3. Set shift lever in "Neutral" position ("N" or "P" position for automatic transmission).
4. Engage parking brake and lock both front and rear wheels with wheel chocks.
5. Measure "CO"% with air cleaner installed.
6. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tailpipe.
7. Make sure fuel pressure regulator control system does not operate.


SEF477B

Run engine at about 2,000 rpm for about 2 minutes under no-load.

Make sure that inspection lamp (Green) on control unit goes on and off periodically more than 9 times during 10 seconds at 2,000 rpm under no-load. (Select mode I or II)



SEF433D

O.K.

N.G.

Race engine two or three times under no-load, then run engine at idle speed.

Set the diagnosis mode of E.C.U. to No. 2 mode and check that inspection lamps (Red and Green) on control unit blink at 2,000 rpm under no-load. They should blink simultaneously.

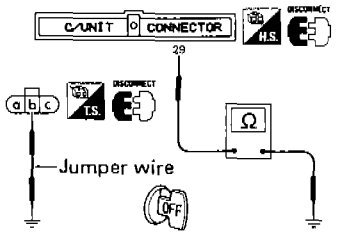
No

Yes

INSPECTION END

Check exhaust gas sensor harness:

1) Turn off engine and disconnect battery ground cable.
2) Disconnect connector from Control Unit.
3) Disconnect exhaust gas sensor harness connector and connect terminal for exhaust gas sensor harness connector to ground with a jumping wire.
4) Check for continuity between terminal No. 29 and ground metal on vehicle body.
5) Connect Control Unit connector and battery ground cable.



SEF547H

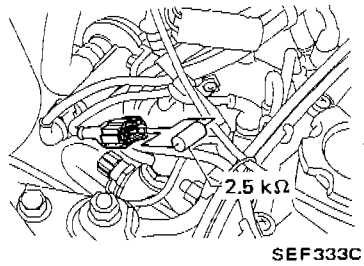
Continuity exists ..... O.K.
Continuity does not exist ..... N.G.

O.K.

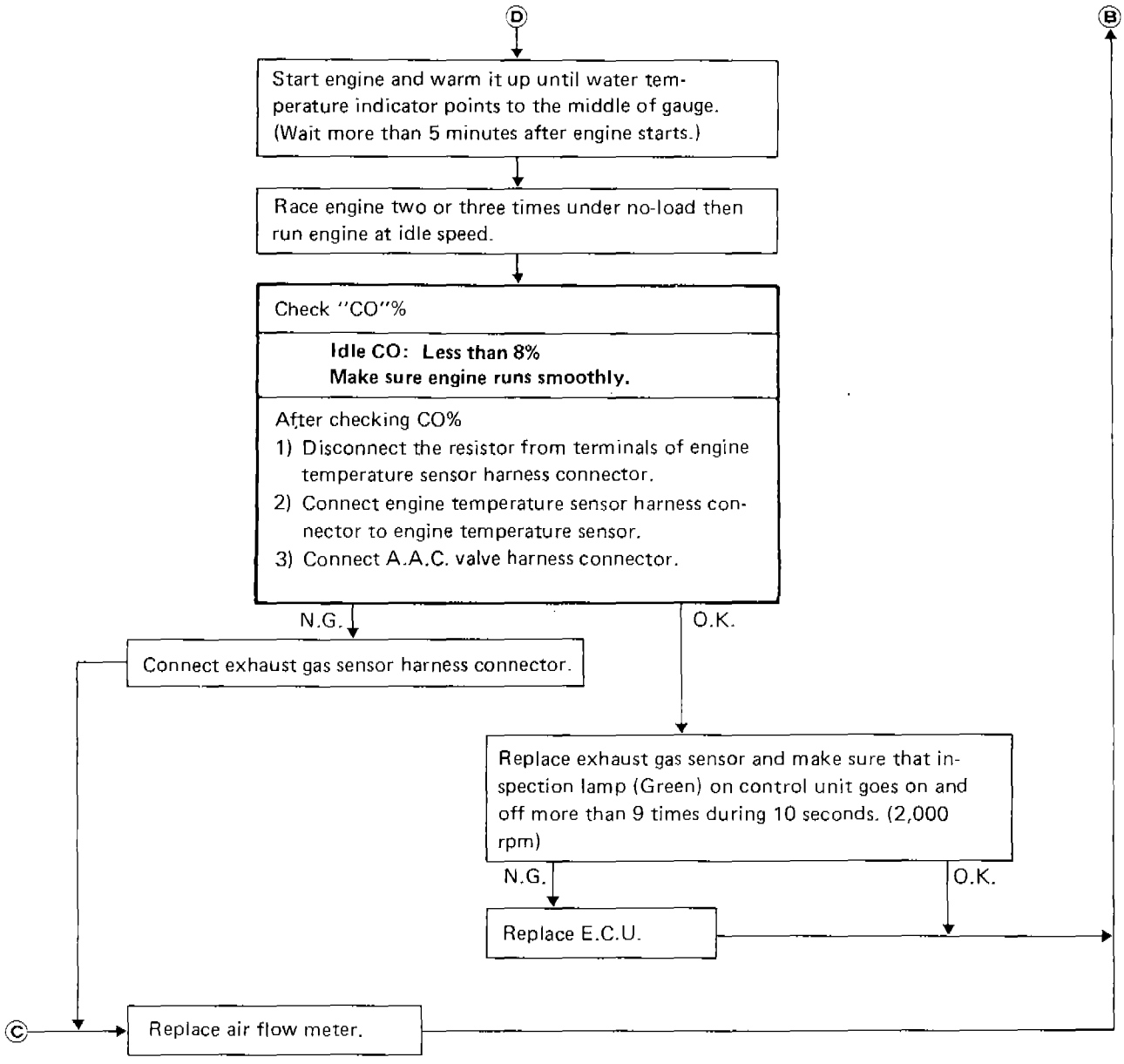
N.G.

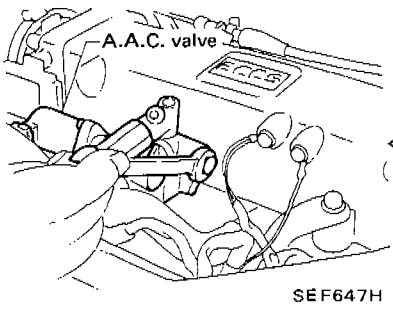
Repair or replace E.C.C.S. harness.

- Disconnect engine temperature sensor harness connector.
- Connect a resistor (2.5 kΩ) between terminals of engine temperature sensor harness connector.
- Disconnect A.A.C. valve harness connector.



SEF333C


Ⓓ
Start engine and warm it up until water temperature indicator points to the middle of gauge. (Wait more than 5 minutes after engine starts.)
Race engine two or three times under no-load then run engine at idle speed.
Check "CO"%
Idle CO: Less than 8%
Make sure engine runs smoothly.
After checking CO%
1) Disconnect the resistor from terminals of engine temperature sensor harness connector.
2) Connect engine temperature sensor harness connector to engine temperature sensor.
3) Connect A.A.C. valve harness connector.
N.G.
O.K.
Connect exhaust gas sensor harness connector.
Replace exhaust gas sensor and make sure that inspection lamp (Green) on control unit goes on and off more than 9 times during 10 seconds. (2,000 rpm)
N.G.
O.K.
Replace E.C.U.
Ⓒ
Replace air flow meter.
Ⓑ



Ⓐ

Disconnect A.A.C. valve harness connector.

Adjust idle speed to 800 rpm by turning idle speed adjusting screw.

Connect A.A.C. valve harness connector.

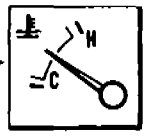
Ⓑ

IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION

For non-catalyzer model
[Without "CO"-meter]

INSPECTION START

Confirm that engine is at normal operating temperature.



SEF457C

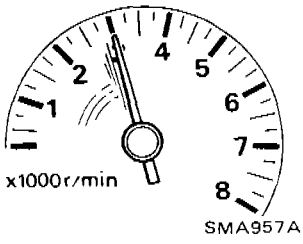
Check and adjust idle speed and ignition timing.

Idle speed: rpm M/T 850±50
A/T 850±50 (in "N" position)
Ignition timing: 15°±2° B.T.D.C.
Refer to page EF & EC-22.

Turn off engine and remove air flow meter from vehicle.

Drill a hole in seal plug which seals air flow meter variable resister and remove seal plug.

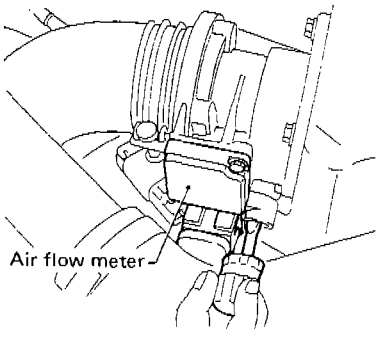
Install air flow meter on vehicle.
Start engine and warm it up untill water temperature indicator points to the middle of gauge.



SMA957A

Race engine two or three times under no-load, then run engine at idle.

Adjust mixture ratio with engine speed set at maximum by turning variable resistor.



SEF648H

Turn variable resistor of air flow meter 2 full turns counterclockwise.

Check idle speed.

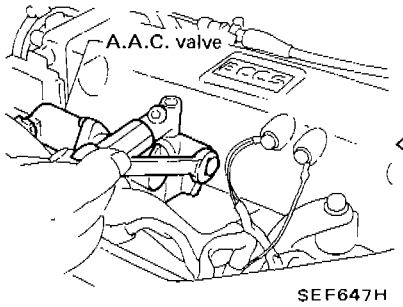
Idle speed: rpm M/T 850±50
A/T 850±50 (in "N" position)

N.G.

O.K.

Stop engine.

INSPECTION END



SEF647H

Disconnect A.A.C. valve harness connector.

Adjust idle speed to 800 rpm by turning idle speed adjusting screw.

Connect A.A.C. valve harness connector.

Contents (Cont'd)

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

DIAGNOSTIC WORKSHEET

There are many kinds of operating conditions that lead to malfunctions on engine components.
A good grasp of such conditions can make trouble-shooting faster and more accurate.
In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions a customer complains.
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for trouble-shooting.

KEY POINTS

WHAT ..... Vehicle & engine model
WHEN ..... Date, Frequencies
WHERE ..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

Worksheet sample

Customer name MR/MS	Model & Year	VIN
Engine #	Trans.	Mileage (kilometer)
Incident Date	Manuf. Date	In Service Date

Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]
	☐ Driveability	☐ Stumble ☐ Surge ☐ Detonation ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes
Weather conditions		☐ Not effected
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH
Check engine light		☐ Turned on ☐ Not turned on

Diagnostic Table

To assist with your trouble diagnoses, some typical diagnostic procedures for the following symptoms are described.

REMARKS

In the following pages, the numbers such as ❶, ❷ in the above chart correspond to those in the service procedure described below.
Possible causes can be checked through the service procedure shown by the mark "○".

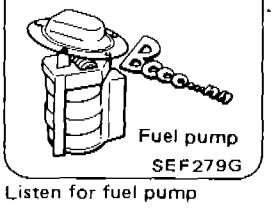
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 2 **Impossible to start — partial combustion**

POSSIBLE CAUSES		❶	❷	❸	❹	❺
SPECIFICATIONS	Mixture ratio	○	○	○		
	Fuel pressure (too low)				○	
	Ignition timing					○
FUEL SYSTEM	Fuel pump	○				
	Fuel pump relay (open circuited)	○				
	Injectors (clogged)		○			

SERVICE PROCEDURE

❶ LISTEN

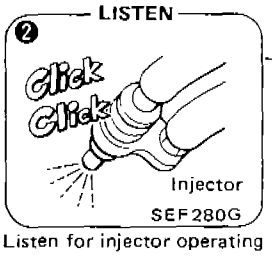


Listen for fuel pump operating sound.

N.G. → Check fuel pump and/or related circuits. [See page EF & EC-102.]

O.K. →

❷ LISTEN

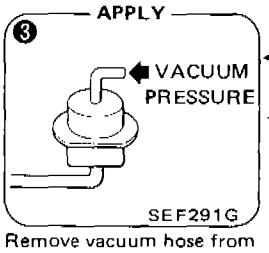


Listen for injector operating sound.

N.G. → Check injector circuit. [See page EF & EC-112.]

O.K. →

❸ APPLY

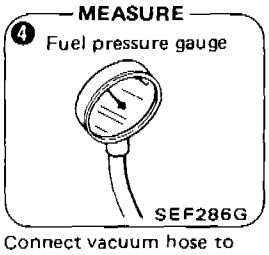


Remove vacuum hose from pressure regulator, and apply vacuum and/or pressure, and try to start.

Improved →

❹ MEASURE

Fuel pressure gauge

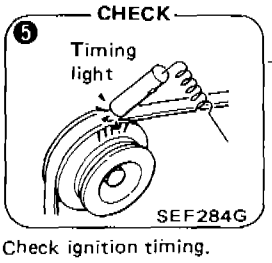


Connect vacuum hose to pressure regulator and measure fuel pressure.

↓

Check idle mixture ratio. [See page EF & EC-25.]

❺ CHECK



Check ignition timing.

→ Adjust ignition timing. [See page EF & EC-22.]

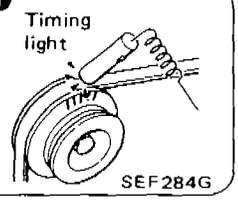
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 10 | Abnormal idling – low idle (after warm-up)

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio		○			○		
	Ignition timing (too retarded)	○						
INTAKE SYSTEM	Throttle chamber (with ports clogged)			○				
	Throttle valve (clogged)				○			
CONTROL SYSTEM	Crank angle sensor						○	
	Air flow meter						○	
	Engine temperature sensor						○	○

SERVICE PROCEDURE

❶ CHECK

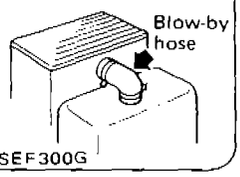


Check ignition timing.

N.G.

Adjust ignition timing. [See page EF & EC-22.]

❷ CHECK

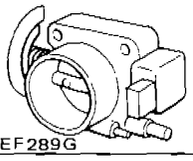


Check blow-by hose for clogging.

N.G.

Clean or replace the hose.

❸ CHECK

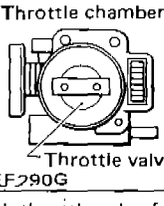


Check throttle chamber ports for clogging.

N.G.

Clean the ports.

❹ CHECK

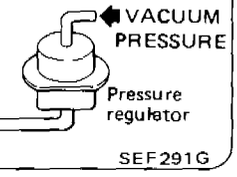


Check throttle valve for clogging.

N.G.

Clean the valve.

❺ APPLY

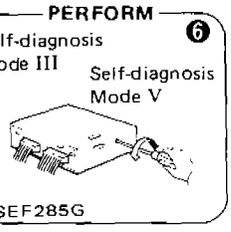


Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and check idling.

Improved → Check idle mixture ratio. [See page EF & EC-25.]

No change → Check load signal circuit. [See EL section.]

❻ PERFORM

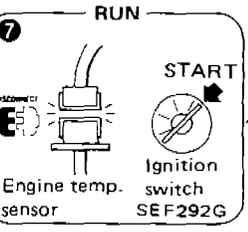


Perform self-diagnosis Modes III and V (for air flow meter, and engine temp. sensor.)

N.G.

Check the malfunctioning parts and/or circuits. [See page EF & EC-84 (air flow meter), page EF & EC-86 (engine temp. sensor).]

❼ RUN



N.G.

Start and run engine with engine temp. sensor connector disconnected.

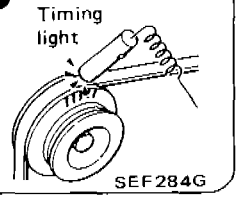
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 11 | **Abnormal idling – high idle (after warm-up)**

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽	❾	❿	⓫
SPECIFICATIONS	Mixture ratio		○	○		○	○			○		
	Ignition timing (too advanced)	○										
INTAKE SYSTEM	Air duct (leaks)		○									
	Throttle chamber (air leaks)				○							
	Throttle valve (stuck control wire)				○							
	Intake manifold (gasket) (air leaks)		○									
	Air regulator (stuck open)			○								
	A.A.C. valve							○				
	F.I.C.D. solenoid (remaining ON)								○			
CONTROL SYSTEM	Crank angle sensor										○	
	Air flow meter										○	
	Engine temperature sensor										○	○
	Idle switch (remaining OFF)							○		○		
OTHERS	Battery (voltage too low)											

SERVICE PROCEDURE

❶ CHECK

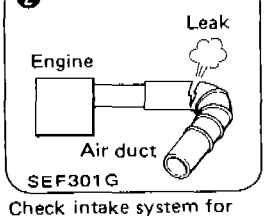


Check ignition timing.

N.G. ↓

Adjust ignition timing.
[See page EF & EC-22.]

❷ CHECK



Check intake system for air leaks.

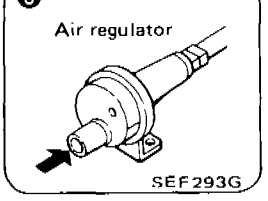
O.K. ↓

Check throttle wire for rough sliding.

N.G. ↓

Repair/replace the part.

❸ CHECK

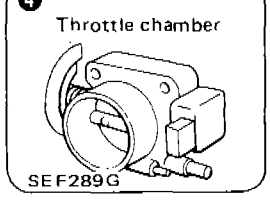


Make sure air regulator stays closed after warm-up.

N.G. ↓

Check air regulator and/or its circuit.
[See page EF & EC-110.]

❹ CHECK

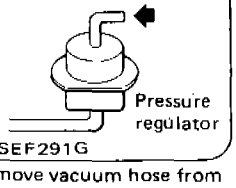


Check throttle chamber ports and valve for clogging.

N.G. ↓

Clean the ports and/or throttle valve.

❺ REMOVE



Remove vacuum hose from pressure regulator, and try to start.

Improved →

❻ MEASURE

Fuel pressure

Connect vacuum hose to pressure regulator and measure fuel pressure.

↓

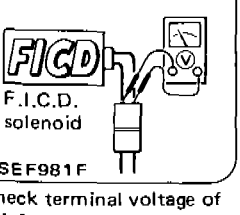
Check idle mixture ratio.
[See page EF & EC-25.]

❼ CHECK

Check A.A.C. valve and/or its circuit
[See page EF & EC-106.]

→ Check sensor circuit.
[See page EF & EC-86 (engine temp. sensor), page EF & EC-82 (crank angle sensor), page EF & EC-84 (air flow meter).]

❽ CHECK



Check terminal voltage of F.I.C.D. solenoid while idling.

↓

Check the part and/or circuit.
[See HA section.]

❾ PERFORM

Self-diagnosis Mode IV

Perform self-diagnosis Mode IV (for idle switch).

N.G. ↓

Check the idle switch circuit.
[See page EF & EC-94.]

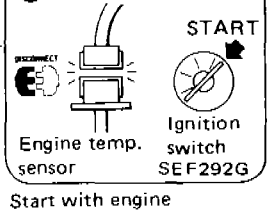
❿ PERFORM

Self-diagnosis Mode III

N.G. ↑

Perform self-diagnosis Mode III (for engine temp. sensor, crank angle sensor and air flow meter).

⓫ CRANK



N.G. ↑

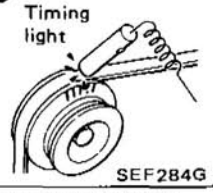
Start with engine temp. sensor connector disconnected.

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 12 Unstable idling – before warm-up

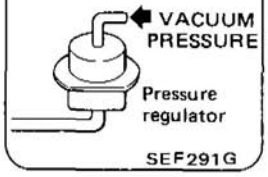
POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio		○	○			
	Ignition timing	○					
INTAKE SYSTEM	Air regulator (not open enough)		○				
	A.A.C. valve				○		
CONTROL SYSTEM	Engine temperature sensor					○	○

SERVICE PROCEDURE

❶ CHECK
Timing light

SEF284G
N.G. → Adjust ignition timing. [See page EF & EC-22.]
Check ignition timing.

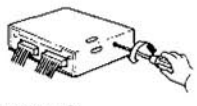
❷ CHECK
Air regulator

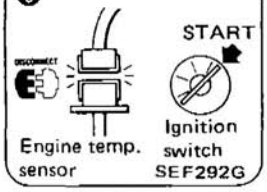
SEF293G
N.G. → Check air regulator and/or its circuit. [See page EF & EC-110.]
Make sure air regulator stays open before warm-up.

❸ APPLY


SEF291G
Improved → Check idle mixture ratio. [See page EF & EC-25.]
Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and check idling.

❹ CHECK
Check A.A.C. valve and/or its circuit. [See page EF & EC-106.]

❺ PERFORM
Self-diagnosis Mode III

SEF285G
N.G. → Check sensor circuit. [See page EF & EC-86.]
Perform self-diagnosis Mode III (for engine temp. sensor).

❻ RUN


SEF292G
N.G. → Check sensor circuit. [See page EF & EC-86.]
Start and run engine with engine temp. sensor connector disconnected.

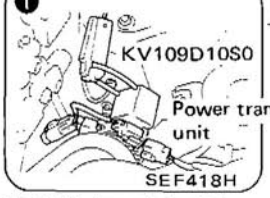
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 14 Poor driveability – stumble (while accelerating)

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼	❽
SPECIFICATIONS	Mixture ratio			○		○	○		○
	Fuel pressure					○	○		
FUEL SYSTEM	Fuel filter (clogged)						○		
	Fuel line (clogged)						○		
	Injectors (clogged)						○		
IGNITION SYSTEM	Power transistor	○	○						
	Ignition coil	○	○						
	Spark plugs (ignition leaks, improper gap)		○						
INTAKE SYSTEM	Air duct (leaks)			○					
CONTROL SYSTEM	Crank angle sensor	○						○	
	Air flow meter							○	
	Engine temperature sensor	○						○	
	Exhaust gas sensor								○
	Idle switch (remaining OFF)				○				
OTHERS	Fuel (poor quality)								

SERVICE PROCEDURE

❶ CHECK



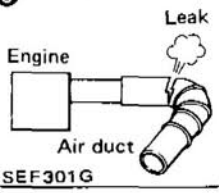
N.G. → Check ignition signal circuit. [See pgae EF & EC-90.]

Check flashes of timing light for weakness.

❷ CHECK Ignition coil

Remove spark plugs and check their ignition sparks.

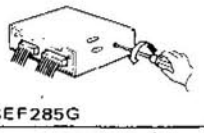
❸ CHECK



N.G. → Repair/replace the part.

Check intake system for air leaks.

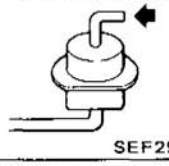
❹ PERFORM Self-diagnosis Mode IV



N.G. → Check the idle switch circuit. [See page EF & EC-94.]

Perform self-diagnosis Mode IV (for idle switch).

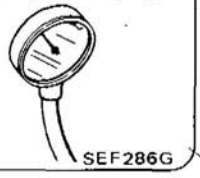
❺ REMOVE Pressure regulator



Improved →

Remove vacuum hose from pressure regulator, and try to drive.

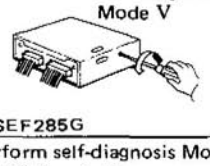
❻ MEASURE Fuel pressure gauge



→ Check idle mixture ratio. [See page EF & EC-25.]

Connect vacuum hose to pressure regulator and measure fuel pressure while driving.

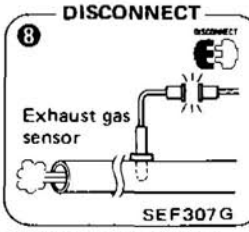
❼ PERFORM Self-diagnosis Mode III, Self-diagnosis Mode V



N.G. → Check the malfunctioning parts and/or circuits. [See page EF & EC-84 (air flow meter), page EF & EC-82 (crank angle sensor), page EF & EC-86 (engine temp. sensor).]

Perform self-diagnosis Mode III and V (for air flow meter, crank angle sensor and engine temp. sensor).

❽ DISCONNECT



Improved → Replace the sensor.

No change → Check idle mixture ratio. [See page EF & EC-25.]

Disconnect exhaust gas sensor connector, and try to drive.

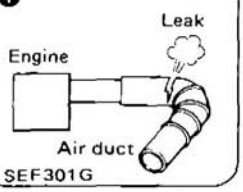
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 15 Poor driveability – surge (while cruising)

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio (too lean)	○		○	○			○
	Fuel pressure (low)			○	○			
	Ignition timing		○					
IGNITION SYSTEM	(missing)						○	
INTAKE SYSTEM	Air duct (leaks)	○						
	Throttle chamber (air leaks)	○						
	Intake manifold (gasket) (air leaks)	○						
CONTROL SYSTEM	Crank angle sensor						○	
	Air flow meter						○	
	Exhaust gas sensor							○
	Idle switch					○		

SERVICE PROCEDURE

❶ CHECK

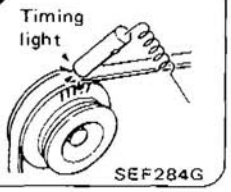


Check intake system for air leaks.

↓ N.G.

Repair/replace the part.

❷ CHECK



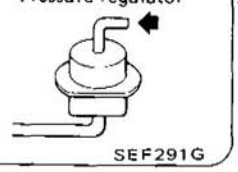
Check ignition timing.

↓ N.G.

Adjust ignition timing.
[See page EF & EC-22.]

❸ REMOVE

Pressure regulator



Remove vacuum hose from pressure regulator, and try to drive.

Improved →

❹ MEASURE

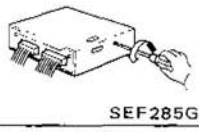
Fuel pressure gauge

Connect vacuum hose to pressure regulator and measure fuel pressure while driving.

→ Check idle mixture ratio.
[See page EF & EC-25.]

❺ PERFORM

Self-diagnosis Mode IV



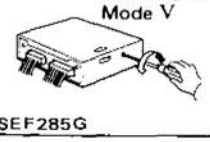
Perform self-diagnosis Mode IV (for idle switch).

↓ N.G.

Check the idle switch circuit.
[See page EF & EC-94.]

❻ PERFORM

Self-diagnosis Mode III
Self-diagnosis Mode V

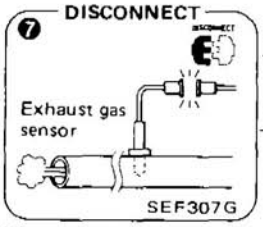


Perform self-diagnosis Mode III and V (for crank angle sensor, air flow meter and ignition signal).

N.G. →

Check the malfunctioning parts and/or circuits.
[See page EF & EC-82 (crank angle sensor), page EF & EC-84 (air flow meter), page EF & EC-90 (ignition signal).]

❼ DISCONNECT



Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

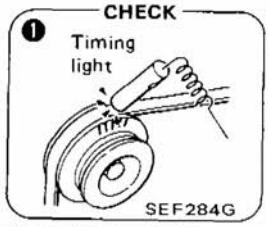
No change → Check idle mixture ratio.
[See page EF & EC-25.]

Diagnostic Table (Cont'd)

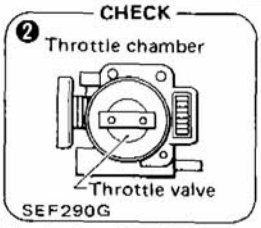
SYMPTOM & CONDITION 18 **Engine stall – during start-up**

	POSSIBLE CAUSES	❶	❷	❸	❹	❺	❻	❼	❽
SPECIFICATIONS	Mixture ratio (too rich/too lean)						○	○	○
	Ignition sparks (weak)			○					
	Ignition timing	○							
	Compression pressure (too low)					○			
FUEL SYSTEM	Canister (too much evaporation to intake)						○		
IGNITION SYSTEM	Spark plugs (wet with fuel, improper gap)				○				
INTAKE SYSTEM	Throttle valve (not open enough)		○						
CONTROL SYSTEM	Exhaust gas sensor								○

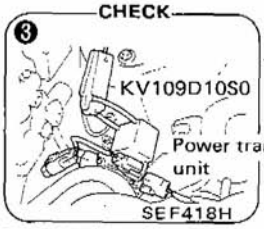
SERVICE PROCEDURE

❶ CHECK


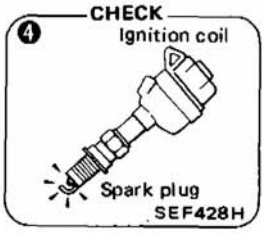
N.G. → Adjust ignition timing. [See page EF & EC-22.]
Check ignition timing.

❷ CHECK


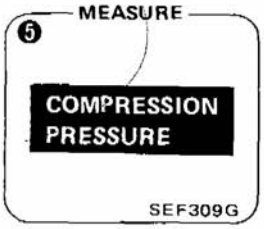
N.G. → Repair/replace the part.
Check throttle valve for rough movement.

❸ CHECK


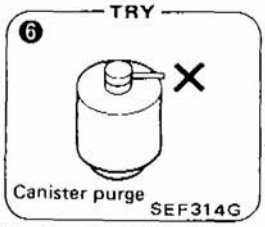
N.G. → Check ignition signal circuit. [See page EF & EC-90.]
Check flashes of timing light for weakness.

❹ CHECK


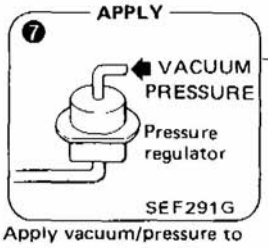
Remove spark plugs and check their ignition sparks.

❺ MEASURE


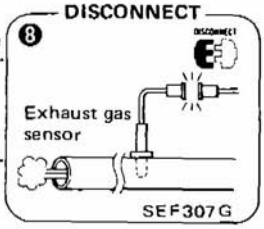
Measure compression pressure.
→ Check cylinder head and gasket. [See EM section.]

❻ TRY


Improved → Replace the canister and/or the hoses.
No change
Shut evaporated fuel to intake valve and try to drive.

❼ APPLY


Improved → Check idle mixture ratio. [See page EF & EC-25.]
Apply vacuum/pressure to pressure regulator after disconnecting vacuum hose, and try to drive.

❽ DISCONNECT


No change → Replace the sensor. Improved
Disconnect exhaust gas sensor connector and try to drive.

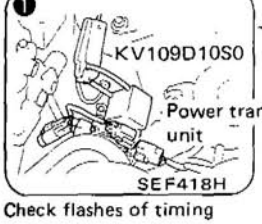
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 21 Engine stall – while cruising

	POSSIBLE CAUSES	❶	❷	❸	❹	❺
SPECIFICATIONS	Mixture ratio			○	○	
	Ignition sparks (weak, missing)	○	○			
CONTROL SYSTEM	Crank angle sensor					○
	Air flow meter					○
	Exhaust gas sensor			○	○	

SERVICE PROCEDURE

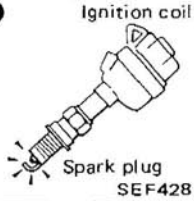
❶ CHECK



Check flashes of timing light for weakness at constant engine rev. (1,000 to 2,000 rpm).

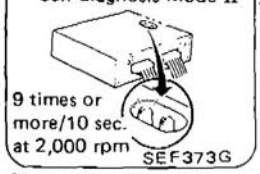
N.G. → Check ignition signal circuit. [See page EF & EC-90.]

❷ CHECK Ignition coil



Remove spark plugs and check their ignition sparks.

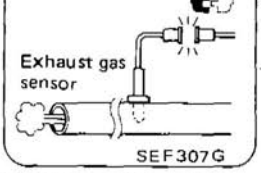
❸ CHECK Self-diagnosis Mode II



Check mixture ratio by flashes of inspection lamps.

N.G. →

❹ DISCONNECT

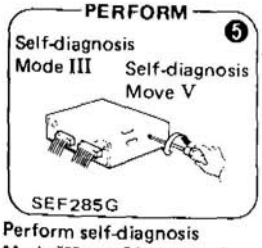


Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check idle mixture ratio. [See page EF & EC-25.]

❺ PERFORM



Perform self-diagnosis Mode III and V (for air flow meter and crank angle sensor).

N.G. → Check the circuits. [See page EF & EC-82 (crank angle sensor), page EF & EC-84 (air flow meter).]

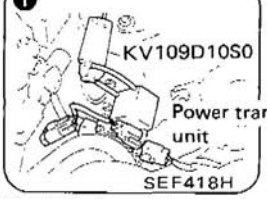
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 22 | Engine stall – while decelerating/just after stopping

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻
SPECIFICATIONS	Mixture ratio					○	○
	Ignition sparks (missing)	○					
	Idle speed (too low)			○			
IGNITION SYSTEM	(missing)	○	○				
INTAKE SYSTEM	A.A.C. valve			○	○		
CONTROL SYSTEM	Exhaust gas sensor					○	○
	Crank angle sensor		○				
	Idle switch (remaining OFF)			○			

SERVICE PROCEDURE

❶ CHECK



Check flashes of timing light while decreasing engine speed.

N.G. →

❷ PERFORM

Self-diagnosis Mode V

Perform self-diagnosis Mode V (for ignition signal and crank angle sensor).

N.G. → Check the malfunctioning parts and/or circuits. [See page EF & EC-90 (ignition siglal), page EF & EC-82 (crank angle sensor).]

❸ MEASURE

Tachometer

Measure idle speed.

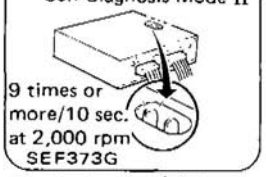
N.G. → Adjust idle speed. [See page EF & EC-25.]

❹ CHECK

Check A.A.C. valve and/or its circuit. [See page EF & EC-106.]

❺ CHECK

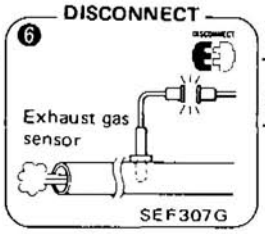
Self-diagnosis Mode II



Check mixture ratio by flashes of inspection lamps.

N.G. →

❻ DISCONNECT



Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check idle mixture ratio. [See page EF & EC-25.]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 23 Engine stall – while loading

POSSIBLE CAUSES		❶	❷	❸	❹	❺
SPECIFICATIONS	Ignition timing		○			
	Idle speed (too low)	○				
INTAKE SYSTEM	A.A.C. valve	○		○		
	F.I.C.D. solenoid (remaining OFF)	○			○	
CONTROL SYSTEM	Idle switch (remaining OFF)	○				○

SERVICE PROCEDURE

❶ MEASURE

Tachometer

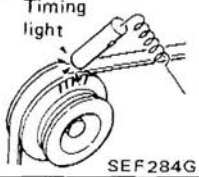
SEF316G

Measure idle speed.

N.G. → Adjust idle speed. [See page EF & EC-25.]

❷ CHECK

Timing light



SEF284G

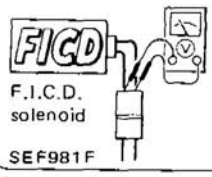
Check ignition timing.

N.G. → Adjust ignition timing. [See page EF & EC-22.]

❸ CHECK

Check A.A.C. valve and/or its circuit. [See page EF & EC-106.]

❹ CHECK



F.I.C.D. solenoid

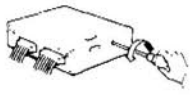
SEF981F

Check terminal voltage of F.I.C.D. solenoid.

→ Check the part and/or circuit. [See HA section.]

❺ PERFORM

Self-diagnosis Mode IV



SEF285G

Perform self-diagnosis Mode IV (for idle switch).

N.G. → Check the idle switch circuit. [See page EF & EC-94.]

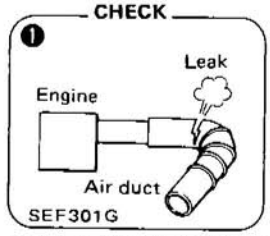
Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 24 Backfire – through the intake

POSSIBLE CAUSES		❶	❷	❸	❹	❺	❻	❼
SPECIFICATIONS	Mixture ratio (too lean)	○		○		○	○	
	Ignition timing (too retarded)		○					
FUEL SYSTEM	Injectors (clogged)				○			
INTAKE SYSTEM	Air duct (air leaks)	○						
	Intake manifold (gaskets) (air leaks)	○						
CONTROL SYSTEM	Air flow meter							○
	Exhaust gas sensor					○	○	

SERVICE PROCEDURE

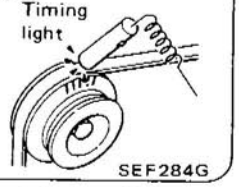
❶ CHECK



Check intake system for air leaks.

N.G. → Repair/replace the part.

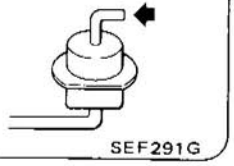
❷ CHECK



Check ignition timing.

N.G. → Adjust ignition timing. [See page EF & EC-22.]

❸ REMOVE



Remove vacuum hose from pressure regulator, and try to drive.

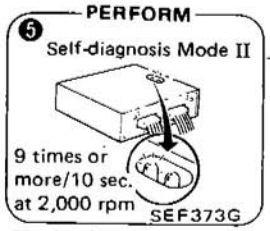
Improved → Check idle mixture ratio. [See page EF & EC-25.]

No change ↓

❹ CLEAN

Clean the injector.

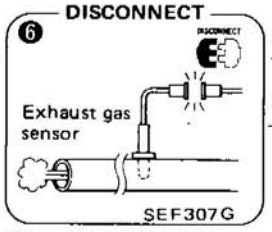
❺ PERFORM



Check mixture ratio by flashes of inspection lamps.

N.G. →

❻ DISCONNECT

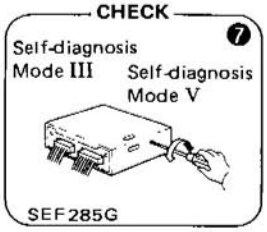


Disconnect exhaust gas sensor connector, and try to drive.

Improved → Replace the sensor.

No change → Check idle mixture ratio. [See page EF & EC-25.]

❼ CHECK



Perform self-diagnosis Mode III and V (for air flow meter).

N.G. ↓

Check the circuits. [See page EF & EC-84 (air flow meter).]

Diagnostic Table (Cont'd)

SYMPTOM & CONDITION 25 **Backfire – through the exhaust**

POSSIBLE CAUSES		❶	❷	❸	❹
SPECIFICATIONS	Mixture ratio (too rich)	○	○		
FUEL SYSTEM	Injectors (fuel leaks)		○		
IGNITION SYSTEM	(missing)				○
INTAKE SYSTEM	Air cleaner element (clogged)	○			
CONTROL SYSTEM	Idle switch (remaining OFF)			○	

SERVICE PROCEDURE

❶ **CHECK**

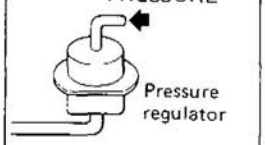
AIR CLEANER ELEMENT

SEF320G

N.G. → Replace the element.

Check air cleaner element for clogging.

❷ **APPLY** PRESSURE

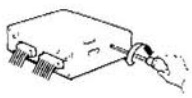


SEF291G

Improved → Check idle mixture ratio. [See page EF & EC-25.]

Apply pressure to pressure regulator after disconnecting vacuum hose, and try to drive.

❸ **PERFORM** Self-diagnosis Mode IV

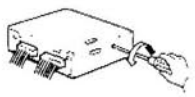


SEF285G

N.G. → Check idle switch and/or its circuit. [See page EF & EC-94.]

Perform self-diagnosis Mode IV (for idle switch).

❹ **PERFORM** Self-diagnosis Mode V



SEF285G

N.G. → Check the malfunctioning part and/or circuit. [See page EF & EC-90 (ignition signal).]

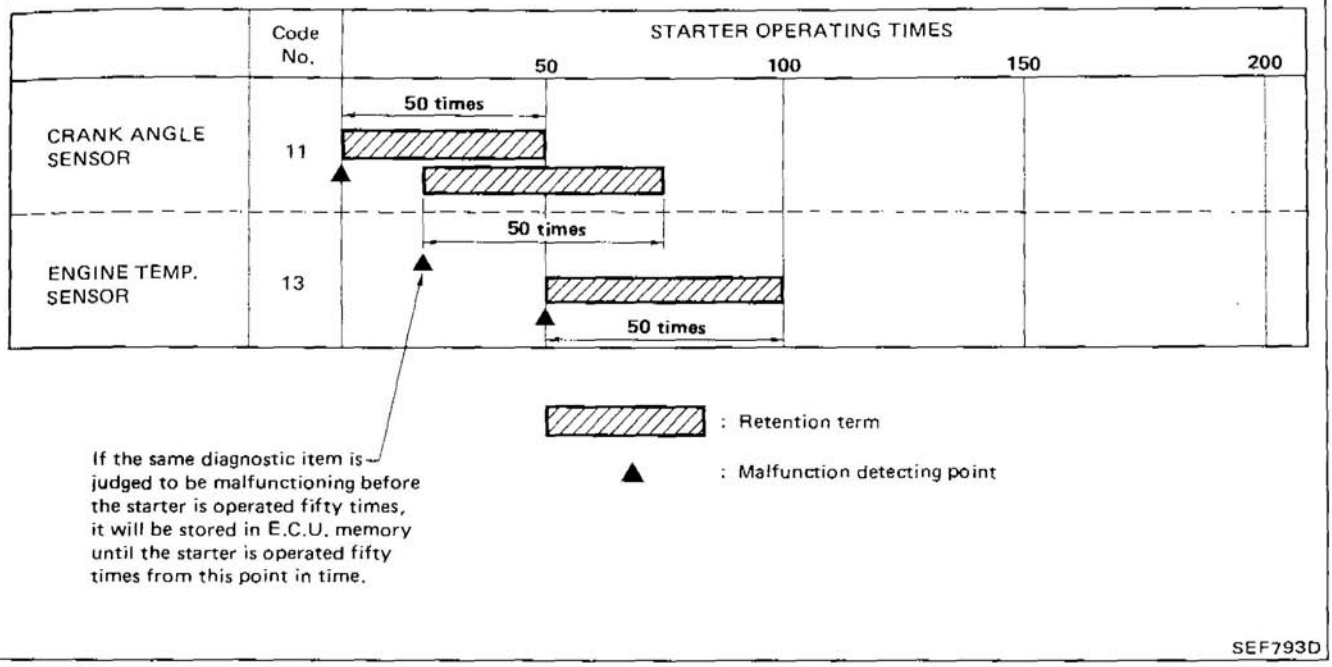
Perform self-diagnosis Mode V (for ignition signal).

Self-diagnosis — Mode III (Cont'd)

RETENTION OF DIAGNOSTIC RESULTS

The diagnostic result is retained in E.C.U. memory until the starter is operated fifty times after a diagnostic item is judged to be malfunctioning. The diagnostic result will then be cancelled automatically. If a diagnostic item which has been judged to be malfunctioning and stored in memory is again judged to be malfunctioning before the starter is operated fifty times, the second result will replace the previous one. It will be stored in E.C.U. memory until the starter is operated fifty times more.

RETENTION TERM CHART (Example)

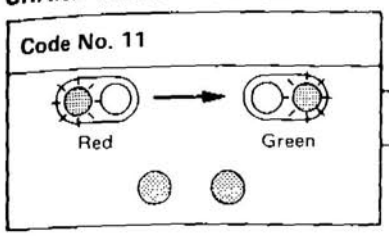


Self-diagnosis — Mode III (Cont'd)

DECODING CHART

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.

CRANK ANGLE SENSOR



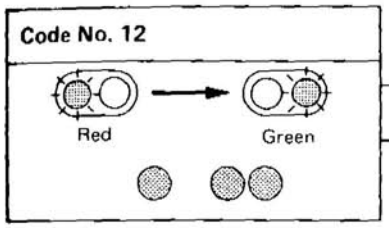
Crank angle sensor circuit

- Either 1° or 180° signal is not entered for the first few seconds during engine cranking.
- Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm.

SYSTEM INSPECTION
See page EF & EC-82.

SEF042F

AIR FLOW METER



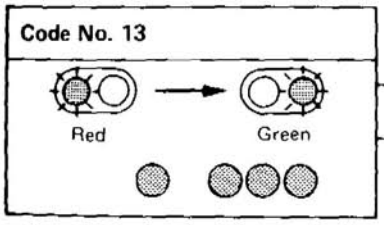
Air flow meter circuit

- The air flow meter circuit is open or shorted.
  (An abnormally high or low voltage is entered.)

SYSTEM INSPECTION
See page EF & EC-84.

SEF043F

ENGINE TEMPERATURE SENSOR



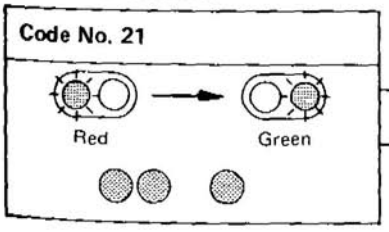
Engine temperature sensor circuit

- The engine temperature sensor circuit is open or shorted.
  (An abnormally high or low output voltage is entered.)

SYSTEM INSPECTION
See page EF & EC-86.

SEF044F

IGNITION SIGNAL



Ignition signal circuit

- The circuit between power transistor unit and E.C.U. is opened.

SYSTEM INSPECTION
See page EF & EC-90.

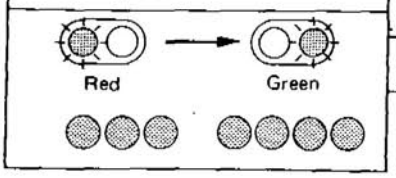
SEF045F

Self-diagnosis — Mode III (Cont'd)

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.

DETONATION SENSOR

Code No. 34



Detonation sensor circuit

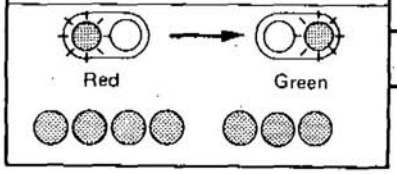
- The detonation sensor circuit is open or shorted.

SYSTEM INSPECTION
See page EF & EC-90.

SEF132F

THROTTLE SENSOR

Code No. 43



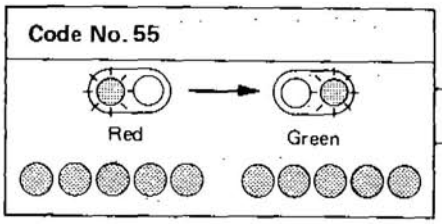
Throttle sensor circuit

- Throttle sensor circuit is open or short.
  (Output voltage is too high or too low.)

SYSTEM INSPECTION
See page EF & EC-98.

SEF079G

Code No. 55



E.C.C.S. normal operation.

SEF984F

Self-diagnosis — Mode IV

In switches ON/OFF diagnosis system, ON/OFF operation of the following switches can be detected continuously.

- Idle switch
- Ignition switch "START"
- Vehicle speed sensor

(1) Idle switch & Ignition switch "START"
The switches ON/OFF status at the point when mode IV is selected is stored in E.C.U. memory. When either switch is turned from "ON" to "OFF" or "OFF" to "ON", the red L.E.D. on E.C.U. alternately comes on and goes off each time switching is detected.

(2) Vehicle speed sensor
The switches ON/OFF status at the point when mode IV is selected is stored in E.C.U. memory. When vehicle speed is 20 km/h (12 MPH) or slower, the green L.E.D. on E.C.U. is off. When vehicle speed exceeds 20 km/h (12 MPH), the green L.E.D. on E.C.U. comes "ON".

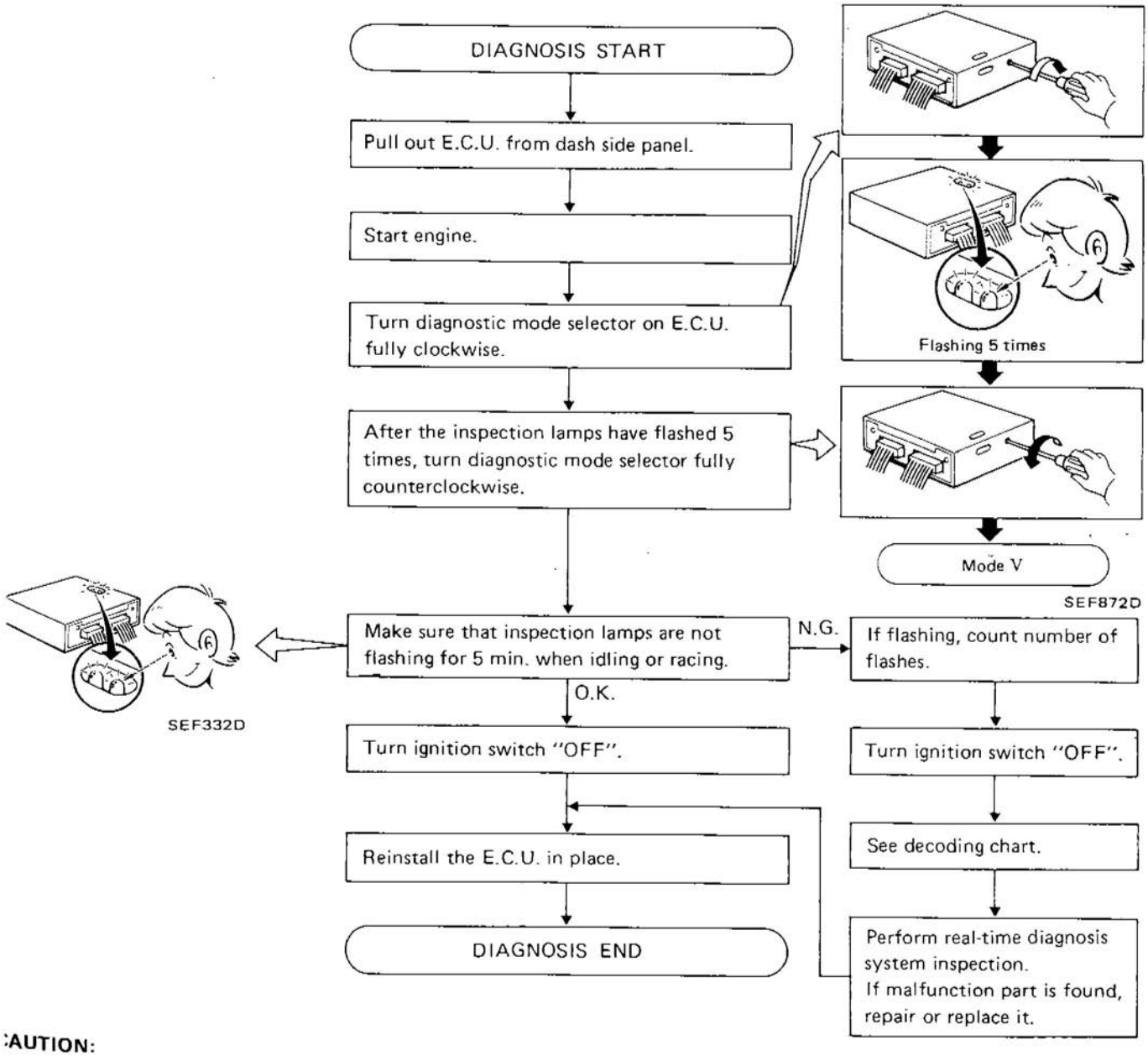
Self-diagnosis — Mode V

In real-time diagnosis, if any of the following items are judged to be faulty, a malfunction is indicated immediately.

- Crank angle sensor (180° signal & 1° signal)
- Ignition signal
- Air flow meter output signal

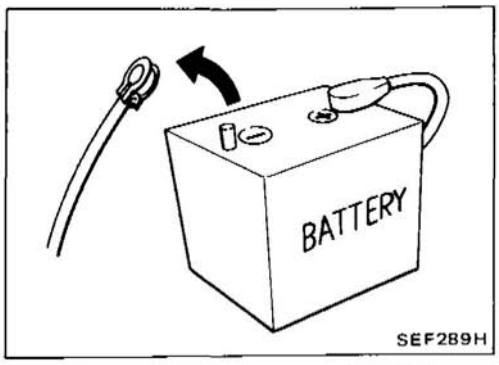
Consequently, this diagnosis is a very effective measure to diagnose whether the above systems cause the malfunction or not, during driving test. Compared with self-diagnosis, real-time diagnosis is very sensitive, and can detect malfunctioning conditions in a moment. Further, items regarded to be malfunctions in this diagnosis are not stored in E.C.U. memory.

SELF-DIAGNOSITC PROCEDURE



CAUTION:

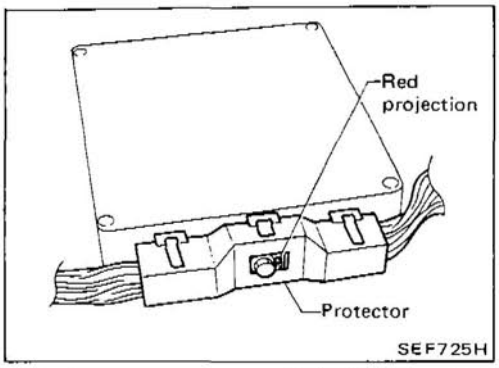
In real-time diagnosis, pay attention to inspection lamp flashing. E.C.U. displays the malfunction code only once, and does not memorize the inspection.



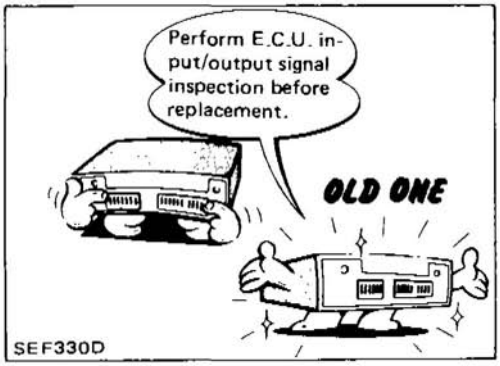
Diagnostic Procedure

CAUTION:

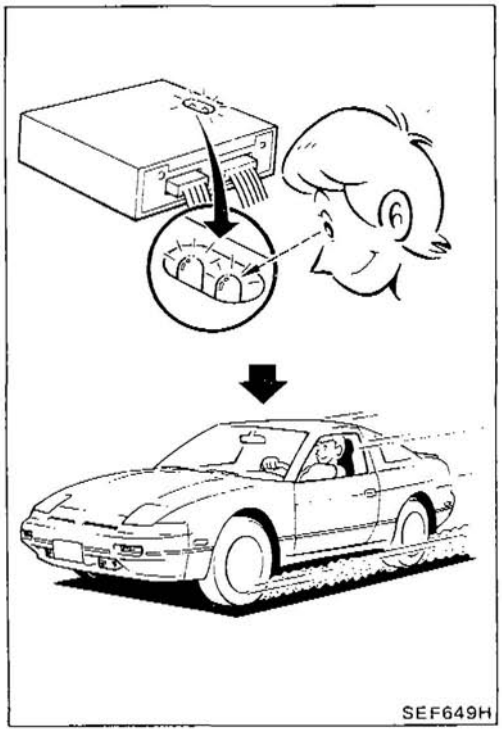
1. Before connecting or disconnecting E.C.U. harness connector to or from any E.C.U., be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage E.C.U. as battery voltage is applied to E.C.U. even if ignition switch is turned off. Otherwise, there may be damage to the E.C.U.



2. When connecting E.C.U. harness connector into E.C.U. or disconnecting it from E.C.U., take care not to damage pin terminal of E.C.U. (Bend or break).
3. Make sure that there are not any bends or breaks on E.C.U. pin terminal, when connecting pin connectors into E.C.U.
4. When connecting E.C.U. harness connector, tighten securing bolt until red projection is in line with connector face.



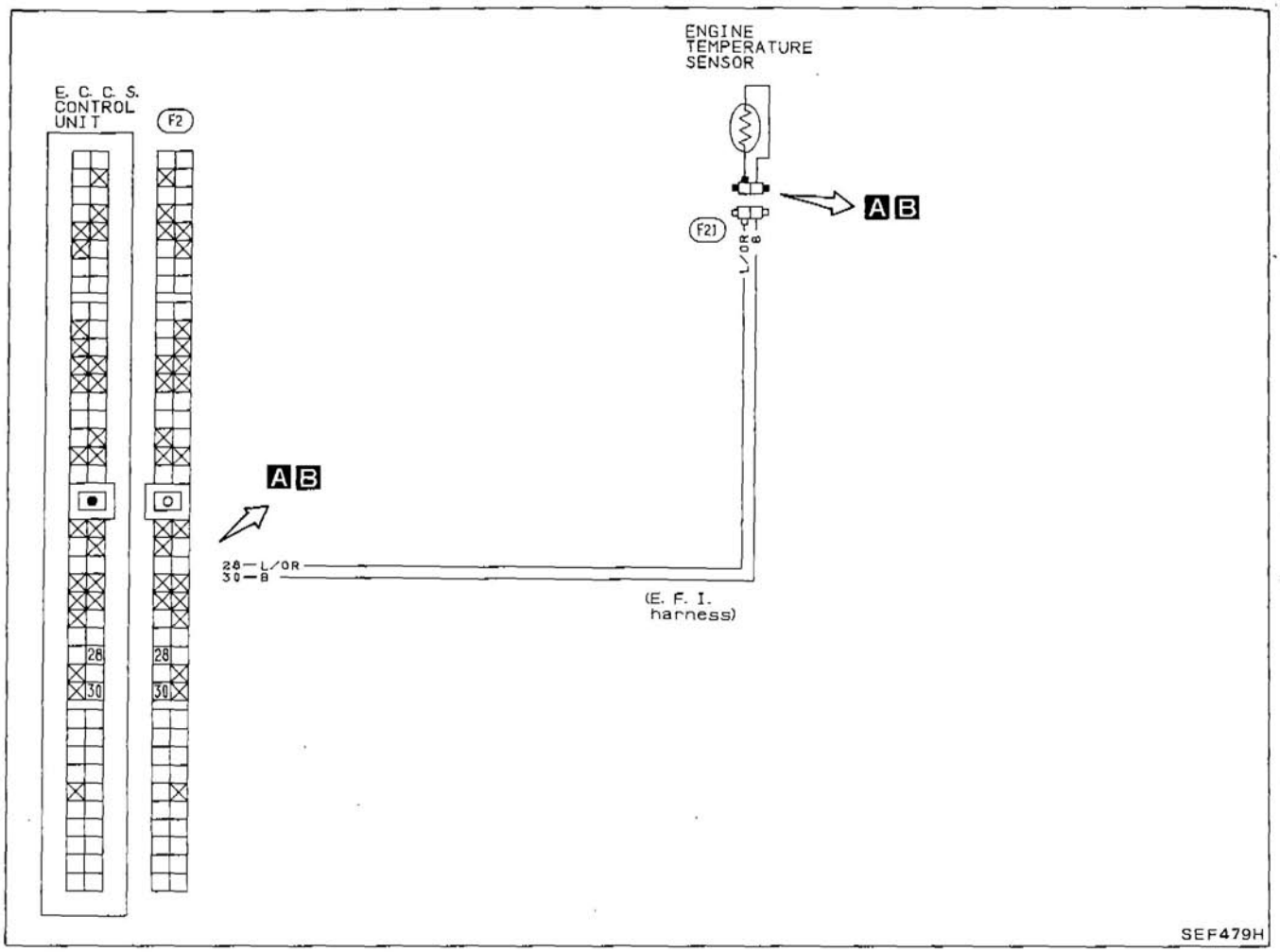
5. Before replacing E.C.U. perform E.C.U. input/output signal inspection and make sure whether E.C.U. functions properly or not. (See page EF & EC-120.)



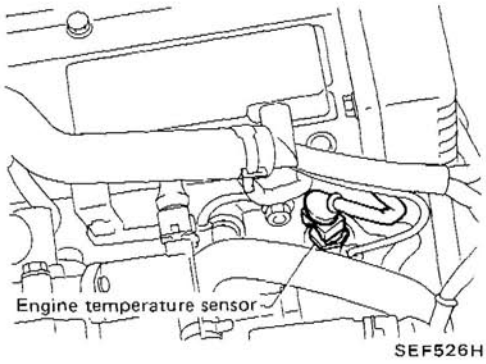
6. After performing this "Diagnostic Procedure", perform E.C.C.S. self-diagnosis and driving test.

Diagnostic Procedure 4

ENGINE TEMPERATURE SENSOR (Code No. 13)

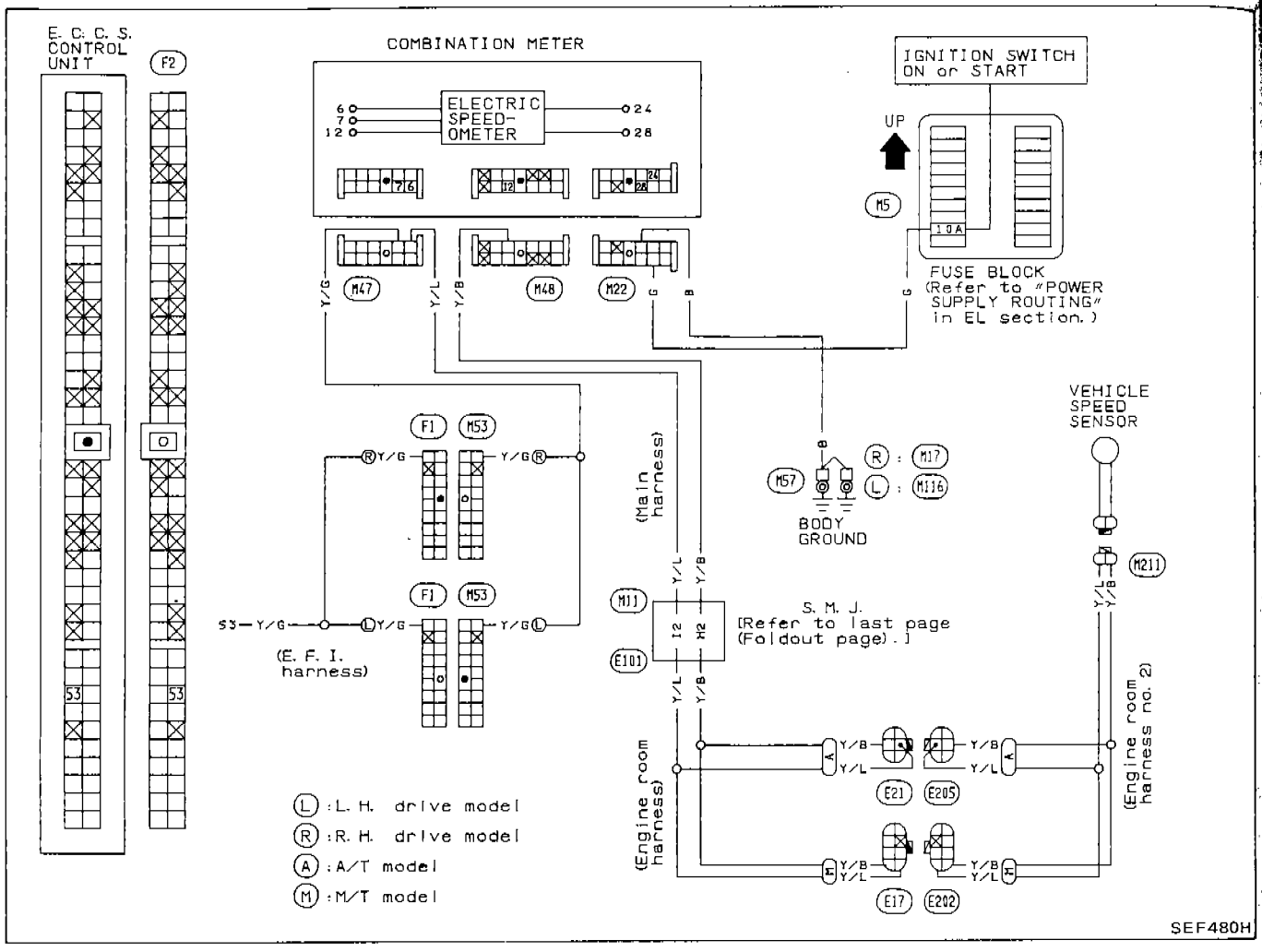


Component location

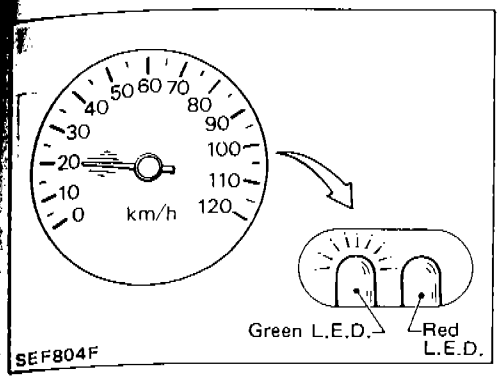


Diagnostic Procedure 5

VEHICLE SPEED SENSOR



Diagnostic Procedure 5 (Cont'd)



INSPECTION START

CHECK INPUT SIGNAL.
1) Perform switch ON/OFF diagnosis (in Mode IV).
2) Make sure green L.E.D. on E.C.U. comes "ON" when vehicle speed reaches 20 km/h (12 MPH).

O.K. → INSPECTION END

N.G. ↓

CHECK COMPONENT
(Vehicle speed sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-128.)

O.K. →
1) Repair or replace harness.
2) Check middle harness connector for proper connection.
3) Check S.M.J.

N.G. ↓

Repair or replace vehicle speed sensor.

↓

Reinstall any part removed.

↓

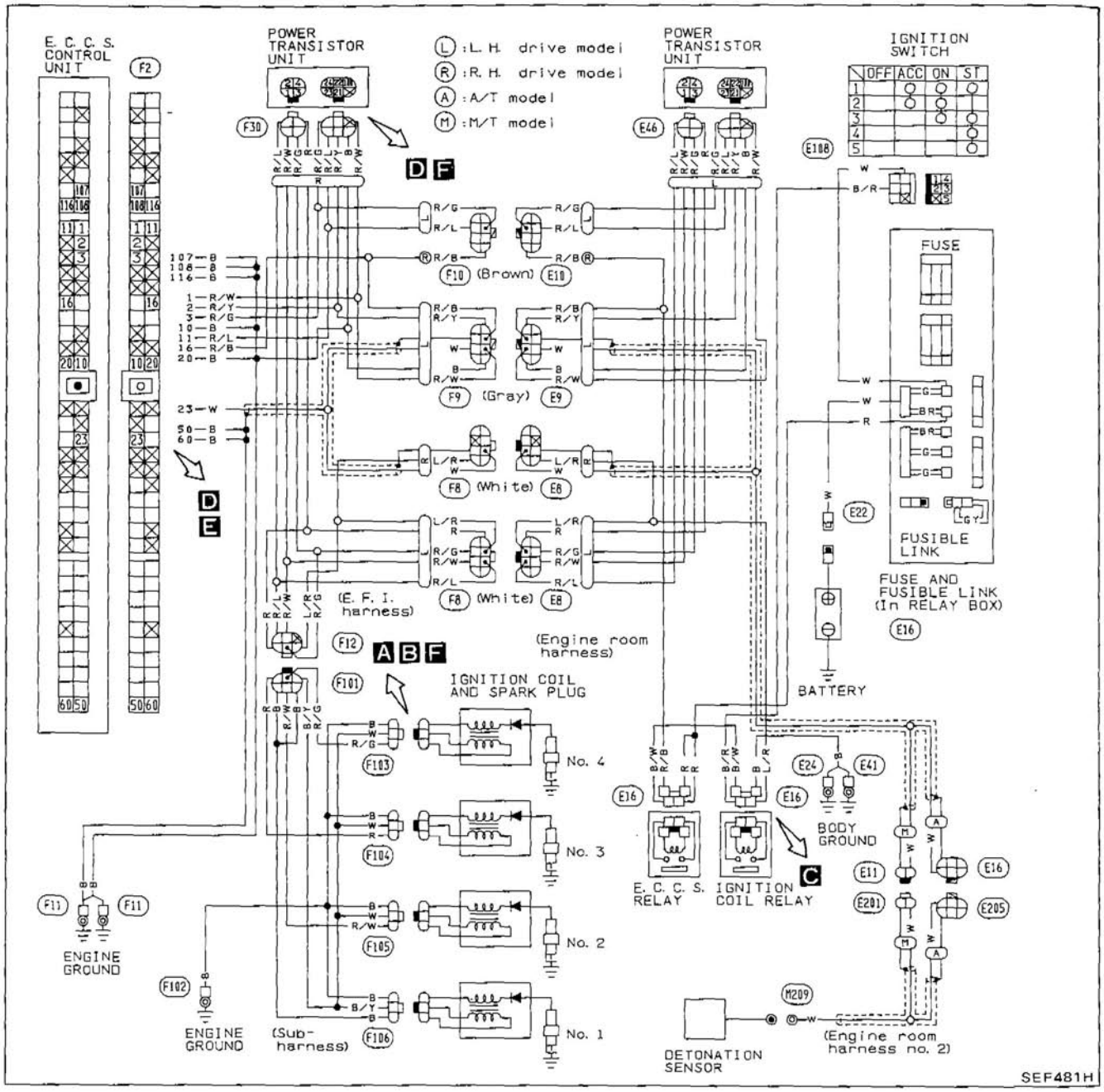
1) Perform switch ON/OFF diagnosis (in Mode IV) again.
2) Make sure green L.E.D. on E.C.U. comes "ON" when vehicle speed reaches 20 km/h (12 MPH).

↓

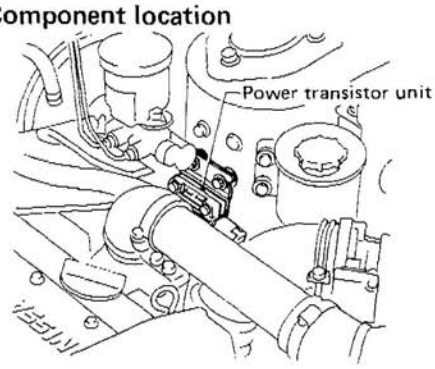
INSPECTION END

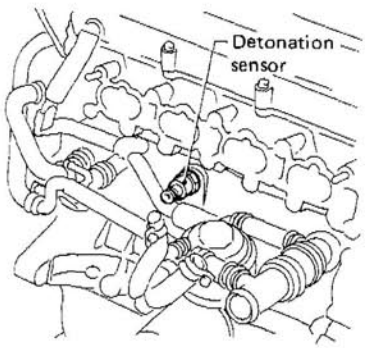
Diagnostic Procedure 6

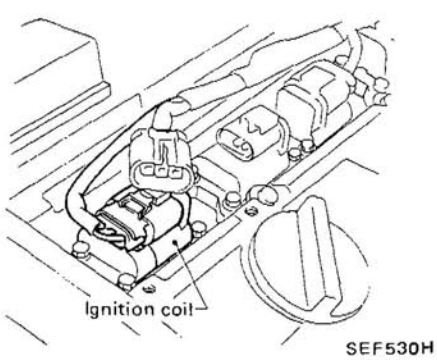
IGNITION SIGNAL (Code No. 21) & DETONATION SENSOR (Code No. 34)



Component location

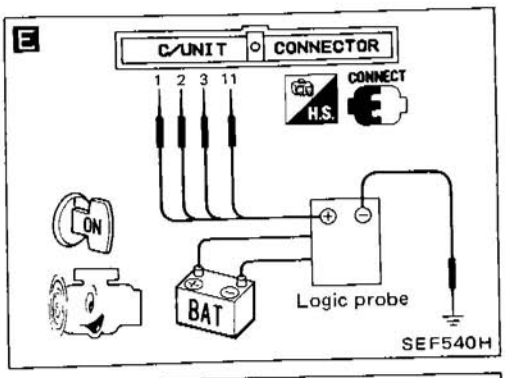


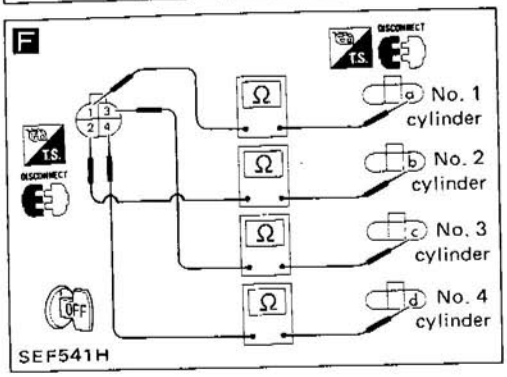




SEF530H

Diagnostic Procedure 6 (Cont'd)





E

CHECK OUTPUT SIGNAL.

1) Reconnect power transistor harness connector.
2) Reconnect E.C.U. harness connector.
3) Reconnect ignition coil harness connector.
4) Start engine.
5) Make sure that pulse signals exist between E.C.U. terminals ①, ②, ③, ⑪ and ground with logic probe.

Pulse signal should exist.

N.G. → CHECK COMPONENT (Power transistor). Refer to "Electrical Components Inspection". (See page EF & EC-125.)

O.K. ↓

F

CHECK HARNESS CONTINUITY BETWEEN POWER TRANSISTOR AND IGNITION COIL.

1) Stop engine and turn ignition switch "OFF".
2) Disconnect power transistor harness connector and ignition coil harness connector.
3) Check continuity between terminals ⓐ and ①, ⓑ and ②, ⓒ and ③, ⓓ and ④.

Continuity:
Approximately 0Ω

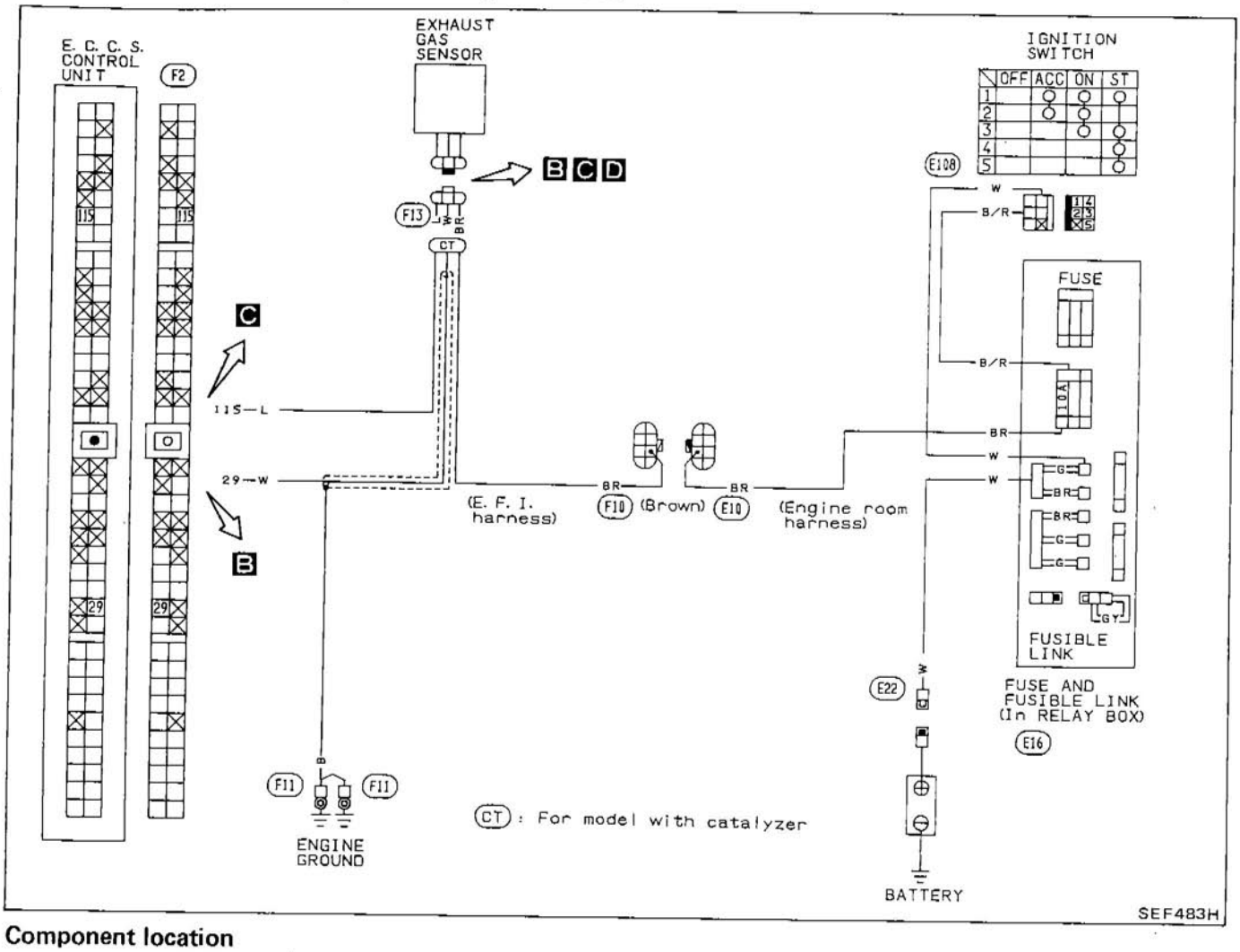
N.G. → 1) Check middle harness connector. 2) Repair harness or connectors.

O.K. ↓

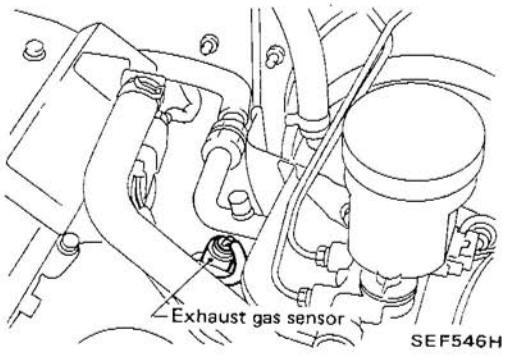
INSPECTION END

Diagnostic Procedure 8

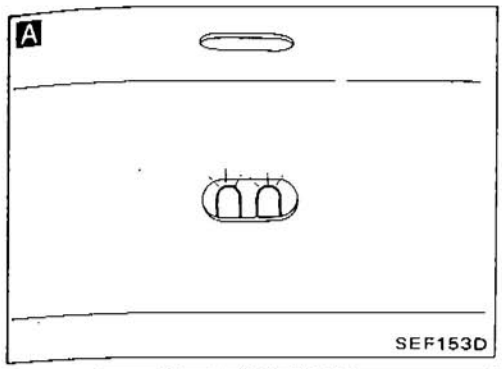
EXHAUST GAS SENSOR (Not self-diagnostic item)

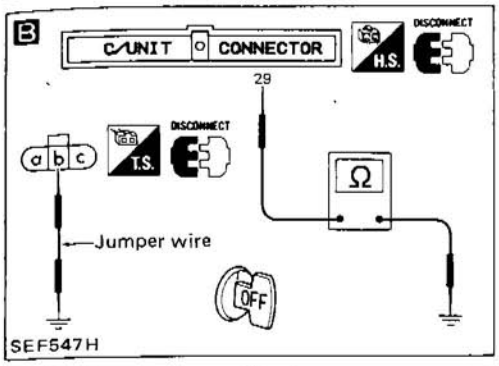


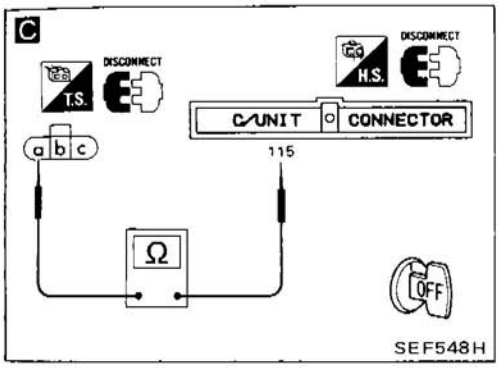
Component location

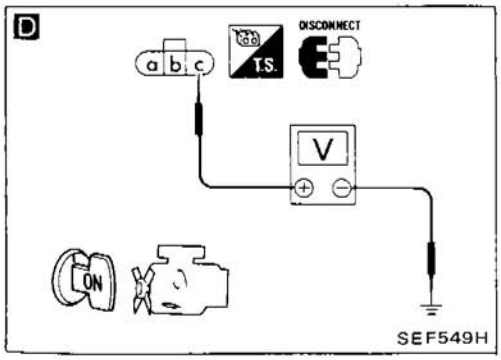


Diagnostic Procedure 8 (Cont'd)









INSPECTION START

A

CHECK INPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Make sure green L.E.D. on E.C.U. blinks at 2,000 rpm.

O.K. → INSPECTION END

N.G.

B

CHECK EXHAUST GAS SENSOR CIRCUIT.
1) Turn off engine.
2) Disconnect E.C.U. harness connector.
3) Disconnect exhaust gas sensor harness connector.
4) Connect a jumper wire from exhaust gas sensor harness connector terminal ⓑ to ground.
5) Check resistance between E.C.U. terminal ㉙ and ground.
Resistance:
Approximately 0Ω

N.G. → Repair or replace harness.

O.K.

C

CHECK EXHAUST GAS SENSOR HEATER CIRCUIT.
Check resistance between terminals ⓐ and ⑮.
Resistance:
Approximately 0Ω

N.G. → Repair or replace harness.

O.K.

D

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓒ and ground.
Voltage: Battery voltage

N.G. →
1) Check fuse.
2) Check middle harness connector for proper connection.

O.K.

Replace exhaust gas sensor.

Reinstall any part removed.

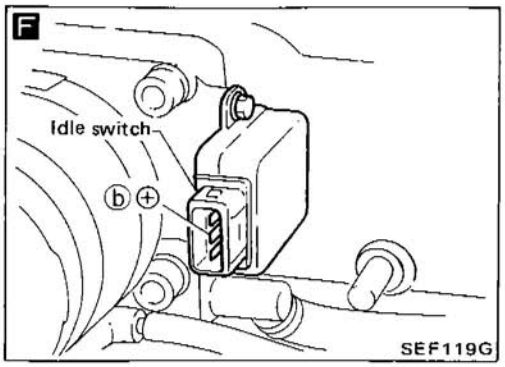
1) Warm up engine sufficiently.
2) Set diagnosis mode to Mode I.
3) Make sure that inspection lamp (Green) on E.C.U. goes on and off periodically more than 9 times during 10 seconds at 2,000 rpm.

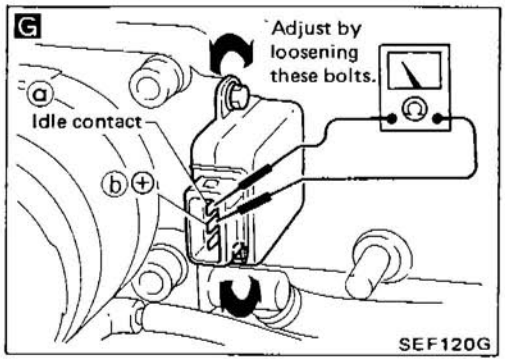
N.G. → Perform IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION.
(See page EF & EC-25.)

O.K.

INSPECTION END

Diagnostic Procedure 9 (Cont'd)





⊕

Disconnect throttle sensor harness connector.

CHECK COMPONENT (Throttle sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-124.)

CHECK IDLE SWITCH OFF → ON SPEED.

1) Reconnect throttle sensor harness connector.

F 2) Disconnect idle switch harness connector.

3) Start and warm up engine sufficiently.

4) Check idle switch OFF → ON speed with circuit tester, closing throttle valve manually.

Idle switch OFF → ON speed:

M/T Idle speed + 250±150 rpm

A/T Engine speed (Idle speed in "N" position) + 250±150 rpm

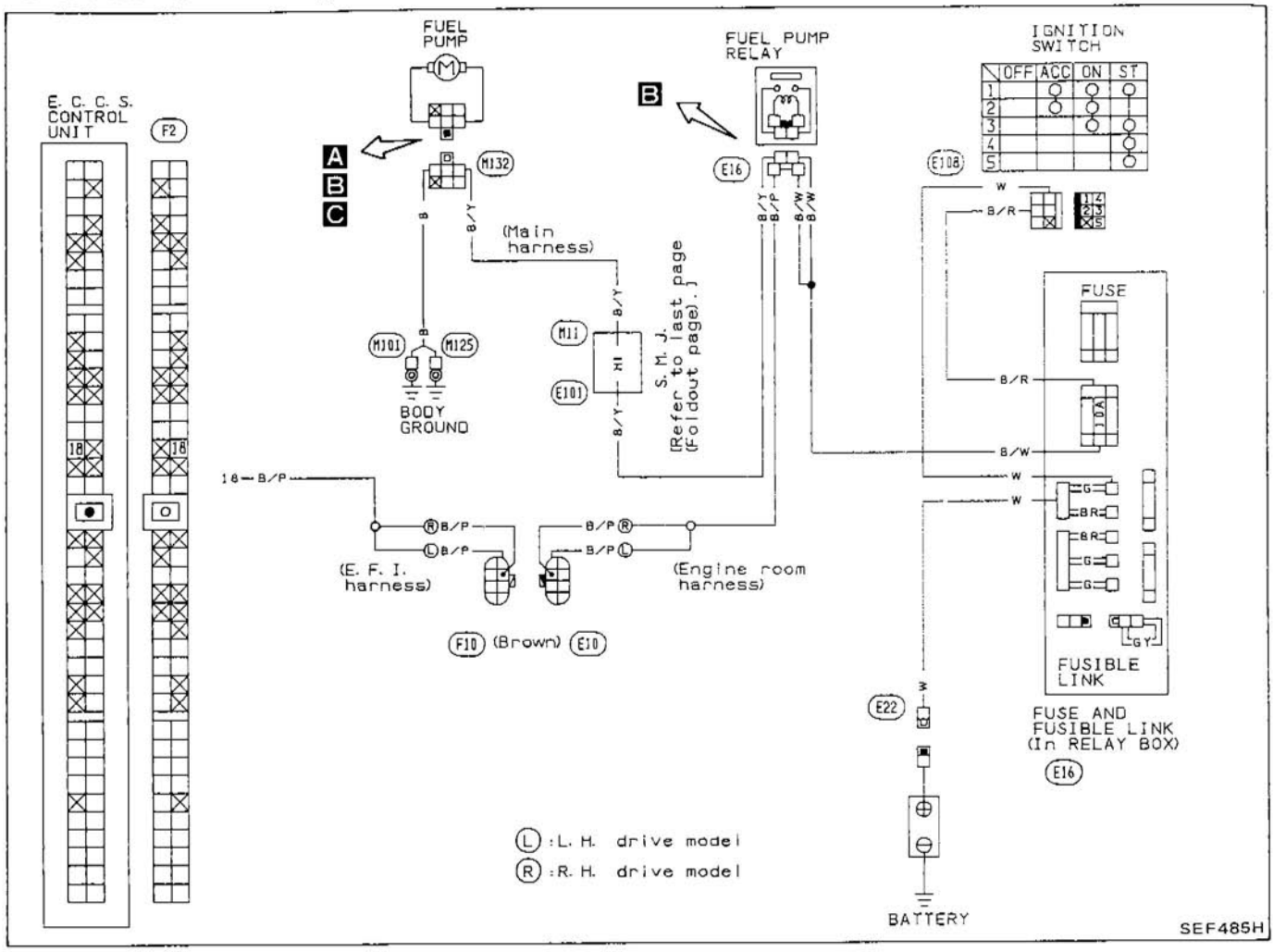
G 5) If N.G., loosen throttle sensor installing screws, then set idle switch OFF → ON speed to the specified value by turning throttle sensor body. (Connect circuit tester with terminals ⓐ and ⓑ on idle switch side and find out OFF → ON point.)

6) Tighten throttle sensor installing screws after setting.

NOTE

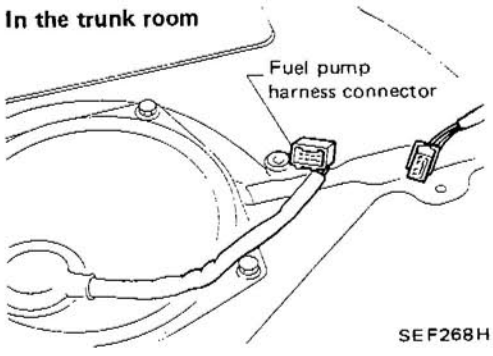
Diagnostic Procedure 10

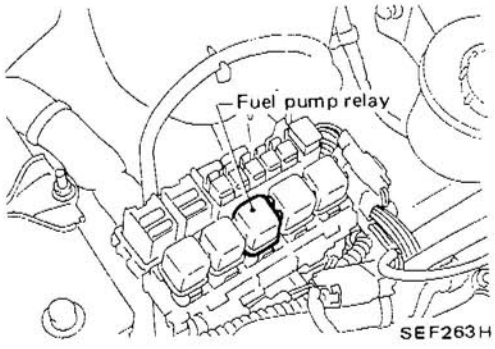
FUEL PUMP (Not self-diagnostic item)



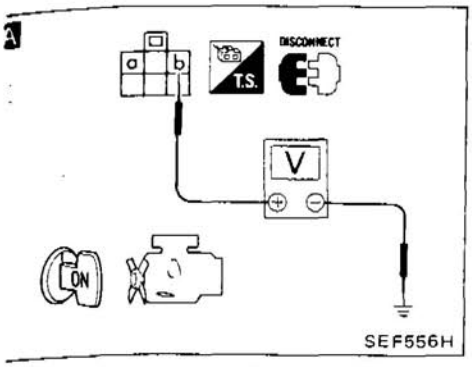
Component location

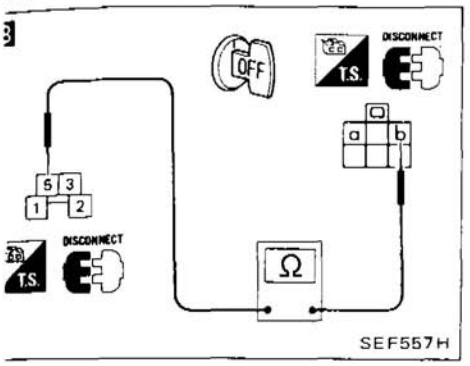
In the trunk room

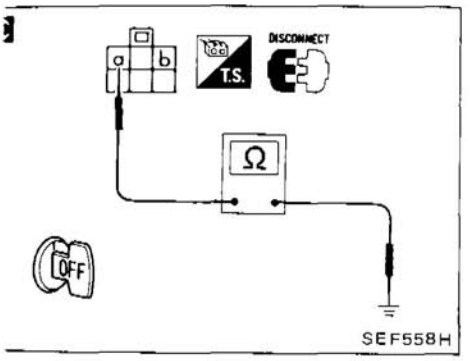




Diagnostic Procedure 10 (Cont'd)







INSPECTION START

A

CHECK POWER SOURCE.
1) Disconnect fuel pump harness connector.
2) Turn ignition switch "ON".
3) Make sure there is battery voltage between terminal ⓑ and ground for 5 seconds after turning ignition switch "ON".

N.G. → **B**

CHECK HARNESS CONTINUITY BETWEEN FUEL PUMP AND FUEL PUMP RELAY.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump relay.
3) Disconnect fuel pump harness connector.
4) Check continuity between terminals ⑤ and ⓑ.

O.K. ↓

CHECK COMPONENT
(Fuel pump relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-128.)

O.K. ↓

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check continuity between terminal ⓐ and ground.
Continuity:
Approximately 0Ω

N.G. → Repair harness or connectors, if necessary.

O.K. ↓

CHECK COMPONENT
(Fuel pump).
Refer to "Electrical Components Inspection".
(See page EF & EC-126.)

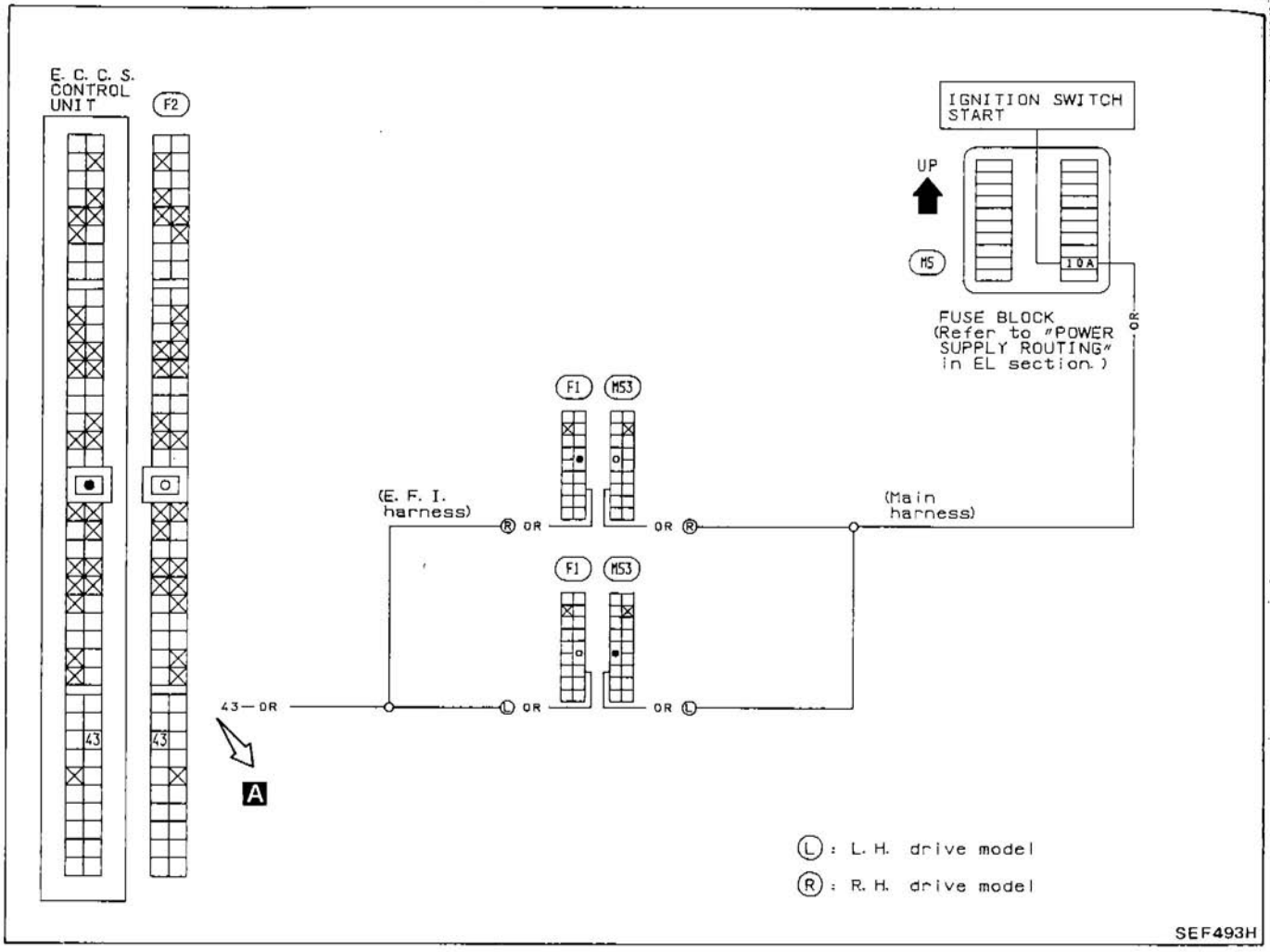
N.G. → Replace fuel pump.

O.K. ↓

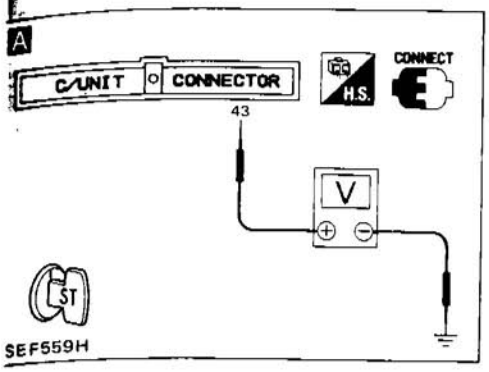
INSPECTION END

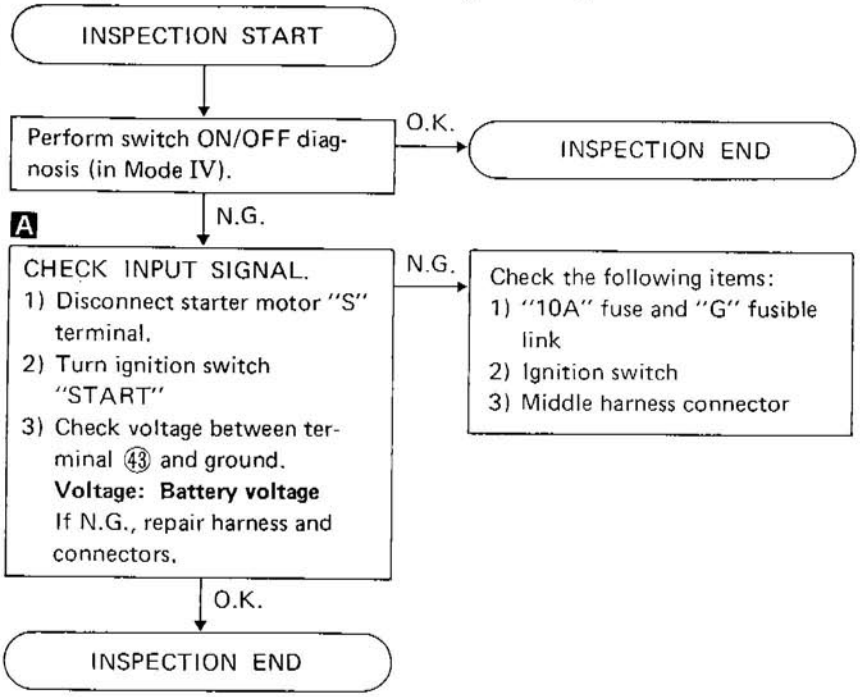
Diagnostic Procedure 11

START SIGNAL (Switch ON/OFF diagnosis)



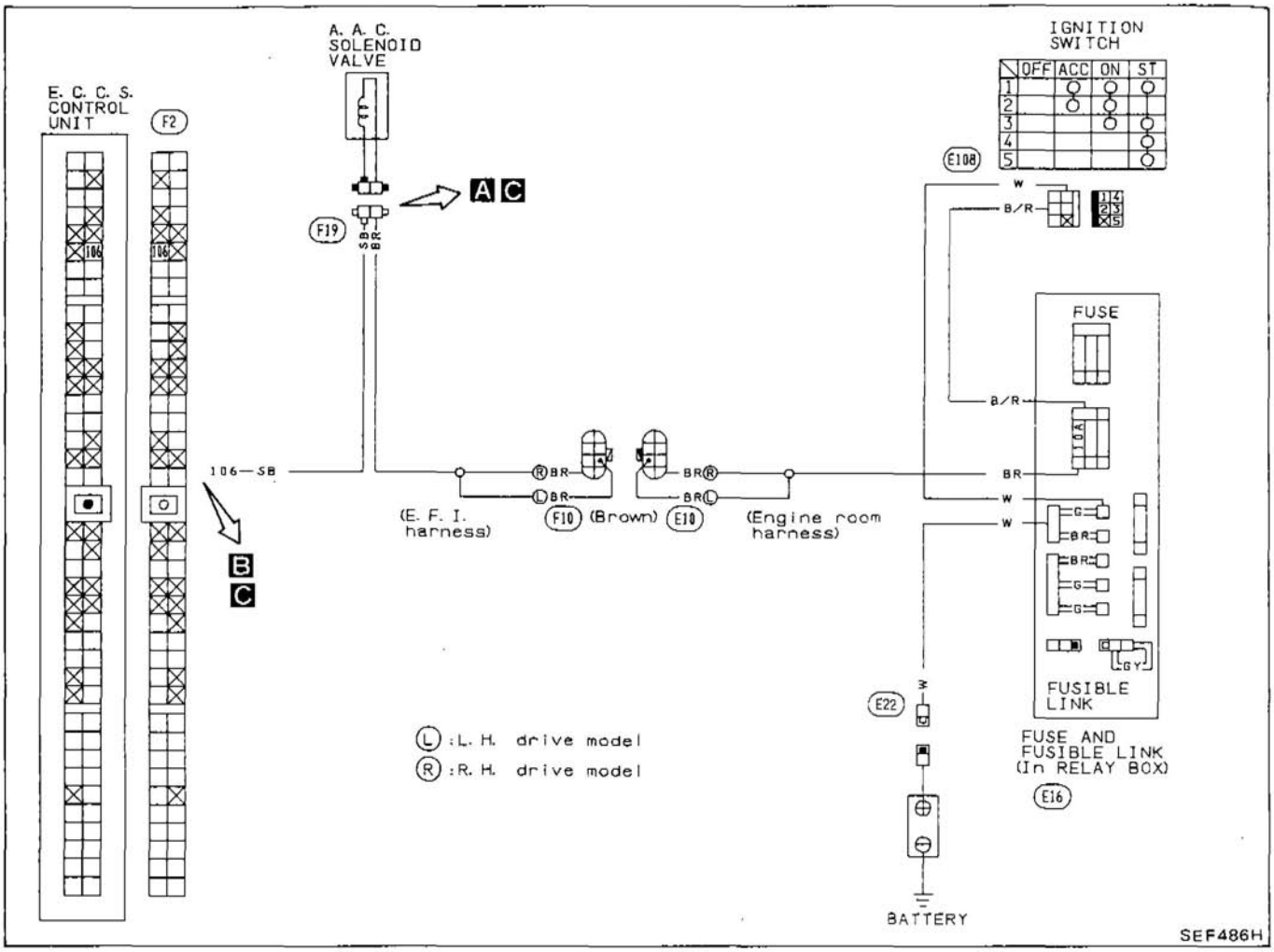
Diagnostic Procedure 11 (Cont'd)



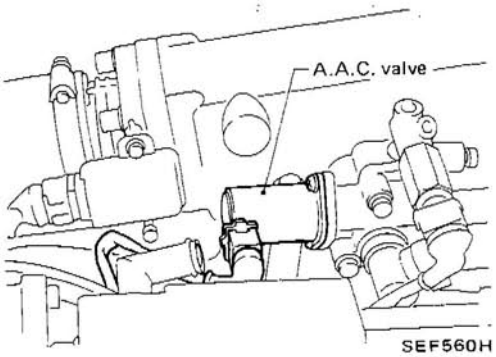


Diagnostic Procedure 12

AUXILIARY AIR CONTROL (A.A.C.) VALVE (Not self-diagnostic item)

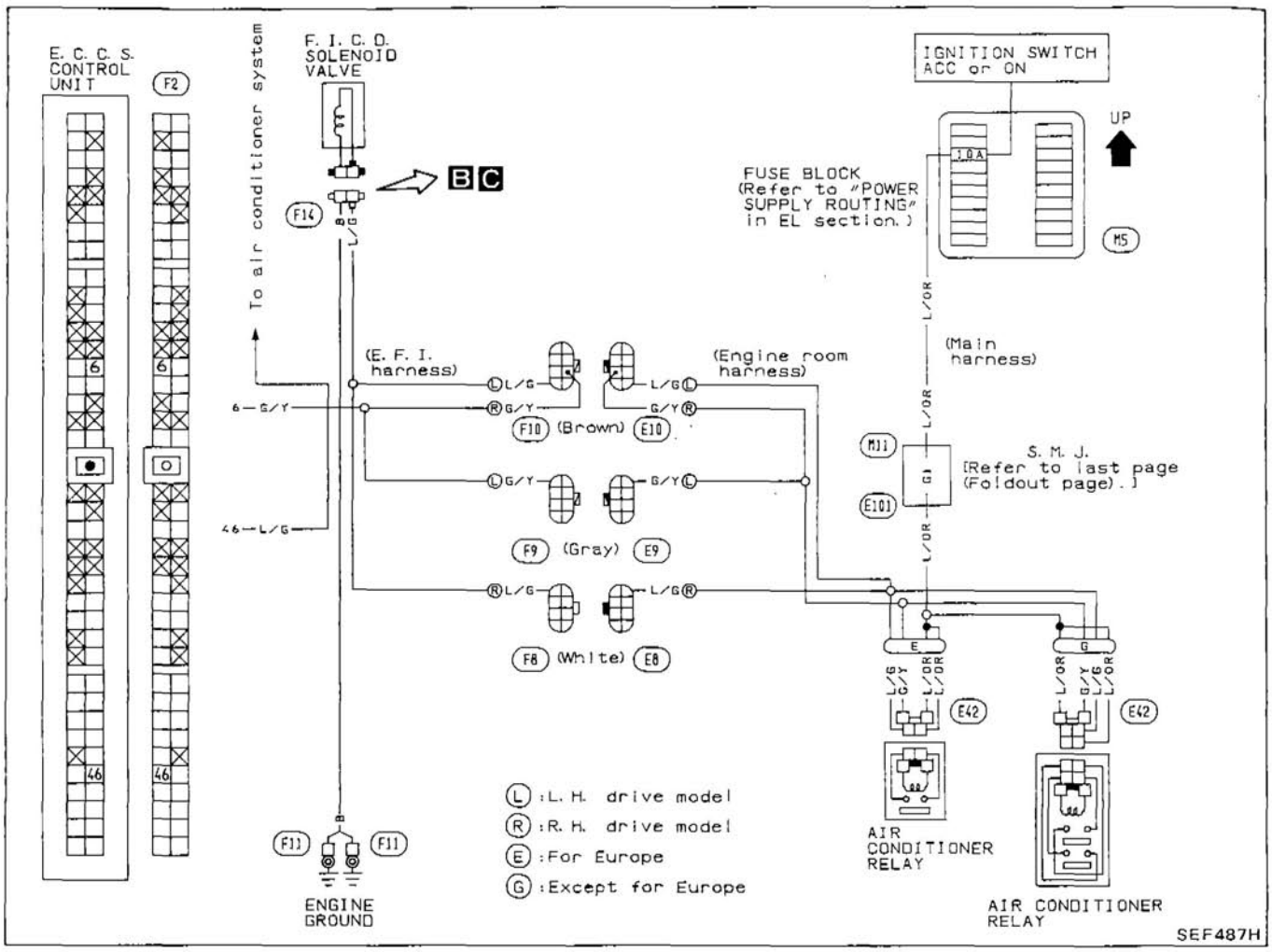


Component location

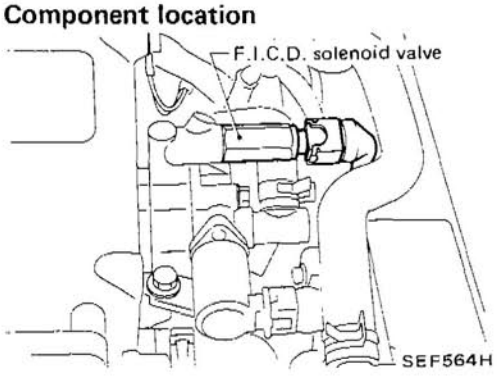


Diagnostic Procedure 13

I.A.A. CONTROL (F.I.C.D. CONTROL) (Not self-diagnostic item)

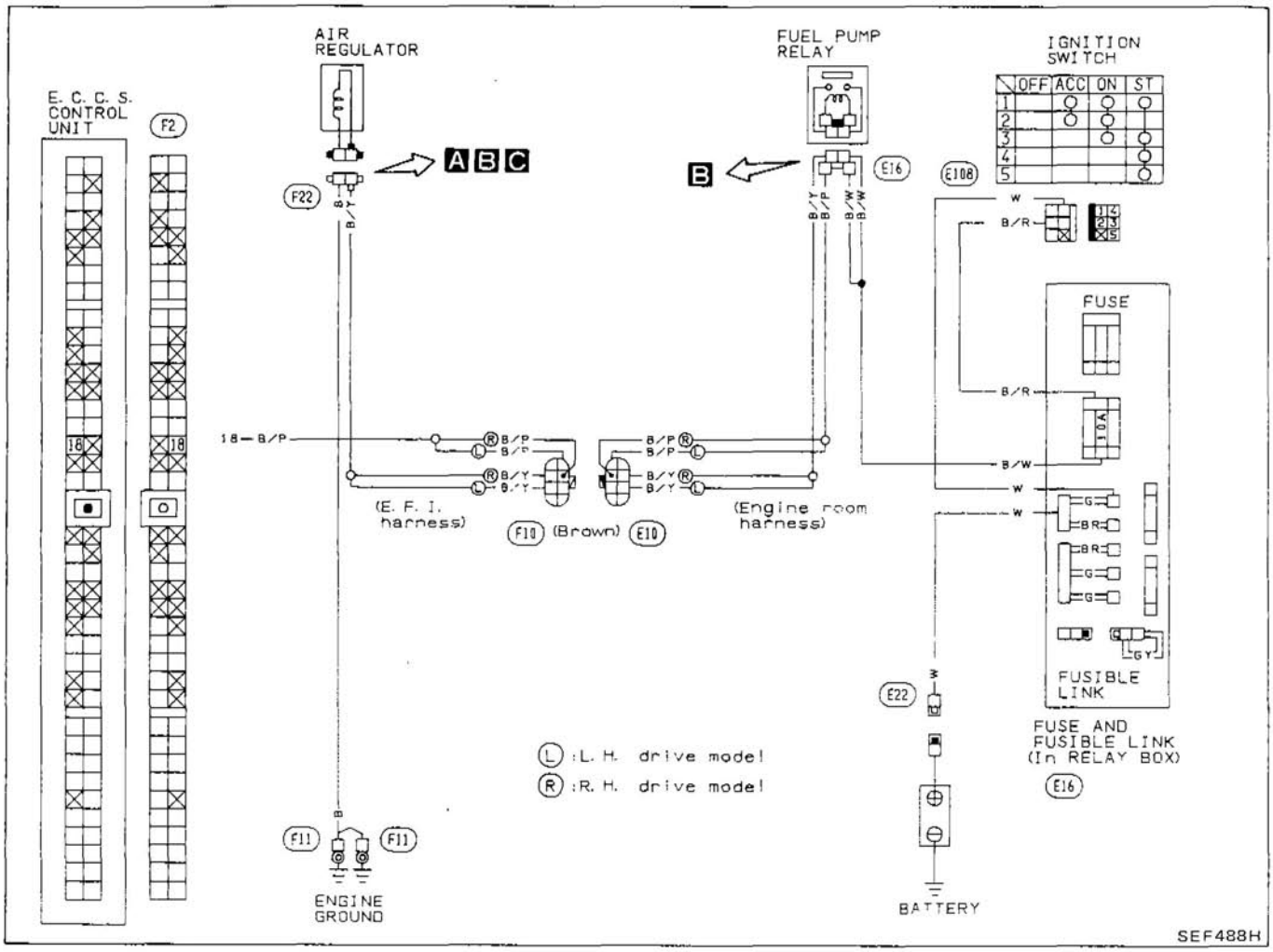


Component location

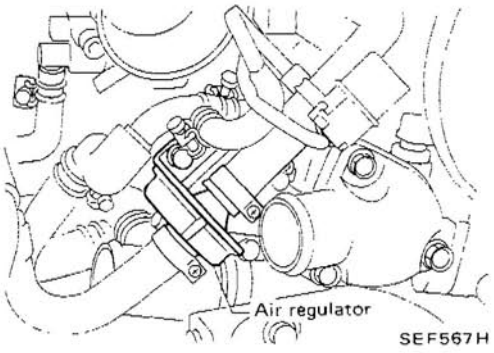


Diagnostic Procedure 14

AIR REGULATOR (Not self-diagnostic item)

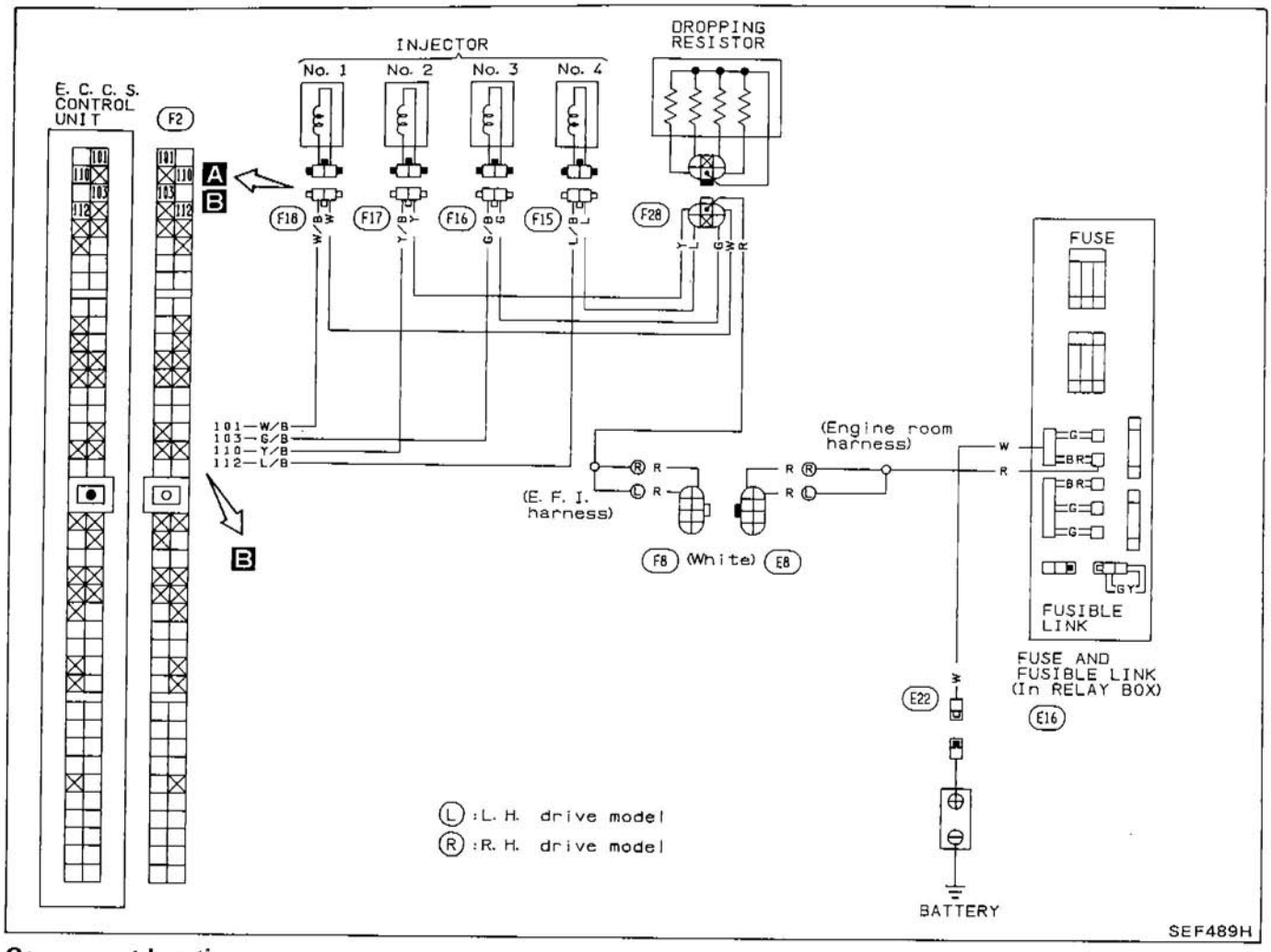


Component location

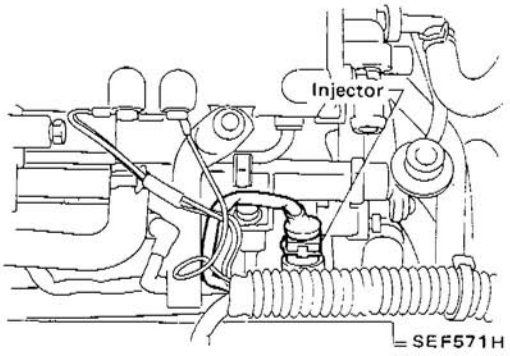


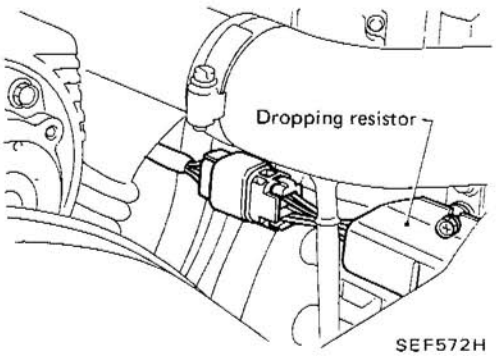
Diagnostic Procedure 15

INJECTOR (Not self-diagnostic item)

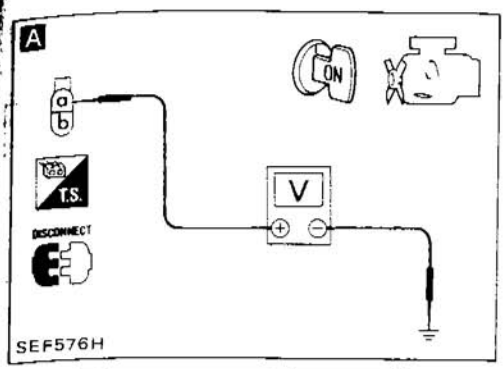


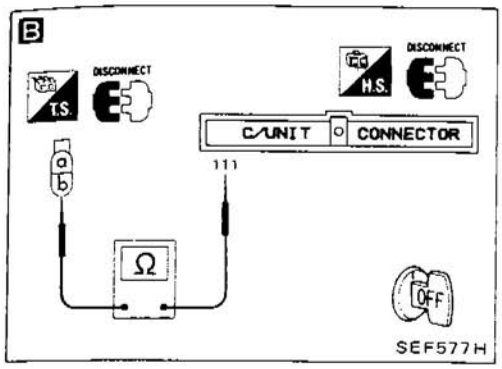
Component location





Diagnostic Procedure 16 (Cont'd)





INSPECTION START

A

CHECK POWER SOURCE.
1) Disconnect pressure regulator control solenoid valve harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following items:
1) "10A" fuse
2) Ignition switch
3) Middle harness connector

O.K. ↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check resistance between terminals ⓑ and (111).
Resistance:
Approximately 0Ω

N.G. → Repair harness or connectors.

O.K. ↓

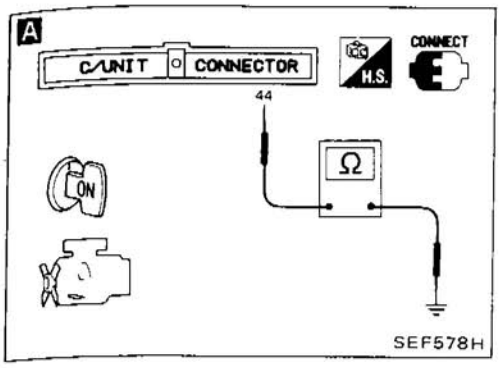
CHECK COMPONENT
(Pressure regulator control solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-126.)

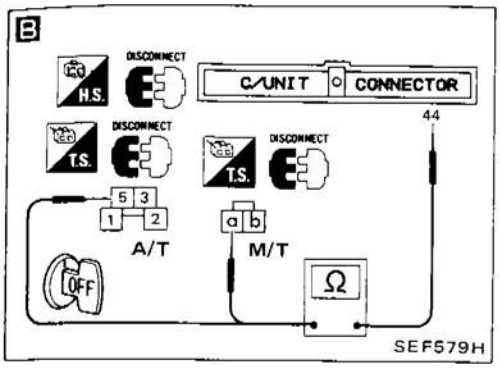
N.G. → Replace pressure regulator control solenoid valve.

O.K. ↓

INSPECTION END

Diagnostic Procedure 17 (Cont'd)





INSPECTION START

A

CHECK INPUT SIGNAL.
1) Turn ignition switch "ON".
2) Check continuity between terminal (44) and ground.

M/T model

Shift lever position	Continuity
"Neutral"	Yes
Except "Neutral"	No

A/T model

Shift lever position	Continuity
"Neutral" or "Park"	Yes
Except "Neutral" or "Park"	No

O.K. → INSPECTION END

N.G. ↓

B

1) Turn ignition switch "OFF".
– **M/T model** –
2) Disconnect E.C.U. harness connector and neutral switch harness connector.
3) Check resistance between terminals (44) and (a).
– **A/T model** –
2) Disconnect E.C.U. harness connector and inhibitor relay.
3) Check resistance between terminals (44) and (5).
Resistance:
Approximately 0Ω

N.G. → Repair or replace harness or connectors.

O.K. ↓

CHECK COMPONENT.
M/T model
- Neutral switch

A/T model
- Inhibitor switch and relay

(See page EF & EC-127.)

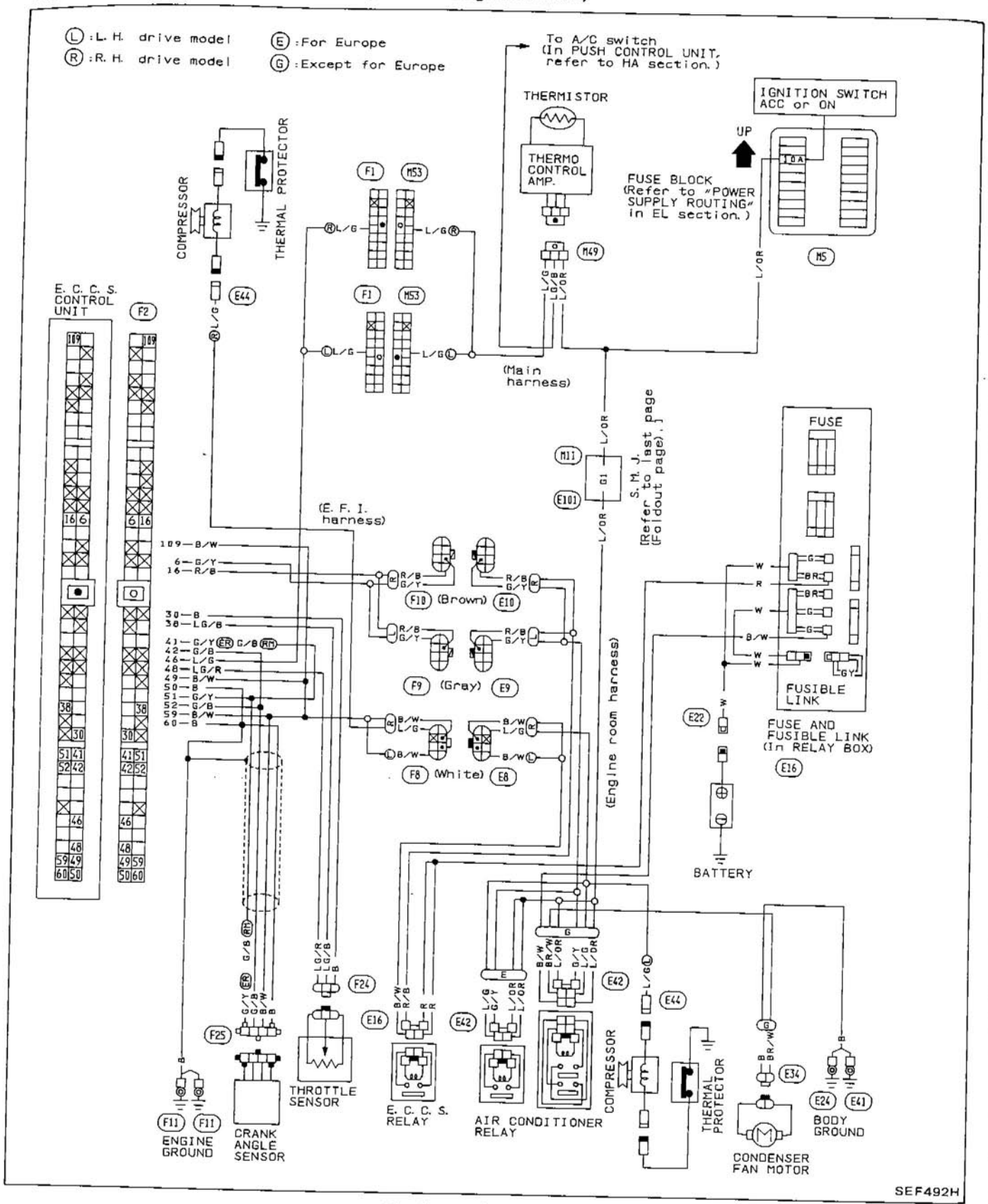
N.G. → Repair or replace.

O.K. ↓

INSPECTION END

Diagnostic Procedure 18

ACCELERATION CUT CONTROL (Not self-diagnostic item)



For inspection of this system, refer to HA section.

Electrical Components Inspection (Cont'd)

E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

E.C.U. inspection table

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	DATA*
1	Ignition signal for No. 1 cylinder	Engine is running. — Idle speed — Engine speed is approximately 2,500 rpm.	0.06V 0.12 - 0.13V
2	Ignition signal for No. 2 cylinder		
3	Ignition signal for No. 3 cylinder		
11	Ignition signal for No. 4 cylinder		
6	Air conditioner relay	A/C switch "OFF"	BATTERY VOLTAGE (11 - 14V)
		A/C switch "ON"	0 - 1.0V
7	Tachometer	Engine is running. — Idle speed — Engine speed is approximately 2,500 rpm.	0.9V 1.7V
16	E.C.C.S. relay	Ignition switch "ON"	0 - 1.0V
		Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
18	Fuel pump relay	Ignition switch "ON" — For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
		Ignition switch "ON" — In 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
23	Detonation sensor	Engine is running. — Idle speed	3 - 4V

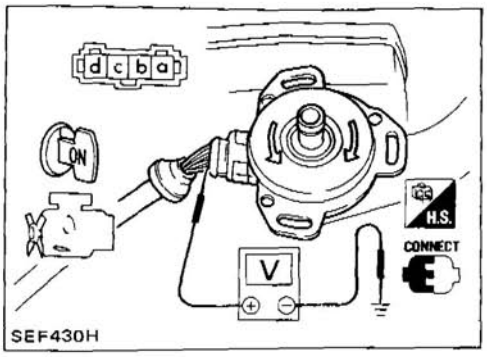
Electrical Components Inspection (Cont'd)

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	DATA*
27	Air flow meter	Engine is running. — Idle speed — Engine speed is approximately 2,500 rpm.	1.6V 2.2V Output voltage varies with engine revolution.
28	Engine temperature sensor	Engine is running.	1.0 - 5.0V Output voltage varies with engine coolant temperature.
29	Exhaust gas sensor	Engine is running. — After warming up sufficiently	0 - Approximately 1.0V
38	Throttle sensor	Ignition switch "ON"	0.5 - 4.0V Output voltage varies with the throttle valve opening angle.
41 51	Crank angle sensor (Reference signal)	Engine is running. **Do not run engine at high speed under no-load.**	0.6 - 0.8V
42 52	Crank angle sensor (Position signal)	Engine is running. **Do not run engine at high speed under no-load.**	2.0 - 2.6V
43	Start signal	Cranking	8 - 12V
44	Neutral switch & Inhibitor switch	Ignition switch "ON" — Neutral/Parking	0V
		Ignition switch "ON" — Except the above gear position	4 - 5V
45	Ignition switch	Ignition switch "OFF"	0V
		Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
46	Air conditioner	Engine is running. — Both air conditioner switch and blower switch are "ON".	0V

Electrical Components Inspection (Cont'd)

CRANK ANGLE SENSOR



SEF430H

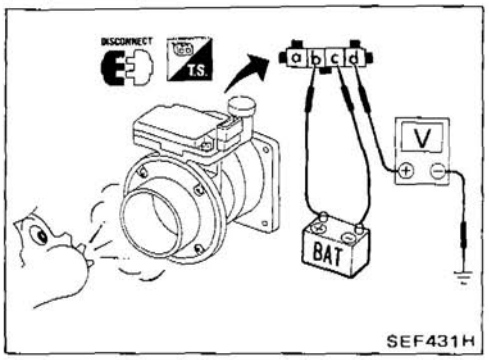
1. Remove crank angle sensor from engine.
2. Check voltage between terminal ⓐ and ground, and terminal ⓑ and ground while rotating the crank angle sensor shaft as shown. At this time make sure that injectors operating sound can be heard.

Voltage:

0V and approximately 5V appear alternately.

After this inspection, malfunction code No. 11 might be displayed though the crank angle sensor is functioning properly. In this case erase the stored memory.

AIR FLOW METER



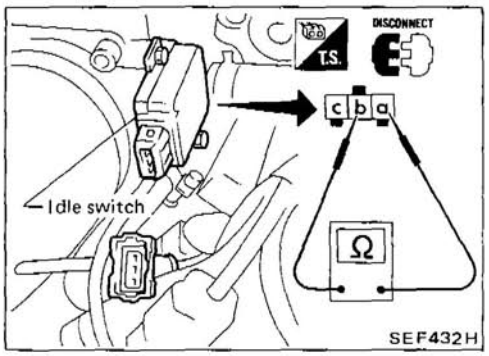
SEF431H

1. Remove air flow meter from vehicle and visually check hot wire air passage for dust.
2. Supply battery voltage between terminals ⓑ and ⓒ.
3. Check voltage between terminal ⓓ and ground while blowing air flow meter as shown.

Voltage:

When blowing Approximately 2V
Not blowing Approximately 1V

IDLE SWITCH

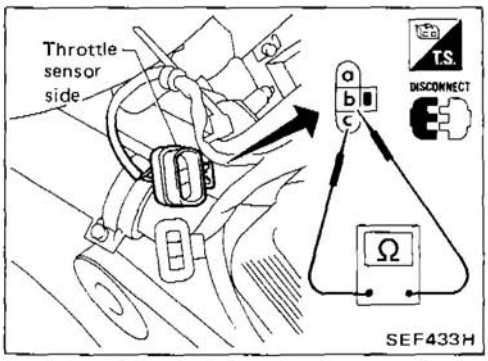


SEF432H

1. Disconnect idle switch harness connector.
2. Check continuity between terminals ⓐ and ⓑ.

Accelerator pedal	Continuity
Completely released	Yes
Depressed	No

THROTTLE SENSOR

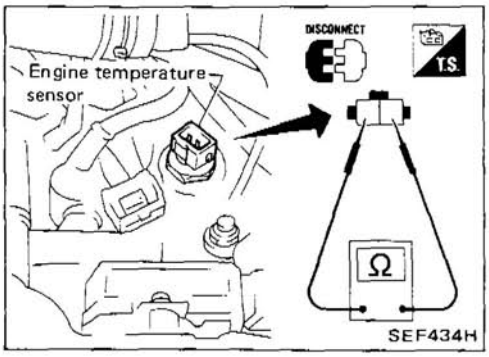


SEF433H

1. Disconnect throttle sensor harness connector.
2. Make sure that resistance between terminals ⓑ and ⓒ changes when opening throttle valve manually.

Accelerator pedal	Resistance
Completely released	Approximately 1 kΩ
Partially depressed	1 - 9 kΩ
Completely depressed	Approximately 9 kΩ

ENGINE TEMPERATURE SENSOR

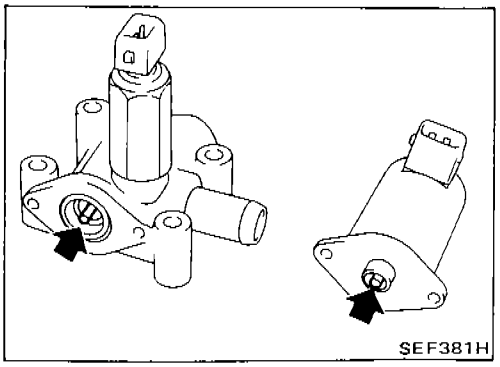


SEF434H

1. Disconnect engine temperature sensor harness connector.
2. Check engine temperature sensor resistance.

Temperature °C (°F)	Resistance (kΩ)
20 (68)	Approx. 2.5
80 (176)	Approx. 0.3

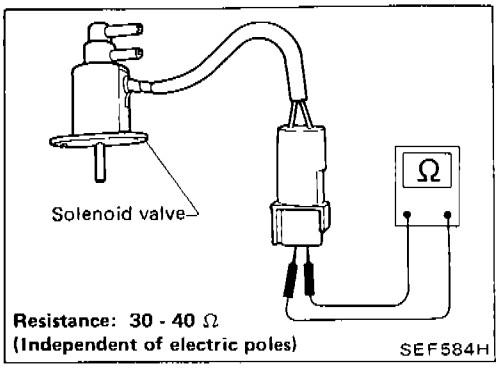
Electrical Components Inspection (Cont'd)


SEF381H

3. Remove A.A.C. valve
4. Check plunger for seizure or sticking.
5. Check spring for damage.

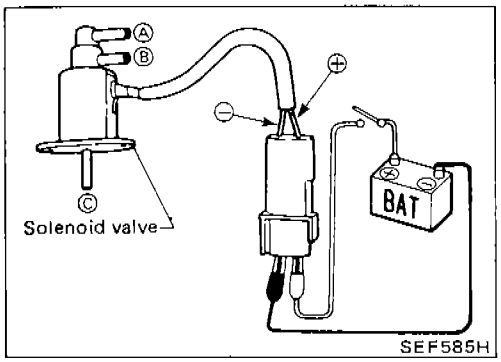
PRESSURE REGULATOR CONTROL SOLENOID VALVE

1. Check it for electric continuity.
   Resistance:
   30 - 40 Ω
   (Above resistance has no change even if the polarity of the circuit tester is changed when measuring it.)



SEF584H

2. Check the solenoid valve for normal operation. Supply it with battery voltage, and check whether there is continuity between ports A, B and C.

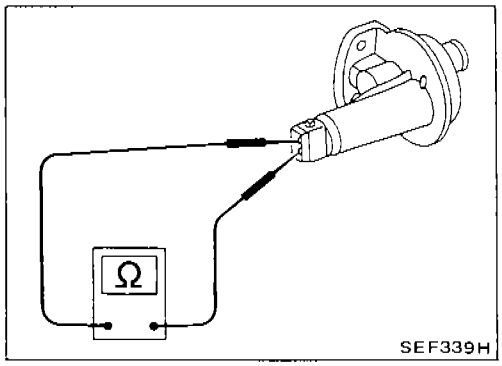


SEF585H

Item \ Solenoid valve	OFF	ON
Continuity	B-C	A-B

AIR REGULATOR

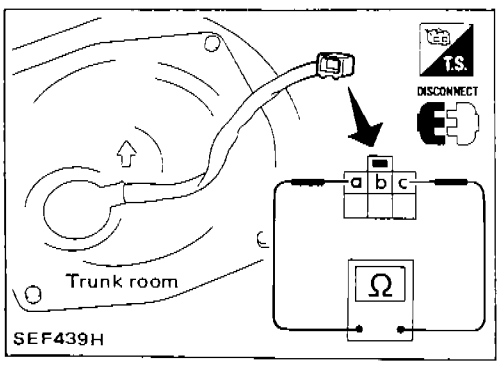
1. Check air regulator resistance.
   Resistance:
   Approximately 70 Ω
2. Check air regulator for clogging.



SEF339H

FUEL PUMP

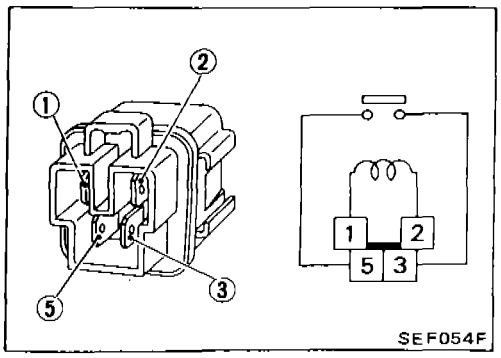
1. Disconnect fuel pump harness connector. Check resistance between terminals ⓐ and ⓒ.
   Resistance:
   Approximately 0.5 Ω



SEF439H

Electrical Components Inspection (Cont'd)

E.C.C.S. RELAY, FUEL PUMP RELAY AND INHIBITOR RELAY

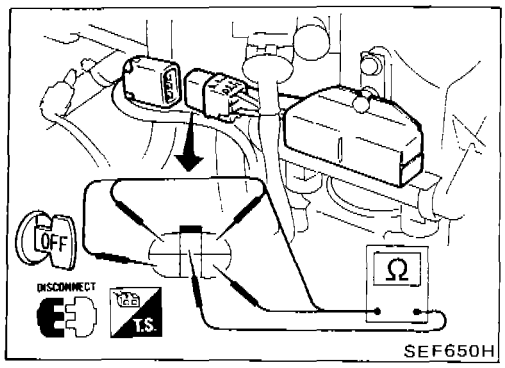


SEF054F

Check continuity between terminals ③ and ⑤.

Condition	Continuity
12V direct current supply between terminals ① and ②	Yes
No supply	No

DROPPING RESISTOR



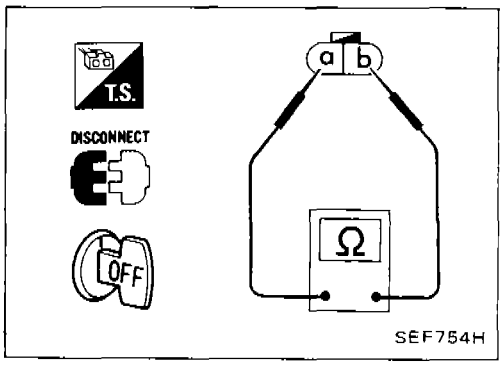
SEF650H

1. Disconnect dropping resistor harness connector.
2. Check dropping resistor resistance.

Resistance:

Approximately 6 Ω

VEHICLE SPEED SENSOR

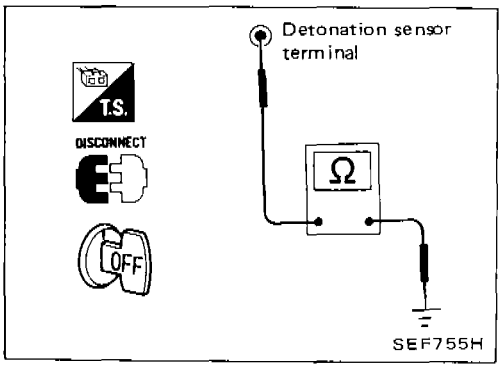


SEF754H

1. Jack up rear wheels.
2. Disconnect vehicle speed sensor harness connector.
3. Check continuity between terminals ⓐ and ⓑ while rotating rear wheel by hand.

Continuity should be intermittent.

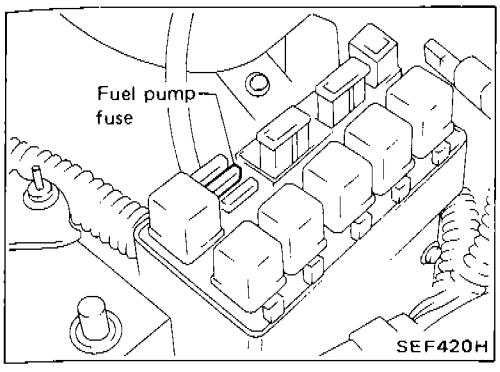
DETONATION SENSOR



SEF755H

1. Disconnect detonation sensor harness.
2. Check continuity between detonation sensor terminal and ground.

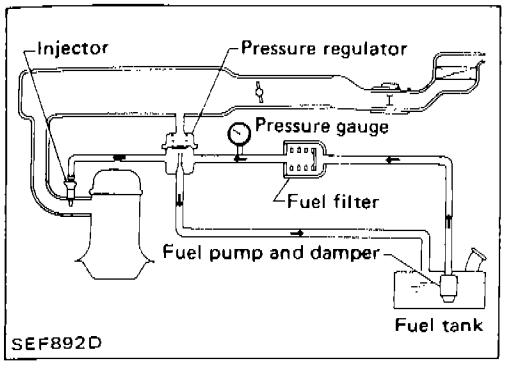
Continuity should exist.



Releasing Fuel Pressure

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

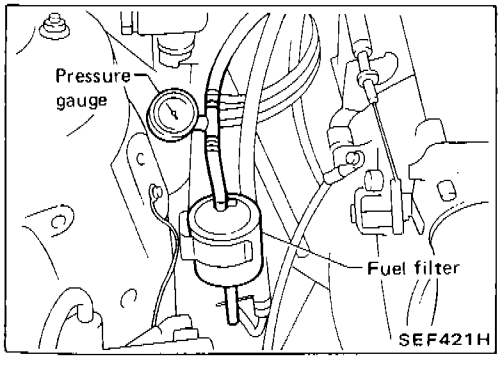
1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump fuse.



Fuel Pressure Check

a. When reconnecting fuel line, always use new clamps.
b. Make sure that clamp screw does not contact adjacent parts.
c. Use a torque driver to tighten clamps.
d. Use Pressure Gauge to check fuel pressure.
e. Do not perform fuel pressure check while fuel pressure regulator control system is operating; otherwise, fuel pressure gauge might indicate incorrect readings.

1. Release fuel pressure to zero.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.



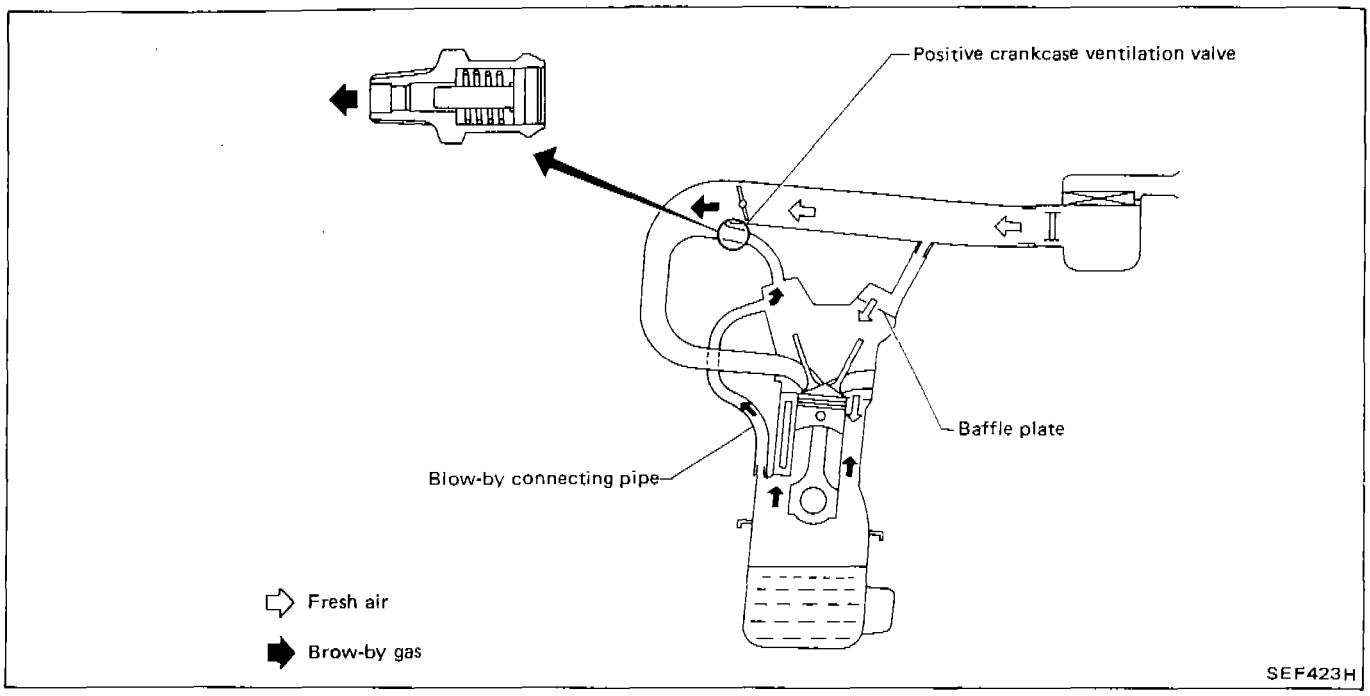
5. Read the indication of fuel pressure gauge.
   At idling:
   When fuel pressure regulator valve vacuum hose is connected.
   Approximately 196 kPa (1.96 bar, 2.0 kg/cm^2, 28 psi)
   When fuel pressure regulator valve vacuum is disconnected.
   Approximately 245 kPa (2.45 bar, 2.5 kg/cm^2, 36 psi)
6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.

Injector Removal and Installation (Cont'd)

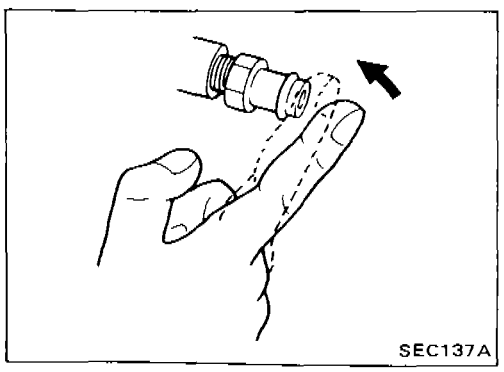
- **Do not attempt to rotate or twist fuel injector and pressure regulator when inserting into fuel tube.**
- **Do not store O-rings in an area where ozone, oxygen, humidity, etc. are relatively high. Do not expose them to direct sunlight.**
- **After properly connecting fuel injector to fuel tube, check connection for fuel leakage.**

6. Assemble injectors with fuel tube.
7. Install fuel tube assembly.

Description



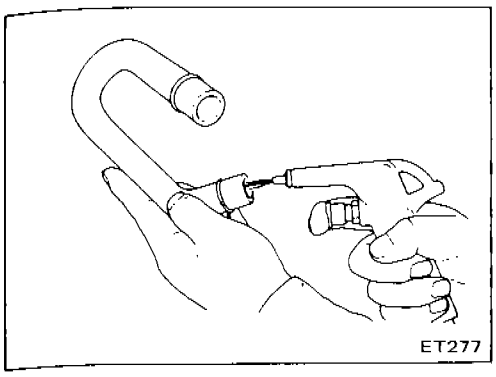
This system returns blow-by gas to the intake manifold.
The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.
The ventilating air is then drawn from the air cleaner, through the hose connecting air inlet to rocker cover, into the crankcase.
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.
On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air inlet under all conditions.



Inspection

P.C.V. (Positive Crankcase Ventilation) VALVE

With engine running at idle, remove ventilation hose from P.C.V. valve; if valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.


ET277

Inspection (Cont'd)

VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

General Specifications

PRESSURE REGULATOR Regulated pressure kPa (bar, kg/cm^2, psi)	250.1 (2.501, 2.55, 36.3)

Inspection and Adjustment

AIR FLOW METER Output voltage	V	1.0 - 3.0
ENGINE TEMPERATURE SENSOR Thermistor resistance at 20°C (68°F)	kΩ	Approx. 2.5
at 80°C (176°F)		Approx. 0.3
THROTTLE VALVE SWITCH Engine speed when idle switch is changed from "OFF" to "ON"	rpm	Idle speed + 250±150
FUEL PRESSURE At idle	kPa (bar, kg/cm^2, psi)	196 (1.96, 2.0, 28)
FUEL INJECTOR Coil resistance	Ω	2 - 3
IDLE SPEED M/T model A/T model in "N" position	rpm	850±50
IDLE SPEED (A/C ON) M/T model A/T model in "N" position		950±50 900±50
IGNITION TIMING (B.T.D.C.) M/T A/T		15°±2°
IDLE CO	%	Idle mixture is preset at factory.
AIR REGULATOR	Ω	Approx. 70
IGNITION COIL Primary resistance [at 20°C (68°F)]	Ω	0.6 - 0.8
Secondary resistance [at 20°C (68°F)]	kΩ	6 - 8

ELECTRICAL SYSTEM

SECTION EL

When you read wiring diagrams:
- Read GI section, "HOW TO READ WIRING DIAGRAMS".

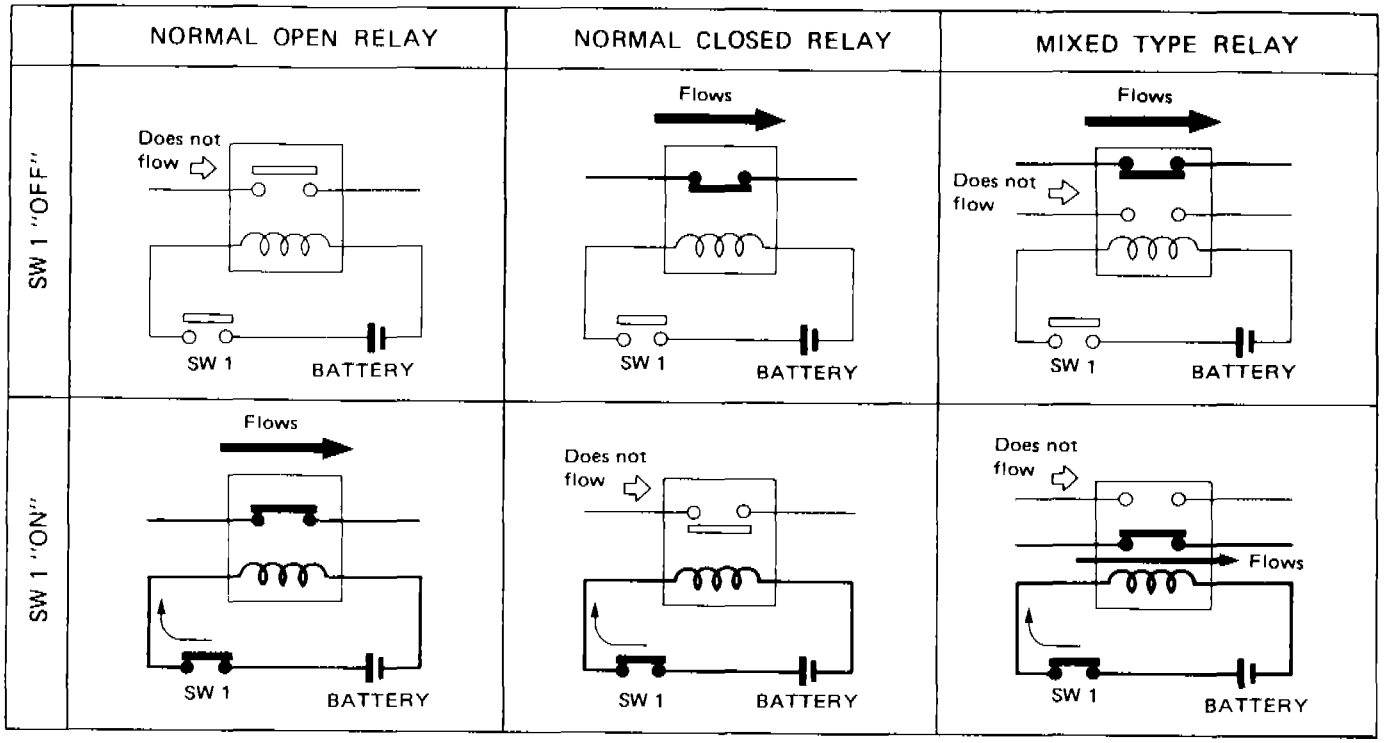
CONTENTS

WIRING DIAGRAM REFERENCE CHART

Description

NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

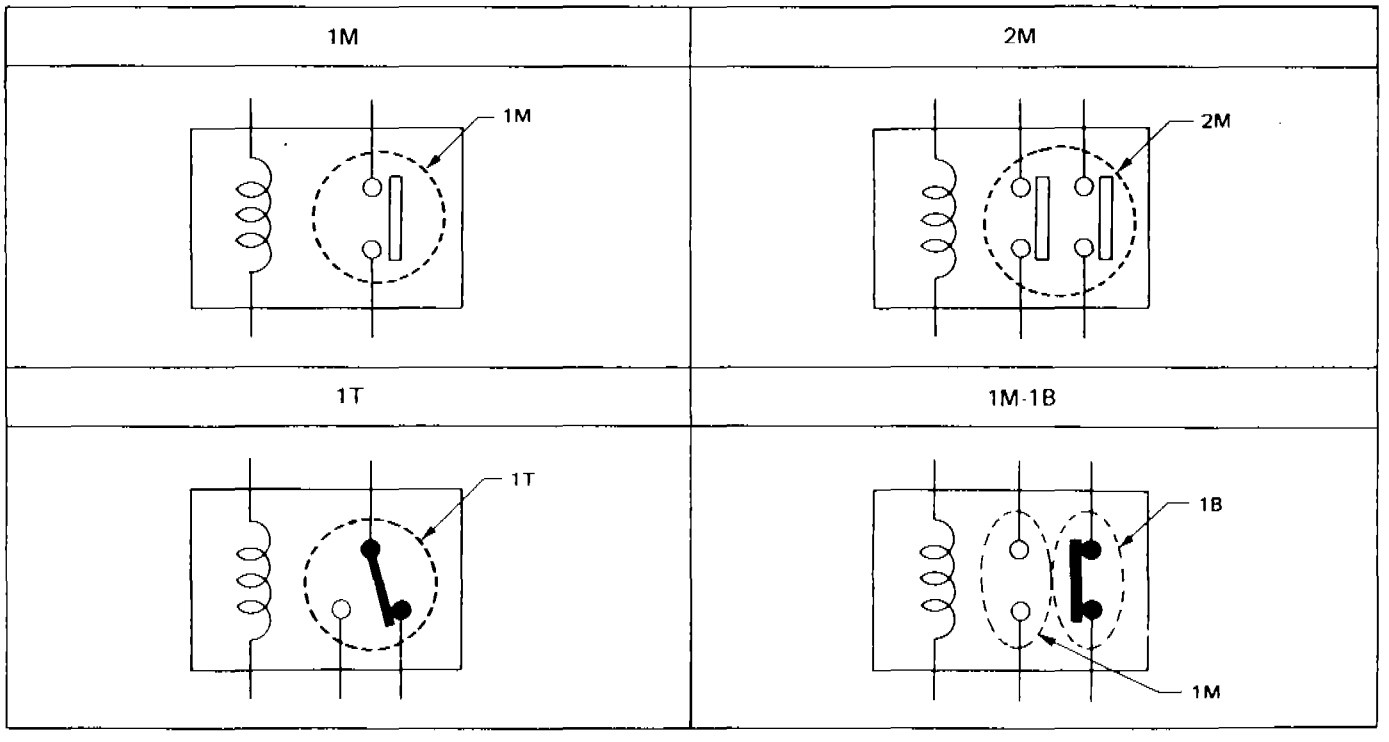
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



SEL881H

TYPE OF STANDARDIZED RELAYS

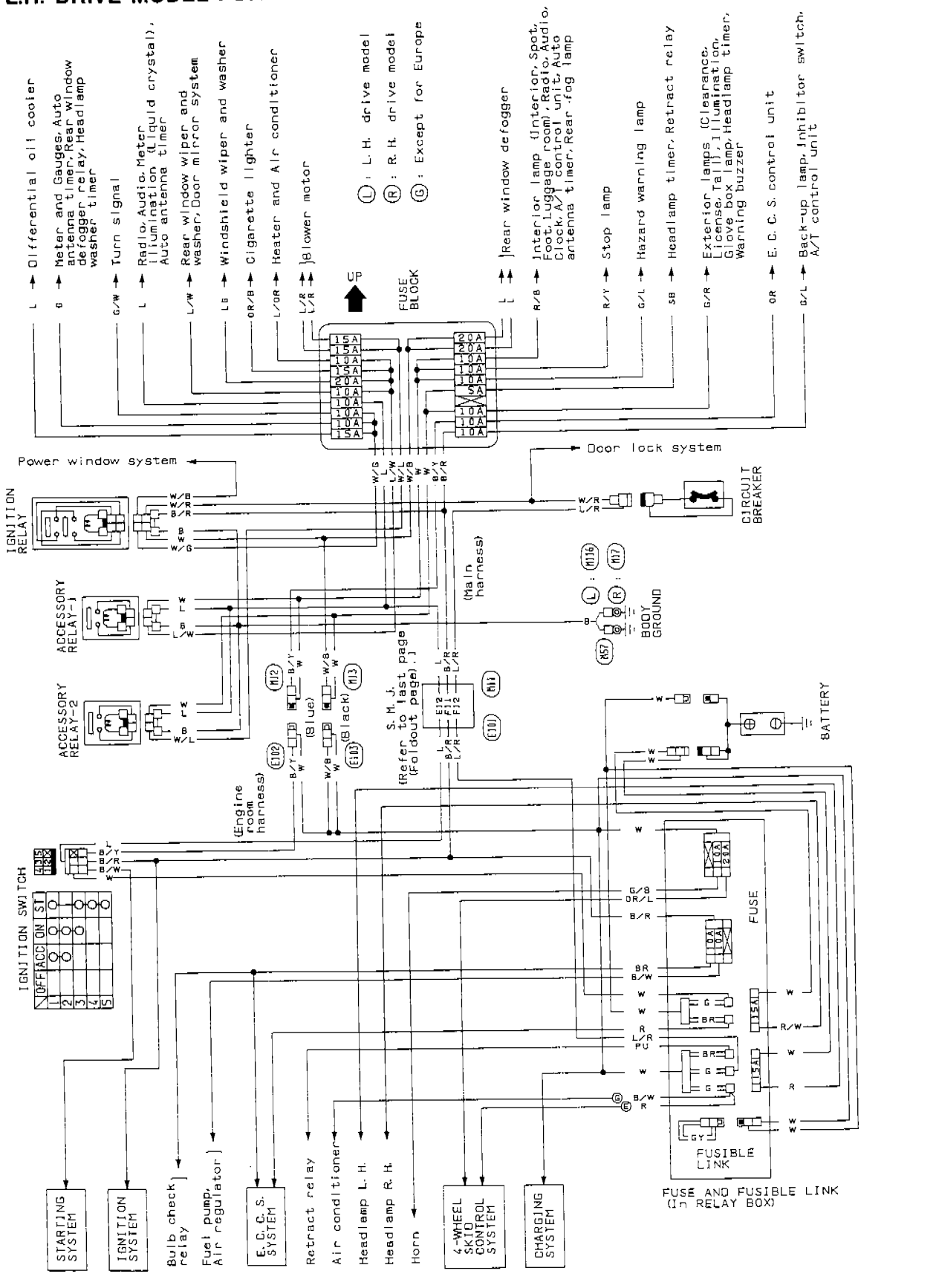
1M ..... 1 Make
1T ..... 1 Transfer
2M ..... 2 Make
1M-1B ..... 1 Make 1 Break



SEL882H

Wiring Diagram (Cont'd)

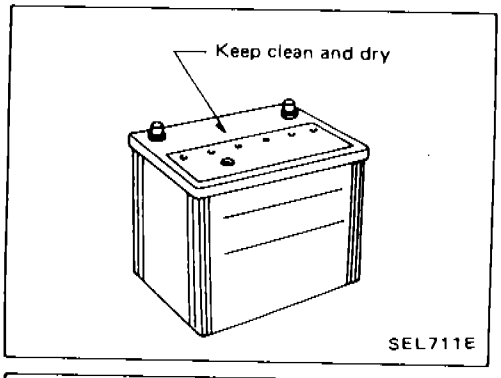
EXCEPT L.H. DRIVE MODEL FOR EUROPE



SEL765L

CAUTION:

a. If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
b. After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
c. Never add distilled water through the hole used to check specific gravity.

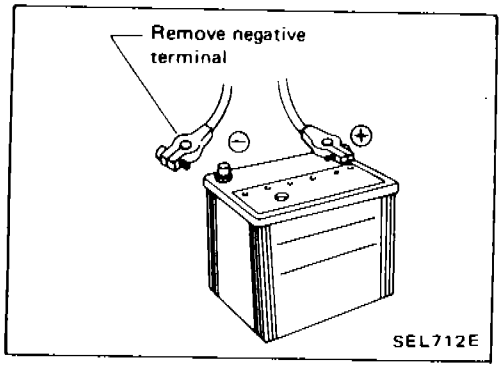


How to Handle Battery

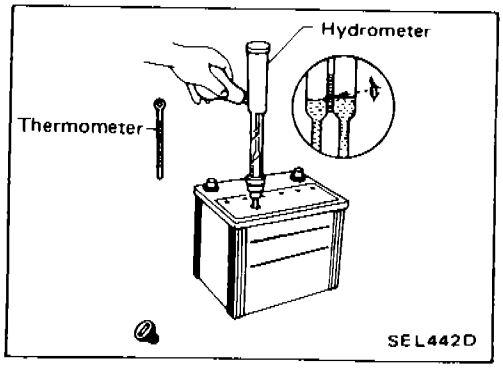
METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

- The battery surface (particularly its top) should always be kept clean and dry.
  If the top surface of a battery is wet with electrolyte or water, leakage current will cause the battery to discharge. Always keep the battery clean and dry.

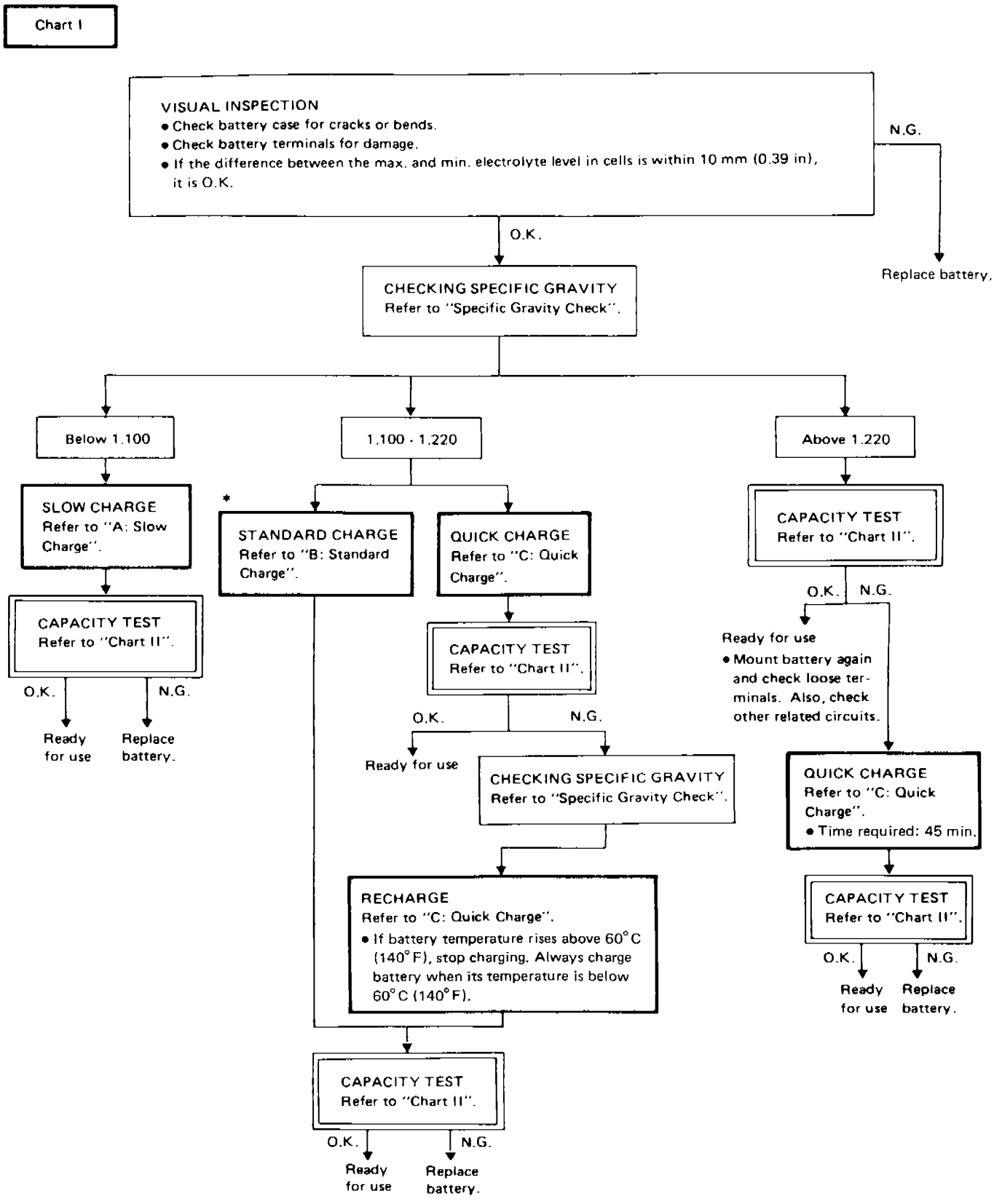


- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal. (If the vehicle has an extended storage switch, turn it off.)



- Check the charge condition of the battery.
  Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.

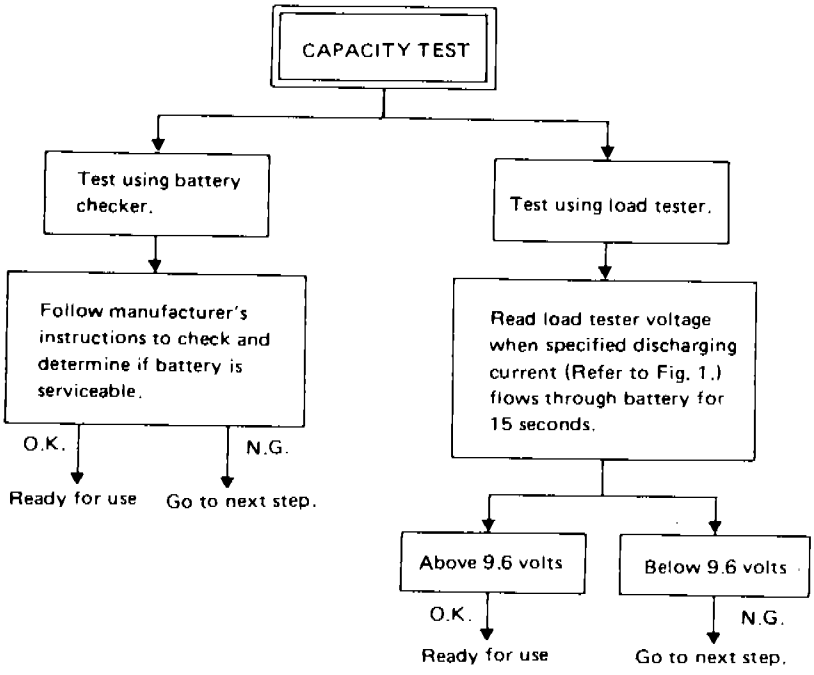
Battery Test and Charging Chart



* "STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.

Battery Test and Charging Chart (Cont'd)

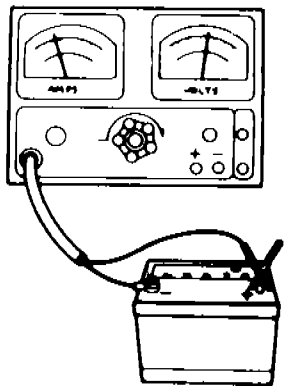
Chart II



- Check battery type and determine the specified current using the following table.

Fig. 1 DISCHARGING CURRENT (Load tester)

Type	Current (A)
28B19R(L)	90
34B19R(L)	99
46B24R(L)	135
55B24R(L)	135
50D23R(L)	150
55D23R(L)	180
65D26R(L)	195
80D26R(L)	195
75D31R(L)	210
95D31R(L)	240
95E41R(L)	300
130E41R(L)	330



SEL697B

Battery Test and Charging Chart (Cont'd)

B: STANDARD CHARGE

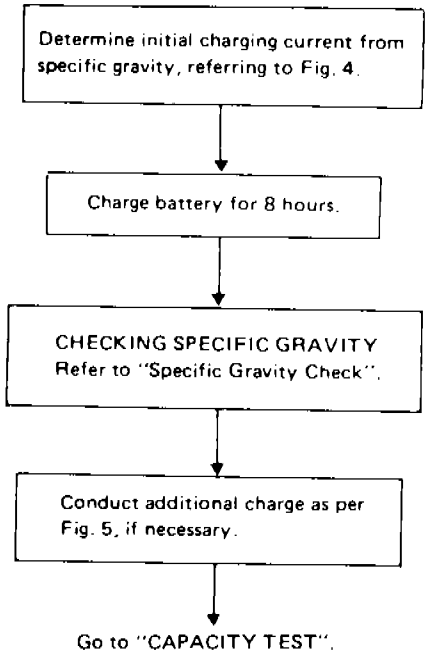
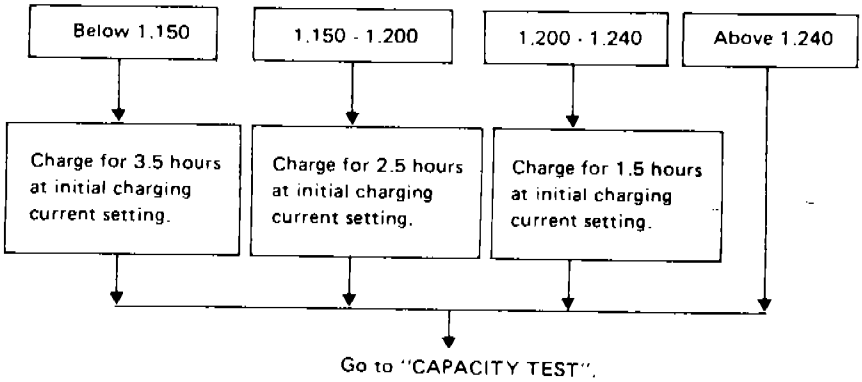


Fig. 4 INITIAL CHARGING CURRENT SETTING
(Standard charge)

BATTERY TYPE / CONVERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L)	50D23R(L) 55D23R(L)	65D26R(L) 80D26R(L)	75D31R(L)	95D31R(L) 95E41R(L)	130E41R(L)
1.100 - 1.130	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	13.0 (A)
1.130 - 1.160	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	11.0 (A)
1.160 - 1.190	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	9.0 (A)
1.190 - 1.220	2.0 (A)	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	5.0 (A)	7.0 (A)

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

Fig. 5 ADDITIONAL CHARGE (Standard charge)



CAUTION:

a. Do not use standard charge method on a battery whose specific gravity is less than 1.100.

b. Set charging current to value specified in Fig. 4. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.

c. Keep battery away from open flame while it is being charged.

d. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.

e. If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

Battery Test and Charging Chart (Cont'd)

C: QUICK CHARGE

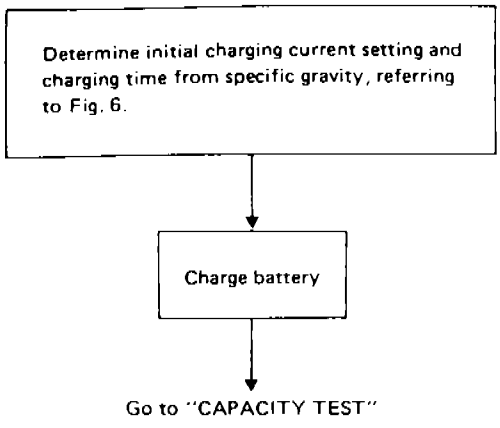


Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

BATTERY TYPE / CURRENT [A] / CONVERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L) 50D23R(L)	55D23R(L) 65D26R(L) 80D26R(L)	75D31R(L) 95D31R(L) 95E41R(L)	130E41R(L)
	10 (A)	15 (A)	20 (A)	30 (A)	40 (A)
1.100 - 1.130	2.5 hours				
1.130 - 1.160	2.0 hours				
1.160 - 1.190	1.5 hours				
1.190 - 1.220	1.0 hours				
Above 1.220	0.75 hours (45 min.)				

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

CAUTION:

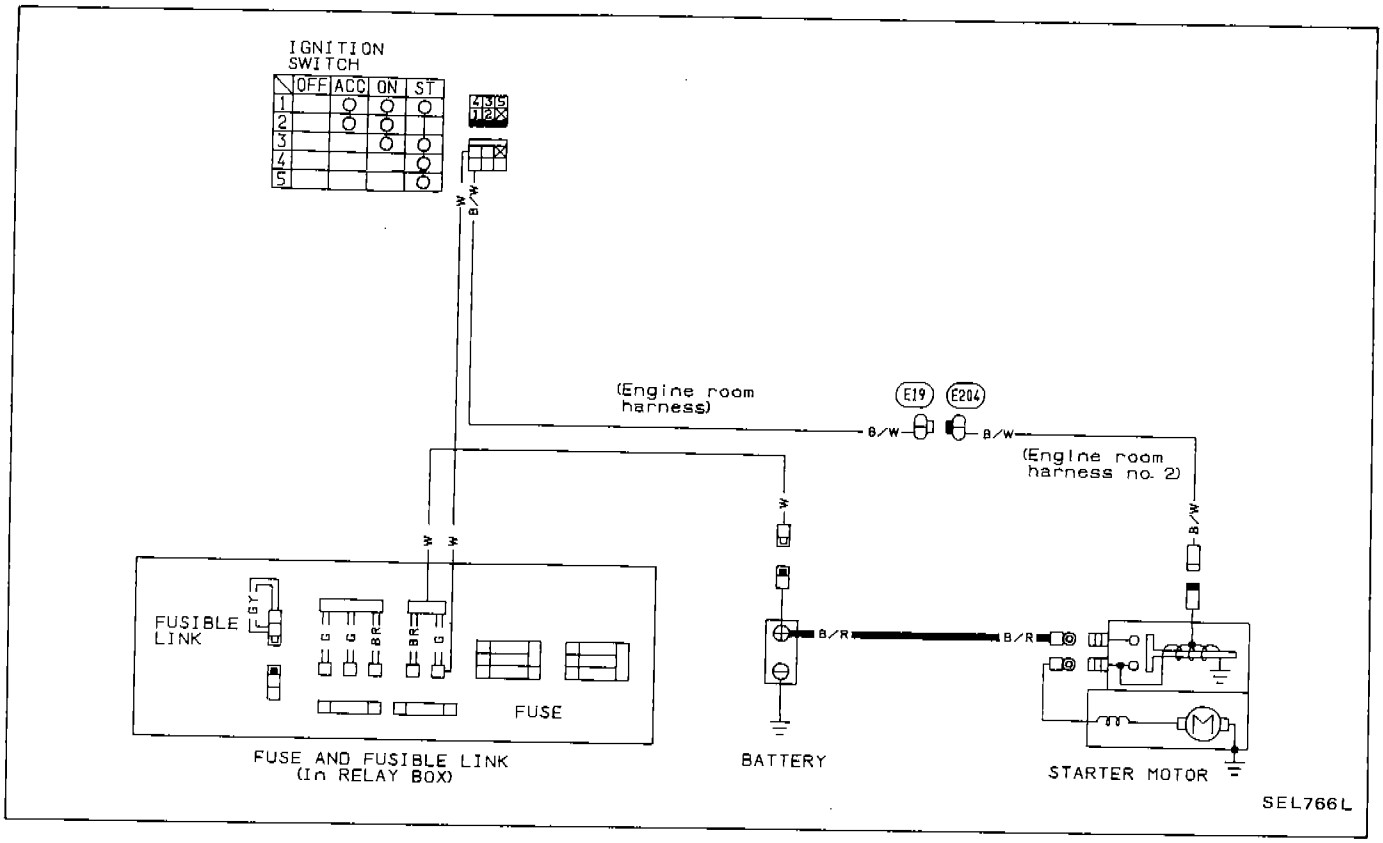
a. **Do not use quick charge method on a battery whose specific gravity is less than 1.100.**
b. **Set initial charging current to value specified in Fig. 6. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
c. **Keep battery away from open flame while it is being charged.**
d. **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
e. **Be careful of a rise in battery temperature because a large current flow is required during quick-charge operation.**
   If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).
f. **Do not exceed the charging time specified in Fig. 6, because charging battery over the charging time can cause deterioration of the battery.**

Service Data and Specifications (S.D.S.)

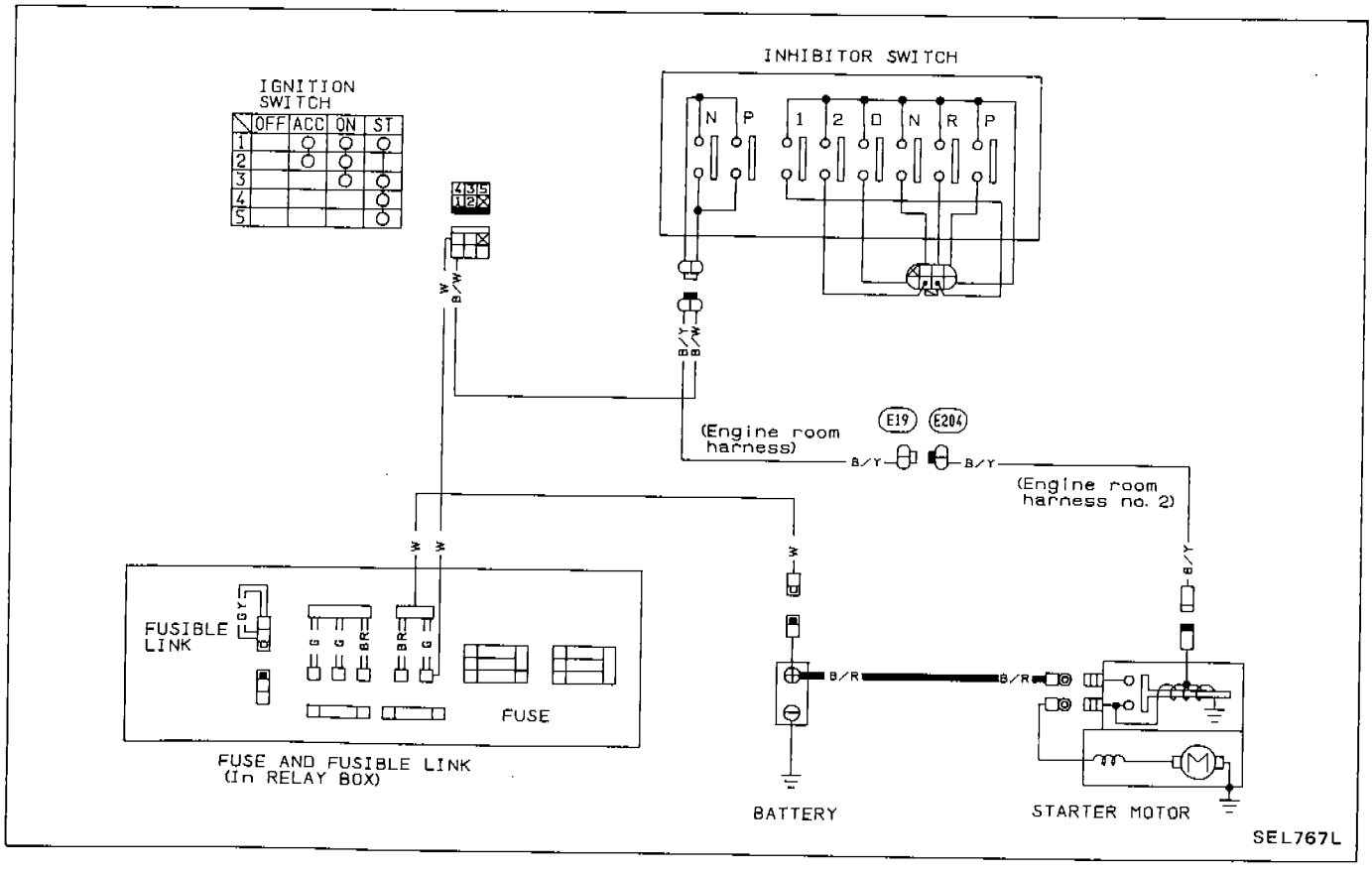
Applied area		Europe	Except Europe (Option)	Except Europe
Type		55D23R		34B19R
Capacity	V-AH	12-60		12-33

Wiring Diagram

M/T MODEL

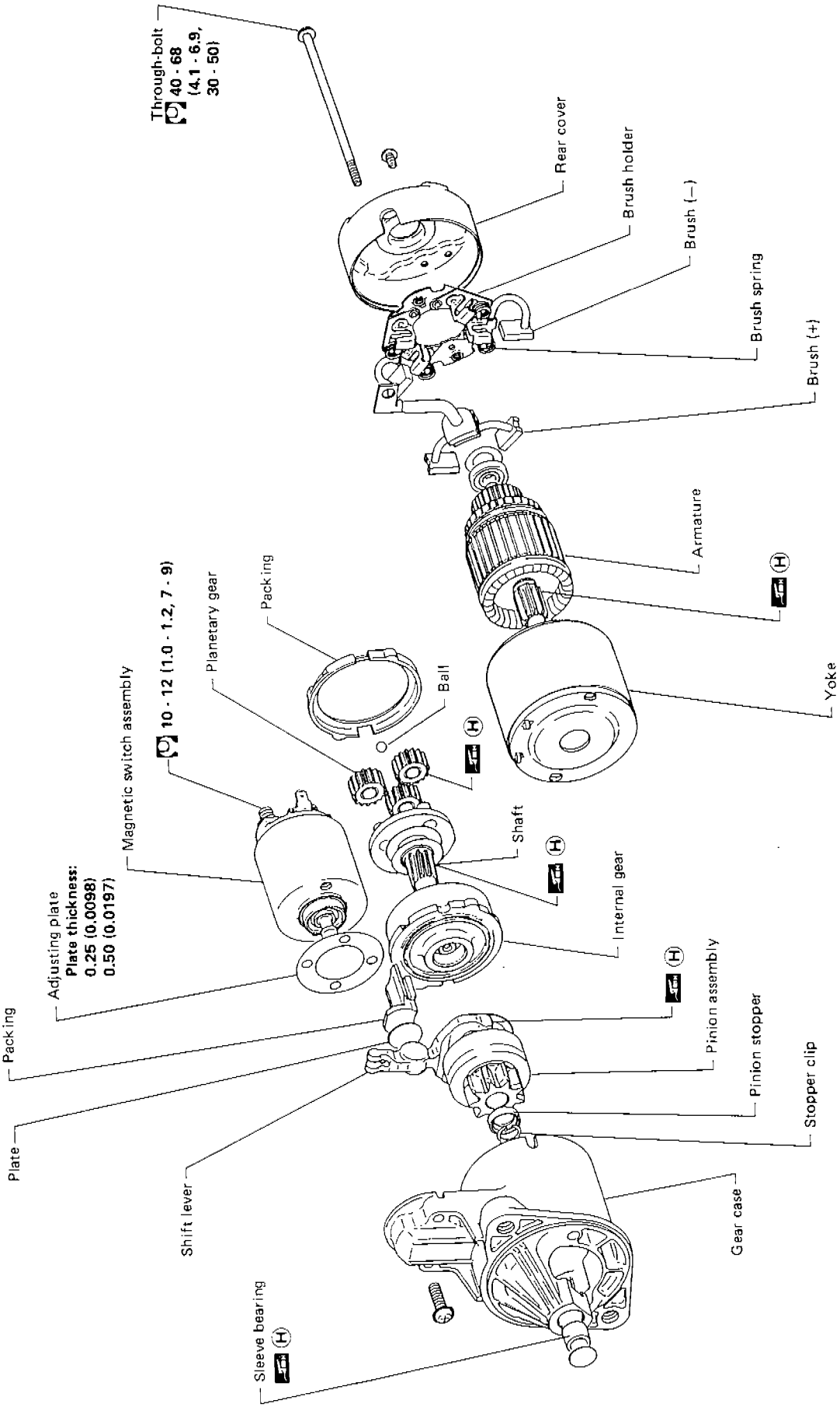


A/T MODEL

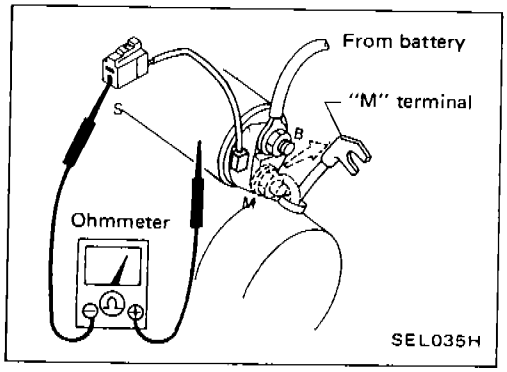


Construction (Cont'd)

M1T71481



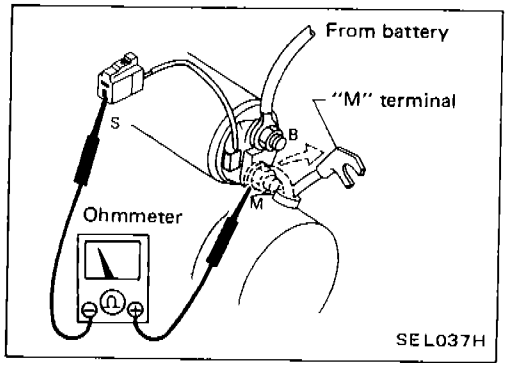
SEL707L



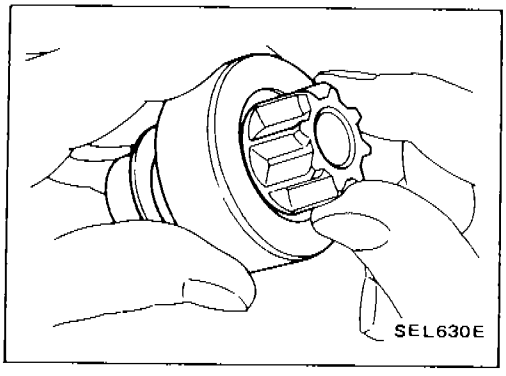
Magnetic Switch Check

- Before starting to check, disconnect battery ground cable.
- Disconnect "M" terminal of starter motor.

1. Continuity test (between "S" terminal and switch body).
- No continuity ... Replace.

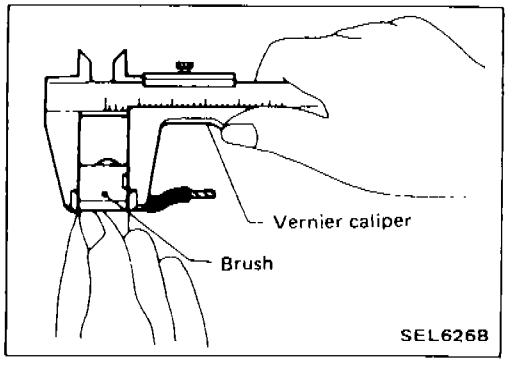


2. Continuity test (between "S" terminal and "M" terminal).
- No continuity ... Replace.



Pinion/Clutch Check

1. Inspect pinion teeth.
- Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
- If it does not lock (or locks) in either direction or unusual resistance is evident. ... Replace.



Brush Check

BRUSH

Check wear of brush.

Wear limit length:
Refer to S.D.S.

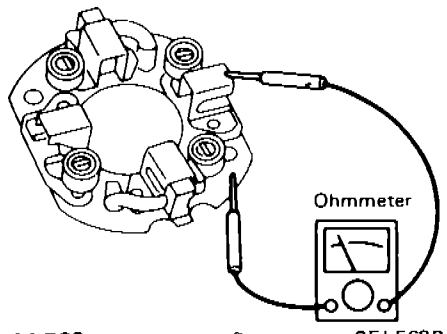
- Excessive wear ... Replace.

Brush Check (Cont'd)

BRUSH HOLDER

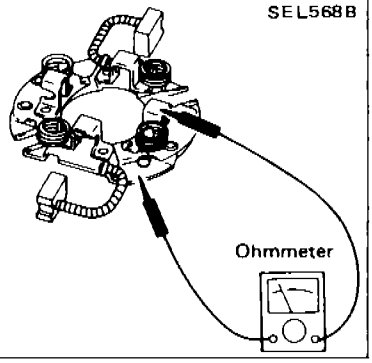
1. Perform insulation test between brush holder (positive side) and its base (negative side).
- Continuity exists. ... Replace.
2. Check brush to see if it moves smoothly.
- If brush holder is bent, replace it; if sliding surface is dirty, clean.

M1T71481

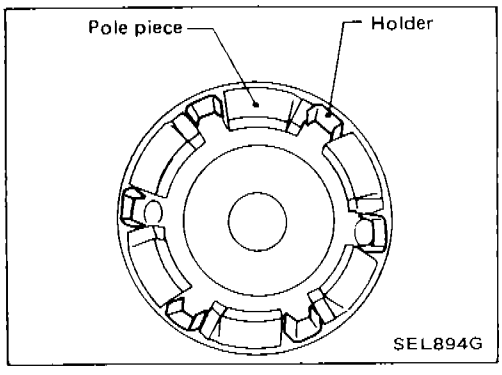


SEL568B

S114-523



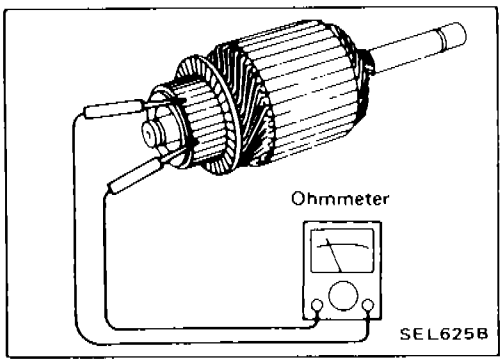
SEL558E



SEL894G

Pole Piece Check

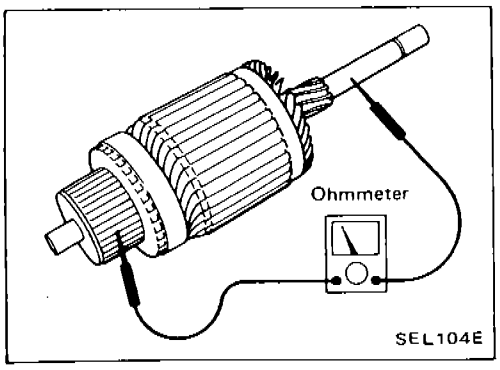
Pole piece is secured to yoke by bonding agent. Check pole piece to see that it is secured to yoke and for any cracks. Replace malfunctioning parts as an assembly.
Holder may move slightly as it is only inserted and not bonded.



SEL625B

Armature Check

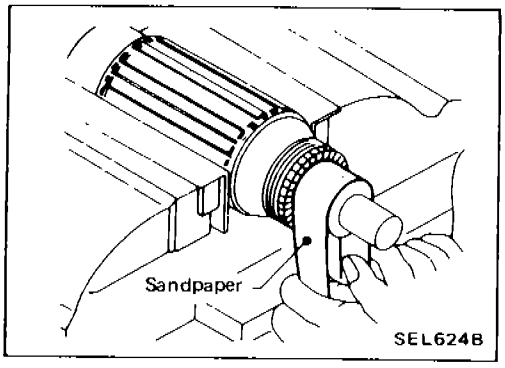
1. Continuity test (between two segments side by side).
- No continuity ... Replace.



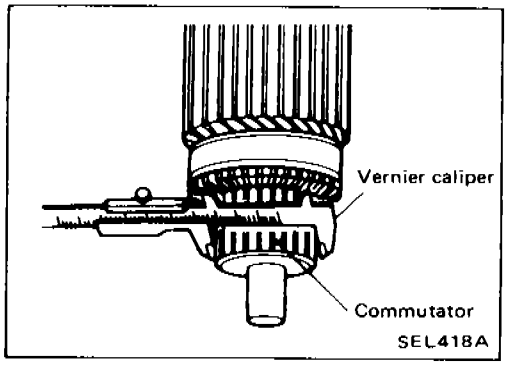
SEL104E

2. Insulation test (between each commutator bar and shaft).
- Continuity exists. ... Replace.

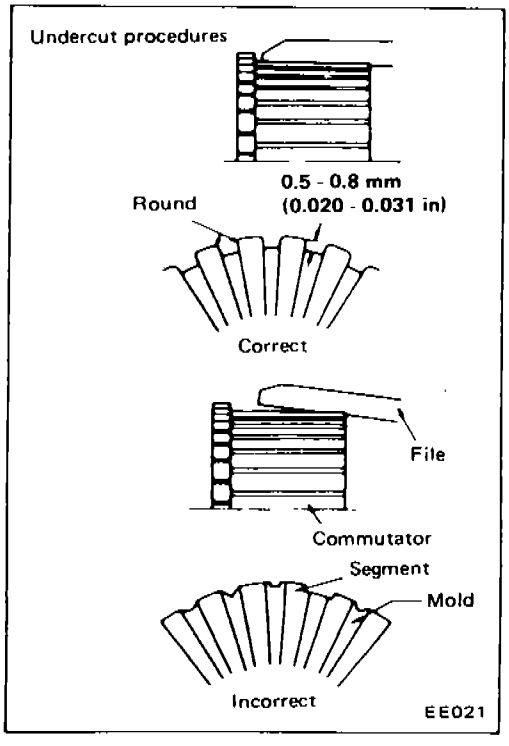
Armature Check (Cont'd)



3. Check commutator surface.
- Rough ... Sand lightly with No. 500 to 600 sandpaper.



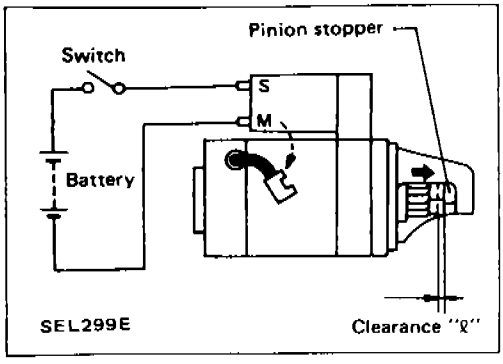
4. Check diameter of commutator.
Commutator minimum diameter:
Refer to S.D.S.
- Less than specified value ... Replace.

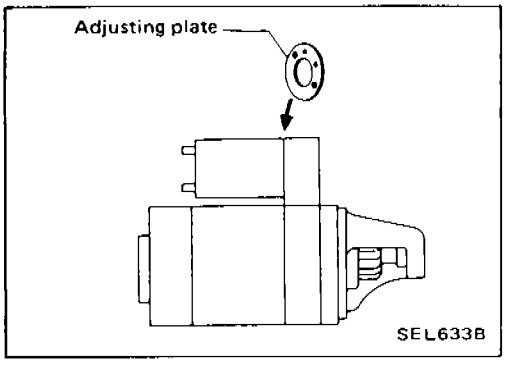


5. Check depth of insulating mold from commutator surface.
- Less than 0.2 mm (0.008 in) ... Undercut to 0.5 to 0.8 mm (0.020 to 0.031 in)

Assembly

Apply high-temperature grease to lubricate the bearing, gears and frictional surface when assembling the starter.
Carefully observe the following instructions.
- Gear case metal
- Moving portion of shift lever
- Plunger of magnetic switch
- Internal gear
- Planetary gear
- Shaft





Assembly (Cont'd)

PINION PROTRUSION LENGTH ADJUSTMENT

With pinion driven out by magnetic switch, push pinion back to remove slack and measure clearance "ℓ" between the front edge of the pinion and the pinion stopper.

Clearance "ℓ":
Refer to S.D.S.

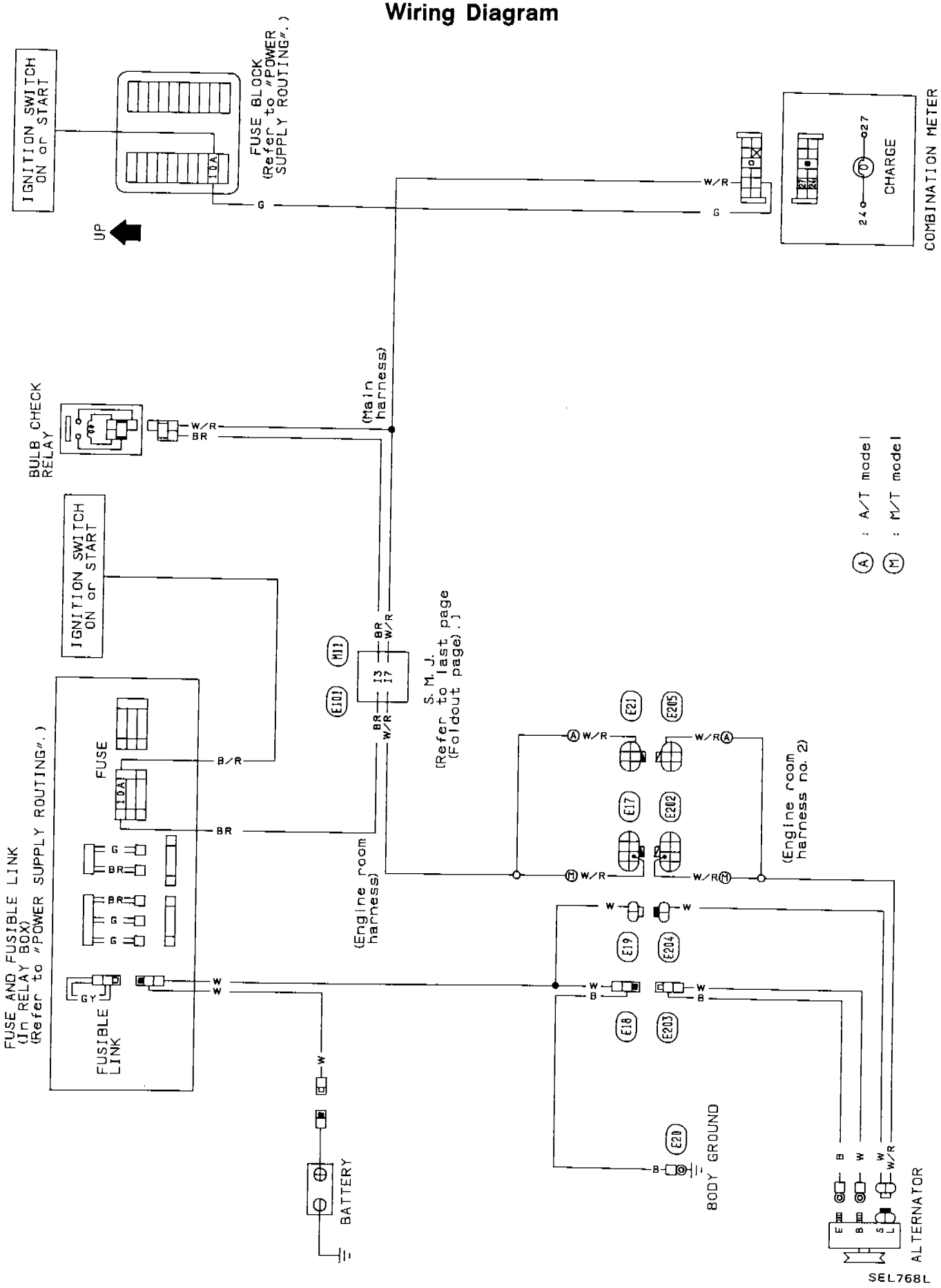
- Not in the specified value ... Adjust by adjusting plate.

Service Data and Specifications (S.D.S.)

STARTER

Type		S114-523	M1T71481
		HITACHI make	MITSUBISHI make
		Reduction gear type	
Applied model		All	
System voltage	V	12	
No-load			
Terminal voltage	V	11.0	
Current	A	Less than 90	50 - 75
Revolution	rpm	More than 2,950	3,000 - 4,000
Minimum diameter of commutator	mm (in)	32.0 (1.260)	28.8 (1.134)
Minimum length of brush	mm (in)	11.0 (0.433)	12.0 (0.472)
Brush spring tension	N (kg, lb)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)
Clearance of bearing metal and armature shaft	mm (in)	0.2 (0.008)	—
Clearance "ℓ" between pinion front edge and pinion stopper	mm (in)	0.3 - 1.5 (0.012 - 0.059)	0.5 - 2.0 (0.020 - 0.079)

Wiring Diagram

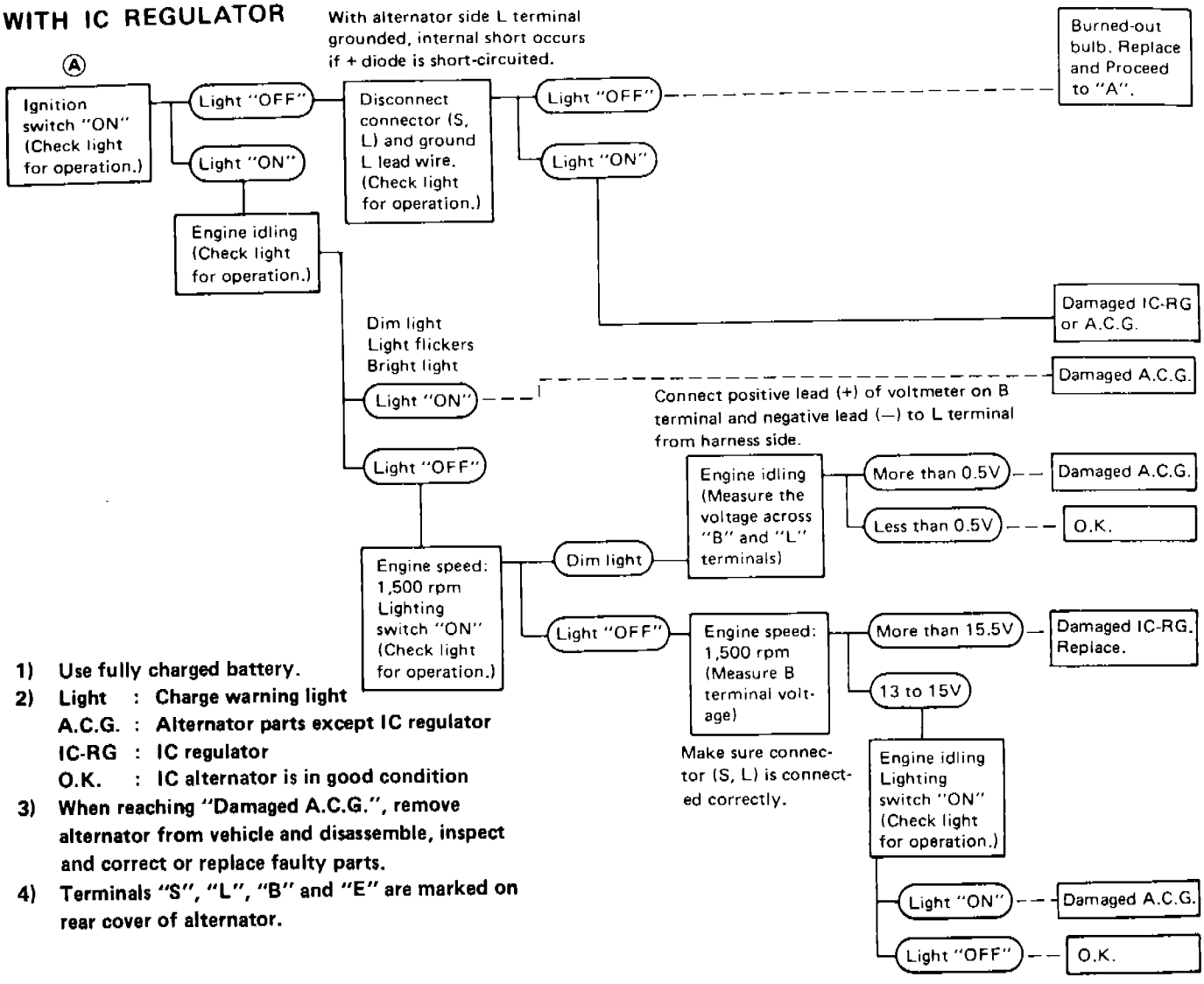


Trouble-shooting

Before conducting an alternator test, make sure that the battery is fully charged. A 30-volt voltmeter and suitable test probes are necessary for the test. The alternator can be checked easily by referring to the Inspection Table.

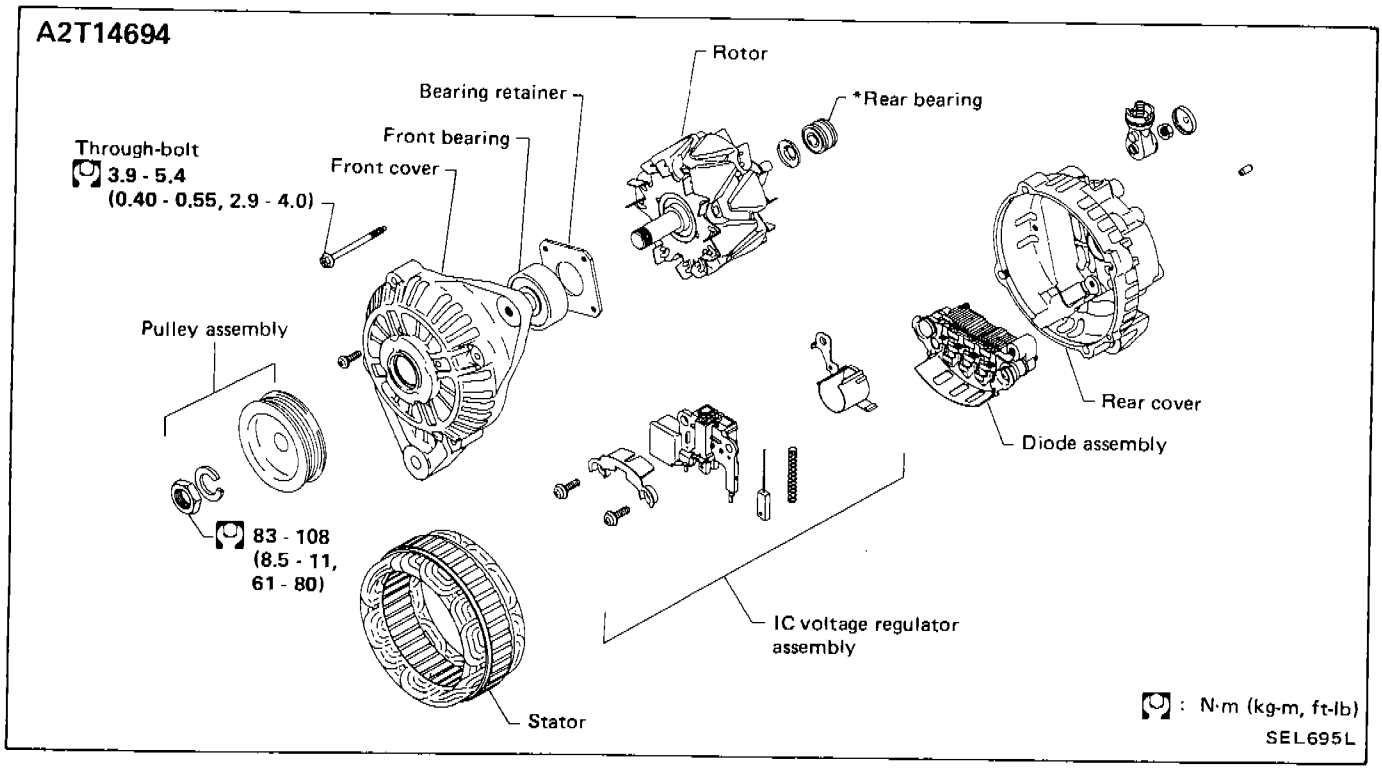
Before starting trouble-shooting, inspect the fusible link.

WITH IC REGULATOR



1) Use fully charged battery.
2) Light : Charge warning light
   A.C.G. : Alternator parts except IC regulator
   IC-RG : IC regulator
   O.K. : IC alternator is in good condition
3) When reaching "Damaged A.C.G.", remove alternator from vehicle and disassemble, inspect and correct or replace faulty parts.
4) Terminals "S", "L", "B" and "E" are marked on rear cover of alternator.

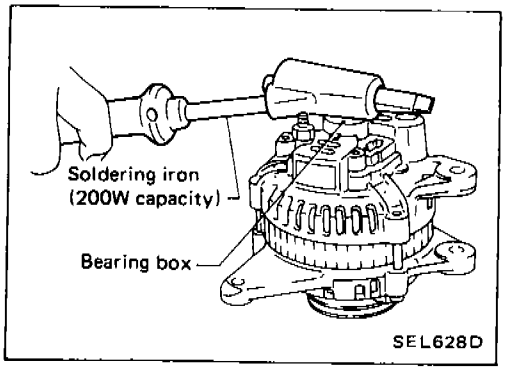
Construction



***Rear bearing**

CAUTION:

Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. Be careful not to lose this ring during removal.



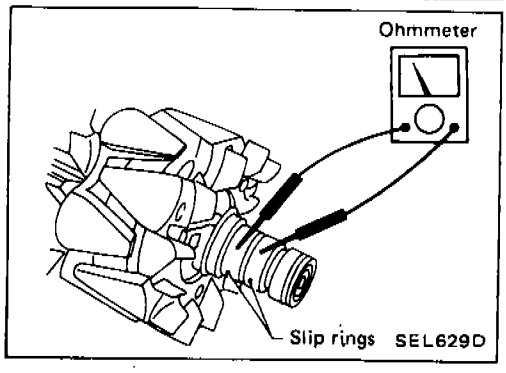
Disassembly

REAR COVER REMOVAL

CAUTION:

To facilitate removal of rear cover, heat just bearing box section with a 200W soldering iron.

Do not use a heat gun, as it can damage diode assembly.

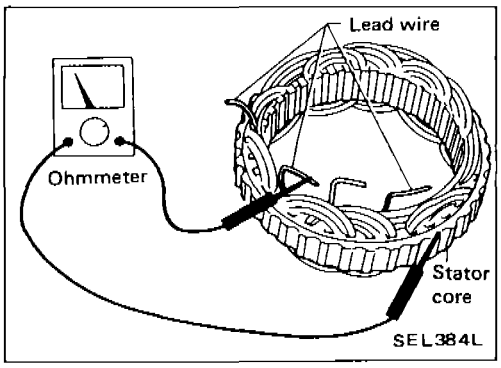


Rotor Slip Ring Check

1. Continuity test

- No continuity ... Replace rotor.

Stator Check (Cont'd)



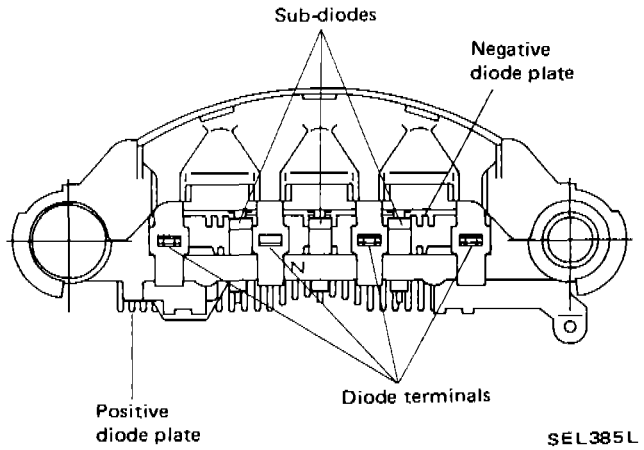
2. Ground test
- Continuity exists. ... Replace stator.

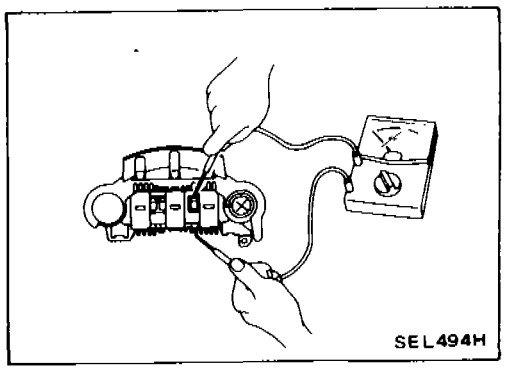
Diode Check

MAIN DIODES

- Use an ohmmeter to check condition of diodes as indicated in chart below:
- If any of the test results is not satisfactory, replace diode assembly.

	Ohmmeter probes		Continuity
	Positive ⊕	Negative ⊖	
Diodes check (Positive side)	Positive diode plate	Diode terminals	Yes
	Diode terminals	Positive diode plate	No
Diodes check (Negative side)	Negative diode plate	Diode terminals	No
	Diode terminals	Negative diode plate	Yes





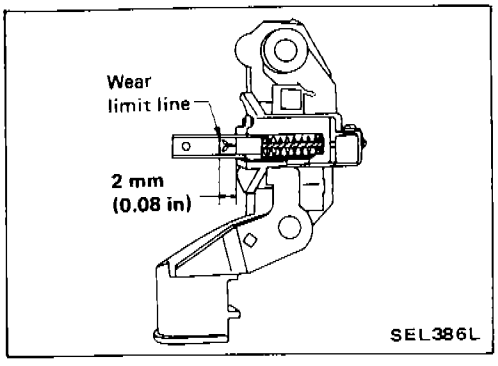
SUB-DIODES

- Attach ohmmeter's probe to each end of diode to check for continuity.
- Continuity is N.G. ... Replace diode assembly.

Assembly

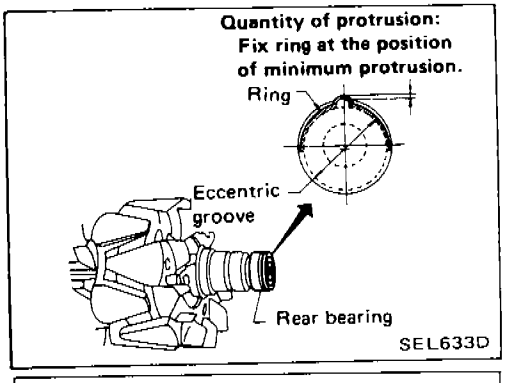
Carefully observe the following instructions.

- When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.



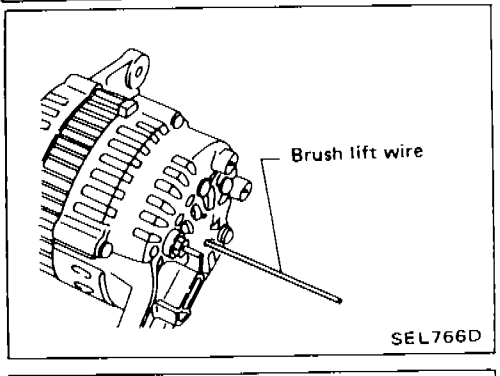
WHEN SOLDERING BRUSH LEAD WIRE

- Position brush so that its wear limit line protrudes 2 mm (0.08 in) beyond end face of brush holder.



RING FITTING IN REAR BEARING

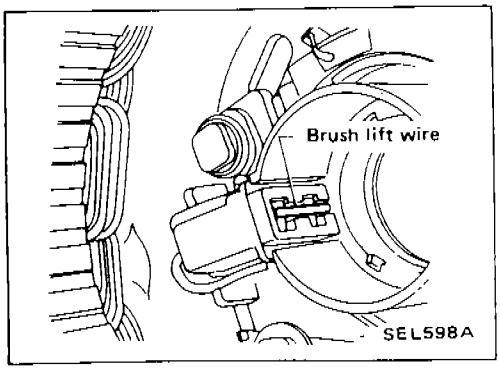
- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.



REAR COVER INSTALLATION

(1) Before installing front cover with pulley and rotor with rear cover, push brush up with fingers and retain brush by inserting brush lift wire into brush lift hole from outside.
(2) After installing front and rear sides of alternator, pull brush lift wire by pushing toward the center.

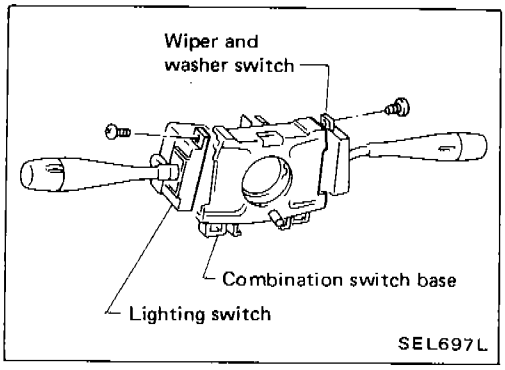
Do not pull brush lift wire by pushing toward outside of rear cover as it will damage slip ring sliding surface.



Service Data and Specifications (S.D.S.)

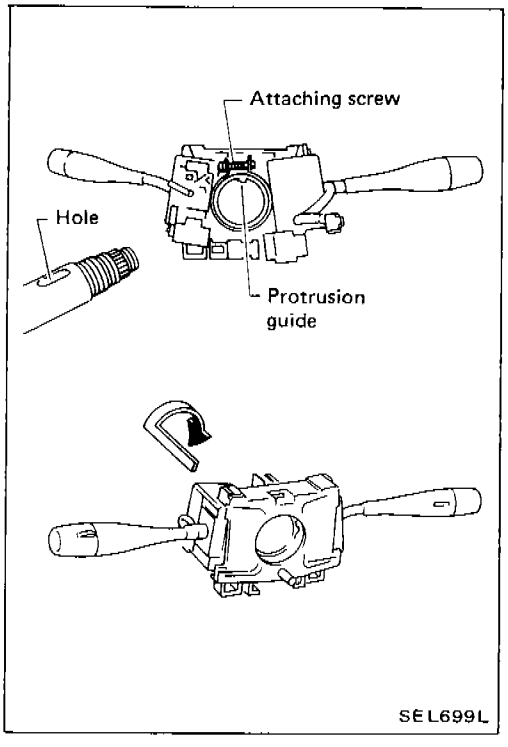
ALTERNATOR

Type		A2T14694
Applied model		All
Nominal rating	V-A	12-80
Ground polarity		Negative
Minimum revolution under no-load (When 13.5 volts is applied)	rpm	Less than 1,100
Hot output current	A/rpm	More than 22/1,300 More than 60/2,500
Regulated output voltage	V	14.1 - 14.7
Minimum length of brush	mm (in)	8.0 (0.315)
Brush spring pressure	N (g, oz)	3.040 - 4.217 (310 - 430, 10.93 - 15.17)
Slip ring minimum outer diameter	mm (in)	22.1 (0.870)



Replacement

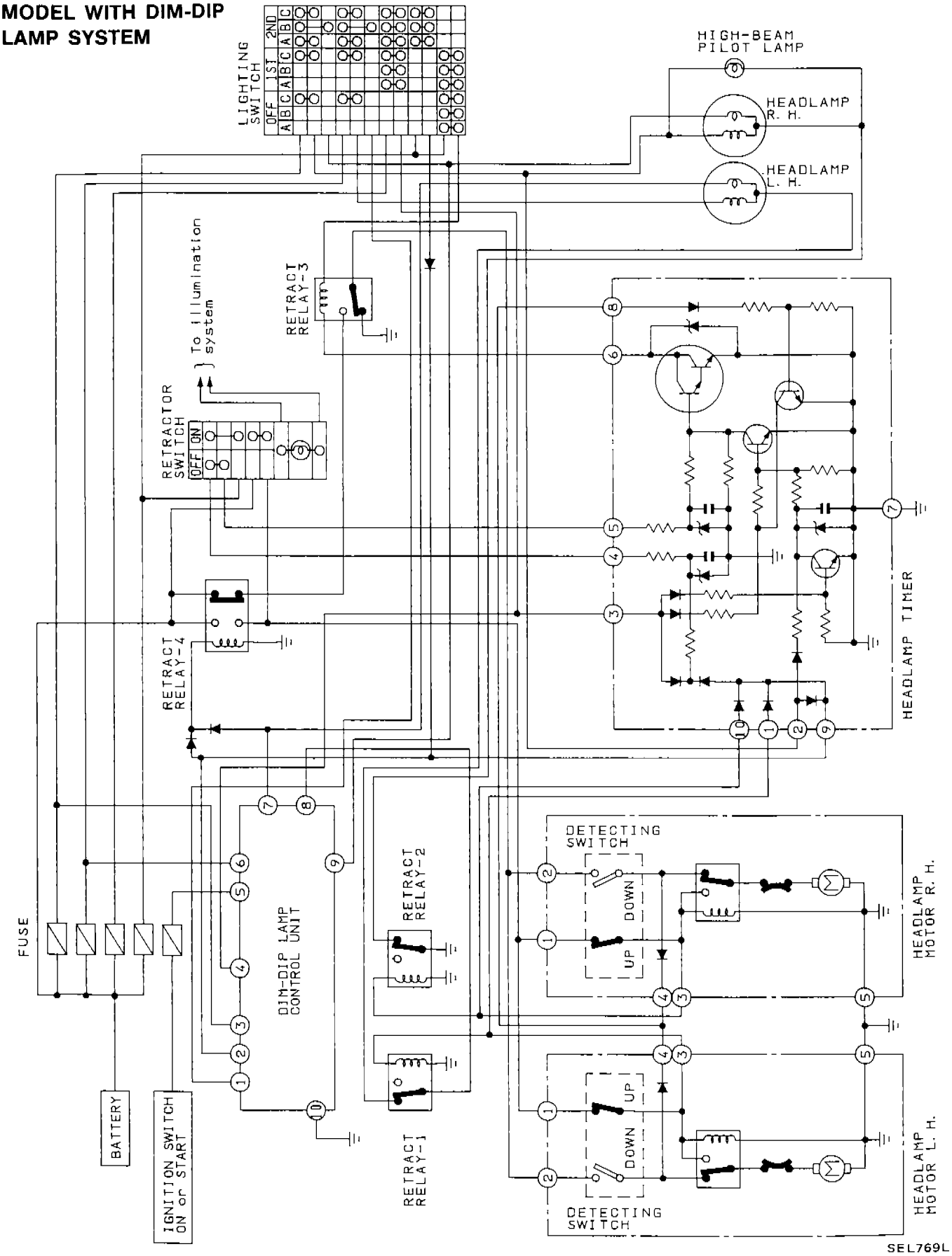
- Each switch can be replaced without removing combination switch base.



- To remove combination switch base, remove base attaching screw and turn after pushing on it.

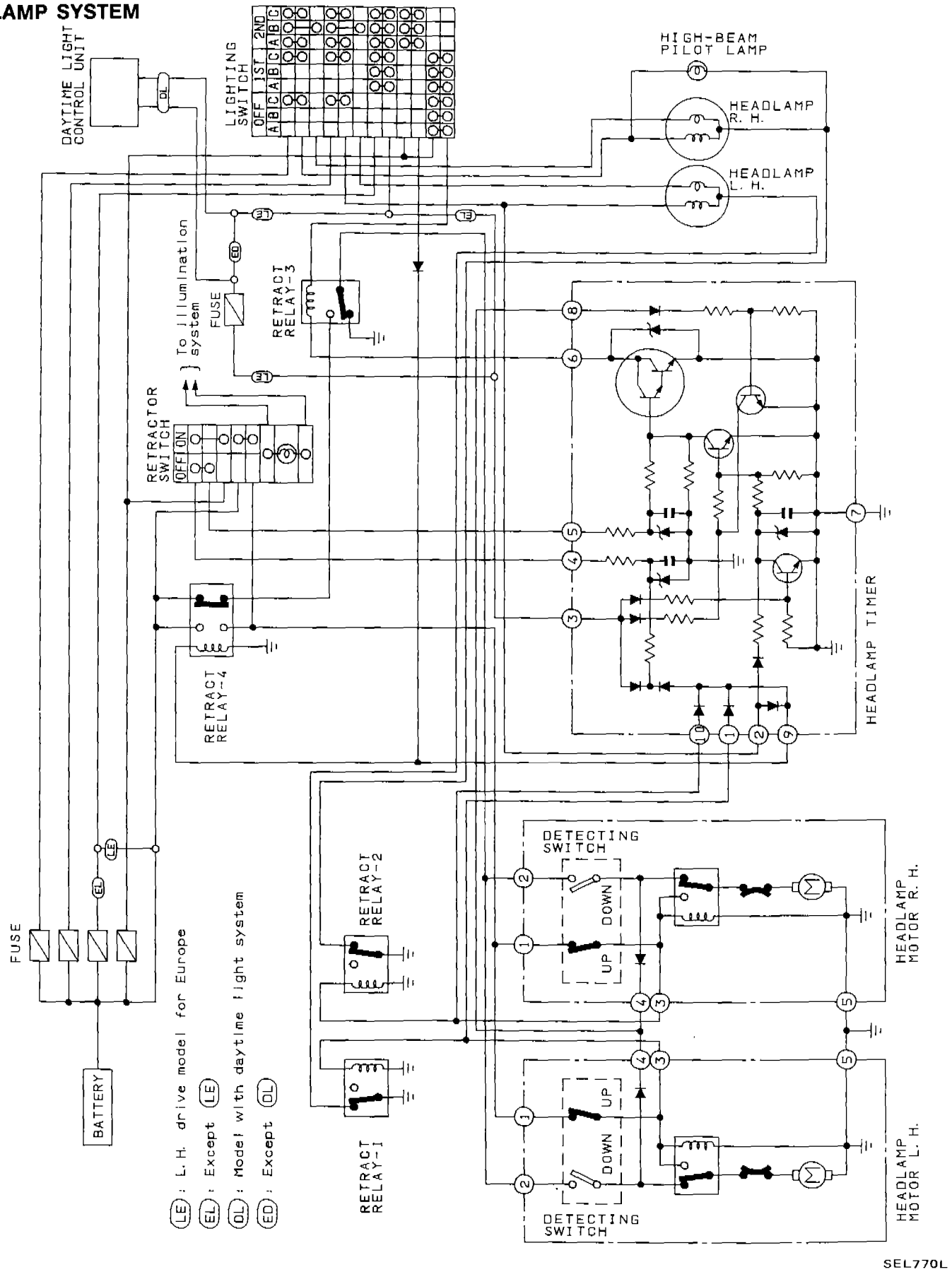
Schematic

MODEL WITH DIM-DIP LAMP SYSTEM



Schematic (Cont'd)

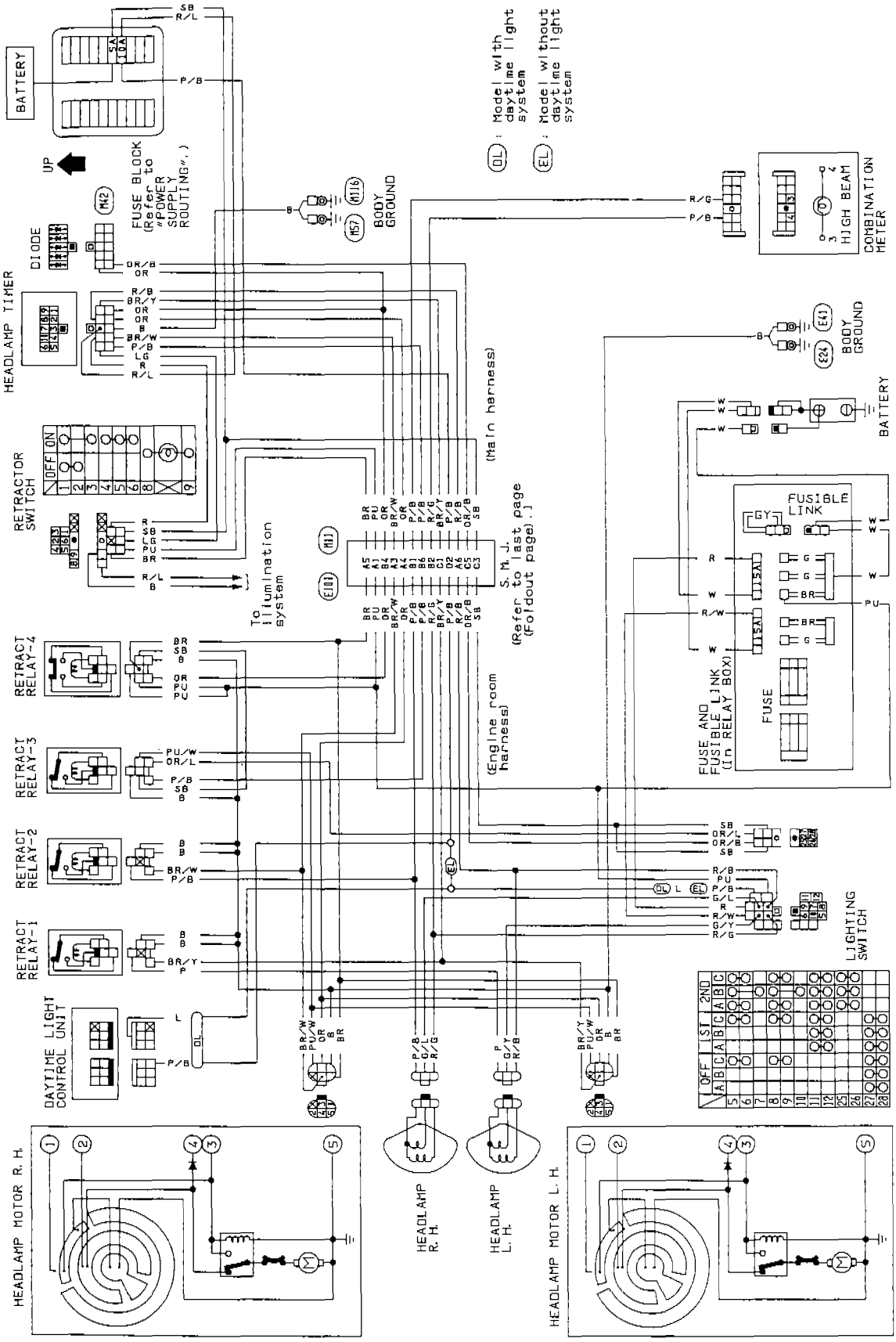
MODEL WITHOUT DIM-DIP LAMP SYSTEM



SEL770L

Wiring Diagram

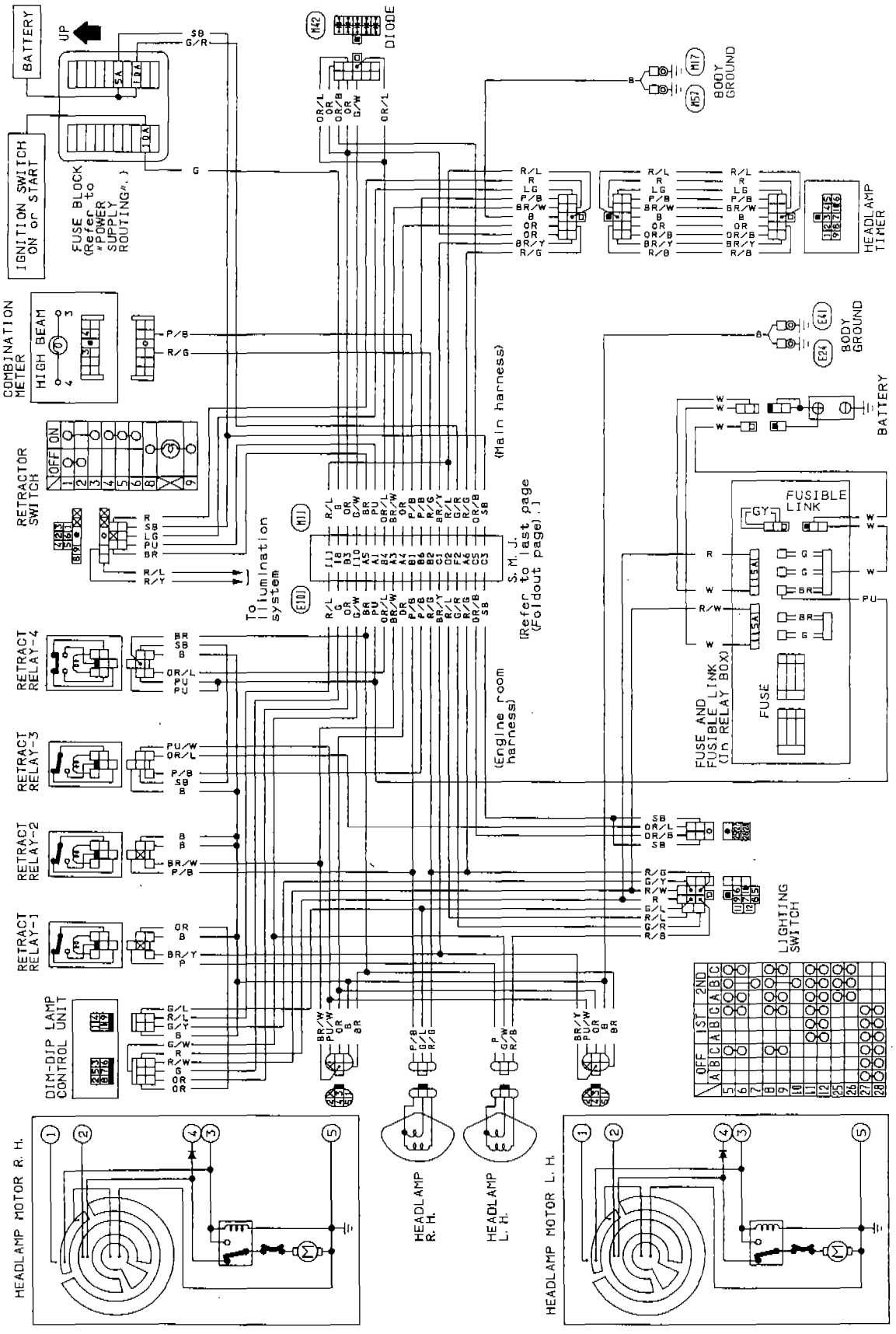
L.H. DRIVE MODEL FOR EUROPE



SEL771L

Wiring Diagram (Cont'd)

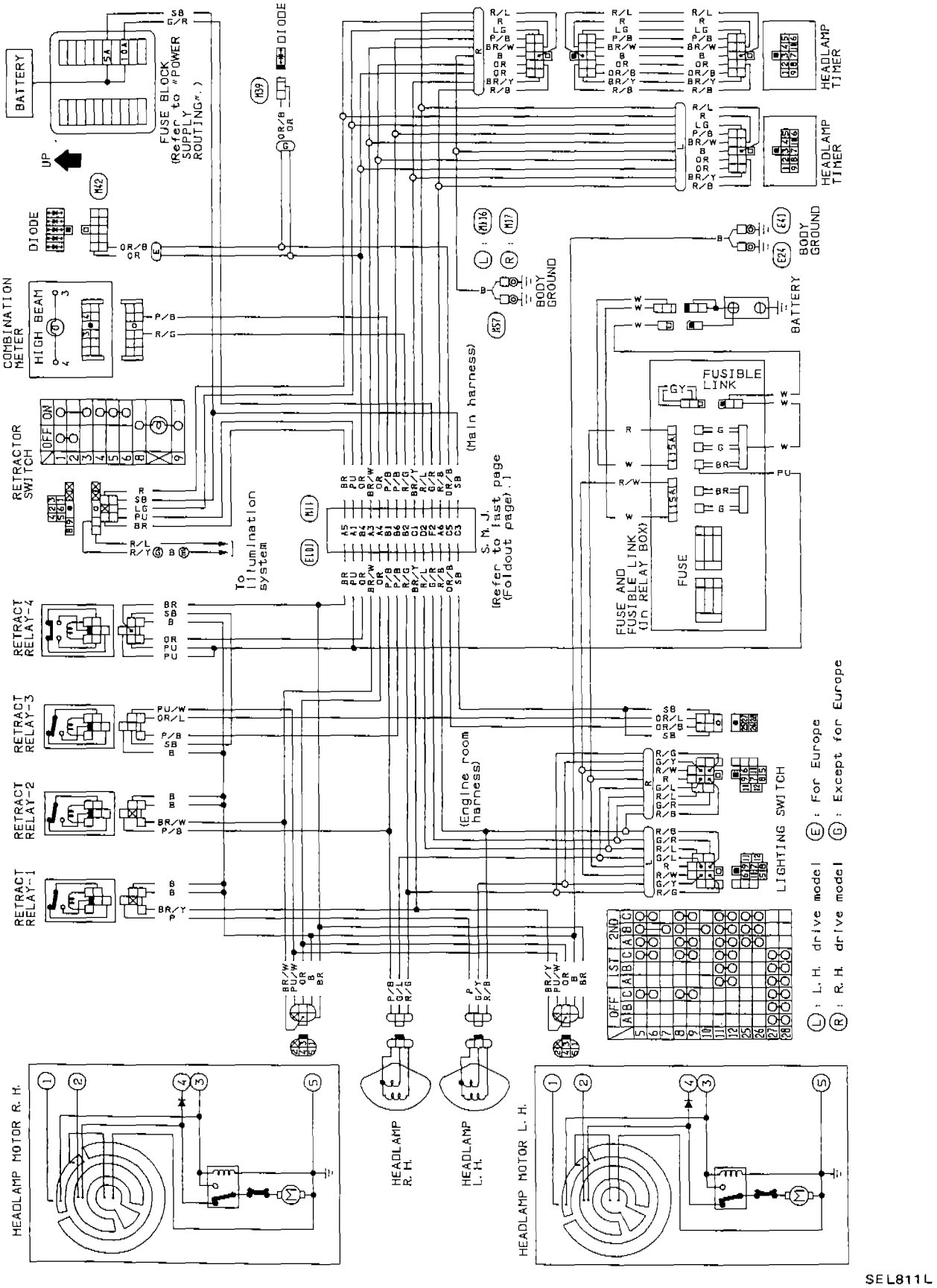
MODEL WITH DIM-DIP LAMP SYSTEM



SEL772L

Wiring Diagram (Cont'd)

L.H. DRIVE MODEL EXCEPT FOR EUROPE AND R.H. DRIVE MODEL WITHOUT DIM-DIP LAMP SYSTEM



SEL811L

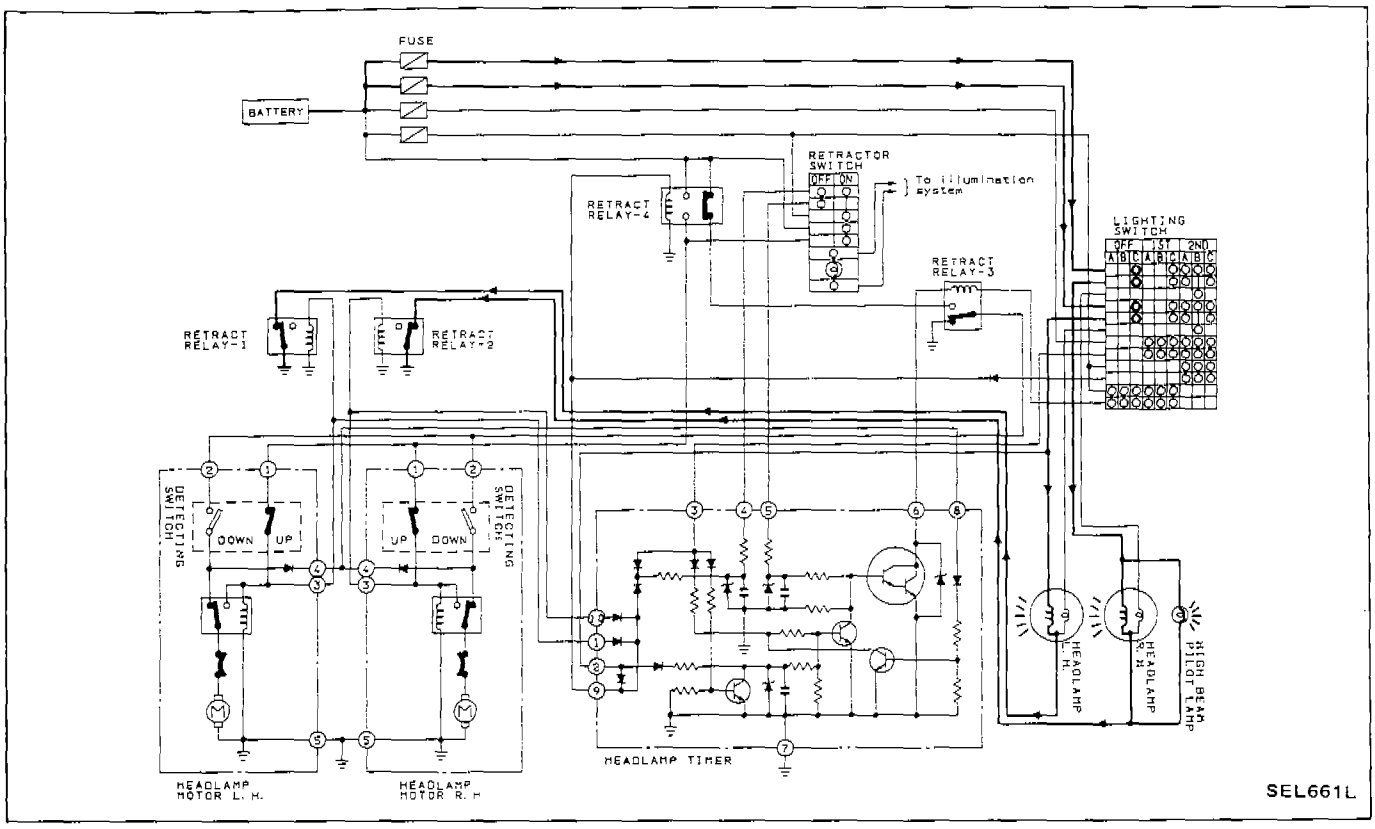
Description

BASIC OPERATION

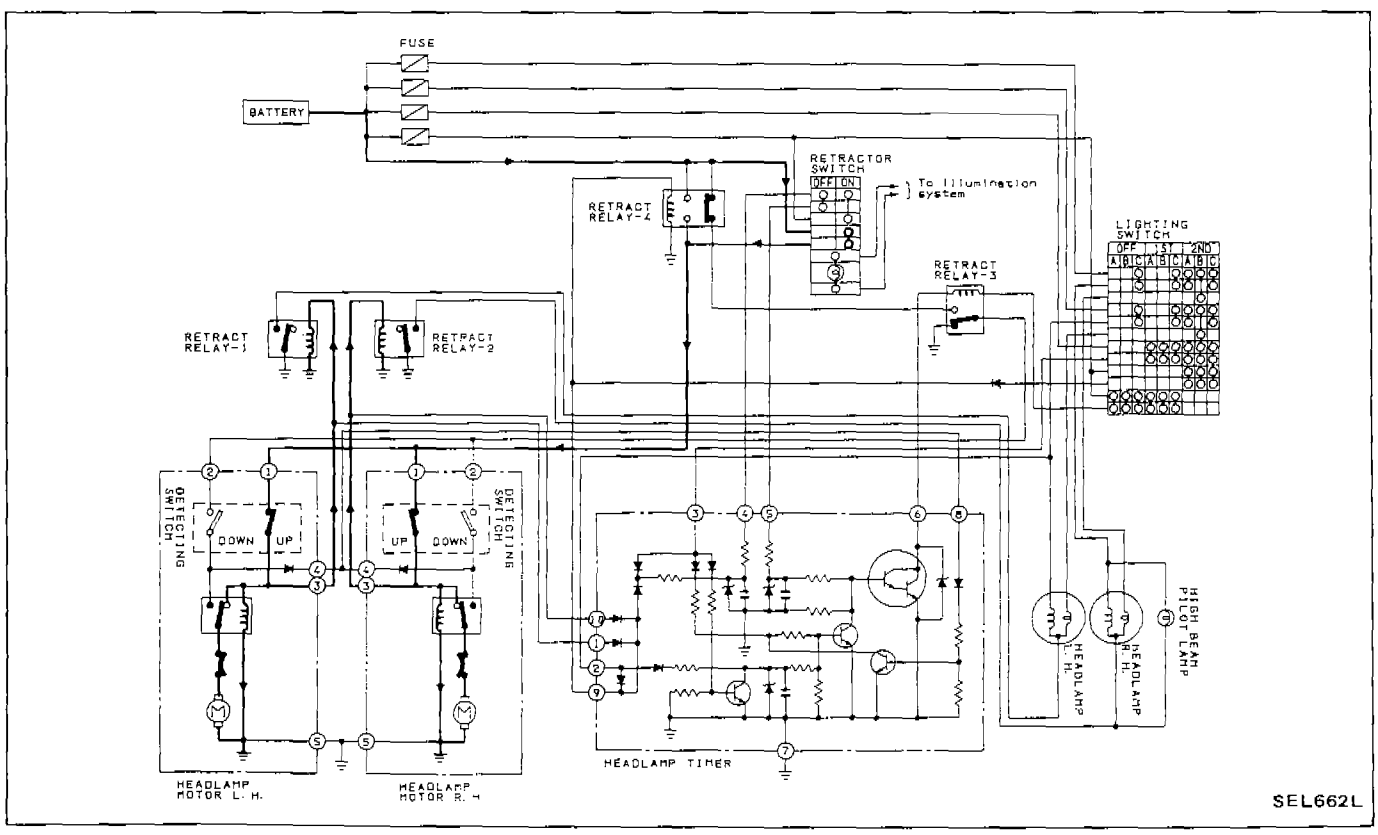
Condition		Operation	
Lighting switch	Retractor switch	Headlamp motor	Headlamps
OFF → 1ST	OFF	No operation	OFF
1ST → 2ND	OFF	Open	ON after headlamp motor reaches fully open position.
2ND → 1ST	OFF	Held to open position	OFF
!ST → OFF	OFF	Closed	OFF
Except for Europe model Momentarily turned to PASSING	OFF	Opened and closed after headlamps go off.	Momentarily ON after headlamp motor reaches fully open position, and then go off.
For Europe model Momentarily turned to PASSING	OFF	Opened and closed	OFF
Held at PASSING position	OFF	Open	ON after headlamp motor reaches fully open position.
Release PASSING position	OFF	Closed after headlamps go off.	OFF
OFF	ON	Open	OFF

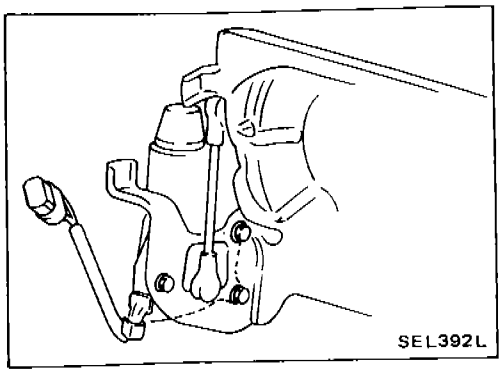
Description (Cont'd)

C-2: After the headlamp reaches fully open position



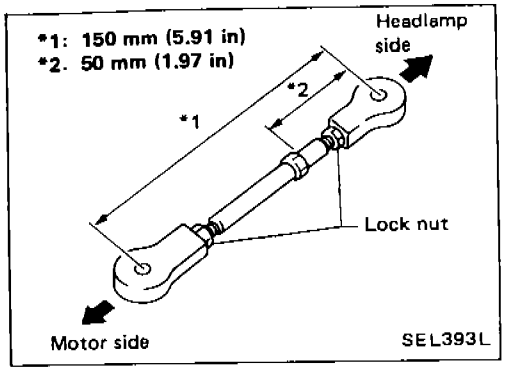
[D] When retractor switch is turned ON (While operating the headlamp motor to open position)




SEL392L

Assembly

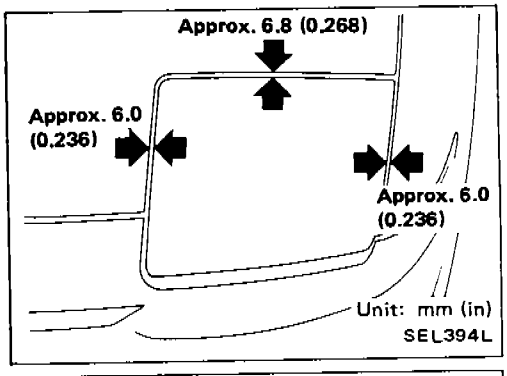
1. Install headlamp motor, ball joint and link A (as one unit) on headlamp bracket.
2. While turning link B, install link A's ball joint on headlamp housing's ball joint.
3. Set distance between centers of upper and lower ball joints as shown in figure at left, and tighten lock nuts.
4. Assemble headlamp, finisher and lid.



Installation and Adjustment

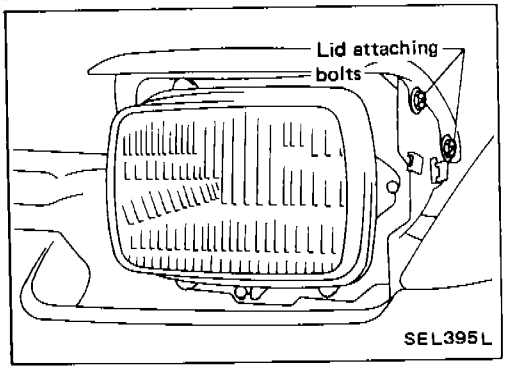
Before doing this, be sure to disconnect battery ground cable.

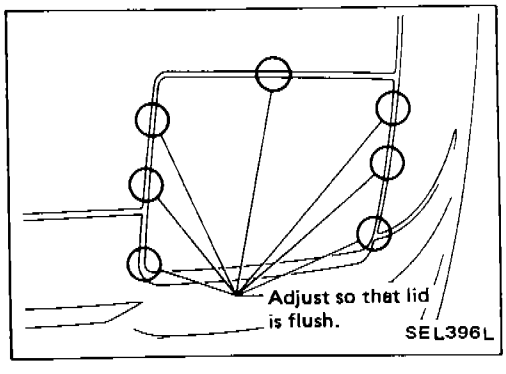
1. Install headlamp bracket to body temporarily.
1) Determine headlamp bracket location on body so that alignment between lid, hood, and fender looks straight.
2) After adjusting alignment, tighten headlamp bracket to body.



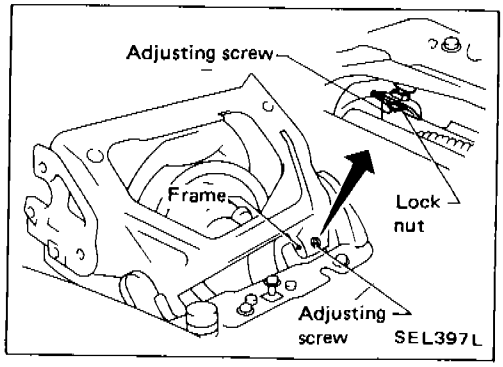
2. Adjust lid alignment.

- Adjust lid, hood and fender for alignment while opening and closing headlamp with motor manual knob.
  Use motor manual knob to open and close headlamp, and adjust alignment while checking that lid is not interfering with hood.



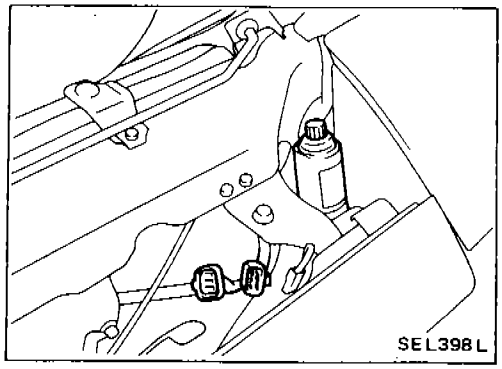


Installation and Adjustment (Cont'd)

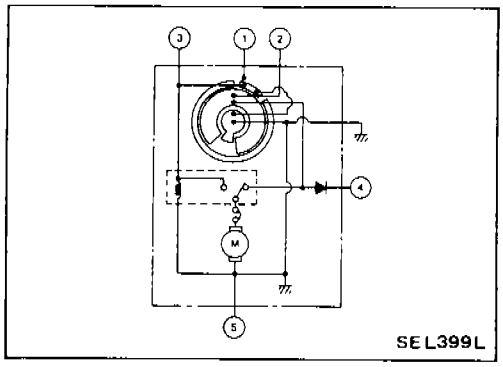


3. Adjust stopper.
1) Loosen lock nut on stopper.
2) Turn motor manual knob to open headlamp assembly completely.
3) Adjust stopper screw.

Headlamp Motor Check



1. Disconnect battery ground cable.
2. Disconnect the headlamp motor connector.
3. Use an ohmmeter to check for continuity in headlamp motor circuit while rotating motor with manual knob.

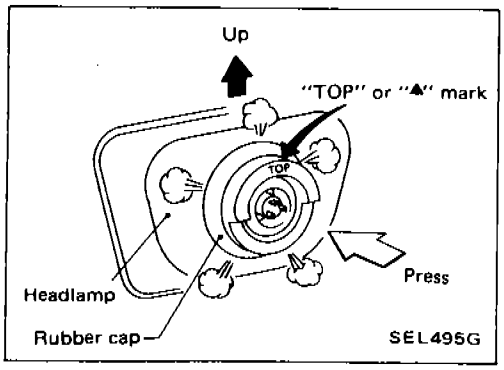


Link A position	Ohmmeter probe (+)	Ohmmeter probe (−)	Continuity
"CLOSE"	①	⑤	YES
	②	⑤	NO
	①	③	NO
	③	①	YES
"OPEN"	①	⑤	NO
	②	⑤	YES
	②	④	NO
	④	②	YES

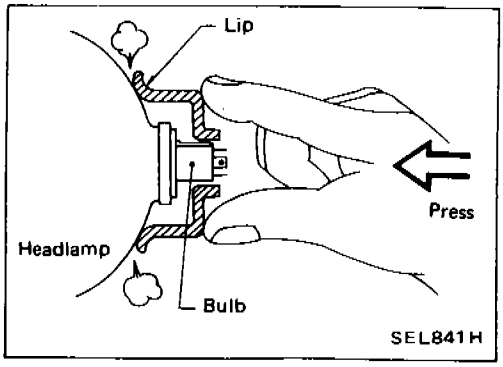
Bulb Replacement

INSTALLING HEADLAMP RUBBER CAP

When installing the rubber cap, set the "TOP" or "▲" mark so that it is facing up.

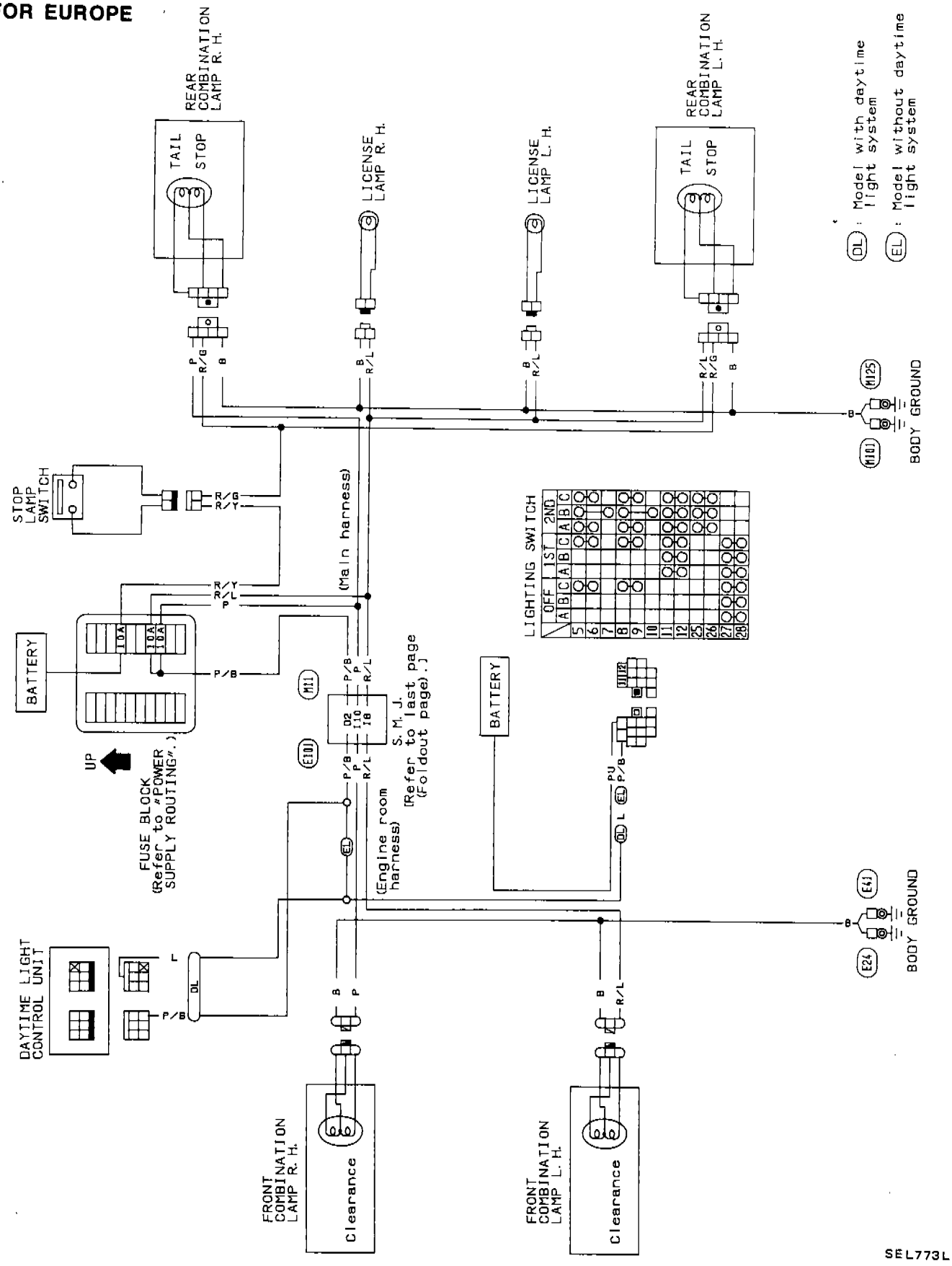


Press the rubber cap firmly so that the lip makes contact with the headlamp body.



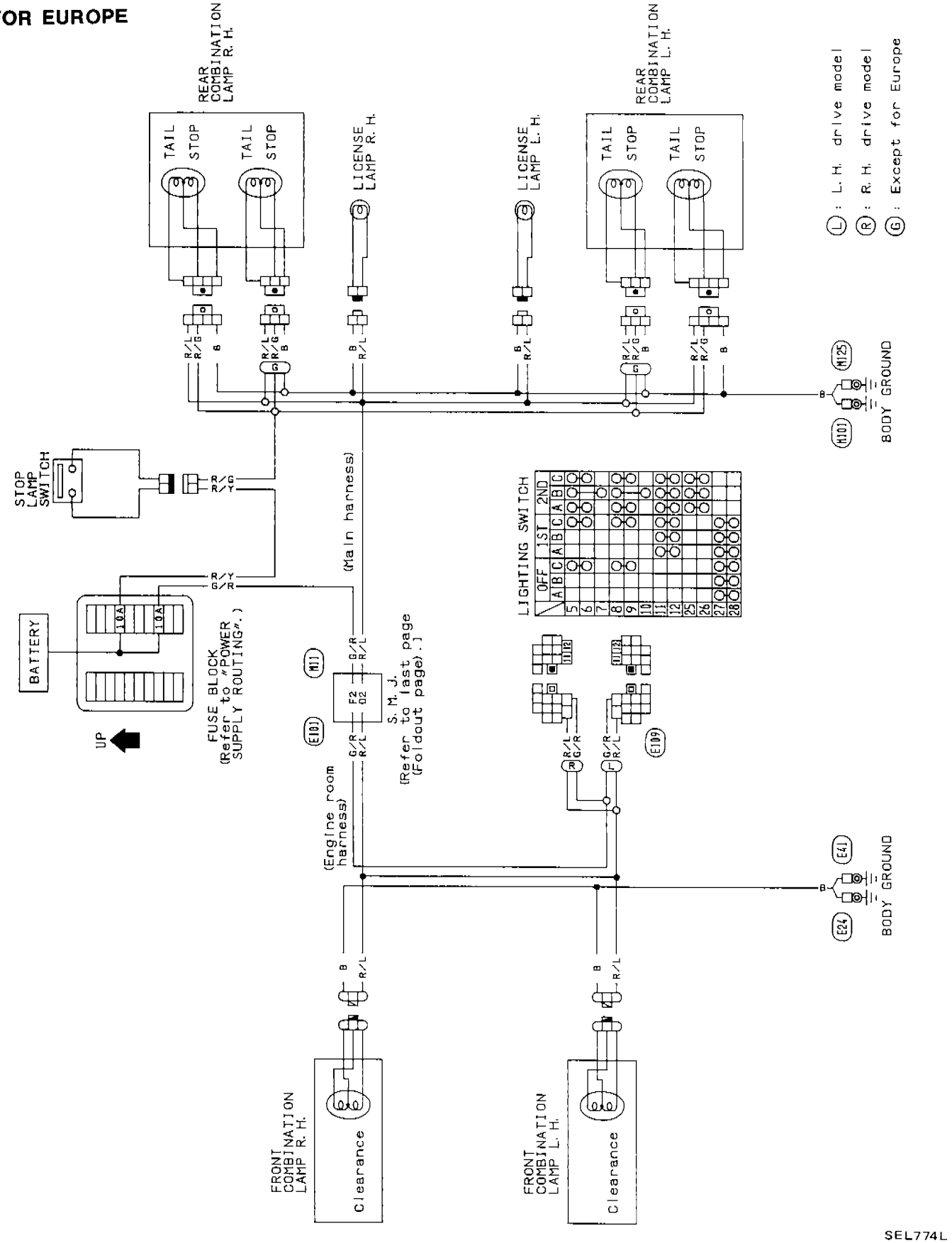
Clearance, License, Tail and Stop Lamps/Wiring Diagram

L.H. DRIVE MODEL FOR EUROPE



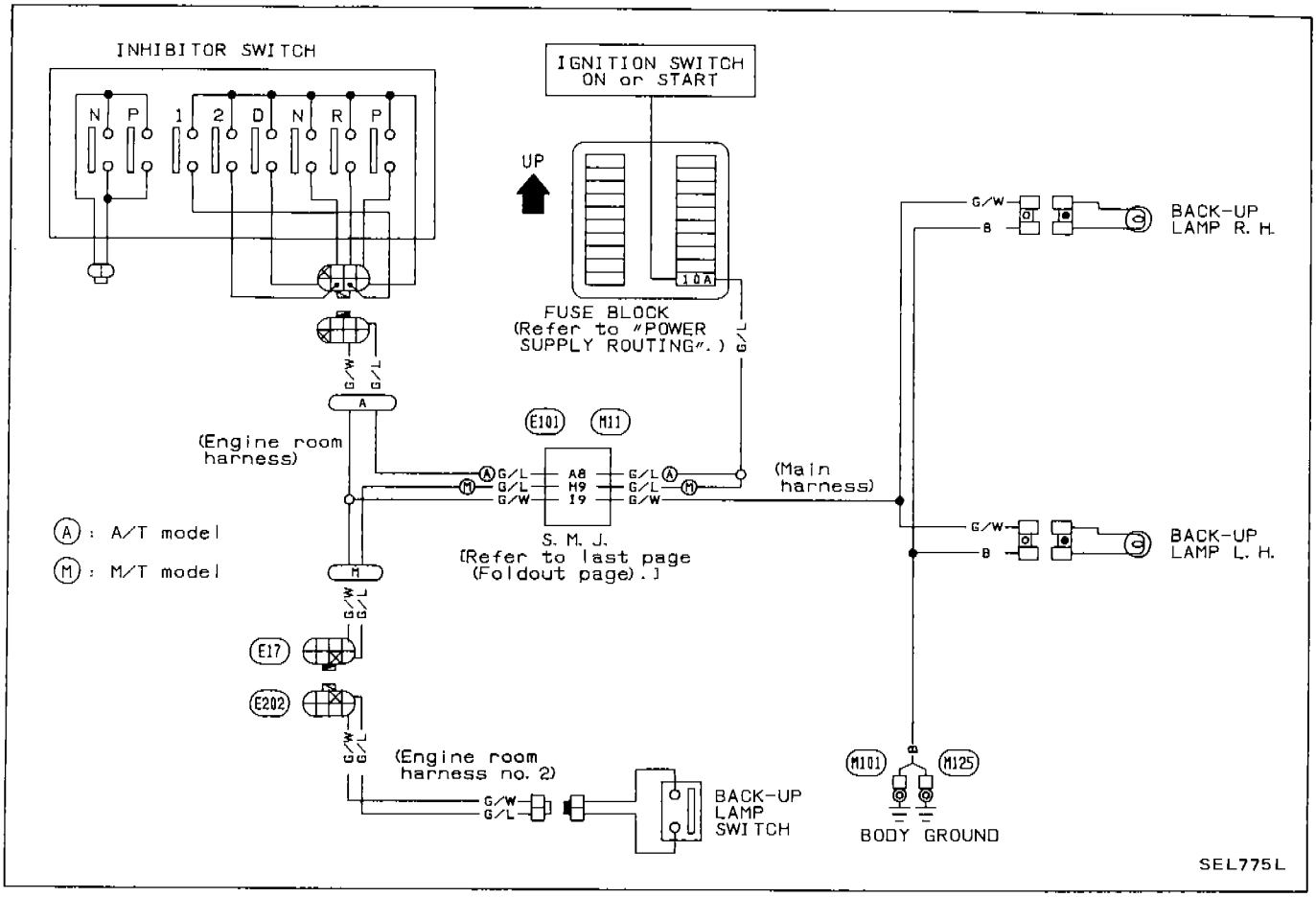
Clearance, License, Tail and Stop Lamps/Wiring Diagram (Cont'd)

EXCEPT L.H. DRIVE MODEL
FOR EUROPE

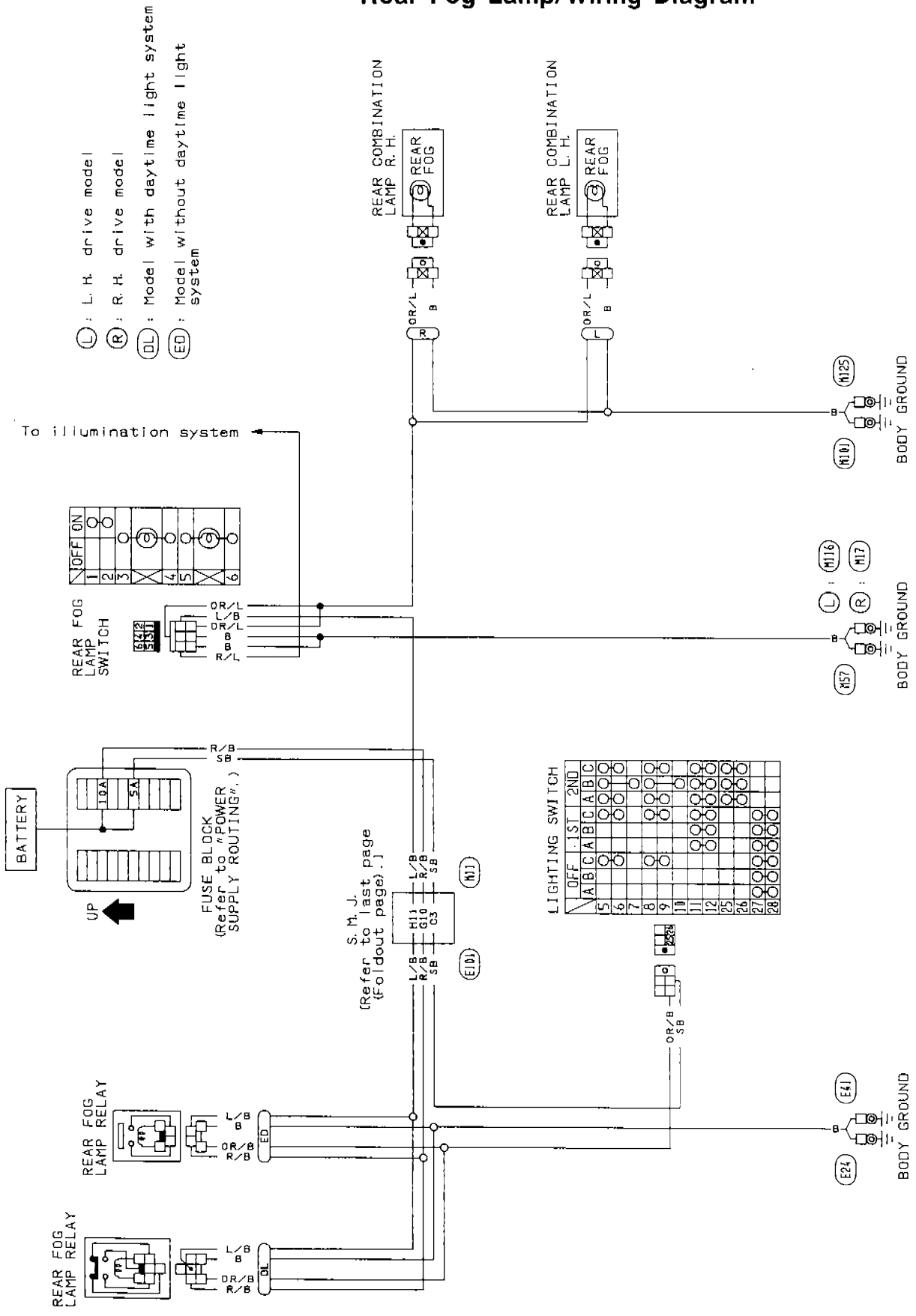


SEL774L

Back-up Lamp/Wiring Diagram

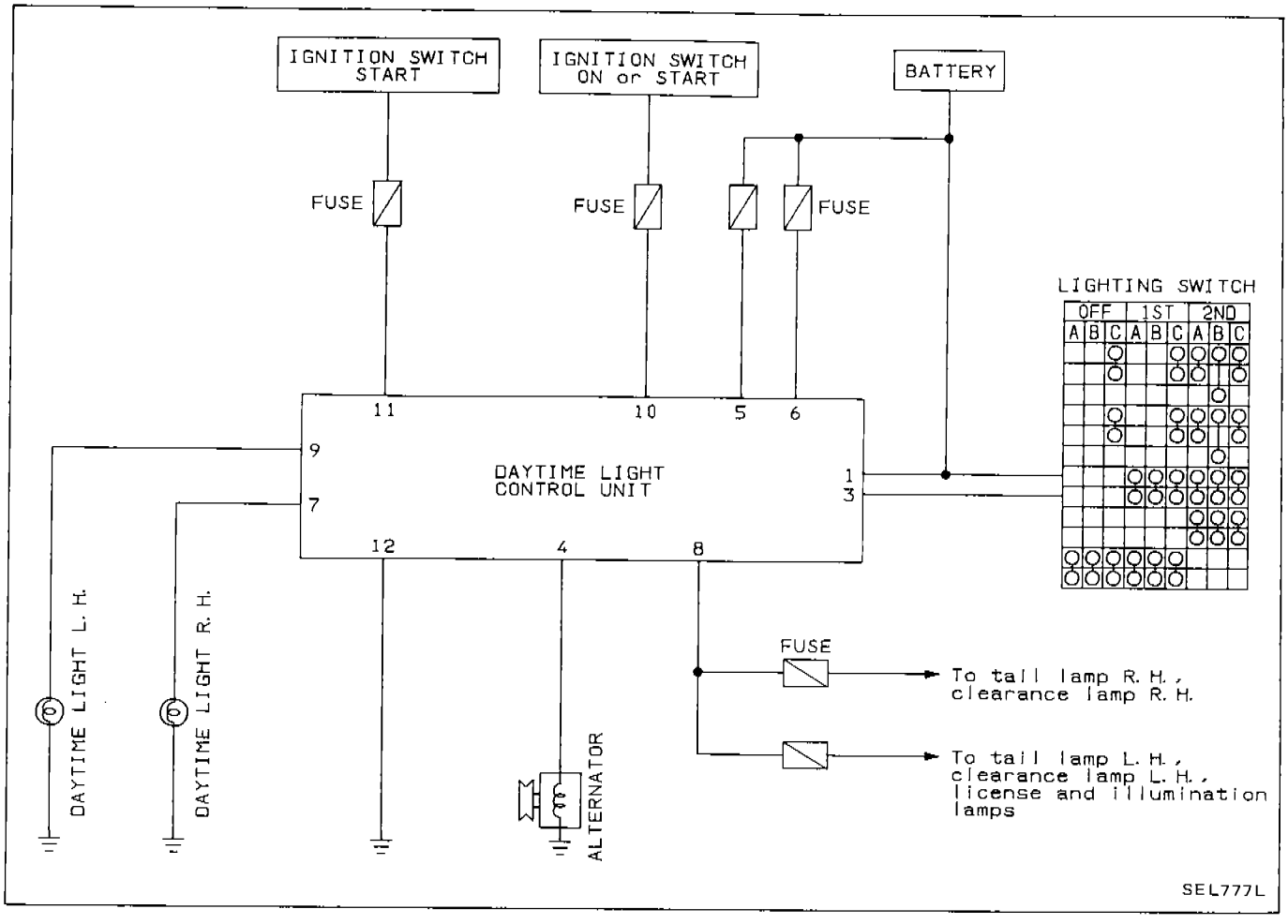


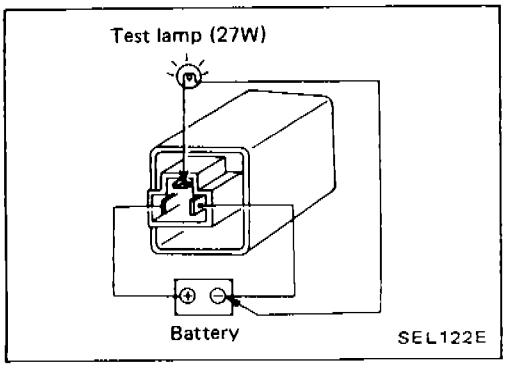
Rear Fog Lamp/Wiring Diagram



SEL776L

Daytime Light/Schematic





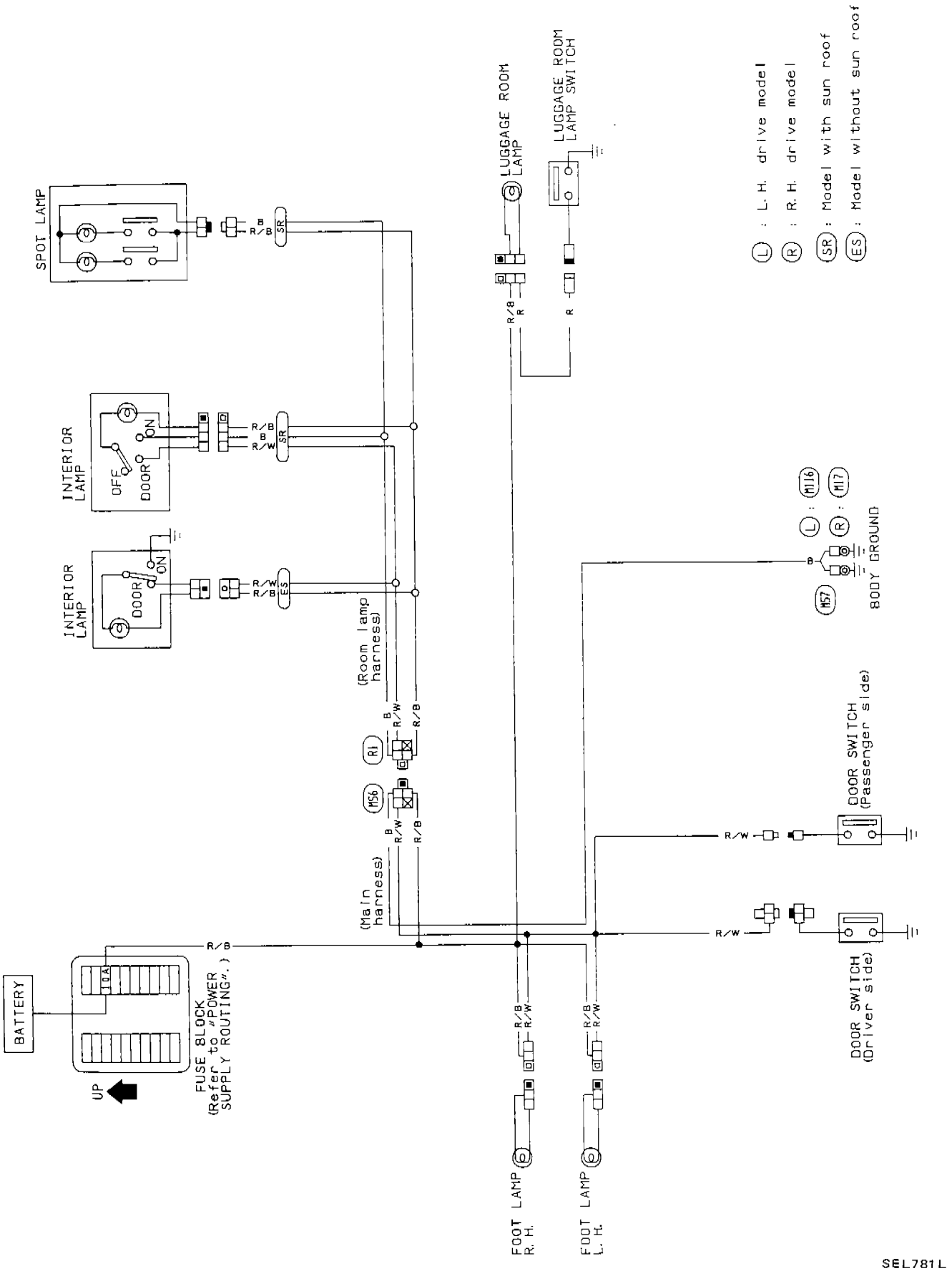
Combination Flasher Unit Check

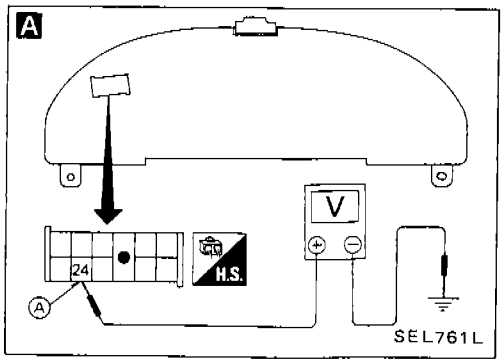
- Before checking, ensure that bulbs meet specifications.
- Connect a battery and test lamp to the combination flasher unit, as shown. Combination flasher unit is properly functioning if it blinks when power is supplied to the circuit.

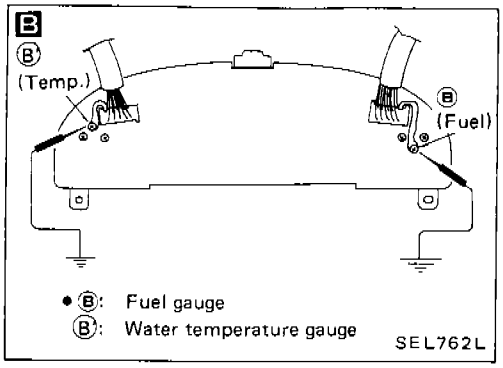
Bulb Specifications

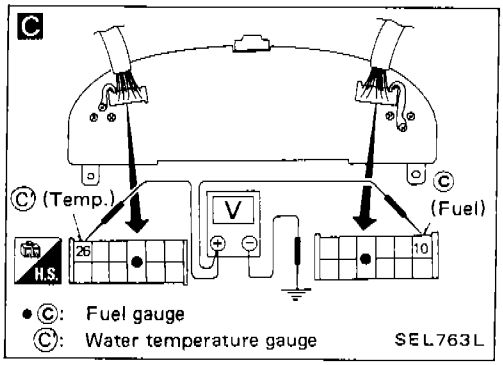
Item	Wattage (W)
Headlamp	60/55
Front combination lamp	
Turn signal/clearance lamp	21/5
Daytime running lamp	27
Side turn signal lamp	5
Rear combination lamp	
Stop/Tail	21/5
Turn signal	21
Rear fog	21
Back-up lamp	21
License plate lamp	5
Interior lamp	10
Spot lamp	8
Luggage compartment lamp	5

Interior Lamp/Wiring Diagram









Inspection/Fuel Gauge and Water Temperature Gauge

INSPECTION START

A

CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal Ⓐ and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Harness continuity between battery terminal and combination meter
2) Ignition relay
3) Fusible link and fuse
4) Ignition switch

O.K.

B

CHECK GAUGE OPERATION.
1) Turn ignition switch "ON".
2) Connect terminals Ⓑ (Fuel), Ⓑ' (Temp.) and ground with wire for **less than 10 seconds.**
3) Check operation of gauge.
Gauge should move smoothly to full scale.

N.G. → Repair or replace gauge.

O.K.

C

Check harness continuity between component and combination meters Ⓒ (Fuel), Ⓒ (Temp.).

N.G. → Repair or replace.

O.K.

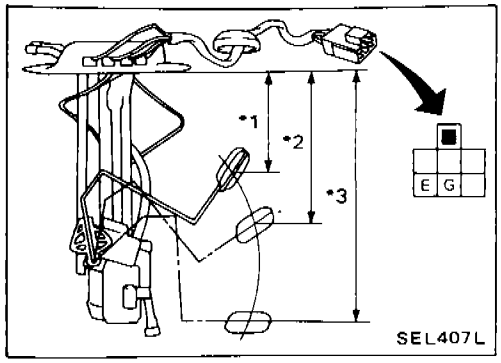
CHECK COMPONENT.
Check gauge units and harness.
Refer to "Fuel Tank Gauge Unit Check" or "Thermal Transmitter Check".

N.G. → Repair or replace.
Refer to FE section. (Fuel gauge)

O.K.

Reinstall any part removed.

INSPECTION END

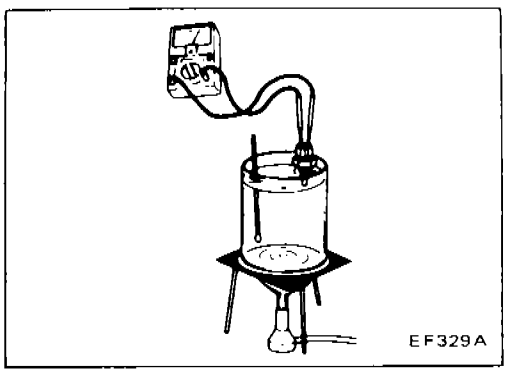


Fuel Tank Gauge Unit Check

● For removal, refer to FE section.

Check the resistance between terminals Ⓖ and Ⓔ.

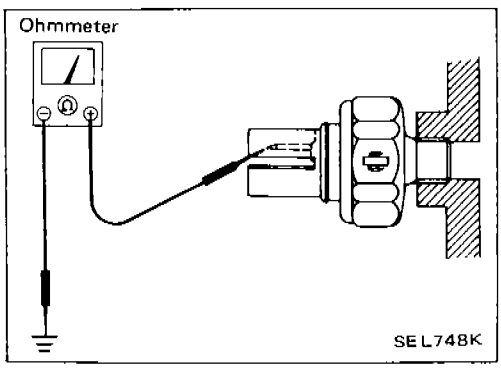
Ohmmeter (+)	Ohmmeter (−)	Float position mm (in)			Resistance Ω	Fuel value ℓ (Imp gal)
G	E	*1	Full	Approx. 64 (2.52)	4.3 - 6.3	57.6 (12-5/8)
		*2	1/2	Approx. 137 (5.39)	27.7 - 34.3	32.9 (7-1/4)
		*3	Empty	Approx. 210 (8.27)	73.3 - 84.8	7.2 (1-5/8)



Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

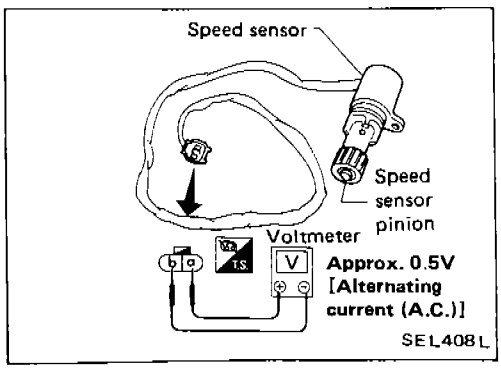
Water temperature	Resistance
60°C (140°F)	Approx. 70 - 90Ω
100°C (212°F)	Approx. 21 - 24Ω



Oil Pressure Switch Check

Check the continuity between the terminals of oil pressure switch and body ground.

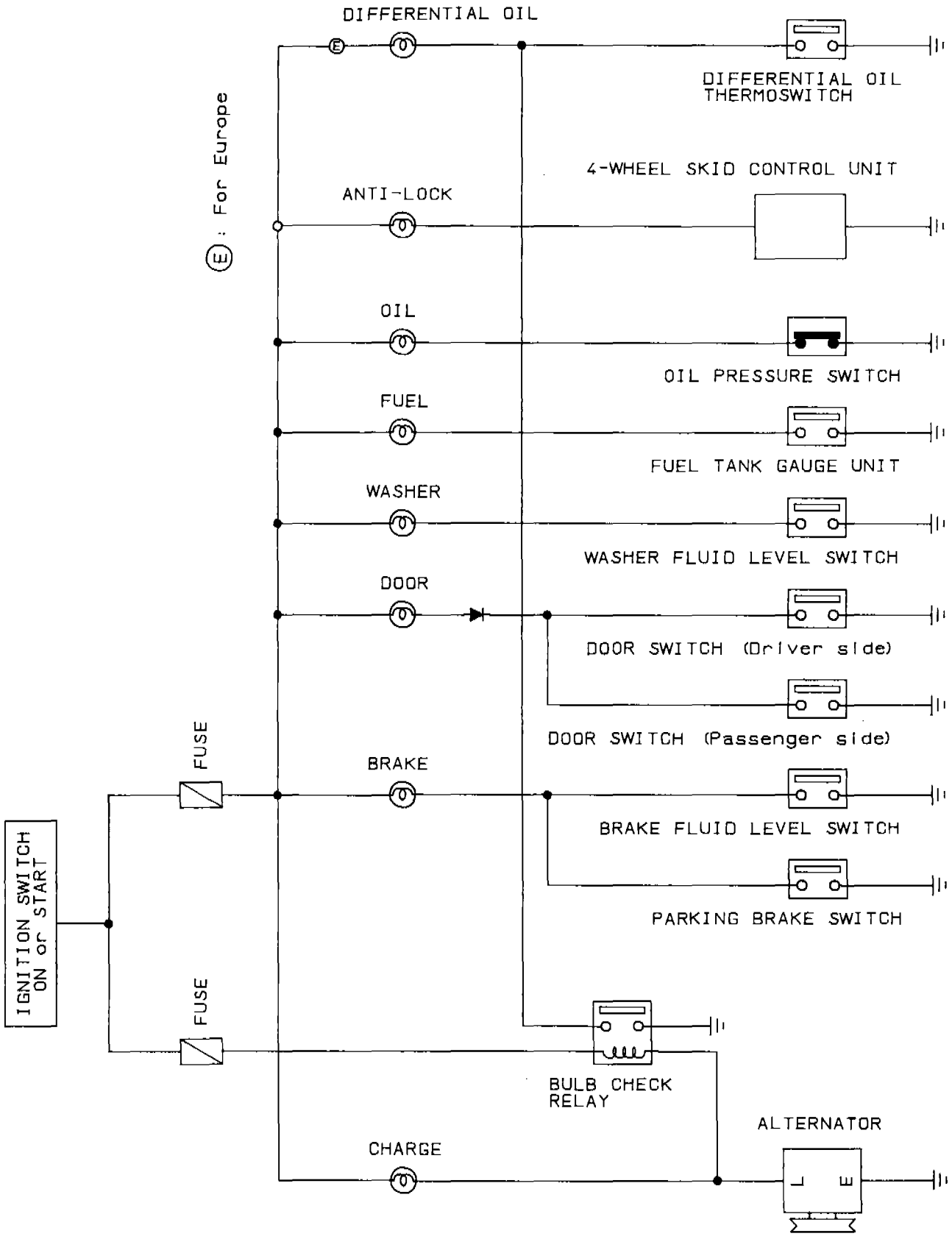
	Oil pressure kPa (bar, kg/cm², psi)	Continuity
Engine start	More than 10 - 20 (0.10 - 0.20, 0.1 - 0.2, 1.4 - 2.8)	NO
Engine stop	Less than 10 - 20 (0.10 - 0.20, 0.1 - 0.2, 1.4 - 2.8)	YES



Speed Sensor Signal Check

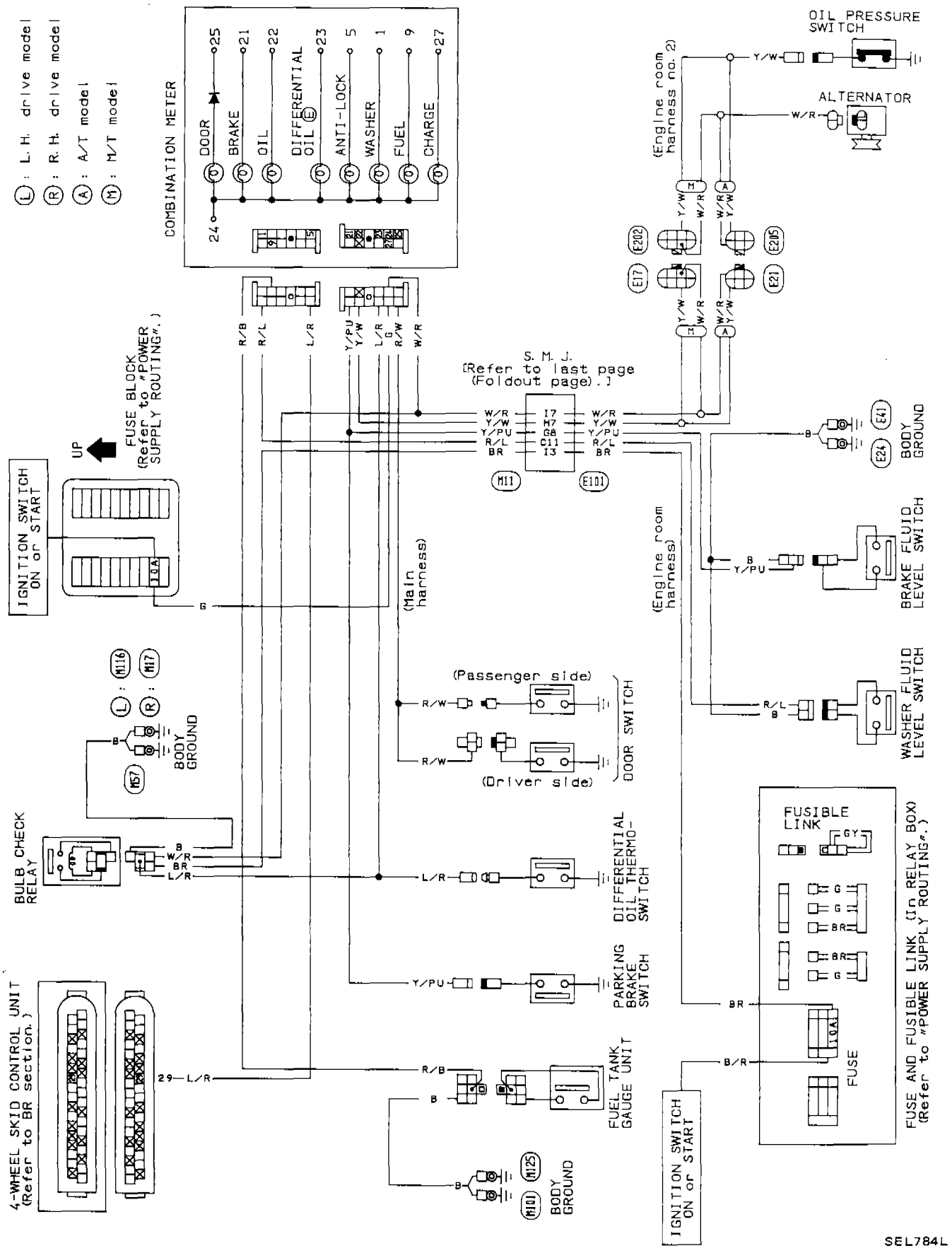
1. Remove speed sensor from transmission.
   Location: Refer to "Location of Electrical Units".
2. Turn speedometer pinion quickly and measure voltage across ⓐ and ⓑ.

Warning Lamps/Schematic

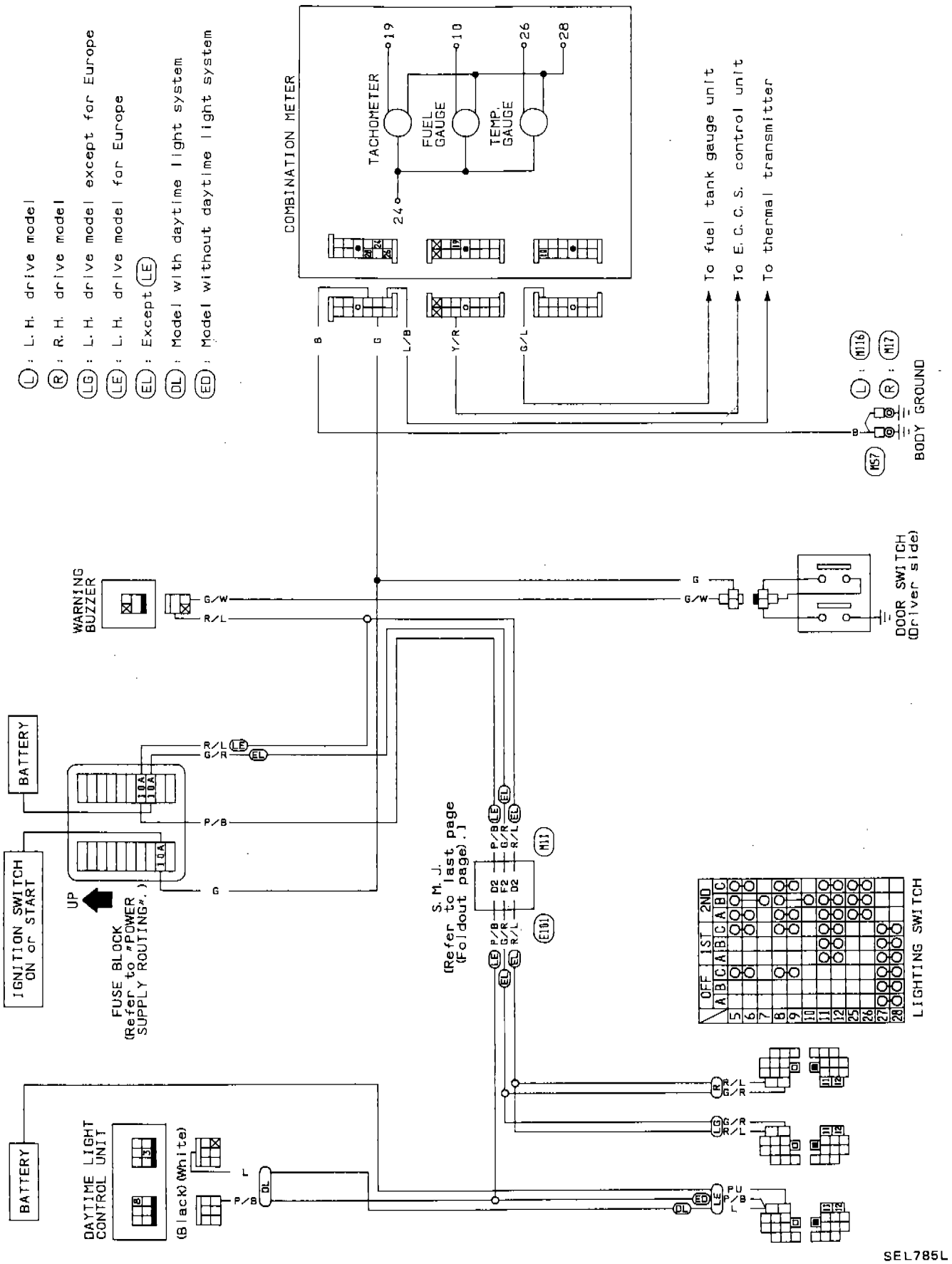


SEL783L

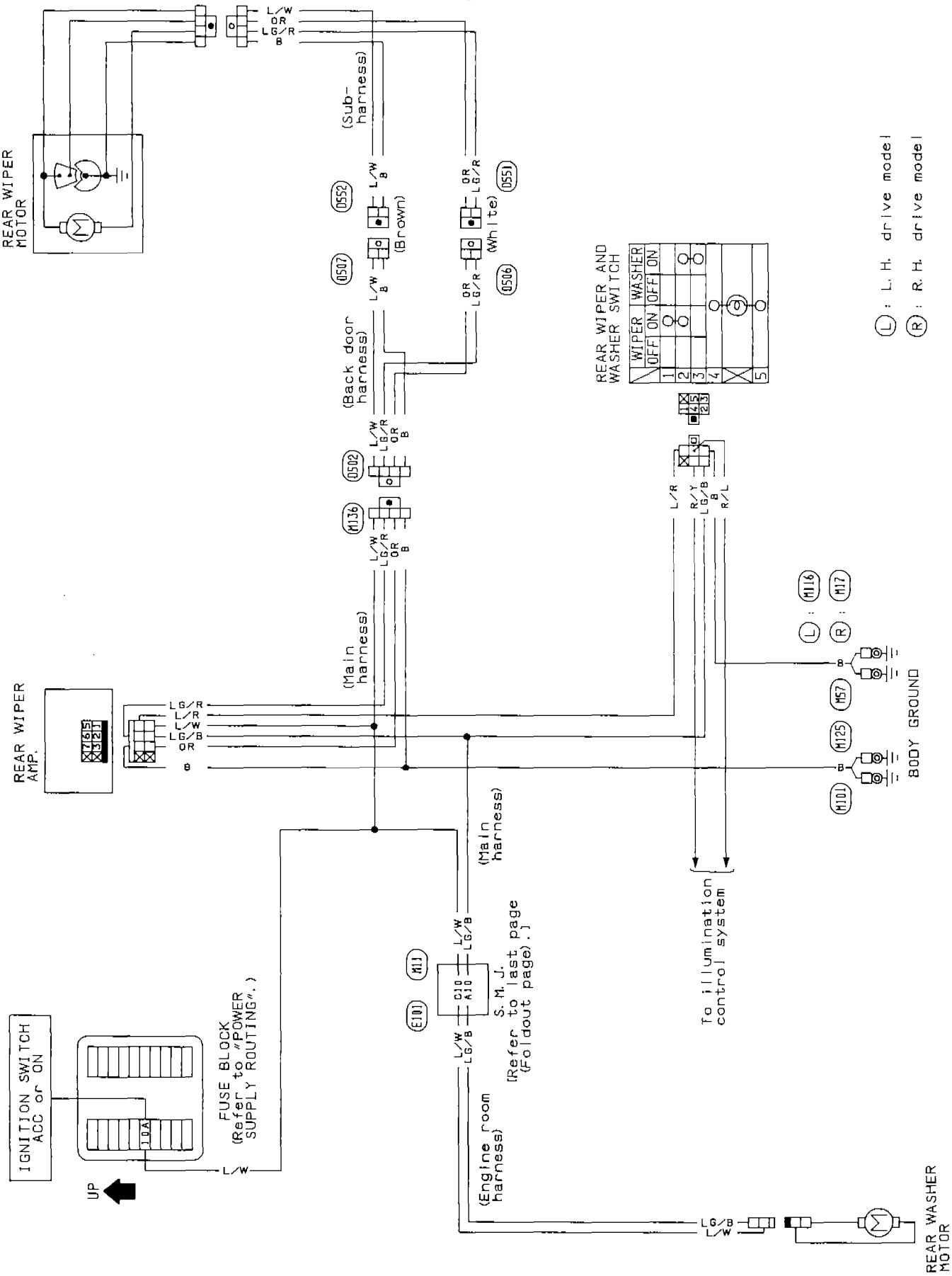
Warning Lamps/Wiring Diagram



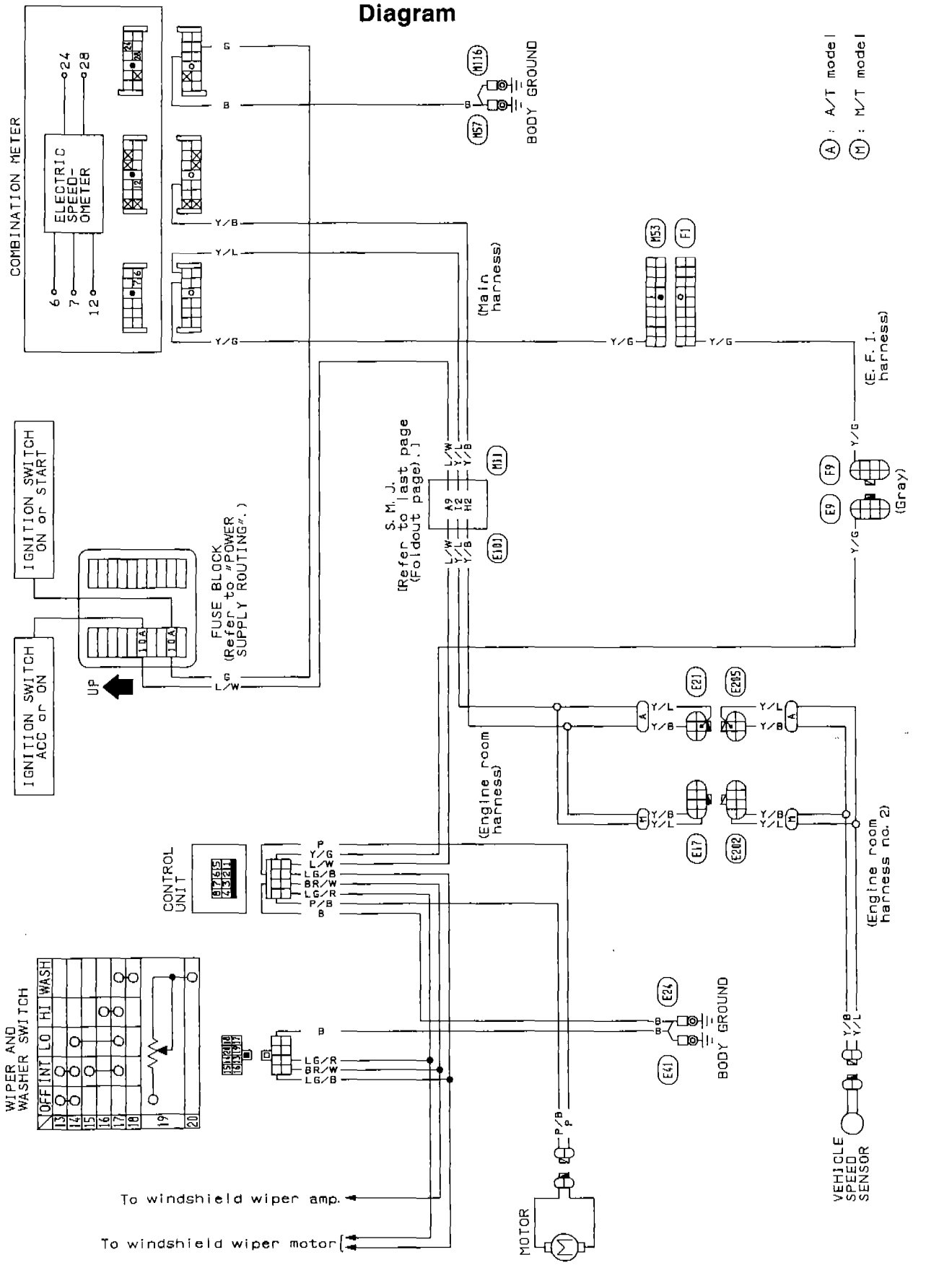
Warning Chime/Wiring Diagram



Rear Wiper and Washer/Wiring Diagram

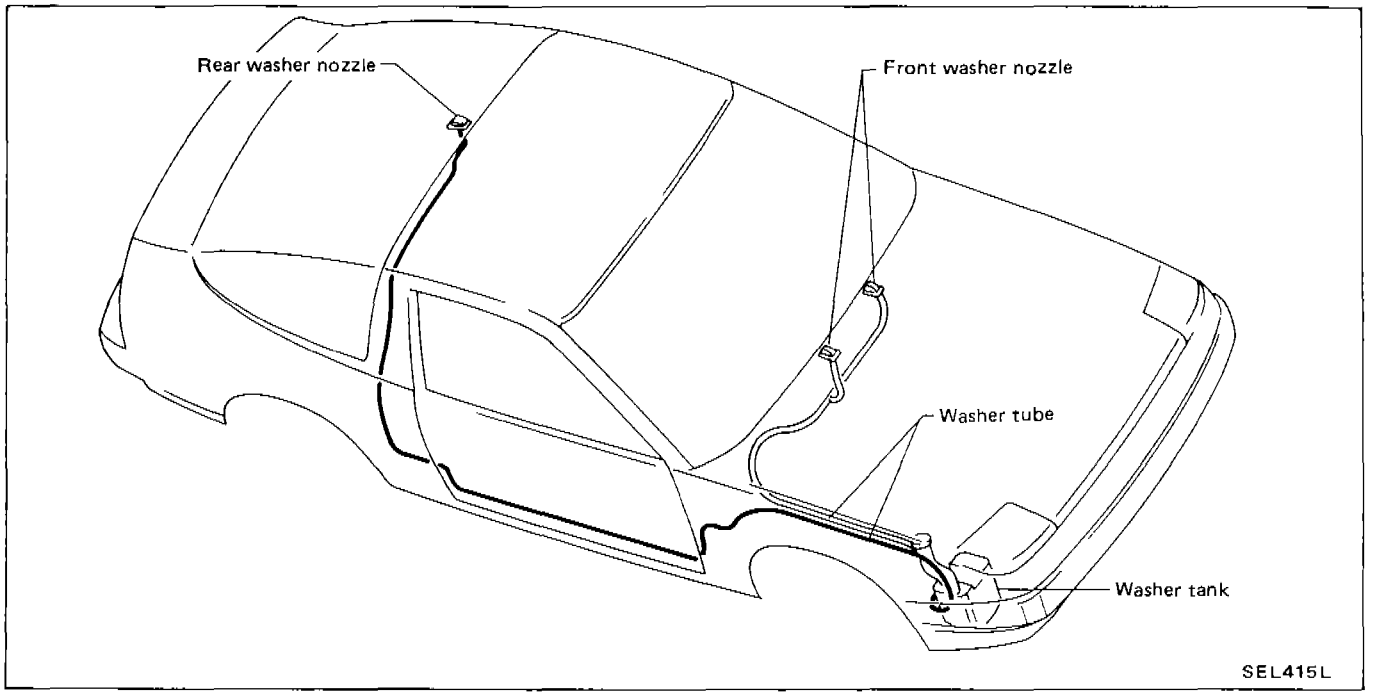


Variable Pressure Window Screen Wiper/Wiring Diagram

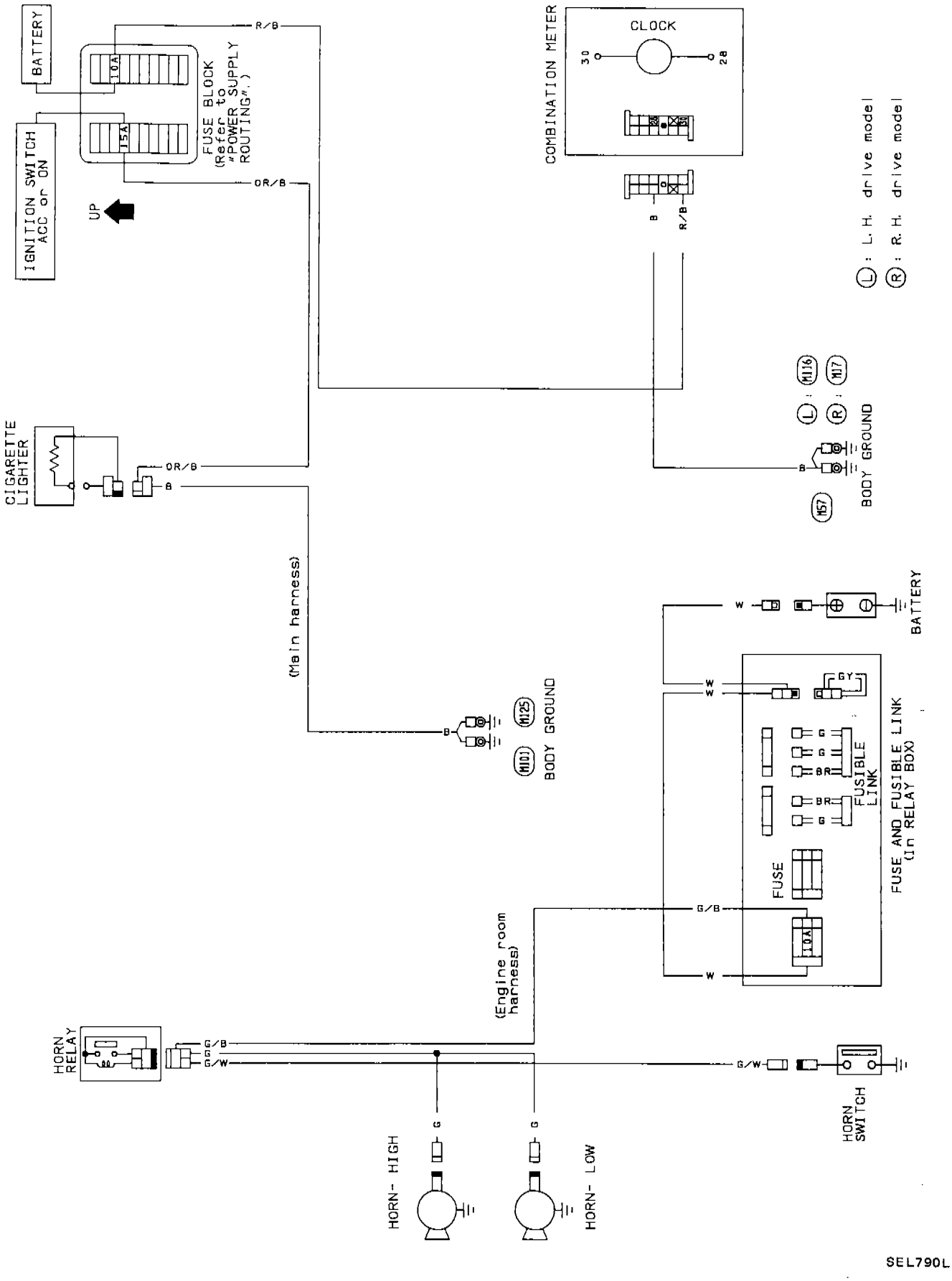


SEL789L

Washer Tube Layout

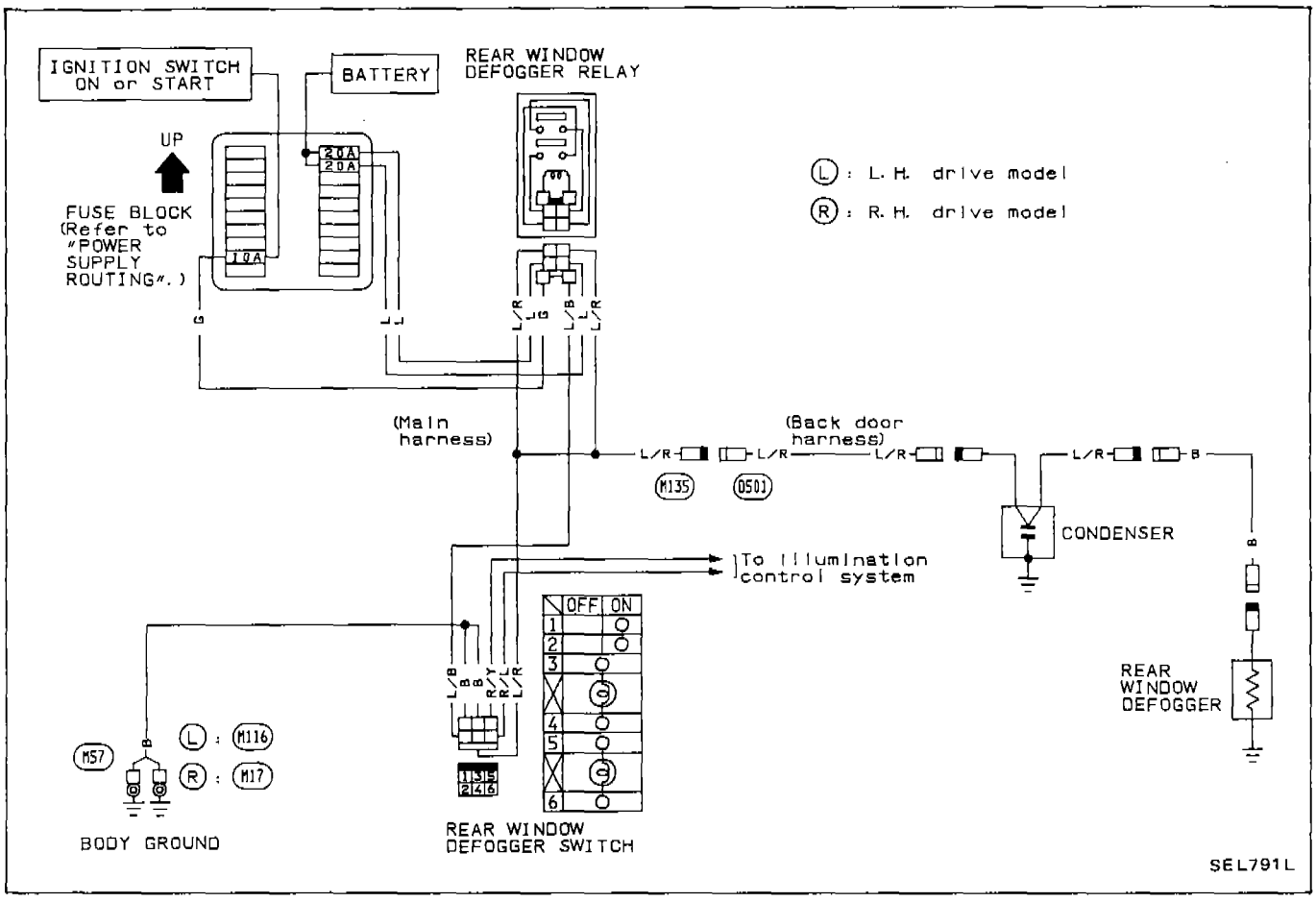


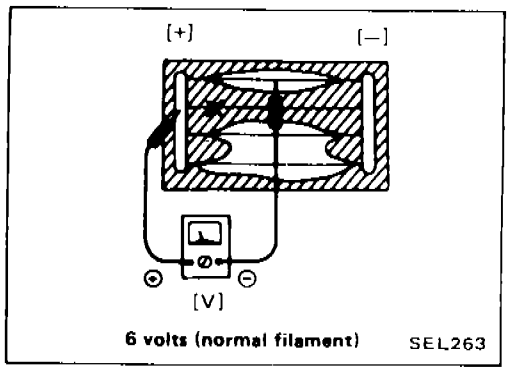
Wiring Diagram



SEL790L

Wiring Diagram

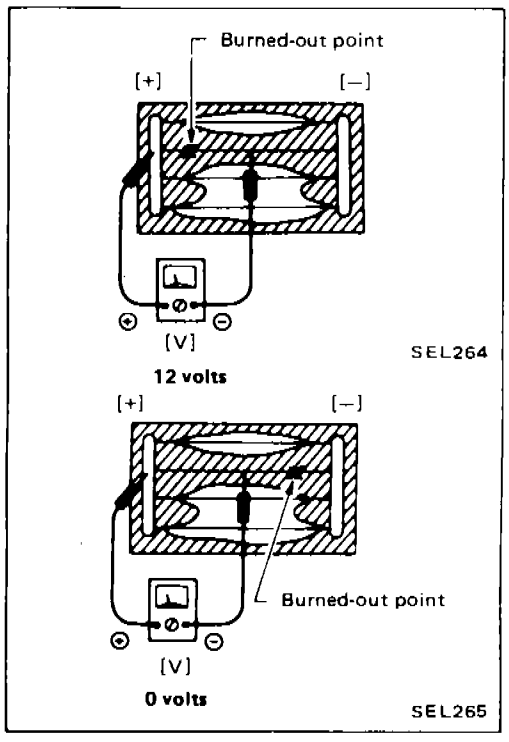




6 volts (normal filament) SEL263

Filament Check

1. Attach probe circuit tester (in volt range) to middle portion of each filament.



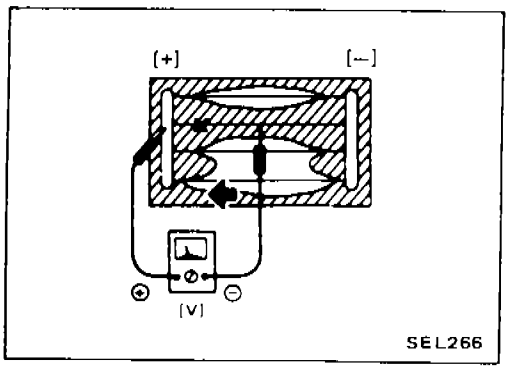
SEL264

12 volts

0 volts

SEL265

2. If a filament is burned out, circuit tester registers 0 or 12 volts.



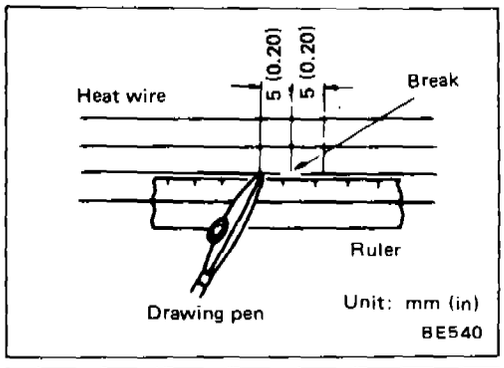
SEL266

3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.

Filament Repair

REPAIR EQUIPMENT

1. Conductive silver composition (Dupont No. 4817 or equivalent)
2. Ruler 30 cm (11.8 in) long
3. Drawing pen
4. Heat gun
5. Alcohol
6. Cloth

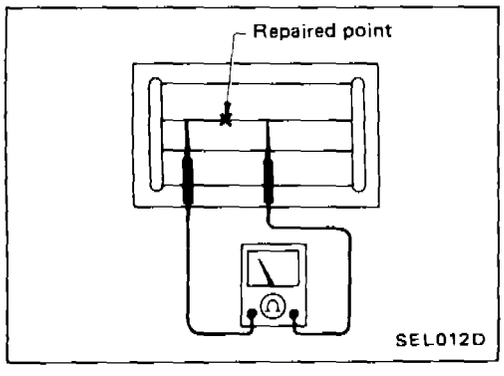


REPAIRING PROCEDURE

1. Wiper broken heat wire and its surrounding area clean with a cloth dampened in alcohol.
2. Apply a small amount of conductive silver composition to tip of drawing pen.

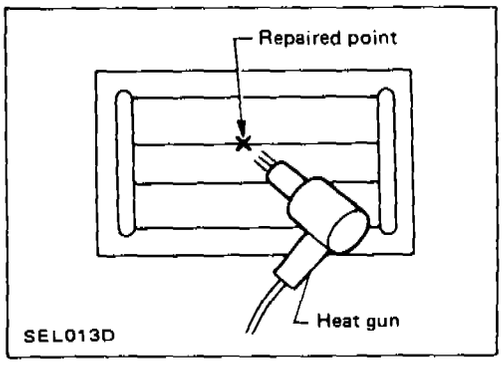
Shake silver composition container before use.

3. Place ruler on glass along broken line. Deposit conductive silver composition on break with drawing pen. Slightly overlap existing heat wire on both sides [preferably 5 mm (0.20 in)] of the break.



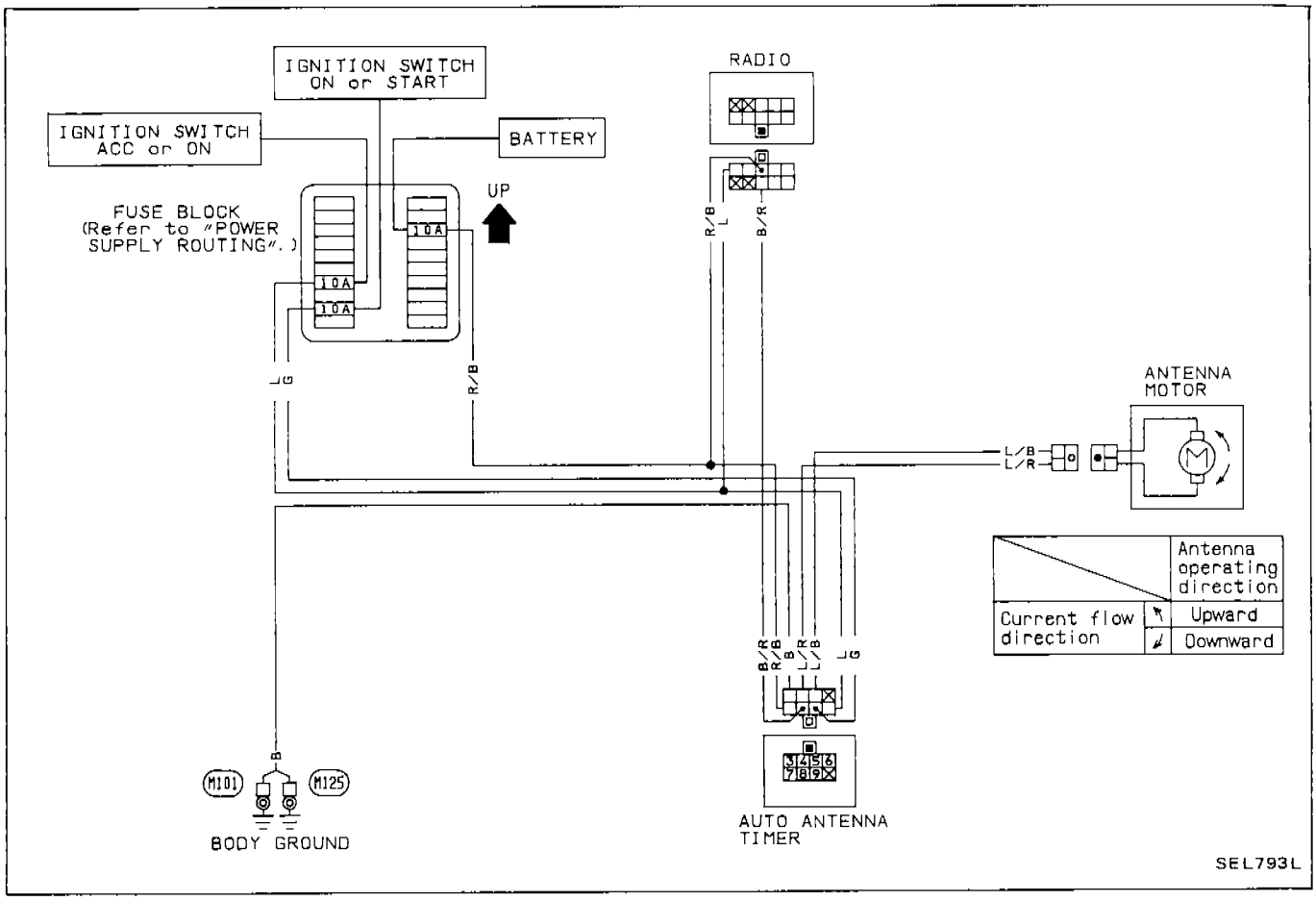
4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

Do not touch repaired area while test is being conducted.

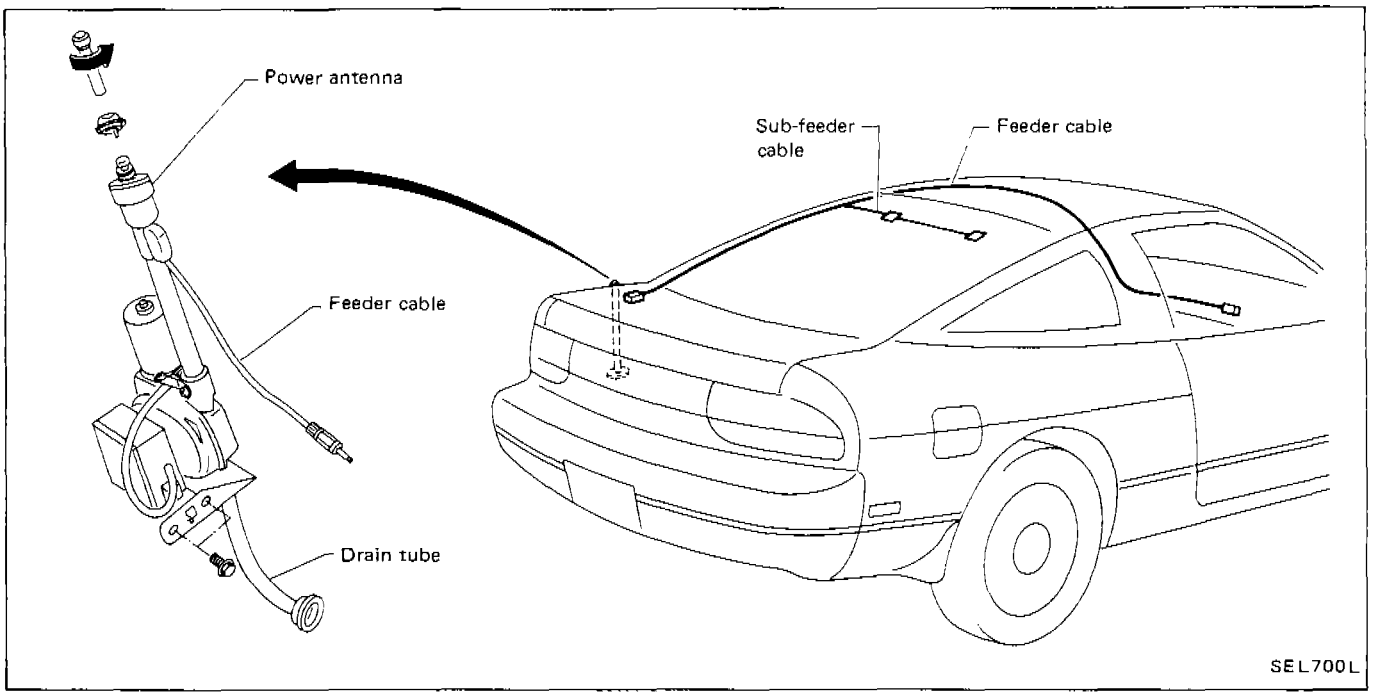


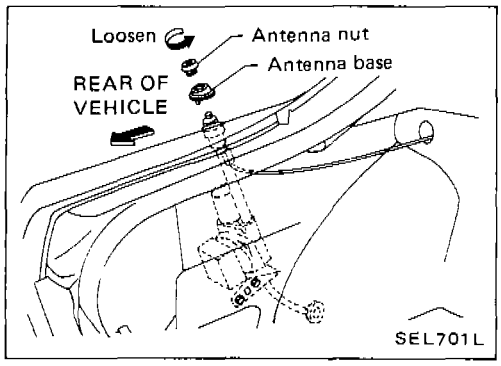
5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

Power Antenna/Wiring Diagram



Location of Antenna

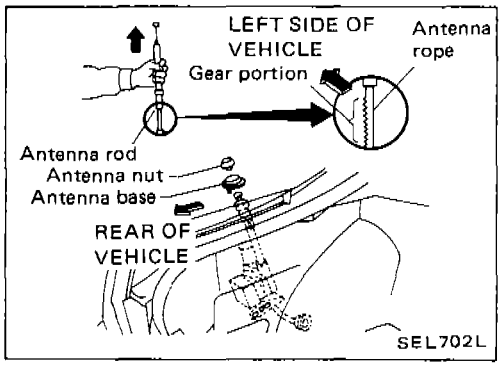




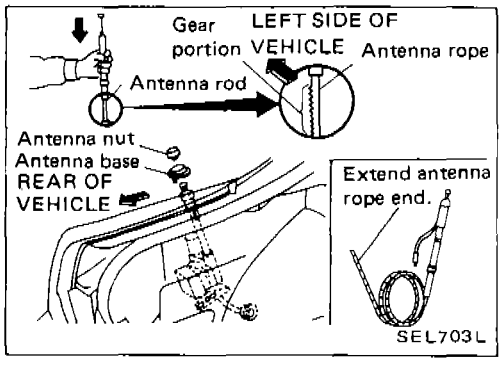
Antenna Rod Replacement

REMOVAL

1. Remove antenna nut and antenna base.



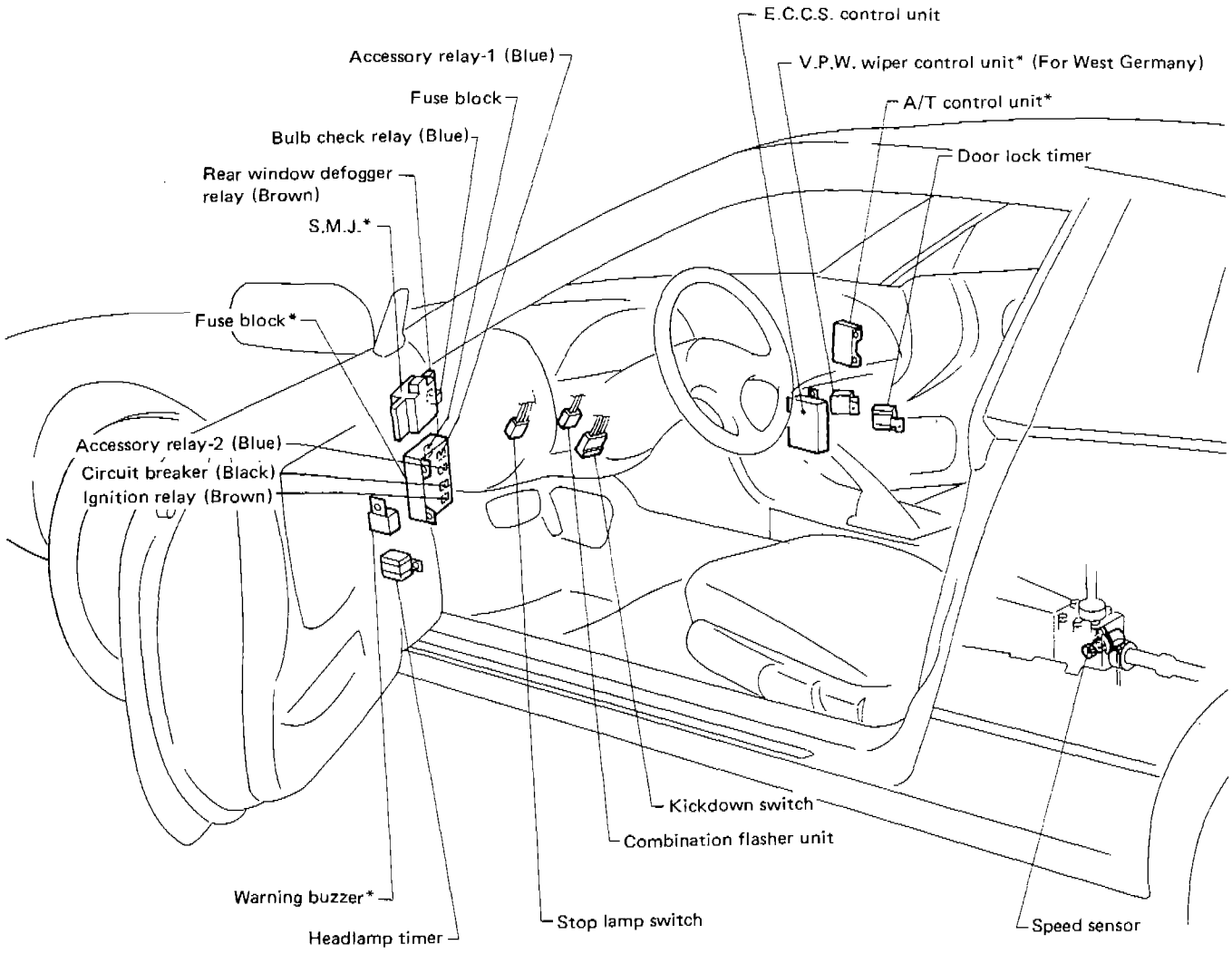
2. Withdraw antenna rod while raising it by operating antenna motor.



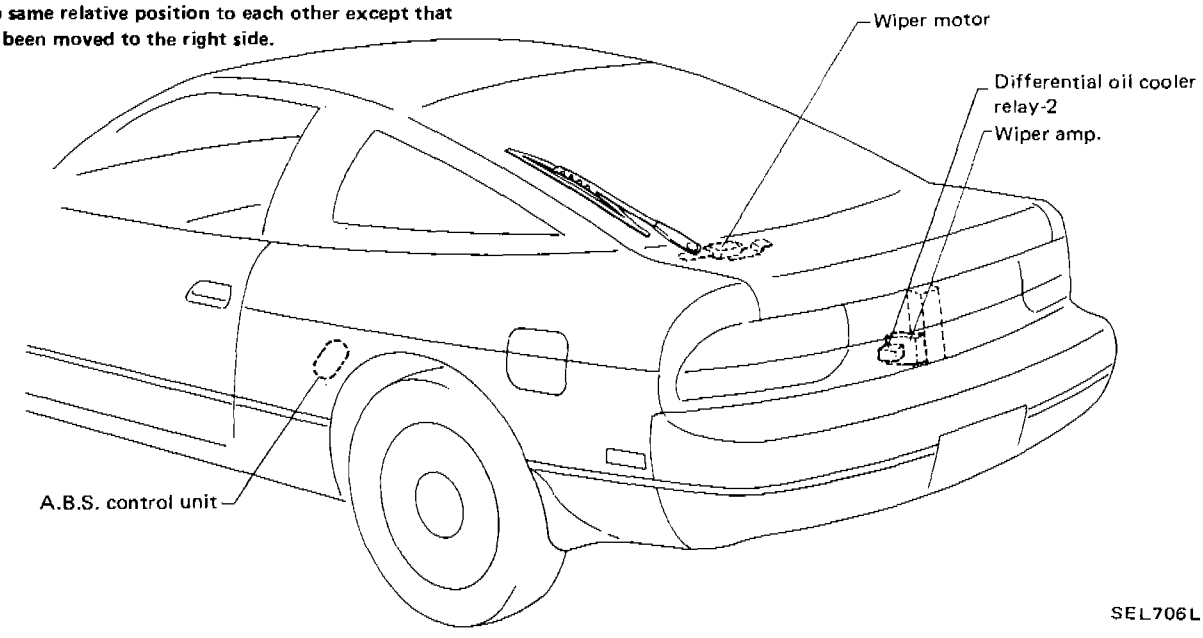
INSTALLATION

1. Lower antenna rod by operating antenna motor.
2. Insert gear section of antenna rope into place with it facing toward antenna motor.
3. As soon as antenna rope is wound on antenna motor, stop antenna motor. Insert antenna rod lower end into antenna motor pipe.
4. Retract antenna rod completely by operating antenna motor.
5. Install antenna nut and base.

Passenger Compartment



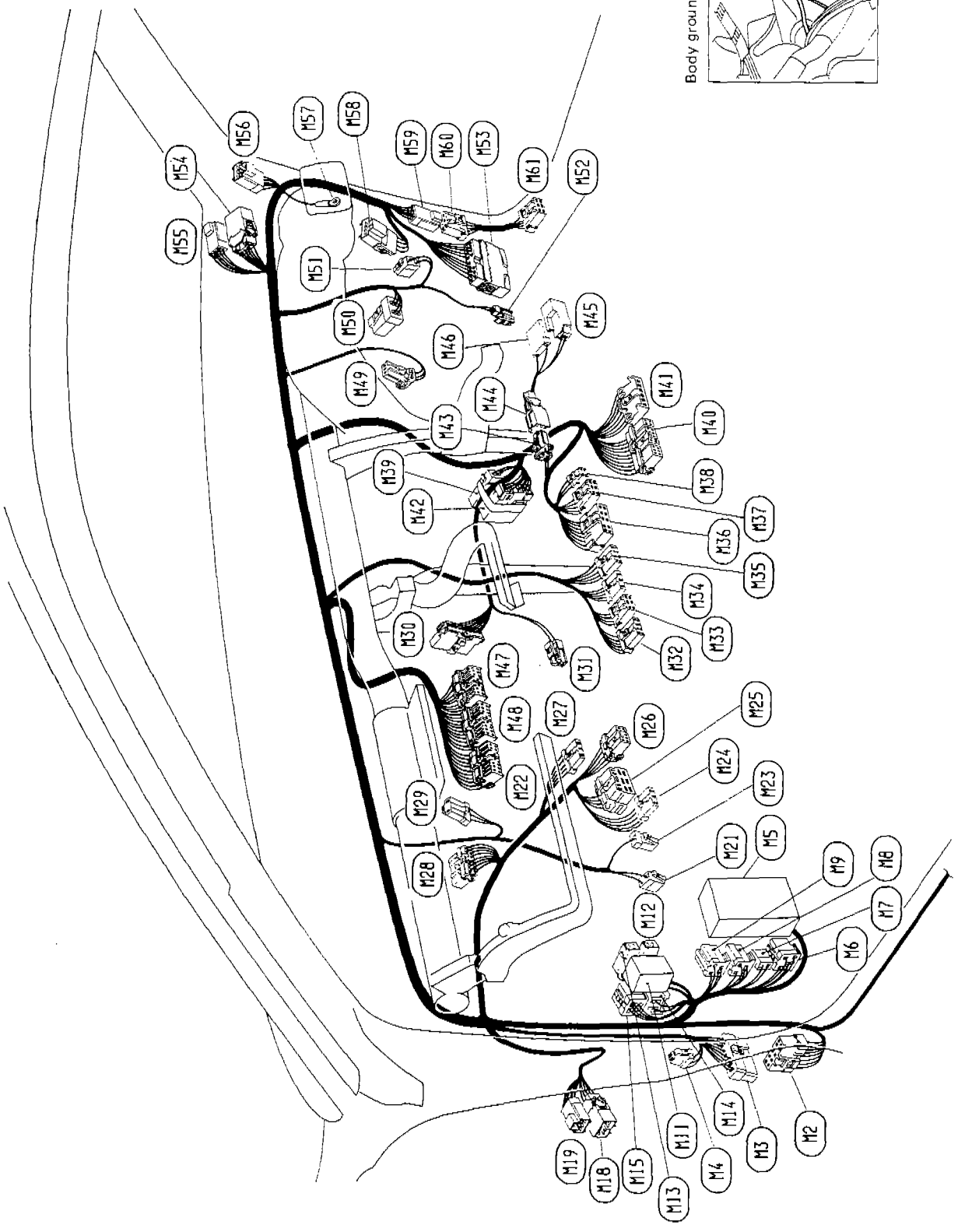
- **Figure shows dashboard for L.H.D. models.**
- **On R.H.D. models, all side panel unit parts marked with an asterisk "*" are symmetrically located to those of L.H.D. models. However, switches and units around steering column remain in the same relative position to each other except that they have all been moved to the right side.**



SEL706L

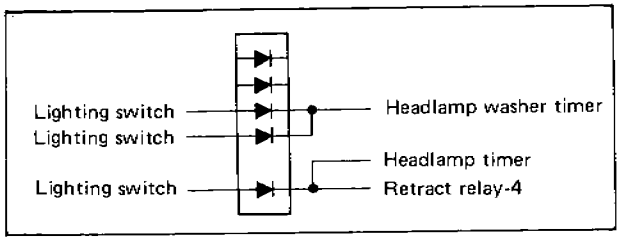
Main Harness

L.H. DRIVE MODEL

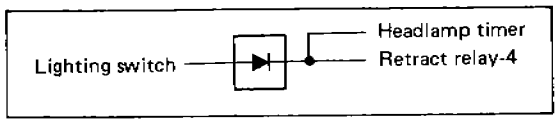


(M2) : Headlamp timer
(M3) : Check connector
(M4) : Warning buzzer
(M5) : Fuse block
(M6) : Ignition relay
(M7) : Circuit breaker (Model with power window system)
(M8) : Accessory relay-2
(M9) : Accessory relay-1
(M11) : To engine room harness (E103)
(M12) : To engine room harness (E102) (Blue)
(M13) : To engine room harness (E103) (Black)
(M14) : Bulb check relay
(M15) : Rear window defogger relay
(M16) : To door harness L.H. (D1)
(M19) : To door harness L.H. (D2)
(M21) : Kickdown switch (A/T model)
(M22) : Combination meter
(M23) : Stop lamp switch
(M24) : Rear fog lamp switch
(M25) : Headlamp retractor switch
(M26) : Illumination control amplifier
(M27) : Not used
(M28) : Not used
(M29) : Combination flasher unit
(M30) : Mode door motor
(M31) : Foot lamp L.H.
(M32) : Headlamp washer switch
(M33) : Rear wiper and washer switch
(M34) : Rear window defogger switch
(M35) : Hazard switch
(M36) : Radio
(M37) : Radio
(M38) : Cassette deck
(M39) : Diode (Except for Europe)
(M40) : Push control unit
(M41) : Fan switch
(M42) : Diode (For Europe)
(M43) : To sub-harness (M44)
(M44) : To main harness (M43)
(M45) : Glove box lamp
(M46) : Glove box lamp switch
(M47) : Combination meter
(M48) : Combination meter
(M49) : Thermo control amplifier
(M50) : Heater resistor
(M51) : Blower motor
(M52) : Foot lamp R.H.
(M53) : To E.F.I. harness (F1)
(M54) : To door harness R.H. (D101)
(M55) : To door harness R.H. (D102)
(M56) : To room lamp harness (R1)
(M57) : Body ground
(M58) : Intake door motor
(M59) : To sub-harness (M60)
(M60) : To main harness (M59)
(M61) : Door lock timer

Diode (M42)



Diode (M39)

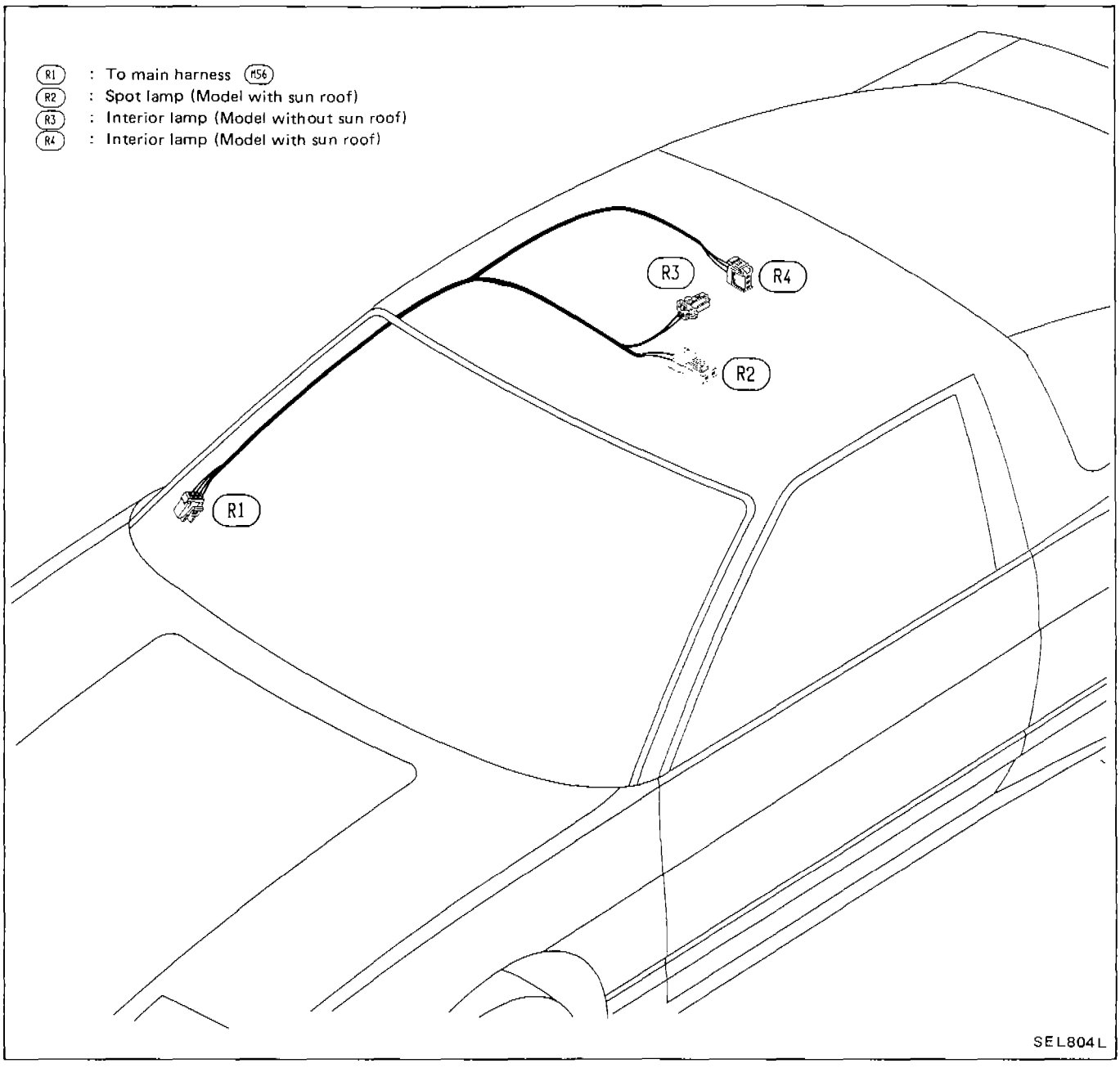


SEL800L

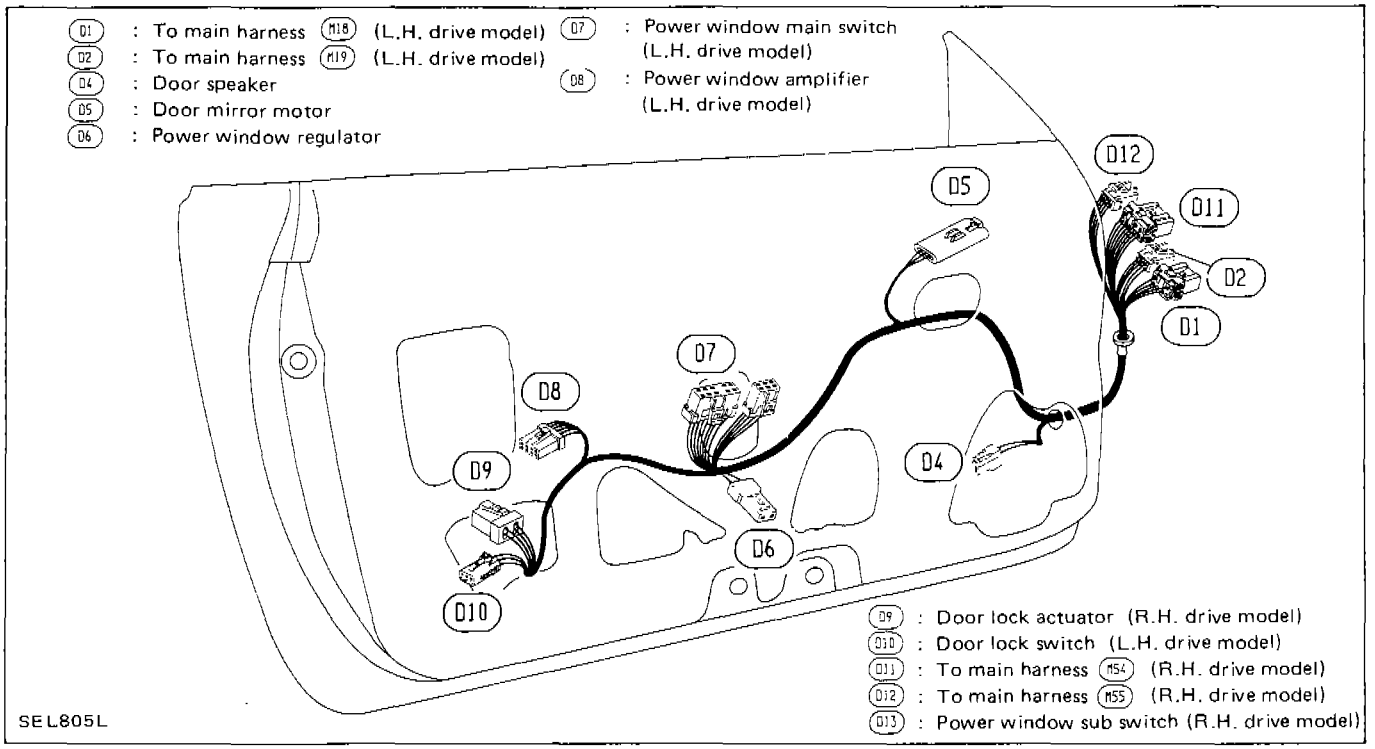
(M101) : Body ground
(M102) : Differential oil temperature sensor
(M103) : Differential oil temperature switch
(M104) : Ash tray illumination
(M105) : Cigarette lighter
(M106) : Door mirror control switch
(M107) : Differential oil cooler pump
(M108) : Parking brake switch
(M109) : A/T device (A/T illumination and O.D. control switch) (A/T model)
(M110) : Not used
(M111) : Door switch R.H.
(M112) : Power antenna motor
(M113) : Power antenna timer
(M114) : Body ground
(M115) : 4-wheel skid control unit
(M117) : Rear speaker L.H.
(M118) : Differential oil cooler relay-2
(M119) : Rear combination lamp L.H.
(M120) : Rear combination lamp L.H.
(M121) : Back-up lamp L.H.
(M122) : Rear wiper amplifier
(M123) : License lamp L.H.
(M124) : License lamp R.H.
(M125) : Body ground
(M126) : Luggage room lamp switch
(M127) : Back-up lamp R.H.
(M128) : Luggage room lamp
(M129) : Rear combination lamp R.H.
(M130) : Rear combination lamp R.H.
(M132) : Fuel tank gauge unit
(M133) : Rear brake skid sensor
(M134) : Rear speaker R.H.
(M135) : To back door harness (D501)
(M136) : To back door harness (D502)
(M139) : Door switch L.H.

SEL803L

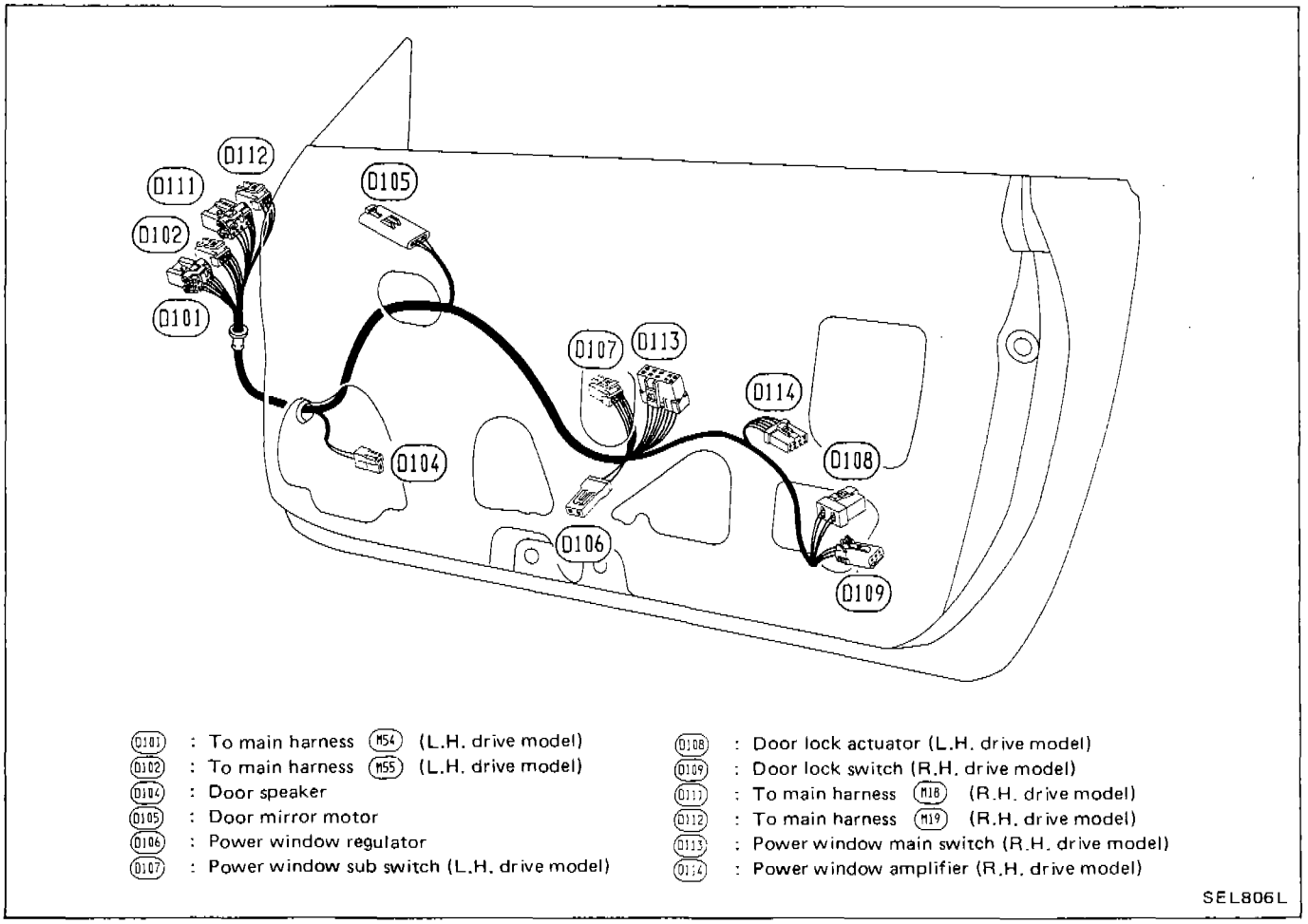
Room Lamp Harness



Door Harness L.H.



Door Harness R.H.



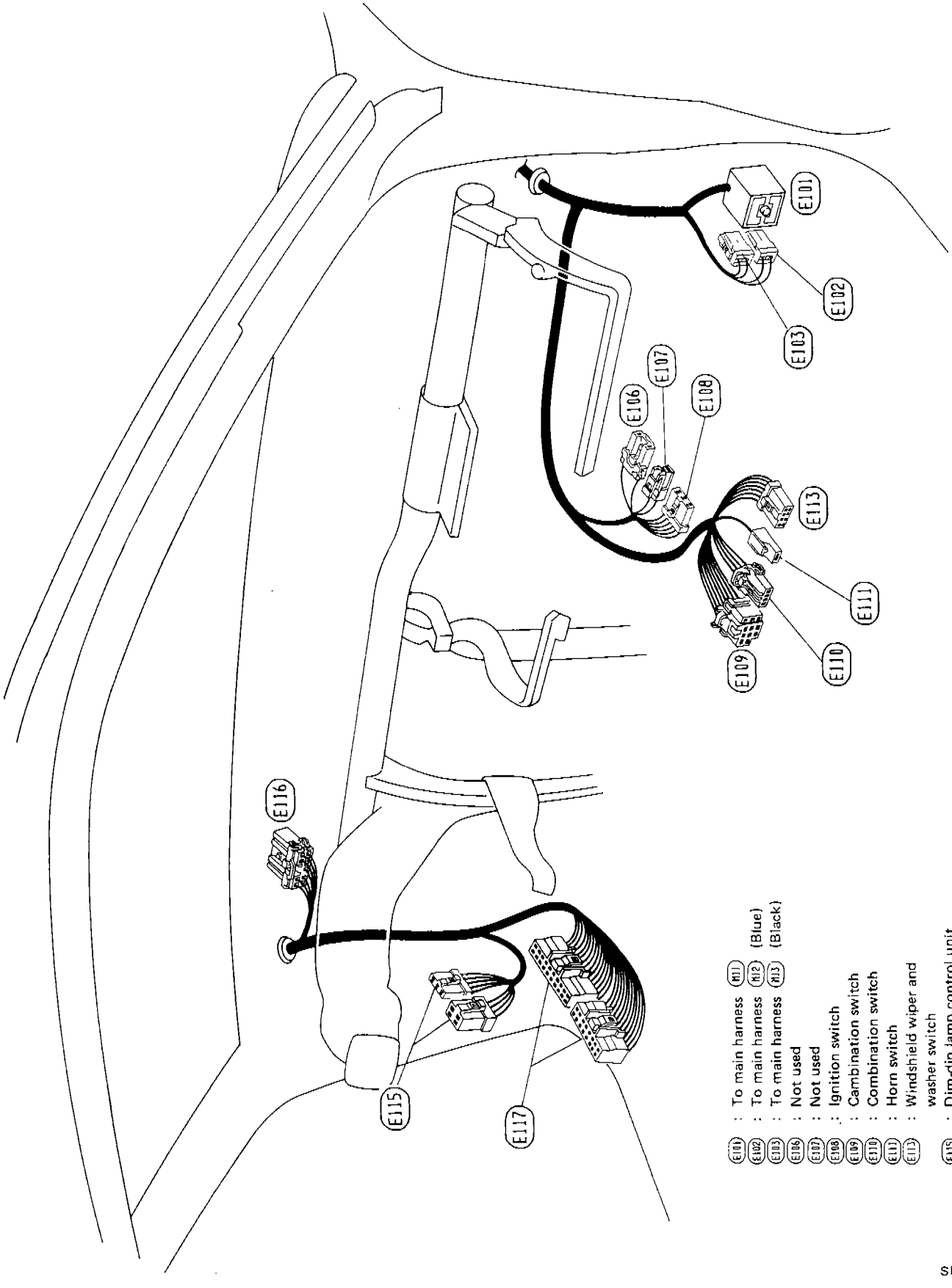
(E1) : Windshield wiper motor
(E2) : Windshield wiper amplifier
(E3) : Side turn signal lamp R.H.
(E4) : Anti-skid brake actuator
(E5) : Rear washer motor
(E6) : Front washer motor
(E7) : Washer fluid level switch
(E8) : To E.F.I. harness (F8) (White)
(E9) : To E.F.I. harness (F9) (Gray)
(E10) : To E.F.I. harness (F10) (Brown)
(E11) : To engine room harness no. 2 (E201) (M/T model)
(E12) : Inhibitor switch (A/T model)
(E13) : Revolution sensor (A/T model)
(E14) : Inhibitor switch (A/T model) (Gray)
(E15) : To solenoid valve sub-harness (A/T model) (Brown)
(E16) : Relay box (Refer to page EL-81.)
(E17) : To engine room harness no. 2 (E202) (A/T model)
(E18) : To engine room harness no. 2 (E203)
(E19) : To engine room harness no. 2 (E204)
(E20) : Body ground
(E21) : To engine room harness no.2 (E205) (M/T model)
(E22) : Battery
(E23) : Battery
(E24) : Body ground
(E25) : Daytime light control unit
(E26) : Headlamp washer amplifier
(E27) : Headlamp washer motor
(E28) : Not used
(E29) : Headlamp R.H.
(E30) : Headlamp motor R.H.
(E31) : Front combination lamp R.H.
(E32) : Daytime light R.H.
(E33) : Horn-high
(E34) : Condenser fan motor
(E35) : Horn-low
(E36) : Headlamp motor L.H.
(E37) : Headlamp L.H.
(E38) : Daytime light L.H.
(E39) : Front combination lamp L.H.
(E40) : Dual-pressure switch
(E41) : Body ground
(E42) : Relay box (Refer to page EL-81.)
(E43) : Dropping resistor (A/T model)
(E44) : Compressor
(E45) : Front brake skid sensor L.H.
(E46) : Power transistor unit
(E47) : Brake fluid level switch
(E48) : Pressure regulator control solenoid valve
(E49) : Body ground for front brake skid sensor L.H.
(E50) : V.P.W. wiper motor
(E51) : Side turn signal lamp L.H.
(E52) : To engine room harness (E28)

SEL796L

NOTE

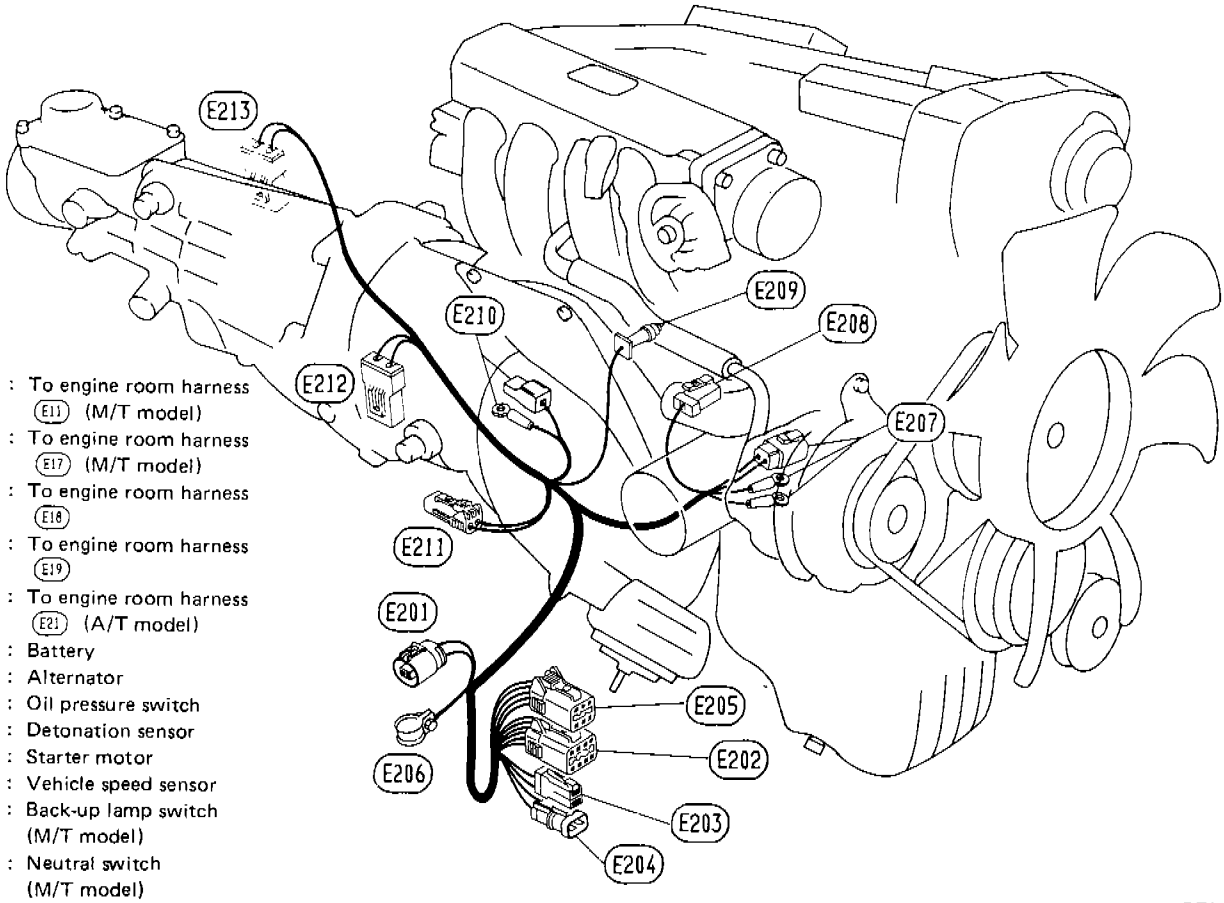
Engine Room Harness (Cont'd)

R.H. DRIVE MODEL



SEL799L

Engine Room Harness No. 2



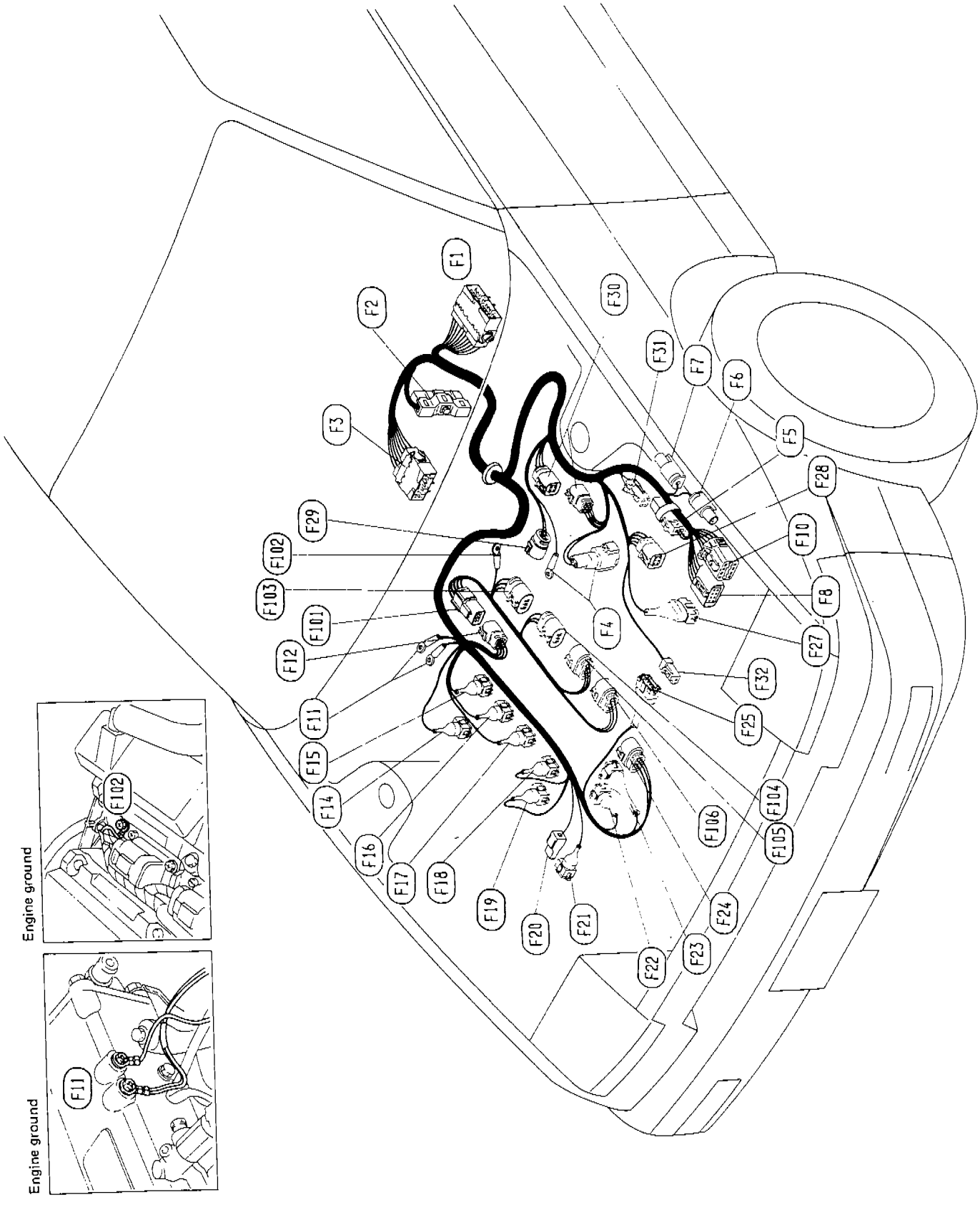
E201 : To engine room harness E11 (M/T model)
E202 : To engine room harness E17 (M/T model)
E203 : To engine room harness E18
E204 : To engine room harness E19
E205 : To engine room harness E21 (A/T model)
E206 : Battery
E207 : Alternator
E208 : Oil pressure switch
E209 : Detonation sensor
E210 : Starter motor
E211 : Vehicle speed sensor
E212 : Back-up lamp switch (M/T model)
E213 : Neutral switch (M/T model)

E.F.I. Harness

L.H. DRIVE MODEL

E.F.I. Harness (Cont'd)

R.H. DRIVE MODEL

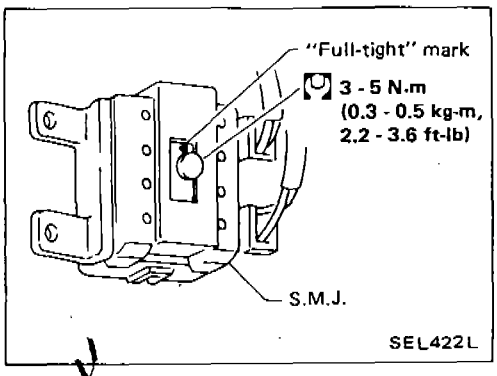


(F1) : To main harness (M53)
(F2) : E.C.C.S. control unit
(F3) : To engine room harness (EJ16)
(F4) : Front brake skid sensor L.H.
(F5) : Resistor
(F6) : Check connector
(F7) : Check connector
(F8) : To engine room harness (E8) (White)
(F10) : To engine room harness (E10) (Brown)
(F11) : Engine ground
(F12) : To ignition coil sub-harness (F101)
(F14) : F.I.C.D. solenoid valve
(F15) : Injector-4
(F16) : Injector-3
(F17) : Injector-2
(F18) : Injector-1
(F19) : A.A.C. solenoid valve
(F20) : Thermal transmitter
(F21) : Engine temperature sensor
(F22) : Air regulator
(F23) : Throttle valve switch
(F24) : Throttle sensor
(F25) : Crank angle sensor
(F27) : Air flow meter
(F28) : Dropping resistor
(F29) : Pressure regulator control solenoid valve
(F30) : Power transistor unit
(F31) : Dropping resistor (A/T model)
(F32) : Compressor
(F101) : To E.F.I. harness (F12)
(F102) : Engine ground
(F103) : Ignition coil-4
(F104) : Ignition coil-3
(F105) : Ignition coil-2
(F106) : Ignition coil-1

SEL810L

REMOVAL

- Remove fuse block retaining screws to gain access to S.M.J.
- Slide fuse block to the side, and remove S.M.J. retaining bolts to detach S.M.J.



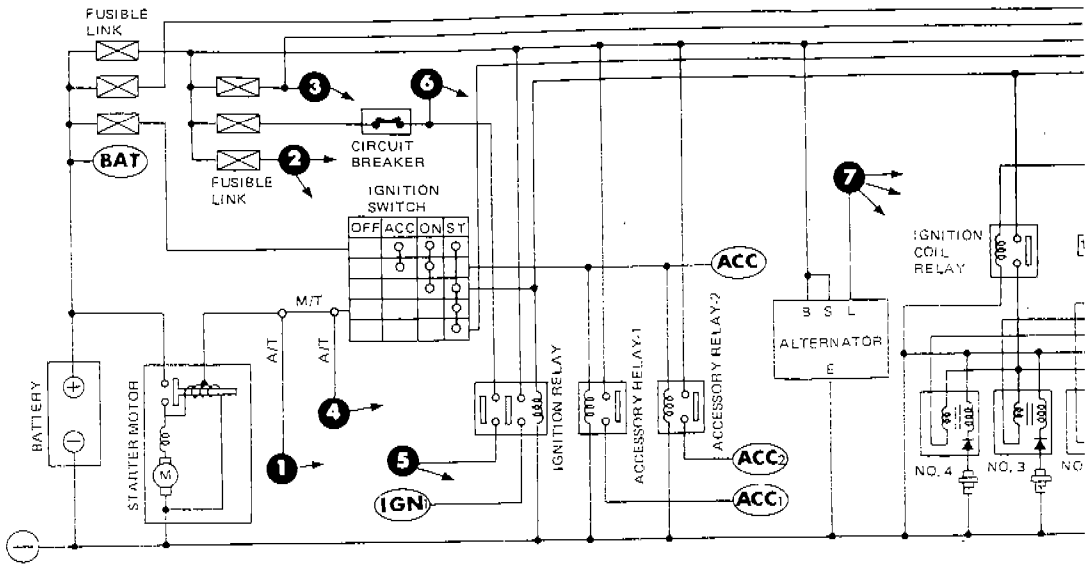
INSTALLATION

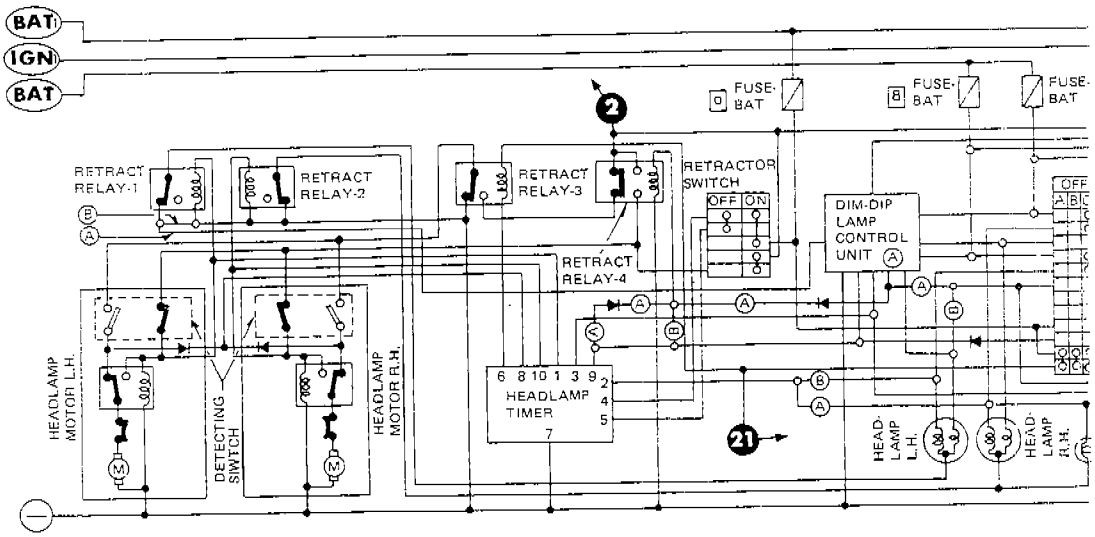
To install S.M.J., tighten bolts until orange "full-tight" mark appears and then retighten to specified torque as required.

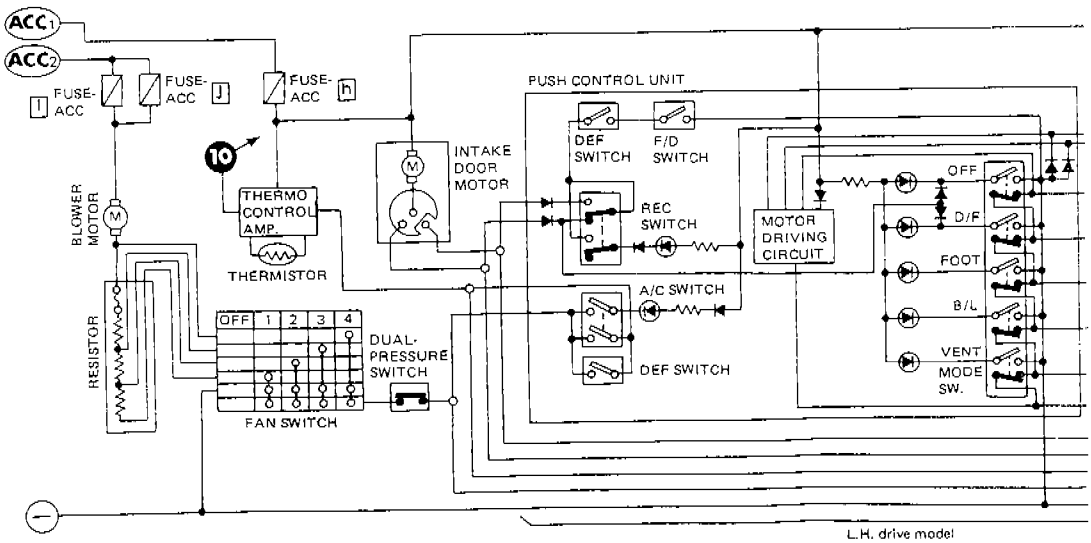
: 3 - 5 N·m
(0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)

CAUTION:
Do not overtighten bolts, otherwise, they may be damaged.

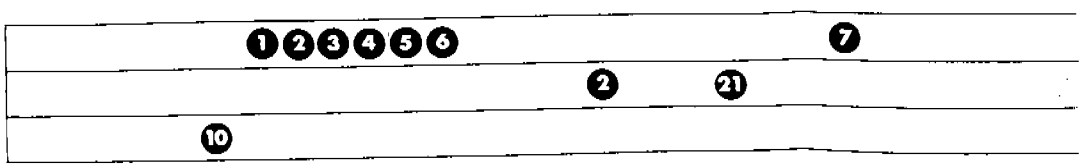
NISSAN 200SX (S13 series)
CIRCUIT DIAGRAM

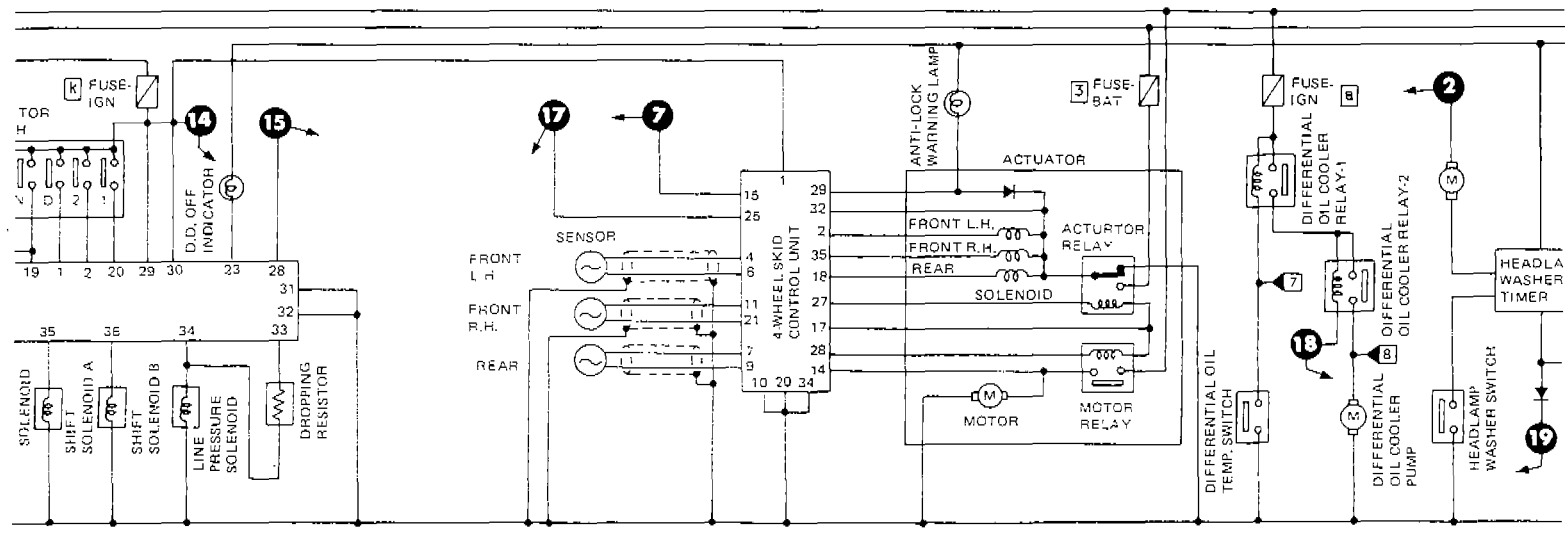


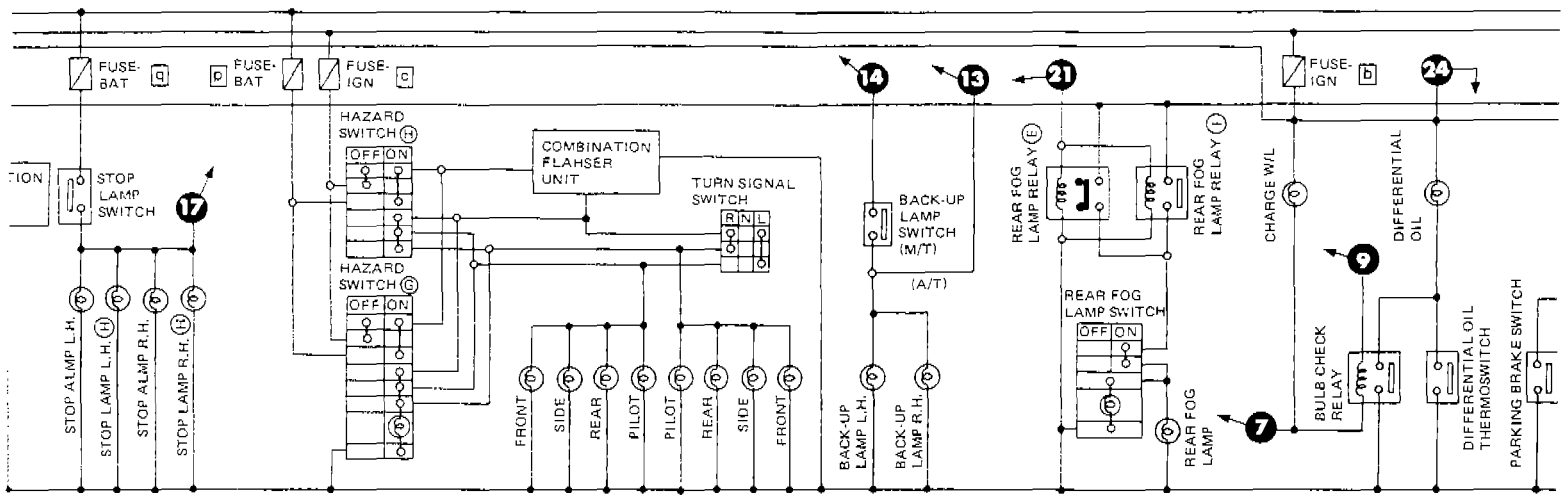


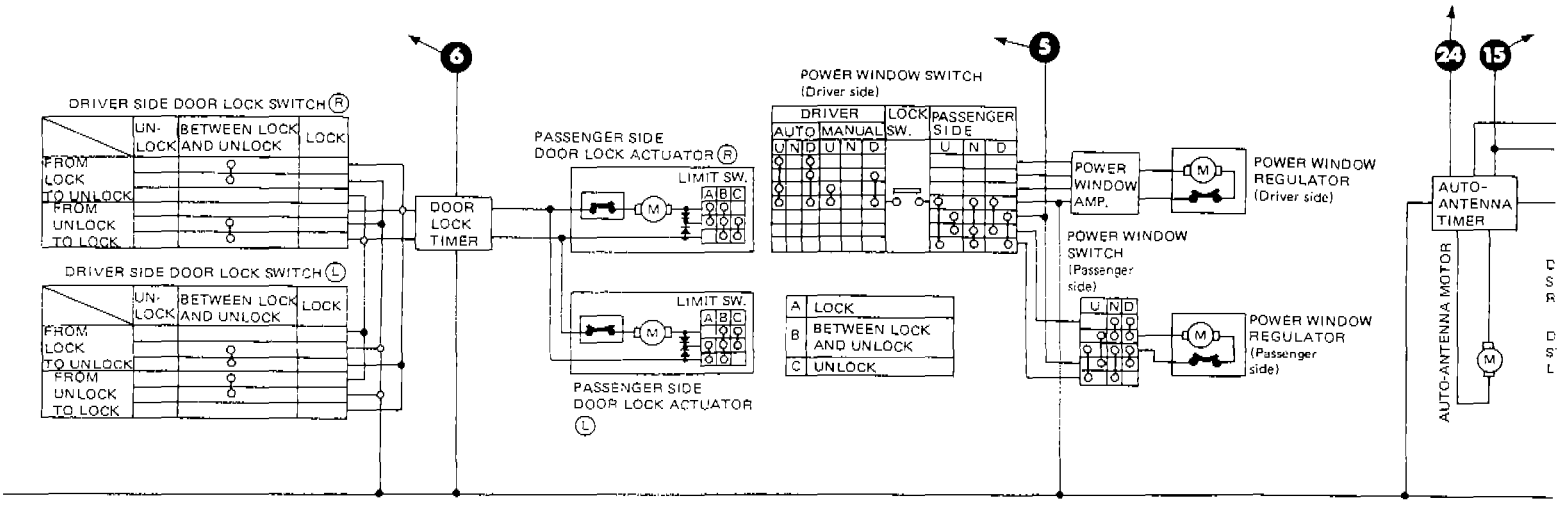


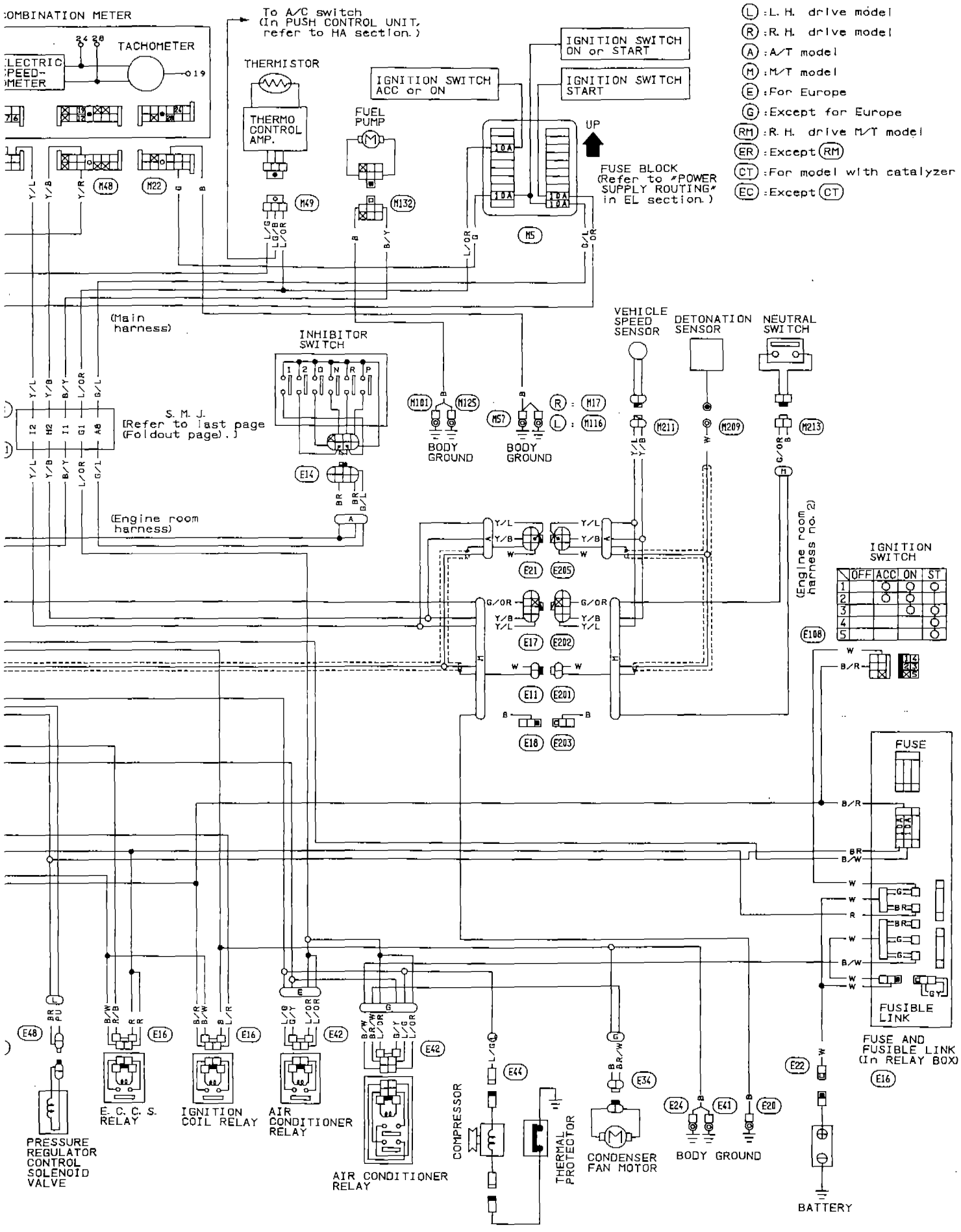
L.H. drive model



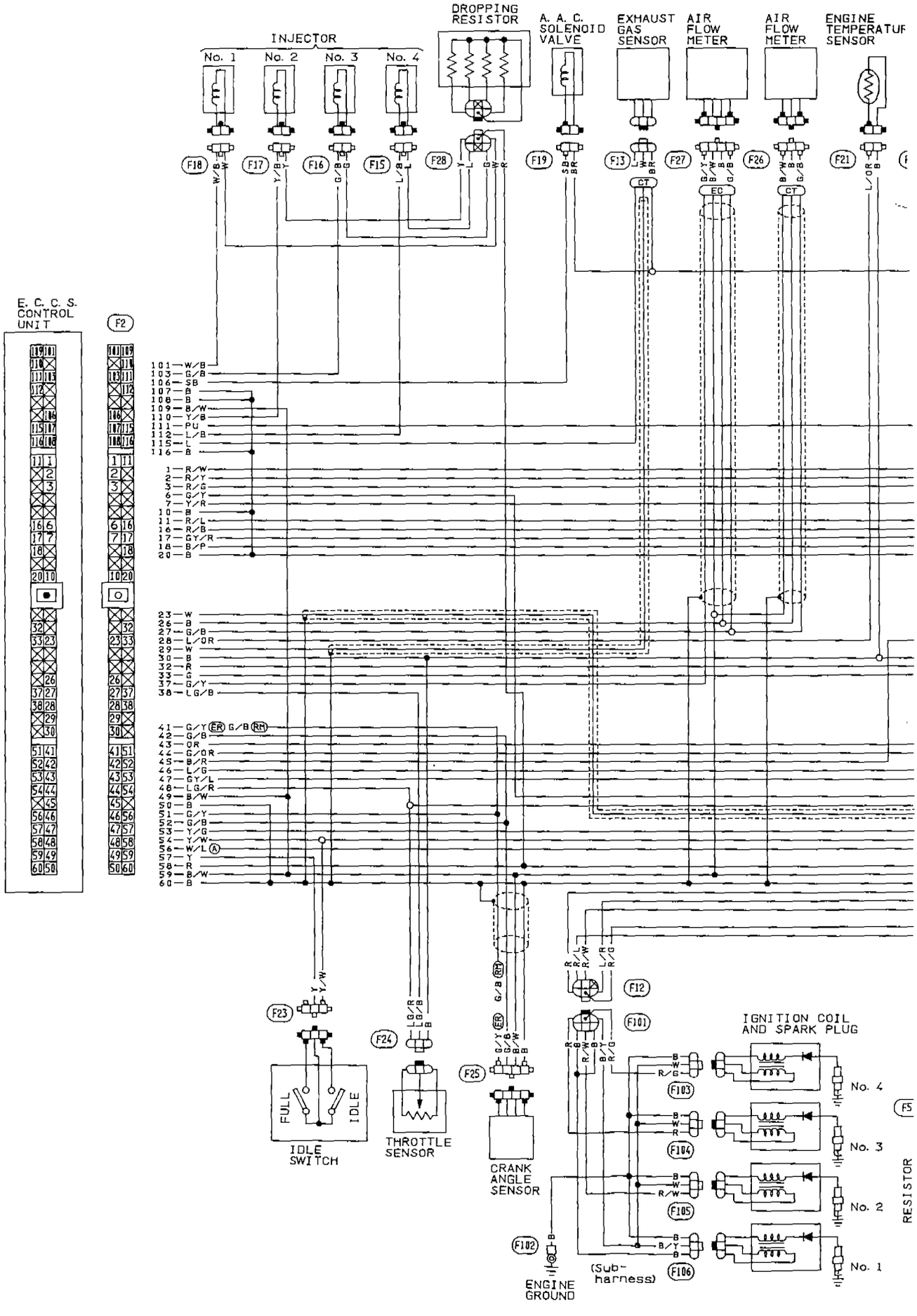

FUSE-IGN
D.D. OFF INDICATOR
SENSOR
FRONT L.H.
FRONT R.H.
REAR
4-WHEEL SKID CONTROL UNIT
ANTI-LOCK WARNING LAMP
ACTUATOR
FRONT L.H.
FRONT R.H.
REAR
ACTURTOR RELAY
SOLENOID
MOTOR
MOTOR RELAY
FUSE-BAT
DIFFERENTIAL OIL TEMP. SWITCH
DIFFERENTIAL OIL COOLER RELAY-1
DIFFERENTIAL OIL COOLER RELAY-2
DIFFERENTIAL OIL COOLER PUMP
HEADLAMP WASHER TIMER
HEADLAMP WASHER SWITCH
SOLENOID
SHIFT SOLENOID A
SHIFT SOLENOID B
LINE PRESSURE SOLENOID
DROPPING RESISTOR


FUSE-BAT
FUSE-IGN
STOP LAMP SWITCH
HAZARD SWITCH
COMBINATION FLASHER UNIT
TURN SIGNAL SWITCH
BACK-UP LAMP SWITCH (M/T)
(A/T)
REAR FOG LAMP RELAY
REAR FOG LAMP SWITCH
REAR FOG LAMP
CHARGE W/L
DIFFERENTIAL OIL
BULB CHECK RELAY
DIFFERENTIAL OIL THERMOSWITCH
PARKING BRAKE SWITCH
STOP LAMP L.H.
STOP LAMP L.H.
STOP LAMP R.H.
STOP LAMP R.H.
FRONT
SIDE
REAR
PILOT
BACK-UP LAMP L.H.
BACK-UP LAMP R.H.


DRIVER SIDE DOOR LOCK SWITCH
UNLOCK
BETWEEN LOCK AND UNLOCK
LOCK
FROM LOCK TO UNLOCK
FROM UNLOCK TO LOCK
DOOR LOCK TIMER
PASSENGER SIDE DOOR LOCK ACTUATOR
LIMIT SW.
POWER WINDOW SWITCH (Driver side)
DRIVER
LOCK SW.
PASSENGER SIDE
AUTO
MANUAL
POWER WINDOW AMP.
POWER WINDOW REGULATOR (Driver side)
POWER WINDOW SWITCH (Passenger side)
POWER WINDOW REGULATOR (Passenger side)
A LOCK
B BETWEEN LOCK AND UNLOCK
C UNLOCK
AUTO-ANTENNA TIMER
AUTO-ANTENNA MOTOR


(L) : L. H. drive model
(R) : R. H. drive model
(A) : A/T model
(M) : M/T model
(E) : For Europe
(G) : Except for Europe
(RM) : R. H. drive M/T model
(ER) : Except (RM)
(CT) : For model with catalyzer
(EC) : Except (CT)
COMBINATION METER
TACHOMETER
To A/C switch (In PUSH CONTROL UNIT, refer to HA section.)
THERMISTOR
THERMO CONTROL AMP.
FUEL PUMP
IGNITION SWITCH ACC or ON
IGNITION SWITCH ON or START
IGNITION SWITCH START
UP
FUSE BLOCK (Refer to "POWER SUPPLY ROUTING" in EL section.)
10A
15A
(Main harness)
INHIBITOR SWITCH
P R N D 2 1
S. M. J. (Refer to last page (Foldout page).)
BODY GROUND
BODY GROUND
VEHICLE SPEED SENSOR
DETONATION SENSOR
NEUTRAL SWITCH
(Engine room harness)
(Engine room harness no. 2)
IGNITION SWITCH
OFF ACC ON ST
FUSE
FUSIBLE LINK
FUSE AND FUSIBLE LINK (In RELAY BOX)
PRESSURE REGULATOR CONTROL SOLENOID VALVE
E. C. C. S. RELAY
IGNITION COIL RELAY
AIR CONDITIONER RELAY
AIR CONDITIONER RELAY
COMPRESSOR
THERMAL PROTECTOR
CONDENSER FAN MOTOR
BODY GROUND
BATTERY

NISSAN 200SX
E. C. C. S. WIRING DIAGRAM

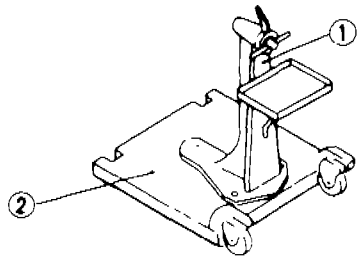
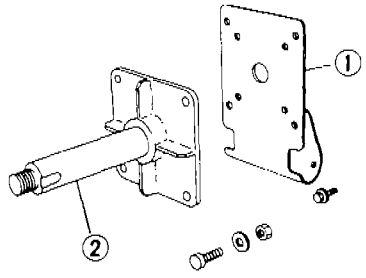
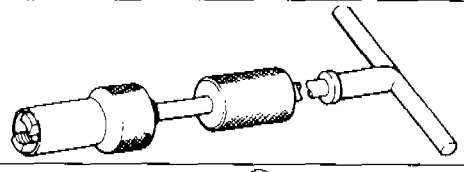
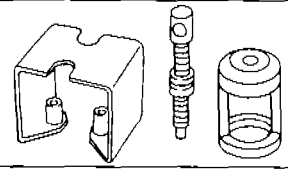
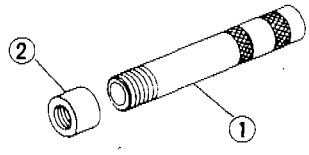


ENGINE MECHANICAL

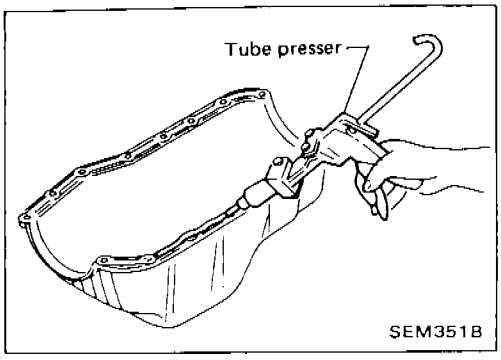
SECTION EM

CONTENTS

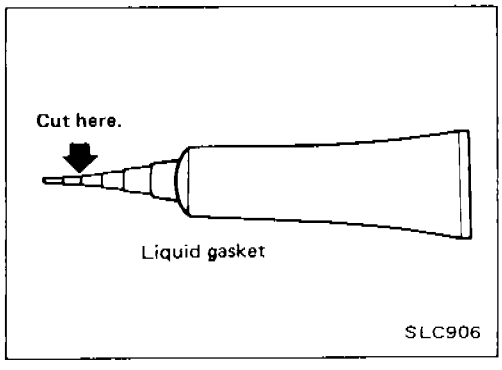
SPECIAL SERVICE TOOLS

Tool number Tool name	Description	
ST0501S000 Engine stand assembly ① ST05011000 Engine stand ② ST05012000 Base		When overhauling engine
Engine attachment assembly ① KV10108101 Engine attachment ② KV10106500 Sub-attachment		
KV10107901 Valve lip seal puller		Displacement valve lip seal
KV10111300 Valve spring compressor		Disassembling and assembling valve components
① KV10107501 Valve lip seal drift ② KV10111400 Valve oil seal drift attachment		Installing valve lip seal

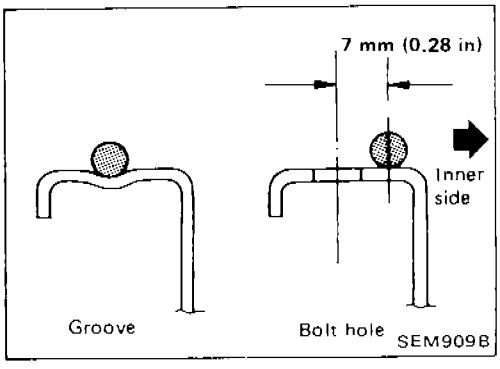
Installation (Cont'd)



3. Apply a continuous bead of liquid gasket to mating surface of oil pan.
- **Use Genuine Liquid Gasket or equivalent.**



- Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide.



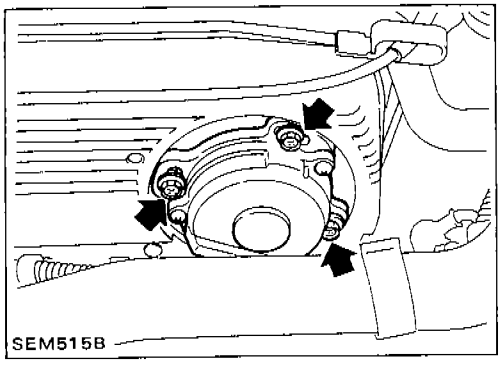
4. Apply liquid gasket to inner sealing surface as shown in figure.
- Attaching should be done within 5 minutes after coating.
5. Install oil pan.
- Wait at least 30 minutes before refilling engine oil.

Removal

1. Drain engine coolant from radiator.

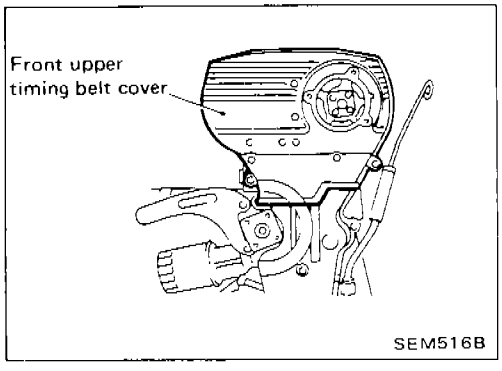
Be careful not to spill coolant on drive belts.

2. Remove air duct, upper radiator hose, radiator shroud and under cover.
3. Remove the following belts.
- Power steering pump drive belt
- Compressor drive belt
- Alternator drive belt
4. Remove water pump pulley, fan and fan coupling.

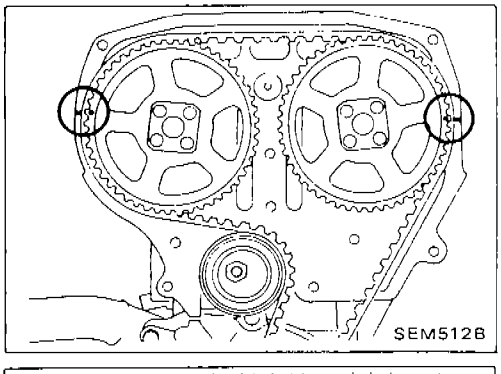


5. Remove crank angle sensor.

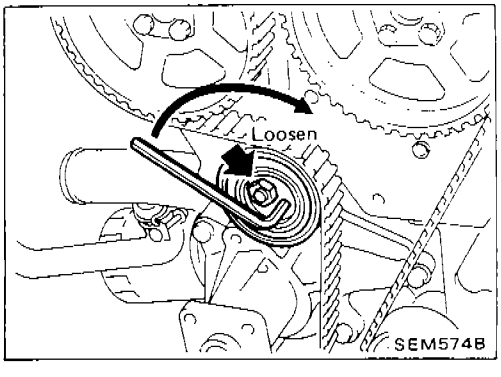
Put aligning mark on crank angle sensor and timing belt cover.



6. Remove front upper timing belt cover.
7. Remove all spark plugs.

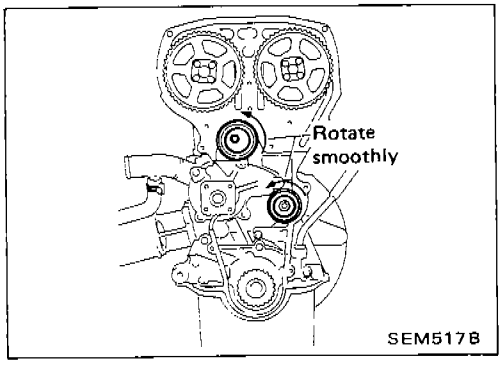


8. Set No. 1 piston at T.D.C. on its compression stroke.
9. Remove crankshaft pulley.



10. Remove front lower timing belt cover.
11. Loosen timing belt tensioner nut, turn tensioner, then remove timing belt.

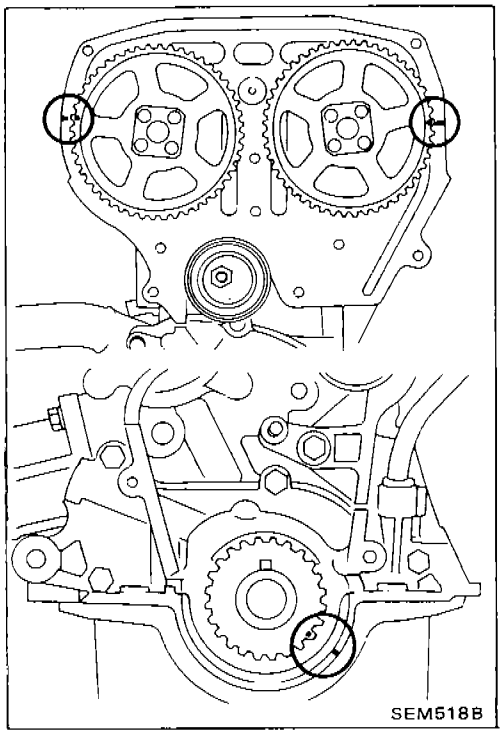
Inspection (Cont'd)



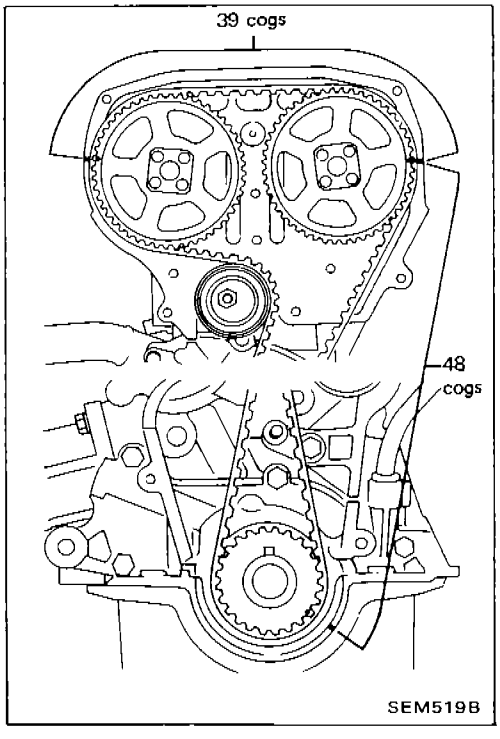
BELT TENSIONER, IDLER PULLEY AND TENSIONER SPRING

1. Check belt tensioner and idler pulley for smooth turning.
2. Check condition of tensioner spring.

Installation



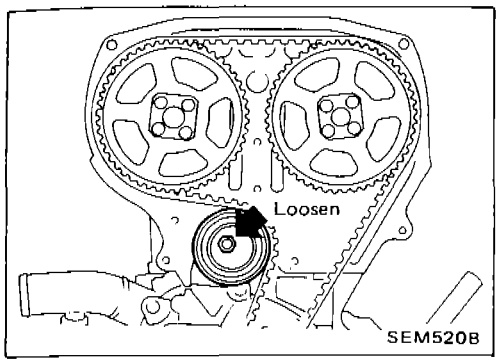
1. Confirm that No. 1 piston is set at T.D.C. on its compression stroke.
2. Install tensioner and tensioner spring.
- **Turn tensioner fully clockwise with hexagon wrench, and temporarily tighten lock nut.**



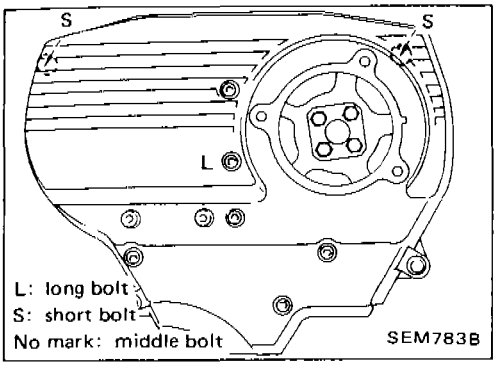
3. Set timing belt.

Align timing marks on timing belt and sprockets.

Installation (Cont'd)



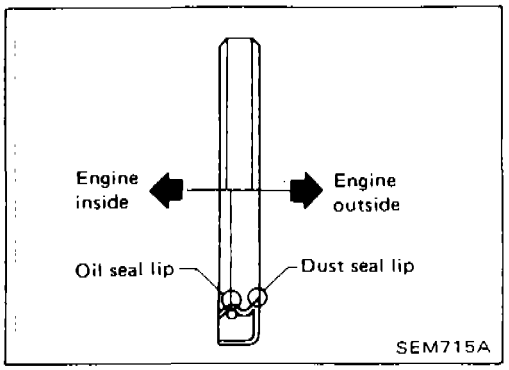
4. Loosen tensioner lock nut, keeping tensioner steady with hexagon wrench.
5. Rotate crankshaft at least two turns clockwise.
6. Adjust belt tension.
   Slowly swing tensioner with hexagon wrench clockwise and counterclockwise two or three times.
7. Tighten tensioner lock nut.



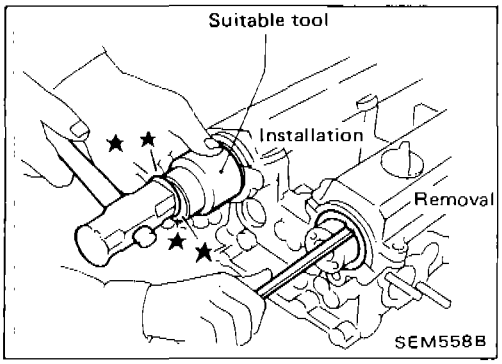
8. Install lower and upper timing belt covers.

9. Install crankshaft pulley with washer.
10. Install engine mount bracket.
11. Install crank angle sensor and water pump pulley.

Align marks on crank angle sensor and front cover that were made when crank angle sensor was removed.



OIL SEAL INSTALLING DIRECTION

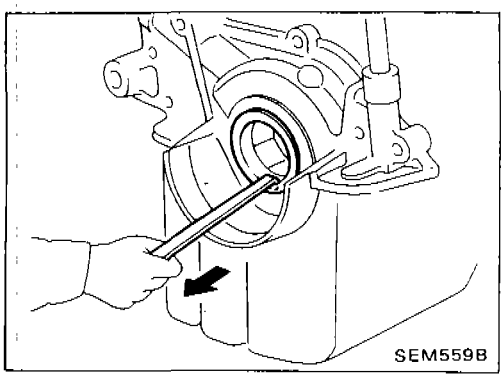


CAMSHAFT OIL SEAL

1. Set No. 1 piston at T.D.C. on its compression stroke.
2. Remove crank angle sensor, front cover, timing belt, camshaft sprockets and rear dust cover.
3. Remove camshaft oil seal.

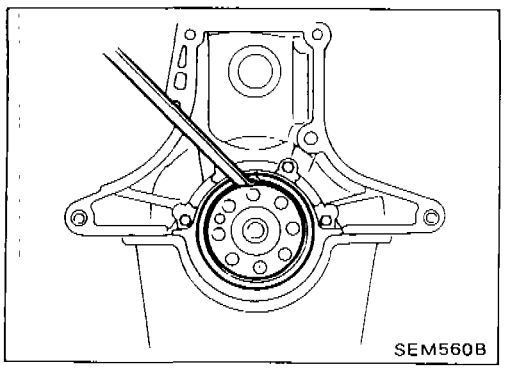
Be careful not to scratch camshaft.

4. Apply engine oil to camshaft oil seal lip and install it in place.



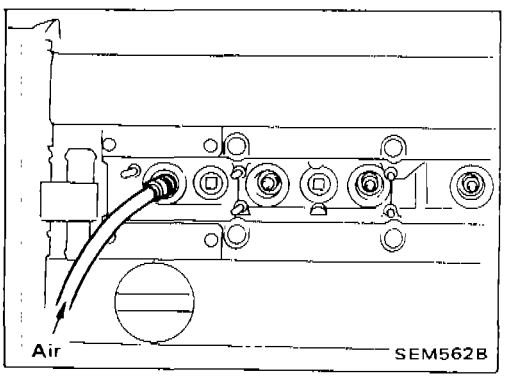
FRONT OIL SEAL

1. Set No. 1 piston at T.D.C. on its compression stroke.
2. Remove timing belt and crankshaft sprocket.
3. Remove front oil seal.
4. Apply engine oil to oil seal lip and install it in place using suitable tool.



REAR OIL SEAL

1. Remove transmission and flywheel.
2. Remove rear oil seal from the retainer.
3. Apply engine oil to oil seal lip and install it in place using suitable tool.

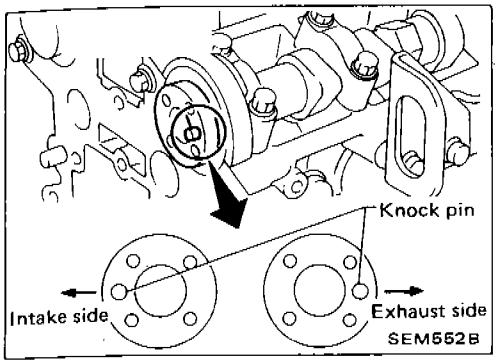


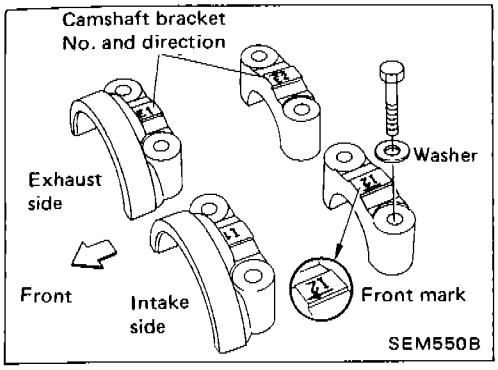
VALVE OIL SEAL

1. Set No. 1 piston at T.D.C. on its compression stroke.
2. Remove throttle chamber and rocker covers.
3. Remove camshafts and valve lifters.
4. Remove spark plug.
5. Install air hose adapter into spark plug hole and apply air pressure to hold valves in place. [Apply pressure of 490 kPa (4.9 bar, 5 kg/cm^2, 71 psi)].

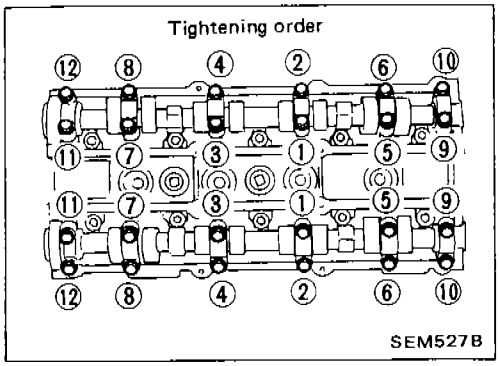
Assembly (Cont'd)

Install camshaft as shown.

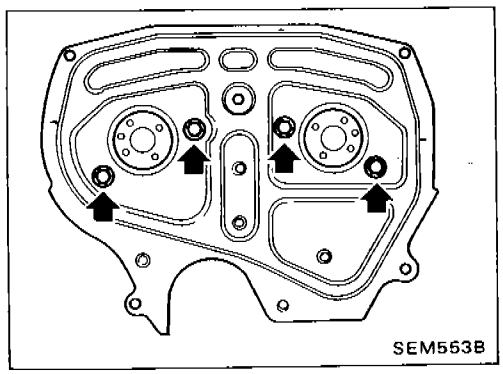




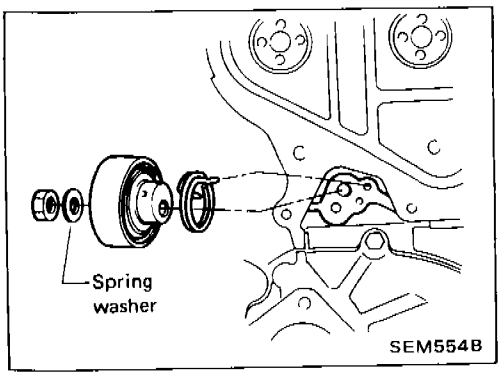
3. Install camshaft brackets.
Front mark is punched on the camshaft bracket.
4. Apply engine oil to camshaft oil seal lip and install it in place.
Always use new camshaft oil seal.
[O]: 9 - 12 N·m (0.9 - 1.2 kg-m, 6.5 - 8.7 ft-lb)



Tighten camshaft bracket bolts gradually in two or three stages.



5. Install rear timing cover.
[O]: 7 - 8 N·m (0.7 - 0.8 kg-m, 5.1 - 5.8 ft-lb)



6. Install timing belt tensioner.
Tensioner nut:
[O]: 22 - 29 N·m (2.2 - 3.0 kg-m, 16 - 22 ft-lb)

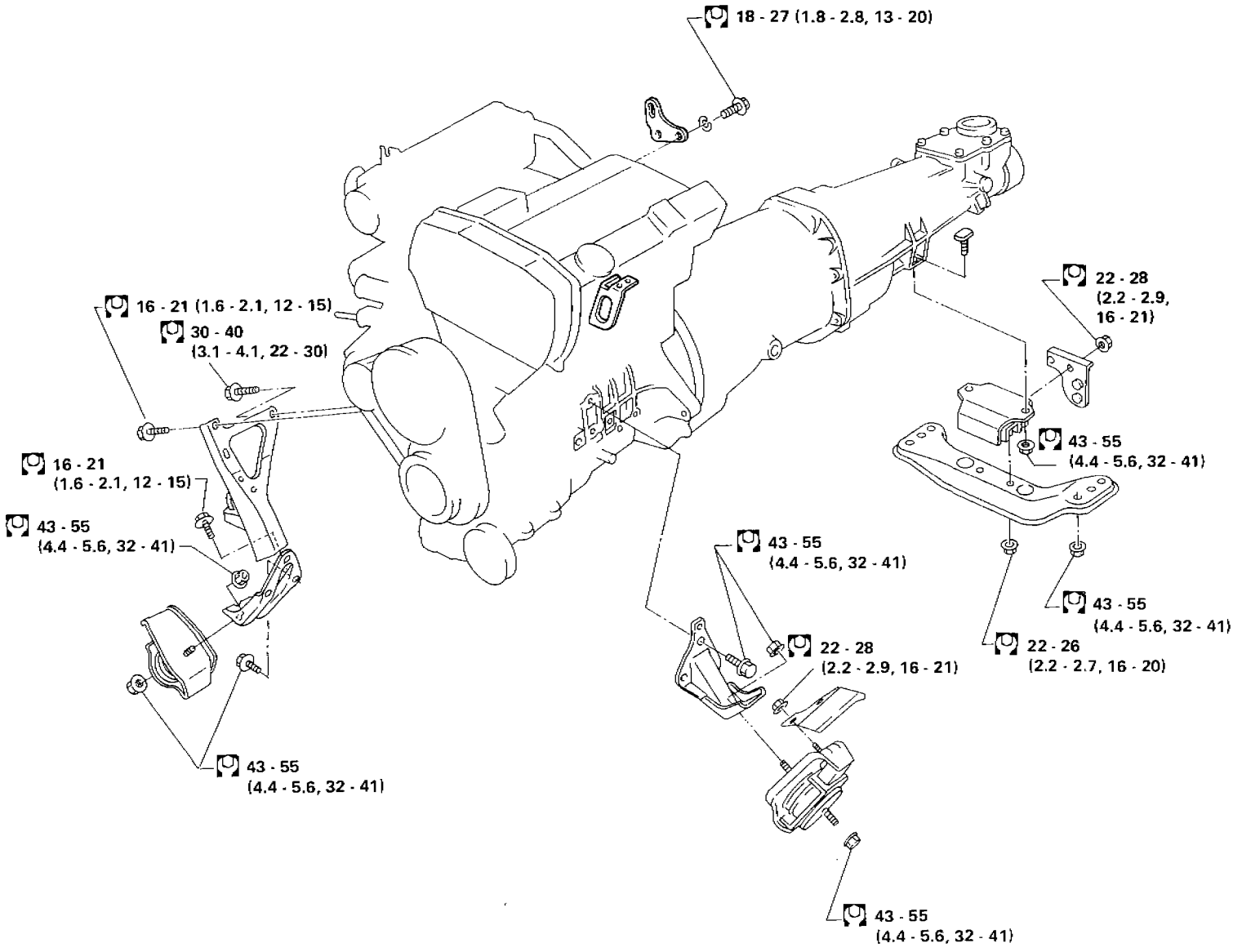
Inspection

Condition 1: Low engine power

Probable cause	Corrective action
Air leak at the connection of compressor housing and suction hose/inlet tube, or inlet tube and intake manifold	Correct the connection.
Exhaust gas leak at the connection of turbine housing and exhaust manifold, connecting tube or exhaust outlet	Correct the connection or replace gasket.
By-pass valve is stuck open.	Replace turbocharger assembly.
Stuck or worn journal or bearing	
Broken shaft	
Sludge on back of tubine wheel	
Broken turbine wheel	

Condition 2: Excessively high engine power

Probable cause	Corrective action
Disconnected or cracked rubber hose of by-pass valve controller	Correct or replace rubber hose.
By-pass valve is stuck closed.	Replace turbocharger assembly.
Controller diaphragm is broken.	



: N·m (kg-m, ft-lb)

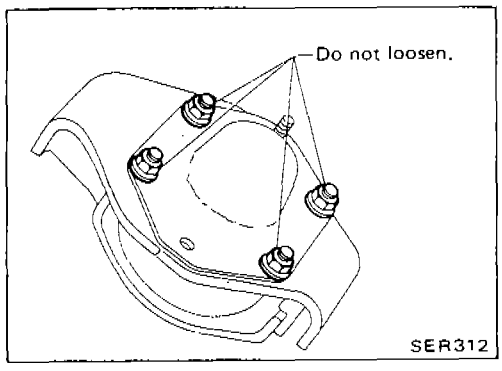
SEM358C

WARNING:

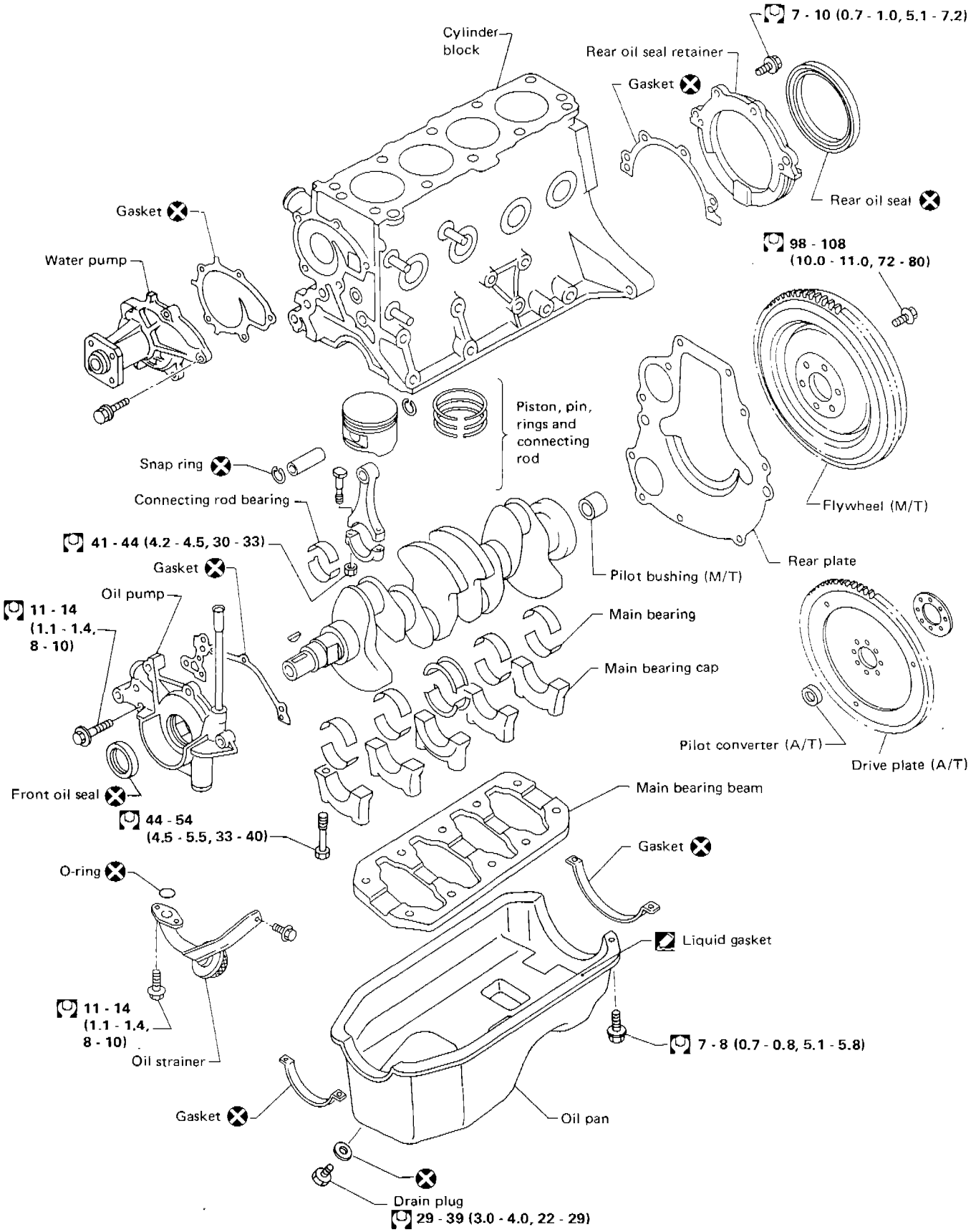
a. Situate vehicle on a flat and solid surface.
b. Place chocks at front and back of rear wheels.
c. Do not remove engine until exhaust system has completely cooled off.
   Otherwise, you may burn yourself and/or fire may break out in fuel line.
d. For safety during subsequent steps, the tension of wires should be slackened against the engine.
e. Before disconnecting fuel hose, release fuel pressure from fuel line.
   Refer to "Releasing Fuel Pressure" in section EF & EC.
f. Be sure to hoist engine and transmission in a safe manner.
g. For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.

CAUTION:

- When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.
- In hoisting the engine, always use engine slingers in a safe manner.



- Do not loosen front engine mounting insulator cover securing nuts.
  When cover is removed, damper oil flows out and mounting insulator will not function.
  For tightening torque, refer to sections AT, MT and PD.

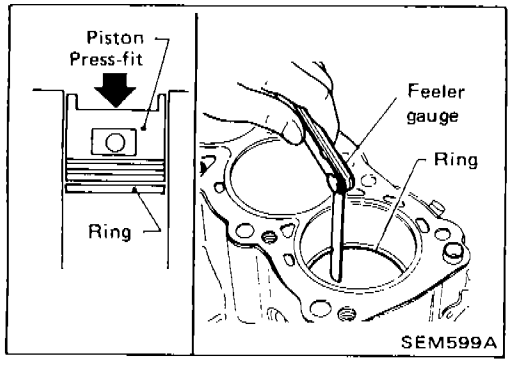


: N·m (kg-m, ft-lb)

SEM359C

Inspection (Cont'd)

PISTON RING END GAP



End gap:

Top ring

0.25 - 0.42 mm (0.0098 - 0.0165 in)

2nd ring

0.38 - 0.64 mm (0.0150 - 0.0252 in)

Oil ring

0.20 - 0.76 mm (0.0079 - 0.0299 in)

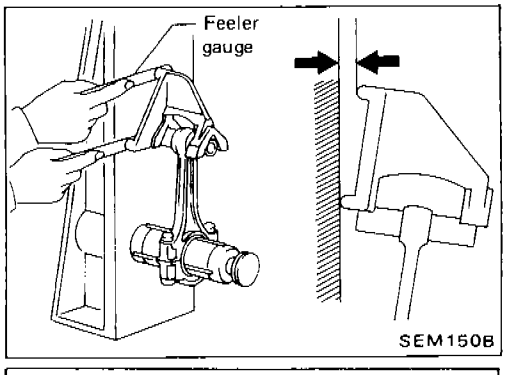
Max. limit of ring gap:

1.0 mm (0.039 in)

If out of specification, replace piston ring. If gap still exceeds the limit even with a new ring, rebore cylinder and use oversized piston and piston rings.

Refer to S.D.S.

CONNECTING ROD BEND AND TORSION



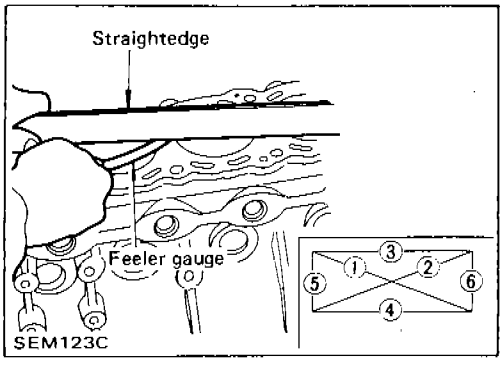
Bend and torsion:

Limit 0.1 mm (0.004 in)

per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.

CYLINDER BLOCK DISTORTION AND WEAR



1. Clean upper face of cylinder block and measure the distortion.

   Limit:

   0.10 mm (0.0039 in)

2. If out of specification, resurface it.

   The resurfacing limit is determined by cylinder head resurfacing in engine.

Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

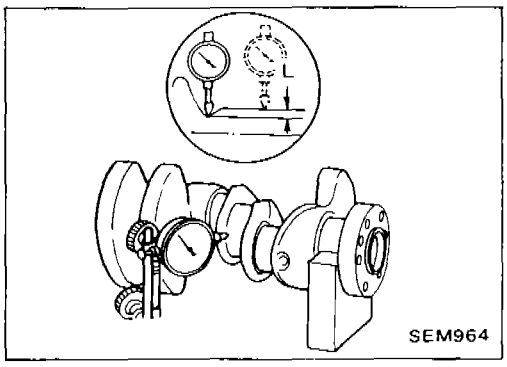
A + B = 0.2 mm (0.008 in)

Nominal cylinder block height from crankshaft center:

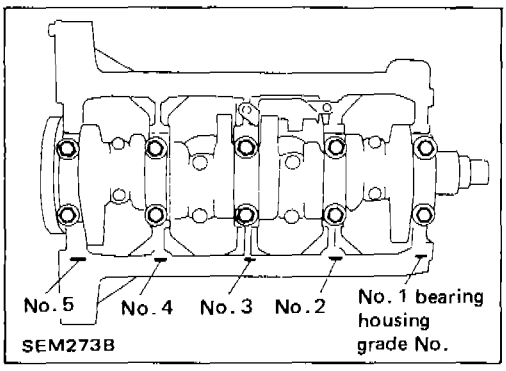
204.75 - 204.85 mm (8.0610 - 8.0649 in)

3. If necessary, replace cylinder block.

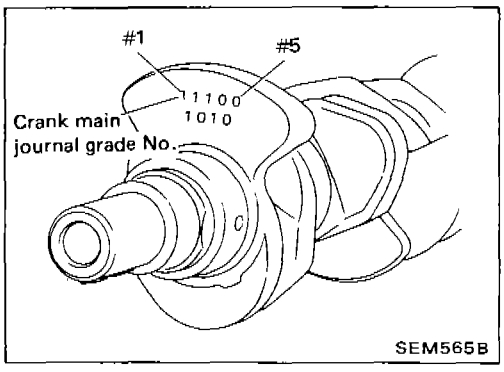
Inspection (Cont'd)



a. When grinding crankshaft journal, confirm that "L" dimension in fillet roll is more than the specified limit.
"L": 0.1 mm (0.004 in)
b. Refer to S.D.S. for grinding crankshaft and available service parts.



8. If crankshaft, cylinder block or main bearing is reused again, measure main bearing clearance.
If crankshaft, cylinder block and main bearings are replaced with new ones, it is necessary to select thickness of main bearings as follows:
a. Grade number of each cylinder block main journal is punched on the respective cylinder block.



b. Grade number of each crankshaft main journal is punched on the respective crankshaft.

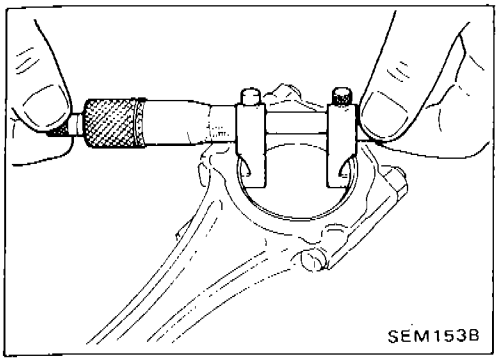
c. Select main bearing with suitable thickness according to the following table.

Main bearing grade number:

		Main bearing housing grade number		
		0	1	2
		Main bearing grade number		
Crankshaft main journal grade number	0	0	1	2
	1	1	2	3
	2	2	3	4

For example:
Main journal grade number: 1
Crankshaft journal grade number: 2
Main bearing grade number = 1 + 2
= 3

Inspection (Cont'd)

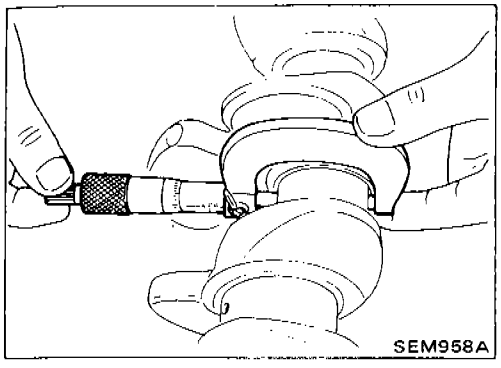


Connecting rod bearing (Big end)

1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.

Tighten bolts to the specified torque.

3. Measure inner diameter "C" of each bearing.



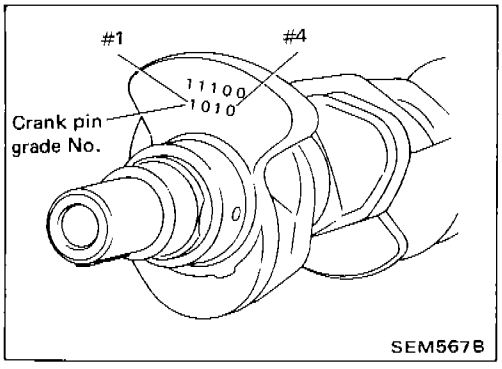
4. Measure outer diameter "Dp" of each crankshaft pin journal.
5. Calculate connecting rod bearing clearance.

   Connecting rod bearing clearance = C – Dp

   Standard:

   0.018 - 0.045 mm (0.0007 - 0.0018 in)

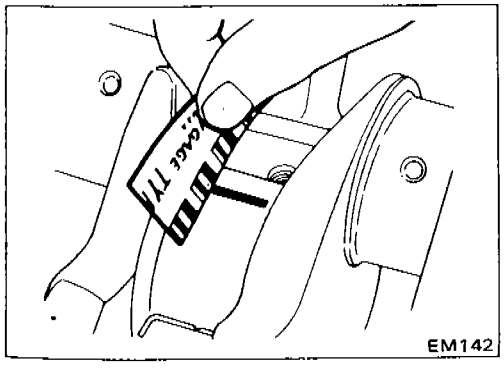
   Limit: 0.1 mm (0.004 in)
6. If it exceeds the limit, replace bearing.
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing. Refer to step 7 of "BEARING CLEARANCE —Main bearing".



8. If bearing, crankshaft or connecting rod is replaced with a new one, select connecting rod bearing according to the following table.

Connecting rod bearing grade number:

Crank pin grade number	Connecting rod bearing grade number
0	0
1	1
2	2



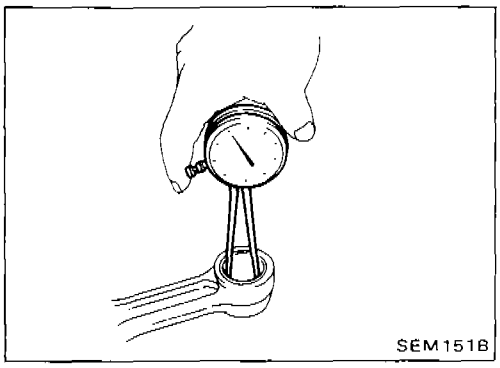
Method B (Using plastigage)

CAUTION:

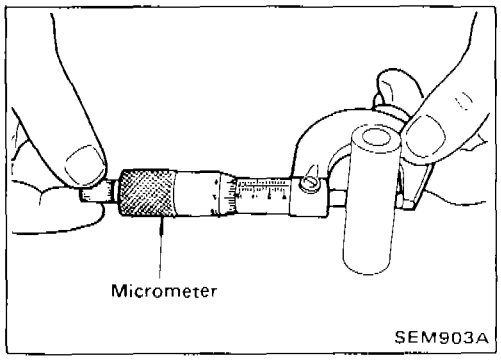
- **Do not turn crankshaft or connecting rod while the plastigage is being inserted.**
- **When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. However, if excessive bearing clearance still exists, use thicker main bearing or undersized bearing so that the specified bearing clearance is obtained.**

Inspection (Cont'd)

CONNECTING ROD BUSHING CLEARANCE (Small end)


SEM151B

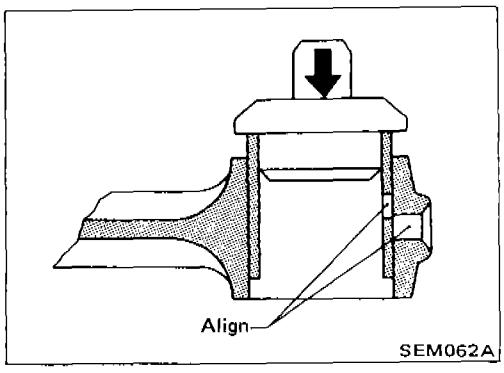
1. Measure inner diameter "C" of bushing.



SEM903A

2. Measure outer diameter "Dp" of piston pin.
3. Calculate connecting rod bearing clearance.
   C – Dp = 0.005 - 0.017 mm (0.0002 - 0.0007 in)
   If it exceeds the limit, replace connecting rod assembly and/or piston set with pin.
   Connecting rod bushing cannot be removed from connecting rod.

REPLACEMENT OF CONNECTING ROD BUSHING (Small end)



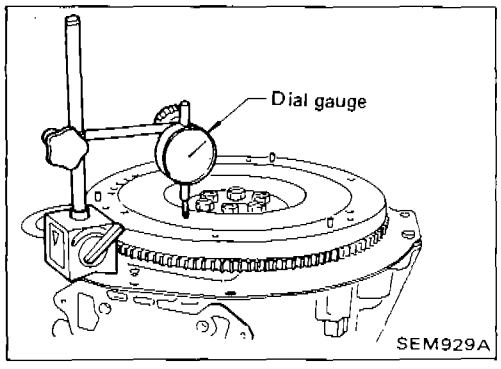
SEM062A

1. Drive in small end bushing until it is flush with end surface of rod.

Be sure to align the oil holes.

2. After driving in small end bushing, ream the bushing.

FLYWHEEL/DRIVE PLATE RUNOUT

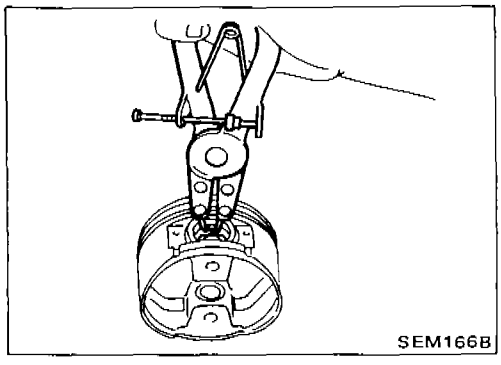


SEM929A

Runout (Total indicator reading):
Less than 0.15 mm (0.0059 in)

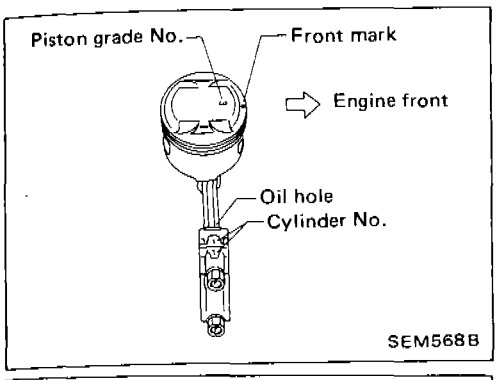
Assembly

PISTON

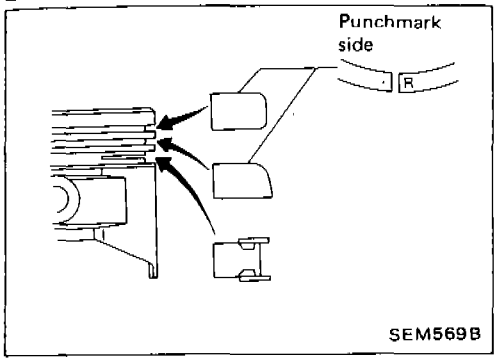

SEM166B

1. Install new snap ring on one side of piston pin hole.

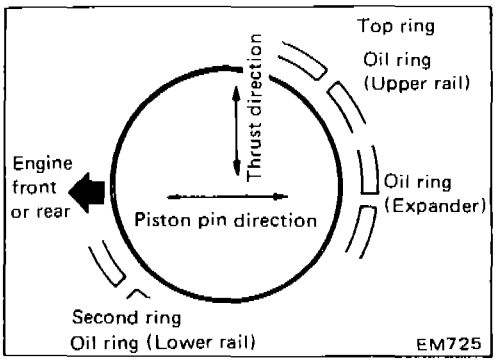
Assembly (Cont'd)



2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.
- **Align the direction of piston and connecting rod.**
- **Numbers stamped on connecting rod and cap correspond to each cylinder.**
- **After assembly, make sure connecting rod swings smoothly.**

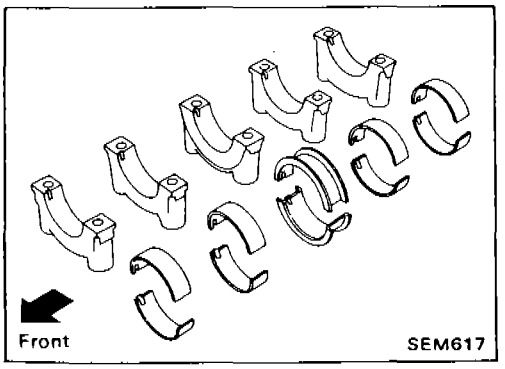


3. Set piston rings as shown.

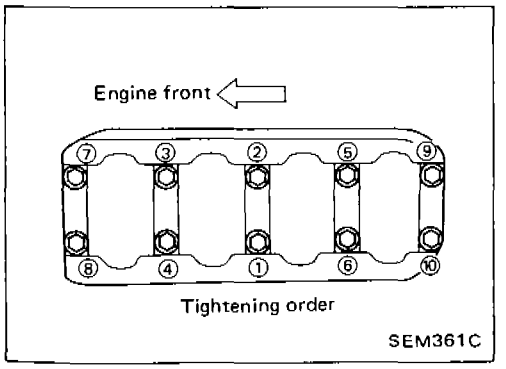


CRANKSHAFT

1. Set main bearings in their proper positions on cylinder block and main bearing cap.
- **Confirm that correct main bearings are used. Refer to "Inspection".**



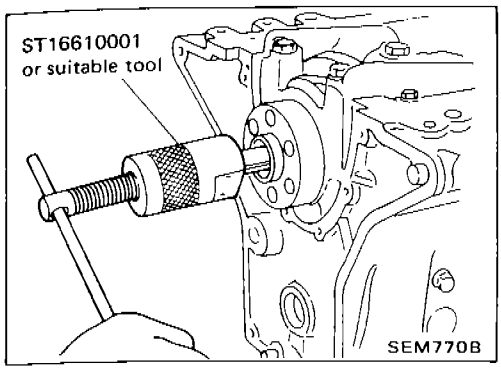
2. Install crankshaft, main bearing caps and main bearing beam and tighten bolts to the specified torque.
- **Prior to tightening bearing cap bolts, place bearing cap in its proper position by shifting crankshaft in the axial direction.**
- **Tighten bearing cap bolts gradually in two or three stages. Start with center bearing and move outward sequentially.**
- **After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.**



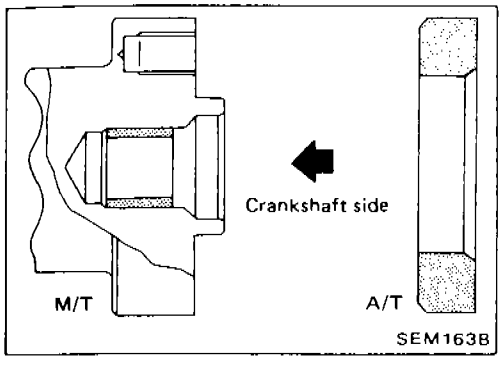
Assembly (Cont'd)

REPLACING PILOT BUSHING

1. Remove pilot bushing (M/T)/pilot converter (A/T).



2. Install pilot bushing (M/T)/pilot converter (A/T).



General Specifications

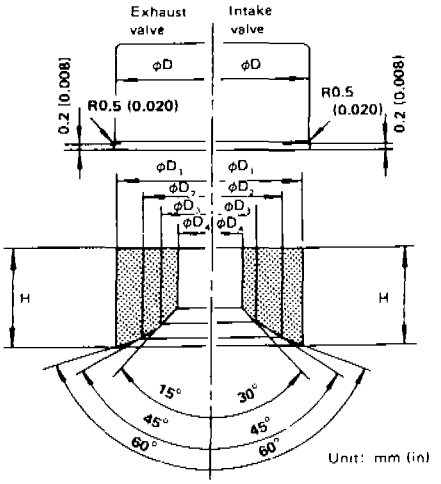
Engine model	CA18DET
Cylinder arrangement	4, in-line
Displacement cm^3 (cu in)	1,809 (110.39)
Bore x stroke mm (in)	83.0 x 83.6 (3.268 x 3.291)
Valve arrangement	D.O.H.C.
Firing order	1-3-4-2
Number of piston rings	
Compression	2
Oil	1
Number of main bearings	5
Compression ratio	8.5

Unit: kPa (bar, kg/cm^2, psi)/rpm

Compression pressure	
Standard	1,177 (11.77, 12.0, 171)/350
Minimum	981 (9.81, 10.0, 142)/350
Differential limit between cylinders	98 (0.98, 1.0, 14)/350

Inspection and Adjustment (Cont'd)

VALVE SEAT



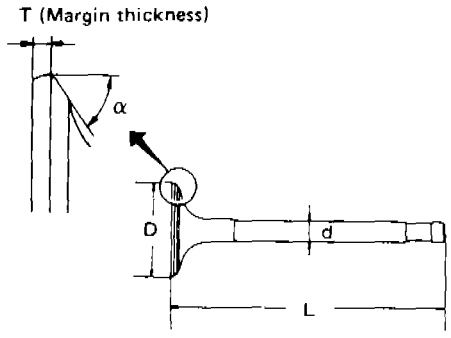
SEM573B

Unit: mm (in)

	Standard		Service	
	Intake	Exhaust	Intake	Exhaust
Cylinder head seat recess diameter (D)	36.000 - 36.016 (1.4173 - 1.4179)	30.000 - 30.016 (1.1811 - 1.1817)	36.500 - 36.516 (1.4370 - 1.4376)	30.500 - 30.516 (1.2008 - 1.2014)
Valve seat outer diameter (D_1)	36.097 - 36.113 (1.4211 - 1.4218)	30.080 - 30.096 (1.1842 - 1.1849)	36.597 - 36.613 (1.4408 - 1.4415)	30.580 - 30.596 (1.2039 - 1.2046)
Face outer diameter (D_2)	33.6 - 33.8 (1.323 - 1.331)	27.4 - 27.6 (1.079 - 1.087)	33.6 - 33.8 (1.323 - 1.331)	27.4 - 27.6 (1.079 - 1.087)
Face inner diameter (D_3)	31.5 (1.240)	24.9 (0.980)	31.5 (1.240)	24.9 (0.980)
Valve seat inner diameter (D_4)	29.85 - 30.15 (1.1752 - 1.1870)	22.85 - 23.15 (0.8996 - 0.9114)	29.9 - 30.1 (1.177 - 1.185)	22.85 - 23.15 (0.8996 - 0.9114)
Height (H)	5.9 - 6.0 (0.232 - 0.236)	6.4 - 6.5 (0.252 - 0.256)	5.35 - 5.45 (0.2106 - 0.2146)	5.75 - 5.85 (0.2264 - 0.2303)

Inspection and Adjustment (Cont'd)

VALVE



SEM188A

Unit: mm (in)

		Standard	Limit
Valve head diameter (D)	In.	34.0 - 34.2 (1.339 - 1.346)	—
	Ex.	28.0 - 28.2 (1.102 - 1.110)	—
Valve length (L)	In.	88.8 - 89.0 (3.496 - 3.504)	—
	Ex.	89.2 - 89.4 (3.512 - 3.520)	—
Valve stem diameter (d)	In.	5.965 - 5.980 (0.2348 - 0.2354)	—
	Ex.	5.945 - 5.960 (0.2341 - 0.2346)	—
Valve face angle (α)	In.	45°30'	—
	Ex.	45°30'	—
Valve head margin (T)	In.	1.3 (0.051)	0.5 (0.020)
	Ex.	1.5 (0.059)	

VALVE SPRING

Unit: mm (in)

	Standard	Limit
Free height (H)	43.1 (1.697)	—
Spring constant N/mm (kg/mm, lb/in)	28.4 (2.9, 162)	—
Out-of-square (S)	—	1.8 (0.071)

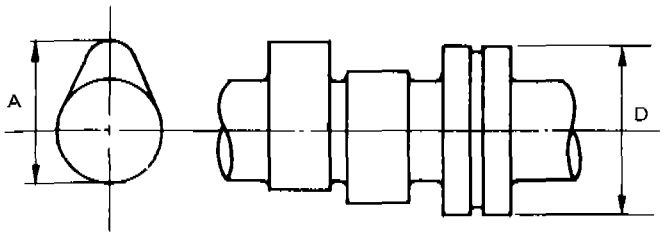
HYDRAULIC VALVE LIFTER

Unit: mm (in)

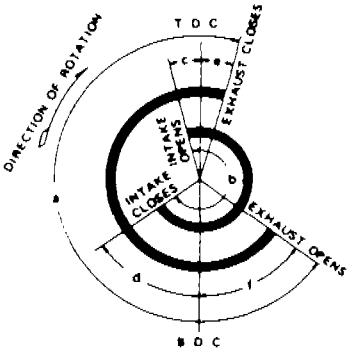
Valve lifter diameter	30.955 - 30.965 (1.2187 - 1.2191)
Lifter guide bore diameter	31.000 - 31.013 (1.2205 - 1.2210)

Inspection and Adjustment (Cont'd)

CAMSHAFT AND CAMSHAFT BEARING



SEM568A



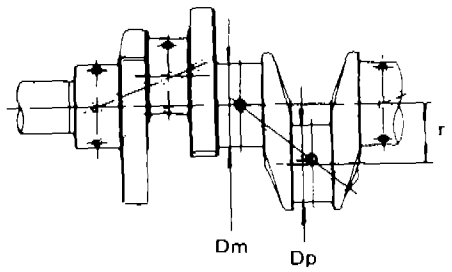
EM120

Unit: mm (in)

		Standard	Limit
Cam height (A)	In.	39.785 - 39.815 (1.5663 - 1.5675)	—
	Ex.	40.485 - 40.515 (1.5939 - 1.5951)	—
Valve lift	In.	7.8 (0.307)	—
	Ex.	8.5 (0.335)	—
Wear limit of cam height		—	0.2 (0.008)
Camshaft journal to bearing clearance		0.045 - 0.090 (0.0018 - 0.0035)	0.15 (0.0059)
Inner diameter of camshaft bearing		28.000 - 28.025 (1.1024 - 1.1033)	—
Outer diameter of camshaft journal (D)		27.935 - 27.955 (1.0998 - 1.1006)	—
Camshaft runout		—	0.05 (0.0020)
Camshaft end play		0.07 - 0.15 (0.0028 - 0.0059)	0.2 (0.008)
Valve timing (Degree on crankshaft)	a	248	—
	b	240	—
	c	0	—
	d	60	—
	e	9	—
	f	59	—

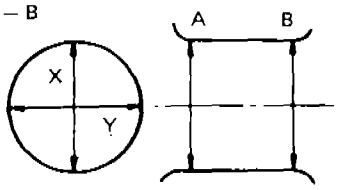
Inspection and Adjustment (Cont'd)

CRANKSHAFT



EM737

Out-of-round X — Y
Taper A — B



EM715

Unit: mm (in)

Main journal diameter (Dm)	52.951 - 52.975 (2.0847 - 2.0856)	
Pin journal diameter (Dp)	44.954 - 44.974 (1.7698 - 1.7706)	
Center distance (r)	41.77 - 41.83 (1.6445 - 1.6468)	
	Standard	Limit
Taper of journal and pin (A — B)	—	0.005 (0.0002)
Out-of-round of journal and pin (X — Y)	—	0.005 (0.0002)
Runout [T.I.R.]*	—	0.025 (0.0010)
Free end play	0.05 - 0.18 (0.0020 - 0.0071)	0.3 (0.012)

* Total indicator reading

Inspection and Adjustment (Cont'd)

BEARING CLEARANCE

Unit: mm (in)

	Standard	Limit
Main bearing clearance	0.021 - 0.048 (0.0008 - 0.0019)	0.1 (0.004)
Connecting rod bearing clearance	0.018 - 0.045 (0.0007 - 0.0018)	0.1 (0.004)

AVAILABLE MAIN BEARING

Standard

Grade number	Thickness mm (in)	Identification color
0	1.825 - 1.829 (0.0719 - 0.0720)	Black
1	1.829 - 1.833 (0.0720 - 0.0722)	Brown
2	1.833 - 1.837 (0.0722 - 0.0723)	Green
3	1.837 - 1.841 (0.0723 - 0.0725)	Yellow
4	1.841 - 1.845 (0.0725 - 0.0726)	Blue

Undersize (service)

Unit: mm (in)

	Thickness	Main journal diameter "Dm"
0.25 (0.0098)	1.947 - 1.960 (0.0767 - 0.0772)	Grind so that bearing clearance is the specified value.

AVAILABLE CONNECTING ROD BEARING

Standard

Grade number	Thickness mm (in)	Identification color
0	1.501 - 1.504 (0.0591 - 0.0592)	—
1	1.504 - 1.507 (0.0592 - 0.0593)	Brown
2	1.507 - 1.510 (0.0593 - 0.0594)	Green

Undersize (service)

Unit: mm (in)

	Thickness	Crank pin journal diameter "Dp"
0.08 (0.0031)	1.540 - 1.548 (0.0606 - 0.0609)	Grind so that bearing clearance is the specified value.
0.12 (0.0047)	1.560 - 1.568 (0.0614 - 0.0617)	
0.25 (0.0098)	1.625 - 1.633 (0.0640 - 0.0643)	

MISCELLANEOUS COMPONENTS

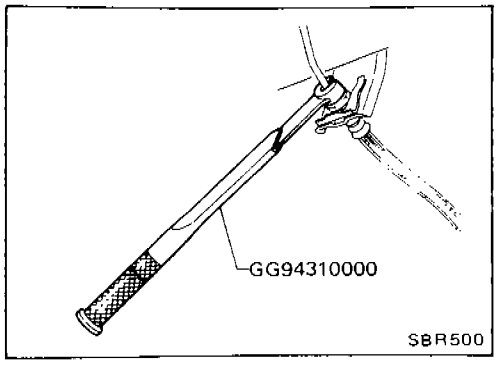
Unit: mm (in)

Camshaft sprocket runout [T.I.R.] *	Less than 0.1 (0.004)
Flywheel runout [T.I.R.] *	Less than 0.15 (0.0059)

* Total indicator reading

TURBOCHARGER

By-pass valve controller diaphragm	0.38 mm (0.0150 in)/ 83.3 - 88.6 kPa (833 - 886 mbar, 625 - 665 mmHg, 24.61 - 26.18 inHg)
Play	0.013 - 0.097 mm (0.0005 - 0.0038 in)



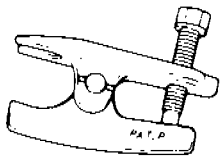
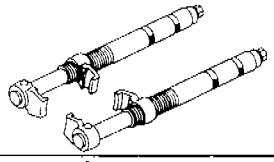
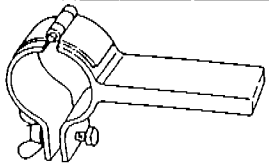
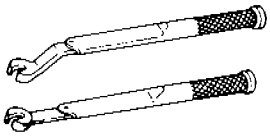
Precautions

- **When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.**
  *** Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**
- **When removing each suspension part, check wheel alignment and adjust if necessary.**
- **Use Tool when removing or installing brake tubes.**

Preparation

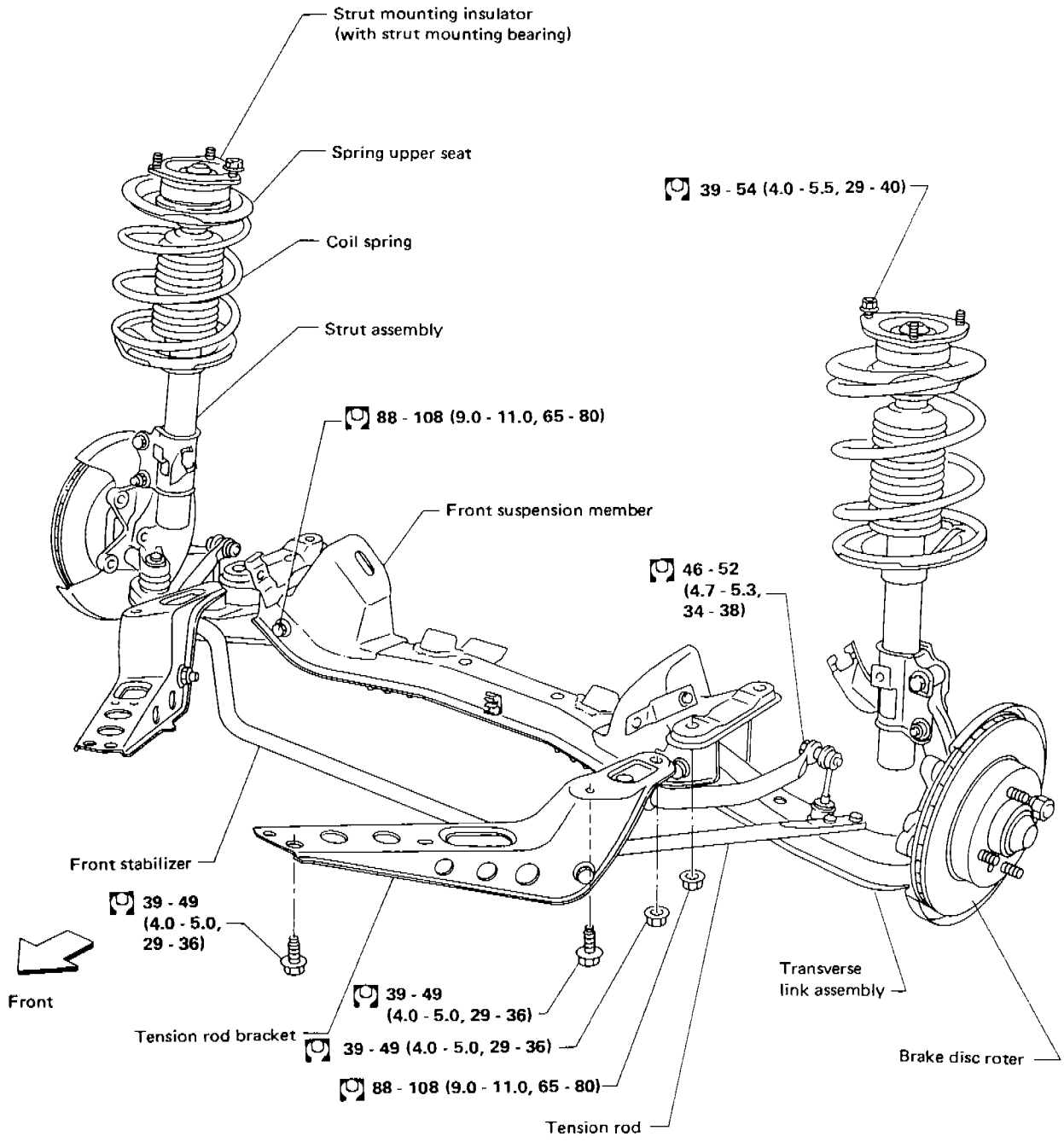
SPECIAL SERVICE TOOLS

*: Special tool or commercial equivalent

Tool number Tool name	Description	
HT72520000* Ball joint remover		Removing tie-rod outer end and lower ball joint
HT71780000* Spring compressor		Removing and installing coil spring
ST35652000* Strut attachment		Fixing strut assembly
GG94310000* Flare nut torque wrench		Removing and installing brake piping

Final tightening for rubber parts requires to be carried out under unladen condition* with tires on ground.

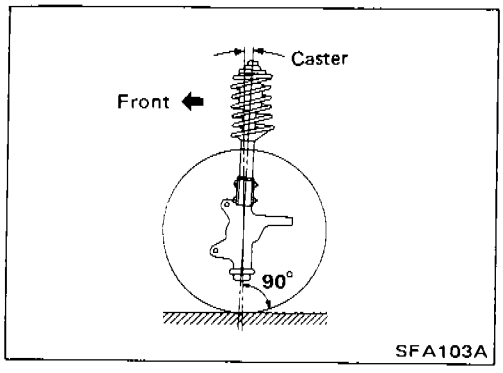
* Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools and mats in designated positions.



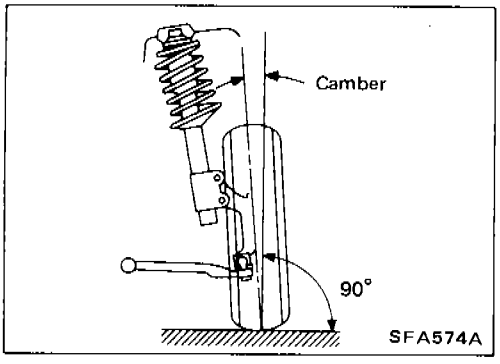
: N·m (kg-m, ft-lb)

SFA540A

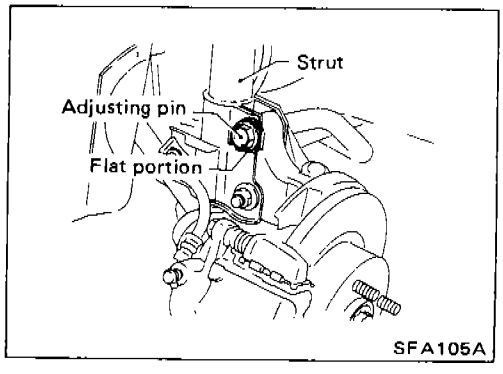
Front Wheel Alignment (Cont'd)



Caster:
5°55′ - 7°25′



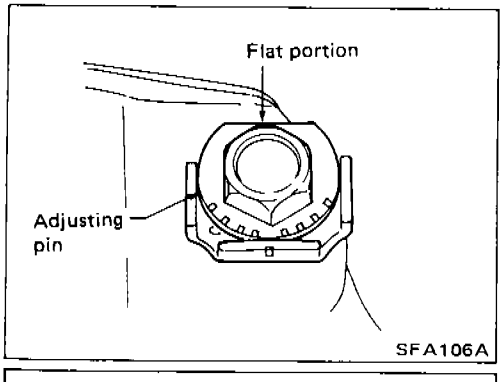
Camber:
–1°25′ to 5′



If camber is not within specification, adjust by turning adjusting pin as follows:

(1) Remove adjusting pin

Adjusting pin is installed with flat portion facing downward.



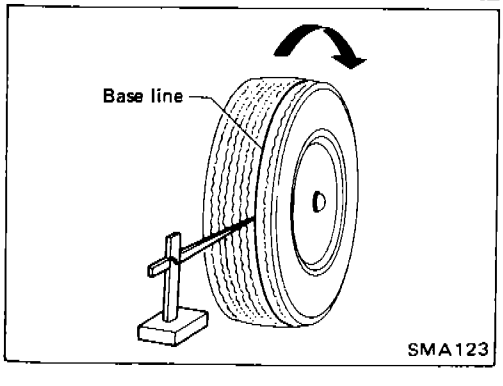
(2) Next replace adjusting pin with flat portion facing upward.

(3) Turn adjusting pin to adjust.

Camber changes about 5′ with each graduation of adjusting pin.

(4) Tighten adjusting pin to specified torque.

: 124 - 143 N·m (12.6 - 14.6 kg-m, 91 - 106 ft-lb)

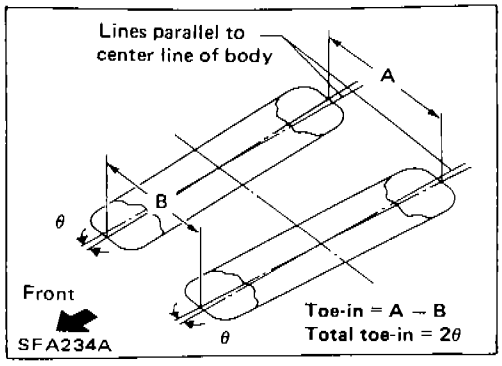


TOE-IN

1. Draw a base line on tread surface of tires.

After lowering front of vehicle, move it up and down to eliminate friction, and set steering wheel in straight-ahead position.

Front Wheel Alignment (Cont'd)



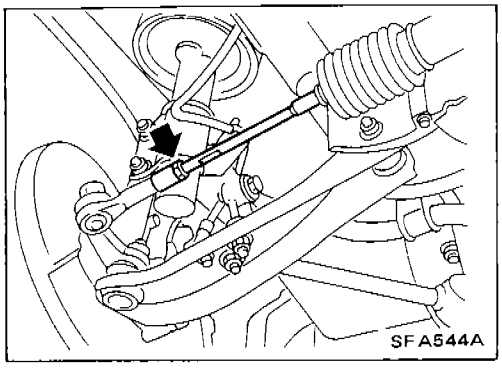
2. Measure toe-in.

Measure distance "A" and "B" at same height as hub center.

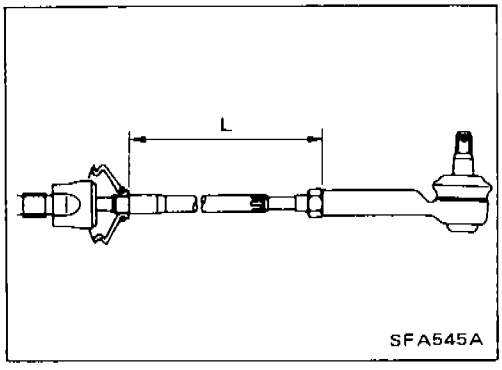
Toe-in:

A – B 0 - 2 mm (0 - 0.08 in)

2θ (Total toe-in) 0′ to 12′



3. Adjust toe-in by varying length of steering tie-rods.
(1) Loosen lock nuts.
(2) Adjust toe-in by turning forward and reverse tie-rod.



Make sure both tie-rods are the same length.

Standard length "L" — reference data:

174.8 mm (6.88 in)

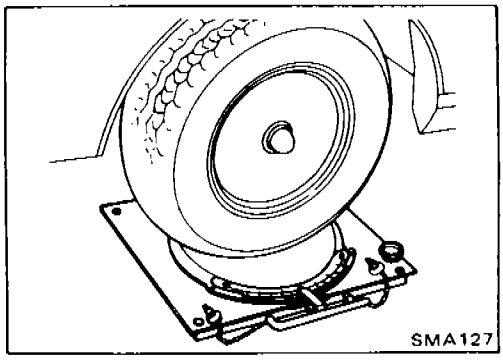
(3) Fix lock nuts, then tighten them designed torque.

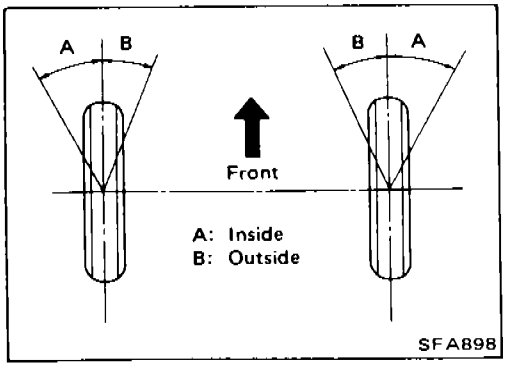
: 37 - 46 N·m

(3.8 - 4.7 kg-m, 27 - 34 ft-lb)

FRONT WHEEL TURNING ANGLE

1. Set wheels in straight-ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.

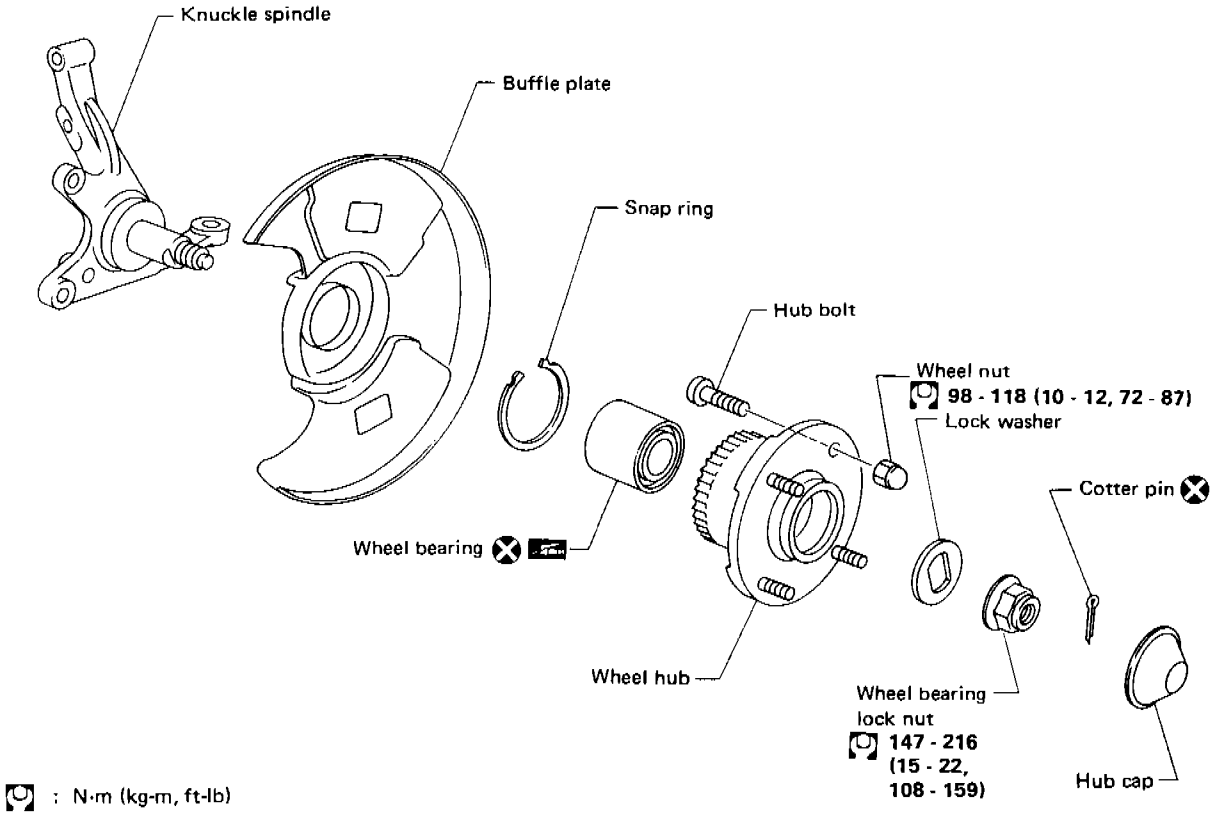


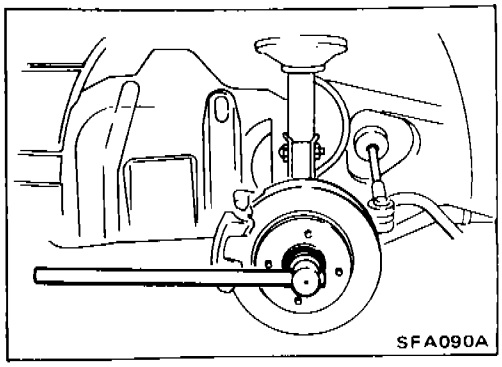


2. Rotate fully steering wheel to the right or left; measure turning angle.

Wheel turning angle:

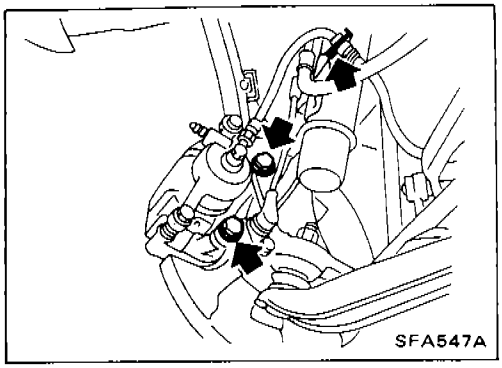
Full turns	Except Europe L.H.D. model	Inside wheel: A	39° - 43°
		Outside wheel: B	33°
	Europe L.H.D. model	Inside wheel: A	36° - 40°
		Outside wheel: B	32°


Knuckle spindle
Buffle plate
Snap ring
Hub bolt
Wheel nut
98 - 118 (10 - 12, 72 - 87)
Lock washer
Cotter pin
Wheel bearing
Wheel hub
Wheel bearing lock nut
147 - 216 (15 - 22, 108 - 159)
Hub cap
: N·m (kg-m, ft-lb)
SFA546A


SFA090A

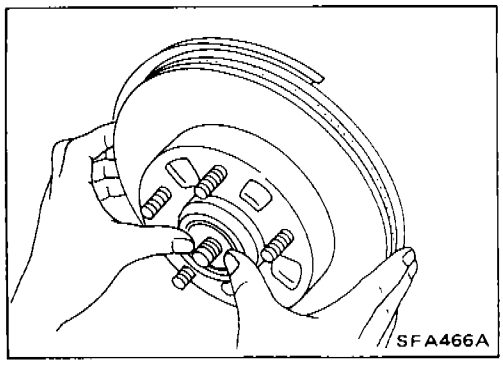
Removal

- Remove wheel bearing lock nut.

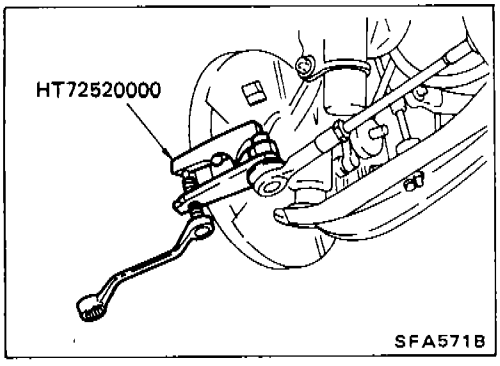

SFA547A

- Remove brake caliper assembly.

Brake hose need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Make sure brake hose is not twisted.

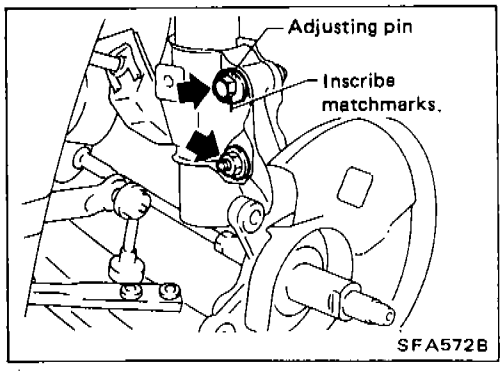

SFA466A

- Remove rotor and wheel hub from spindle.



SFA571B

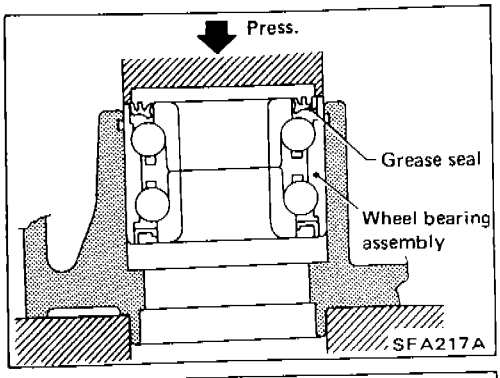
- Remove tie-rod ball joint and lower ball joint.

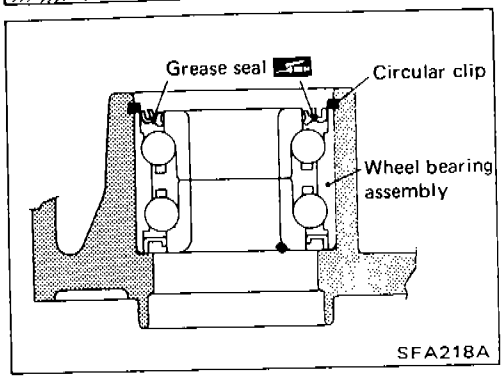


SFA572B

- Remove bolts and nuts as shown at left.

Make matchmarks before removing adjusting pin.





Assembly

1. Press new wheel bearing assembly into wheel hub from inside of rotor disc (with wheel hub).
   Maximum load P:
   29 kN (3 t, 3.3 US ton, 3.0 Imp ton)

CAUTION:

- **Do not press inner race of wheel bearing assembly.**
- **Do not apply oil or grease to mating surfaces of wheel bearing outer race and wheel hub.**
  Be careful not to damage grease seal.

2. Install circular clip into groove of wheel hub.
3. Apply multi-purpose grease to sealing lip.

Inspection (Cont'd)

STRUT MOUNTING INSULATOR

- Check cemented rubber-to-metal portion for separation or cracks. Check rubber parts for deterioration.
- Check thrust bearing parts for abnormal noise or excessive rattle in axial direction.
  Replace if necessary.

LOCK WASHER

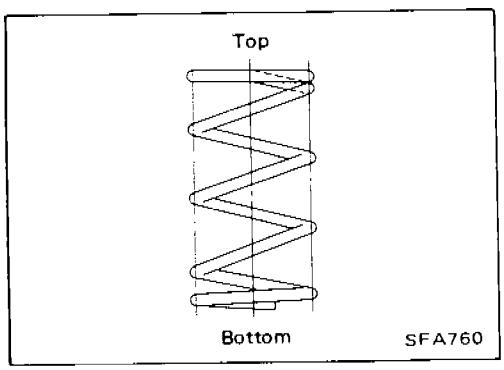
- Check for cracks, deformation or other damage. Replace if necessary.

COIL SPRING

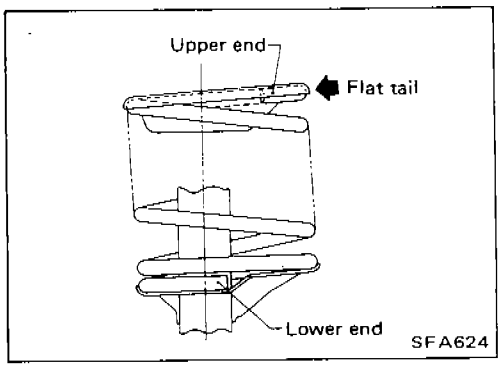
- Check for cracks, deformation or other damage. Replace if necessary.

Assembly

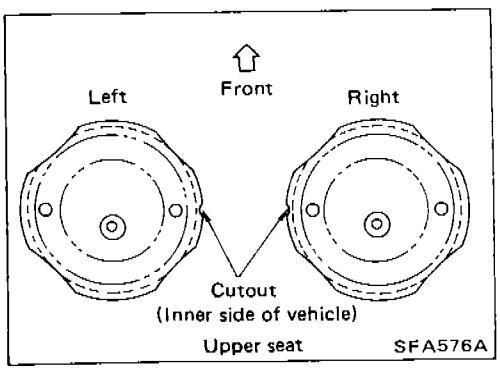
- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)



- When installing coil spring on strut, it must be positioned as shown in figure at left.



- Install upper spring seat with its cutout facing the inner side of vehicle.



General Specifications

COIL SPRING

Item \ Model	Europe	Except Europe
Wire diameter mm (in)	12.7 (0.500)	
Coil diameter mm (in)	170 (6.69)	
Free length mm (in)	360 (14.17)	350 (13.78)
Spring constant N/mm (kg/mm, lb/in)	15.7 (1.6, 90)	
Identification color	Pink x 1	Yellow x 1

FRONT STABILIZER BAR

Stabilizer diameter mm (in)	25 (0.98)
Identification color	Orange

STRUT

Piston rod diameter mm (in)	20.0 (0.787)
Stroke mm (in)	160 (6.30)
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)	
Expansion	912 - 1,245 (93 - 127, 205 - 280)
Compression	392 - 588 (40 - 60, 88 - 132)

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

Camber	degree	−1°25′ to 5′
Caster	degree	5°55′ - 7°25′
Toe-in (Total)	mm (in)	0 - 2 (0 - 0.08)
	degree	0′ - 12′
Kingpin inclination	degree	12°25′ - 13°55′
Front wheel turning angle Full turn*2 inside/outside	degree	36° - 40°/32°*3 39° - 43°/33°*4

*1: Tankful of fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, mats in designated position.
*2: On power steering models, wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.
*3: Europe L.H.D. model
*4: Except Europe L.H.D. model

WHEEL BEARING

Wheel bearing axial end play mm (in)	0.03 (0.0012) or less
Wheel bearing lock nut Tightening tirque N·m (kg-m, ft-lb)	147 - 216 (15 - 22, 108 - 159)

LOWER BALL JOINT

Swing force (Measuring point: cotter pin hole of ball stud) N (kg, lb)	7.8 - 55.9 (0.8 - 5.7, 1.8 - 12.6)
Turning torque N·m (kg-cm, in-lb)	0.49 - 3.43 (5.0 - 35, 4.3 - 30.4)
Vertical end play mm (in)	0 (0)

WHEEL RONOUT (Radial and lateral)

Wheel type	Radial runout	Lateral runout
Aluminum wheel mm (in)	0.3 (0.012) or less	
Steel wheel mm (in)	0.5 (0.020) or less	0.8 (0.031) or less

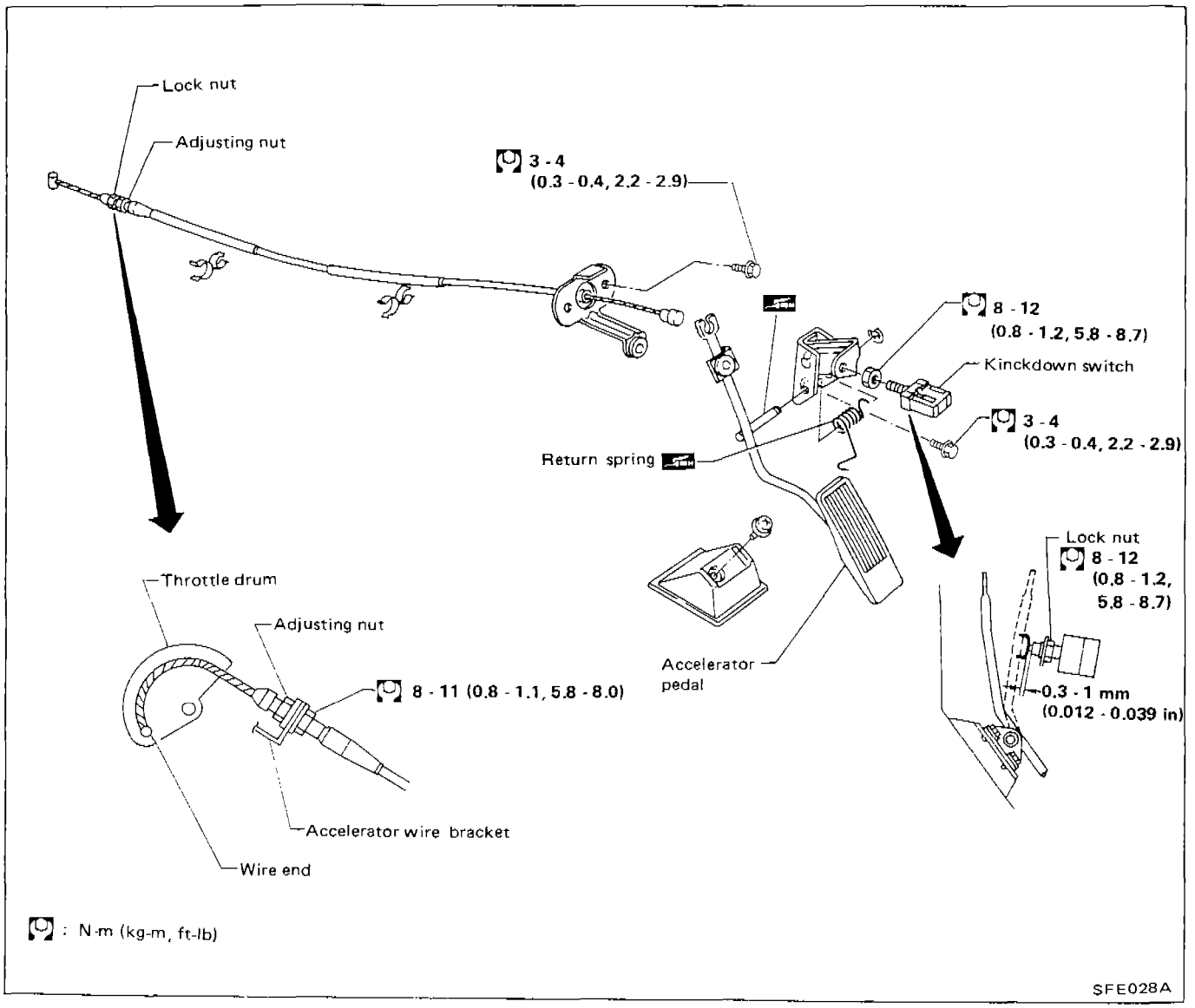
ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

SECTION FE

CONTENTS

Accelerator Control System

- When removing accelerator wire, make a mark to indicate lock nut's initial position.
- Check that throttle valve fully opens when accelerator pedal is fully depressed and that it returns to idle position when pedal is released.
- Adjust accelerator wire according to the following procedure.
  Tighten "adjusting nut" until "throttle drum" starts to move.
  From that position turn back "adjusting nut" 1.5 to 2 turns, and fasten it with a lock nut.
- Check accelerator control parts for improper contact with any adjacent parts.
- When connecting accelerator wire, be careful not to twist or scratch its inner wire.



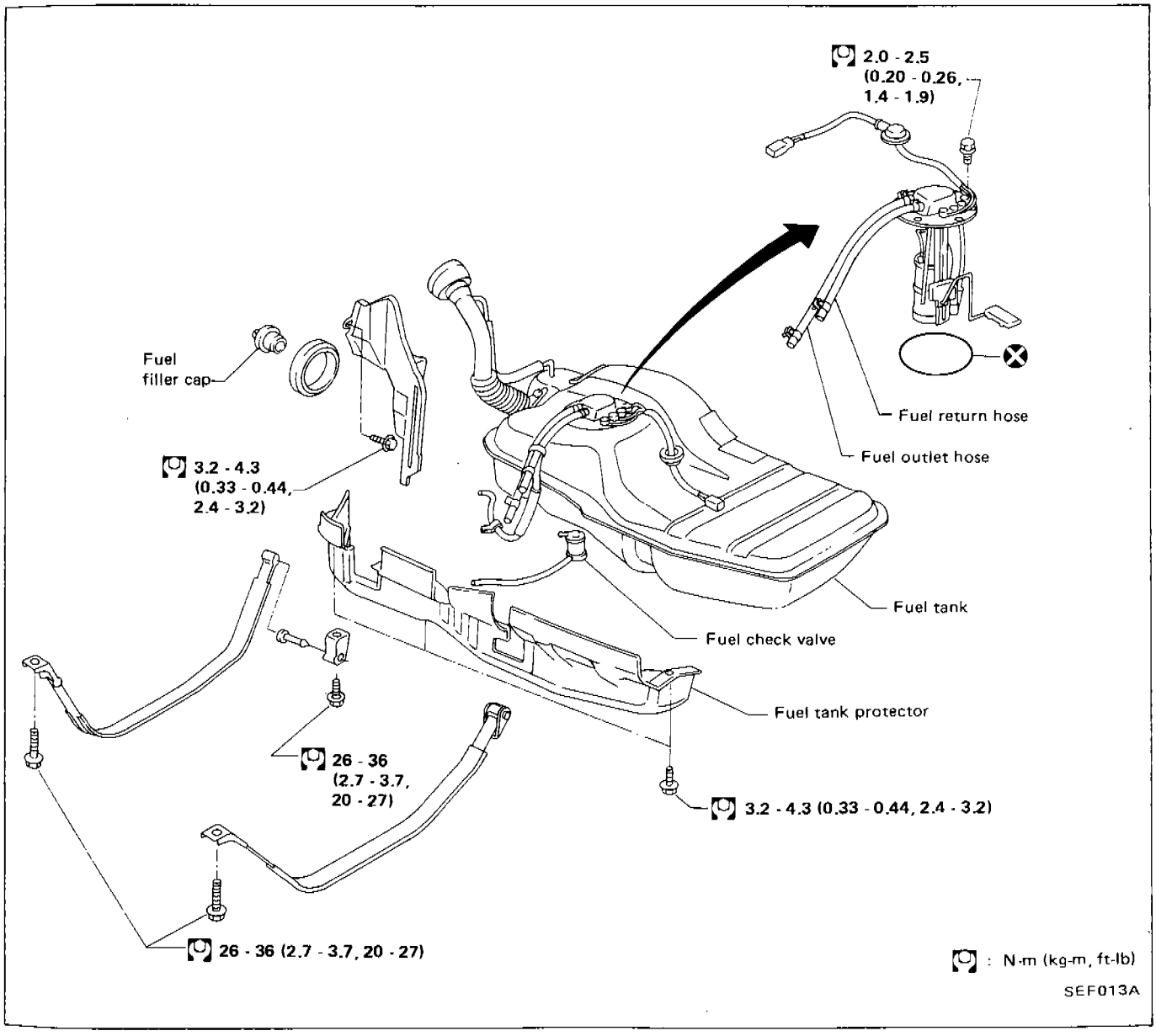
WARNING:

When replacing fuel line parts, be sure to observe the following:

- Put a "CAUTION: INFLAMMABLE" sign in workshop.
- Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Be sure to disconnect battery ground cable before conducting operations.
- Put drained fuel in an explosion-proof container and put lid on securely.

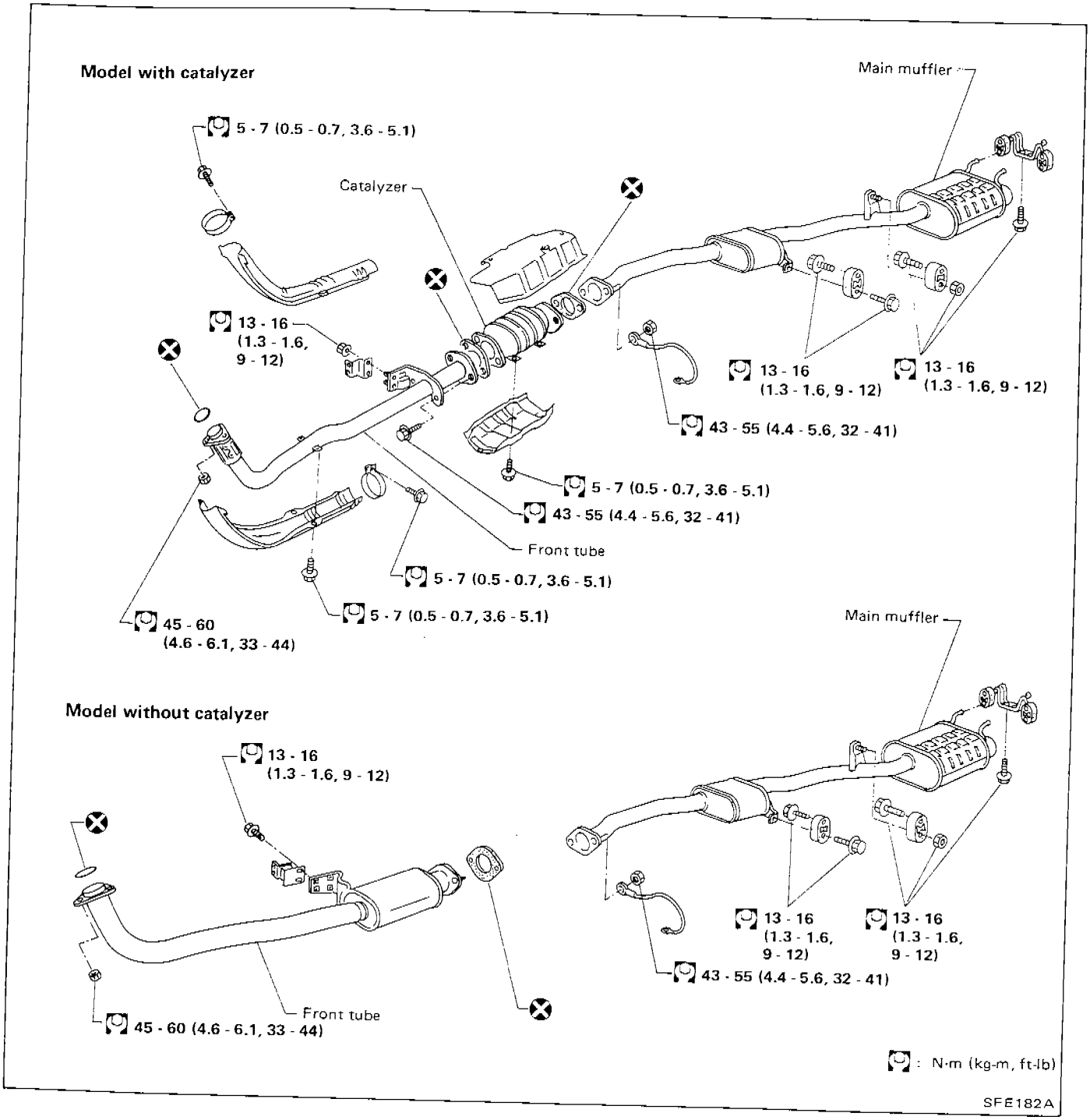
CAUTION:

- For electric fuel pump model, before disconnecting fuel hose, release fuel pressure from fuel line. Refer to "Changing Fuel Filter" in MA section.
- Do not disconnect any fuel line unless absolutely necessary.
- Plug hose and pipe openings to prevent entry of dust or dirt.
- Always replace O-ring and clamps with new ones.
- Do not kink or twist hose and tube when they are installed.
- Do not tighten hose clamps excessively to avoid damaging hoses.
- When installing fuel check valve, be careful of its designated direction. (Refer to section EF & EC.)
- Run engine and check for leaks at connections.



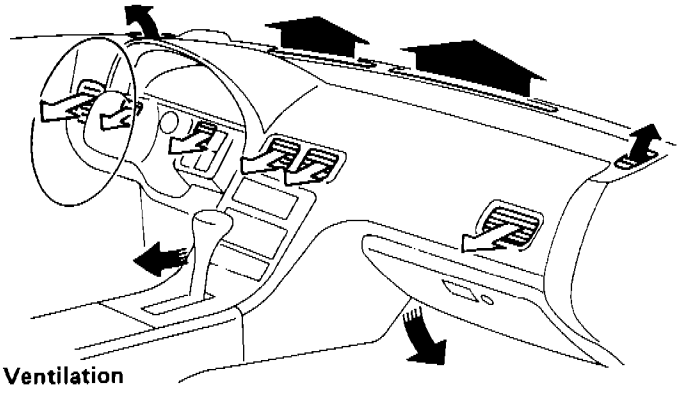
CAUTION:

- Always replace exhaust gaskets with new ones when disassembling.
- Check all tube connections for exhaust gas leaks, and entire system for unusual noises, with engine running.
- After installation, check that mounting brackets and mounting insulator are free from undue stress. If any of above parts are not installed properly, excessive noise or vibration may be transmitted to vehicle body.

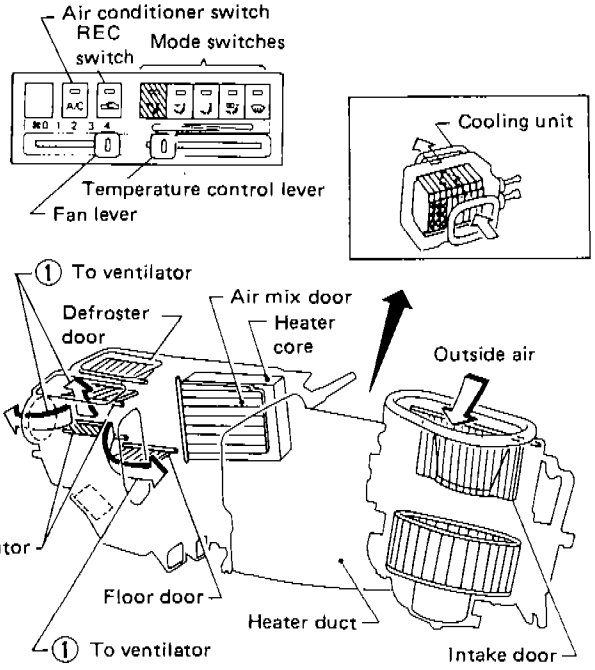


Air Flow

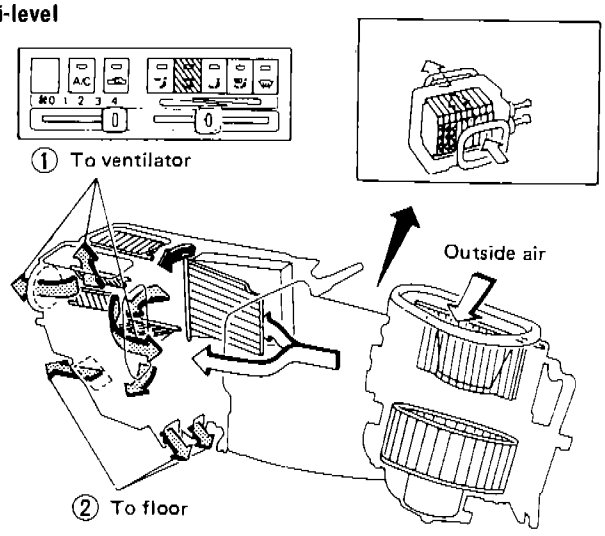
EXCEPT EUROPE MODEL



Ventilation

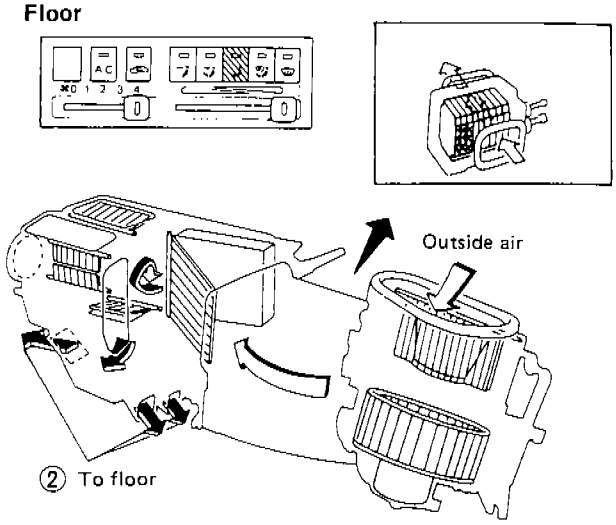


Bi-level

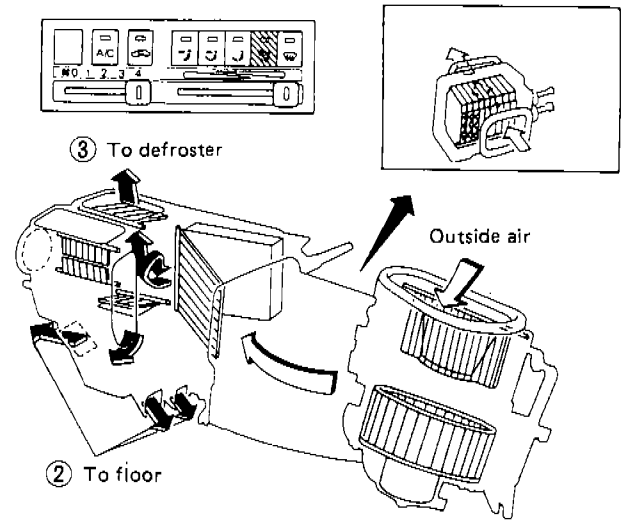


This illustration is for L.H. drive models.
For R.H. drive models, it is basically same.

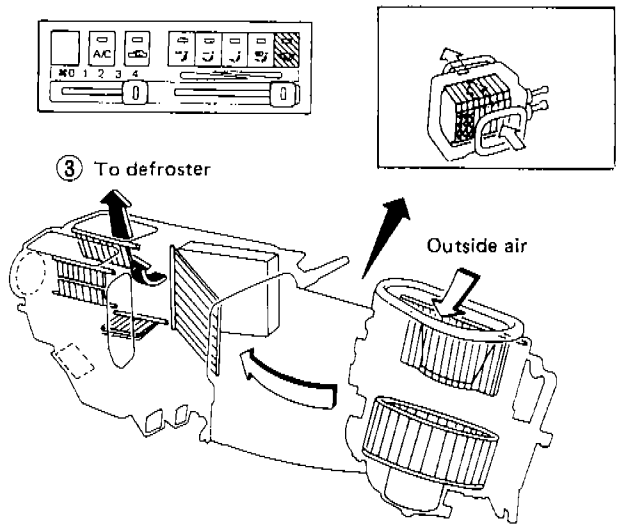
Floor



Floor and defroster



Defroster



: Air passed through heater core

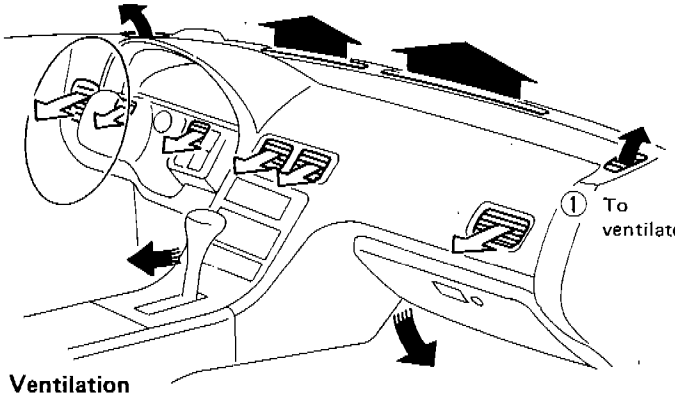
: Mixed air (◀ + ◁)

: Air not passed through heater core

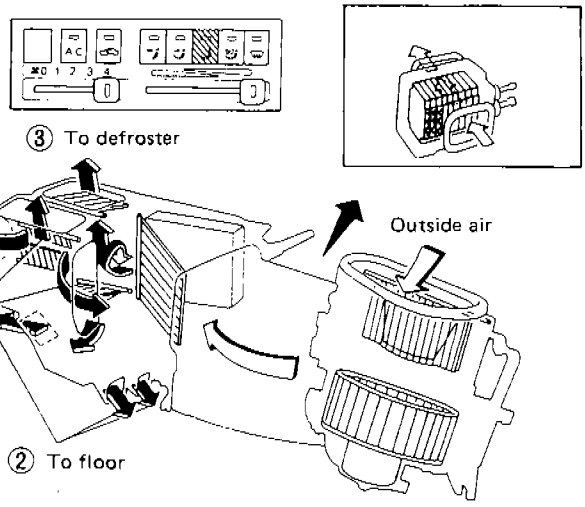
RHA625A

Air Flow (Cont'd)

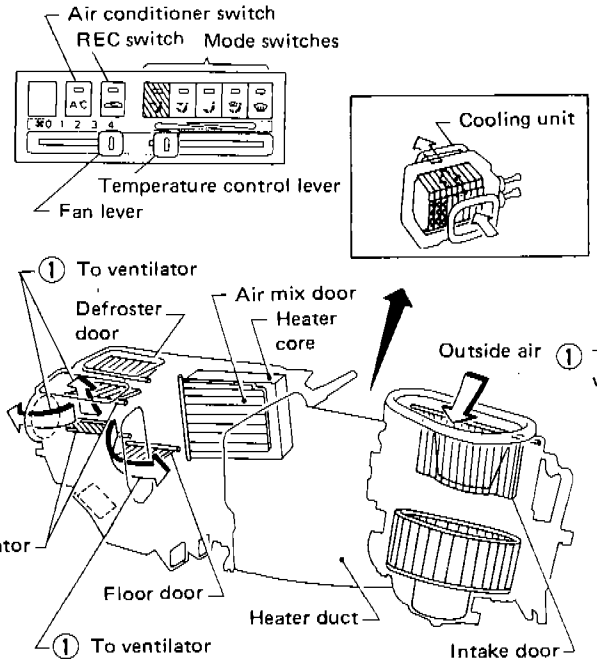
EUROPE MODEL



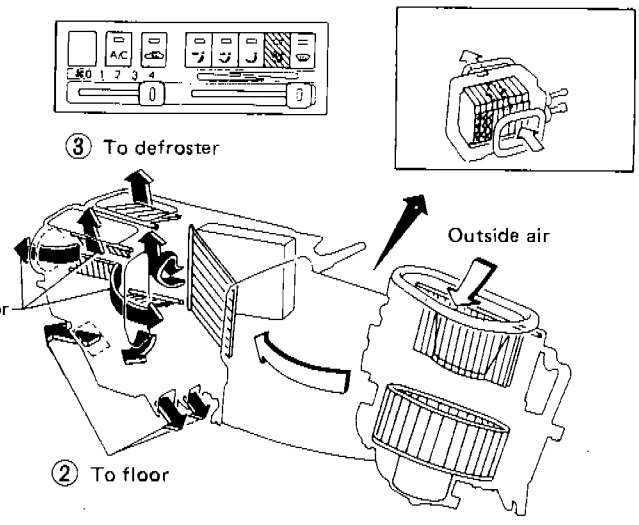
Floor



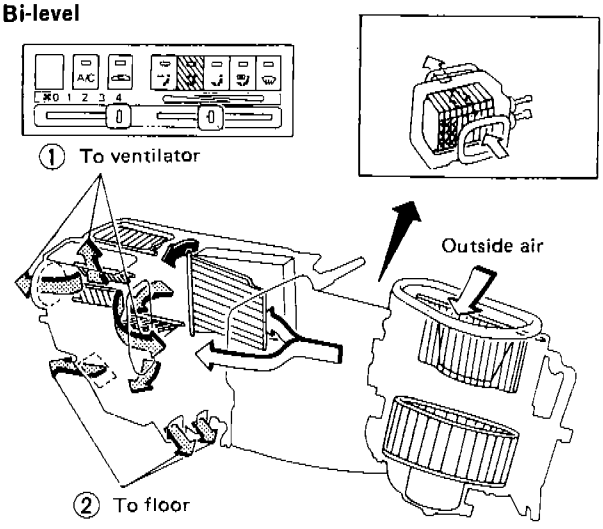
Ventilation



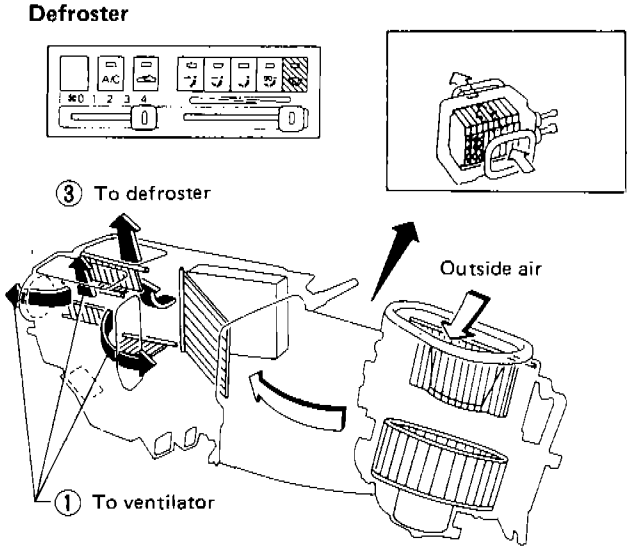
Floor and defroster



Bi-level



Defroster



: Air passed through heater core

: Mixed air (+)

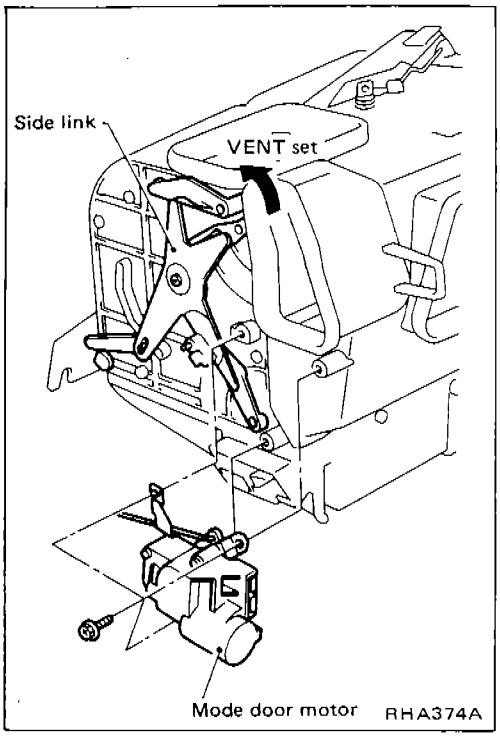
: Air not passed through heater core

This illustration is for L.H. drive models.
For R.H. drive models, it is basically same.

RHA626A

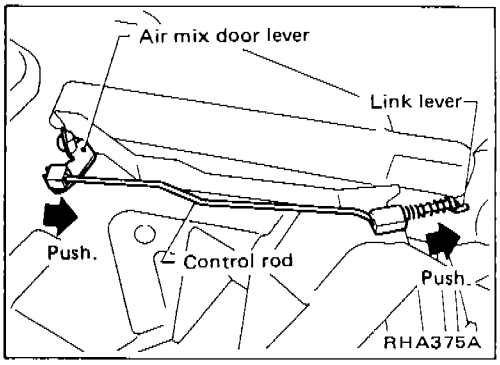
Control Cable Adjustment

- **When disconnecting the control cable, remove the E-ring and take off the cable while pushing the cable outer.**
- **The following illustrations are for L.H. drive models. For R.H. drive models, it is basically same.**



MODE DOOR

1. Move side link with hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to body harness.
3. Turn ignition switch to ACC.
4. Turn VENT switch ON.
5. Attach mode door motor rod to side link rod holder.
6. Turn DEF switch ON. Check that side link operates at the fully-open position. Also turn VENT switch ON to check that side link operates at the fully-open position.

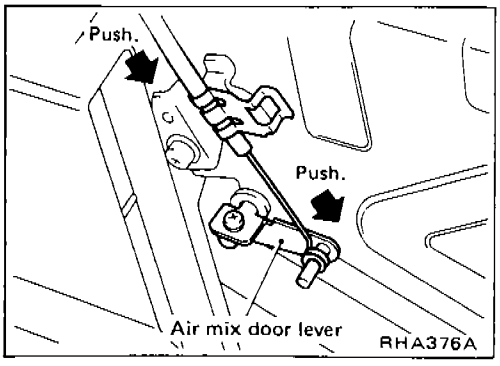


WATER COCK CONTROL ROD

- **When adjusting water cock control rod, first disconnect temperature control cable from air mix door lever. Reconnect and readjust temperature control cable.**

1. Push air mix door lever in direction of arrow.
2. Pull control rod of water cock in direction of arrow so as to make clearance of about 2 mm (0.08 in) between ends of rod and link lever and connect the rod to door lever.

After connecting control rod, check it operates properly.

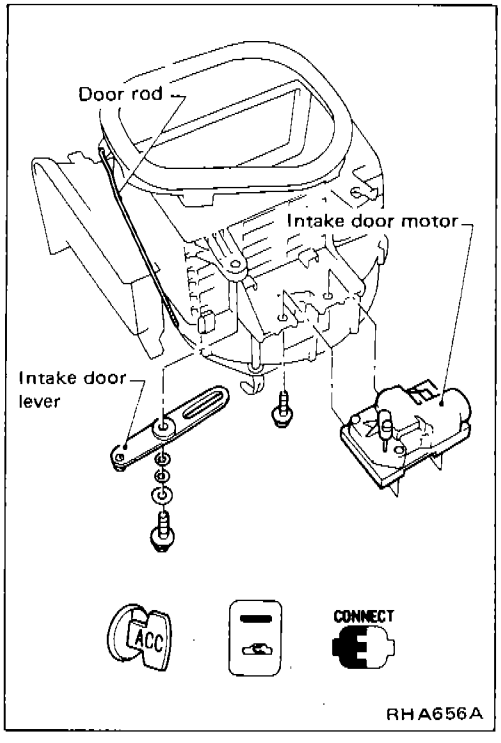


TEMPERATURE CONTROL CABLE

- Clamp the cable while pushing cable outer and air mix door lever in direction of arrow.

After positioning control cable, check it operates properly.

Control Cable Adjustment (Cont'd)

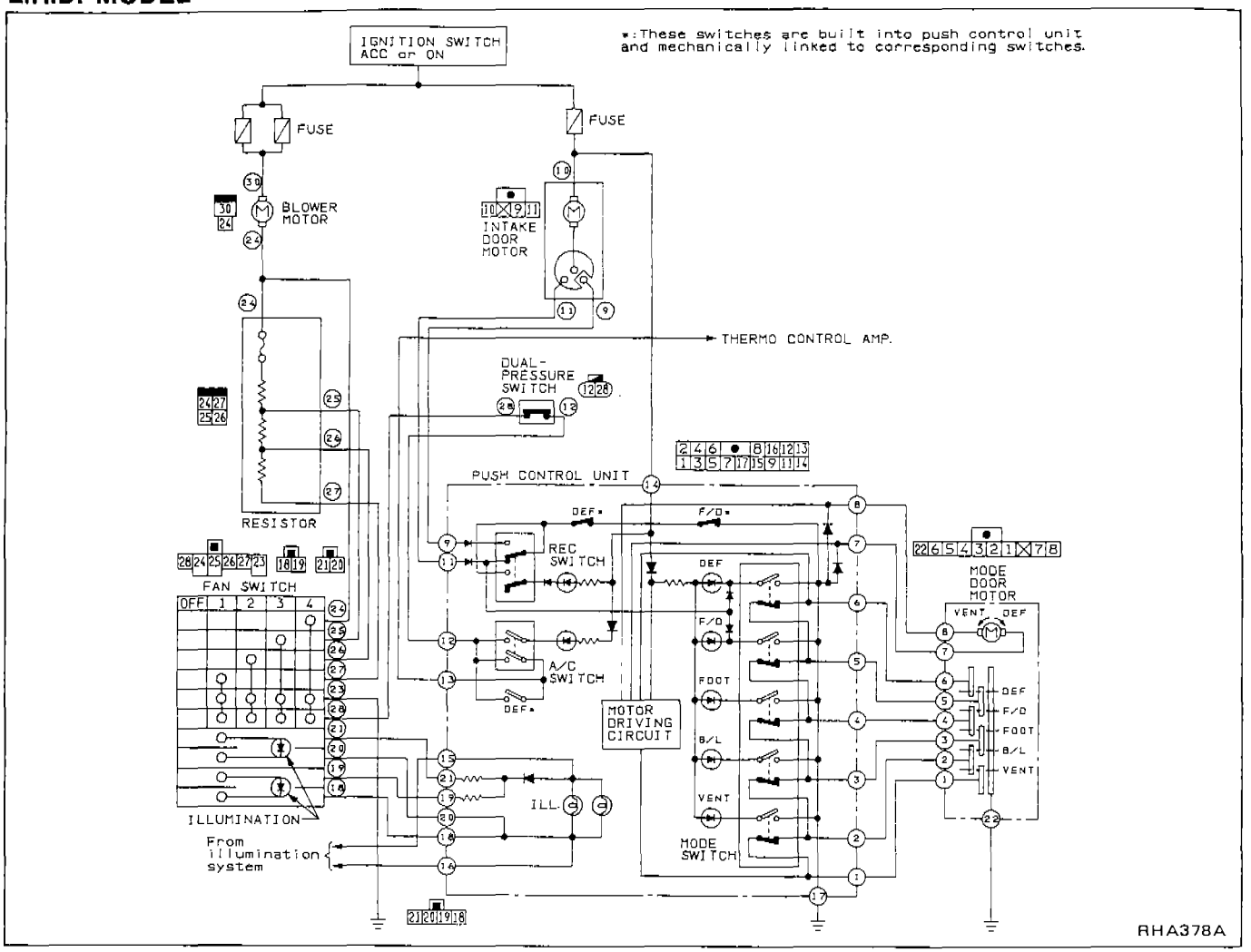


INTAKE DOOR

1. Connect intake door motor harness connector before installing to intake door motor.
2. Turn ignition switch to ACC.
3. Turn REC switch ON.
4. Install intake door motor on intake unit.
5. Install intake door lever.
6. Set intake door lever in REC and secure door rod to holder.
7. Check that intake door operates properly when REC switch is turned ON and OFF.

Push Control System

L.H.D. MODEL



This push control system operates the intake and mode door motors to activate their corresponding doors.

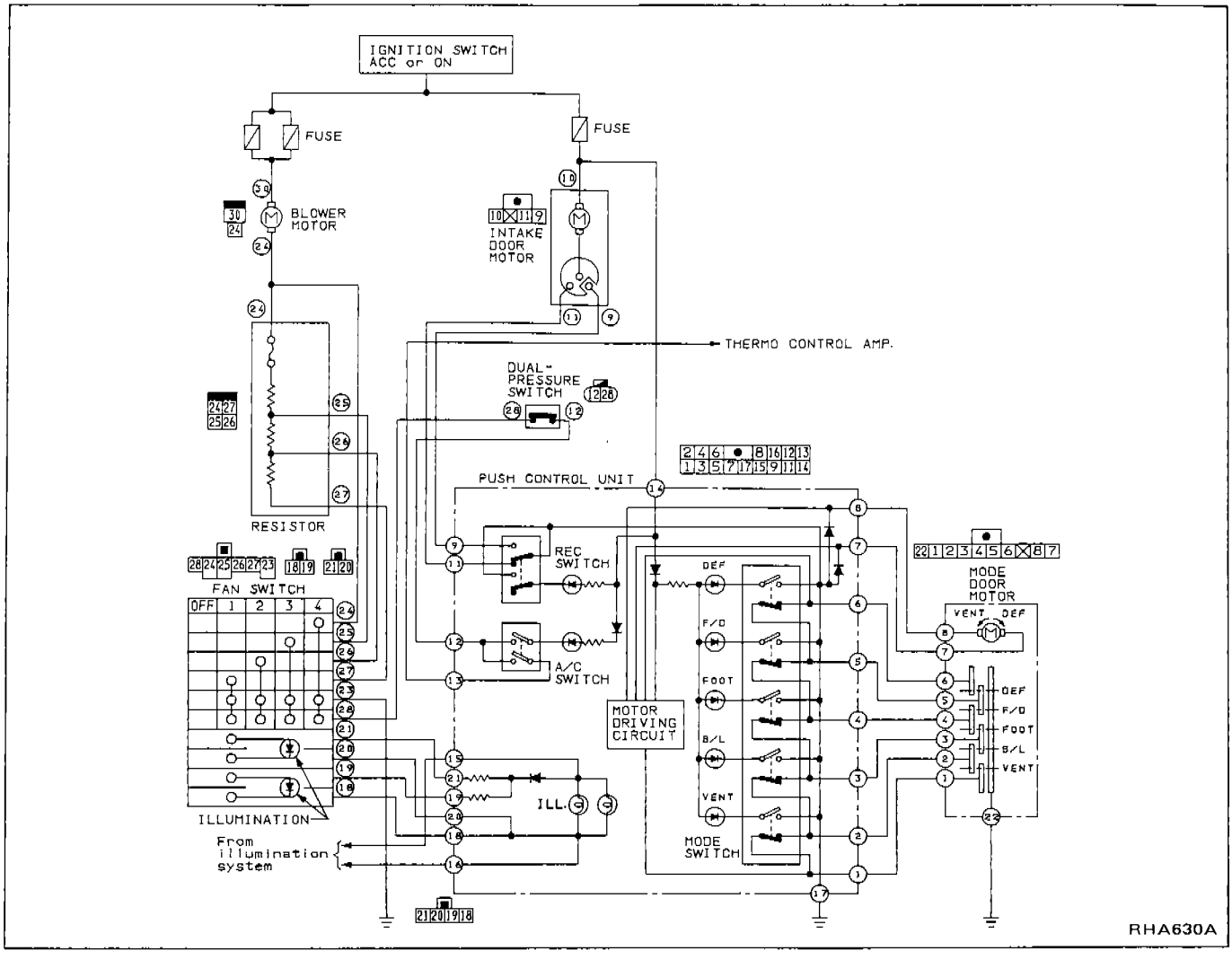
Switches and their control functions

Switch		Indicator illuminates							Air outlet	Intake air	Compressor
		A/C									
A/C		○							Refer to "AIR DISTRIBUTION RATIOS". (See page HA-4.)		ON*1
Mode			○								
				○							
					○						
						○				FRE	
							○			FRE	ON*1
								○*2		REC*2	

*1: Compressor is operated by thermo control amp.
*2: Depending on mode switch position.

Push Control System (Cont'd)

R.H.D. MODEL



This push control system operates the intake and mode door motors to activate their corresponding doors.

Switches and their control functions

Switch		Indicator illuminates							Air outlet	Intake air	Compressor
		A/C									
A/C		○							Refer to "AIR DISTRIBUTION RATIOS". (See page HA-4.)		ON*
Mode			○								
				○							
					○						
						○					
							○				
								○		REC	

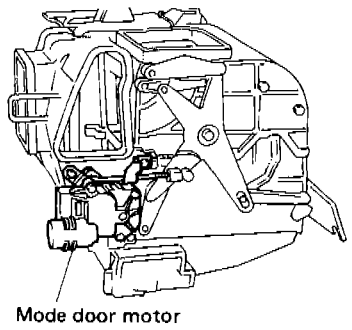
*: Compressor is operated by thermo control amp.

Mode Door Motor (Cont'd)

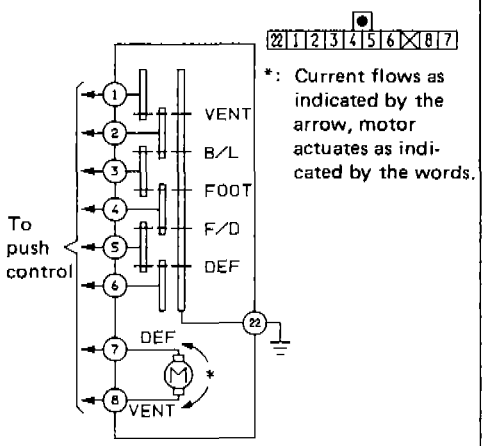
R.H.D. MODEL

The mode door motor is located on the right side of the heater unit. Through the side link it opens and closes the vent, foot and defroster door.

When one mode switch is pushed, the position switch built into it reads the corresponding mode to determine the direction of the motor rotation. As soon as the desired mode is set, the position switch stops the motor.

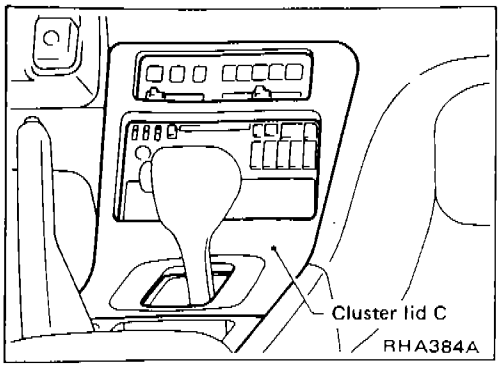


Mode door motor



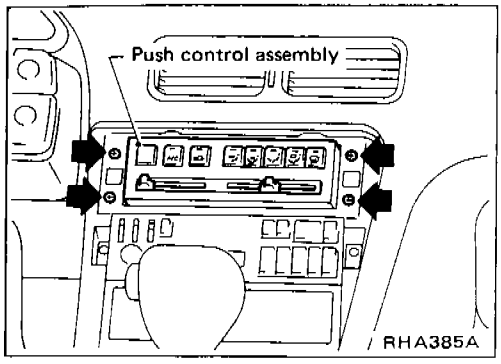
Terminal No.		Mode door motor	
⑦	⑧	Mode door operation	Direction of linkage rotation
⊖	⊖	Stop	Stop
⊖	⊕	VENT → DEF	Counter-clockwise
⊕	⊖	DEF → VENT	Clockwise

RHA631A



Removal and Installation

1. Remove cluster lid C.

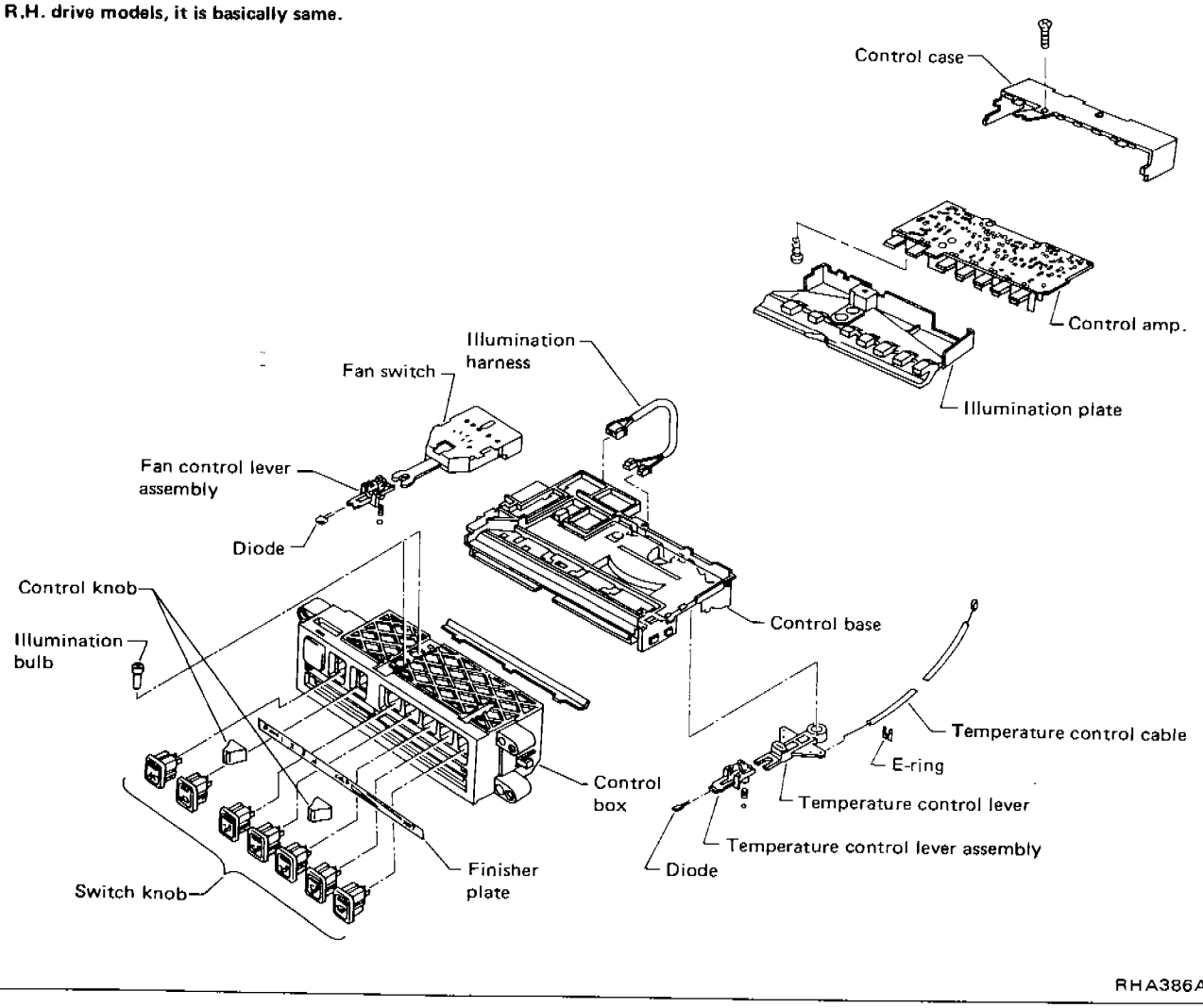


2. Remove audio (radio).
3. Remove four screws of push control unit.
4. Remove temperature control cable.
5. Disconnect push control unit harness connectors.
6. Remove push control unit.
7. Installation is in the reverse order of removal.

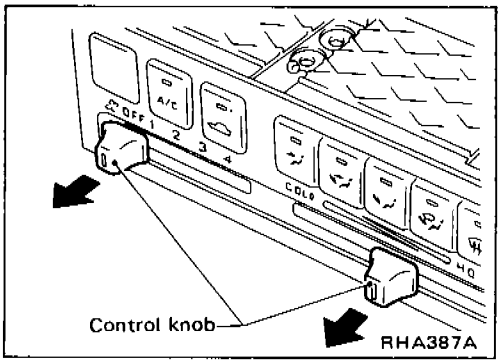
Refer to Control Cable Adjustment for temperature control cable.

Overhaul — Push control unit assembly

This illustration is for L.H. drive models.
For R.H. drive models, it is basically same.

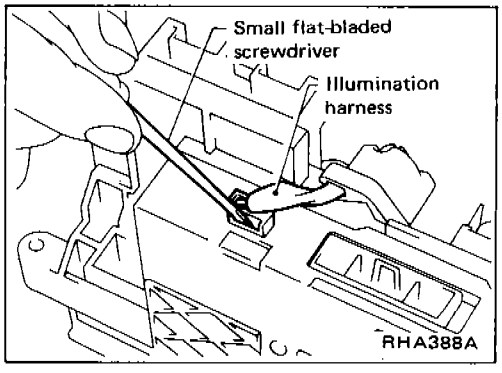


Overhaul — Push control unit assembly (Cont'd)

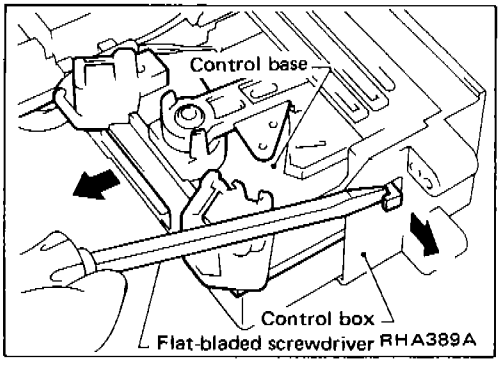


1. Remove two knobs.

Wrap knobs with a cloth and pull in direction indicated by arrow as shown in figure at left. Be careful not to scratch knobs during removal.

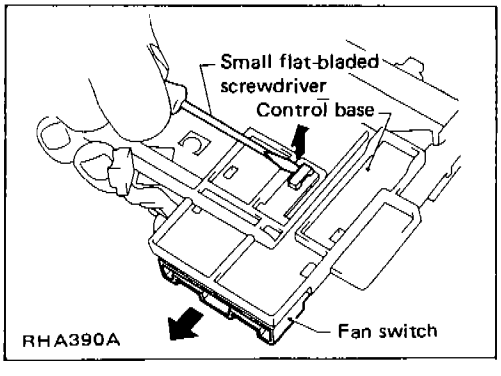


2. Disconnect illumination harness connectors.



3. Remove control base.

Undo hook at each end of control box and remove control base from control box by moving it in direction indicated by arrow.



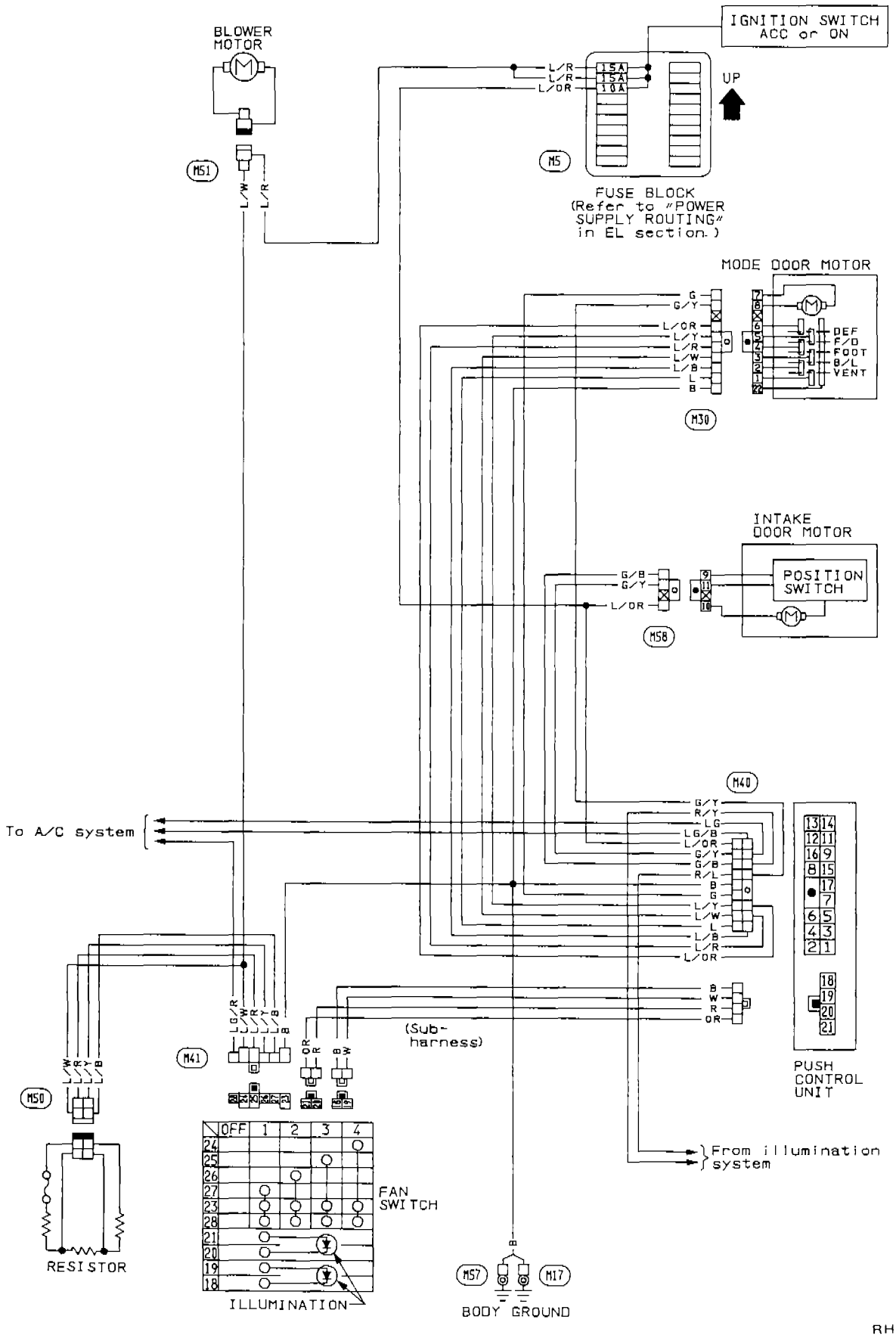
4. Remove fan switch.

5. Remove control knobs.

Wrap finisher with a cloth and remove knobs using pliers or similar tool. Be careful not to scratch finisher's surface.

Wiring Diagram (Cont'd)

R.H.D. MODEL

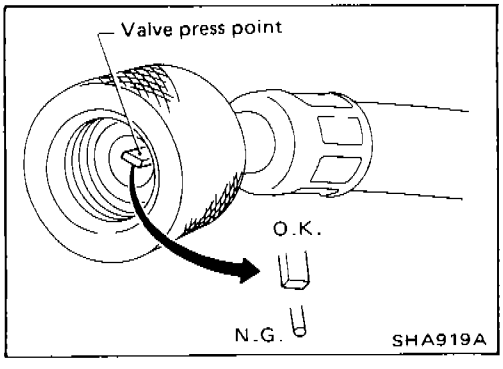


WARNING:

- Always wear eye protection when working around the system.
- Always be careful that refrigerant does not come in contact with your skin.
- Keep refrigerant containers stored below 40°C (104°F) and never drop from high places.
- Work in well-ventilated area because refrigerant gas evaporates quickly and breathing may become difficult due to the lack of oxygen.
- Keep refrigerant away from open flames because poisonous gas will be produced if it burns.
- Do not increase can temperature beyond 40°C (104°F) in charging.
- Do not heat refrigerant can with an open flame. There is a danger that can will explode.

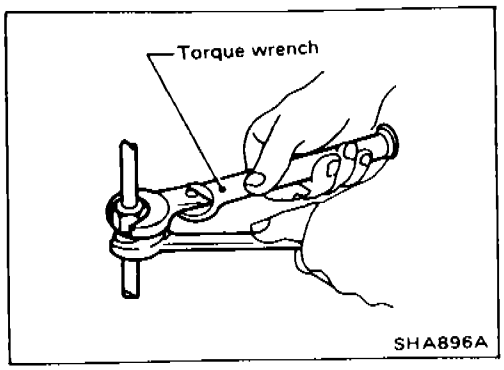
CAUTION:

- Do not use steam to clean surface of condenser or evaporator. Be sure to use cold water or compressed air.
- Compressed air must never be used to clean a dirty line. Clean with refrigerant gas.



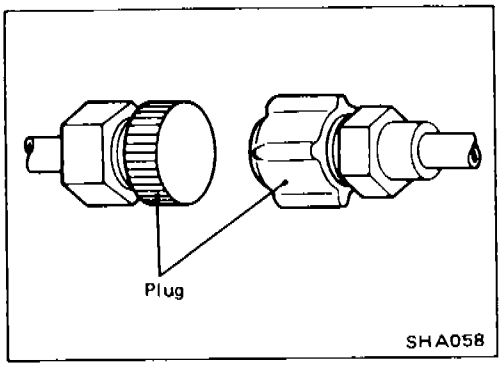
- Do not use manifold gauge whose press point shape is different from that shown. Otherwise, insufficient evacuating may occur.

- Do not over-tighten service valve cap.
- Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

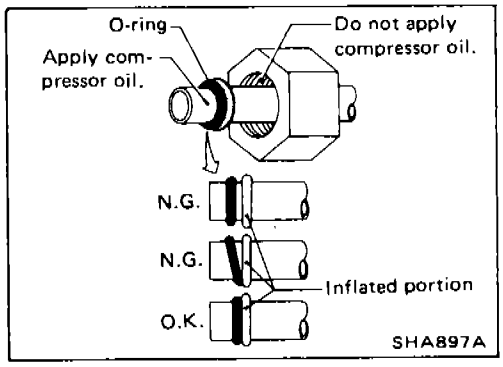


WARNING:
Gradually loosen discharge side hose fitting, and remove it after remaining pressure has been released.
CAUTION:
When replacing or cleaning refrigerant cycle components, observe the following.

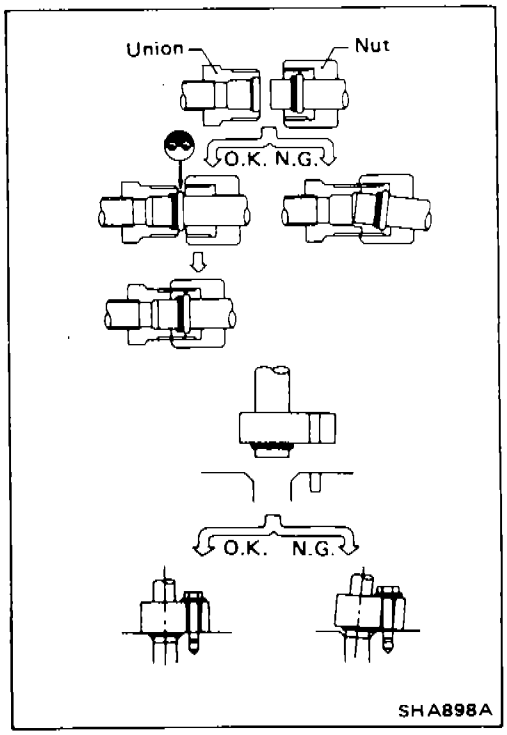
- **Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.**
- **When connecting tubes, always use a torque wrench.**



- **After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.**

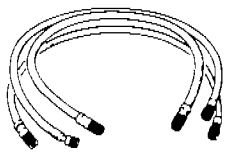
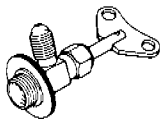
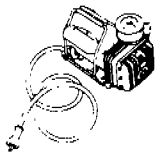
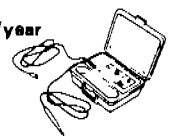


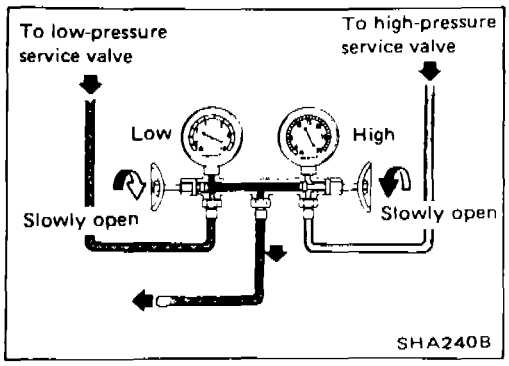
- **Always replace used O-rings.**
- **When connecting tube, apply compressor oil to portions shown in illustration. Be careful not to apply oil to threaded portion.**
- **O-ring must be closely attached to inflated portion of tube.**

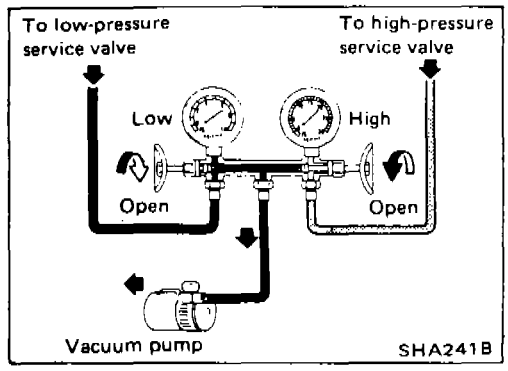


- **After inserting tube into union until O-ring is no longer visible, tighten nut to specified torque.**
- **After connecting line, conduct leak test and make sure that there is no leakage from connections. When the gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.**

SERVICE TOOLS

Tool name	Description	
Manifold gauge		Discharging and charging refrigerant into system
Charging hose		Discharging, evacuating and charging refrigerant into system
Charge valve		Discharging and charging refrigerant into system
Thermometer		Checking temperature
Vacuum pump		Evacuating refrigerant system
Electric leak detector	**Nominal sensitivity:** **15 - 25 g (0.53 - 0.88 oz)/year** 	Checking refrigerant leaks





Elevation m (ft)	Vacuum of system* kPa (mbar, mmHg, inHg)
0 (0)	101.3 (1,013, 760, 29.92)
300 (1,000)	98.0 (980, 735, 28.94)
600 (2,000)	94.6 (946, 710, 27.95)
900 (3,000)	91.3 (913, 685, 26.97)

*: Values show reading of the low-pressure gauge.

Point-1

Discharging

Slowly open the valves to discharge only refrigerant. If they are opened quickly, compressor oil will also be discharged.

Point-2

Evacuating the System

1. Start pump, then open both valves and run pump for over 5 minutes.
2. When low gauge has reached approx. 98.6 to 101.3 kPa (986 to 1,013 mbar, 740 to 760 mmHg, 29.13 to 29.92 inHg), completely close both valves of gauge and stop vacuum pump.

a. The low-pressure gauge reads lower by 3.3 kPa (33 mbar, 25 mmHg, 0.98 inHg) per 300 m (1,000 ft) elevation. Perform evacuation according to the following table.

b. The rate ascension of the low-pressure gauge should be less than 3.3 kPa (33 mbar, 25 mmHg, 0.98 inHg) in 5 minutes.

Point-3

Checking Airtightness

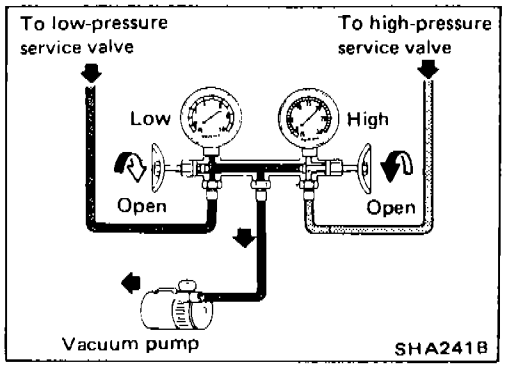
1. Close both low and high-pressure valves and leave them unattended for approx. 5 to 10 minutes.
2. Make sure the pointer of the low-pressure gauge does not deflect toward the "0" direction.
3. If the pointer deflects, gas leakage is present. Repair as outlined under Point-4.

Point-4

Repair

If a malfunction is noticed under Point-3 above, locate and repair the leaking point using the following table as a guide.

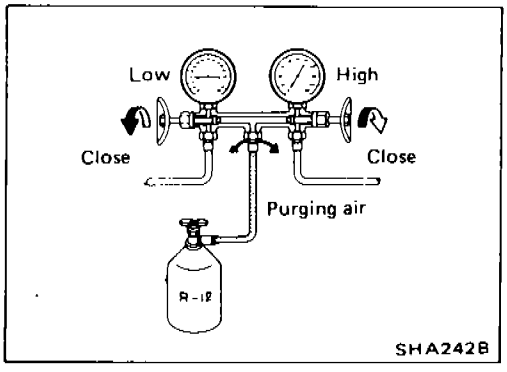
Leak at/around pipe connection	Leak at/around gauge manifold
• O-ring fouled, damaged or deformed • Oil not applied to pipe connections during installation • Pipe connections not properly tightened (too tight or too loose)	• Malfunctioning charging hose • Gauge improperly installed • Malfunctioning valve • Malfunctioning packing, etc.



Point-5

Evacuating the System

1. Close manifold gauge valve securely and disconnect charging hose from refrigerant can.
2. Connect center charging hose to vacuum pump.
3. Start pump, then open both valves and run pump for over 20 minutes.

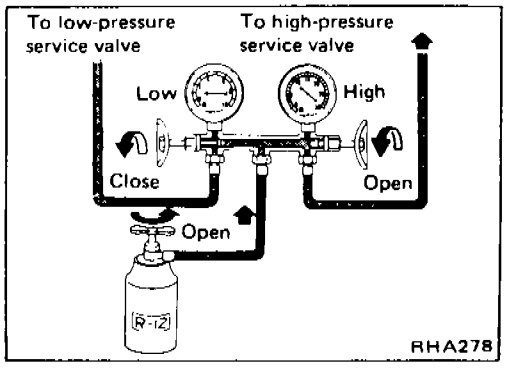


Point-6

Charging

1. Close manifold gauge valves securely and disconnect charging hose from vacuum pump.
2. Purge air from center charging hose.

1) Connect center charging hose to refrigerant can through charge valve.
2) Break seal of refrigerant can and purge air.

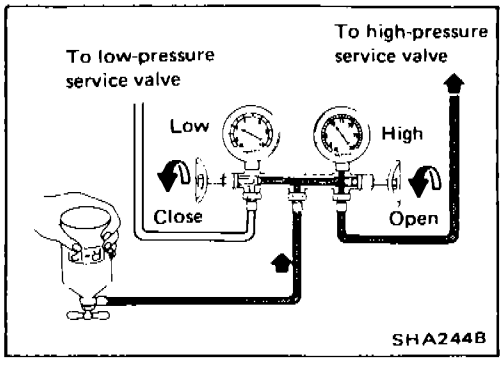


3. Charge refrigerant into system.

WARNING:

Ensure that engine is off.

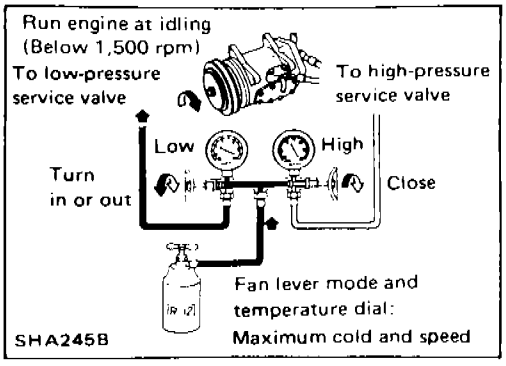
1) Open high-pressure valve of manifold gauge and charge refrigerant into system.



CAUTION:

If charging liquefied refrigerant into the system with the can turned upside down to reduce charging time, charge it only through high-pressure (discharge) service valve. After charging, the compressor should always be turned several times manually.

2) When low-pressure gauge reading is 98 kPa (0.98 bar, 1.0 kg/cm^2, 14 psi), completely close high-pressure valve of manifold gauge and stop charging.



Point-7

Charging

1. Charge refrigerant into system.

WARNING:

Ensure that engine is off.

- Open low-pressure valve of manifold gauge and charge refrigerant into system.

2. When refrigerant charging speed slows down, close high-pressure valve of manifold gauge and open low-pressure valve of manifold gauge and charge it while running the compressor for ease of charging.
3. Start engine — Air conditioning system ON, maximum temperature set, maximum blower speed. Open low-pressure valve on gauge set, with can in upright position, and monitor sight glass. Charge is complete when sight glass is clear.

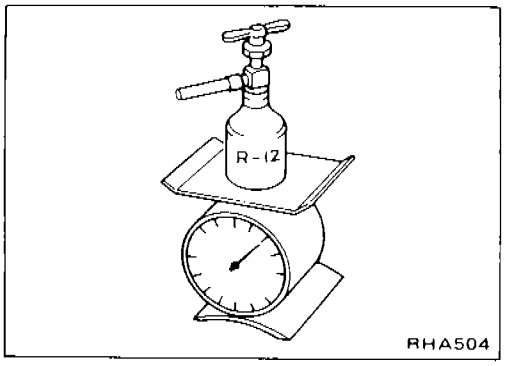
Cycling clutch systems will produce bubbles in sight glass when clutch engages. Therefore, allow 5 seconds after clutch engages to determine if bubbles continue, and, if so, add refrigerant to clear sight glass.

WARNING:

Never charge refrigerant through high-pressure side (discharge side) of system since this will force refrigerant back into refrigerant can and can may explode.

4. Charge refrigerant while controlling low-pressure gauge reading at 275 kPa (2.75 bar, 2.8 kg/cm^2, 40 psi) or less by turning in or out low-pressure valve of manifold gauge.

- **Be sure to purge air from charging hose when replacing can with a new one.**



5. Charge the specified amount of refrigerant into system by weighing charged refrigerant with scale. Overcharging will cause discharge pressure to rise.

Refrigerant amount:

L.H.D. model

0.9 - 1.0 kg (2.0 - 2.2 lb)

R.H.D. model

0.8 - 0.9 kg (1.8 - 2.0 lb)

Point-7

Charging (Cont'd)

The state of the bubbles in sight glass can only be used for checking whether the amount of charged refrigerant is small or not. The amount of charged refrigerant should be correctly judged by means of discharge pressure.

6. After charging, be sure to install valve cap on service valve.
7. Confirm that there are no leaks in system by checking with a leak detector.

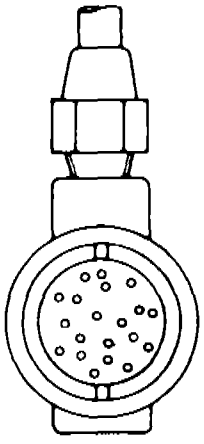
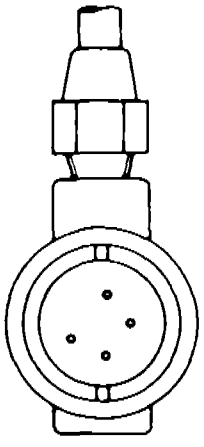
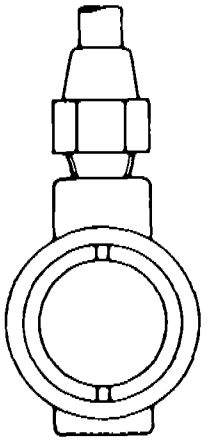
- When refrigerant charging is performed with a charging cylinder, charging station, or automatic charging equipment, engine off, charge only through high side, after specified refrigerant amount has entered the system, close high-pressure valve on gauge set. Start engine return to idle speed, operate A/C at maximum temperature setting, high blower. Observe sight glass to confirm complete charge.

Overcharging will result in increased high pressures, and reduced performance.

Checking Refrigerant Level

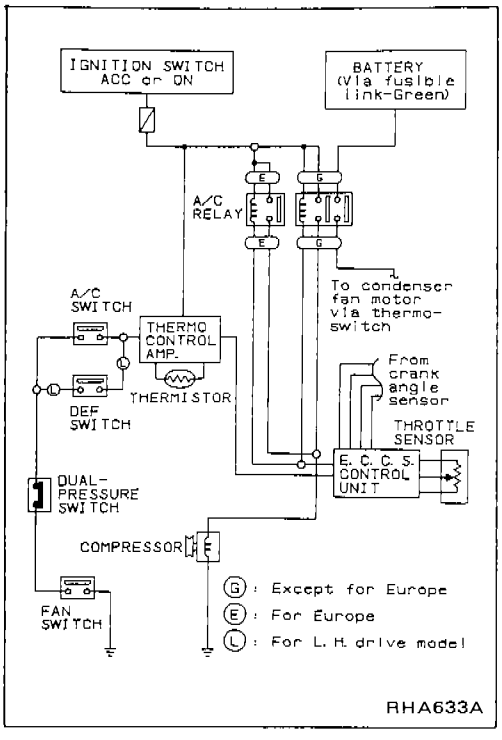
CONDITION

- Door window: Open
- A/C switch: ON
- TEMP. lever position: Max. COLD
- FAN lever position: 4
- Check sight glass after a lapse of about five minutes.

Check item \ Amount of refrigerant	Almost no refrigerant	Insufficient	Suitable	Too much refrigerant
Temperature of high-pressure and low-pressure lines.	Almost no difference between high-pressure and low-pressure side temperature.	High-pressure side is warm and low-pressure side is fairly cold.	High-pressure side is hot and low-pressure side is cold.	High-pressure side is abnormally hot.
State in sight glass.	Bubbles flow continuously. Bubbles will disappear and something like mist will flow when refrigerant is nearly gone.  AC256	The bubbles are seen at intervals of 1 - 2 seconds.  AC257	Almost transparent. Bubbles may appear when engine speed is raised and lowered. No clear difference exists between these two conditions.  AC258	No bubbles can be seen.
Pressure of system.	High-pressure side is abnormally low.	Both pressures on high and low-pressure sides are slightly low.	Both pressures on high and low-pressure sides are normal.	Both pressures on high and low-pressure sides are abnormally high.
Repair.	Stop compressor immediately and conduct an overall check.	Check for gas leakage, repair as required, replenish and charge system.		Discharge refrigerant from service valve of low pressure side.

a. The bubbles seen through the sight glass are influenced by the ambient temperature. Since the bubbles are hard to show up in comparatively low temperatures below 20°C (68°F), it is possible that a slightly larger amount of refrigerant would be filled, if supplied according to the sight glass. Recheck the amount when it exceeds 20°C (68°F). In higher temperature the bubbles are easy to show up.

b. When the screen in the receiver drier is clogged, the bubbles will appear even if the amount or refrigerant is normal. In this case, the outlet side pipe of the receiver drier becomes considerably cold.

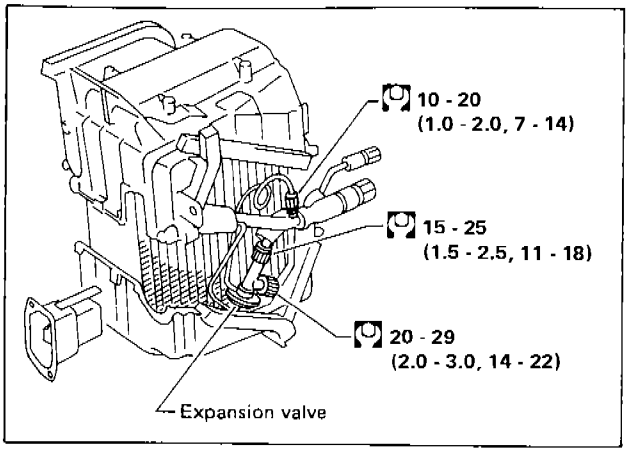


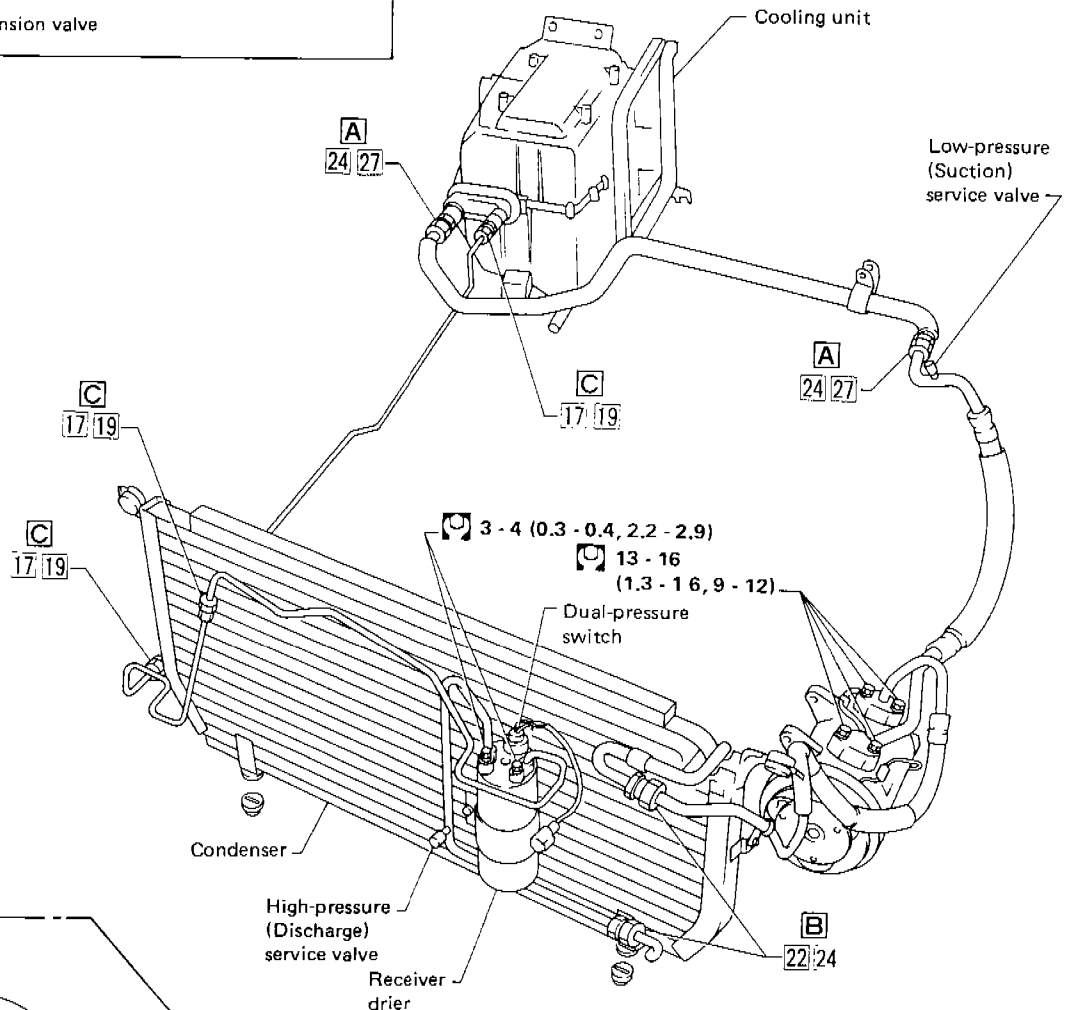
Acceleration Cut System

This system is controlled by the E.C.C.S. control unit.
When the engine is heavily overloaded (throttle sensor judges that throttle valve is at full throttle position or engine speed is more than 6,500 rpm), the compressor is turned off for approx. 5 seconds to reduce overloading.

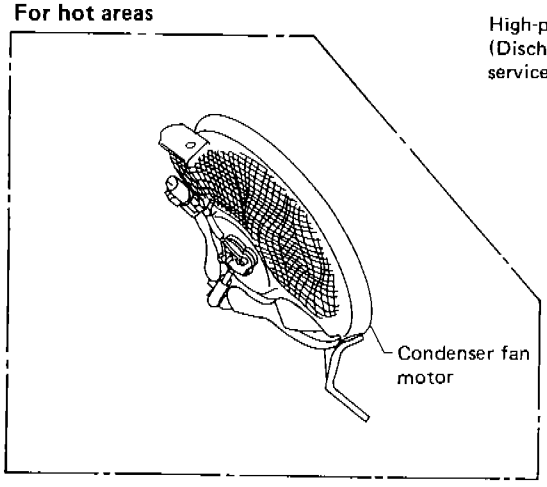
Refrigerant Lines

L.H.D. MODEL





For hot areas

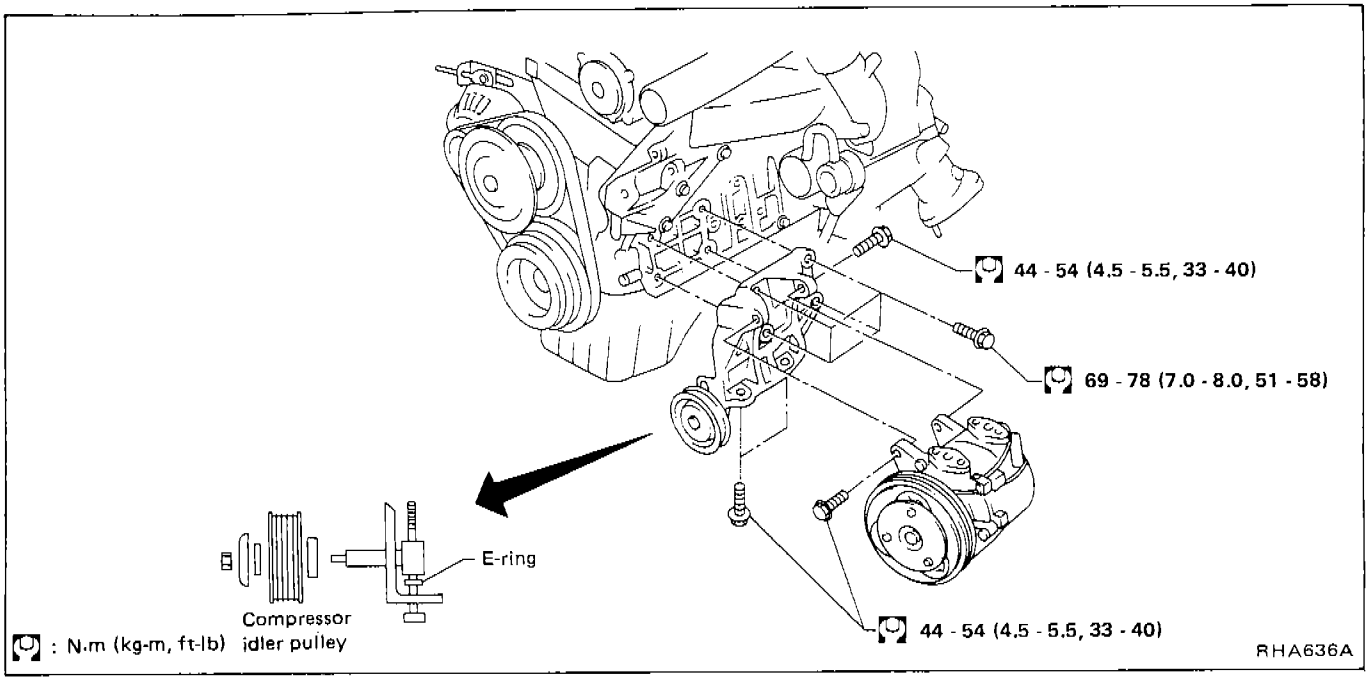


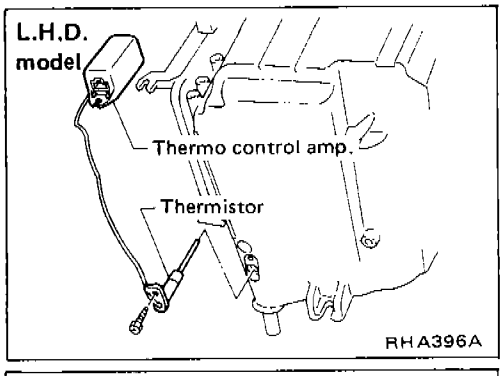
□ (Tightening torque)
□□ (Wrench size)
A 20 - 29 (2.0 - 3.0, 14 - 22)
B 15 - 25 (1.5 - 2.5, 11 - 18)
C 10 - 20 (1.0 - 2.0, 7 - 14)

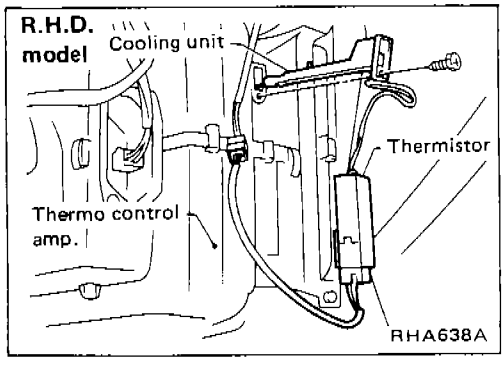
: N·m (kg-m, ft-lb)

RHA634A

Compressor Mounting







Thermo Control Amp.

REPLACEMENT

Remove screws, which secure thermistor locating stay, from front of cooling unit. Replace thermo control amp. assembly with a new one. (Cooling unit need not be removed during the replacement.)

Belt Tension

- **Refer to MA section.**

Fast Idle Control Device (F.I.C.D.)

- **Refer to EF & EC section.**

Performance Chart

TEST CONDITION

Testing must be performed as follows:

Vehicle location: Indoors or in the shade (in a well ventilated place)
Doors: Closed
Door window: Open
Hood: Open
TEMP. lever position: Max. COLD
Air control lever position: (Ventilation)
INTAKE lever position: (Recirculation)
FAN lever position: Max. position
Engine speed: 1,500 rpm
Time required before starting testing after air conditioner starts operating: More than 10 minutes

For hot areas, make sure that condenser fan motor does not operate during the following tests.

TEST READING

L.H.D. model

Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	20 (68)	1.6 - 2.7 (35 - 37)
	25 (77)	4.4 - 6.0 (40 - 43)
	30 (86)	9.2 - 11.3 (49 - 52)
	35 (95)	14.8 - 17.0 (59 - 63)
	40 (104)	18.1 - 20.3 (65 - 69)
60 - 70	20 (68)	2.7 - 4.3 (37 - 40)
	25 (77)	6.0 - 8.2 (43 - 47)
	30 (86)	11.3 - 13.8 (52 - 57)
	35 (95)	17.0 - 19.5 (63 - 67)
	40 (104)	20.3 - 22.8 (69 - 73)

Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (bar, kg/cm^2, psi)	Low-pressure (Suction side) kPa (bar, kg/cm^2, psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	20 (68)	1,030 - 1,255 (10.30 - 12.55, 10.5 - 12.8, 149 - 182)	98.1 - 142.2 (0.981 - 1.422, 1.0 - 1.45, 14.2 - 20.6)
	25 (77)	1,196 - 1,471 (11.96 - 14.71, 12.2 - 15.0, 173 - 213)	122.6 - 171.6 (1.226 - 1.716, 1.25 - 1.75, 17.8 - 24.9)
	30 (86)	1,402 - 1,706 (14.02 - 17.06, 14.3 - 17.4, 203 - 247)	161.8 - 210.9 (1.618 - 2.109, 1.65 - 2.15, 23.5 - 30.6)
	35 (95)	1,608 - 1,971 (16.08 - 19.71, 16.4 - 20.1, 233 - 286)	205.9 - 259.9 (2.059 - 2.599, 2.1 - 2.65, 29.9 - 37.7)
	40 (104)	1,844 - 2,256 (18.44 - 22.56, 18.8 - 23.0, 267 - 327)	259.9 - 318.7 (2.599 - 3.187, 2.65 - 3.25, 37.7 - 46.2)

Performance Chart (Cont'd)

R.H.D. model

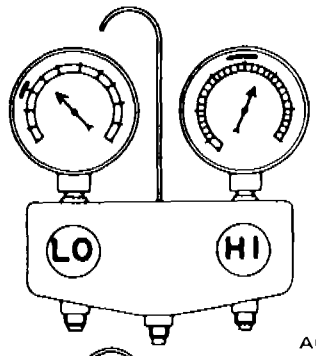
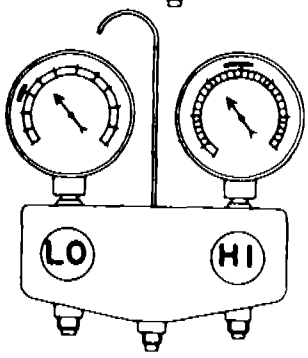
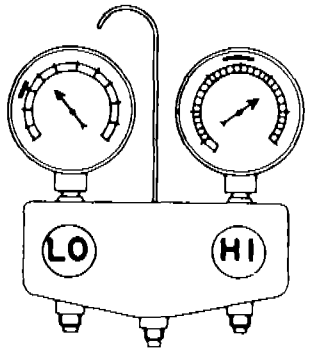
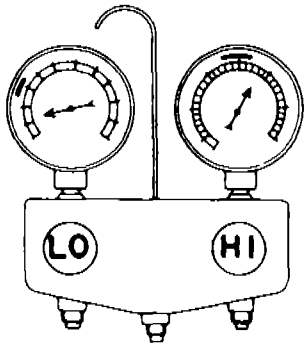
Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	20 (68)	1.5 - 2.5 (35 - 37)
	25 (77)	4.0 - 6.0 (39 - 43)
	30 (86)	9.0 - 12.0 (48 - 54)
	35 (95)	14.5 - 18.0 (58 - 64)
	40 (104)	20.5 - 23.0 (69 - 73)
60 - 70	20 (68)	2.5 - 4.5 (37 - 40)
	25 (77)	6.0 - 9.0 (43 - 48)
	30 (86)	12.0 - 14.5 (54 - 58)
	35 (95)	18.0 - 21.0 (64 - 70)
	40 (104)	23.0 - 26.0 (73 - 79)

Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (bar, kg/cm^2, psi)	Low-pressure (Suction side) kPa (bar, kg/cm^2, psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	20 (68)	922 - 1,304 (9.22 - 13.04, 9.4 - 13.3, 134 - 189)	107.9 - 171.6 (1.079 - 1.716, 1.1 - 1.75, 15.6 - 24.9)
	25 (77)	1,098 - 1,520 (10.98 - 15.20, 11.2 - 15.5, 159 - 220)	127.5 - 201.0 (1.275 - 2.010, 1.3 - 2.05, 18.5 - 29.2)
	30 (86)	1,314 - 1,775 (13.14 - 17.75, 13.4 - 18.1, 191 - 257)	156.9 - 235.4 (1.569 - 2.354, 1.6 - 2.4, 22.8 - 34.1)
	35 (95)	1,550 - 2,059 (15.50 - 20.59, 15.8 - 21.0, 225 - 299)	196 - 284 (1.96 - 2.84, 2.0 - 2.9, 28 - 41)
	40 (104)	1,804 - 2,373 (18.04 - 23.73, 18.4 - 24.2, 262 - 344)	245 - 343 (2.45 - 3.43, 2.5 - 3.5, 36 - 50)

Performance Test Diagnoses (Cont'd)

Condition		Probable cause	Corrective action
 AC355A	Insufficient cooling. Sweat on suction line.	Expansion valve allows too much refrigerant through evaporator.	Check valve for operation. If suction side does not show a pressure decrease, replace valve.
 AC356A	No cooling. Sweat or frosting on suction line.	Malfunctioning expansion valve.	1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.
AIR IN SYSTEM			
 AC359A	Insufficient cooling. Sight glass shows occasional bubbles.	Air mixed with refrigerant in system.	1. Discharge system. 2. Replace receiver drier. 3. Evacuate and charge system.
MOISTURE IN SYSTEM			
 AC360A	After short operation, suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As a warning of this, reading vibrates around 39 kPa (0.39 bar, 0.4 kg/cm^2, 6 psi).	Drier is saturated with moisture. Moisture has frozen in expansion valve. Refrigerant flow is restricted.	1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely. (Repeat 30-minutes evacuating three times.) 4. Recharge system.

Checking and Adjusting

The oil used to lubricate the compressor is circulating with the refrigerant.
Whenever replacing any component of the system or a large amount of gas leakage occurs, add oil to maintain the original amount of oil.

OIL CAPACITY

Unit: mℓ (Imp fl oz)

Applied model	All models
Capacity	
Total in system	200 (7.0)
Amount of oil which can be drained	Approx. 100 (3.5)*
Compressor (Service parts) charging amount	200 (7.0)

*: All oil cannot be drained from system.

OIL RETURN OPERATION

Before checking and adjusting oil level, operate compressor at engine idling speed, with controls set for maximum cooling and high blower speed, for 20 to 30 minutes in order to return oil to compressor.

CHECKING AND ADJUSTING FOR USED COMPRESSOR

1. After oil return operation, stop the engine and discharge refrigerant and then remove compressor from the vehicle.
2. Drain compressor oil from compressor discharge port and measure the amount.

Oil is sometimes hard to extract when compressor is cooled. Remove oil while compressor is warm [maintained to 40 to 50°C (104 to 122°F)].

3. If the amount is less than 90 mℓ (3.2 Imp fl oz), some refrigerant may have leaked out. Conduct leak tests on connections of each system, and if necessary, repair or replace faulty parts.
4. Check the purity of the oil and then adjust oil level following the procedure below.
   (a) When oil is clean;

Unit: mℓ (Imp fl oz)

Amount of oil drained	Adjusting procedure
Above 90 (3.2)*	Oil level is right. Pour in same amount of oil as was drained out.
Below 90 (3.2)	Oil level may be low. Pour in 90 mℓ (3.2 Imp fl oz) of oil.

*: If amount of oil drained is much greater than under normal circumstances, flush air conditioner system with refrigerant. Then pour 200 mℓ (7.0 Imp fl oz) of oil into air conditioner system.

   (b) When oil contains chips or foreign material; After air conditioner system has been flushed with refrigerant, replace receiver drier. Then pour 200 mℓ (7.0 Imp fl oz) of oil into air conditioner system.

CHECKING AND ADJUSTING FOR COMPRESSOR REPLACEMENT

200 mℓ (7.0 Imp fl oz) of oil is charged in compressor (service parts). So it is necessary to drain the proper amount of oil from new compressor. Follow the procedure below.

1. After oil return operation, drain compressor oil from used compressor and measure the amount.
   (It is the same procedure as CHECKING AND ADJUSTING FOR USED COMPRESSOR.)

Checking and Adjusting (Cont'd)

2. Check the purity of the oil and then adjust oil level following the procedure below.

   (a) When oil is clean;

Unit: mℓ (Imp fl oz)

Amount of oil drained from used compressor	Draining amount of oil from new compressor
Above 70 (2.5)*	200 (7.0) − [Amount of oil drained + 20 (0.7)]
Below 70 (2.5)	110 (3.9)

*: If amount of oil drained is greater than under normal circumstances, flush air conditioner system with refrigerant. Then install new compressor. [200 mℓ (7.0 Imp fl oz) of oil is charged in compressor service parts.]

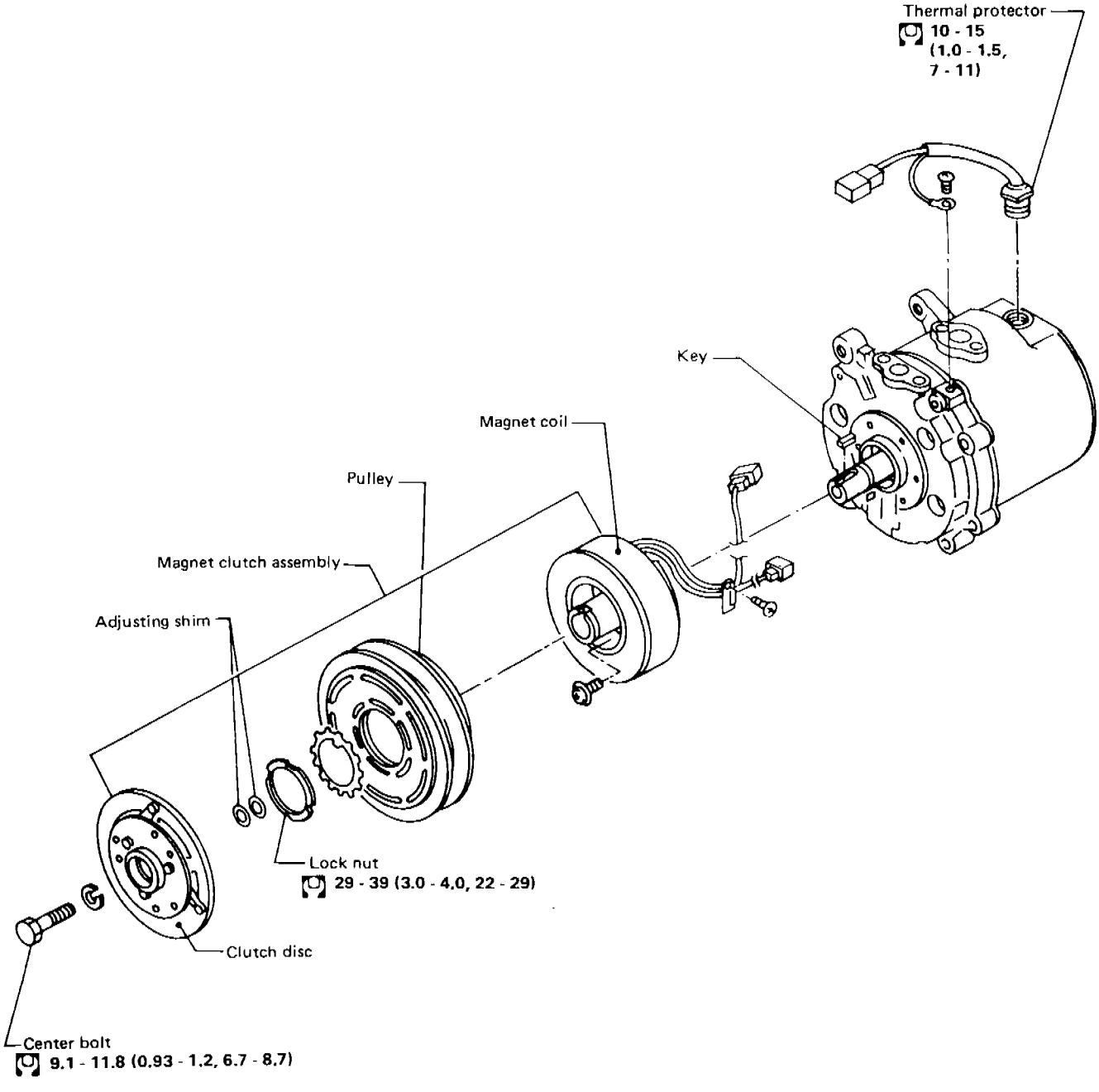
Example:

Unit: mℓ (Imp fl oz)

Amount of oil drained from used compressor	Draining amount of oil from new compressor
90 (3.2)	90 (3.2)
50 (1.8)	110 (3.9)

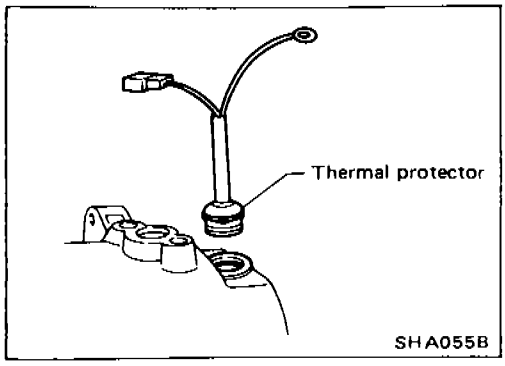
   (b) When oil contains chips or foreign material; After air conditioner system has been flushed with refrigerant, replace receiver drier. Then install new compressor. [200 mℓ (7.0 Imp fl oz) of oil is charged in compressor service parts.]

- Plug all openings to prevent moisture and foreign matter from entering.
- Do not leave compressor on its side or upside down for more than 10 minutes.
- When replacing or repairing compressor, check compressor oil level in system.
- When replacing with a new compressor, drain specified oil from new compressor. Refer to COMPRESSOR OIL.
- Be sure there is no oil or dirt on frictional surface of clutch disc and pulley.
- When replacing compressor clutch, be careful not to scratch shaft or bend pulley.
- When replacing compressor clutch assembly, do not forget BREAK-IN OPERATION.
- When storing a compressor, be sure to fill it with refrigerant to prevent rust formation. Add refrigerant at the low-pressure side and purge air at the high-pressure side, while rotating shaft by hand.
- When replacing parts, always use new O-rings.



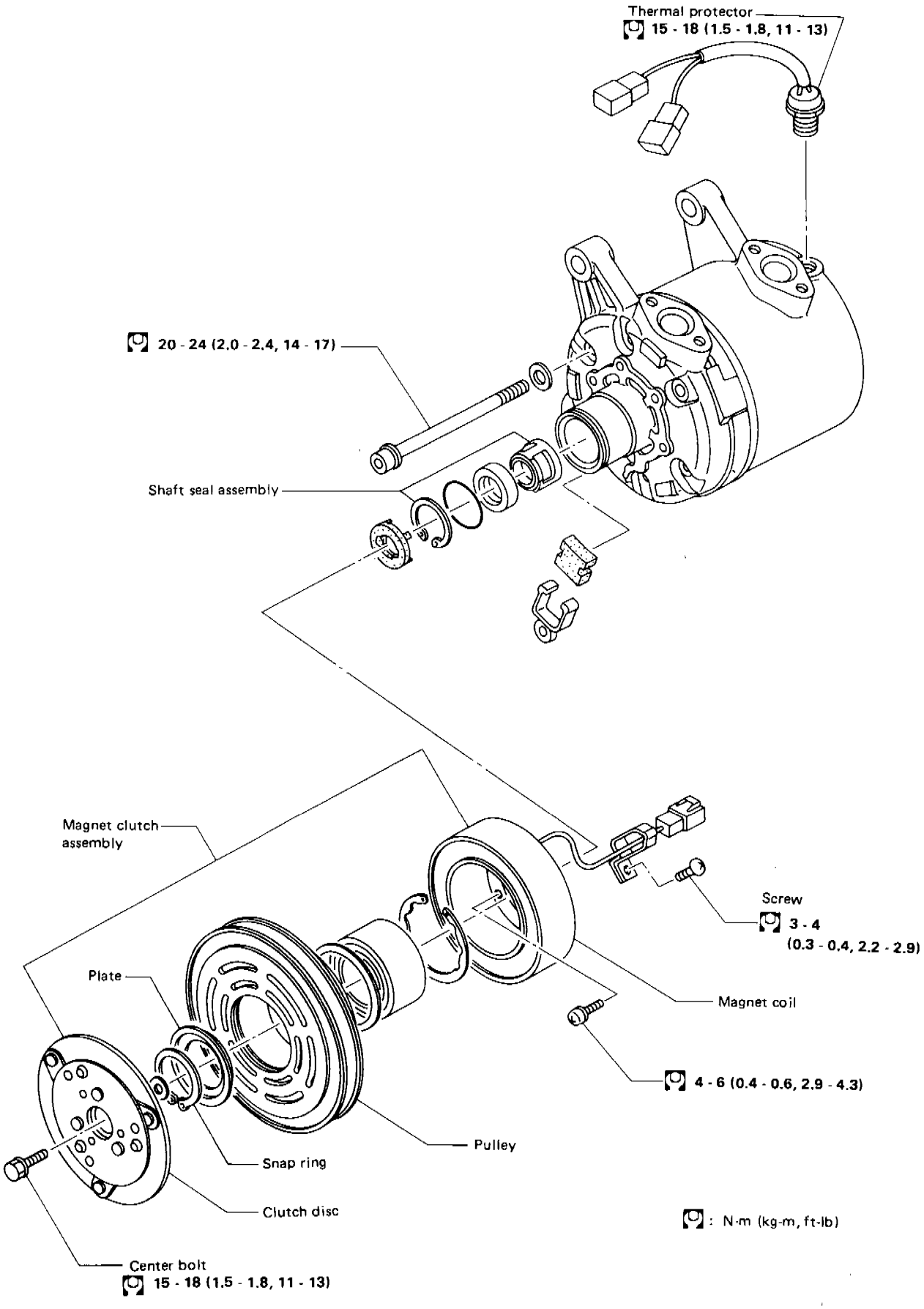
: N·m (kg-m, ft-lb)

RHA283



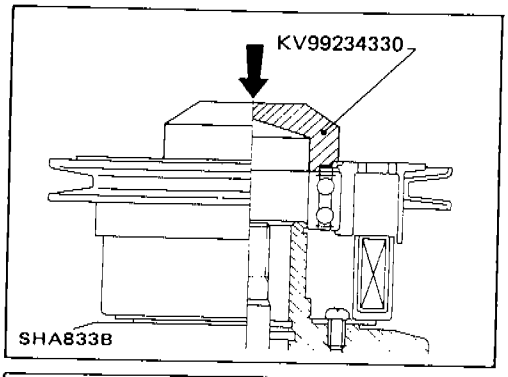
Thermal Protector

- When servicing, do not allow foreign material to get into compressor.
- Check continuity between two terminals.

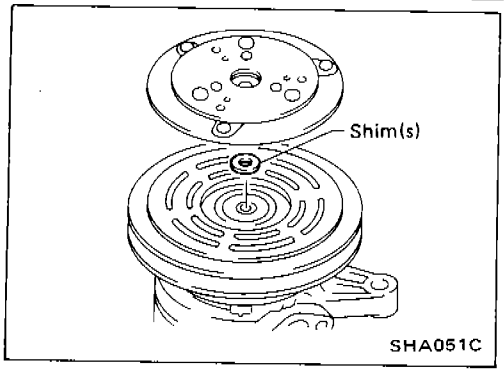

Thermal protector
15 - 18 (1.5 - 1.8, 11 - 13)
20 - 24 (2.0 - 2.4, 14 - 17)
Shaft seal assembly
Magnet clutch assembly
Screw
3 - 4 (0.3 - 0.4, 2.2 - 2.9)
Plate
Magnet coil
4 - 6 (0.4 - 0.6, 2.9 - 4.3)
Pulley
Snap ring
Clutch disc
Center bolt
15 - 18 (1.5 - 1.8, 11 - 13)
: N·m (kg-m, ft-lb)

RHA402

Compressor Clutch (Cont'd)

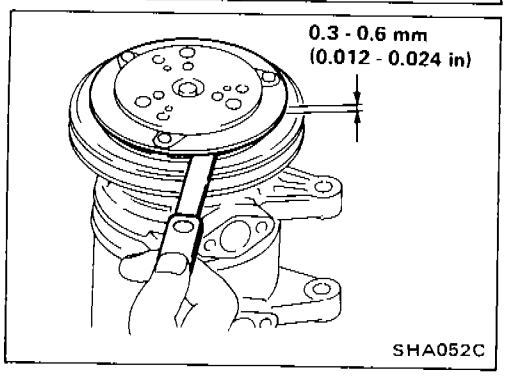


- Press pulley assembly onto the neck of coil assembly using pulley installer.
- Wipe oil thoroughly off the clutch surface.



ADJUSTMENT

- Select adjusting shim(s) which give(s) the correct clearance between pulley and clutch disc.
- Using a plastic mallet, tape clutch disc in place on drive shaft.
- Do not use excessive force with a plastic mallet or in a press, or internal damages may result.
- Place spring washer and center bolt onto drive shaft. Tighten center bolt to drive clutch wheel onto drive shaft.



- Check clearance around the entire periphery of clutch disc.

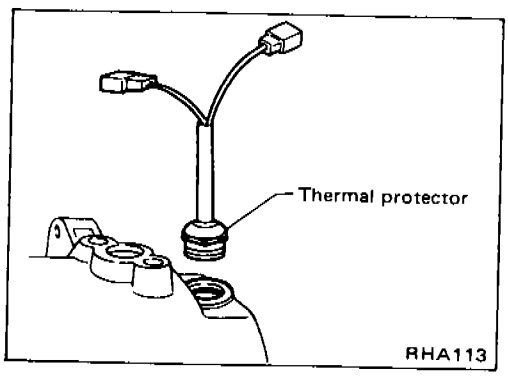
Disc-to-pulley clearance:

0.3 - 0.6 mm (0.012 - 0.024 in)

If the specified clearance is not obtained, replace adjusting spacer and readjust.

BREAK-IN OPERATION

When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch about thirty times.
Break-in operation raises the level of transmitted torque.

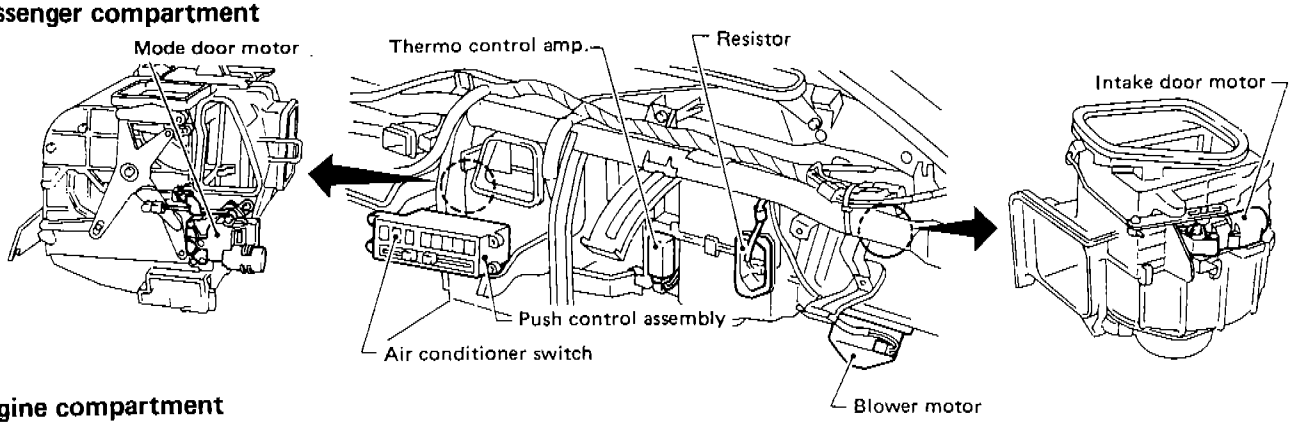


Thermal Protector

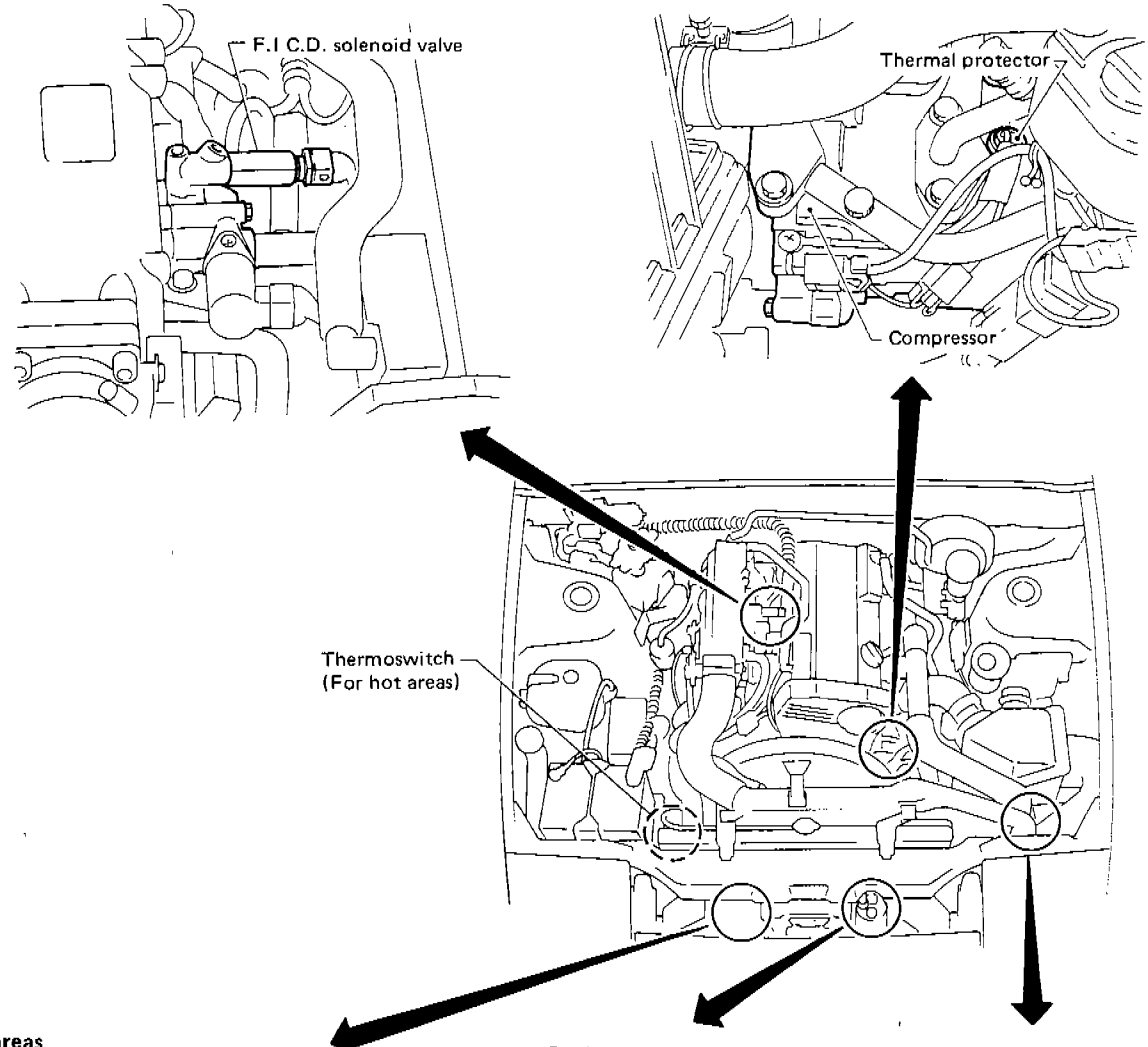
INSPECTION

- When servicing, do not allow foreign material to get into compressor.
- Check continuity between two terminals.

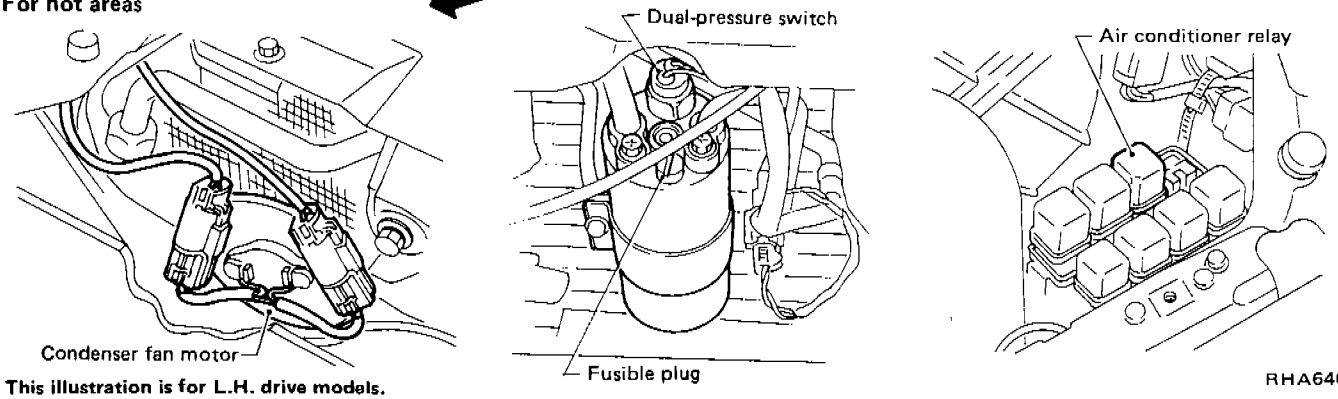
Passenger compartment



Engine compartment



For hot areas



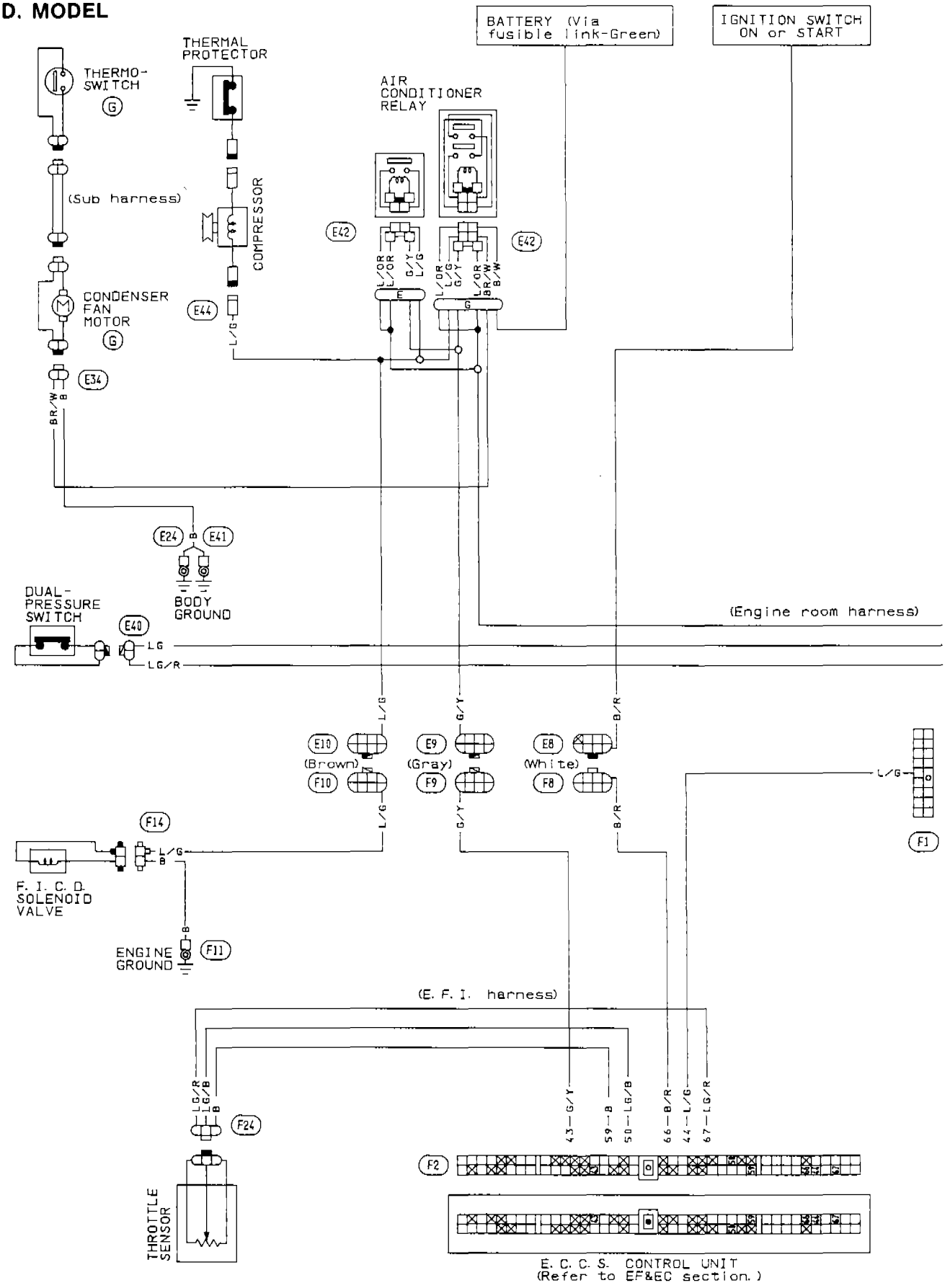
This illustration is for L.H. drive models.
For R.H. drive models, it is basically same.

RHA640A

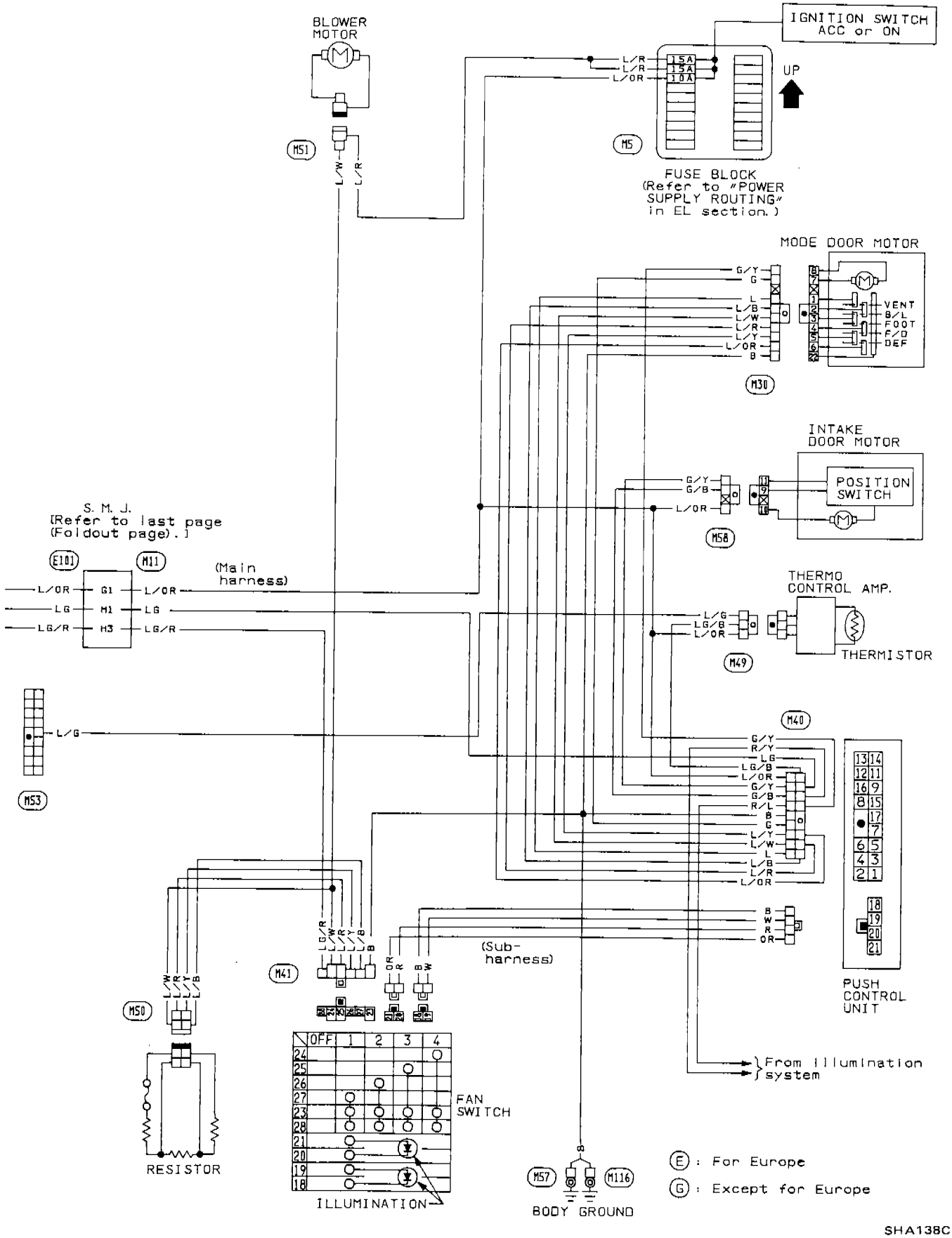
NOTE

Wiring Diagram

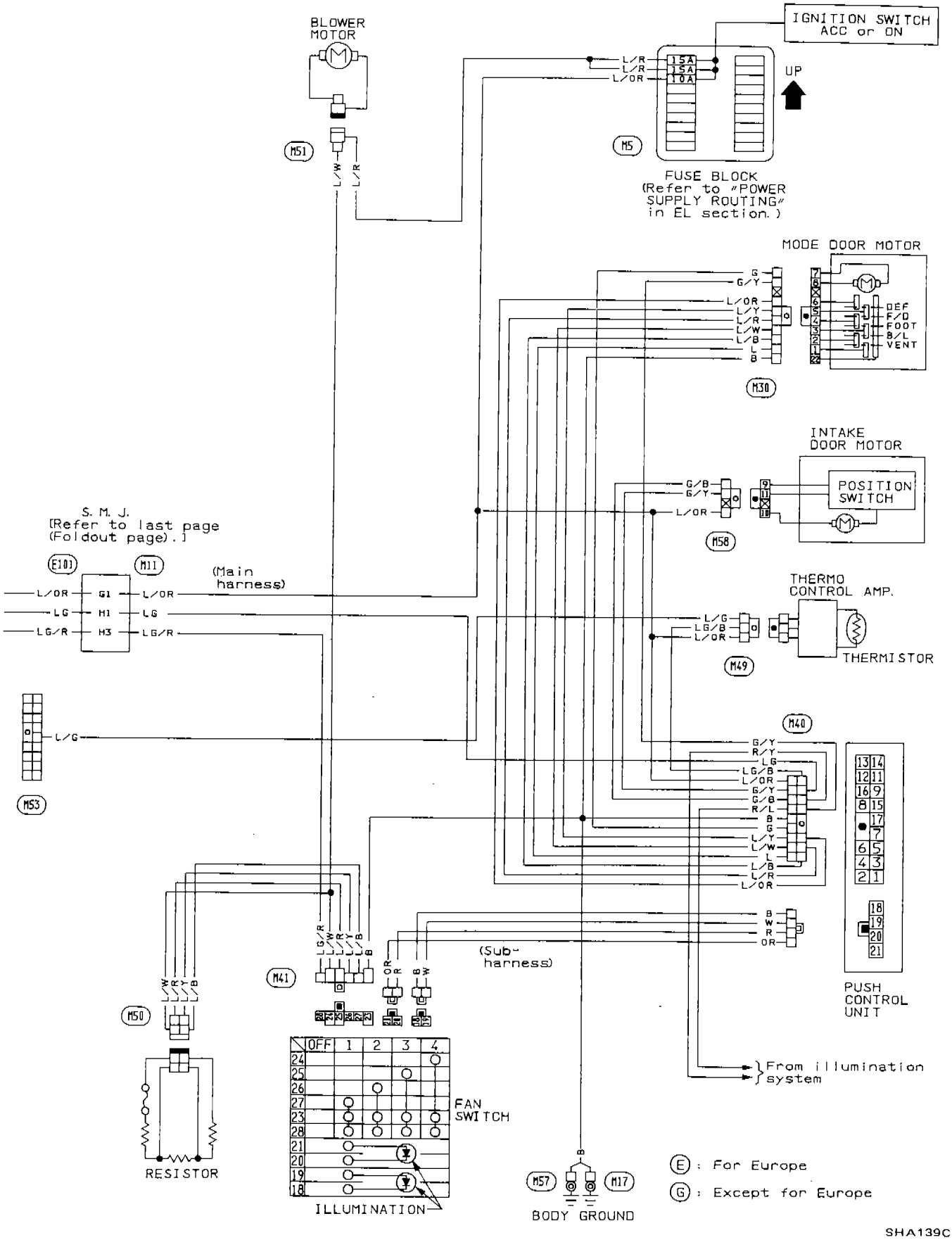
L.H.D. MODEL



Wiring Diagram (Cont'd)



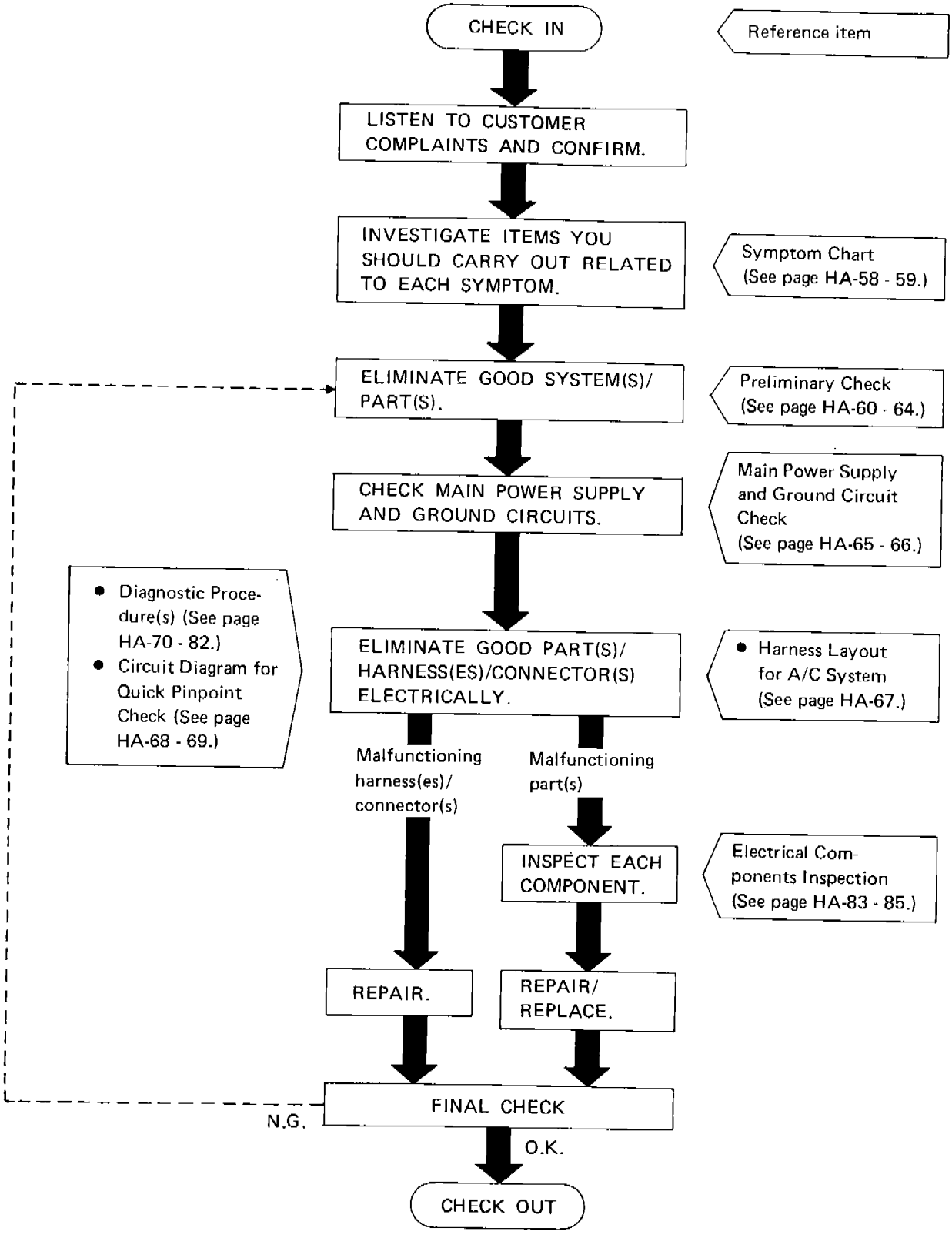
Wiring Diagram (Cont'd)



Contents

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



Symptom Chart

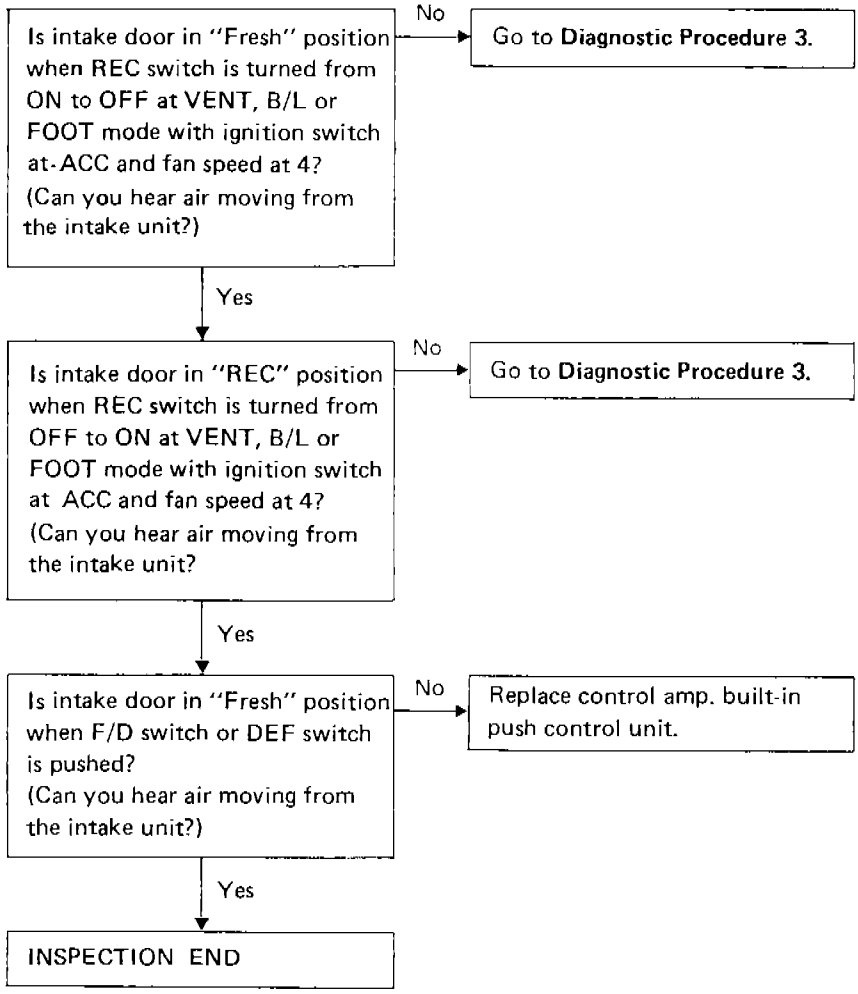
DIAGNOSTIC TABLE

PROCEDURE	Preliminary Check					Diagnostic Procedure					Main Power Supply and Ground Circuit Check			
REFERENCE PAGE	HA-60	HA-61	HA-62	HA-63	HA-64	HA-70 - 71	HA-72 - 73	HA-74	HA-75 - 78	HA-79	HA-65	HA-65	HA-66	HA-65
SYMPTOM	Preliminary check 1: For L.H.D. model only	Preliminary check 2	Preliminary check 3: For L.H.D. model only	Preliminary check 4	Preliminary check 5	Diagnostic procedure 1	Diagnostic procedure 2	Diagnostic procedure 3	Diagnostic procedure 4	Diagnostic procedure 5	15A Fuses	10A Fuse	Push control unit	Thermo control amp.
A/C does not blow cold air.		❶				○			○		○	○		○
Blower motor does not rotate.		❶				❷					○			
Air outlet does not change.				❶			❷					○	○	
Intake door does not change.								❶				○	○	
Intake door is not set at "FRESH" in DEF or F/D mode. (L.H.D. model only)	❶							○				○	○	
Magnet clutch does not operate with A/C switch and fan switch are ON.		❶							❷			○		○
Magnet clutch does not operate in DEF mode. (L.H.D. model only)		❶	❷						○			○		○
Illumination or indicators of push control unit do not come on.										❶		○		
Noise					❶									

❶, ❷ : The number means checking order.
○ : As for checking order, refer to each flow chart. (It depends on malfunctioning portion.)

Preliminary Check

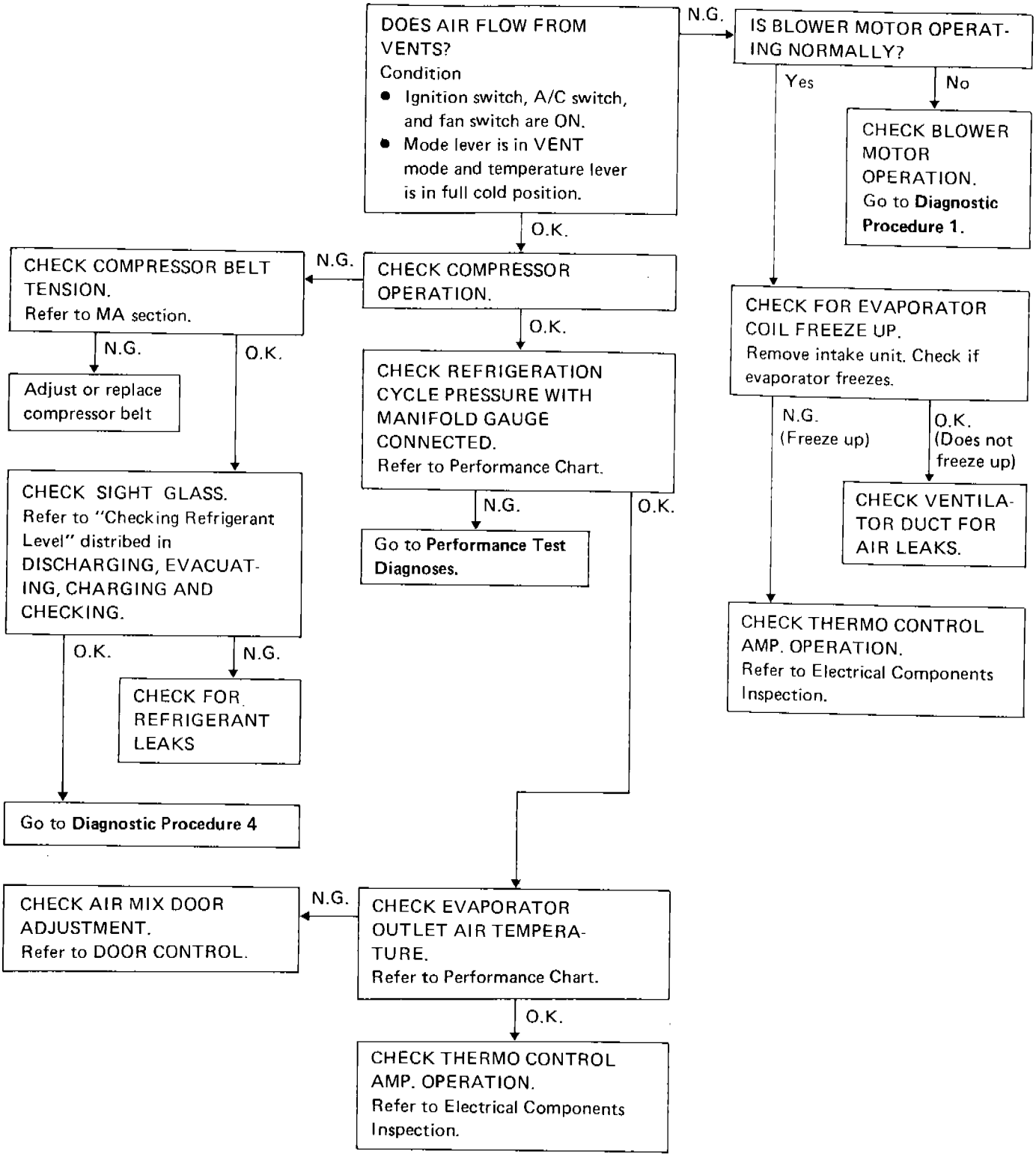
PRELIMINARY CHECK 1: FOR L.H.D. MODEL ONLY
Intake door is set at "FRESH" in DEF or F/D mode.



Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

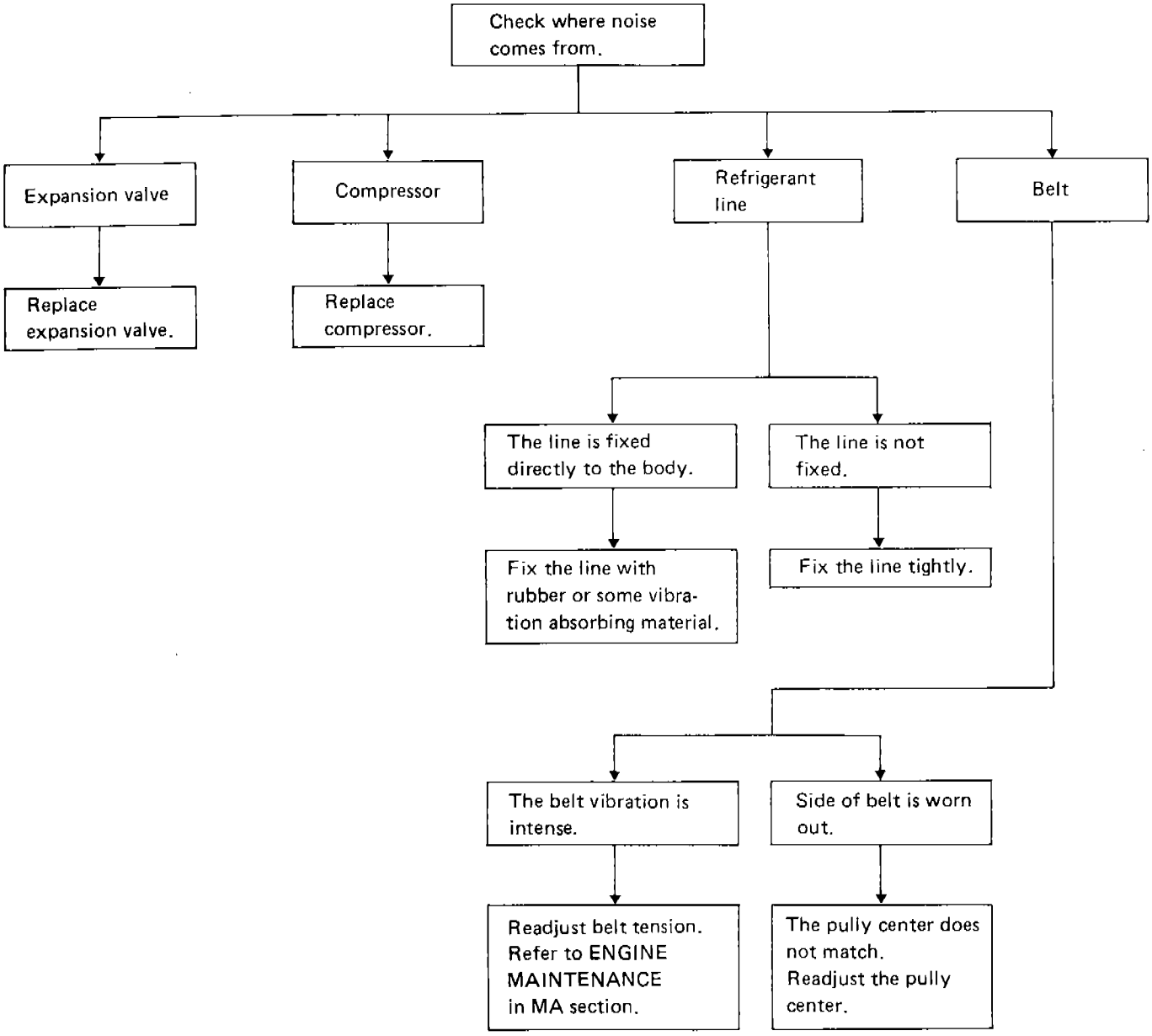
A/C does not blow cold air.



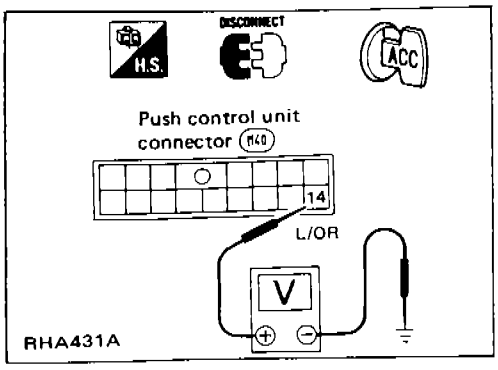
Preliminary Check (Cont'd)

PRELIMINARY CHECK 5

Noise



Main Power Supply and Ground Circuit Check (Cont'd)

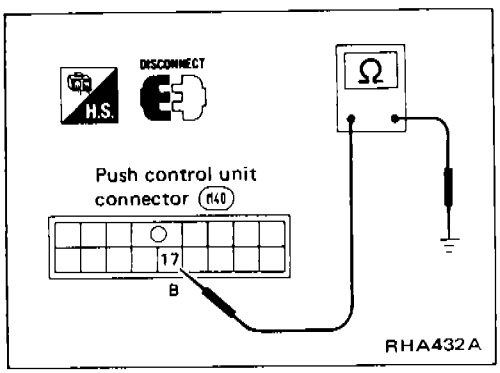


PUSH CONTROL UNIT CHECK

Check power supply circuit for push control unit with ignition switch at ACC.

1. Disconnect push control unit harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ⑭ and body ground.

Voltmeter terminal		Voltage
⊕	⊖	
⑭	Body ground	Approx. 12V

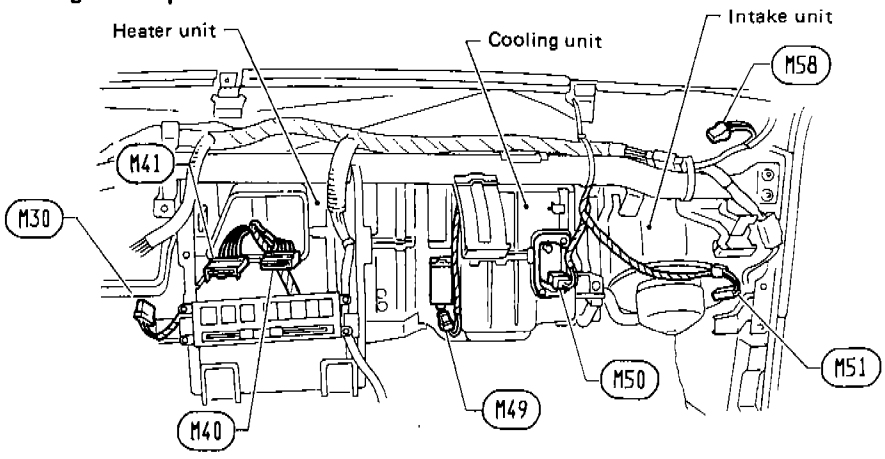


Check body ground circuit for push control unit with ignition switch OFF.

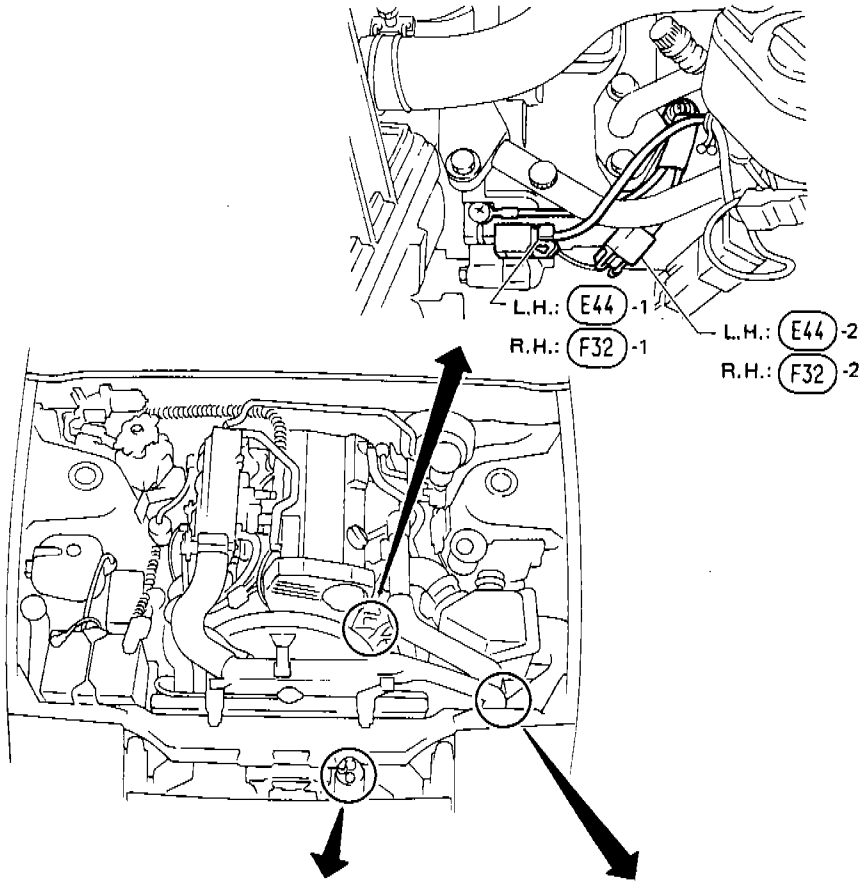
1. Disconnect push control unit harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. ⑰ and body ground.

Harness Layout for A/C System

Passenger compartment



Engine compartment



Engine room harness

- E40 : Dual-pressure switch
- E42 : A/C relay
- L.H. : E44-1 : Compressor (Magnet clutch)
- L.H. : E44-2 : Compressor (Thermal protector)

E.F.I. harness

- R.H. : F32-1 : Compressor (Magnet clutch)
- R.H. : F32-2 : Compressor (Thermal protector)

Main harness

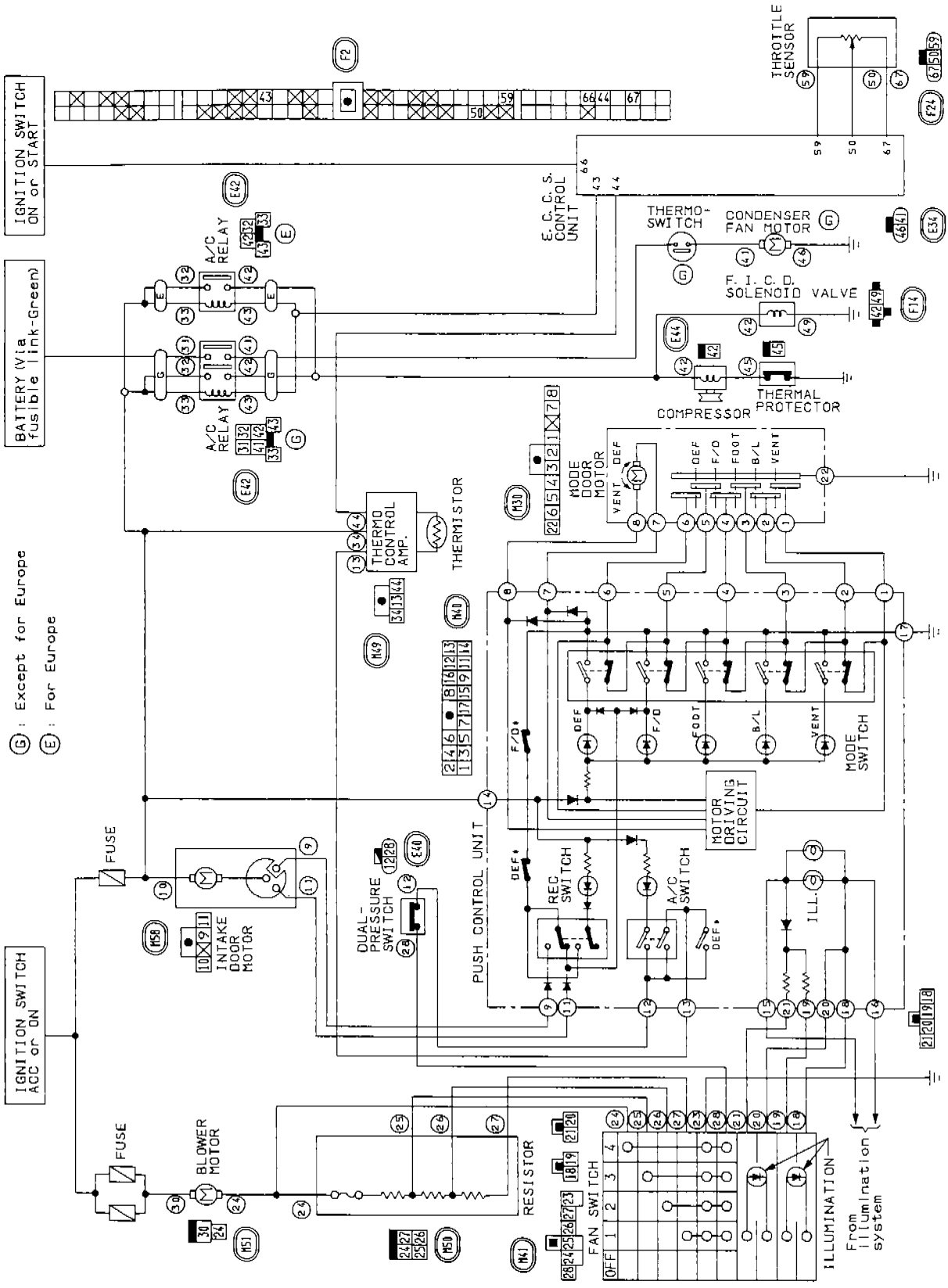
- M30 : Mode door motor
- M40 : Push control unit
- M41 : Fan switch
- M49 : Thermo control amp.
- M50 : Resistor
- M51 : Blower motor
- M58 : Intake door motor

This illustration is for L.H. drive models.
For R.H. drive models, it is basically same.

RHA642A

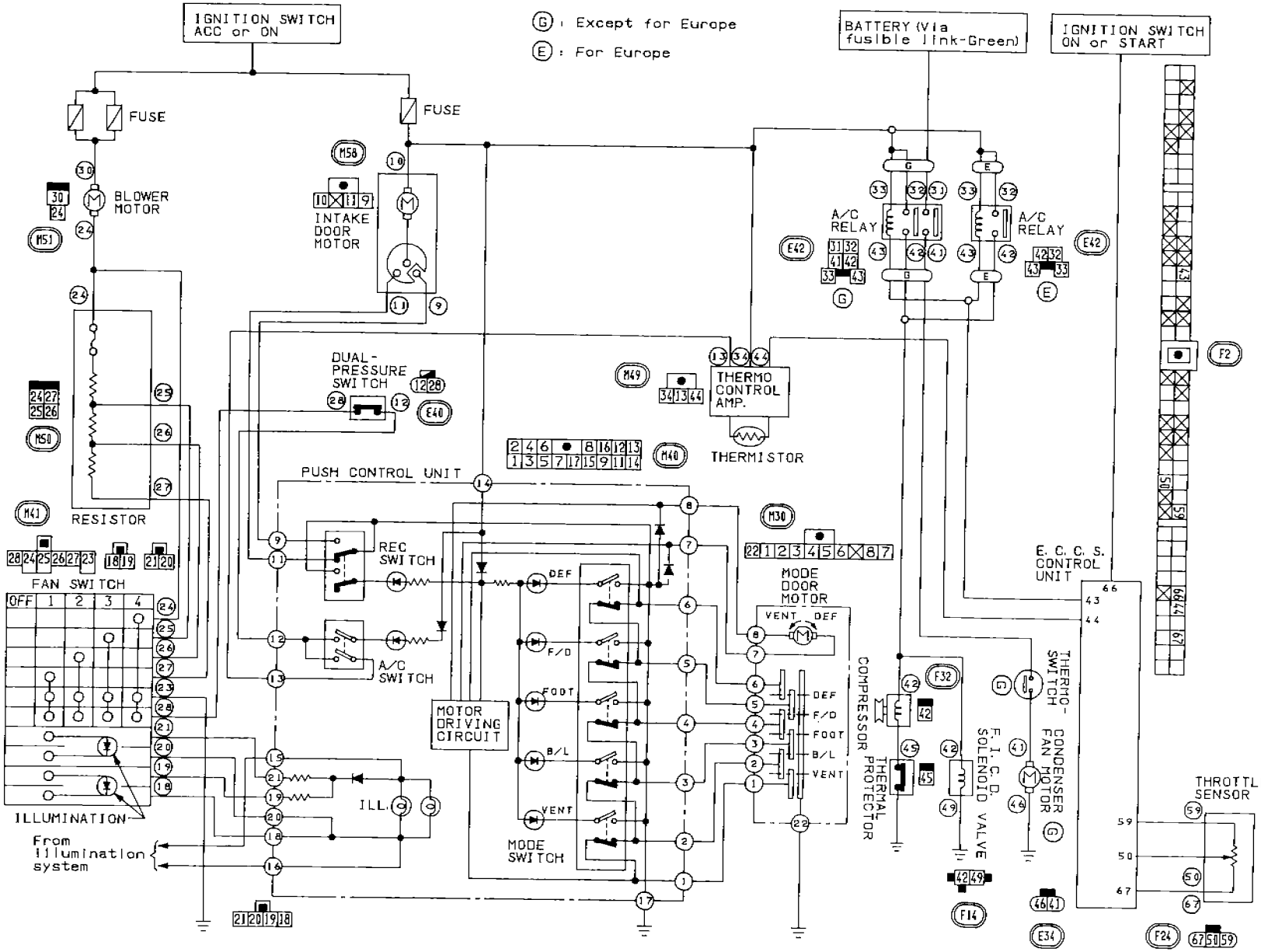
Circuit Diagram for Quick Pinpoint Check

L.H.D. MODEL



- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle " ◎ " are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See page HA-67.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ○ ".
- *: These switches are built in push control unit and mechanically linked to corresponding switches.

SHA140C



- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle " ◎ " are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See page HA-67.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ○ ".

*: These switches are built in push control unit and mechanically linked to corresponding switches.

SHA141C

	INCIDENT	Flow chart No.
1	Fan fails to rotate.	1
2	Fan does not rotate at 1-speed.	2
3	Fan does not rotate at 2-speed.	3
4	Fan does not rotate at 3-speed.	4
5	Fan does not rotate at 4-speed.	5

Diagnostic Procedure 1

SYMPTOM: Blower motor does not rotate.

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**

Check if blower motor rotates properly at each fan speed. Conduct check as per flow chart at left.

1 → A

A CHECK POWER SUPPLY FOR BLOWER MOTOR. Disconnect blower motor harness connector. Do approx. 12 volts exist between blower motor harness terminal No. 30 and body ground?

- N.G. → Check 15A fuses at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)
- O.K. → B

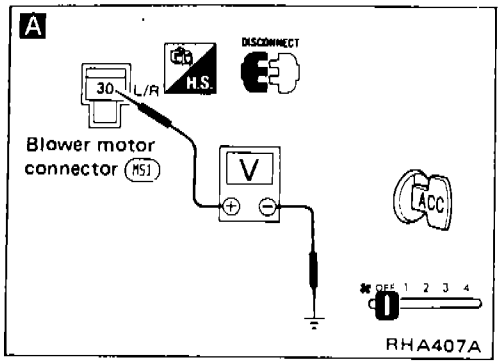
B Check circuit continuity between blower motor harness terminal No. 24 and body ground.

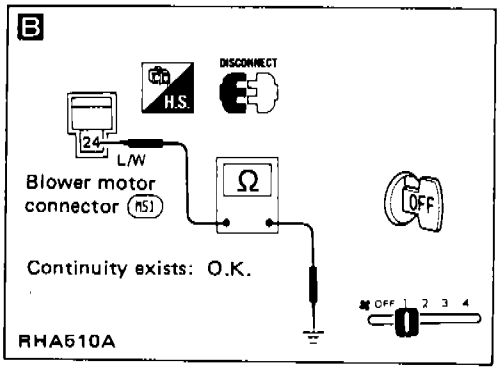
- N.G. → Reconnect blower motor harness connector.
- O.K. → CHECK BLOWER MOTOR. (Refer to Electrical Components Inspection.)
  - N.G. → Replace blower motor.

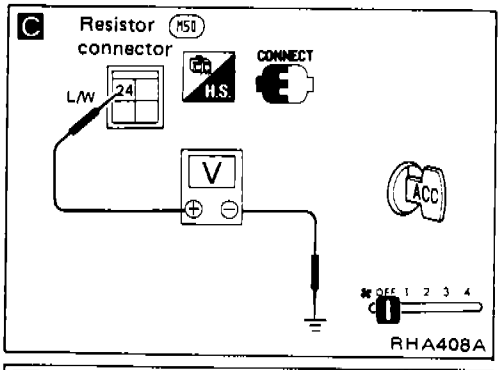
C CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND RESISTOR. Do approx. 12 volts exist between resistor harness terminal No. 24 and body ground?

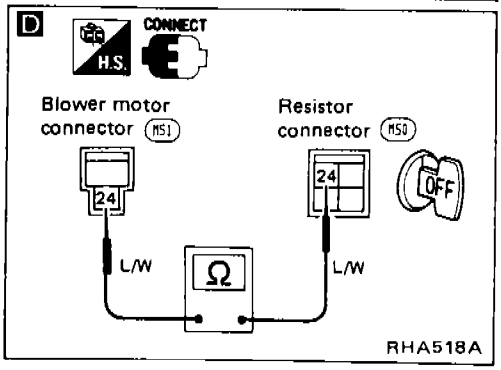
- N.G. → Disconnect blower motor and resistor harness connectors. → D Check circuit continuity between blower motor harness terminal No. 24 and resistor harness terminal No. 24. (Note)
- O.K. → (A) (Go to next page.)

2 → (B) 3 → (C) 4 → (D) 5 → (E) (Go to next page.)



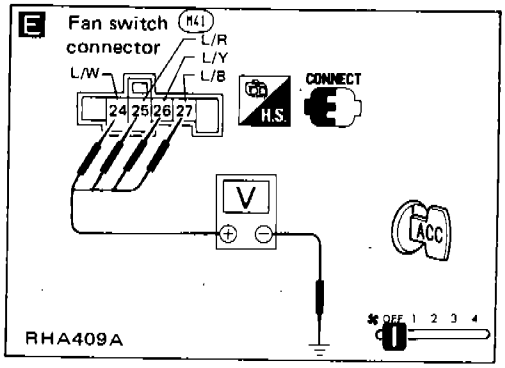


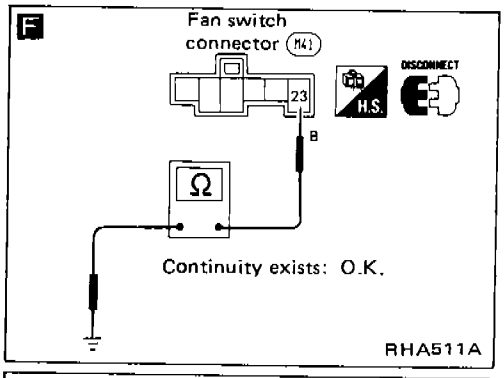


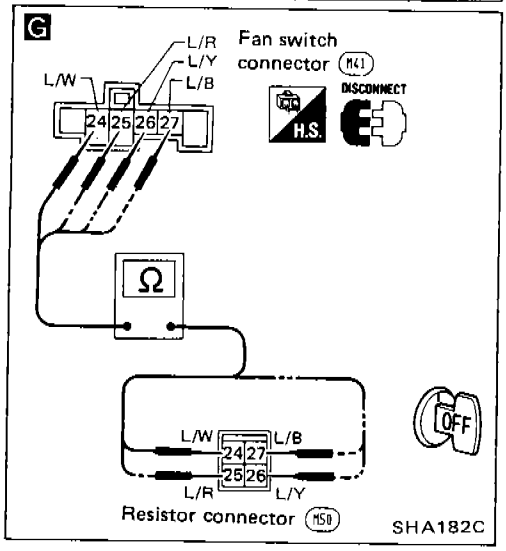


Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 1 (Cont'd)







Ⓐ 1 CHECK RESISTOR AFTER DISCONNECTING IT. (Refer to Electrical Components Inspection.)

Ⓑ 2 Ⓒ 3 Ⓓ 4 Ⓔ 5

O.K. / N.G.

N.G. → Replace resistor.

O.K. → Reconnect resistor harness connector.

1 2 3 4 5

E CHECK FAN SWITCH CIRCUIT.
Do approx. 12 volts exist between each fan switch harness terminal and body ground?

Flow chart No.	Terminal No. ⊕	Terminal No. ⊖	Voltage
2	27	Body ground	Approx. 12V
3	26		
4	25		
5	24		

O.K. → 2 3 4 5

G N.G. → Note: Check circuit continuity between fan switch and resistor.

1 → CHECK FAN SWITCH AFTER DISCONNECTING IT. (Refer to Electrical Components Inspection.)

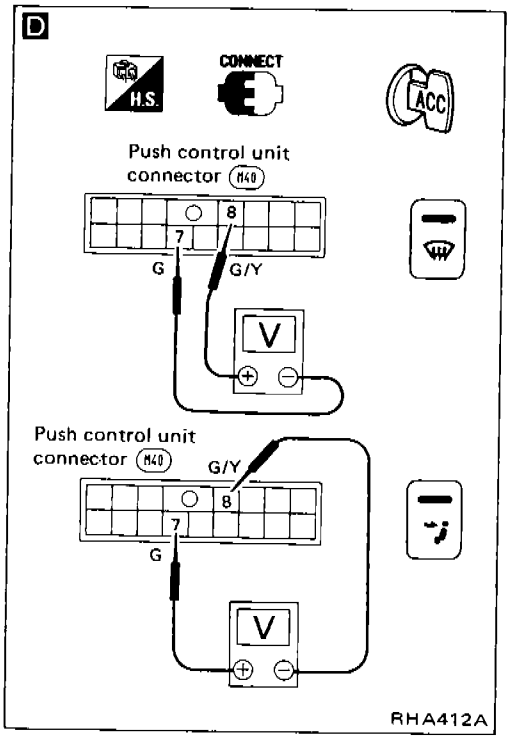
N.G. → Replace fan switch.

F O.K. → Note: Check circuit continuity between fan switch harness terminal No. 23 and body ground.

O.K. → Replace blower motor.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 2 (Cont'd)



Ⓐ

Reconnect push control unit and mode door motor harness connectors.

D

CHECK FOR OUTPUT OF PUSH CONTROL UNIT.
Do approx. 12 volts exist between push control unit harness terminal No. ⑦ and ⑧ when mode is switched from "VENT" to "DEF" or when mode is switched from "DEF" to "VENT"?

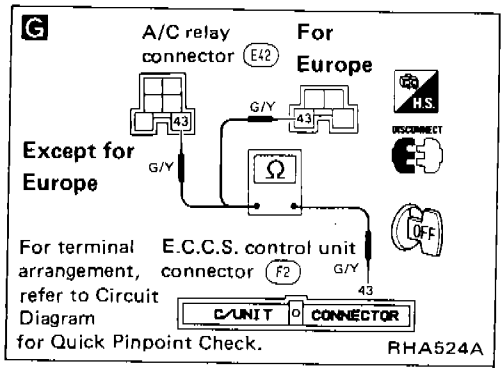
N.G. → Replace control amp. built-in push control unit.

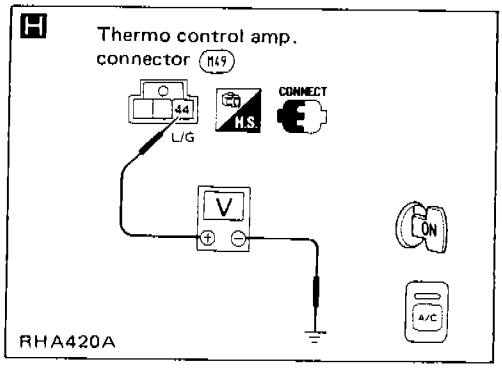
Terminal No.		Mode door motor	
⑦	⑧	Mode door operation	Direction of linkage rotation
⊖	⊖	Stop	Stop
⊖	⊕	VENT → DEF	L.H.D. model: Clockwise R.H.D. model: Counterclockwise
⊕	⊖	DEF → VENT	L.H.D. model: Counterclockwise R.H.D. model: Clockwise

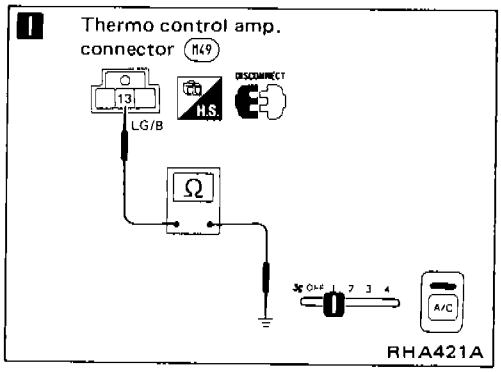
O.K.

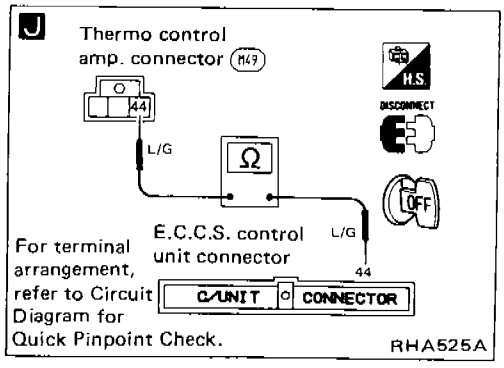
Replace mode door motor.

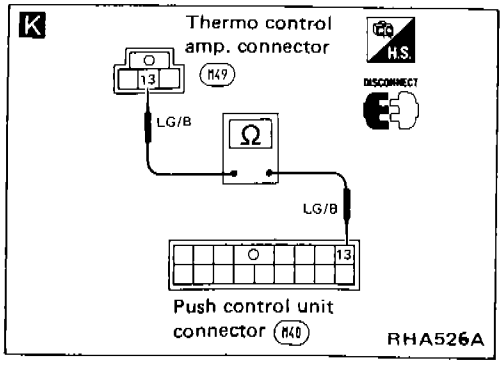
Diagnostic Procedure 4 (Cont'd)











Ⓑ

H

CHECK VOLTAGE FOR THERMO CONTROL AMP.
Do approx. 12 volts exist between thermo control amp. harness terminal No. (44) and body ground?

N.G. → J

O.K.

CHECK POWER SUPPLY FOR THERMO CONTROL AMP.
Go to Main Power Supply and Ground Circuit Check.

I

CHECK BODY GROUND CIRCUIT FOR THERMO CONTROL AMP.
Disconnect thermo control amp. harness connector.
Does continuity exist between thermo control amp. harness terminal No. (13) and body ground?

N.G. → Disconnect push control unit harness connector.

O.K.

Replace thermo control amp.

Ⓒ

G

Check circuit continuity between A/C relay harness terminal No. (43) and E.C.C.S. control unit harness terminal No. (43).

J

Note

Check circuit continuity between E.C.C.S. control unit harness terminal No. (44) and thermo control amp. harness terminal No. (44).

O.K.

CHECK E.C.C.S. CONTROL UNIT.
Refer to EF & EC section.

K

Note

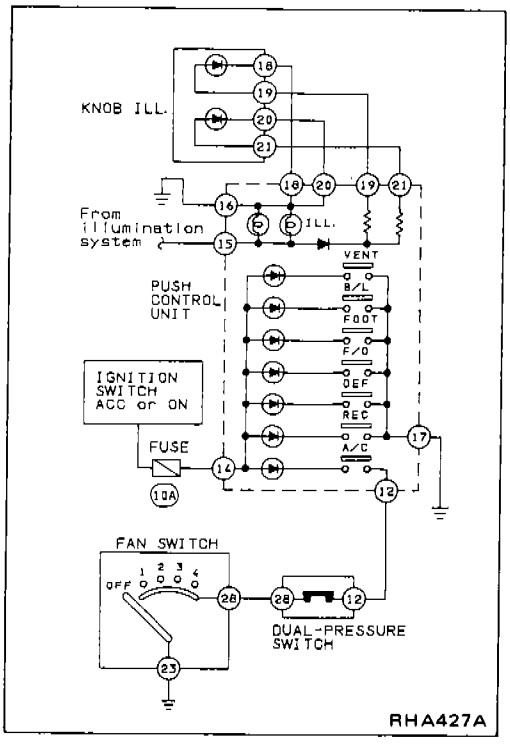
Check circuit continuity between thermo control amp. harness terminal No. (13) and push control unit harness terminal No. (13).

O.K.

Ⓓ

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.



Diagnostic Procedure 5

SYMPTOM: Illumination or indicators of push control unit do not come on.

- **Perform Main Power Supply and Ground Circuit Check before referring to the following flow chart.**

Turn ignition switch and lighting switch ON.

CHECK ILLUMINATION AND INDICATORS.

- Turn A/C, REC and fan switches ON.
- Push VENT, B/L, FOOT, F/D and DEF switches in order.
- Check for incidents and follow the repairing methods as shown:

INCIDENTS								"How to repair"
ILL.	VENT	B/L	FOOT	F/D	DEF	REC	A/C	
X	○	○	○	○	○	○		Go to DIAGNOSTIC PROCEDURE 5-1.
	○	○	○	○	○	○	X	Go to DIAGNOSTIC PROCEDURE 5-2.
○	X	X	X	X	X	X		Go to DIAGNOSTIC PROCEDURE 5-3.
				△				Replace control amp. built-in push control unit.
○	X	X	X	X	X	X	○	Replace control amp. built-in push control nit.
	X	X	X	X	X	X	○	Go to DIAGNOSTIC PROCEDURE 5-4.

○: Illumination or indicator comes on.
X: Illumination or indicator does not come on.
△: Some indicators for VENT, B/L, FOOT, F/D, DEF or REC come on.

DIAGNOSTIC PROCEDURE 5-1

CHECK OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM.
Does other illumination come on with ignition switch and lighting switch ON?

N.G. → CHECK ILLUMINATION SYSTEM.
Refer to illumination/Wiring Diagram in EL section.

O.K. ↓

Turn ignition switch and lighting switch OFF.

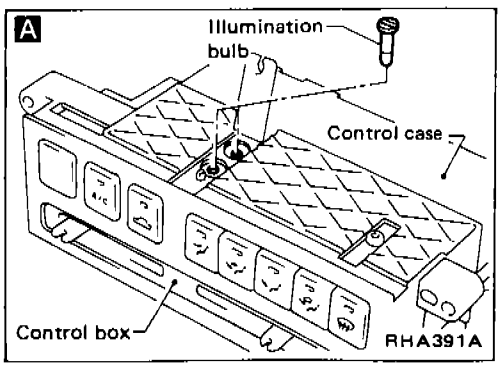
Ⓐ

CHECK ILLUMINATION BULB.
Remove push control unit and disconnect harness connectors.
Remove illumination bulb(s) and check them.

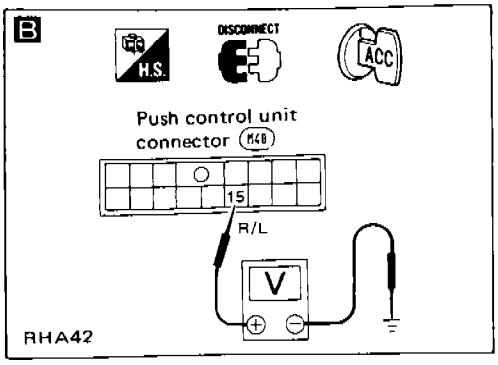
N.G. → Replace illumination bulb(s).

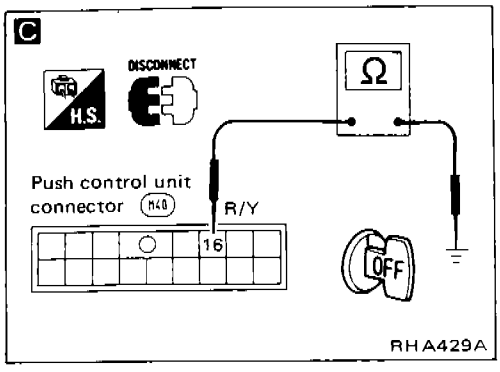
O.K. → Ⓐ

(Go to next page.)



Diagnostic Procedure 5 (Cont'd)





Ⓐ

B

CHECK POWER SUPPLY FOR ILLUMINATION WITH LIGHTING SWITCH ON.
Do approx. 12 volts exist between push control unit harness terminal No. ⑮ and body ground?

N.G. → CHECK POWER SUPPLY FOR A/C ILLUMINATION SYSTEM.
Refer to Illumintion/Wiring Diagram in EL section.

O.K.

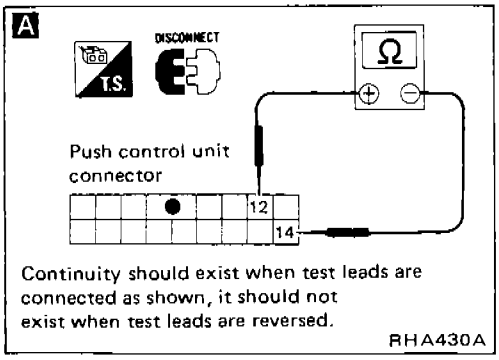
C

CHECK BODY GROUND CIRCUIT FOR ILLUMINATION.
Does contunity exist between push control unit harness terminal No. ⑯ and body ground?

Note

O.K.

Replace control amp. built-in push control unit.



DIAGNOSTIC PROCEDURE 5-2

CHECK MAGNET CLUTCH OPERATION.
Does magnet clutch operate normaly when engine ON, A/C switch, fan switch are ON?

N.G. → Go to Diagnostic Procedure 4.

O.K.

A

Check circuit continuity of L.E.D.

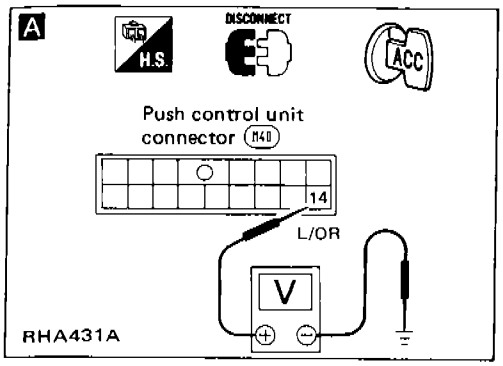
N.G.

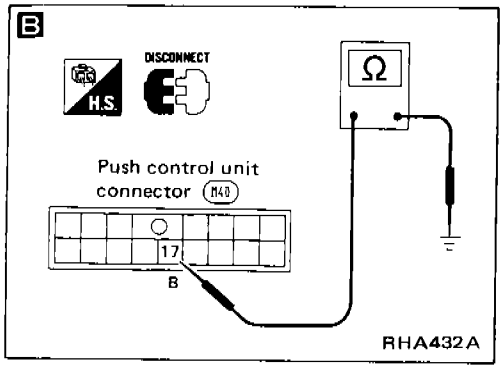
Replace control amp. built-in push control unit.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-3





Turn ignition switch and lighting switch OFF.

↓

Disconnect push control unit harness connector.

↓

A

CHECK POWER SUPPLY FOR PUSH CONTROL UNIT.
Do approx. 12 volts exist between push control unit harness terminal No. ⑭ and body ground?

N.G. → Check 10A fuse at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

↓ O.K.

B

CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.
Does continuity exist between push control unit harness terminal No. ⑰ and body ground?

Note

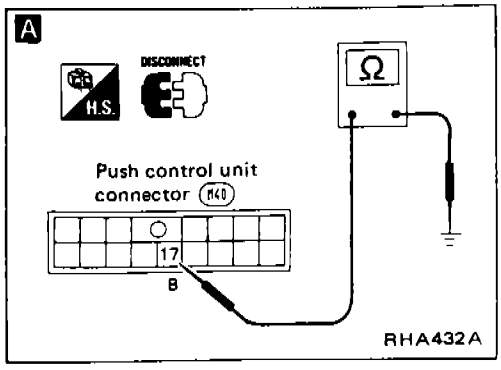
↓ O.K.

Replace control amp. built-in push control unit.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-4



Turn ignition switch and lighting switch OFF.

↓

Disconnect push control unit harness connector.

↓

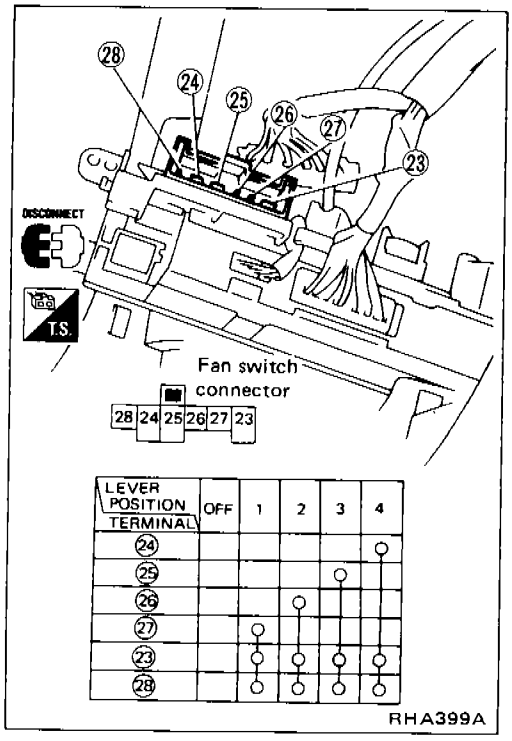
A Note

CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.
Does continuity exist between push control unit harness terminal No. ⑰ and body ground?

↓ O.K.

Replace control amp. built-in push control unit.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

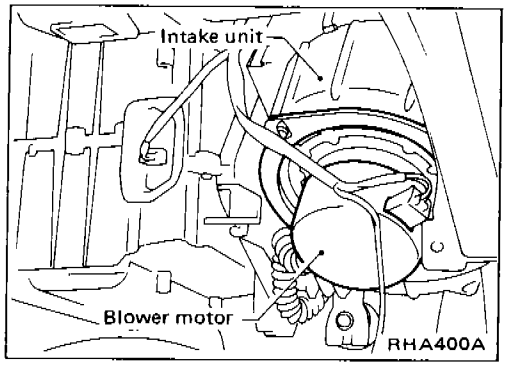


LEVER POSITION / TERMINAL	OFF	1	2	3	4
24					○
25				○	
26			○		
27		○			
23		○	○	○	○
28		○	○	○	○

Electrical Components Inspection

FAN SWITCH

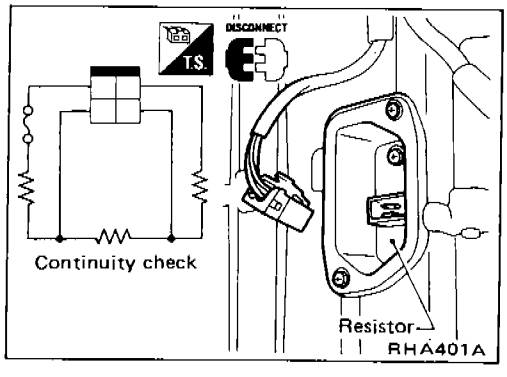
Check continuity between terminals at each switch position.



BLOWER MOTOR

Confirm smooth rotation of the blower motor.

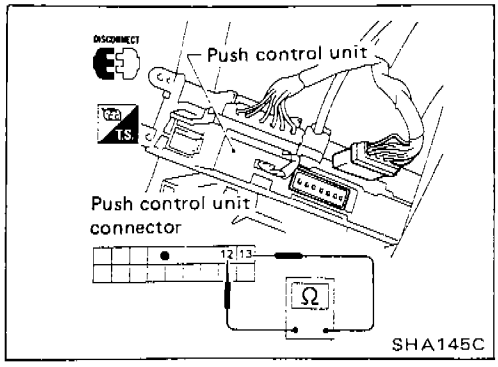
- Ensure that there are no foreign particles inside the intake unit.



BLOWER RESISTOR

Check continuity between terminals.

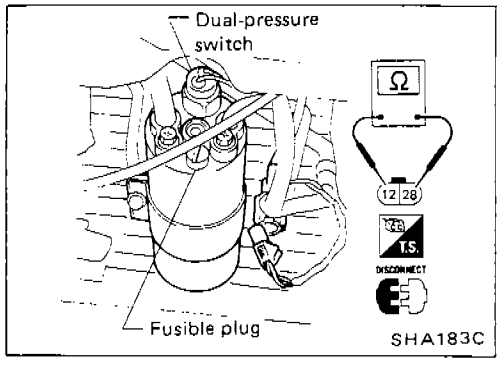
Electrical Components Inspection (Cont'd)



A/C SWITCH

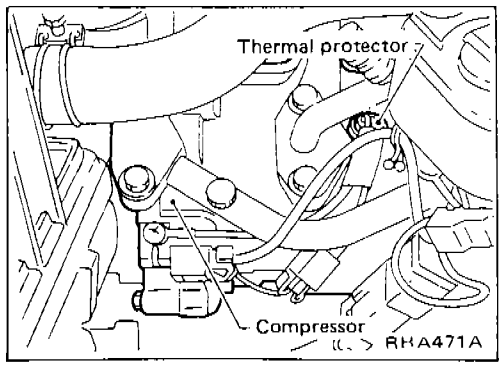
Check continuity between terminals at each switch position.

Switch condition			Terminal No.		Continuity
L.H.D.		R.H.D.	⊕	⊖	
A/C	DEF	A/C			
ON	ON	ON	⑬	⑫	Exists
ON	OFF				
OFF	ON				



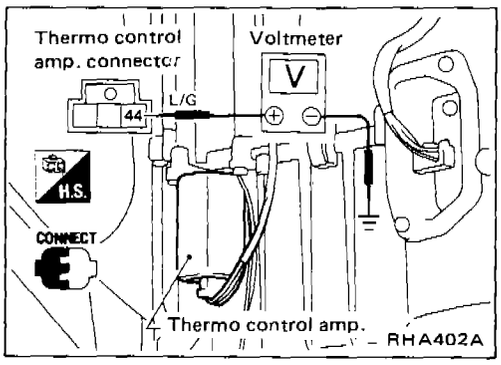
DUAL-PRESSURE SWITCH

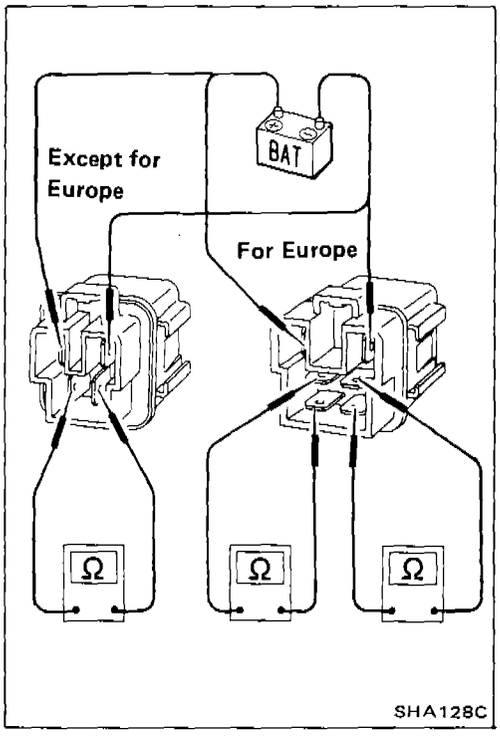
High-pressure side line pressure kPa (bar, kg/cm², psi)	Operation	Continuity
Decreasing to 177 - 216 (1.77 - 2.16, 1.8 - 2.2, 26 - 31) Increasing to 2,452 - 2,844 (24.5 - 28.4, 25 - 29, 356 - 412)	Turn OFF	Does not exist
Increasing to 177 - 235 (1.77 - 2.35, 1.8 - 2.4, 26 - 34) Decreasing to 1,863 - 2,256 (18.6 - 22.6, 19 - 23, 270 - 327)	Turn ON	Exists



THERMAL PROTECTOR

Temperature of compressor °C (°F)	Operation
Increasing to approx. 135 - 145 (275 - 293)	Turn OFF
Decreasing to approx. 120 - 130 (248 - 266)	Turn ON





Electrical Components Inspection (Cont'd)

THERMO CONTROL AMP.

1. Run engine, and operate A/C system.
2. Connect the voltmeter from harness side.
3. Check thermo control amp. operation shown in the table.

Evaporator outlet air temperature °C (°F)	Thermo amp. operation	Tester
Decreasing to 1.5 - 2.5 (35 - 37)	Turn OFF	Approx. 12V
Increasing to 3.0 - 4.0 (37 - 39)	Turn ON	Approx. 0V

A/C RELAY

Check circuit continuity between terminals by supplying 12 volts to coil side terminal of A/C relay.

THERMOSWITCH (For hot areas)

Water temperature °C (°F)	Operation	Continuity
Decreasing to 85 - 91 (185 - 196)	Turn OFF	Does not exist
Increasing to 92 - 98 (198 - 208)	Turn ON	Exists

General Specifications

COMPRESSOR

	L.H.D.	R.H.D.
Model	ATSUGI make NVR 140S	DIESEL-KIKI make DKV-14C
Type	Vane rotary	
Displacement cm^3 (cu in)/rev.	140 (8.54)	
Direction of rotation	Clockwise (Viewed from drive end)	
Drive belt	Poly V	

LUBRICATION OIL

Type	SUNISO 5GS
Capacity mℓ (Imp fl oz)	
Total in system	200 (7.0)
Amount of oil which can be drained	Approx. 100 (3.5)
Compressor (Service parts) charging amount	200 (7.0)

REFRIGERANT

Type	R-12
Capacity kg (lb)	
For Europe	0.85 - 0.95 (1.87 - 2.09)
Except Europe	
L.H.D. model	0.9 - 1.0 (2.0 - 2.2)
R.H.D. model	0.8 - 0.9 (1.8 - 2.0)

Inspection and Adjustment

ENGINE IDLING SPEED (When A/C is ON.)

- **Refer to EF & EC section.**

BELT TENSION

- **Refer to Checking Drive Belts (MA section).**

COMPRESSOR

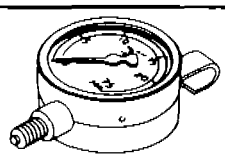
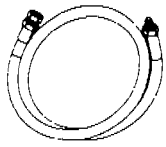
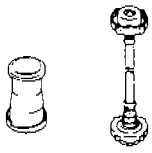
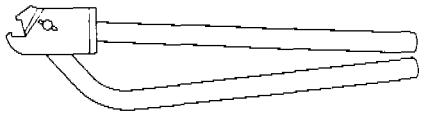
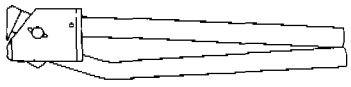
Model	NVR 140S	DKV-14C
Clutch disc-pulley clearance mm (in)	0.3 - 0.6 (0.012 - 0.024)	

ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

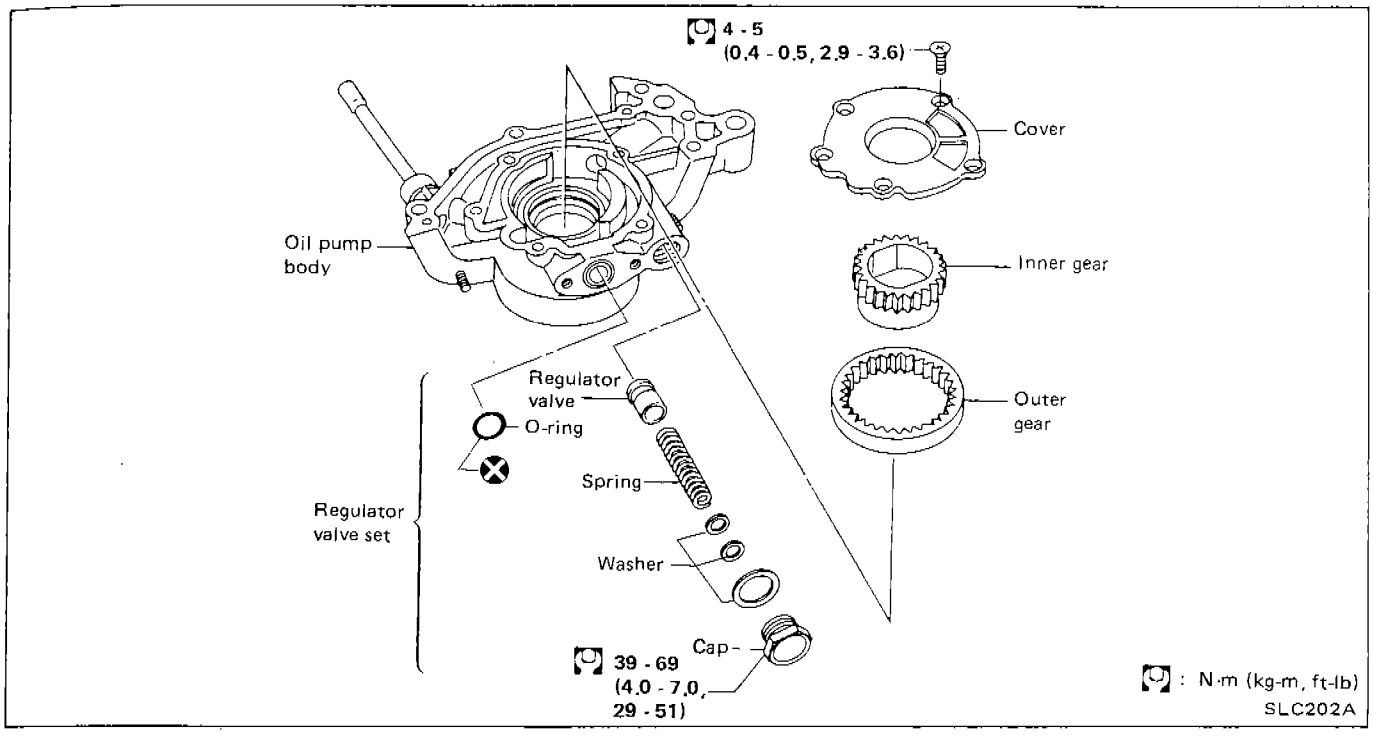
CONTENTS

SPECIAL SERVICE TOOLS

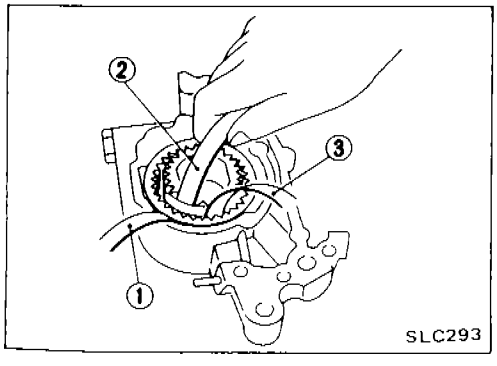
Tool number Tool name	Description	
ST25051001 Oil pressure gauge		
ST25052000 Hose		Adapting oil pressure gauge to cylinder block
EG17650301 Radiator cap tester adapter		Adapting radiator cap tester to radiator filler neck
KV99103510 Radiator plate pliers A		Installing radiator upper and lower tanks
KV99103520 Radiator plate pliers B		Removing radiator upper and lower tanks

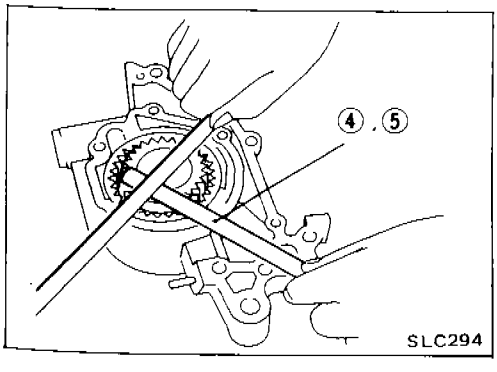
Oil Pump (Cont'd)

DISASSEMBLY AND ASSEMBLY



- **When installing oil pump, apply engine oil to inner and outer gear.**
- **Be sure that O-ring is properly fitted.**





INSPECTION

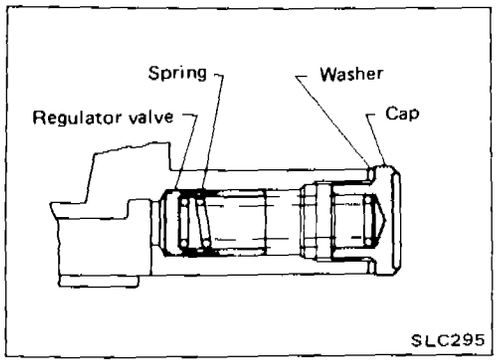
Using a feeler gauge, check the following clearances.

Unit: mm (in)

Body to outer gear clearance ①	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.15 - 0.26 (0.0059 - 0.0102)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Housing to inner gear clearance ④	0.05 - 0.09 (0.0020 - 0.0035)
Housing to outer gear clearance ⑤	0.05 - 0.11 (0.0020 - 0.0043)

If it exceeds the limit, replace gear set or entire oil pump assembly.

Oil Pump (Cont'd)



REGULATOR VALVE INSPECTION

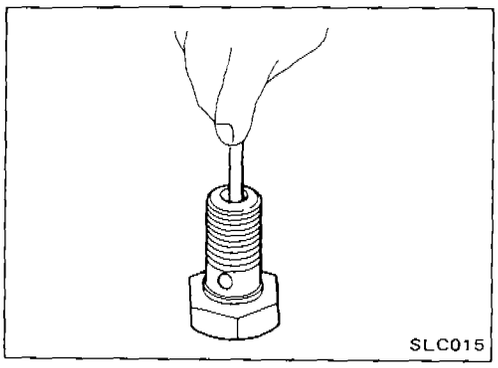
1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump assembly.

OIL PRESSURE RELIEF VALVE INSPECTION

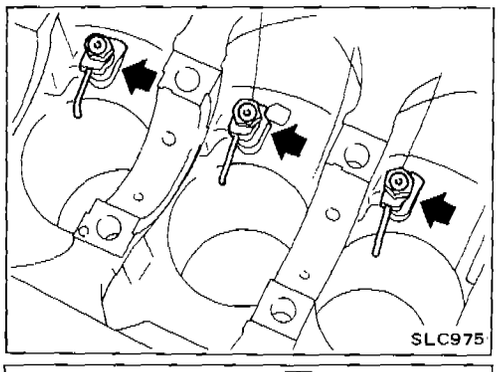
Inspect oil pressure relief valve for movement, cracks and breaks by pushing the ball, If replacement is necessary, remove valve by prying it out with a suitable tool. Install a new valve in place by tapping it.

Oil Jet



INSPECTION (For piston)

1. Blow through outlet of oil jet and make sure that air comes out of inlet.
2. Push cut-off valve of oil jet bolt with a clean resin or brass rod and make sure that cut-off valve moves smoothly with proper repulsion.

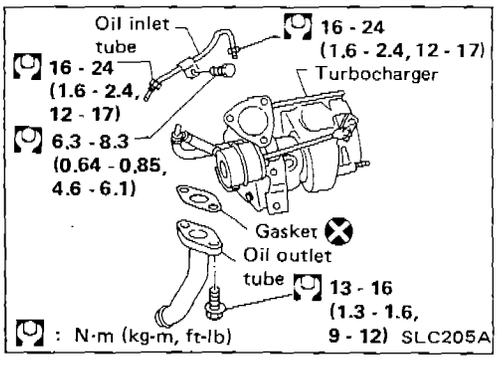


When installing oil jet, align oil jet's boss with hole on cylinder block.

Oil jet bolt:

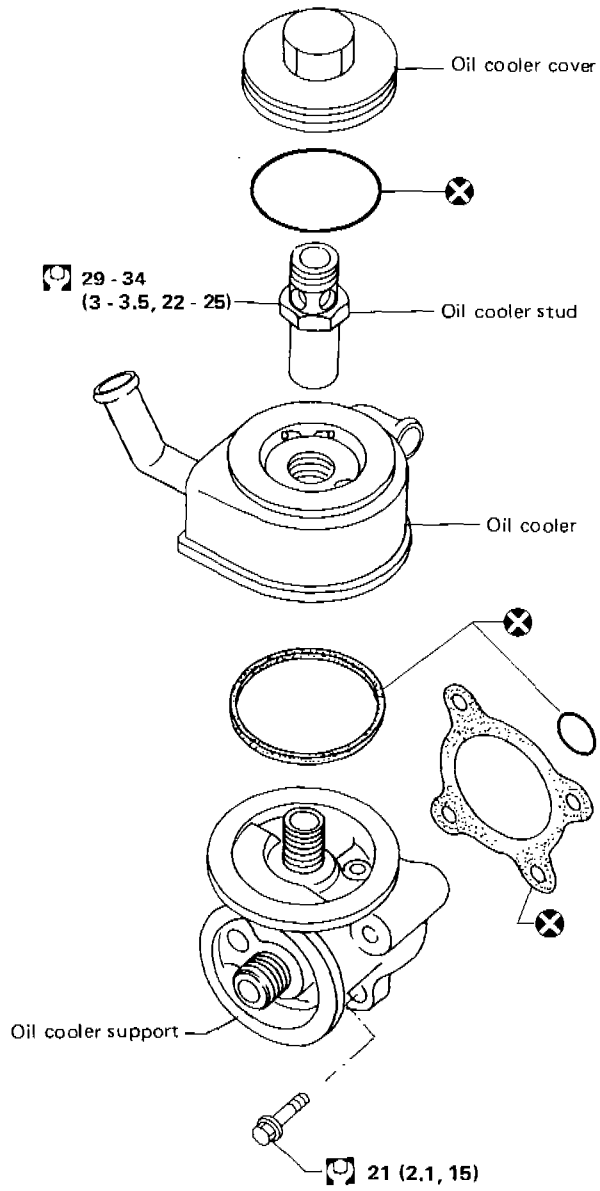
: 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

Turbocharger



- **Before removing water tube, drain coolant first.**
- **After installation, run engine for a few minutes and check for leaks.**

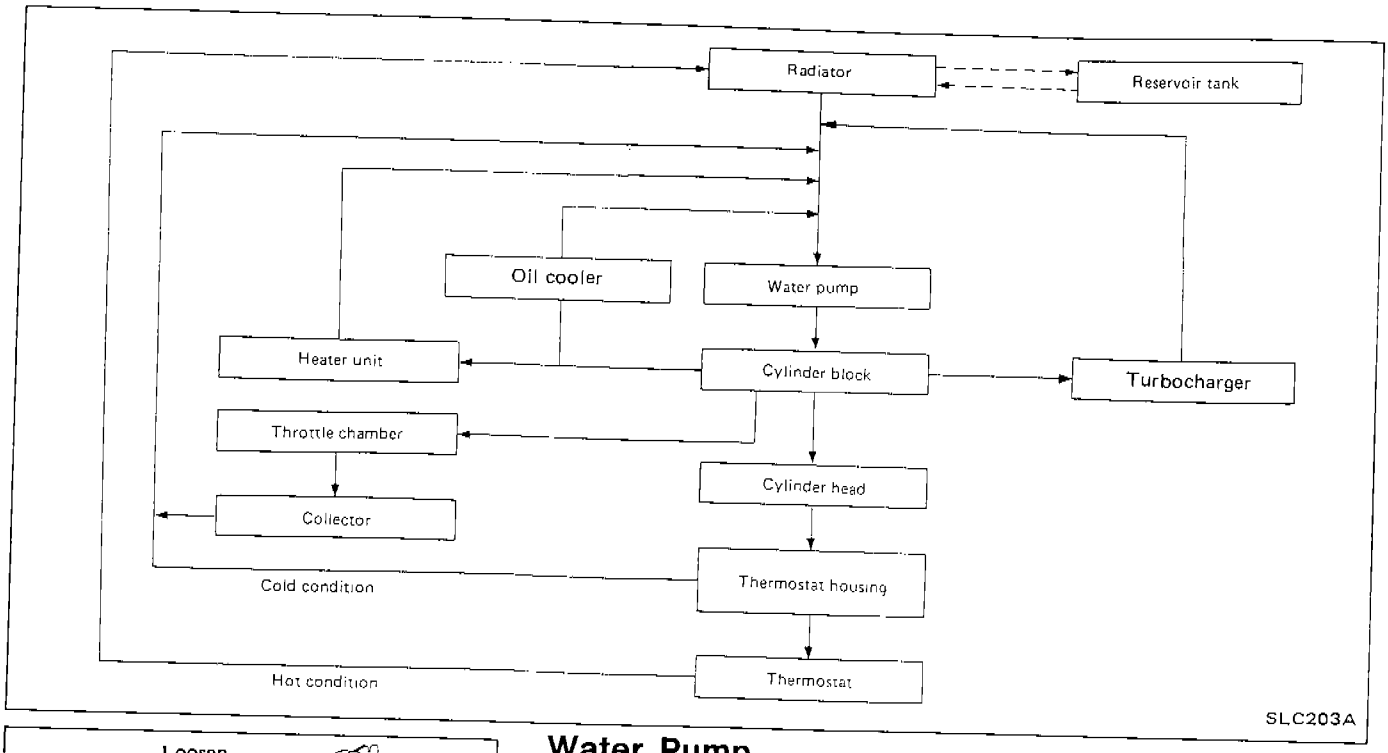
Oil Cooler

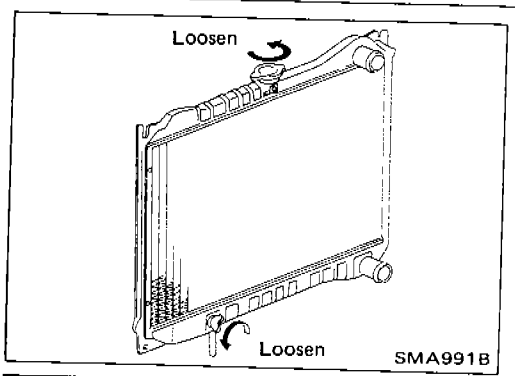


INSPECTION

1. Check oil cooler element and housing for cracks.
2. Check oil cooler for clogging by blowing through coolant inlet.
   Replace it if necessary.

Cooling Circuit

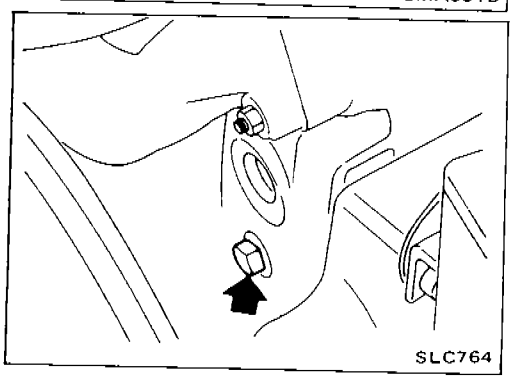




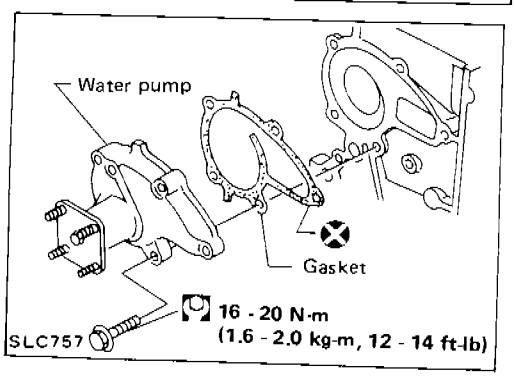
Water Pump

REMOVAL AND INSTALLATION

1. Drain coolant from radiator.



2. Remove cylinder block drain plug located at left rear of cylinder block and drain coolant.



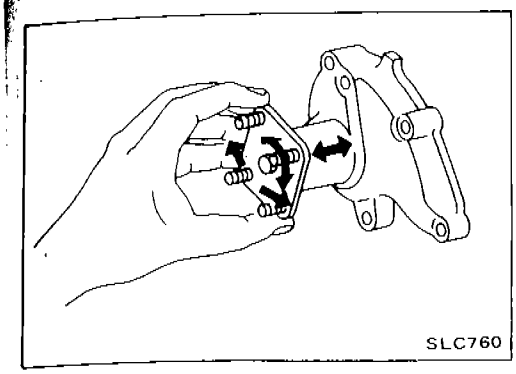
CAUTION:

- **When removing water pump assembly, be careful not to get coolant on timing belt.**
- **Water pump cannot be disassembled and should be replaced as a unit.**
- **After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.**

Water Pump (Cont'd)

INSPECTION

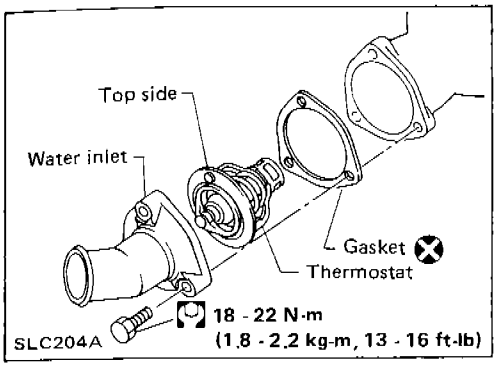
1. Check for badly rusted or corroded body assembly and vane.
2. Check for rough operation due to excessive end play.


SLC760

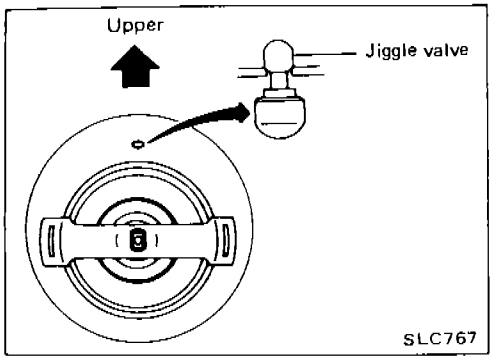
Thermostat

INSPECTION

1. Check for valve seating condition at ordinary temperatures. It should seat tightly.

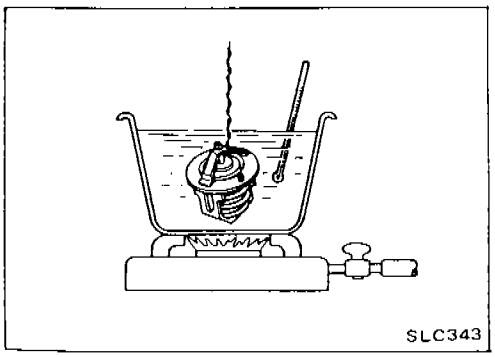


SLC204A



SLC767

2. Check valve opening temperature and maximum valve lift.


SLC343

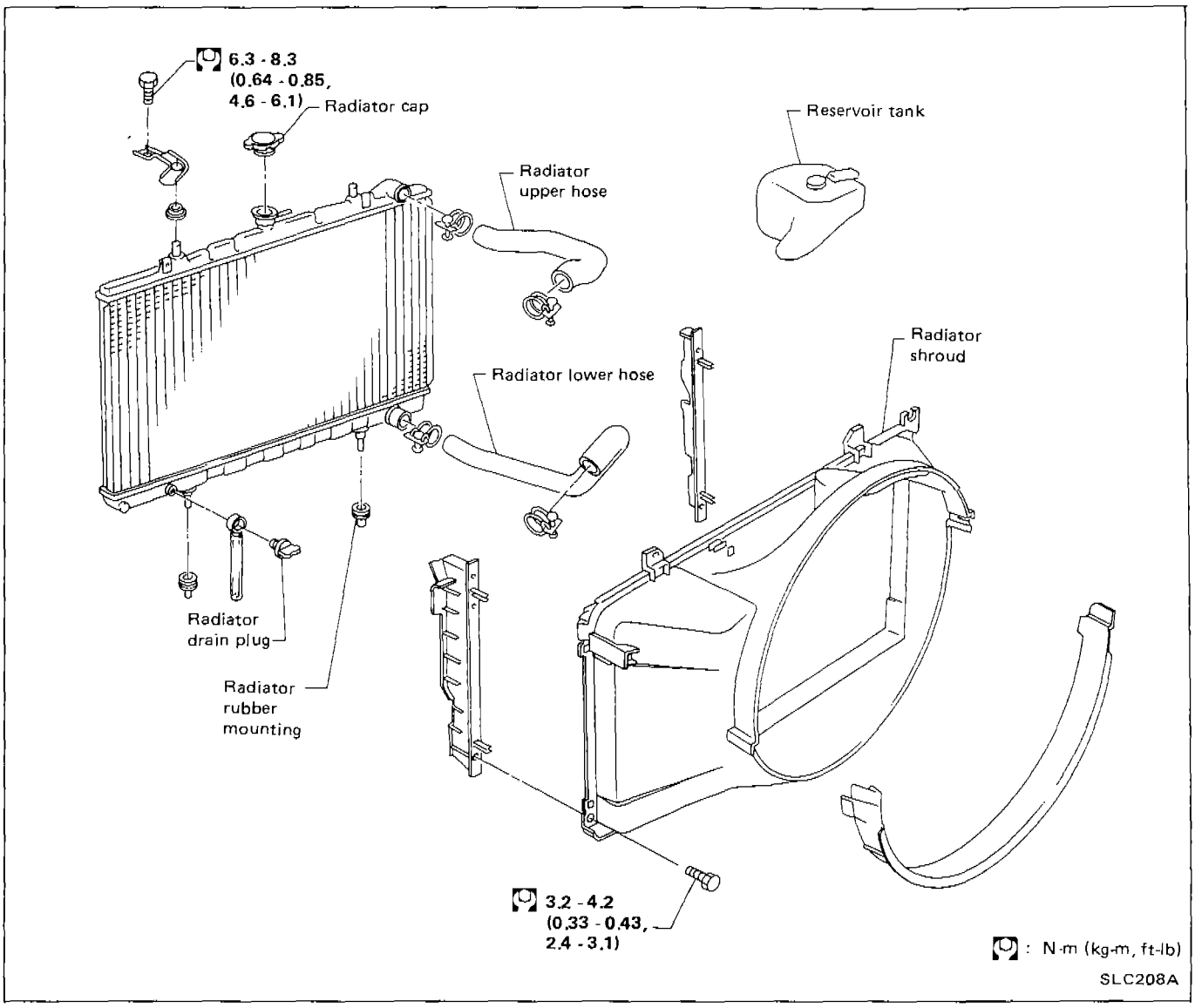
	Standard	Cold type	Hot type*
Valve opening temperature °C (°F)	82 (180)	88 (190)	76.5 (170)
Max. valve lift mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)	8/90 (0.31/194)

*For general areas only

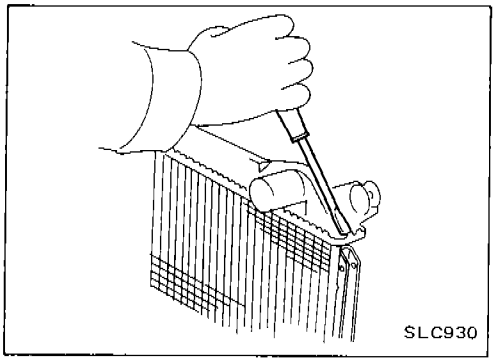
3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

- **After installation, run engine for a few minutes, and check for leaks.**

Radiator

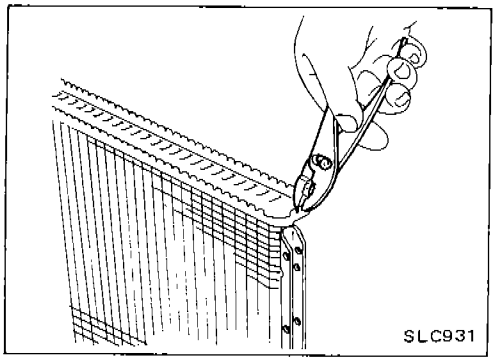

6.3 - 8.3
(0.64 - 0.85,
4.6 - 6.1)
Radiator cap
Reservoir tank
Radiator
upper hose
Radiator lower hose
Radiator
shroud
Radiator
drain plug
Radiator
rubber
mounting
3.2 - 4.2
(0.33 - 0.43,
2.4 - 3.1)
: N·m (kg-m, ft-lb)
SLC208A

Radiator (Aluminum type)(Cont'd)

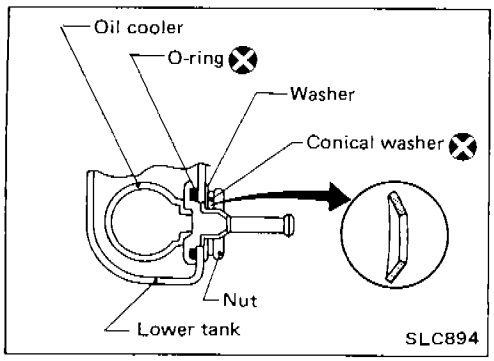


- In areas where Tool cannot be used, use a screwdriver to bend the edge up.

Be careful not to damage tank.



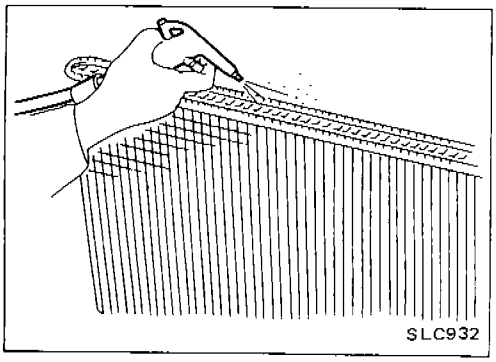
2. Make sure the edge stands straight up.
3. Remove oil cooler from tank. (A/T model only)



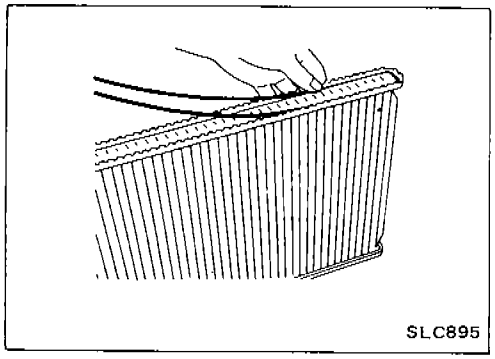
ASSEMBLY

1. Install oil cooler. (A/T model only)

Pay attention to direction of conical washer.



2. Clean contact portion of tank.

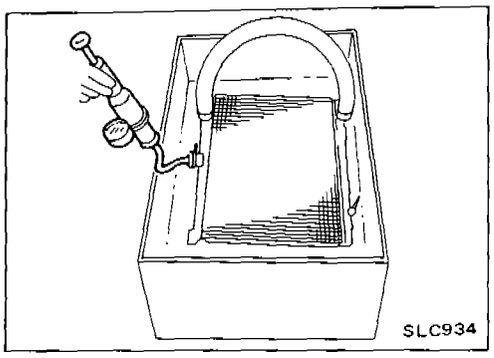


3. Install sealing rubber.

Push it in with fingers.

Be careful not to twist sealing rubber.

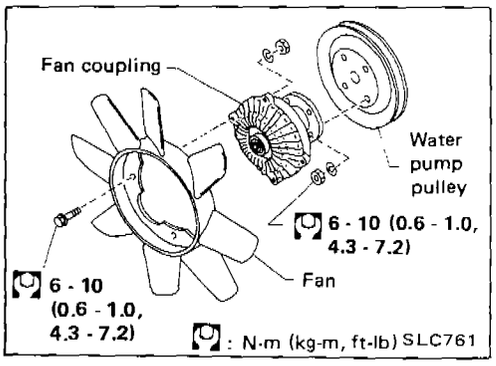
Radiator (Aluminum type)(Cont'd)



2. Check leakage.

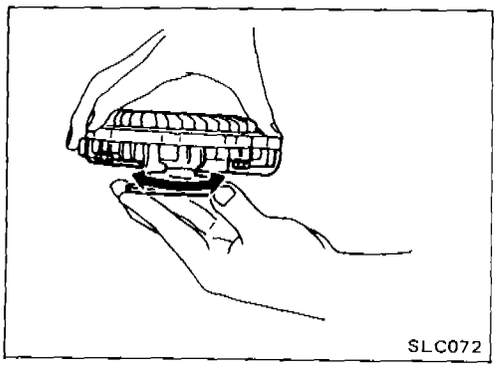
Cooling Fan

DISASSEMBLY AND ASSEMBLY

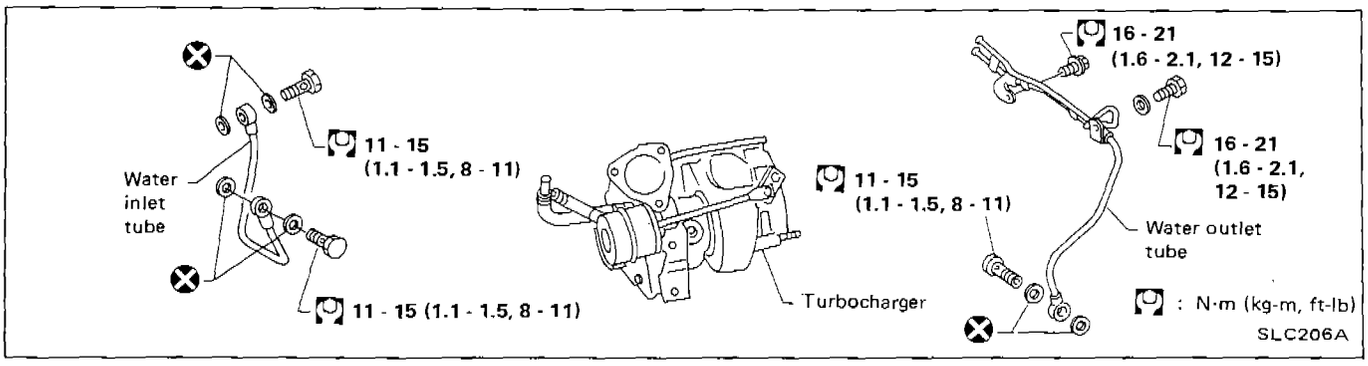


INSPECTION

Check fan coupling for rough operation, oil leakage or bent bimetal.



Turbocharger



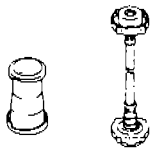
- **When installing oil tubes, first hand-tighten nuts connecting tubes, then slightly tighten bracket securing bolts, and tighten nuts and bolts securely.**
- **Be careful not to deform tubes.**
- **After installation, run engine for a few minutes, and check for oil leakage.**

MAINTENANCE

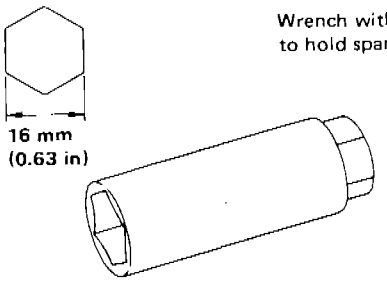
SECTION MA

CONTENTS

SPECIAL SERVICE TOOL

Tool number Tool name	Description
EG17650301 Radiator cap tester adapter	

COMMERCIAL SERVICE TOOL

Tool name	Description
Spark plug wrench	 SEM294A

The following tables show the normal maintenance schedule. Depending upon weather and atmospheric conditions, varying road surfaces, individual driving habits and vehicle usage, additional or more frequent maintenance will be required.

Periodic maintenance beyond the last period shown on the tables requires similar maintenance.

MAINTENANCE OPERATION		MAINTENANCE INTERVAL									Reference page
Perform either at number of kilometers (miles) or months, whichever comes first.	km x 1,000	1	10	20	30	40	50	60	70	80	
	(Miles x 1,000)	(0.6)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	
	Months	–	6	12	18	24	30	36	42	48	
ENGINE	**Underhood and under vehicle**										
Check drive belts for cracks, fraying, wear & tension		X		X		X		X		X	MA-13
Change engine anti-freeze coolant (Ethylene glycol base)						X				X	MA-13
Change engine coolant (Soft water)			X	X	X	X	X	X	X	X	MA-13
Check cooling system				X		X		X		X	MA-14
Check fuel lines						X				X	MA-15
Replace air cleaner filter (Viscous paper type)★						X				X	MA-16
Change engine oil (Use recommended oil)★			Every 5,000 km (3,000 miles) or 6 months								MA-16
Change engine oil filter★			X	X	X	X	X	X	X	X	MA-17
Check & adjust mixture ratio (Check mixture ratio only on models bound for areas affected by emission regulations)		X	X	X	X	X	X	X	X	X	EF & EC-25
Replace fuel filter★						X				X	MA-16
Check & replace spark plugs	Check		X		X		X		X		MA-17
	Replace			X		X		X		X	MA-17
Check positive crankcase ventilation (P.C.V.) system				X		X		X		X	MA-19
Check vacuum fitting hoses & connections				X		X		X		X	MA-19
Replace timing belt			Every 100,000 km (60,000 miles)								EM-9
CHASSIS AND BODY	**Underhood**										
Check brake, clutch & automatic transmission fluid level & leaks★			X	X	X	X	X	X	X	X	MA-21, 22, 24
Change brake fluid★						X				X	MA-24
Check brake booster vacuum hoses, connections & check valve						X				X	MA-24
Check power steering fluid & lines			X	X	X	X	X	X	X	X	MA-26
	Under vehicle										
Check brake, clutch & exhaust systems for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.			X	X	X	X	X	X	X	X	MA-21, 24
Check oil level in manual transmission & differential gear★			X	X	X	X	X	X	X	X	MA-21, 23
Check steering gear & linkage, axle & suspension parts, propeller shaft & drive shafts for damaged, loose & missing parts & lubrication★		X		X		X		X		X	MA-23, 26 FA-5, RA-5, 7
	Outside and inside										
Check wheel alignment. If necessary, rotate & balance wheels				X		X		X		X	MA-25, 26 FA-6
Check brake pads, discs & other brake components for wear, deterioration & leaks★			X	X	X	X	X	X	X	X	MA-25
Lubricate locks, hinges & hood latch★			X	X	X	X	X	X	X	X	MA-27
Check seat belts, buckles, retractors, anchors & adjuster				X		X		X		X	MA-27
Check foot brake, parking brake & clutch for free play, stroke & operation			X	X	X	X	X	X	X	X	CL-5, BR-7, 29

NOTE: Maintenance items with "★" should be performed more frequently according to "Maintenance under severe driving conditions".

Check: Check. Correct or replace if necessary.

MAINTENANCE UNDER SEVERE DRIVING CONDITIONS

The maintenance intervals shown on the preceding pages are for normal operating conditions. if the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance must be performed on the following items as shown in the table.

Severe driving conditions

A — Driving under dusty conditions
B — Driving repeatedly short distances
C — Towing a trailer
D — Extensive idling
E — Driving in extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high
F — Driving in high humidity areas or in mountainous areas
G — Driving in areas using salt or other corrosive materials
H — Driving on rough and/or muddy roads or in the desert
I — Driving with frequent use of braking or in mountainous areas

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
A	Air cleaner filter	Replace	More frequently	MA-16
A B C D	Engine oil	Replace		MA-16
A B C D	Engine oil filter	Replace	Every 5,000 km (3,000 miles) or 3 months	MA-17
A . . . E	Fuel filter	Replace	Every 20,000 km (12,000 miles) or 12 months	MA-16
. . . . . F . . .	Brake fluid	Replace		MA-24
. . C . . . . H .	Automatic & manual transmission oil & differential gear oil	Replace	Every 40,000 km (24,000 miles) or 24 months	MA-22, 23
. . . . . G H .	Steering gear & linkage, axle & suspension parts, propeller shaft & drive shaft	Check	Every 10,000 km (6,000 miles) or 6 months	MA-23, 26 FA-5, RA-5, 7
A . C . . . G H I	Brake pads, discs & other brake components	Check	Every 5,000 km (3,000 miles) or 3 months	MA-25
. . . . . G . .	Lock, hinges & hood latch	Lubricate		MA-27

Maintenance operation: Check = Check. Correct or replace if necessary.

The following tables show the normal maintenance schedule. Depending upon weather and atmospheric conditions, varying road surfaces, individual driving habits and vehicle usage, additional or more frequent maintenance will be required.

Periodic maintenance beyond the last period shown on the tables requires similar maintenance.

STANDARD & THE FIRST FREE SERVICES

MAINTENANCE OPERATION		MAINTENANCE INTERVAL					Reference page
Perform the standard service on a yearly basis, but on a mileage basis when driving more than 20,000 km (12,000 miles) a year.	Months	—	12	24	36	48	
	km x 1,000	1	20	40	60	80	
	(Miles x 1,000)	(0.6)	(12)	(24)	(36)	(48)	
Engine	**Underhood and under vehicle**						
Check drive belts for cracks, fraying, wear & tension				X		X	MA-13
Change engine anti-freeze coolant (Ethylene glycol base)				X		X	MA-13
Check cooling system			X	X	X	X	MA-14
Check fuel lines				X		X	MA-15
Replace air cleaner filter (Viscous paper type)★				X		X	MA-16
Replace timing belt			Every 100,000 km (60,000 miles)				EM-9
Check & adjust mixture ratio*1		X*1	X	X	X	X	EF & EC-25
Replace fuel filter★				X		X	MA-16
Replace spark plugs							
Non-catalyzer models			X	X	X	X	MA-17
Catalyzer models (Use PLATINUM-TIPPED type.)			Every 100,000 km (60,000 miles)				MA-17
Check positive crankcase ventilation (P.C.V.) system*1			X	X	X	X	MA-19
Check vacuum fitting hoses & connections*1			X	X	X	X	MA-19
Check exhaust gas sensor*2				X		X	MA-20
Check vapor lines*2				X		X	MA-19
Chassis and body	**Underhood**						
Check brake & clutch fluid level & leaks			X	X	X	X	MA-21, 24
Check automatic transmission fluid level & leaks★				X		X	MA-22
Change brake fluid★				X		X	MA-24
Check brake booster vacuum hoses, connections & check valve				X		X	MA-24
Check power steering fluid & lines			X	X	X	X	MA-26
	Under vehicle						
Check brake & clutch for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.			X	X	X	X	MA-21, 24
Check oil level in manual transmission & differential gear★				X		X	MA-21, 23
Check steering gear & linkage, axle & suspension parts, propeller shaft, drive shafts & exhaust system for damaged, loose & missing parts, lubrication & leaks★		X		X		X	MA-21, 23, 26 FA-5, RA-5, 7
	Outside and inside						
Check wheel alignment. If necessary, rotate & balance wheels			X	X	X	X	MA-25, 26 FA-6
Check brake pads, discs & other brake components for wear, deterioration & leaks★			X	X	X	X	MA-25
Check seat belts, buckles, retractors, anchors & adjuster				X		X	MA-27
Check foot brake, parking brake & clutch for free play, stroke & operation			X	X	X	X	CL-5, BR-7, 29
Check body corrosion				Annually			MA-28

NOTE: Maintenance items with "★" should be performed more frequently according to "Maintenance under severe driving conditions".

Check: Check. Correct or replace if necessary.

*1: Non-catalyzer models only *2: Catalyzer models only

ENGINE OIL SERVICE

MAINTENANCE OPERATION Perform at the specified time or mileage, whichever comes first.		MAINTENANCE INTERVAL									Reference page
	Months	—	**6**	**12**	**18**	**24**	**30**	**36**	**42**	**48**	
	km x 1,000	1	10	20	30	40	50	60	70	80	
	(Miles x 1,000)	(0.6)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	
Underhood											
Change engine oil (Use recommended oil)★		Every 6 months or 5,000 km (3,000 miles)									MA-16
Change engine oil filter★		X	X	X	X	X	X	X	X		MA-17

NOTE: Maintenance items with "★" should be performed more frequently according to "Maintenance under severe driving conditions".

MAINTENANCE UNDER SEVERE DRIVING CONDITIONS

The maintenance intervals shown on the preceding pages are for normal operating conditions. if the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance must be performed on the following items as shown in the table.

Severe driving conditions

A — Driving under dusty conditions
B — Driving repeatedly short distances
C — Towing a trailer
D — Extensive idling
E — Driving in extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high
F — Driving in high humidity areas or in mountainous areas
G — Driving in areas using salt or other corrosive materials
H — Driving on rough and/or muddy roads or in the desert
I — Driving with frequent use of braking or in mountainous areas

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
Standard service				
A	Air cleaner filter	Replace	Every 12 months or 20,000 km (12,000 miles)	MA-16
A . . . E . . .	Fuel filter	Replace		MA-16
. . . . . F . . .	Brake fluid	Replace		MA-24
. . . . . G H .	Steering gear & linkage, axle & suspension parts, propeller shaft, drive shafts & exhaust system	Check		MA-21, 23, 26 FA-5, RA-5, 7
. . C . . . . H .	Automatic & manual transmission oil, & differential gear oil	Replace	Every 24 months or 40,000 km (24,000 miles)	MA-22, 23
A . C . . . G H I	Brake pads, discs & other brake components	Check	Every 6 months or 10,000 km (6,000 miles)	MA-25
Engine oil service				
A B C D	Engine oil	Replace	More frequently	MA-16
A B C D	Engine oil filter	Replace	Every 3 months or 5,000 km (3,000 miles)	MA-17

Maintenance operation: Check = Check. Correct or replace if necessary.

The following tables show the normal maintenance schedule. Depending upon weather and atmospheric conditions, varying road surface, individual driving habits and vehicle usage, additional or more frequent maintenance will be required.

Periodic maintenance beyond the last period shown on the tables requires similar maintenance.

MAINTENANCE OPERATION Perform either at number of miles (kilometers) or months, whichever comes first.	Miles x 1,000 (km x 1,000) Months	MAINTENANCE INTERVAL 0.6 (1) – 9 (15) 6 18 (30) 12 27 (45) 18 36 (60) 24 45 (75) 30 54 (90) 36 63 (105) 42 72 (120) 48	Reference page
ENGINE MAINTENANCE	**Under bonnet and under vehicle**		
Replace timing belt		Every 60,000 miles (100,000 km)	EM-9
Change engine anti-freeze coolant (Ethylene glycol base)		36, 72	MA-13
Check cooling system		18, 36, 54, 72	MA-14
Check fuel lines		36, 72	MA-15
Check drive belts for cracks, fraying, wear & tension		0.6, 18, 36, 54, 72	MA-13
Replace air cleaner filter (Viscous paper type)*		36, 72	MA-16
Change engine oil (Use recommended oil) & oil filter*		Every 4,500 miles (7,500 km) or 6 months	MA-16, 17
Check & adjust mixture ratio		0.6, 9, 18, 27, 36, 45, 54, 63, 72	EF & EC-25
Replace fuel filter		18, 36, 54, 72	MA-16
Replace spark plugs		9, 18, 27, 36, 45, 54, 63, 72	MA-17
Check positive crankcase ventilation (P.C.V.) system		18, 36, 54, 72	MA-19
Check vacuum hose & connections		18, 36, 54, 72	MA-19
CHASSIS AND BODY MAINTENANCE	**Under bonnet**		
Check brake & clutch fluid level & leaks*		9, 18, 27, 36, 45, 54, 63, 72	MA-21, 24
Check automatic transmission fluid level & leaks*		18, 36, 54, 72	MA-22
Change brake fluid		18, 36, 54, 72	MA-24
Check brake booster vacuum hoses, connections & check valve		36, 72	MA-24
Check power steering fluid & lines		9, 18, 27, 36, 45, 54, 63, 72	MA-26
	Under vehicle		
Check brake & clutch for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.		9, 18, 27, 36, 45, 54, 63, 72	MA-21, 24
Check oil level in manual transmission & differential gear*		18, 36, 54, 72	MA-21, 23
Check steering gear & linkage, axle & suspension parts, propeller shaft, drive shafts & exhaust system for damaged, loose & missing parts, lubrication & leaks*		0.6, 18, 36, 54, 72	MA-21, 23, 26 FA-5, RA-5, 7
	Outside and inside		
Check wheel alignment. If necessary, rotate & balance wheels		18, 36, 54, 72	MA-25, 26 FA-6
Check brake pads, disc & other brake components for wear, deterioration & leaks*		9, 18, 27, 36, 45, 54, 63, 72	MA-25
Check seat belts, buckles, retractors & adjuster		18, 36, 54, 72	MA-27
Check foot brake, hand brake & clutch for free play, stroke & operation		9, 18, 27, 36, 45, 54, 63, 72	CL-5, BR-7, 29
Check body corrosion		Annually	MA-28

NOTE: Maintenance items with "*" should be performed more frequently according to "Maintenance under severe driving conditions".

Check: Check. Correct or replace if necessary.

MAINTENANCE UNDER SEVERE DRIVING CONDITIONS

The maintenance intervals shown on the preceding pages are for normal operating conditions. if the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance must be performed on the following items as shown in the table.

Severe driving conditions

A — Driving under dusty conditions
B — Driving repeatedly short distances
C — Towing a trailer
D — Extensive idling
E — Driving in areas using salt or other corrosive materials
F — Driving on rough and/or muddy roads or in the desert
G — Driving with frequent use of braking or in mountainous areas

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
A	Air cleaner filter	Replace	More frequently	MA-16
A B C D . . .	Engine oil & oil filter	Replace		MA-16, 17
. . C . . F .	Automatic & manual transmission oil, differential gear oil	Replace	Every 36,000 miles (60,000 km) or 24 months	MA-22, 23
. . . . E F .	Steering gear & linkage, axle & suspension parts, propeller shaft, drive shafts & exhaust system	Check	Every 9,000 miles (15,000 km) or 6 months	MA-21, 23, 26 FA-5, RA-5, 7
A . C . E F G	Brake pads, discs & other brake components	Check	Every 4,500 miles (7,500 km) or 3 months	MA-25

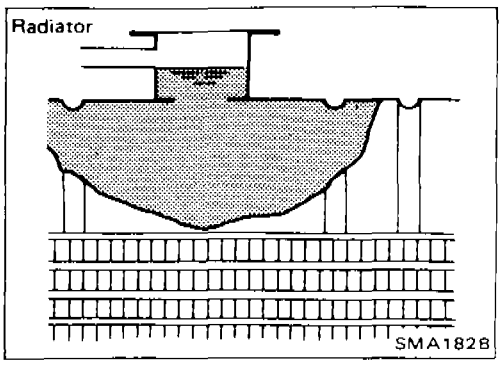
Maintenance operation: Check = Check. Correct or replace if necessary

Fluids and Lubricants

	Capacity (Approximate)		Recommended fluids and lubricants
	Liter	Imp measure	
Engine oil (Refill)			
With oil filter	3.5	3-1/8 qt	API SF/CC, SF/CD, SE or SG*
Without oil filter	3.1	2-3/4 qt	
Cooling system (With reservoir tank)	7.0	6-1/8 qt	Anti-freeze coolant (Ethylene glycol base) or soft water
Manual transmission gear oil	2.4	4-1/4 pt	API GL-4*
Differential carrier gear oil	1.8	3-1/8 pt	API GL-5*
Automatic transmission fluid	7.9	7 qt	Type DEXRON™
Power steering fluid	0.9	3/4 qt	
Brake and clutch fluid	—	—	DOT 3 (US FMVSS No. 116)
Multi-purpose grease	—	—	NLGI No. 2 (Lithium soap base)

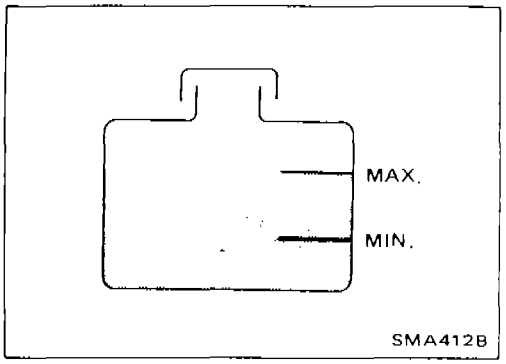
* For further details, see "SAE Viscosity Number".

Changing Engine Coolant (Cont'd)



9. Fill radiator with coolant up to specified level.
   Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.
   Coolant capacity (With reservoir tank):
   7.0 ℓ (6-1/8 Imp qt)

Pour coolant through coolant filler neck slowly to allow air in system to escape.

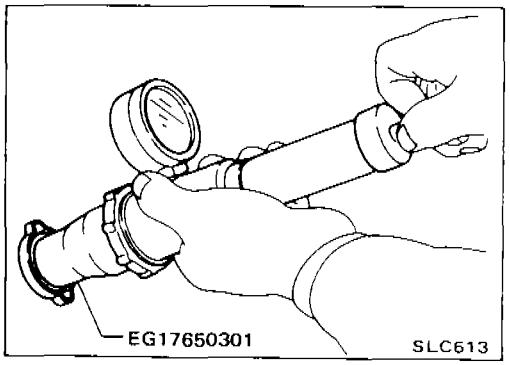


10. Remove reservoir tank, drain coolant, then clean reservoir tank.
11. Fill reservoir tank with coolant up to "MAX" level.
12. Run engine and warm it up.
13. Stop engine and cool it down, then add coolant as necessary.

Checking Cooling System

CHECKING HOSES

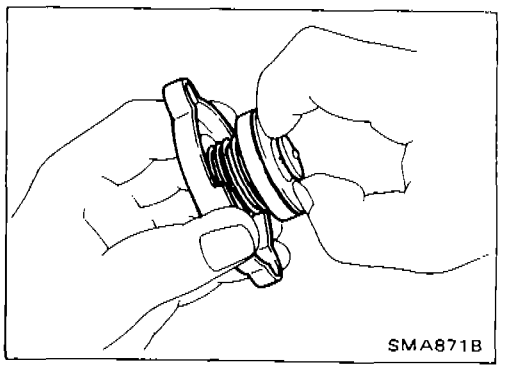
Check hoses for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.



CHECKING RADIATOR CAP

Apply pressure to radiator cap with cap tester to see if it is satisfactory.

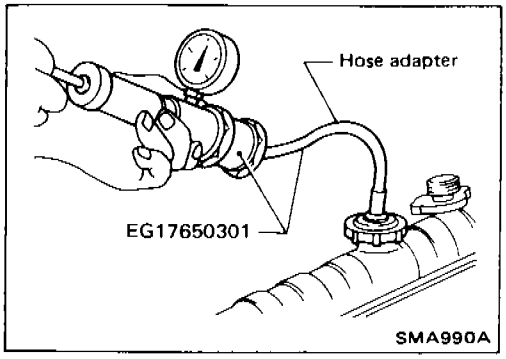
Radiator cap relief pressure:
78 - 98 kPa
(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)



Pull the negative-pressure valve to open it. Check that it closes completely when released.

Checking Cooling System (Cont'd)

CHECKING COOLING SYSTEM FOR LEAKS



Apply pressure to the cooling system with cap tester to check for leakage.

Testing pressure:

98 kPa (0.98 bar, 1.0 kg/cm^2, 14 psi)

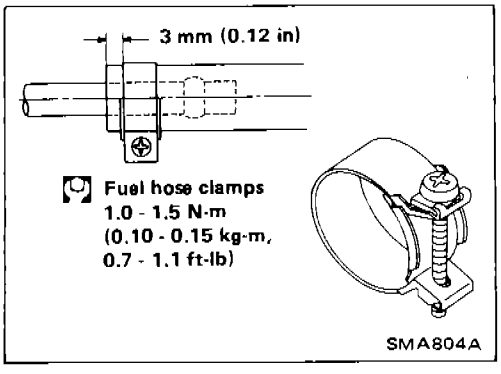
CAUTION:

Higher pressure than the specified value may cause damage to radiator.

Checking Fuel Lines

Inspect fuel lines and tank for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.

If necessary, repair or replace faulty parts.



CAUTION:

Tighten high-pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end.

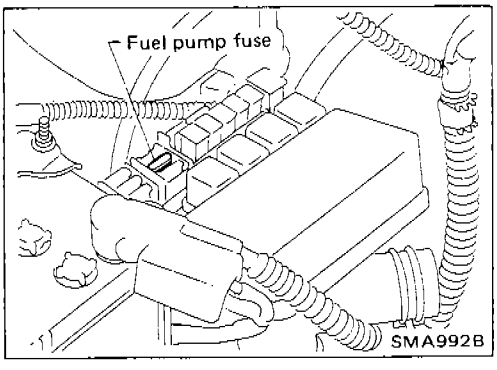
Tightening torque specifications are the same for all rubber hose clamps.

Ensure that screw does not contact adjacent parts.

Changing Fuel Filter

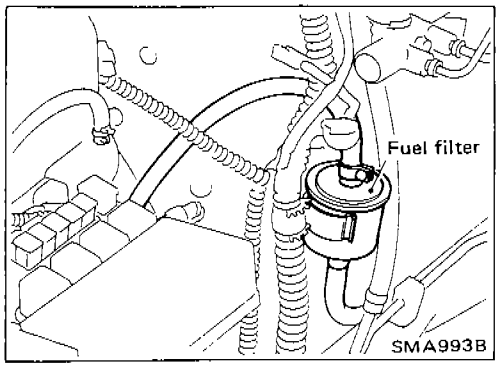
WARNING:

Before removing fuel filter, release fuel pressure from fuel line to eliminate danger.



1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank engine two or three times to make sure that fuel pressure is released.
4. Turn ignition switch off and install fuse for fuel pump.

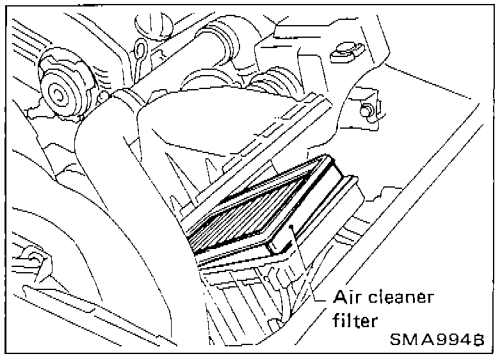
Changing Fuel Filter (Cont'd)



5. Loosen fuel hose clamps.
6. Replace fuel filter.

- **Be careful not to spill fuel over engine compartment. Place a shop towel to absorb fuel.**
- **Use a high-pressure type fuel filter. Do not use a synthetic resinous fuel filter.**
- **When tightening fuel hose clamps, refer to "Checking Fuel Lines".**

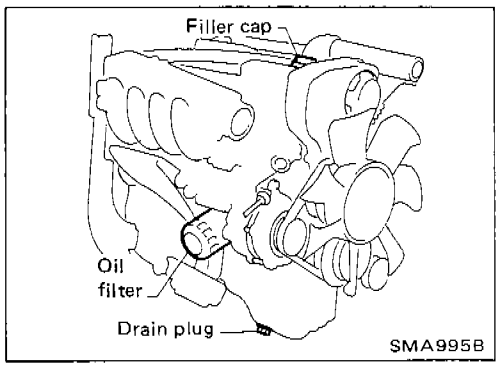
Changing Air Cleaner Filter



Viscous paper type

The viscous paper type filter does not need cleaning between renewals.

Changing Engine Oil



WARNING:

Be careful not to burn yourself, as the engine oil is hot.

1. Warm up engine, and check for oil leakage from engine components.
2. Remove drain plug and oil filler cap.
3. Drain oil and refill with new engine oil.

Refill oil capacity (Approximate):

With oil filter change

3.5 ℓ (3-1/8 Imp qt)

Without oil filter change

3.1 ℓ (2-3/4 Imp qt)

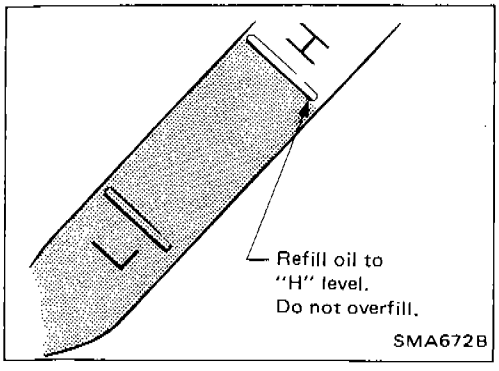
CAUTION:

- **Be sure to clean drain plug and install with new washer.**

  Drain plug:

  : 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
- **Use recommended engine oil.**

Changing Engine Oil (Cont'd)



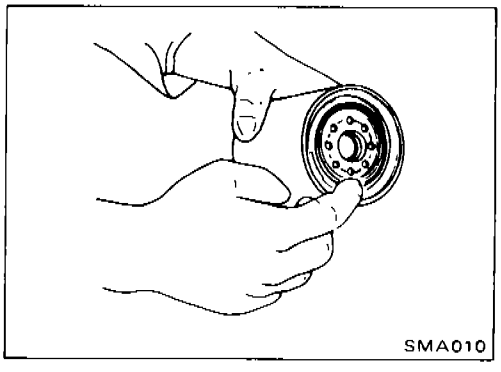
4. Check oil level.
5. Start engine and check area around drain plug and oil filter for oil leakage.
6. Run engine for a few minutes, then turn it off. After several minutes, check oil level.

Changing Oil Filter

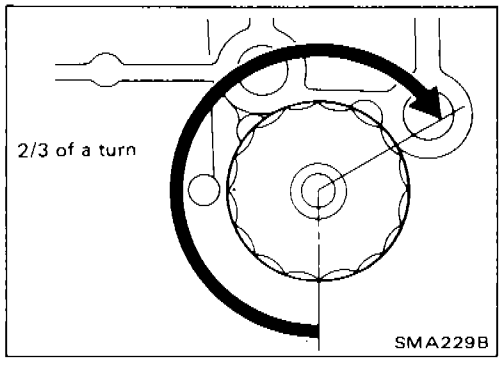
1. Remove oil filter.

WARNING:

Be careful not to burn yourself, as the engine and the engine oil are hot.



2. Before installing new oil filter, clean the oil filter mounting surface on cylinder block, and coat the rubber seal of oil filter with a little engine oil.

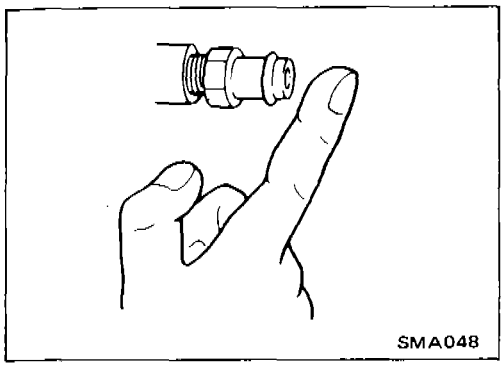


3. Screw in the oil filter until a slight resistance is felt, then tighten additionally more than 2/3 turn.
4. Add engine oil.

Refer to "Changing Engine Oil".

Checking and Changing Spark Plugs

1. Remove ornament cover.



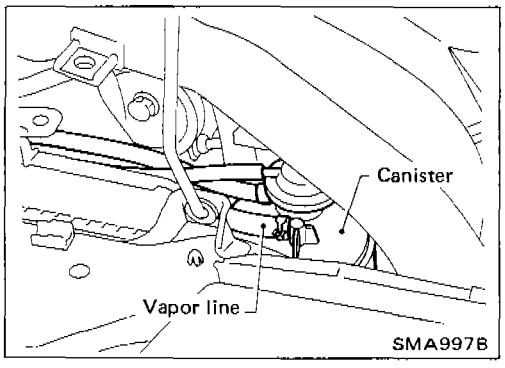
Checking Positive Crankcase Ventilation (P.C.V.) System

CHECKING P.C.V. VALVE

With engine running at idle, remove ventilation hose from P.C.V. valve; if valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

Checking Vacuum Hoses and Connections

Check vacuum hoses for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.

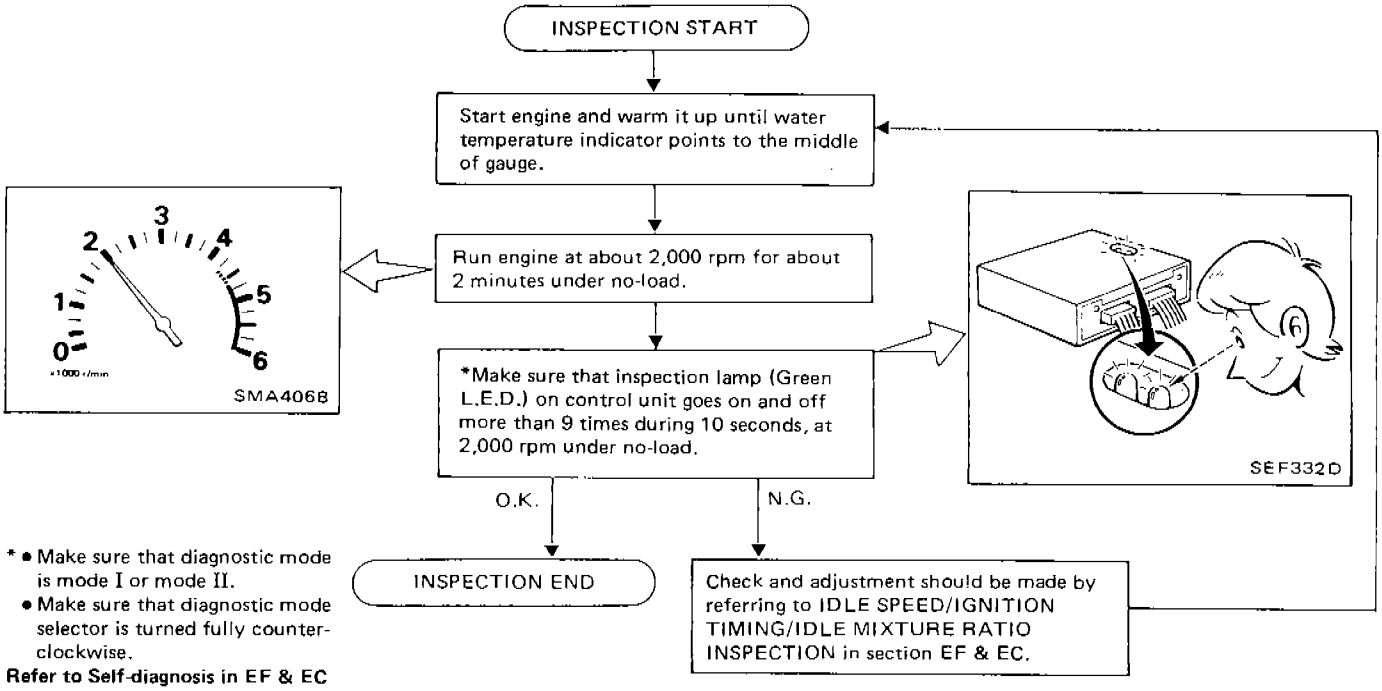


Checking Vapor Lines

1. Visually inspect vapor lines for improper attachment and for cracks, damage, loose connections, chafing and deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc.
   Refer to "EVAPORATIVE EMISSION CONTROL SYSTEM" in EF & EC section.

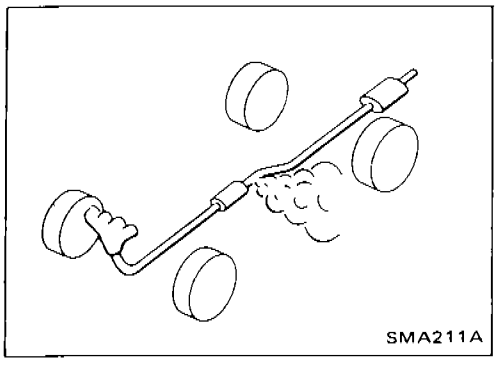
Checking Exhaust Gas Sensor

Checking procedure



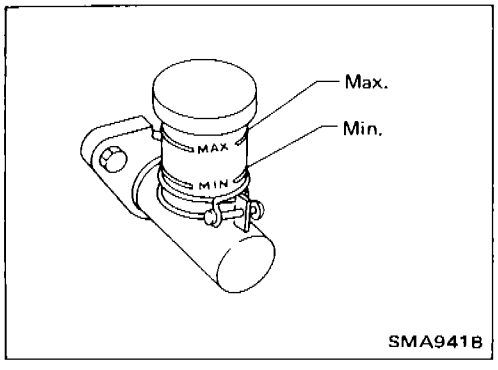
* • Make sure that diagnostic mode is mode I or mode II.
  • Make sure that diagnostic mode selector is turned fully counterclockwise.

Refer to Self-diagnosis in EF & EC section.


SMA211A

Checking Exhaust System

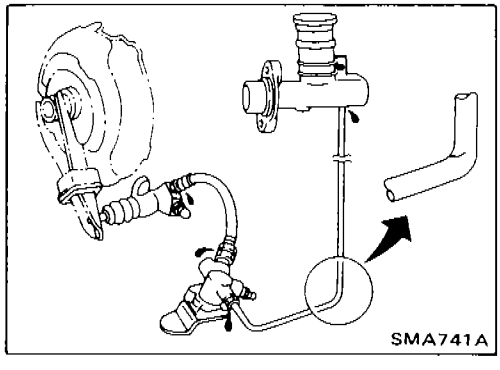
- Check exhaust pipes, muffler and mounting for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.



SMA941B

Checking Clutch Fluid Level and Leaks

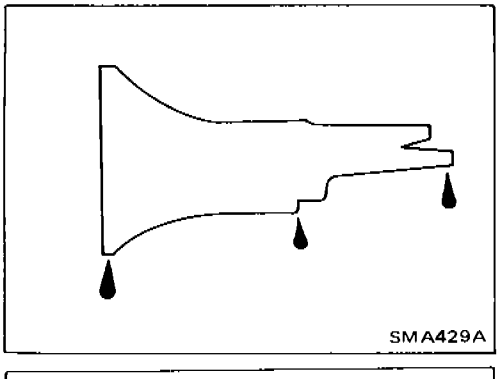
- If fluid level is extremely low, check clutch system for leaks.


SMA741A

Checking Clutch System

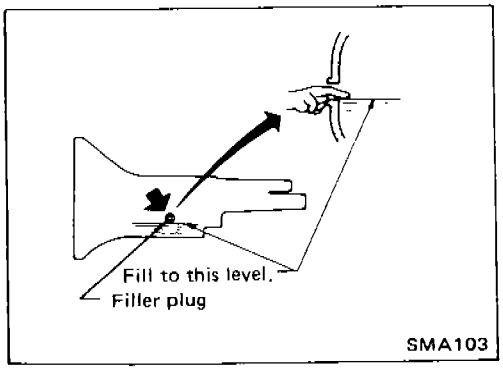
HYDRAULIC TYPE

Check fluid lines and operating cylinder for improper attachment, cracks, damage, loose connections, chafing and deterioration.


SMA429A

Checking M/T Oil

1. Check for oil leakage.



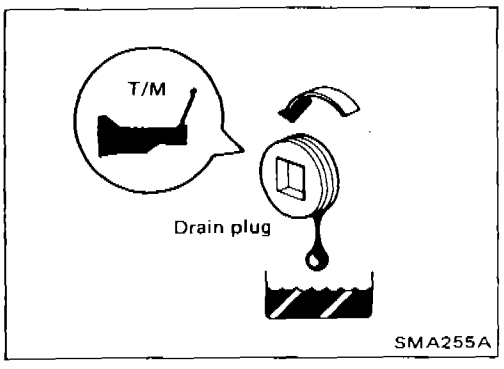
SMA103

2. Check oil level.

Never start engine while checking oil level.

Filler plug:

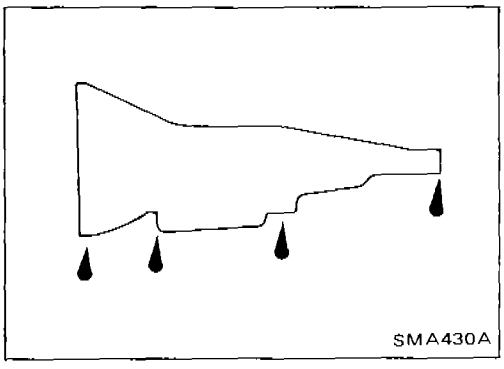
: 25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)



Changing M/T Oil

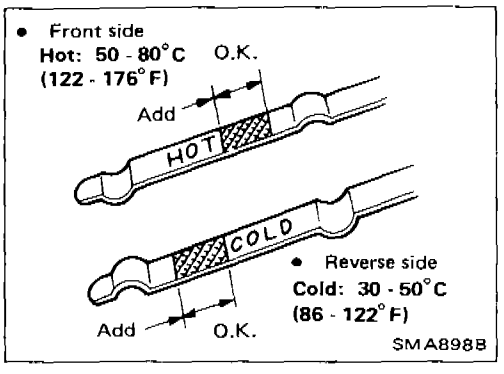
1. Drain oil and refill with new gear oil.
2. Check oil level.

Oil capacity:
2.4 ℓ (4-1/4 Imp pt)
Drain plug:
: 25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)



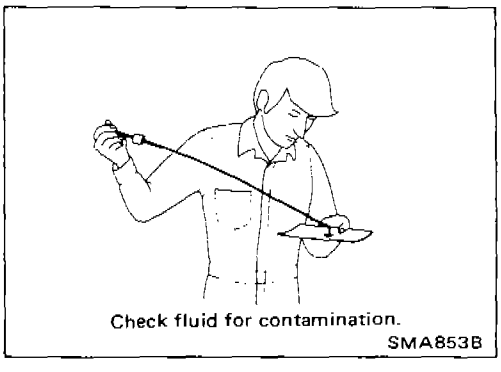
Checking A/T Fluid

1. Check for fluid leakage.

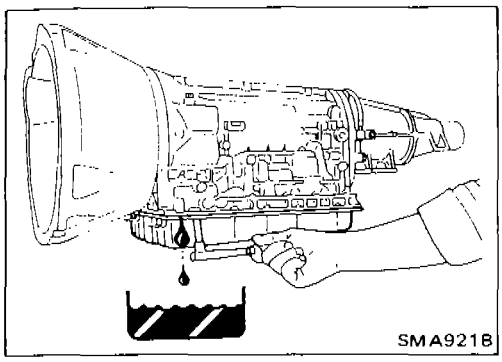


2. Check fluid level.
   Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) after vehicle has been driven approximately 5 minutes in urban areas after engine is warmed up. But it can be checked at fluid temperatures of 30 to 50°C (86 to 122°F) using "COLD" range on dipstick for reference after engine is warmed up and before driving. However, fluid level must be rechecked using "HOT" range.
   1) Park vehicle on level surface and set parking brake.
   2) Start engine and then move selector lever through each gear range, ending in "P".
   3) Check fluid level with engine idling.
   4) Remove dipstick and wipe it clean with lint-free paper.
   5) Reinsert dipstick into charging pipe as far as it will go.
   6) Remove dipstick and note reading. If level is at low side of either range, add fluid to the charging pipe.

Do not overfill.



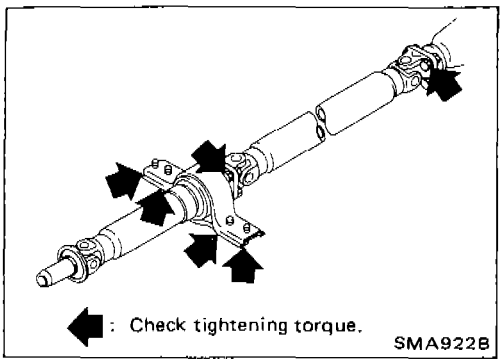
3. Check fluid condition.
   Check fluid for contamination. If fluid is very dark or smells burned, or contains frictional material (clutches, band, etc.), check operation of A/T.
   Refer to section AT for checking operation of A/T.


SMA921B

Changing A/T Fluid

1. Drain fluid by removing oil pan.
2. Replace gasket with new one.
3. Refill with fluid and then check fluid level.

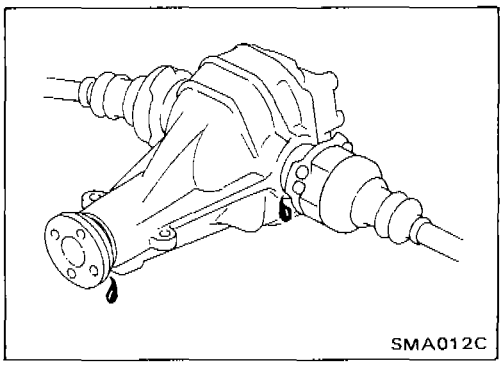
Oil capacity (With torque converter):
7.9 ℓ (7 Imp qt)



SMA922B

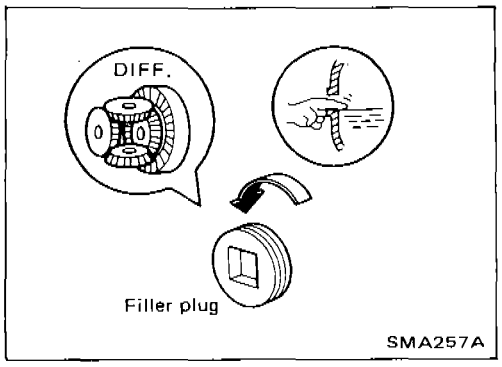
Checking Propeller Shaft

Check propeller shaft and center bearing for damage, looseness or grease leakage.
If greasing points are provided, supply grease as necessary.
Refer to section PD.


SMA012C

Checking Differential Gear Oil

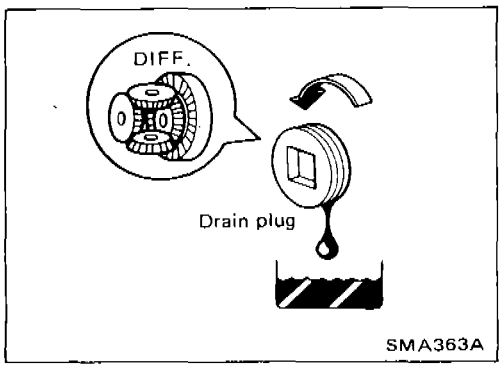
1. Check differential carrier for oil leakage.



SMA257A

2. Check oil level.

Filler plug:
[O]: 59 - 98 N·m (6 - 10 kg-m, 43 - 72 ft-lb)

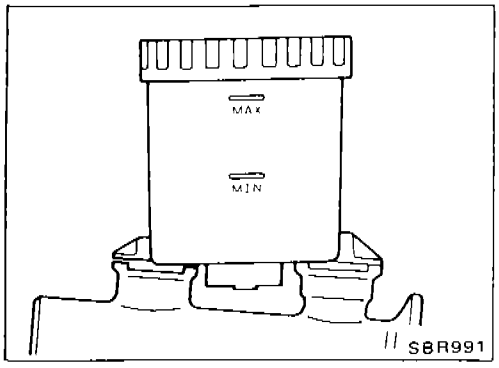


SMA363A

Changing Differential Gear Oil

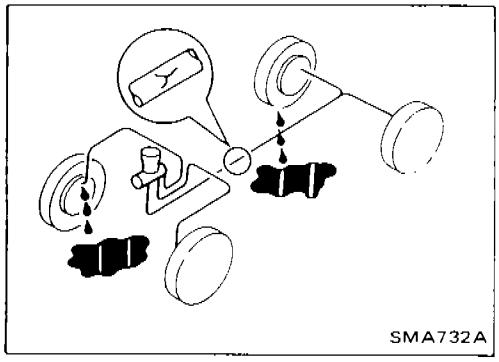
1. Drain oil and refill with new gear oil.
2. Check oil level.

Oil capacity:
1.8 ℓ (3-1/8 Imp pt)
Drain plug:
[O]: 59 - 98 N·m (6 - 10 kg-m, 43 - 72 ft-lb)



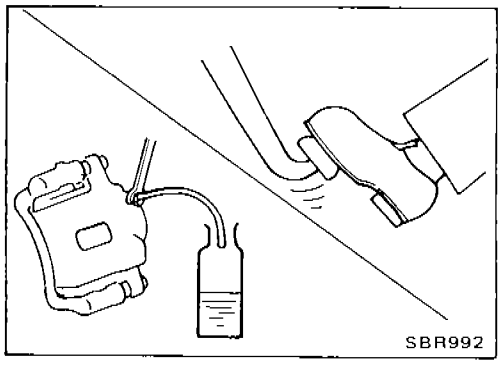
Checking Brake Fluid Level and Leaks

- If fluid level is extremely low, check brake system for leaks.



Checking Brake System

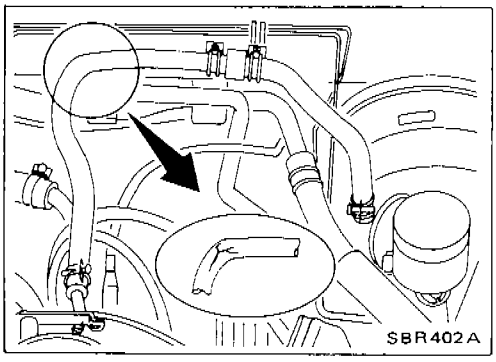
- Check brake fluid lines and parking brake cables for improper attachment and for leaks, chafing, abrasions, deterioration, etc.



Changing Brake Fluid

1. Drain brake fluid from each air bleeder valve.
2. Refill until new brake fluid comes out from each air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill brake fluid.
   Refer to section BR.

- **Refill with recommended brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**



Checking Brake Booster, Vacuum Hoses, Connections and Check Valve

Check vacuum lines, connections and check valve for improper attachment, air tightness, chafing and deterioration.

Chassis and Body Maintenance

INSPECTION AND ADJUSTMENT

Clutch

Unit: mm (in)

Model	R.H.D.	L.H.D.
Pedal free height "H"	182 - 192 (7.17 - 7.56)	186 - 196 (7.32 - 7.72)
Pedal free play "A"	1.0 - 3.0 (0.039 - 0.118)	

Front axle and front suspension (Unladen)*

Camber	degree	−1°25′ to 5′	
Caster	degree	5°55′ - 7°25′	
Toe-in	mm (in)	0 - 2 (0 - 0.08)	
(Total toe-in)	degree	0′ - 12′	
Kingpin inclination	degree	12°25′ - 13°55′	
Front wheel turning angle Full turn Inside/Outside	degree	Except Europe L.H.D.	Europe L.H.D.
		39° - 43°/33°	36° - 40°/32°

*: Tankful of fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, mats in designated position.

Rear axle and rear suspension (Unladen)*

Camber	degree	−1°40′ to −0°40′
Toe-out	mm (in)	0 - 5 (0 - 0.20)
(Total toe-out)	degree	0′ - 28′

*: Tankful of fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, mats in designated position.

Wheel bearing

	Front	Rear
Wheel bearing axle end play mm (in)	0.03 (0.0012) or less	0.05 (0.0020) or less
Wheel bearing lock nut Tightening torque N.m (kg-m, ft-lb)	147 - 216 (15 - 22, 108 - 159)	235 - 314 (24 - 32, 174 - 231)

Brake

Unit: mm (in)

Disc brake			
Pad			
Standard thickness			
CL18VB		10.0 (0.394)	
CL25VA		11.0 (0.433)	
CL9H		9.5 (0.374)	
AD9		10.0 (0.394)	
Minimum thickness			
CL18VB, CL25VA		2.0 (0.079)	
CL9H, AD9		2.0 (0.079)	
Rotor			
Standard thickness			
CL18VB		18.0 (0.709)	
CL25VA		22.0 (0.866)	
CL9H, AD9		9.0 (0.354)	
Minimum thickness			
CL18VB		16.0 (0.630)	
CL25VA		20.0 (0.787)	
CL9H, AD9		8.0 (0.315)	
Pedal			
Free height			
M/T	L.H.D.	177 - 187 (6.97 - 7.36)	
	R.H.D.	178 - 188 (7.01 - 7.40)	
A/T	L.H.D.	186 - 196 (7.32 - 7.72)	
	R.H.D.	188 - 198 (7.40 - 7.80)	
Free play		1 - 3 (0.04 - 0.12)	
Depressed height [under force of 490 N (50 kg, 110 lb) with engine running]		L.H.D	R.H.D.
Except Europe	M/T	90 (3.54) or more	95 (3.74) or more
	A/T	100 (3.94) or more	100 (3.94) or more
Europe	M/T	85 (3.35) or more	90 (3.54) or more
	A/T	95 (3.74) or more	95 (3.74) or more
Parking brake Number of notches [at pulling force 196 N (20 kg, 44 lb)]		6 - 8	

Wheel balance

Wheel balance (Maximum allowable unbalance at rim flange) g (oz)	10 (0.35)
Tire balance weight g (oz)	5 - 60 (0.18 - 2.12) Spacing 5 (0.18)

TIGHTENING TORQUE

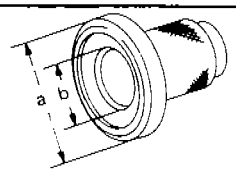
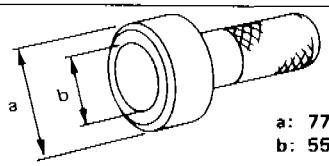
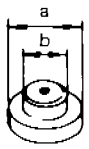
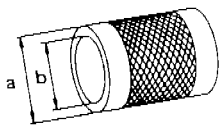
Unit	N·m	kg-m	ft-lb
Clutch			
Pedal stopper lock nut	16 - 22	1.6 - 2.2	12 - 16
Clutch switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Manual transmission			
Drain and filler plugs	25 - 34	2.5 - 3.5	18 - 25
Final drive			
Drain plug	59 - 98	6 - 10	43 - 72
Filler plug	59 - 98	6 - 10	43 - 72
Front axle and front suspension			
Tie-rod lock nut	37 - 46	3.8 - 4.7	27 - 34
Camber adjusting pin	124 - 143	12.6 - 14.6	91 - 106
Rear axle and rear suspension			
Toe adjusting pin	69 - 88	7.0 - 9.0	51 - 65
Camber adjusting pin	69 - 88	7.0 - 9.0	51 - 65
Brake system			
Air bleed valve	7 - 9	0.7 - 0.9	5.1 - 6.5
Brake lamp switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Brake booster input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
Wheel and tire			
Wheel nut	98 - 118	10.0 - 12.0	72 - 87

MANUAL TRANSMISSION

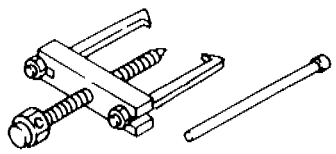
SECTION MT

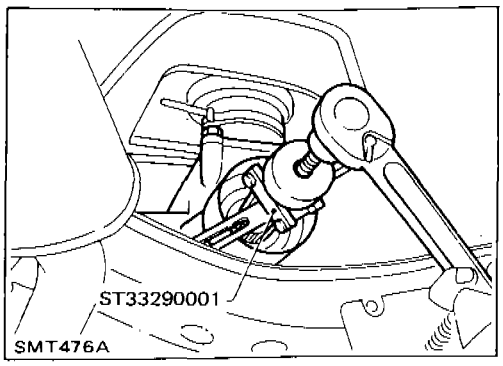
CONTENTS

*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST33400001* Drift	 a: 60 mm (2.36 in) dia. b: 47 mm (1.85 in) dia.	Installing rear oil seal
ST33290001* Puller		Removing rear oil seal
ST30720000* Drift	 a: 77 mm (3.03 in) dia. b: 55.5 mm (2.185 in) dia.	Installing mainshaft ball bearing
ST30613000* Drift	 a: 71.5 mm (2.815 in) dia. b: 47.5 mm (1.870 in) dia.	Installing main drive gear bearing
ST33200000* Drift	 a: 60 mm (2.36 in) dia. b: 44.5 mm (1.752 in) dia.	Installing counter rear bearing Installing 3rd & 4th synchronizer assembly

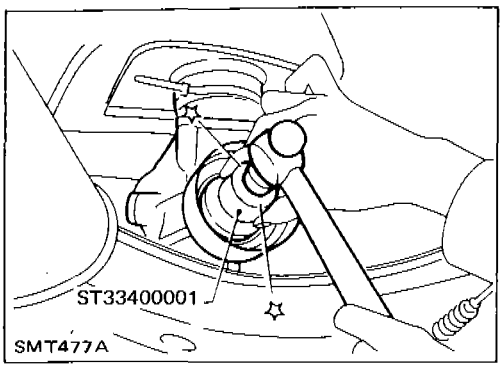
COMMERCIAL SERVICE TOOL

Tool name	Description	
Puller		Removing counter bearings, counter drive and O.D. gears

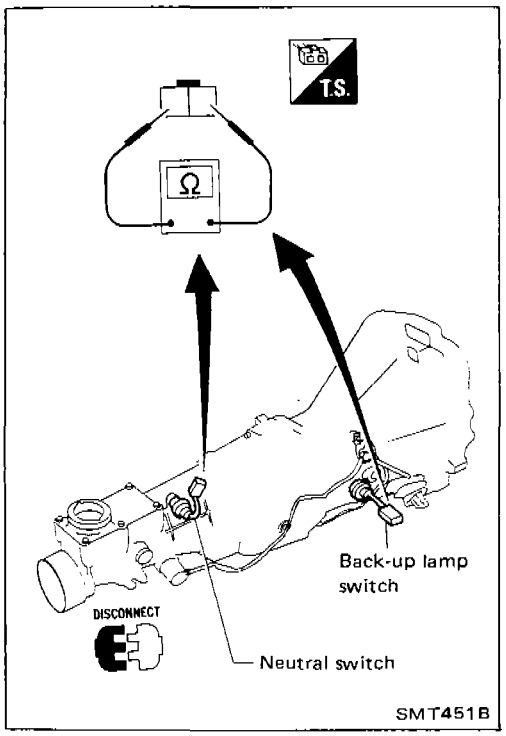


Replacing Rear Oil Seal

REMOVAL



INSTALLATION



Check of Position Switch

BACK-UP LAMP SWITCH

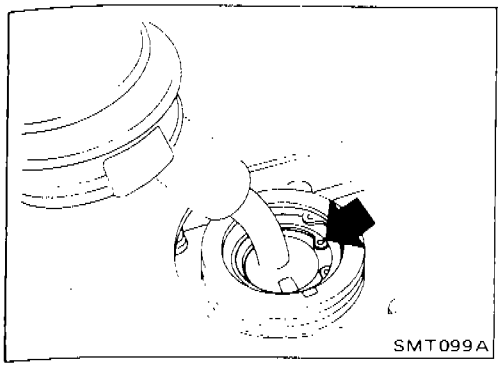
- Check continuity.

Gear position	Continuity
Reverse	Yes
Except reverse	No

NEUTRAL SWITCH

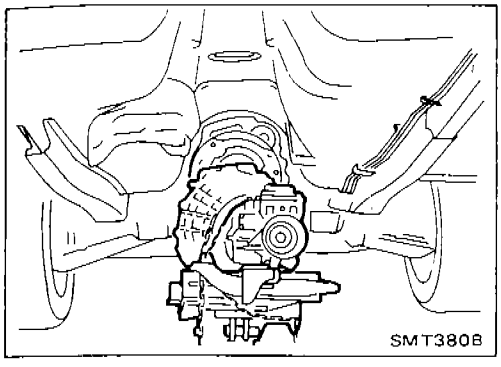
- Check continuity.

Gear position	Continuity
Neutral	Yes
Except neutral	No

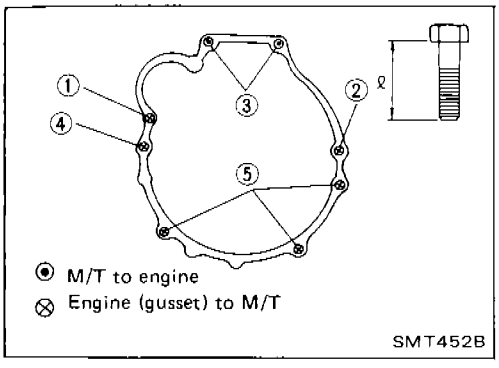

SMT099A

Removal

- Remove shift lever.


SMT380B

- Remove propeller shaft. — Refer to section PD.
- **Insert plug into rear oil seal after removing propeller shaft.**
- **Be careful not to damage spline, sleeve yoke and rear oil seal, when removing propeller shaft.**
- Support engine by placing a jack under oil pan.
- **Do not place jack under oil pan drain plug.**
- Remove transmission from engine.
- **Support manual transmission, while removing it.**



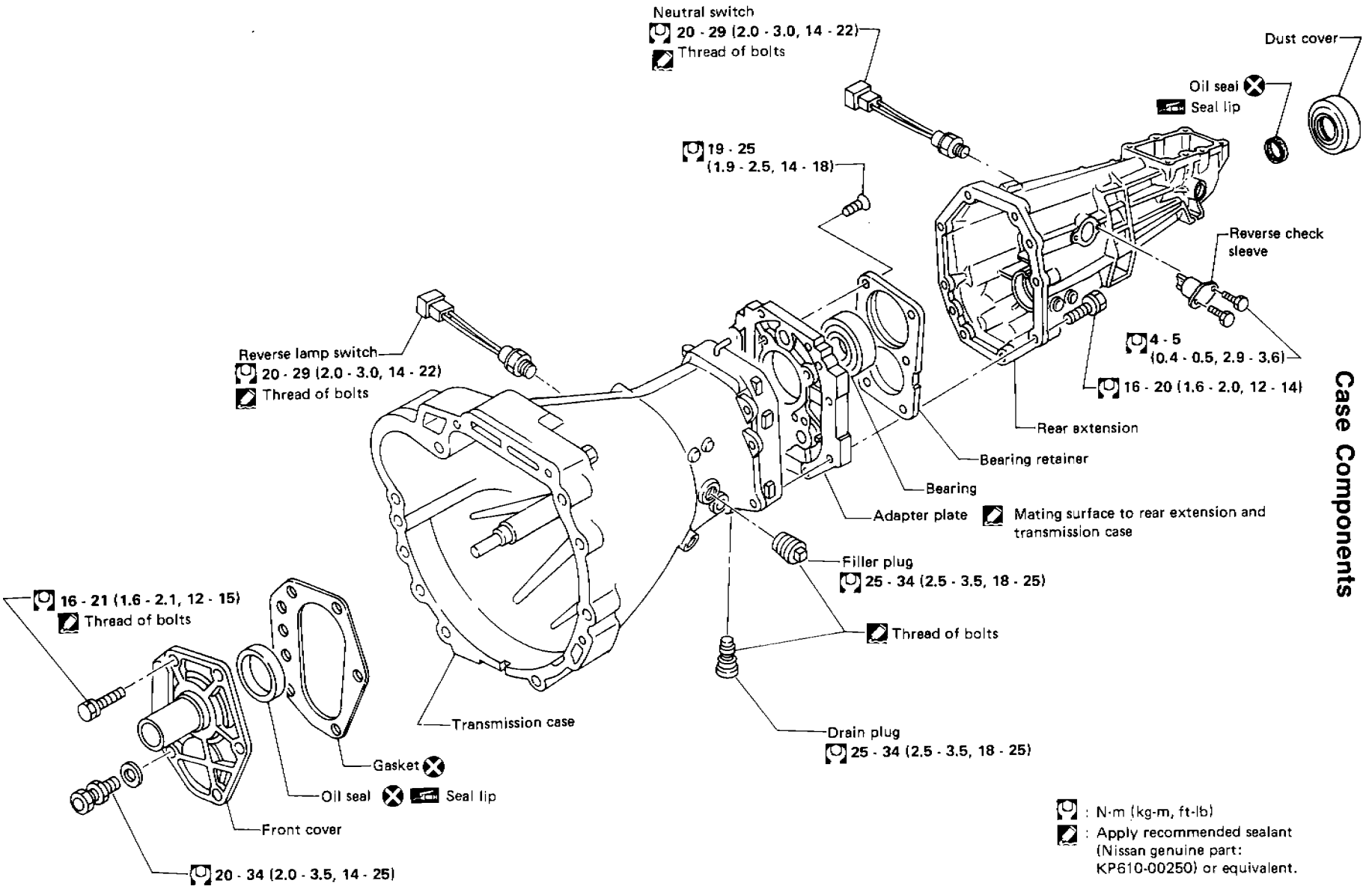
SMT452B

Installation

- Tighten all transmission bolts.

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	80 (3.15)
2	39 - 49 (4.0 - 5.0, 29 - 36)	75 (2.95)
3	39 - 49 (4.0 - 5.0, 29 - 36)	65 (2.56)
4	29 - 39 (3.0 - 4.0, 22 - 29)	40 (1.57)
5	29 - 39 (3.0 - 4.0, 22 - 29)	25 (0.98)
Gusset to engine	29 - 39 (3.0 - 4.0, 22 - 29)	20 (0.79)

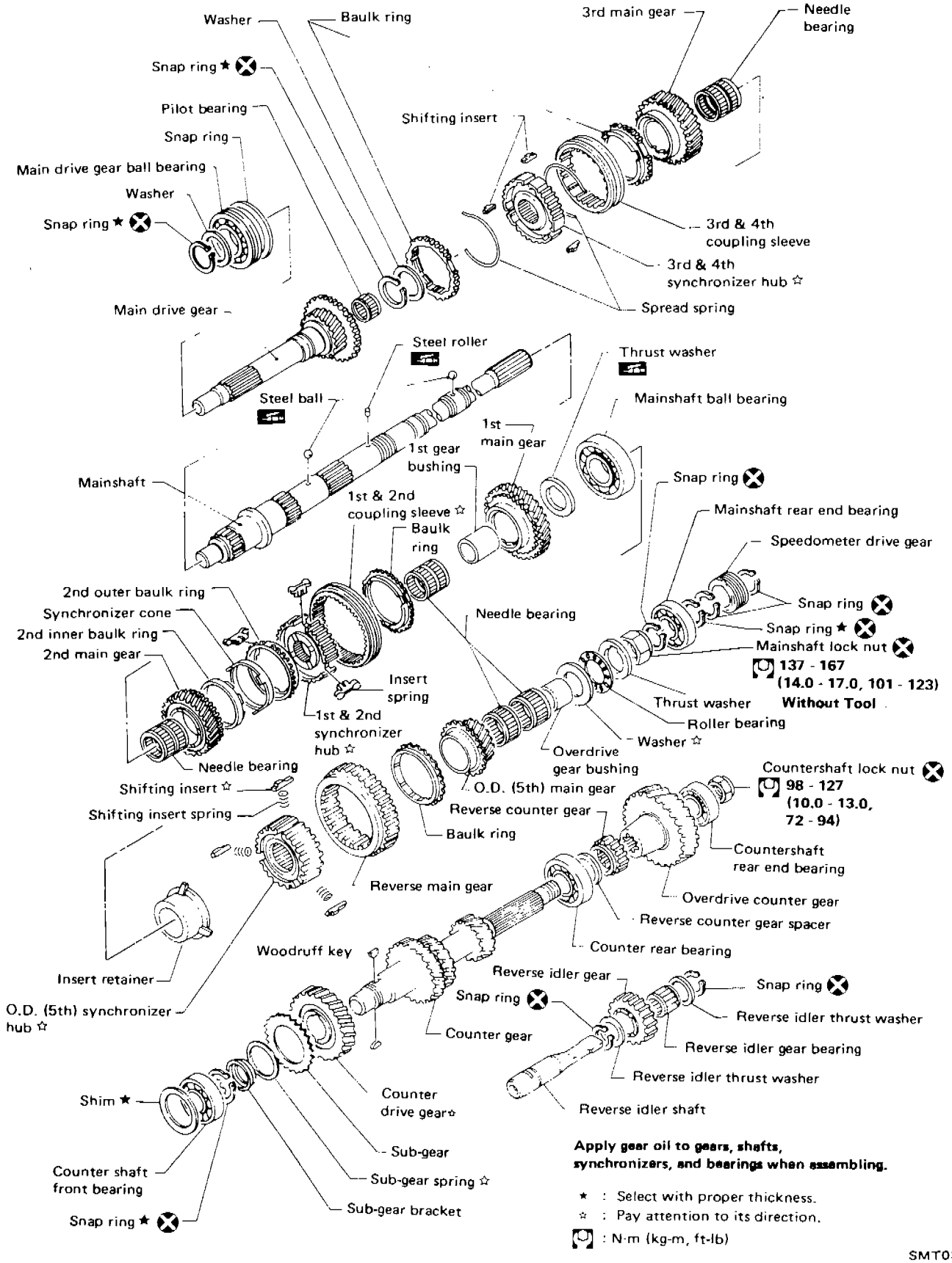
Case Components



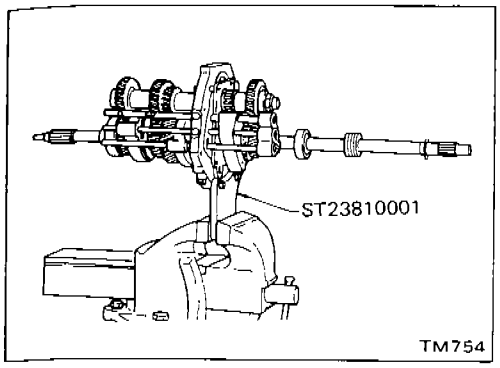
SMT746A

Gear Components

FOR EUROPE

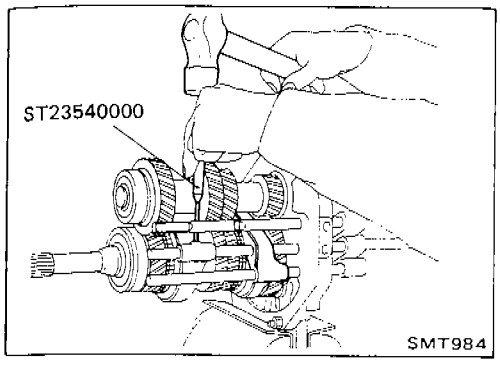


SMT037B

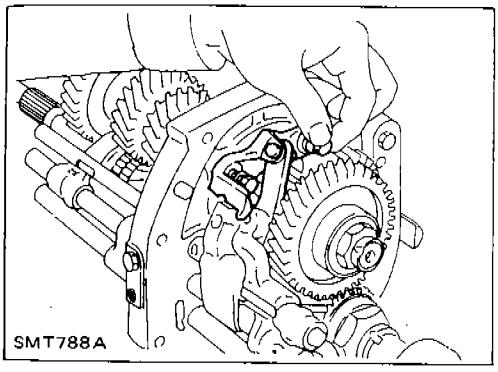


Shift Control Components

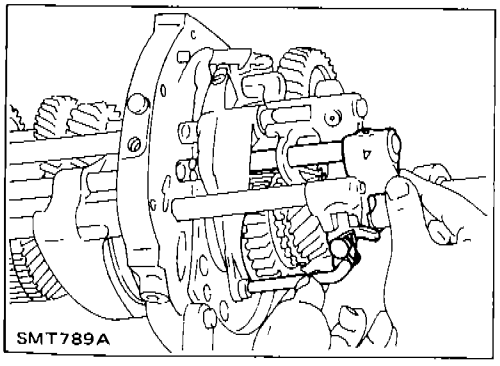
1. Set up Tool on adapter plate.
2. Remove check ball plugs, check springs, and check balls.



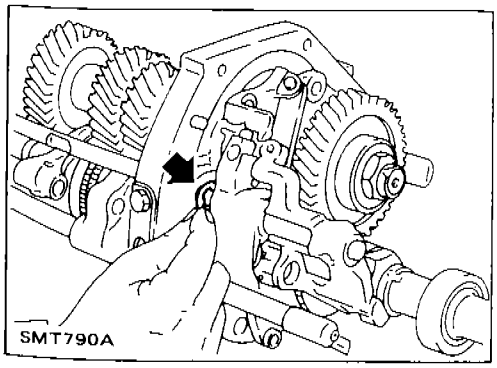
3. Drive out retaining pins. Then drive out fork rods and remove interlock balls.



4. Remove lever bracket securing bolt.

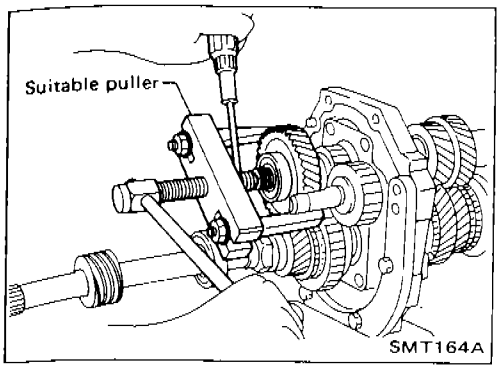


5. Draw out 3rd-4th fork rod.

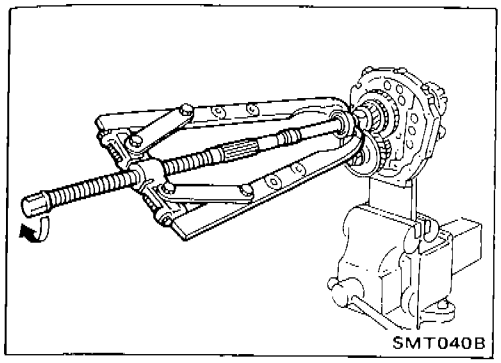


6. Remove E-ring from O.D. and reverse fork rod.

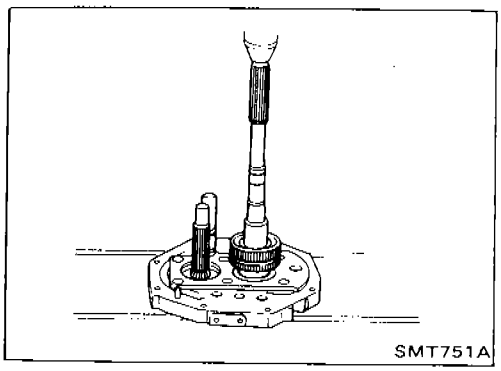
Gear Components (Cont'd)



b. Pull out O.D. counter gear with bearing with suitable puller.
c. Draw out reverse counter gear and spacer.
d. Remove snap rings from reverse idler shaft and draw out reverse idler gear, thrust washers and reverse idler gear bearing.
e. Remove speedometer drive gear and steel ball.

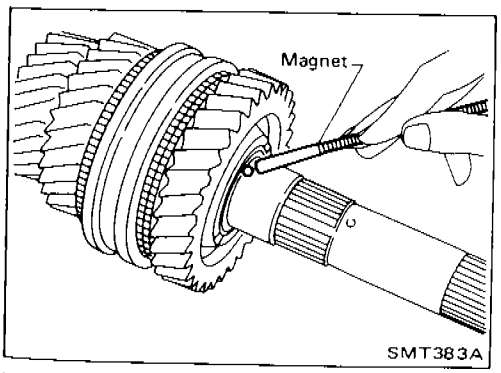


f. Remove snap ring and pull out overdrive mainshaft bearing, then remove snap ring.
g. Remove mainshaft nut.
h. Remove steel roller and washer.
i. Remove roller bearing and washer.
j. Remove O.D. main gear, needle bearing and baulk ring (O.D.).
k. Remove O.D. coupling sleeve, shifting inserts and shifting insert springs.

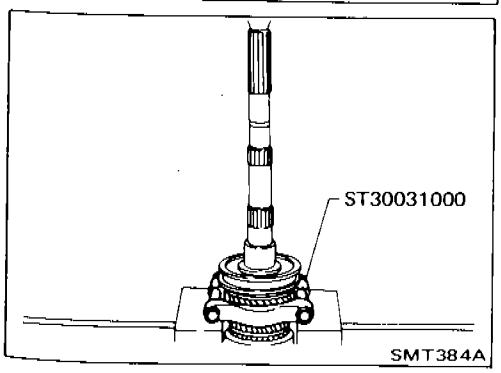


l. Press out mainshaft and counter gear alternately.

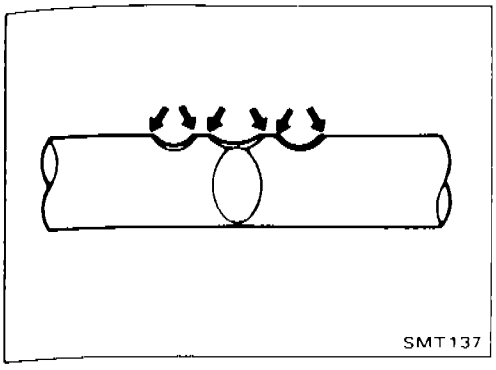
- **Make sure to alternate pressing of mainshaft and counter gear so as not to allow the front surface of one to contact the rear surface of the other.**



6. Remove front side components on mainshaft.
a. Remove 1st gear washer and steel ball.
b. Remove 1st main gear and 1st gear needle bearing.

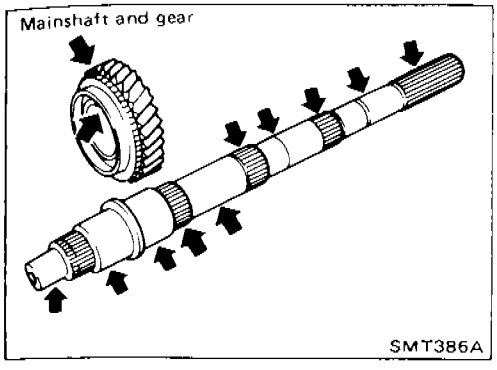


c. Press out 2nd main gear together with 1st gear bushing and 1st & 2nd synchronizer assembly.
d. Remove mainshaft front snap ring.


SMT137

Shift Control Components

- Check contact surface and sliding surface for wear, scratches, projections or other damage.

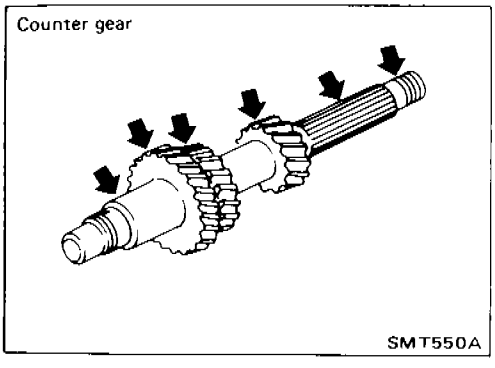


SMT386A

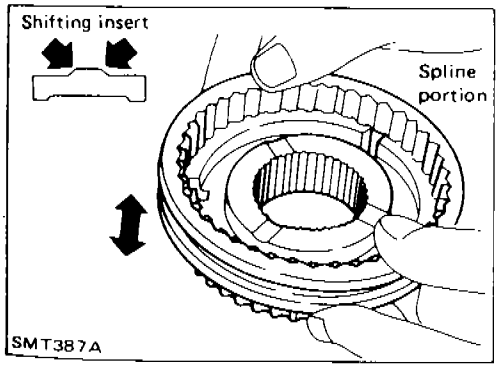
Gear Components

GEAR AND SHAFT

- Check shafts for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



SMT550A

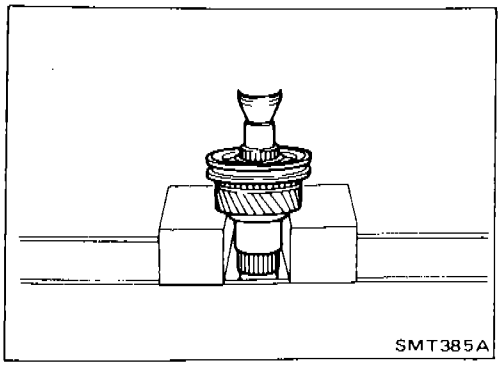


SMT387A

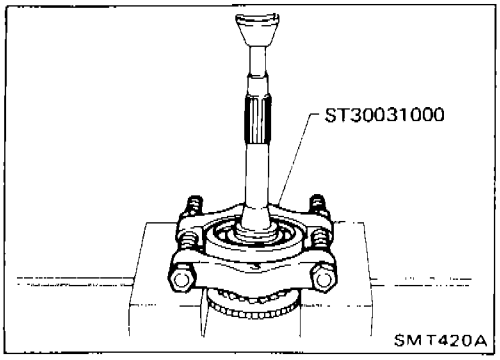
SYNCHRONIZERS

- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check shifting inserts for wear or deformation.
- Check insert springs for deformation.

Gear Components (Cont'd)

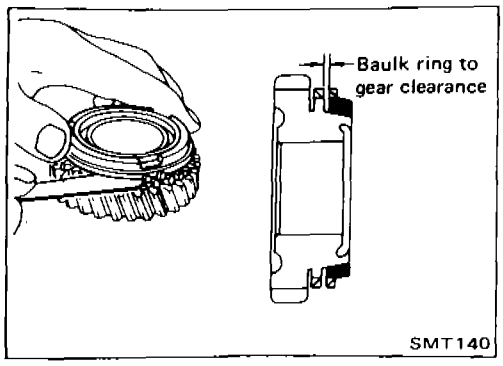


e. Press out 3rd main gear together with 3rd & 4th synchronizer assembly and 3rd gear needle bearing.



7. Remove main drive gear bearing.
a. Remove main drive gear snap ring and spacer.
b. Press out main drive gear bearing.

Gear Components (Cont'd)



● Measure clearance between baulk ring and gear.

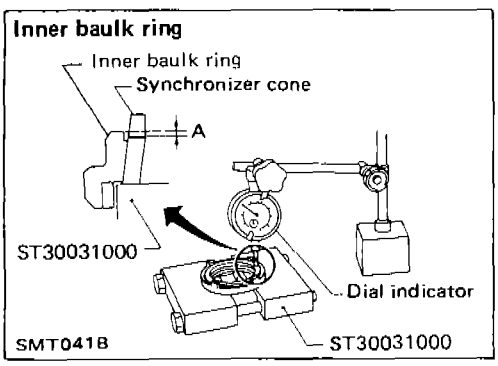
Clearance between baulk ring and gear

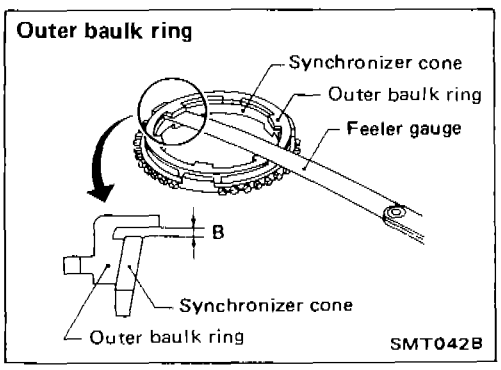
[1st, 3rd, main drive and O.D. baulk ring (For Europe), 1st, main drive and O.D. baulk ring (Except for Europe)]:

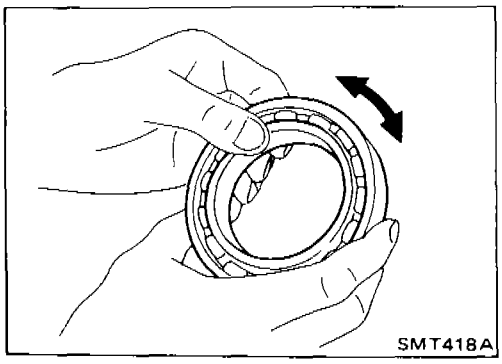
Unit: mm (in)

Dimension	Standard	Wear limit
1st	1.2 - 1.6 (0.047 - 0.063)	0.8 (0.031)
3rd and main drive	1.2 - 1.6 (0.047 - 0.063)	
O.D.	1.2 - 1.4 (0.047 - 0.055)	

If the clearance is smaller than the wear limit, replace baulk ring.







● Measure wear of baulk ring.

[2nd baulk ring (For Europe), 2nd and 3rd baulk ring (Except for Europe)]

a. Place baulk rings in position on synchronizer cone.
b. While holding baulk rings against synchronizer cone as far as it will go, measure dimensions "A" and "B".

Unit: mm (in)

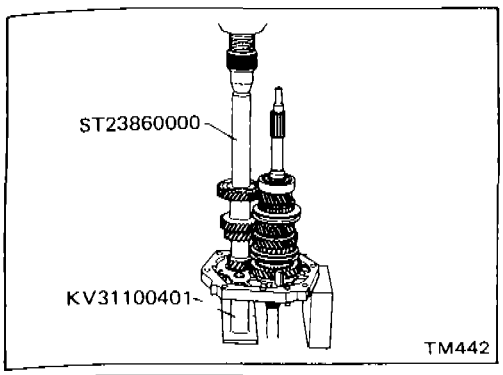
Dimension	Standard	Wear limit
A	0.6 - 1.1 (0.024 - 0.043)	0.2 (0.008)
B	0.7 - 0.9 (0.028 - 0.035)	

c. If dimension "A" or "B" is smaller than the wear limit, replace baulk ring.

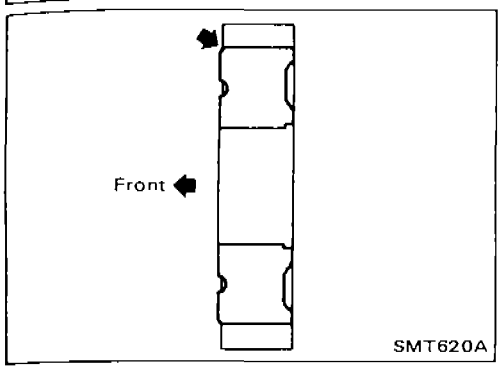
BEARINGS

● Make sure bearings roll freely and are free from noise, crack, pitting or wear.

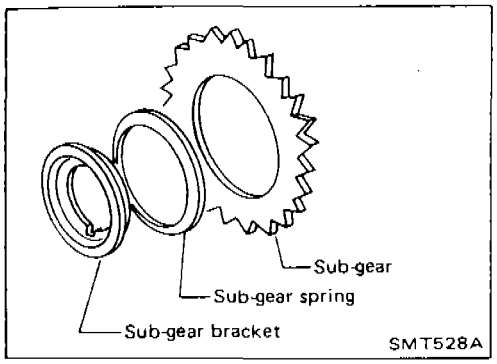
Gear Components (Cont'd)



f. Press counter drive gear with main drive gear with Tool.



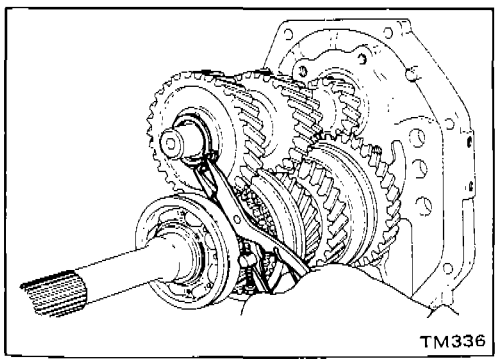
- **Pay attention to direction of counter drive gear.**



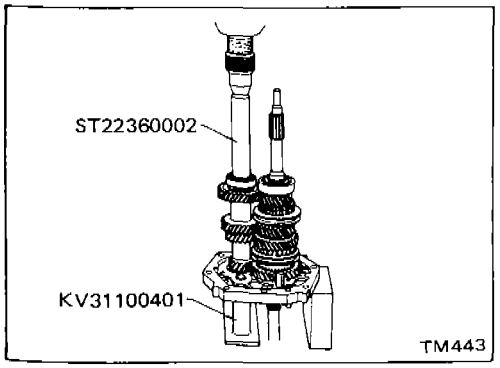
g. Install sub-gear components.
(1) Install sub-gear and sub-gear bracket on counter drive gear and then select proper snap ring to minimize clearance of groove in counter gear.

Allowable clearance of groove:
0 - 0.18 mm (0 - 0.0071 in)
Counter drive gear snap ring: Refer to S.D.S.

(2) Remove snap ring, sub-gear bracket and sub-gear from counter gear.
(3) Reinstall sub-gear, sub-gear spring and sub-gear bracket..

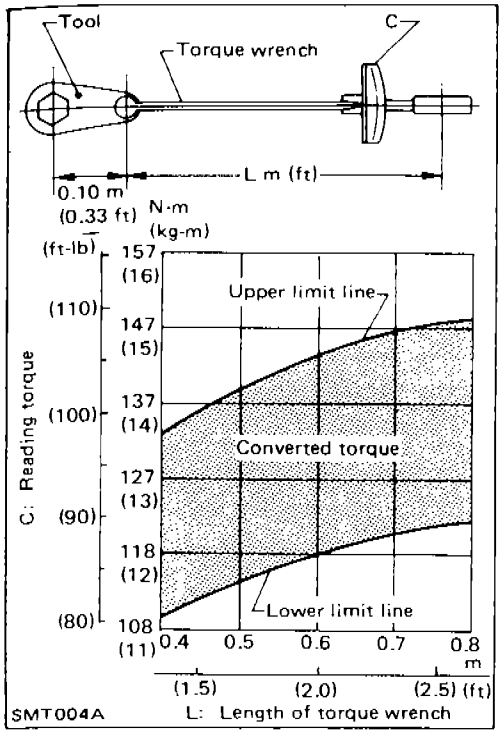


h. Install selected counter drive gear snap ring.



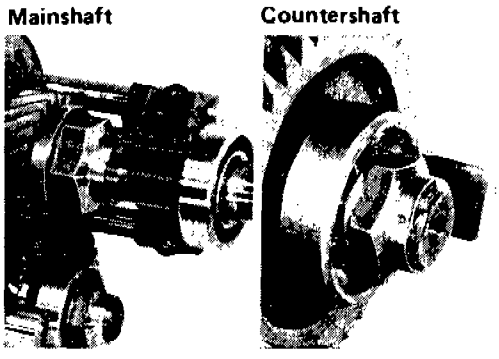
i. Press counter gear front bearing onto counter gear.

Gear Components (Cont'd)



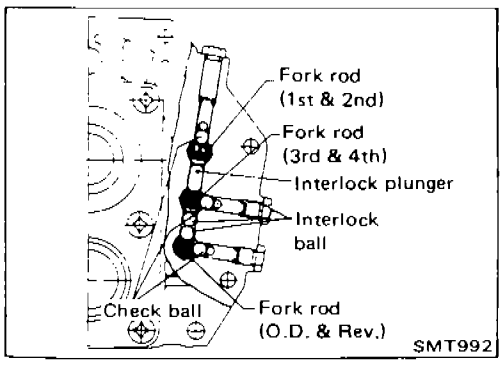
- Use the left chart when deciding the reading torque. (Length of torque wrench vs. setting or reading torque)

9. Tighten countershaft lock nut.
   - **Always use new lock nut.**

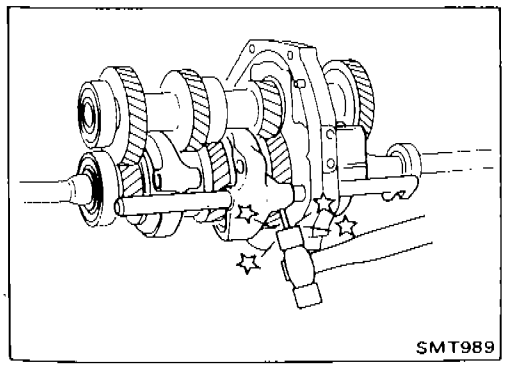


10. Stake mainshaft lock nut and countershaft lock nut with a punch.
11. Measure gear end play. For the description, refer to DISASSEMBLY for Gear Components.

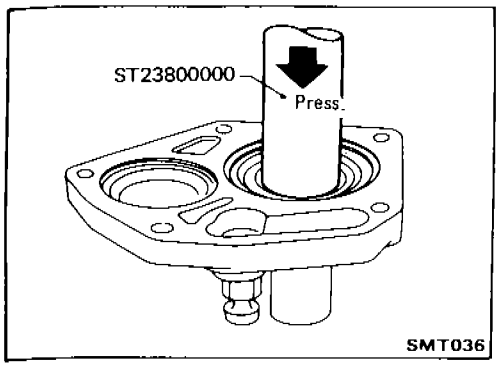
Shift Control Components



1. Install shift rods, interlock plunger, interlock balls and check balls.

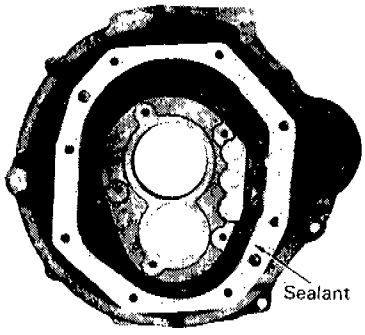


a. 1st-2nd shift fork

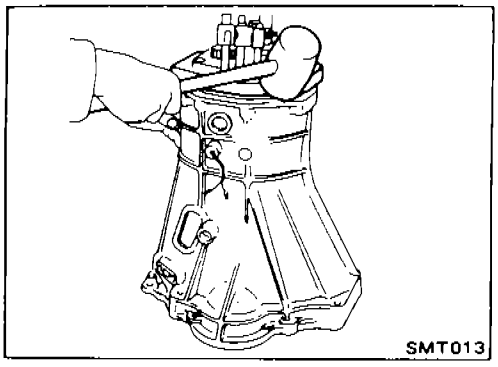


Case Components

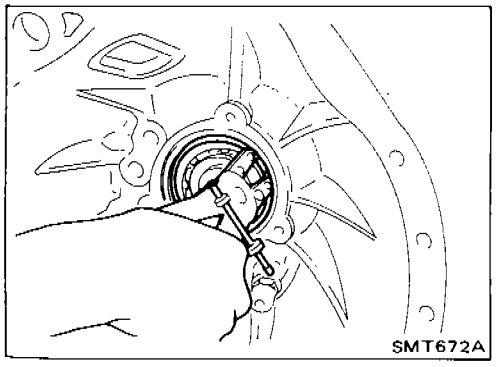
1. Install front cover oil seal.
- **Apply multi-purpose grease to seal lip of oil seal before installing.**



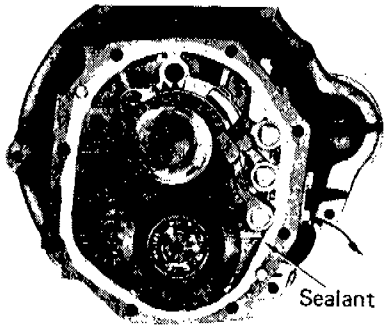
2. Apply sealant to mating surface of transmission case.



3. Install gear assembly onto transmission case.



4. Install snap ring of main drive bearing.



5. Apply sealant to mating surface of adapter plate.
6. Install rear extension.

Inspection and Adjustment (Cont'd)

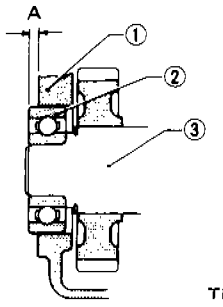
Counter drive gear

Allowable clearance	0 - 0.18 mm (0 - 0.0071 in)
Thickness mm (in)	Part number
1.4 (0.055)	32215-E9000
1.5 (0.059)	32215-E9001
1.6 (0.063)	32215-E9002

AVAILABLE SHIMS

Counter front bearing

Unit: mm (in)



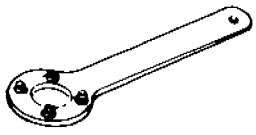
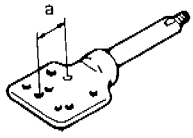
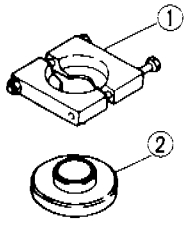
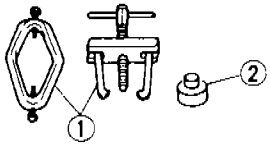
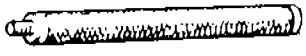
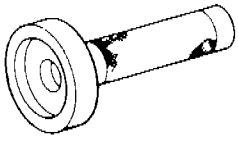
TM371

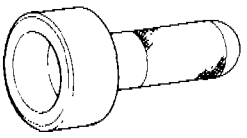
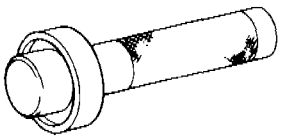
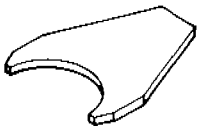
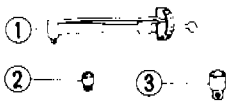
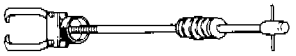
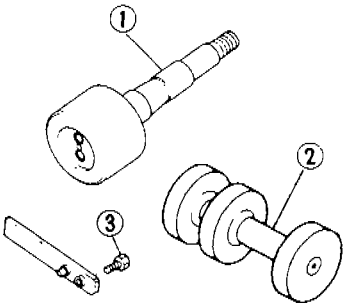
A: Distance from bearing surface to transmission case

1 Transmission case
2 Counter gear front bearing
3 Counter gear

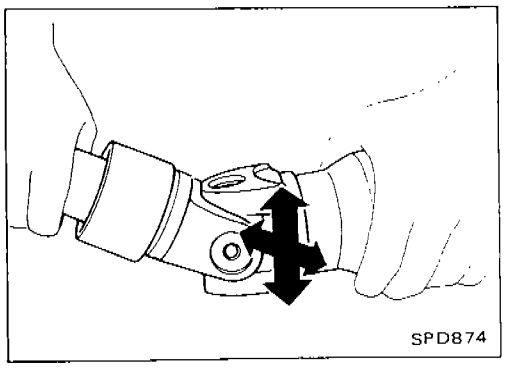
"A"	Thickness of shim	Part number
4.52 - 4.71 (0.1780 - 0.1854)	Not necessary	
4.42 - 4.51 (0.1740 - 0.1776)	0.1 (0.004)	32218-V5000
4.32 - 4.41 (0.1701 - 0.1736)	0.2 (0.008)	32218-V5001
4.22 - 4.31 (0.1661 - 0.1697)	0.3 (0.012)	32218-V5002
4.12 - 4.21 (0.1622 - 0.1657)	0.4 (0.016)	32218-V5003
4.02 - 4.11 (0.1583 - 0.1618)	0.5 (0.020)	32218-V5004
3.92 - 4.01 (0.1543 - 0.1579)	0.6 (0.024)	32218-V5005

SPECIAL SERVICE TOOLS

Tool number Tool name	Description	
ST38060002 Drive pinion flange wrench		Removing and installing propeller shaft lock nut, and drive pinion lock nut.
KV38100800 Differential attachment	 a: 152 mm (5.98 in)	Mounting final drive (To use, make a new hole.)
ST3090S000 Drive pinion rear inner race puller set ① ST30031000 Puller ② ST30901000 Base		Removing and installing drive pinion rear cone
ST3306S001 Differential side bearing puller set ① ST33051001 Body ② ST33061000 Adapter		Removing and installing differential side bearing inner cone
ST30611000 Drift		Installing pinion rear bearing outer race
ST30613000 Drift		Installing pinion rear bearing outer race
ST30701000 Drift		Installing pinion front bearing outer race
KV38100200 Gear carrier side oil seal drift		Installing side oil seal

Tool number Tool name	Description	
KV38100500 Gear carrier front oil seal drift		Installing front oil seal
KV38100300 Differential side bearing inner cone		Installing side bearing inner cone
KV38100600 Side bearing spacer drift		Installing side bearing spacer
ST3127S000 Preload gauge ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter		Measuring pinion bearing preload and total preload
HT72400000 Slide hammer		Removing differential case assembly
KV381039S0 Drive pinion setting gauge ① KV38103910 Dummy shaft ② KV38100120 Height gauge ③ KV38100140 Stopper		Selecting pinion height adjusting washer

Inspection (Cont'd)

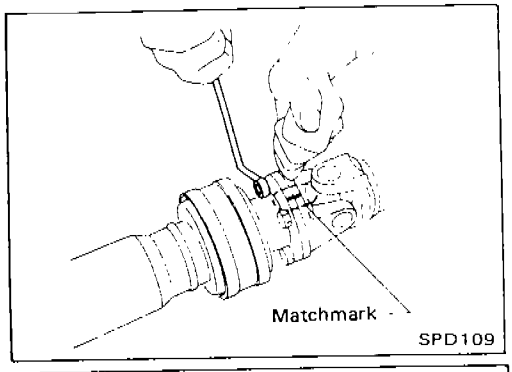

SPD874

- Inspect journal axial play.
  If the play exceeds specifications, replace propeller shaft assembly.
  Journal axial play:
  0 mm (0 in)

Disassembly

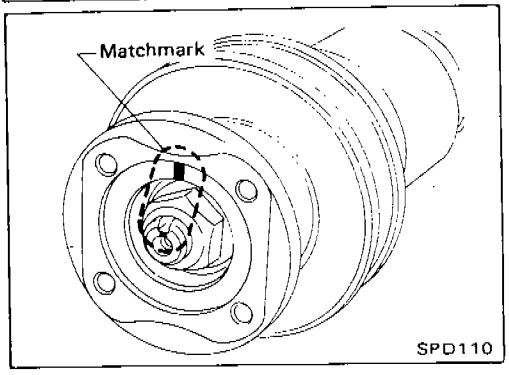
CENTER BEARING

1. Put matchmarks on flanges, and separate 2nd tube from 1st tube.



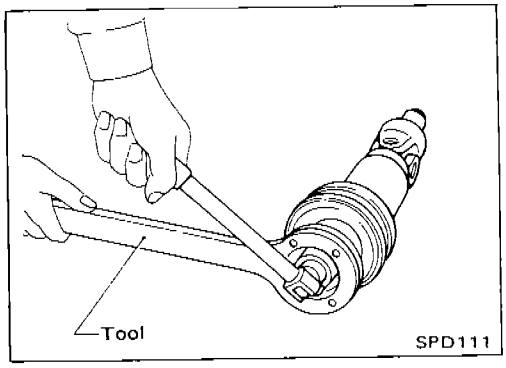
SPD109

2. Put matchmarks on the flange and shaft.



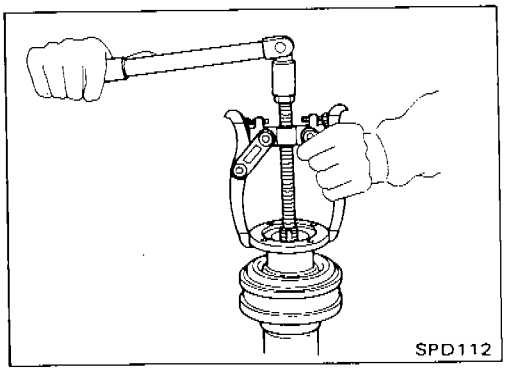
SPD110

3. Remove locking nut with Tool.
   Tool number:
   ST38060002

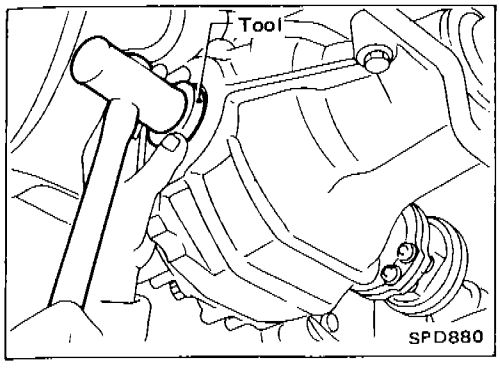


SPD111

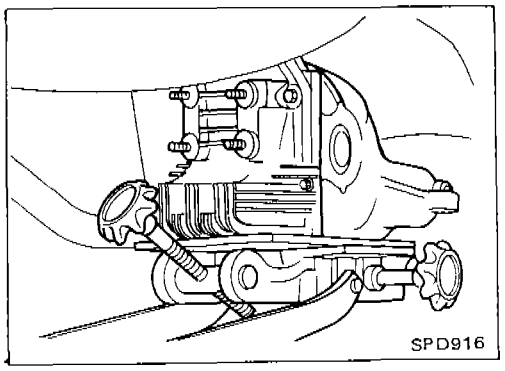
4. Remove companion flange with puller.


SPD112

Side Oil Seal Replacement (Cont'd)



3. Apply multi-purpose grease to sealing lips of oil seal. Press-fit oil seal into carrier with Tool.
   Tool number: KV38100200
4. Install drive shafts.



Removal

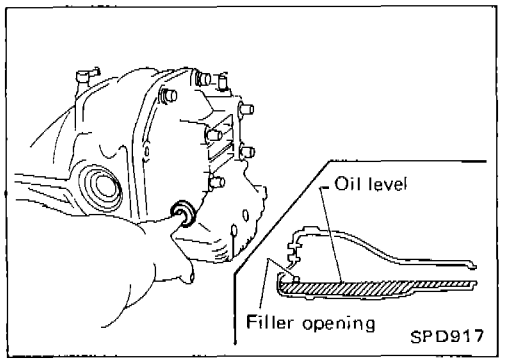
- Remove propeller shaft.

Insert plug into rear oil seal after removing propeller shaft.

- Remove drive shafts.
  Refer to RA section.
- Pull off final drive backward together with jack.

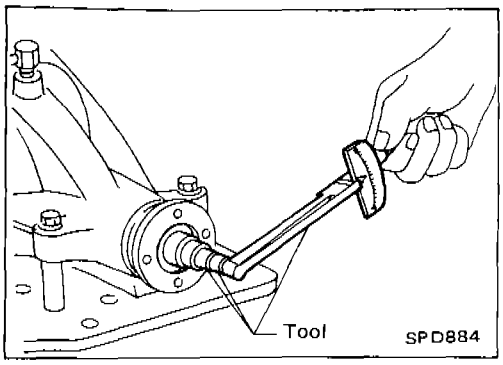
CAUTION:

- **Be careful not to damage spline, sleeve yoke and front oil seal, when removing propeller shaft.**
- **After final drive is removed, support suspension member on a stand to prevent its insulators from being twisted or damaged.**



Installation

- Fill final drive with recommended gear oil.

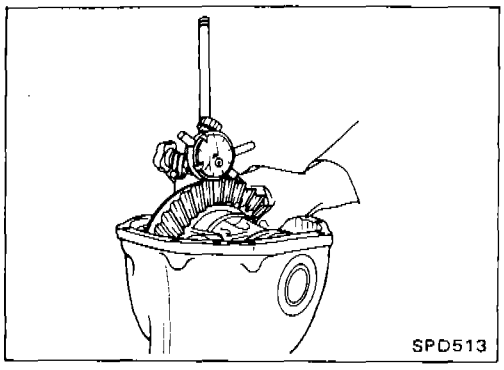


Pre-inspection

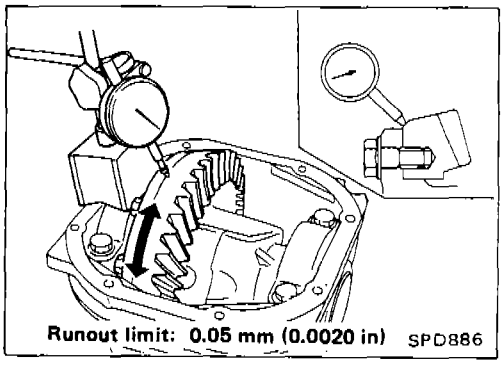
Before disassembling final drive, perform the following inspection.

- Total preload

1) Turn drive pinion in both directions several times to set bearing rollers.
2) Check total preload with Tool.
   Tool number: ST3127S000
   Total preload:
   1.4 - 1.7 N·m
   (14 - 17 kg-cm, 12 - 15 in-lb)



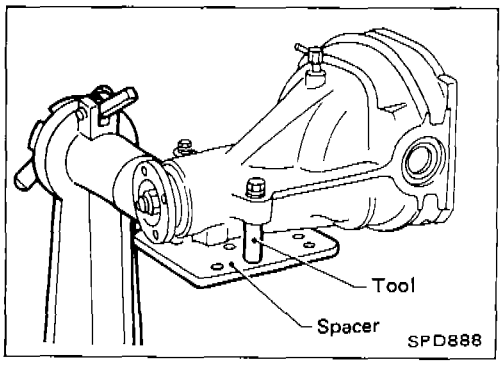
- Ring gear to drive pinion backlash
  Check ring gear-to-drive pinion backlash with a dial indicator at several points.
  Ring gear-to-drive pinion backlash:
  0.10 - 0.15 mm (0.0039 - 0.0059 in)



- Ring gear runout
  Check runout of ring gear with a dial indicator.
  Runout limit:
  0.05 mm (0.0020 in)
- Tooth contact
  Check tooth contact. (Refer to Adjustment.)

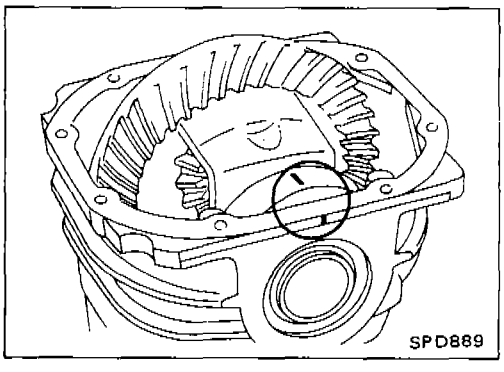
Differential Carrier

1. Using two 45 mm (1.77 in) spacers, mount carrier on Tool.
   Tool number: KV38100800

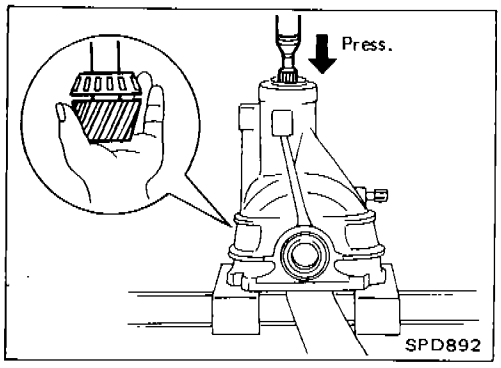


2. Paint or punch matchmarks on one side of the side bearing cap so it can be properly reinstalled.

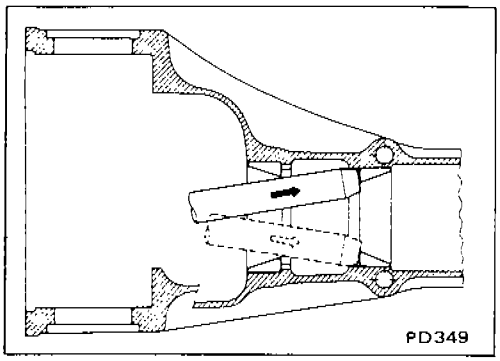
Bearing caps are line-board during manufacture. Replace them in their proper positions.



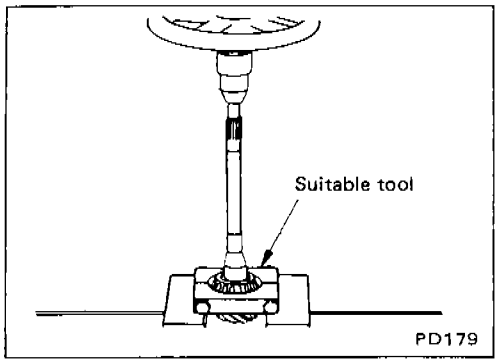
Differential Carrier (Cont'd)



6. Take out drive pinion (together with rear bearing inner race, bearing spacer and adjusting washer).
7. Remove oil seal.
8. Remove front bearing inner race.
9. Remove side oil seal.

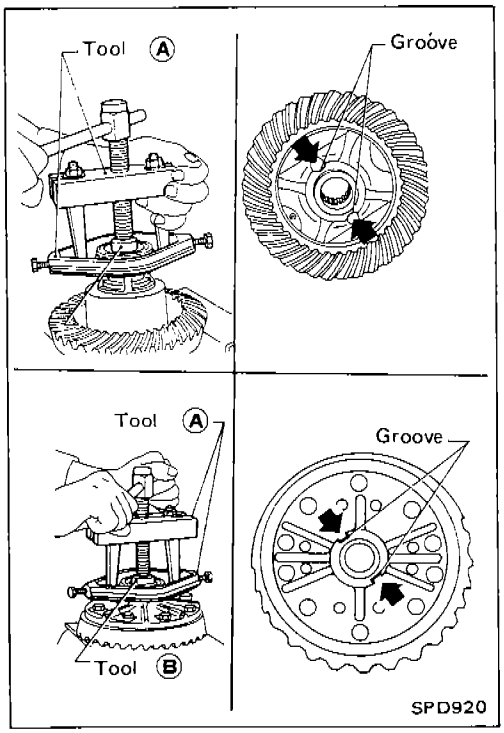


10. Remove pinion bearing outer races with a brass drift.



11. Remove pinion rear bearing inner race and drive pinion height adjusting washer with suitable tool.

Differential Case



1. Remove side bearing inner cones.

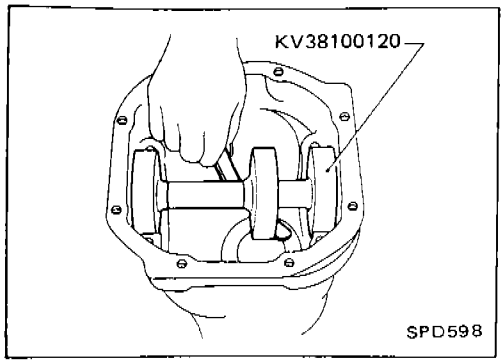
To prevent damage to bearing, engage puller jaws in groove.

Tool number:

Ⓐ ST33051001

Ⓑ ST33061000

Drive Pinion Height (Cont'd)



5. Attach Tool (Height gauge) to gear carrier, and measure the clearance between the height gauge and the dummy shaft face.
6. Substitute these values into the equation to calculate the thickness of the washer.

If value signifying H is not given, regard it as zero and calculate.

T (Thickness of washer) = N − (H x 0.01) + 3.00

Example:

N = 0.23
H = 1
T = N − (H x 0.01) + 3.00
= 0.23 − (1 x 0.01) + 3.00

(1) H 1

+1

(2)

+1
x 0.01

+0.01

(3) N 0.23
− (+0.01)

0.22

(4)

0.22
+3.00

3.22

∴T = 3.22

7. Select the proper washer. (Refer to S.D.S.)

If you cannot find the desired thickness of washer, use washer with thickness closest to the calculated value.

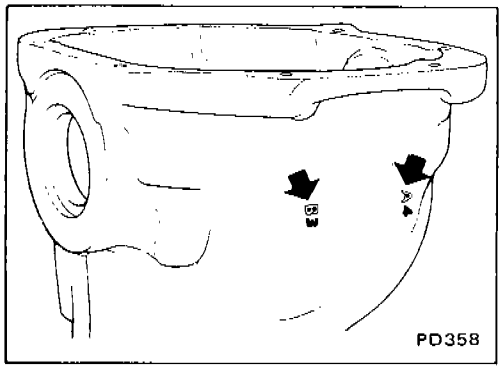
Example:

Calculated value ... T = 3.22 mm
Used washer ... T = 3.21 mm

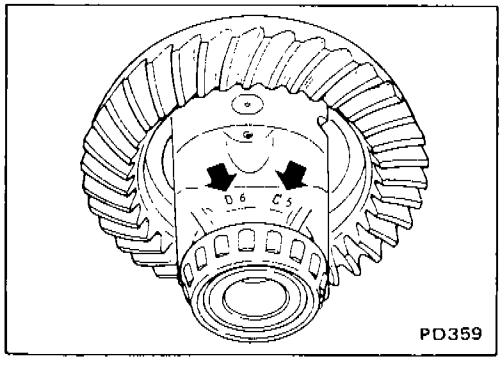
Side Bearing Preload

1. To simplify the job, make a chart like the one below to organize your calculations.

LETTERS	HUNDREDTHS OF A MILLIMETER
A - Left housing	
B - Right housing	
C - Differential case	
D - Differential case	
E - Left side bearing	
F - Right side bearing	
H - (+) or (–): ring gear	
G - Spacer measurement	

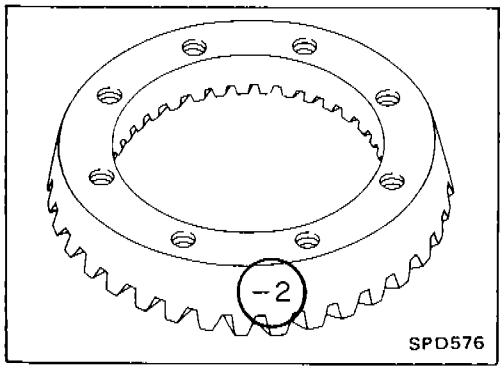

PD358

2. Write the following numbers down in the chart.
   A & B: Figures marked on gear carrier



PD359

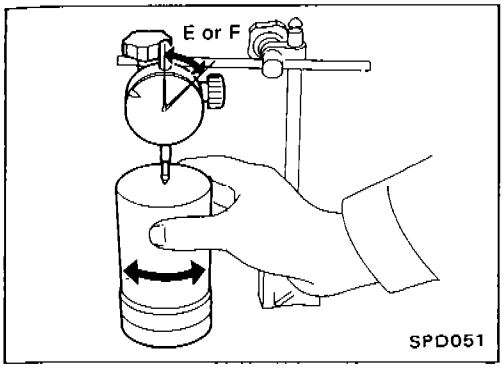
C & D: Figures marked on differential case



SPD576

H: Figure marked on ring gear

Side Bearing Preload (Cont'd)



11. Turn weight block a few times to ensure that bearing is properly seated.
12. Read dial indicator.
- Normal indication:
  0.10 - 0.30 mm (0.0039 - 0.0018 in)
- If the needle fluctuated erratically then bearing is either dirty or damaged and should be cleaned or replaced.

13. Measure both bearings in the same way and write the left side bearing measurement next to "E" and the right side bearing measurement next to "F".
14. Substitute these values into the equation to calculate the thickness of the shim.

If values signifying A, B, C, D and H are not given, regard them as zero and calculate.

Europe model:

Left side

$$T_1 = (A - C + D - H) \times 0.01 + 2.07 + E$$

Right side

$$T_2 = (B - D + H) \times 0.01 + 1.97 + F + G$$

Except Europe model:

Left side

$$T_2 = (B - D + H) \times 0.01 + 1.97 + F + G$$

Right side

$$T_1 = (A - C + D - H) \times 0.01 + 2.07 + E$$

Side Bearing Preload (Cont'd)

Example:

A = 4	H = –2
B = 3	E = 0.18
C = 5	F = 0.15
D = 6	G = 0.08

Left side: Europe
Right side: Except Europe

T_1 = (A – C + D – H) x 0.01 + 2.07 + E
= [4 – 5 + 6 – (–2)] x 0.01 + 2.07 + 0.18

(1) A 4
–C ..... –5
–1
+D ..... +6
5
–H ..... –(–2)
7

(2) 7 x 0.01
0.07

(3) 0.07 +2.07
2.14

(4) 2.14
+E ..... +0.18
2.32

$\therefore T_1$ = 2.32 mm

Right side: Europe
Left side: Except Europe

T_2 = (B – D + H) x 0.01 + 1.97 + F + G
= [3 – 6 + (–2)] x 0.01 + 1.97 + 0.15 + 0.08

(1) B 3
–D ..... –6
–3
+H ..... +(–2)
–5

(2) –5 x 0.01
–0.05

(3) –0.05 +1.97
1.92

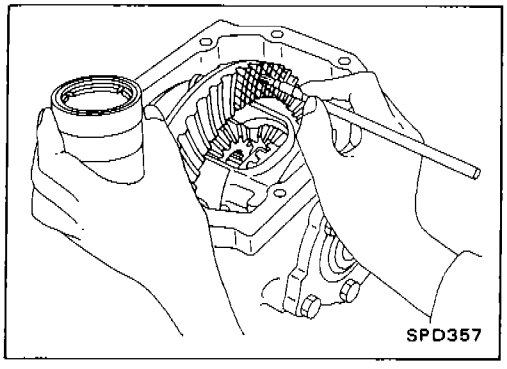
(4) 1.92
+F ..... +0.15
2.07
2.07
+G ..... +0.08
2.15

$\therefore T_2$ = 2.15 mm

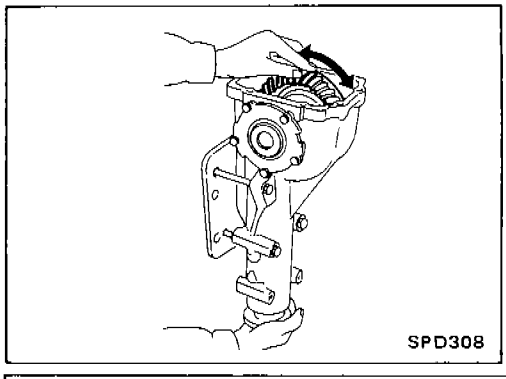
15. Select the proper shims. (Refer to S.D.S.)
If you cannot find the desired thickness of shims, use shims with the total thickness closest to the calculated value.

Tooth Contact

Checking gear tooth contact pattern is necessary to verify correct relationship between ring gear and drive pinion.
Hypoid gear set which is not positioned properly in relation to one another may be noisy, or have short life or both. With the checking of gear tooth contact pattern, the most desirable contact for low noise level and long life can be assured.

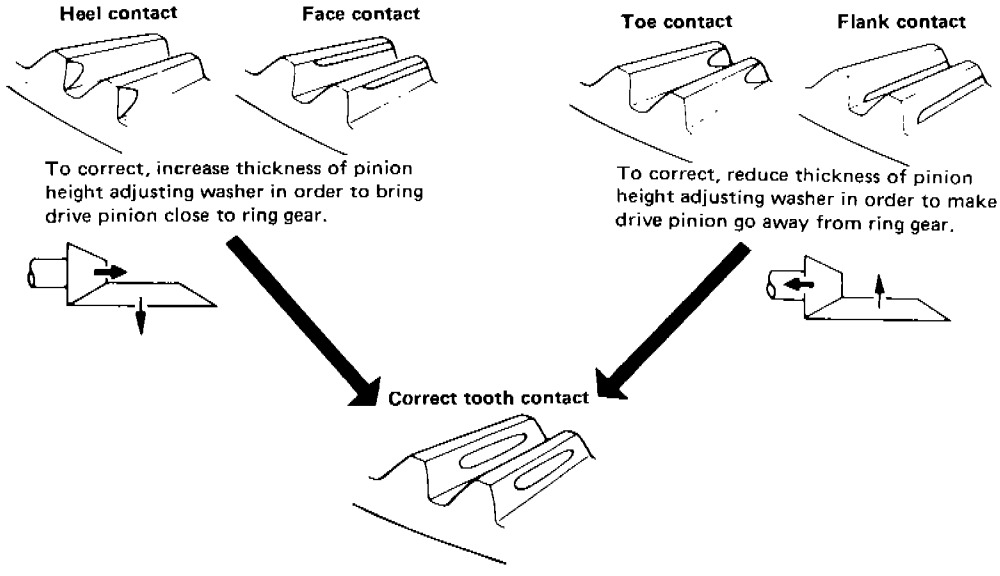

SPD357

1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.

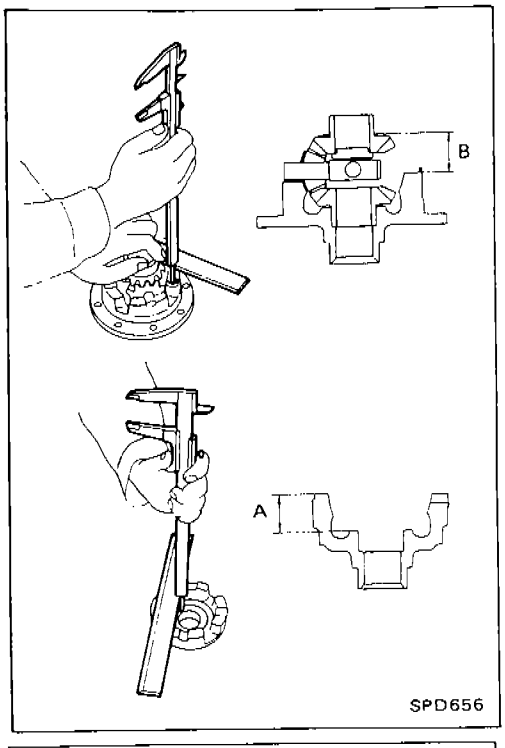

SPD308

3. Hold companion flange steady by hand and rotate the ring gear in both directions.

Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct.
However, in rare cases you may have to use trial-and-error processes until you get a good tooth contact pattern.
The tooth pattern is the best indication of how well the final drive has been set up.

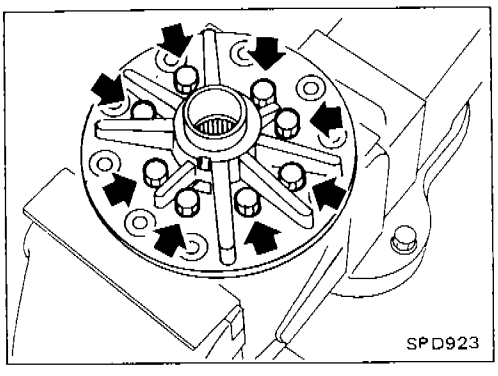


SPD007

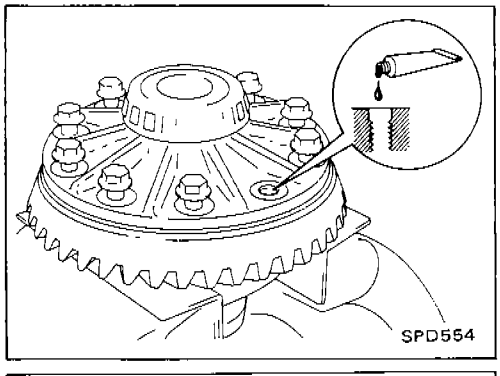


Differential Case

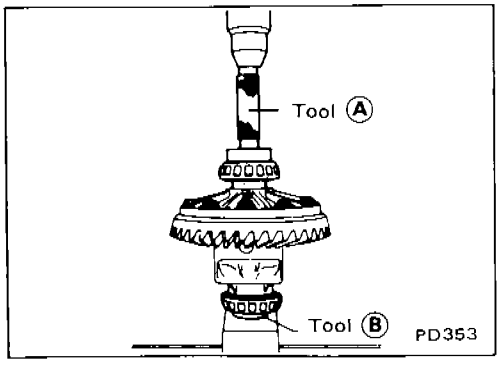
1. Measure clearance between side gear thrust washer and differential case.
   Clearance between side gear thrust washer and differential case (A – B):
   0.15 - 0.20 mm (0.0059 - 0.0079 in)
   The clearance can be adjusted with side gear thrust washer. Refer to S.D.S.
2. Apply oil to gear tooth surfaces and thrust surfaces and check that they turn properly.



3. Install differential case L.H. and R.H.

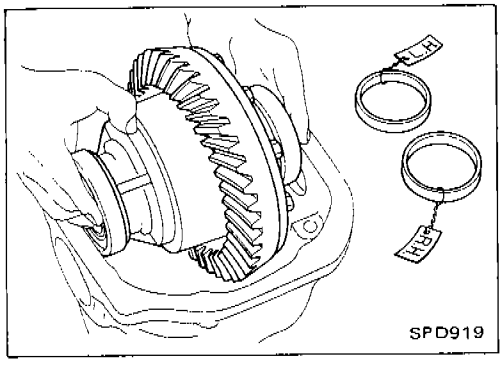


4. Place differential case on ring gear.
5. Apply locking sealant to ring gear bolts, and install them.
   Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.

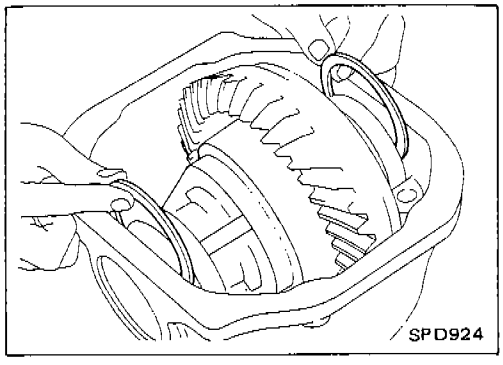


6. Press-fit side bearing inner cones on differential case with Tool.
   Tool number:
   Ⓐ KV38100300
   Ⓑ ST33061000

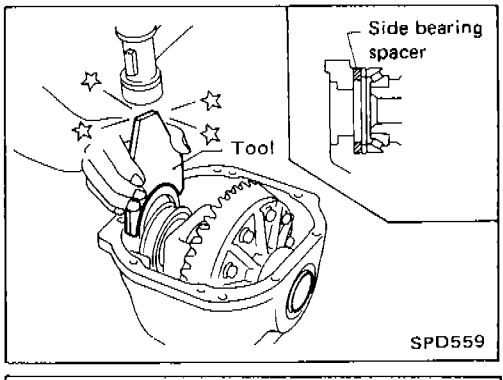
Differential Carrier (Cont'd)



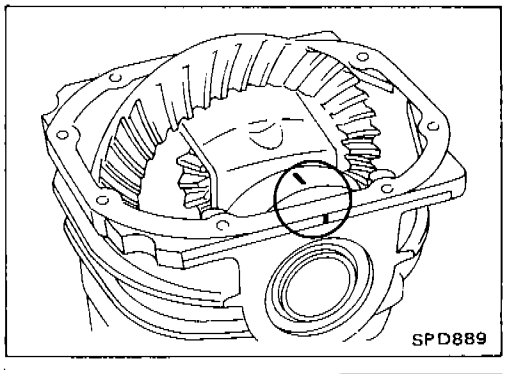
9. Select side bearing adjusting washer.
   Refer to ADJUSTMENT.
10. Install differential case assembly with side bearing outer races into gear carrier.



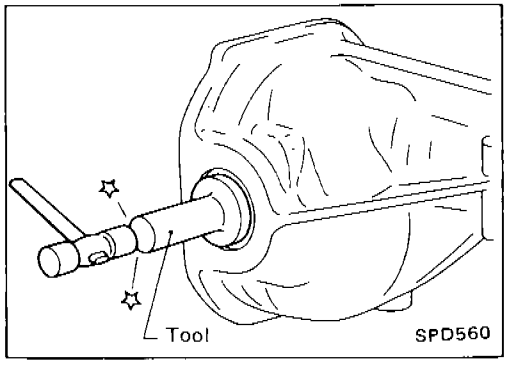
11. Insert left and right side bearing adjusting washers in place between side bearings and carrier.



12. Drive in side bearing spacer with Tool.
    Tool number: KV38100600

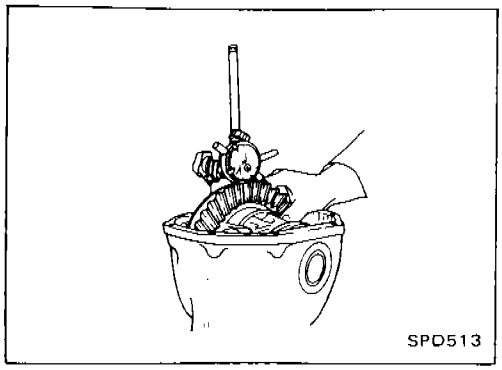


13. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.



14. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install side oil seal.
    Tool number: KV38100200

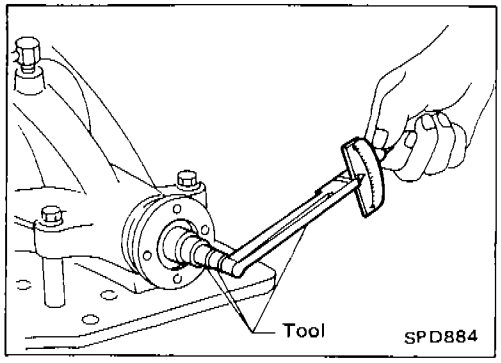
Differential Carrier (Cont'd)



15. Measure ring gear-to-drive pinion backlash with a dial indicator.
    Ring gear-to-drive pinion backlash:
    0.10 - 0.15 mm
    (0.0039 - 0.0059 in)
- If backlash is too small, decrease thickness of left shim and increase thickness of right shim by the same amount.

  If backlash is too great, reverse the above procedure.

Never change the total amount of shims as it will change the bearing preload.



16. Check total preload with Tool.

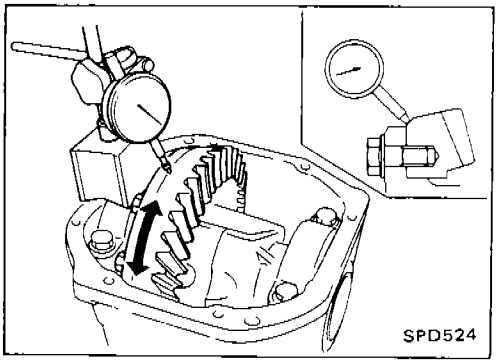
When checking preload, turn drive pinion in both directions several times to seat bearing rollers correctly.

Total preload:
Value more than 0.29 N·m (3.0 kg-cm, 2.6 in-lb) added on measured value of drive pinion preload

- If preload is too great, remove the same amount of shim to each side.
- If preload is too small, add the same amount of shim to each side.

Never add or remove a different number of shims for each side as it will change ring gear-to-drive pinion backlash.

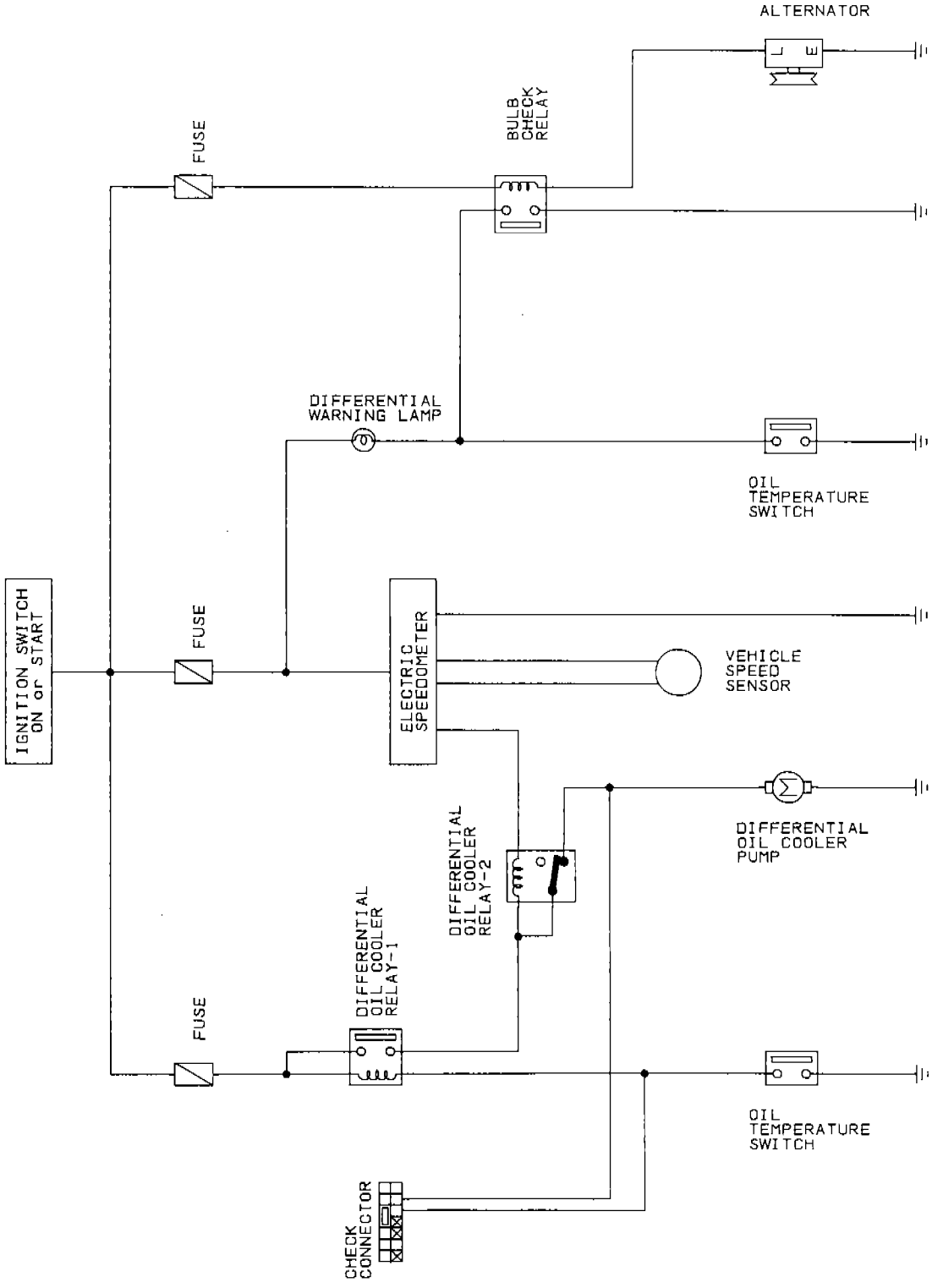
17. Recheck ring gear-to-drive pinion backlash because increase or decrease in thickness of shims will cause change of ring gear-to-pinion backlash.



18. Check runout of ring gear with a dial indicator.
    Runout limit:
    0.05 mm (0.0020 in)
- If backlash varies excessively in different places, foreign matter may be caught between the ring gear and the differential case.
- If the backlash varies greatly when the ring gear runout is within a specified range, replace the hypoid gear set or differential case.

19. Check tooth contact.
    Refer to ADJUSTMENT.
20. Install rear cover and gasket.

Schematic/Differential Oil Cooler System



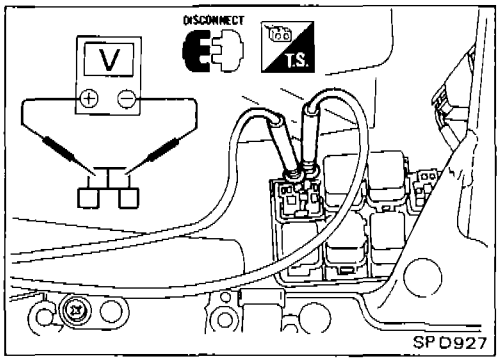
SPD928

Inspection

Thoroughly clean all parts in cleaning solvent and blow dry with compressed air, if available.

OIL PUMP ASSEMBLY

Replace oil pump assembly when motor does not rotate because of motor seizure or other damage.



SPEEDOMETER AMPLIFIER

Check speedometer amplifier operation as follows:

1. Disconnect differential oil cooler relay-1 from relay box and connect circuit tester to connector for relay-1 in relay box as shown.
2. Raise rear wheels.
3. Drive vehicle slowly and check the voltage.
   Less than 10 km/h (6 MPH) ... Approx. 12V
   More than 10 km/h (6 MPH) ... 0V

OIL COOLER ASSEMBLY, OIL TUBE ASSEMBLY, OIL HOSE

If oil leakage is detected during removal, replace oil cooler assembly or oil tube.

Propeller Shaft

GENERAL SPECIFICATIONS

Unit: mm (in)

Transmission type	M/T		A/T	
Anti-skid brake system	Yes	No	Yes	No
Propeller shaft model	3S71A-T			
Number of joints	3			
Coupling method with transmission	Sleeve type			
Type of journal bearings	Shell type (Non-disassembly type)			
Distance between yokes	75.0 (2.953)			
Shaft length (Spider to spider) 1st	410.0 (16.14)		430.0 (16.93)	
2nd	585.0 (23.03)	600.0 (23.62)	585.0 (23.03)	600.0 (23.62)
Shaft outer diameter 1st	75.0 (2.953)			
2nd	75.0 (2.953) ... Large side 63.5 (2.500) ... Small side			

SPECIFICATIONS AND ADJUSTMENT

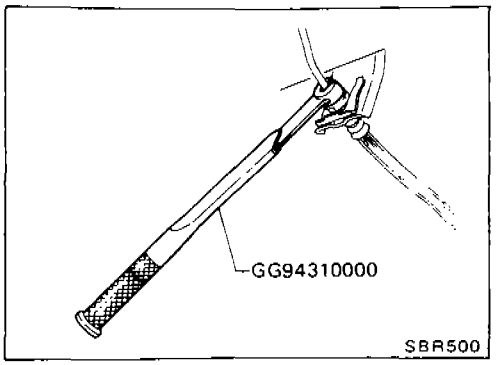
Unit: mm (in)

Propeller shaft model	3S71A-T
Propeller shaft runout limit	0.6 (0.024)
Journal axial play	0 (0)

REAR AXLE & REAR SUSPENSION

SECTION RA

CONTENTS



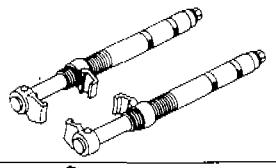
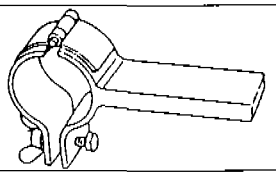
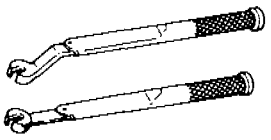
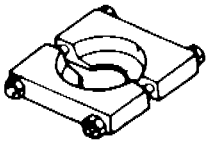
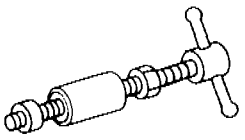
Precautions

- When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.
  * Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, and mats in designated positions.
- Use Tool when removing or installing brake tubes.
- When removing each suspension part, check wheel alignment and adjust if necessary.
- Do not jack up at the lower arm.

Preparation

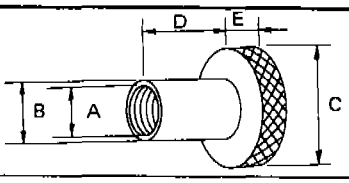
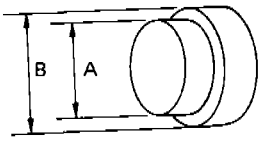
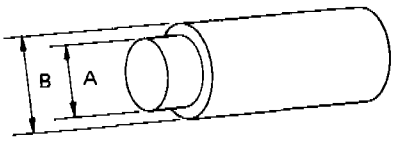
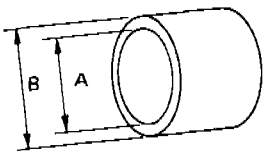
SPECIAL SERVICE TOOLS

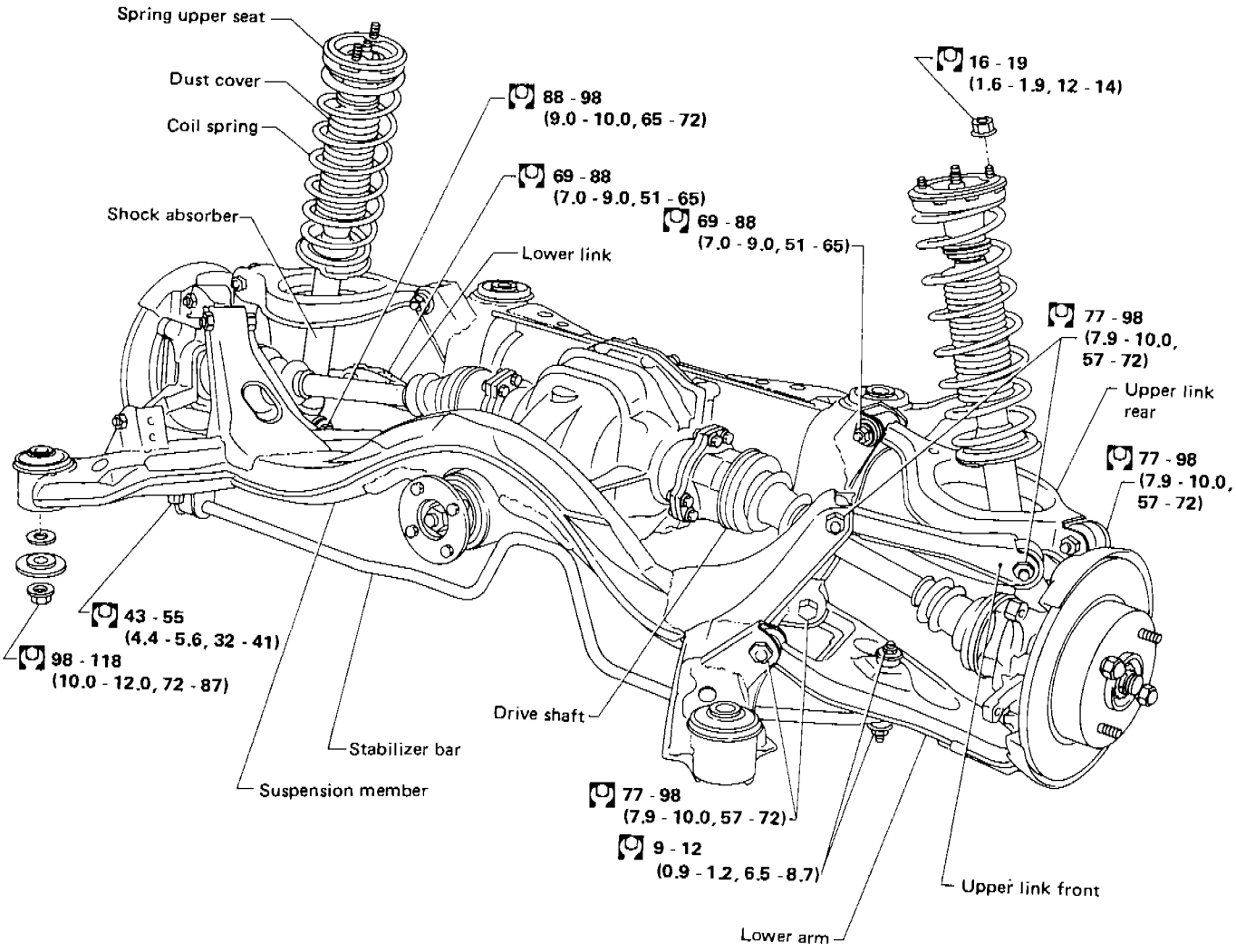
*: Special tool or commercial equivalent

Tool number Tool name	Description	
HT71780000* Spring compressor		Removing and installing coil spring
ST35652000* Strut attachment		Fixing strut assembly
GG94310000* Flare nut torque wrench		Removing and installing brake piping
ST30031000* Bearing puller		Removing inner race of wheel bearing
ST38280000 Arm bushing remover		Removing and installing bushing of rear axle housing

Preparation (Cont'd)

COMMERCIAL SERVICE TOOLS

Tool name	Description	
Attachment Wheel alignment		Measure rear wheel alignment **A: Screw M24 x 1.5** **B: 35 (1.38) dia.** **C: 65 (2.56) dia.** **D: 56 (2.20)** **E: 12 (0.47)** Unit: mm (in)
Rear wheel hub drift		Installing wheel bearing **A: 41 mm (1.61 in) dia.** **B: 49 mm (1.93 in) dia.**
Wheel bearing drift		Removing rear wheel hub **A: 26 mm (1.02 in) dia.** **B: 40 mm (1.57 in) dia.**
Rear drive shaft plug seal drift		Installing rear drive shaft plug seal **A: 67 mm (2.64 in) dia.** **B: 85 mm (3.35 in) dia.**

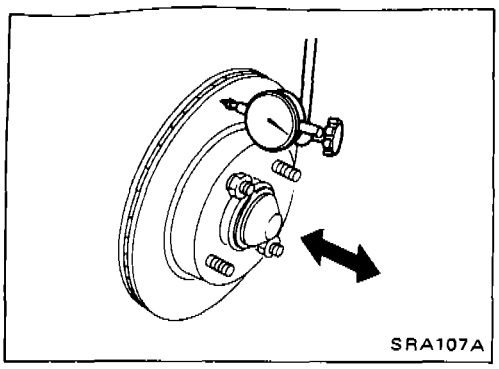


Final tightening for rubber parts requires to be carried out under unladen condition* with tires on ground.

* Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools and mats in designated positions.

: N·m (kg-m, ft-lb)

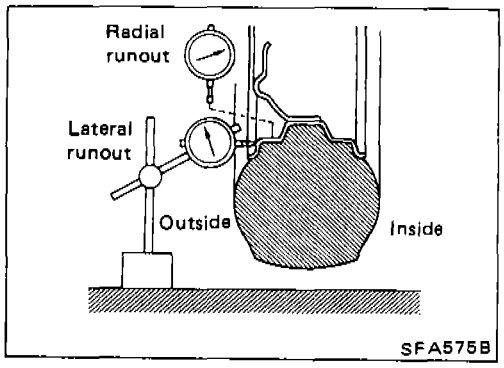
SRA093A


SRA107A

Rear Wheel Bearing

- Check tightening torque of wheel bearing lock nut.
  [O]: 235 - 314 N·m
  (24 - 32 kg-m, 174 - 231 ft-lb)
- Check that wheel bearings operates smoothly.
- Check axial end play.
  Axial end play:
  0.05 mm (0.0020 in) or less

If axial end play is not within specification or wheel bearing does not turn smoothly, replace wheel bearing assembly. Refer to REAR AXLE — Wheel Hub and Axle Housing.



SFA575B

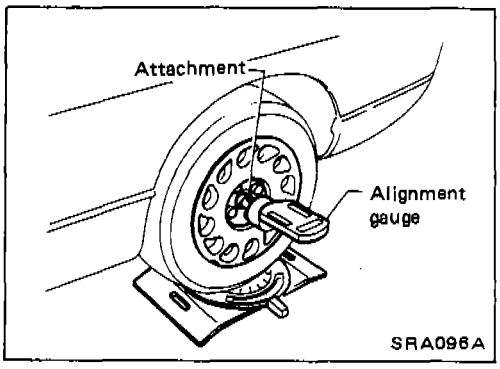
Rear Wheel Alignment

Before checking rear wheel alignment, be sure to make a preliminary inspection.

PRELIMINARY INSPECTION

Make following checks. Adjust, repair or replace if necessary.

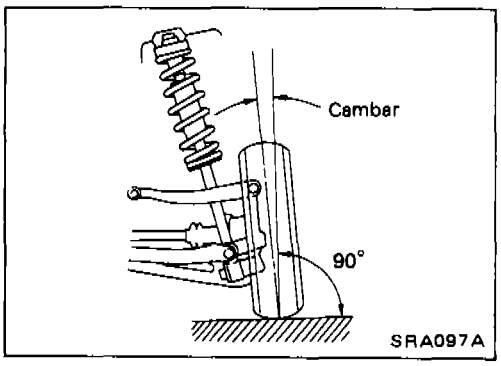
- Check tires for wear and for improper inflation.
- Check rear wheel bearings for looseness.
- Check wheel runout.
  Refer to S.D.S.
- Check that rear shock absorber works properly.
- Check rear axle and rear suspension parts for looseness.
- Check vehicle posture (Unladen).
  "Unladen":
  Fuel tank, radiator and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



SRA096A

CAMBER

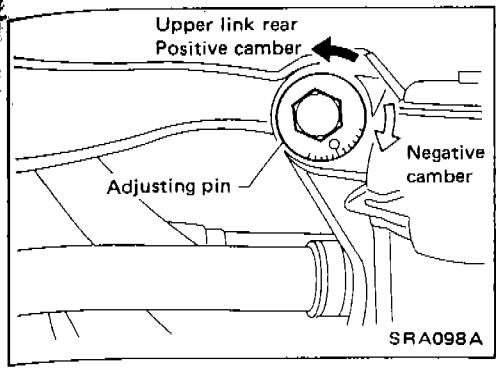
- **Measure camber of both right and left wheels with a suitable alignment gauge and adjust in accordance with the following procedures.**



SRA097A

Camber:
−1°40′ to −0°40′

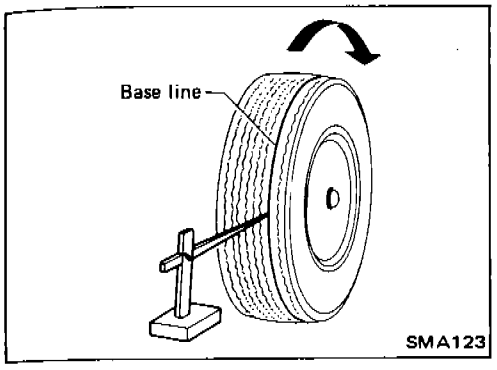
Rear Wheel Alignment (Cont'd)



If camber is not within specification, adjust by turning the adjusting pin.

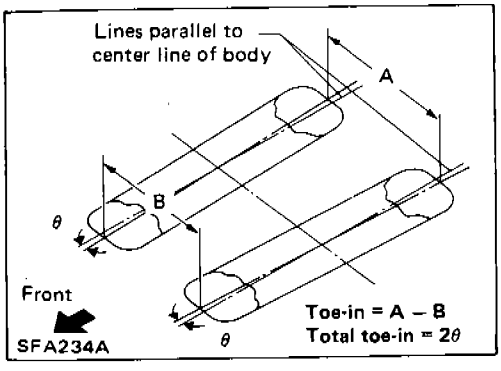
(1) Turn the adjusting pin to adjust.
Camber changes about 5′ with each graduation of the adjusting pin.

(2) Tighten to the specified torque.
[O]: 69 - 88 N·m
(7.0 - 9.0 kg-m, 51 - 65 ft-lb)



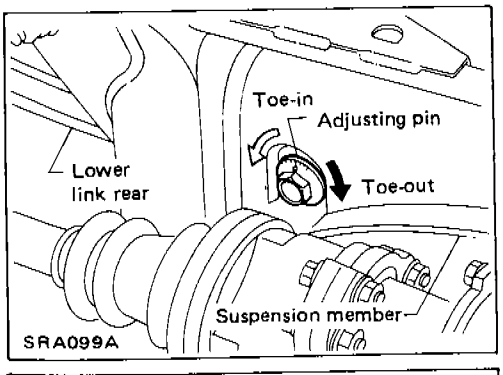
TOE-IN

1. Draw a base line across the tread.
After lowering rear of vehicle, move it up and down to eliminate friction.



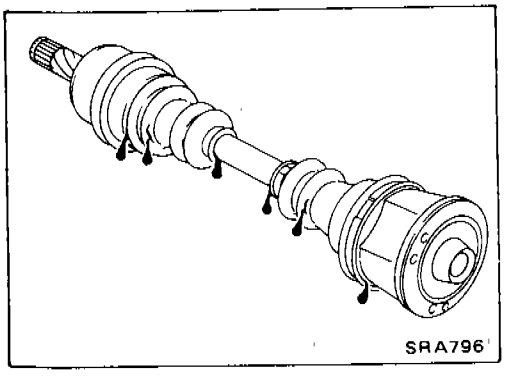
2. Measure toe-in.
Measure distance "A" and "B" at the same height as hub center.

Toe-in:
A – B
0 - 5 mm (0 - 0.20 in)
2θ (Total toe-in)
0′ - 28′



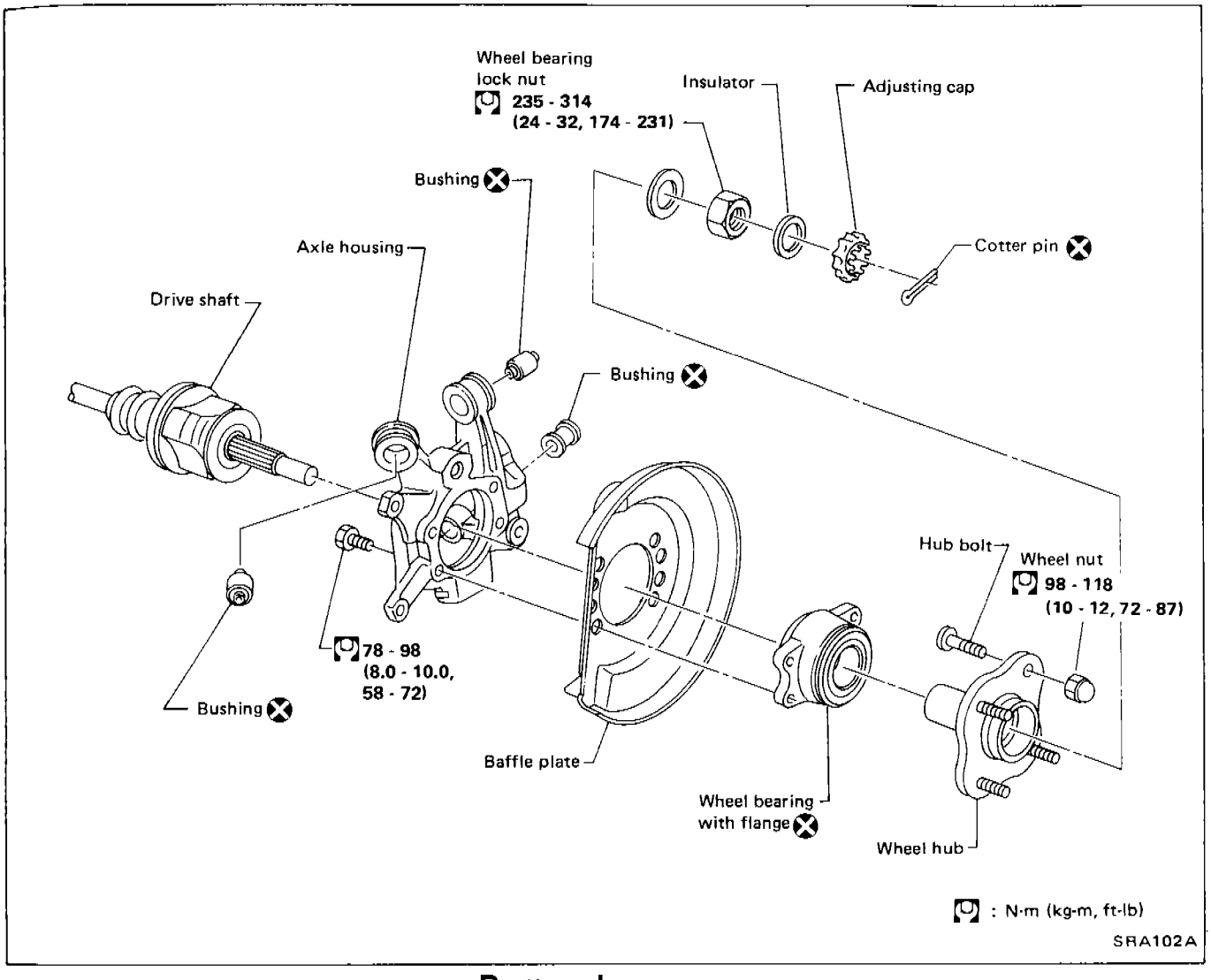
3. Adjust toe-in by turning adjusting pins.
Toe changes about 1.5 mm (0.059 in) [One side] with each graduation of the adjusting pin.

4. Tighten to the specified torque.
[O]: 69 - 88 N·m
(7.0 - 9.0 kg-m, 51 - 65 ft-lb)



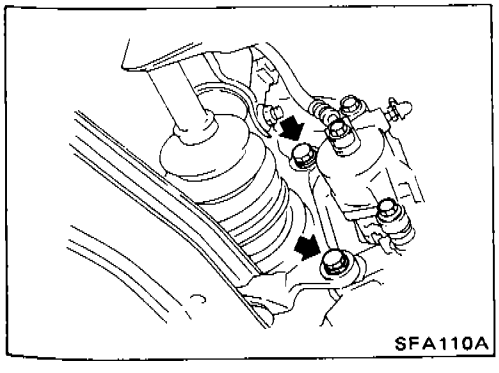
Drive Shaft

Check boot and drive shaft for cracks, wear, damage or grease leakage.



Removal

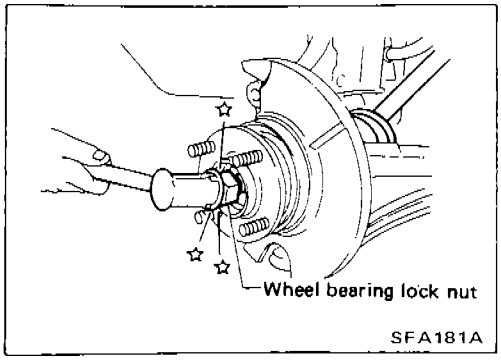
- Remove wheel bearing lock nut.



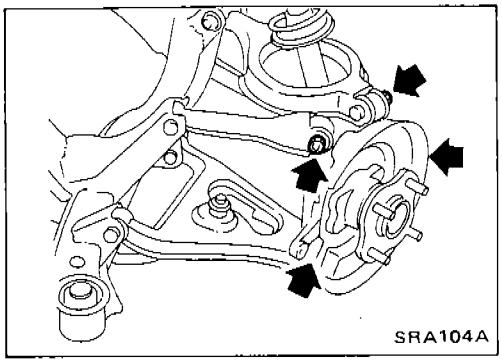
- Remove brake caliper assembly and rotor.

Brake hose need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Make sure brake hose is not twisted.

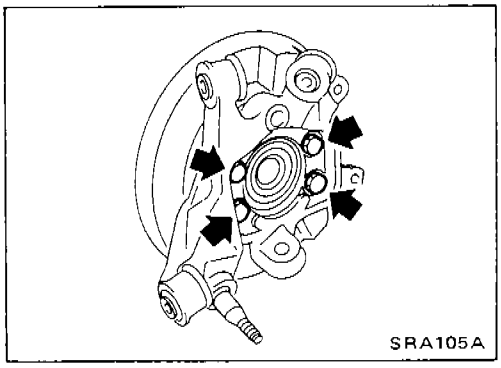
Removal (Cont'd)



- Separate drive shaft from axle housing by slightly tapping it. **When removing drive shaft, cover boots with waste cloth to prevent them from being damaged.**

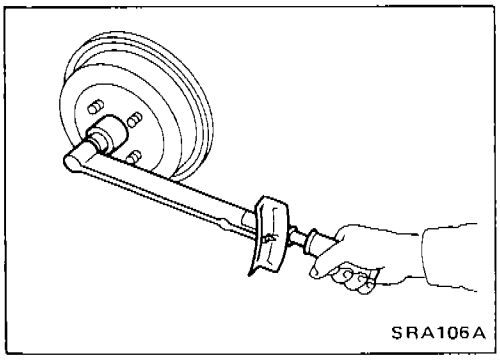


- Remove axle housing.

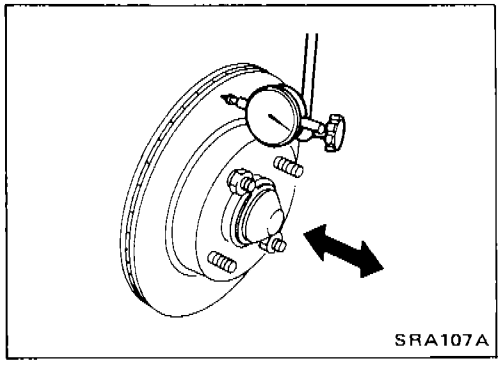


- Remove wheel bearing with flange, and wheel hub from axle housing.

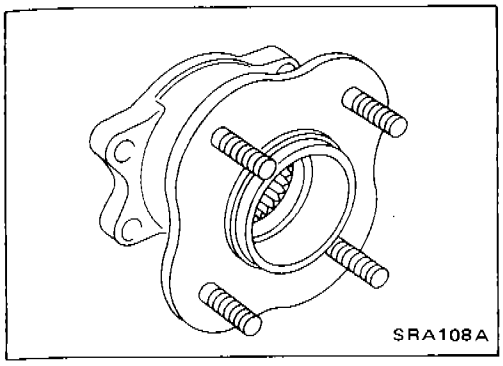
Installation



- Install axle housing with wheel hub.
- Tighten wheel bearing lock nut.
  : 235 - 314 N·m
  (24 - 32 kg-m, 174 - 231 ft-lb)



- Check wheel bearing axial end play.
  Axial end play: 0.05 mm (0.0020 in) or less


SRA108A

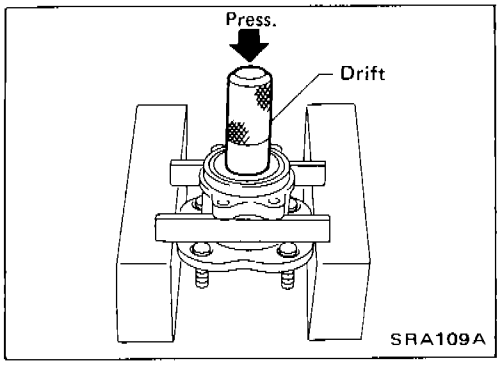
Disassembly

CAUTION:
Wheel bearing with flange usually does not require maintenance. If any of the following symptoms are noted, replace wheel bearing assembly (including flange, and inner and outer seals).

- **Growling noise is emitted from wheel bearing during operation.**
- **Wheel bearing drags or turns roughly when hub is turned with your hand after bearing lock nut is tightened to specified torque.**
- **After wheel bearing is removed from hub.**

WHEEL HUB

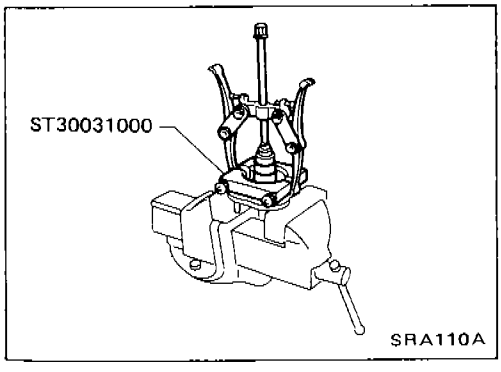
- Remove wheel bearing (with flange) and wheel hub as one unit from axle housing before disassembling.



SRA109A

WHEEL BEARING

- Using a press and drift as shown in figure at left, press wheel bearing out.
- Discard old wheel bearing assembly. Replace with a new wheel assembly.

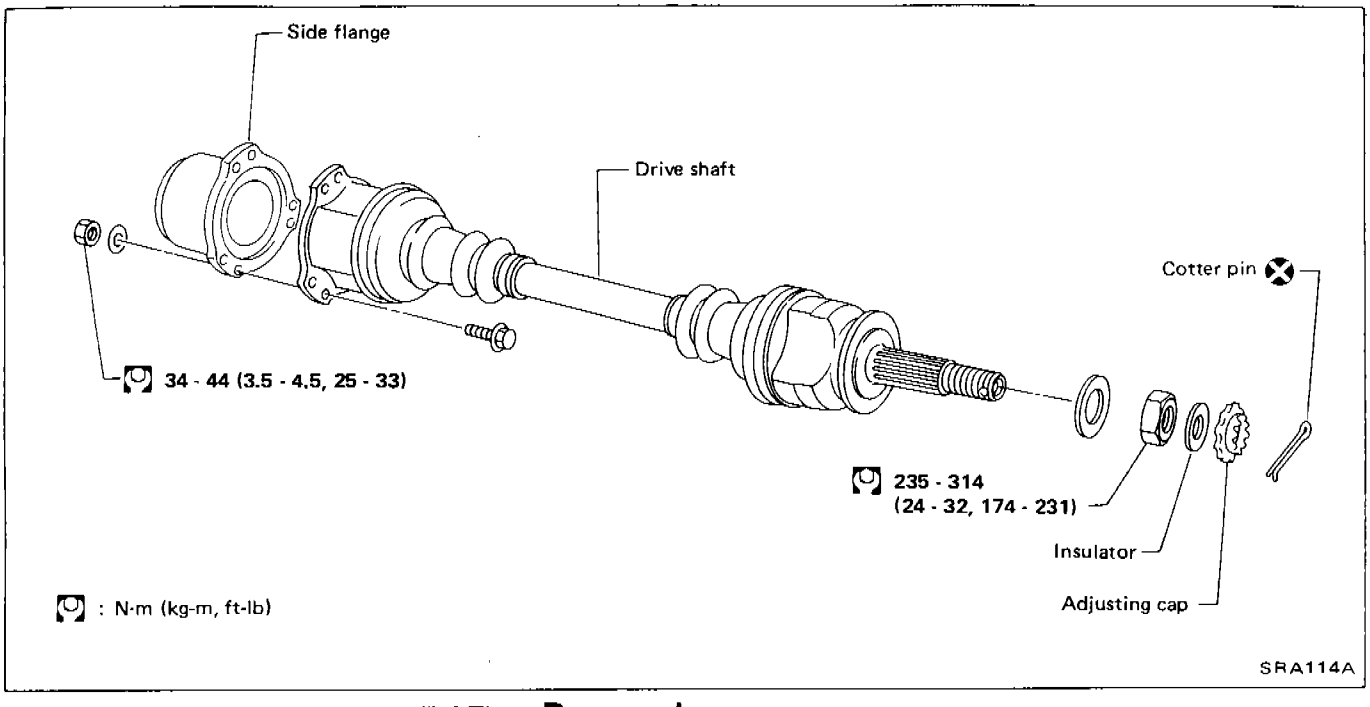


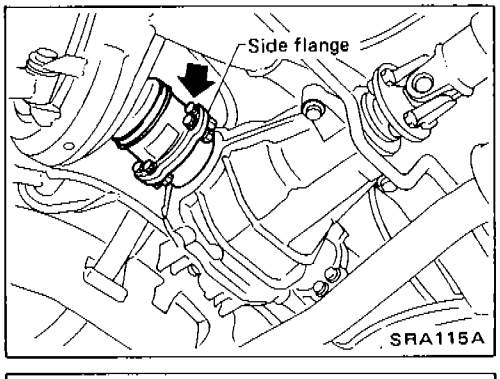
SRA110A

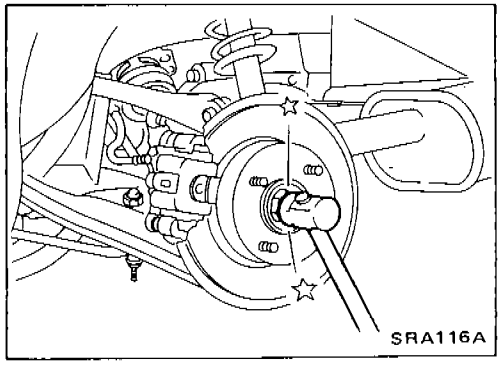
- Remove inner race from hub using a bearing replacer/puller.

CAUTION:

a. Do not reuse old inner race although it is of the same brand as the bearing assembly.
b. Do not replace grease seals as single parts.







Removal

When removing drive shaft, cover boots with waste cloth to prevent damage to them.

FINAL DRIVE SIDE

- Remove side flange mounting bolt and separate shaft.

WHEEL SIDE

- Remove drive shaft by lightly tapping it with a copper hammer.

To avoid damaging threads of drive shaft, install a nut while removing drive shaft.

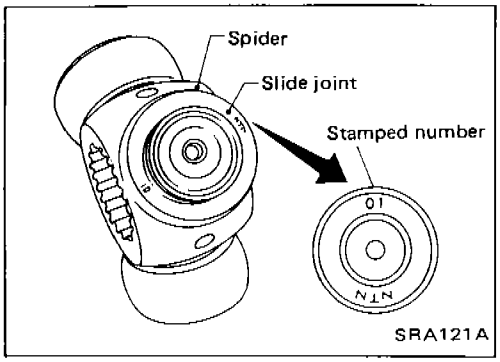
Installation

- Insert drive shaft from wheel hub and temporarily tighten wheel bearing lock nut.
- Tighten side flange mounting bolts to specified torque.
- Tighten wheel bearing lock nut to specified torque.

Inspection (Cont'd)

JOINT ASSEMBLY

- Check spider assembly for bearing, roller and washer damage. Replace spider assembly if necessary.
- Check housing for any damage. Replace housing set and spider assembly, if necessary.



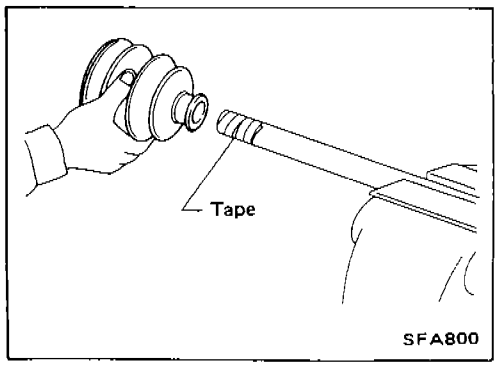
- When replacing only spider assembly, select a new spider assembly from among those listed in table below. Ensure the number stamped on sliding joint is the same as that stamped on new part.

Housing alone cannot be replaced. It must be replaced together with spider assembly.

Stamped number	Part No.
00	39720 10V10
01	39720 10V11
02	39720 10V12

Assembly

- **After drive shaft has been assembled, make sure it moves smoothly over its entire range without binding.**
- **Use Nissan Genuine Grease or equivalent after every overhaul.**

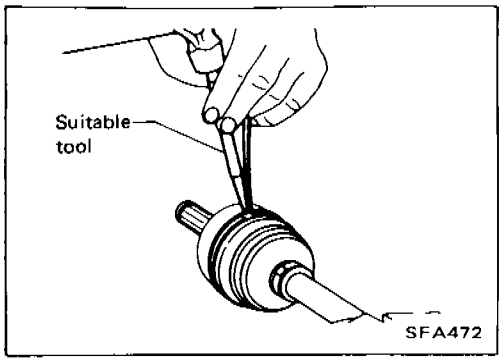


FINAL DRIVE SIDE

1. Install new small boot band, boot and slide joint housing to drive shaft.

Cover drive shaft serration with tape to prevent damage to boot during installation.

Assembly (Cont'd)

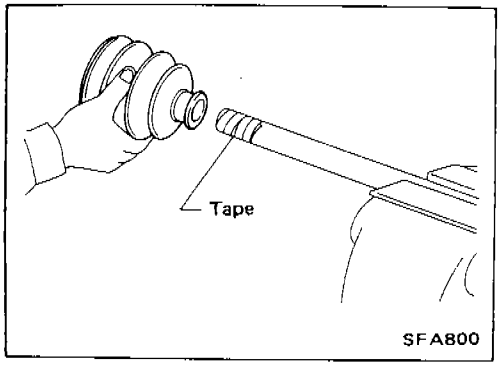


7. Lock new larger boot band securely with a suitable tool, then lock new smaller boot band.

WHEEL SIDE

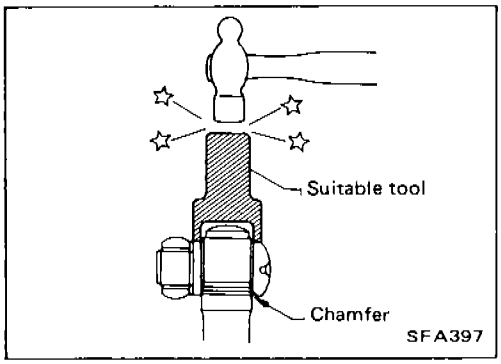
1. Install new small boot band and boot on drive shaft.

Cover drive shaft serration with tape to prevent damage to boot during installation.



2. Install spider assembly securely, making sure marks are properly aligned.
- Press-fit with spider assembly serration chamfer facing shaft.

3. Install new snap ring.



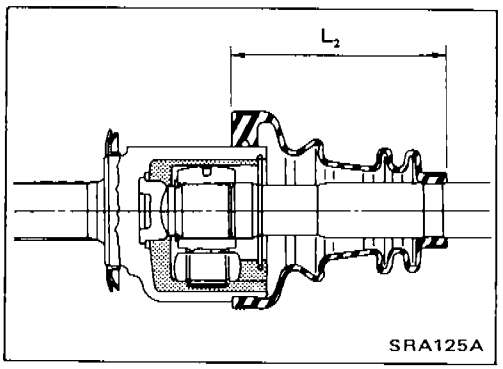
4. Pack drive shaft with specified amount of grease.

Specified amount of grease:
145 - 155 g (5.11 - 5.47 oz)

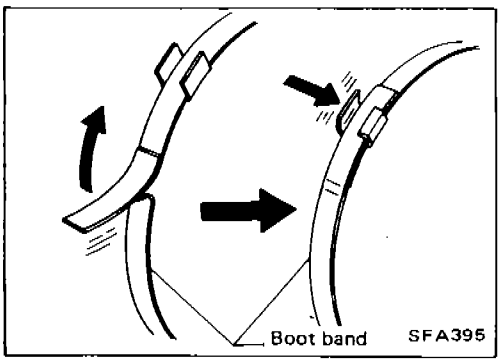
5. Install slide joint housing, then install new snap ring "A".
6. Set boot so that it does not swell and deform when its length is "L_2".

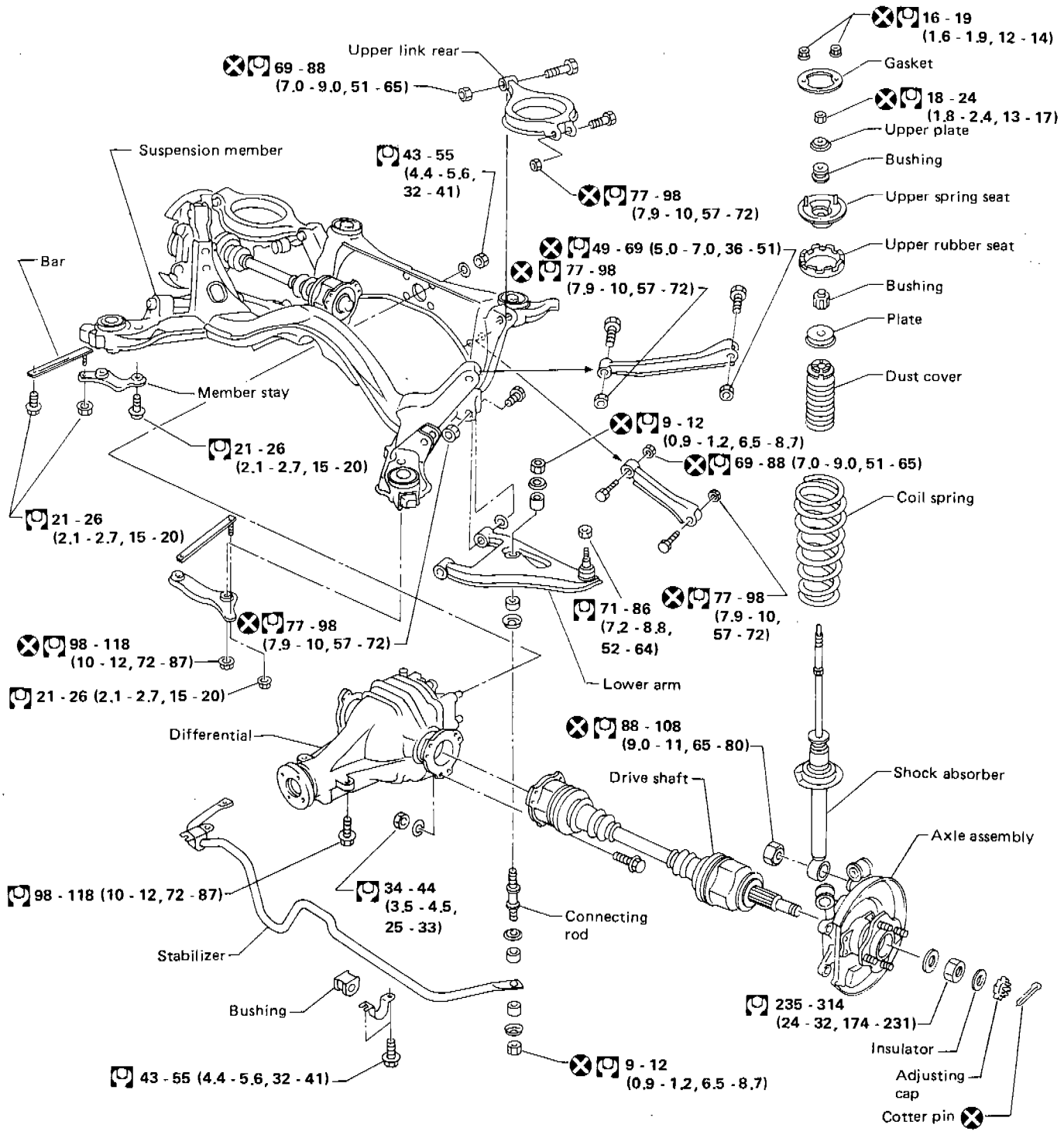
Length "L_2":
110.5 - 112.5 mm (4.35 - 4.43 in)

Make sure that boot is properly installed on the drive shaft groove.



7. Lock new larger and smaller boot bands securely with a suitable tool.





CAUTION:
Do not jack up at lower arm.
When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

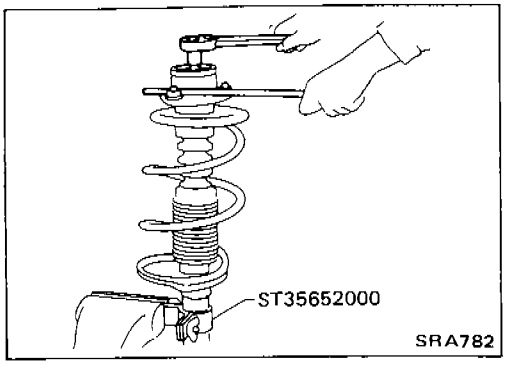
* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

: N·m (kg-m, ft-lb)

SRA144A

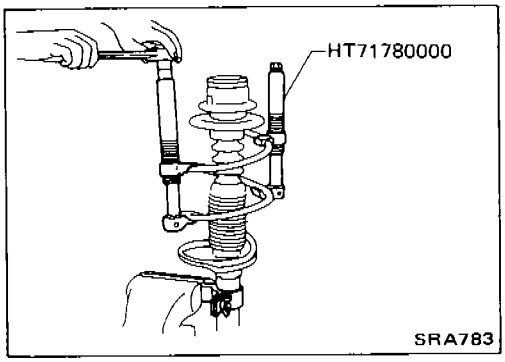
Removal

- Remove shock absorber upper and lower fixing nuts.
- **Do not remove piston rod lock nut on vehicle.**

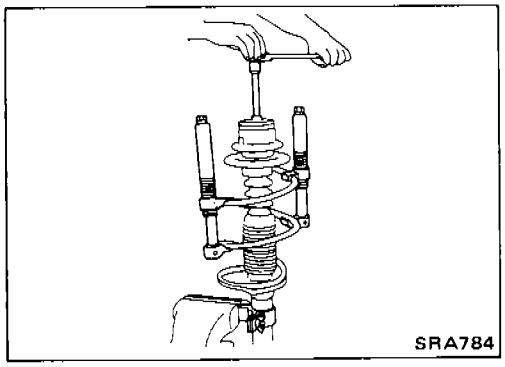


Disassembly

1. Set shock absorber on vise with attachment, then loosen piston rod lock nut.
- **Do not remove piston rod lock nut.**



2. Compress spring with Tool so that the strut upper spring seat can be turned by hand.



3. Remove piston rod lock nut.

Inspection

SHOCK ABSORBER ASSEMBLY

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occuring on welded or gland packing portion.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

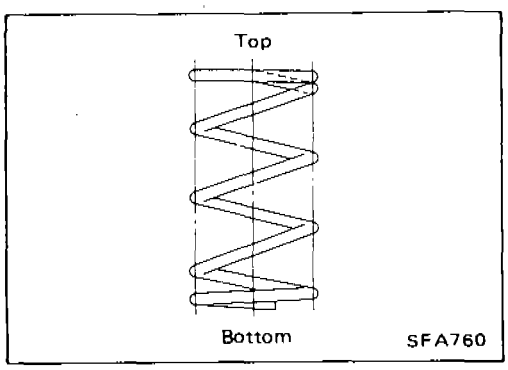
UPPER RUBBER SEAT AND BUSHING

- Check rubber parts for deterioration or cracks. Replace if necessary.

Inspection (Cont'd)

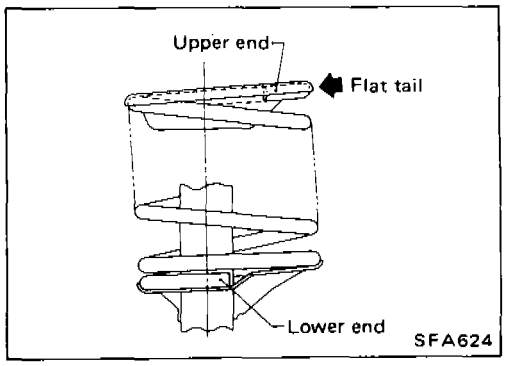
COIL SPRING

- Check for cracks, deformation or other damage. Replace if necessary.

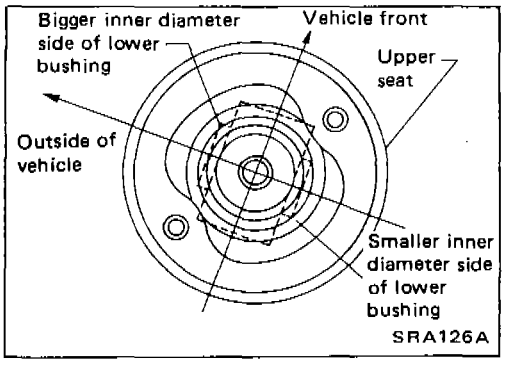


Assembly

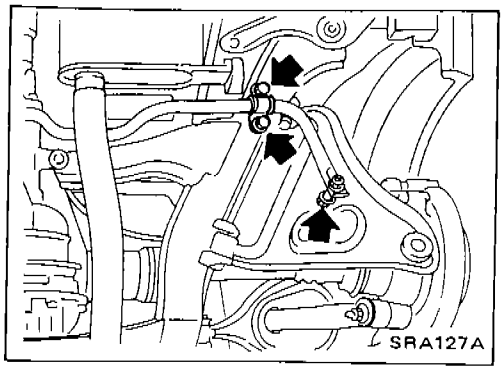
- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)



- When installing coil spring on strut, it must be positioned as shown in figure at left.



- When installing upper spring seat, make sure that it is positioned as shown.

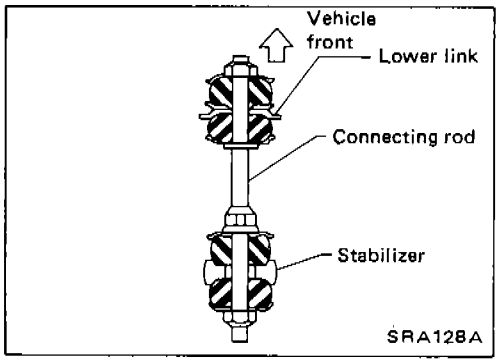


Removal

- Remove connecting rod and clamp.

Inspection

- Check stabilizer bar for deformation or cracks. Replace if necessary.
- Check rubber bushings for deterioration or cracks. Replace if necessary.

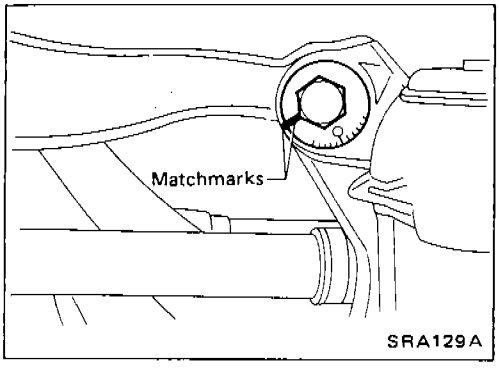


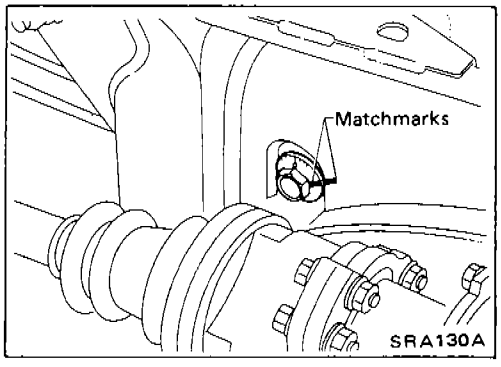
Installation

- When installing connecting rod, make sure direction is correct (as shown at left).

Removal and Installation

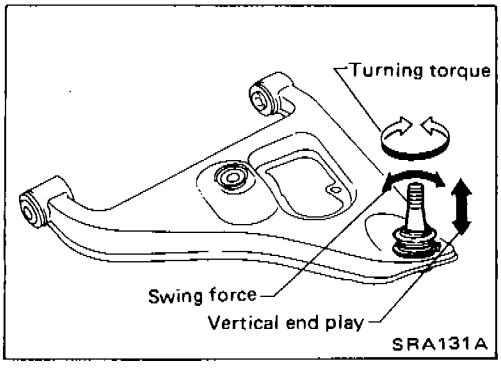
- Refer to "Removal and Installation" of REAR AXLE AND REAR SUSPENSION ASSEMBLY.





Before removing, put matchmarks on adjusting pin.

- When installing, final tightening must be carried out at curb weight with tires on ground.
- After installation, check wheel alignment.
  Refer to "Rear Wheel Alignment" of CHECK AND ADJUSTMENT — On vehicle.



Inspection

REAR SUSPENSION MEMBER

- Replace suspension member assembly if cracked or deformed or if any part (insulator, for example) is damaged.

UPPER AND LOWER LINKS

- Replace upper or lower link as required if cracked or deformed or if bushing is damaged.

SUSPENSION LOWER BALL JOINT

- Measure swing force, turning torque and vertical end play in axial direction. (Use same measurement procedures as that of FA section.)
- If ball stud is worn, play in axial direction is excessive, or joint is hard to swing, replace lower arm.

Ball joint specifications	Swing force	12.7 - 90.2 N (1.3 - 9.2 kg, 2.9 - 20.3 lb)
	Turning torque	0.5 - 3.4 N·m (5 - 35 kg-cm, 4.3 - 30.4 in-lb)
	Vertical end play	0 mm (0 in)

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*)

Camber	degree	−1°40′ to −0°40′
Toe-in	mm (in)	0 - 5 (0 - 0.20)
	(Total) degree	0′ - 28′

* Tankful of fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools, mats in designated position.

WHEEL BEARING

Wheel bearing axial end play mm (in)	0.05 (0.0020) or less
Wheel bearing lock nut Tightening torque N·m (kg-m, ft-lb)	235 - 314 (24 - 32, 174 - 231)

WHEEL RUNOUT (Radial and lateral)

Wheel type		Radial runout	Lateral runout
Aluminum wheel	mm (in)	0.3 (0.012) or less	
Steel wheel	mm (in)	0.5 (0.020) or less	0.8 (0.031) or less

LOWER BALL JOINT

Swing force (Measuring point: cotter pin hole of ball stud) N (kg, lb)	12.7 - 90.2 (1.3 - 9.2, 2.9 - 20.3)
Turning torque N·m (kg-cm, in-lb)	0.5 - 3.4 (5 - 35, 4.3 - 30.4)
Vertical end play mm (in)	0 (0)

STEERING SYSTEM

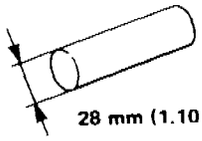
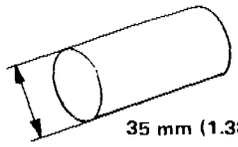
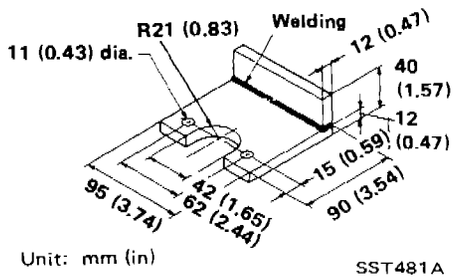
SECTION ST

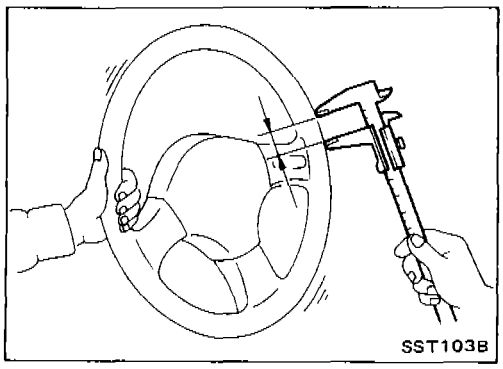
CONTENTS

- Before disassembly, thoroughly clean the outside of the unit.
- Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- When disassembling parts, be sure to place them in order in a parts rack so they can be reinstalled in their proper positions.
- Use nylon cloths or paper towels to clean the parts; common shop rags can leave lint that might interfere with their operation.
- Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.
- Before assembly, apply a coat of recommended A.T.F.* to hydraulic parts. Vaseline may be applied to O-rings and seals. Do not use any grease.
- Replace all gaskets, seals and O-rings. Avoid damaging O-rings, seals and gaskets during installation. Perform functional tests whenever designated.

*: Automatic transmission fluid

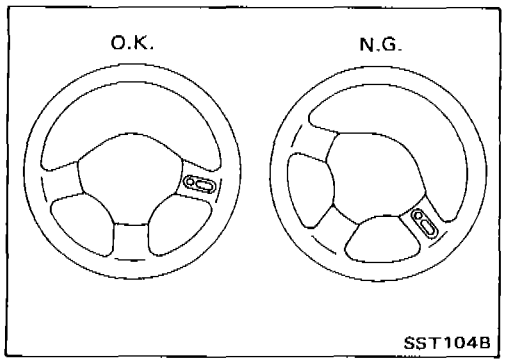
COMMERCIAL SERVICE TOOLS

Tool name	Description	
Rear oil seal drift		Installing rear oil seal
Pinion oil seal drift		Installing pinion oil seal
Oil pump attachment	 Unit: mm (in) SST481A	Disassembling and assembling oil pump


SST103B

Checking Steering Wheel Play

- With wheels in a straight-ahead position, check steering wheel play.
  Steering wheel play:
  35 mm (1.38 in) or less
- If it is not within specification, check rack and pinion assembly.



SST104B

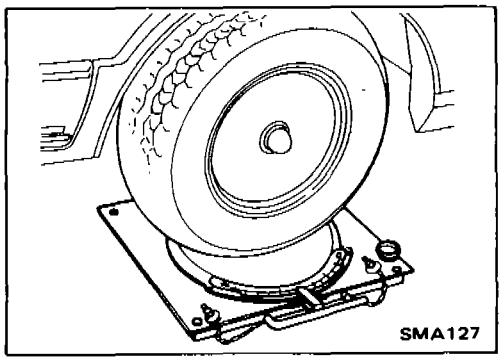
Checking Neutral Position on Steering Wheel

Pre-checking

- Verify that the steering gear is centered before removing the steering wheel.

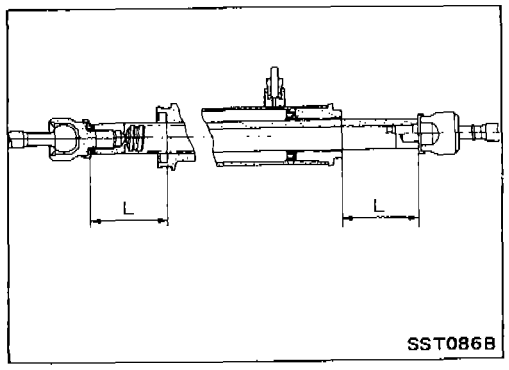
Checking

- Check that the steering wheel is in the neutral position when driving straight ahead.
- If it is not in the neutral position, remove the steering wheel and reinstall it correctly.
- If the neutral position is between two serrated teeth, loosen tie-rod lock nut and move tie-rod in the opposite direction by the same amount on both left and right sides to compensate for error in the neutral position.


SMA127

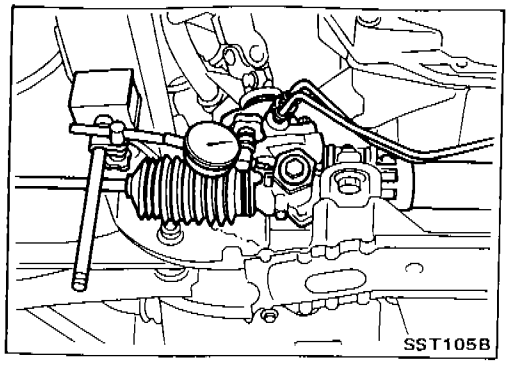
Front Wheel Turning Angle

- Rotate steering wheel all the way right and left; measure turning angle.
  Turning angle of full turns:
  Refer to section FA for S.D.S.



SST086B

- If it is not within specification, check rack stroke.
  Measured length "L":
  Refer to S.D.S.



Checking Gear Housing Movement

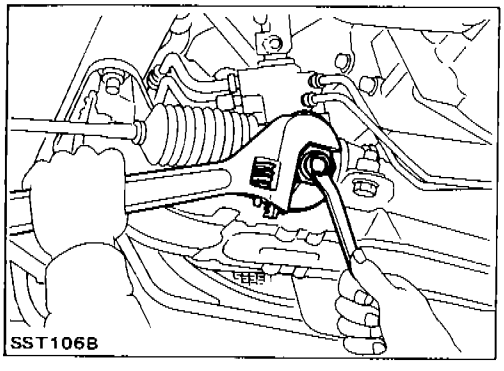
- Check the movement of steering gear housing during stationary steering. The maximum allowable movement is as follows:

Movement of gear housing:
±2 mm (±0.08 in) (on dry paved surface) or less

Apply a force of 49 N (5 kg, 11 lb) to steering wheel to check the gear housing movement.

On models equipped with power steering, turn off ignition key while checking.

- If movement exceeds the limit, replace mount insulator after confirming proper installation of gear housing clamps.



Adjusting Rack Retainer

- Perform this driving test on a flat road.

1. Check whether vehicle moves in a straight line when steering wheel is released.
2. Check whether steering wheel returns to neutral position when steering wheel is released from a slightly turned (approx. 20°) position.

- If any abnormality is found, correct it by resetting adjusting screw.

Bleeding Hydraulic System (Cont'd)

a. Generation of air bubbles in reservoir tank
b. Generation of clicking noise in oil pump
c. Excessive buzzing in oil pump

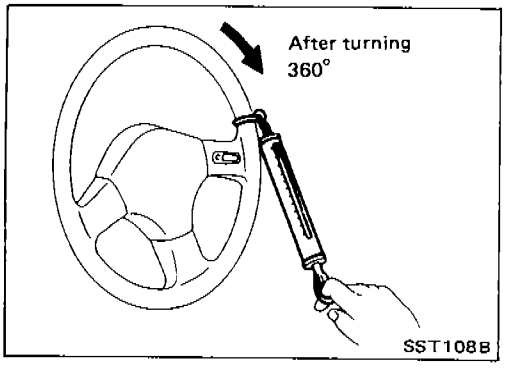
While the vehicle is stationary or while turning the steering wheel slowly, fluid noise may occur in the valve or oil pump. This noise is inherent in this steering system, and it will not affect performance or durability of the system.

Checking Steering Wheel Turning Force

1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Warm up power steering fluid to adequate operating temperature.

Temperature of fluid:
Approximately 60 - 80°C (140 - 176°F).

Tires need to be inflated to normal pressure.



4. Check steering wheel turning force with engine idling when steering wheel has been turned 360° from neutral position.

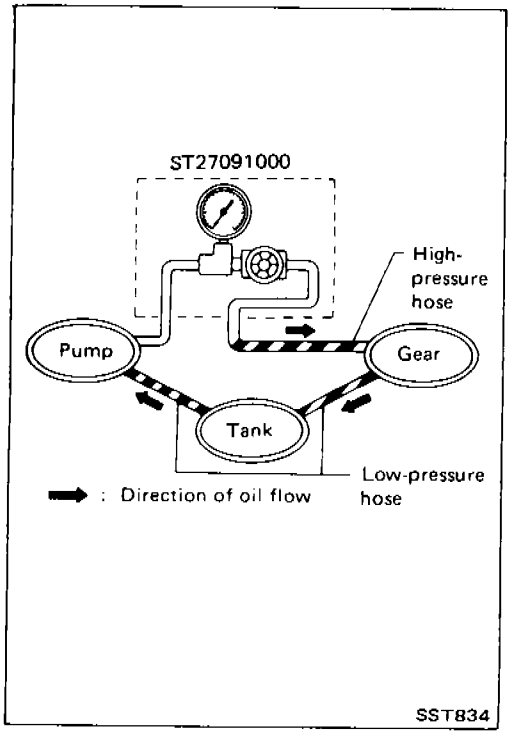
Steering wheel turning force:
39 N (4 kg, 9 lb) or less

Checking Hydraulic System

Before starting, check belt tension, driving pulley and tire pressure.

1. Set Tool. Open shut-off valve. Then bleed air. (See "Bleeding Hydraulic System".)
2. Run engine.

Make sure temperature of fluid in tank rises to 60 to 80°C (140 to 176°F).



Checking Hydraulic System (Cont'd)

WARNING:

Warm up engine with shut-off valve fully opened. If engine is started with shut-off valve closed, oil pressure in oil pump will increase to relief pressure, resulting in an abnormal rise in oil temperature.

3. Check pressure with steering wheel fully turned to left and right positions with engine idling at 1,000 rpm.

CAUTION:

Do not hold the steering wheel in a locked position for more than 15 seconds.

Oil pump maximum standard pressure:
6,865 kPa (68.6 bar, 70 kg/cm^2, 995 psi)
at idling

4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.

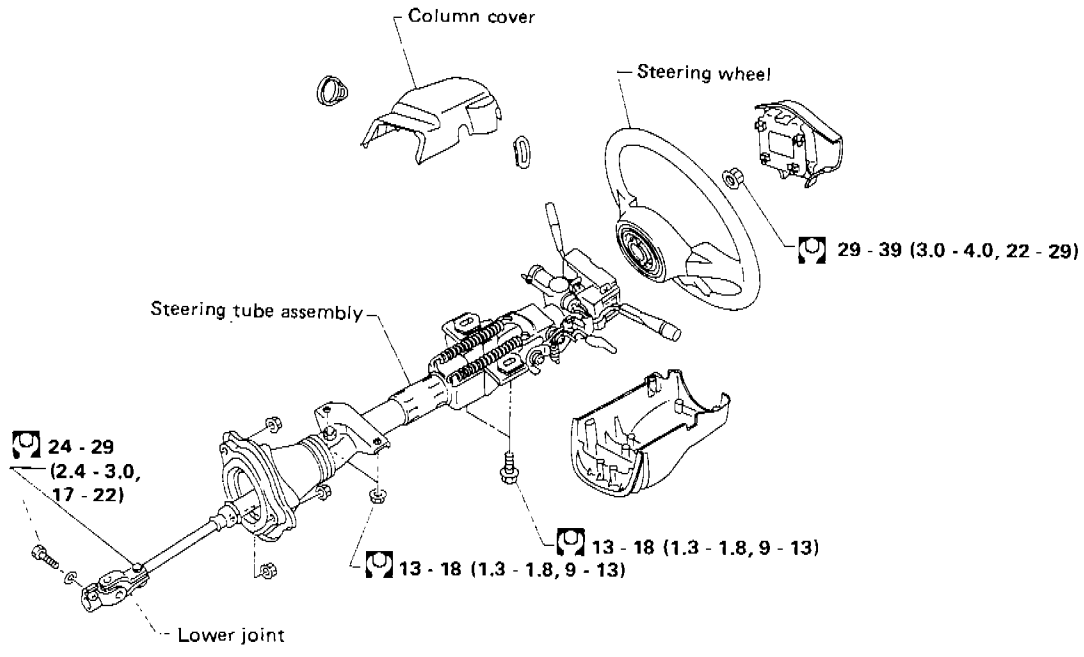
- When pressure reaches standard pressure, gear is damaged.
- When pressure remains below standard pressure, pump is damaged.

CAUTION:

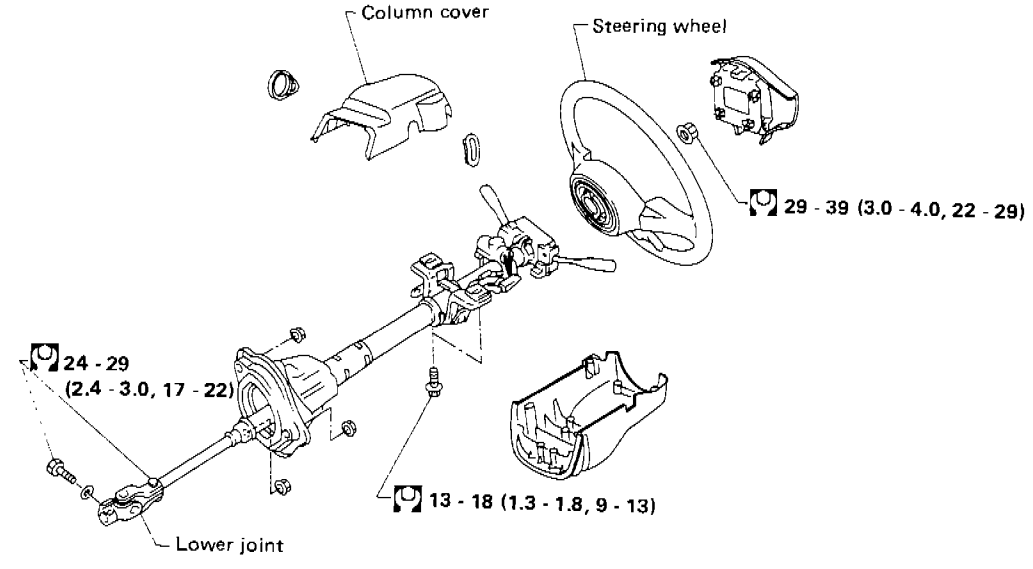
Do not close shut-off valve for more than 15 seconds.

5. If oil pressure is higher than standard pressure, pump is damaged.
6. After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.

L.H.D.

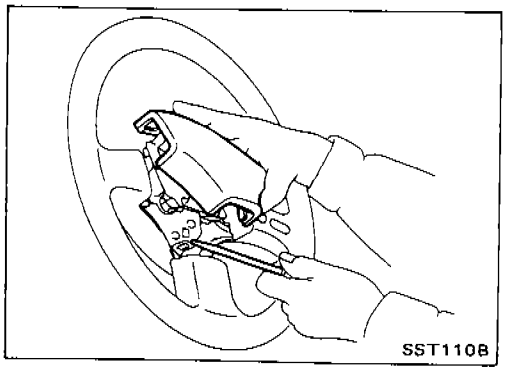


R.H.D.



: N·m (kg-m, ft-lb)

SST144B



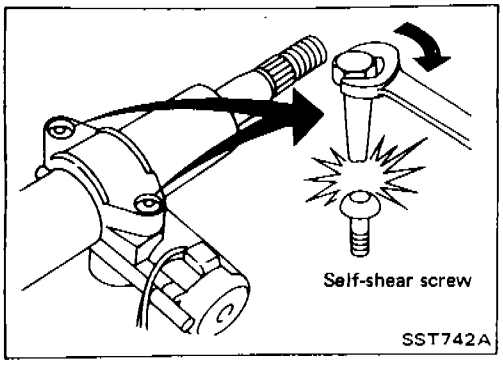
Removal

STEERING WHEEL

- Pull out horn pad.

If it is hard to pull out horn pad, temporarily loosen fixing screw of horn pad retaining spring.

Disassembly and Assembly (Cont'd)

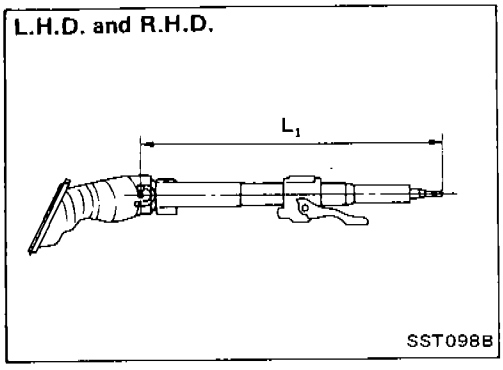


- Steering lock

a) Break self-shear type screws with a drill or other appropriate tool.

b) Install self-shear type screws and then cut off self-shear type screw heads.

Inspection

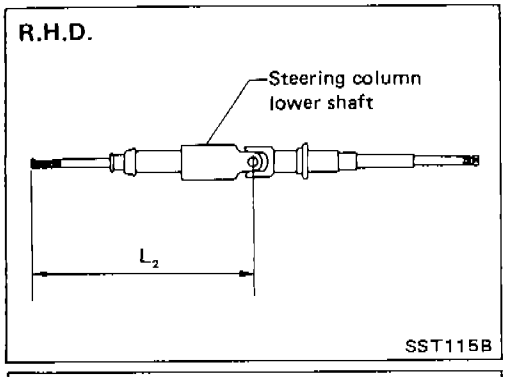


- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.

a. Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.

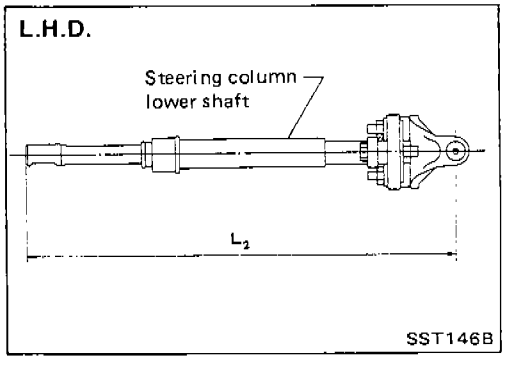
b. Check steering column lower shaft for deformation or breakage. Replace if necessary.

- When the vehicle is involved in a light collision, check steering column length "L_1" and steering column lower shaft length "L_2". If it is not within specifications, replace steering column as an assembly.



R.H.D.:

Steering column length "L_1"
715.2 - 716.8 mm (28.16 - 28.22 in)
Steering column lower shaft length "L_2"
273.7 mm (10.78 in)



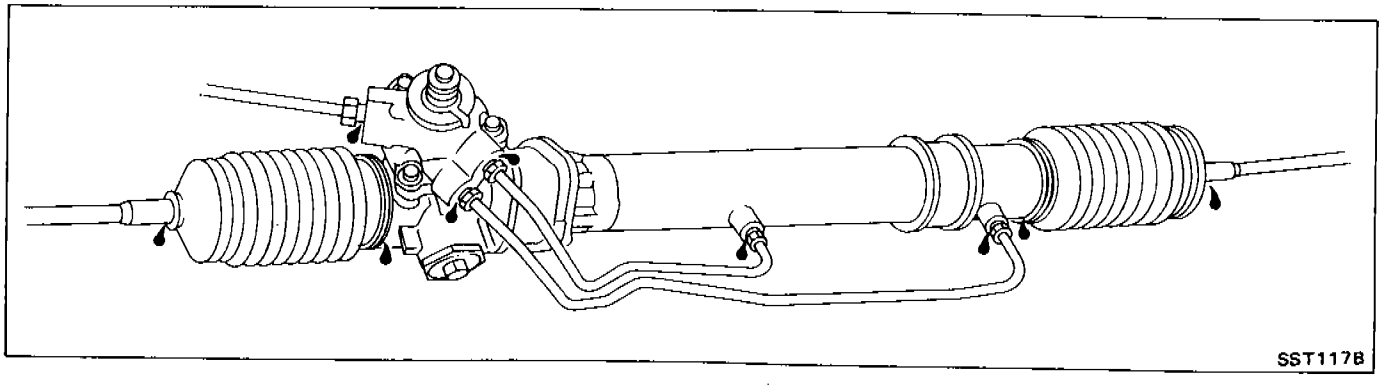
L.H.D.:

Steering column length "L_1"
652.9 - 654.5 mm (25.70 - 25.77 in)
Steering column lower shaft length "L_2"
324.7 mm (12.78 in)

Disassembly and Assembly

The table below lists four ways to repair oil leaks in the steering gear, depending on the location of the leak. **See the following figure for oil leak locations.**

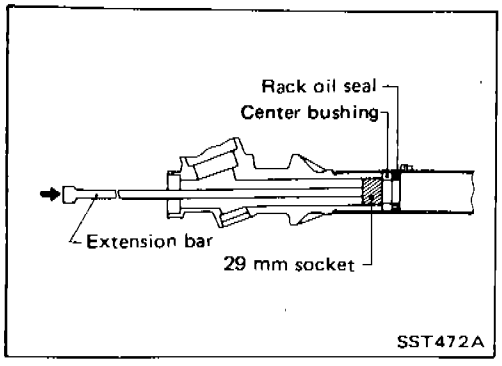
Item \ Position of oil leak	① Rear housing cover and rear housing	② Boot	③ Boot	④ Gear housing tube
Operation	■ Replacement • Rear oil seal • Pinion oil seal • O-ring • Snap ring	■ Replacement • Rack oil seal • Boot clamp	■ Replacement • Rack oil seals • Rack oil seal • O-ring • Back-up collar • Boot clamp	■ Replacement • Gear housing tube • Copper washer
Procedure	Remove gear from vehicle. Measure rack starting force and pinion rotating torque. Replace parts described above.	Replace rack oil seal.	Replace parts described above.	Replace gear housing tube. Measure pinion rotating torque. Adjust adjusting screw. Measure rack starting force and pinion rotating torque.
Service parts to be prepared	• Pinion seal kit	• Gear housing seal kit	• Rack oil seal • Pinion seal kit	• Gear housing seal kit



Disassembly (Cont'd)

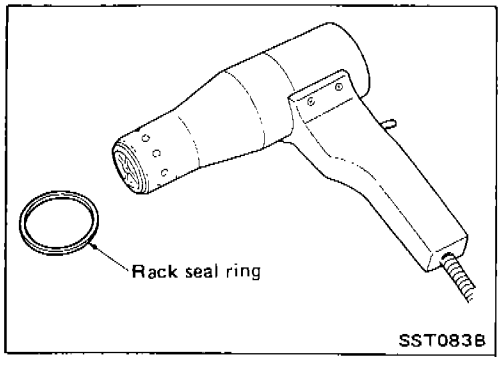
11. Remove center bushing and rack oil seal using tape wrapped socket and extension bar.

Do not scratch inner surfaces of pinion housing.



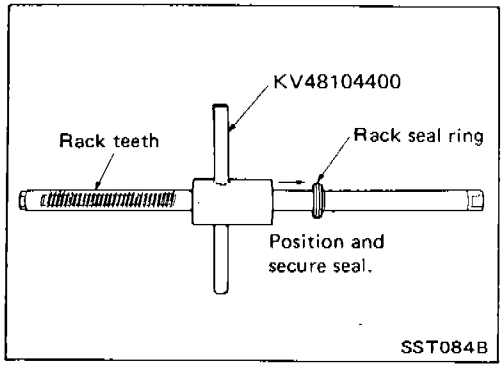
Assembly

1. Using a heat gun, heat rack seal ring (made of Teflon) to approximately 40°C (104°F) and install it onto rack with your hand.

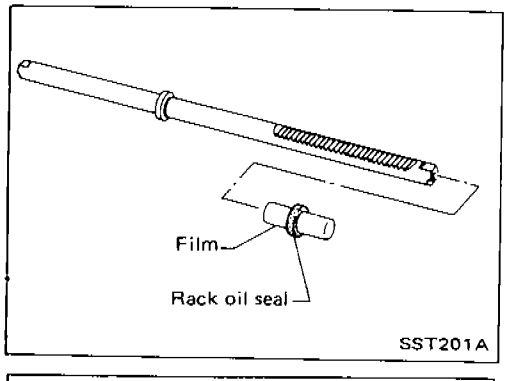


- Using Tool, compress periphery of rack seal ring (made of Teflon) to position and secure it on rack.

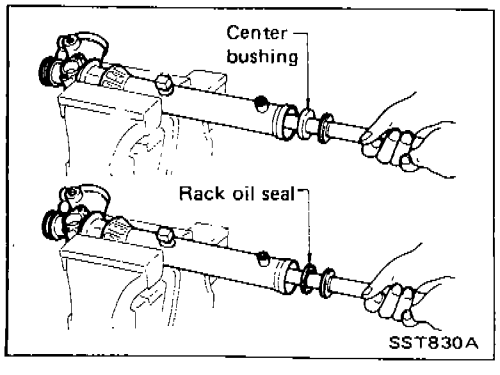
Always insert the tool from the rack gear side.



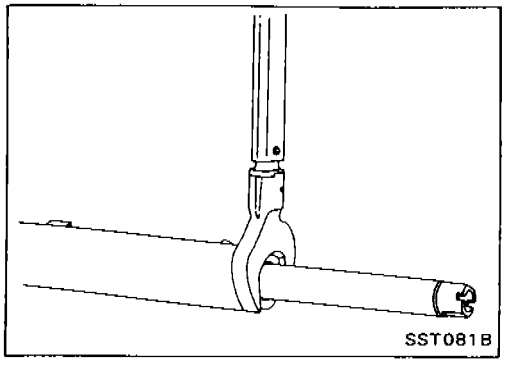
2. Insert rack oil seal.
- Place plastic film into rack oil seal to prevent damage by rack teeth.
- Always remove plastic film after rack oil seal is positioned properly.
- Make sure lips of rack oil seal face each other.



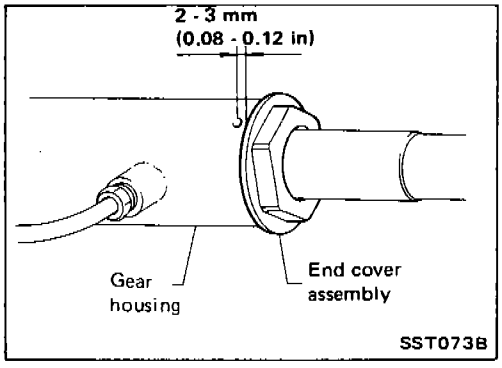
3. Install center bushing and rack oil seal with rack assembly.



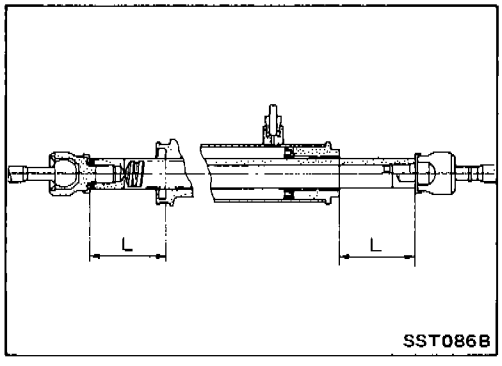
Assembly (Cont'd)



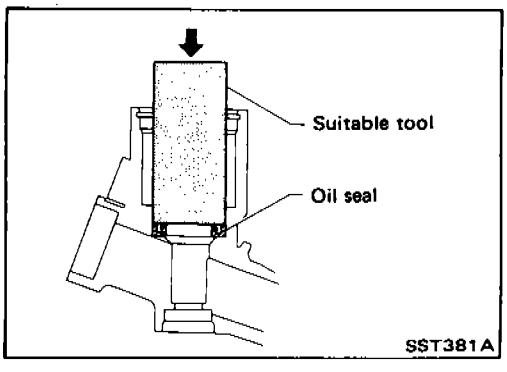
4. Tighten end cover assembly with suitable tool.



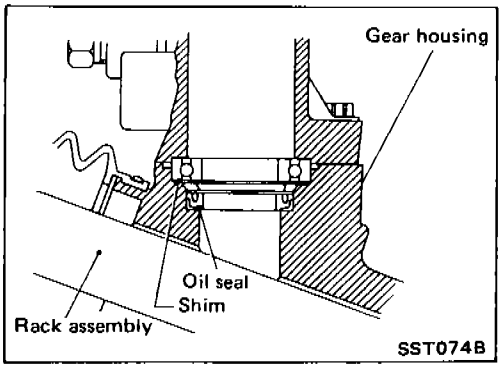
5. Fasten end cover assembly to gear housing by staking.



6. Set rack gear in neutral position.
   Measured length "L":
   Refer to S.D.S.

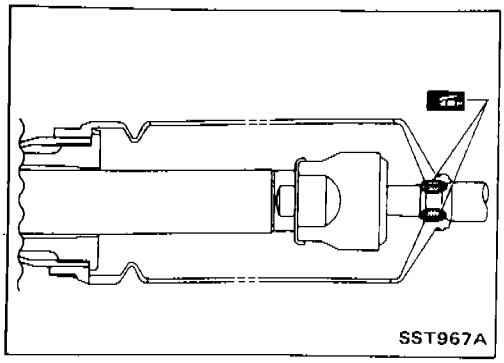


7. Coat seal lip of oil seal with multi-purpose grease and install new pinion oil seal to pinion housing of gear housing with suitable tool.
   - Make sure lip of oil seal faces up when installed.

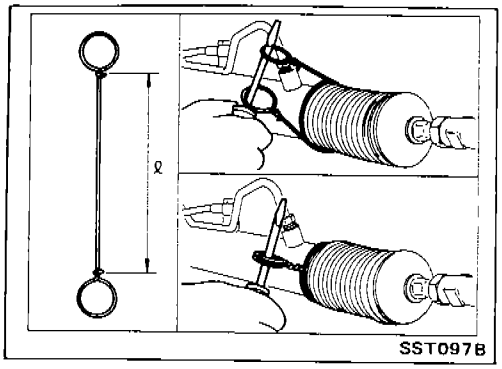


8. Install pinion bearing adjusting shim(s).
   - Whenever pinion assembly, gear housing and rear housing are disassembled, replace shim(s) with new ones. Always use the same number of shim(s) when replacing.

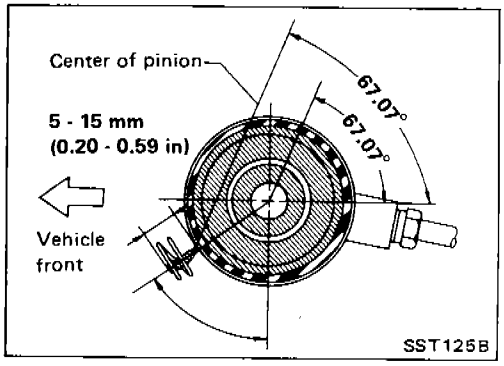
Assembly (Cont'd)



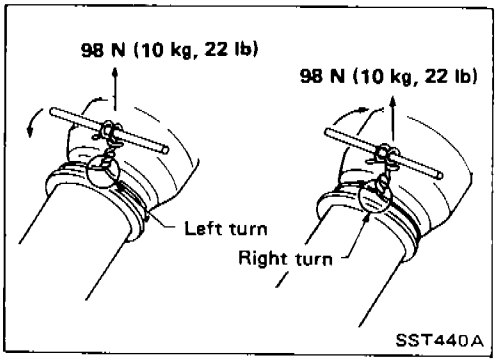
20. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.



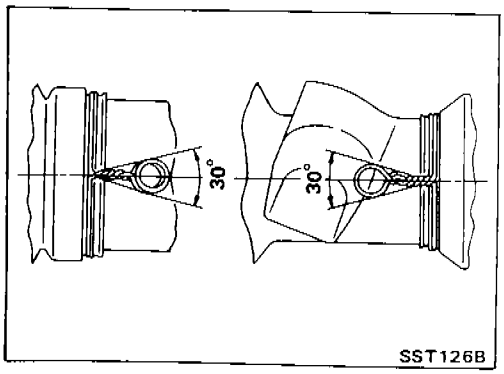
21. Install boot clamps.
- To install, wrap boot clamp around boot groove twice. Tighten clamp by twisting rings at both ends 4 to 4-1/2 turns with screwdriver while pulling with a force of approx. 98 N (10 kg, 22 lb).



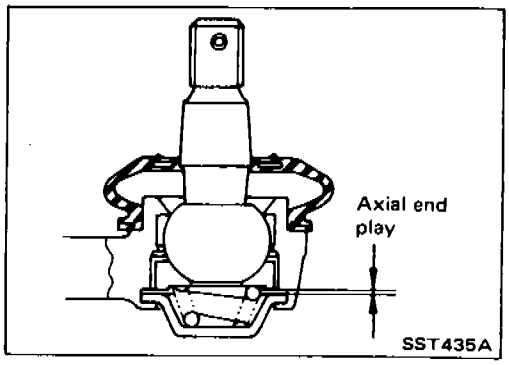
- Install boot clamp so that it is to the rear of the vehicle when gear housing is attached to the body. (This will prevent interference with other parts.)



- Twist boot clamp in the direction shown in figure at left.



- After twisting boot clamp, bend twisted and diagonally so it does not contact boot.



Inspection (Cont'd)

- Check ball joint for axial end play.
  Tie-rod outer ball joint:
  0.5 mm (0.020 in) or less
  Tie-rod inner ball joint:
  0 mm (0 in)
- Check condition of dust cover. If cracked excessively, replace it.

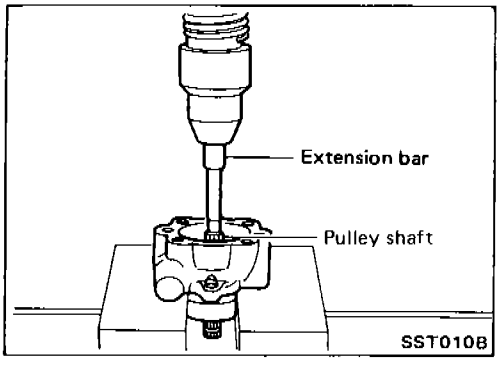
GEAR HOUSING CYLINDER

Check gear housing cylinder for scratches or other damage. Replace if necessary.

Disassembly

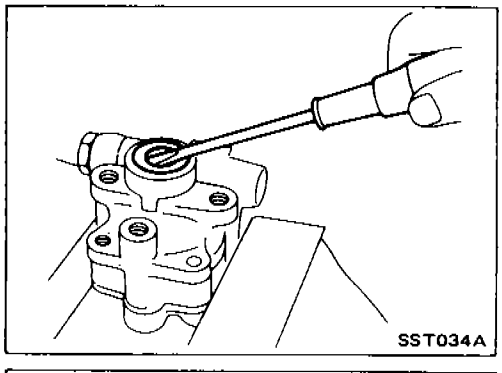
CAUTION:

- **Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.**
- **Disassemble in as clean a place as possible.**
- **Clean your hands before disassembly.**
- **Do not use rags; use nylon cloths or paper towels.**
- **Follow the procedures and cautions in the Service Manual.**
- **When disassembling and reassembling, do not let foreign matter enter or contact the parts.**



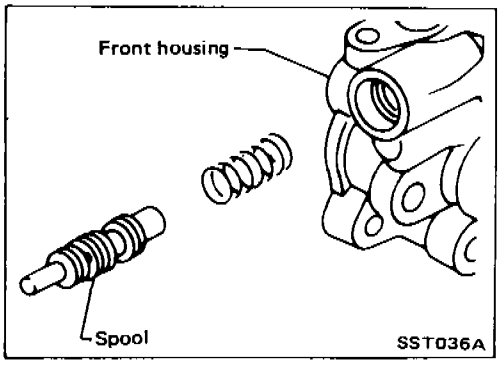
- Remove snap ring, then draw pulley shaft out.

Be careful not to drop pulley shaft.



- Remove oil seal.

Be careful not to damage front housing.



- Remove connector.

Be careful not to drop spool.

Inspection

PULLEY AND PULLEY SHAFT

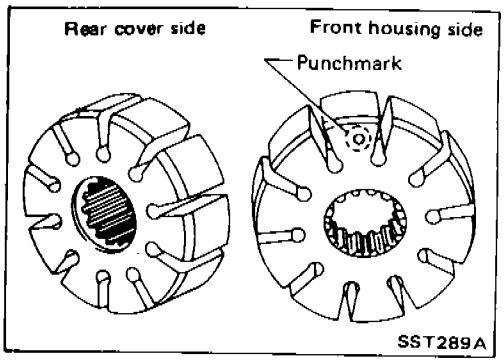
- If pulley is cracked or deformed, replace it.
- If an oil leak is found around pulley shaft oil seal, replace the seal.
- If serration of pulley or pulley shaft is deformed or worn, replace it.

Assembly

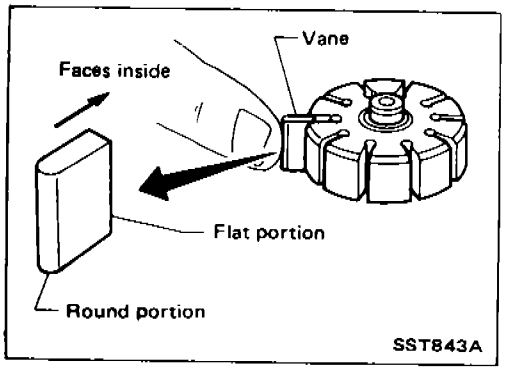
Assemble oil pump in the reverse order of disassembly, noting the following instructions.

- Before installation, coat the O-rings and oil seal with A.T.F.*
- Make sure O-rings and oil seal are properly installed.
- When assembling vanes to rotor, rounded surfaces of vanes must face cam case side.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.

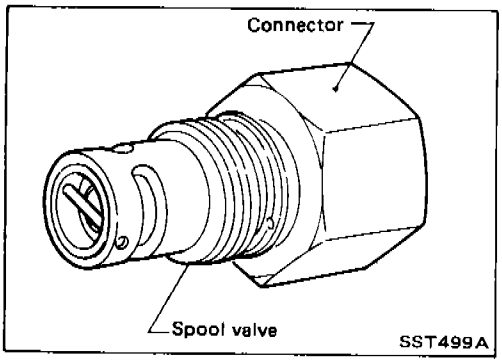
*: Automatic Transmission Fluid



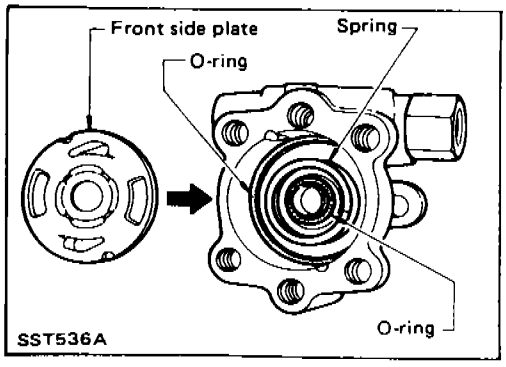
- Pay attention to the direction of rotor.



- Install vanes properly.



CAUTION:
Do not remove spool valve from connector.

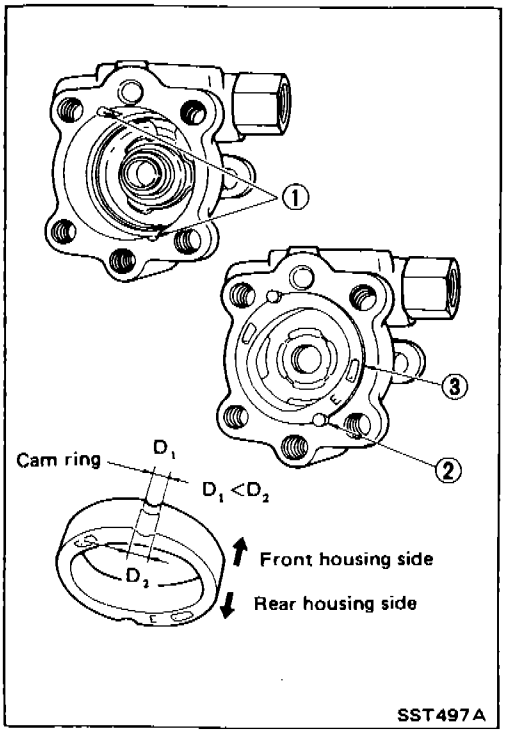


- Apply A.T.F.* to O-ring.

*: Automatic Transmission Fluid

Assembly (Cont'd)

- Insert pin ② into pin groove ① of front housing and rotor. Then install cam ring ③ as shown at left.



General Specifications

Model	R.H.D.	L.H.D.	
		Except Europe	Europe
Steering model	Power steering		
Steering gear type	PR24SC		PR26SC
Turn of steering wheel (Lock to lock)	3.1		3.2
Steering column type	Collapsible, tilt	Collapsible, jumping tilt	

Inspection and Adjustment

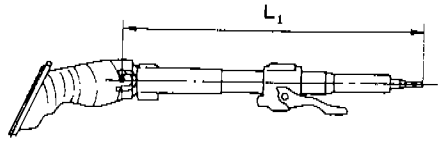
GENERAL

Steering wheel axial play mm (in)	0 (0)
Steering wheel play mm (in)	0 - 35 (0 - 1.38)

STEERING COLUMN

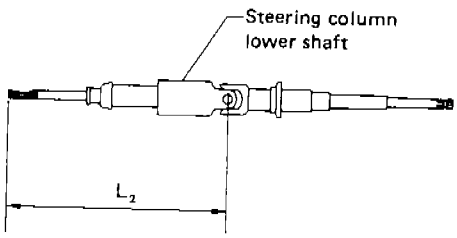
Model	R.H.D.	L.H.D.
Steering column length "L_1" mm (in)	715.2 - 716.8 (28.16 - 28.22)	652.9 - 654.5 (25.70 - 25.77)
Steering column lower shaft length "L_2" mm (in)	273.7 (10.78)	324.7 (12.78)

R.H.D. and L.H.D.



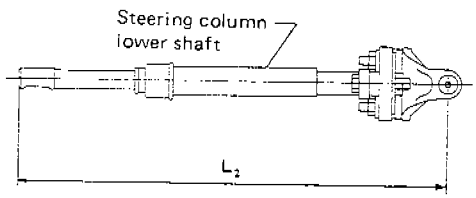
SST098B

R.H.D



SST115B

L.H.D.



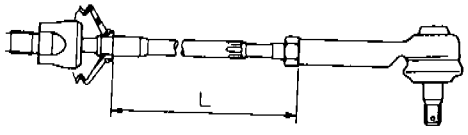
SST146B

Inspection and Adjustment (Cont'd)

STEERING GEAR AND LINKAGE

Item \ Steering gear type	PR24SC	PR26SC
Tie-rod outer ball joint Swinging force* N (kg, lb)	9.12 - 91.30 (0.93 - 9.31; 2.05 - 20.53)	
Rotating torque N·m (kg-cm, in-lb)	0.29 - 2.94 (3.0 - 30.0, 2.6 - 26.0)	
Axial end play mm (in)	0.5 (0.020)	
Tie-rod inner ball joint Swinging force* N (kg, lb)	8.14 - 122.6 (0.83 - 12.5, 1.83 - 27.6)	
Rotating torque N·m (kg-cm, in-lb)	7.4 (75, 65) or less	
Axial end play mm (in)	0 (0)	
Tie-rod standard length "L" mm (in)	174.8 (6.88)	

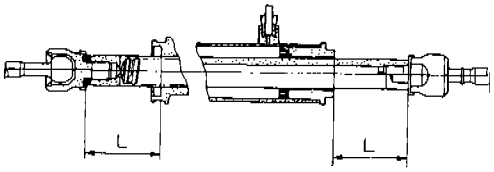
*: Measuring point



SST093B

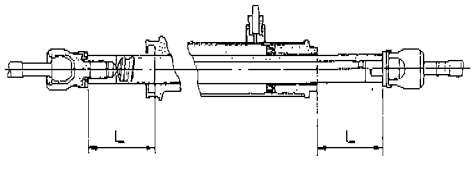
Pinion gear preload (Average) N·m (kg-cm, in-lb)	0.78 - 1.27 (8.0 - 13.0, 6.9 - 11.3)	
Rack stroke "L" mm (in)	68.5 (2.697)	66.0 (2.598)

PR24SC



SST086B

PR26SC



SST164B

POWER STEERING

Rack sliding force N (kg, lb)	166.7 - 255.6 (17.0 - 23.0, 37.5 - 50.7)
Steering wheel turning force (Mesured at one full turn from neutral) N (kg, lb)	39 (4, 9) or less
Normal operating temperature of power steering fluid °C (°F)	60 - 80 (140 - 176)
Fluid capacity (Approximate) ℓ (Imp qt)	0.9 (3/4)
Oil pump maximum pressure kPa (bar, kg/cm², psi)	6,865 (68.6, 70, 995)