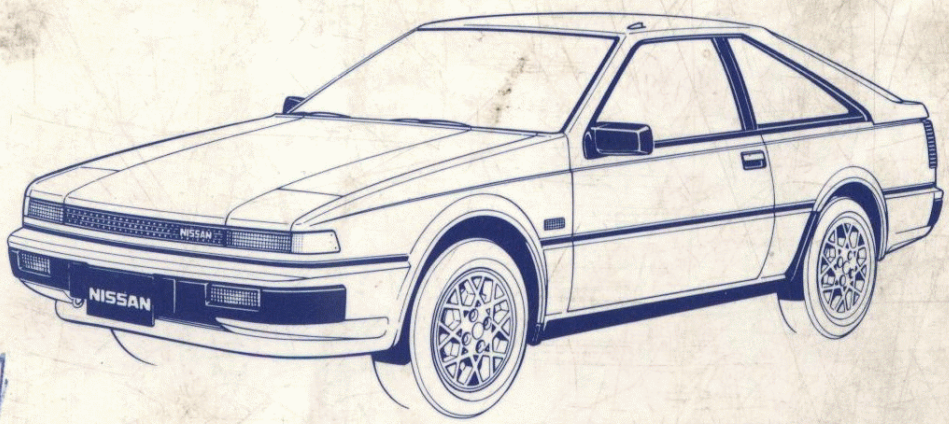
NISSAN

NISSAN 200SX

1986



SERVICE MANUAL

NISSAN 200SX

MODEL S12 SERIES

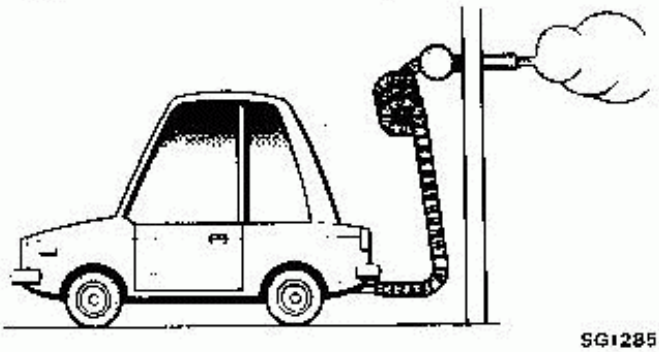
QUICK REFERENCE INDEX

SECTION GI

CONTENTS

The following precautions should be observed to ensure safe and proper service operations. These precautions are not described in each individual section.

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.

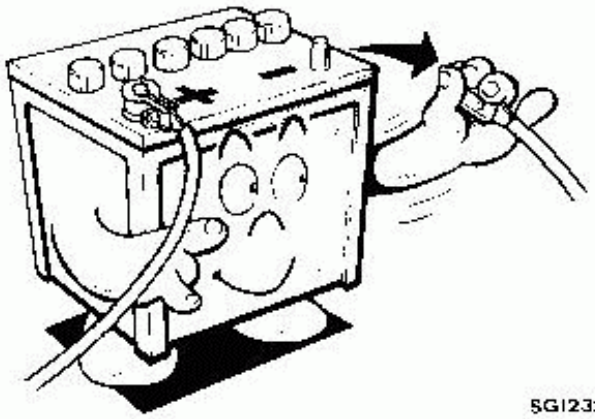


SGI285

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 before working on the vehicle.
   These operations should be done on a level surface.

SGI231

3. When removing a heavy component such as the engine or transaxle/transmission, take care not to lose your balance and drop it. Also do not allow it to hit against adjacent parts, especially the brake tube and brake master cylinder.
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.

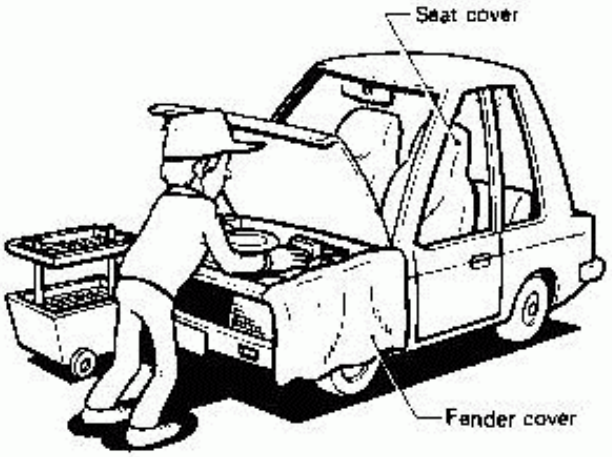


SGI232

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.

SGI233

6. To prevent scratches and soiling, protect fenders, upholstery and carpeting with appropriate covers before servicing.
   Take caution that keys, buckles or buttons on your person do not scratch the paint.



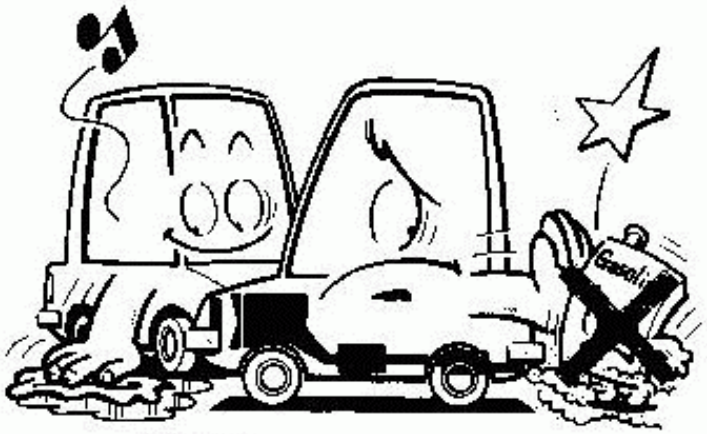
SGI234

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. as instructed and discard used ones.
9. Tapered roller bearings and needle bearings should be replaced as a set of inner and outer races.
10. Arrange the disassembled parts in accordance with their assembled locations and sequence.
11. Do not touch the terminals of electrical components which utilize microcomputers such as electronic control units. Static electrical charges stored in your body may damage internal electronic components.
12. After disconnecting vacuum hose or air hose, attach a tag which indicates the proper connection to prevent incorrect connection.
13. Use only the lubricants specified in the applicable section or those indicated under "Recommended Fuel and Lubricants".
14. Use approved bonding agents, sealants or their equivalents when required.
15. The use of the proper tools and recommended essential tools should be used where specified for proper, safe and efficient service repairs.
6. When effecting repairs on the fuel, oil, water, vacuum or exhaust systems, make certain to check all affected lines for leaks.
7. Dispose of drained oil or the solvent used for cleaning parts in an appropriate manner.

Precautions for a 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.



Clean floor

SGI290

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.

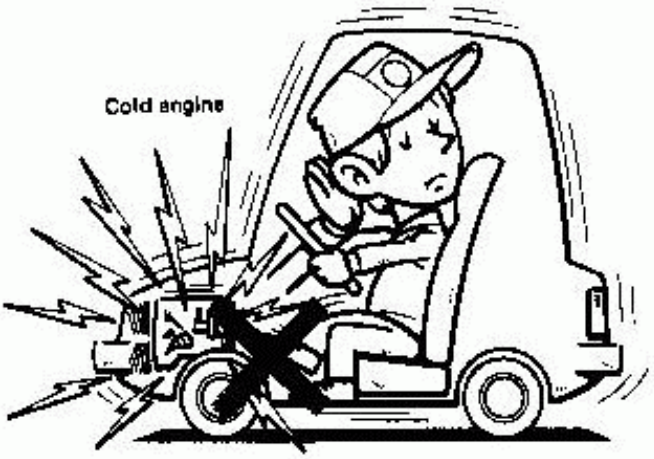
SGI291

Precautions for Turbocharger

The turbocharger system uses engine oil for lubrication and cooling of its rotating components. The turbocharger turbine turns at a speed in excess of 100,000 rpm at full throttle and its temperature can reach 870°C (1,600°F). It is essential to maintain a clean supply of oil flowing through the turbocharger system. Therefore, a sudden interruption of oil supply may cause a malfunction in the turbocharger.

For proper operation of the system, follow the procedure below.

1. Always use the recommended oil. Follow the instructions for proper time to change the oil and proper oil level.
2. Avoid accelerating engine to a high rpm immediately after starting.



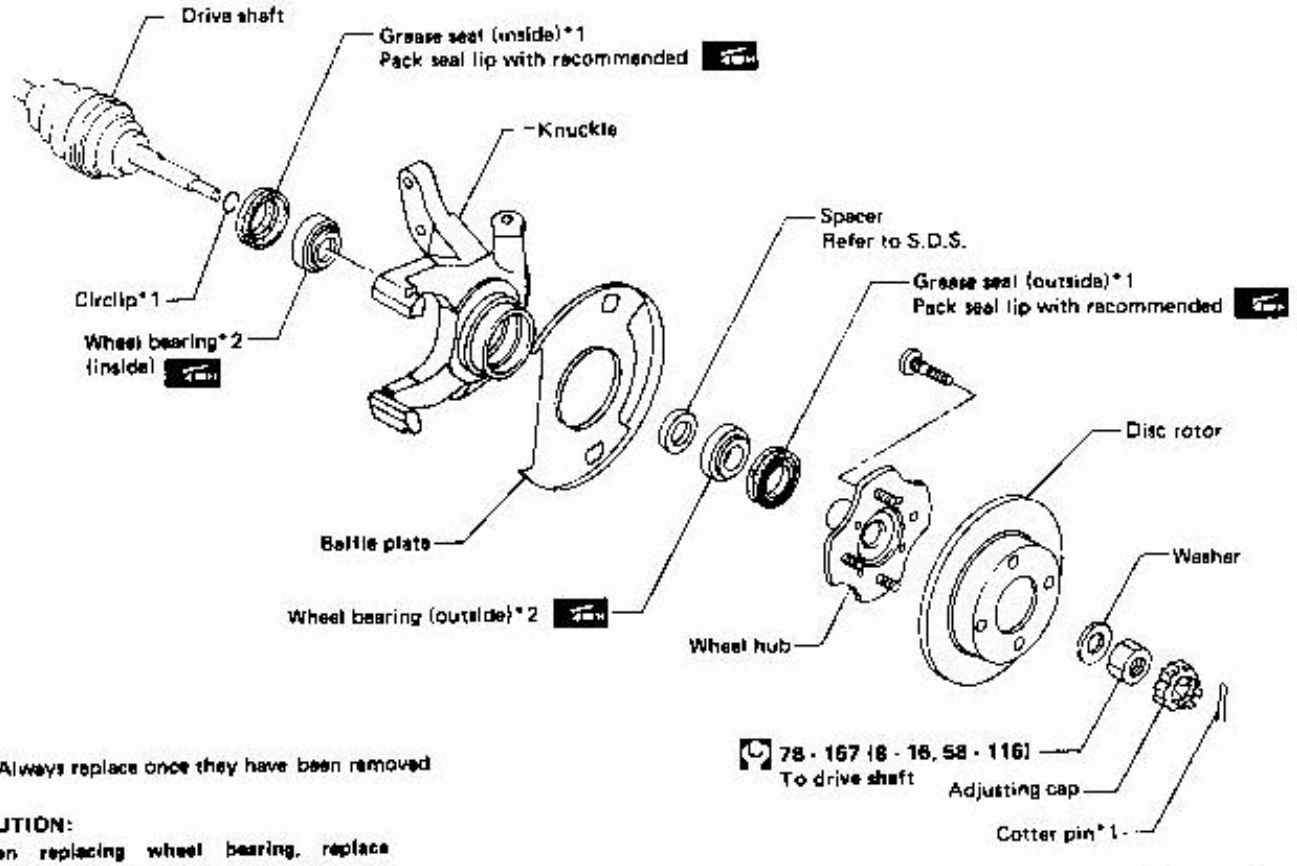
SGI292

3. If engine had been operating at high rpm for an extended period of time, let it idle for a few minutes prior to shutting it off.

1. **A QUICK REFERENCE INDEX**, a black tab (e.g. FA) is provided on the first page. You can quickly find the first page of each section by matching it to the section's black tab.
2. **THE CONTENTS** are listed on the first page of each section.
3. **THE TITLE** is indicated on the upper portion of each page and shows the part or system.
4. **THE PAGE NUMBER** of each section consists of two letters, which designate the particular section, and a number (e.g. "FA-5").
5. **THE FIRST LARGE ILLUSTRATION** of each section is an exploded view (See below) and contains tightening torques, lubrication points and other information necessary to perform repairs.

"Example"

FRONT AXLE — Wheel Hub and Knuckle



*1 Always replace once they have been removed

*2

CAUTION:

When replacing wheel bearing, replace inner and outer wheel bearings at the same time to prevent mix use of bearings of different brands.

: N·m (kg-m, ft-lb)

SFA494

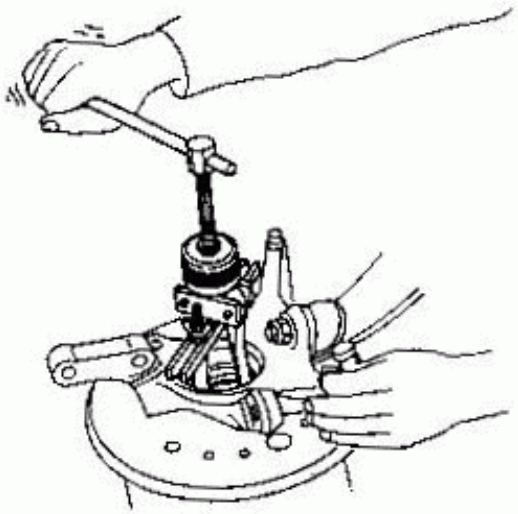
6. **THE FOLLOWING SMALL ILLUSTRATION** shows the important steps such as inspection, use of special tools, knacks of work and hidden or tricky steps which are not shown in the previous large illustration.
Assembly, inspection and adjustment procedures for the complicated units such as the automatic transaxle or transmission, etc. are presented in a step-by-step format where necessary.

"Example"

KNUCKLE

- Remove wheel bearing outer races.

When replacing wheel bearing, replace as a set of outer and inner wheel bearing assembly.



SFA540

7. The followings **SYMBOLS AND ABBREVIATIONS** are used:

: Tightening Torque

: Should be lubricated with grease. Unless otherwise indicated, use recommended multi-purpose grease.

: Should be lubricated with oil.

: Sealing point

: Checking point

: Always replace after every disassembly.

S.D.S.:	Service Data and Specifications
L.H., R.H.:	Left-Hand, Right-Hand
M/T:	Manual Transaxle/Transmission
A/T:	Automatic Transaxle/Transmission
Tool:	Special Service Tools

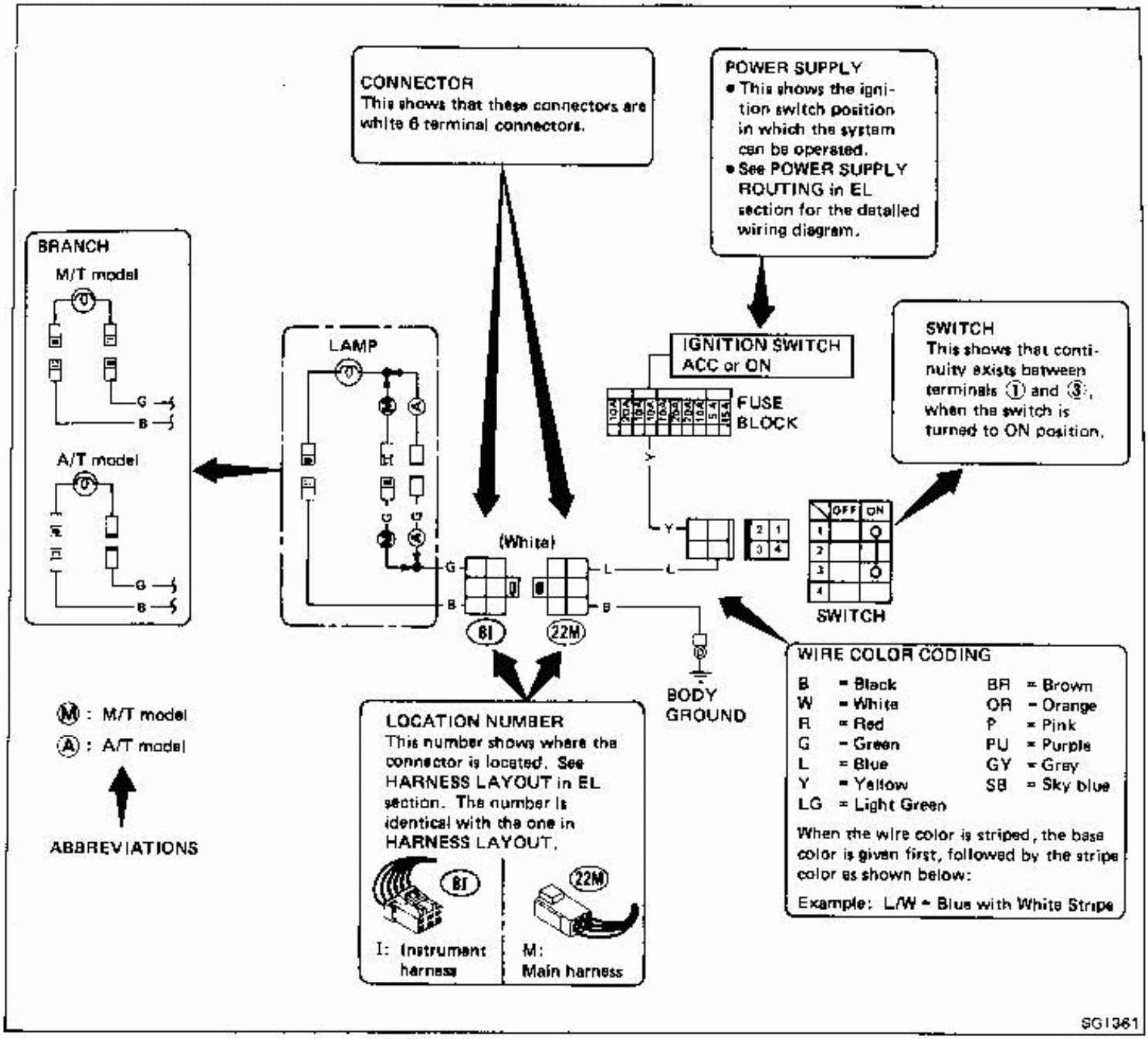
8. The UNIT given in this manual are primarily expressed with the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the yard/pound system.

"Example"

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

9. Symbols used in **WIRING DIAGRAM** are shown below.

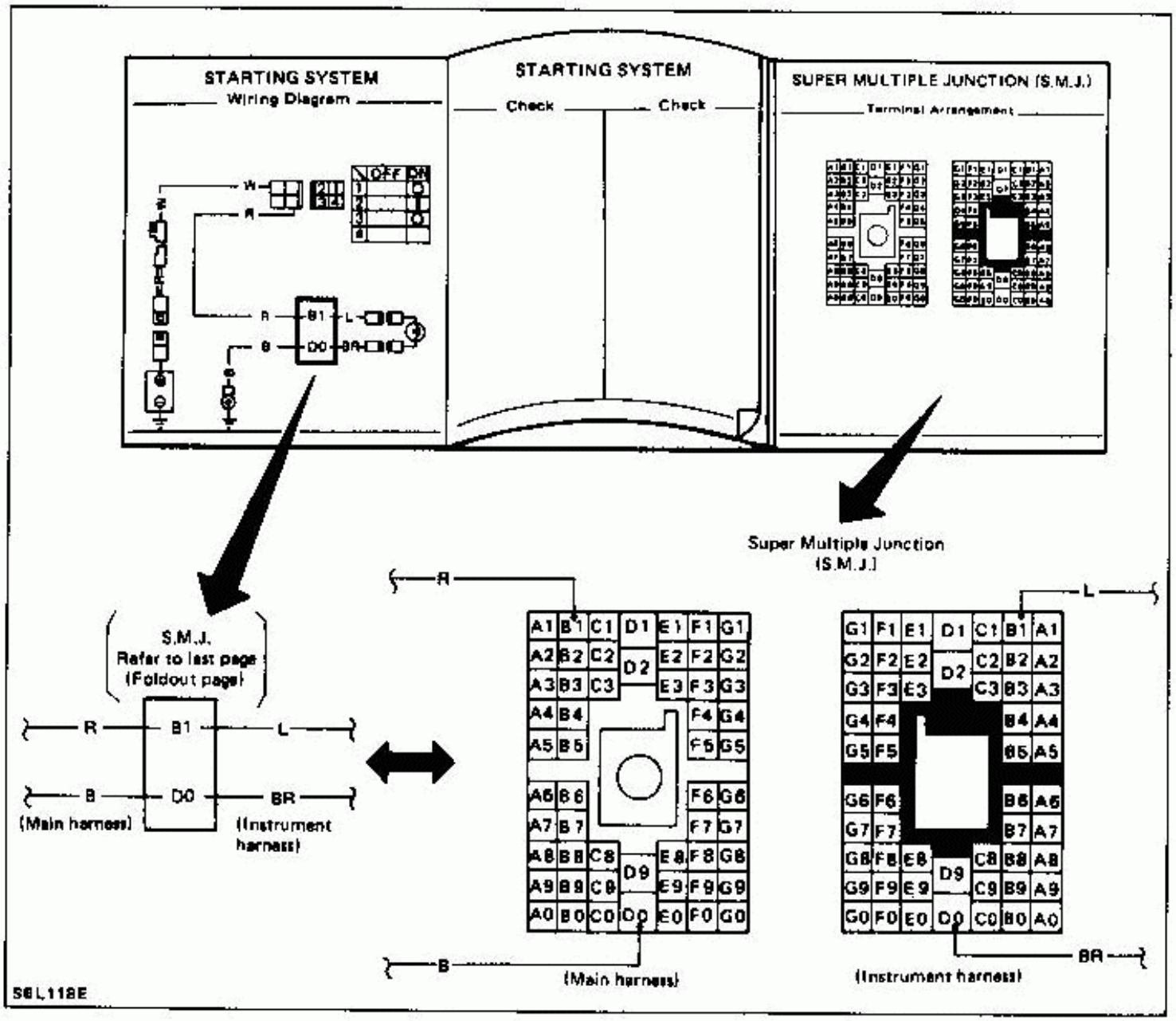
"Example"



10. 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.

"Example"



11. **TROUBLE DIAGNOSES AND CORRECTIONS** are included in sections dealing with complicated components.
12. **SERVICE DATA AND SPECIFICATIONS** and a list of **SPECIAL SERVICE TOOLS** are contained at the end of each section for quick reference of data and special tools.
13. 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.

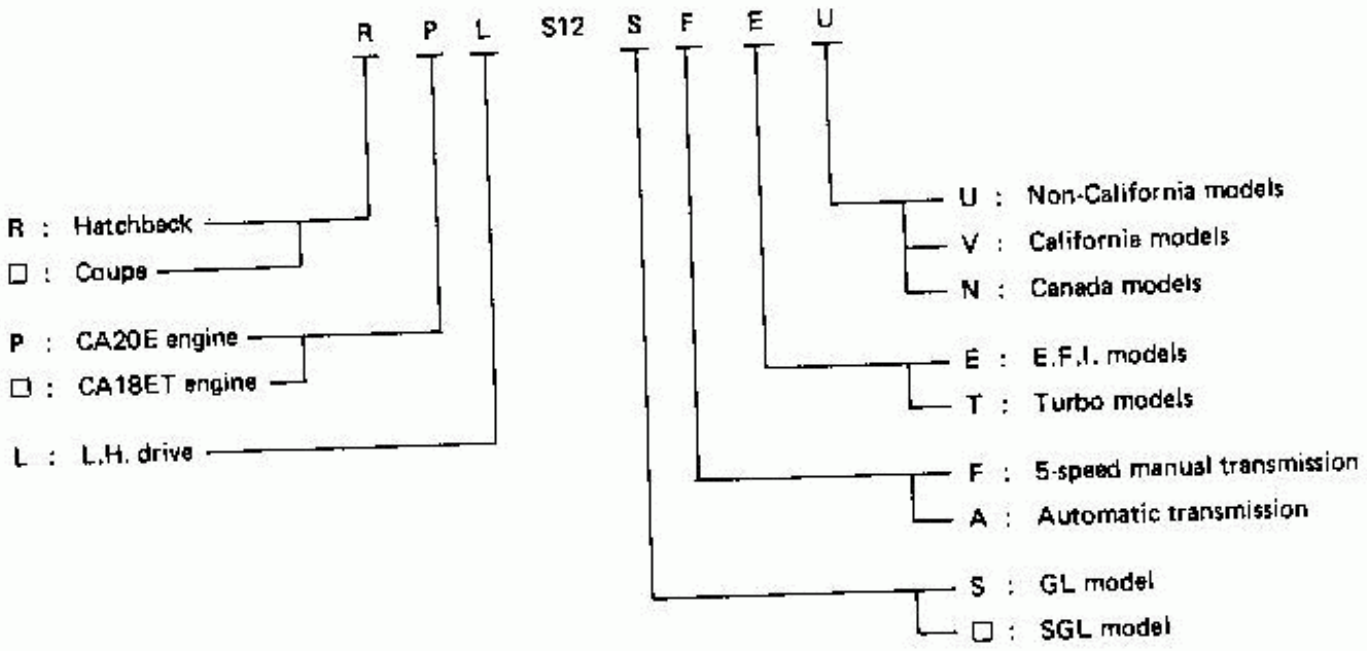
Model Variation

Destination	Body	Grade	Model	Engine	Transmission	Differential carrier	Road wheel*6 size ... off set mm (in)	Tire size
Non-California	Hatchback	SGL	RL-FTU	CA18ET	FS5W71B	R200	5J x 14*1 (Steel) ... 40 (1.57) 6JJ x 15*2 (Steel) ... 35 (1.38) 6JJ x 15*3 (Aluminum) ... 30 (1.18)*4 ... 35 (1.38) 4T x 15*5 ... 40 (1.57)	185/70SR 14*1 195/60R15 86H*2 205/60R15 89H*4 T135/70D15*5
	Coupe	GL	PL-SFEU	CA20E		R180		
			PL-SAEU		L4N71B			
		SGL	PL-FEU		FS5W71B			
			PL-AEU		L4N71B			
	Hatchback	GL	RPL-SFEU		FS5W71B			
			RPL-SAEU		L4N71B			
		SGL	RPL-FEU		FS5W71B			
			RPL-AEU		L4N71B			
California	Hatchback	SGL	RL-FTV	CA18ET	FS5W71B	R200		
	Coupe	GL	PL-SFEV	CA20E		R180		
			PL-SAEV		L4N71B			
		SGL	PL-FEV		FS5W71B			
			PL-AEV		L4N71B			
	Hatchback	GL	RPL-SFEV		FS5W71B			
			RPL-SAEV		L4N71B			
		SGL	RPL-FEV		FS5W71B			
			RPL-AEV		L4N71B			
Canada	Hatchback	SGL	RL-FTN	CA18ET	FS5W71B	R200		
	Coupe	GL	PL-SFEN	CA20E		R180		
			PL-SAEN		L4N71B			
		SGL	PL-FEN		FS5W71B			
			PL-AEN		L4N71B			
	Hatchback		RPL-FEN		FS5W71B			
			RPL-AEN		L4N71B			

*1: GL models
*2: Standard for SGL models, option for GL models.
*3: Standard for Turbo models, option for SGL models.
*4: Turbo models
*5: Spare tire
*6: Pitch circle diameter is 114.3 mm (4.50 in).

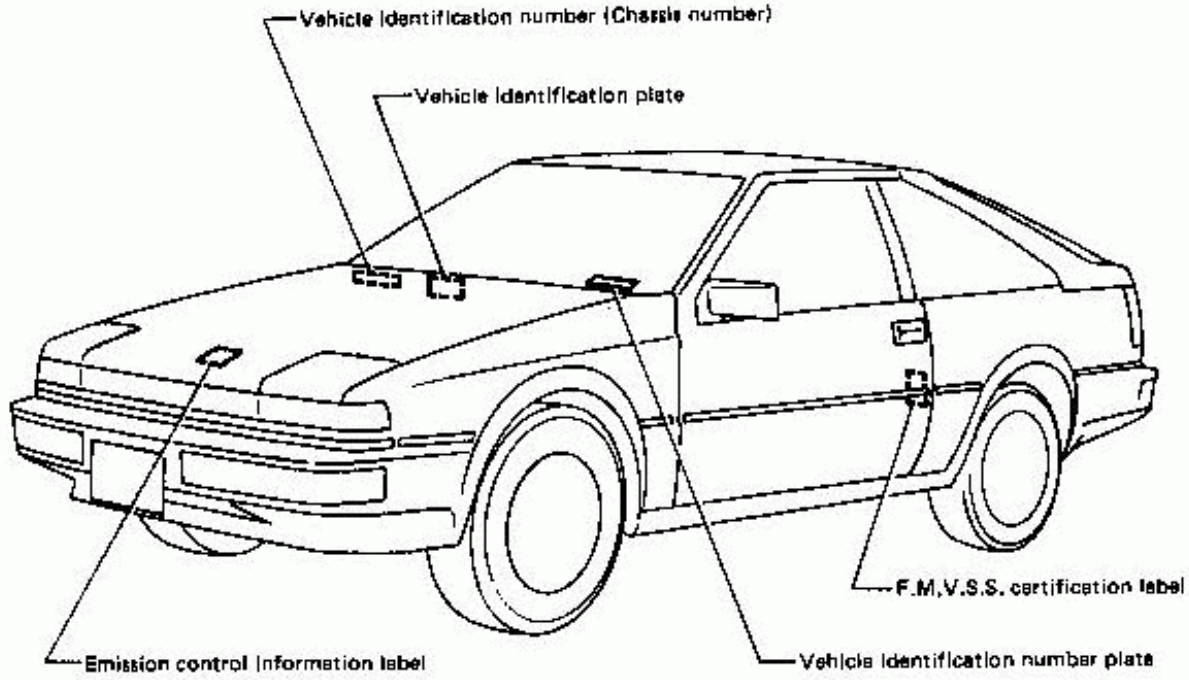
Model Variation (Cont'd)

Prefix and suffix designations:



Note: □ means no indication.

Identification Number



SG1342

VEHICLE IDENTIFICATION NUMBER ARRANGEMENT

JN1 P S 2 4 S * G W 000101

Manufacturer
JN1 : Nissan passenger vehicle

Engine type
P : CA20E
C : CA18ET

Vehicle line
S : NISSAN 200SX

Model change (0 to 9)

Body type
4 : 2-door Coupe
6 : 3-door Hatchback

Restraint system
S : Standard

Check digit (0 to 9 or X)
The code for the check digit is determined by mathematical computation.

Model year
G : 1986 year model

Manufacture plant
W : Kyushu

Vehicle serial number

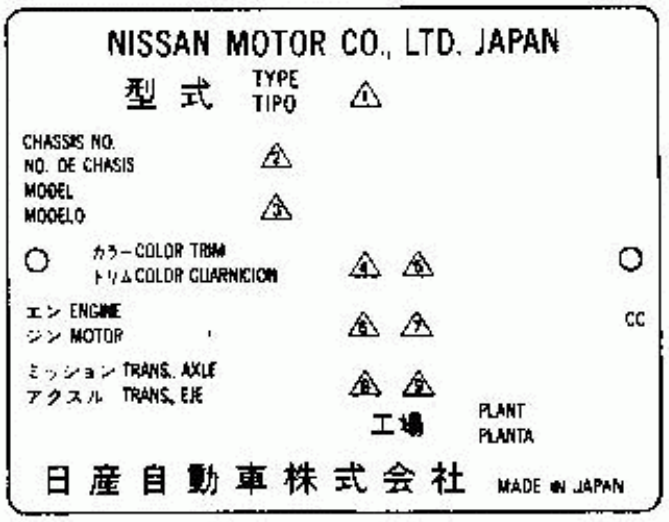
The production of the 1986 NISSAN 200SX starts with the following vehicle identification numbers:

JN1PS24S*GW000101
JN1PS26S*GW000101
JN1CS26S*GW000101

*: Check digit (0 to 9 or X)

Identification Number (Cont'd)

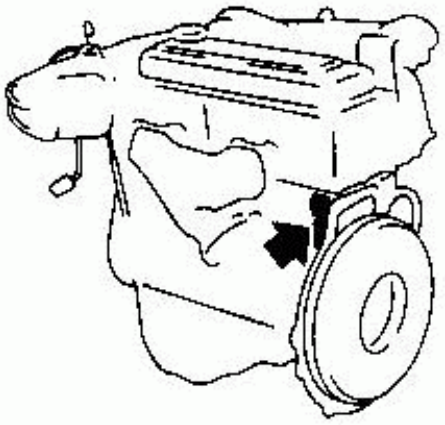
IDENTIFICATION PLATE



1 Type
2 Vehicle identification number (Chassis number)
3 Model
4 Body color code
5 Trim color code
6 Engine model
7 Engine displacement
8 Transmission model
9 Axle model

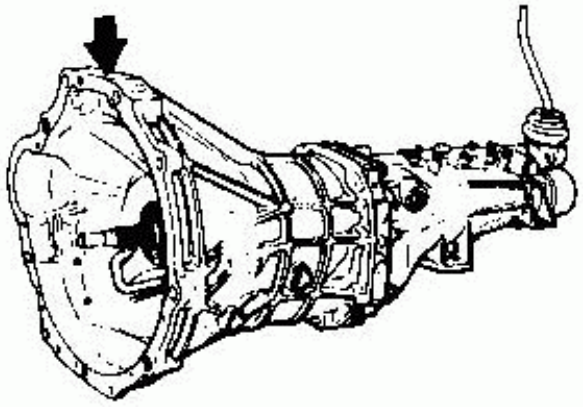
SGI315

ENGINE SERIAL NUMBER



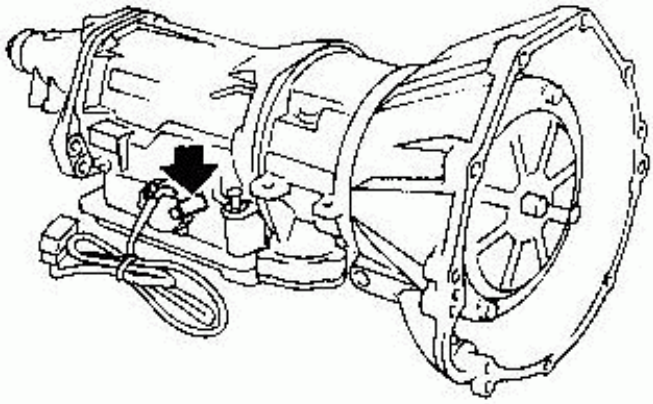
LC438

MANUAL TRANSMISSION NUMBER



TM238

AUTOMATIC TRANSMISSION NUMBER



SGI273

Dimension

			Non-turbo	Turbo
Overall length		mm (in)	4,430 (174.4)	
Overall width		mm (in)	1,660 (65.4)	
Overall height		mm (in)	1,330 (52.4)	
Wheelbase		mm (in)	2,425 (95.5)	
Tread	Front	mm (in)	1,390 (54.7)	1,400 (55.1)
	Rear	mm (in)	1,425 (56.1)	1,435 (56.5)
Min. ground clearance		mm (in)	155 (6.1)	
Over-hang	Front	mm (in)	940 (37.0)	
	Rear	mm (in)	1,065 (41.9)	

RECOMMENDED FUEL AND LUBRICANTS

Fuel

Use unleaded gasoline with an octane rating of at least A.K.I. (Anti-Knock Index) number 87 (Research octane number 91).

Approximate Refill Capacities

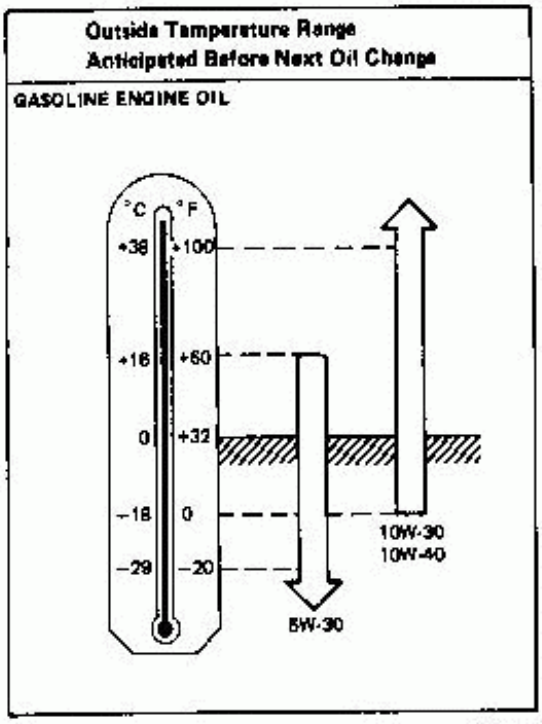
	Liter	US measure	Imp measure
Fuel tank	53	14 gal	11-5/8 gal
Coolant			
With heater	8.6	9-1/8 qt	7-5/8 qt
Engine			
With oil filter	3.6	3-7/8 qt	3-1/8 qt
Without oil filter	3.2	3-3/8 qt	2-7/8 qt
Transmission			
M/T	2.1	4-1/2 pt	3-3/4 pt
A/T	7.0	7-3/8 qt	6-1/8 qt
Differential carrier			
R180	1.0	2-1/8 pt	1-3/4 pt
R200	1.3	2-3/4 pt	2-1/4 pt
Power steering system	0.9	1 qt	3/4 qt
Windshield washer tank	3.5	3-3/4 qt	3-1/8 qt
Air conditioning system			
Refrigerant	1.0 kg	2.2 lb	2.2 lb

Lubricants

Lubricant		Specifications	Remarks
Engine oil	Non-turbo engine	API SF (Energy Conserving Oils)*	For further details, refer to the recommended SAE viscosity chart.
	Turbo engine	API SF/CC or SF/CD	
Gear oil	Transmission	API GL-4	
	Differential	API GL-5	
Automatic-T/M and power steering fluid		Type DEXRON®	–
Multi-purpose grease		NLGI No. 2	Lithium soap base
Brake and clutch fluid		DOT 3	US FMVSS No. 116
Anti-freeze		–	Ethylene glycol base

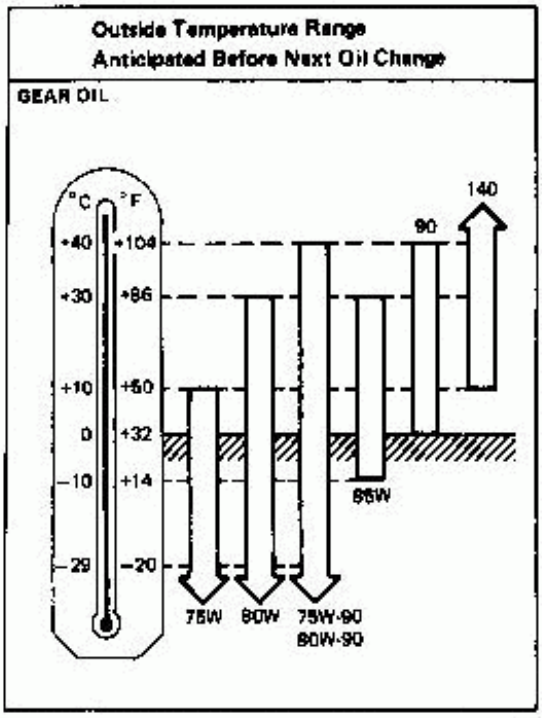
*: ENERGY CONSERVING OILS
In order to improve fuel economy and conserve energy, new lower friction engine oils have been developed. These oils are readily available and can be identified by such labels as energy conserving, energy saving, improved fuel economy, etc.

SAE Viscosity Number



TI0002

10W-30 is preferable if the ambient temperature is above −18°C (0°F). 20W-40 and 20W-50 are usable if the ambient temperature is above 10°C (50°F) for all seasons.



TI0003

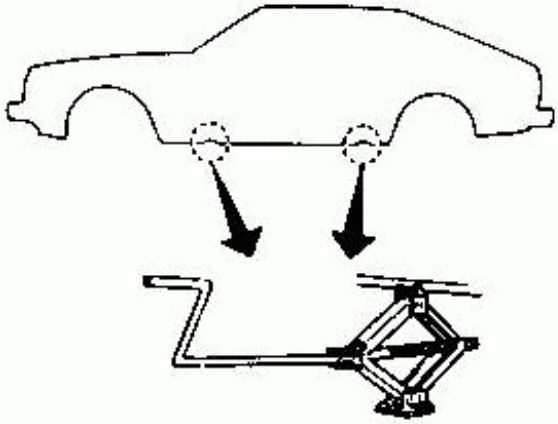
75W-90 (API GL-4) for transmission and 80W-90 (API GL-5) for differential are preferable if the ambient temperature is below 40°C (104°F).

WARNING:

a. **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.**

b. **Place wheel chocks at both front and back of the wheel which is diagonally opposite the jack position. Example: If the jack is positioned at the front L.H. wheel, place wheel chocks at the rear R.H. wheel.**

Pantograph Jack

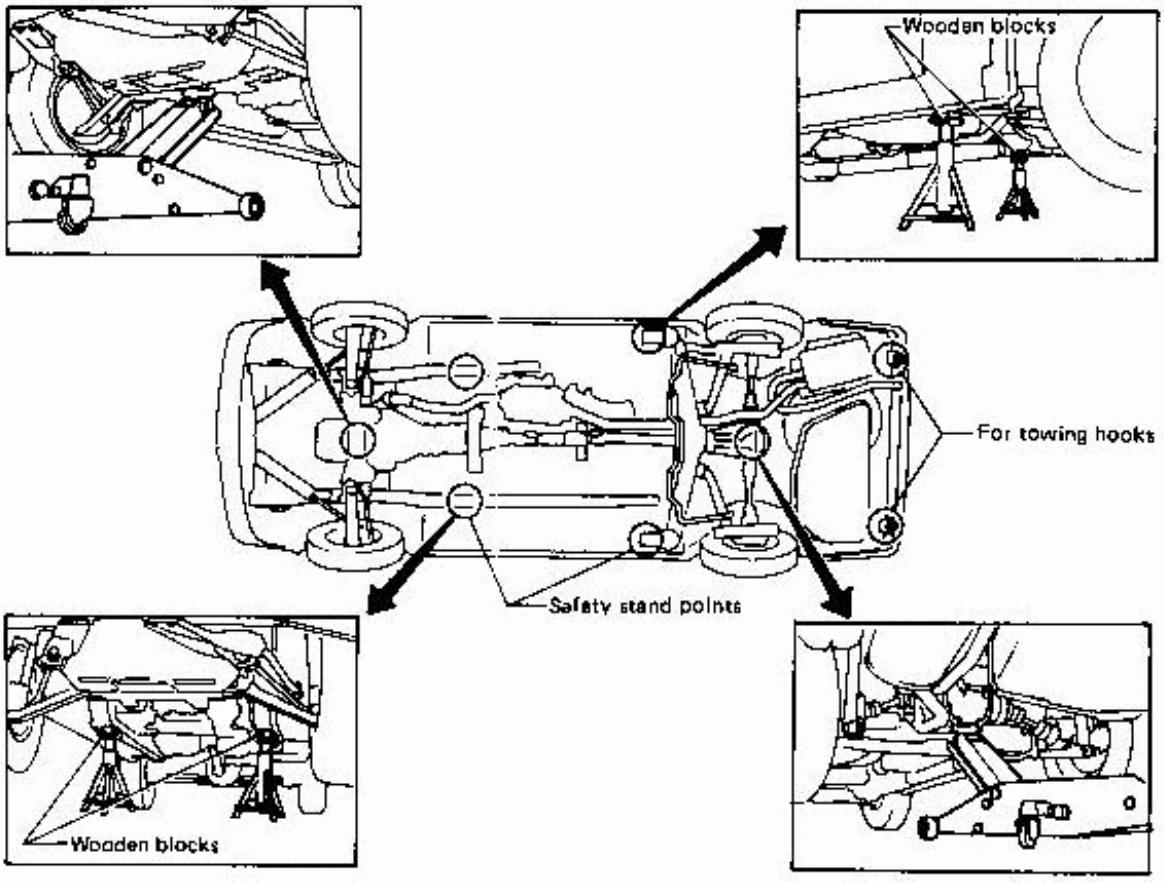


SGI154

Garage Jack and Safety Stand

CAUTION:

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

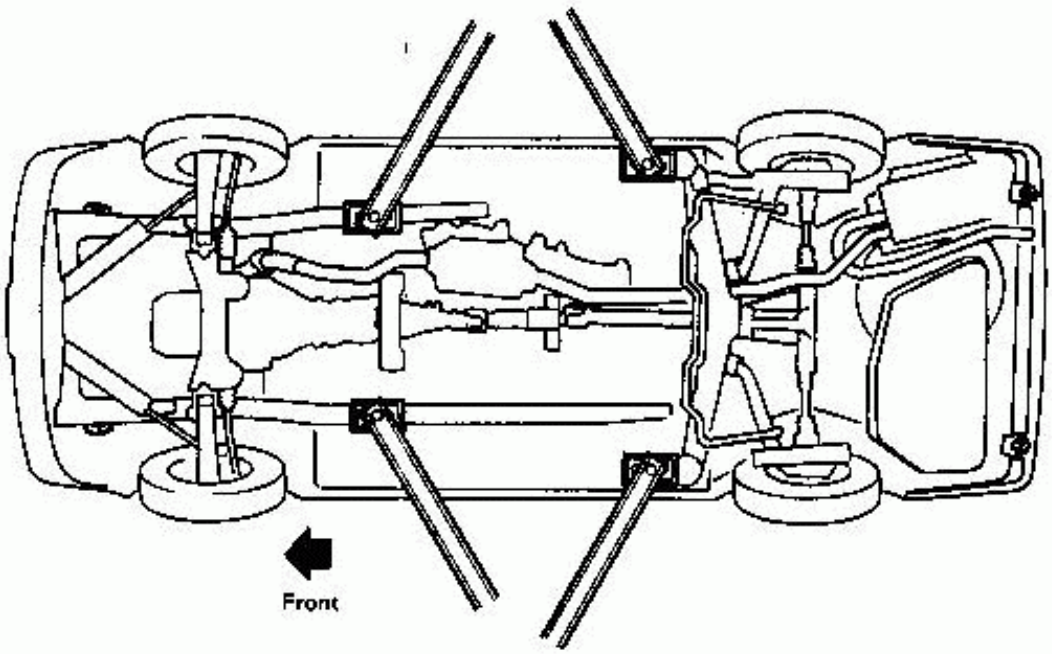


SGI391

LIFTING AND TOWING POINTS

2-point 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.

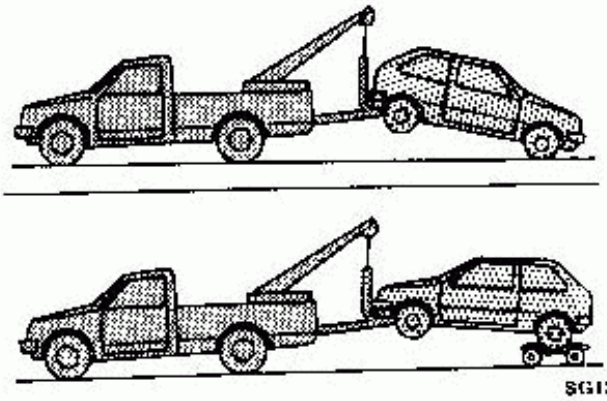


SGI307

Towing

CAUTION:

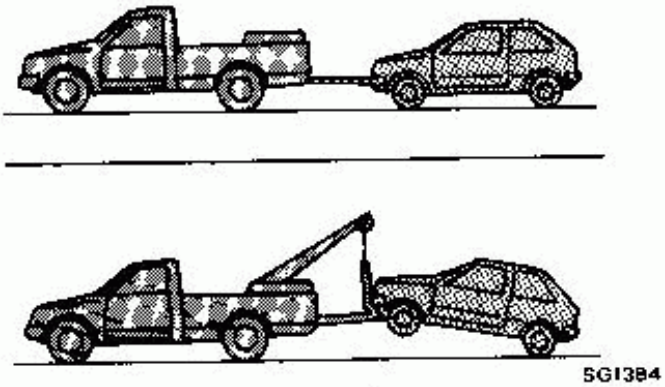
- All applicable State or Provincial (in Canada) laws and local laws regarding the towing operation must be obeyed.
- It is necessary to use proper towing equipment to avoid possible damage to the vehicle during a towing operation.
  Towing is in accordance with Towing Procedure Manual at dealer.
- Always observe posted speed limits.
- Before towing, make sure that the transmission, steering system and power train are in good order. If any unit is damaged, a dolly must be used or the vehicle must be towed with rear wheels off the ground.
- When towing with the front wheels on the ground:
  Turn the ignition key to the "OFF" position and secure the steering wheel in a straight-ahead position with a rope or similar device. Never place the ignition key in the "LOCK" position. This will result in damage to the steering lock mechanism.
- When towing with the rear wheels on the ground, release the parking brake and move the gearshift lever to neutral ("N" position).



SGI383

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

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



SGI384

Automatic transmission models

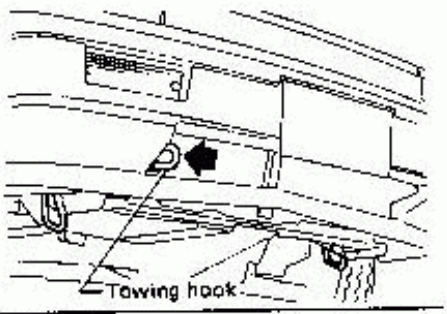
When towing as illustrated, observe the following restricted towing speeds and distances.

Speed	km/h (MPH)	Below 50 (30)
Distance	km (miles)	Less than 65 (40)

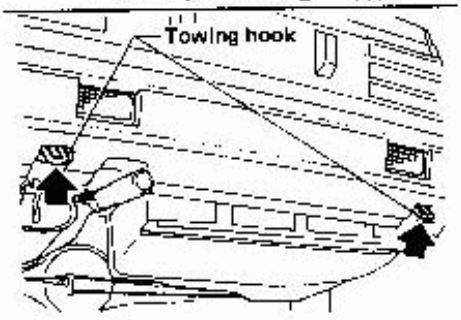
If the speed or distance must be greater, remove the propeller shaft beforehand to prevent damage to the transmission.

TOWING POINT

FRONT



REAR



SGI392

- Use only towing hooks. Otherwise, the vehicle body will be damaged.
- Do not apply force to the towing hook in a lateral direction. Keep the tow rope or similar device straight ahead, in line with the vehicle.

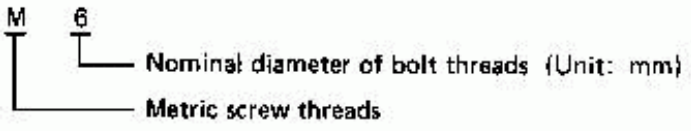
TIGHTENING TORQUE OF STANDARD BOLT

Grade	Bolt or nut size	Bolt or nut diameter* mm	Pitch mm	Tightening torque		
				N·m	kg·m	ft·lb
4T	M6	6.0	1.0	3 - 4	0.3 - 0.4	2.2 - 2.9
	M8	8.0	1.25	8 - 11	0.8 - 1.1	5.8 - 8.0
			1.0	8 - 11	0.8 - 1.1	5.8 - 8.0
	M10	10.0	1.5	16 - 22	1.6 - 2.2	12 - 16
			1.25	16 - 22	1.6 - 2.2	12 - 16
	M12	12.0	1.75	26 - 36	2.7 - 3.7	20 - 27
			1.25	30 - 40	3.1 - 4.1	22 - 30
	M14	14.0	1.5	46 - 62	4.7 - 6.3	34 - 46
7T	M6	6.0	1.0	6 - 7	0.6 - 0.7	4.3 - 5.1
	M8	8.0	1.25	14 - 18	1.4 - 1.8	10 - 13
			1.0	14 - 18	1.4 - 1.8	10 - 13
	M10	10.0	1.5	25 - 35	2.6 - 3.6	19 - 26
			1.25	26 - 36	2.7 - 3.7	20 - 27
	M12	12.0	1.75	45 - 61	4.6 - 6.2	33 - 45
			1.25	50 - 68	5.1 - 6.9	37 - 50
	M14	14.0	1.5	76 - 103	7.7 - 10.5	56 - 76
9T	M6	6.0	1.0	8 - 11	0.8 - 1.1	5.8 - 8.0
	M8	8.0	1.25	19 - 25	1.9 - 2.5	14 - 18
			1.0	20 - 27	2.0 - 2.8	14 - 20
	M10	10.0	1.5	36 - 50	3.7 - 5.1	27 - 37
			1.25	39 - 51	4.0 - 5.2	29 - 38
	M12	12.0	1.75	65 - 88	6.6 - 9.0	48 - 65
			1.25	72 - 97	7.3 - 9.9	53 - 72
	M14	14.0	1.5	109 - 147	11.1 - 15.0	80 - 108

1. **Special parts are excluded.**
2. **This standard is applicable to bolts having the following marks embossed on the bolt head.**

Grade	Mark
4T	4
7T	7
9T	9

*: Nominal diameter



MAINTENANCE

SECTION MA

CONTENTS

The following charts show the normal maintenance schedule. Under severe driving conditions, additional or more frequent maintenance will be required. Refer to "Maintenance under severe driving conditions".

The periodic maintenance schedule is repeated beyond the last mileage and period shown by returning to the first 15,000 miles (24,000 km) or 12 months.

EMISSION CONTROL SYSTEM MAINTENANCE

MAINTENANCE OPERATION		MAINTENANCE INTERVAL						Reference page
Periodic maintenance should be performed at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	5	7.5	15	30	45	60	
	(Kilometers x 1,000)	(8)	(12)	(24)	(48)	(72)	(96)	
	Months	6	6	12	24	36	48	
Drive belts					I		I	MA-8
Air cleaner filter					Replace every 30,000 miles (48,000 km).			MA-8
Vapor lines					I*		I*	MA-8
Fuel lines (hoses, piping, connections, etc.)					I*		I*	MA-9
Fuel filter					See NOTE (1)*			MA-10
Engine coolant					R		R	MA-10
Engine oil	Except turbocharged engine		R		Then replace every 7,500 miles (12,000 km) or 6 months.			MA-11, 12
	Turbocharged engine	R			Then replace every 5,000 miles (8,000 km) or 6 months.			MA-11, 12
Engine oil filter	Except turbocharged engine		R		Then replace every second oil change.			MA-11, 12
	Turbocharged engine	R						MA-11, 12
Spark plugs					Replace every 30,000 miles (48,000 km).			MA-12, 13
Ignition wires					Inspect every 2 years.*			MA-13
Intake & exhaust valve clearance				A	A	A	A	MA-14
Idle rpm				I*	I*	I*	I*	MA-14, 15
Exhaust gas sensor					Inspect every 30,000 miles (48,000 km).			MA-16, 17

CHASSIS AND BODY MAINTENANCE

MAINTENANCE OPERARATION		MAINTENANCE INTERVAL				Reference page
Periodic maintenance should be performed at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	15	30	45	60	
	(Kilometers x 1,000)	(24)	(48)	(72)	(96)	
	Months	12	24	36	48	
Brake lines & hoses		I	I	I	I	MA-27
Brake pads & discs			Inspect every 15,000 miles (24,000 km).			MA-28
Manual and automatic transmission & differential gear oil			Inspect every 15,000 miles (24,000 km).			MA-19, 20, 21
Power steering lines & hoses		I	I	I	I	MA-34
Steering gear & linkage, and axle & suspension parts		I	I	I	I	MA-22, 23, 24, 34
Steering linkage ball joints & front suspension ball joints					I	MA-22, 34
Locks, hinges & hood latch		L	L	L	L	MA-36
Front wheel bearing grease			I		I	MA-23
Exhaust system		I	I	I	I	MA-18
Seat belts, buckles, retractors, anchors & adjuster		I	I	I	I	MA-35

NOTE:

(1) **If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.**

(2) **Maintenance items and intervals with "*" are recommended by NISSAN. Other maintenance items and intervals are required.**

Abbreviations: A = Adjust
R = Replace
L = Lubricate
I = Inspect. 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 operated under severe driving conditions as shown below, more frequent maintenance is required to be performed on the following items as shown in the table.

Severe driving conditions

A – Repeated short distance drving
B – Extensive idling
C – Driving in dusty conditions
D – Driving in extremely low or high ambient temperatures
E – Towing a trailer
F – Driving in areas using road salt or other corrosive materials
G – Driving on rough and/or muddy roads

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
. . C	Air cleaner filter	R	More frequently	MA-8
A B C . E . . .	Engine oil & oil filter	R	Every 3,000 miles (5,000 km) or 3 months	MA-11, 12
A . C . E F G .	Brake pads & discs	I	Every 7,500 miles (12,000 km) or 6 months	MA-28
. . . . E . G .	Manual and automatic transmission & differential gear oil	R	Every 30,000 miles (48,000 km) or 24 months	MA-19, 20, 21
. . . . . G .	Steering gear & linkage, and axle & suspension parts	I	Every 7,500 miles (12,000 km) or 6 months	MA-22, 23, 24, 34
. . C D . F G .	Steering linkage ball joints & front suspension ball joints	I	Every 7,500 miles (12,000 km) or 6 months	MA-22, 34
. . . . . F . .	Locks, hinges & hood latch	L	Every 7,500 miles (12,000 km) or 6 months	MA-35
A . . . E F G .	Exhaust system	I	Every 7,500 miles (12,000 km) or 6 months	MA-18

Maintenance operations: I = Inspect. Correct or replace if necessary. R = Replace L = Lubricate

General maintenance includes those items which should be checked during the normal day-to-day operation of the vehicle. They are essential if the vehicle is to continue operating properly. The owners can perform the checks and inspections themselves or they can have their NISSAN/DATSUN dealers do them for a nominal charge.

Item	Reference item in MA section
OUTSIDE THE VEHICLE	
Tires Check the pressure with a gauge periodically when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear.	• CHECKING TIRE CONDITION
Wheel nuts When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary.	• TIRE REPLACEMENT Wheel nut.
Tire rotation Tires should be rotated every 24,000 km (15,000 miles).	• TIRE ROTATION
Wheel alignment and balance If the vehicle should pull to either side while driving on a straight and level road, or if you detect uneven or abnormal tire wear, there may be a need for wheel alignment. If the steering wheel or seat vibrates at normal highway speeds, wheel balancing may be needed.	• CHECKING TIRE CONDITION Abnormal tire wear • CHECKING WHEEL ALIGNMENT • WHEEL INSPECTION
Windshield glass Check for abrasions or scratches.	–
Windshield wiper blades Check for cracks or wear if they do not wipe properly.	–
Doors and engine hood Check that all doors and the engine hood operate smoothly as well as the trunk lid and back hatch. Also ensure, that all latches lock securely. Lubricate if necessary. Make sure that the secondary latch keeps the hood from opening when the primary latch is released.	• LUBRICATING LOCKS, HINGES AND HOOD LATCH
INSIDE THE VEHICLE	
The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle, etc.	
Lights Make sure that the headlights, stop lights, tail lights, turn signal lights, and other lights are all operating properly and installed securely. Also check headlight aim.	–
Warning lights and buzzers/chimes Make sure that all warning lights and buzzers/chimes are operating properly.	–
Horn Make sure it operates properly.	–
Windshield wiper and washer Check that the wipers and washer operate properly and that the wipers do not streak.	–

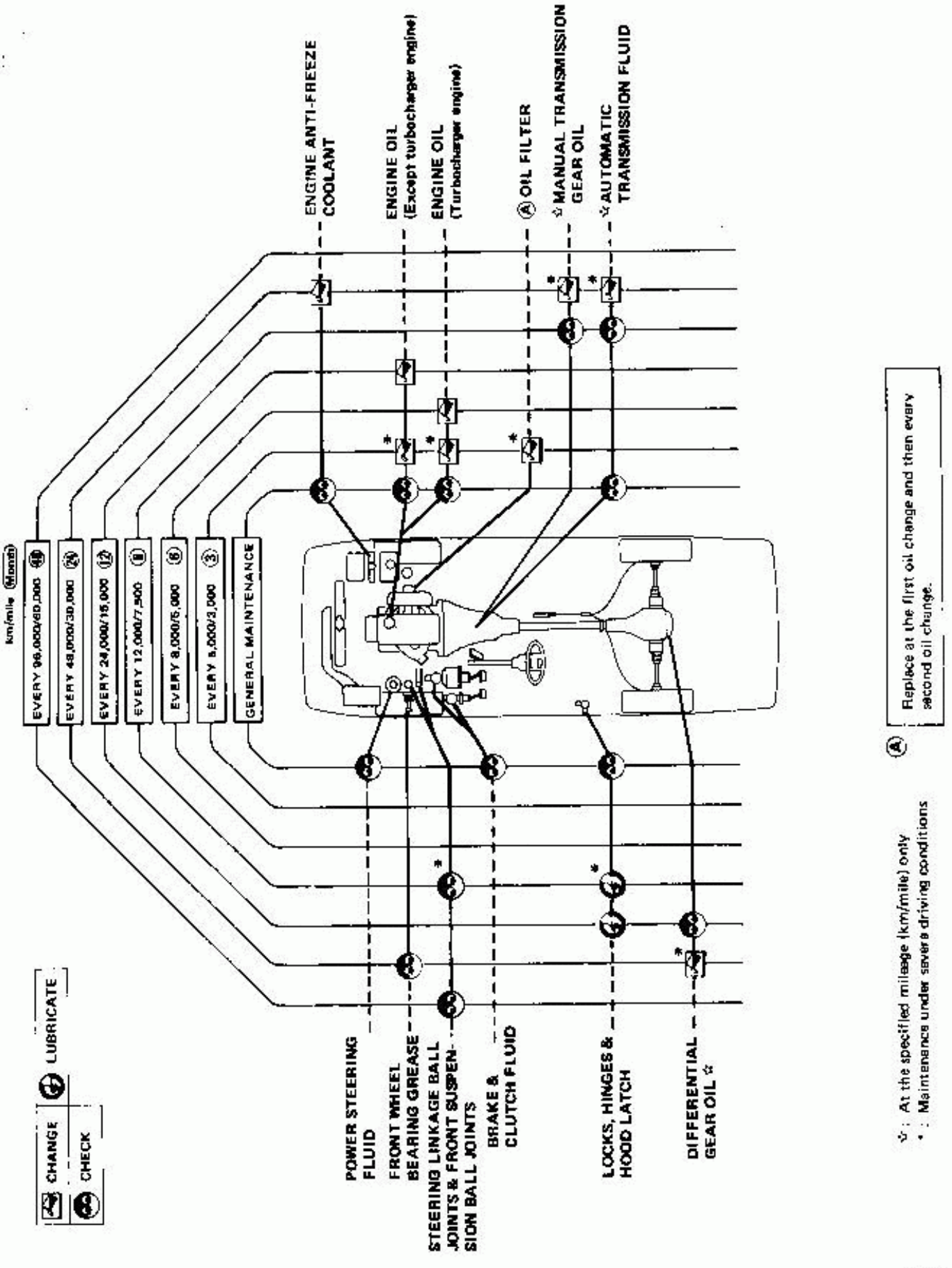
Item	Reference item in MA section
Windshield defroster Check that the air comes out of the defroster outlets properly and in sufficient quantity when operating the heater or air conditioner.	–
Rear view mirror Make sure that it is secure.	–
Sun visors Make sure that they can be moved freely and are secure.	–
Steering wheel Check that it has the specified free play. Be sure to check for changes in the steering condition, such as excessive free play, hard steering or strange noises.	Specification Free play: Less than 35 mm (1.38 in)
Seats Check seat position controls such as seat adjusters, seatback recliner, etc. to ensure they operate smoothly and that all latches lock securely in every position. Check that the head restraints move up and down smoothly and that the locks (if so equipped) hold securely in all latched positions. Check that the latches lock securely for folding-down rear seatbacks.	–
Seat belts Check that all parts of the seat belt system e.g. buckles, anchors and retractors operate properly and smoothly. Check the belt webbing for cuts, fraying, wear or damage.	• INSPECTING SEAT BELTS, BUCKLES, ANCHORS, RETRACTORS AND ADJUSTER
Accelerator pedal Check the pedal for smooth operation and make sure the pedal does not catch or require uneven effort.	–
Clutch pedal Make sure the pedal operates smoothly and check that it has the proper free travel.	• ADJUSTING CLUTCH PEDAL HEIGHT AND FREE PLAY
Brakes Check that the brake does not pull the vehicle to one side when applied.	–
Brake pedal Check the pedal for smooth operation and make sure it has the proper distance under it when depressed fully. Check the brake booster function.	• CHECKING BRAKE PEDAL DEPRESSED HEIGHT • CHECKING BRAKE BOOSTER FUNCTION
Parking brake Check that the lever has the proper travel and confirm that your vehicle is held securely on a fairly steep hill with only the parking brake applied.	• CHECKING PARKING BRAKE
Automatic transmission "Park" mechanism Check that the lock release button on the selector lever operates properly and smoothly. On a fairly steep hill check that your vehicle is held securely with the selector lever in the "P" position without applying any brakes.	–

UNDER THE HOOD AND VEHICLE

The maintenance items listed here should be checked periodically e.g. each time you check the engine oil or refuel.

Item	Reference item in MA section
Windshield washer fluid Check that there is adequate fluid in the tank.	–
Engine coolant level Check the coolant level when the engine is cold.	• CHANGING ENGINE COOLANT
Radiator and hoses Check the front of the radiator and clean off any dirt, insects, leaves, etc., that may have accumulated. Make sure the hoses have no cracks, deformation, rot or loose connections.	–
Brake and clutch fluid levels Make sure that the brake and clutch fluid levels are between the "MAX" and "MIN" lines on the reservoir.	• CHECKING CLUTCH FLUID LEVEL • CHECKING BRAKE FLUID LEVEL & LEAKS
Engine drive belts Make sure that no belt is frayed, worn, cracked or oily.	• CHECKING DRIVE BELT
Engine oil level Check the level on the dipstick after parking the vehicle on a level spot and turning off the engine.	• CHANGING ENGINE OIL AND OIL FILTER
Power steering fluid level Check the level when the fluid is cold and the engine is turned off.	• CHECKING POWER STEERING FLUID LEVEL
Automatic transmission fluid level Check the level on the dipstick after putting the selector level in "P" with the engine idling.	• CHECKING AUTOMATIC TRANSMISSION FLUID LEVEL
Exhaust system Make sure there are no loose supports, cracks or holes. If the sound of the exhaust seems unusual or there is a smell of exhaust fumes, immediately locate the trouble and correct it.	• INSPECTING EXHAUST SYSTEM
Underbody The underbody is frequently exposed to corrosive substances such as those used on icy roads or to control dust. It is very important to remove these substances, otherwise rust will form on the floor pan, frame, fuel lines and around the exhaust system. At the end of winter, the underbody should be thoroughly flushed with plain water, being careful to clean those areas where mud and dirt can easily accumulate.	–
Fluid leaks Check under the vehicle for fuel, oil, water or other fluid leaks after the vehicle has been parked for a while. Water dripping from the air conditioner after use is normal. If you should notice any leaks or gasoline fumes are evident, check for the cause and correct it immediately.	• CHECKING CLUTCH FLUID LEAKS • INSPECTING MANUAL TRANSMISSION OIL • INSPECTING AUTOMATIC TRANSMISSION FLUID • INSPECTING DIFFERENTIAL GEAR OIL • INSPECTING BRAKE LINES & HOSES • CHECKING POWER STEERING LINE & HOSES

LUBRICATION CHART



SMA4296

Checking Drive Belts

1. Inspect for cracks, fraying, wear of oil adhesion. Replace if necessary.

The belts should not touch the bottom of the pulley groove.

2. Check drive belt deflections by pushing on the belt midway between pulleys.

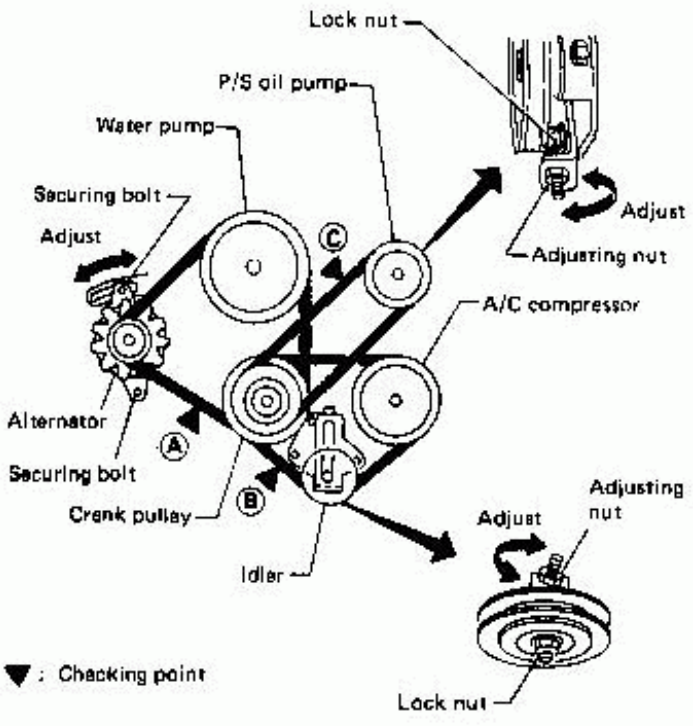
Adjust if belt deflections exceed the limit.

Belt deflection:

Unit: mm (in)

	Used belt deflection		Set deflection of new belt
	Limit	Adjust	
Alternator Ⓐ	13 (0.51)	7 - 10 (0.28 - 0.39)	6 - 8 (0.24 - 0.31)
A/C compressor Ⓑ	7 (0.28)	3 - 5 (0.12 - 0.20)	3 - 5 (0.12 - 0.20)
P/S oil pump Ⓒ	14 (0.55)	8 - 11 (0.31 - 0.43)	6 - 9 (0.24 - 0.35)

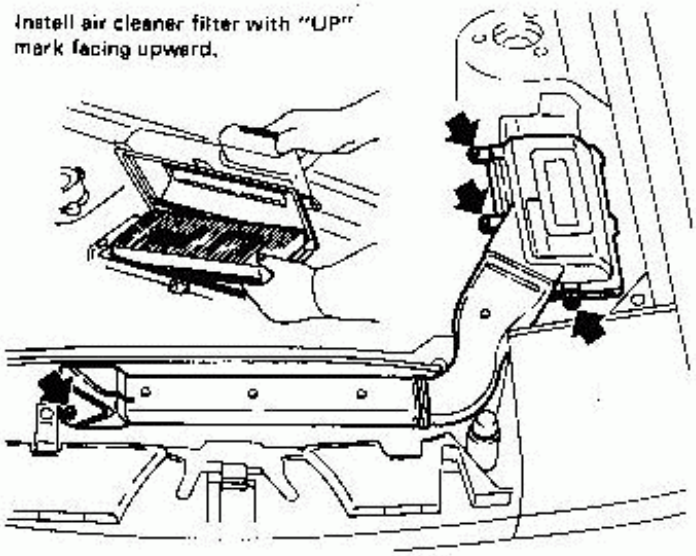
Applied pushing force: 98 N (10 kg, 22 lb)



SMA087B

Replacing Air Cleaner Filter

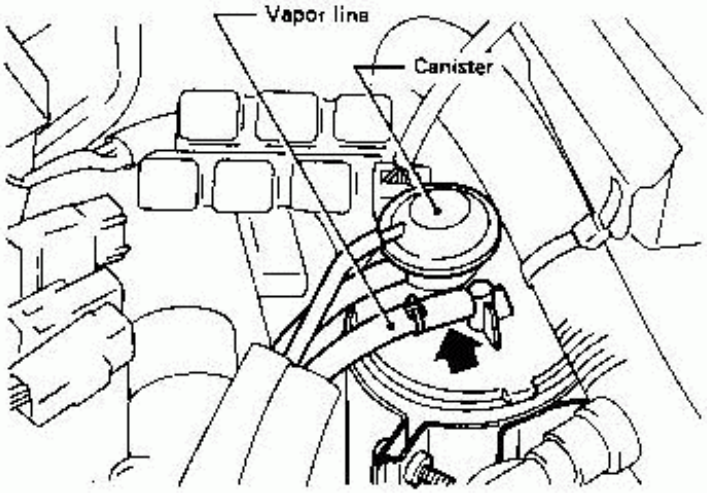
The viscous paper type air cleaner filter does not require any cleaning operation between renewal.



SMA928A

Checking Vapor Lines

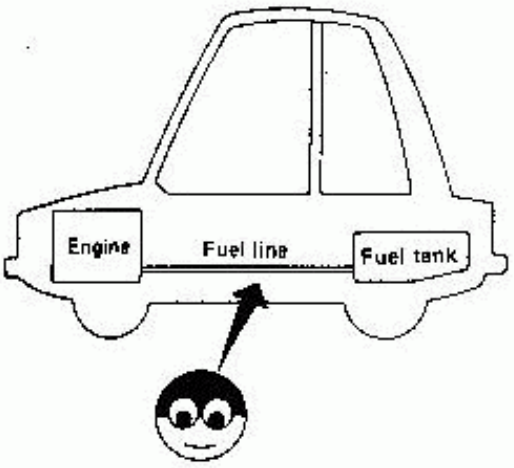
1. Visually inspect vapor lines for proper attachment, cracks, damage, loose connections, chafing and deterioration.
2. Check fuel tank vacuum relief valve for clogging, sticking, etc.



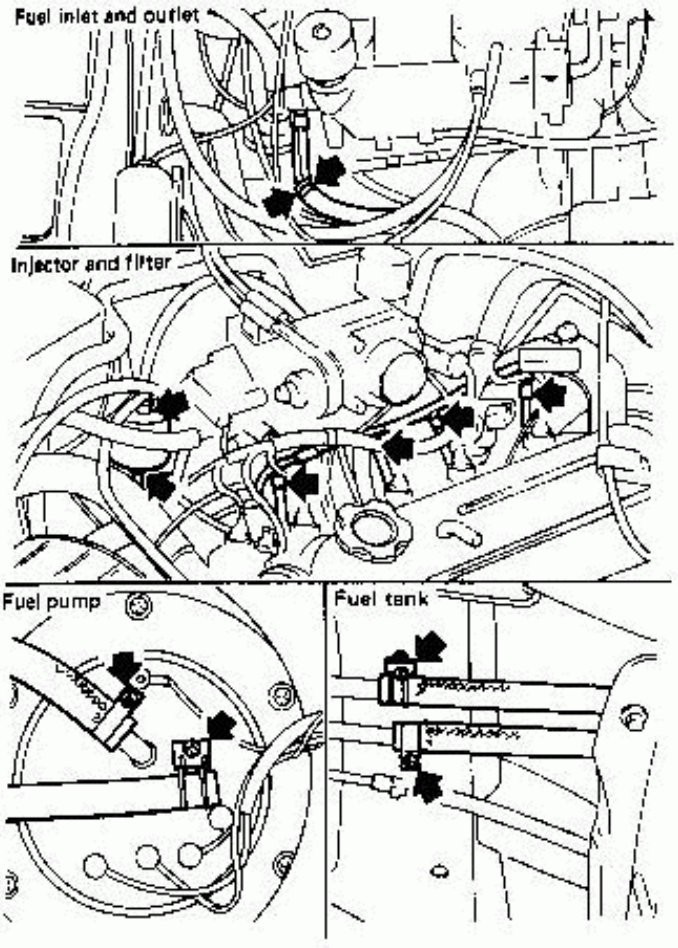
SMA929A

Checking Fuel Lines

Check fuel lines and tank for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



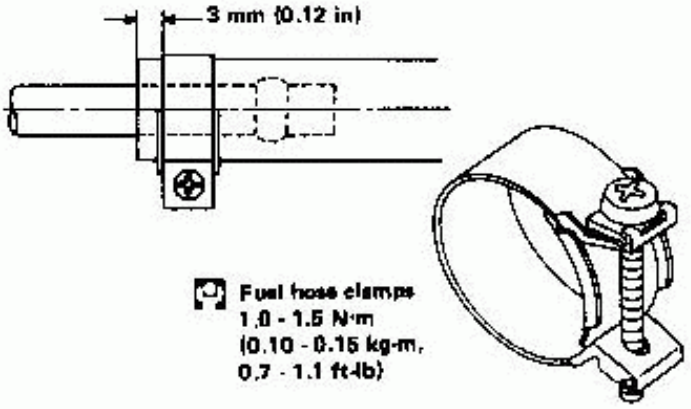
SMA603A



SMA930A

CAUTION:

Do not reuse fuel clamp after loosening. Tighten high pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end. Ensure that screw does not contact adjacent parts.



SMA604A

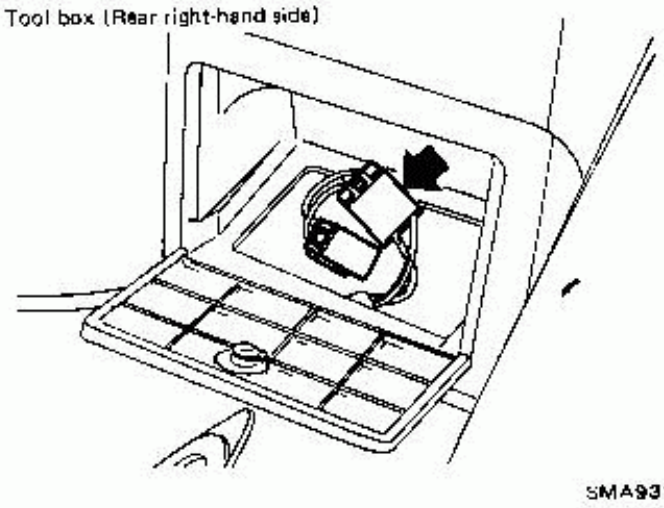
Replacing Fuel Filter

The filter is designed especially for use with the E.F.I. system. Because of the fuel pressure in fuel line is higher than 196 kPa (2.0 kg/cm², 28 psi). Before disconnecting fuel hose, release fuel pressure from fuel line to eliminate danger.

Reduce fuel pressure to zero.

(1) Start engine.

(2) Disconnect the harness connector of fuel pump.



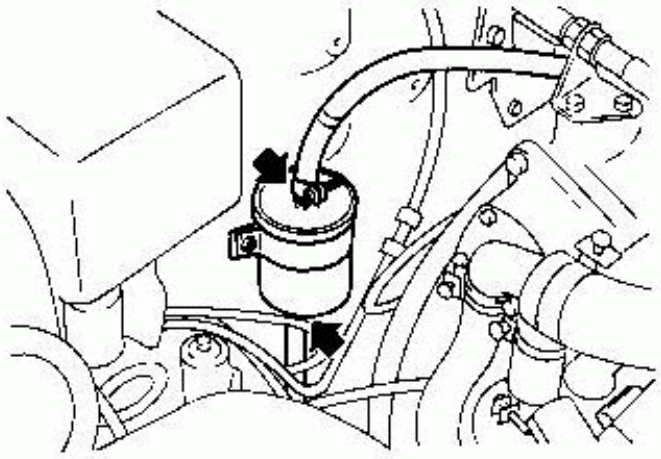
SMA931A

(3) After engine stall, crank the engine twice or three times.

(4) Turn the ignition switch "OFF".

(5) Reconnect the harness connector of fuel pump.

Be careful not to spill fuel over engine compartment. Place a rag to absorb fuel.



SMA932A

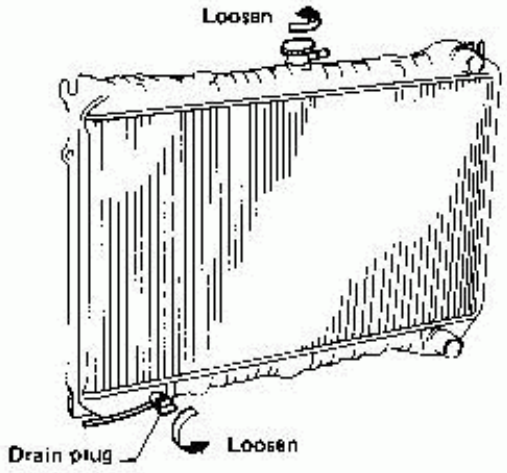
Erase memory (code No.22) from control unit referring to page EF & EC-44.

Changing Engine Coolant

WARNING:

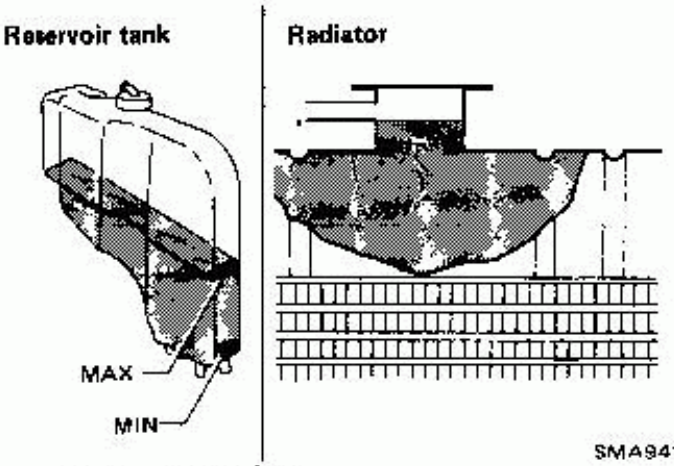
To avoid the danger of being scalded, never attempt to change the coolant when engine is hot.

1. Set heater "TEMP" control lever at fully "HOT" position.
2. Open drain cock at the bottom of radiator, and remove radiator cap.



SMA933A

3. Close drain cock, and fill radiator with coolant.
4. Warm up engine and repeat steps 2 and 3 one or two times to drain old coolant.
5. Fill radiator with new coolant up to filler opening. Follow instructions attached to antifreeze container for mixing ratio of antifreeze to water.
6. Fill reservoir tank up to "MAX" level.



SMA941A

Coolant capacity:

8.6 liter (9-1/8 US qt, 7-5/8 Imp qt) (with heater)

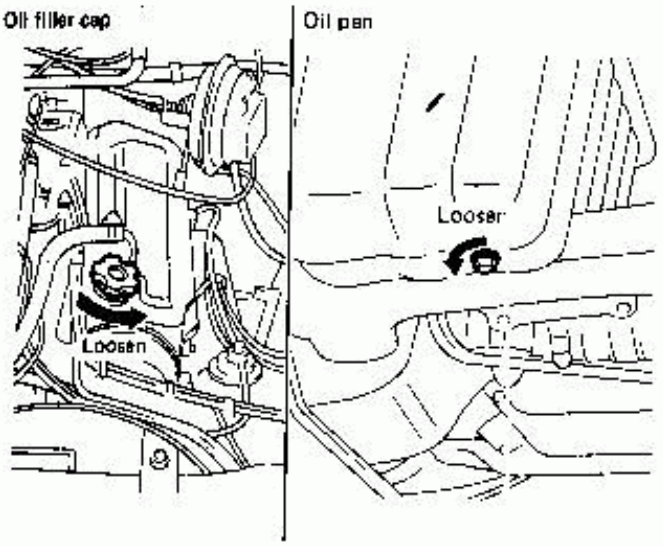
7. Run engine for a few minutes, and then check coolant level, and check drain cock and cap for any sign of leakage.

Changing Engine Oil and Oil Filter

Park the vehicle on a level surface and apply the parking brake.

1. Warm up engine, then stop it, and check for oil leakage from engine components.
2. Remove oil filler cap and drain oil.

WARNING:
Be careful not to burn yourself, as the engine oil may be hot.



SMA934A

3. Clean and install oil pan drain plug with washer.

Drain plug
29 - 39 N·m
(3.0 - 4.0 kg-m, 22 - 29 ft-lb)

4. Remove oil filter.

When removing and installing oil filter, use a tool.

5. Wipe oil filter mounting surface.
6. Smear a little engine oil on rubber gasket of oil filter.

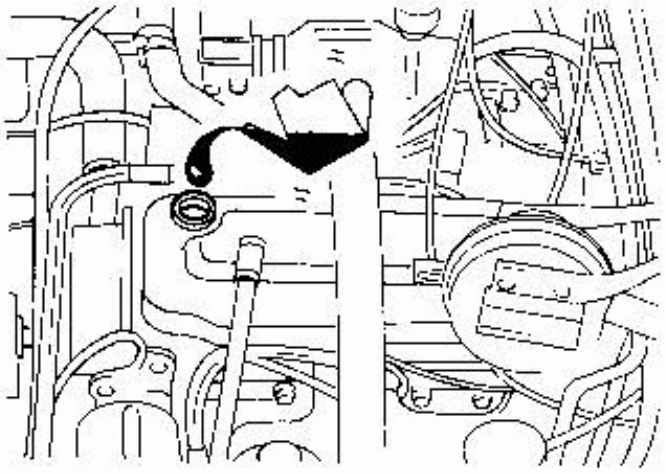
SMA010

7. Install oil filter.

Screw it on until a slight resistance is felt, then tighten an additional 2/3 turn.

8. Add recommended engine oil.

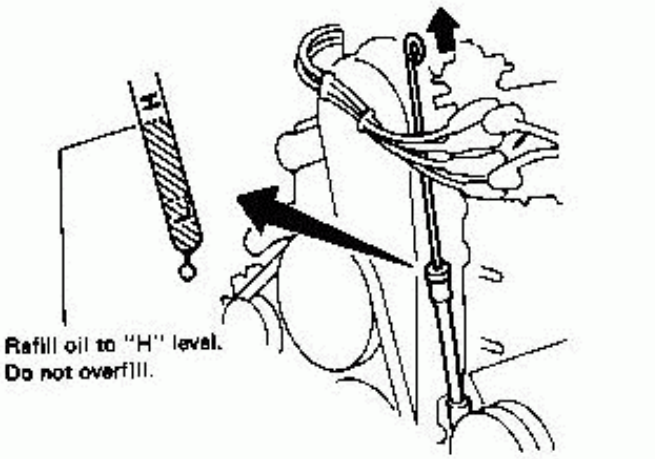
Oil capacity (refill):
3.2 liter (3-3/8 US qt, 2-7/8 Imp qt)
(Without oil filter)
3.6 liter (3-7/8 US qt, 3-1/8 Imp qt)
(With oil filter)



SMA935A

Changing Engine Oil and Oil Filter (Cont'd)

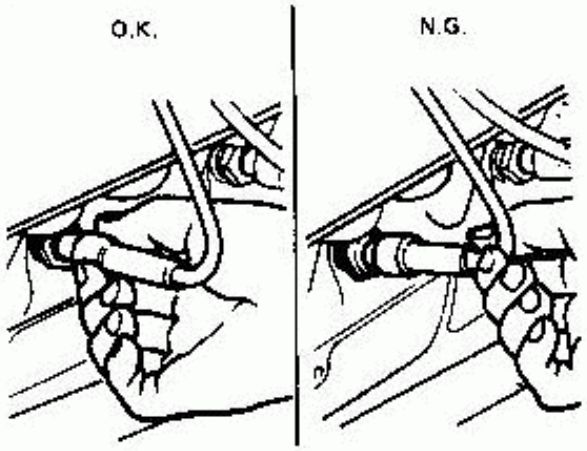
9. Check oil level.
10. Start engine and check area around drain plug and oil filter for any sign of oil leakage.
11. Run engine for a few minutes, then turn it off. After several minutes, check oil level.



SMA055A

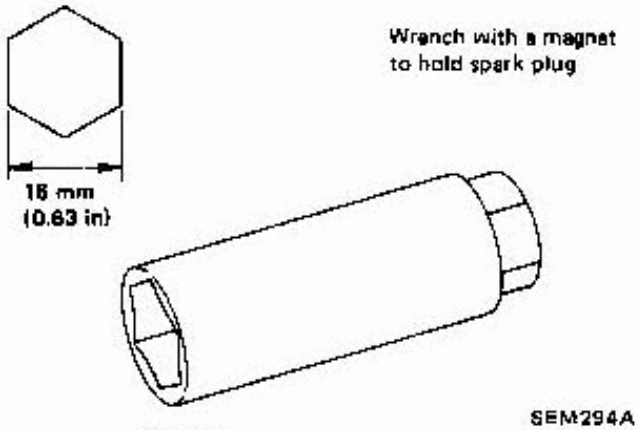
Checking and Replacing Spark Plugs

1. Disconnect ignition wires from spark plugs by pulling on the boots. Do not pull on the wires.

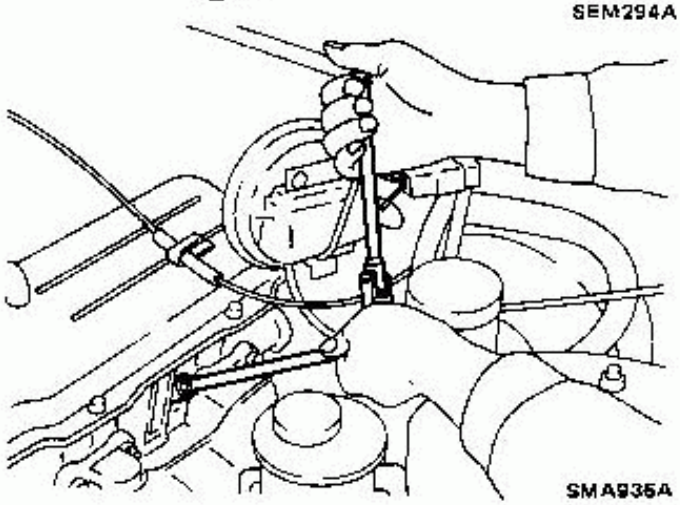


SMA017

2. Remove spark plugs with a suitable spark plug wrench.



SEM294A



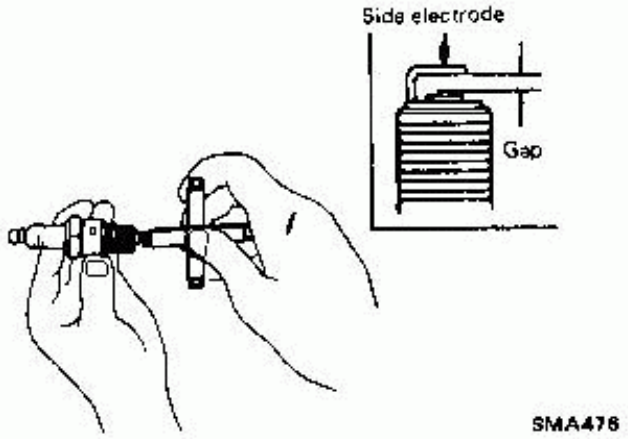
SMA935A

3. After cleaning spark plugs, inspect insulator for cracks or chips, gasket for damage or deterioration and electrode for wear and burns. If they are excessively worn, replace with new spark plugs.

Checking and Replacing Spark Plugs (Cont'd)

4. Check spark plug gap.

Gap: 1.0 - 1.1 mm (0.039 - 0.043 in)



SMA476

Spark plug:

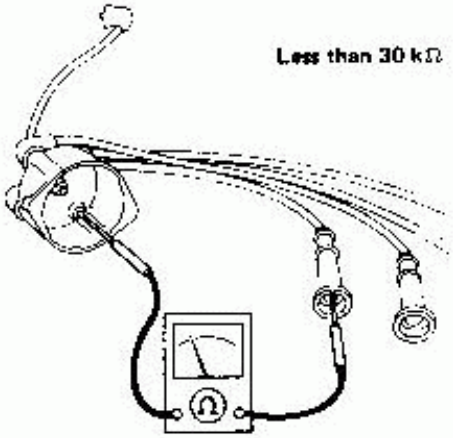
	Standard	Hot	Cold
INT.	BCPR6ES-11	BCPR5ES-11	BCPR7ES-11
EXH.	BCPR5ES-11	BCPR5ES-11	BCPR6ES-11 BCPR7ES-11

5. Install spark plugs. Reconnect ignition wires according to Nos. indicated on them.

Spark plug
20 - 29 N·m
(2.0 - 3.0 kg-m, 14 - 22 ft-lb)

Checking Ignition Wires

1. Check ignition wires for cracks, damage, burned terminals and proper fit.
2. Measure the resistance of the ignition wires staking it and checking for intermittent breaks.



SMA015A

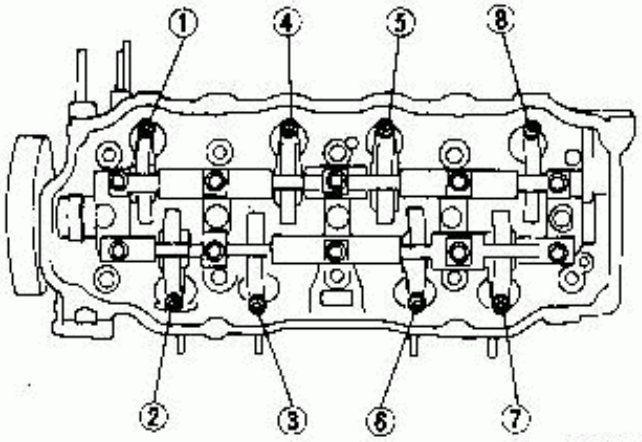
Adjusting Intake and Exhaust Valve Clearance

Adjustment should be made while engine is warm but not running.

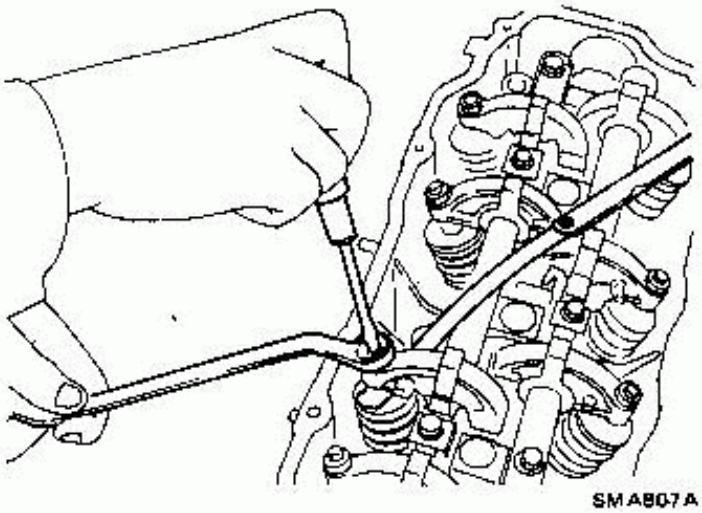
1. Set No. 1 cylinder in top dead center on its compression stroke, and adjust valve clearance ①, ②, ④ and ⑥.
2. Set No. 4 cylinder in top dead center on its compression stroke, and adjust valve clearance ③, ⑤, ⑦ and ⑧.

Adjusting screw lock nuts

: 18 - 22 N-m (1.8 - 2.2 kg-m, 13 - 16 ft-lb)



SMA806A



SMA807A

Valve clearance:

0.30 mm (0.012 in)

Checking and Adjusting Idle-rpm

CAUTION:

Do not attempt to screw the idle adjusting screw down completely. Doing so could cause damage to tip, which in turn will tend to cause malfunctions.

Preparation

1. Make sure that the following parts are in good order.
- E.G.R. valve operation
- Air cleaner clogging
- Ignition system
- Engine oil and coolant levels
- Valve clearance
- E.F.I./E.C.C.S. component parts
- E.F.I./E.C.C.S. harness connectors
- Vacuum hoses
- Air intake system (Oil filler cap, oil level gauge, etc.)

2. Set shift lever in "Neutral" position (in "N" or "P" position for the automatic transmission). Engage parking brake and lock both front and rear wheels with wheel chocks.
3. Turn off air conditioner and headlamps.
4. Keep front wheels straight ahead.

WARNING:

a. Depress brake pedal while racing the engine to prevent forward surge of vehicle.

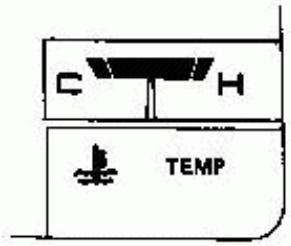
b. Inspection should be carried out while shift lever is in "D" position on automatic transmission equipped models.

c. After inspection and adjustment have been made, shift the lever to "N" or "P" position on automatic transmission.

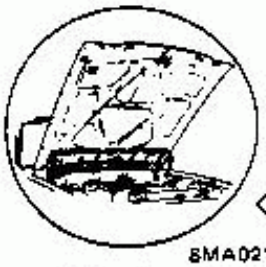
Checking and Adjusting Idle-rpm (Cont'd)

START

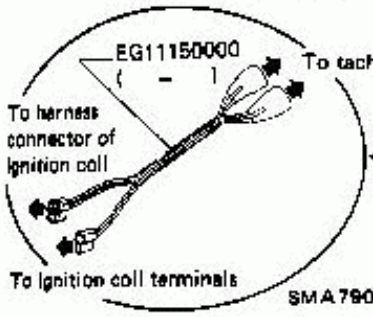
Start engine and warm up engine until water temperature indicator points to the middle of gauge.



SMA937A


SMA021

Open engine hood.



SMA790A

Stop engine and attach adapter harness between ignition coil primary winding terminals and harness connector. Then connect tachometer to adapter harness (CA18ET only).

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

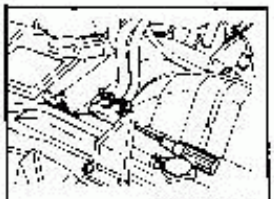
SMA071A

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

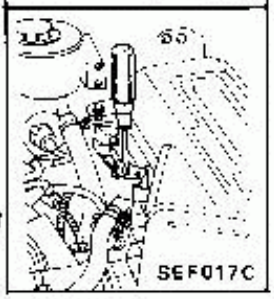
Check idle speed: rpm

Engine model		At sea level	At high altitudes
CA20E	M/T	750 ± 100	
	A/T	700 ± 100	(in "D" position)
CA18ET	M/T	750 ± 50	680 ± 50

CA18ET


SEF624C

CA20E


SEF017C

O.K.

N.G.

Adjust idle speed by turning idle speed adjusting screw.

Disconnect adapter harness connector and connect ignition coil harness connector to ignition coil (CA18ET only).

END

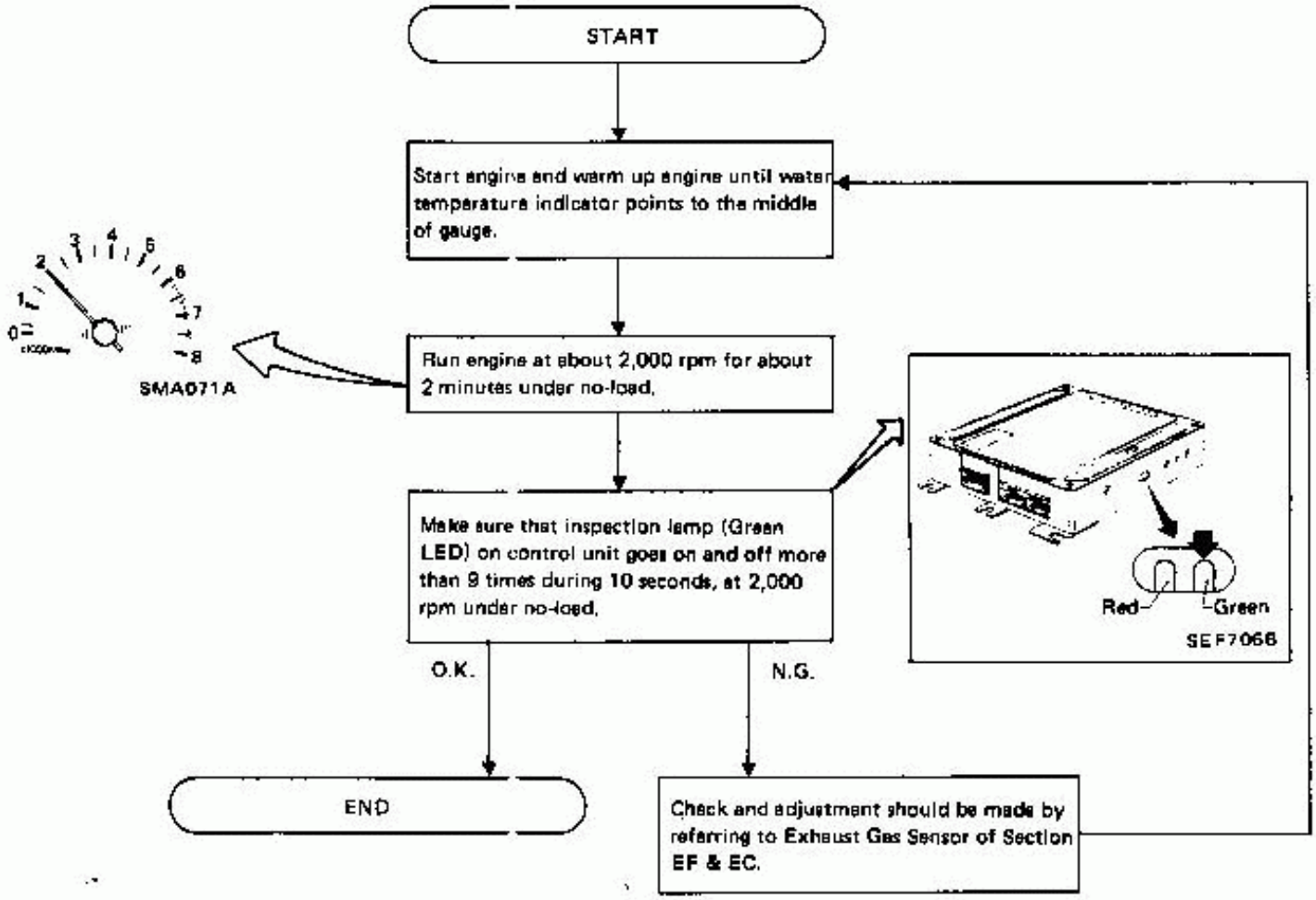
Checking Exhaust Gas Sensor

Preparation

When checking exhaust gas sensor, make sure that the following are in good order.

- Battery
- Engine oil and coolant levels
- E.F.I./E.C.C.S. components
- E.F.I./E.C.C.S. harness and connectors
- Hoses
- Oil filler cap and oil level gauge

Checking procedure

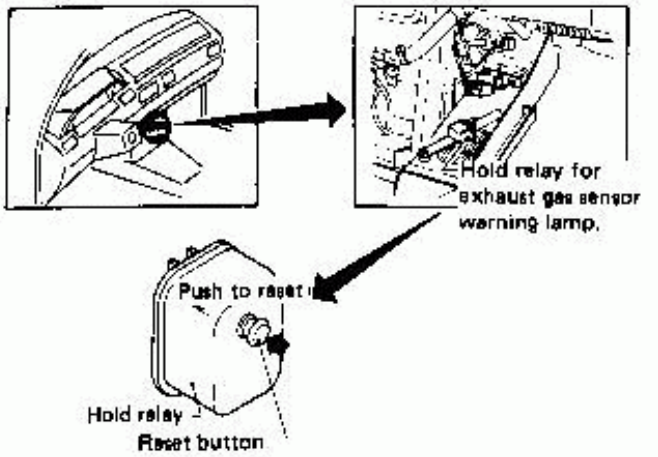


Checking Exhaust Gas Sensor (Cont'd)

FOR U.S.A. MODELS

Every 30,000 miles (48,000 km) service

Exhaust gas sensor should be checked after every 30,000 miles (48,000 km) of operation.
After vehicle has been operated for 30,000 miles (48,000 km) and for 60,000 miles (96,000 km) exhaust gas sensor warning lamp will come on to indicate that sensor should be inspected.
After inspection, reset warning lamp hold relay so that warning lamp will come on after the next 30,000 miles (48,000 km).



SMA419B

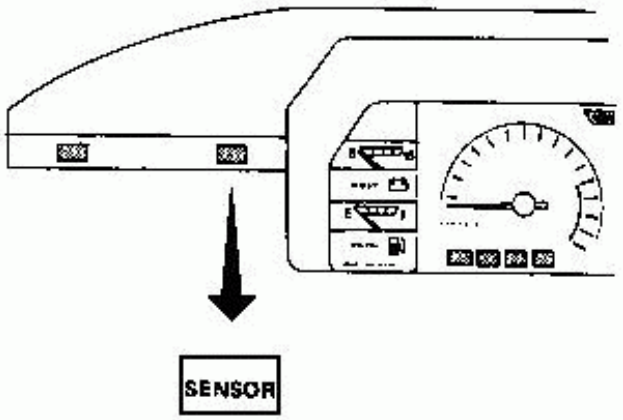
If sensor should be checked at 90,000 miles (144,000 km) of operation (After the third inspection), disconnect warning lamp harness connector.

FOR CANADA MODELS

48,000 km (30,000 miles) service

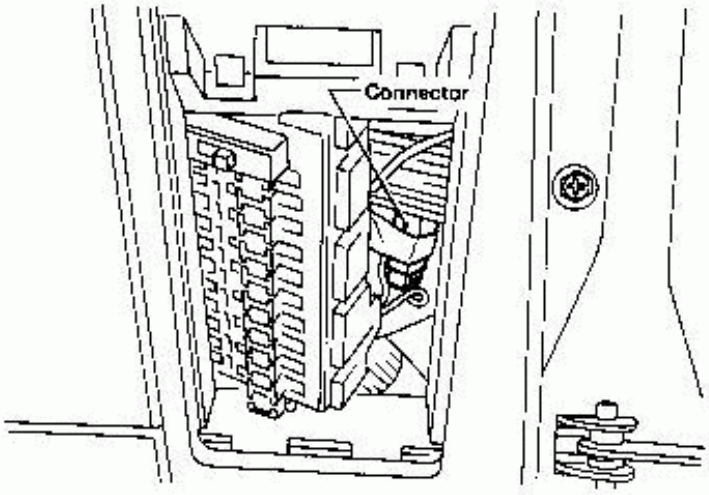
Exhaust gas sensor should be checked after every 48,000 km (30,000 miles) of operation.
The exhaust gas sensor warning lamp will come on at 48,000 km (30,000 miles) to indicate that sensor should be inspected.
After the first inspection, disconnect warning lamp harness connector.

Warning light



SMA940A

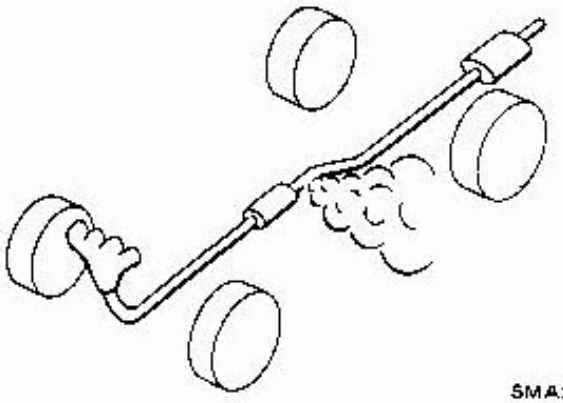
Behind fuse box



SMA175B

Checking Exhaust System

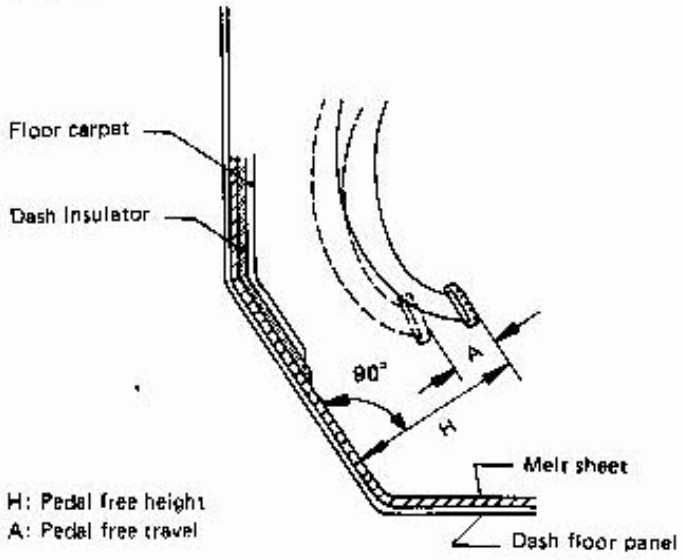
Check exhaust pipes, muffler and mounting for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



SMA211A

Checking Clutch Operation

Check clutch pedal height, free travel and smooth operation.



H: Pedal free height
A: Pedal free travel

SMA816A

Pedal free height "H":
189 - 199 mm (7.44 - 7.83 in)
Pedal free travel "A":
1 - 3.0 mm (0.04 - 0.118 in)

If necessary, adjust clutch pedal free height and pedal free travel. Refer to section CL.

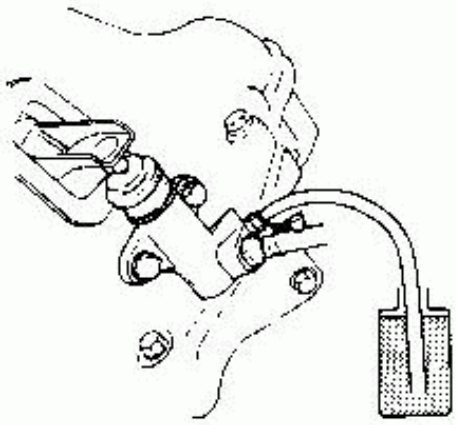
Checking Clutch Fluid Level

If fluid level is extremely low, check clutch system for leaks.

Changing Clutch Fluid

- **Refill with recommended brake fluid "DOT 3".**
- **Do not reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**

1. Drain the fluid in the air bleeder valve.

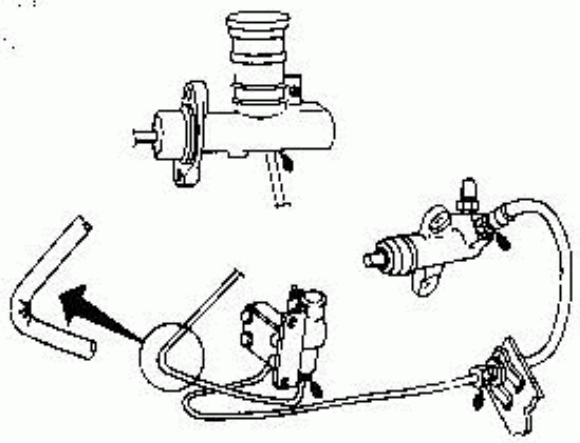


SCL009

2. Refill until the new fluid comes out in the air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill the fluid.
   Refer to section CL.

Checking Clutch System

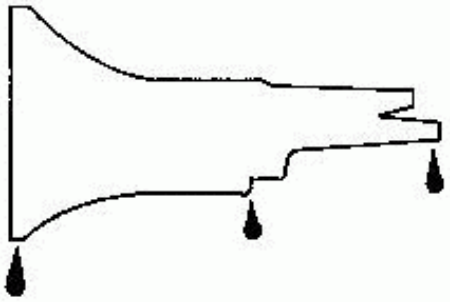
Check clutch fluid lines for proper attachment, leaks, chafing, deterioration, etc.



SMA207B

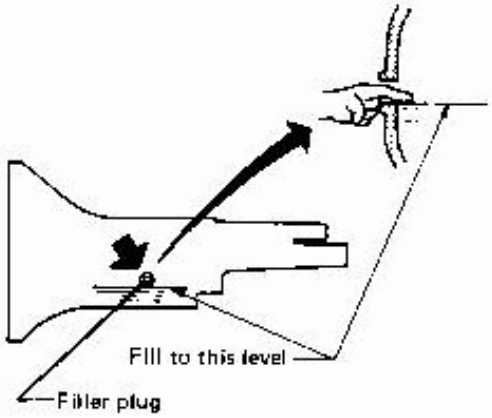
Checking M/T Oil

1. Check manual transmission for leakage.



SMA429A

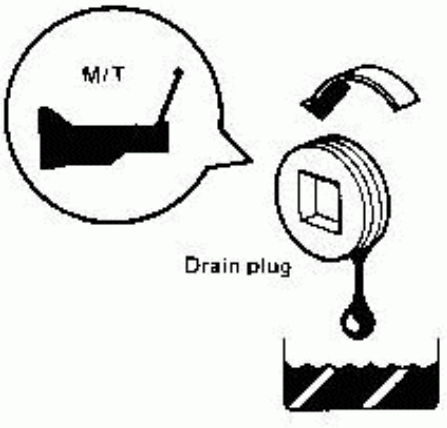
2. Check oil level.



SMA103

Never start engine while checking oil level.

Changing M/T Oil



SMA255A

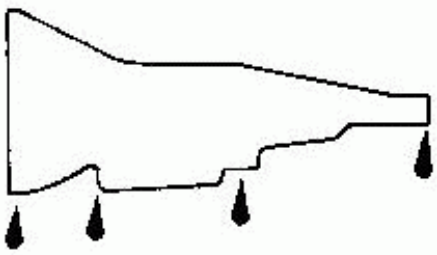
Oil capacity:

FS5W71B

2.1 Liters (4-1/2 US pt, 3-3/4 Imp pt)

Checking A/T Fluid

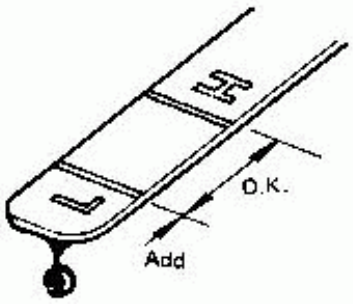
1. Check automatic transmission for leakage.



SMA430A

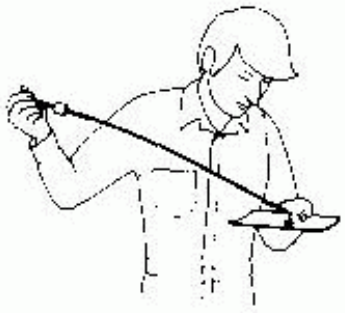
2. Check under following conditions.
(1) Place selector lever in "P" (PARK) position and idle engine.
(2) Maintain fluid temperature at 50 to 80°C (122 to 176°F).
(3) Add oil, if necessary.

Use only A/T fluid having "DEXRON".

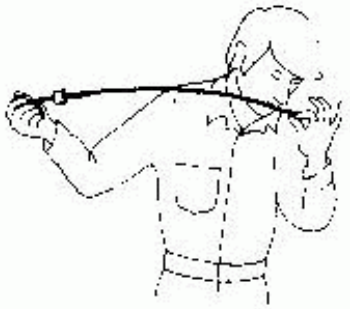


SMA559A

3. Check automatic fluid condition.
Check fluid for contamination to determine condition of automatic transmission. If fluid is very dark or smells burned, the frictional material (clutches, band, etc.) may need replacement.



Check fluid for contamination.



Check fluid for smell.

SMA107

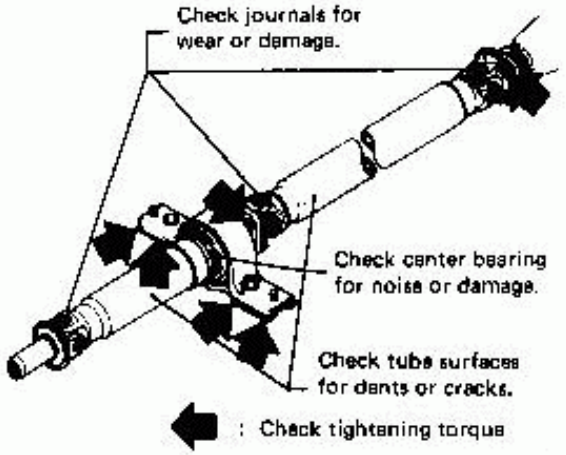
Changing A/T Fluid

1. Drain fluid by removing oil pan.
2. Replace gasket with new one.
3. Refill with fluid and then check fluid level.

Oil capacity:
7.0 liters (7-3/8 US qt, 6-1/8 Imp qt)

Checking Propeller Shaft

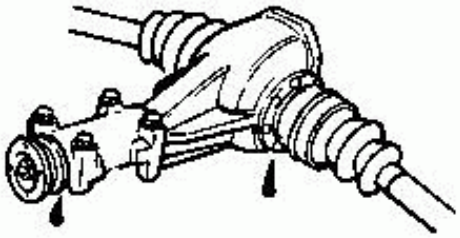
Check propeller shaft for damage, looseness or grease leakage.



SMA231

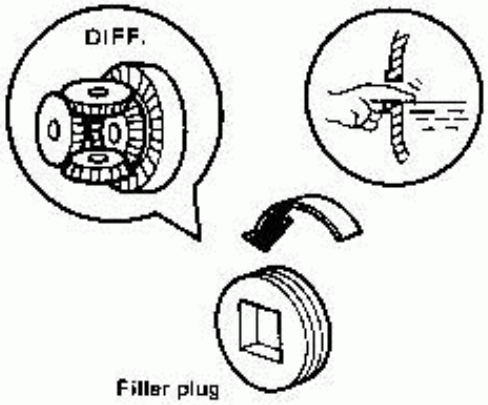
Checking Differential Gear Oil

1. Check differential carrier for signs of oil leakage.



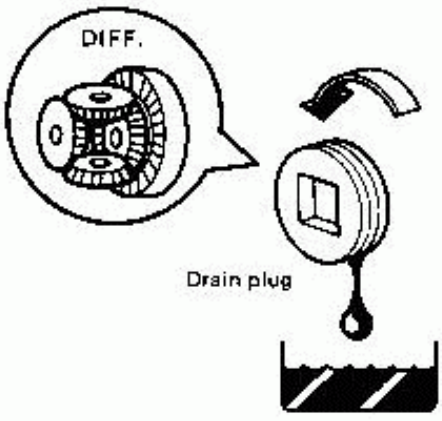
SMA432A

2. Check oil level.



SMA257A

Changing Differential Gear Oil



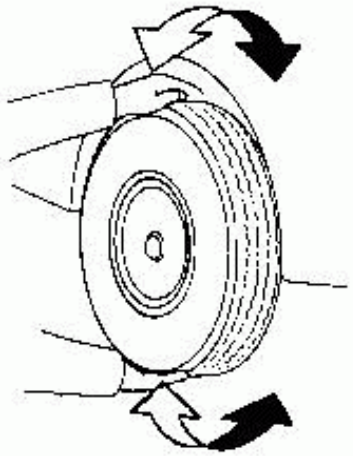
SMA363A

Oil capacity:
Model R200
1.3 Liters (2-3/4 US pt, 2-1/4 Imp pt)
Model R180
1.0 Liters (2-1/8 US pt, 1-3/4 Imp pt)

Checking Front Axle and Front Suspension Parts

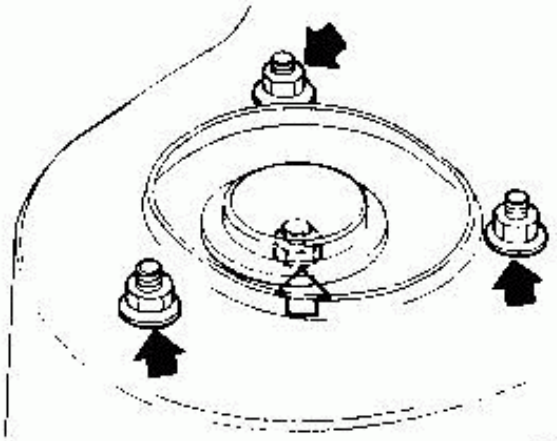
- Check axle and suspension parts for looseness, wear or damage.

(1) Shake each front wheel.

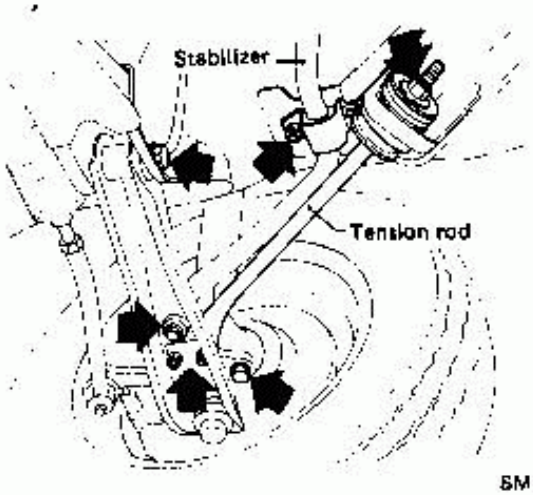


SMA525A

(2) Retighten all nuts and bolts to the specified torque.
Refer to section FA for tightening torque.



SMA514



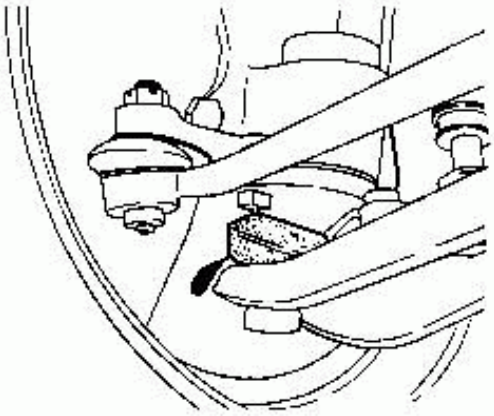
SMA615

(3) Check axle and suspension parts for wear, cracks or damage.

- Check strut (Shock absorber) for oil leakage or damage.

SMA917A

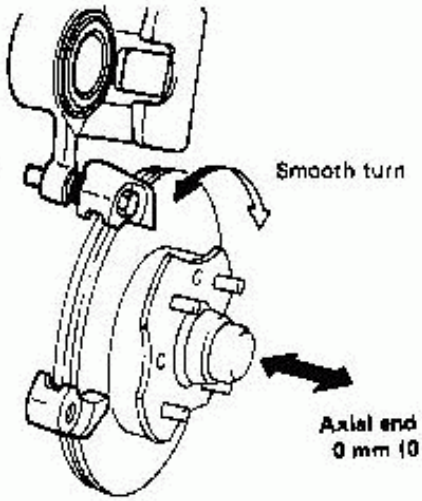
- Check suspension ball joint for grease leakage and ball joint dust cover for damage.



SMA723A

Checking Front Wheel Bearing Grease

- Check that wheel bearings operate smoothly, as well as axial end play and grease leakage.



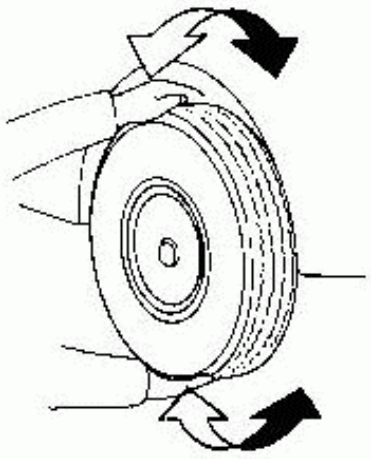
SMA918A

If necessary, adjust wheel bearing preload. Refer to section FA.

Checking Rear Axle and Rear Suspension Parts

- Check axle and suspension parts for looseness, wear or damage.

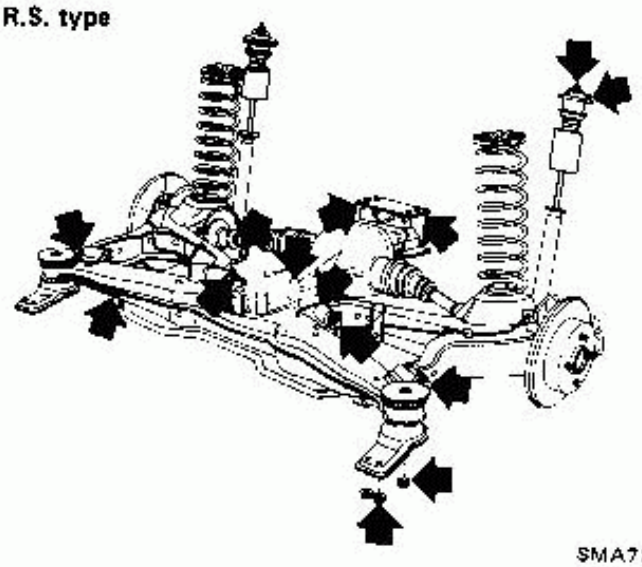
(1) Shake each rear wheel.



SMA525A

(2) Retighten all nuts and bolts to the specified torque.
Refer to section RA for tightening torque.

I.R.S. type

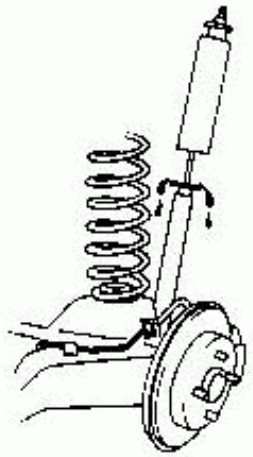


SMA725A

Checking Rear Axle and Rear Suspension Parts (Cont'd)

(3) Check axle and suspension parts for wear, cracks or damage.

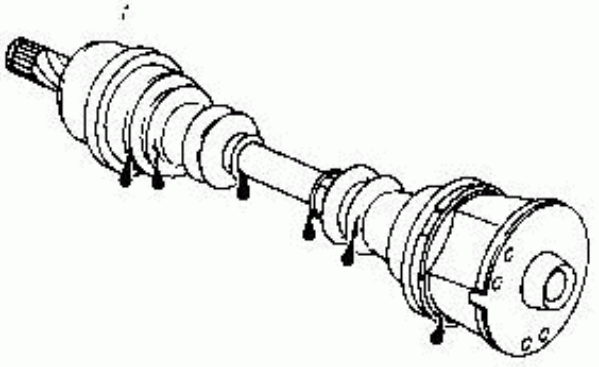
- Check shock absorber for oil leakage or damage.



SMA920A

Checking Drive Shaft

Check boot and drive shaft for cracks, wear, damage or grease leakage.



SMA743A

Checking Front Wheel Alignment

PRELIMINARY INSPECTION

- Tire pressure
- Wheel bearing axial play
- Suspension ball joint
- Steering gear housing looseness at frame
- Steering linkage and connections
- Shock absorber operation
- Tighten each front axle and suspension part.
- Measure vehicle height (Unladen).
  The vehicle must be on a level surface both fore and aft, and transversely.
- Repair or replace the damaged portion or parts.

"Unladen"
Fuel tank, radiator and engine oil pan all full.
Spare tire, jack, hand tools and mats in position.

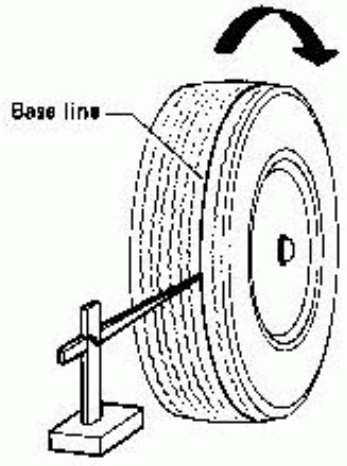
CAMBER, CASTER AND KINGPIN INCLINATION

Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.

Camber:
–25′ to 1°05′
Caster:
2°45′ - 4°15′
Kingpin inclination:
11°40′ - 13°10′

TOE-IN

1. Mark a base line across the tread.

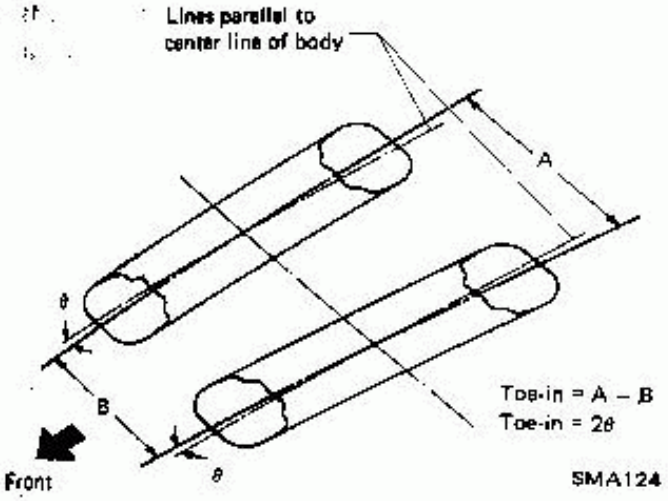


SMA123

After lowering front of vehicle, move it up and down to eliminate friction.

Checking Front Wheel Alignment (Cont'd)

2. Measure toe-in.

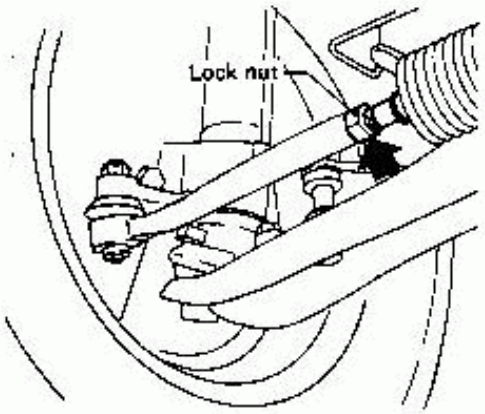


Toe-in:

–0.5 to 1.5 mm (–0.020 to 0.059 in)

–2′ to 8′ (Total toe-in)

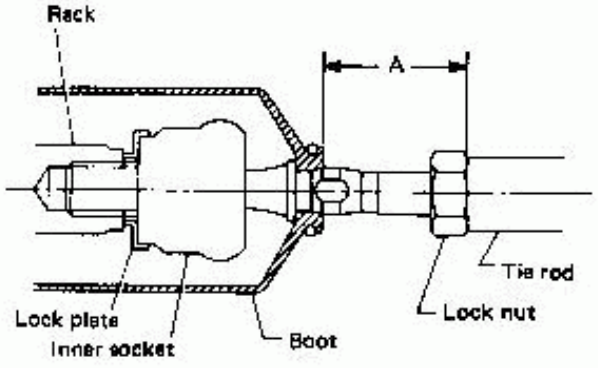
3. Toe-in can be adjusted by varying the length of steering tie-rods.



"A" standard dimension:

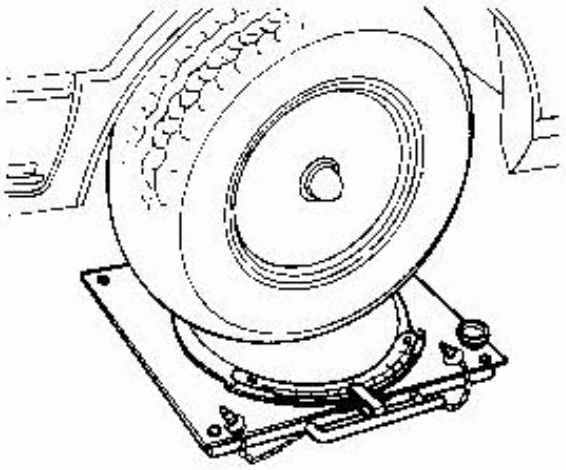
VR24S 36.1 mm (1.421 in)

PR24SA 42.7 mm (1.681 in)



FRONT WHEEL TURNING ANGLE

- Rotate steering wheel all the way right and left; measure turning angle on inner wheel.



Turning angle:

Full turns

Inside

36° - 39°

Outside

30° - 33°

Toe-out turn (Inside/Outside):

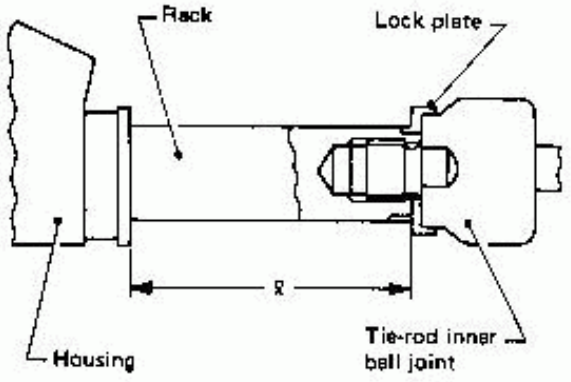
20°/18°43′

- If it is not within specification, check rack stroke.

Refer to section ST.

Rack stroke "ℓ" Unit: mm (in)

	VR24S	PR24SA
Pinion gear side	76 (2.99)	57 (2.24)
Opposite pinion gear side	76 (2.99)	70 (2.76)



Checking Rear Wheel Alignment (I.R.S. type)

PRELIMINARY INSPECTION

- Tire pressure.
- Wheel bearing axial play.
- Shock absorber operation.
- Tighten each rear axle and suspension part.
- Measure vehicle height (Unladen)
  The vehicle must be on a level surface both fore and aft, and laterally.
- Repair or replace the damaged portion or parts.

"Unladen"
Fuel tank, radiator and engine oil pan all full.
Spare tire, jack, hand tools and mats in position.

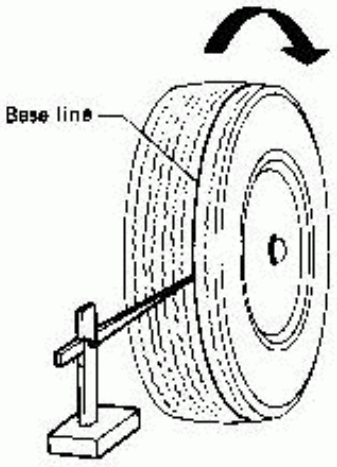
CAMBER

Camber is preset at factory and cannot be adjusted.

Camber:
−1°15′ to 0°15′

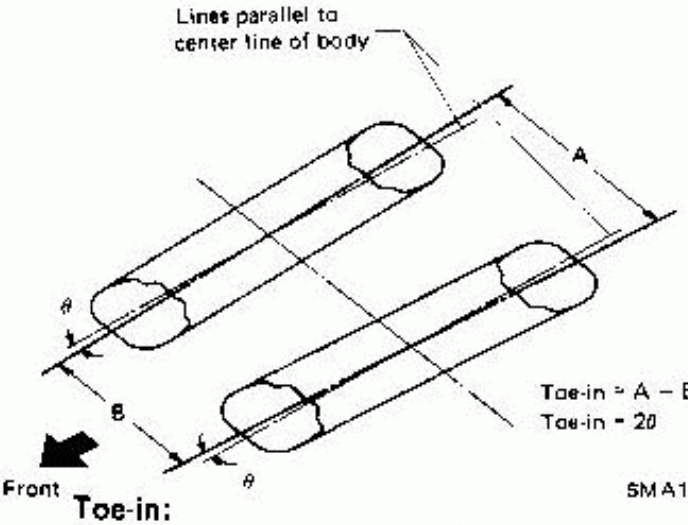
TOE-IN

1. Mark a base line across the tread.



SMA123

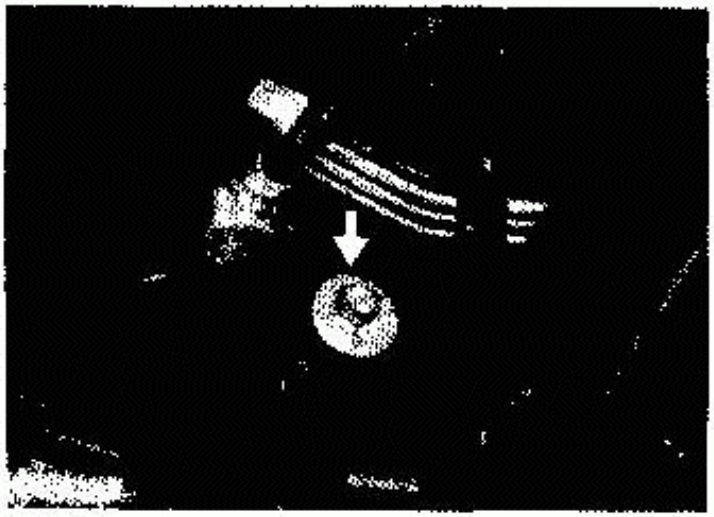
2. Measure toe-in.

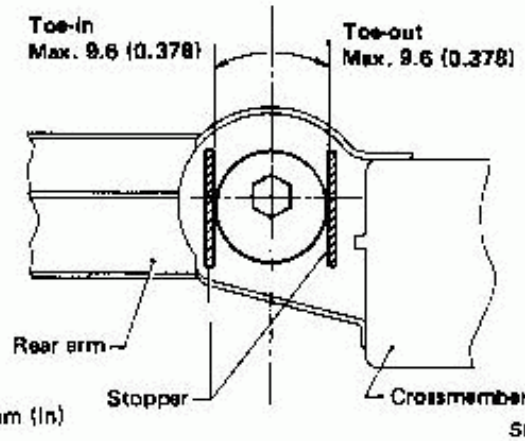


SMA124

Toe-in:
−2 to 0 mm (−0.08 to 0 in)
−12′ to 0′ (Total toe-in)

3. Toe-in can be adjusted by inside of rear arm bushing pins.





Unit: mm (in)

SMA746A

When performing toe adjustment, always set the cams in the same position on the right and left rear arm bushing pins.

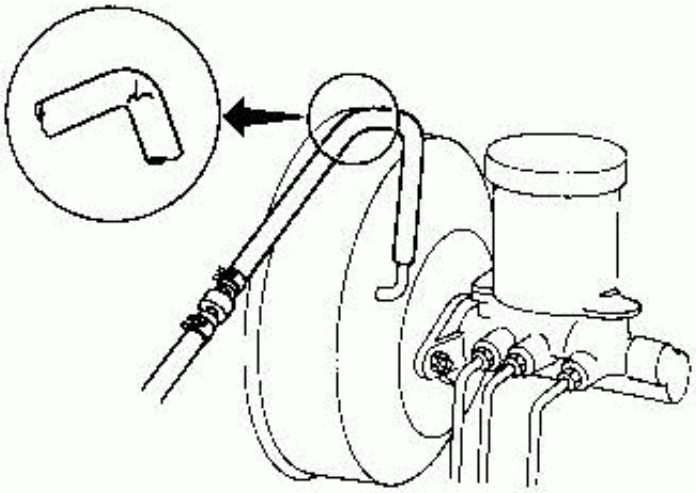
Checking Brake Fluid Level and Leaks

If fluid level is extremely low, check brake system for leaks.

SMA730A

Checking Brake Booster Vacuum Hoses, Connections and Check Valve

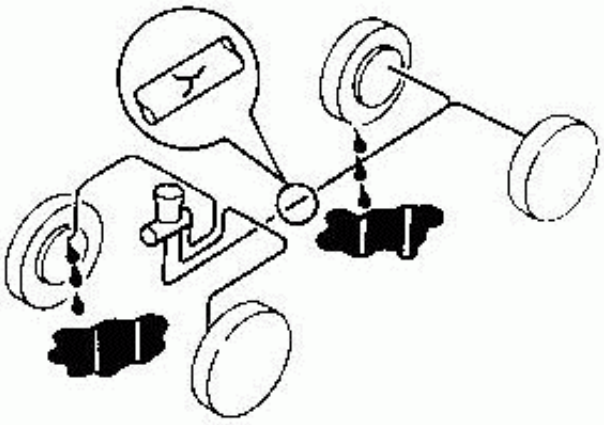
Check vacuum lines, connections and check valve for proper attachment, air tightness, chafing and deterioration.



SMA821A

Checking Brake System

Check brake fluid lines and parking brake cables for proper attachment, leaks, chafing, abrasion, deterioration, etc.

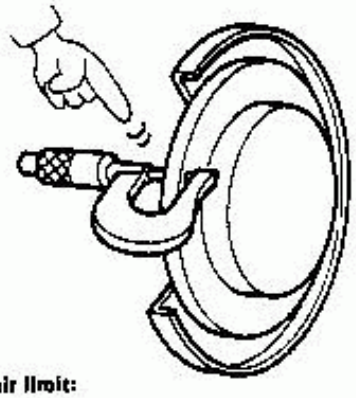


SMA732A

Checking Disc Brake

Check condition of disc brake components.

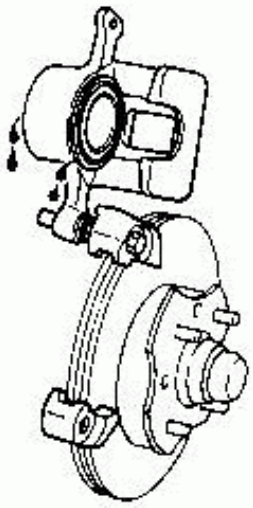
Rotor: Condition and thickness



SMA260A

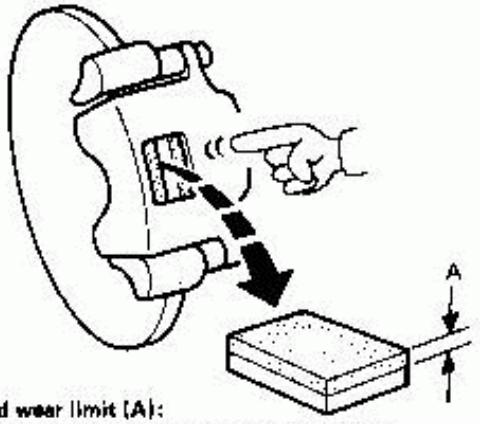
Rotor repair limit:
Front AD22V
18 mm (0.83 in)
Rear CL11H
9 mm (0.35 in)

Caliper: Operation and leakage



SMA922A

Pad: Wear or damage



SMA364A

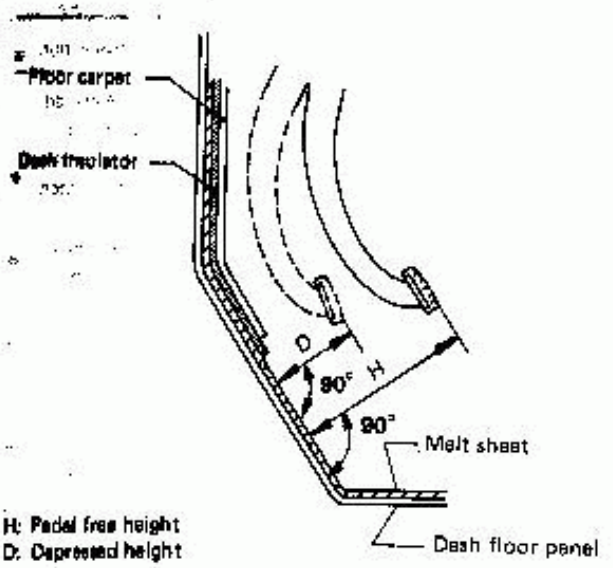
Pad wear limit (A):
AD22V and CL11H: 2.0 mm (0.079 in)

Pad replacement procedure:
Refer to section BR.

Checking Foot Brake Pedal Operation

CAUTION:

1. Check brake pedal free height, depressed height and smooth operation.



H: Pedal free height
D: Depressed height

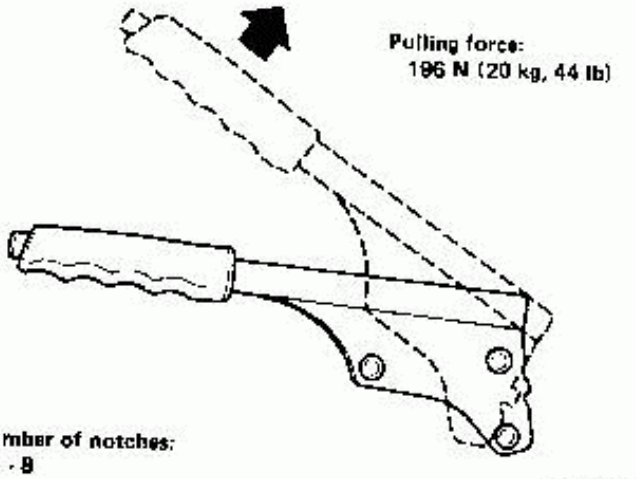
SMA196B

Pedal free height "H":
M/T model 185 - 195 mm (7.28 - 7.68 in)
A/T model 187 - 197 mm (7.36 - 7.76 in)
Depressed height "D":
101 mm (3.98 in) or more

If necessary, adjust pedal height.
Refer to section BR.

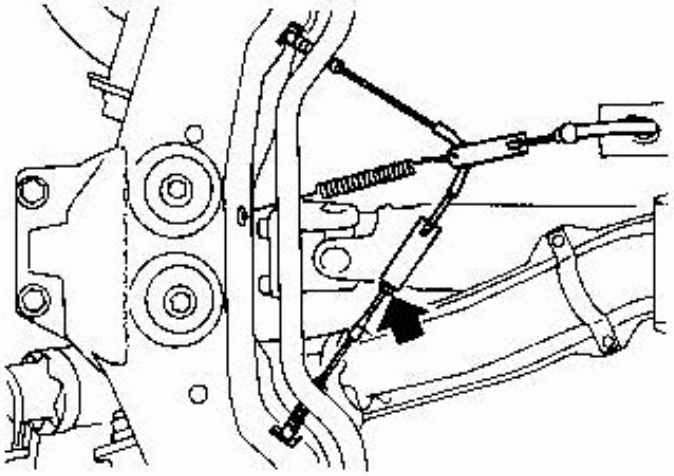
Checking Parking Brake

Pull lever with specified amount of force.
Check lever stroke and smooth operation.



SMA436

2. Use adjuster to adjust lever stroke.



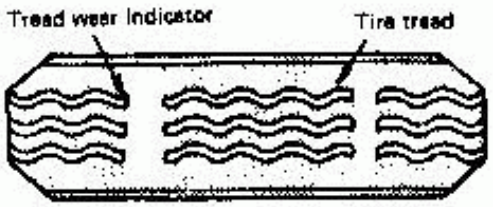
SMA735A

3. Bend parking brake warning lamp switch plate down so that brake warning light comes on when ratchet at parking brake lever is pulled one notch and goes out when fully released.

Checking Tire Condition

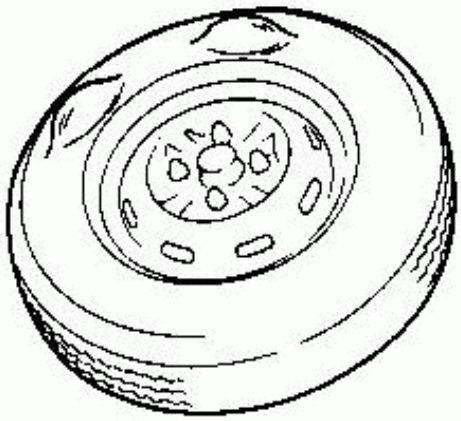
TIRE CONDITION

- When tread wear indicators appear, replace them with new ones.



WH024

- Check tread and side walls for cracks, holes, separation or damage.



SMA639A

- Check tire valves for air leakage.

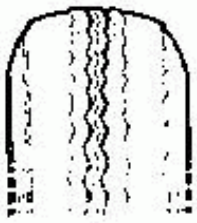
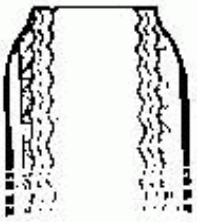
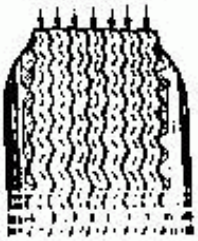
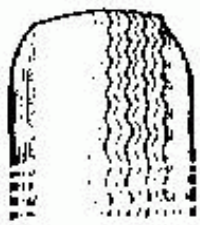
TIRE INFLATION

Tire pressure needs to be measured when tire is cold.

Tire pressure needs to be set to the specifications on the tire placard located in the vehicle.

Abnormal tire wear

Correct abnormal tire wear according to the chart shown below.

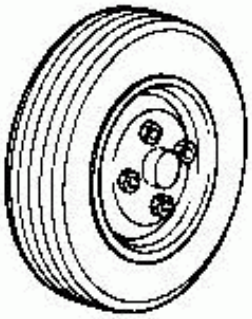
Condition	Probable cause	Corrective action
 Shoulder wear	• Underinflation (both sides wear) • Incorrect wheel camber (one side wear) • Hard cornering • Lack of rotation	• Measure and adjust pressure. • Repair, or replace axle and suspension parts. • Reduce speed • Rotate tires.
 Center wear	• Overinflation • Lack of rotation	• Measure and adjust pressure. • Rotate tires.
Feathered edge  Toe-in or toe-out wear	• Incorrect toe	• Adjust toe-in.
 Uneven wear	• Incorrect camber or caster • Malfunctioning suspension • Unbalanced wheel • Out-of-round brake drum • Other mechanical conditions • Lack of rotation	• Repair, or replace axle and suspension parts. • Repair, replace or, if necessary, reinstall. • Balance or replace. • Correct or replace. • Correct or replace. • Rotate tires.

SMA068

Tire Replacement

CAUTION:

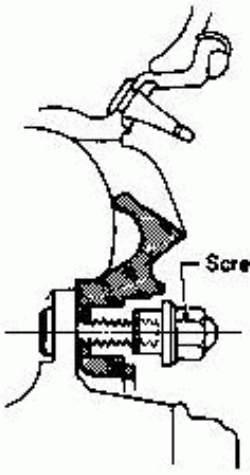
- **Avoid mixed use of different types of tires, such as bias, bias belted and radial tires under any circumstances.**
- **When replacing a tire, use a tire of the same size.**
- Do not use tires and wheels other than those recommended.
- Do not mix tires of different brands or tread patterns.
- When replacing standard tires with those tires of an optional recommended size and of different diameter, the speedometer must be recalibrated.
- To install wheel, tighten wheel nuts in criss-cross fashion.



SMA540A

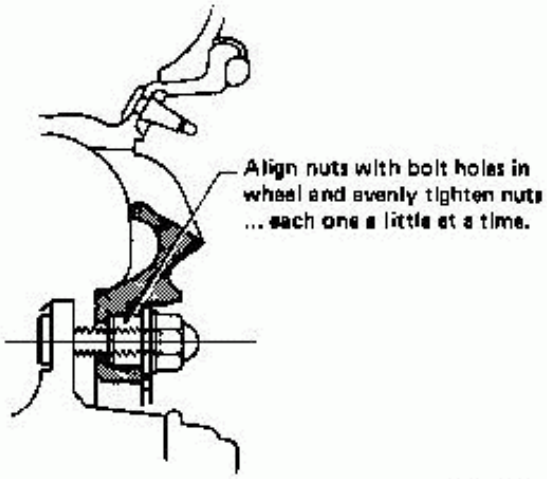
- To install an aluminum wheel, proceed as follows:

(1) Snugly tighten all nuts after the wheel is positioned.



SMA070

(2) Slightly pull the wheel back to properly align the nuts with bolt holes in the wheel, and tighten the nuts as much as possible with your fingers.



SMA071

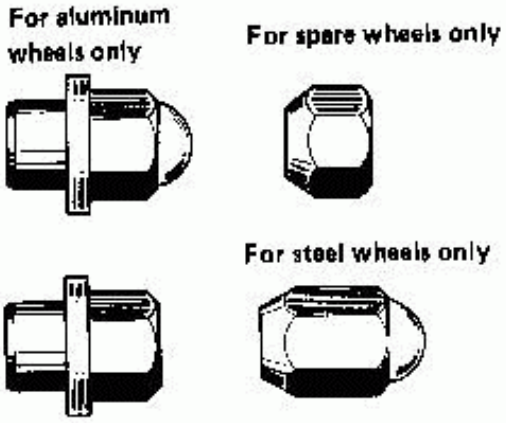
(3) Tighten wheel nuts evenly with a wheel wrench in criss-cross fashion.

Be sure to check the wheel nuts for tightness, after the aluminum wheel has been run for the first 1,000 km (600 miles) (also in case of repairing flat tires, tire rotation, etc.).
Replace if necessary.

Wheel Nut

CAUTION:

- Three types of wheel nuts are used; one is designed for use with steel wheels, two for use with aluminum wheels, and one for use with spare wheels. Do not mix different types of wheel nuts.
- Be careful not to smear threaded portion of bolt and nut as well as seat of nut with oil or grease.



78 - 98 N·m (8.0 - 10.0 kg-m, 58 - 72 ft-lb)

SMA926A

Tire Repair

CAUTION:

When replacing tire, take extra care not to damage tire bead, rim-flange and bead seat.

Install tire, noting the following items:

a. Install valve core and inflate to proper pressure. Check the locating rings of the tire to be sure they show around the rim flanges on both sides.
b. Check valves for leakage after inflating tires.
c. Be sure to tighten valve caps firmly by hand.

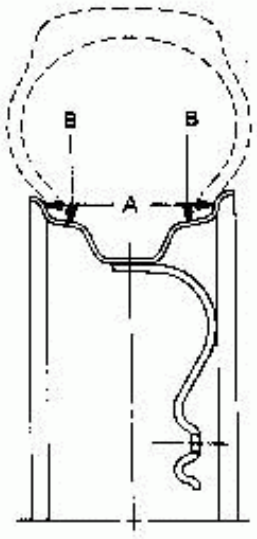
WARNING:

When, while tire is being inflated, bead snaps over safety hump, it might break. Thus, to avoid serious personal injury, never stand over tire when inflating it. Never inflate to a pressure greater than 40 psi (275 kPa). If beads fail to seat at that pressure, deflate the tire, lubricate it again, and then reinflate it. If the tire is overinflated, the bead might break, possibly resulting in serious personal injury.

Wheel Inspection

- Check wheel rim (especially rim flange and bead seat) for rust, distortion, cracks or other damage.
- Examine wheel rim for lateral and radial runout, with dial gauge.

Lateral runout (A) and radial runout (B):
0.5 mm (0.020 in)
Mechanical average between right and left radial runout:
Steel wheel ... Less than 0.5 mm (0.020 in)
Aluminum wheel ... Less than 0.2 mm (0.008 in)

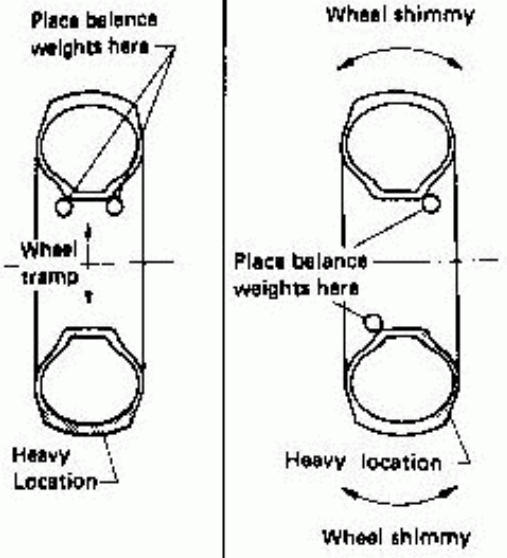


SMA140B

- Replace wheel when any of the following problems occurs.
  a. Bent, dented or heavily rusted
  b. Elongated bolt holes
  c. Excessive lateral or radial runout
  d. Air leaks through welds
  e. Wheel nuts will not stay tight

Balancing Wheels

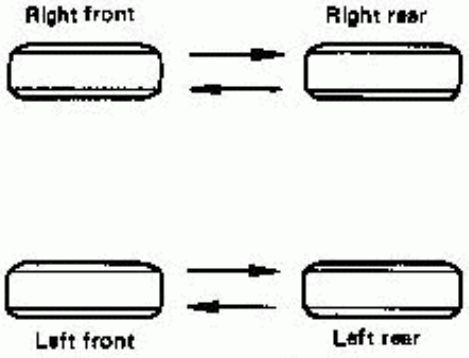
Cause	Wheel static unbalance	Wheel dynamic unbalance
Symptom of unbalance	Wheel tramp Wheel shimmy	Wheel shimmy
Corrective action	Balance statically	Balance dynamically



SMA075

Tire Rotation

RADIAL TIRE



4 WHEELS

SMA736A

Spare Tire

T-TYPE SPARE TIRE

The T-type spare tire is designed for emergency use only.

The spare tire can be used repeatedly for emergency situations.

Precautions when using T-type spare tire

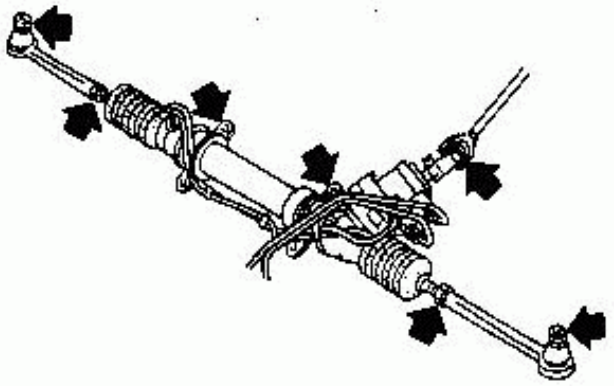
- **Periodically check tire inflation pressure, and always keep it at 60 psi (412 kPa).**
- **Do not drive car at speed faster than 80 km/h (50 MPH).**
- **The T-type spare tire is designed only for temporary use as a spare. Dismount it and keep it as a spare as soon as the standard tire repair has been completed.**
- **Do not attach a tire chain.**
- **Do not use the T-type spare tire on other cars.**
- **Do not make a sharp turn, or apply the brake suddenly while driving.**
- **As soon as the tread wear indicator becomes visible, replace the tire with a new one.**
- **Mounting and dismounting to and from the road wheel can be carried out in the same manner as any ordinary tire.**
- **Use of wheel balance is unnecessary.**

CAUTION:

If the car is equipped with aluminum wheels, be sure to use the wheel nuts for steel wheel on the T-type spare tire wheel. Never use the wheel nuts for aluminum wheel on the spare tire wheel.

The spare tire wheel may come off the axle and cause personal injury if the wheel nuts for aluminum wheels are used on the spare tire wheel.

Checking Steering Gear and Linkage



SMA738A

- Steering gear:

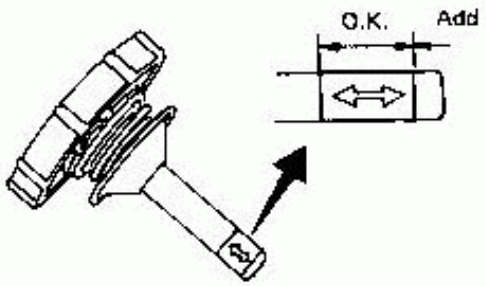
(1) Check gear housing and boots for looseness, damage or grease leakage.
(2) Check connection with steering column for looseness.

- Steering linkage:

(1) Check ball joint, dust cover and other component parts for looseness, wear, damage or grease leakage.
(2) Check any missing parts (cotter pins, washer, etc.).

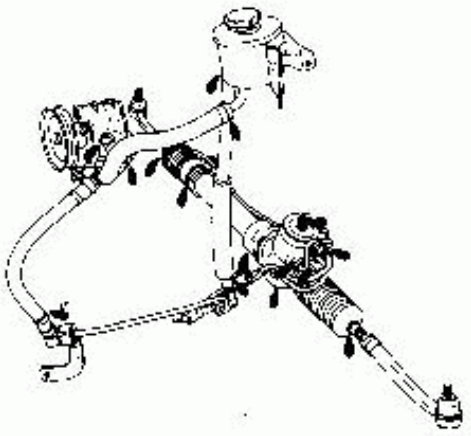
Checking Power Steering System Fluid and Lines

- Check fluid level, when the fluid is cold.



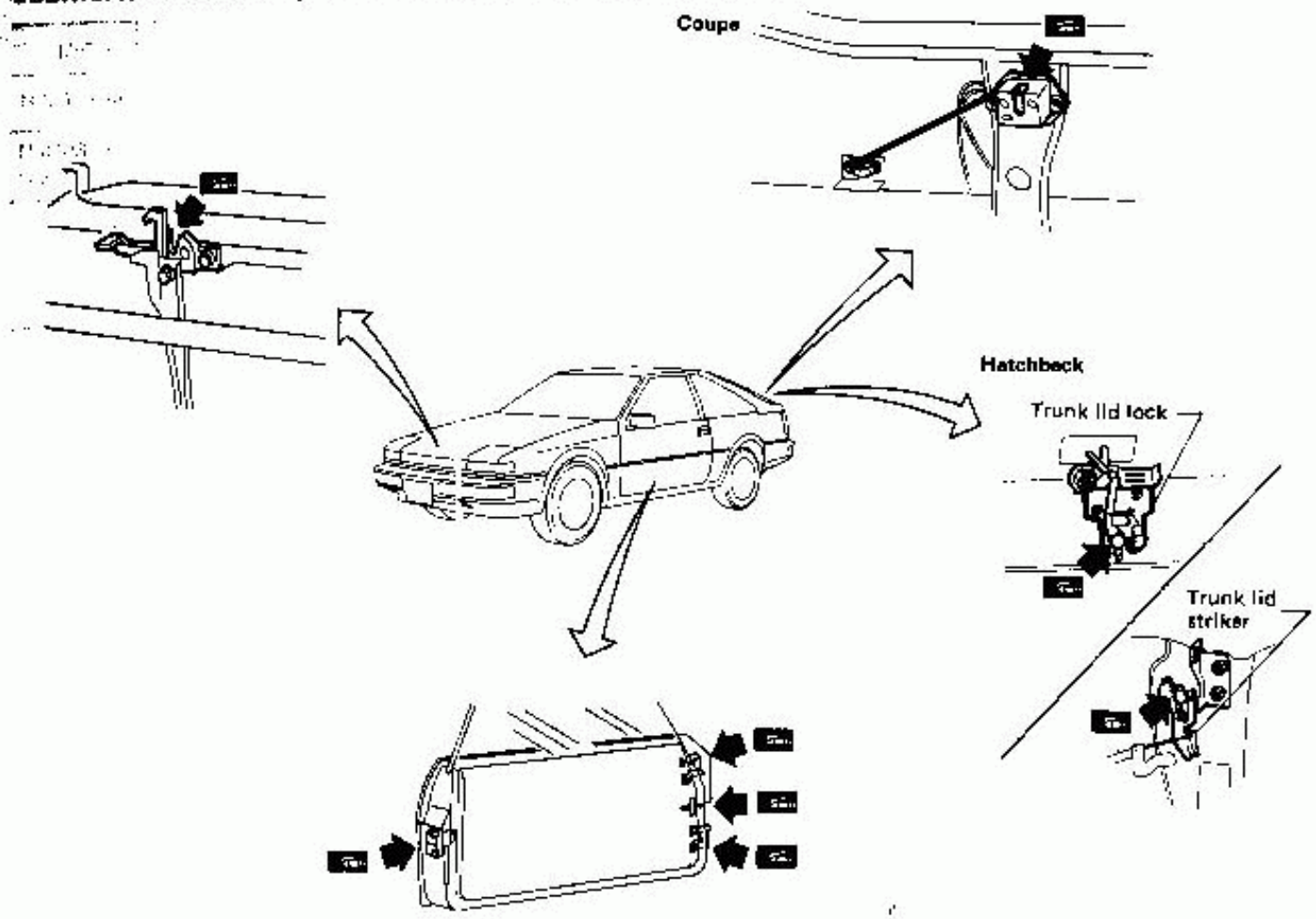
SMA750A

- Check lines for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



SST284A

LUBRICATING LOCKS, HINGES AND HOOD LATCHES



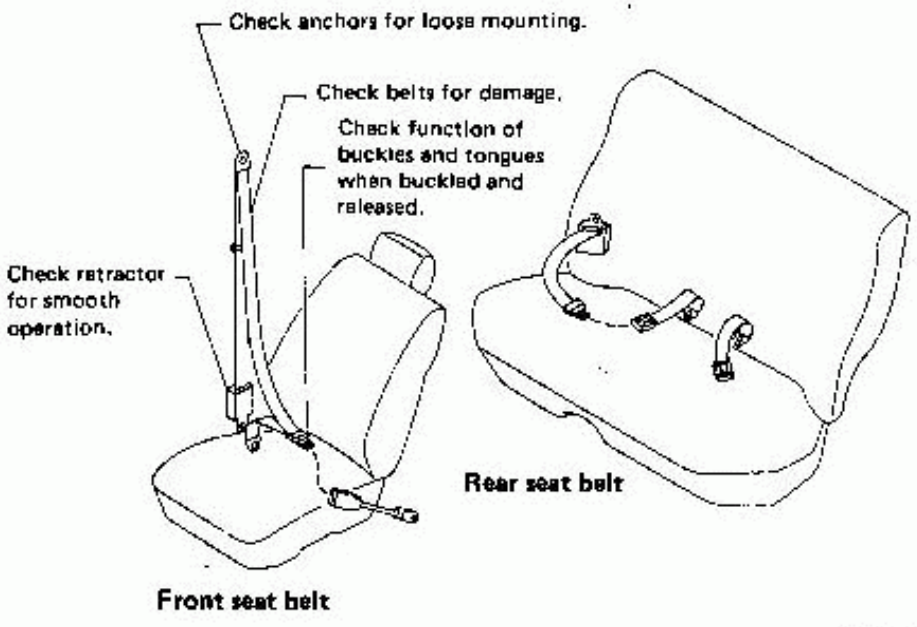
SMA925A

CHECKING SEAT BELTS, BUCKLES, RETRACTORS, ANCHORS AND ADJUSTERS

CAUTION:

1. If the vehicle is collided or overturned, replace the entire belt assembly, regardless of nature of accident.
2. If the condition of any component of a seat belt is questionable, do not have seat belt repaired, but replaced as a belt assembly.
3. If webbing is cut, frayed, or damaged, replace belt assembly.
4. Do not spill drinks, oil, etc. on inner lap belt buckle. Never oil tongue and buckle.
5. Use a NISSAN genuine seat belt assembly.

Anchor bolt
24 - 31 N-m
(2.4 - 3.2 kg-m, 17 - 23 ft-lb)



SMA926A

INSPECTION AND ADJUSTMENT

Basic mechanical system

Valve clearance (Hot) mm (in)	
Intake	0.30 (0.012)
Exhaust	0.30 (0.012)

Drive belt deflection
When applying pushing force of 98 N (10 kg, 22 lb) mm (in)

	Used belt		Set deflection of new belt
	Limit	Adjust	
Alternator	13 (0.51)	7 - 10 (0.28 - 0.39)	6 - 8 (0.24 - 0.31)
A/C compressor	7 (0.28)	3 - 5 (0.12 - 0.20)	3 - 5 (0.12 - 0.20)
P/S oil pump	14 (0.55)	8 - 11 (0.31 - 0.43)	6 - 9 (0.24 - 0.35)

Cooling and lubrication system

Coolant capacity	liter (US qt, Imp qt)
With heater	8.6 (9-1/8, 7-5/8)
Refill oil capacity	liter (US qt, Imp qt)
With oil filter	3.6 (3-7/8, 3-1/8)
Without oil filter	3.2 (3-3/8, 2-7/8)

Ignition system

Spark plug type	Standard	Hot	Cold
INT.	BCPR6ES-11	BCPR5ES-11	BCPR7ES-11
EXH.	BCPR5ES-11	BCPR5ES-11	BCPR6ES-11 BCPR7ES-11
Gap mm (in)	1.0 - 1.1 (0.039 - 0.043)		
Ignition wire Resistance kΩ	Less than 30		

Idle rpm

Engine model		At sea level	At high altitude
CA20E	M/T	750 ± 100	
	A/T	700 ± 100 (in "D" position)	
CA18ET	M/T	750 ± 50	680 ± 50

TIGHTENING TORQUE

Item	N·m	kg-m	ft-lb
Rocker cover screw	1 - 3	0.1 - 0.3	0.7 - 2.2
Valve rocker adjusting nuts	18 - 22	1.8 - 2.2	13 - 16
Alternator adjuster rock bolt	14 - 17	1.4 - 1.7	10 - 12
Oil pan drain plug	29 - 39	3.0 - 4.0	22 - 29
Spark plug	20 - 29	2.0 - 3.0	14 - 22
Fuel hose clamp	1.0 - 1.5	0.10 - 0.15	0.7 - 1.1

SPECTION AND ADJUSTMENT

Unit: mm (in)

Pedal height "H"	189 - 199 (7.44 - 7.83)
Pedal free play "A"	1 - 3.0 (0.04 - 0.118)

Front axle and front suspension

Axial play	mm (in)	0 (0)
Wheel bearing preload (As measured at wheel hub bolt)		
With new parts	N (kg, lb)	6.9 - 14.7 (0.7 - 1.5, 1.5 - 3.3)
With used parts	N (kg, lb)	2.0 - 7.8 (0.2 - 0.8, 0.4 - 1.8)

Wheel alignment (Unladen*1)

Camber	degree	−25′ to 1°05′
Caster	degree	2°45′ - 4°15′
Kingpin inclination	degree	11°40′ - 13°10′
Toe-in	mm (in)	−0.5 to 1.5 (−0.020 to 0.059)
	degree	−2′ to 8′

Standard tie-rod length "A"	VR24S	PR24SA
mm (in)	36.1 (1.421)	42.7 (1.681)

Front wheel turning angle

Toe-out turns Inner wheel/Outer wheel	degree	20°/18°43′
Full turns *2		
Inner wheel	degree	36° - 39°
Outer wheel	degree	30° - 33°

*1: Fuel tank, radiator and engine oil pan all full. Spare tire, jack, hand tools, and mats in designed position.

*2: On power steering models, wheel turning force (at circumference of steering wheel) of 98 - 147 N (10 - 15 kg, 22 - 33 lb) with engine at idle.

Rear axle and rear suspension

Wheel alignment (Unladen*)

Camber	degree	−1°15′ to 0°15′
Toe-in	mm (in)	−2 to 0 (−0.08 to 0)
	degree (Total toe-in)	−12′ to 0

*: Fuel tank, radiator and engine oil pan all full. Spare tire, jack, hand tools, and mats in designed position.

Brake

Unit: mm (in)

Disc brake Pad repair limit		2.0 (0.079)
Rotor repair limit	AD22V	16 (0.63)
	CL11H	9.0 (0.354)
Pedal free height "h" M/T model		185 - 195 (7.28 - 7.68)
A/T model		187 - 197 (7.36 - 7.76)
Pedal depressed height [Under force of 490 N (50 kg, 110 lb) with engine running]		101 (3.98) or more
Parking brake (at pulling force: 196 N (20 kg, 44 lb)] Number of notches		7 - 8

Wheel and tire

Tire inflation

Proper tire pressures are shown on the tire placard affixed to the driver's side center pillar of vehicle.

Tire pressure needs to be checked when tires are COLD.

Wheel rim lateral and radial runout	mm (in)	Less than 0.5 (0.020)
Mechanical average between right and left radial runout	mm (in)	Less than 0.5 (0.020)*1 0.2 (0.008)*2
Wheel balance (Maximum allowable unbalance at rim flange)	gr (oz)	10 (0.35)
Tire balancing weight	gr (oz)	5 - 60 (0.18 - 2.12) Spacing 5 (0.18)

*1: Steel wheel *2: Aluminum wheel

Chassis and Body Maintenance (Cont'd)

TIGHTENING TORQUE

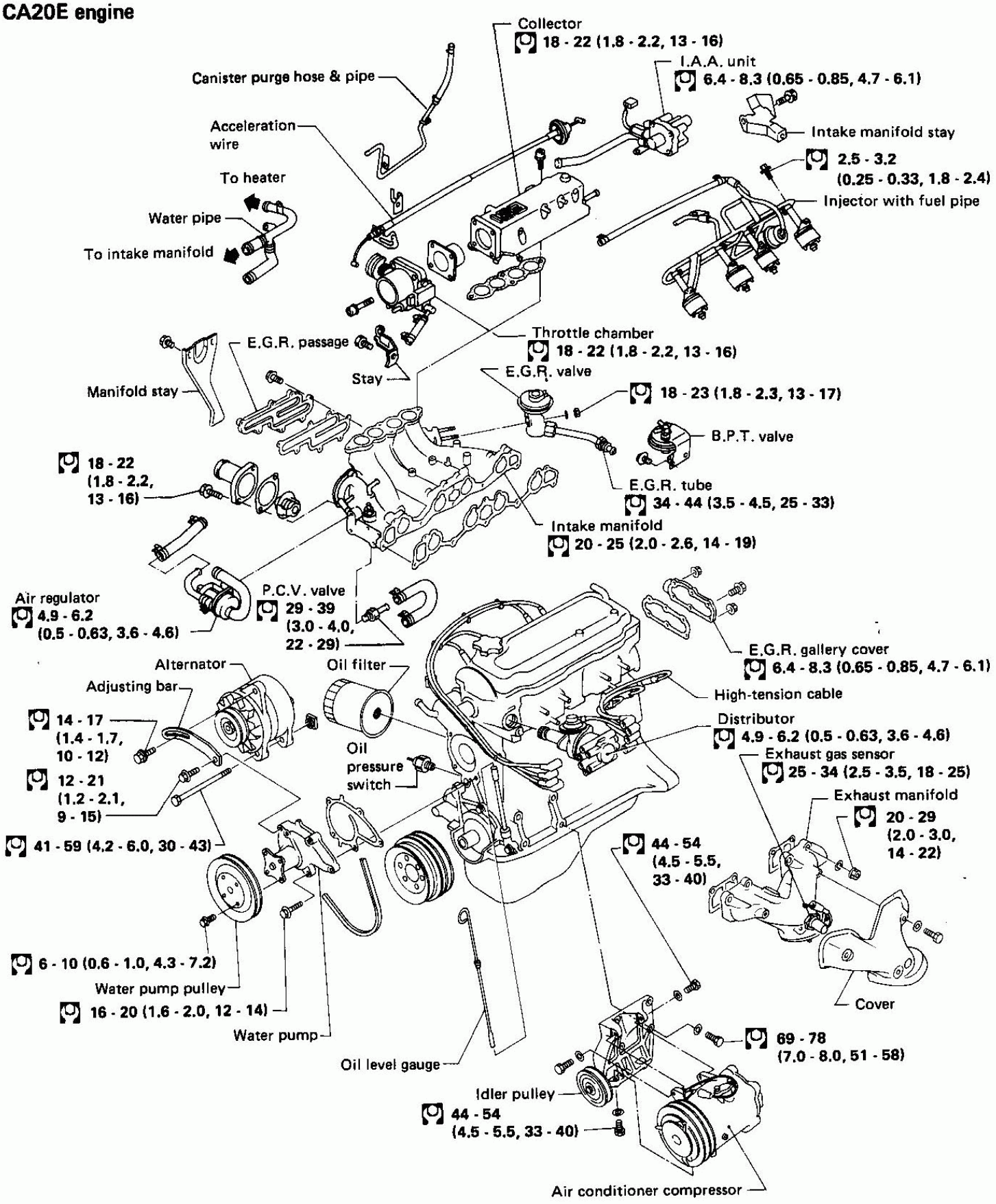
Unit	N·m	kg-m	ft-lb
Clutch			
Pedal stopper lock nut	16 - 22	1.6 - 2.2	12 - 16
Clutch switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Master cylinder push rod lock nut	8 - 11	0.8 - 1.1	5.8 - 8.0
Manual transmission			
Drain and filler plugs	25 - 34	2.5 - 3.5	18 - 25
Differential carrier			
Drain and filler plugs	39 - 59	4 - 6	29 - 43
Front axle and front suspension			
Tie-rod lock nut	78 - 98	8 - 10	58 - 72
Brake			
Air bleeder valve	7 - 9	0.7 - 0.9	5.1 - 6.5
Stop 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	78 - 98	8.0 - 10.0	58 - 72

ENGINE MECHANICAL

SECTION EM

CONTENTS

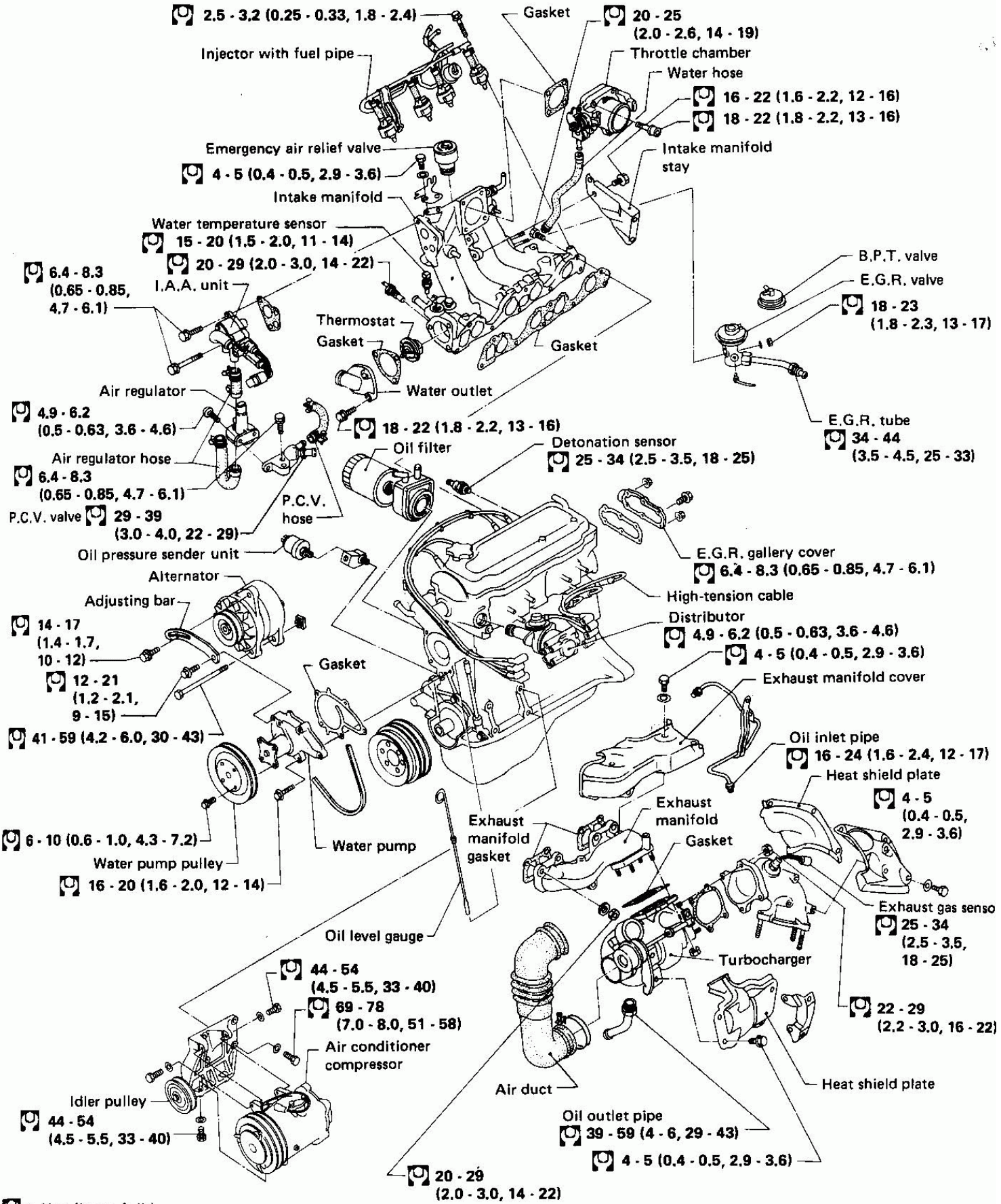
CA20E engine



: N·m (kg-m, ft-lb)

SEM775A

CA18ET engine



: N·m (kg-m, ft-lb)

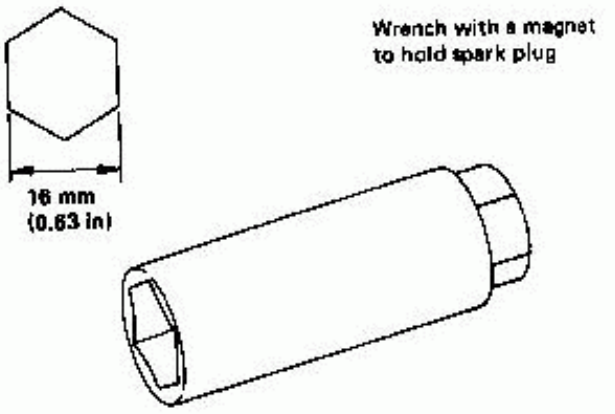
SEM776A

COMPRESSION PRESSURE

Measurement of Compression Pressure

1. Warm up engine.
2. Remove all spark plugs.

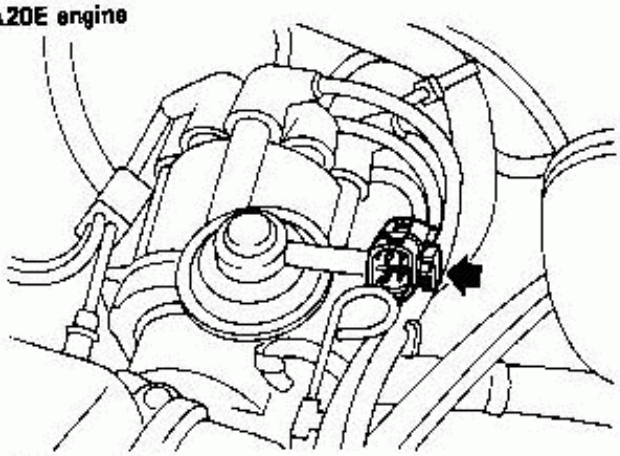
Use a suitable plug wrench shown below.



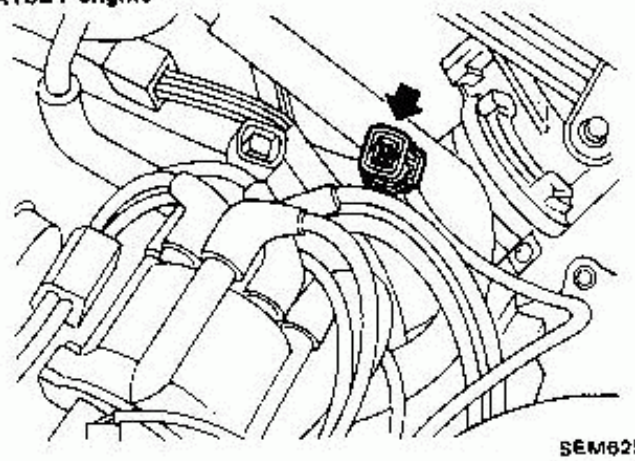
SEM294A

3. Disconnect distributor harness connector.

CA20E engine

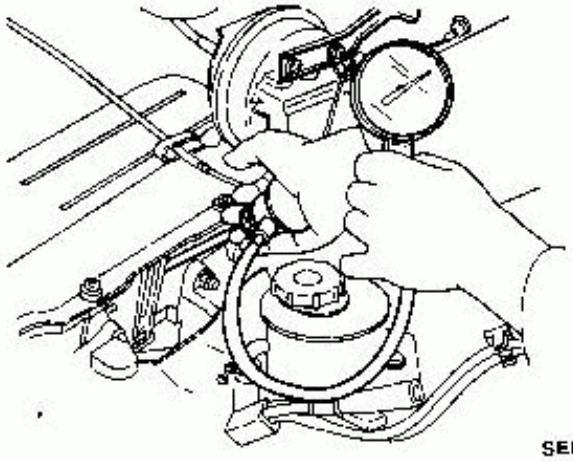


CA18ET engine



SEM625A

4. Attach a compression tester.



SEM628A

5. Depress accelerator pedal to fully open throttle.
6. Crank engine and read gauge indication of each cylinder.

Compression pressure:

kPa (kg/cm², psi) at 350 rpm

Standard

1,177 (12.0, 171)

Minimum

883 (9.0, 128)

Differential limit between cylinders:

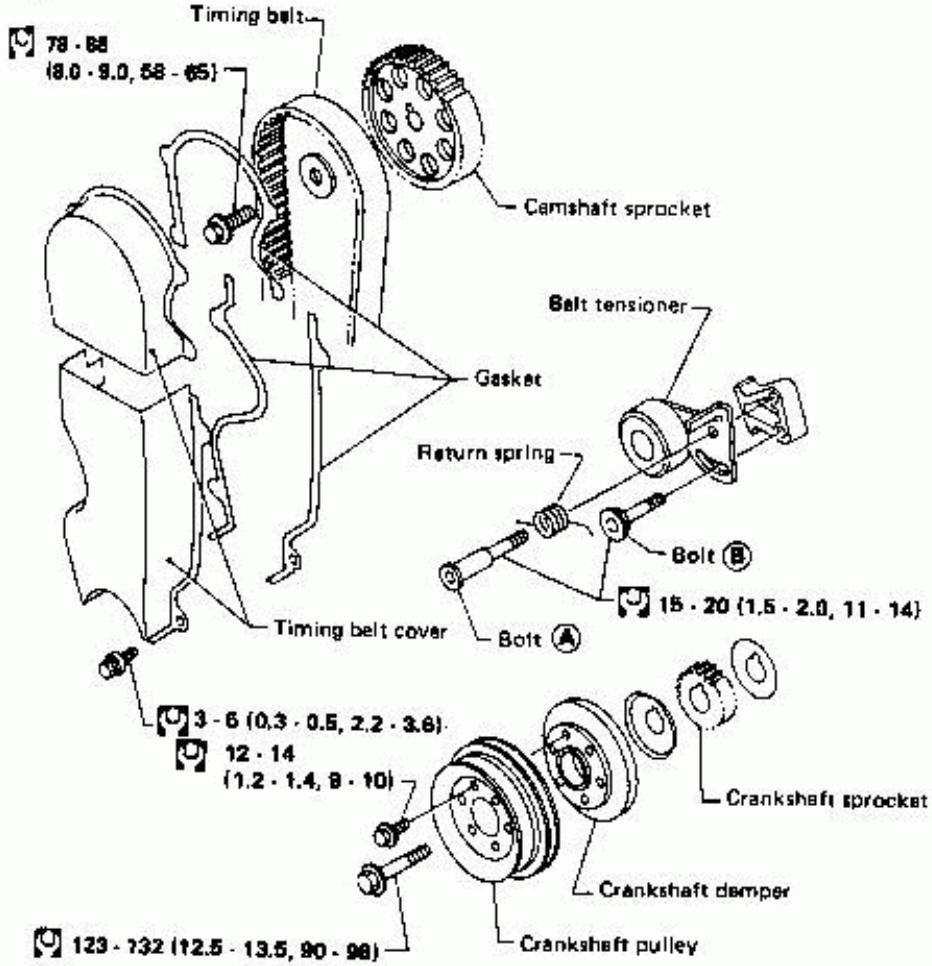
98 (1.0, 14) at 350 rpm

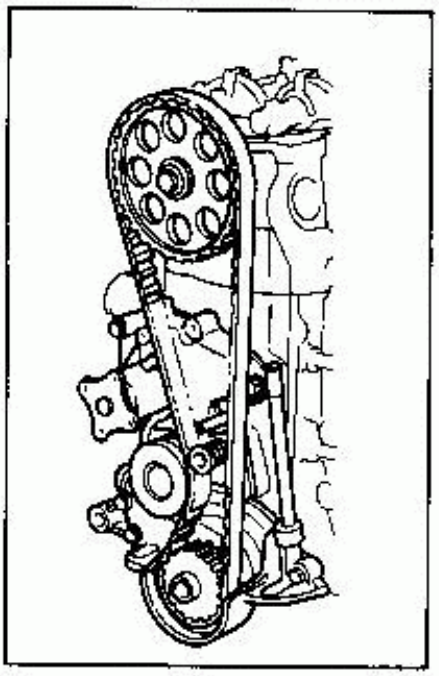
7. If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into cylinders through the spark plug holes and retest compression.

- If adding oil helps the compression pressure, chances are that piston rings are worn or damaged.
- If pressure stays low, valve may be sticking or seating improperly.
- If cylinder compression in any two adjacent cylinders is low, and if adding oil does not help the compression, there is leakage past the gasket surface.

Timing belt

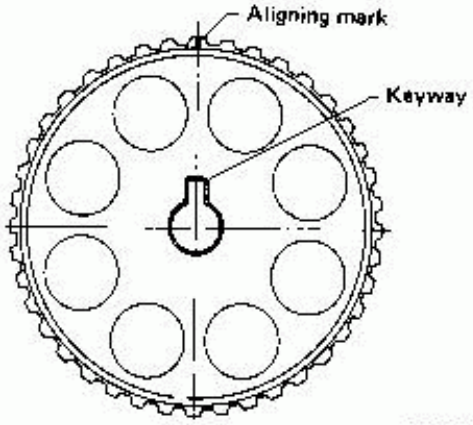
a. Do not bend or twist too tightly.
b. Ensure timing belt is clean and free from oil or water.
c. Before installing timing belt, confirm that No. 1 cylinder is set at T.D.C. on compression stroke.
d. Align arrow on timing belt forward.
e. Align white lines on timing belt with punch mark on camshaft sprocket and crankshaft sprocket.
f. Adjust belt tension with all spark plugs removed.
g. After removing timing belt, do not rotate crankshaft and camshaft separately, because valves will hit piston heads.



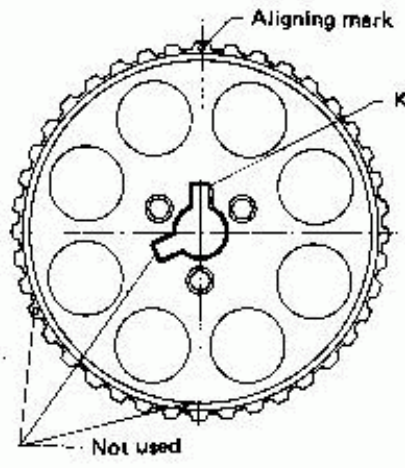


: N·m (kg-m, ft-lb)

SEM545A



SEM711A



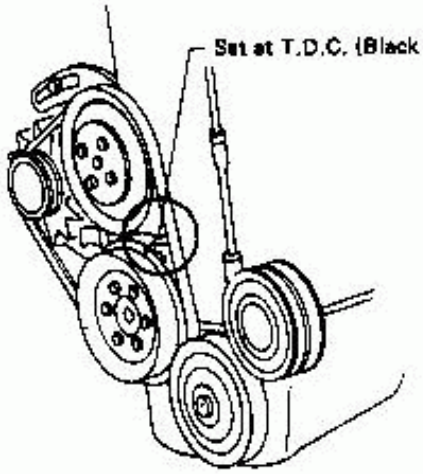
SEM712A

TIMING BELT

Removal

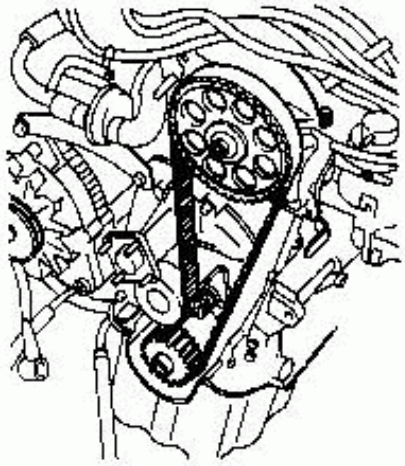
1. Remove the following parts.
- Air intake duct (CA20E engine)
- Cooling fan
- Radiator shroud
2. Remove the following belts.
- Power steering oil pump drive belt
- Compressor drive belt
- Alternator drive belt

3. Set No. 1 cylinder at T.D.C. on its compression stroke.



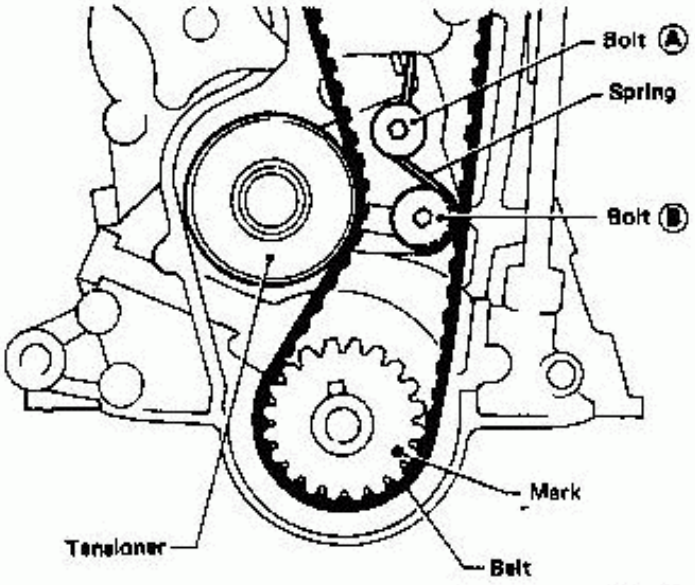
SEM584A

4. Remove front upper and lower belt covers.



SEM629A

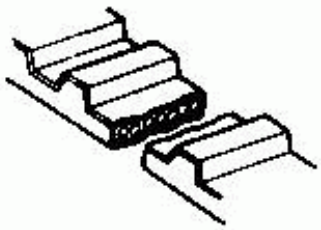
5. Loosen timing belt tensioner and return spring, then remove timing belt.



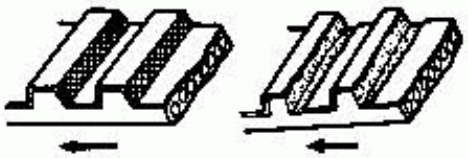
SEM625

Inspection

Visually check the condition of the timing belt.
Replace if any abnormality is found.

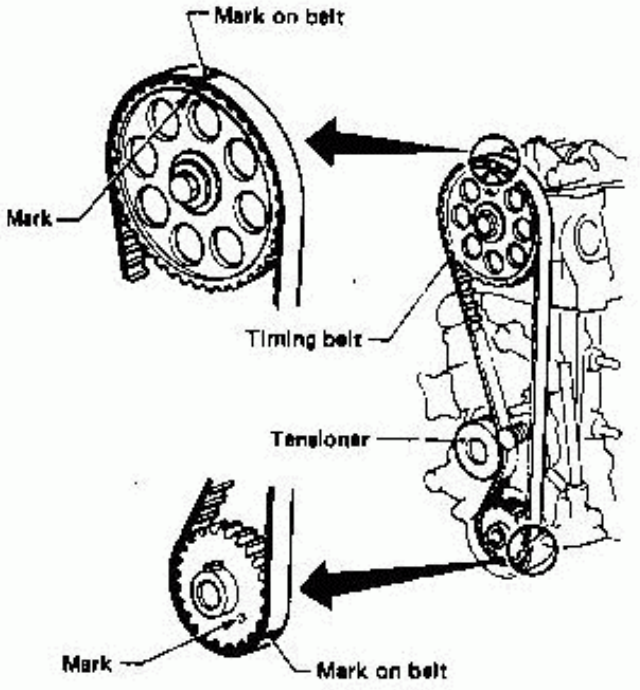
Item to check	Problem	Cause
Belt is broken.	 SEM393A	• Improper handling • Poor belt cover sealing • Coolant leakage at water pump
Tooth is broken/ tooth root is cracked.	 SEM394A	• Camshaft jamming • Distributor jamming • Oil leakage at camshaft/crankshaft oil seal
Back surface is cracked/worn.	 SEM395A	• Tensioner jamming • Overheated engine • Interference with belt cover

Inspection (Cont'd)

Item to check	Problem	Cause
Side surface is worn.	 • Side surface of belt is worn to such an extent that there is no trace of cutoff performed during manufacturing process. • Belt corners are worn and round. • Wicks are frayed and coming out. SEM396A	• Improper installation of belt • Malfunctioning crank pulley plate/timing belt plate
Teeth are worn.	 • Canvas on tooth face is worn down. • Canvas on tooth is fluffy, rubber layer is worn down and faded white, or canvas texture is unclear. SEM397A	• Poor belt cover sealing • Coolant leakage at water pump • Camshaft not functioning properly • Distributor not functioning properly • Excessive belt tension
Oil/Coolant or water is stuck to belt.		• Poor oil sealing of each oil seal • Coolant leakage at water pump • Poor belt cover sealing

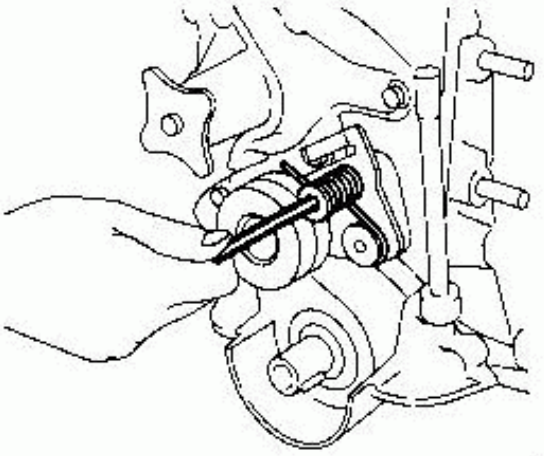
Installation

1. Confirm that No. 1 cylinder is set at T.D.C. on its compression stroke.



SEM624

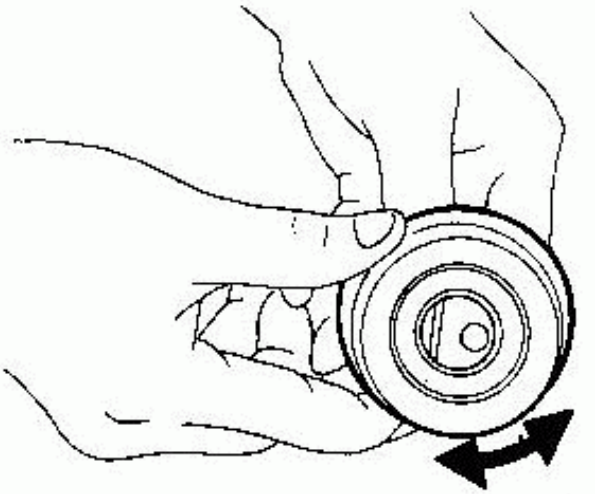
2. Install tensioner and return spring.



SEM623

If coarse stud is once removed, apply locking sealer to threads of stud before installing.

Make sure that tensioner bolts are not securely tightened before drive belt is installed.
Confirm that tensioner pulley can be rotated smoothly.



SEM688

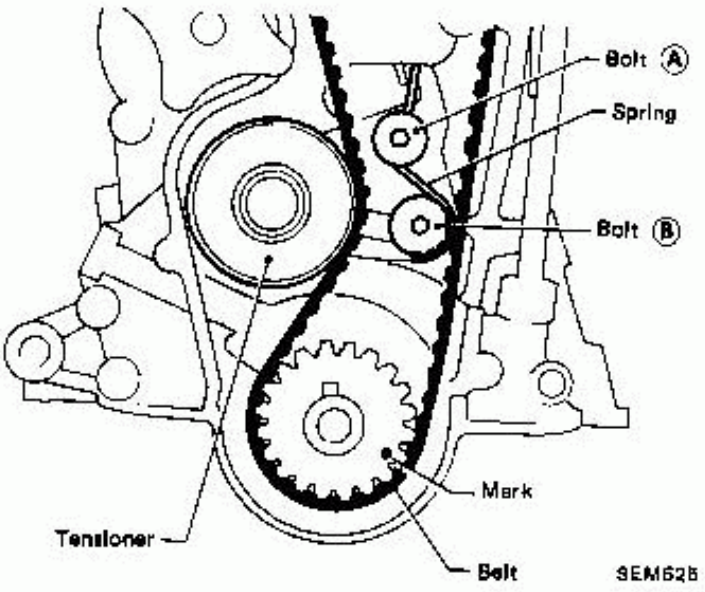
3. Set timing belt.

a. Ensure that timing belt is clean and free of oi or water. Do not bend it.

b. Align white lines on timing belt with punch mark on camshaft pulleys and crankshaft pulley.

c. Have arrow on timing belt pointing toward front belt covers.

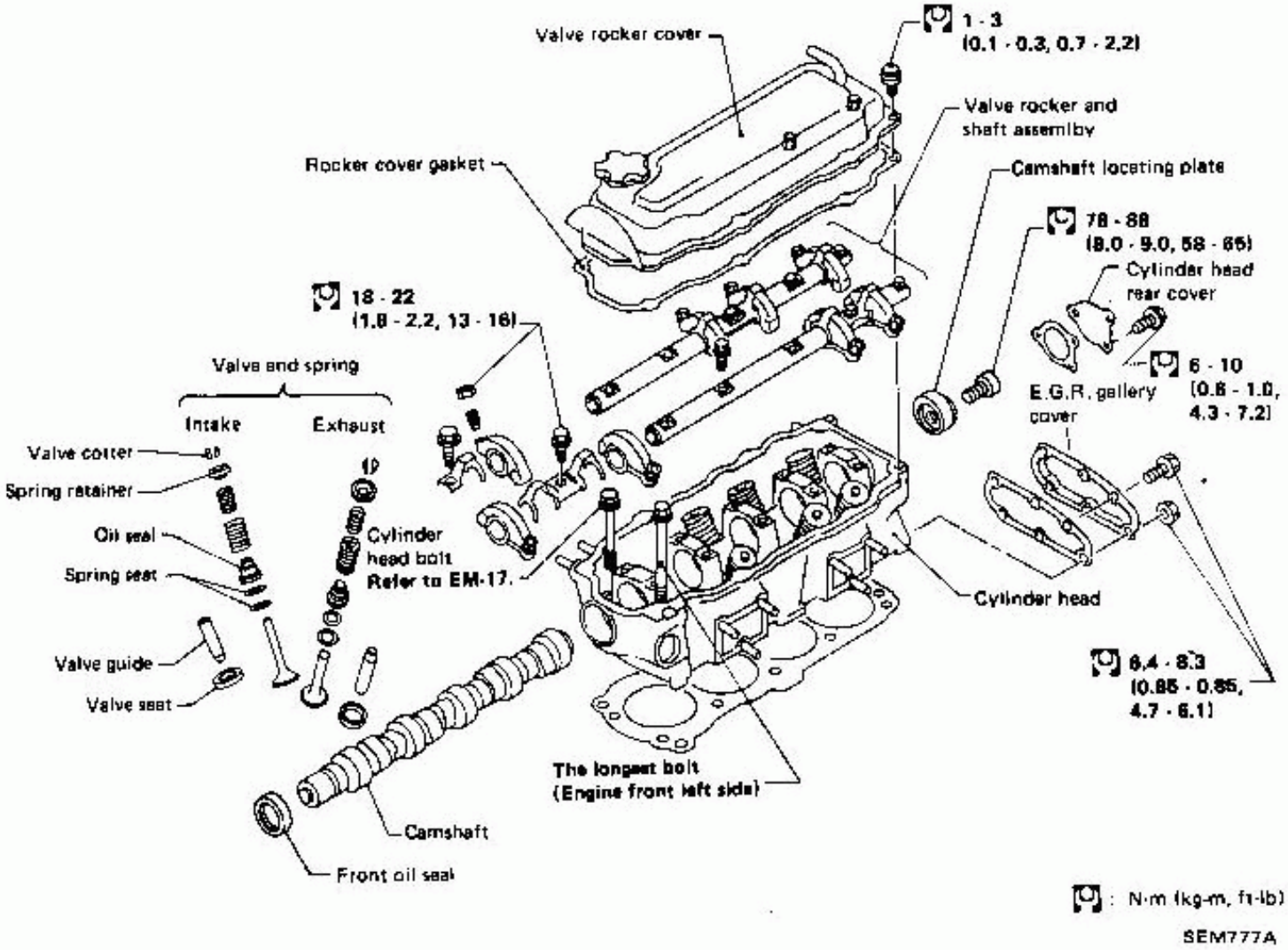
4. Tighten belt tensioner and assemble spring.



SEM625

To set spring, first hook one end on bolt Ⓑ side, then hook the other end on tensioner bracket pawl. After rotating crankshaft two turns clockwise, tighten bolt Ⓑ and then bolt Ⓐ, and belt tension will automatically be the specified value.

Ⓡ : 15 - 20 N·m (1.5 - 2.0 kg-m, 11 - 14 ft-lb)



- When installing sliding parts such as rocker arms and camshaft, be sure to apply engine oil on the sliding surfaces.
- Use new packings and oil seals.
- When installing welch plug, apply sealant.

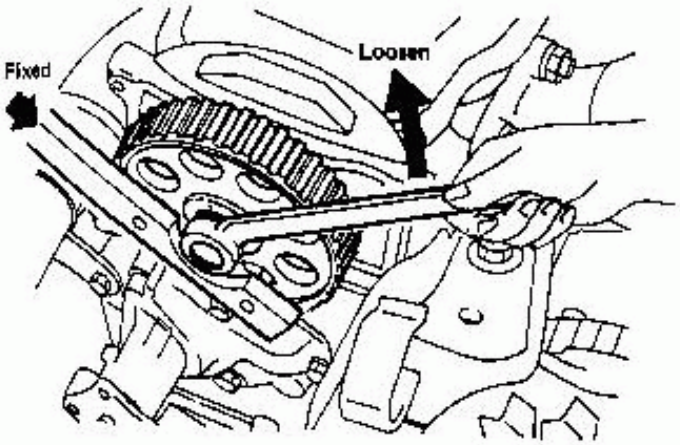
CYLINDER HEAD

Removal

1. Remove air intake pipe (CA18ET engine).
2. Remove timing belt.
   Set No. 1 cylinder at T.D.C. on its compression stroke.

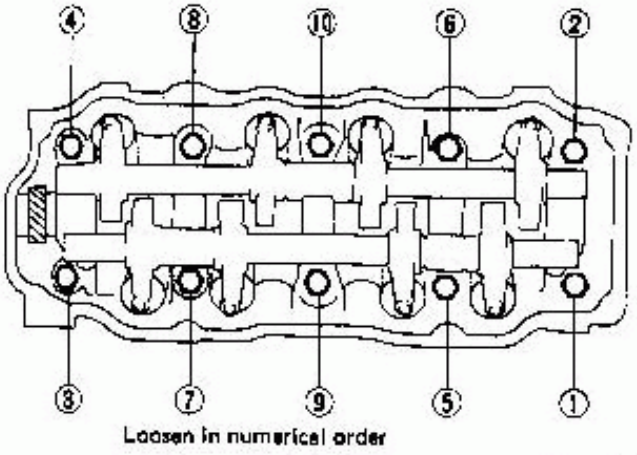
After removing timing belt, do not rotate crankshaft and camshaft separately, because valves will hit piston heads.

3. Remove camshaft pulley.



SEM583A

4. Remove cylinder head with manifolds.



SEM620A

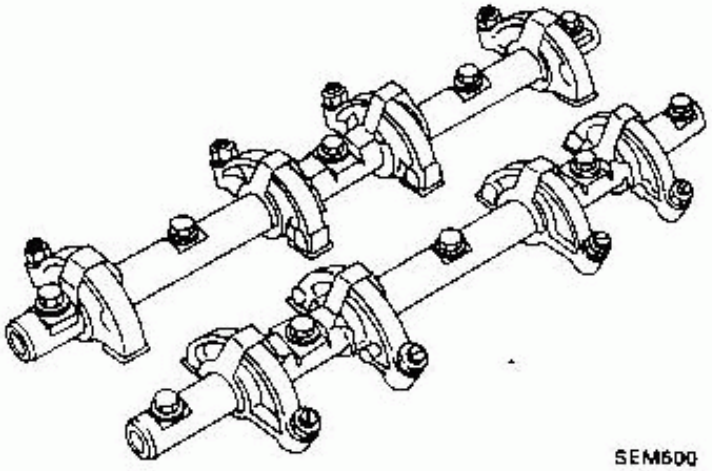
Bolts should be loosened in two or three stages.

Disassembly

1. Remove manifolds from cylinder head.
2. Remove rocker shafts with rocker arms and securing bolts.

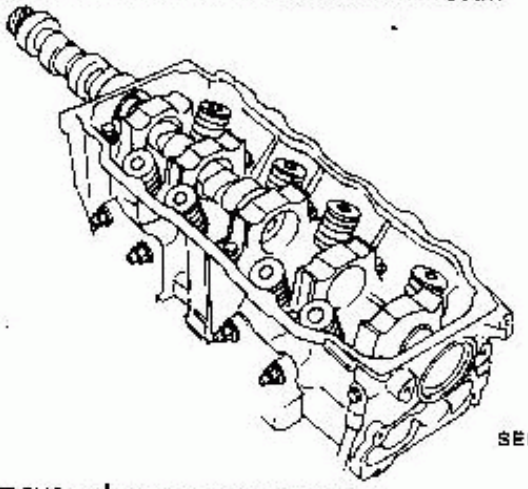
Before removal, fully loosen rocker arm adjusting screws.

The bolts should be loosened in two or three stages.



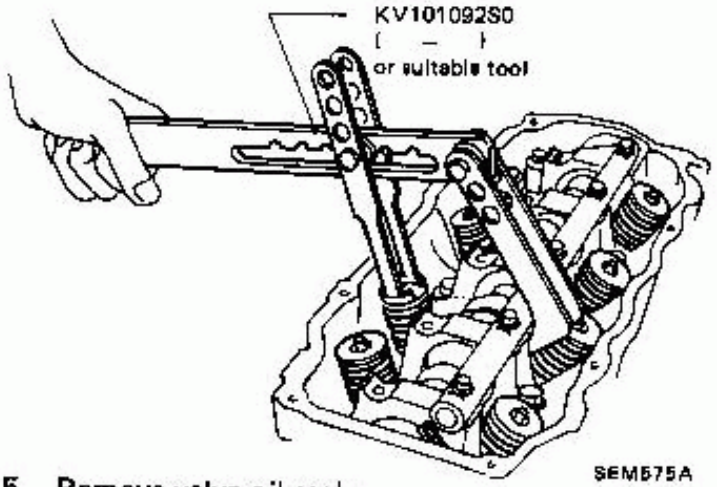
SEM600

3. Remove camshaft and camshaft oil seal.



SEM548A

4. Remove valve component parts.

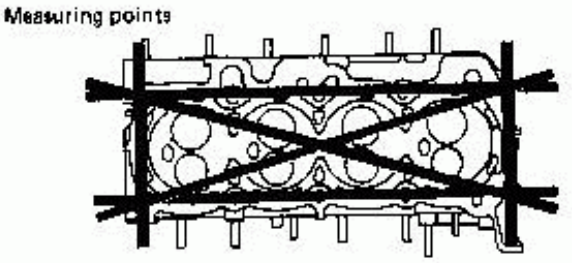


SEM575A

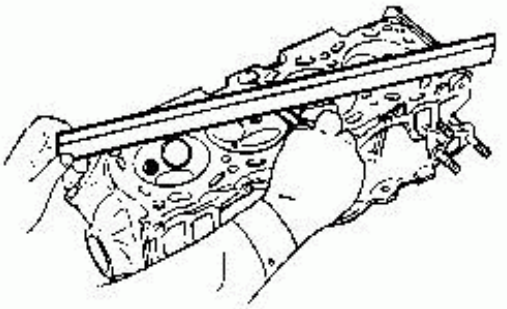
5. Remove valve oil seals.

Inspection

CYLINDER HEAD DISTORTION



Warpage of surface:
Less than 0.1 mm (0.004 in)



SEM585A

If beyond the specified limit, resurface it.

Resurfacing limit:

The resurfacing limit of cylinder head is determined by the cylinder block resurfacing in an 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)

VALVE GUIDE CLEARANCE

- **Valve guide clearance should be measured parallel with rocker arm. (Generally, a large amount of wear occurs in this direction.)**

  Stem to guide clearance:

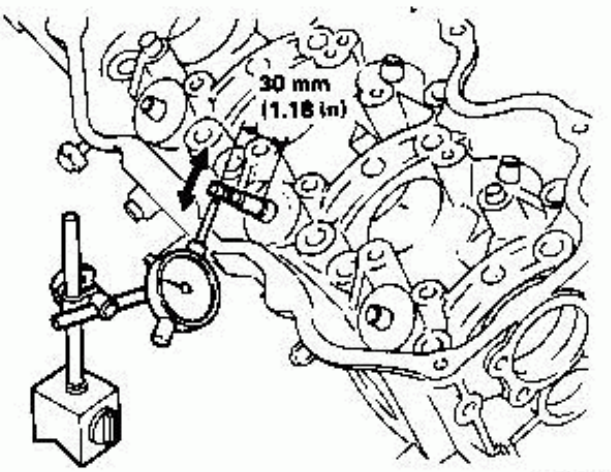
  Maximum limit

  0.10 mm (0.0039 in)

  Maximum allowable deflection

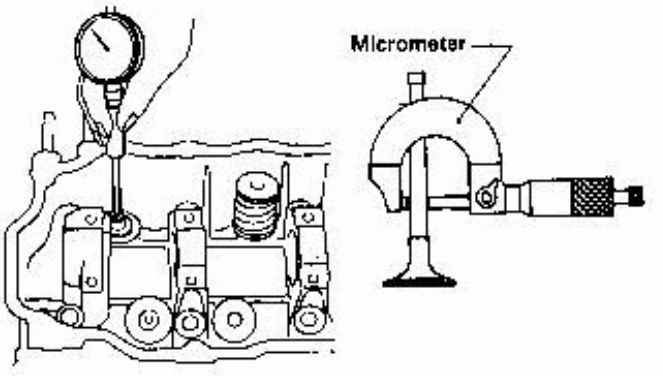
  (Dial indicator reading)

  0.2 mm (0.008 in)



SEM263A

- **To determine the correct replacement part, measure valve stem diameter and valve guide bore.**



SEM653A

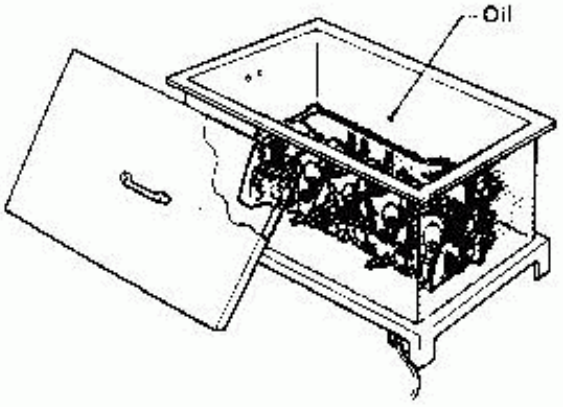
Refer to S.D.S.

Inspection (Cont'd)

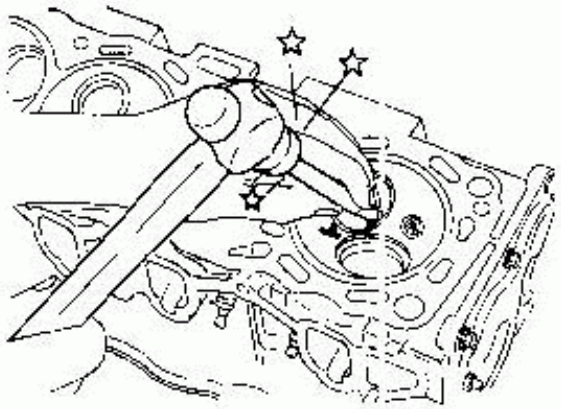
Replacement

Replace valve and/or valve guide.

1. To remove valve guide heat cylinder head to 150 to 160°C (302 to 320°F) and drive out valve guide with a press [under a 20 kN (2t, 2.2 US ton, 2.0 Imp ton) pressure] or hammer, and suitable tool.



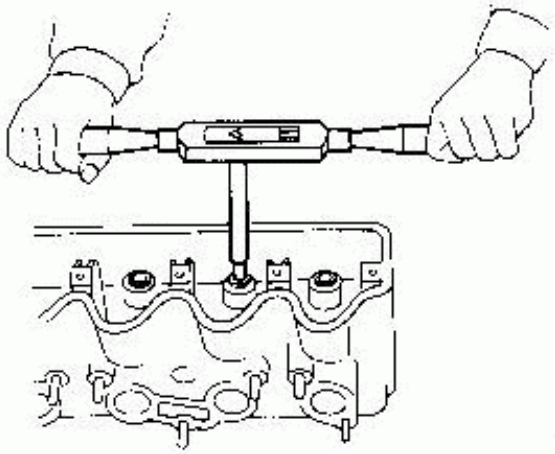
SEM008A



SEM696A

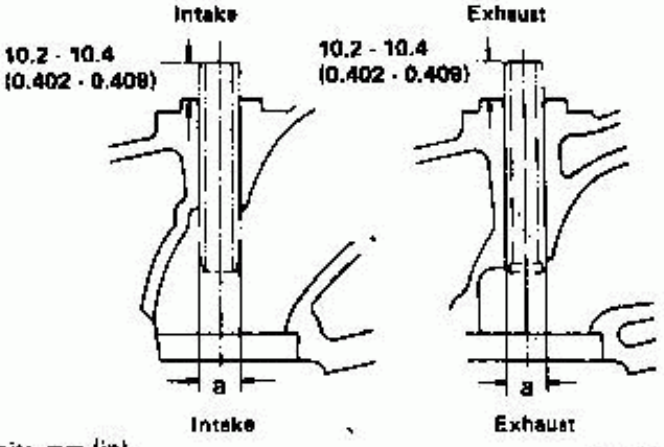
2. Ream cylinder head valve guide hole.

Refer to S.D.S.



SEM641

3. Heat cylinder head to 150 to 160°C (302 to 320°F) and press service valve guide into cylinder head.



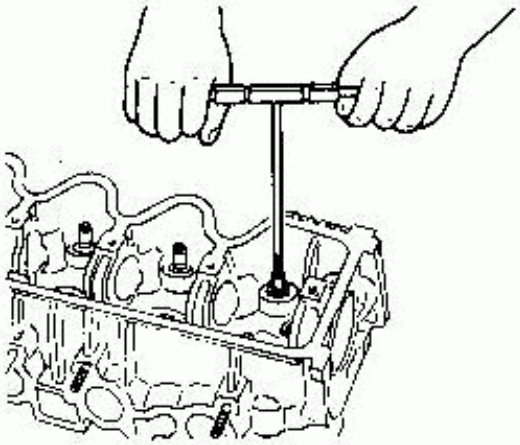
Unit: mm (in)

EM118

4. Ream valve guide.

Finished size: mm (in)

7.000 - 7.018 (0.2756 - 0.2763)



SEM007A

VALVE INSERTS

Check valve inserts for any evidence of pitting at valve contact surface, and reseat or replace if worn out excessively.

- **When repairing valve inserts, check valve and valve guide for wear beforehand. If worn, replace them. Then correct valve seat.**
- **The cutting should be done with both hands for uniform cutting.**

Inspection (Cont'd)

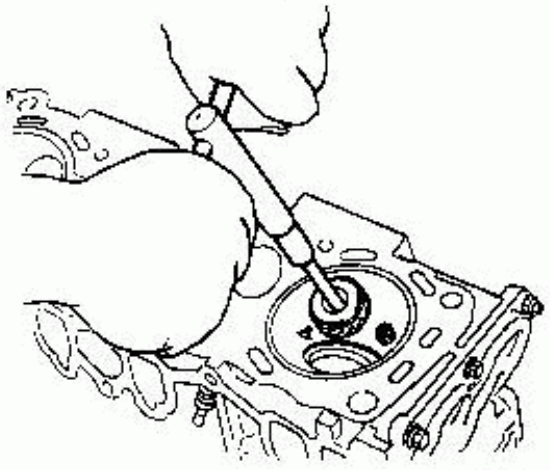
Replacement

If necessary, replace valve inserts as follows:

1. After removing valve insert, ream the cylinder head recess.

   Finished size:
   Refer to S.D.S.

2. Heat cylinder head to a temperature of 150 to 160°C (302 to 320°F).
3. Press fit insert until it seats on the bottom, and caulk more than 4 points.
4. Cut or grind valve inserts using suitable tool at the specified dimensions as shown in S.D.S.



SEM597A

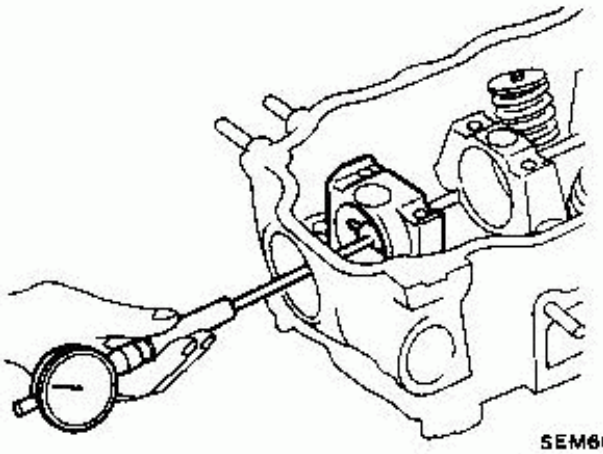
5. After cutting, lap valve inserts with a lapping compound.
6. Check contact condition of valve inserts.

CAMSHAFT VISUAL CHECK

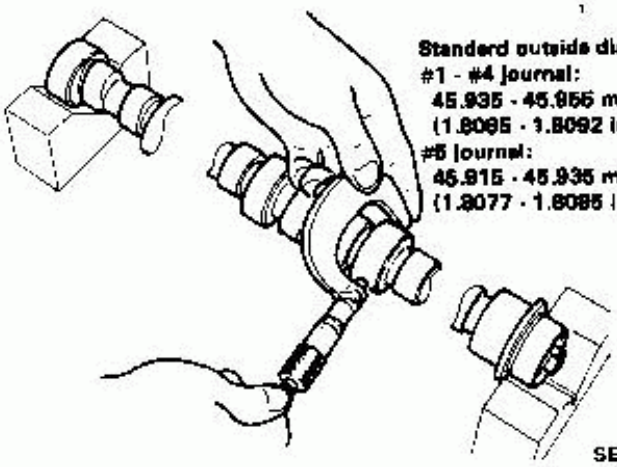
Check camshaft for scratches and seizure.

CAMSHAFT JOURNAL CLEARANCE

Maximum clearance:
0.1 mm (0.004 in)



SEM603

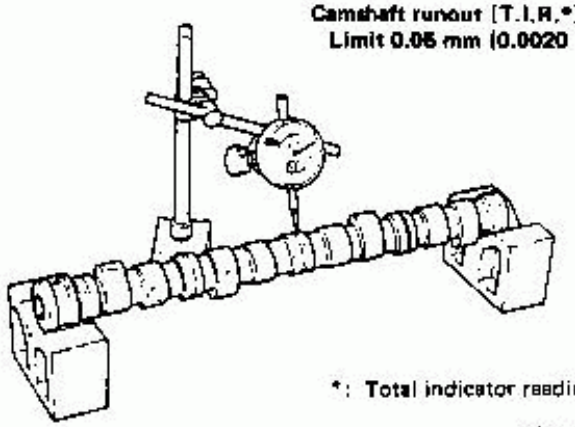


Standard outside diameter
#1 - #4 journal:
45.935 - 45.955 mm
(1.8085 - 1.8092 in)
#5 journal:
45.915 - 45.935 mm
(1.8077 - 1.8085 in)

SEM012A

CAMSHAFT RUNOUT

Camshaft runout [T.I.R.*]:
Limit 0.06 mm (0.0020 in)

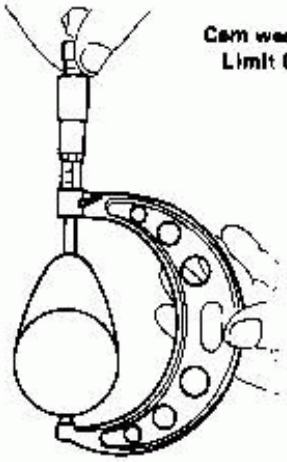


*: Total indicator reading

SEM166

Inspection (Cont'd)

CAMSHAFT CAM HEIGHT



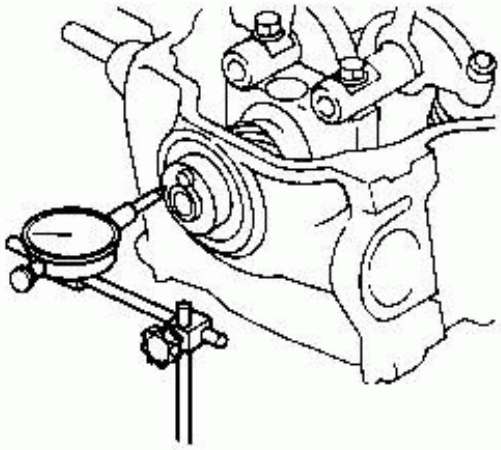
SEM649A

Refer to S.D.S.

CAMSHAFT END PLAY

1. Install locate plate.
2. Measure camshaft end play.

Camshaft end play:
Limit 0.2 mm (0.008 in)



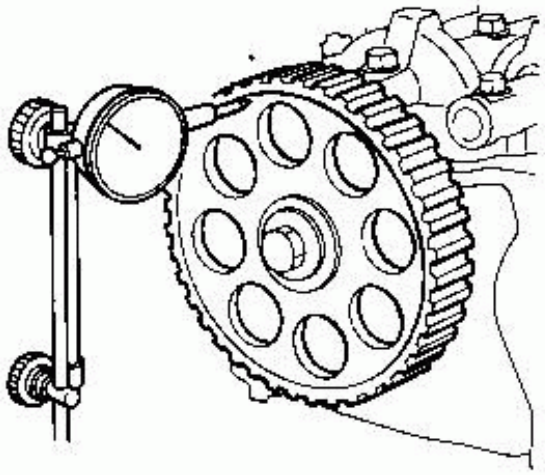
SEM650A

CAMSHAFT SPROCKET RUNOUT

Install sprocket on camshaft and check for runout.

If runout exceeds the specified limit, replace camshaft sprocket.

Runout:
(Total indicator reading)
Limit 0.1 mm (0.004 in)

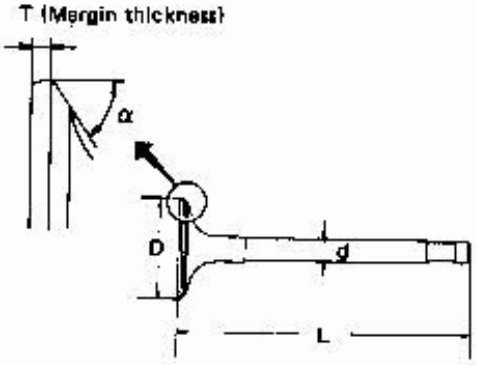


SEM609

VALVE DIMENSIONS

Check dimensions in each valve. For dimensions, refer to S.D.S.

When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace the valve.
Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.



SEM188A

Inspection (Cont'd)

VALVE SPRING SQUARENESS

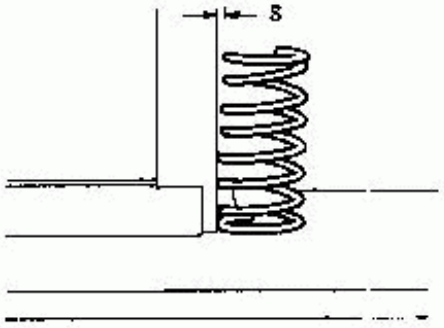
Out of square:

Outer

Less than 2.2 mm (0.087 in)

Inner

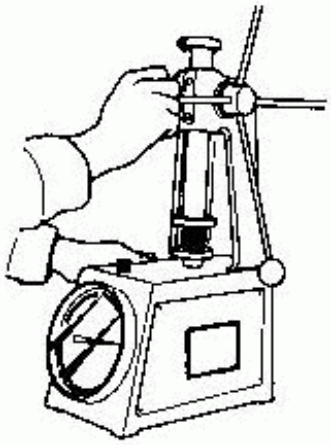
Less than 1.9 mm (0.075 in)



SEM288A

VALVE SPRING PRESSURE LOAD

Refer to S.D.S.



EM113

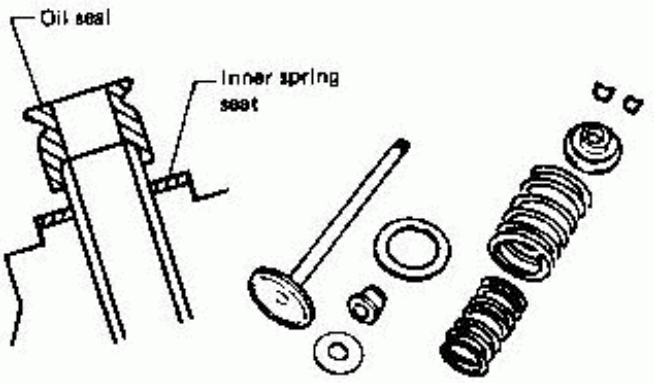
ROCKER SHAFT AND ROCKER ARM

Check rocker shafts and rocker arms for scratches, seizure and wear.

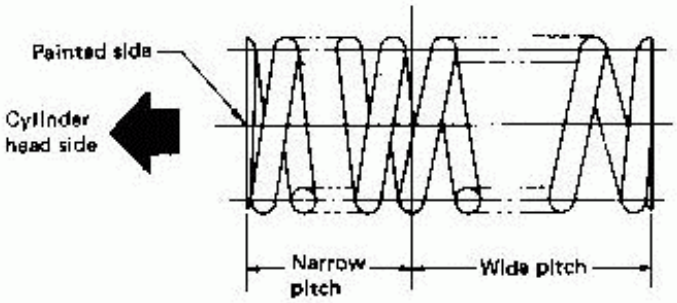
Assembly

1. Install valve component parts.

- Always use new valve oil seal. (Refer to EM-21.)
- Before installing valve oil seal, install inner valve spring seat.
- Install outer valve spring (uneven pitch type) with its narrow pitch side toward cylinder head side.



SEM622



SEM202

2. Install camshaft.
3. Install camshaft locate plate.

: **Locate plate bolt:**
78 - 88 N·m
(8.0 - 9.0 kg-m, 58 - 65 ft-lb)

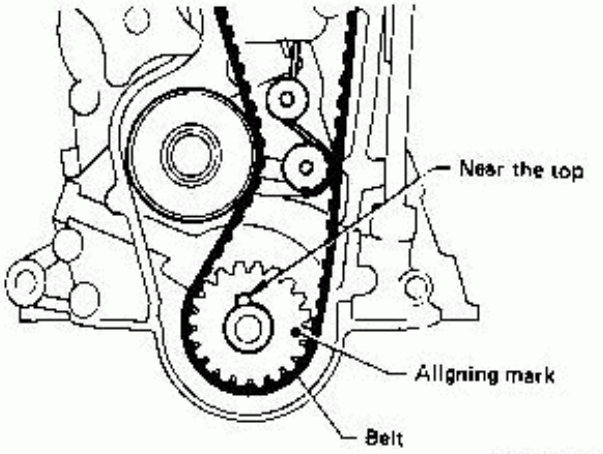
4. Apply engine oil to camshaft oil seal and install it in place.

Always use new camshaft oil seal.

Installation

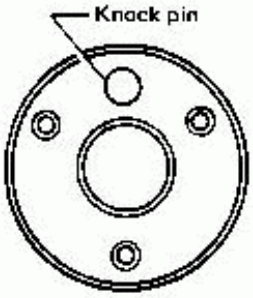
1. Set No. 1 cylinder at T.D.C. on its compression stroke as follows:

(1) Set crankshaft key near to the top.



SEM552A

(2) Set camshaft pin on the top.



SEM995

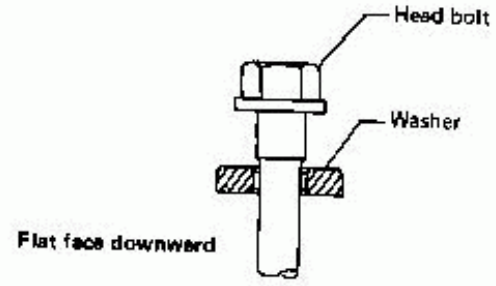
Do not rotate crankshaft and camshaft separately, because valves will hit piston heads.

2. Install cylinder head with new gasket.

Be sure to install washers between bolts and head.

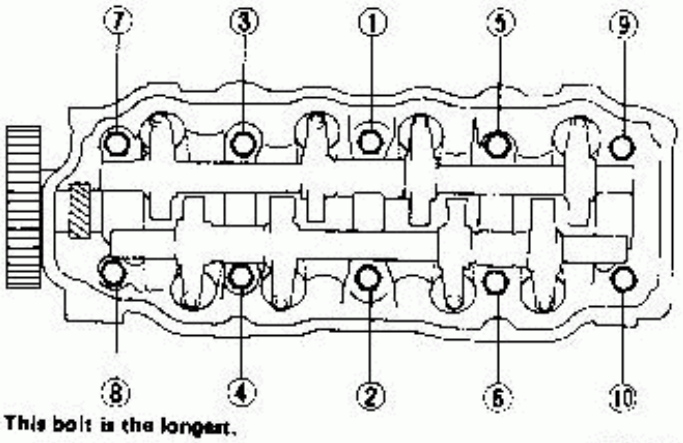
3. Tighten cylinder head bolts.

Tighten cylinder head bolts to the specified torque, referring to the procedures below.



SEM654A

a. Tightening order



SEM627

b. Tightening procedure

(1) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).

(2) Tighten all bolts to 78 N·m (8.0 kg-m, 58 ft-lb).

(3) Loosen all bolts completely.

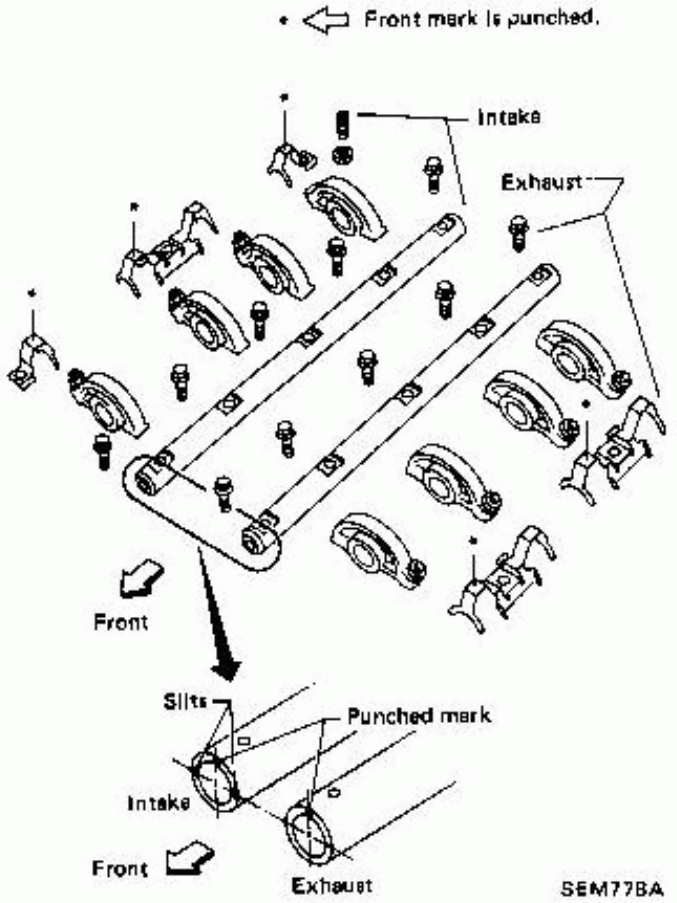
(4) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).

(5) Tighten all bolts to 74 to 83 N·m (7.5 to 8.5 kg-m, 54 to 61 ft-lb) or if you have an angle wrench, turn bolt ⑧ 83 to 88 degrees and the other bolts 75 to 80 degrees clockwise.

Installation (Cont'd)

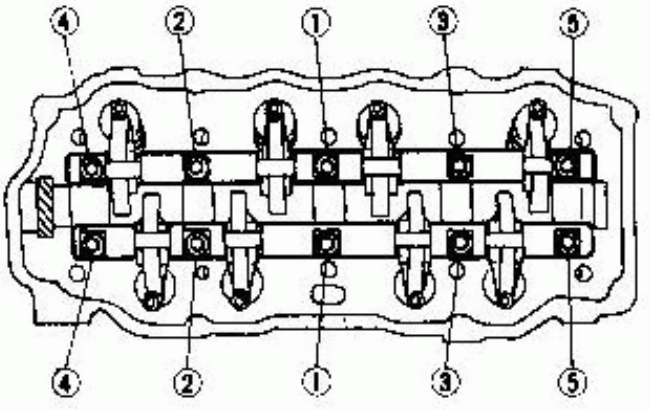
4. Install rocker shaft with rocker arms.

To prevent rocker shaft springs from slipping out of rocker shafts, insert bracket bolts into shaft.



5. Tighten rocker shaft bolts.

- **Tighten bolts gradually, in two or three stages outwardly from center position.**
- **Make sure that rocker arm adjusting screw is fully loosened.**



: 18 - 22 N·m
(1.8 - 2.2 kg-m, 13 - 16 ft-lb)

6. Adjust valve clearance.

Valve clearance

Unit: mm (in)

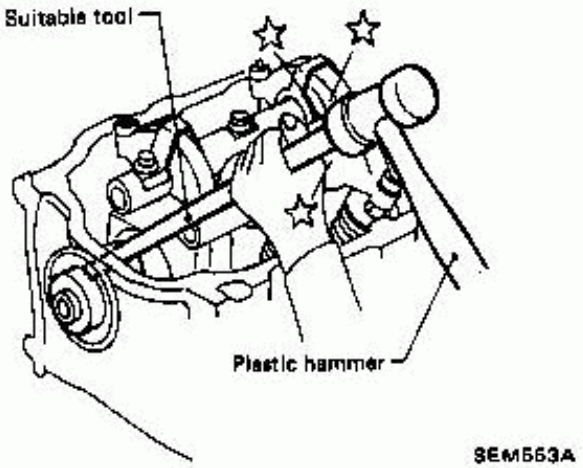
	COLD*	HOT
Intake	0.21 (0.008)	0.30 (0.012)
Exhaust	0.23 (0.009)	0.30 (0.012)

*: At temperature 20°C (68°F)

OIL SEAL REPLACEMENT

Replacement of Camshaft Oil Seal

1. Remove timing belt and camshaft sprocket.
2. Remove camshaft oil seal.



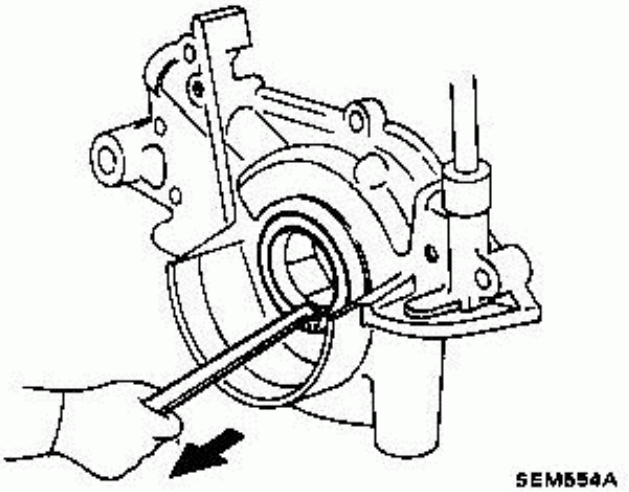
SEM553A

Be careful not to scratch camshaft.

3. Apply engine oil to camshaft oil seal and install it in place.

Replacement of Crankshaft Front Oil Seal

1. Remove oil pump assembly.
2. Remove crankshaft oil seal.

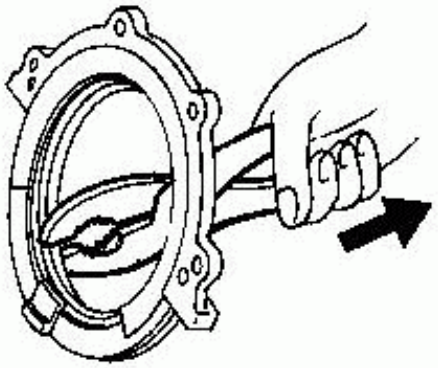


SEM554A

3. Apply engine oil to oil seal and install it in place.

Replacement of Crankshaft Rear Oil Seal

1. Remove flywheel and rear oil seal retainer.
2. Remove rear oil seal from the retainer.

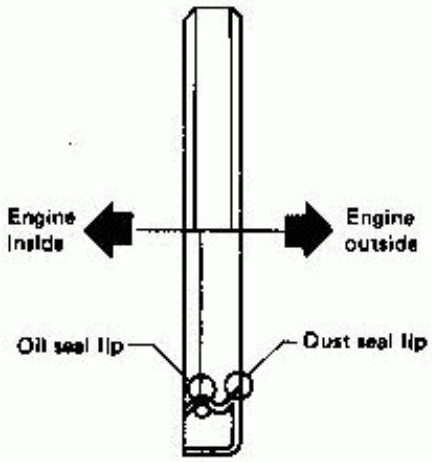


SEM555A

3. Apply engine oil to oil seal and install it in place.
4. Install rear oil seal retainer with gasket.

: 4 - 6 N·m
(0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)

Oil Seal Installing Direction

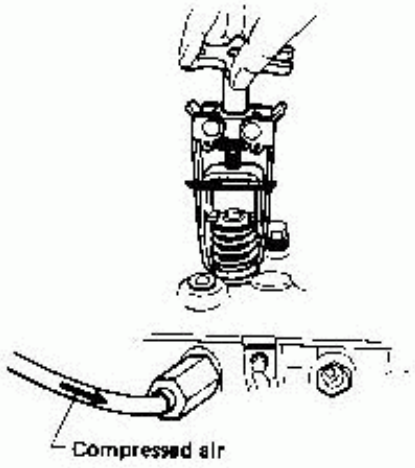


SEM715A

Replacement of Valve Oil Seal

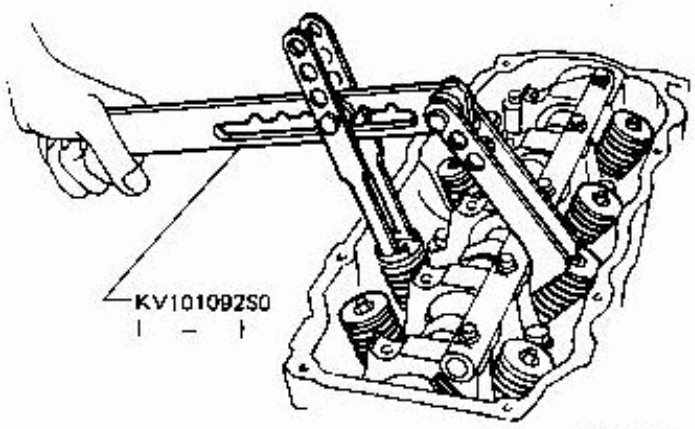
1. Remove rocker cover.
2. Remove rocker shaft assembly.
3. Remove spark plug.
4. Install air hose adapter into spark plug hole and apply air pressure to hold valves in place [Apply pressure of 490 kPa {5 kg/cm², 71 psi}].

When performing this operation piston should be set at T.D.C.



SEM254

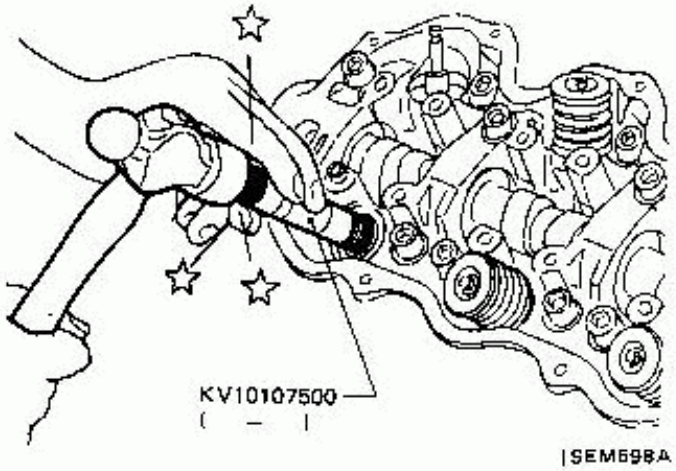
5. Remove valve spring and valve oil seal.



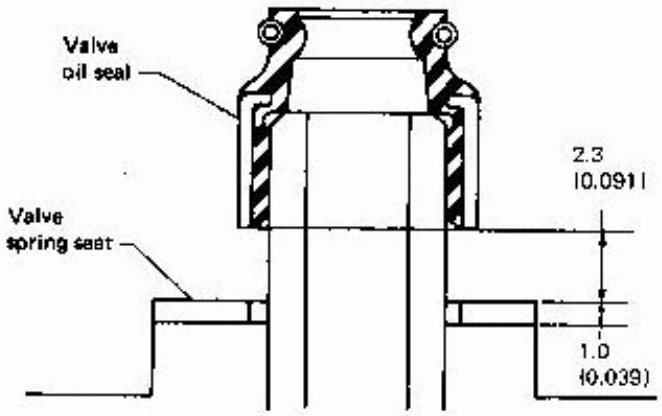
SEM575A

6. Apply engine oil to valve oil seal and install it in place.

Before installing valve oil seal, install valve spring seat.

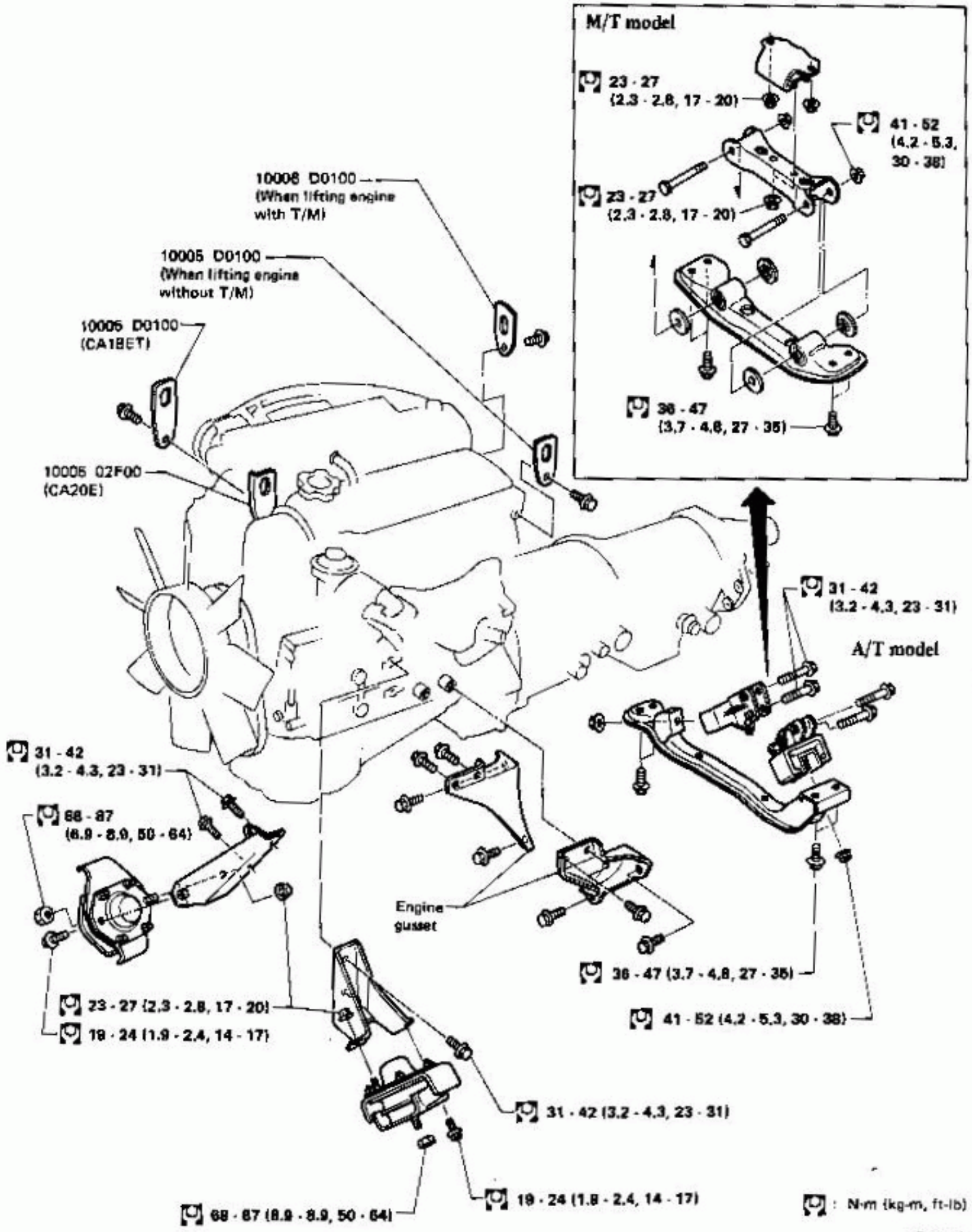


SEM698A



Unit: mm (in)

SEM287A

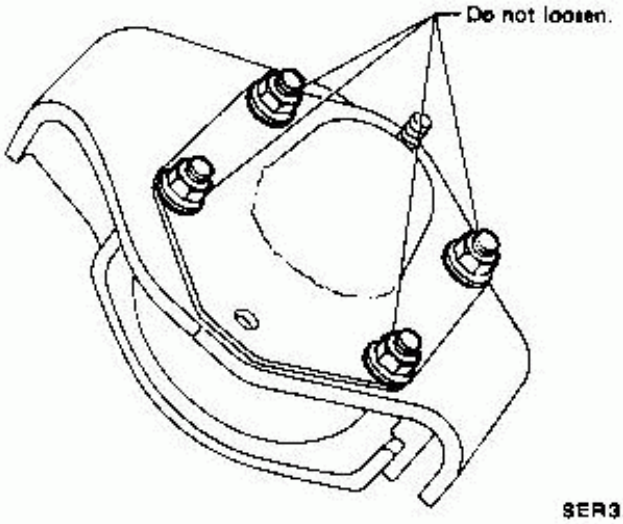

M/T model
23 - 27 (2.3 - 2.8, 17 - 20)
41 - 52 (4.2 - 5.3, 30 - 38)
23 - 27 (2.3 - 2.8, 17 - 20)
36 - 47 (3.7 - 4.8, 27 - 35)
10006 D0100 (When lifting engine with T/M)
10005 D0100 (When lifting engine without T/M)
10005 D0100 (CA18ET)
10005 02F00 (CA20E)
31 - 42 (3.2 - 4.3, 23 - 31)
A/T model
31 - 42 (3.2 - 4.3, 23 - 31)
68 - 87 (6.9 - 8.9, 50 - 64)
Engine gusset
36 - 47 (3.7 - 4.8, 27 - 35)
41 - 52 (4.2 - 5.3, 30 - 38)
23 - 27 (2.3 - 2.8, 17 - 20)
19 - 24 (1.9 - 2.4, 14 - 17)
31 - 42 (3.2 - 4.3, 23 - 31)
19 - 24 (1.8 - 2.4, 14 - 17)
68 - 87 (6.9 - 8.9, 50 - 64)
: N·m (kg-m, ft-lb)
SER311

WARNING:

a. Situate vehicle on as flat and solid a surface as possible.
b. Place chocks at front and rear of rear wheels.
c. You should not remove engine until exhaust system has completely cooled off.
   Otherwise, you may burn yourself and/or fire may break out in the fuel line.
d. For safety during subsequent steps, the tension of wires or chains should be slackened against the engine.

CAUTION:

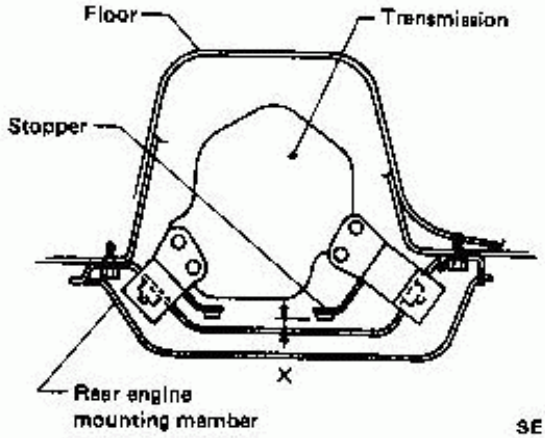
a. Before disconnecting fuel hose, release fuel pressure from fuel line. Refer to the "Releasing Fuel Pressure" in section EF.
b. In lifting engine, be careful not to hit it against adjacent parts, especially against brake tube and brake master cylinder.
c. Do not loosen front engine mounting insulator cover securing nuts.
   When cover is removed, damper oil flows out and mounting insulator will not function.



SER312

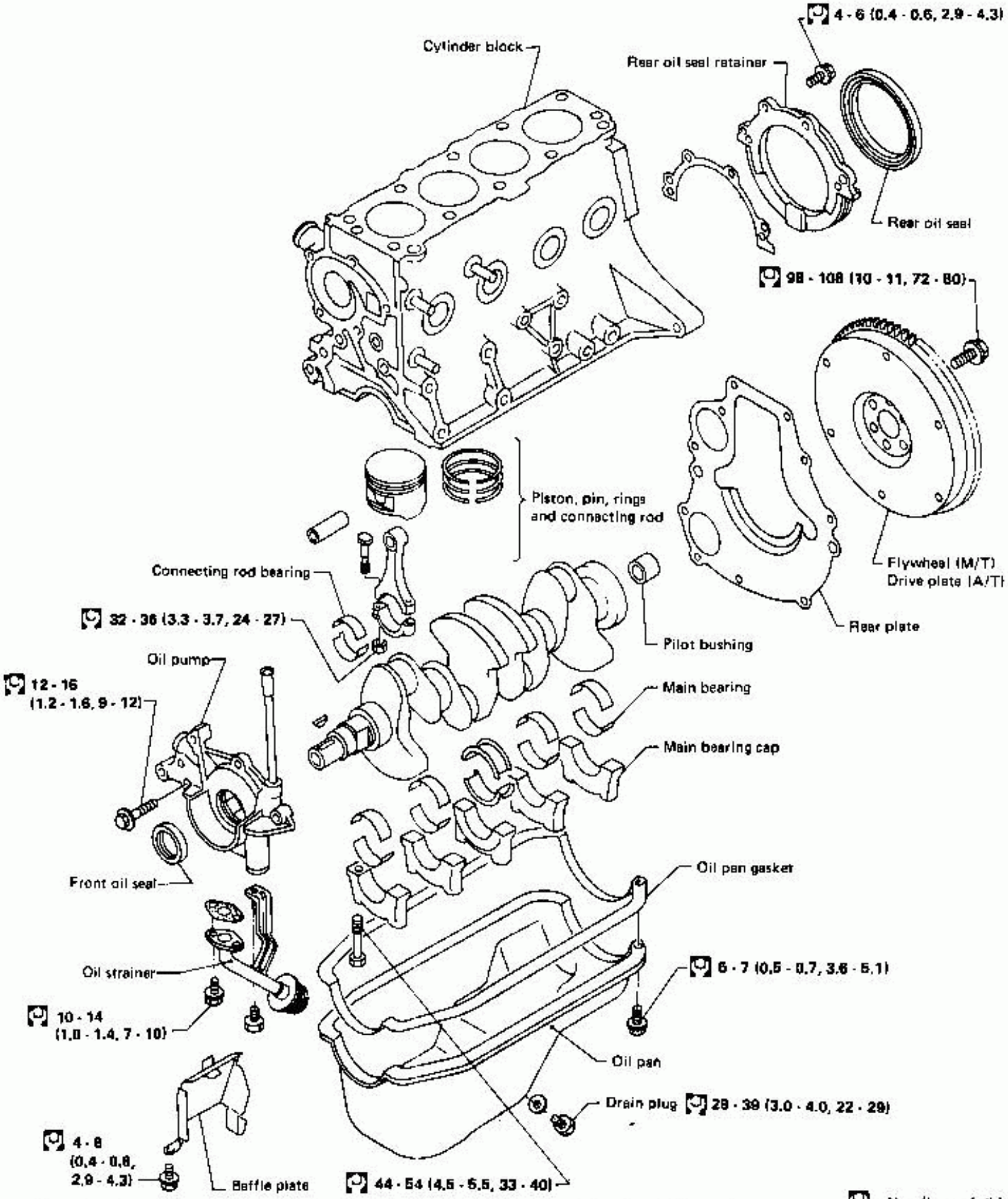
Adjusting Rear Mounting Insulator (Automatic transmission)

Adjust rear mounting stopper clearance "X" to 13±1.5 mm (0.51±0.059 in).



SER313

Cylinder Block, Crankshaft and Piston



: N·m (kg-m, ft-lb)

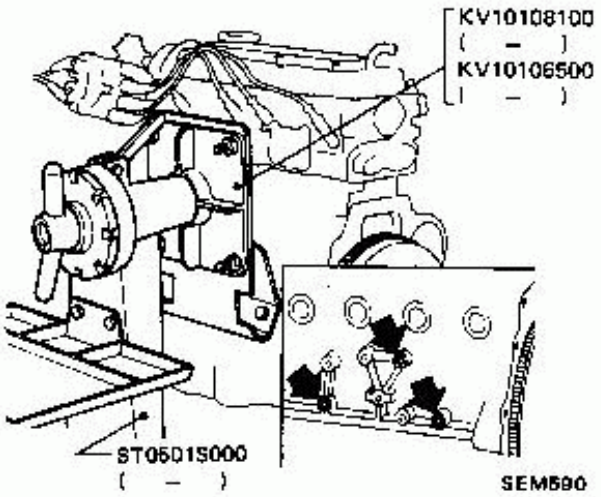
SEM639A

- When installing sliding parts such as bearings, be sure to apply engine oil on the sliding surfaces.
- Always use new gaskets, oil seals and brazen washer.

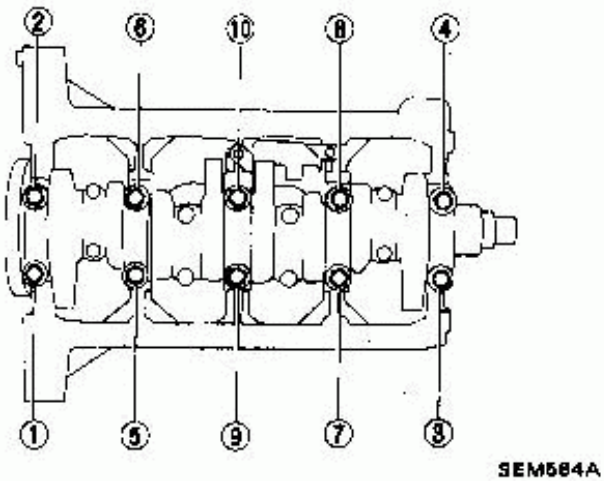
Disassembly

PISTON AND CRANKSHAFT

1. Place engine on work stand.



2. Drain coolant and oil.
3. Remove timing belt.
4. Remove water pump.
5. Remove oil pan and oil pump.
6. Remove cylinder head.
7. Remove pistons.
8. Remove bearing cap and crankshaft.



Place the bearings and caps in their proper order.
Upper bearings (Cylinder block side) have oil groove.

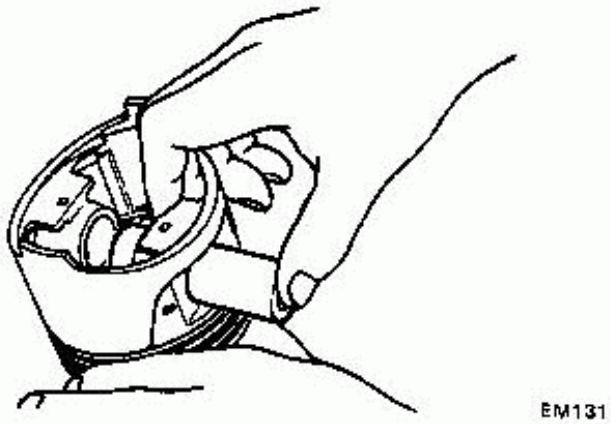
Inspection

PISTON AND PISTON PIN CLEARANCE

- Confirm the fitting of piston pin into piston pin hole to such an extent that it can be pressed smoothly by finger at room temperature.

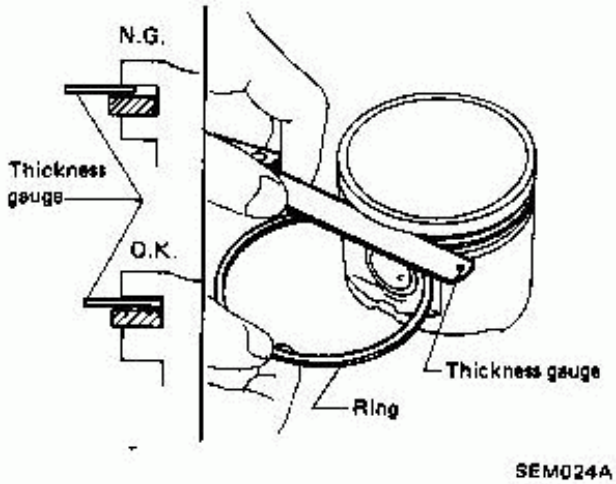
Piston pin to piston clearance:
0.008 - 0.012 mm (0.0003 - 0.0005 in)

Apply engine oil to piston pin.



PISTON RING SIDE CLEARANCE

Max. limit of side clearance (Top and 2nd rings):
0.1 mm (0.004 in)



Standard side clearance:
Top
0.040 - 0.073 mm (0.0016 - 0.0029 in)
2nd
0.030 - 0.063 mm (0.0012 - 0.0025 in)

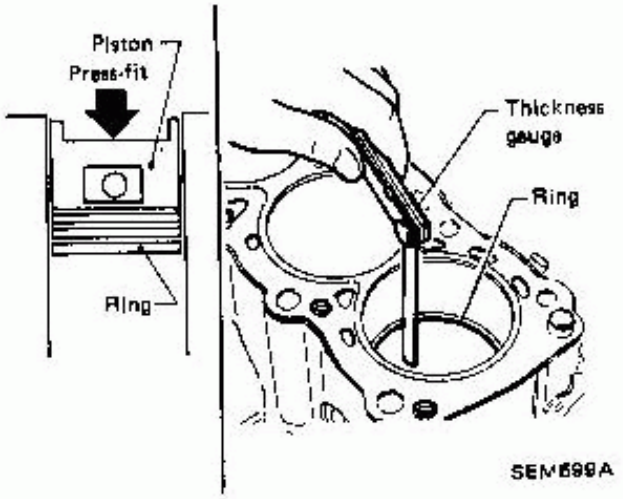
Inspection (Cont'd)

PISTON RING GAP

Max. limit of ring gap:
1.0 mm (0.039 in)

Standard ring gap mm (in):
Top ring (CA20E engine)
0.25 - 0.51 (0.0098 - 0.0201)
Top ring (CA18ET engine)
No. 1 and 2 grade*
0.25 - 0.38 (0.0098 - 0.0150)
No. 3, 4 and 5 grade*
0.28 - 0.42 (0.0110 - 0.0165)
2nd ring
0.15 - 0.31 (0.0059 - 0.0122)
Oil ring (Rail ring)
0.20 - 0.76 (0.0079 - 0.0299)

*: Piston grade

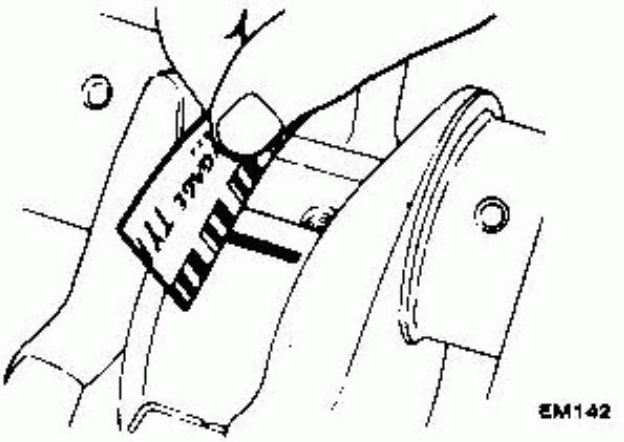


BEARING CLEARANCE

Bearing clearance:
Main bearing
0.04 - 0.06 mm (0.0016 - 0.0024 in)
Limit 0.1 mm (0.004 in)
Connecting rod bearing
0.02 - 0.06 mm (0.0008 - 0.0024 in)
Limit 0.1 mm (0.004 in)

Method A (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.



Method B (Using dial gauge & micrometer)

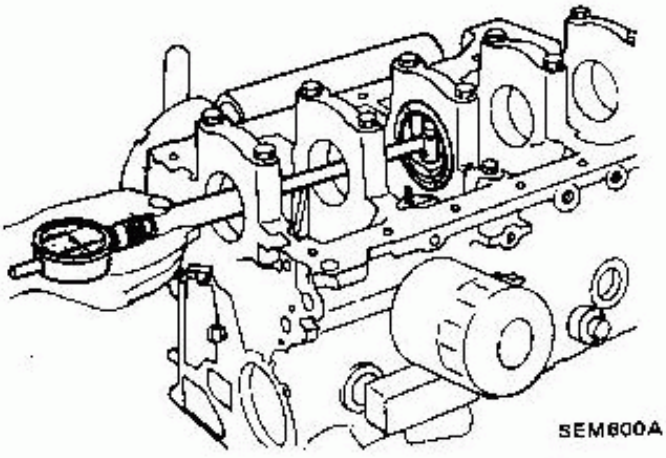
Main bearing

1. Install main bearings to cylinder block and main bearing cap.
2. Install main bearing cap to cylinder block.

Tighten all bolts in correct order and in two or three stages.

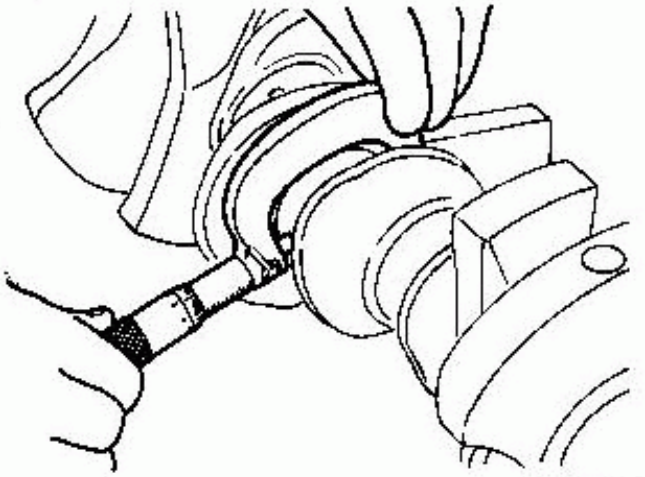
: 44 - 54 N-m
(4.5 - 5.5 kg-m, 33 - 40 ft-lb)

3. Measure inside diameter "A" of main journal.



Inspection (Cont'd)

4. Measure outside diameter "Dm" of main journal in crankshaft.



SEM506A

5. Calculate main bearing clearance.

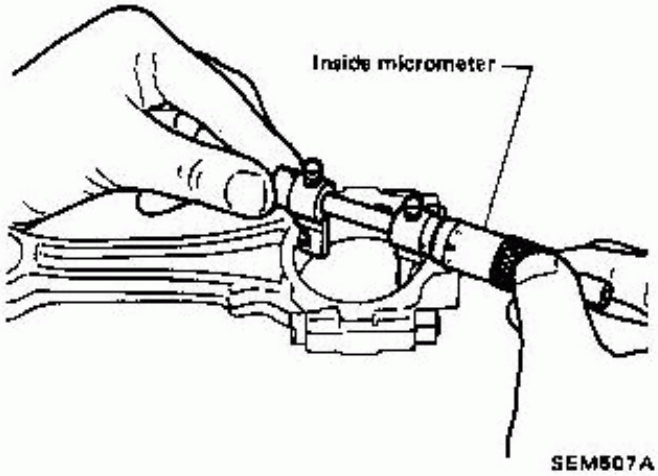
Main bearing clearance
= A – Dm

Connecting rod bearing

1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.

: 32 - 36 N·m (3.3 - 3.7 kg-m, 24 - 27 ft-lb)

3. Measure inside diameter "C" of bearing.



SEM507A

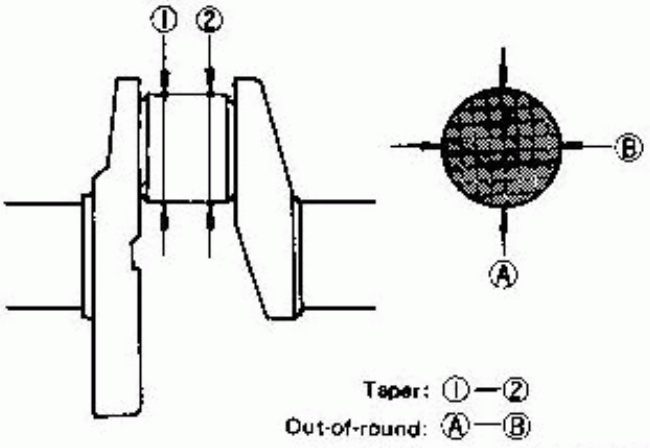
4. Measure outside diameter "Dp" of crankshaft pin journal.
5. Calculate connecting rod bearing clearance.

Connecting rod bearing clearance
= C – Dp

CRANKSHAFT INSPECTION

1. Check crankshaft journals for score, bias, wear or cracks. If faults are minor, correct with fine crocus cloth.
2. Check journals with a micrometer for taper and out-of-round.

Out-of-round (Ⓐ – Ⓑ):
Less than 0.03 mm (0.0012 in)
Taper (① – ②):
Less than 0.03 mm (0.0012 in)



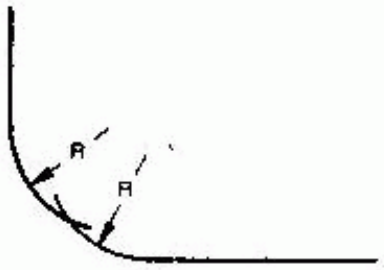
SEM316A

a. When regrinding crank pin and crank journal, fillet roll should be finished in the following dimension (CA18ET) and should not be reground (CA20E).

CA18ET engine

Unit: mm (in)

Main journal and pin journal



R: Pin journal 3.0 - 3.1 (0.118 - 0.122)
Main journal 2.5 - 2.6 (0.098 - 0.102)

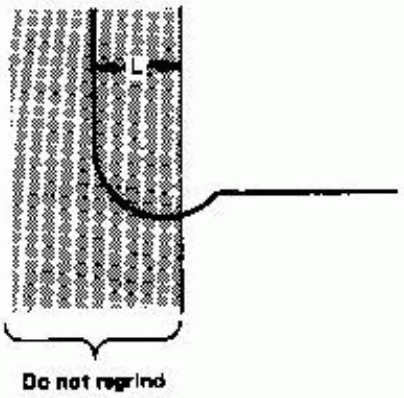
SEM508A

Inspection (Cont'd)

CA20E engine

Unit: mm (in)

Main journal and pin journal



Do not regrind

L: Pin journal 2.6 (0.098)
Main journal 2.0 (0.079)

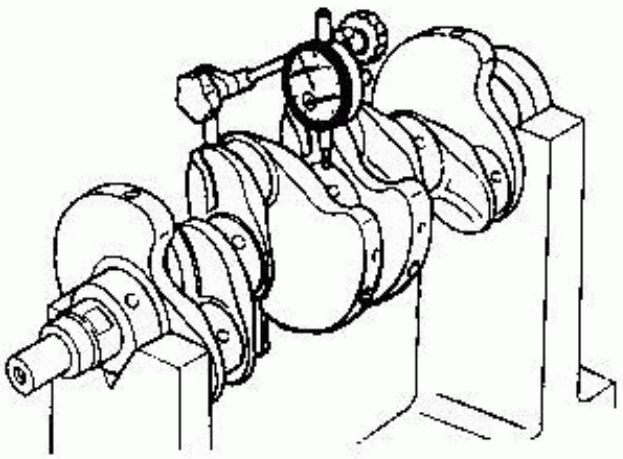
SEM589A

b. Refer to S.D.S. for regrinding crankshaft and available service parts.

CRANKSHAFT RUNOUT

Check crankshaft runout.

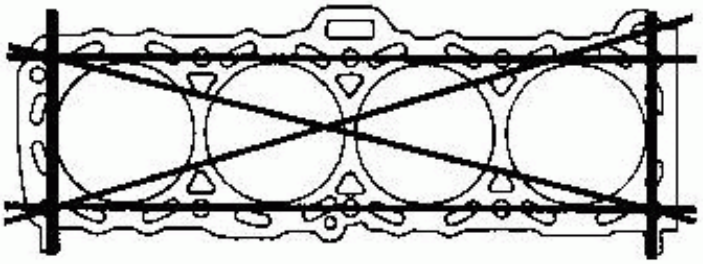
Runout [T.I.R. (Total Indicator Reading)]
Less than 0.05 mm (0.0020 in)



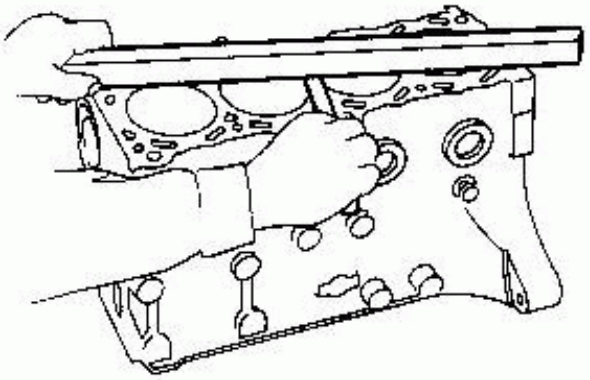
SEM601A

CYLINDER BLOCK DISTORTION AND WEAR

Measuring points



Warpage of surface:
Less than 0.1 mm (0.004 in)



SEM555A

If beyond the specified limit, resurface it.

Resurfacing limit:

The resurfacing limit of cylinder block is determined by the cylinder head resurfacing in an engine.

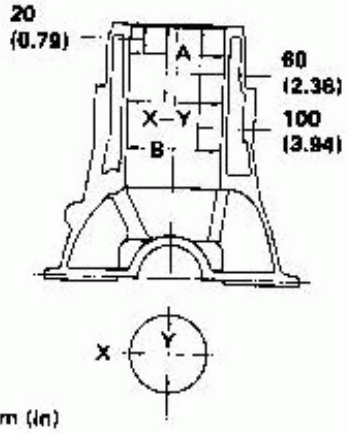
Amount of cylinder head resurfacing is "A"
Amount of cylinder block resurfacing is "B"
The maximum limit is as follows:
A + B = 0.2 mm (0.008 in)

Inspection (Cont'd)

Using a bore gauge, measure cylinder bore for wear, out-of-round or taper.

Standard inside diameter:
Refer to S.D.S.
Wear limit:
0.20 mm (0.0079 in)
Out-of-round (X-Y) limit:
0.02 mm (0.0008 in)
Taper (A-B) limit:
0.02 mm (0.0008 in)

SEM603A



Unit: mm (in)

SEM605

Check for scratches or seizure. If seizure is found, hone it.

CYLINDER BORING

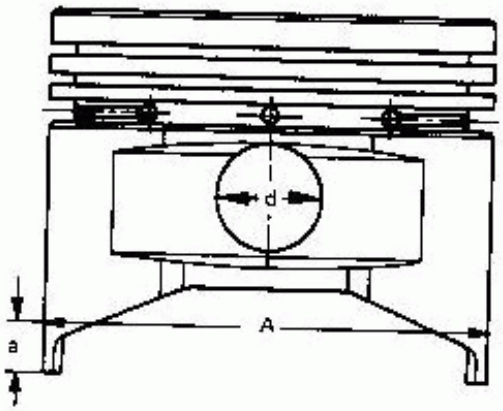
When any cylinder needs boring, all other cylinders must also be bored at the same time.

Determining bore size

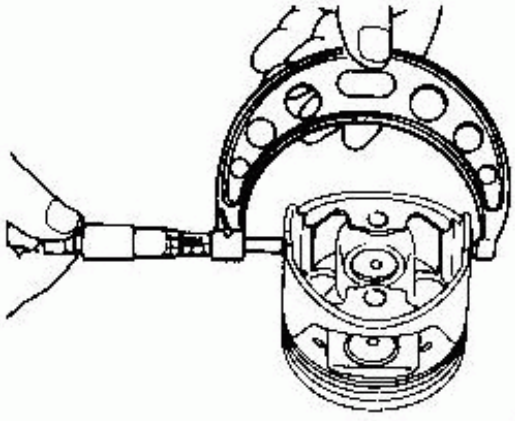
1. Determine piston oversize according to amount of wear of cylinder.

Oversize pistons are available for service. Refer to S.D.S.

2. The size to which cylinders must be honed is, determined by adding piston-to-cylinder clearance to the piston skirt diameter "A".



SEM559A



EM128

Dimension "a":
19.8 mm (0.780 in): CA20E
21.5 mm (0.846 in): CA18ET

Inspection (Cont'd)

Rebored size calculation

D = A + B − C = A + [0.005 to 0.025 mm (0.0002 to 0.0010 in)]

where,

D : Honed diameter
A : Skirt diameter as measured
B : Piston-to-wall clearance
C : Machining allowance 0.02 mm (0.0008 in)

Boring

CAUTION:

a. **To prevent strain due to cutting heat, bore the cylinders in the order of 2-4-1-3.**
b. **Before boring any cylinder, install main bearing caps in place and tighten to the specification so that the crankshaft bearing bores will not become distorted from the boring operation.**

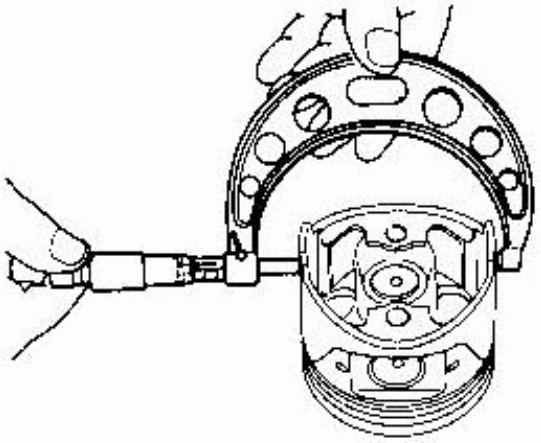
3. Do not bore too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.
4. As a final step, cylinders should be honed to size.
5. Measure the finished cylinder bore for out-of-round or tapered part.
   Refer to S.D.S.

Measurement of a just machined cylinder bore requires utmost care since it is expanded by cutting heat.

PISTON TO CYLINDER WALL CLEARANCE

1. Measure piston diameter.

   Piston diameter "A":
   Refer to S.D.S.
   Measuring point "a" (Distance from the bottom):
   19.8 mm (0.780 in): CA20E
   21.5 mm (0.846 in): CA18ET



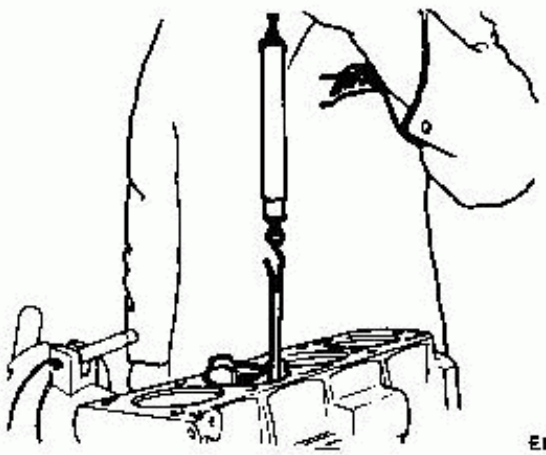
SEM026A

2. Check that piston clearance is within the specification.

   Piston clearance:
   0.025 - 0.045 mm (0.0010 - 0.0018 in)

3. Measure the extracting force by pulling feeler gauge straight upward.

   Feeler gauge thickness:
   0.04 mm (0.0016 in)
   Extracting force:
   2.0 - 14.7 N (0.2 - 1.5 kg, 0.4 - 3.3 lb)

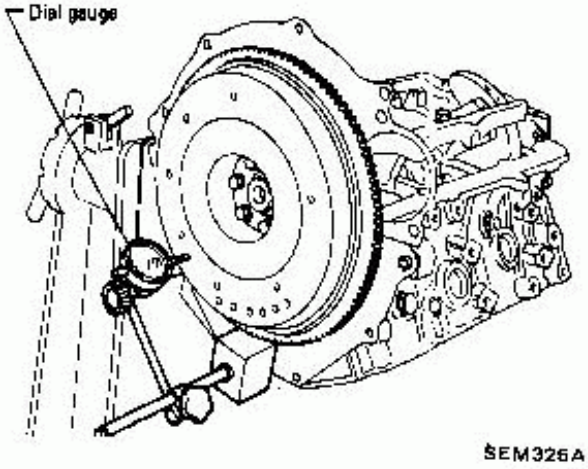


EM541

Inspection (Cont'd)

FLYWHEEL RUNOUT

Runout (Total indicator reading):
Less than 0.15 mm (0.0059 in)

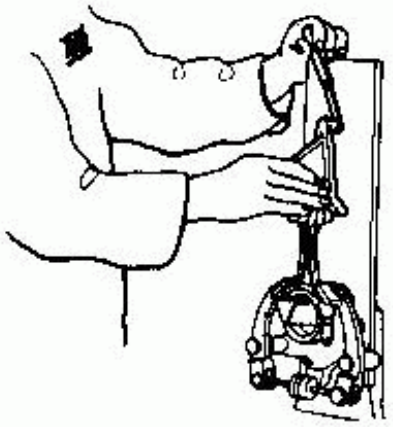


SEM326A

Install ring on flywheel, heating ring gear to about 180 to 220°C (356 to 428°F).

CONNECTING ROD BEND AND TORSION

Bend and torsion:
Limit 0.1 mm (0.004 in) per 100 mm (3.94 in) length



EM133

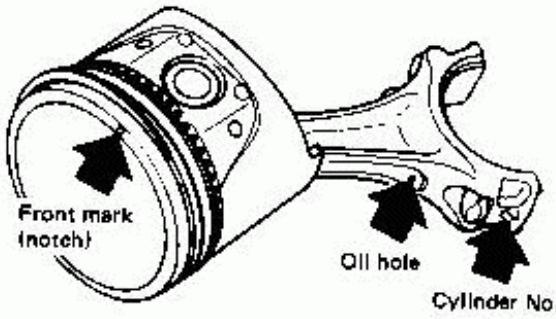
When replacing connecting rod, select one so that weight difference between each cylinder is within 7 g (0.25 oz) with piston and connecting rod assembled.

Assembly

PISTON

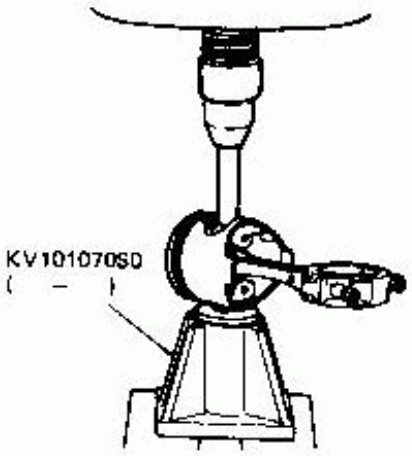
1. Assemble piston with connecting rod

a. **Numbers stamped on the connecting rod and cap correspond to each cylinder. Care should be taken to avoid a wrong combination including bearing.**



SEM580A

b. **When pressing piston pin in connecting rod, apply engine oil to pin and small end of connecting rod.**

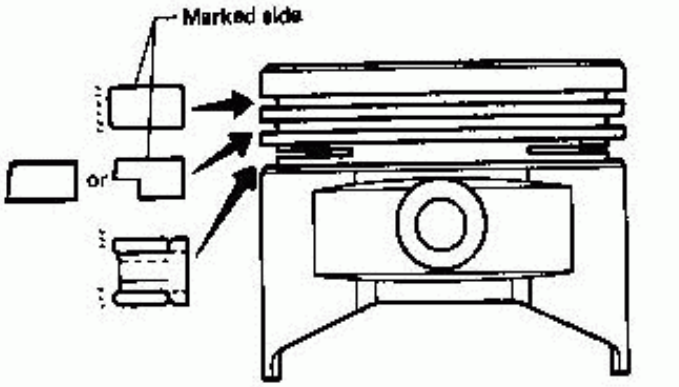


EM156

c. **After assembling, ascertain that piston swings smoothly.**

Assembly (Cont'd)

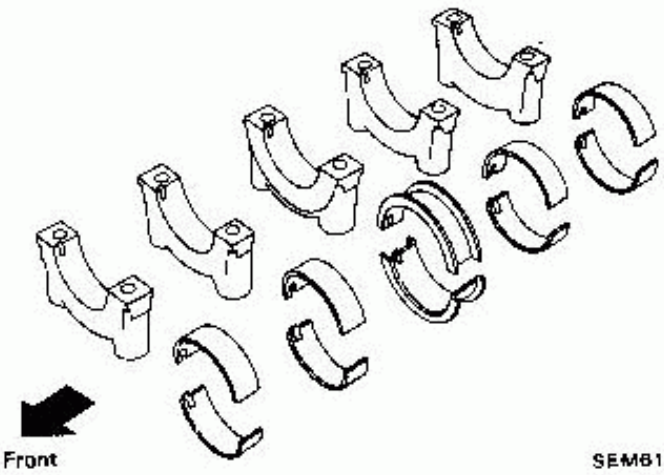
2. Install piston rings.



SEM621A

CRANKSHAFT

1. Set main bearings in the proper position on cylinder block.



SEM617

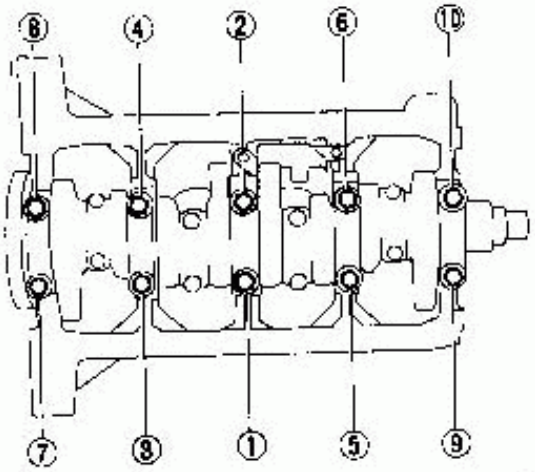
If either crankshaft, cylinder block or main bearing is reused again, it is necessary to measure main bearing clearance.

Upper bearings (Cylinder block side) have oil groove.

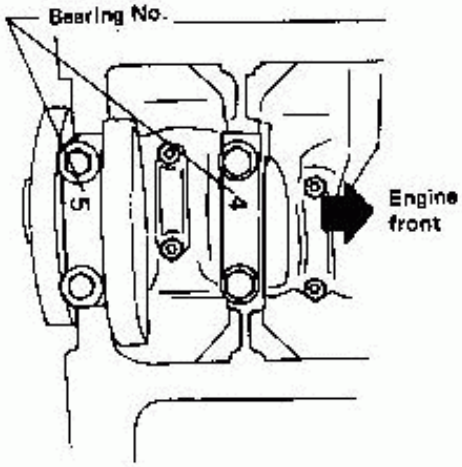
2. Apply engine oil to main bearing surfaces on both sides of cylinder block and cap.
3. Install crankshaft.
4. Install caps with lower main bearings and tighten bolts to specified torque.

   : **Main bearing cap bolt**
   44 - 54 N·m
   (4.5 - 5.5 kg-m, 33 - 40 ft-lb)

- **Arrange the parts so that the indicated number on bearing cap is in a row from the front of engine.**
- **Prior to tightening bearing cap bolts, place bearing cap in proper position by shifting crankshaft in the axial direction.**
- **Tighten bearing cap bolts gradually in separating two or three stages and outwardly from center bearing in sequence.**



SEM618



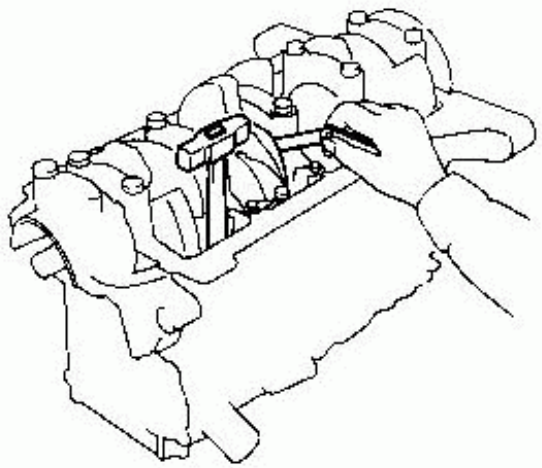
SEM592A

Assembly (Cont'd)

- **After securing bearing cap bolts, make sure that crankshaft turn smoothly.**

5. Measure cranksaft free end play at center bearing.

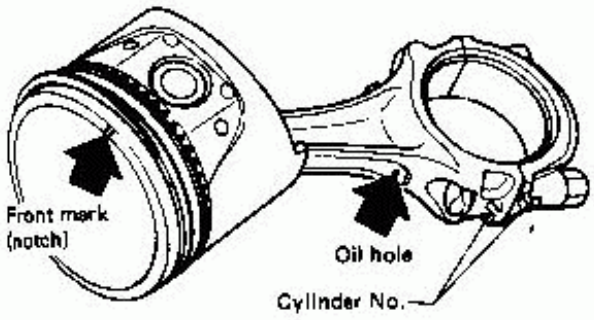
Crankshaft free end play:
Limit
0.30 mm (0.0118 in)



SEM607

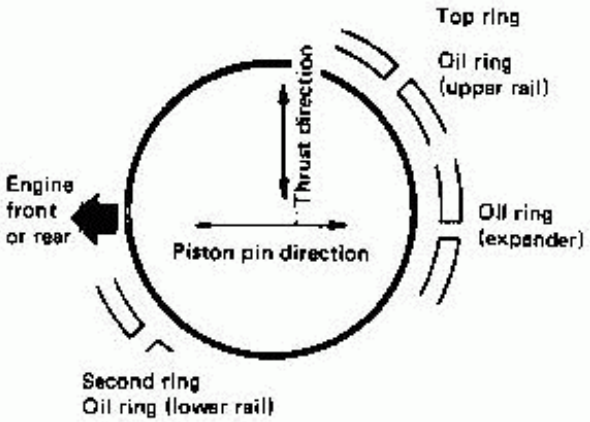
6. Arrange the parts as follows

- **Apply engine oil to cylinder wall, piston and bearing.**
- **Arrange so that the front mark on piston head faces to the front of engine.**



SEM622A

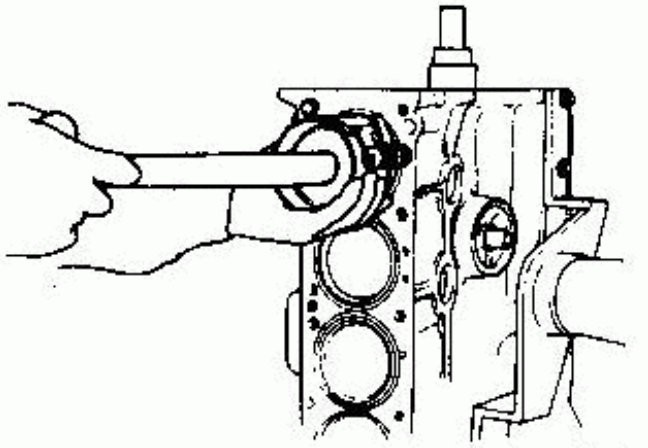
- **Set piston ring as shown below.**



EM725

7. Install pistons with connecting rods.
(1) Install them into corresponding cylinder using Tool.

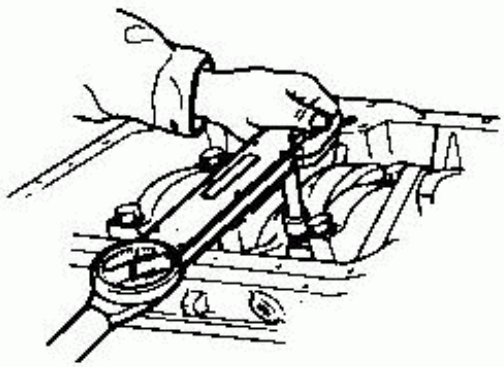
Be careful not to scratch cylinder wall by connecting rod.



SEM620

(2) Install connecting rod bearing caps.

: Connecting rod bearing nut
32 - 36 N-m
(3.3 - 3.7 kg-m, 24 - 27 ft-lb)

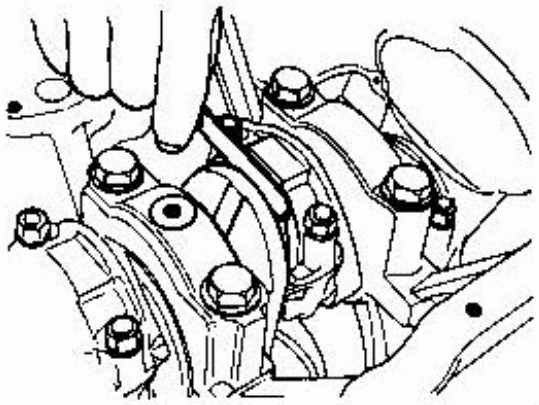


EM329

Assembly (Cont'd)

8. Measure connecting rod side clearance.

Connecting rod side clearance:
Limit 0.30 mm (0.0118 in)

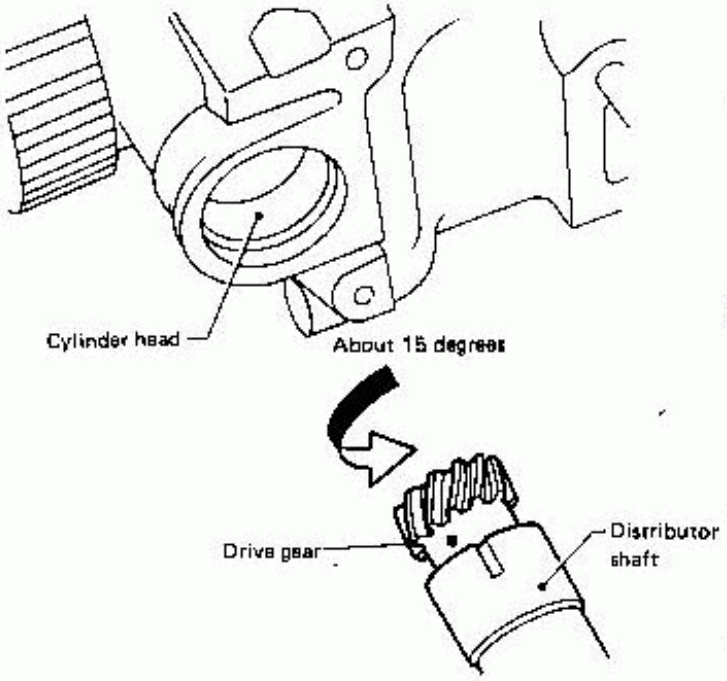


EM134

9. Install outer parts.

When installing distributor, preset as follows:

- **Turn camshaft until No. 1 piston is at T.D.C. on its compression stroke.**
- **Align distributor gear mark advanced by one tooth with the mark on the shaft.**



SEM630A

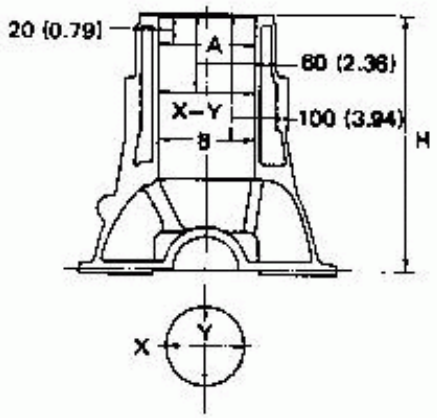
SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

Engine model		CA18ET	CA20E
Cylinder arrangement		4, in-line	
Displacement cm³ (cu in)		1,809 (110.39)	1,974 (120.46)
Bore x stroke mm (in)		83.0 x 83.6 (3.268 x 3.291)	84.5 x 88.0 (3.327 x 3.465)
Valve arrangement		O.H.C.	
Firing order		1-3-4-2	
Number of piston rings Compression		2	
Oil		1	
Number of main bearings		5	
Compression ratio		8.0	8.5
Compression pressure at 350 rpm kPa (kg/cm², psi)	Standard	1,177 (12.0, 171)	
	Minimum	883 (9.0, 128)	
	Differential limit between cylinders	98 (1.0, 14)	
Valve clearance mm (in)	Hot	0.30 (0.012)	
	Cold	INT.: 0.21 (0.008) EXH.: 0.23 (0.009)	

Inspection and Adjustment

CYLINDER BLOCK



SEM528A

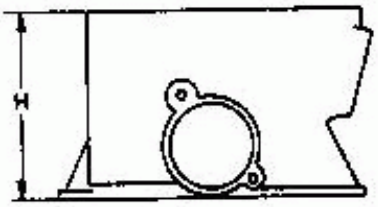
Unit: mm (in)

Engine model	Standard		Limit (*: Wear limit)
	CA18ET	CA20E	
Height (H)	209.75 - 209.85 (8.2579 - 8.2618)	223.25 - 223.35 (8.7894 - 8.7933)	0.2 (0.008)**
Surface flatness	0.03 (0.0012)		0.1 (0.004)
Cylinder bore Inner diameter	83.00 - 83.05 (3.2677 - 3.2697)	84.50 - 84.55 (3.3268 - 3.3287)	0.2 (0.008)*
Out-of-round (X-Y)	Less than 0.015 (0.0006)		0.02 (0.0008)
Taper (A-B)	Less than 0.01 (0.0004)		0.02 (0.0008)
Difference in inner diameter between cylinders	Less than 0.05 (0.0020)		0.2 (0.008)
Piston to cylinder bore clearance	0.025 - 0.045 (0.0010 - 0.0018)		—
Feeler gauge extraction force with gauge thickness 0.04 mm (0.0016 in) N (kg, lb)	2.0 - 14.7 (0.2 - 1.5, 0.4 - 3.3)		—

**: Total amount of cylinder head resurfacing and cylinder block resurfacing.

Inspection and Adjustment (Cont'd)

CYLINDER HEAD



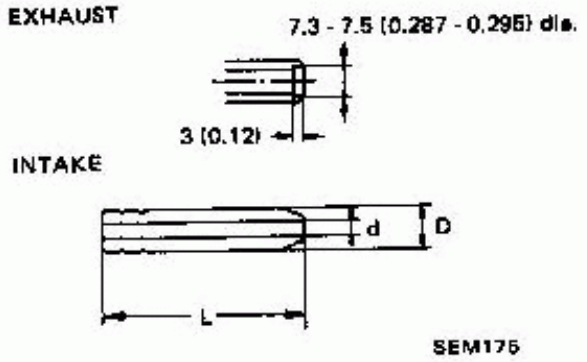
SEM829A

Unit: mm (in)

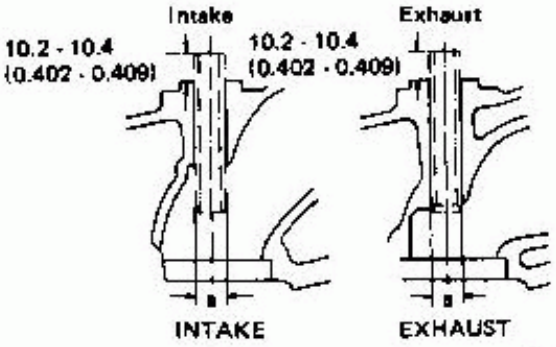
	Standard	Limit
Height (H)	116.6 - 117.0 (4.591 - 4.606)	0.2 (0.008)*
Surface flatness	0.03 (0.0012)	0.1 (0.004)

*: Total amount of cylinder head resurfacing and cylinder block resurfacing

VALVE GUIDE



SEM175



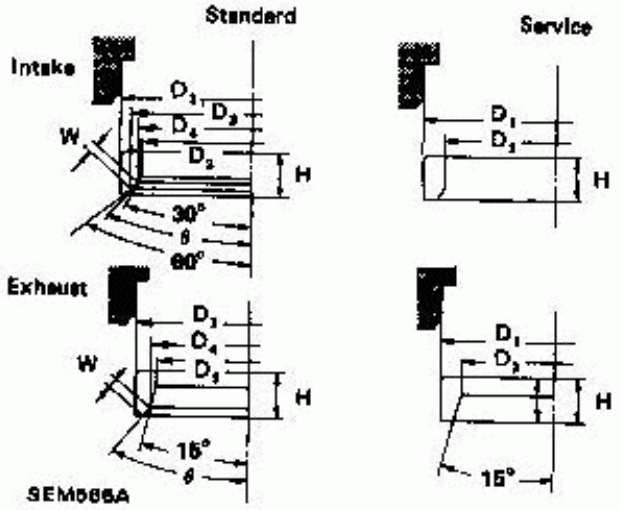
EM116

Unit: mm (in)

		Standard	Service
Length (L)		45.0 (1.772)	45.0 (1.772)
Outer diameter (D)		11.023 - 11.034 (0.4340 - 0.4344)	11.223 - 11.234 (0.4418 - 0.4423)
Inner diameter (d) [Finished size]		7.000 - 7.018 (0.2756 - 0.2763)	
Cylinder head hole diameter (a)		10.975 - 10.996 (0.4321 - 0.4329)	11.185 - 11.196 (0.4404 - 0.4408)
Interference fit		0.027 - 0.059 (0.0011 - 0.0023)	
		Standard	Limit
Stem to guide clearance	In.	0.020 - 0.053 (0.0008 - 0.0021)	0.1 (0.004)
	Ex.	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)
Valve deflection		—	0.2 (0.008)
Stem to guide clearance		—	0.1 (0.004)

Inspection and Adjustment (Cont'd)

VALVE SEAT

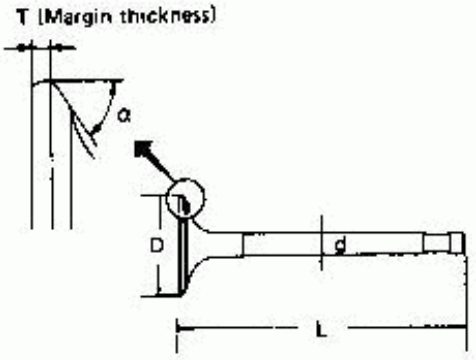


Unit: mm (in)

		Standard	Service*
Cylinder head seat recess diameter (D_1)	In.	43.000 - 43.016 (1.6929 - 1.6935)	43.500 - 43.516 (1.7126 - 1.7132)
	Ex.	37.000 - 37.016 (1.4567 - 1.4573)	37.500 - 37.516 (1.4764 - 1.4770)
Valve seat interference fit	In.	0.081 - 0.113 (0.0032 - 0.0044)	
	Ex.	0.064 - 0.096 (0.0025 - 0.0038)	
Valve seat outer diameter (D_1)	In.	43.097 - 43.113 (1.6967 - 1.6974)	43.597 - 43.613 (1.7164 - 1.7170)
	Ex.	37.080 - 37.096 (1.4598 - 1.4605)	37.580 - 37.596 (1.4795 - 1.4802)
Valve seat inner diameter (D_2)	In.	36.85 - 37.15 (1.4508 - 1.4626)	
	Ex.	29.85 - 30.15 (1.1752 - 1.1870)	
Height (H)	In.	7.6 - 7.7 (0.299 - 0.303)	7.0 - 7.1 (0.276 - 0.280)
	Ex.	7.4 - 7.5 (0.291 - 0.295)	
Face angle (θ)	In.	45°	
	Ex.	45°	
Contacting width (W)	In.	1.8 - 2.1 (0.071 - 0.083)	
	Ex.	1.4 - 1.8 (0.055 - 0.071)	
Face inner diameter (D_4)	In.	37.8 (1.488)	*: Valve seat surface must be corrected into specified value.
	Ex.	34.4 - 34.6 (1.354 - 1.362)	
Face outer diameter (D_3)	In.	40.6 - 40.8 (1.598 - 1.606)	

Inspection and Adjustment (Cont'd)

VALVE

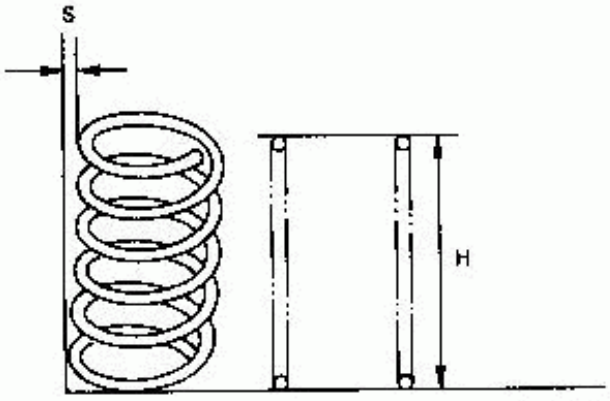


SEM188A

Unit: mm (in)

Engine model	CA18ET	CA20E	Limit
Valve head diameter (D) In.	41.0 - 41.2 (1.614 - 1.622)		–
Ex.	35.0 - 35.2 (1.378 - 1.386)		–
Valve length (L) In.	105.48 - 105.9 (4.1527 - 4.1693)	106.78 - 107.20 (4.2039 - 4.2205)	–
Ex.	106.49 - 106.91 (4.1926 - 4.2090)	107.79 - 108.21 (4.2437 - 4.2602)	
Valve stem diameter (d) In.	6.965 - 6.980 (0.2742 - 0.2748)		–
Ex.	6.945 - 6.960 (0.2734 - 0.2740)		
Valve face angle (α) In.	45°15' - 45°45'		–
Ex.			
Valve head margin (T) In.	1.15 - 1.45 (0.0453 - 0.0571)		0.6 (0.020)
Ex.	1.35 - 1.65 (0.0531 - 0.0650)		
Valve tip grinding allowance	–		0.2 (0.008)

VALVE SPRING



SEM567A

Unit: mm (in)

	Standard	Limit
Free height (H) Outer	49.98 (1.9677)	–
Inner	44.1 (1.736)	–
Spring constant N/mm (kg/mm, lb/in) Outer	20.7 (2.11, 118.2)	–
Inner	11.7 (1.19, 66.8)	–
Out of square (S) Outer	–	2.2 (0.087)
Inner	–	1.9 (0.075)

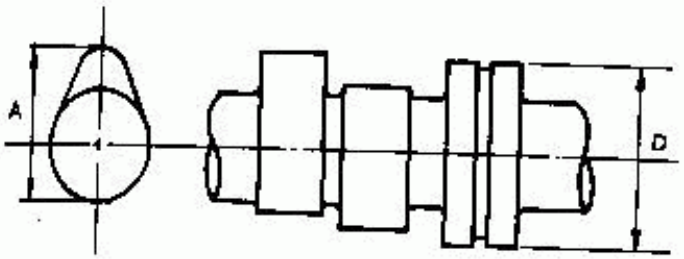
ROCKER ARM AND ROCKER SHAFT

Unit: mm (in)

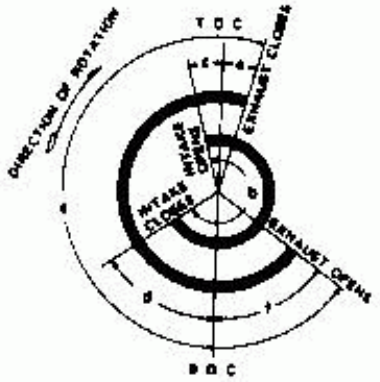
	Standard
Rocker arm to shaft clearance	0.007 - 0.049 (0.0003 - 0.0019)

Inspection and Adjustment (Cont'd)

CAMSHAFT AND CAMSHAFT BEARING



SEM668A



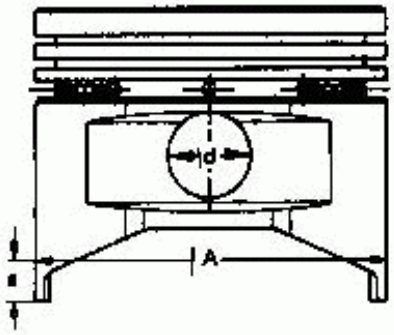
EM120

Unit: mm (in)

		Standard		Limit
Engine model		CA18ET	CA20E	
Cam height (A)	In.	38.240 - 38.290 (1.5055 - 1.5075)	38.834 - 38.884 (1.5289 - 1.5309)	–
	Ex.	38.834 - 38.884 (1.5289 - 1.5309)		–
Valve lift (h)	In.	9.0 (0.354)	10.0 (0.394)	–
	Ex.	10.0 (0.394)		–
Wear limit of cam height		–		0.2 (0.008)
Camshaft journal to bearing clearance		–		0.1 (0.004)
Inner diameter of camshaft bearing		46.000 - 46.016 (1.8110 - 1.8116)		–
Outer diameter of camshaft journal (D)		Journal No. { #1 - #4: 45.935 - 45.955 (1.8085 - 1.8092); #5 : 45.915 - 45.935 (1.8077 - 1.8085)		–
Camshaft runout		–		0.05 (0.0020)
Camshaft end play		0.07 - 0.14 (0.0028 - 0.0055)		0.2 (0.008)
Valve timing (Degree on crankshaft)	a	248	248	–
	b	240	248	–
	c	12	16	–
	d	48	52	–
	e	14	14	–
	f	54	54	–

PISTON, PISTON RING AND PISTON PIN

Piston



SEM568A

Unit: mm (in)

Engine model	CA18ET	CA20E
Piston skirt diameter (A)		
Standard	82.965 - 83.015 (3.2663 - 3.2683)	84.465 - 84.515 (3.3254 - 3.3274)
Service (Oversize)		
Standard	82.965 - 83.035 (3.2671 - 3.2691)	84.495 - 84.535 (3.3262 - 3.3281)
0.5 (0.020)	83.465 - 83.515 (3.2860 - 3.2880)	84.965 - 85.015 (3.3451 - 3.3470)
1.0 (0.039)	83.965 - 84.015 (3.3057 - 3.3077)	85.465 - 85.515 (3.3648 - 3.3667)
Dimension (a)	21.6 (0.646)	19.8 (0.780)
Piston pin hole diameter (d)	20.003 - 20.012 (0.7875 - 0.7879)	
Piston to cylinder bore clearance	0.025 - 0.045 (0.0010 - 0.0018)	

Piston pin

Unit: mm (in)

	CA18ET/CA20E
Piston pin outer diameter	19.995 - 20.000 (0.7872 - 0.7874)
Piston pin to piston pin bore clearance	0.006 - 0.012 (0.0003 - 0.0005)
Interference fit of piston pin to connecting rod	0.017 - 0.038 (0.0007 - 0.0015)

Piston ring

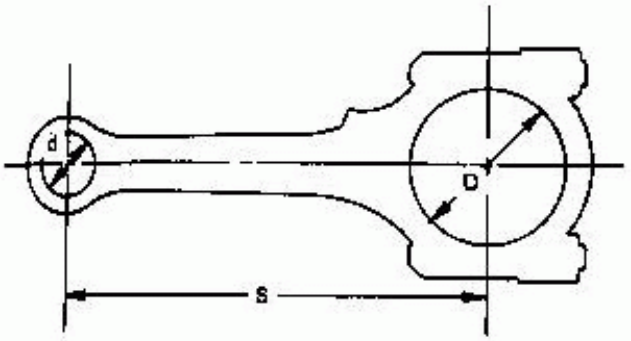
Unit: mm (in)

	Standard		Limit
Engine model	CA18ET	CA20E	
Side clearance			
Top	0.040 - 0.073 (0.0016 - 0.0029)		0.1 (0.004)
2nd	0.030 - 0.063 (0.0012 -0.0025)		
Ring gap			
Top	#1 & #2* 0.25 - 0.38 (0.0098 - 0.0150) #3, #4 & #5* 0.28 - 0.42 (0.0110 - 0.0165)	0.25 - 0.51 (0.0098 - 0.0201)	1.0 (0.039)
2nd	0.15 - 0.31 (0.0059 - 0.0122)		
Oil (Rail)	0.20 - 0.76 (0.0079 - 0.0299)		

* Piston grade

Inspection and Adjustment (Cont'd)

CONNECTING ROD

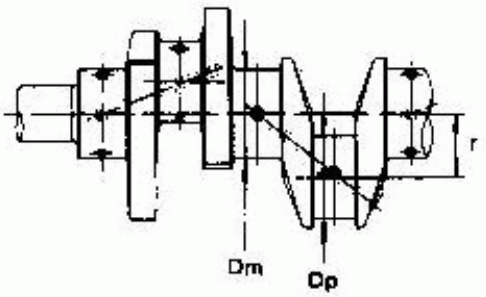


SEM570A

Unit: mm (in)

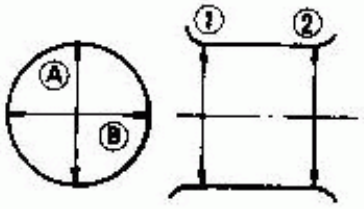
	Standard		Limit
Engine model	CA18ET	CA20E	
Center distance (S)	132.95 - 133.05 (5.2342 - 5.2382)	149.25 - 149.35 (5.8760 - 5.8799)	—
Bend [per 100 mm (3.94 in)]	Less than 0.05 (0.0020)		0.10 (0.0039)
Torsion [per 100 mm (3.94 in)]	Less than 0.05 (0.0020)		0.10 (0.0039)
Piston pin bore diameter (d)	19.955 - 19.978 (0.7860 - 0.7865)		—
Crank pin bore diameter (D)	48.000 - 48.013 (1.8898 - 1.8903)		—
Big end play	0.2 - 0.3 (0.008 - 0.012)		0.3 (0.012)

CRANKSHAFT



EM737

Out-of-round Ⓐ – Ⓑ
Taper ① – ②



EM715

Unit: mm (in)

Engine model	CA18ET	CA20E
Main journal diameter (Dm)	52.951 - 52.964 (2.0847 - 2.0852)	
Pin journal diameter (Dp)	44.961 - 44.974 (1.7701 - 1.7706)	
Center distance (r)	41.77 - 41.83 (1.6445 - 1.6468)	43.97 - 44.03 (1.7311 - 1.7335)
	Standard	Limit
Taper of journal and pin (① – ②)	Less than 0.005 (0.0002)	0.03 (0.0012)
Out-of-round of journal and pin (Ⓐ – Ⓑ)	Less than 0.005 (0.0002)	0.03 (0.0012)
Bend	Less than 0.025 (0.0010)	0.05 (0.0020)
Free end play	0.05 - 0.18 (0.0020 - 0.0071)	0.3 (0.012)

BEARING

Bearing clearance

Unit: mm (in)

	Standard	Limit
Main bearing clearance	0.04 - 0.06 (0.0016 - 0.0024)	0.1 (0.004)
Connecting rod bearing clearance	0.02 - 0.06 (0.0008 - 0.0024)	0.1 (0.004)

Main bearing undersize

Unit: mm (in)

	Crankshaft journal diameter
Standard	52.951 - 52.964 (2.0847 - 2.0852)
0.25 (0.0098) Undersize	52.701 - 52.714 (2.0748 - 2.0754)
0.50 (0.0197) Undersize	52.451 - 52.464 (2.0650 - 2.0655)

Connecting rod bearing undersize

Unit: mm (in)

	Crankshaft pin diameter	
Engine model	CA18ET	CA20E
Standard	44.961 - 44.974 (1.7701 - 1.7706)	
0.08 (0.0031) Undersize	44.891 - 44.894 (1.7670 - 1.7676)	
0.12 (0.0047) Undersize	44.841 - 44.854 (1.7654 - 1.7659)	
0.25 (0.0098) Undersize	44.711 - 44.724 (1.7603 - 1.7608)	
0.50 (0.0197) Undersize	—	44.461 - 44.474 (1.7504 - 1.7509)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

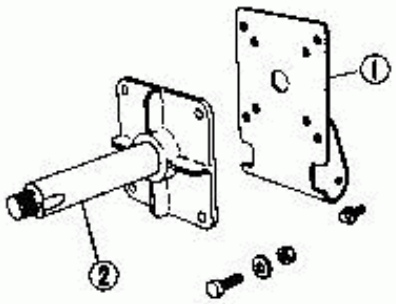
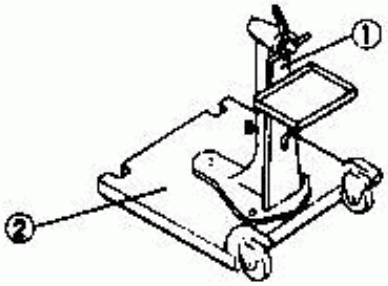
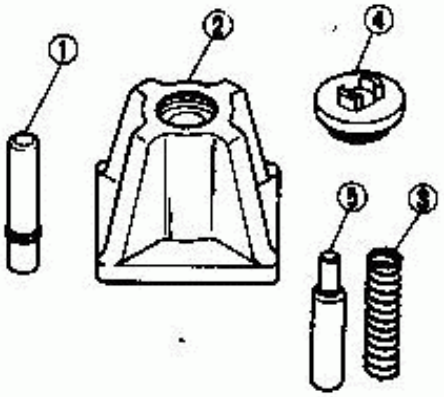
Camshaft sprocket runout [T.I.R.]	Less than 0.1 (0.004)
Flywheel runout [T.I.R.]	Less than 0.15 (0.0059)

Tightening Torque

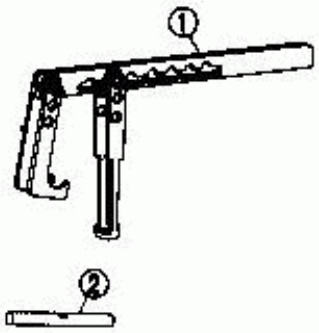
Unit	N·m	kg-m	ft-lb
Engine front side			
Alternator adjusting bar	14 - 17	1.4 - 1.7	10 - 12
Belt tensioner bolt	15 - 20	1.5 - 2.0	11 - 14
Crank pulley damper bolt	123 - 132	12.5 - 13.5	90 - 98
Crank pulley to damper bolt	12 - 14	1.2 - 1.4	9 - 10
Front cover bolt	3 - 5	0.3 - 0.5	2.2 - 3.6
Water pump bolt	16 - 20	1.6 - 2.0	12 - 14
Engine right side			
Air regulator	4.9 - 6.2	0.5 - 0.63	3.6 - 4.6
Alternator bracket	41 - 59	4.2 - 6.0	30 - 43
Collector to intake manifold	18 - 22	1.8 - 2.2	13 - 16
E.G.R. valve	18 - 23	1.8 - 2.3	13 - 17
Fuel injector	2.5 - 3.2	0.25 - 0.33	1.8 - 2.4
Intake manifold bolts and nuts	20 - 25	2.0 - 2.6	14 - 19
I.A.A. unit	6.4 - 8.3	0.65 - 0.85	4.7 - 6.1
Oil cooler connector	29 - 39	3.0 - 4.0	22 - 29
P.C.V. valve	29 - 39	3.0 - 4.0	22 - 29
Throttle chamber	18 - 22	1.8 - 2.2	13 - 16
Water outlet	18 - 22	1.8 - 2.2	13 - 16
Engine left side			
Air conditioner compressor bracket	69 - 78	7.0 - 8.0	51 - 58
Distributor support bolt	4.9 - 6.2	0.50 - 0.63	3.6 - 4.6
Exhaust manifold to exhaust tube	26 - 36	2.7 - 3.7	20 - 27
Exhaust manifold	20 - 29	2.0 - 3.0	14 - 22
Exhaust outlet to turbocharger	22 - 29	2.2 - 3.0	16 - 22
Exhaust gas sensor	40 - 50	4.1 - 5.1	30 - 37
Heat shield plate	4 - 6	0.4 - 0.5	2.9 - 3.6

Unit	N·m		
Engine top side			
Camshaft sprocket	78 - 88	8.0 - 9.0	58
Cylinder head bolt		Refer to EM-17.	
Rocker shaft	18 - 22	1.8 - 2.2	13 - 16
Rocker arm nut	18 - 22	1.8 - 2.2	13 - 16
Rocker cover	1 - 3	0.1 - 0.3	0.7 - 2.2
Spark plug	20 - 29	2.0 - 3.0	14 - 22
Engine bottom side			
Connecting rod cap	32 - 36	3.3 - 3.7	24 - 27
Main bearing cap	44 - 54	4.5 - 5.5	33 - 40
Oil pump	12 - 16	1.2 - 1.6	9 - 12
Oil strainer	10 - 14	1.0 - 1.4	7 - 10
Oil pan	5 - 7	0.5 - 0.7	3.6 - 5.1
Oil pan drain plug	29 - 39	3.0 - 4.0	22 - 29
Engine rear side			
Camshaft locate plate	78 - 88	8.0 - 9.0	58 - 65
Cylinder head rear cover	6 - 10	0.6 - 1.0	4.3 - 7.2
Clutch cover (M/T)	18 - 22	1.8 - 2.2	13 - 16
Drive plate (A/T)	98 - 108	10.0 - 11.0	72 - 80
E.G.R. passage bolt	6.4 - 8.3	0.65 - 0.85	4.7 - 6.1
Flywheel (M/T)	98 - 108	10.0 - 11.0	72 - 80
Rear oil seal retainer	4 - 6	0.4 - 0.6	2.9 - 4.3
Starter motor	29 - 39	3.0 - 4.0	22 - 29
Front engine mounting			
Mount to body (Nut)	68 - 87	6.9 - 8.9	50 - 64
Mount to stay (Nut)	23 - 27	2.3 - 2.8	17 - 20
(Bolt)	19 - 24	1.9 - 2.4	14 - 17
Stay to engine (Bolt)	31 - 42	3.2 - 4.3	23 - 31
Rear engine mounting			
Bracket to body (Bolt)	36 - 47	3.7 - 4.8	27 - 35
A/T: Mount to bracket (Nut)	41 - 52	4.2 - 5.3	30 - 38
A/T: Mount to transmission (Bolt)	31 - 42	3.2 - 4.3	23 - 31
M/T: Bracket to sub-bracket	41 - 52	4.2 - 5.3	30 - 38
M/T: Mount to sub-bracket	23 - 27	2.3 - 2.8	17 - 20
M/T: Mount to transmission	23 - 27	2.3 - 2.8	17 - 20

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
① KV10108100 (–) or suitable tool ② KV10106500 (–) or suitable tool	Engine attachment Engine stand shaft 
ST0501S000 (–) or suitable tool ① ST05011000 (–) ② ST05012000 (–)	Engine stand assembly Engine stand Base 
KV10107050 (–) or suitable tool ①KV10107010 (–) ②ST13030020 (–) ③ST13030030 (–) ④KV10107020 (–) ⑤ST13030051 (–)	Piston pin press stand Center shaft Stand Spring Cap Drift 

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	
KV10109250 (–) or suitable tool ①KV10109210 (–) ②KV10109220 (–)	Valve spring compressor Compressor Adapter	
KV10107500 (–)	Valve lip seal drift	

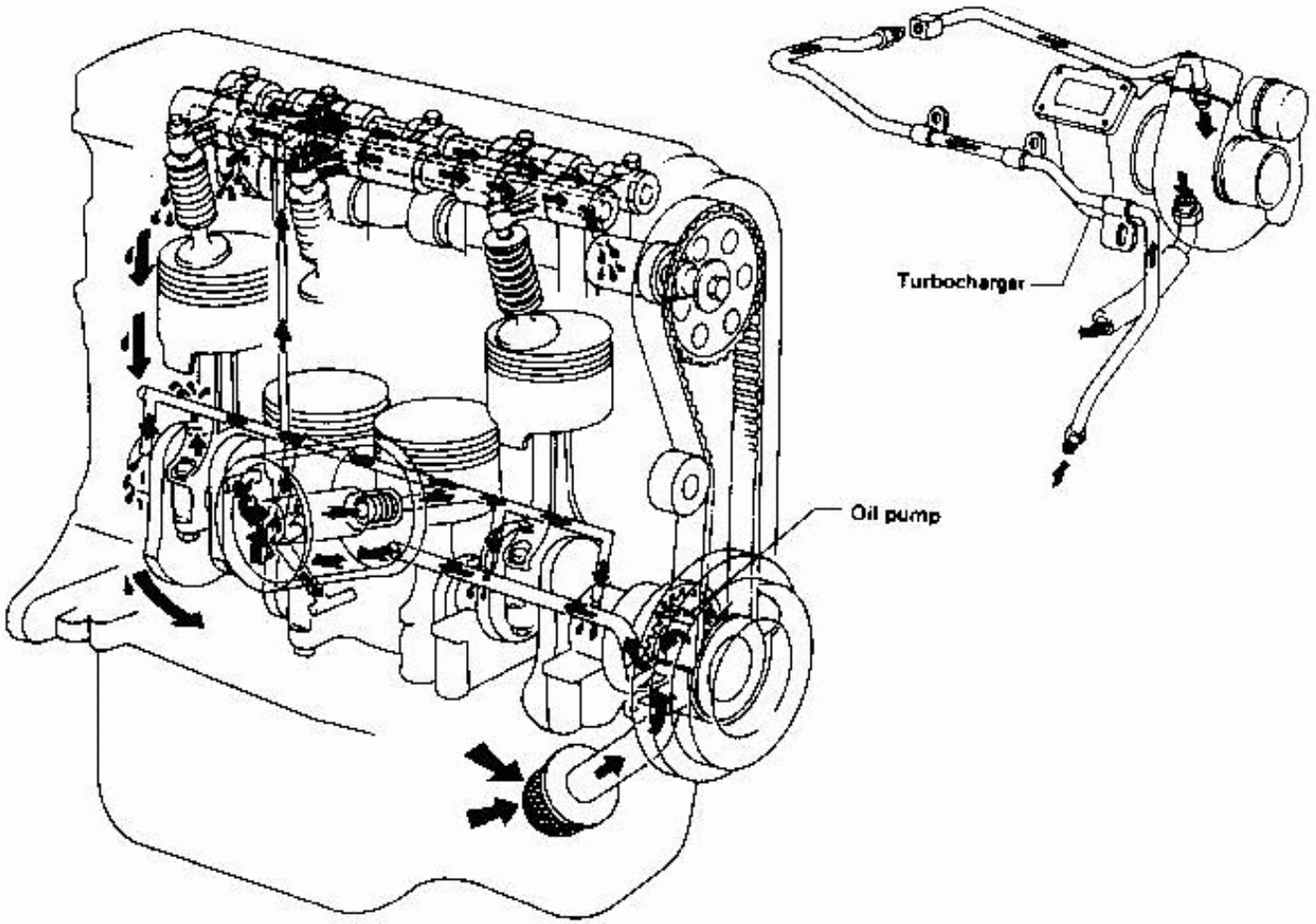
ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

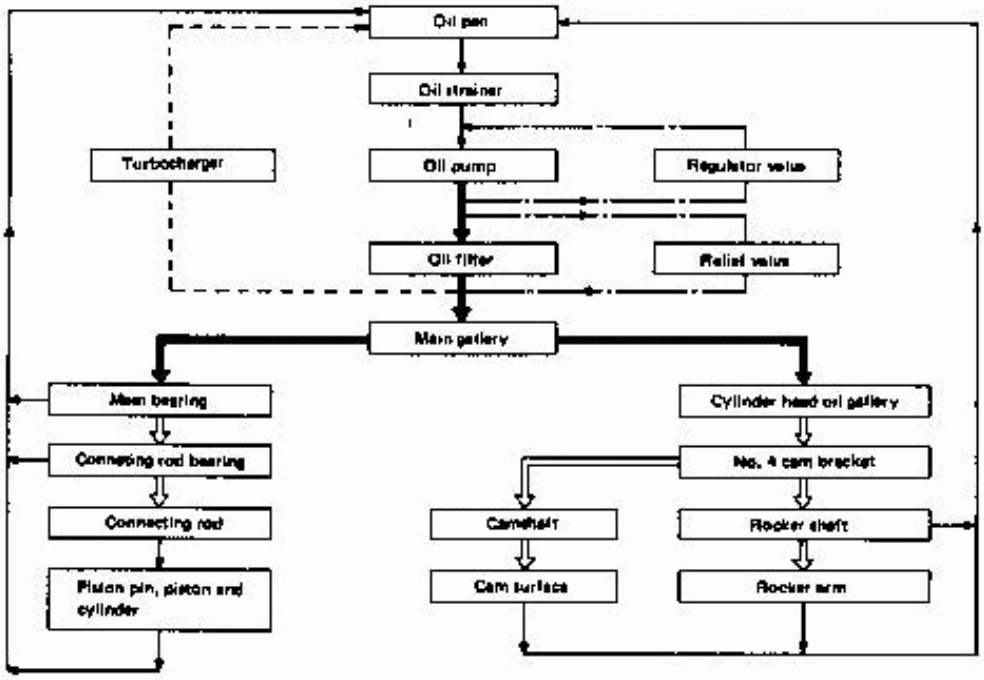
CONTENTS

ENGINE LUBRICATION SYSTEM

Lubrication Circuit



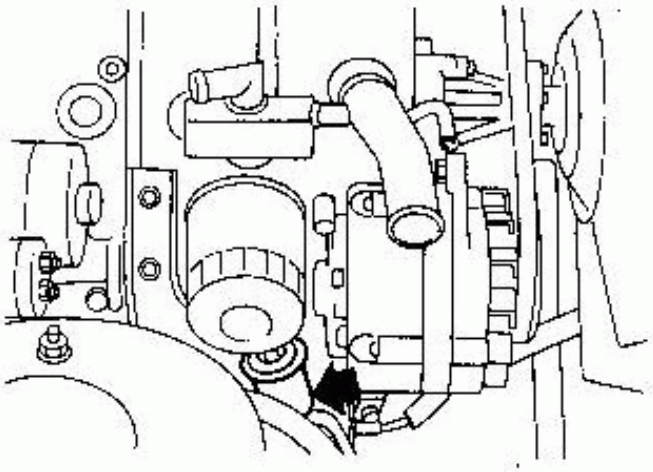
Note: : Oil gallery in cylinder block
: Oil passage
: By-pass passage
: For turbo engine model



SLC736

Oil Pressure Check (On-vehicle service)

1. Warm up engine.
2. Stop engine and remove oil pressure switch.



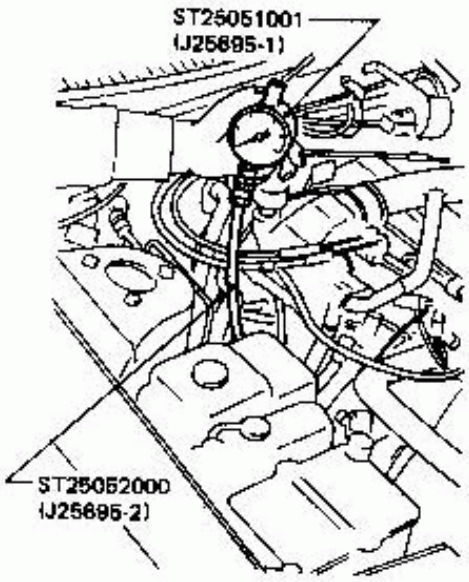
SLC849

3. Install pressure gauge.
4. Start engine and check oil pressure with engine running under no-load.

Engine rpm	Approximate discharge pressure kPa (kg/cm², psi)	
Idle	98 (1, 14)	
2,000	294 (3, 43)	
4,000	392 (4, 57)	Except turbo engine model
	490 (5, 71)	Turbo engine model

Oil pressure switch:

☐ : 10 - 16 N·m (1.0 - 1.6 kg-m, 7 - 12 ft-lb)

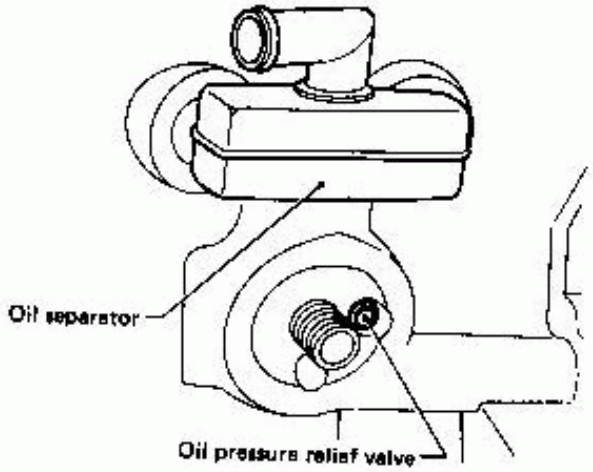


SLC850

The above table shows data tested when SAE 20W-20 oil is used and oil temperature is between 77 and 83°C (171 and 181°F). Slight difference will be found because of oil viscosity or oil temperature. If difference is extreme, check oil passage and oil pump for oil leaks.

Oil Pressure Relief Valve Inspection

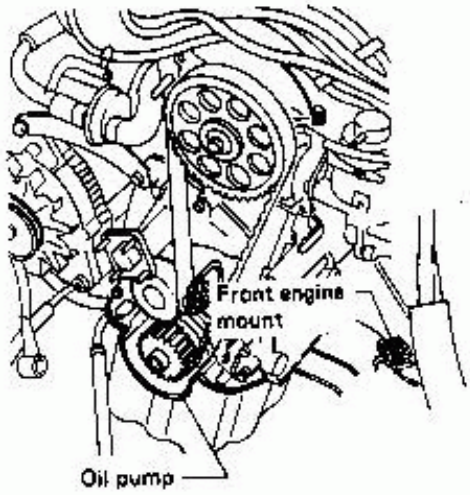
With oil filter removed, check condition of oil pressure relief valve by pushing the ball.



SLC296

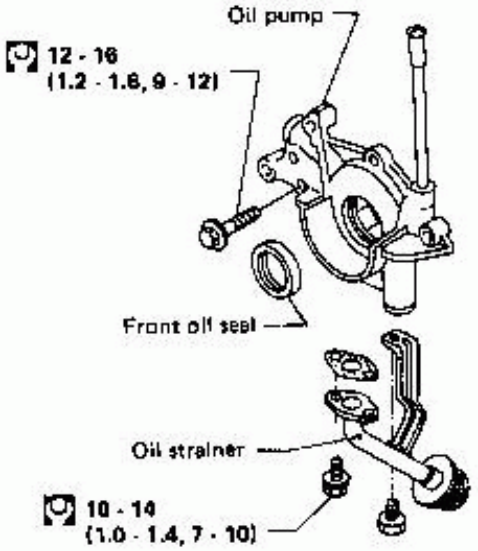
Removal (On-vehicle service)

1. Remove drive belts and alternator.
2. Remove timing belt covers and timing belt.
3. Lift up engine from body.



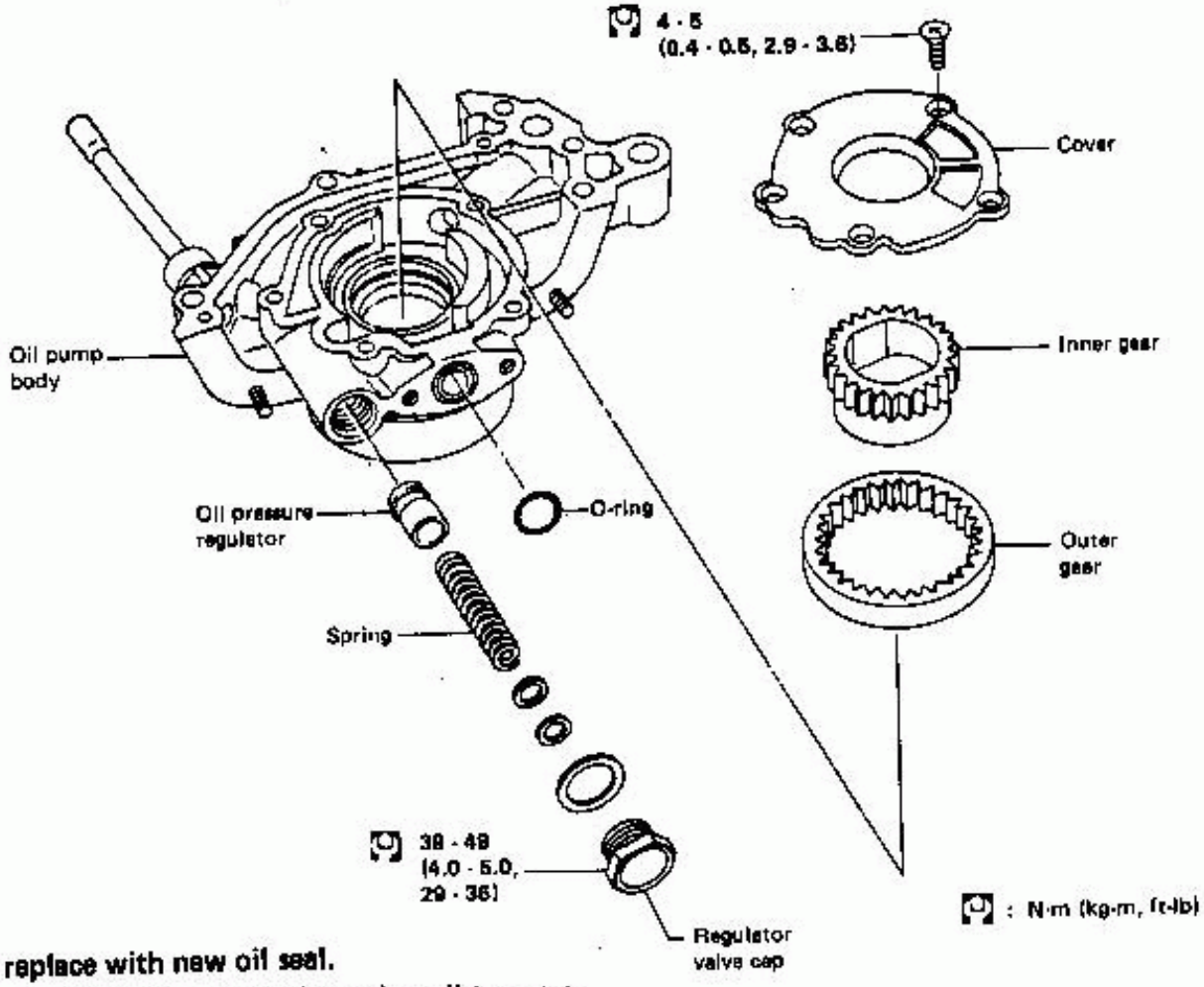
SLC661

4. Remove oil pan.
5. Remove oil pump assembly with oil strainer.



SEM818A

Disassembly and Assembly



Always replace with new oil seal.

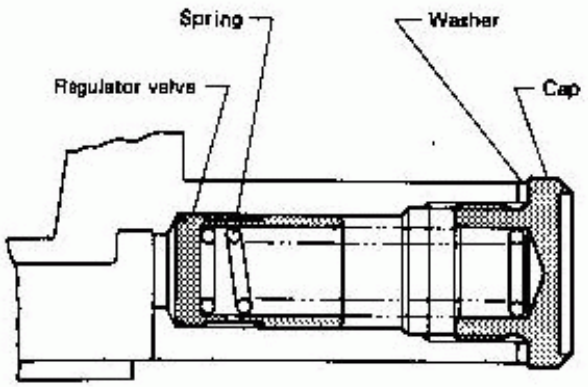
When installing oil pump, apply engine oil to gears.

SLC618

Inspection

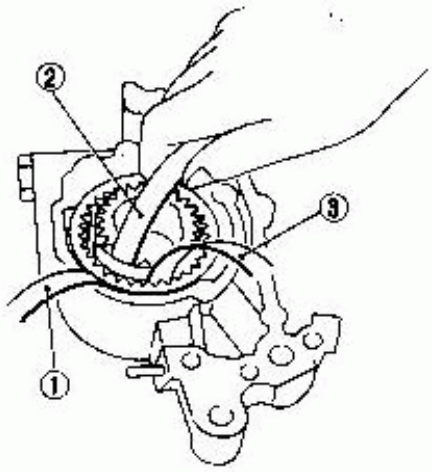
1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.

If damaged, replace entire valve assembly.

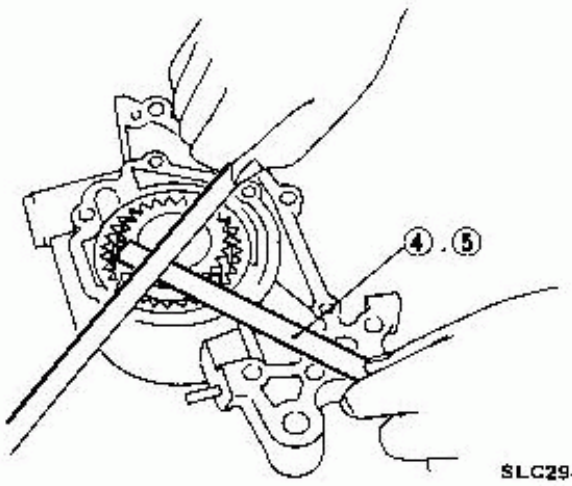


SLC295

3. Using a feeler gauge, check the following clearances.



SLC293



SLC294

Standard value

Body to outer gear clearance ①:
0.11 - 0.20 mm (0.0043 - 0.0079 in)

Inner gear to crescent clearance ②:
0.12 - 0.23 mm (0.0047 - 0.0091 in)

Outer gear to crescent clearance ③:
0.21 - 0.32 mm (0.0083 - 0.0126 in)

Housing to outer gear clearance ④:
0.05 - 0.11 mm (0.0020 - 0.0043 in)

Housing to inner gear clearance ⑤:
0.05 - 0.09 mm (0.0020 - 0.0035 in):

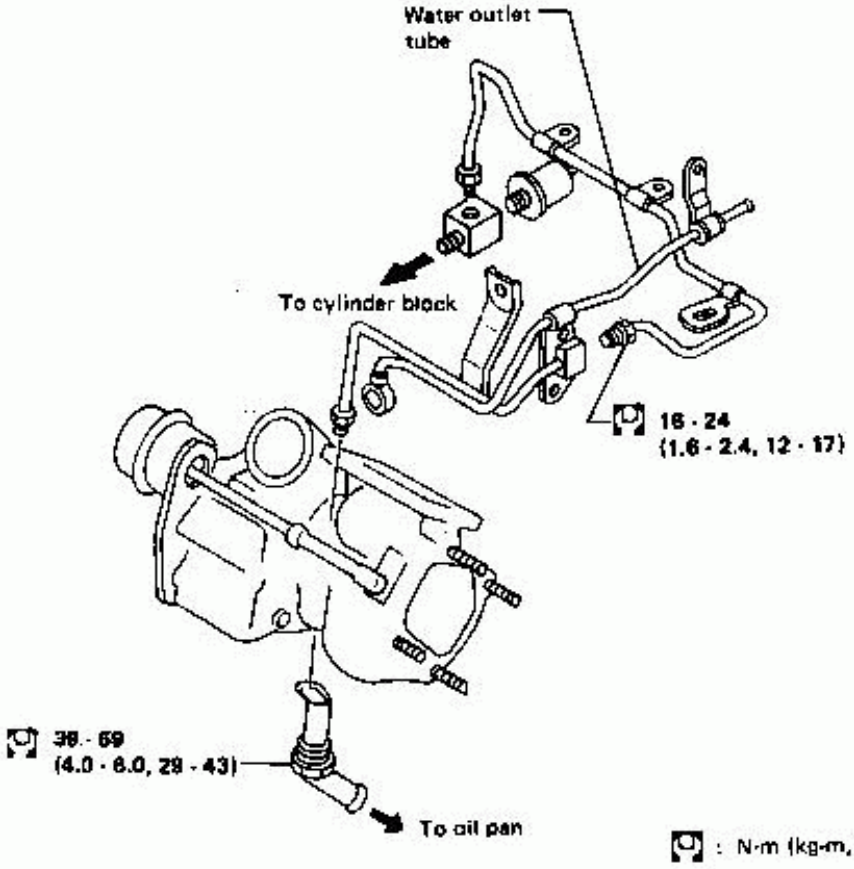
Installation

1. Assemble oil pump.

Be careful not to omit O-ring between oil pump and strainer.

2. Install oil pump assembly.

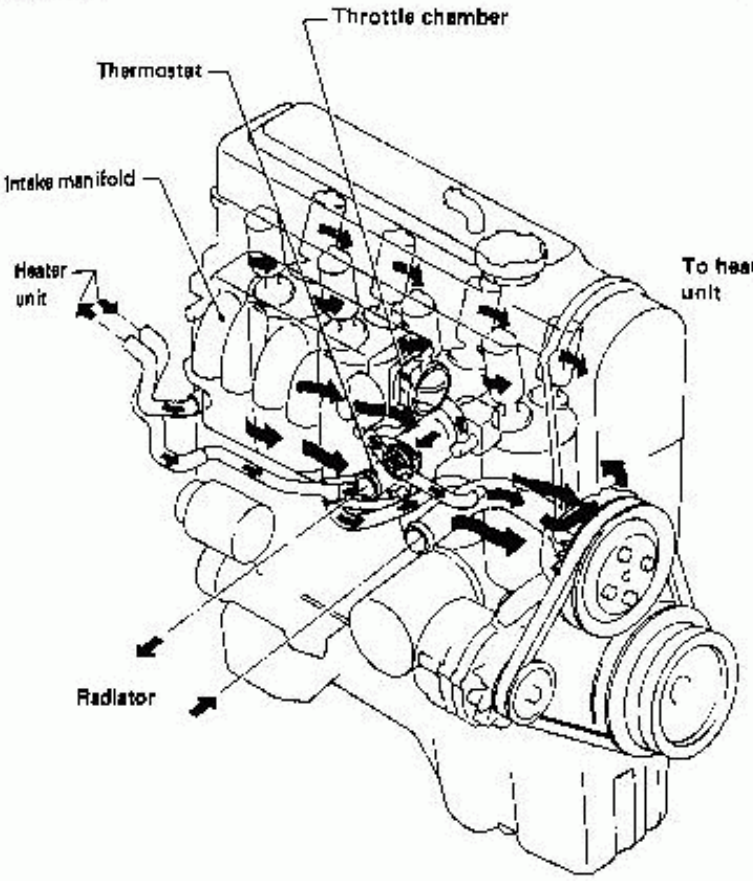
Use a new gasket.



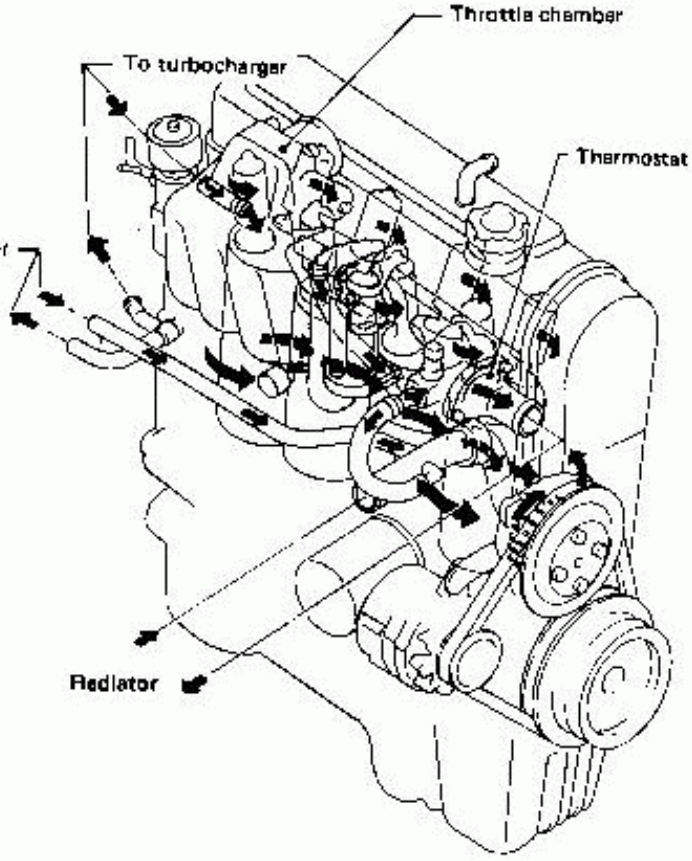
When installing oil tubes, first hand-tighten nuts connecting tubes, then slightly tighten bracket securing bolts, and tighten nuts and bolts securely.
Be careful not to deform tubes.
After installation, run engine for a few minutes, and check for oil leakage.

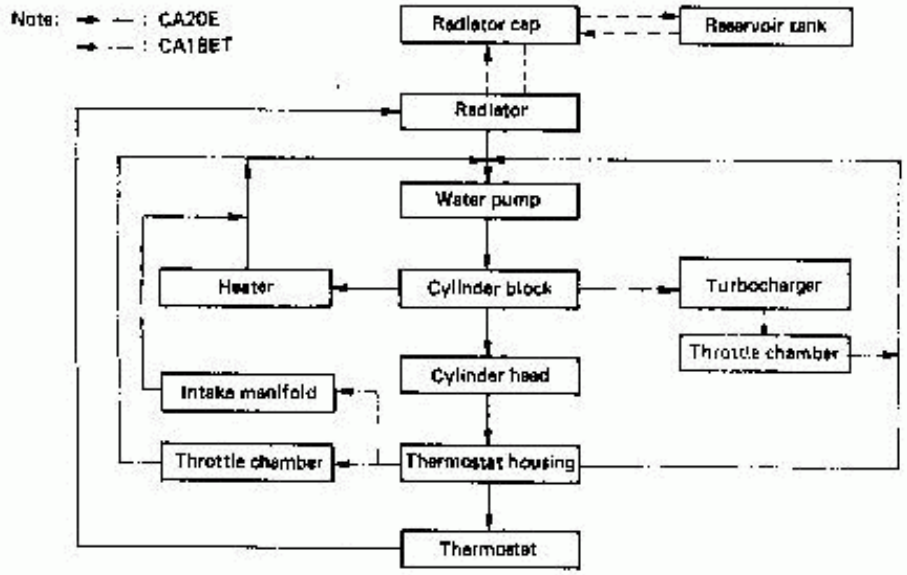
Cooling Circuit

CA20E engine



CA18ET engine





WARNING:

To avoid serious personal injury, never remove radiator cap quickly when engine is hot. Sudden release of cooling system pressure is very dangerous.

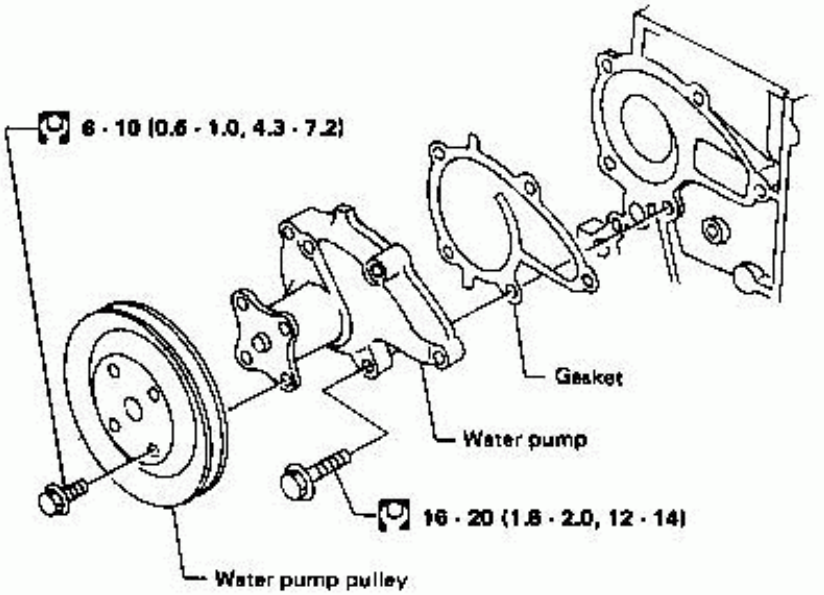
If it is necessary to remove radiator cap when radiator is hot, turn cap slowly counterclockwise to the first stop. After all pressure in the cooling system is released, turn cap passing the stop and remove it.

SLC750

COOLING SYSTEM—Water Pump

Removal and Installation

Refer to EM section.



: N·m (kg-m, ft-lb)

SLC302

When removing water pump assembly, be careful not to get water on the adjacent part of timing belt.
Water pump cannot be disassembled and should be replaced as a unit.
After installation, run engine for a few minutes, and check for leaks.

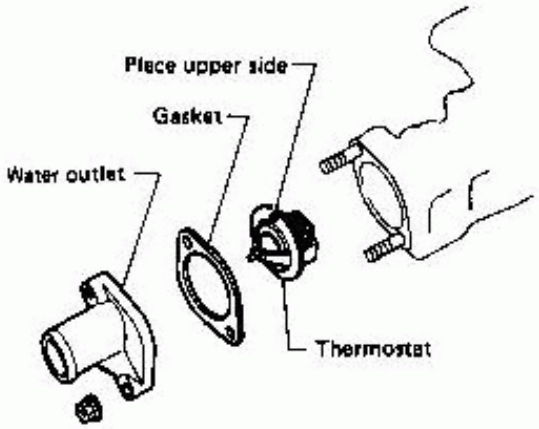
Inspection

1. Check for badly rusted or corroded body assembly and vane.
2. Check for rough operation due to excessive end play.

COOLING SYSTEM—Thermostat

Removal

1. Drain engine coolant.
2. Disconnect upper hose from water outlet.



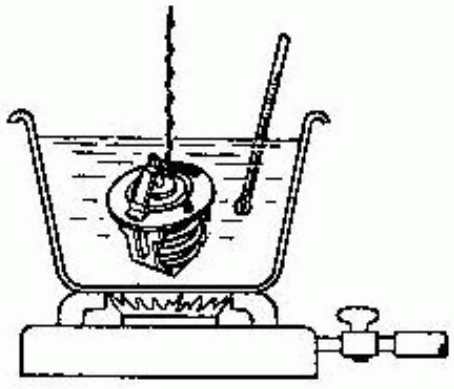
16 - 22 N·m (1.6 - 2.2 kg-m, 13 - 16 ft-lb)

SLC301

Inspection

1. Check for valve seating condition at ordinary temperatures. It should seat tightly.
2. Check valve opening temperature and maximum valve lift.

	Standard	Frigid type
Valve opening temperature °C (°F)	82 (180)	88 (190)
Max. valve lift mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)



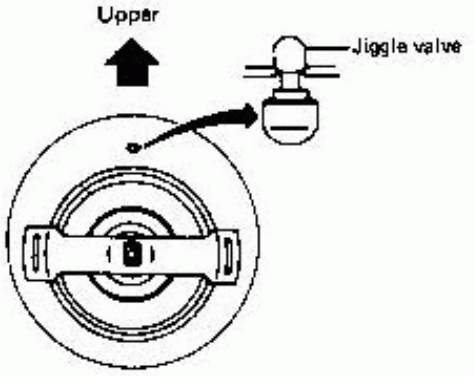
SLC343

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.

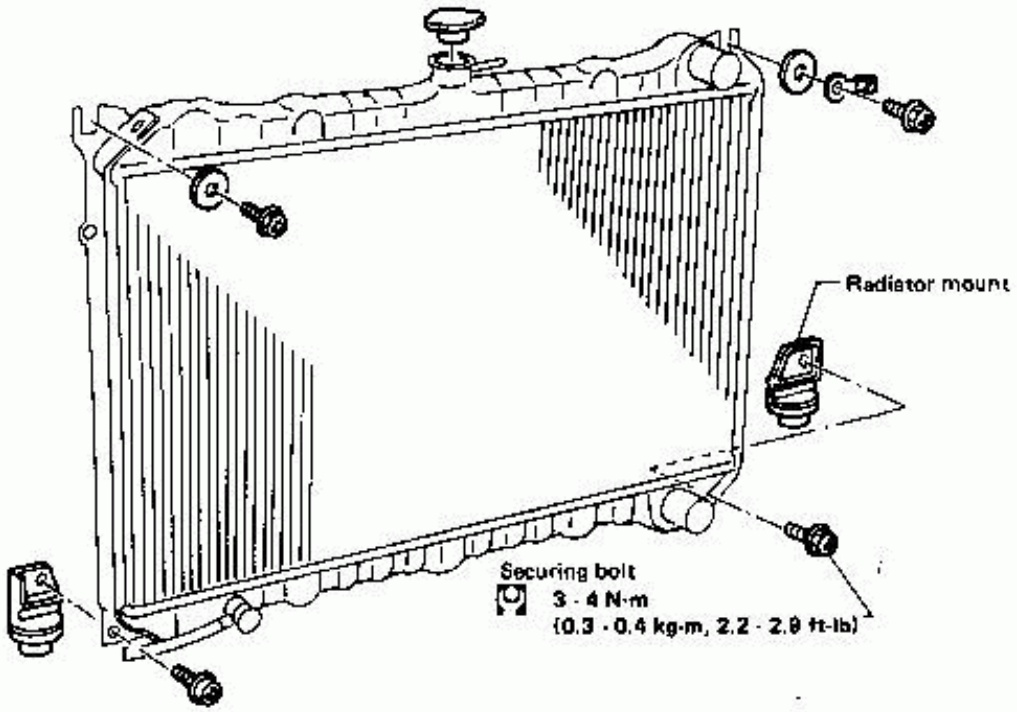
Installation

Install thermostat with jiggle valve facing upward.



SLC787

Disassembly and Assembly



SLC653

CHECKING COOLING SYSTEM

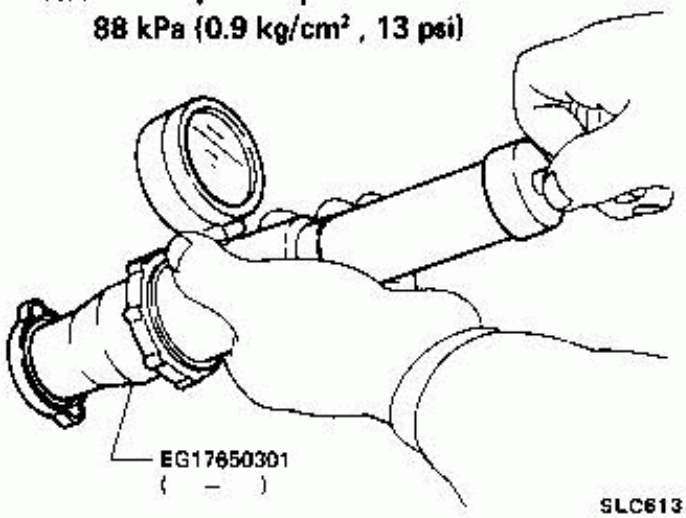
Checking cooling system hoses

Check hoses for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.

Checking radiator cap

Apply pressure to radiator cap with a cap tester and see if it is satisfactory.

Radiator cap relief pressure:
88 kPa (0.9 kg/cm², 13 psi)

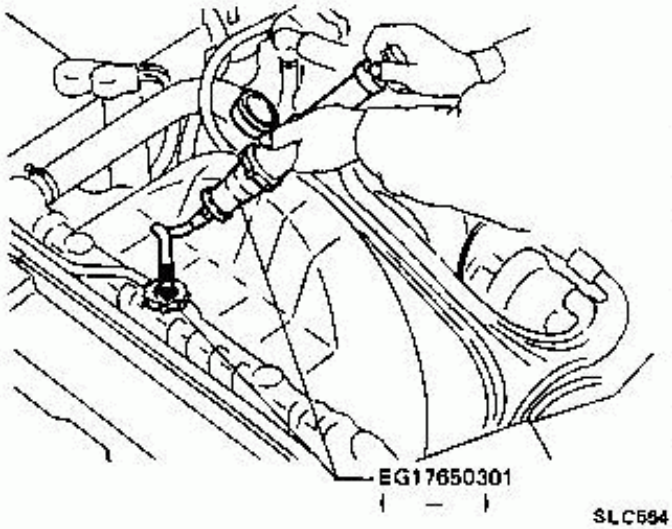


SLC613

Checking cooling system for leaks

Apply pressure to the cooling system with a tester and check for leakage.

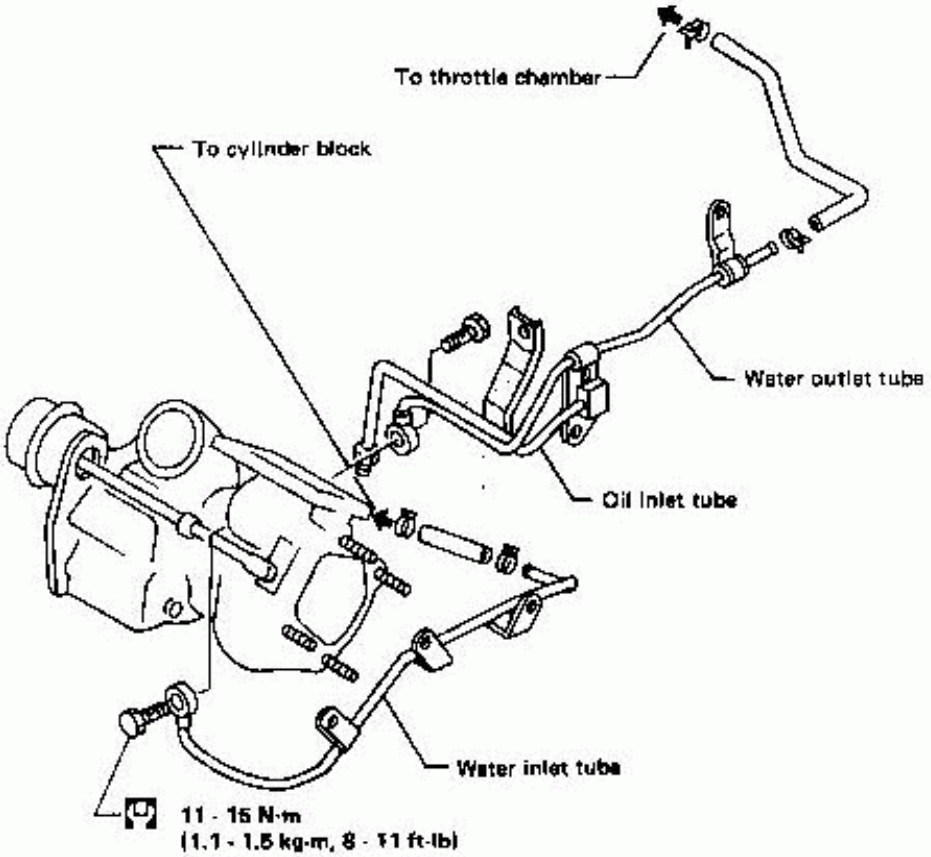
Test pressure:
157 kPa (1.6 kg/cm², 23 psi)



SLC584

CAUTION:
Higher than the specified pressure may cause radiator damage.

Turbocharger



SLC630

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (kg/cm², psi)
600	98 (1, 14)
2,000	294 (3, 43)
4,000 (Except turbo engine model)	392 (4, 57)
(Turbo engine model)	490 (5, 71)

Oil pump inspection (Standard value)

Unit: mm (in)

Body to outer gear clearance	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance	0.12 - 0.23 (0.0047 - 0.0091)
Outer gear to crescent clearance	0.21 - 0.32 (0.0083 - 0.0126)
Housing to outer gear clearance	0.05 - 0.11 (0.0020 - 0.0043)
Housing to inner gear clearance	0.05 - 0.09 (0.0020 - 0.0035)

Oil pressure regulator valve

Regulator valve spring Free length mm (in)	52.5 (2.067)
Installed length/load mm/N (kg), (in/lb)	34.8/77.5 - 85.3 (7.9 - 8.7), (1.370/17.4 - 19.2)
Regulator valve opening pressure kPa (kg/cm², psi)/rpm	373 - 412 (3.8 - 4.2, 54 - 60)/2,000

Tightening torque

Unit	N·m	kg-m	ft-lb
Oil pump securing bolt	12 - 16	1.2 - 1.6	9 - 12
Oil pump cover screw	4 - 5	0.4 - 0.5	2.9 - 3.6
Regulator valve cap	39 - 49	4.0 - 5.0	29 - 36
Oil strainer bolt	10 - 14	1.0 - 1.4	7 - 10
Oil pressure switch	10 - 16	1.0 - 1.6	7 - 12
Turbocharger			
Oil inlet tube	16 - 24	1.6 - 2.4	12 - 17
Oil outlet pipe	39 - 59	4.0 - 6.0	29 - 43

Engine Cooling System

Thermostat

	Standard	Frigid type
Valve opening temperature °C (°F)	82 (180)	88 (190)
Max. valve lift mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)

Radiator

Unit: kPa (kg/cm², psi)

Cap relief pressure	88 (0.9, 13)
Leakage test pressure	157 (1.6, 23)

Tightening torque

Unit	N·m	kg-m	ft-lb
Water pump securing bolt	16 - 20	1.6 - 2.0	12 - 14
Water outlet securing bolt	18 - 22	1.8 - 2.2	13 - 16
Radiator securing bolt	3 - 4	0.3 - 0.4	2.2 - 2.9
Turbocharger cooling tube	11 - 15	1.1 - 1.5	8 - 11

ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

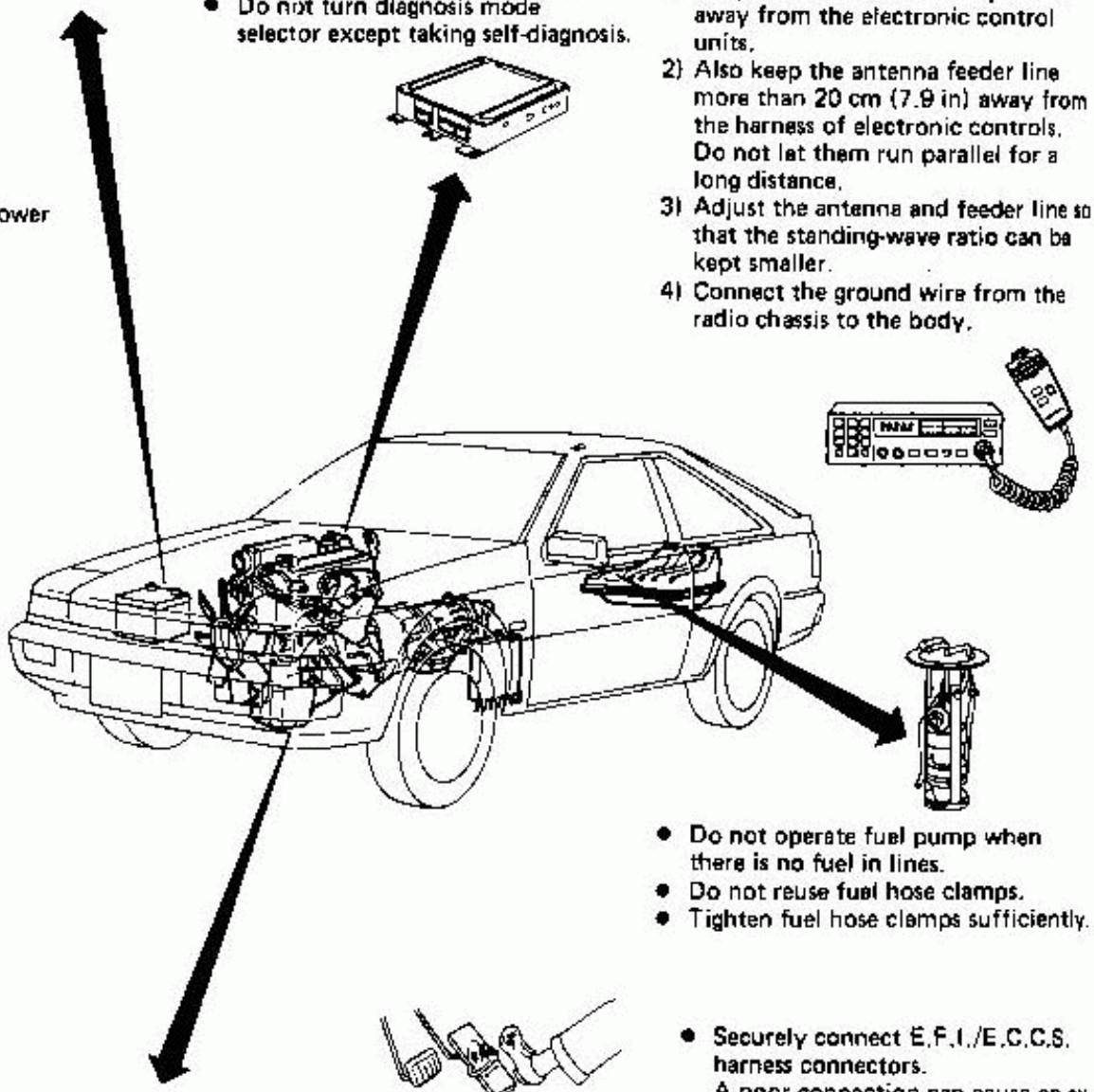
CONTENTS

- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.

- Do not disassemble E.F.I./E.C.C.S. control unit.
- Do not turn diagnosis mode selector except taking self-diagnosis.

- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.
1) Keep the antenna as far as possible away from the electronic control units.
2) Also keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls. Do not let them run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
4) Connect the ground wire from the radio chassis to the body.

- Do not apply battery power directly to injectors.



- Do not operate fuel pump when there is no fuel in lines.
- Do not reuse fuel hose clamps.
- Tighten fuel hose clamps sufficiently.

- Handle air flow meter carefully to avoid damage.
- Do not disassemble air flow meter.
- Do not clean air flow meter with any type of detergent.
- Even a slight leak in the air intake system can cause serious problems.

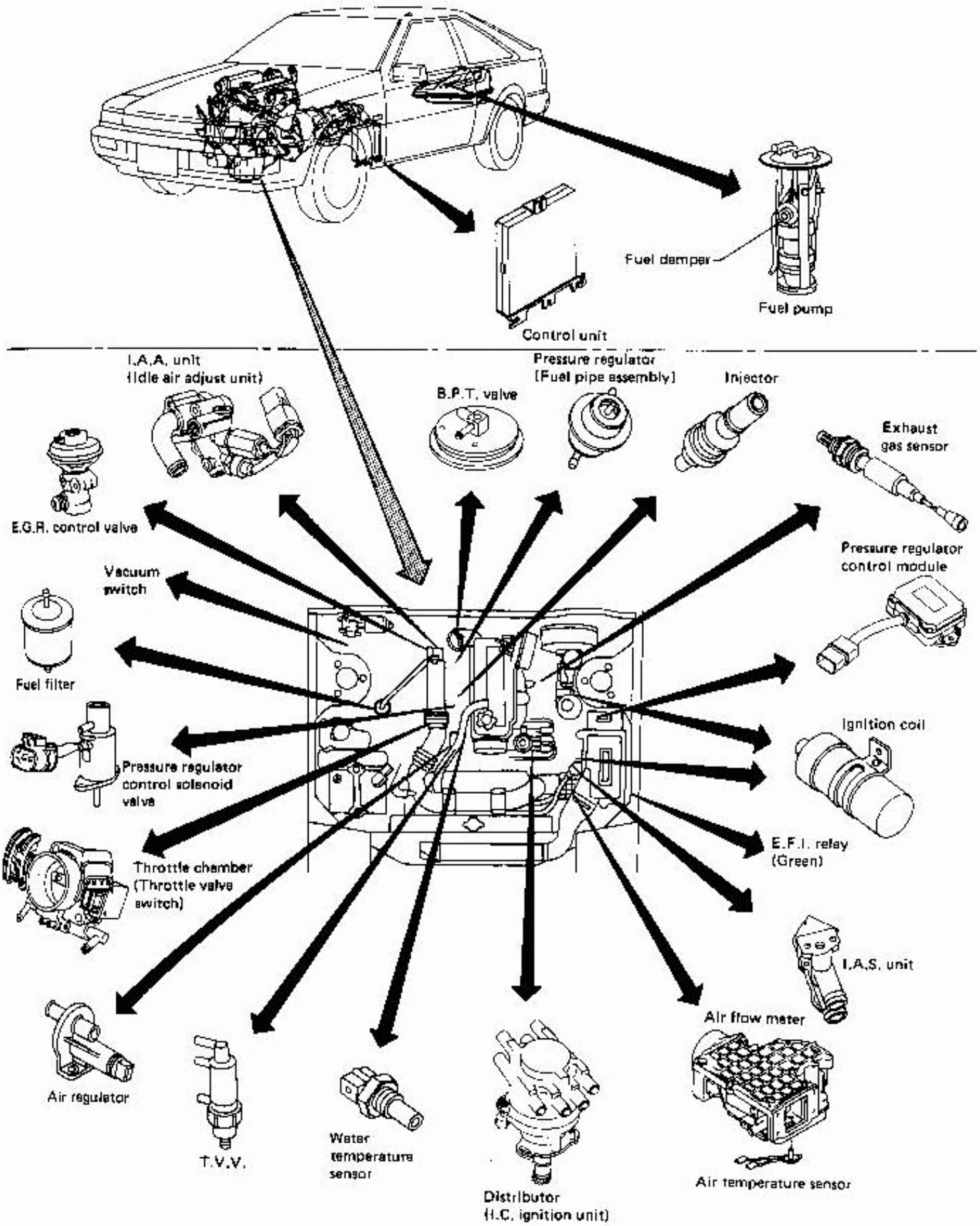
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

- Securely connect E.F.I./E.C.C.S. harness connectors.
A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to IC circuit.
- Keep E.F.I./E.C.C.S. harness at least 10 cm (3.9 in) away from adjacent harnesses. This will prevent an E.F.I./E.C.C.S. system malfunction due to reception of external noise, degraded operation of IC circuit, etc.
- Keep E.F.I./E.C.C.S. parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

- Do not shock or jar the crank angle sensor.

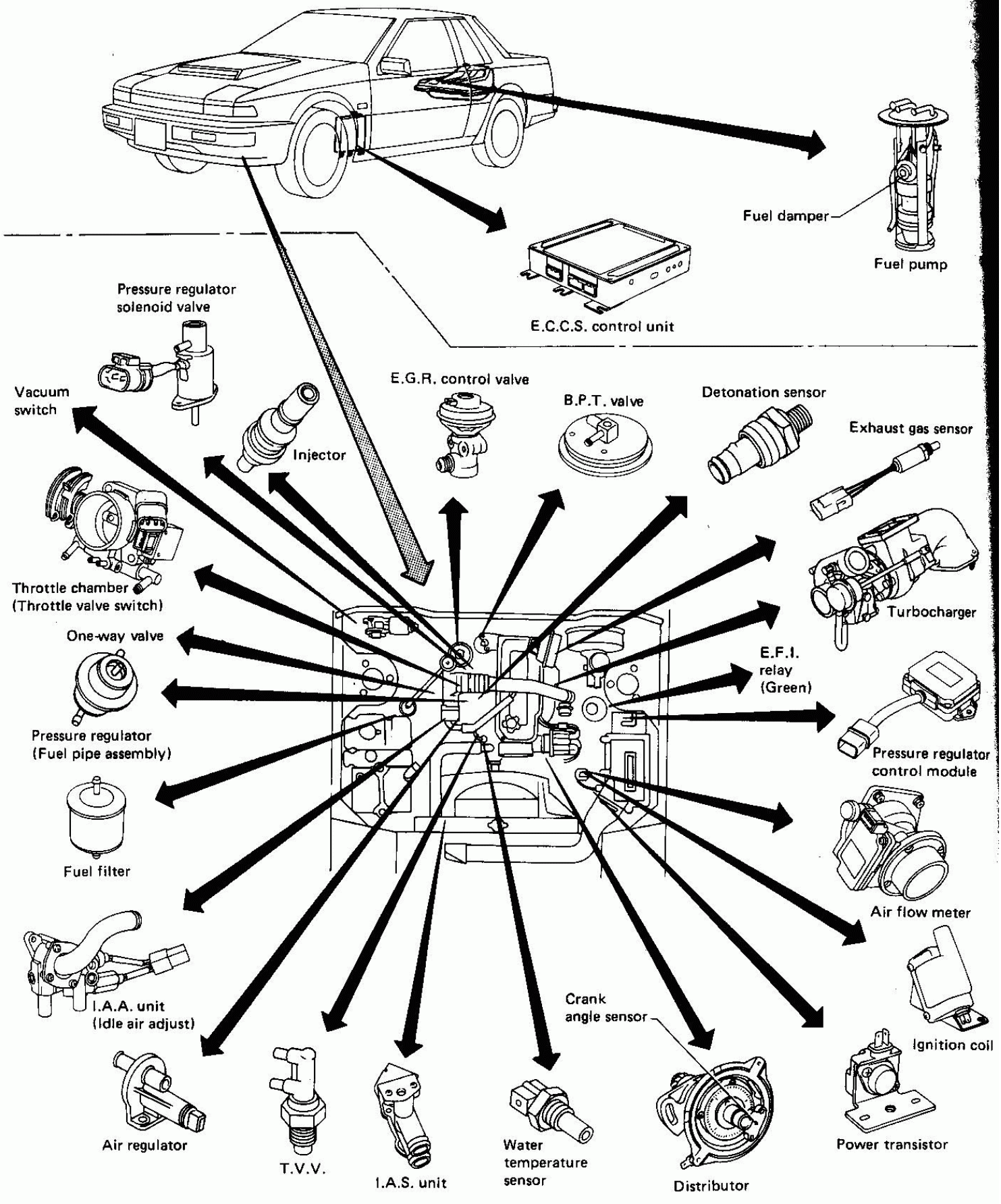
SEF809C

COMPONENT PARTS LOCATION—CA20E Engine



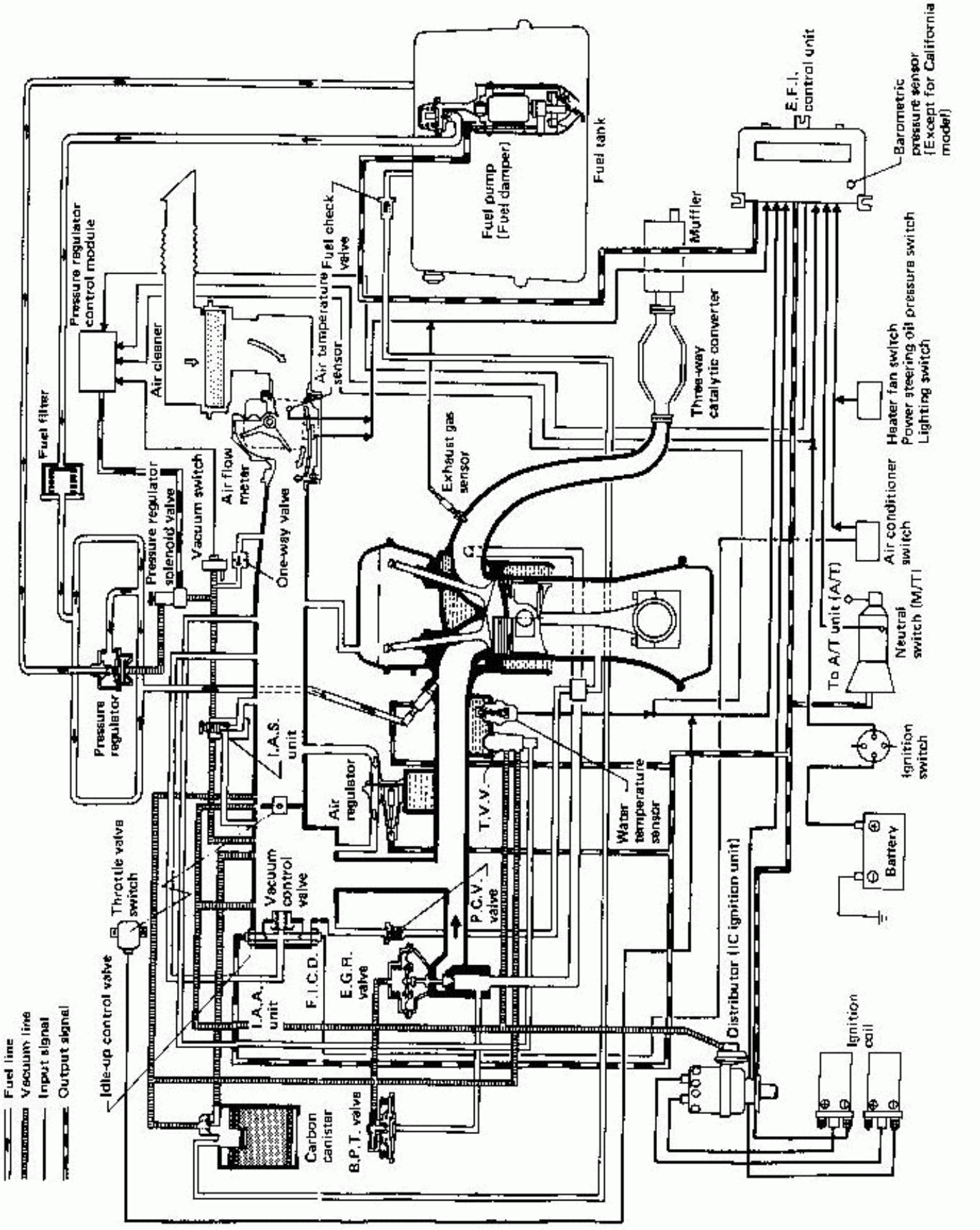
SEF610C

COMPONENT PARTS LOCATION—CA18ET Engine



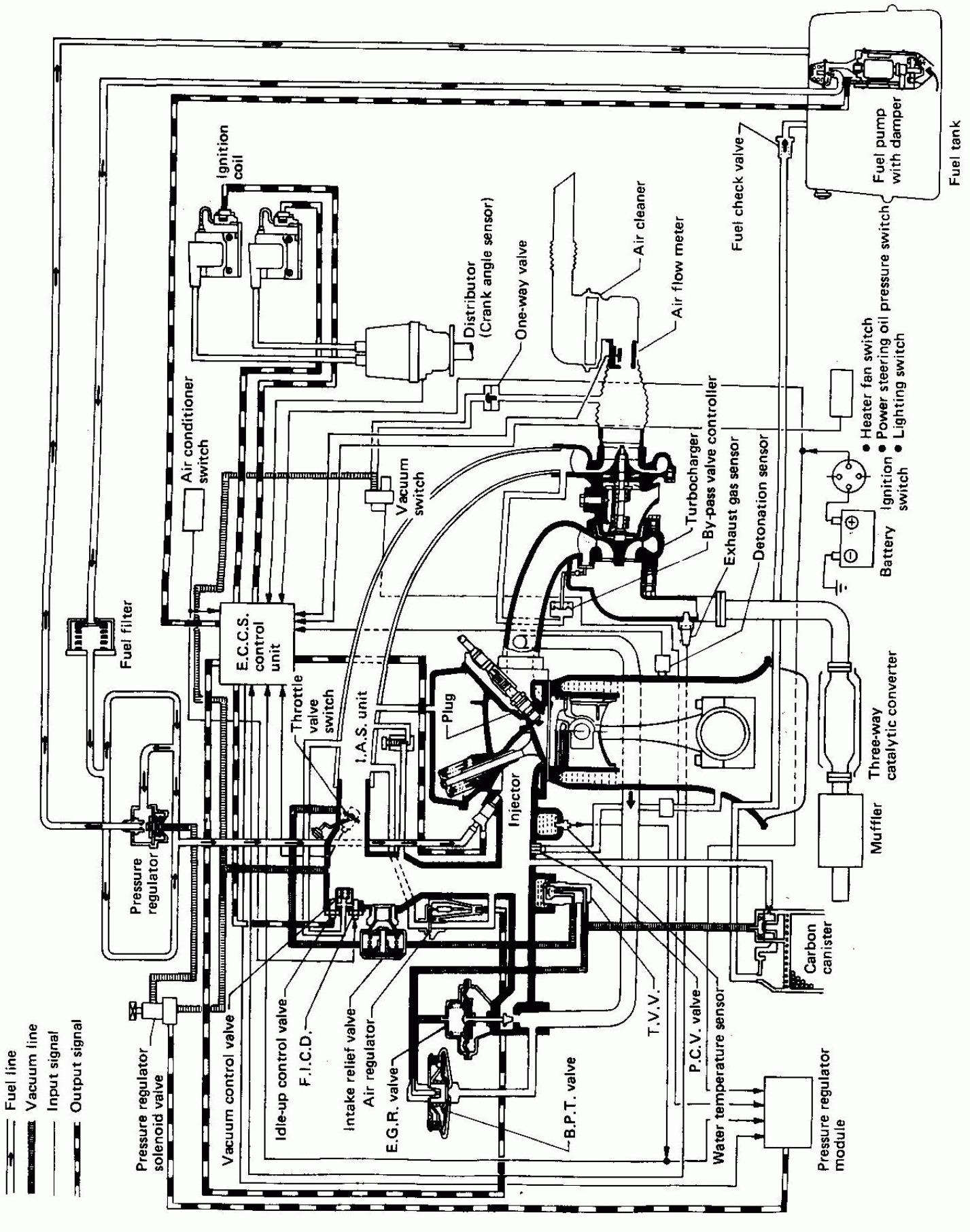
SEF611C

E.F.I. DIAGRAM—CA20E Engine



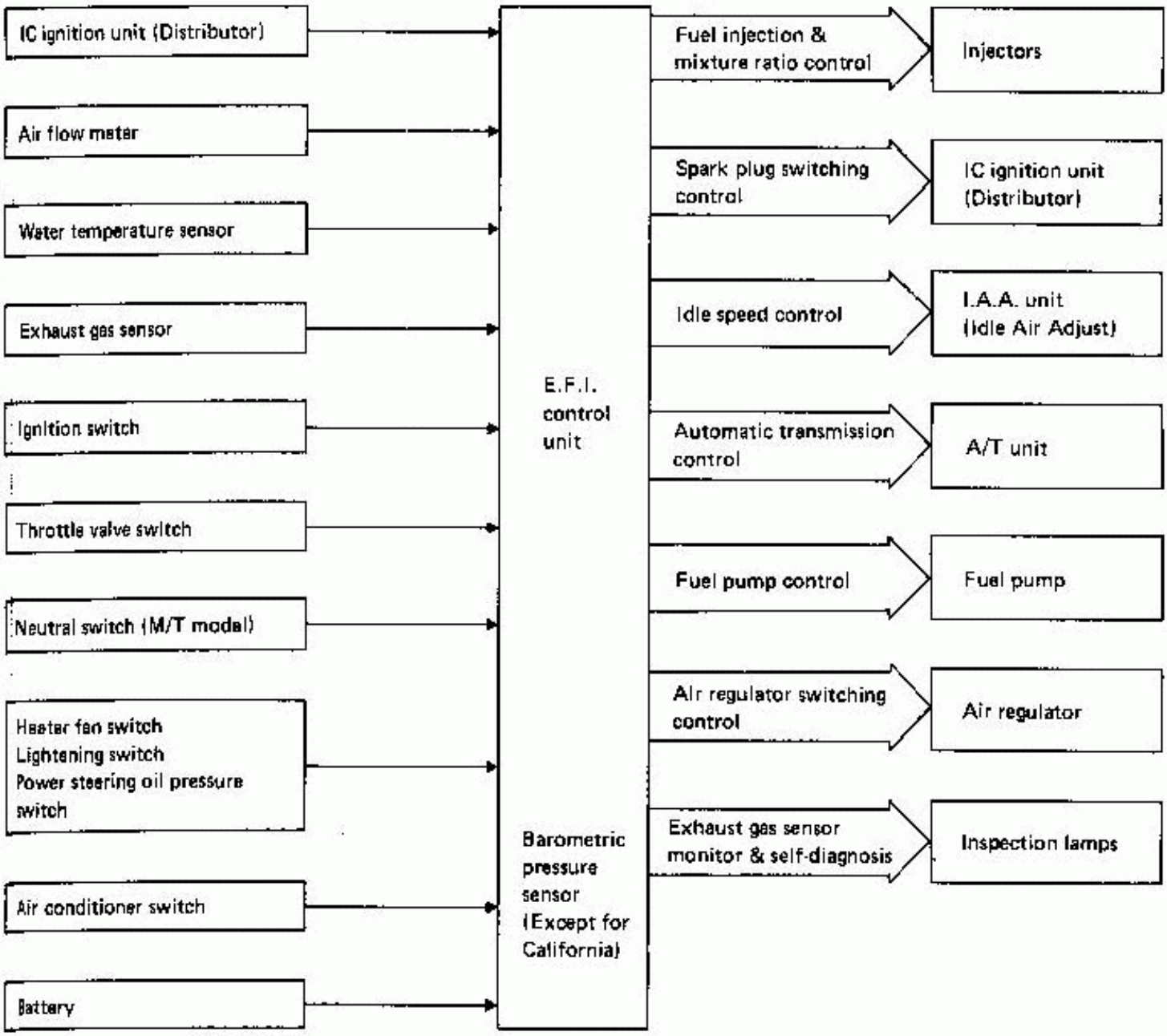
SEF612C

E.C.C.S. DIAGRAM—CA18ET Engine

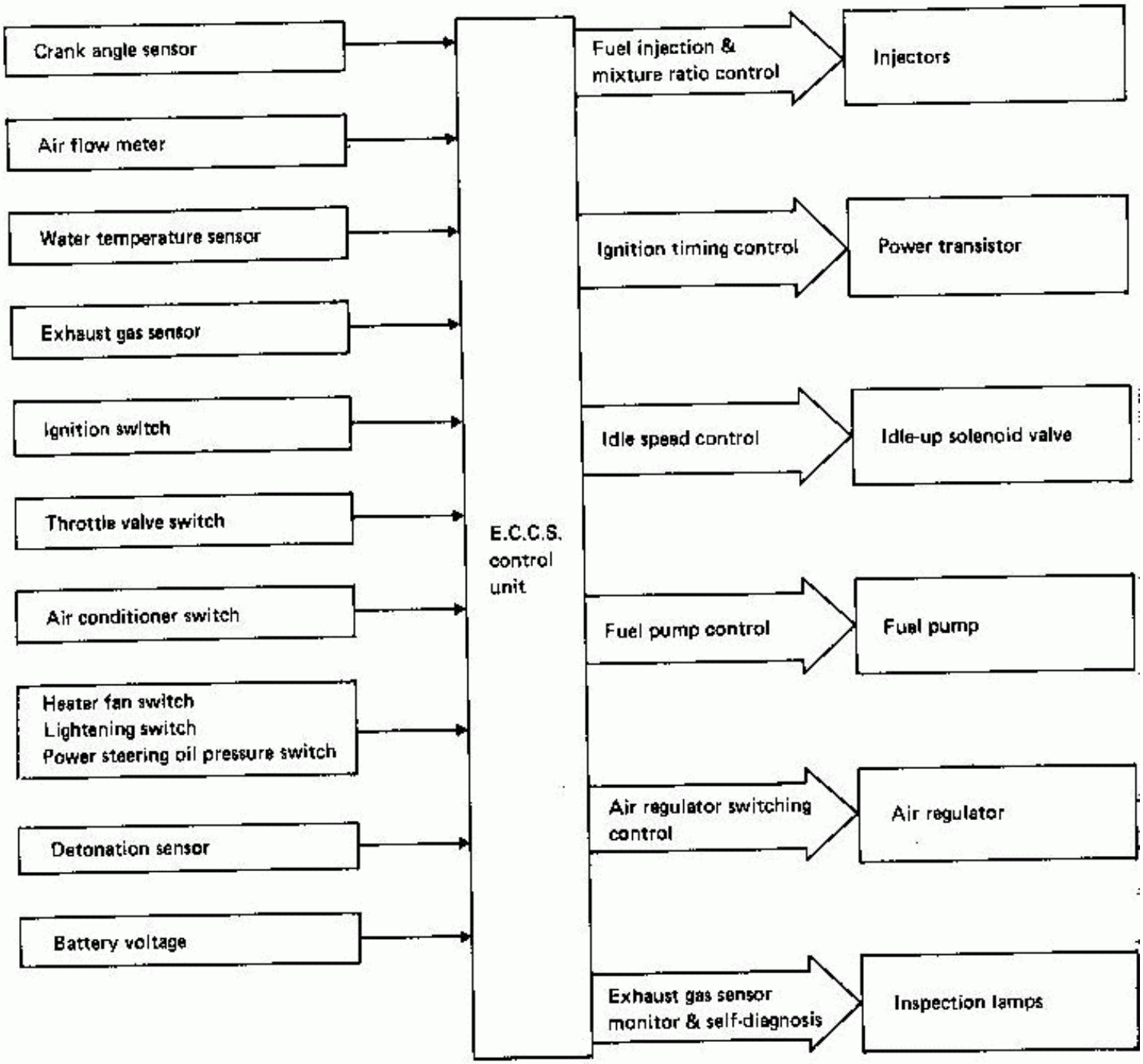


SEF6(

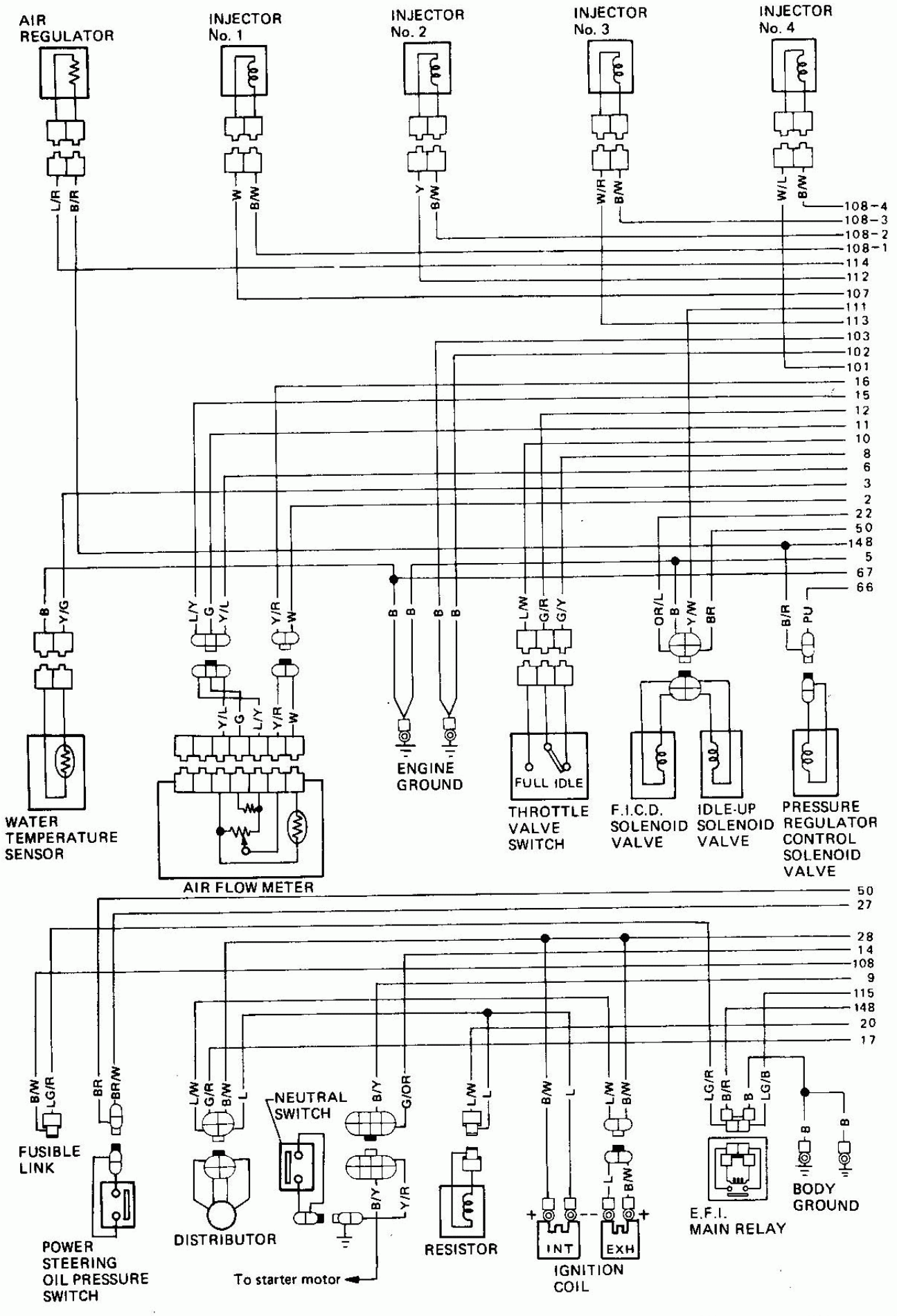
E.F.I. CHART—CA20E Engine



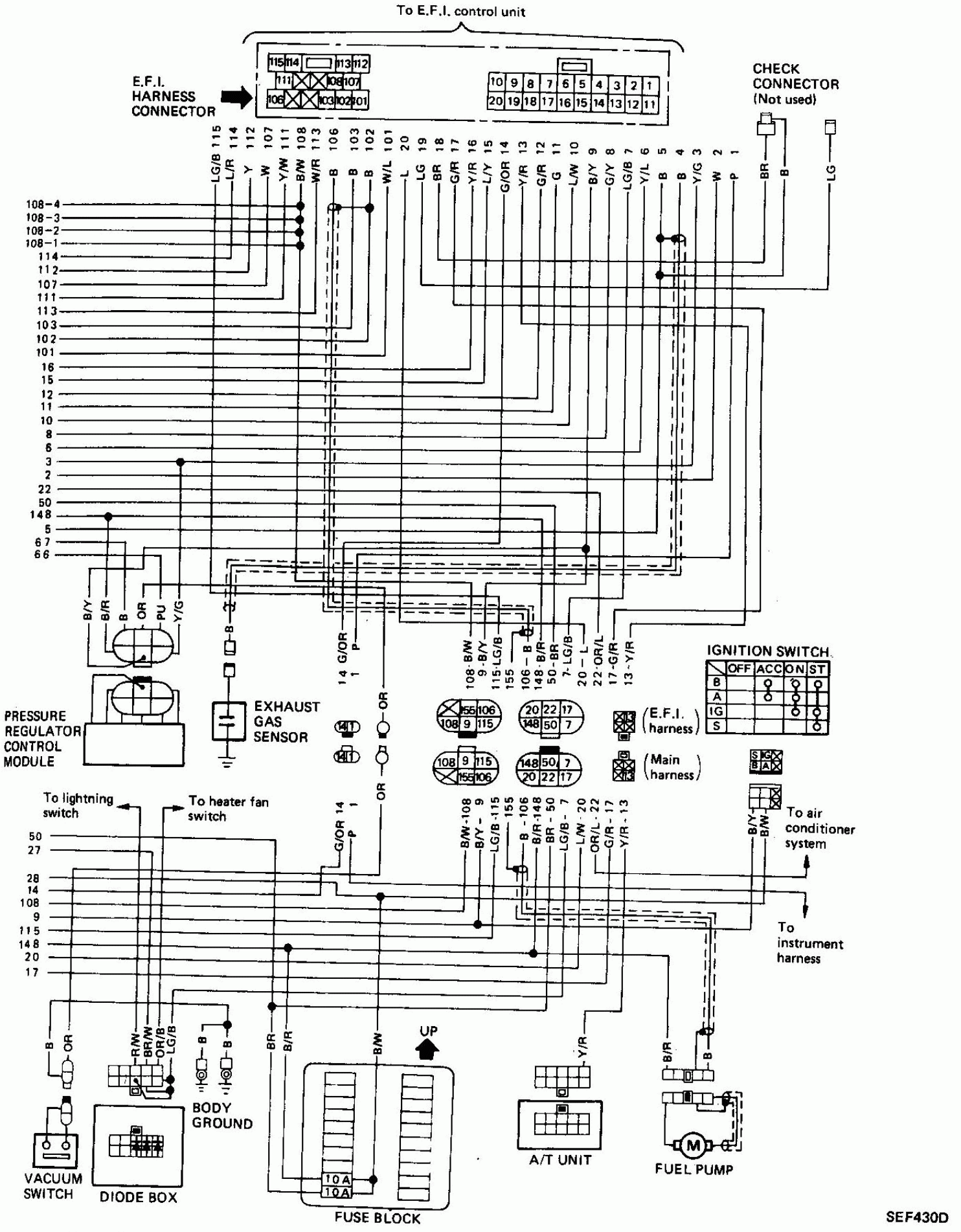
E.C.C.S. CHART—CA18ET Engine



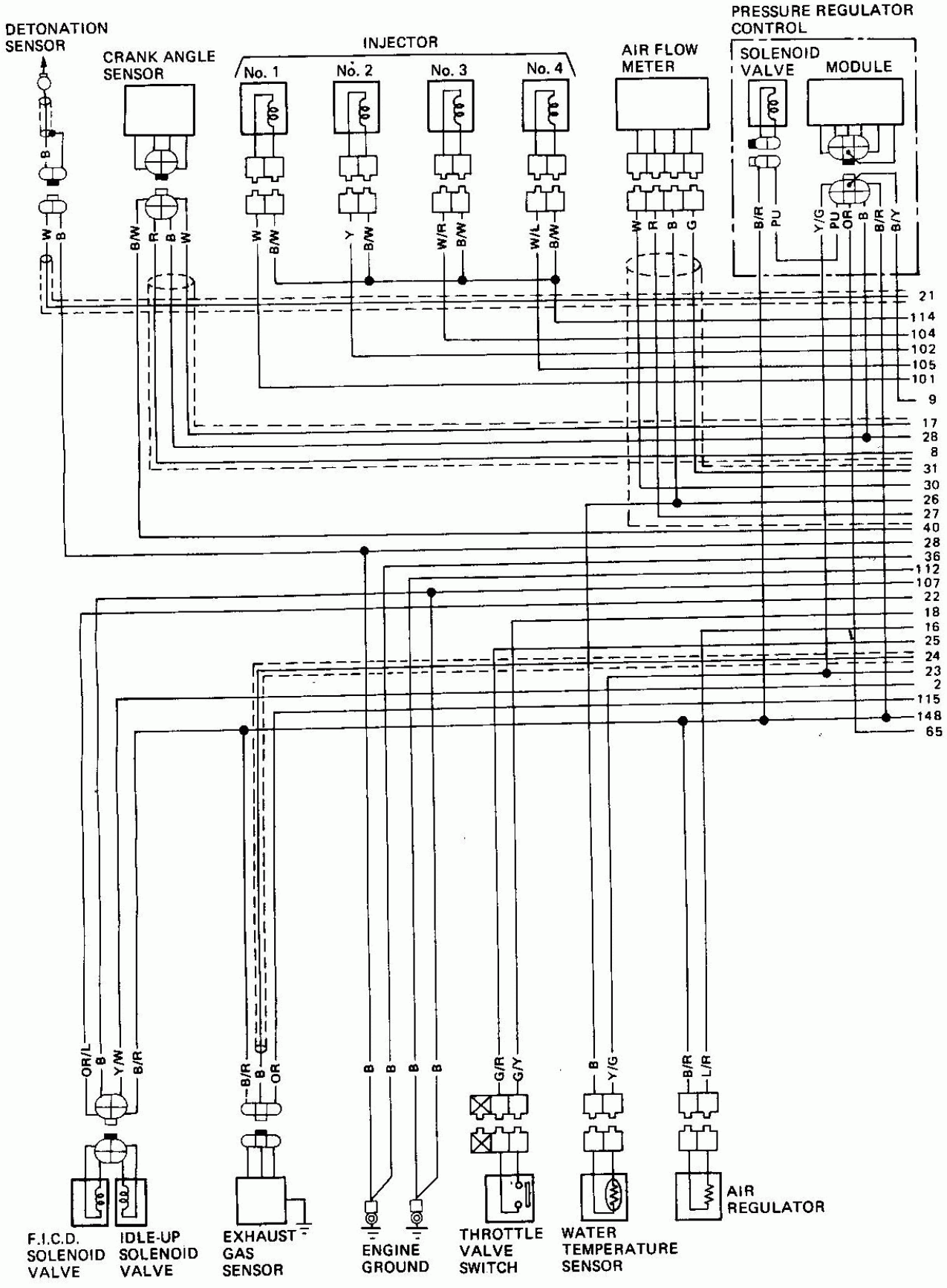
E.F.I. WIRING DIAGRAM—CA20E Engine



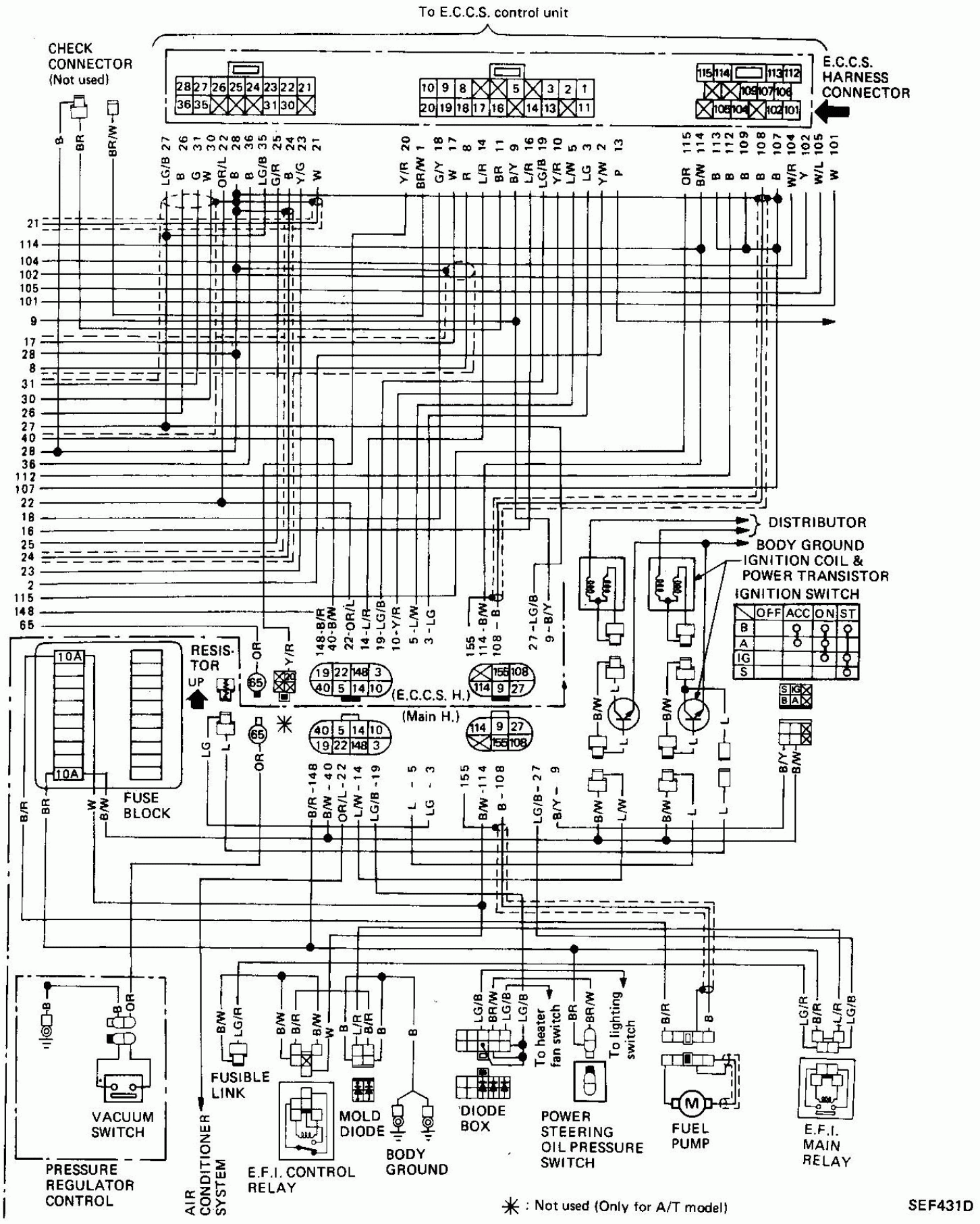
E.F.I. WIRING DIAGRAM—CA20E Engine



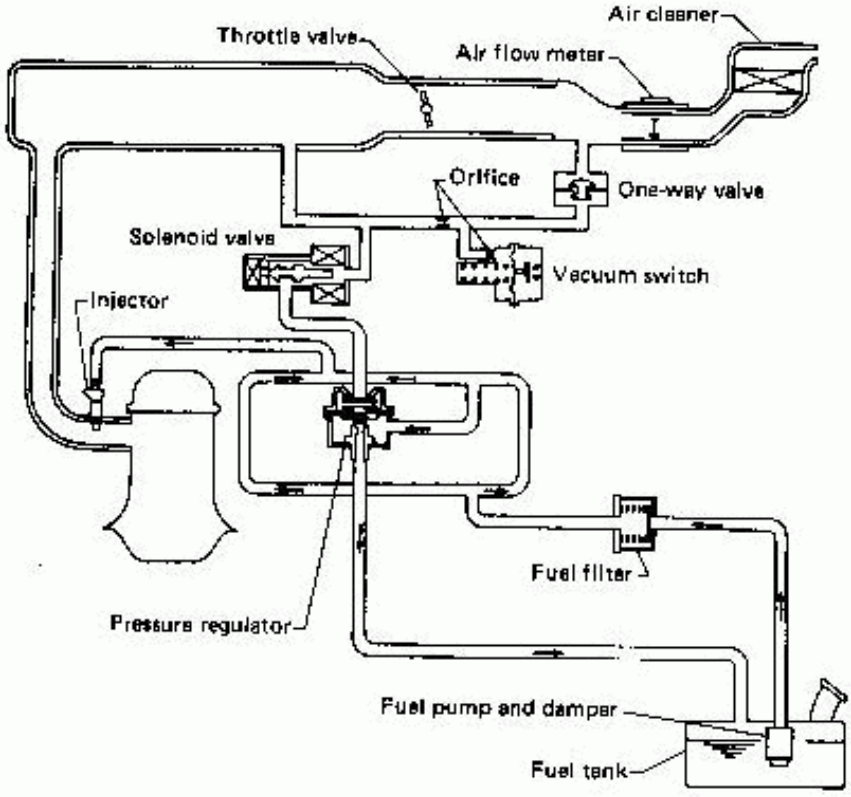
E.C.C.S. WIRING DIAGRAM—CA18ET Engine



E.C.C.S. WIRING DIAGRAM—CA18ET Engine

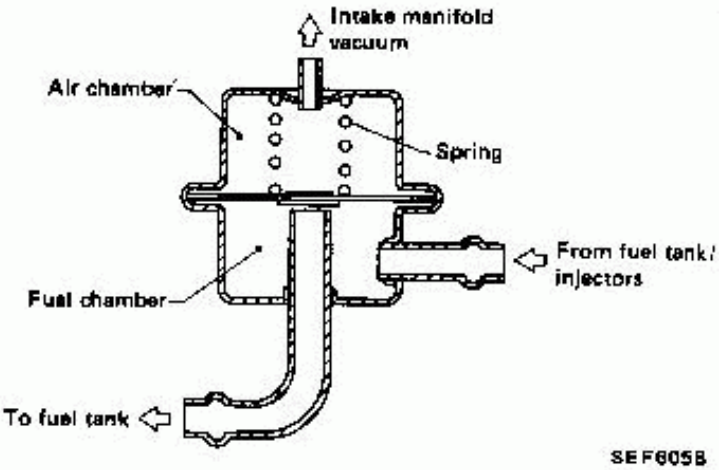


FUEL FLOW SYSTEM DESCRIPTION

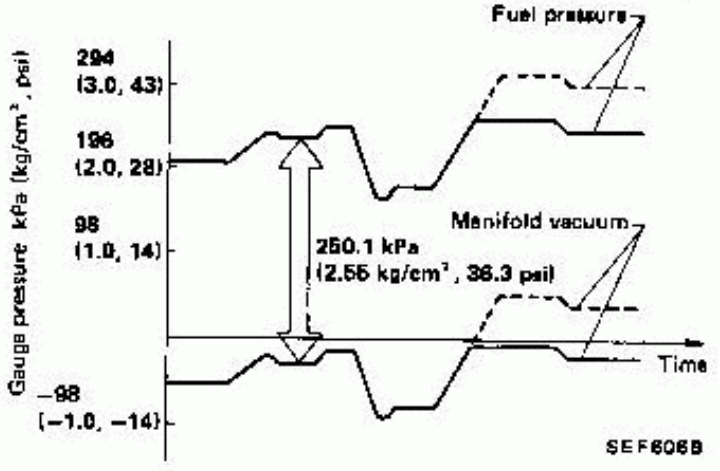


SEF594C

The amount of fuel to be injected is determined by the injection pulse duration as well as by a pressure difference between fuel pressure and intake manifold vacuum pressure. The E.F.I./E.C.C.S. control unit controls only the injection pulse duration. For this reason, the pressure difference between the fuel pressure and intake manifold vacuum pressure should be maintained at a constant level. Since the intake manifold vacuum pressure varies with engine operating conditions, a pressure regulator is placed in the fuel line to regulate the fuel pressure in response to changes in the intake manifold vacuum pressure.



SEF605B

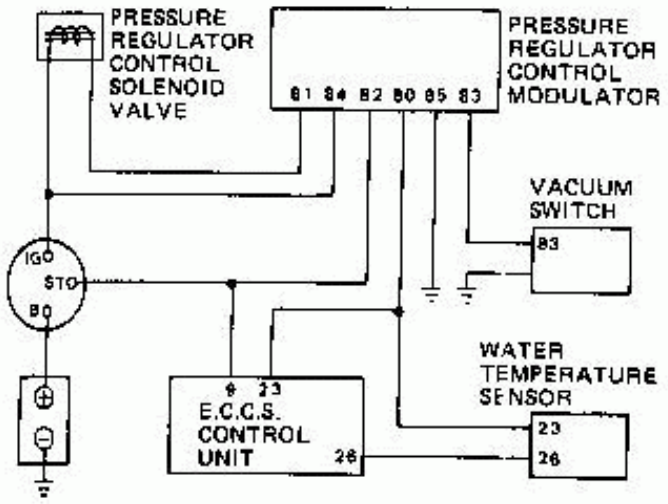


SEF606B

FUEL FLOW SYSTEM DESCRIPTION

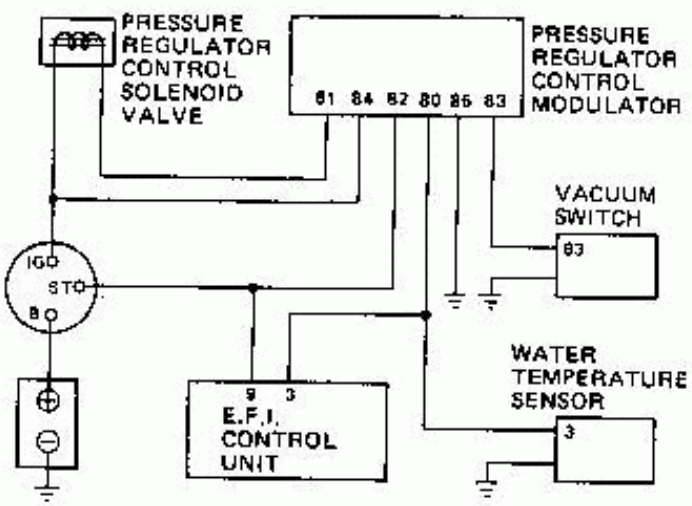
Pressure Regulator Control System

CA18ET engine



SEF593C

CA20E engine



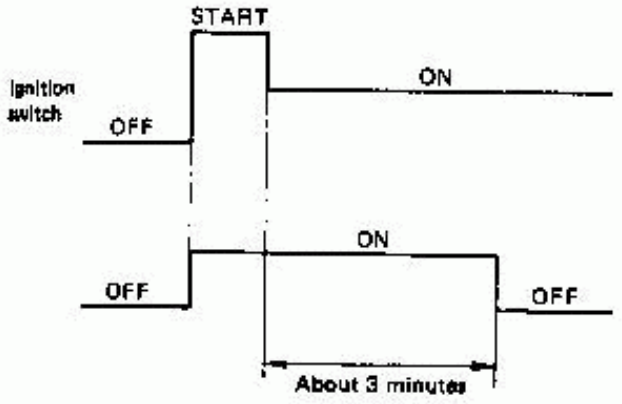
SEF618C

The pressure regulator control improves the starting of a hot engine by cutting off the intake manifold vacuum pressure and increasing the fuel pressure.

OPERATION

This system operates when starting and 3 minutes after start, when all of the following conditions are met.

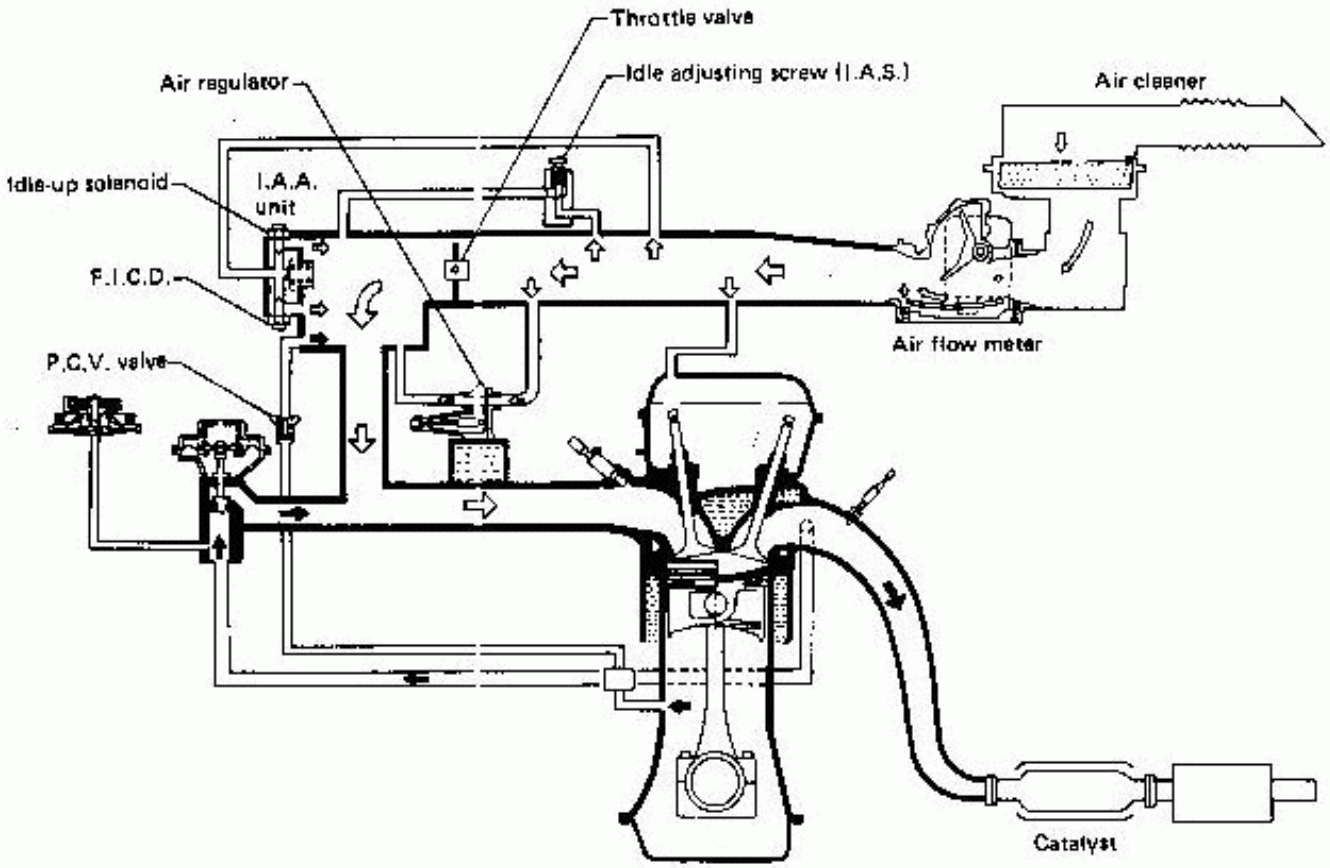
- Water temperature is above 95°C (203°F).
- Vacuum at the vacuum switch is below 10.7 kPa (80 mmHg, 3.15 inHg).



SEF741B

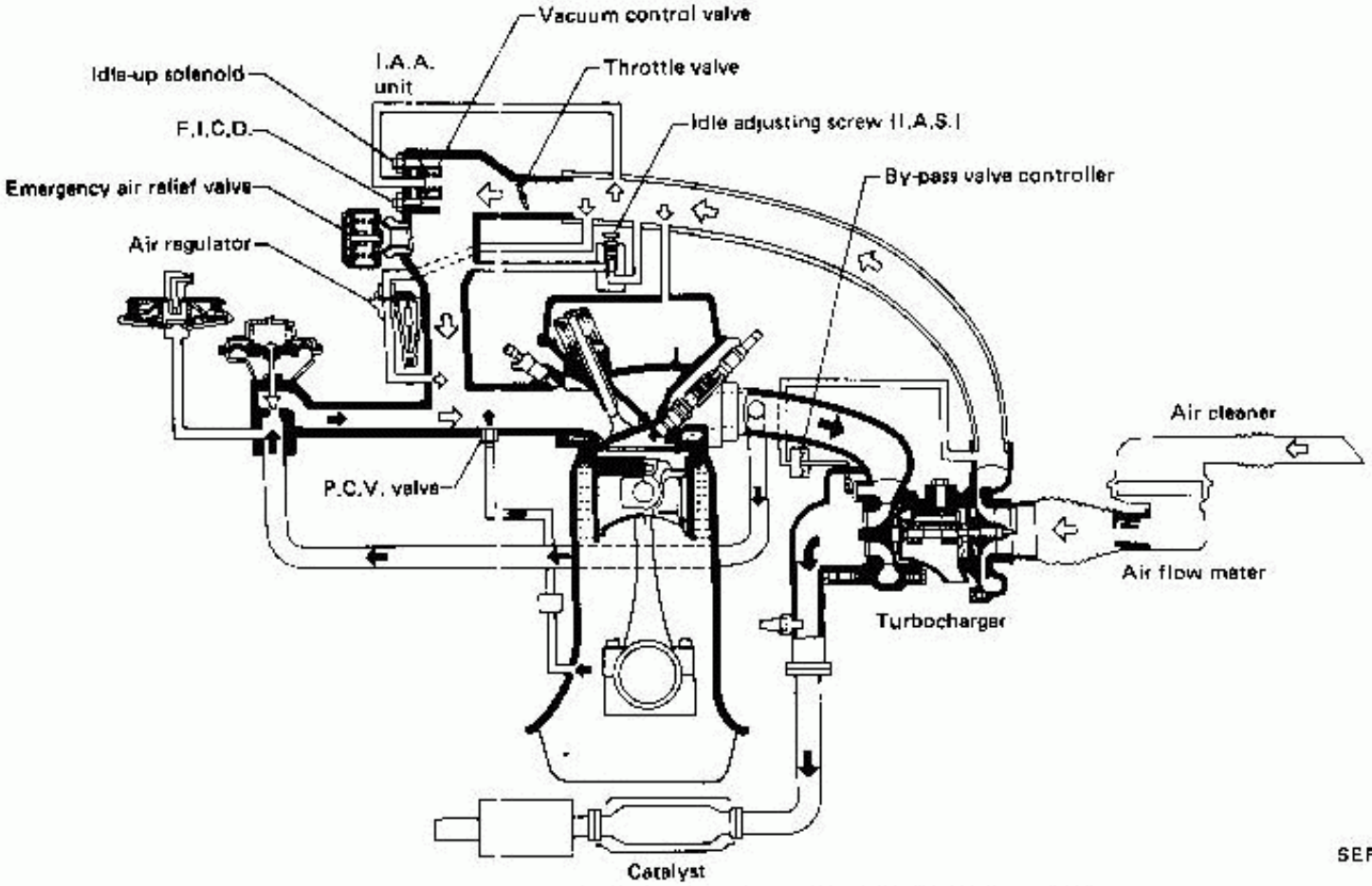
AIR FLOW SYSTEM DESCRIPTION

CA20E Engine



SEF968B

CA18T Engine



SEF969B

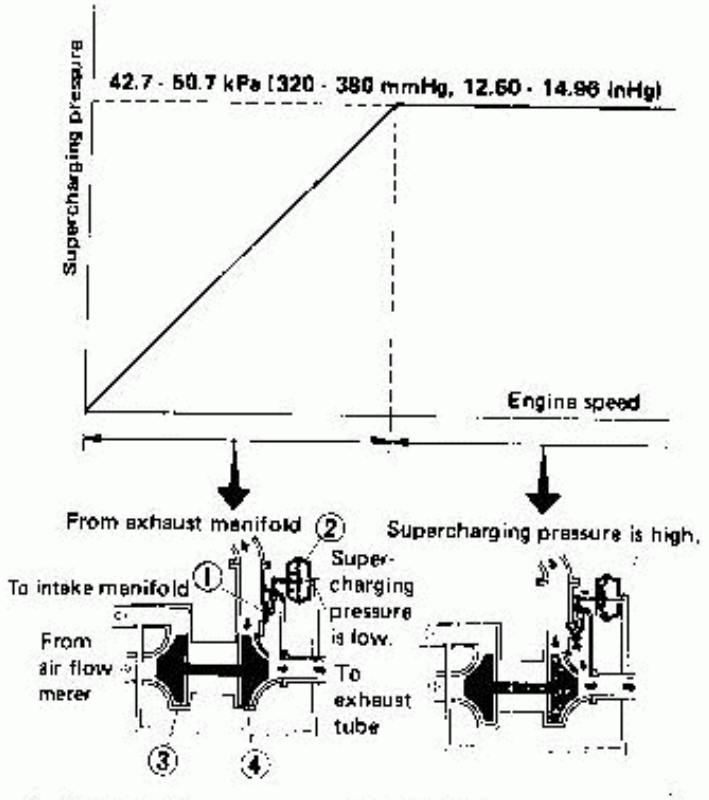
FAIL-SAFE SYSTEM

When air flow meter output voltage is lower than the preset value while the engine is running, the E.C.C.S. control unit switches the idle-up solenoid to ON and the fuel injection pulse duration is fixed at the preset value (when engine speed is less than 2,000 rpm).

TURBOCHARGER

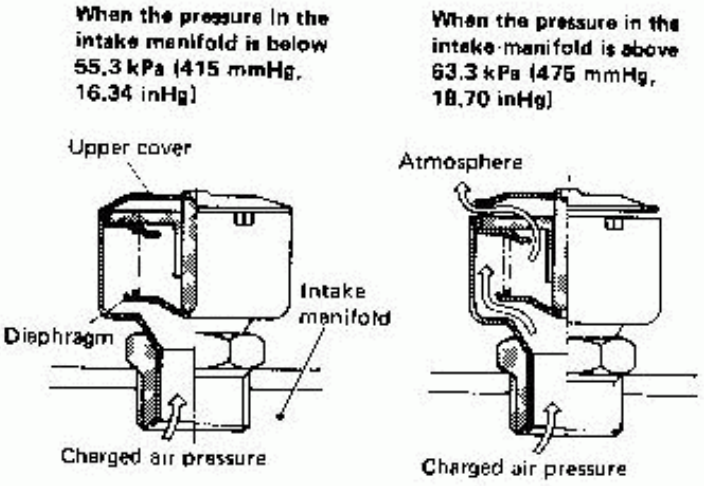
The turbocharger is installed on the exhaust manifold. This system utilizes exhaust gas energy to spin the turbine wheel which is directly connected to the compressor wheel. The compressor supplies pressurized air through the throttle chamber into the intake manifold. Thus, the turbocharger increases charging efficiency and thereby increases power and torque.

To prevent an excessive rise in the supercharging pressure, the turbine speed is maintained within a safe range by controlling the amount of exhaust gas that passes through the turbine. This system consists of a by-pass valve which allows some of the exhaust gas to by-pass the turbine and to flow directly into the exhaust tube.



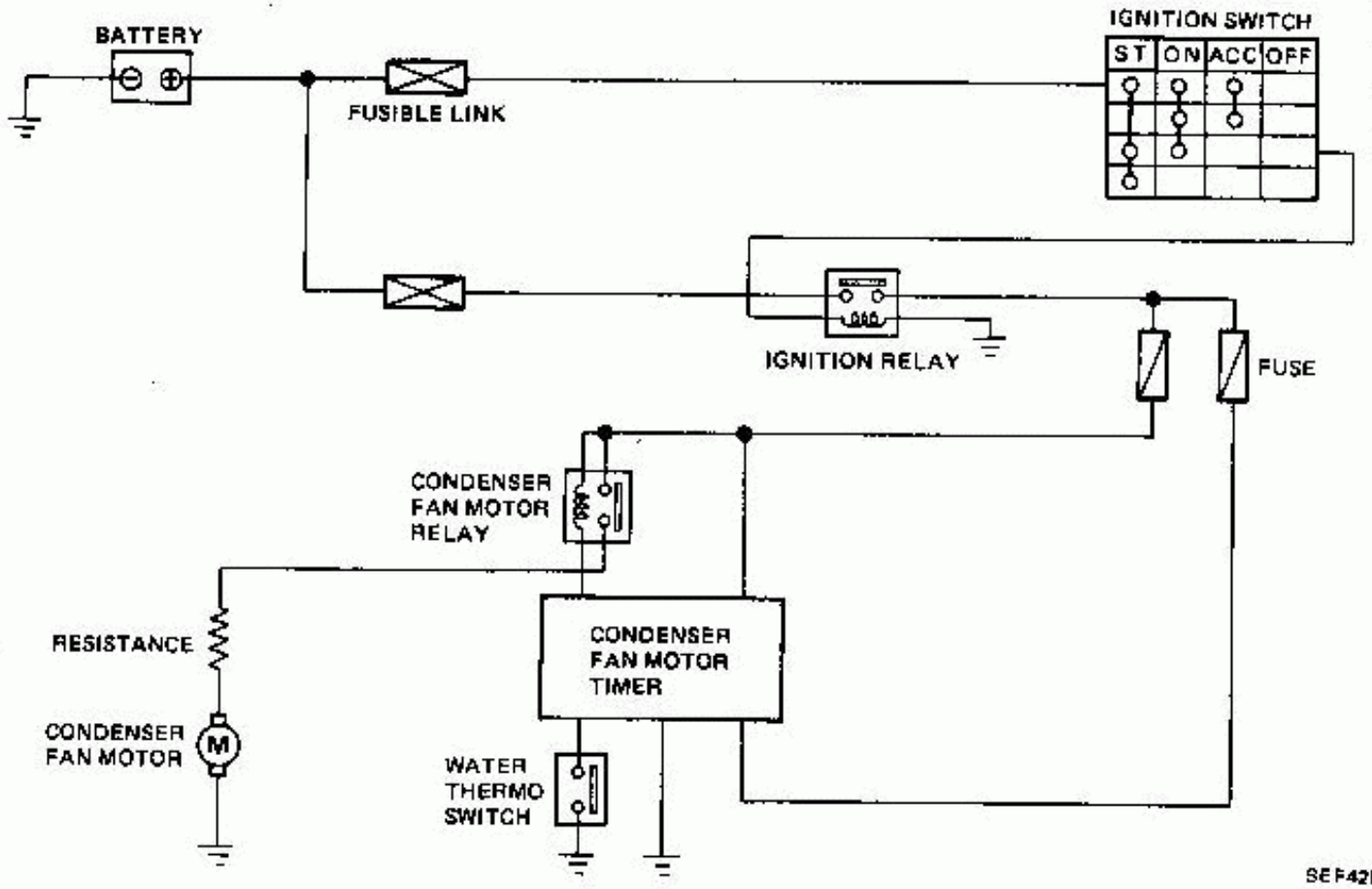
EMERGENCY RELIEF VALVE

To prevent an abnormal rise in supercharging pressure, and possible engine damage, in case the by-pass valve fails to open properly, an emergency relief valve is provided as a safety device on the intake manifold.



CONDENSER FAN MOTOR TIMER SYSTEM DESCRIPTION

Condenser fan motor timer improves hot-restart ability by operating fan motor after ignition switch is turned off. (For wiring diagram and inspection, refer to section HA.)

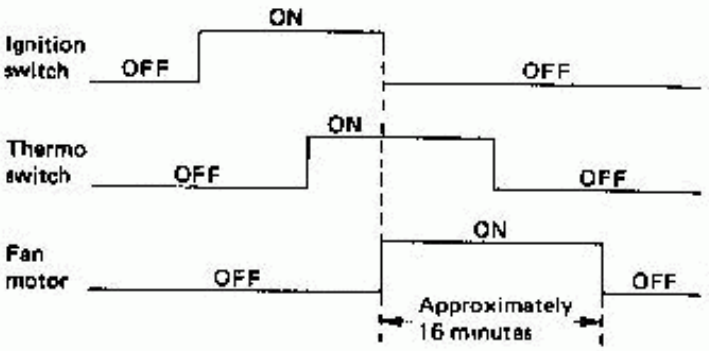


SEF428D

OPERATION

This system operates as follows.

Condition	Fan motor operation
• After ignition switch is turned off • Water temperature: above 80°C (176°F)	ON • Operating voltage : 6V • Operating time : 16 minutes



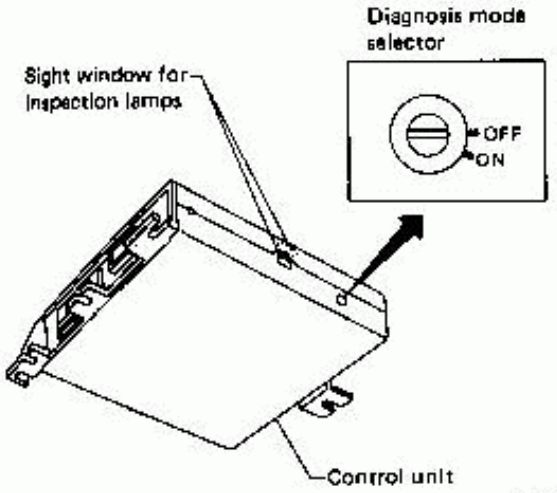
SEF429D

Components

CONTROL UNIT

The control unit consists of a micro-computer, connectors for signal input and output and power supply, inspection lamps and diagnostic mode selector. The control unit controls the amount of fuel that is injected, ignition timing (CA18ET), A/T lock-up disengagement (CA20E) fuel pump operation, idle speed control, feedback of the mixture ratio, air regulator control and spark plug switching (CA20E).

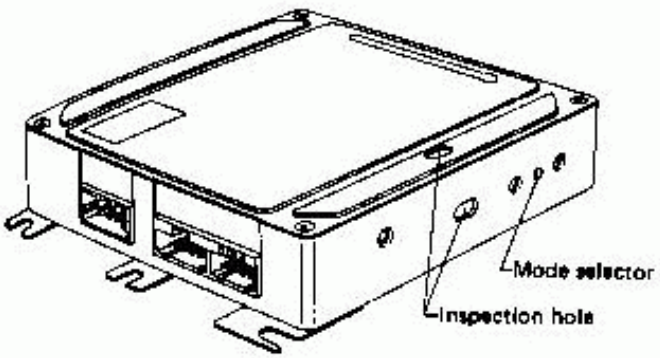
CA20E engine



SEF298C

A barometric pressure sensor is installed in order to correct the mixture ratio according to the elevation. (Except for California)

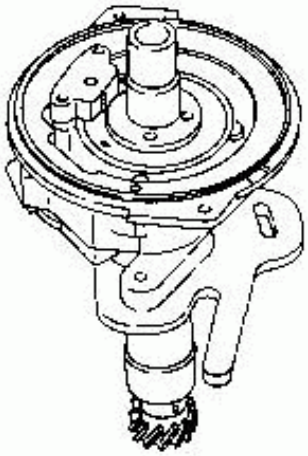
CA18ET engine



SEF611B

CRANK ANGLE SENSOR (CA18ET engine)

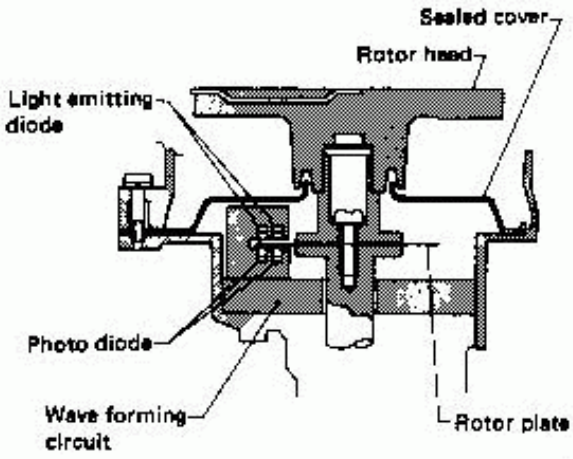
Crank angle sensor is a basic signal sensor for the entire E.C.C.S. It monitors engine speed and piston position, and it sends signals to the E.C.C.S. control unit for control of fuel injection, ignition timing and fuel pump operation.



SEF970B

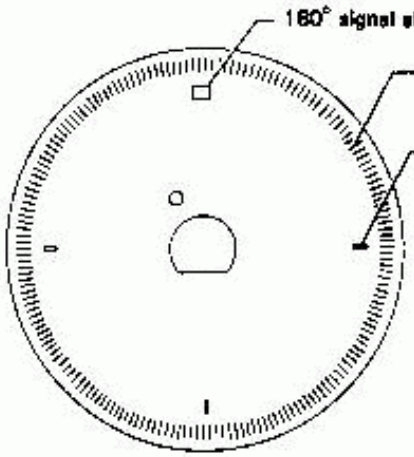
Crank angle sensor has rotor plate and wave forming circuit. Rotor plate has 360 slits for 1° signal (engine speed signal) and 4 slits for 180° signal (crank angle signal). Light Emitting Diodes (L.E.D.) and Photo Diodes are built into wave forming circuit.

When signal rotor plate passes the space between the L.E.D. and Photo Diode, the slit of the signal rotor plate alternately cuts the light which is sent to the photo diode from the L.E.D. This causes an alternative voltage and it is then converted into an on-off pulse by the wave forming circuit, which is sent to the control unit.



SEF613B

Components (Cont'd)



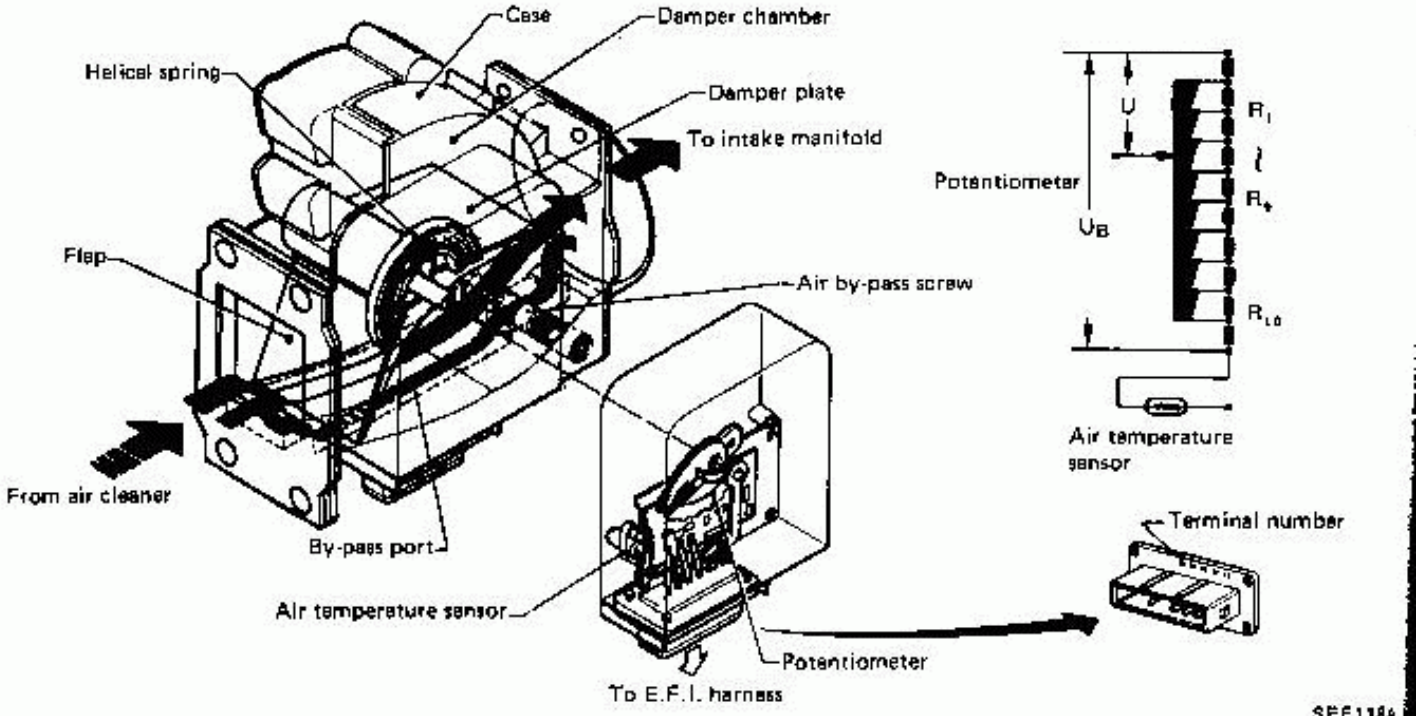
AIR FLOW METER (CA20E engine)

The air flow meter measures the quantity of intake air, and sends a signal to the control unit. The air flow meter is provided with a flap in the air passage.

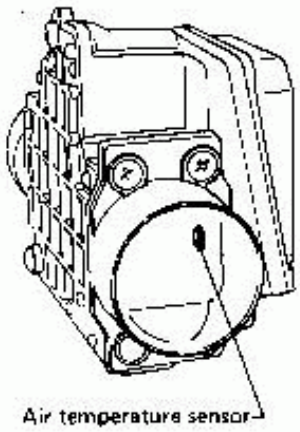
During idling operation when the amount of intake air is extremely small, the air flows parallel with the flap through the by-pass port so that the specified intake air flow can be provided correctly.

An air temperature sensor is installed in the air passage.

The by-pass port has the air by-pass screw which regulates the idle mixture ratio. The air by-pass screw is preset and sealed at the factory.



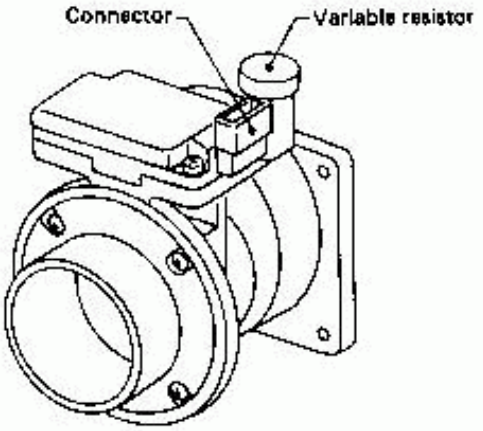
Air temperature sensor



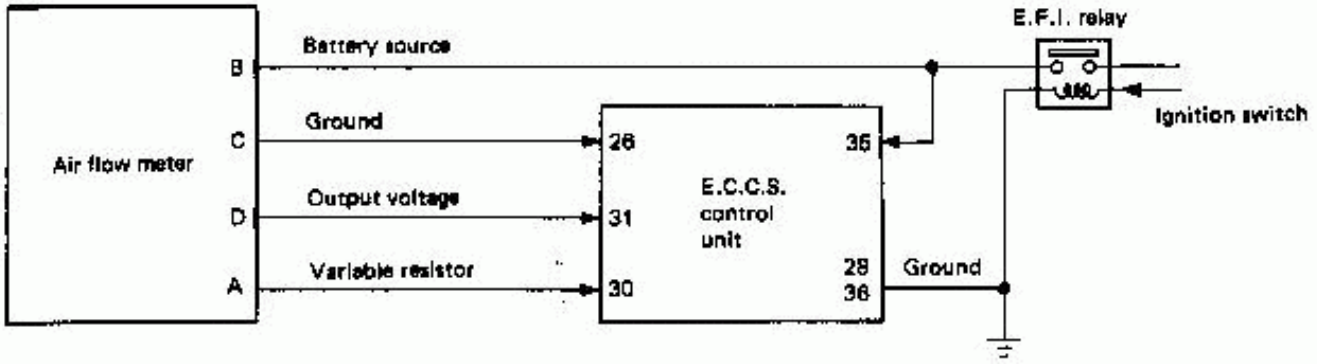
Components (Cont'd)

AIR FLOW METER (CA18ET engine)

The air flow meter measures the mass flowrate of intake air. Measurements are made in such a manner that the control circuit emits an electrical output signal in relation to the amount of heat dissipated from the hot wire placed in the stream of intake air.

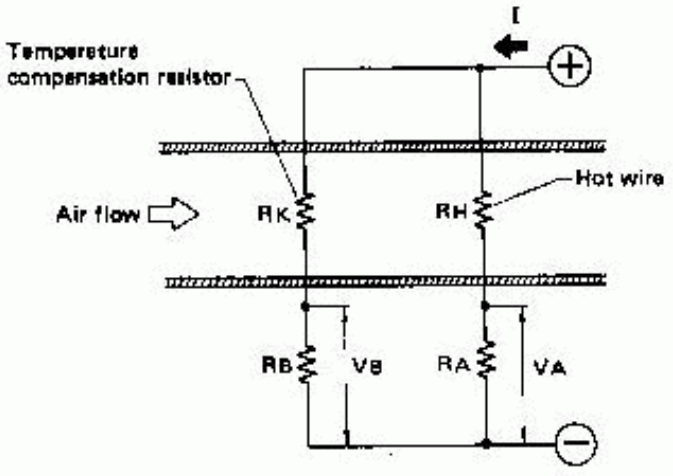


SEF854B



SEF855B

The air flowing around the hot wire removes the heat from the hot wire. The temperature of the hot wire is very sensitive to the mass flowrate of the air. The higher the temperature of the hot wire, the higher its resistance value. This change in the temperature (or: resistance) is determined by the mass flowrate of the air. The control circuit accurately regulates current (I) in relation to the varying resistance value (R_H) so that V_A always equals V_B. The air flow meter transmits an output for voltage V_A to the control unit where the output is converted into an intake air signal.



R_H : Hot wire resistance
R_K : Temperature compensation resistance
R_A, R_B : Constant resistance

SEF617B

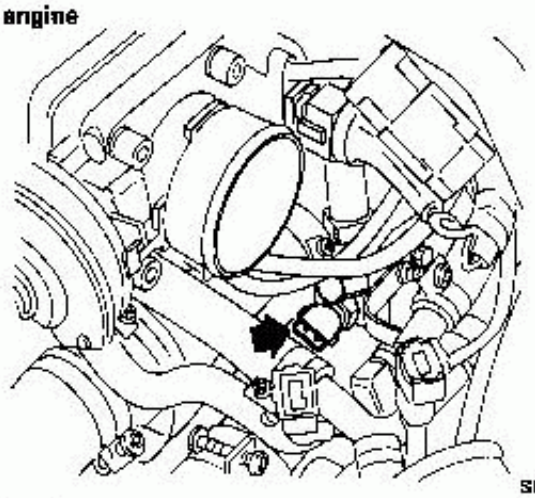
Fail-safe system

Refer to AIR FLOW SYSTEM DESCRIPTION (Page EF & EC-17).

Components (Cont'd)

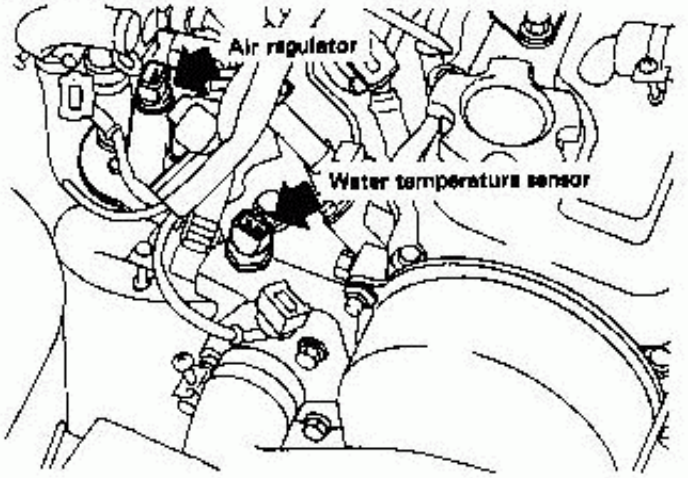
WATER TEMPERATURE SENSOR

CA20E engine



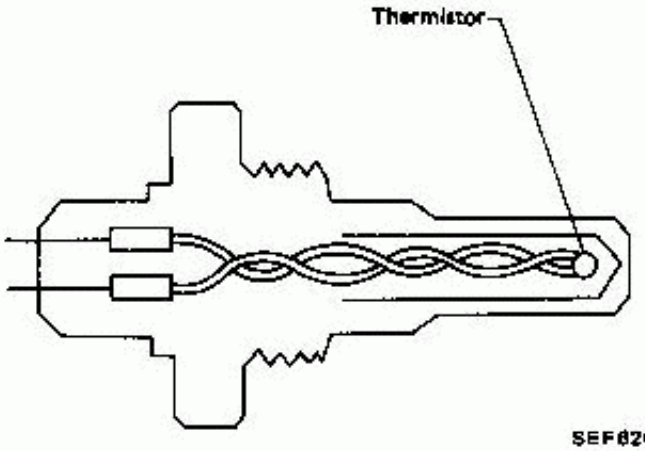
SEF972B

CA18ET engine



SEF868B

The water temperature sensor, built into the water outlet, monitors changes in coolant temperature and transmits a signal to the E.F.I./E.C.C.S. control unit. The temperature sensing unit emplbys a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

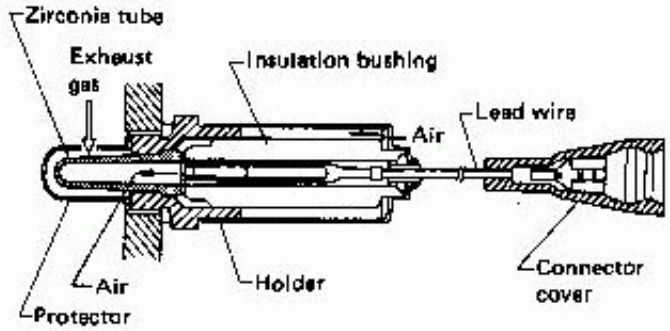


SEF620B

EXHAUST GAS SENSOR

The exhaust gas sensor, which is built into the exhaust manifold, monitors the density of oxygen in the exhaust gas. It consists of a closed-end tube made of ceramic zirconia and other components. Porous platinum electrodes cover the tubes inner and outer surfaces. The closed-end of the tube is exposed to the exhaust gas in the exhaust manifold. The outer surface of the tube contacts the exhaust gas while the inner surface contacts the air.

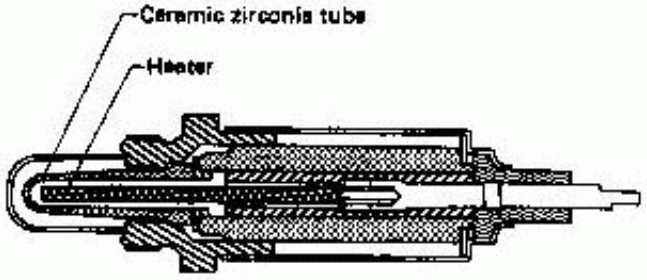
CA20E engine



SEF016B

CA18ET engine

In order to ensure the stable performance of the exhaust gas sensor, a ceramic heater is employed inside the zirconia tube.



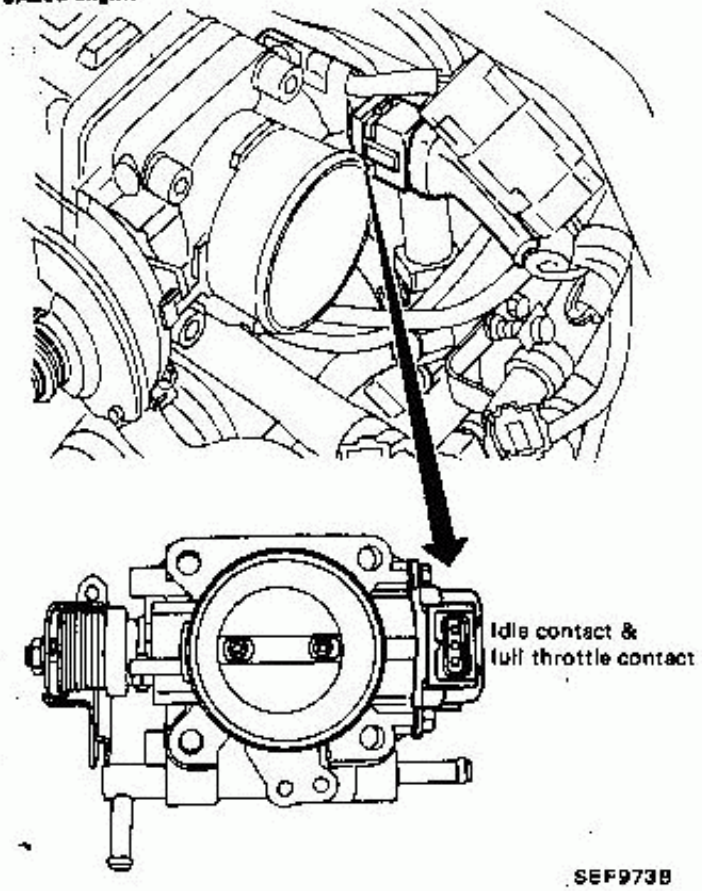
SEF622B

THROTTLE VALVE SWITCH

The throttle valve switch is attached to the throttle chamber and actuates in response to accelerator pedal movement.

This switch has idle contact and full throttle contact (CA20E engine). The idle contact closes when the throttle valve is positioned at idle and opens when it is at any other position.

CA20E engine



SEF973B

Throttle valve switch adjustment

1. Check idle speed.

CA20E:

M/T	750±100 rpm
A/T	700±100 rpm (in "D" position)

CA18ET:

M/T	750±50 rpm (At sea level)
	680±50 rpm (At high altitude)

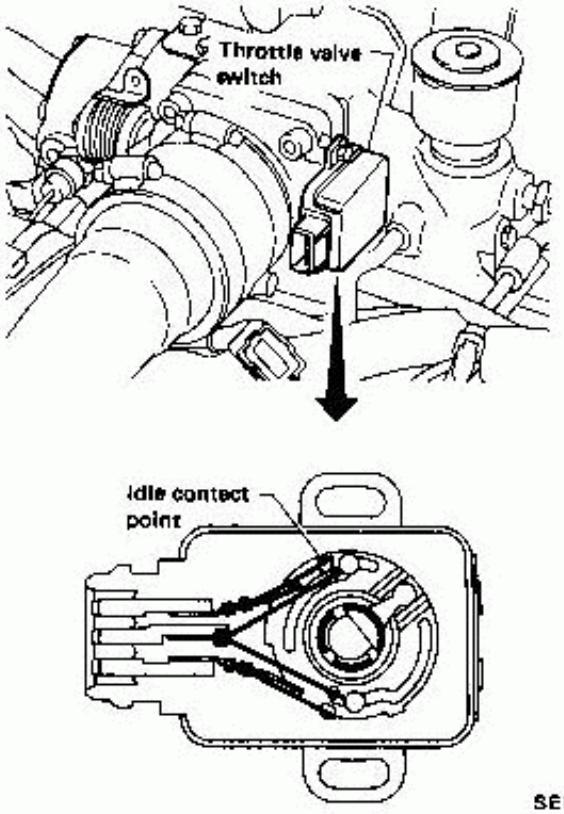
2. Adjust throttle valve switch.

Idle contact point: OFF → ON

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

3. Check that throttle valve switch closes at idle.

CA18ET engine



SEF869B

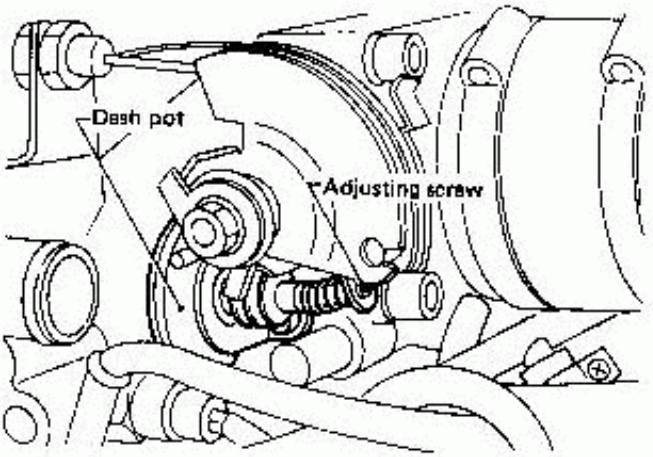
Dash pot (CA20E & CA18ET)

To decrease the intake air gradually when throttle valve is closed, a dash pot is installed on the throttle chamber.

Dash pot touch speed:

2,000±200 rpm ..... M/T

3,000±200 rpm ..... A/T

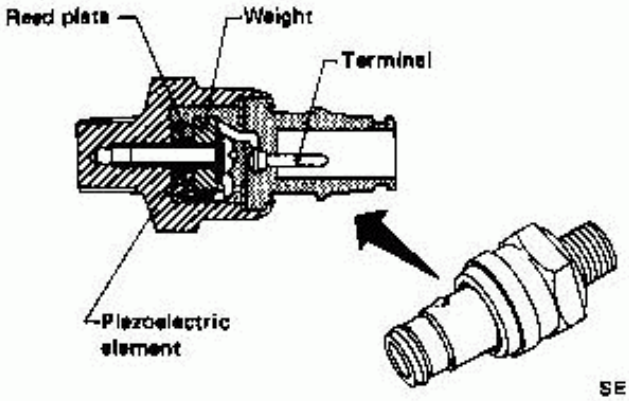


SEF050C

Components (Cont'd)

DETONATION SENSOR (CA18ET engine)

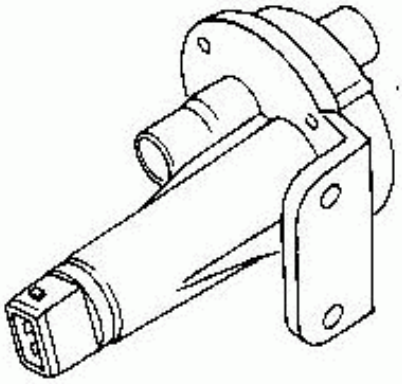
The detonation sensor is attached to the cylinder block and senses engine knocking conditions.
A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is delivered as output.



SEF626B

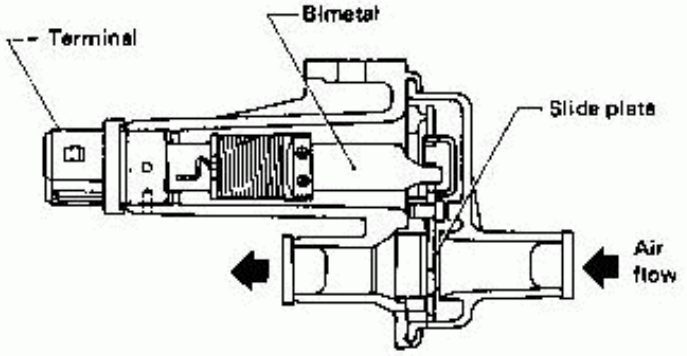
AIR REGULATOR

Air regulator provides an air by-pass when the engine is cold to create a fast idle during warm-up.



SEF936B

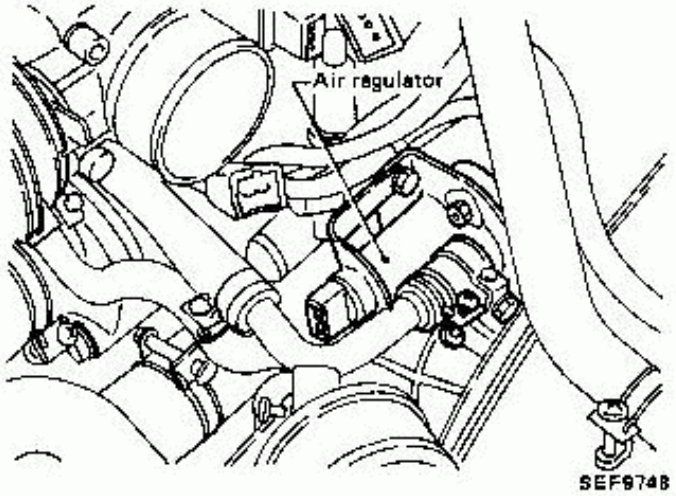
A bimetal, heater and rotary shutter are built into the air regulator. When the bimetal temperature is low, the air by-pass port is open. As the engine starts and electric current flows through a heater, the bimetal begins to rotate the shutter to close off the by-pass port. The air passage remains closed until the engine is stopped and the bimetal temperature drops.



SEF937B

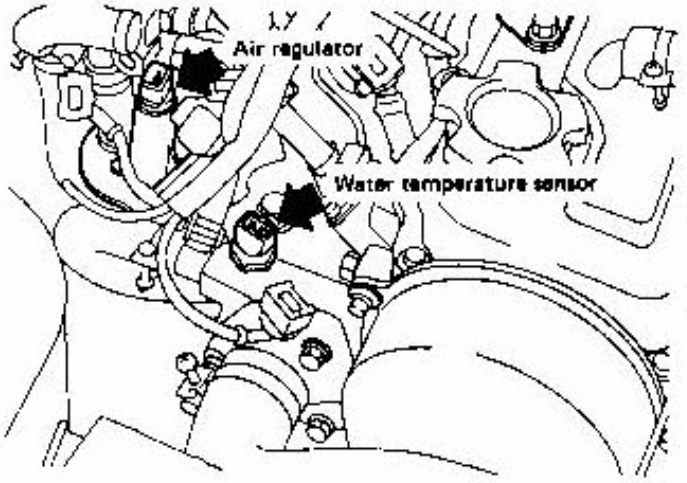
Air regulator location

CA20E engine



SEF974B

CA18ET engine

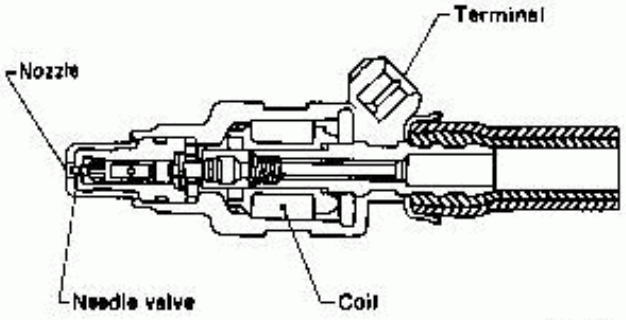


SEF868B

Components (Cont'd)

FUEL INJECTOR

The fuel injector is a small, precision solenoid valve. As the E.F.I./E.C.C.S. control unit outputs an injection signal to each fuel injector, the coil built into the injector pulls the needle valve back, and fuel is injected through the nozzle to intake manifold. The amount of fuel injected is controlled by the E.F.I./E.C.C.S. control unit as an injection pulse duration.



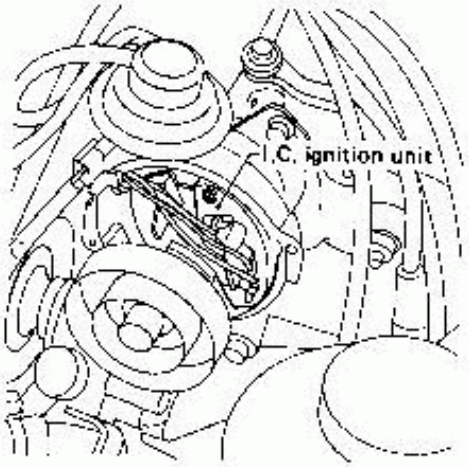
SEF627B

IC IGNITION UNIT (CA20E engine)

The ignition signal is sent to the E.F.I. control unit to control the injected fuel digitally by monitoring the engine revolution.

The signal from the E.F.I. control unit switches the spark plugs and controls the spark timing at the same time.

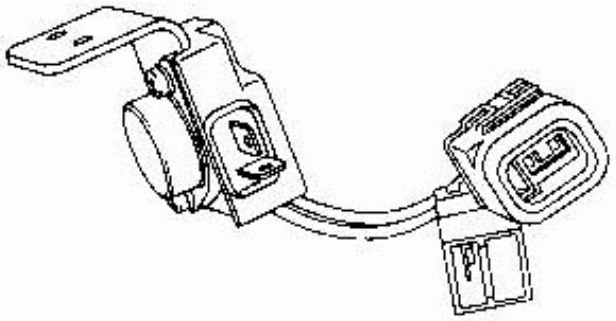
Refer to SPARK PLUG SWITCHING CONTROL SYSTEM (Page EF & EC-31).



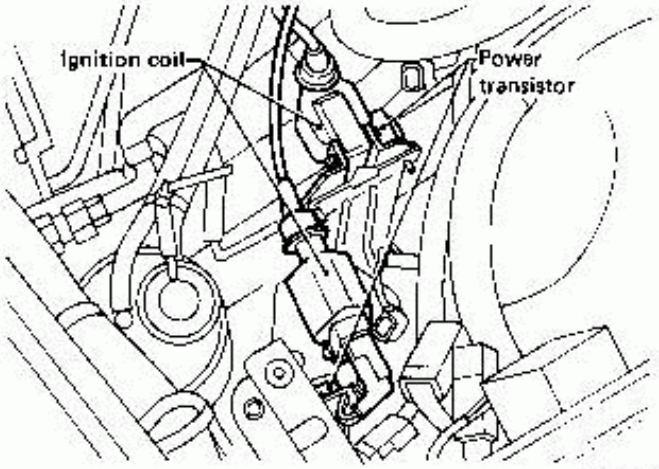
SEF976B

POWER TRANSISTOR (CA18ET engine)

The ignition signal from the E.C.C.S. control unit is amplified by the power transistor, which connects and disconnects the coil primary circuit to induce the proper high voltage in the secondary circuit.



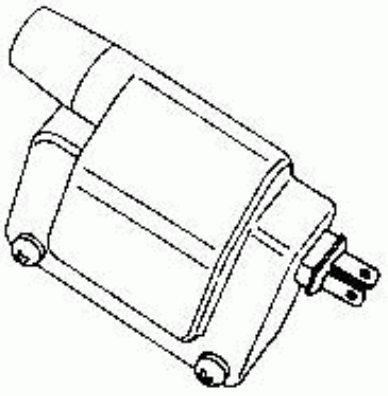
SEF623C



SEF975B

IGNITION COIL (CA18ET engine)

The ignition coil is a mold type.

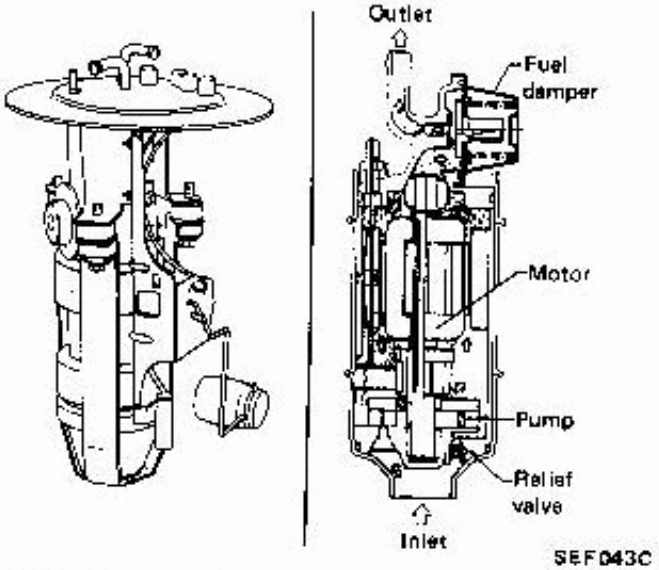


SEF629B

Components (Cont'd)

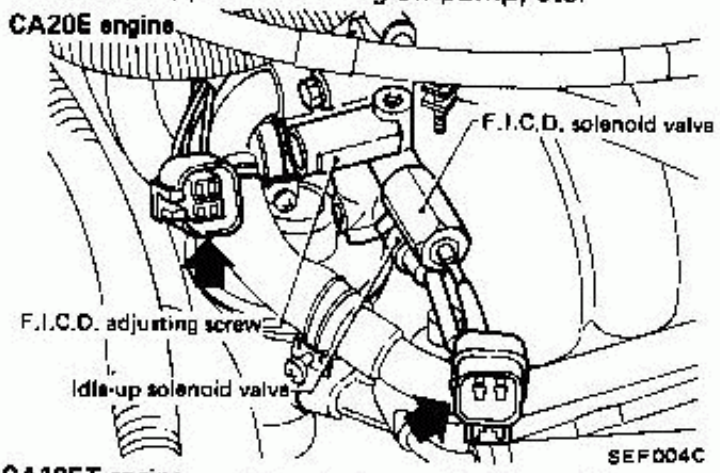
FUEL PUMP

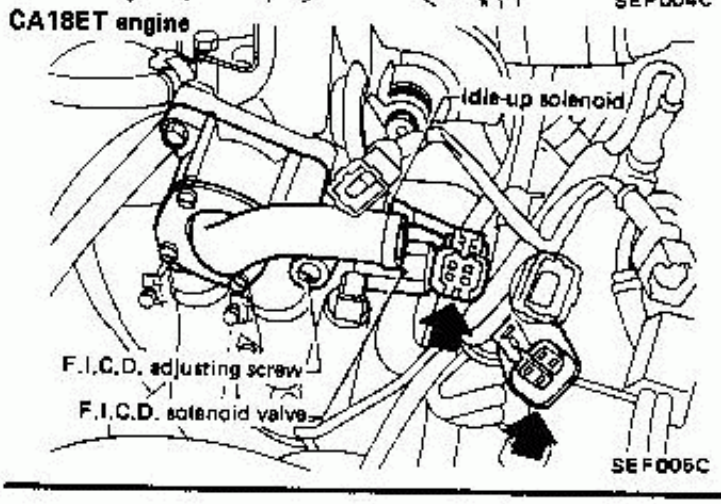
The fuel pump, which is located in the fuel tank, is a wet type pump where the vane rollers are directly coupled to a motor which is filled with fuel.



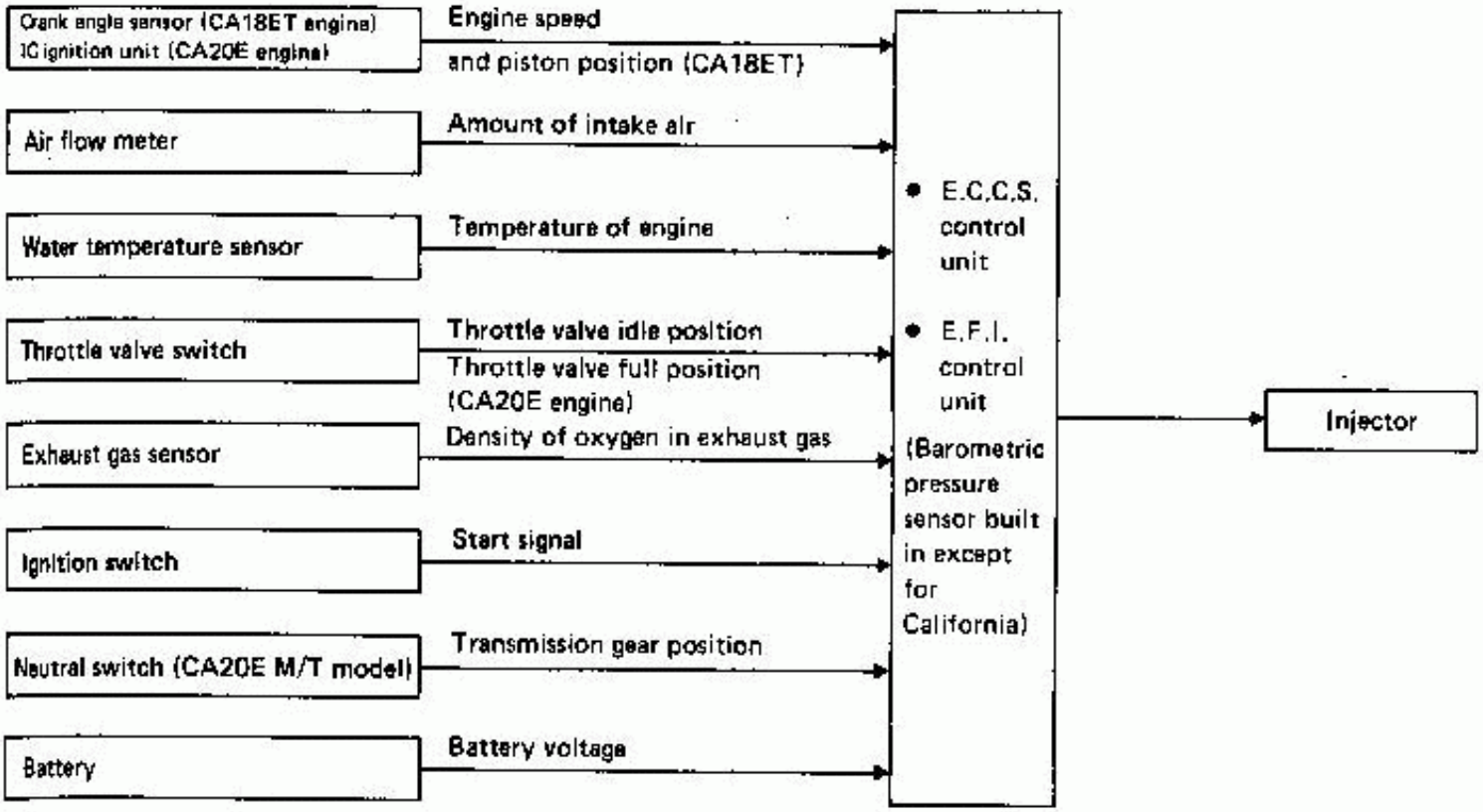
IDLE-UP SOLENOID VALVE

The idle-up solenoid valve is attached to the intake manifold. The solenoid valve actuates to stabilize idle speed when engine load is heavy because of electric load, power steering oil pump, etc.





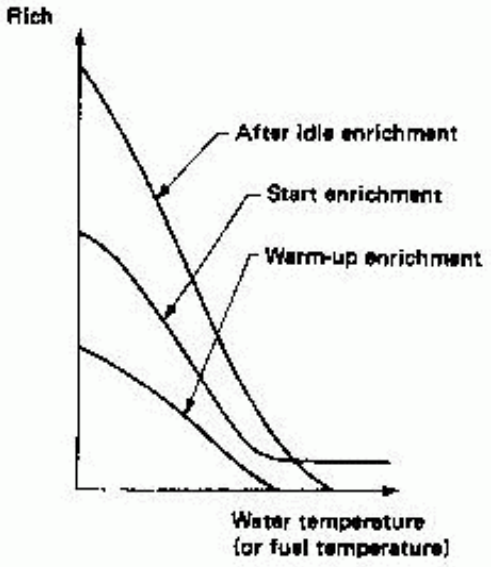
Fuel Injection Control



The E.F.I./E.C.C.S. control unit calculates basic injection pulse width by processing signals from IC ignition unit/crank angle sensor and air flow meter. Receiving signals from each sensor which detects various engine conditions, the control unit adds various enrichments, which are pre-programmmed in the control unit, to the basic injection amount. Thus, the optimum amount of fuel is injected through the injectors.

1) Fuel enrichment
   In the following each conditions, fuel is enriched.

- During warm-up
- When starting
- After idle
- When in hot condition (CA18ET engine)
- With heavy load
- Full throttle (CA20E engine)



SEF872B

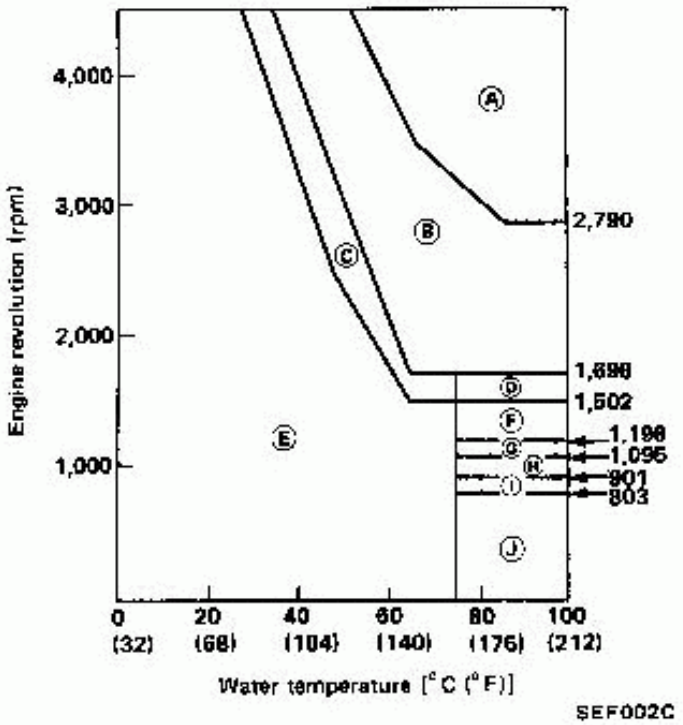
Enrichment rates for "with heavy load" is pre-programmed for engine speed and basic injection pulse width.

Fuel Injection Control (Cont'd)

2) Fuel shut-off (During deceleration)
Fuel shut-off is accomplished under the following conditions:

CA20E engine:

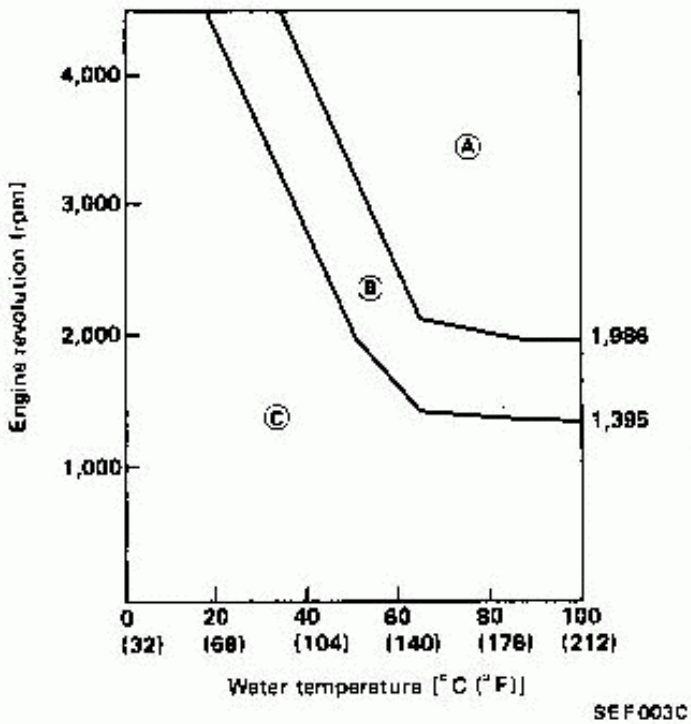
M/T model



SEF002C

Deceleration from	Idle switch	Fuel shut-off zone		Fuel recovery zone
		4 cylinders	2 cylinders	
Ⓐ	ON	Ⓐ Ⓑ Ⓒ Ⓓ	Ⓕ Ⓖ Ⓗ Ⓘ	Ⓔ Ⓙ
Ⓑ	OFF → ON	Ⓑ Ⓒ Ⓓ		
Ⓓ		–	Ⓓ Ⓕ Ⓖ Ⓗ Ⓘ	Ⓙ
Ⓕ			Ⓕ Ⓖ Ⓗ Ⓘ	
Ⓖ			Ⓖ Ⓗ Ⓘ	
Ⓗ			Ⓗ Ⓘ	
Ⓒ Ⓔ	ANY	–	–	–

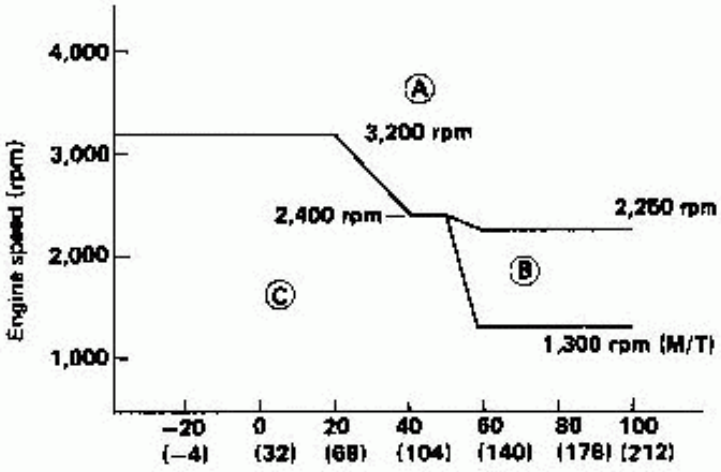
A/T model



SEF003C

Deceleration from	Idle switch	Fuel shut-off zone (4 cylinders)	Fuel recovery zone
Ⓐ	ON	Ⓐ Ⓑ	Ⓒ
Ⓑ	OFF → ON	Ⓑ	

CA18ET engine:



SEF667C

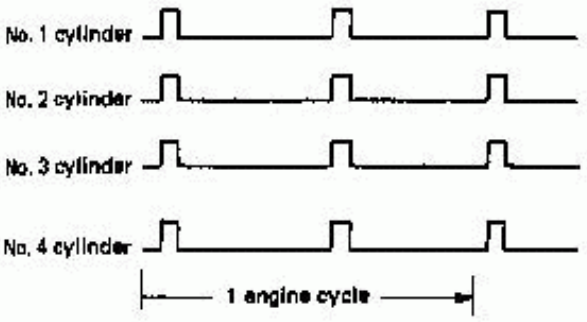
Fuel Injection Control (Cont'd)

Deceleration from	Idle switch	Fuel shut-off zone	Fuel recovery zone
Ⓐ	ON	Ⓐ Ⓑ	Ⓒ
	OFF → ON		
Ⓑ	OFF → ON	Ⓑ	Ⓒ
Ⓒ	ANY	–	–

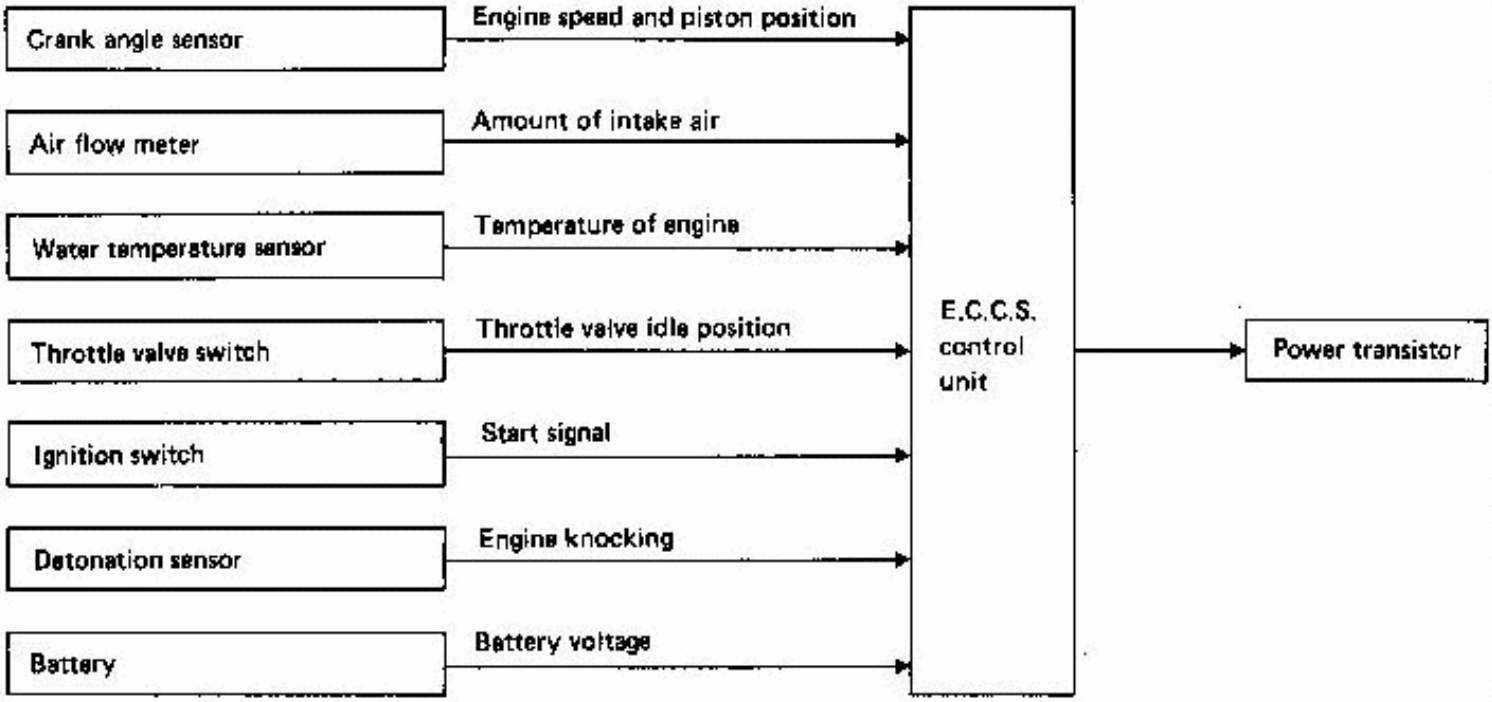
3) Simultaneous injection

The fuel is injected into all four cylinders simultaneously twice each engine cycle.

• Simultaneous injection (CA20E & CA18ET engine)



Ignition Timing Control (CA18ET engine)



Ignition timing is controlled, corresponding to the engine operating conditions, by the E.C.C.S. control unit: that is, as the optimum ignition timing in each driving condition has been pre-programmed in the control unit, the ignition timing is determined by electrical signals processed in the unit.

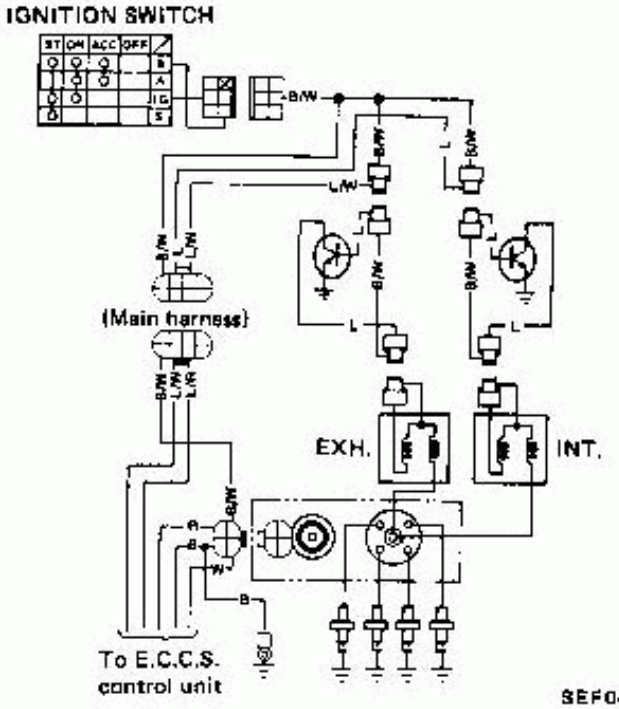
The signal from E.C.C.S. control unit is transmitted to power transistor, and controls ignition timing.

The retard system by detonation sensor is designed only for emergencies. The basic ignition timing is pre-programmed within the anti-knocking zone, even if recommended fuel is used under dry conditions. Consequently, the retard system does not operate under normal driving conditions.

However, if there engine knocking occurs, the detonation sensor monitors knocking condition and the signal is transmitted to the E.C.C.S. control unit. After receiving it, the control unit retards the ignition timing to avoid the knocking condition. In order to reduce engine noise under heavy driving conditions, the spark plug switching control system is controlled, corresponding to the injection pulse duration by the E.C.C.S. control unit.

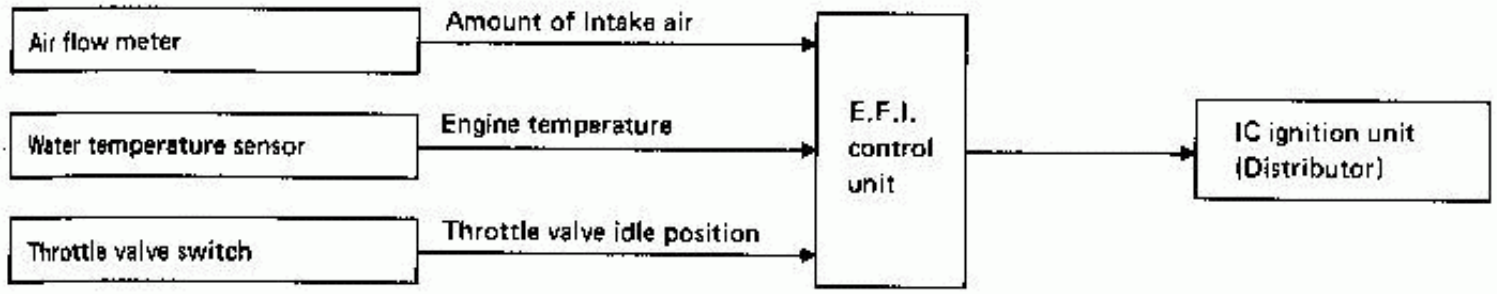
Engine operating condition	Ignition control	
	Spark control	Spark timing
Normal	2-spark plug system	Normal
Heavy load	1-spark plug system	Advanced (4 degree)

IGNITION SYSTEM WIRING DIAGRAM



SEF048C

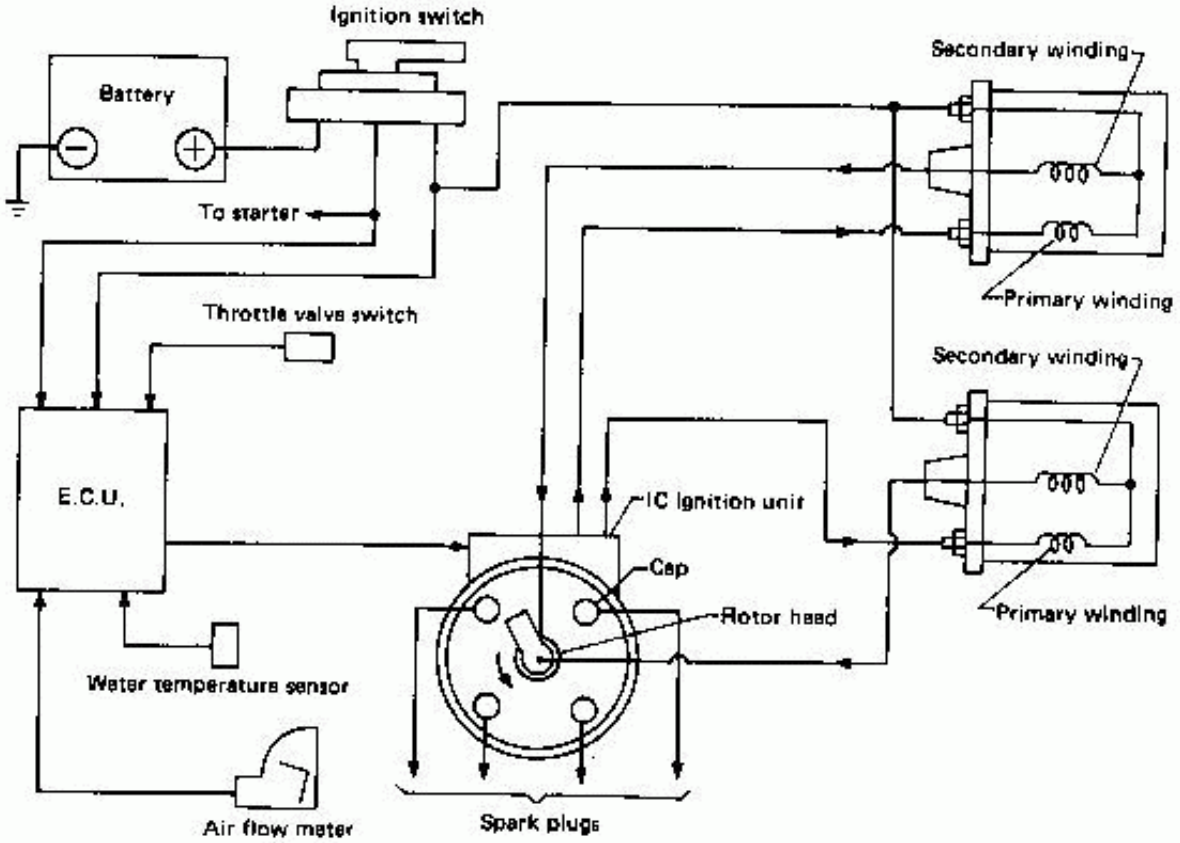
Spark Plug Switching Control (CA20E engine)



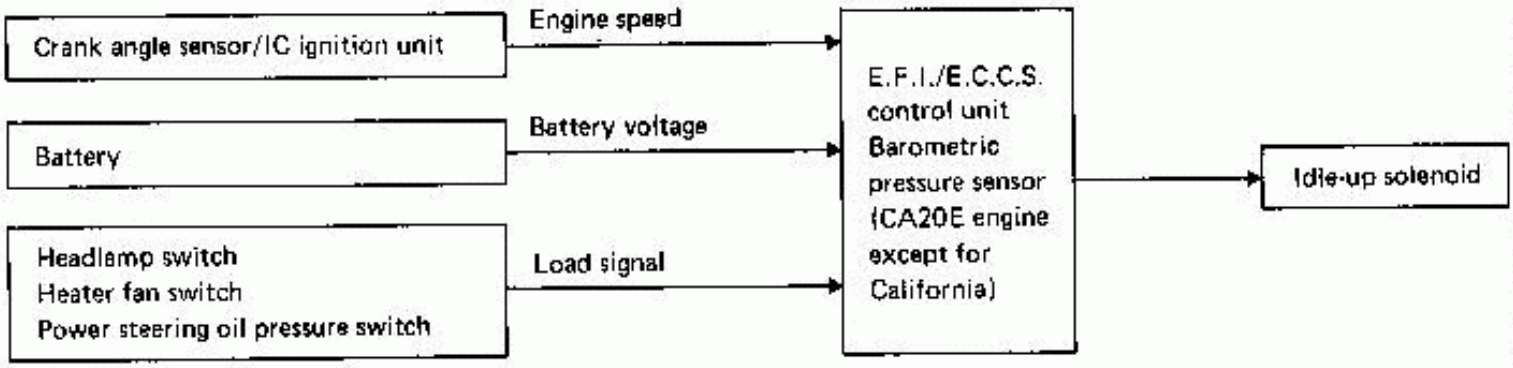
The spark plug switching control system is designed to change the ignition system from 2-plug ignition to 1-plug ignition during heavy load driving in order to reduce engine noise.
For A/T model, this system also functions to advance ignition timing by the specified value during 1-plug ignition.

Operation

Water temperature	Engine operation condition		Ignition control	
	Load		Spark control	Spark timing
Above 15°C (59°F)	Cranking		2-spark plug system	Normal
	Light load	Idle	2-spark plug system	Normal
		Drive	2-spark plug system	Normal
	Heavy load	Drive	1-spark plug system	Advanced (A/T model) Normal (M/T model)
Below 15°C (59°F)	All		2-spark plug system	Normal



Idle-up Control



The idle speed is compensated by the E.F.I./E.C.C.S. control unit to prevent rough idle when any of the following conditions are met.
The control unit senses the idle condition, and determines ON/OFF signal. The signal from control unit is transmitted to the idle-up solenoid valve to stabilize idle speed.

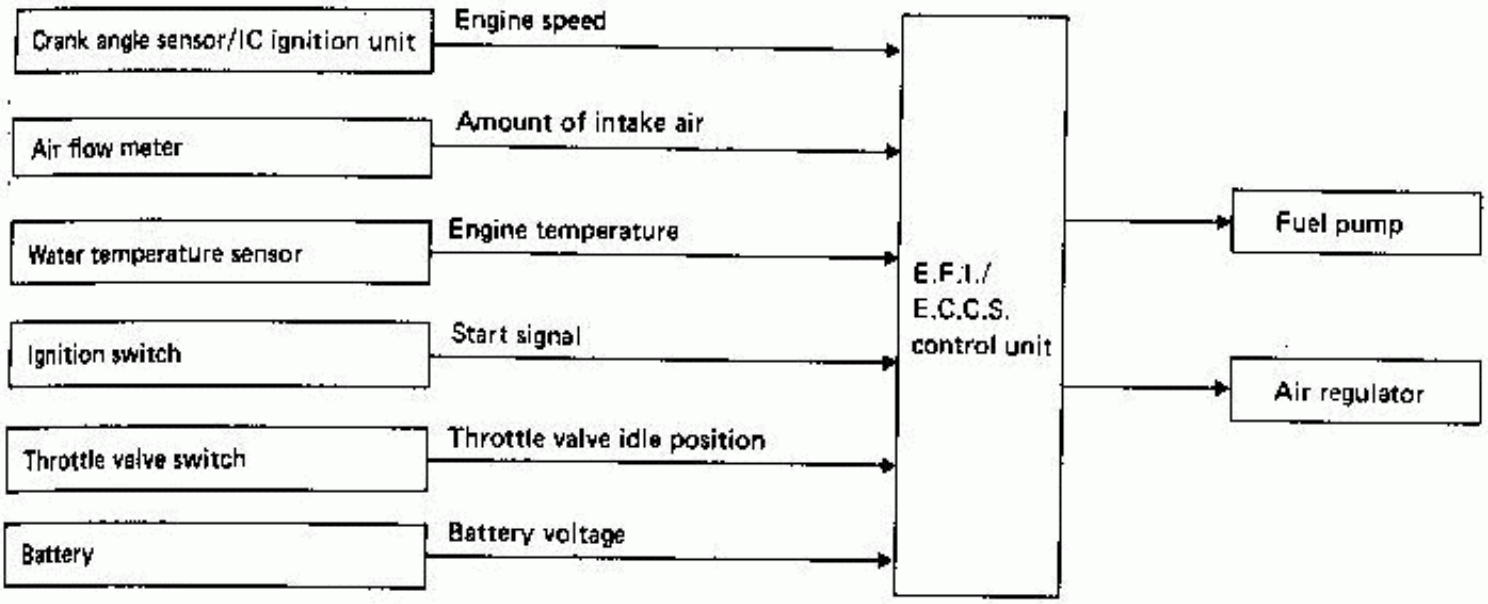
CA20E engine

Condition	Idle-up solenoid operation
• Battery voltage is below 12V • Load signal is ON when engine speed is less than 1,500 rpm • Engine speed is less than 460 rpm • Atmospheric pressure is less than 89.3 kPa (670 mmHg, 26.38 inHg) • When air flow meter is malfunctioning	ON
Except above	OFF

CA18ET engine

Condition	Idle-up solenoid operation
• Load signal is ON when engine speed is less than 1,500 rpm • Battery voltage is below 12V • When air flow meter is malfunctioning	ON
Except above	OFF

Fuel Pump and Air Regulator Control



Air regulator control

The air regulator is controlled by the E.F.I./ E.C.C.S. control unit at the same time the fuel pump ON-OFF is controlled.

Fuel pump voltage control

The fuel pump is controlled by the E.F.I./E.C.C.S. control unit adjusting the voltage supplied to the fuel pump.

CA20E engine:

Conditions		Voltage
• 16.7 seconds after ignition switch is turned to ON • Engine cranking • Engine speed is more than 3,000 rpm • Engine is under heavy load • Engine temp. above 100°C (212°F) • Engine temp. below 10°C (50°F)		Approximately 13.1 [V]
Except above	Idle switch ON	9.95 [V]
	Idle switch OFF	13.1 [V]

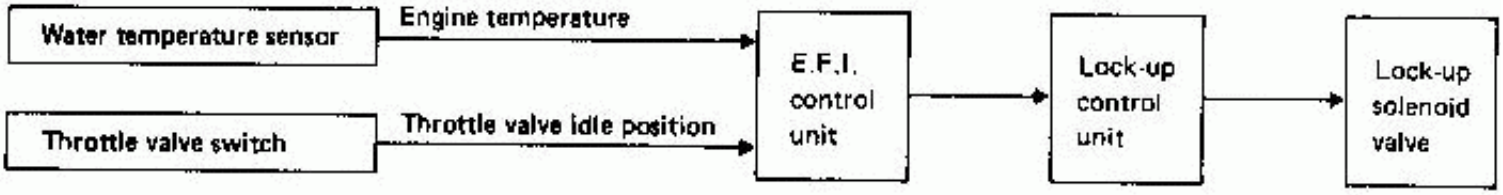
CA18ET engine:

Conditions	Voltage
• 5 seconds after ignition switch is turned to ON • Engine cranking • 25.5 seconds after engine start [above 50°C (122°F)] • Engine temp. above 90°C (194°F) • Engine temp. below 10°C (50°F)	Approximately 13.4 [V]
Except above	9.6 ~ 13.4 [V]

Fuel pump and air regulator ON-OFF control

Ignition switch position	Engine condition	Fuel pump/ Air regulator operation
ON	Stopped	Operates for 5 seconds
	Running	Operates
	After stall	Stops in 1 second
START	Starting	Operates

Automatic Transmission Control (CA20E engine)

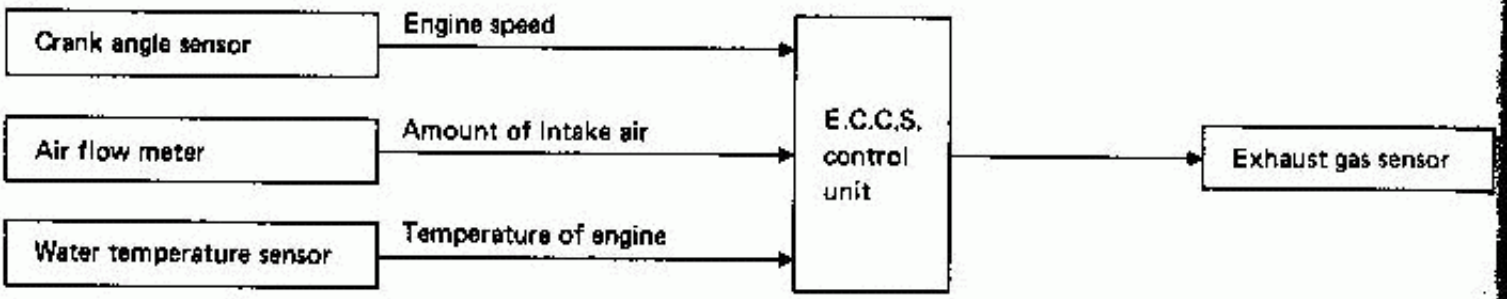


LOCK-UP CONTROL

Lock-up position is controlled, corresponding to the engine operating conditions, by the control unit.

Conditions	Lock-up release solenoid	Lock-up
Idle switch "ON" or coolent temp. below 55°C (131°F)	ON	Released
Except above	OFF	Continued

Exhaust Gas Sensor Heater Control (CA18ET engine)



The E.C.C.S. control unit controls the heater operation in the following way.

Condition	Exhaust gas sensor heater
Engine speed is less than 2,600 rpm and water temperature is more than 10°C (50°F) (Except under heavy load)	ON
Except above	OFF

Caution

a. Before connecting or disconnecting E.F.I./E.C.C.S. harness connector to or from any E.F.I./E.C.C.S. 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.

b. Do not attempt to disassemble any E.F.I./E.C.C.S. component parts. To conduct electrical checks on these component parts, closely follow the steps outlined under "ELECTRONIC CONTROL SYSTEM INSPECTION" on pages EF & EC-49 through EF & EC-76.

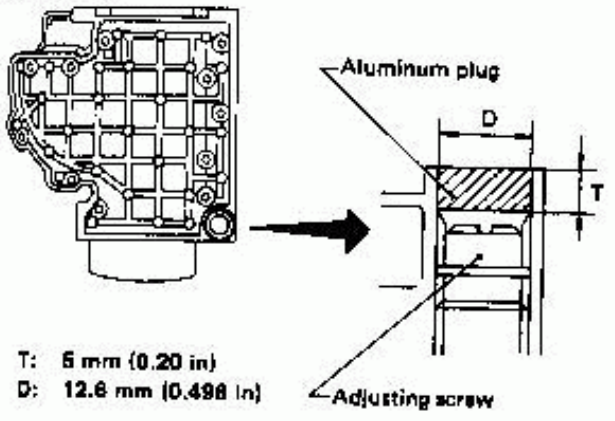
c. When conducting self-diagnosing, follow the steps outlined under "SELF-DIAGNOSIS" on pages EF & EC-41 through EF & EC-48 in order to obtain accurate diagnosing results. After self-diagnosis has been completed, erase the memory properly.

d. Always turn the diagnosis mode selector carefully using a screwdriver. If it is turned forcibly, it may be damaged, resulting in the inability to perform the self-diagnosis or to monitor the mixture ratio.

e. Before troubleshooting, ensure that all harness connectors are secure.

f. While performing the CO% adjustment, be certain of the following to prevent possible damage to the air flow meter.

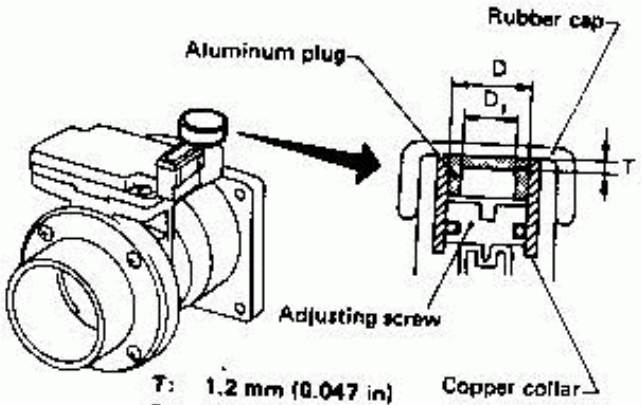
CA20E engine



T: 6 mm (0.20 in)
D: 12.6 mm (0.496 in)

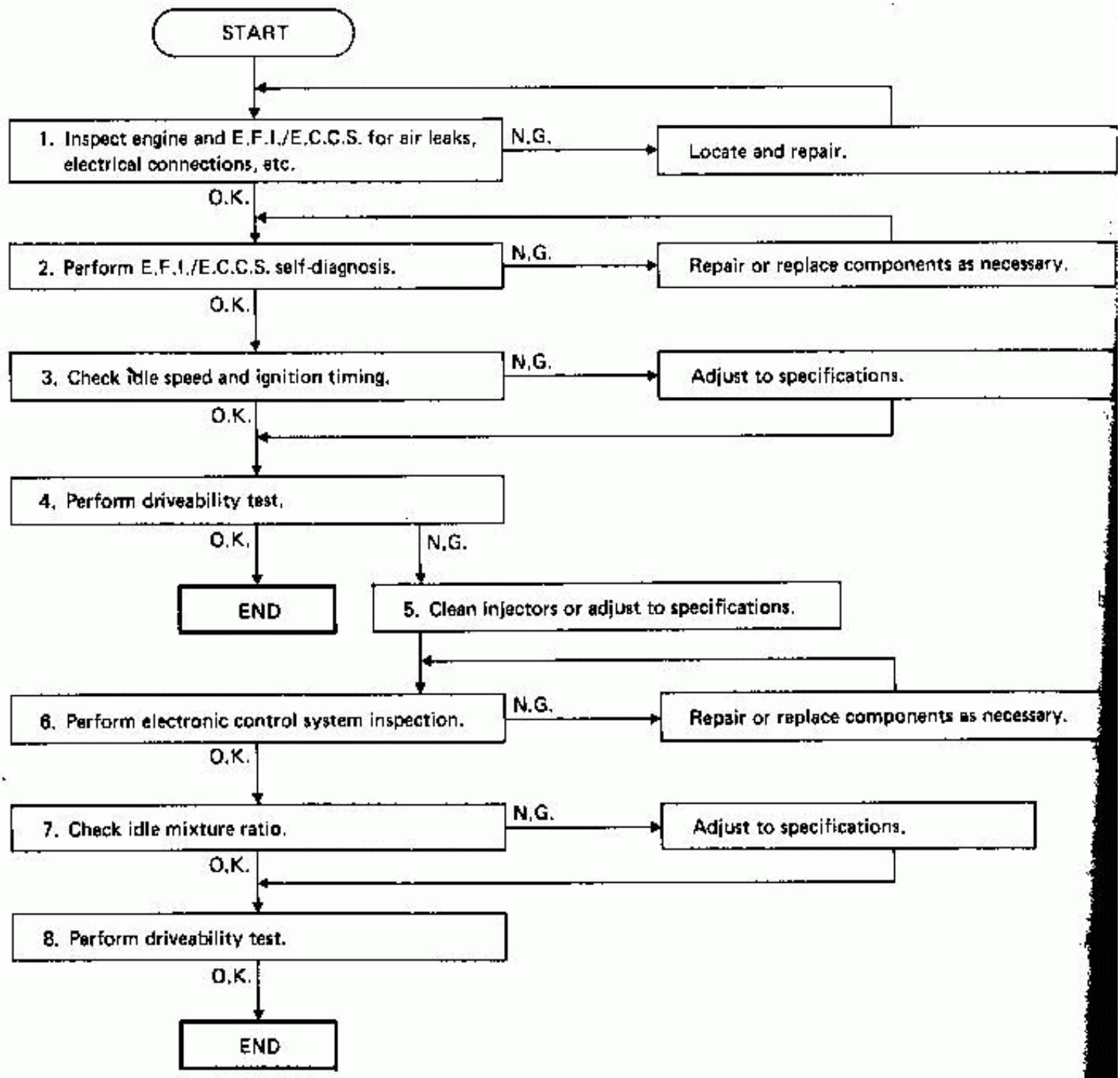
SEF190C

CA18ET engine



T: 1.2 mm (0.047 in)
D: 10 mm (0.39 in)
D_1: 7 mm (0.28 in)

SEF191C


START
1. Inspect engine and E.F.I./E.C.C.S. for air leaks, electrical connections, etc.
N.G.
Locate and repair.
O.K.
2. Perform E.F.I./E.C.C.S. self-diagnosis.
N.G.
Repair or replace components as necessary.
O.K.
3. Check idle speed and ignition timing.
N.G.
Adjust to specifications.
O.K.
4. Perform driveability test.
O.K.
N.G.
END
5. Clean injectors or adjust to specifications.
6. Perform electronic control system inspection.
N.G.
Repair or replace components as necessary.
O.K.
7. Check idle mixture ratio.
N.G.
Adjust to specifications.
O.K.
8. Perform driveability test.
O.K.
END

Driveability (Cont'd)

1. Inspect engine and E.F.I./E.C.C.S. for air leaks, proper electrical connections, etc.
1) Check all hoses and ducts for air leaks.
2) Check air cleaner for clogging.
3) Check harness connectors for proper connections.
4) Check ignition wiring.
5) Check gaskets for leaks at all air intake components.
6) Check air regulator operation.
7) Check E.G.R. valve operation.
2. Perform E.F.I./E.C.C.S. self-diagnosis.
Follow the procedure in E.F.I./E.C.C.S. SELF-DIAGNOSIS (Pages EF & EC-41 - 48).
3. Check idle speed and ignition timing.

Prepare the following conditions:
- **Battery is in good order.**
- **Headlamp switch: OFF**
- **Heater blower: OFF**
- **Air conditioner switch: OFF**
- **Front wheel (Power steering model):**
  KEEP STRAIGHT AHEAD
- **Warm engine to operating temperature.**

Check and adjust as follows:

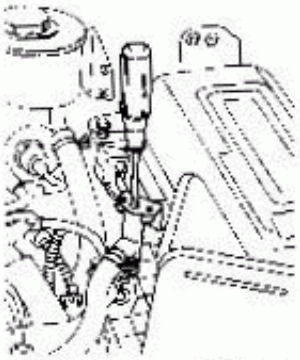
1) Race engine two or three times under no-load, then run engine at idle speed.
2) Check idle speed.

Idle speed: rpm

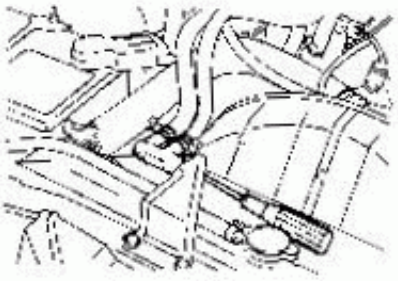
		M/T	A/T (in "D" position)
CA20E		750±100	700±100
CA18ET	At sea level	750±50	—
	At high altitude	680±50	

If necessary, adjust to the specified speed by turning the idle speed adjusting screw.

CA20E **CA18ET**

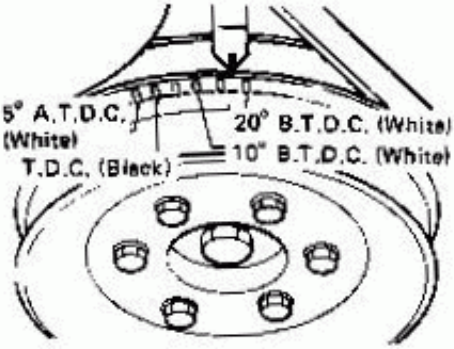


SEF017C



SEF624C

3) Check ignition timing with a timing light.



SMA189A

CA20E (Without vacuum advance):
M/T 4±2° B.T.D.C.
A/T 0±2° B.T.D.C.
CA18ET: 15±2° B.T.D.C.

If necessary, adjust ignition timing by turning distributor.

4) Check throttle valve switch (Idle contact), and adjust if necessary. (Refer to page EF & EC-23.)

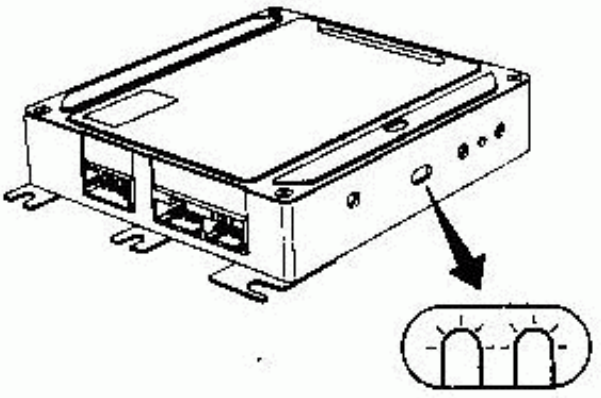
OFF → ON:
M/T Idle speed +150±50 rpm
A/T Engine speed (in "N" position) +150±50 rpm

4. Perform driveability test.
Evaluate effectiveness of adjustments by driving vehicle. If unsatisfactory, proceed to step 5.

5. Clean injectors or adjust to specifications. Check injectors or try replacement injectors.
6. Perform electronic control system inspection. Check the following using circuit tester.
- Injector circuits
- Air regulator circuit
- Exhaust gas sensor heater circuit

Follow the procedure in ELECTRONIC CONTROL SYSTEM INSPECTION (Pages EF & EC-49 · 76).

7. Check idle mixture ratio.
1) Warm up engine to operating temperature.
2) Verify that the diagnosis mode selector is turned "OFF" (CA20E) or fully counterclockwise (CA18ET).
3) Verify that engine is still at operating temperature.
4) Race engine two or three times under no-load, then run engine at idle speed.
5) Look at inspection lamps (red and green).



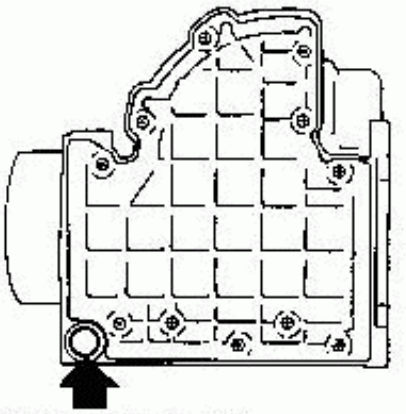
SEF548B

When both inspection lamps blink, it indicates that the idle mixture ratio is correct.

7) If N.G., adjust idle mixture ratio by turning variable resistor (CA18ET) or air by-pass screw (CA20E) on air flow meter so that inspection lamps blink simultaneously.

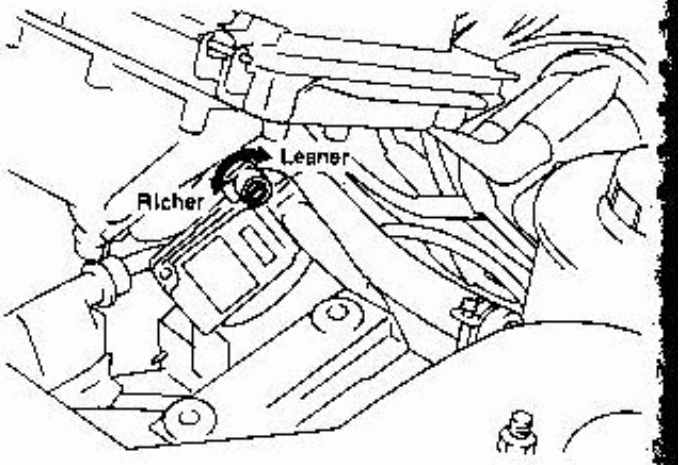
Refer to CAUTION (f.) on page EF & EC-35.

CA20E engine



SEC326A

CA18ET engine



SEF592C

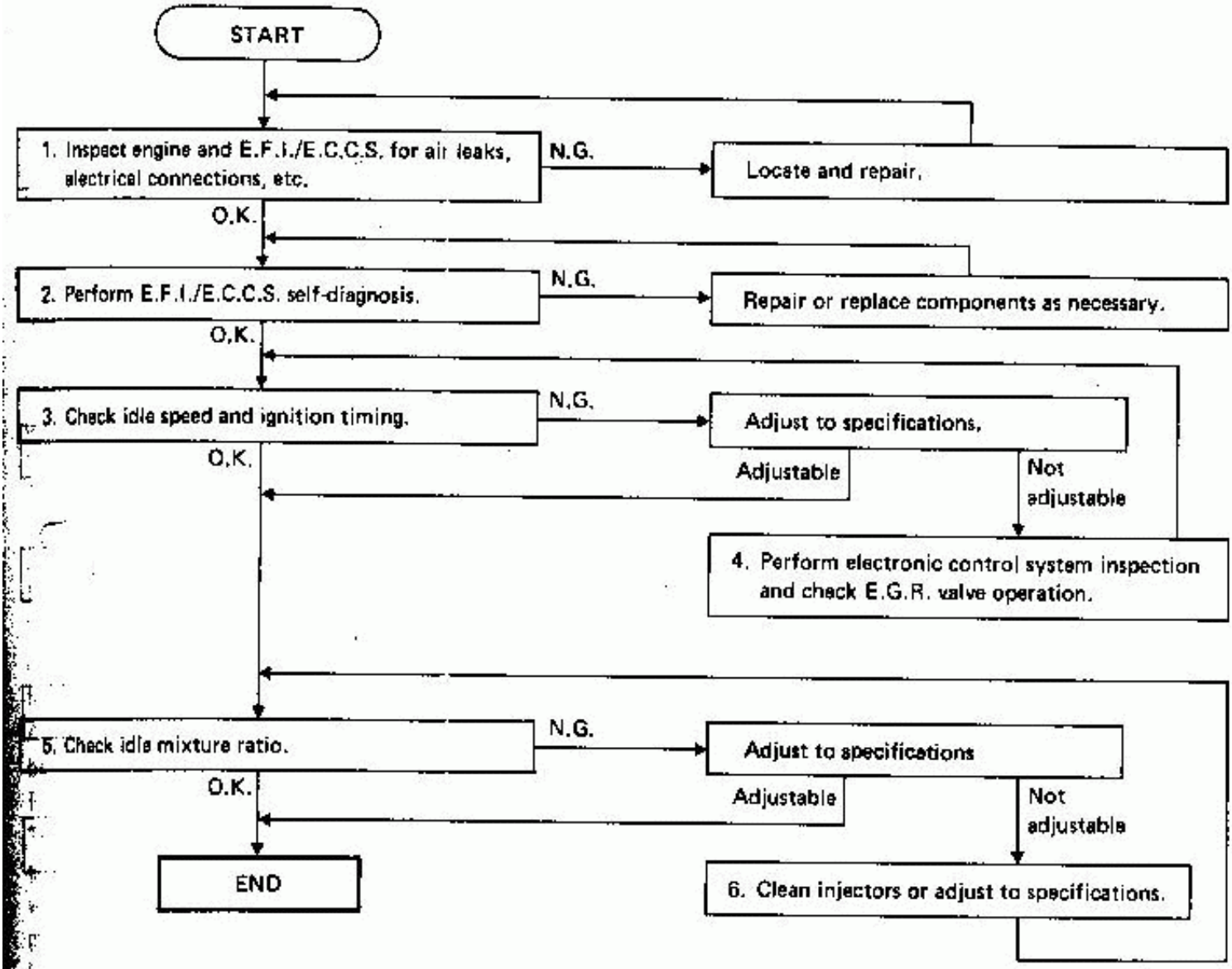
8. Check mixture ratio at middle engine speed.
1) Verify that inspection lamps on control unit blink simultaneously at idle.
2) Race engine two or three times under no-load, then run engine at idle speed.
3) Gradually increase engine speed and check for operating (blinking) of the inspection lamps at different engine rpms (up to approximately 2,000 rpm).
- If both inspection lamps continue to blink during idle to 2,000 rpm range, it indicates that the idle mixture ratio is correct.

4) If N.G., replace air flow meter and adjust idle mixture ratio as per step 7.

9. Perform driveability test.
Re-evaluate vehicle performance.

DIAGNOSTIC PROCEDURE

Improper Idling and Stall

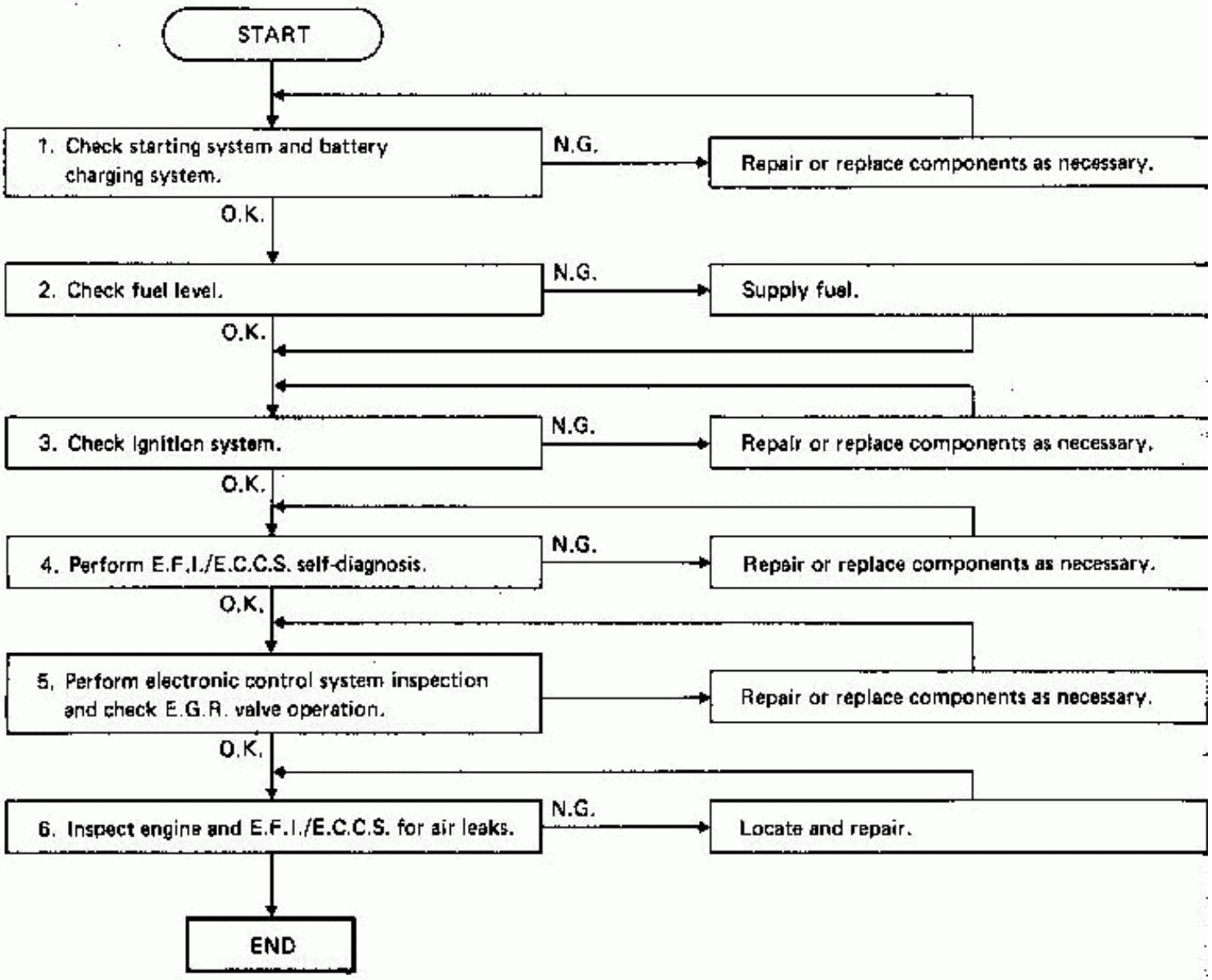


1. Inspect engine and E.F.I./E.C.C.S. for air leaks, electric connections, etc.
   Refer to DRIVEABILITY.
2. Perform E.F.I./E.C.C.S. self-diagnosis.
   Follow the procedure in SELF-DIAGNOSIS (Pages EF & EC-41 - 48).
   Confirm throttle valve switch operation.
   Refer to DRIVEABILITY.
3. Check idle speed and ignition timing.
   Refer to DRIVEABILITY.
4. Perform electronic control system inspection and E.G.R. valve operation.
   Check the following using circuit tester.
   - Injector circuit
   - Air regulator circuit
   - Idle-up solenoid valve

   Follow the procedure in ELECTRONIC CONTROL SYSTEM INSPECTION (Pages EF & EC-49 - 76).
5. Check idle mixture ratio.
   Refer to DRIVEABILITY.
6. Clean injectors or adjust to specifications.
   Refer to DRIVEABILITY.

DIAGNOSTIC PROCEDURE

Engine Startability



1. Check starting system and battery charging system.
1) Check starter operation.
2) Check battery voltage.
Repair or replace as necessary.
2. Check fuel level.
If fuel level is low or empty, add fuel.
3. Check ignition system.
1) Check ignition wiring.
2) Check distributor rotor head.
3) Check spark plug.
4. Perform E.F.I./E.C.C.S. self-diagnosis. Follow the procedure in E.F.I./E.C.C.S. SELF-DIAGNOSIS (Pages EF & EC-41 - 48).
5. Perform electronic control system inspection and check E.G.R. valve operation.
Check the following using circuit tester.
- Injector circuit
- Air regulator circuit

Follow the procedure in ELECTRONIC CONTROL SYSTEM INSPECTION (Pages EF & EC-49 - 76).
6. Inspect engine and E.F.I./E.C.C.S. for air leaks.
Refer to DRIVEABILITY.

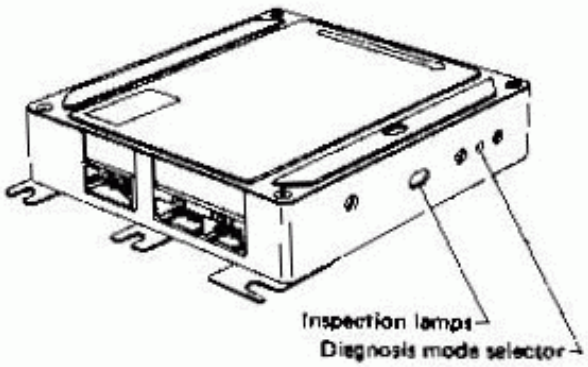
Self-diagnostic System

The self-diagnostic system determines malfunctions of signal systems such as sensors actuators, and wire harnesses based on the status of the input signals received by the E.F.I./E.C.C.S. control unit. A malfunction is displayed by both the red and green L.E.D.s (Light Emitting Diodes).

Basically, self-diagnosis is always performed when the power is furnished to the E.F.I./E.C.C.S. control unit. The self-diagnosis results are retained in the memory chip of the E.F.I./E.C.C.S. control unit and are displayed only when the diagnosis mode selector (located on the side of the control unit) is turned "ON" (CA20E) or fully clockwise (CA18ET).

The self-diagnostic system is provided with functions which display malfunctions being checked as well as those which are stored in the memory. In this sense, it is very effective in determing an "intermittent" malfunction. The results which is or was stored in the memory can be erased by following the steps specified.

A malfunctioning area is determined by the number of blinks of both the red and green L.E.D.s. First, the red L.E.D. blinks and the green follows. The red L.E.D. refers to the tenth digit while the green one refers to the unit digit. For example, when the red L.E.D. blinks three times and the green L.E.D. blinks twice, this implies number "32". In this way, all problems are classified by code numbers.



SEF650B

ITEMS DISPLAYED ALL THE TIME

Whenever performing the self-diagnosis, input the signals regarding the following items because when performing self-diagnosis the following items are displayed by E.C.C.S. control unit as a malfunction even though it is working properly.

Input procedure

1) Throttle valve switch (idle switch) circuit, and air conditioner switch circuit
   After the ignition switch is turned "ON" and "ON-OFF" signals from each switch are entered.
2) Start signal
   After the engine has started and when start signals "ON" and then "OFF" are entered.
3) Neutral switch (CA20E)
   After the ignition switch is turned "ON", a signal from the switch will appear.
4) Load signal (Air conditioner switch)
   After load signal is turned "ON", a signal is entered.

ITEMS RETAINED IN MEMORY

The following items will be retained in the memory from the time of detection until erased.

Judging

1) Crank angle sensor circuit (CA18ET)
- When 1° or 180° signal is not entered after the engine has started.
- When either 1° or 180° signal is not entered often enough.

2) Air flow meter circuit
- When the air flow meter produces an abnormally high output voltage with the engine off.
- When the air flow meter produces an abnormally low output voltage with the engine running.

3) Water temperature sensor circuit
   When the cricuit is shorted or open.
4) Ignition signal
   When an ignition signal is not produced on the primary winding of the ignition coil after the engine has started.
5) Fuel pump circuit
   When current flowing through the control unit to drive the fuel pump is too small or too large while the engine is operating.

Self-diagnostic System (Cont'd)

6) Detonation sensor circuit (CA18ET)
   When the circuit is shorted with the engine operating at a speed of above 2,000 rpms.
7) Air temperature sensor circuit (CA20E)
   When the circuit is shorted or open.

CAUTION:

a. Always turn the diagnosis mode selector carefully using a screwdriver. Do not press hard to turn. Otherwise, the selector may be damaged.
b. When the engine fails to start, crank the engine for more than two seconds before starting the self-diagnosis.
c. Before starting the self-diagnosis, do not erase the stored memory. Doing so will reduce the self-diagnosis function considerably.
d. After a malfunctioning area has been corrected, be sure to erase the memory.
e. The self-diagnosed results are retained in the memory by a small current flow from the battery. Disconnecting the battery cable or the control unit's connector erases the memory stored. Always perform the self-diagnosing regarding "intermittent" checks before disconnecting.
f. The crank angle sensor signal plays an important role in the E.C.C.S. A malfunctioning sensor is sometimes accompanied by a display which shows malfunctions in other signal systems. In such a case, always start with checking the crank angle sensor.
g. If you make a fuel filter change when disconnecting fuel pump connector, the control unit memorizes number 22 in the self-diagnosis.

Self-diagnostic Procedure

SEF661B

START

Verify that diagnosis mode selector is turned "OFF" (CA20E) or fully counterclockwise (CA18ET).

Turn ignition switch to "ON" position.

Make sure that inspection lamps on control unit stay "ON". (Bulb check)

N.G. → Check harness for battery source. (Refer to pages EF & EC-59 and 73.) If battery is O.K., replace control unit.

O.K.

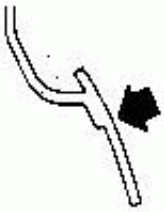
SEF662B

Turn diagnosis mode selector "ON" (CA20E) or fully clockwise (CA18ET).

Make sure that inspection lamps on control unit are displaying code No. 23, No. 24 (CA20E M/T), No.31 and No. 32.

N.G. → Write down the malfunctioning code.

O.K.



SEF663B

Depress accelerator pedal, then release.

Engine model

CA20E M/T

CA18ET & CA20 A/T

Make sure that inspection lamps on control unit are displaying code No. 24, No. 31 and No. 32.

N.G. → Write down the malfunctioning code.

O.K.

SEF876B

Shift manual transmission control lever Neutral → 4th or 5th → Neutral

Make sure that inspection lamps on control unit are displaying code No. 31 and No. 32.

N.G. → Write down the malfunctioning code.

O.K.

Start engine.

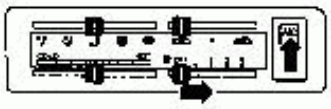
Make sure that inspection lamps on control unit are displaying code No. 31.

N.G. → Write down the malfunctioning code.

O.K.

Ⓐ

Self-diagnostic Procedure (Cont'd)



SEF877B

Ⓐ

Turn air conditioner switch
OFF → ON → OFF

Make sure that inspection lamps on control unit are displaying code No. 44.

N.G. → Write down the malfunctioning code.

O.K.

SEF651B

Turn diagnosis mode selector "OFF" (CA20E) or fully counterclockwise (CA18ET).

Turn off engine.

See decoding chart (Pages EF & EC-45 - 48).

Check malfunctioning area (Pages EF & EC-49 - 76).

Erase the memory of self-diagnosis results.

Procedure for memory erasure

CA18ET engine

Turn ignition switch to "ON" position.

Turn diagnosis mode selector fully clockwise and keep it there for more than 2 seconds.

Turn diagnosis mode selector fully counterclockwise and keep it there for more than 2 seconds.

Turn ignition switch to "OFF" position.

CA20E engine

Turn self-diagnosis mode selector to "OFF" position.

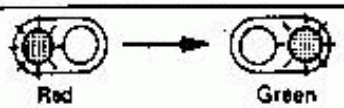
Disconnect the control unit harness connector or battery cable. Keep it off for more than 15 seconds.

Reconnect the harness connector or battery cable.

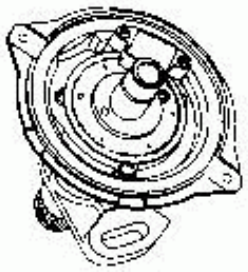
END

Decoding Chart

Code No. 11 CA18ET



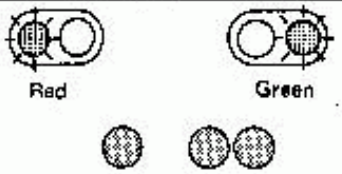
Crank angle sensor circuit is malfunctioning.



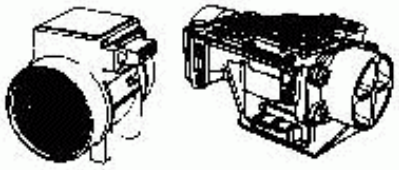
See page EF & EC-61. Ⓐ

SEF657B

Code No. 12 CA20E/CA18ET



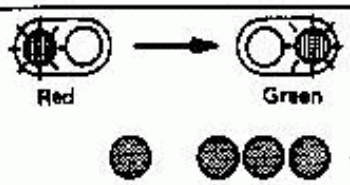
Air flow meter circuit is malfunctioning.



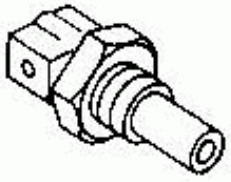
See pages EF & EC-49, 62 and 63. Ⓑ

SEF013C

Code No. 13 CA20E/CA18ET



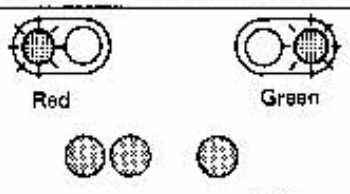
Water temperature sensor circuit is malfunctioning.



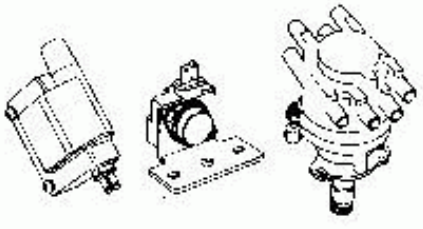
See pages EF & EC-50 and 64. Ⓒ

SEF659B

Code No. 21 CA20E/CA18ET



Ignition signal is malfunctioning.

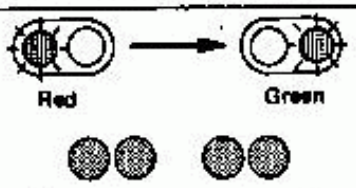


See pages EF & EC-51 and 65. Ⓓ

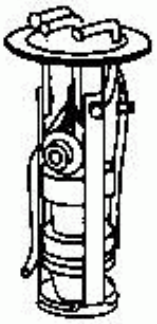
SEF014C

Decoding Chart (Cont'd)

Code No. 22 CA20E/CA18ET



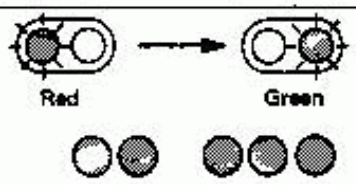
Fuel pump circuit is malfunctioning.



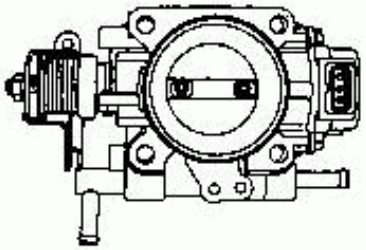
See pages EF & EC-52 and 66.
Ⓔ

SEF662

Code No. 23 CA20E/CA18ET



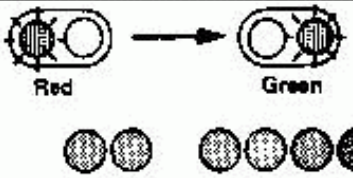
Throttle valve switch (Idle switch) circuit is malfunctioning.



See pages EF & EC-53 and 67.
Ⓕ

SEF678

Code No. 24 CA20E

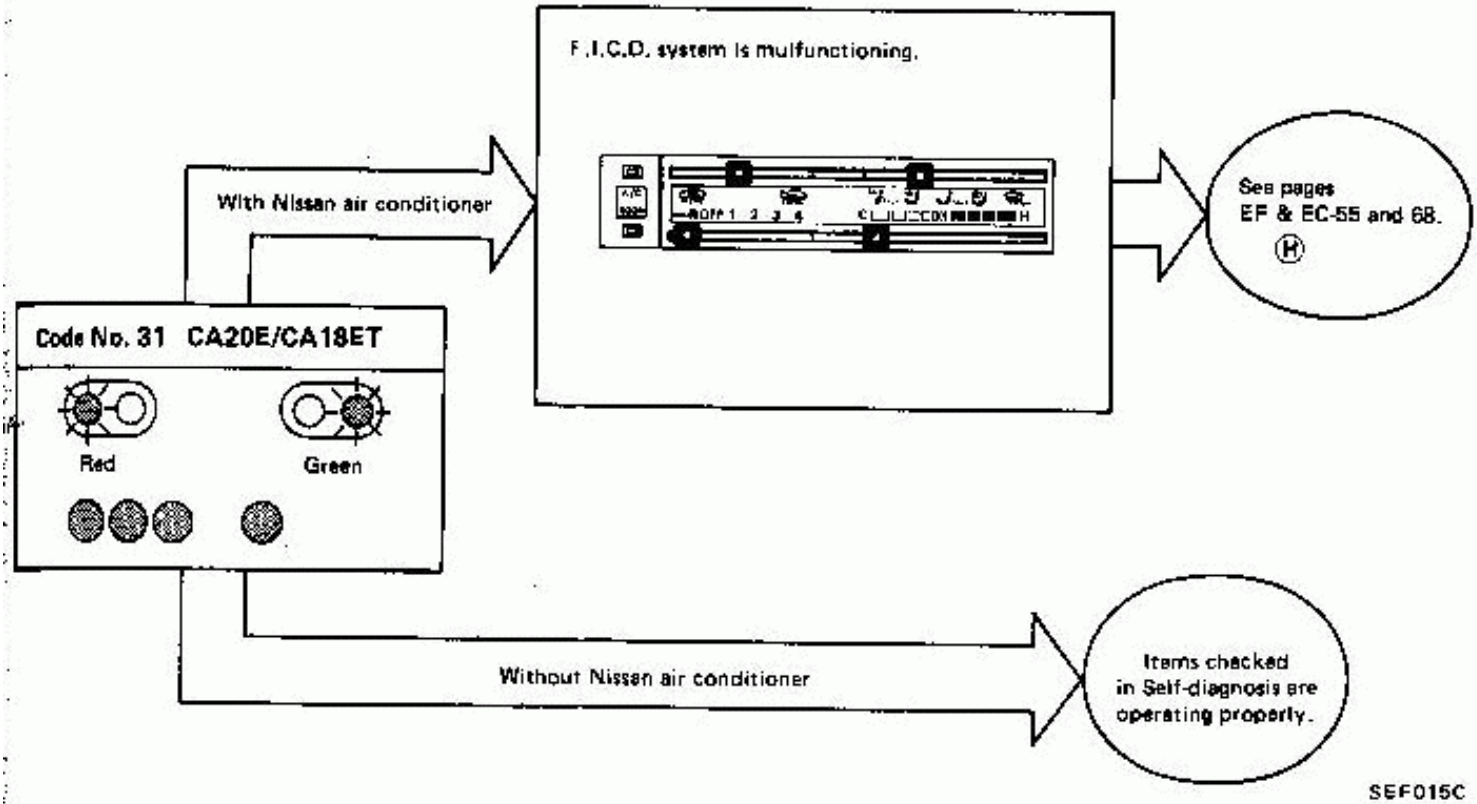


Transmission switch circuit is malfunctioning.

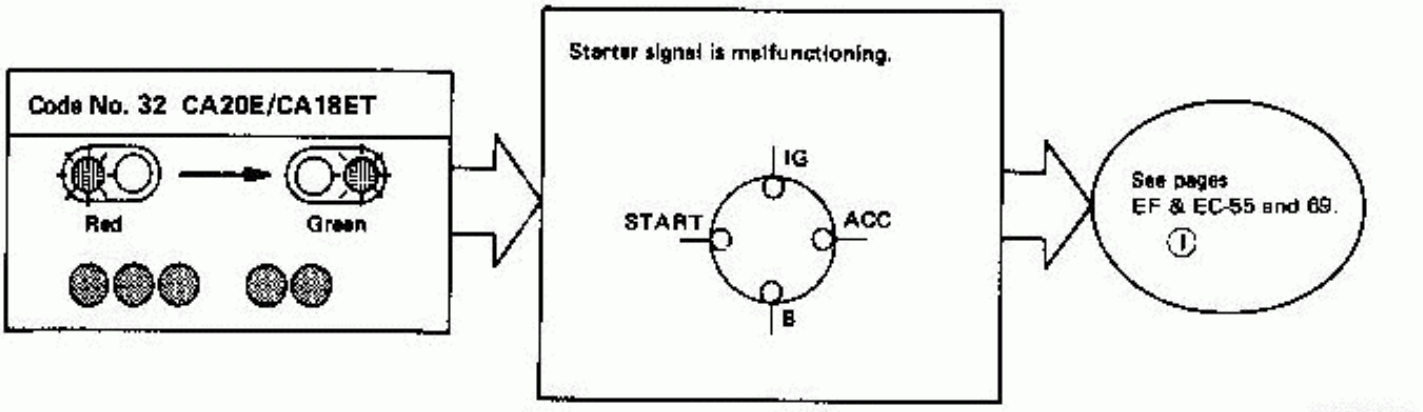
See page EF & EC-54.
Ⓖ

SEF679

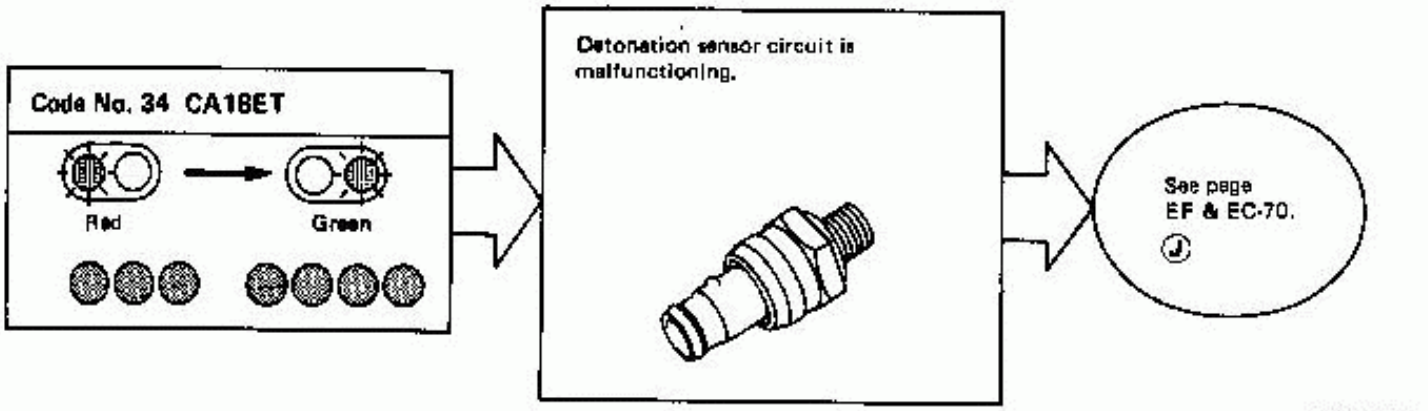
Decoding Chart (Cont'd)



SEF015C

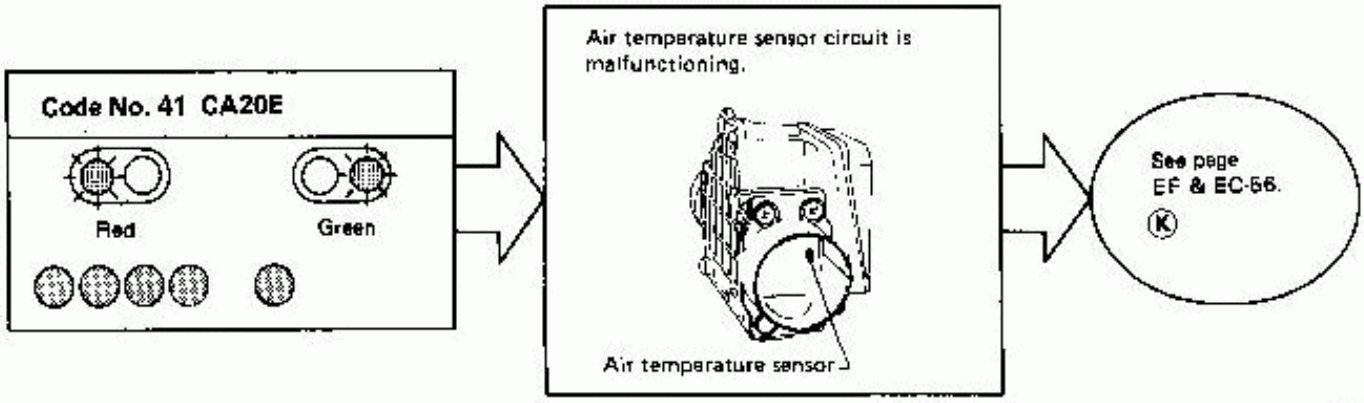


SEF666B

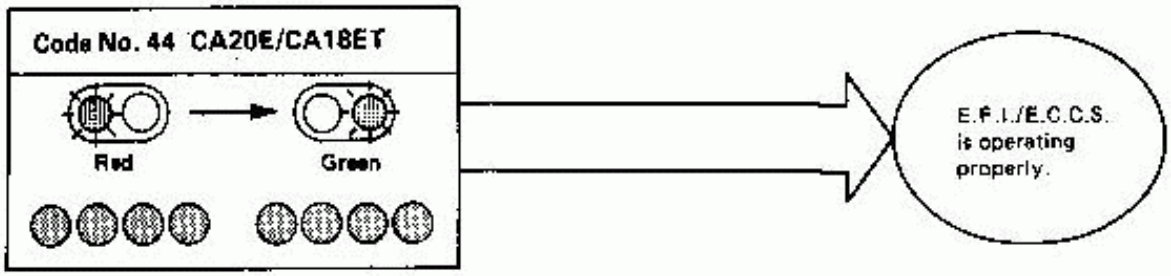


SEF667B

Decoding Chart (Cont'd)



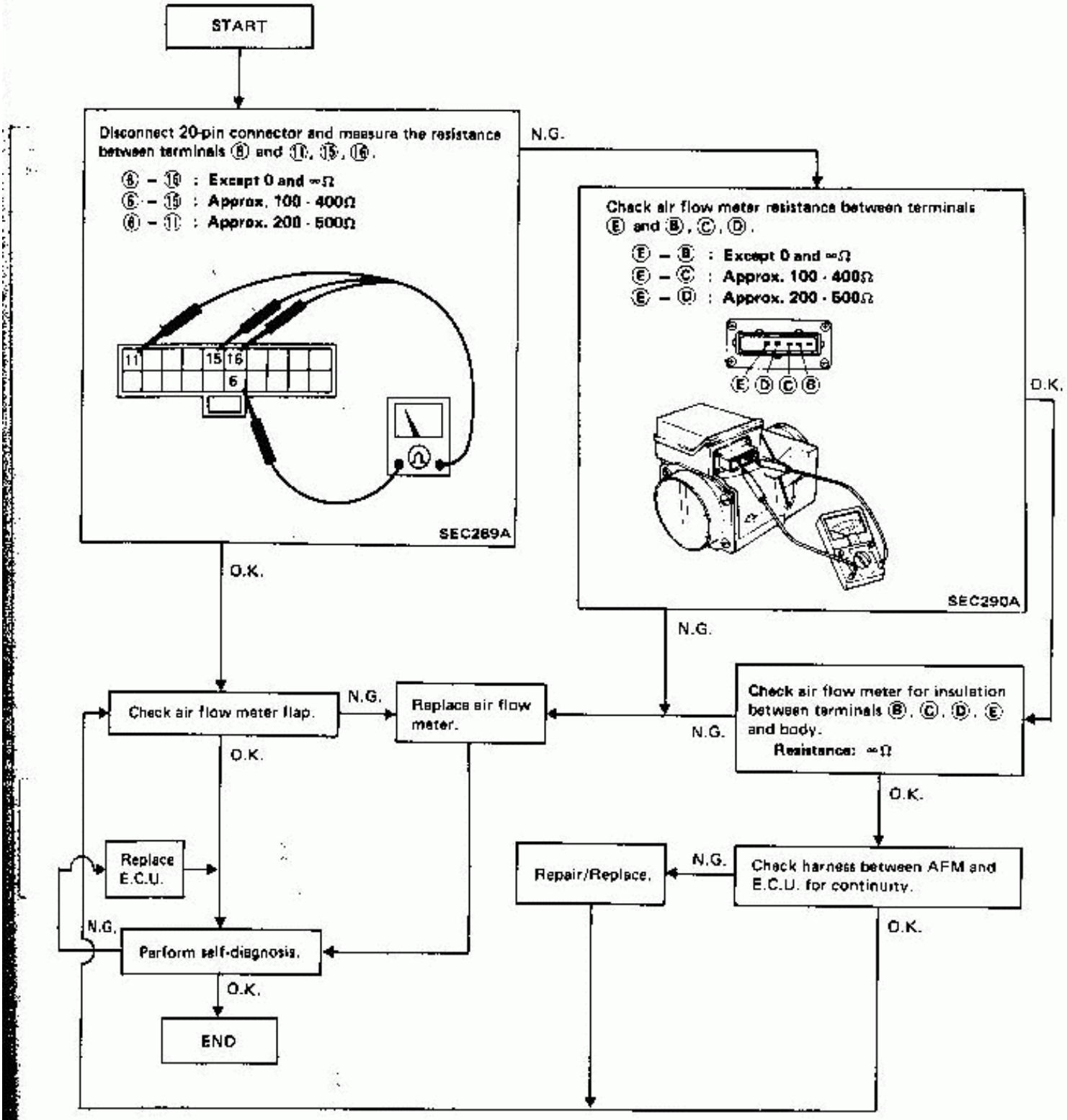
SEC314A



SEF688B

Before checking the following items, ensure that each connector is securely connected.

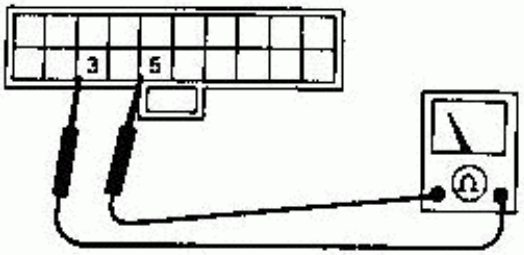
Ⓑ Air flow meter (Code No. 12)



© Water temperature sensor (Code No. 13)

START

Disconnect 20-pin connector and measure the resistance between terminal ③ and ground ⑤.

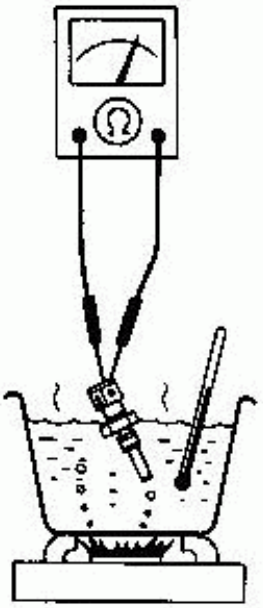


SEC293A

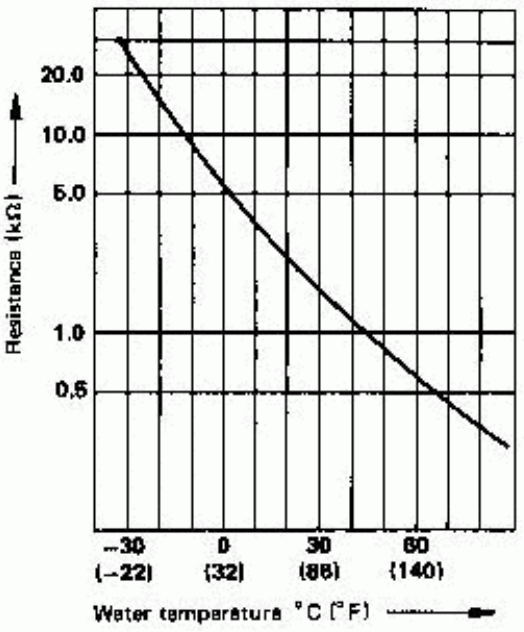
Water temperature	Resistance
Above 20°C (68°F)	Below 2.7 kΩ
Below 20°C (68°F)	Above 2.3 kΩ

N.G.

Dip the sensor into the water maintained at a temperature of 20°C (68°F), 80°C (176°F), etc., and read its resistance.



CHARACTERISTIC CURVE



SEC300A

O.K.

O.K.

Check harness between E.C.U. and water temp. sensor.

N.G.

Repair/Replace.

N.G.

Replace water temp. sensor.

Replace E.C.U.

Perform E.F.I. self-diagnosis.

N.G.

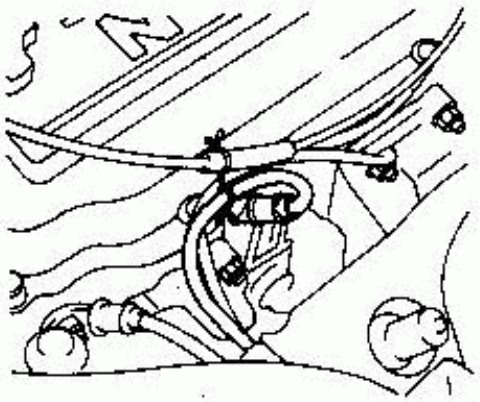
O.K.

END

IGN. (Ignition system) (Code No. 21)

START

Disconnect high-tension cable from one spark plug and check for hot spark during cranking.



SEC294A

N.G.

Check spark plug, ignition coil high-tension cable, distributor cap, IC ignition unit and battery voltage for ignition coil and IC ignition unit.

Repair/Replace.

O.K.

Check mold resistor and E.F.I. harness between E.C.U. and distributor for continuity.
Continuity should exist.

N.G.

Repair/Replace.

O.K.

Replace IC ignition unit.

N.G.

Perform E.F.I. self-diagnosis.

O.K.

Perform E.F.I. self-diagnosis.

O.K.

END

N.G.

Replace E.C.U.

Ⓔ Fuel pump (Code No. 22)

Turn ignition switch "ON" and listen to the fuel pump operating sound. The sound must be heard for about 5 seconds.

N.G.

O.K.

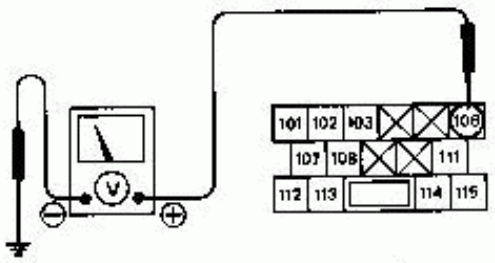
Perform E.F.I. self-diagnosis.

N.G. → Replace E.F.I. control unit.

O.K.

END

Disconnect E.F.I. 15-pin connector, and check voltage between terminal (106) and ground when ignition switch is turned to ON.



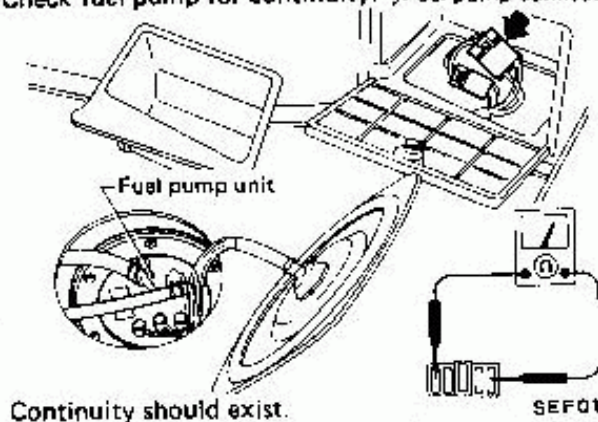
N.G. → Check harness for continuity.

O.K.

N.G. → Repair.

O.K.

Check fuel pump for continuity.



N.G. → Replace fuel pump.

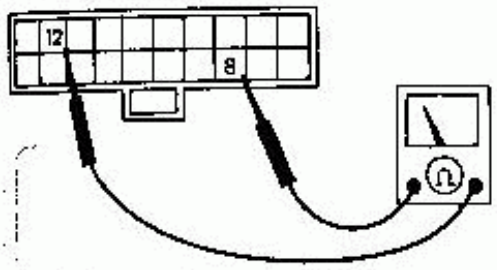
O.K.

Replace E.F.I. control unit.

Throttle valve switch (Idle switch) (Code No. 23)

START

Disconnect 20-pin connector and measure the resistance between ⑧ and ⑫.



Throttle	Resistance
released	0Ω
depressed	∞Ω

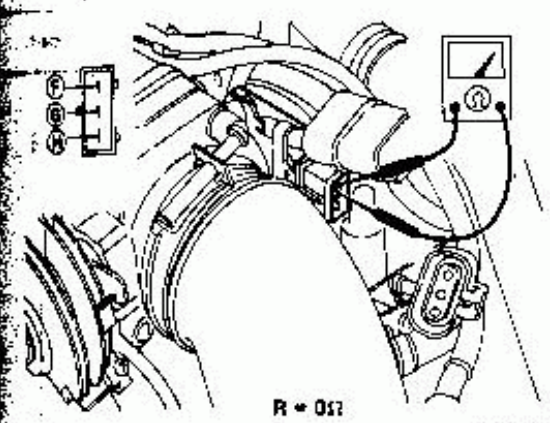
SEC296A

O.K. → Perform E.F.I. self-diagnosis. → O.K. → END

N.G. → Replace E.C.U.

N.G.

Measure the resistance between Ⓕ and Ⓖ.



SEF040C

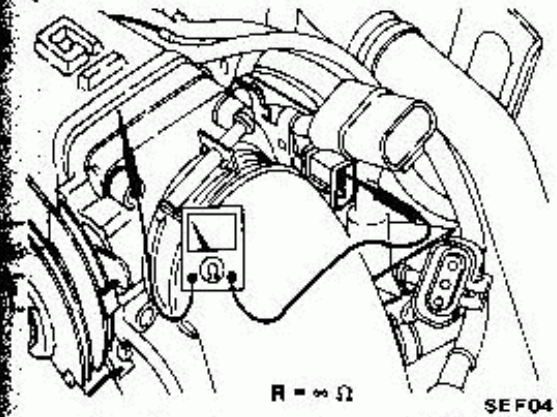
N.G. → Adjustable?

Yes → Adjust idle contact.
(Refer to page EF & EC-23.)
OFF → ON:
M/T Idle speed +250 ±150 rpm
A/T Engine speed
(In "N" position)
+250±150 rpm

No → Replace throttle valve switch.

O.K.

Measure the resistance between Ⓕ, Ⓖ and body ground.



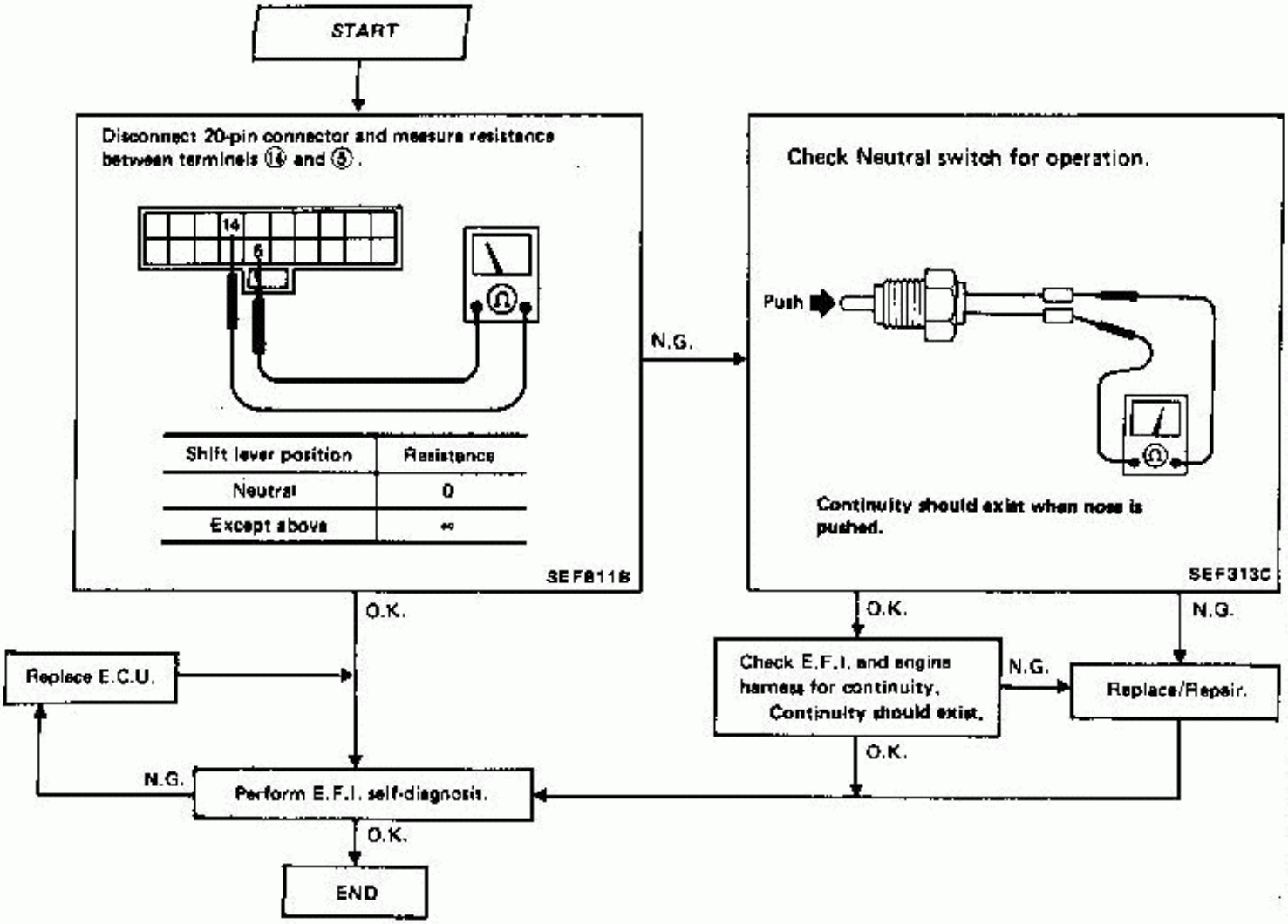
SEF041C

N.G. → Replace throttle valve switch.

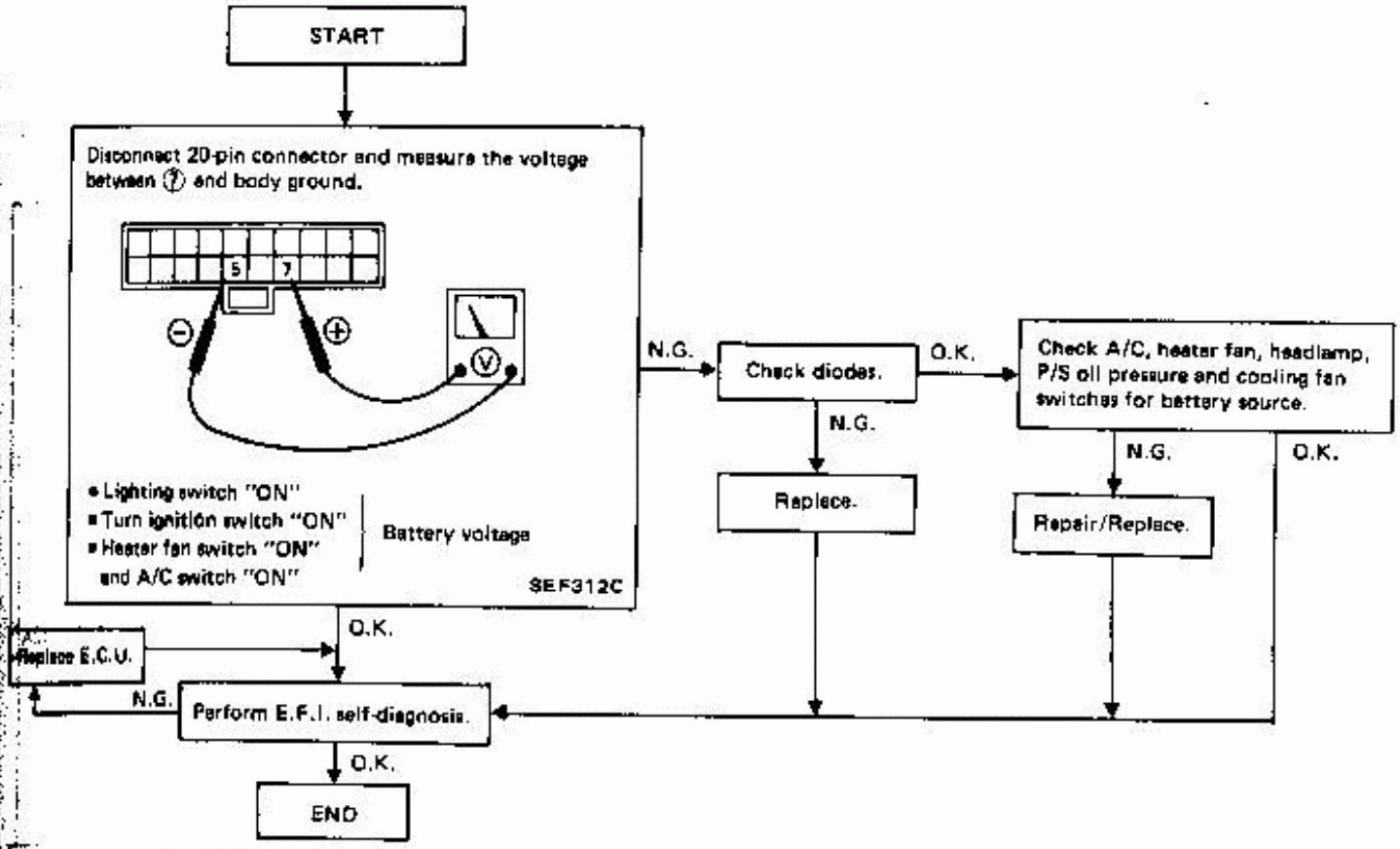
O.K. → Check E.F.I. harness between E.C.U. and throttle valve switch for continuity.
Continuity should exist.

→ Repair/Replace.

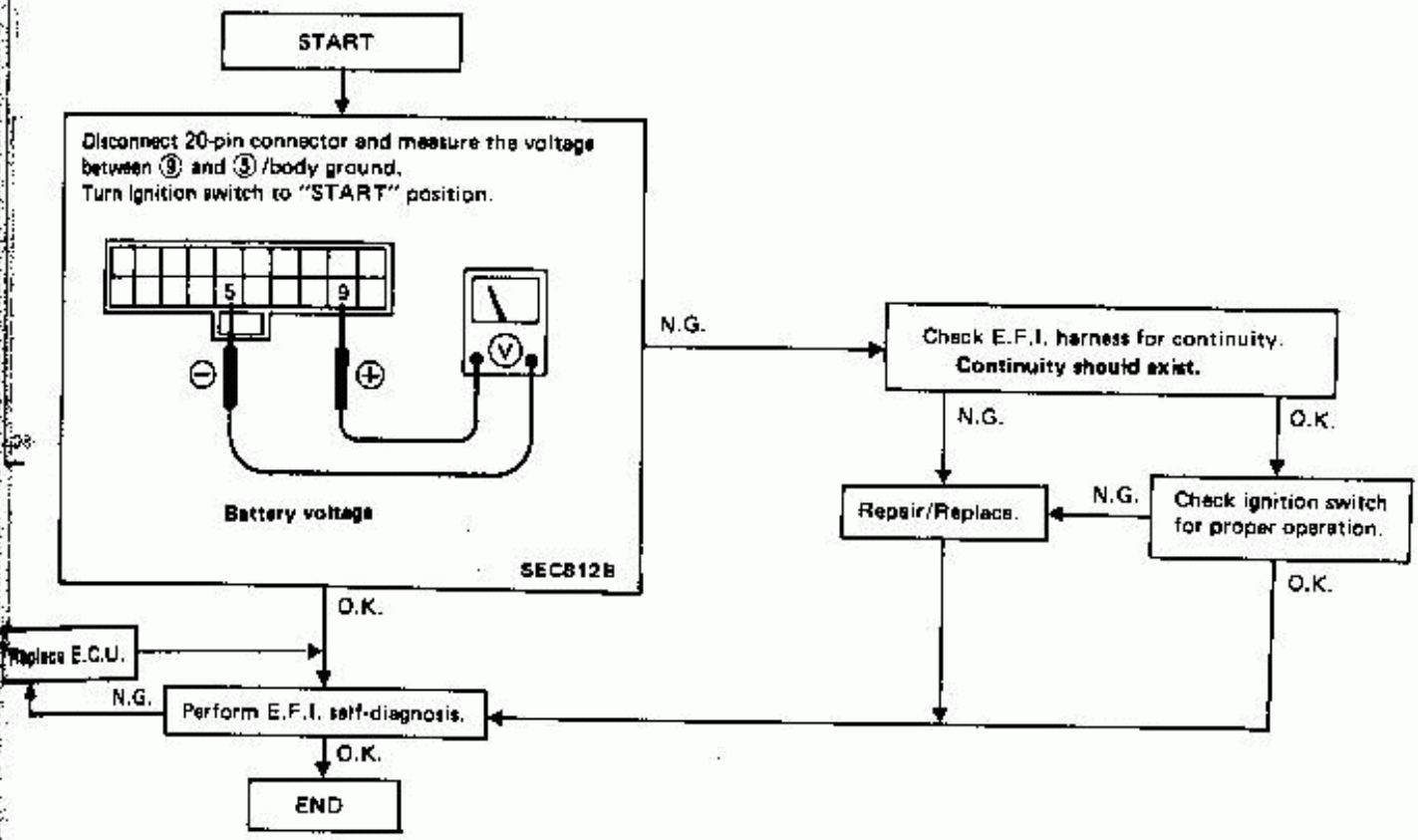
ⓖ Transmission switch (Neutral switch) (Code No. 24)



⑱ Air conditioner switch (Code No. 31)



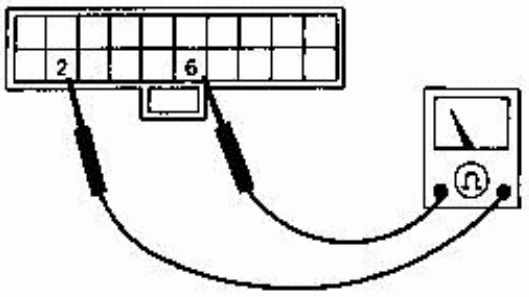
⑲ Starter switch (Code No. 32)



Ⓚ Air temperature sensor (Code No. 41)

START

Disconnect 20-pin connector and measure the resistance between terminals ② and ⑥.



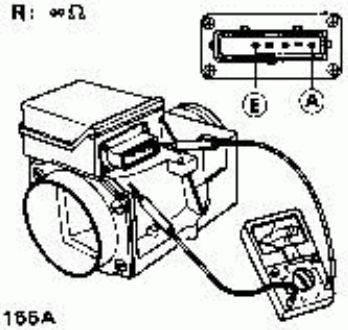
SEC291A

Air temperature	Resistance
Above 20°C (68°F)	Below 2.7 kΩ
Below 20°C (68°F)	Above 2.3 kΩ

N.G.

Measure the resistance of air temperature sensor between terminals (Ⓐ, Ⓔ) and ground.

R: ∞Ω



SEF155A

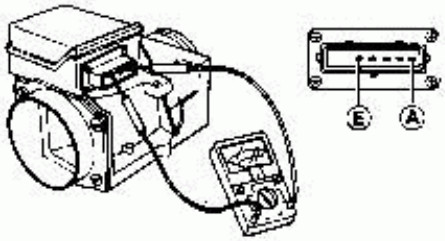
SEC292A

N.G.

O.K.

O.K.

Measure the resistance between terminals Ⓐ and Ⓔ.



Resistance	Air temperature
Below 2.7 kΩ	Above 20°C (68°F)
Above 2.3 kΩ	Below 20°C (68°F)

SEF308C

O.K.

Replace E.C.U.

Replace A.F.M.

N.G.

N.G.

Perform E.F.I. self-diagnosis.

Repair/Replace.

N.G.

Check E.F.I. harness for continuity.

O.K.

O.K.

END

⑭ Air regulator

START

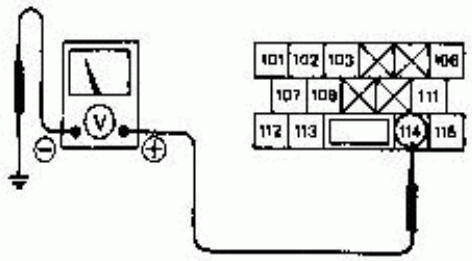
a. Check air regulator operation.
- When engine is cold ... Open
- After warm-up ... Closed

b. Check air regulator shutter for smooth operation.

O.K. → END

N.G.

Disconnect E.F.I. 15-pin connector, and check voltage between (114) and ground when ignition switch is turned to ON.



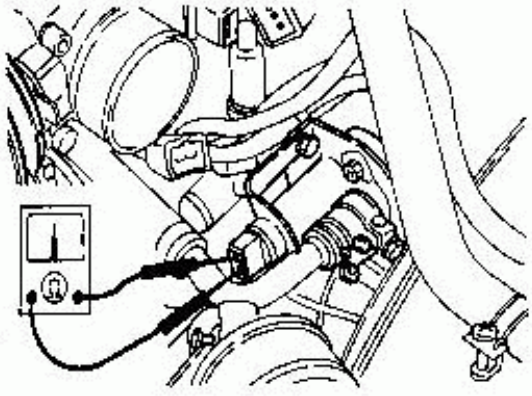
Battery voltage

SEF596C

O.K. → Replace E.C.U.

N.G.

Check air regulator for continuity.



Resistance: Approximately 70Ω

SEF012C

N.G. → Replace air regulator.

O.K.

Check E.F.I. harness for continuity. → Repair/Replace if necessary.

Ⓜ Injector

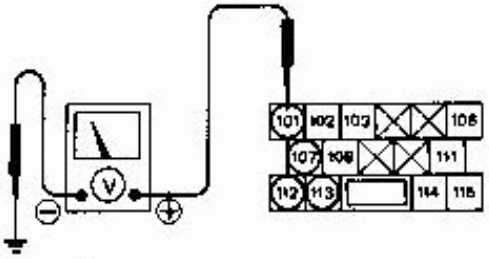
START

Injector operates properly.

Yes → END

No

Disconnect E.F.I. 15-pin connector, and check voltage between terminals (101), (107), (112), (113) and ground.



Battery voltage

SEF597C

O.K. → Check injector for clogging.

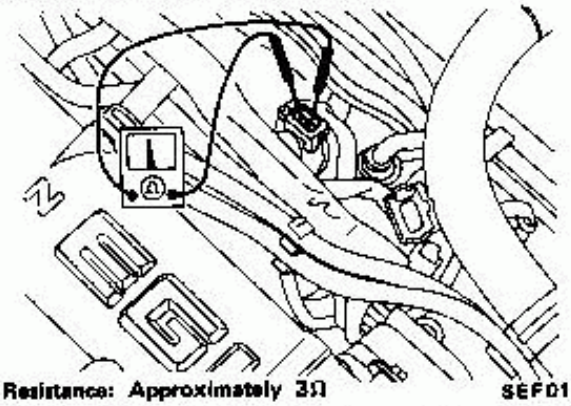
N.G. → Clean injector.

Check injector for clogging.

O.K. → Check component parts for characterisitc or replace E.C.U.

N.G.

Check each injector for continuity.



Resistance: Approximately 3Ω

SEF016C

N.G. → Replace injector.

O.K.

Check E.F.I. harness for continuity.

→ Repair/Replace if necessary.

Battery source and ground

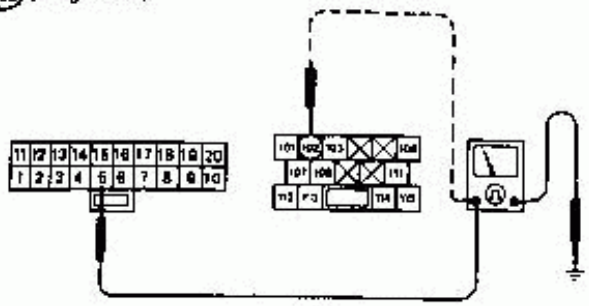
START

Engine operates normally.

Yes → END

No

Disconnect E.F.I. 15-pin and 20-pin connectors, and check continuity between terminals ⑤, ⑩② and ground.



Continuity should exist.

Check voltage between terminal ⑪⑤ and ground.

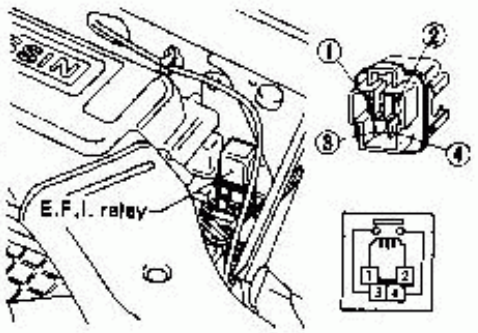
Battery voltage

SEF598C

O.K. → Check component parts for characterisitc or replace E.C.U.

N.G.

Check E.F.I. relay for proper operation.



SEF625C

Check terminals	Normal condition	12V direct current is applied between terminals ① and ②
① – ②	Continuity	–
③ – ④	No continuity	Continuity

N.G. → Replace E.F.I. relay.

O.K.

Check E.F.I. harness for continuity and main harness for battery source.

→ Repair/Replace if necessary.

ⓞ Exhaust gas sensor

Refer to MIXTURE RATIO FEEDBACK SYSTEM INSPECTION.

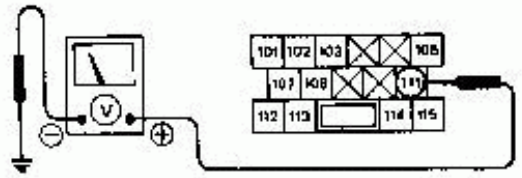
ⓠ Idle-up solenoid valve

START

Does the idle-up system operate properly? — Yes → END

No

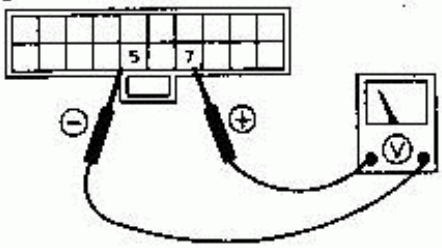
Disconnect E.F.I. 15-pin connector, and check voltage between terminal (111) and ground when ignition switch is turned to ON.



Battery voltage

SEF599C

O.K. → Disconnect 20-pin connector. Turn ignition switch "ON" and measure the voltage between (7) and body ground.



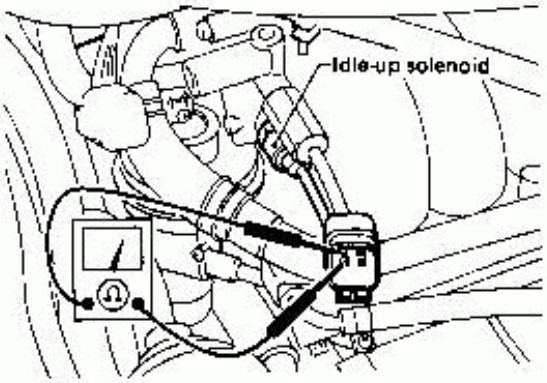
Air conditioner switch	Voltage
ON	12V
OFF	0V

SEC299A

N.G. → Check diodes for open circuit. Check switches (Lighting, heater fan, radiator fan) for battery source. → Repair/Replace.

N.G.

Check idle-up solenoid for continuity.



Resistance: Approximately 30Ω

SEF038C

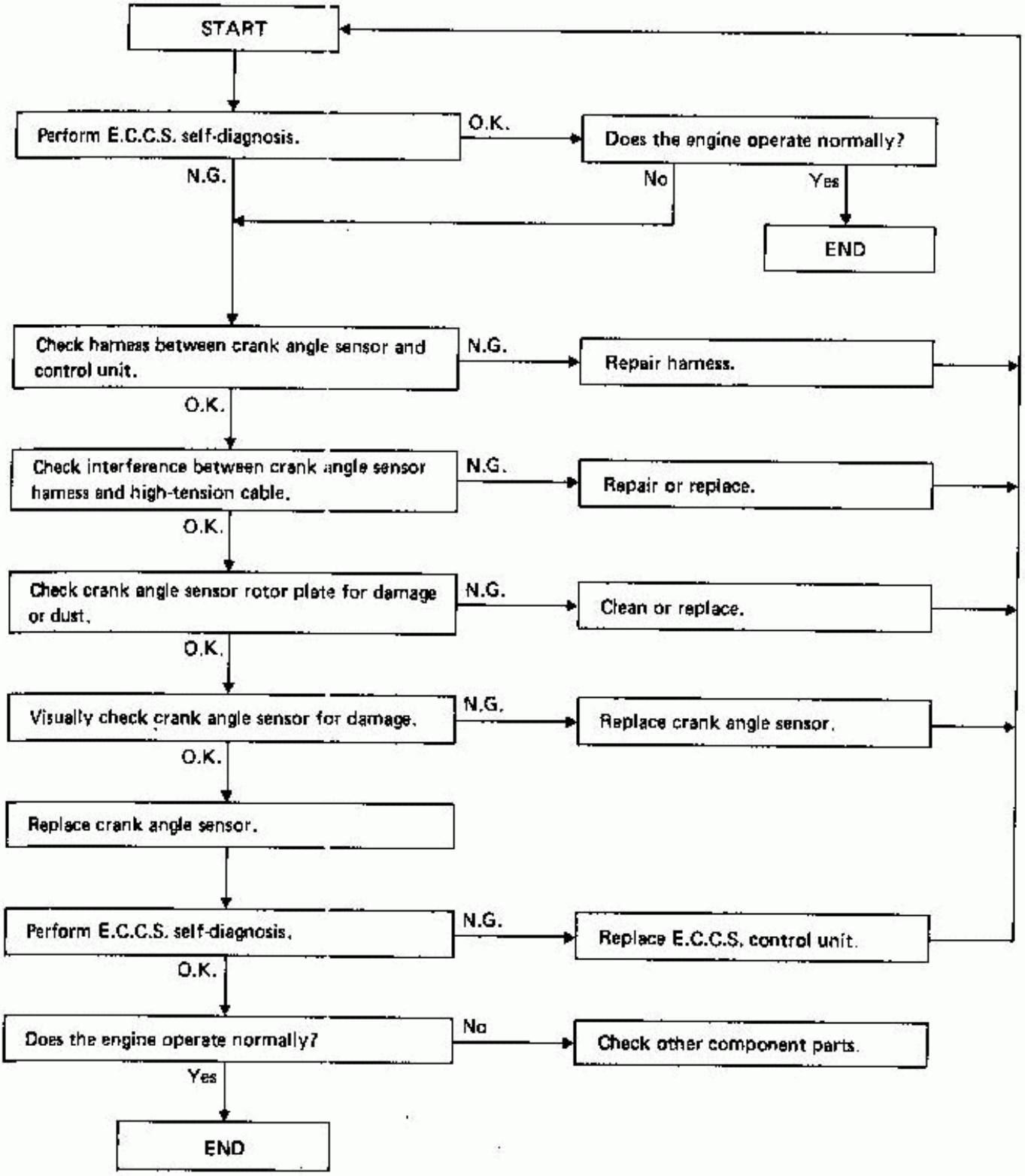
O.K. → Check E.F.I. harness for continuity and main harness for battery source. Check E.F.I. relay. (Refer to page EF & EC-44.) → Repair/Replace.

N.G. → Replace.

PREPARATION

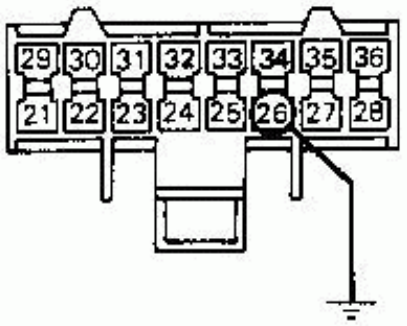
Before checking the following items, ensure that each connector is securely connected.

Ⓐ Crank angle sensor (Code No. 11)



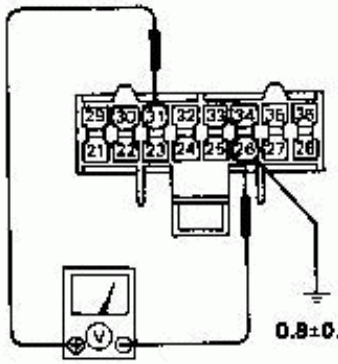
Ⓑ Air flow meter (Code No. 12)

Disconnect 16-pin connector and connect terminal ㉖ to ground with a jumper wire.



SEF917B

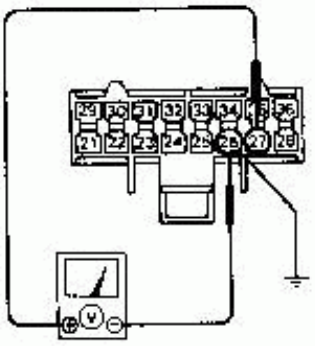
Turn ignition switch "ON" and measure voltage between terminals ㉛ and ㉖.



SEF918B

N.G.

Turn ignition switch "ON" and measure voltage between terminals ㉖ and ㉗.



Battery voltage should exist.

SEF600C

O.K.

N.G.

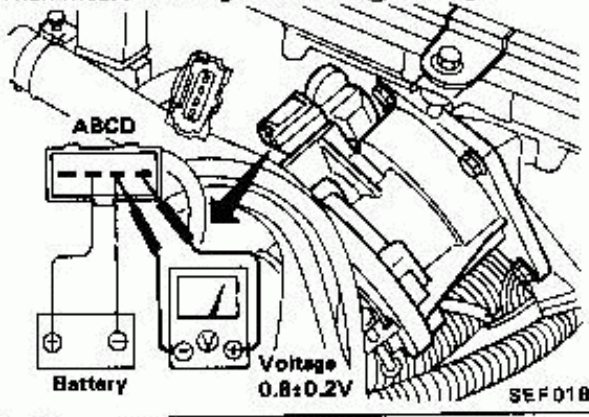
O.K. ← Check harness.

N.G.

Repair harness.

O.K.

Disconnect air flow meter connector.
Apply battery voltage to terminals Ⓑ and Ⓒ.
Then measure voltage between Ⓓ and Ⓒ.

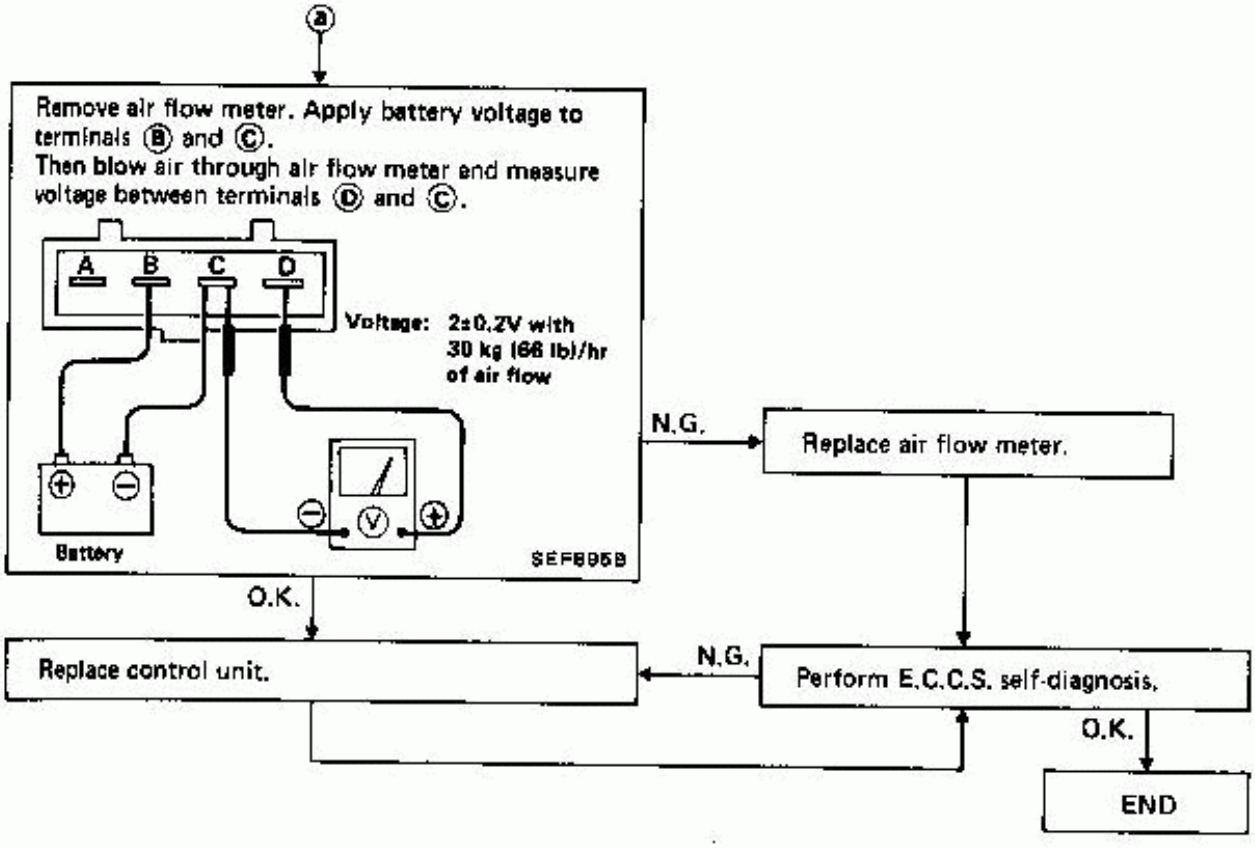


SEF018C

N.G. → Replace air flow meter.

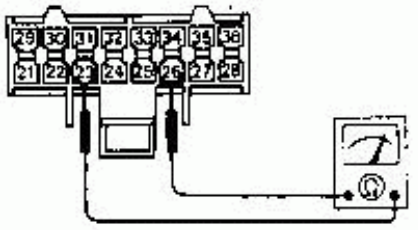
O.K.

ⓐ


Ⓐ
Remove air flow meter. Apply battery voltage to terminals Ⓑ and Ⓒ.
Then blow air through air flow meter and measure voltage between terminals Ⓓ and Ⓒ.
A
B
C
D
Voltage: 2±0.2V with 30 kg (66 lb)/hr of air flow
Battery
SEF895B
N.G.
Replace air flow meter.
O.K.
Replace control unit.
N.G.
Perform E.C.C.S. self-diagnosis.
O.K.
END

© Water temperature sensor (Code No. 13)

Disconnect 16-pin connector and measure the resistance between terminals ㉓ and ㉖.



SEF919B

Water temperature	Resistance
Above 20°C (68°F)	Below 2.7 kΩ
Below 20°C (68°F)	Above 2.3 kΩ

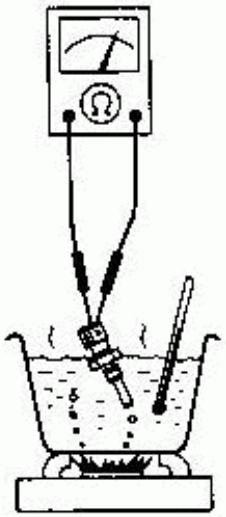
O.K. → Replace control unit.

N.G. → Check harness.

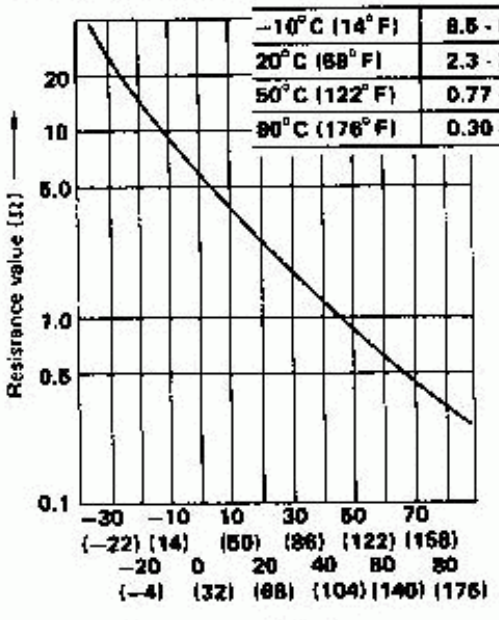
Check harness. N.G. → Repair harness.

Check harness. O.K. →

Dip the sensor into water maintained at a temperature of 20°C (68°F), 80°C (176°F), etc., and read its resistance.



−10°C (14°F)	8.5 - 9.5 kΩ
20°C (68°F)	2.3 - 2.7 kΩ
50°C (122°F)	0.77 - 0.87 kΩ
90°C (176°F)	0.30 - 0.33 kΩ



SEF896B

O.K. → Perform E.C.C.S. self-diagnosis.

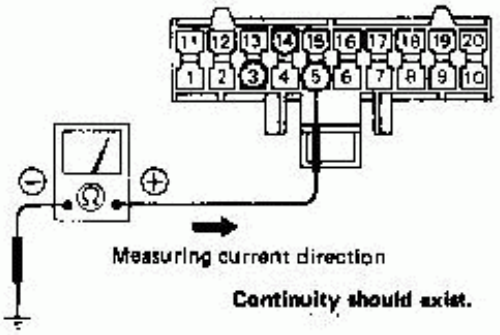
N.G. → Replace water temperature sensor.

Perform E.C.C.S. self-diagnosis. N.G. →

Perform E.C.C.S. self-diagnosis. O.K. → END

⑨ Ignition signal (Code No. 21)

Disconnect 20-pin connector and check continuity between terminals ③, ⑤, ⑭ and ground.



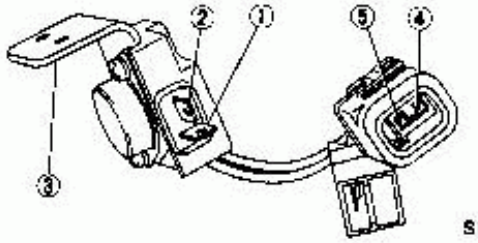
Continuity should exist.

6EF920B

N.G. → Check harness, and repair as necessary.

O.K.

Check power transistor with circuit tester.



SEF626C

N.G. → Replace power transistor.

Tester	Measuring current direction ➡		Should read
Ohmmeter	②	③	Continuity exists
	④	③	
	④	②	
	①	⑤	

O.K.

Perform E.C.C.S. self-diagnosis.

O.K. → END

N.G.

Replace E.C.C.S. control unit.

Refer to Ignition Timing Control (EF & EC-30) for ignition system wiring.

Ⓔ **Fuel pump (Code No. 22)**

Turn ignition switch "ON" and listen to the fuel pump operating sound. The sound must be heard for about 5 seconds.

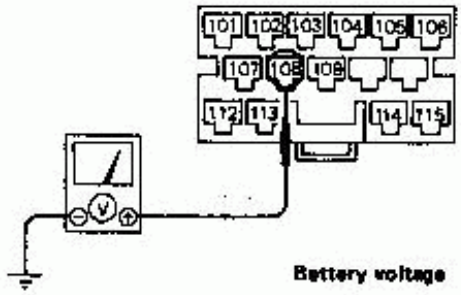
O.K. → Perform E.C.C.S. diagnosis.

N.G. → Replace E.C.C.S. control unit.

O.K. → END

N.G.

Disconnect E.C.C.S. 15-pin connector, and check voltage between terminal (108) and ground when ignition switch is turned to ON.



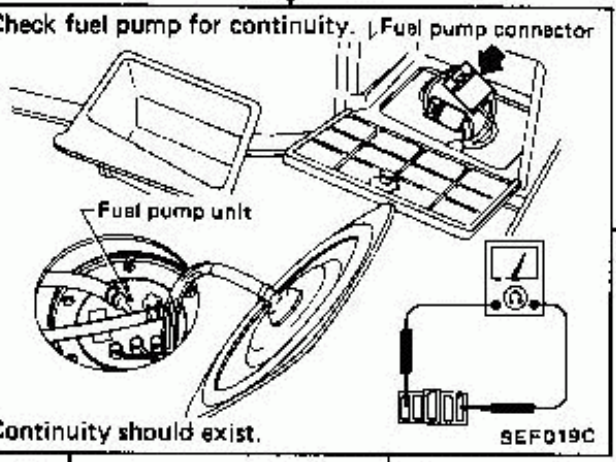
N.G. → Check harness for continuity.

O.K. → Check fuel pump for continuity.

N.G. → Repair harness.

O.K.

Check fuel pump for continuity.



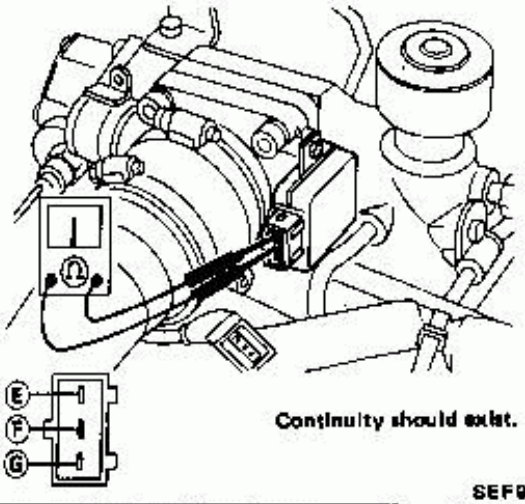
O.K. → Replace E.C.C.S. control unit.

N.G. → Replace fuel pump.

Throttle valve switch (Code No. 23)

Check harness for continuity.
N.G. → Repair harness.
O.K. ↓

Check the throttle valve switch for continuity between Ⓔ and Ⓕ.

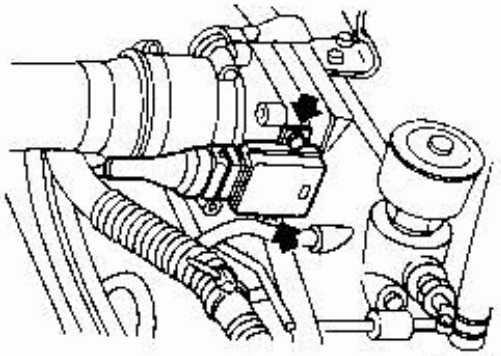


Continuity should exist.

SEF901B

N.G. → Adjust idle switch.
1) Adjust idle switch so that the switch turns on at the engine speed.

OFF → ON:
M/T Idle speed + 250±150 rpm
A/T Engine speed (in "N" position) + 250±150 rpm

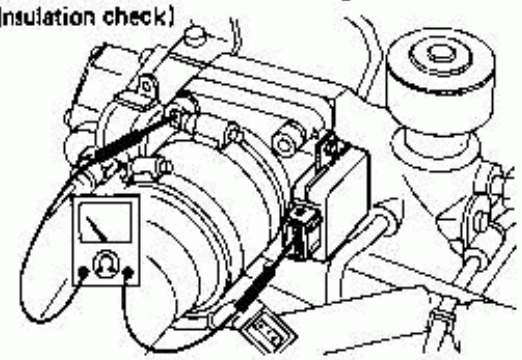


SEF902B

2) Check that idle switch closes at idle speed.

Adjusted → O.K. ↓
Not adjustable → Replace throttle valve switch.

Check continuity between Ⓔ, Ⓕ and ground. (insulation check)



Continuity should not exist.

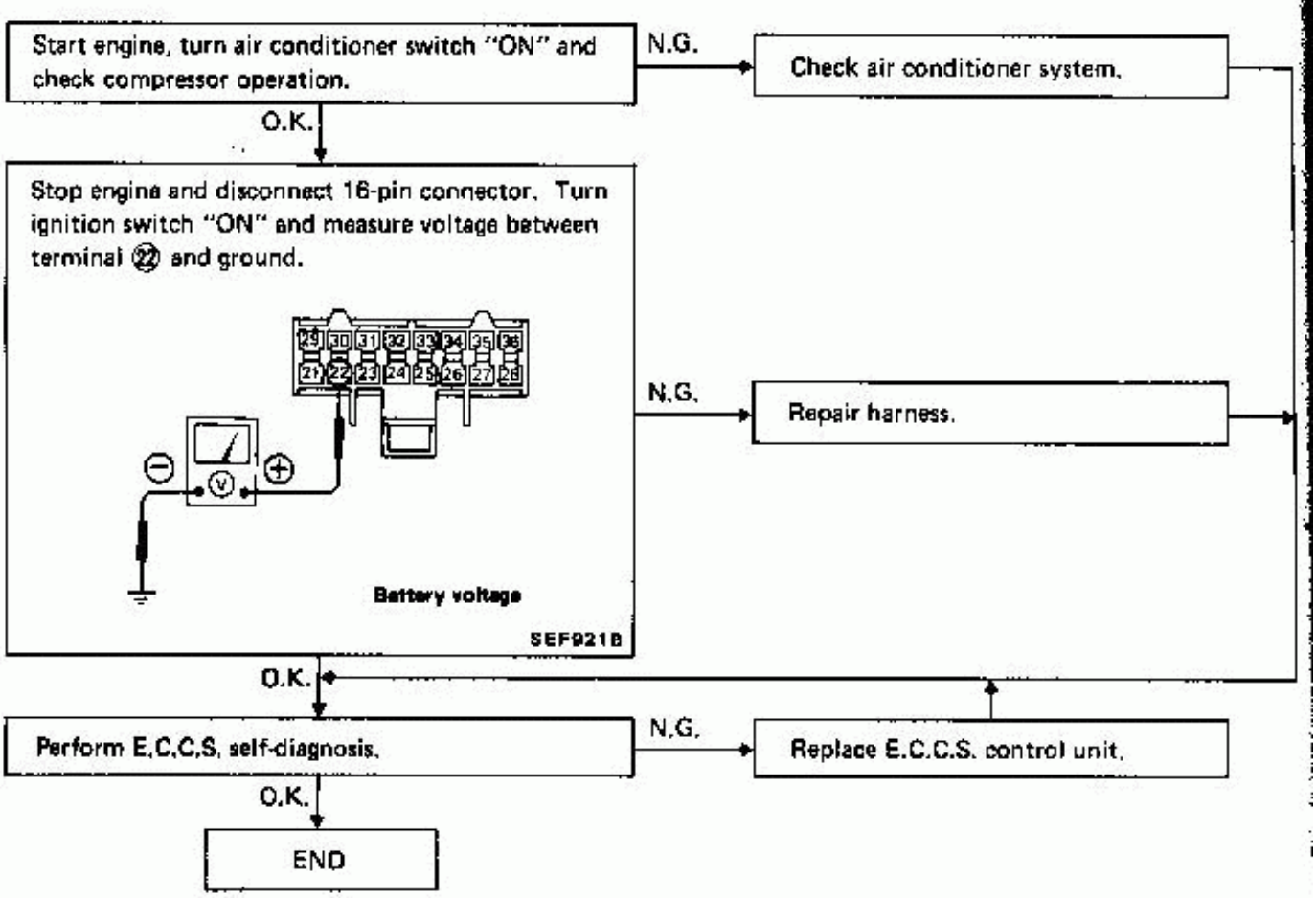
SEF903B

N.G. → Replace throttle valve switch.
O.K. ↓

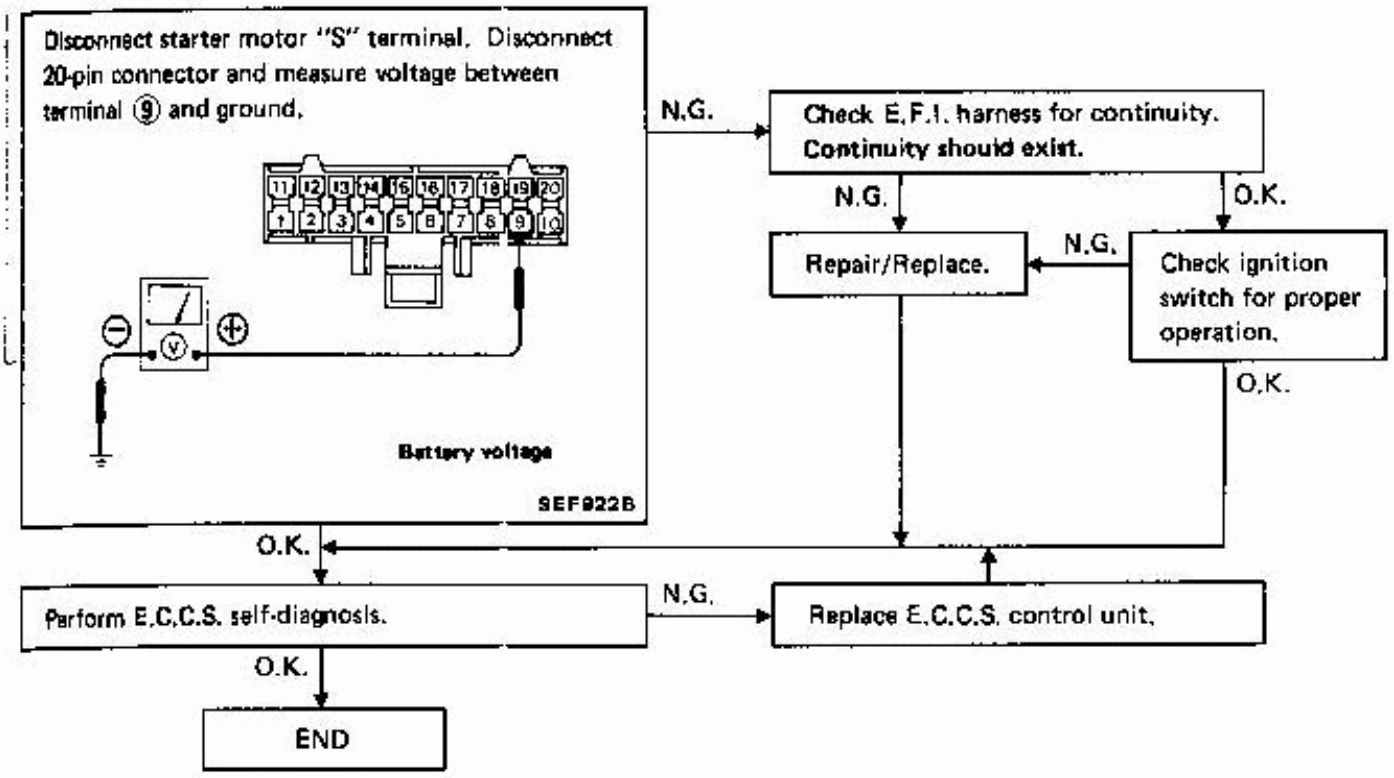
Perform E.C.C.S. self-diagnosis.
N.G. → Replace E.C.C.S. control unit.
O.K. ↓

END

Ⓗ **Air conditioner (Code No. 31)**

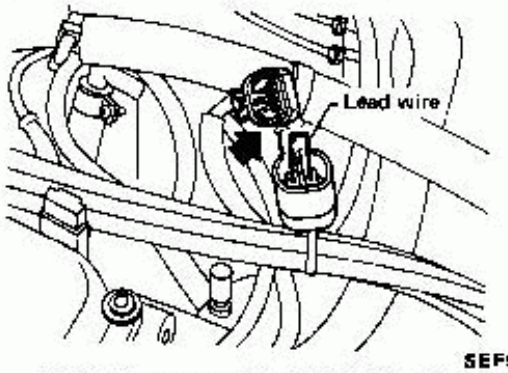


Start signal (Code No. 32)



Ⓙ Detonation sensor (Code No. 34)

1) Disconnect detonation sensor harness connector.
2) Connect both terminals of harness connector with lead wire.
3) Start engine and increase engine speed while checking ignition timing.
4) Check if ignition timing retards by 5 degrees when engine speed increases more than 2,000 rpm.



N.G. → Replace E.C.C.S. control unit.

O.K. ↓

Check E.F.I. harness for continuity. — N.G. → Repair harness.

O.K. ↓

Replace detonation sensor. → Perform E.C.C.S. self-diagnosis.

O.K. → END

N.G. → Replace E.C.C.S. control unit

) Air regulator

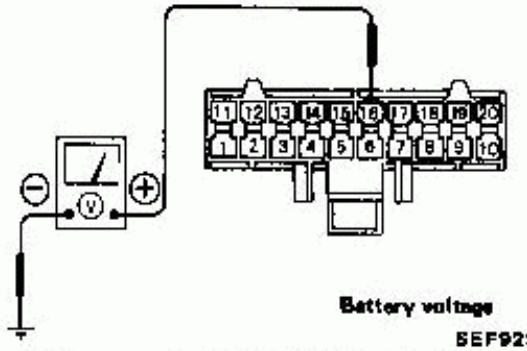
a. Check air regulator operation.
- When engine is cold ..... Open
- After warm-up Closed

b. Check air regulator shutter for smooth operation.

O.K. → END

N.G.

Disconnect E.C.C.S. 20-pin connector, and check voltage between terminal ⑯ and ground when ignition switch is turned to ON.



Battery voltage

SEF923B

O.K. → Replace E.C.C.S. control unit.

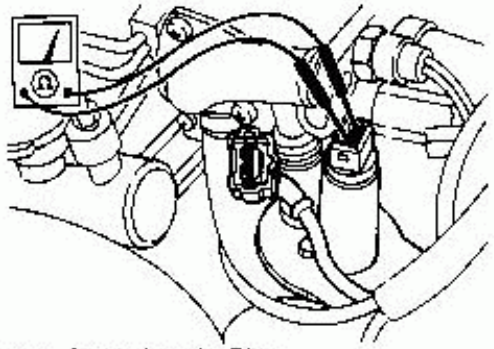
N.G.

Check harness.

N.G. → Repair harness.

O.K.

Check air regulator for continuity.



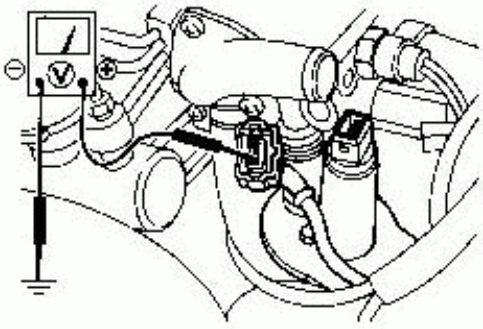
Resistance: Approximately 70Ω

SEF930B

N.G. → Replace air regulator.

O.K.

Turn ignition switch "ON" and measure voltage at the connector of E.F.I. harness.



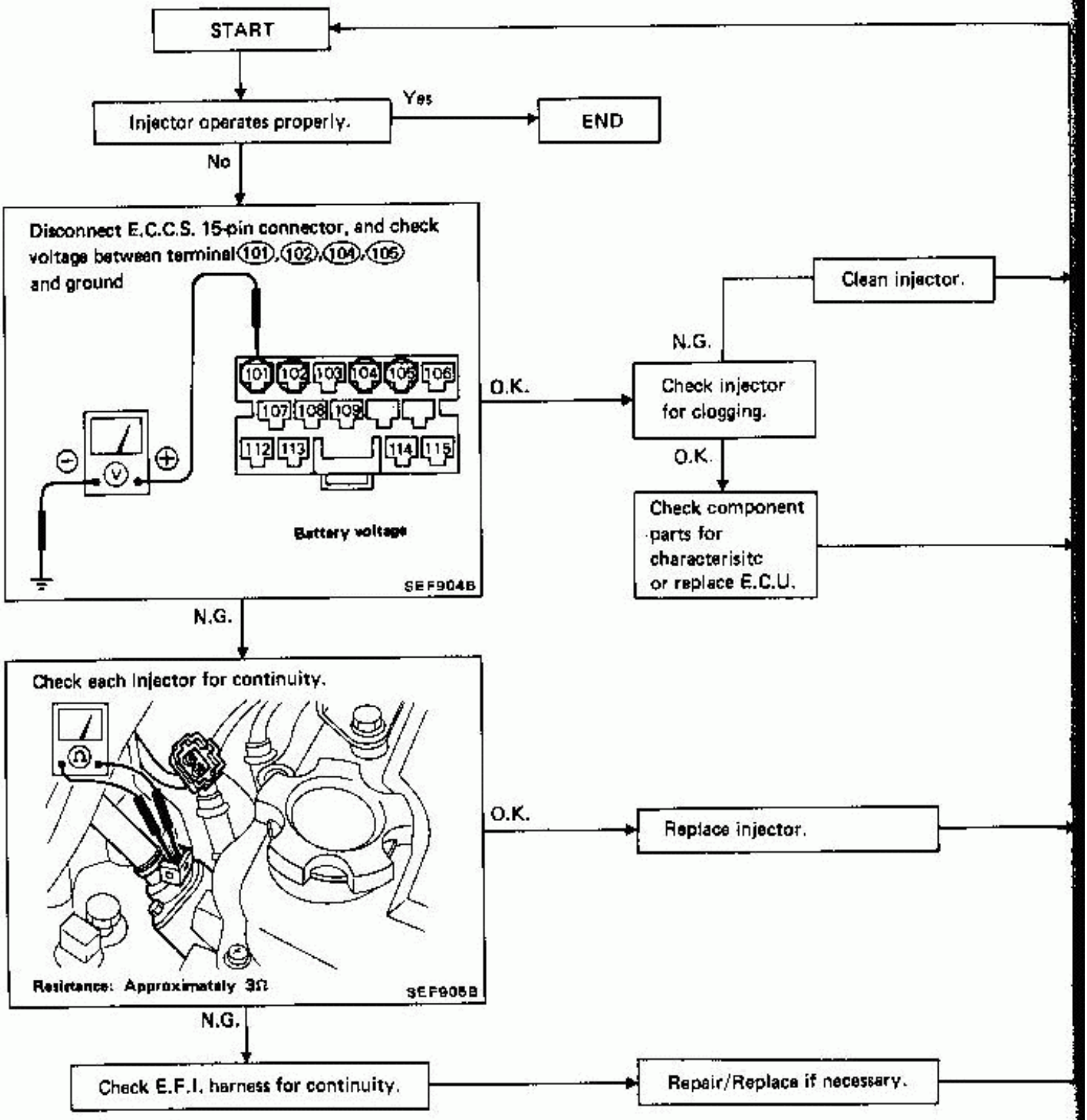
Battery voltage should exist

SEF601C

N.G.

Repair/Replace.

Ⓜ Injector


START
Injector operates properly.
Yes
END
No
Disconnect E.C.C.S. 15-pin connector, and check voltage between terminal (101), (102), (104), (105) and ground
101 102 103 104 105 106
107 108 109
112 113 114 115
Battery voltage
SEF904B
O.K.
Clean injector.
N.G.
Check injector for clogging.
O.K.
Check component parts for characterisitc or replace E.C.U.
N.G.
Check each injector for continuity.
Resistance: Approximately 3Ω
SEF905B
O.K.
Replace injector.
N.G.
Check E.F.I. harness for continuity.
Repair/Replace if necessary.

⑨ Battery source and ground

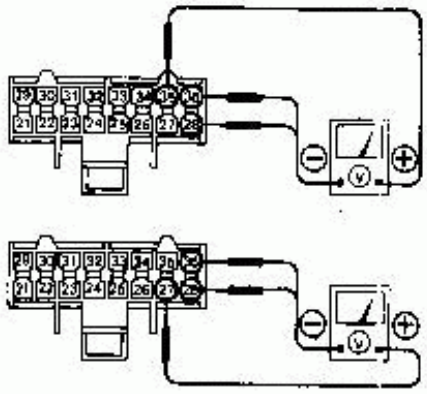
START

Engine operates normally.

Yes → END

No

Disconnect E.C.C.S. 16-pin connector, and check voltage between ㉗, ㉟ and ㉘, ㊱ when ignition switch is turned to ON.



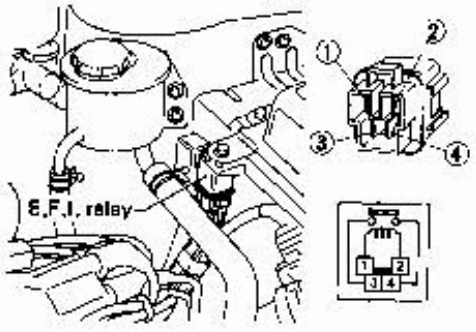
Battery voltage

SEF924B

O.K. → Check component parts for characterisitc or replace E.C.U.

N.G.

Check E.F.I. relay for proper operation.



SEF627C

Check terminals	Normal condition	12V direct current is applied between terminals ① and ②
① – ②	Continuity	–
③ – ④	No continuity	Continuity

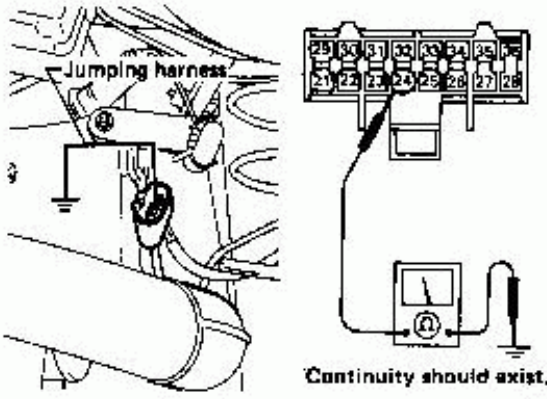
N.G. → Replace E.F.I. relay.

O.K.

Check E.F.I. harness for continuity and main harness for battery source. → Repair/Replace if necessary.

ⓞ Exhaust gas sensor

1. Turn off engine and disconnect battery ground cable.
2. Disconnect exhaust gas sensor harness connector and connect center terminal to ground.
3. Disconnect E.C.C.S. 16-pin connector, and check continuity between terminal ㉔ and ground.



SEF039C

O.K. → Check exhaust gas sensor. **Refer to MIXTURE RATIO FEEDBACK SYSTEM INSPECTION.**

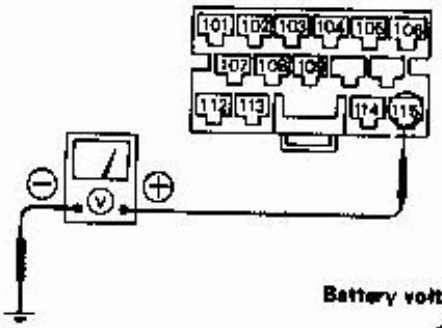
O.K. → END

N.G. → Check E.F.I. harness for continuity.

N.G. → Repair/Replace.

Exhaust gas sensor heater

Disconnect E.C.C.S. 15-pin connector, and check voltage between terminal (15) and ground when ignition switch is turned to ON.



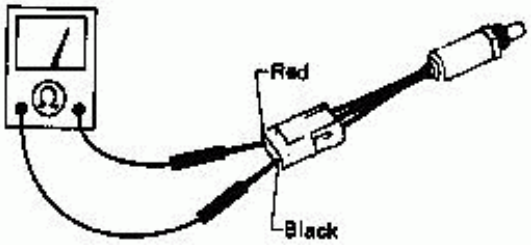
Battery voltage

SEF701B

O.K. → END

N.G.

Measure the resistance of exhaust gas sensor heater. (Left and right hand side terminals)



Resistance 2.87±0.25Ω

SEF702B

N.G. → Replace exhaust gas sensor.

O.K.

Check harness for continuity and measure voltage at connector for battery source. → Repair/Replace.

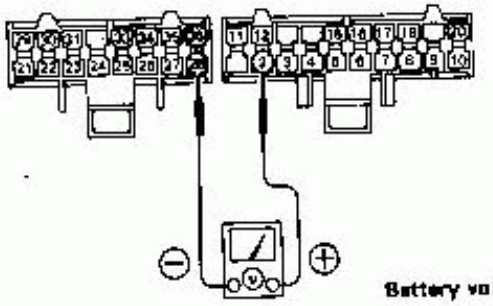
⑥ Idle-up solenoid valve

START

Does the idle-up system operate properly? — Yes → END

No

Disconnect E.C.C.S. 20-pin connector, and check voltage between terminal ② and ground when ignition switch is turned to ON.

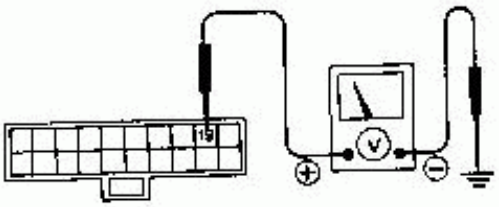


Battery voltage

SEB695B

O.K. →

Disconnect 20-pin connector. Turn ignition switch "ON" and measure the voltage between ⑲ and body ground.



Heater fan switch	Voltage
ON	12V
OFF	0V

SEF602C

O.K. ←

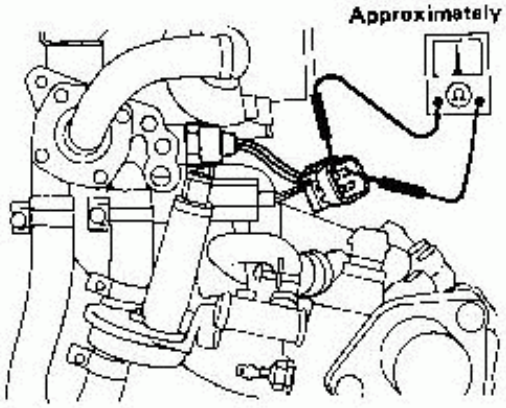
N.G. ↓

Check diodes for open circuit. Check switches (Lighting, heater fan, power steering oil pressure switch) for battery source. → Repair/Replace.

N.G. ↓

Check idle-up solenoid valve for continuity.

Resistance: Approximately 30Ω



SEF042C

O.K. ↓

Check E.F.I. harness for continuity and main harness for battery source. Check E.F.I. relay. (Refer to page EF & EC-73.)

N.G. ↓

Replace.

Repair/Replace.

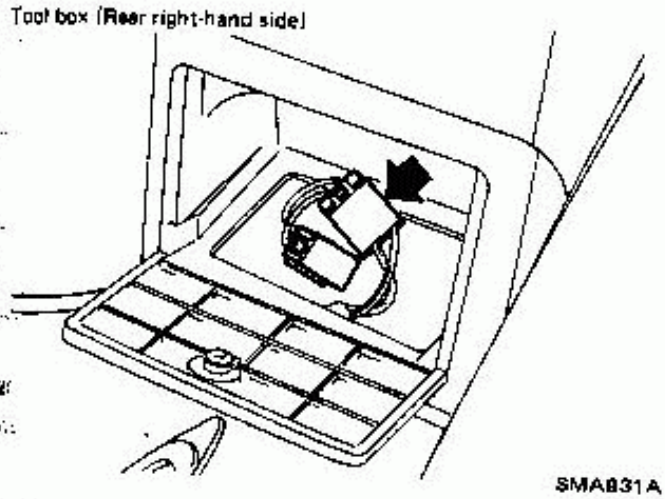
FUEL SYSTEM INSPECTION

Releasing Fuel Pressure

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

(1) Start engine.

(2) Disconnect the harness connector of fuel pump.



SMA831A

(3) After engine stall, crank the engine twice or three times.

(4) Turn the ignition switch "OFF".

(5) Reconnect the harness connector of fuel pump.

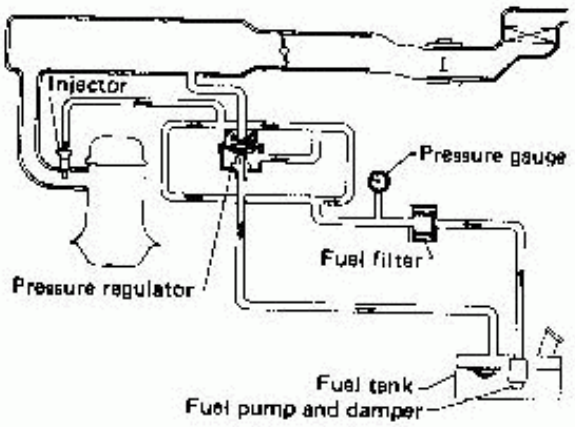
Erase the memory (Code 22) of the self-diagnosis in the control unit.

Fuel Pressure Check

a. **When reconnecting fuel line, always use new clamps and be sure to position them correctly.**

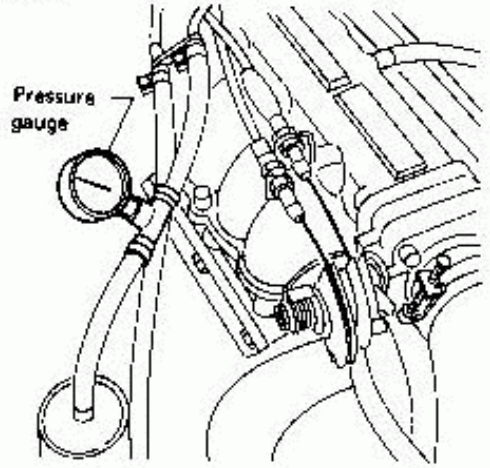
b. **Use a torque driver to tighten clamps.**

c. **Use Pressure Gauge (J-2540034) to check fuel pressure.**



SEF595C

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.



SEF052C

4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

At idling:

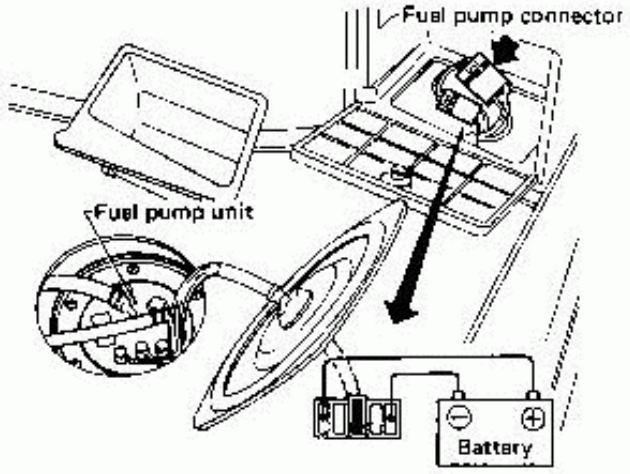
Approximately 206 kPa (2.1 kg/cm², 30 psi)

The moment accelerator pedal is fully depressed:

Approximately 255 kPa (2.6 kg/cm², 37 psi)

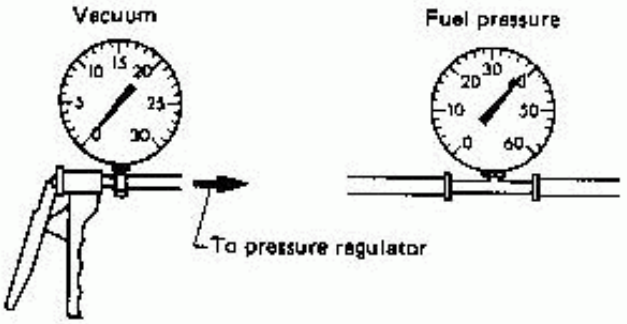
Fuel Pressure Check (Cont'd)

6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake collector.
7. Plug intake collector with a rubber cap.
8. Connect variable vacuum source (J-23738 or equivalent) to fuel pressure regulator.
9. Disconnect body harness connector and connect pins to ground with jumper wire as follows:



SEF051C

10. Read the indication of fuel pressure gauge as vacuum is changed.



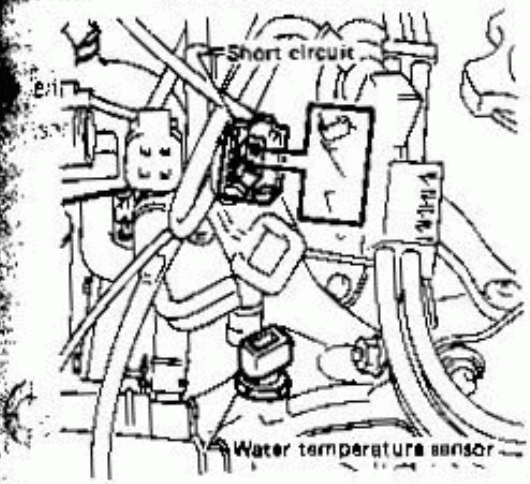
SEF718B

Vacuum kPa (mmHg, inHg)	Fuel pressure kPa (kg/cm², psi)
0 (0, 0)	248.1 - 255.0 (2.53 - 2.60, 36.0 - 37.0)
16.9 (127, 5.00)	227.5 - 241.3 (2.32 - 2.46, 33.0 - 35.0)
33.9 (254, 10.00)	213.8 - 220.7 (2.18 - 2.25, 31.0 - 32.0)
50.8 (381, 15.00)	200.1 - 206.9 (2.04 - 2.11, 29.0 - 30.0)
67.7 (508, 20.00)	179.5 - 193.2 (1.83 - 1.97, 26.0 - 28.0)

Fuel pressure should decrease as vacuum increas
If results are unsatisfactory, replace fuel pressu
regulator.

Pressure Regulator Control System Inspection

Disconnect water temperature sensor harness connector and jump terminals of harness connector with a lead wire.



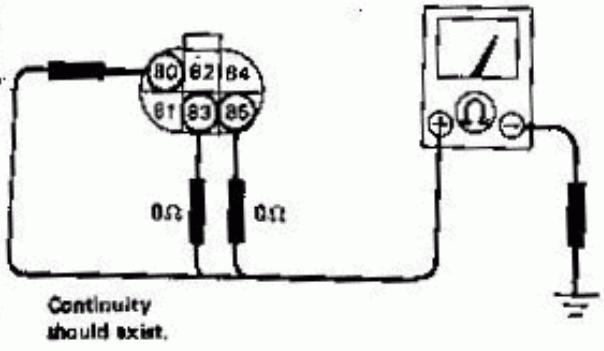
SEF227C

Disconnect a vacuum hose between pressure regulator and solenoid valve.

Start engine and make sure that the vacuum does not exist for three minutes.

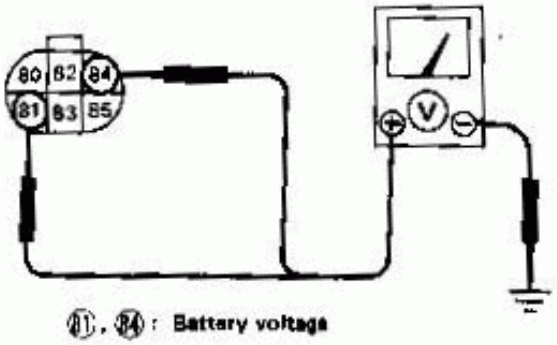
If vacuum exists, disconnect pressure regulator control modulator harness connector and check the circuit and a solenoid valve.

Confirm that ignition switch is in "OFF" position and check for continuity between ⑳, ㉓, ㉕ and ground.



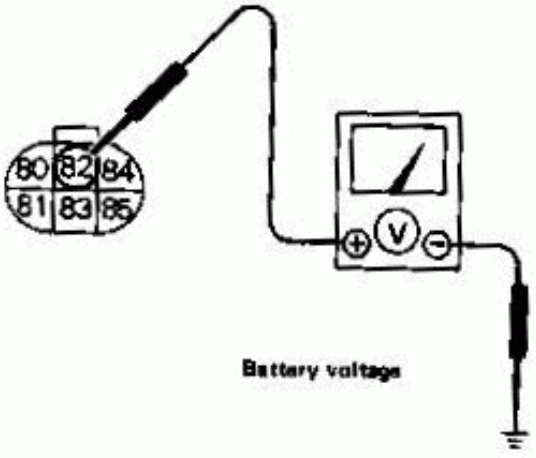
SEF634C

Turn ignition switch "ON" and measure voltage between ㉑, ㉔ and ground.



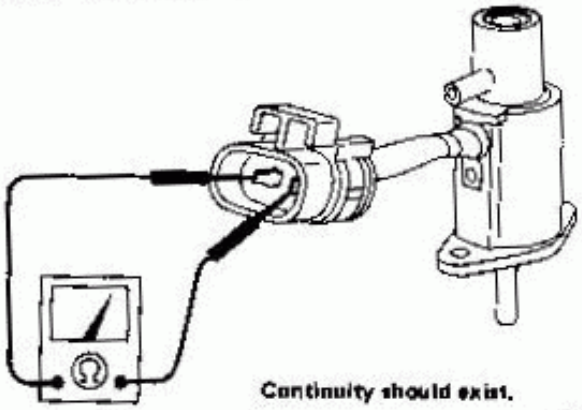
SEF635C

c. Disconnect starter motor "S" terminal.
Turn ignition switch to "START" position and measure voltage between ㉒ and ground.



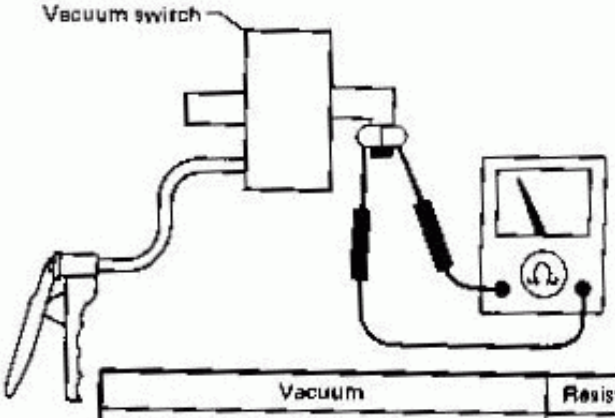
SEF746B

d. Check solenoid valve for continuity between terminals of solenoid valve.



SEF698B

5. Check vacuum switch for proper operation.



Vacuum	Resistance
Above 10.7 kPa (80 mmHg, 3.15 inHg)	∞Ω
Below 10.7 kPa (80 mmHg, 3.15 inHg)	0Ω

SEF228C

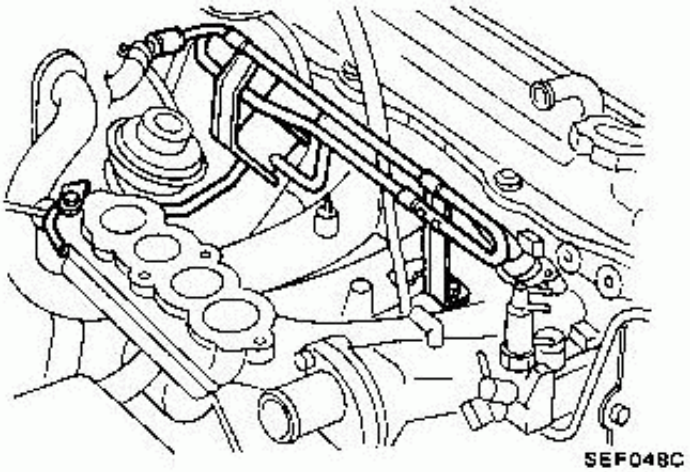
6. If solenoid valve, vacuum switch, circuit and hoses are O.K., replace pressure regulator control modulator.

Injector Removal and Installation

1. Release fuel pressure to zero.
2. Remove or disconnect the following:

CA20E engine

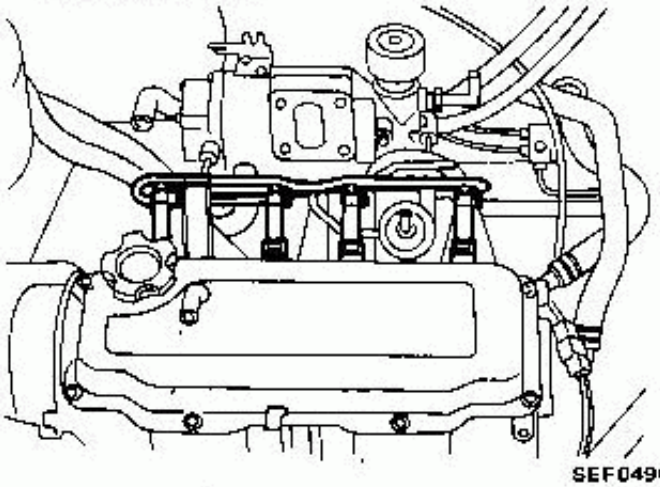
- Drain engine coolant
- E.F.I. harness
- Ignition wire
- Hoses
- Collector with throttle chamber



SEF048C

CA18ET engine

- Air intake pipe
- E.F.I. harness
- Ignition wire
- Accelerator wire
- Throttle chamber

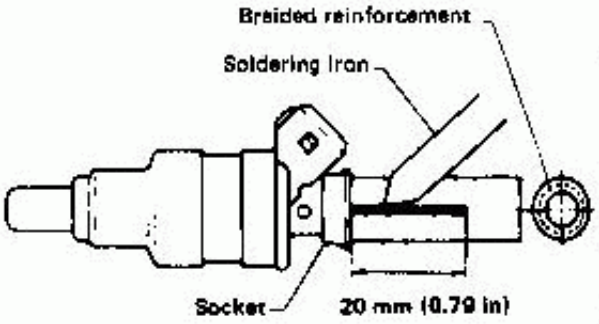


SEF049C

3. Disconnect fuel hoses and pressure regulator vacuum hose.
4. Remove injectors with fuel tube assembly.
5. Remove injector from fuel tube.
6. Remove fuel hose.

1) Heat soldering iron (150 watt) for 15 minutes. Cut hose into braided reinforcement from mark to socket end.

Do not allow soldering iron to cut all the way through the hose and touch injector tail piece.



EF&

2) Then pull rubber hose out with hand.

a. **Be careful not to damage socket plastic connector, etc. with soldering iron.**

b. **Never place injector in a vise when disconnecting rubber hose.**

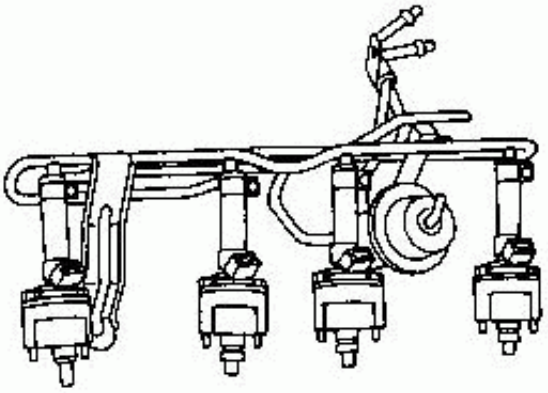
7. Install fuel hose as follows:

1) Clean exterior of injector tail piece.
2) Wet inside of new rubber hose with fuel.
3) Push end of rubber hose with hose socket onto injector tail piece by hand as far as it will go.

CAUTION:

After properly connecting fuel hose to injector and fuel tube, check connection for fuel leakage.

8. Assemble injections with fuel pipe.



SEF9

Inspection

Condition 1: Low engine power

Probable cause	Corrective action
Air leak at the connection of compressor housing and intake 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	
Damage 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.	

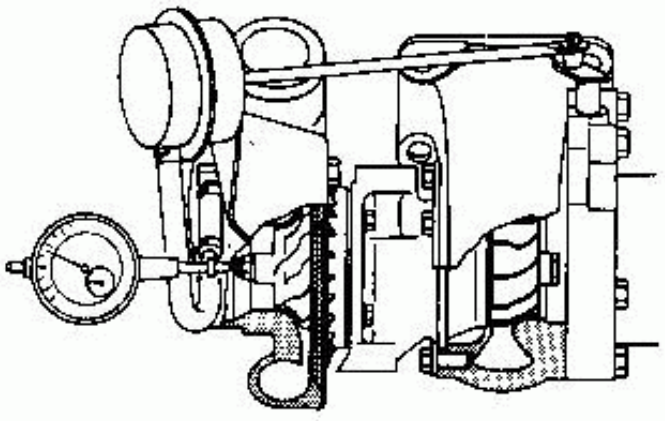
Inspection (Cont'd)

Condition 3: Excessively high oil consumption or exhaust shows pale blue smoke

Probable cause	Corrective action
Oil leak at the connection of lubricating oil passage	Correct the connection.
Oil leak at oil seal of turbine	Replace turbocharger assembly.
Oil leak at oil seal of compressor	
Worn journal or bearing	

1. Inspect turbine and compressor wheel as follows:
- Visually check for cracks, clogging, deformity or other damage.
- Revolve wheels to make sure that they turn freely without any abnormal noise or friction.
- Measure play in axial direction.

Play (axial direction):
0.013 - 0.091 mm (0.0005 - 0.0036 in)

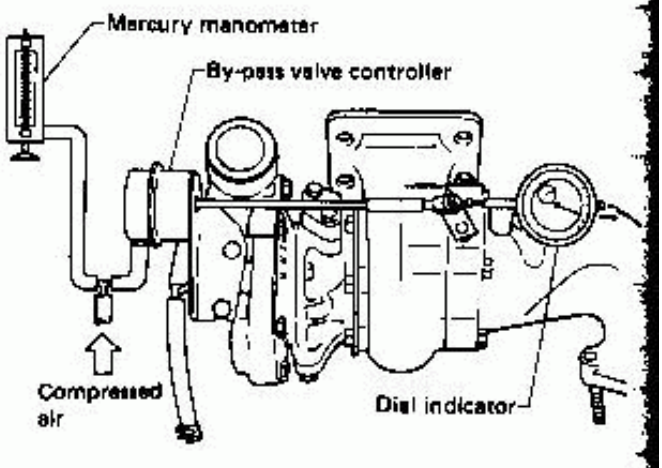


SEF726B

2. Check operation of by-pass valve controller.
- Move by-pass valve to make sure that it is n sticking or scratched.
- Measure rod end play of the by-pass valve co troller.

Do not apply more than 66.7 kPa (500 mmH 19.69 inHg) pressure to controller diaphragm.

By-pass valve controller stroke/pressure:
0.38 mm (0.0150 in)/51.3 - 56.7 kPa
(385 - 425 mmHg, 15.16 - 16.73 inHg)



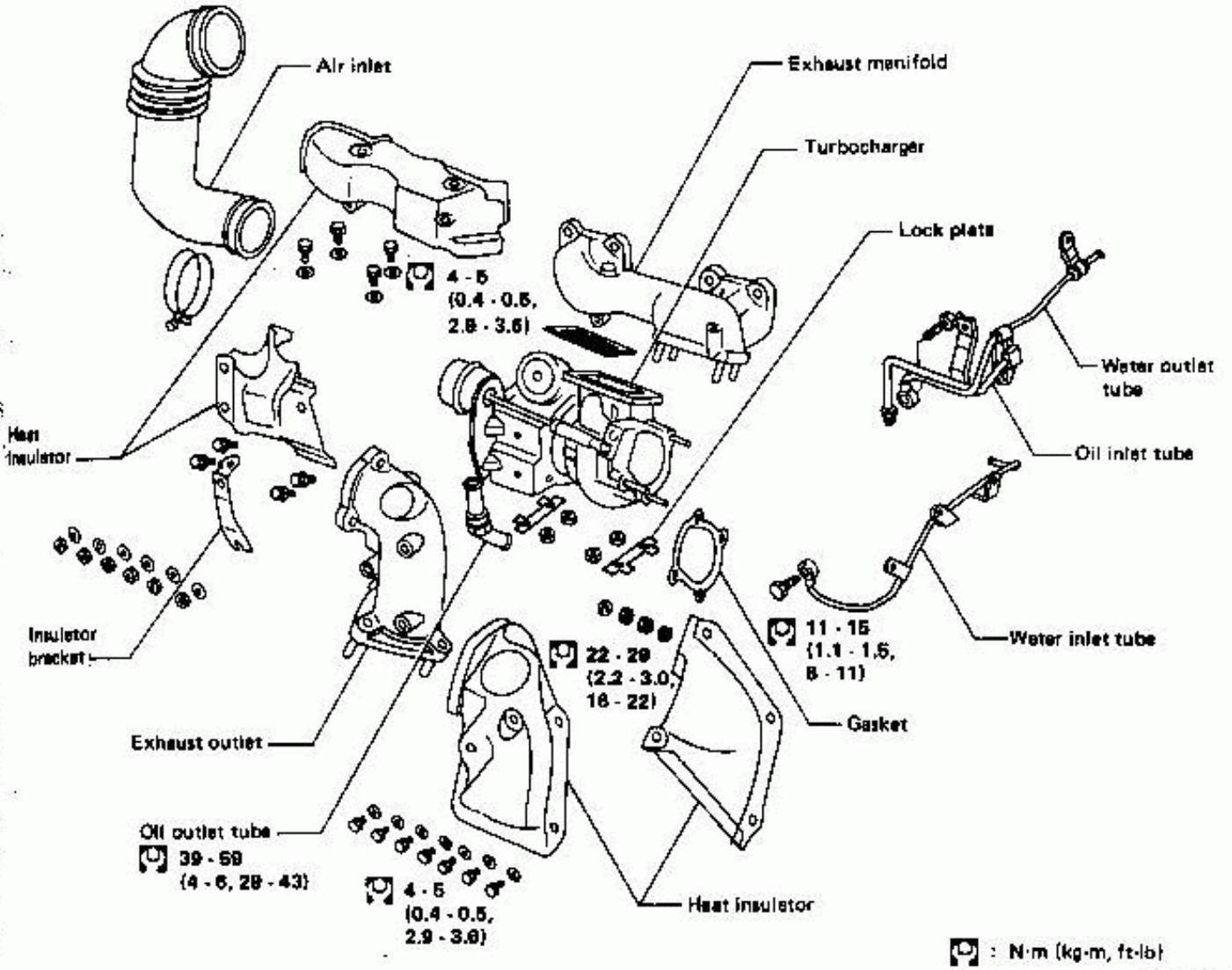
SEC72

Always replace the turbocharger as an assembly faulty.

TURBOCHARGER—CA18ET Engine

Removal and Installation

rbocharger should not be disassembled.



Drain engine coolant.
Remove the following:
Air duct and hoses
Air intake pipe
Exhaust front tube
Heat shield plates
Oil delivery tube and return hose
Water inlet tube
Remove turbocharger from exhaust manifold.
When installing turbocharger to exhaust manifold, securely tighten nuts and lock the nuts with lock plate.

MIXTURE RATIO FEEDBACK SYSTEM INSPECTION

PREPARATION

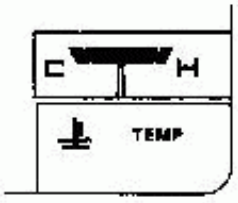
1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.F.I. harness connectors
- Vacuum hoses
- Air intake system
  (oil filler cap, oil level gauge, etc.)
- Valve clearance, engine compression
- E.G.R. valve operation
- Throttle valve and throttle valve switch operation

2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. On automatic transmission equipped models when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "D" position.
4. Make sure that diagnosis mode selector is in "OFF" position.

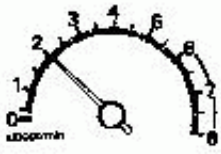
WARNING:

a. When selector lever is shifted to "D" position apply parking brake and block both front and rear wheels with chocks.
b. Depress brake pedal while racing the engine to prevent forward surge of vehicle.
c. After the adjustment has been made, shift the lever to the "N" or "P" position and remove wheel chocks.

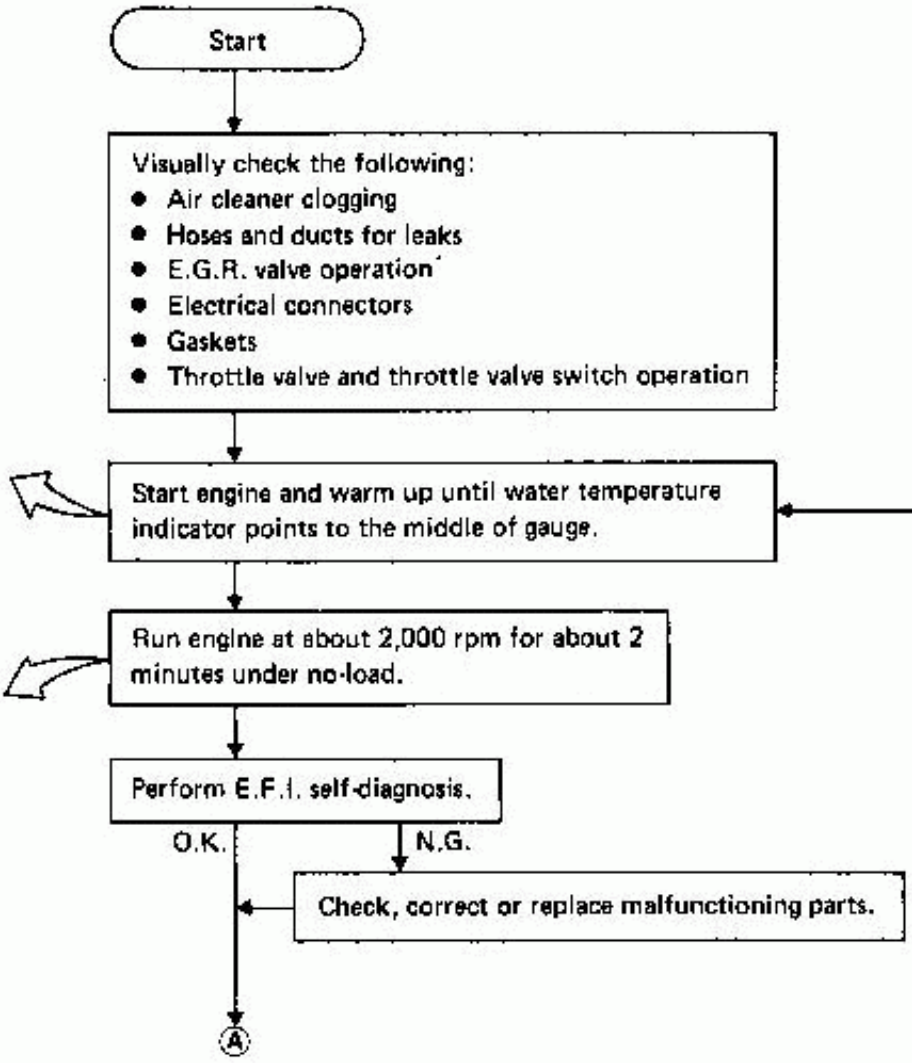
CA20E engine

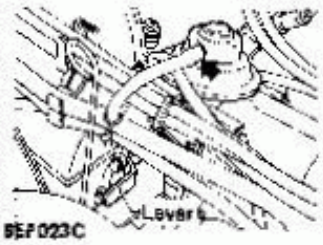


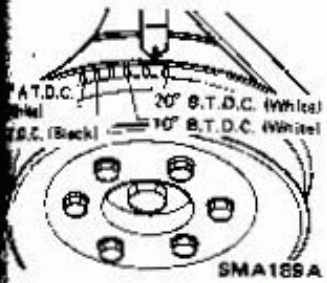
SMA837A

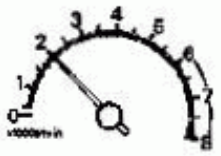


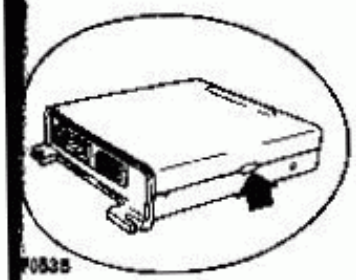
SEF477B











Ⓐ

Does engine run smoothly?

O.K. / N.G.

Check and clean injectors, and replace injectors if necessary.

Open engine hood.
Disconnect distributor vacuum hose from distributor vacuum controller and plug hose with proper cap.

Run engine at about 2,000 rpm for about 2 minutes under no-load.
Run engine at idle speed and ensure that engine speed is below 1,000 rpm.

Race engine two or three times under no-load and run engine for about one minute at idle speed.

Check ignition timing with timing light.

M/T: 4±2° B.T.D.C. A/T: 0±2° B.T.D.C.

O.K. / N.G.

Adjust ignition timing to the specified valve by turning distributor after loosening distributor securing bolt.

Connect distributor vacuum hose to distributor vacuum controller.

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

Make sure that even if inspection lamp (Red) on control unit goes on, the green lamp goes on and off more than 9 times during 10 seconds at 2,000 rpm.

O.K. → Ⓒ / N.G. → Ⓓ

Ⓑ

Ⓒ

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

Check inspection lamps (Red and Green) on control unit blinks.
They should blink simultaneously.

No

Yes

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

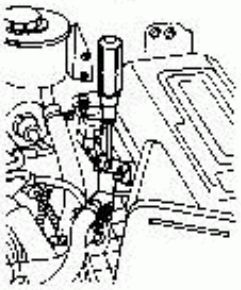
Check idle speed.

Idle speed:
Manual transmission models
750±100 rpm
Automatic transmission models
700±100 rpm (in "D" position)

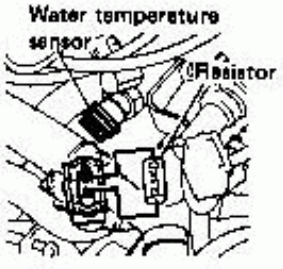
O.K. N.G.

END

Adjust idle speed by turning idle speed adjusting screw.



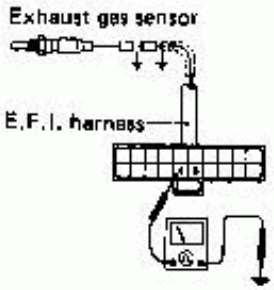
SEF017C



SEF026C

Ⓔ

Ⓓ



SEF024C

Check exhaust gas sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect 20-pin 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. 4 of 20-pin connector and ground metal on vehicle body.

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

O.K. N.G.

Repair or replace E.F.I. harness and connect battery ground cable.

Connect E.F.I. 20-pin connector to control unit.
Connect battery ground cable and disconnect jumping wire.

- Disconnect water temperature sensor harness connector.
- Connect a resistor (2.5 kΩ) between terminals of water temperature sensor harness connector.

Start engine and warm up engine until water temperature indicator points to the middle of gauge.

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

Ⓕ

Ⓑ

MIXTURE RATIO FEEDBACK SYSTEM INSPECTION

Ⓕ

Check "CO"%

Idle CO: Less than 5.0%

O.K.

After checking CO%

1) Disconnect the resistor from terminals of water temperature sensor harness connector.
2) Connect water temperature sensor harness connector to water temperature sensor.

N.G.

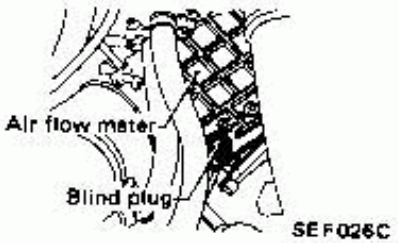
Turn off engine and replace exhaust gas sensor.

Connect exhaust gas sensor harness to exhaust gas sensor.

Ⓔ

Turn off engine and remove air flow meter from vehicle.

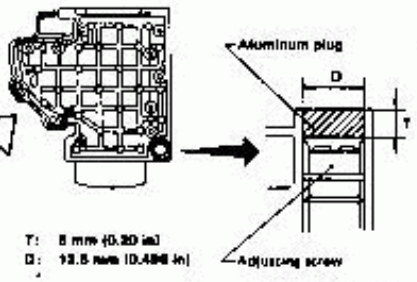
Drill a hole in seal plug which seals air by-pass screw of air flow meter and remove seal plug.



SEF026C

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

Adjust idle mixture ratio by turning air by-pass screw of air flow meter so that inspection lamps (green and red) on E.F.I. control unit blink simultaneously.



SEF190C

Adjustable

Not adjustable

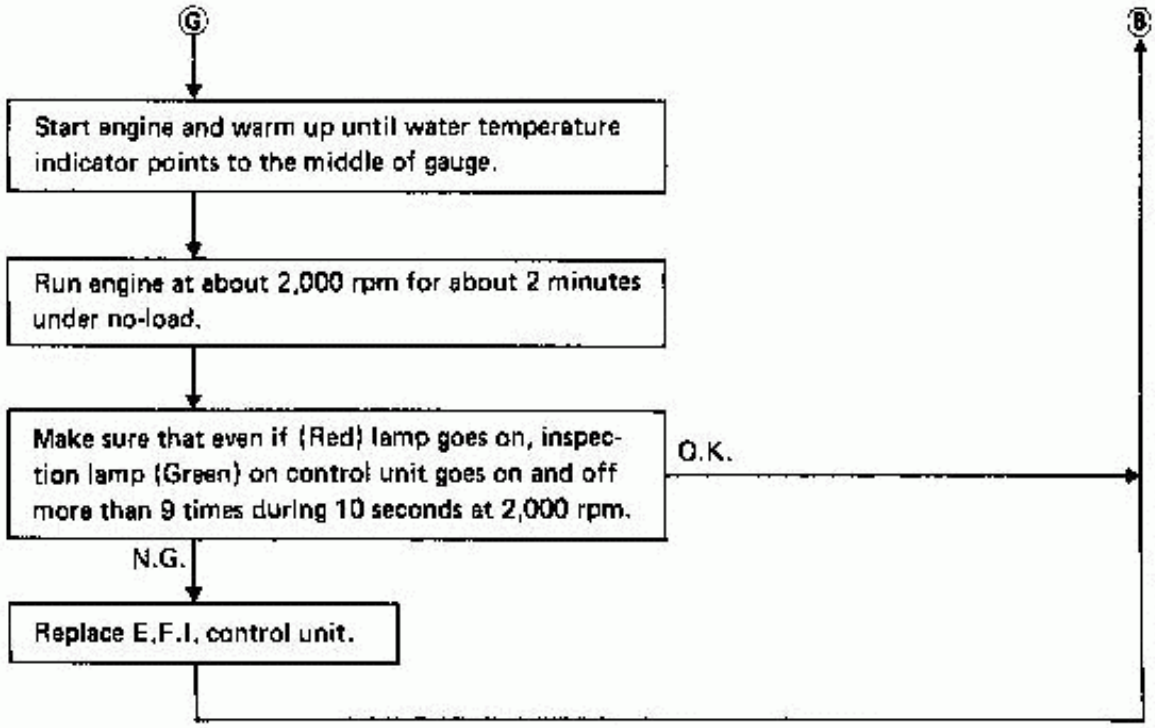
Replace air flow meter.

- Turn off engine and remove air flow meter from vehicle.
- Insert new seal plug into air by-pass screw hole.
- Tap seal plug with a suitable bar, thereby installing seal plug on air flow meter.

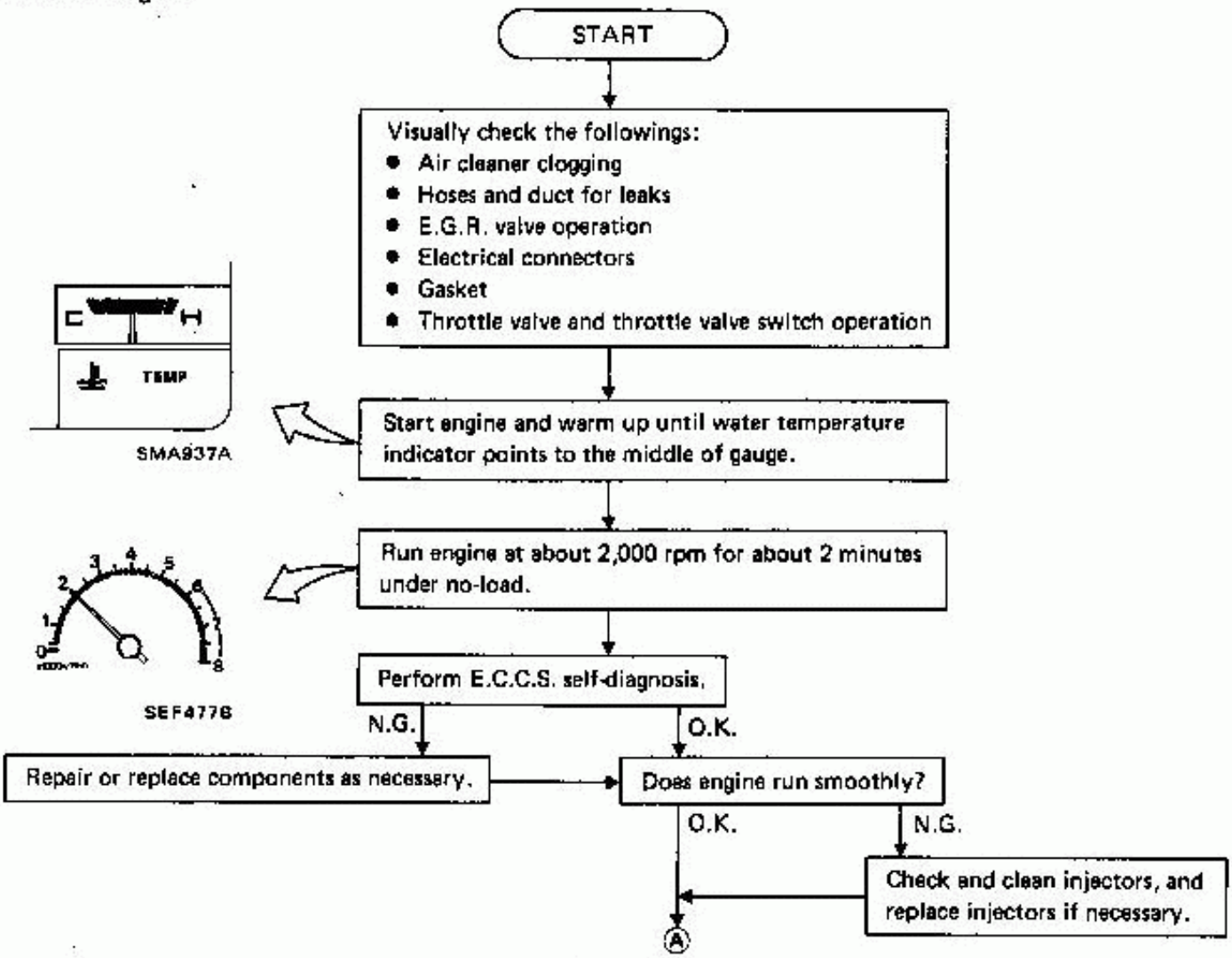
Install air flow meter on vehicle.

Ⓖ

Ⓑ



CA18ET engine



MIXTURE RATIO FEEDBACK SYSTEM INSPECTION

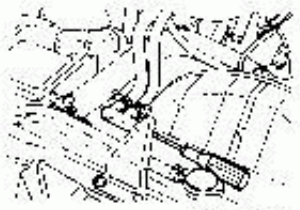
Ⓐ

Open engine hood and run engine at about 2,000 rpm for about 2 minutes under no-load.
Race engine two or three times under no-load, then run engine at idle speed.

Check idle speed.

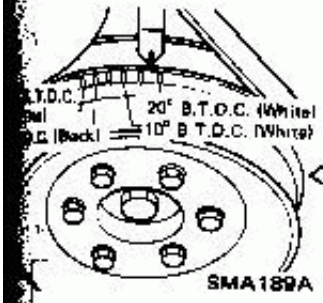
	at sea level	at high altitude
M/T	750±50 rpm	680±50 rpm

N.G. → Adjust idle speed to the specified value, by turning idle speed adjusting screw.



SEF624C

O.K.



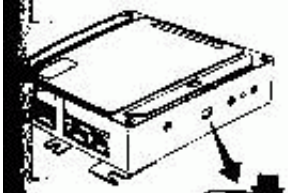
SMA189A

Check ignition timing with a timing light.

15°±2° B.T.D.C.

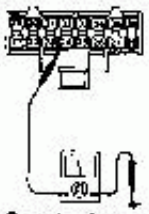
O.K.

N.G. → Adjust ignition timing to the specified value by turning distributor after loosing bolt witch secures distributor.



SEF706B

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



SEF039C

Make sure that even if (Red) lamp goes on, inspection lamp (Green) on control unit goes on and off more than 9 times during 10 seconds (at 2,000 rpm).

O.K.

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

Check inspection lamp (Red and Green) blinks.
They should blink simultaneously.

Not blink → Ⓒ

8link

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

Ⓑ

N.G.

Check exhaust gas sensor harness:

1) Turn off engine and disconnect battery ground cable.
2) Disconnect 16-pin connector from control unit.
3) Disconnect exhaust gas sensor harness connector and connect terminal for exhaust gas sensor to ground with a jumper wire.
4) Check for continuity between terminal No. 24 of 16-pin connector and ground metal on vehicle body.

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

Ⓓ

N.G. → Repair or replace E.C.C.S. harness. → Ⓔ

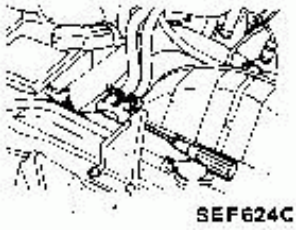
Ⓑ

Check idle speed.

	at sea level	at high altitude
M/T	750±50 rpm	680±50 rpm

O.K. → END

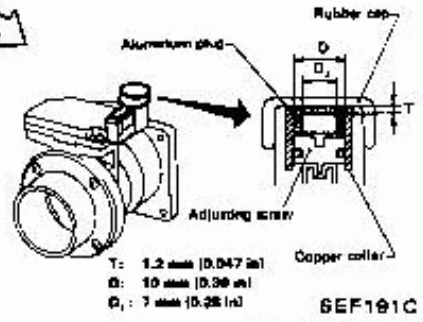
N.G. → Adjust idle speed to the specified value by turning idle speed adjusting screw.



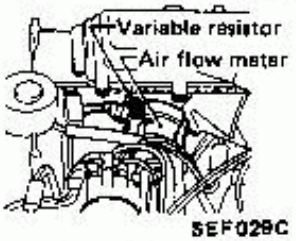
SEF624C

Turn off engine and remove air flow meter from vehicle.

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



SEF191C



SEF029C

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

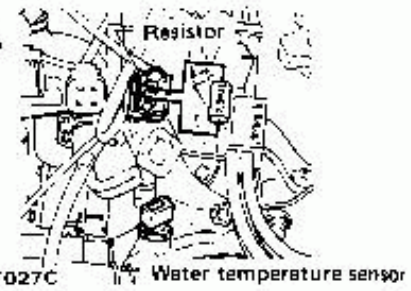
Ⓕ

Ⓒ

Ⓓ

Connect 16-pin connector and battery ground cable. Disconnect the jumping wire.

Disconnect engine coolant temperature sensor harness connector.
Connect a resistor (2.5 kΩ) between terminals of engine coolant temperature sensor harness connector.



SEF027C

Start engine and warm up engine until water temperature indicator points to the middle of gauge.

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

Check "CO"%

Idle CO: Below 8%

After checking CO%
1) Disconnect the resistor from terminals of engine coolant temperature sensor.
2) Connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.

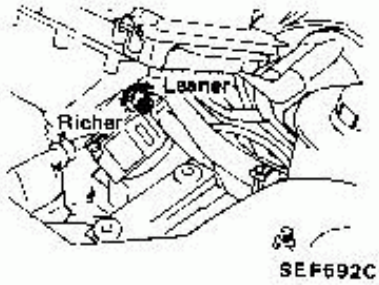
N.G. → Connect exhaust gas sensor harness.

O.K. → Replace exhaust gas sensor and make sure that even if (Red) lamp goes on, inspection lamp (Green) on control unit goes on and off time more than 9 during 10 seconds. (2,000 rpm)

N.G. → Replace C.E.C.U.

O.K. → Ⓔ

Ⓕ



SEF692C

Adjust idle mixture ratio by turning variable resistor of air flow meter so that inspection lamps (red and green) blink simultaneously.

Adjustable

Not adjustable

Replace air flow meter.

Turn off engine and remove air flow meter from vehicle.

Insert new seal plug into variable resistor hole. Tap seal plug with a suitable bar, thereby installing seal plug on air flow meter.

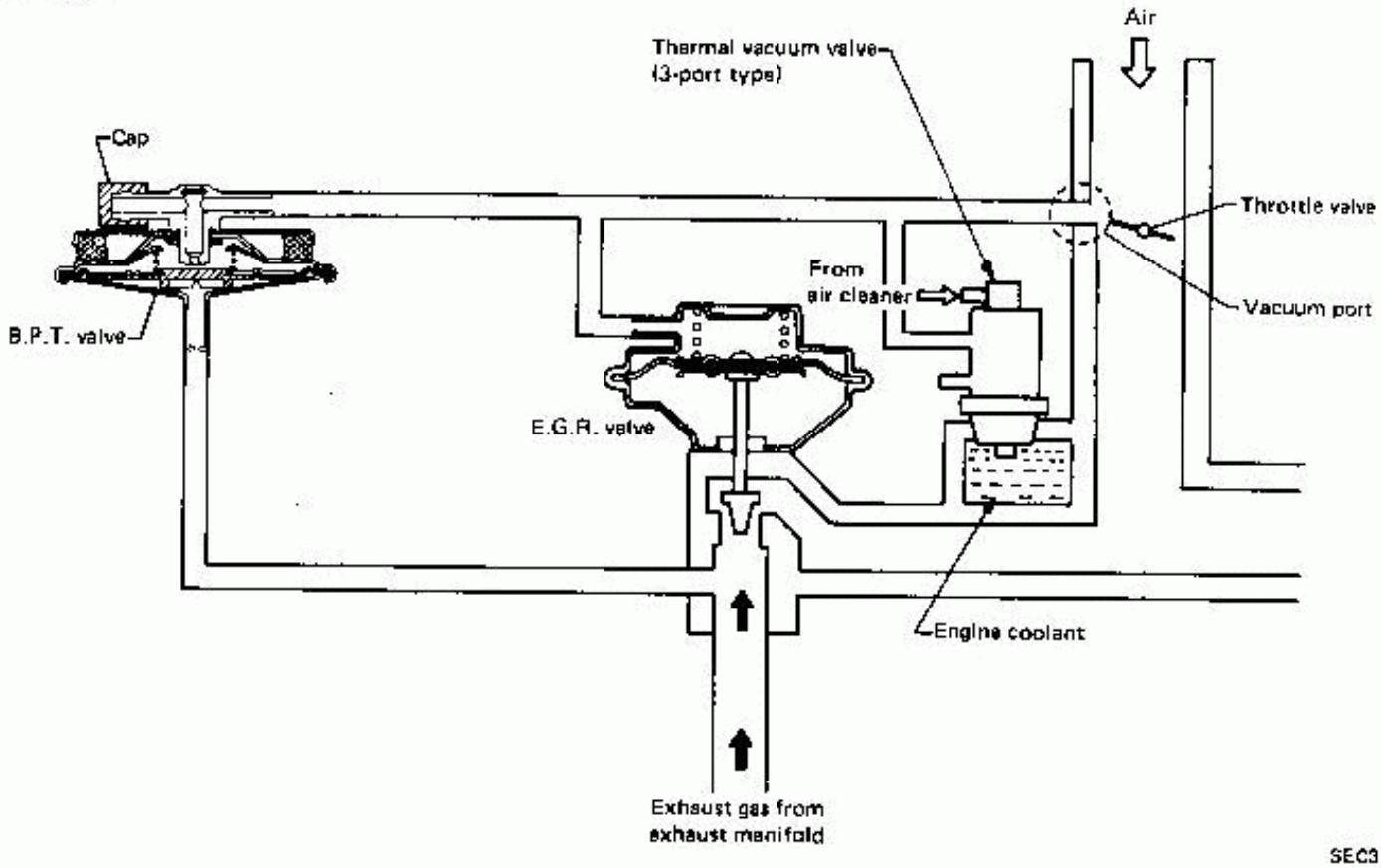
Install air flow meter on vehicle.

Ⓔ

Exhaust Gas Recirculation (E.G.R.) Control System

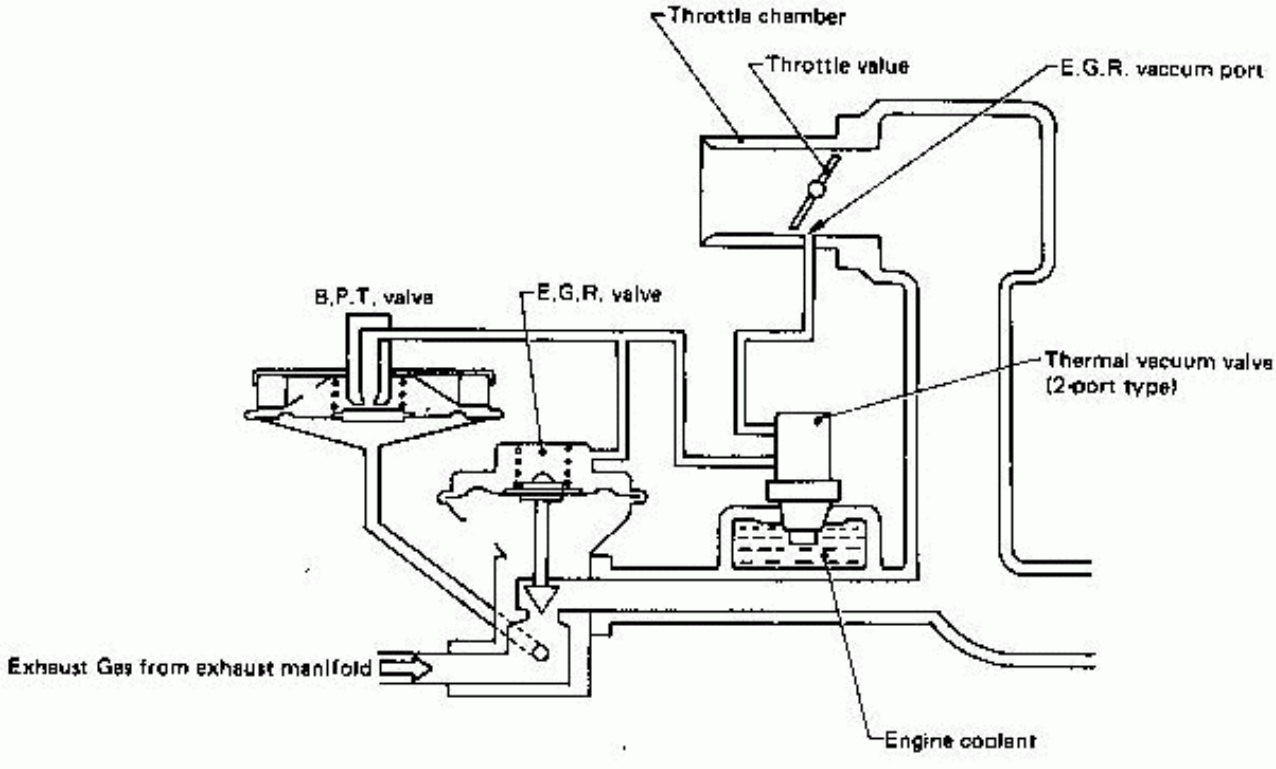
DESCRIPTION

CA20E engine



SEC310A

CA18ET engine



SEF031

Exhaust Gas Recirculation (E.G.R.) Control System (Cont'd)

ERATION

Water temperature °C (°F)	Thermal vacuum valve		B.P.T. valve		E.G.R. control system
	CA20E	CA18ET	Exhaust gas pressure	Operation	
Below 60 (140)	Open	Closed	High	Closed	Not actuated
			Low	Open	
Above 60 (140)	Closed	Open	High	Closed	Actuated
			Low	Open	Not actuated

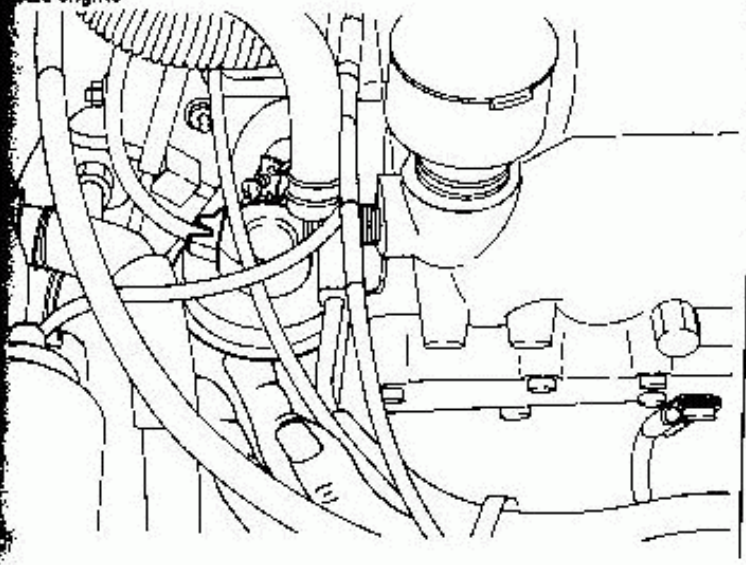
ith the engine at idle or at full throttle, the G.R. control valve closes to deactivate the G.R. system regardless of water temperature peration of the thermal vacuum valve) and B.P.T. ve.

INSPECTION

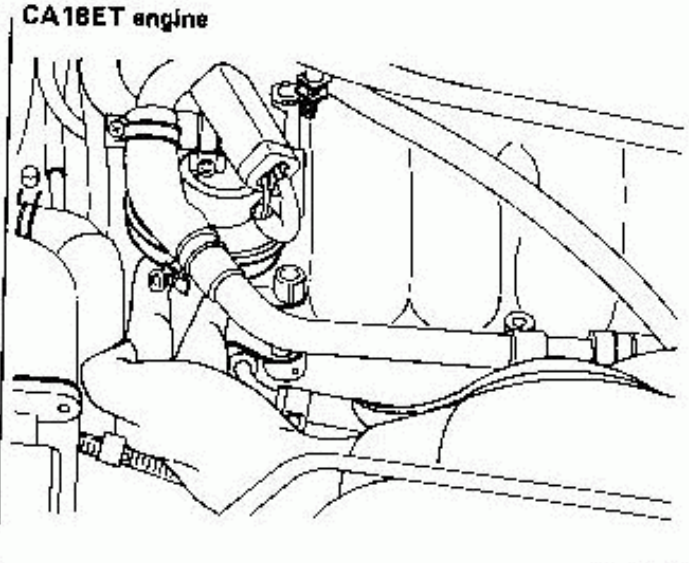
Entire system

Ensure that E.G.R. system is functioning properly by placing your finger on E.G.R. control valve diaphragm.

A20 engine



CA18ET engine



SEF032C

ke sure that E.G.R. control valve operate as llows when engine is revved up to 3,000 to 3,500 m.

Water temperature °C (°F)	E.G.R. diaphragm
Below 60 (140)	Not moved
Above 60 (140)	Moved

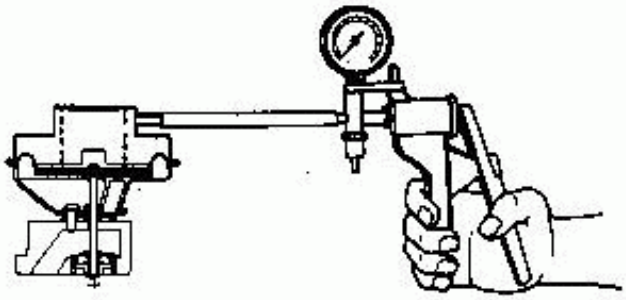
Vacuum piping

1. Disconnect E.G.R. vacuum hose at B.P.T. valve, and check that throttle vacuum is present under no-load at 2,000 rpm.
2. Connect E.G.R. vacuum hose at B.P.T. valve, and disconnect vacuum hose at E.G.R. control valve.
3. Check that throttle vacuum is present when engine is being revved up to 3,000 to 3,500 rpm.
4. Connect the vacuum hose.

Exhaust Gas Recirculation (E.G.R.) Control System (Cont'd)

E.G.R. control valve

1. Dismount E.G.R. control valve from engine and check for operation.



SEC327

Fully open:
More than 13.3 kPa (100 mmHg, 3.94 inHg)

2. Visually check E.G.R. control valve for damage, wrinkle or deformation.

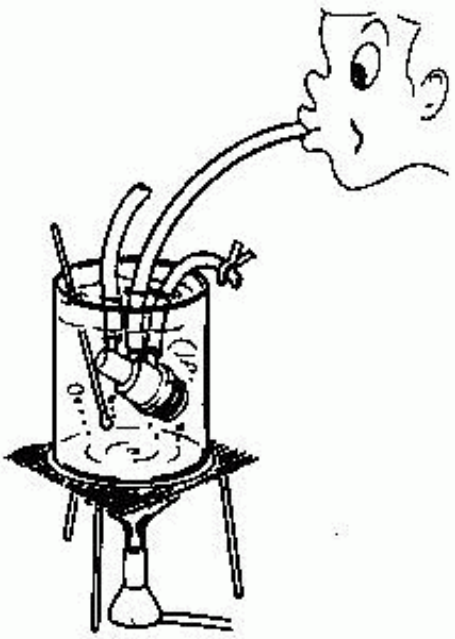
Thermal vacuum valve

Dismount thermal vacuum valve from engine and check for operation.

Thermal vacuum valve operating temperature:

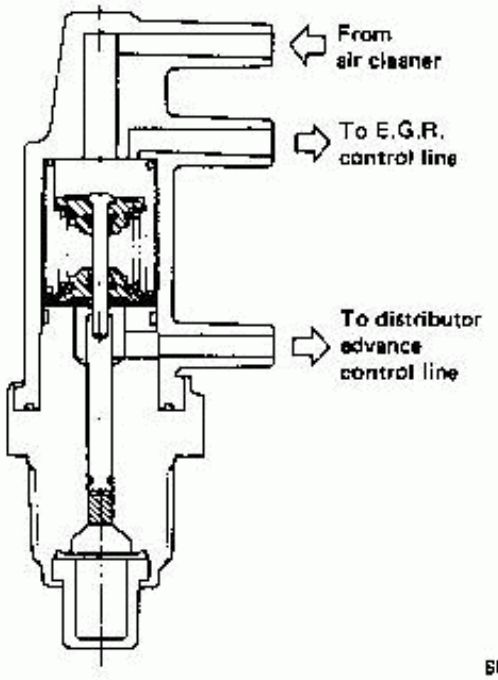
Engine	Operating temperature °C (°F)	
	Open	Closed
CA20E	Below 60 (140)	Above 60 (140)
CA18ET	Above 60 (140)	Below 60 (140)

CAUTION:
Do not allow water to get inside the thermal vacuum valve.



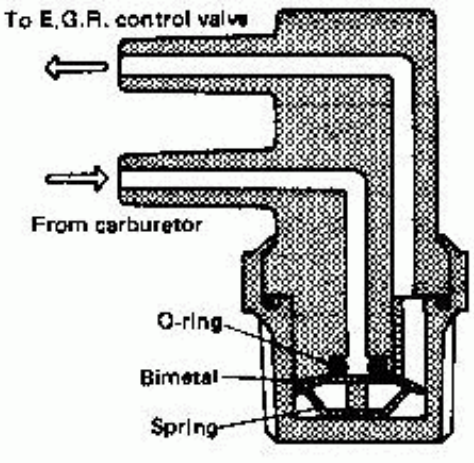
SEC

CA20E engine



SEC

CA18ET engine

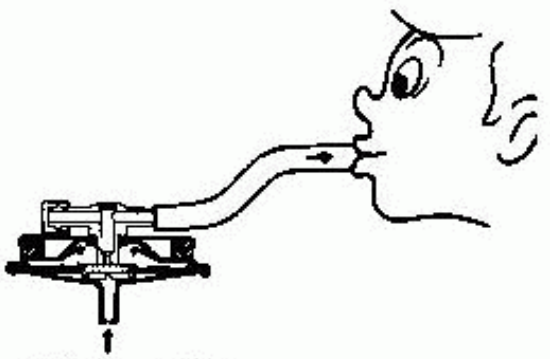


EC

Exhaust Gas Recirculation (E.G.R.) Control System (Cont'd)

B.P.T. valve

1. Disconnect two vacuum hoses on B.P.T. valve.
2. Plug one of two ports of B.P.T. valve.
   Apply a pressure above 0.490 kPa (50 mmH_2O, 1.97 inH_2O) to B.P.T. valve and orally suck back other port of B.P.T. valve as shown below to check for leakage. If a leak is noted, replace valve.

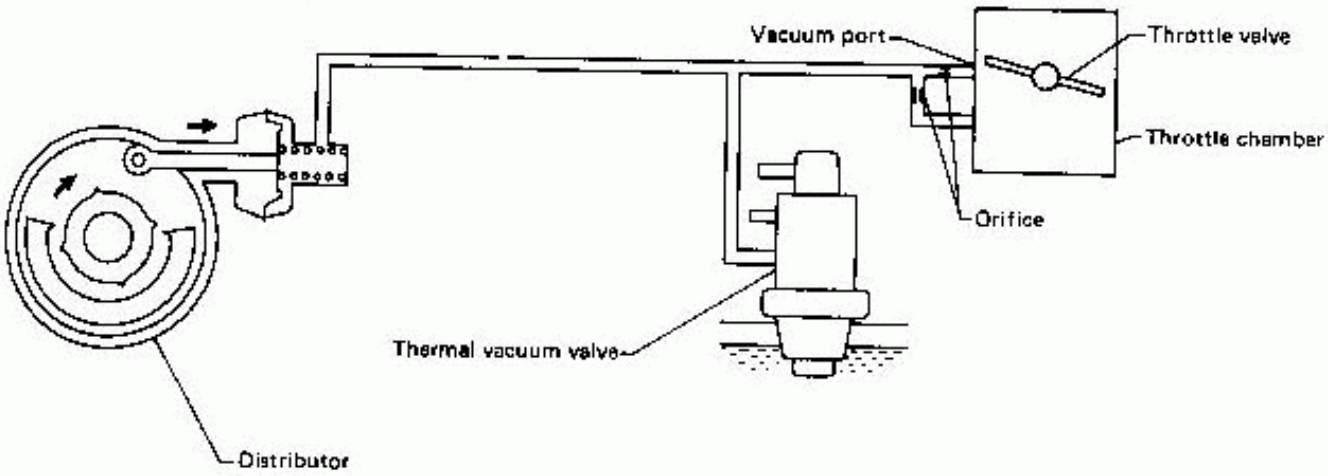


EC381A

Spark Timing Control System (CA20E engine)

DESCRIPTION

The spark timing control system is designed to control the distributor vacuum advance under varying driving conditions so as to reduce HC and NOx emissions.



SEF493B

ERATION

operation of the system is as follows.

Water mperature °C (°F)	Thermal vacuum valve operation	Spark timing control system	
		Normal driving	Heavy load and high speed driving
elow 5 (59)	Closed	Actuated	Slightly actuated
5 - 60 9 - 140)	Open	Not actuated	Not actuated
bove 0 (140)	Closed	Actuated	Slightly actuated

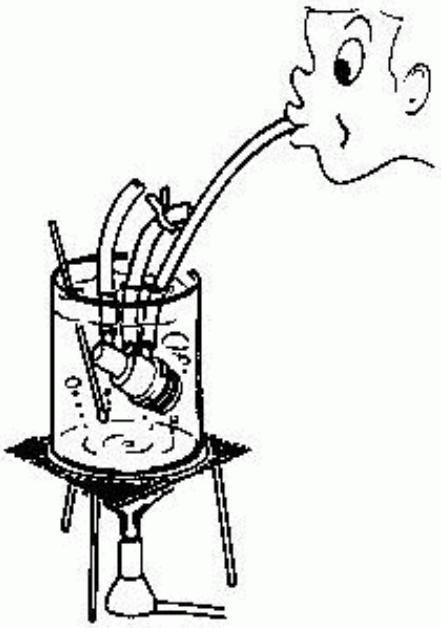
INSPECTION

Thermal vacuum valve

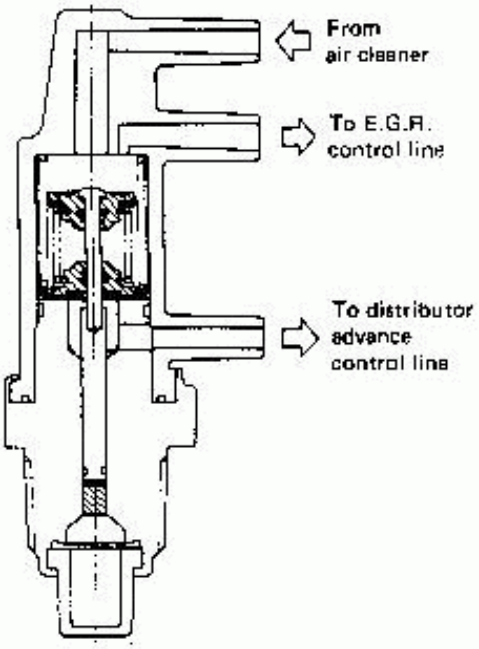
Thermal vacuum valve operating temperature:

Operating temperature °C (°F)	
Open	Closed
15 - 60 (59 - 140)	Below 15 (59) Above 60 (140)

Spark Timing Control System (CA20E engine) (Cont'd)



SEC396

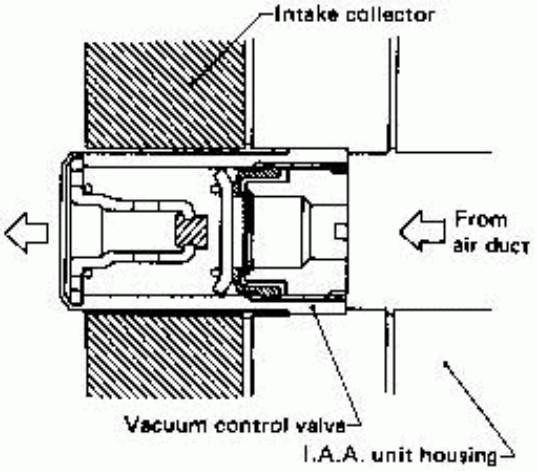


SEC021

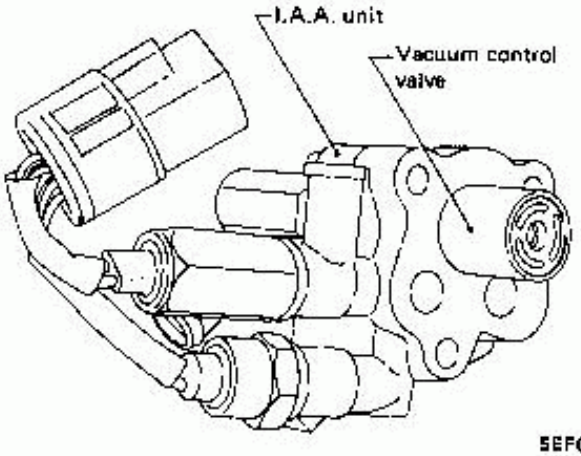
CAUTION:
Do not allow water to enter the thermal vacuum valve.

Intake Manifold Vacuum Control

The vacuum control valve is provided to reduce the engine lubricating oil consumption when the intake manifold vacuum increases to a very high level during deceleration.
The vacuum control valve senses the manifold vacuum. As the manifold vacuum increases beyond the specified valve, the valve opens and air is sucked into the intake manifold.



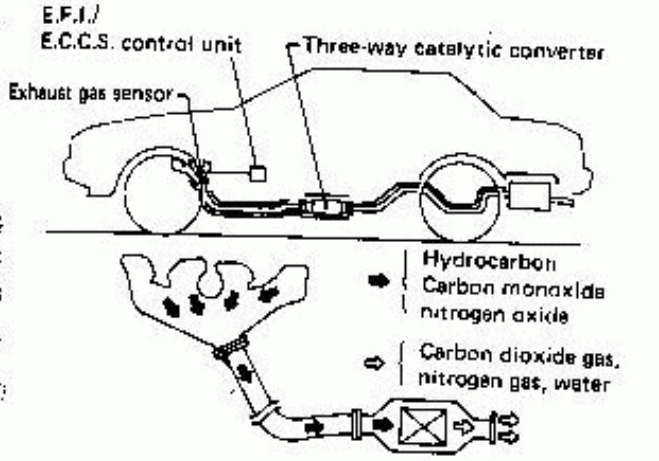
SEC303A



SEF031

Catalytic Converter

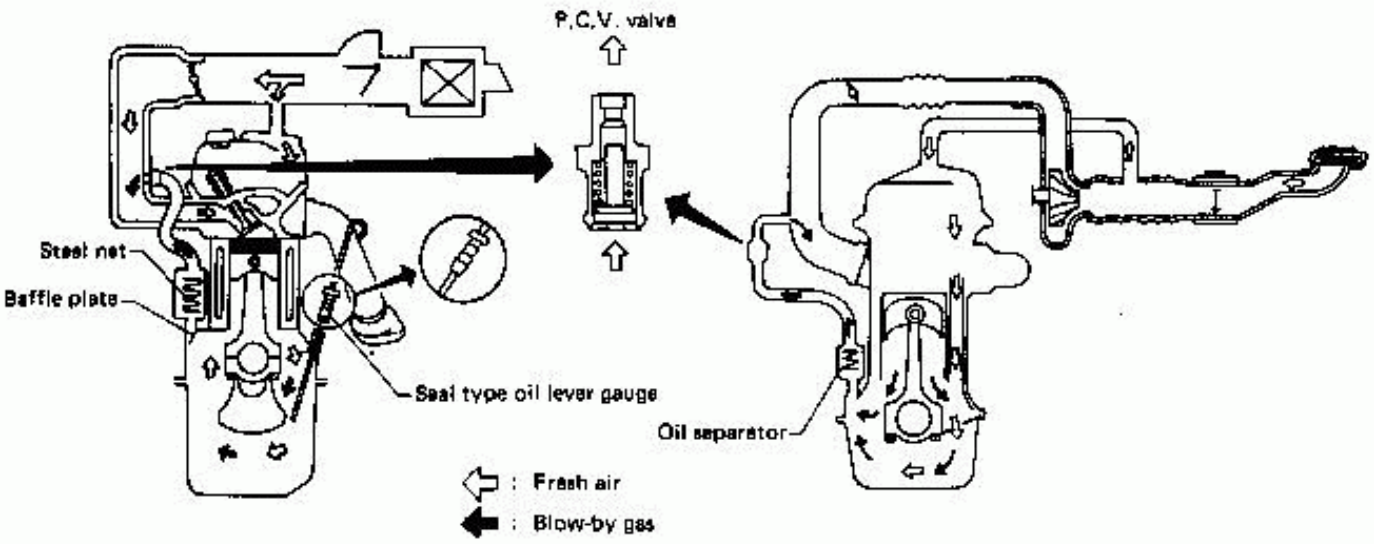
The exhaust gas contains unburned, harmful gases. While the mixture ratio is maintained to the stoichiometric point by the mixture ratio feedback system, the three-way catalytic converter activates to oxidize and reduce harmful gases (HC, CO and NOx) into harmless gases (CO_2, H_2O and N_2). In this way, the catalytic converter cleans the exhaust gas and emits CO_2, H_2O and N_2 into the atmosphere.



8EF034C

CA20E engine

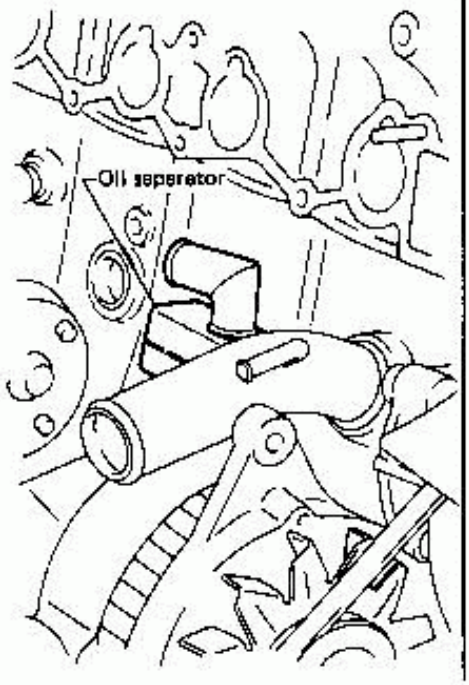
CA18ET engine

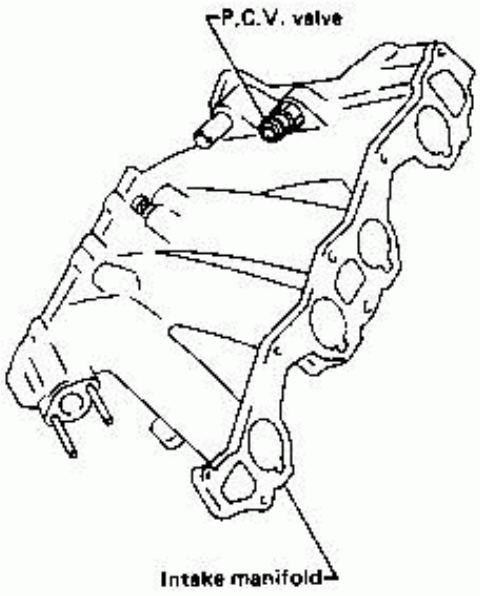


SEF035

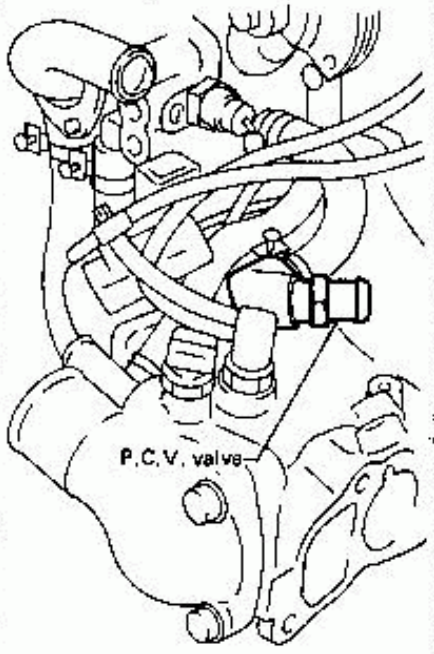
This system is designed to return the blow-by gas to the intake manifold and to charge fresh air into the crankcase. The positive crankcase ventilation (P.C.V.) valve is provided.

CA20E engine





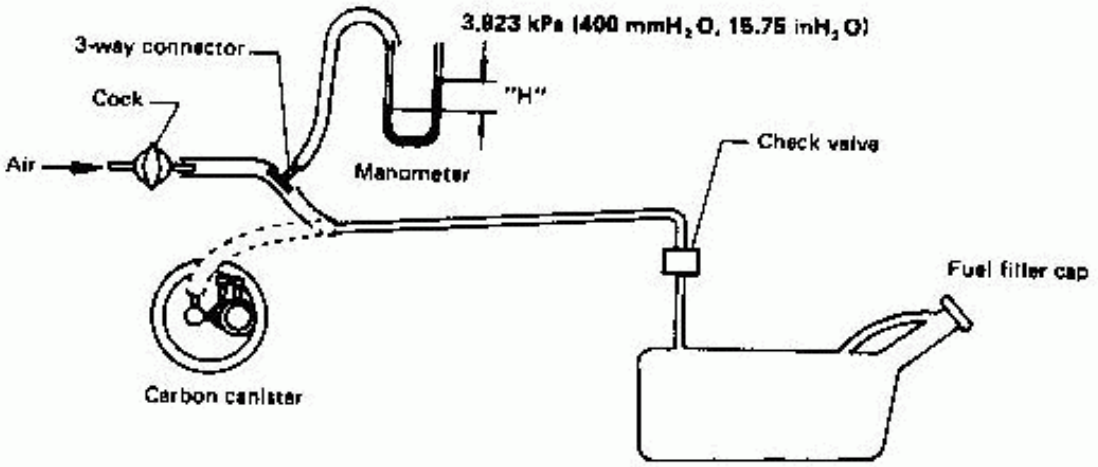
CA18ET engine



SEF036

Inspection

OR VENT LINE



SMA182

Check hoses and fuel tank filler cap.

Disconnect the vapor vent line connecting carbon canister to fuel tank.

Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line.

Supply fresh air into the vapor vent line through the cock little by little until pressure becomes 3.923 kPa (400 mmH_2O, 15.75 inH_2O).

Shut the cock completely and leave it unattended.

After 2.5 minutes, measure the height of the liquid in the manometer.

Variation in height should remain at 0.245 kPa (25 mmH_2O, 0.98 inH_2O).

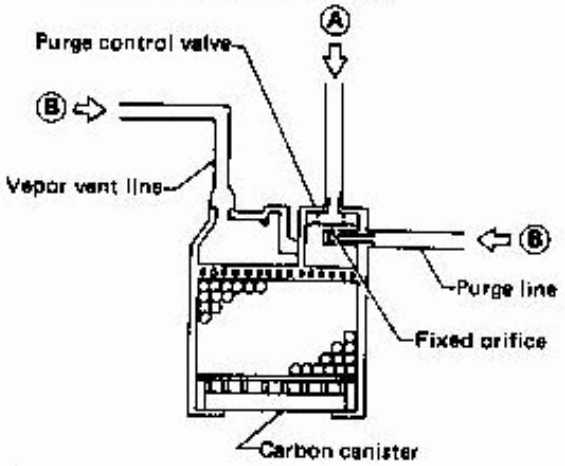
When filler cap does not close completely, the height should drop to zero in a short time.

If the height does not drop to zero in a short time when filler cap is removed, the cause is a stuffy hose.

case the vent line is stuffy the breathing in fuel k is not thoroughly made thus causing insuffi- t deliver of fuel to engine or vapor lock. It st, therefore, be repaired or replaced.

CARBON CANISTER

Check carbon canister as follows:



Ⓐ : Blow air and ensure that there is no leakage.
Ⓑ : Blow air and ensure that there is leakage.

SEC360A

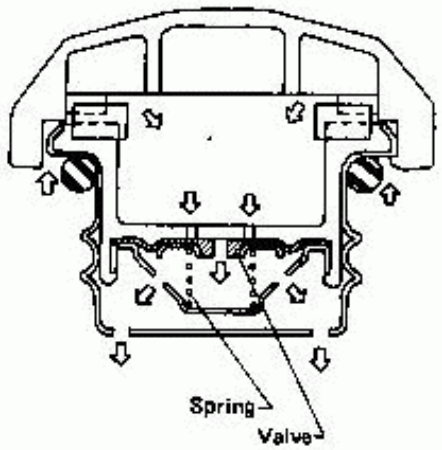
If malfunctioning, replace faulty part.

Inspection (Cont'd)

FUEL TANK VACUUM RELIEF VALVE

Check the valve for flow resistance with a radiator cap tester or the like.

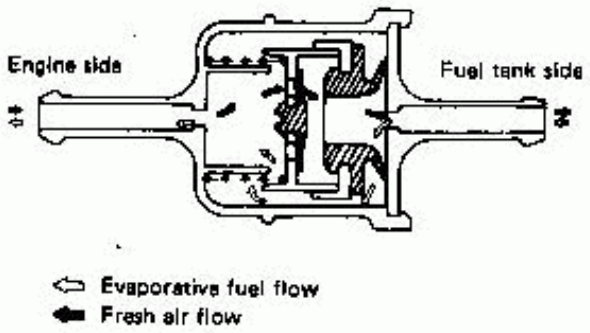
Air flow direction	Air flow quantity	Air flow
To outside	Any	No
To inside	Large	
	Small	Yes



SEC308A

FUEL CHECK VALVE

1. Blow air through connector on fuel tank side with a vacuum tester. A considerable resistance should be felt and a portion of air flow should be directed toward the engine.
2. Blow air through connector on engine side with a vacuum tester. Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected of not being properly functioning in steps 1 and 2 above, replace.



EC090A

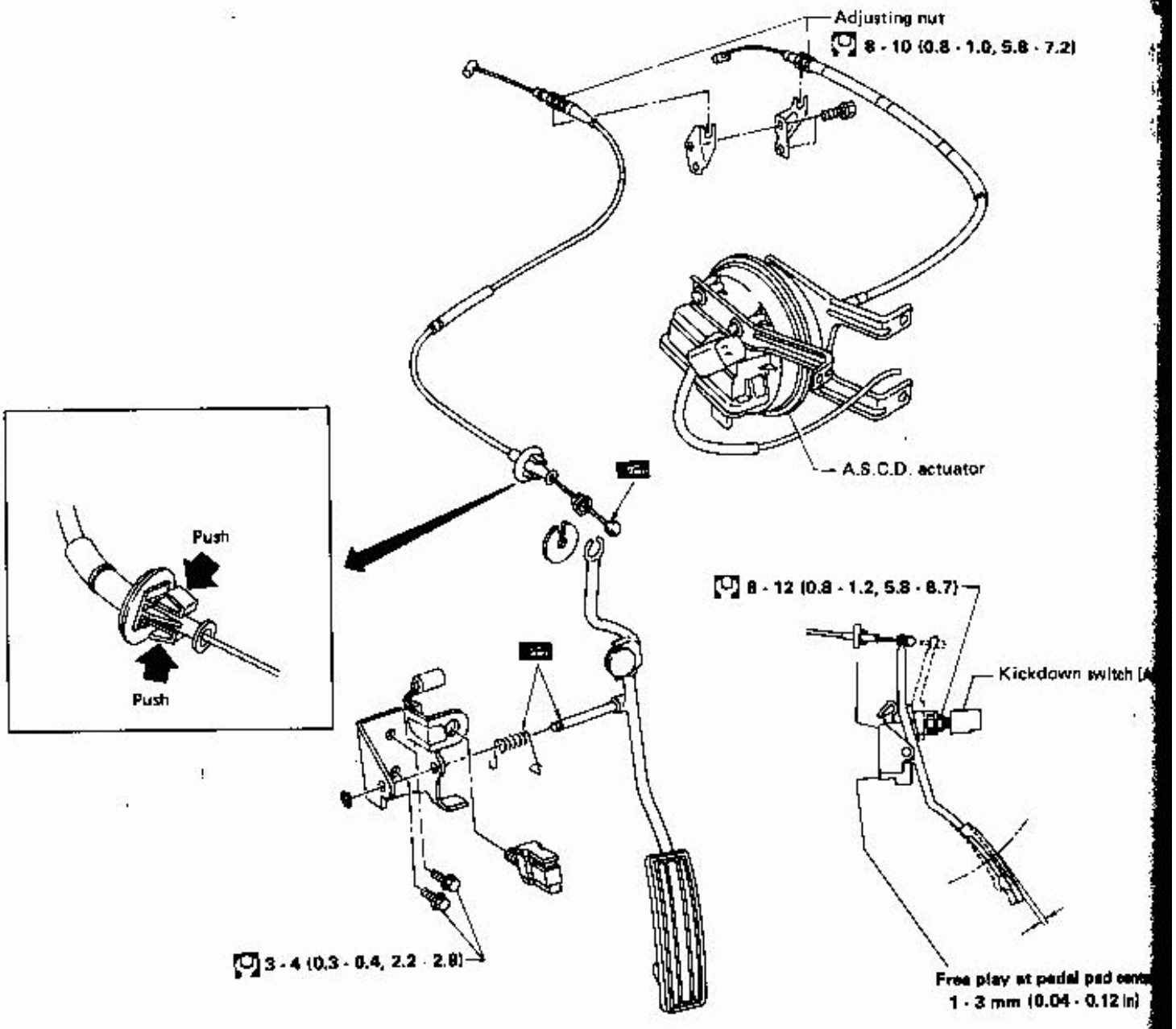
ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

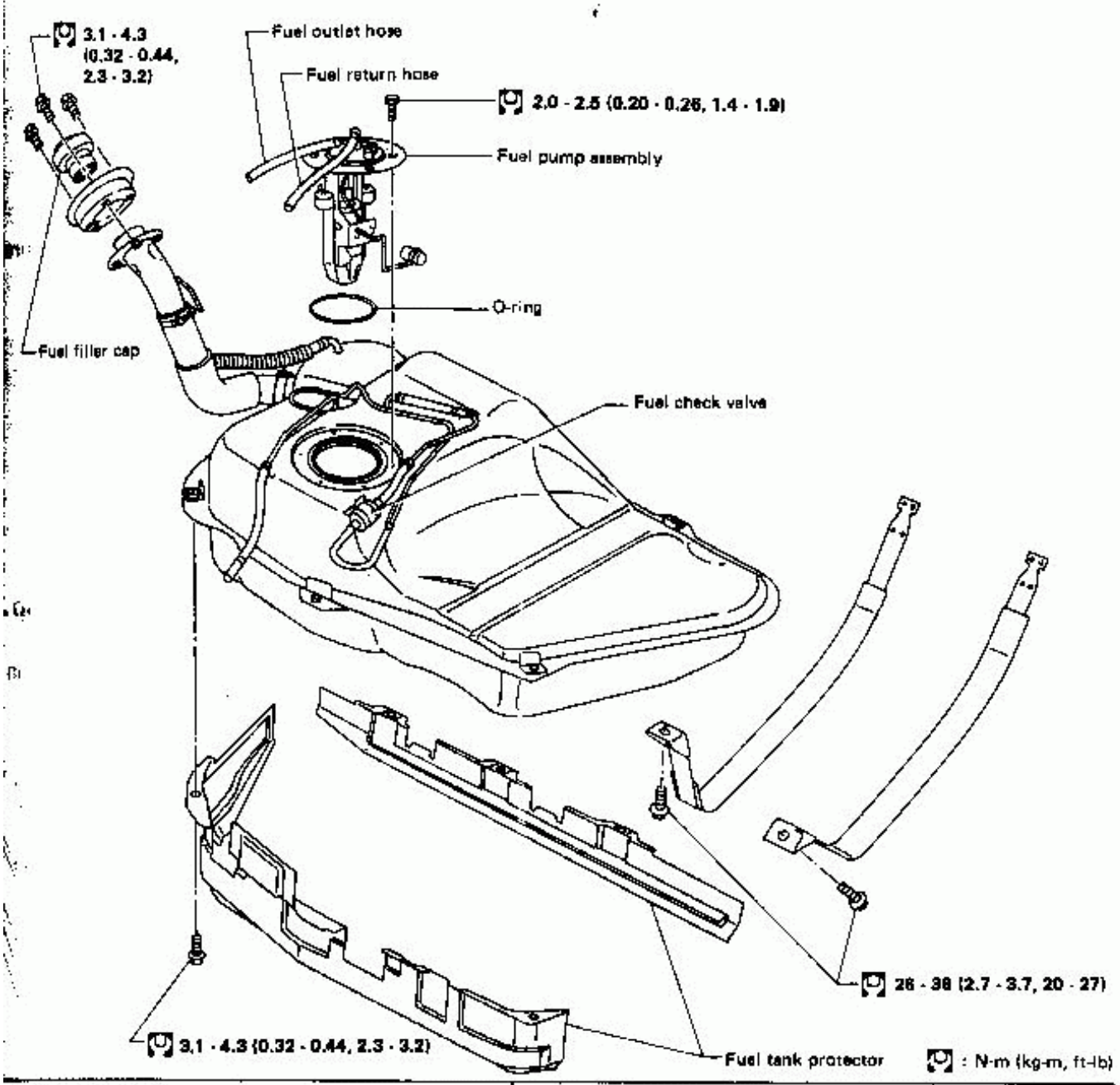
SECTION FE

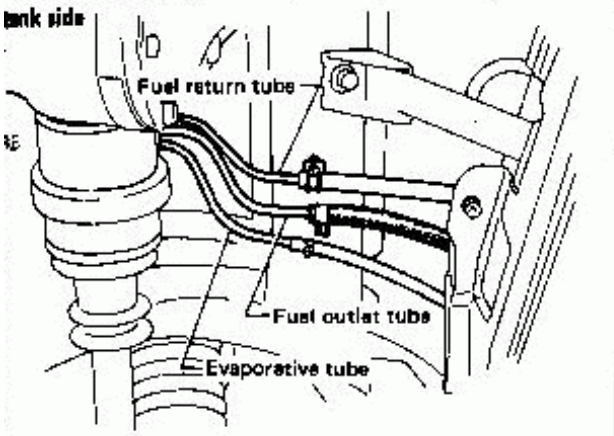
CONTENTS

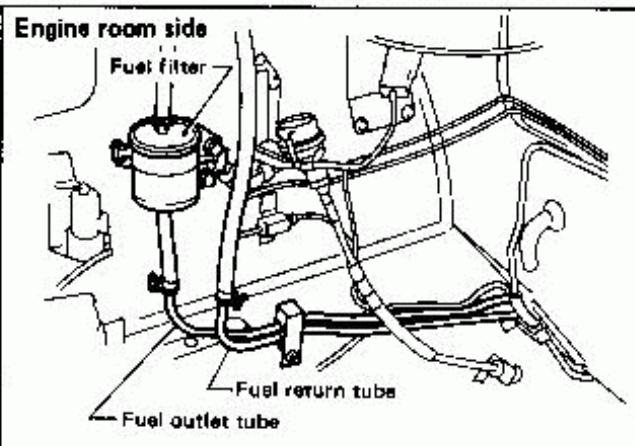
Accelerator Control System

a. Check to see if throttle valve fully opens when accelerator pedal is fully depressed and returns to idle when released.
b. Adjust accelerator pedal free play by turning adjusting nut.
c. On automatic transmission models, make sure kickdown switch rod is fully pushed in when accelerator pedal is depressed completely.
d. On A.S.C.D. equipped models, first adjust accelerator wire and then A.S.C.D. cable. For details, refer to "Automatic Speed Control Device" in EL section.
e. Check accelerator control parts for improper contact with any adjacent parts.
f. When connecting accelerator wire, be careful not to twist or scratch its inner wire.
g. Apply a light coat of recommended multi-purpose grease to all sliding or friction surfaces. Do not apply grease to wire.




3.1 - 4.3 (0.32 - 0.44, 2.3 - 3.2)
Fuel outlet hose
Fuel return hose
2.0 - 2.5 (0.20 - 0.26, 1.4 - 1.9)
Fuel pump assembly
O-ring
Fuel filler cap
Fuel check valve
26 - 38 (2.7 - 3.7, 20 - 27)
3.1 - 4.3 (0.32 - 0.44, 2.3 - 3.2)
Fuel tank protector
: N-m (kg-m, ft-lb)


Fuel return tube
Fuel outlet tube
Evaporative tube


Engine room side
Fuel filter
Fuel return tube
Fuel outlet tube

SFE770

WARNING:

When replacing fuel line parts, be sure to observe the following:

a. **Put a "CAUTION: INFLAMMABLE" sign in workshop.**
b. **Be sure to furnish the workshop with a CO_2 fire extinguisher.**
c. **Be sure to disconnect battery ground cable before conducting operations.**
d. **Put drained fuel in an explosion-proof container and attach lid securely.**

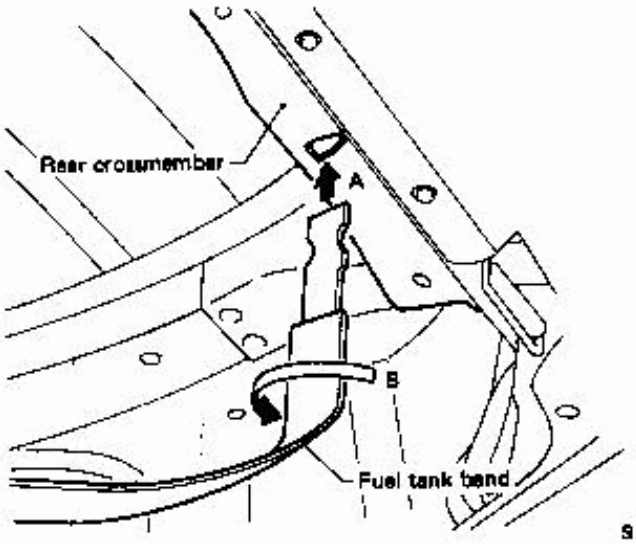
CAUTION:

Before disconnecting fuel hose, release fuel pressure from fuel line. Refer to the "Releasing Fuel Pressure" in EF & EC section.

a. **Do not disconnect any fuel line unless absolutely necessary.**
b. **Plug hose and pipe openings to prevent entry of dust or dirt.**
c. **Always replace O-ring and clamps with new ones.**
d. **Do not kink or twist hose and tube when they are installed.**
e. **Do not tighten hose clamps excessively to avoid damaging hoses.**
f. **When installing fuel check valve, be careful of its designated direction (Refer to section EC).**
g. **Run the engine and check for leaks at connections.**

Installation of Fuel Tank Band

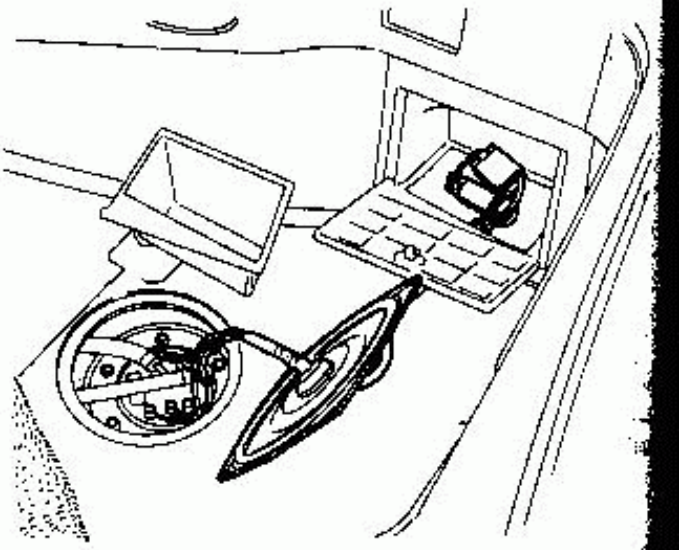
- Insert top of the band into the hole in the rear crossmember (A). Then turn the band 90 degrees (B).
- Install band according to identification marks indicating left and right.

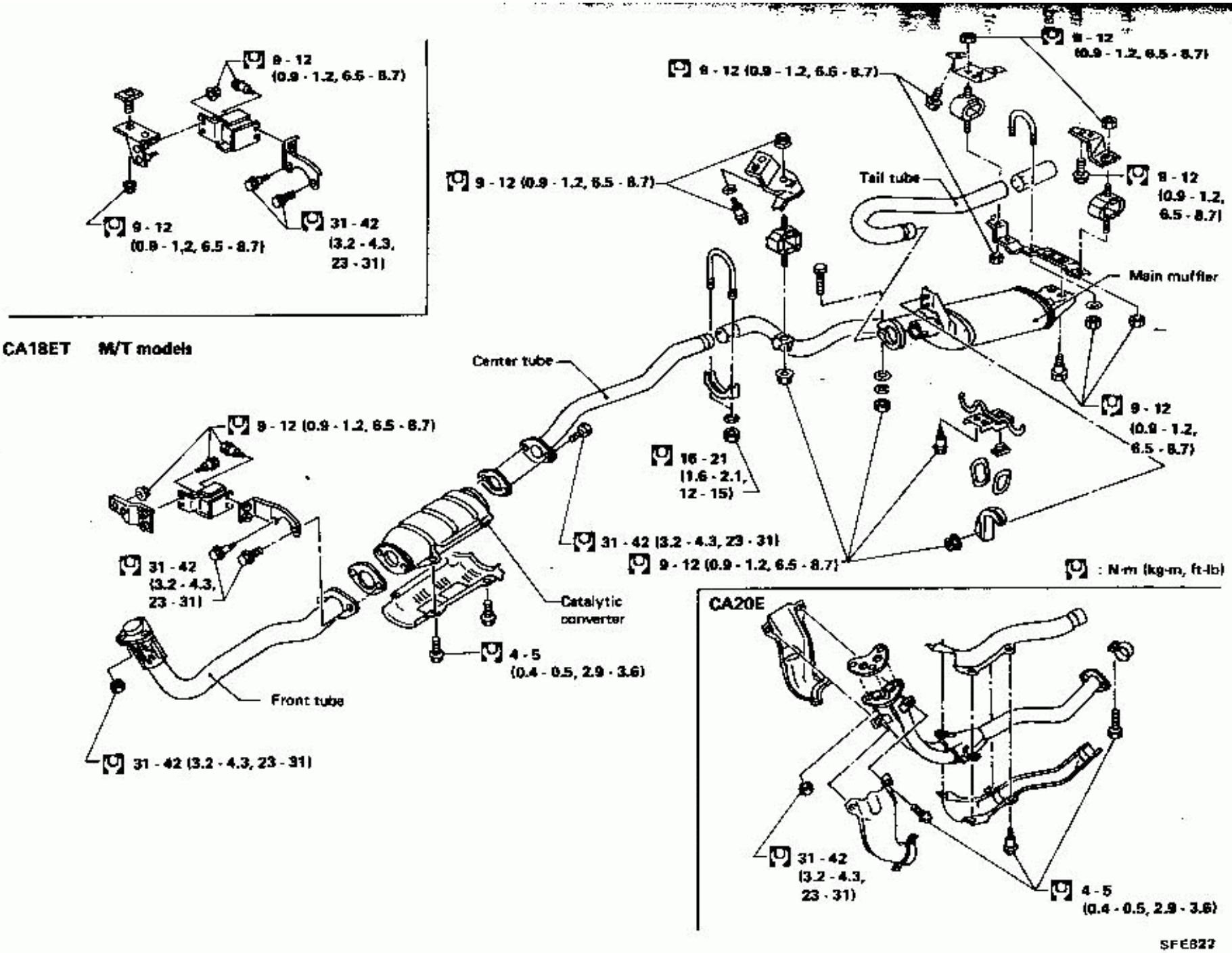


SFE771

Removal of Electric Fuel Pump

Remove electric fuel pump from the hole in the trunk floor.




9 - 12 (0.9 - 1.2, 6.5 - 8.7)
9 - 12 (0.9 - 1.2, 6.5 - 8.7)
31 - 42 (3.2 - 4.3, 23 - 31)
CA18ET M/T models
9 - 12 (0.9 - 1.2, 6.5 - 8.7)
Tail tube
8 - 12 (0.9 - 1.2, 6.5 - 8.7)
Main muffler
Center tube
9 - 12 (0.9 - 1.2, 6.5 - 8.7)
16 - 21 (1.6 - 2.1, 12 - 15)
31 - 42 (3.2 - 4.3, 23 - 31)
9 - 12 (0.9 - 1.2, 6.5 - 8.7)
31 - 42 (3.2 - 4.3, 23 - 31)
Catalytic converter
4 - 5 (0.4 - 0.5, 2.9 - 3.6)
Front tube
31 - 42 (3.2 - 4.3, 23 - 31)
: N·m (kg-m, ft-lb)
CA20E
31 - 42 (3.2 - 4.3, 23 - 31)
4 - 5 (0.4 - 0.5, 2.9 - 3.6)
SFE822

CAUTION:

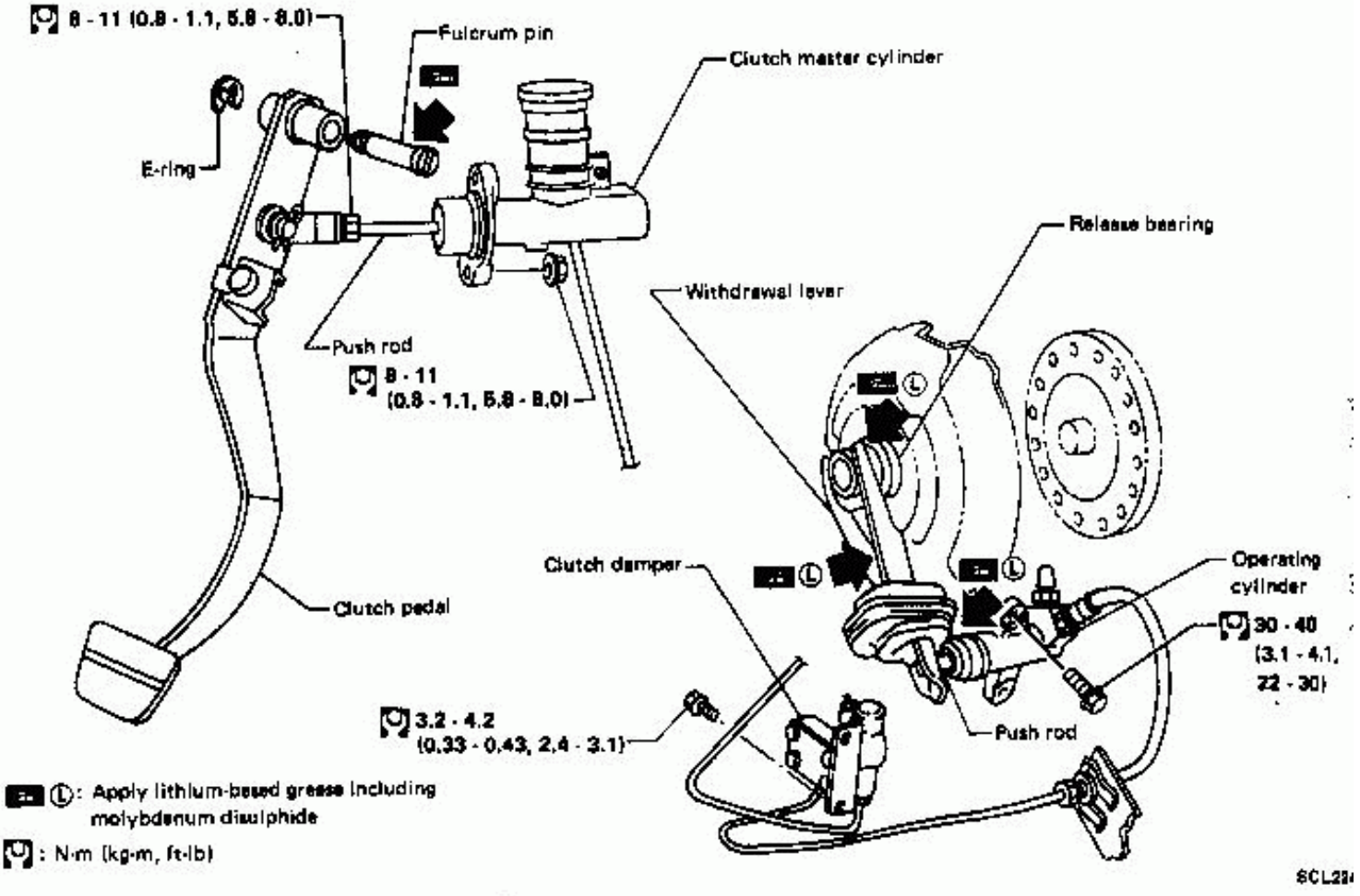
a. Be careful not to drop or damage catalytic converter.
b. Never wet catalytic converter with water, oil, etc.

- On non-turbocharger models, when removing heat shield plates from front tube, remove the entire front tube assembly.
- After installation, make sure that mounting brackets and mounting insulator are free from undue stress. If any of above parts is not installed properly, excessive noises or vibrations may be transmitted to vehicle body.
- When connecting center tube and muffler assembly, use the Genuine Nissan Sealant "Exhaust Sealant Kit 20720-N2225" or an equivalent to eliminate gas leakage at the joint.
- Check all tube connections for exhaust gas leaks, and entire system for unusual noises, with engine running. When plugging a tail pipe, disconnect back pressure tube of B.P.T. valve so as not to damage B.P.T. valve.

SECTION CL

CONTENTS

HYDRAULIC CLUTCH CONTROL



Precautions

- Recommended fluid is brake fluid "DOT 3".
- Do not reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- When removing and installing clutch tube, use Tool GG94310000 (—).
- To clean or wash all parts of master cylinder, operating cylinder and clutch damper, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene. It will ruin the rubber parts of the hydraulic system.

HYDRAULIC CLUTCH CONTROL

Bleeding Procedure

Carefully monitor fluid level at master cylinder during bleeding operation.

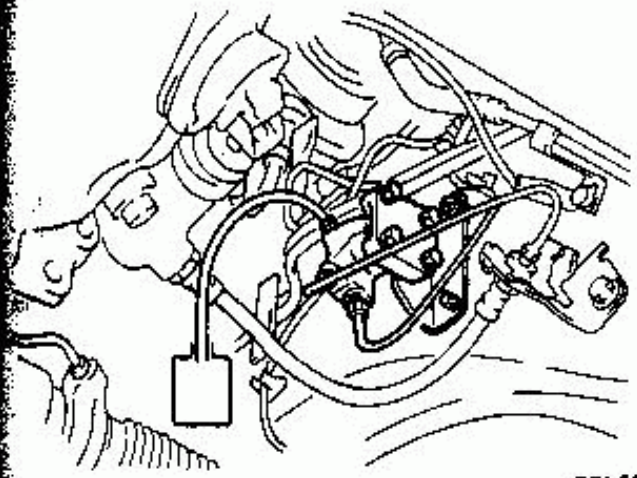
Bleed air according to the following procedure.

Clutch damper → Operating cylinder

Top up reservoir with recommended brake fluid.

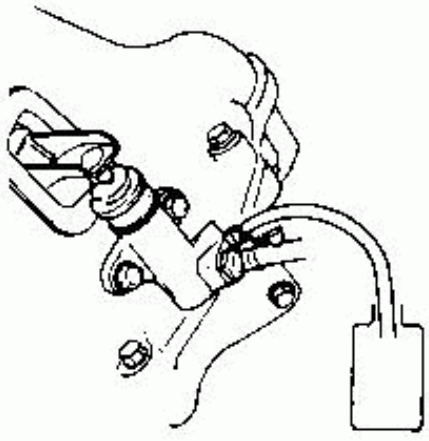
Connect a transparent vinyl tube to air bleeder valve.

Clutch damper



SCL228

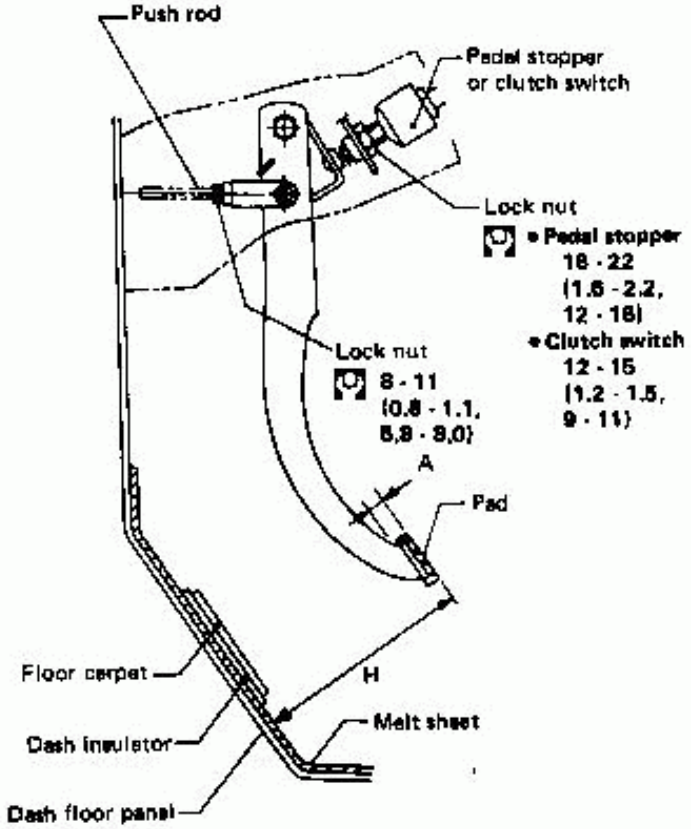
Operating cylinder



SCL009

3. Fully depress clutch pedal several times.
4. With clutch pedal depressed, open bleeder valve to release air.
5. Close bleeder valve.
6. Repeat steps 3 through 5 above until clear brake fluid comes out of air bleeder valve.

Adjusting Clutch Pedal



: N·m (kg-m, ft-lb)

SCL181

Pedal height "H"

189 - 199 mm (7.44 - 7.83 in)

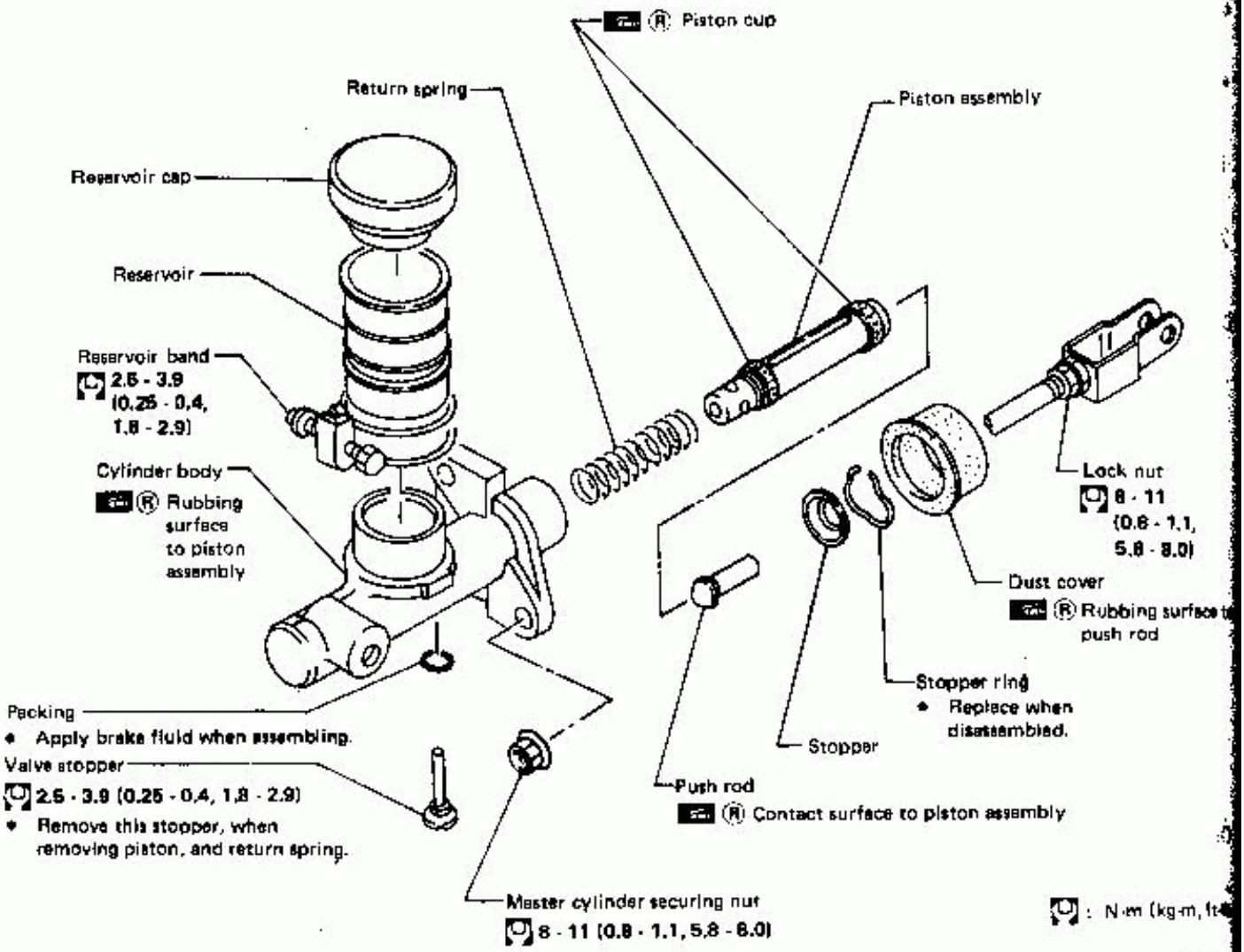
Pedal free play "A"

1 - 3.0 mm (0.039 - 0.118 in)

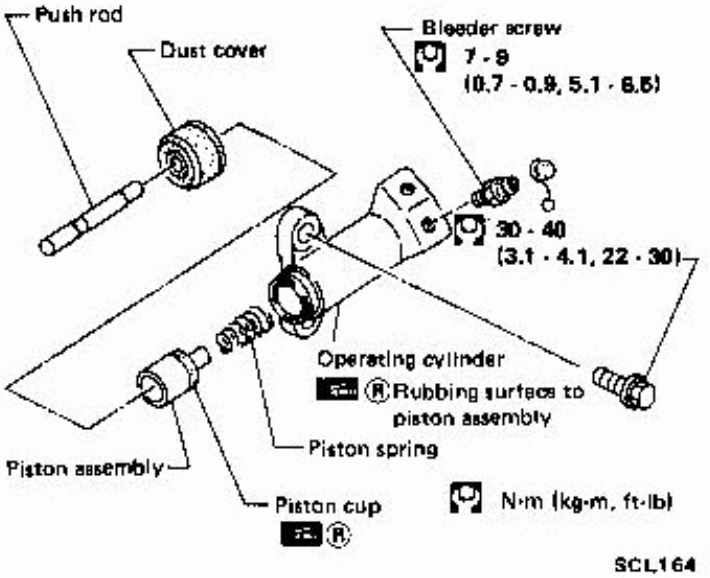
1. Adjust pedal height with pedal stopper or clutch switch.
2. Adjust pedal free play with push rod.

HYDRAULIC CLUTCH CONTROL

Clutch Master Cylinder

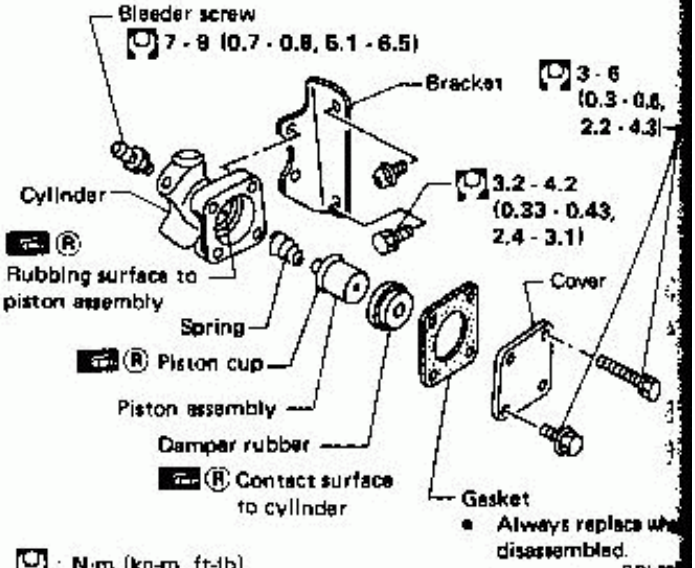


Operating Cylinder



SCL164

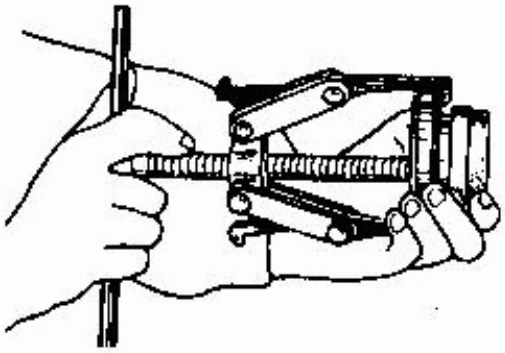
Clutch Damper



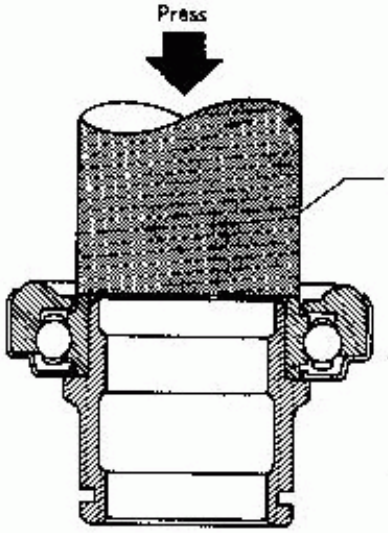
SCL22

Release Bearing

REMOVAL AND INSTALLATION



CL145

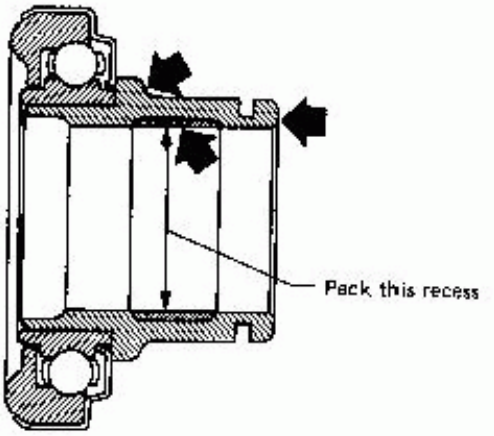


SCL222

LUBRICATION

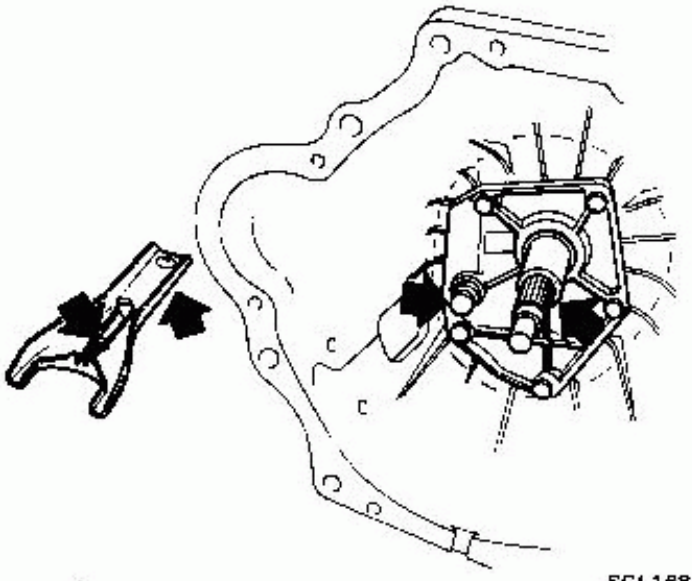
- Apply recommended grease to contact surface and rubbing surface.

Too much lubricant might cause clutch disc facing damage.



: Ⓛ Apply lithium-based grease including molybdenum disulphide.

SCL223

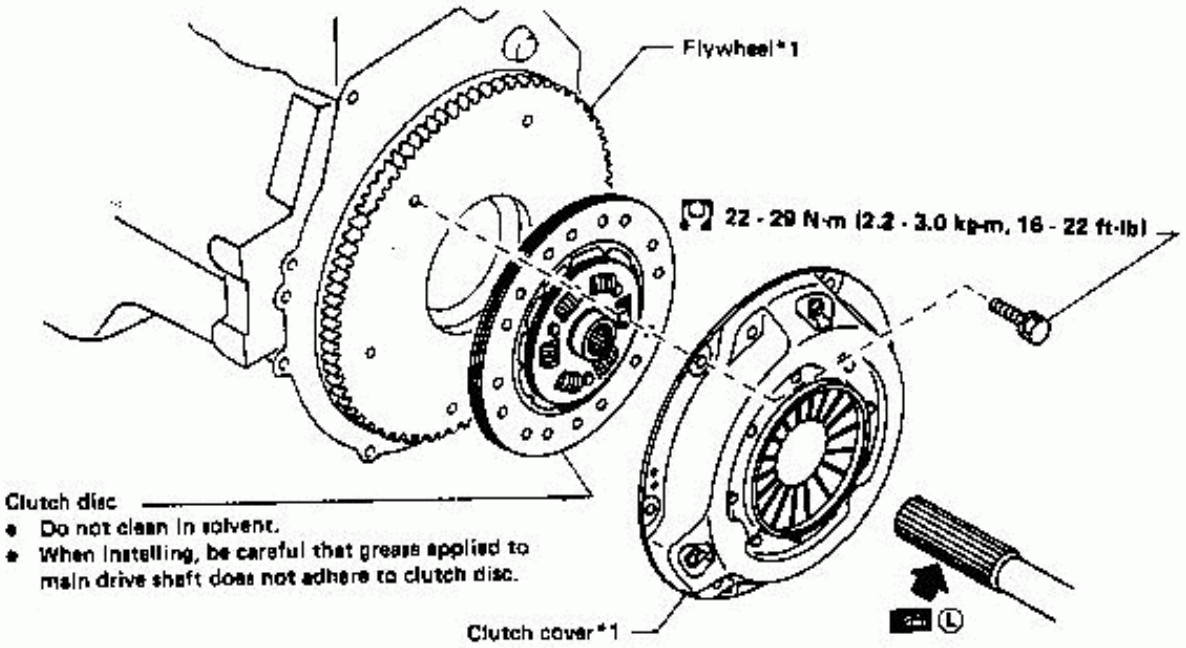


SCL168

: Ⓛ Apply lithium-based grease including molybdenum disulphide.

Clutch Unit

*1: Slight burn or discoloration of contact surface with clutch disc can be fixed by polishing with emery paper.

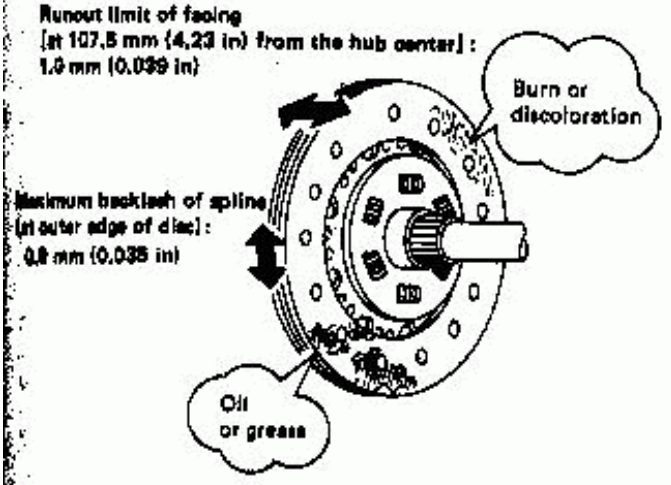


WARNING:

Clean away clutch disc dust using a dust collector after cleaning with a cloth. Do not use compressed air.

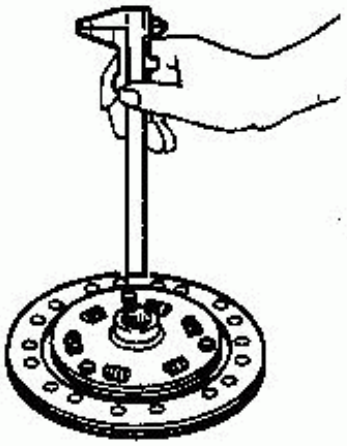
Inspecting Clutch Disc

Check clutch disc for runout, etc.



SCL153

Check clutch disc for wear.



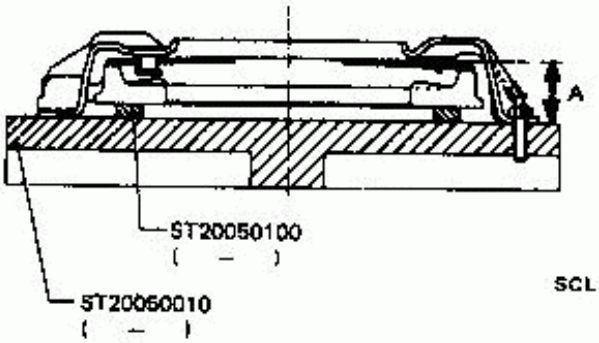
- Measure the depth of rivet head
  Wear limit: 0.3 mm (0.012 in)

SCL207

Inspecting Clutch Cover

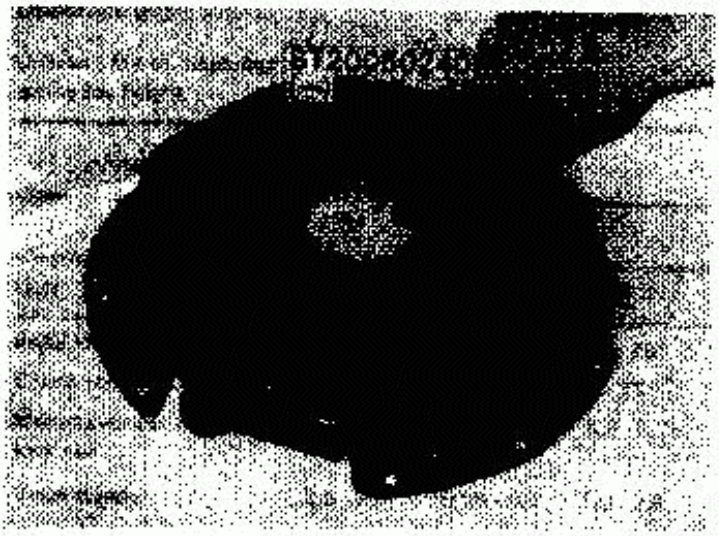
- Check height and unevenness of diaphragm spring after setting Tool.

  Diaphragm spring height "A":
  33 - 35 mm (1.30 - 1.38 in)
  Unevenness limit:
  0.5 mm (0.020 in)



SCL155

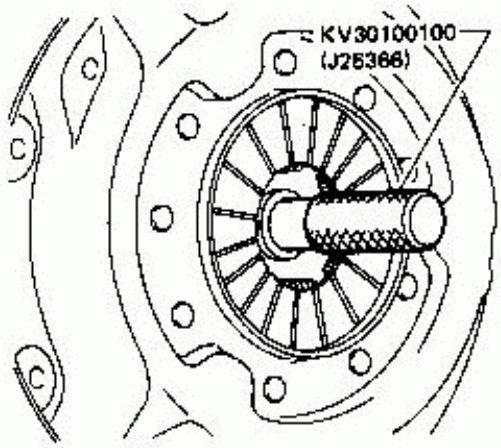
- Adjust unevenness of diaphragm spring with Tool.



- Check thrust rings for wear or damage by shaking cover assembly up and down to listen for chattering noise, or lightly hammering on rivets for a slightly cracked noise.

Installing Clutch Cover

- Insert Tool into clutch disc hub when installing clutch cover and disc.



SCL227

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

CLUTCH CONTROL SYSTEM

Type of clutch control	Hydraulic

CLUTCH MASTER CYLINDER

Bore diameter	mm (in)	15.87 (5/8)

CLUTCH OPERATING CYLINDER

Inner diameter	mm (in)	17.46 (11/16)

CLUTCH DISC

Model	225TBL
Facing size Outer dia. x Inner dia. x thickness mm (in)	225 x 150 x 3.5 (8.86 x 5.91 x 0.138)
Thickness of disc assembly With load 3,923 N (400 kg, 882 lb) mm (in)	7.6 - 8.0 (0.299 - 0.315)

CLUTCH COVER

Model	C225S
Pull load N (kg, lb) CA20E engine	3,923 (400, 882)
CA18ET engine	4,413 (450, 992)

Inspection and Adjustment

CLUTCH PEDAL

Unit: mm (in)

Pedal height*	189 - 199 (7.44 - 7.83)
Pedal free play	1 - 3.0 (0.039 - 0.118)

*Measured from melt sheet to pedal pad.

CLUTCH DISC

Unit: mm (in)

Model	225TBL
Wear limit of facing surface to rivet head	0.3 (0.012)
Runout limit	1.0 (0.039)
Distance of runout checkpoint (from the hub center)	107.5 (4.23)
Maximum backlash of spline (at outer edge of disc)	0.9 (0.035)

CLUTCH COVER

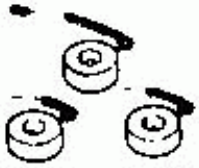
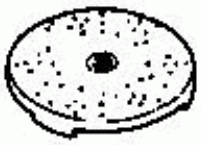
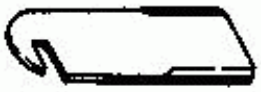
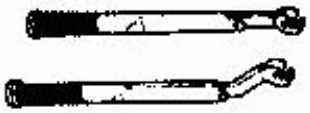
Unit: mm (in)

Model	C225S
Diaphragm spring height	33 - 35 (1.30 - 1.38)
Uneven limit of diaphragm spring toe height	0.5 (0.020)

Tightening Torque

Unit	N·m	kg-m	ft-lb
Pedal stopper lock nut	16 - 22	1.6 - 2.2	12 - 16
Clutch switch lock nut	12 - 16	1.2 - 1.6	9 - 11
Master cylinder push rod lock nut	8 - 12	0.8 - 1.2	5.8 - 8.7
Valve stopper	2.5 - 3.9	0.25 - 0.4	1.8 - 2.9
Reservoir band	2.5 - 3.9	0.25 - 0.4	1.8 - 2.9
Master cylinder securing nut	8 - 11	0.8 - 1.1	5.8 - 8.0
Clutch tube flare nut	15 - 18	1.5 - 1.8	11 - 13
Bleeder screw	7 - 9	0.7 - 0.9	5.1 - 6.5
Operating cylinder securing nut	30 - 40	3.1 - 4.1	22 - 30
Clutch damper securing bolt	3.2 - 4.2	0.33 - 0.43	2.4 - 3.1
Damper cover to cylinder	3 - 6	0.3 - 0.6	2.2 - 4.3
Clutch hose to operating cylinder securing nut	17 - 20	1.7 - 2.0	12 - 14
Clutch cover securing bolt	22 - 29	2.2 - 3.0	16 - 22

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	
ST20600000 (J26366) or KV30100100 (J26366)	Clutch aligning bar	
ST20050100 (—)	Distance piece	
ST20050010 (—)	Base plate	
ST20050240 (—)	Diaphragm spring adjusting wrench	
GG94310000 (—)	Flare nut torque wrench	

MANUAL TRANSMISSION

SECTION MT

CONTENTS

Removal

- Remove propeller shaft.
  Refer to PD section.

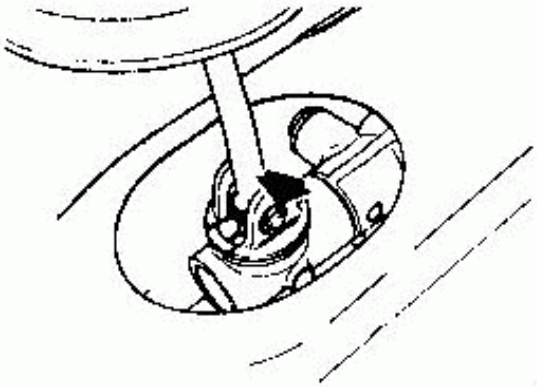
Insert plug into rear oil seal after removing propeller shaft.

- Support engine by placing a jack under oil pan.

CAUTION:

- **Be careful not to damage spline, sleeve yoke and rear oil seal, when removing propeller shaft.**
- **Do not place jack under the oil pan drain plug.**

- Remove shift lever.



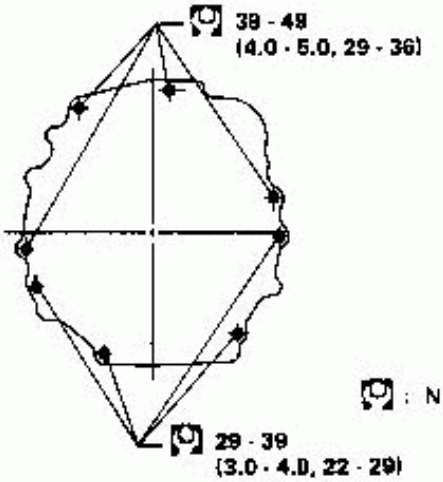
TM335

WARNING:
Support Manual Transmission, while removing it.

Installation

- Tighten bolts securing transmission to engine.

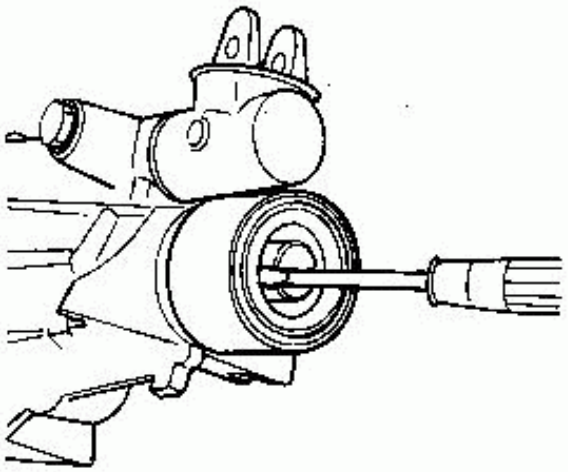
These bolts have different lengths.



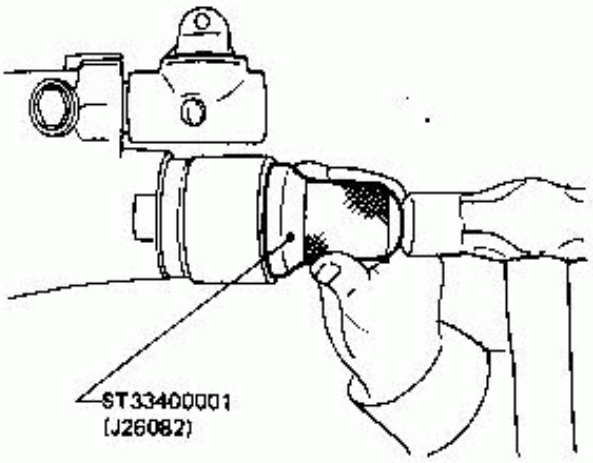
SMT088

- Fill transmission with recommended gear oil.

Rear Extension Oil Seal

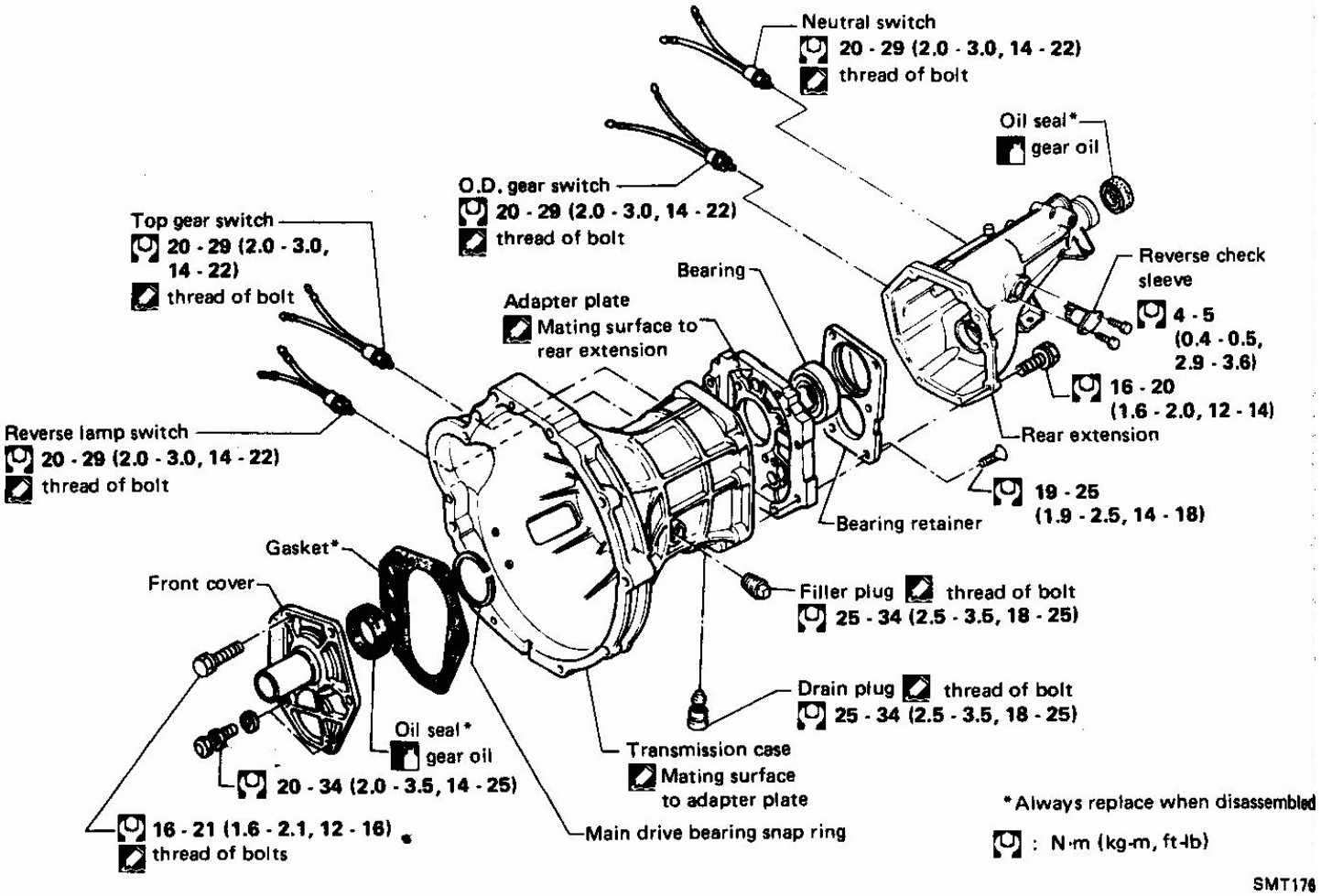


SMT037



SMT066

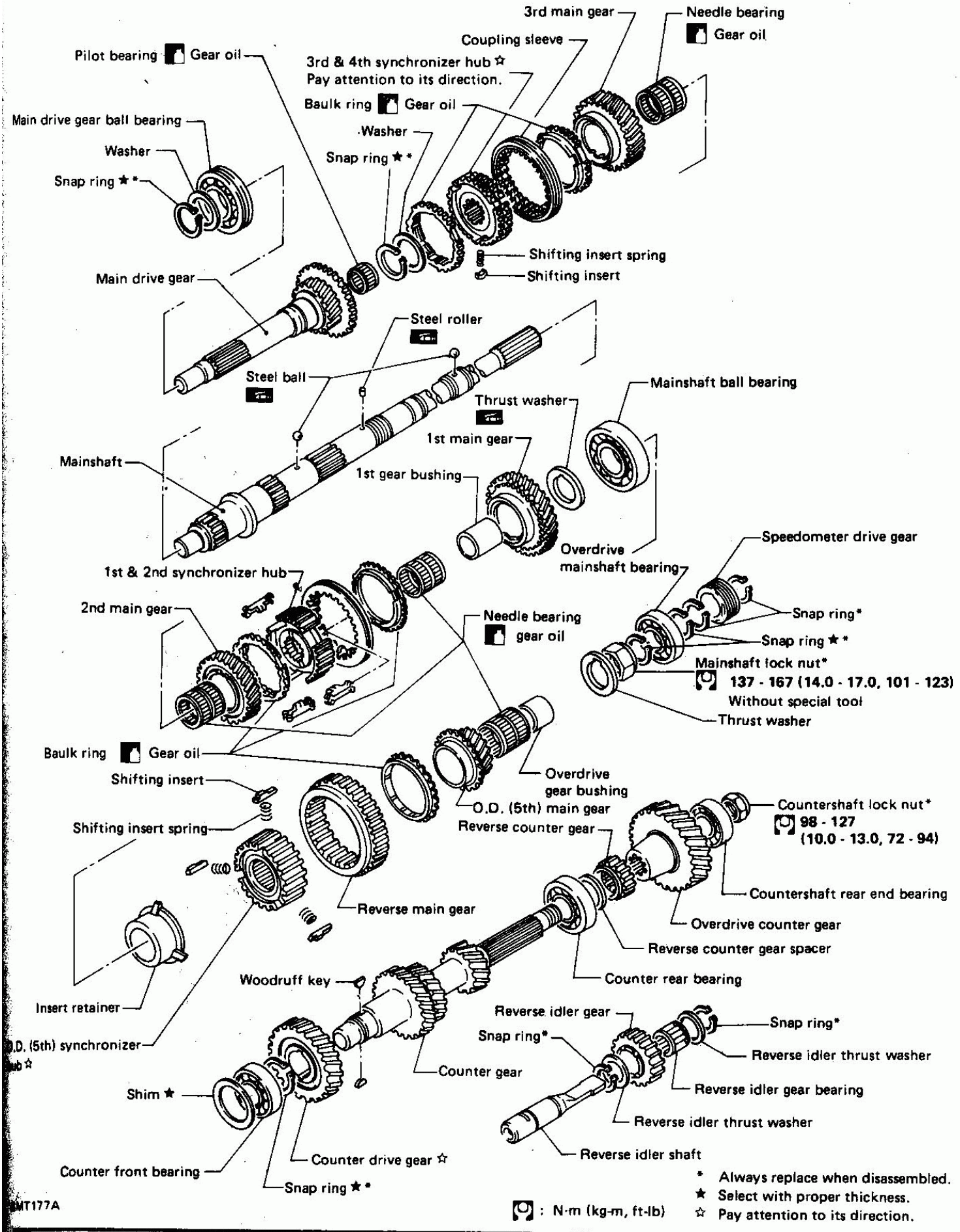
Case Components



Transmission switch application

Engine	Switch			
	Reverse	Top	O.D.	Neutral
CA18ET	○	○	○	–
CA20E	○	–	–	○

Gear Components

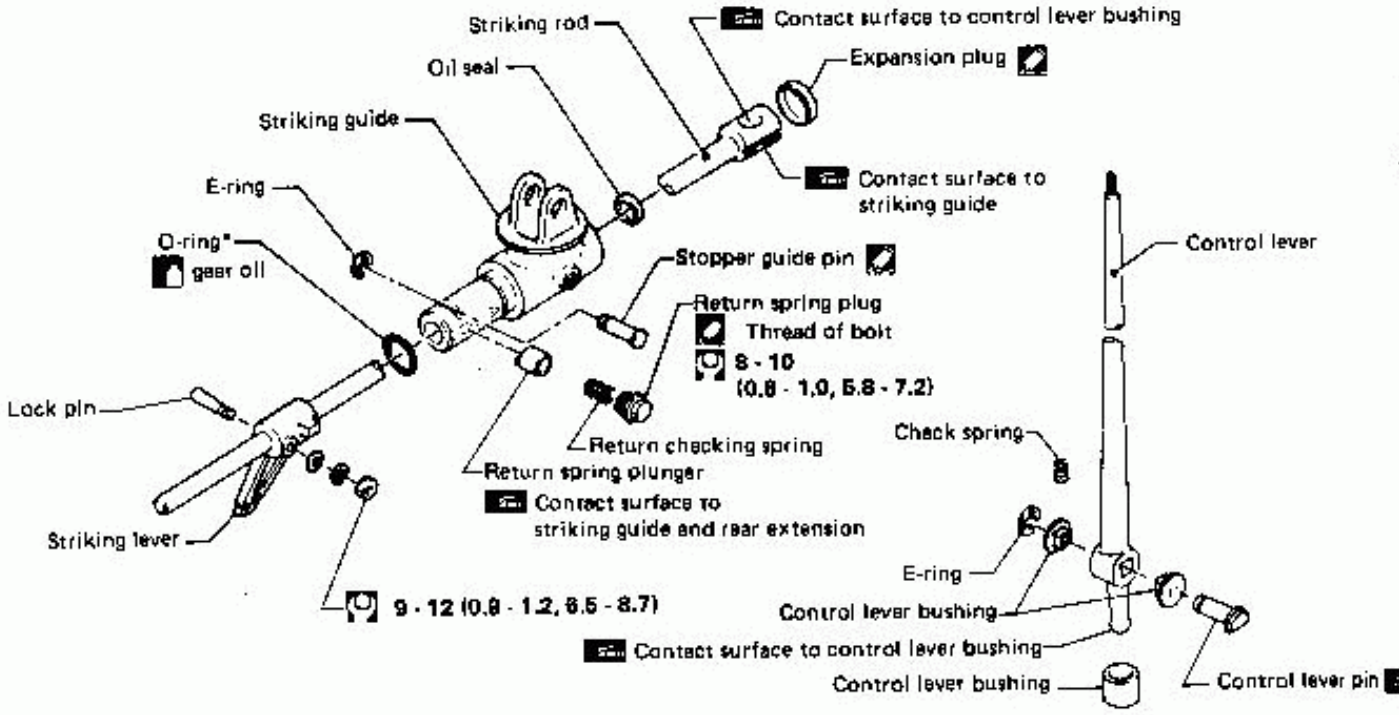


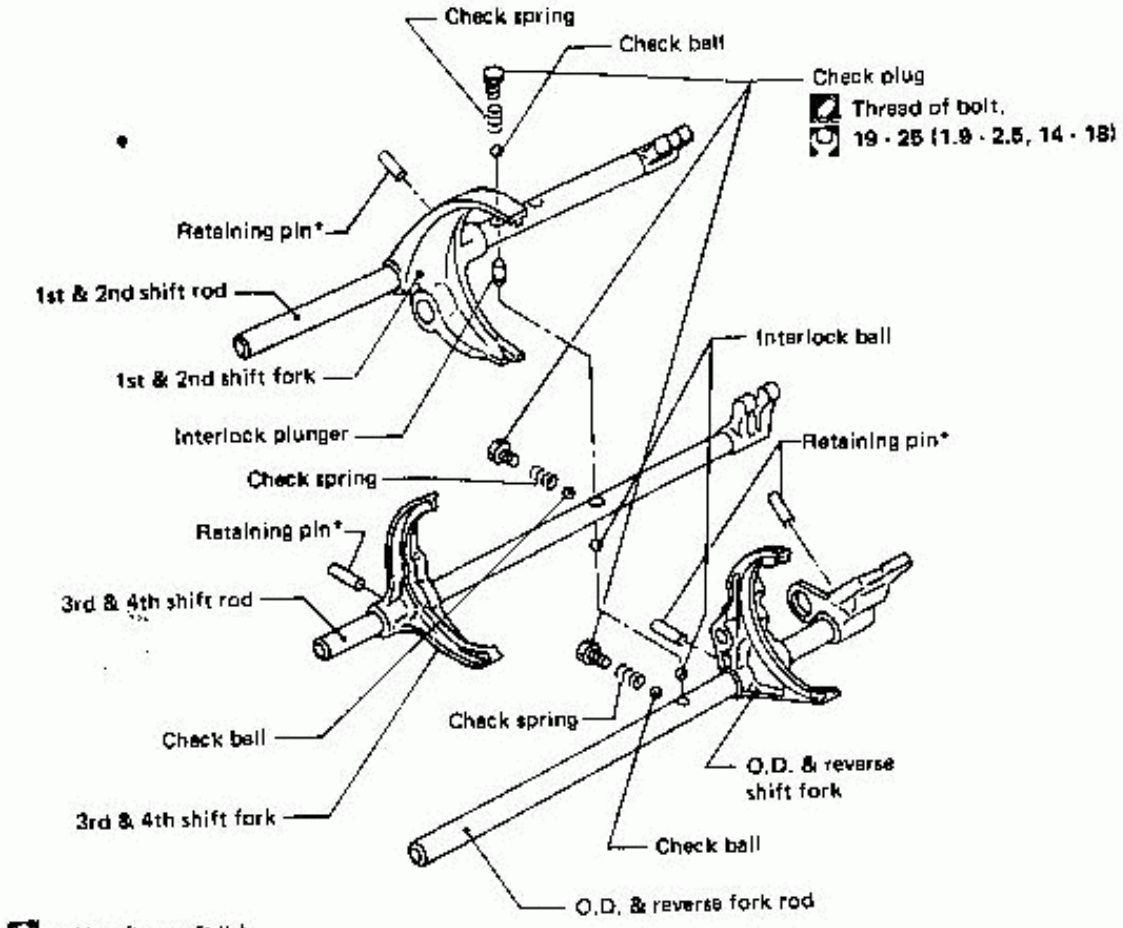
* Always replace when disassembled.
★ Select with proper thickness.
☆ Pay attention to its direction.

: N·m (kg-m, ft-lb)

MT177A

Shift Control Components



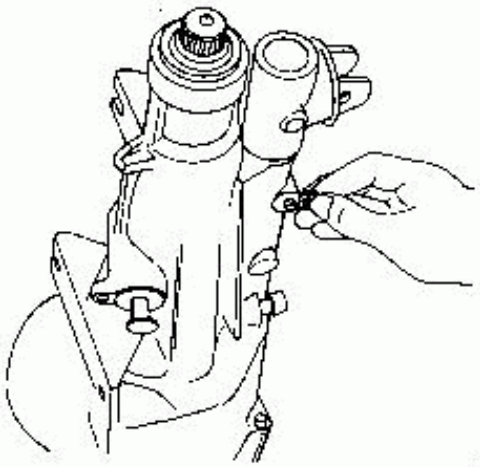


: N·m (kg-m, ft-lb)

*Always replace when disassembled.

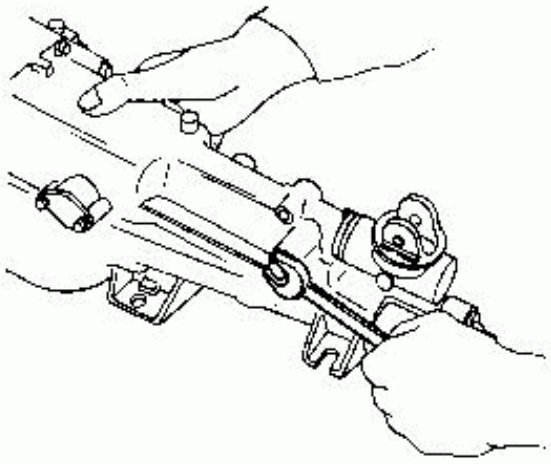
SMT091A

1. Remove E-ring and stopper guide pin.



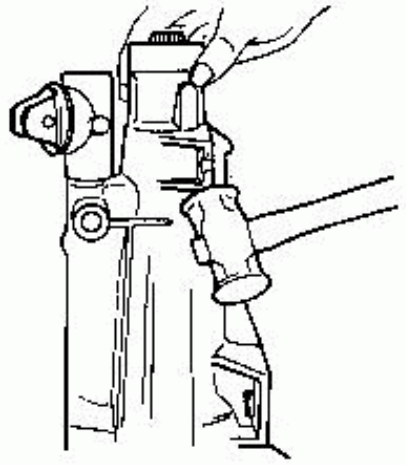
SMT361

2. Remove return spring plug, return spring, and plunger from rear extension.



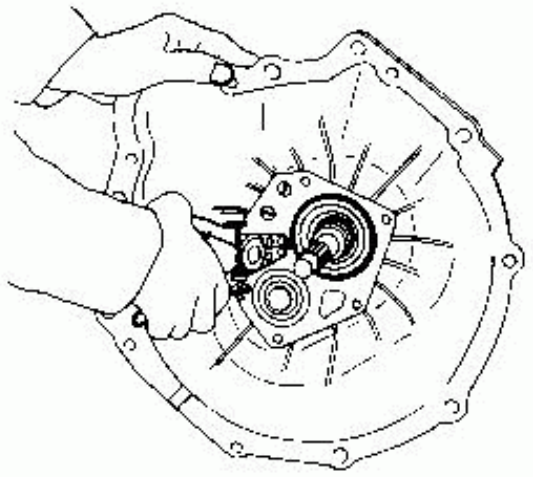
SMT362

3. Remove rear extension by lightly tapping it.



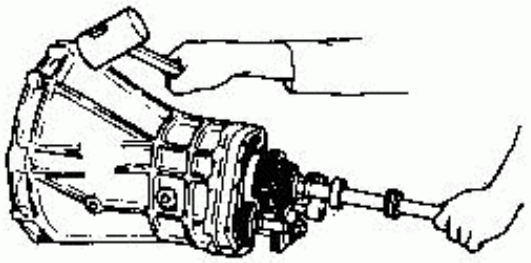
SMT363

4. Remove front cover, gasket, countershaft front bearing shim, and main drive bearing snap ring.



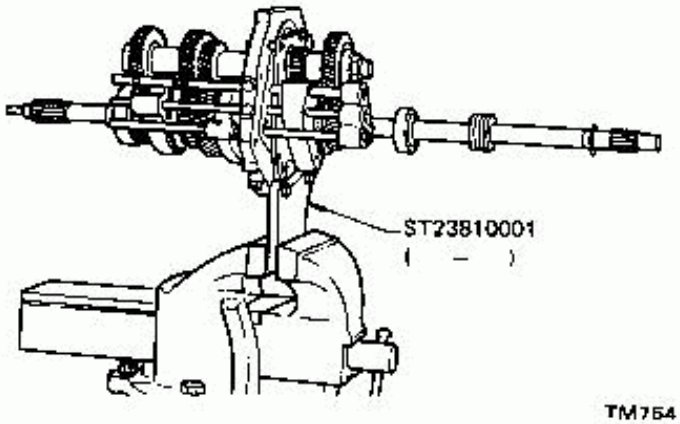
SMT011

5. Separate transmission case from adapter plate.



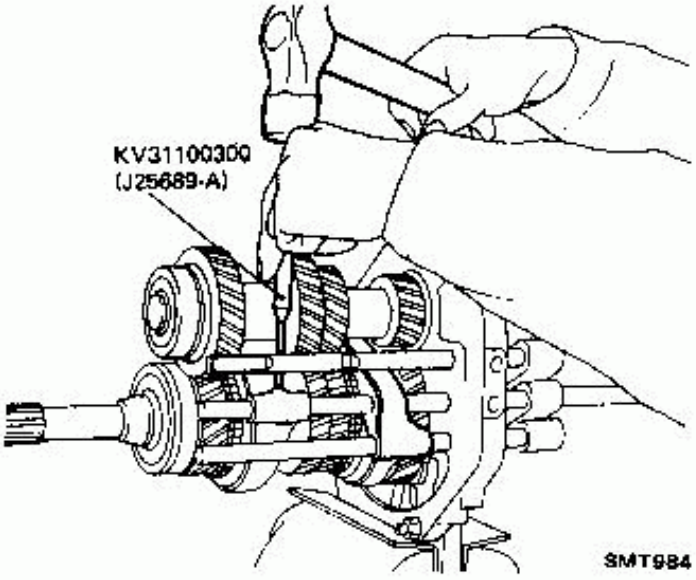
TM753

6. Set up Tool on adapter plate.



TM754

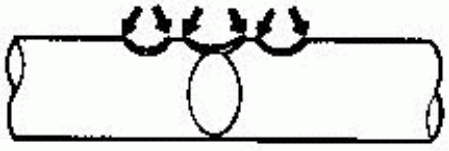
7. Remove check ball plugs, check springs, and check balls.
8. Drive out retaining pins. Then drive out fork rods and remove interlock balls and plunger.



Forks and Fork Rods

INSPECTION

- Check for wear, scratches, projection or damage.

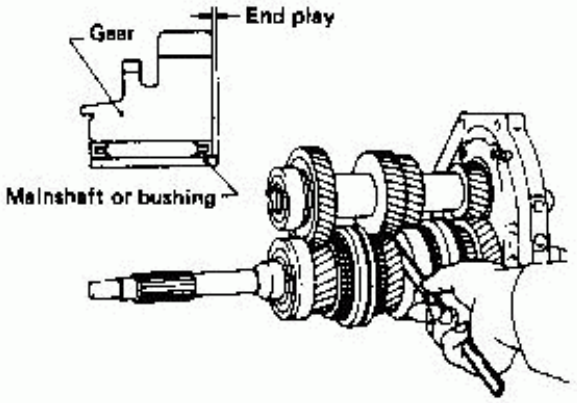


SMT137

Gears and Shafts

DISASSEMBLY

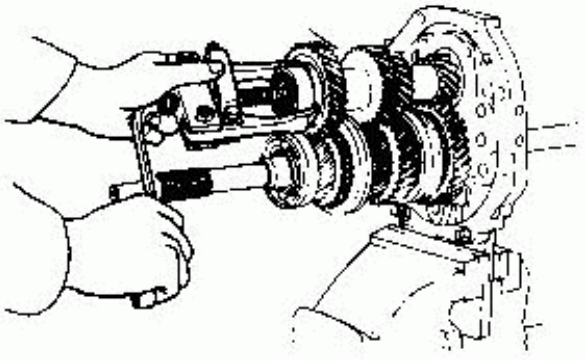
1. Before disassembly, measure each gear end play.
- If end play is not within the specified limit, disassemble and check the parts.
- Replace any part which is worn or damaged.



SMT025

Gear	End play mm (in)
1st	0.31 - 0.41 (0.0122 - 0.0161)
2nd	0.11 - 0.21 (0.0043 - 0.0083)
3rd	0.11 - 0.21 (0.0043 - 0.0083)
O.D.	0.32 - 0.39 (0.0126 - 0.0154)
Reverse idler	0.05 - 0.50 (0.0020 - 0.0197)

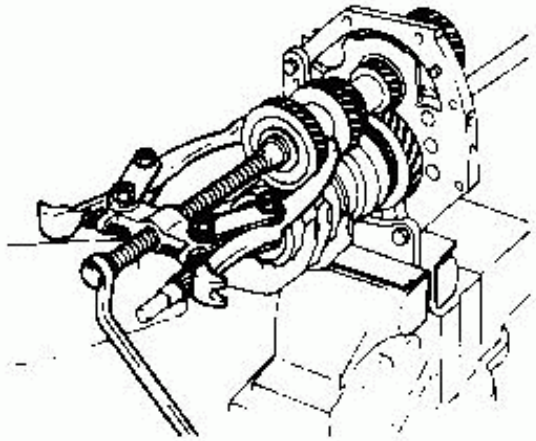
2. Mesh 2nd and reverse gear, then draw out counter front bearing.



TM398

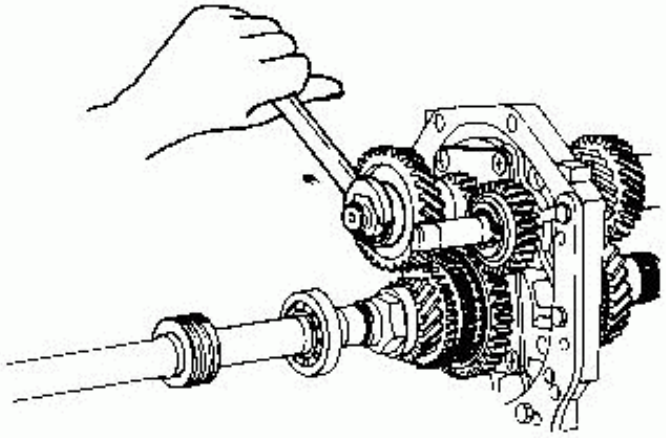
Gears and Shafts (Cont'd)

3. Remove snap ring and draw out counter drive gear with main drive gear.



SMT023

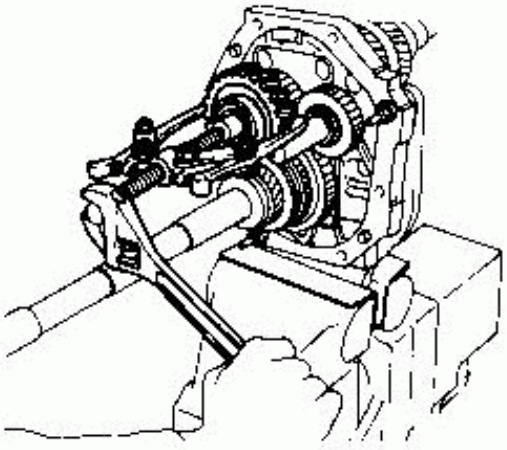
4. Remove snap ring and draw out 3rd & 4th synchronizer and 3rd gear.
5. Release staking on counter gear nut and mainshaft nut and loosen these nuts.



TM767

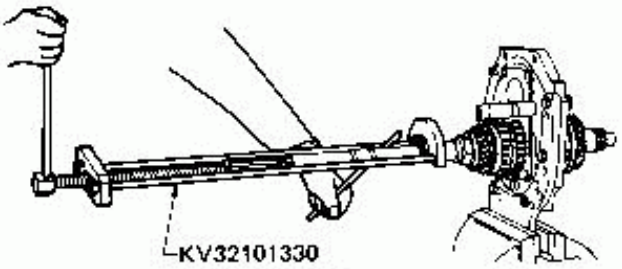
Mainshaft nut: Left-hand thread

6. Pull out O.D. counter gear with bearing.



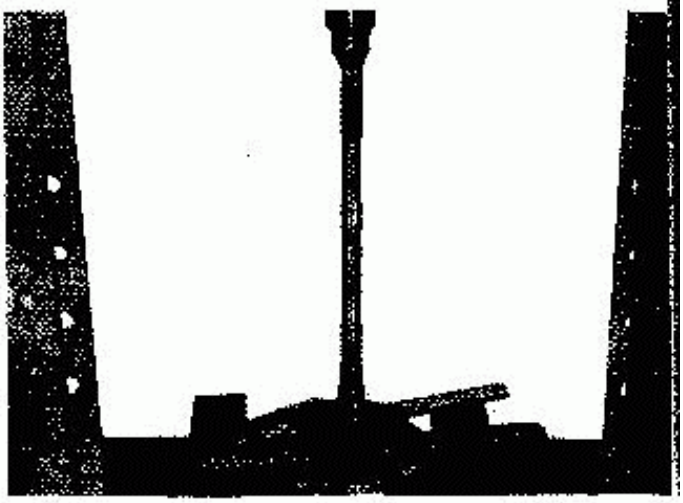
SMT042

7. Draw out reverse counter gear and spacer.
8. Remove snap rings from reverse idler shaft, and draw out reverse idler gear, thrust washers and needle bearing.
9. Remove snap rings, steel ball, speedometer gear and bearing.



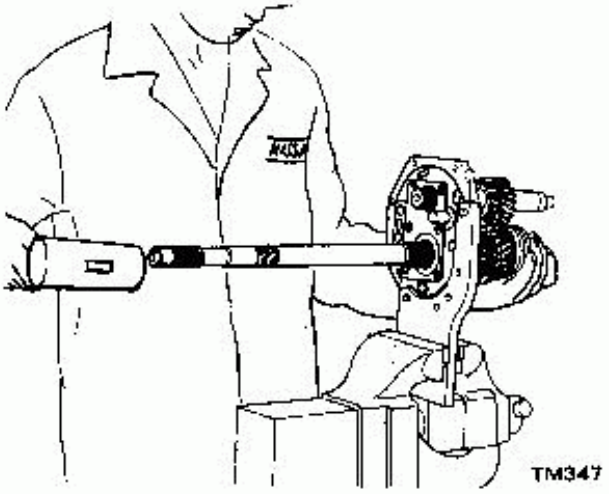
TM7

10. Remove mainshaft nut, thrust washer, steel roller, O.D. gear, needle bearing and baulk ring.
11. Remove O.D. gear bushing, insert retainer and O.D. synchronizer.



Gears and Shafts (Cont'd)

Draw out mainshaft assembly together with counter gear, by tapping rear end of mainshaft and counter gear.

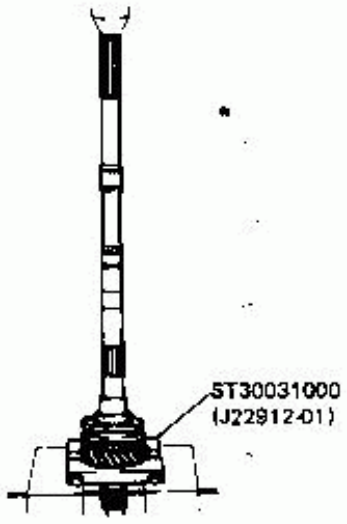


TM347

Remove thrust washer, steel ball, and 1st gear.

Careful not to lose steel ball.

Press out 1st gear mainshaft bushing together with 2nd main gear.



TM049A

Remove 2nd gear needle bearing.

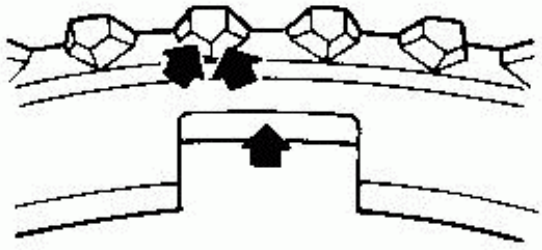
INSPECTION

Check all gears for excessive wear, chips and cracks; replace as required.

Check shaft for bending, cracks and wear; if necessary, replace.

Baulk rings

- If found to be deformed, cracked or otherwise damaged excessively, replace baulk ring.



SMT026

- Place baulk ring in position on gear cone. While holding baulk ring against gear as far as it will go, measure gap between baulk ring and gear.
  If the clearance is smaller than the wear limit, replace baulk ring.

Baulk ring to gear clearance:

Standard

1st & 2nd gear
1.00 - 1.60 mm
(0.0394 - 0.0630 in)

3rd & main drive gear
1.20 - 1.50 mm
(0.0472 - 0.0591 in)

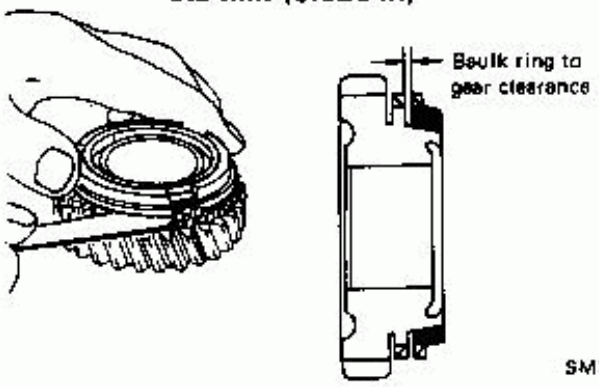
O.D. gear
1.00 - 1.40 mm
(0.0394 - 0.0551 in)

Wear limit

1st & 2nd gear
0.8 mm (0.031 in)

3rd & main drive gear
0.8 mm (0.031 in)

O.D. gear
0.5 mm (0.020 in)



SMT140

Gears and Shafts (Cont'd)

Shifting inserts and springs

If worn excessively, worn unevenly, deformed, or damaged, replace.

SMT064

ASSEMBLY

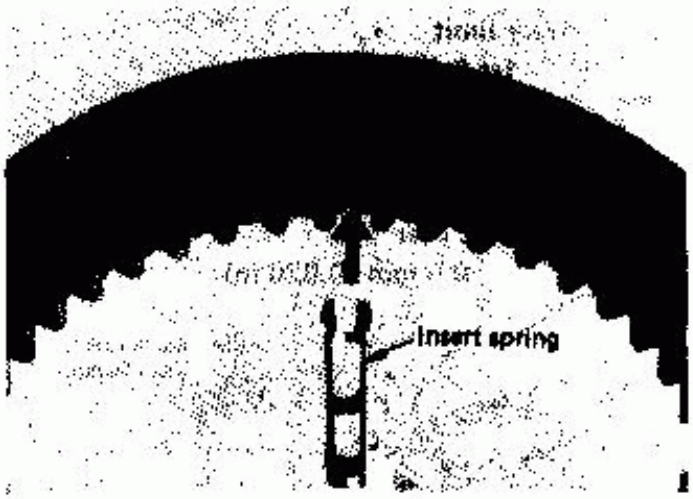
Note:

Apply gear oil to each part.

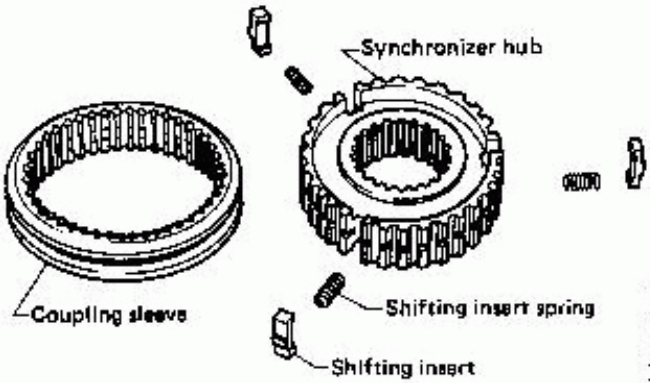
- **Needle bearings**
- **Baulk rings**
- **Shafts**
- **Gears**
- **Oil seals**

1. Place inserts.

- 1st & 2nd

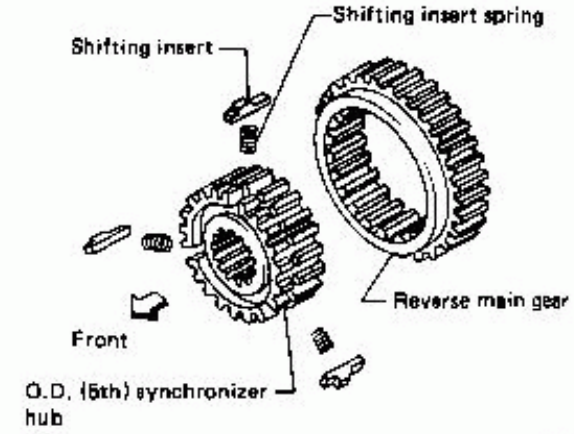


- 3rd & 4th



SMT034

- O.D.

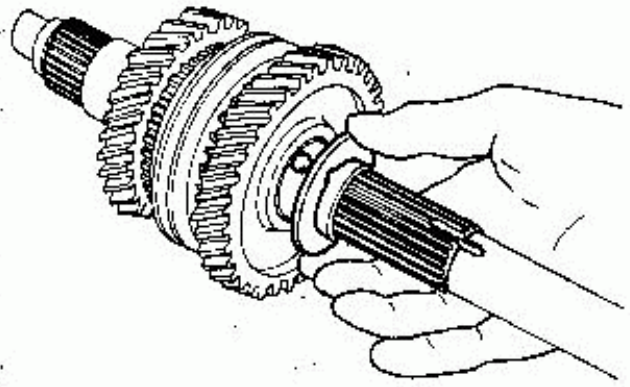


2. Assemble 2nd main gear needle bearing and 1
& 2nd synchronizer assembly, then press 1
gear bushing on mainshaft.

Gears and Shafts (Cont'd)

Assemble 1st main gear, steel ball, and thrust washer on mainshaft.

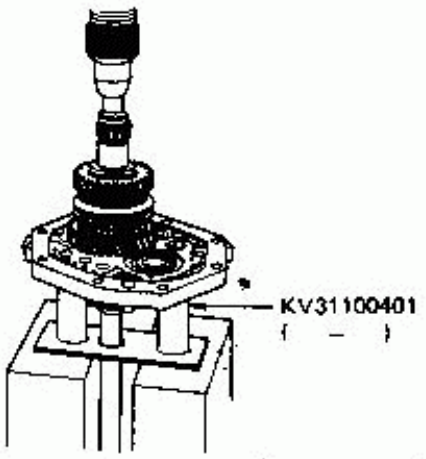
Before installing steel ball and thrust washer apply grease to them.



TM359

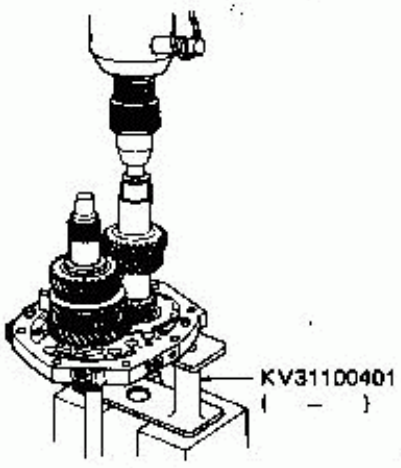
Install counter rear bearing to adapter plate.

Press mainshaft assembly to adapter plate with Tool.



TM439

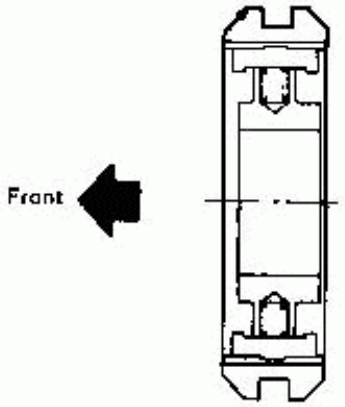
Press counter gear into adapter plate.



TM440

7. Install 3rd main gear, needle bearing and 3rd & 4th synchronizer assembly.

Pay attention to direction of synchronizer.



SMT031

8. Install thrust washer on mainshaft and secure it with mainshaft front snap ring.

Select proper snap ring that will minimize clearance of groove in mainshaft.

TM441

Mainshaft front snap ring:

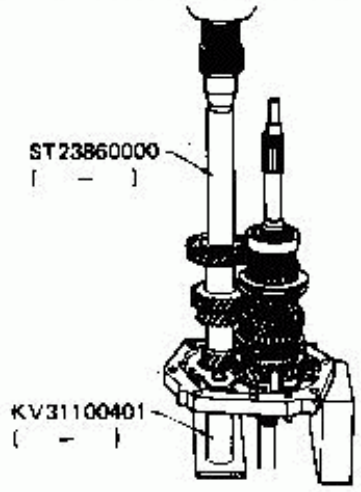
Parts number	Thickness mm (in)
32263-E9000	1.4 (0.055)
32263-E9001	1.5 (0.059)
32263-E9002	1.6 (0.063)

9. Apply gear oil to mainshaft pilot bearing and install it on mainshaft.

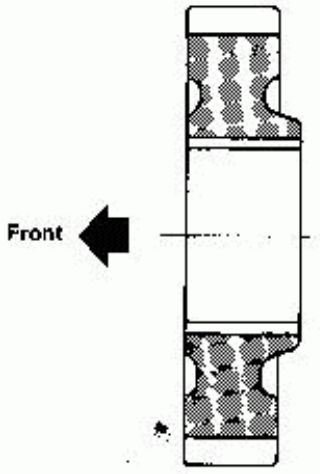
Gears and Shafts (Cont'd)

10. Press counter drive gear with main drive gear with Tool.

Pay attention to direction of counter front gear.



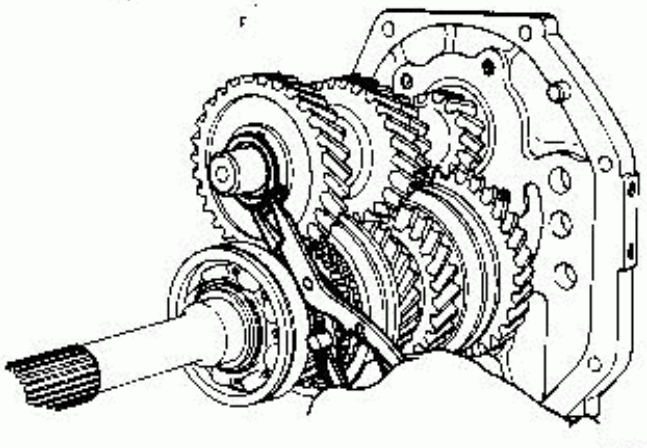
TM442



SMT055

11. Secure counter drive gear with snap ring.

Select proper snap ring that will minimize clearance of groove in countershaft.

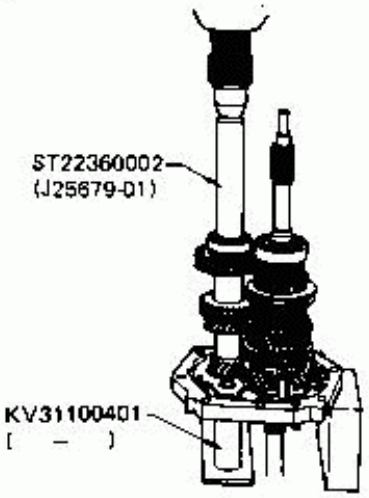


TM356

Counter drive gear snap ring:

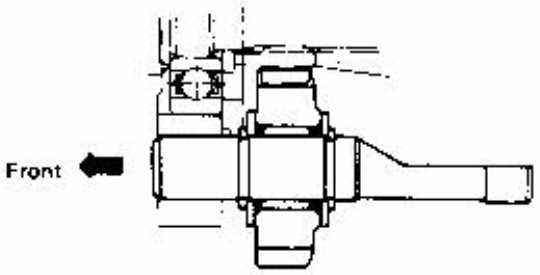
Parts number	Thickness mm (in)
32215-E9000	1.4 (0.055)
32215-E9001	1.5 (0.059)
32215-E9002	1.6 (0.063)

12. Press counter gear front bearing onto counter gear.



TM4

13. Install reverse idler gear to reverse idler shaft with spacers, snap rings and needle bearing.

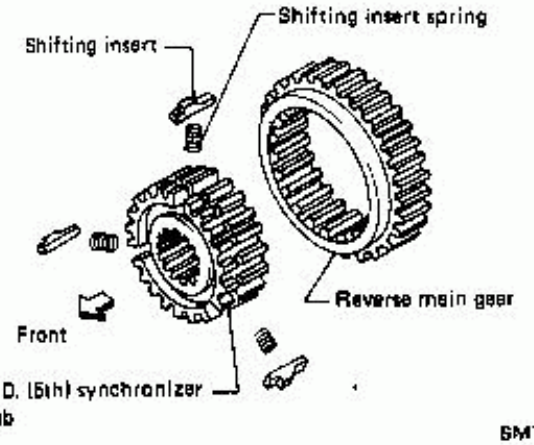


TM

Gears and Shafts (Cont'd)

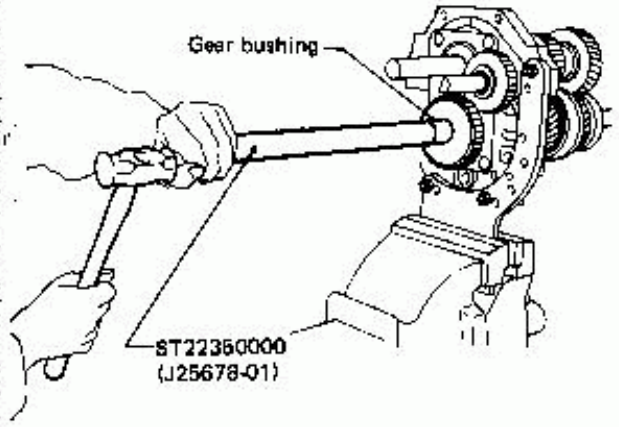
14. Install insert retainer and O.D. synchronizer to mainshaft.

Pay attention to direction of synchronizer.



SMT095A

15. Install O.D. gear bushing to mainshaft.



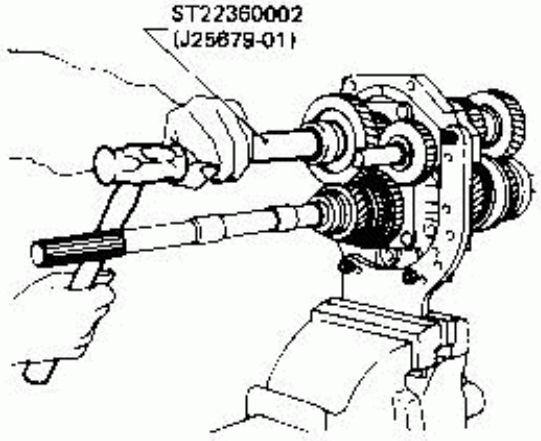
SMT531

16. Install O.D. main gear, steel roller and thrust washer to mainshaft.

17. Install spacer, reverse counter gear and O.D. counter gear to countershaft.

O.D. main gear and O.D. counter gear should be handled as a matched set.

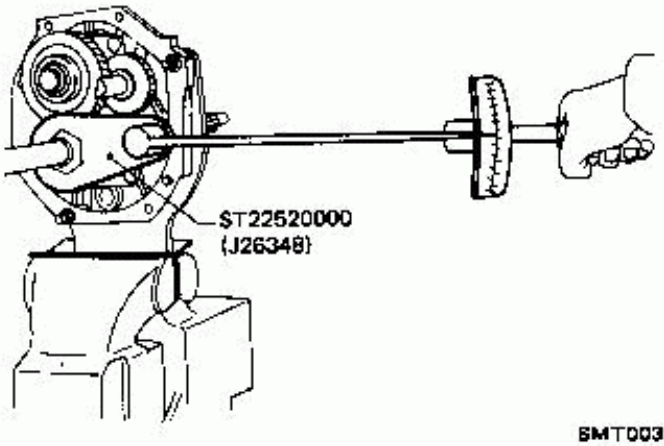
18. Install countershaft rear end bearing.



SMT043

19. Mesh 2nd and reverse gears and tighten mainshaft lock nut.

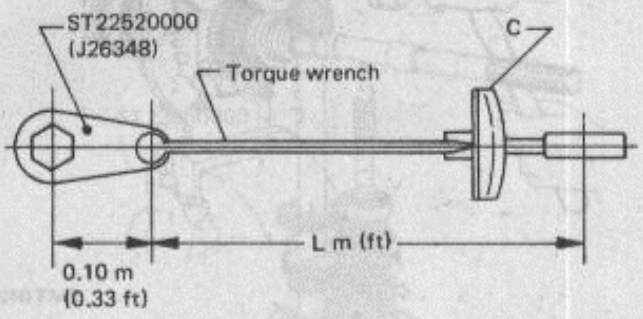
- **Always use new lock nut.**
- With special tool

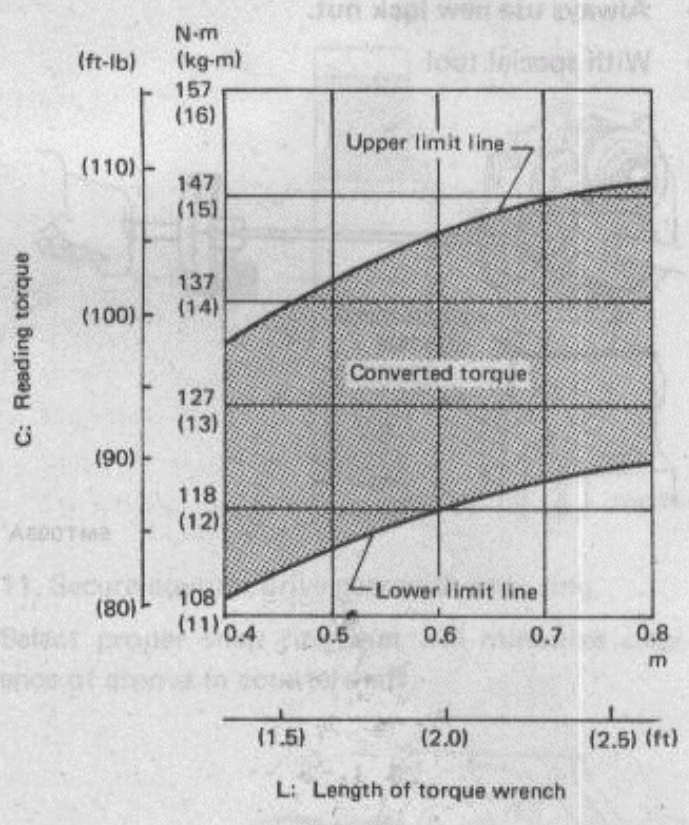


SMT003A

Gears and Shafts (Cont'd)

Using the following chart
(Length of torque wrench vs. setting or reading torque)



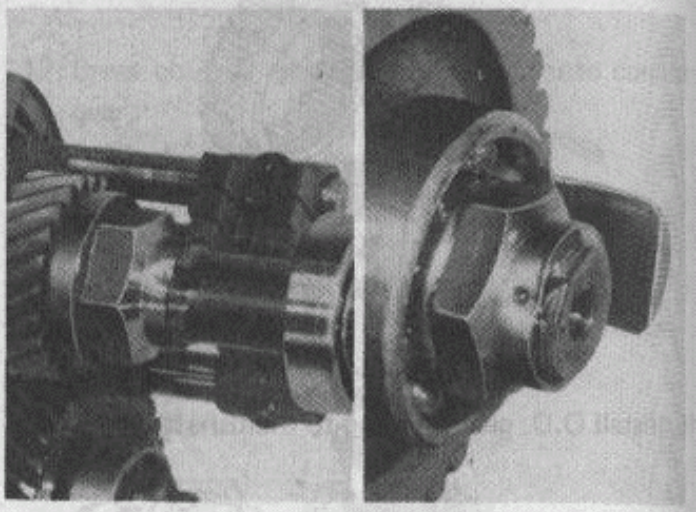


20. Tighten countershaft lock nut.

- **Always use new lock nut.**

21. Stake mainshaft lock nut and countershaft lock nut with a punch.

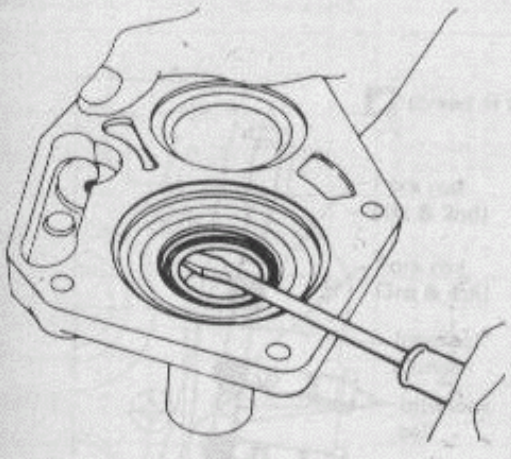
Mainshaft lock nut **Countershaft lock nut**



22. Measure gear end play. For the description, refer to Disassembly of Gears and Shafts.

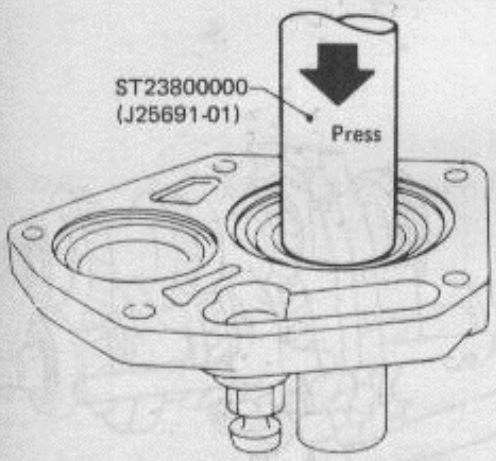
Oil Seals

FRONT COVER OIL SEAL



SMT035

- Be careful not to damage lip of oil seal.

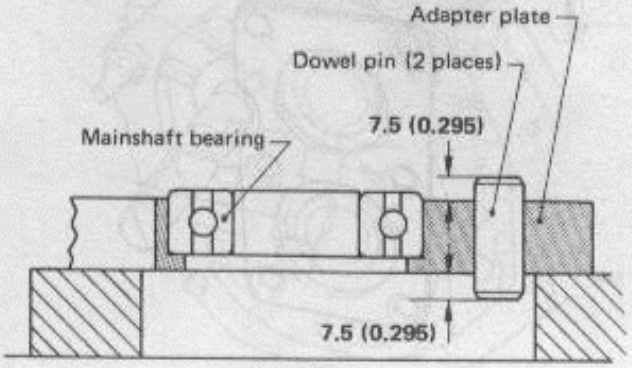


SMT036

Adapter Plate

- When replacing adapter plate parts, use the following procedures.

DOWEL PIN

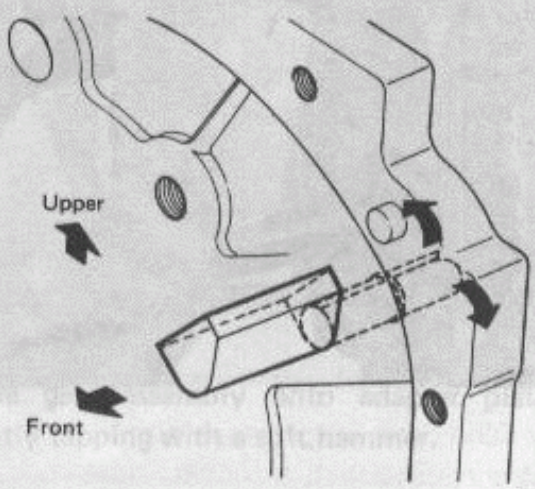


Unit: mm (in)

SMT027

OIL GUTTER

Install oil gutter on adapter plate and expand on rear side.

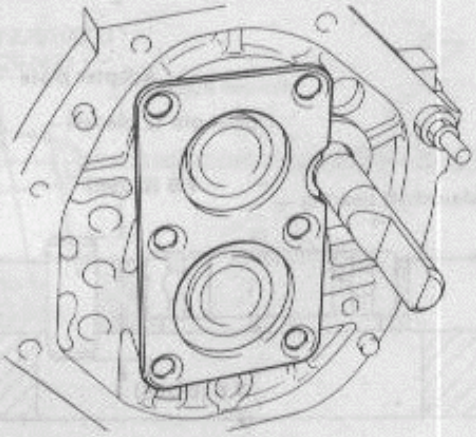


SMT153A

Adapter Plate (Cont'd)

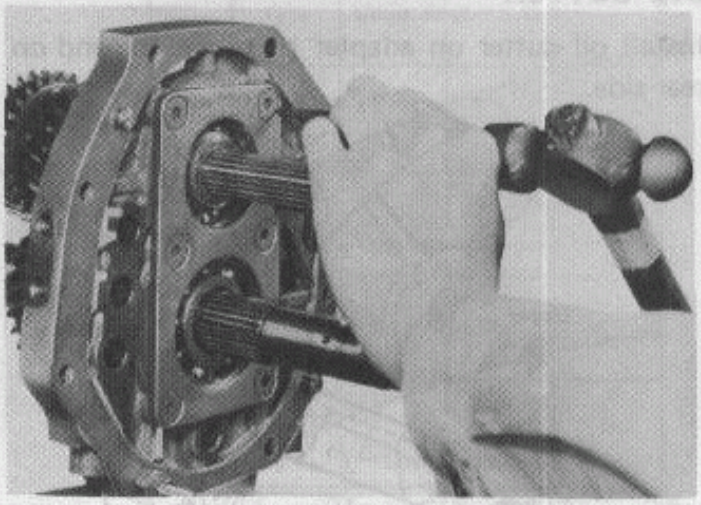
BEARING RETAINER

1. Insert reverse shaft, then install bearing retainer.

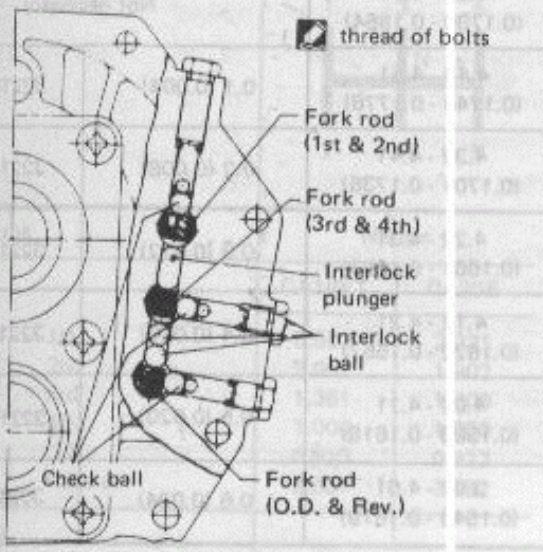


SMT028

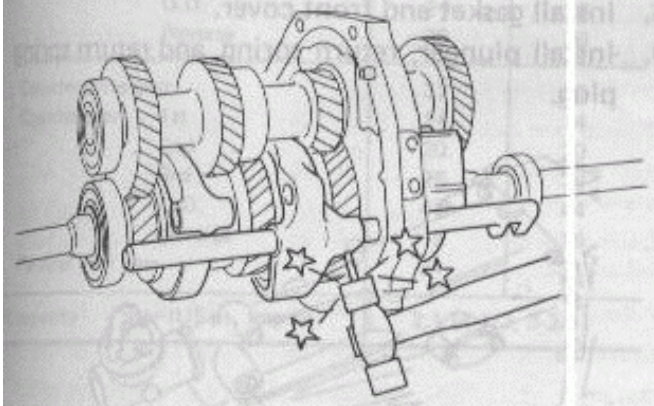
2. Tighten each screw, then stake it at two points.



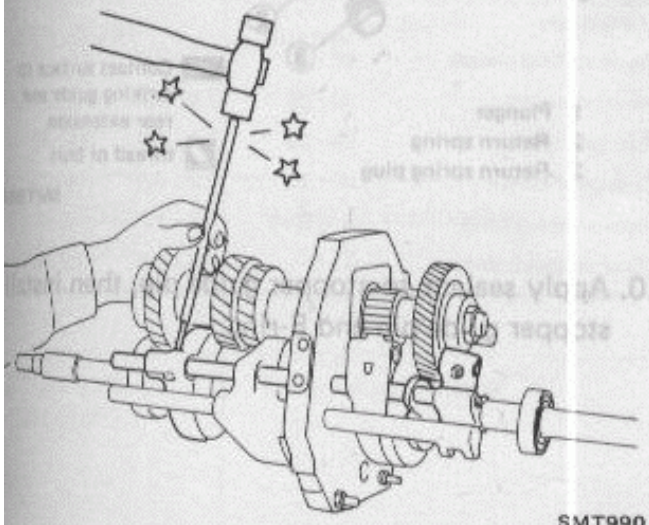
1. Install shift rods, interlock balls and check balls.



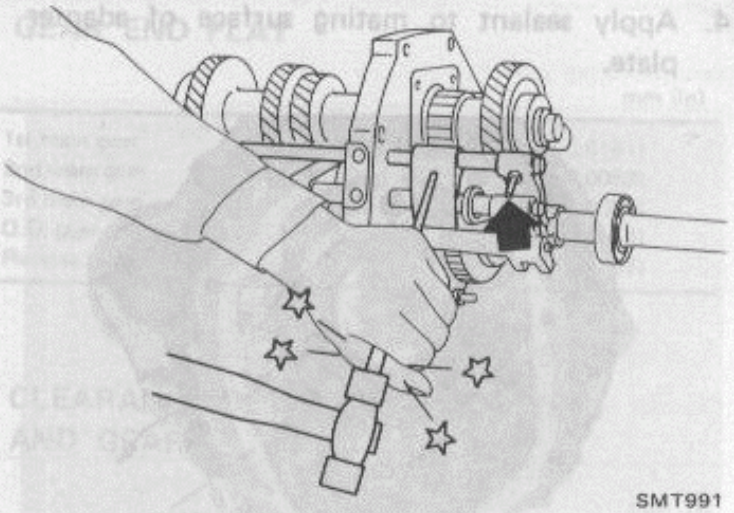
SMT992



SMT989

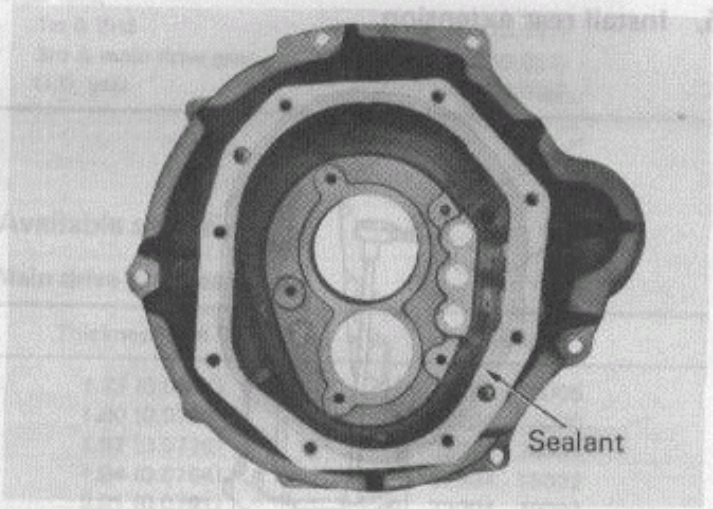


SMT990

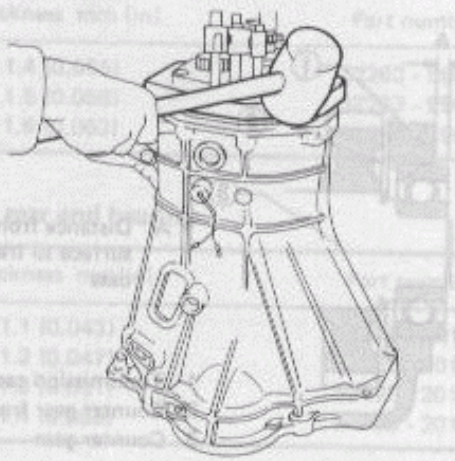


SMT991

2. Apply sealant to mating surface of transmission case.

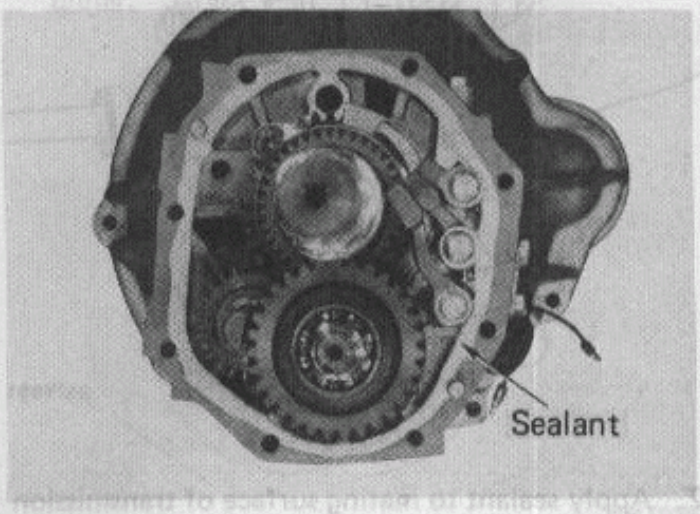


3. Slide gear assembly onto adapter plate by lightly tapping with a soft hammer.

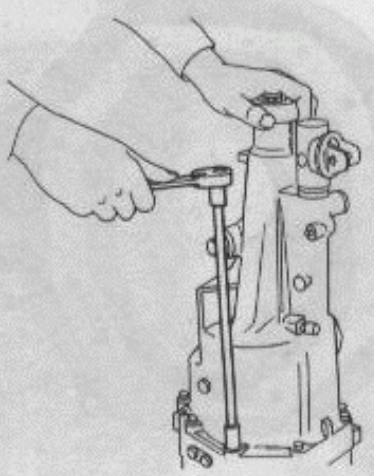


SMT013

4. Apply sealant to mating surface of adapter plate.

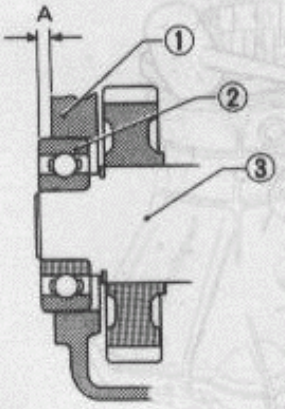


5. Install rear extension.



SMT368

6. Fit main drive bearing snap ring.
7. Select countershaft front bearing shim.



A: Distance from bearing surface to transmission case

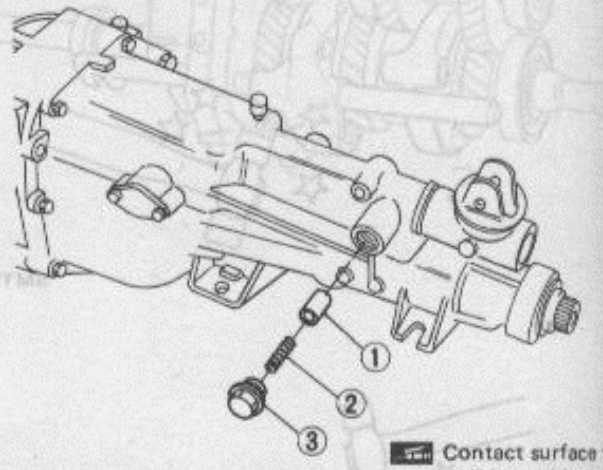
1 Transmission case
2 Counter gear front bearing
3 Counter gear

TM371

Unit: mm (in)

"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

8. Install gasket and front cover.
9. Install plunger, return spring, and return spring plug.



1 Plunger
2 Return spring
3 Return spring plug

Contact surface to striking guide and rear extension

thread of bolt

SMT366

10. Apply sealant to stopper guide pin, then install stopper guide pin and E-ring.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

Transmission model		FS5W71B	
Shift pattern			
Synchromesh type		Warner	
Gear ratio		CA18ET	CA20E
	1st	3.592	3.321
	2nd	2.057	1.902
	3rd	1.361	1.308
	4th	1.000	1.000
	O.D.	0.813	0.833
	Reverse	3.657	3.382
Number of teeth			
Main drive gear		21	22
Main bear	1st	33	33
	2nd	27	27
	3rd	25	26
	O.D.	24	26
	Reverse	36	36
Counter drive gear		32	31
Counter gear	1st	14	14
	2nd	20	20
	3rd	28	28
	O.D.	45	44
	Reverse	15	15
Reverse idler gear		21	21
Oil capacity liter (US pt, Imp pt)		2.1 (4-1/2, 3-3/4)	

Inspection and Adjustment

GEAR END PLAY

	mm (in)
1st main gear	0.31 - 0.41 (0.0122 - 0.0161)
2nd main gear	0.11 - 0.21 (0.0043 - 0.0083)
3rd main gear	0.11 - 0.21 (0.0043 - 0.0083)
O.D. gear	0.32 - 0.39 (0.0126 - 0.0154)
Reverse idler gear	0.05 - 0.50 (0.0020 - 0.0197)

CLEARANCE BETWEEN BAULK RING AND GEAR

	mm (in)
Standard	
1st & 2nd gear	1.00 - 1.60 (0.0394 - 0.0630)
3rd & main drive gear	1.20 - 1.50 (0.0472 - 0.0591)
O.D. gear	1.00 - 1.40 (0.0394 - 0.0551)
Wear limit	
1st & 2nd	0.8 (0.031)
3rd & main drive gear	0.8 (0.031)
O.D. gear	0.5 (0.020)

Available snap ring

Main drive gear bearing

Thickness mm (in)	Part number
1.73 (0.0681)	32204 - 78005
1.80 (0.0709)	32204 - 78000
1.87 (0.0736)	32204 - 78001
1.94 (0.0764)	32204 - 78002
2.01 (0.0791)	32204 - 78003
2.08 (0.0819)	32204 - 78004

Mainshaft front

Thickness mm (in)	Part number
1.4 (0.055)	32263 - E9000
1.5 (0.059)	32263 - E9001
1.6 (0.063)	32263 - E9002

Mainshaft rear end bearing

Thickness mm(in)	Part number
1.1 (0.043)	32228 - 20100
1.2 (0.047)	32228 - 20101
1.3 (0.051)	32228 - 20102
1.4 (0.055)	32228 - 20103

Inspection and Adjustment (Cont'd)

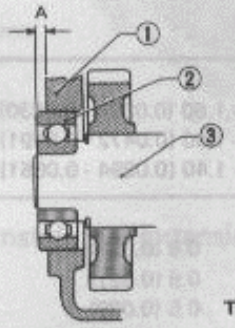
Counter drive gear

Thickness mm (in)	Part number
1.4 (0.055)	32215 - E9000
1.5 (0.059)	32215 - E9001
1.6 (0.063)	32215 - E9002

Available shim

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

Tightening Torque

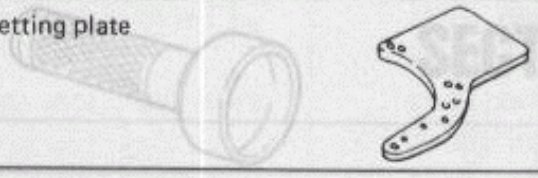
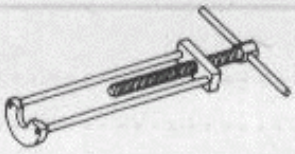
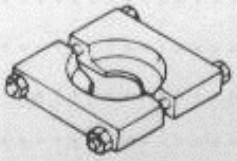
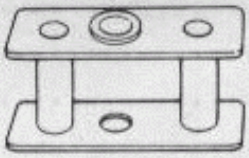
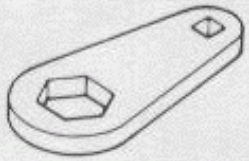
TRANSMISSION INSTALLATION

Unit	N·m	kg-m	ft-lb
Clutch operating cylinder	30 - 40	3.1 - 4.1	22 - 30
Transmission to engine	39 - 49	4.0 - 5.0	29 - 36
Gusset to transmission	29 - 39	3.0 - 4.0	22 - 29
Crossmember to body	31 - 42	3.2 - 4.3	23 - 31
Rear mounting insulator to crossmember	31 - 42	3.2 - 4.3	23 - 31
Rear mounting insulator to rear extension	31 - 42	3.2 - 4.3	23 - 31
Transmission case to rear extension	16 - 21	1.6 - 2.1	12 - 15
Starter motor to transmission	29 - 39	3.0 - 4.0	22 - 29

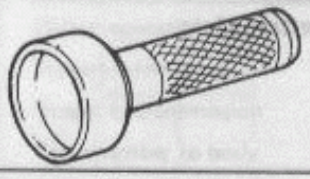
GEAR ASSEMBLY

Unit	N·m	kg-m	ft-lb
Bearing retainer to adapter plate	19 - 25	1.9 - 2.5	14 - 18
Mainshaft lock nut (without special tool)	137 - 167	14.0 - 17.0	101 - 123
Counter gear lock nut	98 - 127	10.0 - 13.0	72 - 94
Rear extension to transmission case	16 - 20	1.6 - 2.0	12 - 14
Front cover to transmission case	16 - 21	1.6 - 2.1	12 - 15
Filler plug	25 - 34	2.5 - 3.5	18 - 25
Drain plug	25 - 34	2.5 - 3.5	18 - 25
Ball pin	20 - 34	2.0 - 3.5	14 - 25
Striking lever lock nut	9 - 12	0.9 - 1.2	6.5 - 8.7
Check ball plug	19 - 25	1.9 - 2.5	14 - 18
Speedometer sleeve installation	4 - 5	0.4 - 0.5	2.9 - 3.6
Reverse lamp switch	20 - 29	2.0 - 3.0	14 - 22
Neutral switch	20 - 29	2.0 - 3.0	14 - 22
Top gear switch	20 - 29	2.0 - 3.0	14 - 22
O.D. gear switch	20 - 29	2.0 - 3.0	14 - 22
Return spring plug	8 - 10	0.8 - 1.0	5.8 - 7.2
Reverse check sleeve	4 - 5	0.4 - 0.5	2.9 - 3.6

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	
ST23810001 (–)	Adapter setting plate	
KV31100300 (J25689-A)	Fork rod pin punch	
KV32101330 (See J26349-A)	Bearing puller	
ST30031000 (J22912-01)	Bearing puller	
KV31100401 (–)	Transmission press stand	
ST23860000 (–)	Counter gear drift	
ST22360002 (J25679-01)	Bearing drift	
ST22520000 (J26348)	Wrench	
ST22350000 (J25678-01)	Mainshaft bearing drift	
ST23800000 (J25691-01)	Transmission adapter	

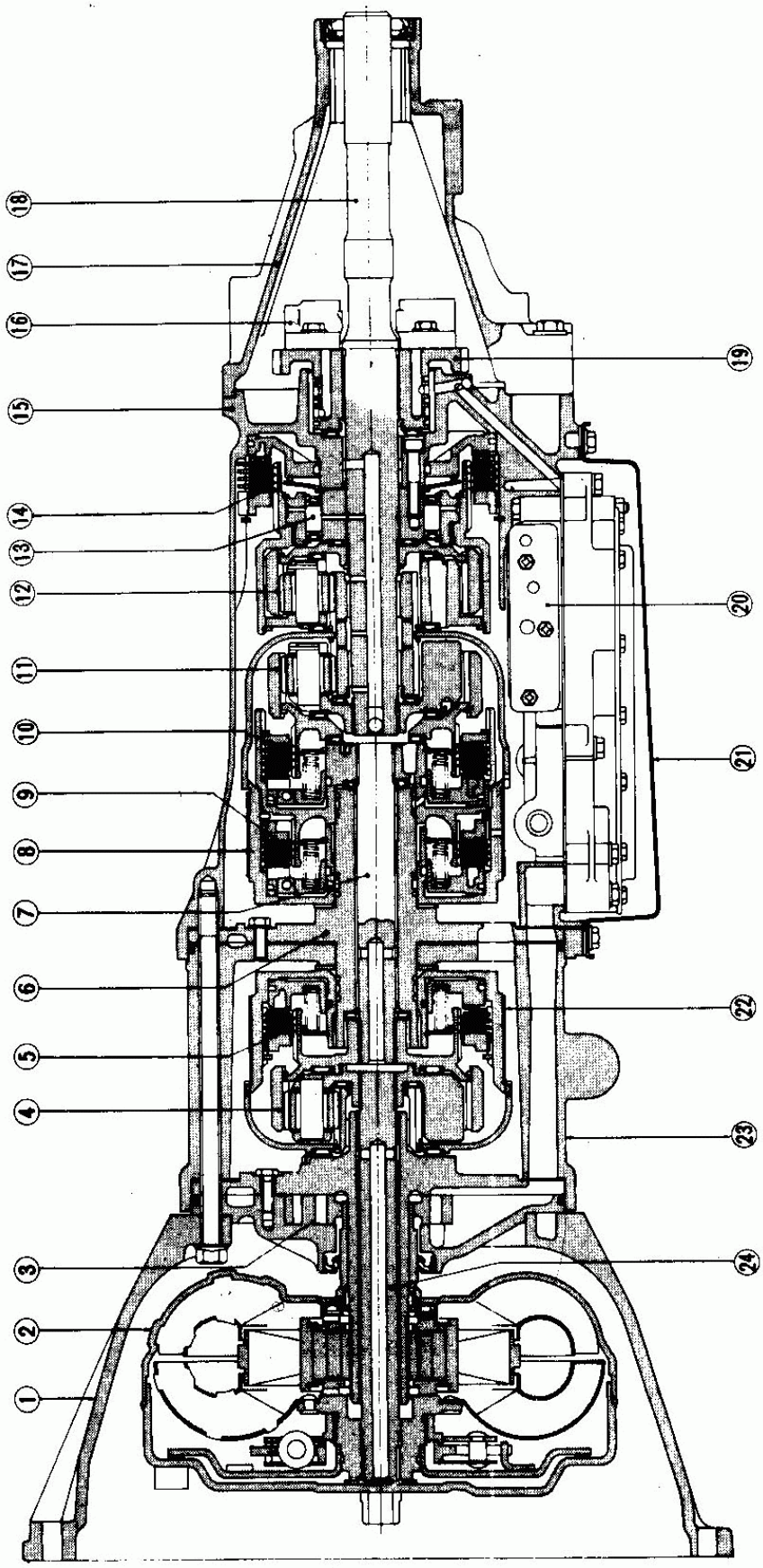
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	
ST33400001 (J26082)	Oil seal drift	
ST33290001 (J25810-A)	Bearing puller	

AUTOMATIC TRANSMISSION

SECTION AT

CONTENTS



1 Converter housing
2 Torque converter
3 Oil pump assembly
4 O.D. planetary gear
5 Direct clutch
6 Drum support
7 Intermediate shaft
8 2nd band brake
9 Front clutch
10 Rear clutch
11 Front planetary gear
12 Rear planetary gear
13 One-way clutch
14 Low & reverse clutch
15 Transmission case
16 Governor valve assembly
17 Rear extension
18 Output shaft
19 Oil distributor
20 Control valve assembly
21 Oil pan
22 O.D. band brake
23 O.D. case
24 Input shaft

SAT40

GENERAL SERVICE NOTICE

Repair Notes

Before proceeding with disassembly, thoroughly clean the outside of the transmission. It is important to prevent the internal parts of the transmission from becoming contaminated by dirt or other foreign matter.

Disassembly should be done in a clean work area.

Use a nylon cloth or paper towel for wiping parts clean. Common shop rags can leave lint that might interfere with the transmission operation.

When disassembling parts, be sure to place them in order in parts rack so they can be put back in 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. It is also very important to perform functional tests whenever it is designated.

The valve body contains many precision parts and requires extreme care when parts are removed and serviced. Place removed parts 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.

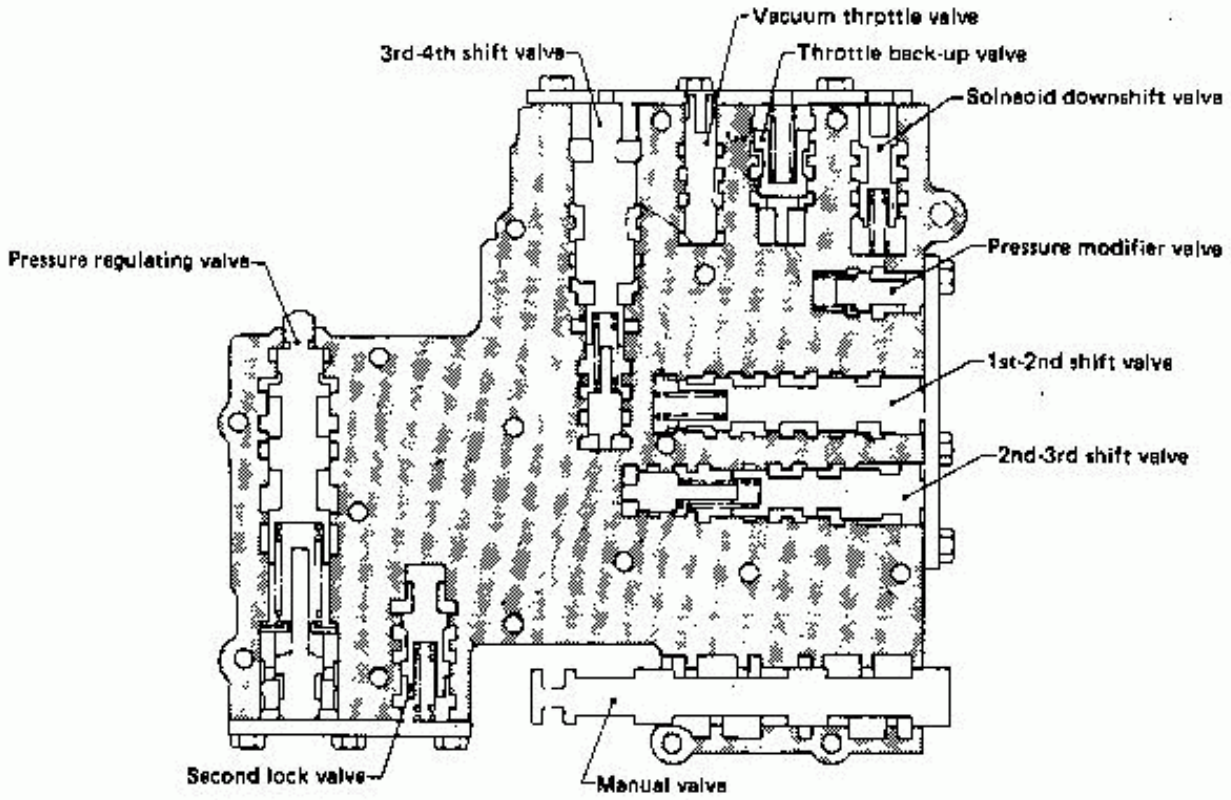
- Before assembly, apply a coat of recommended A.T.F. to all parts. Vaseline may be applied to O-rings and seals. Do not use any grease.
- Care should be taken to avoid damaging O-rings, seals and gaskets when assembling.

Abbreviations used throughout this section stand for the following:

- A.T.F. ..... Automatic transmission fluid
- D_1 ..... Drive range 1st gear
- D_2 ..... Drive range 2nd gear
- D_3 ..... Drive range 3rd gear
- D_4 ..... Drive range 4th gear
- O.D. ..... Overdrive
- 1_2 ..... 1 range 2nd gear
- 1_1 ..... 1 range 1st gear

Control Valve

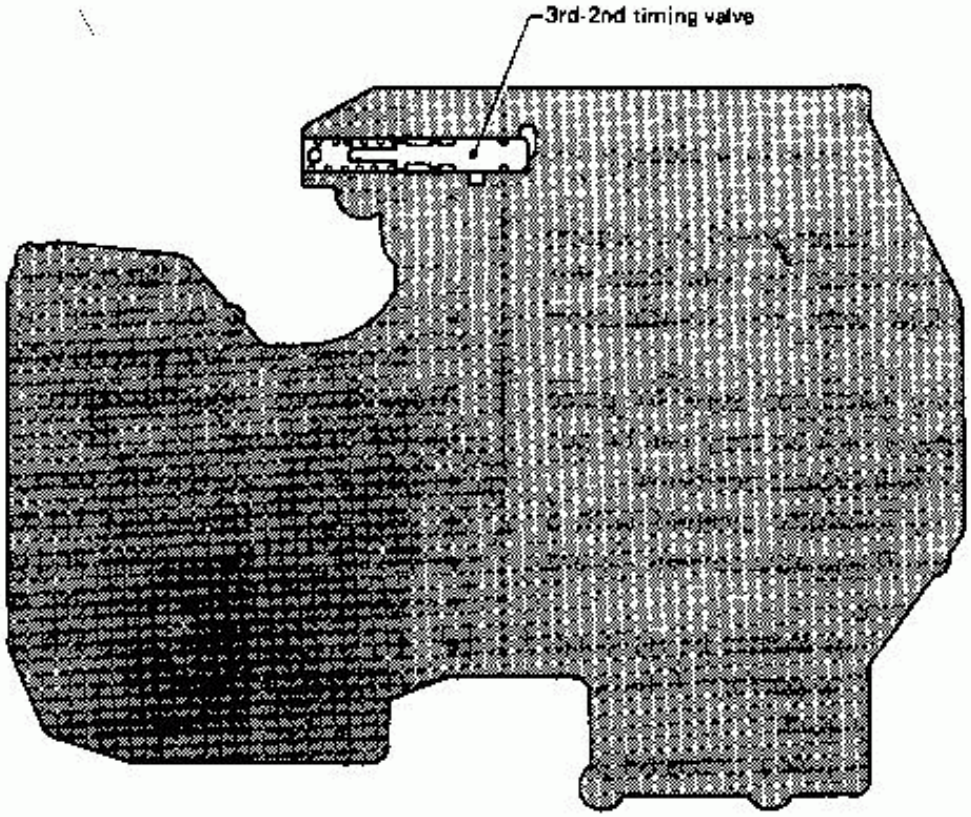
CONTROL VALVE UPPER BODY



SAT742

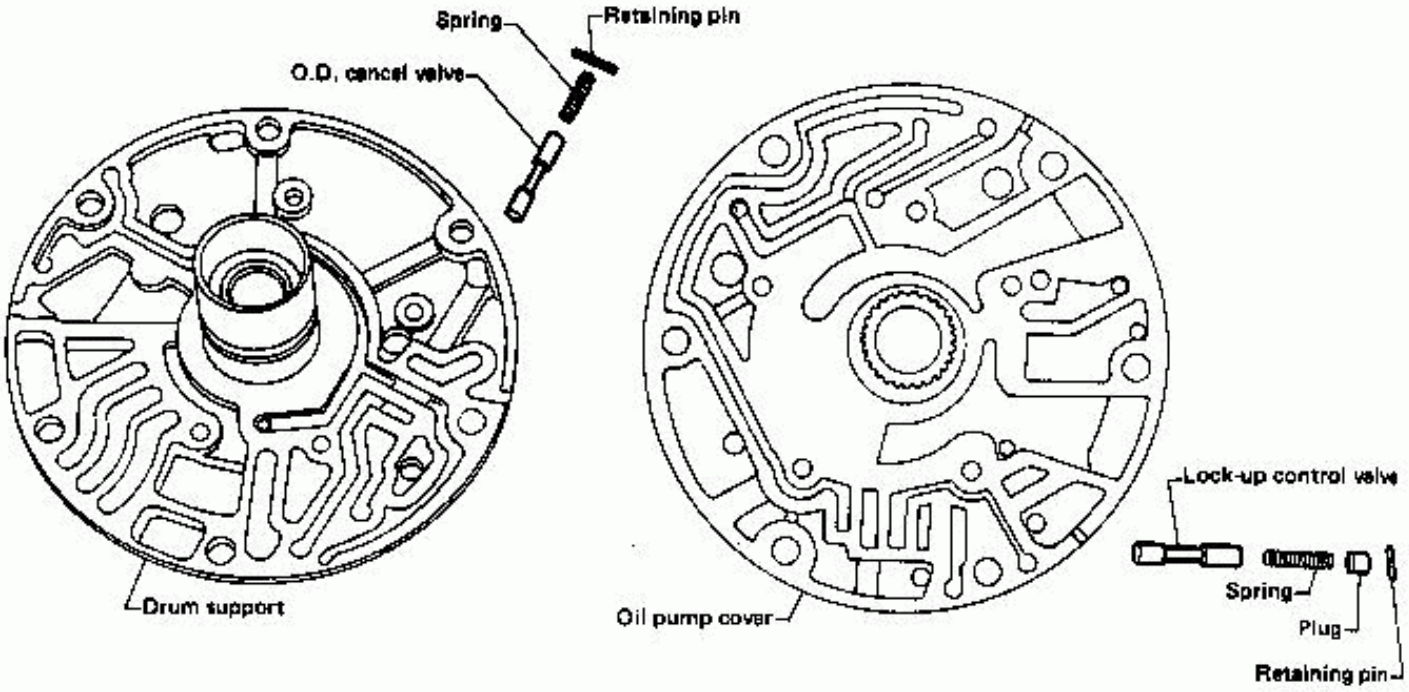
Control Valve (Cont'd)

CONTROL VALVE LOWER BODY



SAT706

Lock-up Control Valve and O.D. Cancel Valve



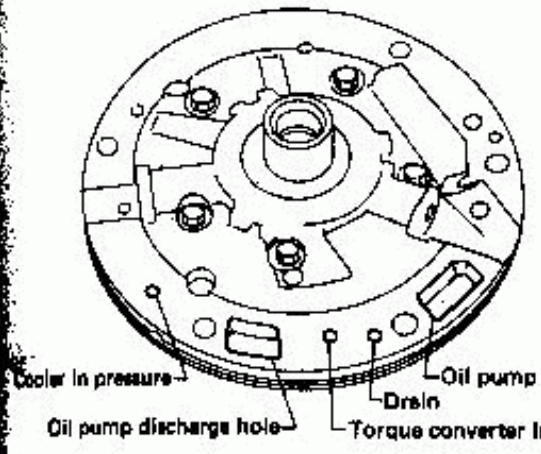
SAT498

Oil Channel

Oil channels which connect components are located in the areas shown below.

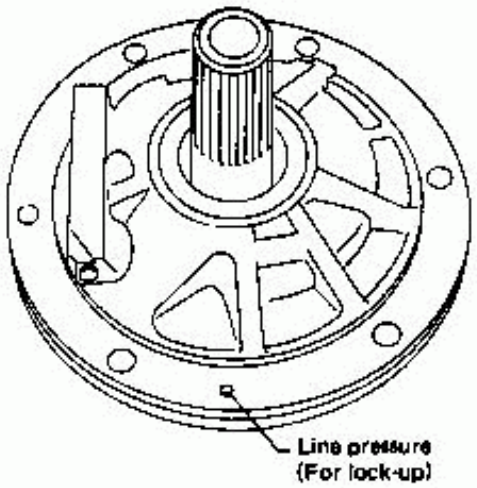
OIL CHANNELS IN OIL PUMP

Oil pump cover side



SAT499

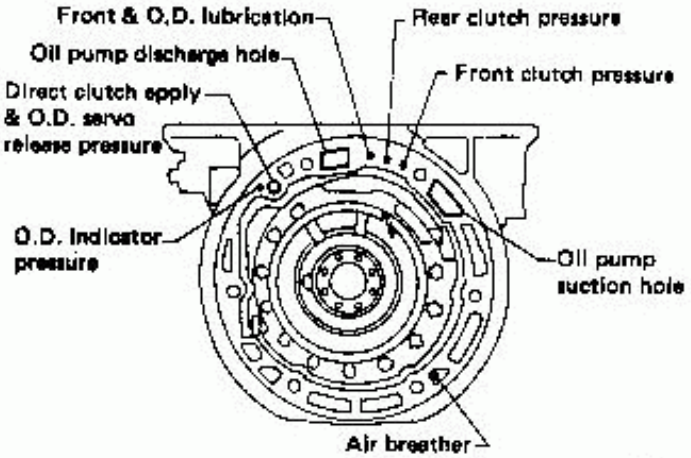
Oil pump housing side



SAT500

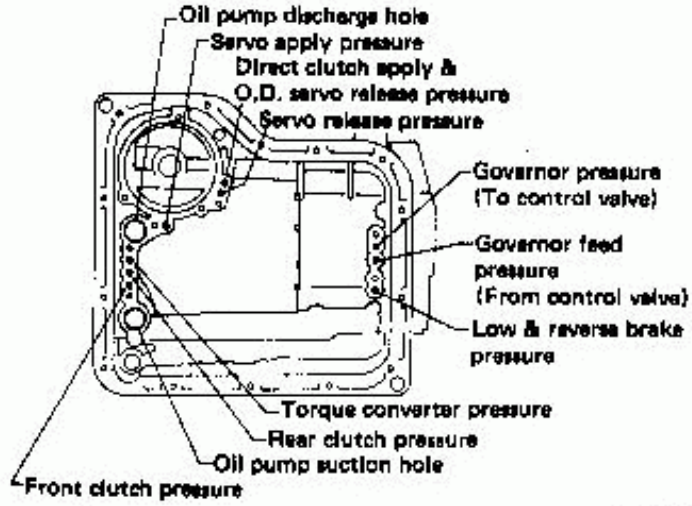
OIL CHANNELS IN TRANSMISSION CASE

Front face side



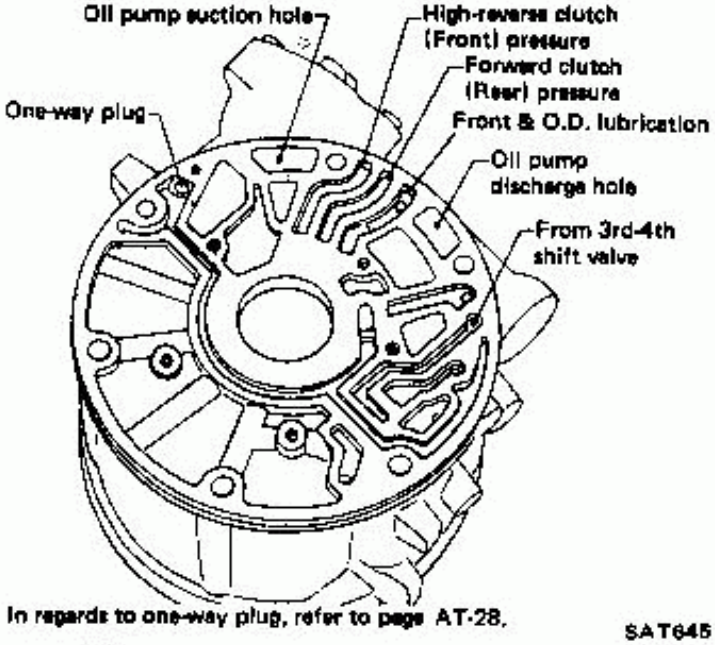
SAT501

Lower face side



SAT502

OIL CHANNELS IN O.D. CASE

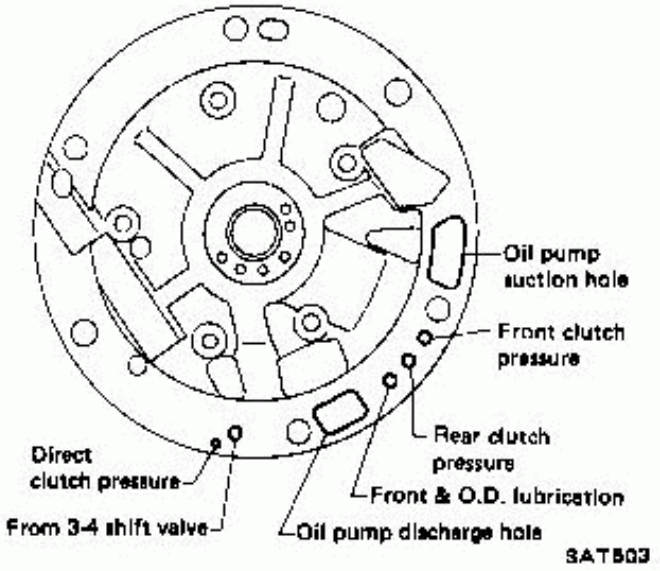


In regards to one-way plug, refer to page AT-28.

SAT645

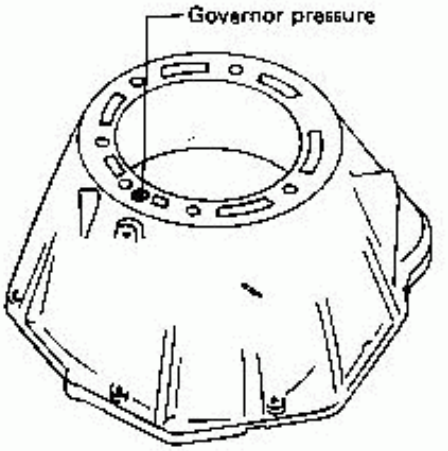
Oil Channel (Cont'd)

OIL CHANNELS IN DRUM SUPPORT



SAT503

OIL CHANNELS IN CONVERTER HOUSING



SAT504

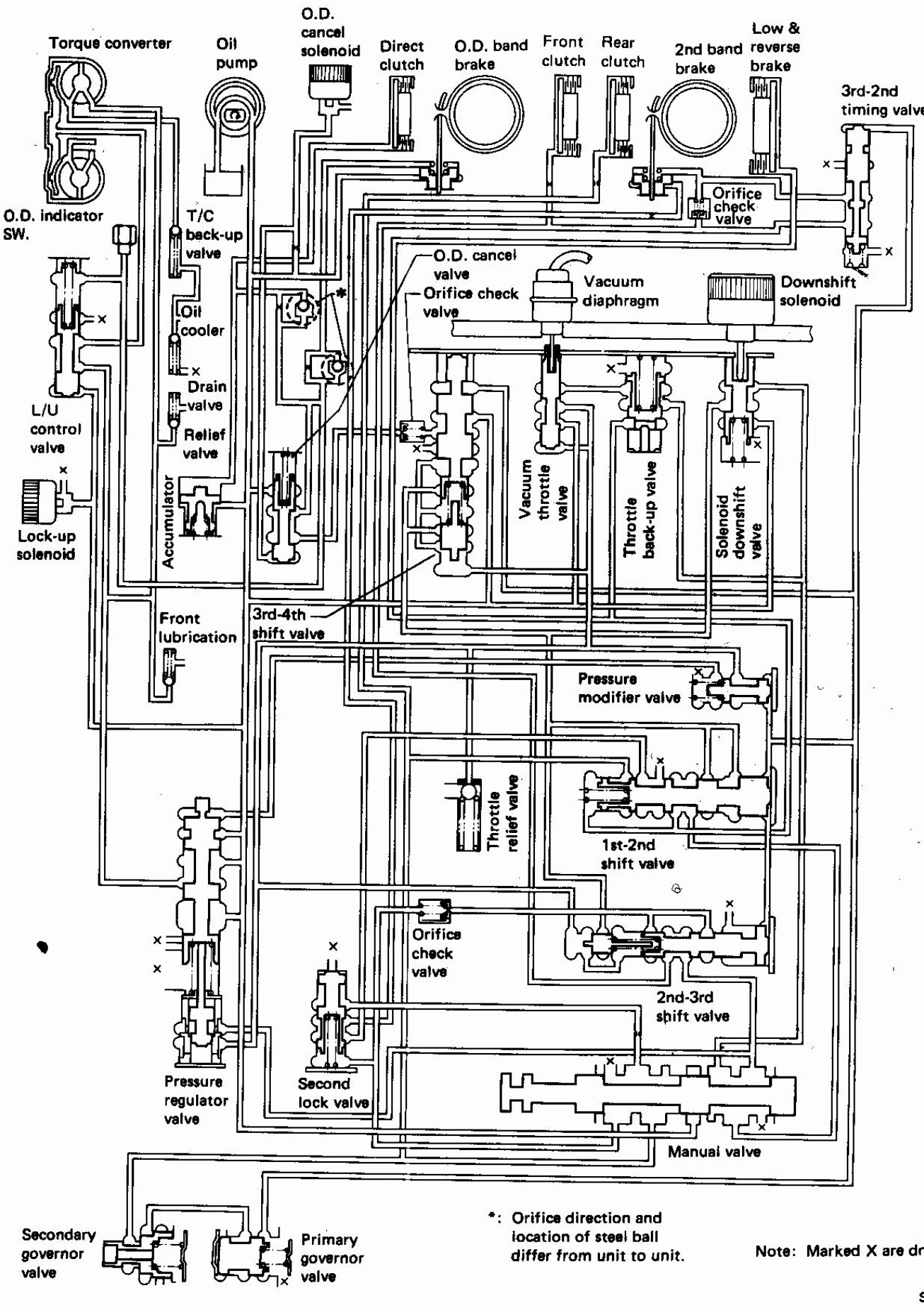
Mechanical Operation

In the L4N71B automatic transmission, each part operates as shown in the following table at each gear select position.

Range		Direct clutch	O.D. band servo		High-reverse clutch (Front)	Forward clutch (Rear)	Low & reverse brake	2nd band servo		One-way clutch	Parking pawl
			Apply	Release				Apply	Release		
Park		ON	(ON)	ON			ON				ON
Reverse		ON	(ON)	ON	ON		ON		ON		
Neutral		ON	(ON)	ON							
D	D_1 (Low)	ON	(ON)	ON		ON				ON	
	D_2 (Second)	ON	(ON)	ON		ON		ON			
	D_3 (Top)	ON	(ON)	ON	ON	ON		(ON)	ON		
	D_4 (O.D.)		ON		ON	ON		(ON)	ON		
2	Second	ON	(ON)	ON		ON		ON			
1	1_2 (Second)	ON	(ON)	ON		ON		ON			
	1_1 (Low)	ON	(ON)	ON		ON	ON			ON	

The low & reverse brake is applied in "1_1" range to prevent free wheeling when coasting and allows engine braking.

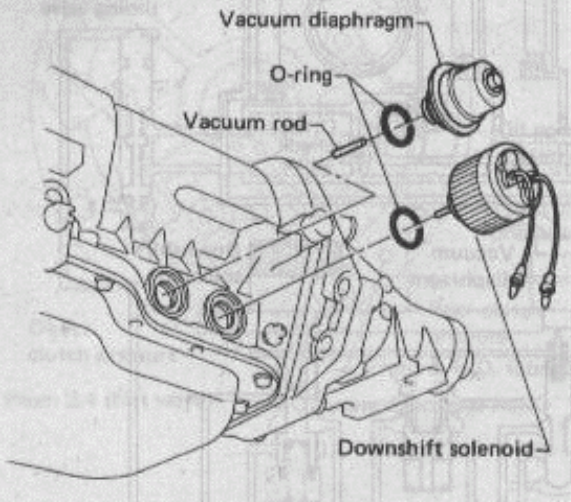
Hydraulic Control Circuits



Control Valve

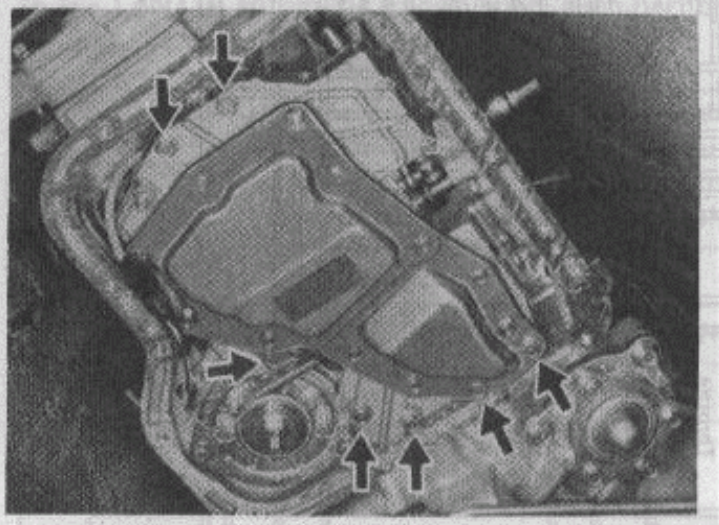
1. Drain fluid by removing oil pan.
2. Remove kickdown solenoid and vacuum diaphragm & rod.

Be careful not to lose vacuum rod.



SAT506

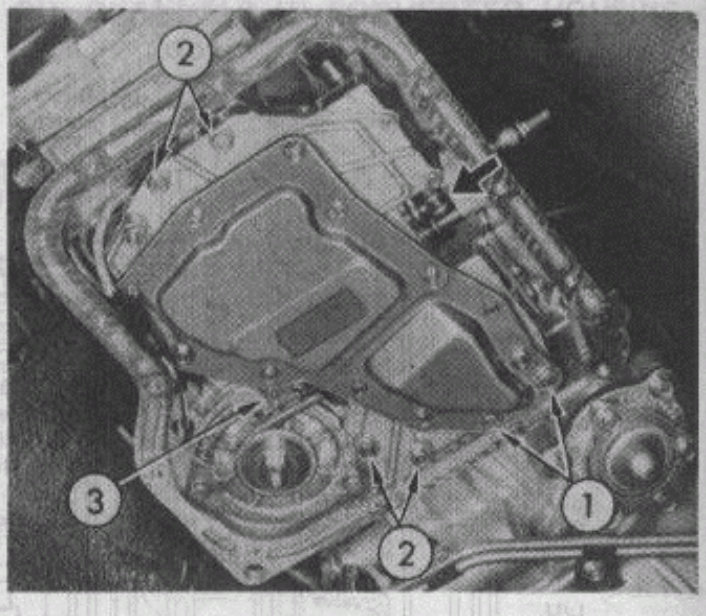
3. Remove control valve assembly.



Be careful not to drop manual valve out of valve body.

4. Disassemble, inspect and assemble control valve assembly. Refer to Control Valve Body.
5. Install control valve assembly.

- **Set manual shaft at Neutral, then align manual plate with groove in manual valve of control valve assembly.**
- **Securing bolts come in 3 different lengths.**



1 40 mm (1.57 in)
2 35 mm (1.38 in)
3 25 mm (0.98 in)

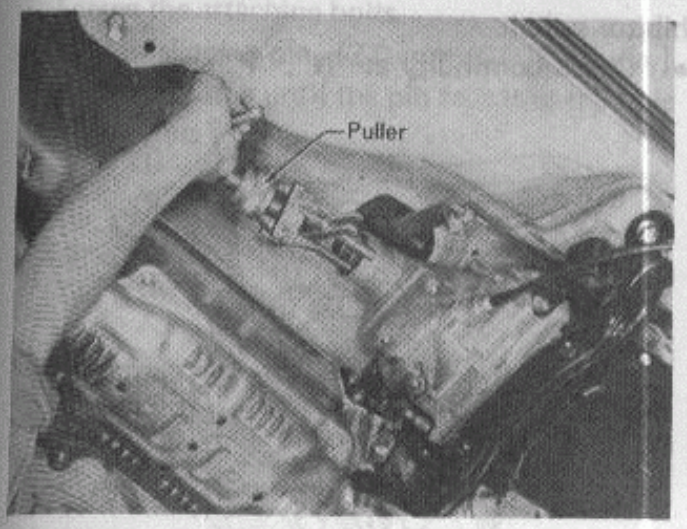
- **After installing control valve to transmission case, make sure that control lever can be moved to all positions.**

6. Install kickdown solenoid and vacuum diaphragm & rod.

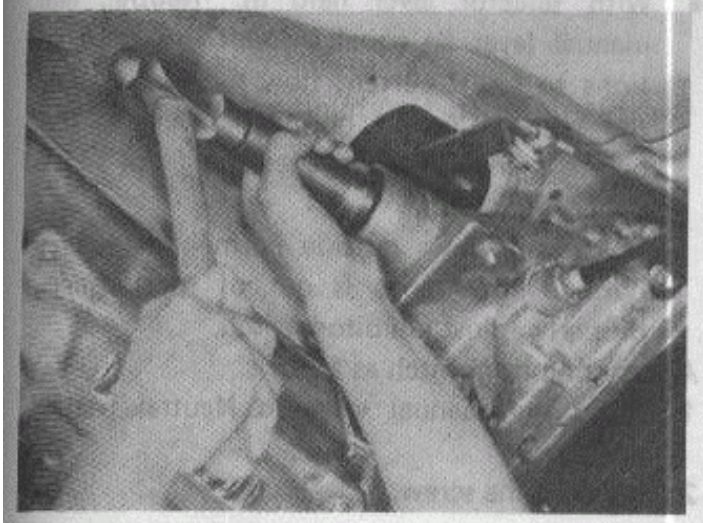
Make sure that vacuum diaphragm rod does not interfere with side plate of control valve.

Extension Oil Seal Replacement

1. Remove oil seal.



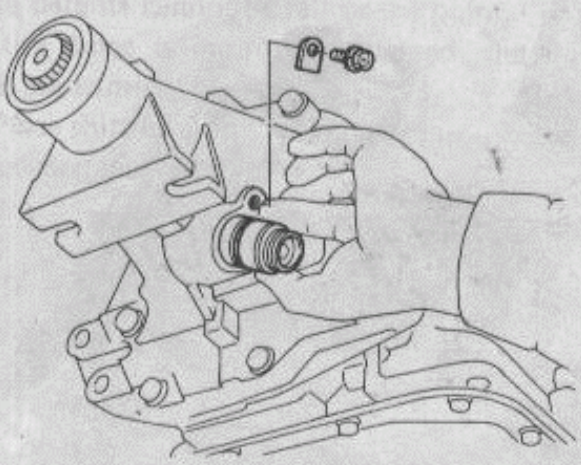
2. Apply coat of A.T.F. to oil seal surface, then drive new seal into place.



3. Coat sealing lips with vaseline, then install propeller shaft.

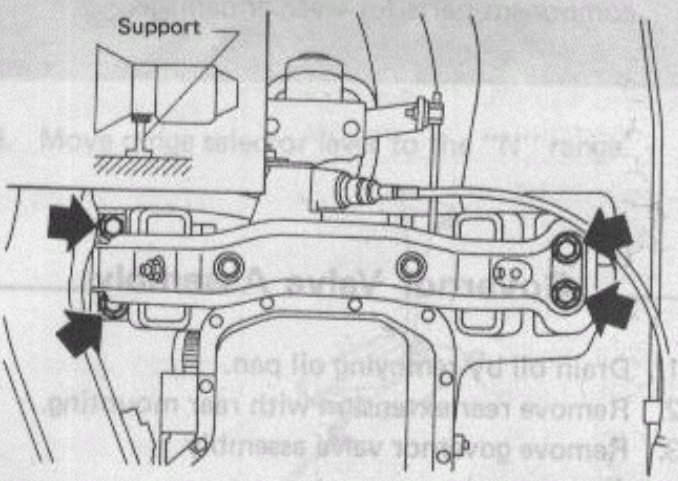
Parking Component

1. Remove oil pan.
2. Remove propeller shaft.
3. Remove speedometer pinion.



SAT511

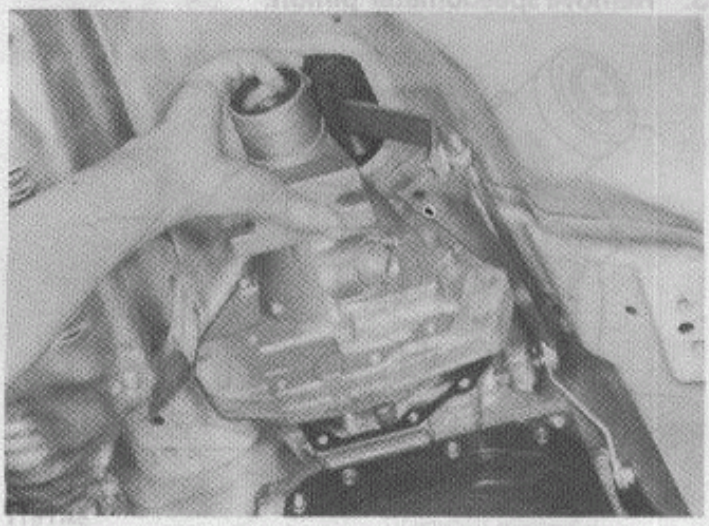
4. Support transmission with a jack, then remove rear mounting bolts.



SAT906

Parking Component (Cont'd)

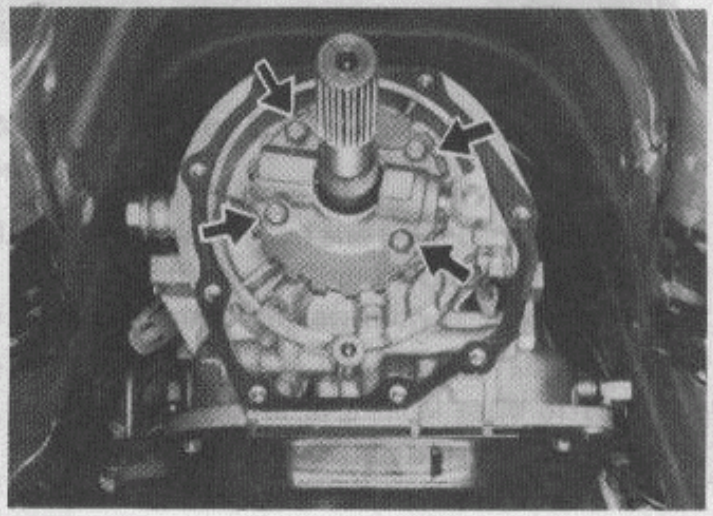
5. Remove rear extension bolts, then draw out rear extension with rear mounting.



6. Remove control valve assembly.
7. Inspect and repair parking components. Check component parts for wear or damage.

Governor Valve Assembly

1. Drain oil by removing oil pan.
2. Remove rear extension with rear mounting.
3. Remove governor valve assembly.

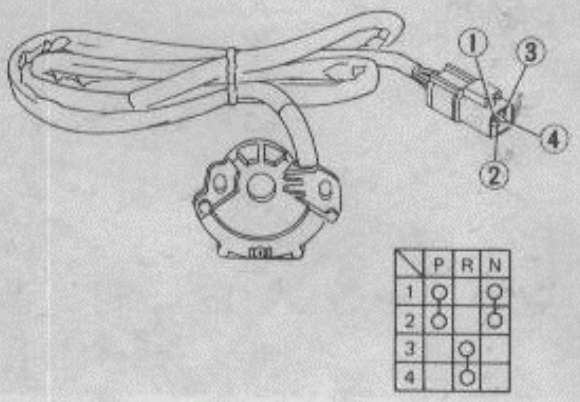


4. Inspect and repair governor valve assembly. Refer to Governor for inspection.

Inhibitor Switch Adjustment

Disconnect harness at connector, then remove inhibitor switch.

- Check continuity at "N", "P" and "R" ranges.

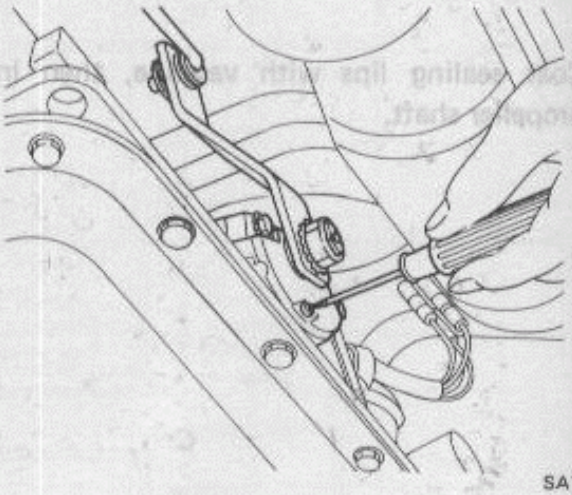


SAT920

- With selector lever held in "Neutral, turn manual lever an equal amount in both directions to see if current flow ranges are nearly the same. (Current normally begins to flow before manual lever reaches a angle of 1.5° in either direction.)
  If current flows outside normal range, or if normal flow range is out of specifications, properly adjust inhibitor switch.

Adjust inhibitor switch as follows:

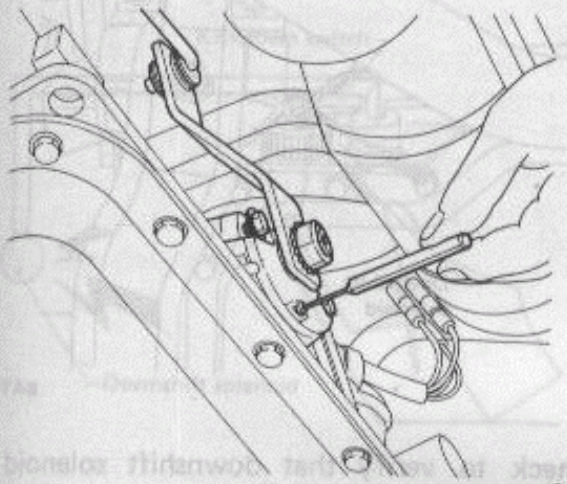
1. Place the manual valve in Neutral (vertical position).
2. Remove the screw.



SAT097

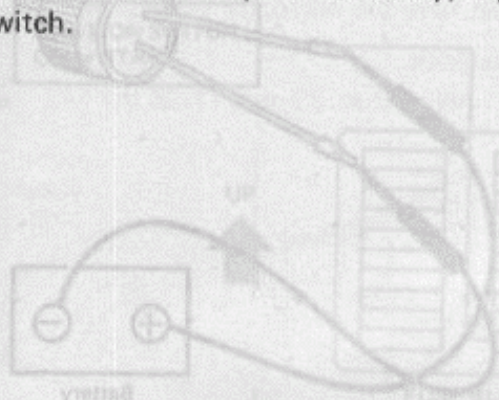
Inhibitor Switch Adjustment (Cont'd)

3. Loosen the attaching bolts.
4. With an aligning pin, [2.0 mm (0.079 in) dia.] move the switch until the pin falls into the hole in the rotor.



SAT098

5. Tighten the attaching bolts equally.
6. Recheck for continuity. If necessary, replace the switch.

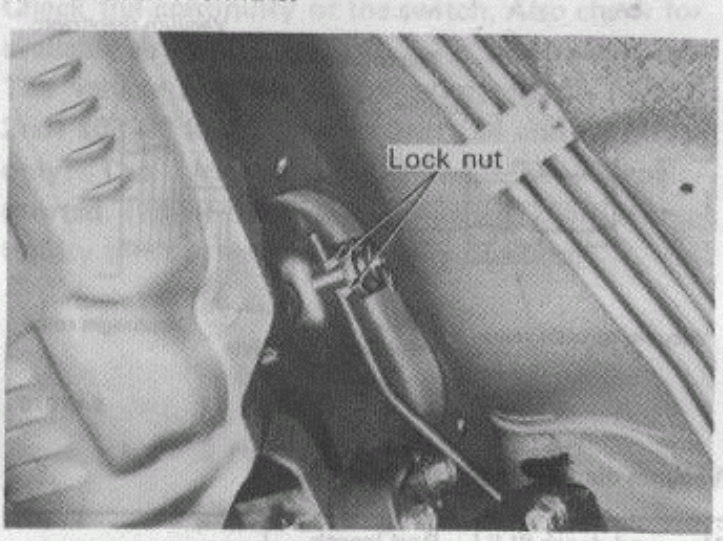


Manual Linkage Adjustment

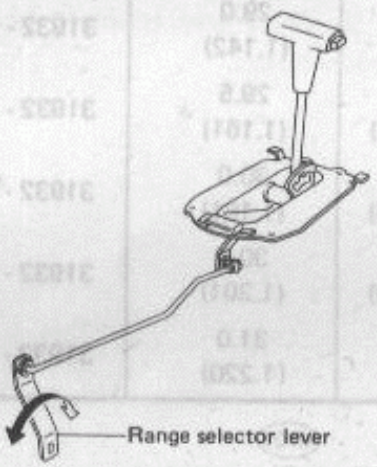
Move the shift lever from the "P" range to "Range 1". You should be able to feel the detents in each range.

If the detents cannot be felt or the pointer indicating the range is improperly aligned, the linkage needs adjustment.

1. Place shift lever in "N" range.
2. Loosen locknuts.



3. Move range selector lever to the "N" range.

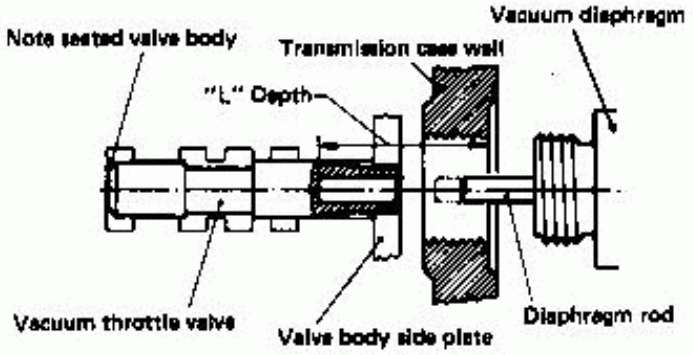


SAT741

4. Tighten lock nuts when floor selector lever is in "N" range pushing selector lever toward the "P" range side.
5. Move selector lever from "P" range to "1" range. Make sure that selector lever can move smoothly.

Vacuum Diaphragm Rod Adjustment

1. Remove diaphragm from transmission case.
2. With a depth gauge, measure depth "L". Be sure vacuum throttle valve is pushed into valve body as far as possible.
3. Check "L" depth with chart below and select proper length rod.



SAT078

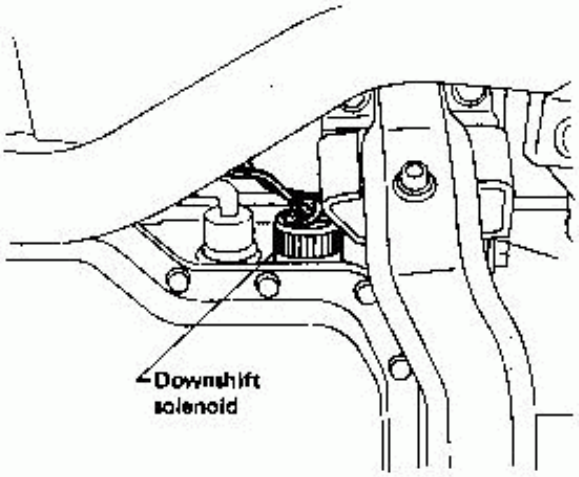
Vacuum diaphragm rod selection

Measured depth "L" mm (in)	Rod length mm (in)	Part number
Under 26.55 (1.0059)	29.0 (1.142)	31932 - X0103
26.65 - 26.05 (1.0098 - 1.0256)	29.5 (1.161)	31932 - X0104
26.15 - 26.55 (1.0295 - 1.0453)	30.0 (1.181)	31932 - X0100
26.65 - 27.05 (1.0492 - 1.0650)	30.5 (1.201)	31932 - X0102
Over 27.15 (1.0689)	31.0 (1.220)	31932 - X0101

Downshift Solenoid

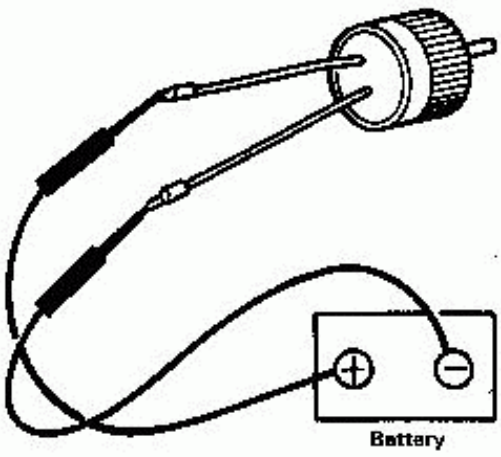
1. Remove downshift solenoid and O-ring.

Catch oil dropping out of the hole.



SAT516

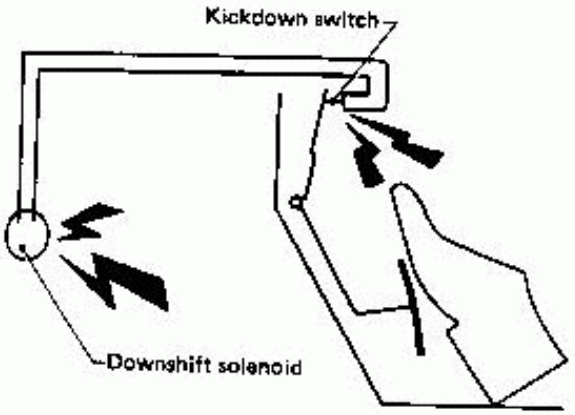
2. Check to verify that downshift solenoid is operating properly. If necessary, replace it with a new one.



SAT517

Kickdown Switch Adjustment

...en the pedal is fully depressed, a click can be ...rd just before the pedal bottoms out. If the ...k is not heard, loosen the locknut and extend ... switch until the pedal lever makes contact with ... switch and the switch clicks.

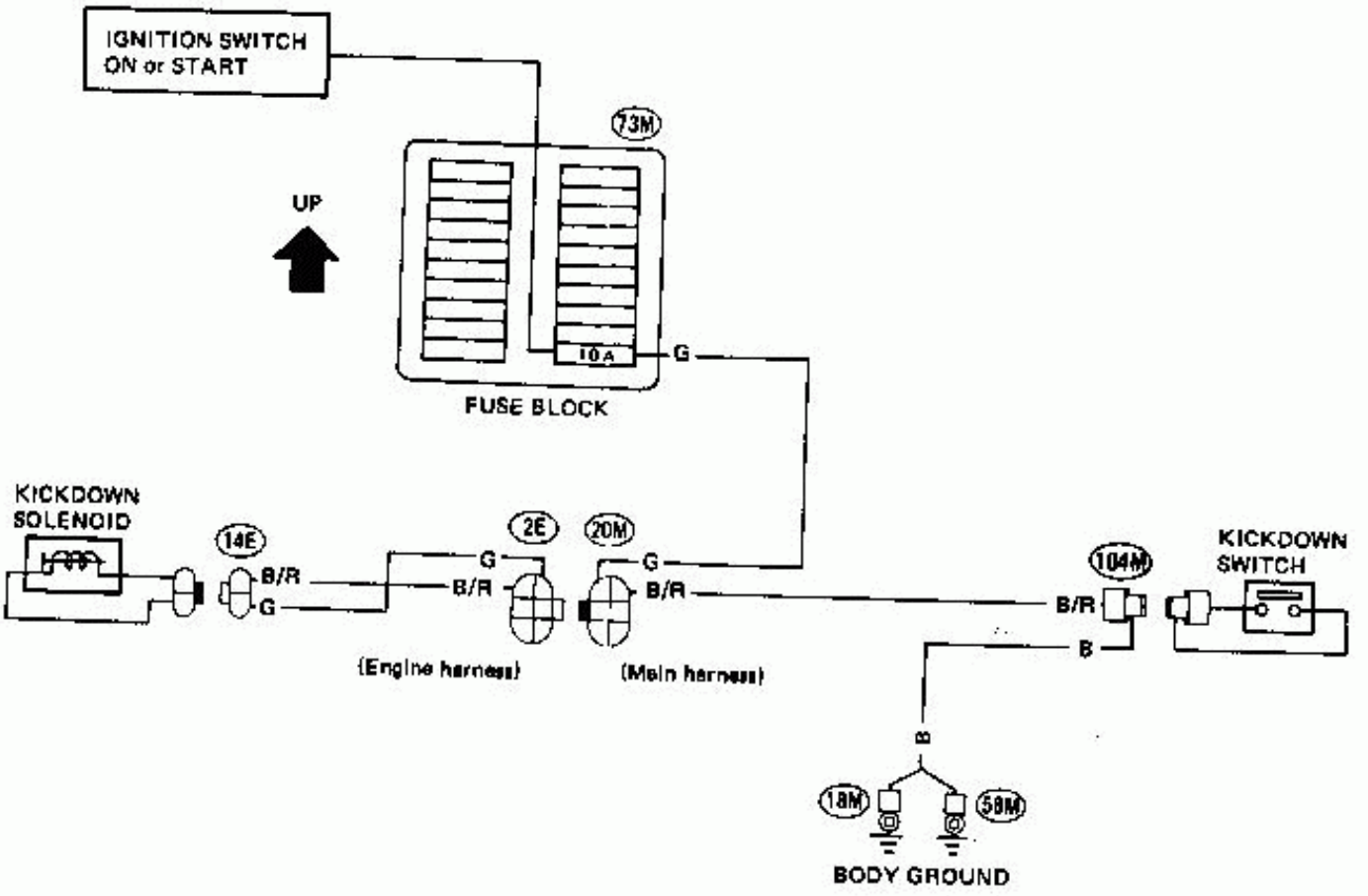


SAT718

Do not allow the switch to make contact too soon. This would cause the transmission to downshift on part throttle.

DIAGNOSIS:

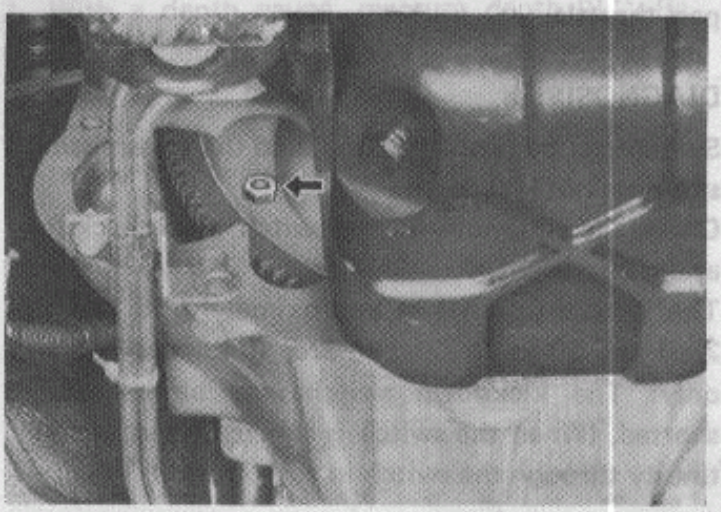
Switch can be heard clicking, and the transmission still does not kickdown:
Check the continuity of the switch. Also check for available current.
The vehicle upshifts at approximately 55 (1st to 2nd) and 90 km/h (2nd to 3rd) (34 and 56 MPH) only: The kickdown switch may be internally shorted. (When the switch is shorted, there is continuity through the switch in any position).



SAT271A

Removal

- Remove bolts securing torque converter to *drive plate.*



a. **Remove those bolts turning crank shaft.**
b. **Before removing torque converter, inscribe matching marks on two parts so that they may be replaced in their original positions during assembly.**

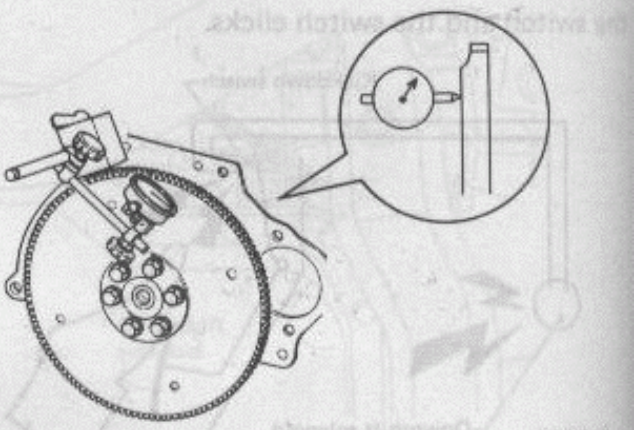
- Plug up openings such as oil charging pipe, etc.

CAUTION:
Take care not to strike any adjacent parts when dismounting transmission.

Installation

- Drive plate runout

Maximum allowable runout:
0.5 mm (0.020 in)

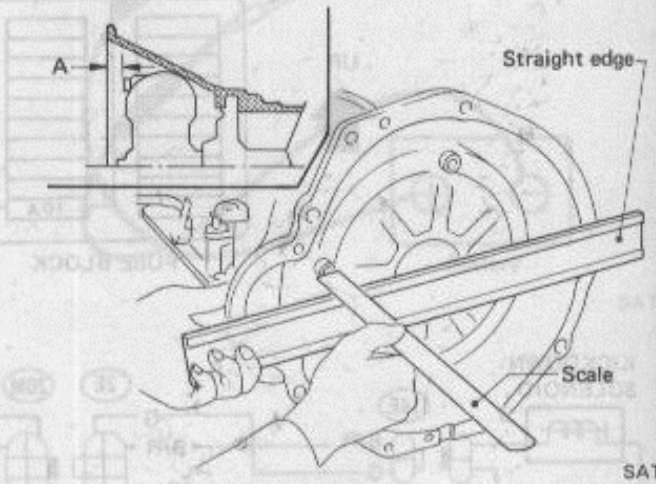


SAT718

If this runout is out of allowance, replace drive plate and ring gear.

- When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly assembled.

Distance "A":
More than 35 mm (1.38 in)



SAT618

- Install converter to drive plate.

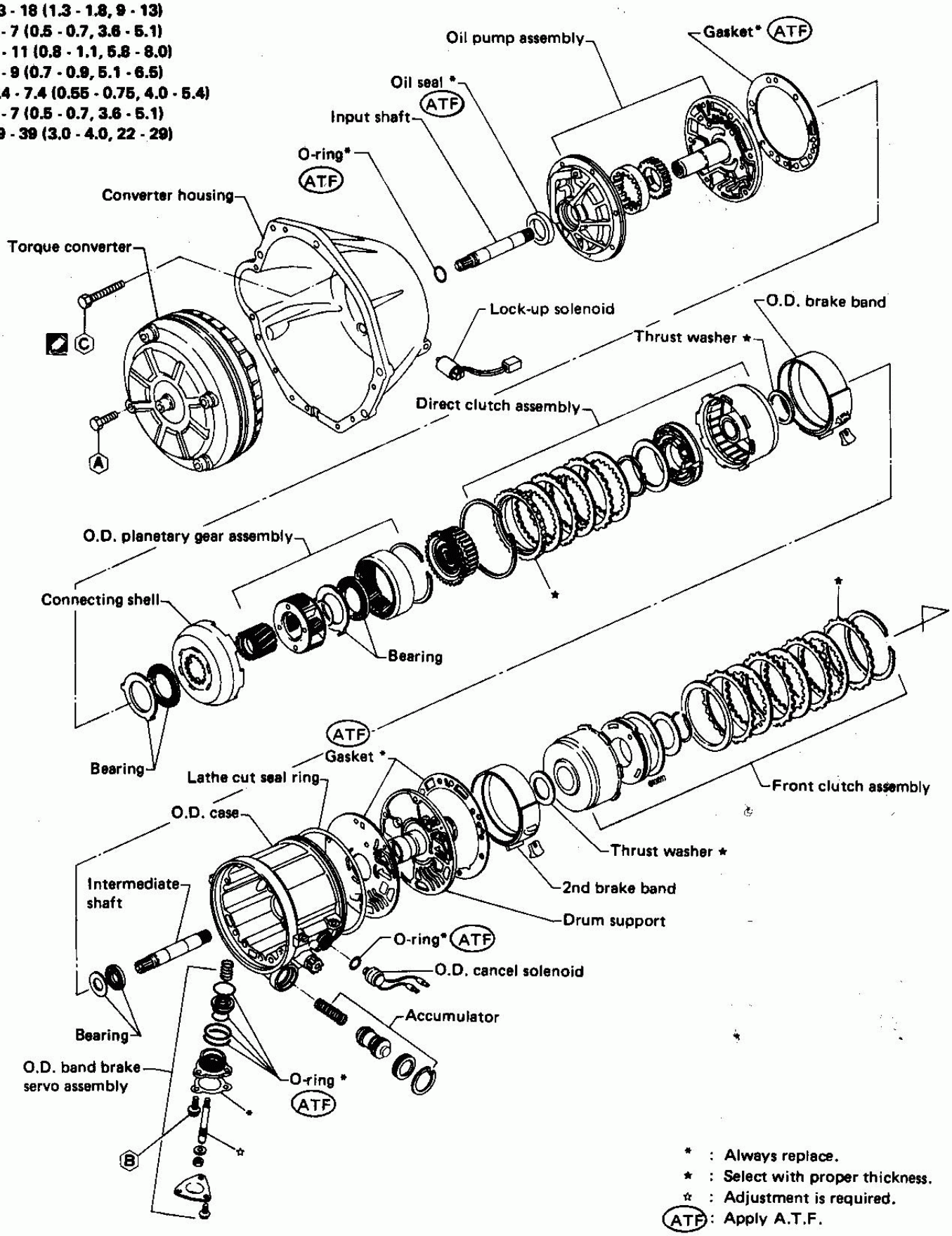
a. **Align matching marks painted across both parts during disassembly.**
b. **Before installing torque converter securing bolts, apply locking sealer to threads of bolts.**

- After converter is installed, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.

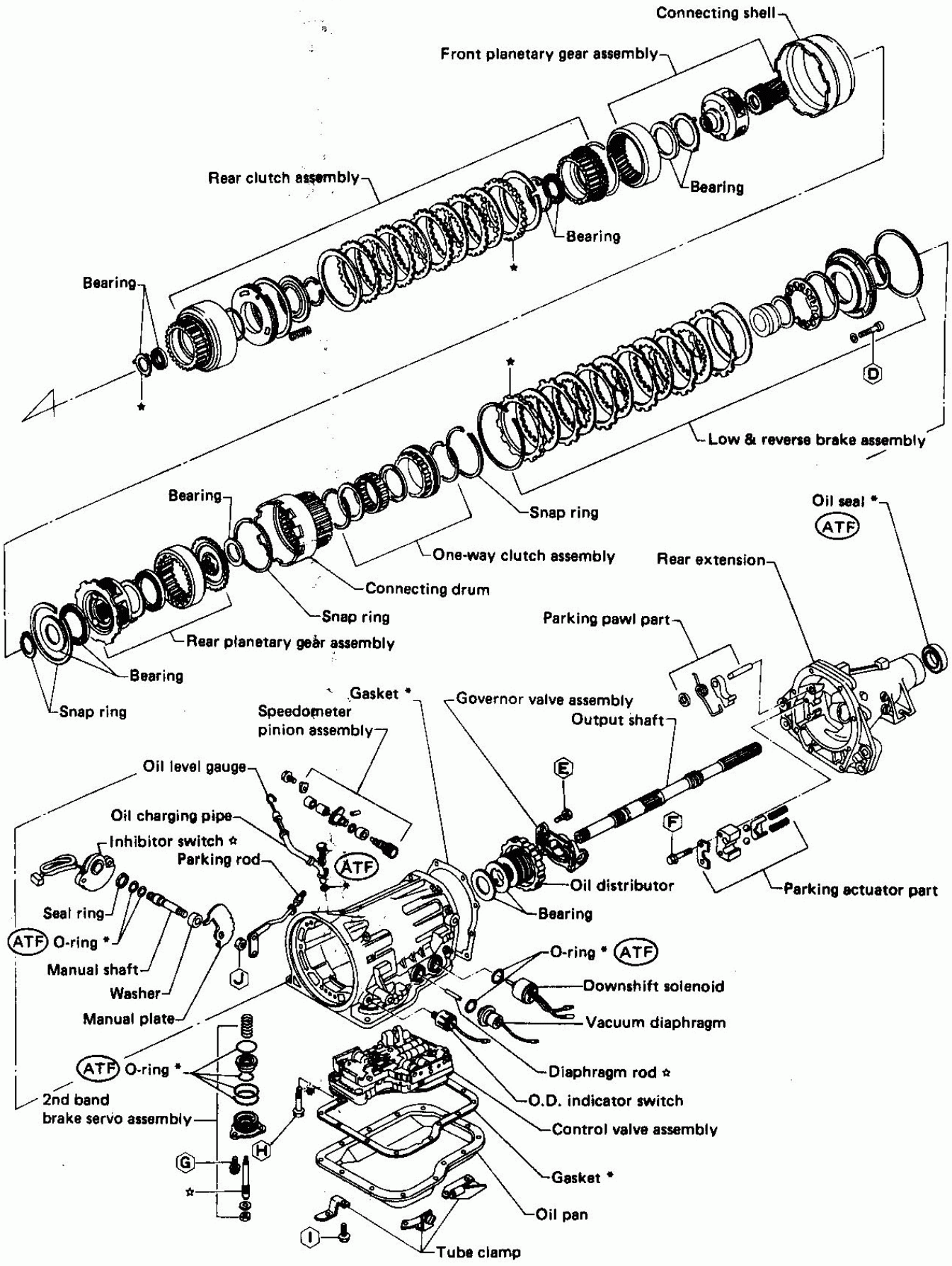
Installation (Cont'd)

Check inhibitor switch for operation.
Check fluid level in transmission.
Move selector lever through all positions to be sure that transmission operates correctly.
With parking brake applied, run engine at idle. 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.
Check to be sure that line pressure is correct. To do this, refer to Line Pressure Test.
Perform stall test.

: N·m (kg-m, ft-lb)
Ⓐ 39 - 49 (4.0 - 5.0, 29 - 36)
Ⓑ 10 - 15 (1.0 - 1.5, 7 - 11)
Ⓒ 44 - 54 (4.5 - 5.5, 33 - 40)
Ⓓ 13 - 18 (1.3 - 1.8, 9 - 13)
Ⓔ 5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Ⓕ 8 - 11 (0.8 - 1.1, 5.8 - 8.0)
Ⓖ 7 - 9 (0.7 - 0.9, 5.1 - 6.5)
Ⓗ 5.4 - 7.4 (0.55 - 0.75, 4.0 - 5.4)
Ⓘ 5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Ⓙ 29 - 39 (3.0 - 4.0, 22 - 29)

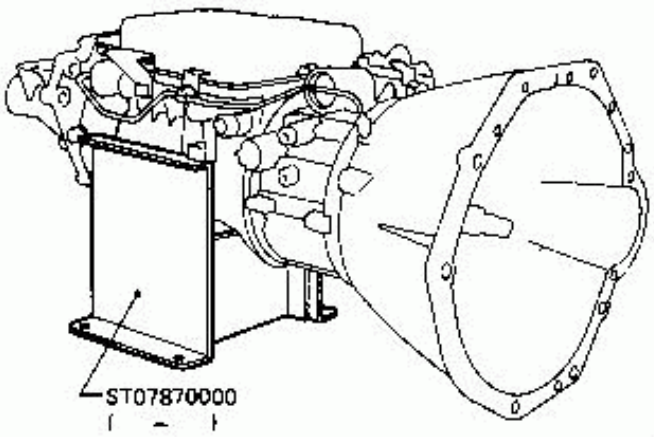


* : Always replace.
★ : Select with proper thickness.
☆ : Adjustment is required.
(ATF): Apply A.T.F.


Connecting shell
Front planetary gear assembly
Bearing
Rear clutch assembly
Bearing
Bearing
D
Low & reverse brake assembly
Bearing
Snap ring
One-way clutch assembly
Connecting drum
Snap ring
Rear planetary gear assembly
Bearing
Snap ring
Oil seal *
ATF
Rear extension
Parking pawl part
Gasket *
Governor valve assembly
Output shaft
Speedometer pinion assembly
Oil level gauge
E
Oil charging pipe
Inhibitor switch ☆
Parking rod
ATF
F
Oil distributor
Parking actuator part
Bearing
Seal ring
ATF O-ring *
Manual shaft
Washer
Manual plate
J
O-ring * ATF
Downshift solenoid
Vacuum diaphragm
ATF O-ring *
2nd band brake servo assembly
Diaphragm rod ☆
O.D. indicator switch
Control valve assembly
H
G
Gasket *
Oil pan
I
Tube clamp

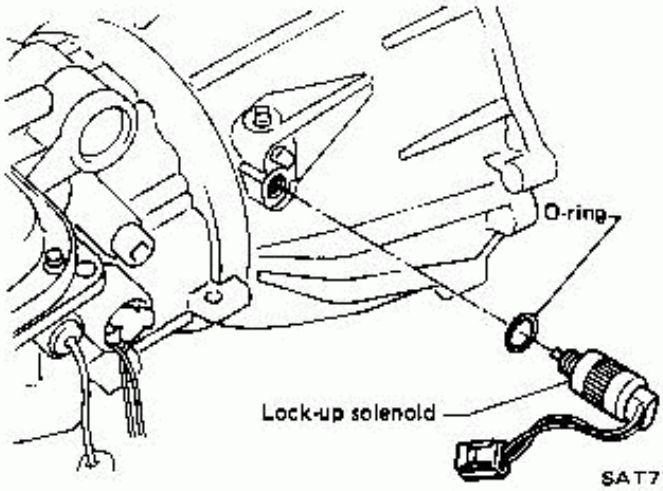
SAT922

1. Remove torque converter, drain A.T.F. through end of rear extension, and place transmission on Tool.



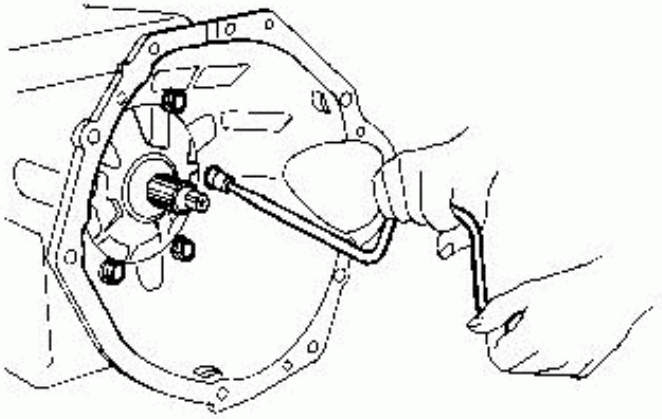
SAT520

2. Remove lock-up solenoid.



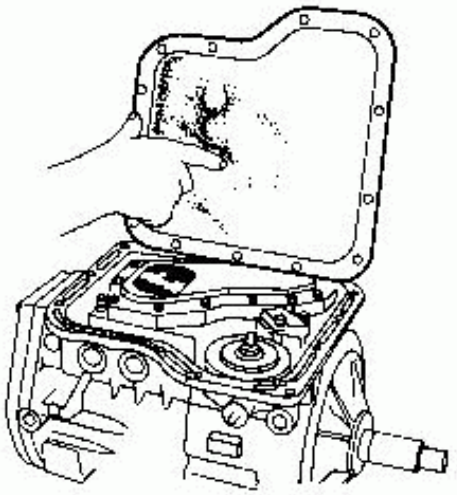
SAT714

3. Remove converter housing.



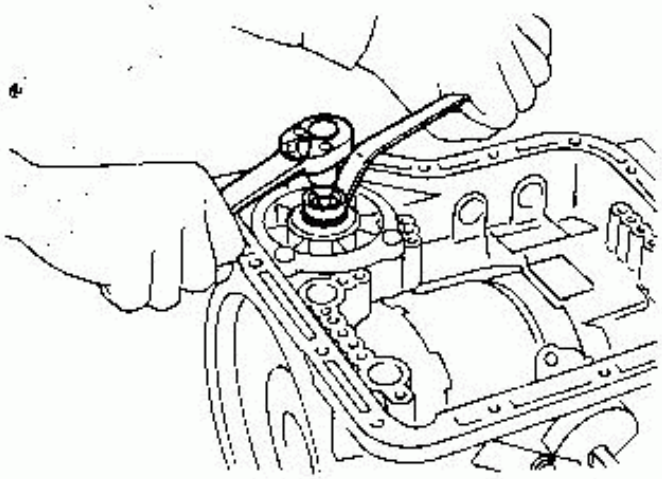
SAT003

4. Remove oil pan and inspect its contents. An analysis of any foreign matter can indicate the types of problems to look for. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band.) may need replacement. A tacky film that will not wipe clean indicates varnish build up which can cause valves, servo, and clutches to stick and may inhibit pump pressure.



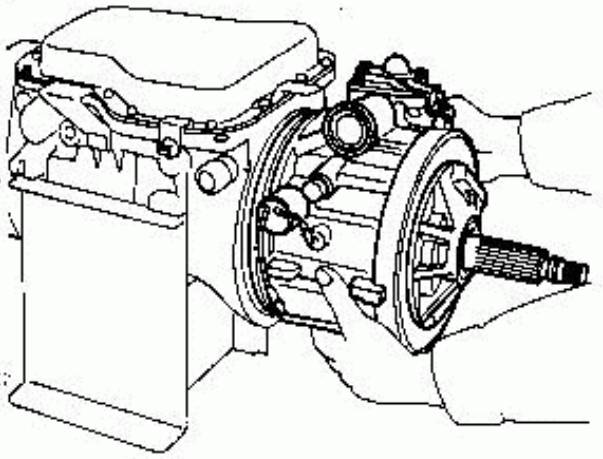
SAT006

5. Loosen 2nd band servo piston stem lock nut and tighten piston stem.



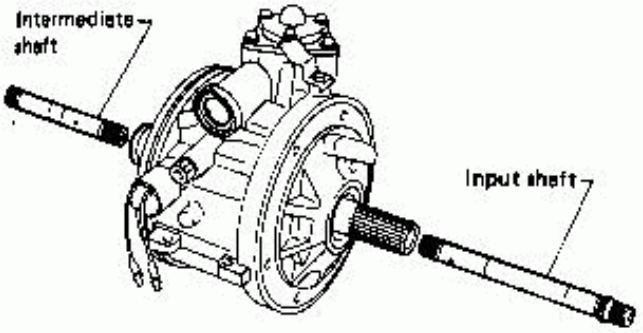
SAT718

6. Remove O.D. component assembly, then remove front clutch thrust washer and needle bearing & race.



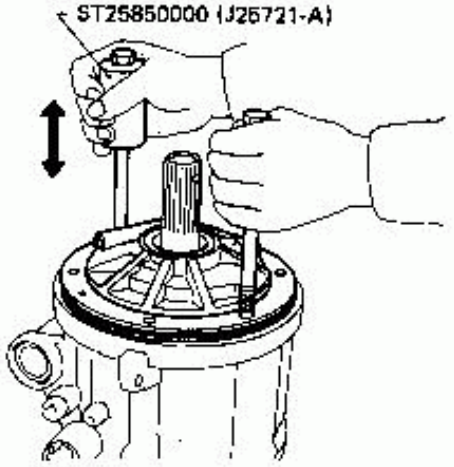
SAT522

7. Draw out input shaft and intermediate shaft.



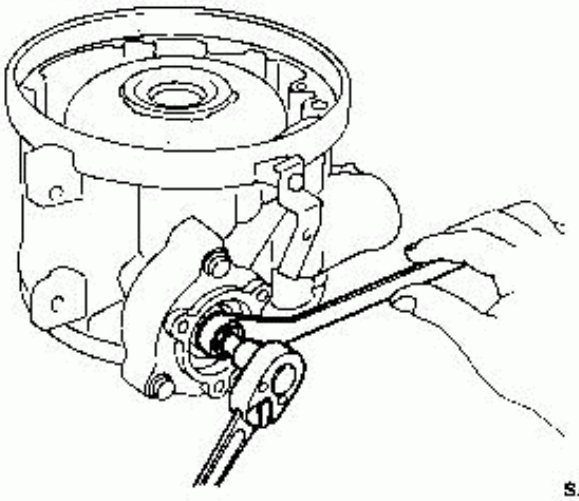
SAT523

8. Attach Tool to pump and remove pump.



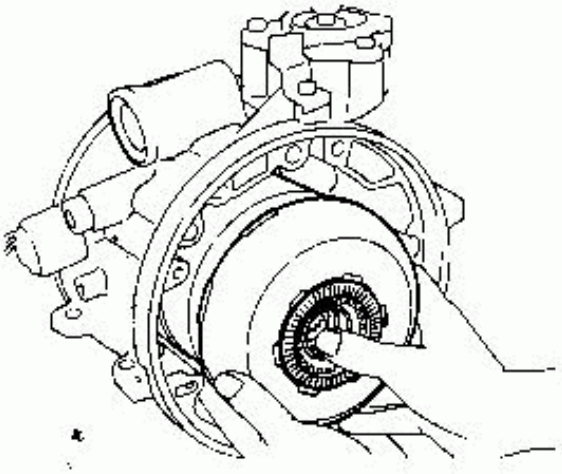
SAT524

9. Remove O.D. servo cover, then loosen O.D. band servo piston stem.



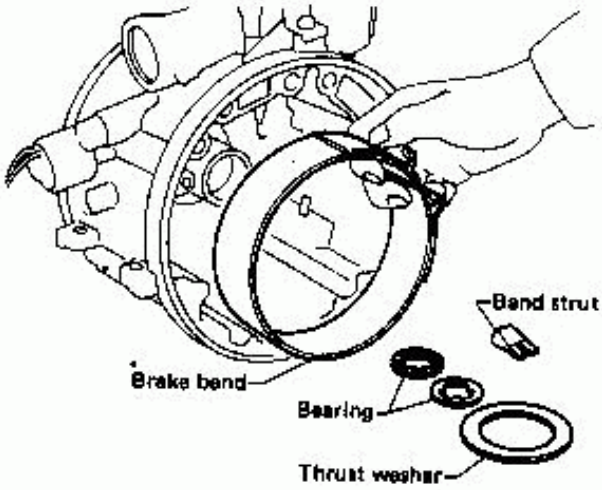
SAT525

10. Remove O.D. pack (O.D. planetary gear & direct clutch assembly).



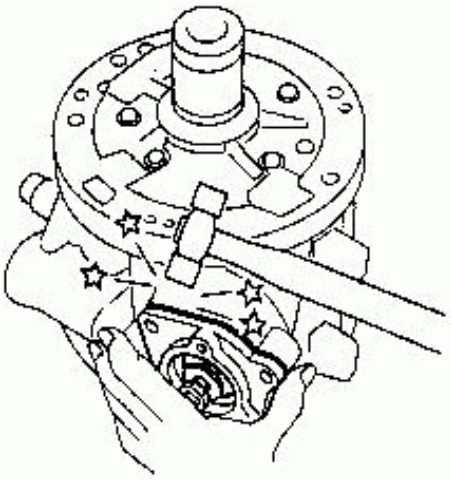
SAT526

11. Remove needle bearing & race and direct clutch thrust washer, then remove O.D. brake band & strut.



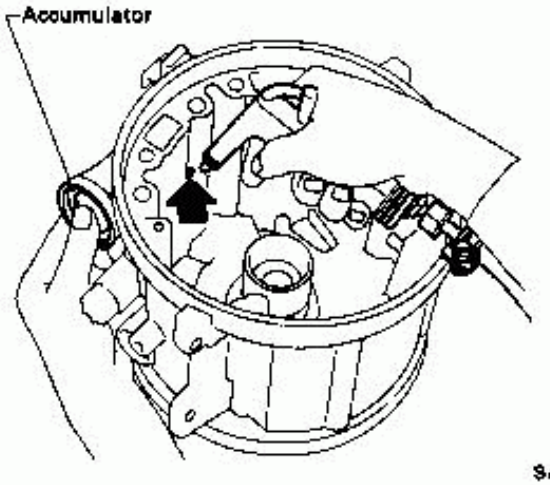
SAT527

12. Remove O.D. servo assembly by lightly tapping retainer.



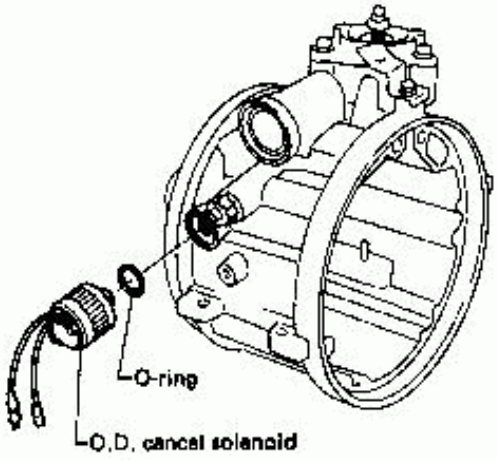
SAT528

13. Remove accumulator snap ring, then apply pressure to remove accumulator plug, piston and spring.



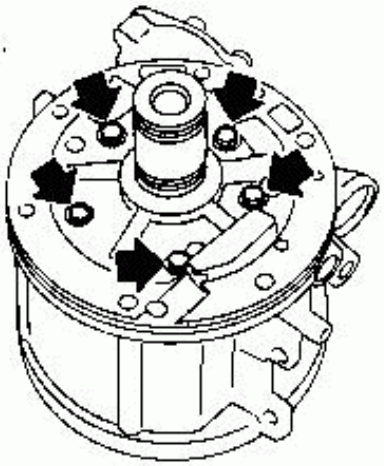
SAT529

14. Remove O.D. cancel solenoid and O-ring.



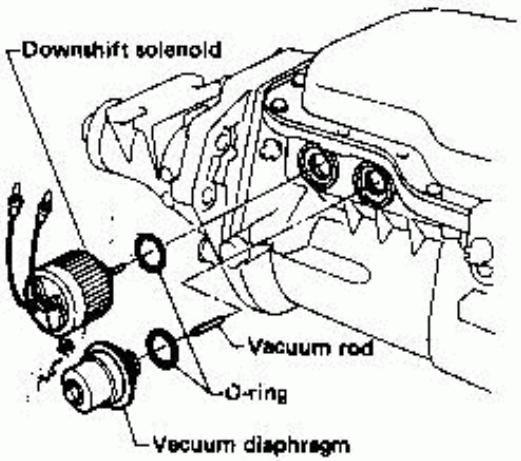
SAT530

15. Remove drum support.



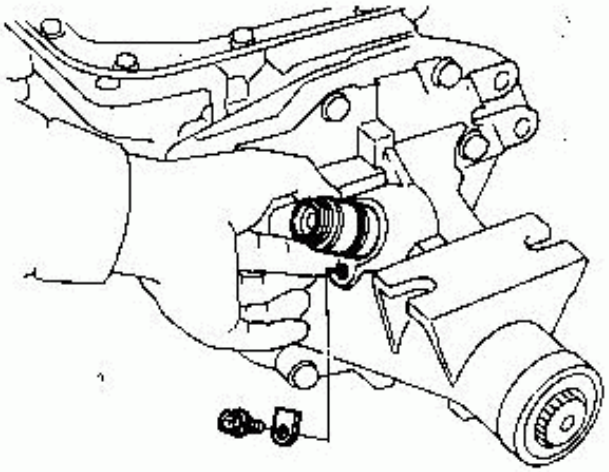
SAT531

16. Remove downshift solenoid, vacuum diaphragm & rod and O-rings.



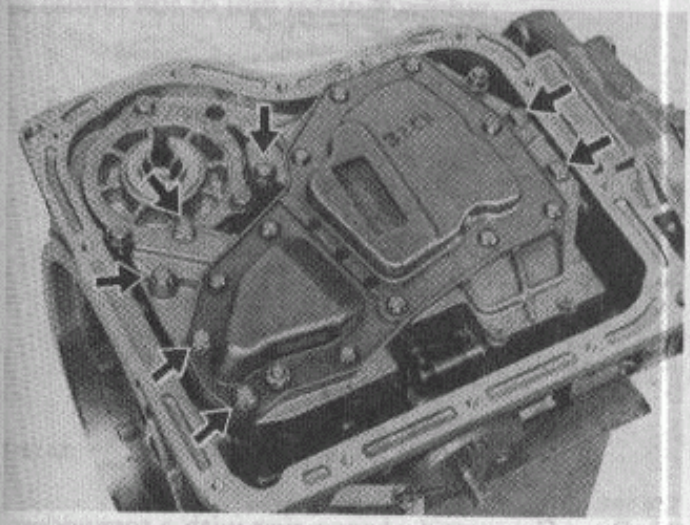
SAT5

17. Remove speedometer pinion.

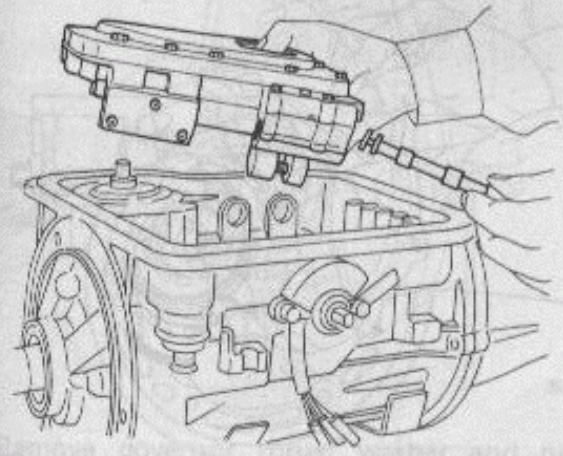


SAT5

18. Remove control valve body.

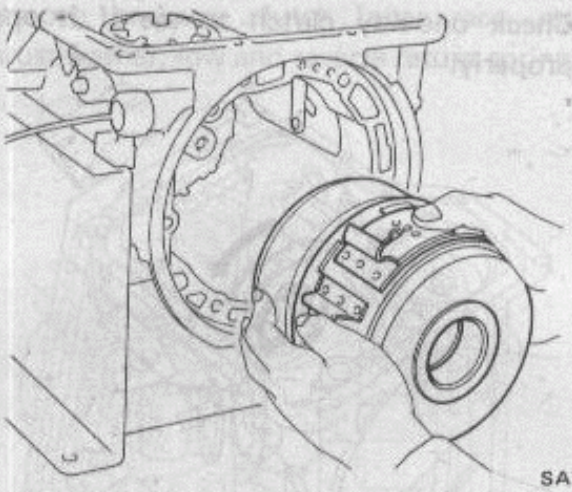


Remove manual valve from valve body as a precaution, to prevent valve from dropping out accidentally.



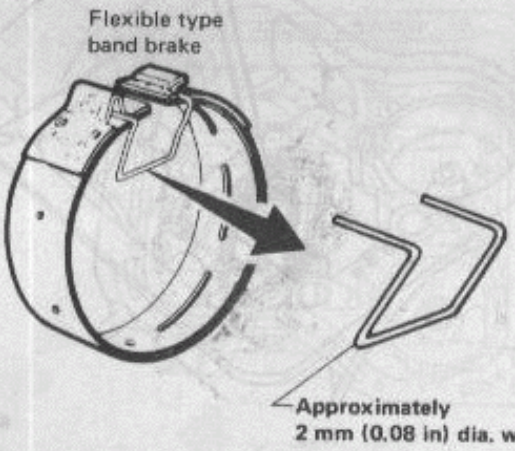
SAT007

19. Remove 2nd brake band strut. Brake band and clutch & planetary gear pack [including high-reverse clutch (Front), forward clutch (Rear) and front planetary gear] may be removed together.



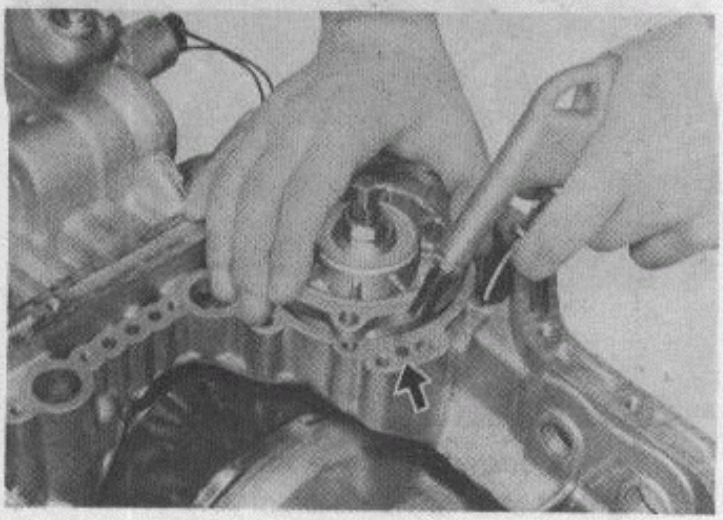
SAT534

To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. Before removing the brake band, always secure it with a clip as shown in the figure below.
Leave the clip in position after removing the brake band.

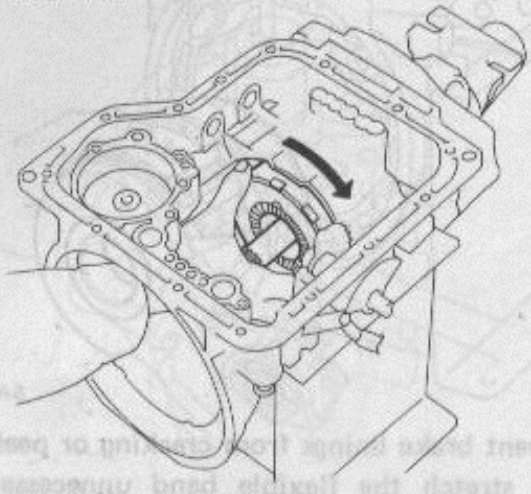


SAT656

20. Remove 2nd band servo retaining bolts. Apply pressure to remove 2nd band servo.

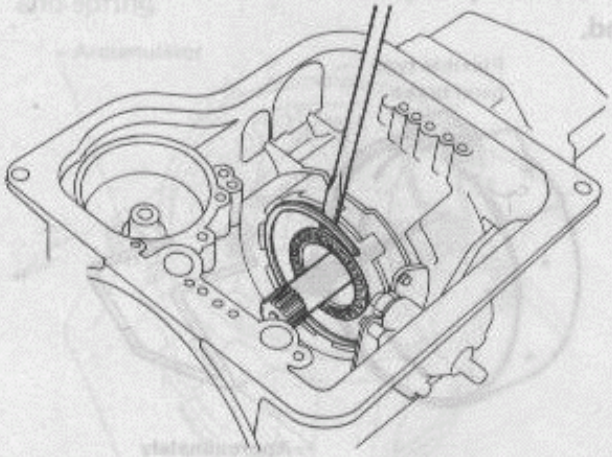


21. Check one-way clutch to see if it operates properly.



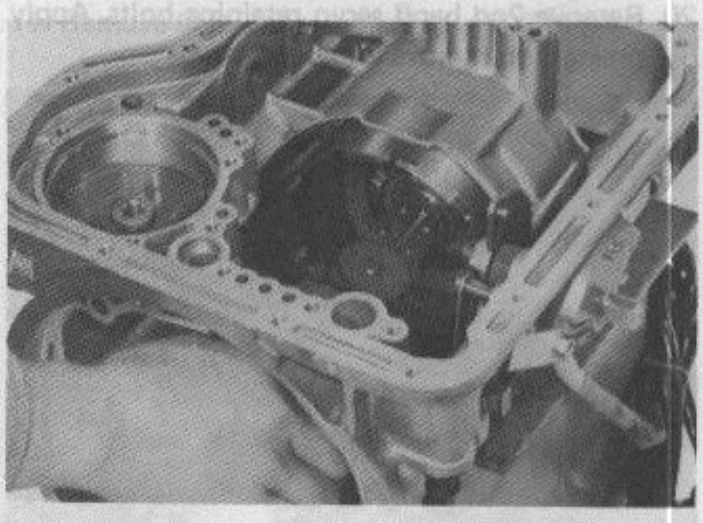
SAT536

22. Remove rear planetary carrier snap ring and rear planetary carrier.

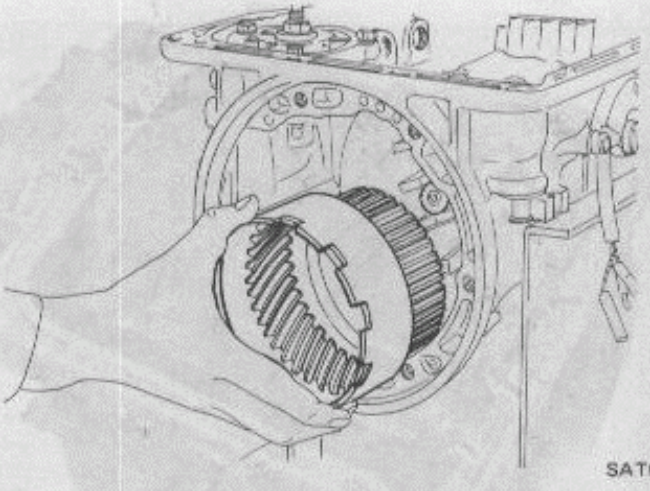


SAT015

23. Remove output shaft snap ring.

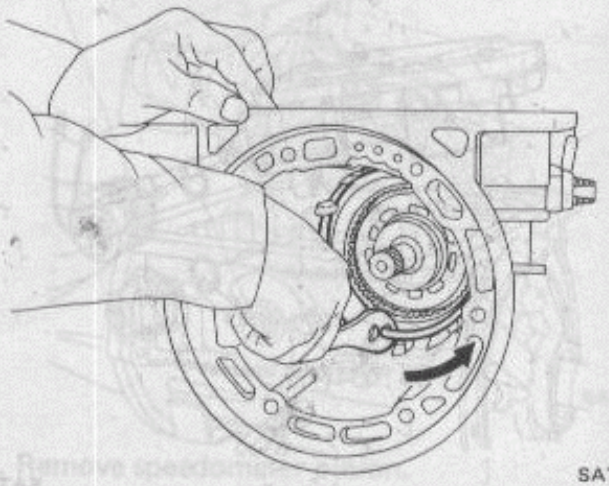


24. Remove connecting drum with internal gear.



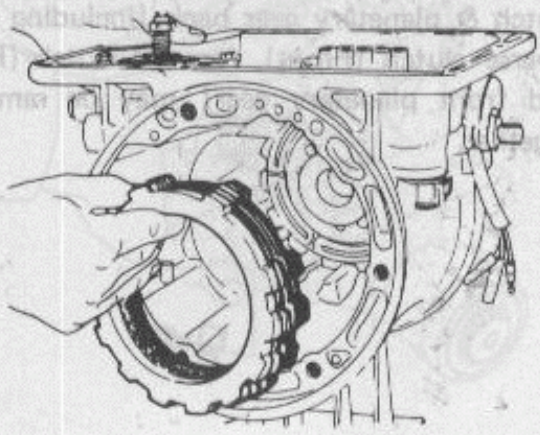
SAT017

25. Pry off one end of snap ring with a screwdriver. Remove snap ring from low and reverse brake assembly while applying plier force in direction of arrow.



SAT087

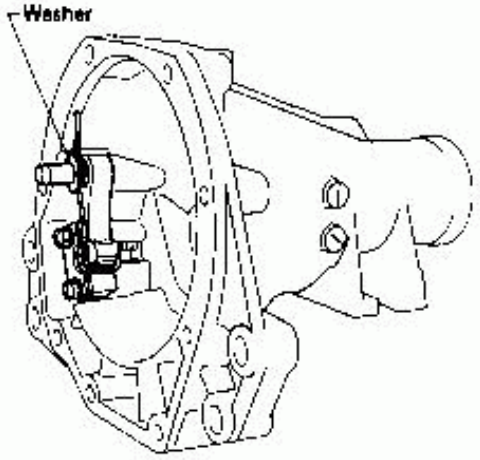
26. Remove low and reverse brake clutch assembly.



AT129

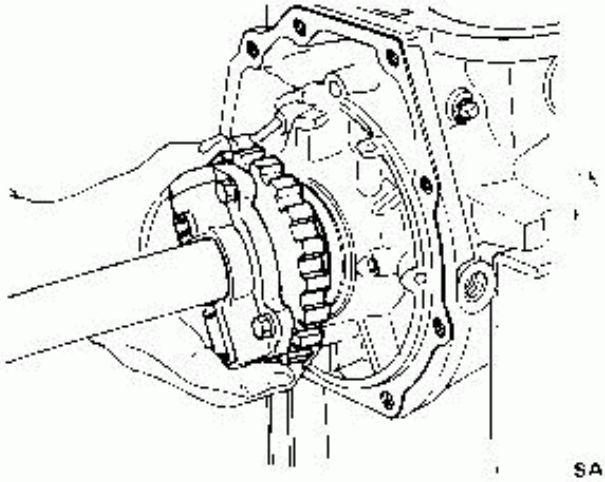
27. Remove rear extension.

Be careful not to lose retainer washer.



SAT637

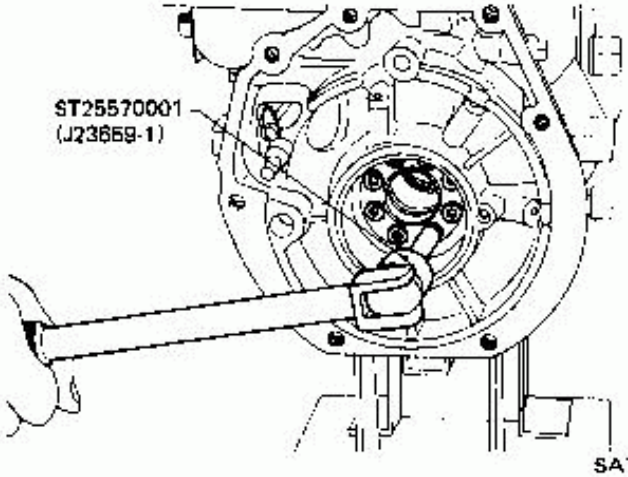
28. Remove output shaft with governor.



SAT019

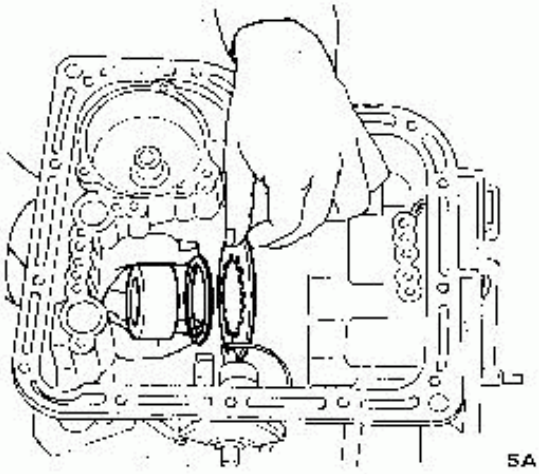
29. Remove governor thrust washer and needle bearing.

Remove one-way clutch inner race attaching hex-head slotted bolts using Tool.



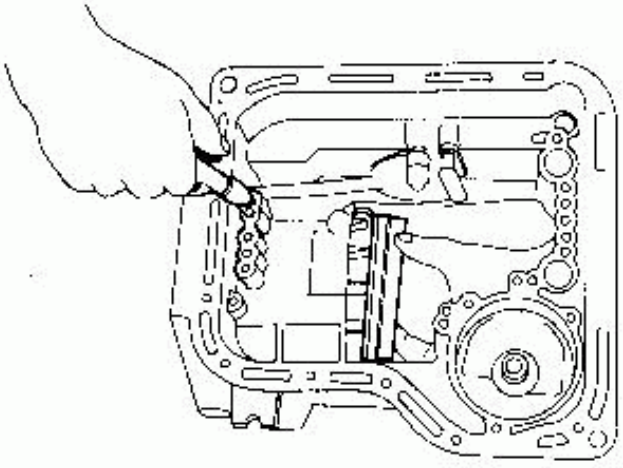
SAT020

30. Remove one-way clutch inner race, return thrust washer, low and reverse return spring.



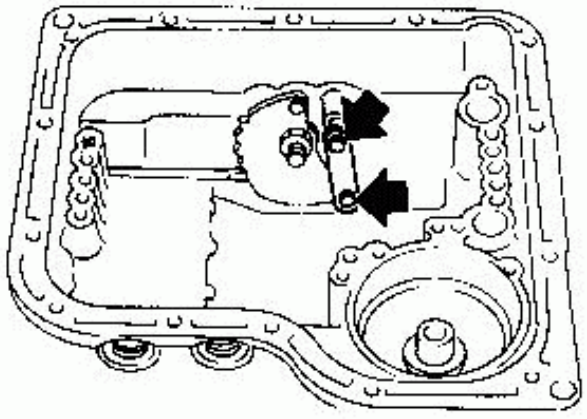
SAT116A

31. Apply air pressure to remove low and reverse brake piston.



SAT022

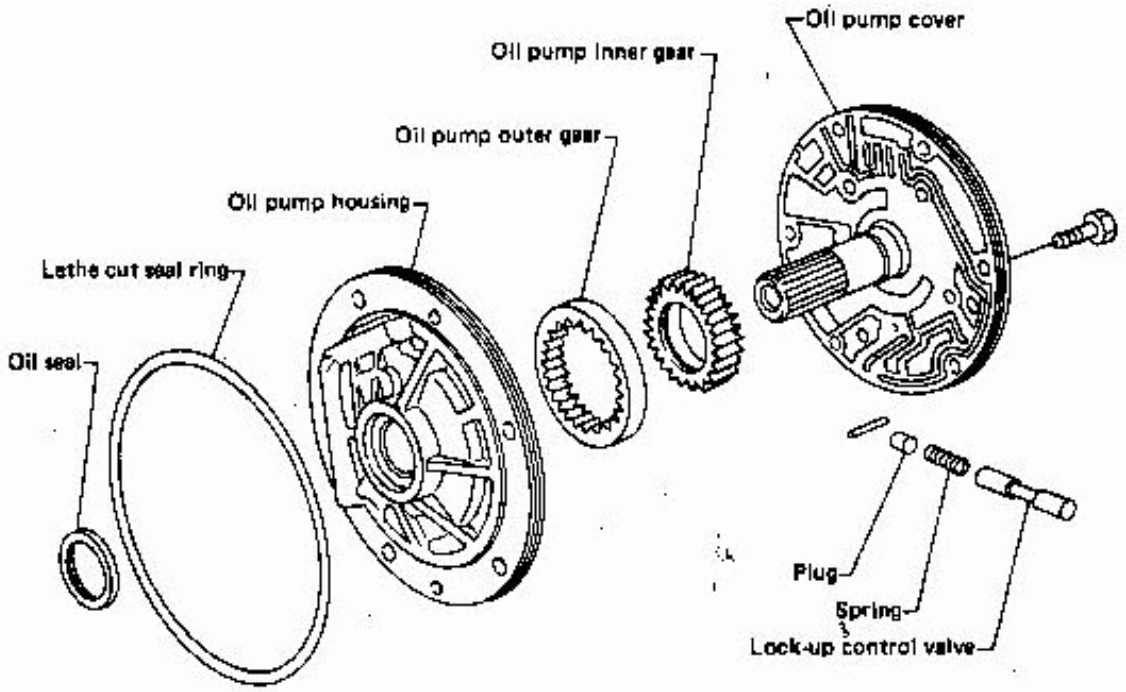
32. Remove snap ring, then remove lock nut, manual plate and parking rod.



SAT720

33. Remove inhibitor switch and manual shaft.
34. Remove O.D. indicator switch and O-ring.

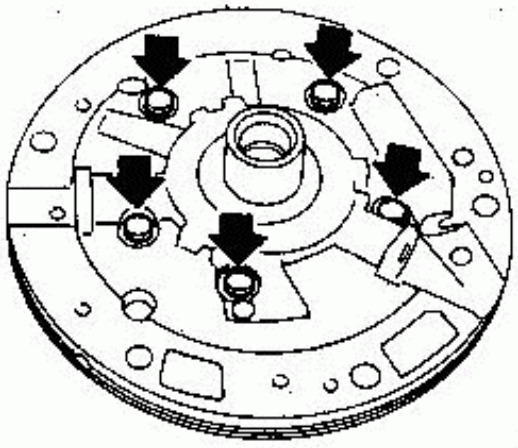
Oil Pump



SAT721

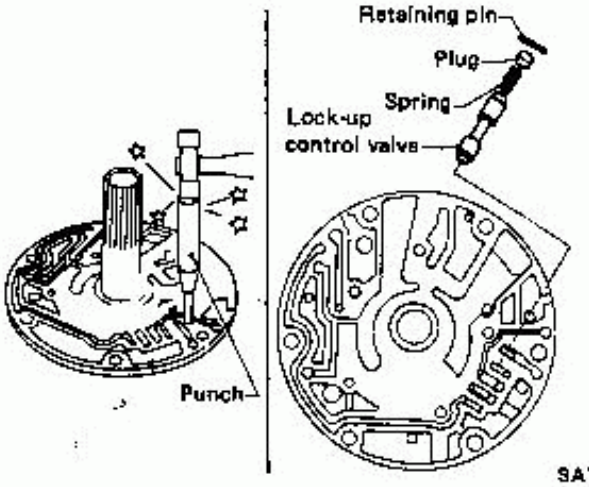
DISASSEMBLY

1. Remove pump cover from pump housing.



SAT838

2. Stake off retaining pin with a punch [outer dia. 1.5 to 1.8 mm (0.059 to 0.071 in)], then remove lock-up control valve and spring.



SAT722

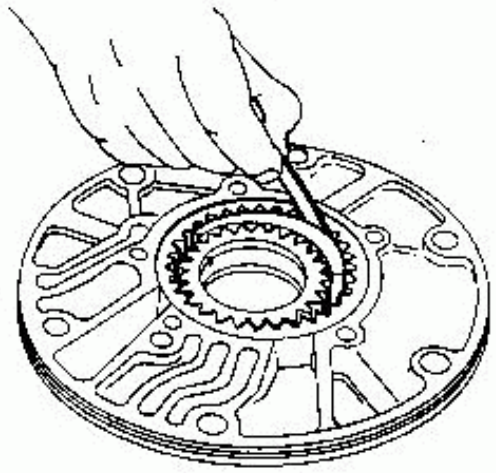
INSPECTION

1. Inspect pump body, bushing and pump shaft, for wear.
2. Inspect gears, lock up control valve, spring and all internal surfaces for damage and visible wear.

Oil Pump (Cont'd)

3. Measure clearance between outer gear and crescent.

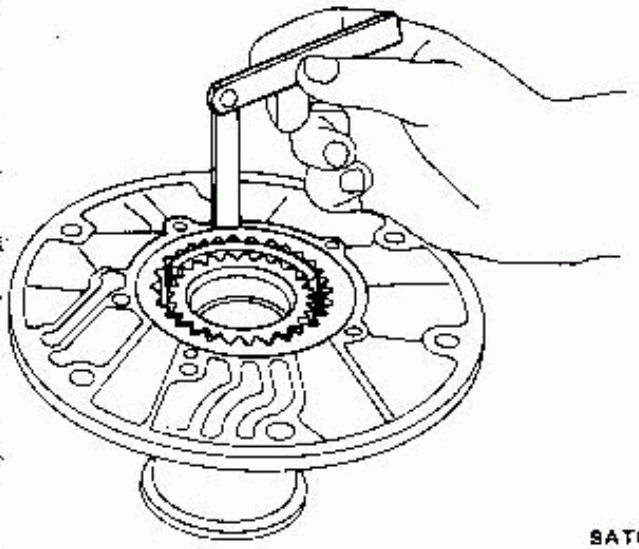
Standard clearance:
0.14 - 0.21 mm (0.0055 - 0.0083 in)
Wear limit:
0.25 mm (0.0098 in)



SAT025

4. Measure clearance between outer gear and pump housing.

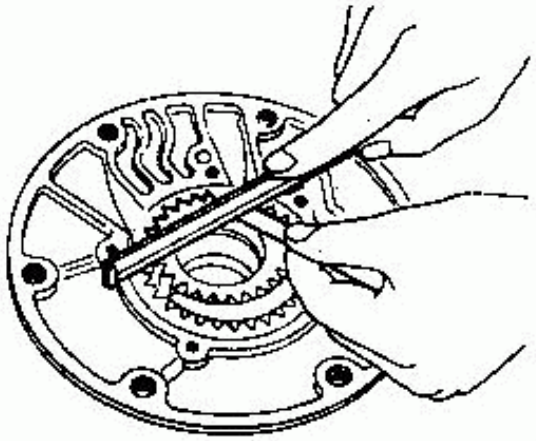
Standard clearance:
0.05 - 0.20 mm (0.0020 - 0.0079 in)
Wear limit:
0.25 mm (0.0098 in)



SAT026

5. With a feeler gauge and straight edge, measure clearance between gears and pump cover.

Standard clearance:
0.02 - 0.04 mm (0.0008 - 0.0016 in)
Wear limit:
0.08 mm (0.0031 in)

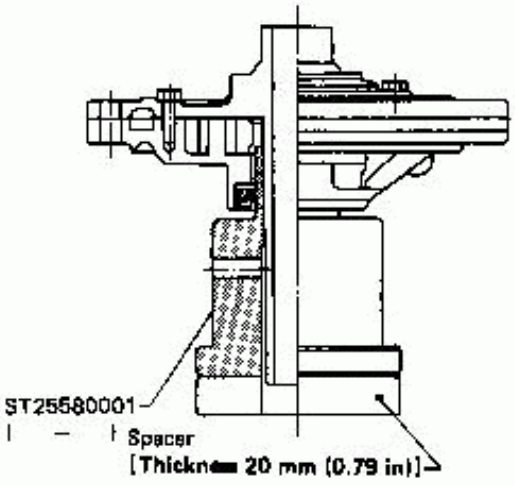


AT152

Oil Pump (Cont'd)

ASSEMBLY

1. Install lock-up control valve and spring into oil pump cover, then tap new retaining pin.
2. Mount pump housing in Tool and suitable spacer. Set up pump housing with inner and outer pump gears on it and install pump cover to pump housing. Temporarily assemble oil pump.

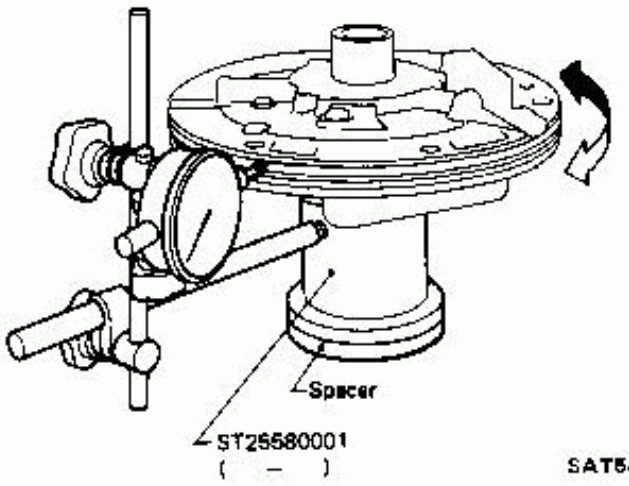


SAT540

3. Set the cover to within the run-out of the specified total indicator reading.

Total indicator reading:

Less than 0.07 mm (0.0028 in)



SAT541

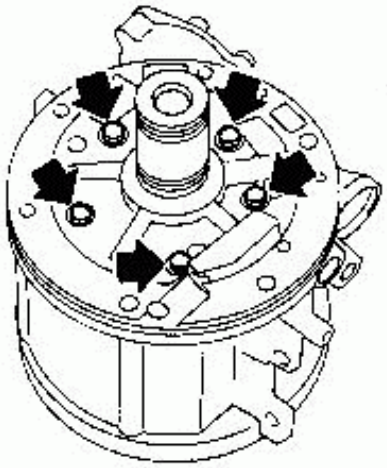
4. Tighten pump securing bolts to the specified torque.

Recheck run-out.

Drum Support

DISASSEMBLY

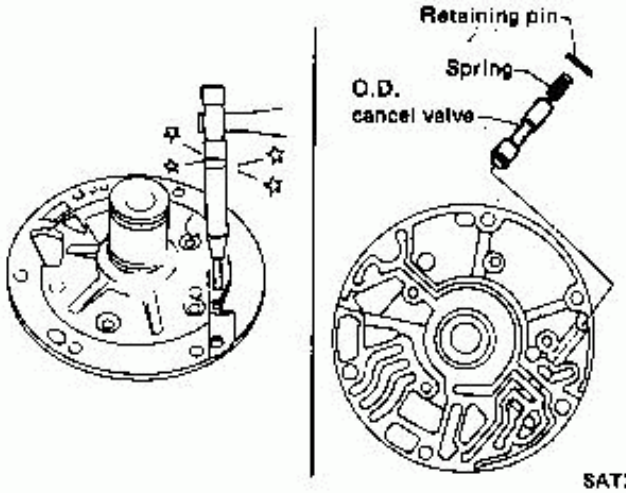
1. Remove drum support and gasket from O.D. case.



SAT531

2. Stake off retaining pin with a punch [outer dia. 1.5 to 1.8 mm (0.059 to 0.071 in)], then remove O.D. cancel valve and spring.

Don't stake it off from contacting face side.

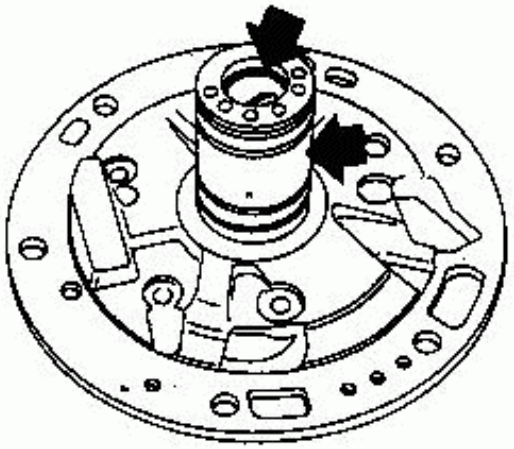


SAT723

Drum Support (Cont'd)

INSPECTION

- Inspect drum support bushing and ring groove areas for wear.



SAT542

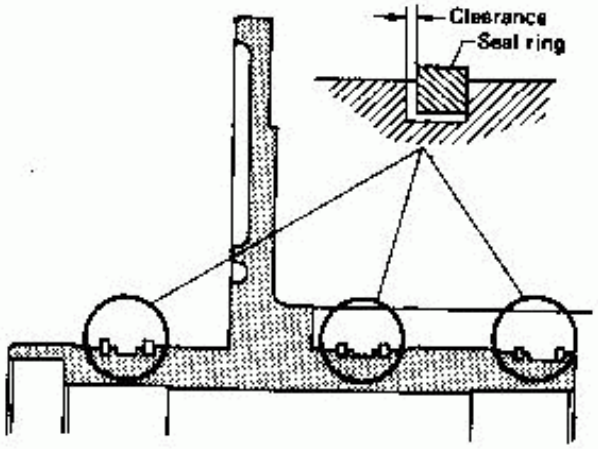
- Measure clearance between seal ring and ring groove.

Standard clearance:

0.05 - 0.20 mm (0.0020 - 0.0079 in)

Wear limit:

0.20 mm (0.0079 in)



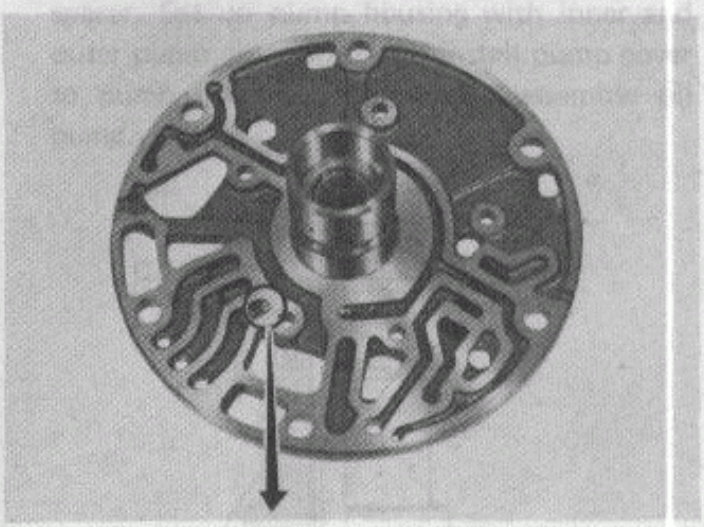
SAT545

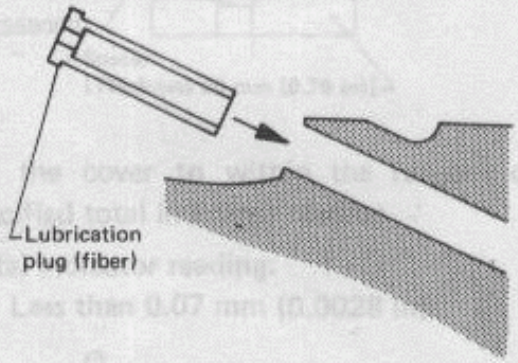
- Inspect O.D. cancel valve & spring and all internal surfaces for damage visible wear.

Drum Support (Cont'd)

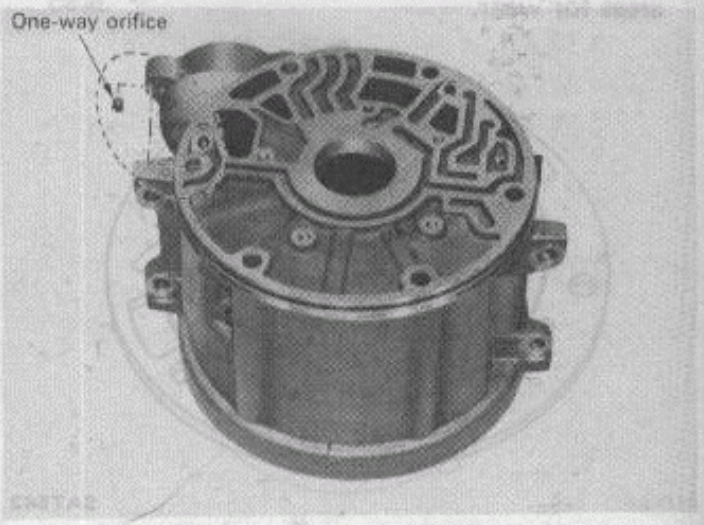
ASSEMBLY

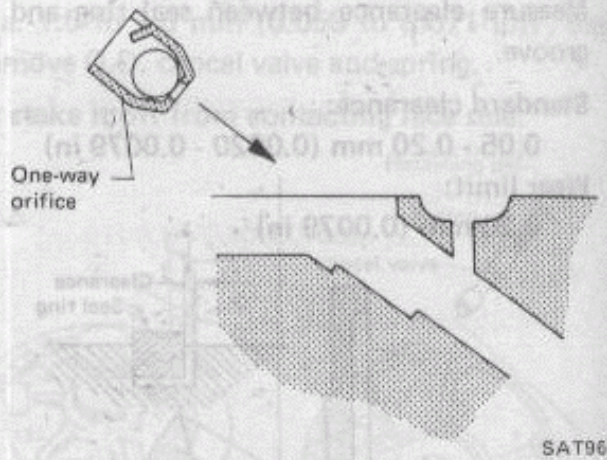
1. Install O.D. cancel valve and spring into drum support, then tap new retaining pins.
2. Install lubrication plug in drum support.





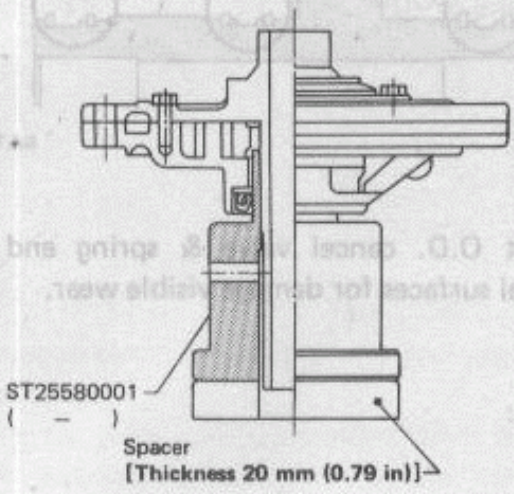
3. Install one-way plug or one-way orifice in O.D. case.





SAT963

4. Mount oil pump assembly in Tool and suitable spacer.

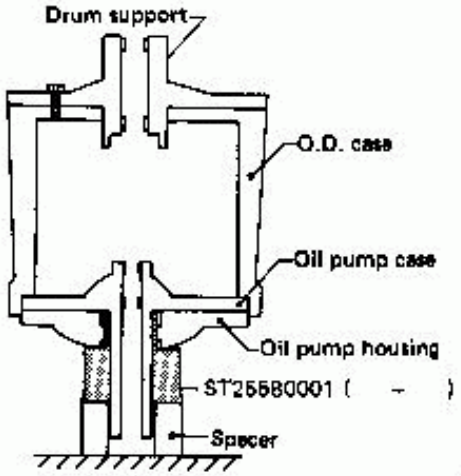


SAT540

Drum Support (Cont'd)

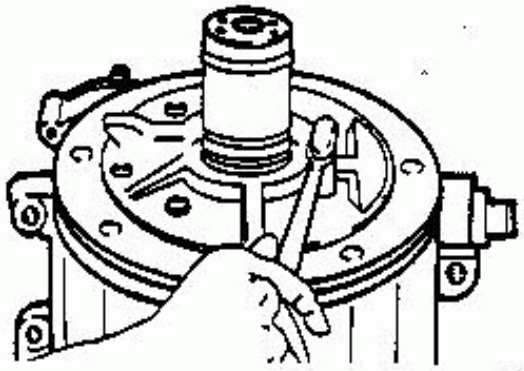
6. Mount O.D. case, drum support and gasket in oil pump assembly.

Ensure O.D. case is inserted properly into oil pump assembly.



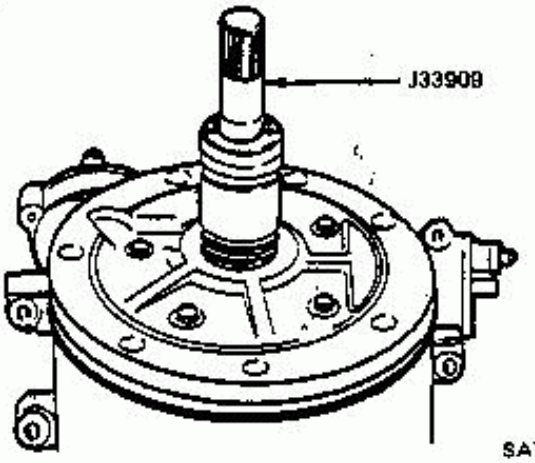
SAT547

6. Loosen drum support bolts before inserting Tool (J33909).



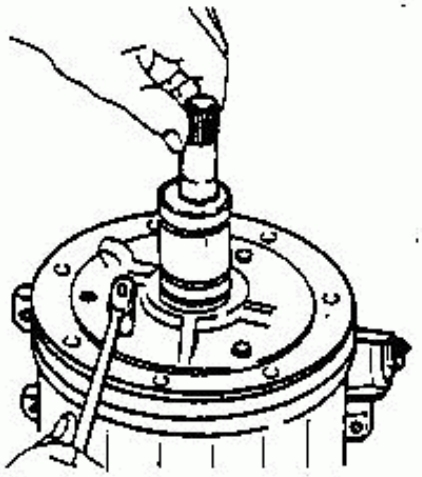
SAT935

7. Insert the tapered edge of Tool and install the Tool until it completely passes through O.D. case.



SAT936

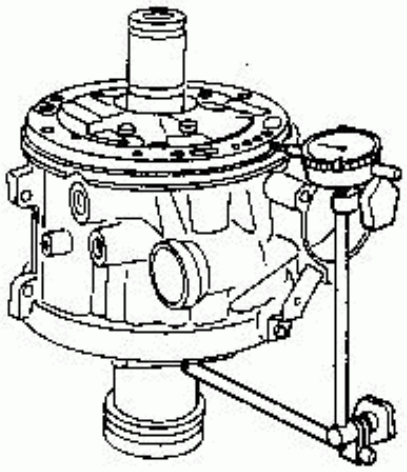
8. Rotate the Tool to ensure proper alignment.
9. Tighten drum support bolts while the Tool is inside O.D. case.



SAT937

10. Remove the Tool (J33909).
11. Check that the drum support is within the run-out of the specified total indicator reading.

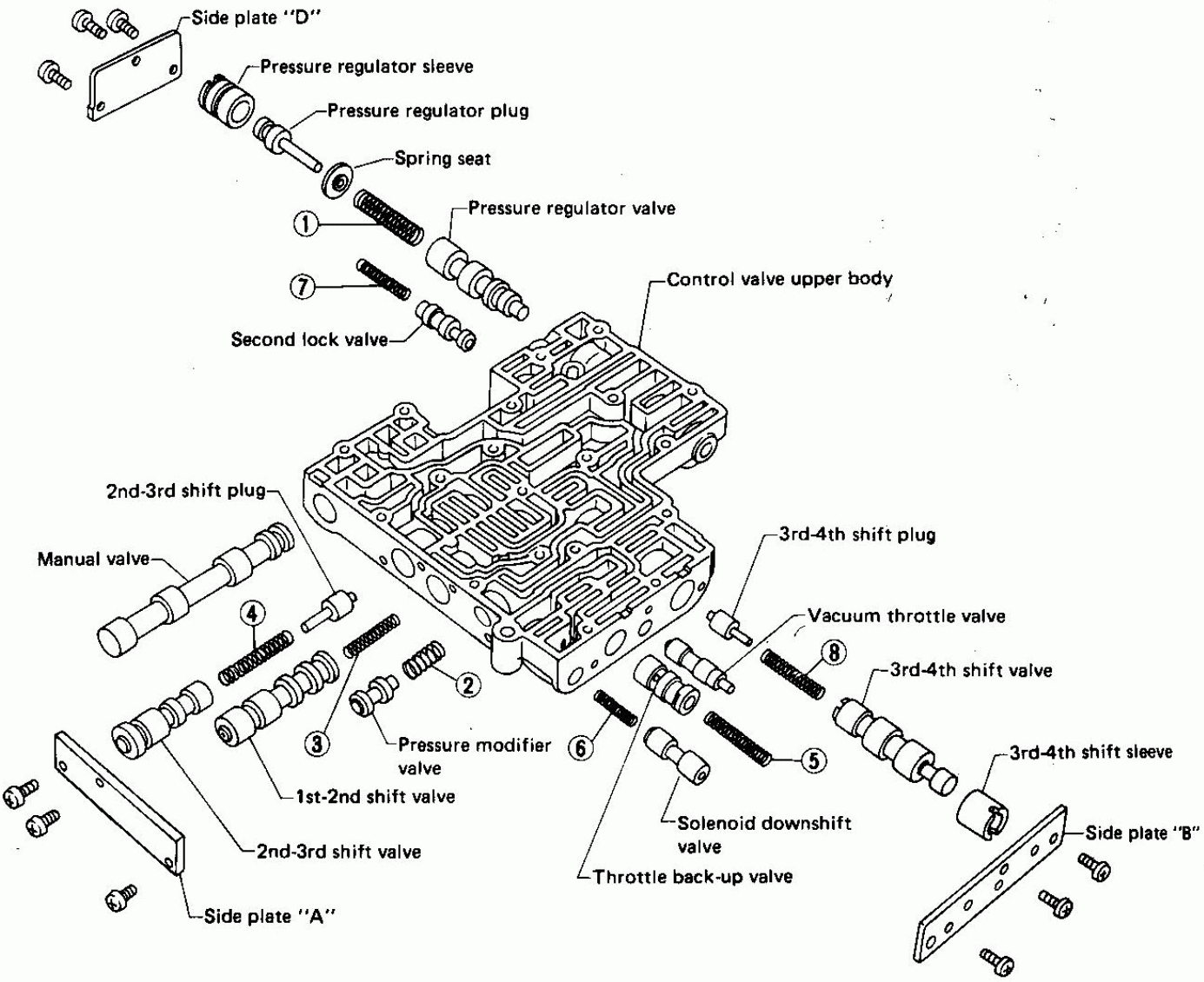
Total indicator reading:
Less than 0.05 mm (0.0020 in)



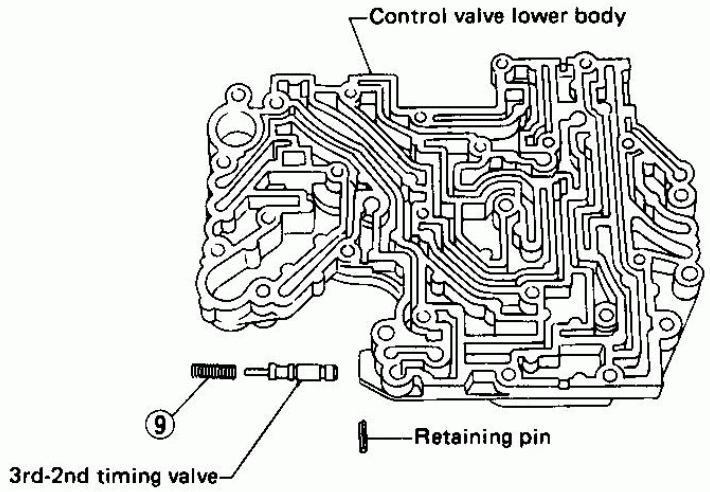
SAT600

Control Valve Body

Upper body side



Lower body side

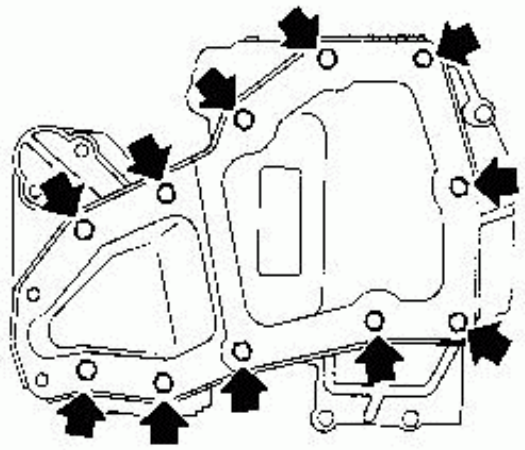


SAT066A

Control Valve Body (Cont'd)

DISASSEMBLY

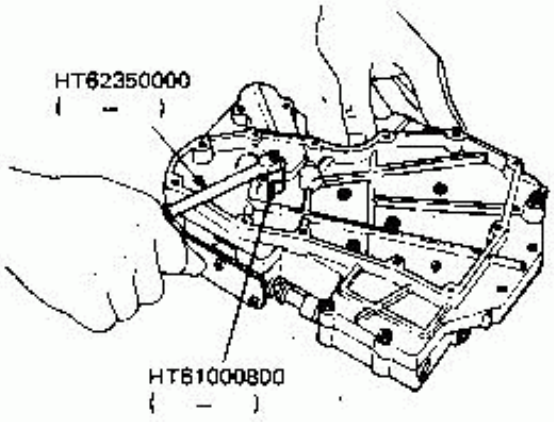
1. Remove oil strainer.



SAT564

2. Separate lower body, separator plate and upper body.

Be careful not to scatter or lose orifice check valve, servo orifice check valve, or throttle relief check valve (ball) and related springs.



AT168

INSPECTION

A newly manufactured valve body represents precision manufactured valves assembled with close tolerances into precision bores of the valve body. If inspection reveals excessive clearances, 0.03 mm (0.0012 in) or more, between the valves and the valve body bores, replace the entire valve body rather than attempt rework.

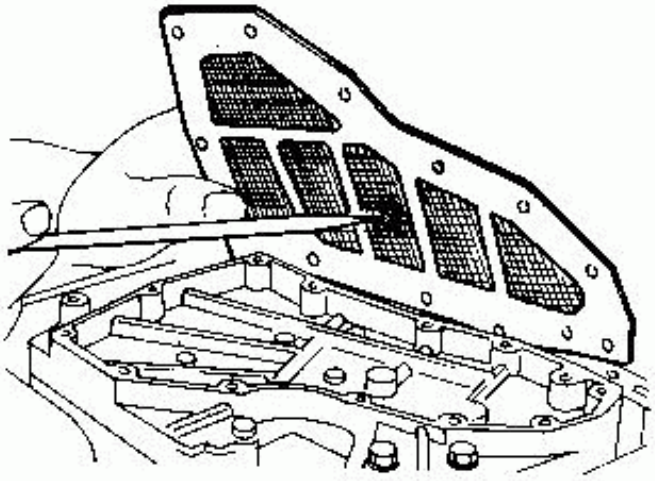
If one or more valves are sticking from varnish deposits or burns resulting from deteriorated oil or overheating, you may be able to clean the valves and valve bodies. Always use crocus cloth, which is a very fine type of cutting material. Never use emery cloth, as it is too coarse and can scratch the valves or valve bores. Scratches can lead to future deposits of varnish or foreign matter.

During cleaning, do not remove the sharp edges of the valve. When edges are rounded or scratched, dirt or foreign matter may enter into the sides of the valves and hinder valve movement.

The valves may be cleaned using alcohol or lacquer thinner. The valve bodies can be dip cleaned with a good carburetor cleaner or lacquer thinner. Do not leave valve bodies submerged in carburetor cleaner longer than five minutes. Rinse parts thoroughly and dry.

Lubricate all parts in clean A.T.F. before reassembly.

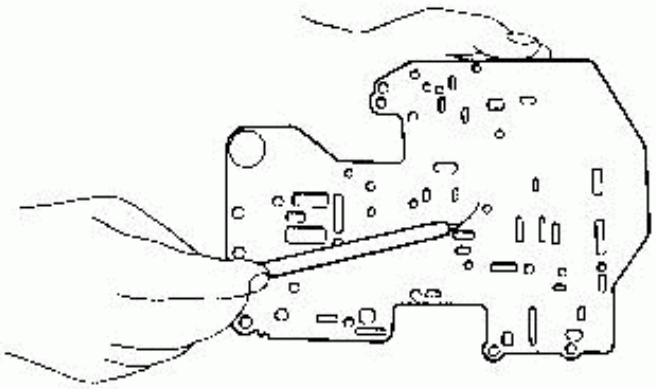
1. Check valves for signs of burning. Replace if beyond clean-up.
2. Check oil strainer for general condition. Replace if necessary.



SAT045

Control Valve Body (Cont'd)

3. Check separator plate for scratches or damage. Replace if necessary. Scratches or score marks can cause oil to by-pass correct oil passages and result in system malfunction.



SAT046

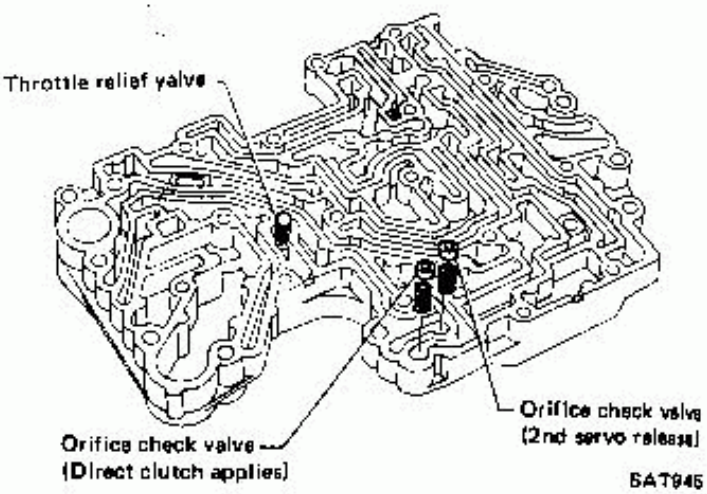
4. Check oil passages in upper and lower valve bodies for varnish deposits, scratches or other damage that would impair valve movement. Check threaded holes and related bolts and screws for stripped threads; replace as needed.
5. Check valve springs for damage. Measure free length of valve springs. If the free length is out of specification, replace it.
   Numbers of each valve spring listed in table below are the same as those in the figure on page AT-30.

Valve spring	Free length mm (in)
① Pressure regulator valve	43.0 (1.693)
② Pressure modifier valve	20.4 (0.803)
③ 1st-2nd shift valve	33.25 (1.3091)
④ 2nd-3rd shift valve	41.0 (1.614)
⑤ Throttle back-up valve	36.0 (1.417)
⑥ Solenoid downshift valve	22.0 (0.866)
⑦ Second lock valve	33.5 (1.319)
Throttle relief check valve	26.8 (1.055)
Orifice check valve	15.5 (0.610)
Servo orifice check valve	
⑧ 3rd-4th shift valve	30.3 (1.193)
⑨ 3rd-2nd timing valve	20.7 (0.815)

ASSEMBLY

1. Install orifice check valves, valve springs, throttle relief valve spring and steel ball in valve body.

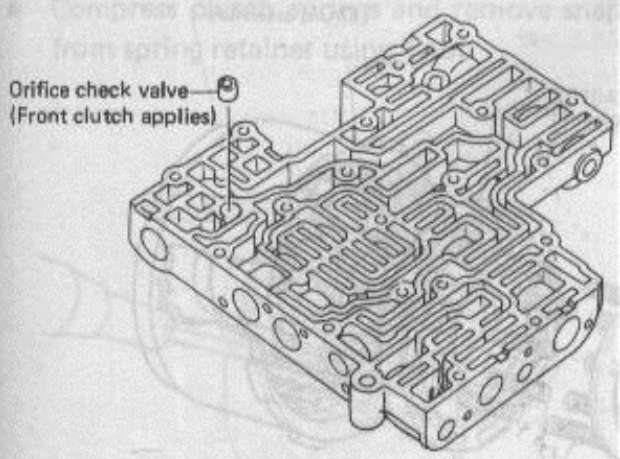
Lower valve body



SAT945

Control Valve Body (Cont'd)

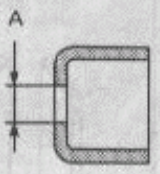
Upper valve body



SAT766

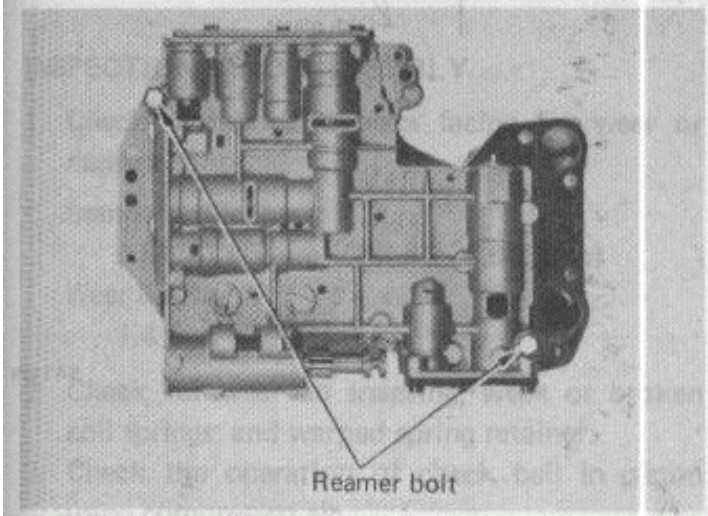
Orifice check valve Unit: mm (in)

Orifice check valve	Diameter "A"	Identification
2nd servo release	1.2 (0.047)	Gold
Front clutch applies	2.2 (0.087)	Black
Direct clutch	2.0 (0.079)	Gray



SAT924

2. Assemble separator plate and upper valve body on lower valve body, then tighten bolts.



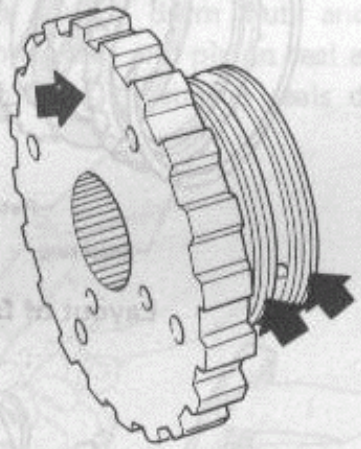
When installing these bolts, first be sure to install the two reamer bolts to their original positions.

3. Install oil strainer.

Oil Distributor

INSPECTION

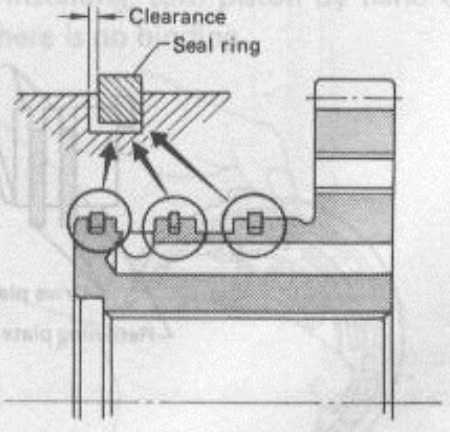
- Inspect contacting surface of oil distributor and ring groove areas for wear.



SAT725

- Measure clearance between seal ring and ring groove.

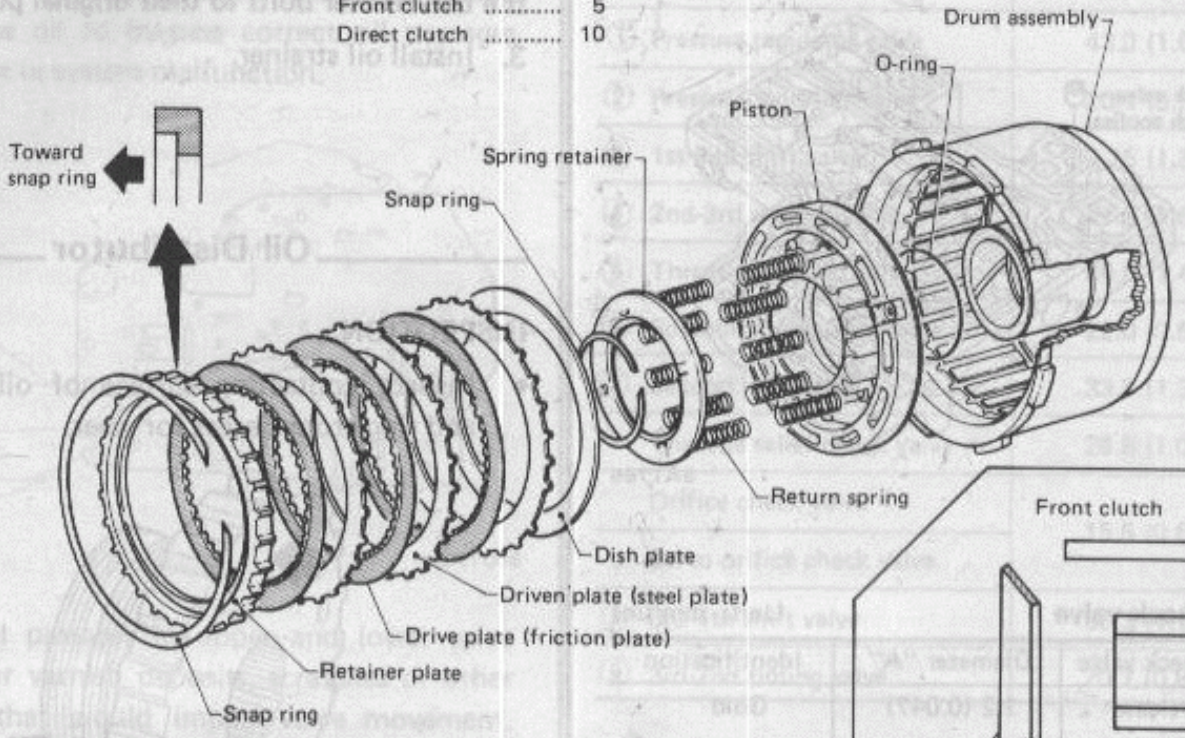
Standard clearance:
0.04 - 0.16 mm (0.0016 - 0.0063 in)
Wear limit:
0.16 mm (0.0063 in)



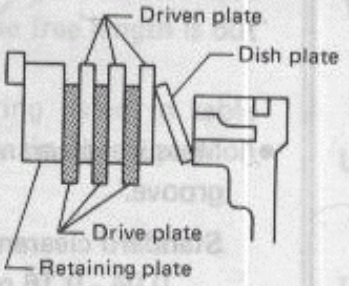
SAT726

Direct Clutch & Front Clutch

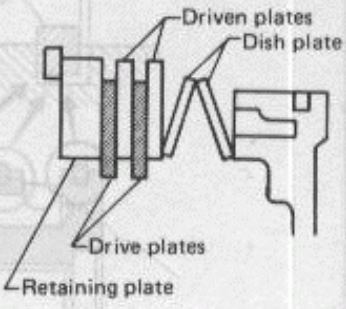
Number of return springs
Front clutch 5
Direct clutch 10

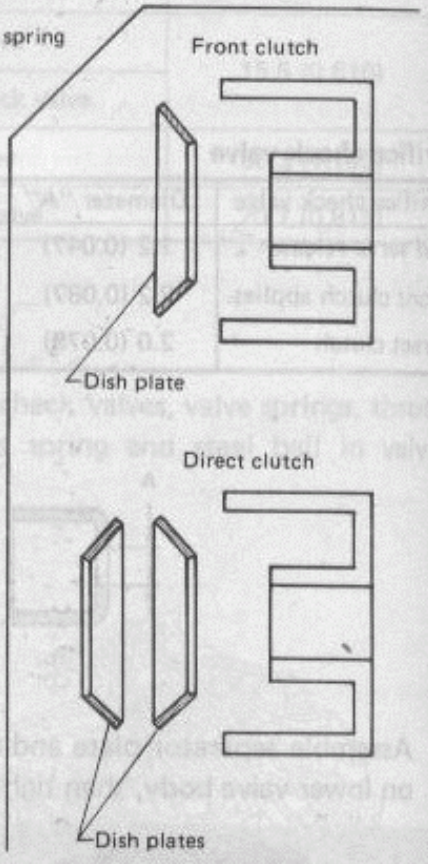


Layout of front clutch plates



Layout of direct clutch plates



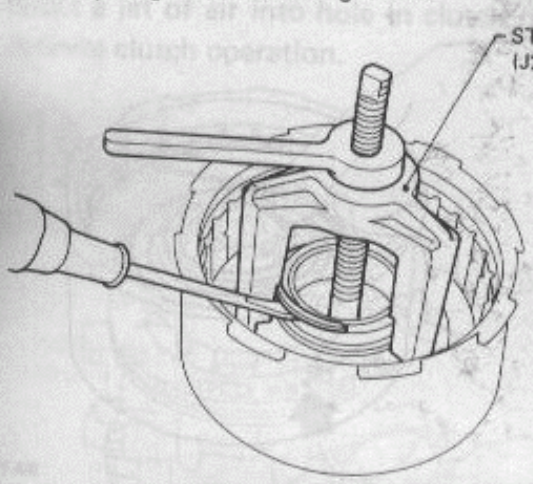


SAT925

Direct Clutch & Front Clutch (Cont'd)

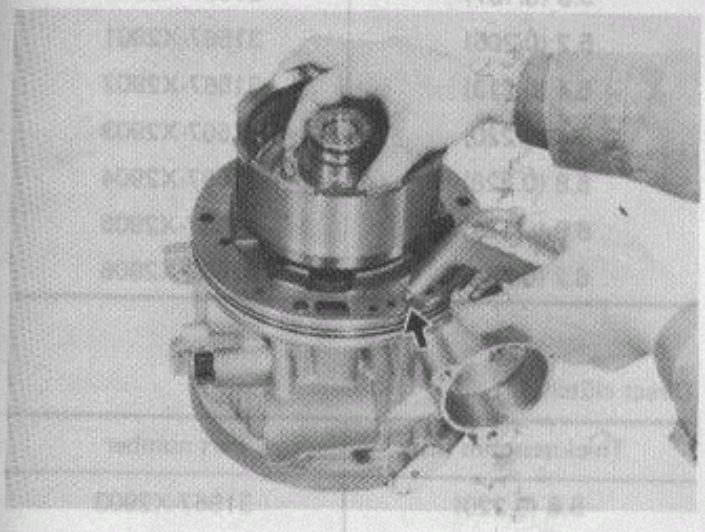
DISASSEMBLY

- Compress clutch springs and remove snap ring from spring retainer using Tool.



SAT551

- For easy removal of piston from drum, mount clutch on drum support. Use an air gun with a tapered rubber up to carefully apply air pressure to loosen piston from drum.

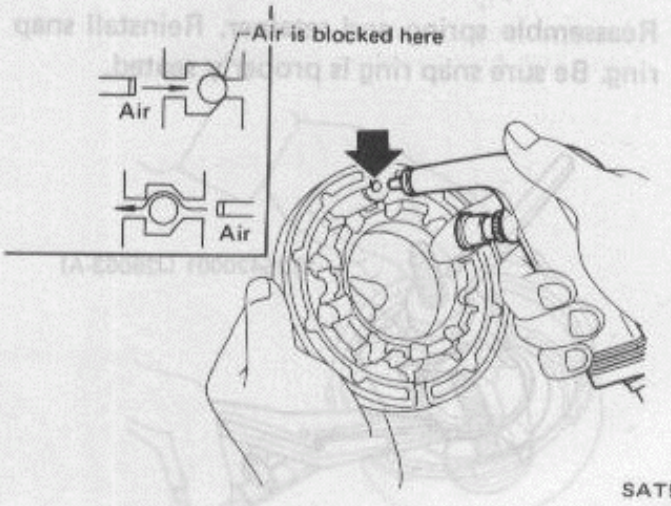


INSPECTION AND ASSEMBLY

1. Check clutch drive plate facing for wear or damage.

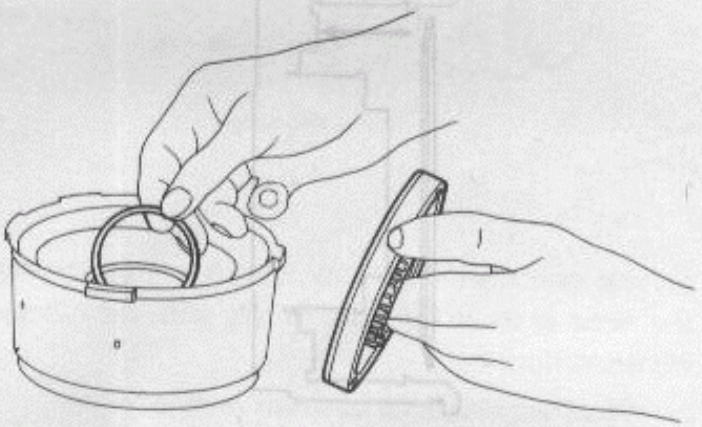
   Standard thickness:
   1.50 - 1.65 mm (0.0591 - 0.0650 in)
   Wear limit:
   1.4 mm (0.055 in)

2. Check for wear on snapring, weak or broken coil springs, and warped spring retainer.
3. Check the operation of check ball in piston using compressed air.



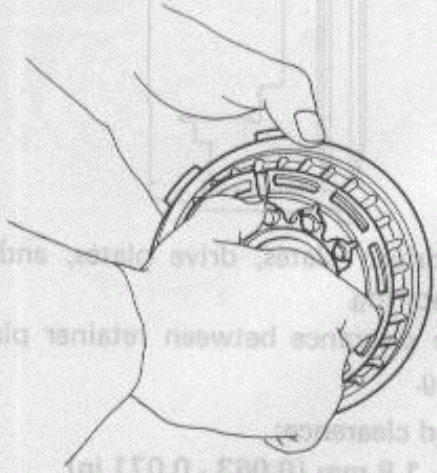
SAT553

4. Lubricate clutch drum hub and seals, and install inner seal and piston seal as illustrated. Be careful not to stretch seals during installation.



SAT031

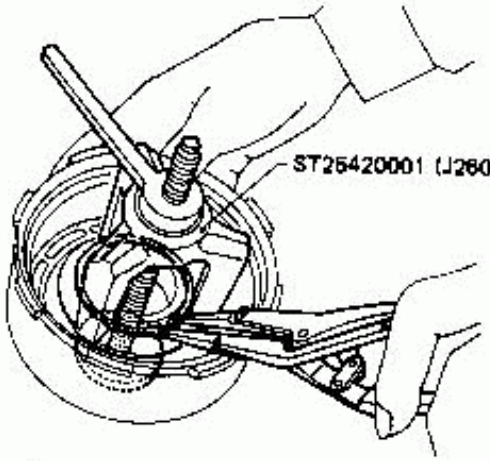
5. Assemble piston, being careful not to allow seal to kink or become damaged during installation. After installing, turn piston by hand to ensure that there is no binding.



SAT032

Direct Clutch & Front Clutch (Cont'd)

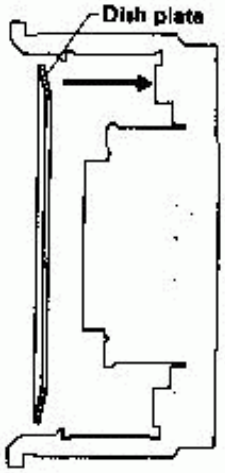
6. Reassemble spring and retainer. Reinstall snap ring. Be sure snap ring is properly seated.



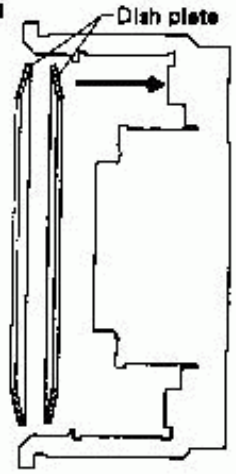
SAT028

7. Install dish plate.

Front clutch



Direct clutch



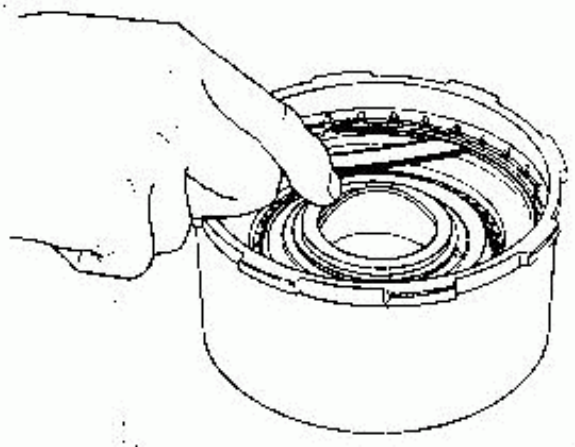
SAT564

8. Install driven plates, drive plates, and secure with snap ring.
9. Measure clearance between retainer plate and snap ring.

Specified clearance:

1.6 - 1.8 mm (0.063 - 0.071 in)

If necessary, try other retaining plates having different thicknesses until correct clearance is obtained.



SAT034

Available retaining plate

Front clutch

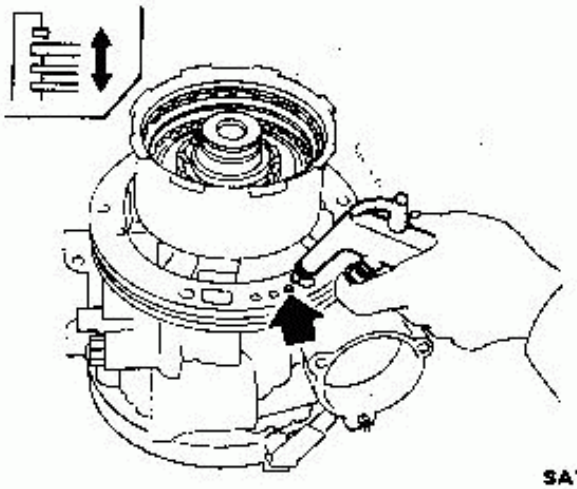
Thickness mm (in)	Part number
5.0 (0.197)	31567-X2900
5.2 (0.205)	31567-X2901
5.4 (0.213)	31567-X2902
5.6 (0.220)	31567-X2903
5.8 (0.228)	31567-X2904
6.0 (0.236)	31567-X2905
6.2 (0.244)	31567-X2906

Direct clutch

Thickness mm (in)	Part number
5.6 (0.220)	31567-X2903
5.8 (0.228)	31567-X2904
6.0 (0.236)	31567-X2905
6.2 (0.244)	31567-X2906
6.4 (0.252)	31507-X8600
6.6 (0.260)	31507-X8601
6.8 (0.268)	31537-X2800
7.0 (0.276)	31537-X2801

Direct Clutch & Front Clutch (Cont'd)

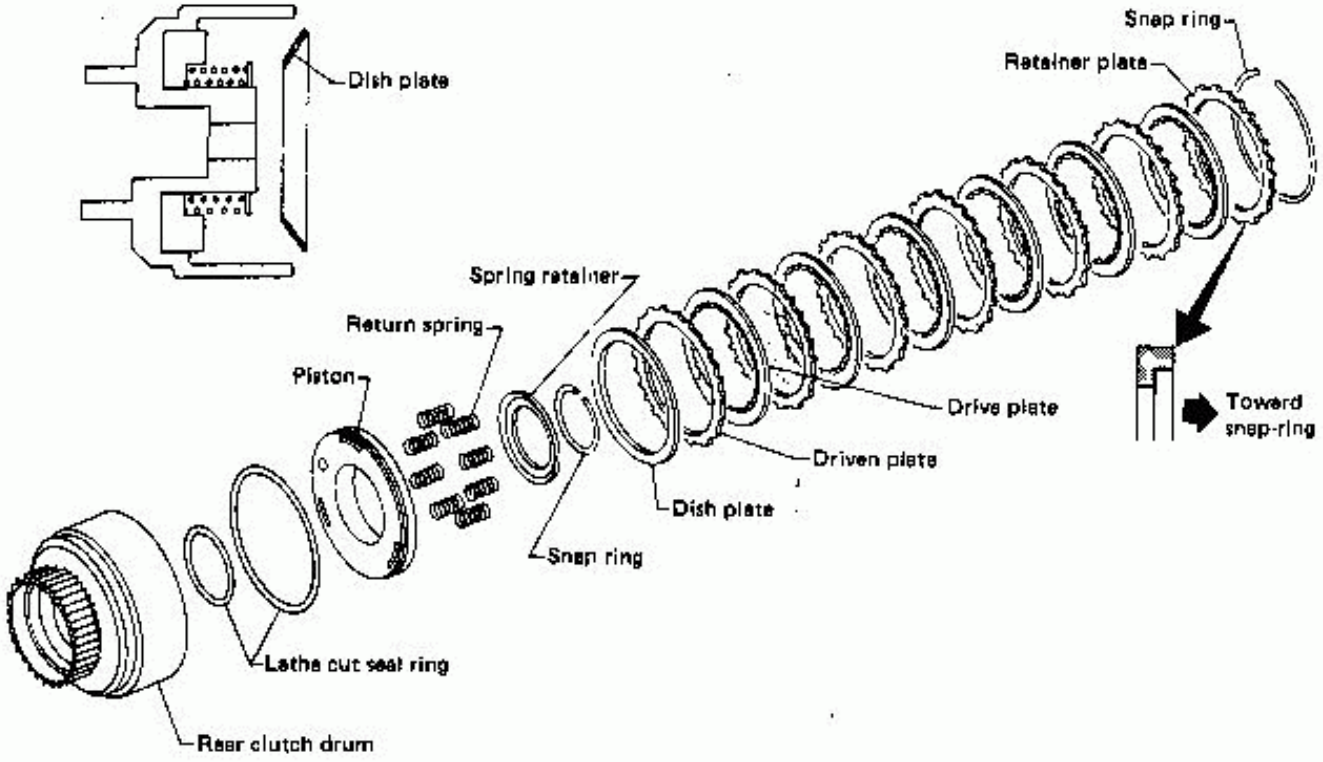
10. Testing front clutch.
    With front clutch assembled on drum support, direct a jet of air into hole in clutch drum for definite clutch operation.



SAT621

Rear Clutch

In regard to the number of clutch sheets (drive plate and driven plate), refer to S.D.S.

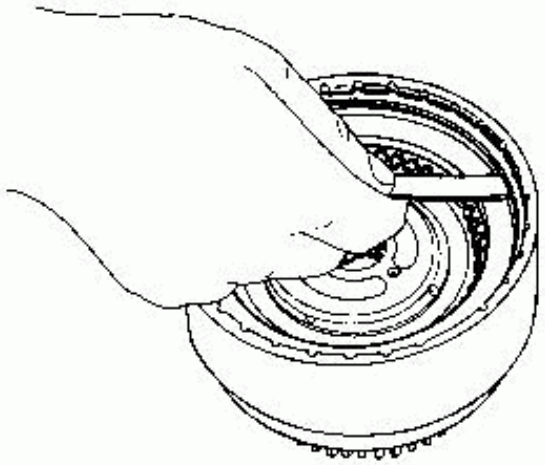


SAT728

Service procedures for rear clutch are essentially the same as those for front clutch, with the following exception:

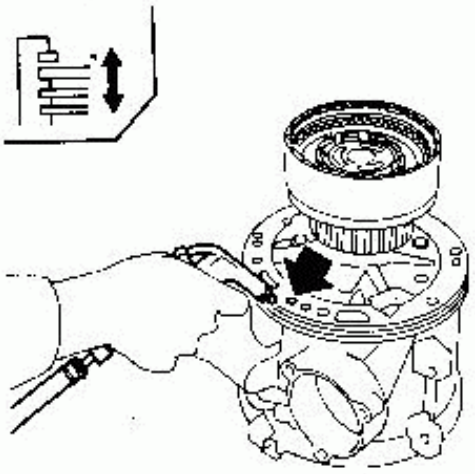
Specified clearance between retainer plate and snap ring:

0.8 - 1.0 mm (0.031 - 0.039 in)



SAT035

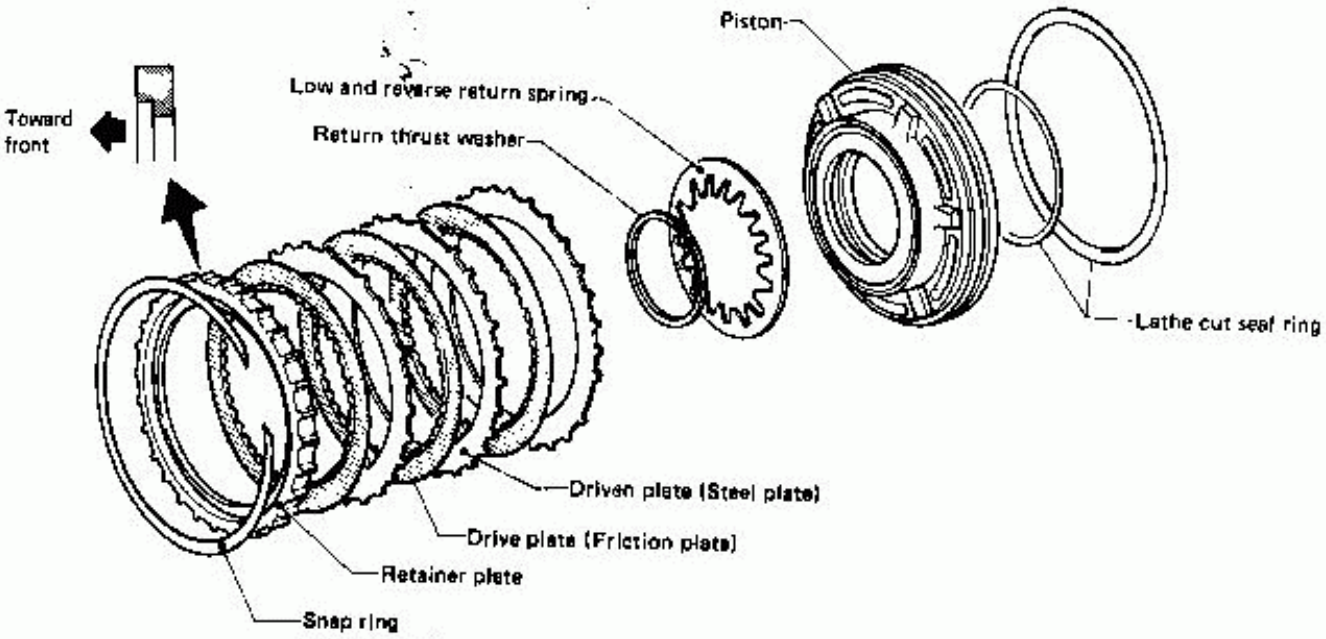
Test rear clutch



SAT622

Low & Reverse Brake

In regard to the number of clutch sheets (drive plate and driven plate), refer to S.D.S.



SAT972

INSPECTION

- Examine for damaged drive plate facing and worn snap ring.
- Check drive plate facing for wear; if necessary, replace.

Drive plate thickness:

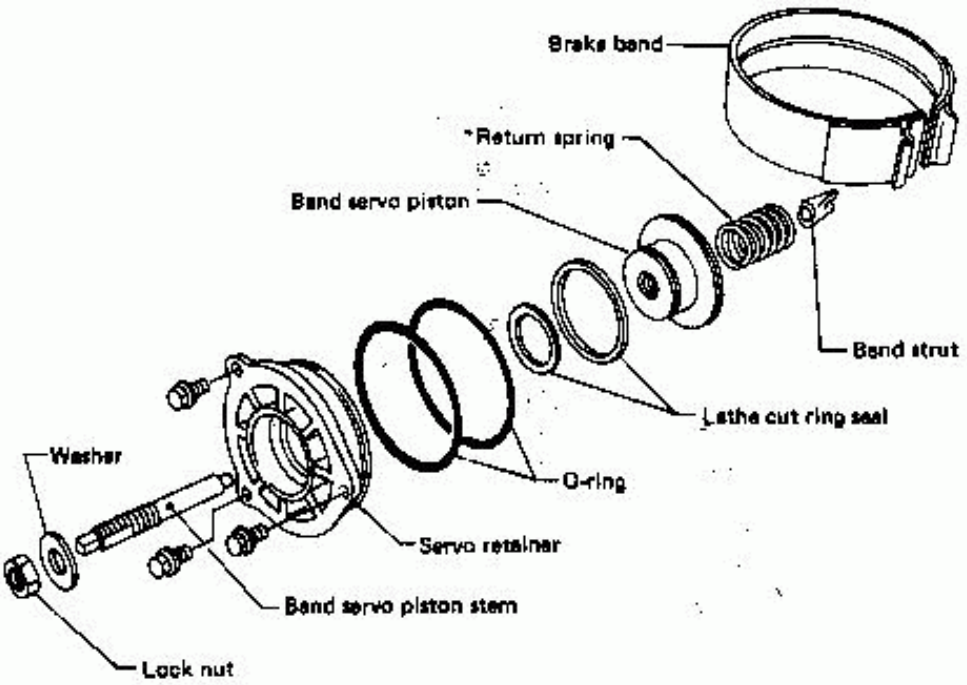
Standard

1.90 - 2.05 mm (0.0748 - 0.0807 in)

Allowable limit

1.8 mm (0.071 in)

Brake Band and Band Servo



SAT559

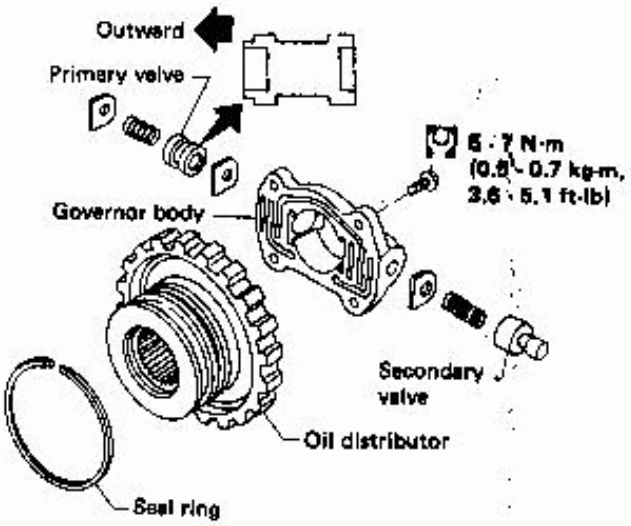
INSPECTION

- Inspect band friction material for wear. If cracked, chipped or burnt spots are apparent, replace the band.

SAT327

- Check band servo components for wear and scoring.

Governor



SAT560

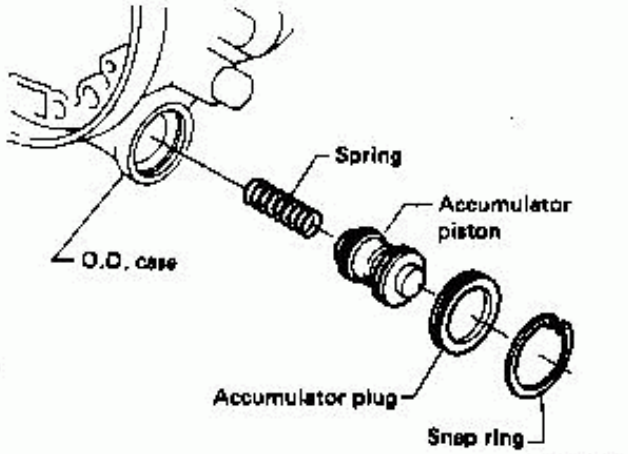
INSPECTION

- Check governor valves and valve body for indication of burning or scratches.
- Check valve springs for damage.
  Measure free length of valve springs.

Valve spring	Free length mm (in)
Primary governor	21.8 (0.858)
Secondary governor	25.1 (0.988)

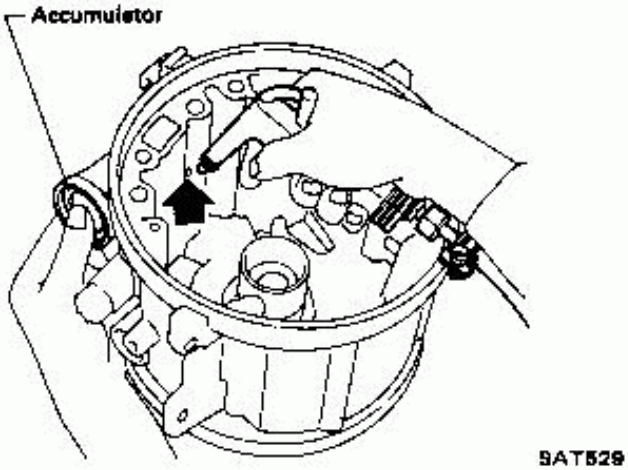
If any abnormalities are found, replace governor body, valves and springs as an assembly.

Accumulator



SAT561

- Remove snap ring, then apply pressure to remove accumulator plug, piston and spring.



SAT529

- Check accumulator components for wear and scoring.

Planetary Carrier

INSPECTION

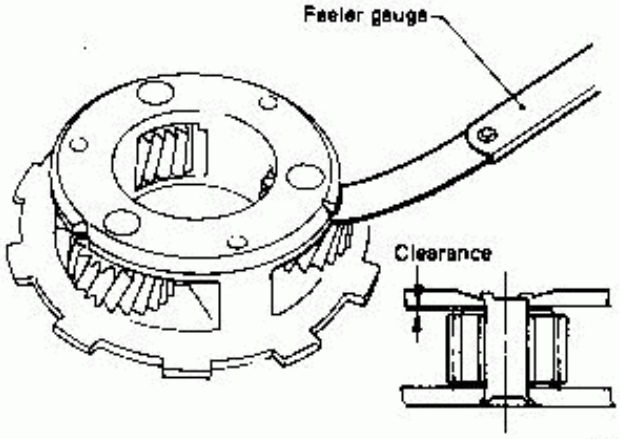
- Check clearance between pinion washer and planetary carrier with a feeler.

  Standard clearance:

  0.20 - 0.70 mm (0.0079 - 0.0276 in)

  Wear limit:

  0.80 mm (0.0315 in)



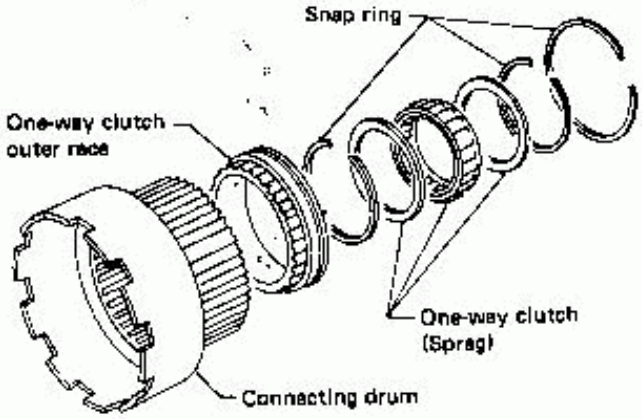
SAT730

- Check planetary gear sets and bearings for damaged or worn gears.

Connecting Drum Assembly

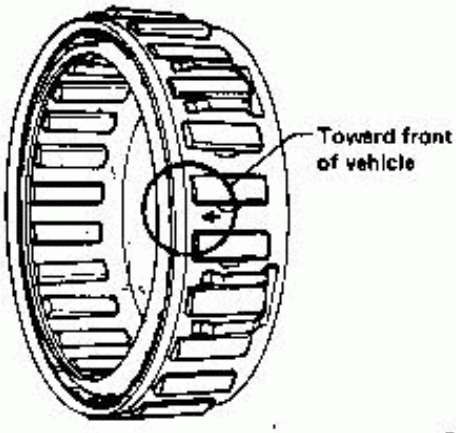
If one-way clutch is out of order as determined during disassembly, repair it as follows:

1. Remove each snap ring, then draw out one-way clutch inner & outer race.



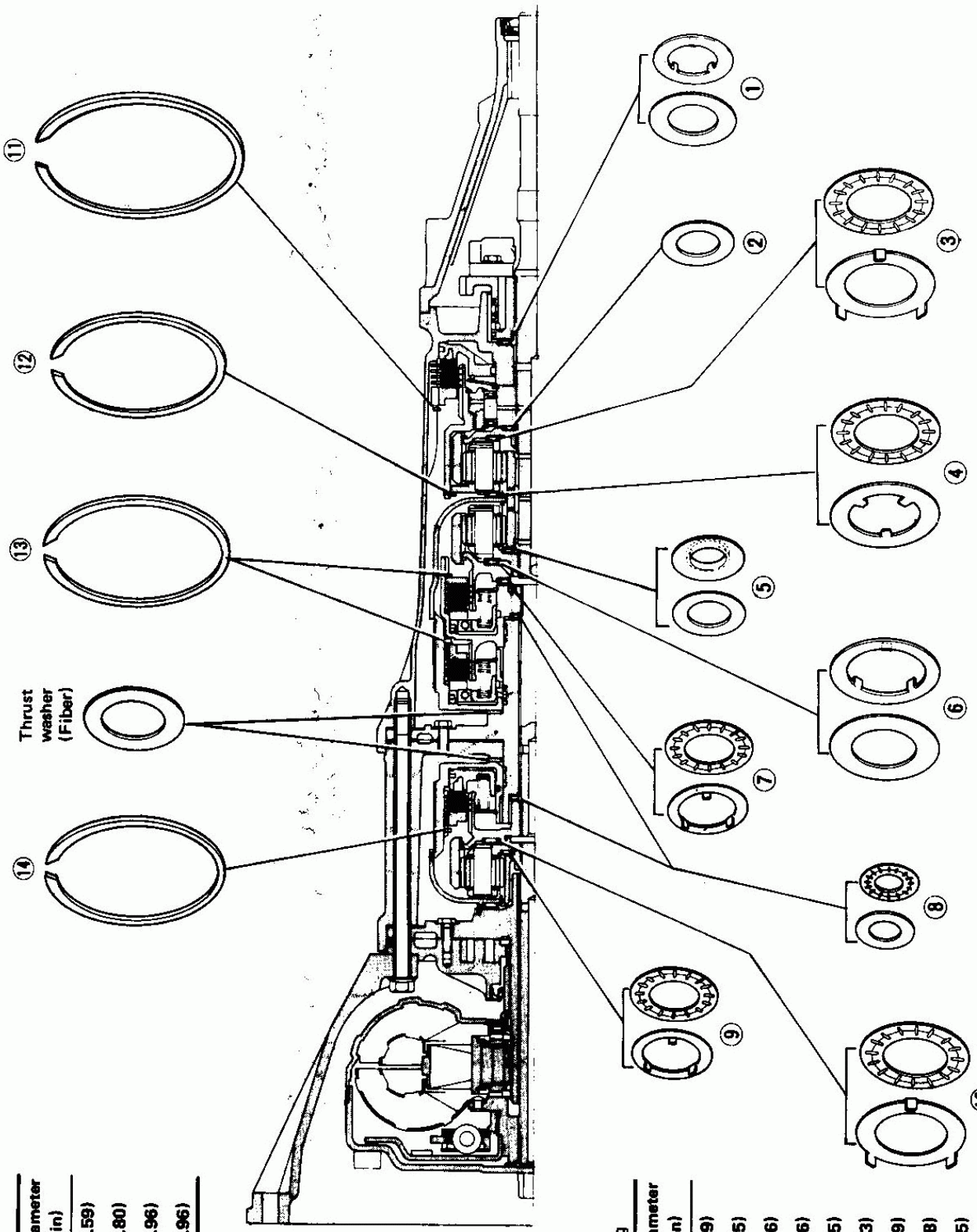
SAT562

2. Inspect one-way sprag and contacting surface for wear or burns.
   Replace parts as necessary.
3. Assemble those parts.



SAT563

When installing/assembling needle bearing, bearing race, snap ring and thrust washer, use the following illustration as a guide to installation procedures and locations.



Snap ring

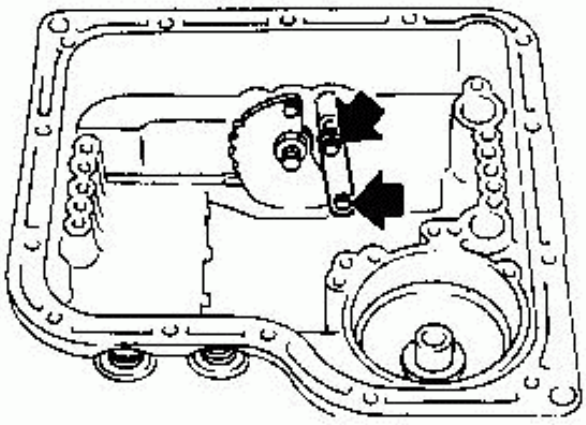
No.	Outer diameter mm (in)
11	142 (5.59)
12	122 (4.80)
13	126 (4.96)
14	126 (4.96)

Needle bearing

No.	Outer diameter mm (in)
1	53 (2.09)
2	47 (1.85)
3	70 (2.76)
4	70 (2.76)
5	47 (1.85)
6	72 (2.83)
7	53 (2.09)
8	35 (1.38)
9	47 (1.85)
10	70 (2.76)

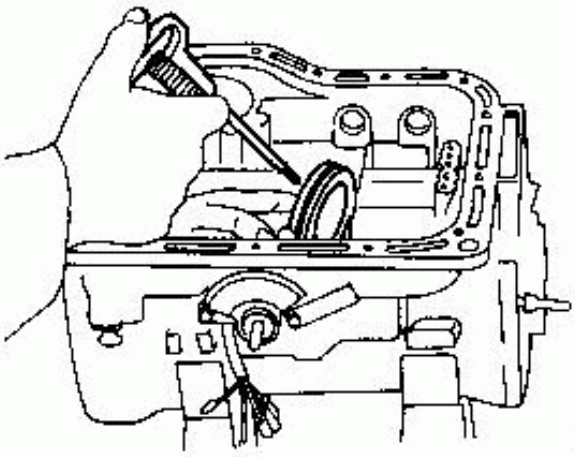
SAT569

1. Install parking rod, manual plate, manual plate lock nut, parking brake lever and snap rings.



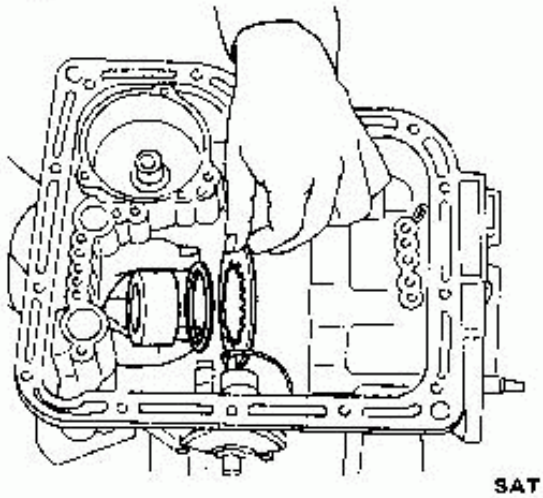
SAT720

2. Lubricate and install low and reverse piston into the case.



SAT048

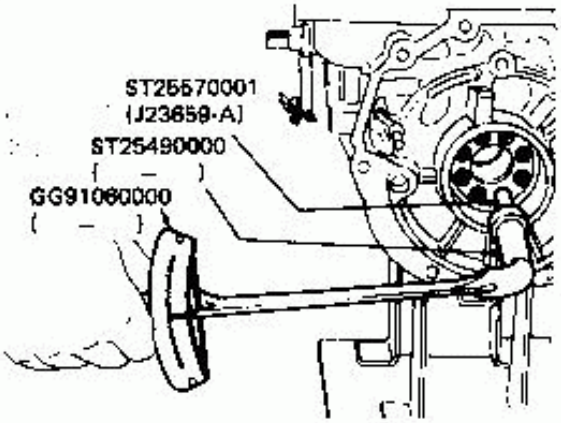
3. Install piston return spring, thrust washer and one-way clutch inner race.



SAT116A

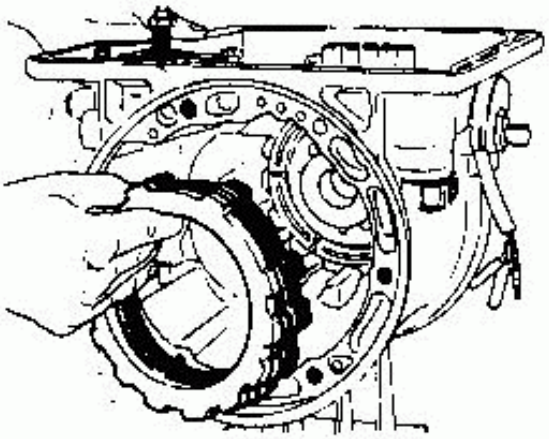
4. Install hex-head slotted bolts.

Check that return spring is centered on race before tightening.



AT131

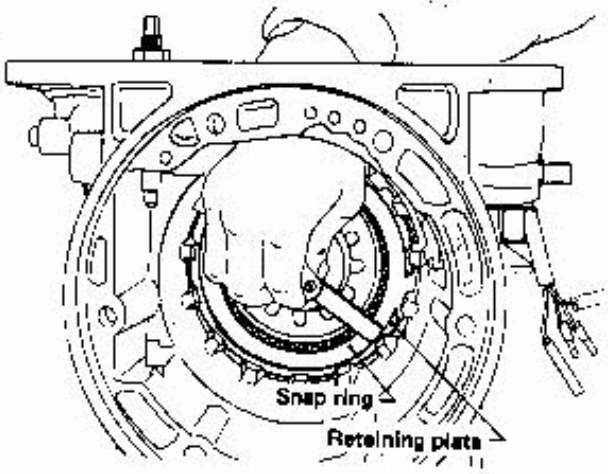
5. Install steel dished plate first, then steel and friction plates, and, finally, retaining plate and snap-ring.



AT129

6. After low and reverse brake has been completely assembled, measure clearance between snap ring and retainer plate. If measurement exceeds specifications adjust by replacing retainer plate with one of a different thickness.

Low and reverse brake clearance:
0.80 - 1.05 mm (0.0315 - 0.0413 in)

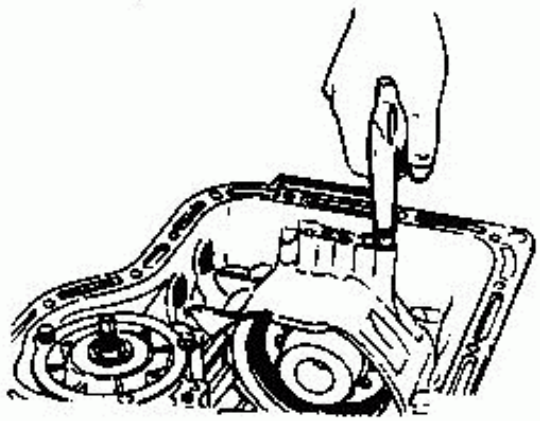


SAT049

Available retainer plates

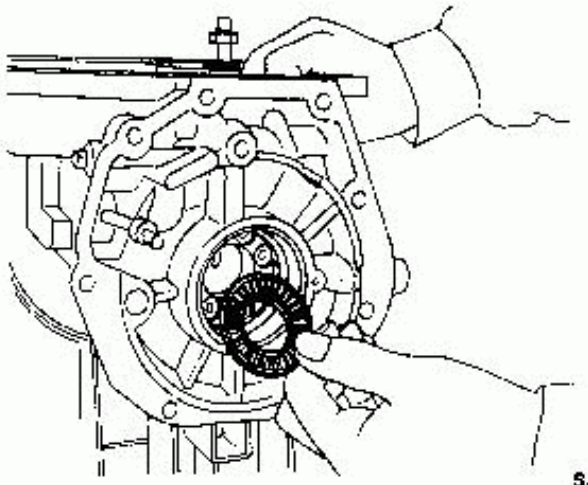
Thickness mm (in)	Part number
7.8 (0.307)	31667-X0500
8.0 (0.315)	31667-X0501
8.2 (0.323)	31667-X0502
8.4 (0.331)	31667-X0503
8.6 (0.339)	31667-X0504
8.8 (0.346)	31667-X0505

7. Check low and reverse brake operation using compressed air.



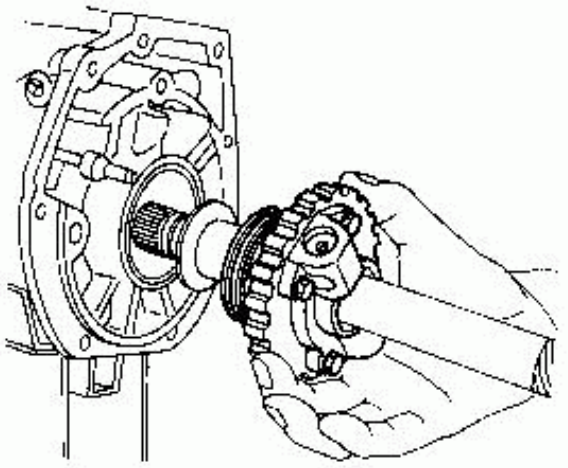
AT158

8. Install governor thrust washer and needle bearing.



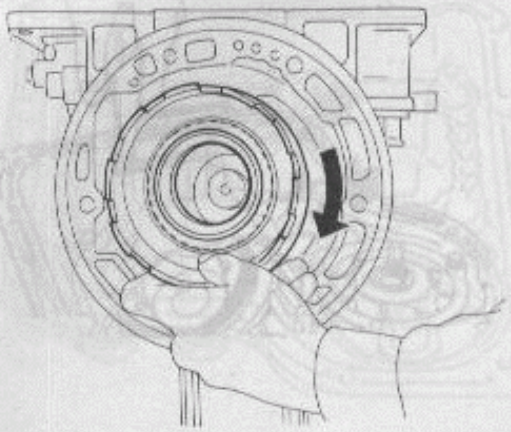
SAT060

9. Install output shaft and governor distributor into case.



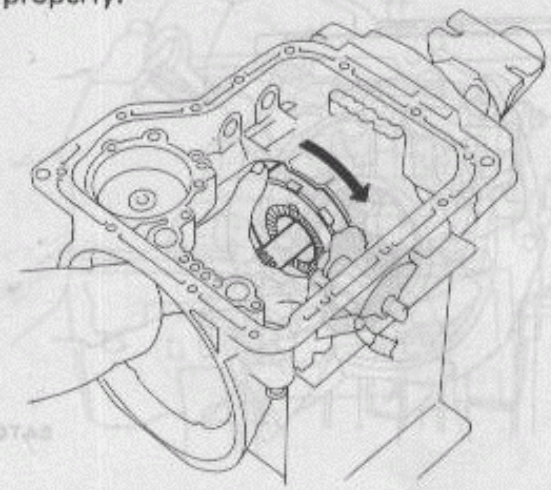
SAT731

10. Install connecting drum with sprag by rotating drum clockwise.



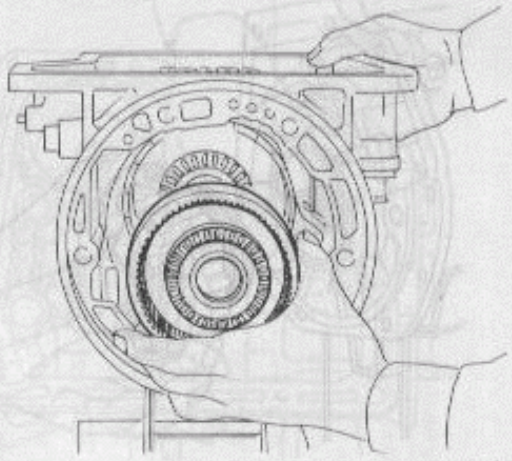
SAT732

11. Check one-way clutch to see if it operates properly.



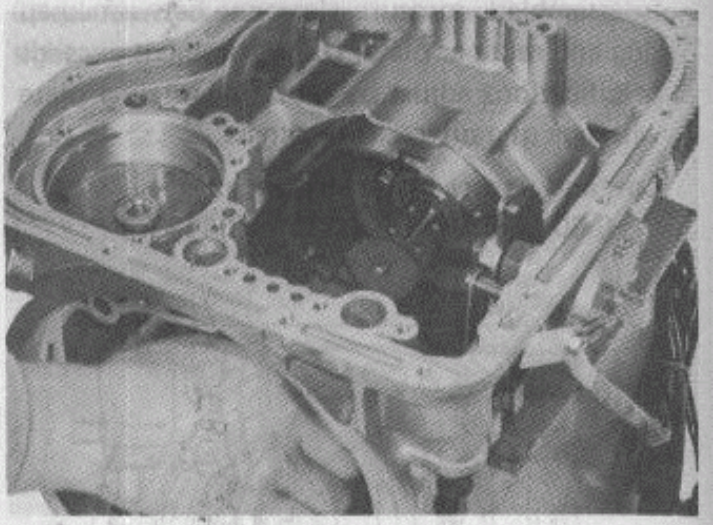
SAT536

12. Install rear internal gear.

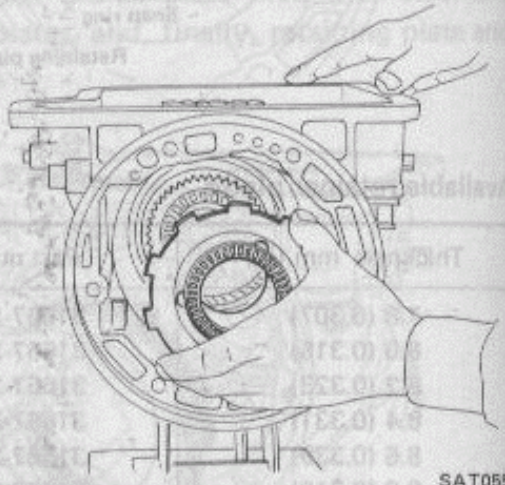


SAT054

13. Install snap-ring on shaft.



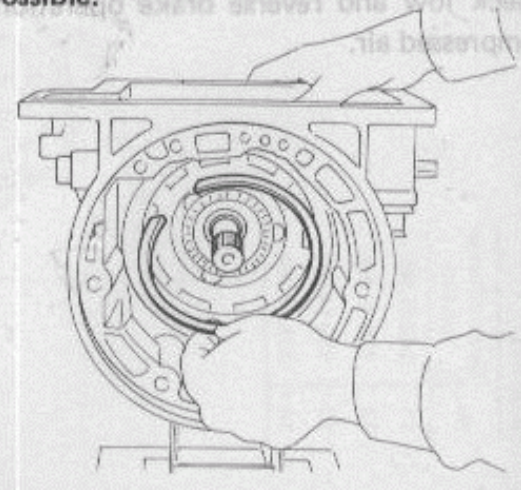
14. Secure thrust bearing and thrust washer with vaseline and install rear planetary carrier.



SAT055

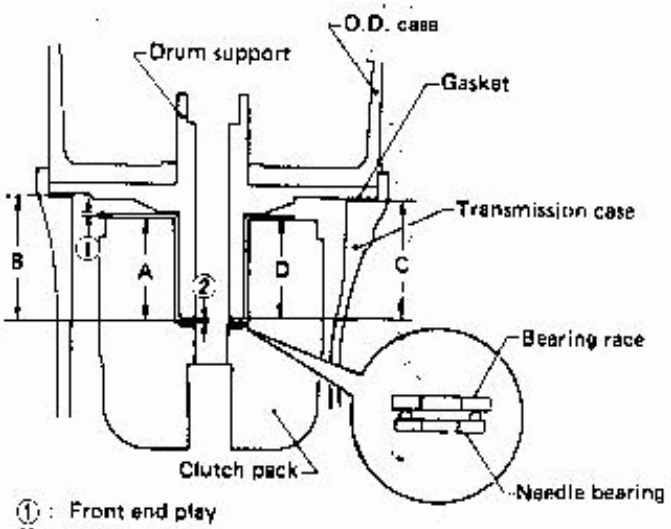
15. Install rear planetary carrier snap ring.

If you have insufficient space to install snap ring into drum groove, pull connecting drum forward as far as possible.



SAT056

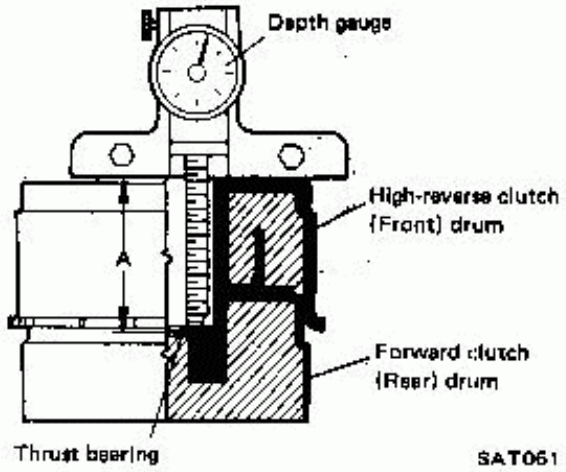
16. Adjust end play as follows:



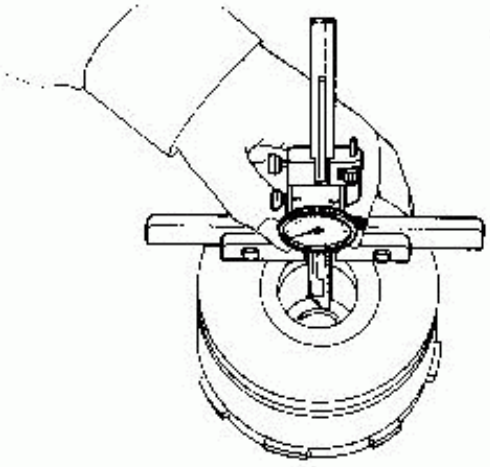
SAT733

Front end play

1) Assemble front clutch and rear clutch drum assemblies together and lay them flat on bench. Be sure rear hub thrust bearing is properly seated. Measure from face of clutch drum to top of thrust bearing race (dimension A).

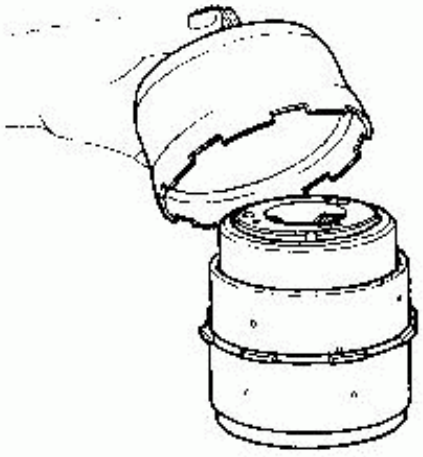


SAT061



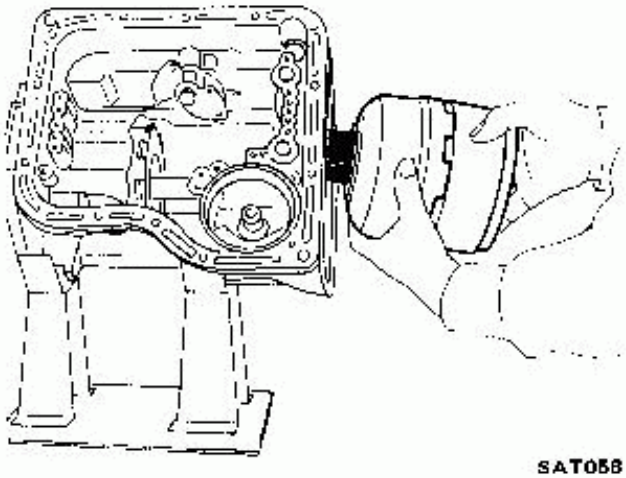
SAT062

2) Assemble front internal gear, front planetary carrier and connecting shell. Secure thrust bearings with vaseline.



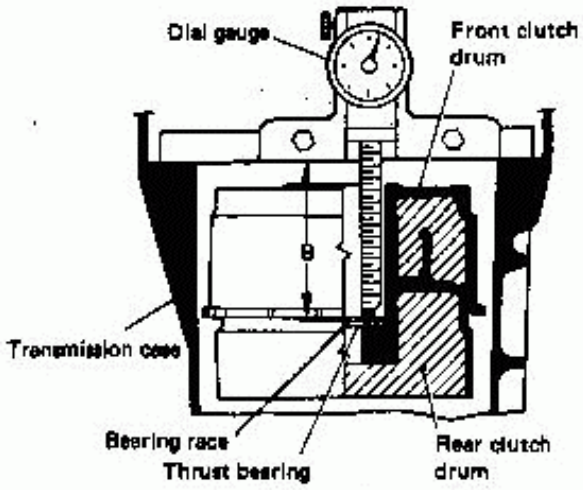
SAT057

3) Install assembly into transmission case. Check that parts are properly seated before proceeding with measurements.

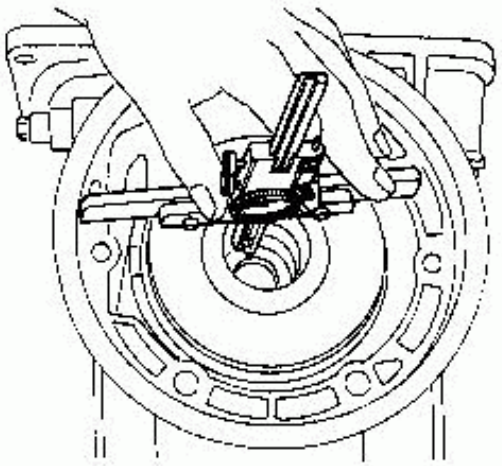


SAT058

4) With a dial gauge or caliper with a seven inch base, measure from rear hub thrust bearing race to case (dimension B).

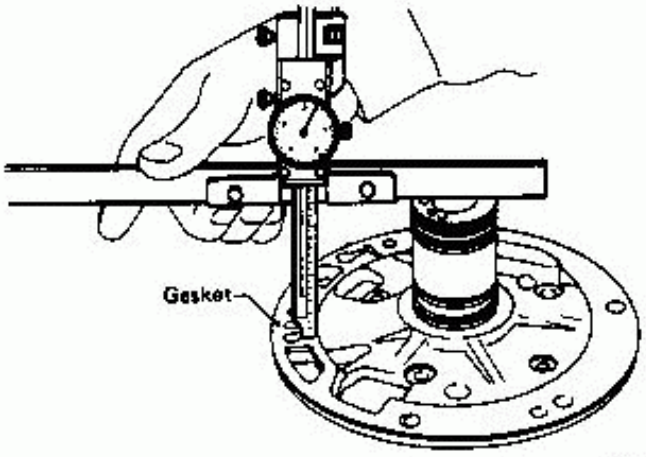


SAT059



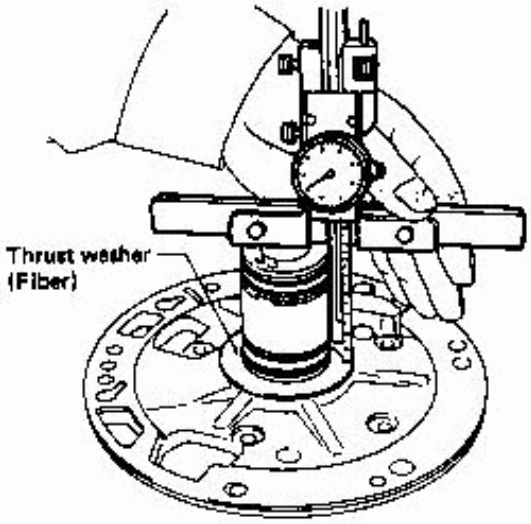
SAT060

5) Measure from top of drum support shaft (front clutch and rear clutch side) to installed gasket (dimension C).



SAT734

6) Install thrust washer. Measure from top of drum support shaft (front clutch and rear clutch side) to thrust washer (dimension D).



SAT671

Front end play = [B – A – 0.1 mm (0.004 in)] – (C – D)

Specified front end play:
0.5 - 0.8 mm (0.020 - 0.031 in)

Front end play can be adjusted with front clutch thrust washers.

Available front clutch thrust washer

Thickness mm (in)	Part number
1.3 (0.051)	31528-X0107
1.5 (0.059)	31528-X0105
1.7 (0.067)	31528-X0106
1.9 (0.075)	31528-X0100
2.1 (0.083)	31528-X0101
2.3 (0.091)	31528-X0102
2.5 (0.098)	31528-X0103
2.7 (0.106)	31528-X0104

Total end play

Total end play = [B – 0.1 mm (0.004 in)] – C

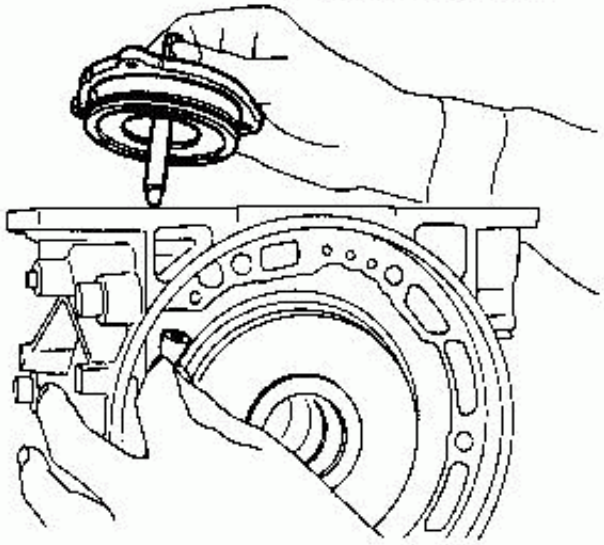
Specified total end play:
0.25 - 0.50 mm
(0.0098 - 0.0197 in)

Total end play can be adjusted with bearing race.

Available oil pump cover bearing race

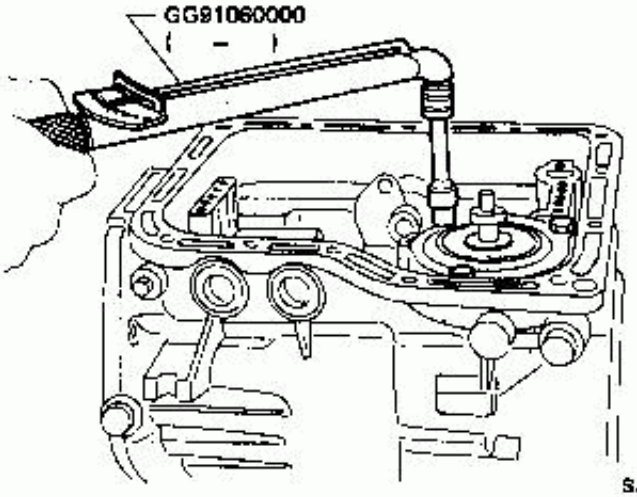
Thickness mm (in)	Part number
1.2 (0.047)	31556-X0100
1.4 (0.055)	31556-X0101
1.6 (0.063)	31556-X0102
1.8 (0.071)	31556-X0103
2.0 (0.079)	31556-X0104
2.2 (0.087)	31556-X0105

17. Install brake band, band strut, and band servo.
Lubricate servo O-rings before installing.



SAT066

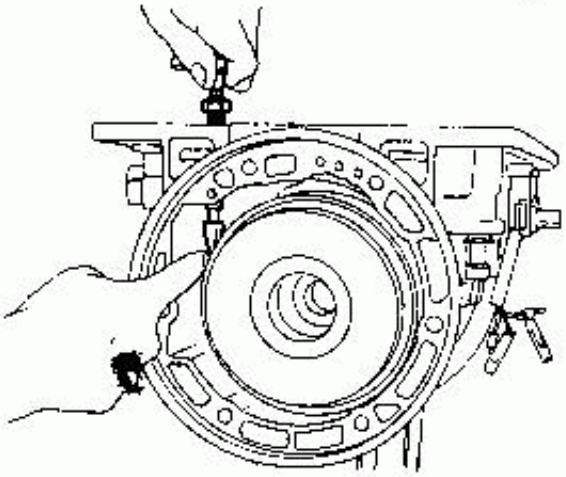
18. Install and tighten the ratainer bolts.
Loosen piston stem.



SAT067

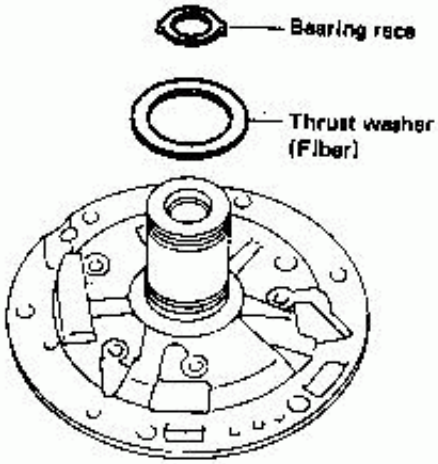
19. Tighten piston stem of brake band servo with finger enough to prevent brake band and strut from falling out.

Do not adjust brake band at this time.



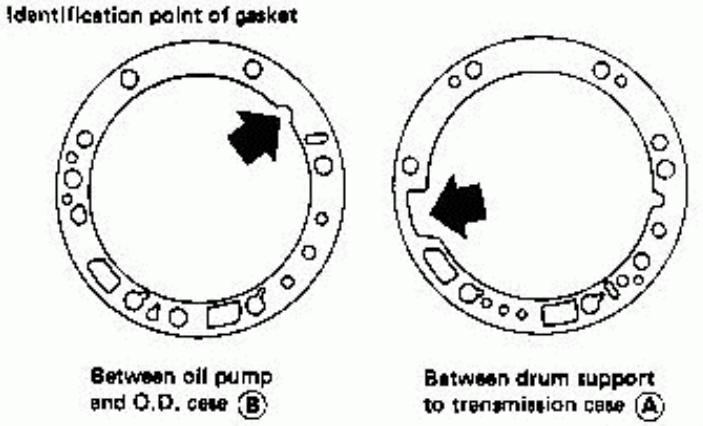
SAT068

20. Apply vaseline to bearing race and thrust washer, then mount them on drum support.



SAT673

21. Mount drum support gasket Ⓐ on drum support after coating with vaseline. Apply A.T.F. to O-ring of drum support. Align drum support with O.D. case to transmission case and install.

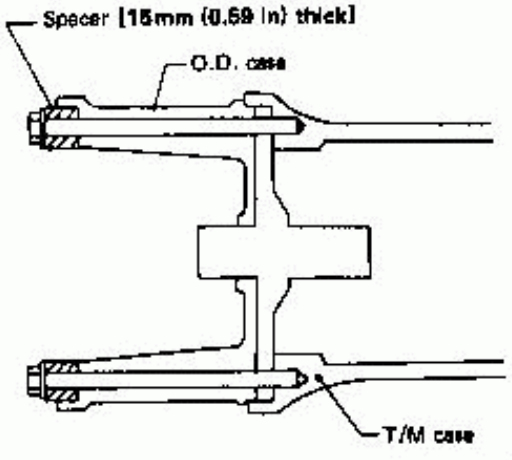


SAT624

22. Apply A.T.F. to O-ring of drum support, then install drum support and O.D. case.

Before installing drum support and O.D. case on transmission case, ensure that they have been centered properly. Refer to Component Parts for Drum Support.

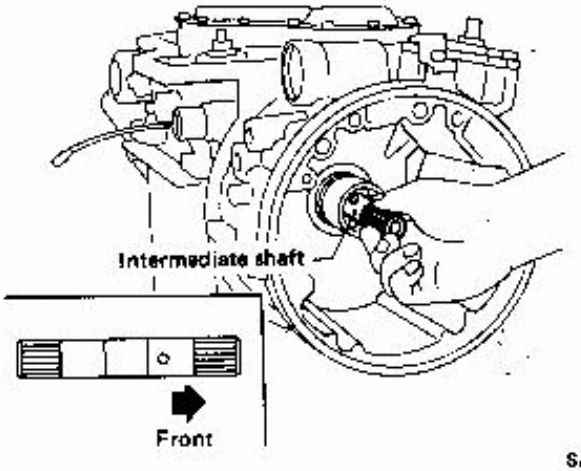
23. Temporarily tighten O.D. case with two converter housing securing bolts.



SAT574

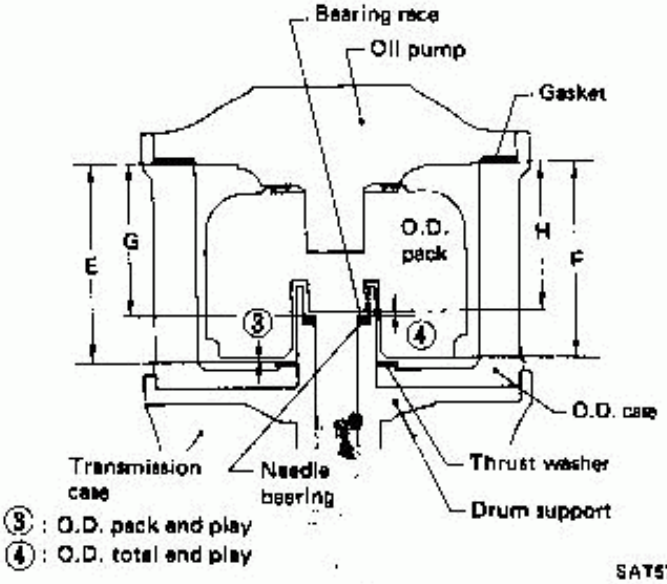
24. Insert intermediate shaft.

Be careful of shaft direction.



SAT575

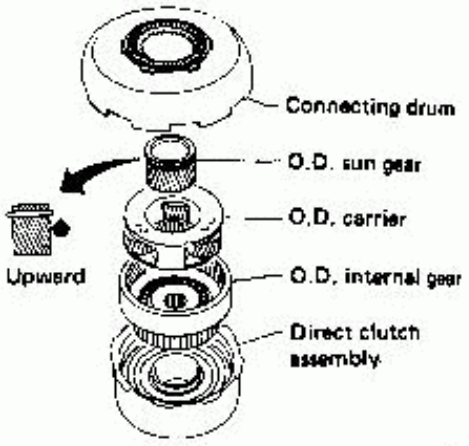
25. Adjust O.D. end play.



SAT576

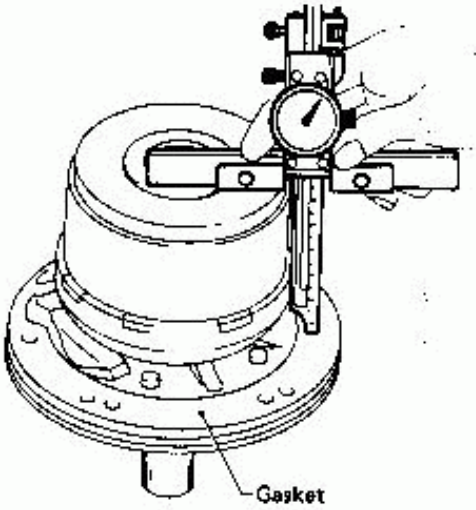
O.D. pack end play

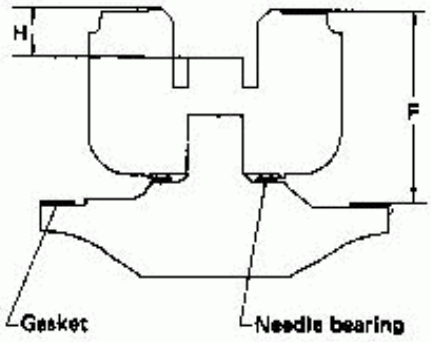
1) Assemble direct clutch assembly, O.D. planetary gear set and connecting drum, and install them on O.D. pack.



SAT577

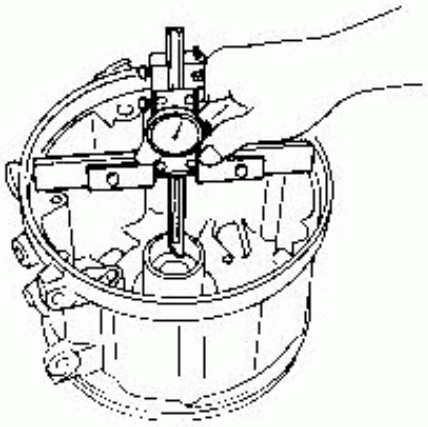
2) Install oil pump bearing, gasket and O.D. pack on oil pump, and measure dimensions F and H.

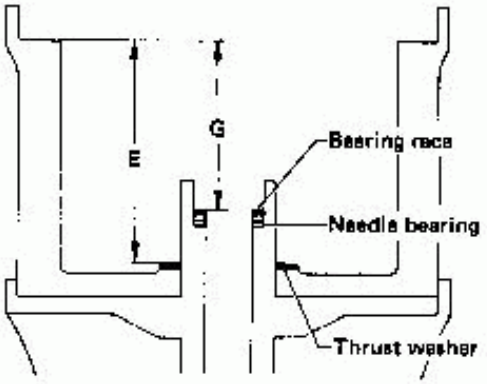




SAT735

3) Attach thrust washer and needle bearing to drum support and O.D. case, and measure dimensions E and G.





SAT736

O.D. pack end play = [E – 0.1 mm (0.004 in)] – F

Specified O.D. pack end play:
0.5 - 0.8 mm (0.020 - 0.031 in)

O.D. pack end play can be adjusted with O.D. thrust washers (these parts are the same as the front clutch thrust washers).

Available O.D. thrust washer

Thickness mm (in)	Part number
1.3 (0.051)	31528-X8607
1.5 (0.059)	31528-X8605
1.7 (0.067)	31528-X8606
1.9 (0.075)	31528-X8600
2.1 (0.083)	31528-X8601
2.3 (0.091)	31528-X8602
2.5 (0.098)	31528-X8603
2.7 (0.106)	31528-X8604

O.D. total end play

O.D. total end play = [G – 0.1 mm (0.004 in)] – (F – H)

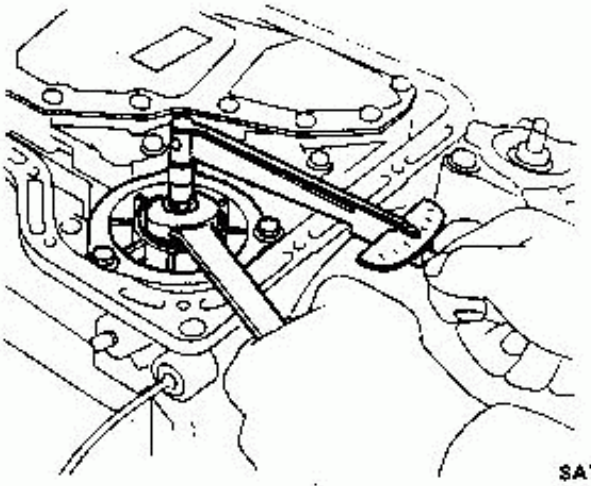
Specified O.D. total end play:
0.25 - 0.50 mm (0.0098 - 0.0197 in)

O.D. total end play can be adjusted with O.D. bearing race.

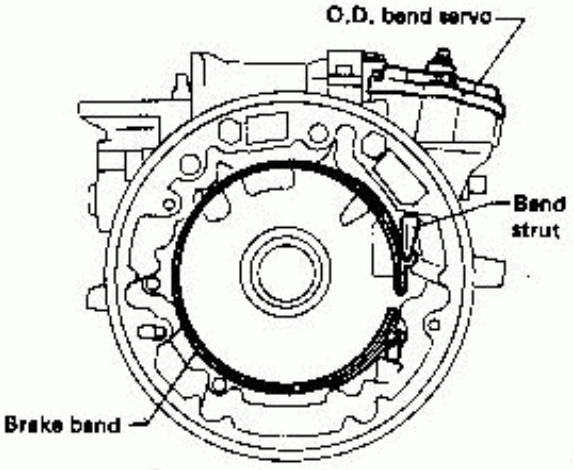
Available O.D. bearing races

Thickness mm (in)	Part number
1.2 (0.047)	31556-X8600
1.4 (0.055)	31556-X8601
1.6 (0.063)	31556-X8602
1.8 (0.071)	31556-X8603
2.0 (0.079)	31556-X8604
2.2 (0.087)	31556-X8605

26. Adjust 2nd brake band. Tighten piston stem to the specified value. Back off three full turns and secure with lock nut.

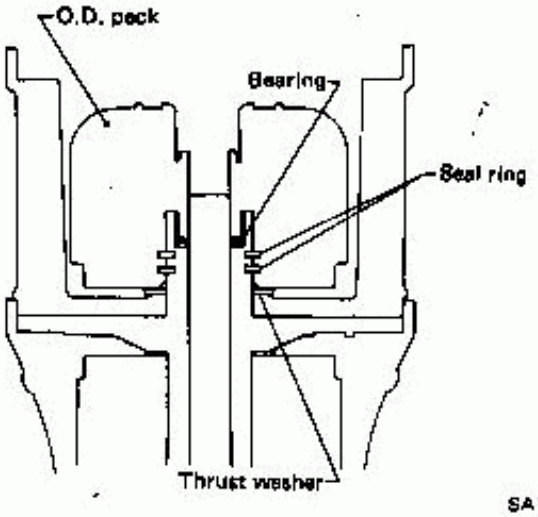

SAT580

27. Lubricate O.D. servo O-rings, then install O.D. band servo, brake band and band strut.



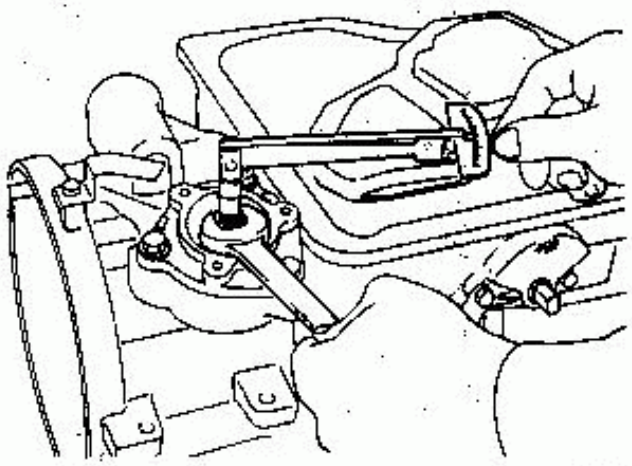
SAT581

28. Lubricate seal ring of drum support, then install O.D. bearing & race, O.D. thrust washer and O.D. pack on drum support. Make sure that brake band strut is correctly installed.



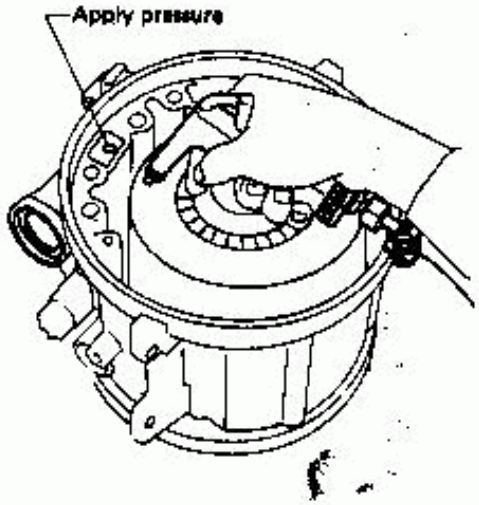
SAT737

29. Adjust O.D. band. Tighten piston stem to the specified value. Back off two full turns and secure with lock nut.



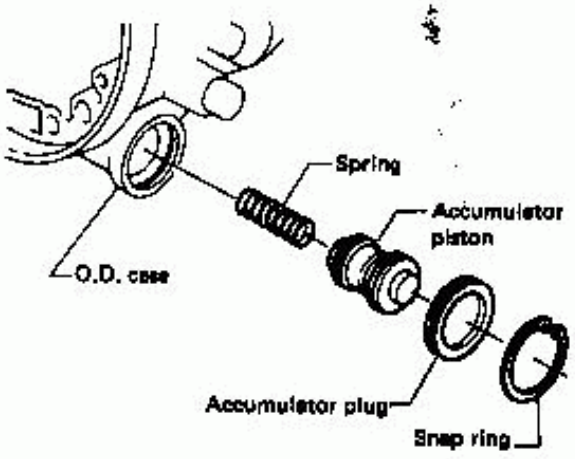
SAT625

30. Test O.D. band servo operation using compressed air.



SAT648

31. Install accumulator parts, then secure with snap ring.



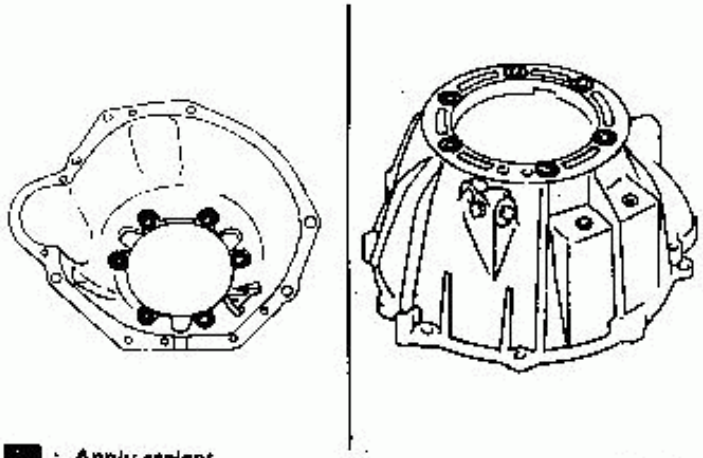
SAT681

32. Lubricate O-ring of oil pump, then install needle bearing & race and oil pump.

Before installing oil pump housing and oil pump on O.D. case, ensure that they have been centered properly.

Refer to Oil Pump in Repair for Component parts.

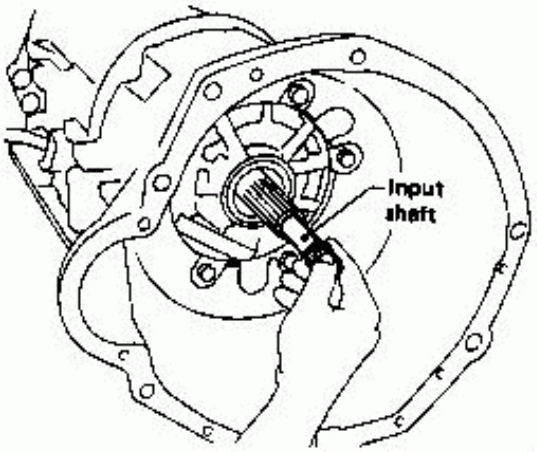
33. Remove the two bolts used to temporarily tighten O.D. case. Apply sealant to seating surface of converter housing around the bolt holes.



▨ : Apply sealant

SAT738

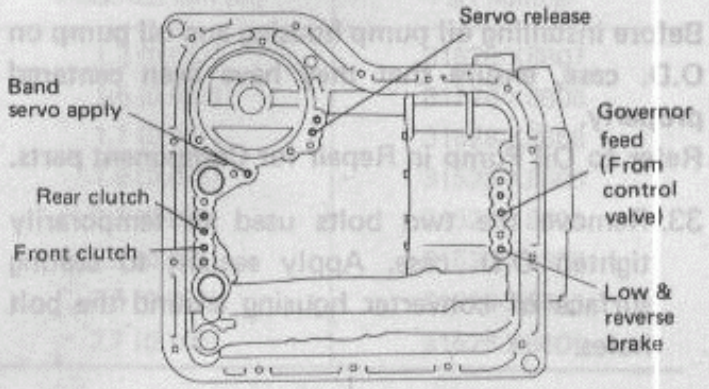
34. Install converter housing on O.D. case and tighten to the specified torque.
35. Install input shaft.



SAT585

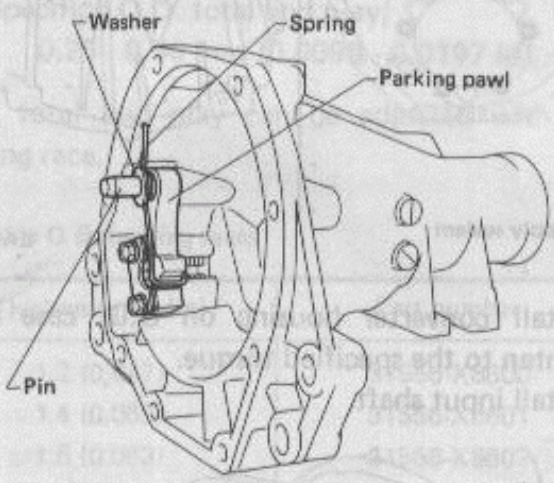
36. Before installing valve body assembly perform a final operation check of all assembled components, with compressed air.

Air check point



SAT586

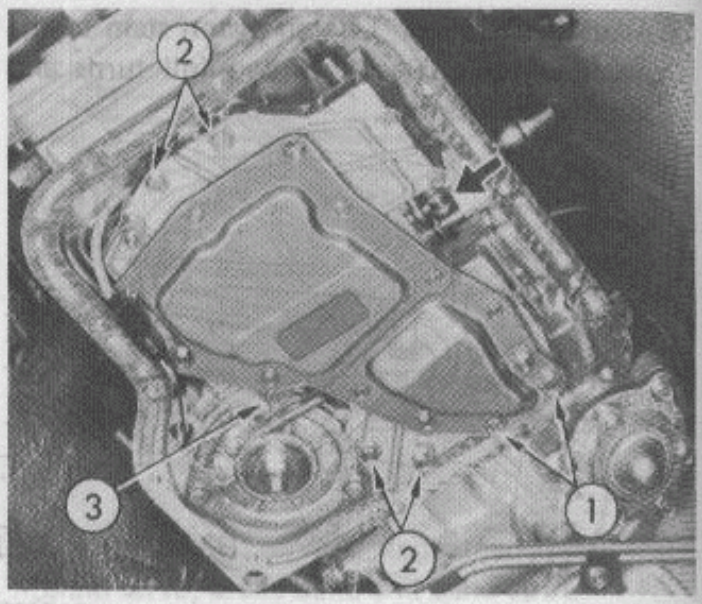
37. Check that parking pawl, pin, spring and washer are assembled correctly.



SAT739

38. Install rear extension.
39. Install control valve assembly. Be sure manual valve is in alignment with selector pin. Tighten control valve body attaching bolts.

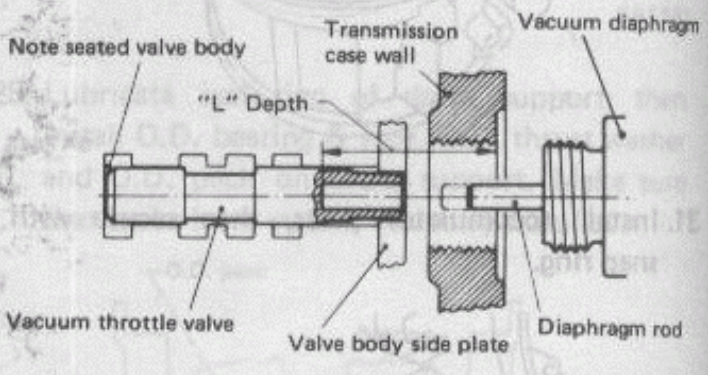
Securing bolt comes in three different lengths.



1 40 mm (1.57 in)
2 35 mm (1.38 in)
3 25 mm (0.98 in)

After installing control valve to transmission case, make sure that control lever can be moved to all positions.

40. Before installing vacuum diaphragm valve, measure depth of hole in which it is inserted. This measurement determines correct rod length to ensure proper performance.

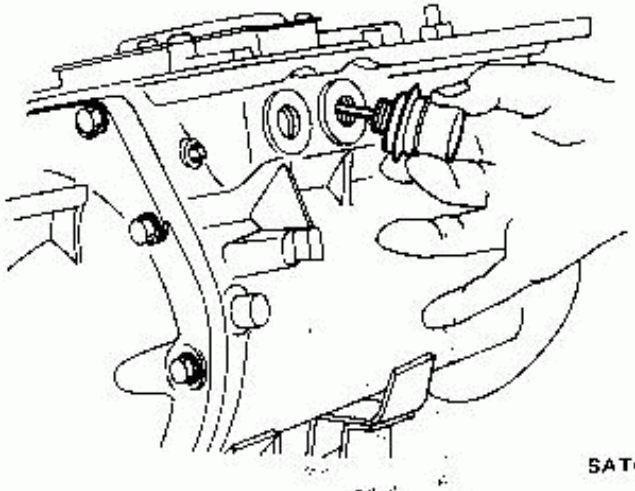


SAT078

Vacuum diaphragm rod selection

Measured depth "L" mm (in)	Rod length mm (in)	Part number
Under 25.55 (1.0059)	29.0 (1.142)	31932-X0103
25.65 - 26.05 (1.0098 - 1.0256)	29.5 (1.161)	31932-X0104
26.15 - 26.55 (1.0295 - 1.0453)	30.0 (1.181)	31932-X0100
26.65 - 27.05 (1.0492 - 1.0650)	30.5 (1.201)	31932-X0102
Over 27.15 (1.0689)	31.0 (1.220)	31932-X0101

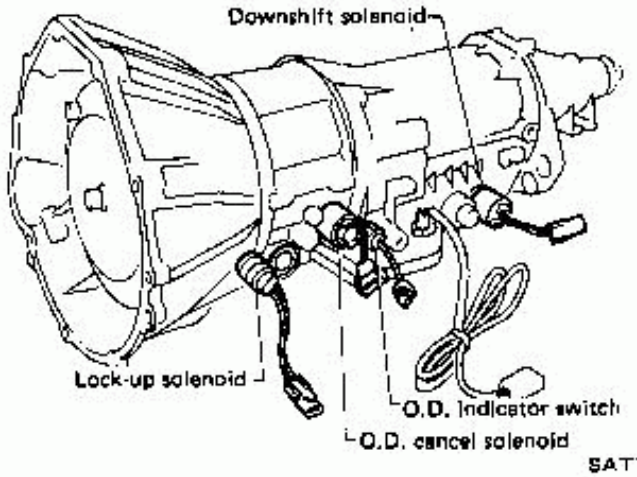
41. Install vacuum diaphragm.



SAT079

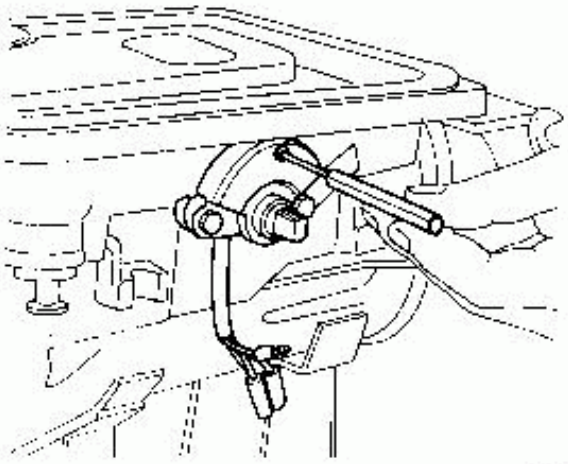
Make sure that vacuum diaphragm rod does not interfere with side plate of control valve.

42. Install downshift solenoid, O.D. cancel solenoid, O.D. indicator switch and lock-up solenoid.



SAT740

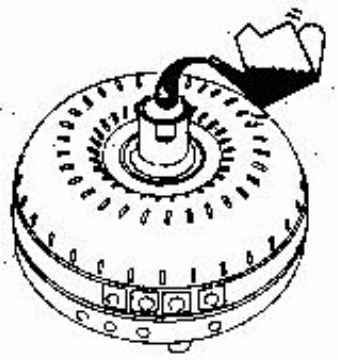
43. Install inhibitor switch. Check for proper operation in each range with a circuit tester. Refer to On-vehicle Service.



SAT082

44. Before installing oil pan, check parking pawl engagement.
45. Install oil pan with new gasket.

46. Pour approx. 2-liters (2-1/8 US qt, 1-3/4 Imp qt) of A.T.F. into converter housing.



SAT618

47. Install torque converter to converter housing.

Be careful not to scratch front oil seal.

Preliminary Checks (Prior to Road Testing)

FLUID LEAKAGE

To detect a fluid leak:

1) Raise vehicle.
2) Clean area suspected of leaking.
3) Start engine, apply foot brake, place selector lever in drive, and wait a few minutes.
4) Stop engine.
5) Check for fresh leakage.

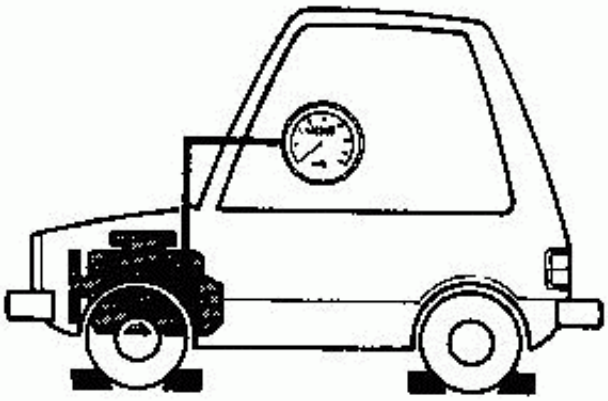
FLUID CONDITION

Examine the A.T.F. and note its color, texture, and odor.

1) Dark of Black Fluid:
   With a burned odor
   – Worn friction material.
2) Milky Pink Fluid: Water Contamination
   – Road water entering through filler tube or breather.
3) Varnished Fluid, light to dark brown and tacky: Oxidation
   – Over or Underfilling.
   – Overheating.

Road Testing

- Before starting road tests, install vacuum gauge.



SAT596

- Perform road tests, using "Symptom" chart, as follows:

"P" RANGE

1. Place selector lever in "P" range and start the engine. Stop the engine and repeat the procedure in all other ranges including neutral.
2. Stop vehicle on a slight upgrade and place selector lever in "P" range. Release parking brake to make sure vehicle remains locked.

"R" RANGE

1. Move selector lever from "P" to "R", and note shift quality.
2. Drive the vehicle in reverse long enough to detect slippage or other abnormalities.

"N" RANGE

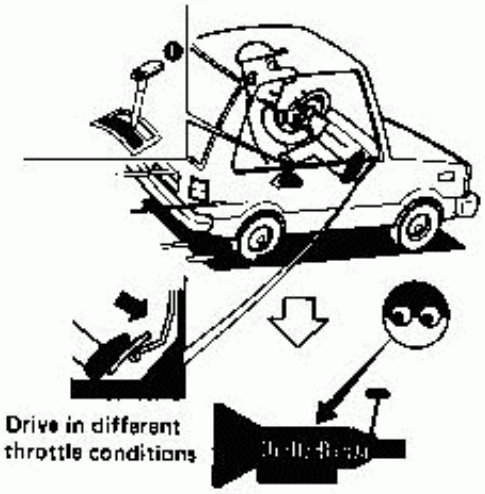
1. Manually shift the selector lever from "R" and "D" to "N" and note quality.
2. Release parking brake with selector lever in "N" range. Lightly depress accelerator pedal to make sure vehicle does not move. (When vehicle is new or soon after clutches have been replaced, vehicle may move slightly. This is not a problem.)

"D" RANGE

1. Move selector lever from "N" to "D" range, and note shift quality.

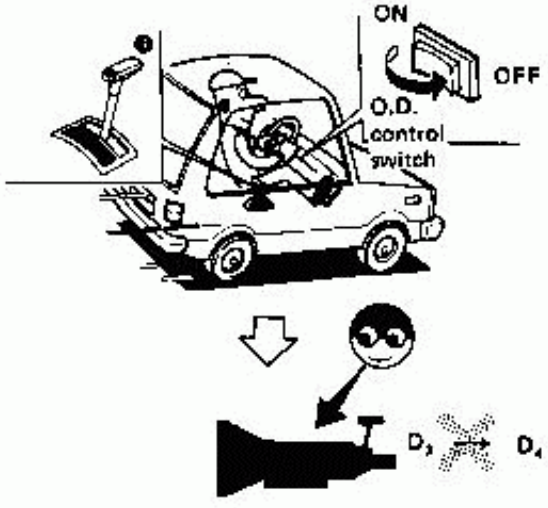
Road Testing (Cont'd)

2. Using the shift schedule as a reference, drive vehicle in "D" range. Record, on symptom chart, respective vehicle speeds at which upshifting and downshifting occur. Check that there is not a considerable jolt when shifting gears. Also determine the timing at which shocks are encountered during shifting and which clutches are engaged.



SAT590

3. Check to determine if shifting to overdrive gear cannot be made while O.D. control switch is "OFF".



SAT927

4. When vehicle is being driven in the 65 to 85 km/h (40 to 53 MPH) range in "D_3" range at half to light throttle position, fully depress accelerator pedal to make sure it downshifts from 3rd to 2nd gear.
5. When vehicle is being driven in the 25 to 35 km/h (16 to 22 MPH) ("D_2" range) at half to light throttle position, fully depress accelerator pedal to make sure it downshifts from 2nd to 1st gear.

"2" RANGE

1. While vehicle is being driven in "2" range, make sure that it does not shift into 1st or 3rd gear, despite speed changes.
2. Move selector lever to "D" range and allow vehicle to operate at 40 to 50 km/h (25 to 31 MPH). Then, shift to "2" range to make sure it downshifts to 2nd gear.

"1" RANGE

1. Place selector lever to "1" range and allow vehicle. Ensure that it does not upshift from 1st to 2nd gear although vehicle speed increases.
2. While vehicle is being driven in "1" range, release accelerator pedal to make sure that engine compression acts as a brake.
3. Place selector lever into "D" or "2" range and allow vehicle to run at 20 to 30 km/h (12 to 19 MPH). Then, move selector lever to "1" range to make sure the downshift to 1st gear is made.

Road Testing (Cont'd)

VEHICLE SPEED WHEN SHIFTING GEARS

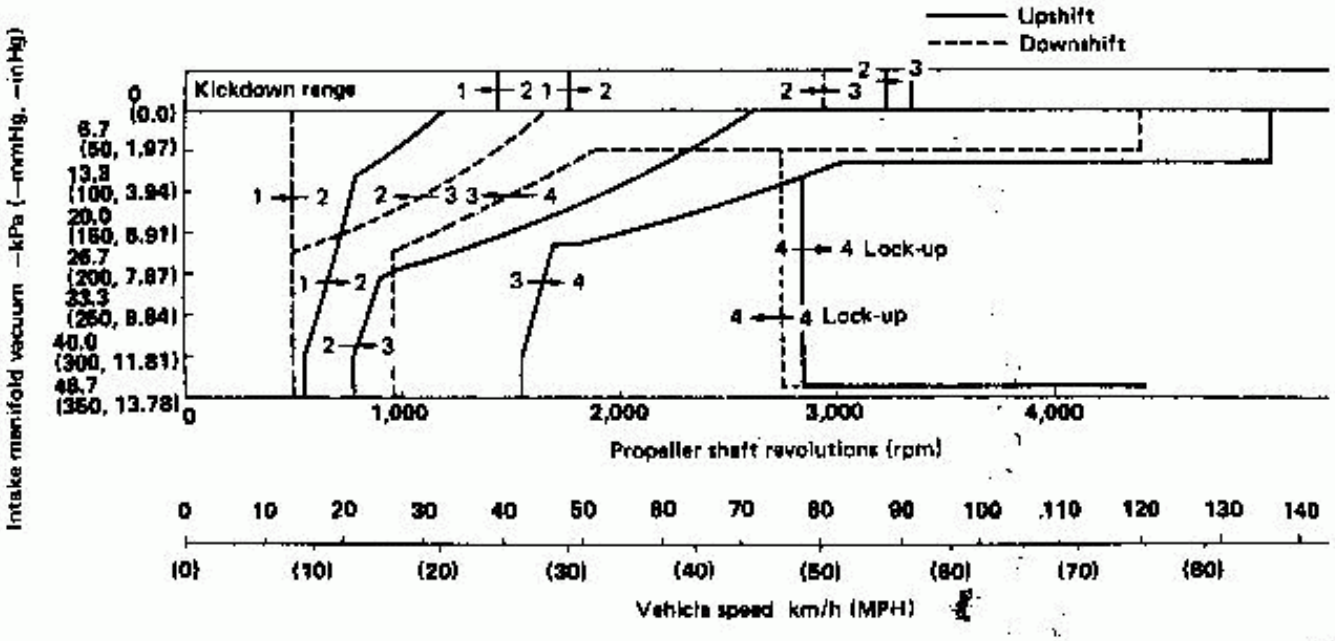
1. Disconnect harness from lock-up control unit. Carry out road test to determine if all items listed in the following chart are within their specified values.
2. Reconnect harness to lock-up control unit. Carry out road test to see if shifting corresponds to the specified shift schedule pattern.

CA20E engine

Throttle position	Gearshift	Vehicle speed km/h (MPH)
Full throttle	$D_1 \rightarrow D_2$	45 - 52 (28 - 32)
	$D_2 \rightarrow D_3$	86 - 93 (53 - 58)
	$D_3 \rightarrow D_4$	—
	$D_4 \rightarrow D_3$	—
	$D_3 \rightarrow D_2$	79 - 85 (49 - 53)
	$D_2 \rightarrow D_1$	35 - 42 (22 - 26)

SHIFT SCHEDULE

CA20E engine



SAT117A

Road Test Symptom Chart

Numbers in chart below correspond with those indicated in Trouble-shooting chart.
It is not necessary to check shaded items.

		SHIFT QUALITY: ROUGH	SHIFT QUALITY: SHIFT TIMING (Mark km/h (MPH))	SHIFT QUALITY: NO SHIFT	SHIFT QUALITY: SHIFT SLIPPAGE	VEHICLE WON'T MOVE	CRUISE SLIPPAGE	POOR POWER/ ACCELERATION	NOISY	ENGINE WON'T START	VEHICLE WON'T STAND STILL	NO ENGINE BRAKING	NO LOCK-UP	COMMENTS
PARK RANGE	ENG. START									Ⓐ				
	HOLDING								Ⓑ		Ⓒ			
"R" RANGE	Man. shift P-R					(A3)			(A4)					
	REVERSE					Ⓔ·(A3)	Ⓔ	Ⓔ	(A4)					
"N" RANGE	Man. shift R-N								(A4)					
	ENG. START									Ⓐ				
	N								Ⓑ		Ⓒ			
"D" RANGE	Man. shift N-D	Ⓕ				Ⓖ·(A3)			(A4)					
	1st					Ⓖ·(A3)		Ⓘ	(A4)					
	Auto shift 1-2	Ⓞ		Ⓙ	Ⓡ				(A4)					
	2nd							Ⓤ	(A4)					
	Auto shift 2-3	Ⓟ		Ⓚ	Ⓢ				(A4)					
	3rd							Ⓤ	(A4)					
	Auto shift 3-4	Ⓠ		Ⓛ	Ⓣ				(A4)					
	4th							Ⓤ	(A4)					
	Lock-up "OFF" → Lock-up "ON"	Ⓝ							(A4)				Ⓜ	
	In lock-up "ON"								(A4)				Ⓜ	
	Lock-up "ON" → Lock-up "OFF"								(A4)					
	Decel. 4-3			Ⓥ	Ⓩ				(A4)					
	Kickdown 4-3			Ⓥ	Ⓩ·(A2)				(A4)					
	Decel. 3-2			Ⓦ	(A1)				(A4)					
	Kickdown 3-2			Ⓦ	Ⓨ·(A1)				(A4)					
	Decel. 2-1			Ⓧ					(A4)					
	Kickdown 2-1			Ⓧ					(A4)					
"2" RANGE	Man. shift D-2			(A5)		Ⓗ·(A3)			(A4)					
	2nd					Ⓗ·(A3)		Ⓘ	(A4)					
"1" RANGE	Man. shift 2-1	(A9)		Ⓧ·(A8)					(A4)					
	Man. shift D-1			Ⓧ·(A8)					(A4)					
	Acceleration					Ⓗ·(A3)		Ⓘ	(A4)					
	"1" Engine Braking								(A4)			(A7)		

Trouble-shooting Chart

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.

Reference		ON vehicle													OFF vehicle										
		Oil level	Range select linkage	Inhibitor switch and wiring	Vacuum diaphragm and piping	Kickdown solenoid, switch and wiring	Engine idling rpm	Line pressure	Control valve	Governor	2nd band servo	Transmission air check	Oil quality	Ignition switch and starter motor	Engine adjustment, brake inspection	O.D. band servo	O.D. control SW.	O.D. cancel solenoid	Lock-up solenoid	Lock-up control unit and sensors	Direct clutch	Rear clutch	Front clutch	O.D. band brake	2nd band brake	Low and reverse brake	Oil pump	Oil passage leak	Torque converter	Transmission one-way clutch	Park linkage	Planetary gear	O.D. cancel valve	Lock-up control valve	Accumulator
Ⓐ	Engine does not start in "N", "P" ranges.	.	2	3	.	.	.	.	.	.	.	.	.	①	.	.	.	.	4	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Engine starts in range other than "N" and "P".	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ⓑ	Transmission noise in "P" and "N" ranges.	1	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	③	.	.	.	.	.	.	.	.
Ⓒ	Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	②	.	.	.	.	.
Ⓓ	Vehicle runs in "N" range.	.	1	.	.	.	.	.	3	.	.	.	2	.	.	.	.	.	.	.	.	④	.	.	.	.	.	.	.	.	.	.	.	.	.
Ⓔ	Vehicle will not run in "R" range (but runs in "D", "2" and "1" ranges). Clutch slips. Very poor acceleration.	1	2	.	.	.	.	3	5	.	.	6	4	.	.	.	.	.	.	.	.	.	⑧	.	⑦	.	⑩	.	.	.	.	.	.	.	.
	Vehicle braked when shifting into "R" range.	.	.	.	.	.	.	.	.	.	3	2	1	.	.	.	.	.	.	.	.	④	.	.	⑤	.	.	.	.	⑥	.	.	.	.	.
Ⓕ	Sharp shock in shifting from "N" to "D" range.	.	.	.	2	.	1	3	4	.	.	.	.	.	.	.	.	.	.	.	.	⑤	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ⓖ	Vehicle will not run in "D" range (but runs in "2", "1" and "R" ranges).	.	1	.	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	④	.	.	.	.	.
Ⓗ	Vehicle will not run in "D", "1", "2" ranges (but runs in "R" range). Clutch ships. Very poor acceleration.	1	2	.	.	.	.	4	5	.	.	6	3	.	7	.	.	.	.	.	.	⑧	⑩	.	.	.	.	⑨	.	.	.	.	.	.	.
Ⓘ	Clutches or brakes slip somewhat in starting.	1	2	.	6	.	.	3	5	.	.	7	4	.	.	.	.	.	.	.	.	.	.	.	.	.	⑧	⑨	.	.	.	.	.	.	.
	Excessive creep.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	No creep at all.	1	2	.	.	.	3	.	5	.	.	.	4	.	.	.	.	.	.	.	.	⑧	⑨	⑩	.	.	.	⑥	⑦	.	.	.	.	.	.	.
Ⓙ	Failure to change gear from "1st" to "2nd".	.	1	.	2	3	.	.	5	6	8	7	4	.	.	.	.	.	.	.	.	.	.	.	⑨	.	.	.	⑩	.	.	.	.	.	.	.
Ⓚ	Failure to change gear from "2nd" to "3rd".	.	1	.	2	3	.	.	5	6	8	7	4	.	.	.	.	.	.	.	.	.	⑨	.	.	.	.	⑩	.	.	.	.	.	.	.	.
Ⓛ	Failure to change gear from "3rd" to "4th".	.	1	.	2	3	.	.	5	6	8	7	4	.	.	.	.	.	.	.	.	.	.	.	⑨	.	.	.	⑩	.	.	.	.	.	.	.
	Too high a gear change point from "1st" to "2nd", from "2nd" to "3rd", from "3rd" to "4th".	.	.	.	1	2	.	3	5	6	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	⑦	.	.	.	.	.	.	.
	Gear change directly from "1st" to "3rd" occurs.	.	.	.	.	.	.	.	2	4	.	3	1	.	.	.	.	.	.	.	.	.	.	.	.	⑤	.	.	⑥	.	.	.	.	.	.	.
	Gear change directly from "2nd" to "4th" occurs.	.	.	.	.	.	.	.	2	4	.	3	1	.	.	.	.	.	.	.	.	.	⑤	.	.	.	.	.	⑥	.	.	.	.	.	.	.
Ⓜ	Lock-up does not occur in "4th" gear	.	.	.	.	.	.	.	.	1	.	.	.	.	.	2	.	.	.	.	.	.	.	.	④	.	.	.	.	.	.	.	.	.	③	.
Ⓝ	Large jolt changing from lock-up "OFF" to "ON".	.	.	.	.	.	.	2	.	3	.	.	1	.	.	.	.	.	.	4	.	.	.	.	⑥	.	.	.	.	.	.	.	.	.	⑤	.

TROUBLE-SHOOTING AND DIAGNOSES

Trouble-shooting Chart (Cont'd)

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.

Reference		ON vehicle														OFF vehicle											
		Oil level	Range select linkage	Inhibitor switch and wiring	Vacuum diaphragm and piping	Kickdown solenoid, switch and wiring	Engine idling rpm	Line pressure	Control valve	Governor	2nd band servo	Transmission air check	Oil quality	Ignition switch and starter motor	Engine adjustment, brake inspection	O.D. band servo	O.D. control SW.	O.D. cancel solenoid	Lock-up solenoid	Lock-up control unit and sensors	Direct clutch	Rear clutch	Front clutch	O.D. band brake	2nd band brake	Low and reverse brake	Oil pump	Oil passage leak	Torque converter	Transmission one-way clutch	Park linkage	Planetary gear	O.D. cancel valve	Lock-up control valve	Accumulator
Ⓞ	Too sharp a shock in change from "1st" to "2nd".				1		2		4		5		3						6	7				Ⓑ				Ⓘ					Ⓙ	
Ⓟ	Too sharp a shock in change from "2nd" to "3rd".				1			2	3		5	4							6	7			Ⓑ					Ⓘ					Ⓙ	
Ⓠ	Too sharp a shock in change from "3rd" to "4th".				1			2	3			7				4			5	6				Ⓑ				Ⓘ					Ⓙ	
Ⓡ	Almost no shock or clutches slipping in change from "1st" to "2nd".	1	2		3			4	6		8	7	5												Ⓘ									
Ⓢ	Almost no shock or slipping in change from "2nd" to "3rd". Engine races extremely fast.	1	2		3			4	6		8	7	5										Ⓘ											
Ⓣ	Almost no shock or slipping in change from "3rd" to "4th".	1	2		3			4	6		8	7	5											Ⓘ											
	Vehicle braked by gear change from "1st" to "2nd".								2				1									Ⓓ			Ⓖ				Ⓚ					
	Vehicle braked by gear change from "2nd" to "3rd".								3		2		1										Ⓓ			Ⓖ									
	Vehicle braked by gear change from "3rd" to "4th".								2				1								Ⓒ	Ⓓ														
Ⓤ	Maximum speed not attained. Acceleration poor.	1	2				5	4	7		6		3		8							Ⓛ	Ⓜ		Ⓑ	Ⓘ		Ⓝ							
Ⓥ	Failure to change gear from "4th" to "3rd".				1				3	4		5	2				6	7	8		Ⓑ	Ⓒ		Ⓛ	Ⓜ			Ⓝ					Ⓞ		
Ⓦ	Failure to change gear from "3rd" to "2nd" and from "4th" to "2nd".				1				3	4	6	5	2									Ⓒ		Ⓛ	Ⓜ	Ⓘ		Ⓝ							
Ⓧ	Failure to change gear from "2nd" to "1st" or from "3rd" to "1st".				1				3	4	6	5	2										Ⓒ			Ⓘ				Ⓚ					
	Gear change shock felt during deceleration by releasing accelerator pedal.		1		2	3		4	5	6																	Ⓝ							Ⓙ
	Too high a change point from "4th" to "3rd", from "3rd" to "2nd", from "2nd" to "1st".		1		2	3		4	5	6										7							Ⓝ							
Ⓨ	Kickdown does not operate when depressing pedal in "3rd" within kickdown vehicle speed.				2	1			4	5			3											Ⓛ			Ⓝ							
	Kickdown operates or engine overruns when depressing pedal in "3rd" beyond kickdown vehicle speed limit.		1		2			3	5	6		7	4										Ⓒ				Ⓝ							
Ⓩ	Races extremely fast or slips in changing from "4th" to "3rd" when depressing pedal.				1			2	4		6	5	3								Ⓖ	Ⓒ		Ⓘ				Ⓚ						
Ⓐ1	Races extremely fast or slips in changing from "3rd" to "2nd" when depressing pedal.				1			2	4		6	5	3									Ⓒ		Ⓘ			Ⓝ							
Ⓐ2	Kickdown does not operate when depressing pedal in "4th" within kickdown vehicle speed.				2	1			4	5			3								Ⓖ	Ⓒ					Ⓚ							
	Kickdown operates or engine overruns when depressing pedal in "4th" beyond kickdown vehicle speed limit.		1		2			3	5	6		7	4										Ⓘ				Ⓝ							
	Shift pattern does not change.				1	3			7						5		2	4		6												Ⓚ		

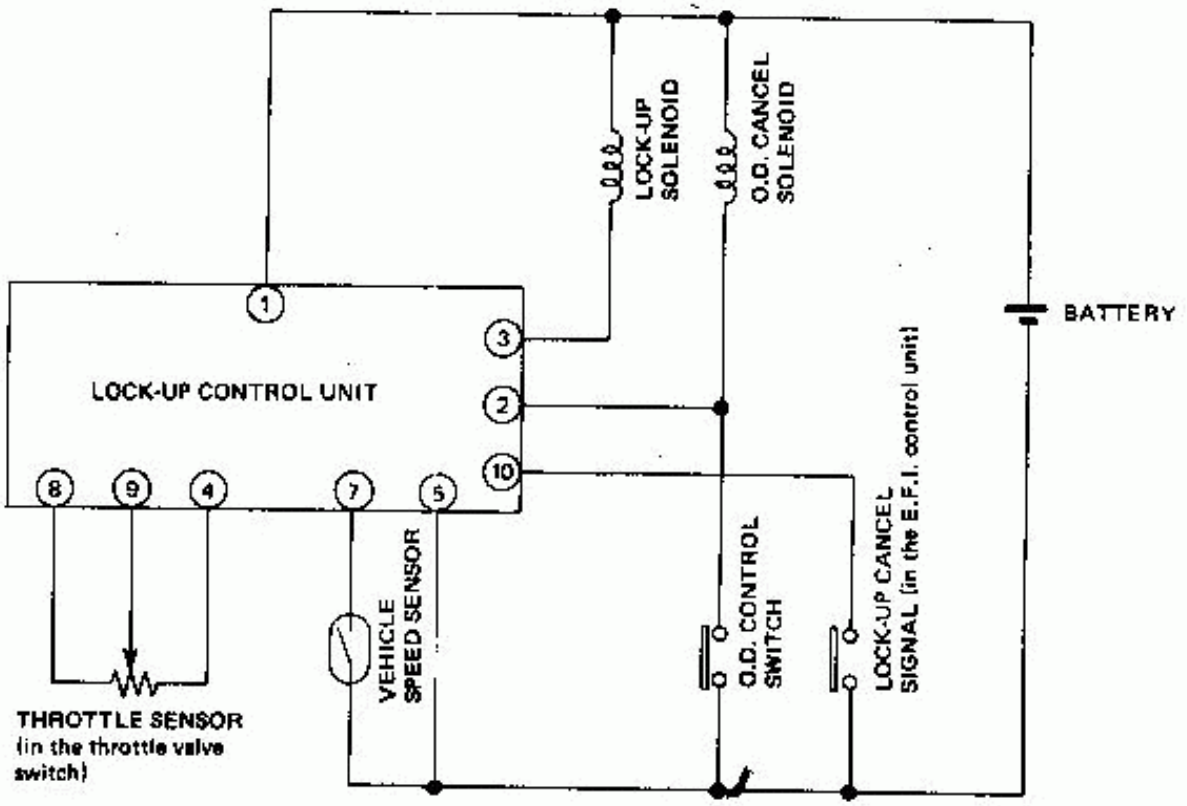
TROUBLE-SHOOTING AND DIAGNOSES

Trouble-shooting Chart (Cont'd)

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.

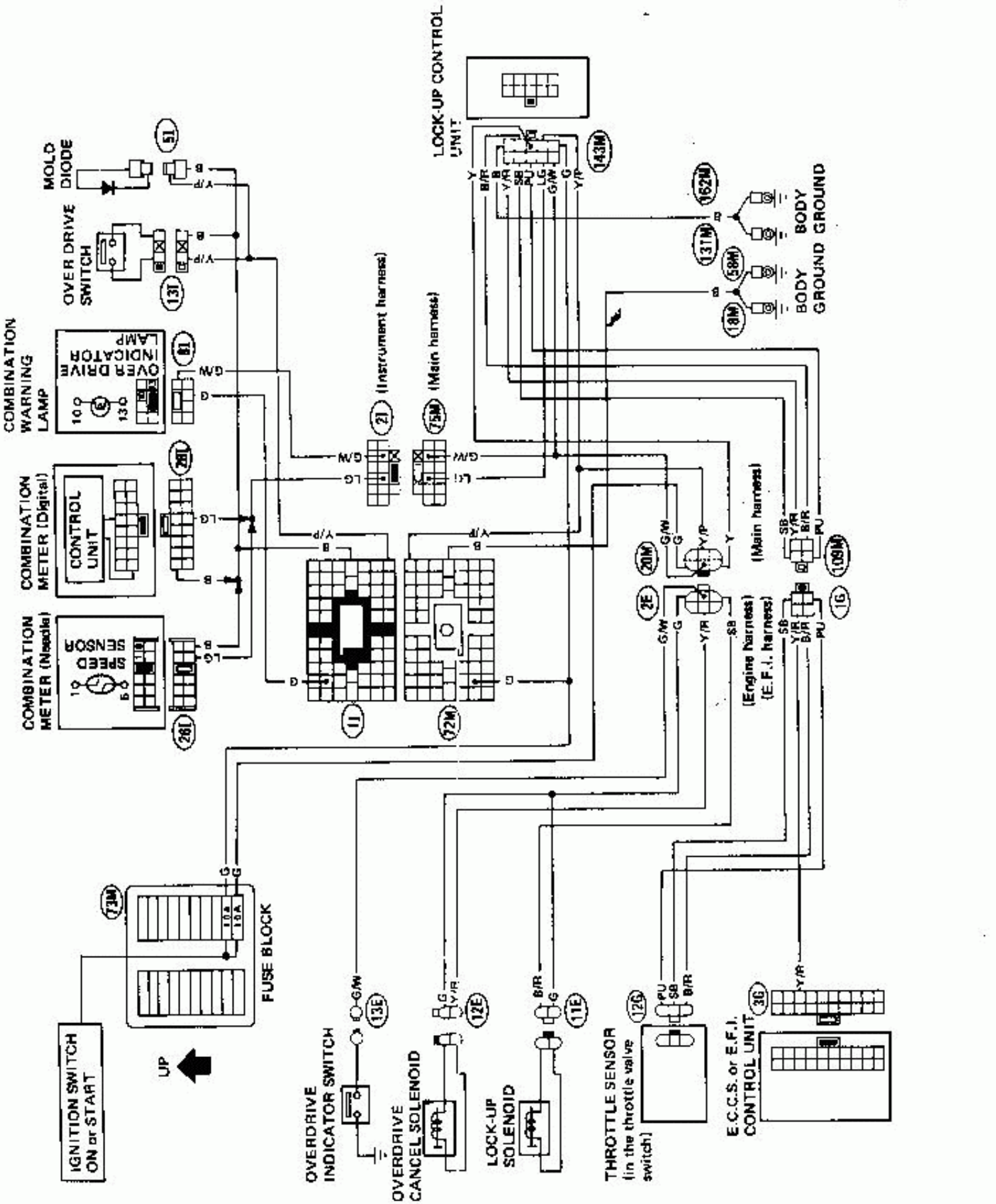
Reference		ON vehicle: Oil level	Range select linkage	Inhibitor switch and wiring	Vacuum diaphragm and piping	Kickdown solenoid, switch and wiring	Engine idling rpm	Line pressure	Control valve	Governor	2nd band servo	Transmission air check	Oil quality	Ignition switch and starter motor	Engine adjustment, brake inspection	O.D. band servo	O.D. control SW.	O.D. cancel solenoid	Lock-up solenoid	Lock-up control unit and sensors	OFF vehicle: Direct clutch	Rear clutch	Front clutch	O.D. band brake	2nd band brake	Low and reverse brake	Oil pump	Oil passage leak	Torque converter	Transmission one-way clutch	Park linkage	Planetary gear	O.D. cancel valve	Lock-up control valve	Accumulator	Rear lubrication
(A3)	Vehicle will not run in any range.	1	2	.	.	.	.	3	5	.	.	6	4	.	.	.	.	.	8	7	.	.	.	.	.	.	⑨	⑩	.	.	⑪	.	.	⑫	.	.
(A4)	Transmission noise in "D", "2", "1" and "R" ranges.	1	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	③	.	⑥	④	.	⑤	.	.	.	.
(A5)	Failure to change from "3rd" to "2nd" when changing lever into "2" range.	.	1	.	.	.	.	2	4	.	5	.	3	.	.	.	.	.	.	.	.	.	.	.	⑥	.	.	⑦	.	.	.	.	.	.	.	.
	Gear change from "2" to "1st" or from "2nd" to "3rd" in "2" range.	.	1	.	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	No shock at change from "1" to "2" range or engine races extremely.	1	2	.	3	.	4	.	7	.	.	8	6	.	5	.	.	.	.	.	.	.	.	.	⑨	.	⑩	.	.	.	.	.	.	.	.	.
(A6)	Failure to change from "3rd" to "2nd" when shifting lever into "1" range.	.	1	.	.	.	.	2	4	5	7	6	3	.	.	.	.	.	.	.	.	.	⑧	.	⑨	.	.	⑩	.	.	.	.	.	.	.	.
(A7)	Engine brake does not operate in "1" range.	.	1	.	.	.	.	2	4	.	.	5	3	.	.	.	.	.	.	.	.	.	.	.	.	⑥	.	⑦	.	.	.	.	.	.	.	.
	Gear change from "1st" to "2nd" or from "2nd" to "3rd" in "1" range.	.	1	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	③	.	.	.	.	.	.	.	.
(A8)	Does not change from "2nd" to "1st" in "1" range.	1	2	.	.	.	.	.	4	5	6	7	3	.	.	.	.	.	.	.	.	.	.	.	.	⑧	.	⑨	.	.	.	.	.	.	.	.
(A9)	Large shock changing from "2nd" to "1st" in "1" range.	.	.	.	1	.	.	.	4	.	.	.	3	.	2	.	.	.	.	.	.	.	.	.	.	⑤	.	.	.	.	.	.	.	.	.	.
	Transmission overheats.	1	.	.	.	.	.	2	5	.	7	6	4	.	3	8	.	.	.	.	⑩	⑨	⑪	⑬	⑫	⑭	⑮	⑯	⑰	.	.	⑱	.	.	.	⑲
	Oil shoots out during operation. White smoke emitted from exhaust pipe during operation.	1	.	.	2	.	.	4	6	.	.	7	3	.	5	.	.	.	.	.	⑨	⑧	⑩	⑫	⑪	⑬	⑭	⑮	⑯	.	.	⑰	.	.	.	⑱
	Offensive smell at oil charging pipe.	1	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	.	.	⑫	.	.	.	.
	Transmission shifts to overdrive even if O.D. control switch is turned to "ON".	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	.	3	.	.	.	.	.	.	.	.	.	.	.	.	④	.	.	.
	Lamp inside O.D. control switch does not glow even if ignition switch is turned to "ON" (engine not started).	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Lamp inside O.D. control switch does not glow even if transmission is shifted to O.D.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

L4N71B Electrical System/Schematic



SAT918

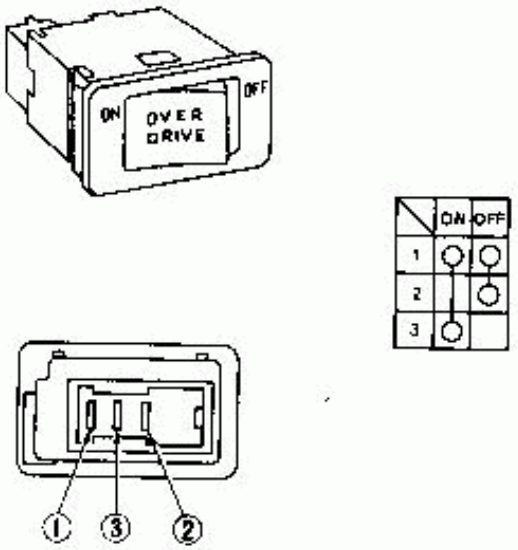
L4N71B Electrical System/Wiring Diagram



SAT272A

O.D. CONTROL SWITCH

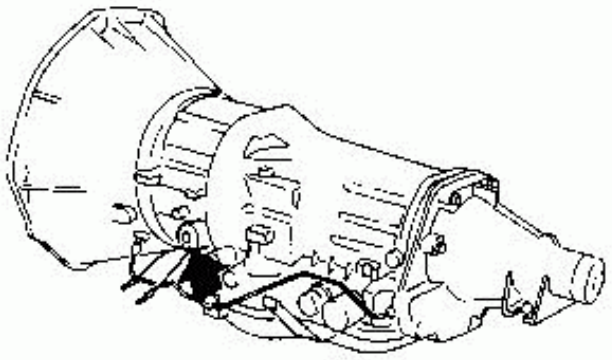
Inspection



SAT931

O.D. CANCEL SOLENOID

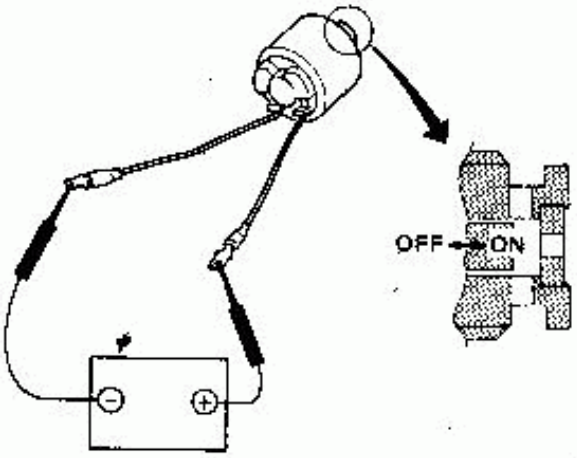
Location



SAT619

Inspection

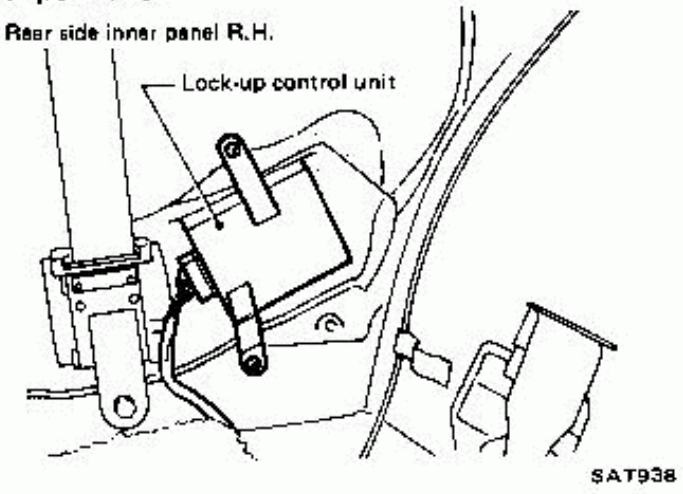
Confirm that clicking sound is heard when power is applied.



SAT620

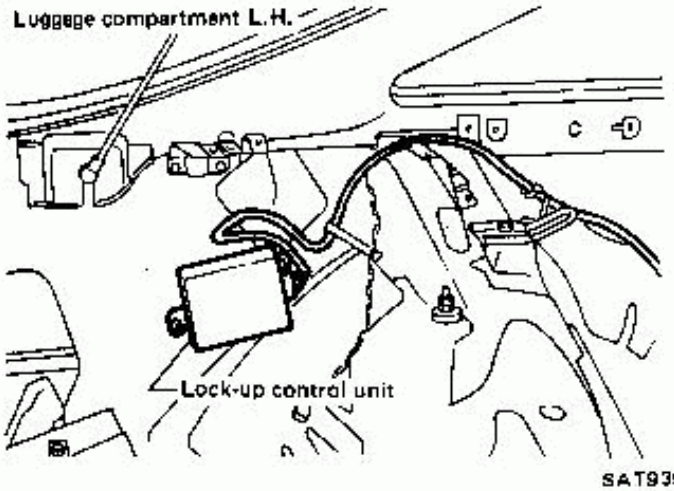
LOCATION OF LOCK-UP CONTROL UNIT

Coupe model



SAT938

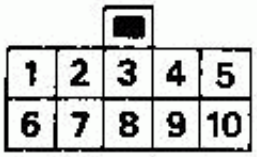
Hatchback model



SAT939

Inspection of Lock-up Control Unit

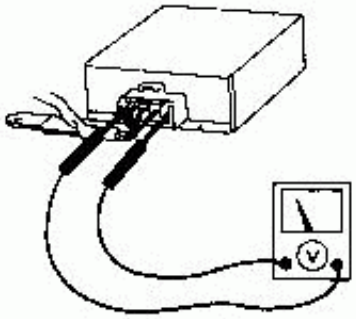
Check voltage between No. 5 terminal (Ground) and each terminal in the following table.



SAT923

(Lock-up control unit harness connector as seen from front)
Note: (6) is not used.

Check lock-up control unit with harness connector connected.

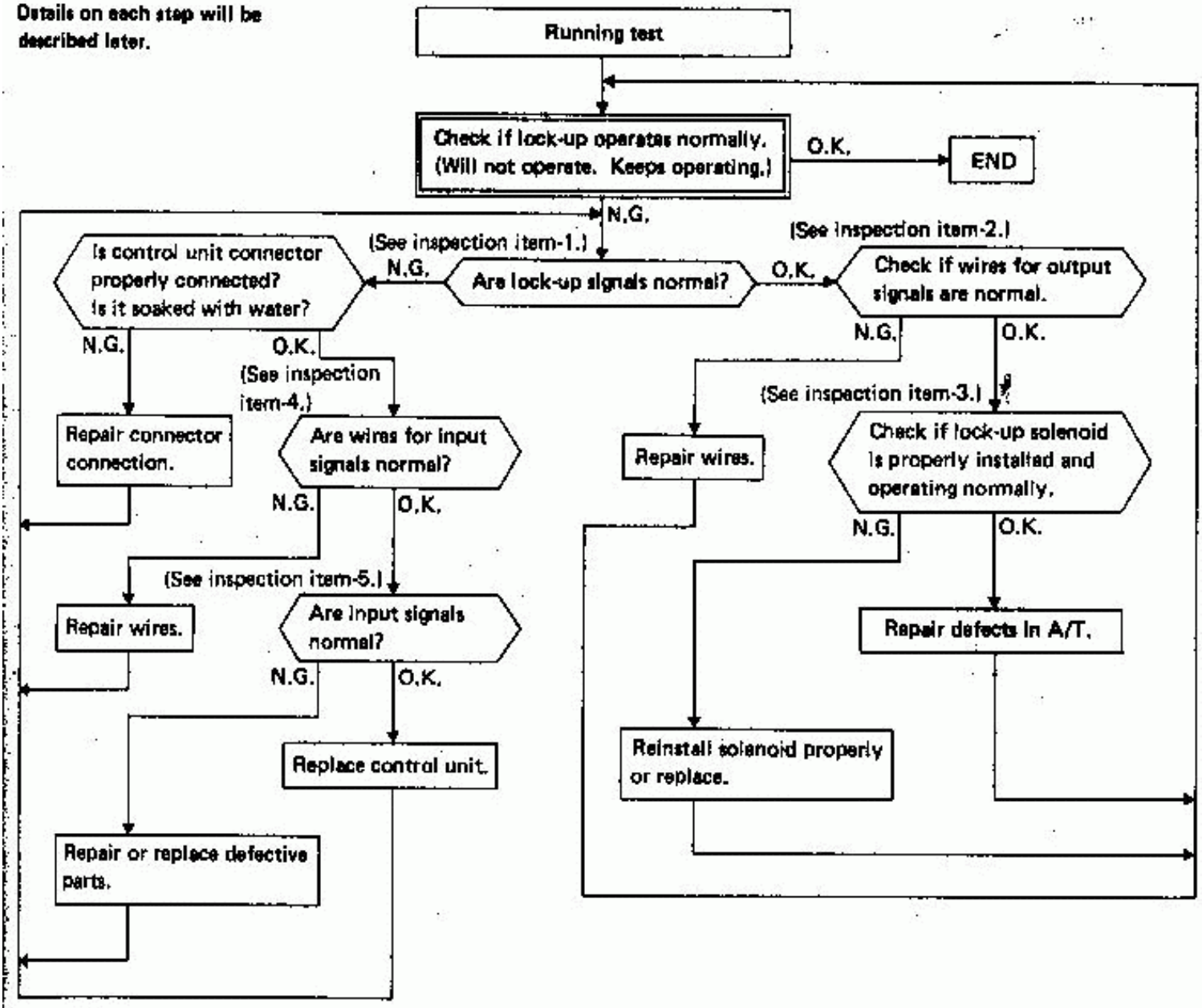


SAT905

Terminal No.	Checking input/output signal	Checking method	Judgement standard
1	Power source	Make ground connection.	12V at all times while ignition switch is turned on.
2	O.D. cancel solenoid	Connect tester to terminals 2 and 5. Measure while operating O.D. control switch.	0V if turned on 12V if turned off
3	Lock-up solenoid	Connect tester to terminals 3 and 5. Measure while driving vehicle in "D" range.	0V if turned on 12V if turned off
4	Throttle sensor (ground)	–	–
5	Ground	–	–
6	–	–	–
7	Vehicle speed sensor	Connect tester to terminals 7 and 5. Check voltage variation while running vehicle over 1 m (3 ft) at very low speed.	Voltage must vary from less than 1V to more than 5V.
8	Throttle sensor (power source)	Connect tester to terminals 8 and 4.	8 - 10V at all times.
9	Throttle sensor	Connect tester to terminals 9 and 4. Measure while operating accelerator pedal.	Full-close throttle: approx. 0.7V Full-open throttle: approx. 7V
10	Lock-up cancel signal	Connect tester to terminals 10 and 5. Measure while operating accelerator pedal.	Water temp. is less than 65°C (149°F) Less than 1V at all times Water temp is more than 70°C (158°F) Fully closed throttle: Less than 1V Partly open throttle: More than 6V

Inspection of Lock-up Control

Details on each step will be described later.

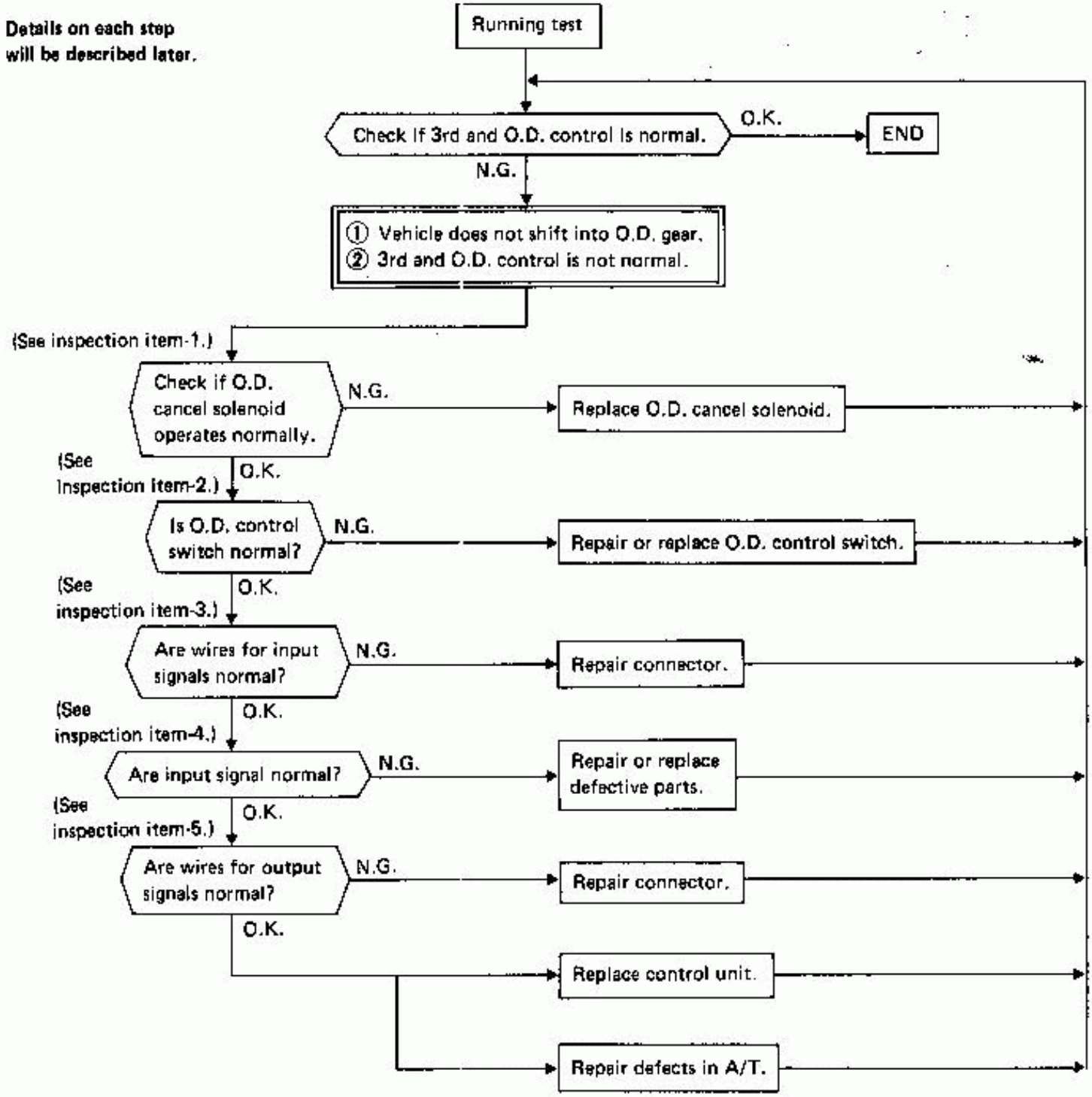


Inspection of Lock-up Control (Cont'd)

INSPECTION POINTS

Inspection item	Item to be checked	Checking method
1	Lock-up signals	Connect tester to control unit connector terminals Nos. 3 and 5 and check lock-up signals while running vehicle with partly open throttle and O.D. control switch ON. • Check if lock-up solenoid is ON when vehicle speed is above 78 km/h (48 MPH). • Check if lock-up solenoid is OFF when vehicle speed is below 73 km/h (45 MPH).
2	Wires for output signals	Check if connector between control unit and lock-up solenoid is properly connected. Also, check connector for continuity.
3	Lock-up solenoid	• Check if O-ring is installed to tip of solenoid. • Check operation of solenoid by applying 12V voltage.
4	Wires for input signals	Check if connections are properly made between control unit and following sensors. Also, check connectors for conduction. • Vehicle speed sensor • E.F.I. control unit connector terminal No. 13
5	Input signals	Check item given on inspection 4 in flow chart on page AT-68.

Inspection of 3rd and O.D. Control



Inspection of 3rd and O.D. Control (Cont'd)

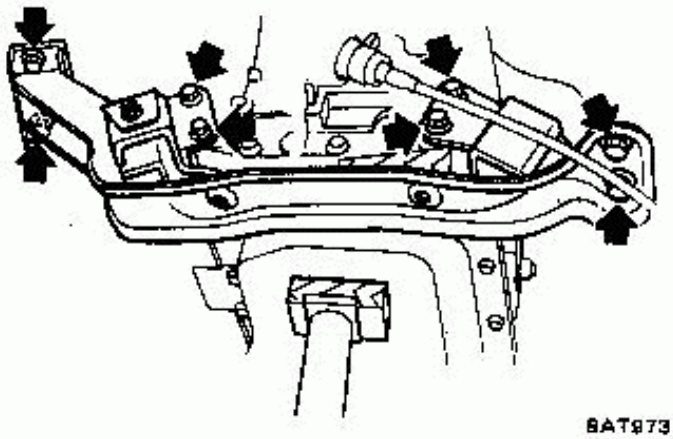
INSPECTION POINTS

Inspection item	Item to be checked	Checking method
1	O.D. solenoid	Check operation of solenoid by applying 12V.
2	O.D. control switch	Check continuity between connectors of O.D. control switch. • Zero continuity when O.D. control switch is turned ON. • Continuity when O.D. control switch is turned OFF.
3	Wires for input signals	Check if connections are properly made between control unit and the following sensors. Also, check connectors for conduction. • Vehicle speed sensor • Throttle sensor • O.D. control switch
4	Input signals	Check terminals No. 7 and 10 for continuity and voltage (Refer to page AT-68).
5	Output signals	Check if connections are properly made between control unit and O.D. cancel solenoid. Also, check connectors for conduction.

Pressure Testing

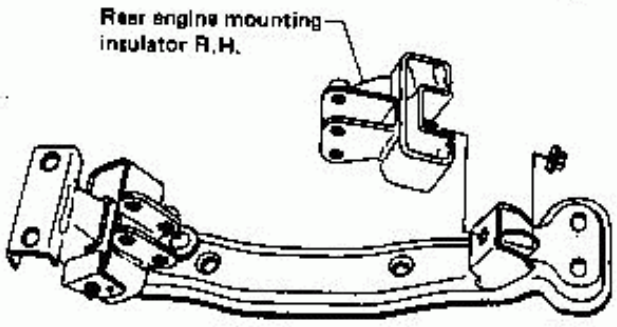
LINE PRESSURE

1. Support automatic transmission with a jack.
2. Remove rear engine mounting bracket assembly.



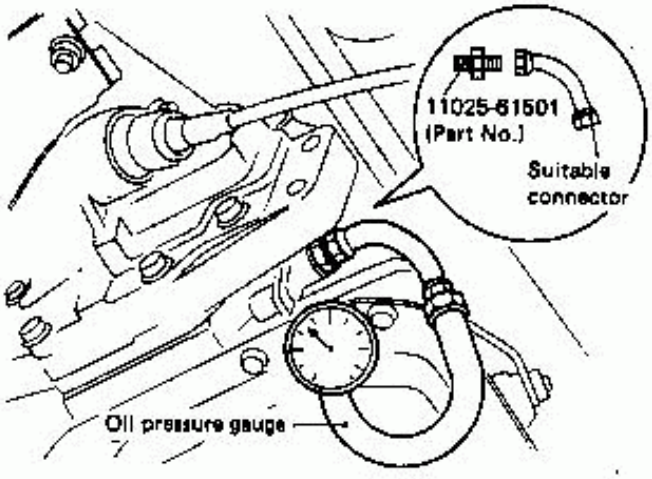
SAT973

3. Remove rear engine mounting insulator R.H.



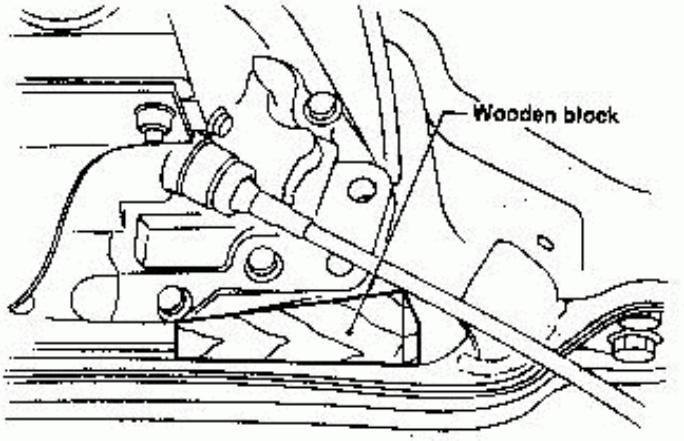
SAT974

4. Remove line pressure plug and install oil pressure gauge and adapters.



SAT975

5. Install rear engine mounting bracket without rear engine mounting insulator R.H.
6. Place a suitable-sized wooden block between transmission and rear engine mounting bracket.



SAT976

7. Warm up engine until engine oil and A.T.F. reach operating temperature.

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

8. Set parking brake and block wheels.
9. Measure line pressure at idle and at stall point while depressing brake pedal fully.

Pressure Testing (Cont'd)

At idling

CA20E engine

Range	Line pressure kPa (kg/cm², psi)
R	412 - 549 (4.2 - 5.6, 60 - 80)
D	314 - 373 (3.2 - 3.8, 46 - 54)
2	588 - 1,147 (6.0 - 11.7, 85 - 166)
1	314 - 373 (3.2 - 3.8, 46 - 54)

At stall test

1. Start engine and place select lever in "D" range.
2. Apply foot brake and accelerate to wide-open throttle.
3. Quickly note the line pressure and immediately release throttle.
4. Shift select lever to "N".
5. Cool off A.T.F.
6. Perform line pressure testing in the same manner as in steps 2 through 6 with select lever in "2", "1" and "R", respectively.

- Do not perform tests for more than five seconds at any shift range.
- Do not proceed to next "range" test immediately after one "range" test is done. Wait until oil temperature decreases.

CA20E engine

Range	Line pressure kPa (kg/cm², psi)
R	1,402 - 1,589 (14.3 - 16.2, 203 - 230)
D	971 - 1,089 (9.9 - 11.1, 141 - 158)
2	991 - 1,138 (10.1 - 11.6, 144 - 165)
1	971 - 1,089 (9.9 - 11.1, 141 - 158)

Judgment by measuring line pressure

If line pressure does not rise, first check to make sure that vacuum hose is connected properly.

1) When line pressure is low at all positions, the problem may be due to:
- Wear on interior of oil pump
- Oil leakage at or around oil pump, control valve body, transmission case or governor
- Sticking pressure regulator valve
- Sticking pressure modifier valve

2) When line pressure is low at a particular position, the problem may be due to the following:
- If oil leaks at or around forward clutch (rear) or governor, line pressure is low in "D", "2" or "1" range but is normal in "R" range.
- If oil leaks at or around low and reverse brake circuit, line pressure becomes low in "R" or "P" range but is normal in "D", "2" or "1" range.

3) When line pressure is high, pressure regulator valve may have stuck.

Stall Testing

The stall test is an effective method of testing clutch and band holding ability, torque converter one-way clutch operation, and engine performance. A stall test should only be performed as a last resort because of the high fluid temperature it generates and the excessive load it places on the engine and transmission.

CAUTION:

a. **Transmission and engine fluid levels should always be checked and fluid added as needed.**
b. **Run engine to attain proper warm-up.**
c. **During test, never hold throttle wide-open for more than 5 seconds.**
d. **Do not test more than two gear ranges without driving vehicle to cool off engine and transmission.**

STALL TEST PROCEDURE

1. Set parking brake and block wheels.

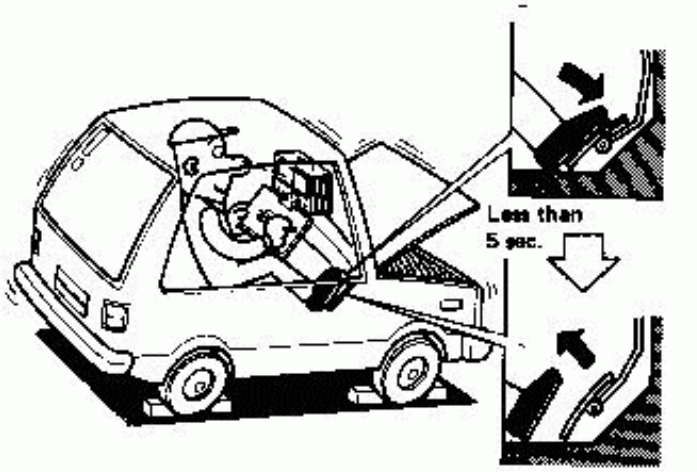
SAT597

2. Install a tachometer where it can be seen by driver during test.
3. Start engine and place selector lever in "D" range.
4. Apply foot brake and accelerate to wide-open throttle.
5. Quickly note the engine stall speed and immediately release throttle.

Stall revolution:

CA20E engine

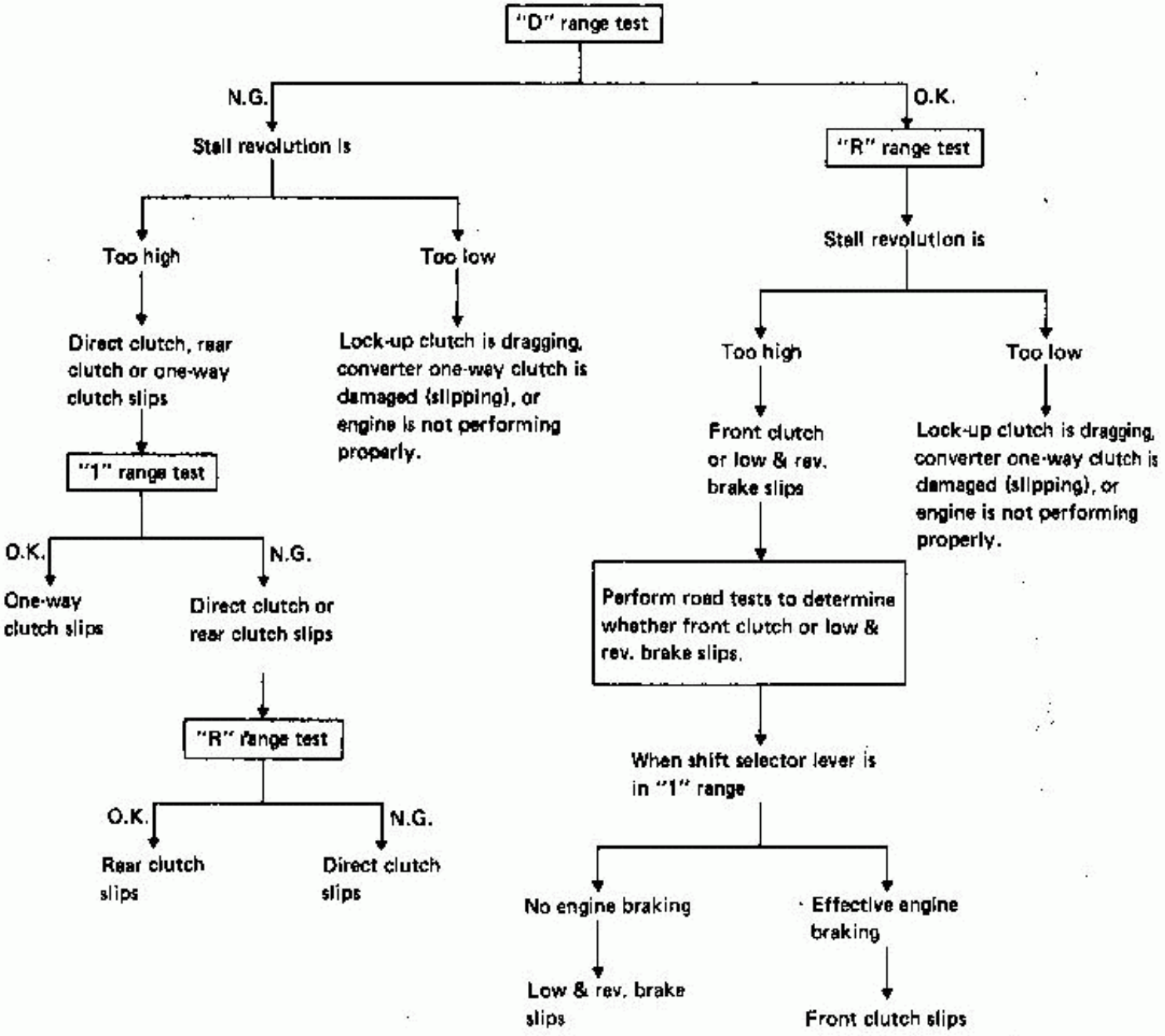
1,900 - 2,200 rpm



SAT598

6. Shift selector lever to "N".
7. Cool off A.T.F.
8. Perform stall tests in the same manner as in steps 3 through 7 with selector lever in "1" and "R", respectively.

STALL TEST ANALYSIS



If converter one-way clutch is frozen, vehicle will have poor high speed performance and low engine rpm when it is raced in "N" range. If converter one-way clutch is slipping, vehicle will be sluggish up to 50 or 60 km/h (30 or 40 MPH).

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

Engine model	CA20E
Automatic transmission model	L4N71B
Transmission model code number	X8386
Stall torque ratio	2.0 : 1
Transmission gear ratio 1st 2nd Top O.D. Reverse	 2.842 1.542 1.000 0.686 2.400
Recommended oil	Automatic transmission fluid "Dexron" type
Oil capacity	7.0 liters (7-3/8 US qt, 6-1/8 Imp qt)

Specifications and Adjustment

Transmission model code number	X8386
Torque converter assembly Stamped mark on the torque converter	EMA
Direct clutch	
Number of drive plates	2
Number of driven plates	2
Clearance mm (in) Standard Allowable limit	 1.6 - 1.8 (0.063 - 0.071) 2.0 (0.079)
Drive plate thickness mm (in) Standard Allowable limit	 1.50 - 1.65 (0.0591 - 0.0650) 1.4 (0.055)

Thickness of retaining plate	Thickness mm (in)	Part number
	5.6 (0.220)	31567-X2903
	5.8 (0.228)	31567-X2904
	6.0 (0.236)	31567-X2905
	6.2 (0.244)	31567-X2906
	6.4 (0.252)	31507-X8600
	6.6 (0.260)	31507-X8601
	6.8 (0.268)	31537-X2900
	7.0 (0.276)	31537-X2901

Specifications and Adjustment (Cont'd)

Transmission model code number	X8366
Front clutch	
Number of drive plates	3
Number of driven plates	3
Clearance mm (in)	
Standard	1.6 - 1.8 (0.063 - 0.071)
Allowable limit	2.2 (0.087)
Drive plate thickness mm (in)	
Standard	1.50 - 1.65 (0.0591 - 0.0650)
Allowable limit	1.4 (0.055)

Thickness of retaining plate	Thickness mm (in)	Part number
	5.0 (0.197)	31567-X2900
	5.2 (0.205)	31567-X2901
	5.4 (0.213)	31567-X2902
	5.6 (0.220)	31567-X2903
	5.8 (0.228)	31567-X2904
	6.0 (0.236)	31567-X2905

Rear clutch	
Number of drive plates	5
Number of driven plates	5
Clearance mm (in)	
Standard	0.8 - 1.0 (0.031 - 0.039)
Allowable limit	1.3 (0.051)
Drive plate thickness mm (in)	
Standard	1.50 - 1.65 (0.0591 - 0.0650)
Allowable limit	1.4 (0.055)

Thickness of retaining plate	Thickness mm (in)	Part number
	9.4 (0.370)	31567-X8580
	9.6 (0.378)	31567-X8581
	9.8 (0.386)	31567-X8582
	10.0 (0.394)	31567-X8583
	10.2 (0.402)	31567-X8584
	10.4 (0.409)	31567-X8585
	10.6 (0.417)	31537-X0100

Transmission model code number	X8366
Low & reverse brake	
Number of drive plates	5
Number of driven plates	5
Clearance mm (in)	
Standard	0.80 - 1.05 (0.0315 - 0.0413)
Allowable limit	1.8 (0.071)
Drive plate thickness mm (in)	
Standard	1.90 - 2.05 (0.0748 - 0.0807)
Allowable limit	1.8 (0.071)

Thickness of retaining plate	Thickness mm (in)	Part number
	7.8 (0.307)	31667-X0500
	8.0 (0.315)	31667-X0501
	8.2 (0.323)	31667-X0502
	8.4 (0.331)	31667-X0503
	8.6 (0.339)	31667-X0504
	8.8 (0.346)	31667-X0505

2nd brake band	
Piston size mm (in)	
Big dia.	72 (2.83)
Small dia.	44 (1.73)
O.D. brake band	
Piston size mm (in)	
Big dia.	60 (2.36)
Small dia.	40 (1.57)
Front end play mm (in)	0.5 - 0.8 (0.020 - 0.031)

Thickness of high-reverse clutch (Front) thrust washer	Thickness mm (in)	Part number
	1.3 (0.051)	31528-X0107
	1.5 (0.059)	31528-X0105
	1.7 (0.067)	31528-X0106
	1.9 (0.075)	31528-X0100
	2.1 (0.083)	31528-X0101
	2.3 (0.091)	31528-X0102
	2.5 (0.098)	31528-X0103
	2.7 (0.106)	31528-X0104

Specifications and Adjustment (Cont'd)

Total end play mm (in)	0.25 - 0.50 (0.0098 - 0.0197)	
Thickness of oil pump cover bearing race	Thickness mm (in)	Part number
	1.2 (0.047)	31556-X0100
	1.4 (0.055)	31556-X0101
	1.6 (0.063)	31556-X0102
	1.8 (0.071)	31556-X0103
	2.0 (0.079)	31556-X0104
	2.2 (0.087)	31556-X0105
O.D. pack end play mm (in)	0.5 - 0.8 (0.020 - 0.031)	
Thickness of O.D. thrust washer	Thickness mm (in)	Part number
	1.3 (0.051)	31528-X8607
	1.5 (0.059)	31528-X8605
	1.7 (0.067)	31528-X8606
	1.9 (0.075)	31528-X8600
	2.1 (0.083)	31528-X8601
	2.3 (0.091)	31528-X8602
	2.5 (0.098)	31528-X8603
	2.7 (0.106)	31528-X8604
O.D. total end play mm (in)	0.25 - 0.50 (0.0098 - 0.0197)	
Thickness of O.D. bearing race	Thickness mm (in)	Part number
	1.2 (0.047)	31556-X8600
	1.4 (0.055)	31556-X8601
	1.6 (0.063)	31556-X8602
	1.8 (0.071)	31556-X8603
	2.0 (0.079)	31556-X8604
	2.2 (0.087)	31556-X8605

Oil pump clearance mm (in)	
Outer gear-pump housing	
Standard	0.05 - 0.20 (0.0020 - 0.0079)
Allowable limit	0.25 (0.0098)
Outer gear-crescent	
Standard	0.14 - 0.21 (0.0055 - 0.0083)
Allowable limit	0.25 (0.0098)
Gears-pump cover	
Standard	0.02 - 0.04 (0.0008 - 0.0016)
Allowable limit	0.08 (0.0031)
Drum support	
Seal ring-ring groove	
Standard	0.05 - 0.20 (0.0020 - 0.0079)
Allowable limit	0.20 (0.0079)
Oil distributor	
Seal ring-ring groove	
Standard	0.04 - 0.16 (0.0016 - 0.0063)
Allowable limit	0.16 (0.0063)
Planetary carrier mm (in)	
Clearance between pinion washer and planetary carrier	
Standard	0.20 - 0.70 (0.0079 - 0.0276)
Allowable limit	0.80 (0.0315)
Run-out of oil pump cover to housing mm (in)	Less than 0.07 (0.0028)
Run-out of drum support to O.D. case mm (in)	Less than 0.05 (0.0020)

STALL REVOLUTION

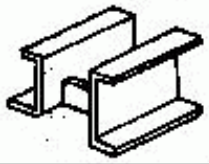
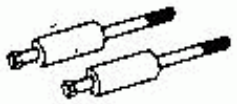
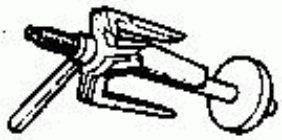
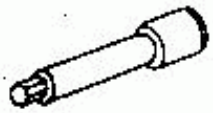
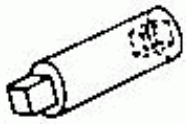
CA20E engine	1,900 - 2,200 rpm

Tightening Torque

Unit	N·m	kg-m	ft-lb
Transmission installation			
Drive plate to Crankshaft	137 - 157	14.0 - 16.0	101 - 116
Drive plate to torque converter	39 - 49	4.0 - 5.0	29 - 36
Converter housing to engine	39 - 49	4.0 - 5.0	29 - 36
Rear mounting bracket to transmission	31 - 42	3.2 - 4.3	23 - 31
Rear mounting bracket to rear insulator	31 - 42	3.2 - 4.3	23 - 31
Rear mounting member to body	59 - 78	6.0 - 8.0	43 - 58
Component part			
Transmission case to converter housing	44 - 54	4.5 - 5.5	33 - 40
Transmission case to rear extension	20 - 26	2.0 - 2.5	14 - 18
Oil pan to transmission case	5 - 7	0.5 - 0.7	3.6 - 5.1
2nd servo piston retainer to transmission case	7 - 9	0.7 - 0.9	5.1 - 6.5
2nd piston stem (when adjusting band brake)	12 - 15*1	1.2 - 1.5*1	9 - 11*1
2nd piston stem lock nut	15 - 39	1.5 - 4.0	11 - 29
One-way clutch inner race to transmission case	13 - 18	1.3 - 1.8	9 - 13
Control valve body to transmission case	5.4 - 7.4	0.55 - 0.75	4.0 - 5.4
Lower valve body to upper valve body	2.5 - 3.4	0.25 - 0.35	1.8 - 2.5
O.D. servo piston retainer to O.D. case	10 - 15	1.0 - 1.5	7 - 11
O.D. piston stem (when adjusting band brake)	7 - 10*2	0.7 - 1.0*2	5.1 - 7.2*2
O.D. stem lock nut	15 - 39	1.5 - 4.0	11 - 29
Side plate to control valve body	2.5 - 3.4	0.25 - 0.35	1.8 - 2.5
Nut for control valve reamer bolt	5 - 7	0.5 - 0.7	3.6 - 5.1
Oil strainer to lower valve body	3 - 4	0.3 - 0.4	2.2 - 2.9
Governor valve body to oil distributor	5 - 7	0.5 - 0.7	3.6 - 5.1
Oil pump housing to oil pump cover	6 - 8	0.6 - 0.8	4.3 - 5.8
Inhibitor switch to transmission case	5 - 7	0.5 - 0.7	3.6 - 5.1

Unit	N·m	kg-m	ft-lb
Manual shaft lock nut	29 - 39	3.0 - 4.0	22 - 29
Oil cooler pipe to transmission case	29 - 49	3.0 - 5.0	22 - 36
Test plug (oil pressure inspection hole)	14 - 21	1.4 - 2.1	10 - 15
Support actuator (parking rod inserting position) to rear extension	8 - 11	0.8 - 1.1	5.8 - 8.0
Drum support to O.D. case	7 - 9	0.7 - 0.9	5.1 - 6.5

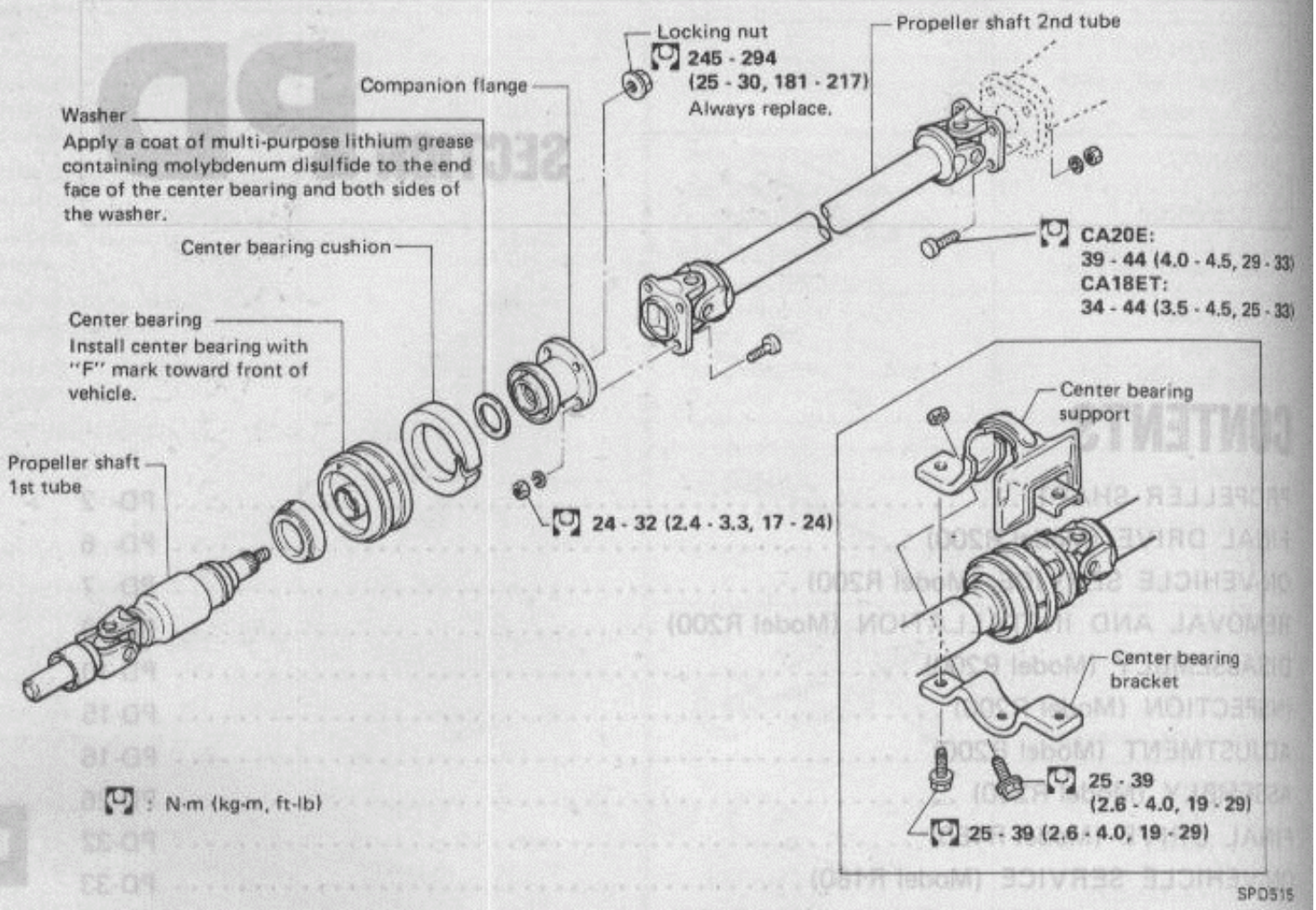
*1 Turn back three turns after tightening.
*2 Turn back two turns after tightening.

Tool number (Kent-Moore No.) Tool name	Tool
ST07870000 (—) (ST07860000) (—) Transmission case stand	
ST25850000 (J25721-A) Sliding hammer	
GG91060000 (—) (GG93010000) (J25703) Torque wrench	
ST25420001 (J26063) (ST25420000) (J26063-A) Clutch spring compressor	
ST26570001 (J23659-A) (ST26570000) (J23659-1) Hex-head extension	
ST25490000 (—) (ST25512001) (—) Socket extension	
ST25580001 (—) Oil pump assembling gauge	
ST25058001 (—) Oil pressure gauge set	
(J33909) Transmission alignment arbor	
11025-61501 (—) Adapter	

PROPELLER SHAFT & DIFFERENTIAL CARRIER

SECTION PD

CONTENTS



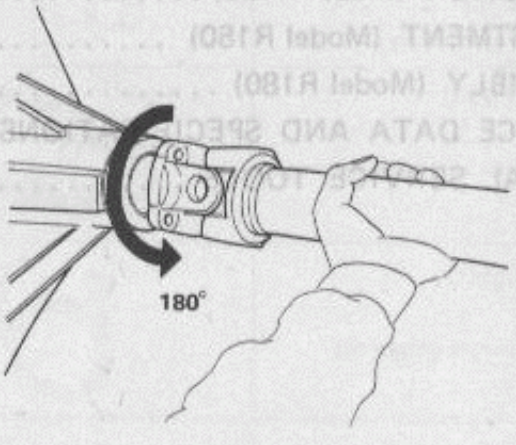
General Inspection

- Inspect propeller shaft tube surface for dents or cracks.
  If damaged, replace propeller shaft assembly.
- If center bearing is noisy or damaged, replace center bearing.

PROPELLER SHAFT VIBRATION

To check and correct an unbalanced propeller shaft, proceed as follows:

1. Remove undercoating and other foreign material which could upset shaft balance, and check shaft vibration by road test.
2. If shaft vibration is noted during road test, disconnect propeller shaft at differential carrier companion flange, rotate companion flange 180 degrees and reconnect propeller shaft.

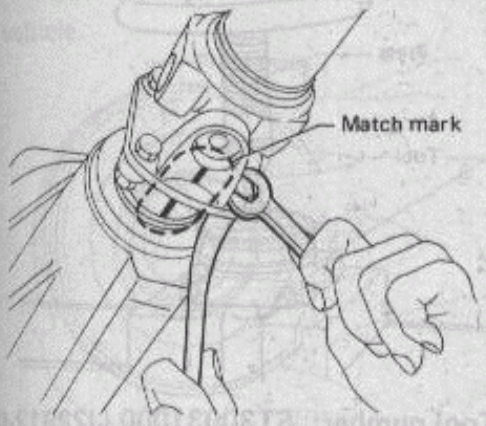


3. Again check shaft vibration. If vibration still persists, replace propeller shaft assembly.

PROPELLER SHAFT

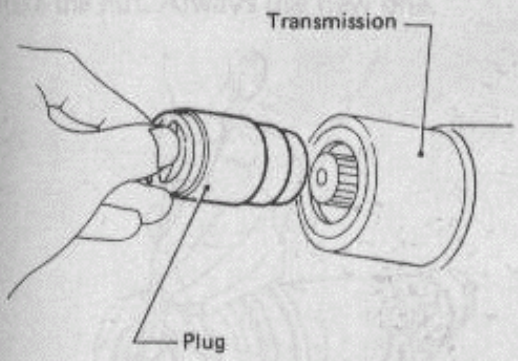
Removal and Installation

- Put match marks on flanges and separate propeller shaft from differential carrier.



SPD103

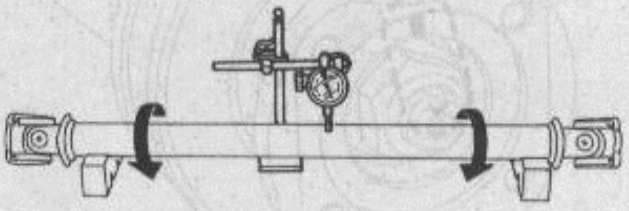
- Draw out propeller shaft from transmission and plug up rear end of transmission rear extension housing.



SPD359

Inspection

- Inspect propeller shaft runout. If runout exceeds specifications, replace propeller shaft assembly.



SPD106

Runout limit: 0.6 mm (0.024 in)

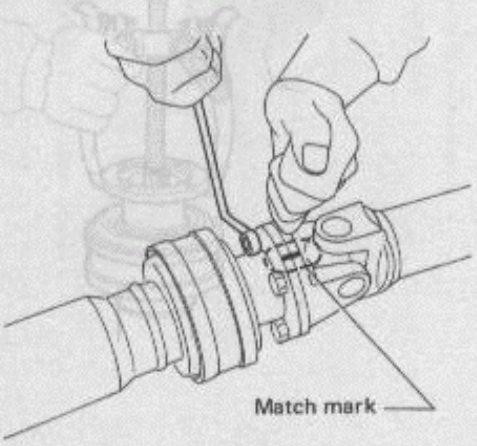
- Inspect journal axial play.
  If the play exceeds specifications, replace propeller shaft assembly.

Journal axial play:
0 mm (0 in)

Disassembly

CENTER BEARING

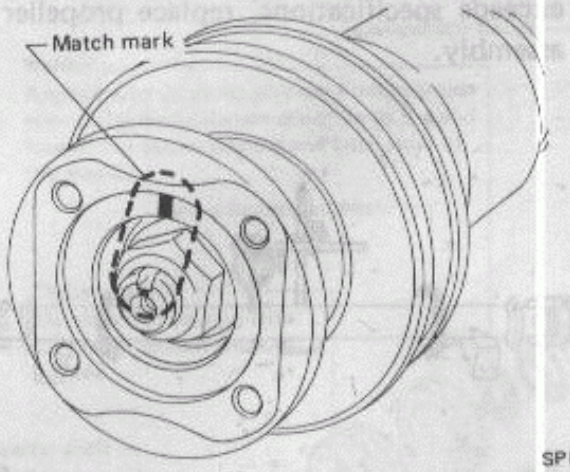
1. Put match marks on flanges, and separate 2nd tube from 1st tube.



SPD109

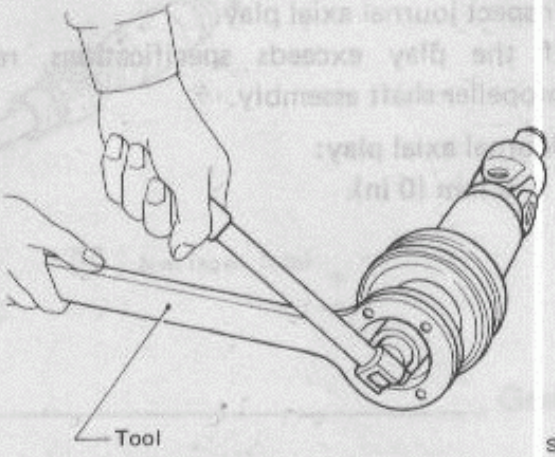
Disassembly (Cont'd)

2. Put match marks on the flange and shaft.



SPD110

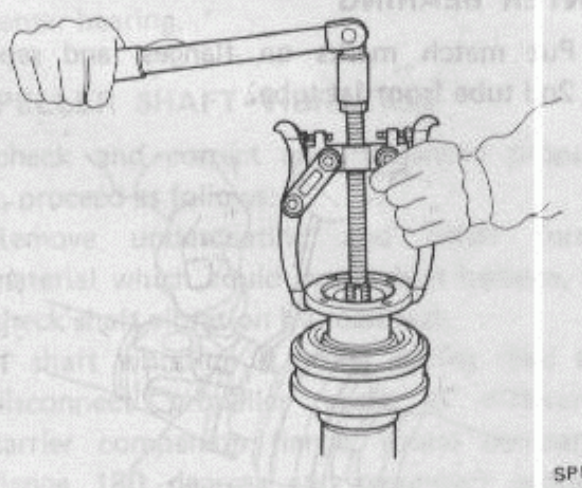
3. Remove locking nut withTool.



SPD111

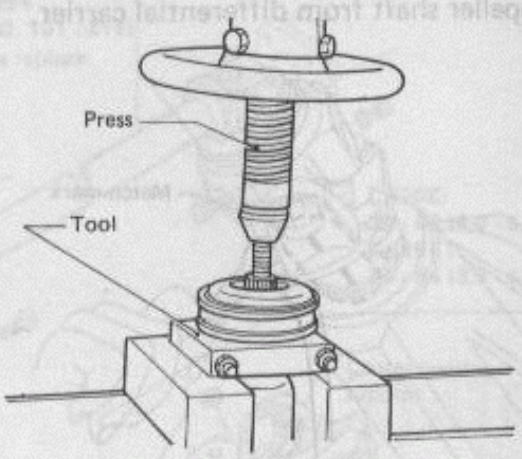
Tool number: ST31520000 (—)

4. Remove companion flange with puller.



SPD112

5. Remove center bearing with Tool and press.



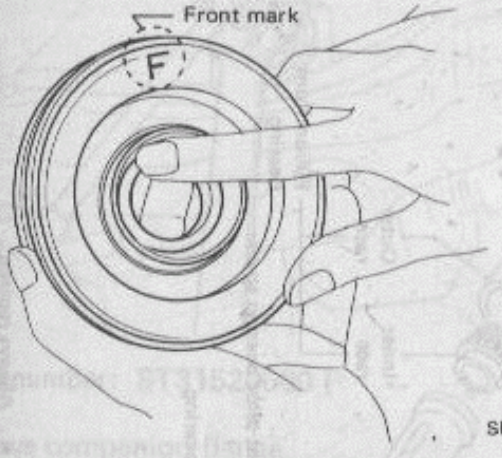
SPD113

Tool number: ST30031000 (J22912-01)

Assembly

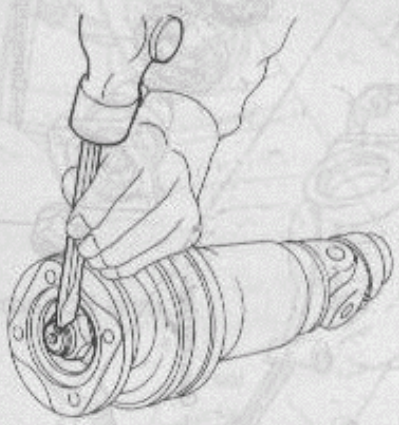
CENTER BEARING

- When installing center bearing, position the "F" mark on center bearing toward front of vehicle.



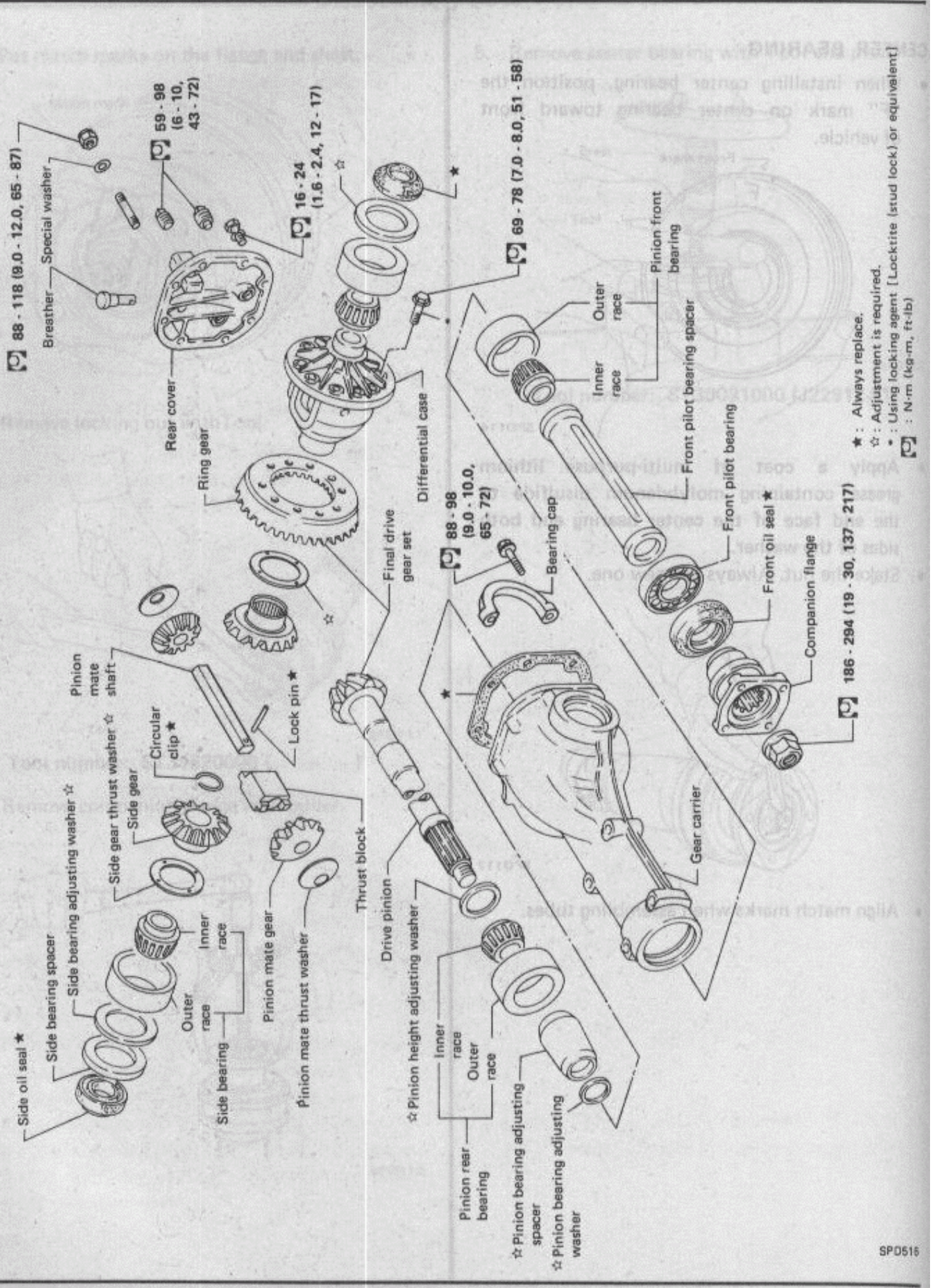
SPD114

- Apply a coat of multi-purpose lithium grease containing molybdenum disulfide to the end face of the center bearing and both sides of the washer.
- Stake the nut. Always use new one.



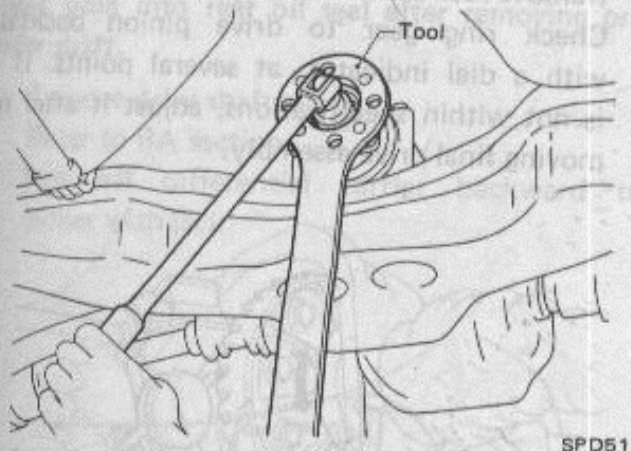
SPD117

- Align match marks when assembling tubes.


88 - 118 (9.0 - 12.0, 65 - 87)
Special washer
Breather
59 - 98 (6 - 10, 43 - 72)
16 - 24 (1.6 - 2.4, 12 - 17)
Rear cover
Ring gear
Differential case
69 - 78 (7.0 - 8.0, 51 - 58)
Outer race
Inner race
Pinion front bearing
Front pilot bearing spacer
Front pilot bearing
Front oil seal ★
Companion flange
186 - 294 (19 - 30, 137 - 217)
88 - 98 (9.0 - 10.0, 65 - 72)
Bearing cap
Final drive gear set
Pinion mate shaft
Lock pin ★
Circular clip ★
Side gear thrust washer ☆
Side gear
Side bearing adjusting washer ☆
Side bearing spacer
Side oil seal ★
Outer race
Inner race
Side bearing
Pinion mate gear
Pinion mate thrust washer
Thrust block
Drive pinion
☆ Pinion height adjusting washer
Inner race
Outer race
Pinion rear bearing
☆ Pinion bearing adjusting spacer
☆ Pinion bearing adjusting washer
Gear carrier
★ : Always replace.
☆ : Adjustment is required.
• : Using locking agent (Locktite (stud lock) or equivalent)
: N·m (kg-m, ft-lb)
SPD516

Front Oil Seal Replacement

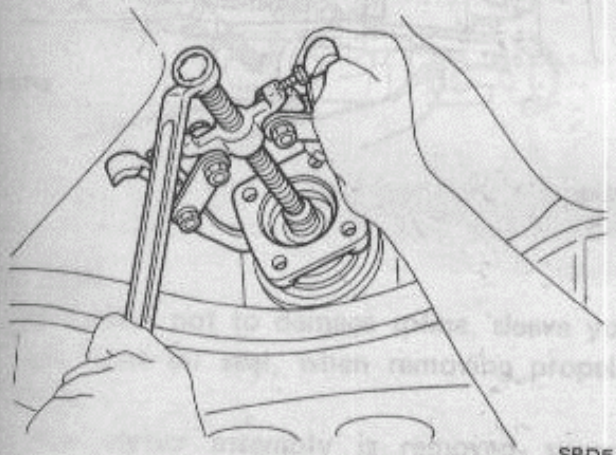
1. Remove propeller shaft.
2. Loosen drive pinion nut.



SPD517

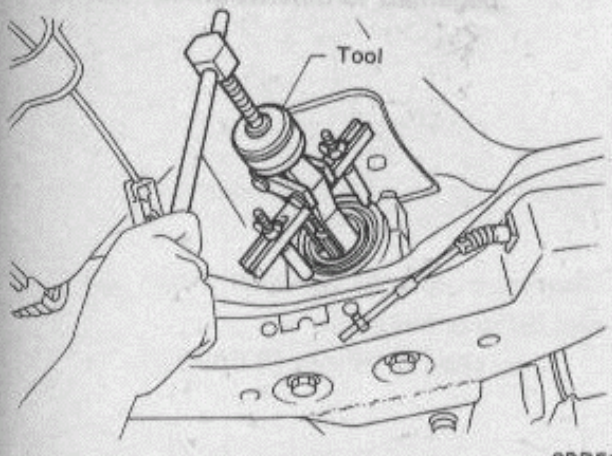
Tool number: ST31520000 (–)

3. Remove companion flange.



SPD518

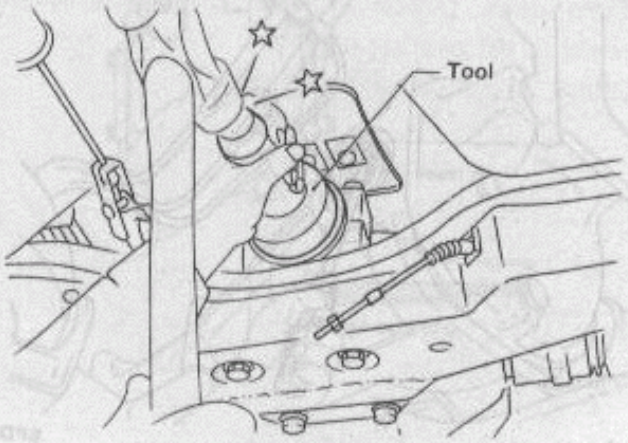
4. Remove front oil seal.



SPD519

Tool number: ST33290001 (J25810-A)

5. Apply multi-purpose grease to cavity at sealing lips of oil seal.
   Press front oil seal into carrier.



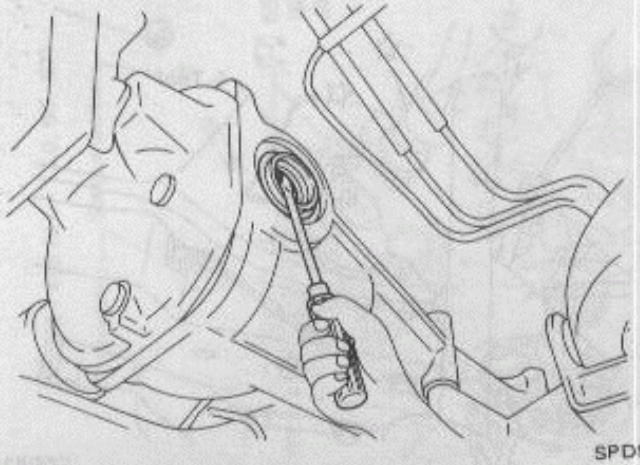
SPD520

Tool number: KV38100500 (–)

6. Install companion flange and drive pinion nut.
7. Install propeller shaft.

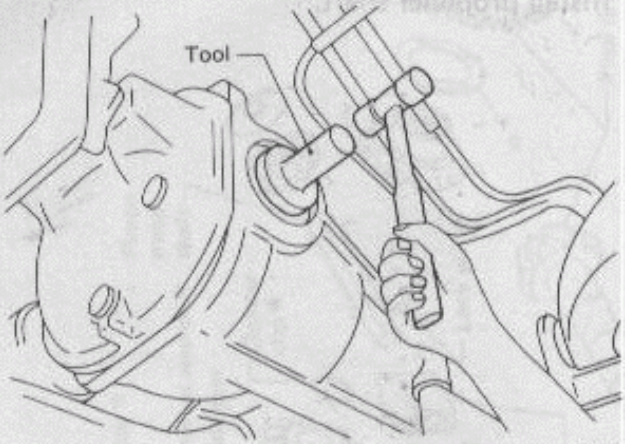
Side Oil Seal Replacement

1. Remove drive shafts.
   Refer to RA section.
2. Remove oil seal.



SPD521

3. Apply multi-purpose grease to cavity at sealing lips of oil seal.
   Press-fit oil seal into carrier.



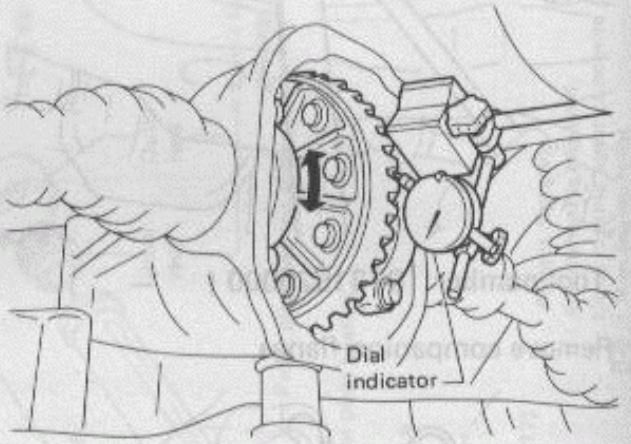
SPD522

Tool number: KV38100200 (–)

4. Install drive shafts.

Ring Gear to Drive Pinion Backlash

1. Support carrier with a jack.
2. Remove rear cover.
3. Check ring gear to drive pinion backlash with a dial indicator, at several points. If it is not within specifications, adjust it after removing final drive assembly.



SPD523

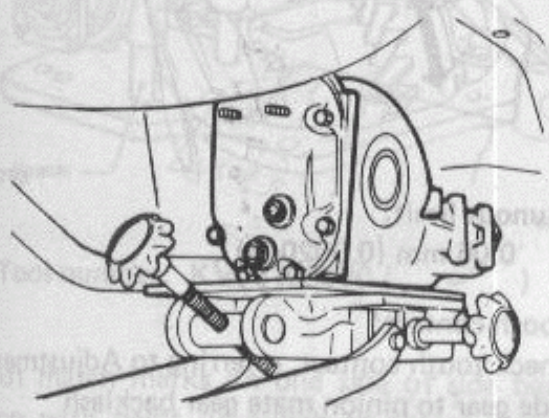
REMOVAL AND INSTALLATION (Model R200)

Removal

- Remove propeller shaft.

Insert plug into rear oil seal after removing propeller shaft.

- Remove drive shafts.
  Refer to RA section.
- Pull off differential carrier backward together with jack.



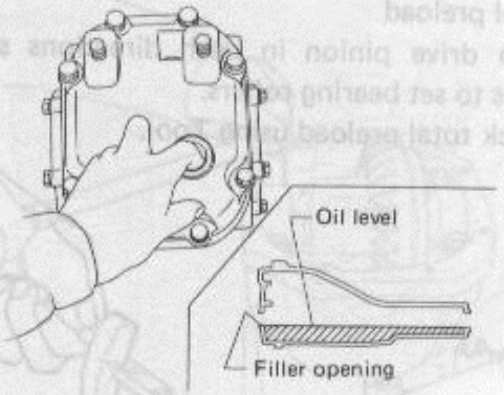
SPD511

CAUTION:

- **Be careful not to damage spline, sleeve yoke and front oil seal, when removing propeller shaft.**
- **After carrier assembly is removed, support suspension member on a stand to prevent its insulators being twisted or damaged.**

Installation

- Fill final drive with recommended gear oil.



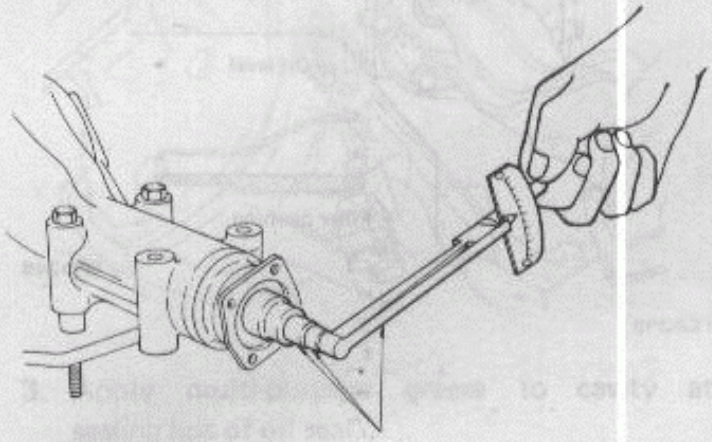
SPD348

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 using Tool.

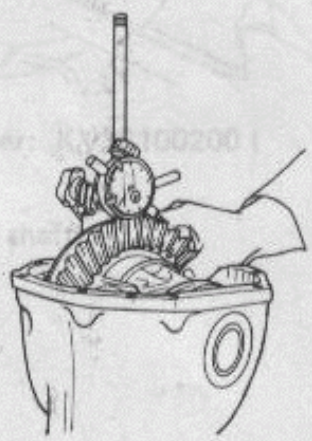


PD245

Tool number: ST3127S000 (See J25765-A)

Total preload:
1.23 - 2.30 N·m
(12.5 - 23.5 kg-cm, 10.9 - 20.4 in-lb)

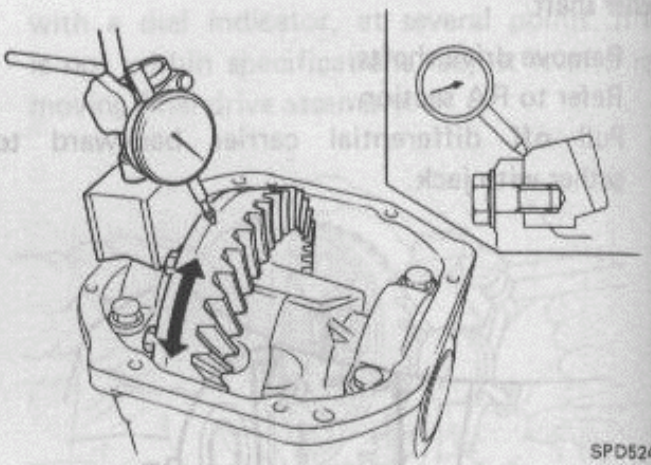
- Ring gear to drive pinion backlash.
  Check backlash of ring gear with a dial indicator at several points.



SPD513

Ring gear-to-drive pinion backlash:
0.13 - 0.18 mm
(0.0051 - 0.0071 in)

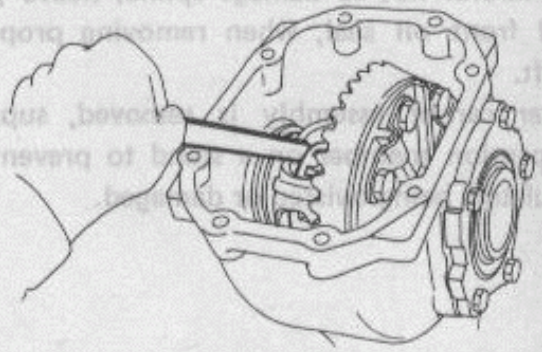
- Ring gear runout
  Check runout of ring gear with a dial indicator.



SPD524

Runout limit:
0.05 mm (0.0020 in)

- Tooth contact
  Check tooth contact, referring to Adjustment.
- Side gear to pinion mate gear backlash
  Using a thickness gauge, measure clearance between side gear thrust washer and differential case.

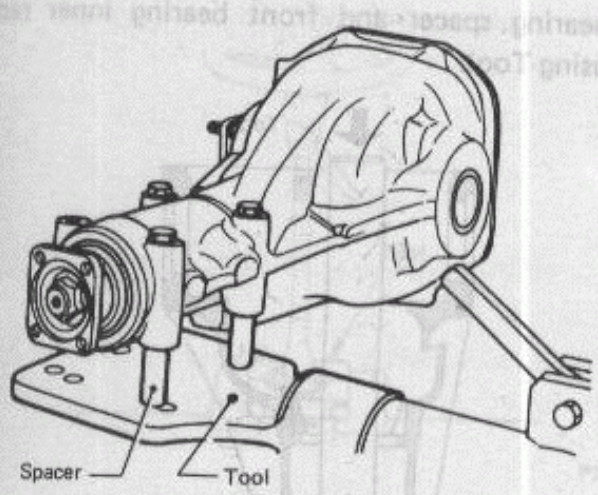


SPD370

Clearance between side gear thrust washer and differential case:
Less than 0.15 mm (0.0059 in)

Differential Carrier

1. Using three 45 mm (1.77 in) spacers, mount carrier on Tool.

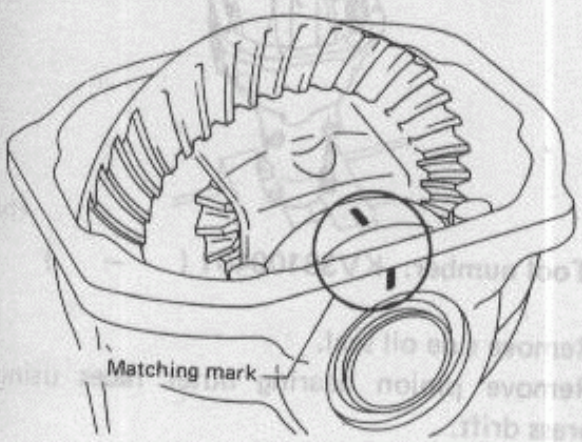


SPD525

Tool number: KV38100800 (–)

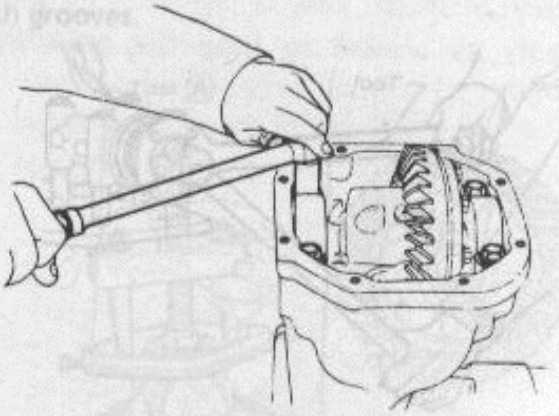
2. Put match marks on one side of side bearing cap with paint or punch to ensure that it is replaced in proper position during reassembly.

Bearing caps are line-board during manufacture and should be put back in their original places.



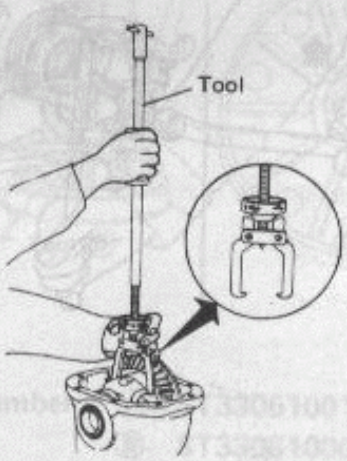
SPD526

3. Remove side bearing caps.



PD343

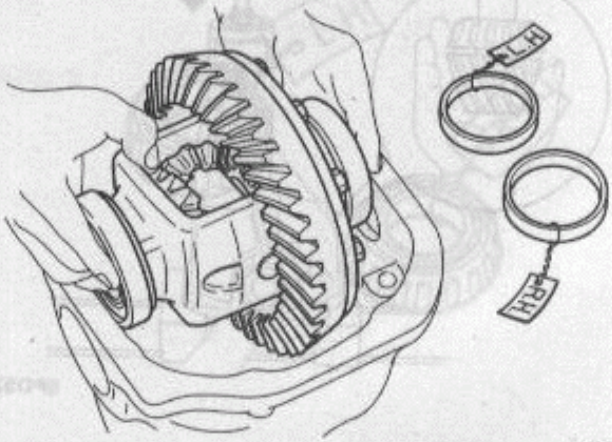
4. Using Tool, lift differential case assembly out.



PD344

Tool number: HT72400000 (–)

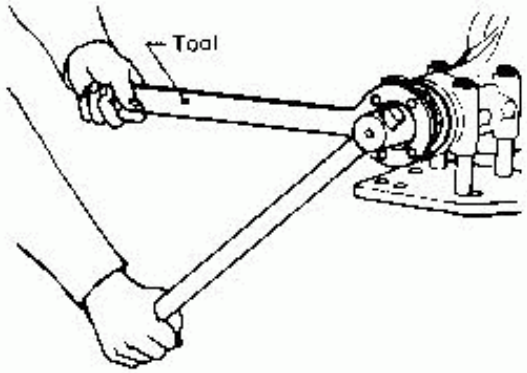
Be careful to keep the side bearing outer races together with inner race – don't mix them up.



SPD527

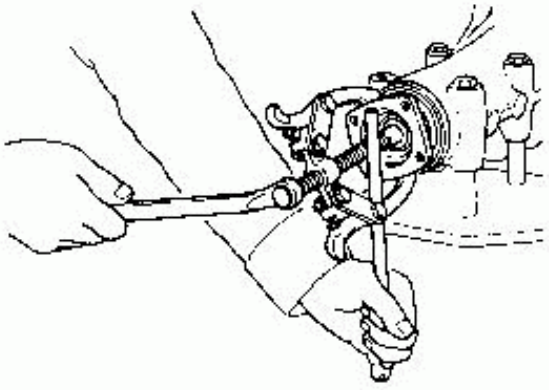
Differential Carrier (Cont'd)

5. Loosen drive pinion nut and pull off companion flange.



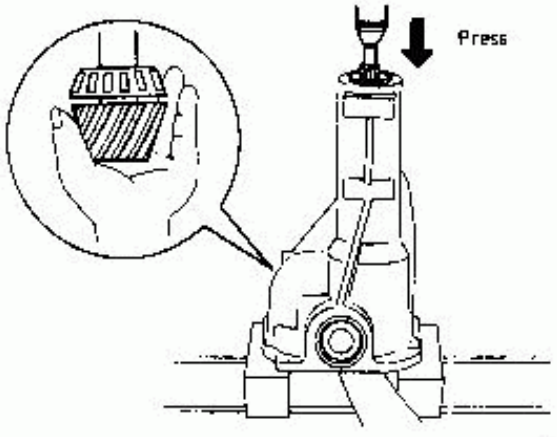
PD345

Tool number: ST31520000 (–)



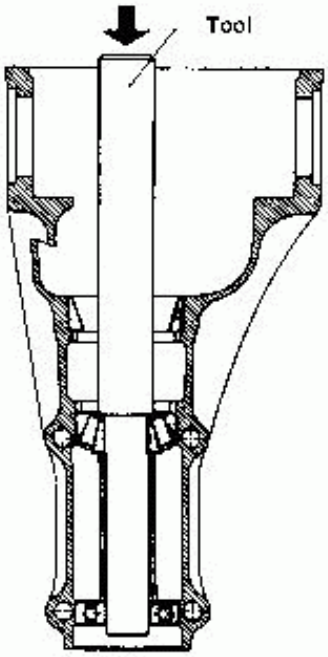
PD346

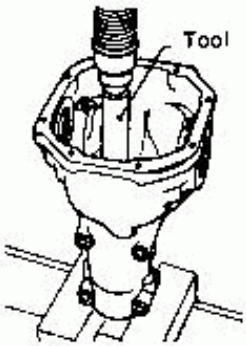
6. Take out drive pinion together with rear bearing inner race, bearing spacer and adjusting washer.



SPD528

7. Remove oil seal.
8. Remove pilot bearing together with pilot bearing spacer and front bearing inner race using Tool.

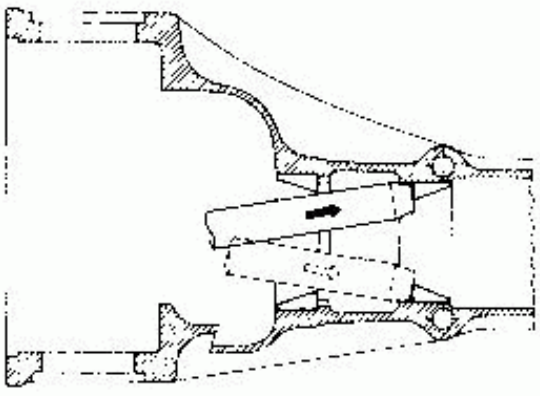




PD348

Tool number: KV38100401 (–)

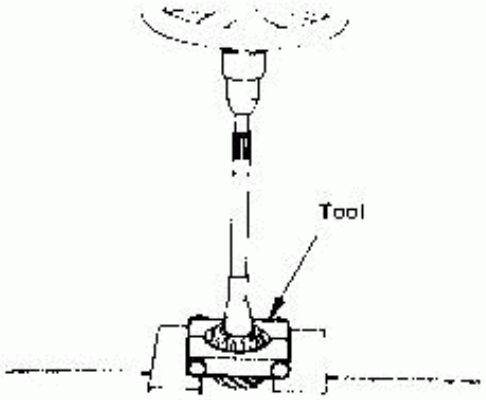
9. Remove side oil seal.
10. Remove pinion bearing outer races using a brass drift.



PD349

Differential Carrier (Cont'd)

11. Remove pinion rear bearing inner race and pinion height adjusting washer.



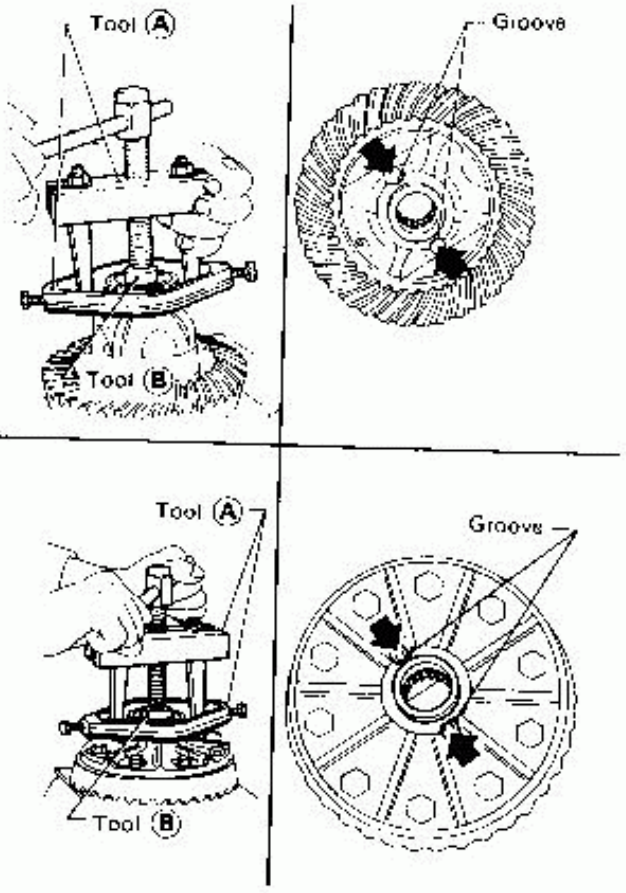
PD179

Tool number: ST30031000 (J22912-01)

Differential Case

1. Remove side bearing inner races.

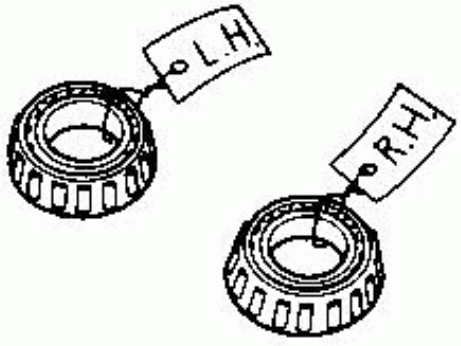
To prevent damage to bearing, engage puller paws with grooves.



SPD529

Tool number: (A) ST33051001 (–)
(B) ST33061000 (J8107-2)

Be careful not to confuse the right and left hand parts.

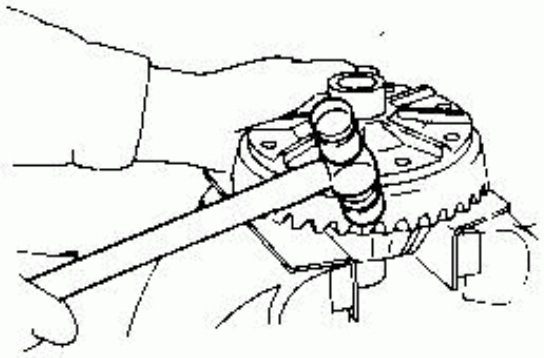


SPD022

Differential Case (Cont'd)

2. Loosen ring gear bolts in a criss-cross fashion.
3. Tap ring gear off the gear case using a soft hammer.

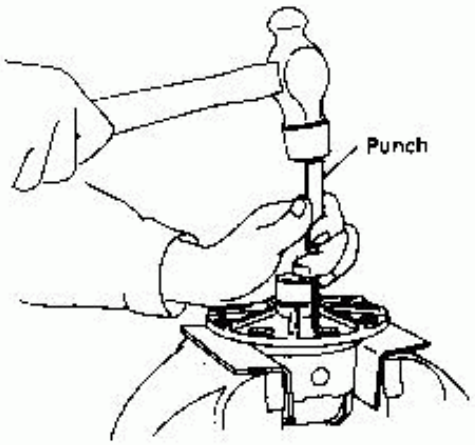
Tap evenly all around to keep ring gear from binding.



SPD024

4. Punch off pinion mate shaft lock pin from ring gear side.

Lock pin is calked at pin hole mouth on differential case.



SPD025

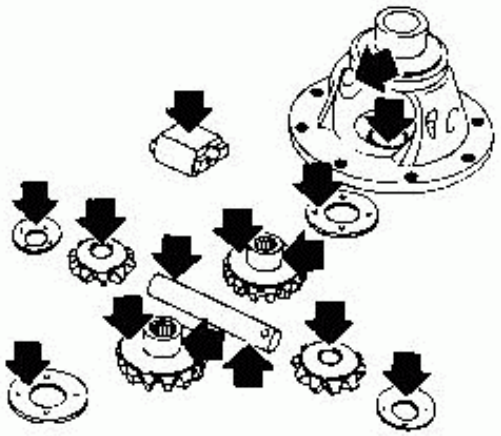
INSPECTION (Model R200)

Ring Gear and Drive Pinion

Check gear teeth for scoring, cracking or chipping. If any damaged part is evident, replace ring gear and drive pinion as a set (hypoid gear set).

Differential Case Assembly

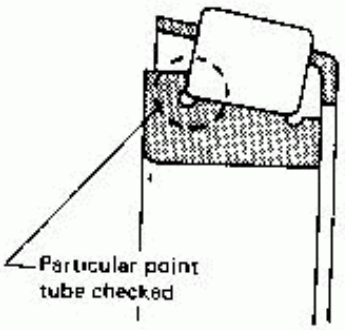
Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft, thrust block and thrust washers.



SPD584

Bearing

1. Thoroughly clean bearing and dry with compressed air.
2. Check bearings for wear, scratches, pitching or flaking.
   Check tapered roller bearing for a burned out portion as shown in the figure below. If damaged, replace outer and inner races as a set.



SPD458

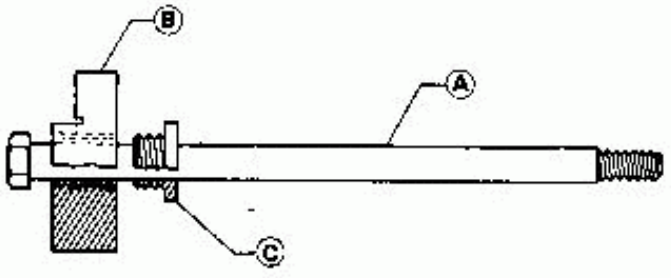
To avoid any confusion while calculating bearing shims, it is absolutely necessary to stay with the metric system. If you measure anything in inches, the results MUST be converted to the metric system. You can use a conversion chart or a calculator as illustrated.

SPD531

Setting Up Each Tools

Set up each tool, rear pinion bearing and front pinion bearing before adjusting pinion height and drive pinion bearing preload.

1. Install rear pinion bearing pilot into gauge plate and slide over hex head long bolt.

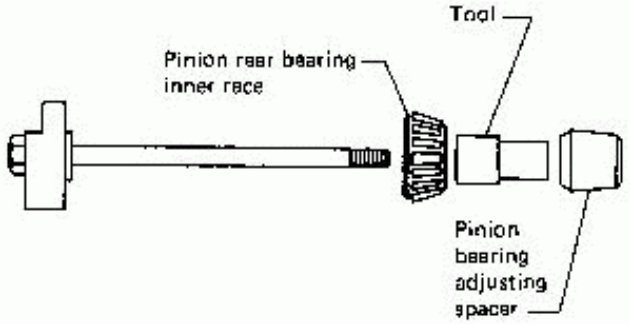


SPD532

Tool number:

- Ⓐ Hex head long bolt (J25269-23)
- Ⓑ Gauge plate (J25269-1)
- Ⓒ Rear pinion bearing pilot (J25269-2)

2. Slide pinion rear bearing inner race, bearing preload adapter and pinion bearing adjusting spacer over hex head long bolt.

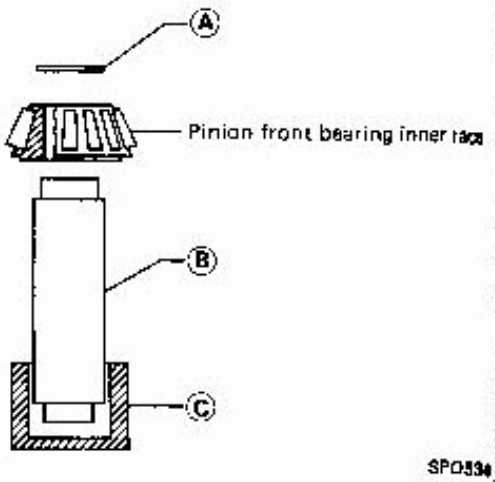


SPD533

Tool number:

Bearing preload adapter (J25269-26)

3. Install these parts into gear carrier.
4. Stand front bearing pilot support on the bench with the appropriate side up and assemble front pinion bearing pilot, front pinion bearing inner race and lead preload washer. Ensure that all parts are seated.



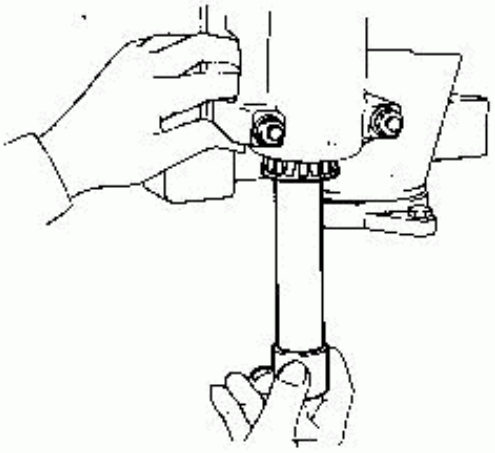
SPD534

Tool number:

- Ⓐ Lead preload washer (J25269-25)
- Ⓑ Front pinion bearing pilot (J25269-3)
- Ⓒ Front bearing pilot support (J25269-29)

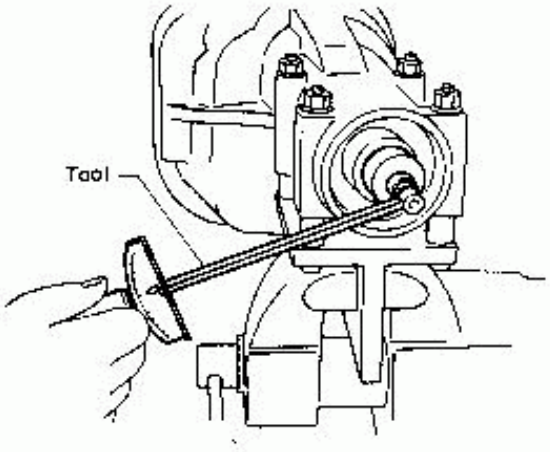
Setting Up Each Tools (Cont'd)

5. Holding these parts together, slide the assembly over hex head long bolt into gear carrier. Install support nut. Finger-tighten the nut and ensure that all parts turn freely and are properly aligned.



SPD535

6. Tighten support nut carefully to correct preload of 0.6 to 1.0 N·m (6 to 10 kg-cm, 5.2 to 8.7 in-lb).

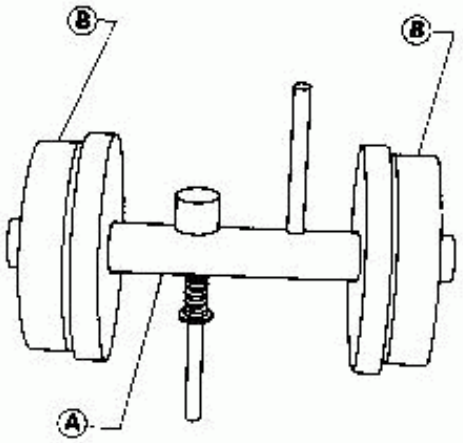


SPD536

Tool number: (J25765)

Drive Pinion Height

1. Install two side bearing discs with arbor assembly. Ensure that arbor turns freely.



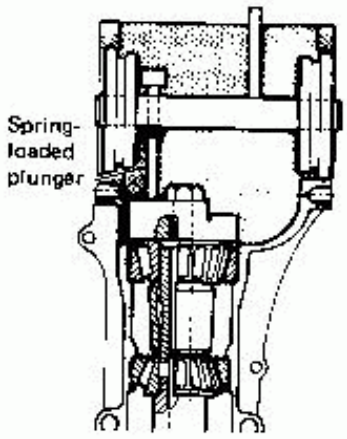
SPD537

Tool number:

Ⓐ	Arbor assembly	(J23597-1)
Ⓑ	Side bearing disc	(J25269-4)

2. Place side bearing discs with arbor assembly into differential carrier.

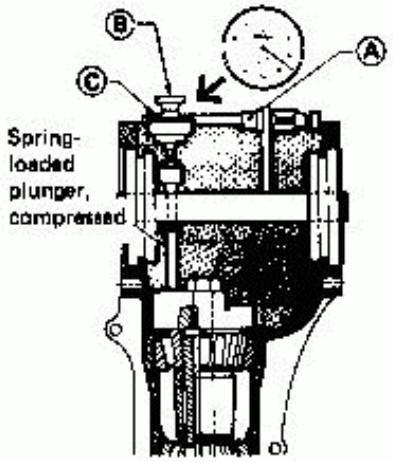
Lift spring loaded plunger and place it on the face of gauge plate.



SPD538

Drive Pinion Height (Cont'd)

3. Install bearing caps.
4. Install dial indicator and tighten hold down clamp.

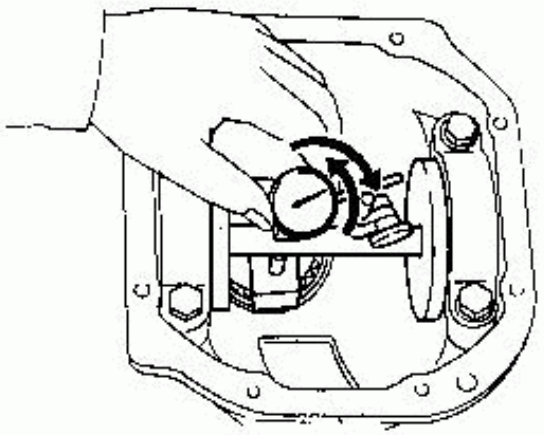


SPD539

Tool number:

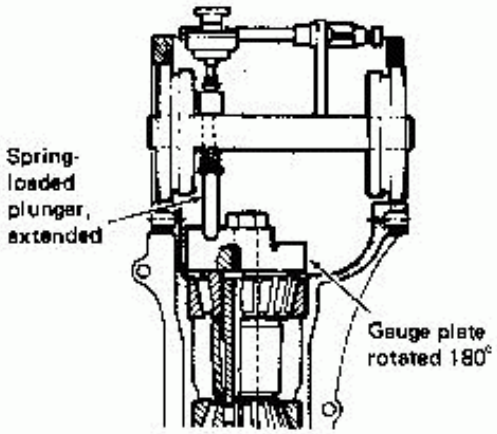
Ⓐ	Hold down clamp	(J8001-1)
Ⓑ	Dial indicator clamp	(J8001-2)
Ⓒ	Dial Indicator	(J8001-6)

5. To zero dial indicator, rotate arbor and plunger back and forth and note highest deflection (the point where needle changes direction). Set dial indicator at zero.



SPD540

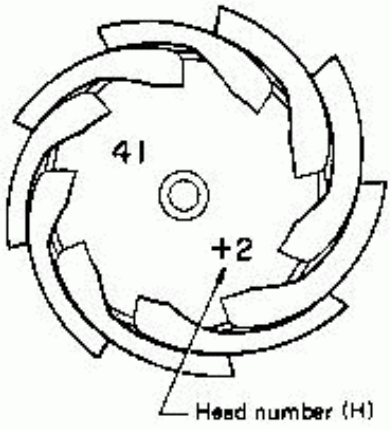
6. Rotate gauge plate until the plunger falls off gauge plate and read dial indicator (Read the dial indicator diectly).
   Repeat to ensure accuracy.



SPD541

7. Read head number (H) on drive pinion head.

The figure for H is a dimensional variation in units of 0.01 mm (0.0004 in) against a standard measurement.



SPD542

Drive Pinion Height (Cont'd)

8. Calculate washer thickness following the chart below.

LINE #	OPERATION	
1.	Standard number	3.00mm
2.	Dial Indicator reading (Step 6)	
3.	ADD lines 1 and 2	
4.	"H" factor (from drive pinion) (Step 7)	
5.	"H" factor sign □	
	PLUS SIGN ⊞ line 5; SUBTRACT line 4 from 3. Enter difference on line 6	
	MINUS SIGN ⊟ line 5; ADD lines 3 and 4. Enter sum on line 6	
6.	Washer size	

Example: Dial Indicator Reading: 0.3 mm

Number on Pinion Head: +2

3.00 (standard measure)
+0.3 (indicator reading)
3.3 (Pinion head is plus, so you
−0.02 SUBTRACT it)
3.28 (mm = total pinion washer you will need)

9. Select the proper washer (Refer to S.D.S.).

If you cannot find the desired thickness of washer, use washer so that thickness is the closest to the calculated value.

Example:

3.28 mm (Calculated total pinion washer in step 8)

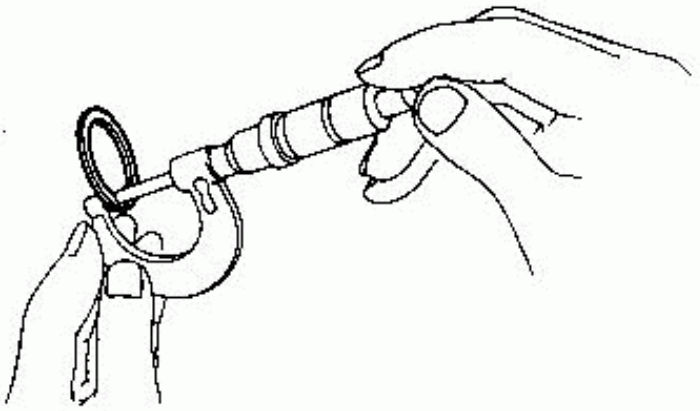
⬇

The correct washer is 3.27 mm (Part number 38154-P6023).

Drive Pinion Preload

1. To determine pinion bearing preload, disassemble pinion height/bearing preload tools and measure thickness of lead washer. This is the correct size pinion bearing adjusting washer required.

If a lead washer is not available, use a piece of thick roll solder to obtain preload washer size.



SPD543

2. Select the proper washer (Refer to S.D.S.).

- **If you cannot find shims with the desired thickness, use shims so that the total thickness is the closest to the calculated value.**
- **Sometimes the correct dimension cannot be set with washers alone. In these cases, washers may be used in combination with drive pinion bearing adjusting spacers. (Refer to S.D.S.)**

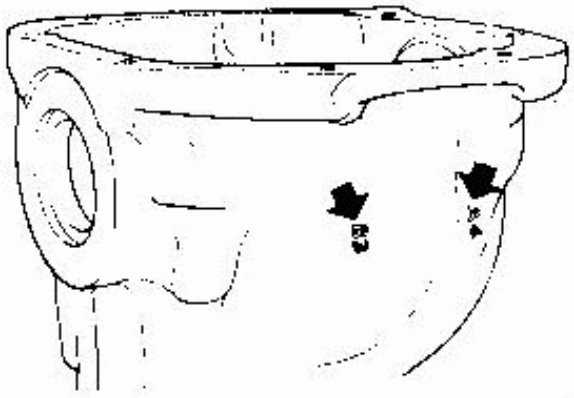
Side Bearing Preload

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	

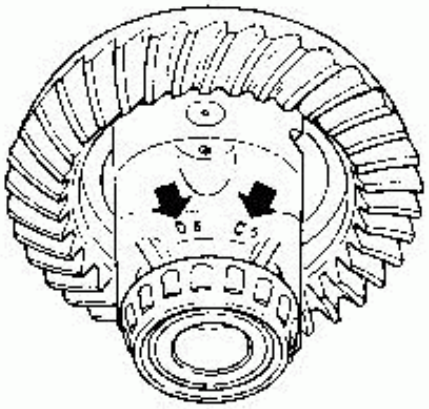
2. Write the following numbers down in the chart.

A & B: Figures marked on gear carrier



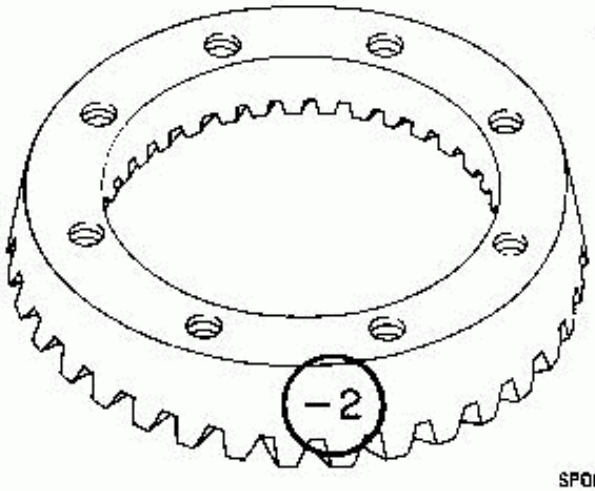
PD358

C & D: Figures marked on differential case



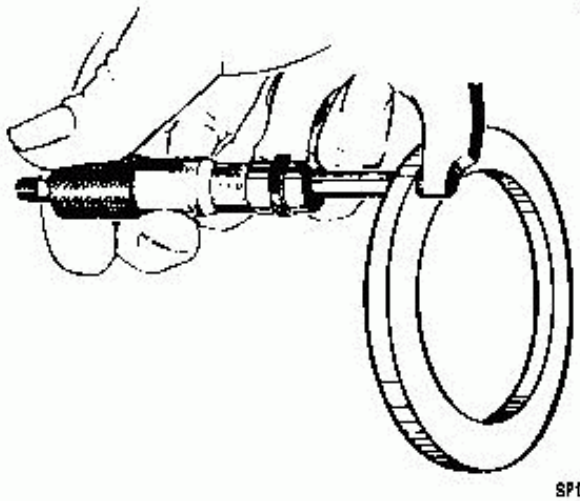
PD3

H: Figures marked on ring gear



SPD67

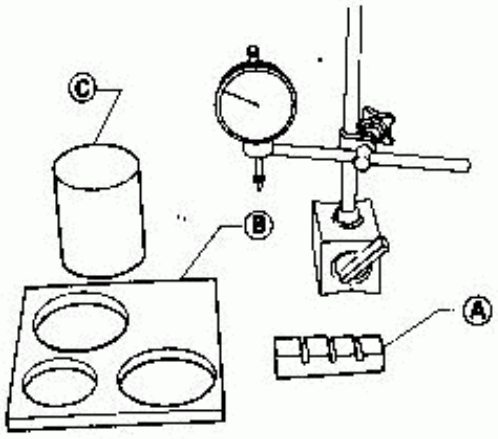
G: This is the difference in thickness of side spacer against standard width [8.10 mm (0.3189 in)]
(G = Standard spacer − Measured spacer).



SPD6

Side Bearing Preload (Cont'd)

3. Measure how far under the standard thickness [21 mm (0.83 in)] the side bearings are. It will require the tools shown below.

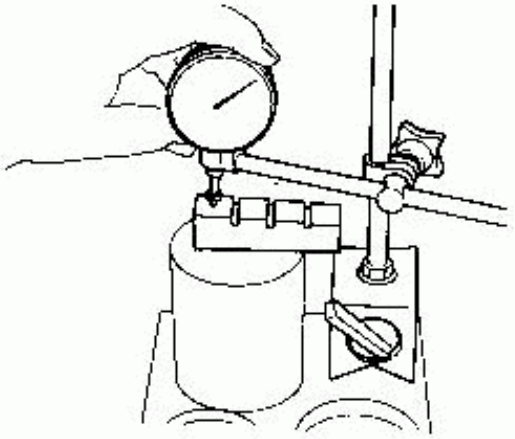


SPD545

Tool number:

Ⓐ	4-step gauge block	(J25407-1)
Ⓑ	Base plate	(J25407-2)
Ⓒ	Weight block	(J25407-3)

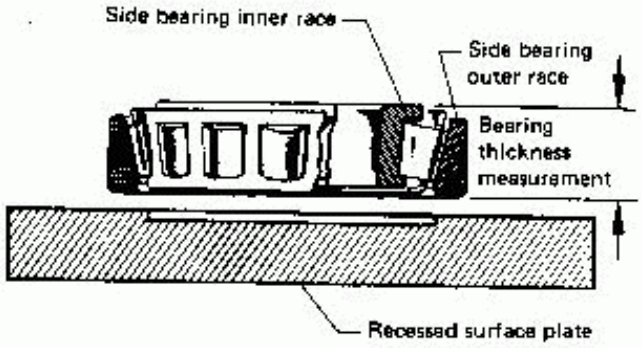
4. Set weight block, 4-step gauge block [21 mm (0.83 in)] and dial indicator on base plate.
5. Adjust dial indicator scale to zero.



SPD546

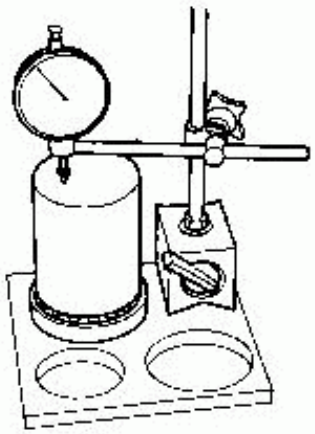
6. Carefully slide 4-step gauge block and weight block out from under dial indicator.
7. Lubricate side bearing and place side bearing on base plate.

Make sure that base plate has a recess in it and that bearing will turn freely when positioned over the recess as shown.



SPD547

8. Place weight block on side bearing.
9. Slide dial indicator on weight block.

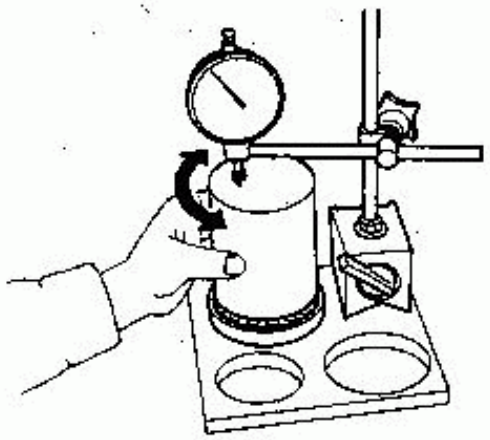


SPD548

Side Bearing Preload (Cont'd)

10. Turn weight block a few times to ensure that bearing is properly seated.
11. Read dial indicator.

- **Normal indication:**
  0.10 - 0.30 mm (0.0039 - 0.0118 in)
- **If the needle fluctuates erratically, then bearing is either dirty or defective and should be cleaned or replaced.**



SPD549

12. 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".

13. Calculate washer thickness following the charts below.

Left (ring gear) side:

LINE #	OPERATION	
1L	Left side standard number	2.05 mm
2L	Enter "A" factor (gear carrier)	
3L	Enter "D" factor (differential case)	
4L	Enter "E" factor (left bearing)	
5L	**ADD** Lines 1L, 2L, 3L, and 4L. Enter **SUM**	
6L	Enter "C" factor (differential case)	
7L	**SUBTRACT** Line 6L from 5L — Enter **DIFFERENCE**	
8L	Enter "H" factor (ring gear)	
9L	Enter "H" factor's sign □	
	PLUS SIGN + Line 9L; **SUBTRACT** Line 8L from 7L. Enter difference on Line 10L.	
	MINUS SIGN — Line 9L; **ADD** Lines 7L and 8L. Enter sum on Line 10L.	
10L	Left side shim size "T_1"	

Side Bearing Preload (Cont'd)

Right side:

LINE #	OPERATION	
1R	Right side standard number	1.95 mm
2R	Enter "B" factor (gear carrier)	
3R	Enter "F" factor (right bearing)	
4R	Enter "G" factor (R 200 only) (See Chart Below)	
5R	**ADD** Lines 1R, 2R, 3R, and 4R. Enter **SUM**	
6R	Enter "D" factor (differential case)	
7R	**SUBTRACT** Line 6R from 5R. — Enter **DIFFERENCE**	
8R	Enter "H" factor (ring gear)	
9R	Enter "H" factor's sign □	
	PLUS SIGN + Line 9R; **ADD** Lines 7R and 8R. Enter sum on Line 10R.	
	MINUS SIGN — Line 9R; **SUBTRACT** Line 8R from 7R. Enter difference on line 10R.	
10R	Right side shim size "T_2"	

	G FACTOR CALCULATION R200 ONLY	
A.	Side bearing spacer — Standard size	8.10 mm
B.	Enter actual spacer measurement	
C.	**SUBTRACT** Line B from Line A and enter **DIFFERENCE** on Line 4R of right side of chart.	

The formulas are as follows:

$T_1 = A - C + D + E - H + 2.05$ (mm)

$T_2 = B - D + F + G + H + 1.95$ (mm)

Example:

Left Side T1			Right Side T2		
	+	—		+	—
A	3	C 3	B	3	D 3
D	3		F	14	H 2
E	18		G	7	
H	2		std. shim	1.95	
std. shim	2.05			2.19	5
	2.31	3		−5	
	−3				
	2.28			2.14	

The measurement for the shim pack on the left (T1) should be 2.28 mm and for the right (T2) 2.14 mm. To check the accuracy of your work in the previous step, the side bearing shim measurement should be figured with a Side Bearing Shim Calculator.

Side Bearing Preload (Cont'd)

Follow the instructions for the sample given below:

EXAMPLE CALCULATOR

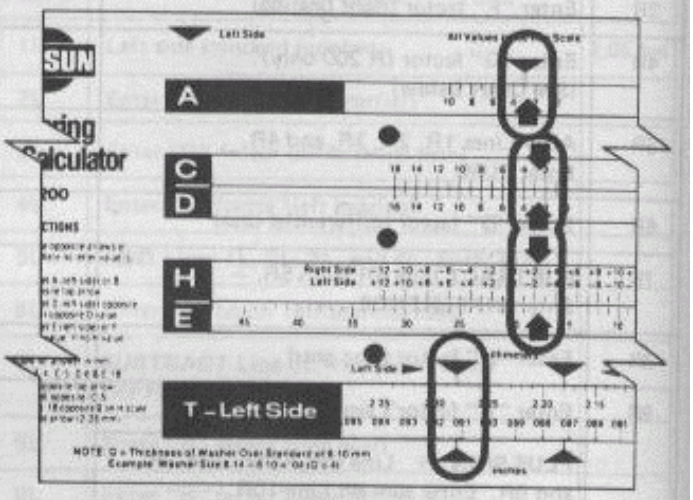
Left Side

Step 1. Move slide 1 to place C 3 in line with an arrow.

Step 2. Move slide 2 to place D 3 in line with C 3.

Step 3. Move slide 3 to place E 18 in line with H −2.

Step 4. Read answer at left side arrow, 2.28mm or close to .087 in.



SPD550

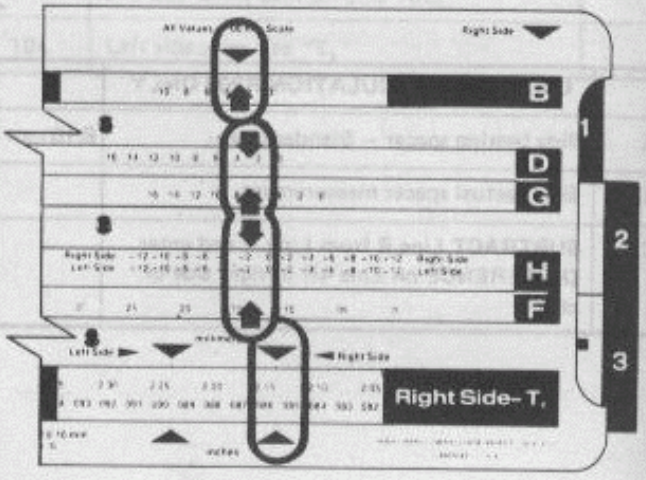
Right Side

Step 1. Move slide 1 to place B 3 in line with an arrow.

Step 2. Move slide 2 to place G 7 in line with D 3.

Step 3. Move slide 3 to place F 14 in line with H 2 (red scale for right side).

Step 4. Read answer at right side arrow 2.14mm or closer to .086 in.



SPD551

14. Compare these answers with the answers on the previous page. If both answers agree, proceed to the next step.
15. Select the proper washer (Refer to S.D.S.).

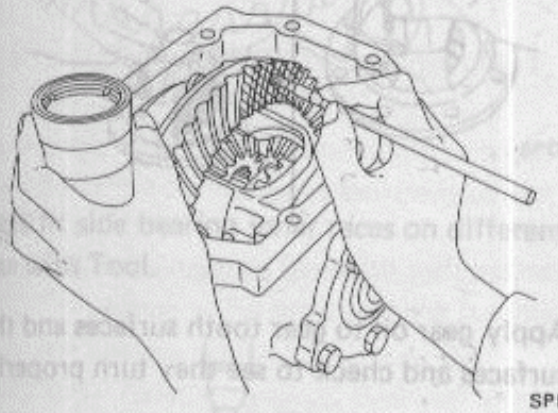
If you cannot find the desired thickness of washer, use washer so that thickness is the closest to the calculated value.

Tooth Contact

Gear tooth contact pattern check is necessary to verify correct relationship between ring gear and drive pinion.

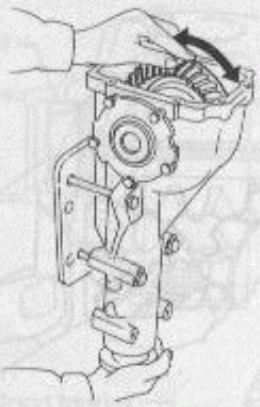
Hypoid gear set which are not positioned properly may be noisy, or have short life or both. With a pattern check, the most desirable contact for low noise level and long life can be assured.

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.



SPD357

3. Hold companion flange steady by hand and rotate the ring gear in both directions.

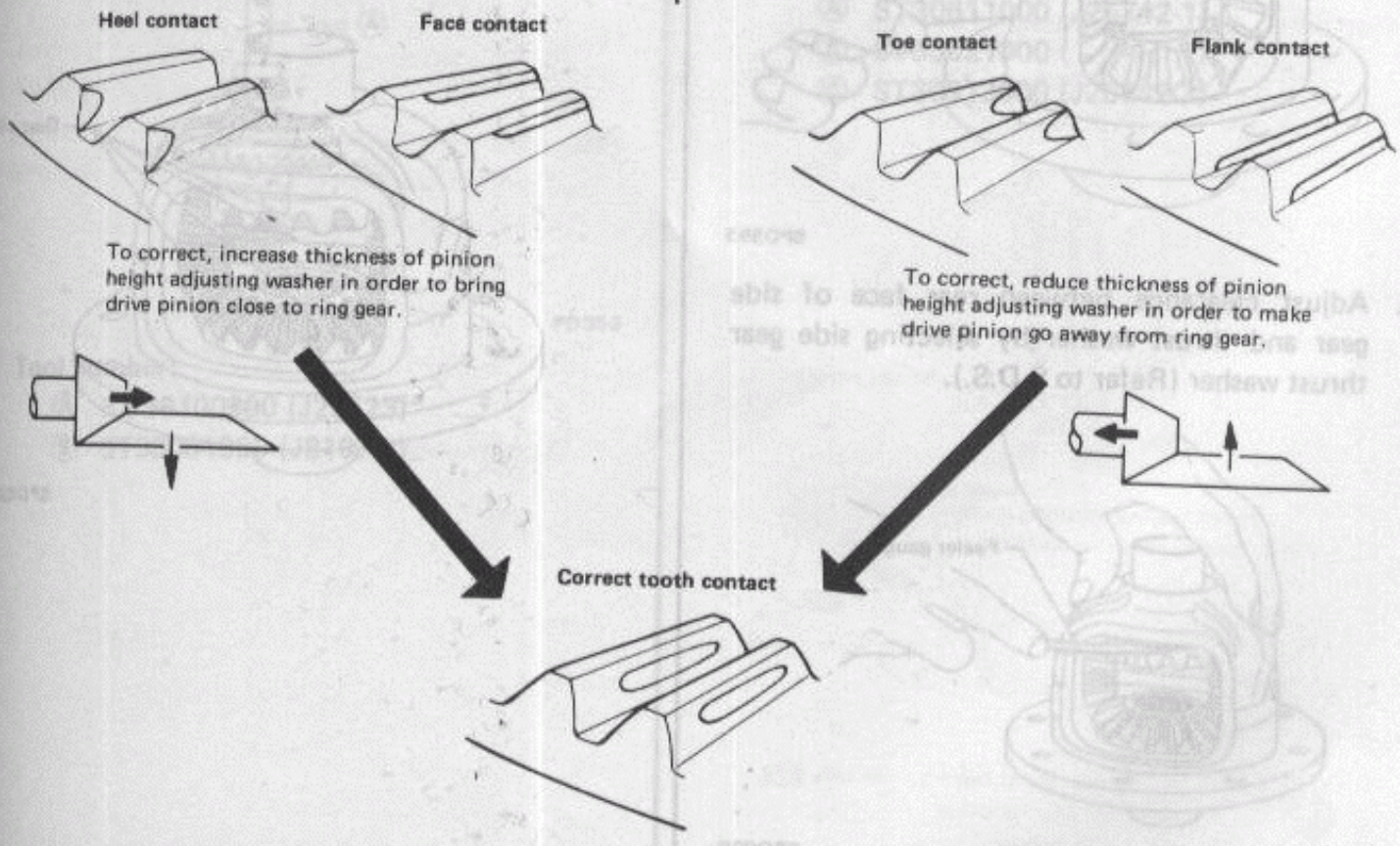


SPD308

Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct.

However, in extremely rare cases you will have to use trial-and-error processes until you get a good tooth contact pattern.

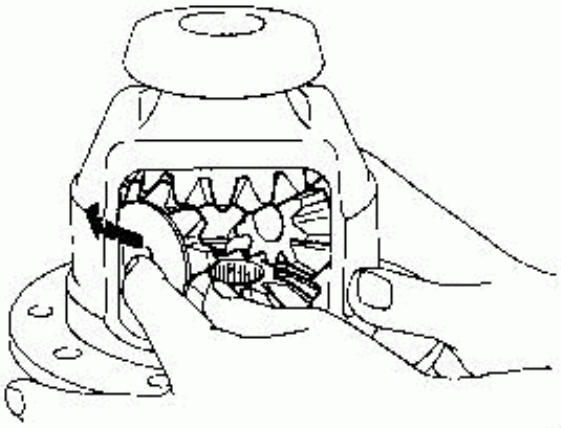
The tooth pattern is the best indication of how well a differential has been set up.



SPD007

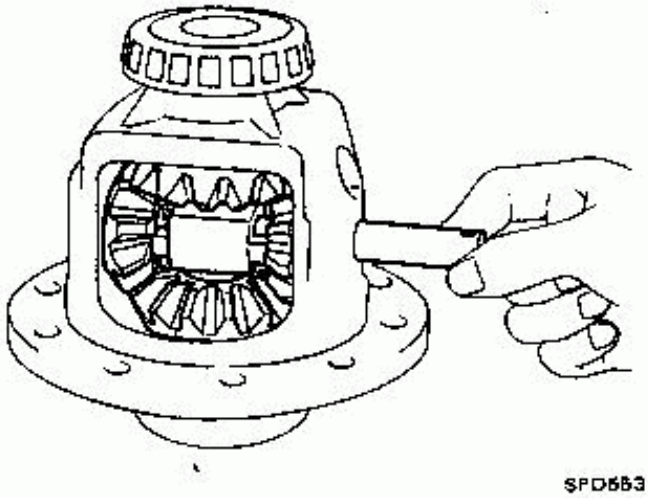
Differential Case

1. Install side gears, pinion mate gears, thrust washers and thrust block into differential case.



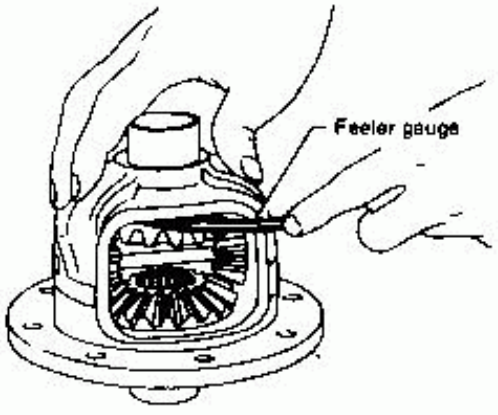
SPD552

2. Fit pinion mate shaft to differential case so that it meets lock pin holes.



SPD553

3. Adjust clearance between rear face of side gear and thrust washer by selecting side gear thrust washer (Refer to S.D.S.).

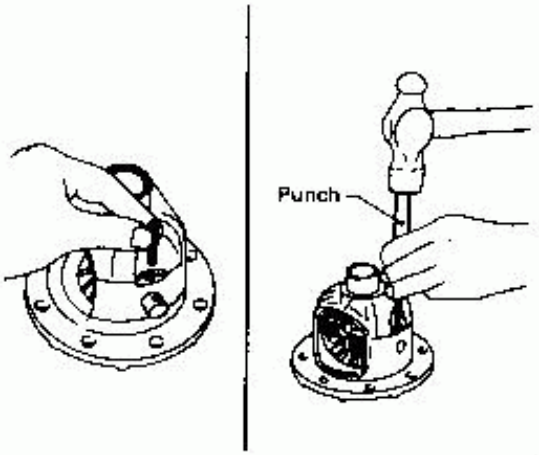


SPD029

Clearance between side gear thrust washer and differential case:
Less than 0.15 mm (0.0059 in)

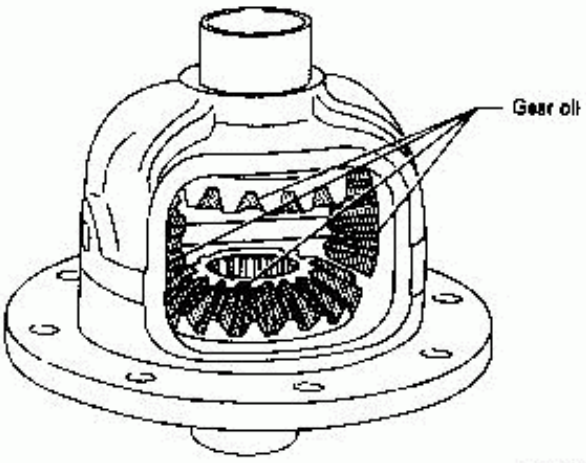
4. Install pinion mate shaft lock pin using a punch.

Make sure lock pin is flush with case.



SPD030

5. Apply gear oil to gear tooth surfaces and thrust surfaces and check to see they turn properly.

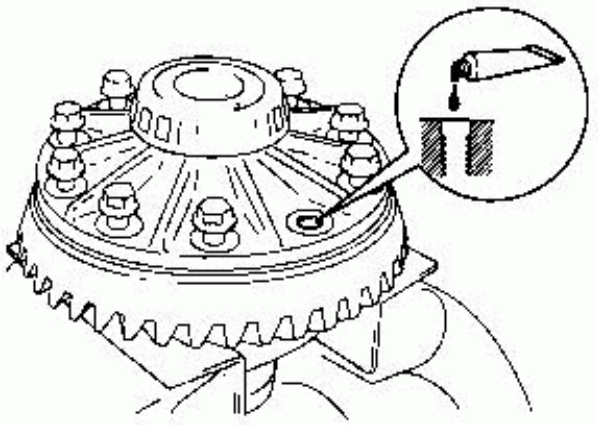


SPD322

Differential Case (Cont'd)

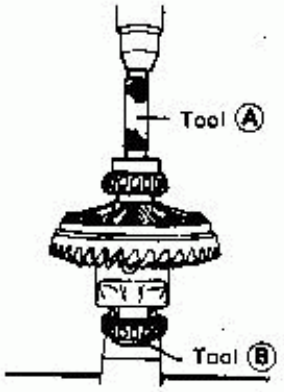
6. Place differential case on ring gear.
7. Apply locking agent [Locktite (stud lock) or equivalent] to ring gear bolts, and install them.

Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.



SPD554

8. Press fit side bearing inner races on differential case with Tool.



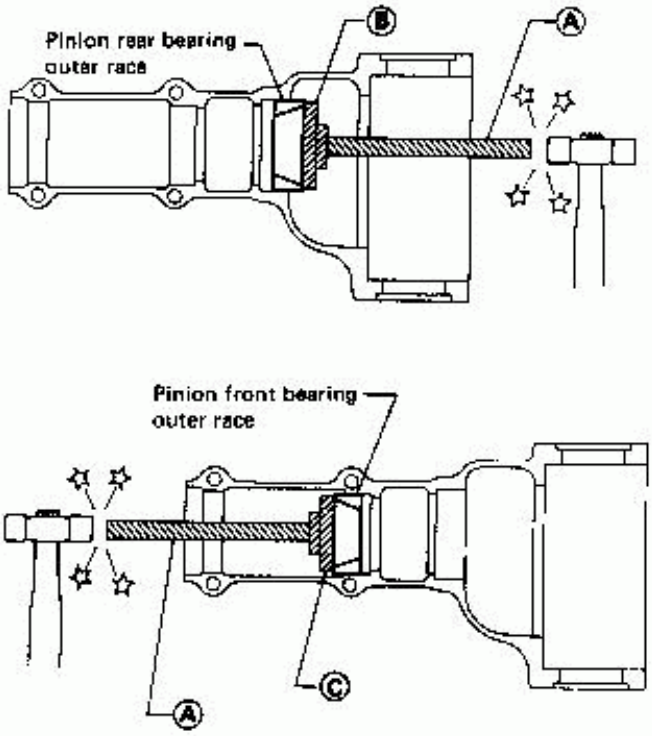
PD353

Tool number:

- Ⓐ **KV38100300 (J25523)**
- Ⓑ **ST33061000 (J8107-2)**

Differential Carrier

1. Press-fit front and rear bearing outer races using Tools.

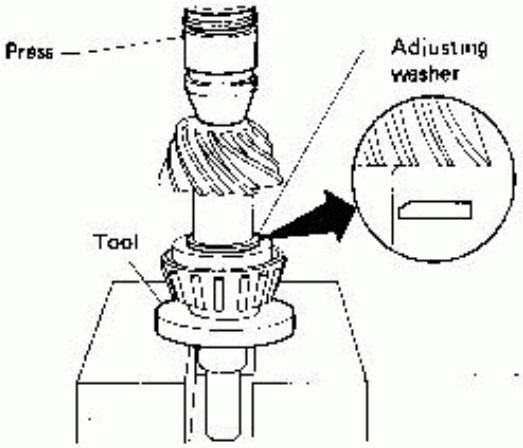


SPD555

Tool number:

- Ⓐ **ST30611000 (J25742-1)**
- Ⓑ **ST30621000 (–)**
- Ⓒ **ST30613000 (J25742-3)**

2. Select pinion height adjusting washer and pinion bearing adjusting washer spacer, referring to Adjustment.
3. Install pinion height adjusting washer in drive pinion, and press fit rear bearing inner race in it, using press and Tool.

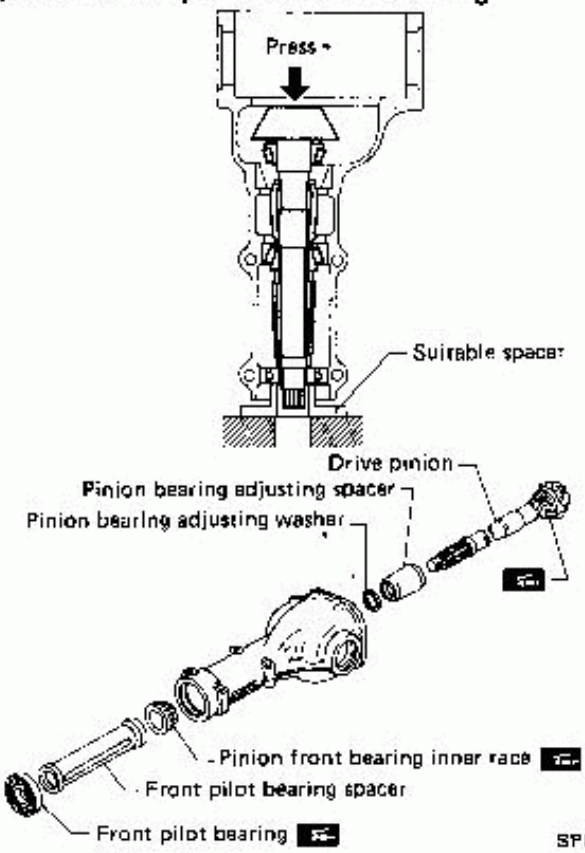


SPD377

Tool number: ST30901000 (—)

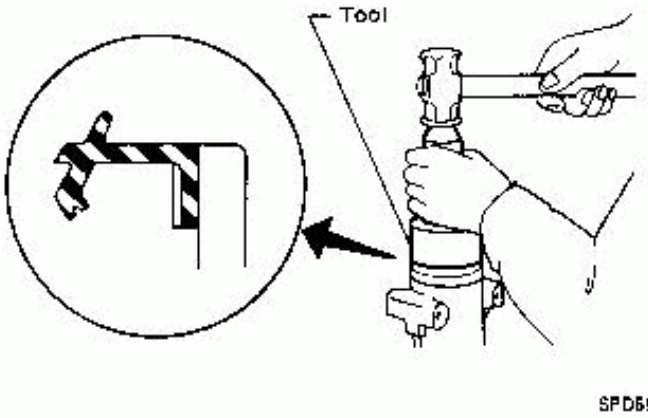
4. Set drive pinion assembly (as shown in figure below) in differential carrier and install drive pinion, using press and suitable tool.

Stop when drive pinion touches bearing.



SPD556

5. Apply multi-purpose grease to cavity at sealing lips of oil seal.
   Install front oil seal.

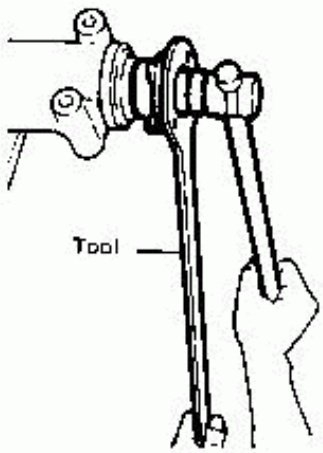


SPD557

Tool number: ST30720000 (—)

6. Install companion flange, and tighten pinion nut to specified torque.

Ascertain that threaded portion of drive pinion and pinion nut are free from oil or grease.

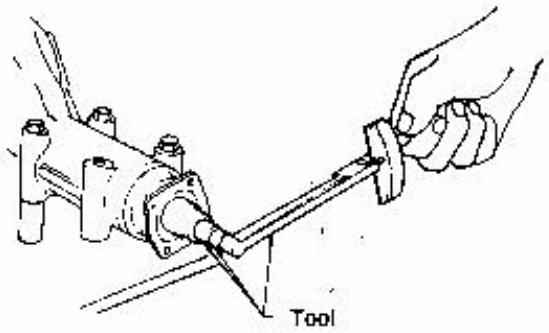


PD488

Tool number: ST31520000 (—)

Differential Carrier (Cont'd)

7. Turn drive pinion in both directions several times, and measure pinion bearing preload.



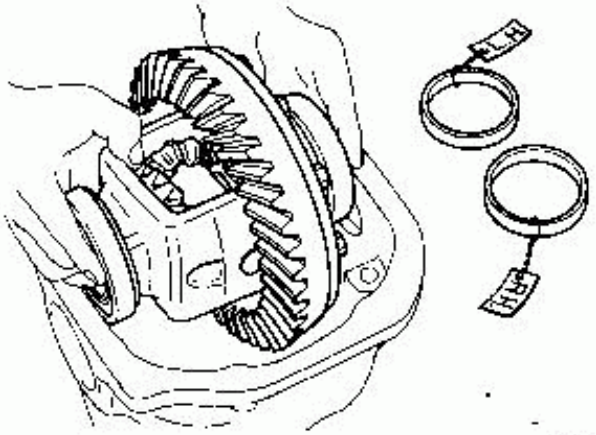
PD340

Tool number:
ST3127S000 (See J25765-A)

Pinion bearing preload:
1.13 - 1.72 N·m
(11.5 - 17.5 kg-cm, 10.0 - 15.2 in-lb)

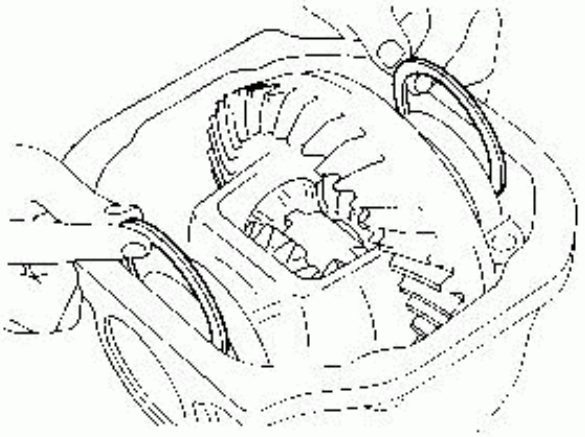
When pinion bearing preload is outside the specifications, replace pinion bearing adjusting washer and spacer with a different thickness.

8. Select side bearing adjusting washer.
   Refer to Adjustment.
9. Install differential case assembly with side bearing outer races into gear carrier.



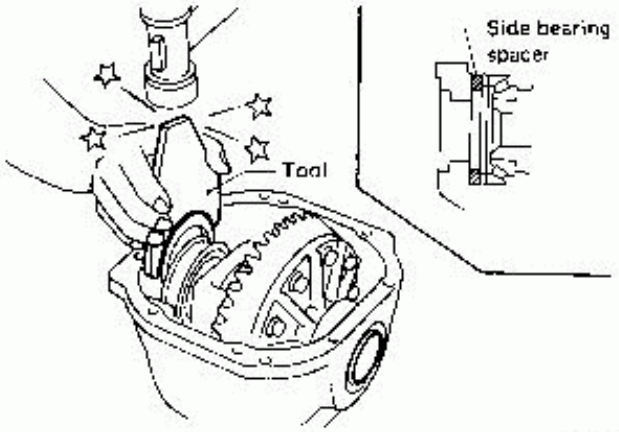
SPD527

10. Insert left and right side bearing adjusting washers in place between side bearings and carrier.



SPD558

11. Drive in side bearing spacer using Tool.

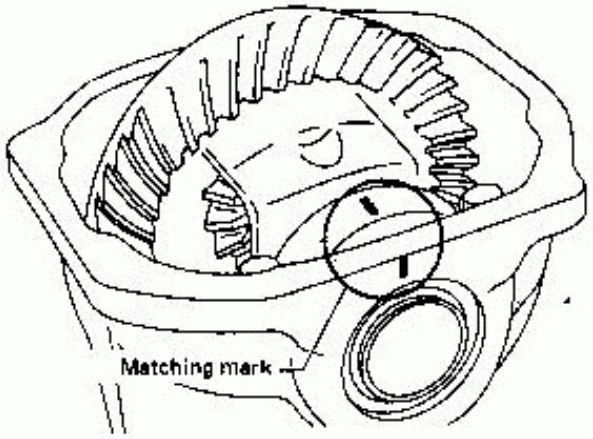


SPD559

Tool number: KV38100600 (J25267)

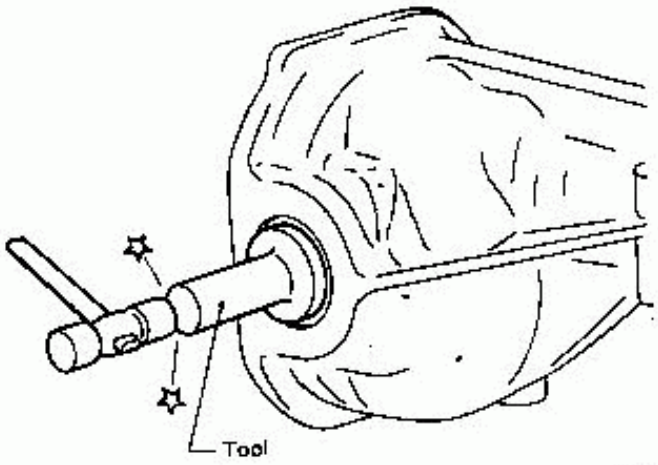
Differential Carrier (Cont'd)

12. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.



SPD626

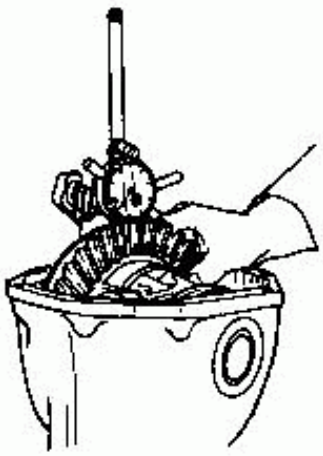
13. Apply multi-purpose grease to cavity at sealing lips of oil seal.
    Install side oil seal.



SPD550

Tool number: KV38100200 (–)

14. Measure ring gear-to-drive pinion backlash with a dial indicator.



SPD513

Ring gear-to-drive pinion backlash:
0.13 - 0.18 mm
(0.0051 - 0.0071 in)

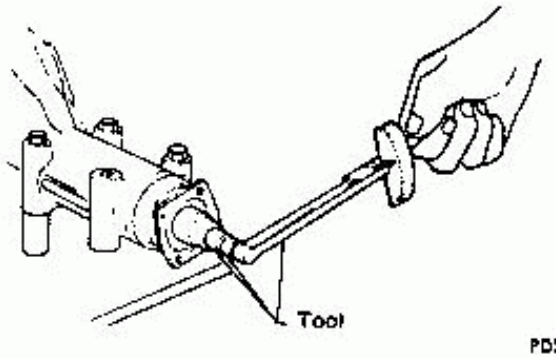
- If backlash is too small, decrease thickness of right shim and increase thickness of left shim by the same amount.

  If backlash is too great, reverse the above procedure.

Never change the total amount of shims as it will change the bearing preload.

15. Check total preload with Tool.

When checking preload, turn drive pinion in both directions several times to set bearing rollers.



PD340

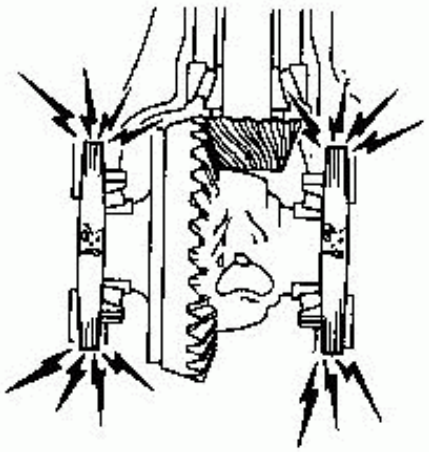
Tool number: ST3127S000 (See J25765-A)

Total preload:
1.23 - 2.30 N·m
(12.5 - 23.5 kg-cm, 10.9 - 20.4 in-lb)

Differential Carrier (Cont'd)

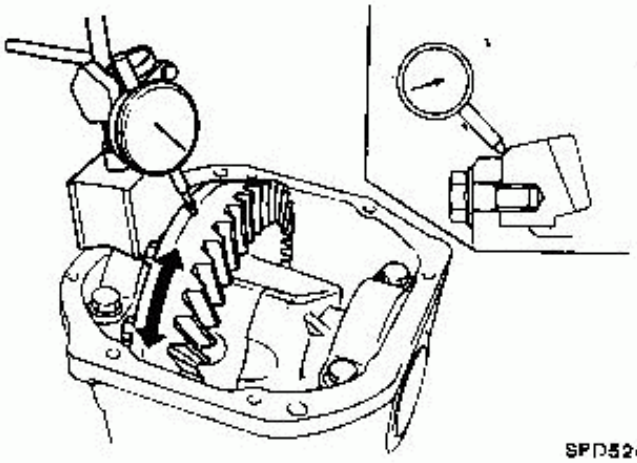
- If preload is too great, add the same amount of shim to each side.
- If preload is too small, remove the same amount of shim to each side.

Never add or remove a different number of shims for each side as it will change ring gear-to-drive pinion backlash.



SPD561

16. Recheck ring gear-to-drive pinion backlash because increase or decrease in thickness of shims will cause change of ring gear-to-pinion backlash.
17. Check runout of ring gear with a dial indicator.

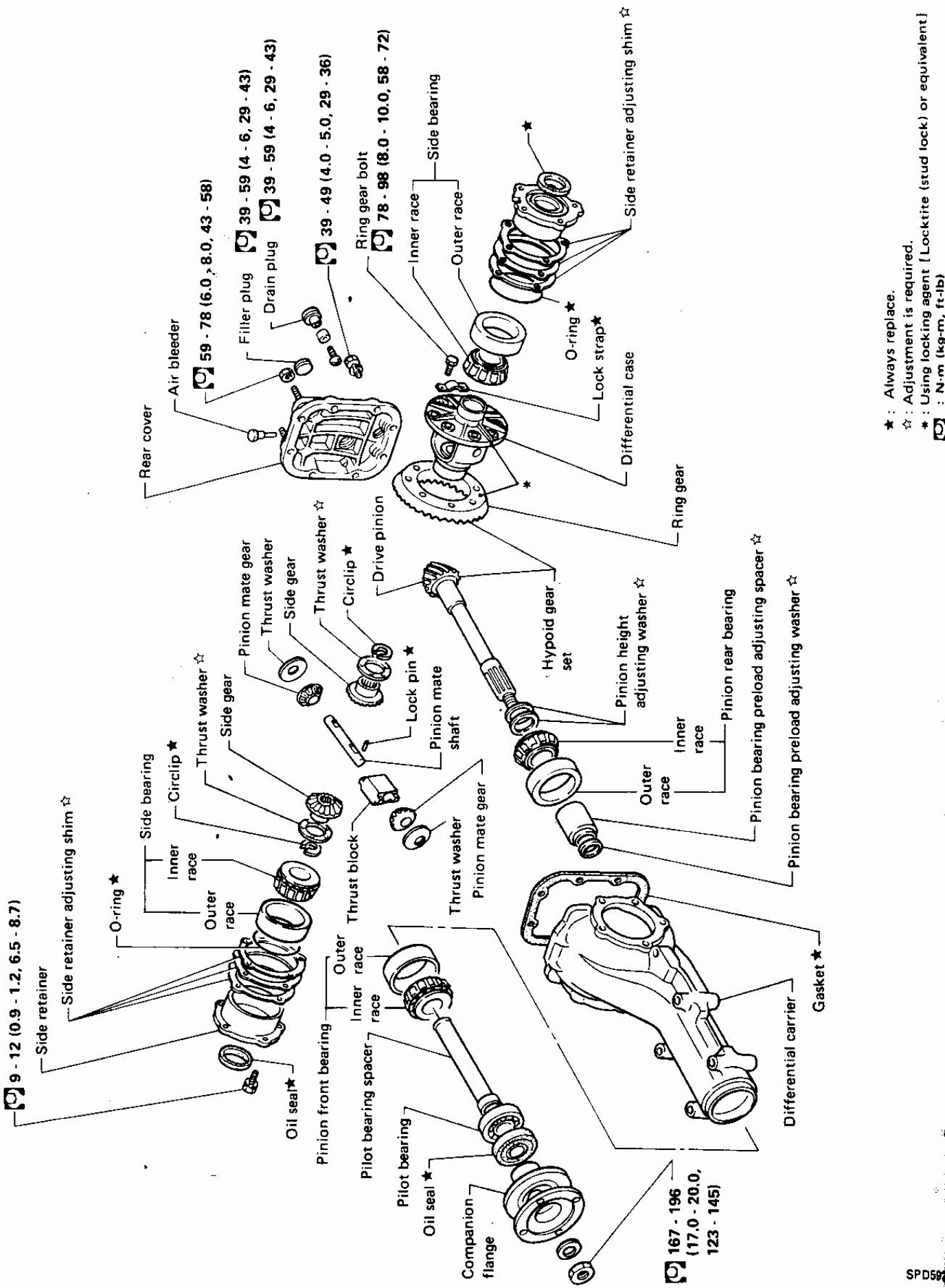


SPD524

Runout limit:
0.05 mm (0.0020 in)

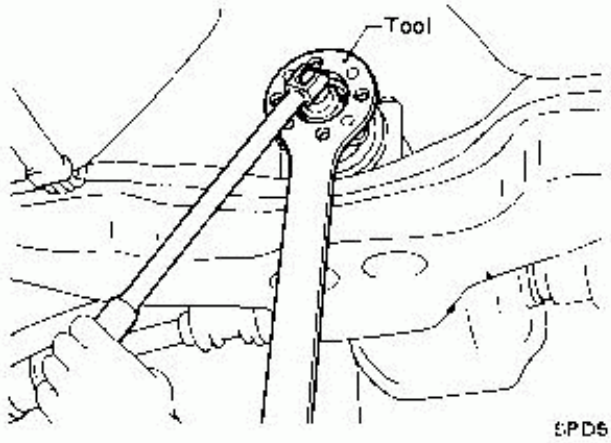
- If backlash varies excessively in different places, the variance may have resulted from foreign matter caught between the ring gear and the differential case.
- If the backlash varies greatly when the runout of the ring gear is within a specified range, the hypoid gear set or differential case should be replaced.

18. Check tooth contact.
    Refer to Adjustment.
19. Install rear cover and gasket.


9 - 12 (0.9 - 1.2, 6.5 - 8.7)
Side retainer
Side retainer adjusting shim ☆
O-ring ★
Side bearing
Inner race
Outer race
Circlip ★
Thrust washer ☆
Side gear
Oil seal ★
Pinion front bearing
Outer race
Inner race
Pilot bearing spacer
Pilot bearing
Oil seal ★
Companion flange
167 - 196 (17.0 - 20.0, 123 - 145)
Thrust block
Thrust washer
Pinion mate gear
Pinion mate shaft
Lock pin ★
Pinion mate gear
Thrust washer
Side gear
Thrust washer ☆
Circlip ★
Drive pinion
Hypoid gear set
Pinion height adjusting washer ☆
Outer race
Inner race
Pinion rear bearing
Pinion bearing preload adjusting spacer ☆
Pinion bearing preload adjusting washer ☆
Gasket ★
Differential carrier
Rear cover
Air bleeder
59 - 78 (6.0 - 8.0, 43 - 58)
Filler plug
39 - 59 (4 - 6, 29 - 43)
Drain plug
39 - 59 (4 - 6, 29 - 43)
39 - 49 (4.0 - 5.0, 29 - 36)
Ring gear bolt
78 - 98 (8.0 - 10.0, 58 - 72)
Inner race
Outer race
Side bearing
Side retainer adjusting shim ☆
O-ring ★
Lock strap ★
Differential case
Ring gear
★ : Always replace.
☆ : Adjustment is required.
* : Using locking agent [Locktite (stud lock) or equivalent]
: N·m (kg-m, ft-lb)
SPD592

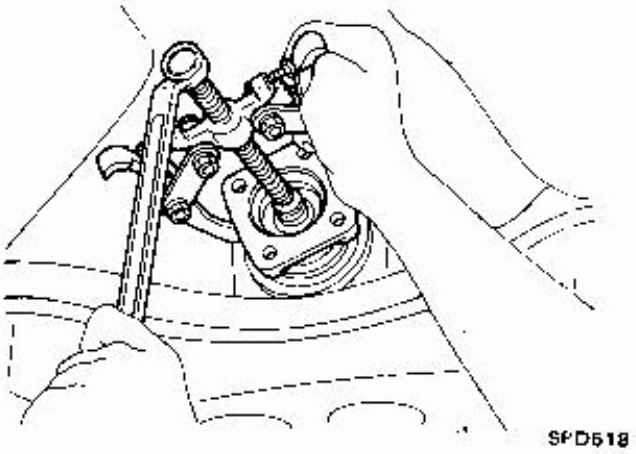
Front Oil Seal Replacement

1. Remove propeller shaft.
2. Loosen drive pinion nut.

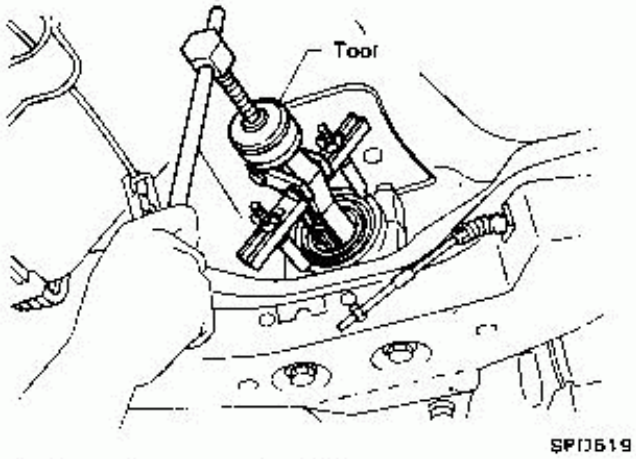


Tool number: ST31520000 (—)

3. Remove companion flange.

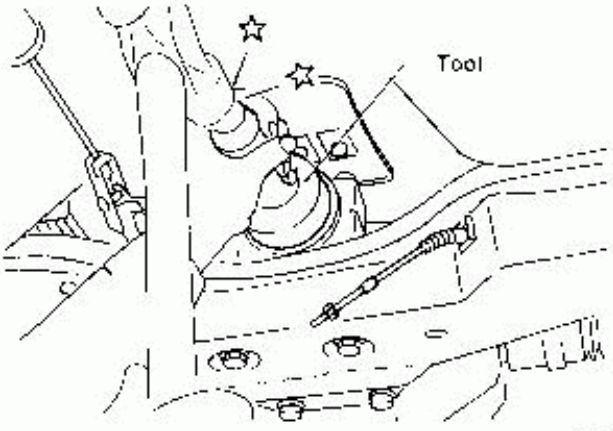


4. Remove front oil seal.



Tool number: ST33290001 (J25810-A)

5. Apply multi-purpose grease to cavity at sealing lips of oil seal.
   Press front oil seal into carrier.

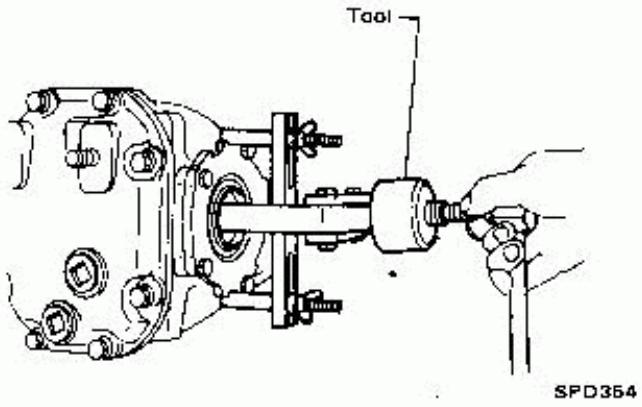


Tool number: ST30720000 (—)

6. Install companion flange and drive pinion nut.
7. Install propeller shaft.

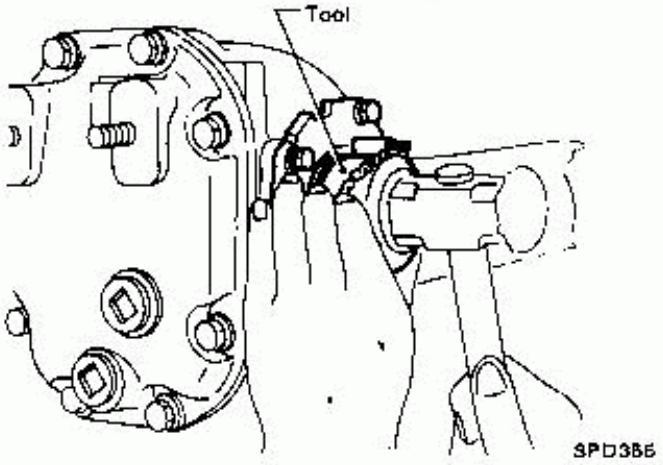
Side Oil Seal Replacement

1. Remove drive shafts.
   Refer to RA section.
2. Remove oil seal.



Tool number: ST33290001 (J25810-A)

3. Apply multi-purpose grease to cavity at sealing lips of oil seal.
   Press-fit oil seal into carrier.

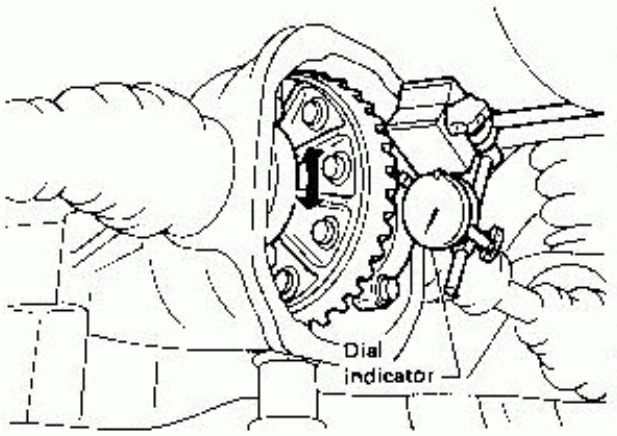


Tool number: ST33270000 (—)

4. Install drive shafts.

Ring Gear to Drive Pinion Backlash

1. Support carrier with a jack.
2. Remove rear cover.
3. Check ring gear to drive pinion backlash with a dial indicator, at several points. If it is not within specifications, adjust it after removing final drive assembly.

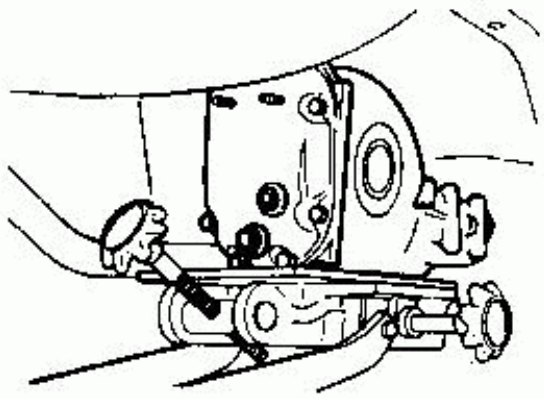


Removal

- Remove propeller shaft.

Insert plug into rear oil seal after removing propeller shaft.

- Remove drive shafts.
  Refer to RA section.
- Pull off differential carrier backward together with jack.



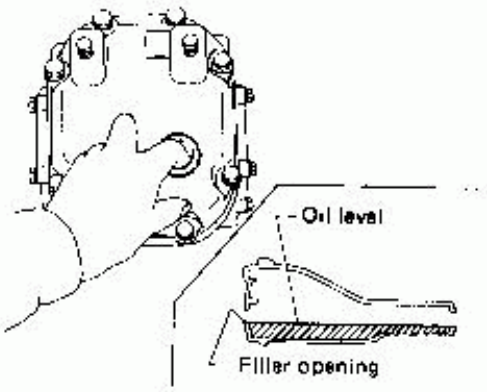
SPD511

CAUTION:

- **Be careful not to damage spline, sleeve yoke and front oil seal, when removing propeller shaft.**
- **After carrier assembly is removed, support suspension member on a stand to prevent its insulators being twisted or damaged.**

Installation

- Fill final drive with recommended gear oil.



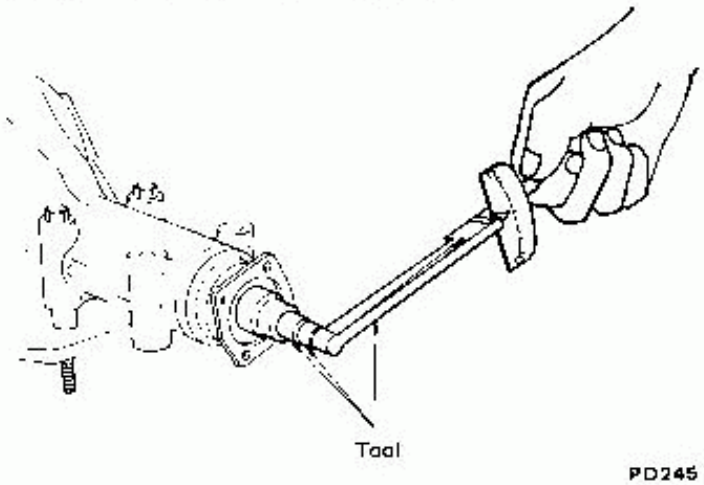
SPD348

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 using Tool.

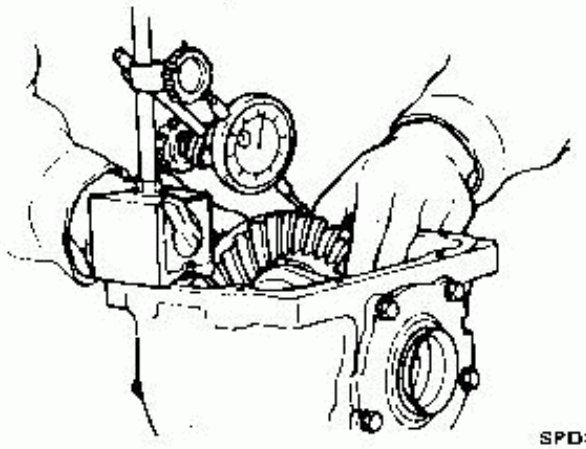


PD245

Tool number: ST3127S000 (See J25765-A)

Total preload:
1.0 - 2.3 N·m
(10 - 23 kg-cm, 8.7 - 20.0 in-lb)

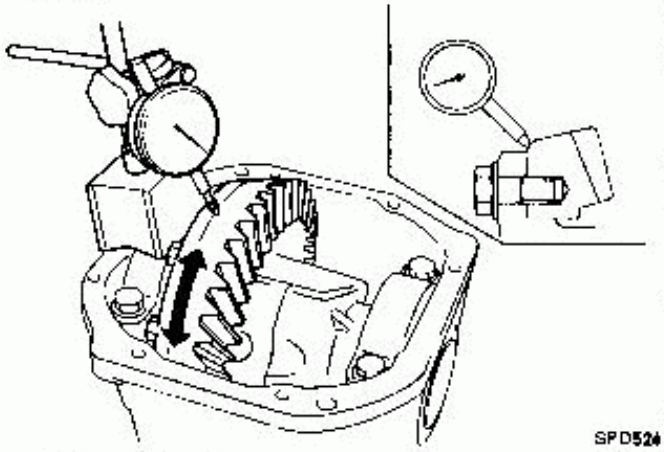
- Ring gear to drive pinion backlash.
  Check backlash of ring gear with a dial indicator at several points.



SPD368

Ring gear-to-drive pinion backlash:
0.13 - 0.18 mm
(0.0051 - 0.0071 in)

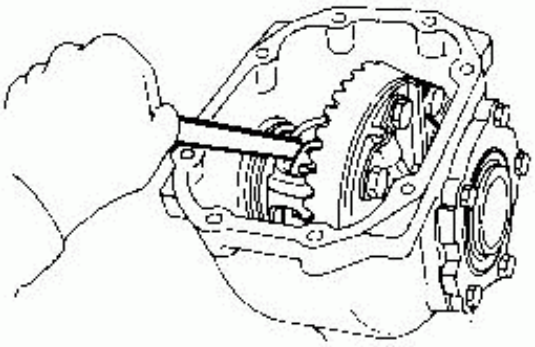
- Ring gear runout
  Check runout of ring gear with a dial indicator.



SPD524

Runout limit:
0.05 mm (0.0020 in)

- Tooth contact
  Check tooth contact, referring to Adjustment.
- Side gear to pinion mate gear backlash
  Using a thickness gauge, measure clearance between side gear thrust washer and differential case.

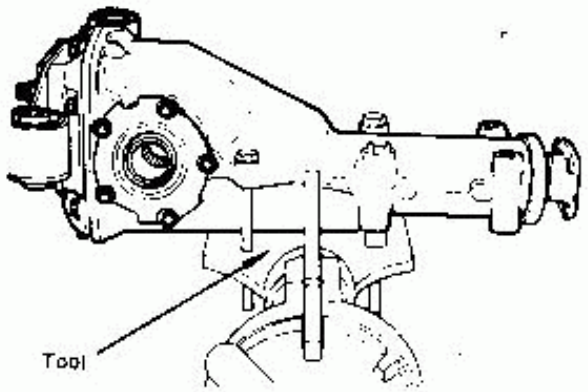


SPD370

Clearance between side gear thrust washer and differential case:
Less than 0.15 mm (0.0059 in)

Differential Carrier

1. Mount carrier on Tool.

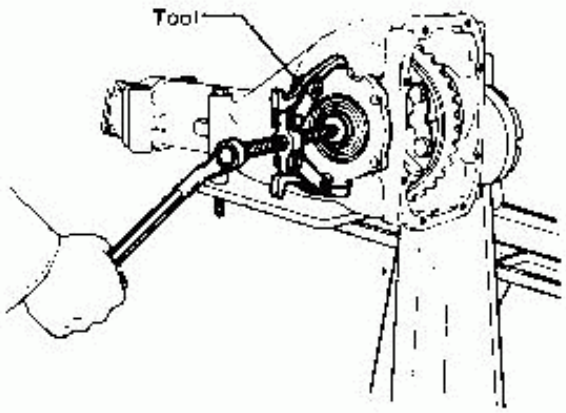


PD408

Tool number: KV38100800 (—)

2. Remove side retainers.

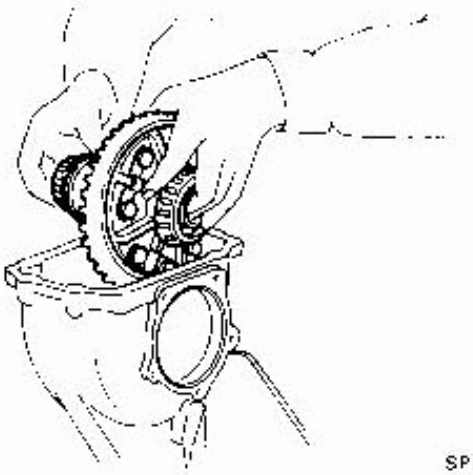
- Mark right and left side retainers before removal.
- Be careful not to confuse right and left hand side retainers and shims.



PD409

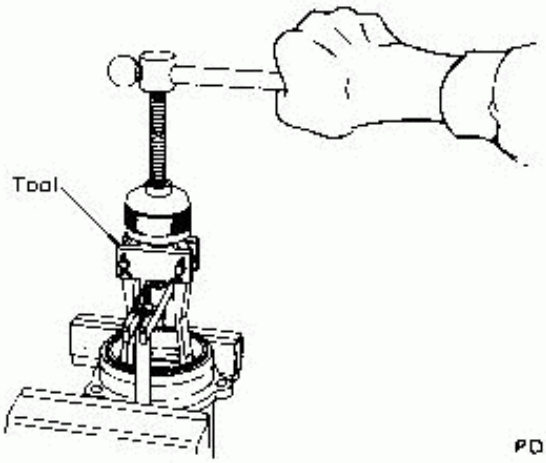
Tool number: ST33710000 (—)

3. Extract differential case from carrier.



SPD309

4. Remove side outer races.



PD243

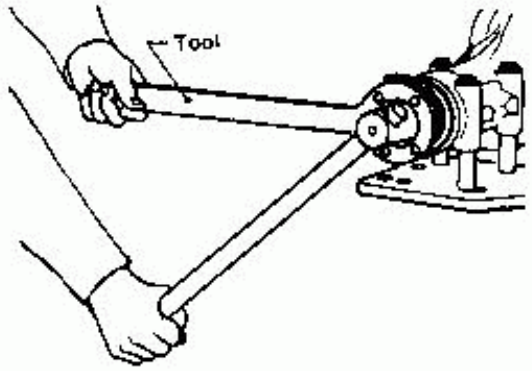
Tool number: ST33290001 (J25801-A)

Be careful to keep the side bearing outer races together with inner race – do not mix them up.

5. Remove side oil seal.

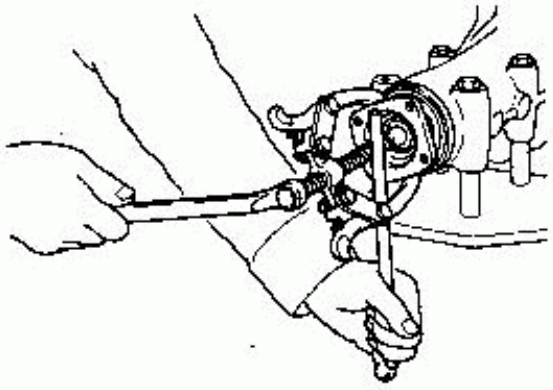
Differential Carrier (Cont'd)

6. Loosen drive pinion nut and pull off companion flange.



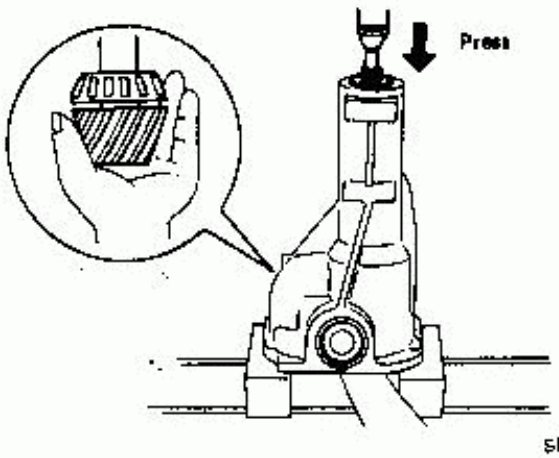
PD345

Tool number: ST31520000 (—)



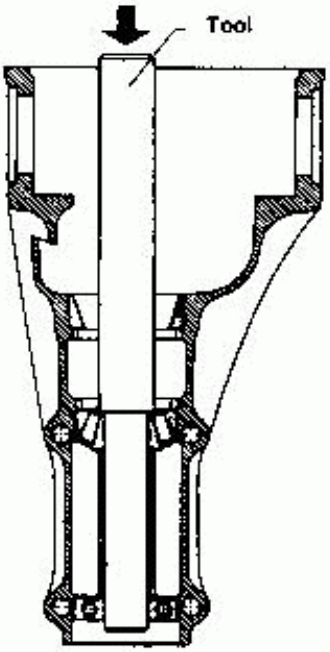
PD346

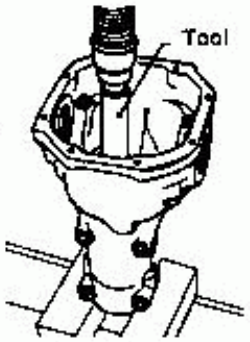
7. Take out drive pinion together with rear bearing inner race, bearing spacer and adjusting washer.



SPD528

8. Remove front oil seal.
9. Remove pilot bearing together with pilot bearing spacer and front bearing inner race using Tool.

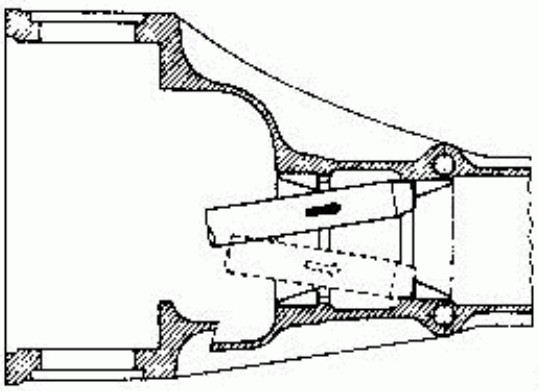




PD348

Tool number: ST30650001 (J25749-A)

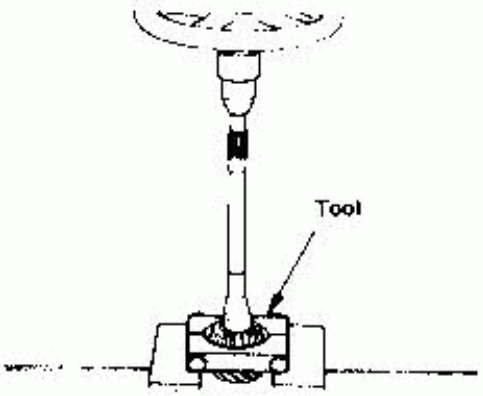
10. Remove pinion bearing outer races using a brass drift.



PD349

Differential Carrier (Cont'd)

11. Remove pinion rear bearing inner race and pinion height adjusting washer.



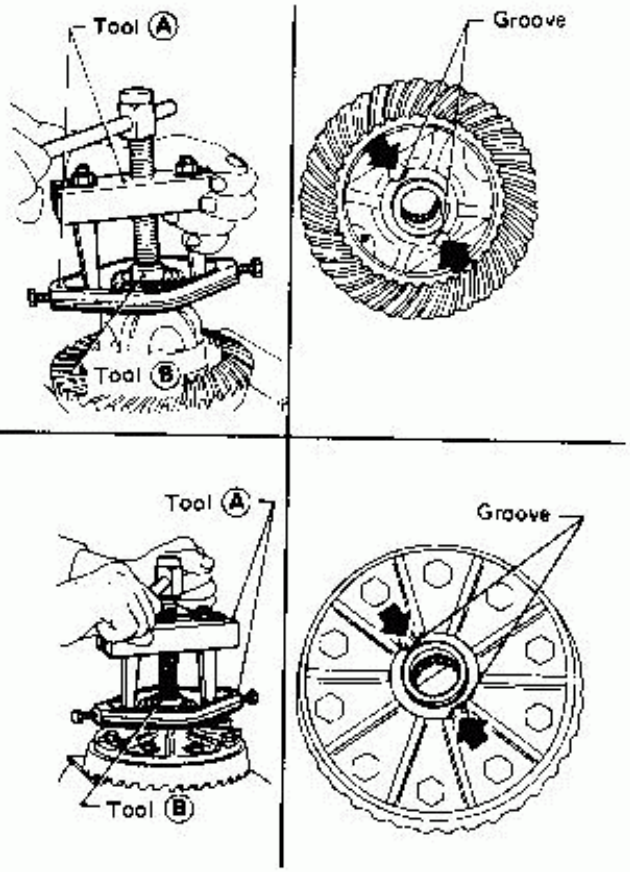
PD179

Tool number: ST30031000 (J22912-01)

Differential Case

1. Remove side bearing inner races.

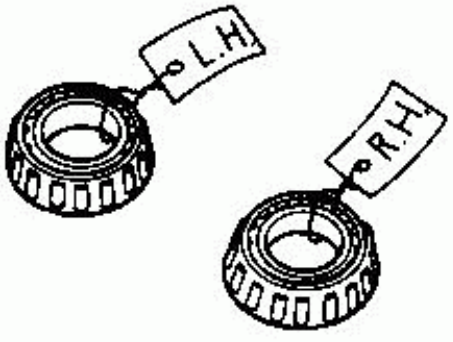
To prevent damage to bearing, engage puller paws with grooves.



SPD529

Tool number: Ⓐ ST33051001 (—)
Ⓑ ST33061000 (J8107-2)

Be careful not to confuse the right and left hand parts.

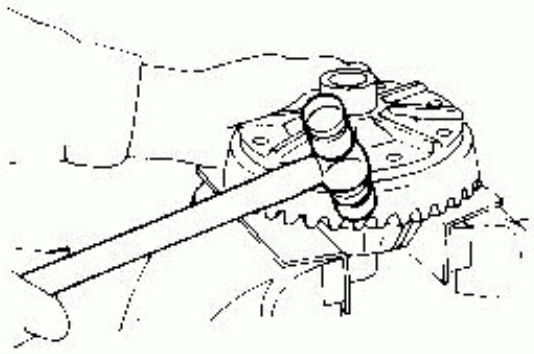


SPD022

Differential Case (Cont'd)

2. Remove lock straps and loosen ring gear bolts in a criss-cross fashion.
3. Tap ring gear off the gear case using a soft hammer.

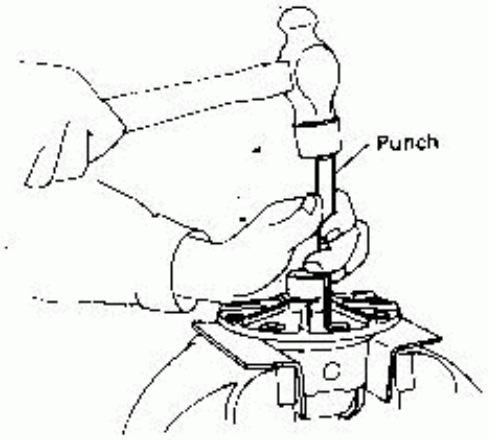
Tap evenly all around to keep ring gear from binding.



SPD024

4. Punch off pinion mate shaft lock pin from ring gear side.

Lock pin is calked at pin hole mouth on differential case.



SPD025

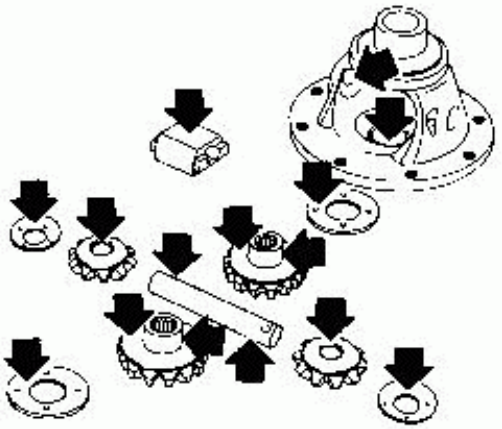
INSPECTION (Model R180)

Ring Gear and Drive Pinion

Check gear teeth for scoring, cracking or chipping. If any damaged part is evident, replace ring gear and drive pinion as a set (hypoid gear set).

Differential Case Assembly

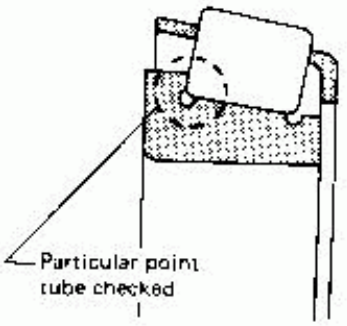
Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft, thrust block and thrust washers.



SPD584

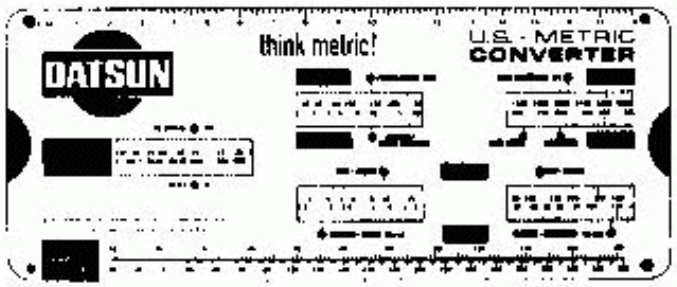
Bearing

1. Thoroughly clean bearing and dry with compressed air.
2. Check bearings for wear, scratches, pitching or flaking.
   Check tapered roller bearing for a burned out portion as shown in the figure below. If damaged, replace outer and inner races as a set.



SPD458

To avoid any confusion while calculating bearing shims, it is absolutely necessary to stay with the metric system. If you measure anything in inches, the results MUST be converted to the metric system. You can use a conversion chart or a calculator as illustrated.

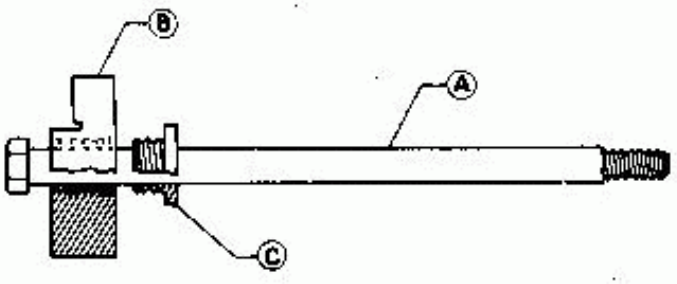


SPD631

Setting Up Each Tools

Set up each tool, rear pinion bearing and front pinion bearing before adjusting pinion height and drive pinion bearing preload.

1. Install rear pinion bearing pilot into gauge plate and slide over hex head long bolt.

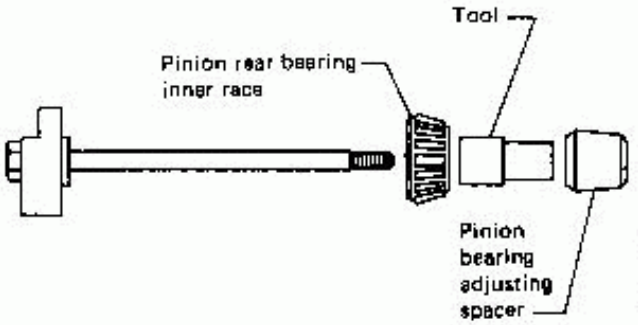


SPD632

Tool number:

- Ⓐ Hex head long bolt (J25269-23)
- Ⓑ Gauge plate (J25269-1)
- Ⓒ Rear pinion bearing pilot (J25269-2)

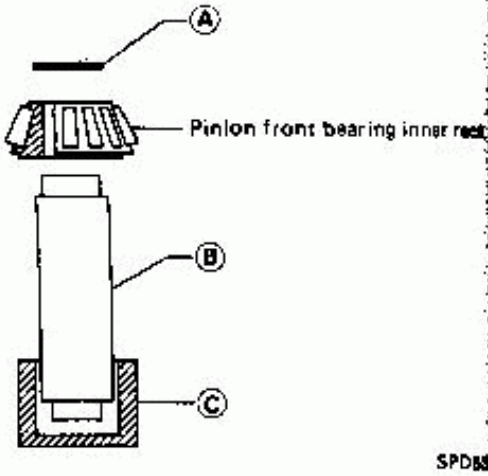
2. Slide pinion rear bearing inner race, bearing preload adapter and pinion bearing adjusting spacer over hex head long bolt.



SPD633

Tool number:
Bearing preload adapter (J25269-27)

3. Install these parts into gear carrier.
4. Stand front bearing pilot support on the bench with the appropriate side up and assemble front pinion bearing pilot, front pinion bearing inner race and lead preload washer. Ensure that all parts are seated.



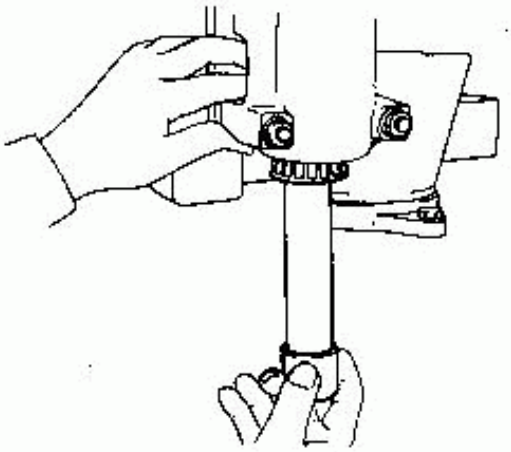
SPD634

Tool number:

- Ⓐ Lead preload washer (J25269-24)
- Ⓑ Front pinion bearing pilot (J25269-3)
- Ⓒ Front bearing pilot support (J25269-29)

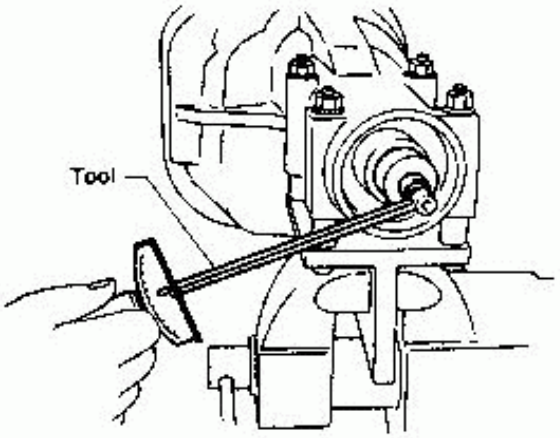
Setting Up Each Tools (Cont'd)

5. Holding these parts together, slide the assembly over hex head long bolt into gear carrier. Install support nut. Finger-tighten the nut and ensure that all parts turn freely and are properly aligned.



SPD535

6. Tighten support nut carefully to correct preload of 0.6 to 1.0 N·m (6 to 10 kg-cm, 5.2 to 8.7 in-lb).

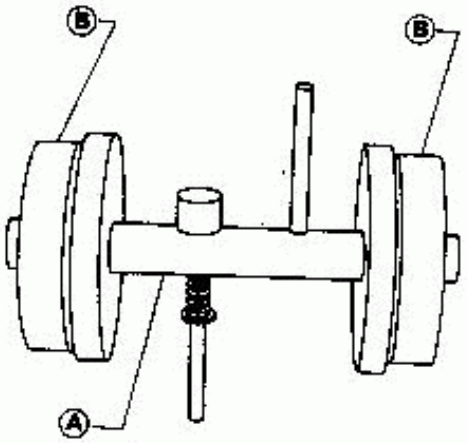


SPD536

Tool number: (J25765)

Drive Pinion Height

1. Install two side bearing discs with arbor assembly. Ensure that arbor turns freely.



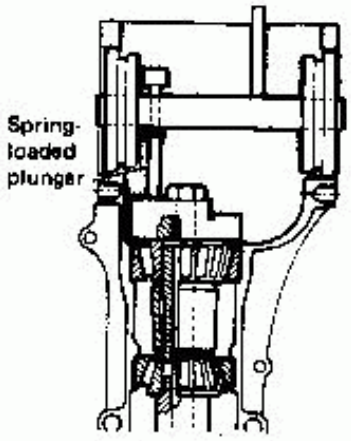
SPD537

Tool number:

- **Ⓐ Arbor assembly (J23597-1)**
- **Ⓑ Side bearing disc (J25269-4)**

2. Place side bearing discs with arbor assembly into differential carrier.

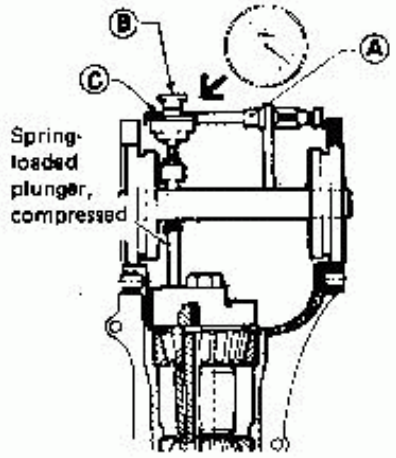
Lift spring loaded plunger and place it on the face of gauge plate.



SPD538

Drive Pinion Height (Cont'd)

3. Install bearing caps.
4. Install dial indicator and tighten hold down clamp.

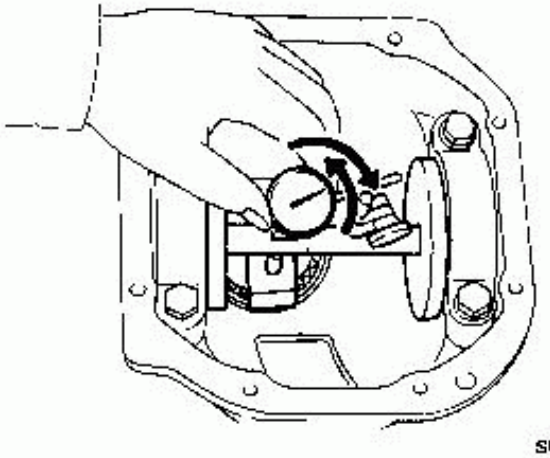


SPD539

Tool number:

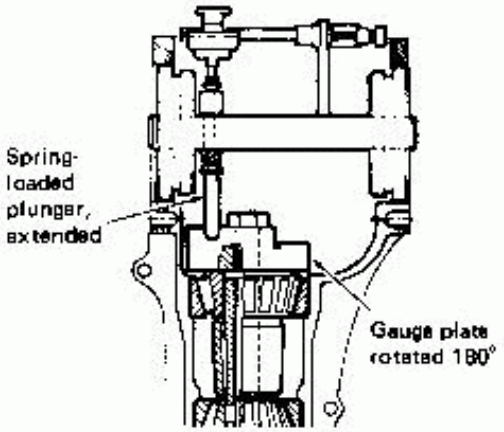
Ⓐ	**Hold down clamp**	**(J8001-1)**
Ⓑ	**Dial indicator clamp**	**(J8001-2)**
Ⓒ	**Dial indicator**	**(J8001-6)**

5. To zero dial indicator, rotate arbor and plunger back and forth and note highest deflection (the point where needle changes direction). Set dial indicator at zero.



SPD540

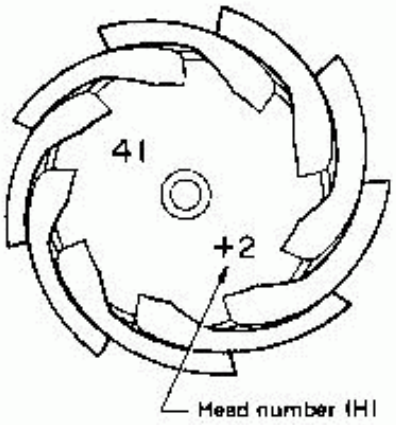
6. Rotate gauge plate until the plunger falls off gauge plate and read dial indicator (Read the dial indicator diectly).
   Repeat to ensure accuracy.



SPD541

7. Read head number (H) on drive pinion head.

The figure for H is a dimensional variation in units of 0.01 mm (0.0004 in) against a standard measurement.



SPD542

Drive Pinion Height (Cont'd)

Calculate washer thickness following the chart below.

LINE #	OPERATION	
1.	Standard number	3.00mm
2.	Dial Indicator reading (Step 6)	
3.	**ADD** lines 1 and 2	
4.	"H" factor (from drive pinion) (Step 7)	
5.	"H" factor sign □	
	PLUS SIGN ⊞ line 5; **SUBTRACT** line 4 from 3. Enter difference on line 6	
	MINUS SIGN ⊟ line 5; **ADD** lines 3 and 4. Enter sum on line 6	
6.	Washer size	

Example: Dial Indicator Reading: 0.3 mm

Number on Pinion Head: +2

3.00 (standard measure)
+0.3 (indicator reading)
3.3 (Pinion head is plus, so you
−0.02 SUBTRACT it)
3.28 (mm = total pinion washer you will need)

. Select the proper washer (Refer to S.D.S.).

f you cannot find the desired thickness of washer, e washer so that thickness is the closest to the lculated value.

Example:

3.28 mm (Calculated total pinion washer in step 8)

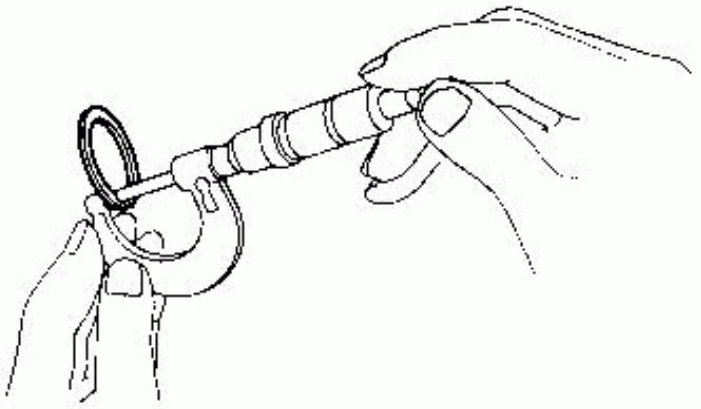
⬇

The correct washer is 3.27 mm (Part number 38154-P6023).

Drive Pinion Preload

1. To determine pinion bearing preload, disassemble pinion height/bearing preload tools and measure thickness of lead washer. This is the correct size pinion bearing adjusting washer required.

If a lead washer is not available, use a piece of thick roll solder to obtain preload washer size.



SPD543

2. Select the proper washer (Refer to S.D.S.).

- **If you cannot find shims with the desired thickness, use shims so that the total thickness is the closest to the calculated value.**
- **Sometimes the correct dimension cannot be set with washers alone. In these cases, washers may be used in combination with drive pinion bearing adjusting spacers. (Refer to S.D.S.)**

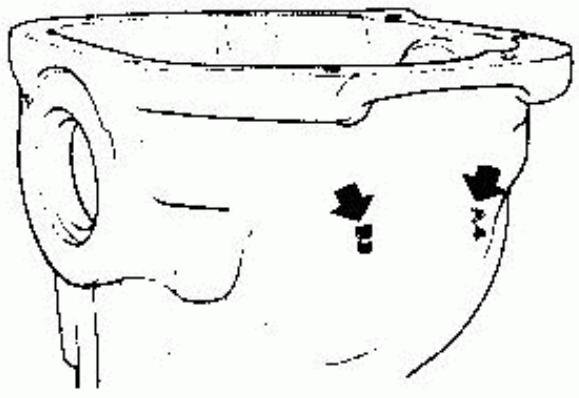
Side Bearing Preload

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	
G1- Left side bearing retainer	
G2- Right side bearing retainer	

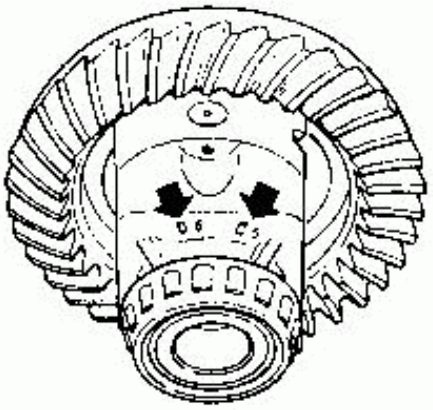
2. Write the following numbers down in the chart.

A & B: Figures marked on gear carrier



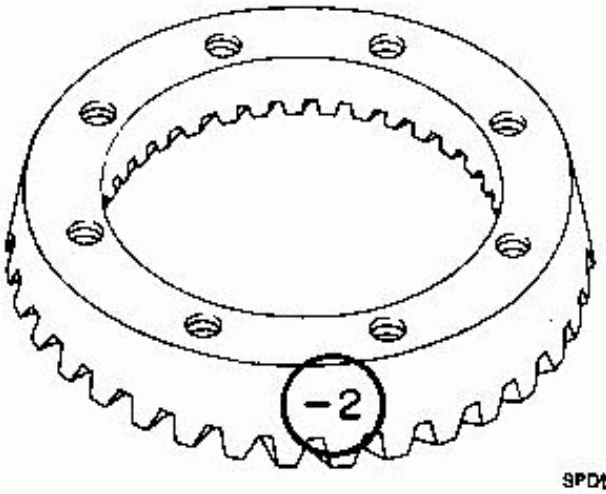
PD368

C & D: Figures marked on differential case



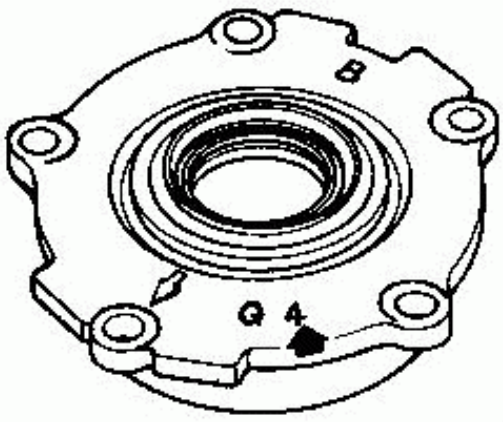
PD369

H: Figures marked on ring gear



SPD575

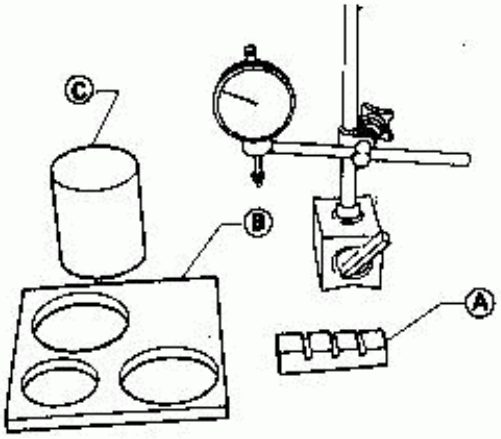
G: Figures marked on side retainer



PD189

Side Bearing Preload (Cont'd)

3. Measure how far under the standard thickness [20 mm (0.79 in)] the side bearings are. It will require the tools shown below.

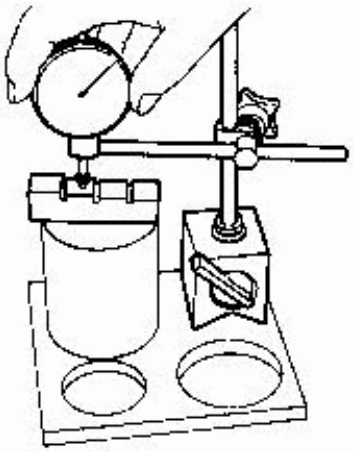


SPD546

Tool number:

Ⓐ	4-step gauge block	(J25407-1)
Ⓑ	Base plate	(J25407-2)
Ⓒ	Weight block	(J25407-3)

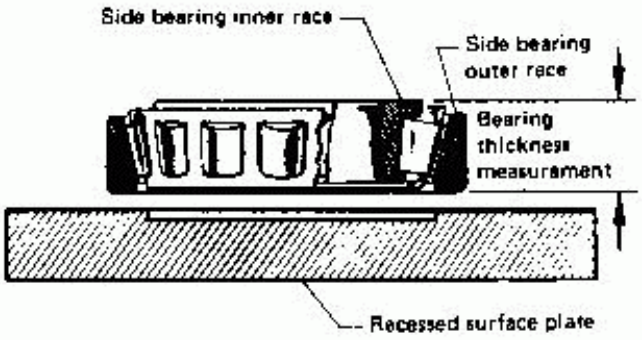
4. Set weight block, 4-step gauge block [20 mm (0.79 in)] and dial indicator on base plate.
5. Adjust dial indicator scale to zero.



SPD577

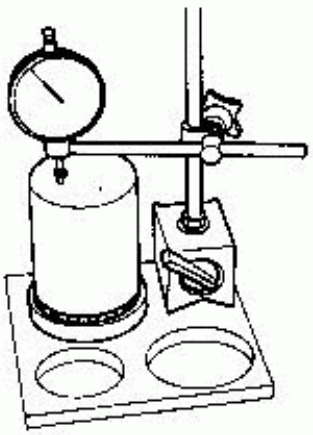
6. Carefully slide 4-step gauge block and weight block out from under dial indicator.
7. Lubricate side bearing and place side bearing on base plate.

Make sure that base plate has a recess in it and that bearing will turn freely when positioned over the recess as shown.



SPD547

8. Place weight block on side bearing.
9. Slide dial indicator on weight block.

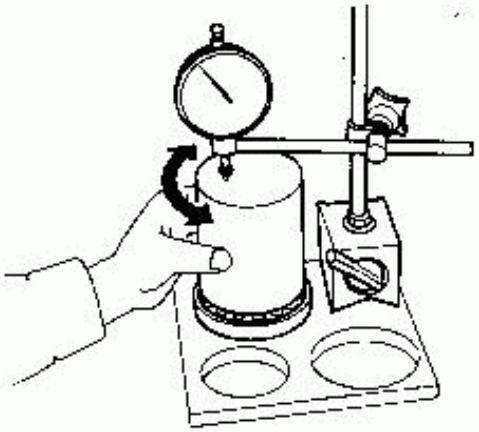


SPD548

Side Bearing Preload (Cont'd)

10. Turn weight block a few times to ensure that bearing is properly seated.
11. Read dial indicator.

- **Normal indication:**
  0.10 - 0.30 mm (0.0039 - 0.0118 in)
- **If the needle fluctuates erratically, then bearing is either dirty or defective and should be cleaned or replaced.**



SPD549

12. 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".

13. Calculate washer thickness following the charts below.

Left (ring gear) side:

LINE #	OPERATION	
1L	Left side standard number	0.76 mm
2L	Enter "A" factor (gear carrier)	
3L	Enter "C" factor (differential case)	
4L	Enter "G_L" factor (left side bearing retainer)	
5L	**ADD** Lines 1L, 2L, 3L, and 4L. Enter **SUM**	
6L	Enter "D" factor (differential case)	
7L	Enter "E" factor (left bearing)	
8L	**ADD** Lines 6L and 7L. Enter **SUM**	
9L	**SUBTRACT** Line 8L from 5L — Enter **DIFFERENCE**	
10L	Enter "H" factor (ring gear)	
11L	Enter "H" factor's sign (±)	
	PLUS SIGN + Line 11L; **ADD** Line 9L and 10L Enter difference on Line 12L	
	MINUS SIGN − Line 11L; **SUBTRACT** Lines 10L from 9L. Enter sum on Line 12L	
12L	Left side shim size "T_L"	

Side Bearing Preload (Cont'd)

Right side:

LINE #	OPERATION	
1R	Right side standard number	0.76 mm
2R	Enter "B" factor (gear carrier)	
3R	Enter "G_2" factor (right side bearing retainer)	
4R	Enter "D" factor (differential carrier)	
5R	**ADD** Lines 1R, 2R, 3R, and 4R. Enter **SUM**	
6R	Enter "F" factor (right bearing)	
7R	**SUBTRACT** Line 6R from 5R — Enter **DIFFERENCE**	
8R	Enter "H" factor (ring gear)	
9R	Enter "H" factor's sign □	
	PLUS SIGN + Line 9R; **SUBTRACT** Lines 8R from 7R. Enter sum on Line 10R	
	MINUS SIGN − Line 9R; **ADD** Line 7R and 8R. Enter difference on line 10R.	
10R	Right side shim size "T_2"	

The formulas are as follows:

$T_1 = A + C + G_1 - D - E + H + 0.76$ (mm)

$T_2 = B + G_2 + D - F - H + 0.76$ (mm)

Example:

Left Side T1

A	3	D	5
C	4	E	16
G1	5		
H	+2		
standard shim	0.76		
sub total	90	21 (smaller number)	
subtract smaller fig.	−21		
	0.69		

Right Side T2

B	4	F	20
G2.	4	H	2
D	5		
standard shim	0.76		
sub total	89	22	
subtract smaller fig.	−22		
	0.67		

The measurement for the shim pack on the left (T_1) should be 0.69 mm and for the right (T_2) 0.67 mm. To check the accuracy of your work in the previous step, the side bearing shim measurement should be figured with a Side Bearing Shim Calculator.

Side Bearing Preload (Cont'd)

Follow the instructions for the sample given below:

EXAMPLE CALCULATOR

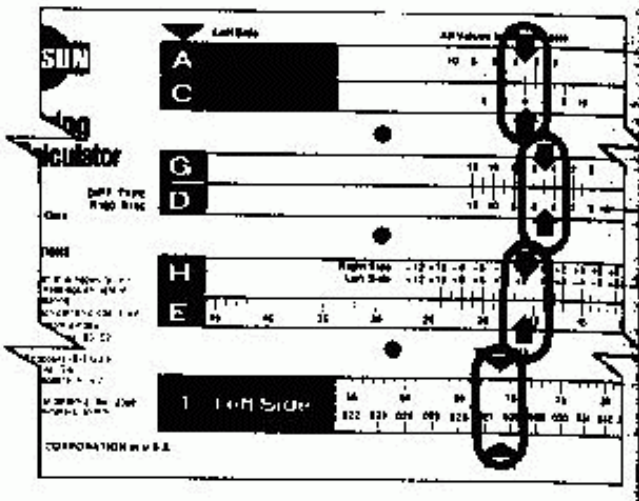
Left side

Step 1. Move slide 1 to place C 4 in line with A 3.

Step 2. Move slide 2 to place D 3 in line with G 5.

Step 3. Move slide 3 to place E 16 in line with H +2.

Step 4. Read answer at left side arrow, 0.69 mm or close to 0.028 in.



SPD

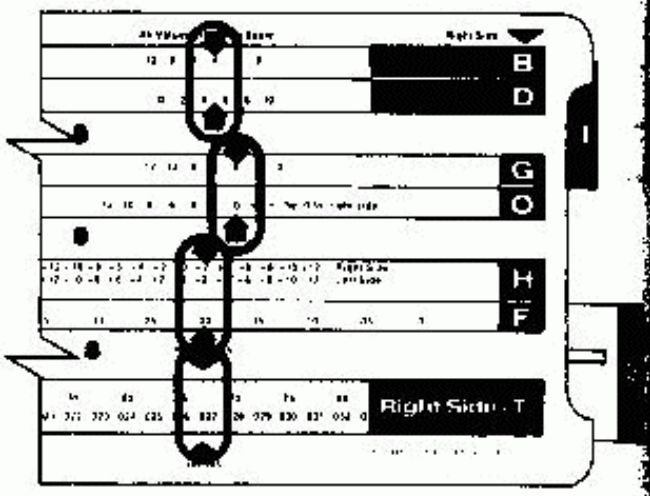
Right side

Step 1. Move slide 1 to place D 5 in line with B 4.

Step 2. Move slide 2 to place O 0 in line with G 4.

Step 3. Move slide 3 to place F 20 in line with H 2 (red scale for right side).

Step 4. Read answer at right side arrow, 0.67 mm or close to 0.027 in.



SPD

14. Compare these answers with the answers on the previous page. If both answers agree, proceed to the next step.
15. Select the proper washer (Refer to S.D.S.).

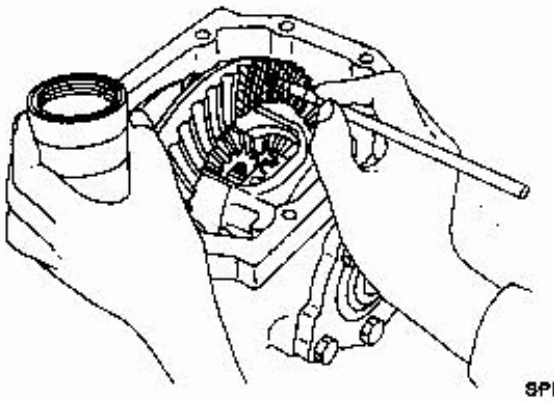
If you cannot find the desired thickness of washer, use washer so that thickness is the closest to the calculated value.

Tooth Contact

ar tooth contact pattern check is necessary to rify correct relationship between ring gear and ive pinion.

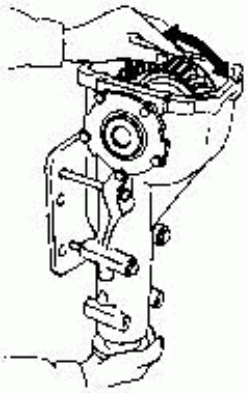
ypoid gear set which are not positioned properly ay be noisy, or have short life or both. With a ttern check, the most desirable contact for low oise level and long life can be assured.

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.



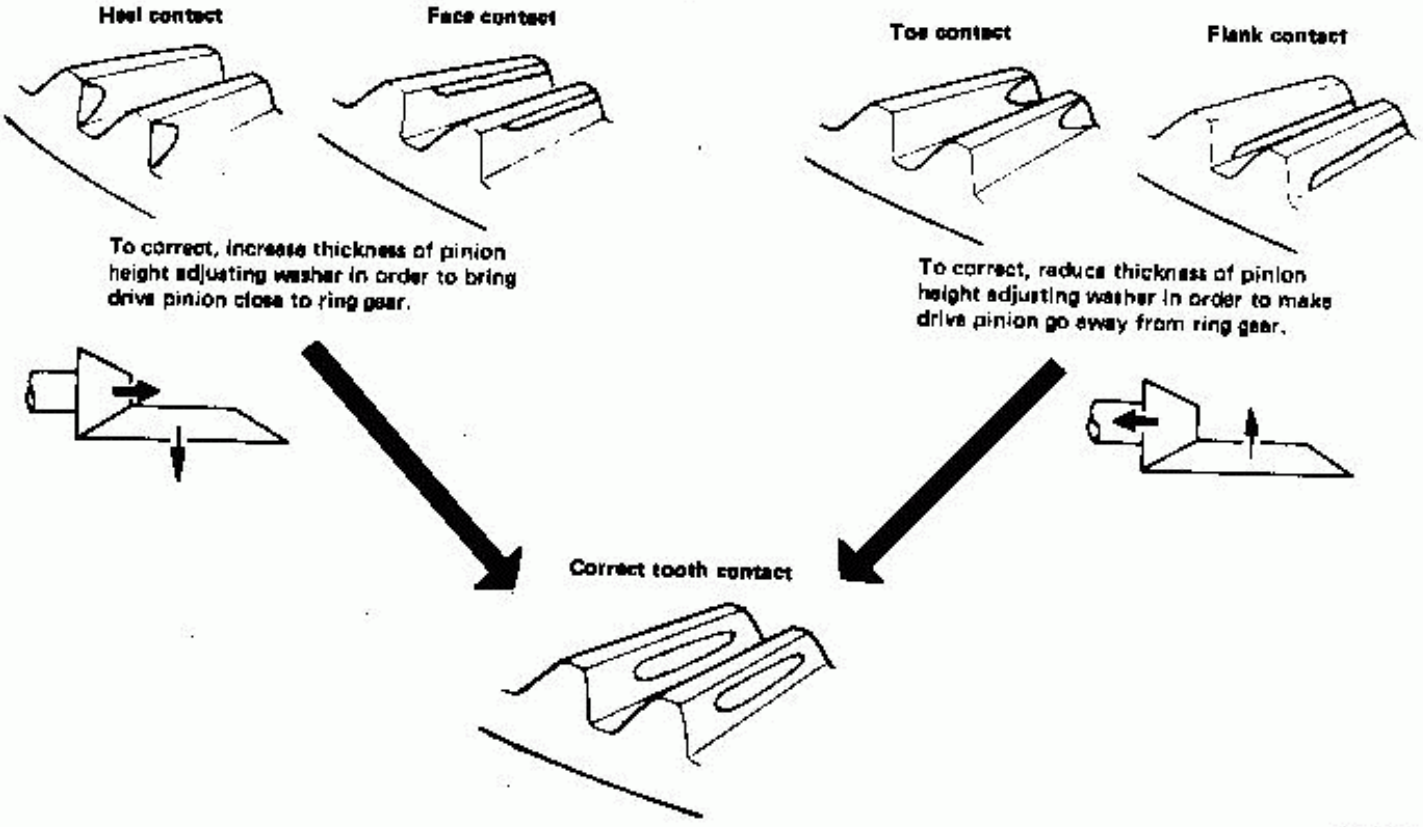
SPD357

3. Hold companion flange steady by hand and rotate the ring gear in both directions.



SPD308

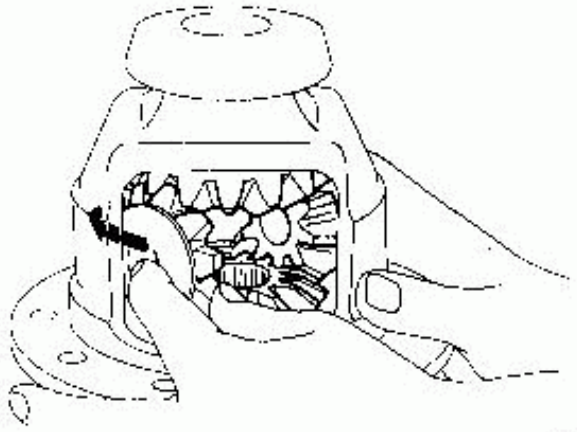
Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct.
However, in extremely rare cases you will have to use trial-and-error processes until you get a good tooth contact pattern.
The tooth pattern is the best indication of how well a differential has been set up.



SPD007

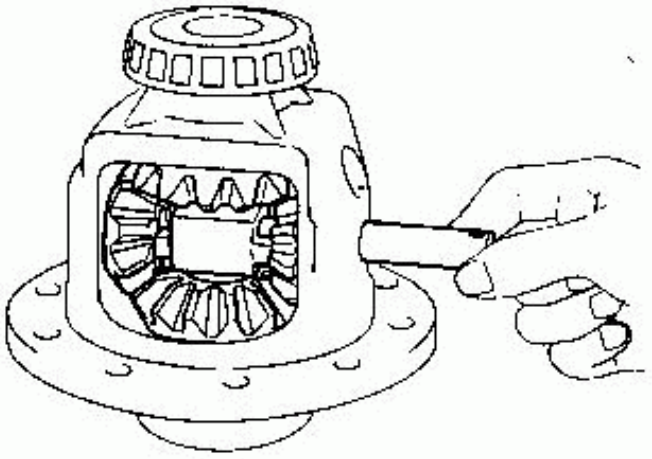
Differential Case

1. Install side gears, pinion mate gears, thrust washers and thrust block into differential case.



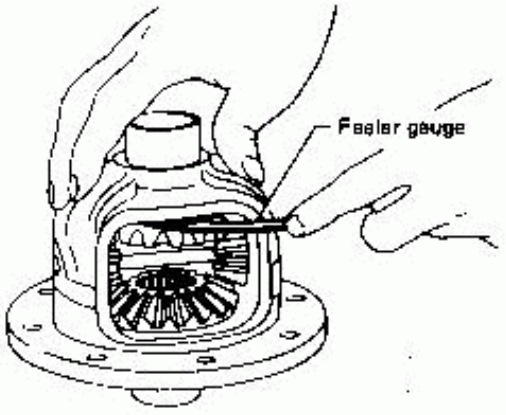
SPD552

2. Fit pinion mate shaft to differential case so that it meets lock pin holes.



SPD553

3. Adjust clearance between rear face of side gear and thrust washer by selecting side gear thrust washer (Refer to S.D.S.).

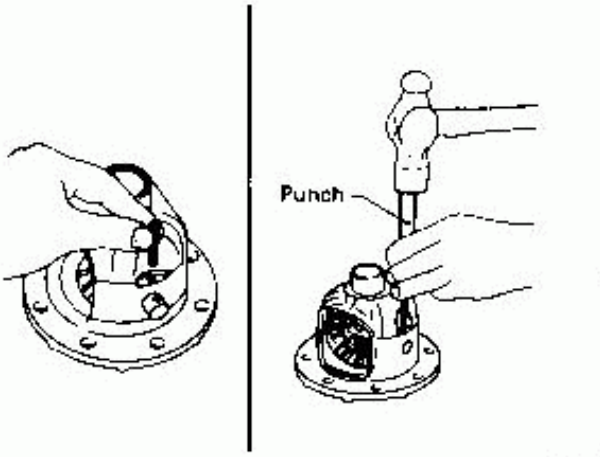


SPD029

Clearance between side gear thrust washer and differential case:
Less than 0.15 mm (0.0059 in)

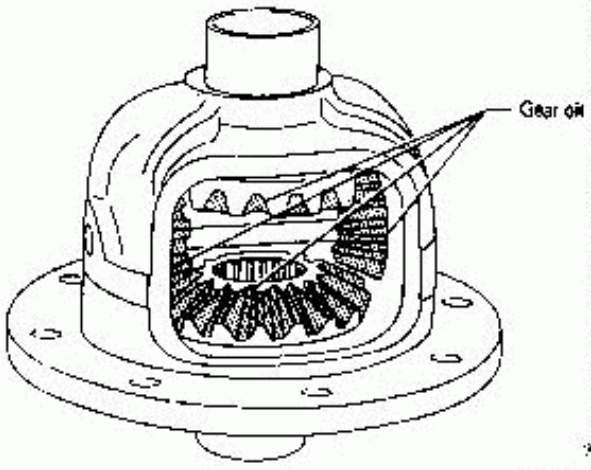
4. Install pinion mate shaft lock pin using a punch.

Make sure lock pin is flush with case.



SPD030

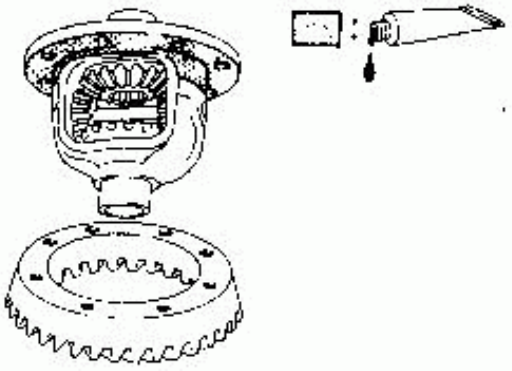
5. Apply gear oil to gear tooth surfaces and thrust surfaces and check to see they turn properly.



SPD323

Differential Case (Cont'd)

6. Apply locking agent [Locktite (stud lock) or equivalent] to contacting surfaces of ring gear and differential case, then place differential case on ring gear.

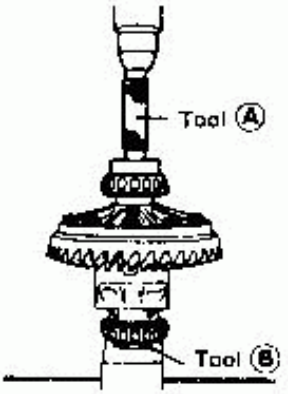


SPD600

7. Apply locking agent [Locktite (stud lock) or equivalent] to ring gear bolts, and install them.

Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.

8. Press-fit side bearing inner races on differential case with Tool.



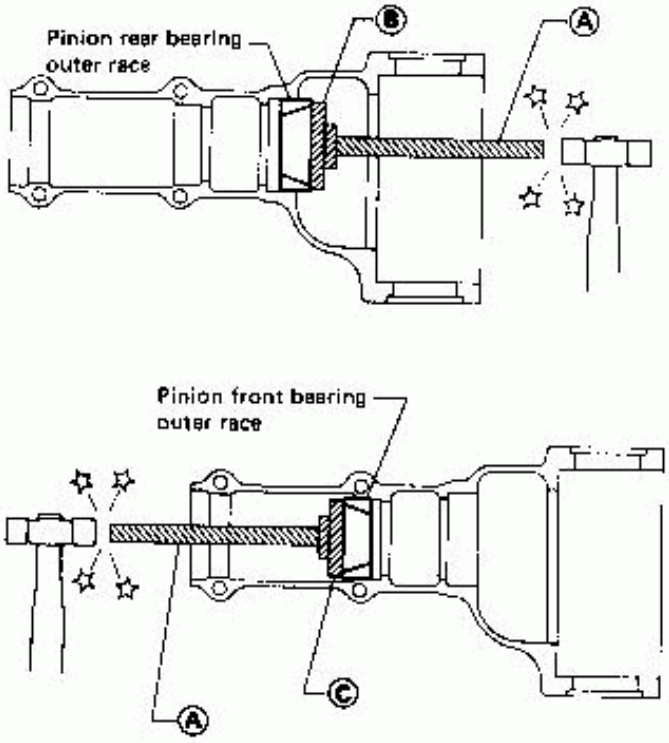
PD353

Tool number:

Ⓐ ST33230000 (J25805-01)
Ⓑ ST33061000 (JB107-2)

Differential Carrier

1. Press-fit front and rear bearing outer races using Tools.



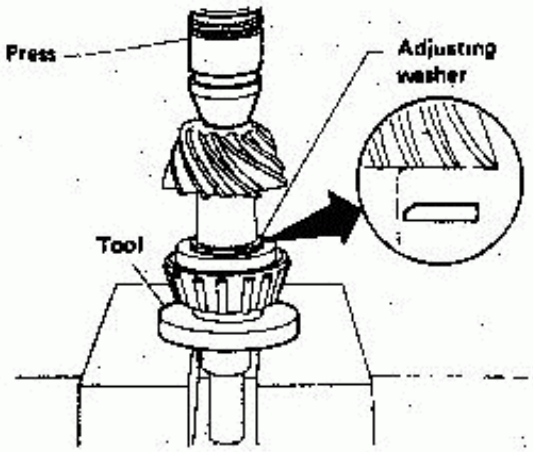
SPD656

Tool number:

Ⓐ ST30611000 (J25742-1)
Ⓑ ST30621000 (–)
Ⓒ ST30701000 (J25742-2)

Differential Carrier (Cont'd)

2. Select pinion height adjusting washer and pinion bearing adjusting washer spacer, referring to Adjustment.
3. Install pinion height adjusting washer in drive pinion, and press fit rear bearing inner race in it, using press and Tool.

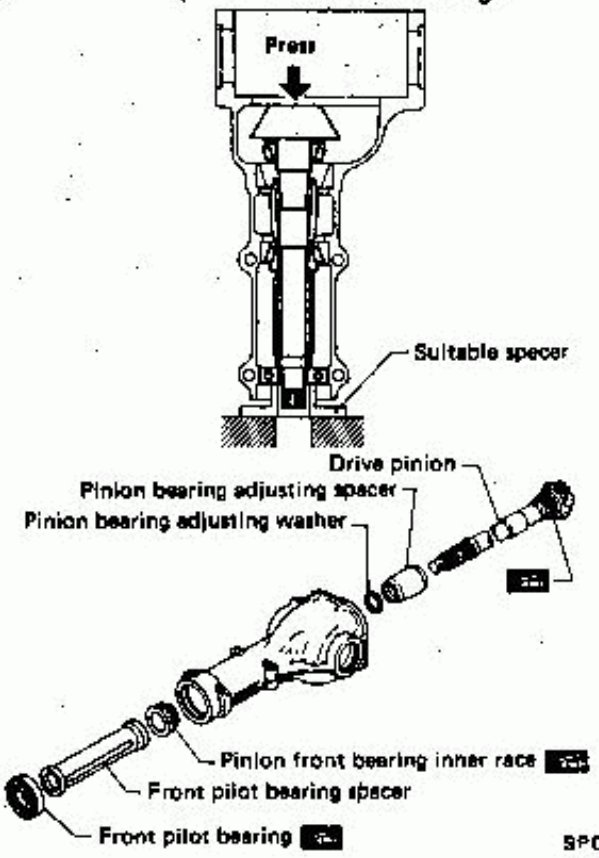


SPD377

Tool number: ST30901000 (—)

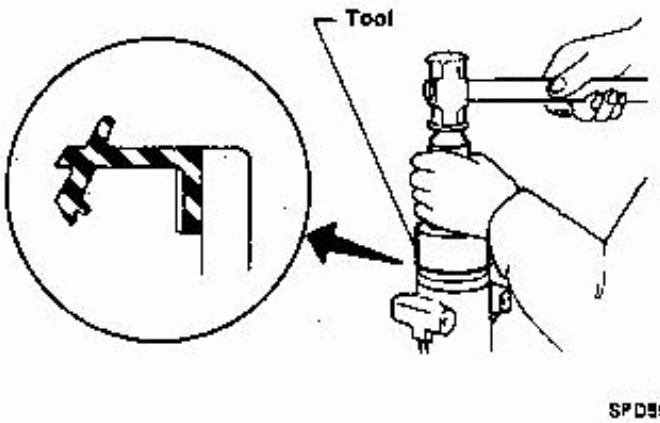
4. Set drive pinion assembly (as shown in figure below) in differential carrier and install drive pinion, using press and suitable tool.

Stop when drive pinion touches bearing.



SPD556

5. Apply multi-purpose grease to cavity at sealing lips of oil seal.
   Install front oil seal.

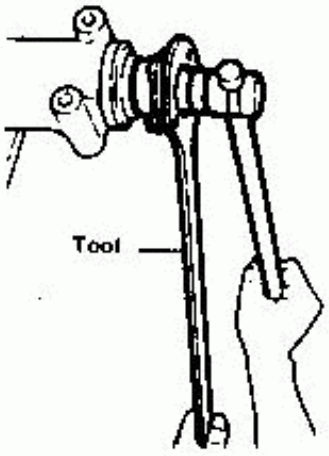


SPD557

Tool number: ST30720000 (—)

6. Install companion flange, and tighten pinion nut to specified torque.

Ascertain that threaded portion of drive pinion and pinion nut are free from oil or grease.

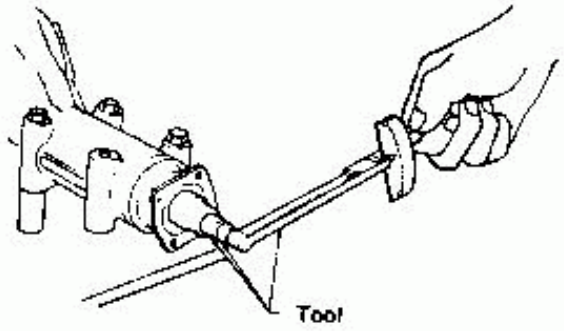


PD486

Tool number: ST31520000 (—)

Differential Carrier (Cont'd)

7. Turn drive pinion in both directions several times, and measure pinion bearing preload.



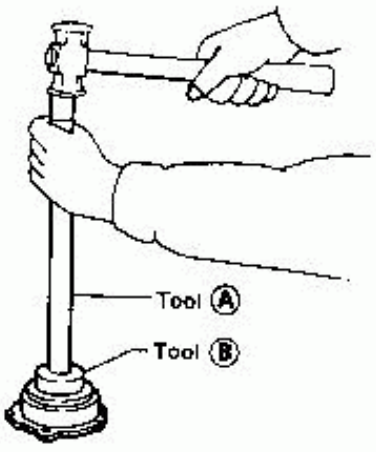
PD340

Tool number:
ST3127S000 (See J25765-A)

Pinion bearing preload:
0.9 - 1.7 N·m
(9 - 17 kg-cm, 7.8 - 14.8 in-lb)

When pinion bearing preload is outside the specifications, replace pinion bearing adjusting washer and spacer with a different thickness.

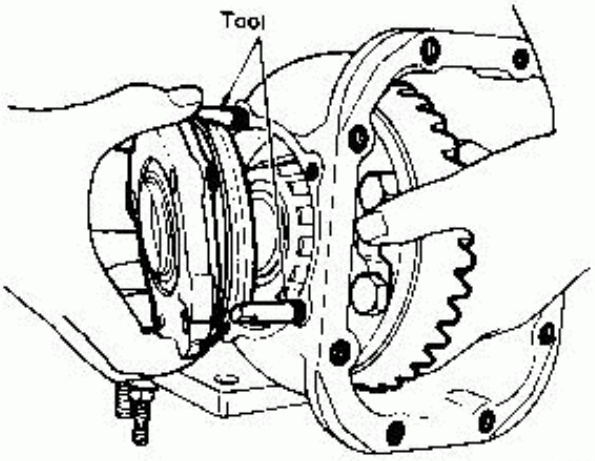
8. Select side retainer adjusting washer.
   Refer to Adjustment.
9. Press-fit side bearing outer race into side retainer.



SPD332

Tool number:
Ⓐ ST30611000 (J25742-1)
Ⓑ ST30621000 (—)

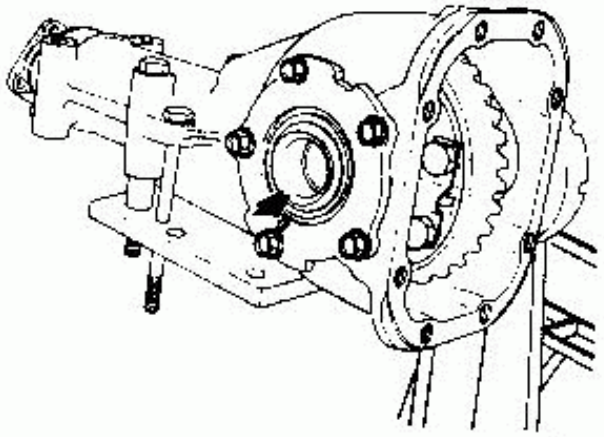
10. Install side oil seal.
11. Install differential case assembly.
12. Place side retainer adjusting shims and O-ring on side retainer, and install them in gear carrier.



PD191

Tool number: ST33720000 (J25817)

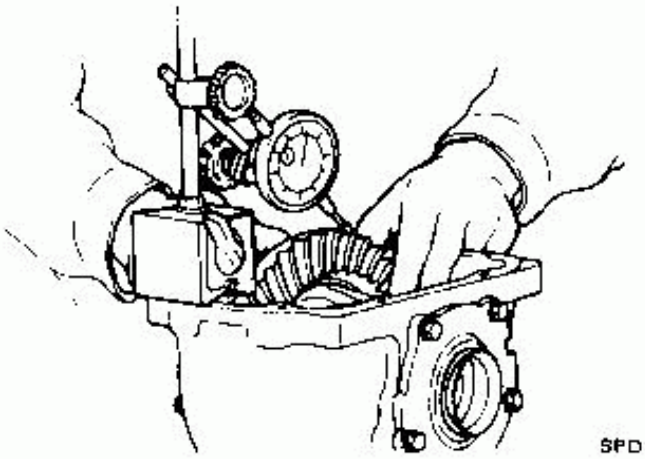
- **Align arrows stamped on side retainer and gear carrier.**



PD420

Differential Carrier (Cont'd)

13. Measure ring gear-to-drive pinion backlash with a dial indicator.



SPD368

Ring gear-to-drive pinion backlash:
0.13 - 0.18 mm
(0.0051 - 0.0071 in)

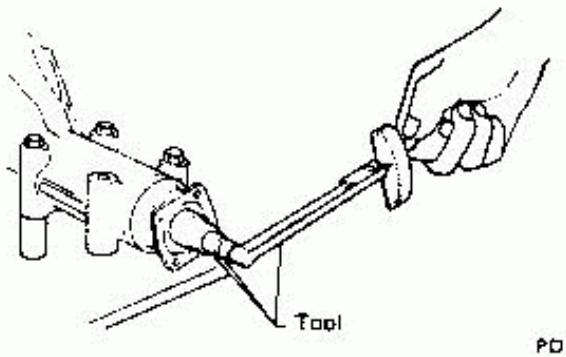
- If backlash is too small, decrease thickness of right shim and increase thickness of left shim by the same amount.

  If backlash is too great, reverse the above procedure.

Never change the total amount of shims as it will change the bearing preload.

14. Check total preload with Tool.

When checking preload, turn drive pinion in both directions several times to set bearing rollers.



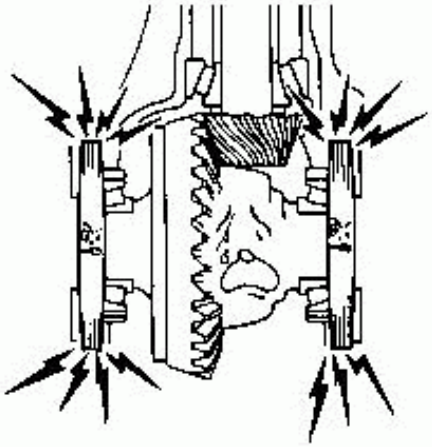
PD340

Tool number: ST3127S000 (See J25765-A)

Total preload:
1.0 - 2.3 N·m
(10 - 23 kg-cm, 8.7 - 20.0 in-lb)

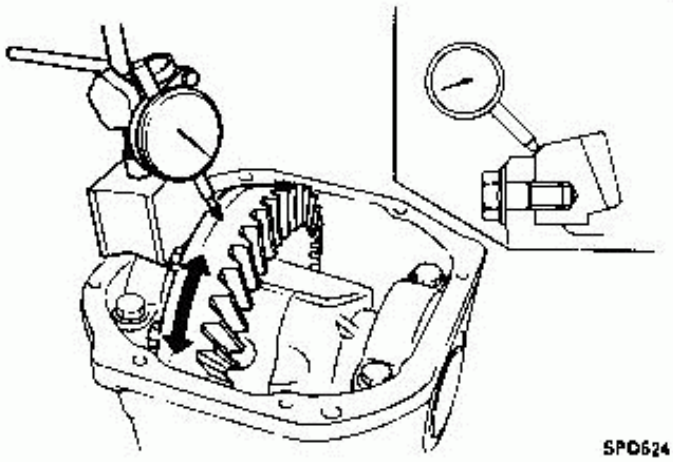
- If preload is too great, add the same amount of shim to each side.
- If preload is too small, remove the same amount of shim to each side.

Never add or remove a different number of shims for each side as it will change ring gear-to-drive pinion backlash.



SPD561

15. Recheck ring gear-to-drive pinion backlash because increase or decrease in thickness of shims will cause change of ring gear-to-pinion backlash.
16. Check runout of ring gear with a dial indicator.



SPD524

Runout limit:
0.05 mm (0.0020 in)

Differential Carrier (Cont'd)

- If backlash varies excessively in different places, the variance may have resulted from foreign matter caught between the ring gear and the differential case.
- If the backlash varies greatly when the runout of the ring gear is within a specified range, the hypoid gear set or differential case should be replaced.

17. Check tooth contact.
    Refer to Adjustment.
18. Install rear cover and gasket.

Propeller Shaft

GENERAL SPECIFICATIONS

Unit: mm (in)

Applied model		CA20E engine		CA18E turbo engine
		M/T	A/T	M/T
Propeller shaft model		3S63A		
Number of joints		3		
Coupling method with transmission		Sleeve type		
Distance between yokes		63 (2.48)		
Type of journal bearing		Shell type (non-disassembly type)		
Shaft length (Spider to spider)	1st	442 (17.40)	412 (16.22)	442 (17.40)
	2nd	490 (19.29)	490 (19.29)	490 (19.29)
Shaft outer diameter	1st	75 (2.95)	75 (2.95)	75 (2.95)
	2nd	50.8 (2.000)	50.8 (2.000)	50.8 (2.000)

SERVICE DATA

Unit: mm (in)

Model	3S63A
Propeller shaft runout limit	0.6 (0.024)
Journal axial play	0 (0)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Propeller shaft to differential carrier			
CA20E	39 - 44	4.0 - 4.5	29 - 33
CA18E turbo	34 - 44	3.5 - 4.5	25 - 33
Propeller shaft 1st tube to 2nd tube	24 - 32	2.4 - 3.3	17 - 24
Center bearing locking nut	245 - 294	25 - 30	181 - 217
Center bearing bracket to body	25 - 39	2.6 - 4.0	19 - 29

GENERAL SPECIFICATIONS (R200 and R180)

Applied model	CA18E turbo	CA20E engine	
	M/T	M/T	A/T
Final drive model	R200	R180	
Ring gear pitch diameter mm (in)	200 (7.87)	180 (7.09)	
Gear ratio	4.111	4.111	
Number of teeth (Ring gear/Drive pinion)	37/9	37/9	
Oil capacity (approx.) ℓ (US pt, Imp pt)	1.3 (2-3/4, 2-1/4)	1.0 (2-1/8, 1-3/4)	

SERVICE DATA (R200)

Drive pinion bearing preload adjusting method	Adjusting spacer and washer
Pinion bearing preload (With front oil seal) N·m (kg-cm, in-lb)	1.13 - 1.72 (11.5 - 17.5, 10.0 - 15.2)
Pinion bearing preload (Without front oil seal) N·m (kg-cm, in-lb)	1.0 - 1.3 (10 - 13, 8.7 - 11.3)
Total preload N·m (kg-cm, in-lb)	1.23 - 2.30 (12.5 - 23.5, 10.9 - 20.4)
Side bearing adjusting method	Shim
Backlash	
Drive pinion to ring gear mm (in)	0.13 - 0.18 (0.0051 - 0.0071)
Side gear to pinion mate gear (Clearance between side gear to differential case) mm (in)	Less than 0.15 (0.0059)
Ring gear runout limit mm (in)	0.05 (0.0020)

Final Drive (Cont'd)

Pinion height adjusting washer (R200)

Thickness mm (in)	Part No.
3.09 (0.1217)	38154-P6017
3.12 (0.1228)	38154-P6018
3.15 (0.1240)	38154-P6019
3.18 (0.1252)	38154-P6020
3.21 (0.1264)	38154-P6021
3.24 (0.1276)	38154-P6022
3.27 (0.1287)	38154-P6023
3.30 (0.1299)	38154-P6024
3.33 (0.1311)	38154-P6025
3.36 (0.1323)	38154-P6026
3.39 (0.1335)	38154-P6027
3.42 (0.1346)	38154-P6028
3.45 (0.1358)	38154-P6029
3.48 (0.1370)	38154-P6030
3.51 (0.1382)	38154-P6031
3.54 (0.1394)	38154-P6032
3.57 (0.1406)	38154-P6033
3.60 (0.1417)	38154-P6034
3.63 (0.1429)	38154-P6035
3.66 (0.1441)	38154-P6036
0.05 (0.0020)	38453-28500
0.07 (0.0028)	38454-28500

Drive pinion bearing preload adjusting washer (R200)

Thickness mm (in)	Part No.
3.80 - 3.82 (0.1496 - 0.1504)	38125-61001
3.82 - 3.84 (0.1504 - 0.1512)	38126-61001
3.84 - 3.86 (0.1512 - 0.1520)	38127-61001
3.86 - 3.88 (0.1520 - 0.1528)	38128-61001
3.88 - 3.90 (0.1528 - 0.1535)	38129-61001
3.90 - 3.92 (0.1535 - 0.1543)	38130-61001
3.92 - 3.94 (0.1543 - 0.1551)	38131-61001
3.94 - 3.96 (0.1551 - 0.1559)	38132-61001
3.96 - 3.98 (0.1559 - 0.1567)	38133-61001
3.98 - 4.00 (0.1567 - 0.1575)	38134-61001
4.00 - 4.02 (0.1575 - 0.1583)	38135-61001
4.02 - 4.04 (0.1583 - 0.1591)	38136-61001
4.04 - 4.06 (0.1591 - 0.1598)	38137-61001
4.06 - 4.08 (0.1598 - 0.1606)	38138-61001
4.08 - 4.10 (0.1606 - 0.1614)	38139-61001

Drive pinion bearing preload adjusting spacer (R200)

Length mm (in)	Part No.
55.10 (2.1693)	38165-B4002
55.40 (2.1811)	38165-B4003
55.70 (2.1929)	38165-B4004
56.00 (2.2047)	38165-61001
56.25 (2.2146)	38166-61001

Side bearing adjusting washer (R200)

Thickness mm (in)	Part No.
2.00 (0.0787)	38453-N3100
2.05 (0.0807)	38453-N3101
2.10 (0.0827)	38453-N3102
2.15 (0.0846)	38453-N3103
2.20 (0.0866)	38453-N3104
2.25 (0.0886)	38453-N3105
2.30 (0.0906)	38453-N3106
2.35 (0.0925)	38453-N3107
2.40 (0.0945)	38453-N3108
2.45 (0.0965)	38453-N3109
2.50 (0.0984)	38453-N3110
2.55 (0.1004)	38453-N3111
2.60 (0.1024)	38453-N3112

Side gear thrust washer (R200)

Thickness mm (in)	Part No.
0.75 - 0.80 (0.0295 - 0.0315)	38424-N3100
0.80 - 0.85 (0.0315 - 0.0335)	38424-N3101
0.85 - 0.90 (0.0335 - 0.0354)	38424-N3102
0.90 - 0.95 (0.0354 - 0.0374)	38424-N3103

SERVICE DATA (R180)

Model		R180
Drive pinion bearing preload adjusting method		Adjusting spacer and washer
Drive pinion preload (With front oil seal) N·m (kg-cm, in-lb)		0.9 - 1.7 (9 - 17, 7.8 - 14.8)
Drive pinion preload (Without front oil seal) N·m (kg-cm, in-lb)		1.0 - 1.3 (10 - 13, 8.7 - 11.3)
Side bearing adjusting method		Shim
Back-lash	Drive pinion to ring gear mm (in)	0.13 - 0.18 (0.0051 - 0.0071)
	Side gear to pinion mate gear (Clearance between side gear to differential case) mm (in)	0 - 0.15 (0 - 0.0059)
Ring gear runout limit mm (in)		0.05 (0.0020)
Total preload N·m (kg-cm, in-lb)		1.0 - 2.3 (10 - 23, 8.7 - 20.0)

Final Drive (Cont'd)

Drive pinion bearing preload adjusting spacer (R180)

Length mm (in)	Part No.
52.20 (2.0551)	38130 78500
52.40 (2.0630)	38131 78500
52.60 (2.0709)	38132 78500
52.80 (2.0787)	38133 78500
53.00 (2.0866)	38134 78500
53.20 (2.0945)	38135 78500

Drive pinion bearing preload adjusting washer (R180)

Thickness mm (in)	Part No.
2.31 (0.0909)	38141 09400
2.33 (0.0917)	38140 09400
2.35 (0.0925)	38139 09400
2.37 (0.0933)	38138 09400
2.39 (0.0941)	38137 09400
2.41 (0.0949)	38136 09400
2.43 (0.0957)	38135 09400
2.45 (0.0965)	38134 09400
2.47 (0.0972)	38133 09400
2.49 (0.0980)	38132 09400
2.51 (0.0988)	38131 09400
2.53 (0.0996)	38130 09400
2.55 (0.1004)	38129 09400
2.57 (0.1012)	38128 09400
2.59 (0.1020)	38127 09400

Pinion height adjusting washer (R180)

Thickness mm (in)	Part No.
3.09 (0.1217)	38154-P6017
3.12 (0.1228)	38154-P6018
3.15 (0.1240)	38154-P6019
3.18 (0.1252)	38154-P6020
3.21 (0.1264)	38154-P6021
3.24 (0.1276)	38154-P6022
3.27 (0.1287)	38154-P6023
3.30 (0.1299)	38154-P6024
3.33 (0.1311)	38154-P6025
3.36 (0.1323)	38154-P6026
3.39 (0.1335)	38154-P6027
3.42 (0.1346)	38154-P6028
3.45 (0.1358)	38154-P6029
3.48 (0.1370)	38154-P6030
3.51 (0.1382)	38154-P6031
3.54 (0.1394)	38154-P6032
3.57 (0.1406)	38154-P6033
3.60 (0.1417)	38154-P6034
3.63 (0.1429)	38154-P6035
3.66 (0.1441)	38154-P6036

Side retainer adjusting shim (R180)

Thickness mm (in)	Part No.
0.20 (0.0079)	38453-21100
0.25 (0.0098)	38453-21101
0.30 (0.0118)	38453-21102
0.40 (0.0157)	38453-21103
0.50 (0.0197)	38453 21104

Side gear thrust washer (R180)

Thickness mm (in)	Part No.
0.775 (0.0305)	38424-W2000
0.825 (0.0325)	38424-W2001
0.875 (0.0344)	38424-W2002
0.925 (0.0364)	38424-W2003
0.975 (0.0384)	38424-W2004

Final Drive (Cont'd)

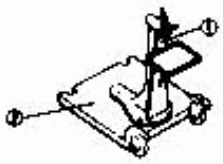
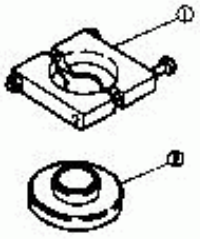
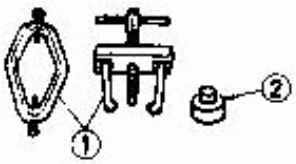
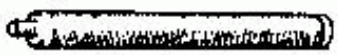
TIGHTENING TORQUE (R200)

Unit	N·m	kg-m	ft-lb
Final drive installation			
Drive shaft to rear axle	27 - 37	2.8 - 3.8	20 - 27
Rear cover to mounting insulator	88 - 118	9.0 - 12.0	65 - 87
Mounting insulator to body	59 - 78	6 - 8	43 - 58
Differential carrier to suspension member	59 - 78	6 - 8	43 - 58
Companion flange to propeller shaft	34 - 44	3.5 - 4.5	25 - 33
Final drive assembly			
Drive pinion nut	186 - 294	19 - 30	137 - 217
Ring gear bolt [using Locktite (stud lock) or equivalent]	69 - 78	7.0 - 8.0	51 - 58
Side bearing cap bolt	88 - 98	9.0 - 10.0	65 - 72
Rear cover fixing bolt	16 - 24	1.6 - 2.4	12 - 17
Companion flange to propeller shaft fixing bolt	39 - 44	4.0 - 4.5	29 - 33
Filler and drain plugs	59 - 98	6 - 10	43 - 72

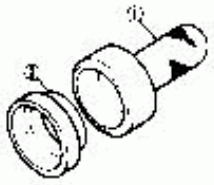
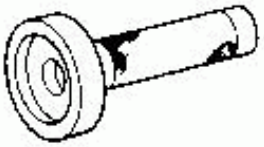
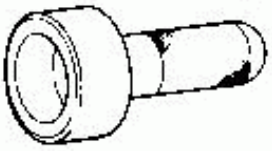
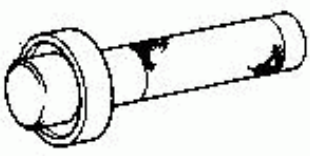
TIGHTENING TORQUE (R180)

Unit	N·m	kg-m	ft-lb
Final drive installation			
Drive shaft to rear axle	27 - 37	2.8 - 3.8	20 - 27
Rear cover to mounting insulator	59 - 78	6 - 8	43 - 58
Mounting insulator to body	59 - 78	6 - 8	43 - 58
Differential carrier to suspension member	88 - 118	9 - 12	65 - 87
Companion flange to propeller shaft	34 - 44	3.5 - 4.5	25 - 33
Final drive assembly			
Drive pinion nut	167 - 196	17 - 20	123 - 145
Ring gear bolt	78 - 98	8.0 - 10.0	58 - 72
Side retainer bolt	9 - 12	0.9 - 1.2	6.5 - 8.7
Rear cover fixing bolt	39 - 49	4 - 5	29 - 36
Filler and drain plugs	39 - 59	4 - 6	29 - 43

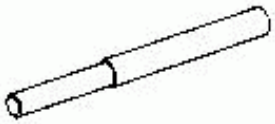
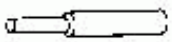
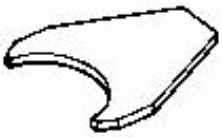
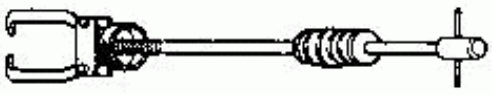
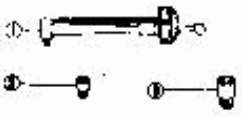
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	Unit application	
		R180	R200
ST31520000 (–)	Drive pinion flange wrench 	X	X
KV38100800 (–) Equivalent tool (J25604-01)	Differential attachment 	X	X
ST0501S000 (–) ① ST05011000 (–) ② ST05012000 (–)	Engine stand Engine stand Base 	X	X
ST3090S000 (–) ① ST30031000 (J22912-01) ② ST30901000 (–)	Drive pinion rear inner race puller set Puller Base 	X	X
ST3306S001 (–) ① ST33051001 (–) ② ST33061000 (J8107-2)	Diff. side bearing puller set Body Adapter 	X	X
ST30611000 (J25742-1)	Drift 	X	X

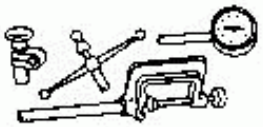
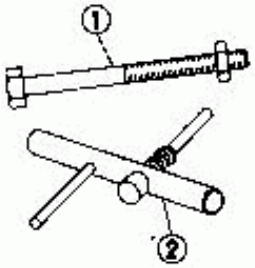
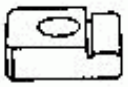
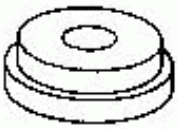
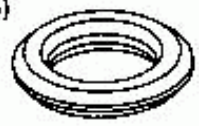
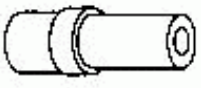
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	Unit application	
		R180	R200
ST30613000 (J25742-3)	Drift 	–	X
ST30621000 (–)	Drift 	X	X
ST30701000 (J25742-2)	Drift 	X	–
KV38102580 (–) ① ST30720000 (–) ② KV38102510 (–)	Oil seal drift set Drift bar Drift 	X	–
KV38100200 (–)	Gear carrier side oil seal drift 	–	X
KV38100500 (–)	Gear carrier front oil seal drift 	–	X
ST33290001 (J25810-A)	Side bearing outer race puller 	X	X
KV38100300 (J25523)	Diff. side bearing drift 	–	X

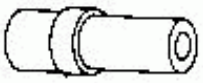
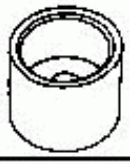
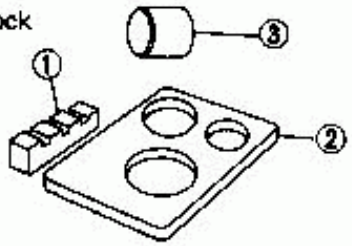
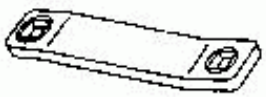
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	Unit application	
		R180	R200
KV38100401 (–)	Pilot bearing drift 	–	X
ST30650001 (J25749-A)	Pilot bearing drift 	X	–
ST33710000 (–)	Diff. side retainer attachment 	X	–
ST33720000 (J25817)	Diff. side retainer guide 	X	–
ST33270000 (–)	Side oil seal drift 	X	–
KV38100600 (J25267)	Side bearing spacer drift 	–	X
HT72400000 (–)	Slide hammer 	–	X
ST3127S000 (See J25765-A) ① GG91030000 (J25765-A) ② HT62940000 (–) ③ HT62900000 (–)	Preload gauge Torque wrench Socket adapter  Socket adapter	X	X

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	Unit application	
		R180	R200
(J8001-M)	Metric dial indicator set (J8001-6 dial indicator only) 	X	X
(J25269-B)	Pinion height & preload gauge set ① J25269-23 bolt & nut ② J23597-1 arbor (Long plunger) Use with J23597-1 	X	X
(J25269-1)	Gauge plate 	X	X
(J25269-2)	Rear pinion bearing pilot 	X	X
(J25269-3)	Front pinion bearing pilot 	X	X
(J25269-4)	Side bearing discs (2 Req'd) 	X	X
(J25269-25)	Lead preload washers (Pkg. of 6) 	X	X
(J25269-26)	Bearing preload adapter 	–	X

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	Unit application	
		R180	R200
(J25269-27)	Bearing preload adapter 	X	–
(J25269-29)	Front bearing pilot support 	X	X
(J25269-32)	Instructions	X	X
(J26407-01)	Side bearing measuring set consists of: ① J26407-1 4-step gauge block ② J26407-2 base plate ③ J26407-3 weight block 	X	X
(J26099-A)	Differential shim organizer 	X	X
(J26335)	Differential filler plug wrench 	–	X

FRONT AXLE & FRONT SUSPENSION

SECTION FA

CONTENTS

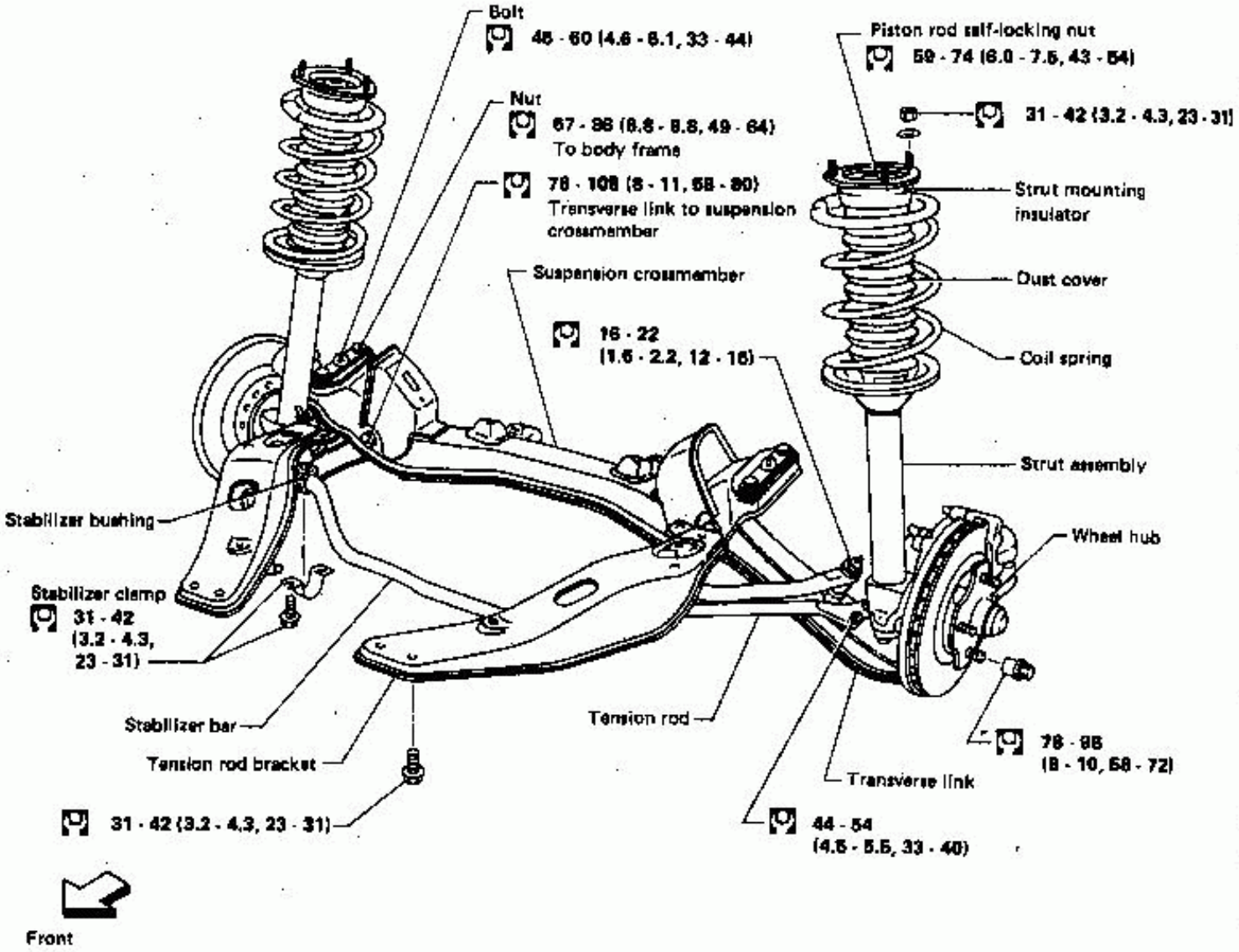
FRONT AXLE AND FRONT SUSPENSION

Wheel alignment

- Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.
- The vehicle requires only toe-in adjustments.
  −0.5 to 1.5 mm (−0.020 to 0.059 in)
  −2° to 8°

Refer to section MA for Checking Wheel Alignment.

Final tightening should be carried out under unladen condition* with tires on ground when installing suspension parts with rubber parts.
*Fuel, radiator coolant and engine oil are filled up. Spare tire, jack, hand tools and mats are in designed position.

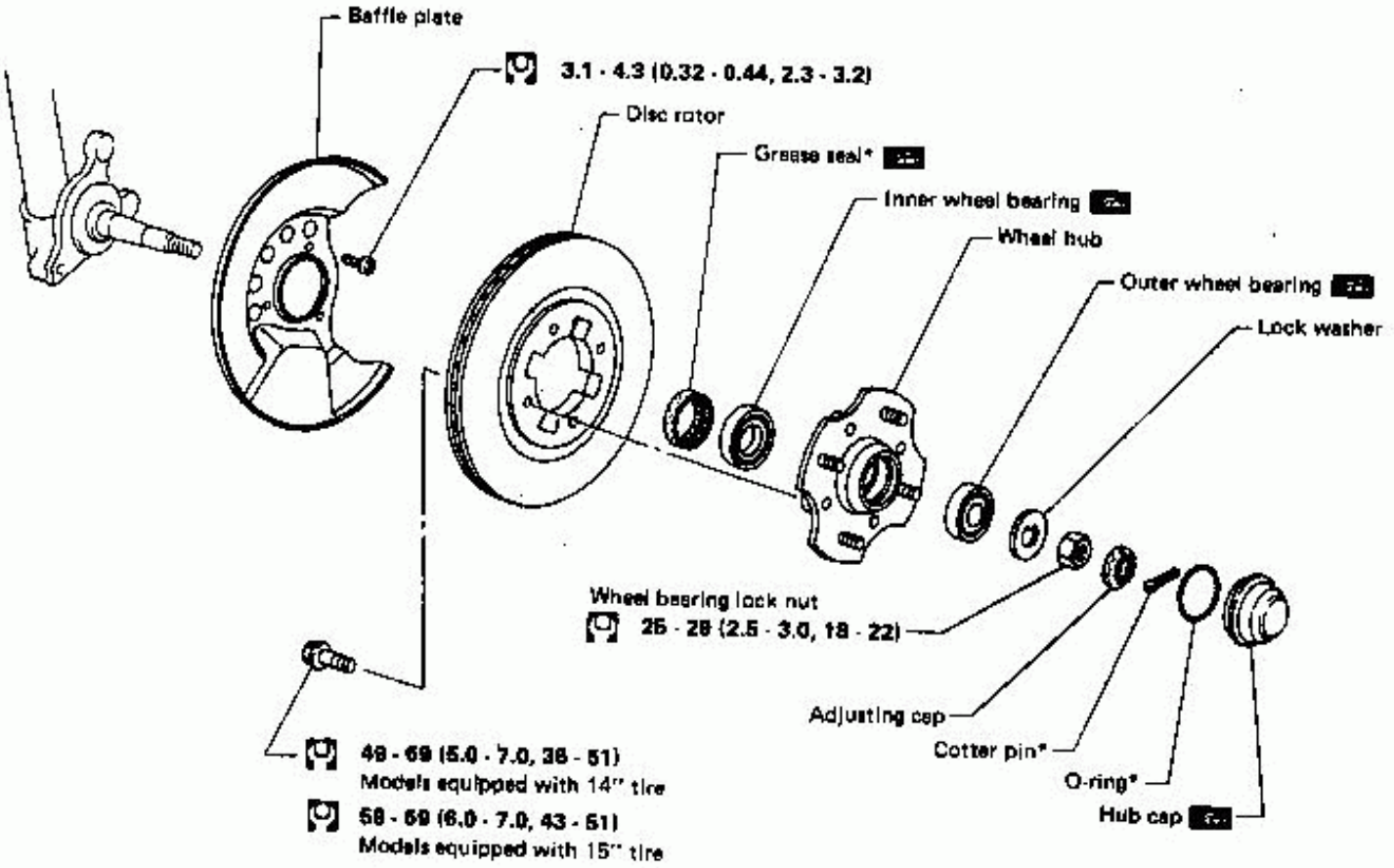


Wheel bearing

- Do not overtighten wheel bearing nut, as this can cause wheel bearing seizure.
- **Axial play: 0 mm (0 in)**
- **Tightening torque** 25 - 29 N·m (2.5 - 3.0 kg-m, 18 - 22 ft-lb)
- **Return angle** 90°
- **Rotation starting torque**
  with new grease seal 0.39 - 0.83 N·m (4.0 - 8.5 kg-cm, 3.5 - 7.4 in-lb)
  with used grease seal 0.10 - 0.44 N·m (1.0 - 4.5 kg-cm, 0.87 - 3.9 in-lb)
  As measured at wheel hub bolt
  with new grease seal 6.9 - 14.7 N (0.7 - 1.5 kg, 1.5 - 3.3 lb)
  with used grease seal 2.0 - 7.8 N (0.2 - 0.8 kg, 0.4 - 1.8 lb)
- When measuring starting torque, do not include "dragging" resistance with brake pads.

: N·m (kg-m, ft-lb)

SFA834



*: Always replace once they have been removed.

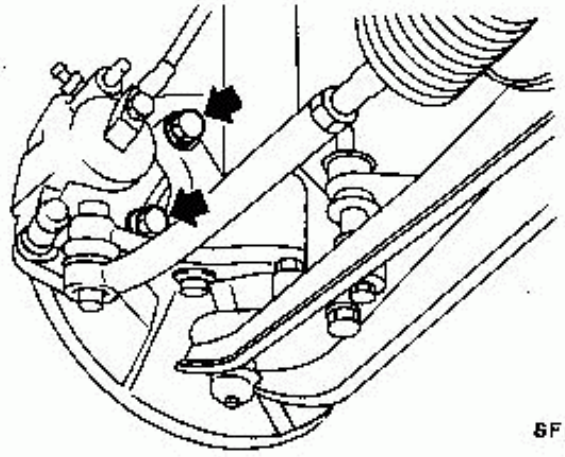
: N·m (kg-m, ft-lb)

SFA635

Removal

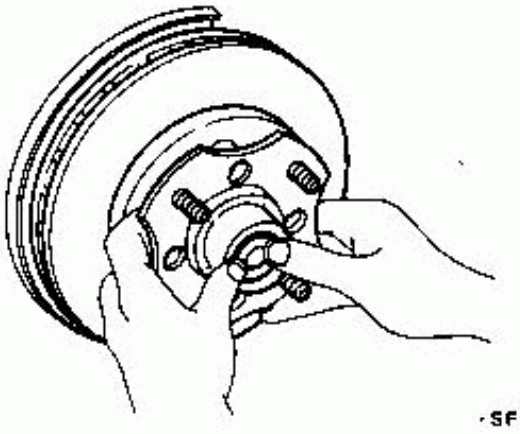
1. Remove brake caliper assembly.

Brake hose does not need to be disconnected from brake caliper assembly.
Make sure brake hoses are secure.



SFA636

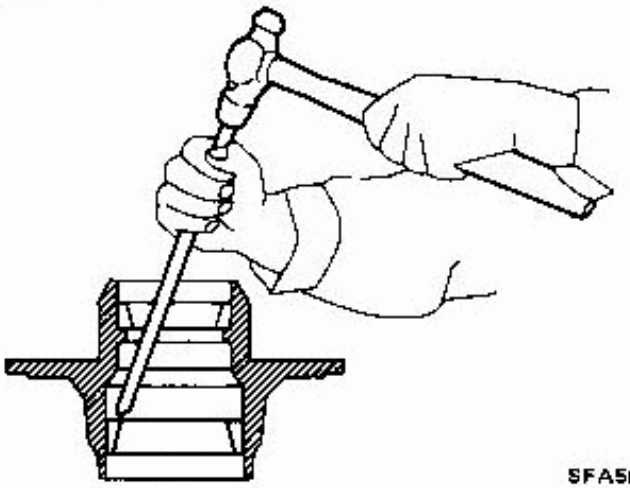
2. Remove wheel hub with disc brake rotor and wheel bearing from spindle.



SFA637

Be careful not to drop outer bearing.

3. If it is necessary to replace bearing outer race, drive it out from hub with a brass drift and mallet.



SFA580

Inspection

WHEEL BEARING

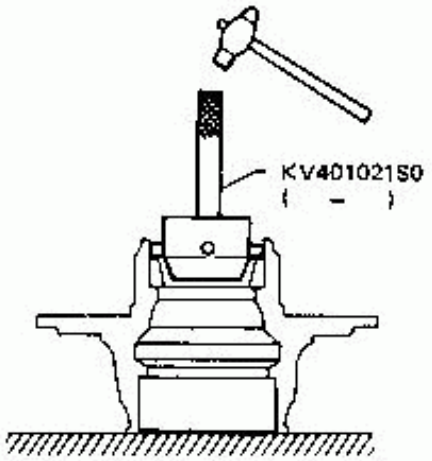
Check wheel bearing to see that it rolls freely and is free from noise, crack, pitting, or wear.

WHEEL HUB

Check wheel hub for crack by means of a magnetic exploration or dyeing test, and replace if cracked.

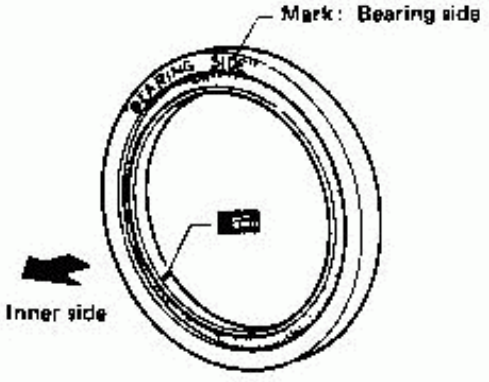
Installation

- Install bearing outer race with Tool until it seats in hub.



SFA124

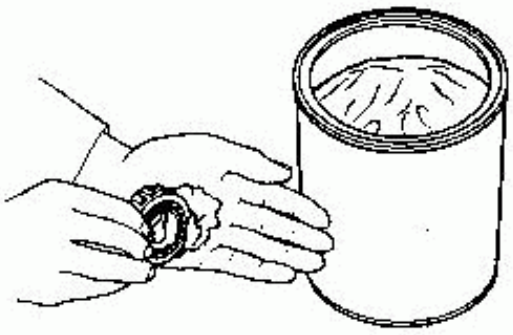
- Install new grease seal, coating sealing lips with recommended multi-purpose grease.



SFA126

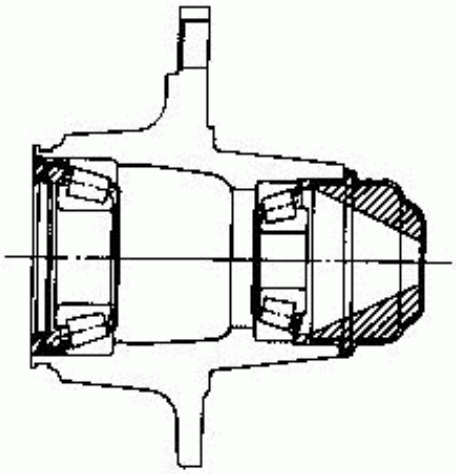
Installation (Cont'd)

- Coat each bearing cone with recommended multi-purpose grease.



FA781

- Pack hub and hub cap with recommended multi-purpose grease up to shaded portions.



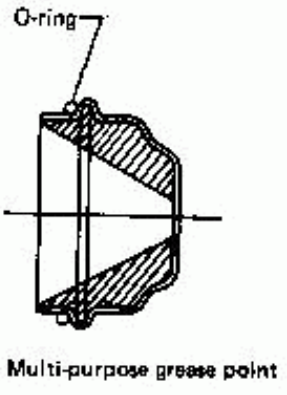
SFA966

Preload Adjustment

After wheel bearing has been replaced or front axle has been reassembled be sure to adjust wheel bearing preload as described below.

1. Before adjustment, thoroughly clean all parts to prevent dirt entry.
2. Apply recommended multi-purpose grease sparingly to the following parts.

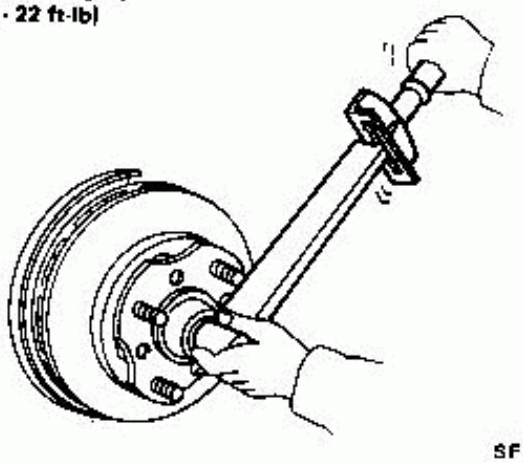
- Threaded portion of spindle.
- Contact surface between lock washer and outer wheel bearing.
- Hub cap and O-ring.
- Grease seal lip.



SMA203A

3. Tighten wheel bearing lock nut.

25 - 29 N·m (2.5 - 3.0 kg-m, 18 - 22 ft-lb)



SFA639

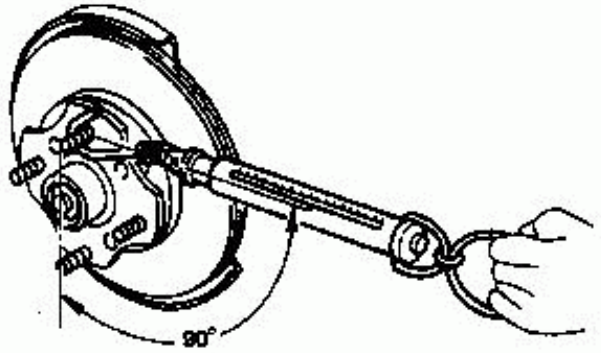
4. Turn wheel hub several times in both directions to seat wheel bearing correctly.
5. Again tighten wheel bearing nut.
6. Turn back wheel bearing lock nut within 60°.

Preload Adjustment (Cont'd)

7. Fit adjusting cap and new cotter pin.

SFA967

8. Measure wheel bearing preload and axial play.

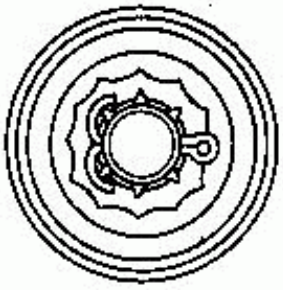


Axial play: 0 mm (0 in)
When bearing preload (As measured at wheel hub bolt):
With new parts 8.9 - 14.7 N (0.7 - 1.5 kg, 1.5 - 3.3 lb)
With used parts 2.0 - 7.8 N (0.2 - 0.8 kg, 0.4 - 1.8 lb)

SFA640

Repeat above procedures until correct starting torque is obtained.

9. Spread cotter pin.



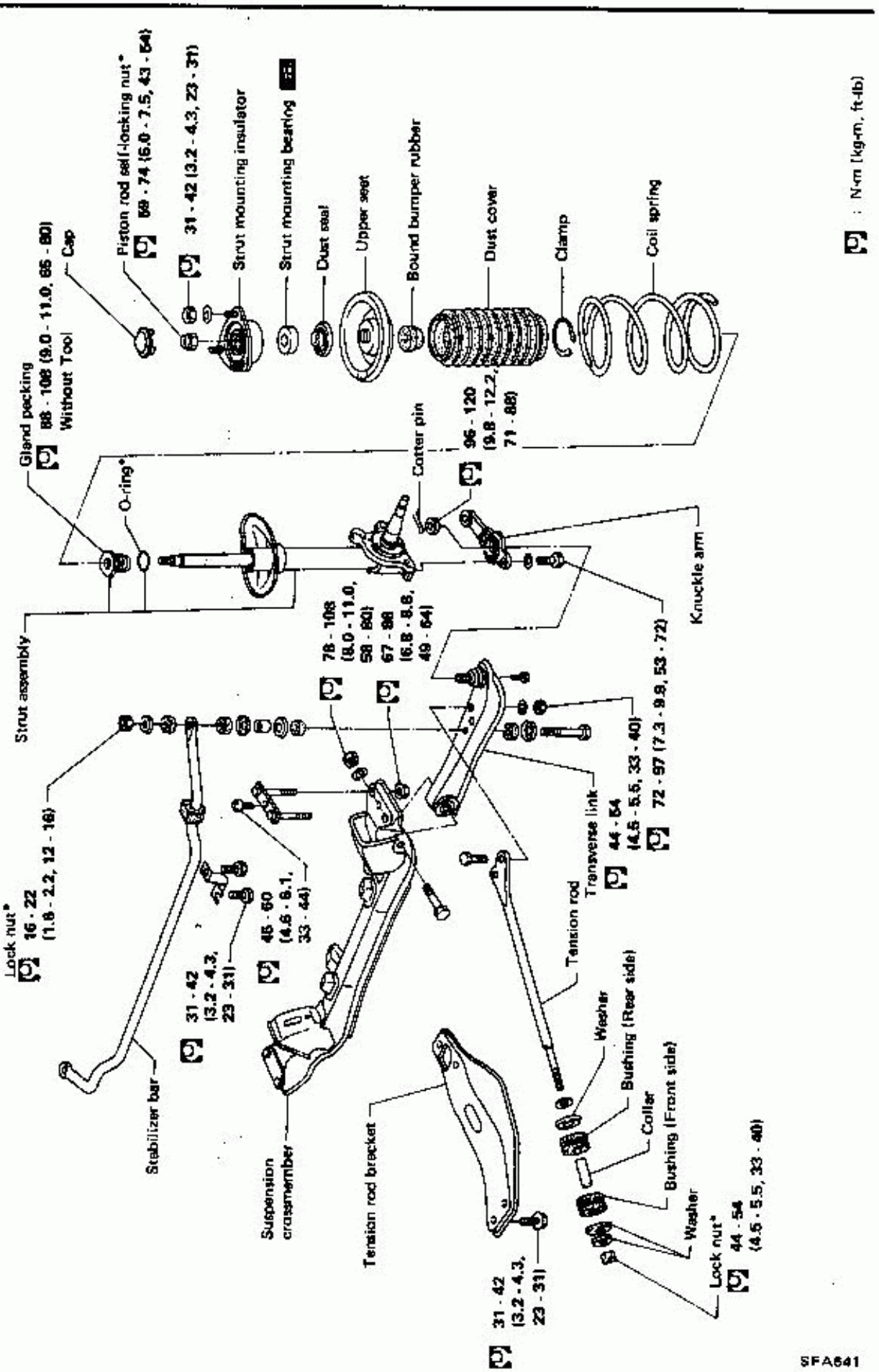
SFA968

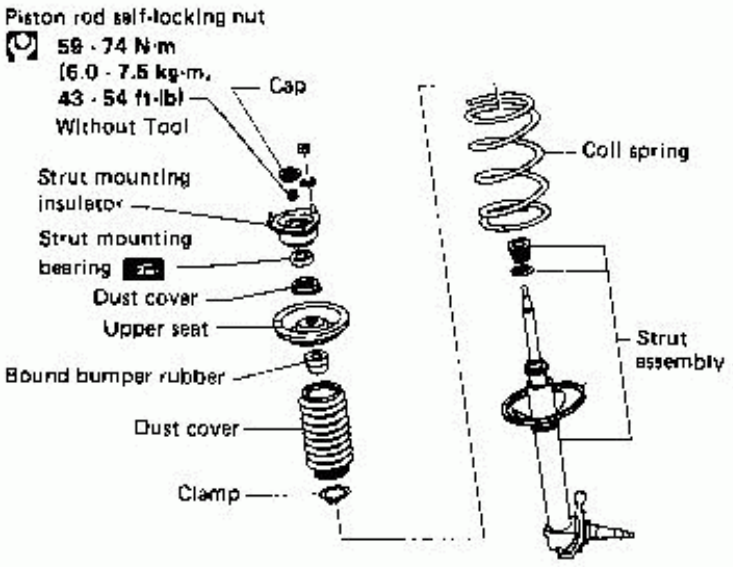
10. Install hub cap with new O-ring.

When removing each suspension part, check wheel alignment and adjust if necessary. Refer to section MA for front axle and front suspension.
When installing a bushing, do not allow it to project beyond the surface area of the washer.
Do not allow the bushings and washers to come in contact with grease, oil, soapy water, etc.

*: Always replace whenever disassembled.

• Final tightening should be carried out under unladen conditions with tires on ground when installing each bushing.
**Fluid, radiator coolant and engine oil are filled up.
Spare tire, jack, hand tools and mats are in designed position.

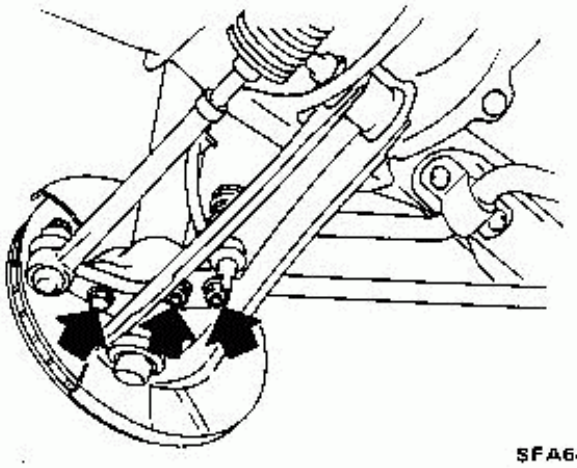




SFA642

Removal and Installation

- Remove tension rod nuts and knuckle arm fixing bolts.



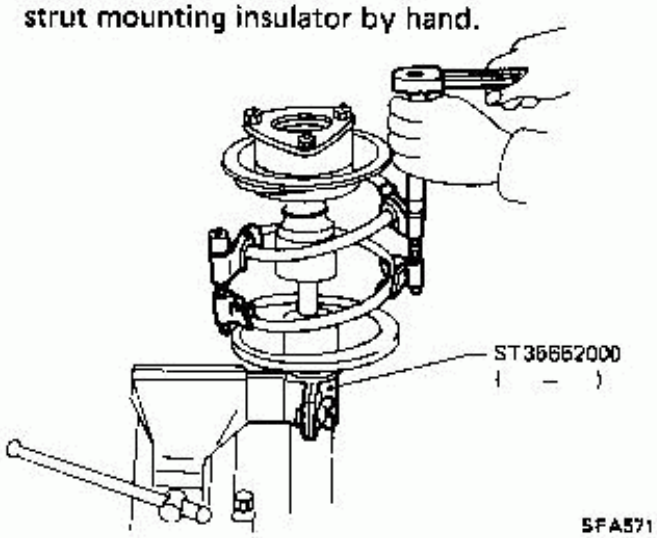
SFA643

Make sure brake hose is secure.

Disassembly

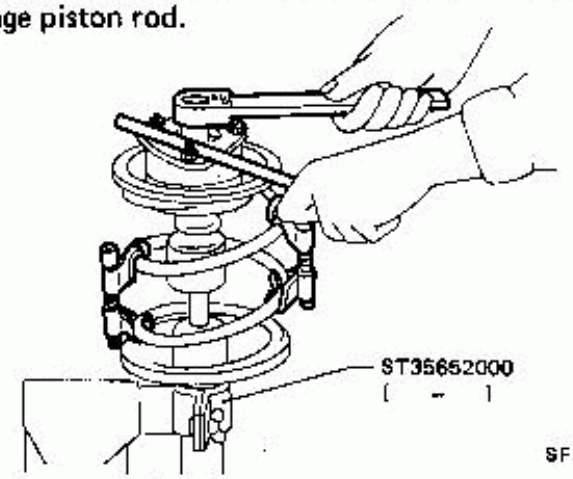
Avoid dirt and dust getting inside strut.

- Compress spring so as to permit turning of strut mounting insulator by hand.



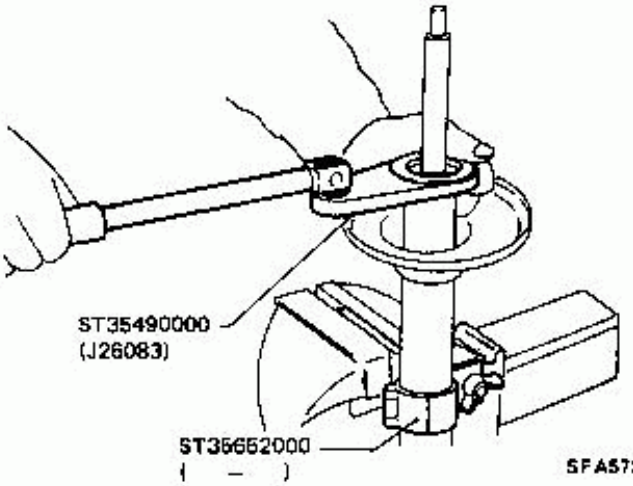
SFA571

- Remove piston rod lock nut so as not to damage piston rod.



SFA572

- Remove gland packing with Tool. Retract piston rod by pushing it down until it bottoms.



SFA573

- Slowly withdraw piston rod from cylinder together with piston guide.

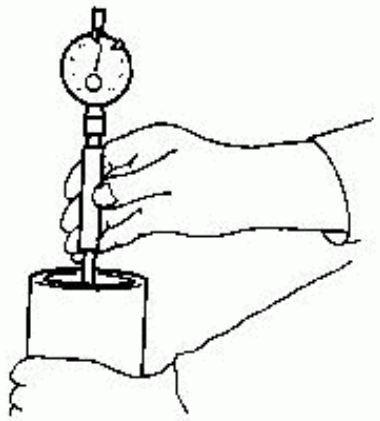
Inspection

- Wash all parts, except for nonmetallic parts, clean with suitable solvent and dry with compressed air.
- Blow dirt and dust off of nonmetallic parts using compressed air.
- Oil oozing out around gland packing does not call for strut replacement.
  If oil leakage is evident on spring seat, check piston rod and gland packing to correct the cause of problem.
  If oil leakage occurs on welded portion of outer strut casing, replace strut assembly.
- If shock absorber itself is malfunctioning, replace as shock absorber kit (including piston rod, cylinder, bottom valve and guide bushing).

INNER CYLINDER AND OUTER CASING

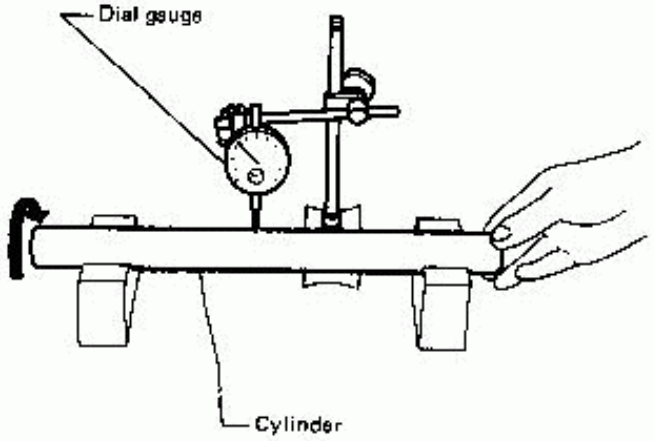
- Inspect inner cylinder and outer casing for cracks, deformation or other damage. For inner cylinder damage, replace shock absorber. For outer casing damage, replace strut assembly.

Inner diameter:
Inner cylinder
32.0 - 32.1 mm (1.260 - 1.264 in)



SFA136

Maximum runout:
Inner cylinder
Less than 0.2 mm (0.008 in)

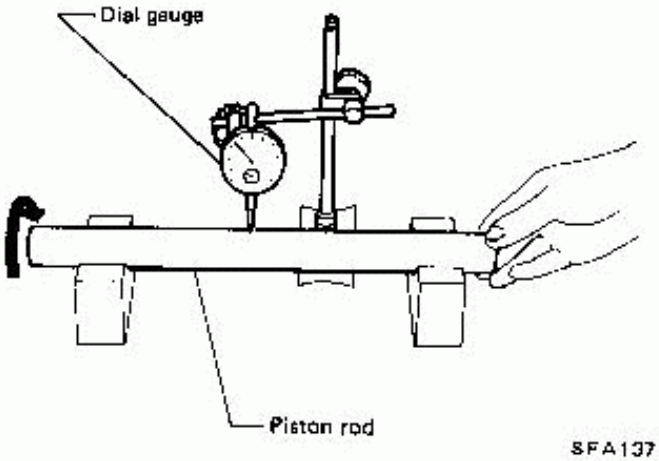


SFA137

PISTON ROD

- *Inspect piston rod for cracks, deformation or other damage. Replace shock absorber, if* necessary.
- Inspect threads for cracks or other damage. Replace shock absorber, if necessary.

Rod diameter:
21.78 - 21.94 mm (0.8575 - 0.8638 in)
Maximum runout:
0.2 mm (0.008 in)



SFA137

STRUT MOUNTING INSULATOR

Replace if cemented rubber-to-metal portion are melted or cracked. Rubber parts also need to be replaced, if deteriorated.

STRUT MOUNTING BEARING

Replace if inspection reveals abnormal noise or excessive rattle in axial direction.

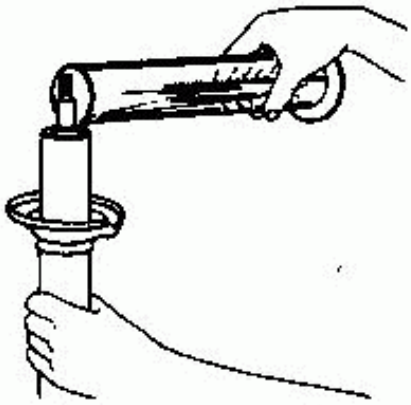
Assembly

Before assembly, keep away from dust to prevent entry of dust.

- Add correct amount of fluid.

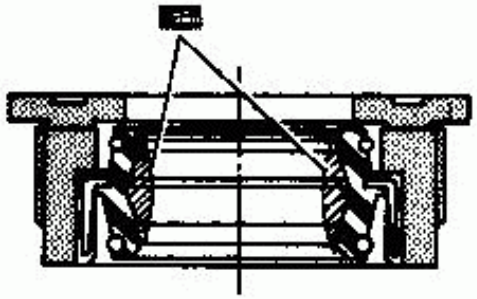
Use "NISSAN GENUINE STRUT FLUID" or equivalent.
Oil capacity is very important since performance of strut varies with amount of fluid in strut.

Capacity:
280 mℓ (9.5 US fl oz, 9.9 Imp fl oz)



FA065

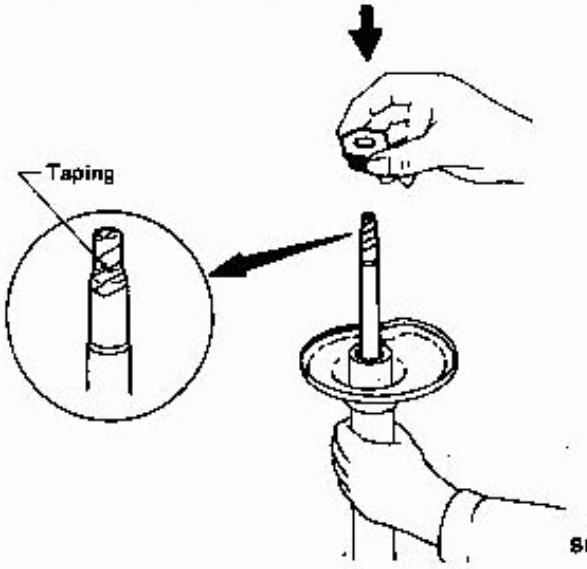
- Lubricate sealing lip of gland packing.



SFA141

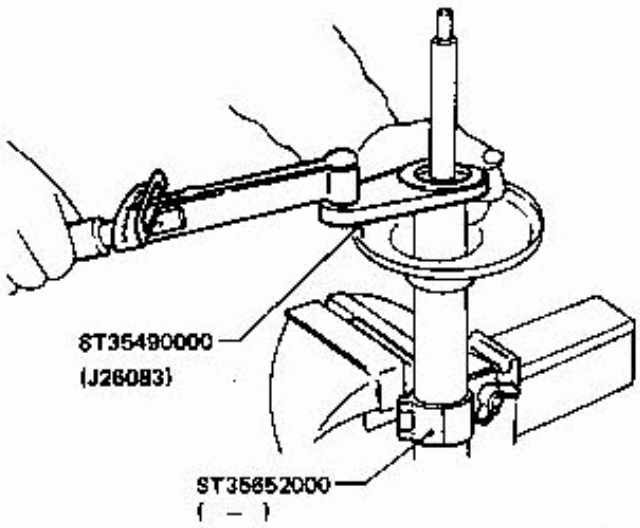
- Install gland packing.

Be careful not to damage sealing lip.

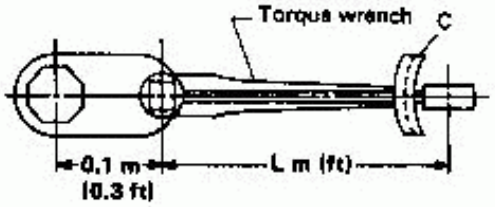


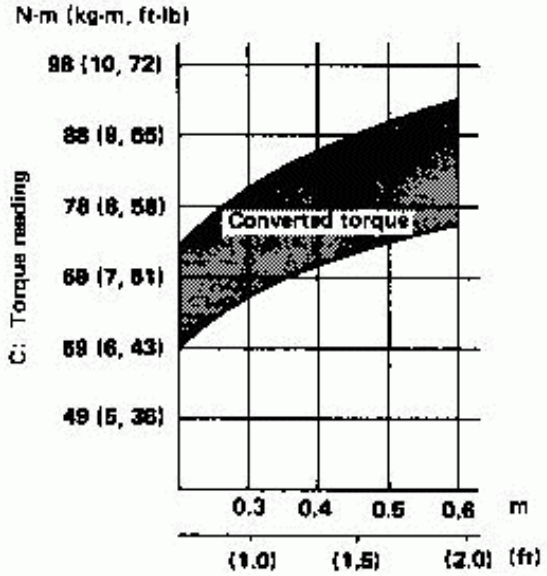
SFA574

- Tighten gland packing with Tool.



SFA591

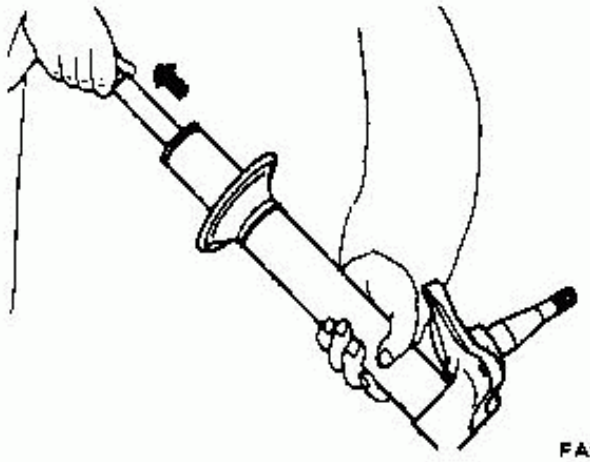




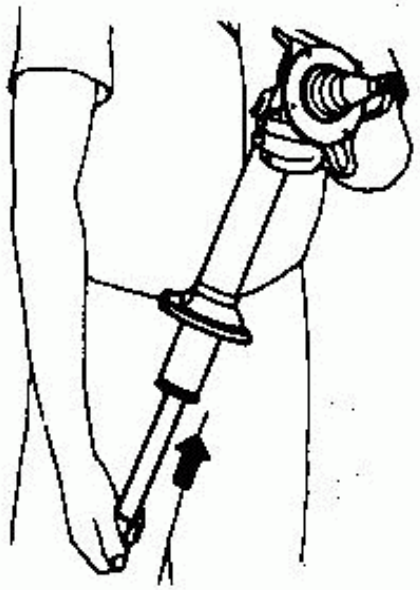
L: Length of torque wrench

SFA644

●Repeat following procedures several times so that air will be thoroughly bled from strut.

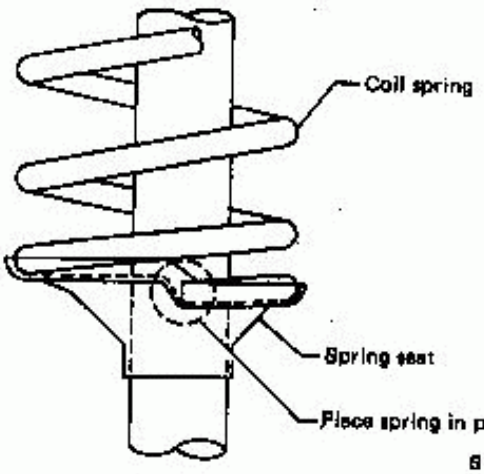


FA279



FA280

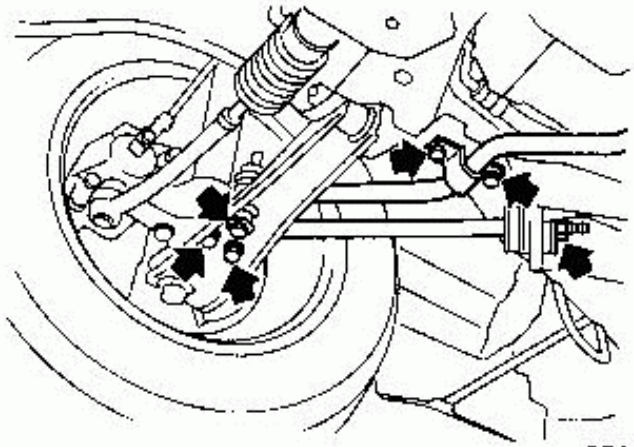
After placing spring in position between upper and lower spring seats, release compressor gradually.



SFA149

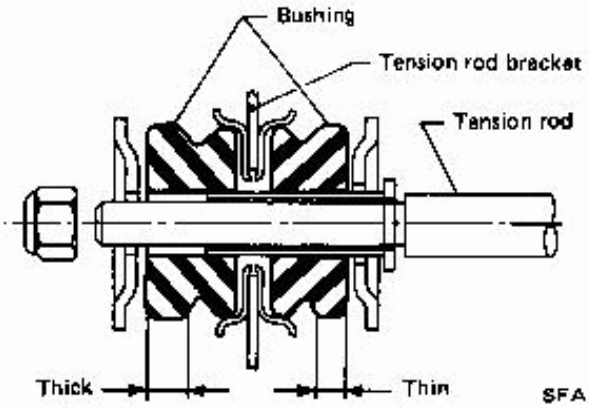
Removal and Installation

- Remove tension rod and stabilizer bar.



SFA645

- Install tension rod as shown below.

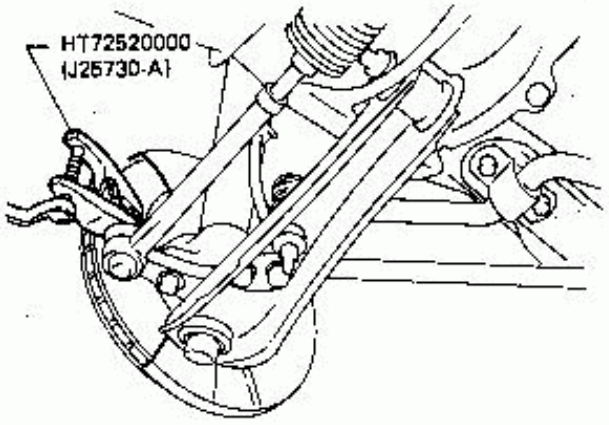


SFA969

- **Final tightening needs to be carried out under unladen condition with tires on ground.**

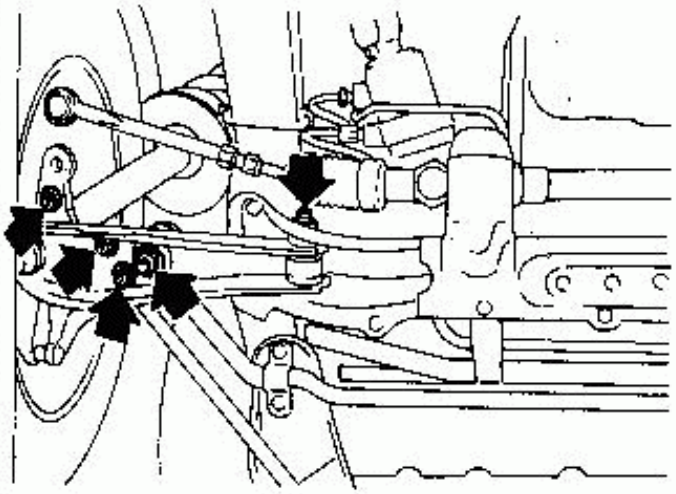
Removal and Installation

- Separate knuckle arm from tie-rod with Tool.



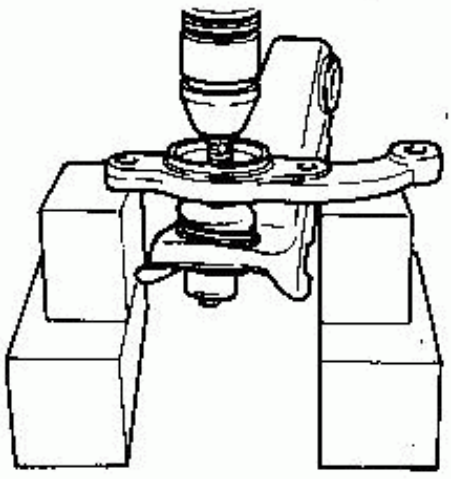
SFA646

- Separate knuckle arm from strut. Remove stabilizer, tension rod and transverse link.



SFA576

- Separate ball joint from knuckle arm with press.

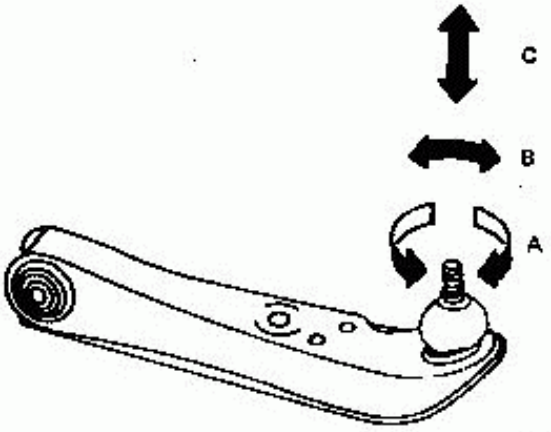


SFA577

- To install transverse link, first temporarily tighten nuts securing transverse link spindle which connects transverse link to suspension cross member.
- Final tightening needs 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 designed position.
- Make sure mating surface of bushing is clean and free from oil and grease.

Inspection

- Check ball joint for play. If ball stud is worn, play in axial direction is excessive or joint is hard to swing, replace transverse link assembly.



SFA581

Turning torque "A":
New parts
2.5 - 7.8 N·m
(25 - 80 kg-cm, 22 - 69 in-lb)
Used parts
More than
1.5 N·m (15 kg-cm, 13 in-lb)

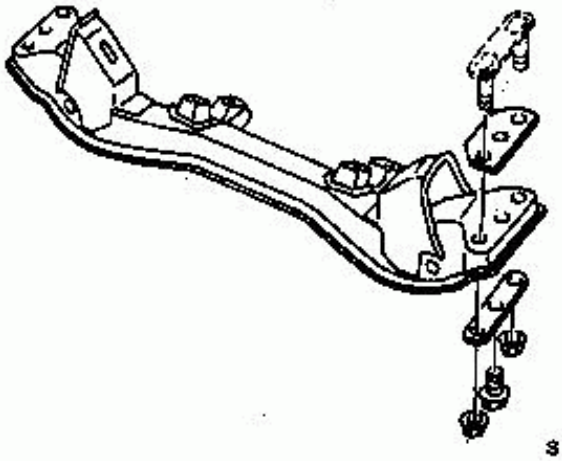
Turning torque "B":
New parts
2.5 - 7.8 N·m
(25 - 80 kg-cm, 22 - 69 in-lb)
Used parts
More than
1.5 N·m (15 kg-cm, 13 in-lb)

Axial play "C":
0.1 - 1.3 mm (0.004 - 0.051 in)

- Check condition of dust cover. Replace if necessary.
- Check rubber bushing for damage, cracks and deformation; replace transverse link if necessary.
- Check transverse link for damage, cracks, deformation; replace transverse link if necessary.
- To lubricate, remove plug and install grease nipple in its place.
  Pump grease slowly until old grease is completely forced out. After greasing, reinstall plug.

When a high-pressure grease gun is used, operate the grease gun carefully so that grease is injected slowly and new grease does not come out from the clamp portion.

Removal and Installation



SFA647

Precaution

Support engine weight to remove load from engine mounting.

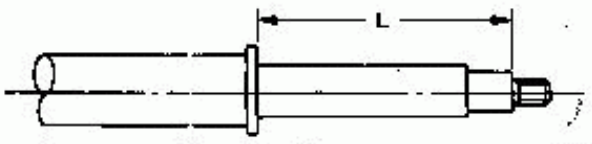
Inspection

Check suspension crossmember for deformation or cracking:

Replace if necessary.

General Specifications

Grade	GL		SGL			
Model	Coupe	Hatchback	Coupe	Hatchback	Coupe	Hatchback
Engine	CA20E				CA18ET	
Susp. Type	I.R.S.					
Coil spring Coil diameter mm (in)	150 (5.91)					
Wire diameter mm (in) L.H.	13.0 (0.512)	12.5 (0.492)	13.0 (0.512)			
R.H.	13.0 (0.512)					
Free length mm (in) Left	330 (12.99)	320.5 (12.62)	330 (12.99)			
Right	339 (13.35)	330 (12.99)	339 (13.35)			
Spring constant N/mm (kg/mm, lb/in)	21.0 (2.14, 119.8)					
Identification color L.H.	Pink 1 Purple 2	Orange 1 Purple 2	Pink 1, Purple 2			
R.H.	Light green 1 Purple 2	Pink 1 Purple 2	Light green 1, Purple 2			
Strut Type	Independent strut					
Oil capacity mℓ (US fl oz, Imp fl oz)	280 (9.5, 9.9)					
Inner cylinder mm (in) Inner diameter	32 (1.26)					
Maximum runout	0.2 (0.008)					
Piston rod mm (in) Rod diameter	22 (0.87)					
Maximum runout	0.2 (0.008)					
Stroke "L" mm (in)	165 (6.50)					
Maximum length mm (in)	195 (7.68)					
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb) Expansion	785 (80, 176)					
Compression	392 (40, 88)					
Stabilizer bar diameter mm (in)	25 (0.98)					
Tension rod diameter mm (in)	18 (0.71)					



SFA666

Inspection and Adjustment

Wheel alignment (Unladen *1)

Camber	degree	−25′ to 1°05′
Caster	degree	2°45′ - 4°15′
Toe-in		
	mm (in)	−0.5 to 1.5 (−0.020 to 0.059)
	degree*2	−2′ to 8′
Kingpin inclination	degree	11°40′ - 13°10′
Front wheel turning angle		
Toe-out-turn Inside/Outside	degree	20°/18°43′
Full turn Inside/Outside	degree	36 - 39°/30 - 33°

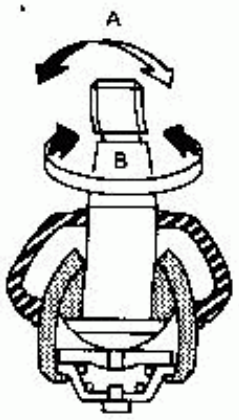
*1: Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools, mats are in designed position.
*2: Total toe-in

Wheel bearing

Wheel bearing axial play	mm (in)	0 (0)
Wheel bearing lock nut Tightening torque	N·m (kg-m, ft-lb)	25 - 29 (2.5 - 3.0, 18 - 22)
Return angle	degree	60°
Wheel bearing starting torque	N·m (kg-cm, in-lb)	
With new grease seal		0.39 - 0.83 (4.0 - 8.5, 3.5 - 7.4)
With used grease seal		0.10 - 0.44 (1.0 - 4.5, 0.87 - 3.91)
At wheel hub bolt	N (kg, lb)	
With new grease seal		6.9 - 14.7 (0.7 - 1.5, 1.5 - 3.3)
With used grease seal		2.0 - 7.8 (0.2 - 0.8, 0.4 - 1.8)

Lower ball joint

Stud end play	mm (in)	0.1 - 1.3 (0.004 - 0.051)
Turning torque "A"	N·m (kg-cm, in-lb)	
New parts		2.5 - 7.8 (25 - 80, 22 - 69)
Used parts		More than 1.5 (15, 13)
Turning torque "B"	N·m (kg-cm, in-lb)	
New parts		2.5 - 7.8 (25 - 80, 22 - 69)
Used parts		More than 1.5 (15, 13)



SFA667

Tightening Torque

Item	N·m	kg-m	ft-lb
Wheel hub			
Wheel hub to disc rotor			
14"-tire model	49 - 69	5 - 7	36 - 51
15"-tire model	59 - 69	6.0 - 7.0	43 - 51
Wheel nut	78 - 98	8.0 - 10.0	58 - 72
Knuckle arm and knuckle spindle			
Knuckle arm to knuckle spindle	72 - 97	7.3 - 9.9	53 - 72
Knuckle arm to tie-rod	64 - 98	6.5 - 10.0	40 - 72
Ball joint to knuckle arm	96 - 120	9.8 - 12.2	71 - 88
Torque member fixing bolt	72 - 97	7.3 - 9.9	53 - 72
Knuckle spindle to baffle plate	3.1 - 4.3	0.32 - 0.44	2.3 - 3.2
Tie-rod lock nut			
Power steering model	78 - 98	8 - 10	58 - 72
Manual steering model	78 - 98	8 - 10	58 - 72
Strut assembly			
Strut to knuckle arm	72 - 97	7.3 - 9.9	53 - 72
Strut to hoodledge	31 - 42	3.2 - 4.3	23 - 31
Piston rod self-locking nut	59 - 74	6.0 - 7.5	43 - 54
Gland packing	88 - 108	9.0 - 11.0	65 - 80
Transverse link			
Transverse link to suspension crossmember	78 - 108	8.0 - 11.0	58 - 80
Tension rod			
Tension rod to tension rod bracket	44 - 54	4.5 - 5.5	33 - 40
Tension rod bracket to body	31 - 42	3.2 - 4.3	23 - 31
Tension rod to transverse link	44 - 54	4.5 - 5.5	33 - 40
Stabilizer bar			
Stabilizer bar clamp to tension rod bracket	31 - 42	3.2 - 4.3	23 - 31
Stabilizer bar to transverse link	16 - 22	1.6 - 2.2	12 - 16
Suspension crossmember			
Suspension crossmember to body			
Nut	67 - 86	6.8 - 8.8	49 - 64
Bolt	45 - 60	4.6 - 6.1	33 - 44

SPECIAL SERVICE TOOLS

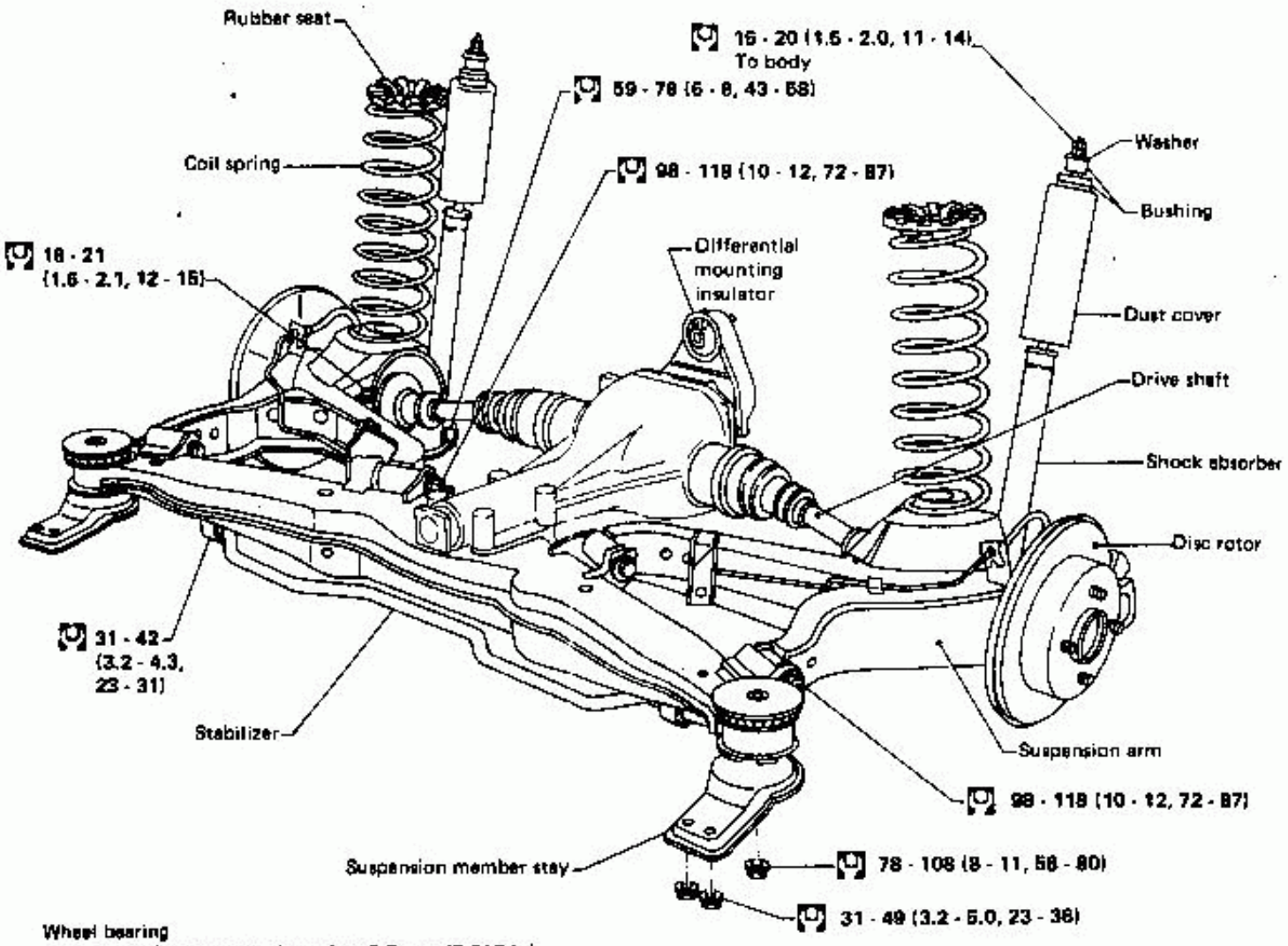
Tool number (Kent-Moore No.)	Tool name
KV40102150 (–)	Bearing outer race drift set
① ST35325000 (–)	Drift bar
② KV40102110 (–)	Drift (A)
③ KV40102120 (–)	Drift (B)
④ KV40102130 (–)	Screw (A)
⑤ KV40102140 (–)	Screw (B)
⑥ KV40102150 (–)	Screw (C)
ST35652000 (–)	Clamp
ST35490000 (J26083)	Gland packing wrench

REAR AXLE & REAR SUSPENSION

SECTION RA

CONTENTS

Wheel alignment
- Camber cannot be adjusted.
- Vehicle requires only toe-in adjustment.
  −2 to 0 mm (−0.08 to 0 in), (−12′ to 0)
  Refer to section MA for checking wheel alignment.

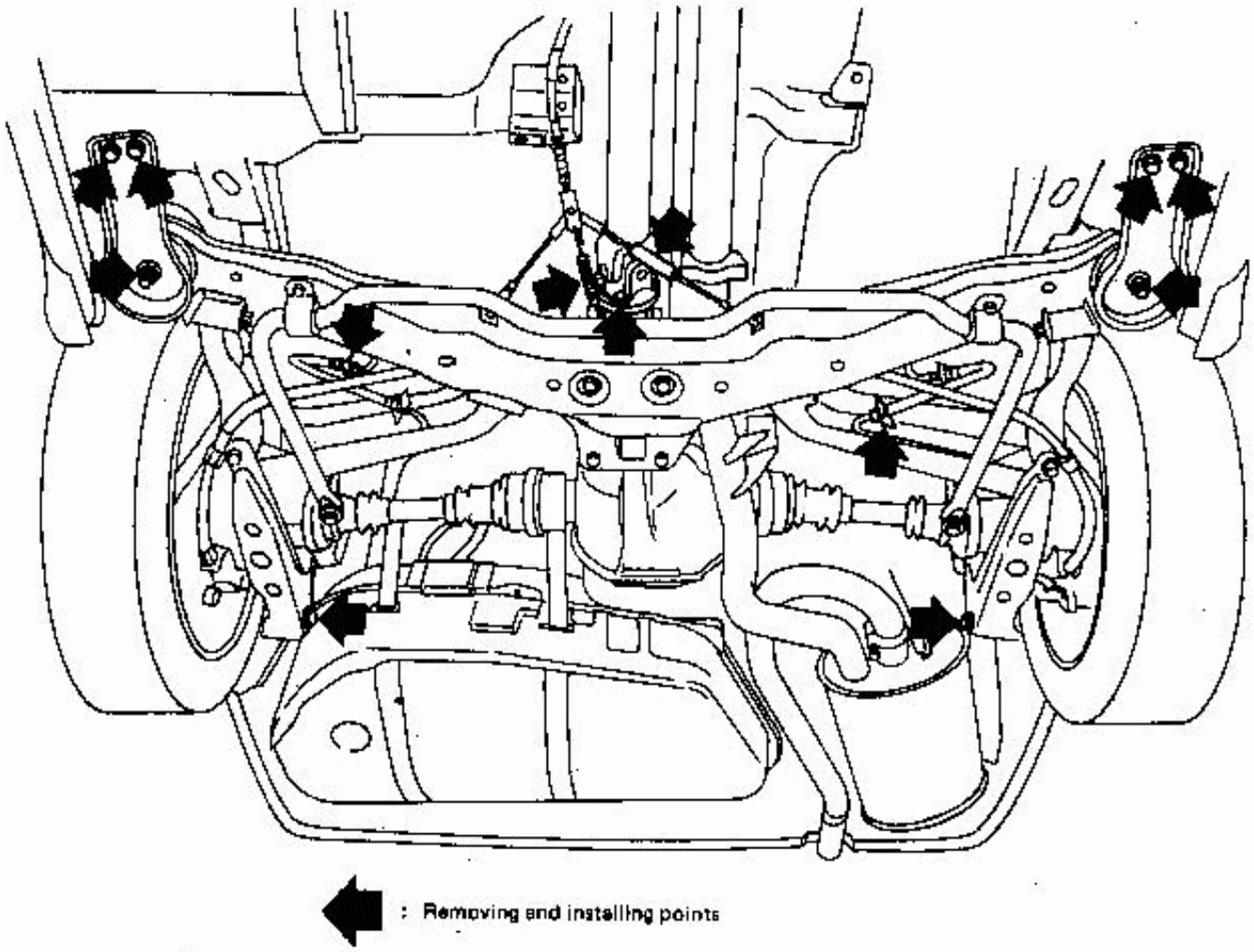


Wheel bearing
- Axle shaft end play: **Less than 0.3 mm (0.012 in)**
- Bearing preload: **Less than 0.7 N·m (7 kg-cm, 6.1 in-lb)**
  At hub bolt
  Less than 12.06 N (1.23 kg, 2.71 lb)

: N·m (kg-m, ft-lb)

SRA495

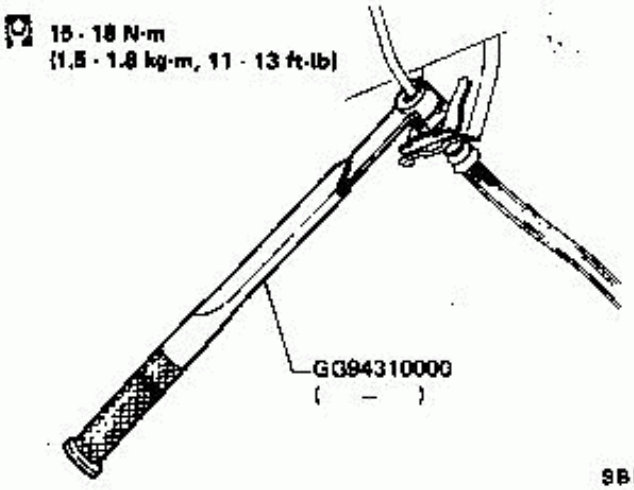
Removal and Installation



SRA496

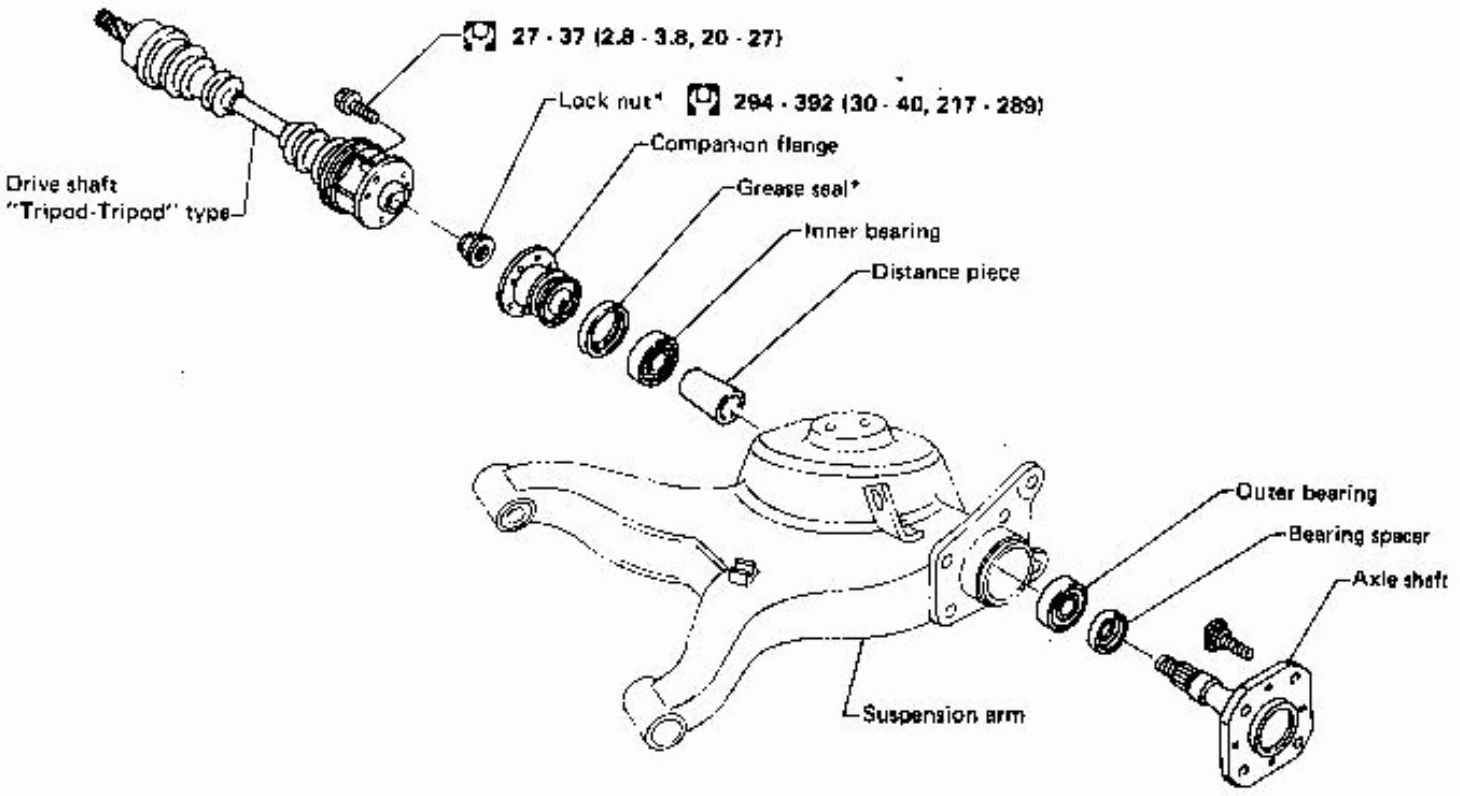
- Disconnect brake hydraulic line and parking brake cable.

CAUTION:
Use Tool when removing or installing brake tubes.



SBR500

- Remove rear exhaust tube (Refer to Section FE for removal).
- Disconnect propeller shaft (Refer to Section PD for removal).

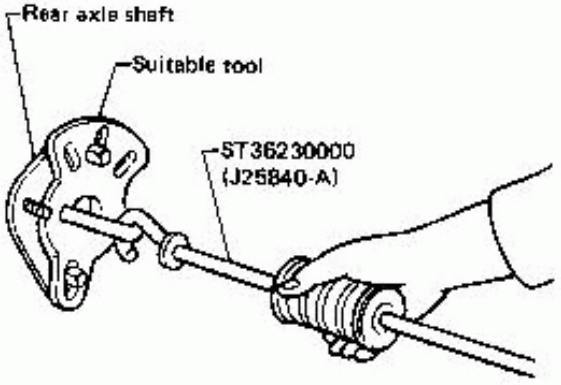


*Always replace when disassembled.
: N·m (kg-m, ft-lb)

SRA499

Removal

- Disconnect drive shaft. Refer to Drive Shaft for removal and installation.
- Remove wheel bearing lock nut while operating parking brake.
- Remove brake caliper and rotor. Refer to Section BR.
- Draw out rear axle shaft with Tool.



SRA511

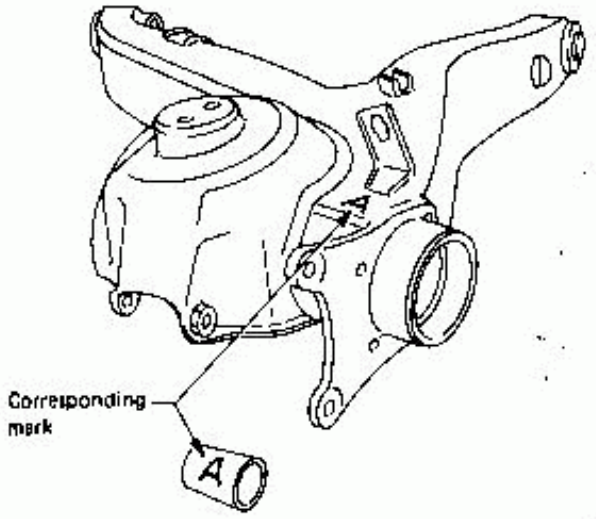
Inspection

Check rear axle shaft for cracks, wear or deformation. Replace if necessary.

Installation

- Wheel bearings are sealed type. When installing, make sure that the sealed side of outer bearing faces the axle shaft flange and that the sealed side of inner bearing faces the companion flange.
- Select a distance piece having a mark corresponding to the mark on bearing housing.

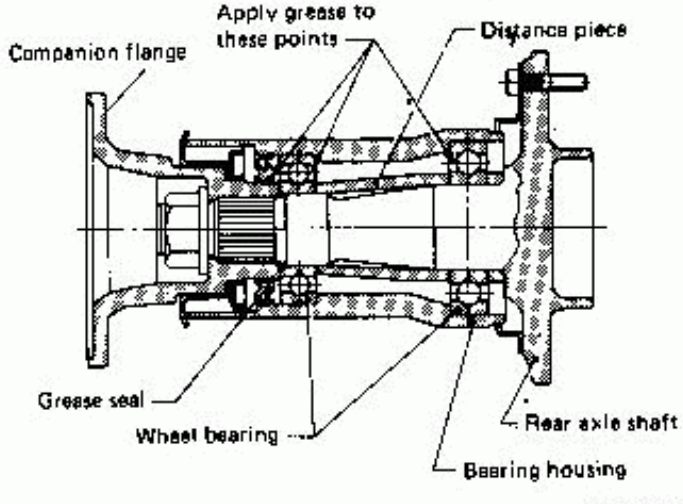
When a distance piece is reused, make sure that both ends are not collapsed or deformed.
When installing, make sure that larger side faces axle shaft flange.



SRA445

- Fill recommended multi-purpose grease to the portions indicated below.

CAUTION:
Keep grease away from lock nut thread portion and seating surface.



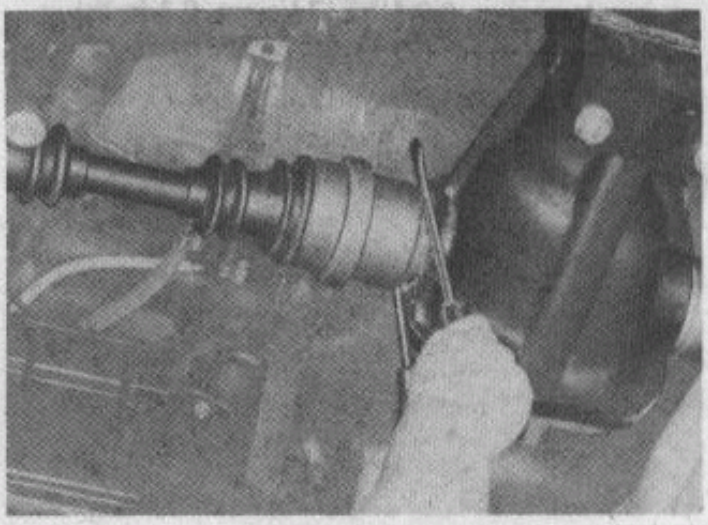
SRA446

- Measure rear wheel bearing preload after installing rear axle shaft.

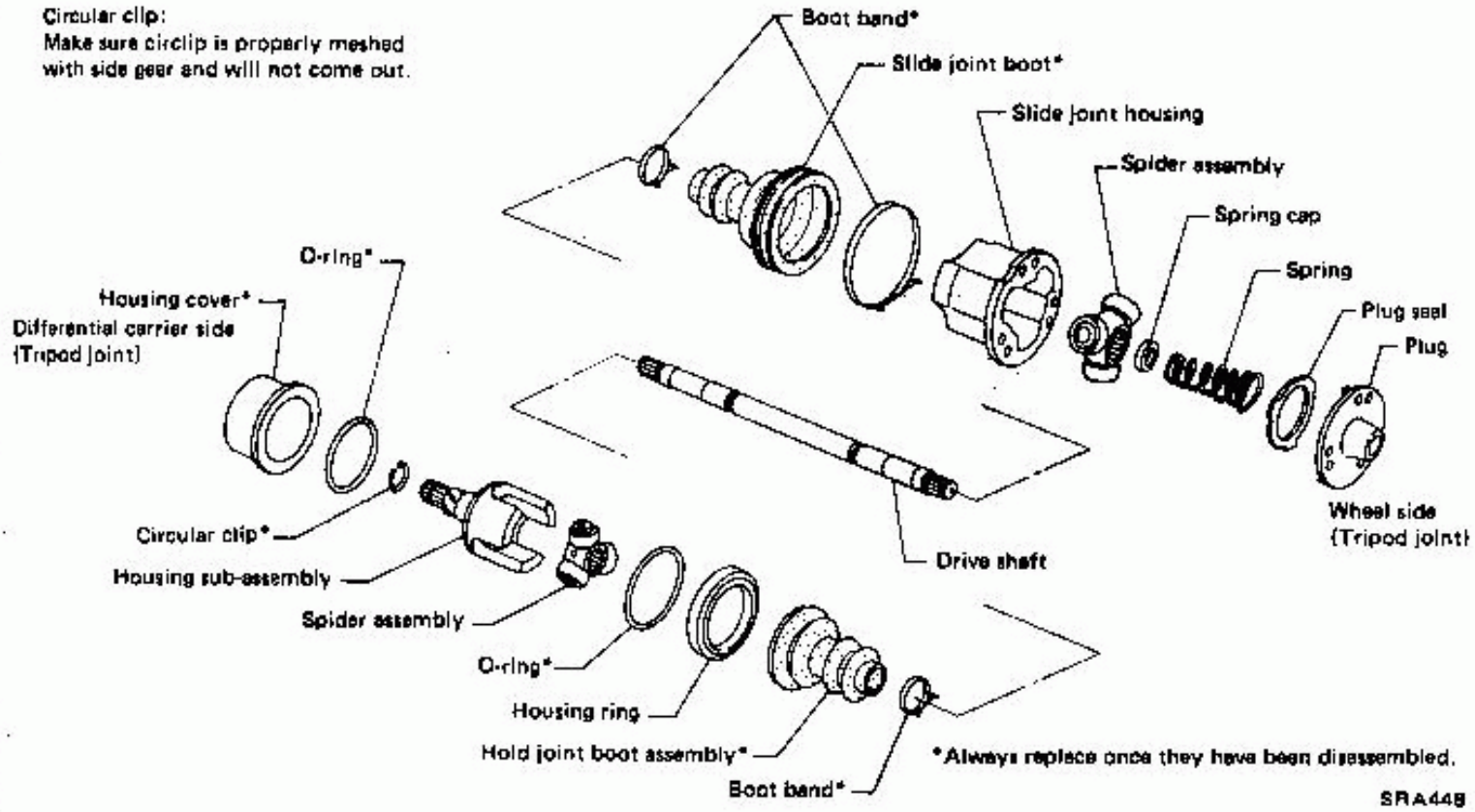
Rear wheel bearing preload:
Less than 0.7 N·m (7 kg-cm, 6.1 in-lb)
At hub bolt:
Less than 12.06 N (1.23 kg, 2.71 lb)

Removal and Installation

- Remove spring seat stay.
- Extract drive shaft from differential carrier by prying it with a suitable steel bar.



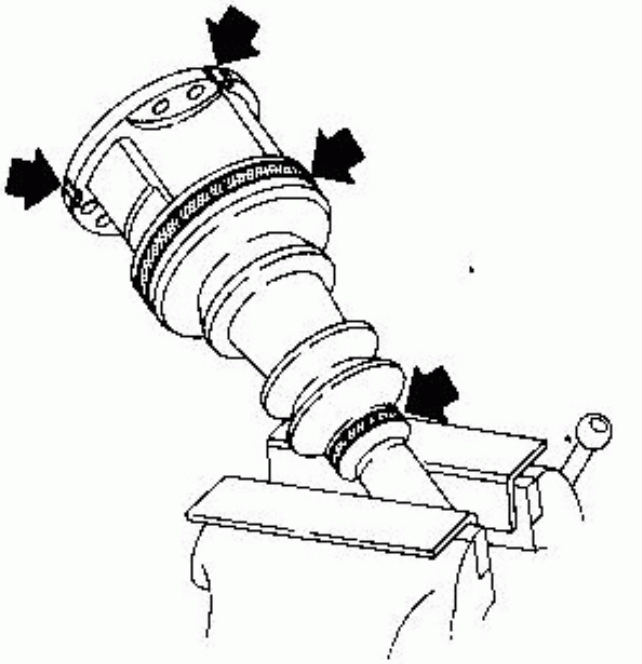
CAUTION:
Be careful not to damage oil seal of differential carrier.



Disassembly

WHEEL SIDE

Remove plug and boot bands.



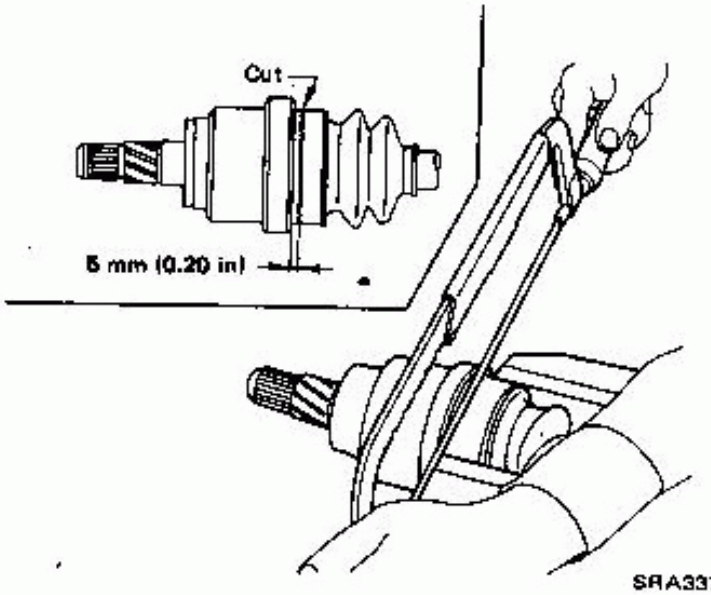
DIFFERENTIAL CARRIER SIDE

- Snugly place drive shaft assembly in a vise.

Be careful not to damage drive shaft assembly.

- Cut off hold joint boot assembly with a metal saw blade and remove housing sub-assembly.

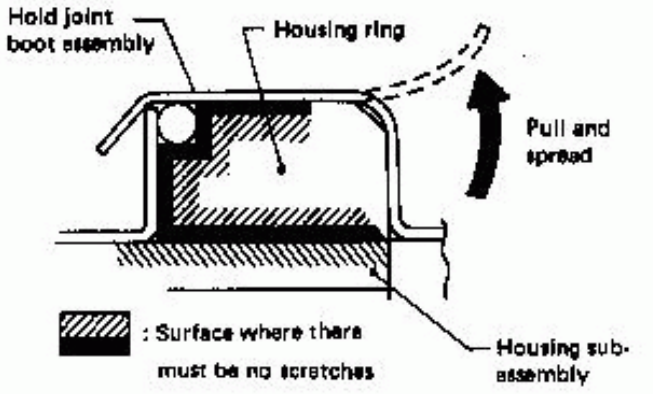
When cutting, ensure that drive shaft is pushed into housing sub-assembly to prevent spider assembly from being scratched.



Disassembly (Cont'd)

- Remove spider assembly. Refer to WHEEL SIDE.
- Cut off remaining part of hold joint boot assembly with a metal saw blade and remove housing ring.

Be careful not to scratch housing sub-assembly.
Be careful not to scratch housing ring excessively.

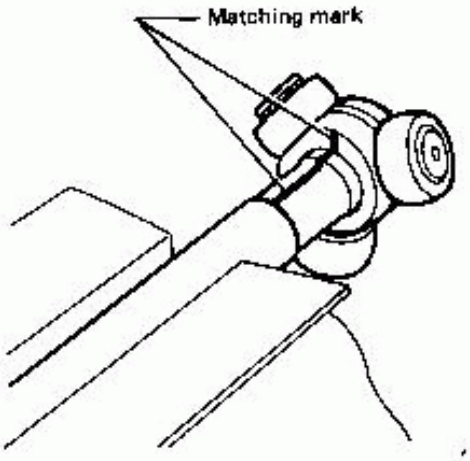


SRA451

- Remove spider assembly.

CAUTION:
The spider assembly is a non-disassembling type, consisting of a tripod, rollers, needle bearing and washer.

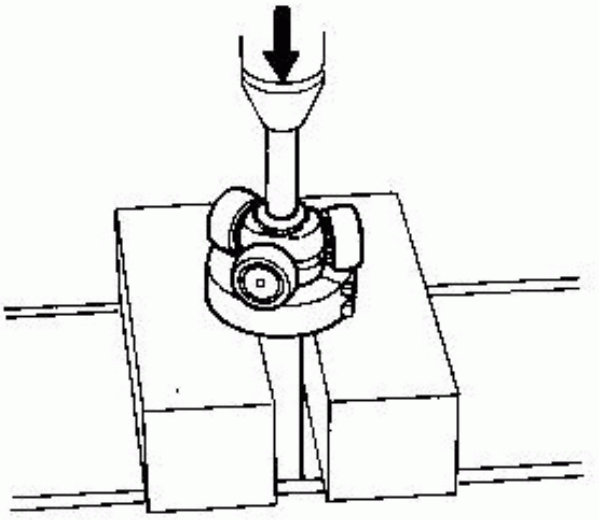
1) Make matching mark.



SFA391

2) Detach spider assembly using a press.

Do not attempt to directly touch contact surface of drive shaft end. Use a suitable tool.
Be careful not to drop drive shaft.



SFA392

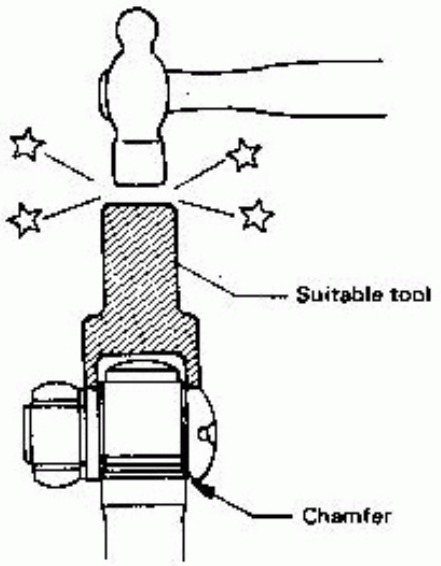
Inspection

DRIVE SHAFT

Check for cracks or other damage. Replace if necessary.

TRIPOD JOINT

- Check spider assembly for bearing and washer damage. Replace spider assembly if necessary.
- Check slide joint housing and housing sub-assembly for any damage. Replace if necessary.



SFA397

Assembly

- After drive shaft has been assembled, ensure that it moves smoothly over its entire range without binding.
- Use NISSAN GENUINE GREASE or equivalent after every overhaul.

WHEEL SIDE

Be careful not to scratch boot with drive shaft serration.

- Install spider assembly.

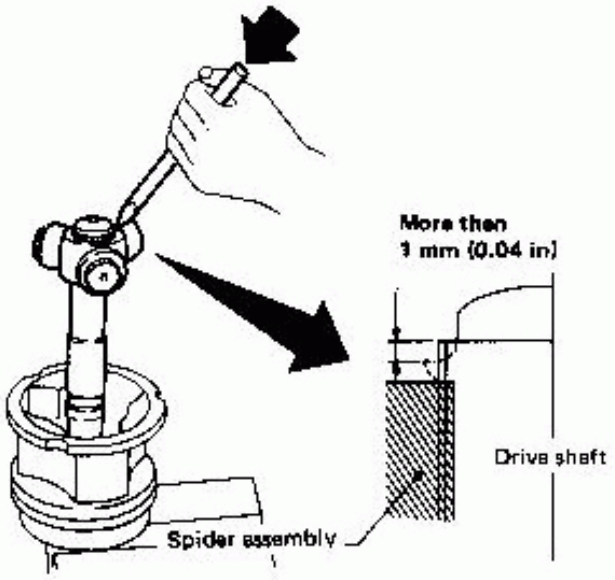
1) Place drive shaft in a vise, using soft cushioning pads.
2) Install spider assembly securely, ensuring marks are properly aligned.

Press-fit spider assembly with serration chamfer facing shaft.

3) Stake serration portion evenly at three places.

Avoid areas which have been previously staked.
Always stake two or three teeth at each place.

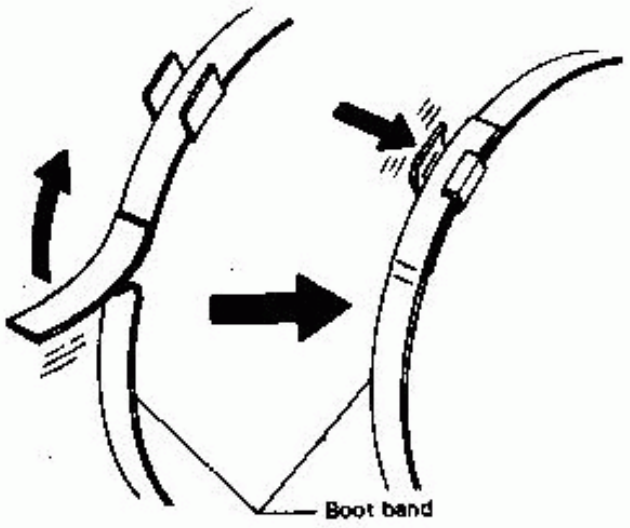
Stake more than 1 mm (0.04 in)



SFA422

Assembly (Cont'd)

- Install hold joint boot assembly and boot band.



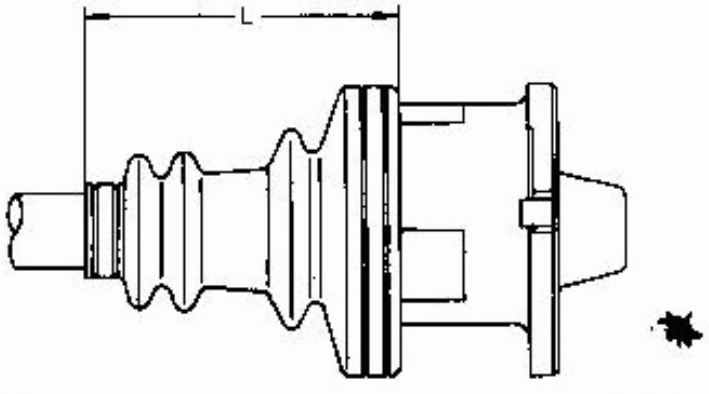
SFA395

- Pack with grease.

Specified amount of grease:
185 - 195 g (6.52 - 6.88 oz)

- Set boot so that it does not swell or deform when its length is "L".

Length "L": 111.6 mm (4.39 in)



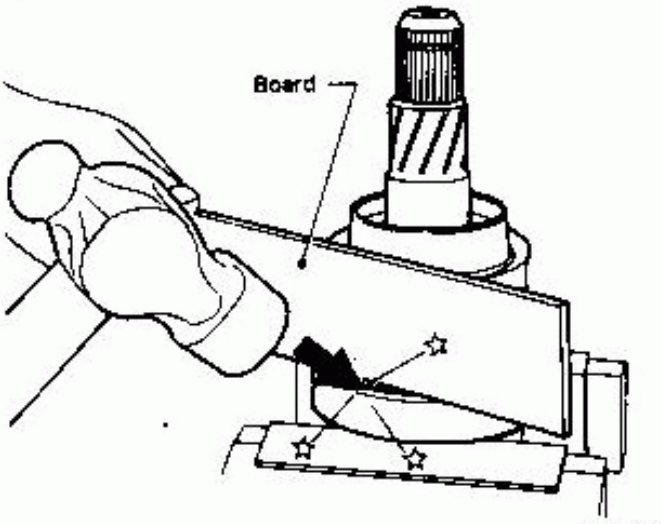
SRA452

DIFFERENTIAL CARRIER SIDE

CAUTION:
When replacing housing ring or housing sub-assembly, always replace them as a set.

- Bend the edge of hold joint boot assembly over along the entire circumference.

Before starting, bend the edge at two positions (180° apart) and ensure that housing cover does not rattle.
Place a board on housing cover to prevent it from being scratched.



SRA340

- Install new boot band and hold joint boot assembly onto drive shaft.

Be careful not to scratch boot with drive shaft serration.

- Install spider assembly. Refer to WHEEL SIDE.
- Pack with grease.

Specified amount of grease:
155 - 165 g (5.47 - 5.82 oz)

- Place hold joint boot assembly so that its flange is in vise.

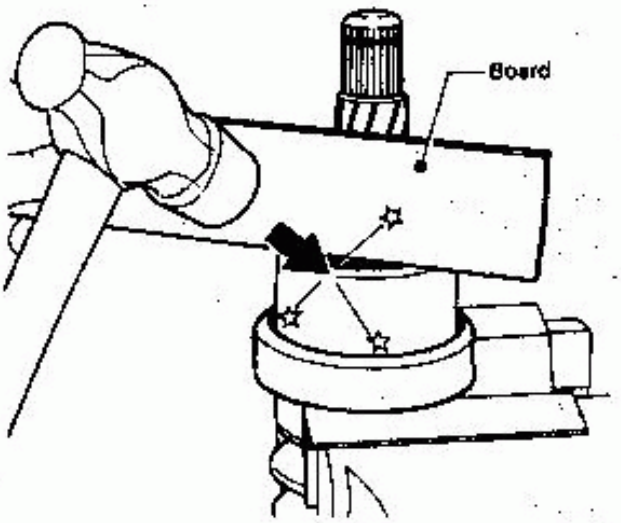
Do not place any other part of hold joint boot assembly on a vise.

- Insert housing sub-assembly into place.
- Bend the edge of housing cover over along the entire circumference.

Assembly (Cont'd)

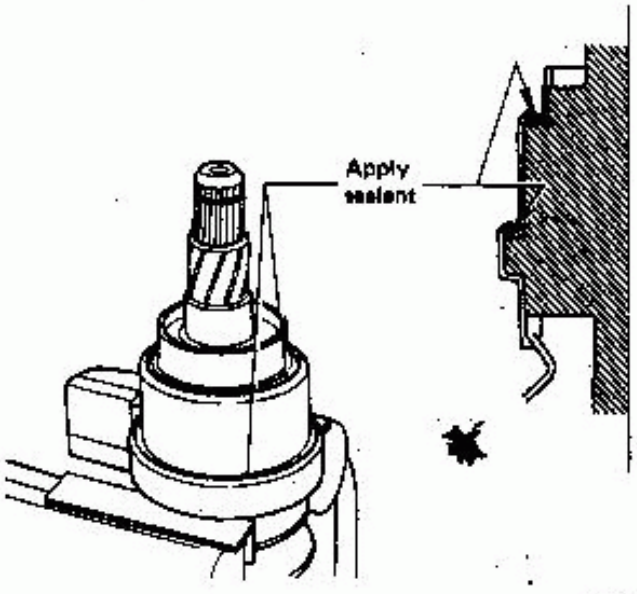
Before starting, bend the edge at two positions (180° apart) and ensure that housing sub-assembly does not rattle.

Place a board on housing sub-assembly to prevent it from being scratched.



SRA341

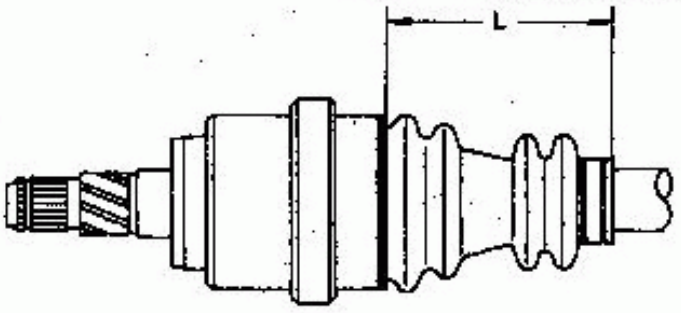
- Apply sealant.



SRA342

- Set boot so that it does not swell or deform when its length is "L".

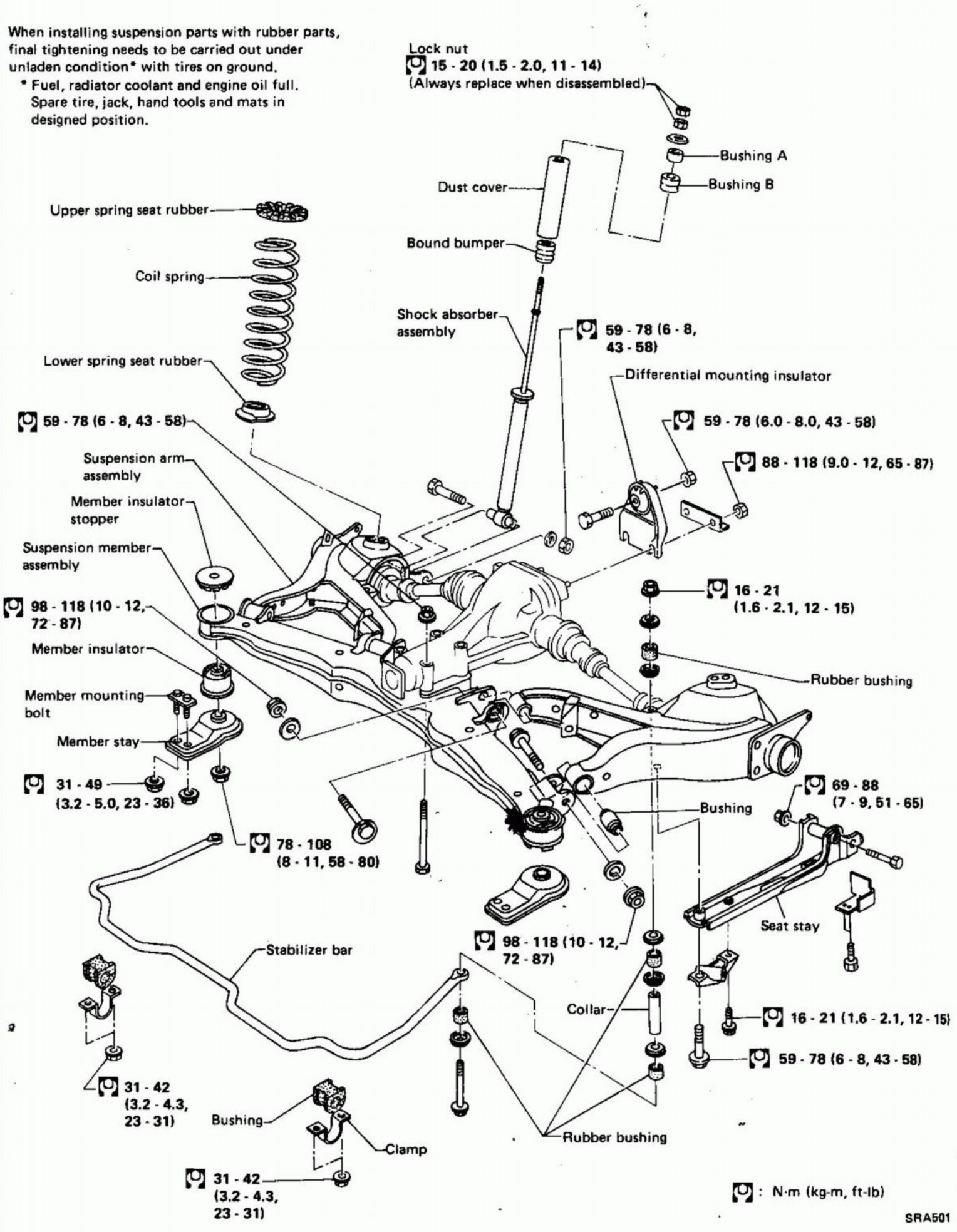
Length "L": 92.5 mm (3.642 in)



SRA463

When installing suspension parts with rubber parts, final tightening needs to be carried out under unladen condition* with tires on ground.

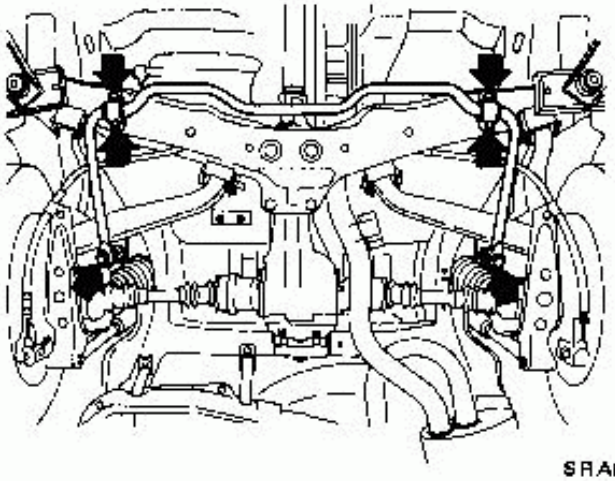
* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designed position.



Stabilizer Bar

REMOVAL AND INSTALLATION

- Remove stabilizer bar.



SRA502

- Final tightening needs to be carried out under unladen condition with tires on ground.

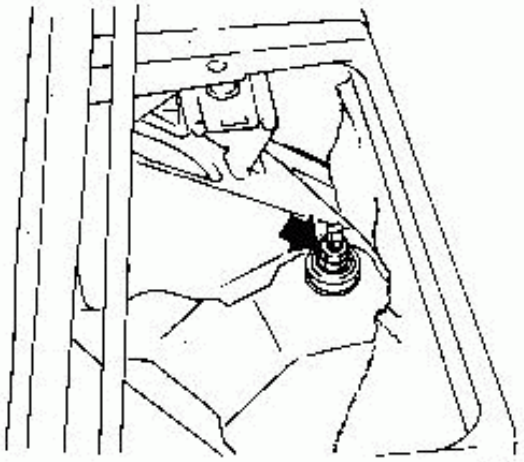
INSPECTION

- Check stabilizer bar for deformation or cracks. Replace if necessary.
- Check rubber bushings for deterioration or cracks. Replace if necessary.

Shock Absorber

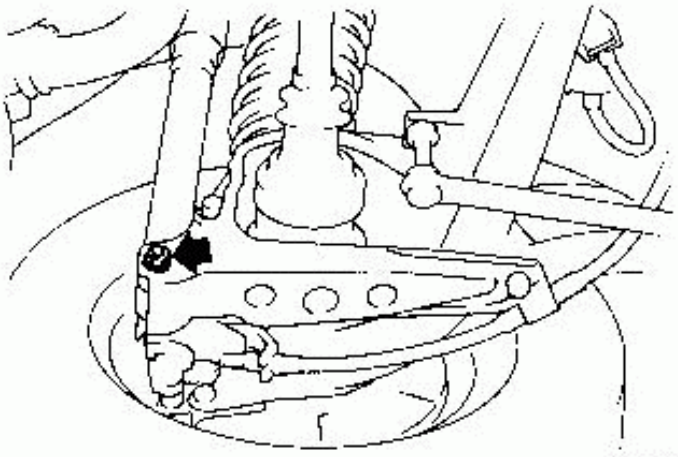
REMOVAL AND INSTALLATION

- Remove shock absorber upper end nut.



SRA503

- Disconnect shock absorber lower end.



SRA504

- Final tightening needs to be carried out under unladen condition with tires on ground.

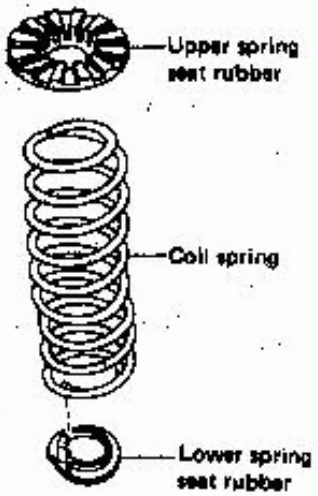
INSPECTION

- Check all rubber parts for wear, cracks, damage or deformation. Replace if necessary.
- If oil leakage occurs, replace shock absorber assembly.
- Inspect threads for cracks or other damage. Replace if necessary.
- Inspect piston rod for cracks, deformation or other damage. Replace shock absorber assembly if necessary.

Coil Spring

REMOVAL AND INSTALLATION

- Jack up vehicle after setting suitable spring compressor. Then remove coil spring.
- Install coil spring securely. Make sure that upper and lower spring seat rubbers are not twisted and have not slipped off when installing coil spring.



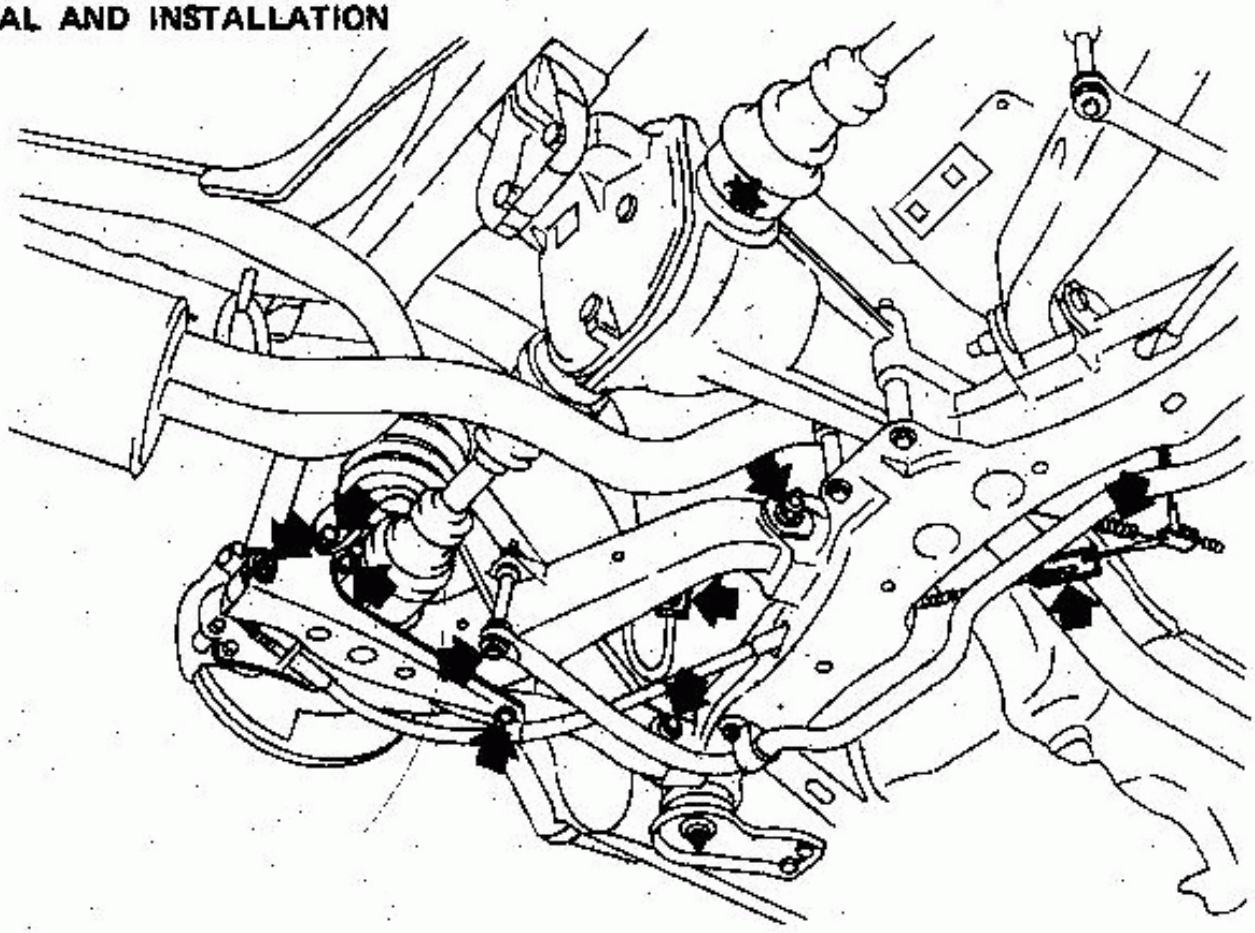
SRA605

INSPECTION

- Check coil spring for yield, deformation or cracks. Replace if necessary.
- Check upper and lower spring seat rubbers for wear, cracks or damage. Replace if necessary.

Suspension Arm

REMOVAL AND INSTALLATION

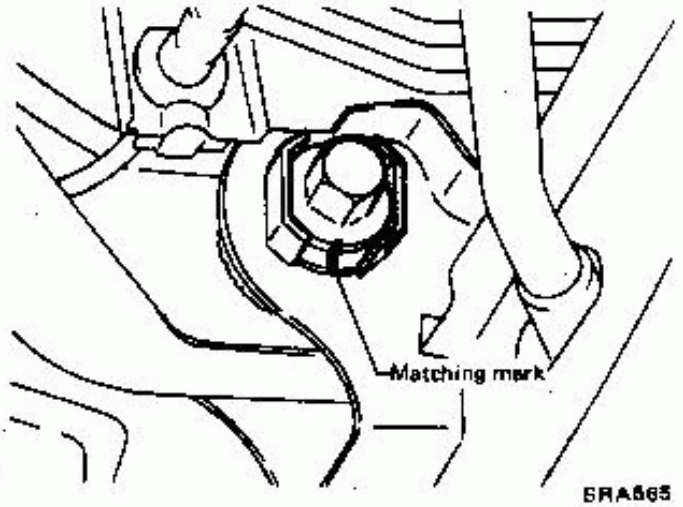


SRA606

Suspension Arm (Cont'd)

- Remove axle shaft assembly. Refer to Axle Shaft for removal.
- Remove stabilizer bar bolt.
- Disconnect shock absorber lower end.
- Remove suspension arm pin.

Before removing, put matching mark on suspension arm pin.



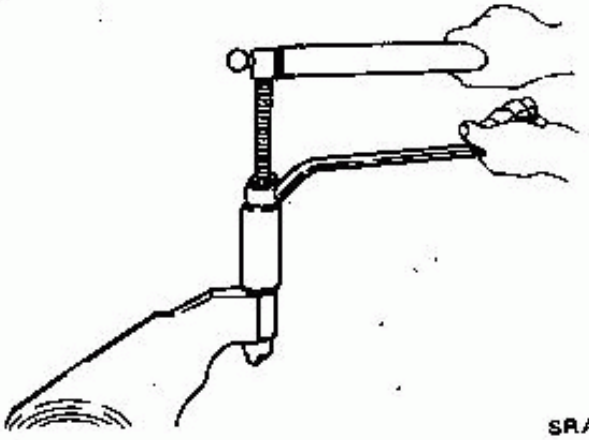
SRA565

- **When installing, tighten suspension arm pin nut to specified torque after installing wheels and placing vehicle on ground under unladen condition.**
- Adjust wheel alignment after installing rear arm. Refer to section MA.

INSPECTION

- Check suspension arm for deformation or cracks. Replace if necessary.
- Check rubber bushings for wear or other damage.

If necessary, replace rubber bushing with a suitable tool.



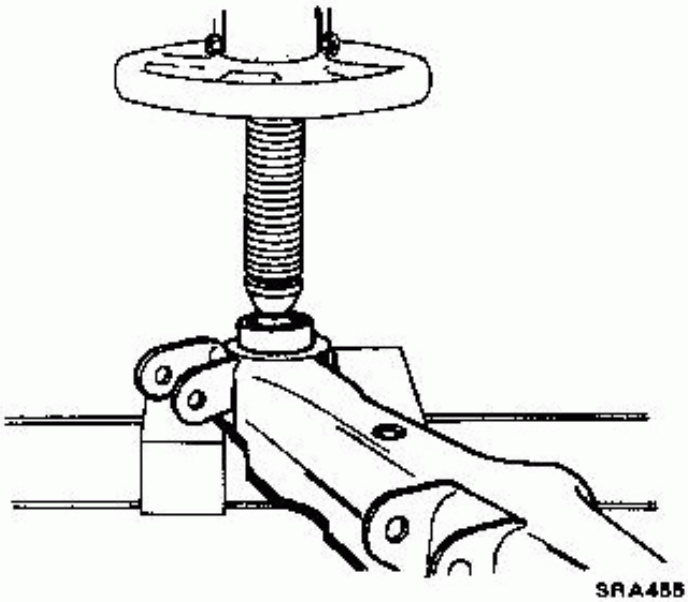
SRA465

Suspension Member

INSPECTION

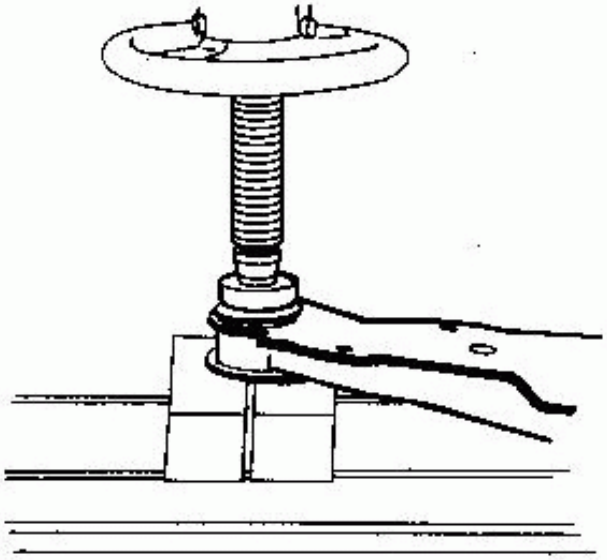
- Check differential mounting insulator for deformation or cracks. Replace if necessary.
- Check suspension member for deformation or cracks. Replace if necessary.

a. **If member insulator is deformed or cracked, replace it with a suitable tool.**



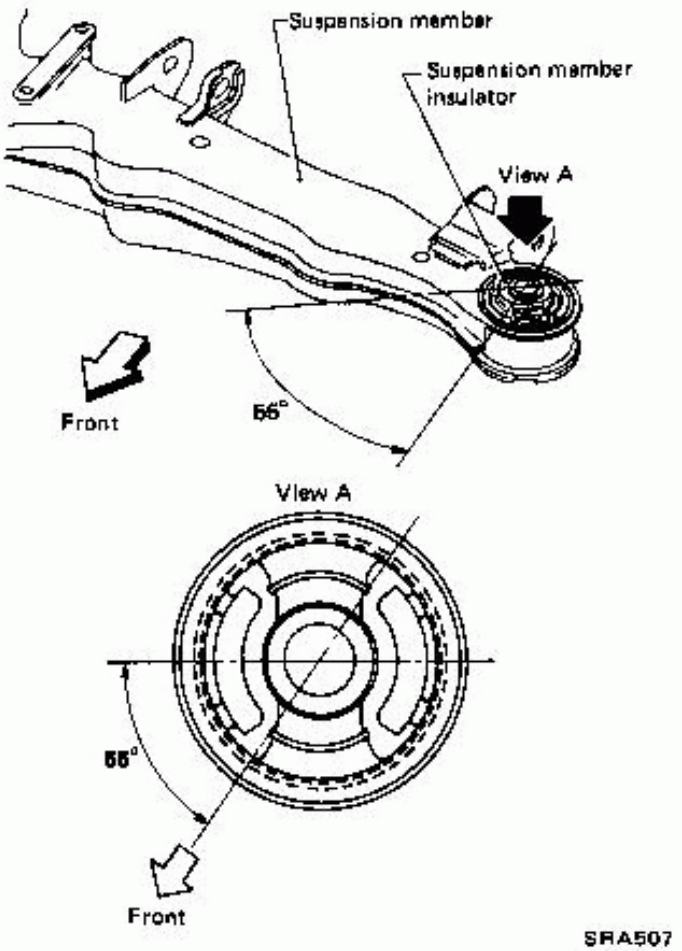
SRA455

b. **Install member insulator with a suitable tool. Be sure to install in its proper place.**



SRA456

Suspension Member (Cont'd)



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

Suspension type		I.R.S.
Coil spring		
Wire diameter	mm (in)	12.9 (0.508)
Coil diameter	mm (in)	110.9 (4.37)
Free length	mm (in)	
Left Right		355 (13.98)
Spring constant N/mm (kg/mm, lb/in)		22.6 (2.3, 129)
Identification color		Blue x 1, Violet x 2
Shock absorber		
Type		Gas-filled double acting hydraulic
Piston rod diameter	mm (in)	12.5 (0.492)
Stroke	mm (in)	209 (8.23)
Damping force [at 0.3 m (1.0 ft/sec.)]		
Expansion	N (kg, lb)	667 - 804 (68 - 82, 150 - 181)
Compression	N (kg, lb)	177 - 294 (18 - 30, 40 - 66)
Stabilizer bar diameter	mm (in)	24 (0.94)

Inspection and Adjustment

Wheel alignment (Unladen*)

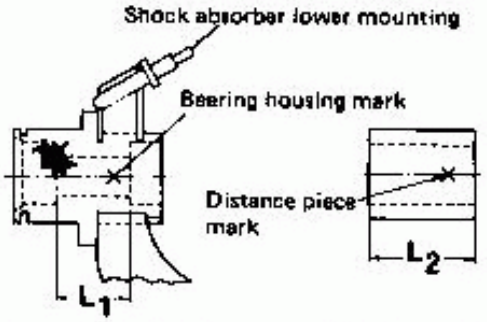
Camber	degree	−1°15' to 0°15'
Toe-in	mm (in)	−2 to 0 (−0.08 to 0)
	degree (Total toe-in)	−12' to 0

*: Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools and mats in designed position.

REAR AXLE SHAFT
(Independent rear suspension)

	Mark	Length "L_1" mm (in)
Rear bearing housing	A	55.85 - 55.95 (2.1988 - 2.2028)
	No mark	55.95 - 56.05 (2.2028 - 2.2067)
	C	56.05 - 56.15 (2.2067 - 2.2106)

	Mark	Length "L_2" mm (in)
Distance piece	A	55.82 - 55.88 (2.1976 - 2.2000)
	B	55.92 - 55.98 (2.2016 - 2.2039)
	C	56.02 - 56.08 (2.2055 - 2.2079)



REAR BEARING HOUSING DISTANCE PIECE

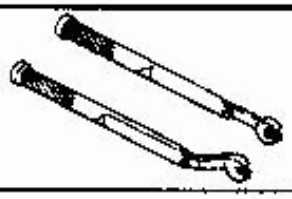
RAZ58

Wheel bearing preload N·m (kg-cm, in-lb)	Less than 0.7 (7, 6.1)
Wheel bearing preload (At hub bolt) N (kg, lb)	Less than 12.06 (1.23, 2.71)
Rear axle shaft end play mm (in)	0 - 0.3 (0 - 0.012)

Tightening Torque

Item	N·m	kg-m	ft-lb
Wheel nut	78 - 98	8.0 - 10.0	58 - 72
Three-way connector			
Connector mounting bolt	8 - 11	0.8 - 1.1	5.8 - 8.0
Connector to brake hose	15 - 18	1.5 - 1.8	11 - 13
Brake tube connector flare nut	15 - 18	1.5 - 1.8	11 - 13
Propeller shaft to companion flange			
CA18ET	34 - 44	3.5 - 4.5	25 - 33
CA20E	39 - 44	4.0 - 4.5	29 - 33
Drain plug	59 - 98	6.0 - 10.0	43 - 72
Filler plug	59 - 98	6.0 - 10.0	43 - 72
Shock absorber			
Lower end fixing bolt	59 - 78	6.0 - 8.0	43 - 58
Upper end fixing bolt	15 - 20	1.5 - 2.0	11 - 14
Suspension member			
Suspension member to suspension member stay	78 - 108	8 - 11	58 - 80
Suspension member stay to body	31 - 49	3.2 - 5.0	23 - 36
Suspension member to suspension arm	98 - 118	10 - 12	72 - 87
Seat stay			
Seat stay to suspension arm			
Front	59 - 78	6 - 8	43 - 58
Rear	69 - 88	7 - 9	51 - 65
Seat stay to parking brake cable clamp	16 - 21	1.6 - 2.1	12 - 15
Differential carrier			
Differential carrier to mounting bracket	88 - 118	9 - 12	65 - 87
Mounting bracket to body	59 - 78	6 - 8	43 - 58
Differential carrier to suspension member	59 - 78	6 - 8	43 - 58
Stabilizer bar			
Stabilizer bar to suspension arm	16 - 21	1.6 - 2.1	12 - 15
Stabilizer bar to suspension member	31 - 42	3.2 - 4.3	23 - 31
Drive shaft			
Drive shaft to companion flange			
CA18ET	27 - 37	2.8 - 3.8	20 - 27
CA20E	39 - 49	4 - 5	29 - 36
Wheel bearing lock nut	294 - 392	30 - 40	217 - 289

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
GG94310000 (—)	Flare nut torque wrench 
ST36230000 (J25840-A)	Sliding hammer 

BRAKE SYSTEM

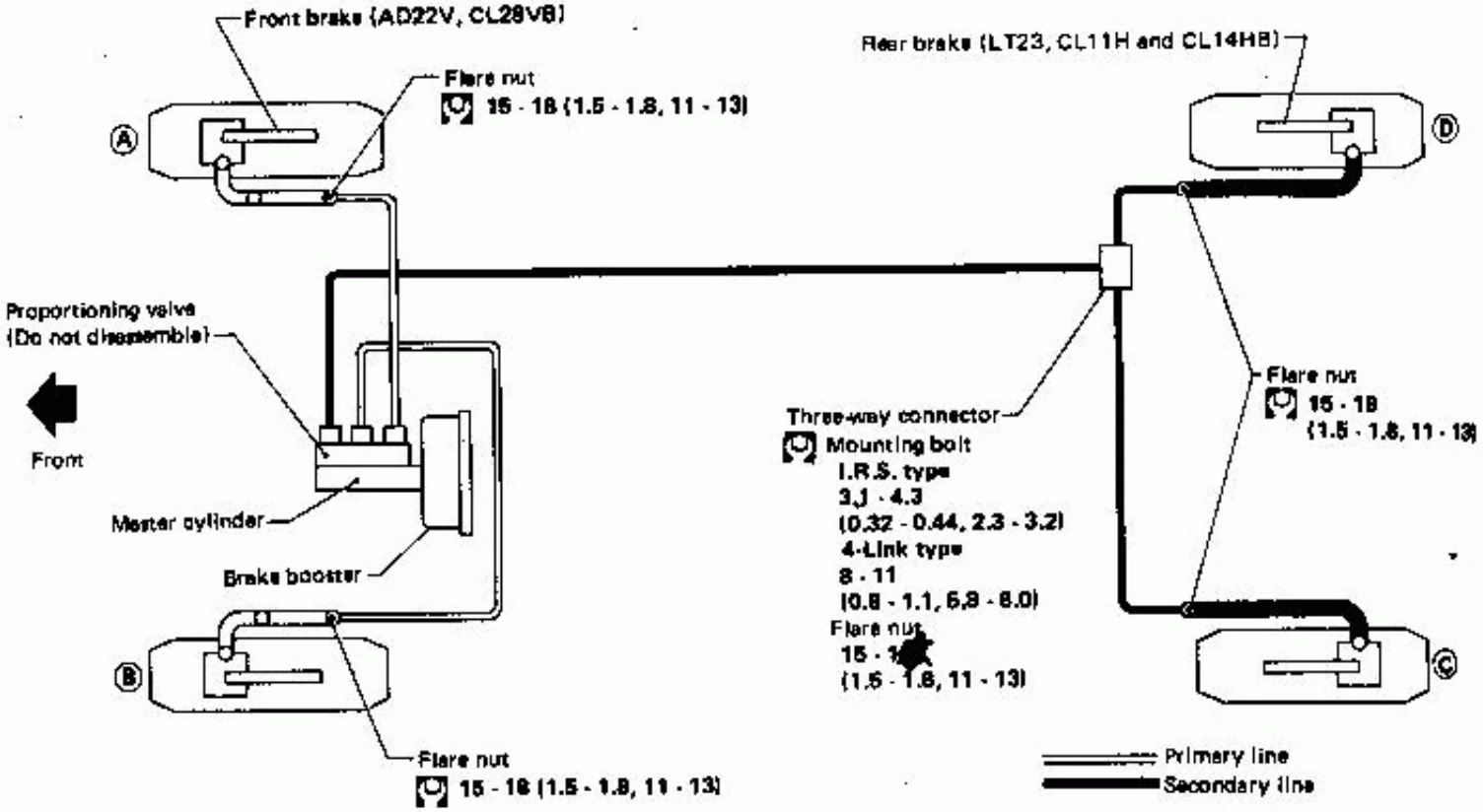
SECTION BR

CONTENTS

BRAKE HYDRAULIC LINE

Precautions

- Recommended fluid is brake fluid "DOT 3".
- Do not reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.



WARNING:
Clean pad and shoe dust using a dust collector after cleaning with waste cloth.

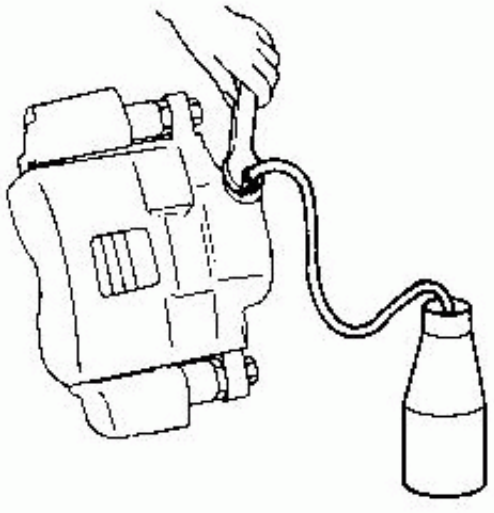
: N·m (kg-m, ft-lb)

SBR182A

Bleeding Procedure

PRECAUTIONS
Carefully monitor brake fluid level at master cylinder during bleeding operation.

- Bleed air according to the following procedure:
  Left rear caliper or cylinder Ⓒ → Right rear caliper or cylinder Ⓓ → Right front caliper Ⓐ → Left front caliper Ⓑ
- Connect a transparent vinyl tube to air bleeder valve of caliper.



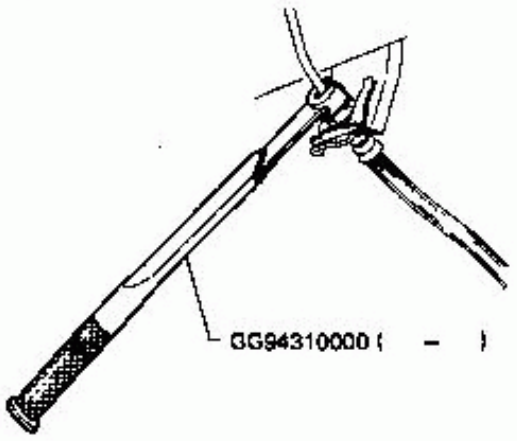
SBR606

BRAKE HYDRAULIC LINE

Removal and Installation

CAUTION :

a. When removing and installing brake tube, use Tool.



SBR600

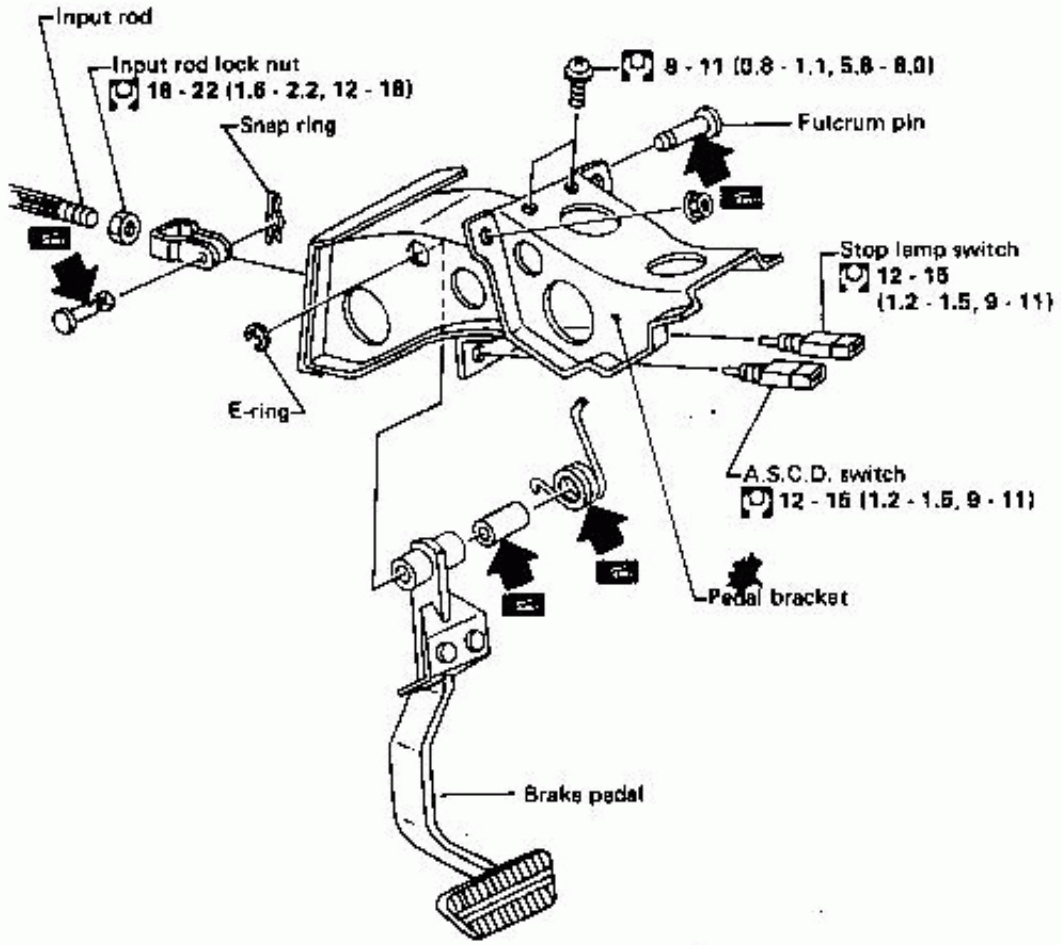
b. Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.

- To remove brake hose, first remove flare nut securing brake tube to hose, then withdraw lock spring. Next disconnect the other side.
- All hoses must be free from excessive bending, twisting and pulling.
- Whenever installing brake lines, be sure to check for oil leakage by fully depressing brake pedal.

Inspection

Check brake lines (tubes and hoses) for evidence of cracks, deterioration or other damage. Replace any damaged parts.

If leakage occurs around connectors, re-tighten or, if necessary, replace damaged parts.



: N·m (kg-m, ft-lb)

SBR899

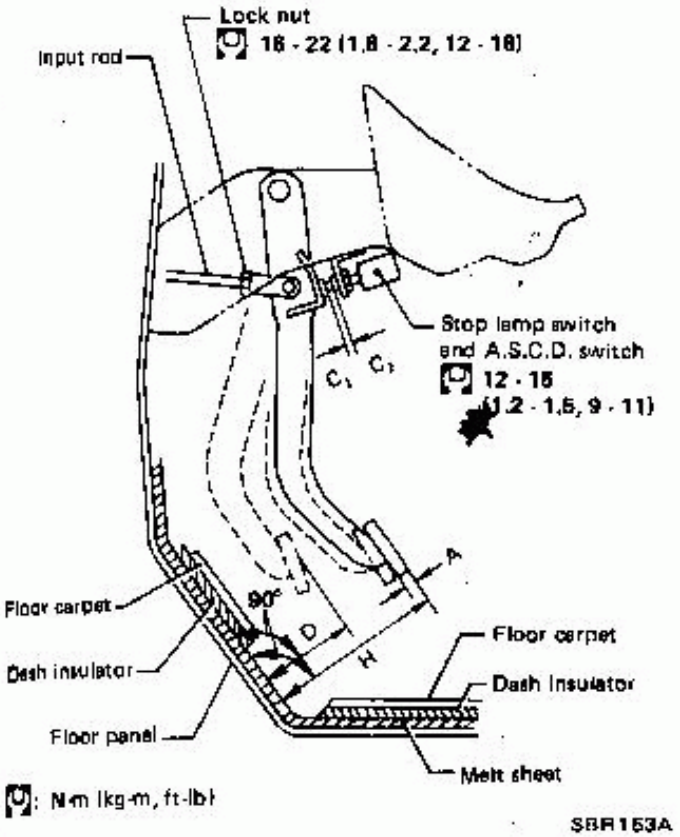
Inspection

Check brake pedal for the following items, servicing as necessary.

- Brake pedal bend
- Clevis pin deformation
- Crank for any welded portion

Adjustment

Check brake pedal free height from floor panel. Adjust if necessary.



SBR153A

H: Free height

M/T	185 - 195 mm (7.28 - 7.68 in)
A/T	187 - 197 mm (7.36 - 7.76 in)

D: Depressed height

101 mm (3.98 in) or more

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.

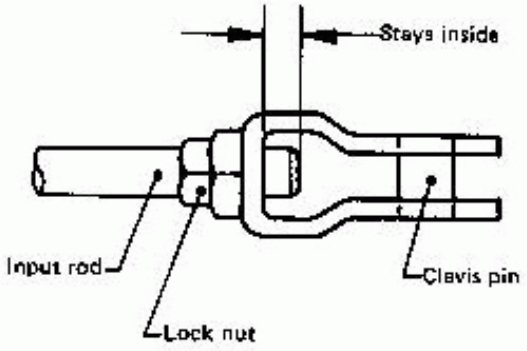
0.3 - 1.0 mm (0.012 - 0.039 in)

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.

Be sure that tip of input rod stays inside.



SBR930

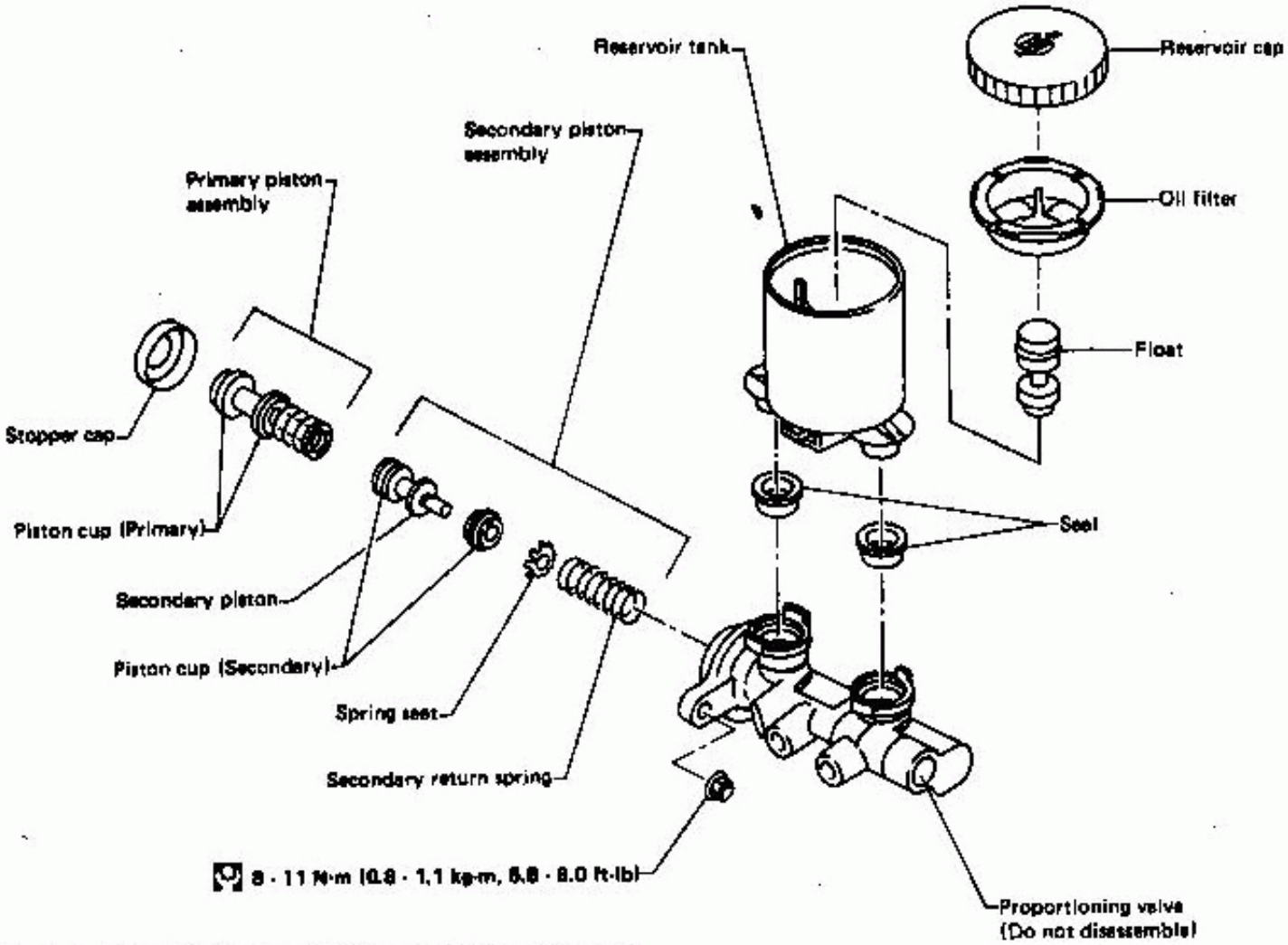
(2) Adjust clearance "C_1" and "C_2" with stop lamp switch and A.S.C.D. switch respectively. Then tighten lock nuts.

(3) Check pedal free play.

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

(4) Check brake pedal depressed height with engine running.

If depressed height is below the specified value, check brake system for leaks, accumulation of air or any damage regarding component parts (master cylinder, wheel cylinder, etc.), and make the necessary repairs.



- Apply brake fluid or rubber grease to sliding contact surface when assembling master cylinder.
- Check parts for wear or damage. Replace if any of above conditions are observed.
- Replace piston assembly when disassembled.

SBR822

BRAKE BOOSTER

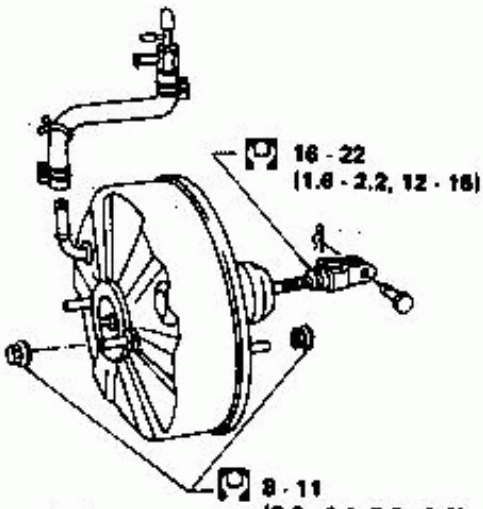
Operating Check

- Depress brake pedal several times with engine off, then check that there is not change in pedal stroke.
- Depress brake pedal, then start engine. If pedal goes down slightly, operation is normal.

Airtight Check

- Start engine, then stop it in one or two minutes. Depress brake pedal several times slowly. If pedal goes further down the first time, but gradually rises after second or third time, the booster is airtight.
- Depress brake pedal while engine is running, then stop it with pedal depressed. If there is no change in pedal stroke after holding pedal for thirty seconds, brake booster is airtight.

Removal and Installation



: N·m (kg-m, ft-lb)

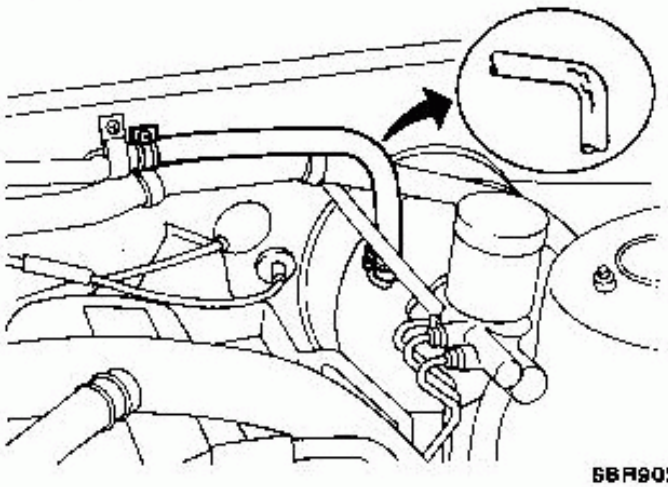
SBR901

Do not apply any oil or lubricants to vacuum hose and check valve.

Inspection

HOSES AND CONNECTORS

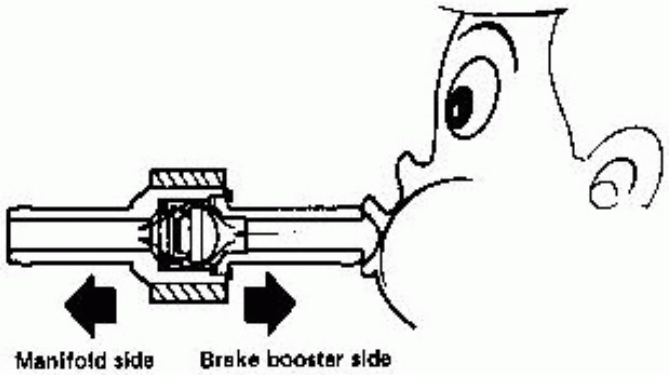
- Check condition of vacuum hoses and connectors.
- Check vacuum hoses and check valve for air tightness.



SBR902

CHECK VALVE

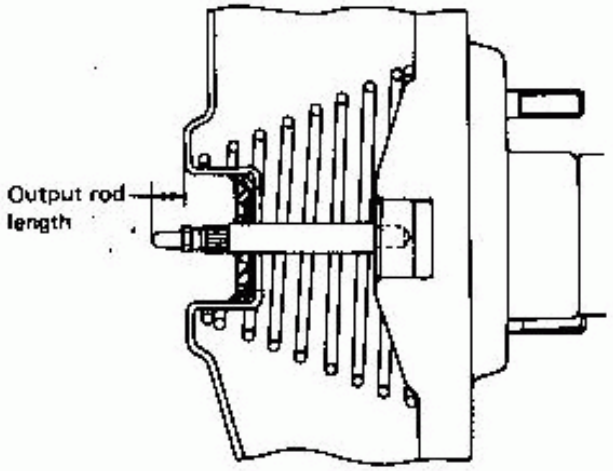
- When pressure is applied to the brake booster side of check valve and valve does not open, replace check valve with a new one.



SBR848

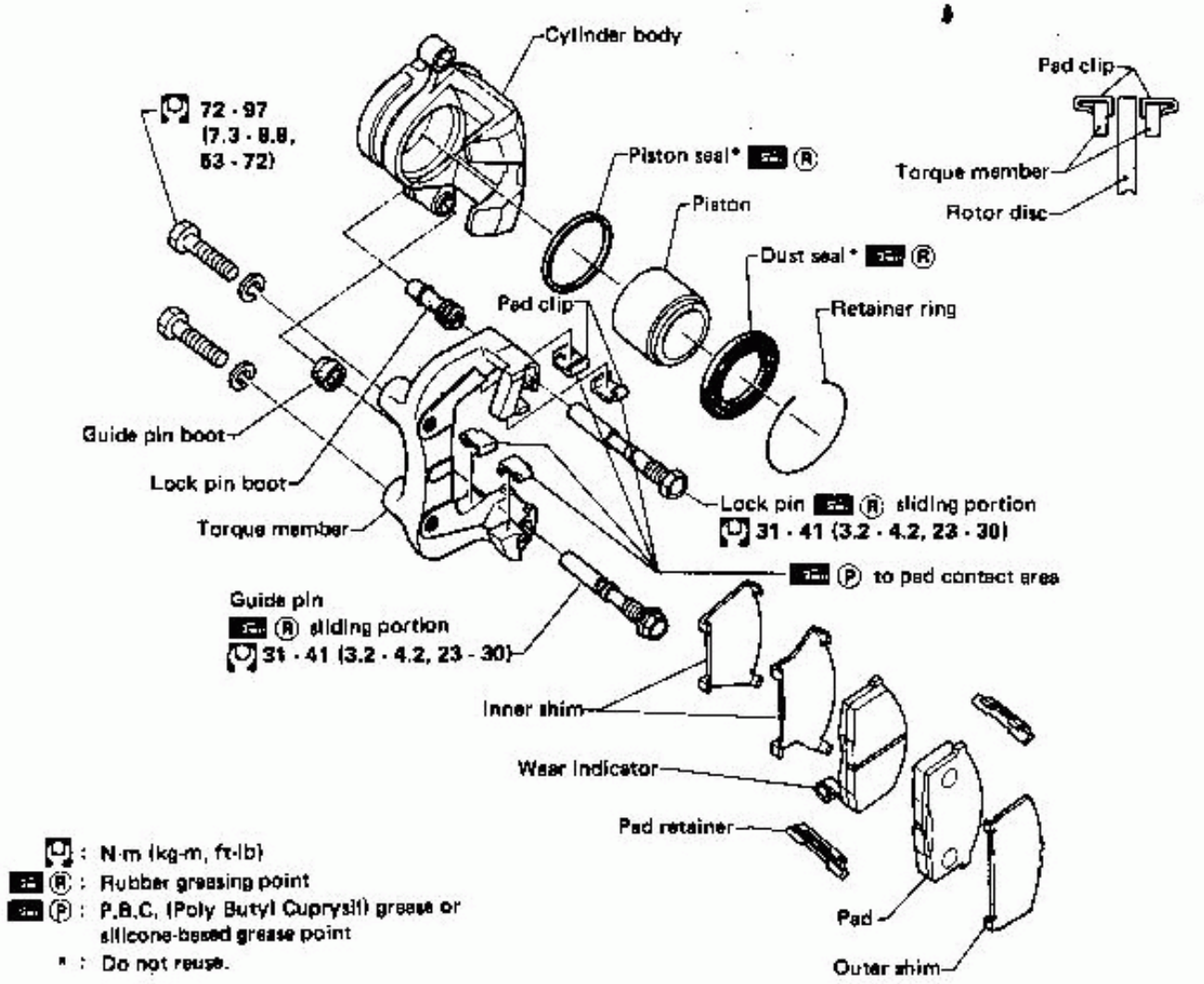
OUTPUT ROD LENGTH

Do not adjust output rod length.



SBR426

FRONT DISC BRAKE (AD22V)—Caliper

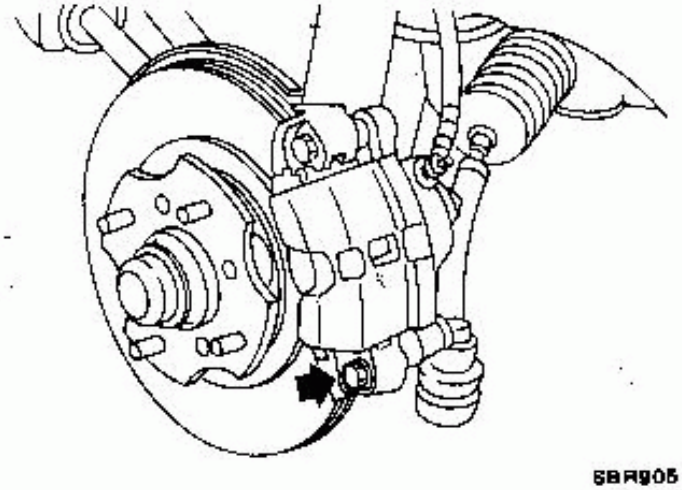


SBR040A

Pad Replacement

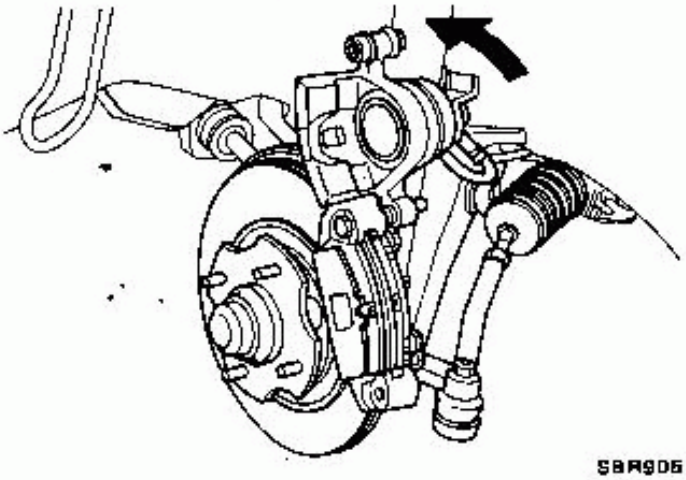
CAUTION:
When cylinder body is open, do not depress brake pedal, or piston will pop out.

1. Remove guide pin.



SBR905

2. Open cylinder body upward. Then removed pad retainer, and inner and outer shims.



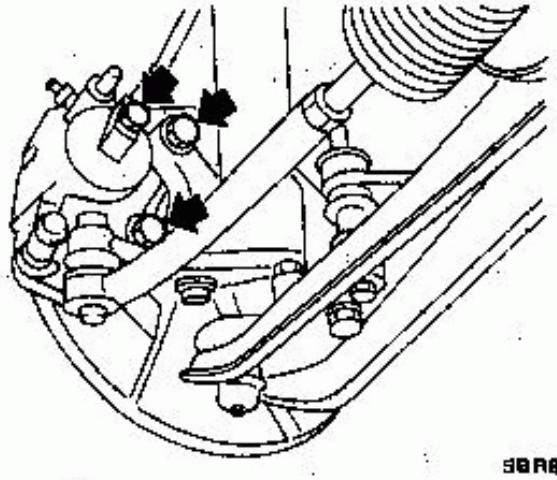
SBR906

Be careful not to damage piston boot or get oil on rotor. Always replace shims in replacing pads.

FRONT DISC BRAKE (AD22V)—Caliper

Removal and Installation

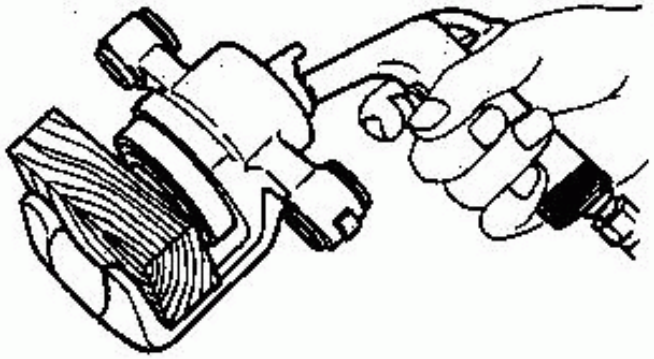
Remove torque member fixing bolts and brake hose connector.



SBR807

Disassembly

Push out piston with dust seal using compressed air.



SBR772

Inspection

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

CYLINDER BODY

- Check inside surface of cylinder 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.

PISTON

Check piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.

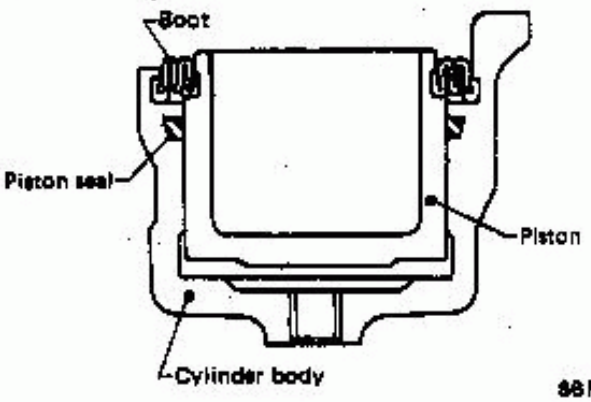
CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

PIN, PIN BOLT, RETAINER BOOT, RUBBER BUSHING, RETAINER BUSHING, AND PIN BOOT

Check for wear, cracks or other damage. Replace if any of the above conditions are observed.

Assembly

- With dust seal fitted to piston, insert dust seal into groove on cylinder body and install piston.
- Properly secure dust seal.
- Pay attention to piston seal direction.



SBR674

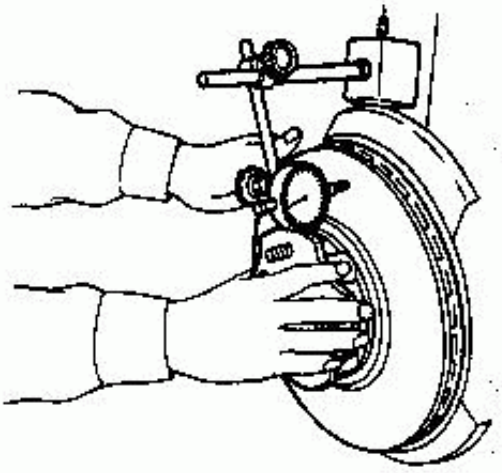
Inspection

RUBBING SURFACE

Check rotor for roughness, cracks or chips.

RUNOUT

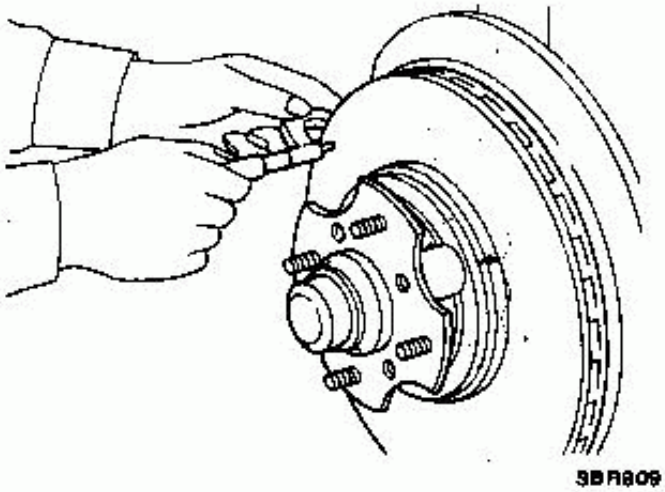
Make sure axle shaft has no axial end play. Then check runout with a dial gauge.



SBR909

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

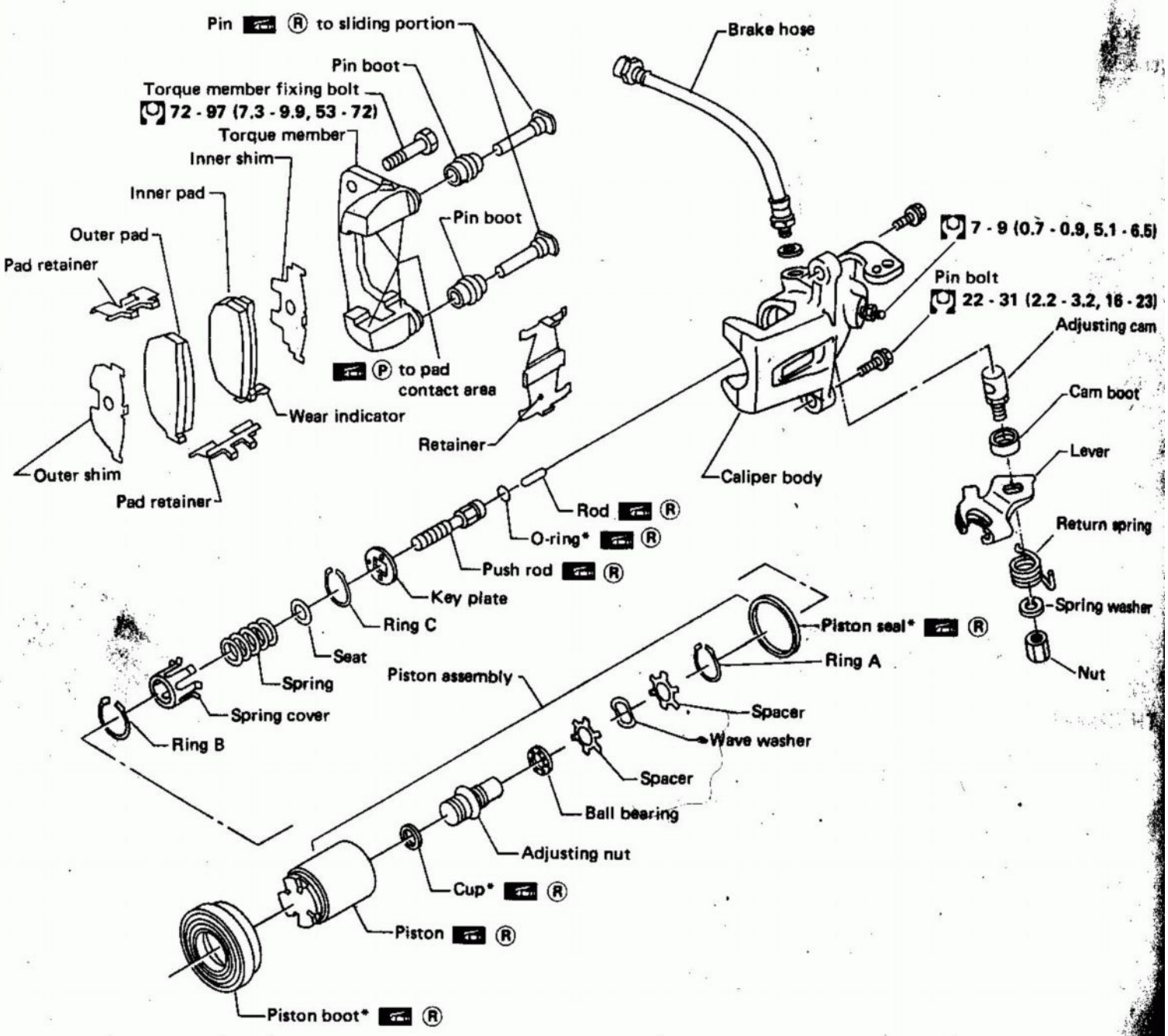
THICKNESS



SBR909

Rotor repair limit:
Minimum thickness
16.0 mm (0.630 in)

REAR DISC BRAKE (CL11H)—Caliper



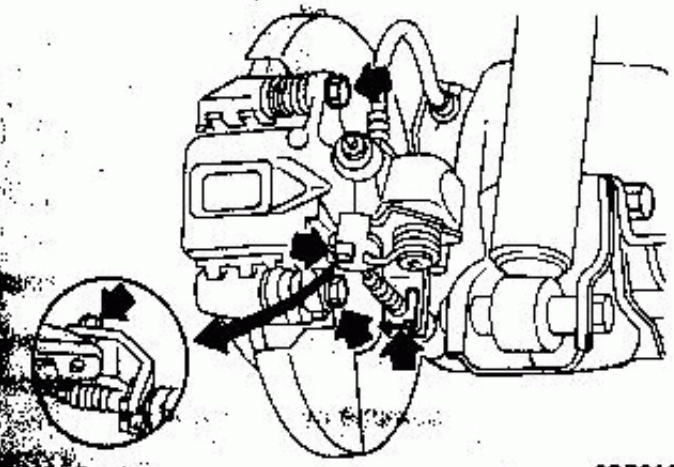
: N·m (kg-m, ft-lb)
Ⓟ : P.B.C. (Poly Butyl Cuprysil) grease or silicon-based grease points
Ⓡ : Rubber grease points
* : Alwaysreplace at each disassembled.

SBR147A

Pad Replacement

CAUTION:
When cylinder body is open, do not depress brake pedal, or piston will pop out.

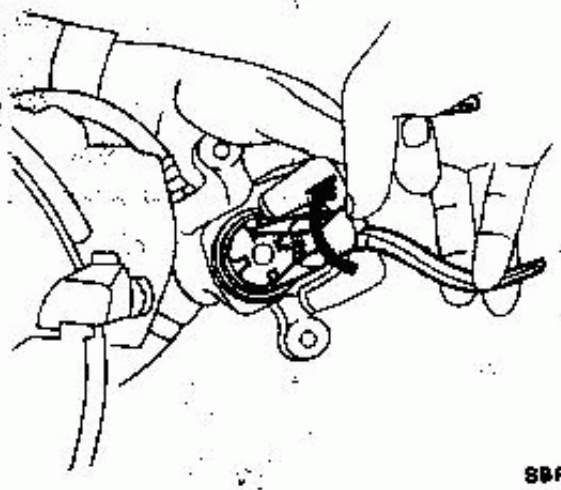
- Remove parking cable stay fixing bolt, pin bolts and lock spring. Then remove pad retainers, pads and shims.



SBR910

- When installing pads, retract piston into cylinder body by turning it clockwise.

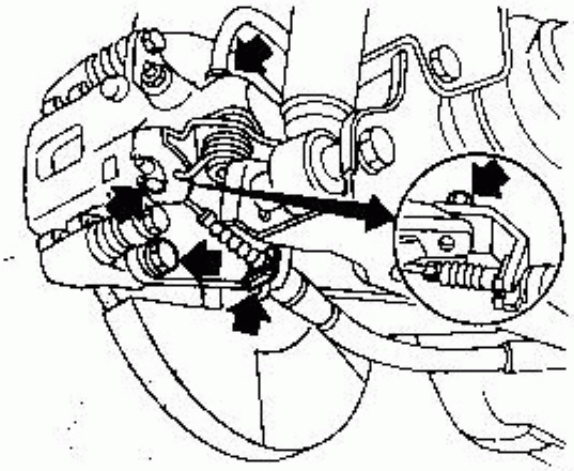
Be careful not to damage piston boot or get oil on rotor.
Always replace shims when replacing pads.



SBR941

Removal and Installation

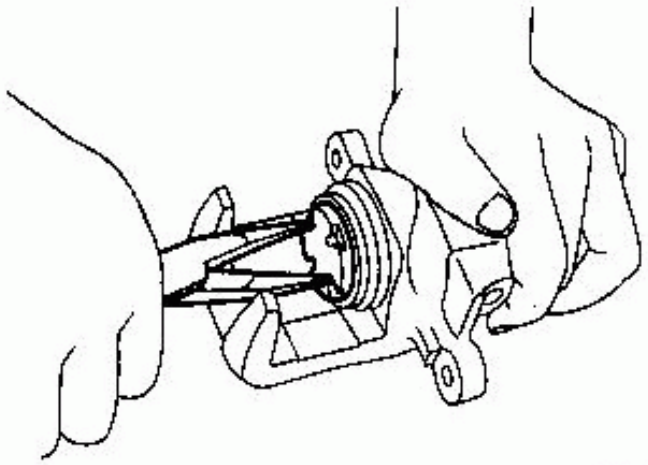
Disconnect parking brake cable and brake hose, then remove caliper assembly.



SBR911

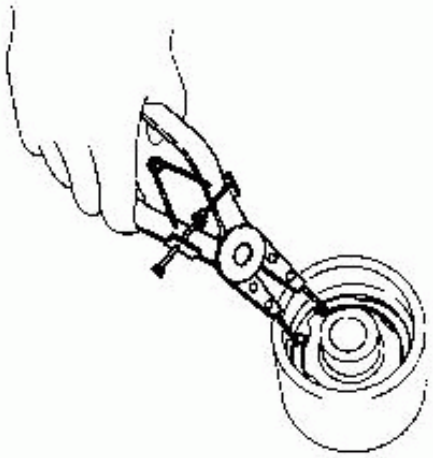
Disassembly

1. Remove piston by turning it counterclockwise with suitable long nose pliers.



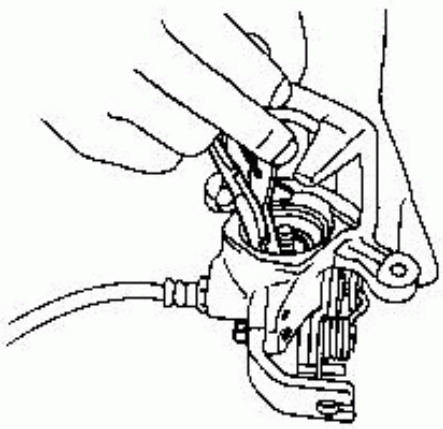
SBR646

2. Pry off ring A from piston with suitable pliers and remove adjusting nut.



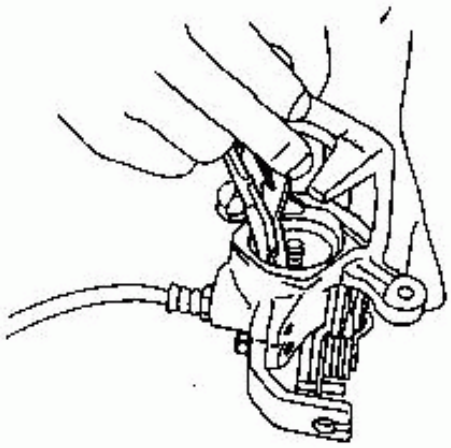
SBR889

3. Disassemble cylinder body.
- Pry off ring B with suitable pliers, then remove spring cover, spring and seat.



SBR148A

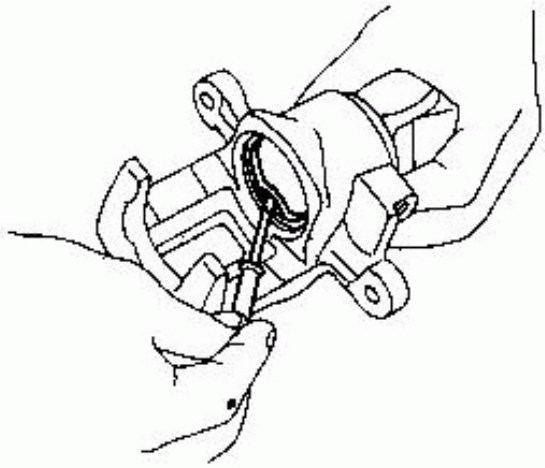
- Pry off ring C, then remove key plate, push rod and rod.



SBR891

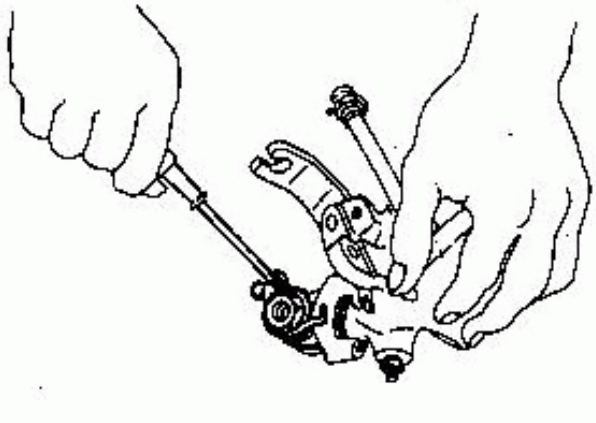
- Remove piston seal.

Be careful not to damage cylinder body.



SBR656

4. Remove return spring and lever.



SBR149A

Inspection

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

CYLINDER BODY

- Check inside surface of cylinder 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.

TORQUE MEMBER

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

PISTON

Check piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.

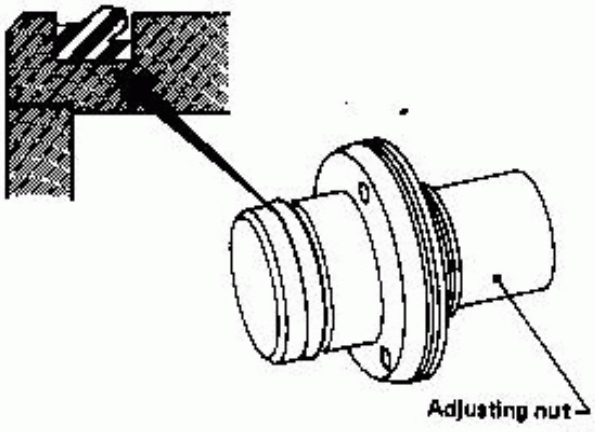
CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface.

PIN AND PIN BOOT

Check for wear, cracks or other damage. Replace if any of the above conditions are observed.

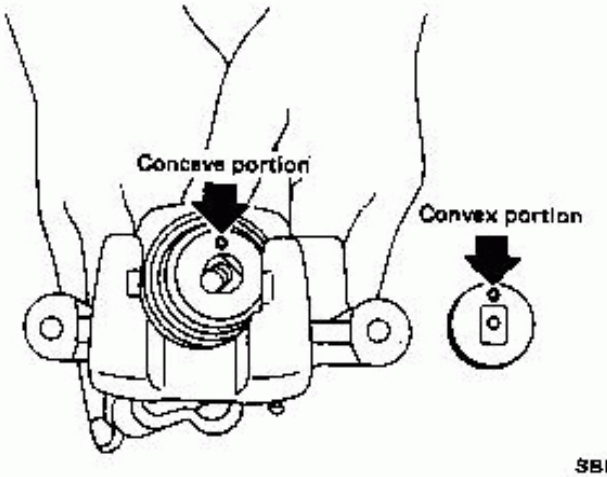
Assembly

- Install cup securely in the specified direction.



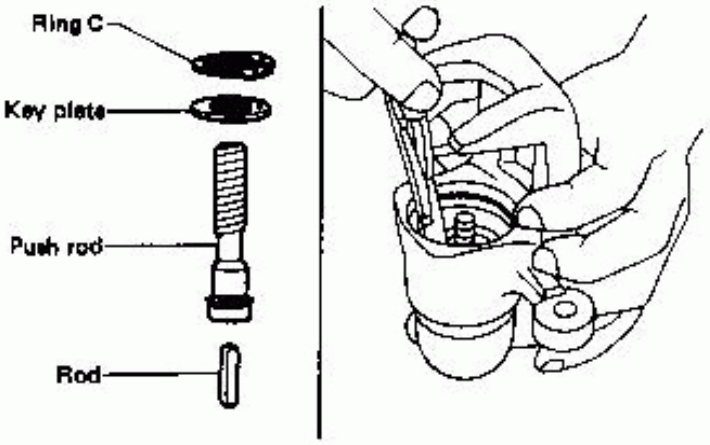
SBR892

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



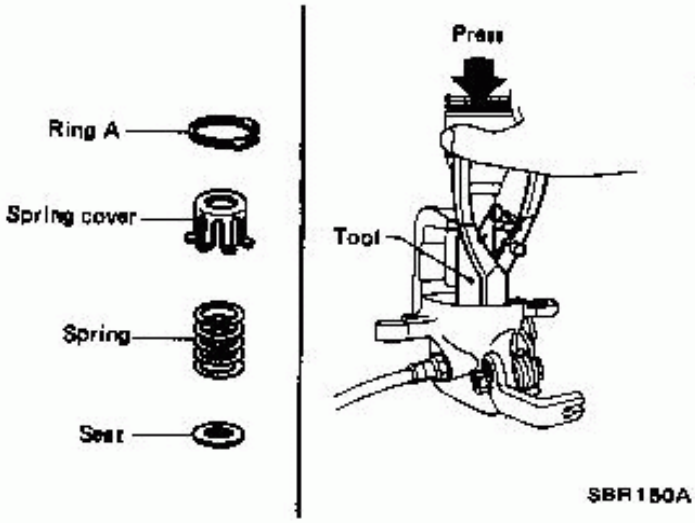
SBR642

- Install ring C with suitable tool.



SBR878

- Install seat, spring, spring cover and ring B with suitable press and drift.



SBR150A

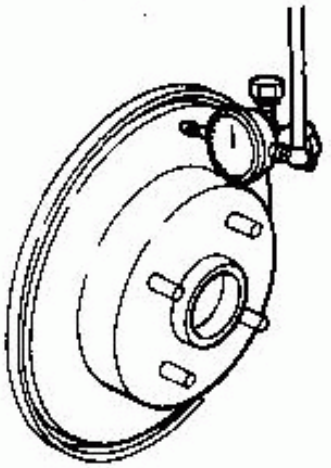
Inspection

RUBBING SURFACE

Check rotor for roughness, cracks or chips. Repair or replace if necessary.

RUNOUT

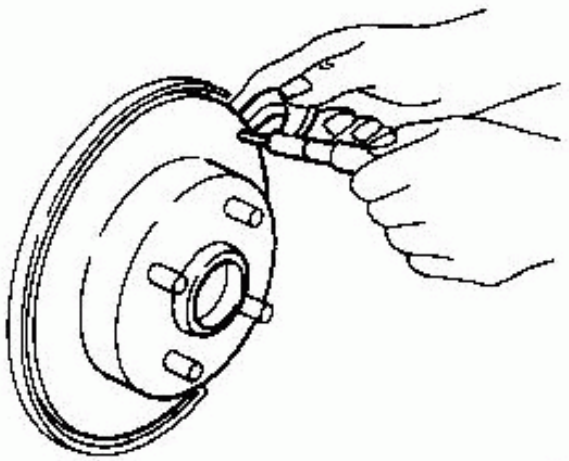
Make sure that axial end play is within the specifications before measuring. Refer to section RA.
Then check runout with a dial gauge.



SBR845

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

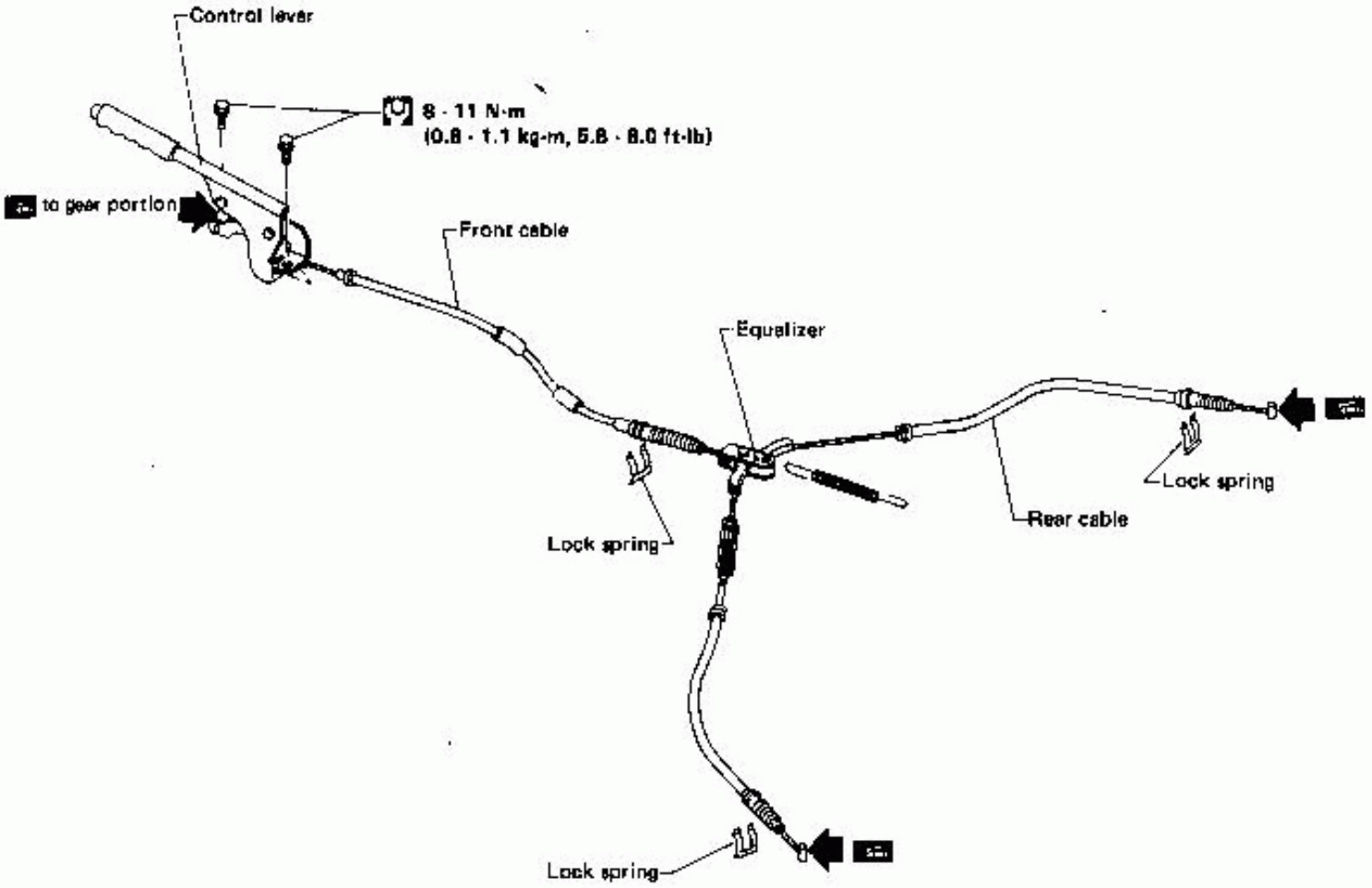
THICKNESS



SBR847

Rotor repair limit:
Minimum thickness
9.0 mm (0.354 in)

I.R.S. model



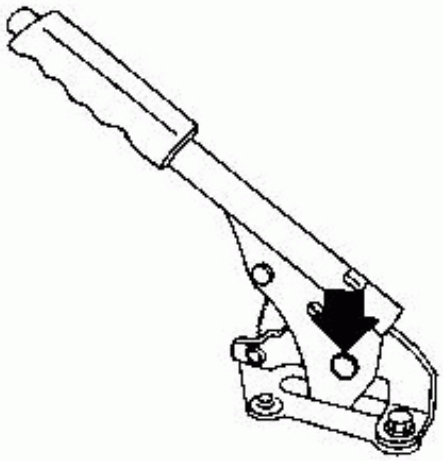
SBR912

PARKING BRAKE

Removal

If necessary, separate cable from parking brake lever by breaking pin.

Front cable, clevis pin and cotter pin are available as service parts.



SBR914

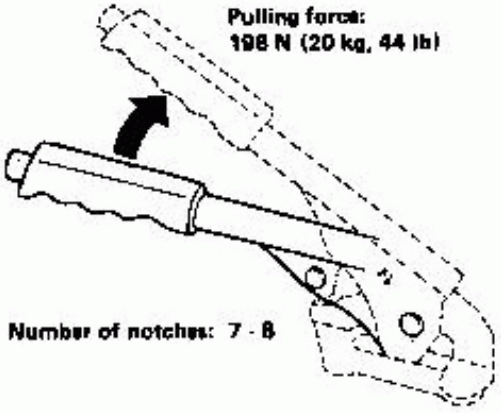
Inspection

1. Check control lever for wear or other damage. Replace if necessary.
2. Check wires for discontinuity or deterioration. Replace if necessary.
3. Check warning lamp and switch. Replace if necessary.
4. Check parts at each connecting portion and, if found deformed or damaged, replace.

Adjustment

STROKE

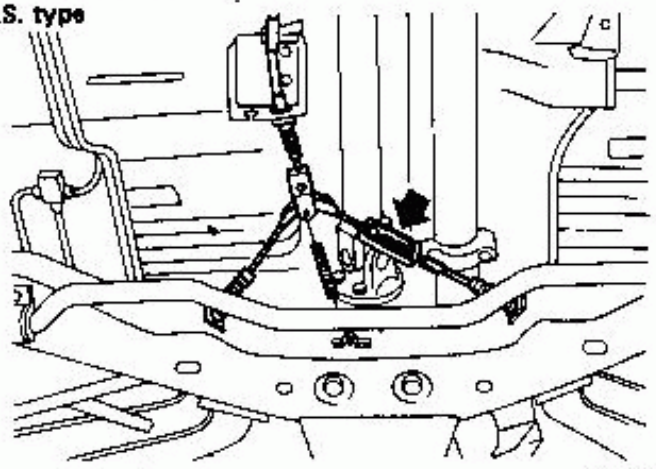
- Pull lever with specified amount of force. Check lever stroke and smooth operation.



SBR915

- Adjust lever stroke.

I.R.S. type



SBR916

WARNING LAMP SWITCH

Bend parking brake warning lamp switch plate so that brake warning light comes on when ratchet at parking brake lever is pulled one or two notches and goes out when fully released.

General Specifications

Front brake Brake model	AD22V
Pad Width x thickness x length mm (in)	43 x 10 x 105 (1.69 x 0.39 x 4.13)
Rotor outer diameter mm (in)	250 (9.84)
Caliper inner diameter mm (in)	54 (2.13)
Rear brake Brake model	CL11H
Pad Width x thickness x length mm (in)	40 x 8.0 x 75 (1.57 x 0.315 x 2.95)
Rotor outer diameter mm (in)	258 (10.16)
Caliper inner diameter mm (in)	38.18 (1.5031)
Master cylinder Inner diameter mm (in)	23.81 (15/16)
Brake booster Model	G23-M23
Diaphragm diameter mm (in)	230 (9.06)
Control valve Model	Proportioning valve (within master cylinder)
Split point kPa (kg/cm^2, psi)	3,432 (35, 498)
Reducing ratio	0.4
Recommended brake fluid	DOT 3

Inspection and Adjustment

BRAKE PEDAL

Pedal ratio	3.8
Free height mm (in)	M/T 185 - 195 (7.28 - 7.68) A/T 187 - 197 (7.36 - 7.76)
Depressed height [Under force of 490 N (50 kg, 110 lb) with engine running] mm (in)	101 (3.98) or more
Clearance between pedal stopper and threaded end of stop lamp switch mm (in)	0.3 - 1.0 (0.012 - 0.039)
Clearance between pedal stopper and threaded end of A.S.C.D. switch mm (in)	
Pedal free play mm (in)	1 - 3 (0.04 - 0.12)

PARKING BRAKE

Type	Center lever type
Number of notches when warning lamp switch comes on	1 or 2
Number of notches [When pulled under force of 196 N (20kg, 44 lb)]	7 - 8

CHECK VALVE

Maximum vacuum leakage [15 seconds after 66.7 kPa (500 mmHg, 19.69 inHg) is applied.] kPa (mmHg, inHg)	1.3 (10, 0.39)

BRAKE BOOSTER

Maximum vacuum leakage (15 seconds after engine is stopped) kPa (mmHg, inHg)	3.3 (25, 0.98)
Input rod length mm (in)	145 (5.71)

Inspection and Adjustment (Cont'd)

DISC BRAKE

	Front brake	Rear brake
Brake model	AD22V	CL11H
Pad repair limit Minimum thickness mm (in)	2 (0.08)	
Rotor repair limit Maximum runout mm (in)	0.07 (0.0028)	
Minimum thickness mm (in)	16.0 (0.630)	9.0 (0.354)

Tightening Torque

Item	N·m	kg-m	ft-lb
Brake pedal			
Pedal bracket to body	8 - 11	0.8 - 1.1	5.8 - 8.0
Pedal bracket to pedal	8 - 11	0.8 - 1.1	5.8 - 8.0
Stop lamp switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Brake booster			
Brake booster to body	8 - 11	0.8 - 1.1	5.8 - 8.0
Input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
Brake booster to master cylinder	8 - 11	0.8 - 1.1	5.8 - 8.0
Three-way connector			
Three-way connector to brake tube	15 - 18	1.5 - 1.8	11 - 13
Three-way connector mounting bolt			
I.R.S.	3.1 - 4.3	0.32 - 0.44	2.3 - 3.2
4-link	8 - 11	0.8 - 1.1	5.8 - 8.0
Brake hose connector	17 - 20	1.7 - 2.0	12 - 14
Brake tube flare nut	15 - 18	1.5 - 1.8	11 - 13
Wheel cylinder air bleeder	7 - 9	0.7 - 0.9	5.1 - 6.5
Front disc brake			
Baffle plate	3.1 - 4.3	0.32 - 0.44	2.3 - 3.2
Torque member fixing bolt	72 - 97	7.3 - 9.9	53 - 72
Torque member to cylinder body (Pin bolt)	31 - 41	3.2 - 4.2	23 - 30
Disc rotor to wheel hub	49 - 69	5.0 - 7.0	36 - 51
Rear disc brake			
Baffle plate	3.1 - 4.3	0.32 - 0.44	2.3 - 3.2
Torque member fixing bolt	38 - 52	3.9 - 5.3	28 - 38
Torque member to cylinder body (Pin bolt)	22 - 31	2.2 - 3.2	16 - 23
Parking brake			
Control lever to body	8 - 11	0.8 - 1.1	5.8 - 8.0
Adjuster lock nut	3.1 - 4.3	0.32 - 0.44	2.3 - 3.2
Front & rear cable clamp to body	3.1 - 4.3	0.32 - 0.44	2.3 - 3.2

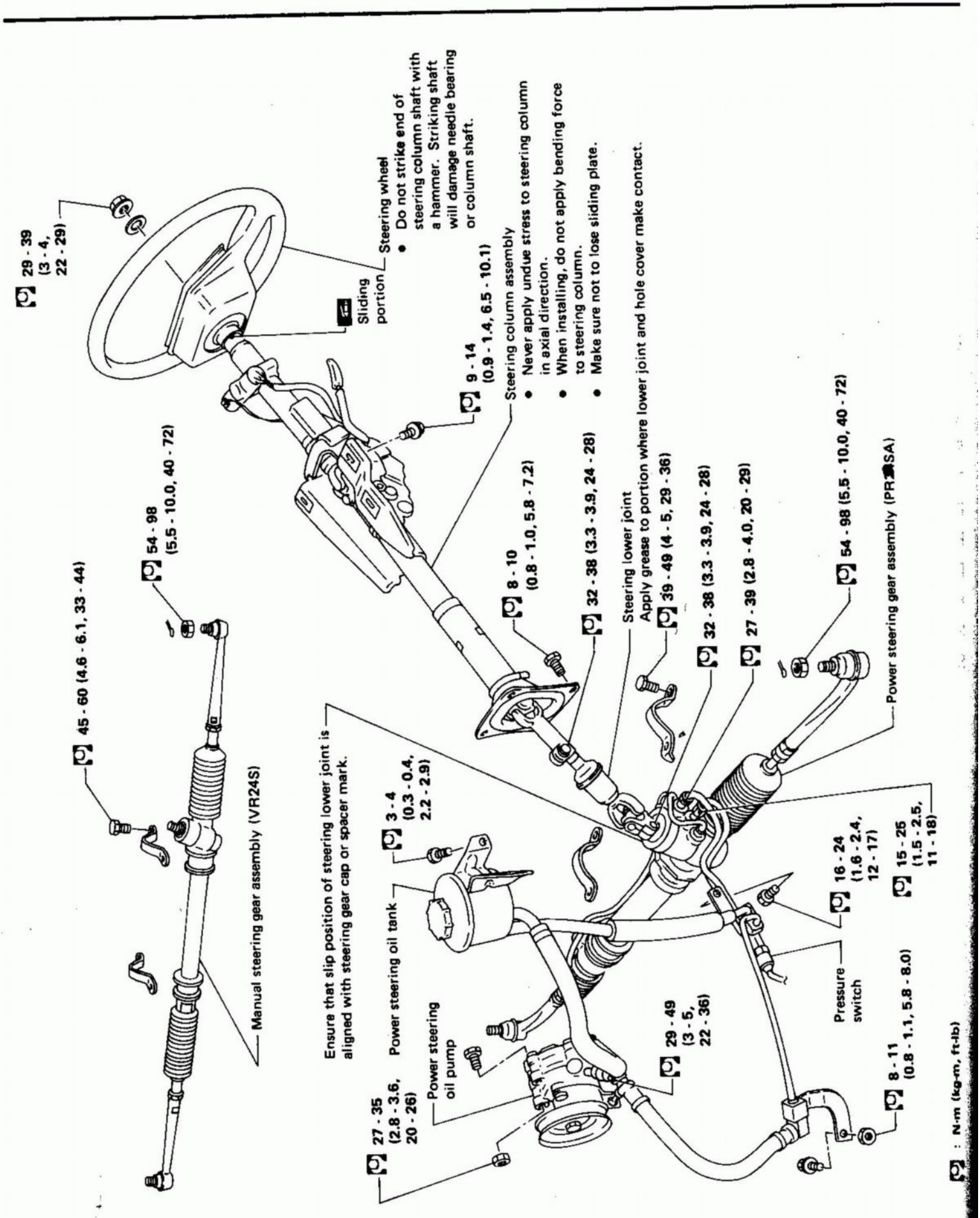
SPECIAL SERVICE TOOL

Tool number (Kent-Moore No.)	Tool name
GG94310000 (–)	Flare nut torque wrench 

STEERING SYSTEM

SECTION ST

CONTENTS

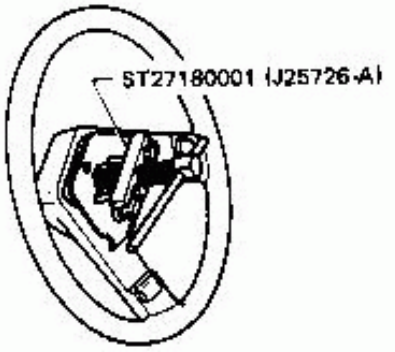

29 - 39 (3 - 4, 22 - 29)
Steering wheel
• Do not strike end of steering column shaft with a hammer. Striking shaft will damage needle bearing or column shaft.
Sliding portion
9 - 14 (0.9 - 1.4, 6.5 - 10.1)
Steering column assembly
• Never apply undue stress to steering column in axial direction.
• When installing, do not apply bending force to steering column.
• Make sure not to lose sliding plate.
54 - 98 (5.5 - 10.0, 40 - 72)
45 - 60 (4.6 - 6.1, 33 - 44)
Manual steering gear assembly (VR24S)
8 - 10 (0.8 - 1.0, 5.8 - 7.2)
32 - 38 (3.3 - 3.9, 24 - 28)
Steering lower joint
Apply grease to portion where lower joint and hole cover make contact.
39 - 49 (4 - 5, 29 - 36)
32 - 38 (3.3 - 3.9, 24 - 28)
27 - 39 (2.8 - 4.0, 20 - 29)
54 - 98 (5.5 - 10.0, 40 - 72)
Power steering gear assembly (PR2[illegible]SA)
Ensure that slip position of steering lower joint is aligned with steering gear cap or spacer mark.
3 - 4 (0.3 - 0.4, 2.2 - 2.9)
Power steering oil tank
Power steering oil pump
27 - 35 (2.8 - 3.6, 20 - 26)
29 - 49 (3 - 5, 22 - 36)
16 - 24 (1.6 - 2.4, 12 - 17)
15 - 25 (1.5 - 2.5, 11 - 18)
Pressure switch
8 - 11 (0.8 - 1.1, 5.8 - 8.0)
: N·m (kg-m, ft-lb)
SST276

STEERING WHEEL, LOCK AND LOWER JOINT

Removal and Installation

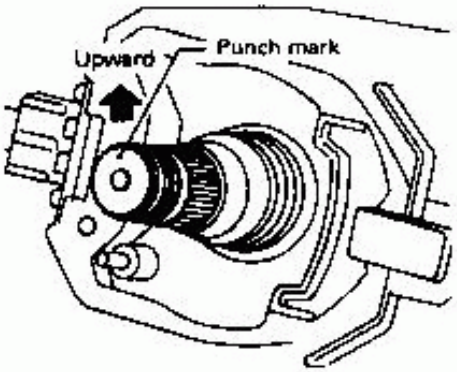
STEERING WHEEL

Remove steering wheel using Tool.



SST068

- Install steering wheel on column shaft in a straight-ahead position.

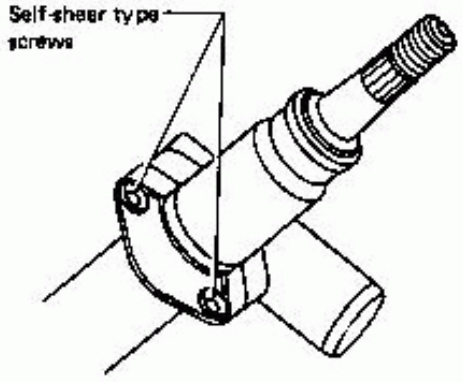


SST070

- After installing, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal.

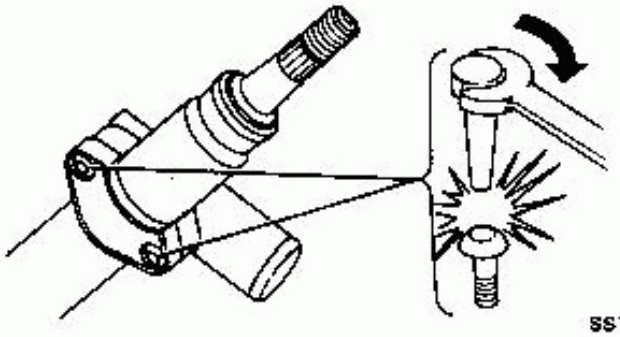
STEERING LOCK

Break self-shear type screws with a drill or other appropriate tool.



SST705A

Install self-shear type screws and then cut off self-shear type screw heads.

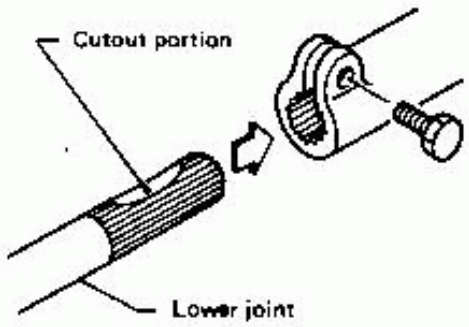


SST706A

STEERING LOWER JOINT

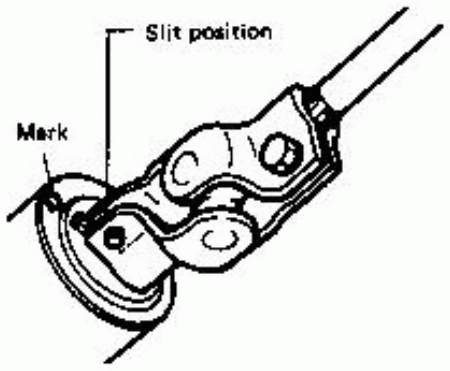
Remove hole cover if necessary.

- When fitting, be sure tightening bolt faces cutout portion perfectly.

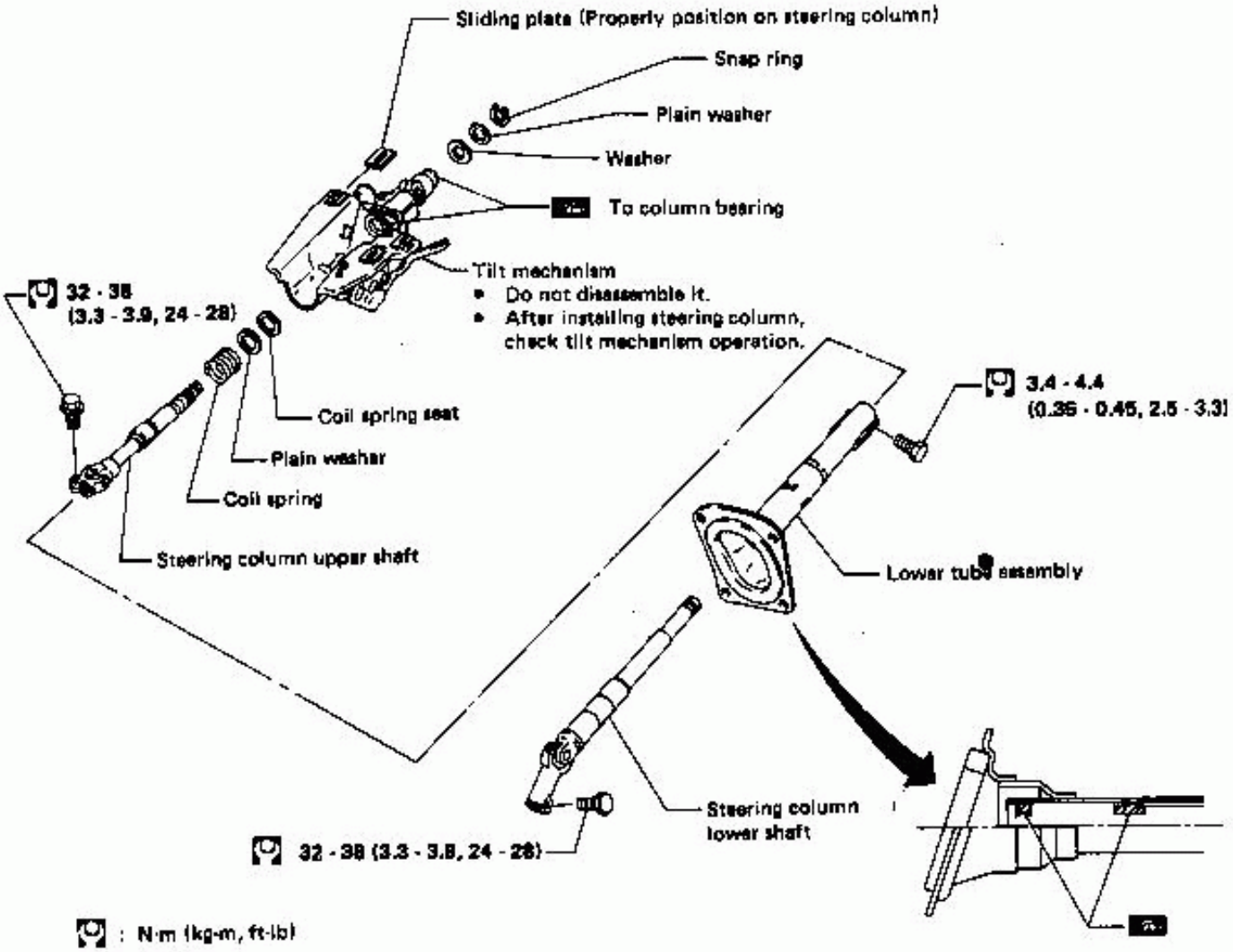


SST840

Ensure that slit position of steering lower joint is aligned with steering gear cap or spacer mark.



SST841


Sliding plate (Properly position on steering column)
Snap ring
Plain washer
Washer
To column bearing
Tilt mechanism
• Do not disassemble it.
• After installing steering column, check tilt mechanism operation.
32 - 38 (3.3 - 3.9, 24 - 28)
Coil spring seat
Plain washer
Coil spring
Steering column upper shaft
3.4 - 4.4 (0.35 - 0.45, 2.5 - 3.3)
Lower tube assembly
Steering column lower shaft
32 - 38 (3.3 - 3.9, 24 - 28)
: N·m (kg-m, ft-lb)
SST277A

Installation

- Finger tighten all lower bracket and clamp retaining bolts; then retighten them securely. Make sure that undue stress is not applied to steering column.

Inspection

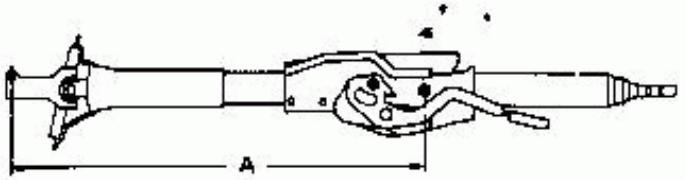
- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.

(1) Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column assembly, if necessary.

(2) Check jacket tube for deformation or breakage. Replace if necessary.

- When the vehicle is involved in a light collision, check dimension "A". If it is not within specifications, replace steering column as an assembly.

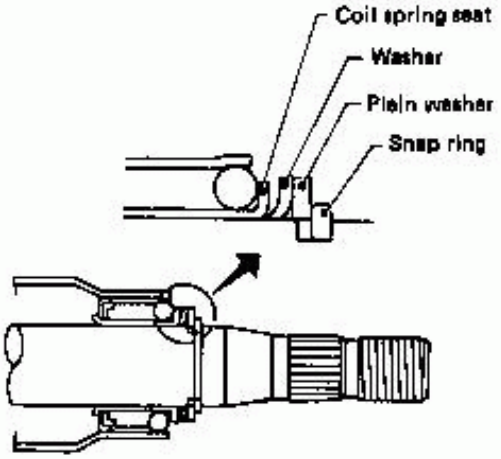
Column length "A":
516.2 - 517.8 mm
(20.32 - 20.39 in)



SST278A

Disassembly and Assembly

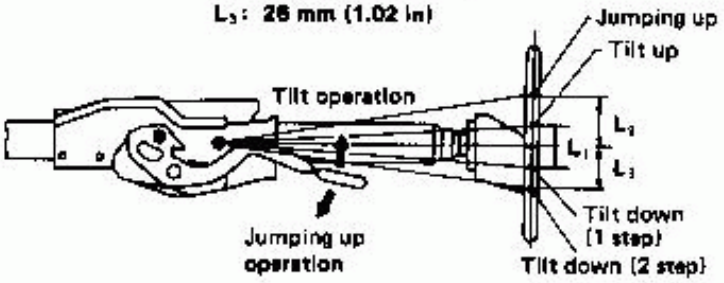
- When disassembling and assembling, unlock steering lock with key.
- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.



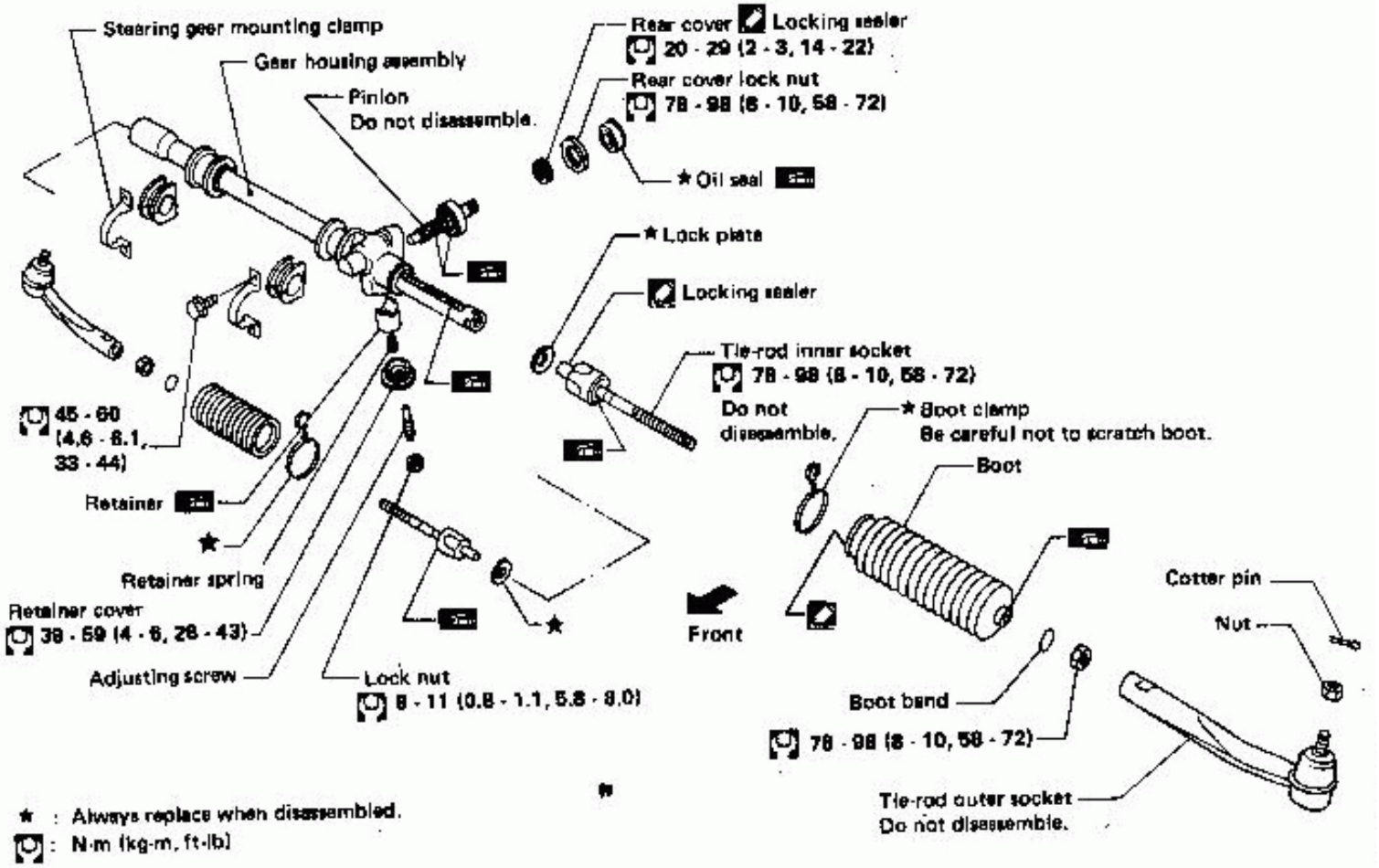
SST514A

- After installing steering column, check tilt mechanism operation.

L_1: 13 mm (0.51 in)
L_2: 32.5 mm (1.280 in)
L_3: 26 mm (1.02 in)



SST280A

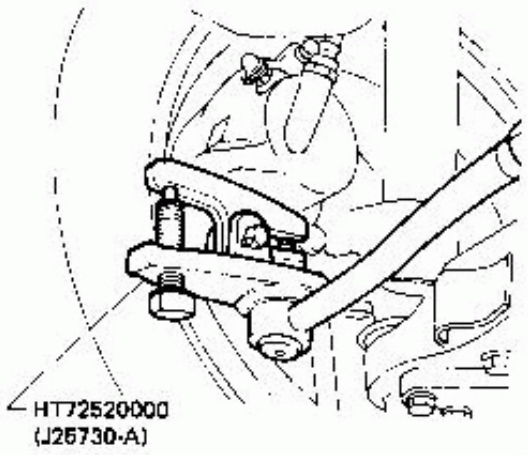


★ : Always replace when disassembled.
: N·m (kg-m, ft-lb)

SST515A

Removal and Installation

Detach tie-rod ball studs from knuckle arms with Tool.

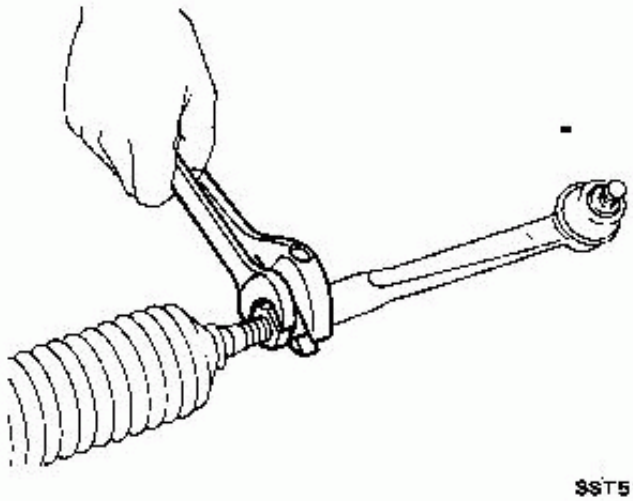


SST516A

After properly installing steering gear, check wheel alignment. Refer to section MA.

Disassembly

Disconnect tie-rod inner socket.



SST517A

Inspection

RACK

Thoroughly examine rack gear. If rack gear is damaged, cracked or worn, replace.

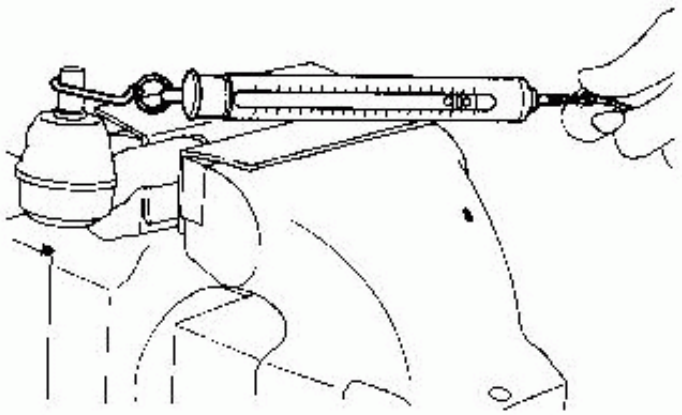
PINION ASSEMBLY

1. Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace.
2. Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers and races. Replace if necessary.

TIE-ROD OUTER SOCKET

1. Check ball joint for swinging torque.

Tie-rod outer ball joint:
Swinging torque
0.15 - 2.9 N·m
(1.5 - 30 kg-cm, 1.3 - 26.0 in-lb)



SST130A

2. Check condition of dust cover. If it is cracked excessively, replace socket.

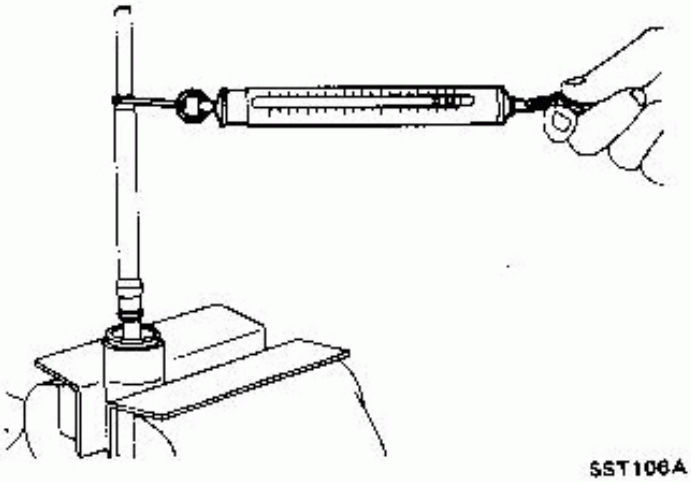
TIE-ROD INNER SOCKET

Check ball joint for swinging torque and play. If ball stud is worn and play in axial direction is excessive or joint is hard to swing, replace as a complete unit.

Tie-rod inner ball joint:
Swinging torque
0.1 - 7.8 N·m
(1 - 80 kg-cm, 0.9 - 69.4 in-lb)

Inspection (Cont'd)

Axial play
0 mm (0 in)



SST106A

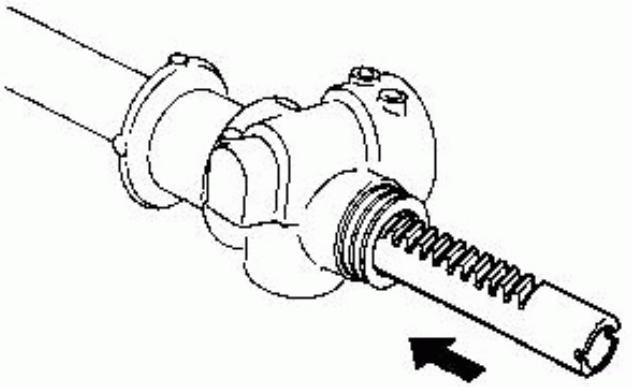
BOOT

Check condition of boot. If it is cracked excessively, replace boot.

Assembly and Adjustment

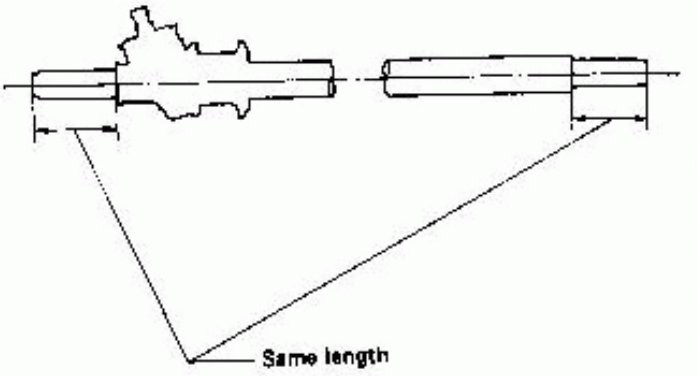
STEERING GEAR

1. Insert rack gear from gear housing side.



SST518A

2. Set rack gear in neutral position.



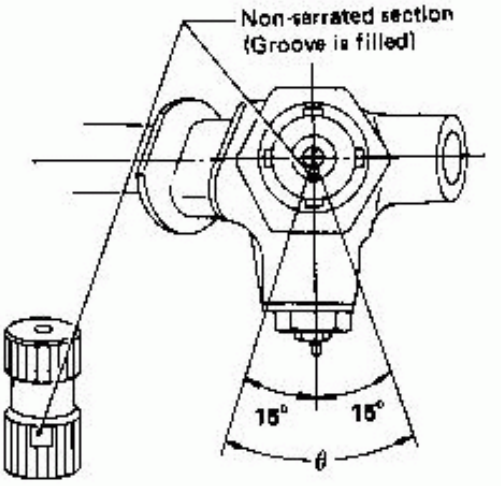
SST519A

3. On models equipped with variable gears, engage rack and pinion as outlined below.

- The non-serrated section of pinion should be within angle θ, as shown in the figure below, when rack is set to Neutral.

  Standard angle θ: 0° ± 15°

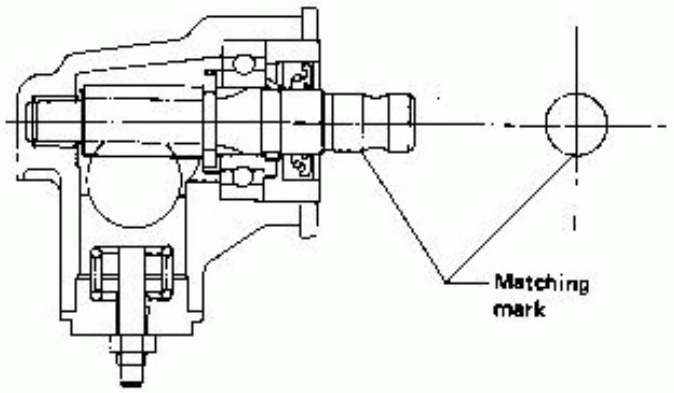
  If angle θ is not within specifications, reengage pinion.



SST520A

Assembly and Adjustment (Cont'd)

On the R24S model, insert pinion assembly with the punch mark situated as shown in figure below. Pinion rack gear should be held in place.

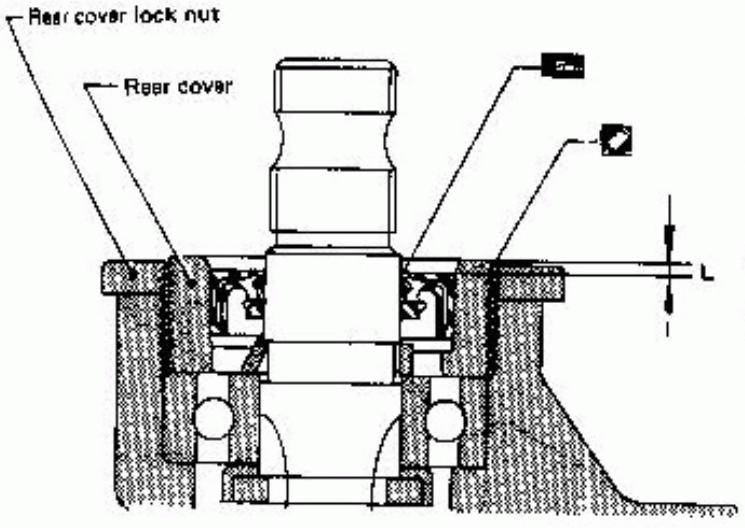


SST521A

4. Install rear cover using Tool and secure with lock nut.

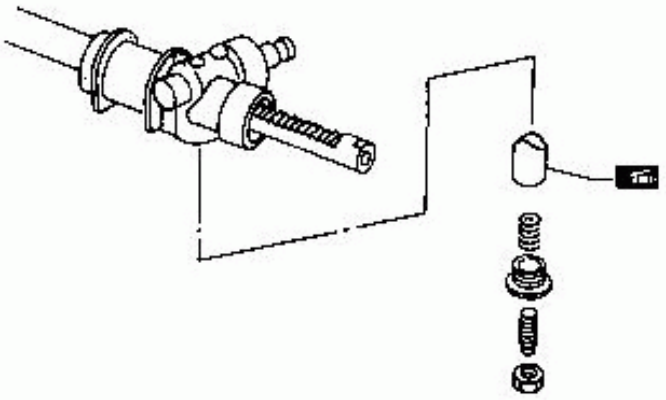
   Tool number: KV48102000 (J28822)

- **Before installing rear cover, apply locking sealer to threaded areas. Do not allow sealer to get into pinion bearing.**
- **Apply a coat of multi-purpose grease to sealing lips of dust seal.**
  Always install dust seal so that dimension "L" is 1.5±0.3 mm (0.059±0.012 in).



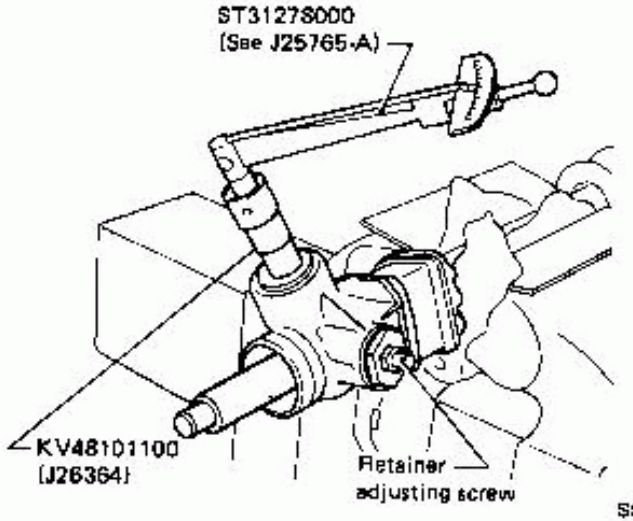
SST247A

5. Insert retainer and spring. Then, install retainer cover.



SST522A

6. Adjust pinion rotating torque as follows.
1) Set gears to Neutral position.
2) Loosen lock nut.
3) Tighten adjusting screw one or two times to a torque of 4.9 N·m (50 kg-cm, 43 in-lb).
4) Loosen adjusting screw and retighten it to a torque of 0.2 N·m (2 kg-cm, 1.7 in-lb).
5) Rotate pinion to move rack back and forth two times, and return it to Neutral position.
6) Slowly rotate the pinion and measure rotating torque ±360° from Neutral position.
   Find the position where the rotating torque is at its maximum.

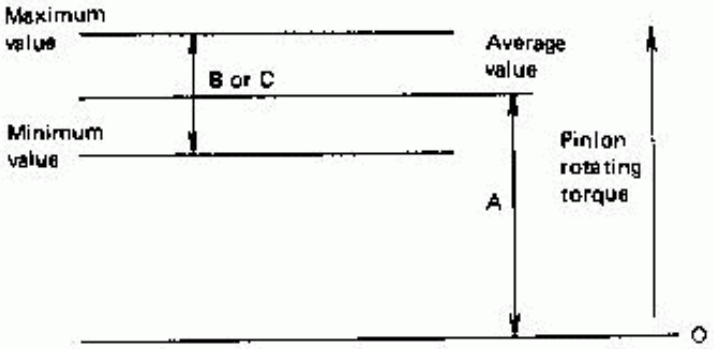


SST249A

Assembly and Adjustment (Cont'd)

7) Loosen adjusting screw at the position where the rotating torque is at its maximum.
8) Hand-tighten adjusting screw until its end touches retainer.
9) Prevent adjusting screw from rotating and tighten lock nut to specified torque holding adjusting screw in place.
10) While slowly rotating pinion ±100° from Neutral position, make sure its rotating torque is within the following range.

Average value "A" in the ±100° range from neutral position:
0.8 - 1.1 N·m
(8 - 11 kg-cm, 6.9 - 9.5 in-lb)
Max. allowable fluctuation "B" when ±100° from neutral position:
Below 0.4 N·m (4 kg-cm, 3.5 in-lb)
Max. allowable fluctuation "C" when ±500° from neutral position:
Below 0.6 N·m (6 kg-cm, 5.2 in-lb)



SST272A

11) If pinion rotating torque is not according to this specification, readjust.

If pinion's rotating torque is outside the specifications, although adjustment has been made, retainer spring should be replaced and adjustment repeated.

Retainer springs

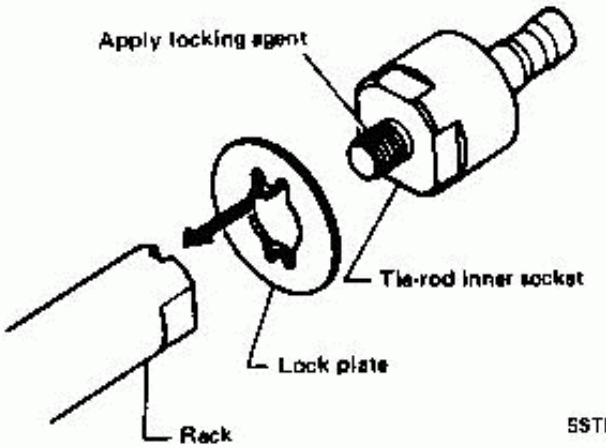
Part number	Set load N (kg, lb)	Identification (Color)
48237-W1002	343 (35, 77)	Blue
48237-01F01	392 (40, 88)	Unpainted
48237-01F02	441 (45, 99)	Green
48237-01E00	490 (50, 110)	White
48237-01E10	539 (55, 121)	Pink

1) Guide to selection of retainer spring (average value)
- **Rotating torque smaller than specified range – Use spring with larger set load.**
- **Rotating torque greater than specified range – Use spring with smaller set load.**

2) Guide to selection of retainer spring (max. fluctuation)
- **Use spring with smaller set load.**

7. Apply locking agent to threaded portion of inner socket and fit inner socket to rack end together with new lock plate.

Be sure lock plate ratchet enters groove at end portion of rack so that rack and inner socket fit snugly.

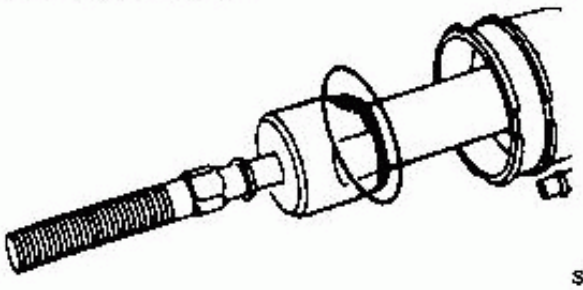


SST838

Assembly and Adjustment (Cont'd)

8. Tighten inner socket and securely bend lock plate at 2 cutout portions of inner socket.

To prevent damage to boot, remove burrs after bending lock plate.



SST435

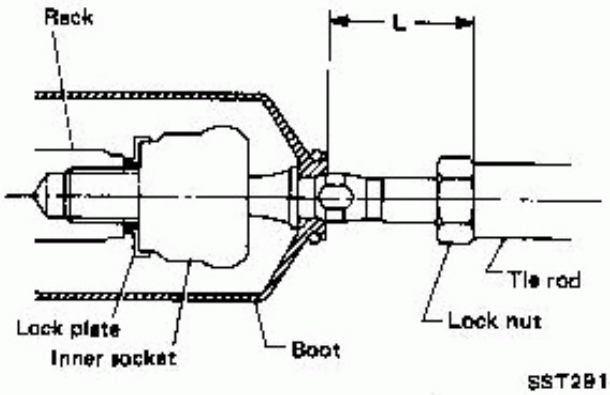
TIE-ROD AND BOOT

1. Fit boot on tie-rod inner socket.
2. Fit tie-rod inner socket to rack end together with lock nut.

• Apply locking agent to threaded portion of tie-rod.

3. Tighten lock nut.
4. Fit lock nut and outer socket to inner socket, and tighten lock nut with tie-rod length that has been set to the length specified.

Tie-rod length "L":
Refer to S.D.S.

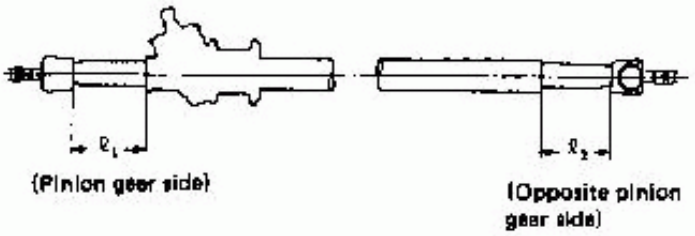


SST291A

• When installing tie-rod or adjusting toe-in, be careful not to twist boots.
• Toe-in: Refer to MA section.

5. Measure rack stroke.

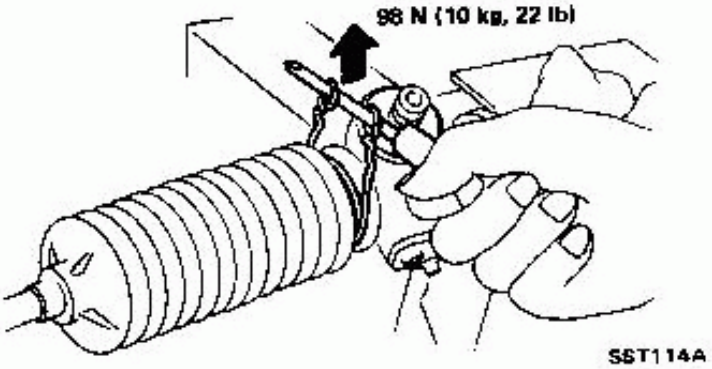
Measure length "ℓ_1 & ℓ_2":
Refer to S.D.S.



SST537A

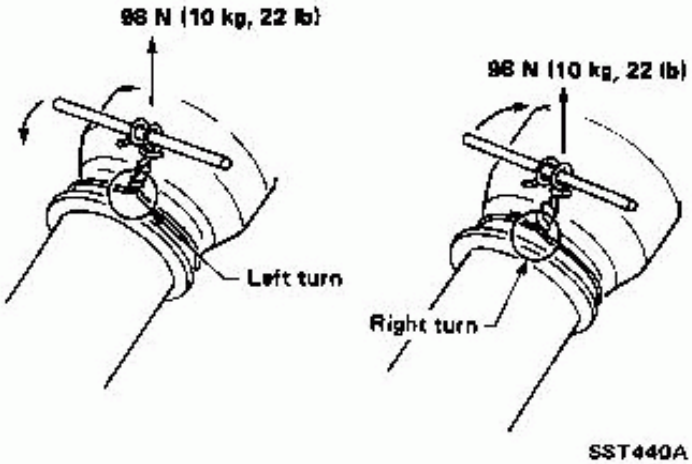
6. Install boot to gear housing.

• **Apply sealant between boot and gear housing.**



SST114A

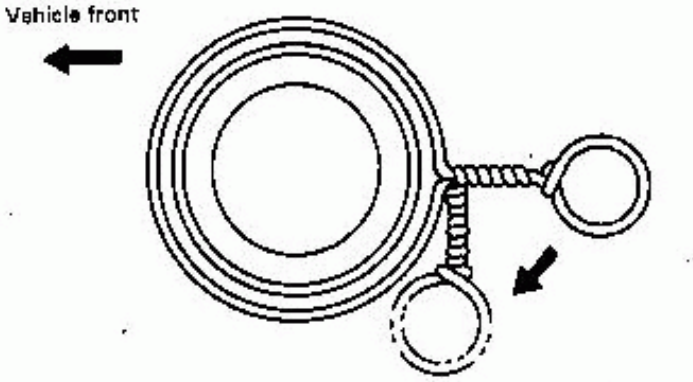
• **Twist boot clamp as shown below.**



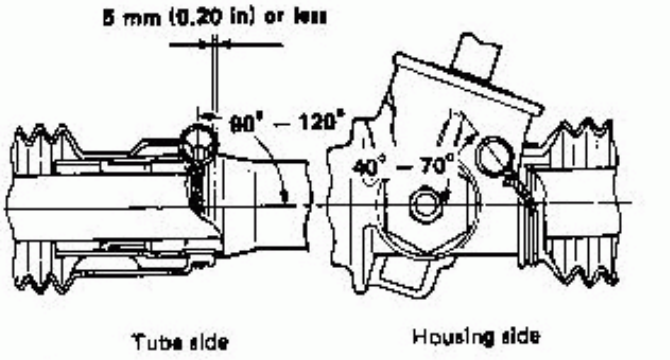
SST440A

Assembly and Adjustment (Cont'd)

- After twisting boot clamp 4 to 4.5 times, bend clamp diagonally so that cut section of wire does not touch boot.



SST282A



SST441A

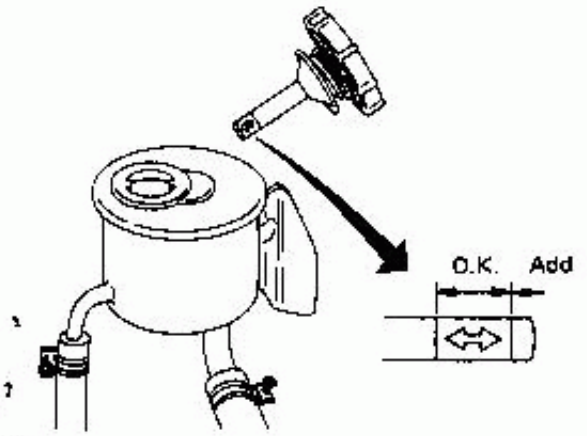
POWER STEERING SYSTEM—Checking

Fluid Level Check

Check the fluid level when the fluid is cold.

CAUTION:
Do not overfill.

Recommended fluid is Automatic Transmission Fluid "Dexron Type".
Refer to section GI for "Recommended Lubricant".



A

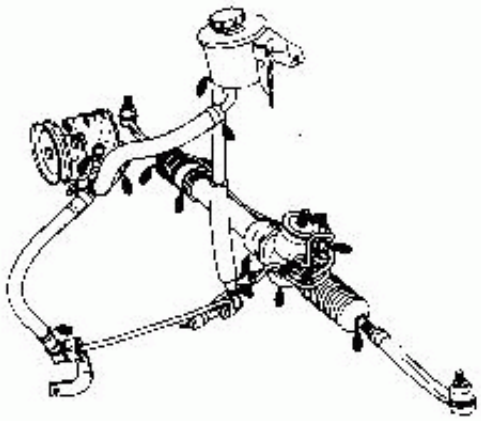
Fluid Leakage Check

1. Run engine at idle speed or 1,000 rpm.
   Make sure temperature of fluid in pump rises to 60 to 80°C (140 to 176°F).
2. Turn steering wheel right-to-left several times.
3. Hold steering wheel at each "lock" position for five seconds and carefully check for fluid leakage.

CAUTION:
Do not hold steering wheel at lock position for more than fifteen seconds at a time.

4. If fluid leakage at connectors is noticed, loosen flare nut and then retighten.

Check points



S5T284A

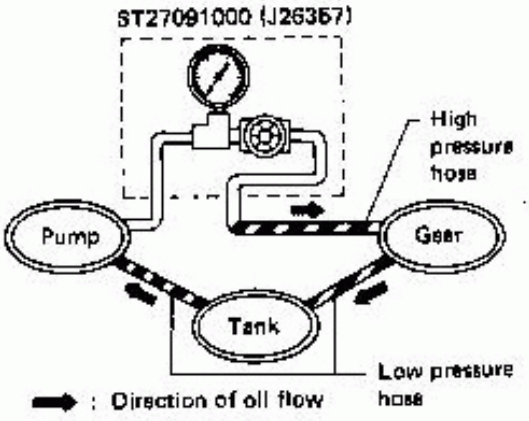
Bleeding Hydraulic System

1. Raise front end of vehicle until wheels clear ground.
2. While adding fluid, quickly turn steering wheel fully to right and left and lightly touch steering stoppers.
   Repeat steering wheel operation until fluid level no longer decreases.
3. Start engine.
   Repeat step 2 above.

Hydraulic System Check

Before starting, check belt tension, driving pulley and tire pressure.

1. Set Tool. Open shut off valve. Then bleed air. (See "Bleeding Hydraulic System".)



SST834

2. Run engine.

Make sure temperature of fluid in tank rises to 60 to 80°C (140 to 176°F).

3. Check pressure with steering wheel fully turned to left and right positions.

CAUTION:
Do not hold steering wheel at lock position for more than fifteen seconds.

Standard pressure:
6,669 - 7,257 kPa (68 - 74 kg/cm², 967 - 1,052 psi) at idling

4. If oil pressure is below the standard, slowly close shut-off valve and check pressure.

- If pressure rises to standard level, gear is damaged.
- If pressure remains below standard, pump is damaged.
  Gear may be damaged.

CAUTION:
Do not close shut-off valve for more than fifteen seconds.

5. After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.

Pressure Switch Check

1. Warm up engine.
2. Turn steering wheel fully.
3. Disconnect pressure switch connector.
4. Make sure engine idle speed decreases by 50 to 100 rpm.
   If it does not, replace pressure switch.

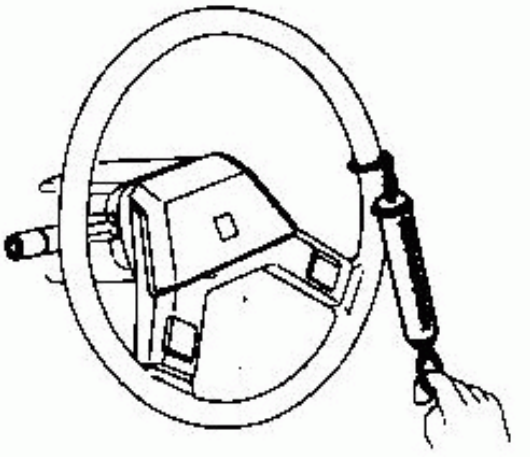
Turning Force Check

1. Park vehicle on a level, dry surface and set parking brake.
2. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F)].

- **Tires must be inflated to normal pressure.**

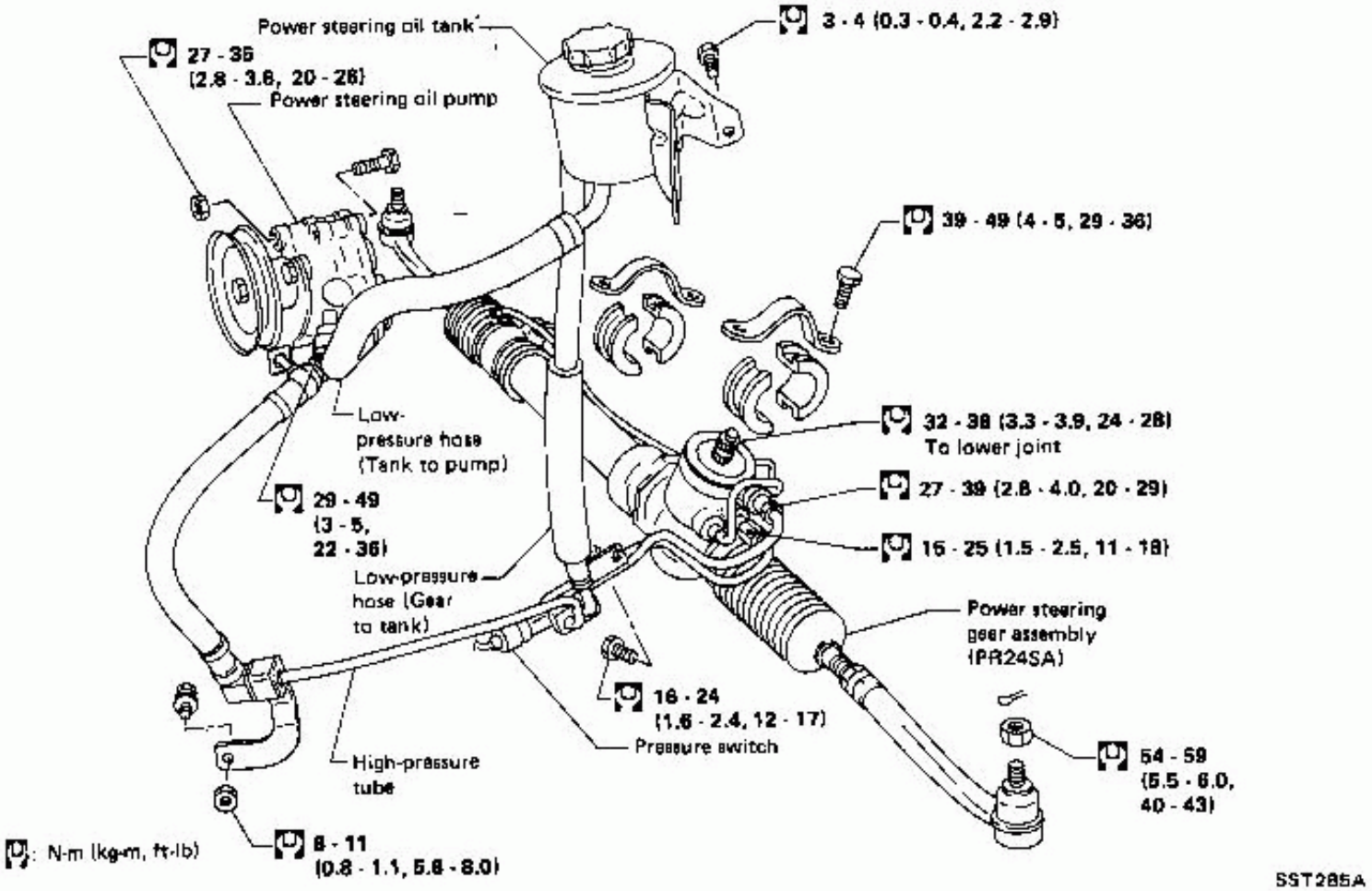
3. Check steering wheel turning force when steering wheel has been turned 360° from neutral position.

Steering wheel turning force:
Less than 39 N (4 kg, 9 lb)



SST474

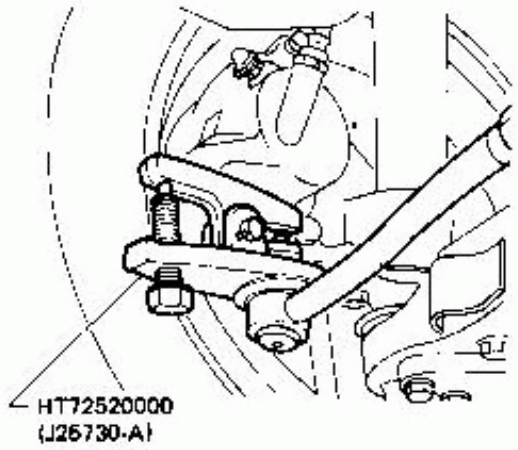
POWER STEERING SYSTEM—Removal



SST285A

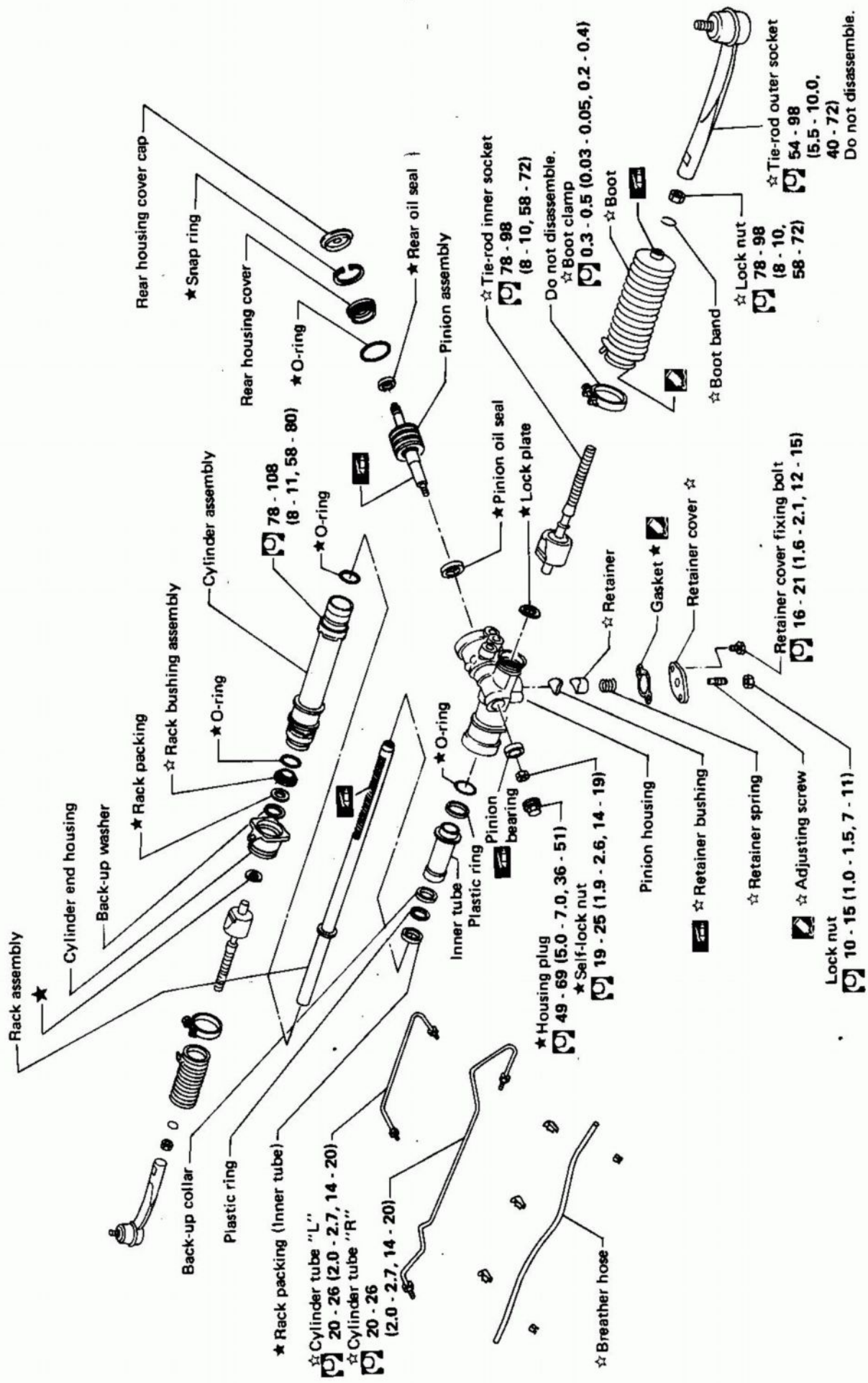
CAUTION:

- **Whenever disconnecting hydraulic lines, cover openings to prevent foreign matter from entering.**
- **Be careful not to damage flare nut.**
- Detach tie-rod ball studs from knuckle arms with Tool.



SST516A

- Remove exhaust tube fixing nut and manual transmission control linkage or automatic transmission control cable.
  If necessary, refer to sections FE, MT and AT.



☆or ★ : are available for service replacement.
★ : Always replace when disassembled.
: N·m (kg-m, ft-lb)

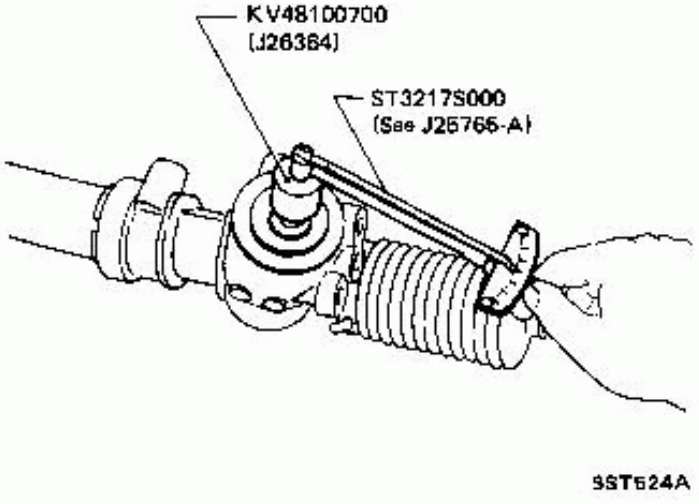
SST523A

Pre-Disassembly Inspection

Prior to disassembling, measure pinion rotating torque and rack sliding force. If they are not within specifications, adjust retainer adjusting screw.

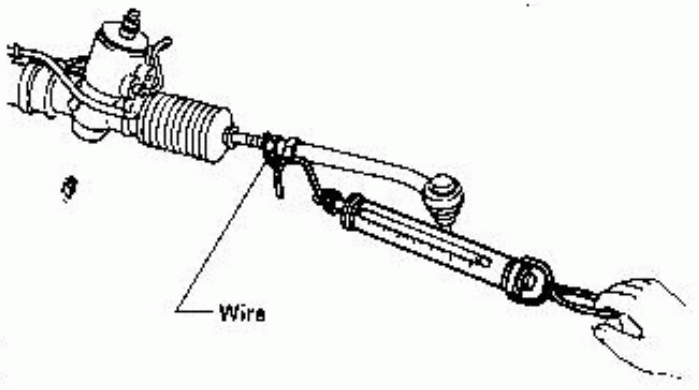
- **Before measuring, be sure to disconnect cylinder tube and drain fluid.**
- **Pinion assembly can be turned by wrapping vinyl tape around serration area of stub shaft and fitting socket wrench.**
- **Use soft jaws when holding steering gear housing. Handle it carefully as it is made of aluminum.**

PINION ROTATING TORQUE



SST624A

RACK SLIDING FORCE



SST625A

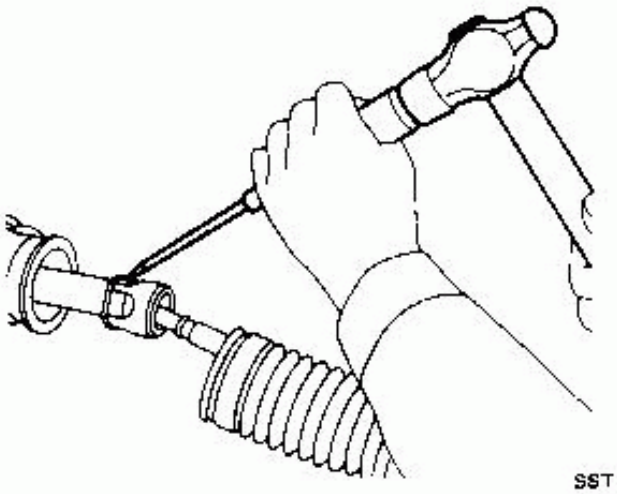
Disassembly

CAUTION:

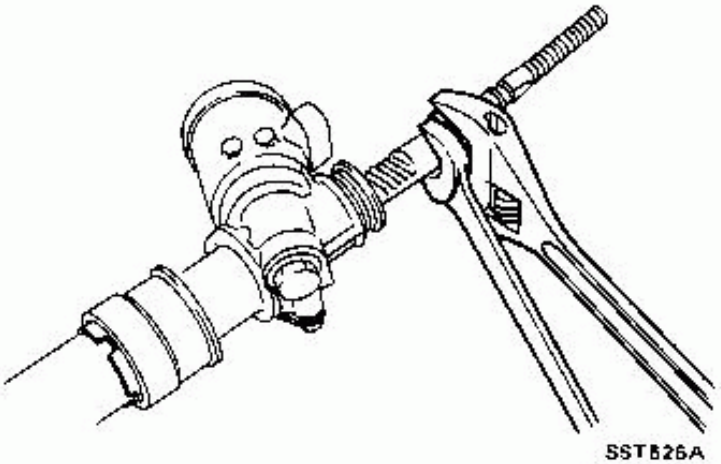
- **The parts which can be disassembled are strictly limited. Never disassemble parts other than the specified ones.**
- **Disassembly should be performed in a place as clean as possible.**
- **Hands should be cleaned before disassembly.**
- **Do not use a rag. Be sure to use nylon or paper cloth.**
- **When disassembling and reassembling, do not allow any foreign matter to enter or contact any parts of steering gear.**

1. Remove tie-rod assembly.

- Flatten lock plate.



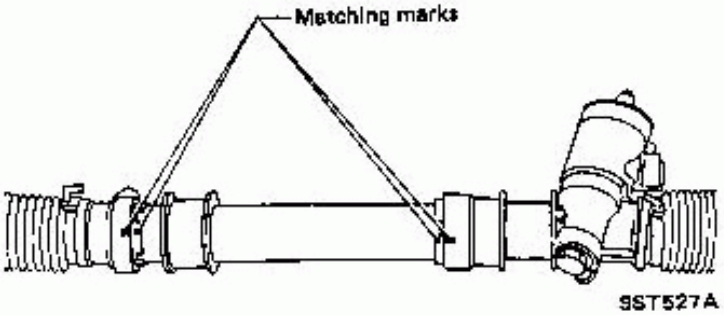
SST881



SST626A

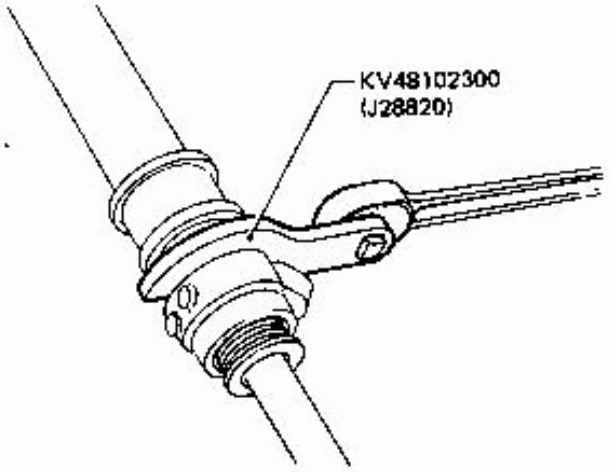
Disassembly (Cont'd)

2. Remove retainer.
3. Remove pinion assembly.
4. Remove cylinder tube "R" and "L".
5. Apply matching marks.



SST527A

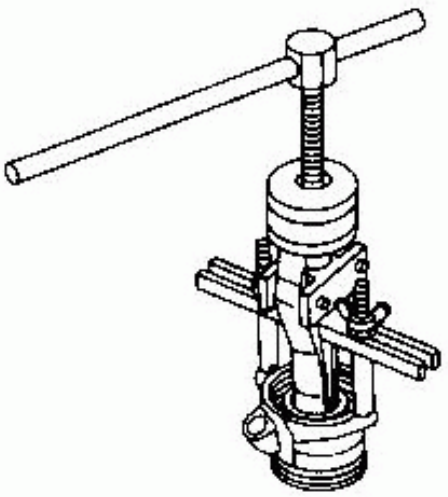
6. Remove cylinder end housing using Tool.



SST528A

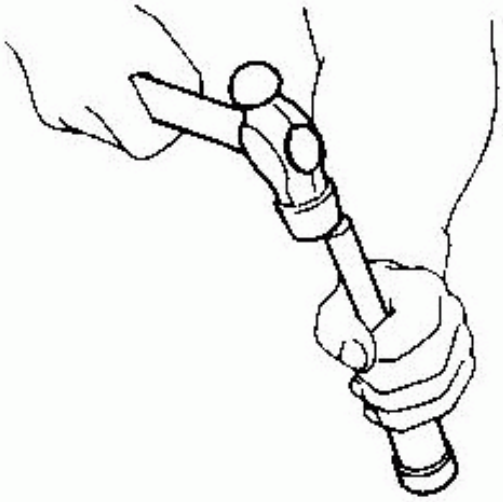
7. Disconnect cylinder lock nut using Tool and separate cylinder from pinion housing.
8. Draw out rack assembly.

9. Remove rack bushing assembly.



SST884

10. Remove rack packing and back-up collar.



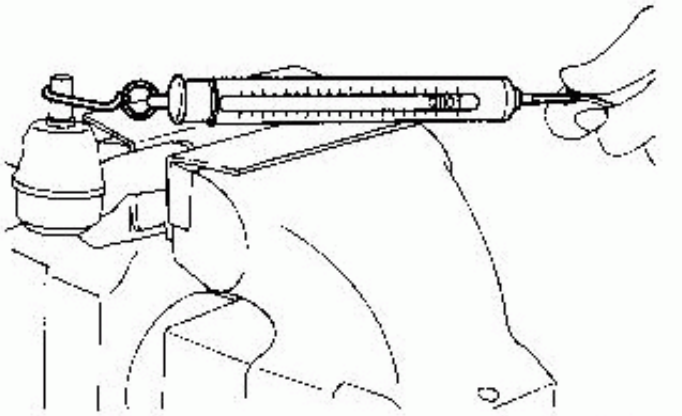
SST429

Inspection

Thoroughly clean all parts in cleaning solvent or automatic transmission fluid "Dexron Type", and blow dry with compressed air.

TIE-ROD OUTER SOCKET

1. Check ball joint for swinging torque.



SST130A

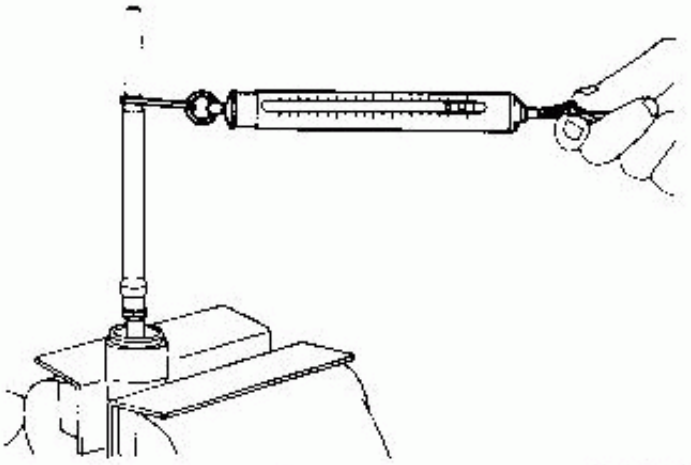
Tie-rod outer socket:
Swinging torque
0.15 - 2.94 N·m
(1.5 - 30 kg-cm, 1.3 - 26.0 in-lb)

2. Check condition of dust cover. If it is cracked, replace.

TIE-ROD INNER SOCKET

Check inner socket for swinging torque and axial end play. If ball stud is worn and play in axial direction is excessive or joint is hard to swing, replace as a complete unit.

Tie-rod inner socket:
Swinging torque
0.1 - 7.8 N·m
(1 - 80 kg-cm, 0.9 - 69.4 in-lb)
Axial play
0 mm (0 in)



SST106A

BOOT

Check condition of boot. If it is cracked, replace boot.

CYLINDER TUBES AND BREATHER HOSE

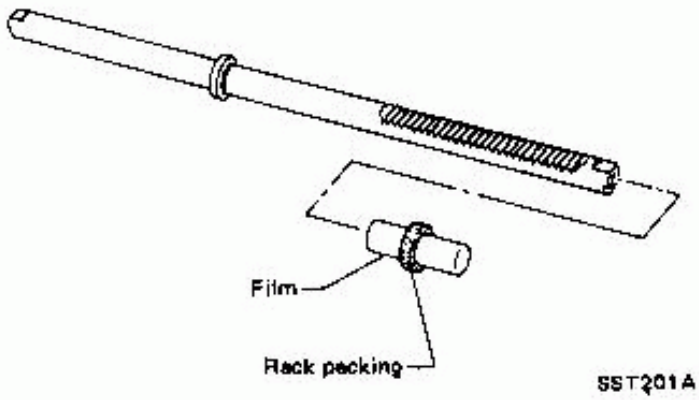
Check cylinder tubes and breather hose for scratches or other damage.
Replace if necessary.

STEERING GEAR COMPONENT PARTS

Thoroughly examine steering gear component parts. If parts are damaged, cracked or worn, replace steering gear as an assembly.

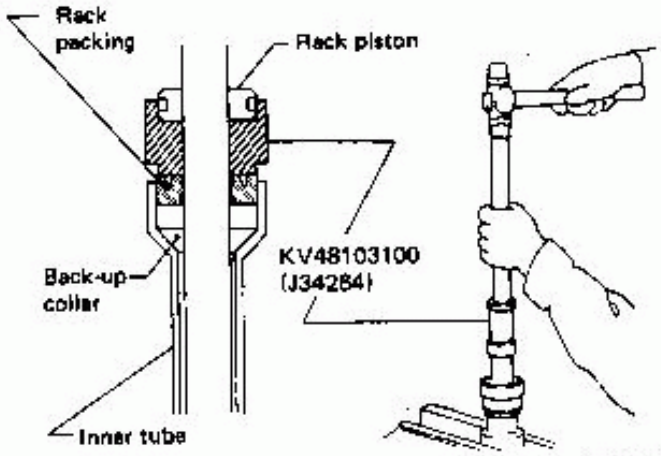
Assembly

1. Insert rack packing.
- Place plastic film on inner side of rack packing to prevent damage by rack teeth.
- Always remove plastic film after rack packing is positioned properly.



SST201A

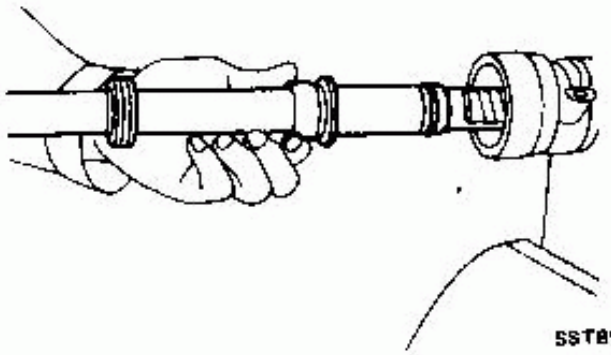
2. Attach back-up collar to inner tube.
3. Insert rack assembly into inner tube.
4. Press rack packing into inner tube.



SST202A

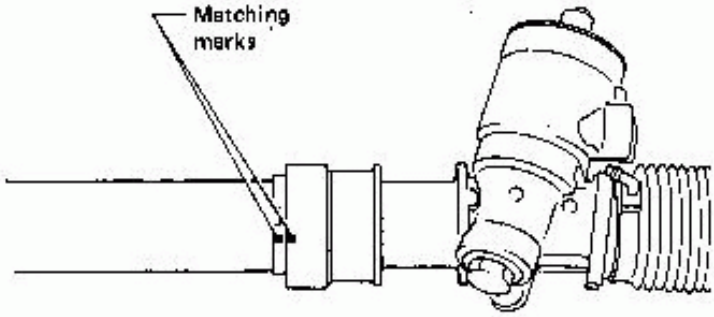
5. Insert rack assembly, then set inner tube assembly to pinion housing.

Coat rack teeth with grease.


SST894

6. Position cylinder assembly on pinion housing by aligning matching marks.

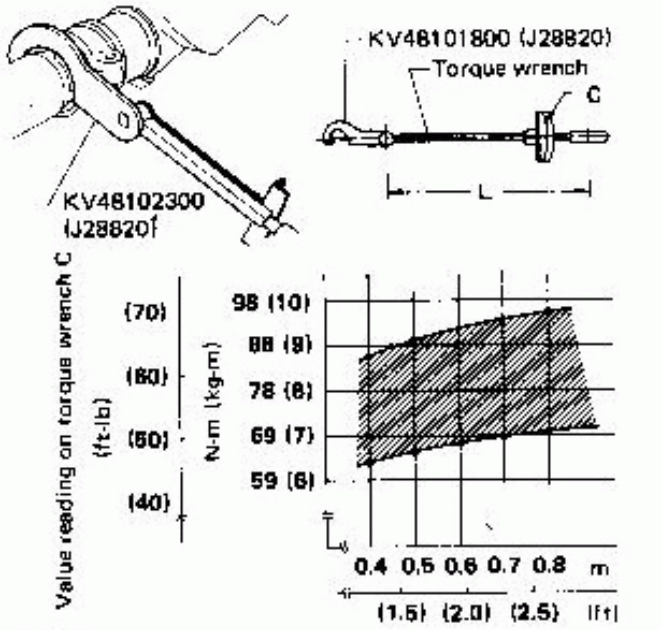
Be careful not to damage piston teflon ring.



SST529A

7. Tighten cylinder lock nut using Tool.

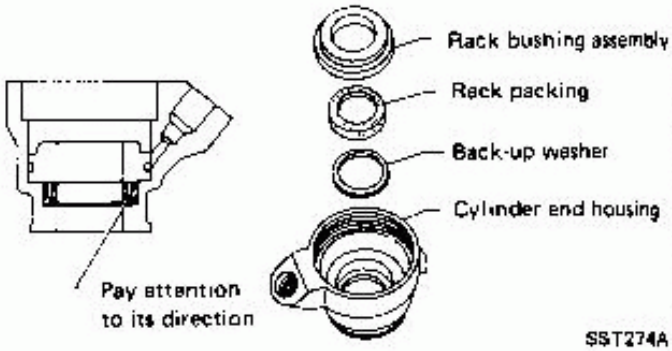
Lock nut: Without Tool
78 - 108 N·m
(8.0 - 11.0 kg-m, 58 - 80 ft-lb)



SST265A

Effective length of torque wrench L

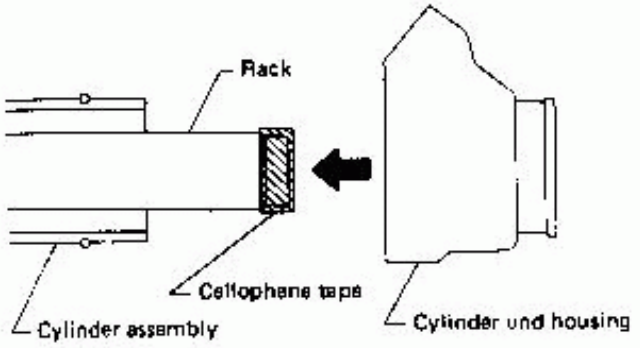
8. Install back-up washer, rack packing and rack bushing assembly to cylinder end housing.



SST274A

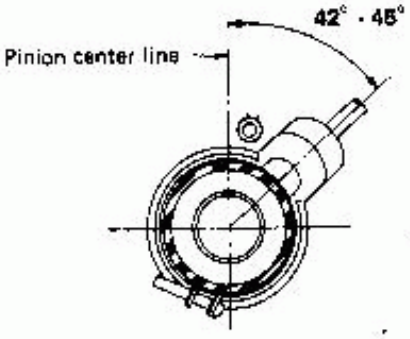
Assembly (Cont'd)

9. Wrap cellophane tape around rack end. Then position cylinder end housing on cylinder assembly by aligning matching marks.



SST275A

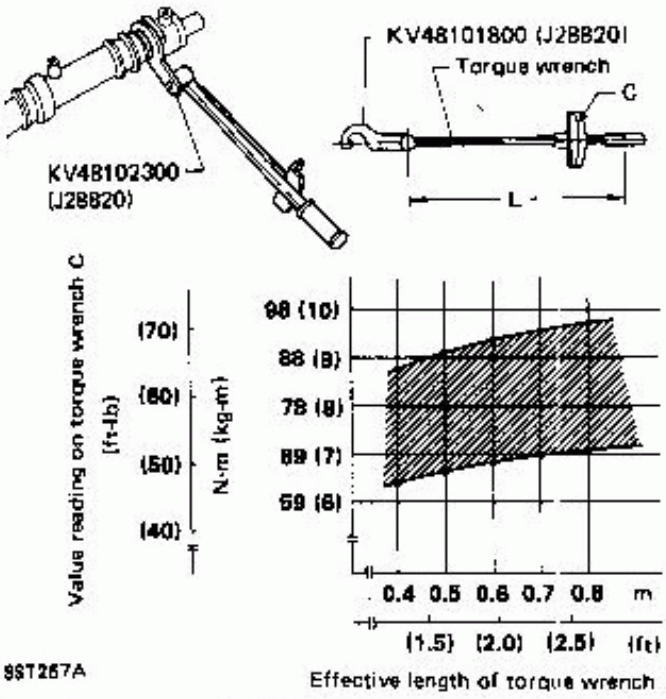
If matching marks are not present, position cylinder end housing as follows:



SST266A

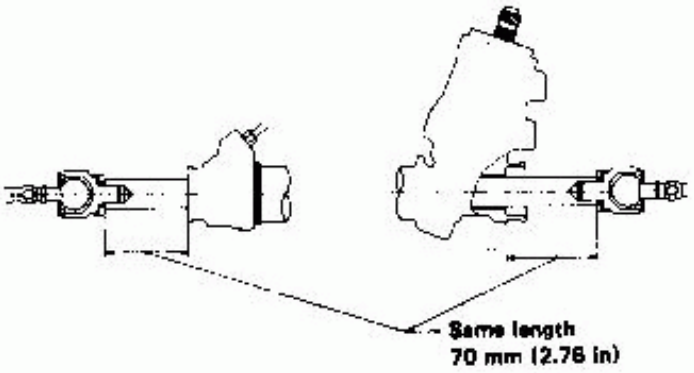
10. Tighten cylinder end housing Tool.

: Lock nut: Without Tool
78 - 108 N·m
(8.0 - 11.0 kg-m, 58 - 80 ft-lb)



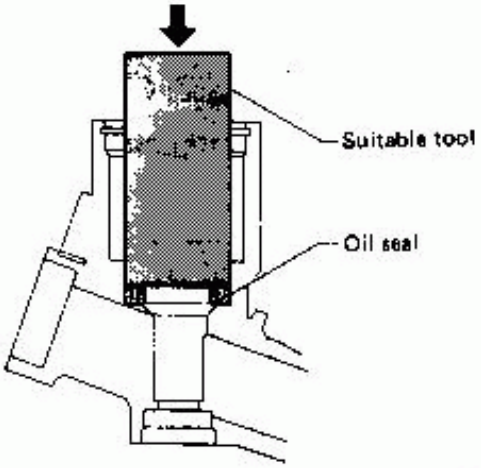
SST267A

11. Set in neutral position.



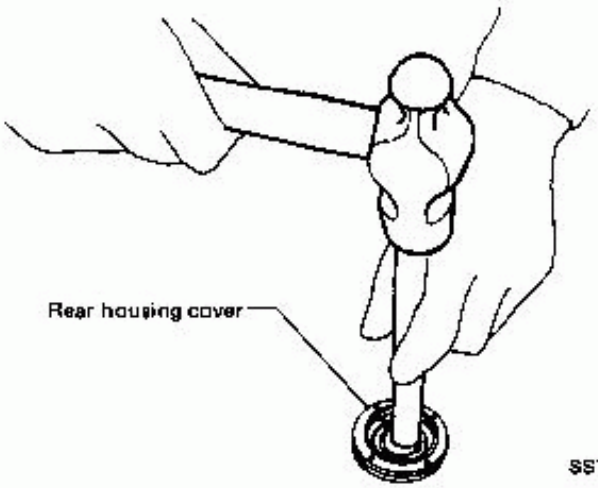
SST365A

12. Coat seal lip of oil seal with multi-purpose grease and install new pinion oil seal to pinion housing using suitable tool.



SST381A

13. Install rear oil seal using suitable tool.

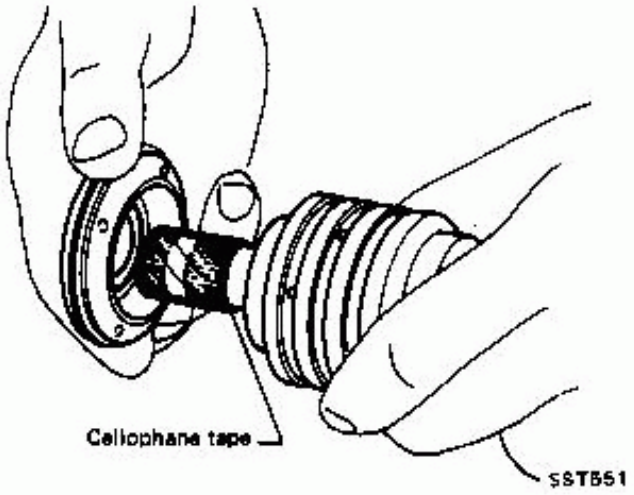


SST268A

Assembly (Cont'd)

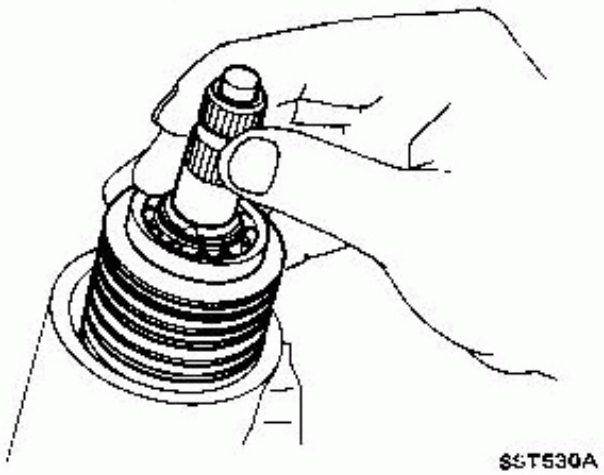
14. Install rear housing cover assembly to pinion.

Wrap cellophane tape around pinion serrations to prevent oil seal from being damaged.

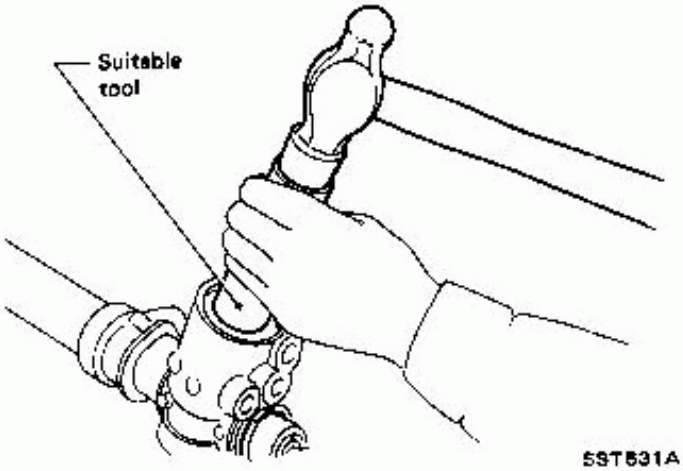


15. Install pinion assembly to pinion housing.

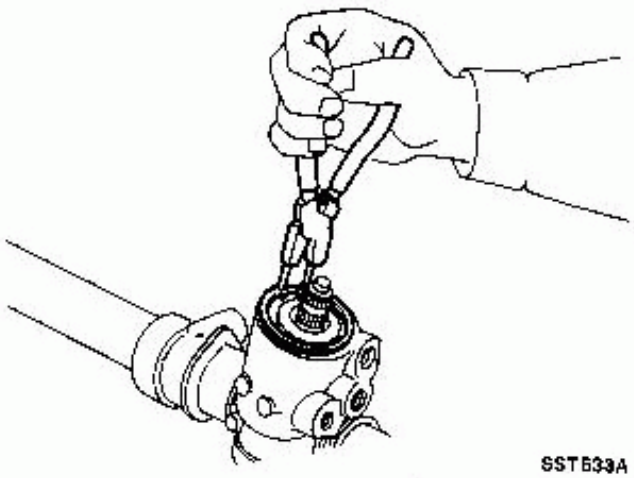
Be careful not to damage pinion teflon ring.



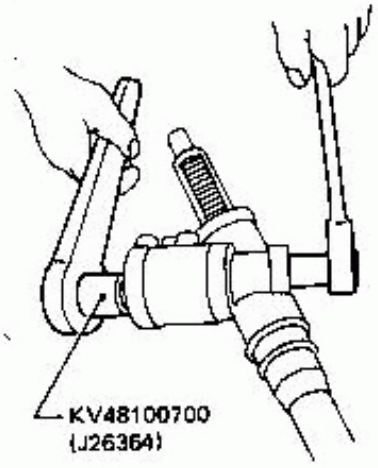
When installing pinion assembly, use suitable tool.



16. Install snap ring.



17. Tighten self-lock nut using suitable tool and wrap pinion shaft serrations with a cloth to prevent pinion shaft from turning.



18. Install retainer bushing, retainer, retainer spring, gasket and retainer cover.

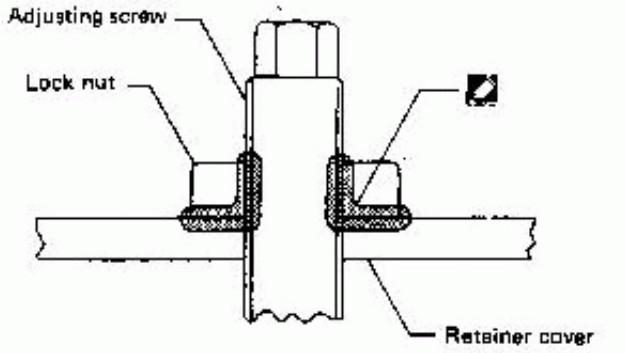
Apply a coat of sealant to both surfaces of gasket.

19. Adjust pinion rotating torque as follows.
1) Set gears to Neutral.
2) Tighten adjusting screw one or two times to a torque of 4.9 N·m (50 kg-cm, 43 in-lb).
3) Loosen adjusting screw, then retighten it to 0.05 to 0.20 N·m (0.5 to 2 kg-cm, 0.43 to 1.74 in-lb).

Assembly (Cont'd)

4) Apply a coat of locking sealer to adjusting screw and lock nut.

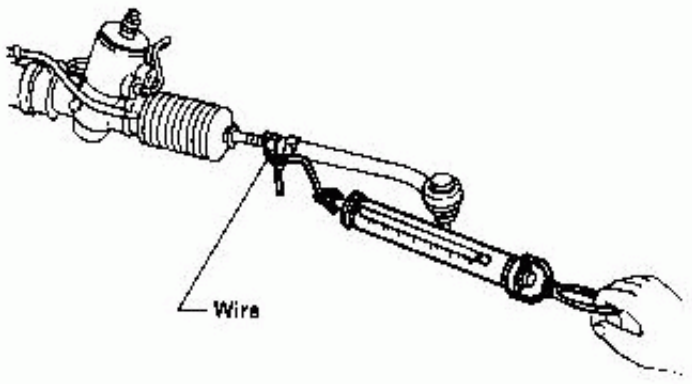
- Shaded areas shown in the following figure refer to portions that should be coated with sealer.



SST259A

5) Prevent adjusting screw from turning, and tighten lock nut to specified torque.
6) Move rack over its entire stroke several times.
7) Measure rack sliding force and pinion rotating torque.

[Rack sliding force]

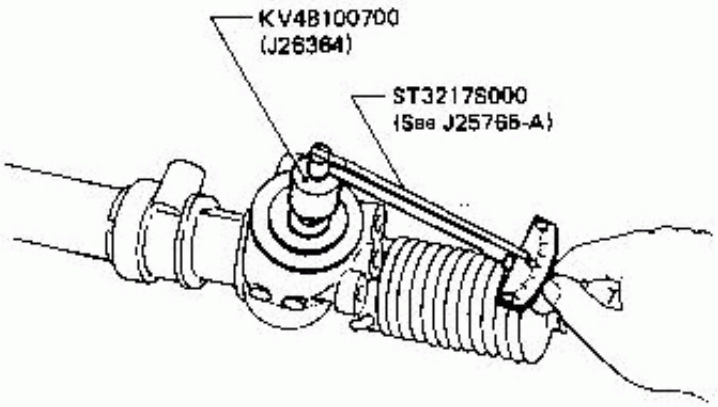


SST525A

Rack sliding force:
Less than 245 N (25 kg, 55 lb)

Measure rack sliding force in both directions within the range of ±5 mm (±0.20 in) from neutral position.

[Pinion rotating torque]

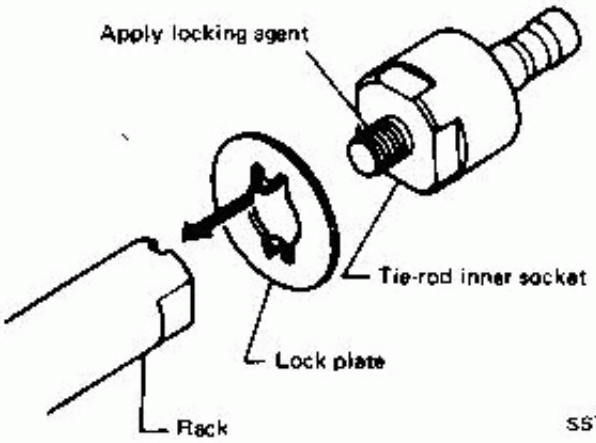


SST524A

Pinion rotating torque:
Less than 1.9 N-m (19 kg-cm, 16 in-lb)

20. Apply locking agent to threaded portion of inner socket and fit inner socket to rack end together with new lock plate.

Be sure lock plate ratchet enters groove at end portion of rack so that rack and inner socket fit snugly.

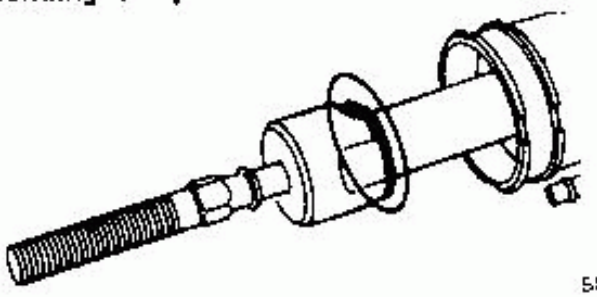


SST836

Assembly (Cont'd)

21. Tighten inner socket and securely bend lock plate at 2 cutout portions of inner socket.

    To prevent damage to boot, remove burrs after bending lock plate.

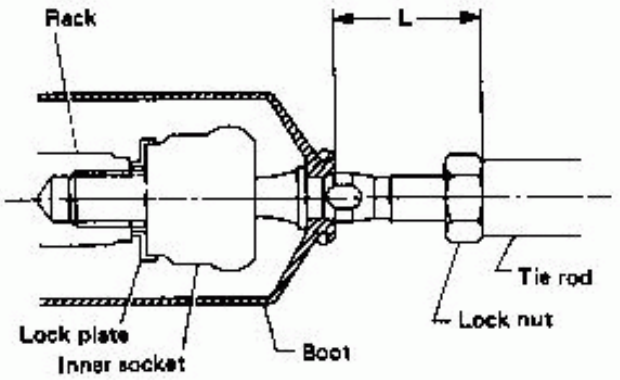


SST435

22. Tighten outer socket lock nut.

    Tie-rod length "L":

    Refer to S.D.S.

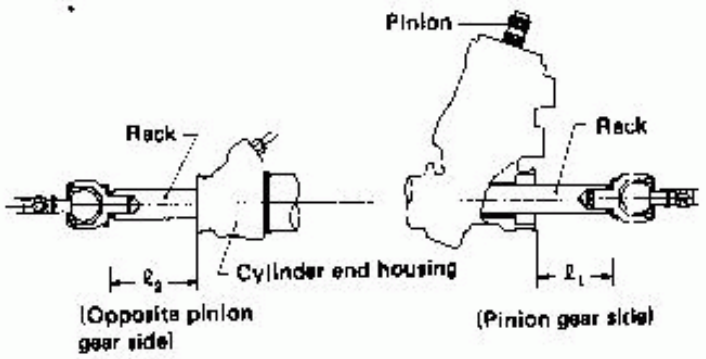


SST291A

- When installing tie-rod or adjusting toe-in, be careful not to twist boots.
- Toe-in: Refer to MA section.

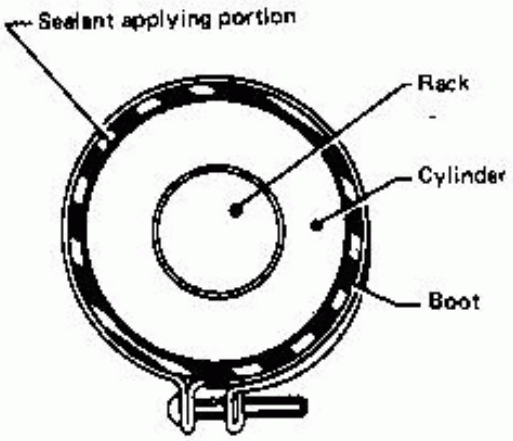
23. Measure rack stroke.

    Measure length "ℓ_1 & ℓ_2": Refer to S.D.S.



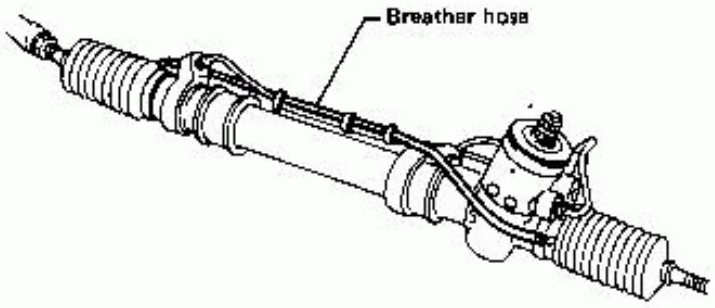
SST538A

24. Apply a coat of sealant to contact surfaces between boot and cylinder before installing boot.



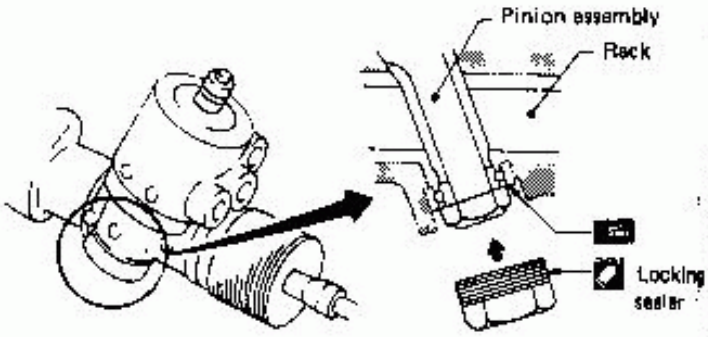
SST888

25. Install breather hose.



SST532A

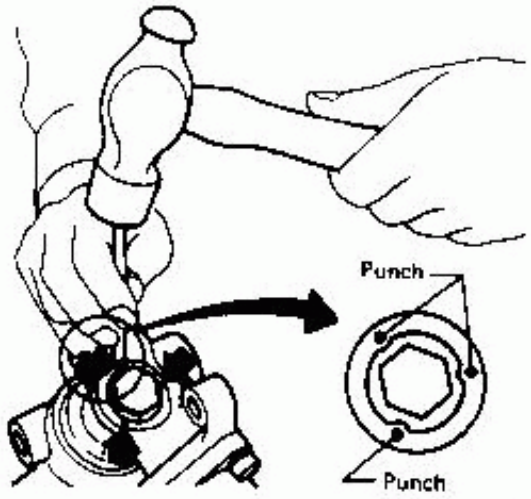
26. Install cylinder tube "R" and "L".
27. Apply grease to pinion bearing, coat threads of housing plug with locking sealer, and tighten plug.



SST271A

Assembly (Cont'd)

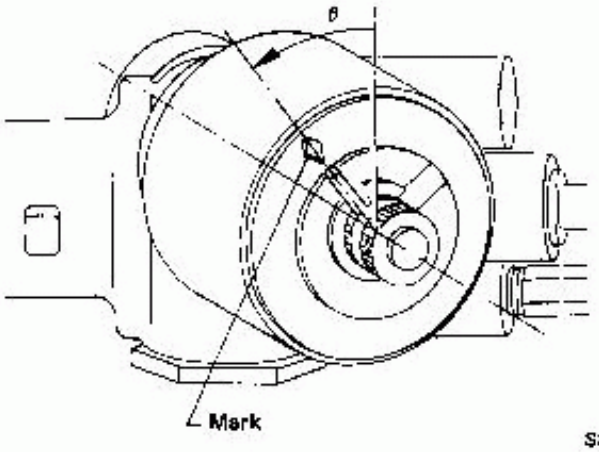
28. Stake housing plug at three places with a punch.



SST556

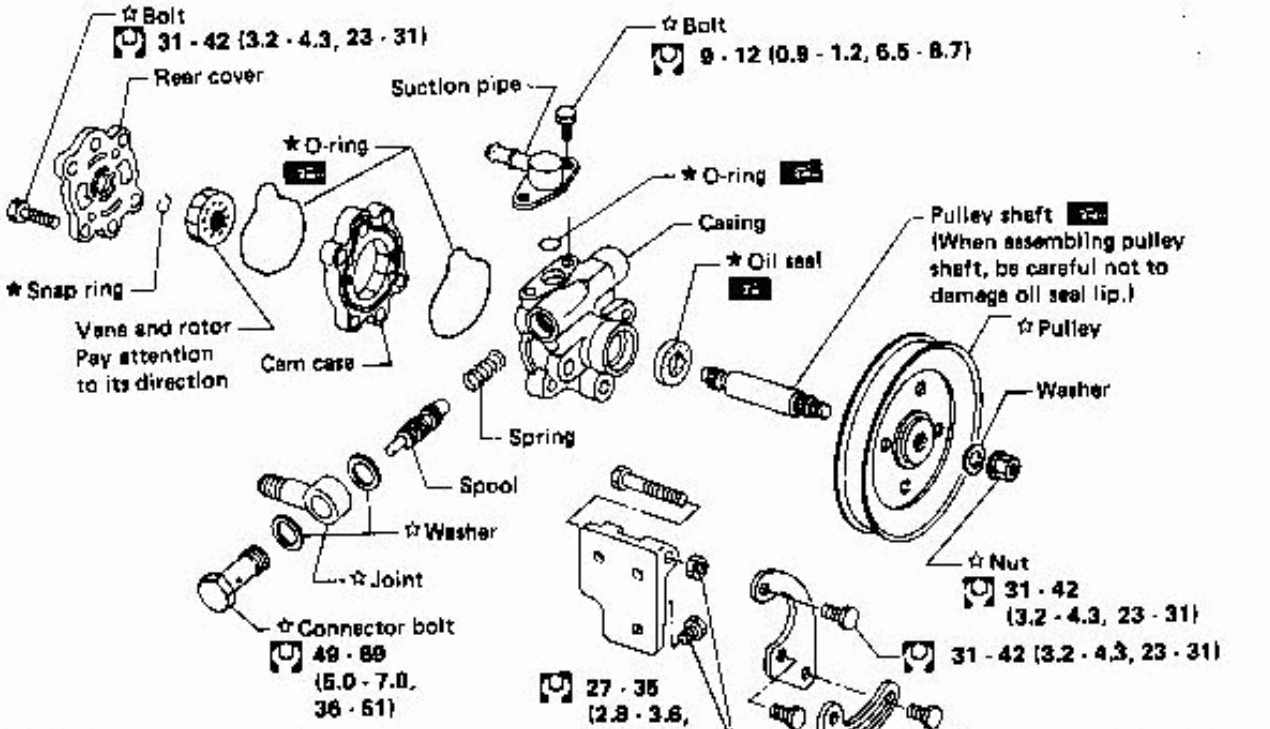
29. Set rear cover cap at neutral position.

Rear cover set angle "θ":
10° - 20°



SST124A

POWER STEERING OIL PUMP



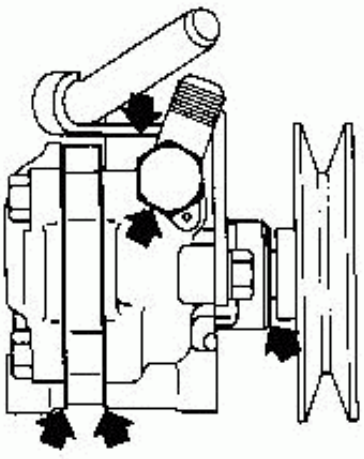
: N·m (kg-m, ft-lb)
: Lubrication points
(With automatic transmission fluid "Dexron Type")
★ or ☆: are available for service replacement.
★: always replace when disassembled.

5ST288A

Pre-Disassembly Inspection

The power steering oil pump should be disassembled only if any of the following conditions are observed.

- Oil leak at any of the following points



5ST287A

- Deformed or damaged pulley

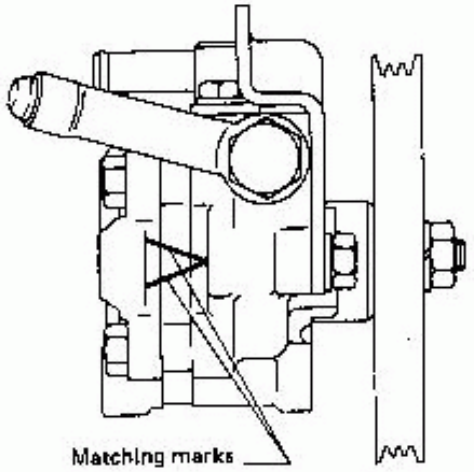
Diassembly

CAUTION:

- The parts which can be disassembled are strictly limited. Never disassemble parts other than the specified ones.
- Disassembly should be performed in a place as clean as possible.
- Do not use a rag. Be sure to use nylon or paper cloth.
- When disassembling and reassembling, do not allow any foreign matter to enter or contact any parts.

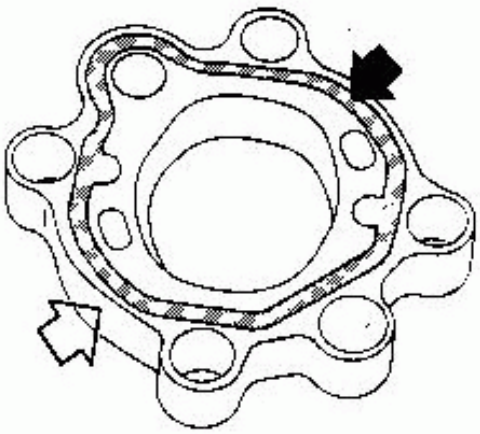
Disassembly (Cont'd)

1. Inscribe matching marks as shown below.



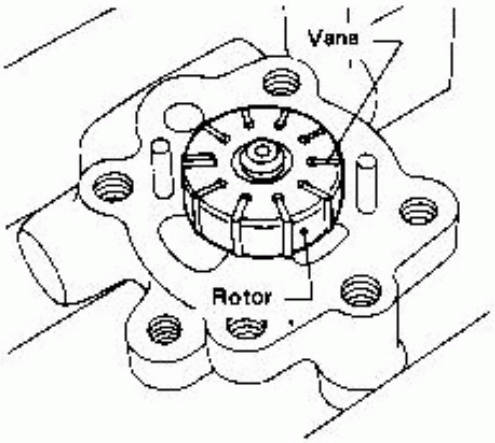
SST127A

2. Remove rear cover.
3. Remove O-rings from cam case.



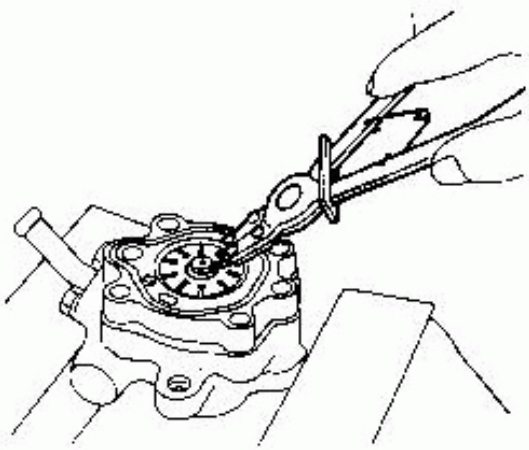
SST031A

CAUTION:
When removing cam case, be sure that the vane does not come off the rotor.



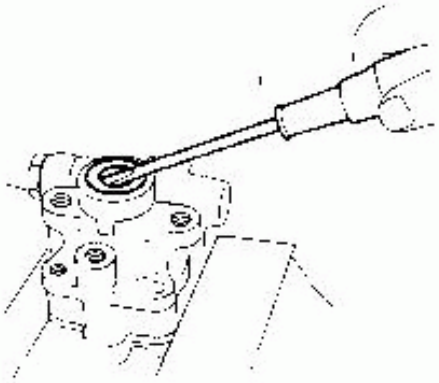
SST032A

4. Remove snap ring, then draw pulley shaft out.
- **Be careful not to drop pulley shaft.**



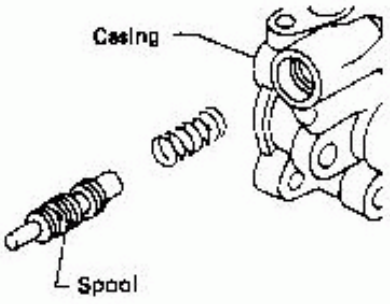
SST033A

5. Install cam case and rear cover, then remove oil seal.
- **Be careful not to damage casing.**



SST034A

6. Remove joint.
- **Be careful not to drop spool.**



SST036A

7. Remove suction pipe, then remove O-ring.

Inspection

Wash clean all disassembled parts in suitable cleaning solvent.

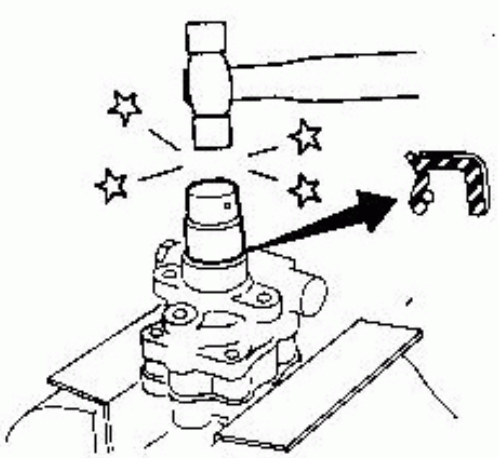
PULLEY AND PULLEY SHAFT

a. If pulley is cracked or deformed, replace it.
b. If an oil leak is noticed around pulley shaft oil seal, replace it.
c. If serration of pulley or pulley shaft is deformed or worn, replace it.

Assembly

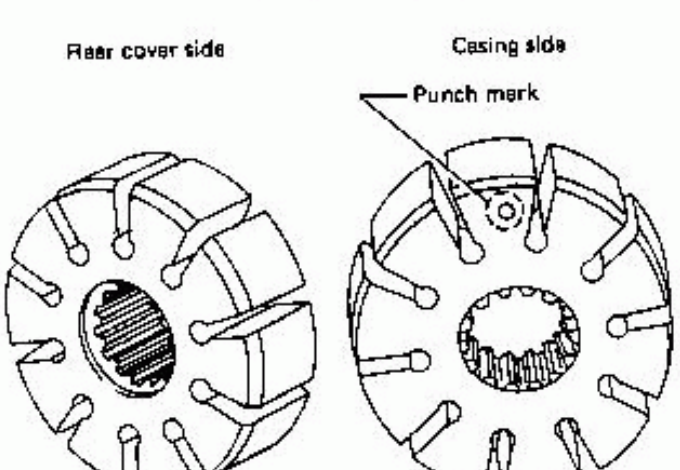
Assemble oil pump in the reverse order of disassembly, noting the following instructions.

- Before installing O-rings and oil seal, apply a thin coat of power steering fluid to them.
- Make certain that O-rings and oil seal are installed properly.
- When assembling vanes to rotor, rounded surfaces of vanes must be facing cam case side.
- Always install new O-ring and an oil seal.
- Be careful of oil seal direction.



SST038A

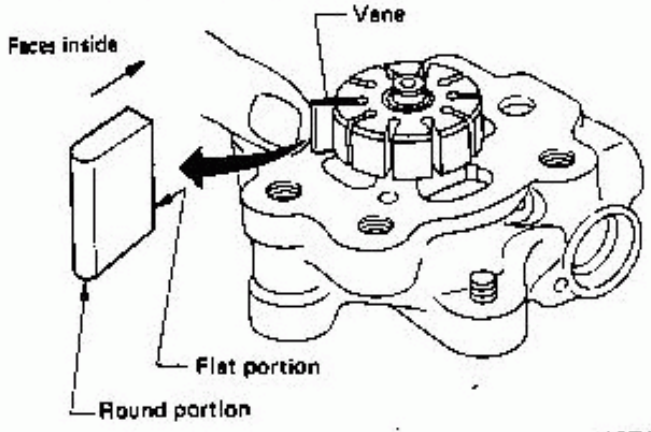
- Pay attention to the direction of rotor.



SST289A

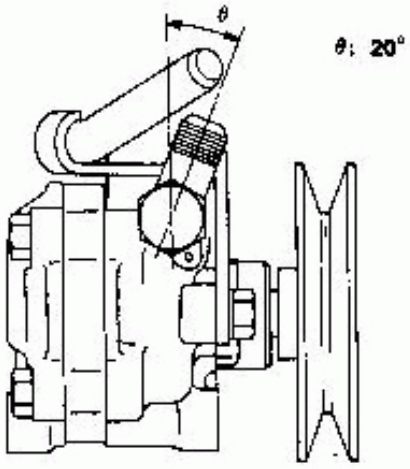
Assembly (Cont'd)

- Install vanes properly.



SST290A

- Install connector properly.

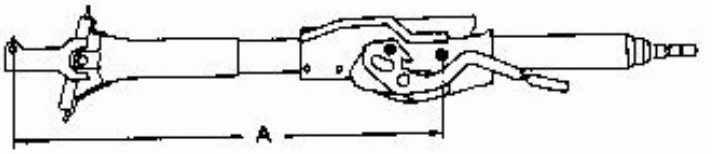


SST268A

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

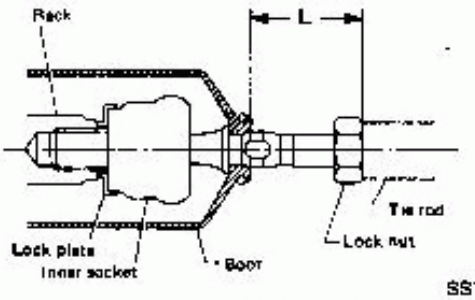
General Specifications

Steering gear type	Manual steering [VR24S]	Power steering [PR24SA]
Steering column	Collapsible	
Steering column length "A" mm (in)	516.2 - 517.8 (20.32 - 20.39)	



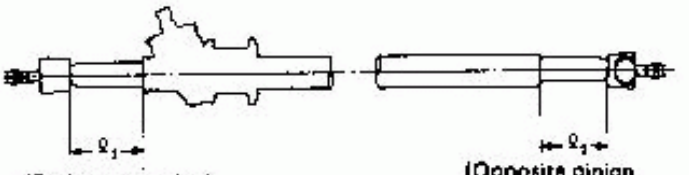
SST278A

Turns of steering wheel (Lock to lock)	4.1	2.9
Steering overall gear ratio	20.7 - 25.1	16.4

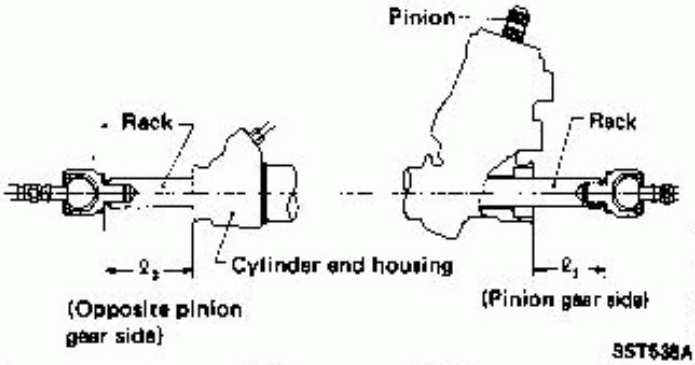


SST291A

Pinion rotating torque (Pinion gear and rack gear assembly) N·m (kg-cm, in-lb)	*1	*1
Rack sliding force N (kg, lb)	–	*1
Steering wheel turning force at 360° position from neutral N (kg, lb)	–	Less than 39 (4, 9)
Normal operating temperature of fluid °C (°F)	–	60 - 80 (140 - 176)
Fluid capacity ℓ (US qt, Imp qt)	–	Approximately 0.9 (1, 3/4)
Power steering fluid type	–	Automatic transmission fluid "Dexron Type"
Oil pump maximum pressure kPa (kg/cm², psi)	–	6,669 - 7,257 (68 - 74, 967 - 1,052)
Measured length "ℓ_1 & ℓ_2" mm (in)		
Pinion gear side "ℓ_1"	76 (2.99)	67 (2.24)
Opposite pinion gear side "ℓ_2"	76 (2.99)	70 (2.76)



SST537A



SST538A

*1: See Assembly for Manual and Power Steering Gear and Linkage.

Inspection and Adjustment

GENERAL

Steering gear type	VR24S	PR24SA
Steering wheel axial play mm (in)	0 (0)	0 (0)
Steering wheel play mm (in)	Less than 35 (1.38)	Less than 35 (1.38)

STEERING GEAR AND LINKAGE

Steering gear type	VR24S	PR24SA
Tie-rod outer ball joint swinging torque N·m (kg-cm, in-lb)	0.15 - 2.94 (1.5 - 30, 1.3 - 26.0)	0.15 - 2.94 (1.5 - 30, 1.3 - 26.0)
Tie-rod inner ball joint swinging torque N·m (kg-cm, in-lb)	0.1 - 7.8 (1 - 80, 0.9 - 69)	0.1 - 7.8 (1 - 80, 0.9 - 69)
Tie-rod length "L" mm (in)	36.1 (1.421)	42.7 (1.681)

Tightening Torque

STEERING COLUMN

Unit	N·m	kg-m	ft-lb
Steering wheel nut	29 - 39	3 - 4	22 - 29
Lower joint to column	32 - 38	3.3 - 3.9	24 - 28
Lower joint to gear	32 - 38	3.3 - 3.9	24 - 28
Hole cover to dash panel	8 - 10	0.8 - 1.0	5.8 - 7.2
Jacket lower tube to steering column clamp	3.4 - 4.4	0.35 - 0.45	2.6 - 3.3
Steering column clamp to mounting bracket	9 - 14	0.9 - 1.4	6.5 - 10.1

STEERING GEAR AND LINKAGE

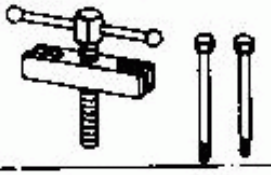
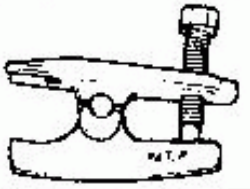
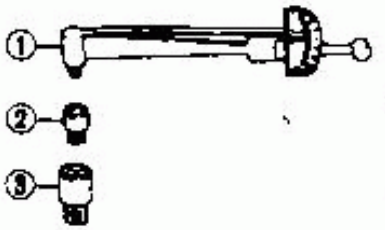
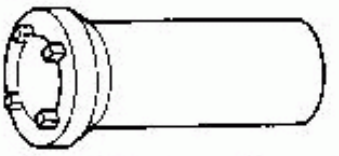
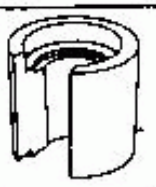
Model VR24S

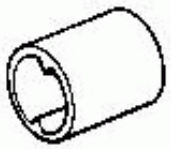
Unit	N·m	kg-m	ft-lb
Tie-rod to knuckle	54 - 98	5.5 - 10.0	40 - 72
Tie-rod lock nut	78 - 98	8 - 10	58 - 72
Tie-rod to gear	78 - 98	8 - 10	58 - 72
Gear housing clamp bolt	45 - 60	4.6 - 6.1	33 - 44
Retainer cover	39 - 59	4 - 6	29 - 43
Adjusting screw lock nut	8 - 11	0.8 - 1.1	5.8 - 8.0
Rear cover	20 - 29	2 - 3	14 - 22
Rear cover lock nut	78 - 98	8 - 10	58 - 72

Model: PR24SA

Unit	N·m	kg-m	ft-lb
Gear and linkage			
Tie-rod to knuckle	54 - 98	5.5 - 10.0	40 - 72
Tie-rod lock nut	78 - 98	8 - 10	58 - 72
Tie-rod to gear	78 - 98	8 - 10	58 - 72
Gear housing clamp bolt	39 - 49	4 - 5	29 - 36
Boot clamp securing bolt	0.3 - 0.5	0.03 - 0.05	0.2 - 0.4
Retainer cover fixing bolt	16 - 21	1.6 - 2.1	12 - 15
Adjusting screw lock nut	10 - 15	1.0 - 1.5	7 - 11
Self-lock nut	19 - 25	1.9 - 2.6	14 - 19
Housing plug	49 - 69	5 - 7	36 - 51
Cylinder tube flare nut	20 - 26	2.0 - 2.7	14 - 20
Cylinder lock nut	78 - 108	8 - 11	58 - 80
Low pressure connector at gear	27 - 39	2.8 - 4.0	20 - 29
Oil pump, tank and hoses			
High pressure hose to pump	29 - 49	3 - 5	22 - 36
High pressure pipe to gear	15 - 25	1.5 - 2.5	11 - 18
Pump belt adjusting bracket fixing bolt	8 - 10	0.8 - 1.0	5.8 - 7.2
Pump to bracket			
M8	16 - 21	1.6 - 2.1	12 - 15
M10	31 - 42	3.2 - 4.3	23 - 31
Pump bracket to engine	27 - 35	2.8 - 3.6	20 - 26
Pully lock nut	31 - 42	3.2 - 4.3	23 - 31
Suction connector	9 - 12	0.9 - 1.2	6.5 - 8.7
Tank bracket securing bolt	3 - 4	0.3 - 0.4	2.2 - 2.9

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	Unit application	
		VR24S	PR24SA
ST27180001 (J25726-A)	Steering wheel puller 	X	X
HT72520000 (J25730-A)	Ball joint remover 	X	X
ST3127S000 (See J25765-A) ① GG91030000 (J25765-A) ② HT62900000 (–) ③ HT62940000 (–)	Preload gauge Torque wrench Socket adapter (Useless) Socket adapter (Useless) 	X	X
ST27091000 (J26357)	Pressure gauge 	–	X
KV48102300 (J28820)	Cylinder lock nut wrench 	–	X
KV48102000 (J28822)	End cover socket wrench 	X	–
KV48103100 (J34264)	Oil seal drift 	–	X
KV48100700 (J26364)	Torque adapter 	–	X

Tool number (Kent-Moore No.)	Tool name	Unit application	
		VR24S	PR24SA
KV48101100 (J26364)	Torque adapter 	X	–

SECTION BF

CONTENTS

* For theft warning system and digital touch entry system, refer to EL section.
* For seat belts, refer to MA section.
* Method of reading electrical diagram in BF section is basically the same as in the EL section. So refer to "HOW TO READ DIAGRAM" in EL section.
* For power supply routing, refer to "POWER SUPPLY" in EL section.
* Black box internal circuits in BF section are a summary of actual circuit. Use only for studying the operation.
* "Remarks" and "Connections" in electrical diagram show the terminal meaning and actual electrical flow.
* For connector Nos. in wiring diagrams in this section, refer to Harness Layout in EL section.

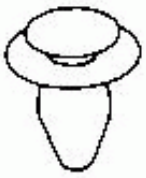
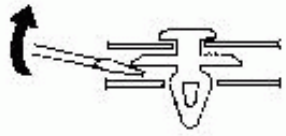
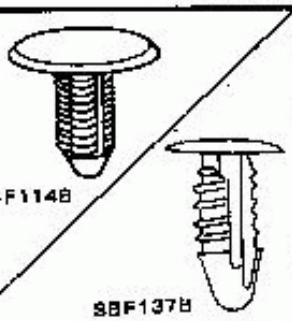
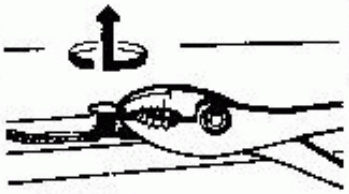
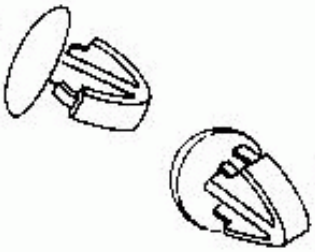
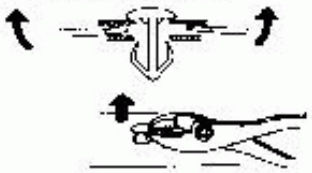
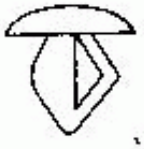
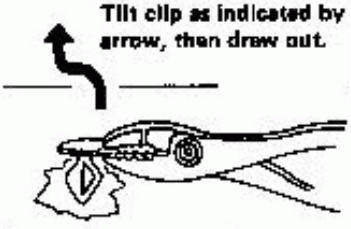
GENERAL SERVICING

Precautions

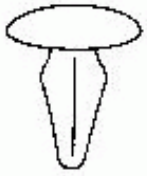
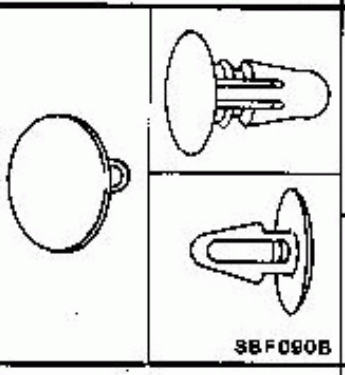
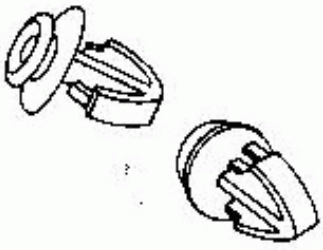
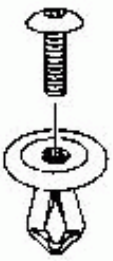
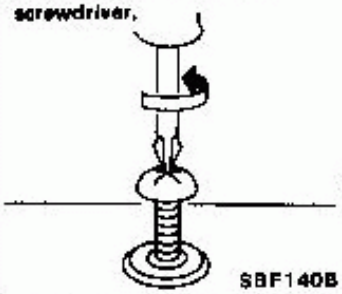
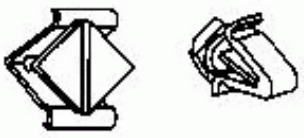
- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removing or installation. Be careful not to soil or damage them.
- Apply sealing compound where necessary while installing 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

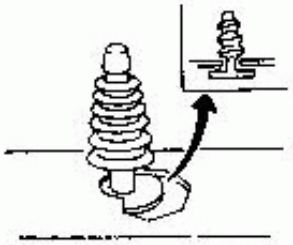
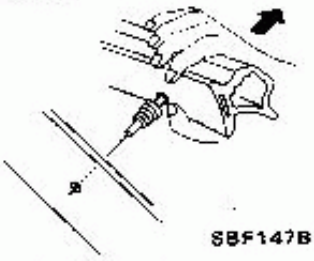
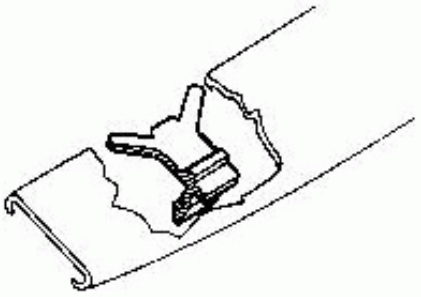
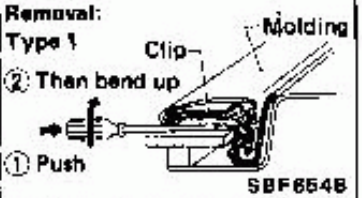
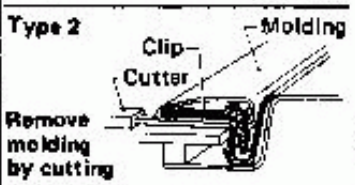
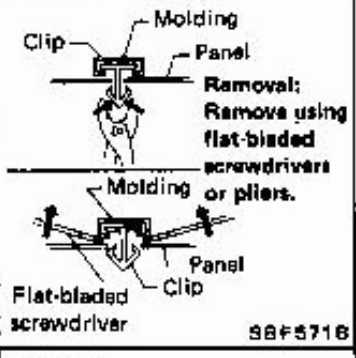
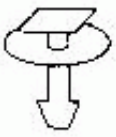
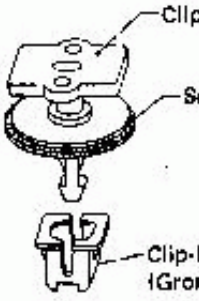
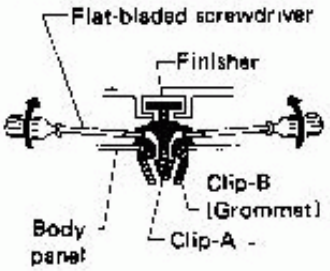
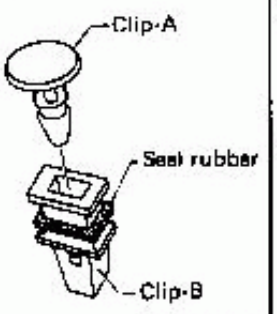
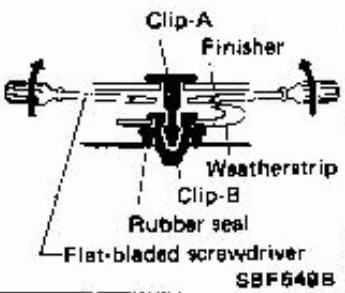
- Clips and fasteners in BF section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

No.	Symbol	Shape	Removal & installation	Location
C101	 SBF092B	 SBF109B	**Removal:** **Remove by bending up with a flat-bladed screwdriver.**  SBF094B	• Door trim • Rear side lower trim • Rear side upper trim (Coupe) • Luggage side upper trim (Hatchback)
C102	 SBF113B	 SBF114B SBF137B	 **Removal:** **Pull up by rotating** SBF115B	• Trunk front trim (Coupe) • Trunk side trim (Coupe) • Trunk rear trim (Coupe) • Luggage floor mat (Hatchback)
C103	 SBF110B	 SBF111B	**Removal:** **Remove with flat-bladed screwdrivers or pliers.**  SBF112B	• Rear bumper fascia
C105	 SBF141B	 SBF142B	**Removal:** **Tilt clip as indicated by arrow, then draw out.**  SBF143B	• Rear side upper trim (Coupe) • Parcel shelf (Coupe) • Rear seatback board – Behind rear seatback (Coupe) • Luggage side upper trim (Hatchback) • Luggage side lower trim (Hatchback) • Luggage rear trim (Hatchback) • Back door lower trim (Hatchback) • Luggage floor mat (Hatchback)

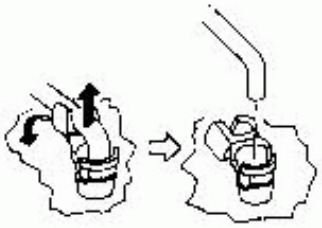
Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & installation	Location
C106	 SBF089B	 SBF090B	**Removal:** Remove with flat-bladed screwdrivers or pliers.   SBF091B	• Hood front sealing rubber • Hood rear sealing rubber • Rear bumper fascia • Door inside seal rear
C107	 SBF365B	 SBF366B	**Removal:** Remove by bending up with flat-bladed screwdrivers.  SBF367B	• Power window switch finisher
C108	 SBF564B	 SBF565B	**Removal:** Remove by bending up with a flat-bladed screwdriver.  SBF566B	• Rear side lower trim (Hatchback) • Rear side upper trim (Coupe)
CS102	 SBF138B	 SBF139B	**Removal:** Screw out with a Phillips screwdriver.  SBF140B	• Front bumper fascia • Fender protector • Dash side trim • Headlamp under cover
CG101	 SBF144B	 SBF145B	**Removal:**  Rotate 45° to remove.  Removal: **Installation:**  SBF085B	• Front grille

Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & installation	Location
CE103	 SBF103B	 SBF104B	**Removal:**  SBF147B	• Door weatherstrip
CE106	 SBF653B		**Removal:** **Type 1** Clip, Molding, ② Then bend up, ① Push  SBF654B **Type 2** Clip, Molding, Cutter, **Remove molding by cutting off the clip.**  SBF914B	• Back window molding (Coupe) • Back door window molding (Hatchback)
CF107	 SBF669B	 SBF570B	 Clip, Molding, Panel, **Removal: Remove using flat-bladed screwdrivers or pliers.**, Molding, Panel, Clip, Flat-bladed screwdriver SBF571B	• Back door side trim (Hatchback)
CF109	 SBF650B	 Clip-A, Seal, Clip-B (Grommet) SBF651B	**Removal:**  Flat-bladed screwdriver, Finisher, Clip-B (Grommet), Body panel, Clip-A SBF652B	• Air outlet grille (Coupe)
CF110	 SBF647B	 Clip-A, Seal rubber, Clip-B SBF648B	**Removed:**  Clip-A, Finisher, Weatherstrip, Clip-B, Rubber seal, Flat-bladed screwdriver SBF649B	• Body side weatherstrip • Windshield side molding

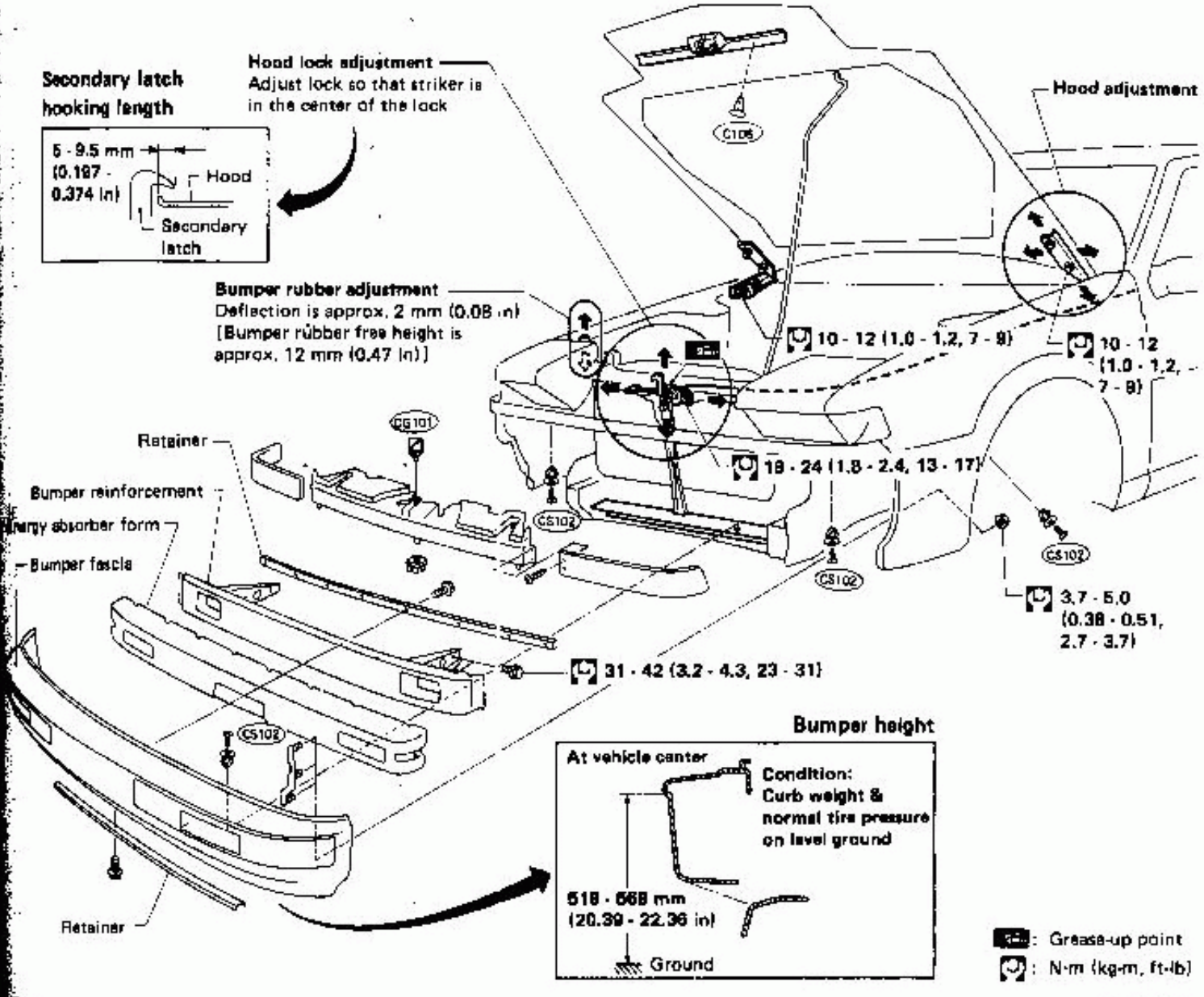
Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & installation	Location
CR101		 SBF106B	**Removal:**  SEF146B	• Back door lock key cylinder
CR103		 SBF768B	**Removal:**  SBF770B	• Front door lock system

- When removing and installing hood or back door, place a cloth or other padding on hood or back door corners to avoid scratching vehicle body.
- When removing clip or fastener, refer to CLIP & FASTENER.
- Apply sealing compound where necessary when installing parts.

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. Doing so increases effort required to unlock hood.
- Bumper fascia: It is made of plastic, so do not use excessive force and take care to keep oil away from it.
- When adjusting or removing/installing hood or removing/installing hood switch, check theft warning system operation.



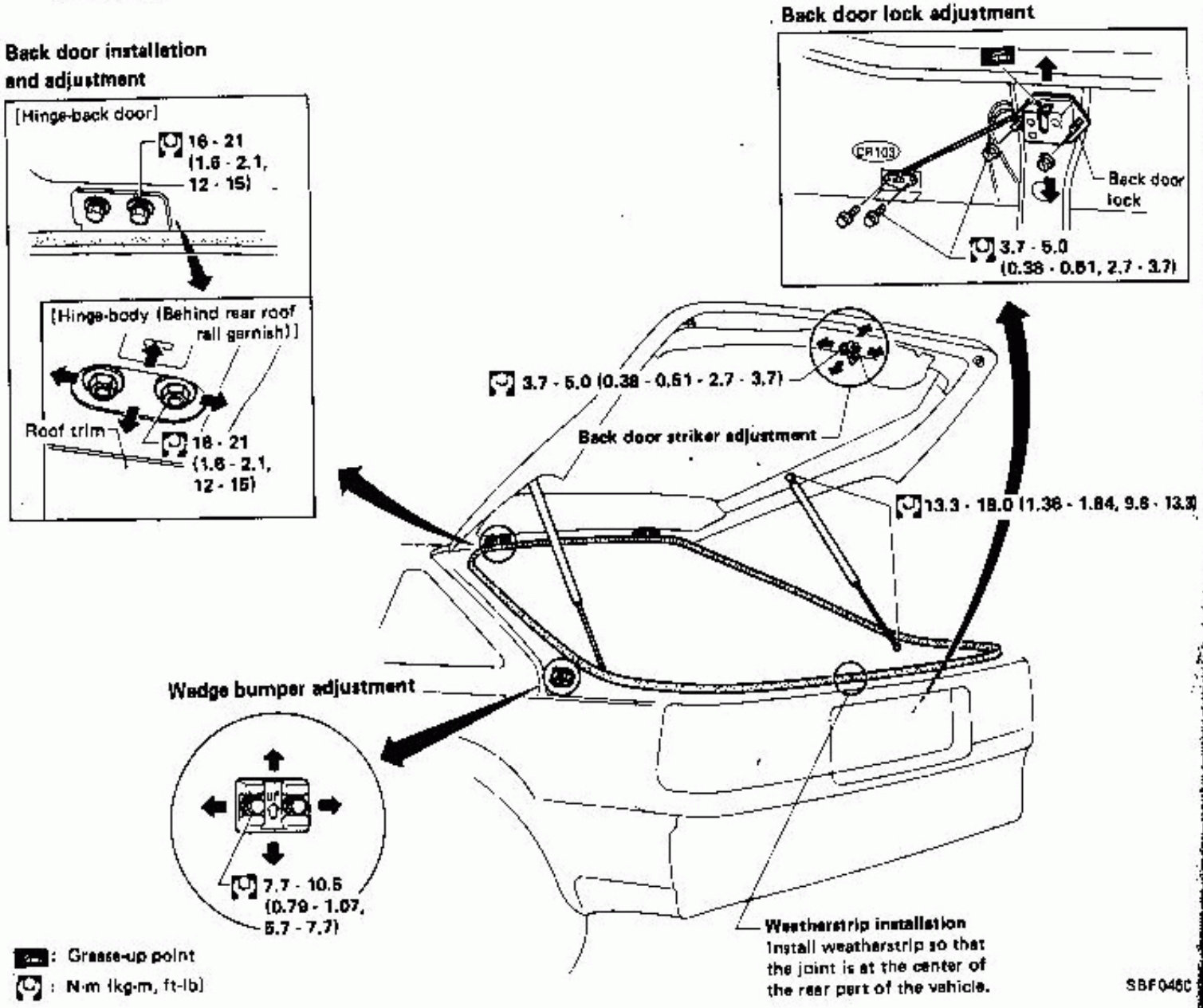
Rear End

- Back door adjustment (Hatchback): Adjust at hinge-body portion for proper back door fit.
- Trunk lid adjustment (Coupe): Adjust at hinge-trunk lid portion for proper trunk lid fit.
- Back door lock system adjustment (Hatchback): Adjust lock & striker so that they are in the center. After adjustment, check back door lock operation.
- Trunk lid lock system adjustment (Coupe): Adjust striker so that it is in the center of the lock. After adjustment, check trunk lid lock operation.
- Bumper fascia: It is made of plastic, so do not use excessive force and take care to keep oil away from it.
- When adjusting or removing/installing trunk lid/back door or removing/installing trunk lid/back door lock system, check theft warning system operation.

WARNING:

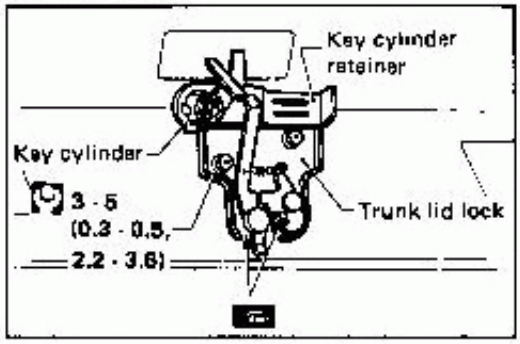
a. Be careful not to scratch back door stay when installing back door. A scratched stay may cause gas leakage.

b. The contents of the back door stay are under pressure. Do not take apart, puncture, apply heat or allow fire near it.

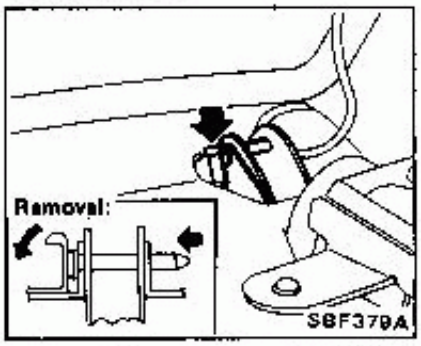


Rear End (Cont'd)

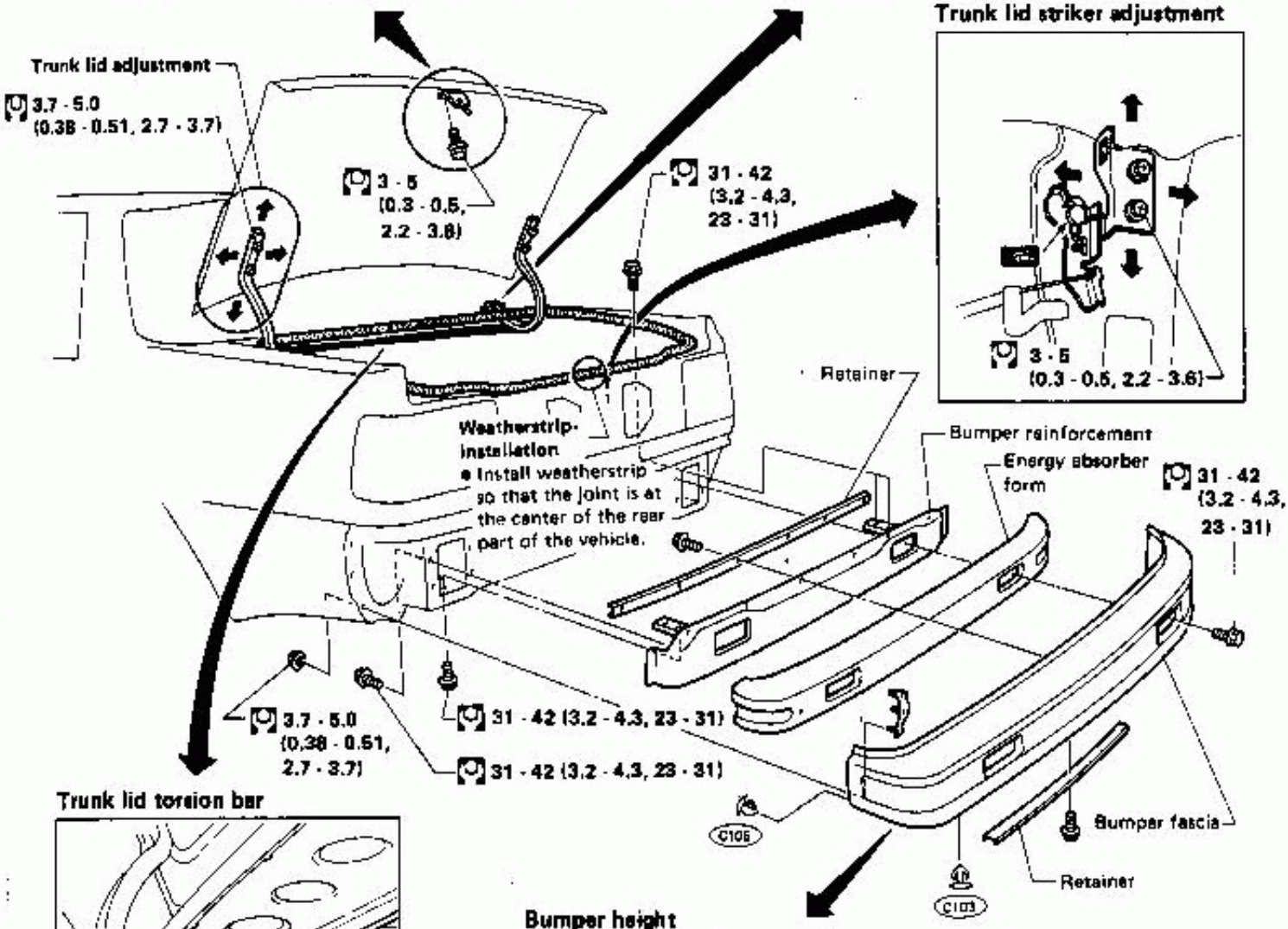
Trunk lid lock



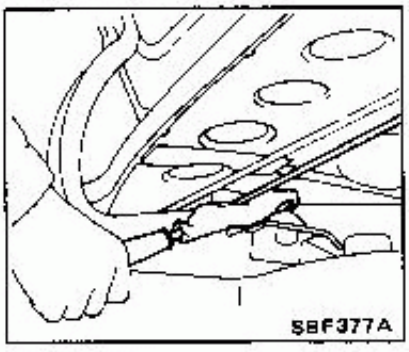
Trunk lid hinge



Trunk lid striker adjustment

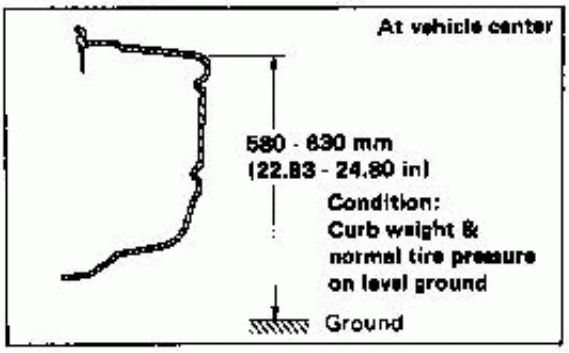


Trunk lid torsion bar



WARNING:
When removing torsion bar, carefully release its reaction force.

Bumper height

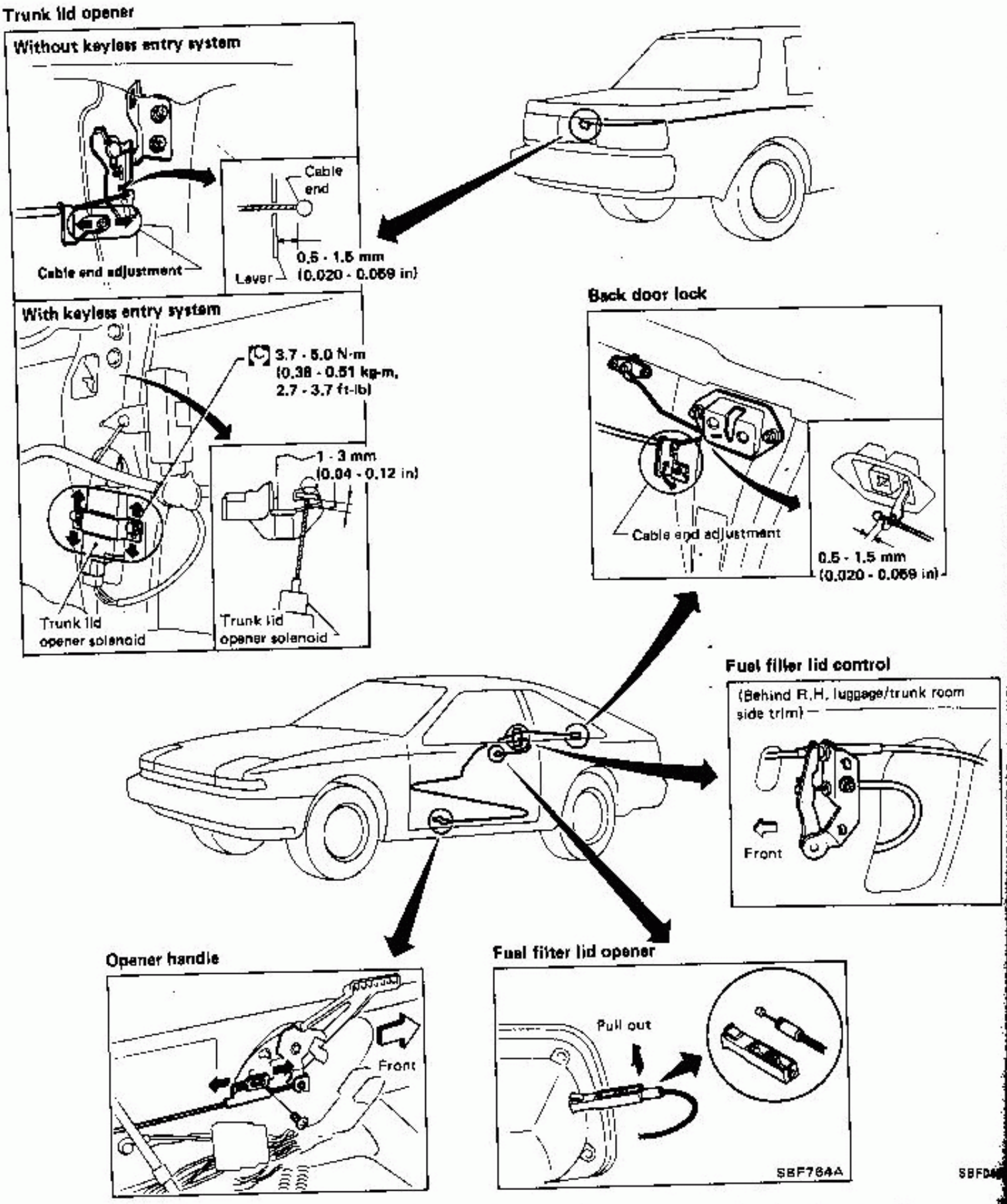


: Grease-up point
: N·m (kg-m, ft-lb)

SBF561C

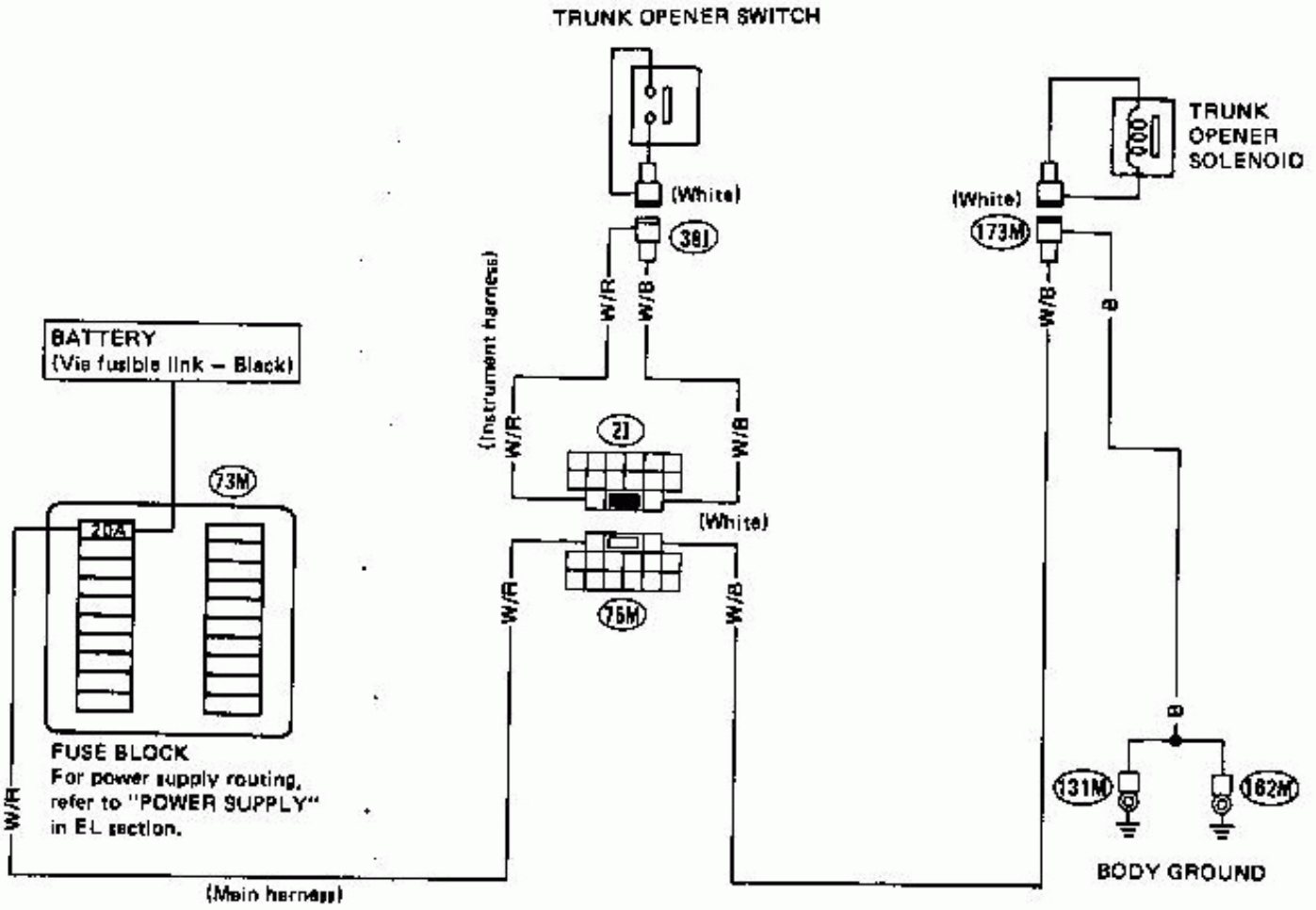
Trunk Lid/Back Door and Fuel Filler Lid Opener

- Opener cable: Do not attempt to bend cable using excessive force.
- After installation, make sure that trunk lid/back door and fuel filler lid open smoothly.



Trunk Lid/Back Door and Fuel Filler Lid Opener (Cont'd)

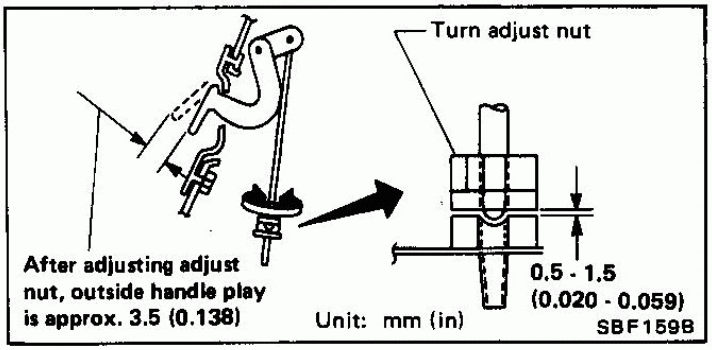
ELECTRICAL TRUNK LID OPENER/WIRING DIAGRAM



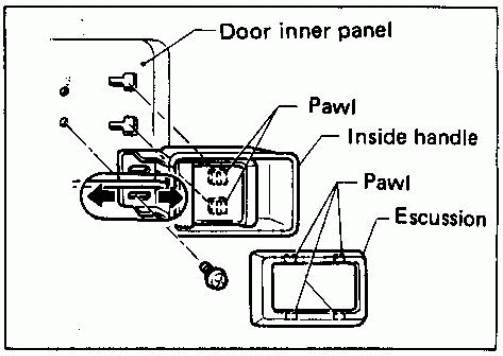
Front Door

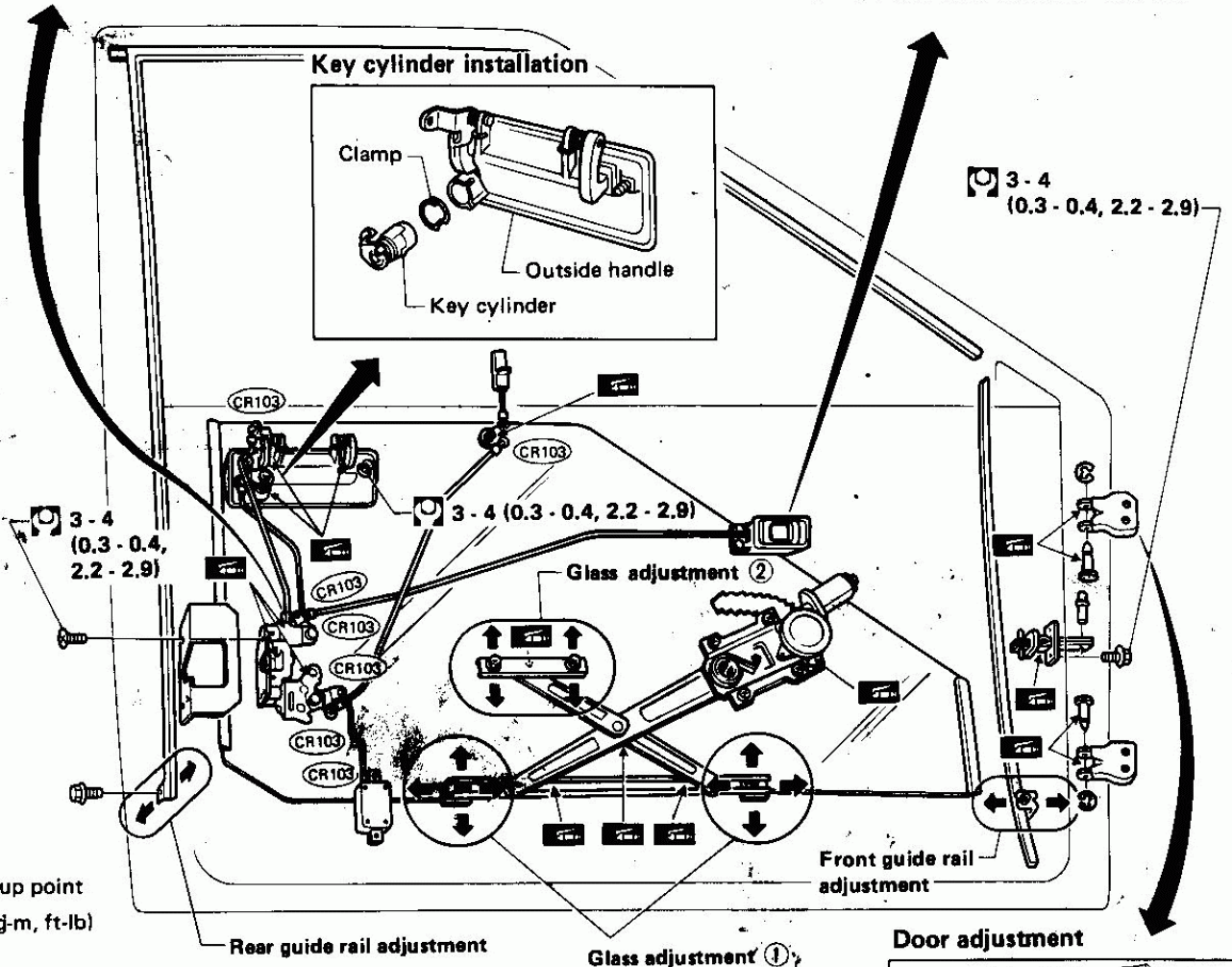
- When adjusting door or door lock, check door lock operation.
- When adjusting or removing/installing door or removing/installing door lock system or door switch, check theft warning system operation.

Outside handle adjustment

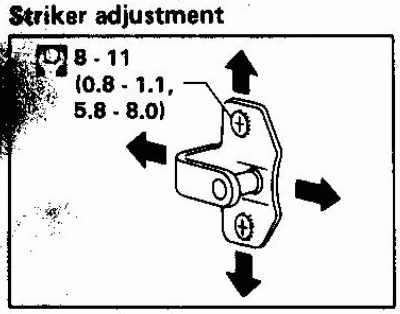


Inside handle installation and adjustment

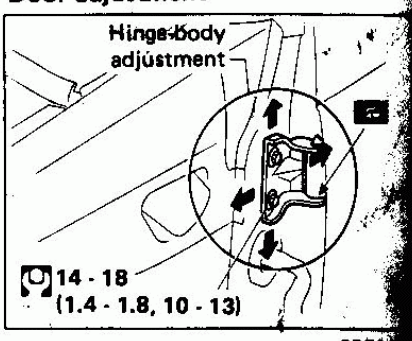




Striker adjustment



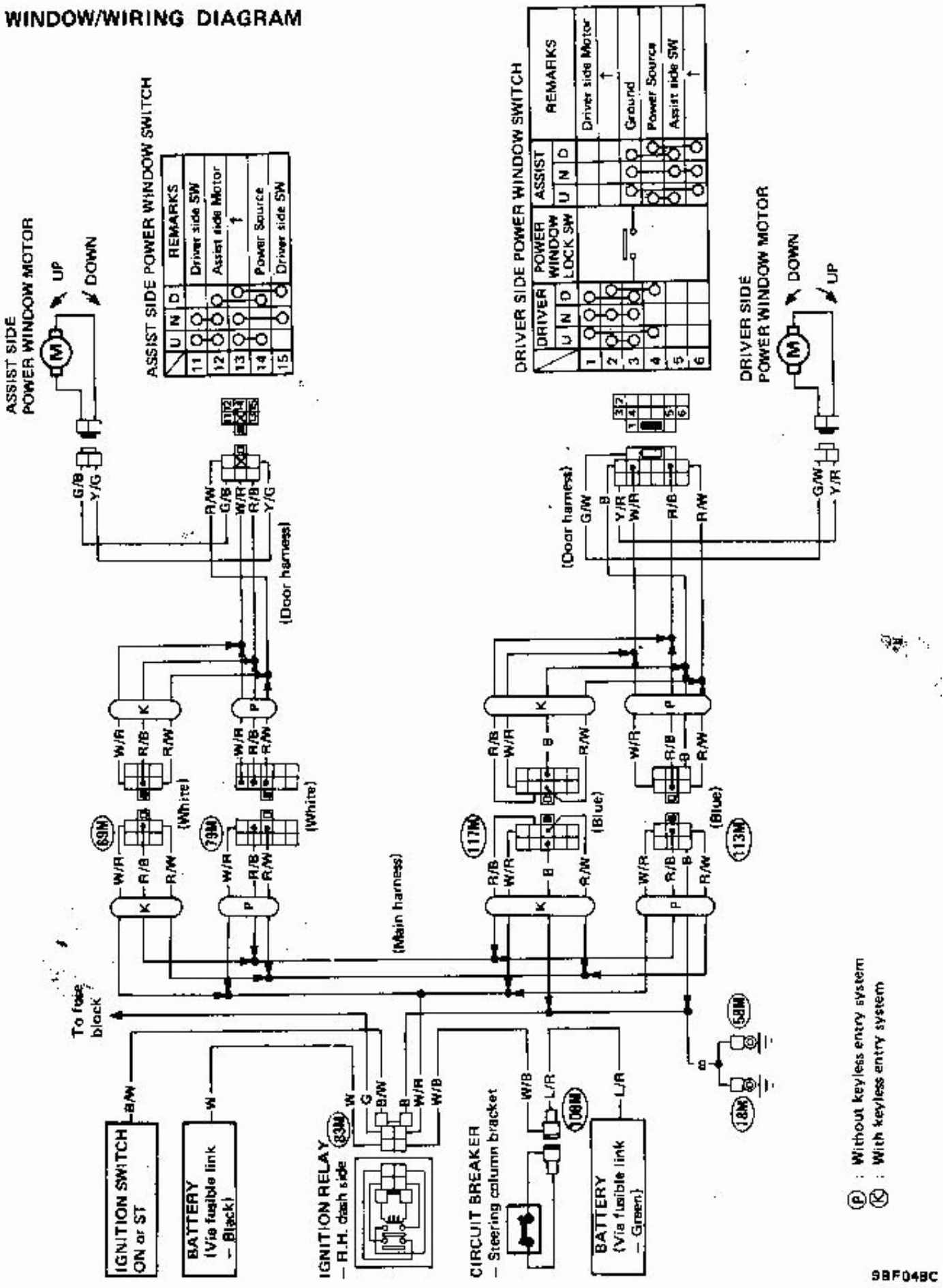
Door adjustment



SBF0

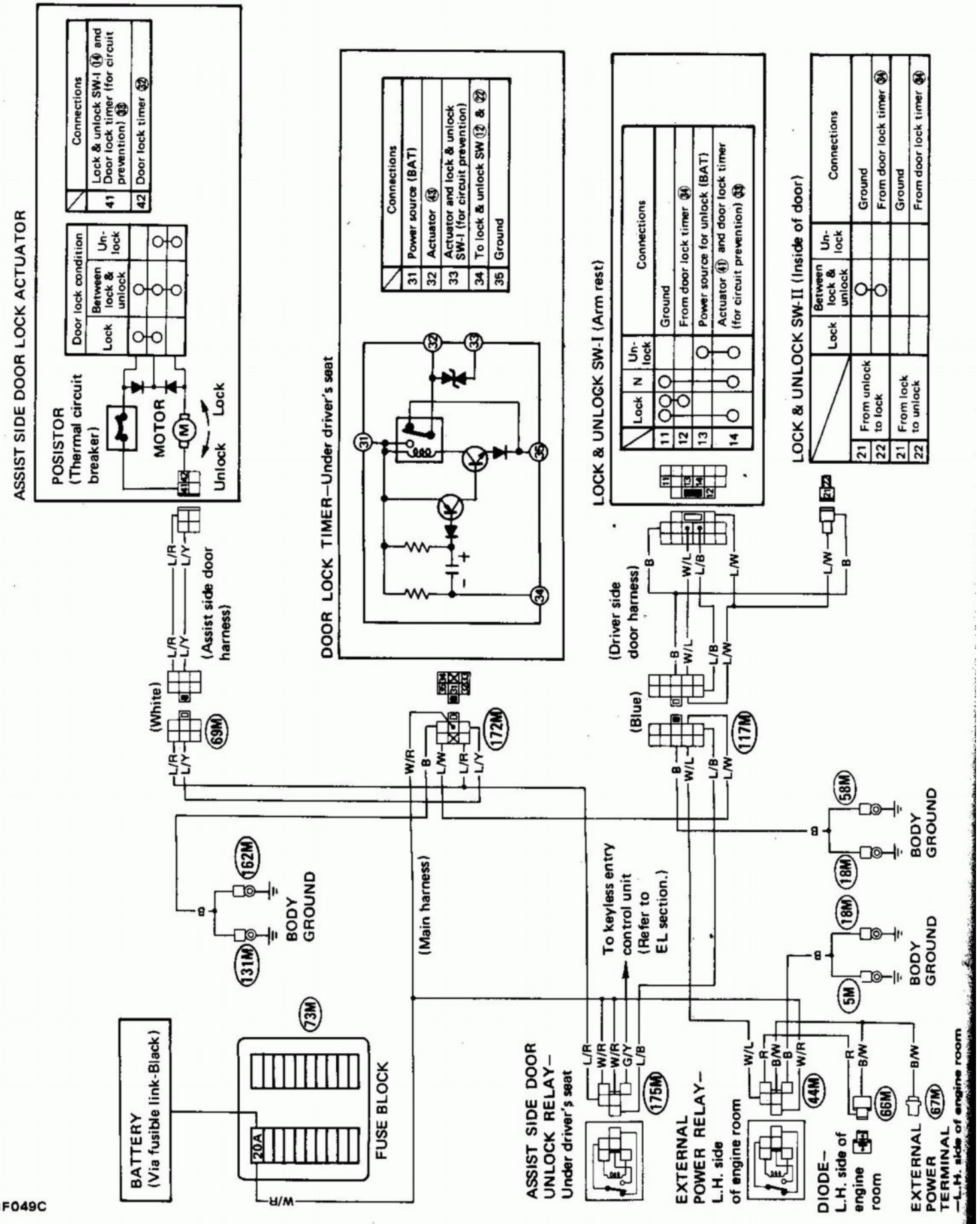
Front Door (Cont'd)

POWER WINDOW/WIRING DIAGRAM

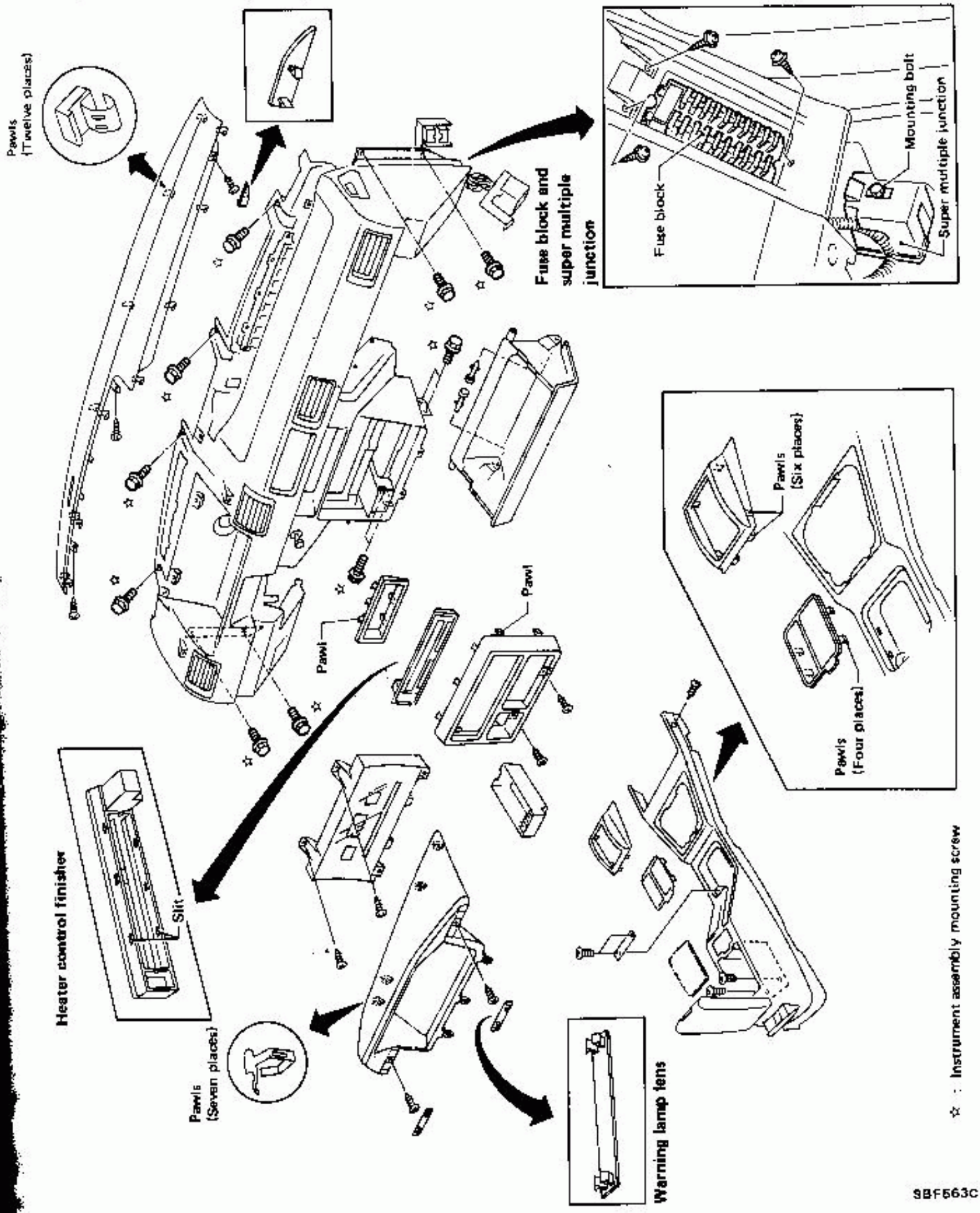


Front Door (Cont'd)

POWER DOOR LOCK/WIRING DIAGRAM



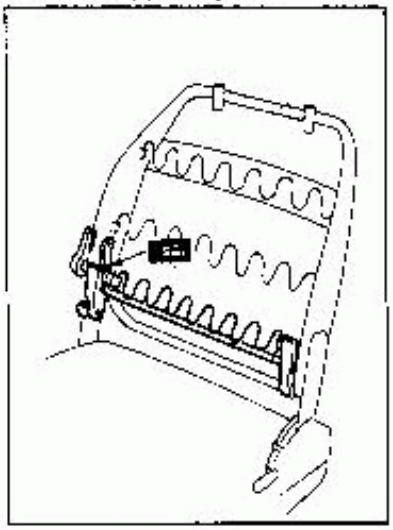
- These parts are made of plastic, so do not use excessive force and be careful not to damage them.

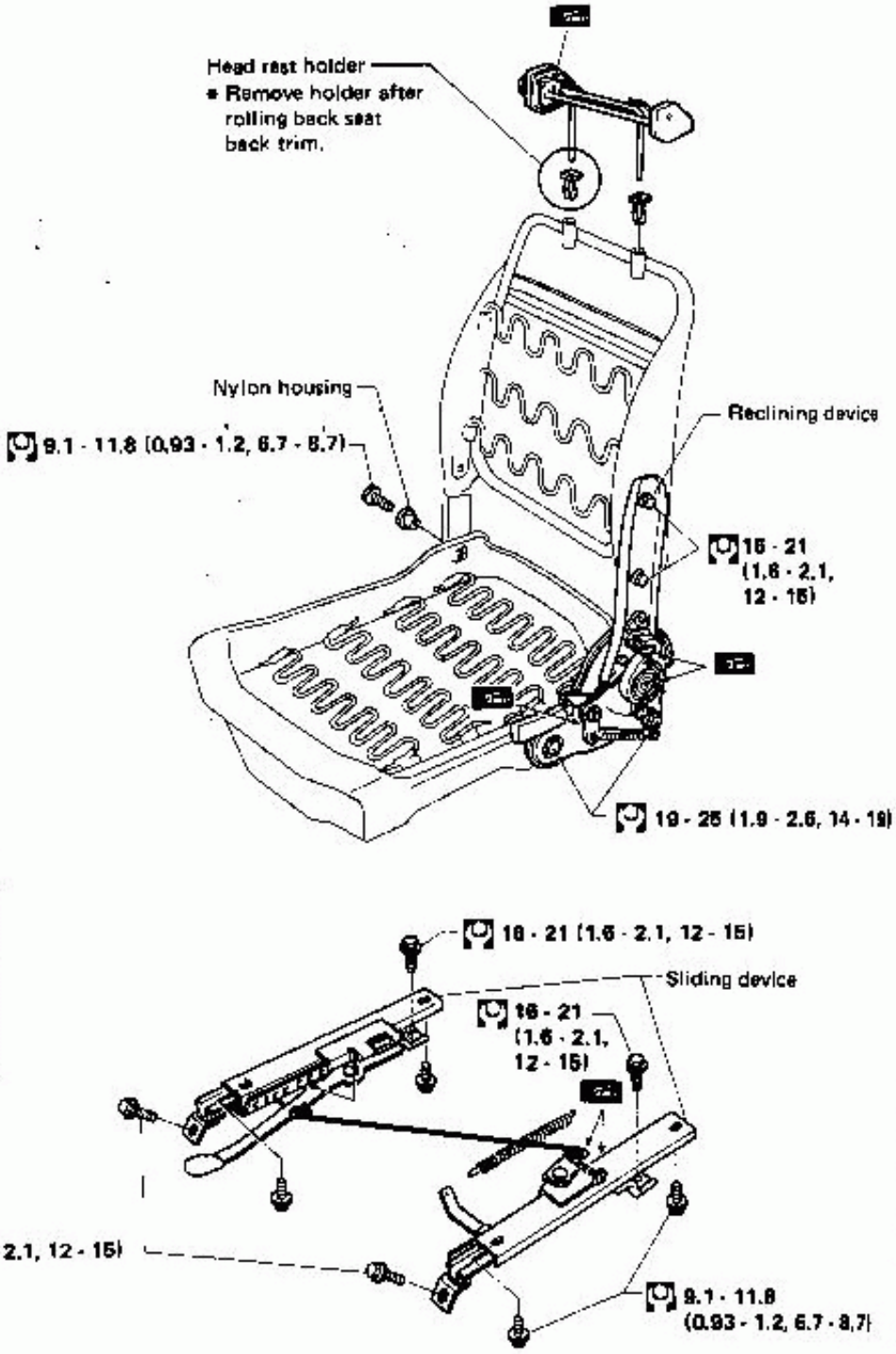


- When removing or installing the seat trim, carefully handle it to keep dirt out and avoid damage.

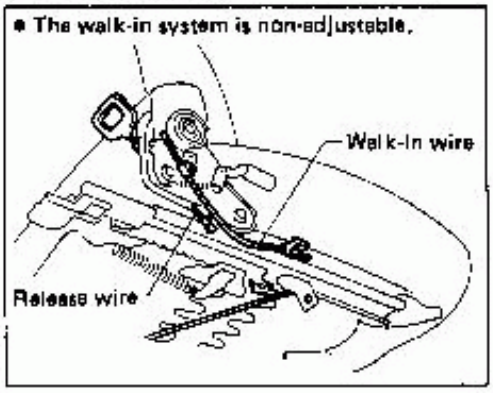
Front Seat

Lumbar support system





Walk-in mechanism

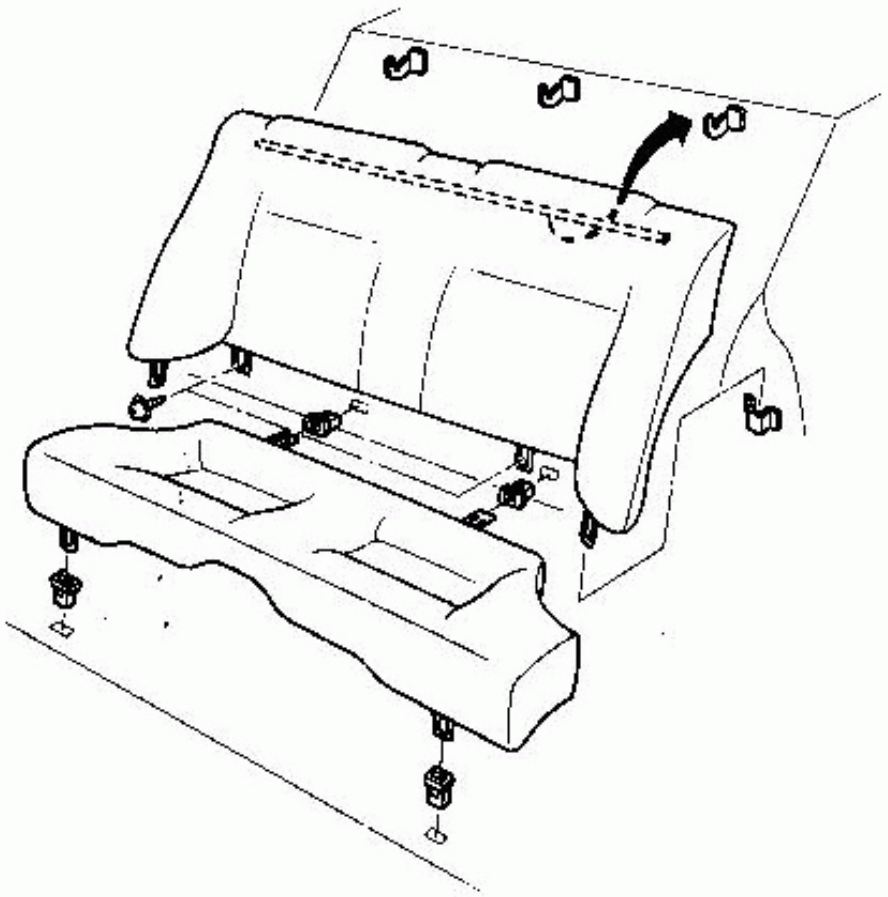


: N·m (kg-m, ft-lb)
: Grease-up point
(Do not apply too much grease as it will drip)

98F051

Rear Seat

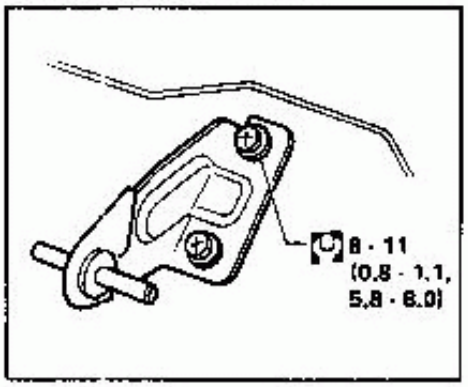
COUPE



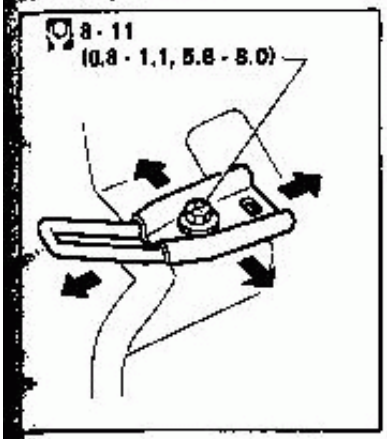
SBF052C

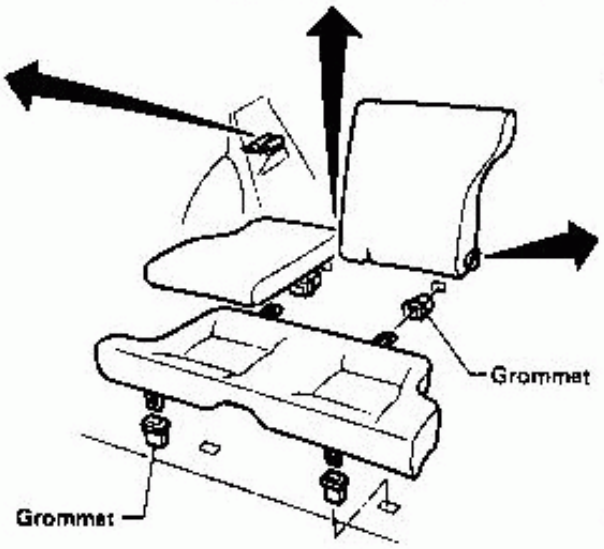
HATCHBACK

Center bracket installation

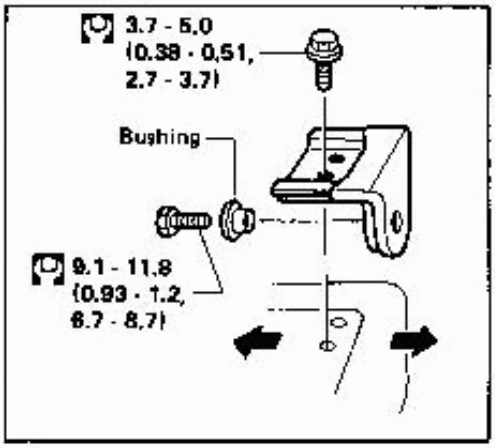


Striker adjustment





Seat back adjustment



: N·m (kg-m, ft-lb)

SF053C

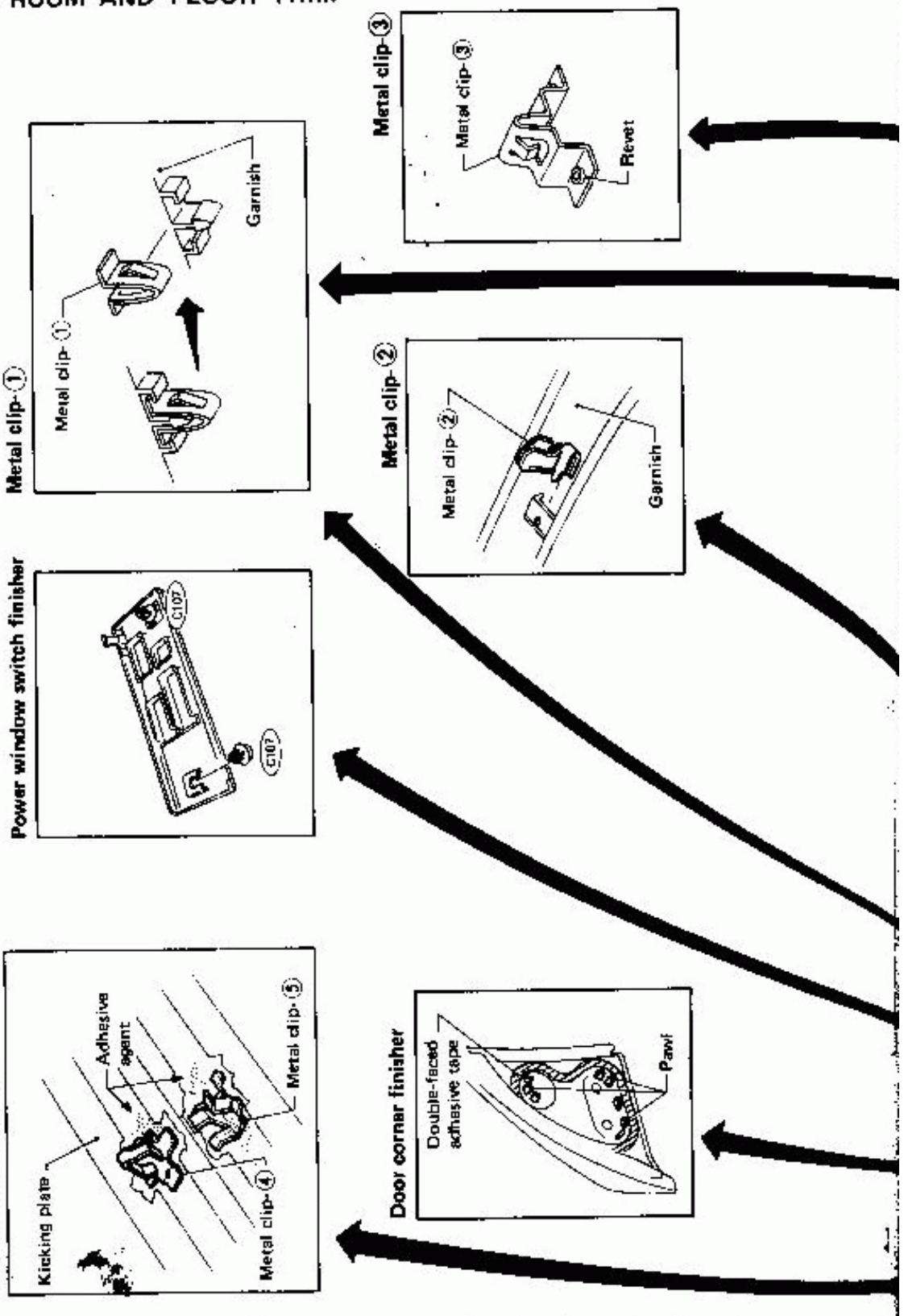
TRIM AND MOLDING

- When removing clip or fastener, refer to CLIP & FASTENER.
- When handling trim or molding, do not use excessive force and take care not to damage them.

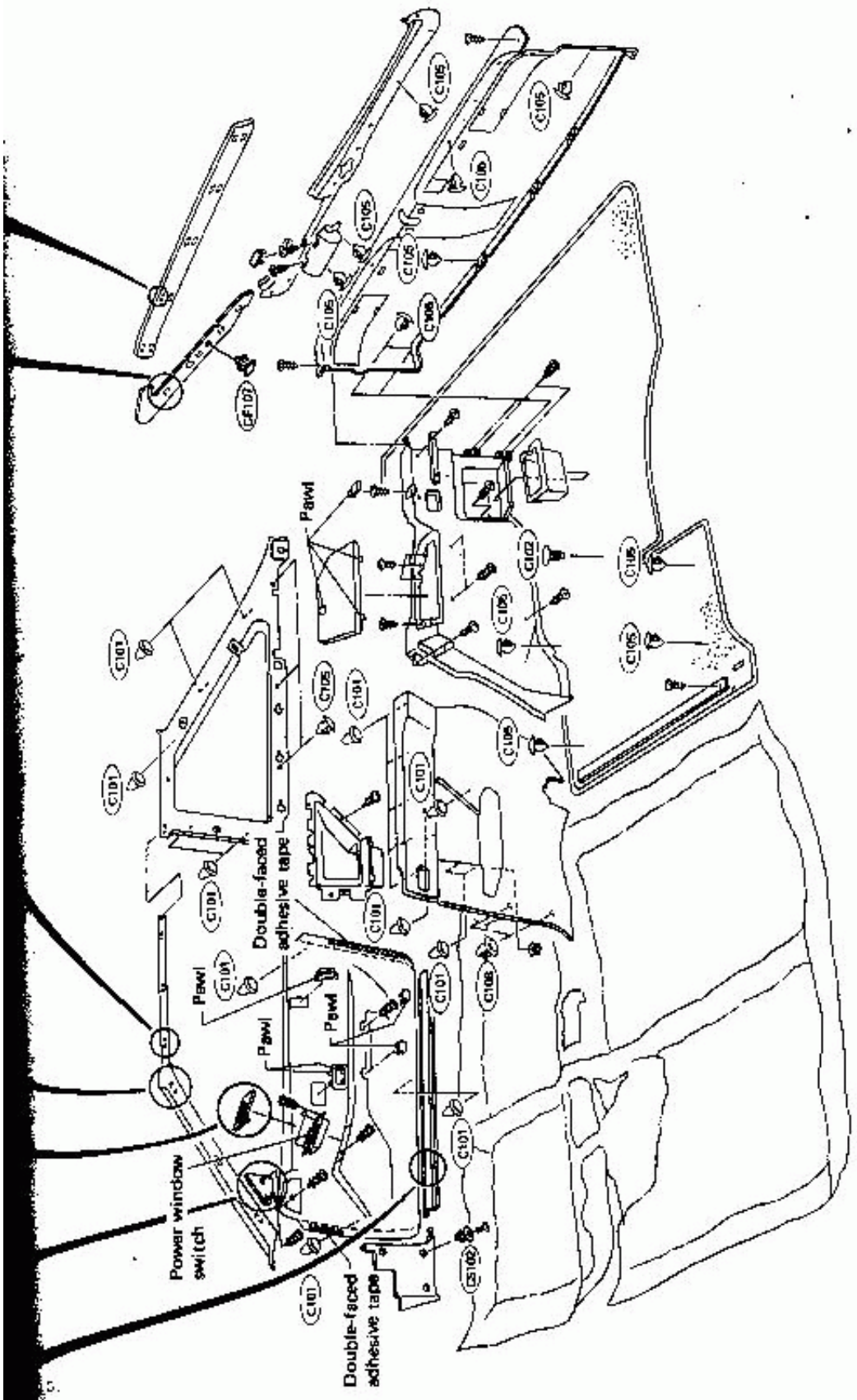
Inside Trim

SIDE, LUGGAGE/TRUNK ROOM AND FLOOR TRIM

Hatchback



Inside Trim (Cont'd)

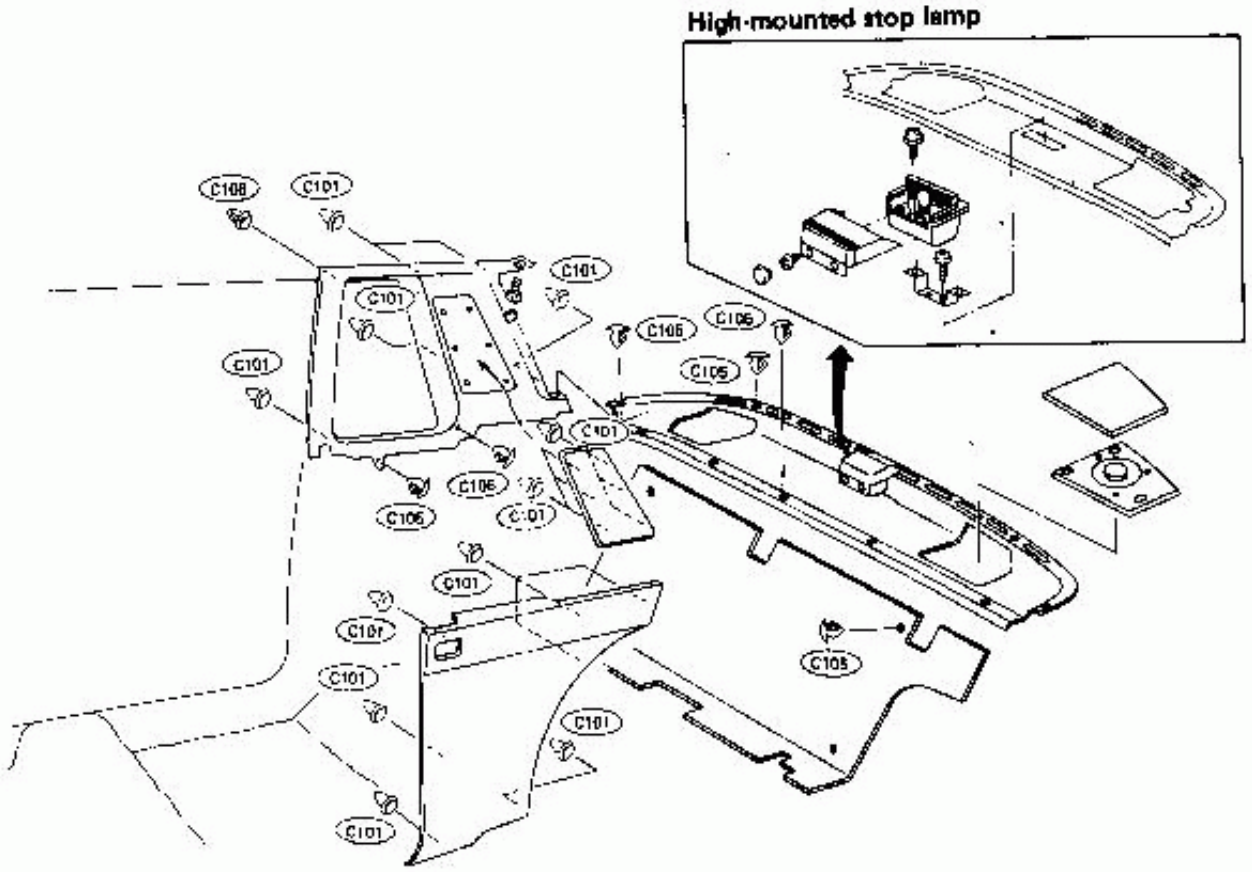


SBF054C

Inside Trim (Cont'd)

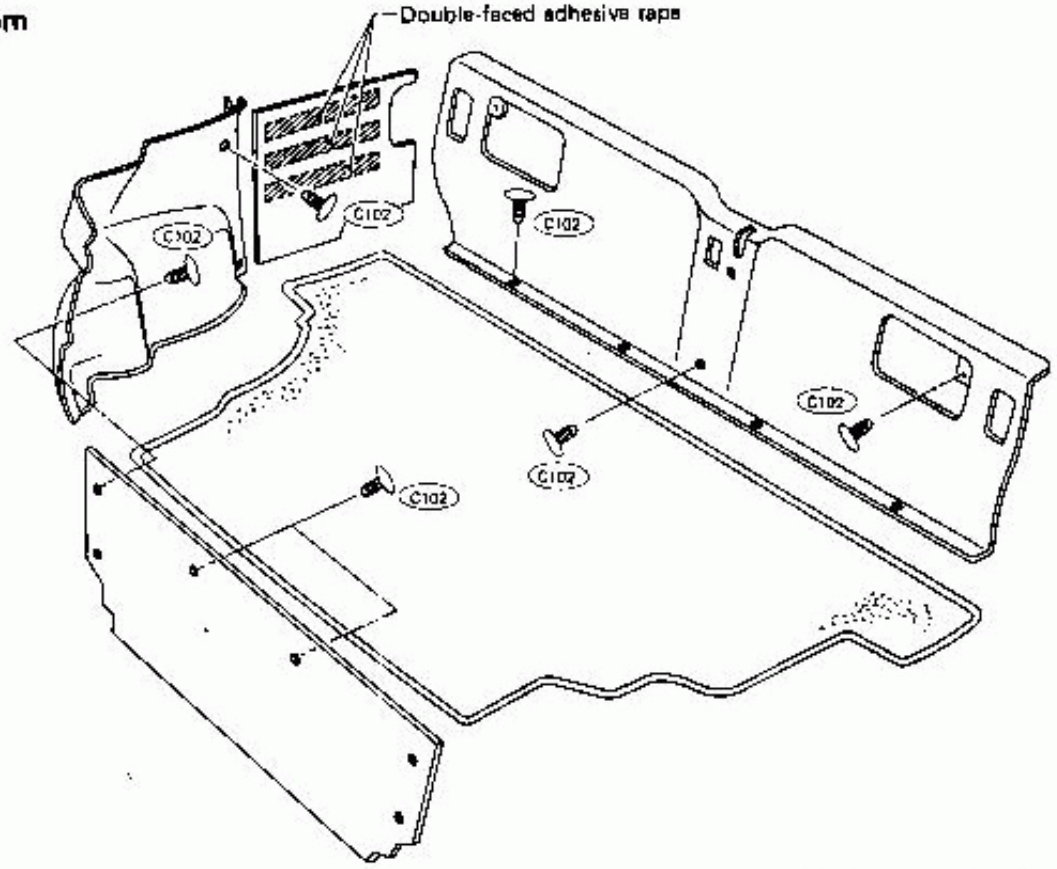
Coupe — Passenger room

- Front portion of passenger room trim is the same as that of Hatchback.



SBF564C

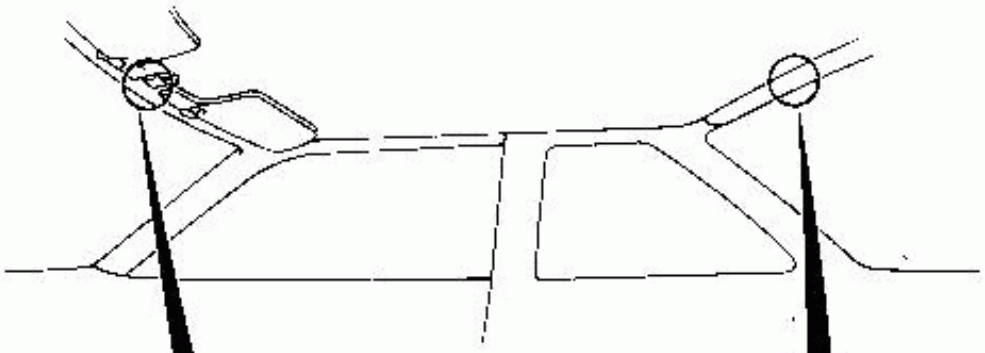
Coupe — Trunk room



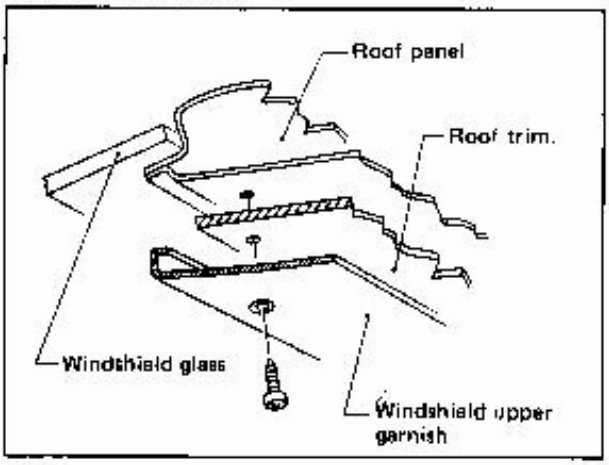
SBF0

Inside Trim (Cont'd)

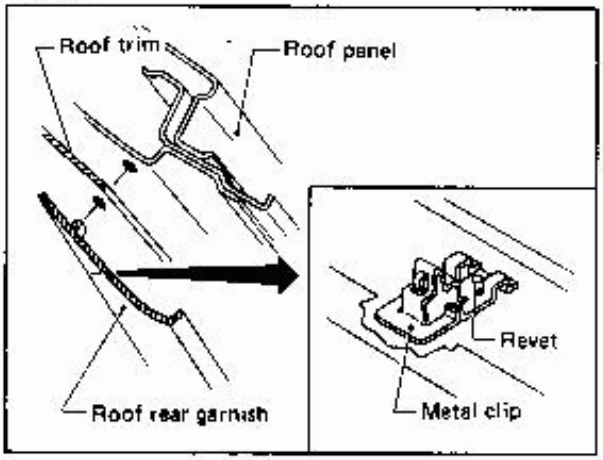
ROOF TRIM

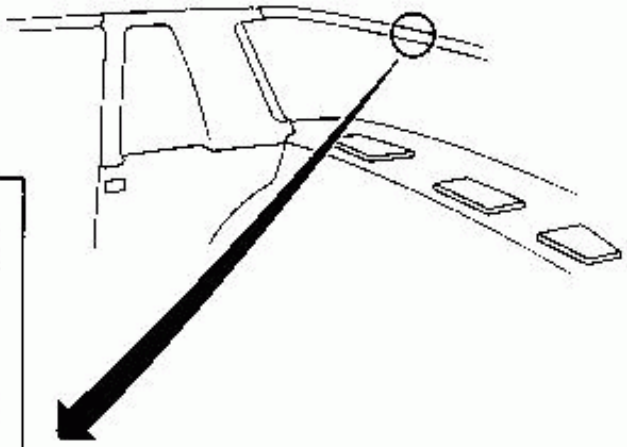


Roof trim front end

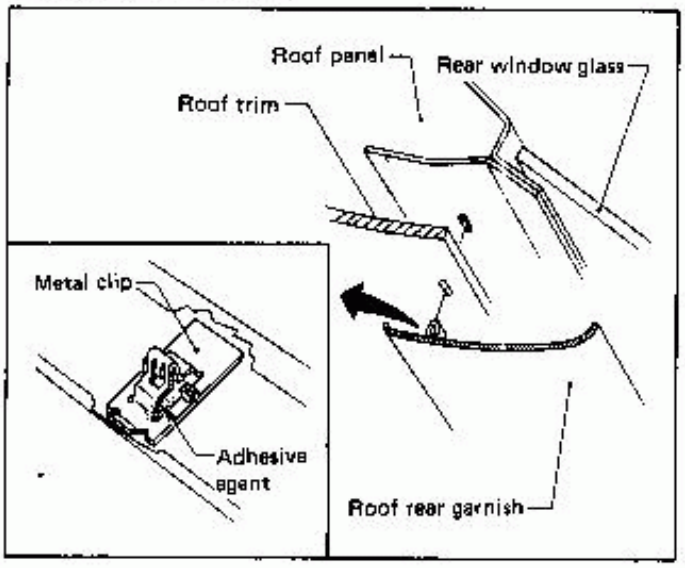


Hatchback roof trim rear end





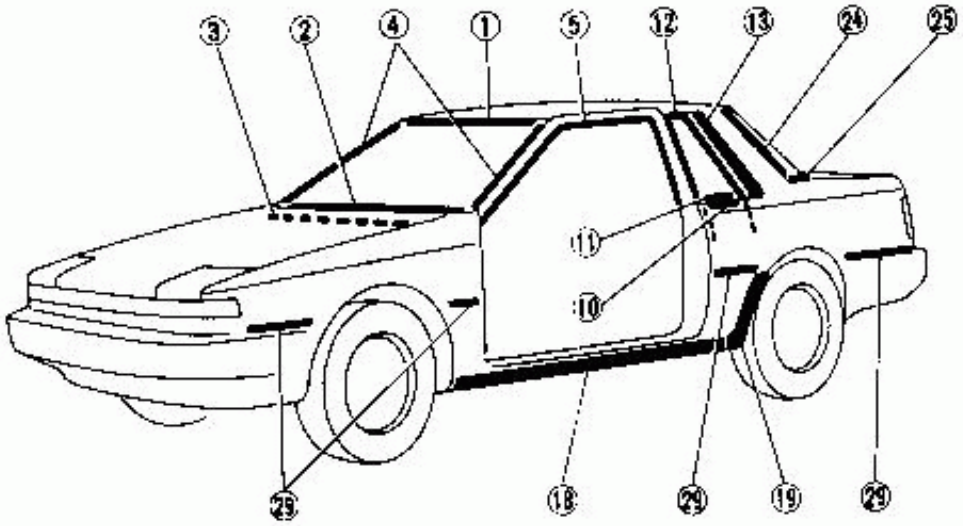
Coupe roof trim rear end

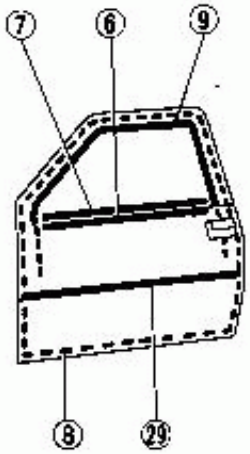


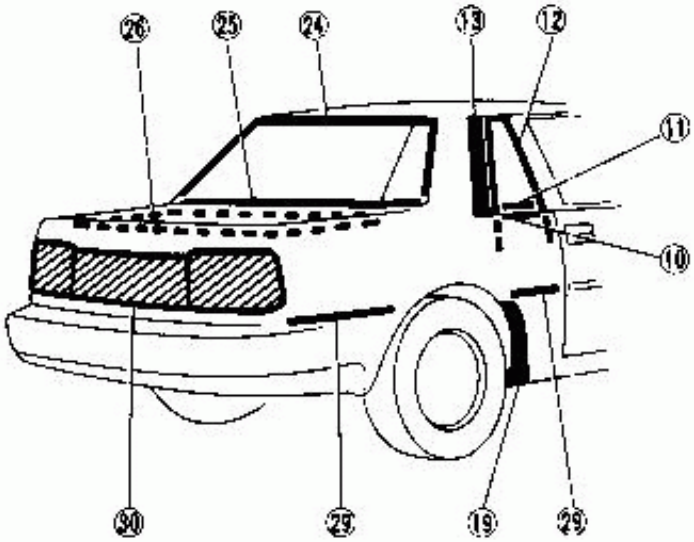
SBF592B

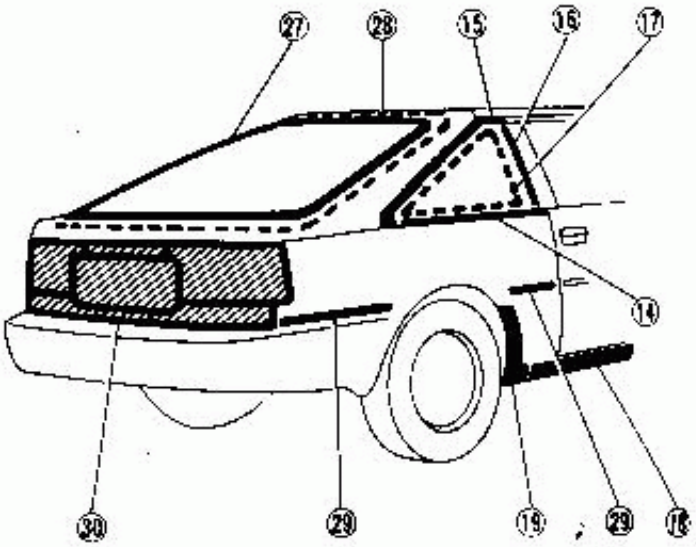
Weatherstrip and Exterior

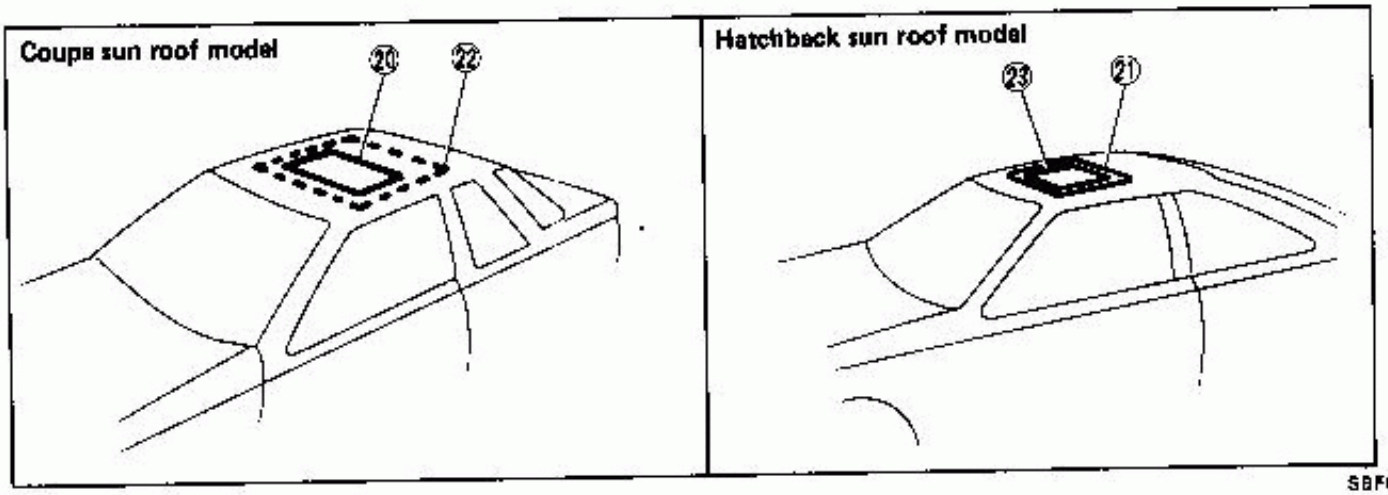
- Apply sealing compound where necessary while installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.









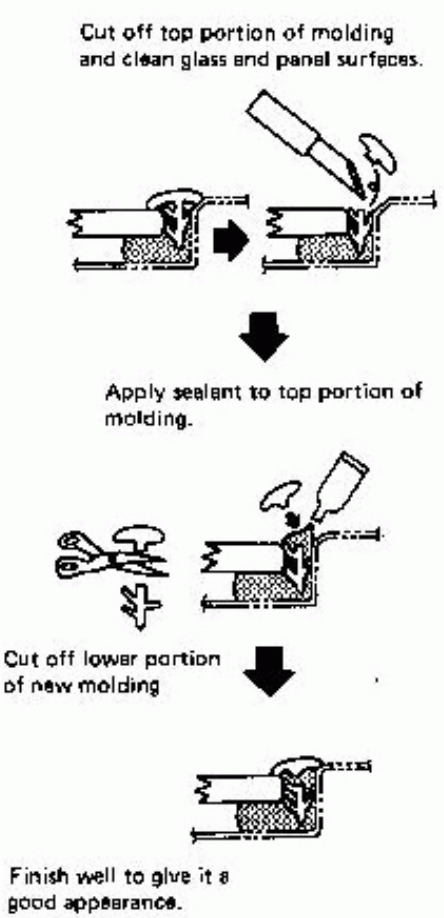


SBF067D

Weatherstrip and Exterior (Cont'd)

① Windshield upper molding

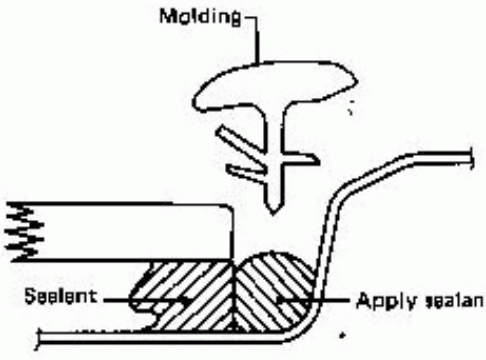
Method 1



SBF628B

Method 2

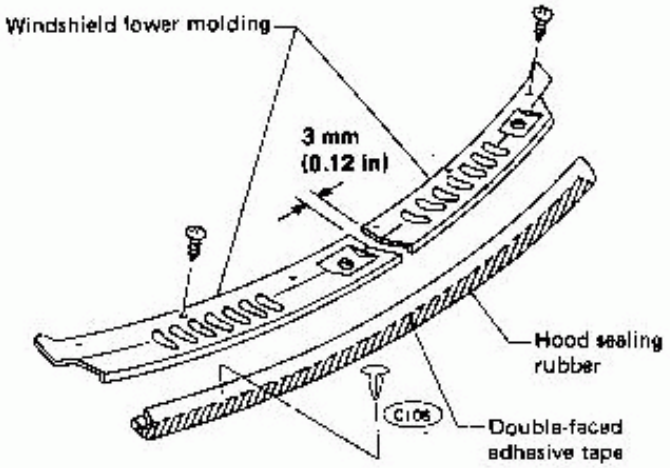
1. Cut off sealant at back door glass end.
2. Clean the side on which panel was mounted.



SBF809A

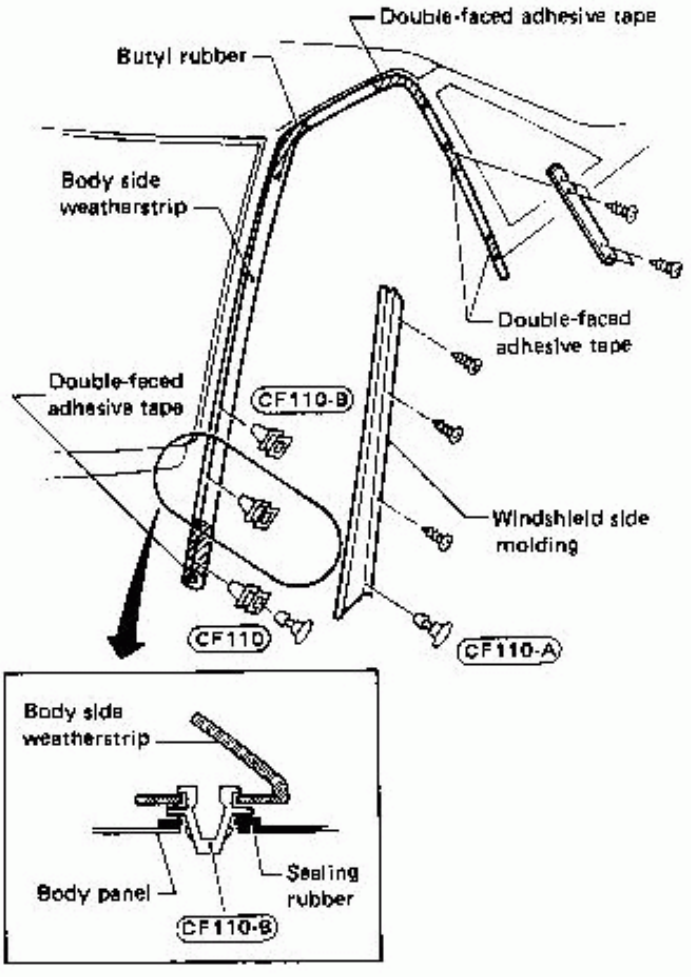
3. Install molding by aligning the molding mark located on center with vehicle center.

② ③ Windshield lower molding and Hood sealing rubber



SBF629B

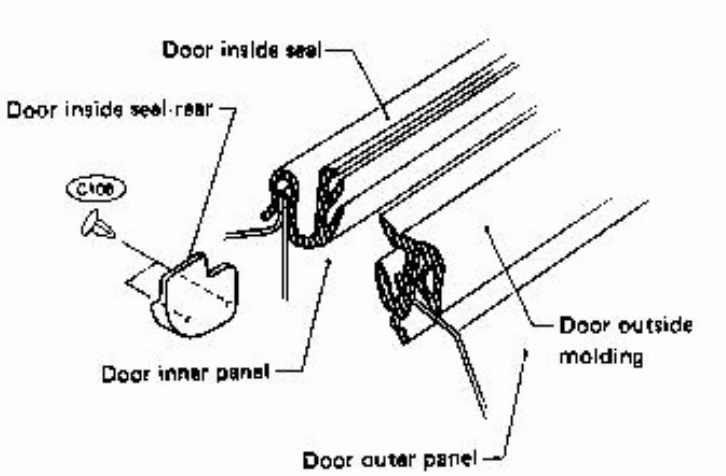
④ ⑤ Windshield side molding and Body side weatherstrip



SBF135C

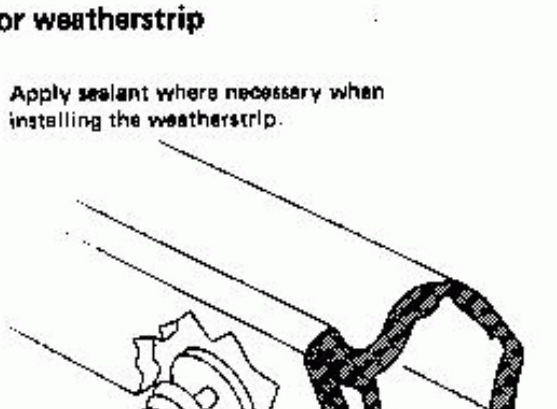
Weatherstrip and Exterior (Cont'd)

⑥ ⑦ Door outside molding and inside seal



SBF631B

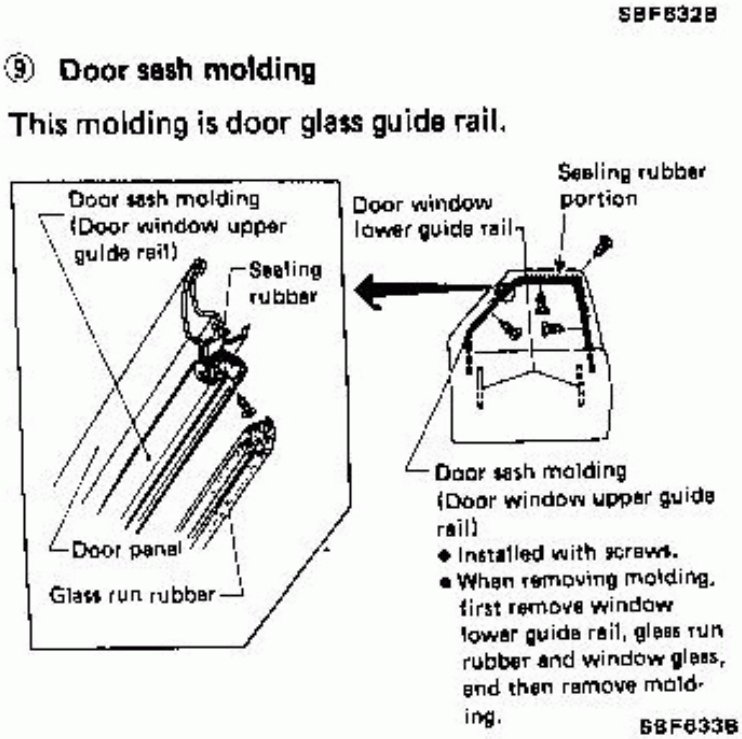
⑧ Door weatherstrip



SBF632B

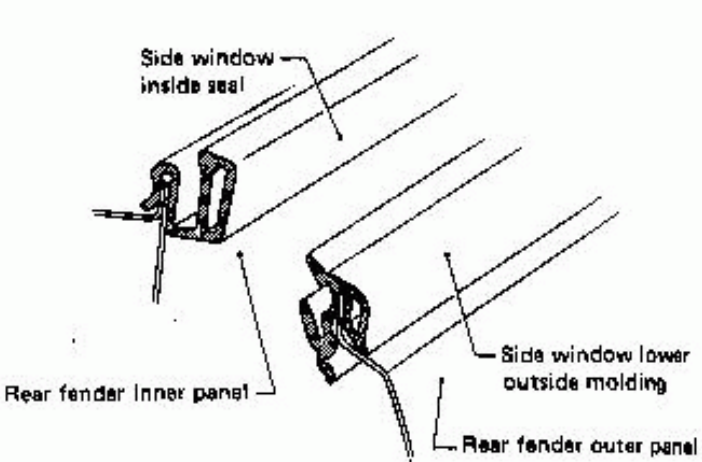
⑨ Door sash molding

This molding is door glass guide rail.



SBF633B

⑩ ⑪ Side window lower outside molding and inside seal (Coupe)

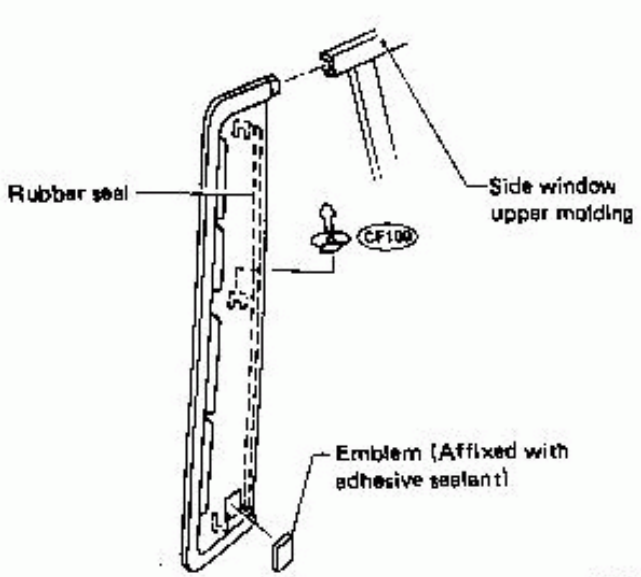


SBF634B

⑫ Side window upper & side molding (Coupe)

It's same as door sash molding. So refer to "⑨ Door sash molding" and "Side Window".

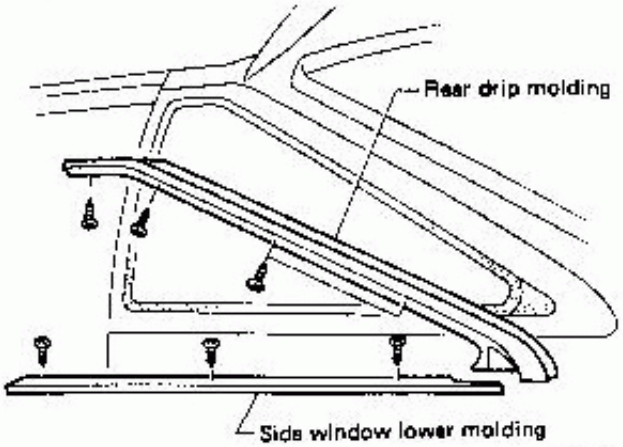
⑬ Air outlet grille (Coupe)



SBF635B

Weatherstrip and Exterior (Cont'd)

⑭ ⑮ Side window lower molding and RR Drip molding (Hatchback)

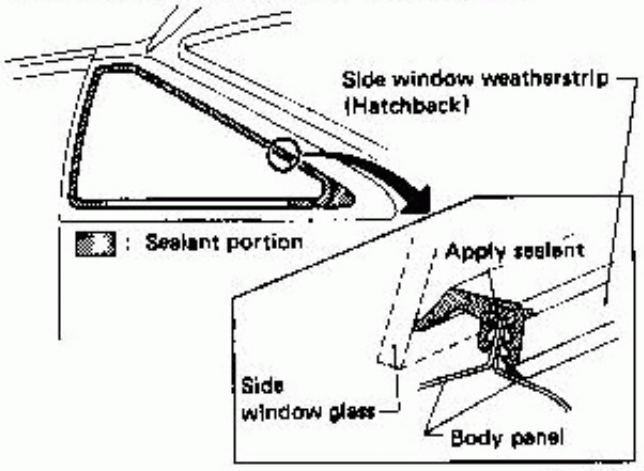


SBF636B

⑯ Side window front molding (Hatchback)

This molding is assembled with window glass. So when replacing, replace as a set.

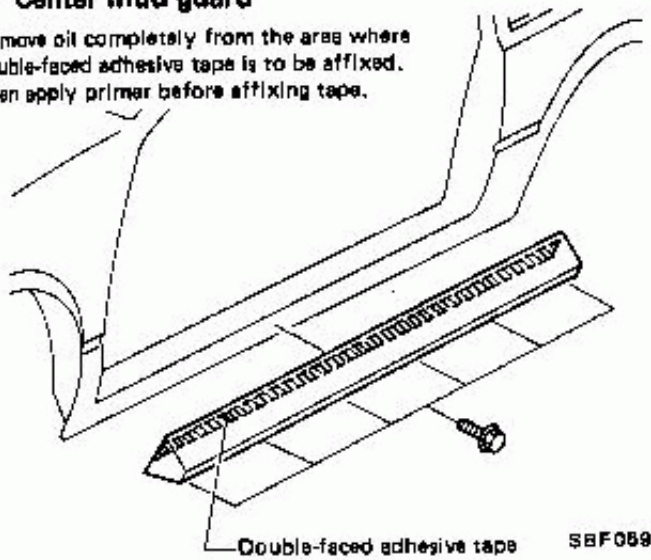
⑰ Side window weatherstrip (Hatchback)



SBF658C

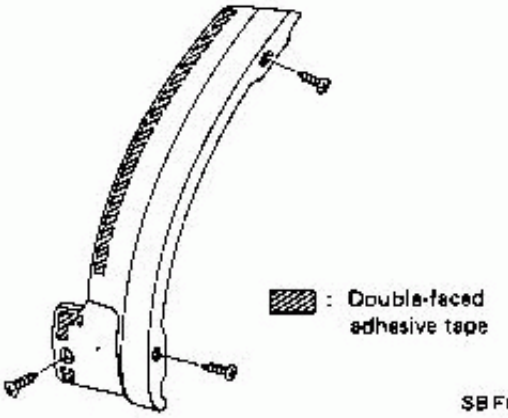
⑱ Center mud guard

Remove oil completely from the area where double-faced adhesive tape is to be affixed. Then apply primer before affixing tape.



SBF059C

⑲ Rear fillet molding

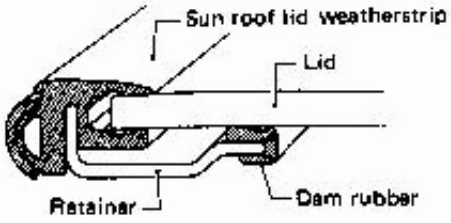


SBF638B

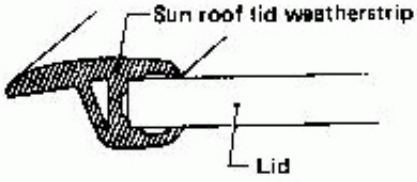
⑳ ㉑ Sun roof lid weatherstrip

Sun roof lid weatherstrip is bonded to lid. Apply primer before bonding it.

[Coupe]

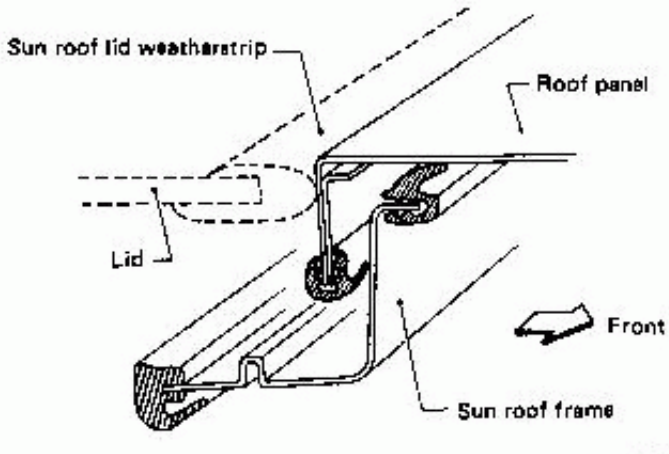


[Hatchback]



SBF639B

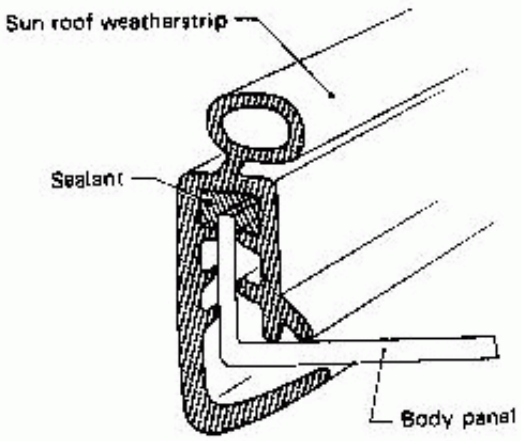
㉒ Sun roof weatherstrip (Coupe)



SBF640B

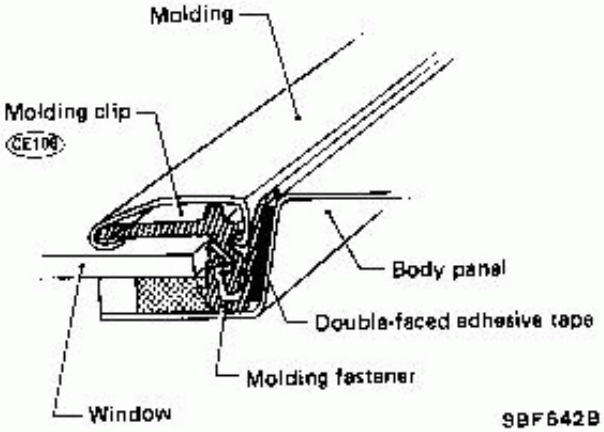
Weatherstrip and Exterior (Cont'd)

㉓ Sun roof weatherstrip (Hatchback)



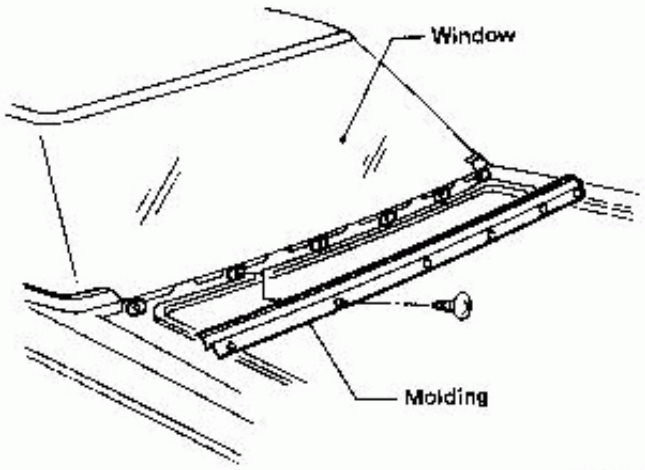
SBF060C

㉔ Back window upper & side molding (Coupe)



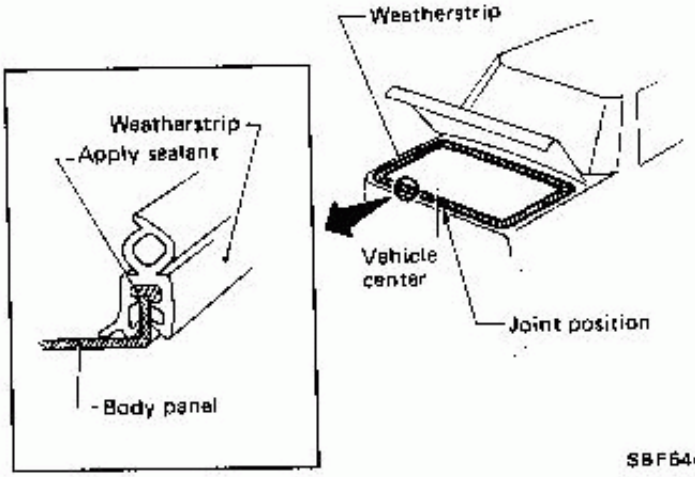
SBF642B

㉕ Back window lower molding (Coupe)



SBF566C

㉖ Trunk lid weatherstrip (Coupe)

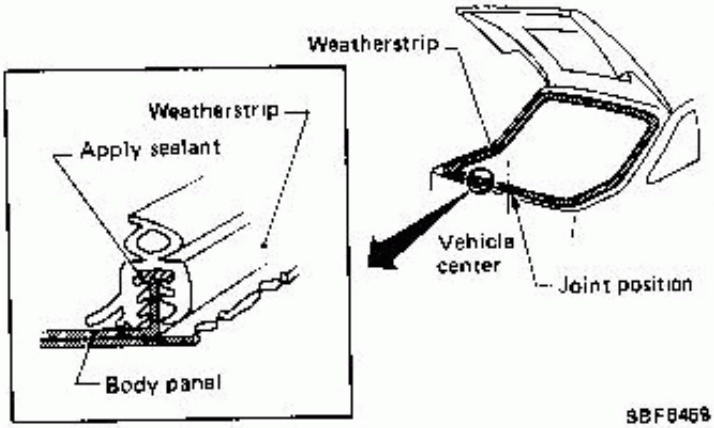


SBF644B

㉗ Back door window molding (Hatchback)

This molding is same as coupe back window upper & side molding. Refer to "㉔ Back window upper & side molding".

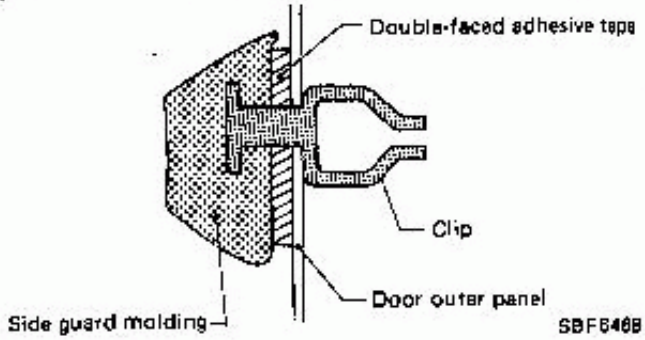
㉘ Back door weatherstrip (Hatchback)



SBF645B

㉙ Side guard molding

- **Side guard molding is affixed to fender panel with doublefaced adhesive tape, and to door panel with clip & doublefaced adhesive tape.**

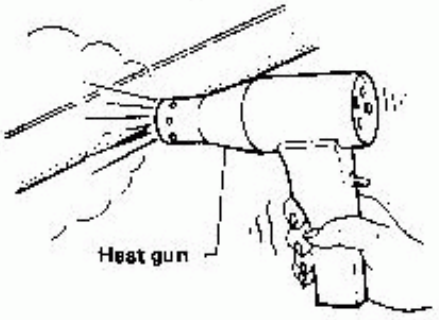


SBF646B

Weatherstrip and Exterior (Cont'd)

- **Remove it only if it is necessary to do so.**
- **Removal:**

1. Heat molding portion to 30 to 40°C (86 to 104°F) with a heat gun.

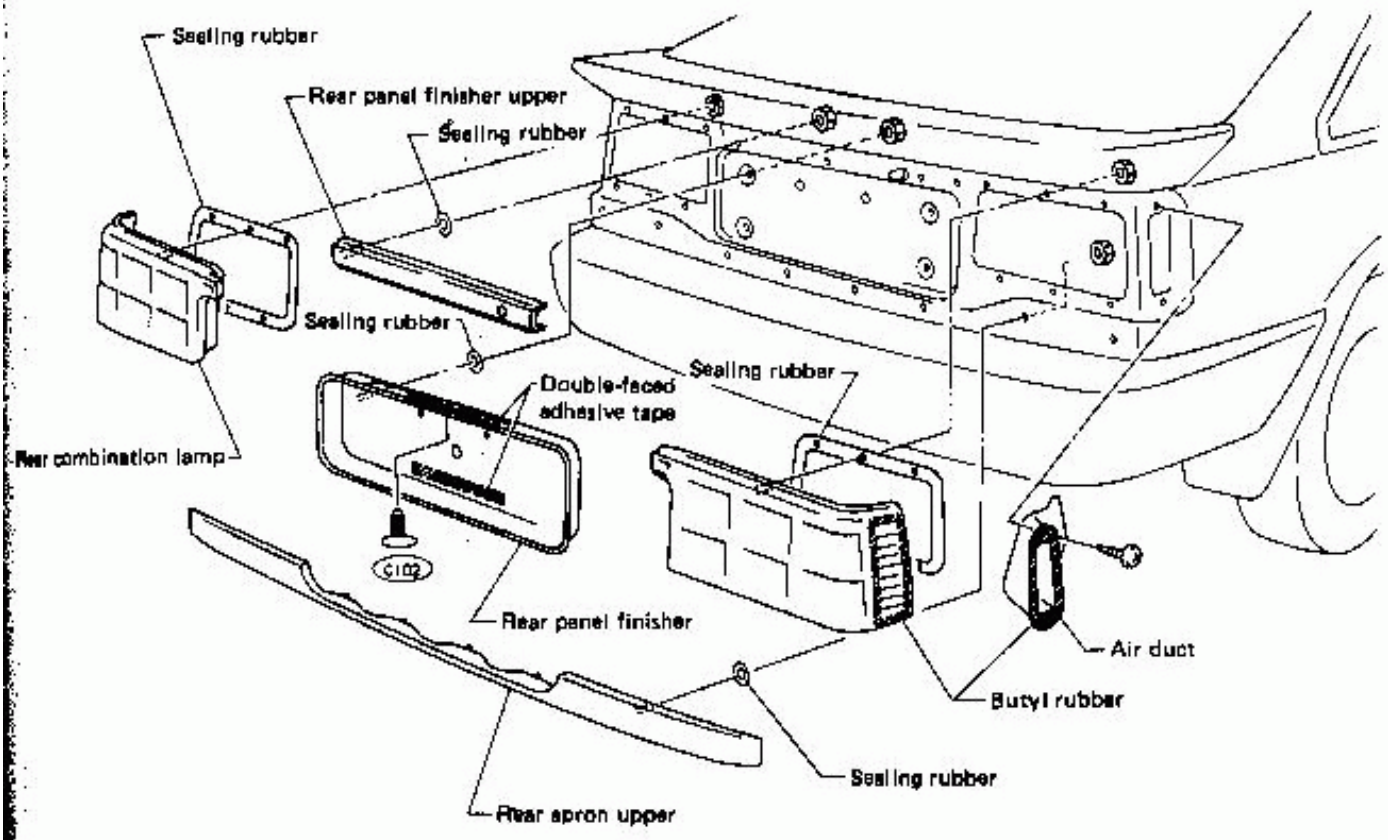


2. Raise end of molding and, while cutting off bonding agent, detach molding.

- **Installation.**

1. Remove all traces of bonding agent from body panel. Then clean contact face of body.
2. Heat body panel and molding to 30 to 40°C (86 to 104°F) with a heat gun. Then install molding.

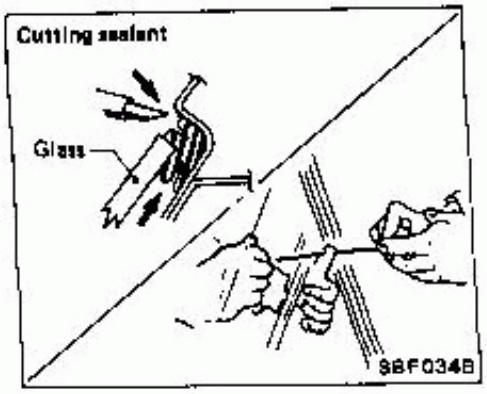
Rear panel finisher, rear panel finisher upper, rear apron upper, rear combination lamp and air duct.



Windshield, Rear Window (Coupe) and Back Door Window (Hatchback)

REMOVAL

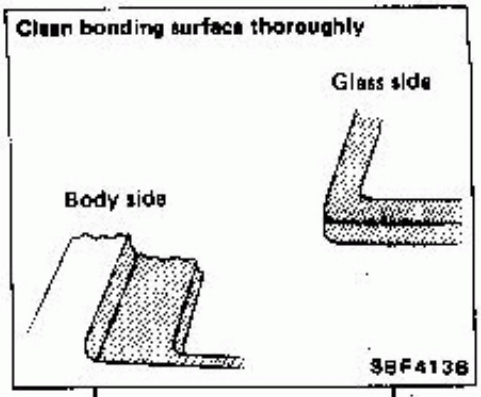
After removing moldings, remove glass.



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. Ideally, sealant should be stored in a refrigerator.
- Be sure to install moldings.



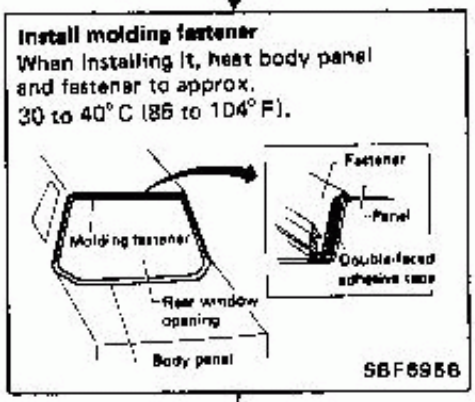
Body side

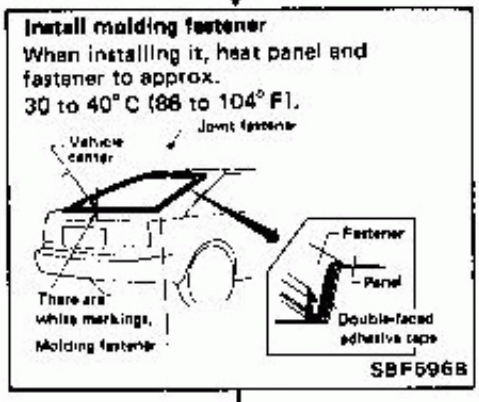
Glass side

Windshield

Rear window (Coupe)

Back door window (Hatchback)





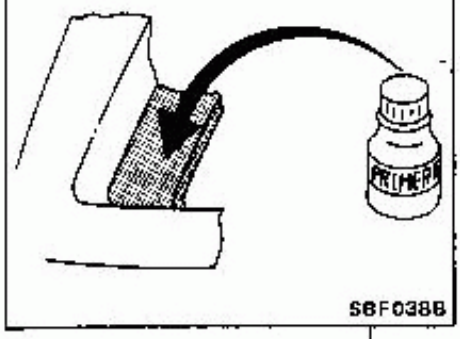
Ⓐ

Ⓑ

Windshield, Rear Window (Coupe) and Back Door Window (Hatchback) (Cont'd)

Ⓐ

Apply Primer E



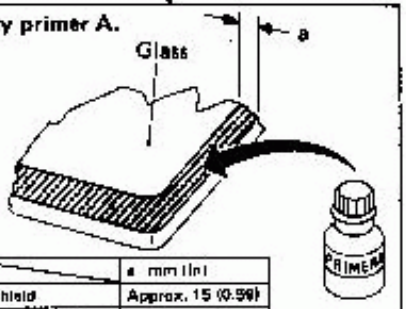
SBF038B

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

CAUTION:
Allow Primers to dry for 10 to 15 minutes before processing to the next

Ⓑ

Apply primer A.



	a mm (in)
Windshield	Approx. 15 (0.59)
Rear window (Coupe)	Approx. 8 (0.35)
Back door window (Hatchback)	Approx. 20 (0.79)

SBF594B

CAUTION:
Do not apply Primer A to windshield operating flanges.

Body side

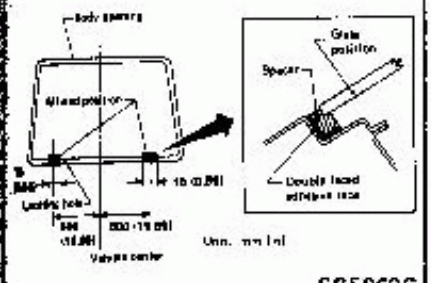
Glass side

Windshield

Rear window (Coupe)

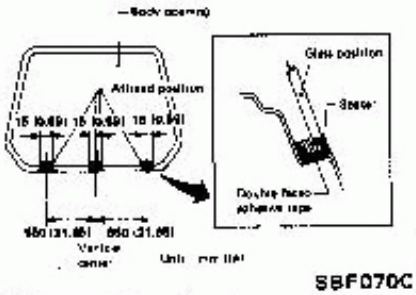
Back door window (Hatchback)

Install spacer to panel with double-faced adhesive tape.



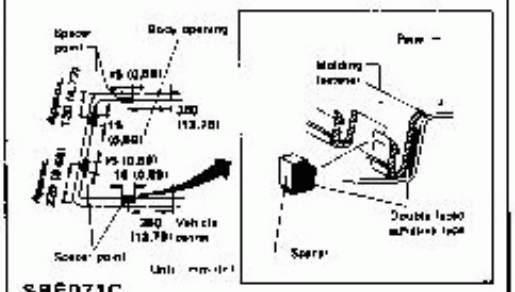
SBF069C

Install spacers to panel with double-faced adhesive tape.



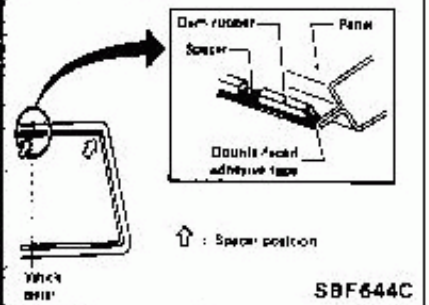
SBF070C

Install spacers with double-faced adhesive tape at molding fastener slit portion.



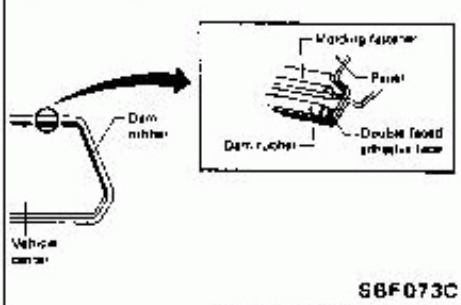
SBF071C

Install dam rubber with double-faced adhesive tape.



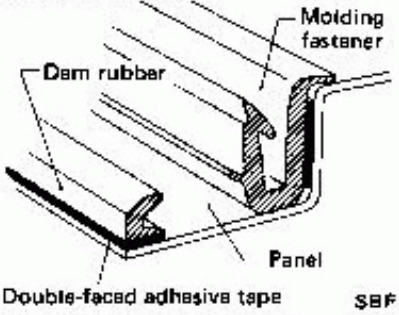
SBF644C

Install dam rubber with double-faced adhesive tape.



SBF073C

Install dam rubber with double-faced adhesive tape.



SBF502B

Ⓒ Ⓓ Ⓔ Ⓕ

Windshield, Rear Window (Coupe) and Back Door Window (Hatchback) (Cont'd)

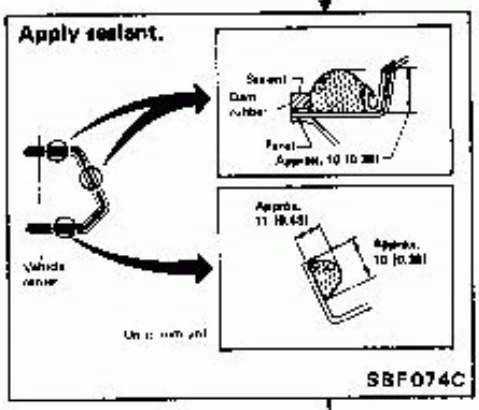
Ⓒ Windshield – Body side

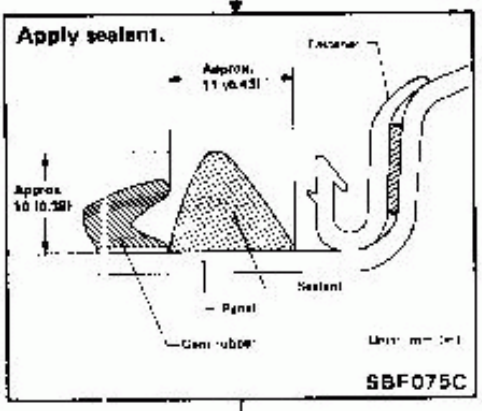
Ⓓ Rear window (Coupe) – Body side

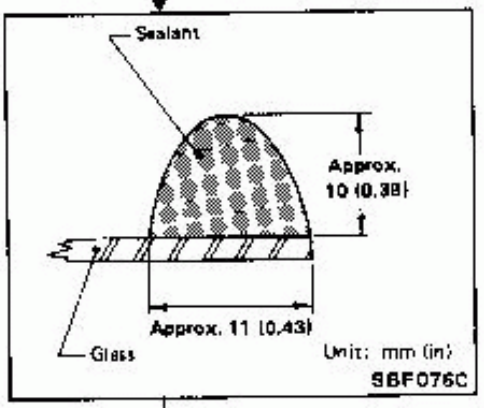
Ⓔ Back door window (Hatchback) – Body side

Ⓕ Windshield – Glass side

Ⓕ Except windshield – Glass side







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.

Windshield

Set upper molding.

Rear window (Coupe)
Back door window (Hatchback)

Check for water leakage.

Windshield

Install side molding, lower molding and body side weatherstrip.

Rear window (Coupe)

Install moldings.

Back door window (Hatchback)

Install moldings and welt.

Windshield, Rear Window (Coupe) and Back Door Window (Hatchback) (Cont'd)

Reference

Period required for sealant to dry to desired hardness

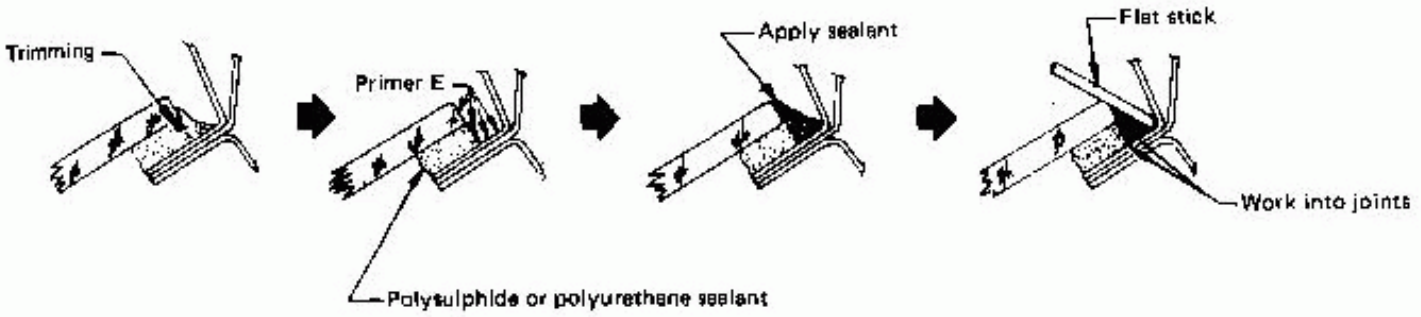
Temperature [°C (°F)] \ Relative humidity [%]	90	50	25
25 (77)	1.2	2.3	4.1
5 (41)	2.6	5.6	11.3

Unit: days

CAUTION:
Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

REPAIRING LEAKS

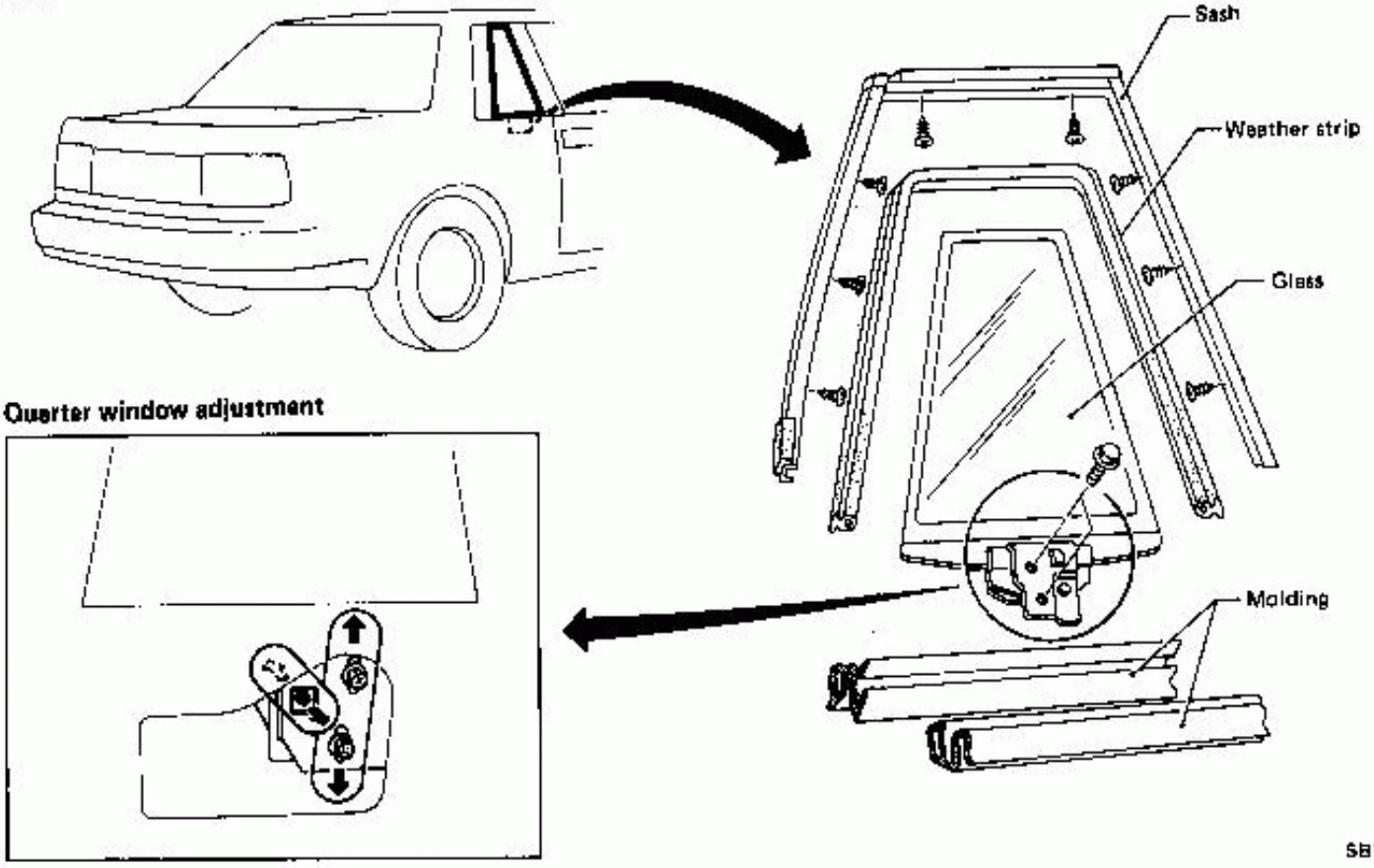
Leaks can be repaired without removing and reinstalling glass.
If water is leaking between caulking material and body or between glass and caulking material, determine the extent of the leak by applying water while pushing glass outward. To stop the leak, apply Primer and then sealant to the leak point.



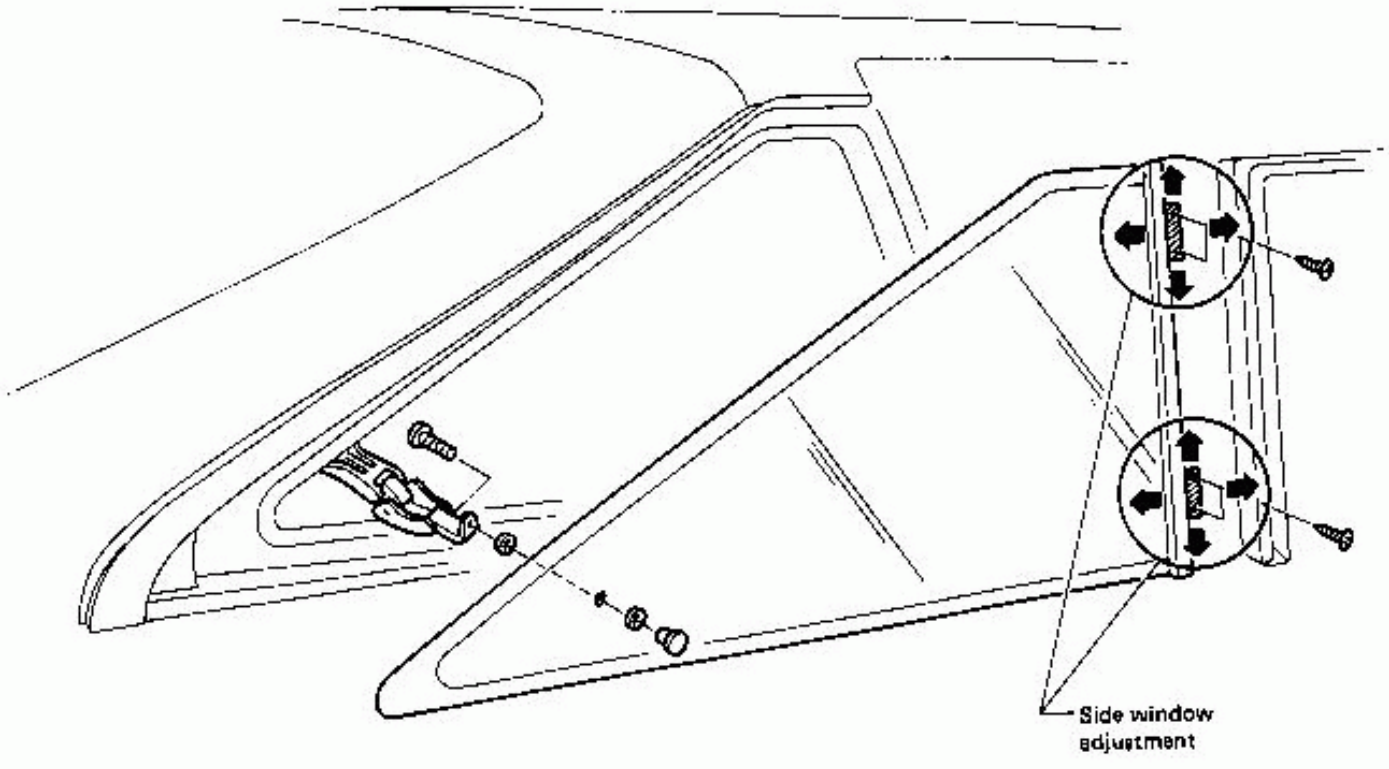
SBF543B

Side Window

COUPE



HATCHBACK

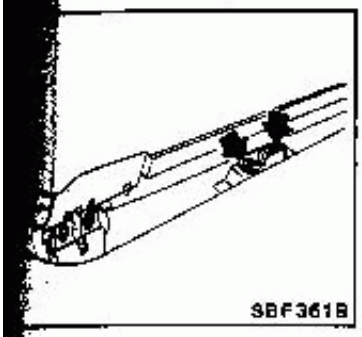


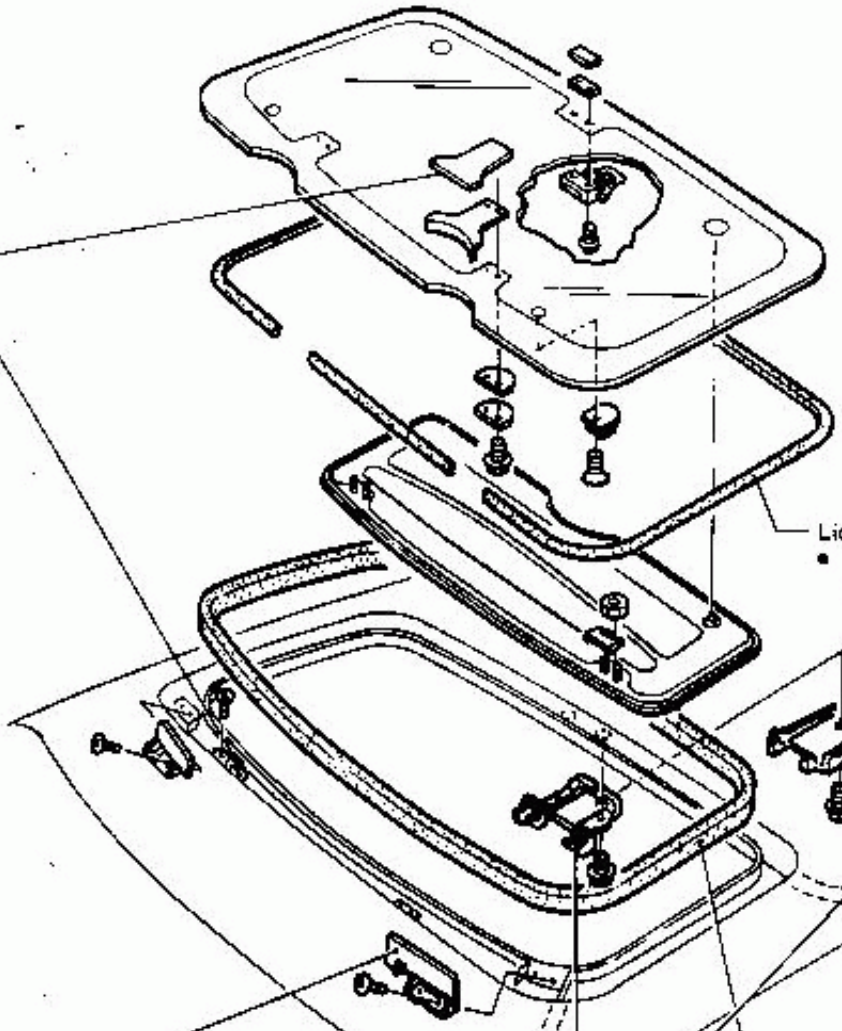
Service Procedure

Handle glass lid with care so not to damage it.

Female hinge

Hinge bracket

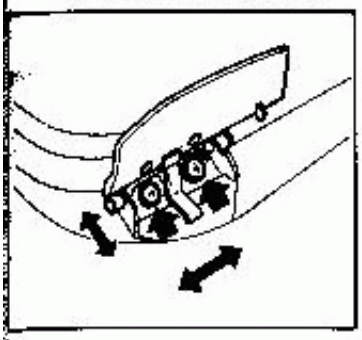




Lid weatherstrip
- Lid weatherstrip is bonded to lid.

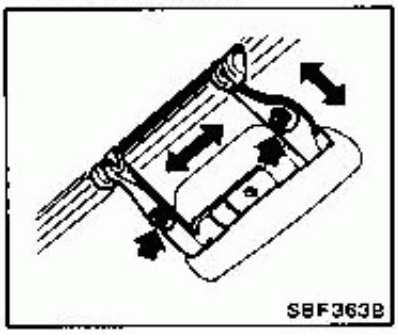
Weatherstrip

Air deflector adjustment



Drain hose
- After installation of drain hoses, make sure water drains smoothly.

Handle adjustment

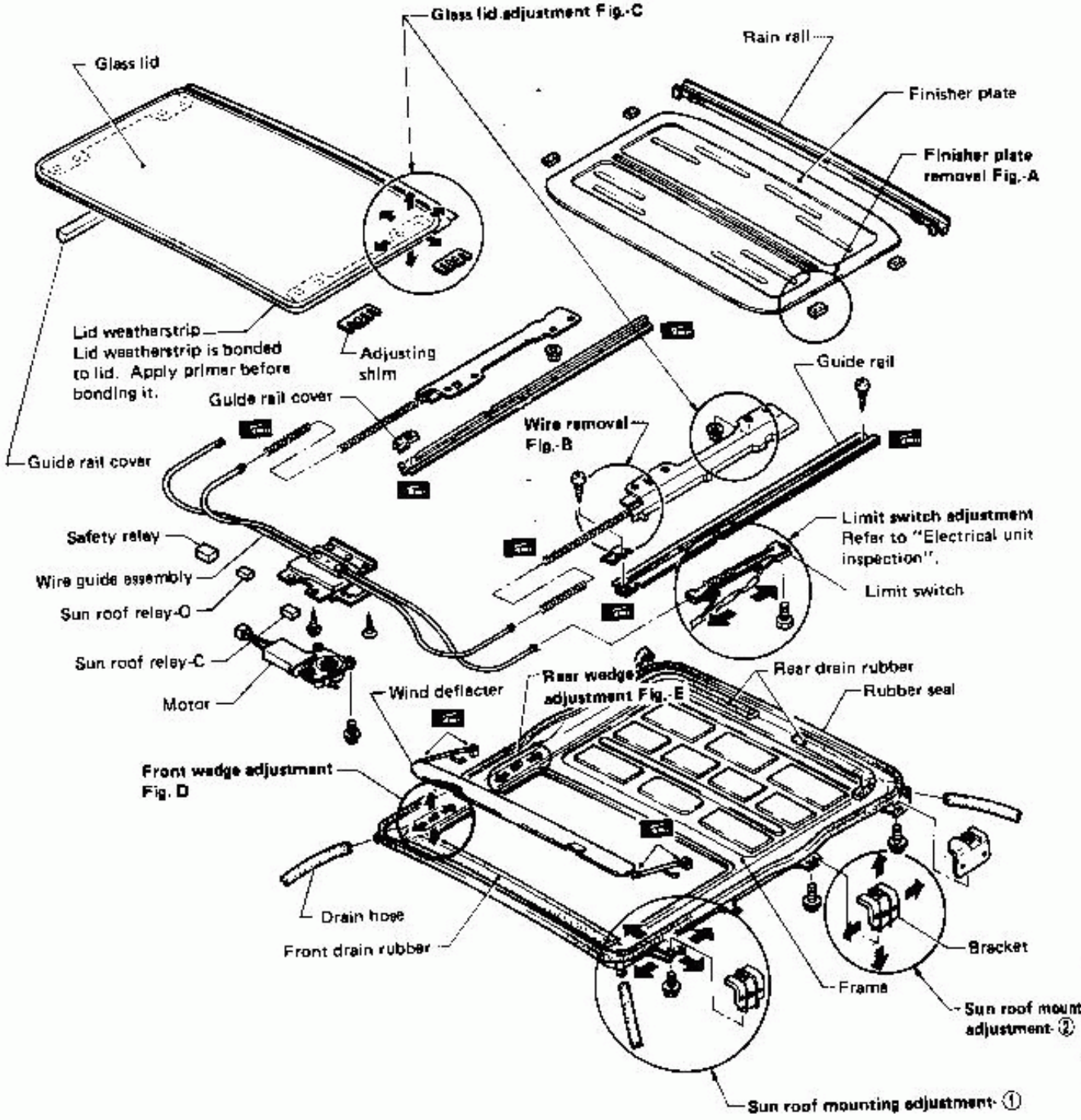


SBF068C

ELECTRICAL SUN ROOF (Coupe)

Service Procedure

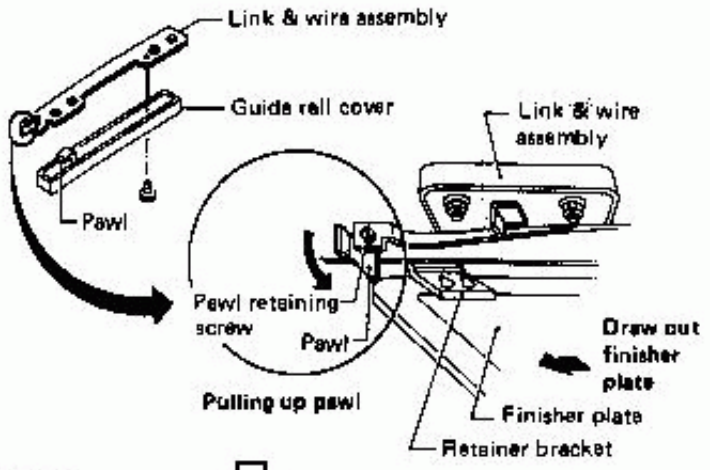
- Do not move or remove limit switch unless it is necessary.
- After any adjustment, check sun roof operation and lid alignment.
- Handle finisher plate and glass lid with care so not to damage it.



Service Procedure (Cont'd)

Finisher plate removal & installation

Remove guide rail cover and pull up pawl by loosening retaining screw, then draw out finisher plate with sun roof lid open.



Removal:
Raise pawl of retainer bracket, shift finisher plate and remove locate pins from retainer bracket. Then remove finisher plate.

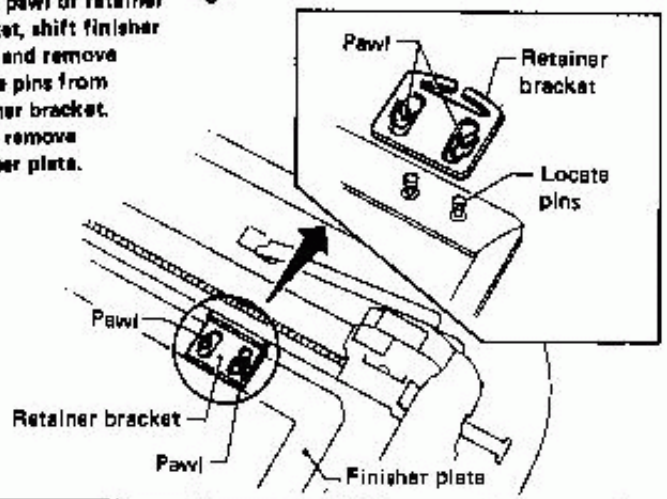


Fig.-A

Wire removal & installation

- When replacing wire, remove rail first and then link & wire assembly.
- Be sure to lubricate.

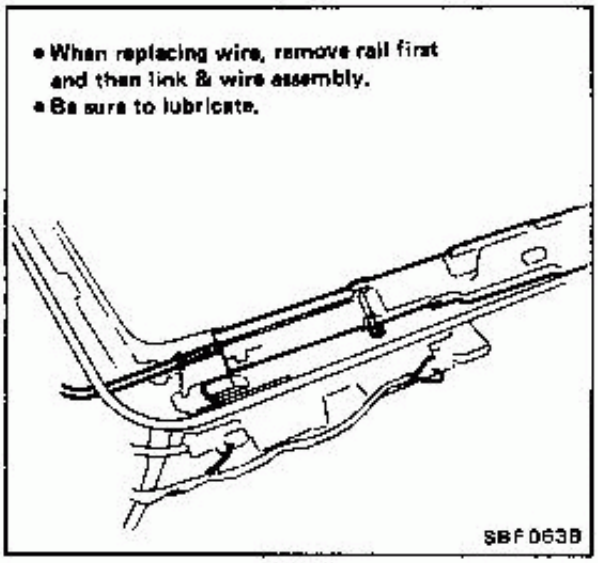


Fig.-B

Glass lid adjustment

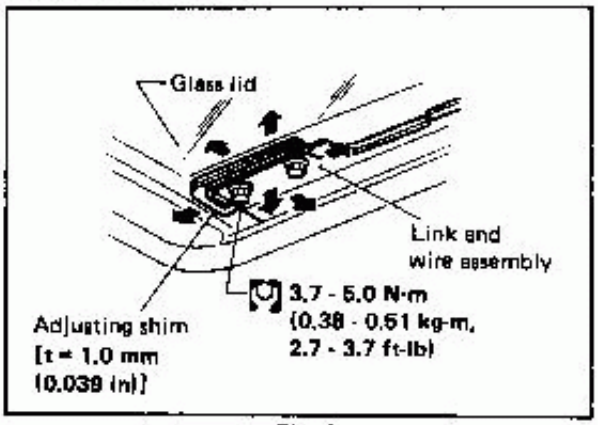
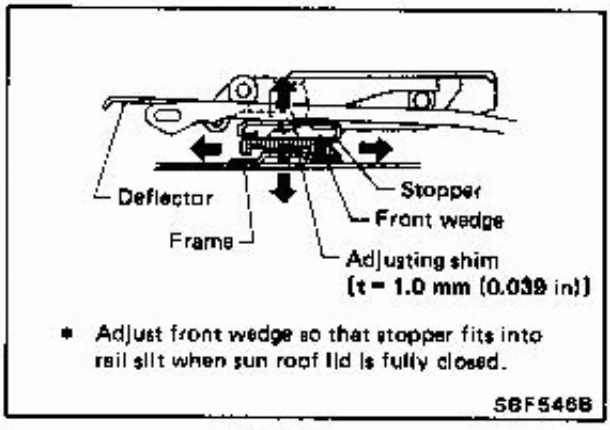


Fig.-C

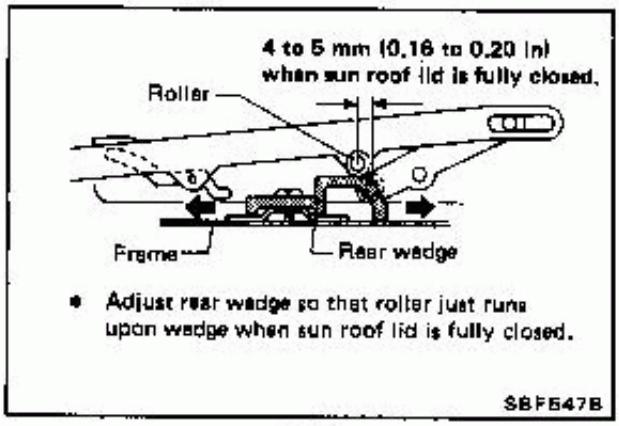
Front wedge adjustment



- Adjust front wedge so that stopper fits into rail slit when sun roof lid is fully closed.

Fig.-D

Rear wedge adjustment



- Adjust rear wedge so that roller just runs upon wedge when sun roof lid is fully closed.

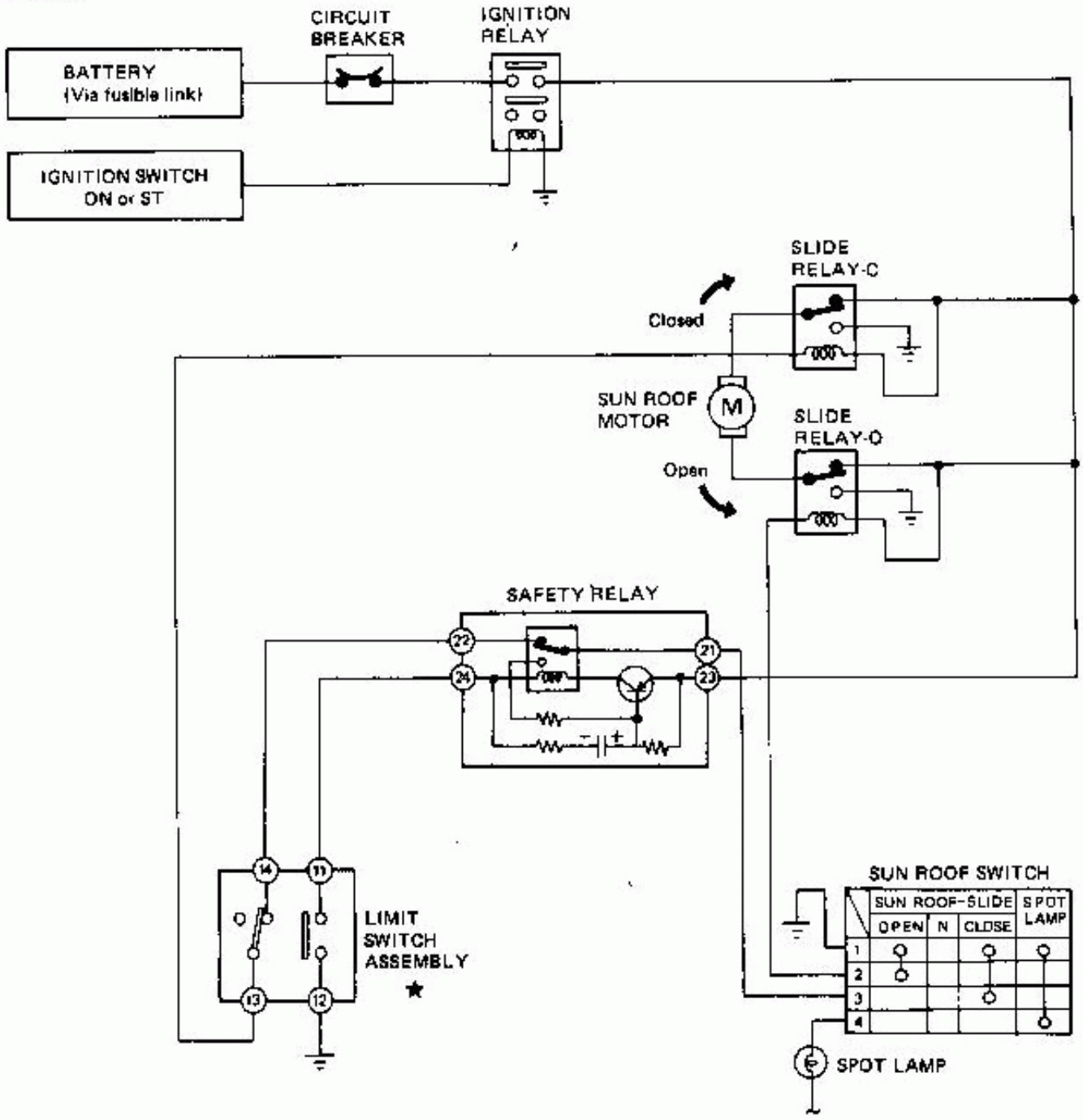
Fig.-E

SBF064C

ELECTRICAL SUN ROOF (Coupe)

Electrical Circuit

SCHEMATIC



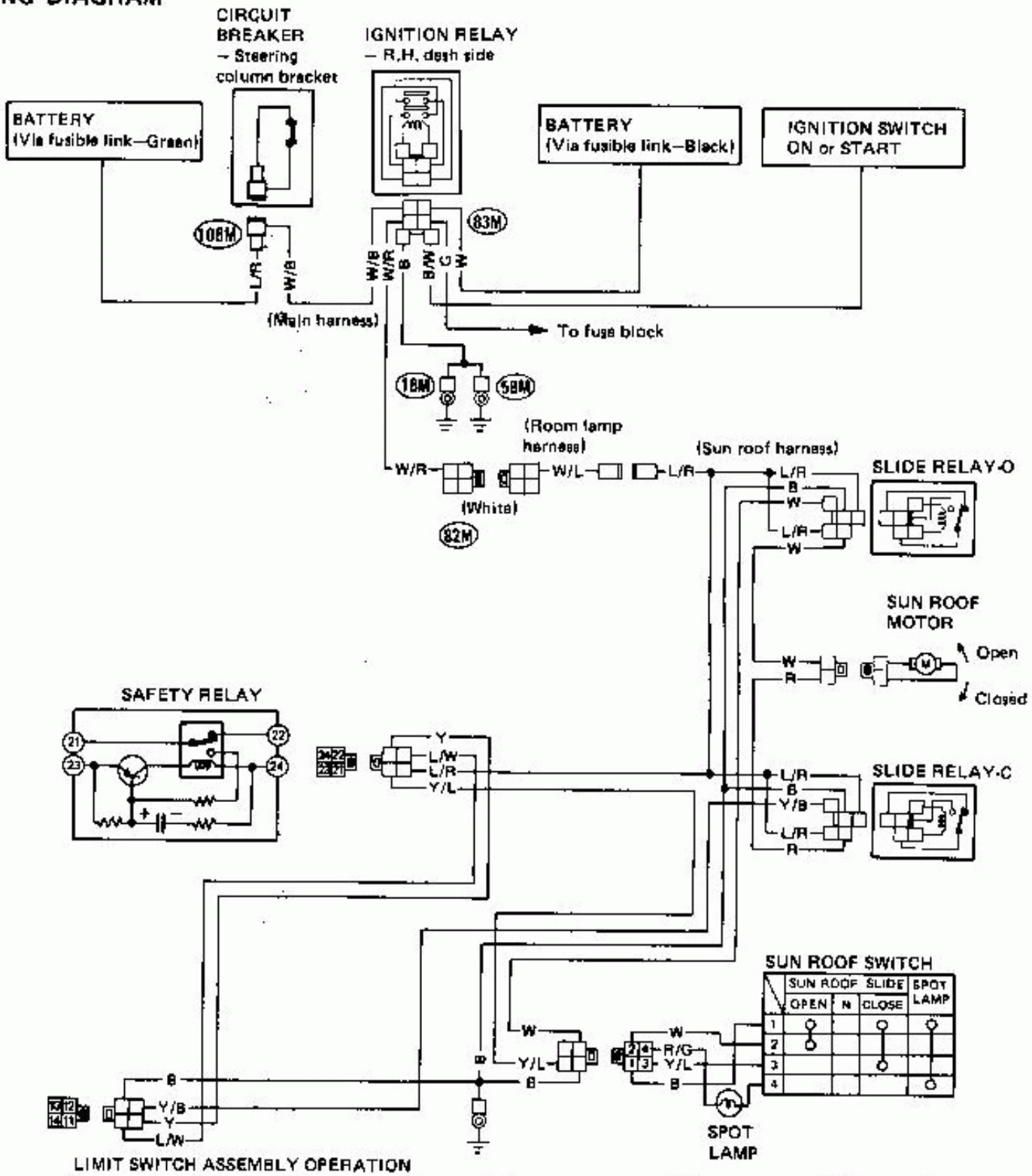
★
LIMIT SWITCH ASSEMBLY OPERATION

		Outer lid position				
		Fully closed	Between fully closed and approx. 100 mm (3.94 in) opened	Approx. 100 mm (3.94 in) opened	Between approx. 100 mm (3.94 in) opened and fully opened	Fully opened
Safety limit switch	⑪	○	○	○		
	⑫	○	○	○		
Slide limit switch	⑬		○	○	○	○
	⑭		○	○	○	○

ELECTRICAL SUN ROOF (Coupe)

Electrical Circuit (Cont'd)

WIRING DIAGRAM



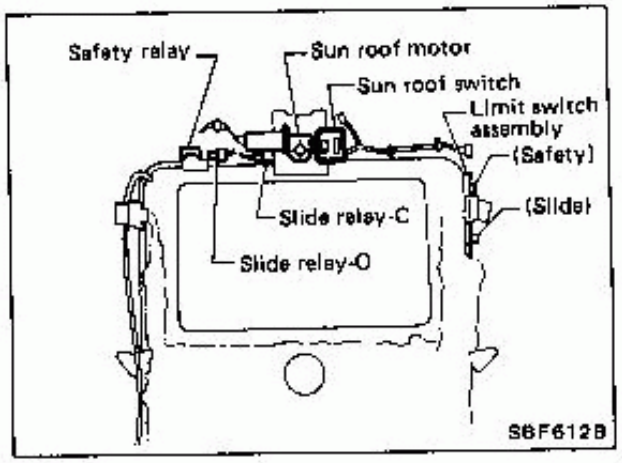
LIMIT SWITCH ASSEMBLY OPERATION

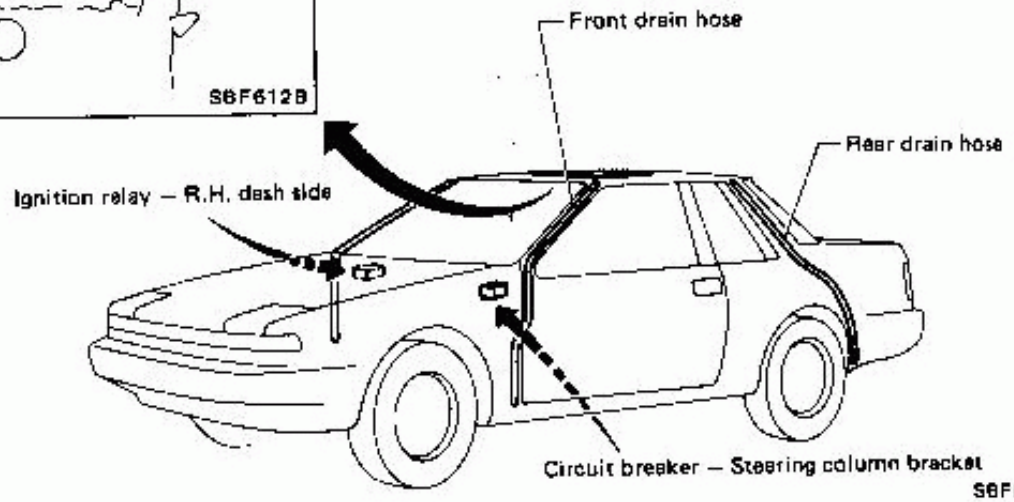
		Outer lid position					Harness color
		Fully closed	Between fully closed and approx. 100 mm (3.94 in) opened	Approx. 100 mm (3.94 in) opened	Between approx. 100 mm (3.94 in) opened and fully opened	Fully opened	
Safety limit switch	⑪	○	○	○			L/W
	⑫	○	○	○			B
Slide limit switch	⑬		○	○	○	○	Y/R
	⑭		○	○	○	○	Y

5BF567C

ELECTRICAL SUN ROOF (Coupe)

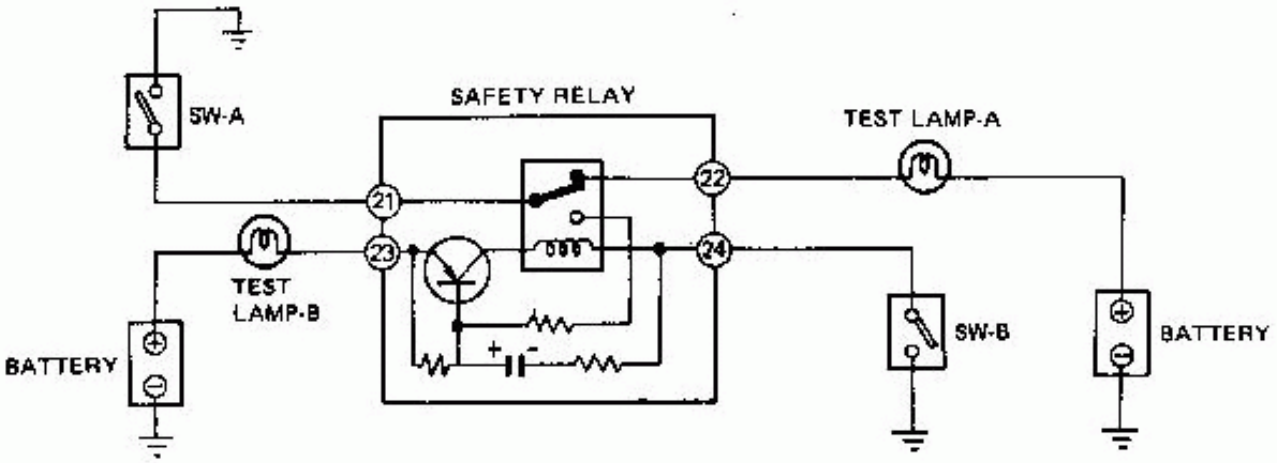
Drain Hose & Electrical Unit Location





Electrical Unit Inspection

SAFETY RELAY



Safety relay operation

SW-A operating condition	OFF	Turn ON	ON	Turn OFF	Turn ON
SW-B operating condition	OFF	OFF	Turn ON	ON	ON
Safety relay operation Test lamp-A	OFF	Turn ON	Turn OFF	OFF	Turn ON
Test lamp-B	OFF	OFF	Turn ON	Turn OFF	OFF

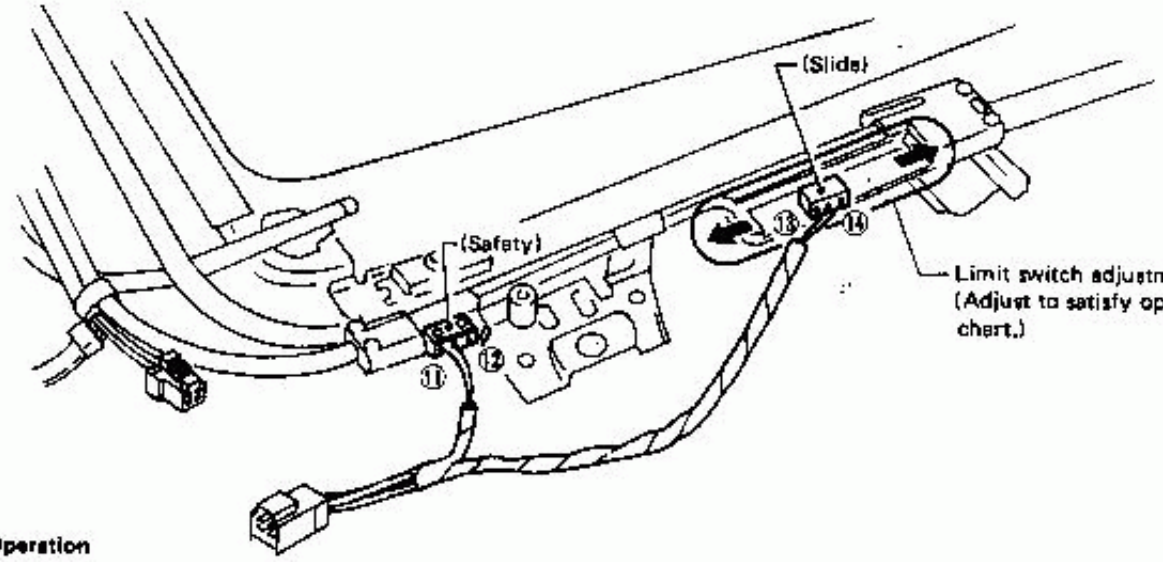
Carry out this inspection in this chart from left to right continuously.

S6F651

Electrical Unit Inspection (Cont'd)

LIMIT SWITCH

- Do not move or remove limit switch unless it is necessary.

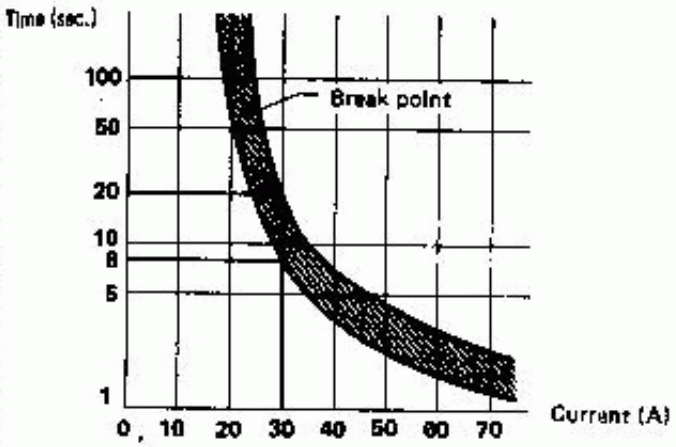


Operation

		Outer lid position					Harness color
		Fully closed	Between fully closed and approx. 100 mm (3.94 in) open	Approx. 100 mm (3.94 in) open	Between approx. 100 mm (3.94 in) open and fully open	Fully open	
Safety limit SW	⑪	○	○	○			L/W
	⑫	○	○	○			B
Slide limit SW	⑬		○	○	○	○	Y/R
	⑭		○	○	○	○	Y

SBF558C

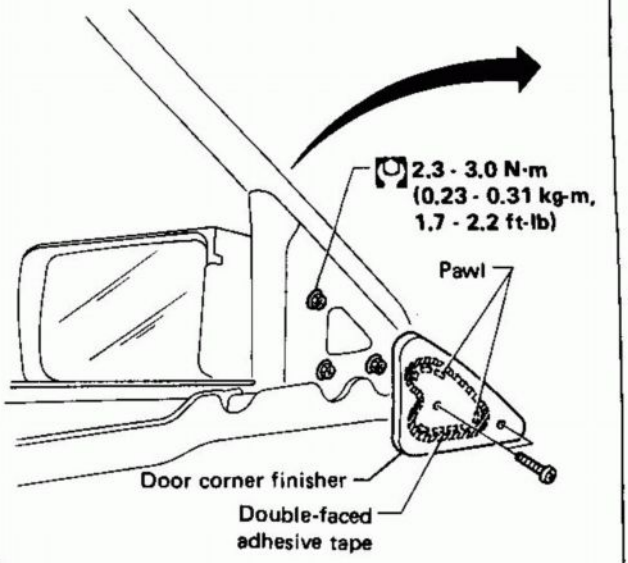
CIRCUIT BREAKER



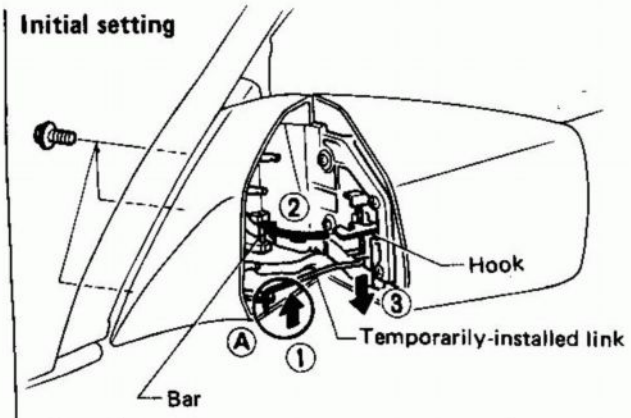
For example, when current is 30A, the circuit is broken within 8 to 20 seconds.

SBF560B

Door Mirror



SBF066C



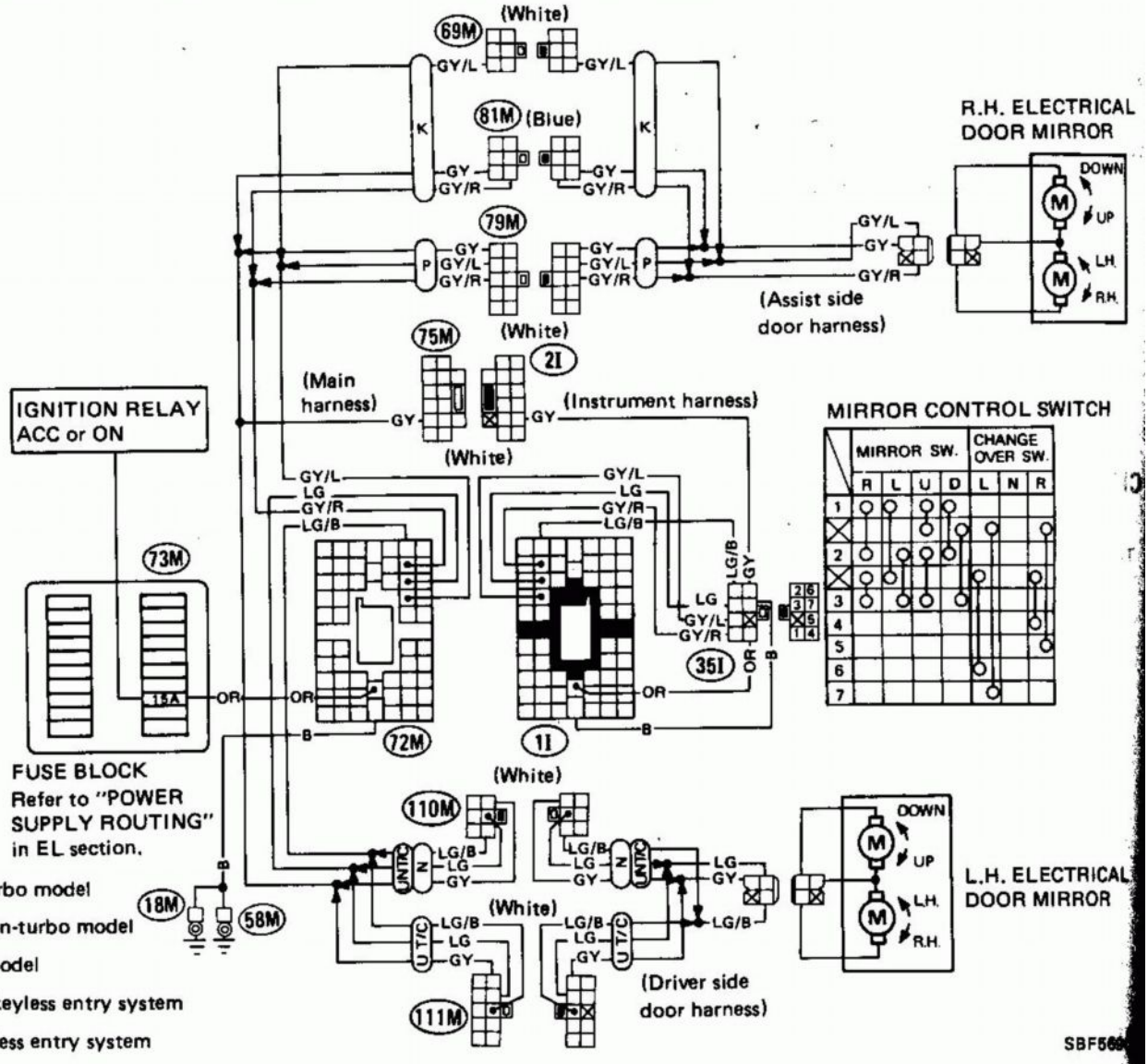
Procedure

1. After installing mirror base to door, remove portion (A) of temporarily-installed link.
2. Hook the bar with the hook and make sure it is hooked securely.
3. Tilt mirror body backward and while holding mirror, remove temporarily-installed link.

CAUTION:

Never remove temporarily-installed link from mirror body, before hooking the bar with the hook.

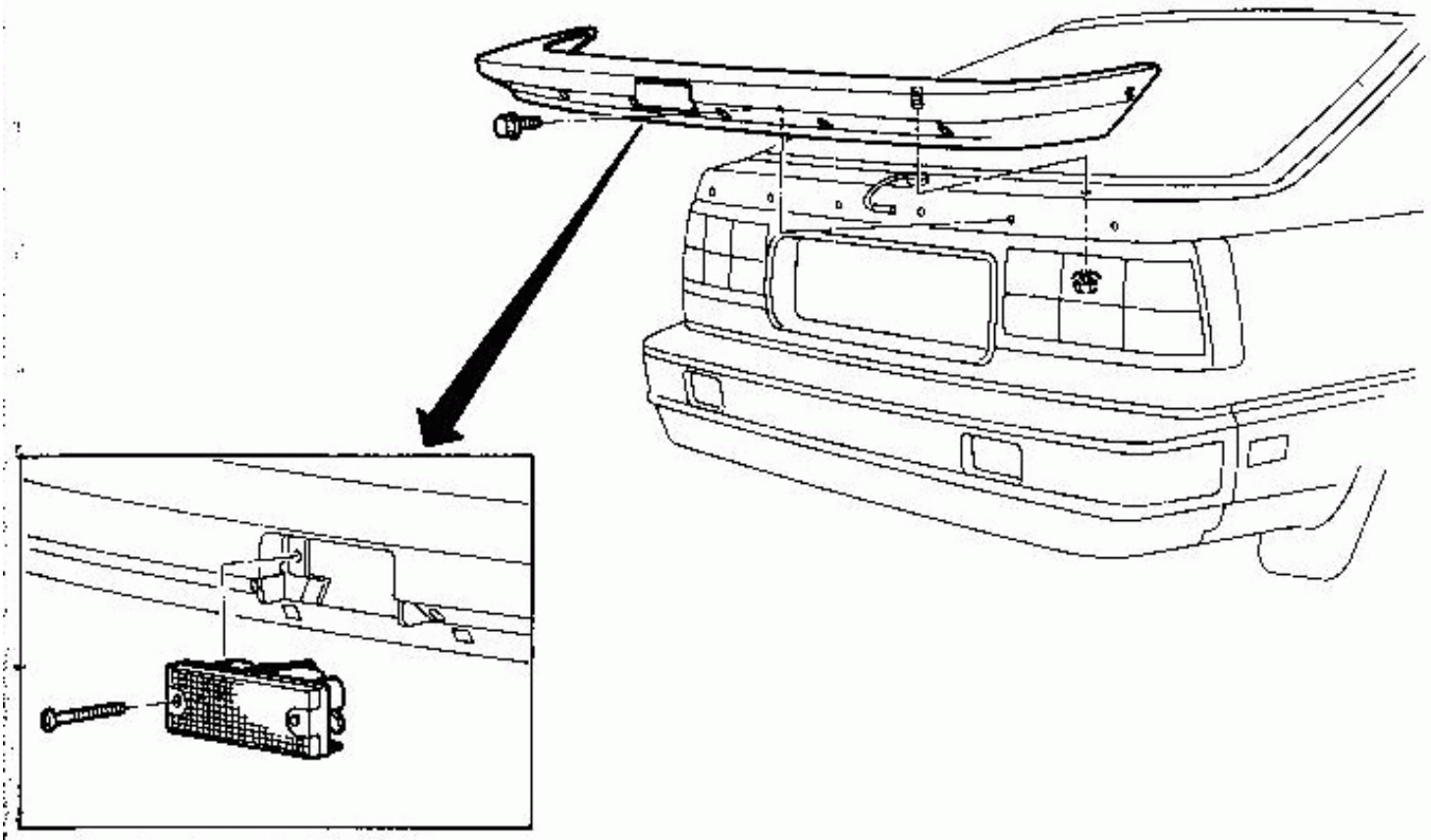
ELECTRICAL REMOTE CONTROL DOOR MIRROR/WIRING DIAGRAM



(U T/C) : U.S.A. turbo model
(UN T/C) : U.S.A. non-turbo model
(N) : Canada model
(P) : Without keyless entry system
(K) : With keyless entry system

SBF569

- When installing, make sure that there are no gaps or waves at ends of rear air spoiler.



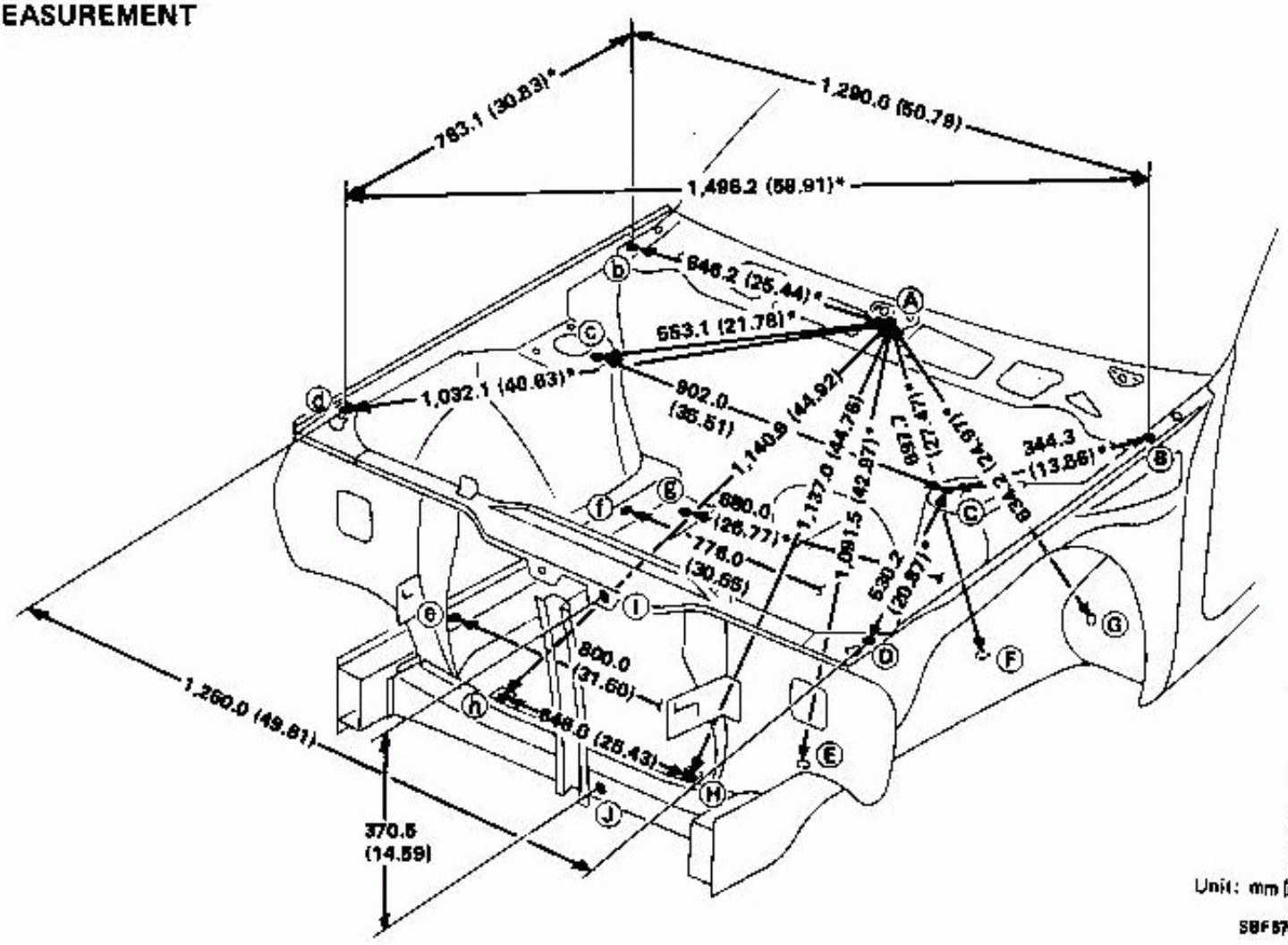
High-mounted stop lamp (For U.S.A.)

SBF570C

- All dimensions indicated in figures are actual ones.
- When a tram tracking gauge is used, adjust both pointers to equal length and check the pointers and gauge itself to make sure there is no free play.
- When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
- Measurements should be taken at the center of the mounting holes.
- An asterisk (*) following the value at the measuring point indicates that the measuring point on the other side is symmetrically the same value.
- Measurement points
  The coordinates of the measurement points are the distances measured from the respective dimension lines in the directions of "x", "y" and "z".
  Dimension lines: "x" line – Center line of vehicle
  "y" line – Center line of front axle (Any measurement point in front of the dimension line refers to a minus "–" value.)
  "z" line – Datum line (Any measurement point under the dimension line refers to a minus "–" value.)

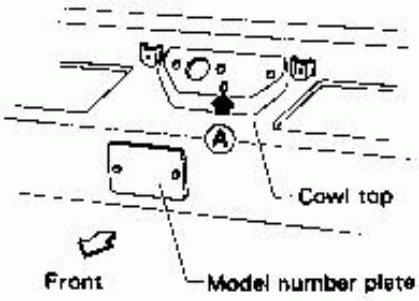
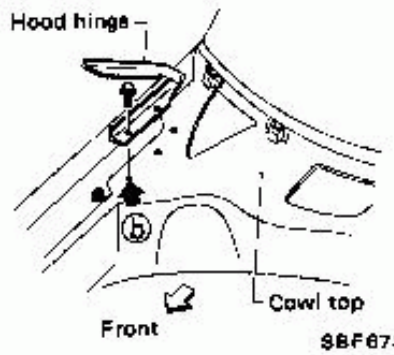
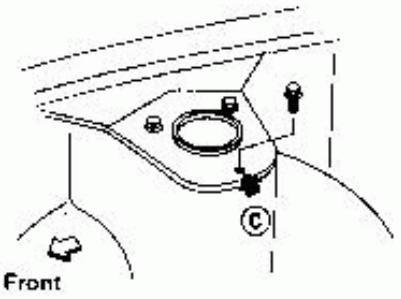
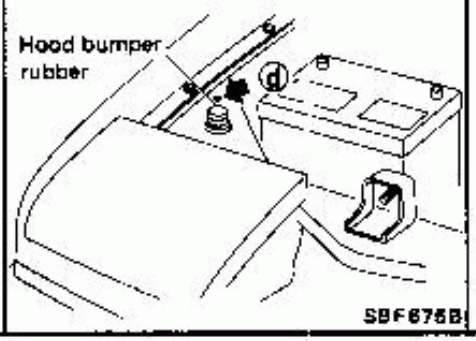
Engine Compartment

MEASUREMENT

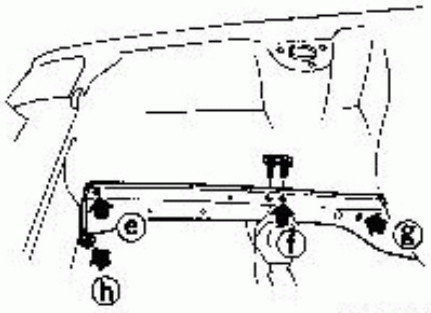
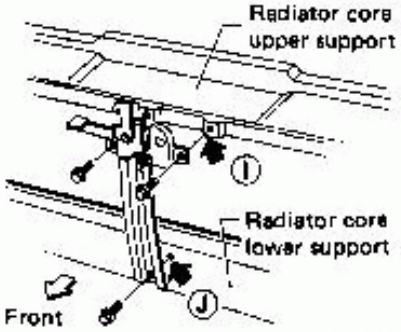


Engine Compartment (Cont'd)

MEASUREMENT POINTS

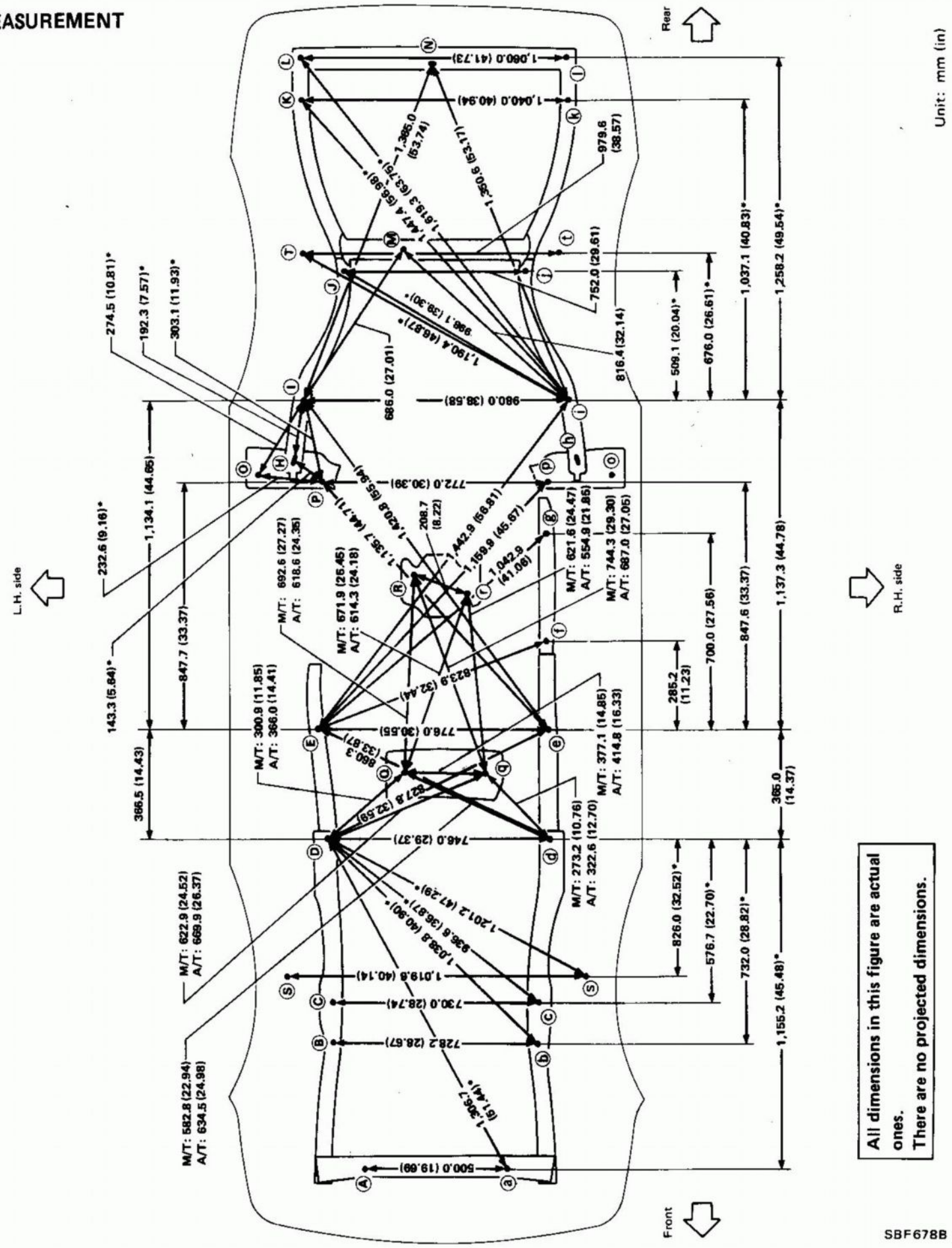
Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in) "x"	"y"	"z"
Ⓐ	7 (0.28)		Hole for water draining at windshield wiper pivot mounting	0.0 (0.0)	345.9 (13.62)	922.7 (36.33)
Ⓑ Ⓑ	12 (0.47)		Hole for hood hinge front mounting	645.0 (25.39)	314.8 (12.39)	898.0 (35.35)
Ⓒ Ⓒ	11 (0.43)		Hole for front suspension upper mounting	451.0 (17.76)	35.5 (1.398)	844.4 (33.24)
Ⓓ Ⓓ	8 (0.31)		Hole for locating at radiator core side upper support	630.0 (24.80)	−460.2 (−18.12)	786.4 (30.96)

Engine Compartment (Cont'd)

Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in)		
				"x"	"y"	"z"
Ⓔ ⓔ	16 (0.63)	 SBF676B	Hole for air bleeding at upper side of front side member	400.0 (15.75)	−550.0 (−21.65)	444.4 (17.50)
Ⓕ ⓕ	14 (0.55)		Hole for installing bolt for suspension member at upper side of front side member	388.0 (15.28)	18.0 (0.709)	444.4 (17.50)
Ⓖ ⓖ	16 (0.63)		Hole for locating at the side of front side member	340.0 (13.39)	230.0 (9.06)	400.0 (15.75)
Ⓗ ⓗ	R.H. side 16 (0.63) L.H. side 16 x 22 (0.63 x 0.87)		Hole for radiator lower mounting	R.H. side 330.0 (12.99) L.H. side 316.0 (12.44)	−568.2 (−22.37)	325.0 (12.80)
Ⓘ	12 (0.47)	 SBF677B	Hood lock mounting hole at radiator core upper support	L.H. side 75.5 (2.972)	−683.9 (−26.93)	706.4 (27.81)
Ⓙ	11 (0.43)		Hood lock stay lower mounting hole at radiator core lower support	L.H. side 20.0 (0.787)	−636.6 (−25.06)	343.1 (13.51)

Underbody

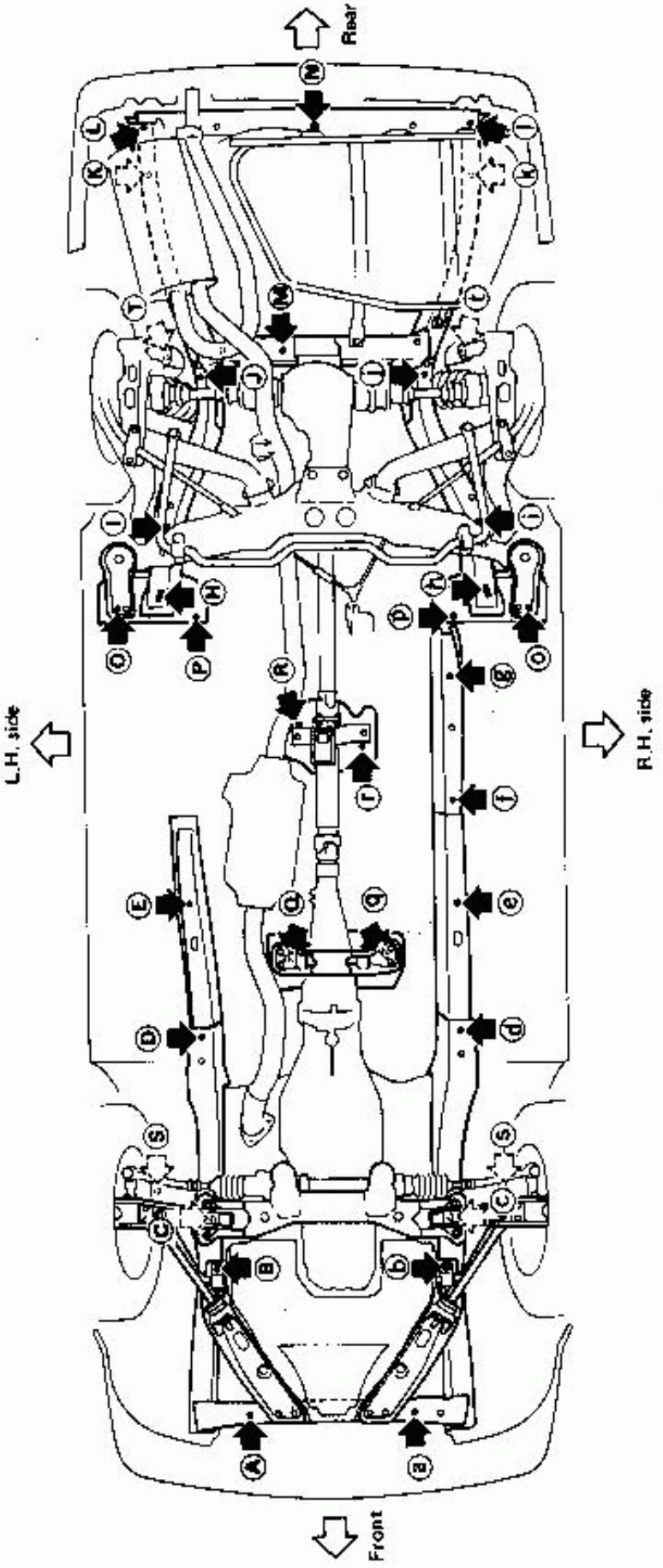
MEASUREMENT



All dimensions in this figure are actual ones.
There are no projected dimensions.

SBF678B

MEASUREMENT POINTS



(The following illustration depicts manual transmission model.)

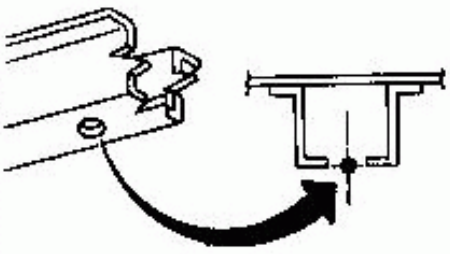
SBF093C

BODY ALIGNMENT

Underbody (Cont'd)

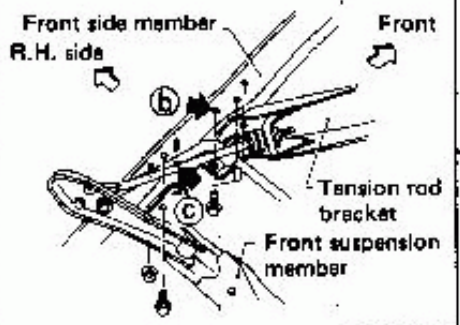
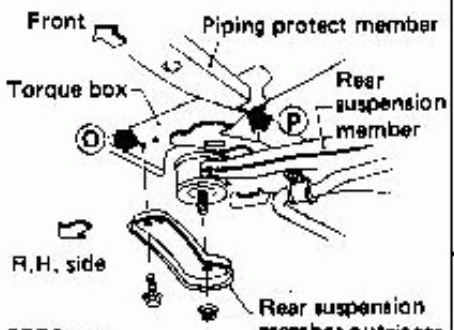
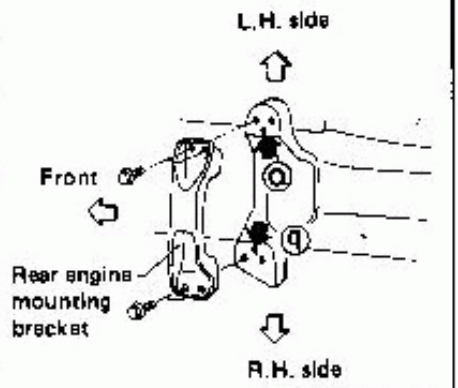
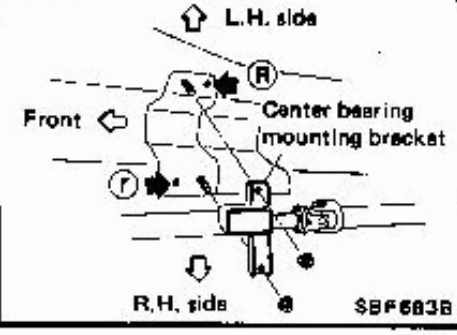
Points	Hole dia. mm (in)	Detailed points	Coordinates mm (in)		
			"x"	"y"	"z"
Ⓐ Ⓐ	14 (0.55)	Hole for locating at radiator core lower support	250.0 (9.84)	−610.0 (−24.02)	309.8 (12.20)
Ⓓ Ⓓ	14 (0.55)	Hole for locating at front side member	373.0 (14.69)	535.0 (21.06)	218.6 (8.61)
Ⓔ Ⓔ	16 (0.63)	Hole for locating at extension front side member	R.H. side 370.0 (14.57) L.H. side 406.0 (15.98)	900.0 (35.43)	218.8 (8.61)
Ⓕ	18 (0.71)	Hole for water draining at piping protect member (R.H. side only)	R.H. side only		
			387.0 (14.45)	1,185.0 (46.65)	229.3 (9.03)
Ⓖ	18 (0.71)	Hole for water draining at piping protect member (R.H. side only)	R.H. side only		
			387.0 (14.45)	1,600.0 (62.99)	224.3 (8.83)
Ⓗ Ⓗ	40 × 17 (1.57 × 0.67)	Hole for tie-down hook at rear side member front	495.0 (19.49)	1,837.8 (72.35)	290.8 (11.45)
Ⓘ Ⓘ	16 (0.63)	Hole for locating at rear side member front	490.0 (19.29)	2,025.0 (79.72)	334.6 (13.17)
Ⓙ Ⓙ	14 (0.55)	Hole for locating at rear side member front	376.0 (14.80)	2,478.0 (97.56)	537.0 (21.14)
Ⓚ Ⓚ	16 (0.63)	Hole for locating at rear side member rear (Behind fuel tank or muffler)	520.0 (20.47)	3,050.0 (120.08)	490.0 (19.29)
Ⓛ Ⓛ	15 (0.59)	Hole for locating at extension rear side member rear	530.0 (20.87)	3,277.5 (129.04)	447.9 (17.63)
Ⓜ	12 (0.47)	Hole for tie-down hook located on final drive mounting member or fuel tank mounting member	L.H. side 100.0 (3.94)	2,570.0 (101.18)	481.1 (18.94)
Ⓝ	20 × 25 (0.79 × 0.98)	Working hole located on rear crossmember	R.H. side 20.0 (0.787)	3,285.0 (129.33)	459.2 (18.08)

At underside of member

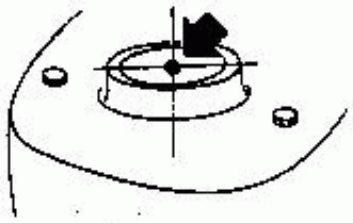


56F4276

Underbody (Cont'd)

Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in)		
				"x"	"y"	"z"
ⓑ ⓑ	13 (0.51)	 SBF680B	Hole for tension rod bracket & stabilizer bar mounting	364.1 (14.33)	−180.0 (−7.09)	375.2 (14.77)
ⓒ ⓒ	14 (0.55)		Hole for locations behind front suspension member mounting	365.0 (14.37)	−20.0 (−0.787)	375.2 (14.77)
ⓞ ⓞ	13 (0.51)	 SBF681B	Hole for rear suspension member outrigger mounting at torque box	615.0 (24.21)	1,786.0 (70.31)	283.3 (11.15)
Ⓟ Ⓟ	10 (0.39)		Hole for locating at torque box	386.0 (15.20)	1,745.0 (68.70)	283.3 (11.15)
ⓠ ⓠ	12 (0.47)	 SBF682B	Hole for rear engine mounting	M/T model		
				L.H. side 167.0 (6.57) R.H. side 210.0 (8.27)	L.H. side 737.0 (29.02) R.H. side 740.0 (29.13)	L.H. side 304.0 (11.97) R.H. side 296.5 (11.67)
				A/T model		
				L.H. side 180.0 (7.09) R.H. side 231.0 (9.09)	L.H. side 814.0 (32.05) R.H. side 813.0 (32.01)	L.H. side 356.0 (14.02) R.H. side 300.0 (11.81)
Ⓡ ⓡ	10 (0.39)	 SBF683B	Hole for locating at center bearing mounting reinforcement	L.H. side		
				82.0 (3.228)	1,424.0 (56.06)	325.0 (12.80)
				R.H. side		
				102.0 (4.02)	1,351.0 (53.19)	258.8 (10.19)

Underbody (Cont'd)

Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in)		
				"x"	"y"	"z"
Ⓢ Ⓢ	84 (3.31)	 56F430B	Front suspension upper mounting	509.8 (20.07)	36.0 (1.417)	862.5 (33.96)
Ⓣ Ⓣ	12.5 (0.492)		Rear suspension shock absorber upper mounting	489.8 (19.28)	2,535.0 (99.80)	778.3 (30.64)

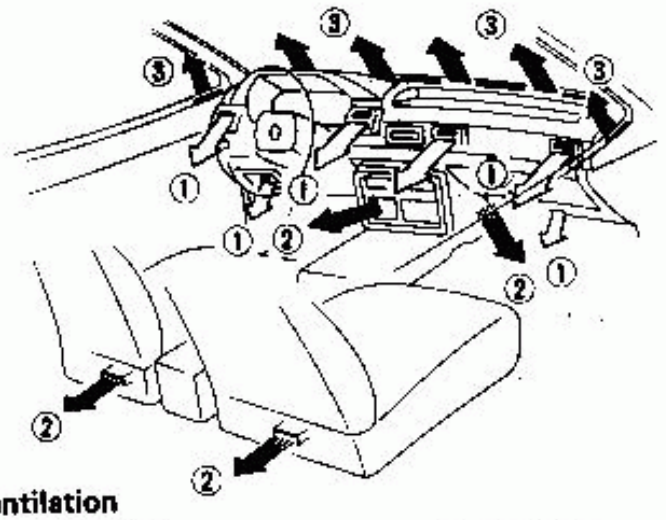
HEATER & AIR CONDITIONER

SECTION HA

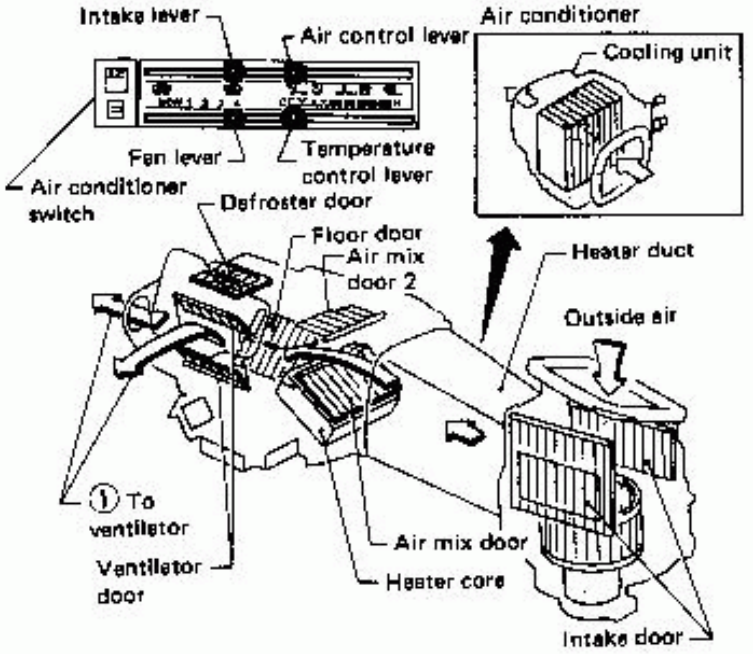
CONTENTS

AIR FLOW AND COMPONENT LAYOUT

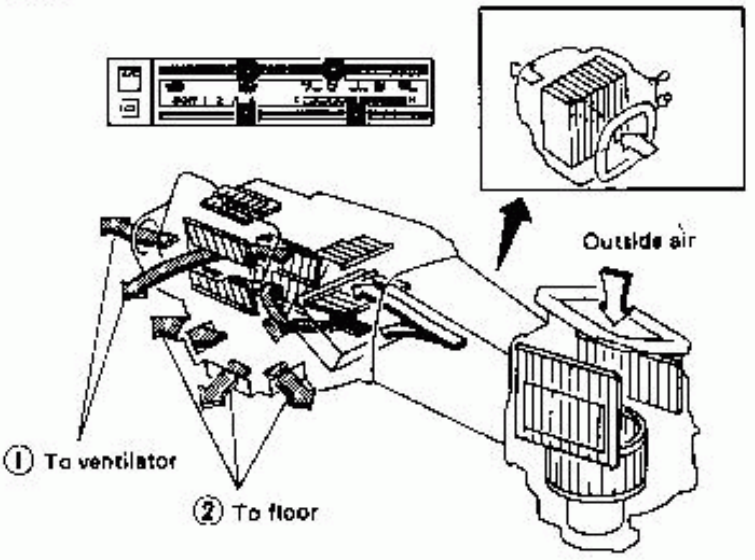
Air Flow



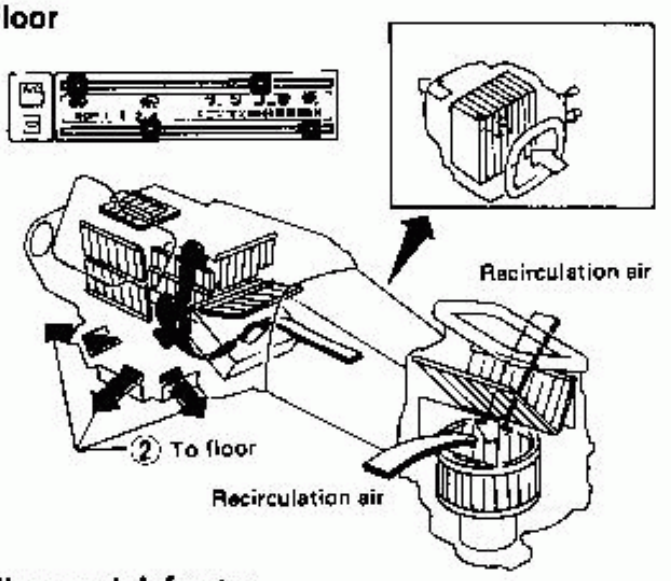
Ventilation



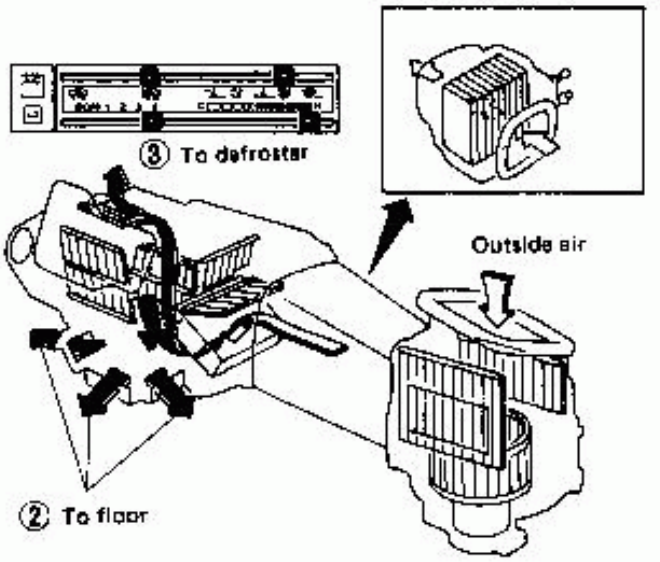
Bi-level



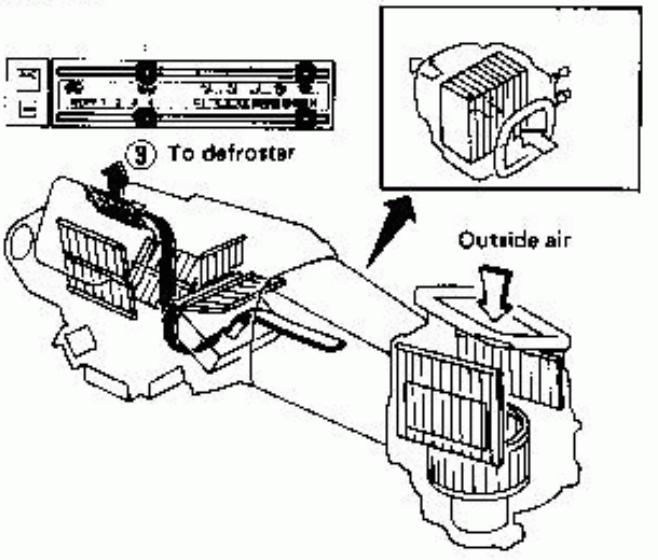
Floor



Floor and defroster



Defroster



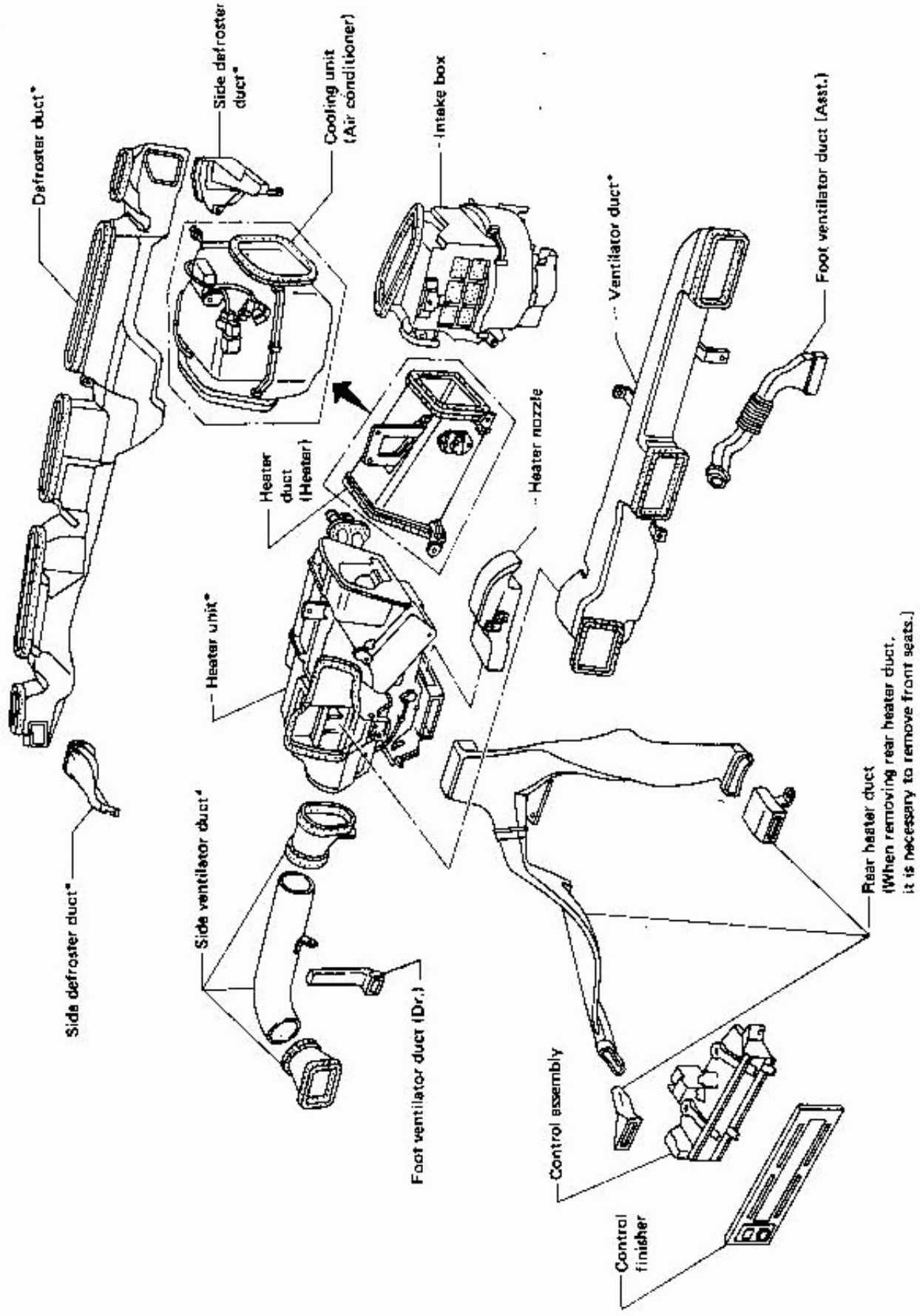
: Air passed through heater core

: Air not passed through heater core

: Mixed air (: Air passed through heater core + : Air not passed through heater core)

RHA288

Component Layout

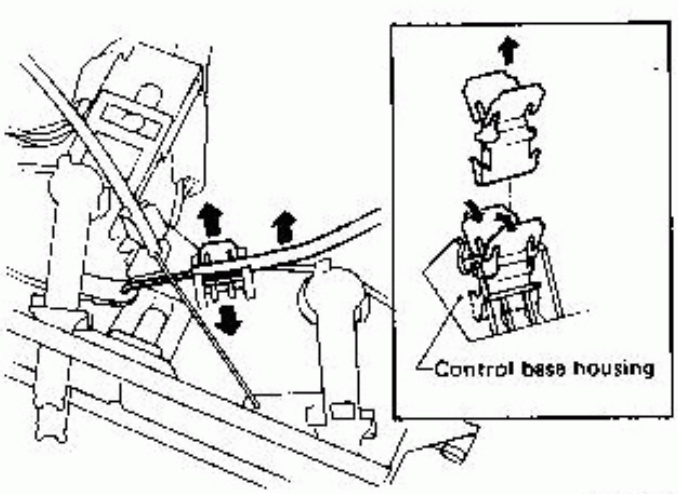


* For removal, it is necessary to remove instrument assembly.

RHA089

Control Cable and Rod Adjustment

- Be sure to expand control cable clip with both hands and then remove control cable from cable clip.
- Be sure to compress cable clip with both hands and then remove it from control base housing.
- Be sure to butt clip against the bottom of control base housing.

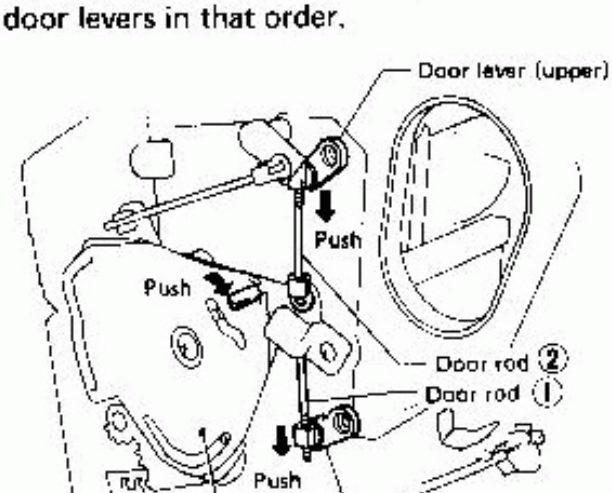


RHA026

- When adjusting ventilator door rod, defroster door rod, disconnect air control cable from side link first, and then adjust door rod and door cable. Reconnect air control cable and re-adjust it.

VENTILATOR DOOR CONTROL ROD

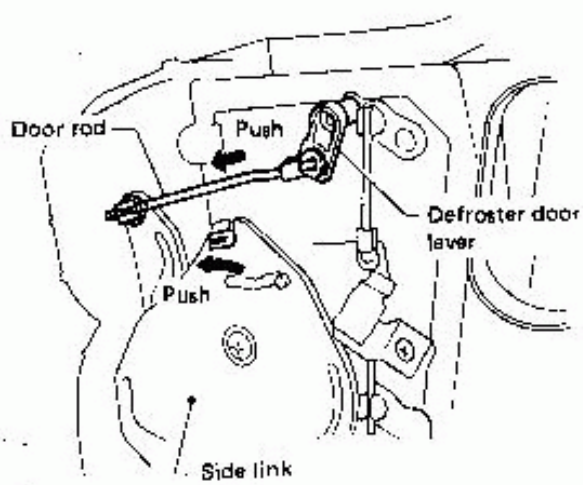
1. Move side link in direction of arrow.
2. With upper and lower ventilator door levers held in the direction of the arrow, connect rods ① and ② to their corresponding ventilator door levers in that order.



RHA267

DEFROSTER DOOR CONTROL ROD

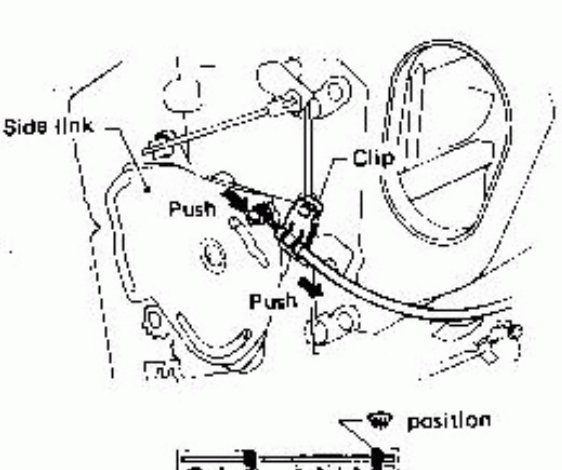
1. Move side link in direction of arrow.
2. Connect rod to side link while pushing defroster door lever in direction of arrow.



RHA268

AIR CONTROL CABLE

- Clamp the cable while pushing cable outer case and side link in direction of arrow.



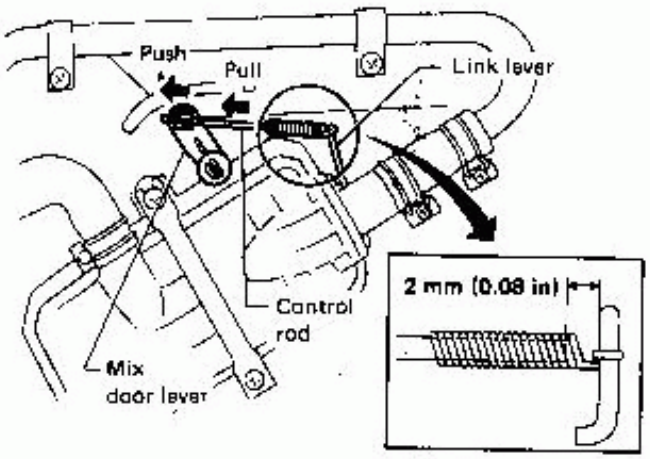
RHA269

Control Cable and Rod Adjustment (Cont'd)

WATER COCK CONTROL ROD

- **When adjusting water cock control rod, first disconnect temperature control cable from air mix door lever and then adjust control rod. Reconnect temperature control cable and re-adjust it.**

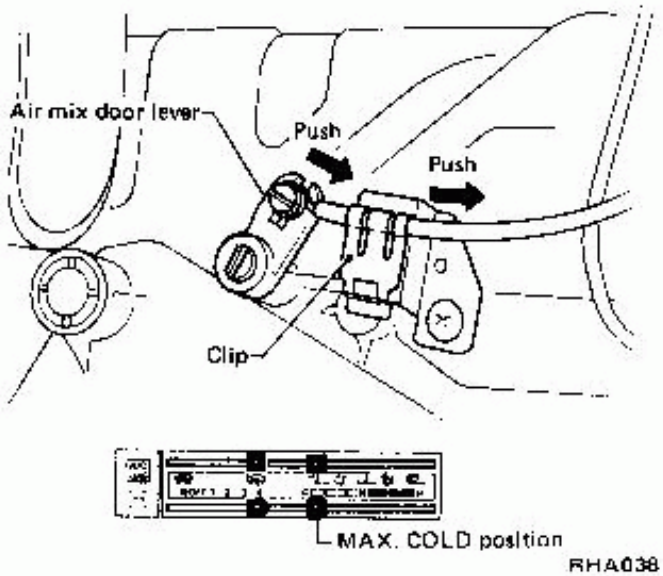
1. Push air mix door lever in direction of arrow.
2. Pull control rod of water cock in direction of arrow so as to make clearance of about 2 mm (0.08 in) between ends of rod and link lever and connect the rod to door lever.



RHA090

TEMP. CONTROL CABLE

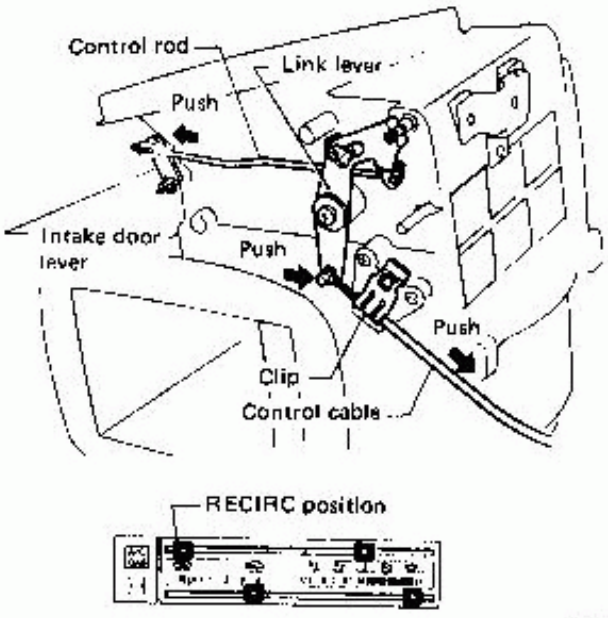
- Clamp the cable while pushing cable outer case and air mix door lever in direction of arrow.



RHA038

INTAKE DOOR CONTROL CABLE

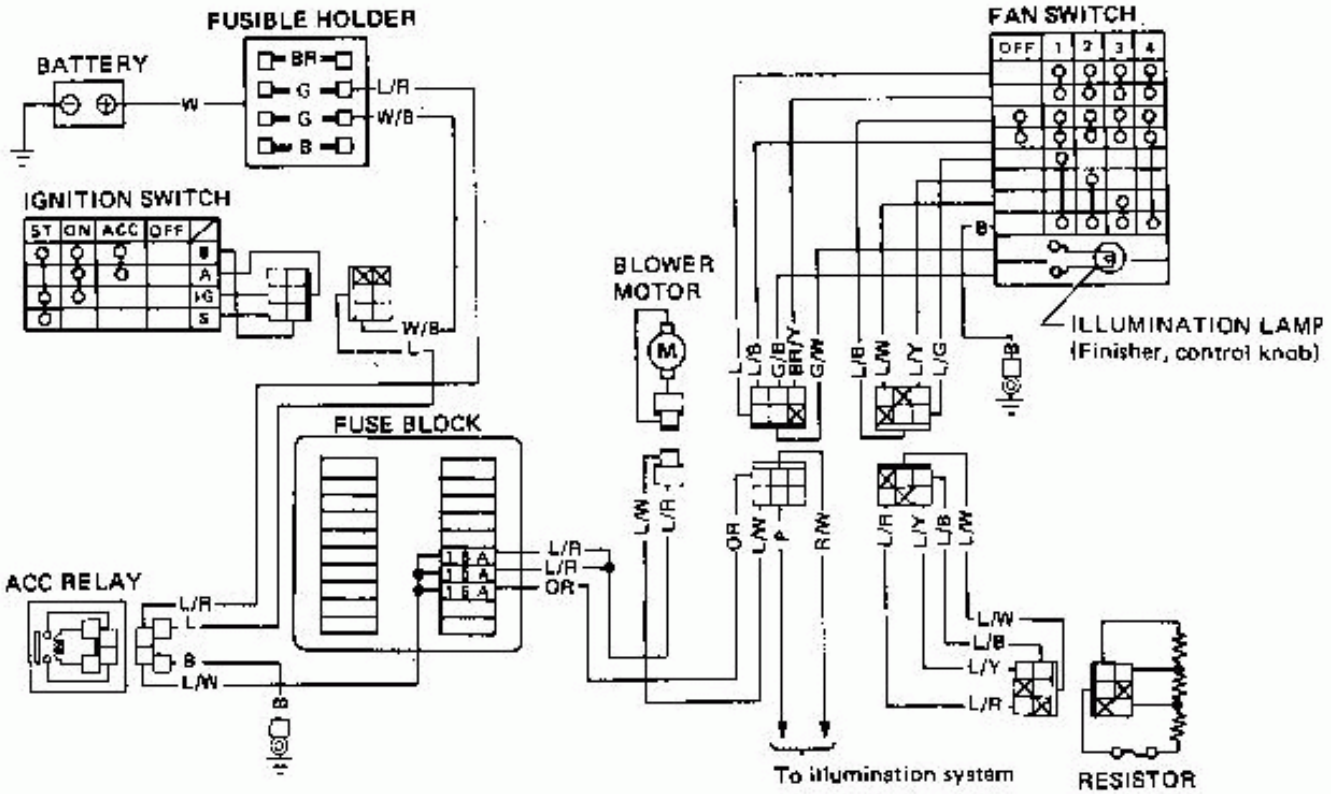
1. Move link lever in direction of arrow.
2. Connect the rod to door lever while pushing door lever in direction of arrow.
3. Clamp the cable while pushing cable outer case in direction of arrow.



RHA069

HEATER ELECTRICAL CIRCUIT

Wiring Diagram

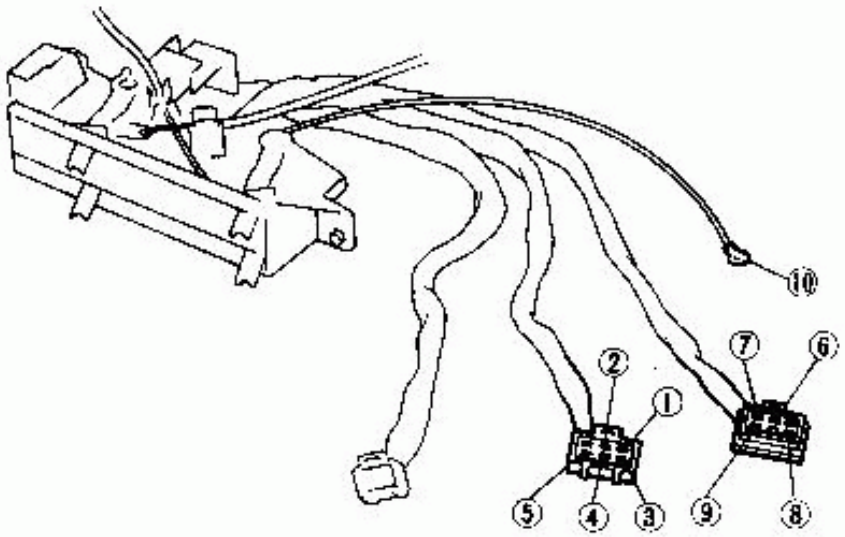


RHA070

Fan Switch Check

LEVER POSITION / TERMINAL	OFF	1	2	3	4
①		○	○	○	○
⑤		○	○	○	○
⑥	○	○	○	○	○
③	○	○	○	○	○
⑦		○			
⑨			○		
⑧				○	
⑩		○	○	○	○
②	○				
④	○				

Illumination lamp
(Finisher, control knob)

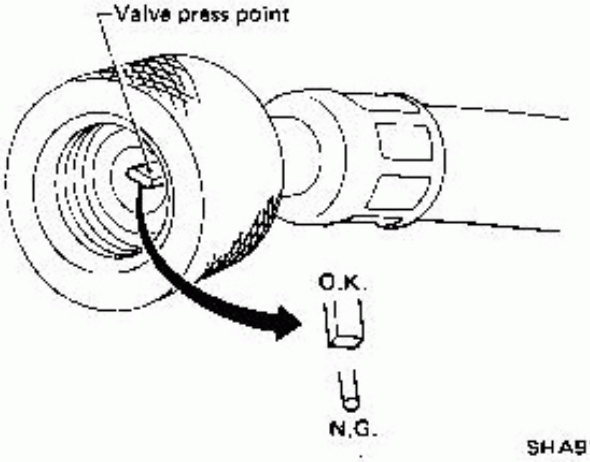


RHA071

Precautions

WARNING:

- Always be careful that refrigerant does not come in contact with your skin,
- Always wear eye protection when working around the system.
- Keep refrigerant containers stored below 50°C (122°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 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. Otherwise, insufficient evacuating may occur.

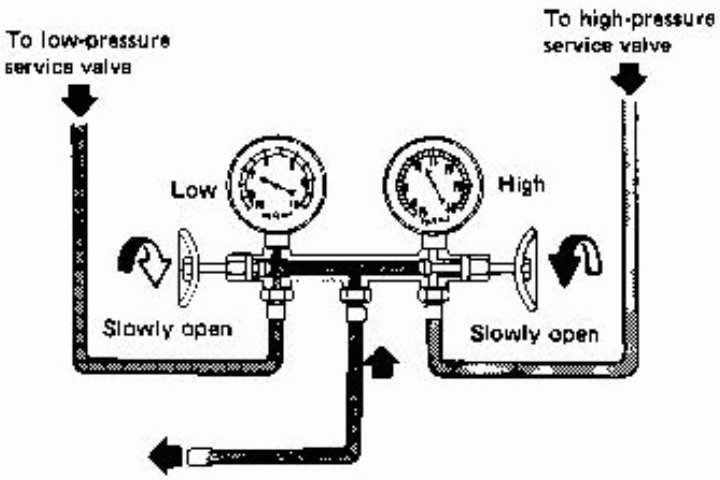


SHA919A

- Do not over-tighten service valve cap.
- Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

Discharging

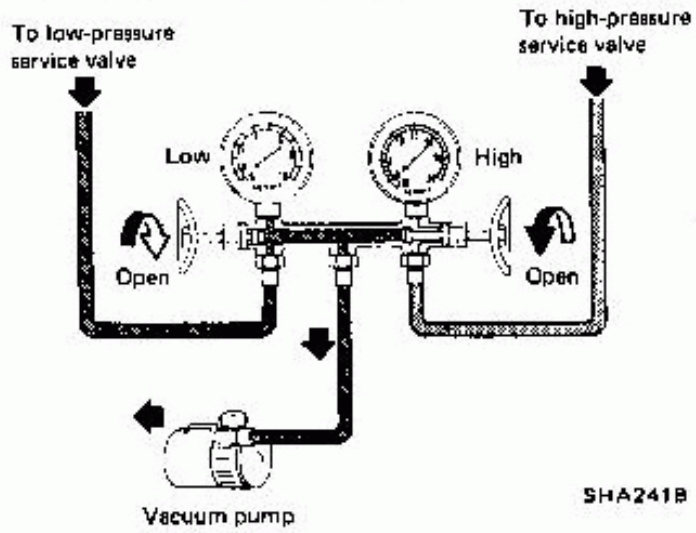
Slowly open the valves to discharge only refrigerant. If they are opened quickly, compressor oil will also be discharged.



SHA240B

Evacuating The System

1. Start pump, then open both valves and run pump for about 20 minutes.



2. When low gauge has reached approx. 101.3 kPa (760 mmHg, 29.92 inHg), completely close both valves of gauge and stop vacuum pump. Let it stand for 5 to 10 minutes in this state and confirm that the reading does not rise.

a. The low-pressure gauge reads lower by 3.3 kPa (25 mmHg, 0.98 inHg) per 300 m (1,000 ft) elevation. Perform evacuation according to the following table.

Elevation m (ft)	Vacuum of system* kPa (mmHg, inHg)
0 (0)	101.3 (760, 29.92)
300 (1,000)	98.0 (735, 28.94)
600 (2,000)	94.6 (710, 27.95)
900 (3,000)	91.3 (685, 26.97)

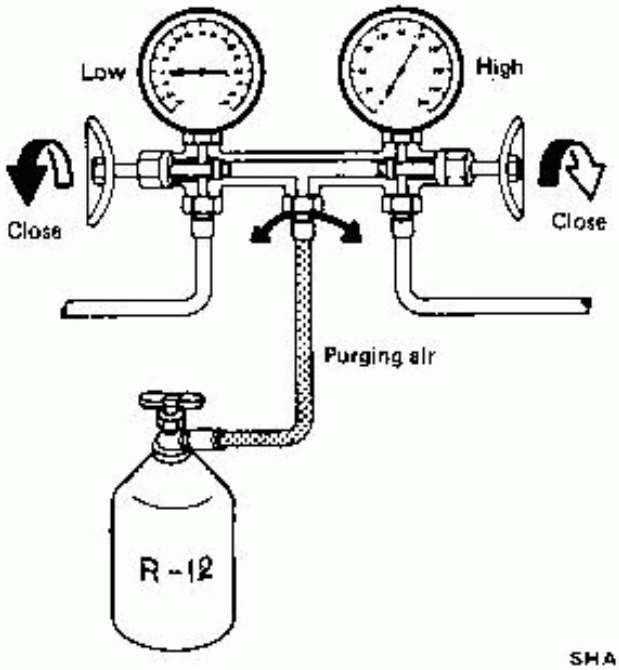
*: Values show reading of the low-pressure gauge.

b. The rate of ascension of the low-pressure gauge should be less than 3.3 kPa (25 mmHg, 0.98 inHg) in five minutes.

Charging

1. Evacuate refrigerant system.
2. Close manifold gauge valves securely and disconnect charging hose from vacuum pump.
3. Purge air from center charging hose.

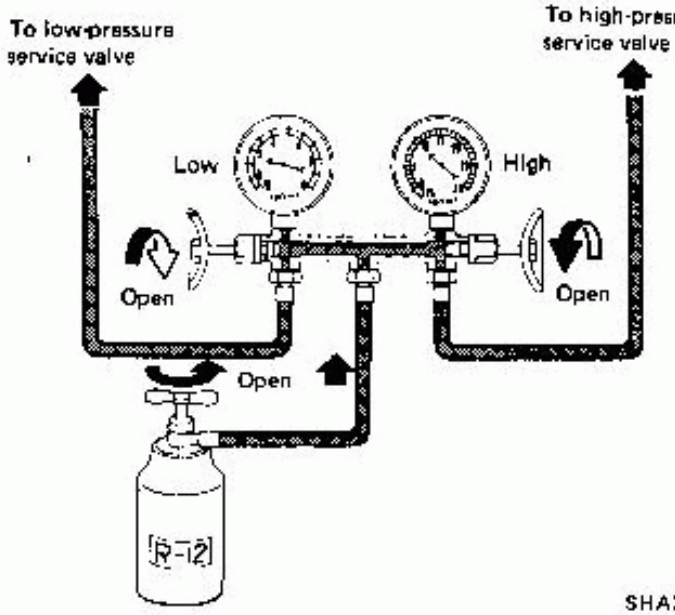
1) Connect center charging hose to refrigerant can through can top.
2) Break seal of refrigerant can and purge air.



4. Charge refrigerant into system.

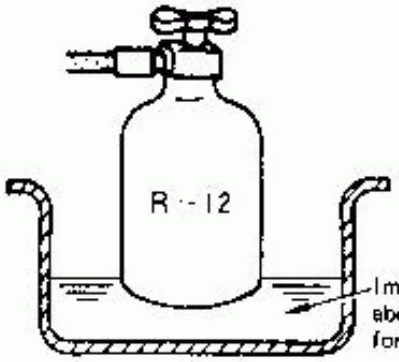
WARNING:
Ensure that engine is off.

1) Open high- and low-pressure valves of manifold gauge and charge refrigerant into system.



Charging (Cont'd)

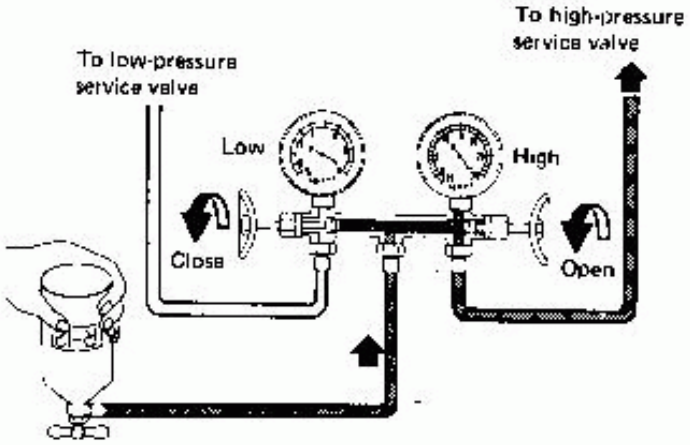
2) Quick charging



AC184A

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.

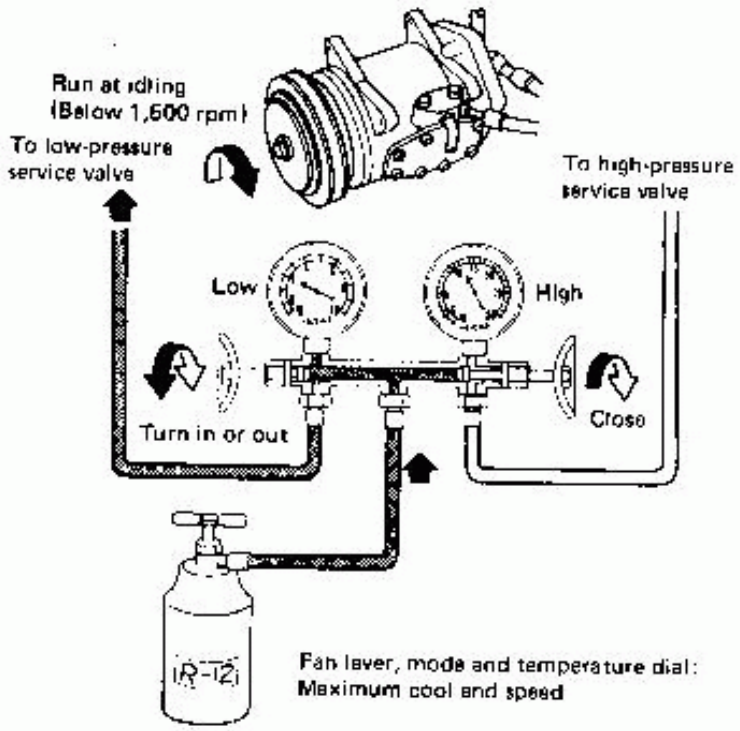


SHA244B

5. When refrigerant charging speed slows down, charge it while running the compressor for ease of charging.

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.



SHA245B

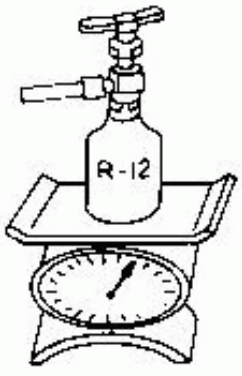
6. Charge refrigerant while controlling low-pressure gauge reading at 275 kPa (2.8 kg/cm², 40 psi) or less by turning in or out low-pressure valve of manifold gauge.

- **Be sure to purge air from charging hose when replacing can with a new one.**

7. Charge the specified amount of refrigerant into system by weighing charged refrigerant with scale. Overcharging will cause discharge pressure to rise.

Refrigerant amount:

0.9 - 1.1 kg (2.0 - 2.4 lb)



SHA900A

Charging (Cont'd)

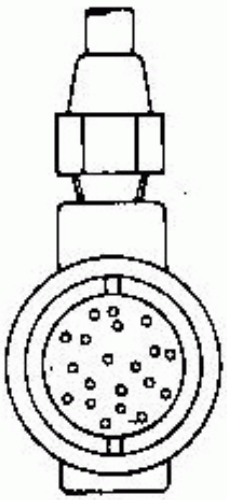
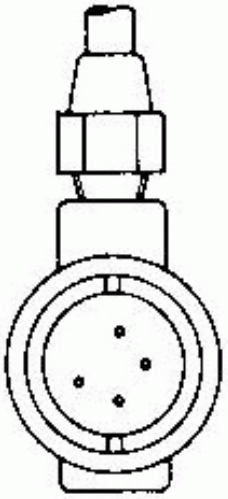
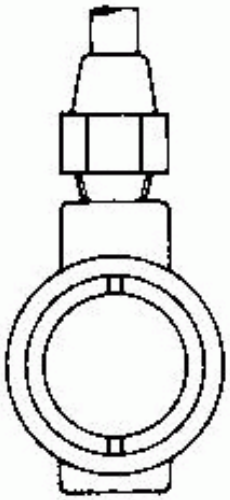
The state of the bubbles in sight glass should only be used for checking whether the amount of charged refrigerant is small or not. The amount of charged refrigerant can be correctly judged by means of discharge pressure.

8. After charging, be sure to install valve cap on service valve.
9. Confirm that there are no leaks in system by checking with a leak detector.

Checking Refrigerant Level

CONDITION

- Door window: Open
- A/C switch: ON
- TEMP. lever position: Max. COLD
- FAN lever position: Maximum speed
- Check sight glass after a lapse of about five minutes.

Amount of refrigerant / Check item	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 pressure 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. Be sure to recheck the amount when it exceeds 20°C (68°F). In higher temperature the bubbles are easy to show up.**

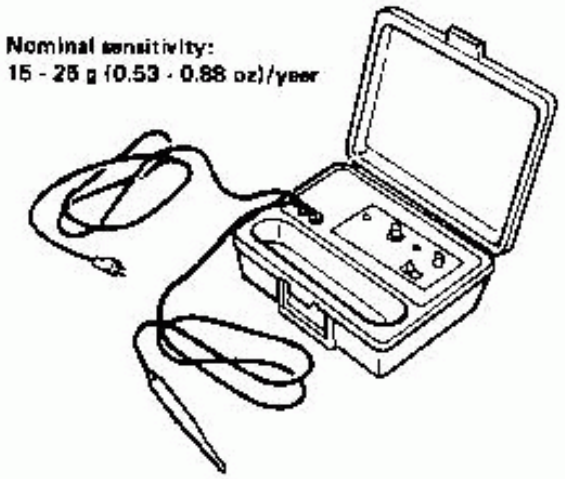
b. **When the screen in the receiver drier is clogged, the bubbles will appear even if the amount of refrigerant is normal. In this case, the outlet side pipe of the receiver drier becomes considerably cold.**

Checking Refrigerant Leaks

ELECTRIC LEAK-DETECTOR

The leak detector is a delicate device that detects small amounts of halogen.

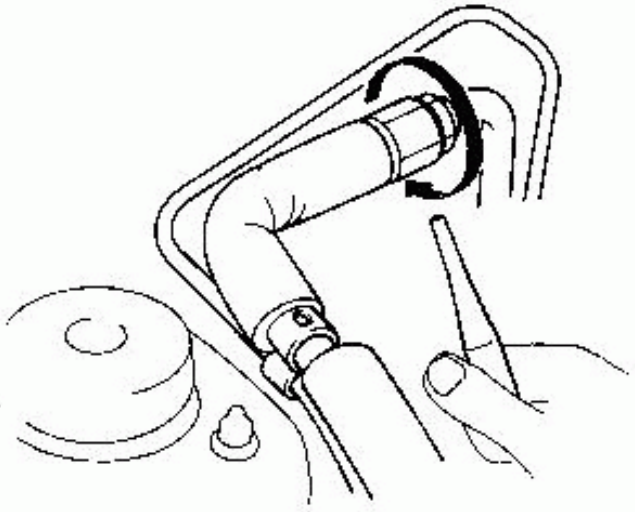
In order to use the device properly, read the manufacturer's manuals and perform the specified maintenance and inspections.



SHA733A

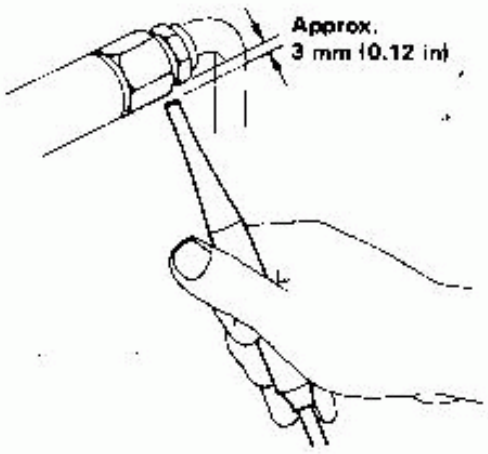
GENERAL PRECAUTIONS FOR HANDLING LEAK DETECTOR

1. Each fitting must be checked around its entire periphery.



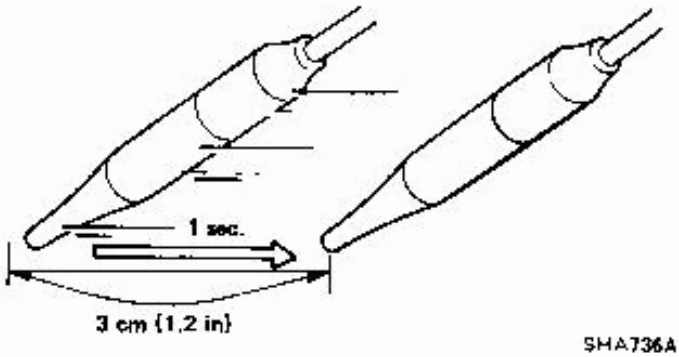
SHA734A

2. Move probe close to and 3 mm (0.12 in) away from the point to be checked.



SHA735A

3. The moving speed of the probe must be maintained at less than 3 cm (1.2 in)/sec.



SHA736A

MEASUREMENT STANDARD

If any reaction is noted using a detector having a nominal sensitivity of 15 to 25 g (0.53 to 0.88 oz)/year, that portion found leaking must be repaired.

- Oil deposited during assembling must be wiped off before inspection.
- If any trace of oil is noted at and around connection fittings, it is a sure indication that refrigerant is leaking.
- **When the gas leaking point is located, disconnect that line and replace the O-ring. Check seal seat for fit for further use and then tighten connections to the specified torque.**
- **Do not overtighten.**

A/C PERFORMANCE TEST

Performance Chart-A (In the hot climate)

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:	(FACE)
INTAKE lever position:	RECIRC
FAN lever position:	4
Engine speed:	1,500 rpm
Time required before starting testing after air conditioner starts operating:	More than 10 minutes

TEST READING

Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	At temperature °C (°F)	
50 - 70	20 (68)	5.8 - 8.7 (42 - 48)
	25 (77)	10.6 - 13.5 (51 - 56)
	30 (86)	15.4 - 18.3 (60 - 65)
70 - 90	20 (68)	8.7 - 11.6 (48 - 53)
	25 (77)	13.5 - 16.4 (56 - 62)
	30 (86)	18.3 - 21.2 (65 - 70)

Ambient air temperature to compressor pressure table

Ambient air		High pressure (Discharge side) kPa (kg/cm², psi)	Low pressure (Suction side) kPa (kg/cm², psi)
Relative humidity %	Air temperature °C (°F)		
50 - 90	25 (77)	755 - 1,059 (7.7 - 10.8, 109 - 154)	39 - 118 (0.4 - 1.2, 6 - 17)
	30 (86)	951 - 1,275 (9.7 - 13.0, 138 - 185)	98 - 186 (1.0 - 1.9, 14 - 27)
	35 (95)	1,147 - 1,500 (11.7 - 15.3, 166 - 218)	157 - 265 (1.6 - 2.7, 23 - 38)
	40 (104)	1,344 - 1,716 (13.7 - 17.5, 195 - 249)	216 - 333 (2.2 - 3.4, 31 - 48)

Performance Chart-B (In the cold climate)

When the ambient air temperature is low, conduct a performance test using the following conditions and measuring methods. If measured data are within the O.K. zone, performance is O.K.

TEST CONDITION

Doors:	Closed
Door window:	Closed
Hood:	Open
Air control lever position:	(FACE)
Intake lever position:	RECIRC.
Fan lever position:	4
Air conditioner switch:	ON
TEMP. lever position:	Make cold-hot adjustment so intake air temperature (before the blower) can be set at 30°C (86°F). (Refer to "HOW TO MEASURE".)
Engine speed:	1,500 rpm
Intake air temperature:	30°C (86°F)
Compressor discharge pressure:	1,912 kPa (19.5 kg/cm², 277 psi) (Refer to "HOW TO MEASURE".)

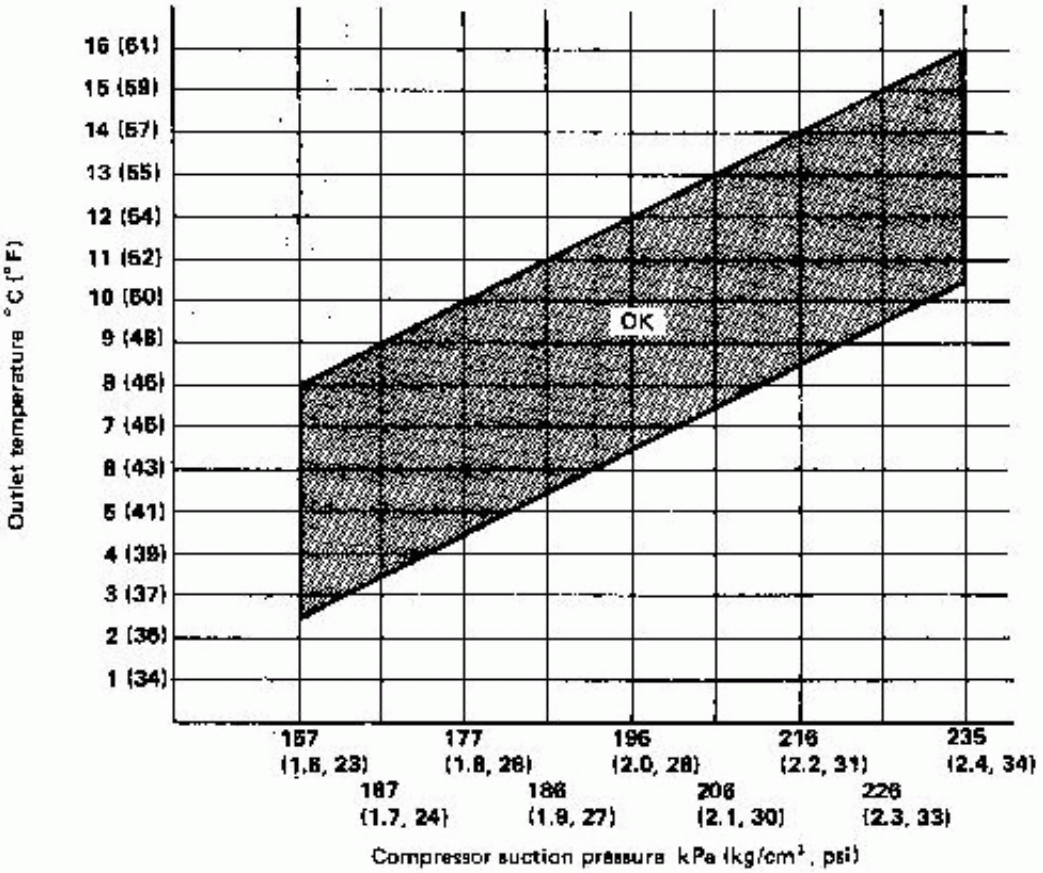
ITEMS TO MEASURE

- Compressor discharge pressure
- Compressor suction pressure
- Outlet temperature
  Measure the outlet temperature by inserting a thermocouple into the connecting port between the cooling unit and heater unit, not into the vent in the instrument panel.
- Intake temperature
- Intake humidity
  Measure the intake air temperature (wet and dry bulb) immediately before the blower and determine the humidity by using the humidity conversion table.

HOW TO MEASURE

- When installation of the instruments used for measuring the above items, start the engine and turn on the air conditioner. Set the engine speed at 1,500 rpm and make an adjustment with the temperature lever so as to keep the intake air temperature at 30°C (86°F).
- The compressor discharge pressure should be raised to a pressure of 1,912 kPa (19.5 kg/cm², 277 psi) and set at that level by blocking the front of the condenser with corrugated paper (amount of blockage should be changed depending on the outside temperature at that time).
  When the intake air temperature reaches 30°C (86°F) and compressor discharge pressure 1,912 kPa (19.5 kg/cm², 277 psi), the above listed items should be measured and recorded. As a standard, measurement is started ten minutes after the A/C compressor is engaged. However, even if the above conditions are reached earlier due to the difference in temperature, etc., the A/C compressor should be operated for at least five minutes.
  Ten minutes after starting the A/C compressor, make sure that the intake relative humidity drops to below 50% and remains there. This means there is proper recirculation. If it fails to do this, check the recirculation system such as the intake unit for air tightness and the intake lever for proper operation. After completing this, measure the above listed items again.

TEST CHART



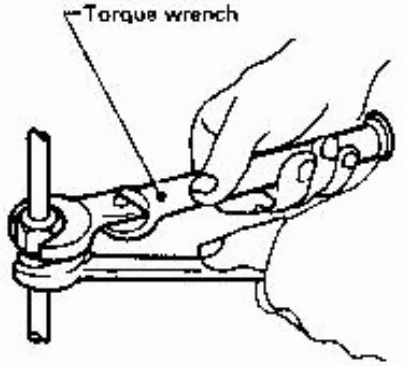
RHA091

WARNING:

Gradually loosen discharge side hose fitting, and remove it after remaining pressure has been released.

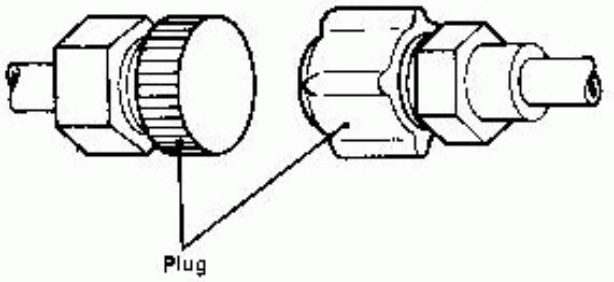
When replacing or cleaning refrigerant cycle components, observe the following:

- 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, be sure to use a torque wrench.



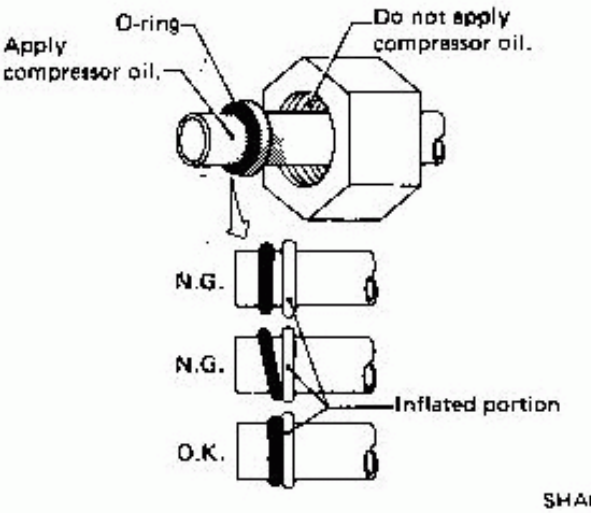
SHA896A

- After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.



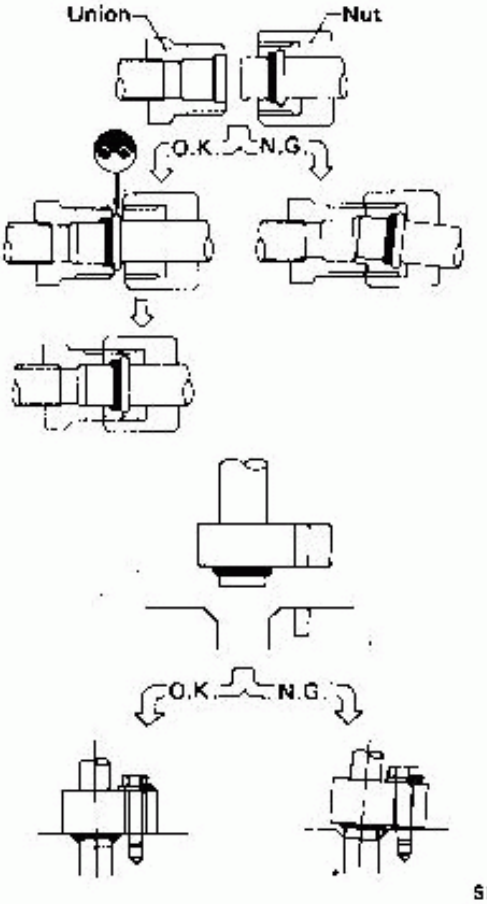
SHA058

- 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.



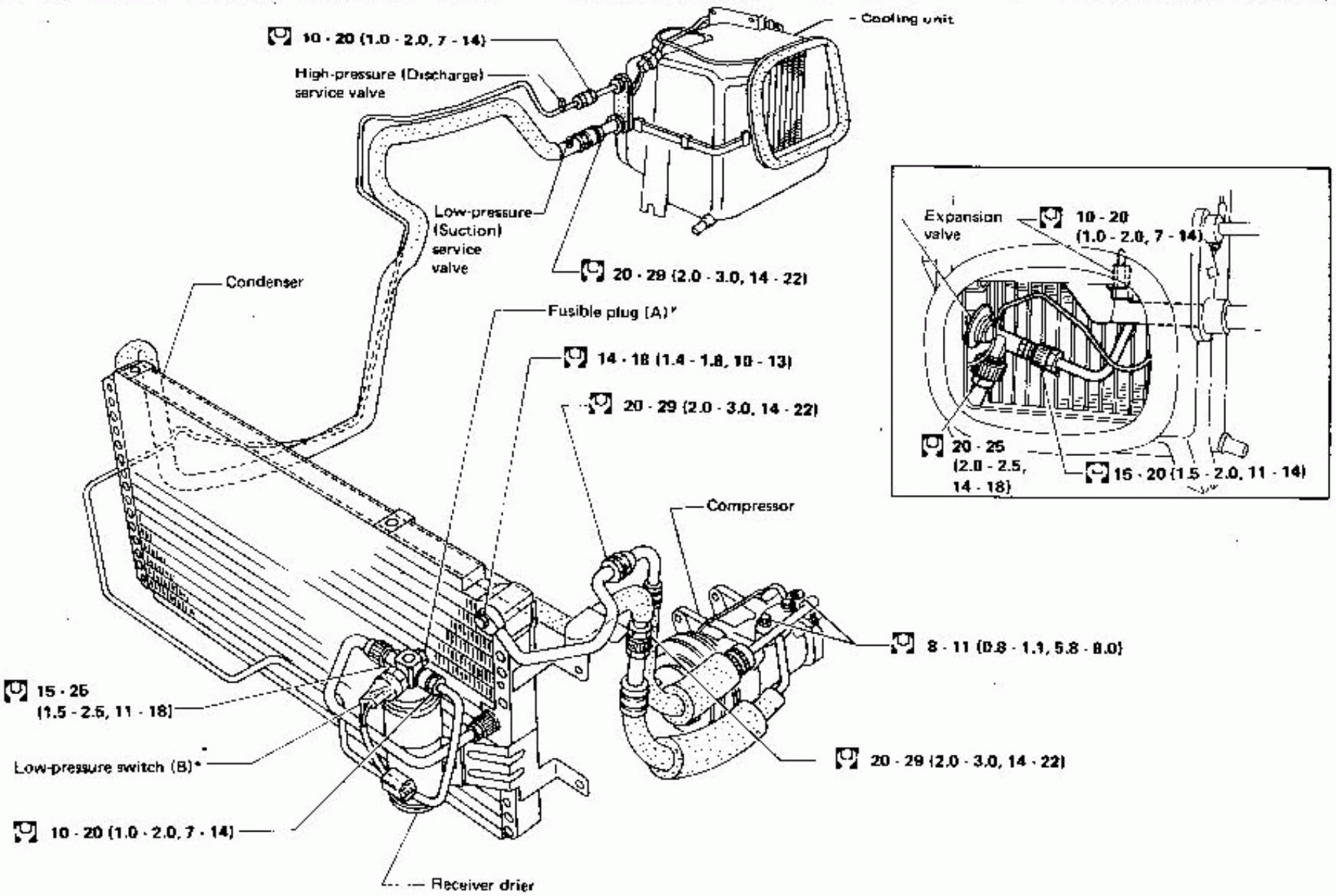
SHA897A

- After inserting tube into union until O-ring is no longer visible, tighten nut to specified torque.



SHA898A

- 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. Check fit for further use and then tighten connection to seal seat for the specified torque.



: N-m (kg-m, ft-lb)

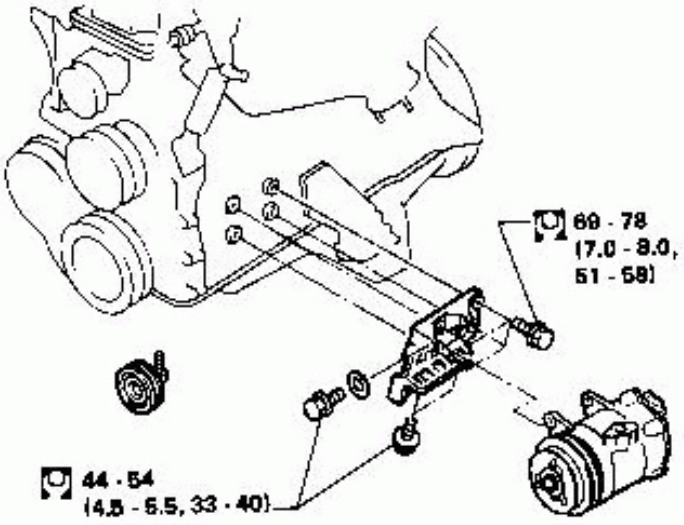
*(A) FUSIBLE PLUG
Open at temperatures above 105°C (221°F), thereby discharging refrigerant to the atmosphere. If this valve opened, check the refrigerant line and replace valve.

*(B) LOW-PRESSURE SWITCH

High-pressure side line pressure	Operation
Decreasing to 177 - 216 kPa (1.8 - 2.2 kg/cm², 26 - 31 psi)	Turn OFF
Increasing to 177 - 235 kPa (1.8 - 2.4 kg/cm², 26 - 34 psi)	Turn ON

RHA393

Compressor Mounting



: N·m (kg-m, ft-lb)

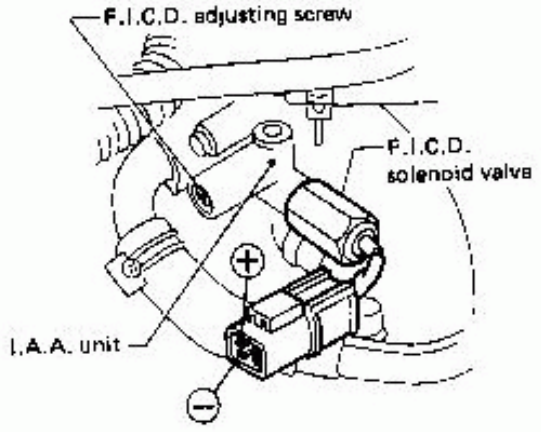
SHA376B

Idle Speed Adjusting

FAST IDLE CONTROL DEVICE (F.I.C.D.)

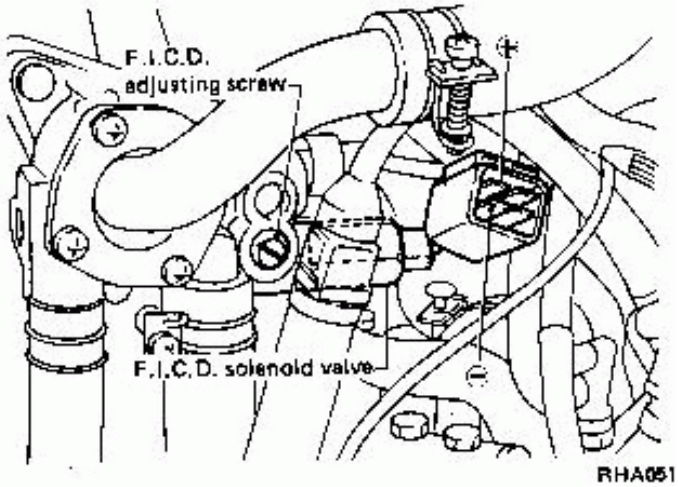
1. Run engine until it reaches operating temperature.
2. With air conditioning system OFF (when compressor is not operated), make sure that engine is at correct idle speed.
3. With air conditioning system ON (Intake lever at "RECIRC" position, fan control lever at "4" position), make sure that compressor, F.I.C.D. actuator and solenoid valve are functioning properly.
4. Set idle speed at the specified value.

Non-turbocharged model



RHA078

Turbocharged model



RHA051

ENGINE IDLING SPEED

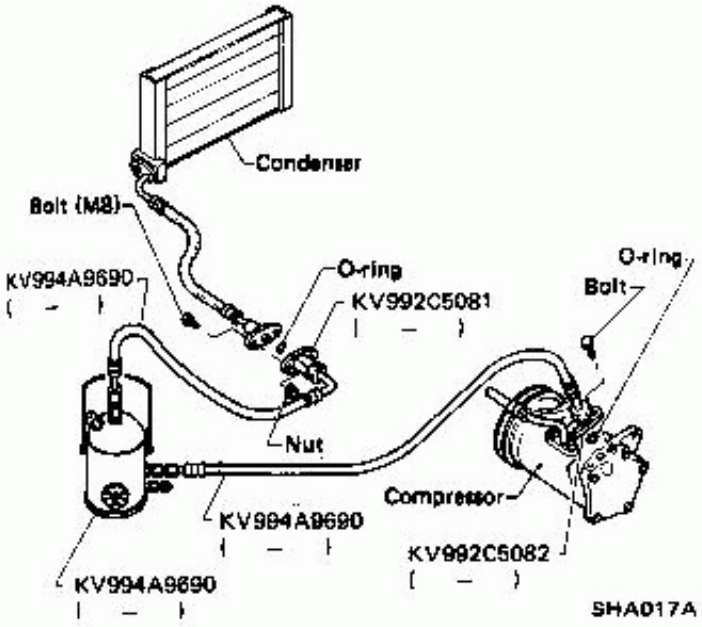
Transmission			Non-turbocharged model	Turbocharged model
When A/C is OFF				
	M/T	rpm	650 - 850	700 - 800
	A/T	rpm	600 - 800 at "D" range	–
When A/C is ON				
	M/T	rpm	1,000 - 1,050	
	A/T	rpm	1,050 - 1,100 at "N" range	

COMPRESSOR OIL—For MJS170

Checking and Adjusting

The oil used to lubricate the compressor is circulating with the refrigerant.
Whenever replacing any component of the system of a large amount of gas leakage occurs, add oil to maintain the original amount of oil.

Total amount of oil in the system:
150 mℓ (5.1 US fl oz, 5.3 Imp fl oz)



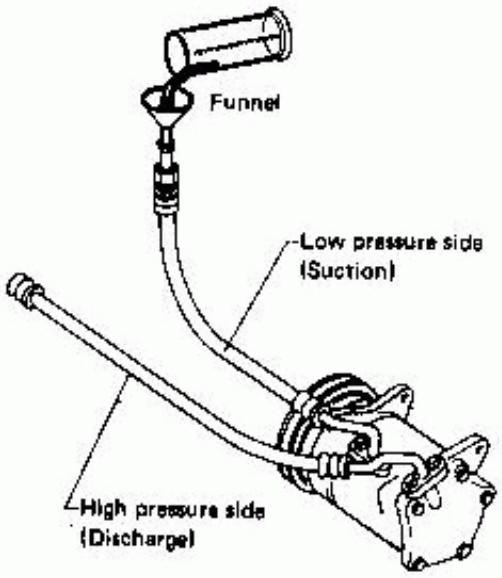
1. Connect oil separator KV994A9690 between compressor discharge side and condenser.
2. Evacuate and charge the system.
3. Operate compressor at engine idling with air conditioner set for maximum cooling and high fan speed.
4. Stop compressor operation after 10 minutes.

Never allow engine speed to exceed idling speed.

CAUTION:
Do not continue compressor operation for more than 10 minutes.

5. Disconnect oil separator and connect refrigerant line to original positions.
6. Disconnect low flexible hose from compressor suction valve.
7. Add new oil from compressor suction port.

Amount of oil to be added:
120 mℓ (4.1 US fl oz, 4.2 Imp fl oz)



- **About 30 mℓ (1.0 US fl oz, 1.1 Imp fl oz) of oil remains unremoved in the system.**

8. After adding oil, rotate compressor clutch by hand 5 to 10 turns.
9. Connect refrigerant line and evacuate and charge system.
10. Conduct leak test and performance test.
11. Gradually loosen drain cap of oil separator to release residual pressure. Remove cap and drain oil.
12. To prevent formation of rust and intrusion of moisture or dust, perform the following before placing oil separator kit into storage.

1) Cap each opening of flexible hose and double union securely.
2) Cap oil separator, evacuate it from service valve, and charge refrigerant.

Checking and Adjusting (Cont'd)

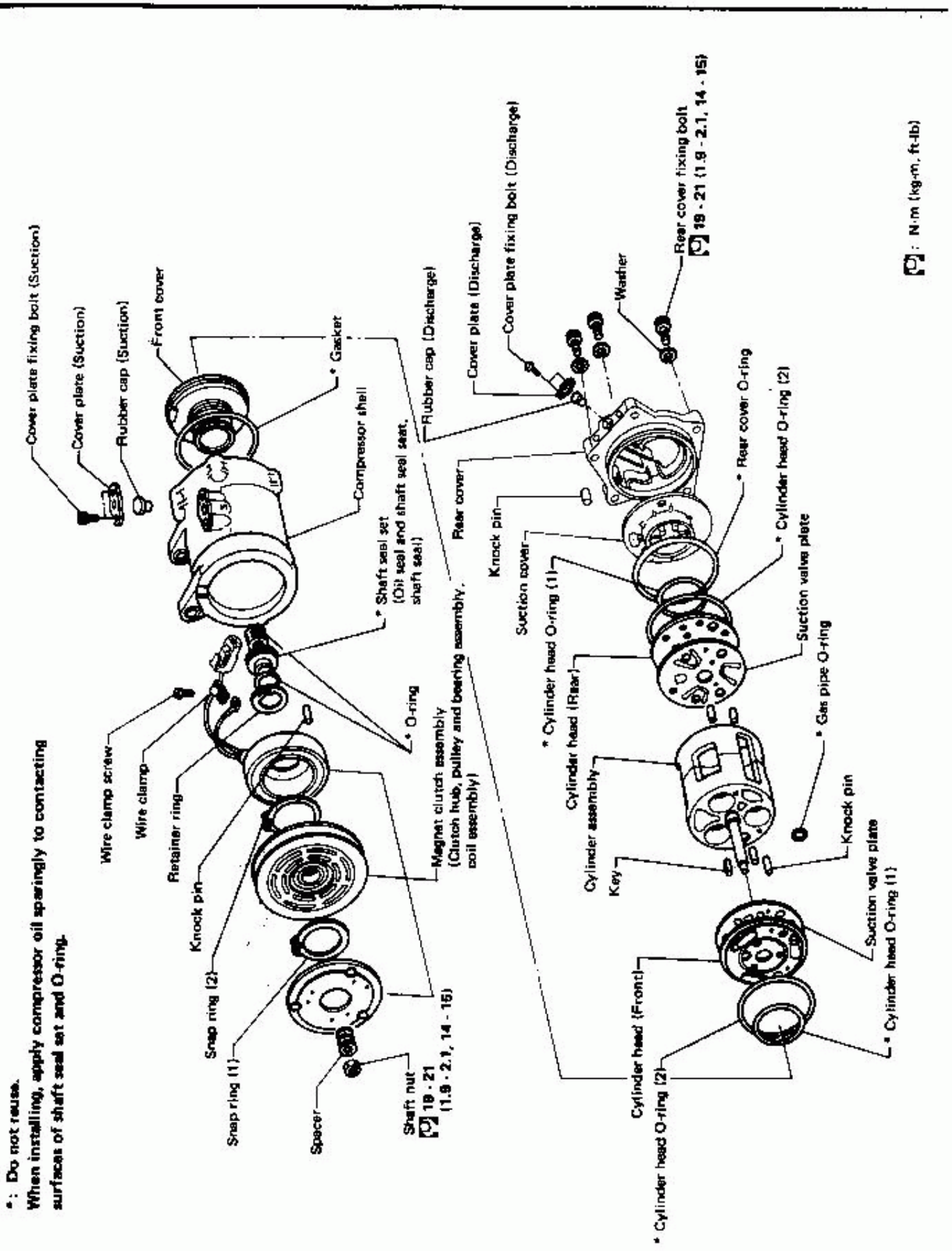
IF OIL SEPARATOR IS NOT AVAILABLE

Add oil in accordance with the table below.

Condition		Amount of oil to be added mℓ (US fl oz, Imp fl oz)
Replacement of compressor		1. Remove all oil from new and old compressors.* 2. Charge new compressor with the same amount of oil as was in the old compressor.
Replacement of evaporator		70 (2.4, 2.5)
Replacement of receiver dryer (liquid tank)		10 (0.3, 0.4)
Replacement of condenser	There is no sign of oil leakage from condenser.	10 (0.3, 0.4)
	There are evidences of a large amount of oil leakage from condenser.	60 (2.0, 2.1)
Replacement of flexible hose or pipe	There is no sign of oil leakage.	Oil need not be added.
	There are evidences of a large amount of oil leakage.	60 (2.0, 2.1)
Gas leakage	There is no sign of oil leakage.	Oil need not be added.
	There are evidances of a large amount of oil leakage.	60 (2.0, 2.1)

* Remove compressor oil as follows.

1. With the compressor upside down, completely drain the oil through the suction port (from the embossed letter "s" mark side).
2. When the oil stops flowing out, rotate the clutch hub two or three times to completely drain the oil.

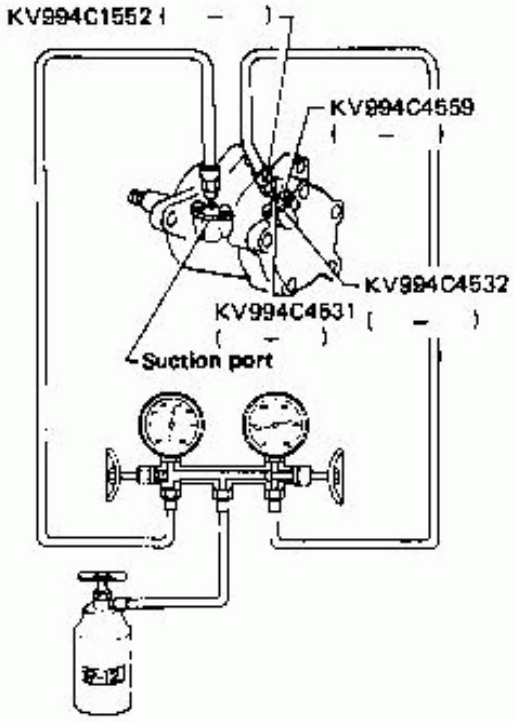


*: Do not reuse.
When installing, apply compressor oil sparingly to contacting surfaces of shaft seal set and O-ring.

SHA905A

Leak Test

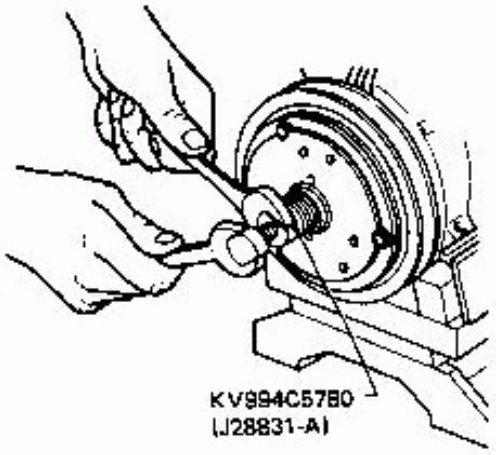
EVACUATE AND CONDUCT LEAK TEST



SHA907A

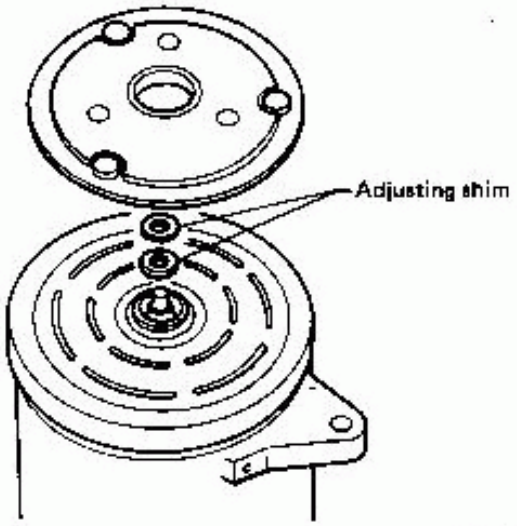
Clutch Replacement

- When removing shaft nut, hold clutch hub with Tool KV99412302.
- Using Tool KV994C5780 (J28831-A), clutch hub can be removed easily.

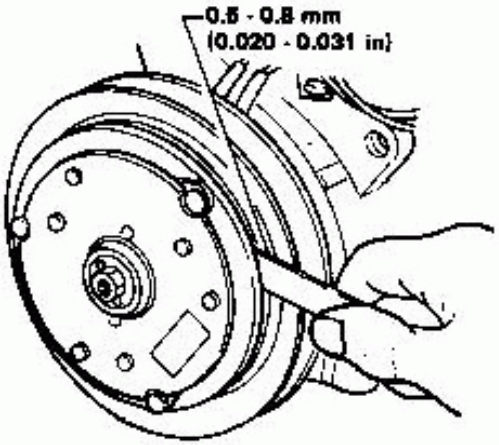


SHA268A

- When assembling clutch hub, adjust hub-to-pulley clearance with shims.



SHA272A



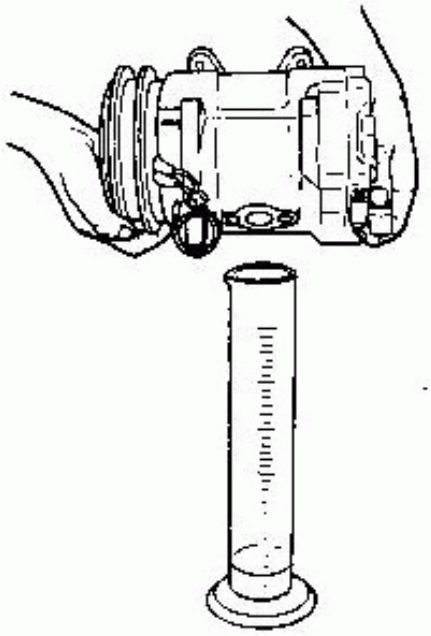
SHA908A

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.

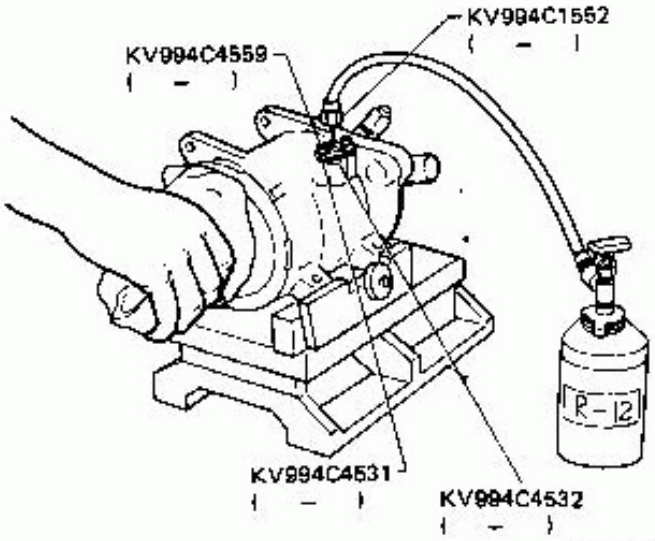
Shaft Seal Replacement

- Before disassembling, be sure to measure the amount of oil.
  After assembling, charge with the same amount of new oil.



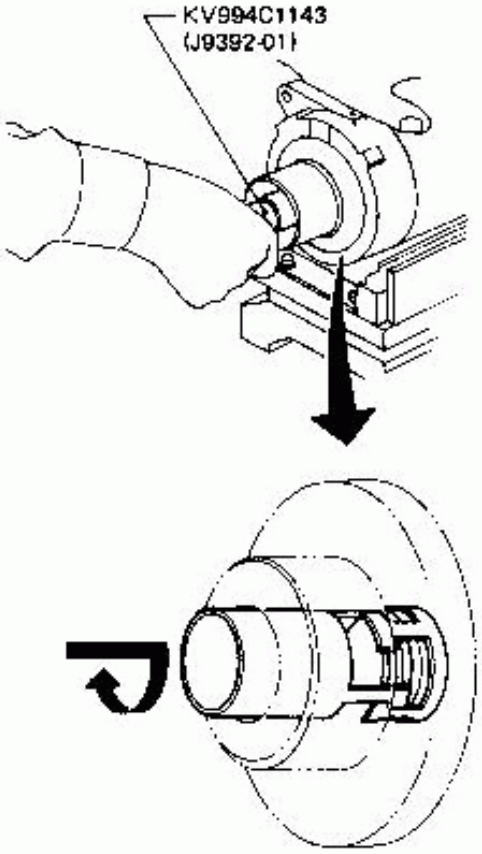
SHA033A

- When removing seal seat
  Apply pressure with refrigerant.



SHA274A

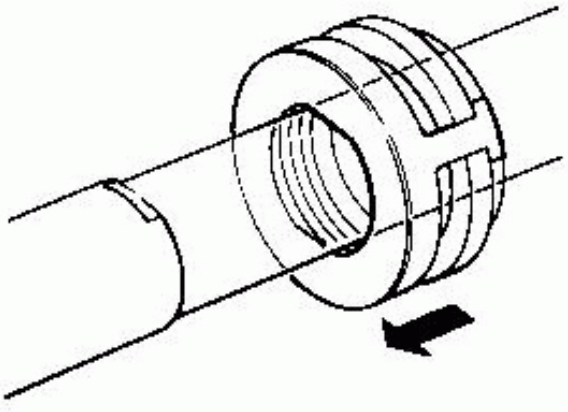
- With Tool KV994C1143 (J9392-01), depress carbon seal and hook the case of shaft seal.



SHA276A

- When installing shaft seal

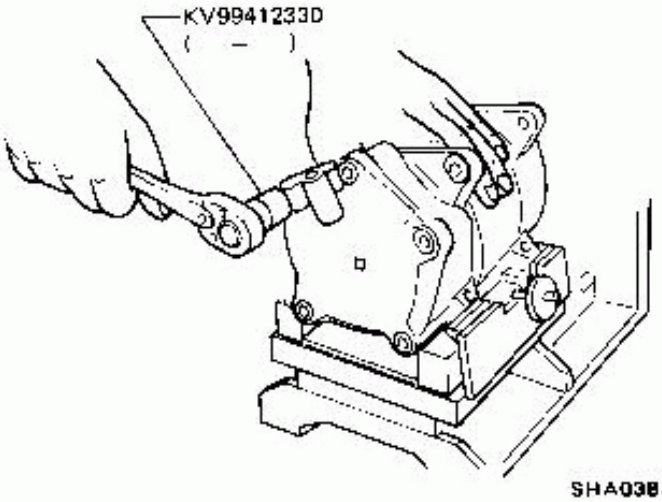
1) Cap Tool KV994C5784 to the top end of compressor shaft.
2) Using Tool KV994C1143, insert shaft seal with shaft seal case and shaft cutout aligned.
   Apply force to turn the seal somewhat to the left and right. Ensure that the shaft seal seats properly in the shaft cutout.



AC037

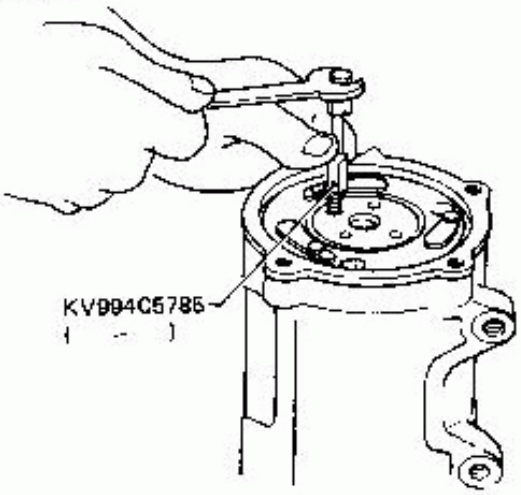
Valve Replacement

- Using Tool KV99412330, remove rear cover.



SHA038A

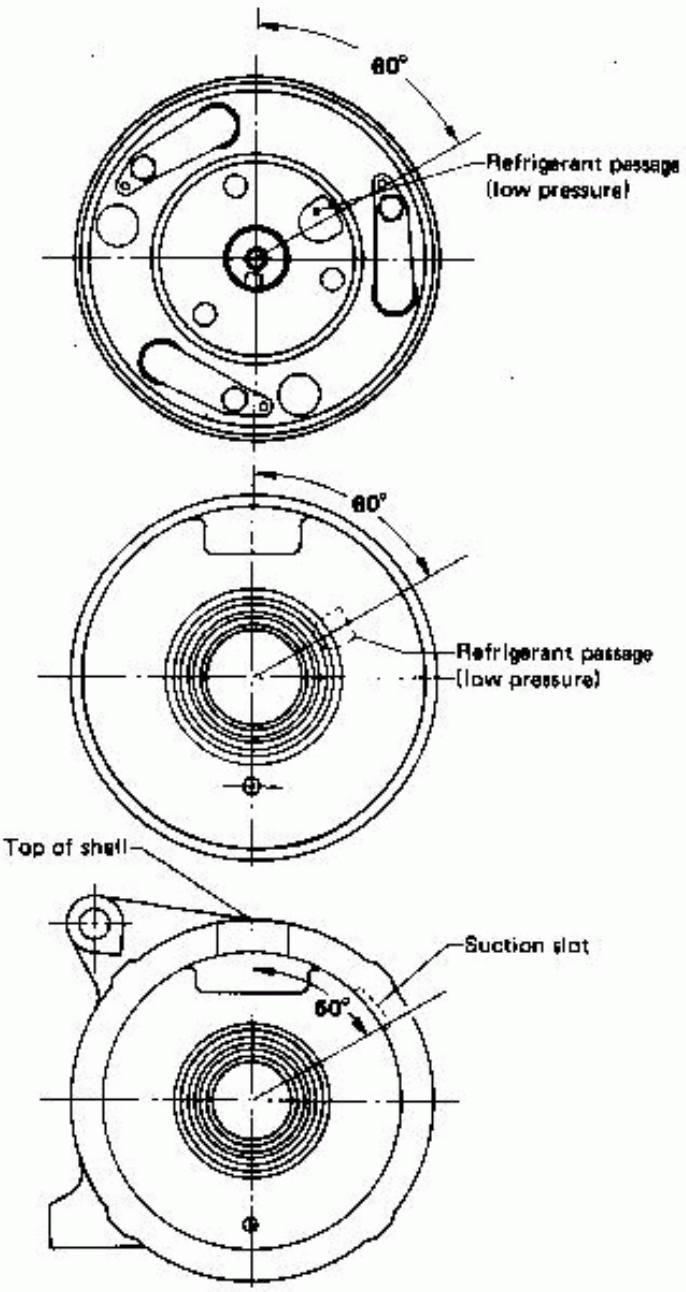
- Using Tool KV994C5785, remove rear cylinder head.



SHA909A

- When assembling

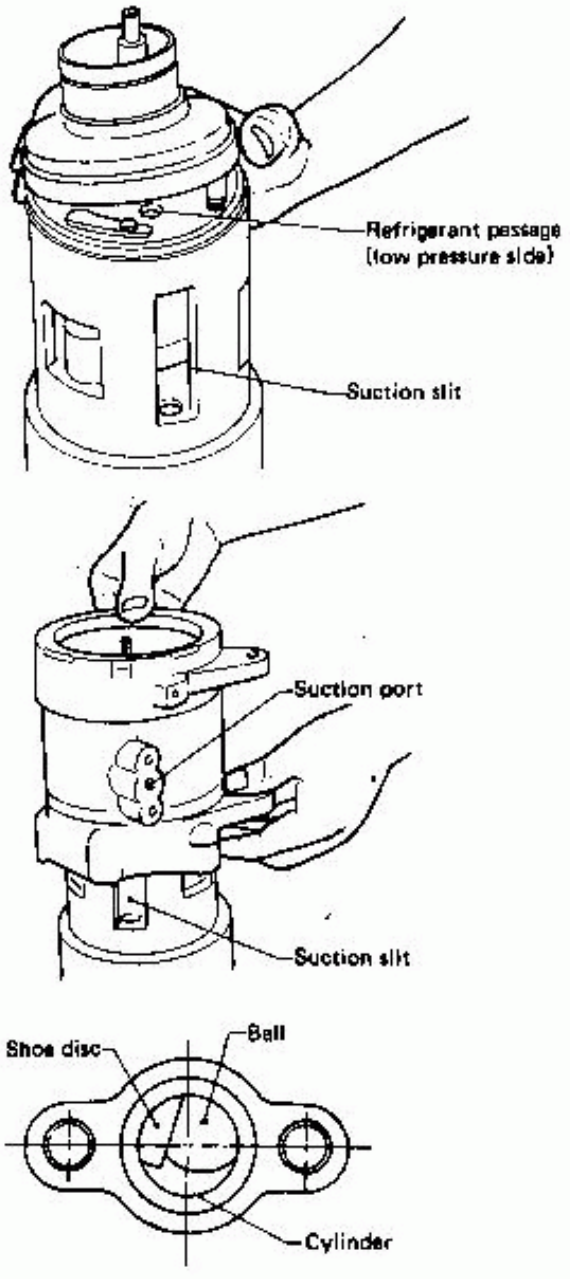
1) Front cover must be installed so that the cut-out portions of front cover and shell are aligned.
   For this purpose, install front cover on cylinder head so that angle between threaded hole in front cover and low pressure side refrigerant passage in cylinder head is about 60°.



SHA276A

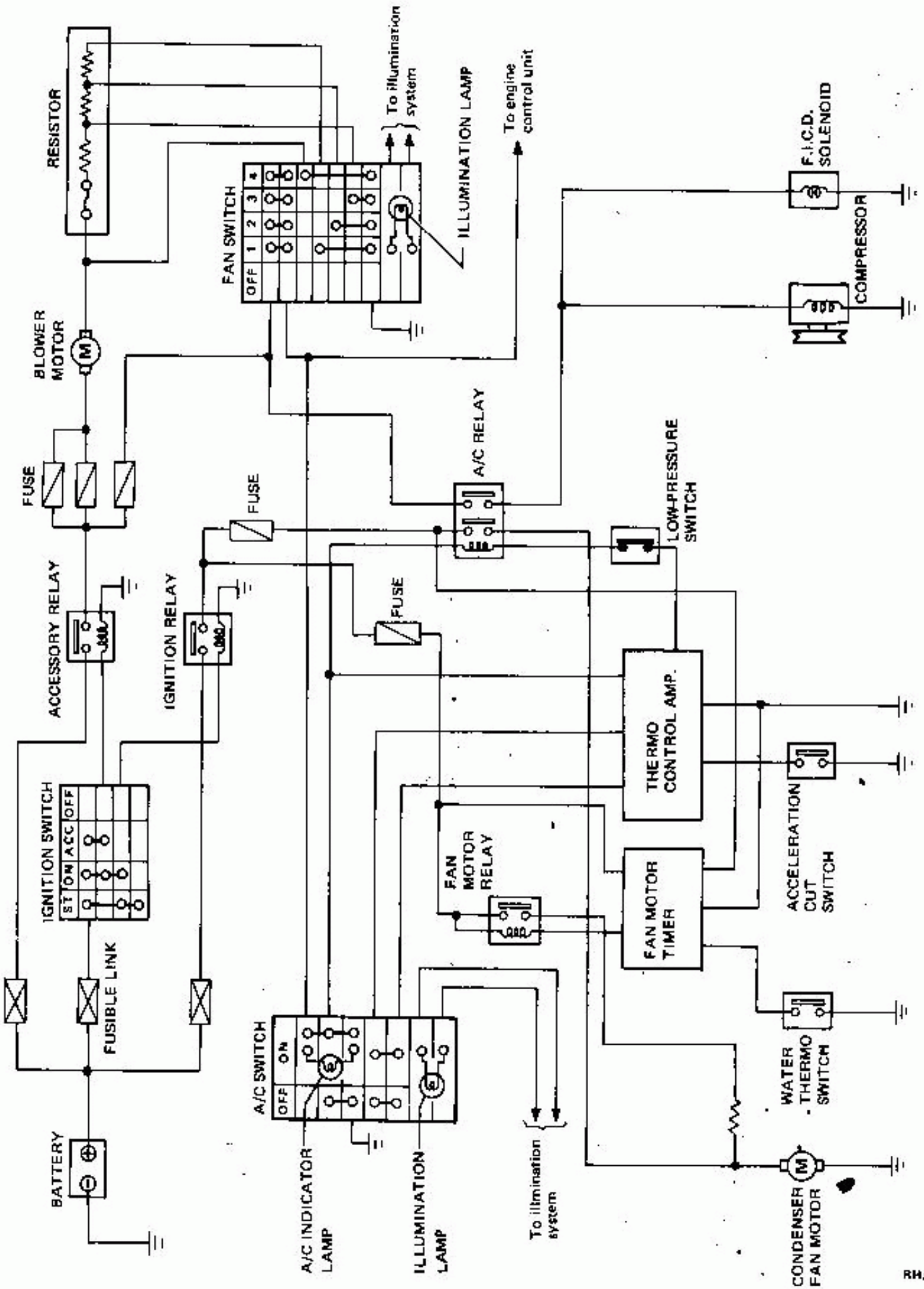
Valve Replacement (Cont'd)

2) When installing shell on cylinder, adjust position of shell so that suction inlet of shell opens in the same direction as suction slot of cylinder assembly. Then, make sure swash plate is visible in suction inlet by removing suction valve.



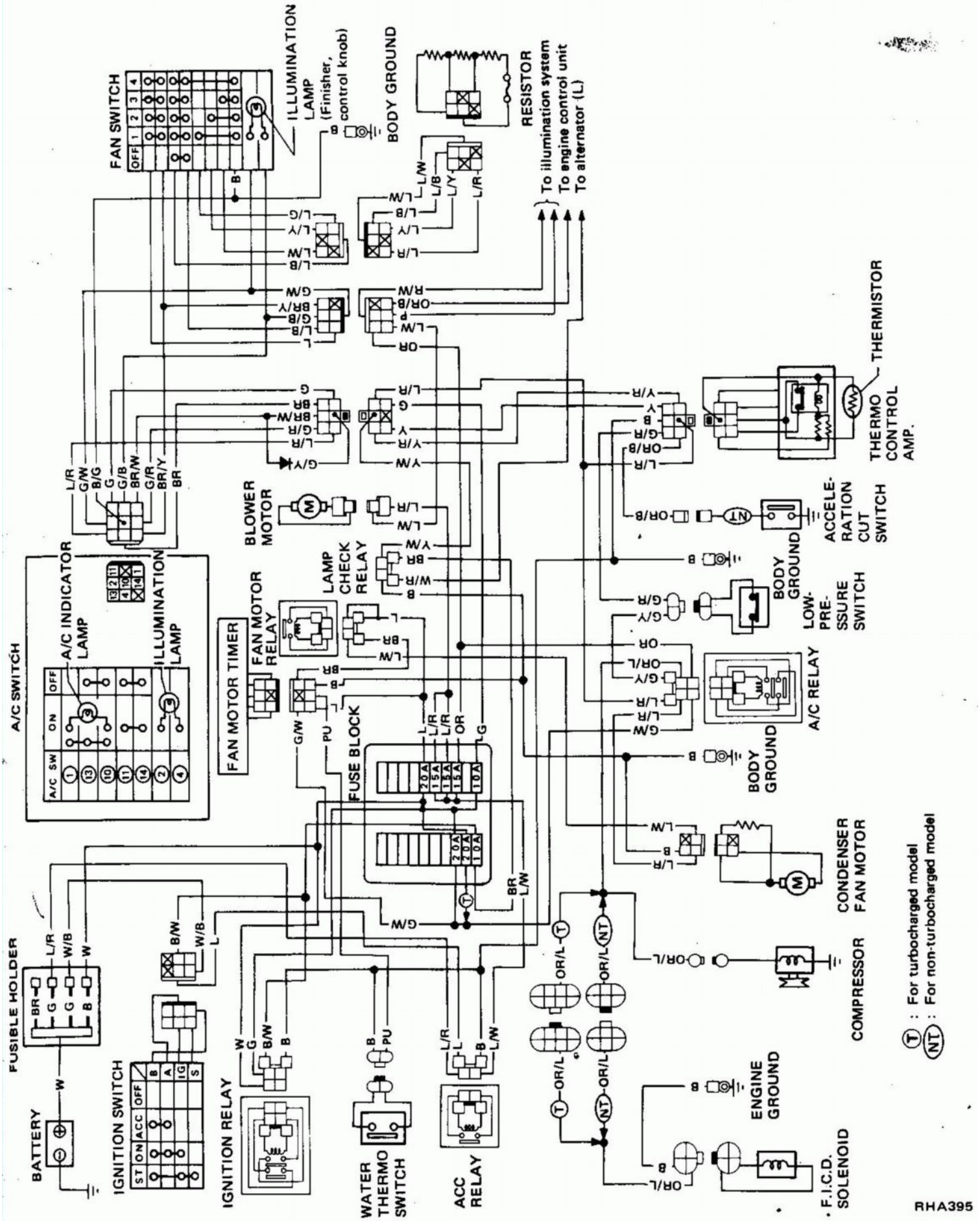
A/C ELECTRICAL CIRCUIT

Schematic



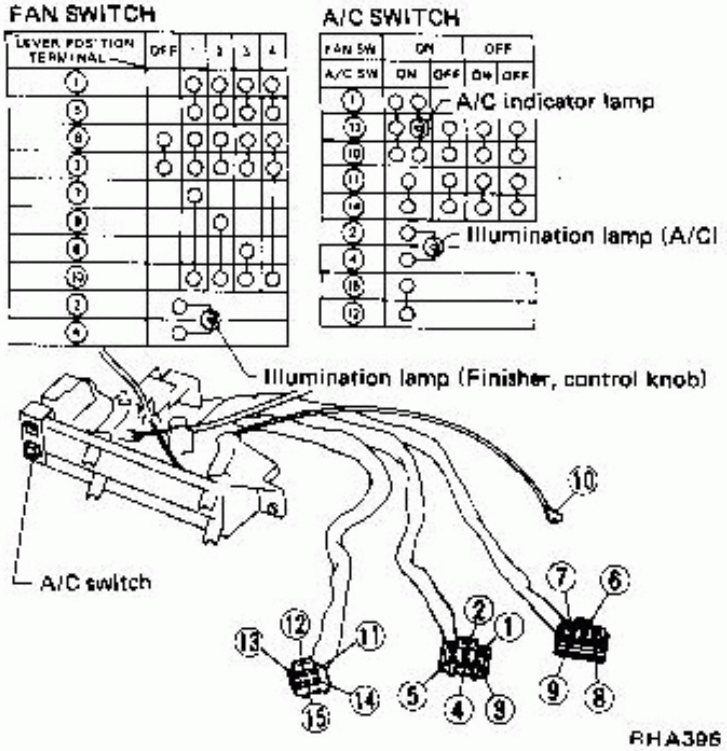
A/C ELECTRICAL CIRCUIT

Wiring Diagram



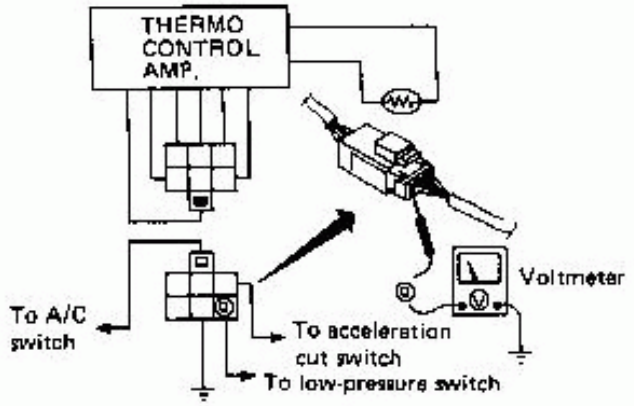
Inspection

FAN SWITCH AND A/C SWITCH



RHA396

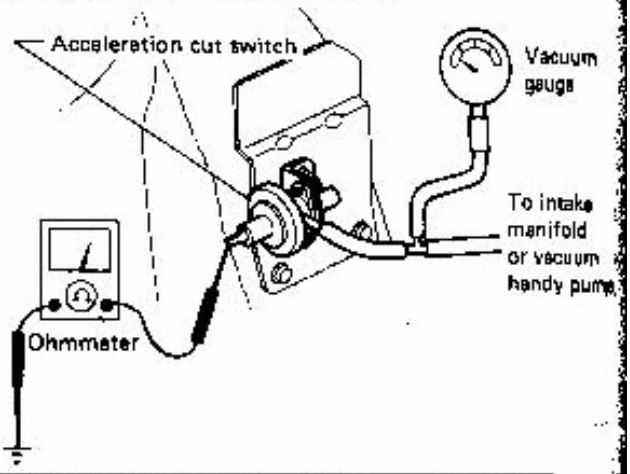
THERMO CONTROL AMP.



	Evaporator outlet air temperature °C (°F)	Thermo AMP. operation	Tester
Standard	Decreasing to 0 - 2 (32 - 36)	OFF	Approx. 12V
	Increasing to 3.4 - 5.0 (38 - 41)	ON	Approx. 0V
Acceleration cut (Non-turbocharged)	Decreasing to 3.4 - 5.0 (38 - 41)	OFF	Approx. 12V
	Increasing to 6.6 - 8.2 (44 - 47)	ON	Approx. 0V

RHA083

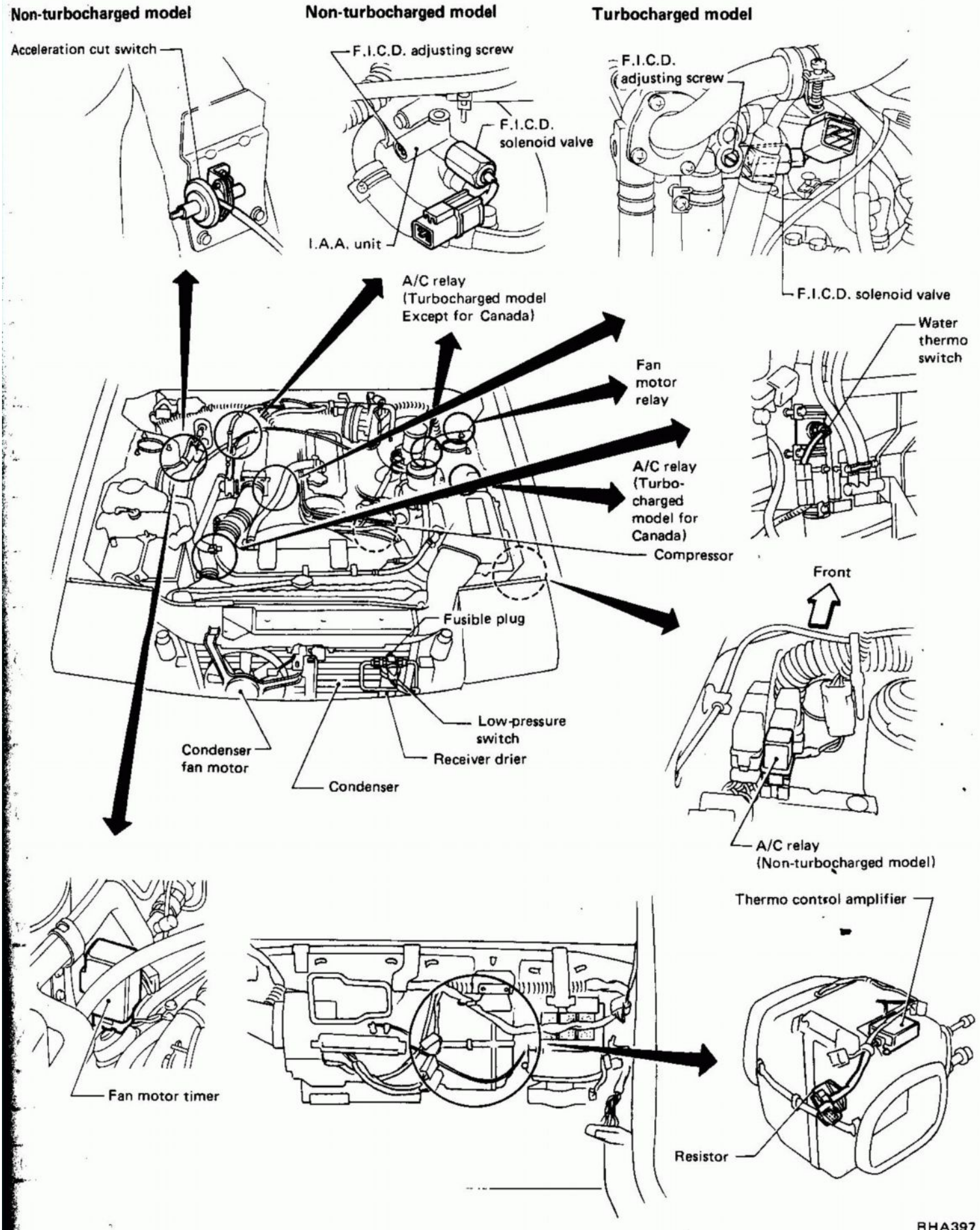
ACCELERATION CUT SWITCH



Pressure	Above −13.3 kPa (−100 mmHg, −3.94 inHg)	Below −24.0 kPa (−180 mmHg, −7.09 inHg)
Switch	0Ω	∞Ω

RHA084

A/C COMPONENT LAYOUT



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

COMPRESSOR

Model	HITACHI make MJS170
Type	Swash plate
Displacement cm³ (cu in)/Rev.	170 (10.37)
Cylinder bore x stroke mm (in)	40.0 x 22.6 (1.57 x 0.890)
Direction of rotation	Clockwise (Viewed from drive end)
Drive belt	B type

LUBRICATION OIL

Model	HITACHI make MJS170
Type	SUNISO 5GS
Capacity mℓ (US fl oz, Imp fl oz) Total in system	150 (5.1, 5.3)
Remaining oil in system after oil return operation and draining it	120 (4.1, 4.2)
Compressor (Service parts) charging amount	150 (5.1, 5.3)

REFRIGERANT

Type	R-12
Capacity kg (lb)	0.9 - 1.1 (2.0 - 2.4)

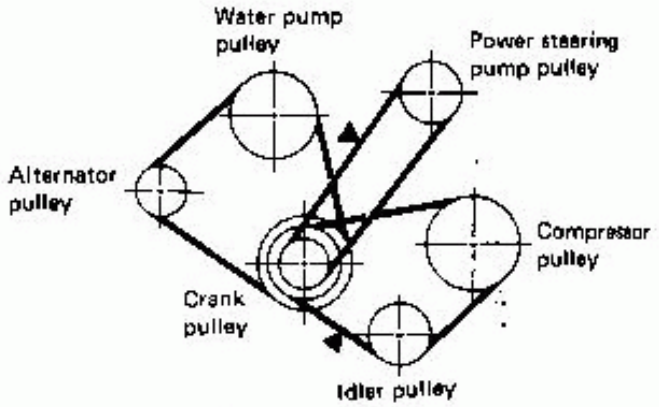
Inspection and Adjustment

ENGINE IDLING SPEED

Transmission	Non-turbocharged model	Turbocharged model
When A/C is OFF M/T rpm	650 - 850	700 - 800
A/T rpm	600 - 800 at "D" range	–
When A/C is ON M/T rpm	1,000 - 1,050	
A/T rpm	1,050 - 1,100 at "N" range	

BELT TENSION

	Belt deflection [Applied pressure is 98 N (10 kg, 22 lb)]		
	Used	New	Limit
Compressor belt mm (in)	3 - 5 (0.12 - 0.20)	3 - 5 (0.12 - 0.20)	7 (0.28)
Power steering pump belt mm (in)	8 - 11 (0.31 - 0.43)	6 - 9 (0.24 - 0.35)	14 (0.55)



▶ : Measuring point

RHA087

COMPRESSOR

Model	MJS170
Clutch disc-pulley clearance mm (in)	0.5 - 0.8 (0.020 - 0.031)

Tightening Torque

COMPRESSOR INSTALLATION

	CA20S ENGINE		
	N·m	kg-m	ft-lb
Compressor bracket to cylinder block	67 - 80	6.8 - 8.2	49 - 59
Compressor to compressor bracket	44 - 54	4.5 - 5.5	33 - 40
Compressor shaft nut	19 - 21	1.9 - 2.1	14 - 15
Compressor rear cover fixing bolt	19 - 21	1.9 - 2.1	14 - 15

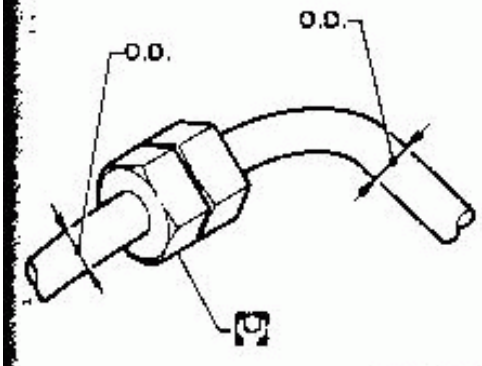
COMPRESSOR

Model	MJS170		
	N·m	kg-m	ft-lb
Shaft nut	19 - 21	1.9 - 2.1	14 - 15
Rear cover fixing bolt	19 - 21	1.9 - 2.1	14 - 15

REFRIGERANT LINE

When connecting lines made of different material, basically use the lower tightening torque of the two.

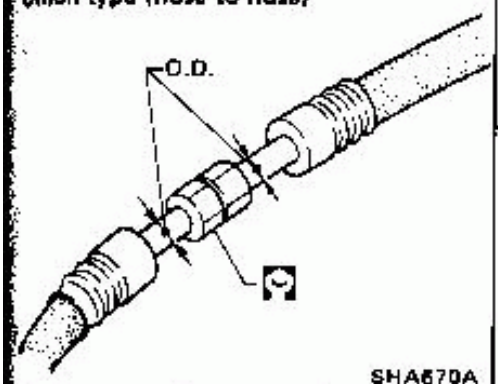
Union type (pipe to pipe)



SHA669A

Pipe O.D. mm (in)	Material					
	Steel or copper			Aluminum		
	N·m	kg-m	ft-lb	N·m	kg-m	ft-lb
6 (1/4)	10 - 20	1.0 - 2.0	7 - 14	–	–	–
8 (5/16)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
10 (3/8)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
12 (1/2)	20 - 29	2.0 - 3.0	14 - 22	15 - 25	1.5 - 2.5	11 - 18
16 (5/8)	25 - 34	2.5 - 3.5	18 - 26	20 - 29	2.0 - 3.0	14 - 22
19 (3/4)	25 - 34	2.5 - 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22

Union type (hose to hose)

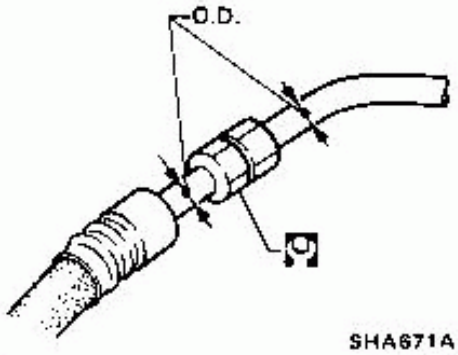


SHA670A

Pipe O.D. mm (in)	Material					
	Steel or copper			Aluminum		
	N·m	kg-m	ft-lb	N·m	kg-m	ft-lb
6 (1/4)	10 - 20	1.0 - 2.0	7 - 14	–	–	–
8 (5/16)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
10 (3/8)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
12 (1/2)	25 - 34	2.5 - 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22
16 (5/8)	25 - 34	2.5 - 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22

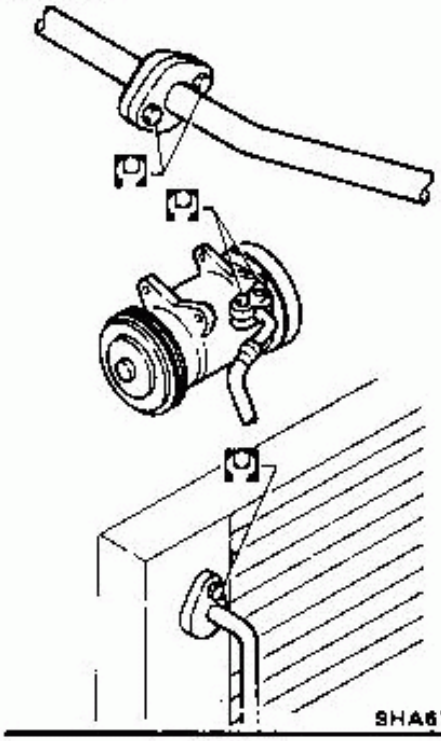
Tightening Torque (Cont'd)

Union type (hose to pipe)



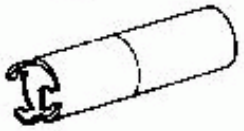
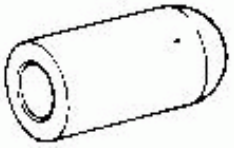
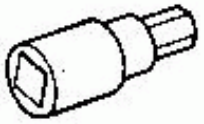
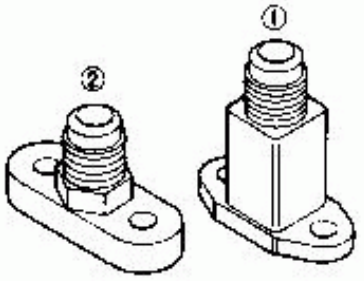
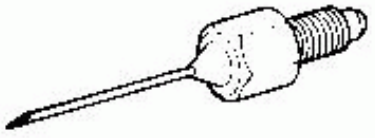
- Use tightening torque for flexible hose.

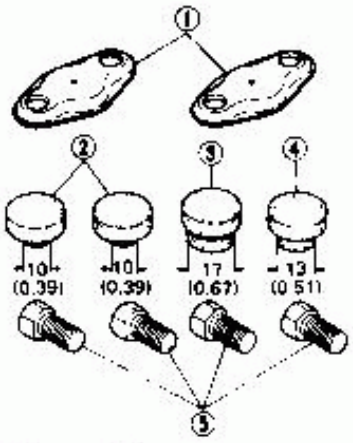
Plate type



Bolt type				Tightening torque		
Grade	Nominal size	Bolt diameter mm (in)	Pitch mm (in)	N·m	kg-m	ft-lb
4T	M6	6.0 (0.236)	1.0 (0.039)	3 - 4	0.3 - 0.4	2.2 - 2.9
	M8	8.0 (0.315)	1.25 (0.0492)	8 - 11	0.8 - 1.1	5.8 - 8.0
	M10	10.0 (0.394)	1.5 (0.059)	16 - 22	1.6 - 2.2	12 - 16
7T	M6	6.0 (0.236)	1.0 (0.039)	6 - 7	0.6 - 0.7	4.3 - 5.1
	M8	8.0 (0.315)	1.25 (0.0492)	14 - 18	1.4 - 1.8	10 - 13
	M10	10.0 (0.394)	1.5 (0.059)	25 - 35	2.6 - 3.6	19 - 26

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Tool
KV99412302 (J24878-1) Clutch hub wrench	
KV994C5780 (J28831-A) Clutch hub puller	
KV994C1143 (J9392-01) Shaft seal remover and installer	
KV994C5784 (J33212) Shaft seal pilot	
KV99412330 (–) Allen socket	
KV994C5785 (–) Cylinder head remover	
KV994A9690 (–) Oil separator kit	
KV992C5079 (–) ① KV992C5081 (–) Adapter connector A ② KV992C5082 (–) Adapter connector B	
KV994C1552 (–) Charge nozzle	

Tool number (Kent-Moore No.) Tool name	Tool
KV994C4548 (J33902) Blind cover set ① KV994C4531 (–) Blind cover ② KV994C4532 (–) Gasket ③ KV994C4533 (–) Gasket (Useless) ④ KV994C4534 (–) Gasket (Useless) ⑤ KV994C4559 (–) Bolt	 Unit: mm (in)

ELECTRICAL SYSTEM

SECTION EL

CONTENTS

HOW TO READ DIAGRAMS

Description

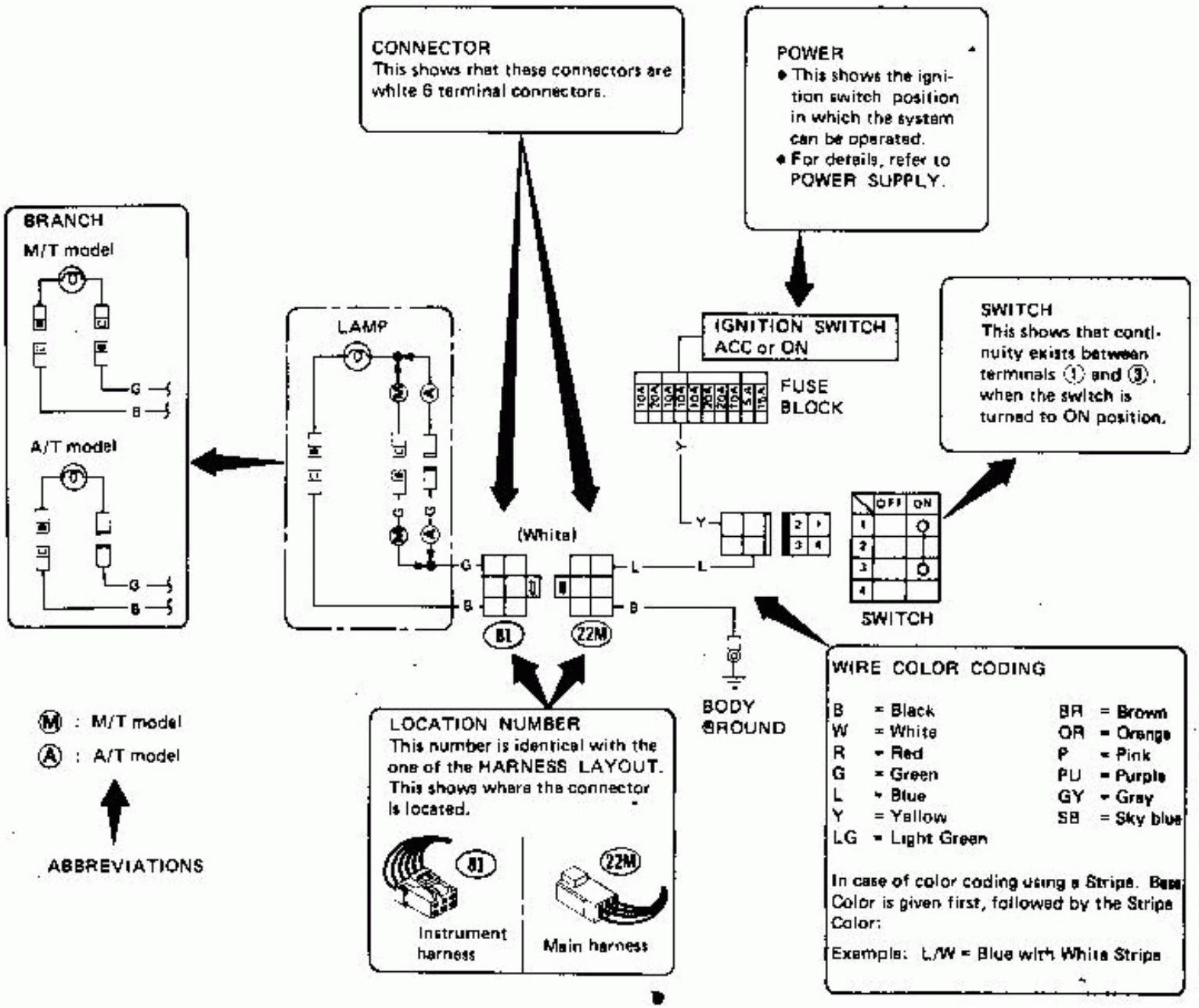
POWER SUPPLY ROUTING

This diagram is helpful in identifying specific problems in the power supply portion of the electrical circuits. For example, let's say a vehicle has an inoperative rear window defogger. A quick check proves that meter and gauges in the vehicle are operative. The power supply diagram shows that there cannot be a problem between the battery, ignition relay, ignition switch or fuse since the power supply circuit for the rear window defogger is common with the meter and gauges. Therefore, the cause of this specific problem must lie past the fuse, such as in the wiring, rear window defogger or ground.

WIRING DIAGRAM

This diagram identifies types and number of connectors, electrical terminal positions in the connector, color coding of wires, and connector codes. Refer to the following example.

Example



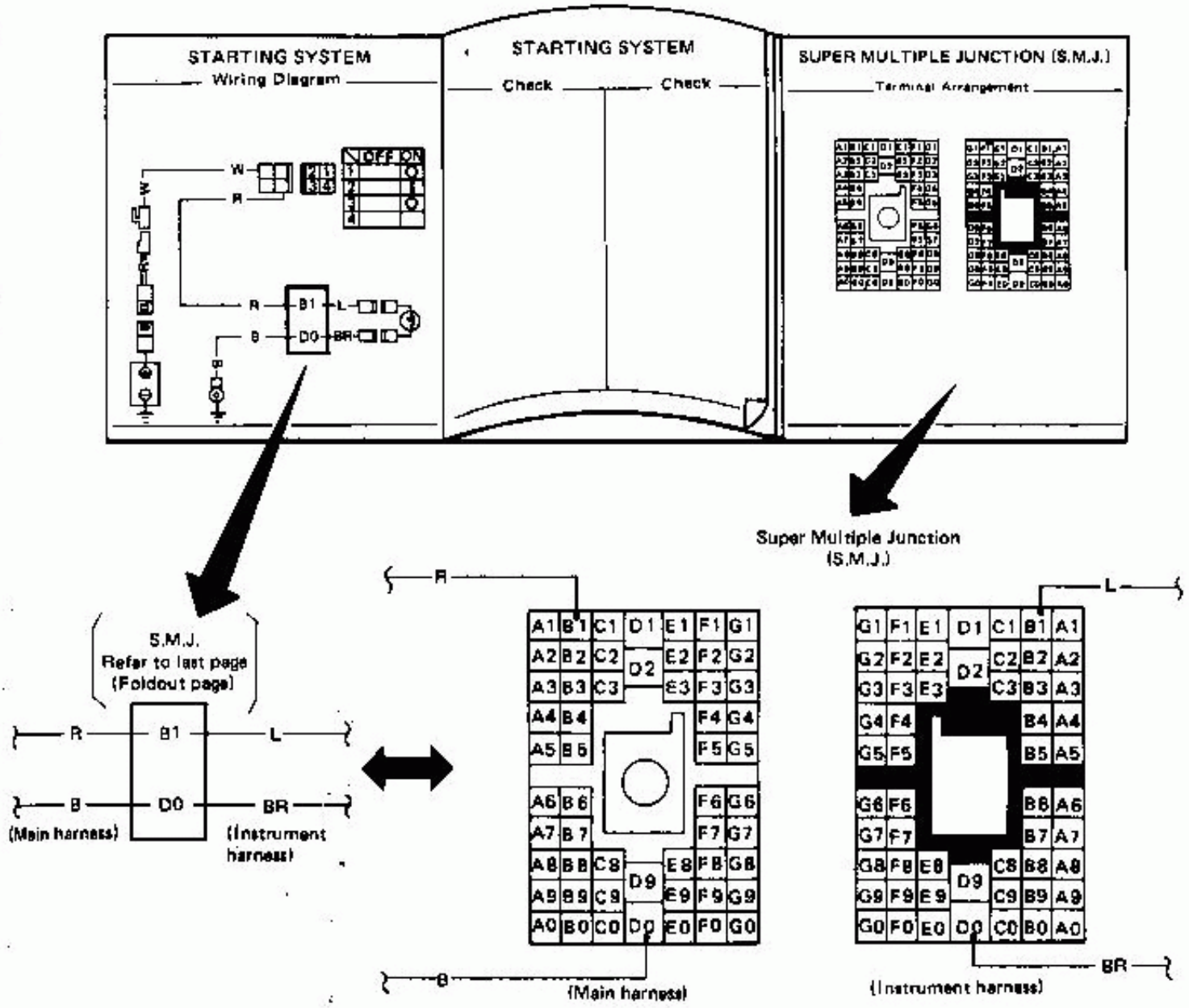
SEL768E

Description (Cont'd)

SUPER MULTIPLE JUNCTION (S.M.J.)

- The "S.M.J." indicated in wiring diagrams refers to the super multiple junction, and is drawn in a simplified form. The location of connector terminals should therefore be referred to in the foldout at the end of the Service Manual.
- The foldout should be spread, as shown in the example below, in order to read the entire wiring diagram.

Example

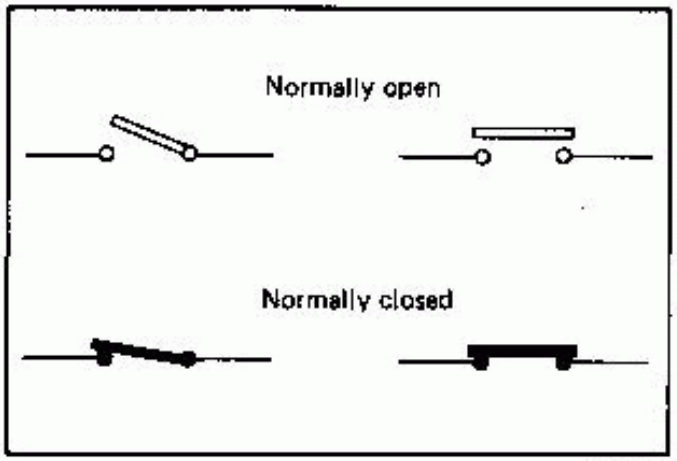


SEL118E

Description (Cont'd)

SWITCH POSITIONS IN DIAGRAMS

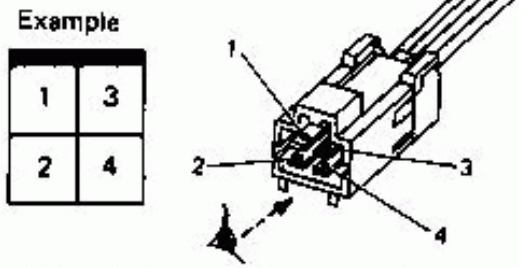
- Ignition switch in lock position
- Light switch and wiper switch in off position
- Doors closed



SEL764E

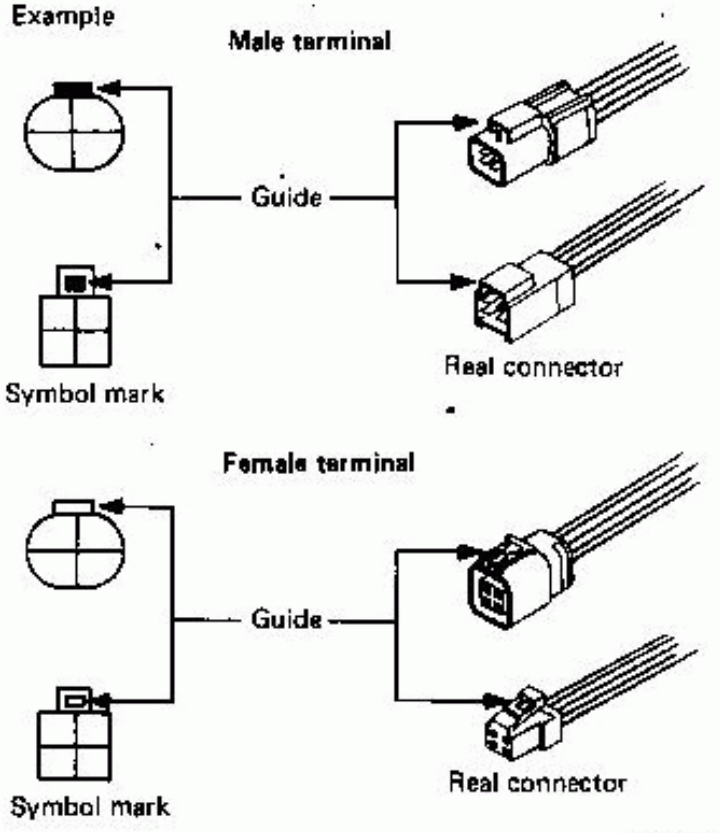
CONNECTOR SYMBOLS

1. Direction of connector



SEL766E

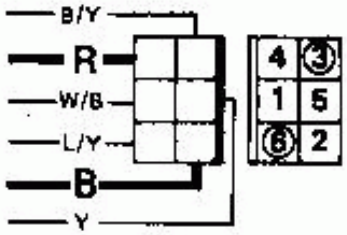
2. Male and female terminals
   Connectors for male terminals are in black and female terminals in white.



SEL765E

HOW TO IDENTIFY THE MULTIPLE SWITCH

The multiple switch is identified in the symbol chart and shown in the diagrams below.



WIPER SWITCH

	OFF	INT	LO	HI	WASH
1					○
2				○	
③	○	○	●		
4	○	○			
5		○			
⑥		○	●	○	○

Continuity circuit of wiper switch

SWITCH POSITION	CONTINUITY CIRCUIT
OFF	3 - 4
INT	3 - 4, 5 - 6
LO	3 - 6
HI	2 - 6
WASH	1 - 6

Case of wiper switch in LO position.
Continuity circuit: Red wire – Male connector – ③ terminal (Female connector) – ● Wiper switch ● – ⑥ terminal – Male connector – Black wire

SEL787E

Description (Cont'd)

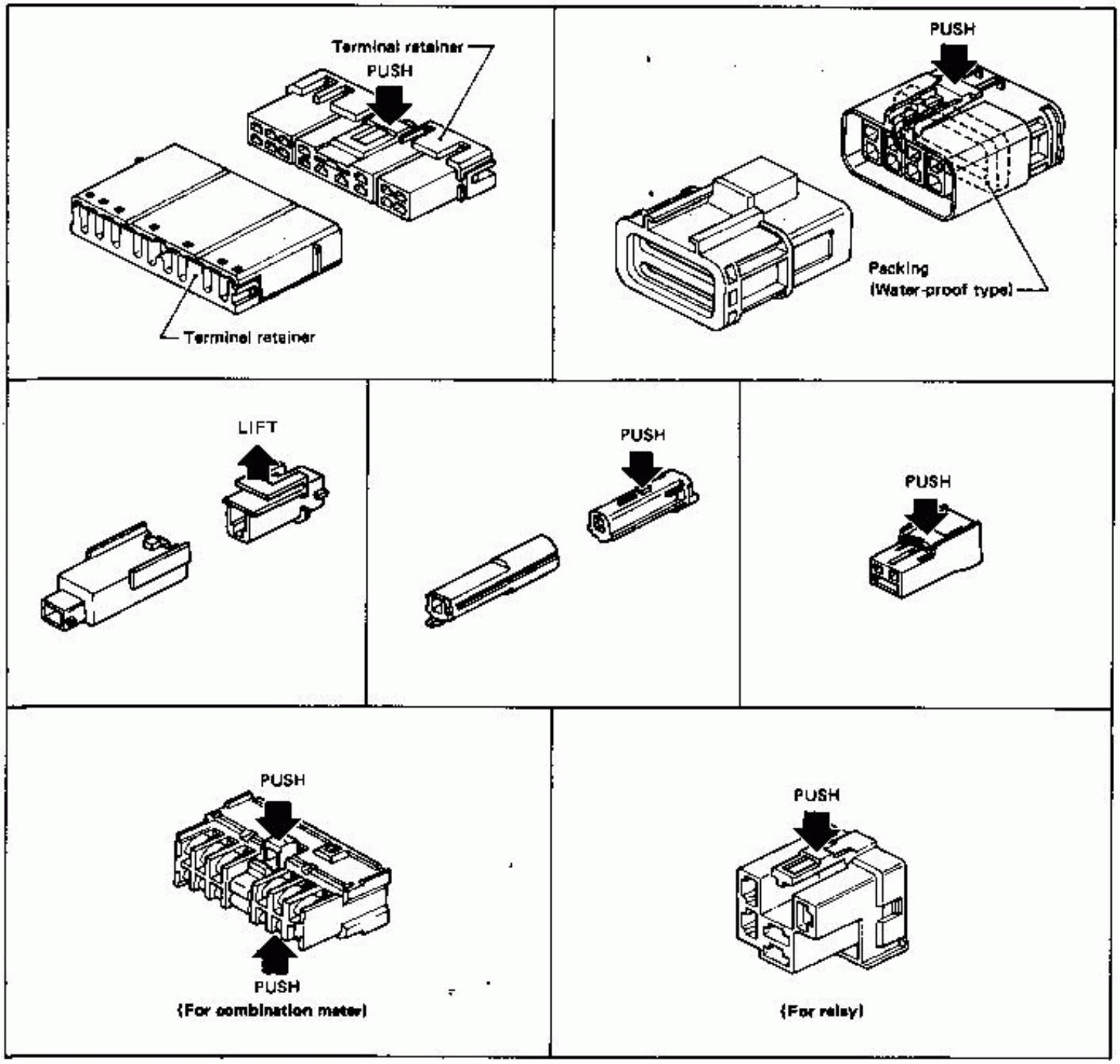
HARNESS CONNECTOR

- All harness connectors have been modified to prevent accidental looseness or disconnection.
- The connector can be disconnected by pushing or lifting the locking section.

CAUTION:

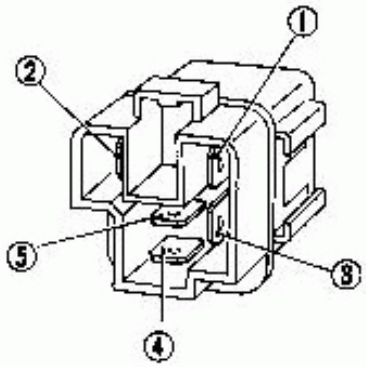
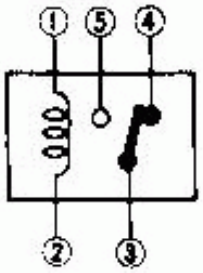
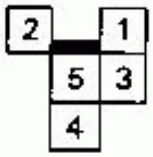
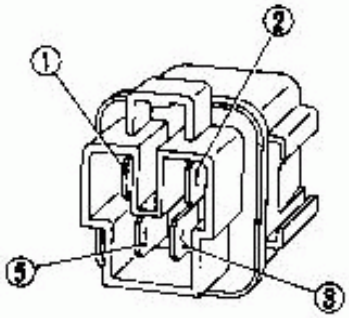
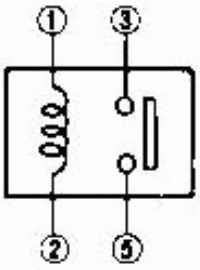
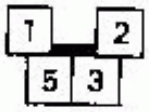
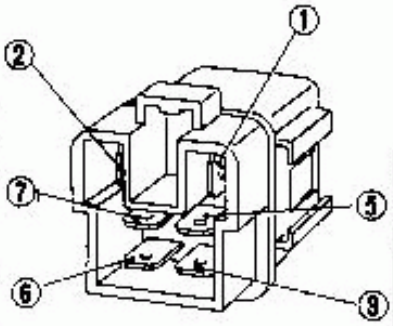
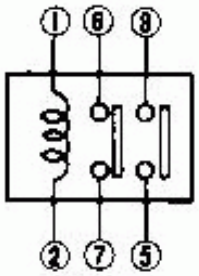
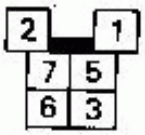
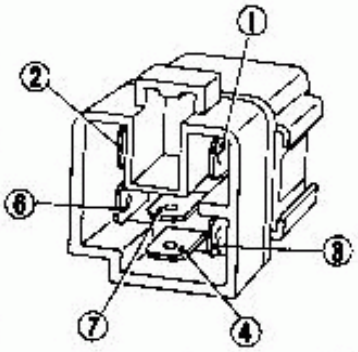
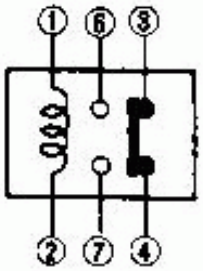
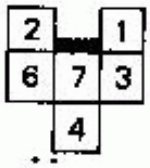
Do not pull the harness when disconnect the connector.

[Example]



SEL769D

STANDARDIZED RELAY

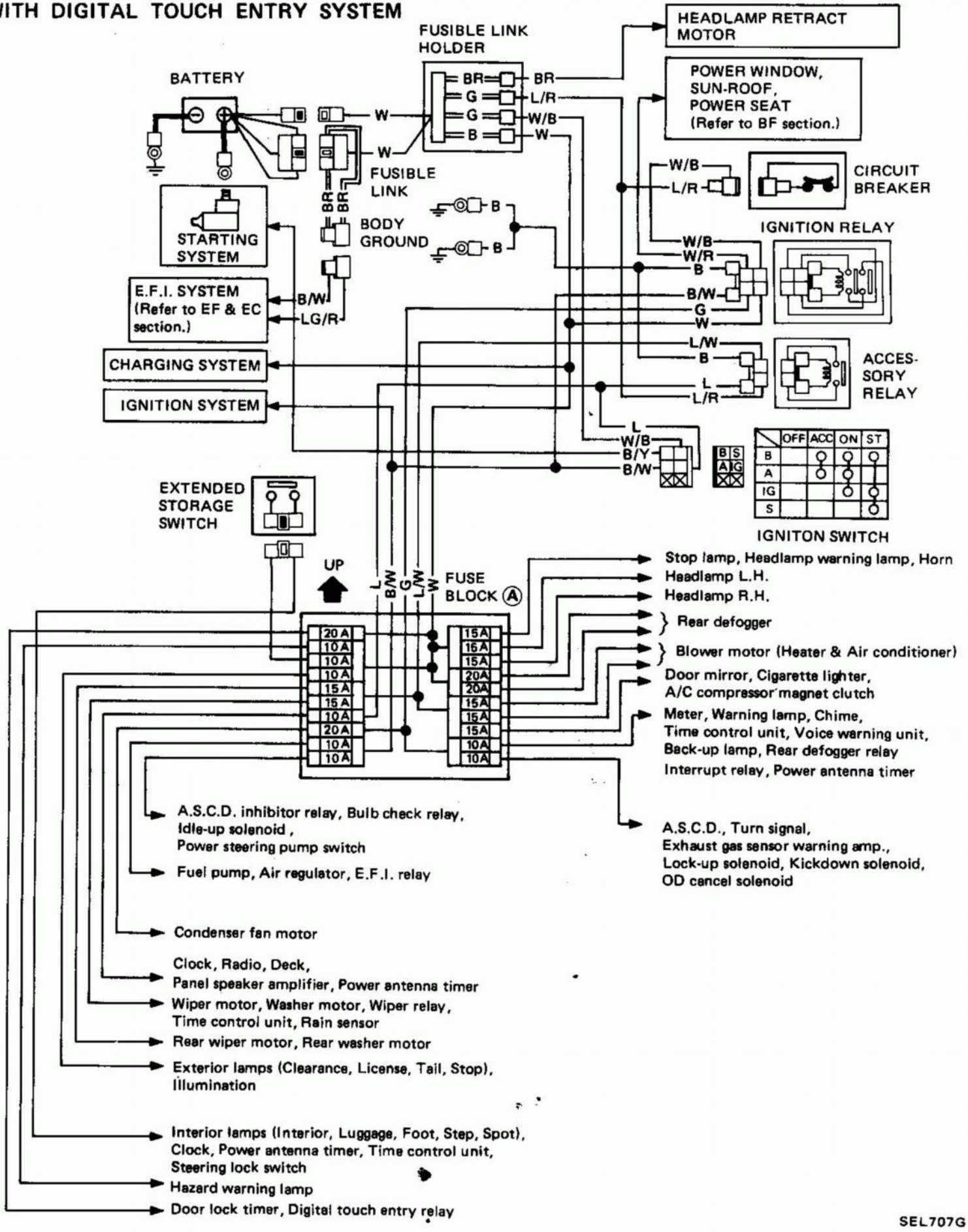
Type	Outer view	Circuit	Symbols	Case color
1T				BLACK
1M				BLUE
2M				BROWN
1M-1B				GRAY

SEL839D

POWER SUPPLY ROUTING

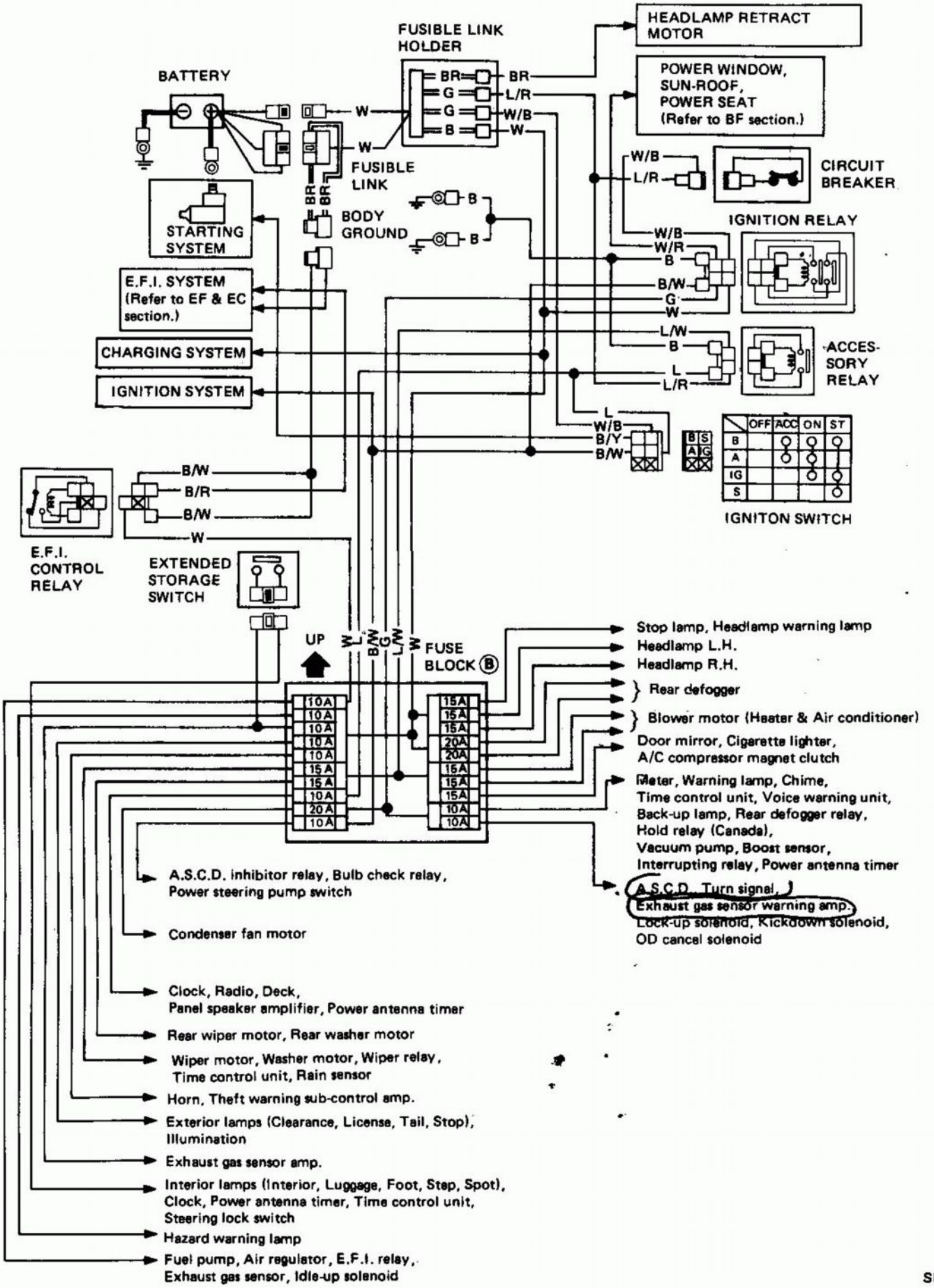
Wiring Diagram

WITH DIGITAL TOUCH ENTRY SYSTEM



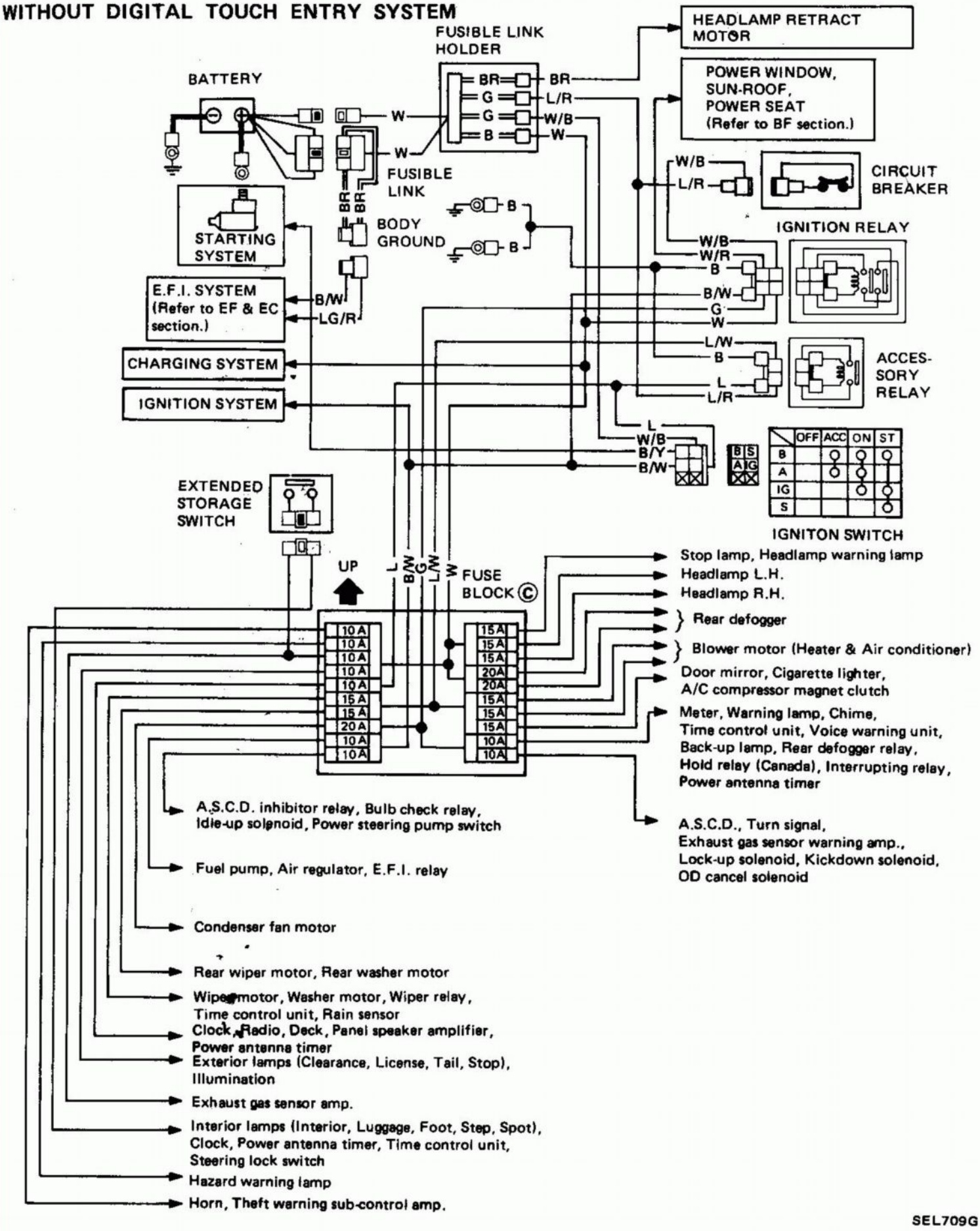
Wiring Diagram (Cont'd)

WITHOUT DIGITAL TOUCH ENTRY SYSTEM (Turbocharger model)



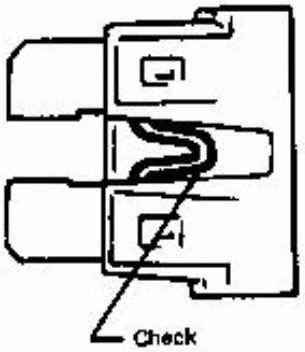
Wiring Diagram (Cont'd)

WITHOUT DIGITAL TOUCH ENTRY SYSTEM



SEL709G

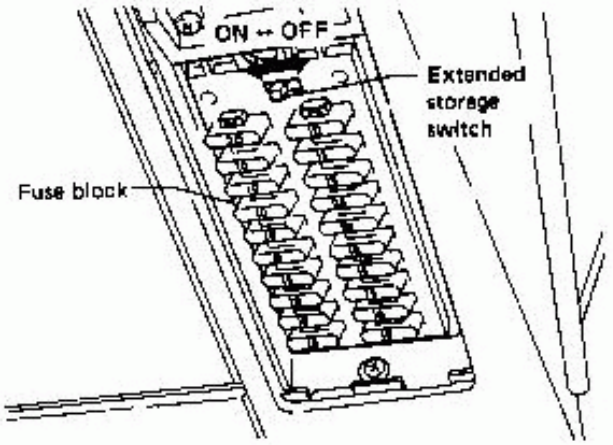
Check



SEL276

a. If fuse is blown, be sure to eliminate cause of problem before installing new fuse.
b. Use fuse of specified rating. Never use fuse of more than specified rating.
c. Do not install fuse in oblique direction; always insert it into fuse holder properly.

Extended Storage Switch



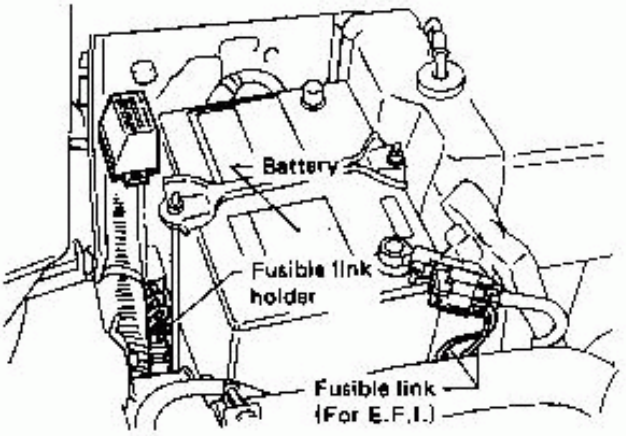
SEL171E

Extended storage switch prevents battery from discharging when vehicle is not used for an extended period of time by interrupting flow of current to clock, interior lamp, power antenna timer and time control unit.

When checking the power supply circuit for each system, make sure extended storage switch is ON.

Fusible Link

A melted fusible link can be detected either by visual inspection or by feeling with finger tip. If its condition is questionable, use circuit tester or test lamp.



SEL172E

CAUTION:

a. If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.
b. Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness or vinyl or rubber parts.

CAUTION:

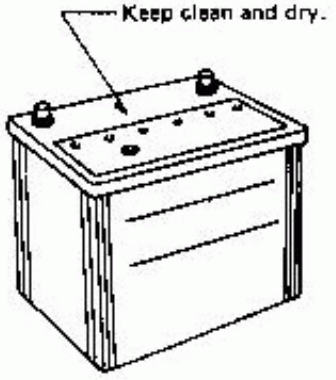
a. If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
b. After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
c. Never add distilled water through the hole used to check specific gravity.

How to Handle Battery

METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

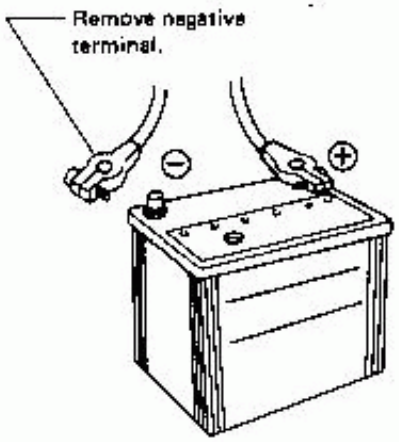
- The battery surface (particularly its top) should always be kept clean and dry.



SEL711E

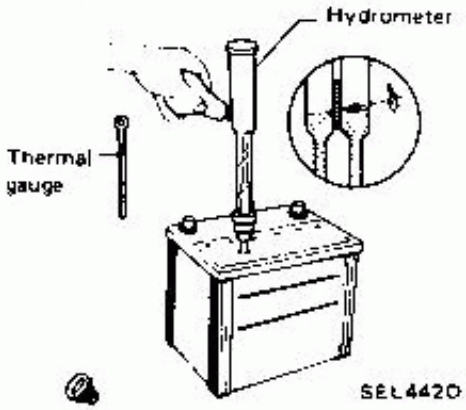
If the top surface of a battery is wet with electrolyte or water, leakage current will cause the battery to discharge. Always keep the battery clean and dry.

- 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.)



SEL712E

- Check the charge condition of the battery.



SEL442D

Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.

CHECKING ELECTROLYTE LEVEL

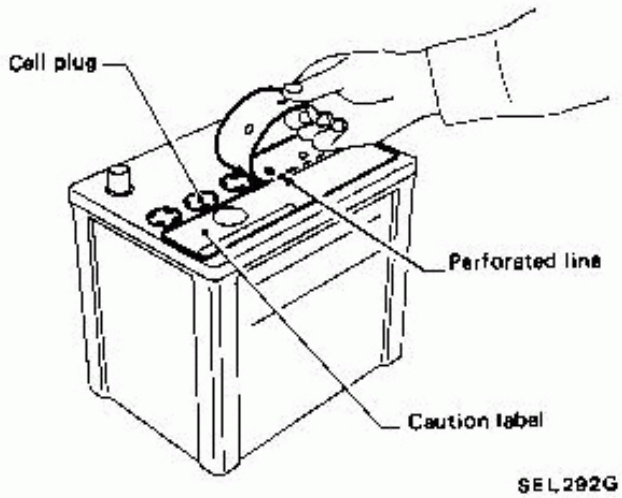
WARNING:

Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If the acid contacts the eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

Normally the battery does not require additional water. However, when the battery is used under severe conditions, adding distilled water may be necessary during the battery life.
To maintain serviceability, a perforated line has been added to the battery caution label.

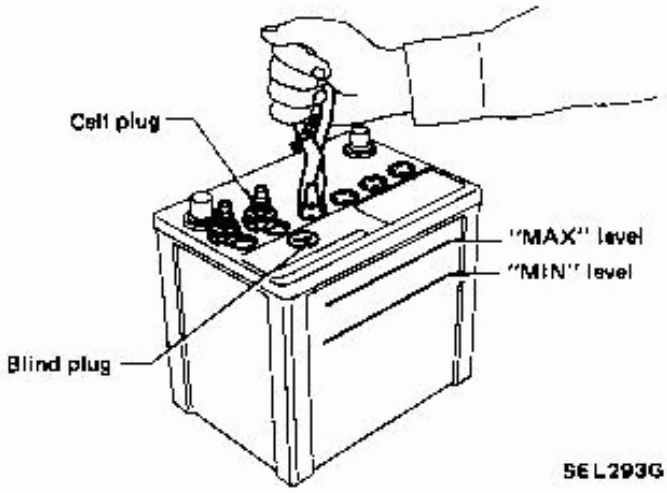
How to Handle Battery (Cont'd)

- If the electrolyte level is low, remove label at perforated line.



SEL292G

- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.

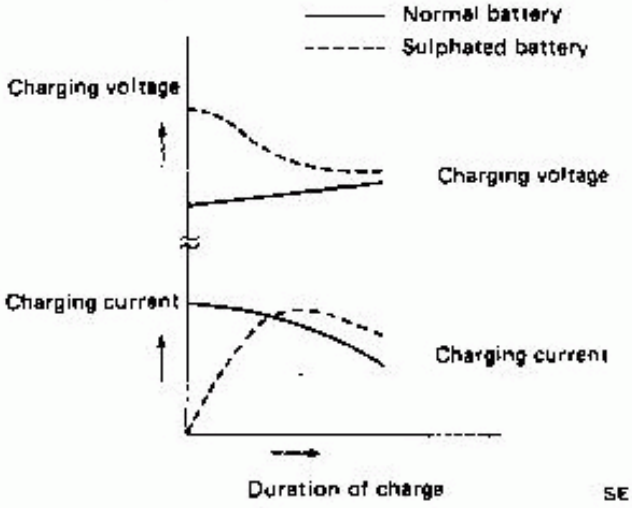


SEL293G

SULPHATION

When a battery has been left unattended for a long period of time and has a specific gravity of less than 1.100, it will be completely discharged, resulting in sulphation on the cell plates.

Compared with a battery discharged under normal conditions, the current flow in a "sulphated" battery is not as smooth although its voltage is high during the initial stage of charging, as shown in the following figure.



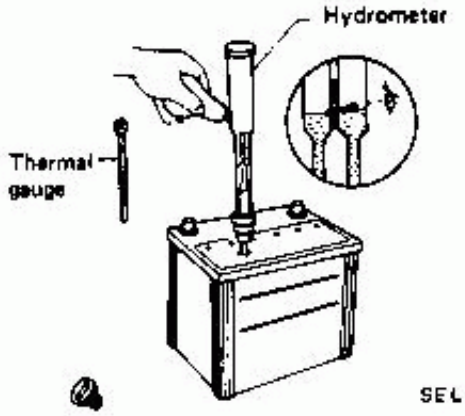
SEL709E

Specific Gravity Check

SPECIFIC GRAVITY CHECK

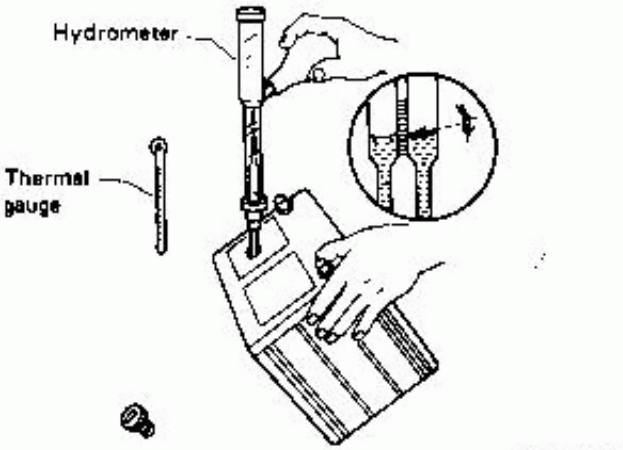
1. Read hydrometer and thermal gauge indications at eye level.

   Read top level with scale.



SEL442D

- When electrolyte level is too low, tilt battery case to raise it for easy measurement.

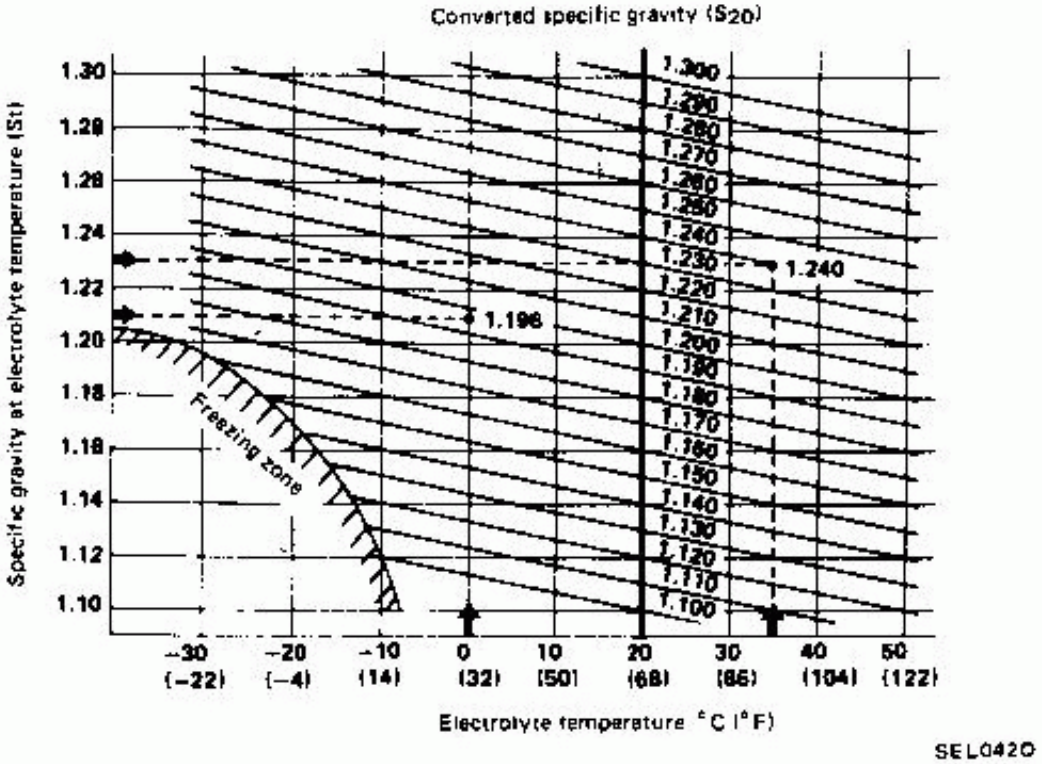


SEL710E

2. Convert into specific gravity at 20°C (68°F).

Example:

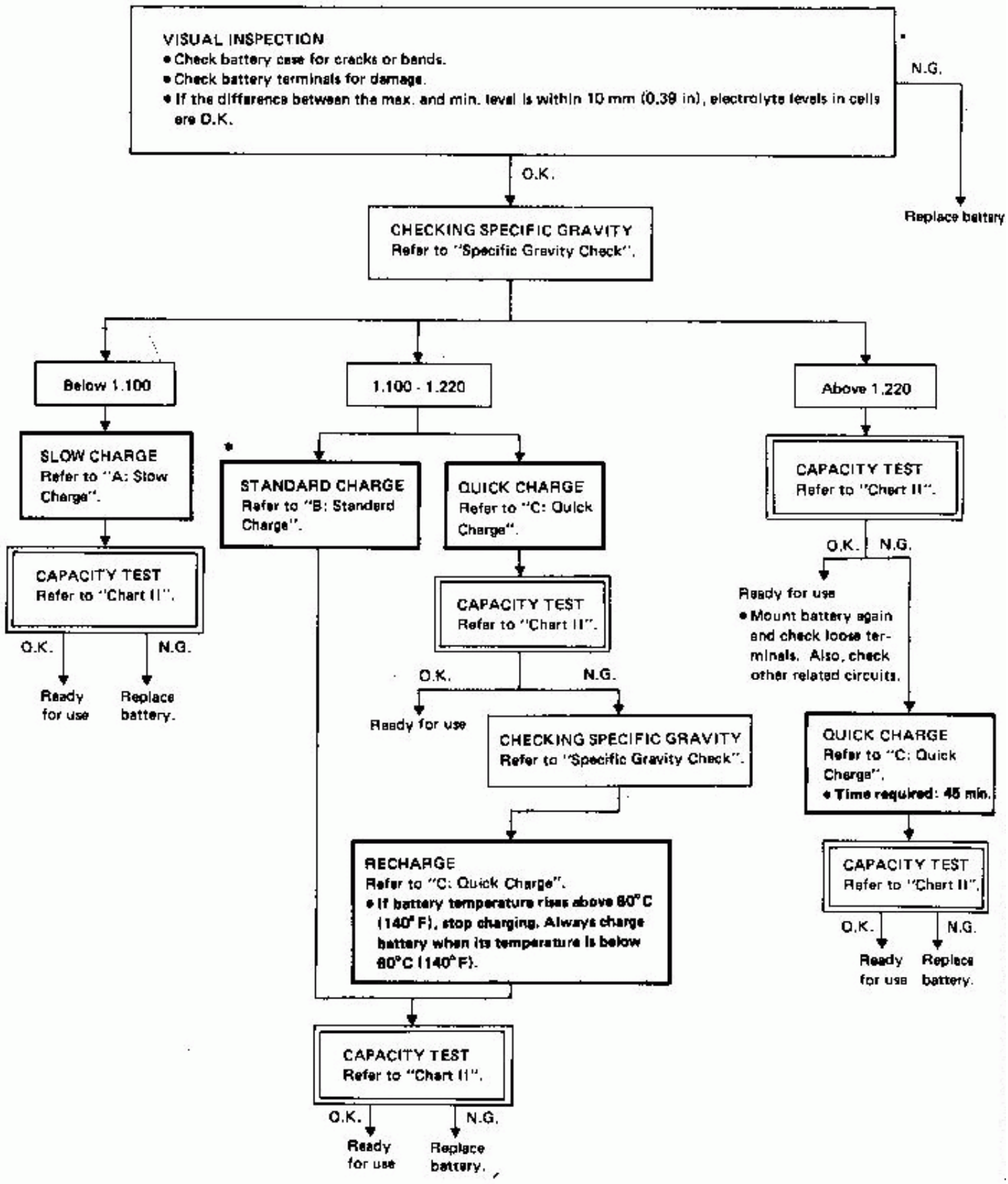
- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20°C (68°F) is 1.240.
- When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20°C (68°F) is 1.196.



SEL042D

M.F. Battery Test and Charging Chart

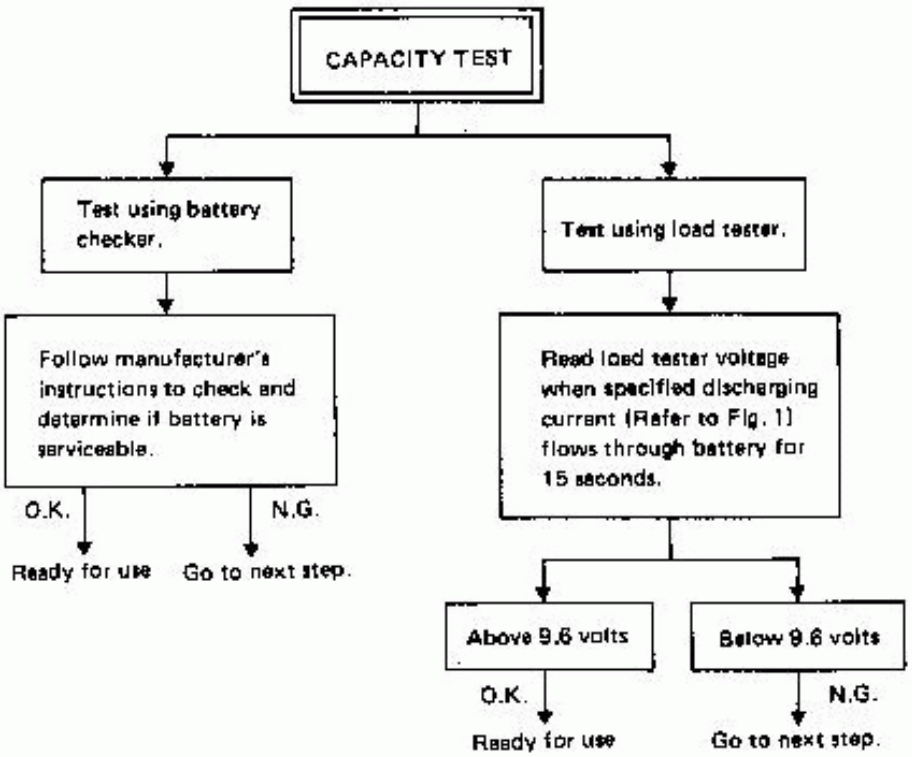
Chart I



* "STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.

M.F. Battery Test and Charging Chart (Cont'd)

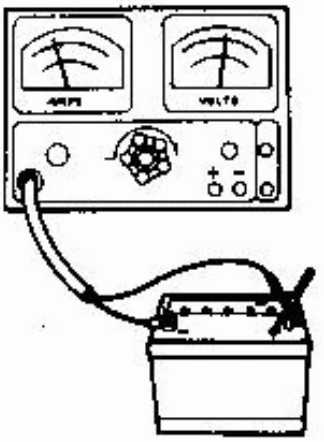
Chart II



- Check battery type and determine the specified current using the following table.

Fig. 1 DISCHARGING CURRENT (Load tester)

Type	Current (A)
NS40S-MF	90 (A)
NS40ZA-MF	99 (A)
NS60-MF	135 (A)
N50S-MF	150 (A)
N80-MF 55D23-MF	180 (A)
NS70-MF	195 (A)
N70Z-MF	210 (A)
NX120-7-MF	240 (A)



SEL697B

M.F. Battery Test and Charging Chart (Cont'd)

A: SLOW CHARGE

Determine initial charging current from specific gravity referring to Fig. 2.

- Charge battery.
- Check charging voltage 30 minutes after starting the battery charge.

12 to 15 volts — O.K. → Continue to charge for 12 hours.

Below 12 volts or above 15 volts — N.G. → Replace battery.

CHECKING SPECIFIC GRAVITY
Refer to "Specific Gravity Check".

Conduct additional charge as per Fig 3, if necessary.

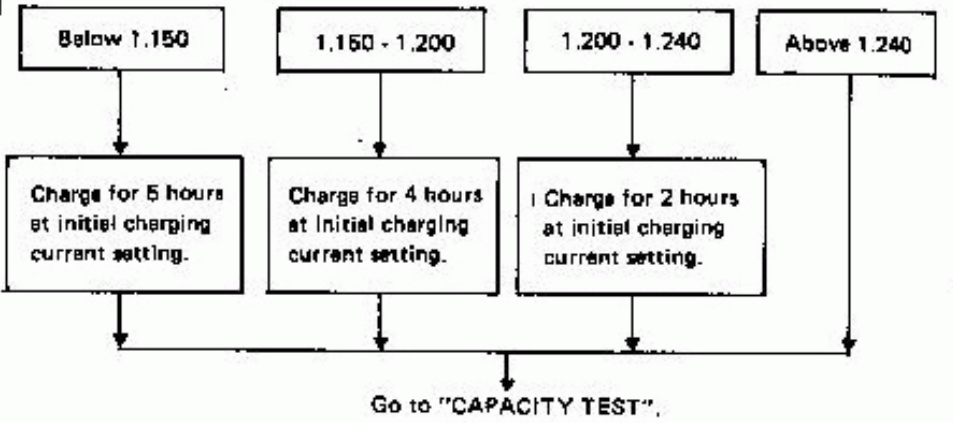
Go to "CAPACITY TEST".

Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

BATTERY TYPE / CONVERTED SPECIFIC GRAVITY	NS40S-MF NS40ZA-MF	NS60-MF	N60-MF 55D23-MF N50S-MF	NS70-MF	N70Z-MF	NX120-7-MF
Below 1.100	4.0 (A)	5.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	10.0 (A)

- Check battery type and determine the specified current using the following table.
- After starting charging, adjustment of charging current is not necessary.

Fig. 3 ADDITIONAL CHARGE (Slow charge)



CAUTION:

a. Set charging current to value specified in Fig. 2. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
b. Keep battery away from open flame while it is being charged.
c. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
d. If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

M.F. Battery Test and Charging Chart (Cont'd)

B: STANDARD CHARGE

Determine initial charging current from specific gravity, referring to Fig. 4.

↓

Charge battery for 8 hours.

↓

CHECKING SPECIFIC GRAVITY
Refer to "Specific Gravity Check".

↓

Conduct additional charge as per Fig. 5, if necessary.

↓

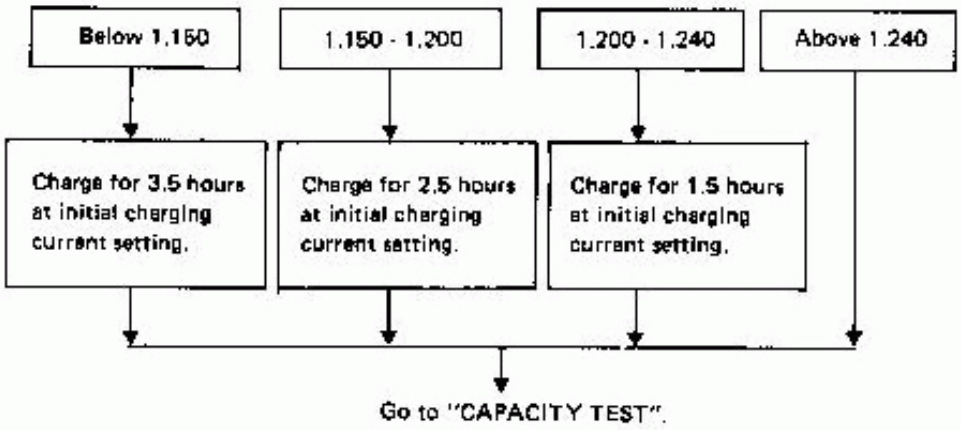
Go to "CAPACITY TEST".

Fig. 4 INITIAL CHARGING CURRENT SETTING (Standard charge)

BATTERY TYPE / CONVERTED SPECIFIC GRAVITY	NS40S-MF NS40ZA-MF	NS60-MF	N60-MF 55D23-MF N50S-MF	NS70-MF	N70Z-MF	NX120-7-MF
1.100 - 1.130	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)
1.130 - 1.160	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)
1.160 - 1.190	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)
1.190 - 1.220	2.0 (A)	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	5.0 (A)

- Check battery type and determine the specified current using the following table.
- 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).

M.F. Battery Test and Charging Chart (Cont'd)

C: QUICK CHARGE

Determine initial charging current setting and charging time from specific gravity, referring to Fig. 6.

↓

Charge battery

↓

Go to "CAPACITY TEST".

Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

BATTERY TYPE / CONVERTED SPECIFIC GRAVITY / CURRENT [A]	NS40S-MF NS40ZA-MF	NS60-MF N60S-MF	N60-MF 55D23-MF NS70-MF	N70Z-MF NX120-7-MF
	10 (A)	15 (A)	20 (A)	30 (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 following table.
- 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 if the battery is charged over the charging time, it can cause deterioration of the battery.

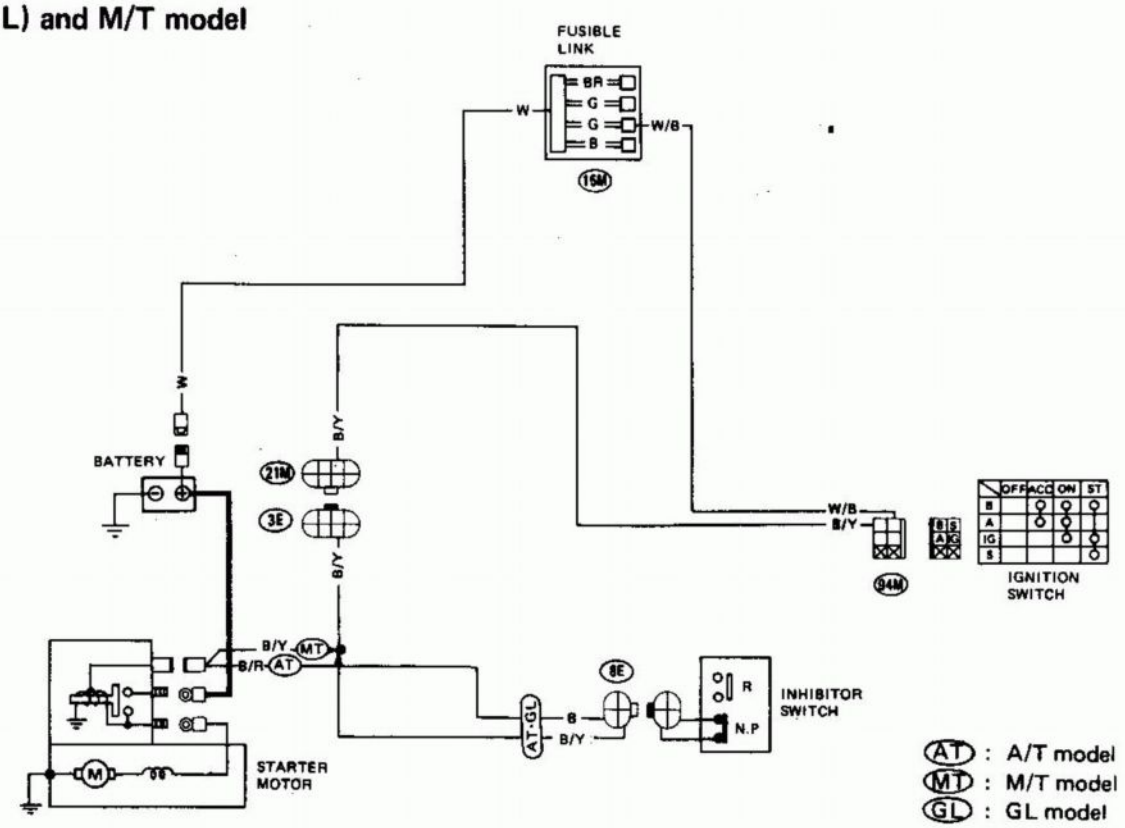
Service Data and Specifications (S.D.S.)

Applied model		U.S.A.	Canada
Type		55D23R-MF	NS70-MF
		Maintenance-free	
Capacity	V-AH	12-60	12-65

Wiring Diagram

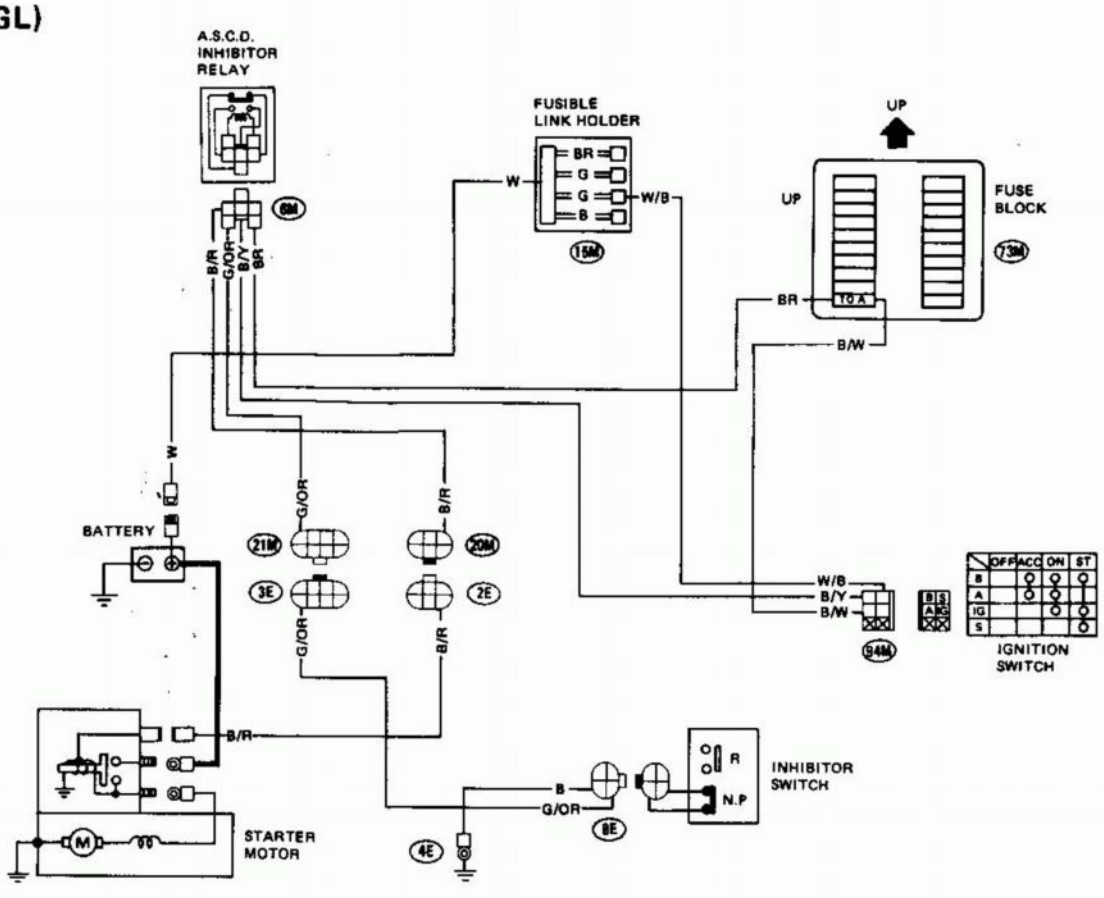
MODELS WITHOUT THEFT WARNING SYSTEM

A/T model (GL) and M/T model



SEL777F

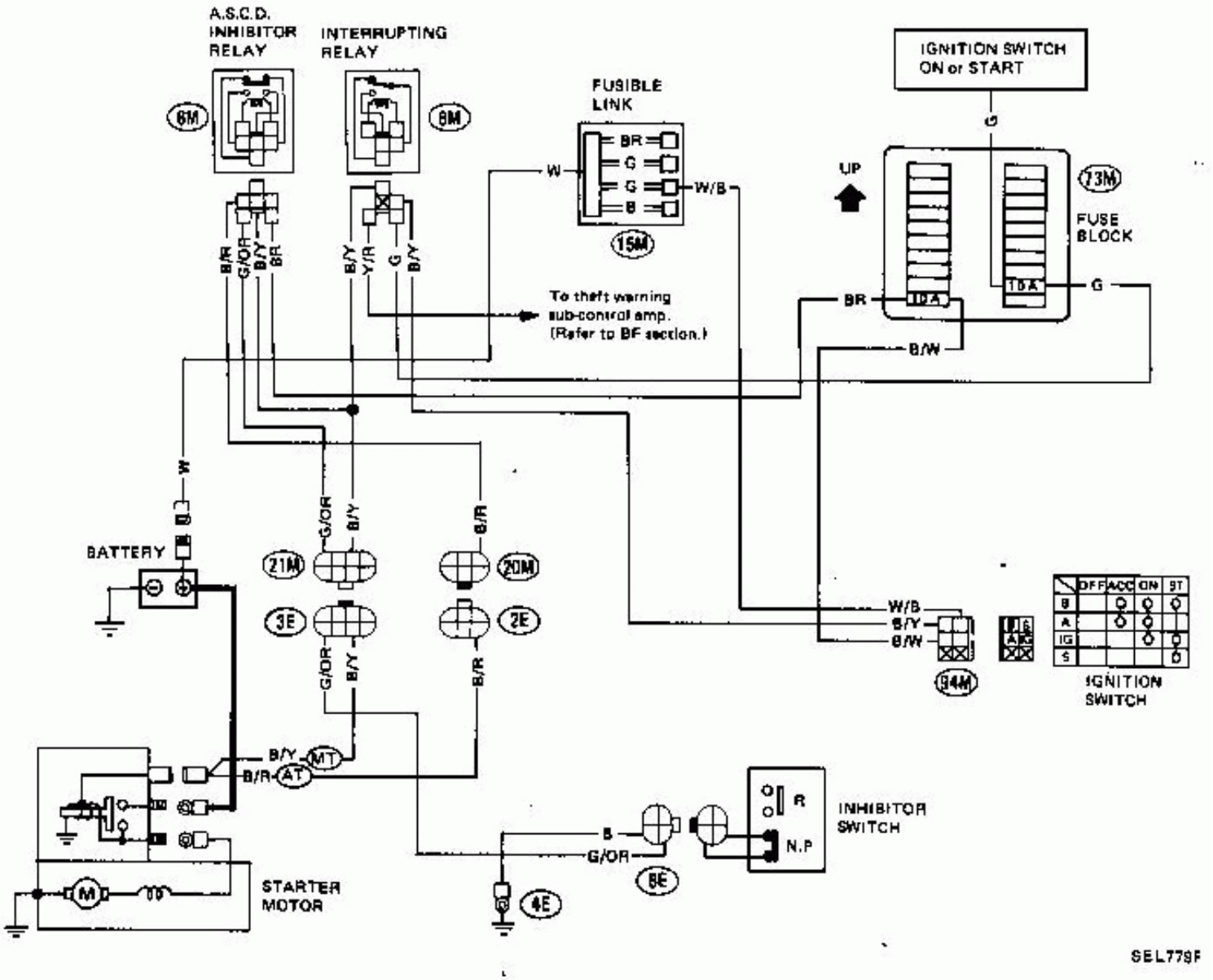
A/T model (SGL)



SEL778F

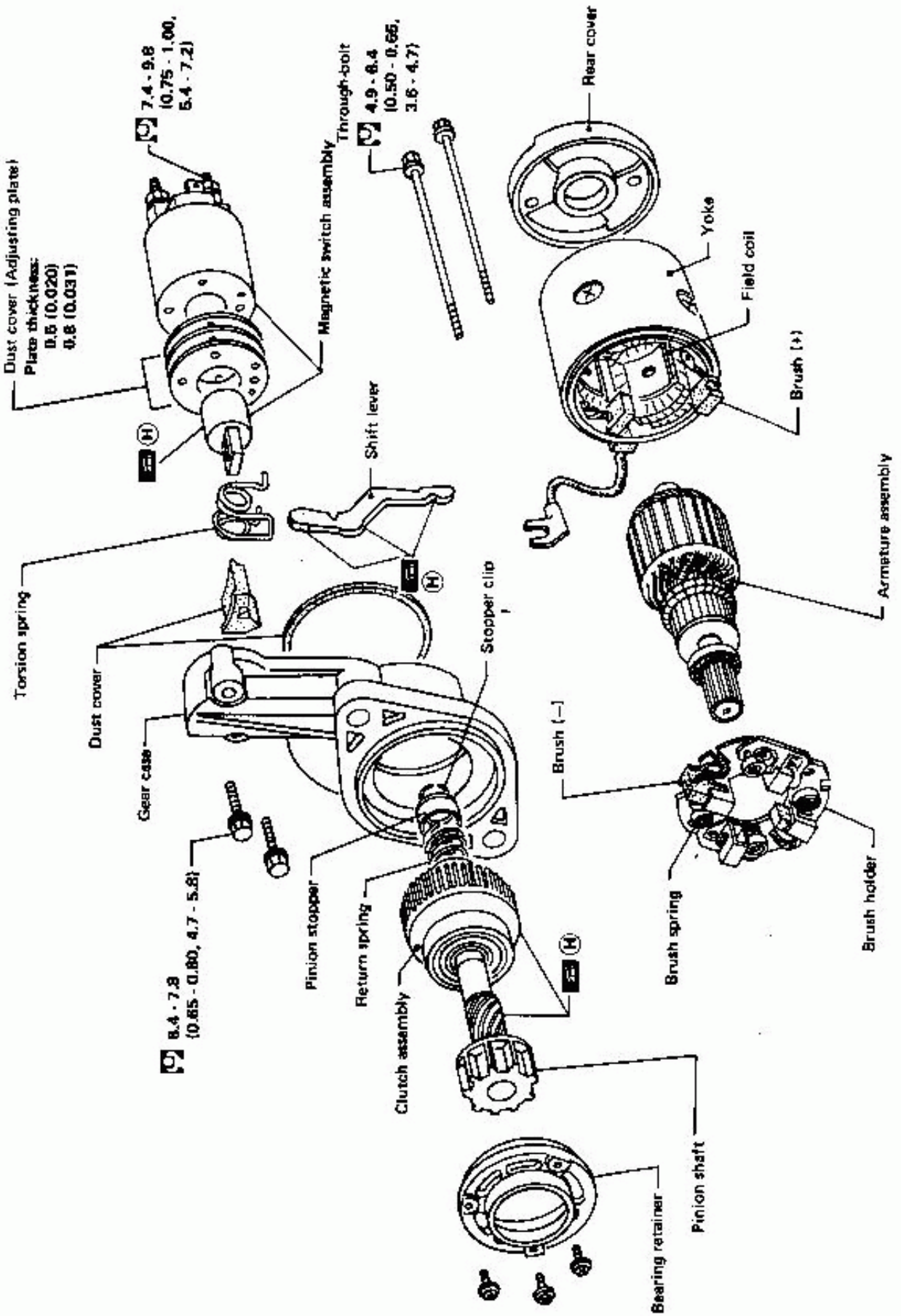
Wiring Diagram (Cont'd)

MODELS WITH THEFT WARNING SYSTEM



Construction

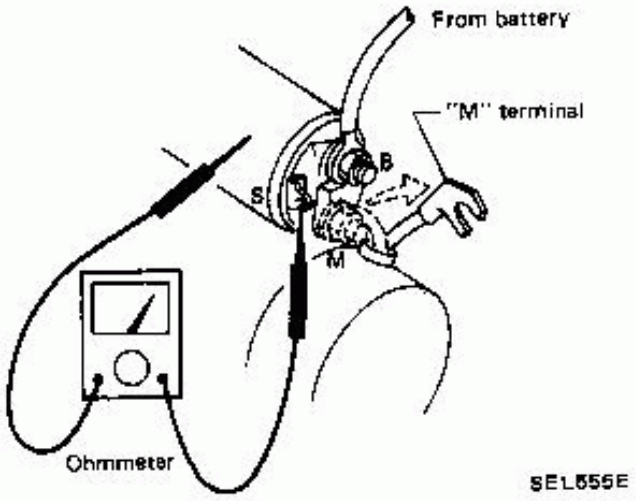
S114-322A



Magnetic Switch Check

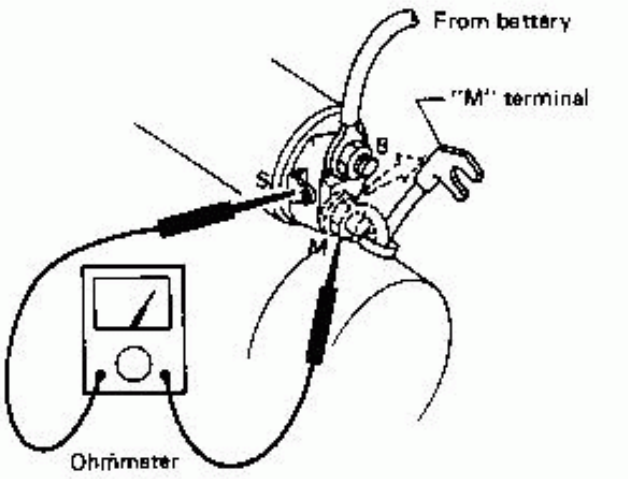
- Before starting to check, disconnect battery ground cable.
- Disconnect "M" terminal of starter motor.

1. Continuity test (between "S" terminal and switch body).
   - No continuity ... Replace.



SEL555E

2. Continuity test (between "S" terminal and "M" terminal).
   - No continuity ... Replace.

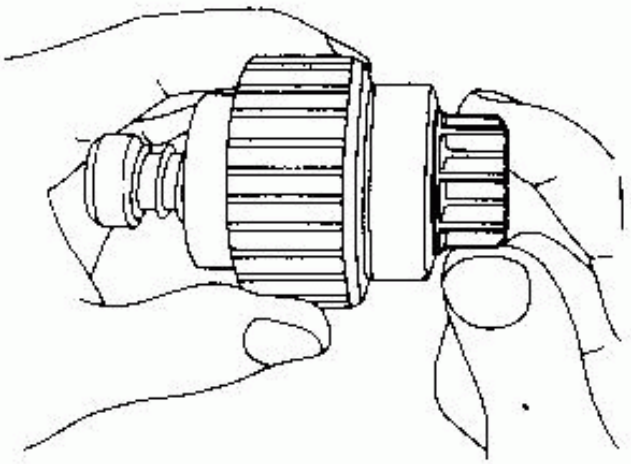


SEL556E

Pinion/Clutch Check

1. Check to see if pinion assembly (S114-320A)/ clutch assembly (S114-322) 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.

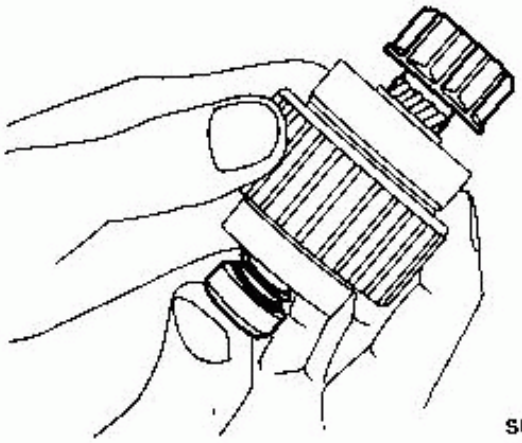
S114-322A



SEL569B

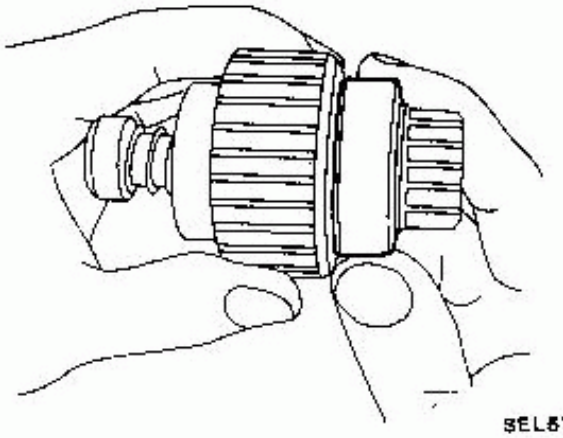
Pinion/Clutch Check (Cont'd)

2. Check pinion movement.
   (S114-322A only)


SEL670B

- If it is hard to move, apply grease or, if necessary, replace.

3. Check ball bearing.
   (S114-322A only)
   Spin outer race of ball bearing to ensure that it turns smoothly without binding.


SEL671B

- Abnormal resistance . . . . Replace.

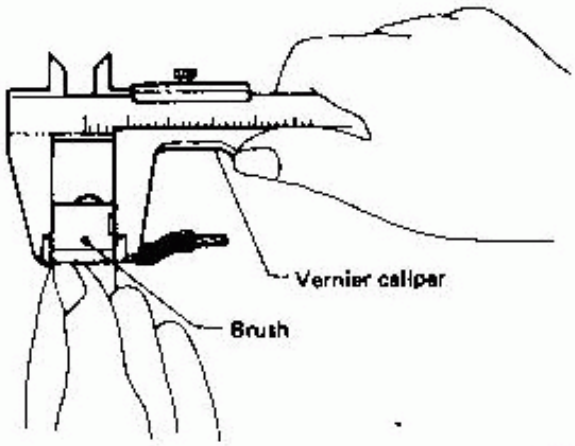
4. Inspect pinion teeth.
   - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
5. Inspect clutch gear teeth.
   - Replace clutch gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)

Brush Check

BRUSH

Check wear of brush.

Wear limit length: 11 mm (0.43 in)



SEL626B

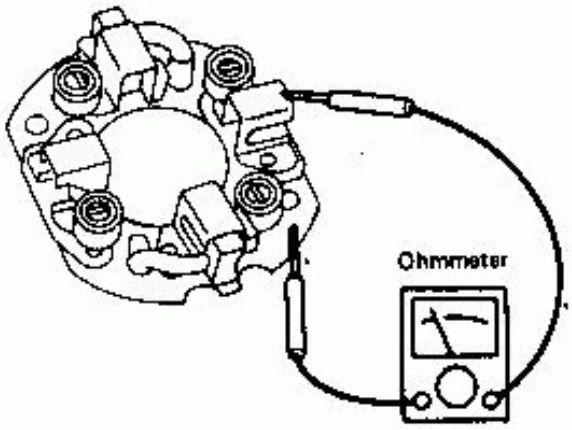
- Excessive wear . . . . Replace.

Brush Check (Cont'd)

BRUSH HOLDER

1. Perform insulation test between brush holder (positive side) and its base (negative side).

S114-322A



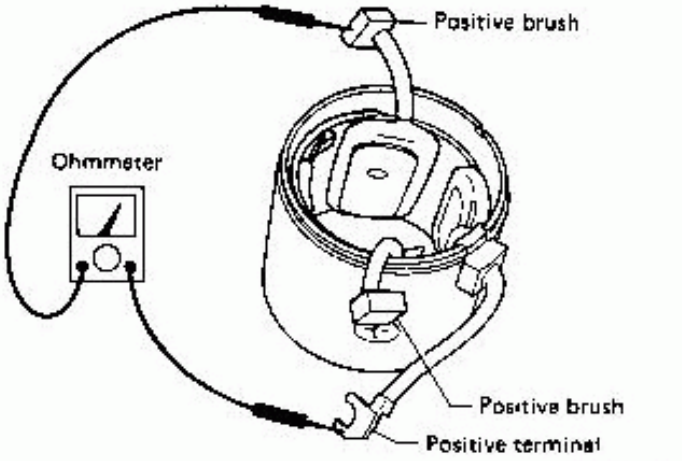
SEL668B

- 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.

Field Coil Check

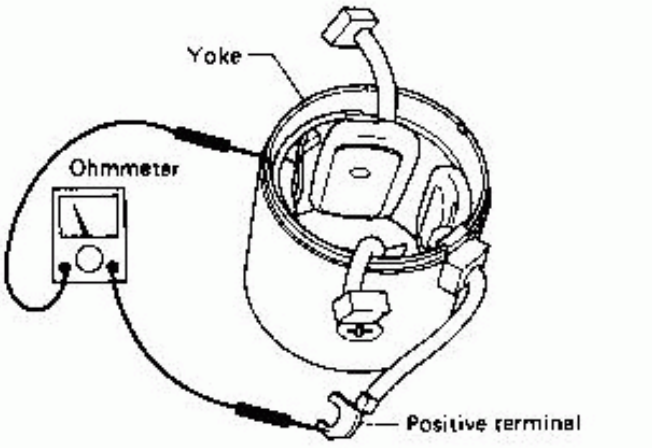
1. Continuity test (between field coil positive terminal and positive brushes).



SEL102E

- No continuity . . . . Replace field coil.

2. Insulation test (between field coil positive terminal and yoke).

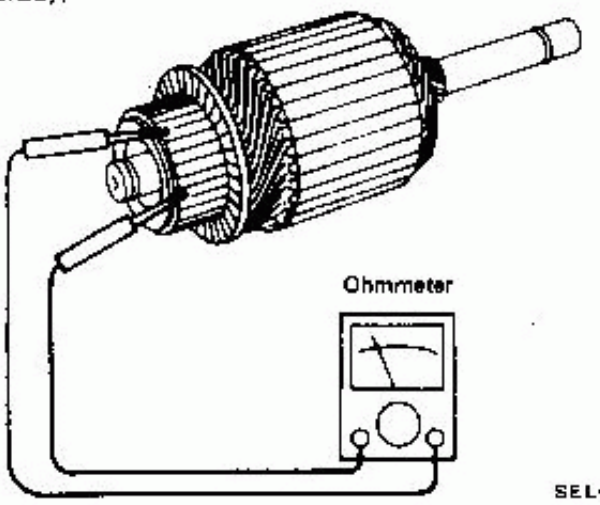


SEL103E

- Continuity exists . . . . Replace field coil.

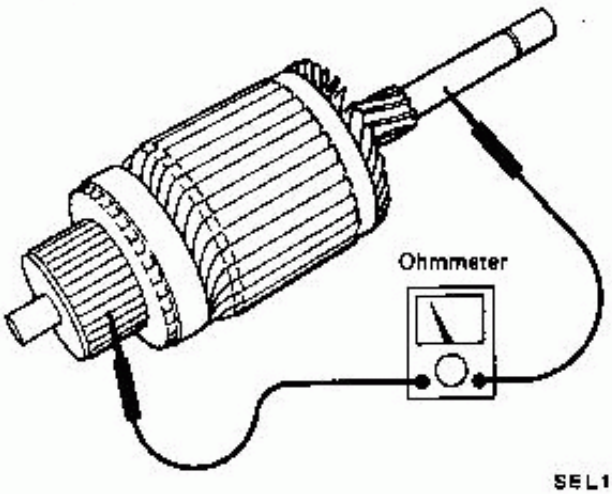
Armature Check

1. Continuity test (between two segments side by side).



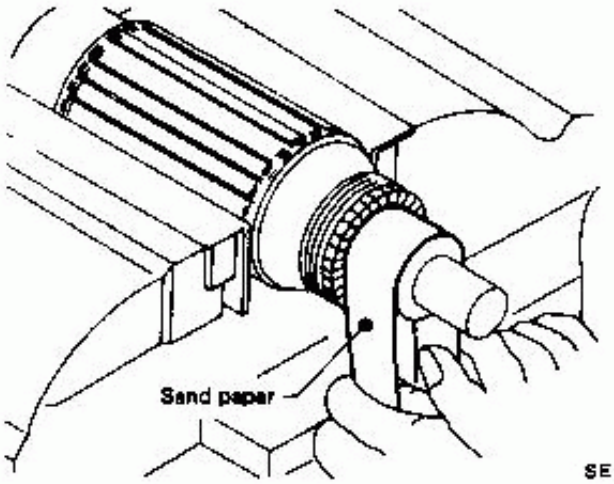
- No continuity . . . . Replace

2. Insulation test (between each commutator bar and shaft).



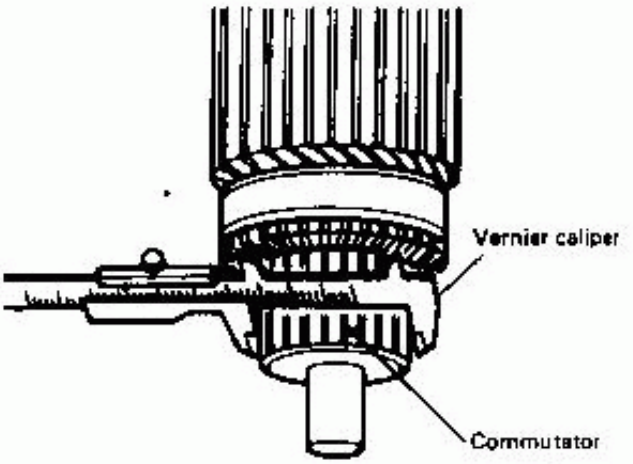
- Continuity exists . . . . Replace.

3. Check commutator surface.
   - Rough ... Sand lightly with No. 500 - 600 sandpaper.

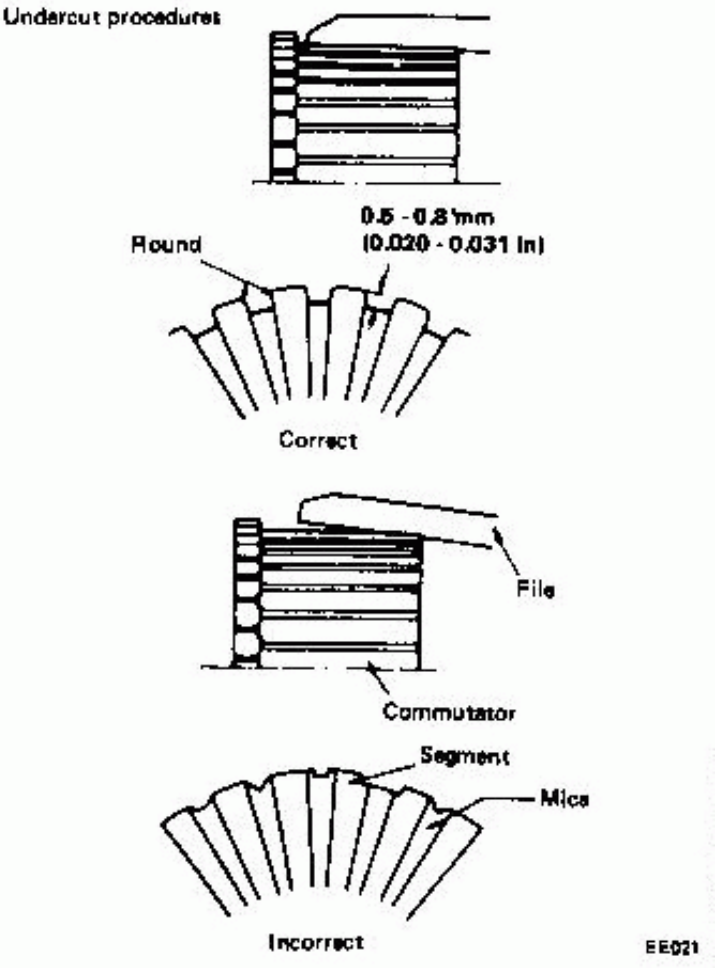


4. Check diameter of commutator.

   Commutator minimum diameter:
   29 mm (1.14 in)
   - Less than specified value . . . . Replace.



5. Check depth of insulating mica from commutator surface.
   - Less than 0.2 mm (0.008 in) ... Undercut to 0.5 - 0.8 mm (0.020 - 0.031 in)



Assembly

Carefully observe the following instructions.

GREASE POINT

- Rear cover metal (S114-320A only)
- Gear case metal (S114-320A only)
- Frictional surface of pinion
- Moving portion of shift lever
- Plunger of magnetic switch
- Reduction gear (S114-322 only)

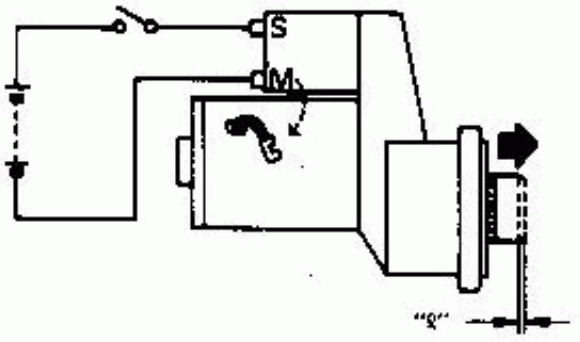
PINION PROTRUSION LENGTH ADJUSTMENT

S114-322A

Compare movement "ℓ" in height of pinion when it is pushed out with magnetic switch energized and when it is pulled out by hand until it touches stopper.

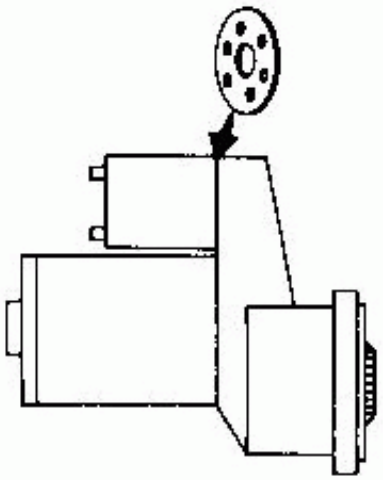
Movement "ℓ":

0.3 - 1.5 mm (0.012 - 0.059 in)



SEL497D

- Not in the specified value ... Adjust by dust cover (Adjusting plate).



SEL573B

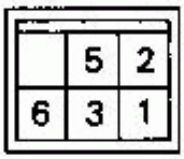
Service Data and Specifications (S.D.S.)

Type			S114-322A
			Reduction gear type
Applied model			Canada (U.S.A. option)
System voltage		V	12
No load	Terminal voltage	V	11
	Current	A	Less than 100
	Revolution	rpm	More than 3,900
Outer diameter of commutator		mm (in)	More than 29 (1.14)
Minimum length of brush		mm (in)	11 (0.43)
Brush spring tension		N (kg, lb)	15.7 - 19.6 (1.6 - 2.0, 3.5 - 4.4)
Clearance between bearing metal and armature shaft		mm (in)	–
Clearance "ℓ" between pinion front edge and pinion stopper		mm (in)	–
Movement "ℓ" in height of pinion		mm (in)	0.3 - 1.5 (0.012 - 0.059)

FAN MOTOR TIMER

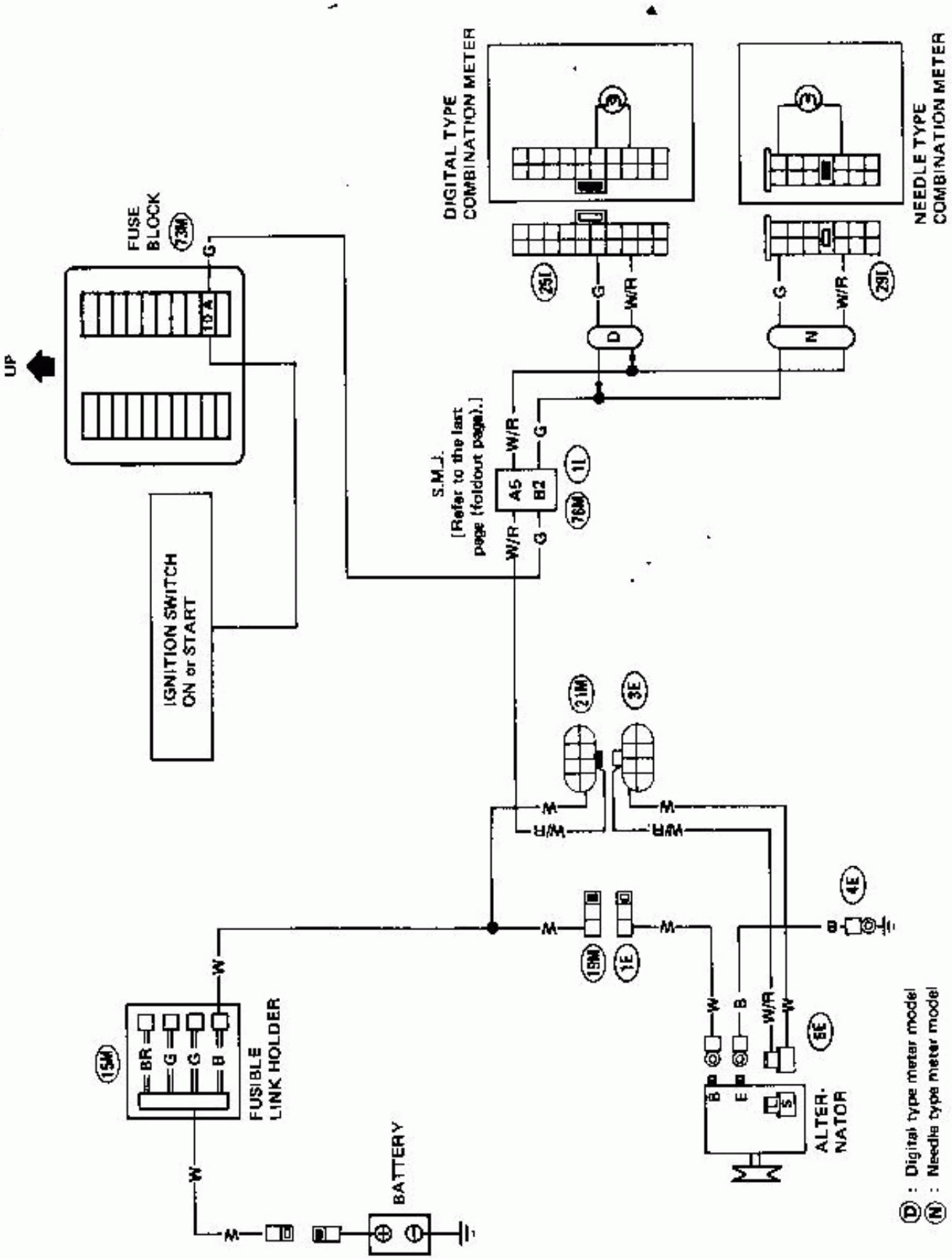
Trouble-shooting

1. Ignition switch ON.
2. Connect No. 3 terminal to body ground.
3. Ignition switch OFF.
4. If continuity exists between No. 5 and No. 6 terminals, fan motor rotates.
5. If fan motor rotates for 16 minutes, fan motor timer is O.K.



SEL045H

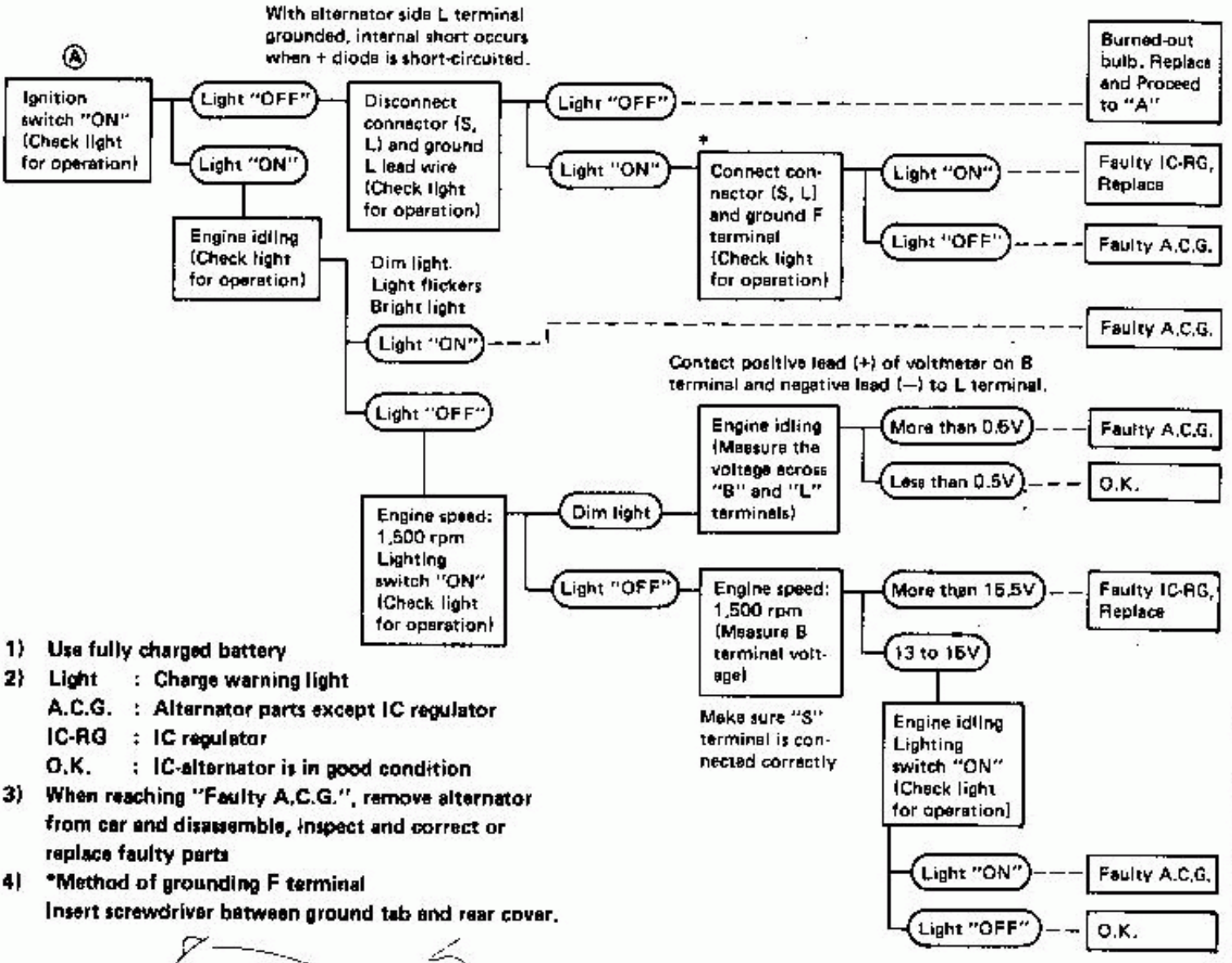
Wiring Diagram



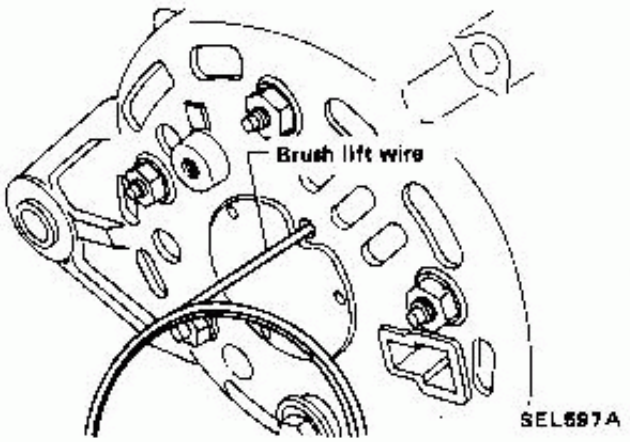
SEL780F

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.



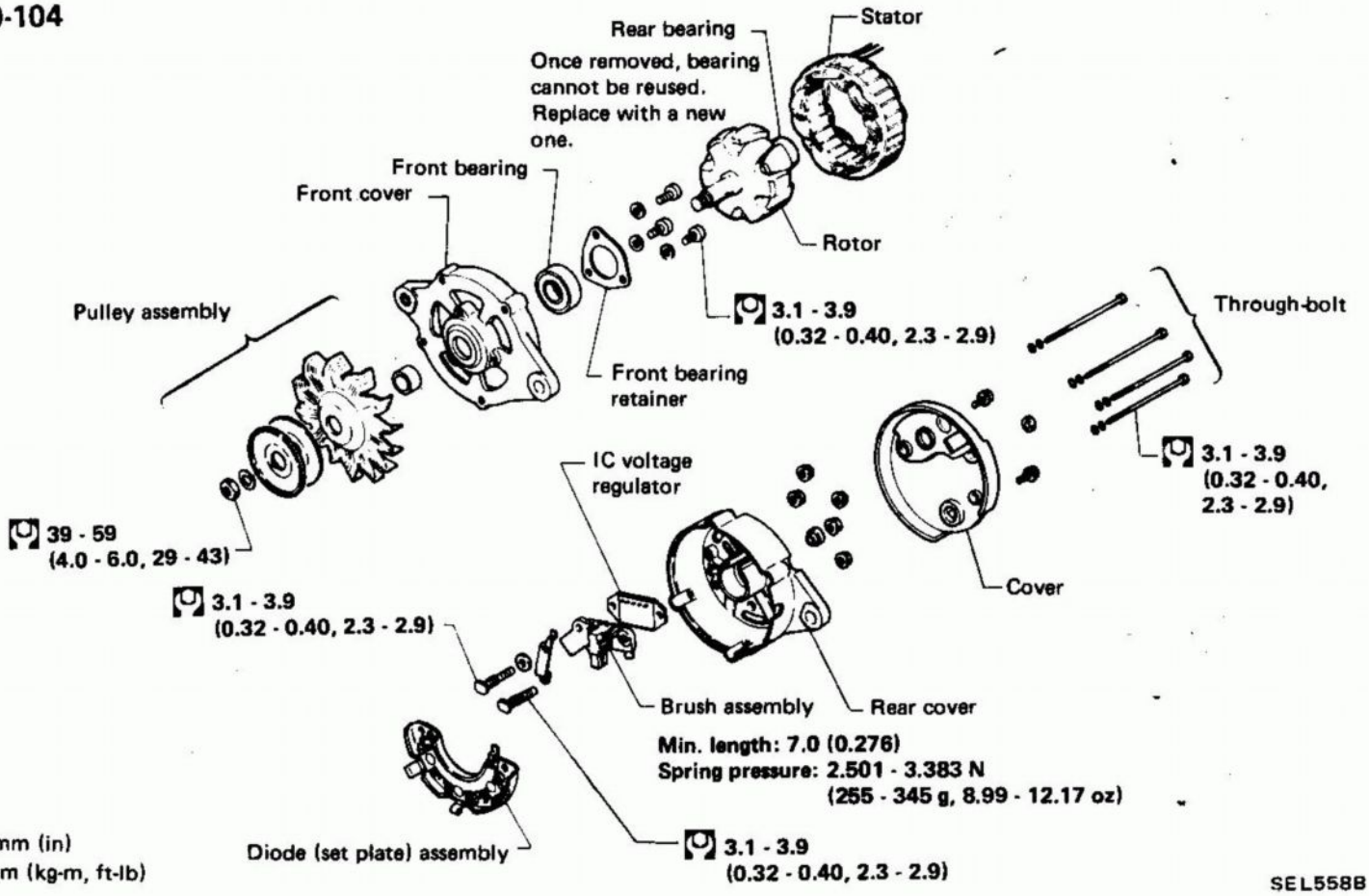
1) Use fully charged battery
2) Light : Charge warning light
   A.C.G. : Alternator parts except IC regulator
   IC-RG : IC regulator
   O.K. : IC-alternator is in good condition
3) When reaching "Faulty A.C.G.", remove alternator from car and disassemble, inspect and correct or replace faulty parts
4) *Method of grounding F terminal
   Insert screwdriver between ground tab and rear cover.



5) Terminals "S", "L", "BAT" and "E" are marked on rear cover of alternator.

Construction

LR160-104

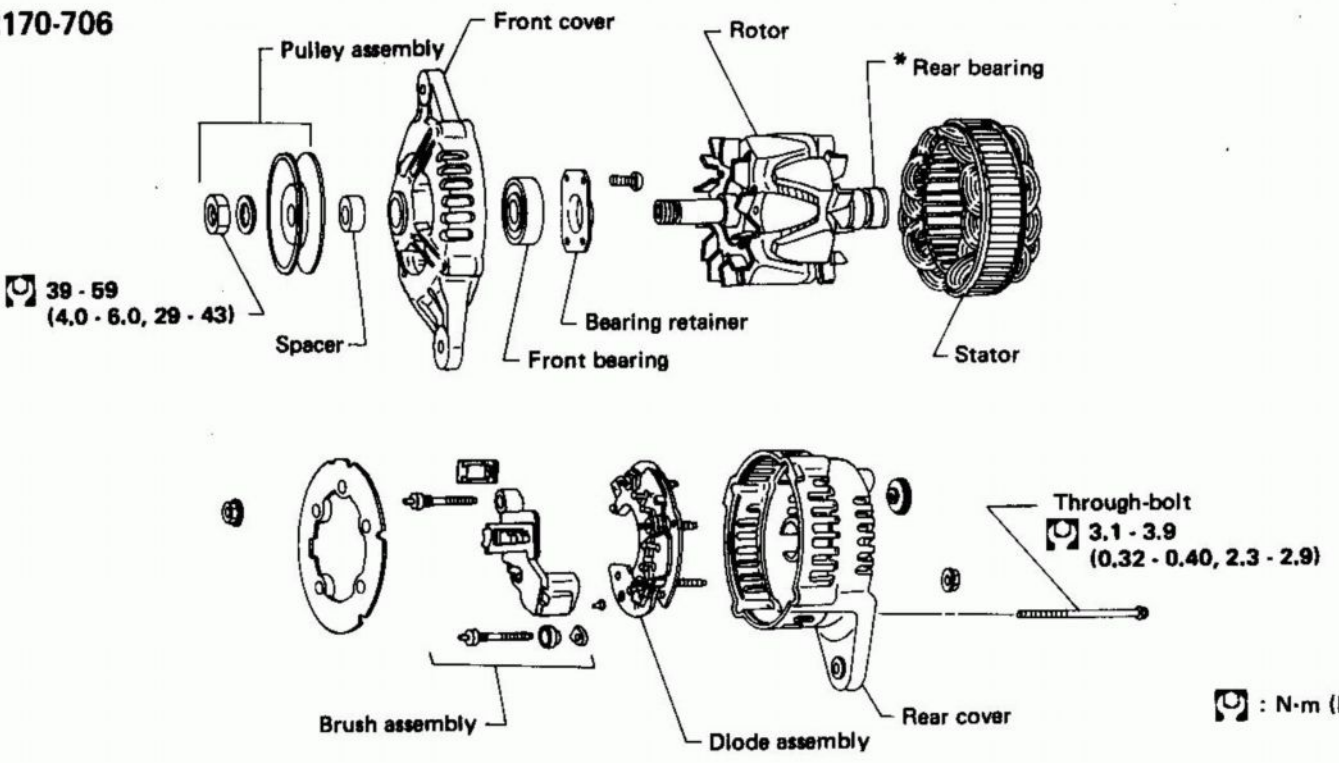


***Rear bearing**

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.

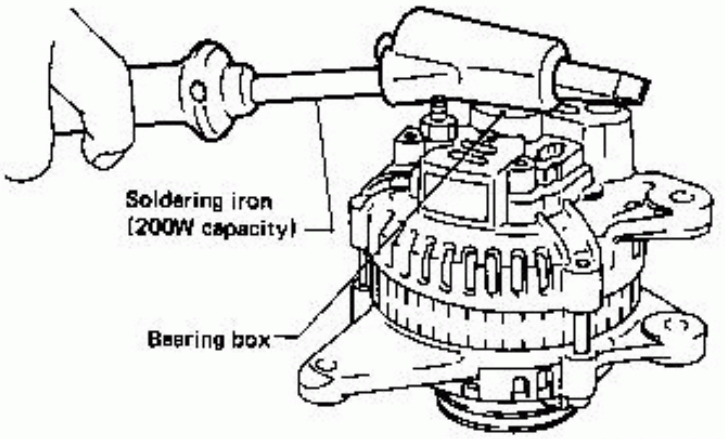
LR170-706



Disassembly

LR170-706

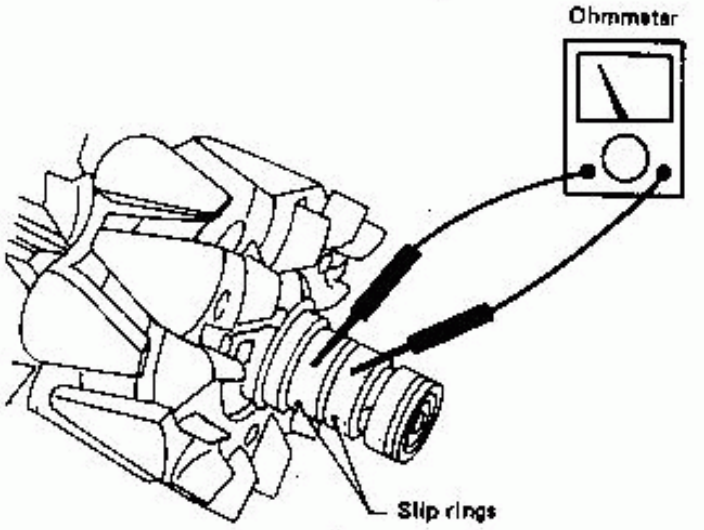
CAUTION:
Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. To facilitate removal of rear cover, heat just bearing box section with a 200-watt soldering iron.
Do not use a heat gun, as it can damage diode assembly.



SEL628D

Rotor Slip Ring Check

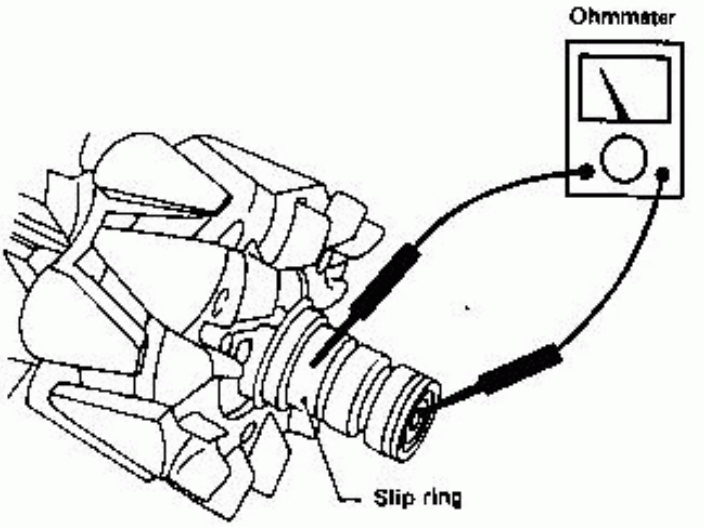
1. Continuity test



SEL629D

- No continuity ... Replace rotor.

2. Insulator test



SEL630D

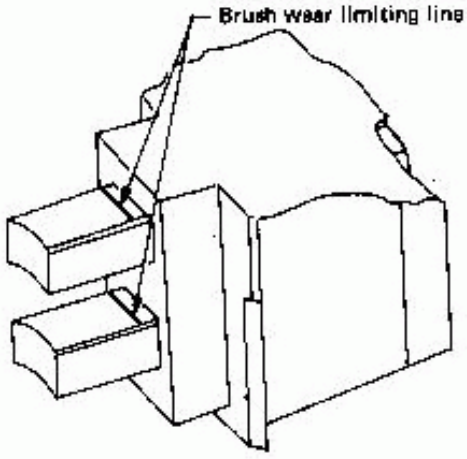
- Continuity exists ... Replace rotor.

3. Check slip ring for wear.

Slip ring minimum outer diameter:
30.0 mm (1.181 in) [LR160-104]
21.6 mm (0.850 in) [LR170-706]

Brush Check

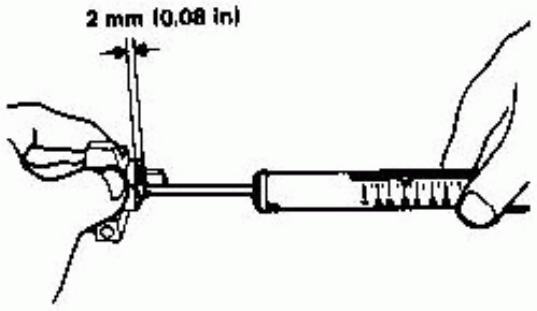
1. Check smooth movement of brush.
   - Not smooth ... Check brush holder and clean.
2. Check brush for wear.



SEL631D

   - Replace brush if it is worn down to the limit line.
3. Check brush pig tail for damage.
   - Damaged ... Replace.
4. Check brush spring pressure.
   Measure brush spring pressure with brush projected approximately 2 mm (0.08 in) from brush holder.

   Spring pressure:
   2.501 - 3.383 N (255 - 345 g, 8.99 - 12.17 oz) [LR160-104]
   1.471 - 3.531 N (150 - 360 g, 5.29 - 12.70 oz) [LR170-706]



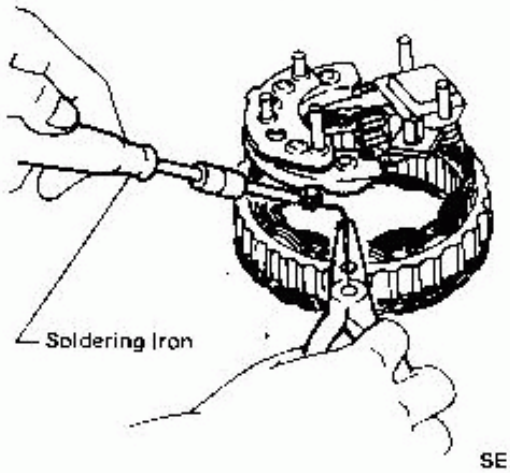
EE049

   - Not in the specified value ... Replace.

Stator Check

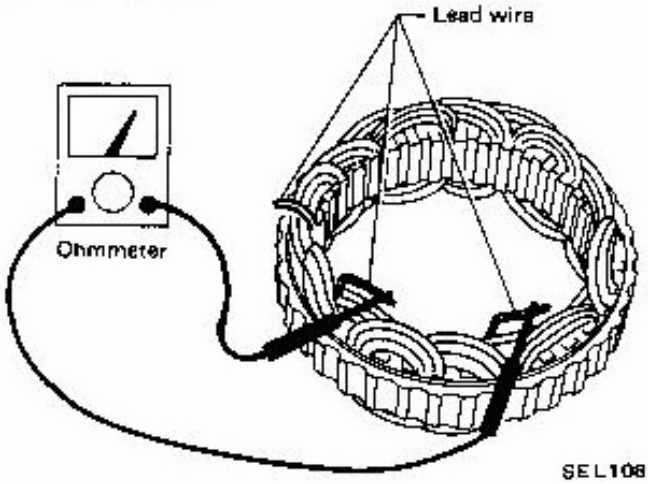
To test the stator or diode, you must separate them by unsoldering the connecting wires.

CAUTION:
Use only as much heat as required to melt solder. Diodes will be damaged by excessive heat.



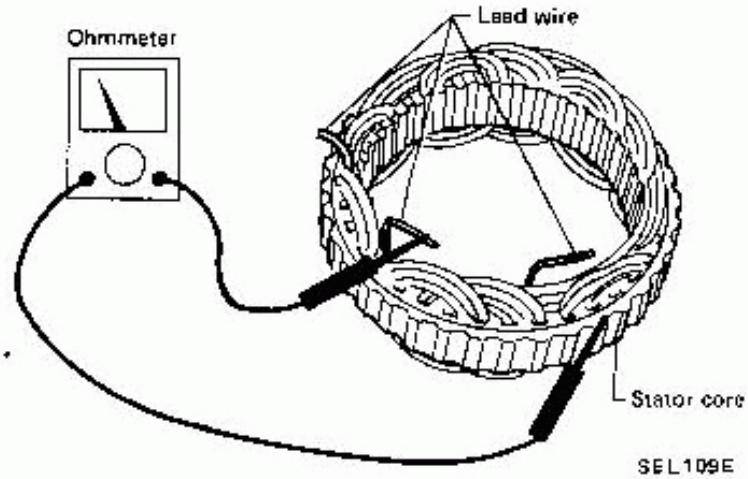
SEL587A

1. Continuity test



SEL108E

   - No continuity ... Replace stator.
2. Ground test



SEL109E

   - Continuity exists ... Replace stator.

Diode Check

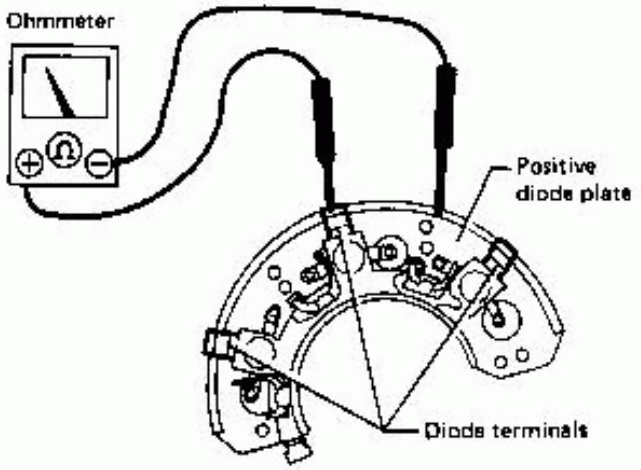
DIODE

- 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 ⊖	
Diode check (Positive side)	Positive diode plate	Diode terminals	Yes
	Diode terminals	Positive diode plate	No
Diode check (Negative side)	Negative diode plate	Diode terminals	No
	Diode terminals	Negative diode plate	Yes

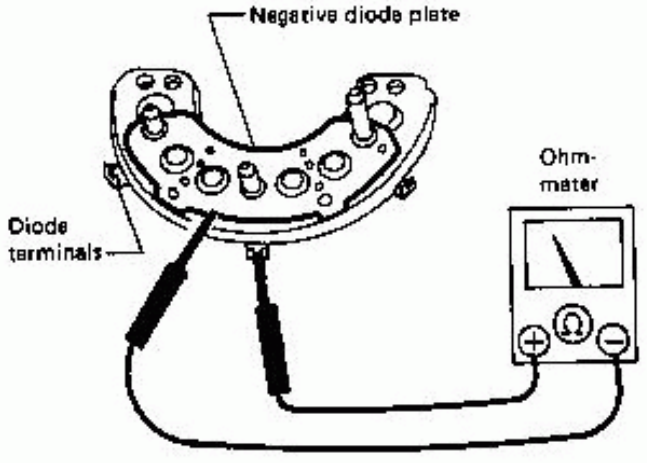
LR160-104

Positive side



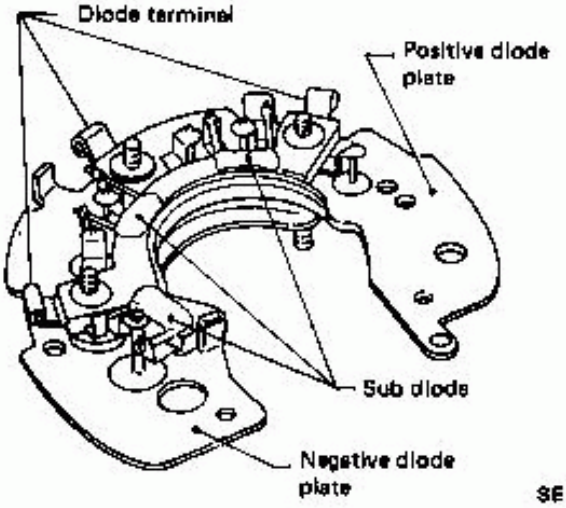
SEL319E

Negative side



SEL320E

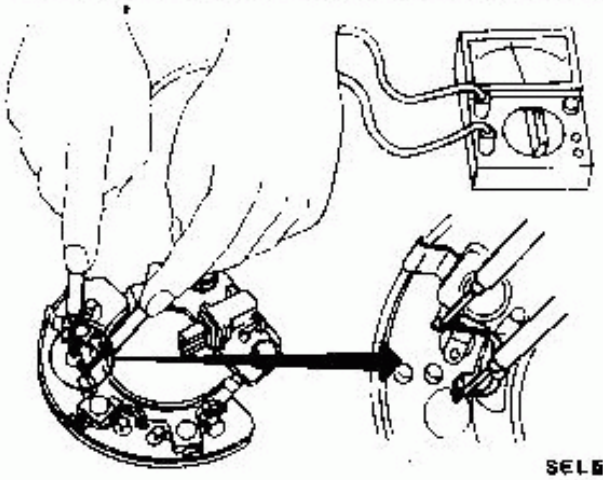
LR170-706



SEL788D

SUB-DIODE

- Attach ohmmeter's probe to each end of diode to check for continuity.
- If, after reversing ohmmeter probes, continuity still exists, or still does not exist, sub-diode is faulty and diode assembly must be replaced.



SEL583A

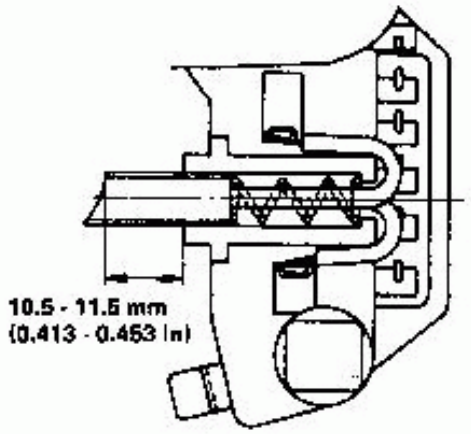
Assembly

Carefully observe the following instructions.

1. When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.
2. When soldering brush lead wire, observe the following.

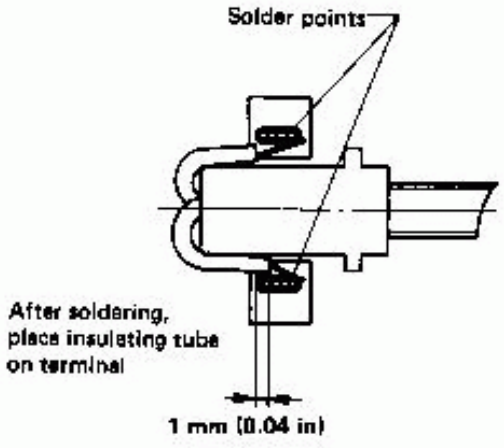
LR160-104

(1) Position brush so that it extends 11 mm (0.43 in) from brush holder.



SEL595A

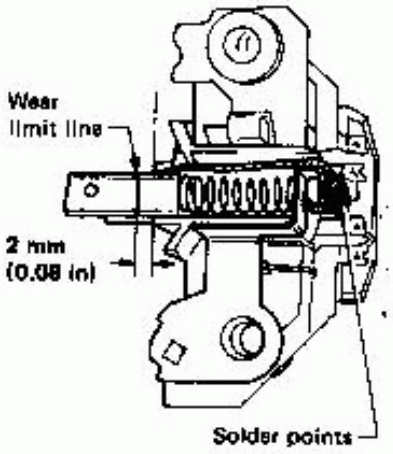
(2) Coil lead wire 1.5 times around terminal groove. Solder outside of terminal.



SEL596A

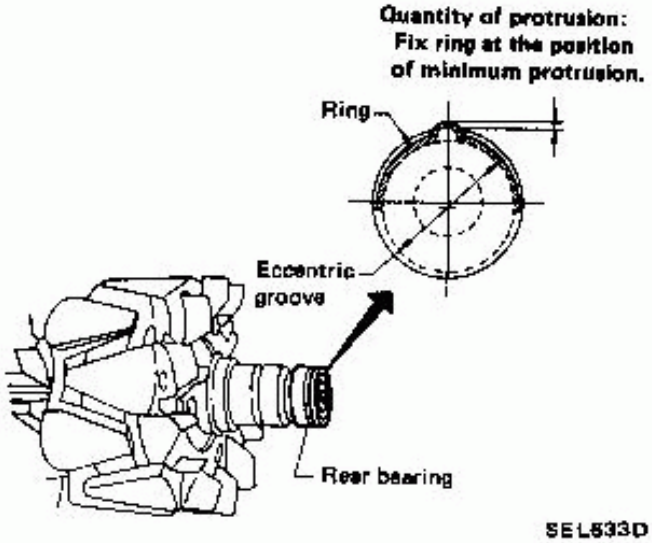
LR170-706

- Position brush so that its wear limit line protrudes 2 mm (0.08 in) beyond end face of brush holder.



SEL632D

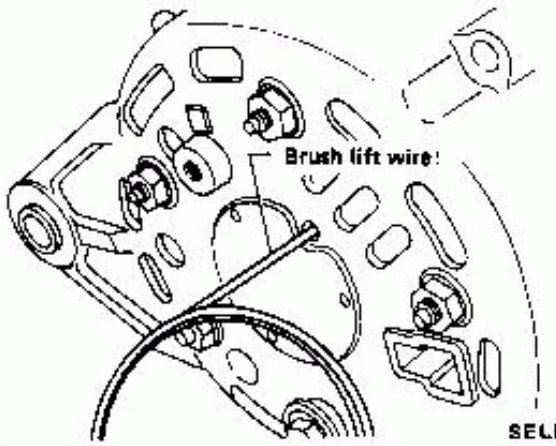
3. Fit ring into groove in rear bearing so that it is at the position of minimum protrusion. (Only for LR170-706)



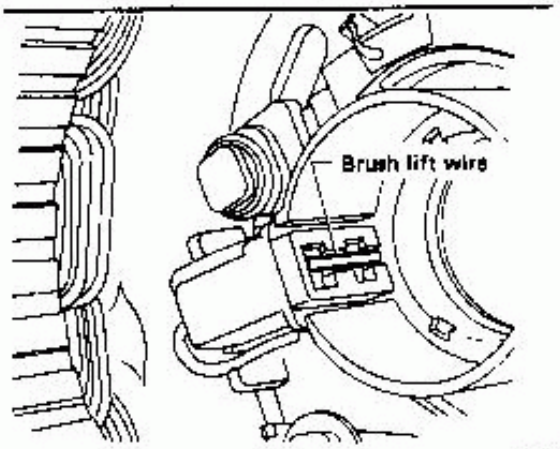
SEL633D

Assembly (Cont'd)

4. Before installing front cover with pulley and rotor with rear cover, push brush up with fingers and retain brush, by inserting brush lift into brush lift hole from outside.
   After installing, remove wire for brush lift.



SEL597A



SEL598A

5. After installing front and rear sides of alternator, pull brush lift by pushing toward center.

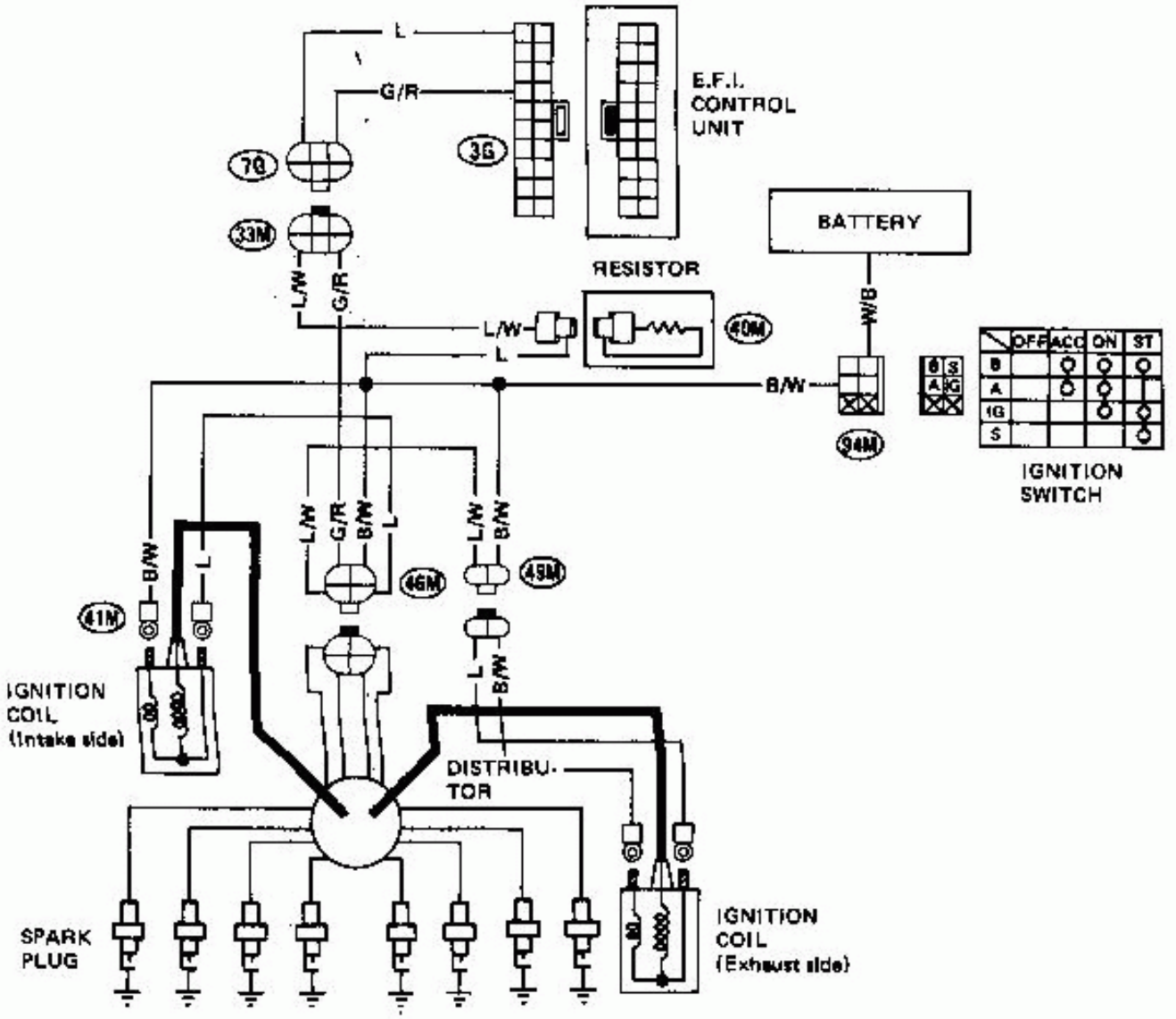
Do not pull brush lift by pushing toward outside of cover as it will damage slip ring sliding surface.

Service Data and Specifications (S.D.S.)

Type	LR160-104	LR170-706
Applied model	Non-turbocharger model	Turbocharger model
Nominal rating V-A	12 - 60	12 - 70
Ground polarity	Negative	
Minimum revolution under no-load (when 14 volts is applied) rpm	Less than 1,000	
Hot output current A/rpm	More than 50/2,500 50/5,000	More than 21/1,300 More than 50/2,500 More than 70/5,000
Regulated output voltage V	14.4 - 15.1	14.4 - 15.0
Minimum length of brush mm (in)	More than 7.0 (0.276)	More than 5.5 (0.217)
Brush spring pressure N (g, oz)	2.501 - 3.383 (255 - 345, 8.99 - 12.17)	1.471 - 3.531 (150 - 360, 5.29 - 12.70)
Slip ring outer diameter mm (in)	More than 30 (1.18)	More than 21.6 (0.850)

IGNITION SYSTEM (Non-turbocharger model)

Wiring Diagram



SEL301E

- For ignition system for turbocharger model, refer to EF & EC section.

Trouble-shooting

Engine turns erratically.

Engine turns but does not start.

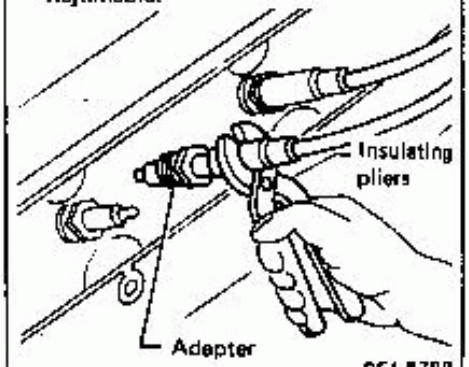
Check ignition timing.
- N.G. → Adjust.
- O.K.

Attach adapter *1 to high tension cable and position tip of adapter approx. 5 mm (0.24 in) away from cylinder block. With adapter held in that position, crank engine to see if spark jumps across gaps between tip and cylinder block at regular intervals.
- O.K. → Check for burned or fouled spark plug.
  - N.G. → Clean or replace.
  - O.K. → Check fuel system.
- N.G. → Check air gap between reluctor and stator.
  - O.K. → Check IC ignition system.

IC ignition System is checked using a volt-ohmmeter. Follow the steps in the sequence indicated. If a fault is found, correct the problem before continuing. If all tests indicate "O.K." replace the IC ignition Unit. DO NOT REPLACE THE UNIT UNTIL ALL TESTS HAVE BEEN COMPLETED AND INDICATE "O.K.".

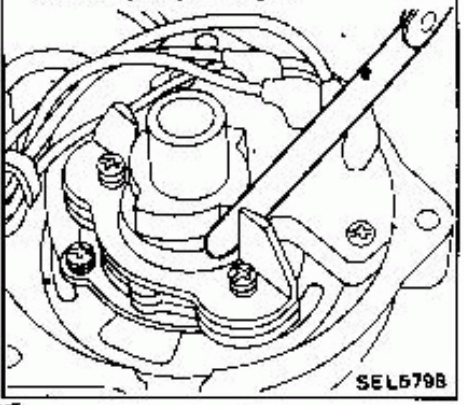
Go to Test Table.

Before cranking, disconnect harness connector to carburetor. Before operation, make sure there is no inflammable.



SEL578B

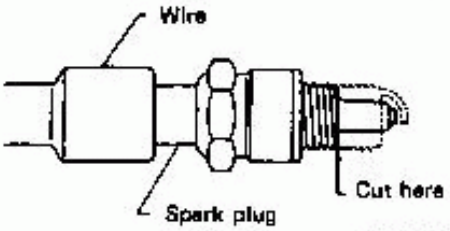
Specified value ... Refer to S.D.S. If necessary, adjust air gap.


SEL579B

WARNING:
When current is flowing, never touch with bare hand high tension cables or any other parts with high voltage. If parts are moist, touching them could cause an electric shock, even if they are insulated. Always wear dry, well-insulated gloves or wrap effected parts with dry cloth before handling.

NOTE:
1. **When performing the following tests, use a multitester which can measure accurately in the following ranges; 0 to 20V D.C.; 0 to 1,000Ω, 0 to 10V A.C.; 0 to 50,000Ω.**
2. **If possible, start the vehicles and let it run for 5 to 15 minutes with the hood closed. This will bring all components to normal operating temperature, and will make it easier to diagnose intermittent problems.**
3. **It is not necessary to disconnect the harness connectors when performing the tests which follow. Simply insert the meter probes into the back of appropriate connector cavity.**

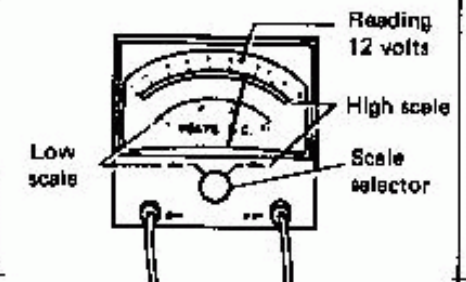
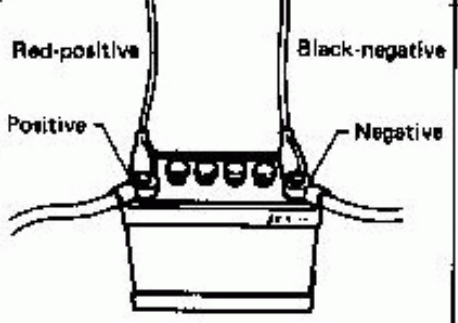
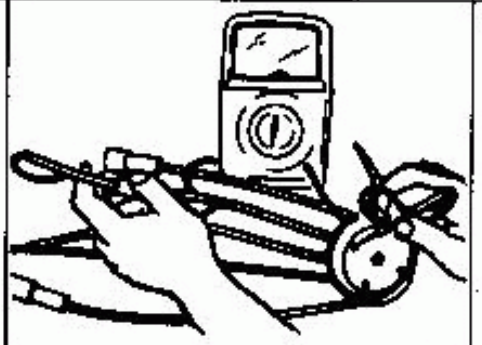
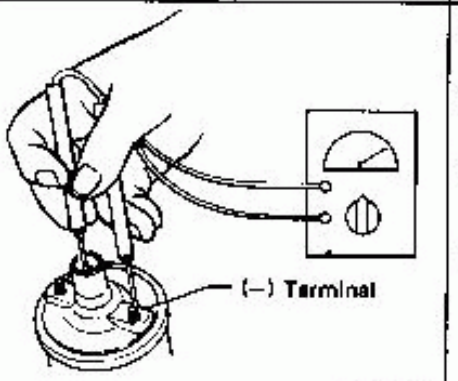
*1:
Preparation of spark plug for checking
Many things can be utilized as an adapter. However, it is recommended that a used spark plug whose threaded portion has been half cut off as shown in the figure be utilized.



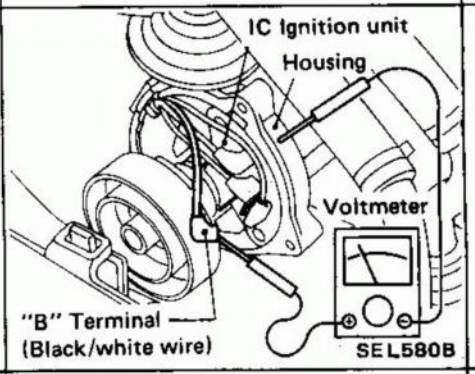
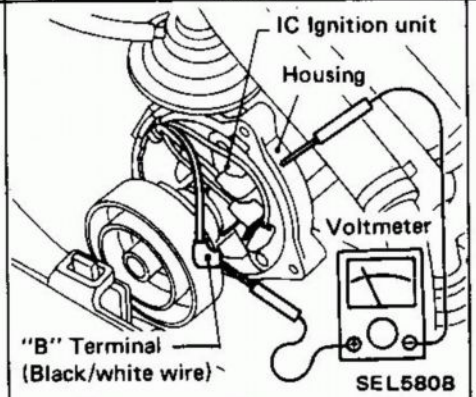
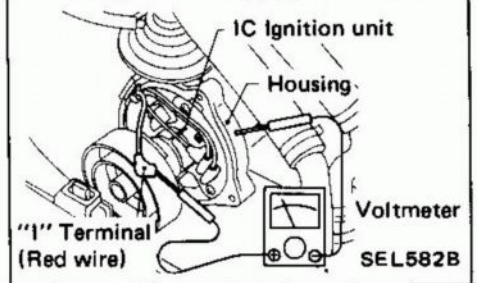
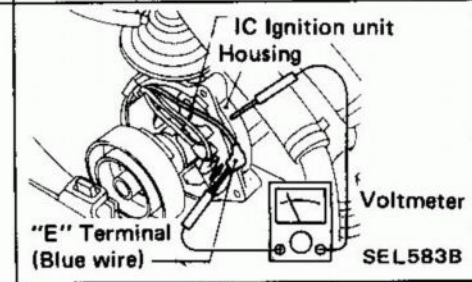
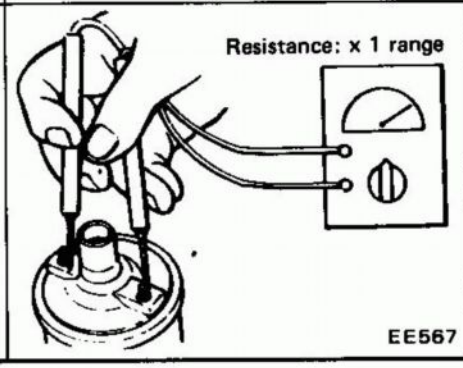
SEL581B

Trouble-shooting (Cont'd)

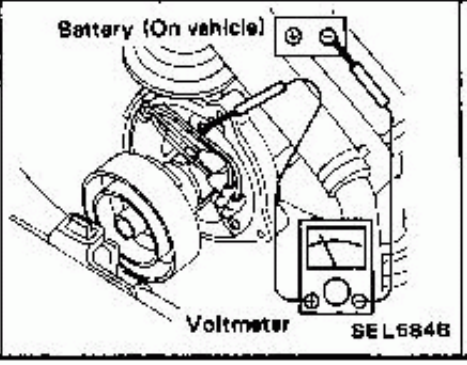
TEST TABLE

TEST	TEST METHOD	CONDITIONS	RESULT	ACTION
1. Battery Voltage (no load)	 SEL103	1. Ignition key in "OFF" position. 2. Connect voltmeter as illustrated and set to appropriate scale. 3. Read and record battery voltage reading. Battery voltage ☐	11.5 – 12.5 volts	Proceed to Step 2.
			Below 11.5 volts	Battery, charging system or starting system – Faulty. Refer to applicable sections in Service Manual to correct the situation.
2. Battery Cranking Voltage	 SEL103	1. Connect voltmeter as illustrated and set to appropriate scale. 2. Remove coil wire from distributor cap and ground it. 3. Read voltmeter while cranking engine for approximately 15 seconds. 4. Record voltage reading. Battery cranking voltage ☐	Voltage reading greater than 9.6 volts	Battery O.K. Proceed to Step 3.
			Voltage reading less than 9.6 volts	Battery, charging system or starting system – Faulty. Refer to applicable sections in Service Manual to correct the situation.
3. Secondary Wiring	 EF126	1. Connect ohmmeter as illustrated and measure the resistance of each high tension cable.	Resistance readings less than 30,000 ohms	Distributor cap and high tension cables – O.K. Proceed to Step 4.
			Resistance readings greater than 30,000 ohms	Replace high tension cable(s) and/or distributor cap as required.
4. Ignition Coil Secondary Circuit	 SEL104	1. Ignition key in "OFF" position. 2. Coil wire removed from coil. 3. Connect ohmmeter as illustrated. Check both coils.	8,000 - 12,000 ohms	Ignition coil secondary windings – O.K. Proceed to step 5 for California
			Resistance reading not between 8,000 - 12,000 ohms	Faulty ignition coil – replace

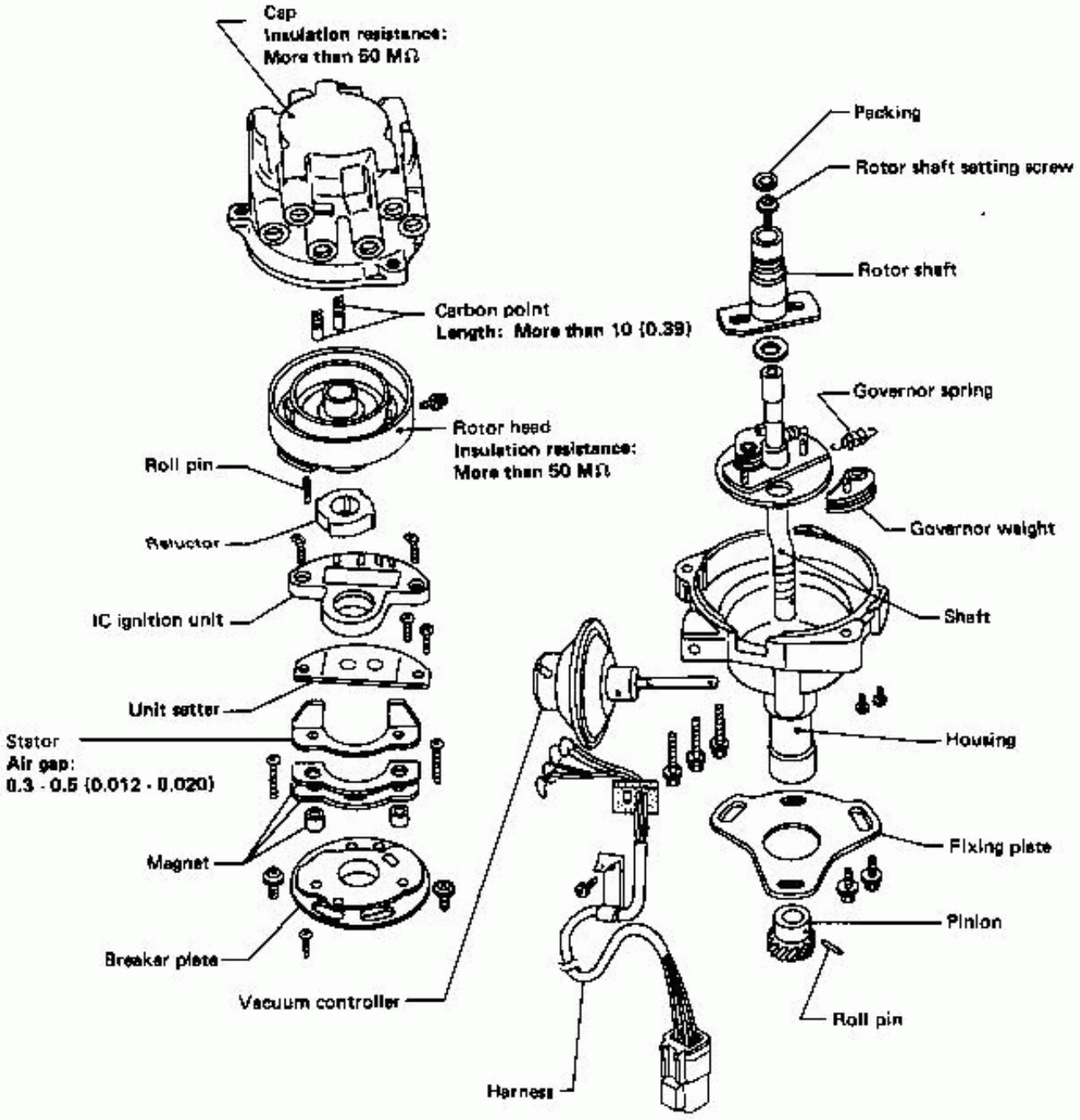
Trouble-shooting (Cont'd)

TEST	TEST METHOD	CONDITIONS	RESULT	ACTION
5. Power Supply Circuit		1. Connect voltmeter as illustrated and set to appropriate scale. 2. Turn ignition key to "ON" position.	11.5 - 12.5 volts	Proceed to Step 6.
			Below 11.5 volts	Check wiring from ignitio switch to IC unit.
6. Power Supply Circuit (Cranking)		1. Connect voltmeter as illustrated and set to appropriate scale. 2. Pull out coil wire from distributor cap and ground it. 3. Turn key to "START" position and observe voltmeter while engine is cranking.	Voltage reading is less than 1 volt below battery cranking voltage and is greater than 8.6 volts.	Proceed to Step 7-A.
			Voltage reading is more than 1 volt below battery cranking voltage and/or is below 8.6 volts.	Check ignition switch and wiring from switch to IC unit.
7-A. Ignition Primary Circuit		1. Connect voltmeter as illustrated and set to appropriate scale. 2. Ignition key in "ON" position.	11.5 - 12.5 volts	Proceed to Step 7-B.
			Below 11.5 volts	Proceed to Step 8.
7-B. Ignition Primary Circuit		1. Connect voltmeter as illustrated and set to appropriate scale. 2. Ignition key in "ON" position.	11.5 - 12.5 volts	Proceed to Step 9.
			Below 11.5 volts	Proceed to Step 8.
8. Ignition Coil Primary Circuit		1. Ignition key in "OFF" position. 2. Coil wire removed from coil. 3. Connect ohmmeter as illustrated. **Check both coils.**	0.84 - 1.02 ohms	Ignition coil primary winding O.K. Check ignition switch and wiring from ignition switch to coil and IC unit.
			Resistance reading not between 0.84 - 1.02 ohms	Faulty ignition coil — replace.

Trouble-shooting (Cont'd)

TEST	TEST METHOD	CONDITIONS	RESULT	ACTION
9. IC Unit Ground Circuit		1. Connect voltmeter as illustrated and set to appropriate scale. 2. Pull out coil wire from distributor cap and ground it. 3. Turn key to "START" position and observe voltmeter while engine is cranking	0.5 volts or less	Replace IC ignition unit assembly.
			More than 0.5 volts	Check distributor ground, wiring from chassis ground to battery including battery cable connections.

Construction



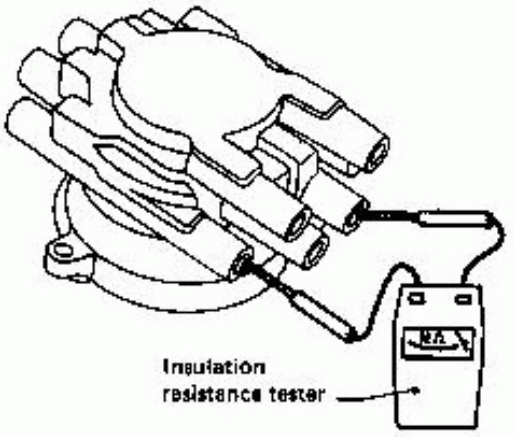
Unit: mm (in)

SEL3

Cap and Rotor Head Check

1. Check cap and rotor head for dust, carbon deposits and cracks.
2. Measure insulation resistance between electrodes on ignition coil side and spark plug side.

Insulation resistance:
More than 50 MΩ



SEL597B

- Less than specified value ... Replace.

Reluctor and Stator Check

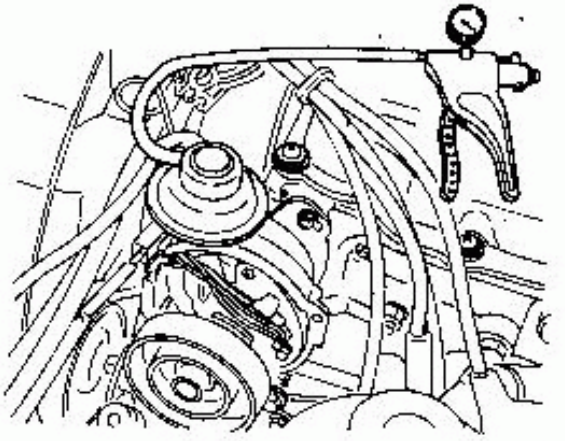
Check reluctor and stator for bending or scratches. If necessary, replace.

Breaker Plate Check

- If breaker plate shows any signs of binding or dragging, replace.

Vacuum Advance Check

Apply negative pressure to vacuum controller with a vacuum pump to see if leakage is present. Also check breaker plate for smooth movement.

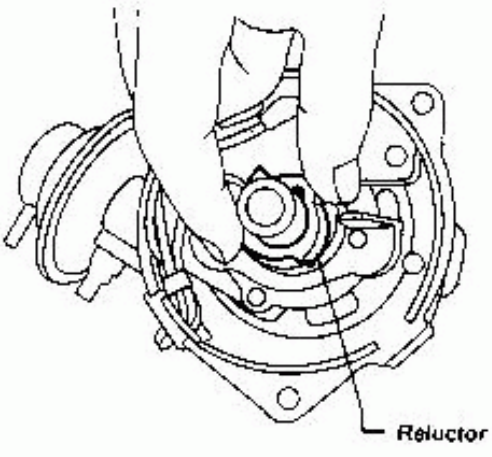


SEL302E

- If leak is found, replace vacuum controller.
- If breaker plate does not move smoothly, this condition could be due to sticky steel balls or pivot. Apply grease to steel balls or, if necessary, replace breaker plate assembly.

Governor Advance Check

- While preventing the shaft from turning, turn reluctor counterclockwise by hand and release it. It should return to its original position.



SEL598B

Assembly

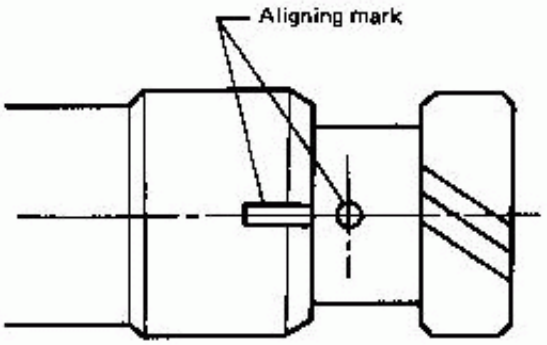
To assemble, reverse order of disassembly. Note the following:

GREASE POINT

- Shaft bearing metal
- Governor spring
- Frictional surface of governor weight
- Frictional surface of breaker plate

INSTALLATION OF PINION

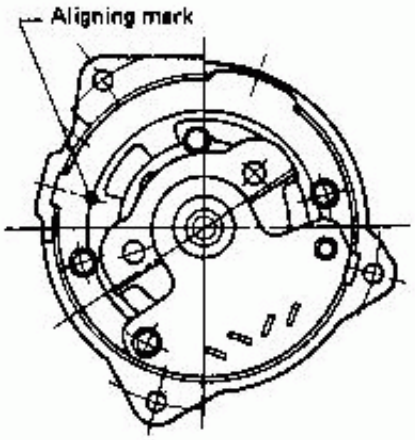
Align aligning marks on pinion and housing, and drive pinion into the shaft.
After driving pinion into place, drive a new roll pin into the shaft.



SEL599B

INSTALLATION OF BREAKER PLATE

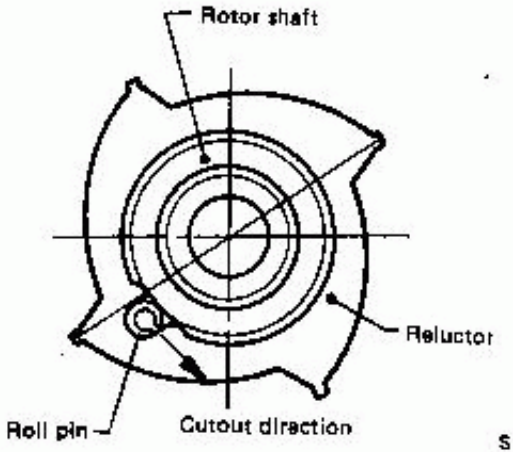
Ensure that aligning marks on breaker plate and housing are lined up properly.



SEL600B

INSERTING ROLL PIN INTO RELUCTOR

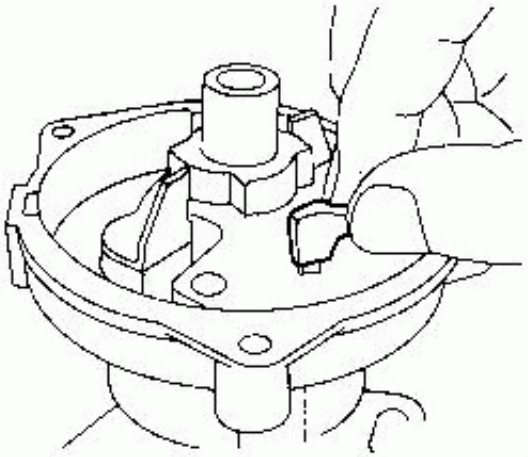
Position cutout direction of roll pin in parallel with notch in rotor shaft.



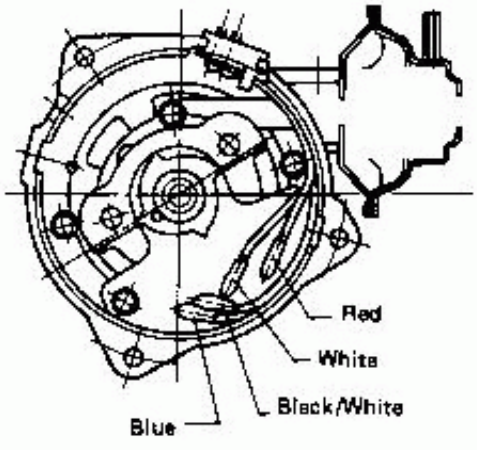
SEL601B

CONNECTING HARNESS

Ensure that harness to IC ignition unit is tightly secured.



SEL602B

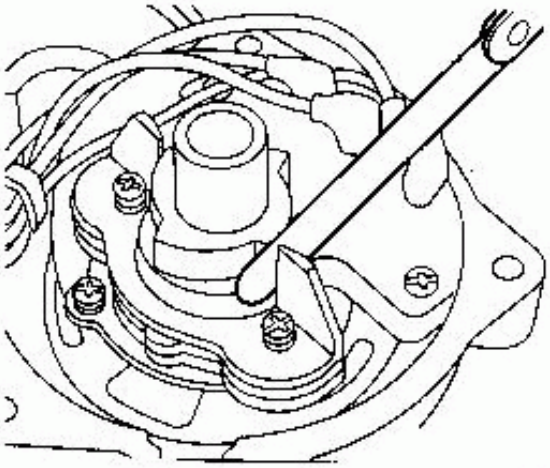


SEL603B

Adjustment

AIR GAP

Measure air gap between reluctor and stator. If it is not within specifications, loosen stator retaining screws and adjust.



SEL579B

Service Data and Specifications (S.D.S.)

DISTRIBUTOR

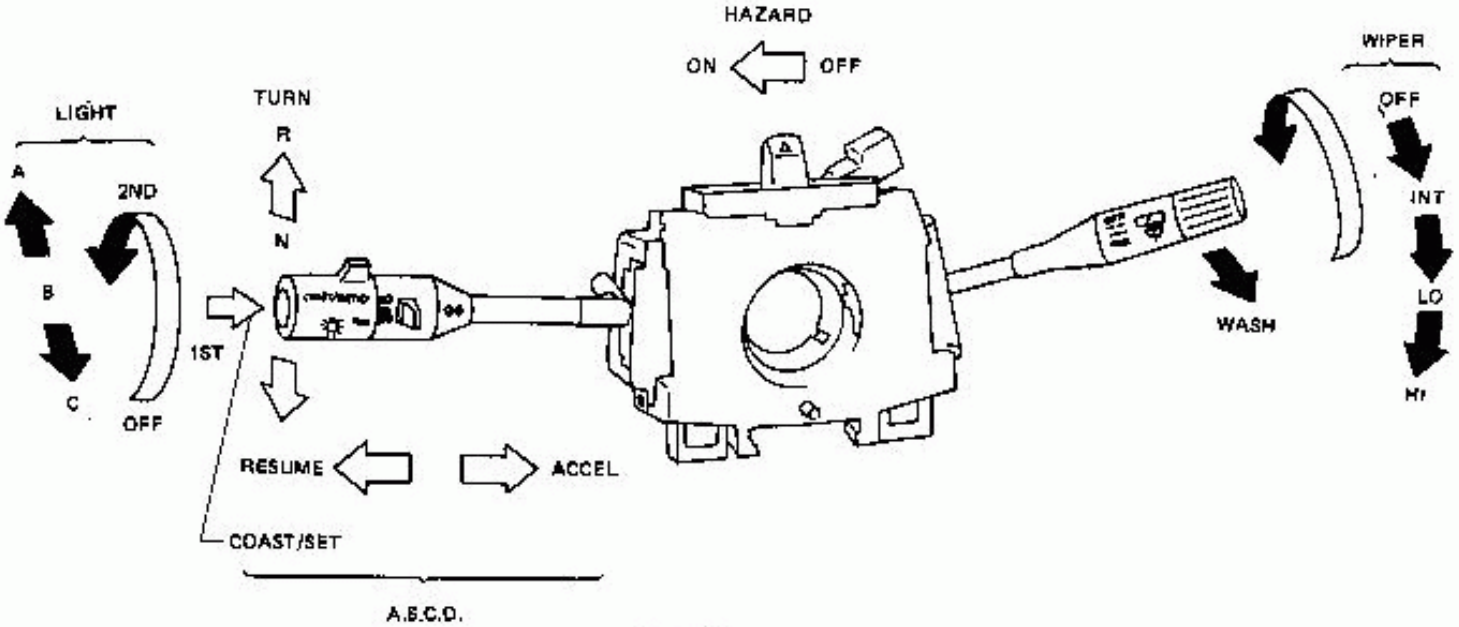
Type		D4N84-17
Applied model		Non-turbocharger model
Firing order		1-3-4-2
Rotating direction		Counterclockwise
Air gap	mm (in)	0.3 - 0.5 (0.012 - 0.020)
Cap insulation resistance	MΩ	More than 50
Rotor head insulation resistance	MΩ	More than 50
Cap carbon point length	mm (in)	10 (0.39)
Vacuum advance [Distributor degree/distributor kPa (mmHg, inHg)]		0°/9.3 (70, 2.76) 6.5°/18.0 (135, 5.31) 6.5°/21.66 (162.5, 6.398) 9.5°/30.7 (230, 9.06)
Centrifugal advance [Distributor degree/distributor rpm]		0°/600 10.5°/1,900

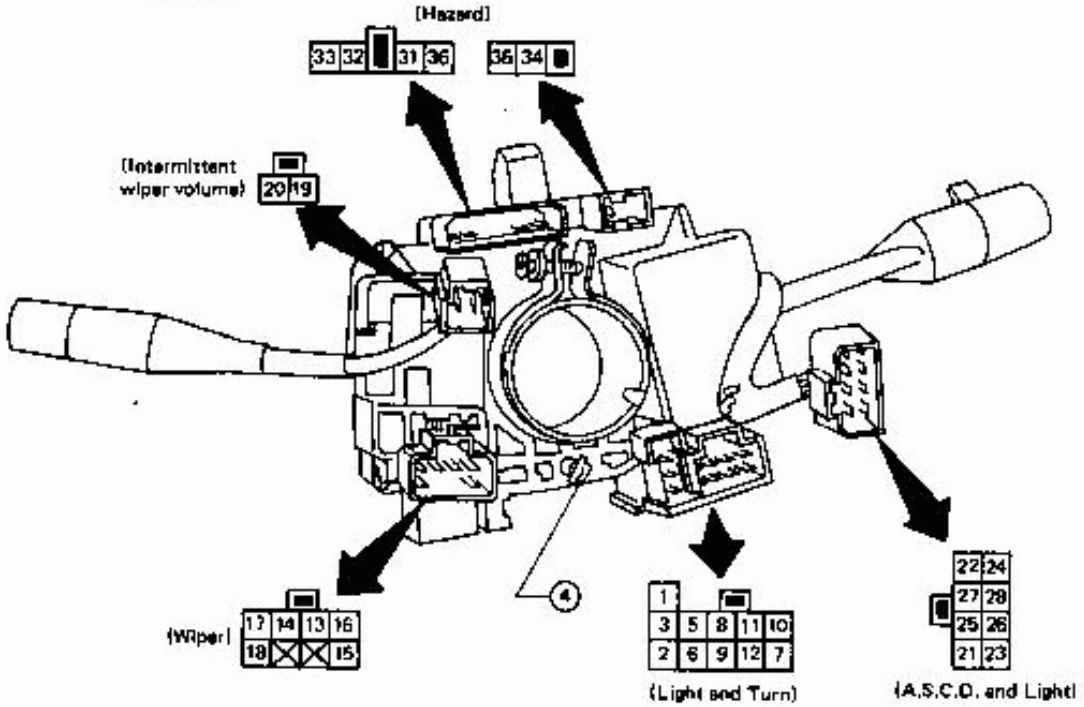
IGNITION COIL

Type	Intake side	CIT-110	STC-110
	Exhaust side	CIT-113	STC-113
Make		HITACHI	HANSHIN
Applied model		Non-turbocharger model	
Primary voltage	V	12	
Primary resistance [at 20°C (68°F)]	Ω	0.84 - 1.02	
Secondary resistance [at 20°C (68°F)]	KΩ	8- 12	

COMBINATION SWITCH

Check





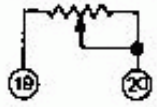
LIGHTING SWITCH

	OFF			1ST			2ND		
	A	B	C	A	B	C	A	B	C
5			○			○	○	○	○
6			○			○	○		○
7								○	
8			○			○	○	○	○
9			○			○	○		○
10								○	
11	○	○	○	○	○	○			
12	○	○	○	○	○	○			
26				○	○	○	○	○	○
25				○	○	○	○	○	○
27							○	○	○
28							○	○	○

WIPER SWITCH

	OFF	INT	LO	HI	WASH
13	○	○			
14	○	○	○		
15		○	○	○	
16				○	
17		○	○	○	○
18					○

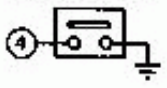
INTERMITTENT WIPER VOLUME



A.S.C.D. SWITCH

	COAST/SET	RESUME	ACCEL
21	○	○	○
22	○		
23		○	
24			○

HORN SWITCH



	OFF	ON
31		○
32		○
33		○
34		○
35	○	○
36	○	

HAZARD SWITCH

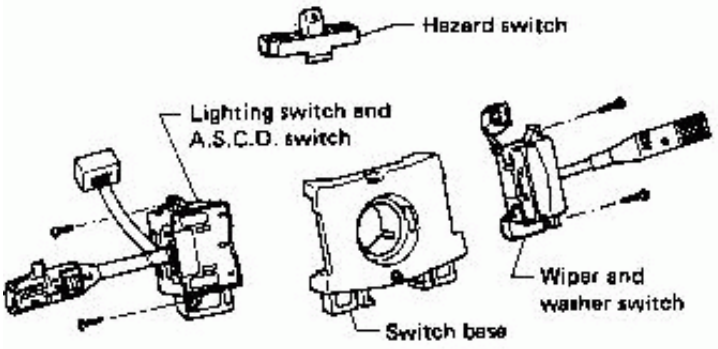
	R	N	L
1	○		○
2	○		
3			○

TURN SIGNAL SWITCH

SEL173E

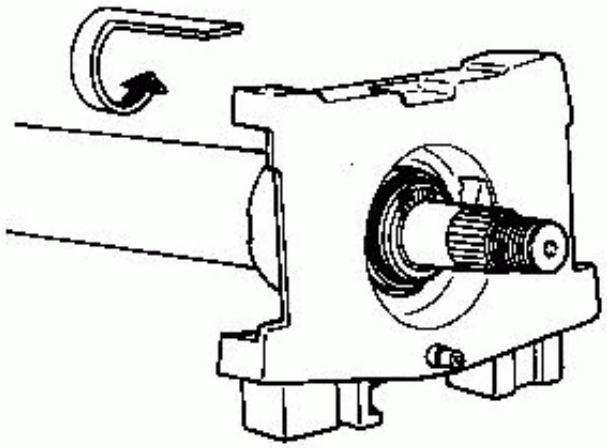
Replacement

Lighting switch, wiper & washer switch and A.S.C.D. switch can be replaced without removing combination switch base.



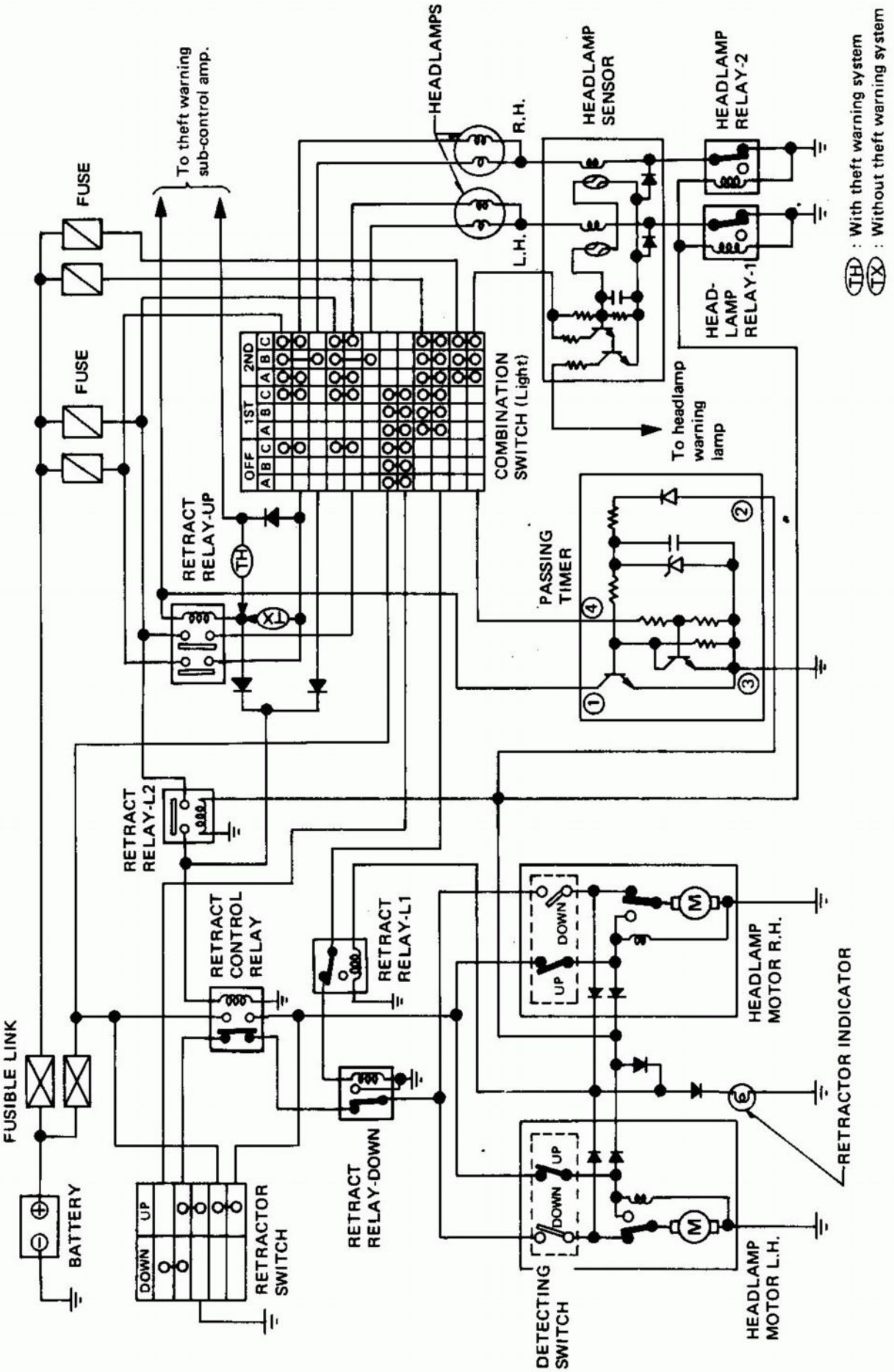
SEL174E

To remove combination switch base, loosen base attaching screw and turn after pushing on it.

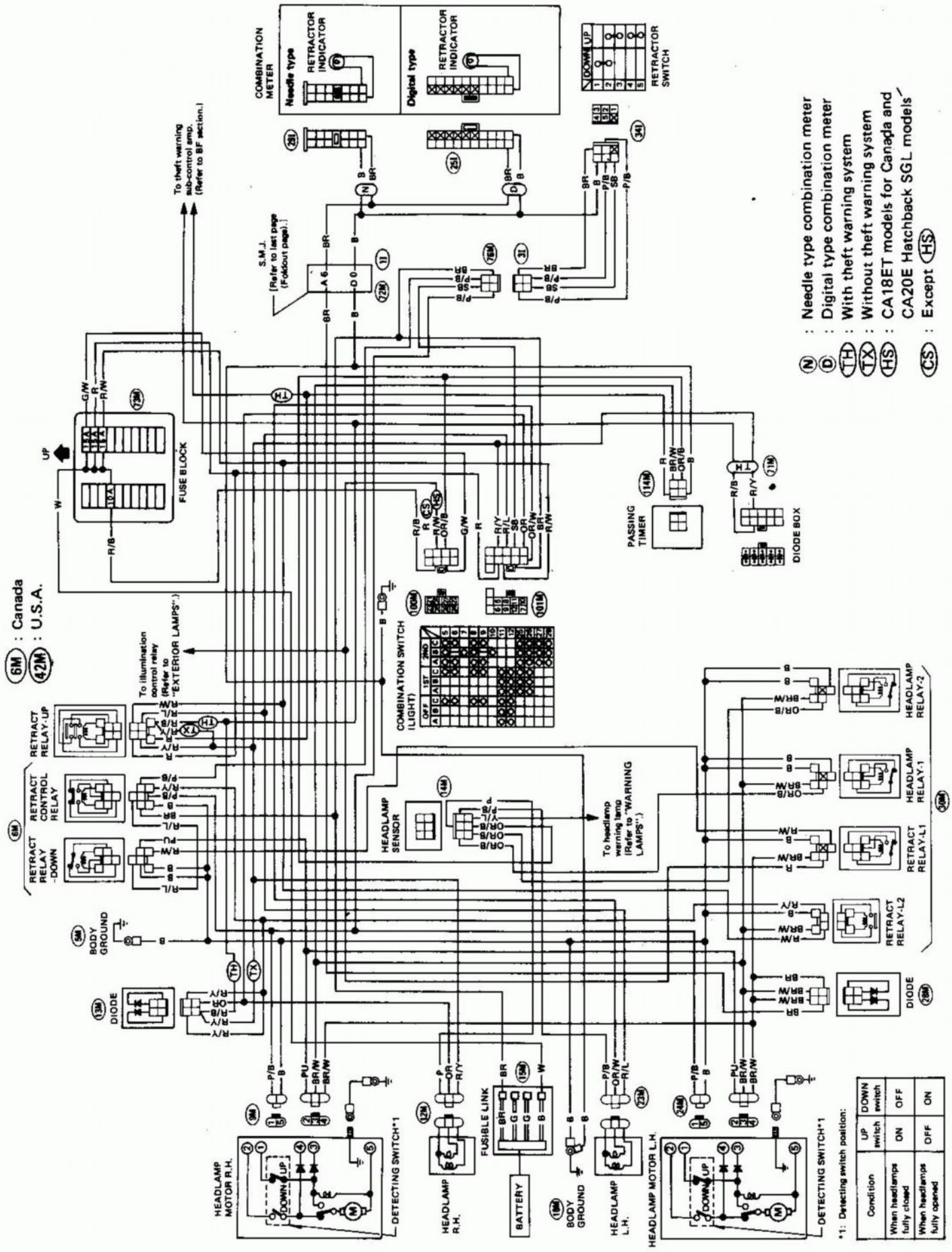


SEL175E

Schematic


HEADLAMPS
R.H.
L.H.
HEADLAMP SENSOR
HEADLAMP RELAY-2
HEAD-LAMP RELAY-1
To theft warning sub-control amp.
FUSE
FUSE
COMBINATION SWITCH (Light)
OFF
1ST
2ND
To headlamp warning lamp
PASSING TIMER
RETRACT RELAY-UP
RETRACT RELAY-L2
RETRACT CONTROL RELAY
RETRACT RELAY-L1
RETRACT RELAY-DOWN
FUSIBLE LINK
BATTERY
RETRACTOR SWITCH
UP
DOWN
HEADLAMP MOTOR R.H.
HEADLAMP MOTOR L.H.
RETRACTOR INDICATOR
DETECTING SWITCH
TH : With theft warning system
TX : Without theft warning system
SEL176E

Wiring Diagram



SEL710G

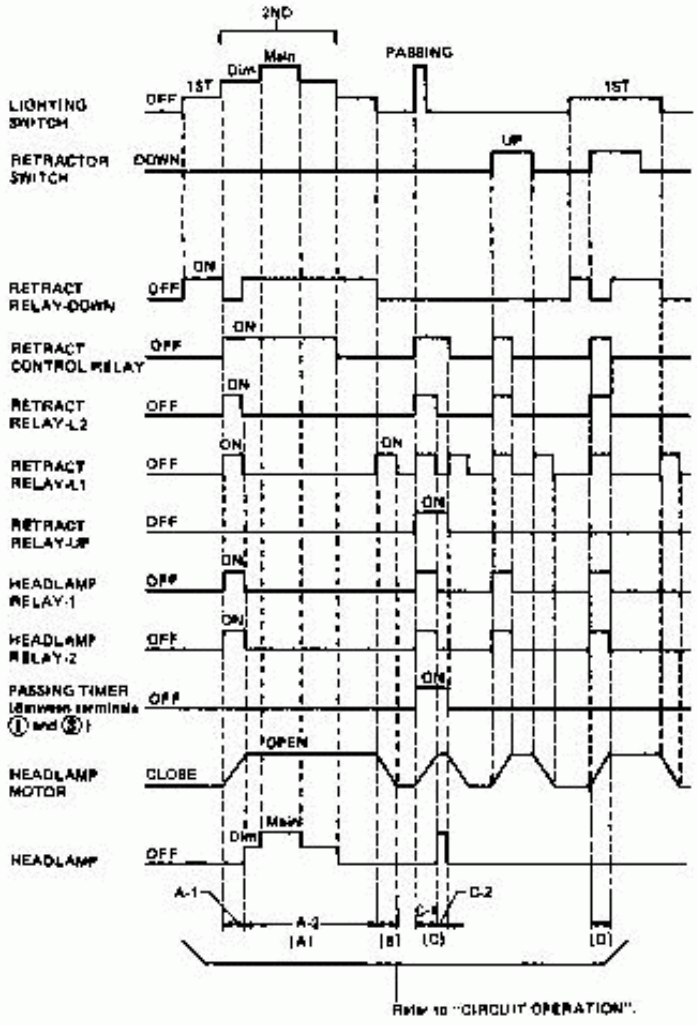
Description

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
1ST → OFF	OFF	Closed	OFF
Momentarily turned to PASSING	OFF	Opened and closed after headlamps go off.	Momentarily ON after headlamp motor reaches fully open position, and go off.
OFF	ON	Open	OFF

TIMING CHART

- The following chart depicts the operational modes of relays and headlamp motors in relation to the positions of the lighting switch and retract switch.



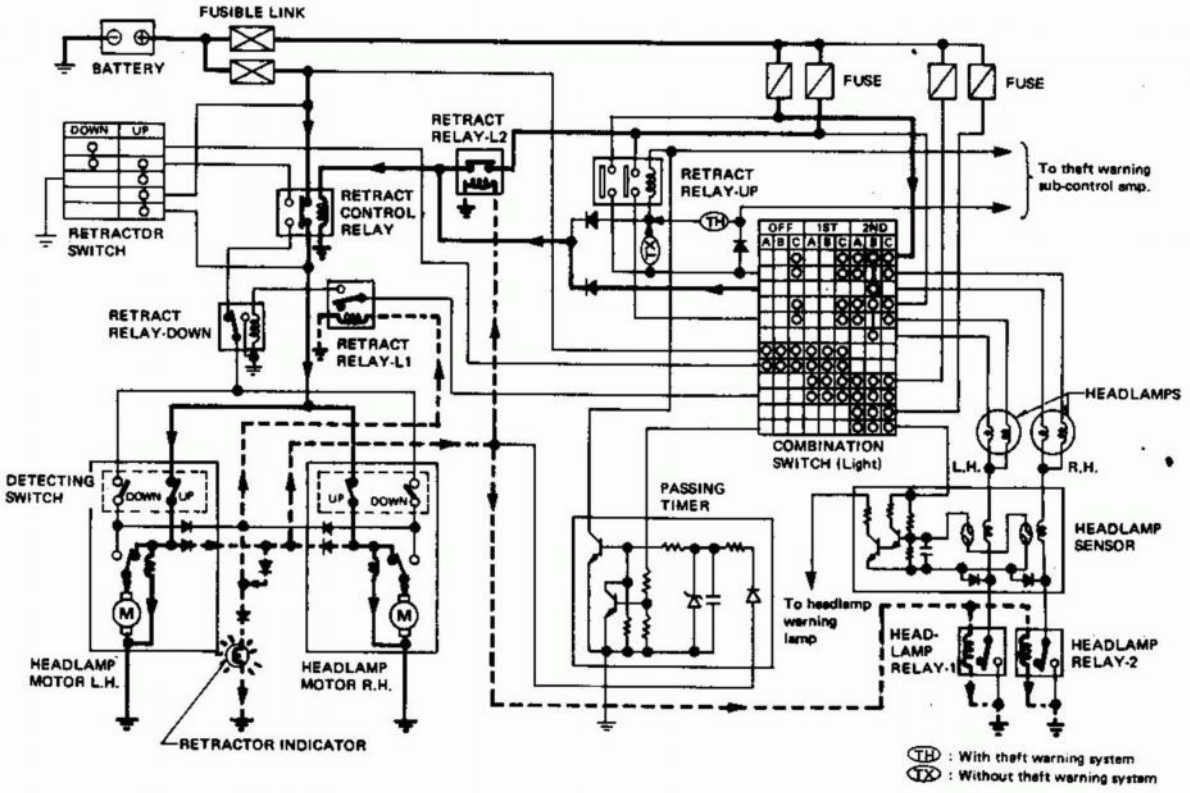
SEL177E

Description (Cont'd)

CIRCUIT OPERATION

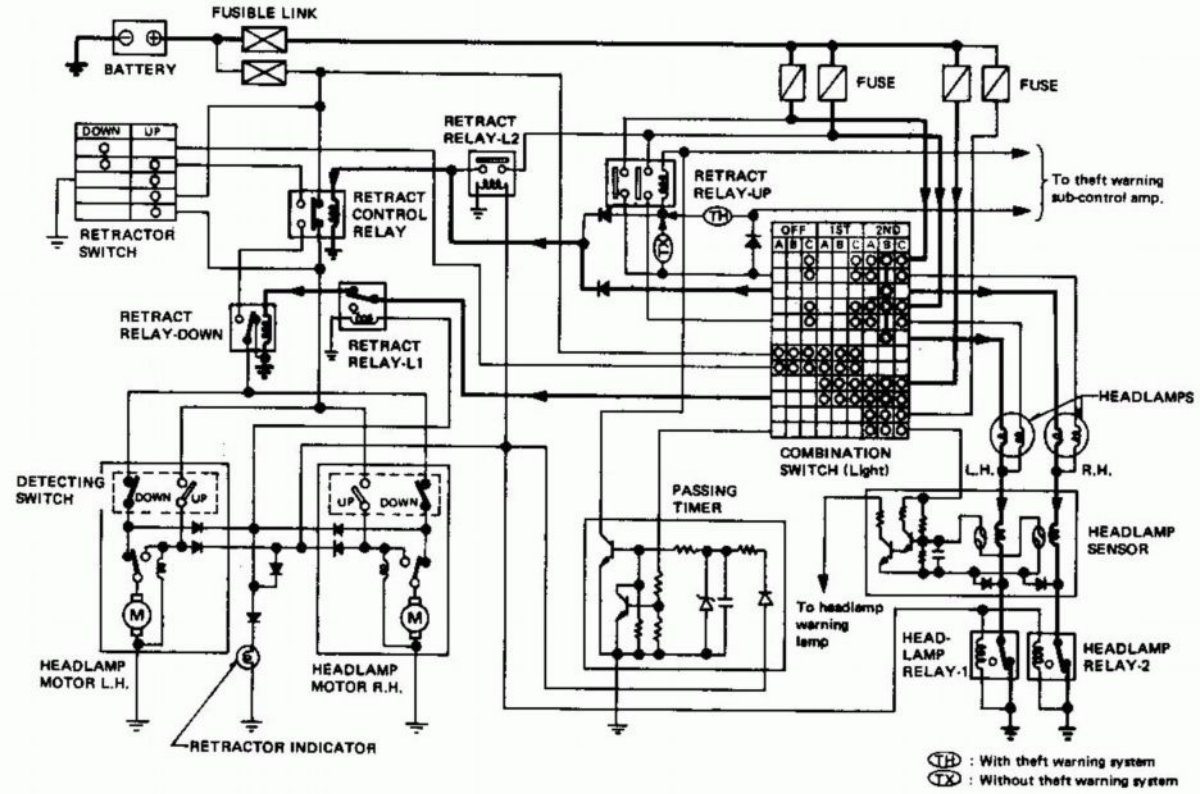
[A] When lighting switch is switched from "1ST" → "2ND"

A-1: While operating the headlamp motor to open position



SEL178E

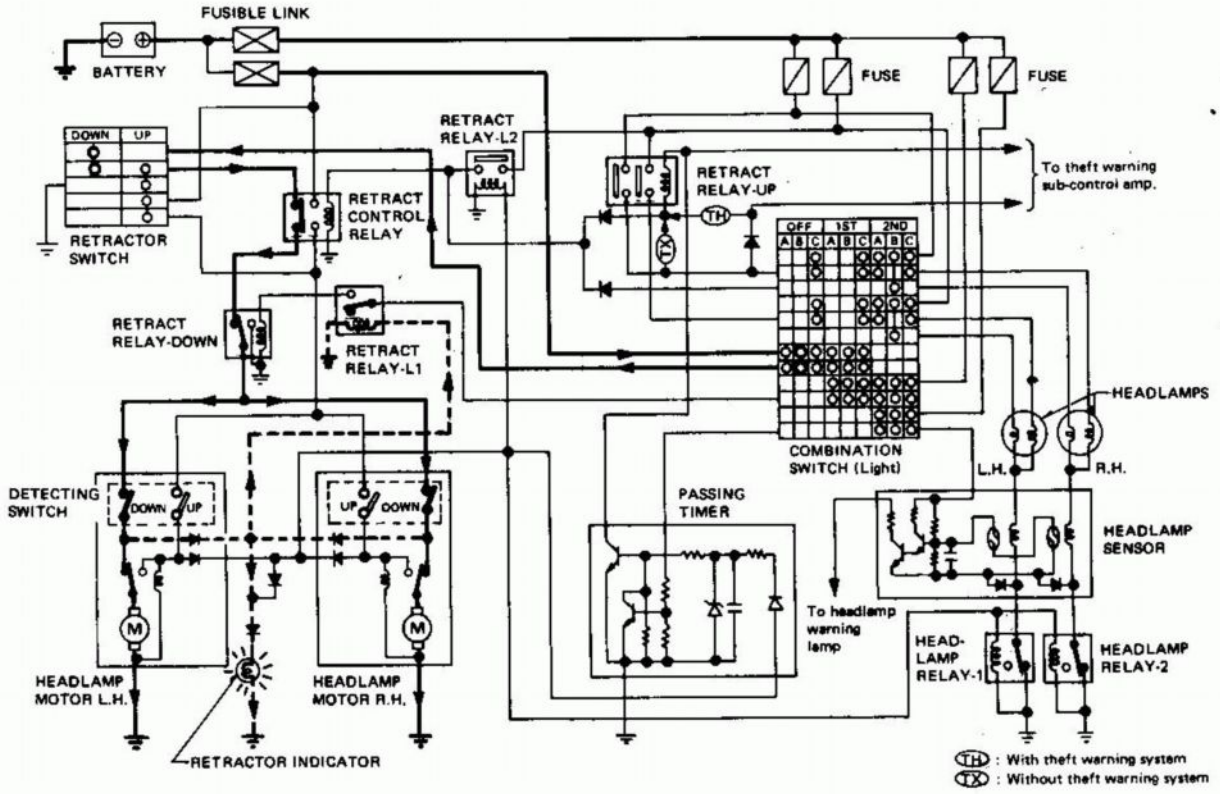
A-2: After the headlamp motor reaches fully open position



SEL179E

Description (Cont'd)

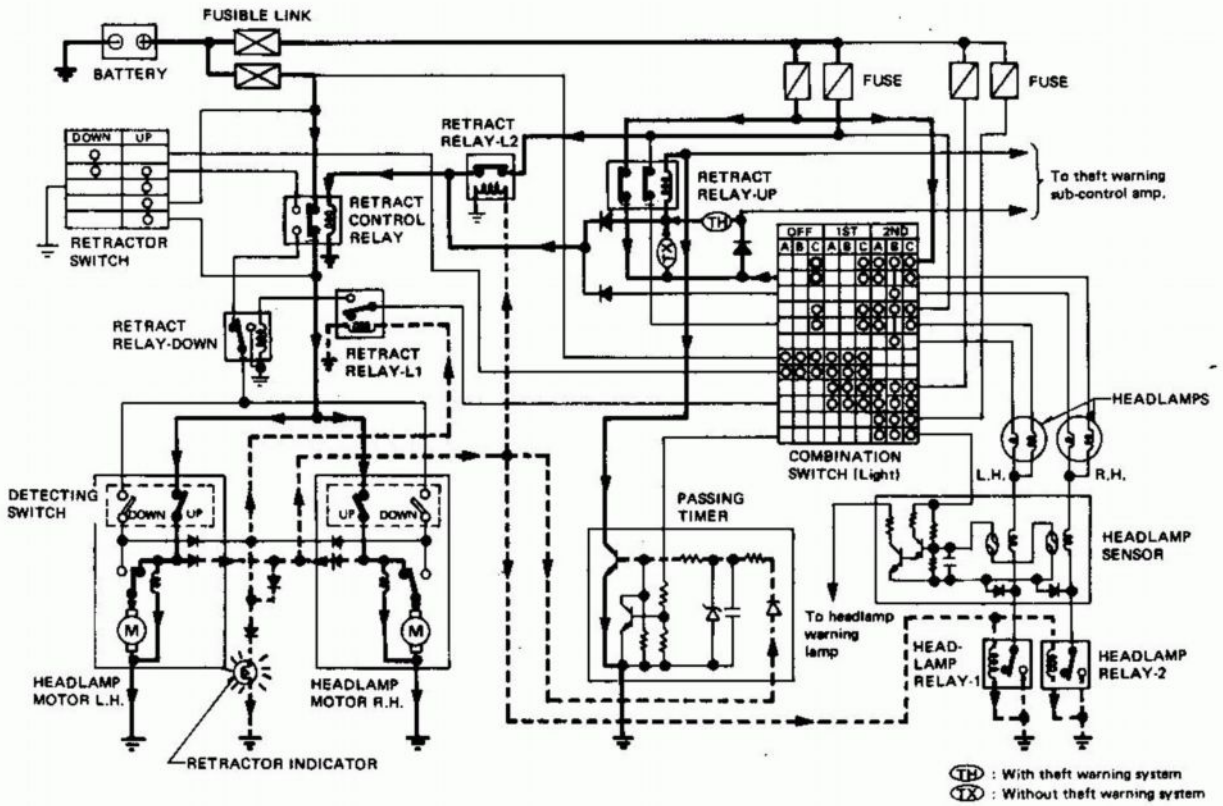
[B] When lighting switch is switched from "1ST" → "OFF" (While operating the headlamp motor to closed position)



SEL180E

[C] When lighting switch is switched to "PASSING"

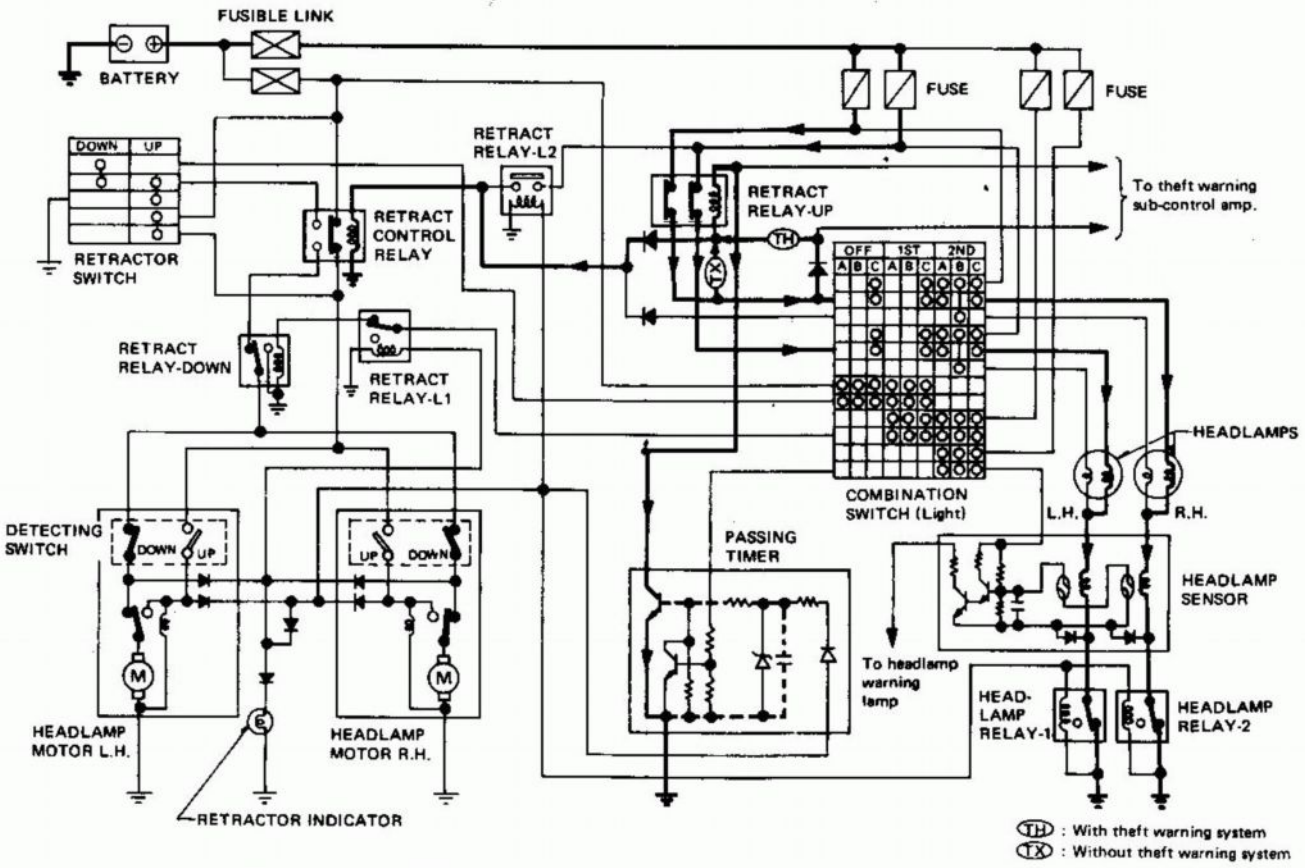
C-1: While operating the headlamp motor to open position



SEL181E

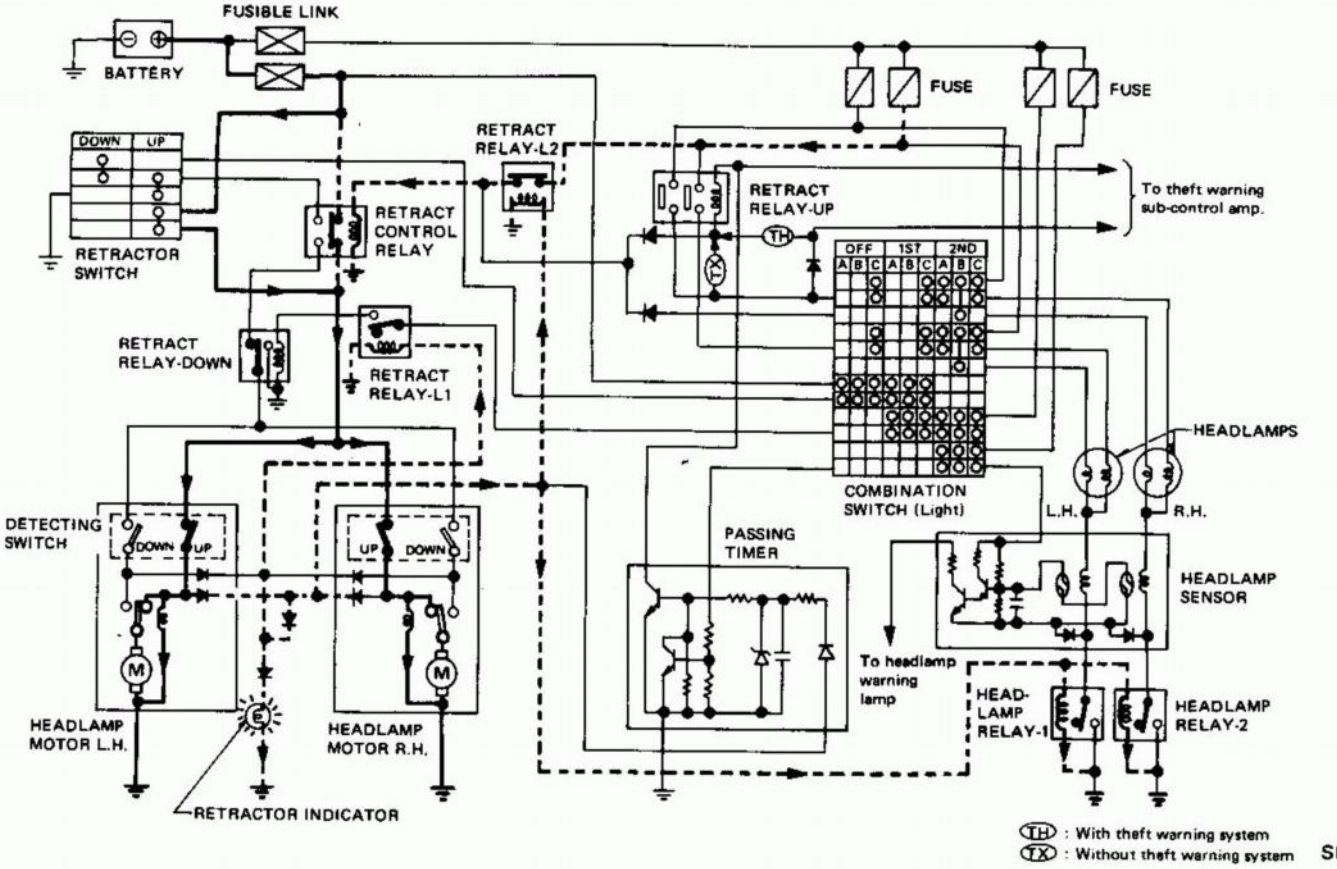
Description (Cont'd)

C-2: After the headlamp reaches fully open position



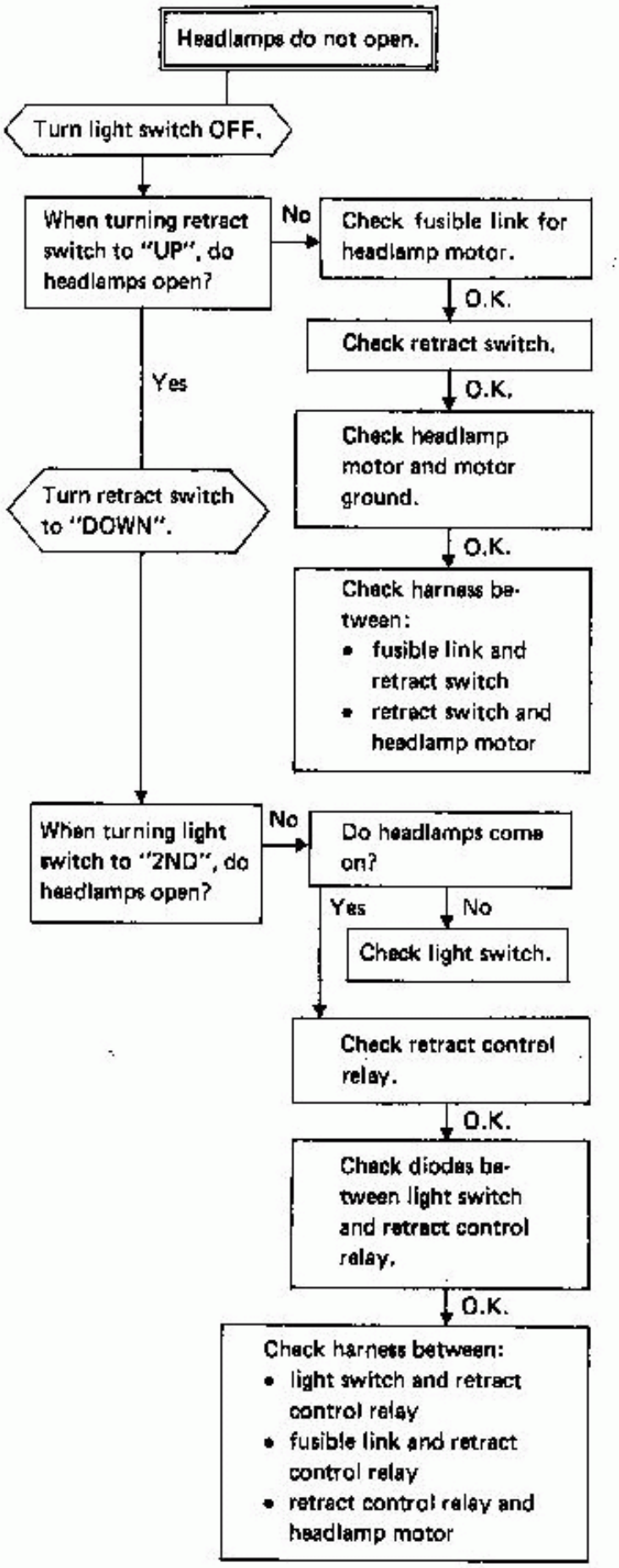
SEL182E

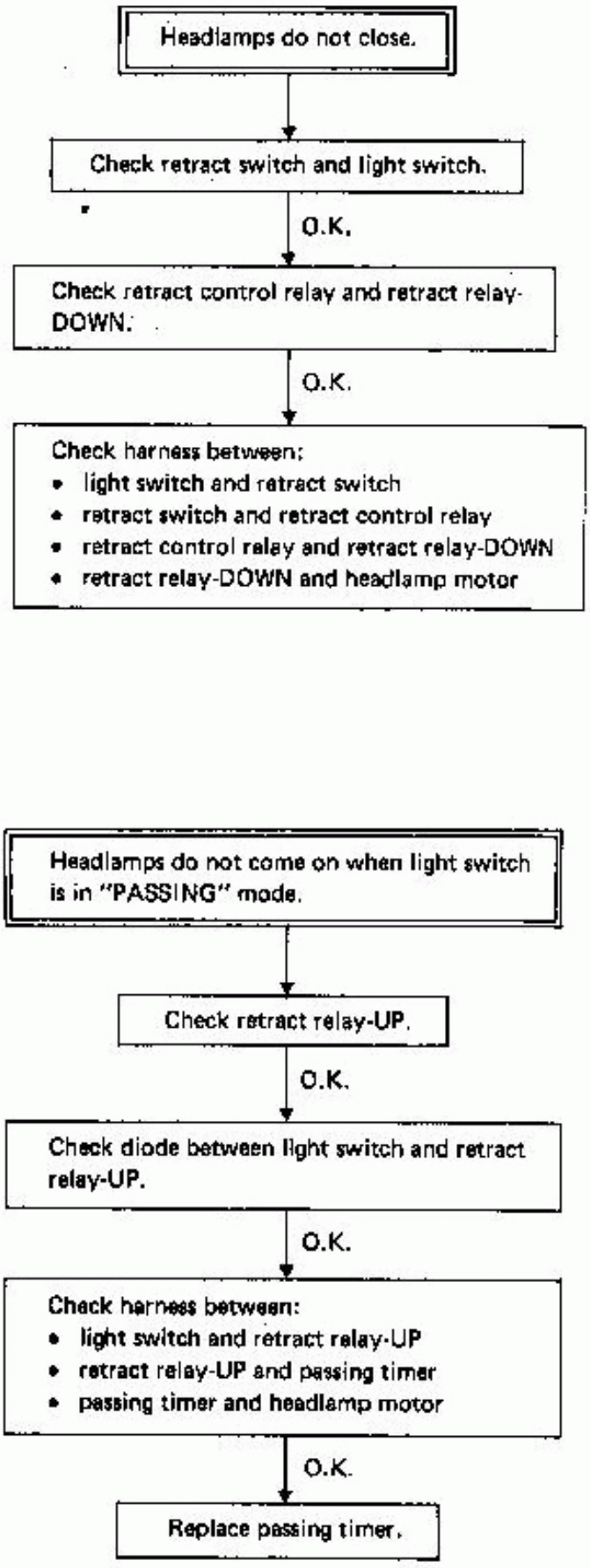
[D] When retractor switch is turned ON (While operating the headlamp motor to open position)



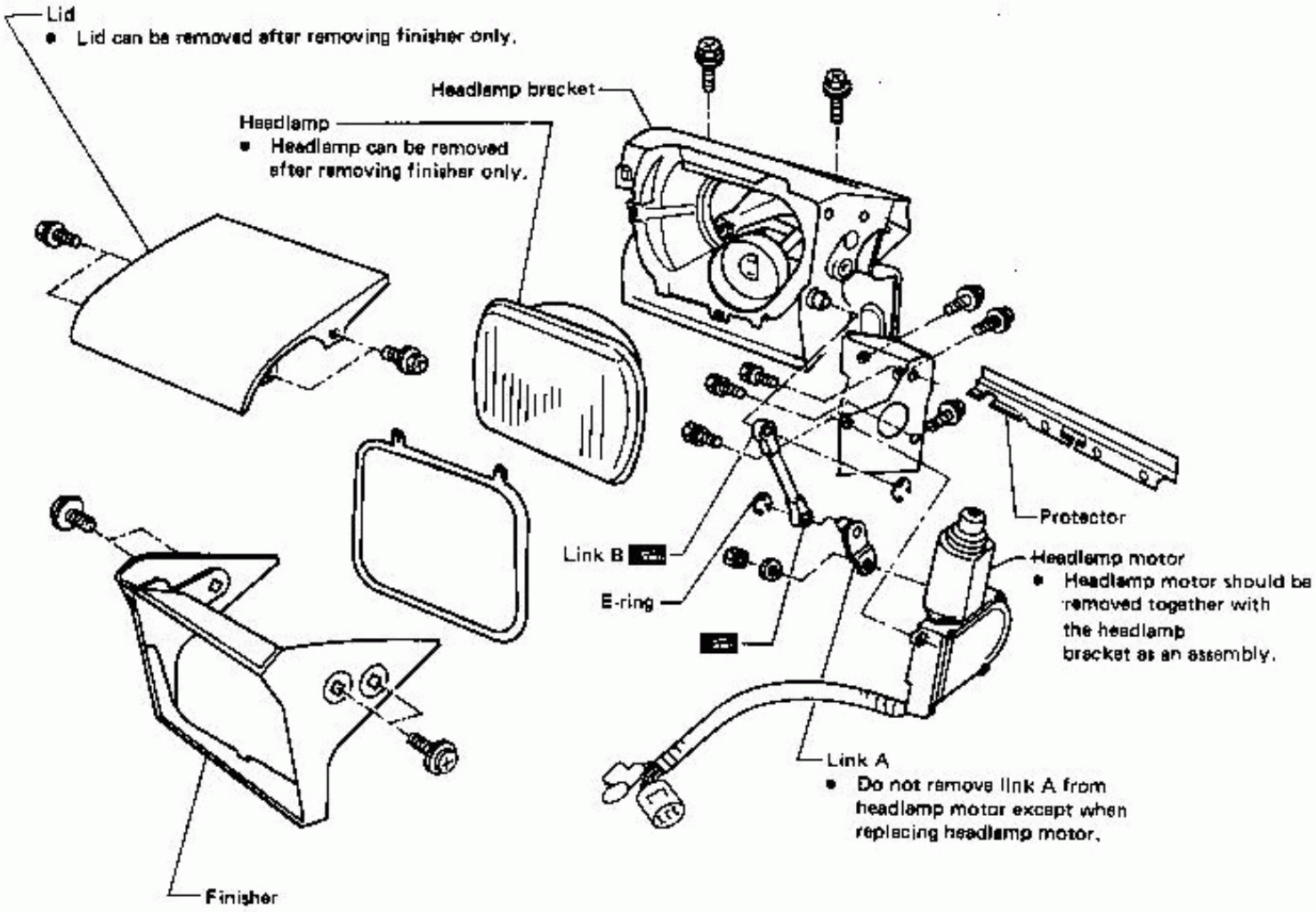
SEL183E

Trouble-shooting





Removal

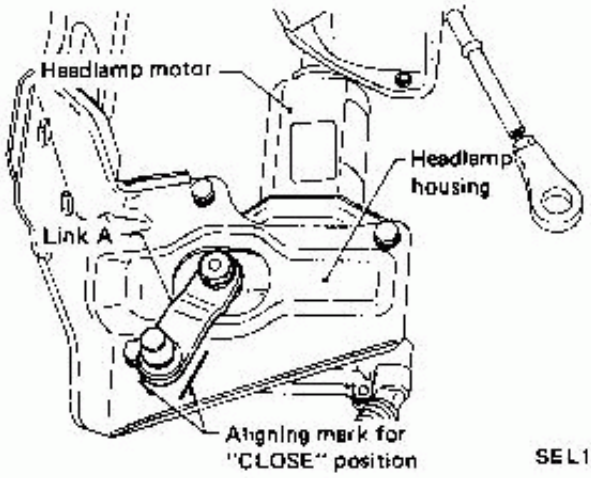


: Grease-up points

SEL185E

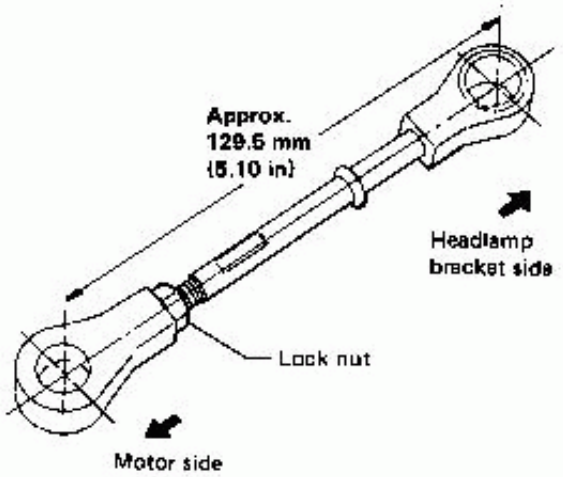
Assembly

1. Set the headlamp motor to "CLOSE" position.
- Connect harness to headlamp motor and set retract switch to "CLOSE". Headlamp motor can now be set to "DOWN" with retract switch.
2. Assemble headlamp motor to the headlamp bracket.
3. Assemble the link A to the headlamp motor as shown below.



SEL186E

4. Assemble link B to link A and the headlamp bracket.
- If the lock nut on link B has been loosened, confirm that link B is the length shown below, then tighten lock nut firmly.



SEL187E

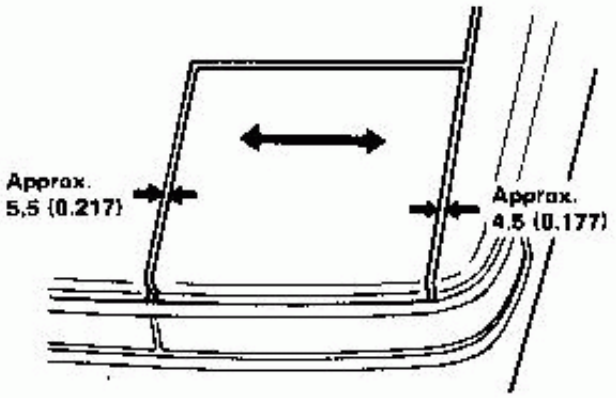
Installation and Adjustment

1. Install headlamp bracket to body temporarily and check right-left alignment.

1) Cover headlamp bracket with lid and turn motor manual knob to close headlamp.

Before doing this, be sure to disconnect battery ground cable.

2) Determine headlamp bracket location on body so that right-left alignment between lid, hood, and fender is as shown below.



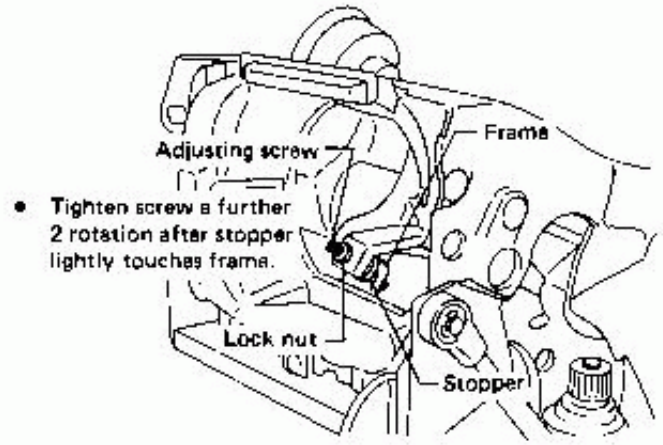
Unit: mm (in)

SEL188E

3) After adjusting right-left alignment, remove lid and tighten headlamp bracket securely to body.

2. Adjust stopper.

1) Loosen lock nut on stopper.
2) Turn motor manual knob to open headlamp assembly completely.
3) Adjust stopper screw.



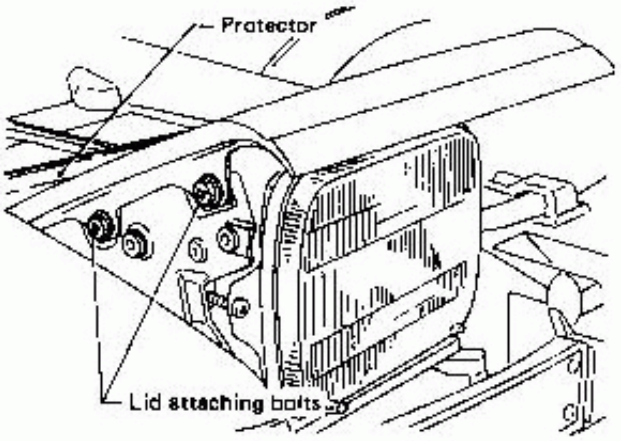
SEL189E

Installation and Adjustment (Cont'd)

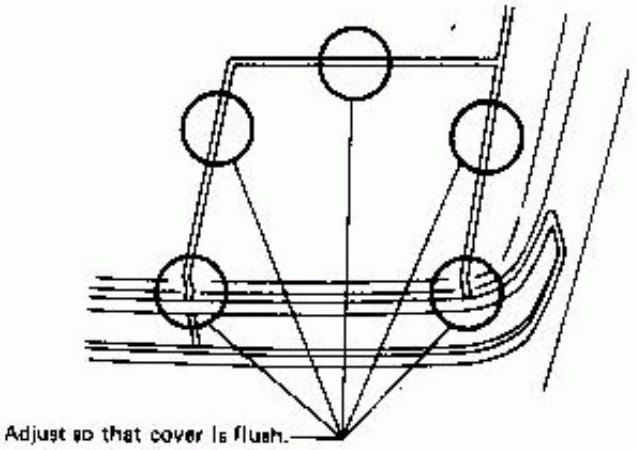
3. Adjust lid alignment.

- 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 protector.
Before starting adjustment, be sure that battery ground cable is disconnected.



SEL190E



SEL191E

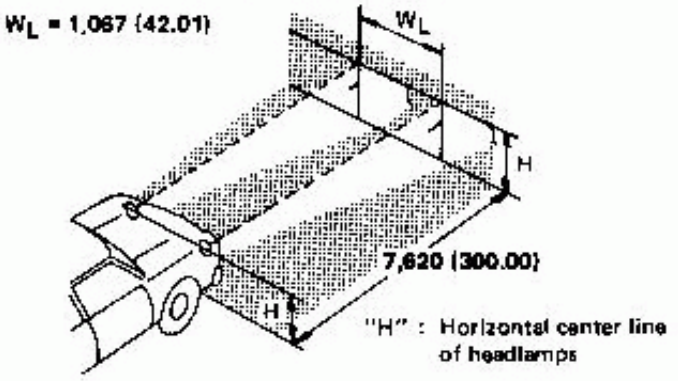
Aiming Adjustment

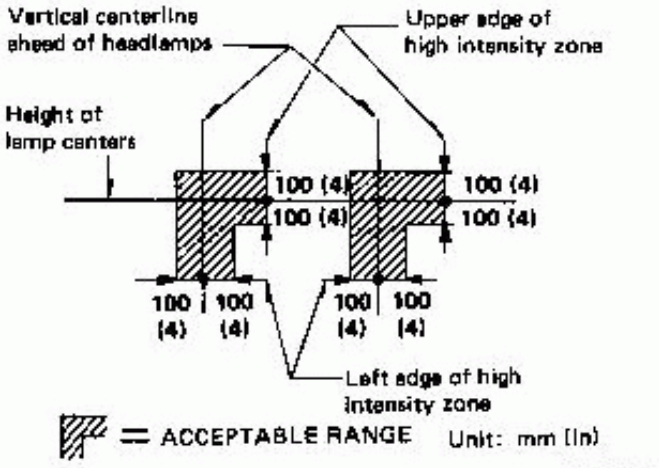
When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. For operating instructions of any aimer, it should be in good repair, calibrated and used according to respective operation manuals supplied with the unit.
If any aimer is not available, aiming adjustment can be done as follows:

For details, refer to the regulations in your own country.

CAUTION:

a. **Keep all tires inflated to correct pressures.**
b. **Place vehicle and tester on one and same flat surface.**
c. **See that there is no load in vehicle (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).**



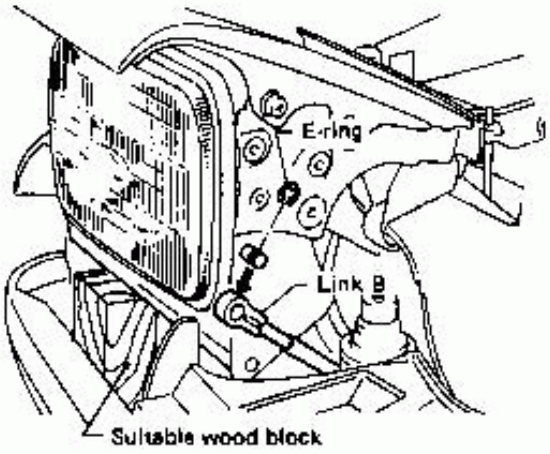


SEL914D

- **Adjust headlamps so that upper edge and left edge of high intensity zone are within the acceptable range as shown in the figure above.**
- **Dotted lines in illustration show center of headlamp.**

Headlamp Motor Check

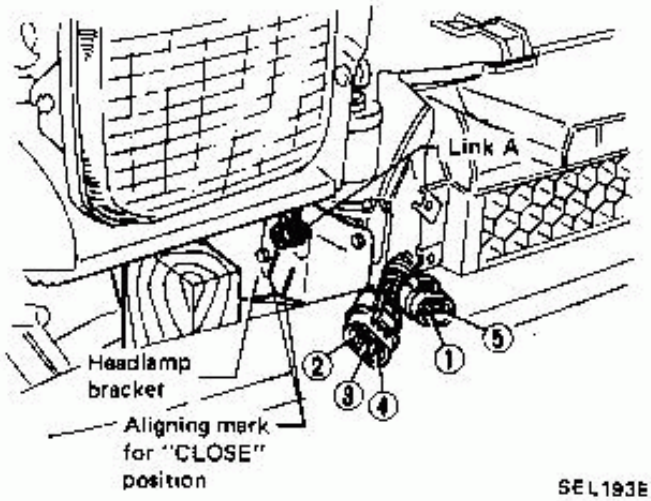
1. Disconnect battery ground cable.
2. Fully open the headlamp with motor manual knob.
3. Remove headlamp finisher and front combination lamp.
4. Support headlamp bracket with a suitable block of wood from below.
5. Remove E-ring, and link B from headlamp bracket.



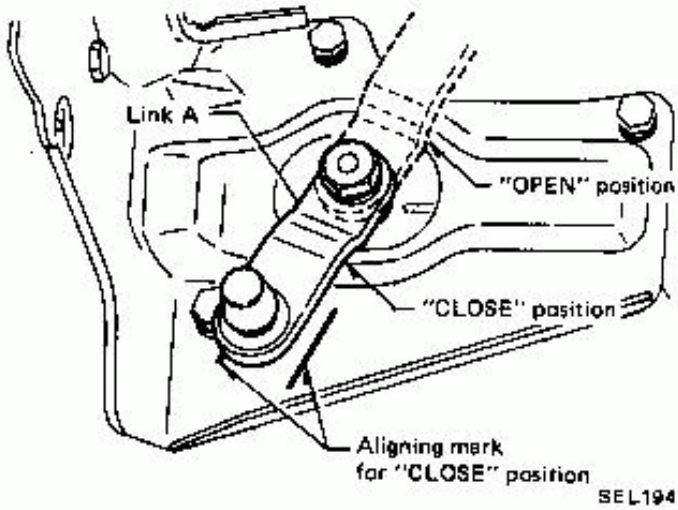
SEL192E

6. Use an ohmmeter to check for continuity in headlamp motor circuit while rotating motor with manual knob.

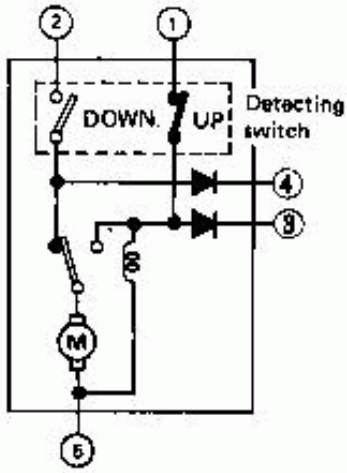
Link A position	Ohmmeter probe (+)	Ohmmeter probe (−)	Continuity
"CLOSE"	①	⑤	YES
	②	⑤	NO
	①	③	NO
	③	①	YES
"OPEN"	①	⑤	NO
	②	⑤	YES
	②	④	NO
	④	②	YES



SEL193E



SEL194E

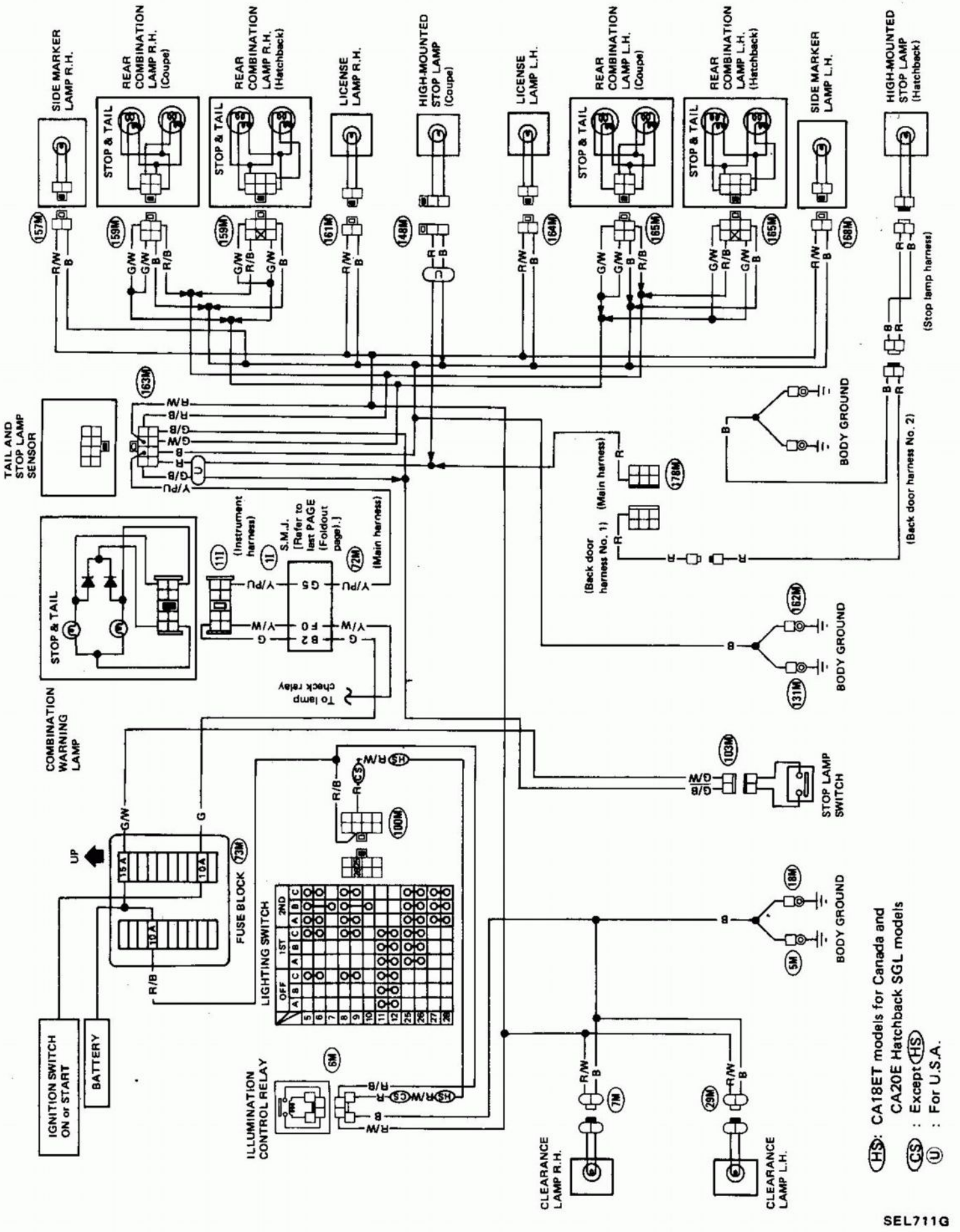


SEL195E

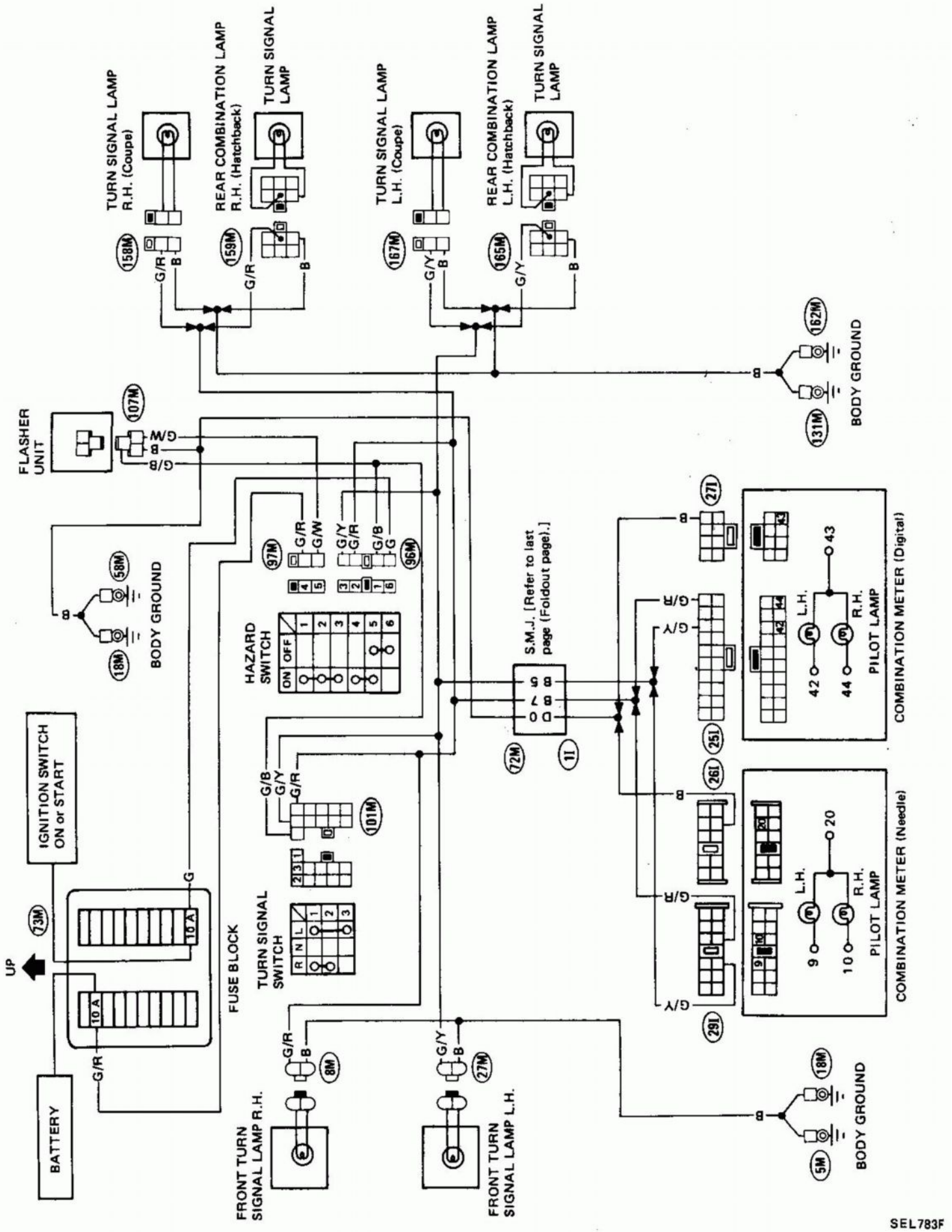
- Detecting switch position:

Link A position	UP switch	DOWN switch
"OPEN"	OFF	ON
"CLOSED"	ON	OFF
Between "OPEN" and "CLOSED"	ON	ON

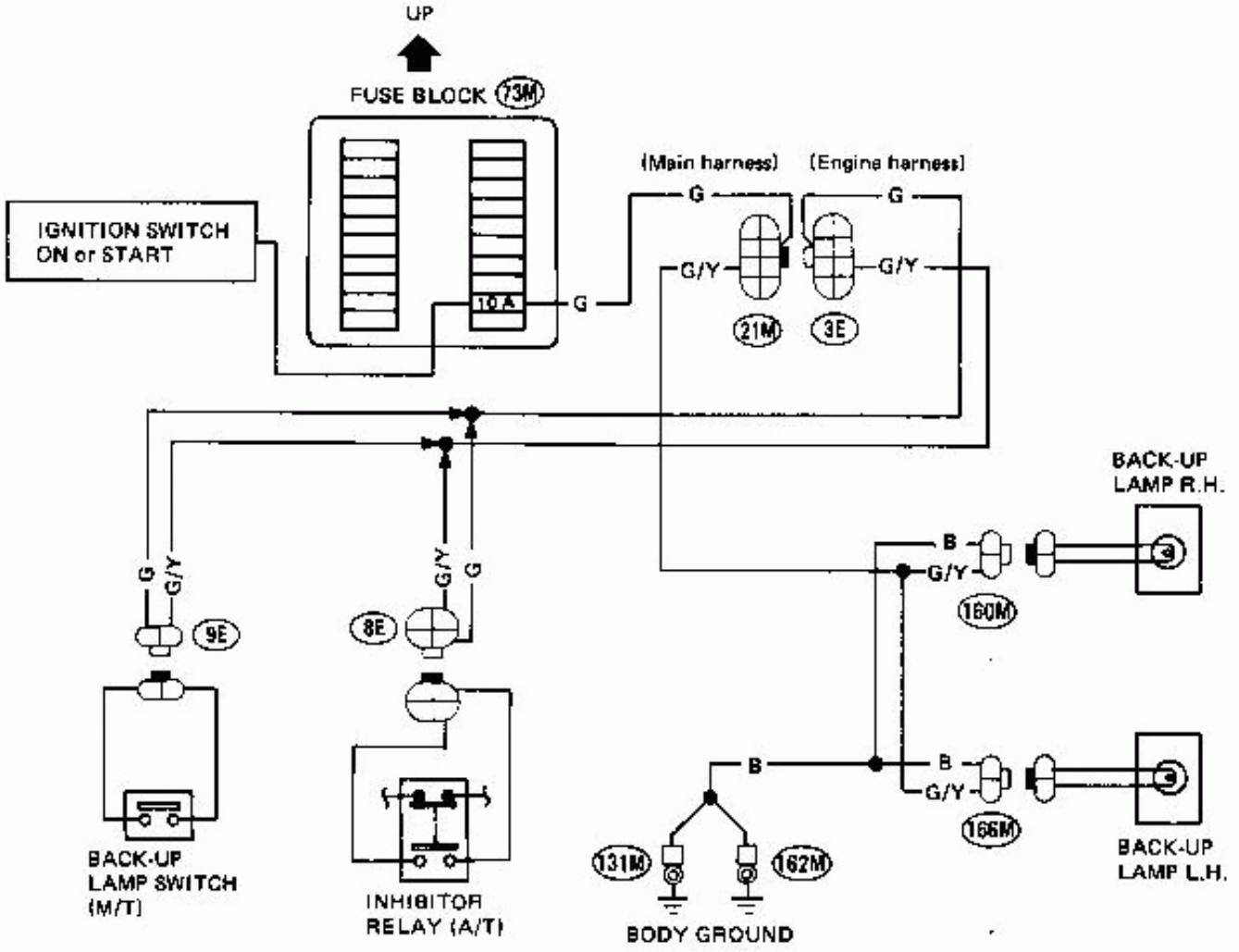
Clearance, License, Tail and Stop Lamps/Wiring Diagram



Turn Signal and Hazard Warning Lamp/Wiring Diagram



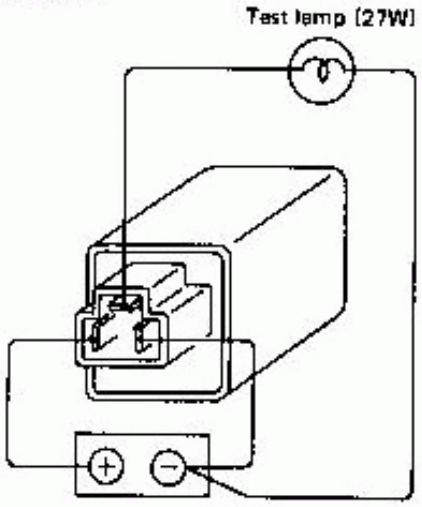
Back-up Lamp/Wiring Diagram



SEL784F

Combination Flasher Unit Check

The flasher unit is working normally if test lamp blinks when battery and test lamp are connected as shown below.



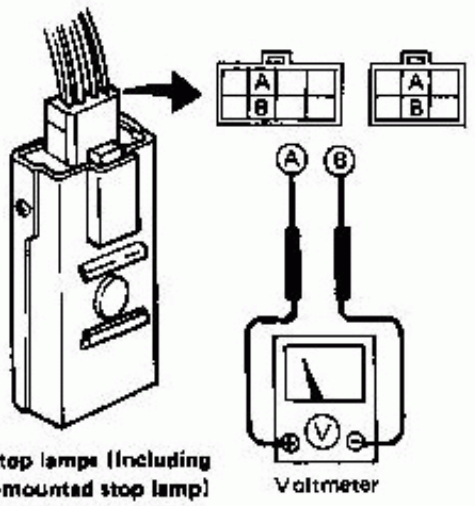
SEL199E

Stop and Tail Lamp Sensor Check

- Before checking, ensure that bulbs conform to specifications.

STOP LAMP

Start engine.
Stop lamp switch on. (Depress brake pedal)

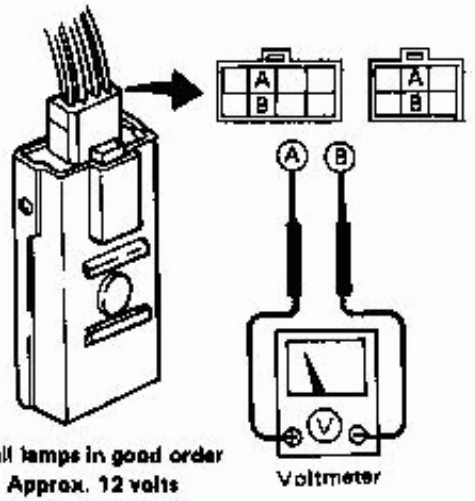


All stop lamps (including high-mounted stop lamp)
... Approx. 12 volts
At least one of stop lamps (including high-mounted stop lamp) removed
... Approx. 1 volt

SEL898G

TAIL LAMP

Start engine.
Lighting switch on.



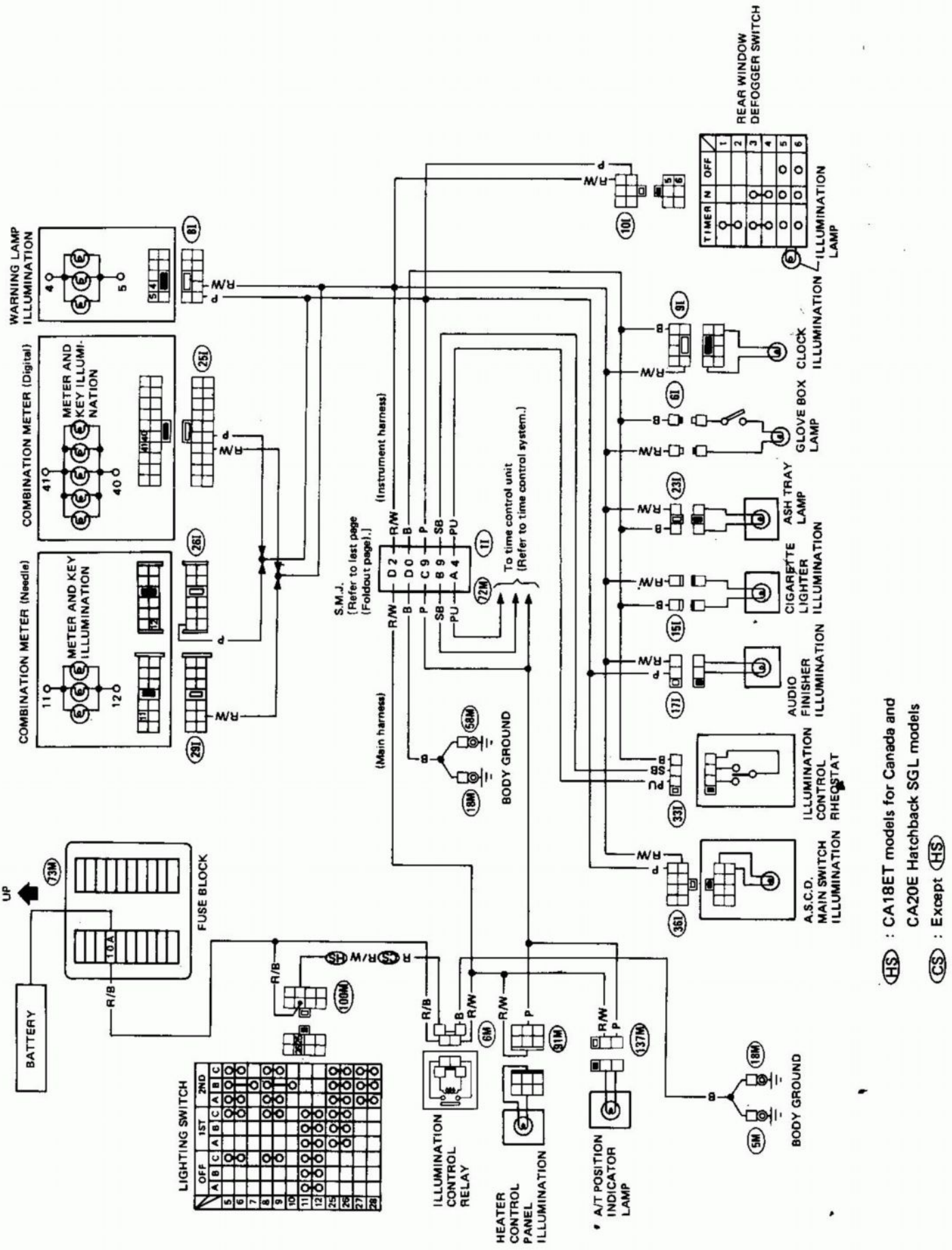
All tail lamps in good order
... Approx. 12 volts
At least one of tail lamps removed
... Approx. 1 volt

SEL898G

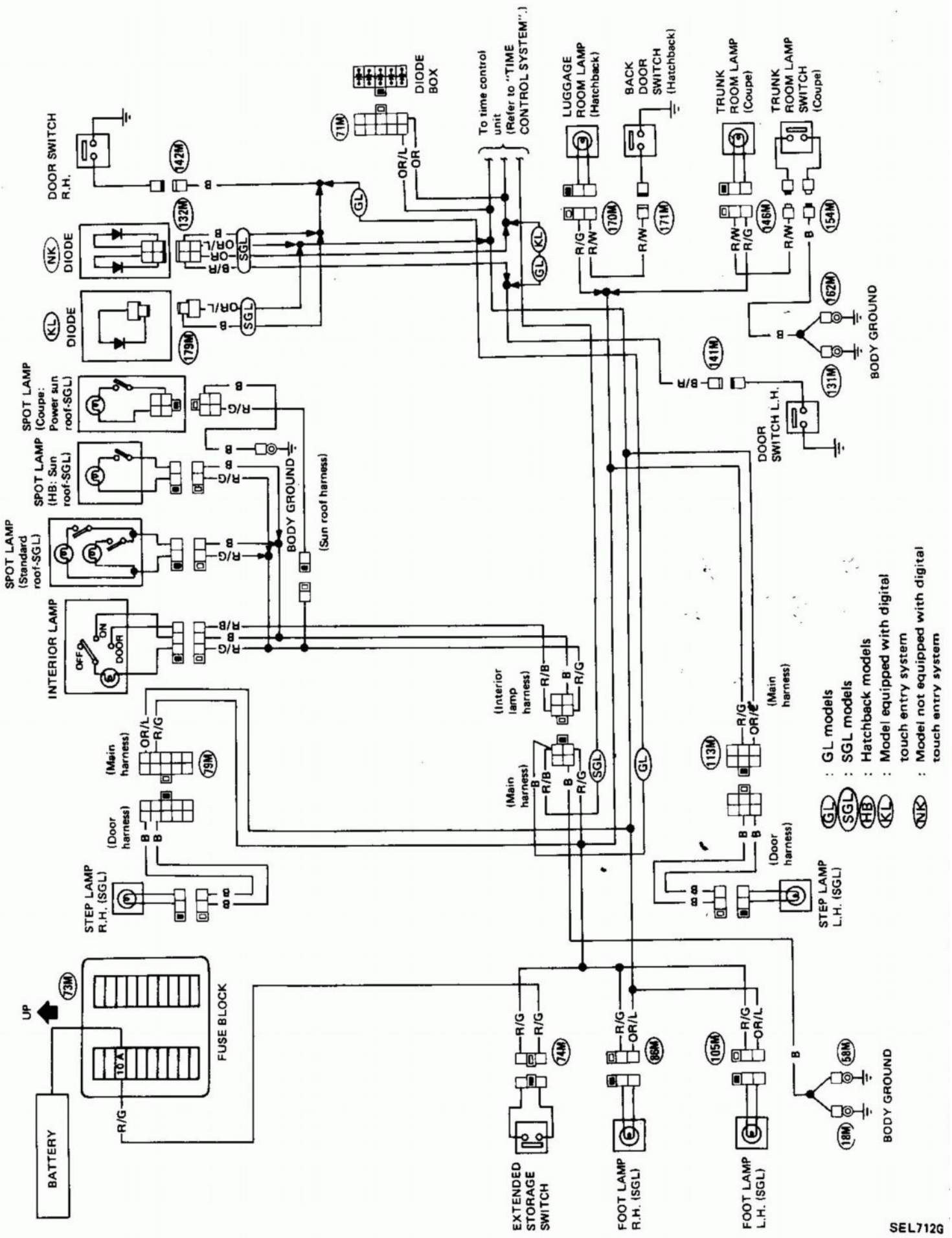
Bulb Specifications

Item	Wattage (W)	Bulb No.
Headlamp	65/35	H6054
Front turn signal lamp	27	1156
Front side marker lamp	3.8	194
Rear side marker lamp	3.8	194
Rear combination lamp		
Turn signal	27	1156
Stop/Tail	27/8	1157
High-mounted stop lamp	27	1156
Back-up lamp	27	1156
License plate lamp	10	–
Interior lamp	10	–
Spot lamp	5	–
Rear (luggage) compartment lamp	5	–
Trunk compartment lamp	3.4	158
Step lamp	3.4	158
Glove box lamp	3.4	158
Foot lamp	3	–

Illumination/Wiring Diagram

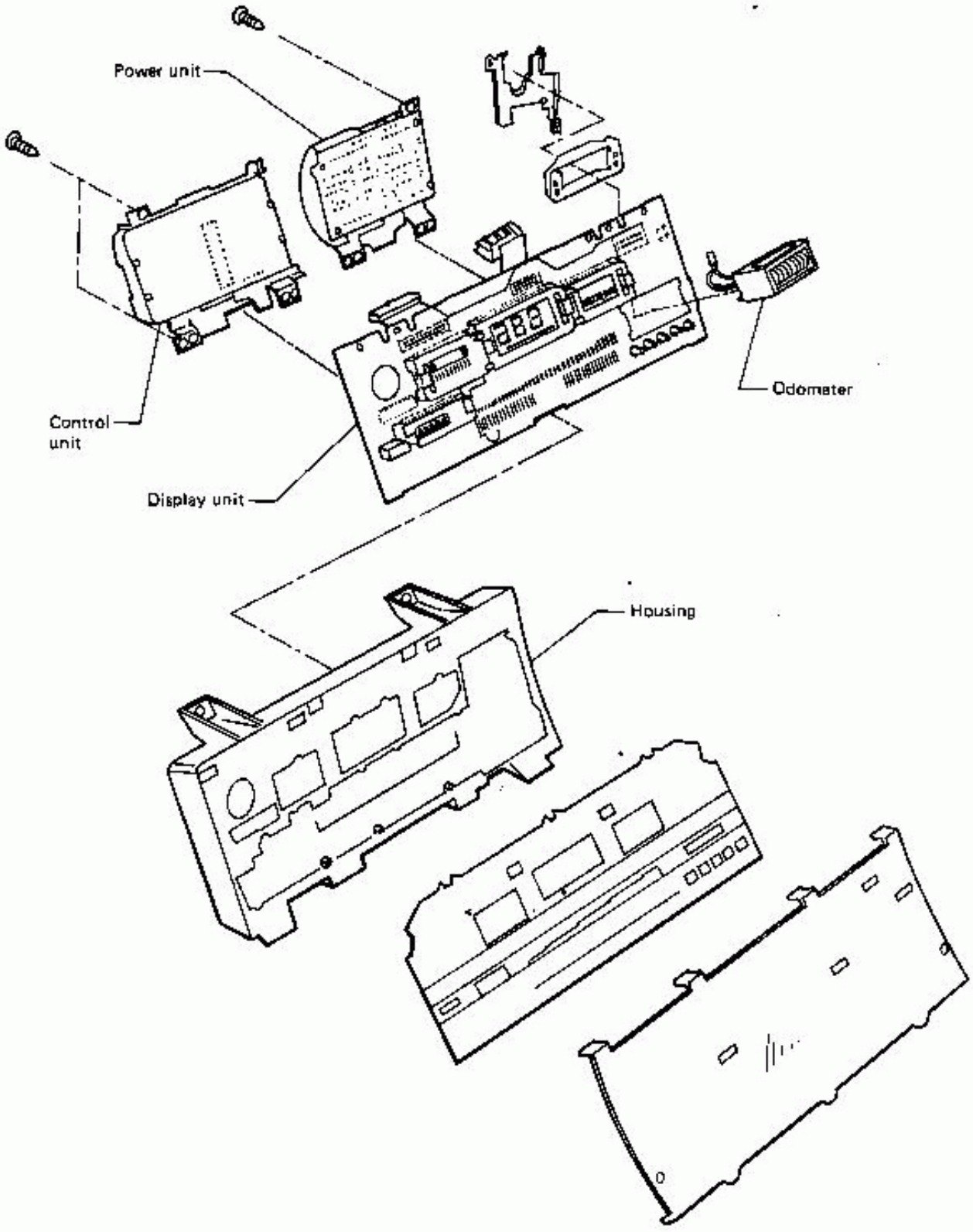


Interior, Luggage, Foot, Step and Spot Lamps/Wiring Diagram



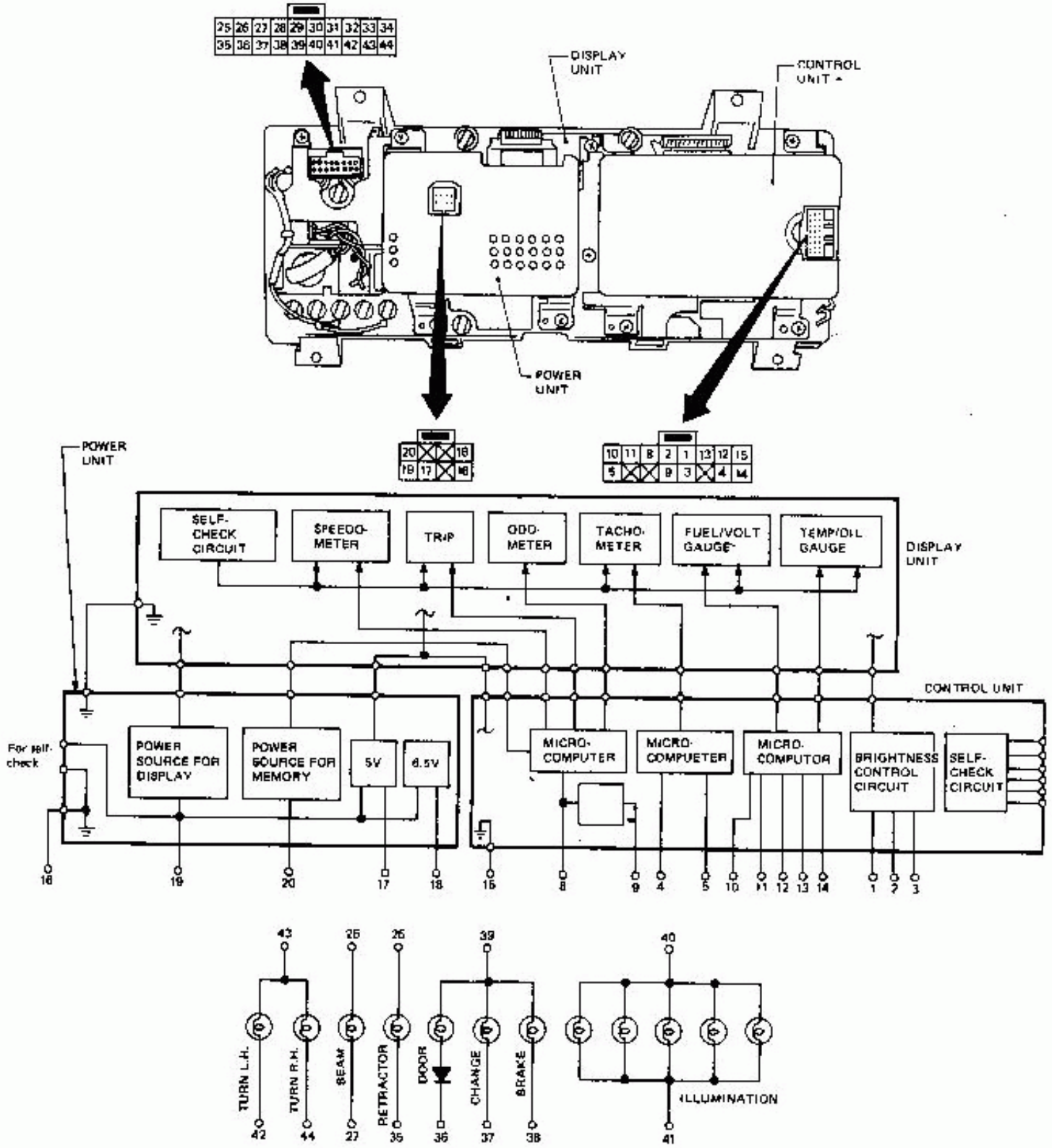
Combination Meter

CAUTION:
No electrical terminal should be touched with bare hands.



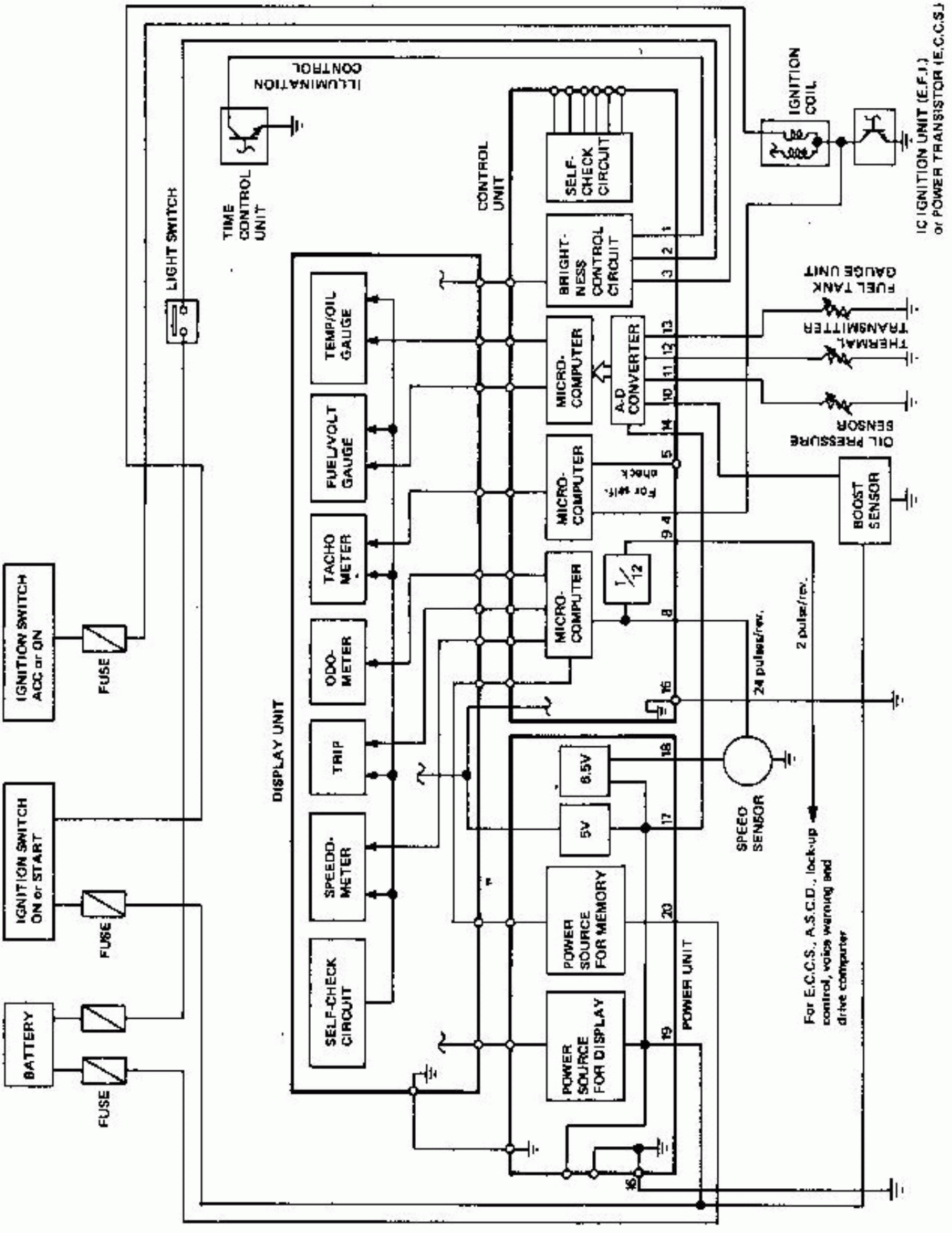
SEL203E

Combination Meter (Cont'd)



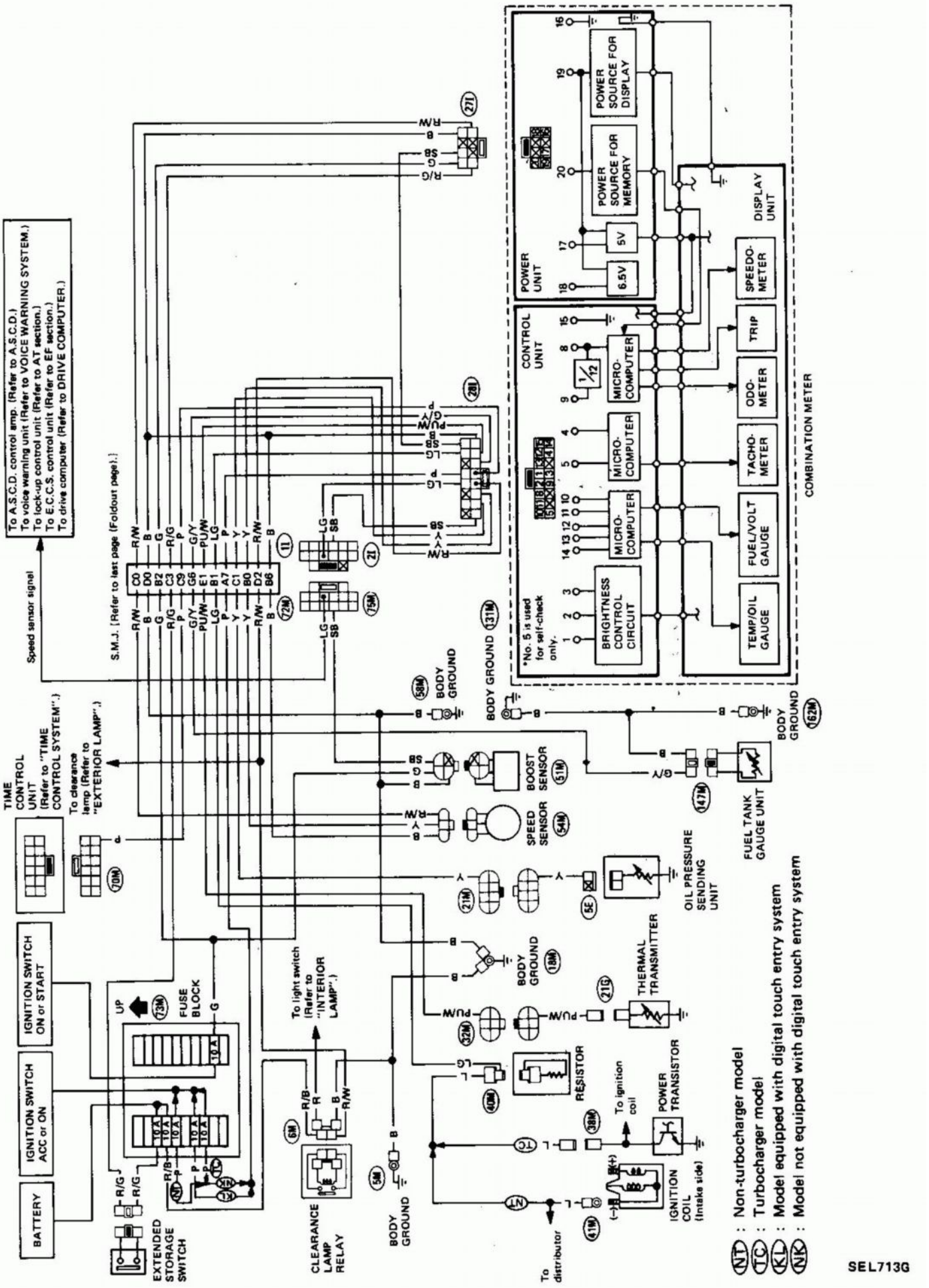
SEL204E

Schematic



SEL205E

Wiring Diagram



Self-check

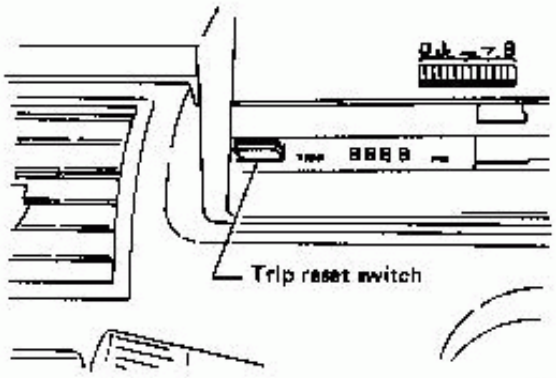
Digital type combination meter consists of three units: a control unit, power unit, and display unit. These units can be replaced separately.
In order to judge if there is a defect in the meter and which unit is malfunctioning, trouble-shooting should be performed by using the following three types of self-check functions built into the meter.

For details, refer to "Trouble-shooting".

SEGMENT CHECK

This is used to check for an open circuit in each segment of the display and a short circuit between segments.

(1) While pushing trip reset switch, switch ignition switch from "OFF" to "ON". Trip reset switch should remain pushed in until self-check operation start.
(2) Meter starts to automatically perform self-check. Segments for meters and gauges should illuminate one after another.
(3) If any particular segment remains off, combination meter itself is faulty.



SEL207E

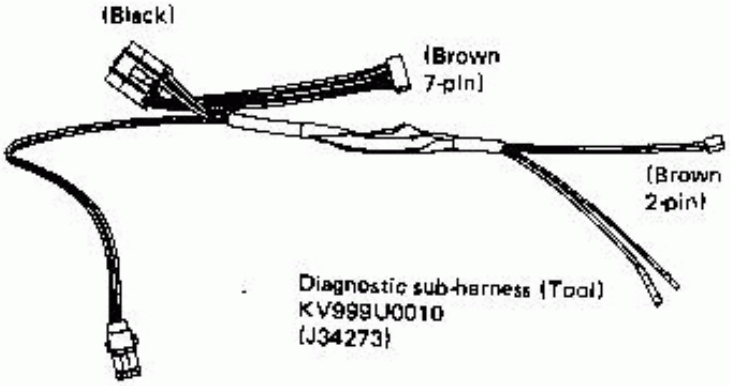
A segment check will be cancelled and the normal display restarted in the following cases:

- **If the vehicle has operated during the segment-check.**
- **If a series of segment-check items have been completed.**

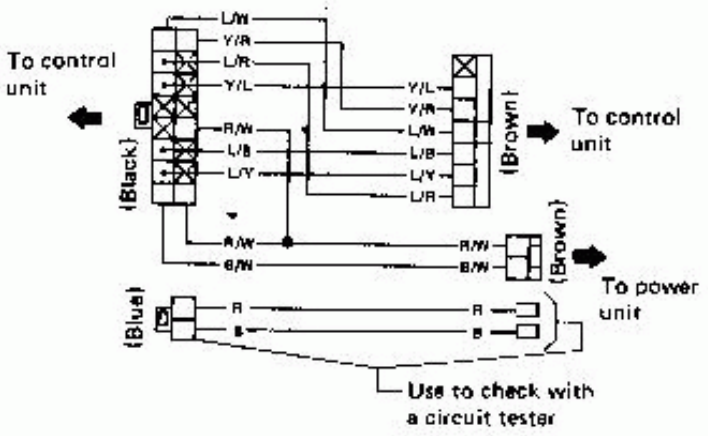
PRE-PROGRAMED SIGNAL CHECK

This is used to check for a defect in the meter.

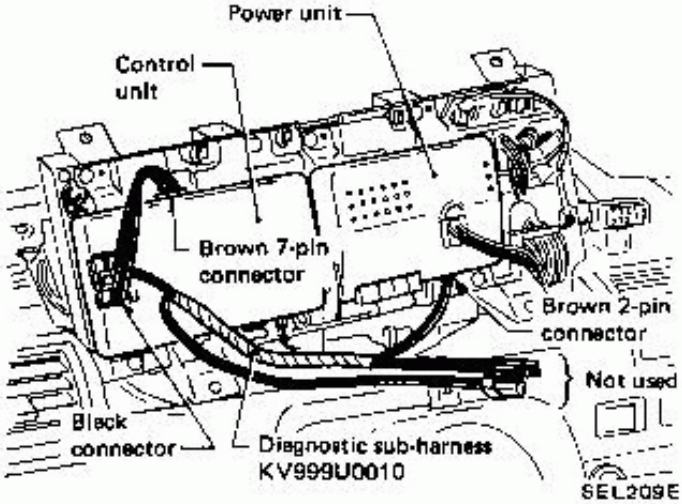
(1) Turn the ignition switch off.
(2) Remove combination meter.
(3) Disconnect only the harness connector which is connected to the control unit. Leave harness connector connected to power unit.
(4) Connect a self-checking tool (Diagnostic sub-harness) to meter as shown below.



SEL350E



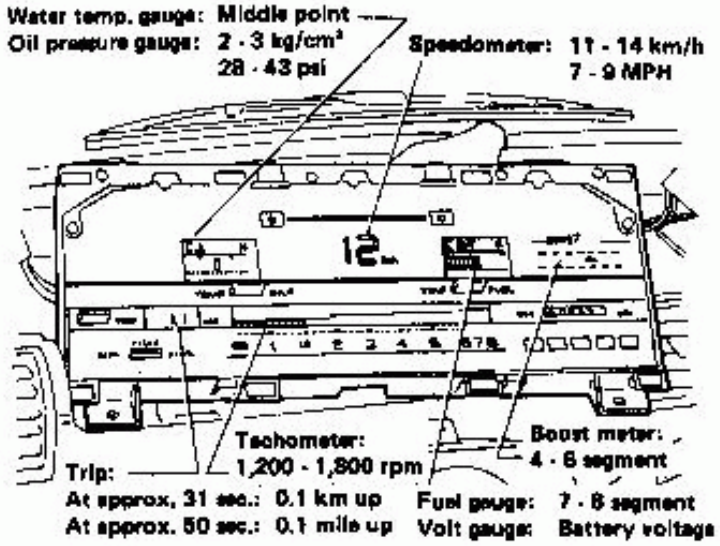
SEL208E



SEL209E

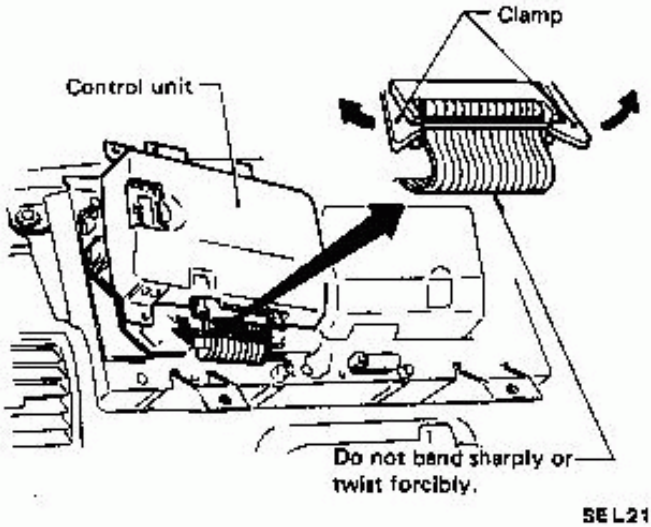
Self-check (Cont'd)

(5) Turn the ignition switch to "ON".
(6) If a display such as the following figure appears on meter, the results of the pre-programed signal check are satisfactory.

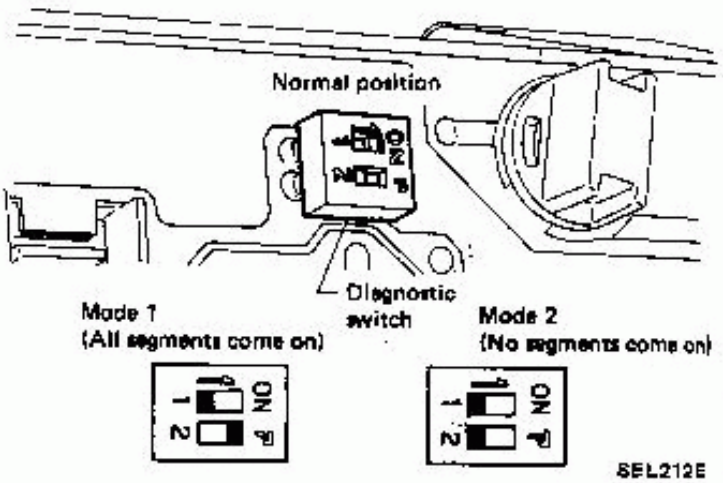


DISPLAY UNIT CHECK

This is used to check for a defect in display unit.
(1) Turn the ignition switch OFF.
(2) Remove combination meter.
(3) Remove control unit from the meter, and then disconnect the harness connector between control unit and display unit.



(4) Connect the vehicle harness connectors to the power unit and the display unit, if disconnected.
(5) Turn the ignition switch to ON.
(6) Turn diagnostic switch on the back of display unit to mode 1 and see if all display segments come on.
(7) Then, turn diagnostic switch to mode 2 to see if all segments go out.



(8) If none of the segments remains off in mode 1 or remain on in mode 2, display unit is in good condition.
(9) After checks are completed, return diagnostic switch to normal position.

METER AND GAUGES —Digital Type

Trouble-shooting —Quick Reference Table—

The following Quick Reference Table lists various combination meter troubles and self-checks and voltage or resistance checks to be made.
For trouble-shooting procedures, refer to the pertinent flow charts on the pages that follow this Table.

Reference flow chart number		Trouble Condition	Check item				
			Self-check			Volt/ohm check	
			Segment check	Display unit check	Pre-programed signal check	Meter side	Vehicle harness side
Speedometer	1	Always indicates zero "0"			○	○	○
	2	Indication error is noted			○		
	3	Indicated value changes irregularly			○		○
	4	All segments become illuminated		○		○	
	5	All segments fail to illuminate		○		○	
	6	Sometimes indicates zero "0"			○		○
Tachometer	7	Will not operate		○	○	○	○
	8	All segments remain illuminated		○			
	9	Display sometimes goes not			○		○
Multiple gauges	10	All segments remain illuminated		○		○	
	11	All segments fail to illuminate		○		○	
	12	Only fuel gauge will not function			○		○
	13	Fuel gauge does not reach "Full"	○				○
	14	Only water temp. gauge will not function			○		○
	15	Only oil pressure gauge will not function			○		○
	–	Only volt gauge will not function	Replace control unit				
Others	16	Boost gauge will not function		○	○		○
	17	Trip meter will not function		○		○	
	18	Odometer will not function				○	
	19	All display segments fail to illuminate		○		○	○
	20	Illumination control fails to function					○
	21	All displays are dark			○		
	22	Uneven brightness	Readjust with brightness adjusting volume				
	23	Extra segments become illuminated or some fail to illuminate	○				

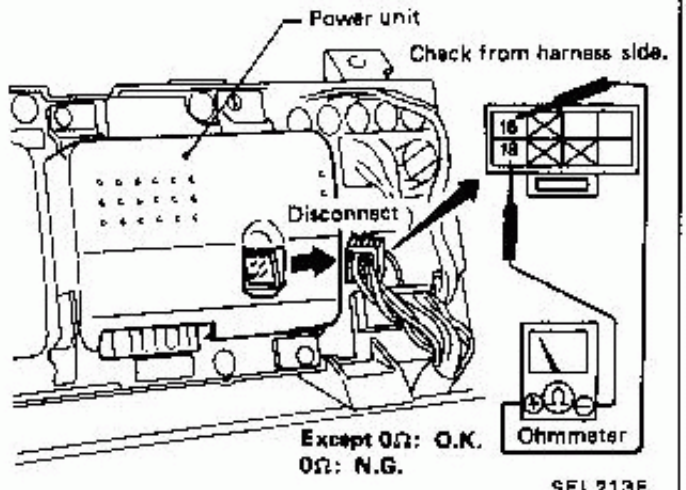
Trouble-shooting Flow Chart —Speedometer—

1. ALWAYS INDICATES ZERO "0"

Make pre-programed signal check. (Refer to "Self-Check".)

- O.K. → Go to "Power Unit Check" to check power unit output voltage for speed sensor. (Between terminals ⑱ and ⑯).
  - O.K. → Go to "Speed Sensor Signal Check" to check speed sensor output.
    - O.K. → Check speedometer cable.
    - N.G. → Check harness between meter and speed sensor.
      - O.K. → Replace speed sensor.
  - N.G. → Check if power unit and speed sensor connecting harness is short-circuited.
    - O.K. → Replace power unit.
    - N.G. → Repair harness and replace power unit.
- N.G. → Replace control unit.

1. Disconnect harness connector from power unit.
2. Check continuity between terminals ⑱ and ⑯ of harness connector to power unit.



2. INDICATION ERROR IS NOTED

Make pre-programed signal check. (Refer to "Self-Check".)

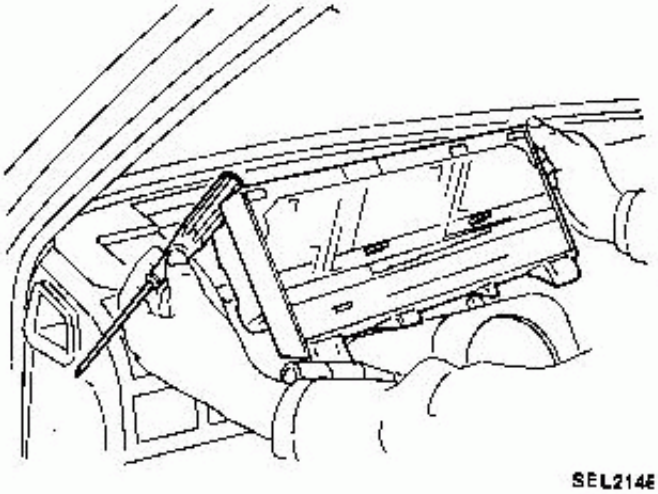
- O.K. → Replace speed sensor.
- N.G. → Replace control unit.

3. INDICATED VALUE CHANGES IRREGULARLY

To see if display changes, lightly tap on control unit and display unit with screwdriver while making pre-programed signal check.

- O.K. → Check harness between meter and speed sensor.
  - O.K. → Replace speed sensor.
  - N.G. → Replace control unit.
- N.G. → Replace control unit.

(1) For pre-programed signal check procedure, refer to "Self-Check".
(2) Lightly tap on corners of control unit and display unit with screwdriver while watching meter display.
(3) If no change occurs, speedometer circuit is in good order.



Trouble-shooting Flow Chart —Speedometer— (Cont'd)

4. ALL SEGMENTS BECOME ILLUMINATED

Make display unit check. (Refer to "Self-Check".)

O.K. → Replace control unit.

N.G. → Go to "Power Unit Check" to check power unit output voltage for display. (Between terminal (GND) and (VDM))

- O.K. → Replace display unit.
- N.G. → Replace power unit.

5. ALL SEGMENTS FAIL TO ILLUMINATE

Make display unit check. (Refer to "Self-Check".)

O.K. → Replace control unit.

N.G. → Go to "Power Unit Check" to check power unit output voltage for speedometer. (Between terminals (F1) and (F1))

- O.K. → Replace display unit.
- N.G. → Replace power unit.

6. SOMETIMES INDICATES ZERO "0"

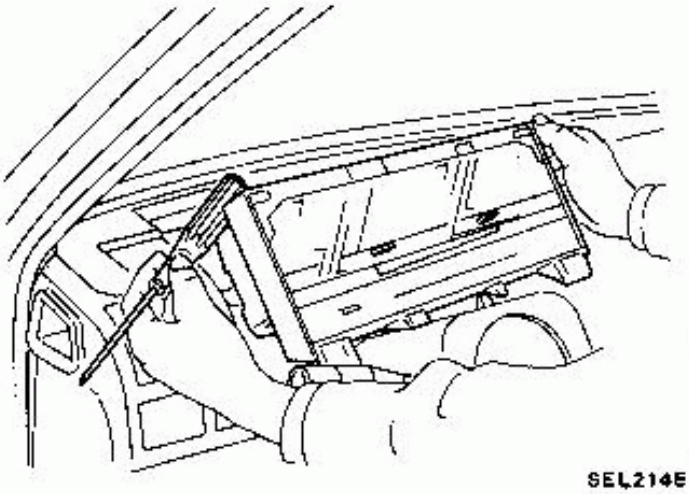
While making pre-programed signal check, lightly tap on control unit and display unit with screwdriver to see if display changes.

O.K. → Check harness between meter and speed sensor.

- O.K. → Replace speed sensor.
- N.G. → Replace control unit.

N.G. →

(1) For pre-programed signal check procedure, refer to "Self-Check".
(2) Lightly tap on corners of control unit and display unit with screwdriver.
(3) If no change occurs, tachometer circuit is in good order.



SEL214E

Trouble-shooting Flow Chart —Tachometer—

7. WILL NOT OPERATE

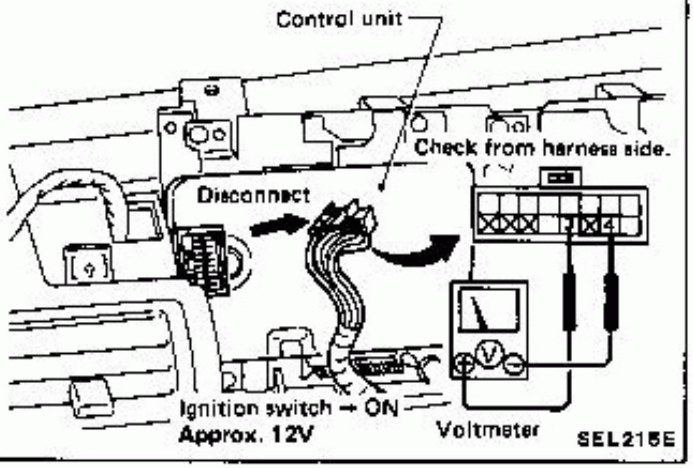
Make pre-programed signal check. (Refer to "Self-Check".)

- O.K. → Check ignition signal circuit.
- N.G. → Make display unit check. (Refer to "Self-Check".)
  - O.K. → Replace control unit.
  - N.G. → Go to "Power Unit Check" to check power unit output voltage for tachometer. (Between terminals (VDL) and (GND))
    - O.K. → Replace display unit.
    - N.G. → Replace power unit.

Check ignition signal circuit.

- O.K. → Replace control unit.
- N.G. → Check resistor and harness between meter and ignition coil.

- Check terminal voltage between ⑨ and ④ of harness connector for control unit.



8. ALL SEGMENTS REMAIN ILLUMINATED

Make display unit check. (Refer to "Self-Check".)

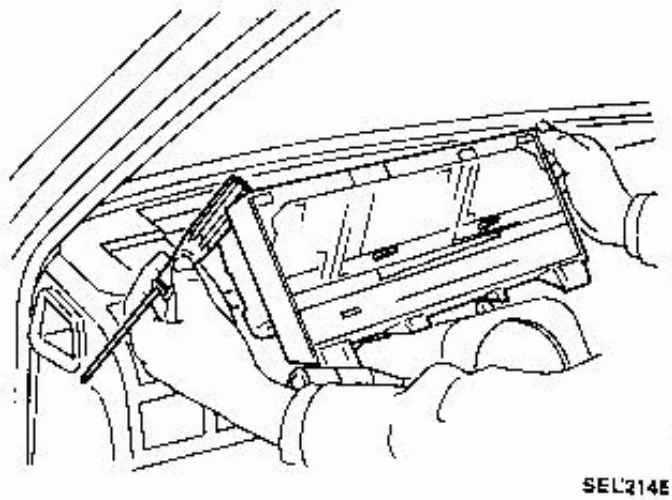
- O.K. → Replace control unit.
- N.G. → Replace display unit.

9. DISPLAY SOMETIMES GOES OUT

While making pre-programed signal check, lightly tap on control unit and display unit with screwdriver to see if display changes.

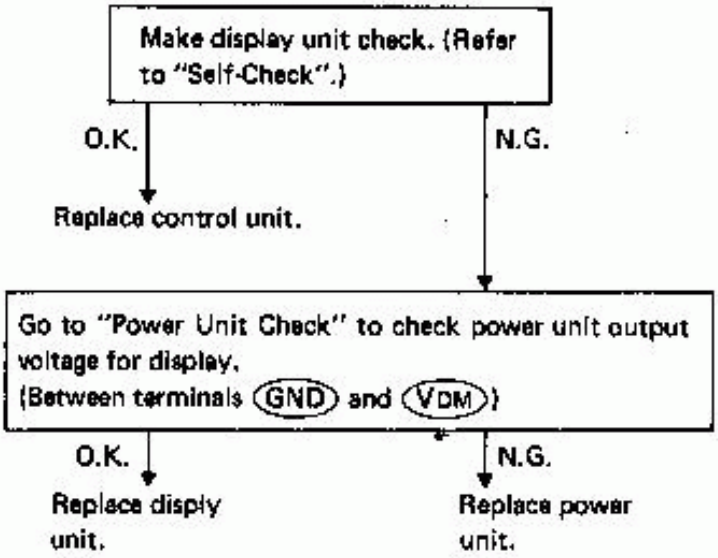
- O.K. → Check resistor and harness between meter and ignition coil.
- N.G. → Replace control unit.

(1) For pre-programed signal check procedure, refer to "Self-Check".
(2) Lightly tap on corners of control unit and display unit with screwdriver.
(3) If no change occurs, tachometer circuit is in good order.

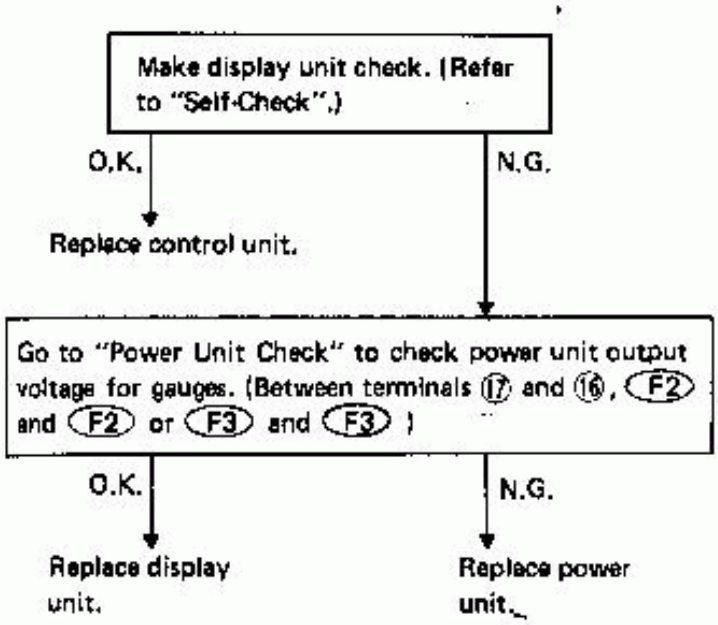


Trouble-shooting Flow Chart —Multiple Gauges—

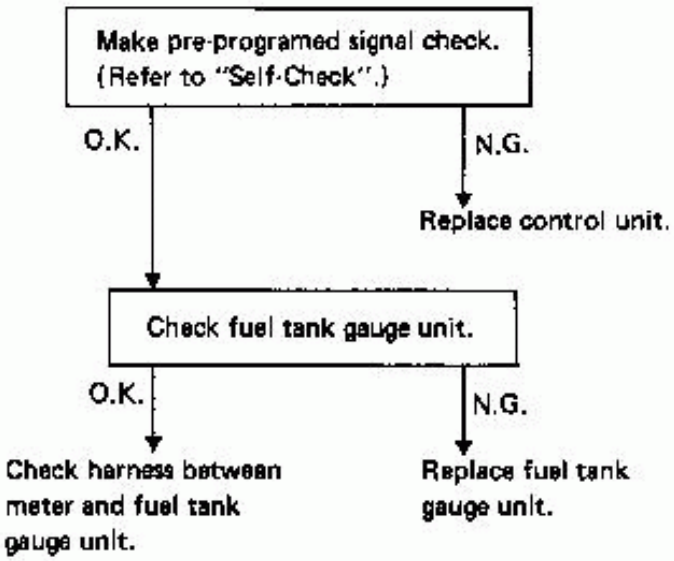
10. ALL SEGMENTS REMAIN ILLUMINATED



11. ALL SEGMENTS FAIL TO ILLUMINATE



12. ONLY FUEL GAUGE WILL NOT FUNCTION



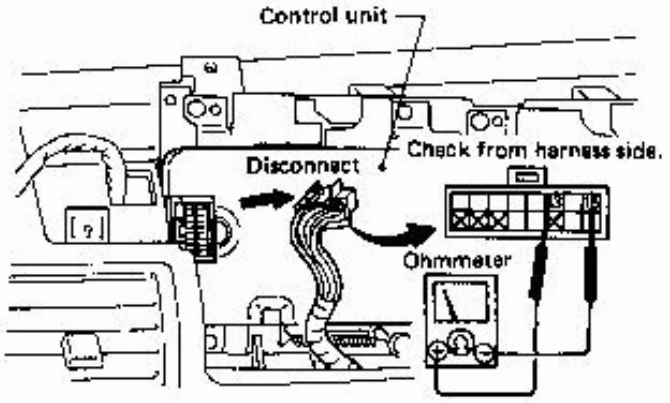
Trouble-shooting Flow Chart —Multiple Gauges— (Cont'd)

13. FUEL GAUGE DOES NOT REACH "FULL"

Check if all segments of fuel gauge light up when fuel tank is filled with fuel.

- YES → No trouble
- NO → Make segment check. (Refer to "Self-Check".)
  - O.K. → Measure resistance of fuel tank gauge unit.
    - O.K. → Replace control unit.
    - N.G. → Check fuel tank gauge unit.
  - N.G. → Replace display unit.

(1) Turn ignition switch OFF.
(2) Remove combination meter.
(3) Disconnect harness connector from control unit.
(4) Measure resistance between terminals ⑬ and ⑮



Remaining fuel	Resistance
Full tank	Less than 26Ω

SEL216E

14. ONLY WATER TEMP. GAUGE WILL NOT FUNCTION

Make pre-programed signal check. (Refer to "Self-Check".)

- O.K. → Go to "Thermal Transmitter Check".
  - O.K. → Check harness between meter and thermal transmitter.
  - N.G. → Replace thermal transmitter.
- N.G. → Replace control unit.

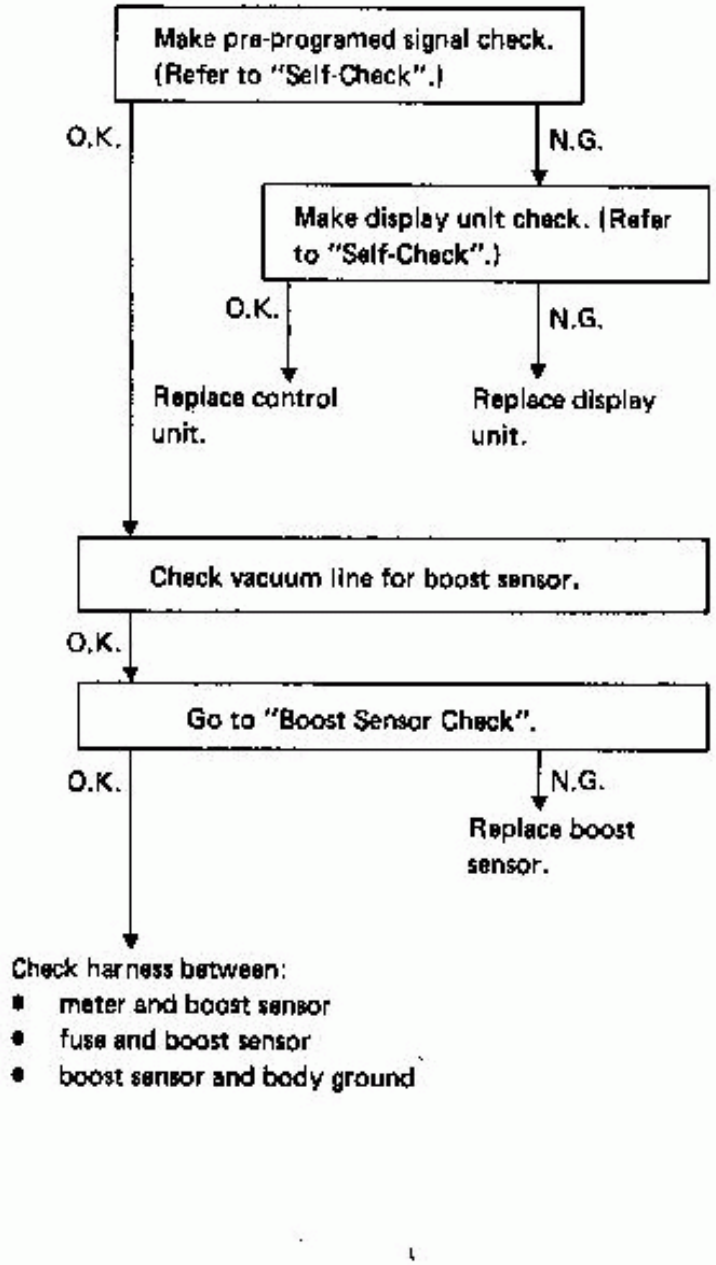
15. ONLY OIL PRESSURE GAUGE WILL NOT FUNCTION

Make pre-programed signal check. (Refer to "Self-Check".)

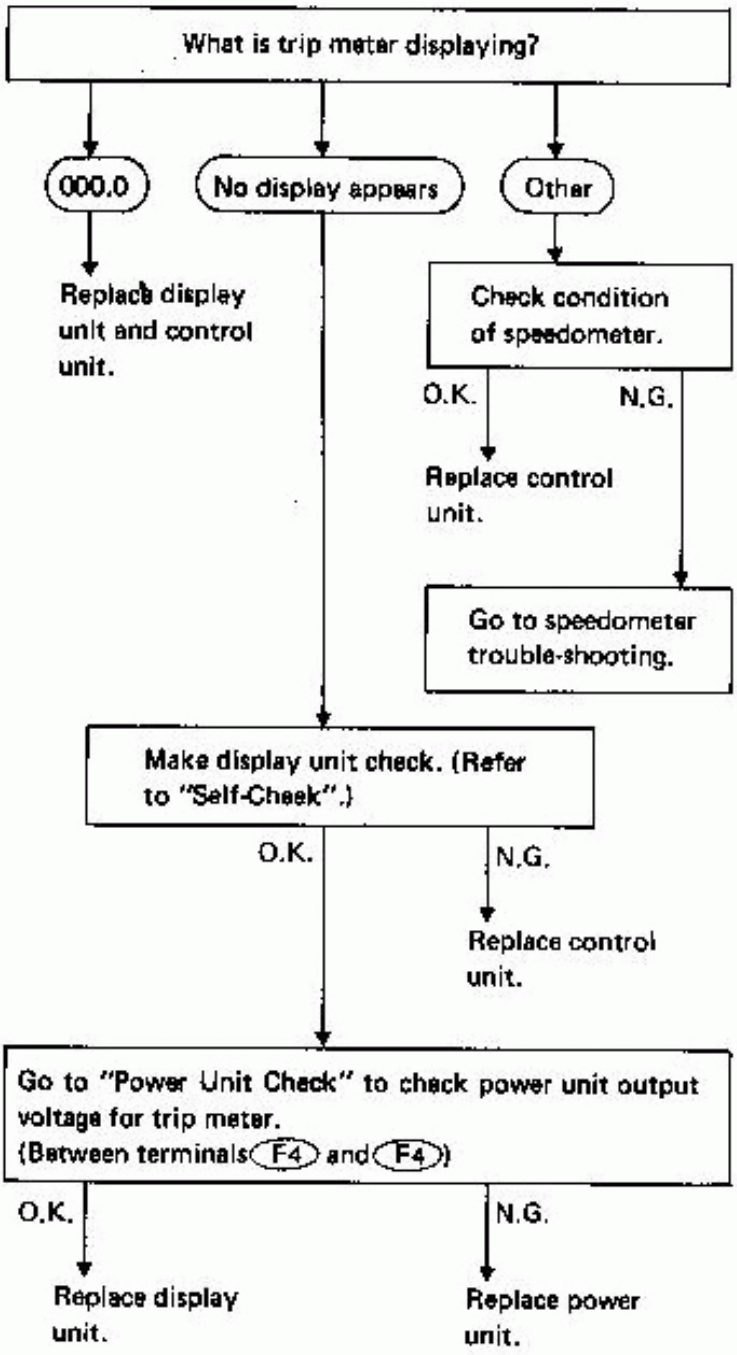
- O.K. → Go to "Oil Pressure Sending Unit Check".
  - O.K. → Check harness between meter and oil pressure sending unit.
  - N.G. → Replace oil pressure sending unit.
- N.G. → Replace control unit.

Trouble-shooting Flow Chart —Boost Gauge and Trip Meter—

16. BOOST GAUGE WILL NOT FUNCTION

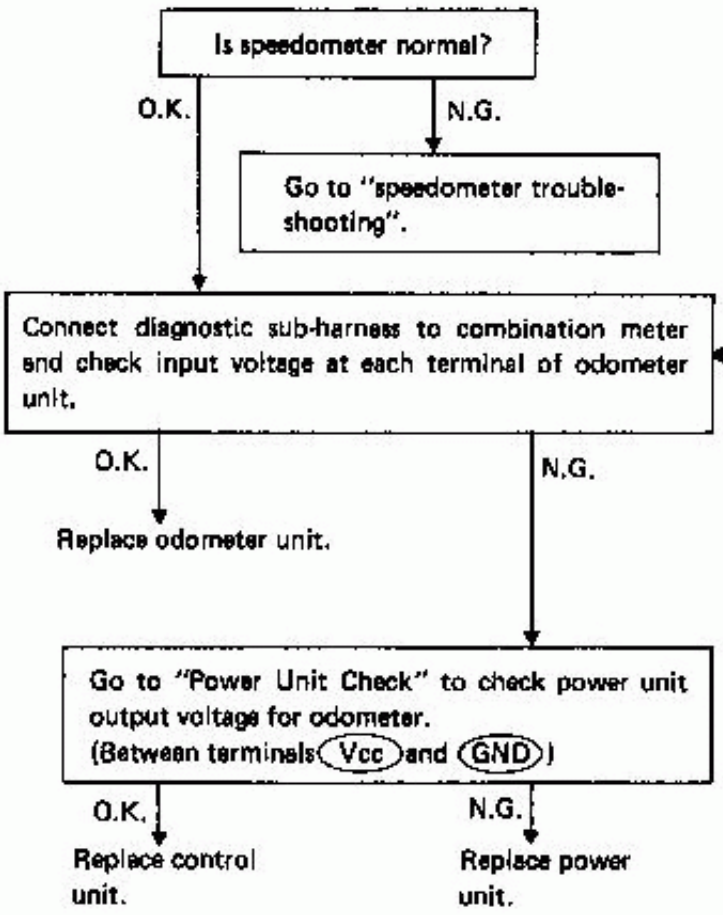


17. TRIP METER WILL NOT FUNCTION

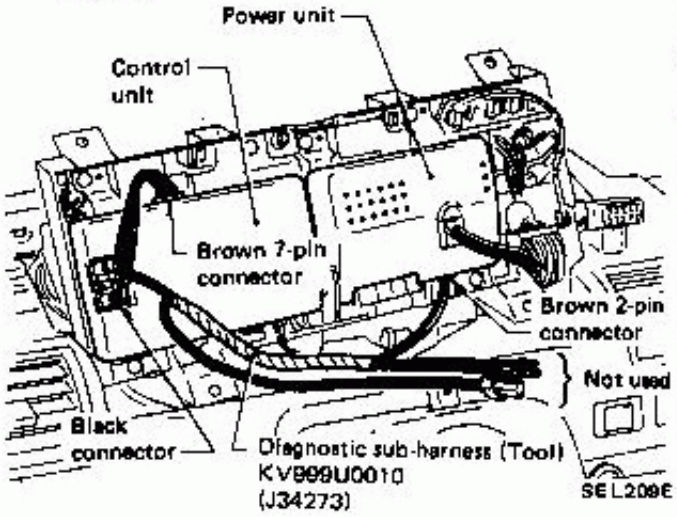


Trouble-shooting Flow Chart —Odometer—

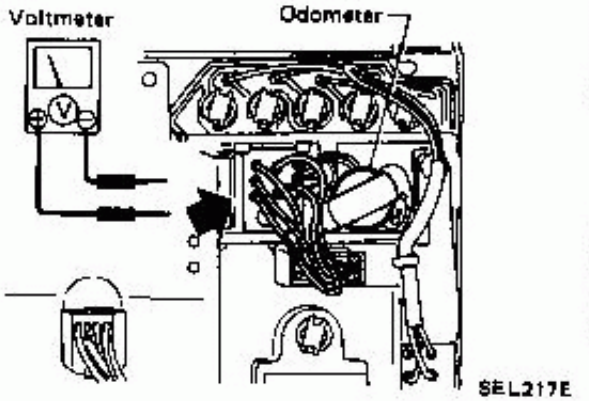
18. ODOMETER WILL NOT FUNCTION



(1) Turn the ignition switch OFF.
(2) Remove combination meter.
(3) Disconnect only the harness connector which is connected to the control unit.
Leave harness connector connected to power unit.
(4) Connect self-check tool (Diagnostic sub-harness) to combination meter as shown below.



(5) Turn ignition switch to ON.
(6) Measure voltage at each harness to the odometer unit.



	Voltmeter terminals		Measuring voltage
	(+)	(–)	
Harness color	Green	Red	Pointer swings between 0 and 4 V.
		White	
		Blue	
		Yellow	

Trouble-shooting Flow Chart —Others—

19. ALL DISPLAY SEGMENTS FAIL TO ILLUMINATE

Go to "Power Unit Check" to check power source circuit for power unit. (Between terminals ⑲ and ⑯, and ⑳ and ⑯)

O.K. → Check power source circuit for control unit. (Between terminals ③ and ⑮)

N.G. → Check harness between fuse and power unit.

O.K. → Make display unit check. (Refer to "Self-Check".)

N.G. → Check harness between fuse and control unit.

O.K. → Check power source circuit for control unit. (Between terminals ⑭ and ⑮)

N.G. → Go to "Power Unit Check" to check power unit output voltage for display unit. (Between terminals (VDD) and (GND))

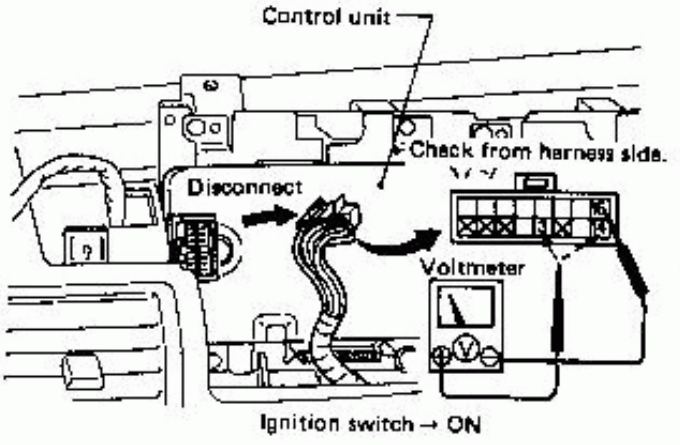
O.K. → Replace control unit.

N.G. → Replace power unit.

O.K. → Replace control unit.

N.G. → Replace power unit.

(1) Turn ignition switch OFF.
(2) Disconnect harness connector from control unit.
(3) Turn ignition switch to ON.
(4) Check terminal voltage between ③ and ⑮ or ⑭ and ⑮ .



Trouble-shooting Flow Chart —Others— (Cont'd)

20. ILLUMINATION CONTROL FAILS TO FUNCTION

Check light switch circuit.

- O.K. → Check illumination control circuit.
- N.G. → Check harness between meter control unit and light switch.

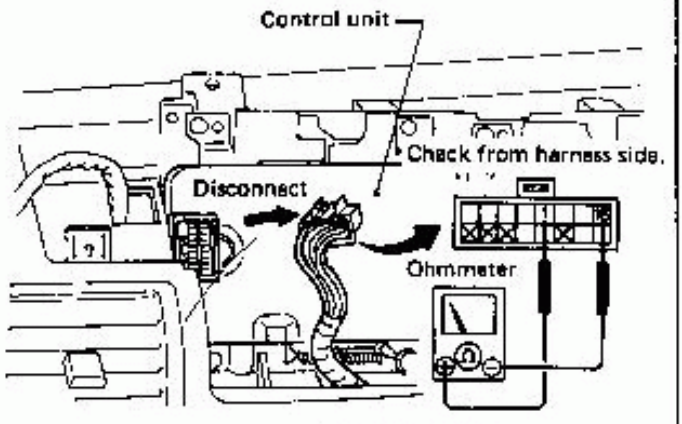
Check illumination control circuit.

- O.K. → Replace meter control unit.
- N.G. → Check if harness between meter control unit and time control unit is short-circuited.

Check if harness between meter control unit and time control unit is short-circuited.

- O.K. → Go to "TIME CONTROL SYSTEM—Trouble-shooting" for checking illumination control function.
- N.G. → Replace meter control unit and time control unit, and repair harness.

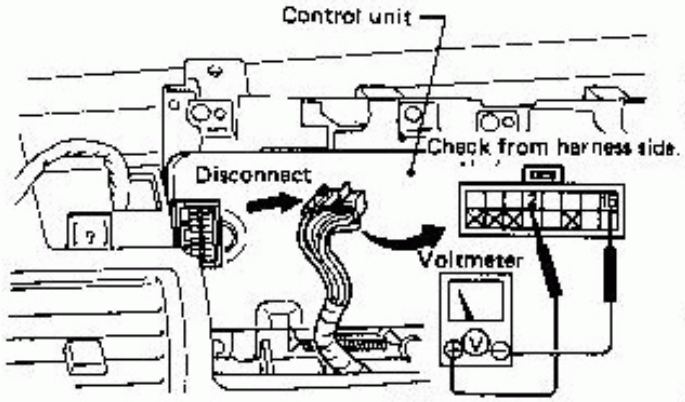
1. Turn ignition switch and light switch OFF.
2. Check continuity between terminals ① and ⑮ of harness connector to meter control unit.



Except 0Ω: O.K.

SEL222E

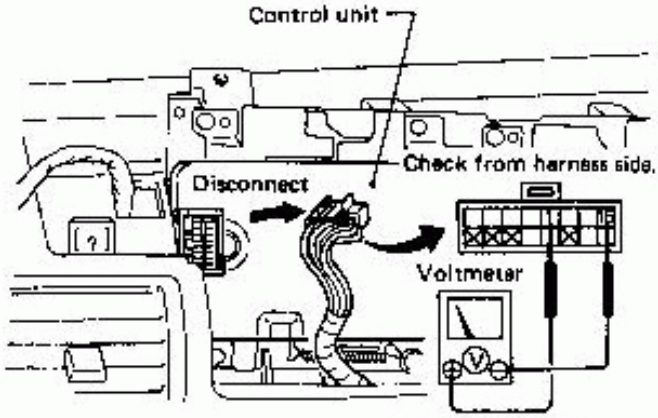
1. Turn ignition switch OFF.
2. Remove combination meter.
3. Disconnect harness connector from meter control unit.
4. Turn light switch to 1st position.
5. Check terminal voltage between ② and ⑮



Light switch → 1st
Approx. 12V

SEL220E

1. Turn light switch to 1st.
2. Check terminal voltage between ① and ⑬ of harness connector to meter control unit.



Light switch → 1st
Approx. 5 - 9V

SEL221E

Trouble-shooting Flow Chart —Others— (Cont'd)

21. ALL DISPLAYS ARE DARK

Make pre-programed signal check. (Refer to "Self-Check".)

- O.K. → Check harness between meter control unit and light switch.
- N.G. → Replace meter control unit.

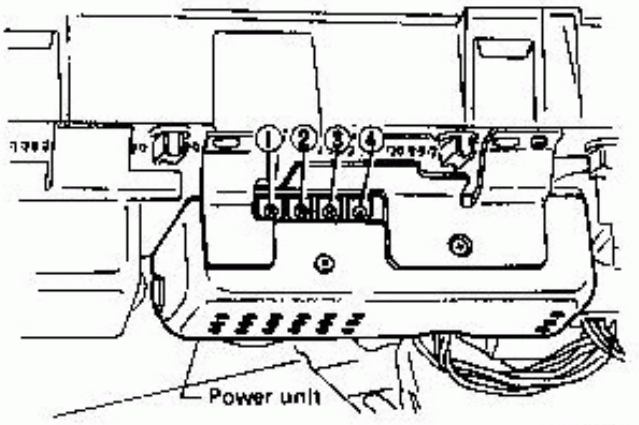
22. UNEVEN BRIGHTNESS

Readjust brightness with volume in power unit.

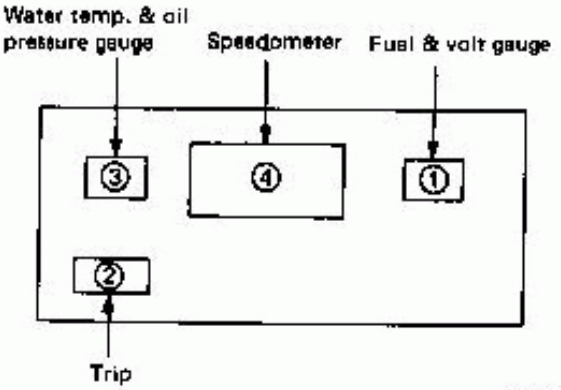
- Brightness can be equally balanced. → O.K.
- Brightness does not change. → Replace power unit.
- Brightness cannot be equally balanced. → Replace power unit and display unit.

1. Turn ignition switch OFF.
2. Remove combination meter.
3. Leave all harness connectors connected to combination meter.
4. Turn ignition switch to ON.
5. Adjust brightness with brightness control volume on power unit.

- **Brightness will increase when volume is turned clockwise and decrease when turned counterclockwise.**



SEL223E



SEL224E

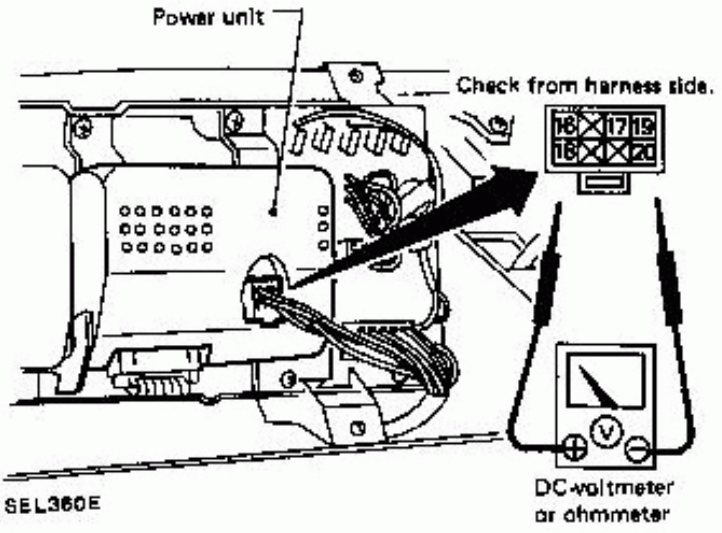
23. EXTRA SEGMENTS BECOME ILLUMINATED OR SOME FAIL TO ILLUMINATE

Make segment check. (Refer to "Self-Check".)

- O.K. → No trouble
- N.G. → Replace display unit.

Power Unit Check

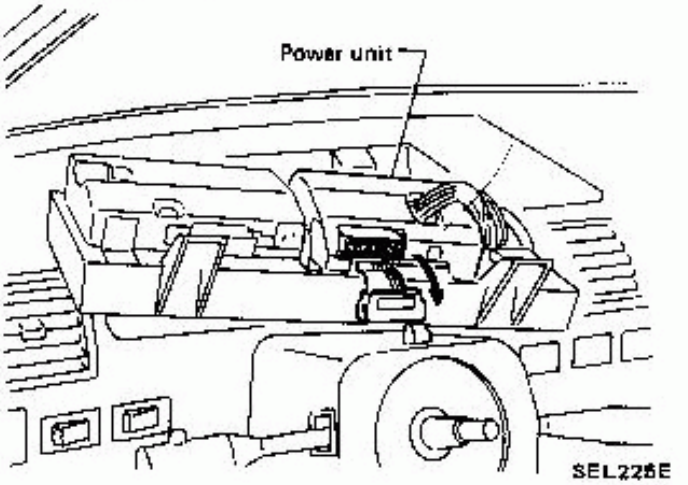
1. Remove combination meter with harness connected.
2. Check power source circuit.



Voltmeter terminals		Ignition switch position		
(+)	(−)	OFF	ACC	ON
⑳	⑯	Approx. 12V		
⑲		0V	0V	Approx. 12V
⑱		0V	0V	Approx. 6.5V
⑰		0V	0V	Approx. 12V

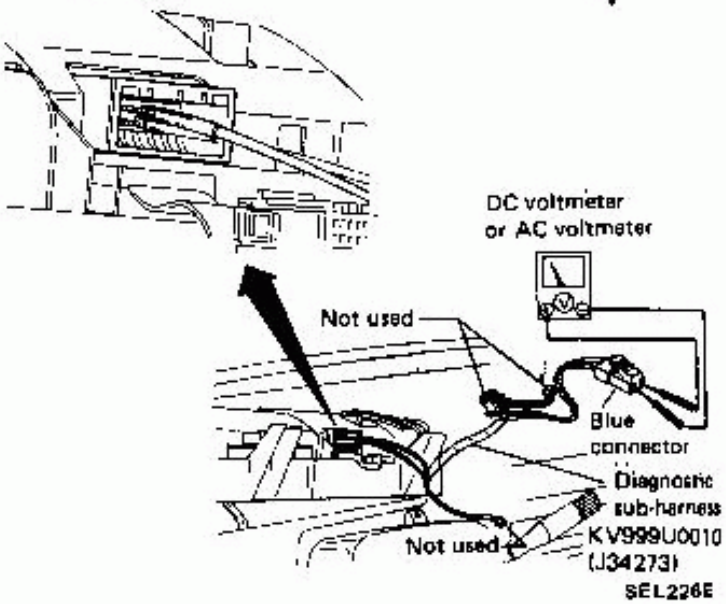
Ohmmeter terminals		Ignition switch OFF
(+)	(−)	
⑯	Body ground	Continuity exists

3. Disconnect the connector between power unit and display unit.

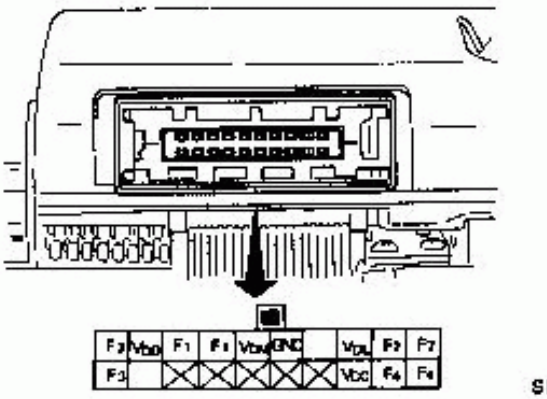


4. Connect voltmeter probes to blue connector of diagnostic sub-harness (Tool) as follows:
   - To red harness side . . . . . (+)
   - To black harness side . . . (−)

5. Put check terminals (two 1-pin terminals) of diagnostic sub-harness (Tool) into terminals of power unit.



6. Turn ignition switch to "ON" and check voltage at each terminal.



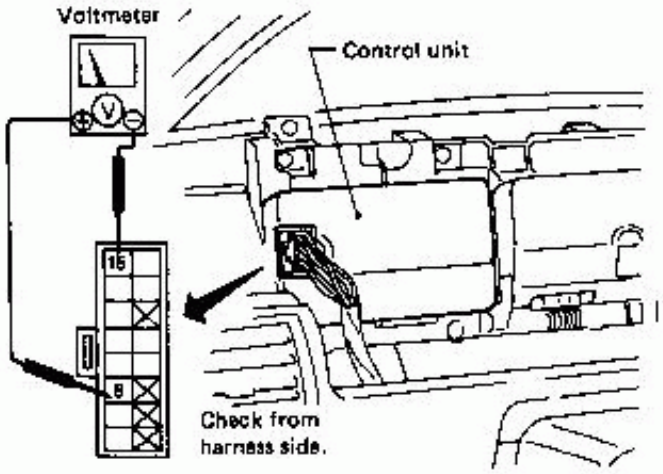
	Diagnostic sub-harness check terminal		Voltage [V]	Remarks
	Red	Black		
DC-voltmeter should be used	VDL	GND	Approx. 12	For tacho and boost gauge
	VDD		Approx. 5	For display unit
	VCC		Approx. 5	For odometer
	GND	VDM	Approx. 19	For speedometer, multiple gauge and trip
AC-voltmeter should be used	F1	F1	Approx. 3 (A.C.)	For speedometer
	F2	F2	Approx. 3 (A.C.)	For fuel & volt gauge
	F3	F3	Approx. 3 (A.C.)	For water temp. & oil pressure gauge
	F4	F4	Approx. 3 (A.C.)	For trip

Speed Sensor Signal Check

SPEED SENSOR OUTPUT CHECK

When speedometer is functioning properly, this test is not necessary. Go to "Meter output check".

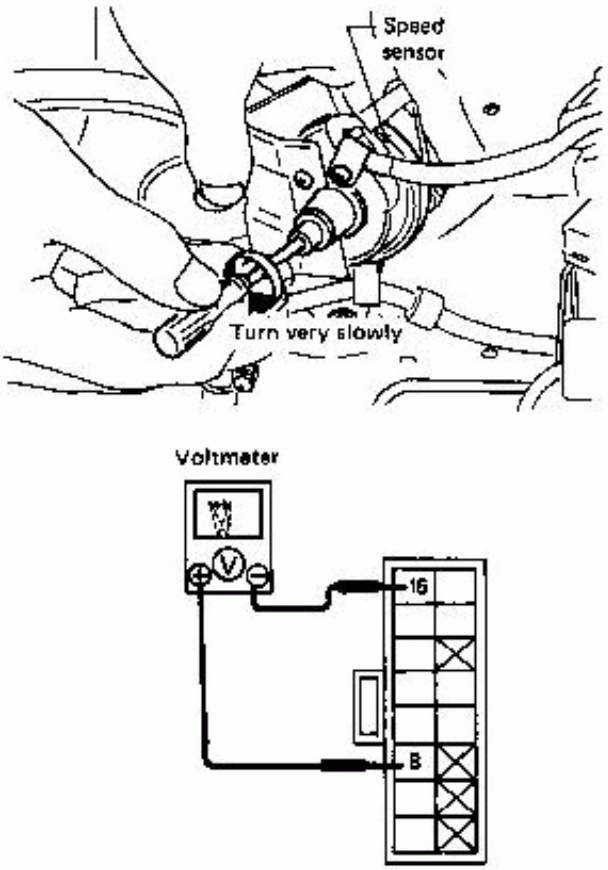
1. Remove combination meter with harness connected.
2. Disconnect speedometer cable from speed sensor, and remove speed sensor with harness connected.
3. Connect a voltmeter between terminals ⑧ and ⑮ on combination meter control unit.



SEL228E

4. Turn ignition switch to "ON".
5. Slowly turn speed sensor rotor shaft with a suitable screwdriver to make sure voltmeter pointer deflects.

Do not turn rotor shaft quickly as voltmeter deflects 24 times per revolution of rotor shaft.



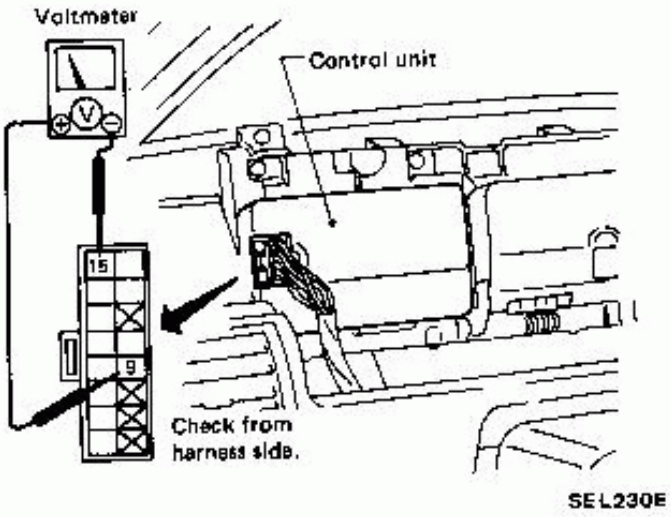
SEL229E

Speed Sensor Signal Check (Cont'd)

METER OUTPUT CHECK

- **Combination meter emits speed sensor signal to control E.F.I. control unit, A.S.C.D. control unit, voice warning unit, drive computer, lock-up control unit.**

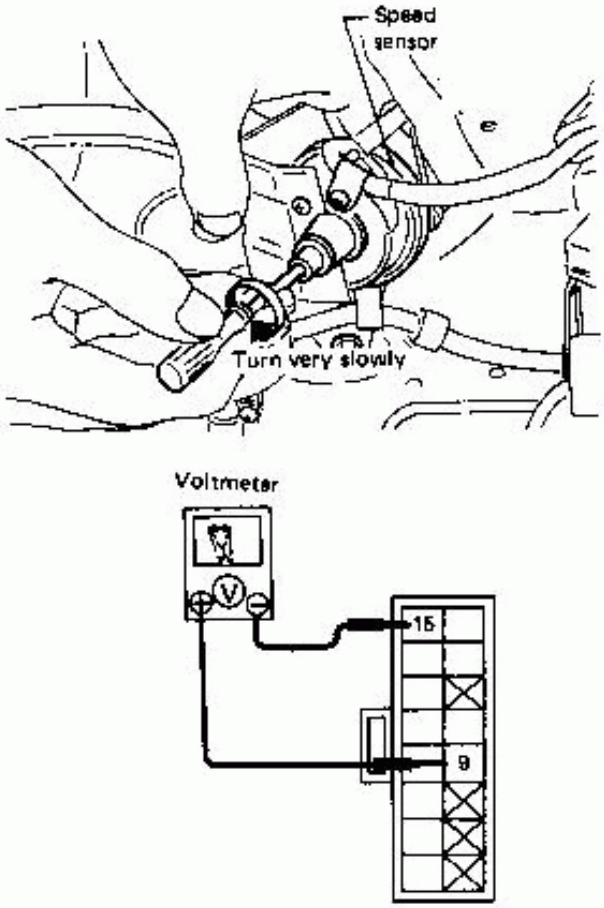
1. Remove combination meter with harness connected.
2. Disconnect speedometer cable from speed sensor and remove speed sensor with harness connected.
3. Connect a voltmeter between terminals ⑨ and ⑮ on combination meter control unit.



SEL230E

4. Turn ignition switch to "ON".
5. Slowly turn speed sensor rotor shaft with a suitable screwdriver to make sure voltmeter pointer deflects.

Voltmeter pointer deflects twice for each rotation of rotor shaft.



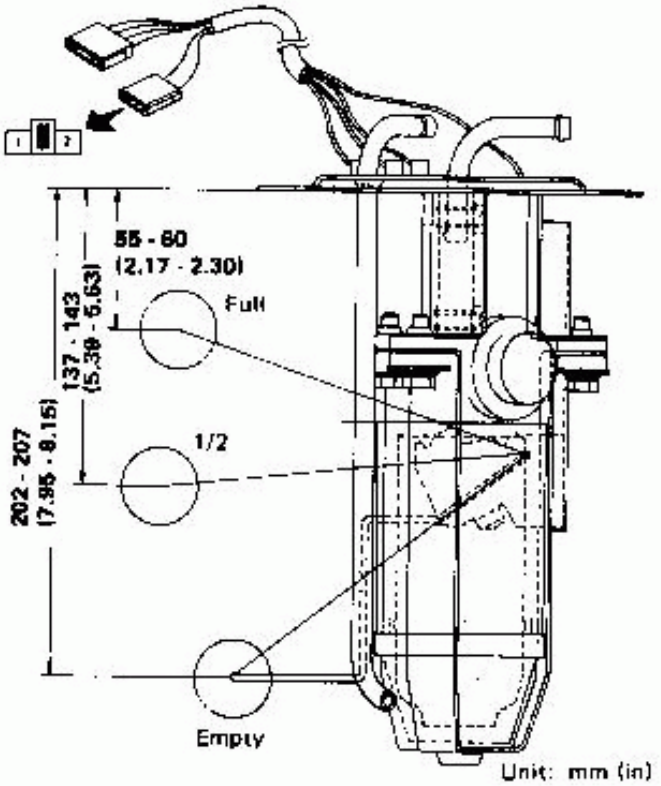
SEL231E

- **Even if speedometer is operating normally, the combination meter control unit should be replaced if meter output check is no good.**
- **When speedometer does not operate, refer to speedometer trouble-shooting.**

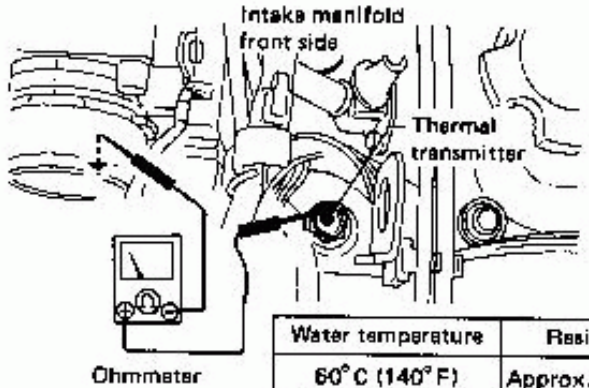
Fuel Tank Gauge Unit Check

- For removal, refer to FE section.

Ohmmeter terminal (+)	Ohmmeter terminal (−)	Float position	Resistance value
①	②	Full	Less than 26 Ω
		1/2	Approx. 135 – 195 Ω
		Empty	Approx. 685 – 1010 Ω



Thermal Transmitter Check

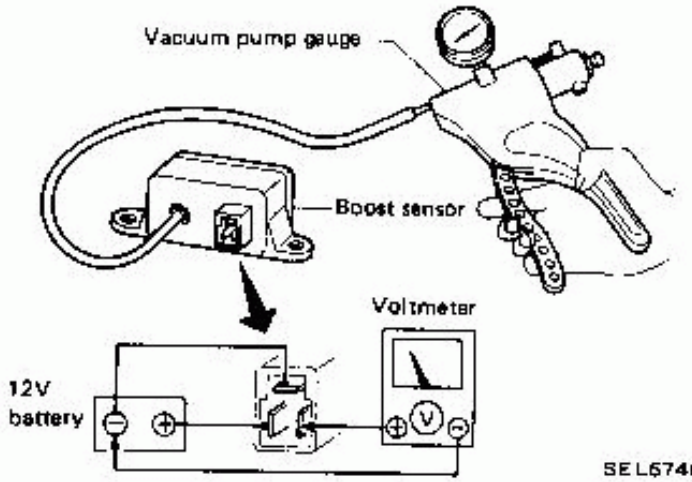


Water temperature	Resistance
60°C (140°F)	Approx. 70 - 90Ω
80°C (176°F)	Approx. 35 - 45Ω

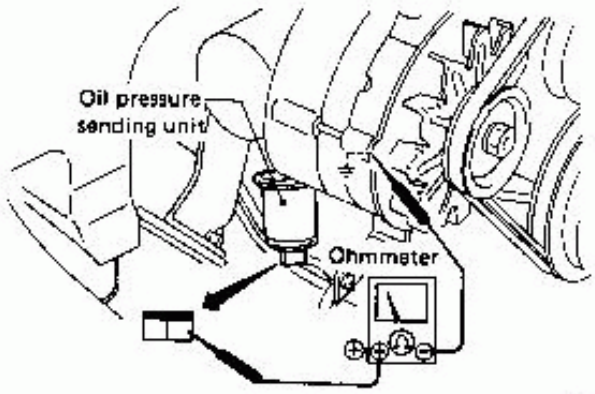
Boost Sensor Check

1. Connect vacuum pump gauge to boost sensor vacuum hose.
2. Disconnect harness connector from boost sensor and connect battery and voltmeter as shown.
3. Apply vacuum pressure to boost sensor by vacuum pump gauge and measure voltages.

Approx. 2.2V at 0 kPa (0 mmHg, 0 inHg)
(Atmospheric pressure)
Approx. 1.3V
at −53.3 kPa (−400 mmHg, −15.75 inHg)



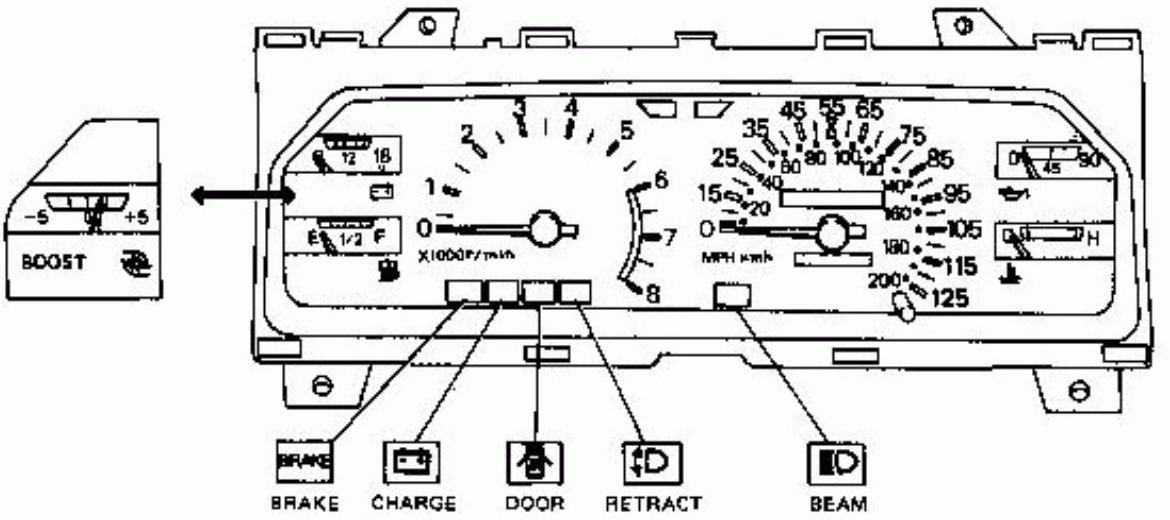
Oil Pressure Sending Unit Check

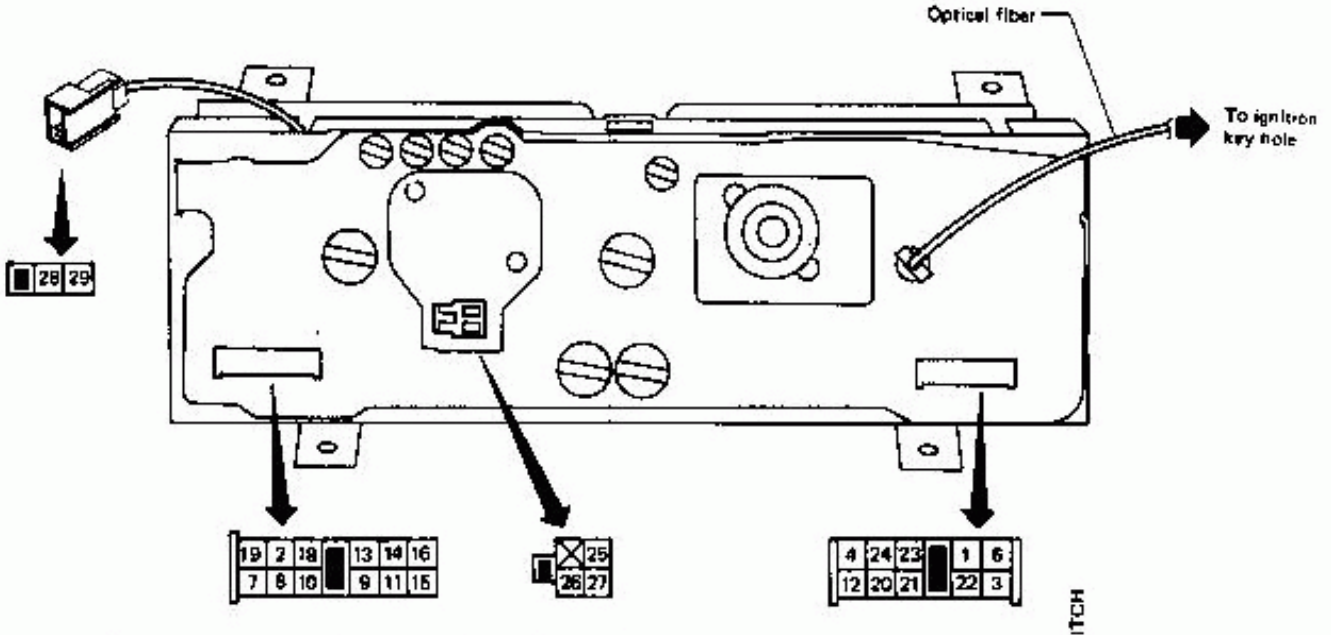


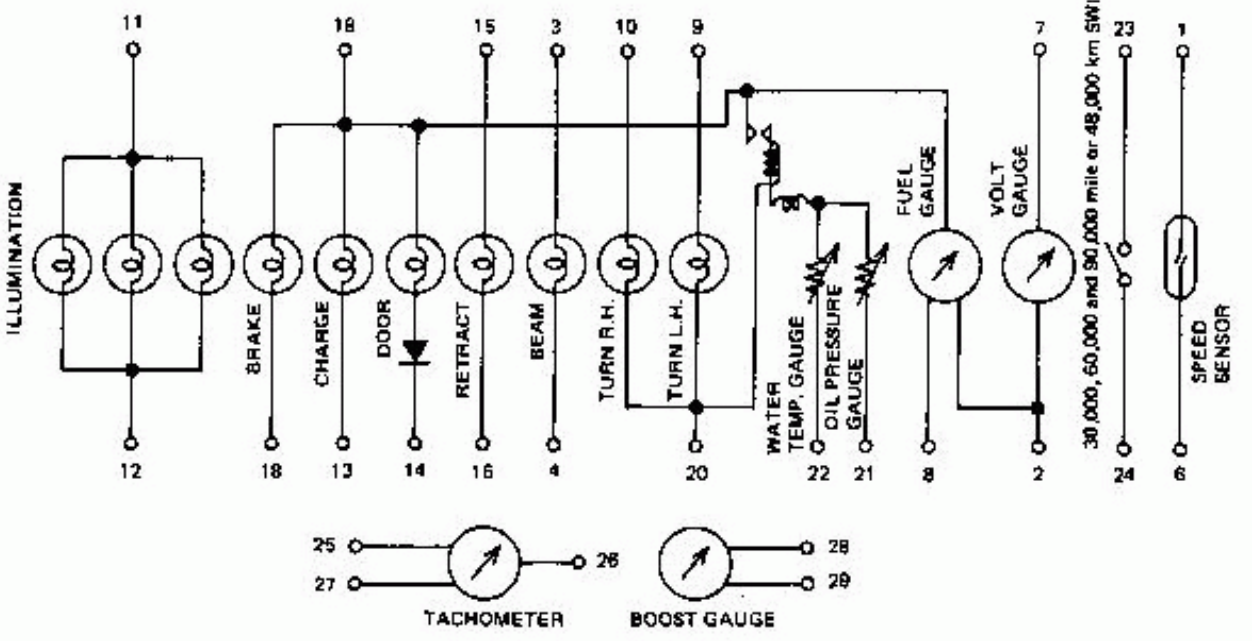
Engine	Resistance
When engine is stopped	More than 73 Ω
When engine is running (idling)	Less than 50 Ω

METER AND GAUGES —Needle Type—

Combination Meter

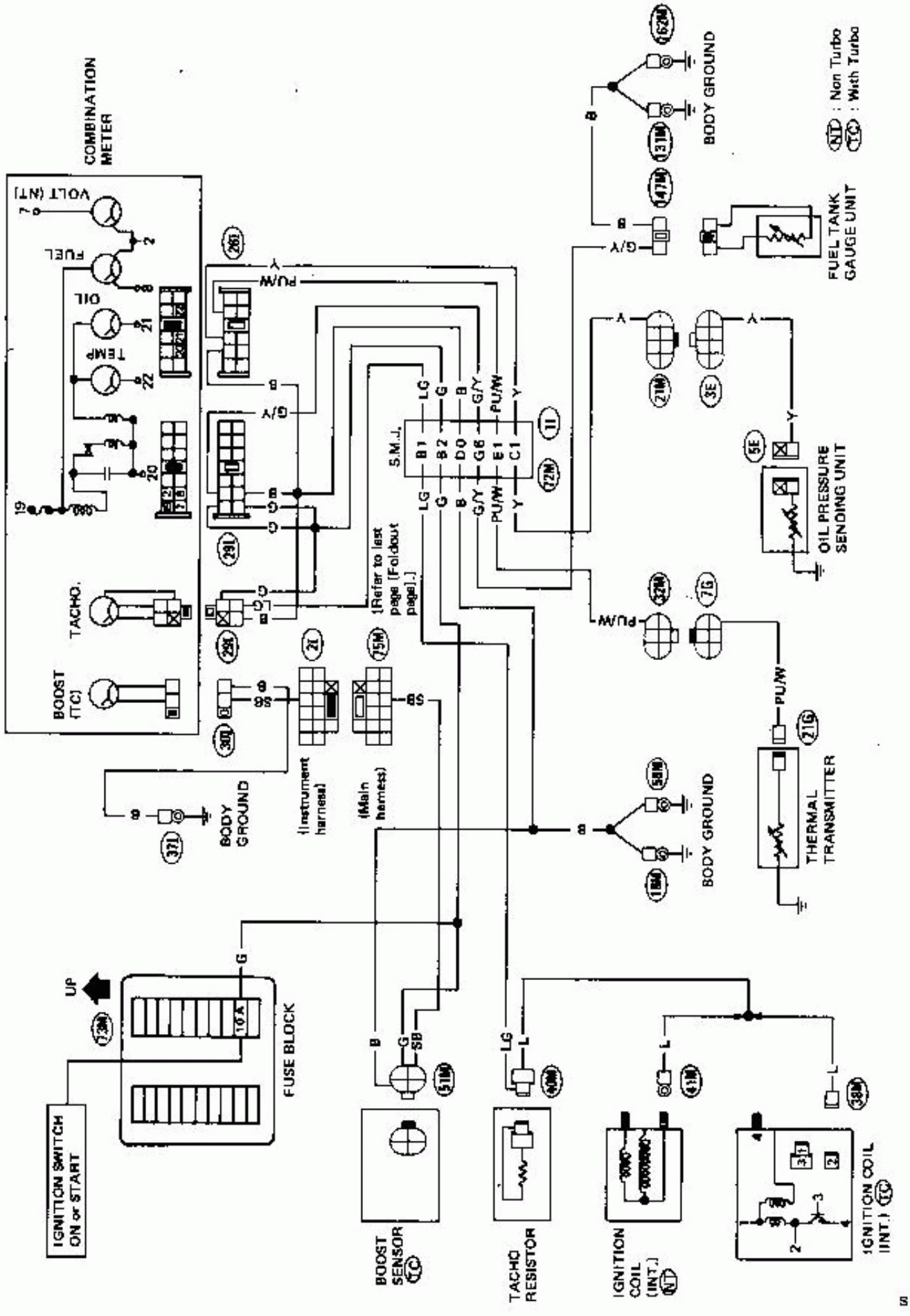






SEL714G

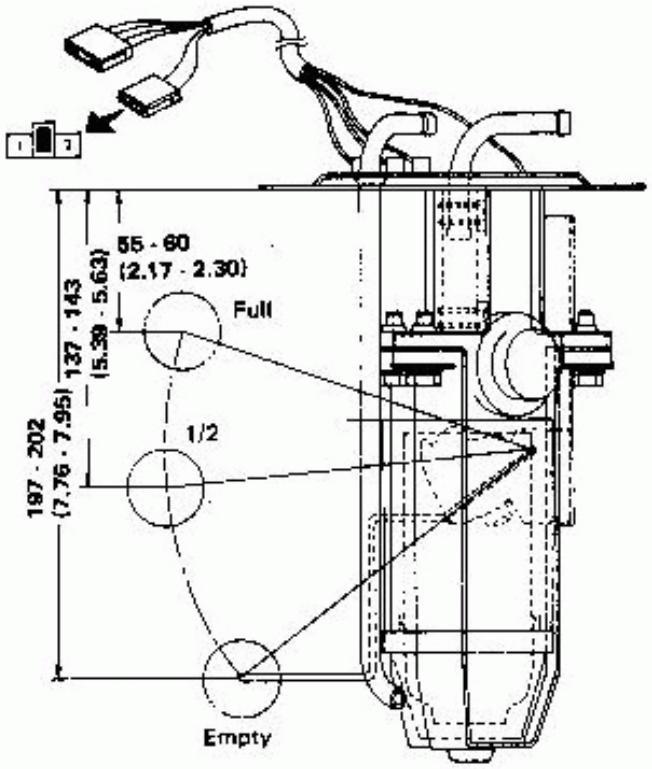
Tacho, Temp., Oil, Fuel, Volt and Boost Gauges/Wiring Diagram



Fuel Tank Gauge Unit Check

- For removal, refer to FE section.

Ohmmeter terminal (+)	Ohmmeter terminal (−)	Float position	Resistance value
①	②	Full	Approx. 4 - 6 Ω
		1/2	Approx. 30 - 35 Ω
		Empty	Approx. 80 - 90 Ω



Unit: mm (in)

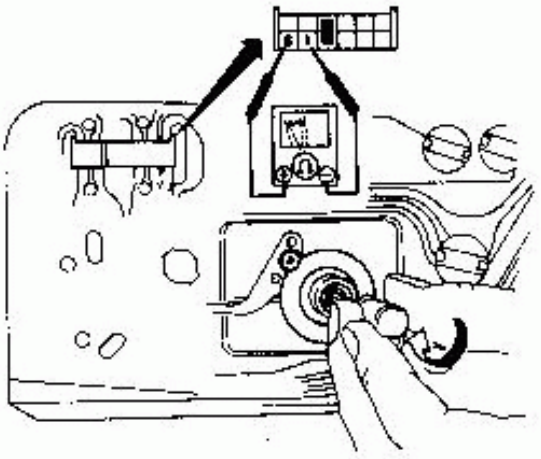
SEL237E

- For checking oil pressure sending unit, boost sensor and thermal transmitter, refer to page EL-77.

Speed Sensor Signal Check

- Speed sensor is built into the speedometer.
- Turn speedometer slowly using small screwdriver, and check continuity of speed sensor circuit.

Continuity exists two times for each turn ... O.K.



SEL238E

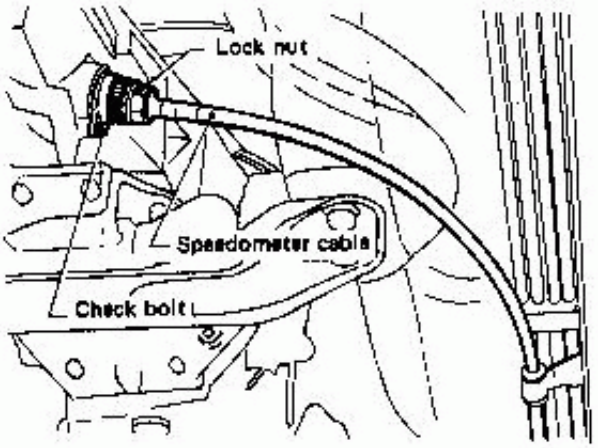
Removal and Installation of the Speedometer Cable

CAUTION:
Be sure to use the following procedure.

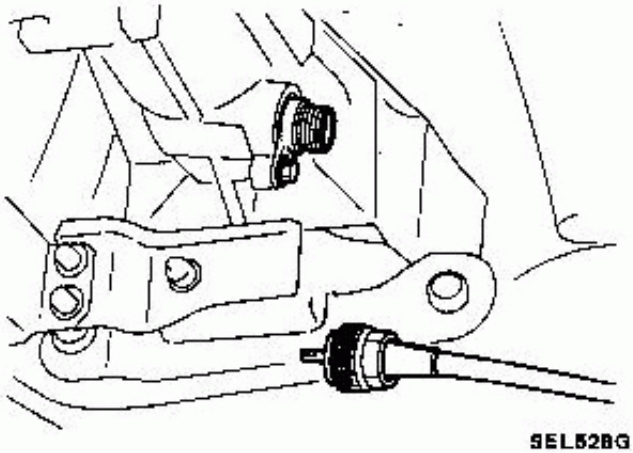
NEEDLE TYPE

Removal

1. Loosen the lock nut at the rear extension and pull out the speedometer cable.

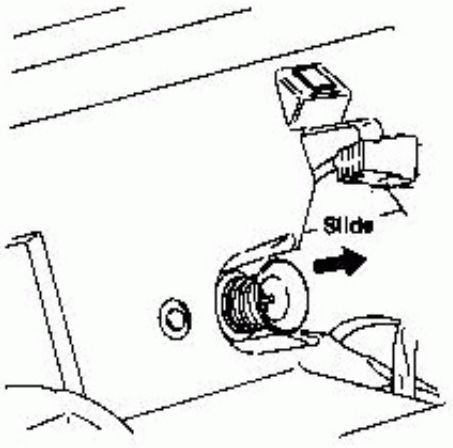


SEL527G



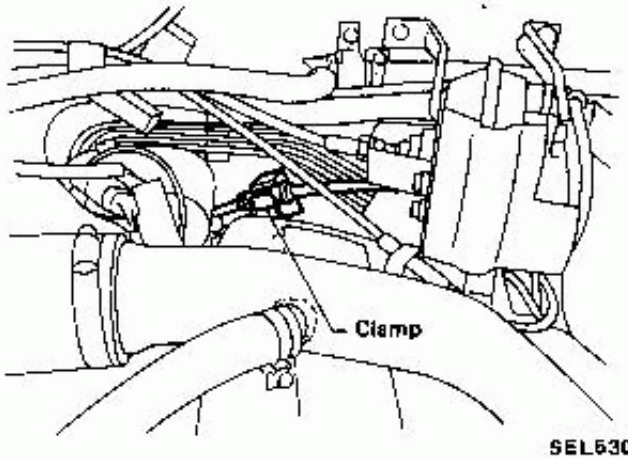
SEL528G

2. Remove the combination meter unit. (Refer to BF-15 in S12 Service Manual.)
3. Slide the speedometer cable to free it.

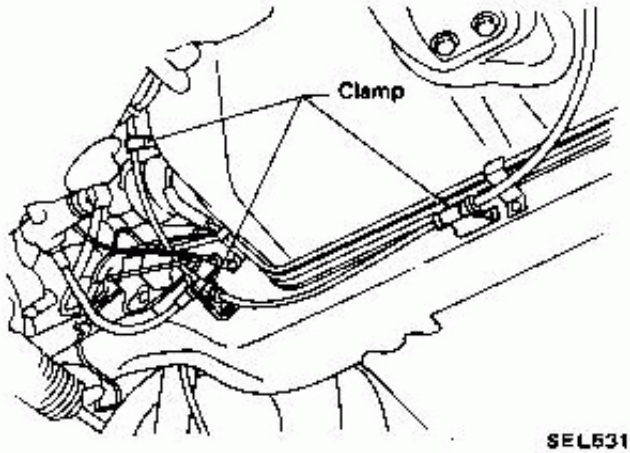


SEL529G

4. Detach the speedometer cable from the clamp. (4 points)

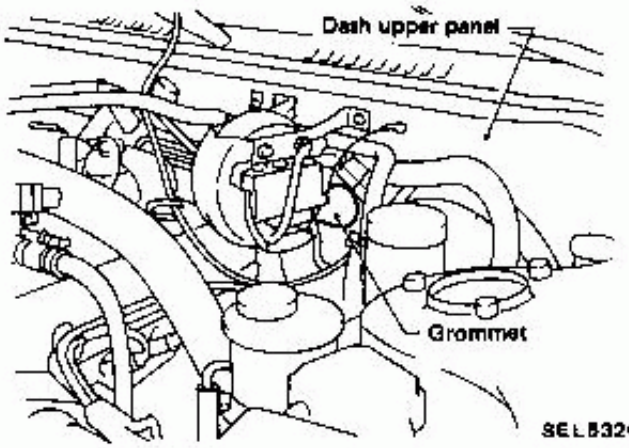


SEL530G



SEL531G

5. Remove the grommet from the dash upper panel. (by hand)



SEL532G

6. Pull out the speedometer cable.

Removal and Installation of the Speedometer Cable (Cont'd)

Installation

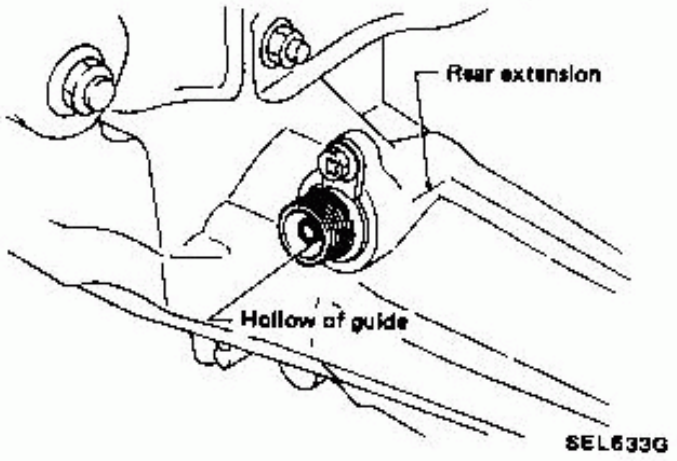
Installation is in the reverse order of removal.

CAUTION:

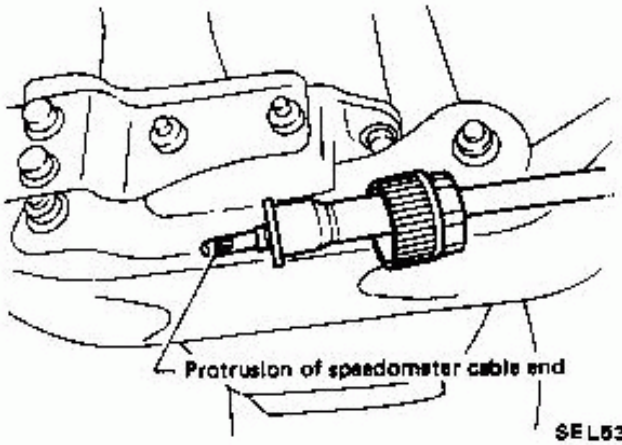
When inserting the speedometer cable in the hole in the rear extension, join the protuberance at the speedometer cable end and the hollow of the guide in the rear extension.

Lock nut tightening torque

10 - 15 N·m (1 - 1.5 kg-m, 7 - 11 ft-lb)



SEL533G

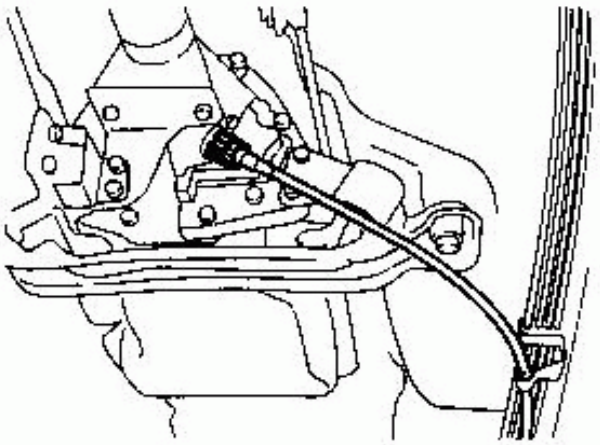


SEL534G

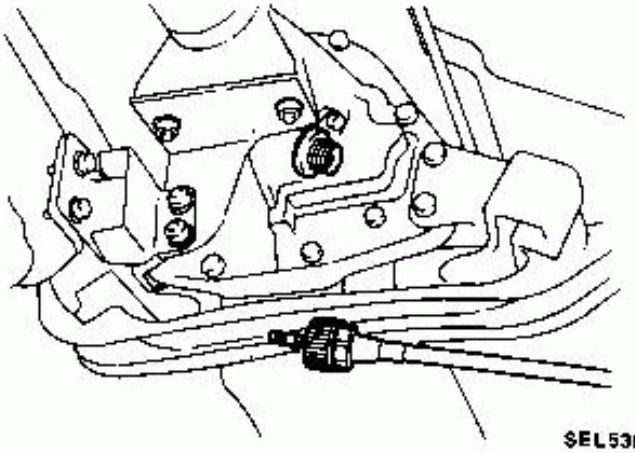
DIGITAL TYPE

Removal

1. Loosen the lock nut and pull out the speedometer cable in the rear extension.

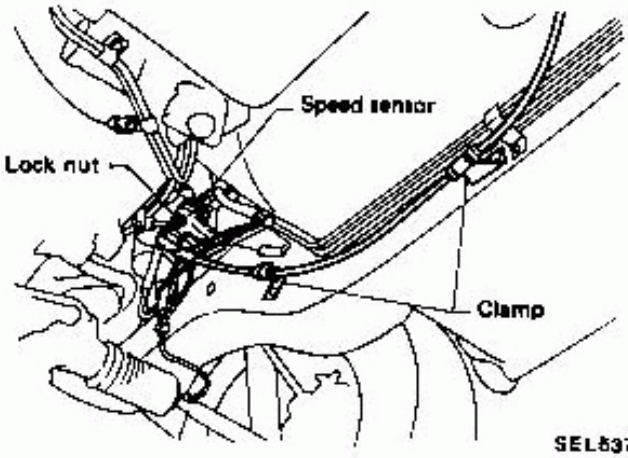


SEL535G



SEL536G

2. Loosen the lock nut and pull out the speedometer cable at the speed sensor.



SEL537G

Removal and Installation of the Speedometer Cable (Cont'd)

3. Detach the speedometer cable from the clamp. (2 points)
4. Remove the speedometer cable.

Installation

Installation is in the reverse order of removal.

CAUTION:

When inserting the speedometer cable in the hole in the rear extension, join the protuberance at the speedometer cable end and the hollow of the guide in the rear extension.

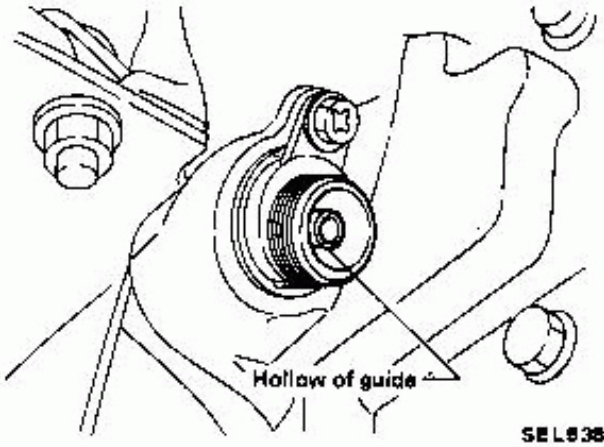
Lock nut tightening torque

Digital meter side

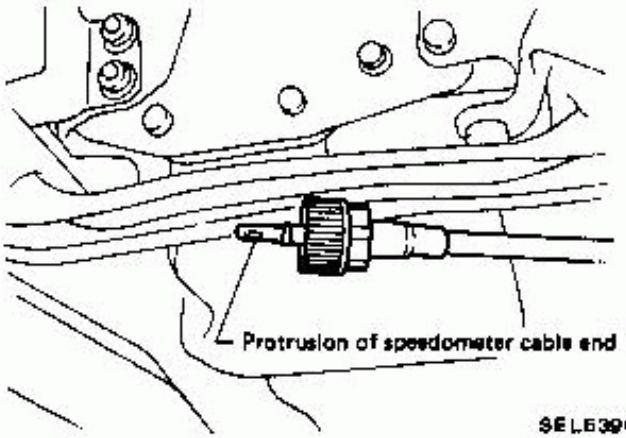
4 N·m (0.4 kg-m, 2.9 ft-lb)

Extension side

10 N·m (1.0 kg-m, 7 ft-lb)

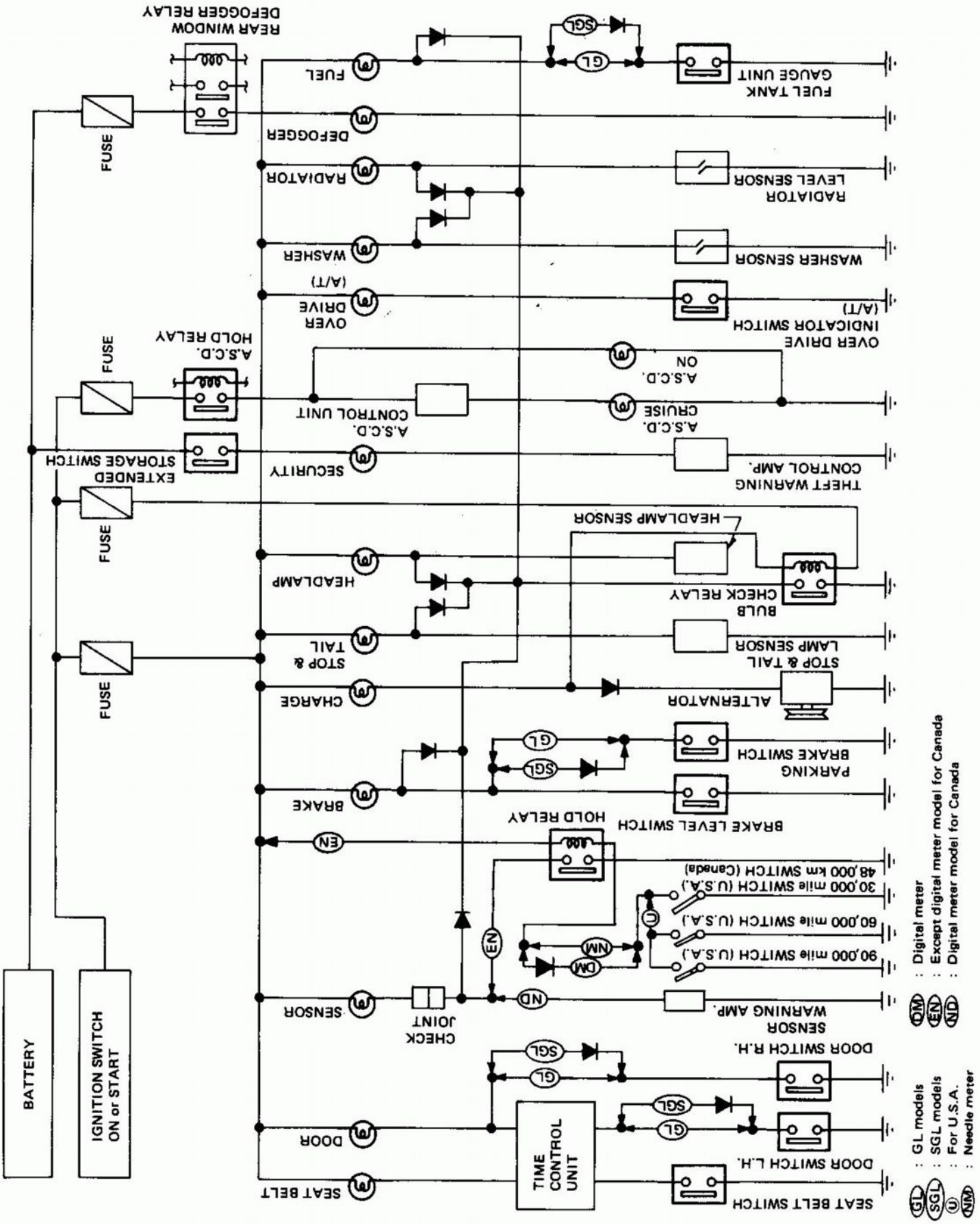


SEL638G



SEL639G

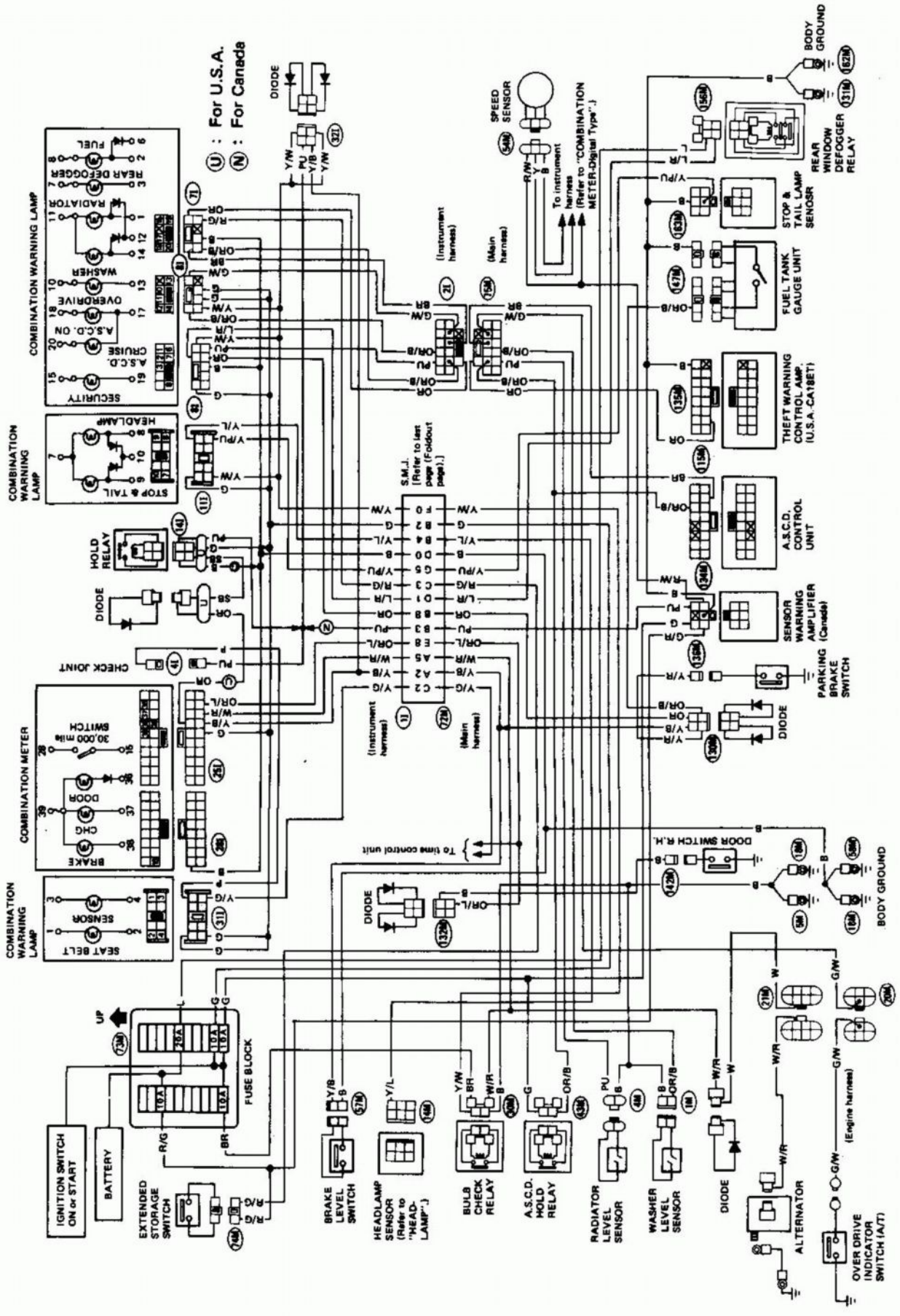
Warning Lamps/Schematic



SEL715D

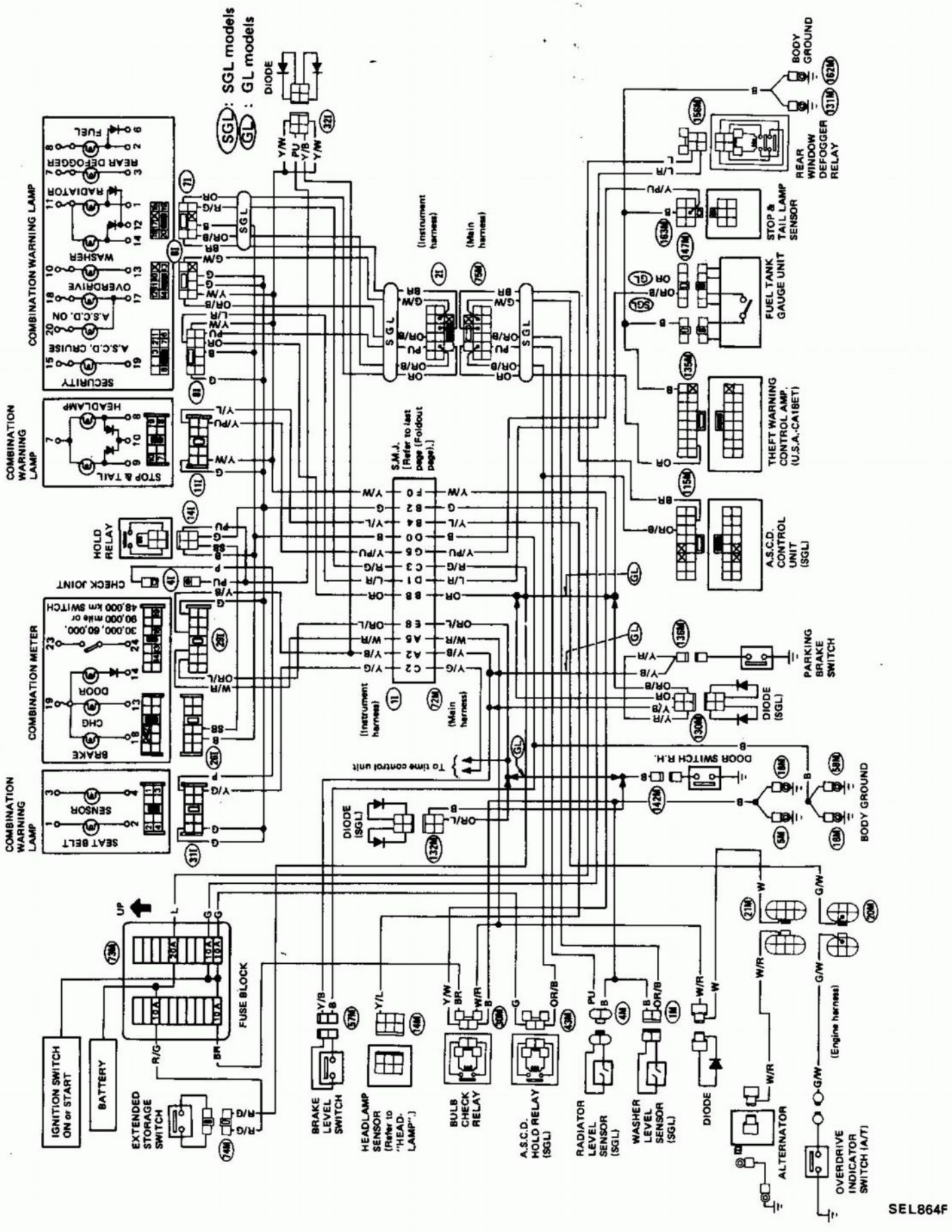
Warning Lamps/Wiring Diagram

DIGITAL TYPE METER MODEL



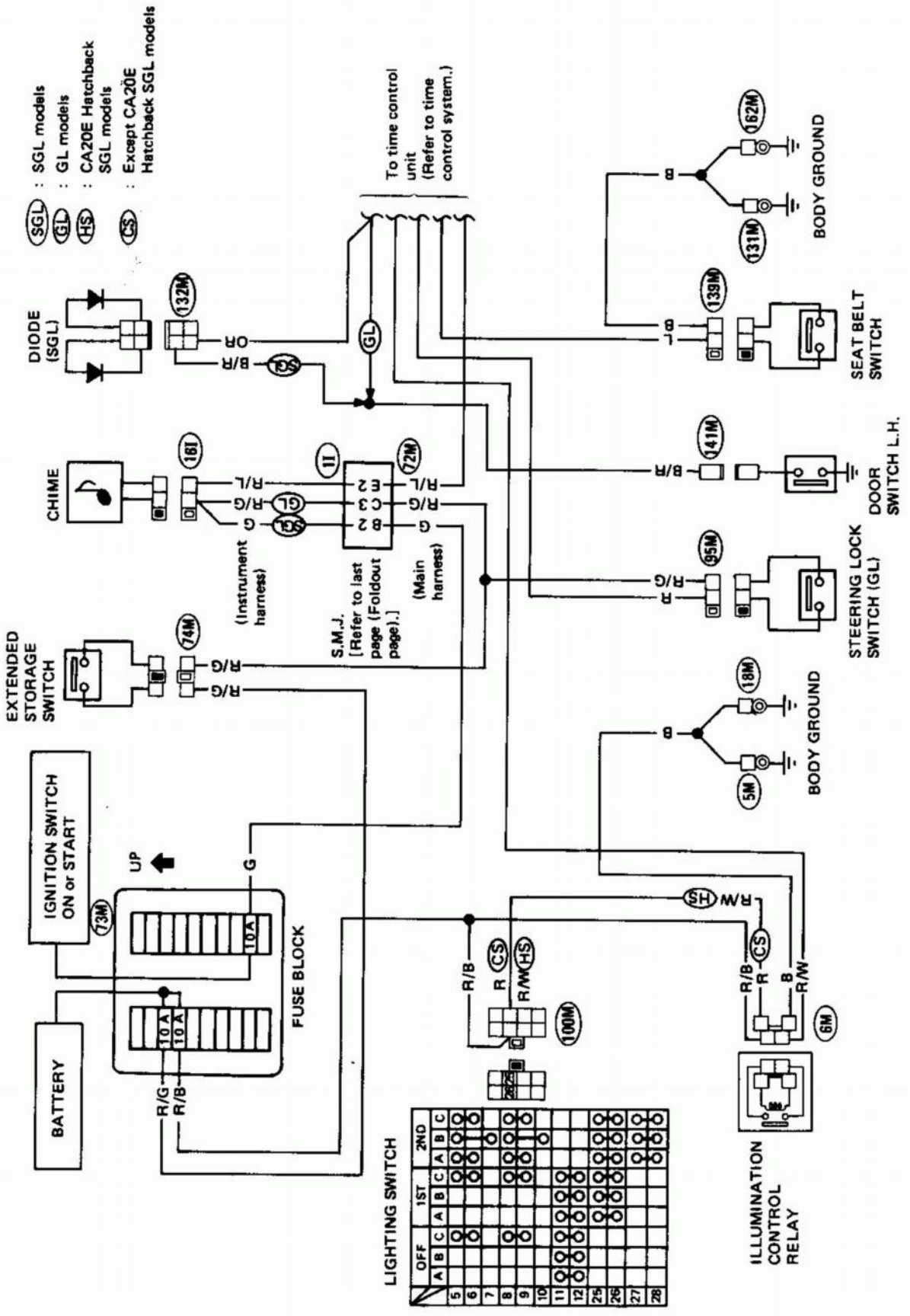
SEL716G

NEEDLE TYPE METER MODEL



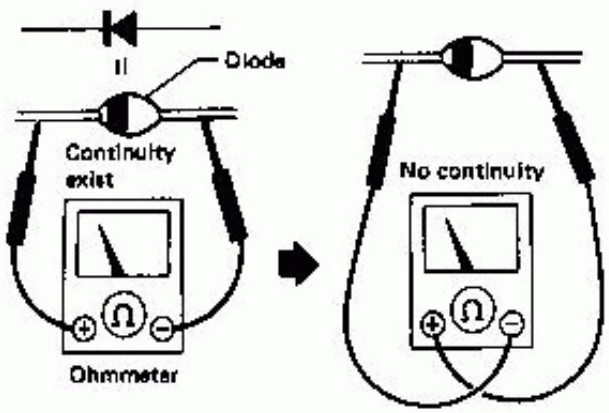
Warning Chime/Wiring Diagram

- Chime is designed as to give a light warning, key warning, and seat-belt warning. For trouble-shooting, refer to "TIME CONTROL SYSTEM".



Diode Check

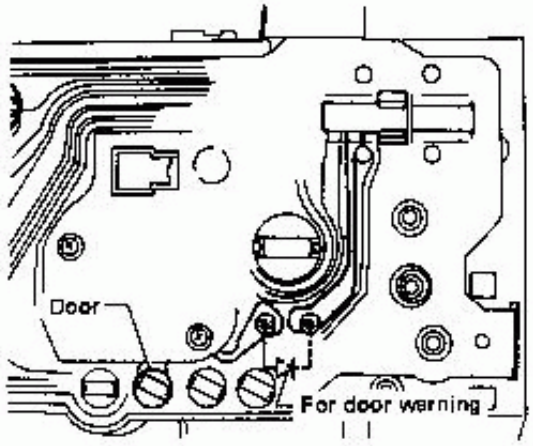
- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown below.



SEL700D

NEEDLE TYPE COMBINATION METER

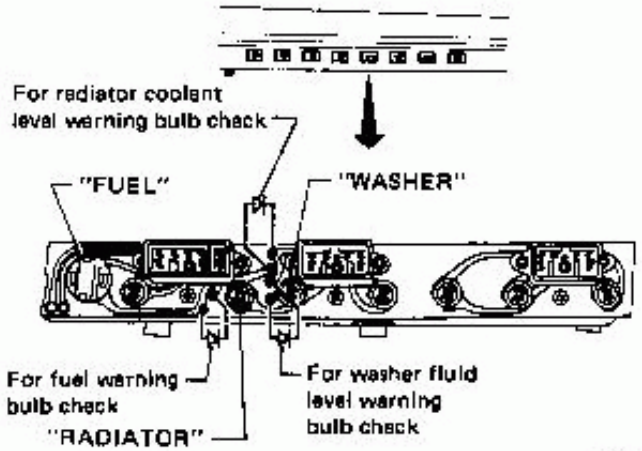
- Diodes for warning lamps are built into the combination meter printed circuit.



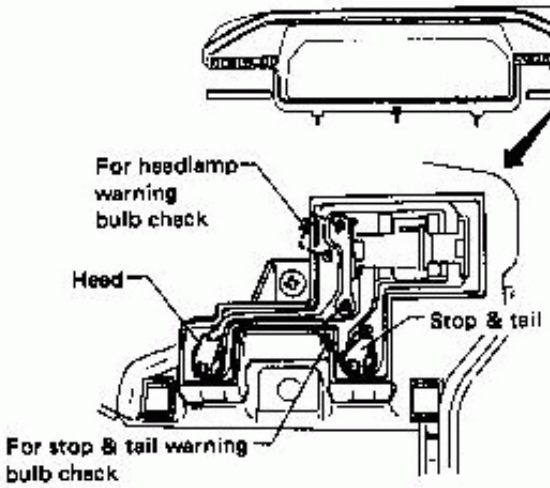
SEL250E

COMBINATION WARNING LAMP

- Diodes for warning lamps are located on the panel where warning bulbs are located.

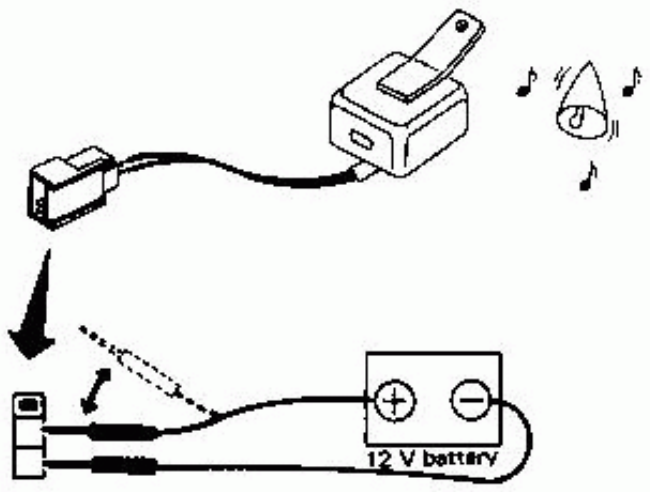


SEL251E



SEL252E

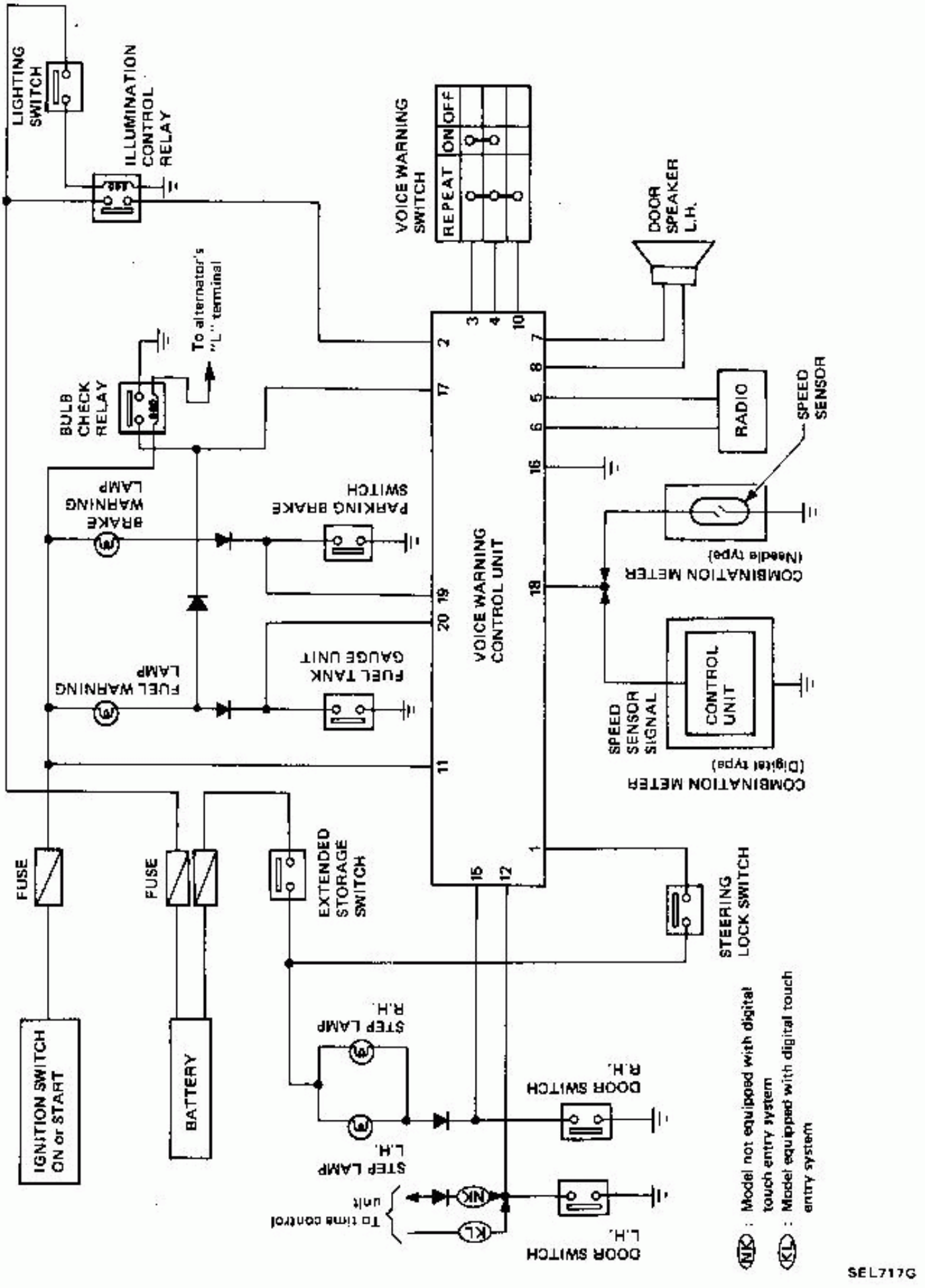
Warning Chime Check



SEL878D

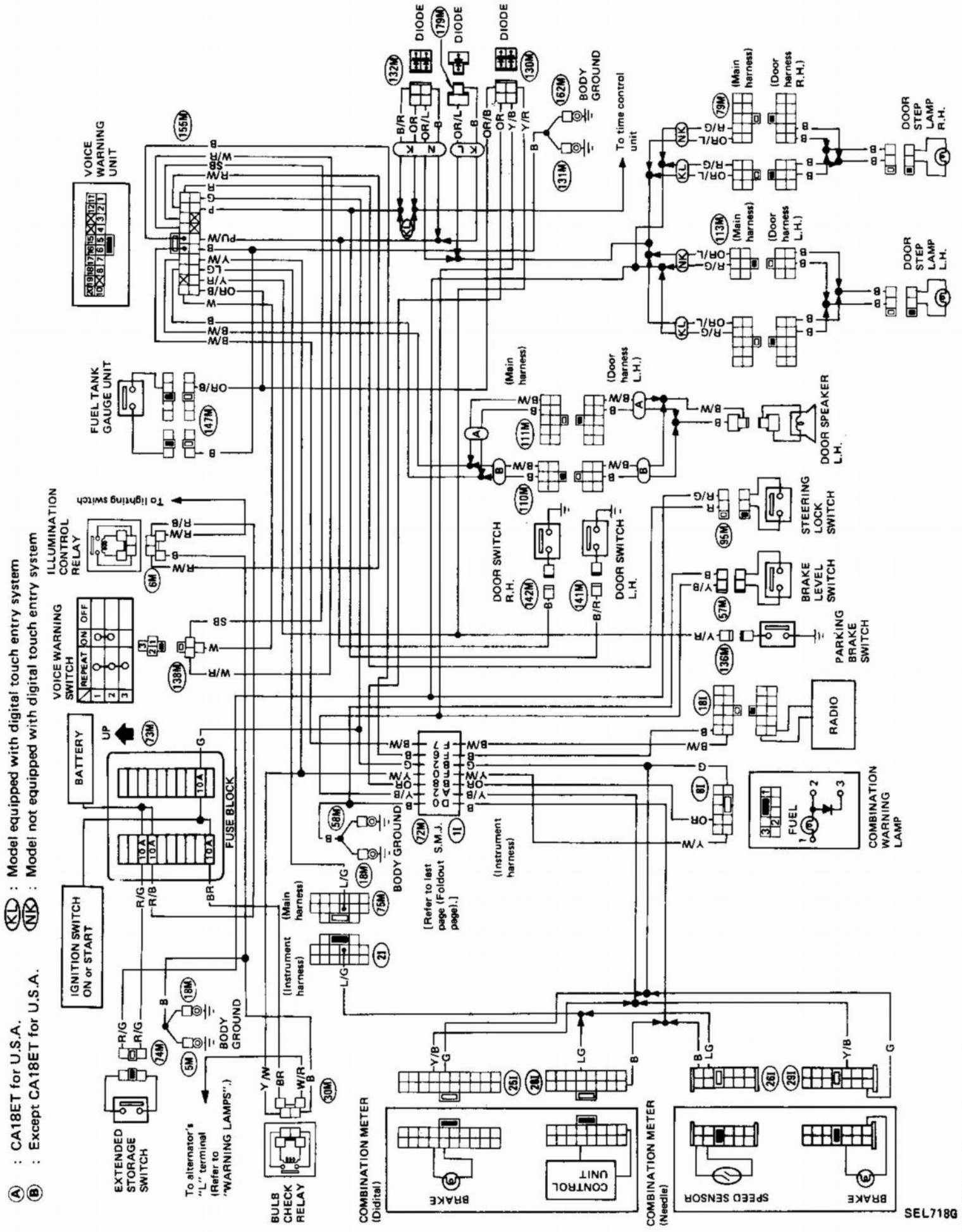
VOICE WARNING SYSTEM

Schematic



VOICE WARNING SYSTEM

Wiring Diagram



VOICE WARNING SYSTEM

Operational Check

Item		Condition		Voice Warning
Left door	Ignition switch "ON".	Door switch L.H. is "ON". (Driver's side is open)	Speed switch is "ON". Vehicle speed is more than 10 km/h (6 MPH).	"Left door is open".
Right door		Door switch R.H. is "ON". (Right door is open)		"Right door is open".
Parking brake		Parking brake switch is "ON".		"Parking brake is ON".
Fuel level		Fuel level less than 10ℓ (2-5/8 US gal, 2-1/4 Imp gal)	—	"Fuel level is low".
Light	Ignition switch "OFF"	Door switch L.H. is "ON". (Driver's side door is open)	Lighting switch is "ON".	"Lights are ON".
Ignition key			Steering lock switch is "ON".	"Key is in the ignition".

- If the warning is not properly given under the above condition, go to "Trouble-Shooting".

Trouble-shooting

NO VOICE WARNING IS GIVEN.

Ignition sw. "ACC"

Check if speaker in driver's door produces sound when radio is turned "ON".

N.G. → Check harness connector running to driver's door speaker.

O.K.

Ignition sw. "OFF"

Check voice warning switch.

N.G. → Replace voice warning switch.

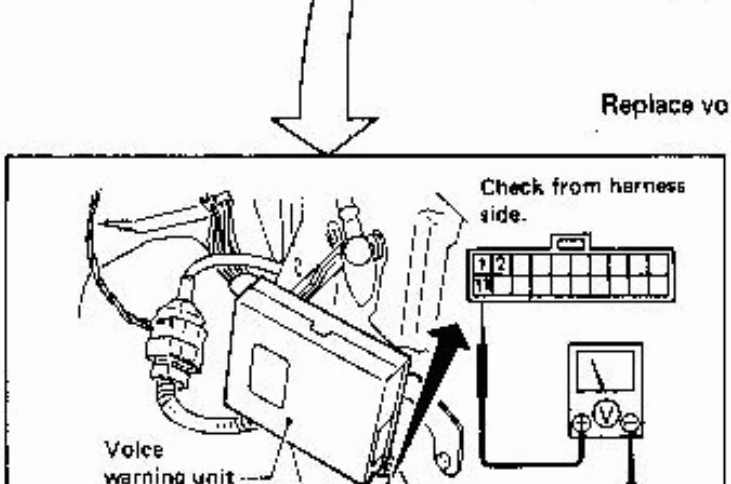
O.K.

Disconnect connector running to voice warning device and check voltage at each terminal of connector.

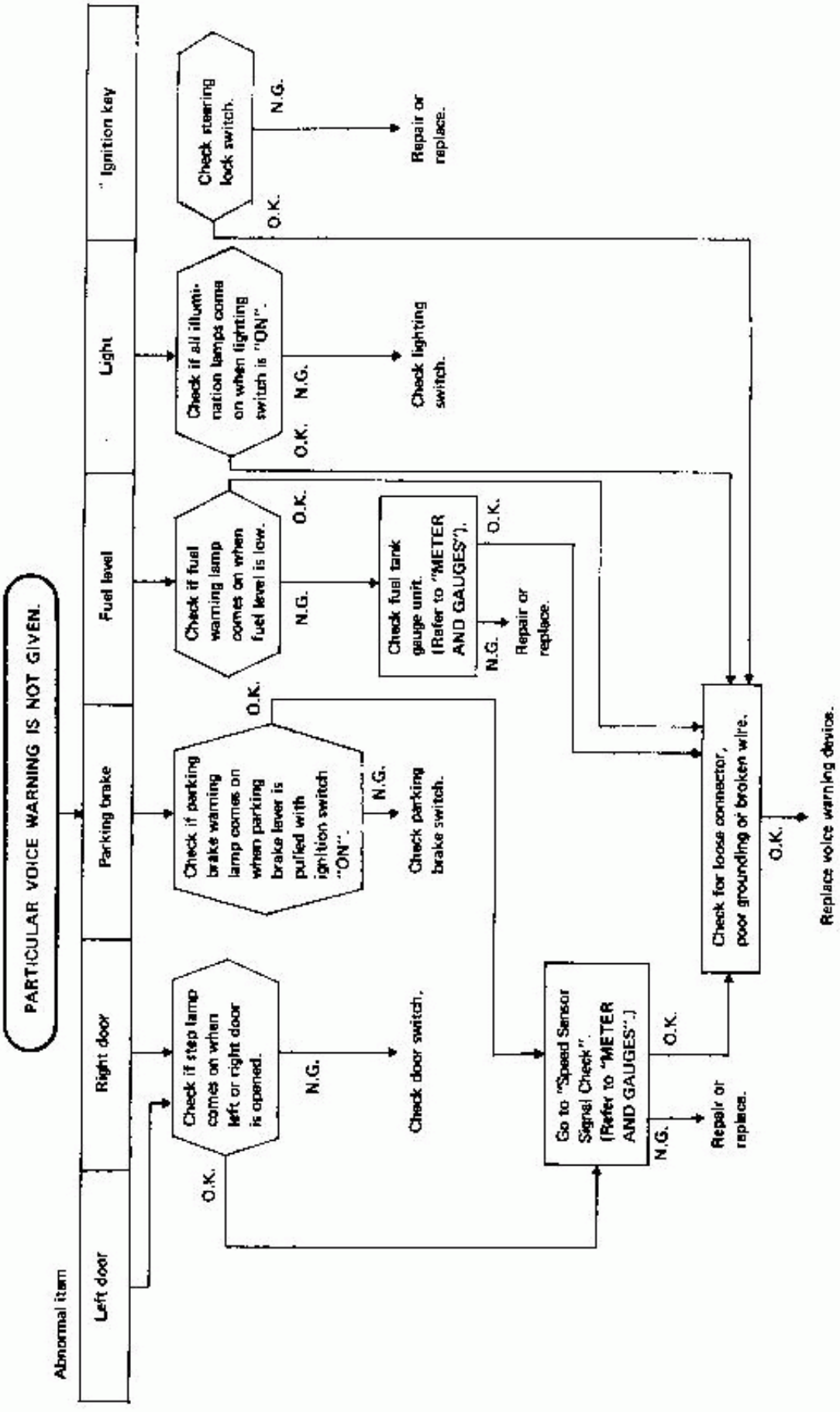
Voltmeter		Condition	Normal
Positive terminal	Negative terminal		
①	Body ground	Ignition key "OFF"	More than 9V
②		Lighting switch "ON"	More than 9V
⑪		Ignition key "ON"	More than 9V

O.K. → Replace voice warning device.

N.G. → Check harness.

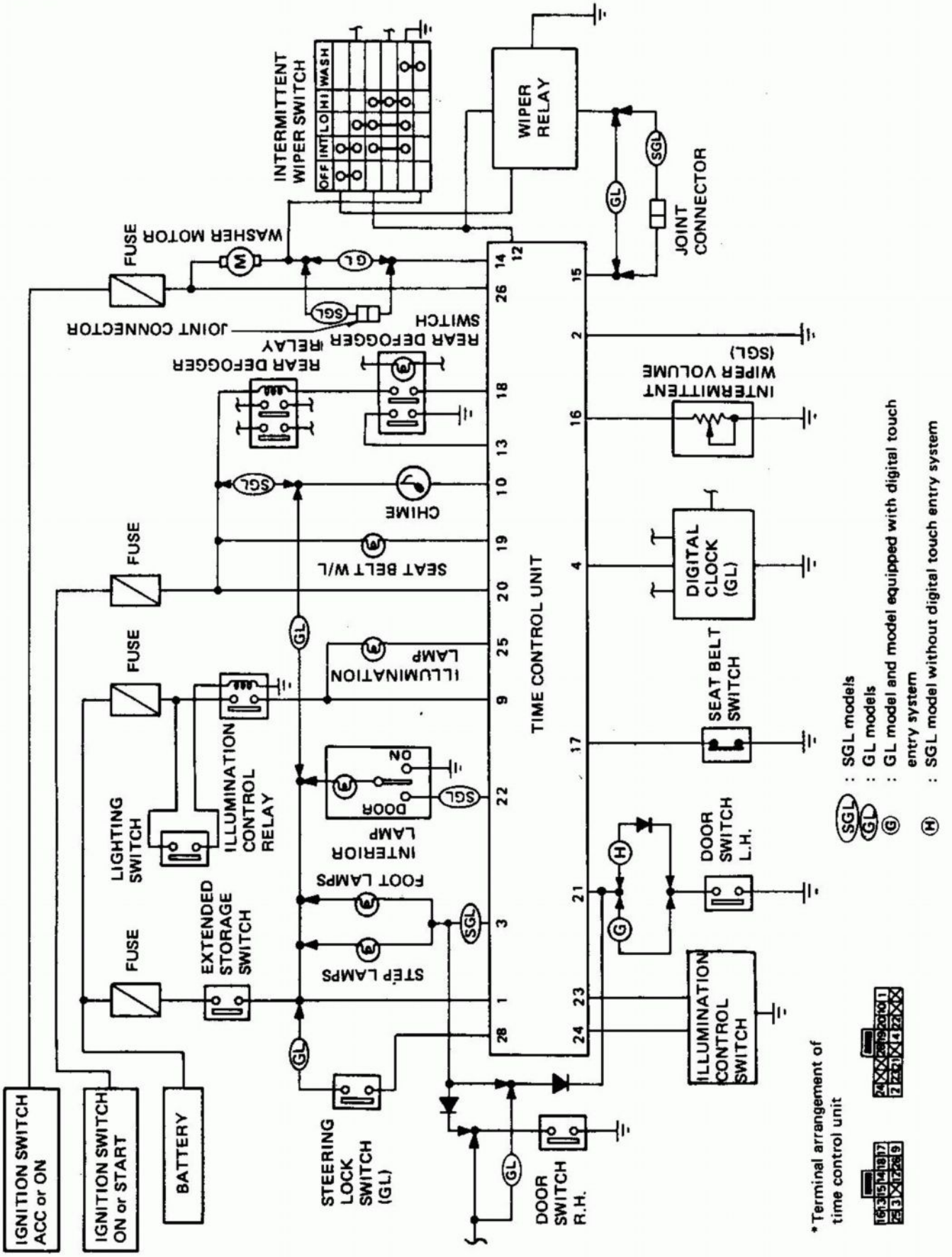


Trouble-shooting (Cont'd)

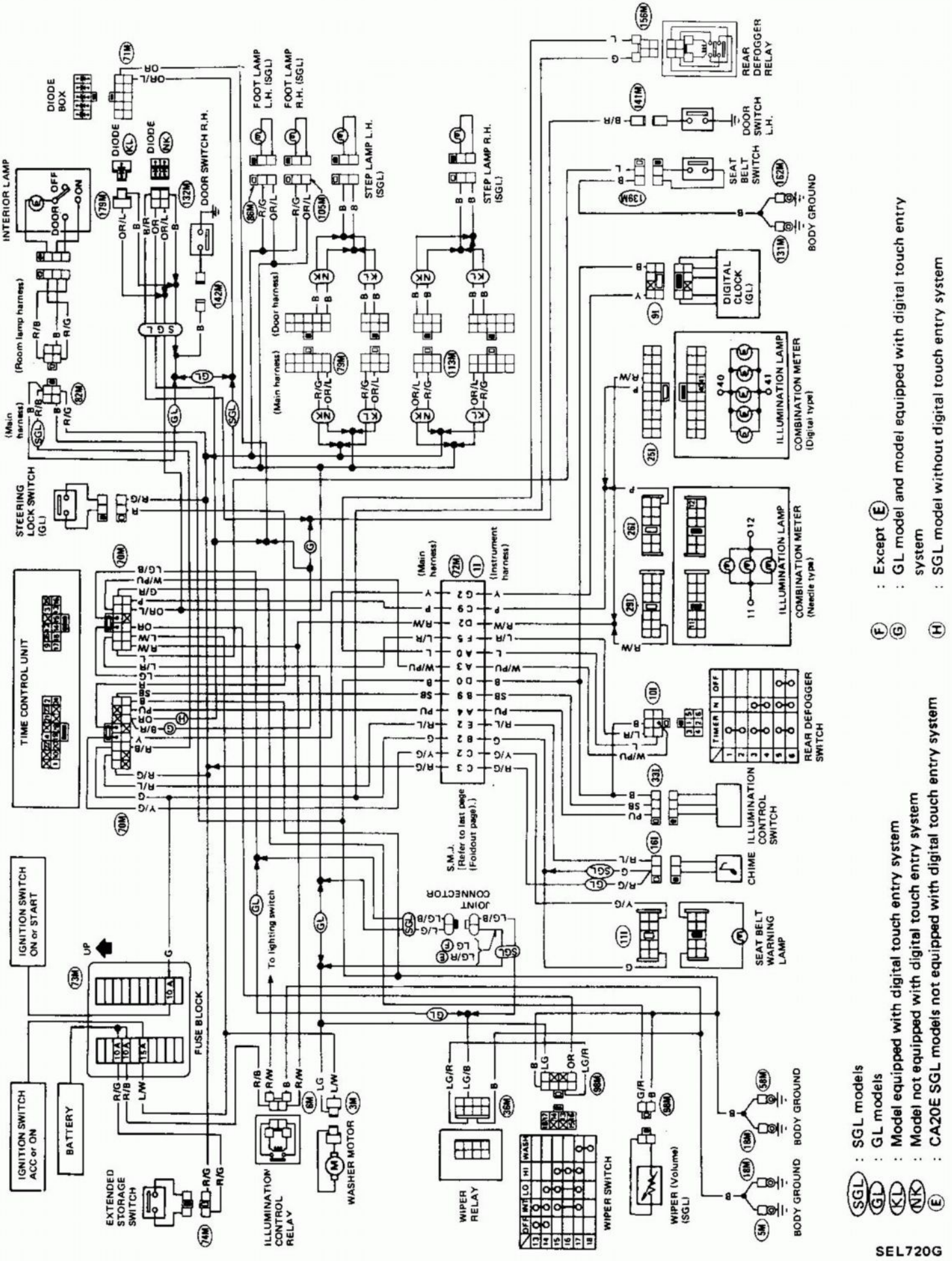


Schematic

CAUTION:
Never touch the terminals of time control unit with bare hands.



Wiring Diagram



Description

FUNCTION

- Time control unit has the following functions.

	Item	Details of control
1	Intermittent wiper control	Regulates intermittent time from approximately 3 to 12 seconds depending on the intermittent wiper volume setting.
2	Washer and wiper combination control	Wiper is operated in conjunction with washer switch.
3	Interior lamp timer	Fades out interior lamp when driver's side door is opened and closed.
4	Illumination control	Regulates brightness of illumination in 16 stages depending on the illumination control switch setting.
5	Light warning chime timer*1	Sounds warning chime if driver's side door is opened when light switch is "ON" and ignition switch "OFF".
6	Key warning chime timer*1	Sounds warning chime if driver's side door is opened when ignition switch is "OFF" and steering lock switch "ON" (ignition key is inserted in key hole).
7	Seat belt warning lamp timer	Seat-belt warning lamp blinks for about 7 seconds when ignition switch is turned to "ON".
8	Seat belt warning chime timer	Sounds warning chime for about 7 seconds if ignition switch is turned "ON" when seat belt switch is "ON" (seat belt is unfastened).
9	Rear defogger timer	Operates rear defogger for about 15 minutes when rear defogger switch is turned to "TIME".
10	Clock*2	Generates clock pulses and drive clock.

*1: Item No. 5 and 6 are applied only for models without voice warning.
*2: Item No. 10 is applied only for GL model.

Description (Cont'd)

OPERATING CONDITIONS

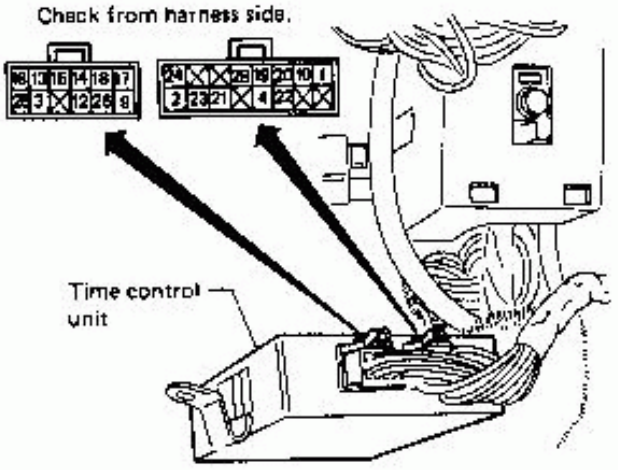
Input signal / Input terminal / Output terminal / Item		Power source from battery	Ignition switch	Light switch	Wiper switch "INT"	Washer switch	Driver's side door switch *1	Steering lock switch *2	Seat belt switch *3	Illumination control switch	Rear defogger switch "TIMER"
		①	㉖ or ⑳	⑨	⑫	⑭	㉑	㉘	⑰	㉓ or ㉔	⑬
Intermittent wiper control	⑮	ON	ACC or ON		ON						
Washer and wiper combination control	⑮	ON	ACC or ON			ON					
Interior lamp timer	㉒	ON					ON → OFF				
Illumination control	㉕	ON		ON						ON	
Light warning chime timer	⑩	ON	OFF or ACC	ON			ON				
Key warning chime timer	⑩	ON	OFF or ACC				ON	ON			
Seat belt warning lamp timer	⑲	ON	OFF or ACC → ON								
Seat belt warning chime timer	⑩	ON	OFF or ACC → ON						ON		
Rear defogger timer	⑱	ON	ON								ON
Clock	④	ON									

*1: Door switch is turned ON when door is opened.
*2: Steering lock switch is turned ON when ignition key is pulled out of key cylinder.
*3: Seat belt switch is turned ON when driver's side seat belt is unfastened.

TIME CONTROL SYSTEM

Preparation for Trouble-shooting

1. Remove R.H. dash side cover.
2. Remove time control unit with harness connected.

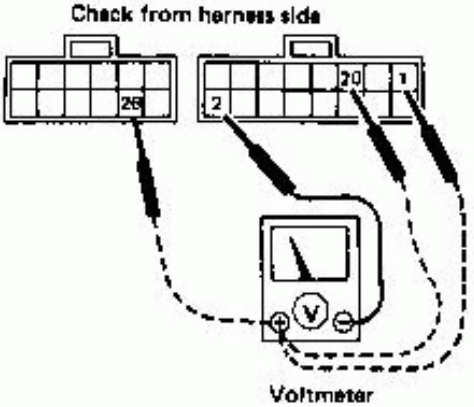


SEL258E

Power Supply Circuit Check

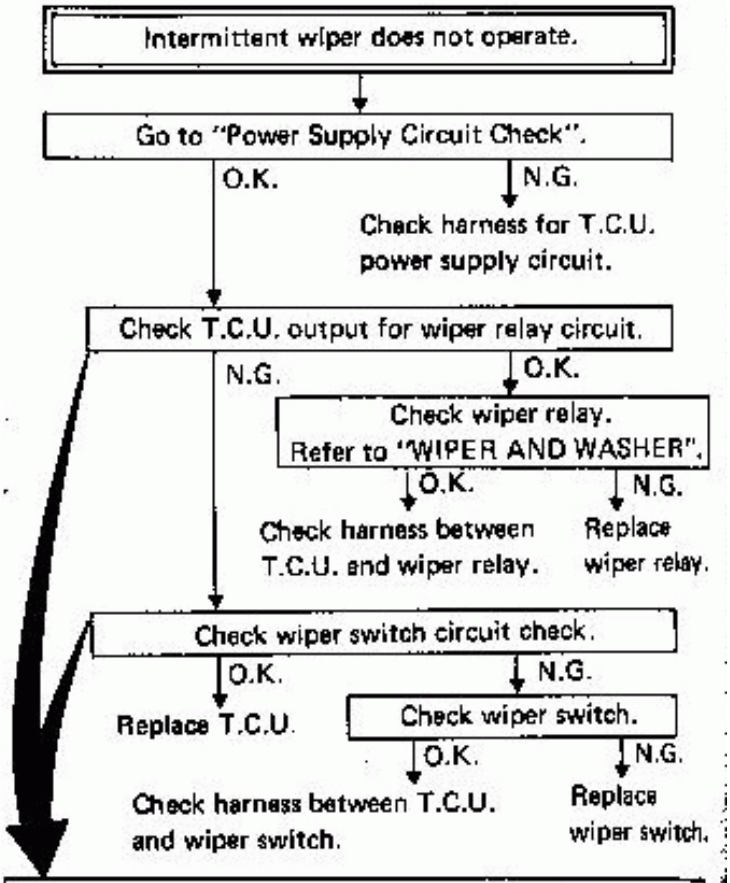
Voltmeter terminals		Ignition switch position		
(+)	(−)	OFF	ACC	ON
①	②	Approx. 12V	Approx. 12V	Approx. 12V
⑱	②	0V	0V	Approx. 12V
㉖	②	0V	Approx. 12V	Approx. 12V

Ohmmeter terminals		Continuity
(+)	(−)	
②	Body ground	Yes



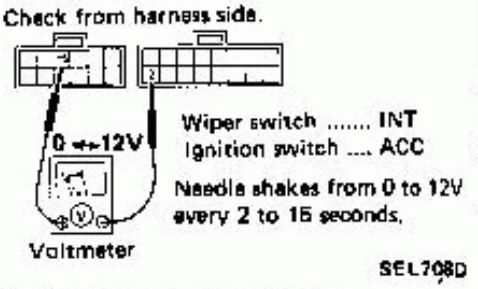
SEL724D

Trouble-shooting



T.C.U. OUTPUT FOR WIPER RELAY CIRCUIT CHECK

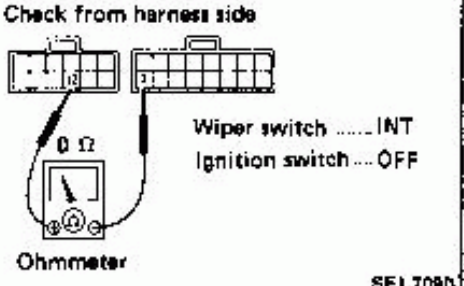
1. Turn wiper switch to "INT".
2. Turn ignition switch to "ACC".
3. Measure voltage across ⑮ and ②.



SEL708D

WIPER SWITCH CIRCUIT CHECK

1. Turn wiper switch to "INT".
2. Turn ignition switch to "OFF".
3. Check continuity between ⑫ and ②.



SEL709D

Trouble-shooting (Cont'd)

Intermittent time of wiper cannot be adjusted.

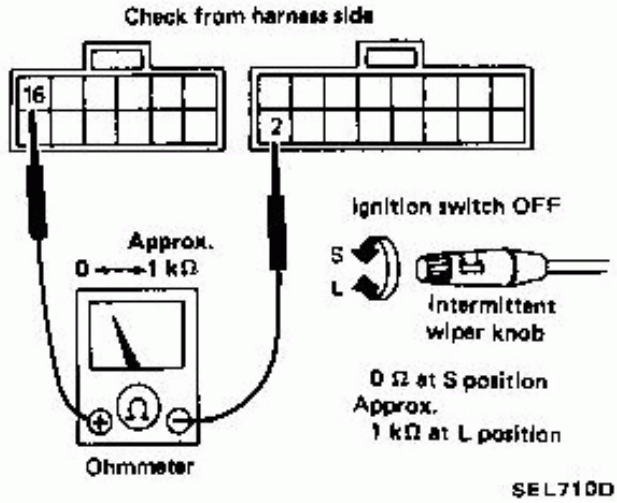
Check intermittent wiper volume circuit.

O.K. → Replace T.C.U.

N.G. → Check intermittent wiper volume.

- O.K. → Check harness between T.C.U. and intermittent wiper volume.
- N.G. → Replace wiper switch.

1. Turn ignition switch to "OFF".
2. Measure resistance between ⑯ and ② while turning intermittent wiper volume.



SEL710D

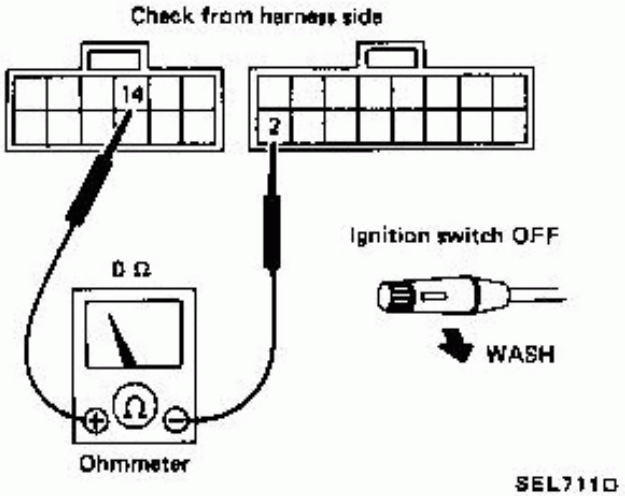
Wiper and washer activate individually but not in combination.

Check washer switch circuit.

O.K. → Replace T.C.U.

N.G. → Check harness between T.C.U. and washer switch.

1. Turn ignition switch to "OFF".
2. Turn washer switch to "ON".
3. Check continuity between ⑭ and ② .



SEL711D

Trouble-shooting (Cont'd)

Interior lamp does not fade out after driver's side door is closed.

Check if door warning lamp goes off after all doors are closed.

- O.K. → Go to "Power Supply Circuit Check".
- N.G. → Check door switch and harness between T.C.U. and driver's side door switch.

Go to "Power Supply Circuit Check".

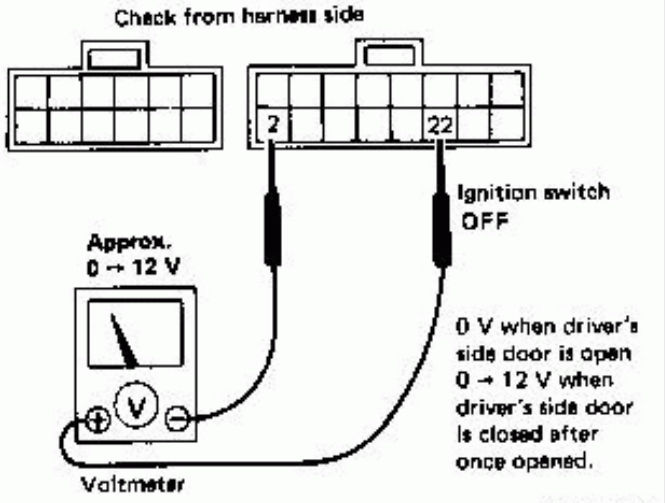
- O.K. → Check T.C.U. output for interior lamp circuit.
- N.G. → Check harness for T.C.U. power supply circuit.

Check T.C.U. output for interior lamp circuit.

- N.G. → Replace T.C.U.
- O.K. → Check harness between T.C.U. and interior lamp.

T.C.U. OUTPUT FOR INTERIOR LAMP CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Measure voltage across ㉒ and ②.



SEL712D

Illumination control system does not actuate.

Check light switch circuit.

- O.K. → Check illumination circuit.
- N.G. → Check harness between T.C.U. and light switch.

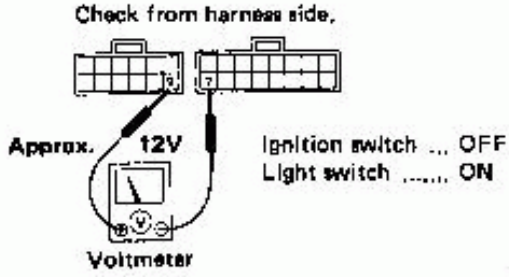
Check illumination circuit.

- O.K. → Check illumination control circuit.
- N.G. → Check for loose harness connector.

Check illumination control circuit.

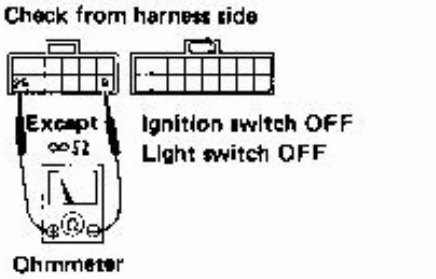
- O.K. → Replace T.C.U.
- N.G. → Check illumination control switch.

LIGHT SWITCH CIRCUIT CHECK



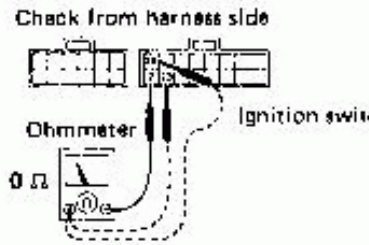
SEL715D

ILLUMINATION CIRCUIT CHECK



SEL716D

ILLUMINATION CONTROL CIRCUIT CHECK



Ohmmeter (+)	Ohmmeter (−)	Illumination control switch: DARK	Illumination control switch: BRIGHT
㉔	②	0 Ω	Except 0 Ω
㉓	②	Except 0 Ω	0 Ω

SEL157E

Trouble-shooting (Cont'd)

Light warning chime does not activate.

Check if other warning chimes function.

O.K. → Go to "Light switch circuit check". (Refer to back page.)

O.K. → Replace T.C.U.

N.G. → Check harness between T.C.U. and light switch.

N.G. → Go to "Power Supply Circuit Check".

O.K. → Check T.C.U. output for chime circuit.

O.K. → Check chime, and harness between T.C.U. and chime.

N.G. → Check harness for T.C.U. power supply circuit.

Key warning chime does not activate.

Check if other warning chimes function.

N.G. → Go to "Power Supply Circuit Check".

O.K. → Check steering lock switch circuit.

O.K. → Replace T.C.U.

N.G. → Check steering lock switch.

Seat belt warning chime does not activate.

Check if other warning chimes function.

N.G. → Check steering lock switch circuit.

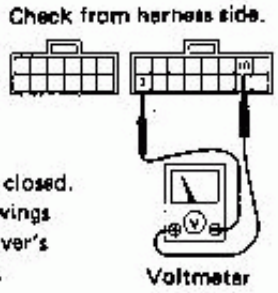
O.K. → Check seat belt switch circuit.

O.K. → Replace T.C.U.

N.G. → Check seat belt switch, and harness between T.C.U. and seat belt switch.

T.C.U. OUTPUT FOR CHIME CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Measure voltage across ⑩ and ② when driver's door is opened and closed.

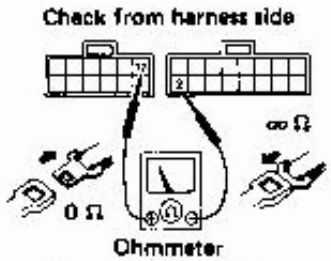


Ignition switch ... OFF
Light switch ... 1ST
- Approx. 12V when driver's side door is closed.
- Voltmeter needle swings (0 ↔ 12V) when driver's side door is opened.

SEL718D

SEAT BELT SWITCH CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Unfasten driver's seat belt.
3. Check for continuity between ⑰ and ②.
4. Fasten driver's seat belt.
5. Check to determine if continuity does not exist between ⑰ and ②.



SEL721D

STEERING LOCK SWITCH CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Check voltage between ㉘ and ②.

- 12V when ignition key is set into key cylinder.
- 0V when ignition key is pulled out of key cylinder.

SEL719D

Trouble-shooting (Cont'd)

Seat belt warning lamp does not come on.

Go to "Power Supply Circuit Check".

O.K. → Check T.C.U. output for belt warning lamp circuit.

N.G. → Check harness for T.C.U. power supply circuit.

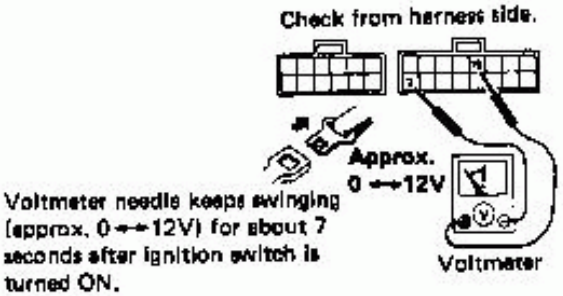
Check T.C.U. output for belt warning lamp circuit.

N.G. → Replace T.C.U.

O.K. → Check warning lamp.

T.C.U. OUTPUT FOR BELT WARNING LAMP CIRCUIT CHECK

1. Unfasten seat belt.
2. Measure voltage across ⑲ and ② when ignition switch is "ON".



Rear defogger does not activate, or does not go off automatically.

Go to "Power Supply Circuit Check".

O.K. → Check T.C.U. output for rear defogger circuit.

N.G. → Check harness for T.C.U. power supply circuit.

Check T.C.U. output for rear defogger circuit.

N.G. → Check defogger switch circuit.

O.K. → Check rear defogger relay, and harness between T.C.U. and rear defogger relay.

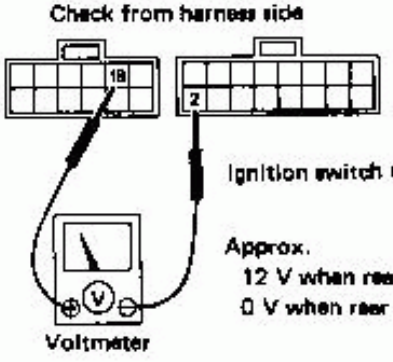
Check defogger switch circuit.

O.K. → Replace T.C.U.

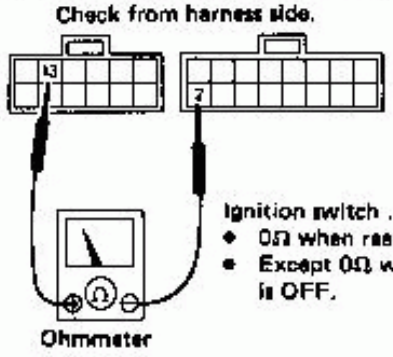
N.G. → Check defogger switch, and harness between T.C.U. and defogger switch.

T.C.U. OUTPUT FOR REAR DEFOGGER CIRCUIT CHECK

1. Turn ignition switch to "ON".
2. Measure voltage across ⑱ and ② while operating rear defogger switch.



DEFOGGER SWITCH CIRCUIT CHECK



Trouble-shooting (Cont'd)

Clock does not activate.

Go to "Power Supply Circuit Check".

O.K. / N.G.

N.G. → Check harness for T.C.U. power supply circuit.

Check T.C.U. output for clock.

O.K. / N.G.

N.G. → Replace T.C.U.

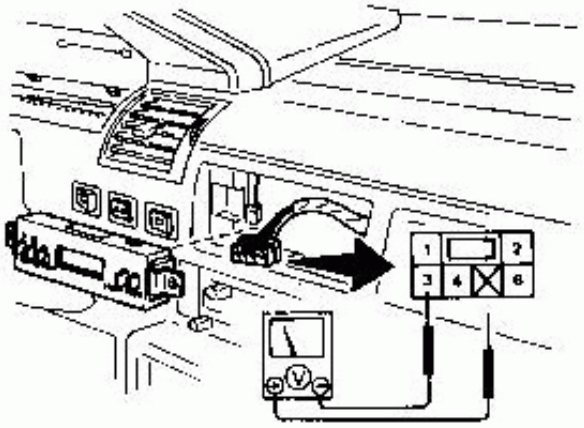
Check clock.

O.K. / N.G.

O.K. → Replace clock.

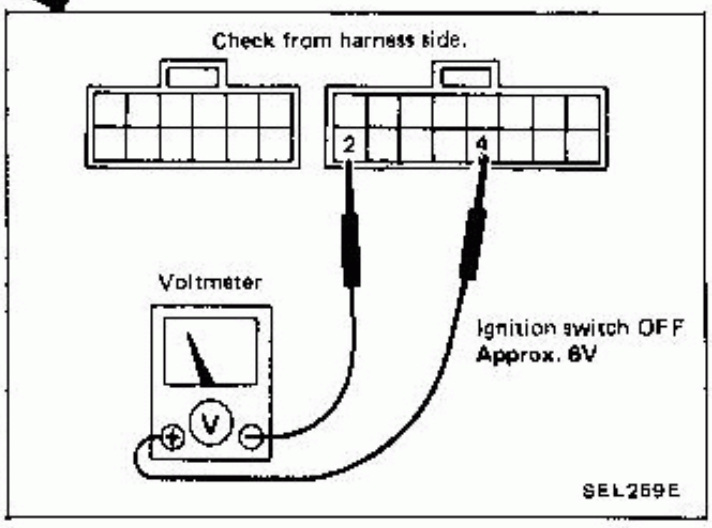
N.G. → Check harness between:
- fuse and clock
- T.C.U. and clock

1. Remove clock.
2. Disconnect harness connector for clock.
3. Check terminal voltage at instrument harness connector for clock.



SEL280E

Voltmeter terminal		Ignition switch position		
(+)	(−)	OFF	ACC	ON
①	③	Approx. 12V	Approx. 12V	Approx. 12V
④		0	Approx. 12V	Approx. 12V
⑥		Approx. 6V	Approx. 6V	Approx. 6V



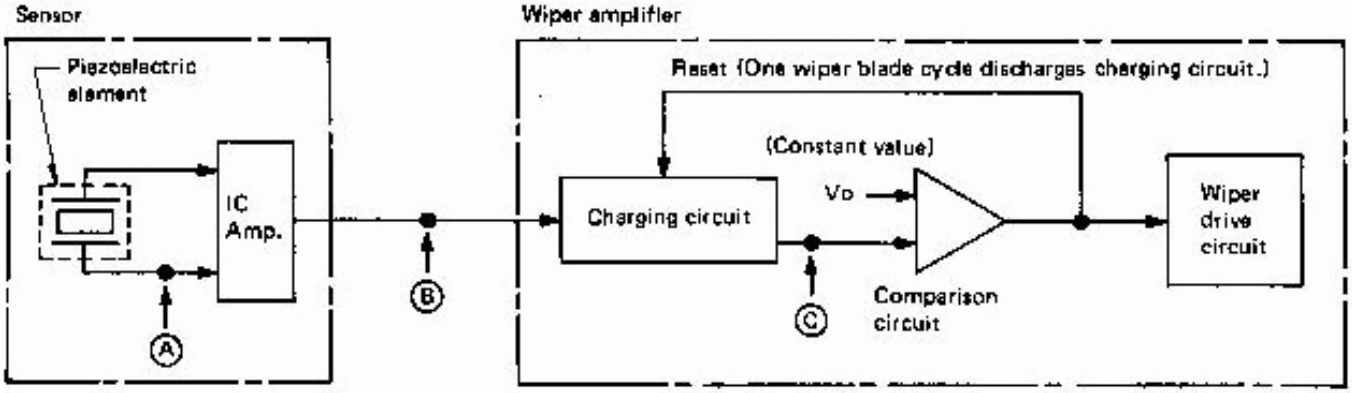
SEL269E

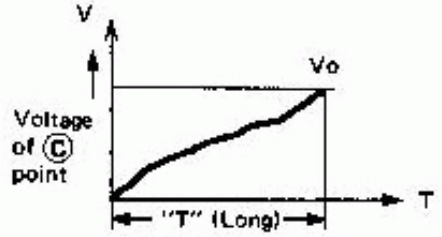
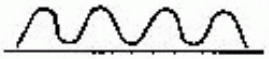
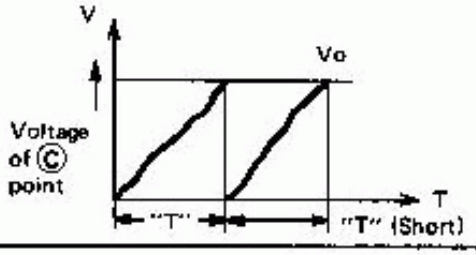
AUTO WIPER (Rain sensitive type)

Description

The auto wiper automatically varies anywhere between 3 cycle/min. and 52 cycle/min. This is accomplished by the sensor that is installed on the engine hood which detects the intensity and frequency of rainfall. The auto wiper operates when the wiper switch is set to "AUTO". It can also be operated while the "MIST" switch is being pressed.

Operating Principle



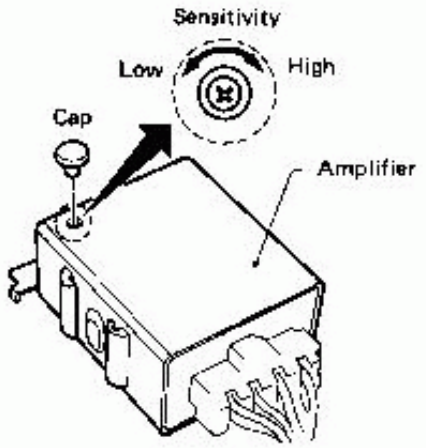
	Waves of Ⓐ point	Waves of Ⓑ point	Voltage of Ⓒ point – intermittent time
Slighter rainfall			
Heavier rainfull			

SEL788F

1. Voltage (vibration) which corresponds to the intensity and frequency of rainfall on the sensor is produced at Ⓐ point in the sensor.
2. It is fed to IC amplifier (Ⓑ point) and this increased voltage is stored in the charging circuit.
3. When the stored voltage (Ⓒ point) reaches the specified level (Vo: constant value), current flows from the comparison circuit to the wiper drive circuit which operates the wiper.
   The intermittent time "T" is proportional to the speed that causes the stored voltage to reach the specified level. In other words, the heavier the rainfall and the faster the vehicle speed, the shorter the intermittent time "T", and vice versa.

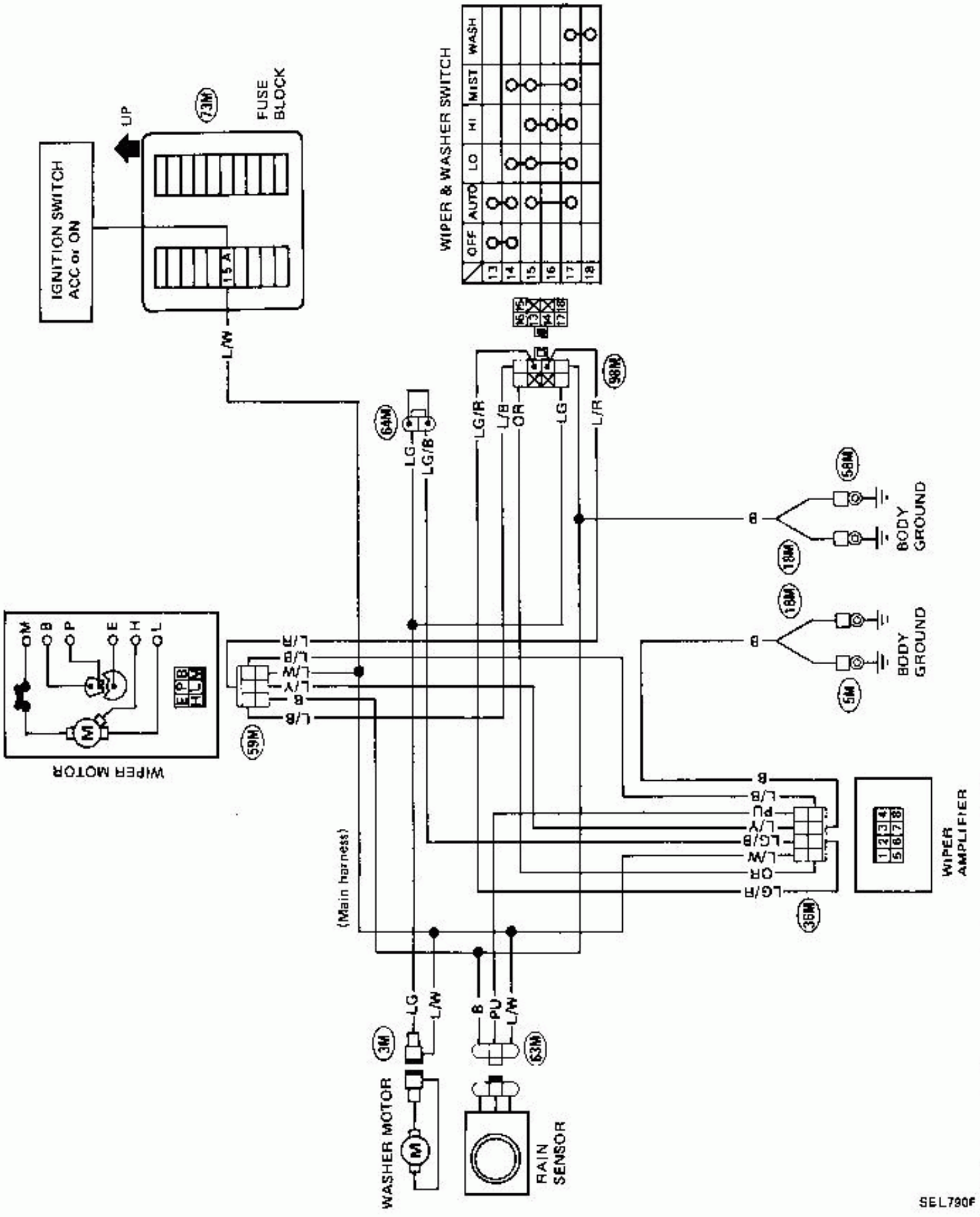
Sensitivity Adjusting Screw

The sensitivity adjusting screw is designed to adjust the commencement of wiper operation. It is built into the auto wiper amplifier.



SEL789F

Wiring Diagram



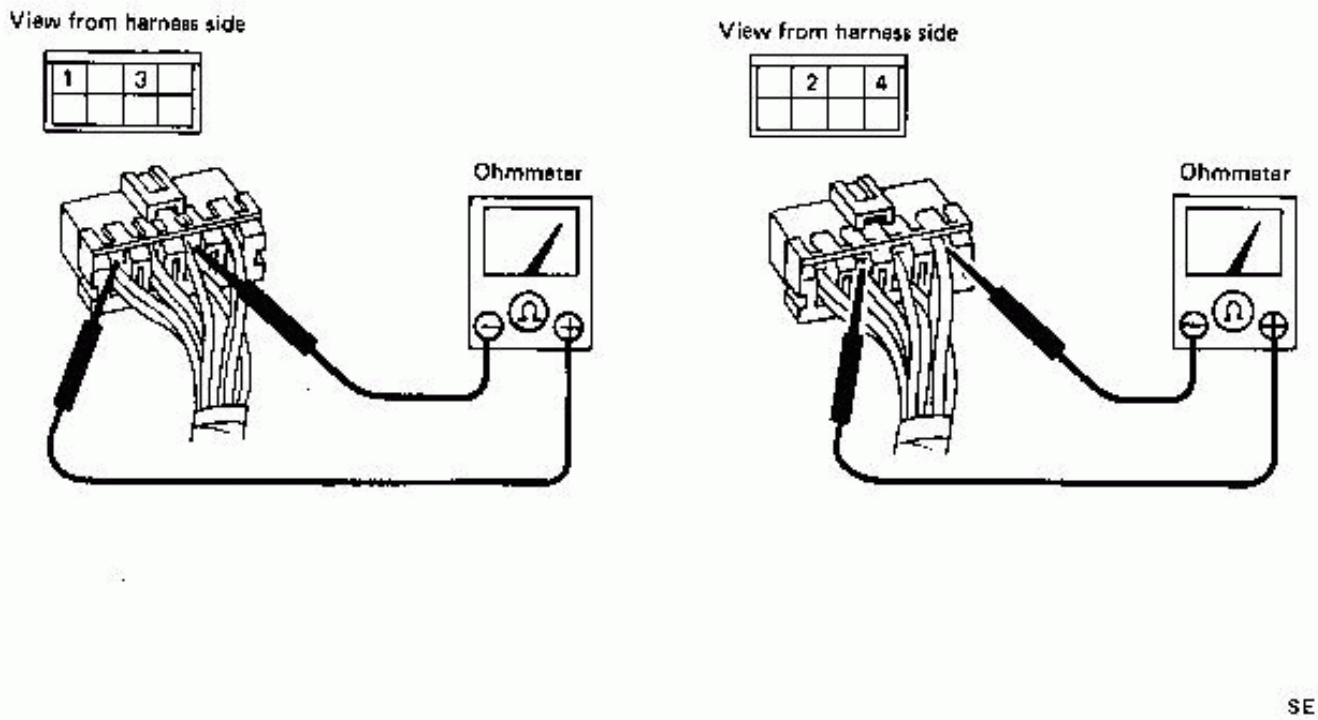
Trouble-shooting

Trouble 1
Windshield wiper does not operate intermittently when wiper switch is set to "AUTO". (It operates properly when switch is set to "LO" and "HI".)

Check to see if there is continuity when wiper switch is set to "AUTO". ... CHECK 1

- O.K. → Replace auto wiper amplifier.
- N.G. → Replace wiper switch.

CHECK 1



Trouble-shooting (Cont'd)

Trouble 2
Wiper operation does not change is response to amount of reinfall when wiper switch is set to "AUTO". (Although wiper operates intermittently at constant speed)

Check to see if power is supplied to sensor. ... CHECK 2

N.G. → Malfunctioning power source circuit

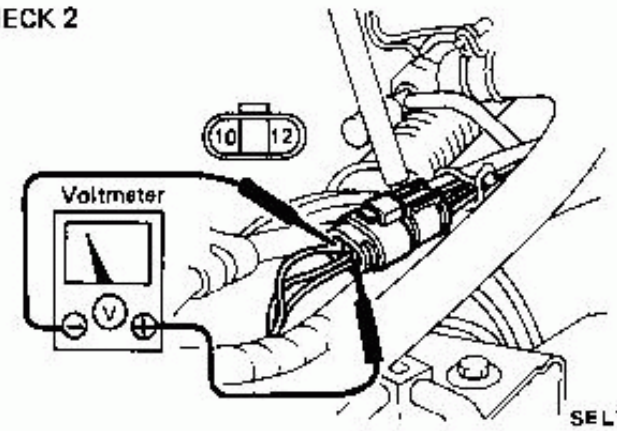
O.K.

Check to see if sensor output is fed to auto wiper amplifier. ... CHECK 3

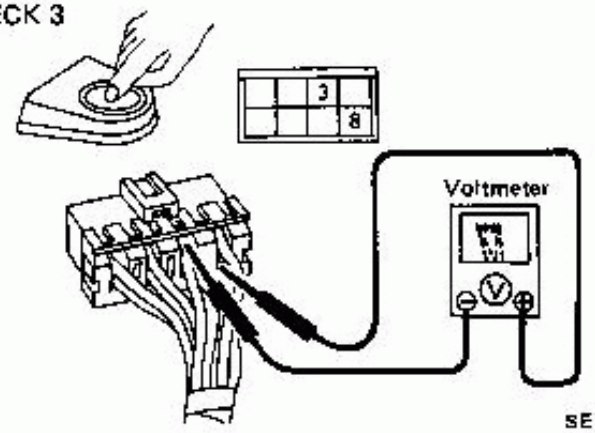
O.K. → Replace auto wiper amplifier.

N.G. → Replace sensor.

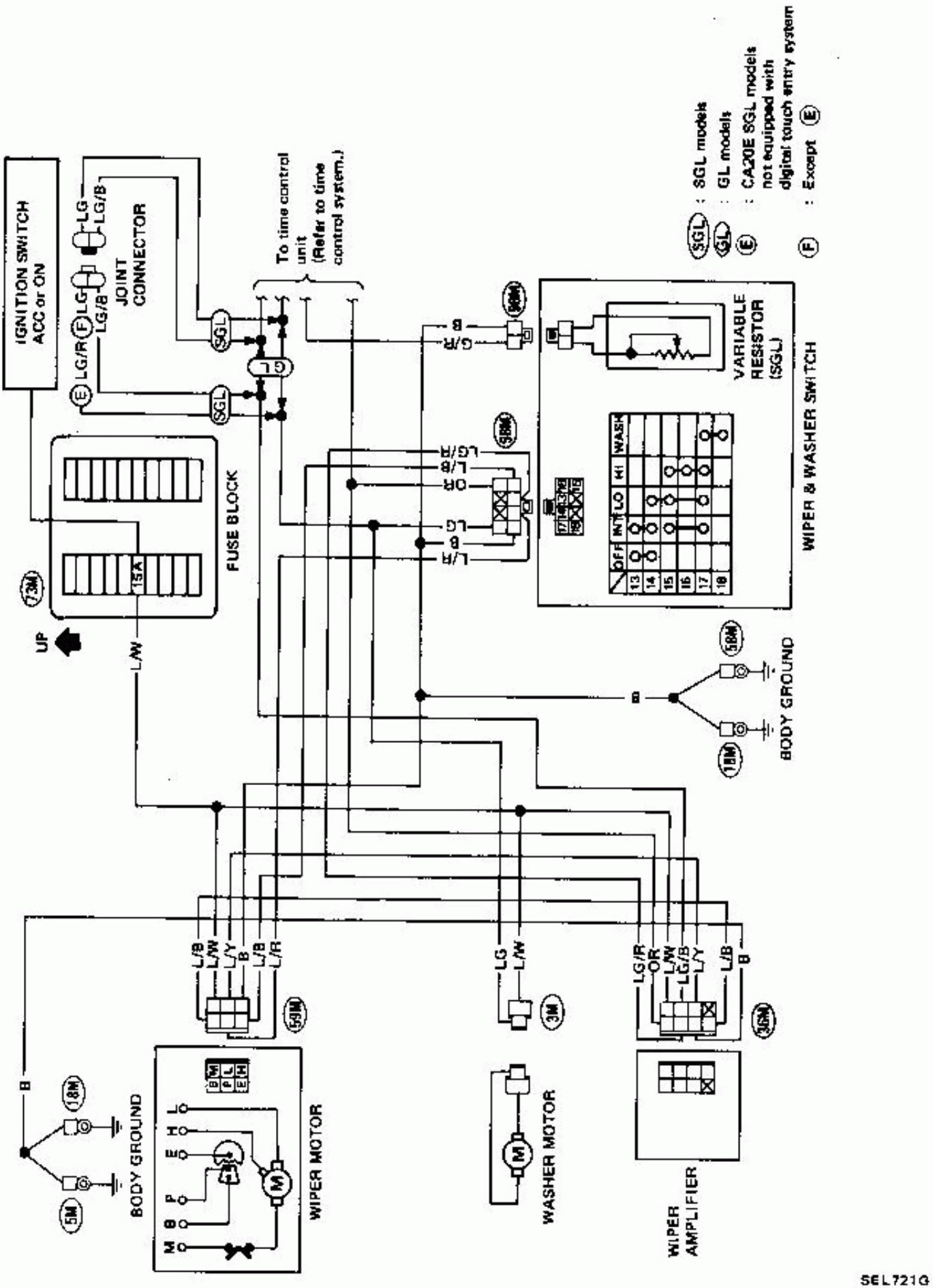
CHECK 2



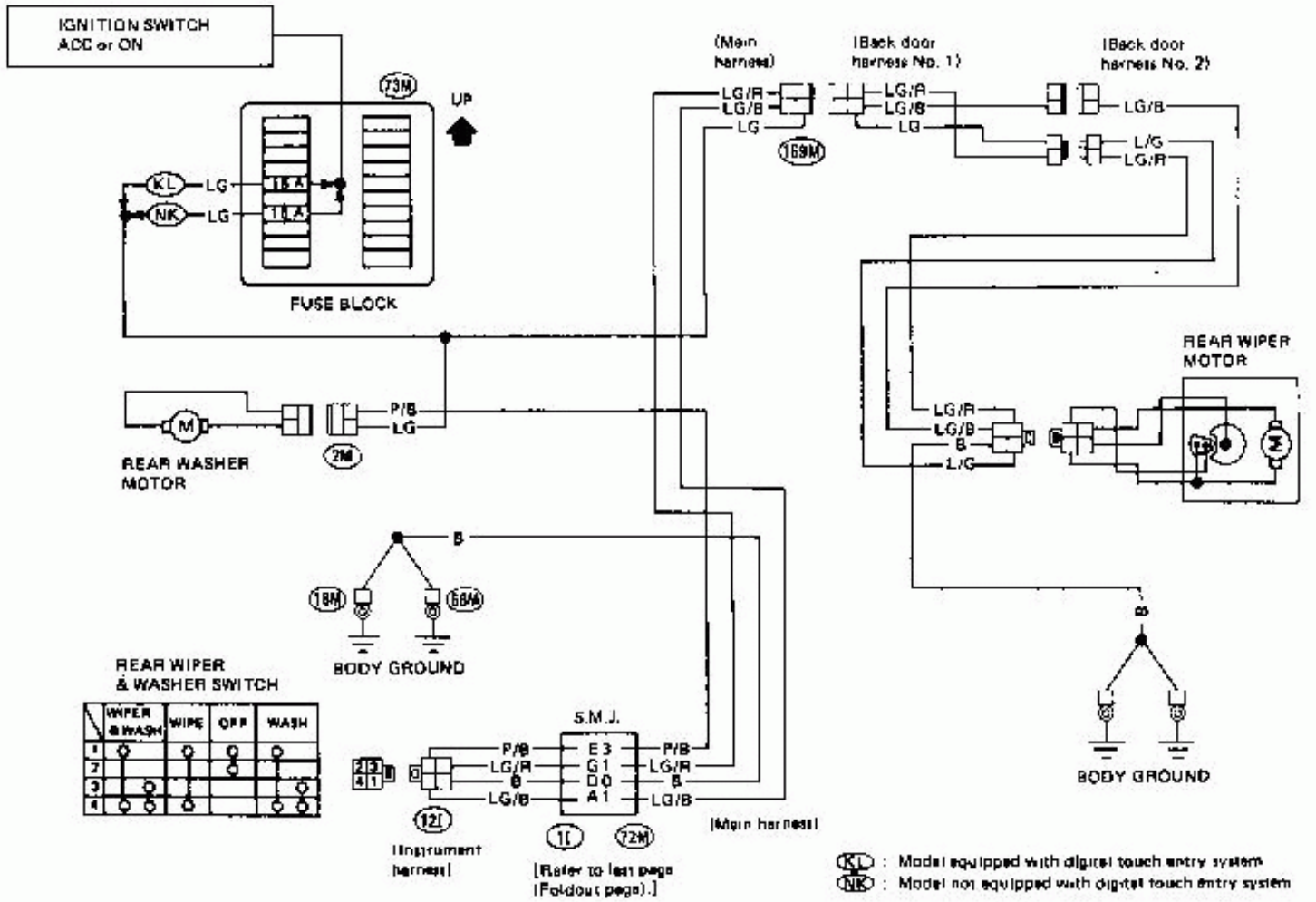
CHECK 3



Windshield Wiper and Washer/Wiring Diagram



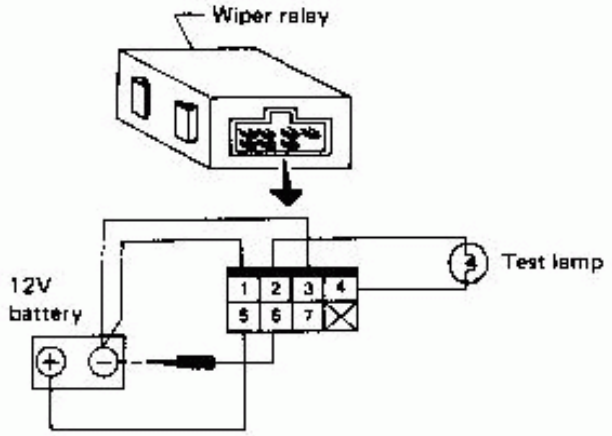
Rear Wiper and Washer/Wiring Diagram



SEL722G

Wiper Relay Check

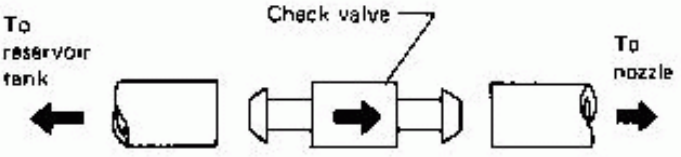
1. Make connections as shown below.
2. If test lamp comes on when connected to terminal ⑥ and battery ground, wiper relay is normal.



SEL263E

Check Valve

- A check valve is provided in the washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.

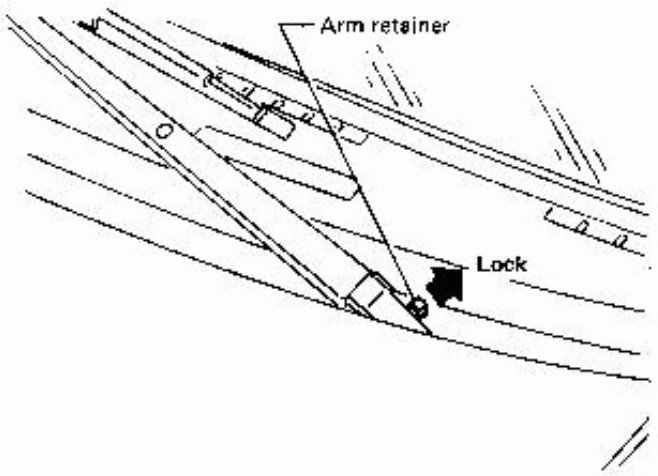


SEL264E

Windshield Wiper Removal and Installation

REMOVAL

- When removing wiper arm, lift up wiper arm, pull out arm retainer, and hold arm steady.



SEL265E

INSTALLATION

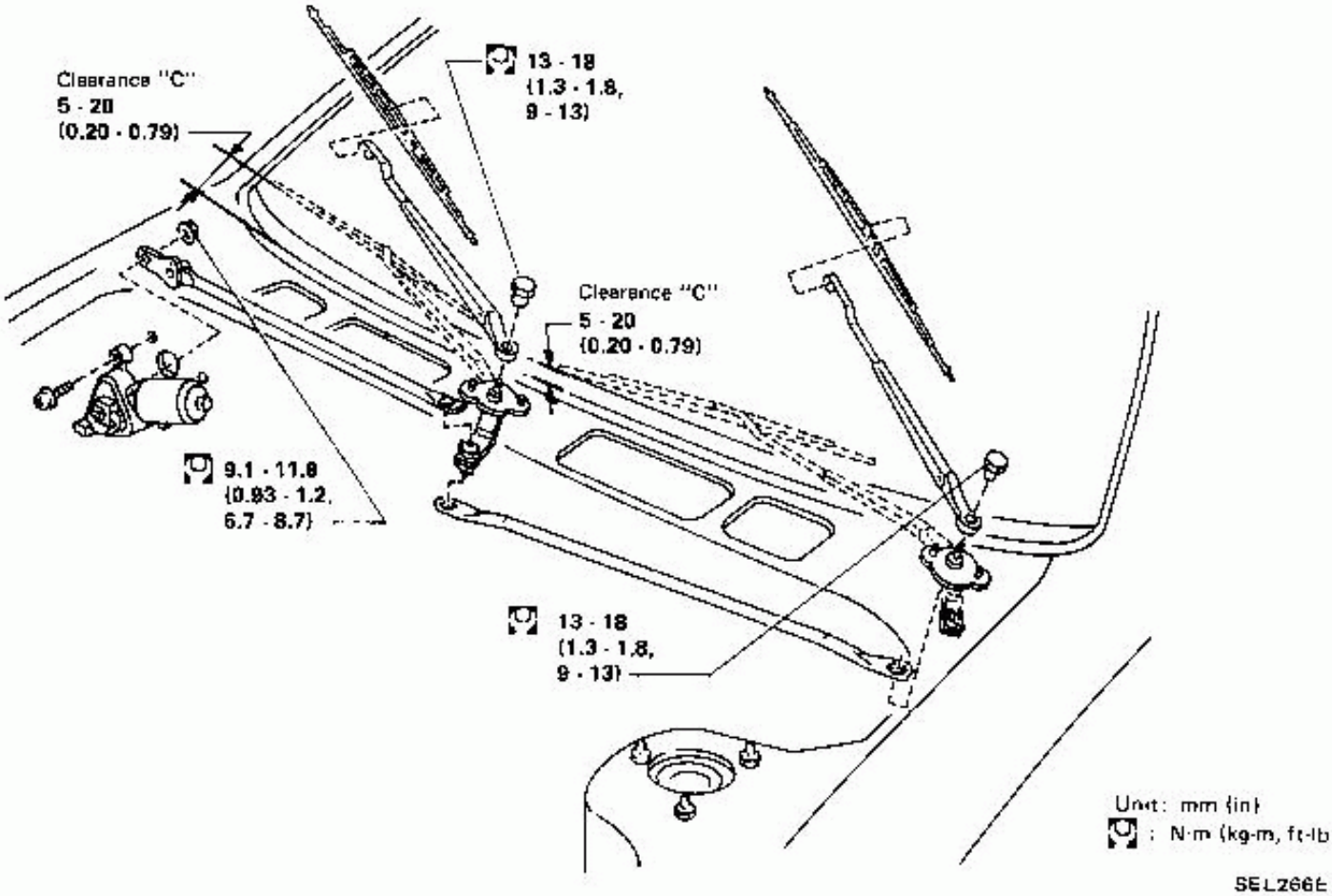
Wiper arms of different length are used for the driver's side and passenger side. They have an identifying mark and care must be taken to install them properly.

Identifying mark

"D" (short arm) . . . . . Driver's side
"A" (long arm) . . . . . Passenger side

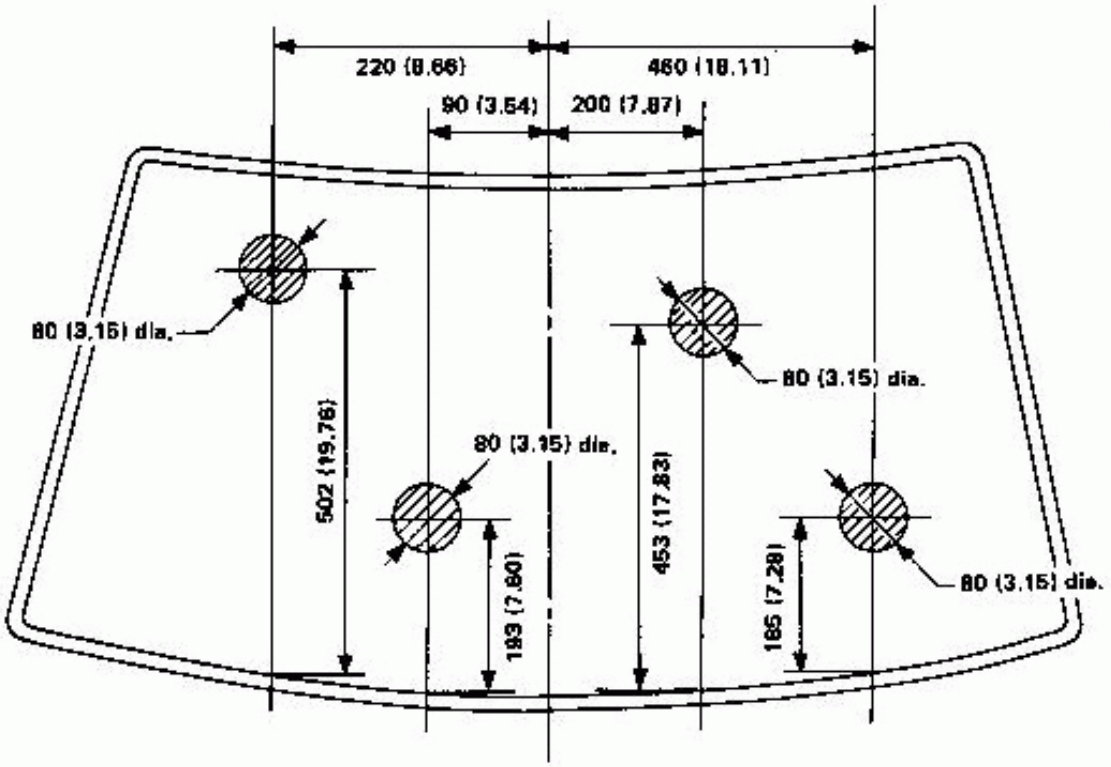
Adjustment

1. Prior to wiper arm installation, set wiper switch to "LOW" to operate wiper motor and then turn it "OFF" (Auto Stop).
2. Adjust wiper blades within clearance "C", and tighten wiper arm attaching nut to the specified torque.
3. Eject washer fluid. Set wiper switch to "LOW" to operate wiper motor and then turn it "OFF".
4. Ensure that wiper blades stop within clearance "C".



SEL266E

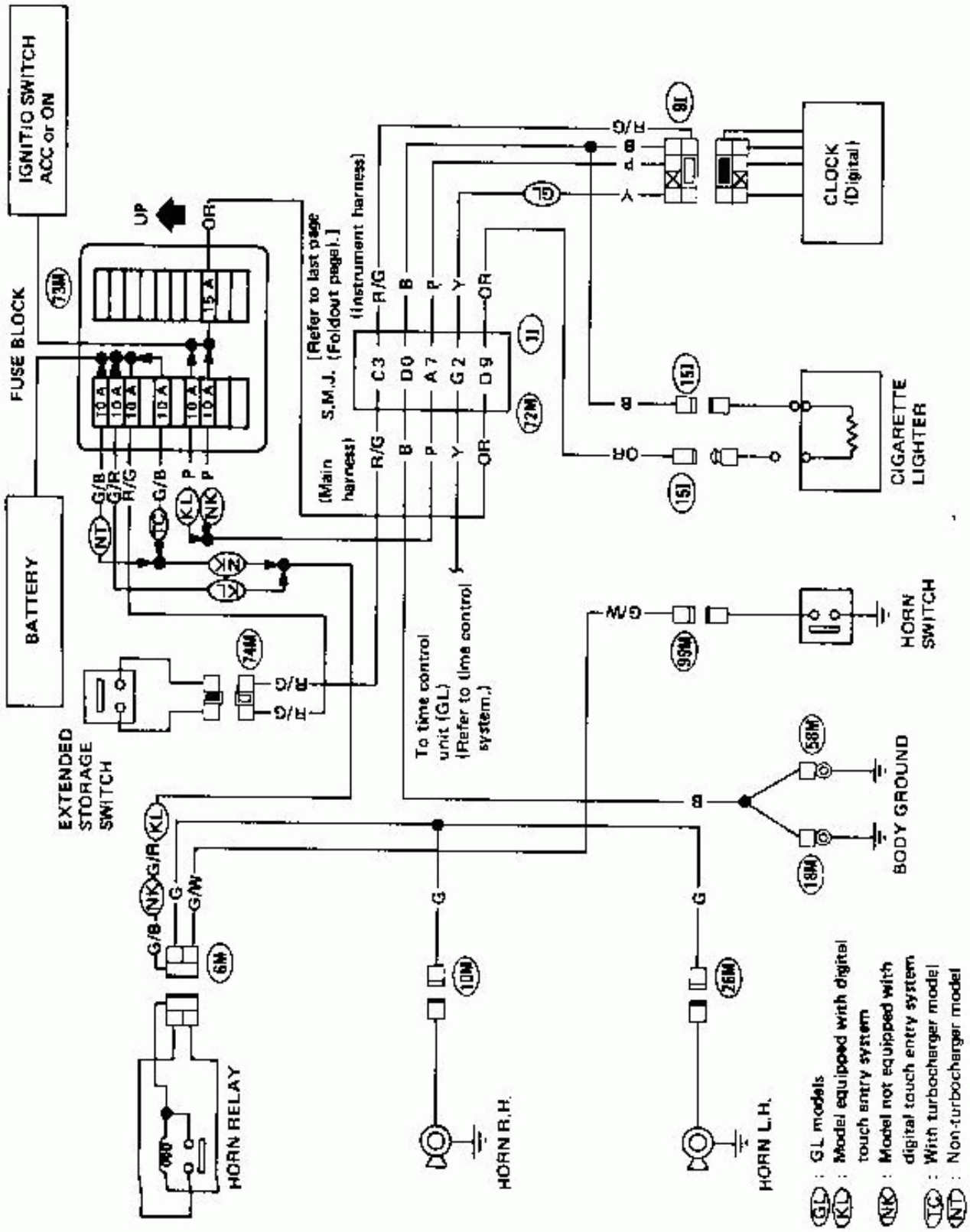
Washer Nozzle Adjustment



Unit: mm (in)

SEL046H

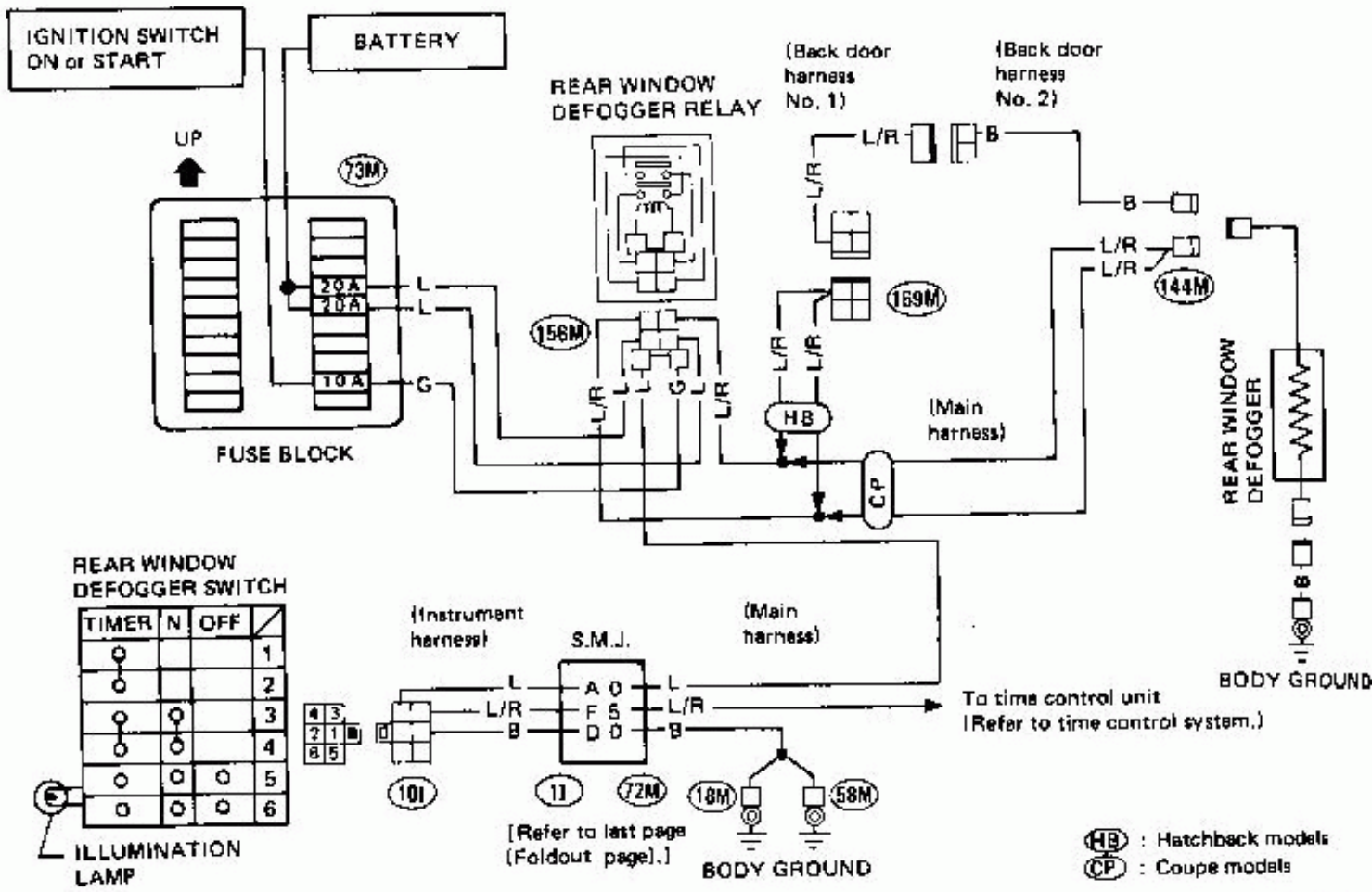
Wiring Diagram



SEL723G

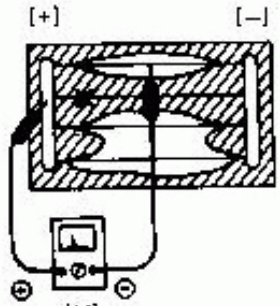
REAR WINDOW DEFOGGER

Wiring Diagram



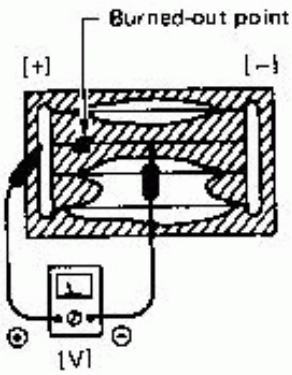
Filament Check

1. Attach probe circuit tester (in volt range) to middle portion of each filament.

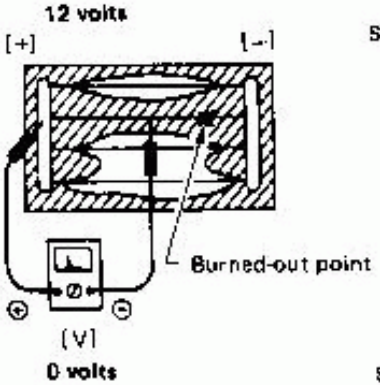


6 volts (normal filament) SEL263

2. If a filament is burned out, circuit tester registers 0 or 12 volts.



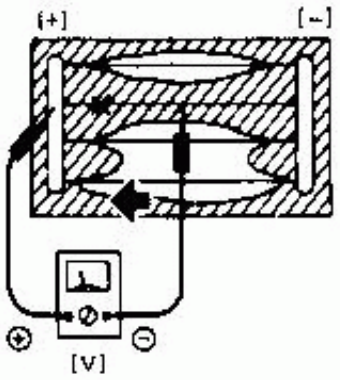
12 volts SEL264



0 volts SEL265

Filament Check (Cont'd)

3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.



SEL266

Filament Repair

REPAIR EQUIPMENT

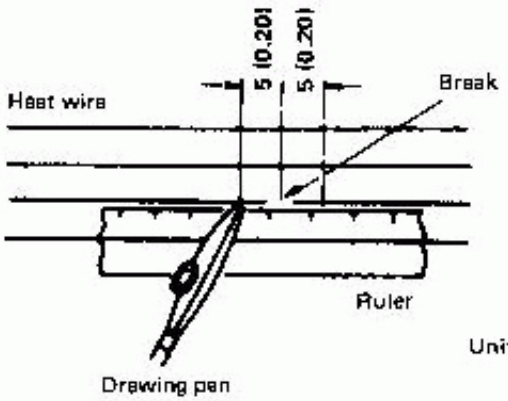
1. Conductive silver composition (Dupont No. 4817 or equivalent)
2. Ruler, 30 cm (11.8 in) long
3. Drawing pen
4. Heat gun
5. Alcohol
6. Cloth

REPAIRING PROCEDURE

1. Wipe 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.

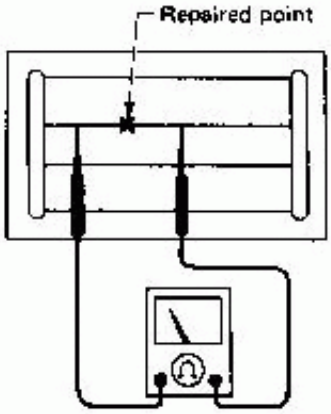


Unit: mm (in)

BE540

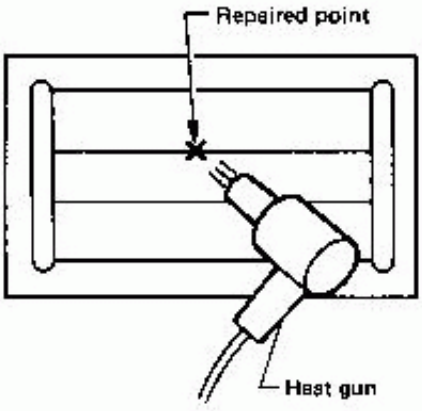
4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

Do not touch repaired area while test is being conducted.



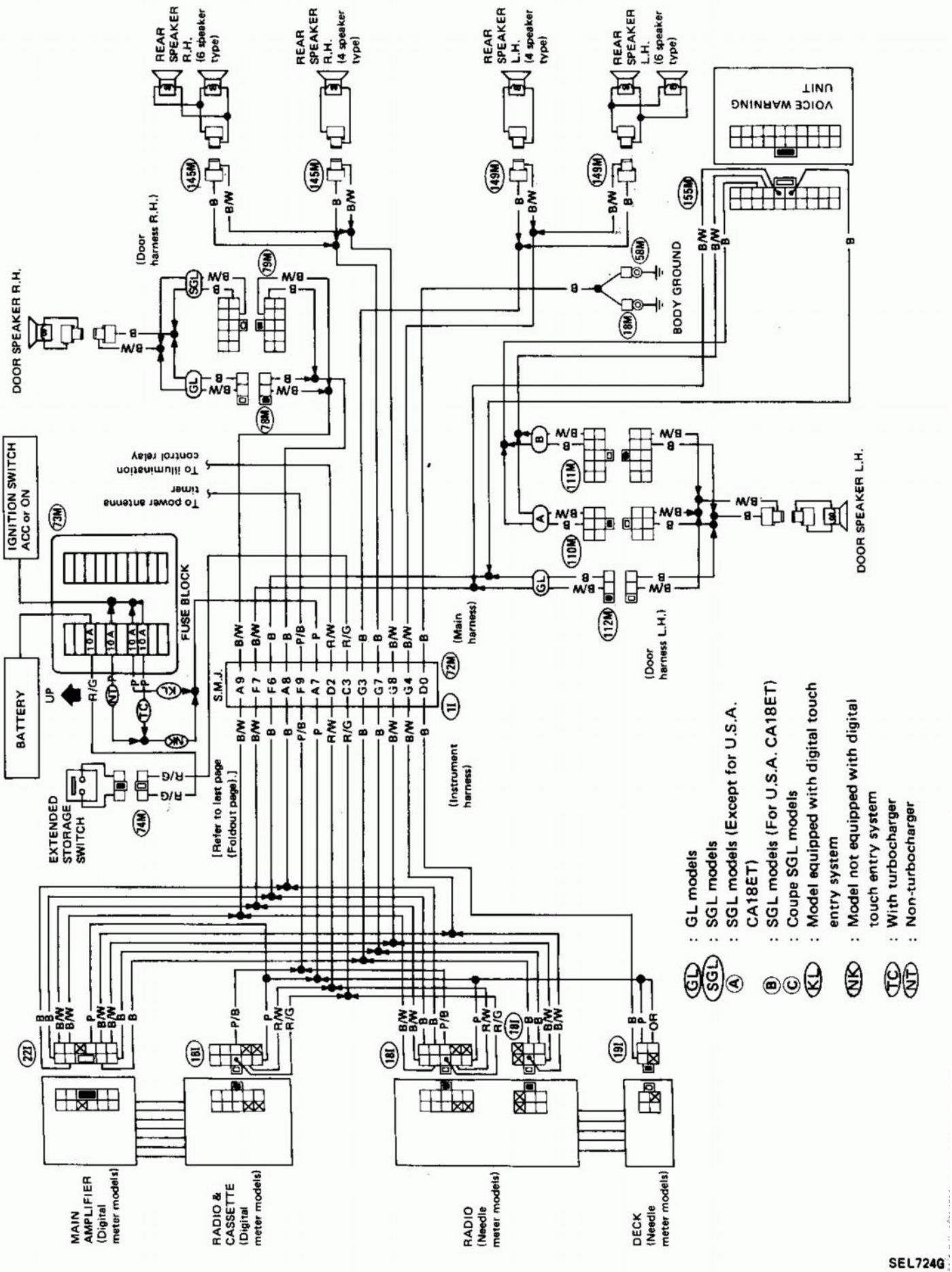
SEL012D

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.



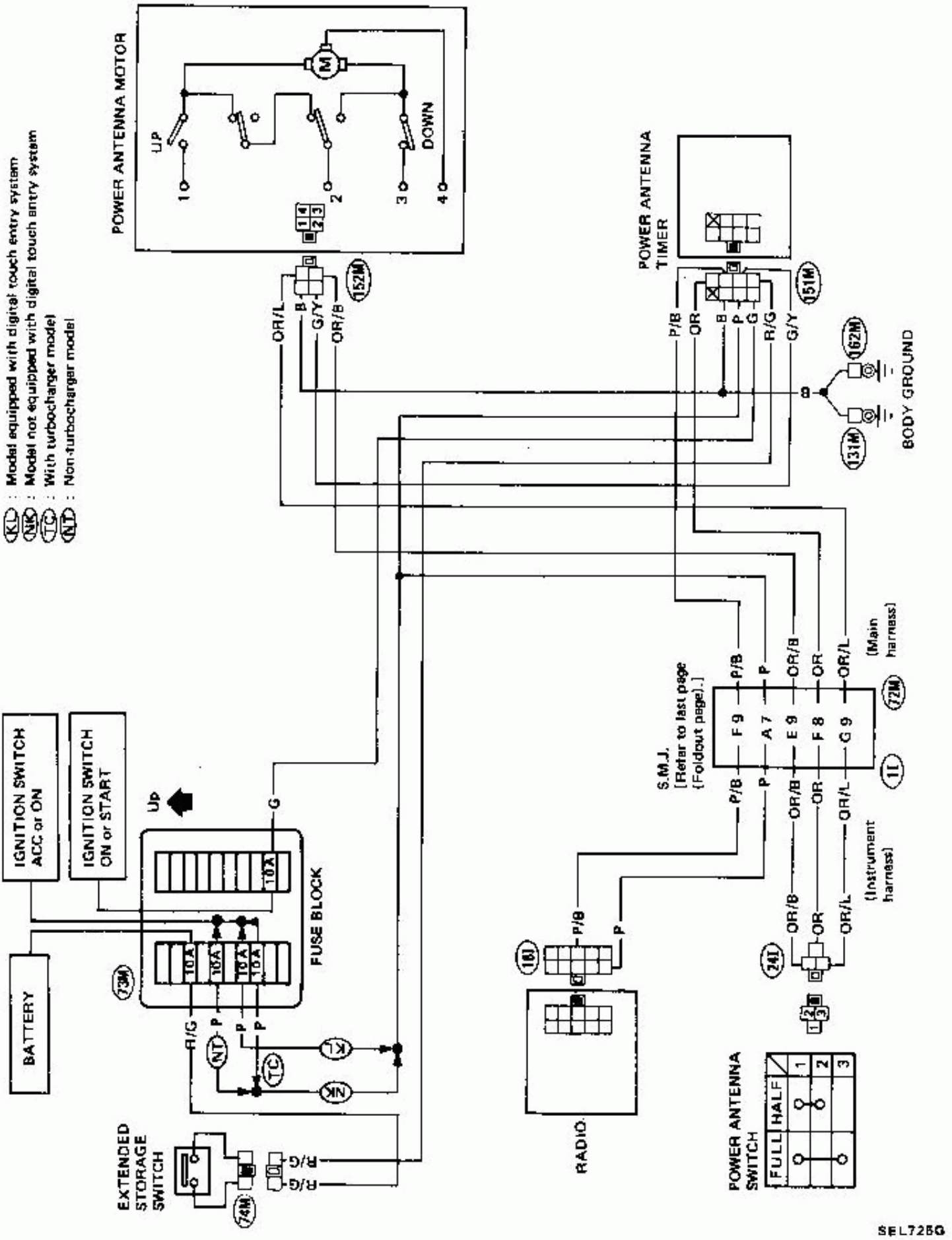
SEL013D

Audio/Wiring Diagram



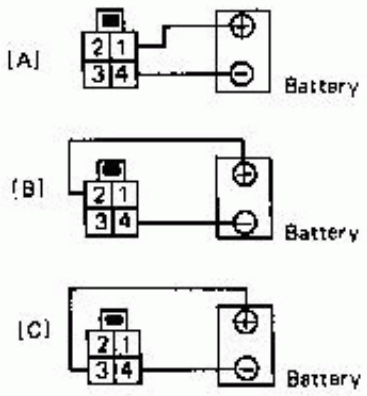
SEL724G

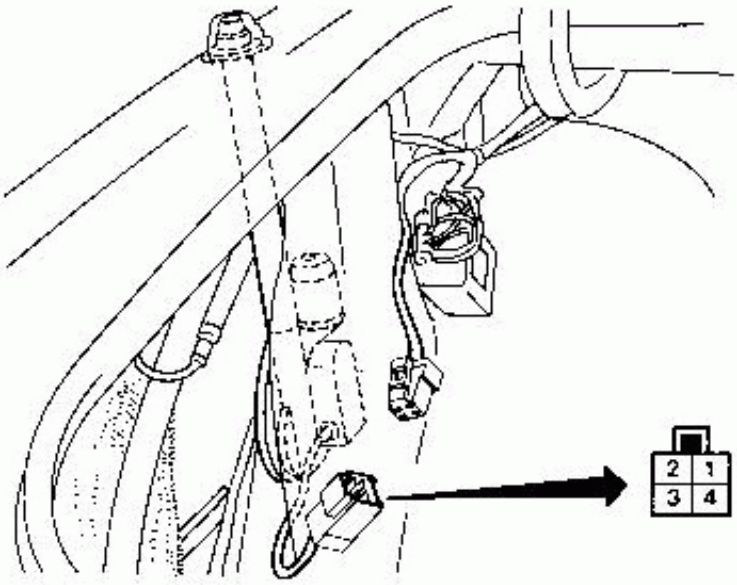
Power Antenna/Wiring Diagram



Power Antenna Motor Check

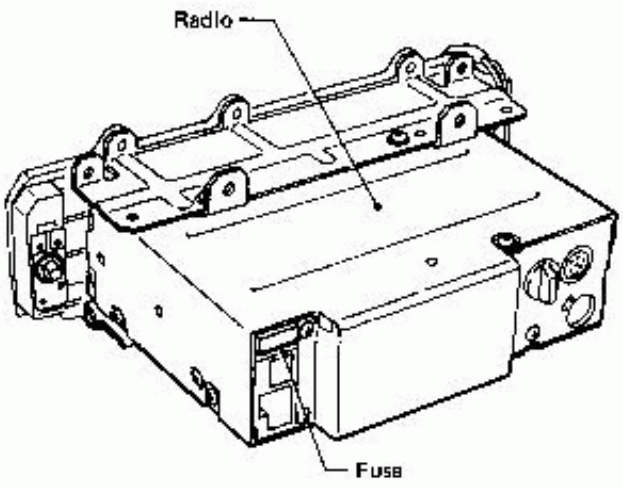
Antenna operation	Fully extended height / Half extended height / Fully retracted height						
Checking measures		B	A	B	C	A	C



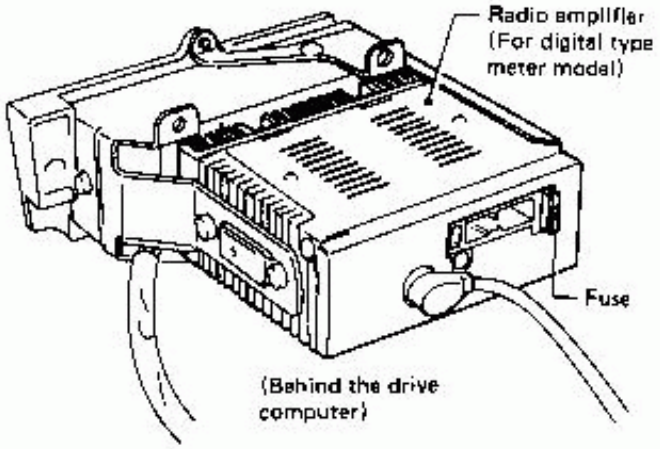


SEL270E

Radio Fuse Check

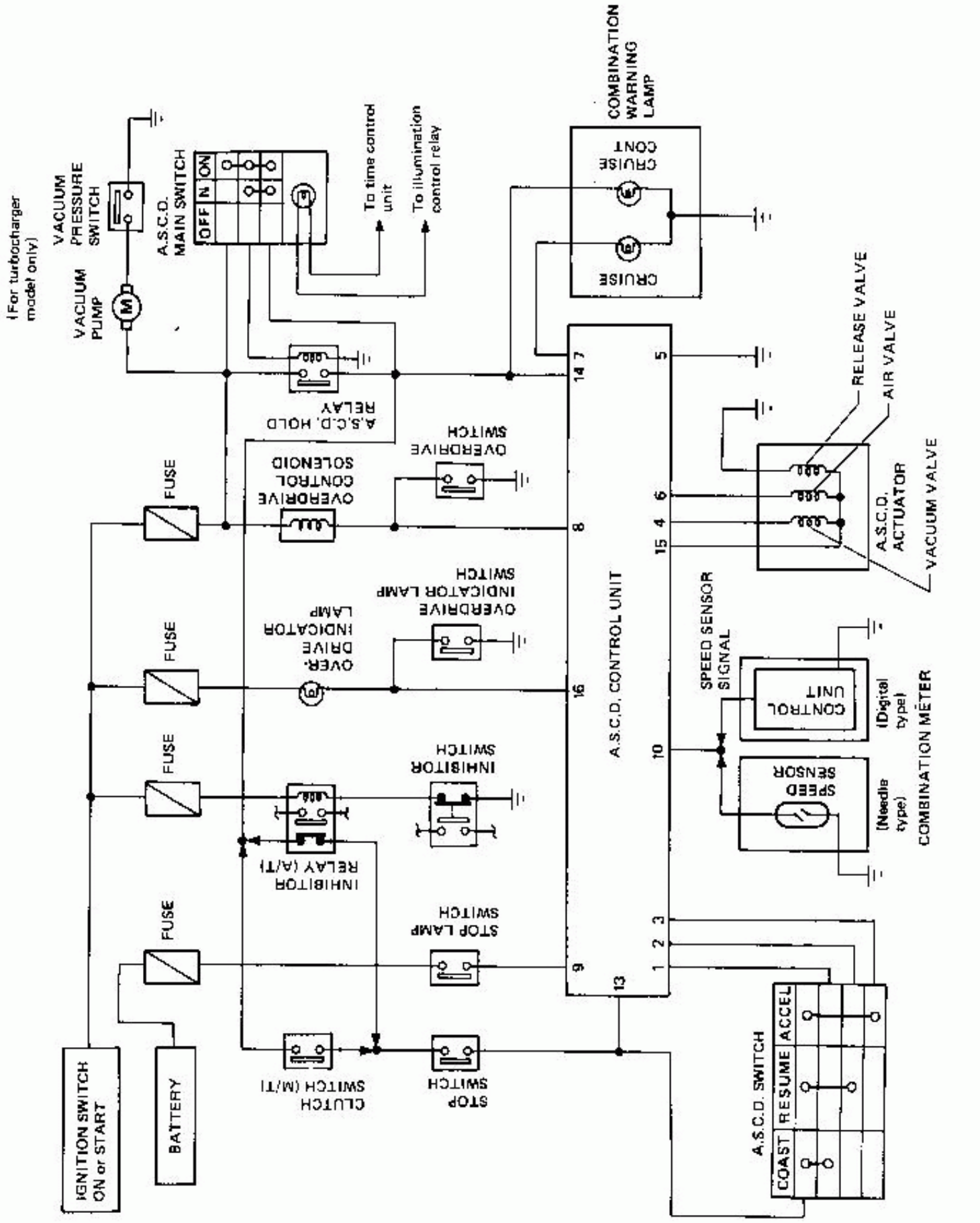


SEL271E



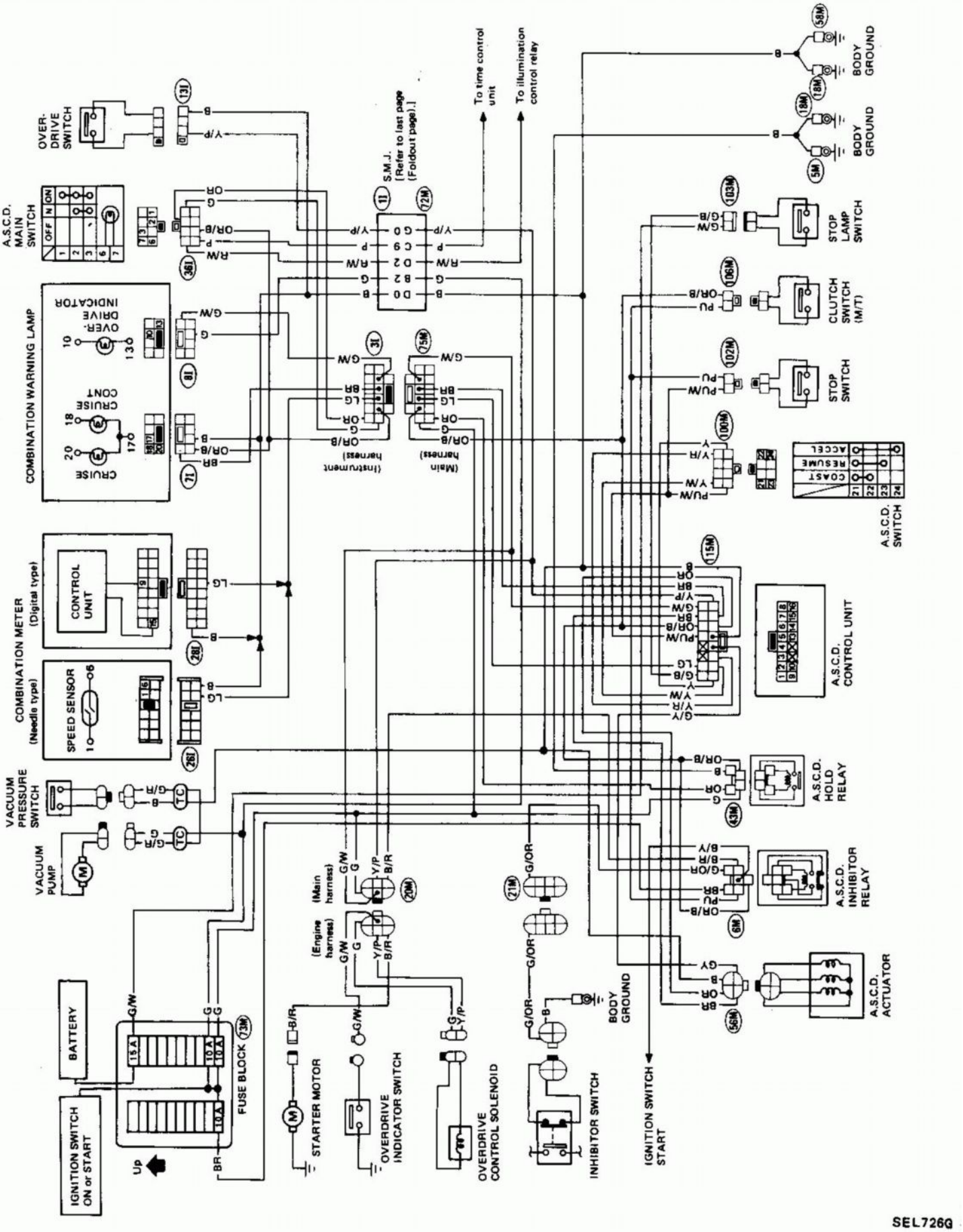
SEL272E

Schematic



SEL273E

Wiring Diagram

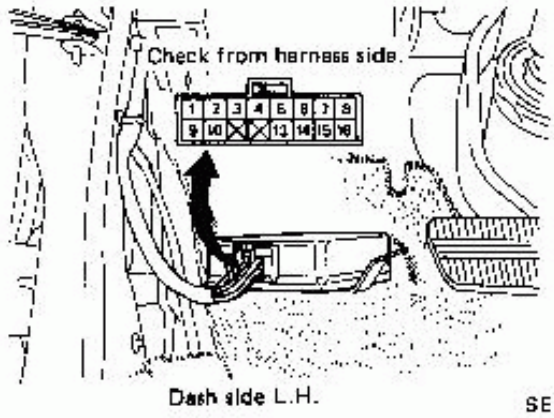


SEL726G

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Preparation for Trouble-shooting

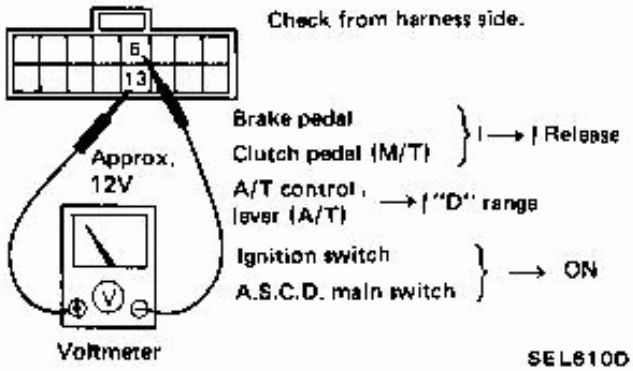
- Remove A.S.C.D. control unit with harness connected.



SEL275E

POWER SUPPLY CIRCUIT CHECK

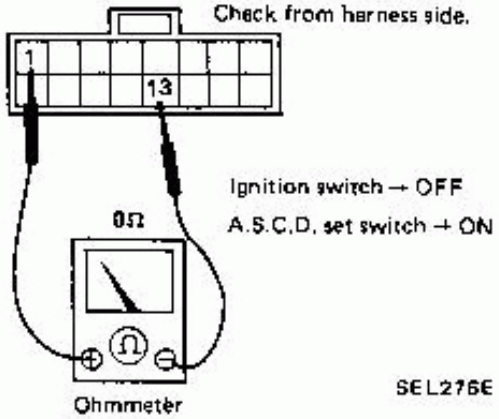
1. Release brake and clutch pedals.
2. Turn ignition switch to "ON".
3. Turn A.S.C.D. main switch to "ON".
4. Check voltage between ⑬ and ⑤.



SEL610D

SET SWITCH CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Push A.S.C.D. set switch.
3. Check continuity between ① and ⑬.



SEL276E

A.S.C.D. control unit cannot be set properly.

↓

Turn A.S.C.D. main switch "OFF" and then "ON" to make sure indicator (located above combination meter) illuminates.

↓ Yes

Check for loose vacuum hose.

↓ O.K.

Check power supply circuit for A.S.C.D. control unit.

O.K. ↓

Check set switch circuit for A.S.C.D. control unit.

O.K. ↓

Go to "A.S.C.D. Actuator Check".

O.K. ↓

*

(Next page)

No → Check A.S.C.D. main switch and A.S.C.D. relay.

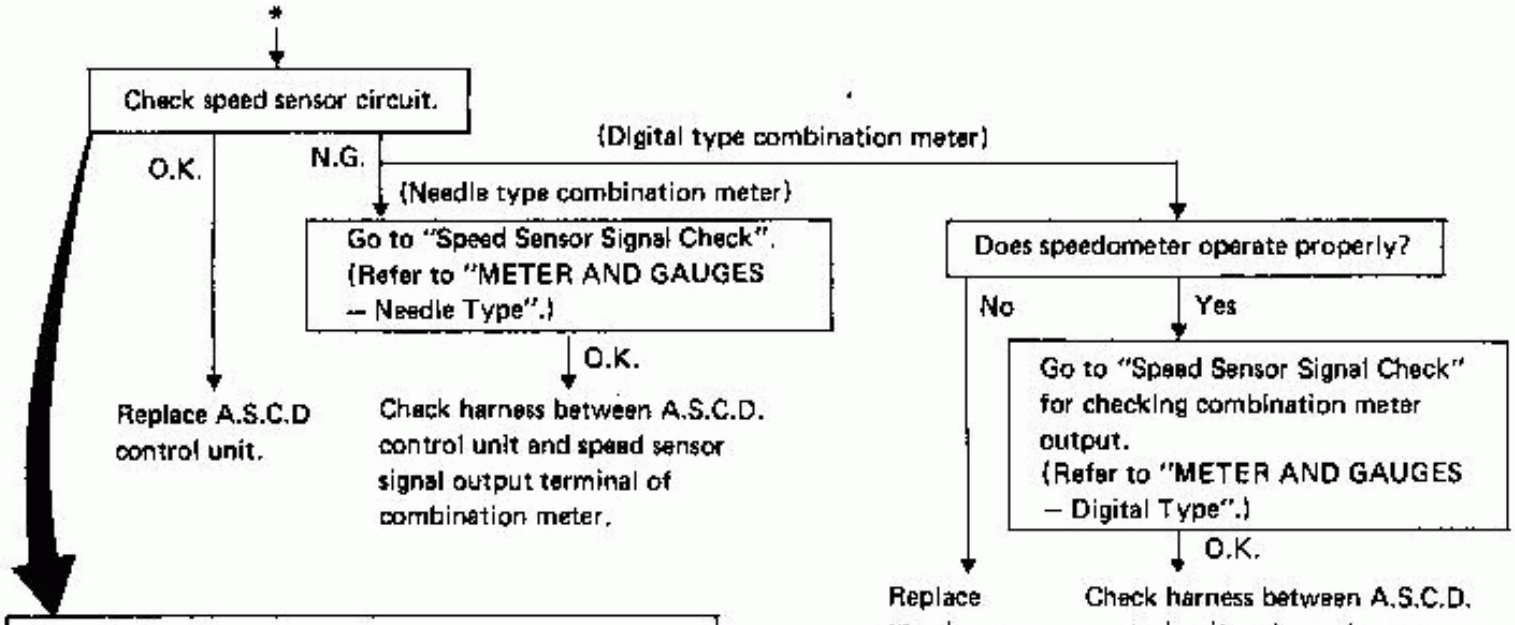
N.G. → Check stop switch, clutch switch (M/T model), inhibitor relay and inhibitor switch (A/T model).

O.K. → Check harness between A.S.C.D. power supply circuit.

N.G. → Check set switch, and harness between control unit and set switch.

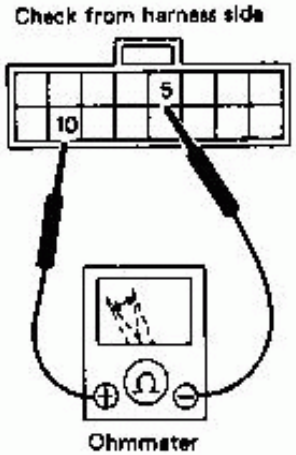
N.G. → Replace actuator.

Trouble-shooting (Cont'd)



1. Turn ignition switch to "OFF".
2. Disconnect speedometer cable from transmission.
3. Connect an ohmmeter between ⑩ and ⑤.
4. Turn ignition switch to "ON".
5. Slowly turn speedometer cable pinion by hand to make sure ohmmeter pointer deflects.

- **Ohmmeter pointer deflects twice per rotation of pinion.**

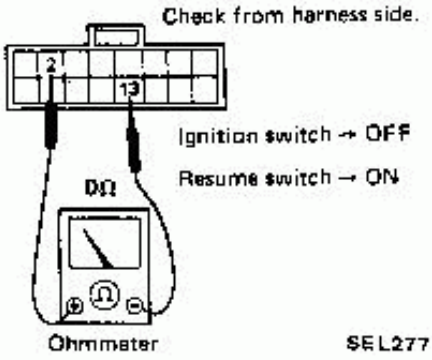


Trouble-shooting (Cont'd)

Resume switch will not operate.
↓
Check resume switch circuit.
↓ O.K. → Replace A.S.C.D. control unit.
↓ N.G. → Check resume switch.

RESUME SWITCH CIRCUIT CHECK

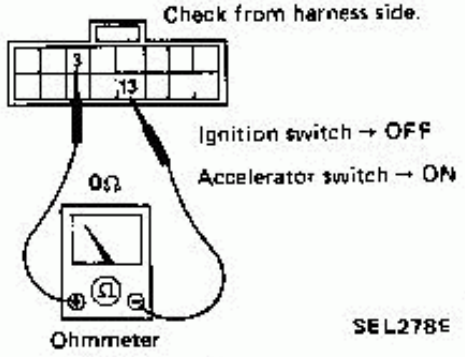
1. Turn ignition switch to "OFF".
2. Turn resume switch to "ON".
3. Check continuity between ② and ⑬.



Accelerate switch will not operate.
↓
Check accelerate switch circuit.
↓ O.K. → Replace A.S.C.D. control unit.
↓ N.G. → Check accelerate switch.

ACCELERATE SWITCH CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Turn accelerate switch to "ON".
3. Check continuity between ③ and ⑬.



Engine hunts.
↓
Check vacuum hose for breakage, cracks or fracture.
↓ O.K.
↓ N.G. → Repair or replace hose.
Does A.S.C.D. wire move smoothly?
↓ O.K.
↓ N.G. → Repair or replace wire.
Go to "Actuator Check".
↓ O.K.
↓ N.G. → Replace actuator.
Replace A.S.C.D. control unit.

Large difference between set vehicle speed and actual speed.
↓
Check A.S.C.D. wire and actuator move smoothly.
↓ O.K.
↓ N.G. → Replace wire or actuator.
Check vacuum hose for breakage, cracks or fracture.
↓ O.K.
↓ N.G. → Repair or replace hose.
Go to "Actuator Check".
↓ O.K. → Replace A.S.C.D. control unit.
↓ N.G. → Replace actuator.

Trouble-shooting (Cont'd)

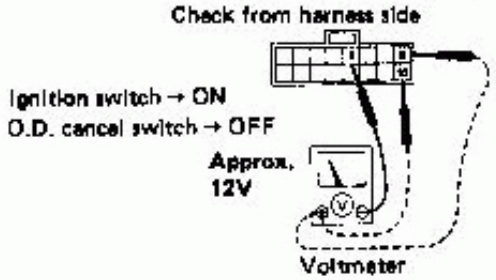
A/T model only:
- When A.S.C.D. is set while vehicle is operating in "O.D." range, O.D. will be cancelled and shifting to O.D. cannot be made thereafter.
- O.D. will not be cancelled even if actual car speed is 6 km/h (4 MPH) lower than set speed. (Set speed cannot be maintained.)
- O.D. will not be cancelled even if accelerator switch is turned "ON".

Check O.D. cancel circuit for A.S.C.D. control unit.

O.K. → Replace A.S.C.D. control unit.

N.G. → Check harness between O.D. cancel solenoid, O.D. cancel switch and A.S.C.D. control unit.

- Turn ignition switch to "ON".
- Turn O.D. cancel switch to "OFF".
- Check voltage ⑧ - ⑤ and ⑯ - ⑤.

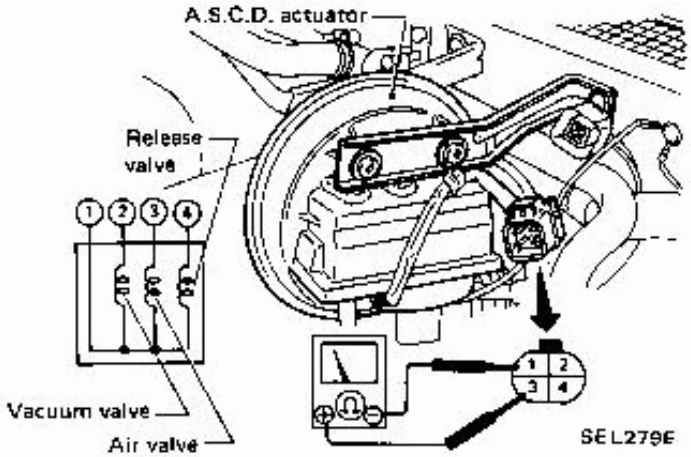


SEL741D

A.S.C.D. Actuator Check

1. Check continuity between terminal Ⓘ and terminals ②, ③ and ④.

Continuity exist ... O.K.

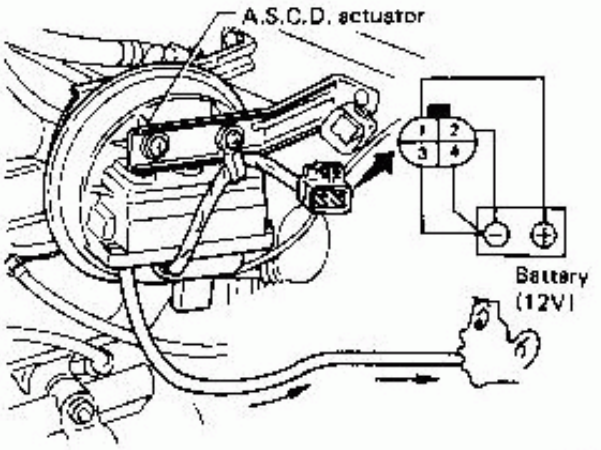


SEL279E

CAUTION:
Do not attempt to remove valves from actuator.

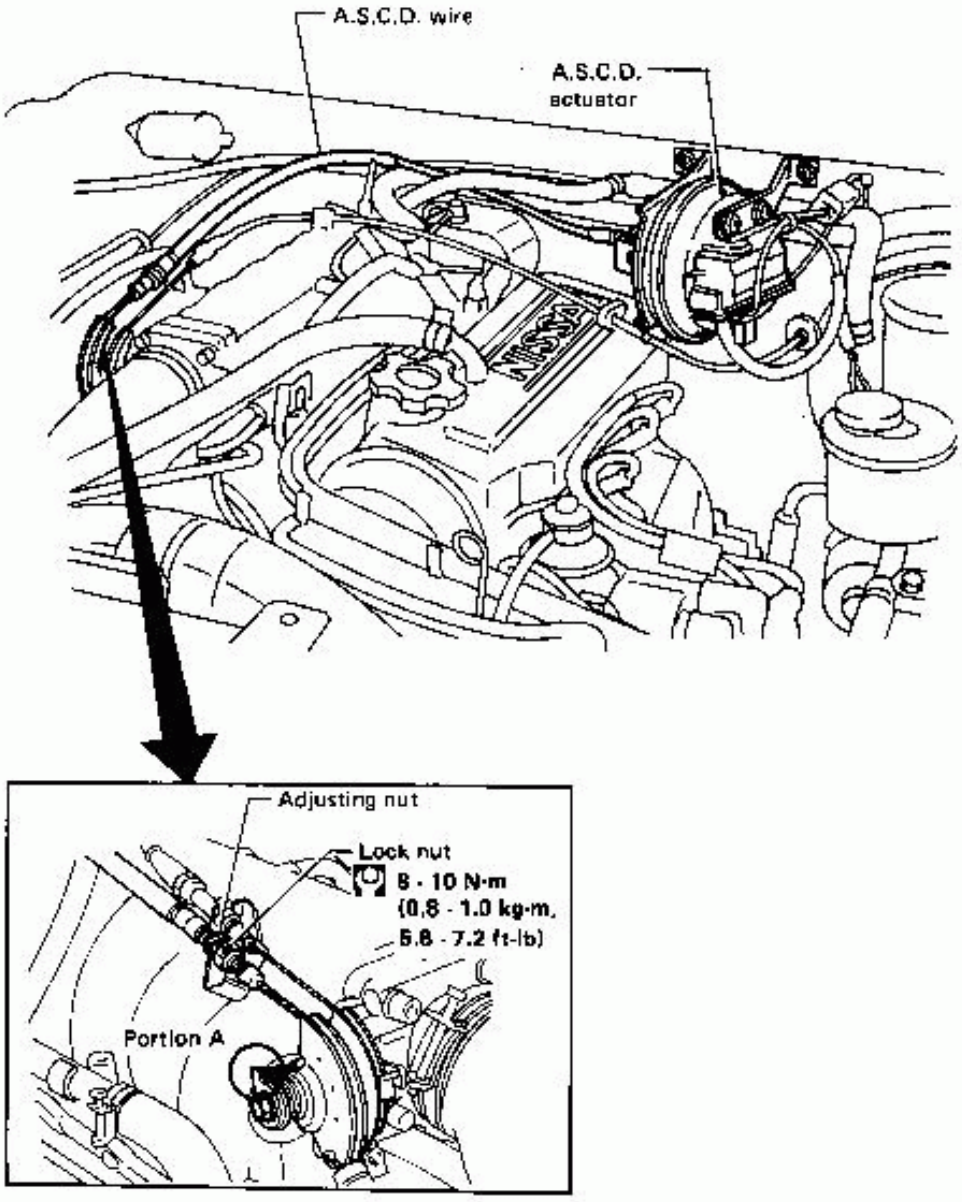
2. Connect battery (approx. 12V) to harness connector of actuator as shown below, and apply vacuum to actuator.
   If diaphragm moves smoothly, actuator is O.K.

CAUTION:
When checking actuator by applying vacuum, do not apply engine vacuum directly as it is too strong to check actuator properly.



SEL280E

A.S.C.D. Wire Adjustment



SEL281E

CAUTION:

- **Be careful not to twist wire when removing it.**
- **Do not tense wire excessively during adjustment.**

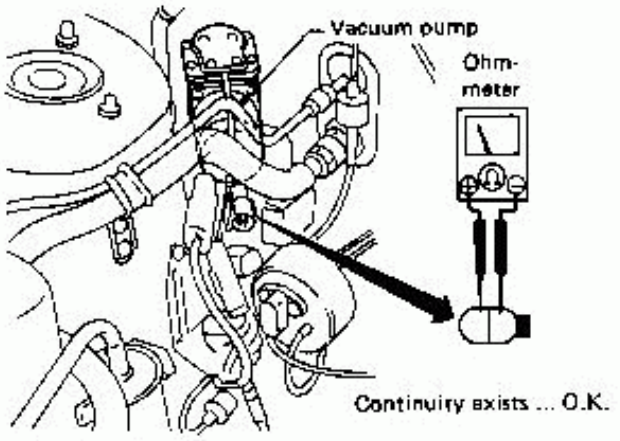
After confirming that accelerator wire is properly adjusted, adjust the tension of A.S.C.D. wire in the following manner:

(1) Tighten A.S.C.D. wire with adjusting nut until portion A of throttle lever comes into contact.
(2) Then, back off adjusting nut 1/2 to 1 turn.
(3) Securely tighten lock nut to hold adjusting nut in place.

- For A.S.C.D. stop switch and clutch switch adjustment, refer to BR and CL sections.

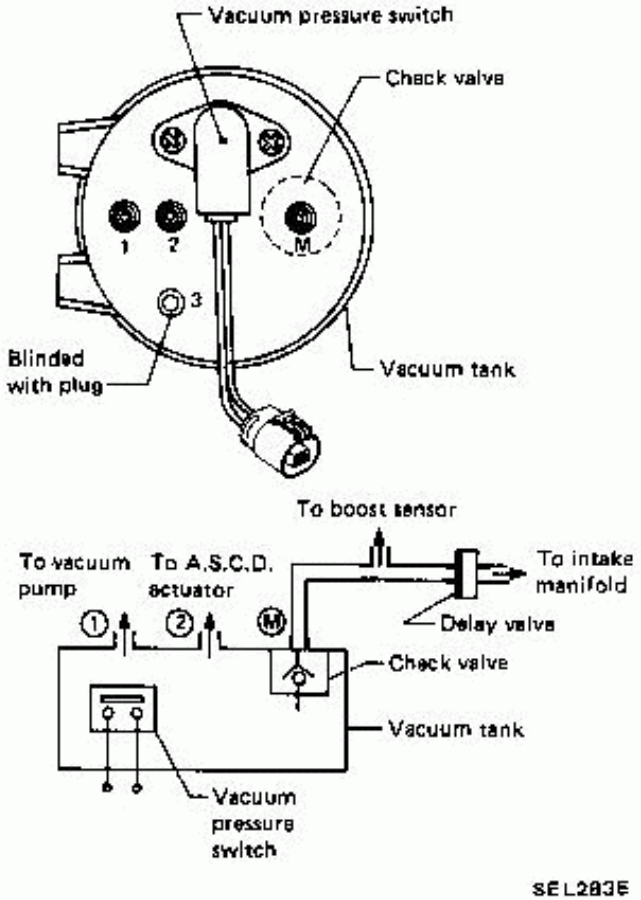
Vacuum Pump Check

1. Disconnect harness connector from vacuum pump.
2. Check continuity between terminals at connector for vacuum pump.



SEL282E

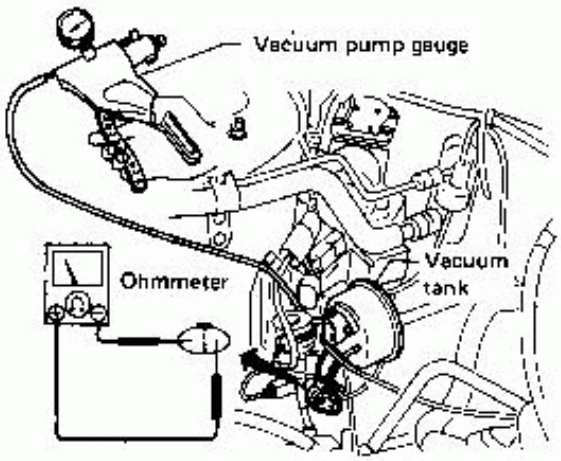
Vacuum Tank



SEL283E

Vacuum Pressure Switch Check

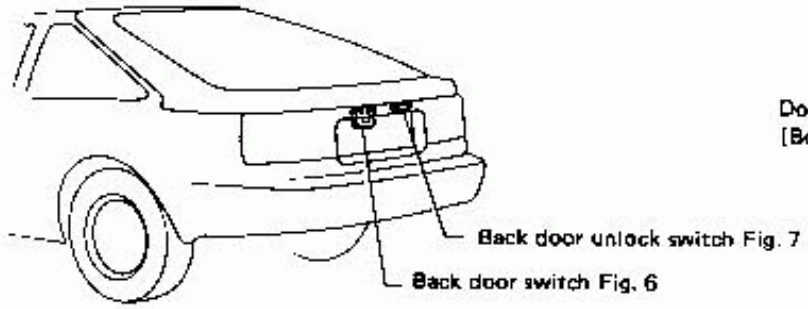
1. Disconnect harness connector from vacuum tank.
2. Disconnect vacuum hose between vacuum pump and vacuum tank from vacuum pump.
3. Connect vacuum pump gauge to vacuum hose.
4. Check pressure switch using a vacuum pump gauge.

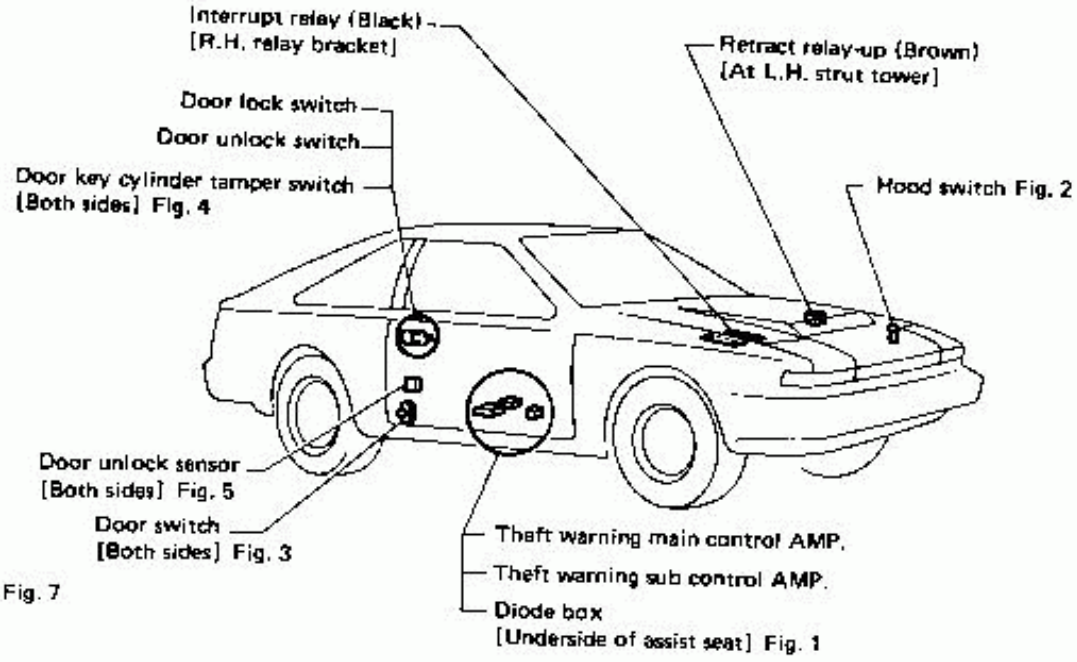


SEL284E

Pressure	Resistance (Ω)
Atmospheric pressure	0
Vacuum pressure: approx. more than 38.7 kPa (290 mmHg, 11.42 inHg)	∞

- When adjusting hood, door, back door or removing & installing them or switches, check theft warning system operation.





THEFT WARNING MAIN CONTROL AMP., SUB CONTROL AMP and DIODE BOX

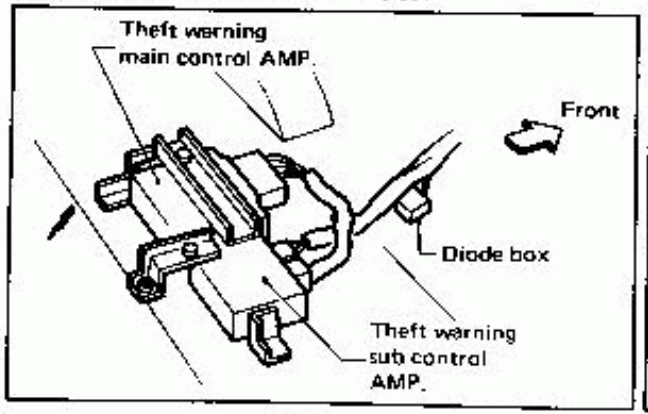


Fig. 1

HOOD SWITCH

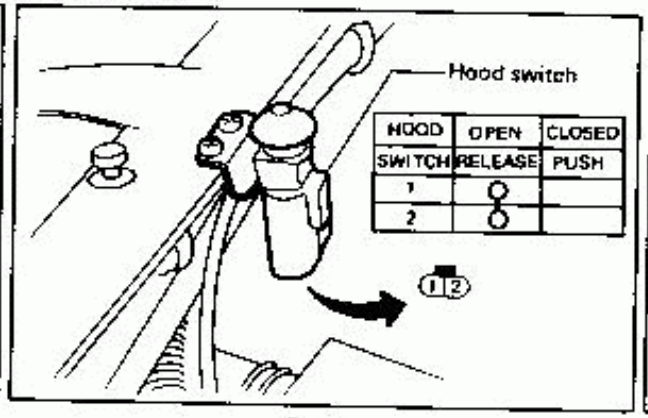


Fig. 2

DRIVER & ASSIST SIDE DOOR SWITCH

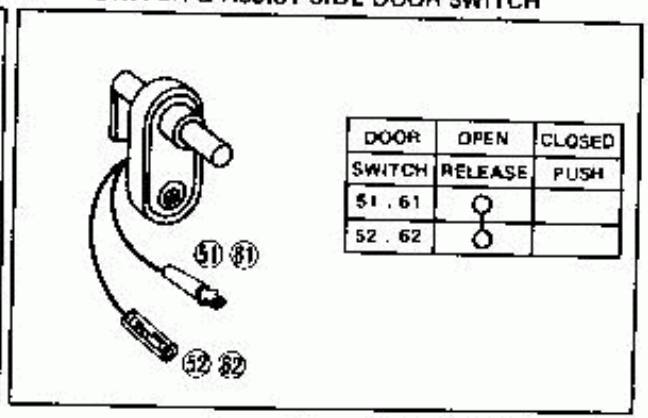
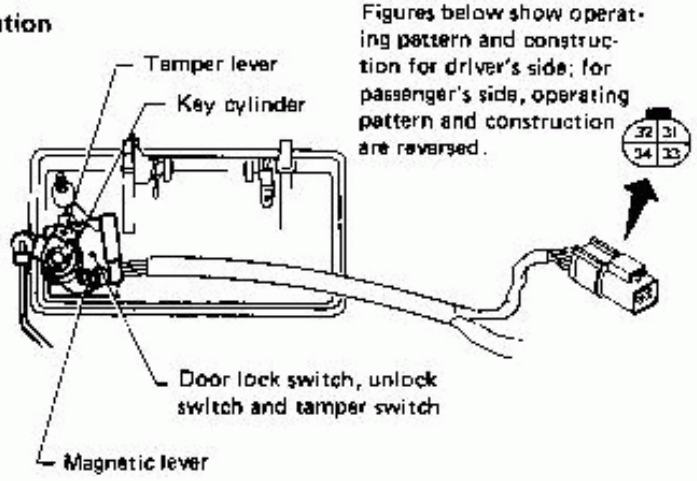


Fig. 3

SEL809F

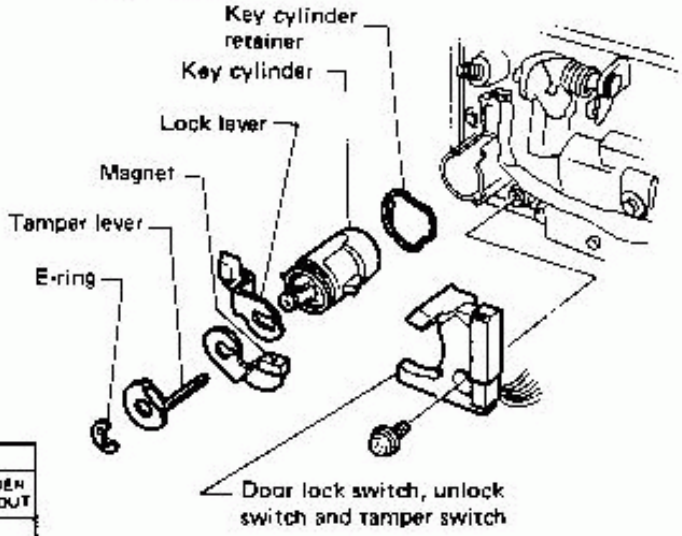
Door lock switch, unlock switch and key cylinder tamper switch (Fig. 4)

Formation



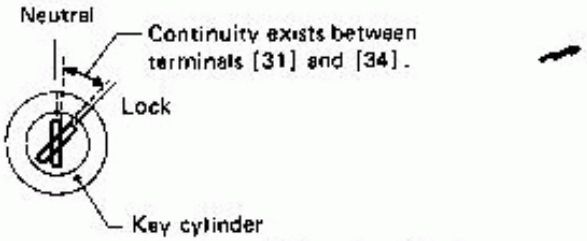
	LOCK		N	UNLOCK		TAMPER	
	FULL STROKE	BETWEEN FULL STROKE AND N		BETWEEN FULL STROKE AND N	FULL STROKE	NORMAL	CYLINDER DRAW OUT
31, 41		○					
32, 42				○			
33, 43							○
34, 44		○		○			○

Construction

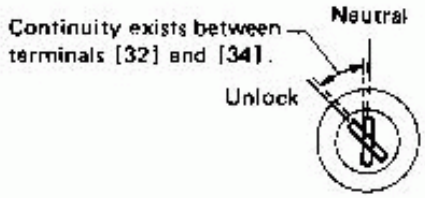


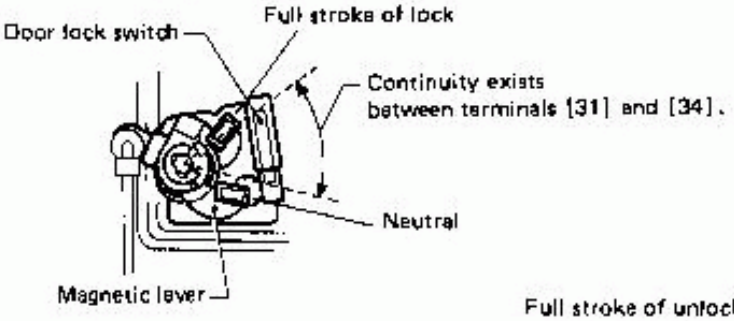
Operation

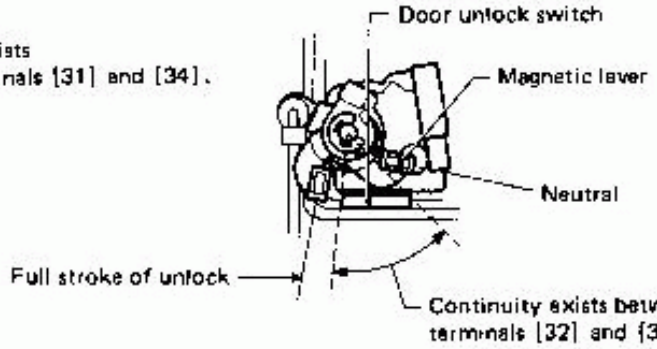
Door lock switch



Door unlock switch

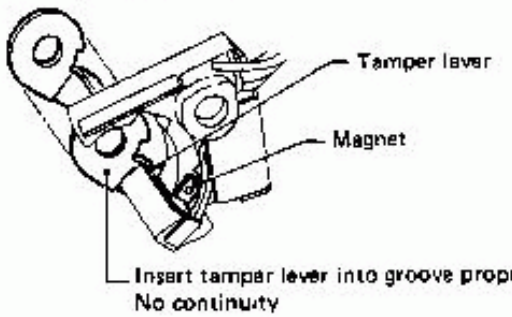






Tamper switch

Pull tamper lever:
Continuity exists between terminals [33] and [34].



SEL810F

DRIVER & ASSIST SIDE DOOR UNLOCK SENSOR

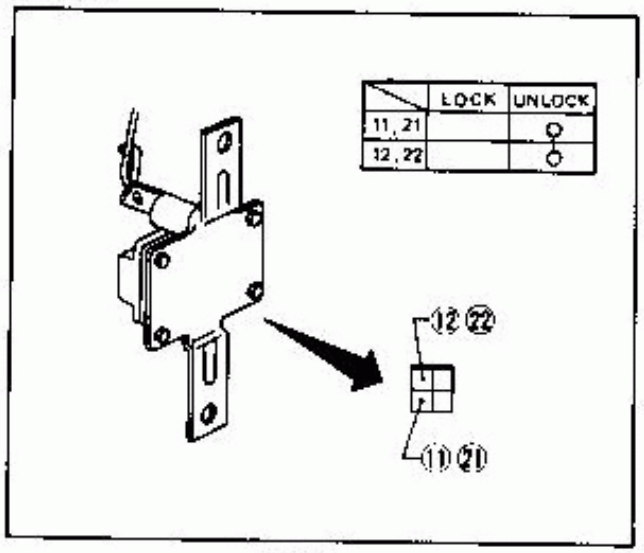


Fig. 5

BACK DOOR SWITCH

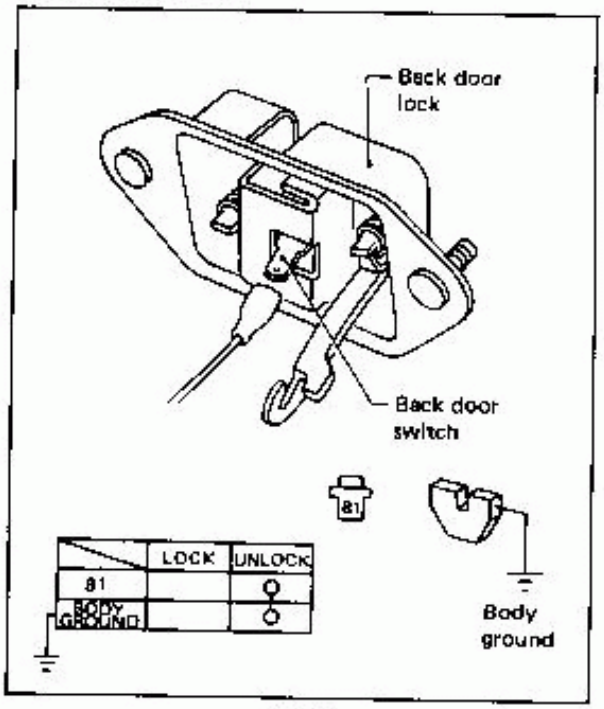


Fig. 6

BACK DOOR UNLOCK SWITCH

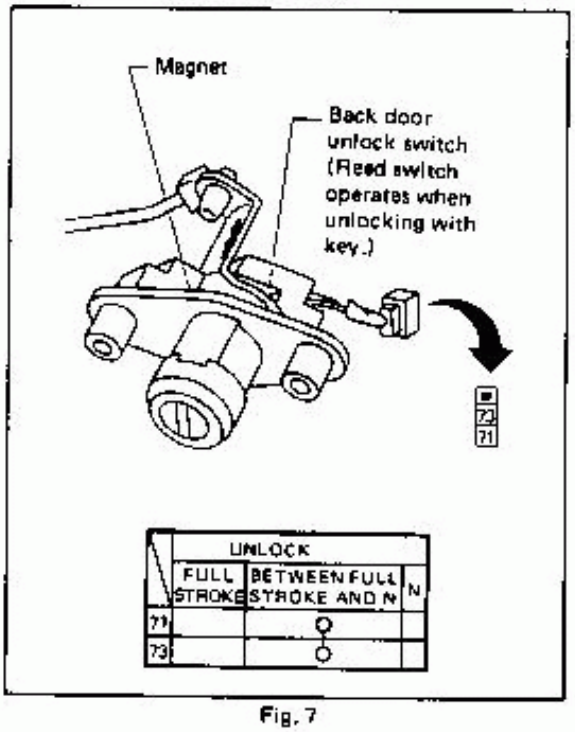
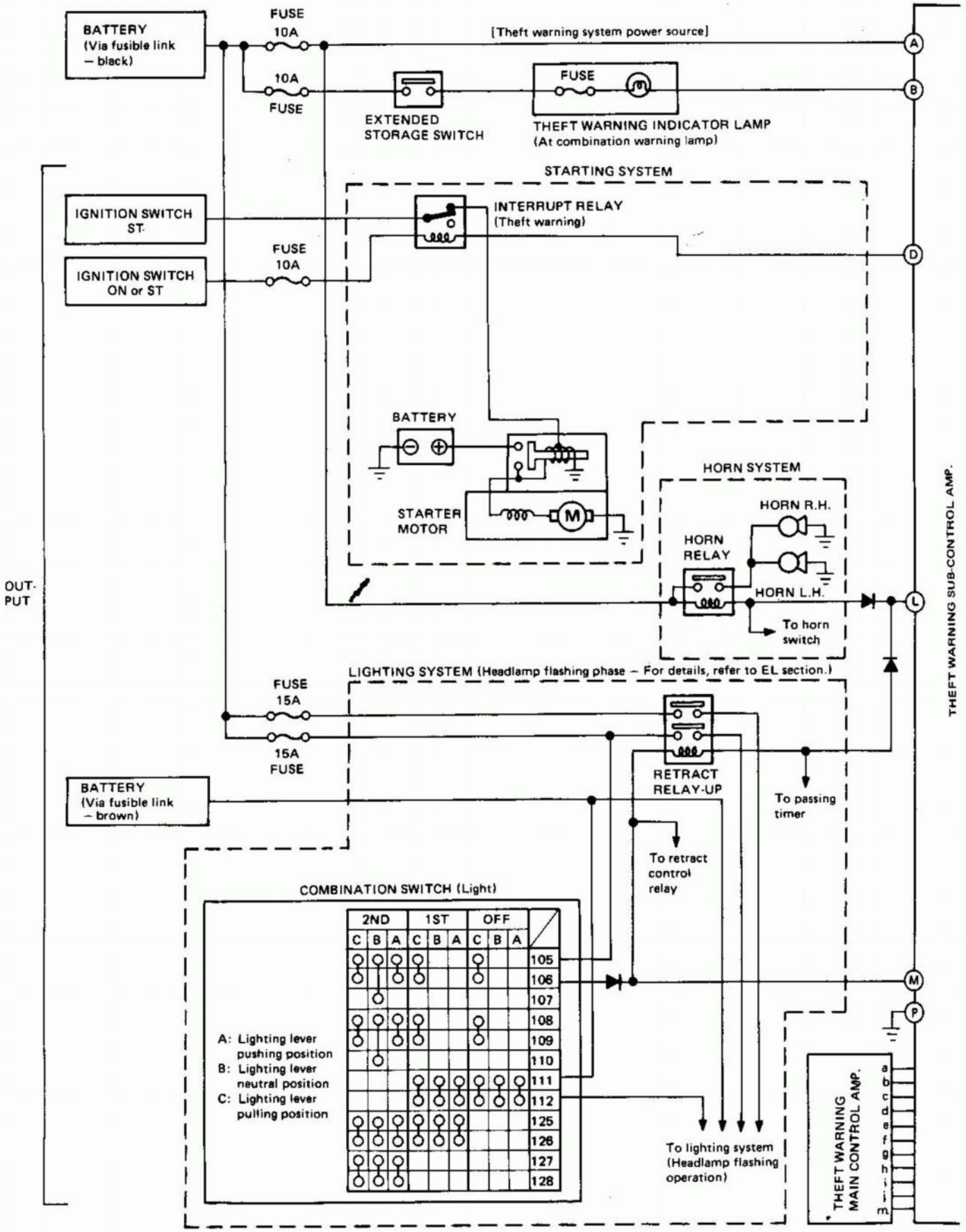


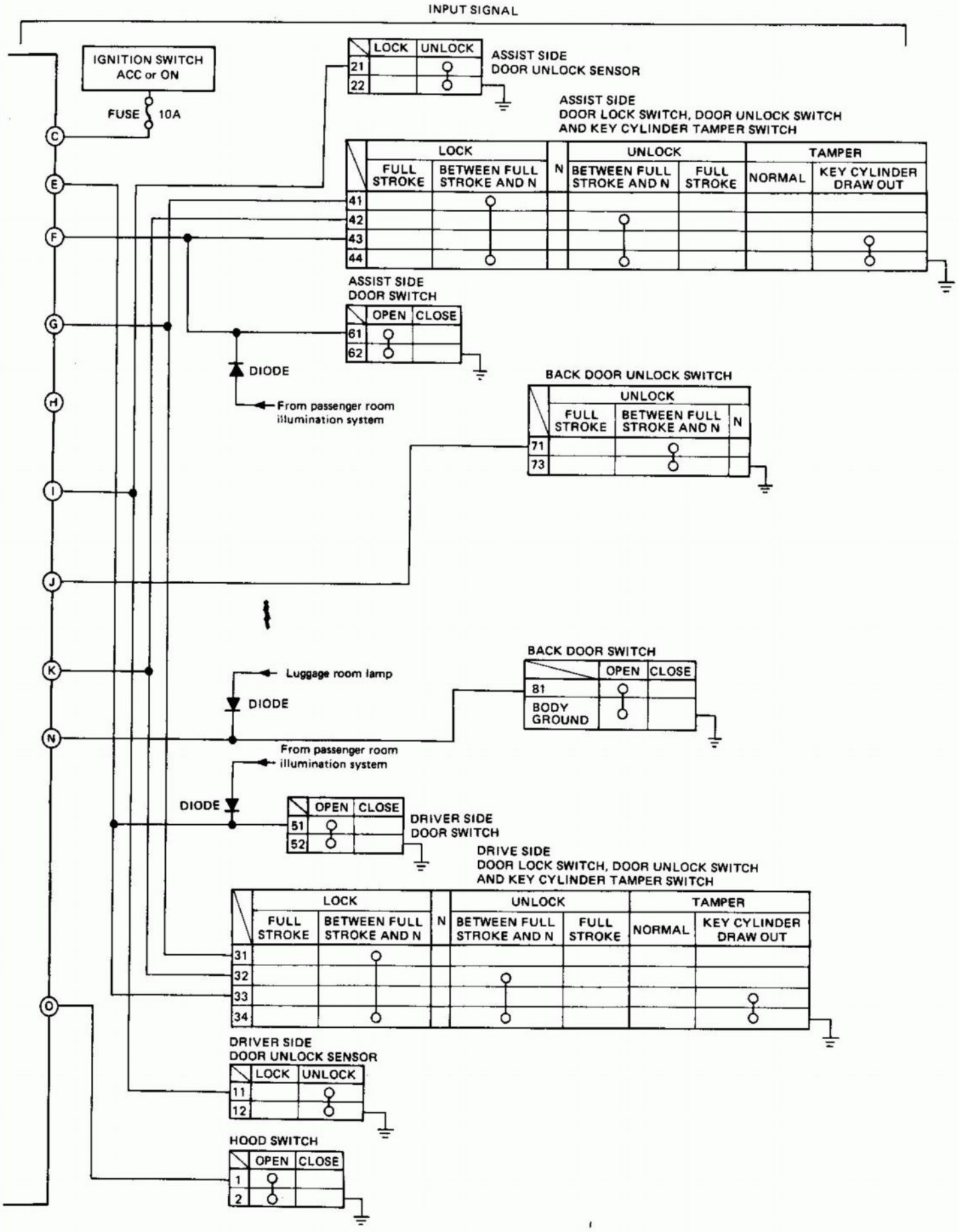
Fig. 7

THEFT WARNING SYSTEM

Schematic



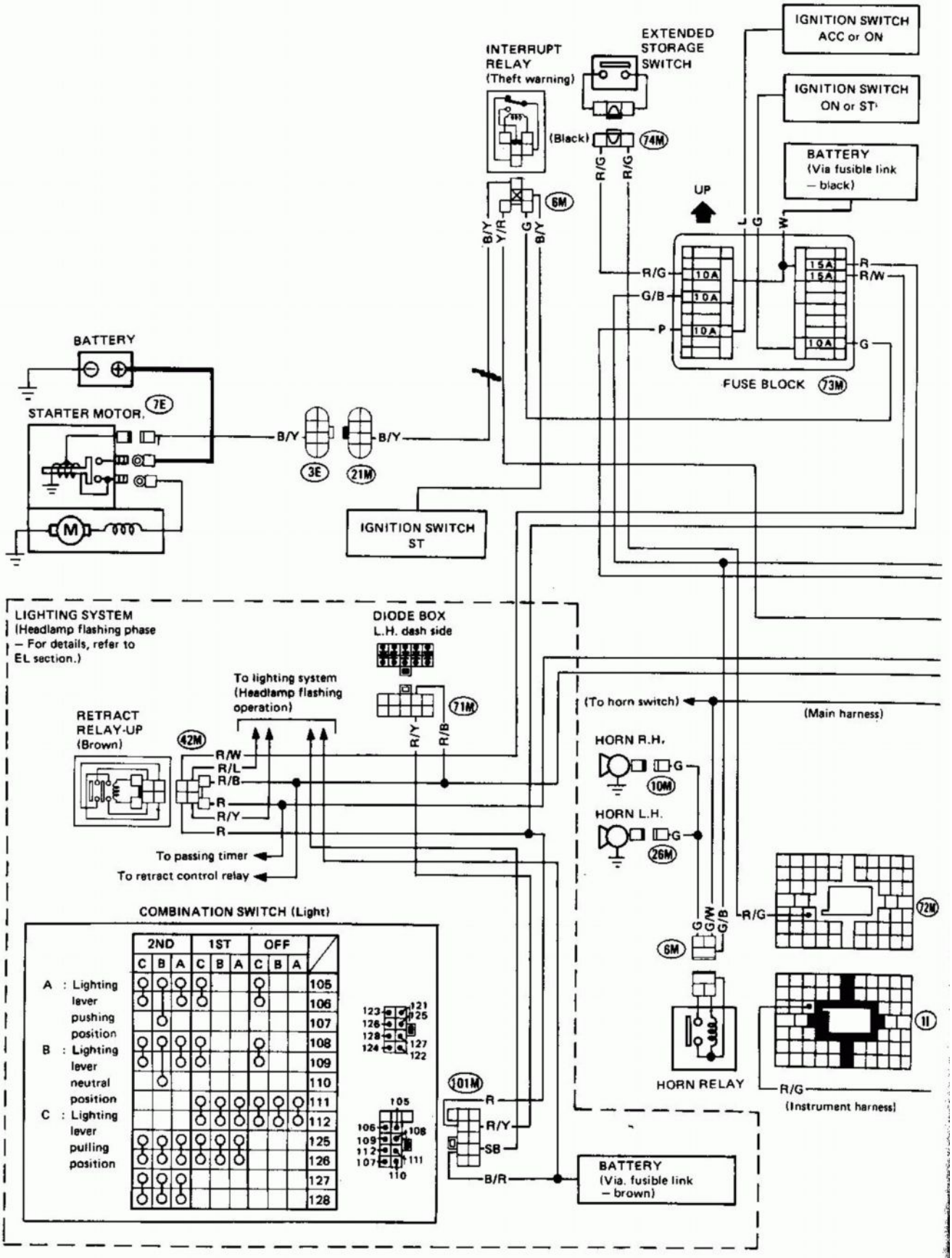
Schematic (Cont'd)



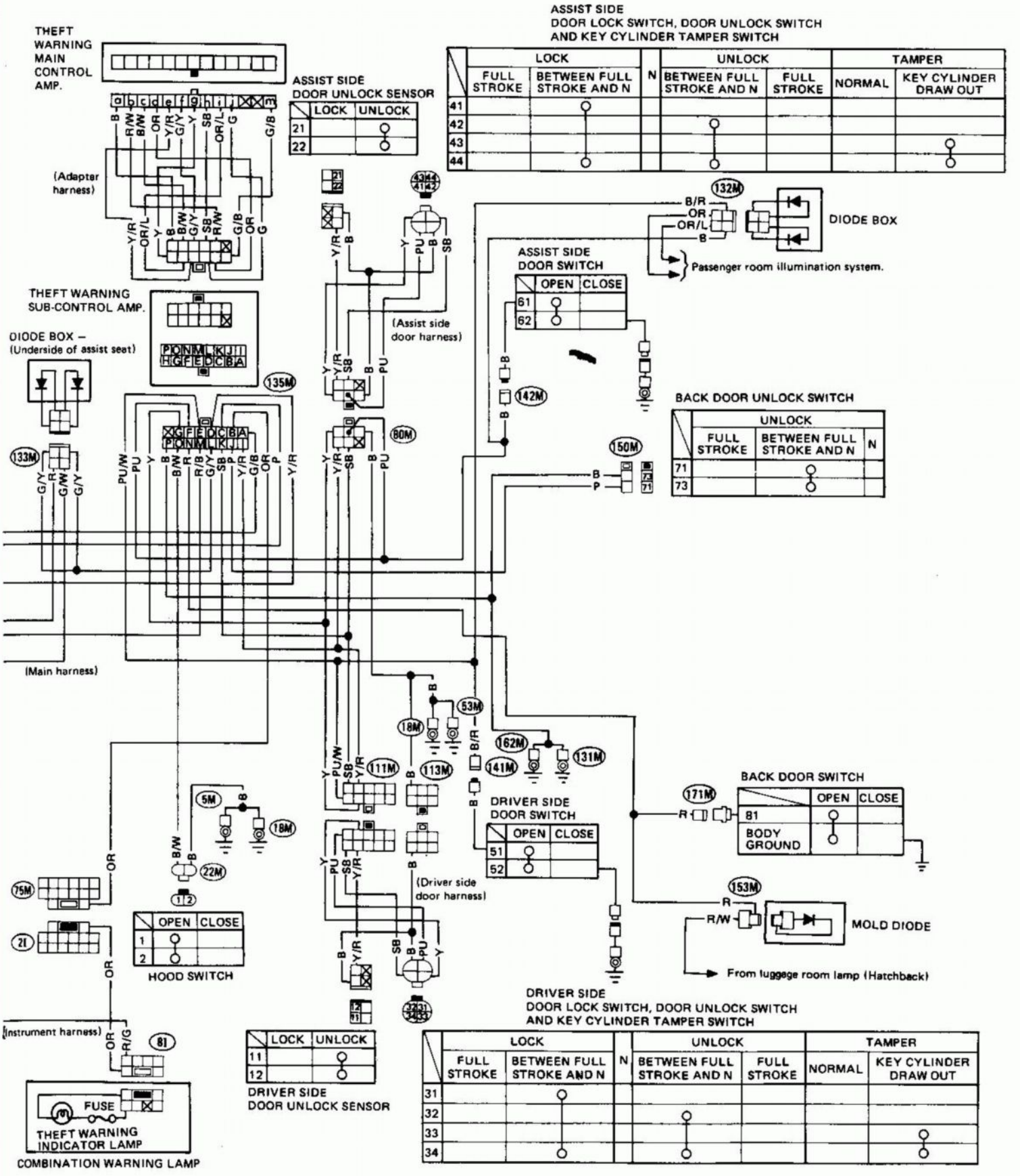
SEL811F

THEFT WARNING SYSTEM

Wiring Diagram



Wiring Diagram (Cont'd)



SEL812F

THEFT WARNING SYSTEM

Trouble-shooting

- Wenn disconnecting the main harness or adapter harness connector at control units, be sure to remove battery ground cable first. And after disconnecting harness connector, reinstall battery ground cable.
- In trouble-shooting, if "CHECKS Ⓐ – Ⓟ, ⓩ" are indicated, be sure to refer to "CHECKS Ⓐ – Ⓟ, ⓩ" in the "Terminal Check".
- In trouble-shooting, if the cause of trouble is found to be due to "Faulty sub-control unit, Faulty main control unit or Faulty adapter harness", be sure to refer to "Control Unit Inspection".
- "DISARMED PHASE" means that theft warning system is not set.
- "READY PHASE" means that period for approx. 30 sec. after theft warning system has been set. (Locking & closing all doors) – Indicator lamp ON.
- "ARMED PHASE" means that theft warning system has been set (Locked & Closed all doors and finished "ARMED PHASE") and standing by – Indicator lamp goes out.
- "ALARM PHASE" means that alarm operates (Horn sounds and headlamps blink intermittently) and starter motor does not work.

CONTENTS

No.	INCIDENT: Theft warning system responds in one of these ways.		PHASE	Refer to TROUBLE-SHOOTING PROCEDURE.
1	Indicator lamp	does not blink (Remains out)	DISARMED	IND ①
2		remains blinking	DISARMED	IND ②
3		does not come ON (1)	READY with key lock	IND ③
4		does not come ON (2)	READY without key lock	IND ④
5		remains lit	DISARMED and Resetting from READY	IND ⑤
6		does not go out (Comes ON)	DISARMED	IND ⑥
7		does not go out (Remains lit)	ARMED	IND ⑦
8	Armed	is set even if ignition switch is ACC or ON	DISARMED	ARM ①
9		is set even if at least one of doors is unlock	DISARMED	ARM ②
10		is set even if at least one of doors is open	DISARMED	ARM ③
11		is not set	READY & ARMED	ARM ④

THEFT WARNING SYSTEM

Trouble-shooting (Cont'd)

No.	INCIDENT: Theft warning system responds in one of these ways.		PHASE	Refer to TROUBLE-SHOOTING PROCEDURE.
12	Alarm	is given without any cause	ARMED	ALR ①
13		does not operate	ALARM	ALR ②
14		does not stop (Alarm continues over 4 minutes)	ALARM	ALR ③
15		does not stop even if stop signal is given	ALARM	ALR ④
16		continues (is not intermittent)	ALARM	ALR ⑤
17		stops too soon	ALARM	ALR ⑥
18	Starter motor	does not operate	DISARMED, READY and ARMED	ST ①
19		operates	ALARM	ST ②
20	Reset (Cancel)	cannot be performed by unlocking power door lock	READY	RES ①
21		cannot be performed by opening door	READY	RES ②
22		cannot be performed by ignition switch	READY and ARMED	RES ③
23		cannot be performed by unlocking key cylinder with key	READY, ARMED and ALARM	RES ④
24	Headlamps	do not rise up	ALARM	HLP ①
25		do not retract	After ALARM	HLP ②
26		rise up	ARMED and DISAREMD	HLP ③

• Symbol: : Customer complaint, : Action, : Judgment
: Probable cause

Trouble-shooting (Cont'd)

1. IND ①

Indicator lamp does not blink (Remains out) — DISARMED PHASE
- Ignition switch OFF.
- At least one of the doors, hood a back door is open.

Disconnect main harness connector at sub-control unit.

Check body ground circuit.
- **Refer to check Ⓟ.**

N.G. → Faulty body ground circuit

O.K.

Check system source.
- **Refer to check Ⓐ.**

N.G. → Faulty system source circuit

O.K.

Check system cancel signal. (Ignition switch)
- **Refer to check Ⓒ.**

N.G. → Faulty ignition switch circuit

O.K.

Check indicator lamp circuit.
- **Refer to check Ⓑ.**

N.G. → Faulty indicator lamp bulb; Faulty indicator lamp circuit

O.K.

Check door switch trigger for passenger's side.
- **Refer to check Ⓔ.**

N.G. → Faulty door switch; Faulty harness

O.K.

Check door switch trigger for driver's side.
- **Refer to check Ⓕ.**

N.G. → Faulty door switch; Faulty harness

O.K.

Check back door switch trigger.
- **Refer to check Ⓝ.**

N.G. → Faulty back door switch; Faulty back door switch circuit

O.K.

Check hood switch trigger.
- **Refer to check Ⓞ.**

N.G. → Faulty hood switch; Faulty hood switch circuit

O.K.

- Faulty sub-control unit
- Faulty main control unit
- Faulty adapter harness

Trouble-shooting (Cont'd)

2. IND ②

Indicator lamp remains blinking. – DISARMED PHASE
- Ignition switch OFF.
- Doors, hood and back door are closed.

↓

Disconnect main harness connector at sub-control unit.

↓

Check door switch trigger and tamper switch trigger for passenger's side.
- **Refer to check Ⓔ.**

N.G. →
- Faulty door switch
- Faulty tamper switch
- Faulty harness
- Faulty key cylinder installation
- Faulty door alignment

O.K. ↓

Check door switch trigger and tamper switch trigger for driver's side & tamper switch trigger for back door.
- **Refer to check Ⓕ.**

N.G. →
- Faulty door switch
- Faulty tamper switch
- Faulty harness
- Faulty key cylinder installation
- Faulty door alignment

O.K. ↓

Check back door switch trigger.
- **Refer to check Ⓝ.**

N.G. →
- Faulty back door switch
- Faulty back door switch circuit
- Faulty back door alignment

O.K. ↓

Check hood switch trigger.
- **Refer to check Ⓞ.**

N.G. →
- Faulty hood switch
- Faulty hood switch circuit
- Faulty hood alignment

O.K. ↓
- Faulty sub-control unit
- Faulty main control unit
- Faulty adapter harness

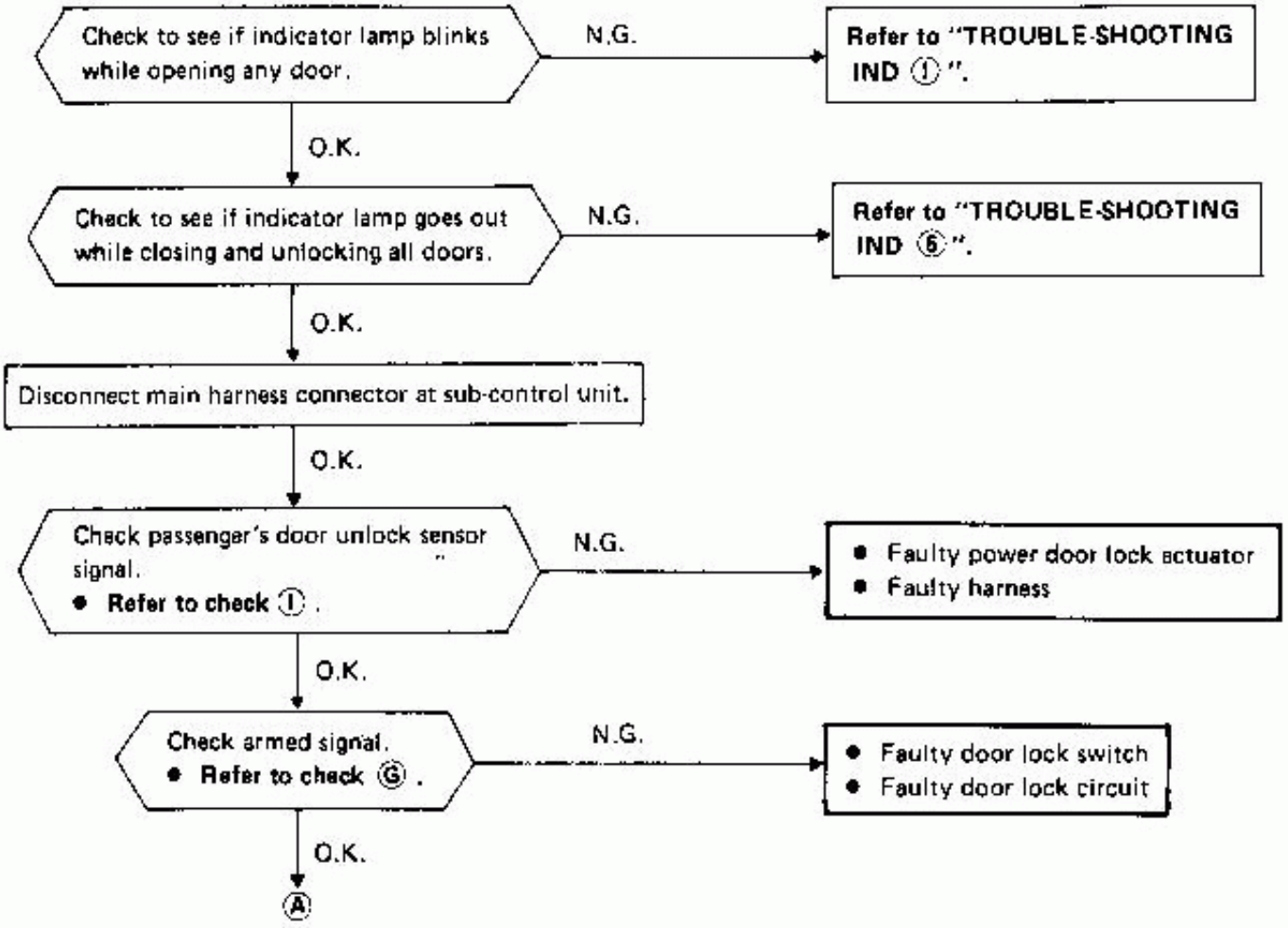
Trouble-shooting (Cont'd)

3. IND ③ & 4. IND ④

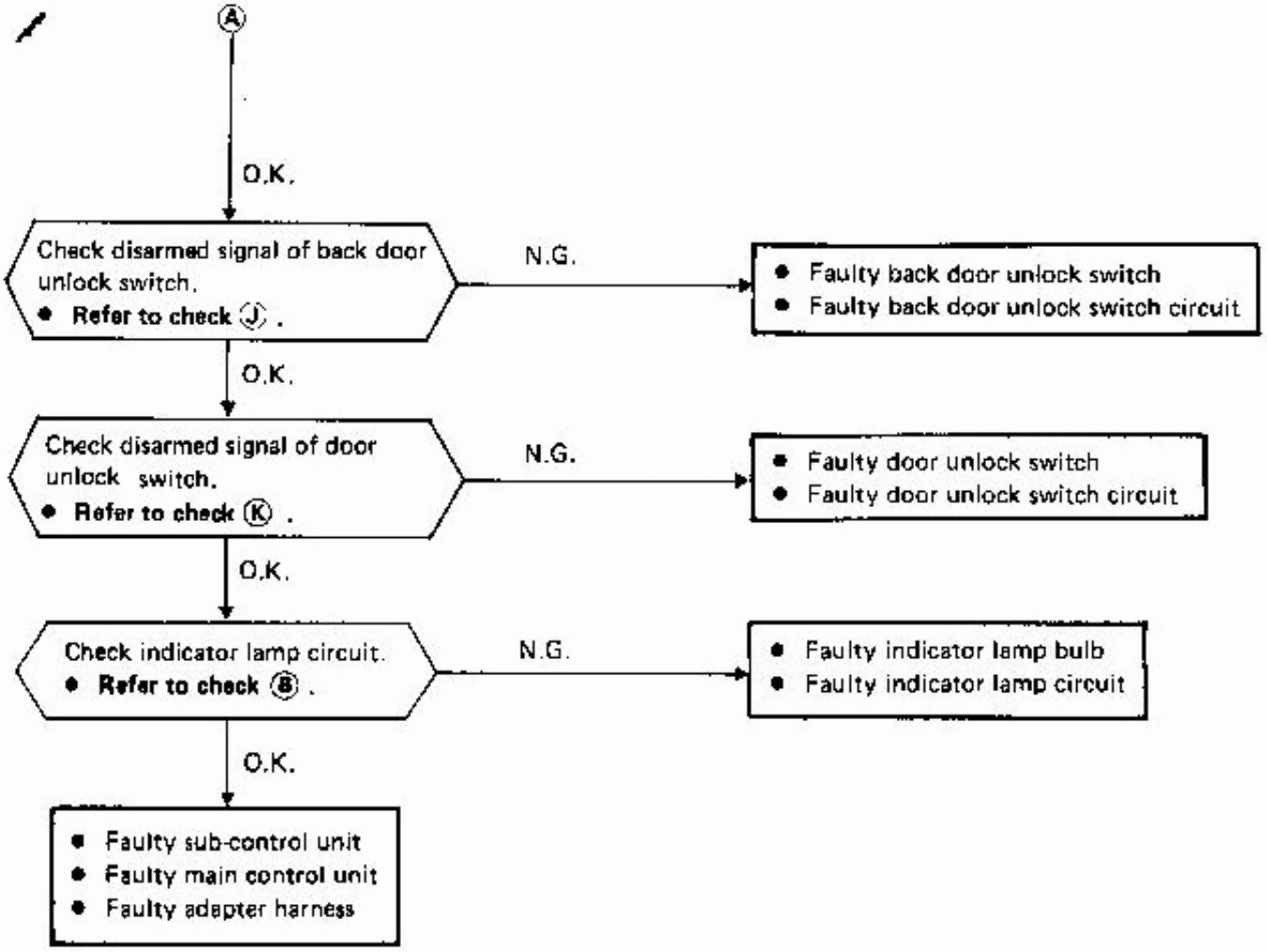
Indicator lamp does not come ON (1) — READY PHASE with key lock
- Ignition switch OFF.
- Doors, hood and back door are closed.
- After closing doors, hood and back door, doors are locked with key.

OR

Indicator lamp does not come ON (2) — READY PHASE without key lock
- Ignition switch OFF.
- After closing hood and back door, lock & close doors without key or after locking & closing doors, close hood and back door.



Trouble-shooting (Cont'd)



Trouble-shooting (Cont'd)

5. IND ⑤

Indicator lamp remains lit. – DISARMED PHASE and Resetting from READY PHASE
- Ignition switch OFF.
- At least one of the doors is open or unlocked.

or
- Reset the armed phase.

Disconnect main harness connector at sub-control unit.

Check to see if indicator lamp comes ON.
- ON → • Faulty indicator lamp circuit
- OFF ↓

Check door switch trigger and tamper switch trigger for passenger's side.
• **Refer to check Ⓔ.**
- N.G. → • Faulty door switch • Faulty tamper switch • Faulty harness • Faulty key cylinder installation • Faulty door alignment
- O.K. ↓

Check door switch trigger and tamper switch trigger for driver's side & tamper switch trigger for back door.
• **Refer to check Ⓕ.**
- N.G. → • Faulty door switch • Faulty tamper switch • Faulty harness • Faulty key cylinder installation • Faulty door alignment
- O.K. ↓

Check back door switch trigger.
• **Refer to check Ⓝ.**
- N.G. → • Faulty back door switch • Faulty back door switch circuit • Faulty back door alignment
- O.K. ↓

Check hood switch trigger.
• **Refer to check Ⓞ.**
- N.G. → • Faulty hood switch • Faulty hood switch circuit • Faulty hood alignment
- O.K. ↓

Check passenger's door unlock sensor signal.
• **Refer to check Ⓘ.**
- N.G. → • Faulty power door lock actuator • Faulty harness
- O.K. ↓

Check system cancel signal. (Ignition switch)
• **Refer to check Ⓒ.**
- N.G. → • Faulty ignition switch circuit
- O.K. ↓

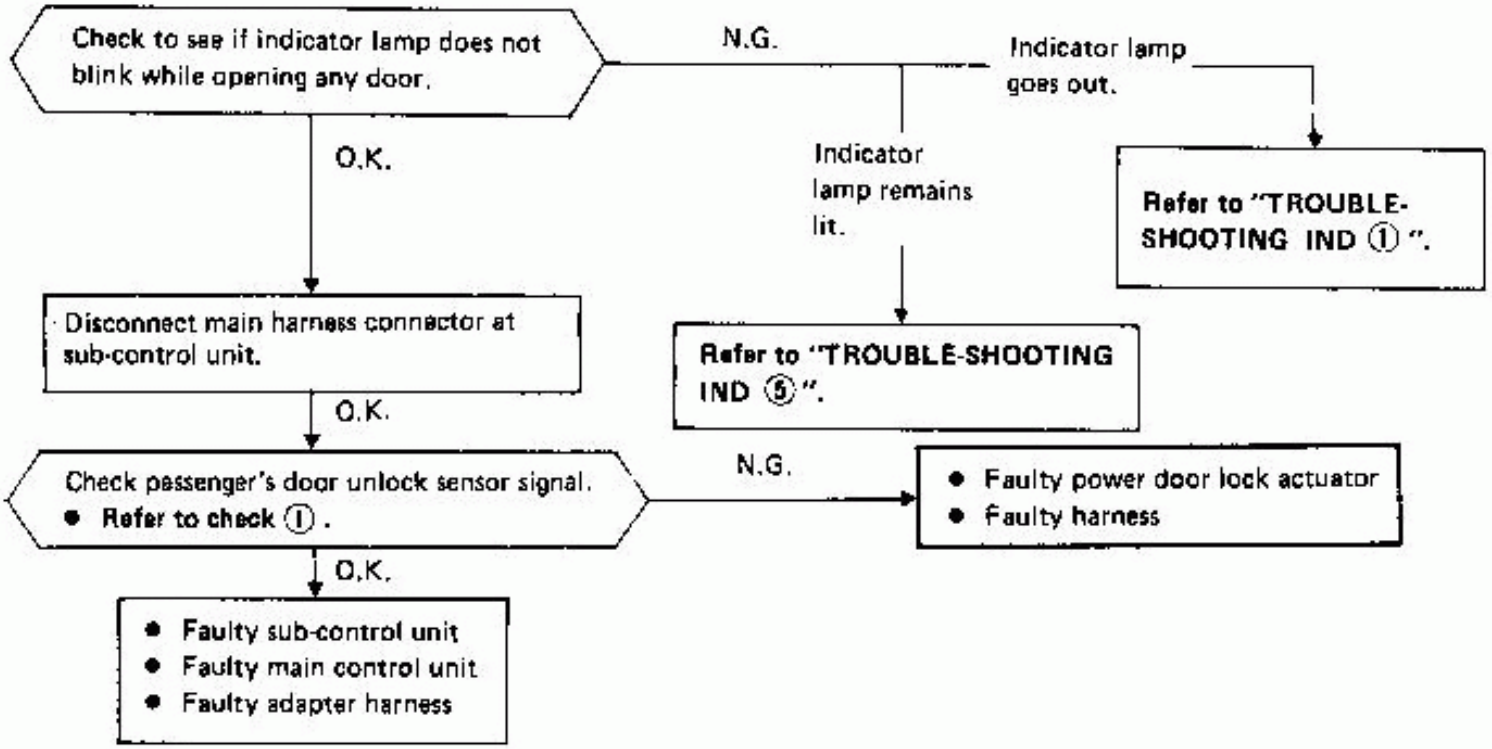
Check disarmed signal.
• **Refer to check Ⓙ and Ⓚ.**
- N.G. → • Faulty unlock switch or magnet lever • Faulty unlock circuit
- O.K. ↓

• Faulty sub-control unit • Faulty main control unit • Faulty adapter harness

Trouble-shooting (Cont'd)

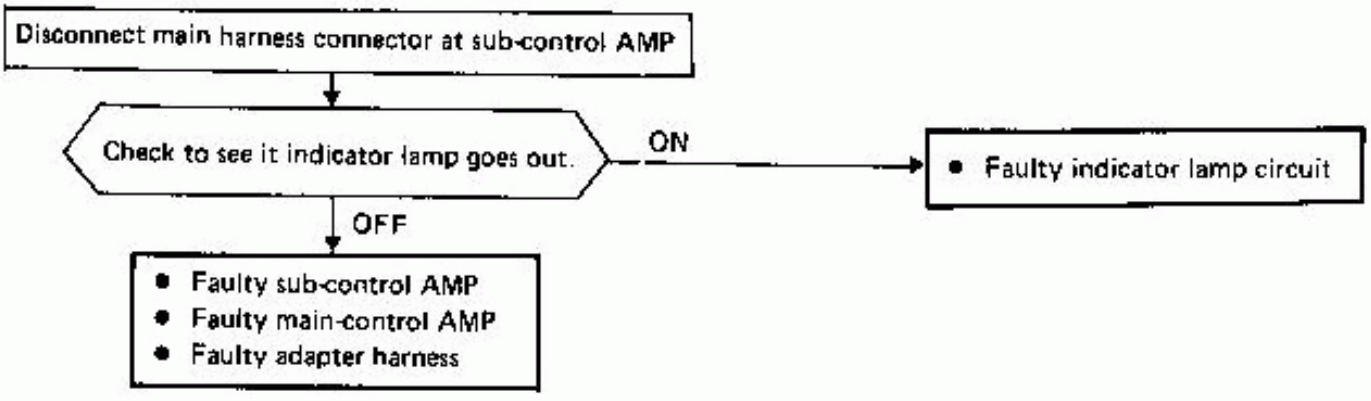
6. IND ⑥

Indicator lamp does not go out (Comes on). – DISARMED PHASE
- Ignition switch OFF.
- Doors, hood and back door close but at least one of the doors, hood or back door unlocks.



7. IND ⑦

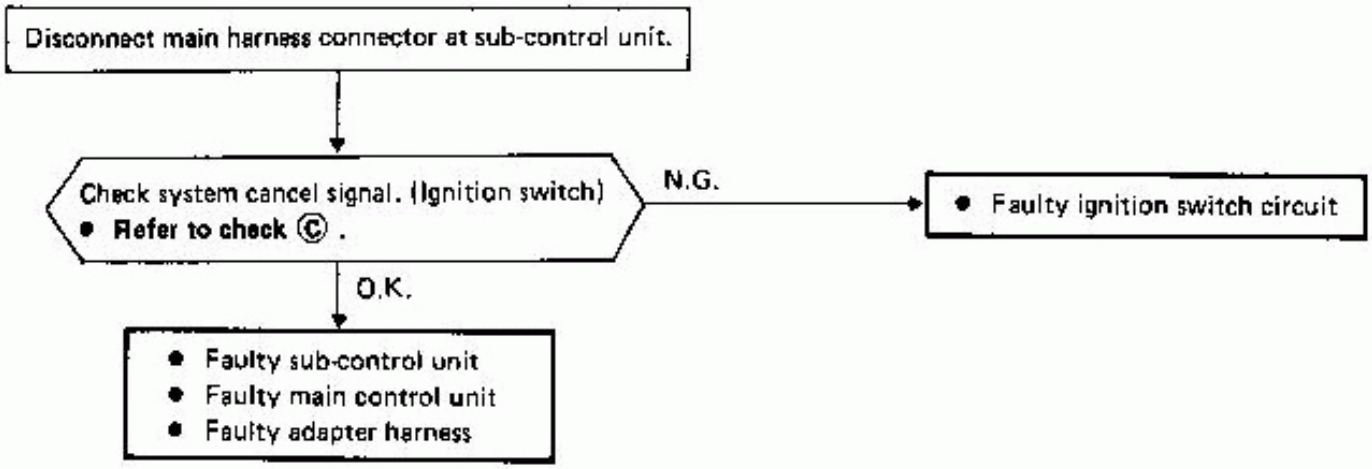
Indicator lamp does not go out (Remains lit). – ARMED PHASE
- Ignition switch OFF.
- More than 40 seconds have passed after closing & locking all doors, hood and back door.



Trouble-shooting (Cont'd)

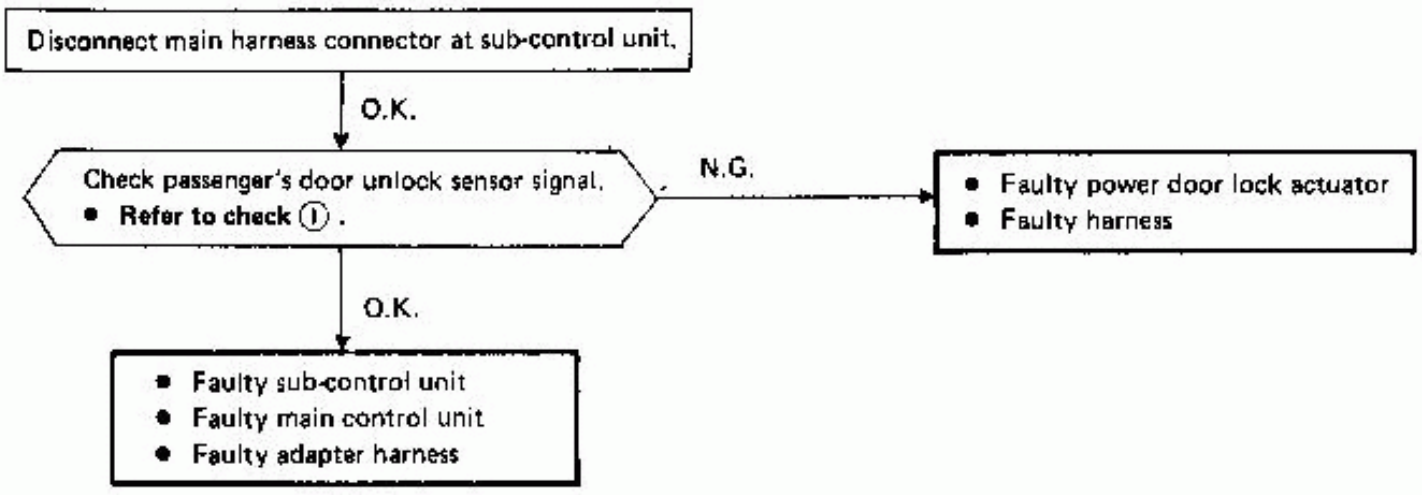
8. ARM ①

Armed is set, even if ignition switch is in ACC or ON position. – DISARMED PHASE



9. ARM ②

Armed is set, even if at least one of the doors is unlocked. – DISARMED PHASE



Trouble-shooting (Cont'd)

10. ARM ③

Armed is set, even if at least one of the doors is open. – DISARMED PHASE

Disconnect main harness connector at sub-control unit.

Check door switch trigger for passenger's side.
- **Refer to check Ⓔ .**

N.G. → • Faulty door switch • Faulty harness

O.K.

Check door switch trigger for driver's side.
- **Refer to check Ⓕ .**

N.G. → • Faulty door switch • Faulty harness

O.K.

Check back door switch trigger.
- **Refer to check Ⓝ .**

N.G. → • Faulty back door switch • Faulty back door switch circuit

O.K.

Check hood switch trigger.
- **Refer to check Ⓞ .**

N.G. → • Faulty hood switch • Faulty hood switch circuit

O.K.

- Faulty sub-control unit
- Faulty main control unit
- Faulty adapter harness

11. ARM ④

Armed is not set. – READY & ARMED PHASE
- Ignition switch OFF.
- Doors, hood and back door are closed & locked.

Check to see if indicator lamp comes on after the system is set.

N.G. → **Refer to "TROUBLE-SHOOTING IND ③ and IND ④".**

O.K.

Check to see if indicator lamp goes out after about 30 seconds.

N.G. → **Refer to "TROUBLE-SHOOTING IND ⑦".**

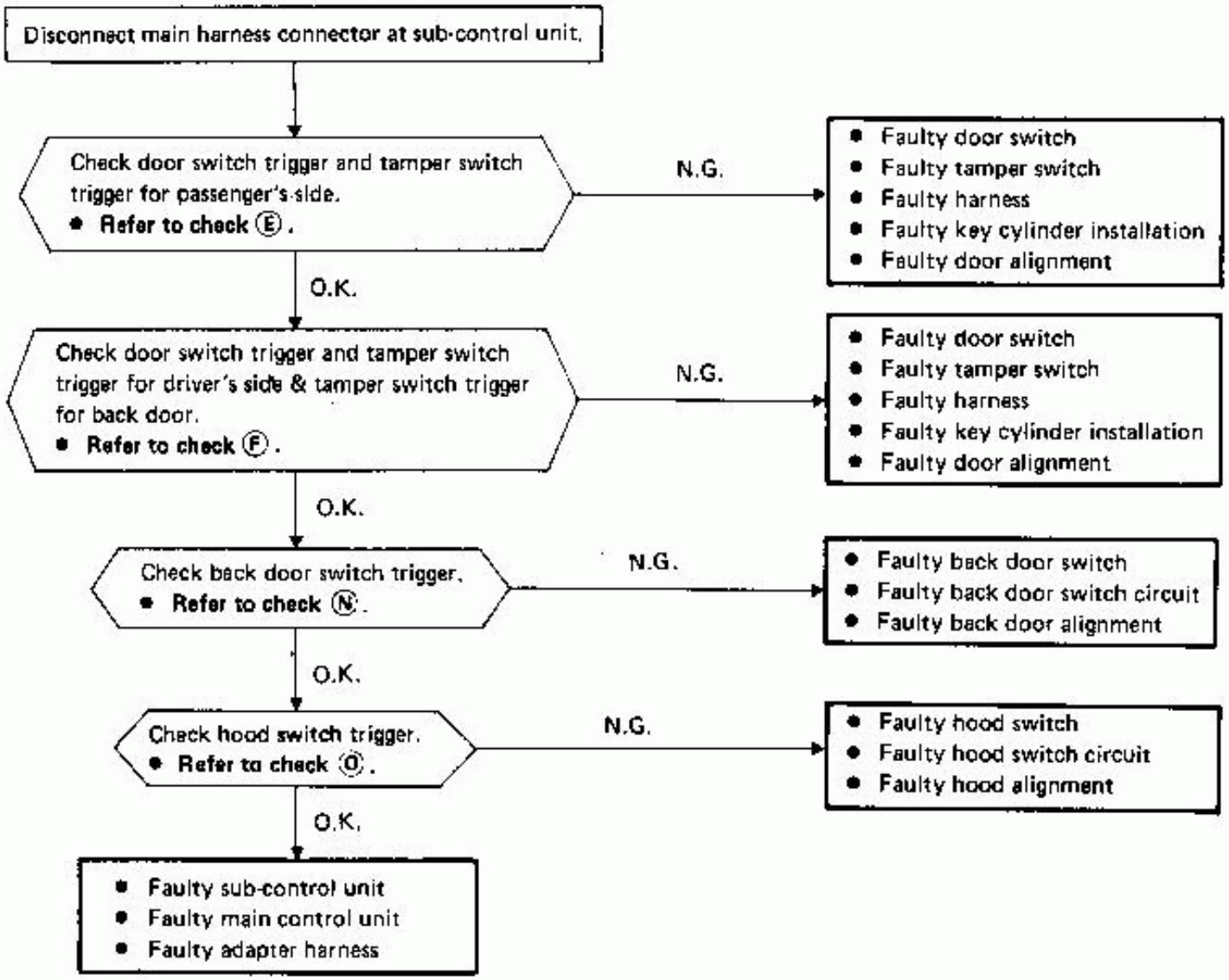
O.K.

Refer to "TROUBLE-SHOOTING ALR ② ".

Trouble-shooting (Cont'd)

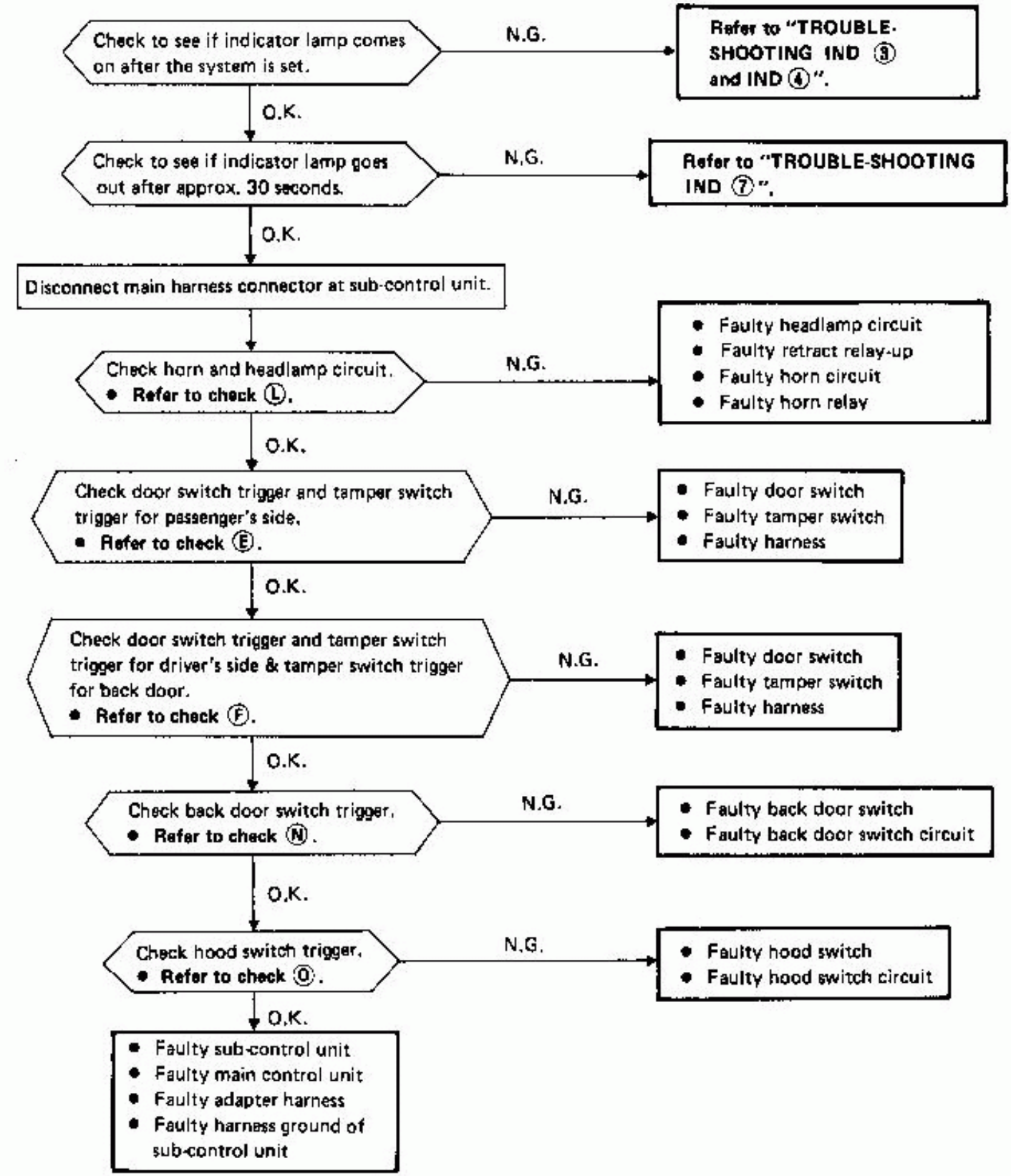
12. ALR ①

Alarm is given without any cause. – ARMED PHASE
- Ignition switch OFF.
- Doors, hood and back door locked & closed.



13. ALR ②

Alarm does not operate, even if any door is opened without key or any key cylinder is drawn out. – ALARM PHASE
- Ignition switch OFF.



Trouble-shooting (Cont'd)

14. ALR ③

Alarm does not stop (Alarm continues for over 4 minutes) – ALARM PHASE
- Ignition switch OFF.

Did door switches, hood switch, back door switch or all tamper switches operate during alarm?
- YES → No trouble
- NO ↓

Does alarm continue for over 4 minutes again during alarm without operating door switches, hood switches, back door switch or all tamper switches?
- NO → No trouble
- YES ↓

Disconnect main harness connector at sub-control unit. ↓

Check door switch trigger and tamper switch trigger for passenger's side.
- **Refer to check Ⓔ.**
- N.G. →
  - Faulty door switch
  - Faulty tamper switch
  - Faulty harness
  - Faulty key cylinder installation
  - Faulty door alignment
- O.K. ↓

Check door switch trigger and tamper switch trigger for driver's side & tamper switch trigger for back door.
- **Refer to check Ⓕ.**
- N.G. →
  - Faulty door switch
  - Faulty tamper switch
  - Faulty harness
  - Faulty key cylinder installation
  - Faulty door alignment
- O.K. ↓

Check back door switch trigger.
- **Refer to check Ⓝ.**
- N.G. →
  - Faulty back door switch
  - Faulty back door switch circuit
  - Faulty back door alignment
- O.K. ↓

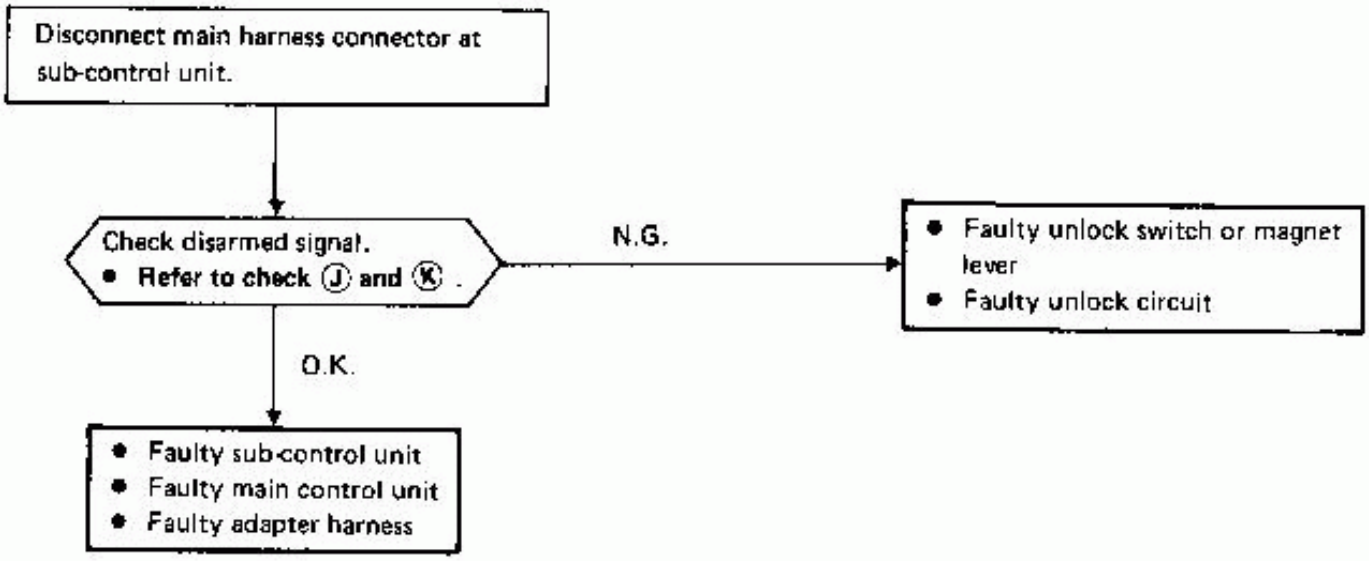
Check hood switch trigger.
- **Refer to check Ⓞ.**
- N.G. →
  - Faulty hood switch
  - Faulty hood switch circuit
  - Faulty hood alignment
- O.K. ↓

- Faulty sub-control unit
- Faulty main-control unit
- Faulty adapter harness

Trouble-shooting (Cont'd)

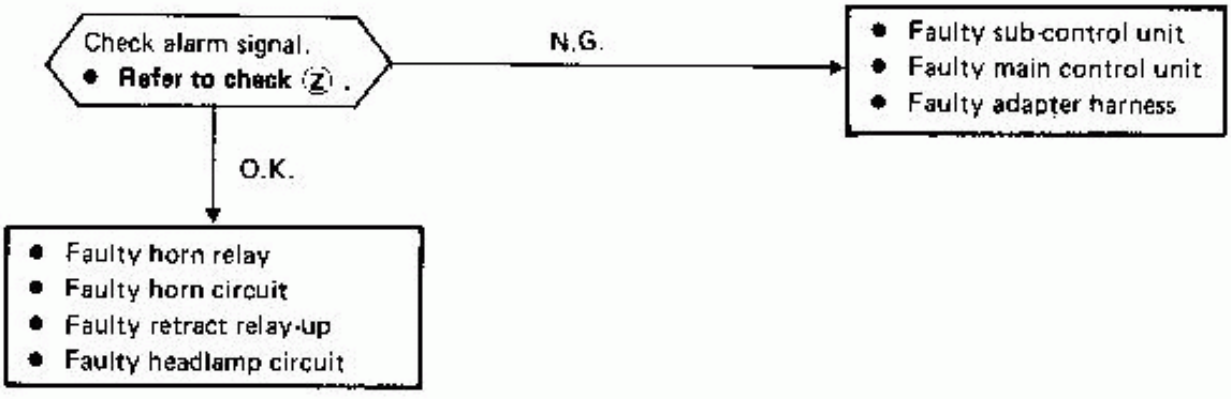
15. ALR ④

Alarm does not stop even if stop signal is given — ALARM PHASE
- Doors or back door unlocked during alarm operation.



16. ALR ⑤

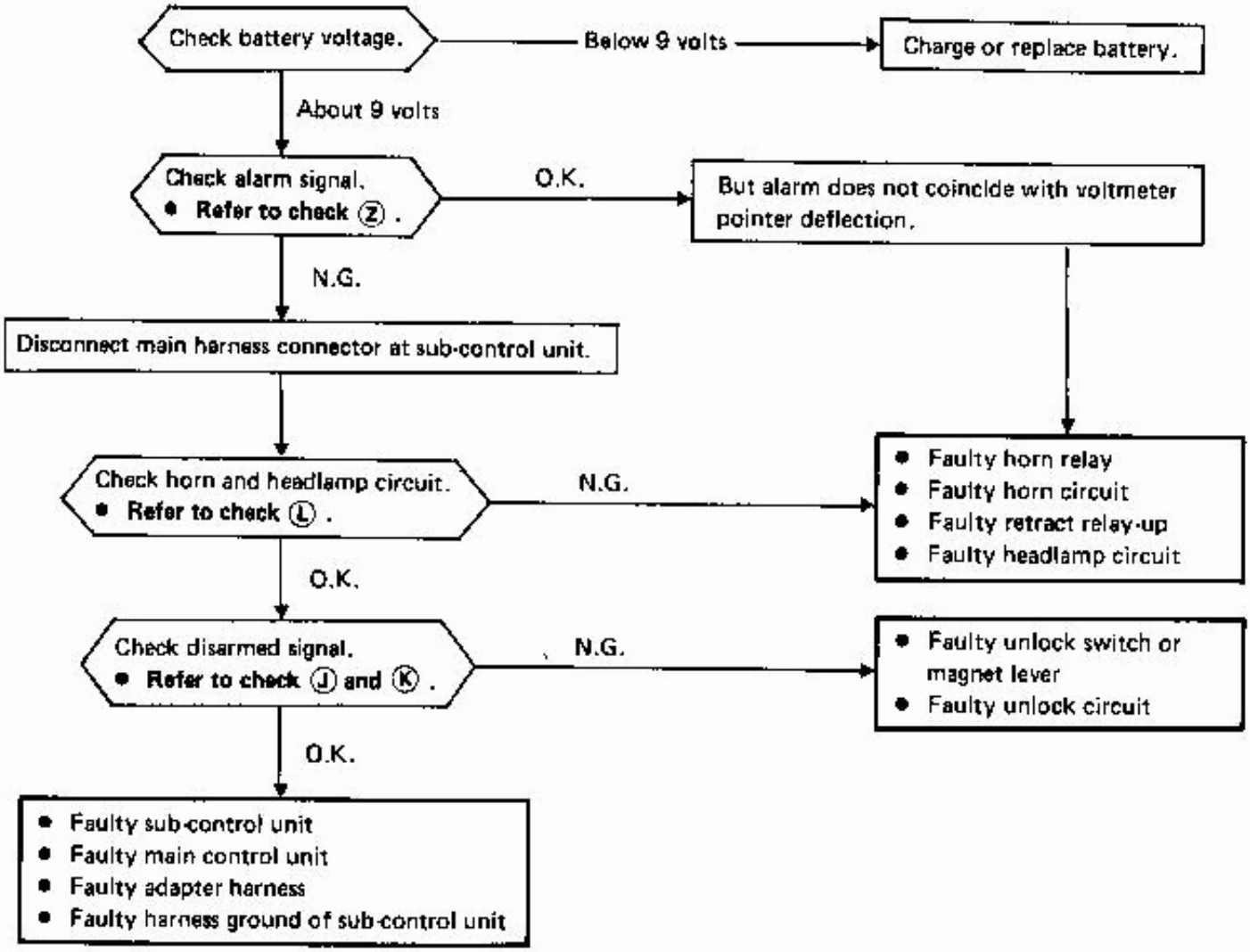
Alarm continues (Alarm is not intermittent). — ALARM PHASE
- Ignition switch OFF.



Trouble-shooting (Cont'd)

17. ALR ⑥

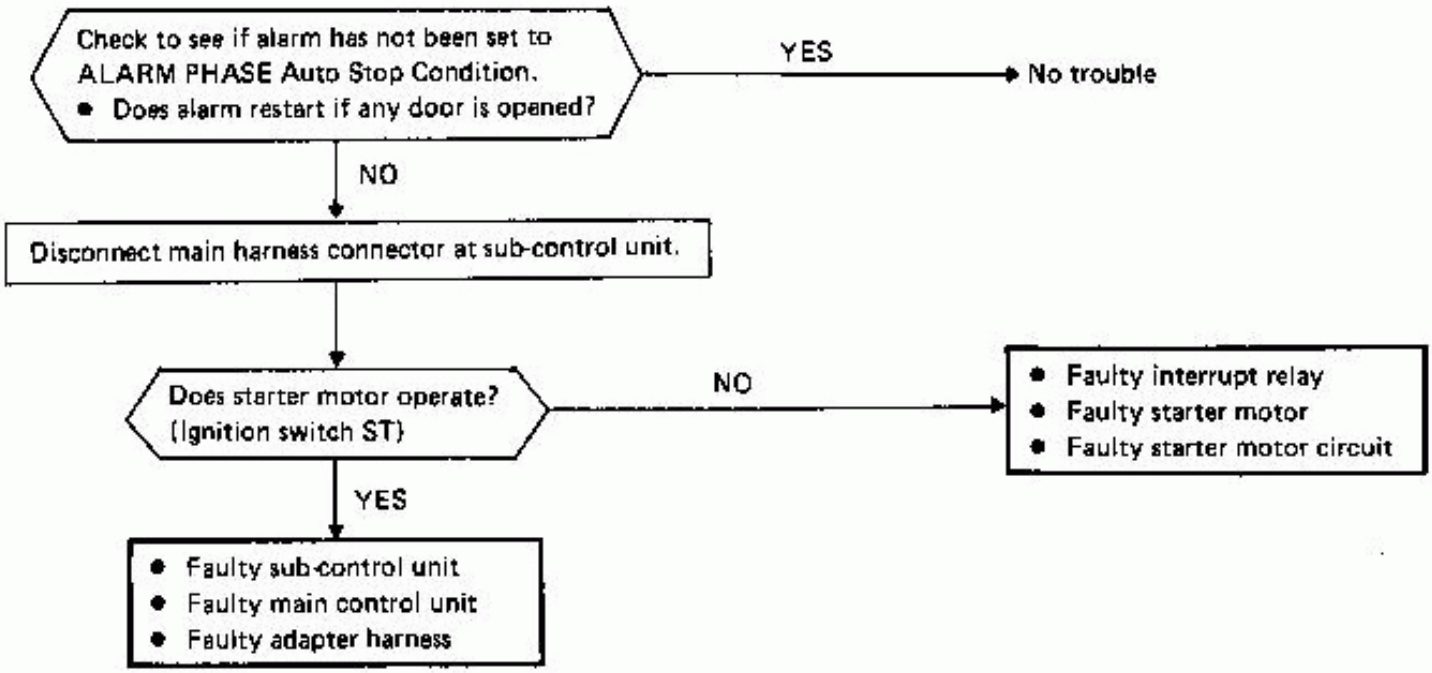
Alarm stops too soon (Alarm does not continue for 2 to 4 minutes) — ALARM PHASE
- Ignition switch OFF.



Trouble-shooting (Cont'd)

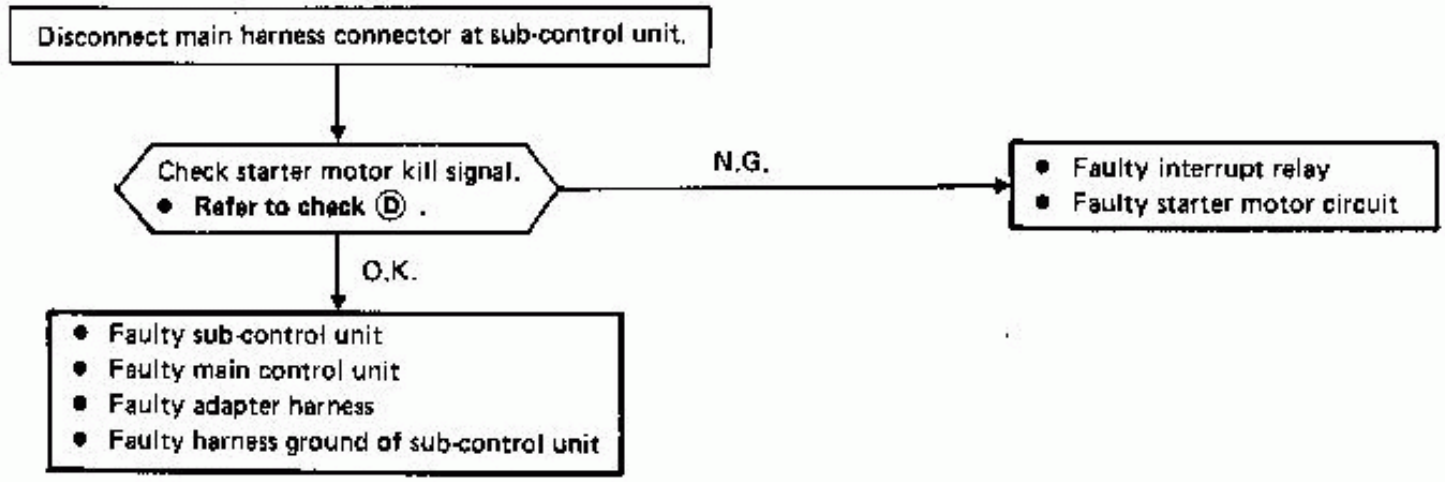
18. ST ①

Starter motor does not operate — DISARMED, READY and ARMED PHASE
- Ignition switch ST.



19. ST ②

Starter motor operates — ALARM PHASE
- Ignition switch ST.



Trouble-shooting (Cont'd)

20. RES ①

Reset (Cancel) cannot be performed by unlocking power door lock – READY PHASE

Disconnect main harness connector at sub-control unit.

Check power door lock system.
- **Refer to check Ⓘ.**

N.G.
- Faulty power door lock actuator
- Faulty power door lock switch
- Faulty harness

- Faulty sub-control unit
- Faulty main control unit
- Faulty adapter harness

21. RES ①

Reset (Cancel) cannot be performed by opening door – READY PHASE

Disconnect main harness connector at sub-control unit.

Check door switch trigger for passenger's side.
- **Refer to check Ⓔ.**

N.G.
- Faulty door switch
- Faulty harness

O.K.

Check door switch trigger for driver's side.
- **Refer to check Ⓕ.**

N.G.
- Faulty door switch
- Faulty harness

O.K.

Check back door switch trigger.
- **Refer to check Ⓝ.**

- Faulty back door switch
- Faulty back door switch circuit

O.K.

Check hood switch trigger.
- **Refer to check Ⓞ.**

- Faulty hood switch
- Faulty hood switch circuit

- Faulty sub-control unit
- Faulty main control unit
- Faulty adapter harness

Trouble-shooting (Cont'd)

22. RES ③

Reset (Cancel) cannot be performed by ignition switch
– READY and ARMED PHASE

Disconnect main harness connector at sub-control unit.

Check system cancel signal (Ignition switch).
- **Refer to check Ⓒ .**

N.G. → Faulty ignition switch circuit

- Faulty sub-control unit
- Faulty main control unit
- Faulty adapter harness

23. RES ④

Reset cannot be performed by unlocking key cylinder with key –
– READY, ARMED and ALARM PHASE

Disconnect main harness connector at sub-control unit.

Check disarmed signal.
- **Refer to check Ⓙ and Ⓚ .**

N.G. →
- Faulty unlock switch or magnet lever
- Faulty unlock circuit

O.K.

READY and ARMED PHASE

ALARM PHASE

- Vehicle cannot be disarmed.
- Alarm does not stop.
- Starter motor only does not operate.

- Faulty sub-control unit
- Faulty main control unit
- Faulty adapter harness

- Faulty interrupt relay
- Faulty starter motor
- Faulty starter motor circuit

Trouble-shooting (Cont'd)

24, 25, 26 HLP ① , ② , ③

Headlamps do not rise up – ALARM PHASE
Headlamps do not retract – After ALARM
Headlamps rise up – ARMED & DISARMED PHASE

Disconnect main harness connector at sub-control unit.

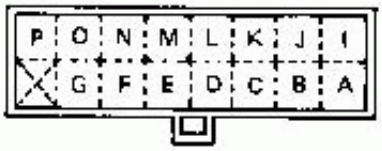
Check headlamp motor operation.
- Refer to check Ⓜ

NO →
- Faulty retract control relay
- Faulty retract control circuit

YES ↓
- Faulty sub-control unit
- Faulty main control unit
- Faulty adapter harness

THEFT WARNING SYSTEM

Terminal Check



Terminal arrangement of connector for theft warning sub-control unit (View from harness side)

Check table of connector terminals for sub-control unit. (Disconnect connector at sub-control unit)

Terminal	Function	From	Normal operation	If N.G., check
A	System source	Fuse box	Battery voltage should come between [A] and body ground	10A fuse, Harness
B	Security lamp operating control	Fuse box (Through extended storage switch)	Ground [B], security lamp should come on.	10A fuse, Harness, Bulb of security lamp Extended storage switch
C	System cancel signal	Fuse box	Battery voltage should come between [C] and body ground when key is in A CC or ON.	10A fuse, Harness
D	Starter kill	(Through interrupt relay)	Ground [D] starter should not operate.	Theft interrupt relay, Harness
F	Door switch trigger and tamper switch trigger for passenger's side	Passenger's door switch and tamper switch	Battery voltage should come between [F] and body ground when passenger's door is closed. Zero voltage between [F] and body ground when passenger's door is open. Battery voltage between [F] and body ground when passenger's tamper switch is installed to key cylinder when passenger's door is closed.	Door switch, Tamper switch, Harness
E	Door switch trigger and tamper switch trigger of driver's side.	Driver's door switch and tamper switch.	Battery voltage should come between [E] and body ground when driver's door is closed. Zero voltage between [E] and body ground when driver's door is open. Battery voltage should come between [E] and body ground when driver's door tamper switches is installed to key cylinders (when driver's door is closed).	Door switch, Tamper switch, Harness
G	Arm signal	Door lock switches.	Continuity exists between [G] and body ground when key stops between neutral and full stroke of lock.	Door lock switch, Harness

Terminal Check (Cont'd)

Terminal	Function	From	Normal operation	If N.G., check
I	Driver's and passenger's door unlock sensor signal	Door unlock sensor	Continuity exists between [I] and body ground when at least one of driver's and passenger's doors is unlocked. No continuity between [I] and body ground when driver's and passenger's doors are locked.	Door unlock sensor, Harness
J	Disarm signal Back door	Back door unlock switch	Continuity exists between [J] and body ground when key stops between neutral and full stroke of unlock.	Unlock switch, Harness
K	Disarm signal (Driver's and passenger's doors)	Door unlock switches	Continuity exists between [K] and body ground when key stops between neutral and full stroke of unlock.	Unlock switch, Harness
L	Alarm signal	Fuse box (Through horn relay)	Ground [L], horn should sound.	Horn relay, 10A fuse, Harness
M	Rise up headlamps	Retract control relay	Connect [A] and [M] with jumper cable. Headlamps should rise up.	Retract control relay, Harness, Headlamp retract circuit
N	Back door switch trigger	Back door switch	Battery voltage should come between [N] and body ground when back door is closed. Zero voltage between [N] and body ground when back door is open.	Back door switch, Harness
O	Hood switch trigger	Hood switch	No continuity between [O] and body ground when hood is closed. Continuity exists between [O] and body ground when hood is open.	Hood switch, Harness
P	System ground	Body ground	Continuity exists between [P] and body ground.	Body ground terminal, Harness

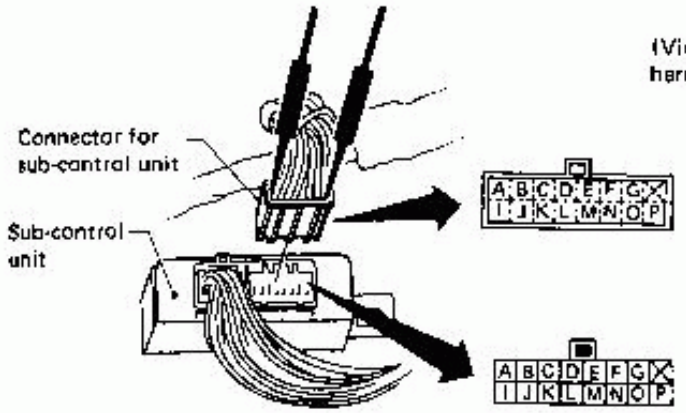
Connect connector to sub-control unit

Terminal	Function	From	Normal operation	If N.G., check
L (Check ⓩ)	Alarm signal	Fuse box (Through horn relay) Fuse box (Through retract relay-up)	Connect voltmeter between [A] and [L]. Pointer deflection should come intermittently under alarm phase.	Sub-control unit, Main control unit, Adapter harness

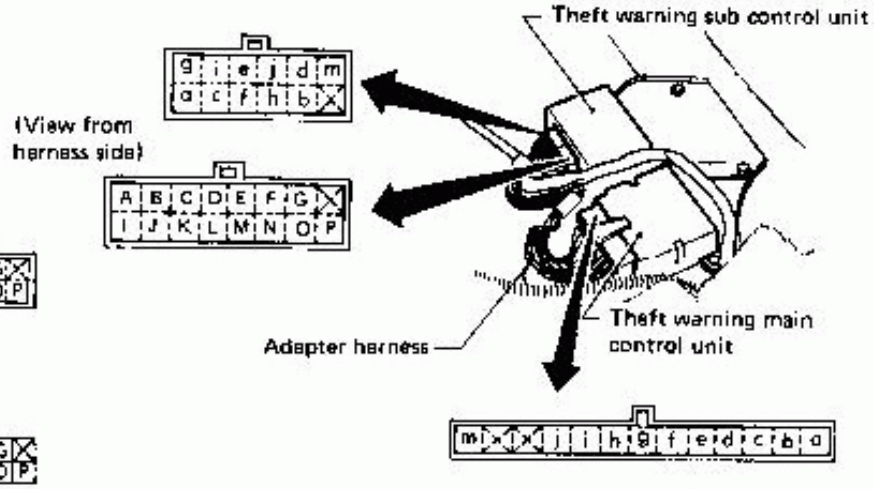
Terminal Check (Cont'd)

Preparation for check

- Disconnect body harness connector at sub-control unit. (Except check Ⓩ)

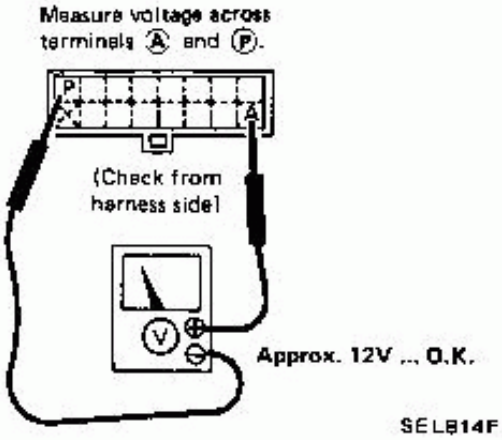


Terminal arrangement for check
(View from harness side)



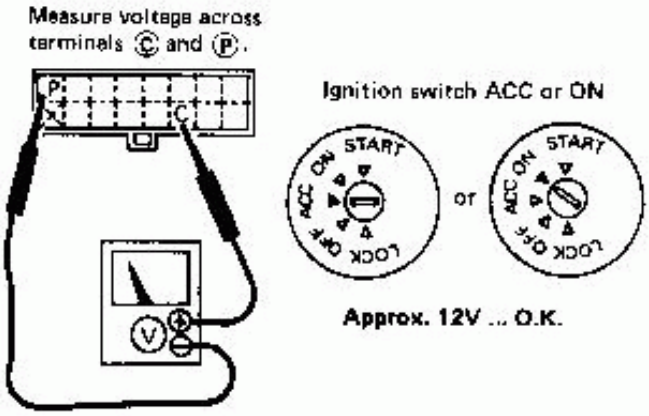
SEL813F

CHECK Ⓐ ... System source check



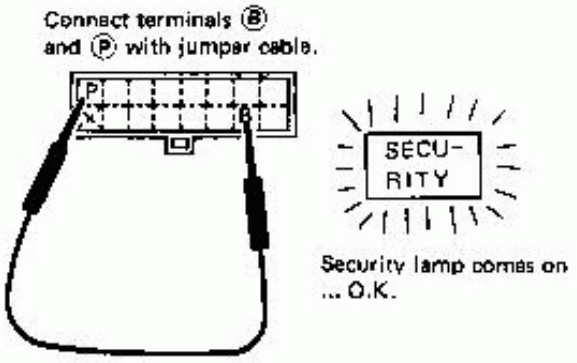
SEL814F

CHECK Ⓒ ... System cancel signal check



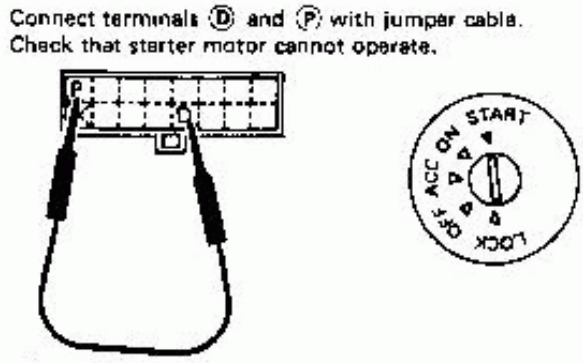
SEL815F

CHECK Ⓑ ... Security lamp circuit check



SEL816F

CHECK Ⓓ ... Starter kill signal check

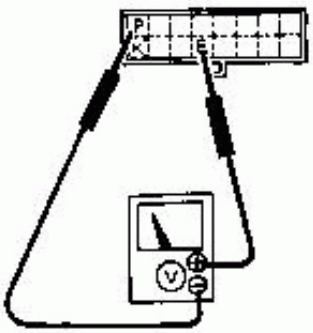


SEL817F

Terminal Check (Cont'd)

CHECK Ⓔ ... Door switch trigger and tamper switch trigger of driver's side

Measure voltage across terminals Ⓟ and Ⓔ.

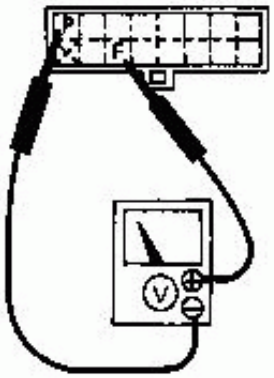


Driver's door is closed ... 12V
Driver's door is open ... 0V
Driver's door tamper switch is installed to key cylinder with driver's door closed ... 12V
Driver's door tamper switch is removed from key cylinder with driver's door closed ... 0V
... O.K.

SEF899G

CHECK Ⓕ ... Door switch trigger and tamper switch trigger of passenger's side

Measure voltage across terminals Ⓕ and Ⓟ.

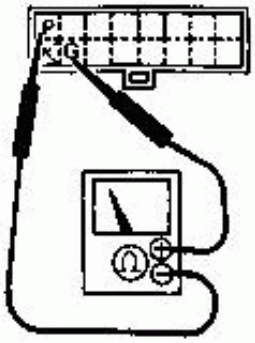


Passenger's door is closed.
... 12V
Passenger's door is open.
... 0V
Passenger's tamper switch is installed to key cylinder with passenger's door closed.
... 12V
Passenger's tamper switch is removed from key cylinder with passenger's door closed.
... 0V
... O.K.

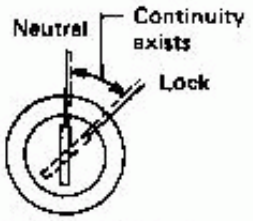
SEL819F

CHECK Ⓖ ... Arm signal check

Check for continuity between terminals Ⓖ and Ⓟ.



[Example]
Key cylinder for driver's side



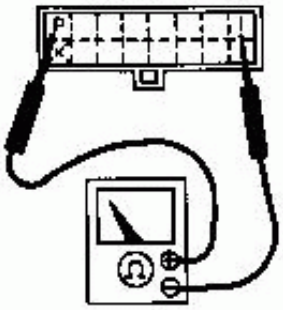
- Stop key between neutral and full stroke of lock

Continuity exists ... O.K.

SEL820F

CHECK Ⓘ ... Door unlock sensor signal

Check for continuity between terminals Ⓘ and Ⓟ.



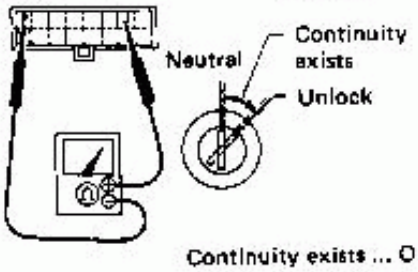
At least one of driver's and passenger's doors is unlocked.
... Continuity exists
Driver's and passenger's doors are locked ...
No continuity
... O.K.

SEL821F

CHECK Ⓙ ... Disarm signal of back door unlock switch check

Check for continuity between terminals Ⓙ and Ⓟ.

- Stop key between neutral and full stroke of unlock



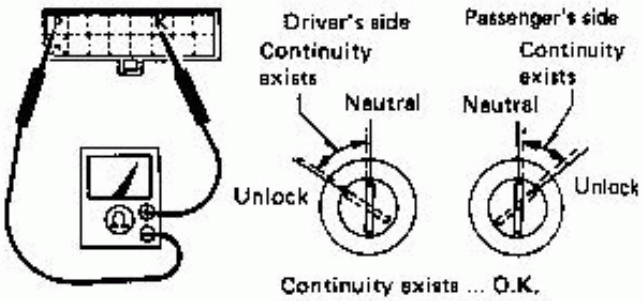
Continuity exists ... O.K.

SEL822F

CHECK Ⓚ ... Disarm signal of door unlock switch check

Check for continuity between terminals Ⓚ and Ⓟ.

- Stop key between neutral and full stroke of unlock.

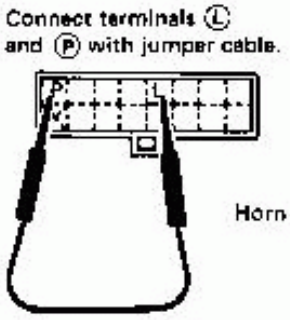


Continuity exists ... O.K.

SEL823F

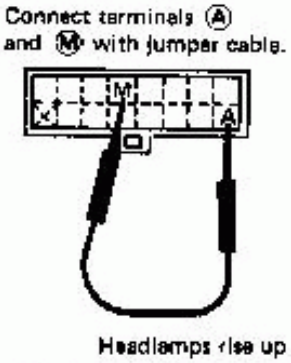
Terminal Check (Cont'd)

CHECK Ⓛ ... Alarm check



SEL824F

CHECK Ⓜ ... Rise up headlamps

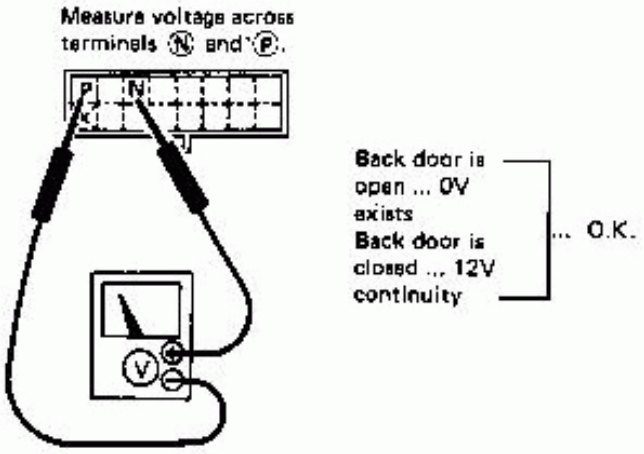


SEL825F

Remove jumper cable.

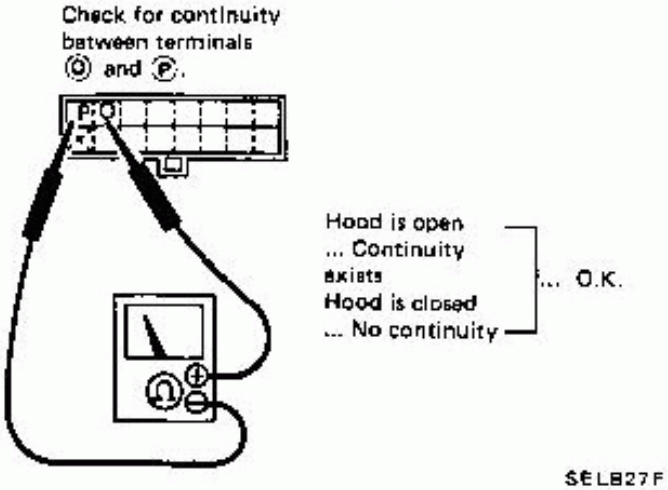
Headlamps retract ... O.K.

CHECK Ⓝ ... Back door switch trigger check



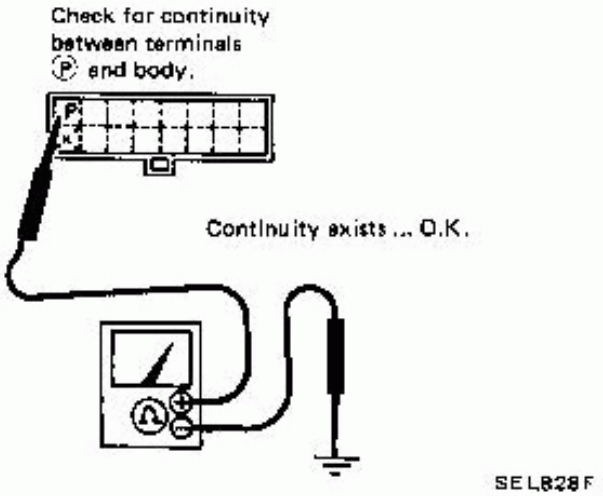
SEL826F

CHECK Ⓞ ... Hood switch trigger check



SEL827F

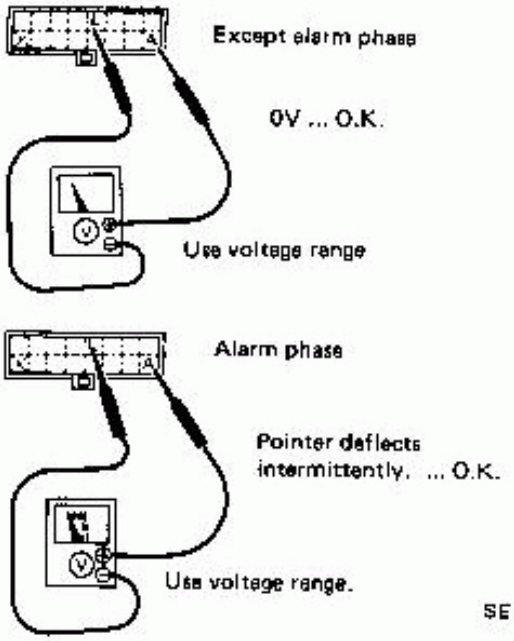
CHECK Ⓟ ... Body ground circuit check



SEL828F

CHECK Ⓩ ... Alarm signal check

1. Connect connector to theft warning sub-control unit.
2. Connect between terminals Ⓐ and Ⓛ.



SEL829F

Control Unit Check

CONTROL UNIT INSPECTION

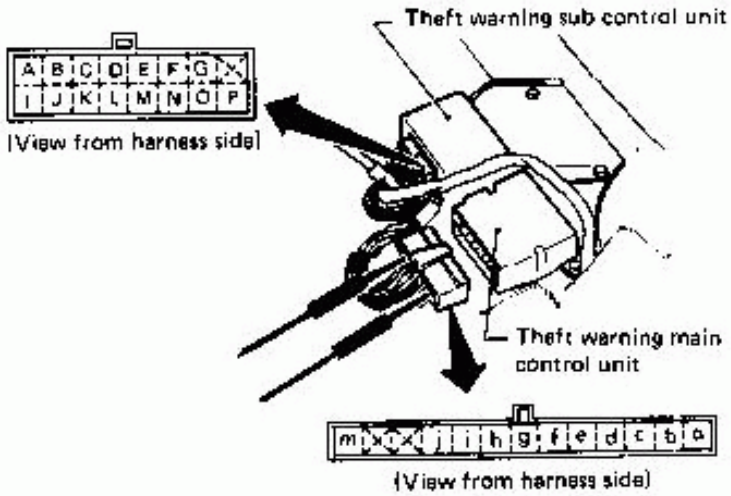
- This inspection is available only when the cause of trouble in "Trouble-shooting" is due to a " faulty sub-control unit" or "faulty main control unit" or "faulty adapter harness".
- This inspection should be carried out with adapter harness disconnected at main control unit. When disconnecting adapter harness, first disconnect battery ground cable. Be sure to reconnect battery ground cable afterwards.

TROUBLE-SHOOTING PROCEDURE

1. (O.K.) in following checks indicates "Replace main control unit" and (N.G.) indicates "Replace sub-control unit or "Replace adapter harness".
2. In case of (N.G.), check adapter harness referring to "Adapter harness check".
3. If theft warning does not operate normally even after replacing sub-control unit, replace main control unit.

Preparation for check

Disconnect adapter harness at main control unit.



SEL830F

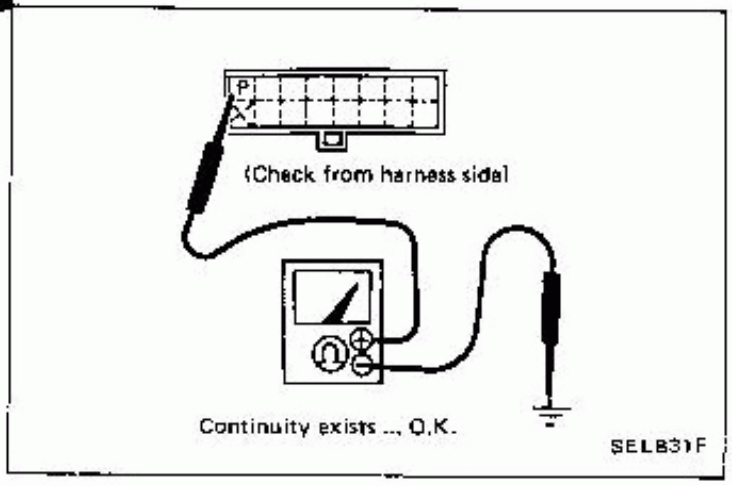
Control Unit Check (Cont'd)

Check ⓐ ... Ground circuit check

Check for continuity between terminals sub-control unit Ⓟ and body.

N.G. → Faulty ground circuit

O.K.

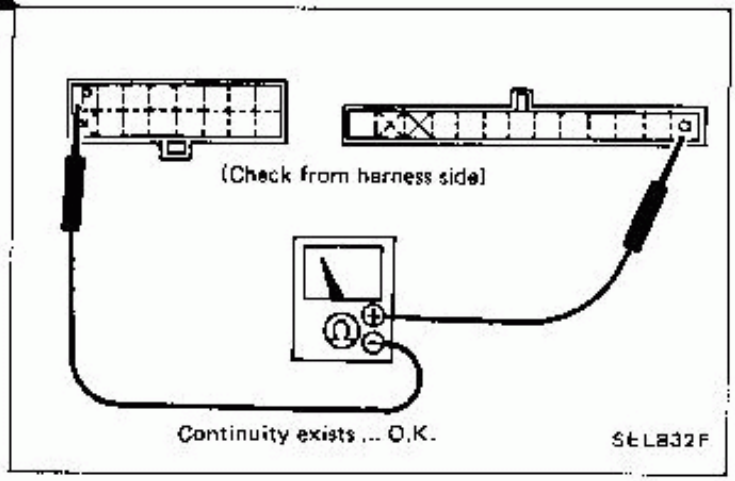


Check for continuity terminals ⓐ and sub-control unit Ⓟ.

N.G. → (N.G.) Replace sub-control unit or adapter harness. (Refer to "Adapter harness check".)

O.K.

(O.K.) Replace main control unit.



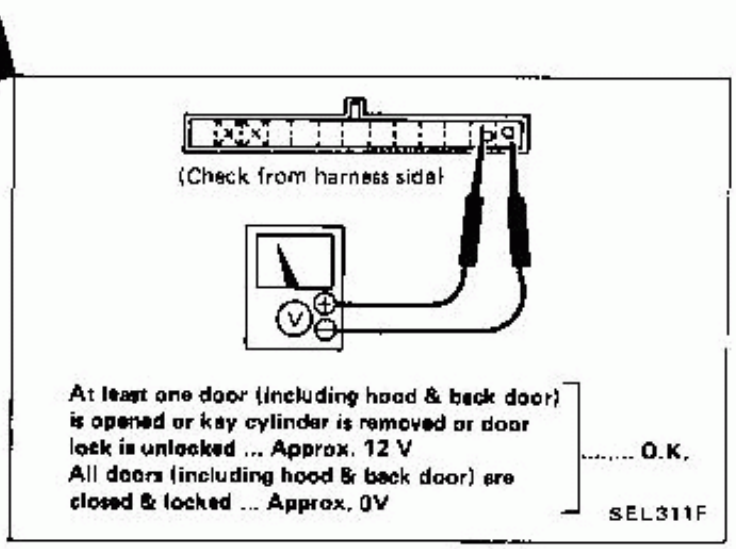
Check ⓑ ... Door unlock signal check

Measure voltage across terminals ⓑ and ⓐ.

N.G. → (N.G.) Replace sub-control unit or adapter harness. (Refer to "Adapter harness check".)

O.K.

(O.K.) Replace main control unit.



Control Unit Check (Cont'd)

Check ⓒ ... Hood signal check

Connect ⓒ and ⓓ with jumper cable.

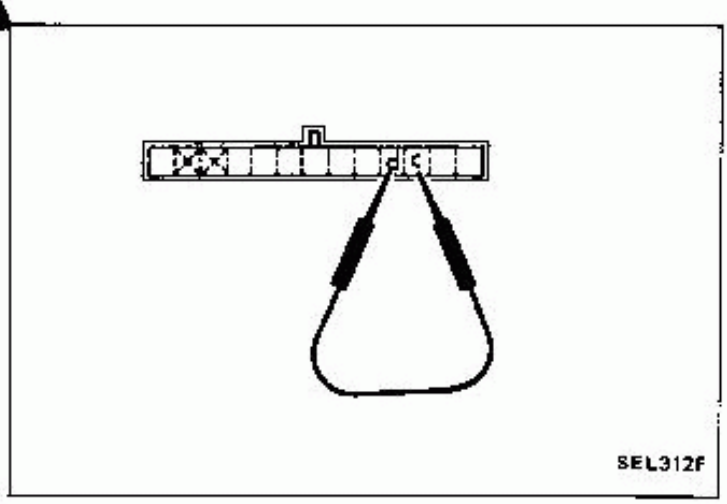
↓

Open hood.

↓

Does indicator lamp come on?

- NO → (N.G.) Replace sub-control unit or adapter harness. (Refer to "Adapter harness check".)
- YES → (O.K.) Replace main control unit.



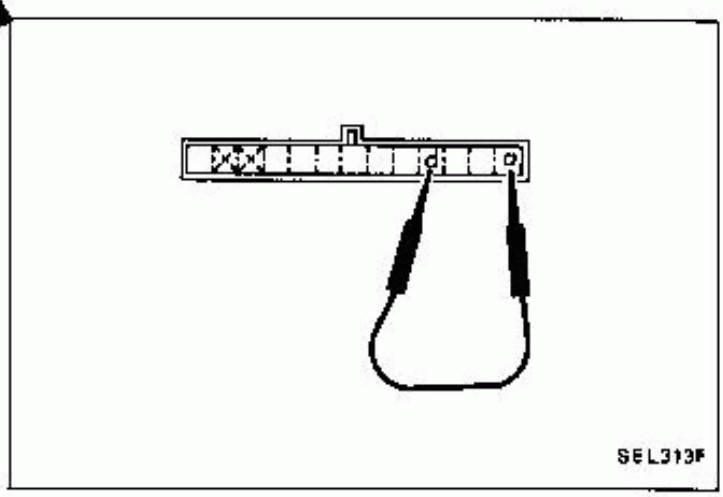
Check ⓓ ... Indicator lamp circuit check

Connect ⓓ and ⓐ with jumper cable.

↓

Does indicator lamp come on?

- NO → (N.G.) Replace sub-control unit or adapter harness. (Refer to "Adapter harness check".)
- YES → (O.K.) Replace main control unit.



Check ⓔ ... Starter kill singal check

Connect ⓔ and ⓐ with jumper cable.

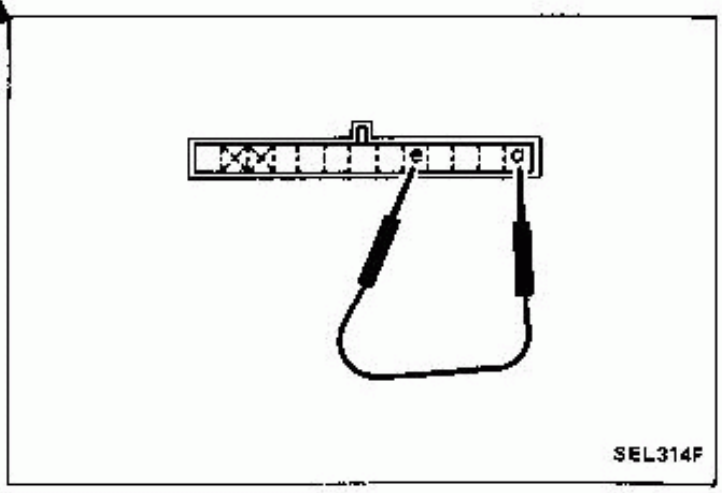
↓

Turn ignition switch to ST.

↓

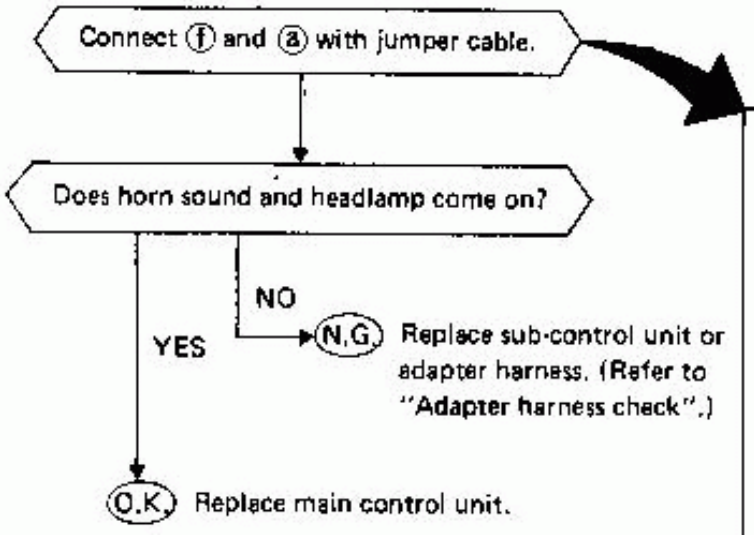
Does starter motor turn over?

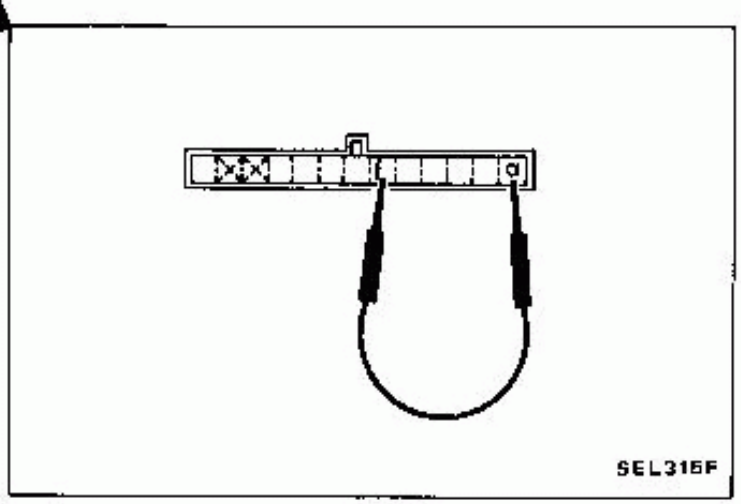
- YES → (N.G.) Replace sub-control unit or adapter harness. (Refer to "Adapter harness check".)
- NO → (O.K.) Replace main control unit.



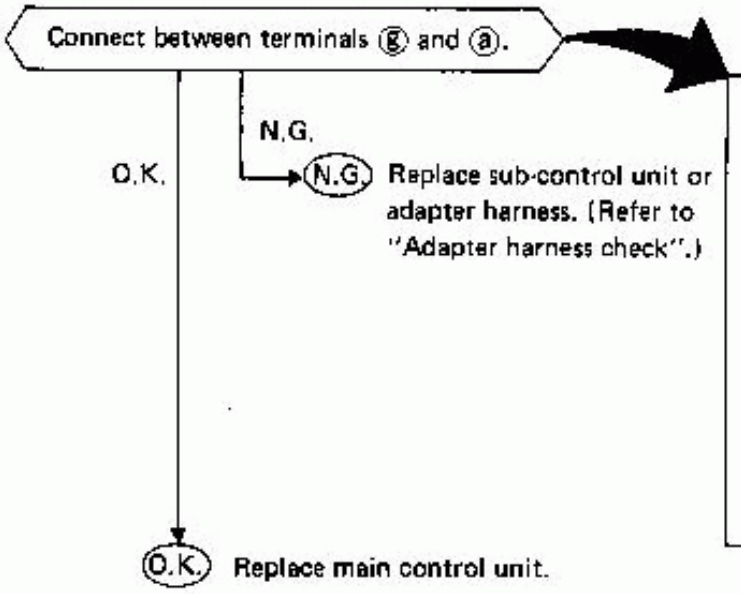
Control Unit Check (Cont'd)

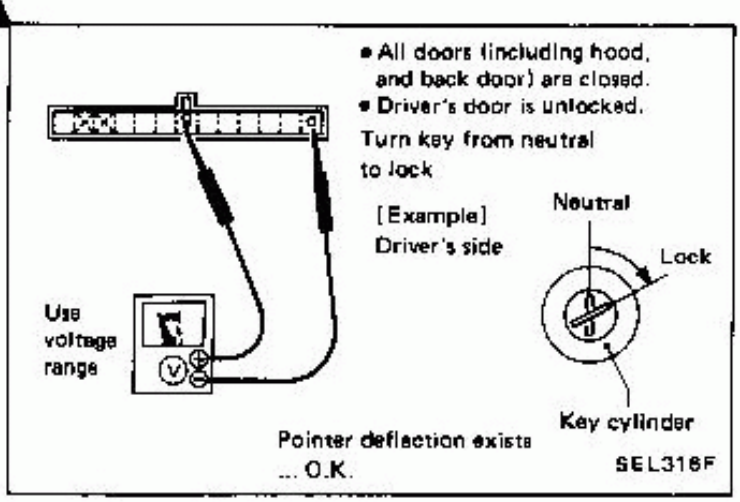
Check ⓕ ... Alarm check





Check ⓖ ... Arm signal check





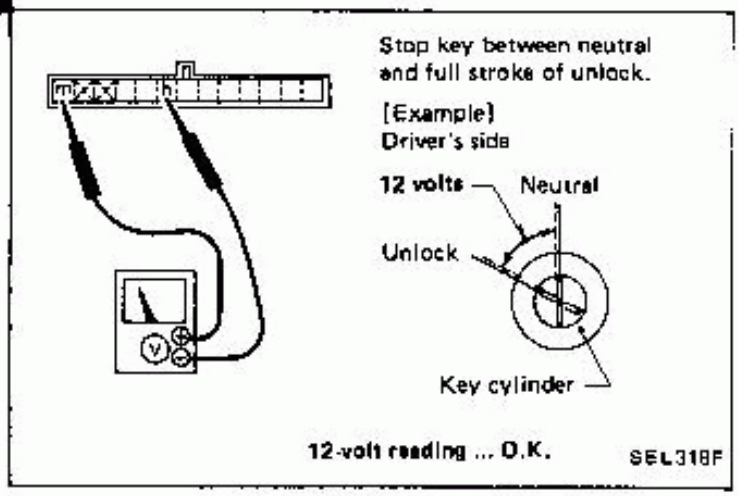
Control Unit Check (Cont'd)

Check ⓗ ... Unlock signal check

Measure voltage across terminals ⓗ and ⓜ.

O.K. → Replace main control unit.

N.G. → Replace sub-control unit or adapter harness. (Refer to "Adapter harness check".)

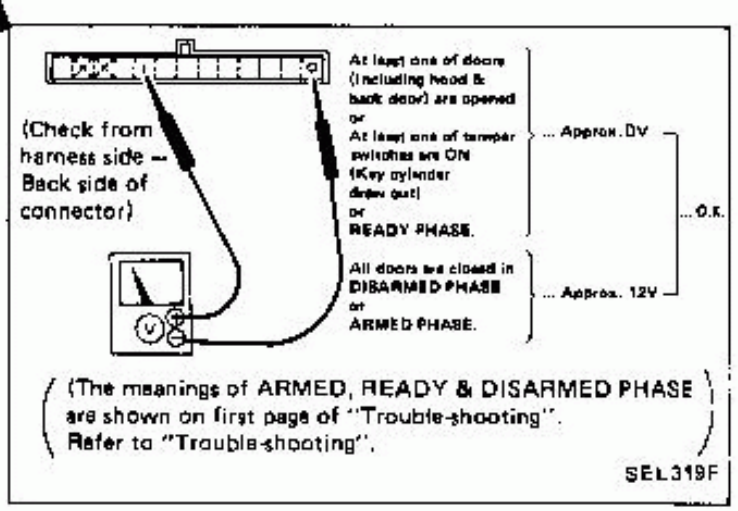


Check ⓙ ... Door switch signal check

Measure voltage across terminals ⓙ and ⓐ.

O.K. → Replace main control unit.

N.G. → Replace sub-control unit or adapter harness. (Refer to "Adapter harness check".)

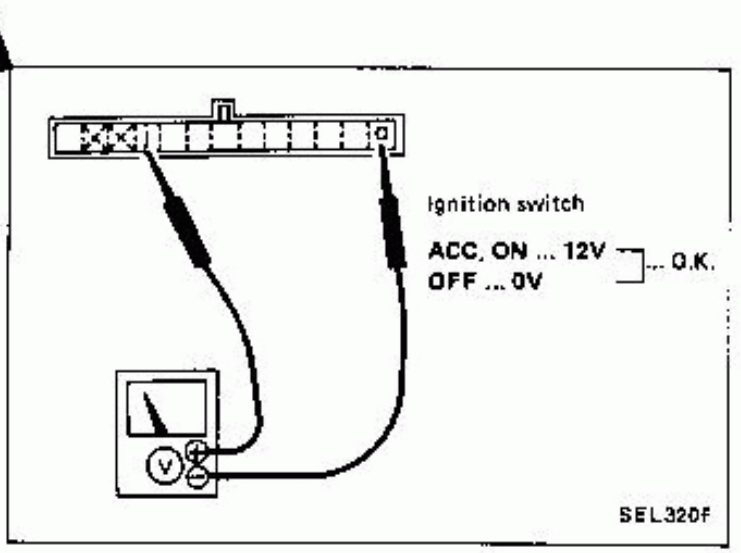


Check ⓙ ... System cancel signal check

Measure voltage across terminals ⓙ and ⓐ.

O.K. → Replace main control unit.

N.G. → Replace sub-control unit or adapter harness. (Refer to "Adapter harness check".)



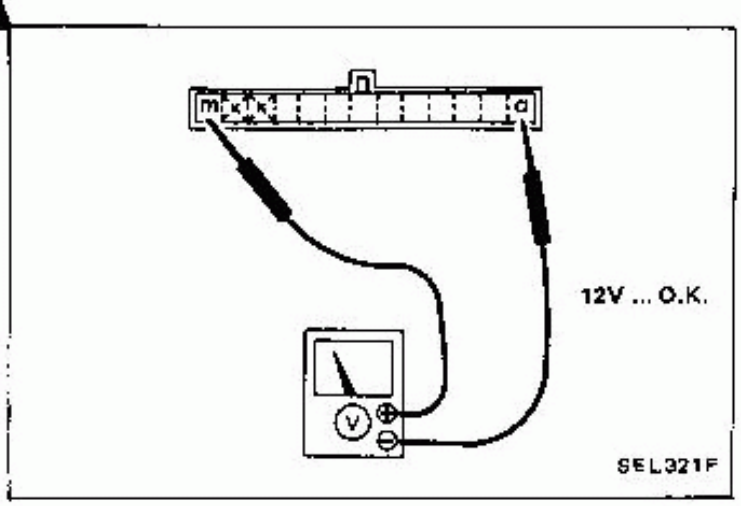
Control Unit Check (Cont'd)

Check ⓜ ... System source check

Measure voltage across terminals ⓜ and ⓐ.

O.K. → Ⓞ.K. Replace main control unit.

N.G. → Ⓝ.G. Replace sub-control unit or adapter harness. (Refer to "Adapter harness check".)



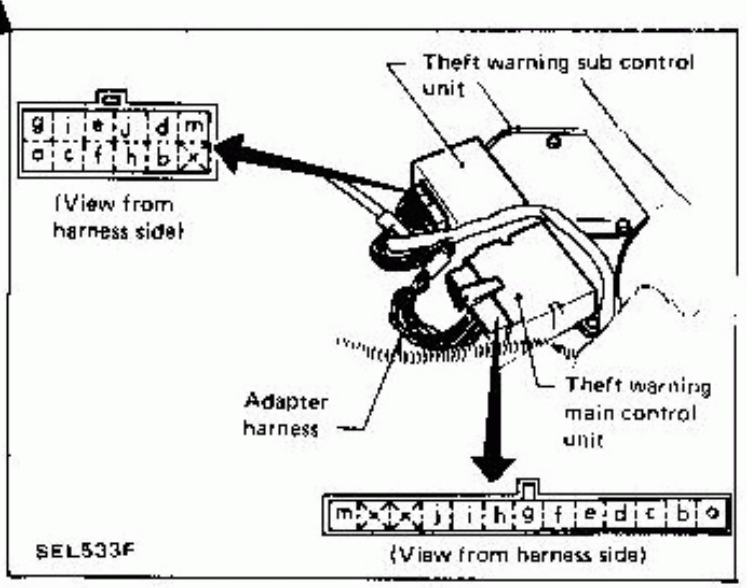
Adapter Harness Check

- This inspection is available only when the cause of trouble in "Control Unit Check" is due to a "Replace sub-control unit or adapter harness".

Check for continuity between same letter of sub-control unit and main control unit.

O.K. → Replace sub-control unit.

N.G. → Replace adapter harness.



- If theft warning does not operate normally even after replacing adapter harness, replace sub-control unit.
- If theft warning does not operate normally even after replacing sub-control unit, replace adapter harness.

DIGITAL TOUCH ENTRY SYSTEM

Description

The digital touch entry system provides remote control of the door locks and trunk lid lock (Coupe). By pressing the keypads located directly below the front door outside handle, the system permits the doors to be locked and unlocked and the trunk lid to be unlocked (released) from outside of the vehicle without using a key. All the operations can also be performed with a key.

1 Unlocking of the driver's door
2 Unlocking of the passenger's door
3 Locking of all the doors
4 Unlocking of the trunk lid (Coupe)

Terms used for digital touch entry system

(1) Fixed number

This is basic number peculiar to each unit of the digital touch entry system. To change the code number, this number must be entered before the code number.

(2) Code number

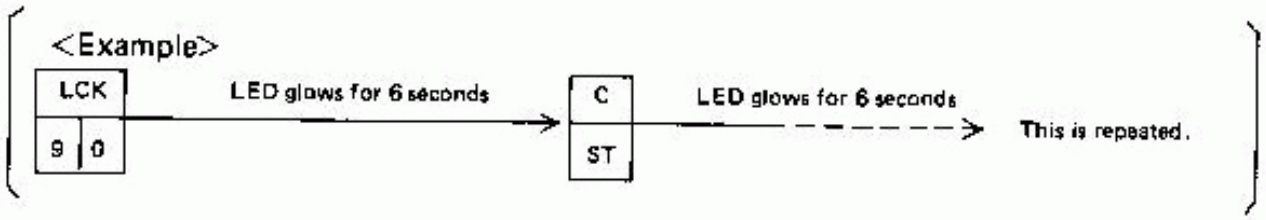
This is the system operation number of the customer's choice (4 to 7 digits). This number can be changed any time.

Other Accessory Functions

2. Accessory Functions

(1) Lighting of keypad

Each time one keypad is pushed, a light-emitting diode (LED) glows for about six seconds, thereby assuring easy use at night.



(2) Anti-theft function

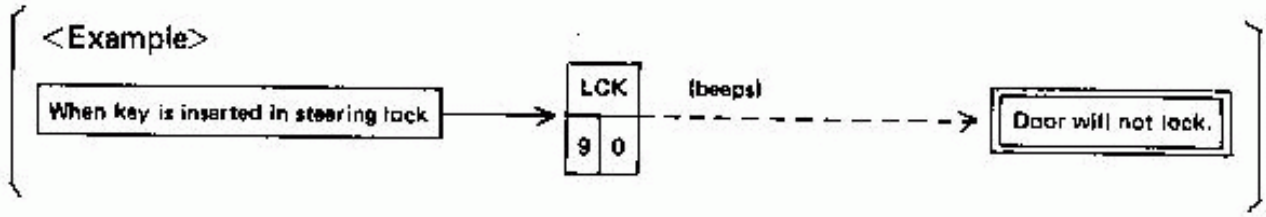
① When entering a code number, the beep will stop for about six seconds if as many as 24 keypads have been pressed by mistake.

② If as many as 80 keypads are pressed by mistake, all the functions of the system will stop for thirty seconds.

③ After a lapse of thirty seconds, if as many as 8 keypads are pressed by mistake, all the functions will stop for thirty seconds once more and this action will be repeated until the fixed number or code number is correctly inputted.

(3) Key reminder function

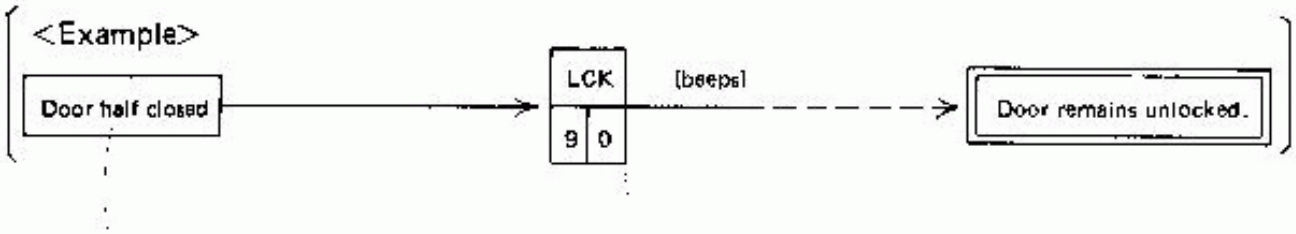
If the lock keypad LCK 9 0 is pressed with the key inserted in the steering lock, an alarm (beep) will sound and the door lock will remain unlocked. (However, when the door is locked with the inside lock knob pressed and is shut by pulling the outside handle without using the key, the door is locked and the alarm does not sound.) In this case, the door lock can be released by inputting the code number.



Other Accessory Functions (Cont'd)

(4) Prevention of half-closed door

When the driver or passenger door is not completely closed, an alarm (beep) will sound and the door will remain unlocked if the lock keypad LCK 9 0 is pressed.



(5) Method of storing personal code number with vehicle battery removed and its duration

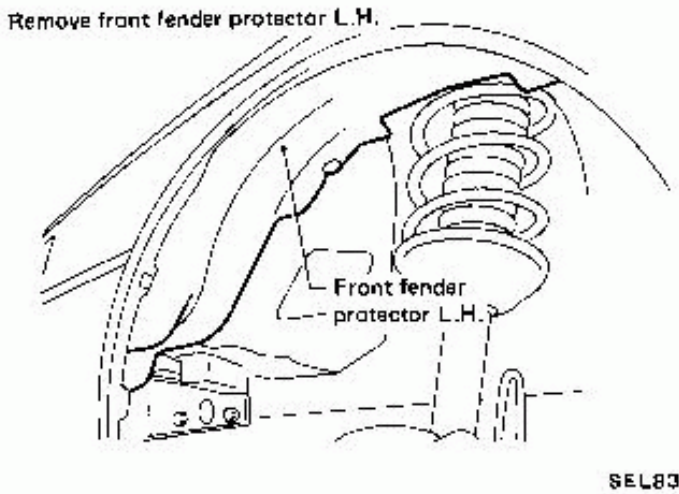
A rechargeable dry cell (Nickel-Cadmium) is employed so that the personal code number can be stored for a certain period of time even when the vehicle battery is removed. As a result, this system can store the code number in memory for about twenty days. If the vehicle is left without the battery for over twenty days, the code number will be erased. Enter the code number again when the battery is remounted on the vehicle. The rechargeable dry cell is recharged constantly, thus requiring no replacement.

(6) Countermeasure for run-down battery

External power terminal is provided behind the left front combination lamp in case the key is left in the vehicle when the battery has completely discharged.

Method of unlocking driver's side door

Remove front combination lamp L.H.

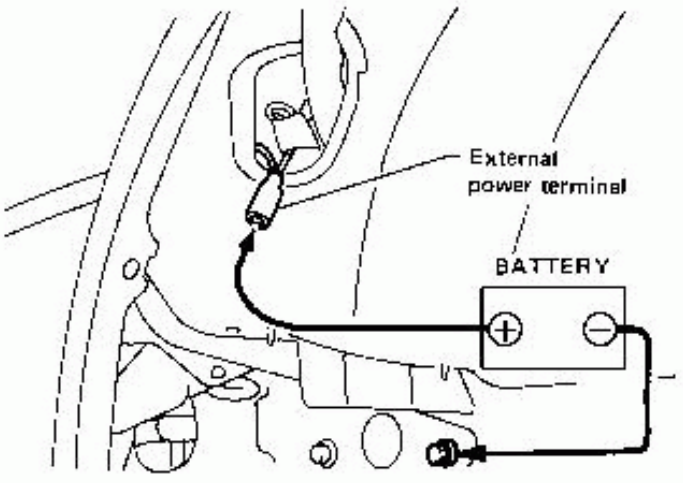


SEL833F

Connect battery as shown below.

Enter the code number (Beep sound is made) which will unlock the driver's door.

If UP 7 8 or TRK 1 2 is pressed after entering the code number, those functions do not operate.



SEL834F

Cautions

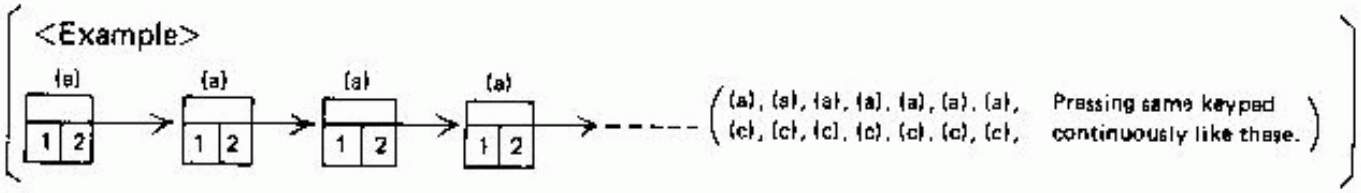
3. Cautions

(1) Safekeeping of key

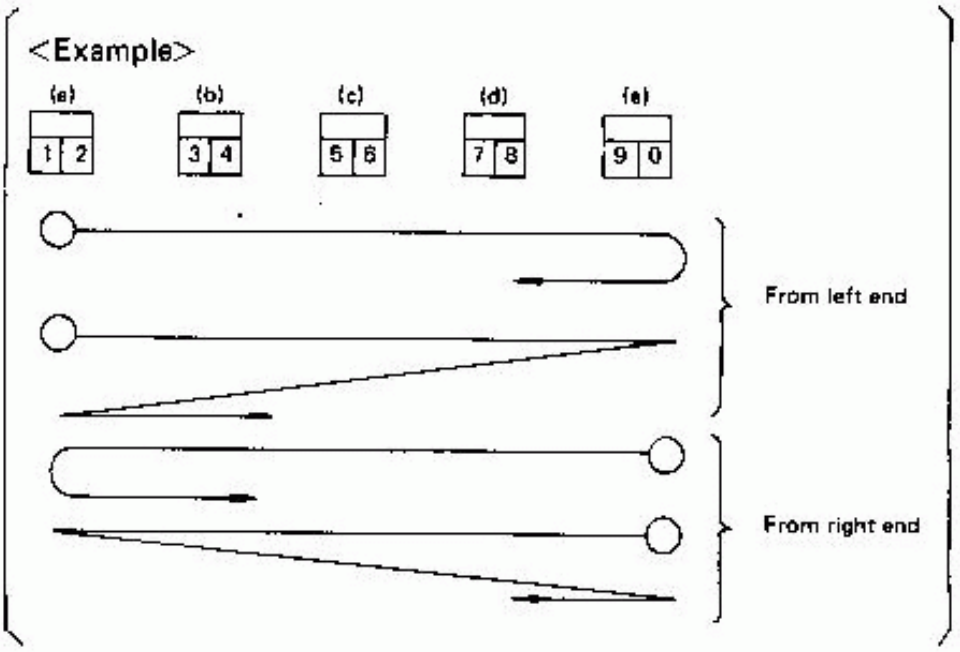
This system can unlock the door without using the key. However, always carry the key with you to prevent the vehicle from being stolen.

(2) Code numbers unavailable for use

① Continuously pressing the same keypad



② Pressing of consecutive keypads



③ Fixed number

(3) When keypads are frozen or contaminated

① Do not use hot water to defrost.

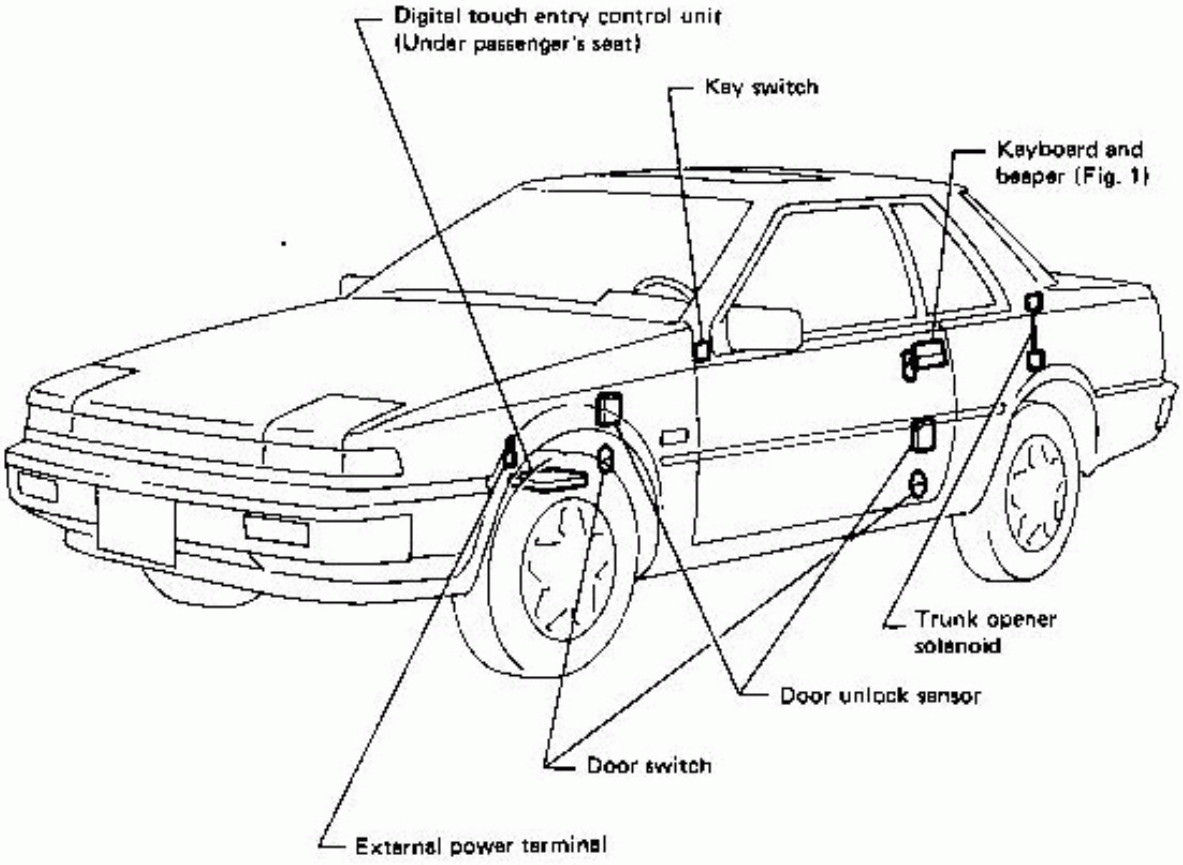
② Do not use an antifreezing agent or a thawing agent.

③ Do not use a compound or wax containing a compound.

Location of Electrical Units

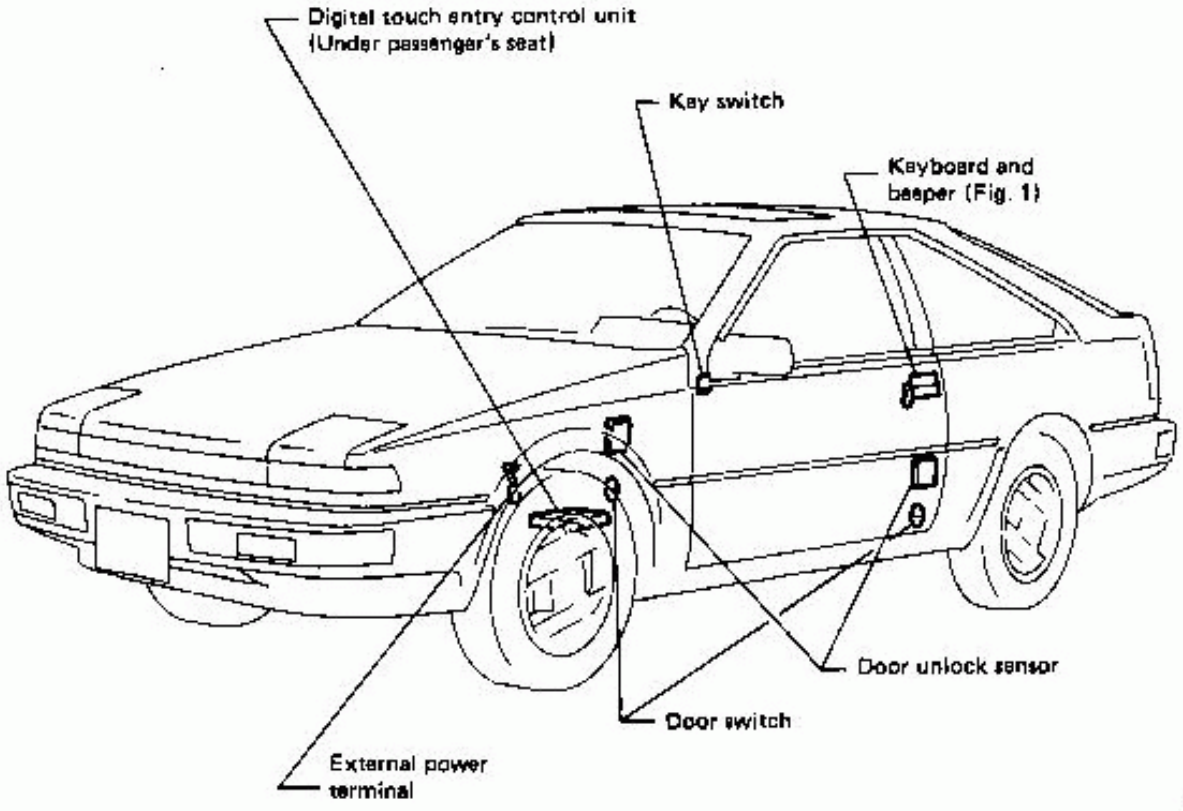
- When adjusting doors, trunk lid (Coupe) or removing and installing them or switches, check digital touch entry system.

Coupe



SEL835F

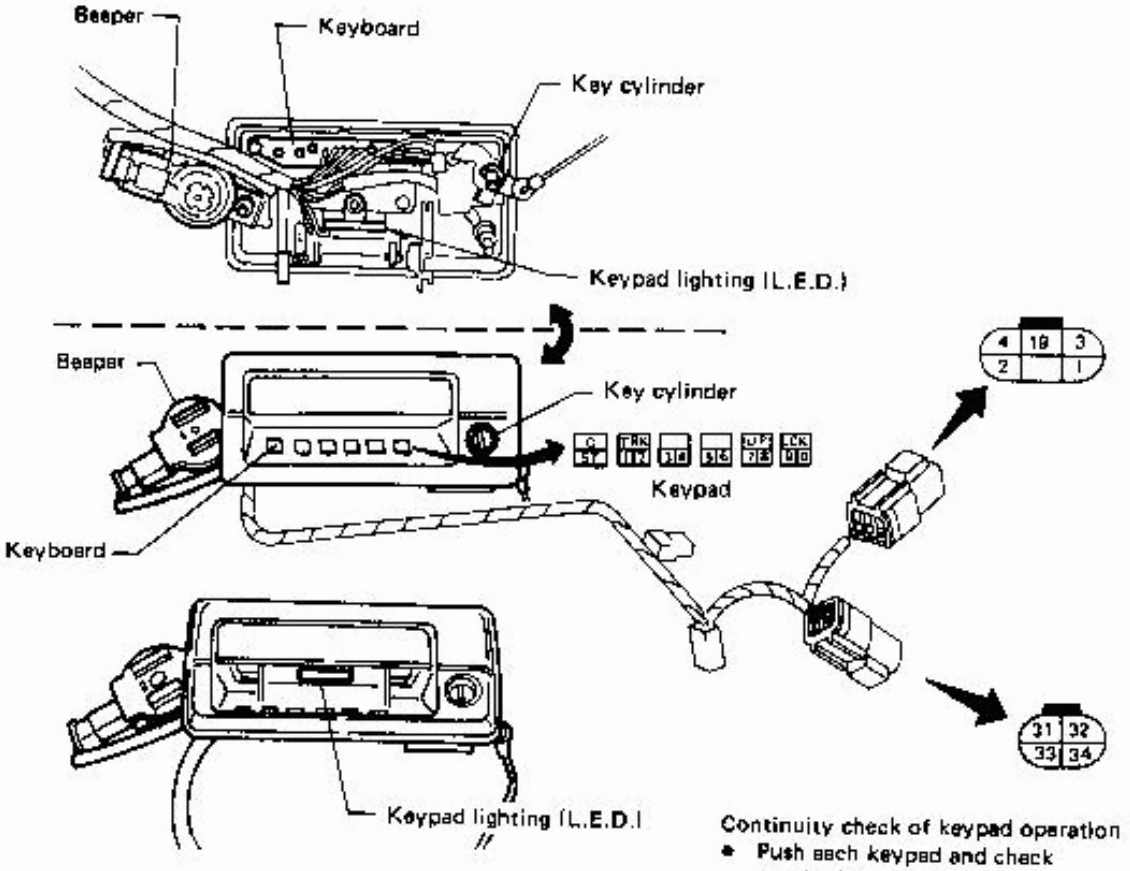
Hatchback



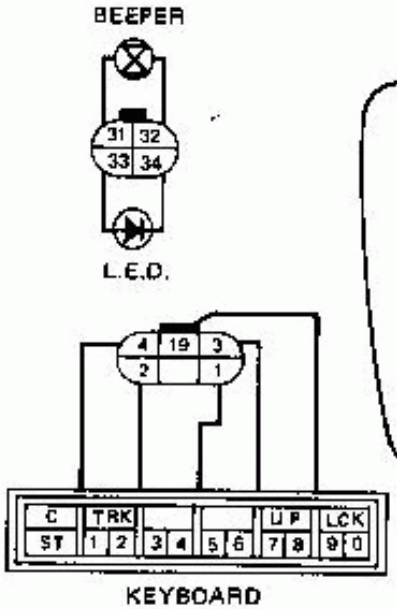
SEL836F

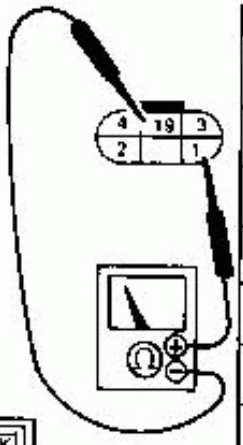
Operation of Electrical Units

Keyboard and beeper (Fig. 1)



Continuity check of keypad operation
- Push each keypad and check continuity with circuit tester.





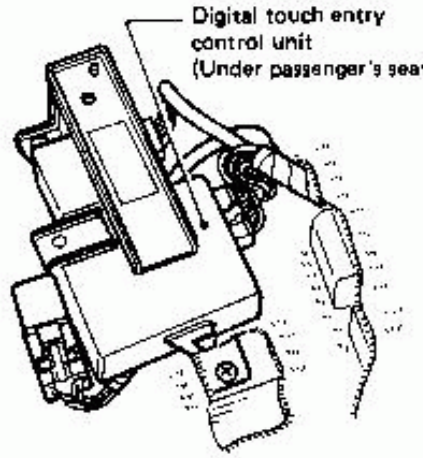
Pushed keypad	One terminal	Other terminals ①	②	③	④
C ST	⑲	○	–	–	○
TRK 1 2		–	○	–	○
3 4		–	–	○	○
5 6		○	○	–	–
UP 7 8		–	○	○	–
LCK 9 0		○	–	○	–

○ Continuity exists.
– No continuity

SEL837F

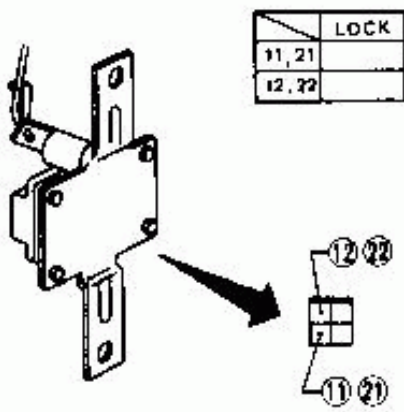
Operation of Electrical Units (Cont'd)

Digital touch entry control unit (Fig. 2)



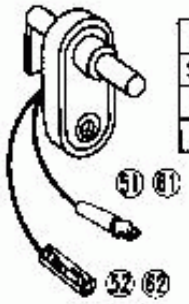
SEL838F

Door unlock sensor (Driver's side) (Fig. 3)



	LOCK	UNLOCK
11, 21		○
12, 22		○

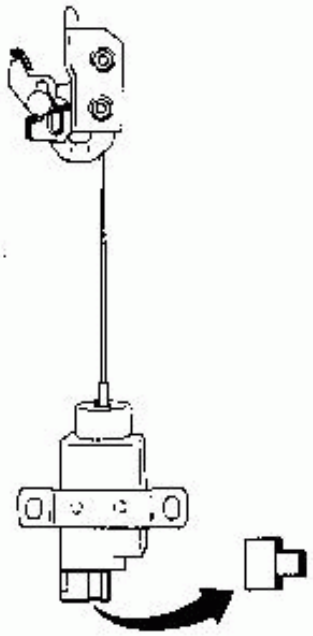
Door switch (Fig. 4)



DOOR SWITCH	OPEN RELEASE	CLOSED PUSH
51, 61	○	
52, 62	○	

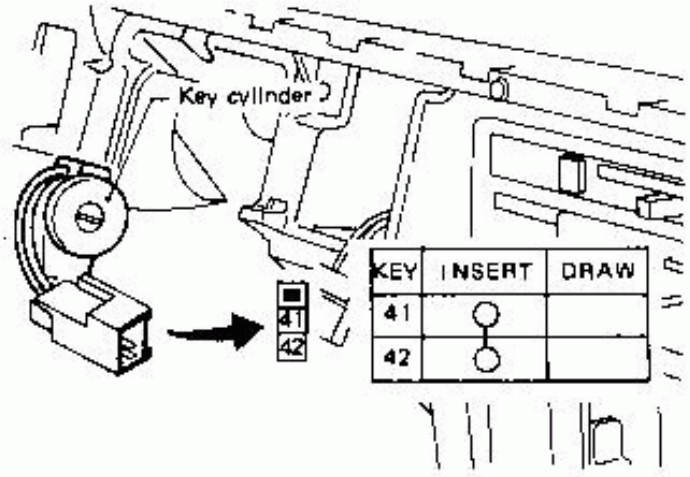
SEL839F

Trunk opener solenoid (Coupe) (Fig. 5)



SEL330F

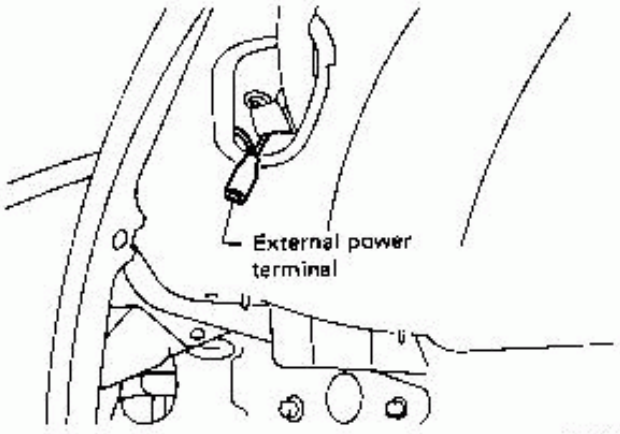
Key switch (Fig. 6)



KEY	INSERT	DRAW
41	○	
42	○	

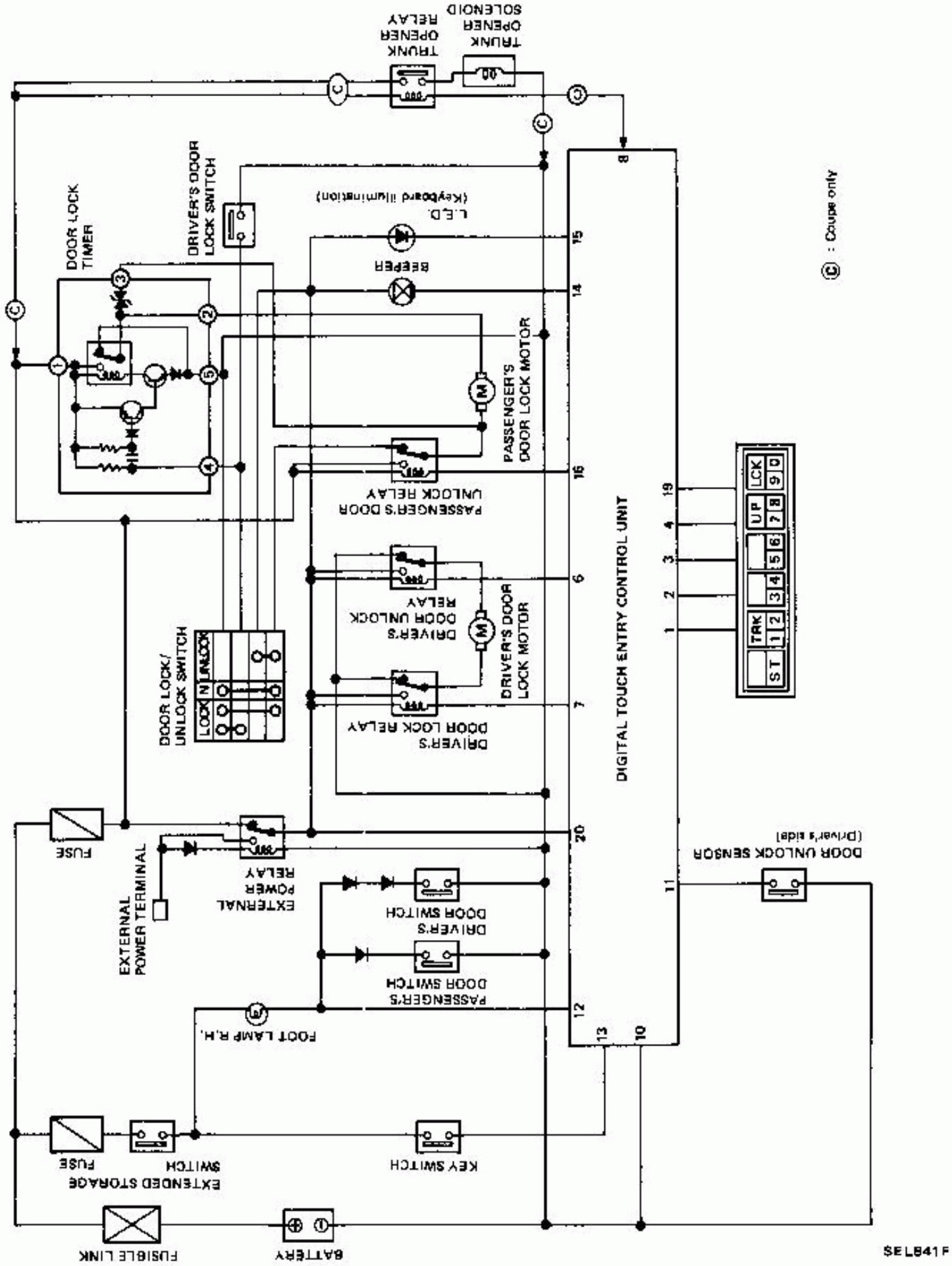
SEL331F

External power terminal (Fig. 7)



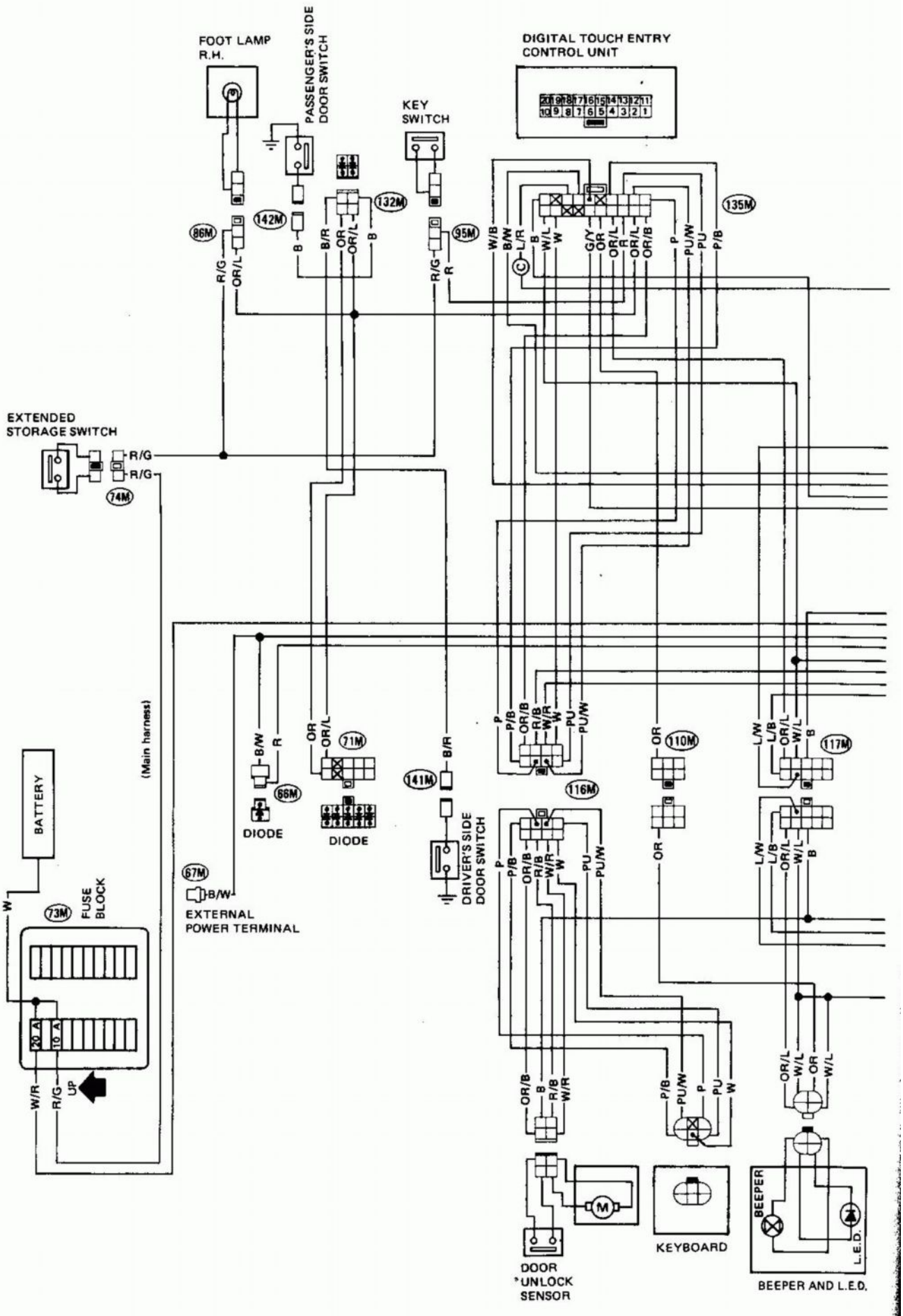
SEL840F

Schematic

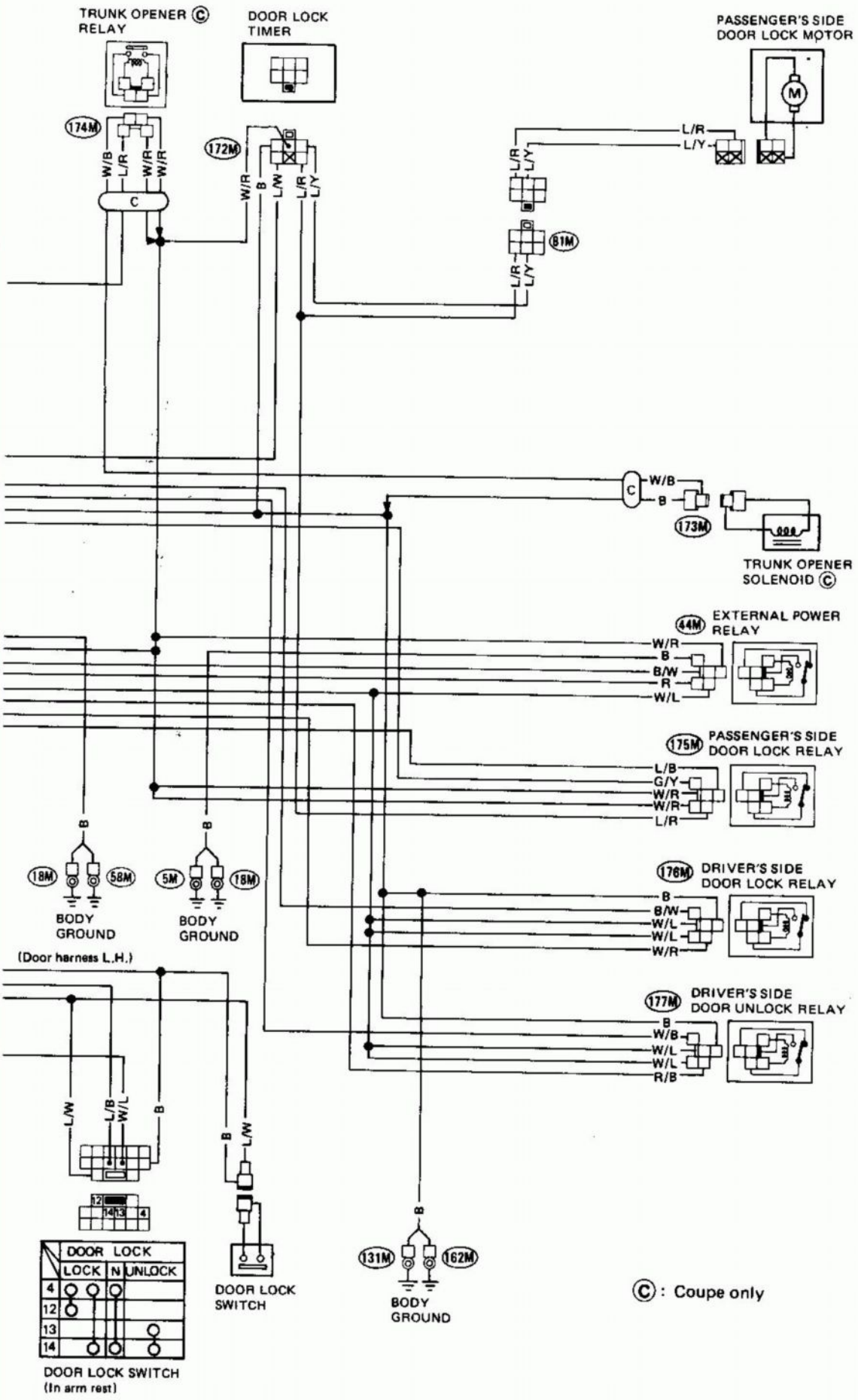

TRUNK OPENER SOLENOID
TRUNK OPENER RELAY
DRIVER'S DOOR LOCK SWITCH
DOOR LOCK TIMER
(Keyboard illumination)
L.E.D.
BEEPER
PASSENGER'S DOOR LOCK MOTOR
PASSENGER'S DOOR UNLOCK RELAY
DRIVER'S DOOR UNLOCK RELAY
DRIVER'S DOOR LOCK MOTOR
DRIVER'S DOOR LOCK RELAY
DOOR LOCK/ UNLOCK SWITCH
DIGITAL TOUCH ENTRY CONTROL UNIT
FUSE
EXTERNAL POWER TERMINAL
EXTERNAL POWER RELAY
DRIVER'S DOOR SWITCH
PASSENGER'S DOOR SWITCH
FOOT LAMP R.H.
DOOR UNLOCK SENSOR (Driver's side)
EXTENDED STORAGE FUSE
EXTENDED STORAGE SWITCH
KEY SWITCH
FUSIBLE LINK
BATTERY
© : Coupe only
SEL841F

DIGITAL TOUCH ENTRY SYSTEM

Wiring Diagram



Wiring Diagram (Cont'd)



Trouble-shooting

- When trouble-shooting, if "checks 1-7" are indicated, be sure to refer to "checks 1-7" in the "Terminal check". (Refer to pages EL-192 and 193.)

INCIDENT: The digital touch entry system malfunctions in one of these ways.	
A	When keypad is pressed, it does not beep and light does not glow.
B	When keypad is pressed, it beeps but light does not glow.
C	When keypad is pressed, it does not beep but light glows.
D	When fixed number is entered, a long beep is not heard.
E	After fixed number has been entered, registration sound (repeated beeps) is not heard even if code number is entered.
F	Driver's door does not unlock when code number is entered.
G	Driver's door unlocks when code number is entered, but the other doors do not unlock even when keypad [UP: 7, 8] is pressed within six seconds.
H	Driver's door unlocks when code number is entered, but trunk lid does not open even when keypad [TRK: 1, 2] is pressed within six seconds, (Coupe).
J	Doors do not lock when keypad [LCK: 9, 0] is pressed.
K	Door left ajar locks when keypad [LCK: 9, 0] is pressed.
L	Door locks if keypad [LCK: 9, 0] is pressed when key is inserted in steering lock.

Trouble-shooting (Cont'd)

CUSTOMER COMPLAINT	
A	When keypad is pressed, it does not beep and light does not glow.

TROUBLE-SHOOTING PROCEDURE A

1. Is ground circuit normal?
   Remove digital touch entry control unit from wiring.
   Check for continuity between terminal [10] and body ..... Check 1

   O.K. → 2

   N.G. → Faulty ground circuit

2. Is power circuit normal?
   Check if 12V exists across terminals [20] and [10] ..... Check 2 (2-1)

   O.K. → 3

   N.G. → Faulty power circuit, improper power relay connection, or faulty power relay

3. Is keyboard switch circuit normal?
   Check for continuity between terminals [19] and [1], [2], [3], and [4] ..... Check 3

   O.K. → Carry out trouble-shooting procedures B and C.

   N.G. → Faulty circuit between keyboard and control unit, improper keyboard connection, or faulty keyboard

Trouble-shooting (Cont'd)

CUSTOMER COMPLAINT	
B	When keypad is pressed, it beeps but light does not glow.

TROUBLE-SHOOTING PROCEDURES B

1. Is illumination circuit normal?
   Check if voltage across terminals [15] and [10] is 6V ..... Check 2 (2-2)
   - O.K. → 2. Connect terminals [15] and [10] to see if light glows ..... Check 4 (4-1)
     - O.K. → 3. Connect wiring to control unit and keypad to see if light glows.
       - O.K. → No trouble
       - N.G. → Replace control unit.
     - N.G. → Low battery
   - N.G. → Faulty illumination circuit or poor connection

CUSTOMER COMPLAINT	
C	When keypad is pressed, it does not beep but light glows.

TROUBLE-SHOOTING PROCEDURE C

1. Is beeper circuit normal?
   Check if voltage across terminals [14] and [10] is 12V ..... Check 2 (2-3)
   - O.K. → 2. Connect terminals [14] and [10] and check if a beep is heard ..... Check 4 (4-2)
     - O.K. → 3. Connect wiring to control unit and press keypad to see if it beeps.
       - O.K. → No trouble
       - N.G. → Replace control unit.
     - N.G. → Low battery
   - N.G. → Faulty beeper circuit or poor connection

Trouble-shooting (Cont'd)

CUSTOMER COMPLAINT	
D	When fixed number is entered, a long beep is not heard.

TROUBLE-SHOOTING PROCEDURE D

1. Is keyboard switch circuit normal?
   Check for continuity between terminals [19] and [1], [2], [3], and [4] ..... Check 3
   - N.G. → Faulty circuit between keyboard and control unit, improper keyboard connection, or faulty keyboard.
   - O.K. ↓
2. Connect wiring to control unit and input the fixed number to see if a long beep is heard.
   - N.G. → Replace control unit
   - O.K. ↓

No trouble

CUSTOMER COMPLAINT	
E	After fixed number has been entered, registration sound (repeated beeps) is not heard even if code number is entered.

TROUBLE-SHOOTING PROCEDURE E

1. Is code number unavailable for use?
   - N.G. → Faulty control unit
   - O.K. ↓
2. Enter fixed number and code number again to see if registration sound is heard.
   - N.G. → Faulty control unit
   - O.K. ↓

No trouble

Trouble-shooting (Cont'd)

CUSTOMER COMPLAINT	
F	Driver's door does not unlock when code number is entered.

TROUBLE-SHOOTING PROCEDURE F

Connect terminals [6] and [10] to see if driver's door unlocks. ..... Check 4 (4-3)

N.G. → Faulty driver's door lock actuator, faulty unlock relay, faulty harness, improper connector connection.

O.K. ↓

Replace control unit.

CUSTOMER COMPLAINT	
G	Driver's door unlocks when code number is entered, but the other doors do not unlock even when keypad  is pressed within six seconds.

TROUBLE-SHOOTING PROCEDURE G

Connect terminals [16] and [10] to see if all doors except driver's unlock. ..... Check 4 (4-4)

N.G. → Faulty door except driver's actuator, faulty unlock relay, faulty harness, improper connector connection

O.K. ↓

Replace control unit.

Trouble-shooting (Cont'd)

CUSTOMER COMPLAINT	
H	Driver's door unlocks when code number is entered, but trunk lid does not open even when keyboard TRK (1 2) is pressed within six seconds, (Sedan).

TROUBLE-SHOOTING PROCEDURE H

Connect terminals [8] and [10] to see if trunk lid opens (Sedan)/back door unlocks (Wagon). ..... Check 4 (4-5)

- N.G. → Faulty trunk opener relay, faulty trunk opener solenoid, faulty harness, improper connector connection, faulty back door unlock relay-1, open circuit breaker, burned fusible link, burned fuse.
- O.K. → Replace control unit.

CUSTOMER COMPLAINT	
J	Doors do not lock when keypad LCK (9 0) is pressed.

TROUBLE-SHOOTING PROCEDURE J

1. Connect terminals [7] and [10] to see if all doors lock. ..... Check 4 (4-6)
   - N.G. → Faulty lock relay, faulty harness, improper connector connection, faulty door lock timer.
   - O.K. ↓
2. Is door lock indicator switch circuit normal?
   Check for continuity between terminals [11] and [10] ..... Check 5
   ..... Check 5
   - N.G. → Faulty door lock actuator, faulty harness improper connector connection.
   - O.K. ↓

Replace control unit.

CUSTOMER COMPLAINT	
K	Door left ajar locks when keypad [LCK / 9 0] is pressed.

TROUBLE-SHOOTING PROCEDURE K

< At least one of doors opens. >

Is door switch circuit normal?
Measure voltage across terminals [12] and [10]. ..... Check 6

- N.G. → Faulty door switch, faulty harness, improper connector connection, faulty step lamp relay.
- O.K. → Replace control unit.

CUSTOMER COMPLAINT	
L	Door locks if keypad [LCK / 9 0] is pressed when key is inserted in steering lock.

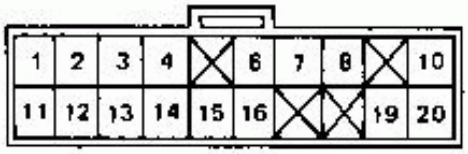
TROUBLE-SHOOTING PROCEDURE L

< Key is inserted in steering lock. >

Is key reminder indicator switch normal?
Check if 12 V exists across terminals [13] and [10]. ..... Check 2 (2-4)

- N.G. → Faulty key reminder indicator switch, faulty harness, improper connector connection.
- O.K. → Replace control unit.

Terminal Check



Terminal arrangement of connector for digital touch entry control unit (View from harness side)

Check table of connector terminals for digital touch entry control unit. (Check disconnecting connector at control unit.)

Terminal	Function	From	Normal operation	If N.G., check
1 2 3 4	Key pad signal	Keyboard (On the driver's door)	When each key pad is pressed, continuity should come between specific terminals and [19]. (Refer to "Check 3" in the "Terminal Check".)	Keyboard, Harness
6	Driver's door unlocking signal	Fusible link (Through fuse, external power relay and driver's door unlock relay)	Ground [6], driver's door should be unlocked.	Fusible link, Fuse, External power relay, Driver's door unlock relay, Harness
7	All doors locking signal	Fusible link (Through fuse, external power relay and driver's door lock relay)	Ground [7], all doors should be locked.	Fusible link, Fuse, External power relay, Driver's door lock relay, Harness
8	Trunk lid opening signal (Coupe)	Fusible link (Through fuse and trunk opener relay)	Ground [8], trunk lid should be opened.	Fusible link, Fuse, trunk opener relay
10	System ground	Body ground	Continuity should exist between [10] and body ground.	Body ground terminal, Harness
11	Door unlock sensor signal	Driver's door unlock sensor	No continuity between [11] and [10] when driver's door is locked. Continuity exists between [11] and [10] when driver's door is unlocked.	Driver's door unlock sensor, Harness

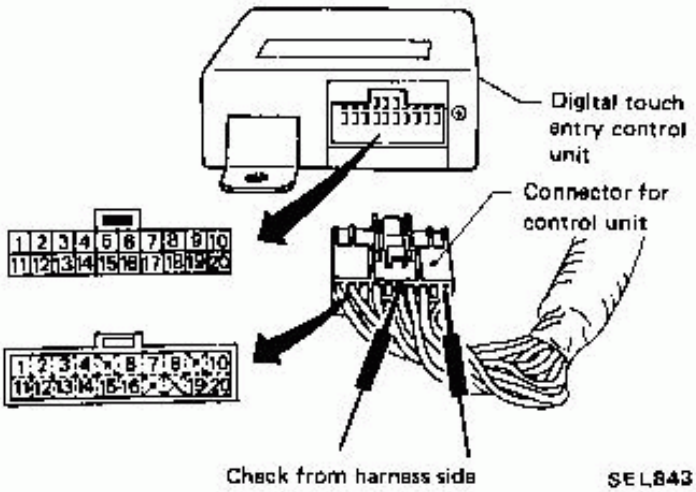
Terminal Check (Cont'd)

Terminal	Function	From	Normal operation	If N.G., check
12	Door switch trigger	Fusible link (Through fuse, extended storage switch and door switches)	Battery voltage should come between [12] and [10] when driver's and passenger's doors are closed. Zero voltage between [12] and [10] when at least one door is open.	Fusible link, Fuse, Extended storage switch, Door switch Harness
13	Key is in ignition or not.	Fusible link (Through fuse, extended storage switch and key switch)	Battery voltage should come between [13] and [10] when key is inserted in key cylinder. Zero voltage between [13] and [10] when key is drawn from key cylinder.	Fusible link, Fuse, Extended storage switch, Key switch, Harness
14	Beeper sounding	Fusible link (Through fuse, external power relay and beeper)	Ground [4], beeper should sound.	Fusible link, Fuse, External power relay, Beeper, Harness
15	Keyboard illumination	Fusible link (Through fuse, external power relay and keyboard illumination)	Ground [15], key illumination should come.	Fusible link, Fuse, External power relay, Keyboard illumination, Harness
16	Passenger's door unlock signal	Fusible link (Through fuse and passenger's door unlock relay)	Ground [16], passenger's door should be unlocked.	Fusible link, Fuse Passenger's door unlock relay, Harness
19	Key pad signal	Keyboard (On the driver's door)	When each key pad is pressed, continuity should come between specific terminals of [1], [2], [3], [4] and [19]. (Refer to "Check 3" in the "Terminal Check".)	Keyboard, Harness
20	System source	Fusible link (Through fuse and external power relay)	Battery voltage should not come between [20] and [10].	Fusible link, Fuse, External power relay, Harness

Terminal Check (Cont'd)

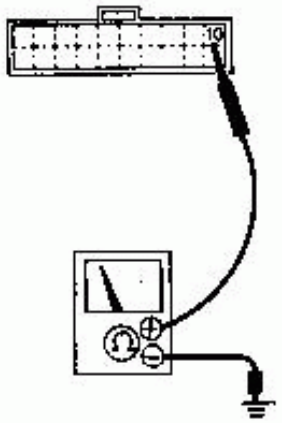
Preparation and terminal arrangement for check

- Disconnect body harness connector at digital touch entry control unit.



SEL843F

CHECK 1 . . . Ground circuit check

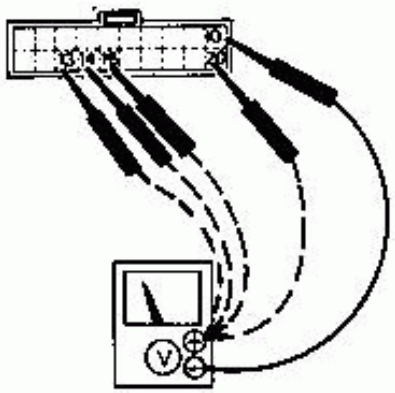


1. Disconnect connector at control unit.
2. Check for continuity between terminal [10] and body ground.

Continuity exists ... O.K.

SEL844F

CHECK 2 . . . Power source signal check



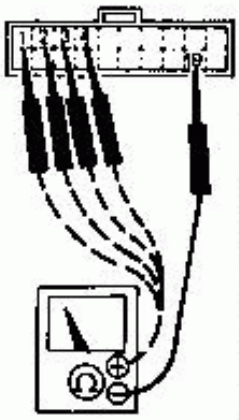
1. Disconnect connector at control unit.
2. Measure voltage across terminals [13], [14], [15], [20] and [10].

Voltmeter terminals (+)	Voltmeter terminals (−)	Voltage	Check number
20	10	Approx. 12	2-1
15		Approx. 6	2-2
14		Approx. 12	2-3
13		Approx. 12 or 0	2-4*A

* A Key is inserted in key cylinder ... 12V
  Key is drawn from key cylinder ... 0V

SEL845F

CHECK 3 . . . Keypad signal check



1. Disconnect connector at control unit.
2. Push each keypad and check for continuity.

Pushed keypad	One terminal	Other terminals 1	2	3	4
1 2 3	19	○	–	–	○
4 5 6		–	○	–	○
7 8 9		–	–	○	○
* 0 #		○	○	–	–
CLEAR		–	○	○	–
ENTER		○	–	○	–

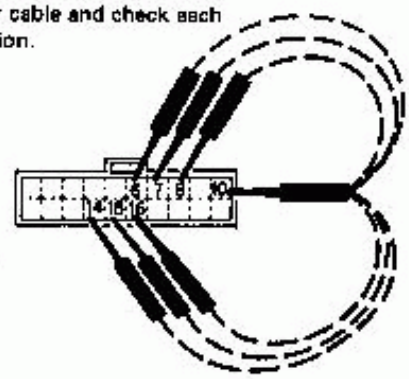
○ Continuity exists.
– No continuity

SEL846F

Terminal Check (Cont'd)

CHECK 4 . . . Operating circuit check

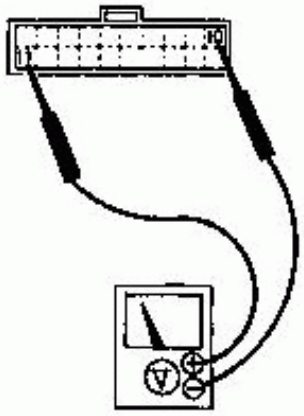
1. Disconnect connector at control unit.
2. Connect terminals with jumper cable and check each operation.



Terminal		Operation	Check number
One	Other		
15	10	Keyboard illumination comes on.	4-1
14		Electronic buzzer sounds.	4-2
6		Driver's door is unlocked.	4-3
16		Passenger's door is unlocked	4-4
8		Trunk lid is opened (Coupe).	4-5
7		All doors are locked.	4-6

SEL847F

CHECK 5 . . . Door unlock sensor signal check

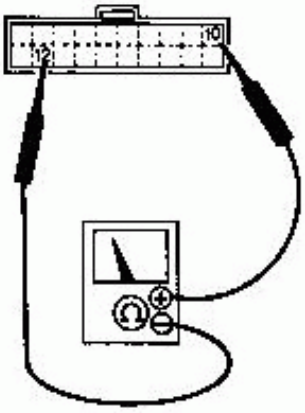


1. Disconnect connector at control unit.
2. Check for continuity between terminals [11] and [10].

Driver's door is locked. ... No continuity
Driver's door is unlocked. ... Continuity exists
... O.K.

SEL848F

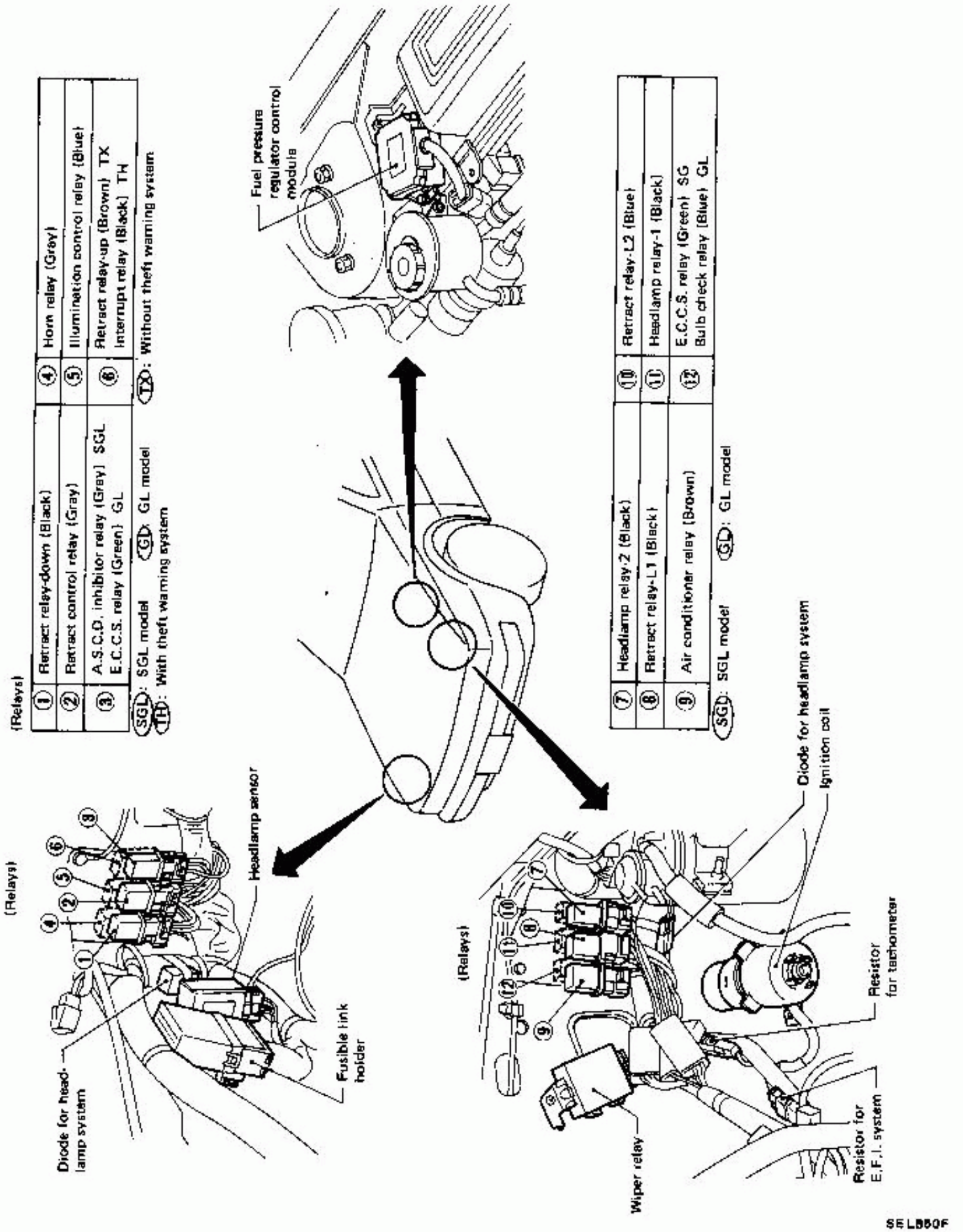
CHECK 6 . . . Door switch trigger check

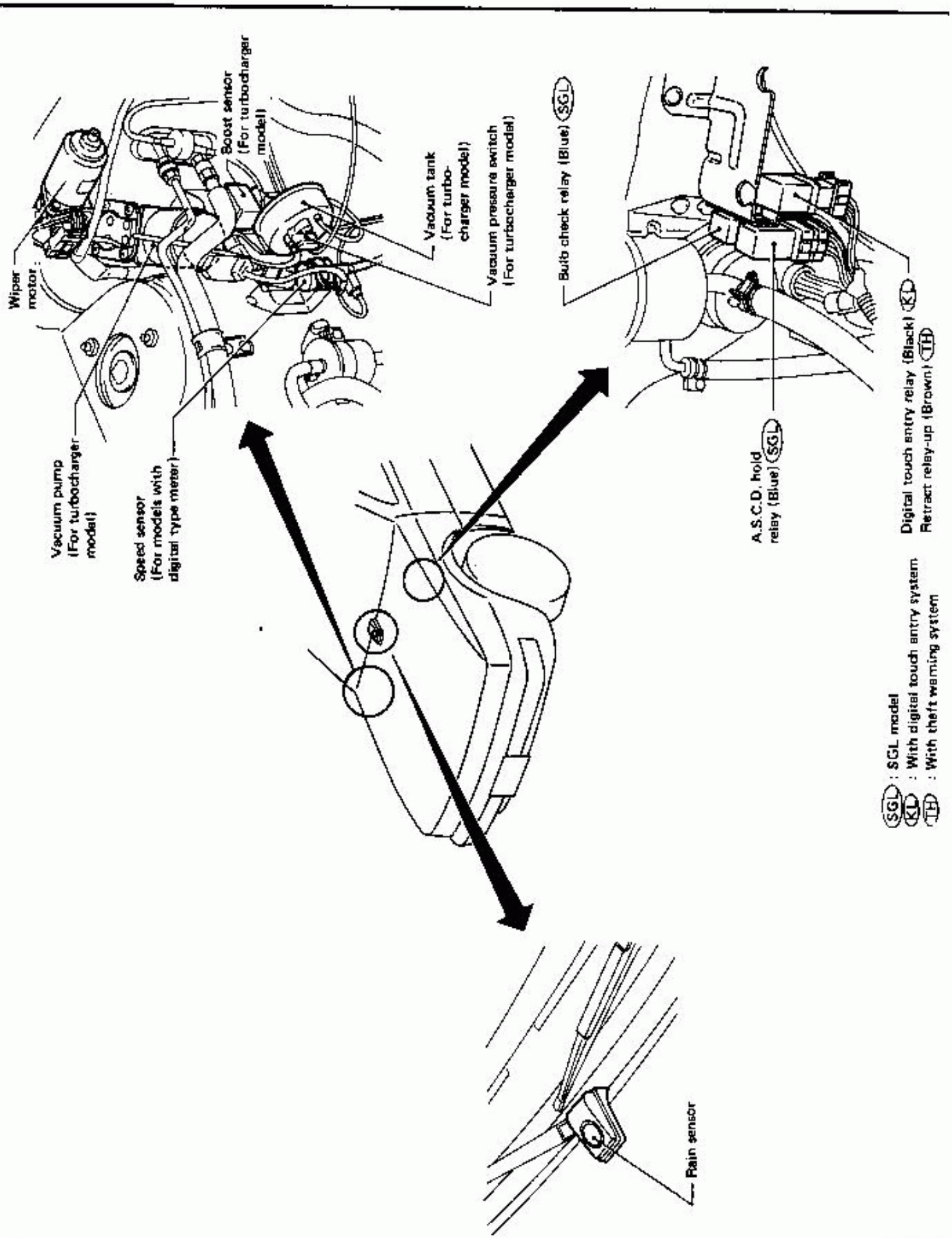


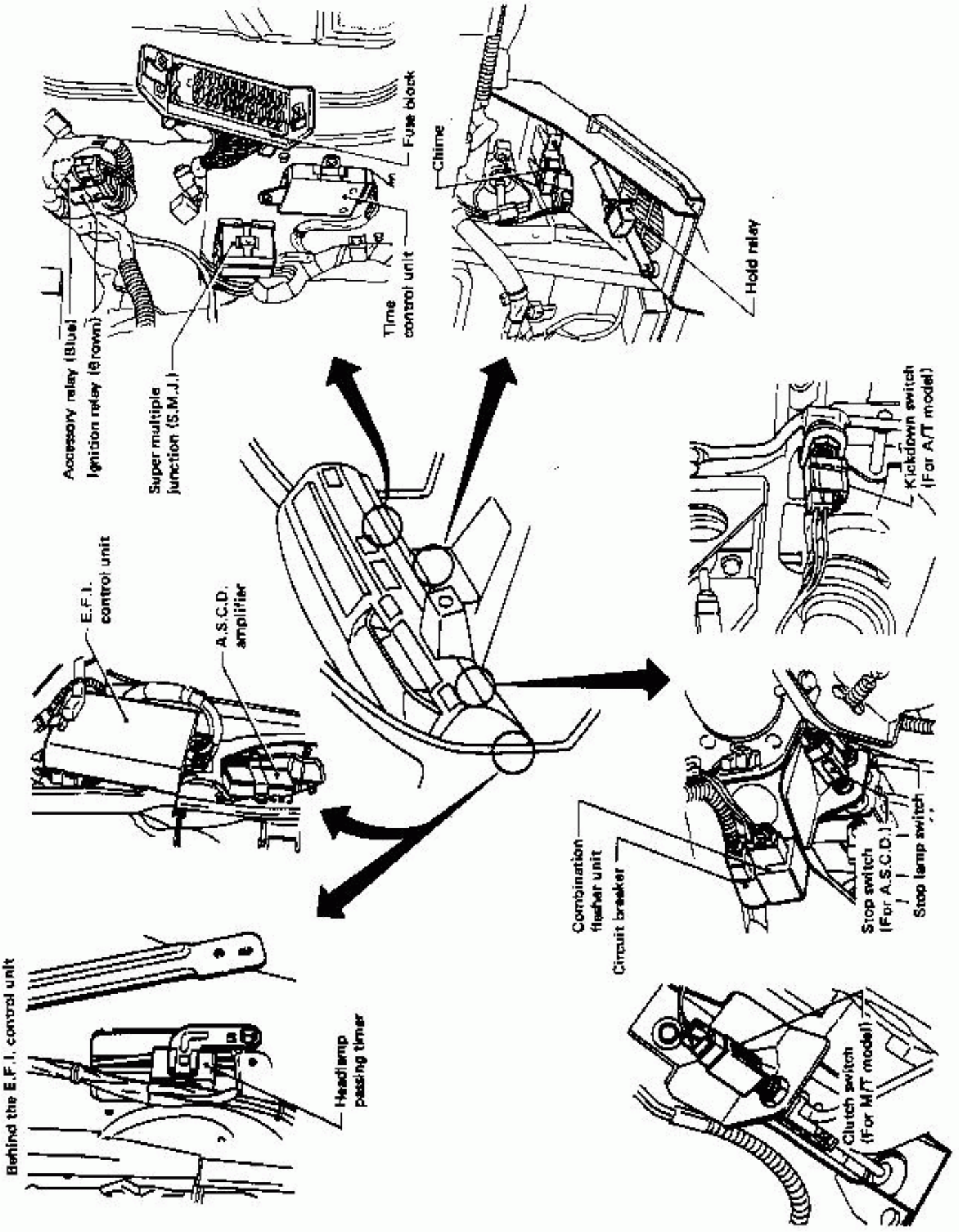
1. Disconnect connector at control unit.
2. Measure voltage across terminals [12] and [10].

Driver's and passenger's doors closed. ... 12V
At least one door is open. ... 0V
... O.K.

SEL849F

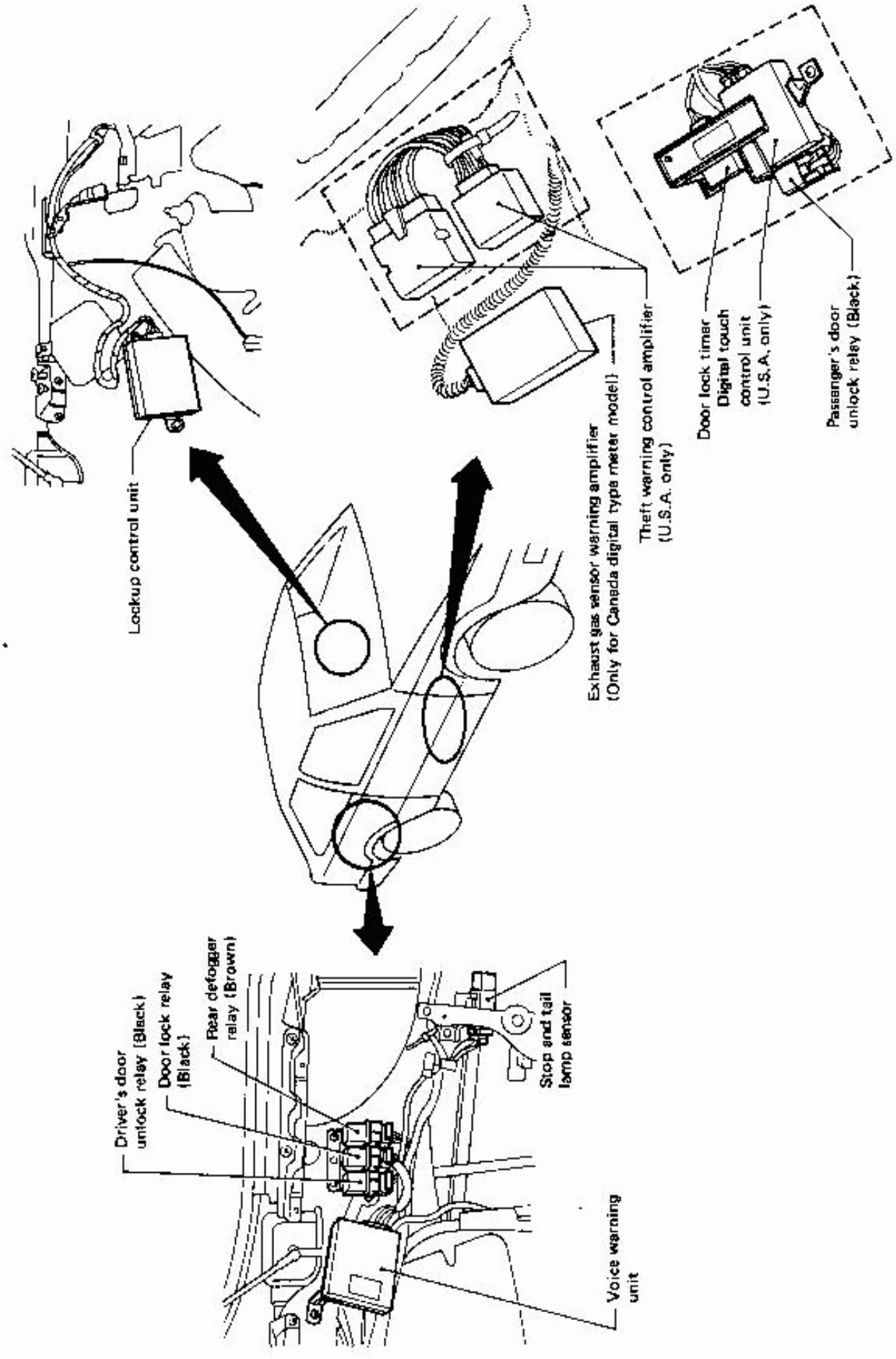

(Relays)
① Retract relay-down (Black)
② Retract control relay (Gray)
③ A.S.C.D. inhibitor relay (Gray) SGL
E.C.C.S. relay (Green) GL
④ Horn relay (Gray)
⑤ Illumination control relay (Blue)
⑥ Retract relay-up (Brown) TX
Interrupt relay (Black) TH
SGL: SGL model GL: GL model
TH: With theft warning system
TX: Without theft warning system
Fuel pressure regulator control module
(Relays)
⑦ Headlamp relay-2 (Black)
⑧ Retract relay-L1 (Black)
⑨ Air conditioner relay (Brown)
⑩ Retract relay-L2 (Blue)
⑪ Headlamp relay-1 (Black)
⑫ E.C.C.S. relay (Green) SG
Bulb check relay (Blue) GL
SGL: SGL model GL: GL model
(Relays)
Headlamp sensor
Diode for head-lamp system
Fusible link holder
(Relays)
Diode for headlamp system
Ignition coil
Resistor for tachometer
Wiper relay
Resistor for E.F.I. system
SELB50F


Wiper motor
Boost sensor (For turbocharger model)
Vacuum tank (For turbo-charger model)
Vacuum pressure switch (For turbocharger model)
Vacuum pump (For turbocharger model)
Speed sensor (For models with digital type meter)
Bulb check relay (Blue) (SGL)
A.S.C.D. hold relay (Blue) (SGL)
Digital touch entry relay (Black) (KL)
Retract relay-up (Brown) (TH)
Rain sensor
(SGL) : SGL model
(KL) : With digital touch entry system
(TH) : With theft warning system
SEL851F


Accessory relay (Blue)
Ignition relay (Brown)
Super multiple junction (S.M.J.)
Fuse block
Time control unit
Chime
Hold relay
Kickdown switch (For A/T model)
E.F.I. control unit
A.S.C.D. amplifier
Combination flasher unit
Circuit breaker
Stop switch (For A.S.C.D.)
Stop lamp switch
Clutch switch (For M/T model)
Behind the E.F.I. control unit
Headlamp passing timer

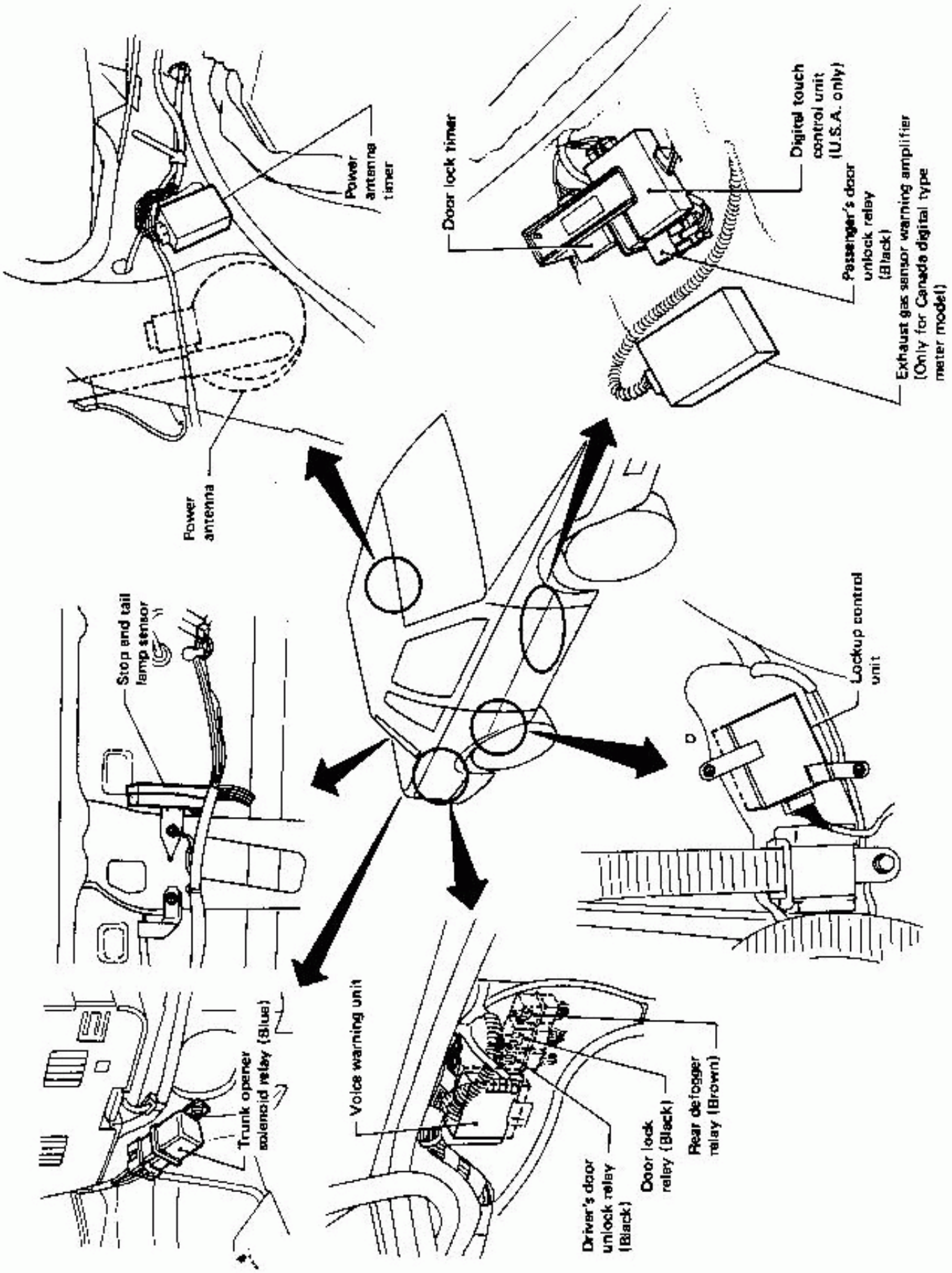
SEL285E

LOCATION OF ELECTRICAL UNITS



SEL852F

LOCATION OF ELECTRICAL UNITS

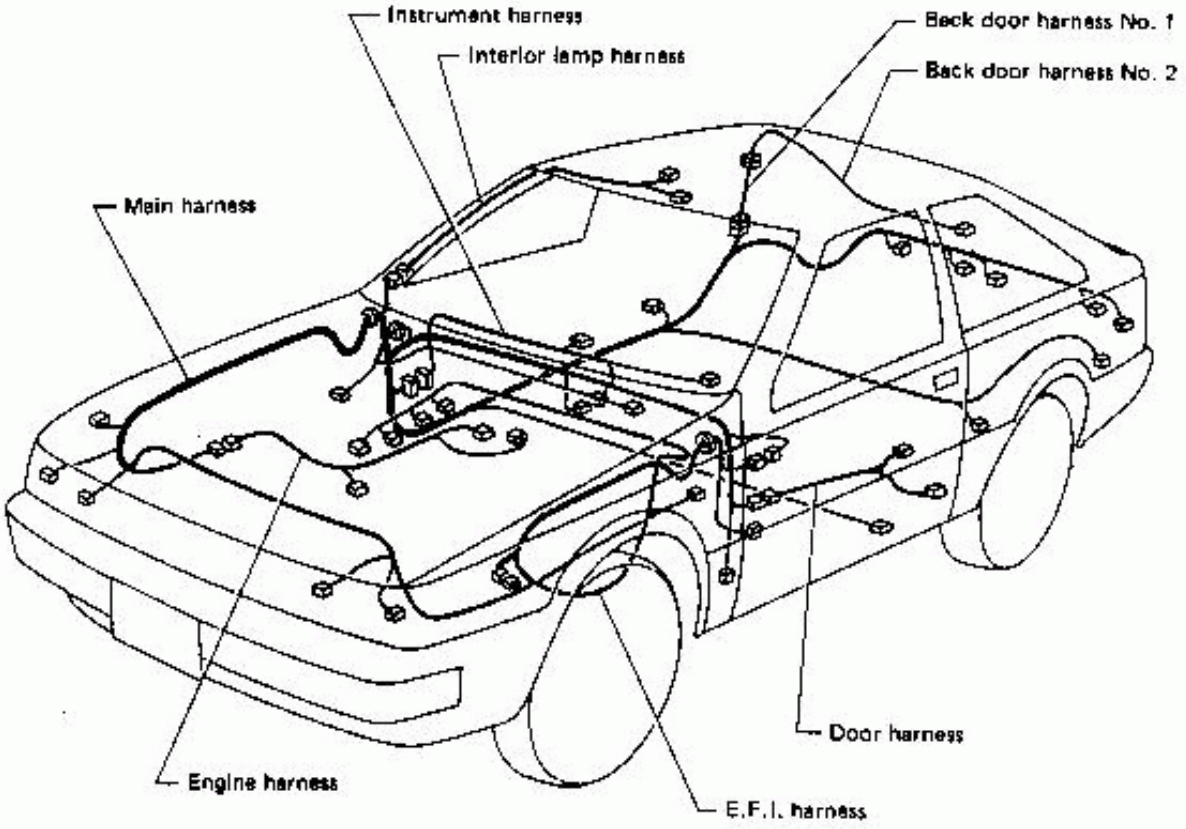


SEL853F

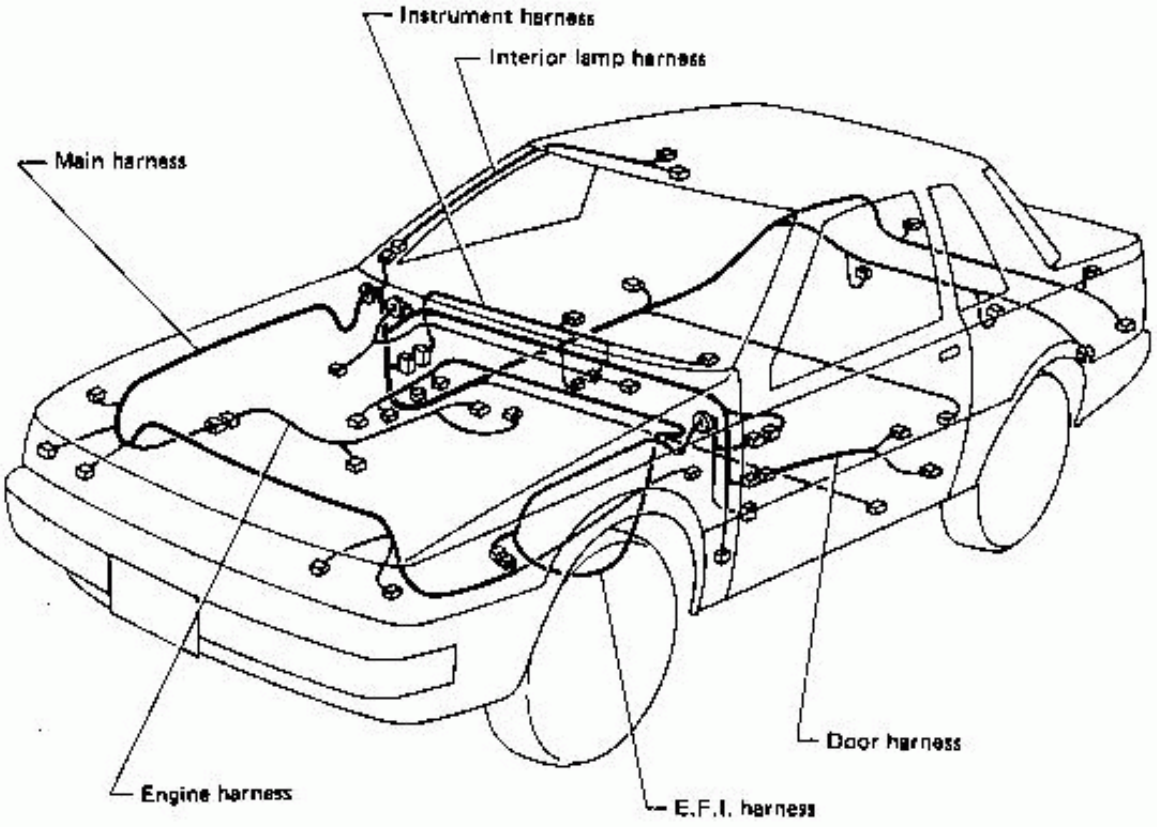
HARNESS LAYOUT

Outline

HATCHBACK

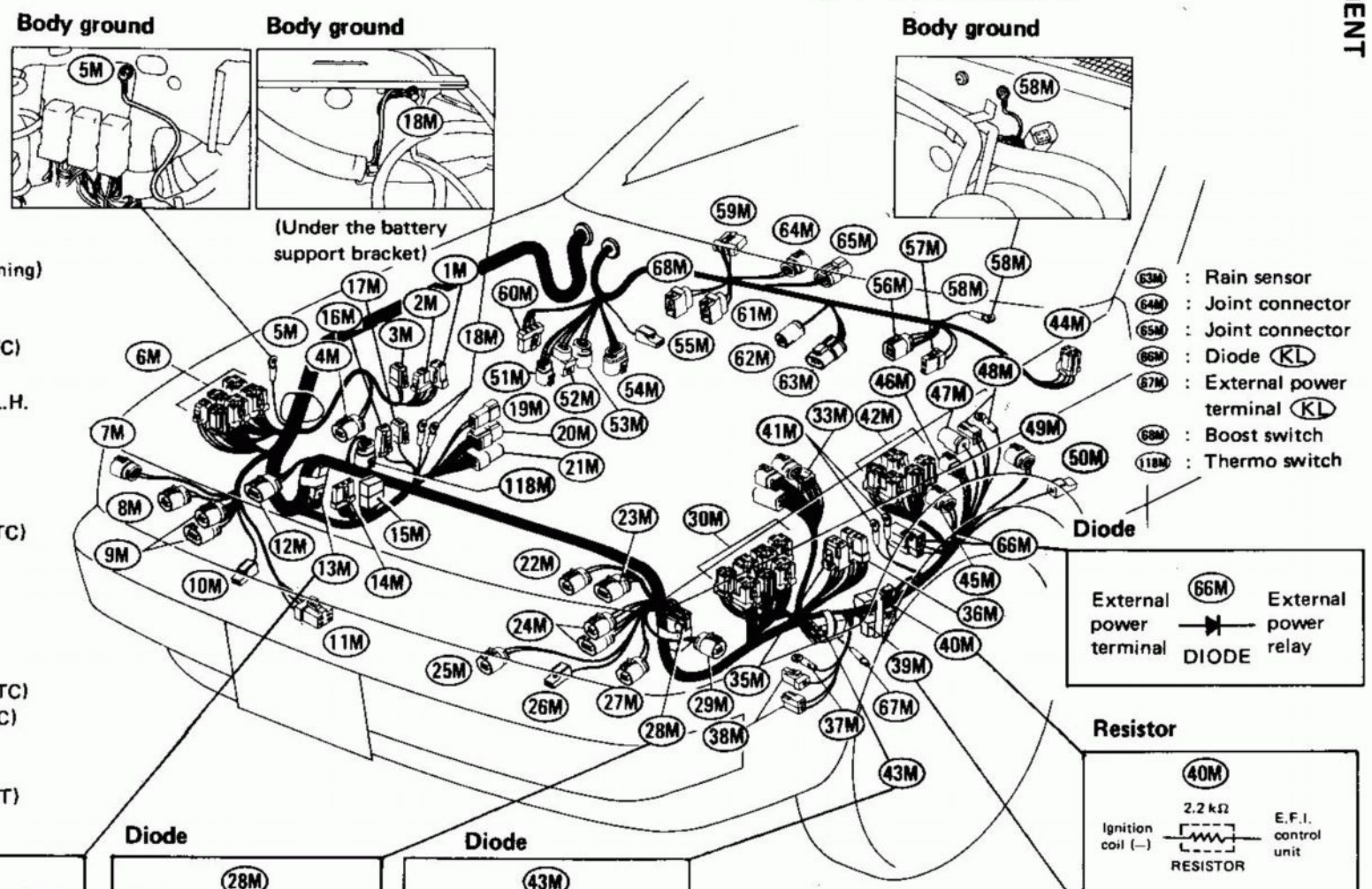


COUPE



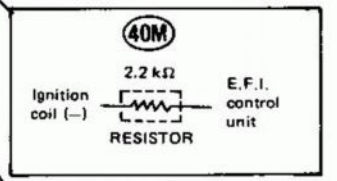
SEL289E

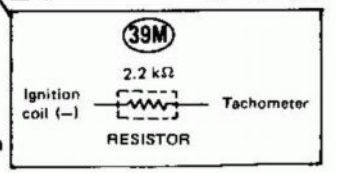
1M : Windshield washer sensor
2M : Back door window washer motor
3M : Windshiled washer motor
4M : Radiator coolant level switch
5M : Body ground
6M : Relays on bracket (Refer to page EL-190)
7M : Clearance lamp R.H.
8M : Front turn signal lamp R.H.
9M : Headlamp motor R.H.
10M : Horn R.H.
11M : Fan motor
12M : Headlamp R.H.
13M : Diode
14M : Headlamp sensor
15M : Fusible link holder
16M : Battery
17M : Fusible link
18M : Body ground
19M : To 1E engine harness
20M : To 2E engine harness
21M : To 3E engine harness
22M : Hood switch (Theft warning)
23M : Headlamp L.H.
24M : Headlamp motor L.H.
25M : Low pressure switch (A/C)
26M : Horn L.H.
27M : Front turn signal lamp L.H.
28M : Diode
29M : Clearance lamp L.H.
30M : Relays on bracket (Refer to page EL-190)
31M : To 9G E.F.I. harness (TC)
32M : To 7G E.F.I. harness
33M : To 22G E.F.I. harness
34M : To 8G E.F.I. harness
35M : Radio condenser
36M : Windshield wiper relay
37M : Ignition coil (Ground) (TC)
38M : Ignition coil (Intake) (TC)
39M : Resistor
40M : Resistor
41M : Ignition coil (Intake) (NT)
42M : Relays on bracket (Refer to page EL-191.)
43M : Diode (CA18ET)
44M : Fan motor relay
45M : Power steering pump switch
46M : Distributor
47M : Magnet clutch
48M : Ignition coil (Exhaust) (TC)
49M : Ignition coil (Exhaust) (NT)
50M : Condenser ground
51M : Boost sensor (TC)
52M : Vacuum pump (TC)
53M : Vacuum tank (TC)
54M : Speed sensor (DM)
55M : Accelerate cut switch (A/C)
56M : A.S.C.D. actuator
57M : Brake level switch
58M : Body ground
59M : Wiper motor
60M : Fan motor timer
61M : Boost switch (TC)
62M : To 24G E.F.I. harness
63M : Rain sensor
64M : Joint connector
65M : Joint connector
66M : Diode (KL)
67M : External power terminal (KL)
68M : Boost switch
118M : Thermo switch



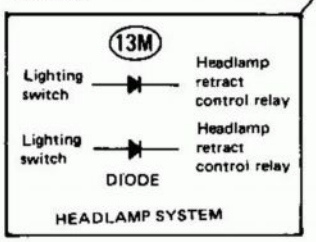
Diode

Resistor

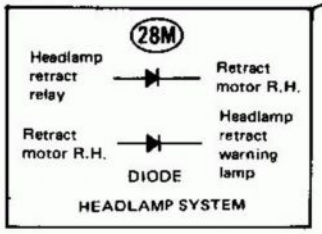




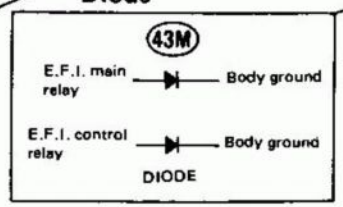
Diode



Diode



Diode



TC : Turbocharger models
NT : Non-turbocharger models
A/C : Air conditioner
DM : Digital type meter models
KL : With digital touch entry system

SEL727G

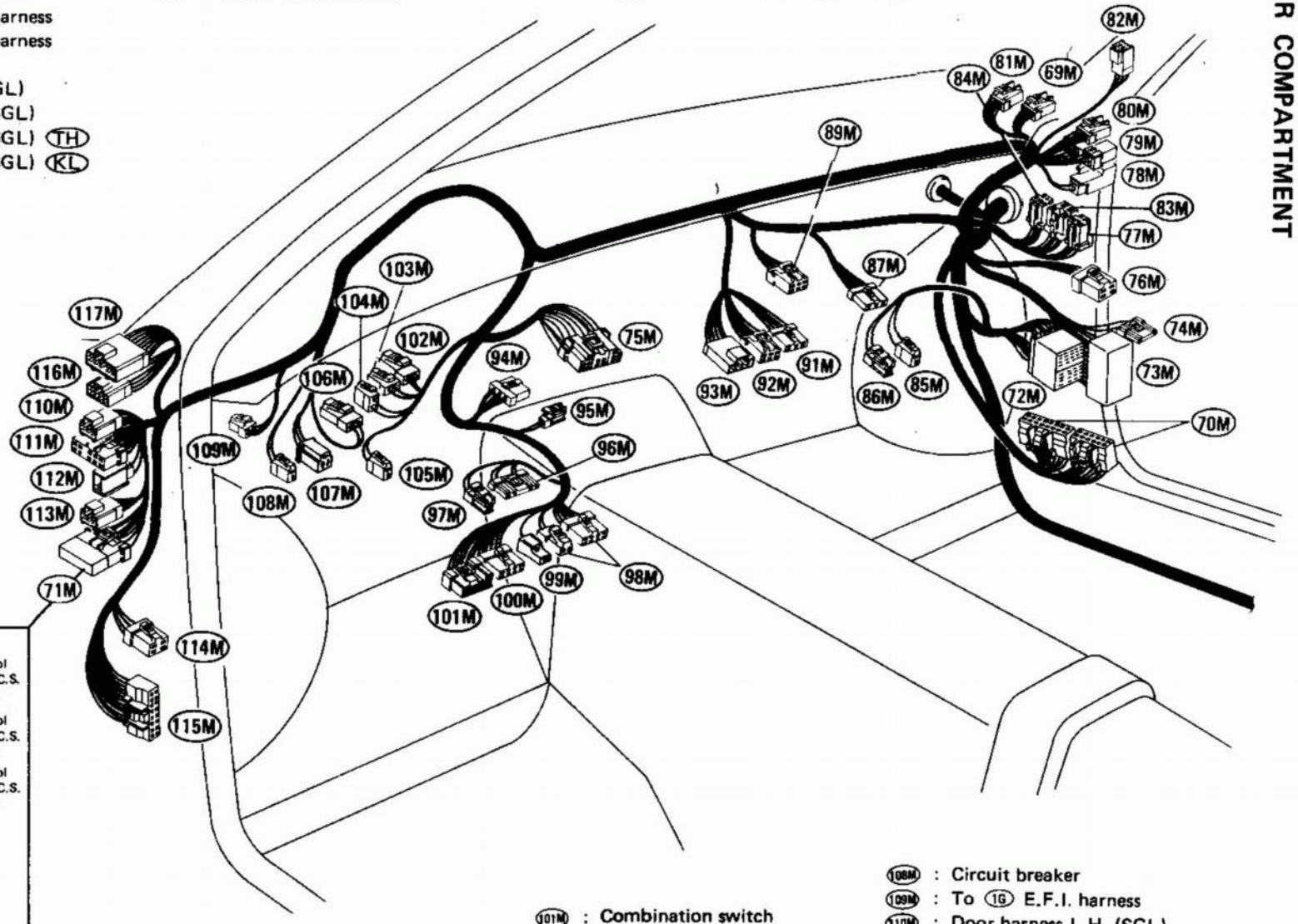
HARNESS LAYOUT

Main Harness (Cont'd)

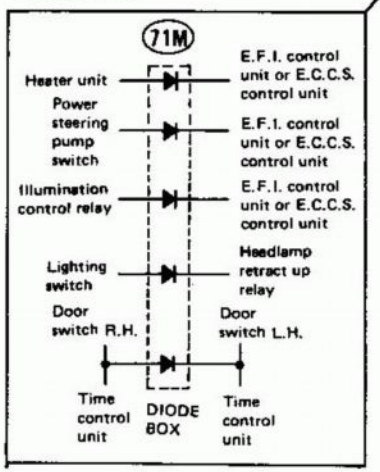
(69M) : Door harness R.H. (SGL) (KL)
(70M) : Time control unit
(71M) : Diode box
(72M) : To (11) instrument harness
(73M) : Fuse block
(74M) : Extended storage switch
(75M) : To (21) instrument harness
(76M) : To (31) instrument harness
(77M) : Accessary relay
(78M) : Door harness R.H. (GL)
(79M) : Door harness R.H. (SGL)
(80M) : Door harness R.H. (SGL) (TH)
(81M) : Door harness R.H. (SGL) (KL)
(82M) : Room lamp harness
(83M) : Ignition relay (SGL)
(84M) : Ignition relay (GL)
(85M) : Blower motor
(86M) : Foot lamp R.H.
(87M) : Resistor (Heater & air conditioner)

(89M) : Thermo switch
(91M) : Heater unit
(92M) : Air conditioner unit
(93M) : Heater unit
(94M) : Ignition switch
(95M) : Steering lock switch

(SGL) : SGL models
(GL) : GL models
(TH) : With theft warning system
(KL) : With digital touch entry system
(NT) : Non-turbocharger models



Diode box



(96M) : Combination switch (Hazard)
(97M) : Combination switch (Hazard)
(98M) : Combination switch (Wiper)
(99M) : Combination switch (Horn)
(100M) : Combination switch (A.S.C.D. and Light)

(101M) : Combination switch (Light and Turn)
(102M) : Stop switch (A.S.C.D.)
(103M) : Stop lamp switch
(104M) : Kickdown switch (NT)
(105M) : Foot lamp L.H.
(106M) : Clutch switch (A.S.C.D.)
(107M) : Flasher unit

(108M) : Circuit breaker
(109M) : To (16) E.F.I. harness
(110M) : Door harness L.H. (SGL)
(111M) : Door harness L.H. (TH)
(112M) : Door harenss L.H. (GL)
(113M) : Door harness L.H. (SGL)
(114M) : Headlamp passing timer
(115M) : A.S.C.D. controller
(116M) : Door harness L.H. (SGL) (KL)
(117M) : Door harness L.H. (SGL) (KL)

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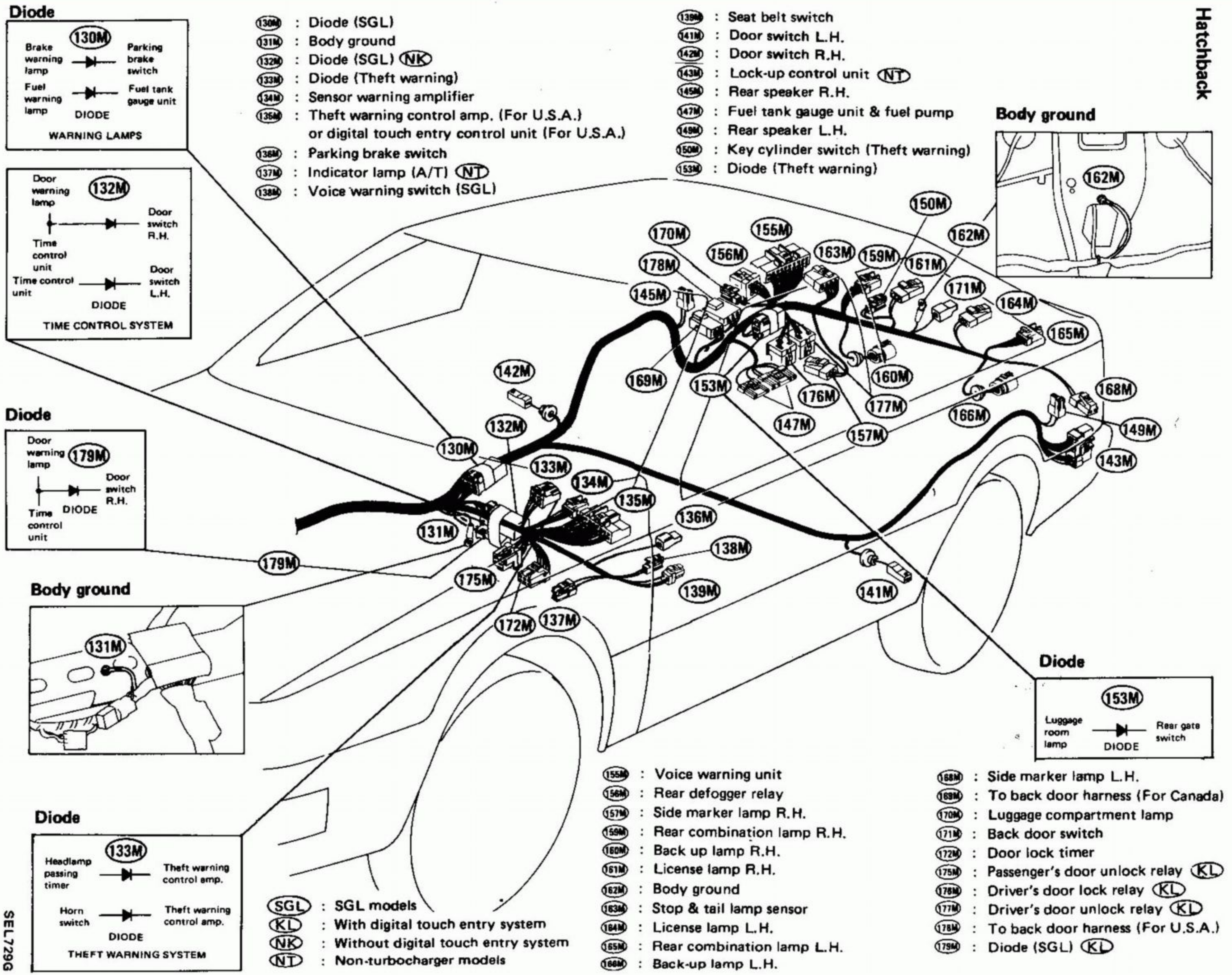
Hatchback

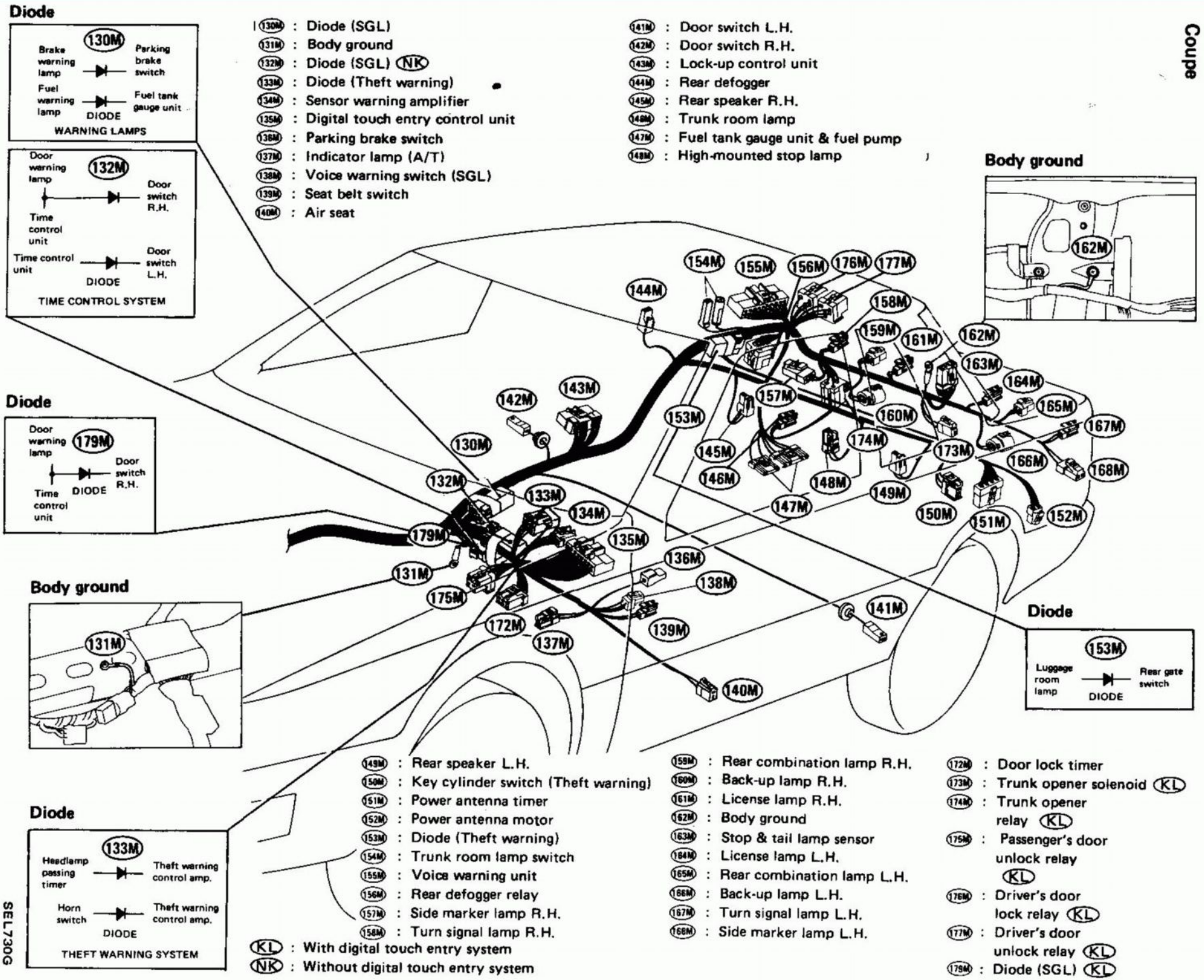
- 130M : Diode (SGL)
- 131M : Body ground
- 132M : Diode (SGL) NK
- 133M : Diode (Theft warning)
- 134M : Sensor warning amplifier
- 135M : Theft warning control amp. (For U.S.A.) or digital touch entry control unit (For U.S.A.)
- 136M : Parking brake switch
- 137M : Indicator lamp (A/T) NT
- 138M : Voice warning switch (SGL)
- 139M : Seat belt switch
- 141M : Door switch L.H.
- 142M : Door switch R.H.
- 143M : Lock-up control unit NT
- 145M : Rear speaker R.H.
- 147M : Fuel tank gauge unit & fuel pump
- 149M : Rear speaker L.H.
- 150M : Key cylinder switch (Theft warning)
- 153M : Diode (Theft warning)



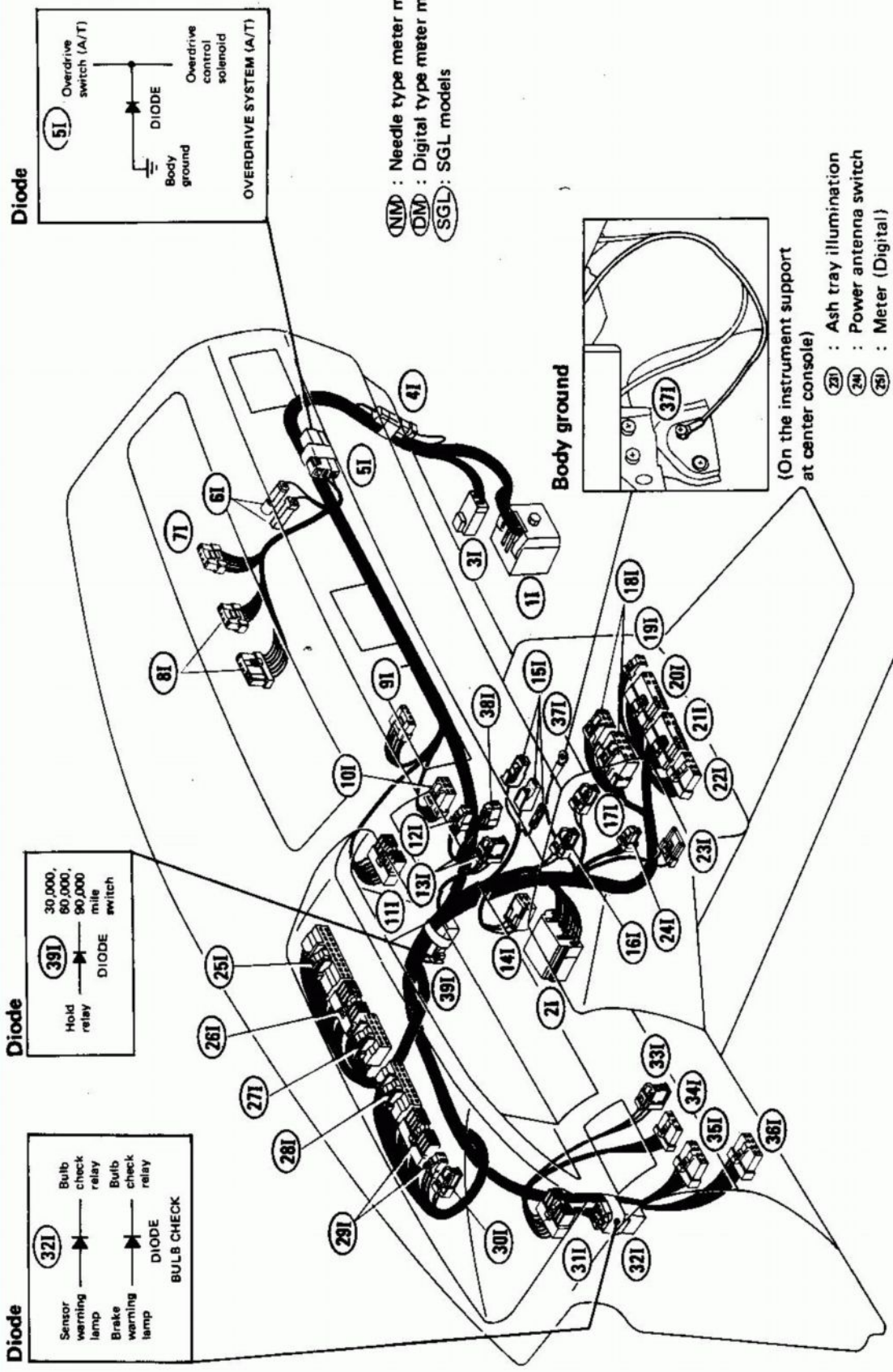
- 155M : Voice warning unit
- 156M : Rear defogger relay
- 157M : Side marker lamp R.H.
- 159M : Rear combination lamp R.H.
- 160M : Back up lamp R.H.
- 161M : License lamp R.H.
- 162M : Body ground
- 163M : Stop & tail lamp sensor
- 164M : License lamp L.H.
- 165M : Rear combination lamp L.H.
- 166M : Back-up lamp L.H.
- 168M : Side marker lamp L.H.
- 169M : To back door harness (For Canada)
- 170M : Luggage compartment lamp
- 171M : Back door switch
- 172M : Door lock timer
- 175M : Passenger's door unlock relay KL
- 176M : Driver's door lock relay KL
- 177M : Driver's door unlock relay KL
- 178M : To back door harness (For U.S.A.)
- 179M : Diode (SGL) KL

- SGL : SGL models
- KL : With digital touch entry system
- NK : Without digital touch entry system
- NT : Non-turbocharger models

SEL729G


Diode
130M
Brake warning lamp
Parking brake switch
Fuel warning lamp
Fuel tank gauge unit
DIODE
WARNING LAMPS
Door warning lamp
132M
Door switch R.H.
Time control unit
Time control unit
Door switch L.H.
DIODE
TIME CONTROL SYSTEM
Diode
Door warning lamp
179M
Door switch R.H.
Time control unit
DIODE
Body ground
131M
Diode
133M
Headlamp passing timer
Theft warning control amp.
Horn switch
Theft warning control amp.
DIODE
THEFT WARNING SYSTEM
130M : Diode (SGL)
131M : Body ground
132M : Diode (SGL) (NK)
133M : Diode (Theft warning)
134M : Sensor warning amplifier
135M : Digital touch entry control unit
136M : Parking brake switch
137M : Indicator lamp (A/T)
138M : Voice warning switch (SGL)
139M : Seat belt switch
140M : Air seat
141M : Door switch L.H.
142M : Door switch R.H.
143M : Lock-up control unit
144M : Rear defogger
145M : Rear speaker R.H.
146M : Trunk room lamp
147M : Fuel tank gauge unit & fuel pump
148M : High-mounted stop lamp
Body ground
162M
Diode
153M
Luggage room lamp
Rear gate switch
DIODE
149M : Rear speaker L.H.
150M : Key cylinder switch (Theft warning)
151M : Power antenna timer
152M : Power antenna motor
153M : Diode (Theft warning)
154M : Trunk room lamp switch
155M : Voice warning unit
156M : Rear defogger relay
157M : Side marker lamp R.H.
158M : Turn signal lamp R.H.
159M : Rear combination lamp R.H.
160M : Back-up lamp R.H.
161M : License lamp R.H.
162M : Body ground
163M : Stop & tail lamp sensor
164M : License lamp L.H.
165M : Rear combination lamp L.H.
166M : Back-up lamp L.H.
167M : Turn signal lamp L.H.
168M : Side marker lamp L.H.
172M : Door lock timer
173M : Trunk opener solenoid (KL)
174M : Trunk opener relay (KL)
175M : Passenger's door unlock relay (KL)
176M : Driver's door lock relay (KL)
177M : Driver's door unlock relay (KL)
179M : Diode (SGL) (KL)
(KL) : With digital touch entry system
(NK) : Without digital touch entry system

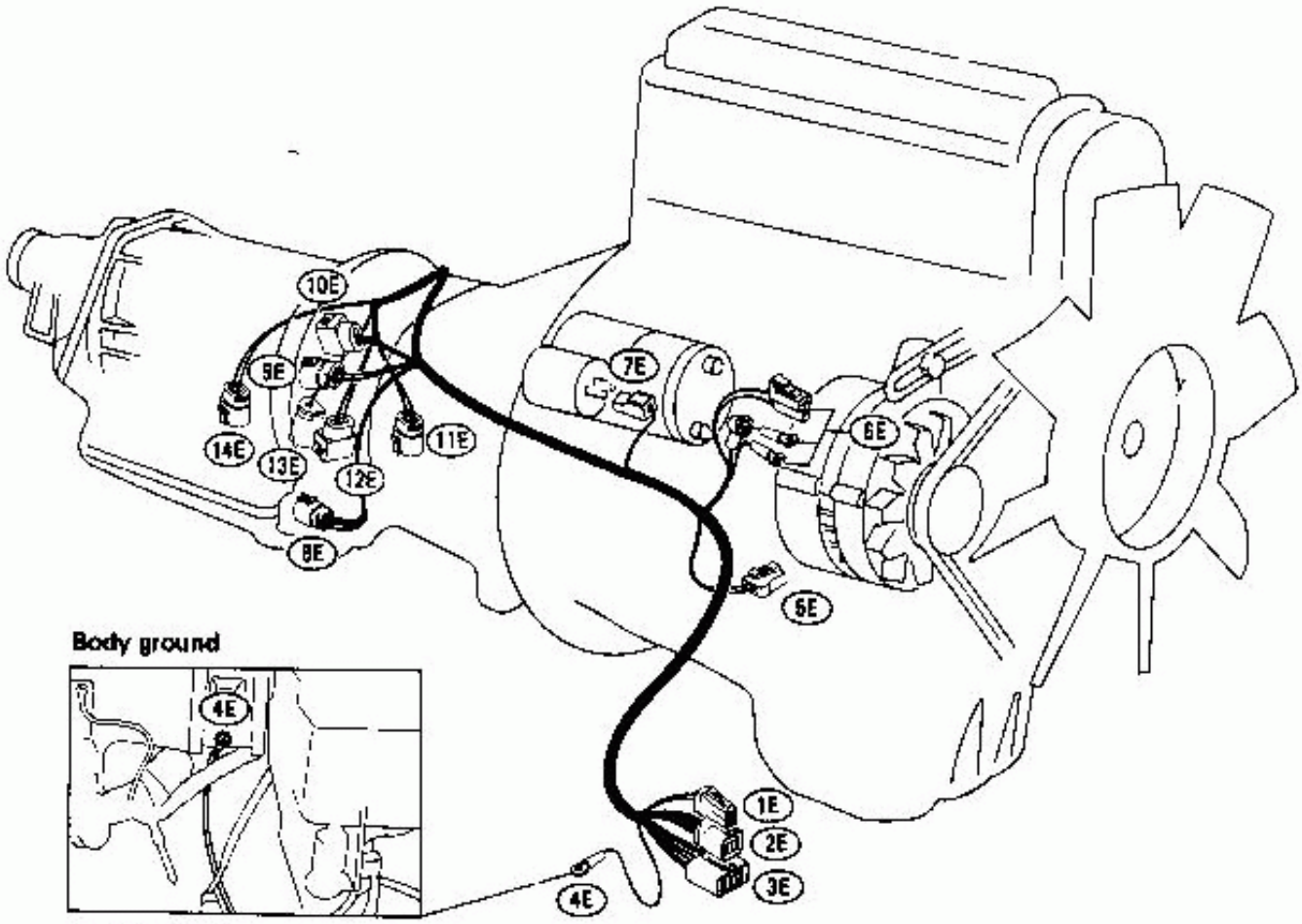
Instrument Harness



(11) : To (24) main harness
(21) : To (34) main harness
(31) : To (78) main harness
(41) : Check joint (U.S.A.)
(51) : Diode
(61) : Glove box lamp switch
(71) : Combination warning lamp (SGL)
(81) : Combination warning lamp
(91) : Clock
(101) : Rear defogger switch
(111) : Combination warning lamp
(121) : Rear wiper & washer switch
(131) : Over drive switch (A/T)
(141) : Hold relay
(151) : Cigarette lighter
(161) : Chime
(171) : Audio finisher illumination
(181) : Audio
(191) : *Deck (NM)
(201) : Not used
(211) : Main amplifier (DM)
(221) : Drive computer
(231) : Ash tray illumination
(241) : Power antenna switch
(251) : Meter (Digital)
(261) : Meter (Needle)
(271) : Meter (Digital)
(281) : Meter (Digital)
(291) : Meter (Needle)
(301) : Meter (Needle)
(311) : Combination warning lamp
(321) : Diode
(331) : Illumination control switch
(341) : Retract headlamp switch
(351) : Remote control mirror switch (SGL)
(361) : A.S.C.D. main switch (SGL)
(371) : Body ground (NM–SGL)
(381) : Trunk opener switch
(391) : Diode (Digital type meter model for U.S.A.)

SEL731G

Engine Harness



Body ground

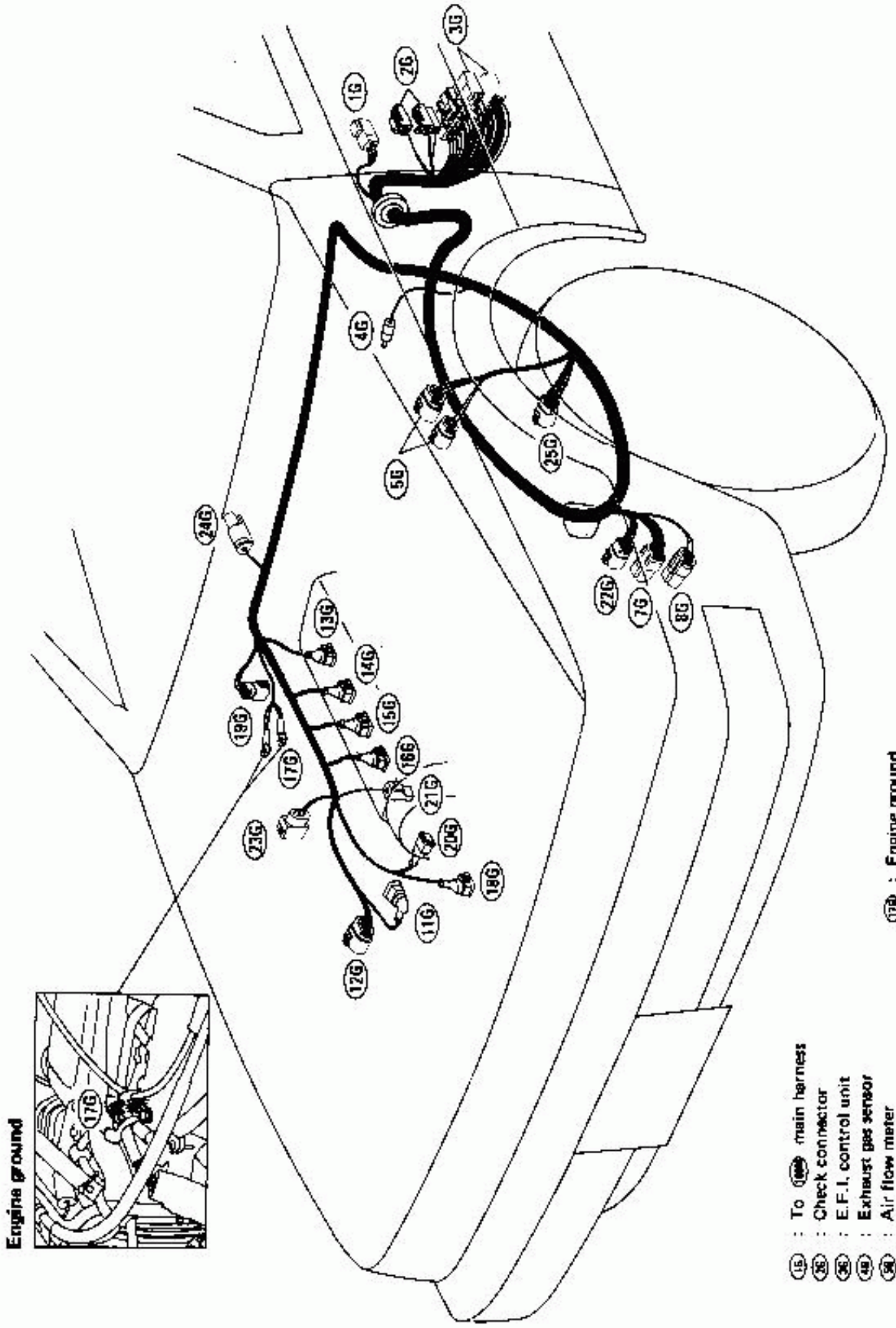
(On the washer fluid tank bracket)

- 1E : To 1M main harness
- 2E : To 2M main harness (A/T)
- 3E : To 21M main harness
- 4E : Body ground
- 5E : Oil pressure sending unit
- 6E : Alternator
- 7E : Starter motor
- 8E : Inhibitor switch (A/T)
- 9E : Back-up lamp switch (M/T)
- 10E : Top gear switch (M/T, turbo charger)
- 11E : Lock-up solenoid (A/T)
- 12E : Overdrive control solenoid (A/T), Overdrive gear switch (M/T, turbo charger)
- 13E : Overdrive indicator switch (A/T)
- 14E : Kickdown solenoid (A/T)

SEL295E

E.F.I. Harness

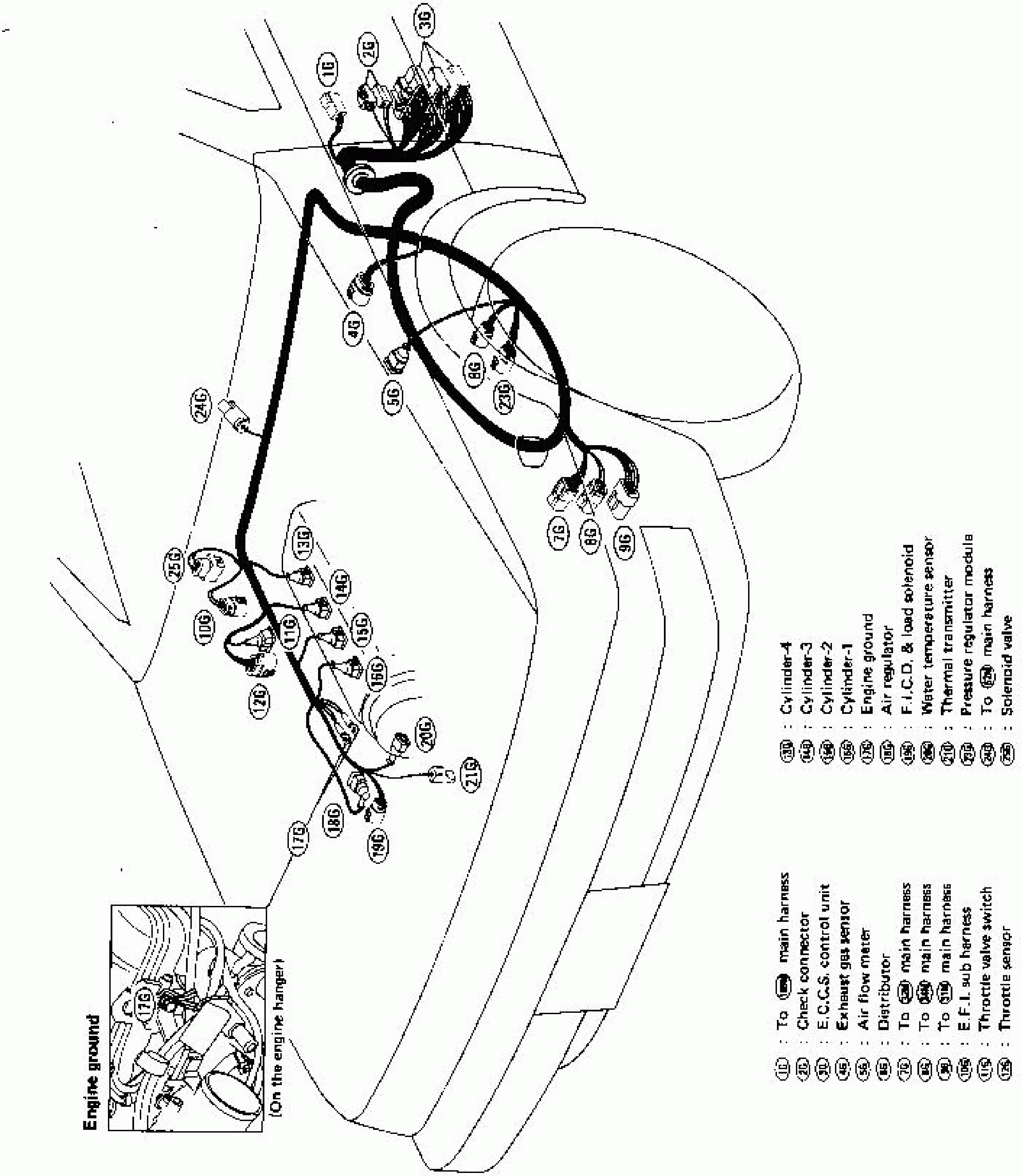
NON-TURBOCHARGER MODEL (CA20E engine model)



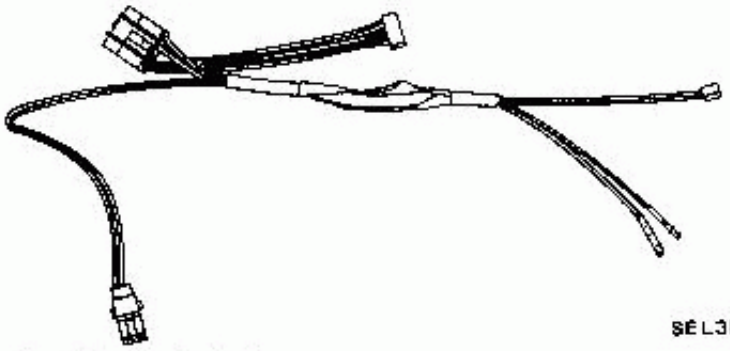
SEL732G

E.F.I. Harness (Cont'd)

TURBOCHARGER MODEL (CA18ET engine model)



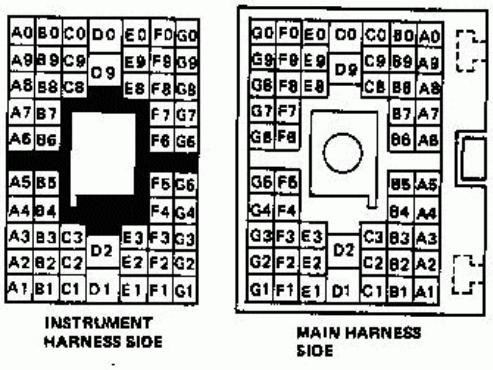
SPECIAL SERVICE TOOL

Tool number (Kent-Moore No.)	Tool name
KV999U0010 (J34273)	Diagnostic sub-harness (For digital type combination meter)  SEL350E

SUPER MULTIPLE JUNCTION (S.M.J.)

Terminal Arrangement

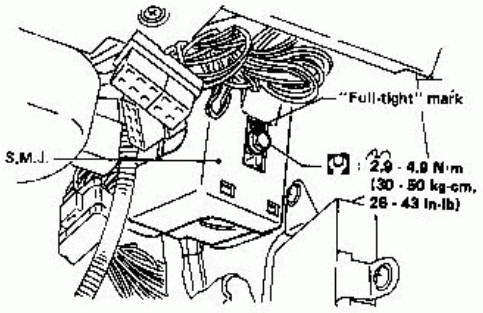
- Terminal numbers, i.e. "B1", "D0", etc, are identical to those which are shown as "S.M.J." in the wiring diagrams.



SEL303E

Disconnecting and Connecting

- S.M.J. is located on the right side of the dash.
- To disconnect the S.M.J., loosen the fixing bolt.
- To connect the S.M.J., tighten the bolt until the "full-tight" marking appears on the housing surface.
  Make sure the specified tightening torque is used.



SEL318E

INCH TO METRIC CONVERSION TABLE

(Rounded-off for automotive use)

inches	mm	inches	mm
.100	2.54	.610	15.49
.110	2.79	.620	15.75
.120	3.05	.630	16.00
.130	3.30	.640	16.26
.140	3.56	.650	16.51
.150	3.81	.660	16.76
.160	4.06	.670	17.02
.170	4.32	.680	17.27
.180	4.57	.690	17.53
.190	4.83	.700	17.78
.200	5.08	.710	18.03
.210	5.33	.720	18.29
.220	5.59	.730	18.54
.230	5.84	.740	18.80
.240	6.10	.750	19.05
.250	6.35	.760	19.30
.260	6.60	.770	19.56
.270	6.86	.780	19.81
.280	7.11	.790	20.07
.290	7.37	.800	20.32
.300	7.62	.810	20.57
.310	7.87	.820	20.83
.320	8.13	.830	21.08
.330	8.38	.840	21.34
.340	8.64	.850	21.59
.350	8.89	.860	21.84
.360	9.14	.870	22.10
.370	9.40	.880	22.35
.380	9.65	.890	22.61
.390	9.91	.900	22.86
.400	10.16	.910	23.11
.410	10.41	.920	23.37
.420	10.67	.930	23.62
.430	10.92	.940	23.88
.440	11.18	.950	24.11
.450	11.43	.960	24.38
.460	11.68	.970	24.64
.470	11.94	.980	24.89
.480	12.19	.990	25.15
.490	12.45	1.000	25.40
.500	12.70	2.000	50.80
.510	12.95	3.000	76.20
.520	13.21	4.000	101.60
.530	13.46	5.000	127.00
.540	13.72	6.000	152.40
.550	13.97	7.000	177.80
.560	14.22	8.000	203.20
.570	14.48	9.000	228.60
.580	14.73	10.000	254.00
.590	14.99	20.000	508.00
.600	15.24		

METRIC TO INCH CONVERSION TABLE

(Rounded-off for automotive use)

mm	inches	mm	inches
1	.0394	51	2.008
2	.079	52	2.047
3	.118	53	2.087
4	.157	54	2.126
5	.197	55	2.165
6	.236	56	2.205
7	.276	57	2.244
8	.315	58	2.283
9	.354	59	2.323
10	.394	60	2.362
11	.433	61	2.402
12	472	62	2.441
13	.512	63	2.480
14	.551	64	2.520
15	.591	65	2.559
16	.630	66	2.598
17	.669	67	2.638
18	.709	68	2.677
19	.748	69	2.717
20	.787	70	2.756
21	.827	71	2.795
22	.866	72	2.835
23	.906	73	2.874
24	.945	74	2.913
25	.984	75	2.953
26	1.024	76	2.992
27	1.063	77	3.031
28	1.102	78	3.071
29	1.142	79	3.110
30	1.181	80	3.150
31	1.220	81	3.189
32	1.260	82	3.228
33	1.299	83	3.268
34	1.339	84	3.307
35	1.378	85	3.346
36	1.417	86	3.386
37	1.457	87	3.425
38	1.496	88	3.465
39	1.535	89	3.504
40	1.575	90	3.543
41	1.614	91	3.583
42	1.654	92	3.622
43	1.693	93	3.661
44	1.732	94	3.701
45	1.772	95	3.740
46	1.811	96	3.780
47	1.850	97	3.819
48	1.890	98	3.858
49	1.929	99	3.898
50	1.969	100	3.937

QUICK REFERENCE CHART : 200SX [ ] 1986

ENGINE TUNE-UP DATA

Engine model		CA20E	CA18ET
Firing order		1-3-4-2	
Idle speed (See page MA-15.) rpm	M/T	750±100	750±50 680±50 (at high altitudes)
	A/T (in "D" position)	700±100	–
Ignition timing (degree B.T.D.C. at idle speed) (See page EF & EC-37.)		A/T 0±2° M/T 4±2° (Distributor vacuum hose disconnected)	15±2°
"CO" % at idle speed %		Idle mixture screw is preset and sealed at factory. EF & EC-84-88	EF & EC-88-91
Valve clearance (Hot) (MA-14) mm (in)	Intake	0.30 (0.012)	
	Exhaust	0.30 (0.012)	

Drive belt deflection (Cold) mm (in)	Used belt deflection		Set deflection of new belt
	Limit	Adjusted deflection	
Alternator	13 (0.51)	7 - 10 (0.28 - 0.39)	6 - 8 (0.24 - 0.31)
Air conditioner compressor	7 (0.28)	3 - 5 (0.12 - 0.20)	3 - 5 (0.12 - 0.20)
Power steering pump	14 (0.55)	8 - 11 (0.31 - 0.43)	6 - 9 (0.24 - 0.35)
Applied pressed force N (kg, lb)	98 (10, 22)		

Radiator cap relief pressure kPa (kg/cm², psi)	88 (0.9, 13)	
Cooling system leakage testing pressure kPa (kg/cm², psi)	157 (1.6, 23)	
Compression pressure at 350 rpm kPa (kg/cm², psi)	Standard	1,177 (12.0, 171)
	Minimum	883 (9.0, 128)
High tension cable resistance kΩ	Less than 30	

Spark plug		Intake side	Exhaust side
Type	Hot	BCPR5ES-11	BCPR5ES-11
	Standard	BCPR6ES-11	BCPR5ES-11
	Cold	BCPR7ES-11	BCPR6ES-11, BCPR7ES-11
Gap mm (in)		1.0 - 1.1 (0.039 - 0.043)	

Tightening torque	N-m	kg-m	ft-lb
Rocker arm nut	18 - 22	1.8 - 2.2	13 - 16
Spark plug	20 - 29	2.0 - 3.0	14 - 22
Oil pan drain plug	29 - 39	3.0 - 4.0	22 - 29
Alternator adjusting bolt	14 - 17	1.4 - 1.7	10 - 12

CLUTCH PEDAL

Unit: mm (in)

Pedal height	189 - 199 (7.44 - 7.83)
Pedal free play	1 - 3 (0.04 - 0.12)

FRONT WHEEL ALIGNMENT (Unladen*1)

Camber	degree	–25′ to 1°05′
Caster	degree	2°45′ - 4°15′
Toe-in	mm (in)	–0.5 to 1.5 (–0.020 to 0.059)
	degree	–2′ to 8′ (Total toe-in)
Front wheel turning angle Toe-out turns (Inner wheel/Outer wheel)	degree	20°/18°43′
Full turns*2		
Inner wheel		36° - 39°
Outer wheel		30° - 33°

*1: Tankful of fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools, and mats in designated positions.
*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 at idle.

WHEEL

Wheel nut tightening torque N-m (kg-m, ft-lb)	78 - 98 (8.0 - 10.0, 58 - 72)

FRONT WHEEL BEARING

Wheel bearing lock nut Tightening torque	N-m (kg-m, ft-lb)	25 - 29 (2.5 - 3.0, 18 - 22)
Return angle	degree	60°
Wheel bearing starting torque * At wheel hub bolt	N (kg, lb)	
With new grease seal		6.9 - 14.7 (0.7 - 1.5, 1.5 - 3.3)
With used grease seal		2.0 - 7.8 (0.2 - 0.8, 0.4 - 1.8)
Wheel bearing end play	mm (in)	0 (0)

REAR WHEEL ALIGNMENT (Unladen*)

Camber	degree	–1°15′ to 0°15′
Toe-in	mm (in)	–2 to 0 (–0.08 to 0)
	degree	–12′ to 0 (Total toe-in)

*: Tankful of fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools, and mats in designated positions.

REAR WHEEL BEARING

Wheel bearing end play	mm (in)	Less than 0.3 (0.012)

BRAKE

Unit: mm (in)

Disc brake Pad repair limit		2.0 (0.079)
Rotor diameter repair limit	Front side	16 (0.63)
	Rear side	9.0 (0.354)
Pedal free height M/T model		185 - 195 (7.28 - 7.68)
A/T model		187 - 197 (7.36 - 7.76)
Pedal depressed height*1		101 (3.98) or more
Parking brake Number of notches*2		7 - 8

*1: Under force of 490 N (50 kg, 110 lb) with engine running
*2: At pulling force: 196 N (20 kg, 44 lb)

REFILL CAPACITIES

		Liter	US measure
Fuel tank		53	14 gal
Coolant	With heater	8.6	9-1/8 qt
Engine	With oil filter	3.6	3-7/8 qt
	Without oil filter	3.2	3-3/8 qt
Transmission	M/T	2.1	4-1/2 pt
	A/T	7.0	7-3/8 qt
Differential carrier	R180	1.0	2-1/8 pt
	R200	1.3	2-3/4 pt
Power steering system		0.9	1 qt
Windshield washer tank		1.5	1-5/8 qt
Windshield and rear window washer tank		3.5	3-3/4 qt
Air conditioning system	Refrigerant	0.8 - 1.0 kg	1.8 - 2.2 lb

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