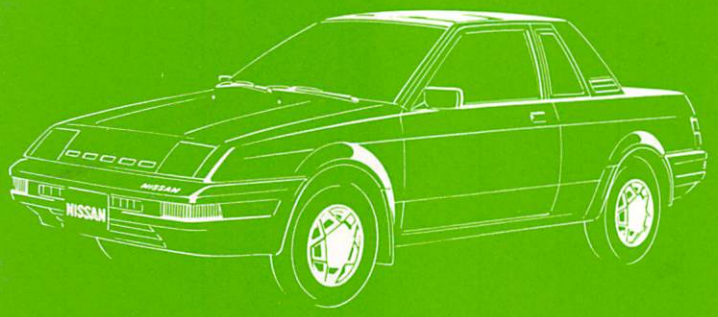


DATSUN

1983 DATSUN NISSAN PULSAR NX

SERVICE MANUAL

TURBO

THE NAME OF QUALITY
NISSAN
NISSAN MOTOR CO.,LTD.

NISSAN
PULSAR NX

Model N12 Series

FOREWORD

This service manual has been prepared primarily for the purpose of assisting service personnel in providing effective service and maintenance of the 1983 NISSAN PULSAR NX series equipped with TURBO engine.

This manual includes procedures for maintenance, adjustments, removal and installation, disassembly and assembly of components, and trouble-shooting.

All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of publication. If your NISSAN model differs from the specifications contained in this manual, consult your NISSAN/DATSUN dealer for information.

The right is reserved to make changes in specifications and methods at any time without notice.

QUICK REFERENCE INDEX

GENERAL INFORMATION ..... GI
MAINTENANCE ..... MA
ENGINE MECHANICAL ..... EM
ENGINE LUBRICATION & COOLING SYSTEMS LC
ENGINE FUEL & EMISSION CONTROL SYSTEM ..... EF&EC
ENGINE REMOVAL & INSTALLATION ..... ER
ENGINE CONTROL, FUEL & EXHAUST SYSTEMS ..... FE
AUTOMATIC TRANSAXLE ..... AT
FRONT AXLE & FRONT SUSPENSION ..... FA
REAR AXLE & REAR SUSPENSION ..... RA
BRAKE SYSTEM ..... BR
STEERING SYSTEM ..... ST
BODY ..... BF
HEATER & AIR CONDITIONER ..... HA
ELECTRICAL SYSTEM ..... EL

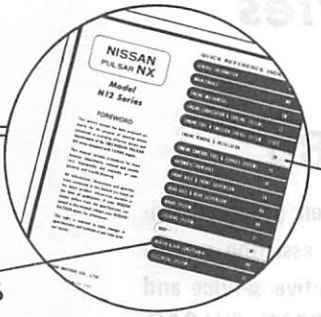
NISSAN MOTOR CO., LTD.

HOW TO USE THIS MANUAL

- This Service Manual is designed as a guide for servicing models equipped with the E15ET engine.
- This manual includes service procedures specified for models equipped with the E15ET engine.
  This manual does not contain procedures which are the same as those for vehicles without the E15ET engine.
  Please use this manual is conjunction with the NISSAN PULSAR NX series Service Manual (Pub. No. SM3E0N12U0).

Servicing of TURBO vehicles

Specific section titles are printed white on a black background in the QUICK REFERENCE INDEX.



Those sections which are printed black on a white background are not contained in this manual.

NO

YES

This Service Manual contains information on the modifications resulting from the installation of the E15ET engine.
The section titles found in the new and old Service Manuals are as indicated below.

Service procedures are the same as those for the non-TURBO series. Carry out the servicing of TURBO vehicles in accordance with the Service Manual for non-TURBO series.

IMPORTANT SAFETY NOTICE

The proper performance of service is essential for both the safety of the mechanic and the efficient functioning of the vehicle.
The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately.
Special service tools have been designed to permit safe and proper performance of service. Be sure to use them.

Service varies with the procedures used, the skills of the mechanic and the tools and parts available. Accordingly, anyone using service procedures, tools or parts which are not specifically recommended by NISSAN must first completely satisfy himself that neither his safety nor the vehicle's safety will be jeopardized by the service method selected.

SECTION GI

DIMENSIONS

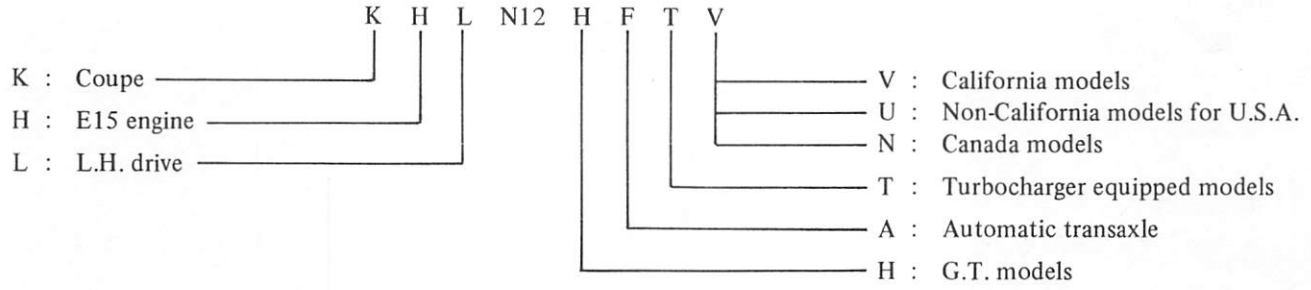
Item \ Model			All
Overall length		mm (in)	4,125 (162.4)
Overall width		mm (in)	1,620 (63.8)
Overall height		mm (in)	1,355 (53.3)
Wheelbase		mm (in)	2,415 (95.1)
Tread	Front	mm (in)	1,395 (54.9)
	Rear	mm (in)	1,385 (54.5)
Min. ground clearance		mm (in)	165 (6.5)
Overhang	Front	mm (in)	880 (34.6)
	Rear	mm (in)	830 (32.7)
Room space	Length	mm (in)	1,605 (63.2)
	Width	mm (in)	1,370 (53.9)
	Height	mm (in)	1,110 (43.7) 1,100 (43.3)*1

*1: Sun roof model

MODEL VARIATION

Destination	Body	Grade	Model	Engine	Transaxle	Road wheel size ... offset mm (in)	Tire size
California	Coupe	GT	KHLN12HATV	E15ET	RL3F01A	4-1/2Jx13 (Steel) ... 42 (1.65) 5Jx13 (Aluminum) ... 40 (1.57)	175/70SR13
Non-California			KHLN12HATU				
Canada			KHLN12HATN				

Prefix and suffix designations



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 must be performed on the following items as shown in the table.

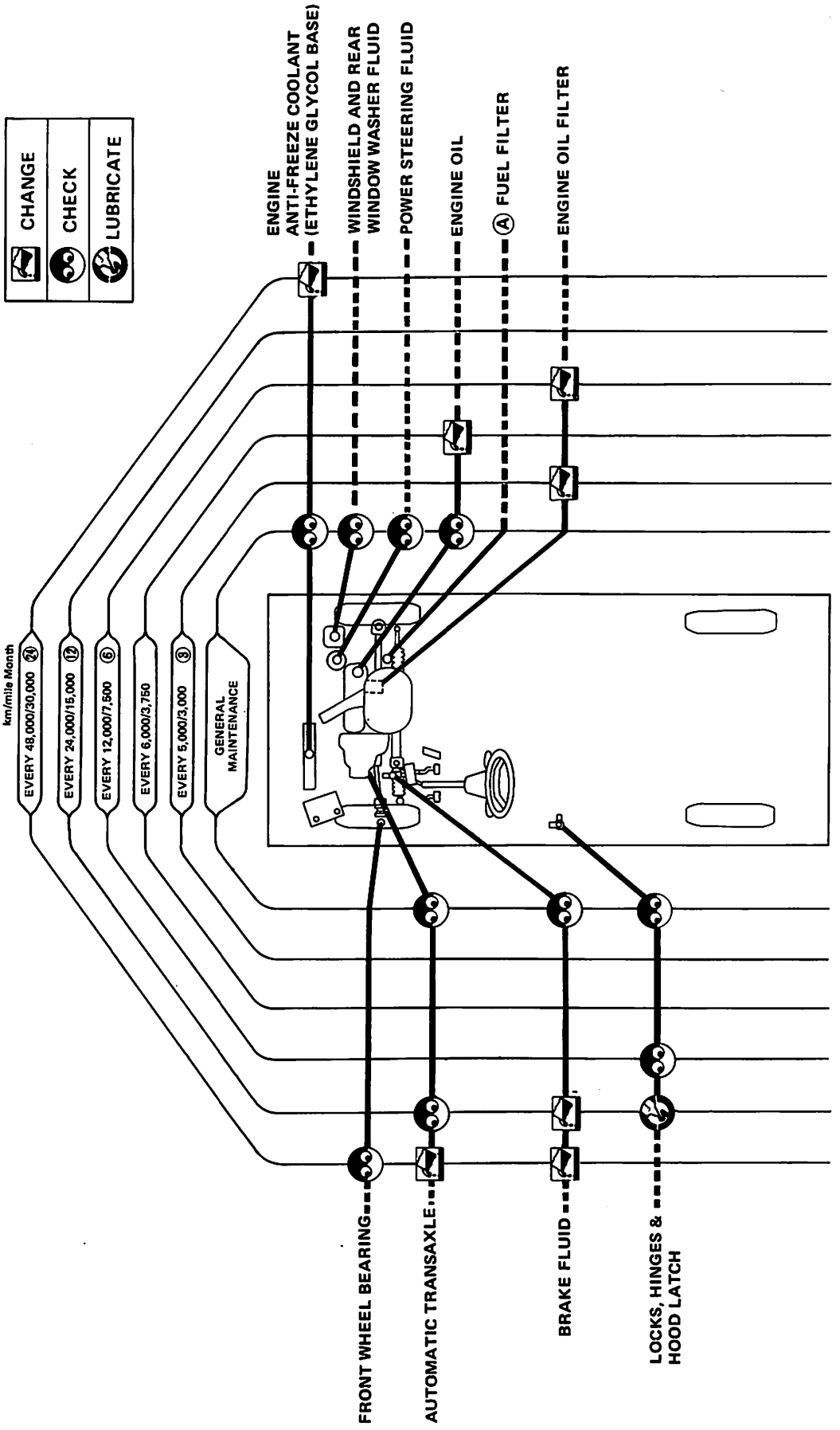
Severe driving conditions

A – Repeated short distance driving
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
H – Driving in high humidity areas or in mountainous areas

Driving condition	Maintenance item	Maintenance operation	Maintenance interval
A B C . E	Engine oil	R	More frequently
	Engine oil filter	R	Every 3,000 miles (5,000 km) or 3 months
A . C . E F G . .	Brake pads, discs, drums & lining	I	Every 7,500 miles (12,000 km) or 6 months
. . . . . H .	Brake fluid	R	Every 15,000 miles (24,000 km) or 12 months
. . . . E . G . .	Manual and automatic transaxle gear oil	R	Every 30,000 miles (48,000 km) or 24 months
. . . . . G . .	Steering gear & linkage & suspension parts	I	Every 7,500 miles (12,000 km) or 6 months
. . . D . F G . .	Front drive shaft boots	I	Every 7,500 miles (12,000 km) or 6 months
. . C D . F G . .	Steering linkage ball joints & front suspension ball joints	I	Every 7,500 miles (12,000 km) or 6 months
. . . . . F . . .	Locks, hinges & hood latch	I	Every 7,500 miles (12,000 km) or 6 months
A . . . E F G . .	Exhaust system	I	Every 7,500 miles (12,000 km) or 6 months

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

LUBRICATION CHART



Ⓐ If car is operated under extreme adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the fuel filter might become clogged. In such an event, replace the parts immediately.

*: Maintenance under severe driving conditions

SMA582A

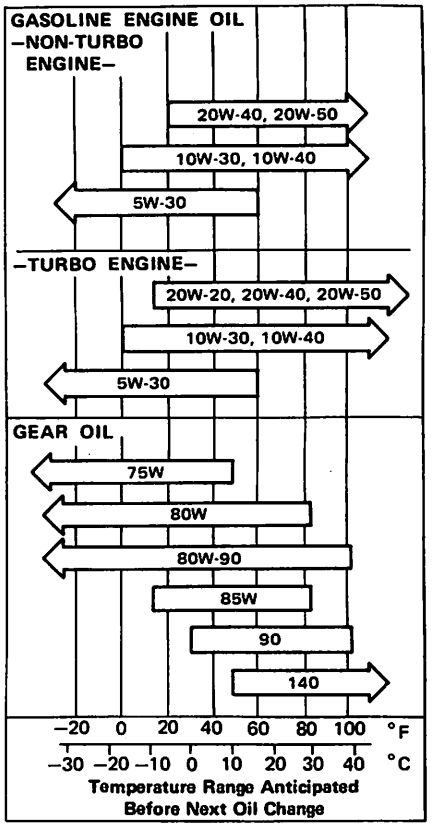
RECOMMENDED FUEL AND LUBRICANTS

FUEL

Gasoline		Gasoline octane number (minimum)	
		RON	(R + M)/2
U.S.A. models and Canada turbo models*	Unleaded	91	87
Canada non-turbo models	Unleaded or leaded		

***: The fuel filler opening of U.S.A. models and Canada turbo models are designed for use with an unleaded fuel gun [nozzle diameter less than 21.3 mm (0.84 in)] only.**

SAE VISCOSITY NUMBER



LUBRICANTS

Lubricant		Specifications	Remarks
Engine oil	Non-turbo engine	API SF (Energy Conserving Oils)	For further details, refer to "Engine oil and oil filter recommendation".
	Turbo engine	API SE *1	
Manual transaxle gear oil		API GL-4	For further details, refer to the recommended SAE viscosity chart.
Automatic transaxle and power steering gear fluid		Type DEXRON	–
Multi-purpose grease		NLGI No. 2	Lithium soap base
Brake fluid		DOT 3	US FMVSS No. 116
Anti-freeze		–	Ethylene glycol base

***1: On models equipped with a turbocharger, use 10W-30, 10W-40, 20W-20, 20W-40 or 20W-50 except under extremely cold conditions. Use 5W-30 only under extremely cold conditions.**

APPROXIMATE REFILL CAPACITIES

		Liter	US measure	Imp measure
Fuel tank		50	13-1/4 gal	11 gal
Engine coolant	With heater	6.1	6-1/2 qt	5-3/8 qt
	Without heater	5.5	5-7/8 qt	4-7/8 qt
	Reservoir tank	0.7	3/4 qt	5/8 qt
Engine oil	With oil filter	3.7	3-7/8 qt	3-1/4 qt
	Without oil filter	3.3	3-1/2 qt	2-7/8 qt
Transaxle	Automatic	6.0	6-3/8 qt	5-1/4 qt
Windshield washer tank		1.5	1-5/8 qt	1-3/8 qt
Power steering system		1.0	1-1/8 qt	7/8 qt
Air conditioning system	Compressor oil	0.15	5.1 fl oz	5.3 fl oz
	Refrigerant	0.8 - 1.0 kg	1.8 - 2.2 lb	1.8 - 2.2 lb

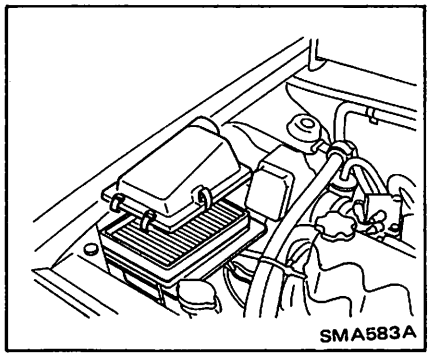
ENGINE MAINTENANCE

BEFORE ENGINE START

REPLACING AIR CLEANER FILTER

Air cleaner filter is a viscous paper type and does not require cleaning.

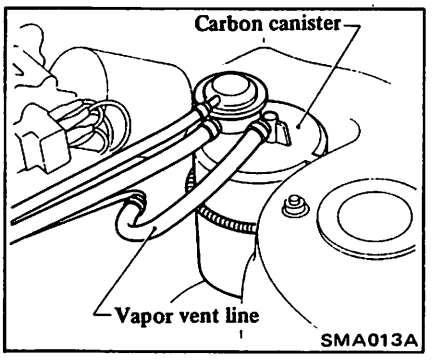
1. Loosen air flow meter attaching screw.
2. Remove air cleaner cover and remove air cleaner filter.



3. Install new air cleaner filter and install air cleaner cover.

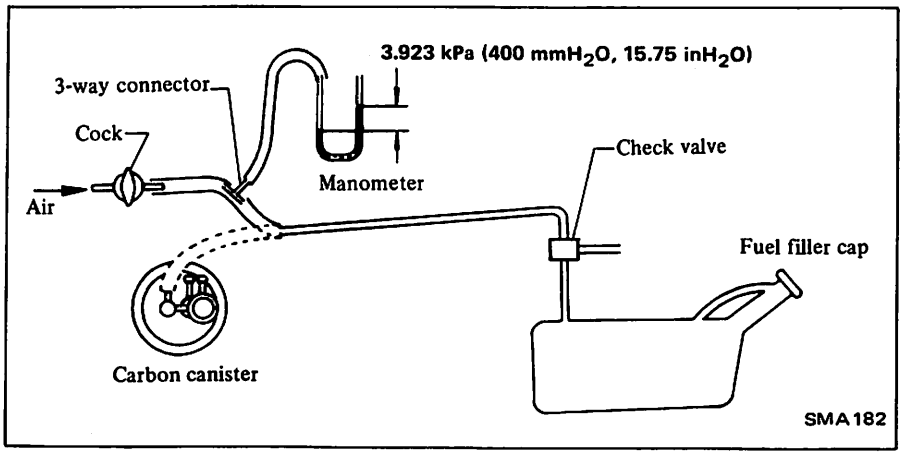
CHECKING VAPOR LINES

1. Check all hoses and fuel tank filler cap.
2. Disconnect vapor vent line connecting carbon canister to fuel tank.



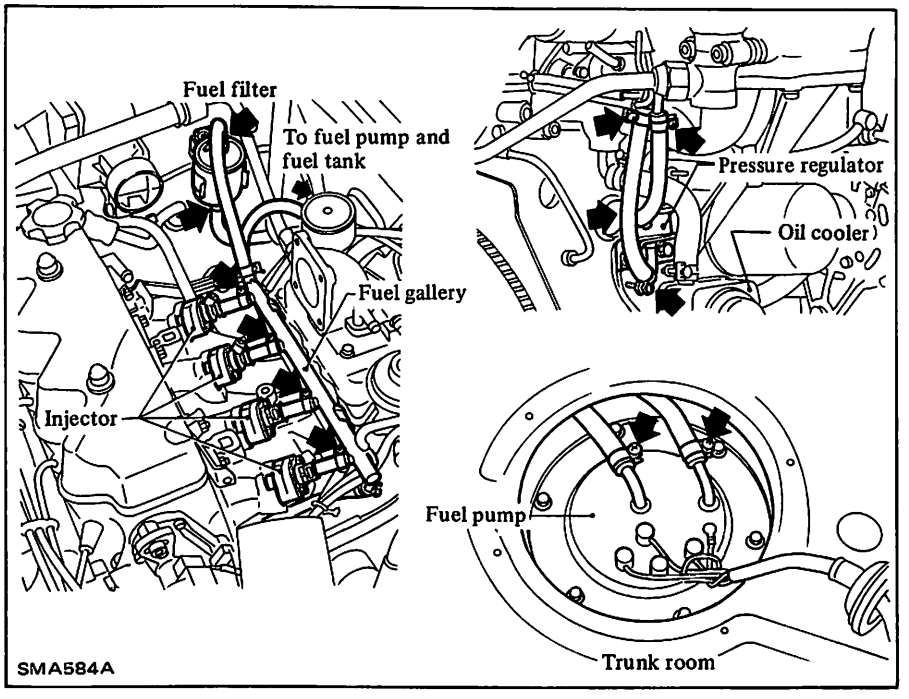
3. Connect 3-way connector, manometer and cock (or equivalent 3-way charge cock) to end of vent line.
4. Slowly supply fresh air into vapor vent line through cock until pressure reaches 3.923 kPa (400 mmH_2O, 15.75 inH_2O).
5. Shut cock completely.
6. After 2-1/2 minutes, measure height of liquid in manometer.
7. Variation in height should remain 0.245 kPa (25 mmH_2O, 0.98 inH_2O).
8. When filler cap does not close completely, height should soon drop to zero.
9. If height does not soon drop to zero when filler cap is removed, the cause is a clogged hose.

If vent line is clogged, breathing in fuel tank is poor, thus causing insufficient delivery of fuel to engine or vapor lock. It must, therefore, be repaired or replaced.



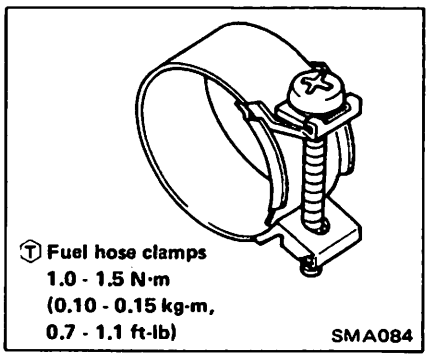
CHECKING FUEL LINES
(Hoses, piping, connections, etc.)

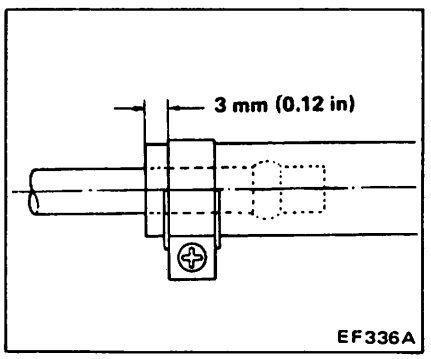
1. Check fuel line for leaks, particularly around connection of fuel pipe and fuel hose.
2. Retighten loose connections and replace any damaged or deformed parts.



CAUTION:

a. **Do not reuse fuel hose clamp after loosening.**
b. **Tighten high pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end or screw position (wider than other portions of clamp) is flush with hose end. Tightening torque specifications are the same for all rubber hose clamps. When tightening hose clamp, ensure that screw does not come into contact with adjacent parts.**





REPLACING FUEL FILTER

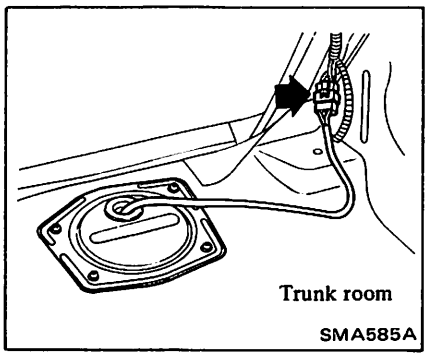
The fuel filter is designed especially for use with the EFI system. It should be replaced as an assembly.

1. Follow the procedure below to reduce fuel pressure to zero.

CAUTION:

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

(1) Start the engine.
(2) Remove fuel pump connector with engine running.

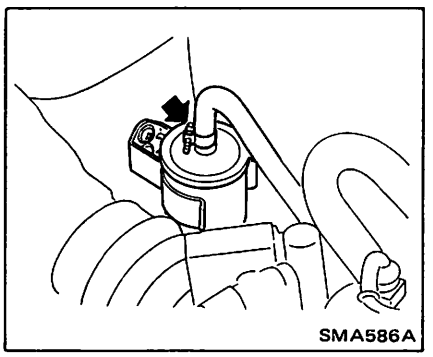


(3) After engine stall, crank the engine twice or three times.
(4) Turn ignition switch off and connect fuel pump connector.

2. Unfasten clamps securing fuel hoses to the outlet and inlet sides of fuel filter, and disconnect fuel hoses.

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

3. Remove fuel filter.



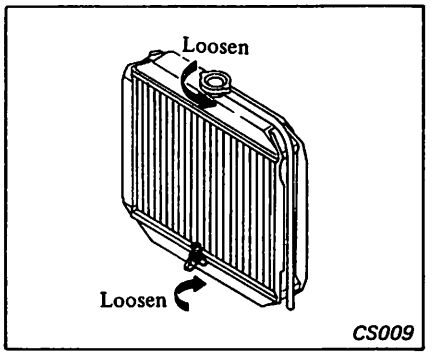
4. To install fuel filter, reverse the order of removal.

CHANGING ENGINE COOLANT

WARNING:
To avoid being scalded, never change the coolant when the engine is hot.

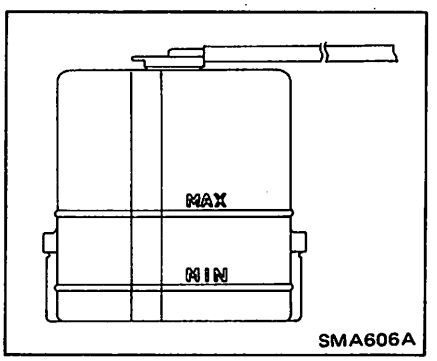
When replacing engine coolant, set heater "TEMP" control lever to fully "HOT" position.

1. To flush system, open drain cock at bottom of radiator. Then thoroughly flush until clear water comes out.



2. Close drain cock.
3. Fill radiator with coolant up to specified level. Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

Coolant capacity:
Without heater
6.1 liters
(6-1/2 US qt, 5-3/8 Imp qt)
With heater
5.5 liters
(5-7/8 US qt, 4-7/8 Imp qt)
Reservoir tank
0.7 liter
(3/4 US qt, 5/8 Imp qt)

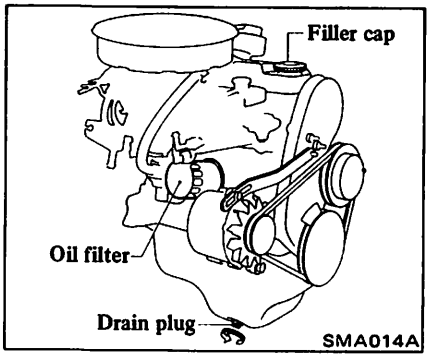


4. Install filler cap and fill reservoir tank with coolant up to "MAX" level.
5. Start engine and warm up engine until water temperature indicator points to the middle of gauge.
6. Stop engine and cool engine off completely.
7. Refill radiator with coolant up to filler opening if the coolant level is lower the specified level.
8. Also, refill reservoir tank with coolant up to "MAX" level.

CHANGING ENGINE OIL AND REPLACING OIL FILTER

1. Start engine and warm it up until water temperature indicator points to middle of gauge, then turn off engine.
2. Remove oil filler cap and oil pan drain plug, and allow oil to drain.

WARNING:
Use care as the engine oil is hot.

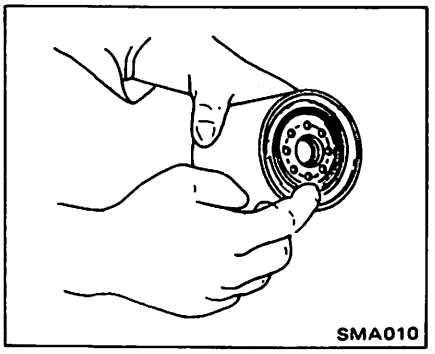


- **A milky oil indicates the presence of cooling water. Isolate the cause and take corrective measure.**
- **An oil with extremely low viscosity indicates dilution with gasoline.**

3. Using oil filter wrench, remove oil filter.
4. After draining engine oil, wipe oil pan drain hole with a clean rag.
5. Clean and install oil pan drain plug with washer.

Ⓣ : **Oil pan drain plug**
35 - 47 N·m
(3.6 - 4.8 kg-m,
26 - 35 ft-lb)

6. Wipe oil filter mounting surface with a clean rag.
7. Smear a little engine oil on rubber seal of new oil filter.

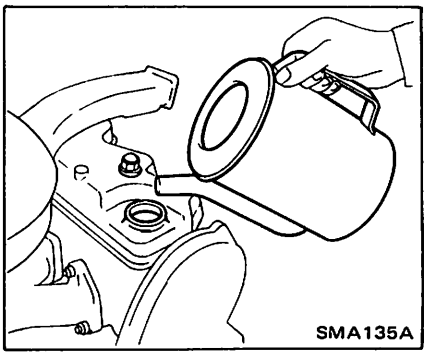


8. Install new oil filter by hand.

Do not use oil filter wrench to tighten the filter.

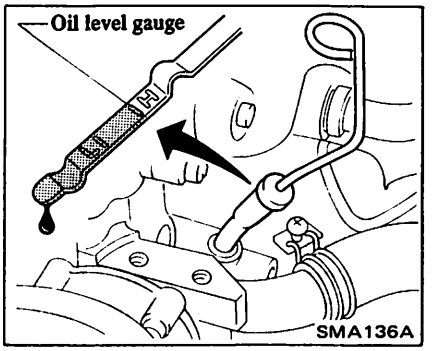
9. Refill engine with the appropriate new engine oil by referring to Recommended Lubricants.
Check oil level with dipstick.

Oil capacity:
With oil filter
3.7 liters
(3-7/8 US qt, 3-1/4 Imp qt)
Without oil filter
3.3 liters
(3-1/2 US qt, 2-7/8 Imp qt)



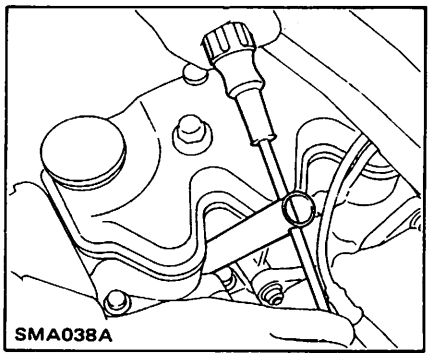
10. Install oil filler cap and start engine.
11. Check area around drain plug and oil filter for any sign of oil leakage.
If leakage is evident, retighten or replace.
12. Run engine until water temperature indicator points to middle of gauge. Then turn off engine and wait a few minutes. Check oil level with oil level gauge. If necessary, add engine oil.

When checking oil level, park car on a level surface.



REPLACING SPARK PLUG

1. Disconnect spark plug wire at boot. Do not pull on the wires.
2. Remove spark plugs with spark plug wrench.



3. Check spark plug gap.
4. Install new spark plugs are reconnect high tension cables.

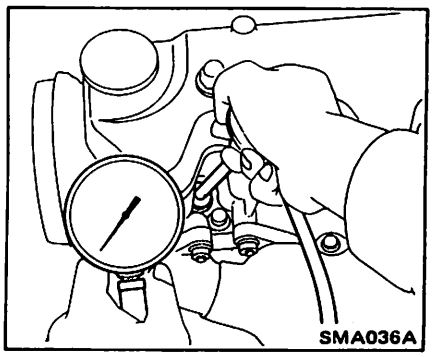
Spark plug type:

	All models
Standard	BPR6ES-11
Hot type	BPR5ES-11
Cold type	BPR7ES-11
Plug gap mm (in)	1.0 - 1.1 (0.039 - 0.043)

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

CHECKING ENGINE COMPRESSION PRESSURE

1. Warm up engine until water temperature indicator points to middle of gauge.
2. Remove air cleaner and all spark plugs.
3. Disconnect cold start valve and all injector connectors.
4. Properly attach a compression tester to spark plug hole in cylinder being tested.



5. Depress accelerator pedal to fully open throttle and choke valve.
6. Crank engine and read gauge indication.
- Run engine at about 350 rpm.
- Engine compression measurement should be made as quickly as possible.

Compression pressure:
kPa (kg/cm^2, psi)/at rpm
Standard
1,089 (11.1, 158)/350
Minimum
892 (9.1, 129)/350
Differential limit between cylinders:
98 (1.0, 14)/350

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 gasketed surface.
  Oil and water in combustion chambers can result from this problem.

AFTER ENGINE WARM-UP

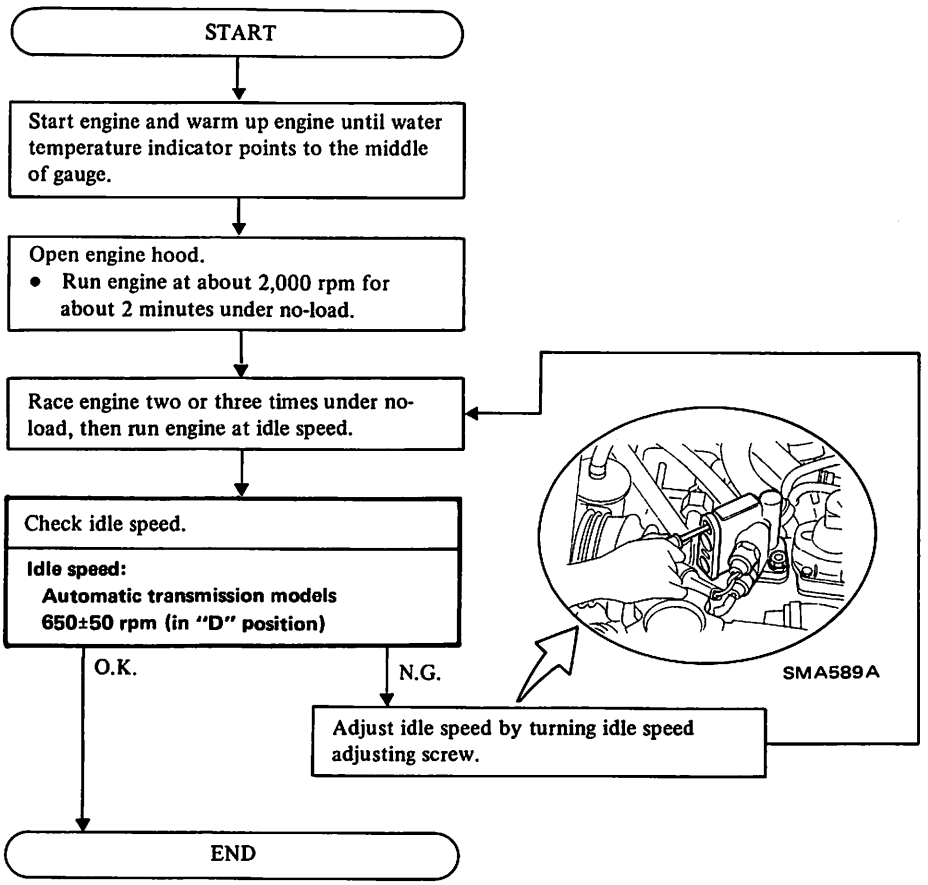
ADJUSTING IDLE RPM (U.S.A.)

Preparation

1. Connect engine tachometer in its proper position.
2. On air conditioner equipped models, the air conditioner system should be "OFF".
3. Apply parking brake and block both front and rear wheels with chocks.
4. The electrical components (lights, heater, all accessories, etc.) should be turned off so that idle speed can be inspected and/or adjusted accurately. (Refer to EF & EC section.)
5. Make the check after the radiator cooling fan has stopped. If it is operating, wait until it stops.

WARNING:
a. Inspections should be carried out while shift lever is in "D" position on automatic transaxle equipped models.
b. On automatic transaxle equipped models, racing the engine should be carried out while shift lever is in "N" or "P" position and brake pedal should be depressed.
c. After adjustment has been made, shift the lever to "N" or "P" position.

Maintenance procedure



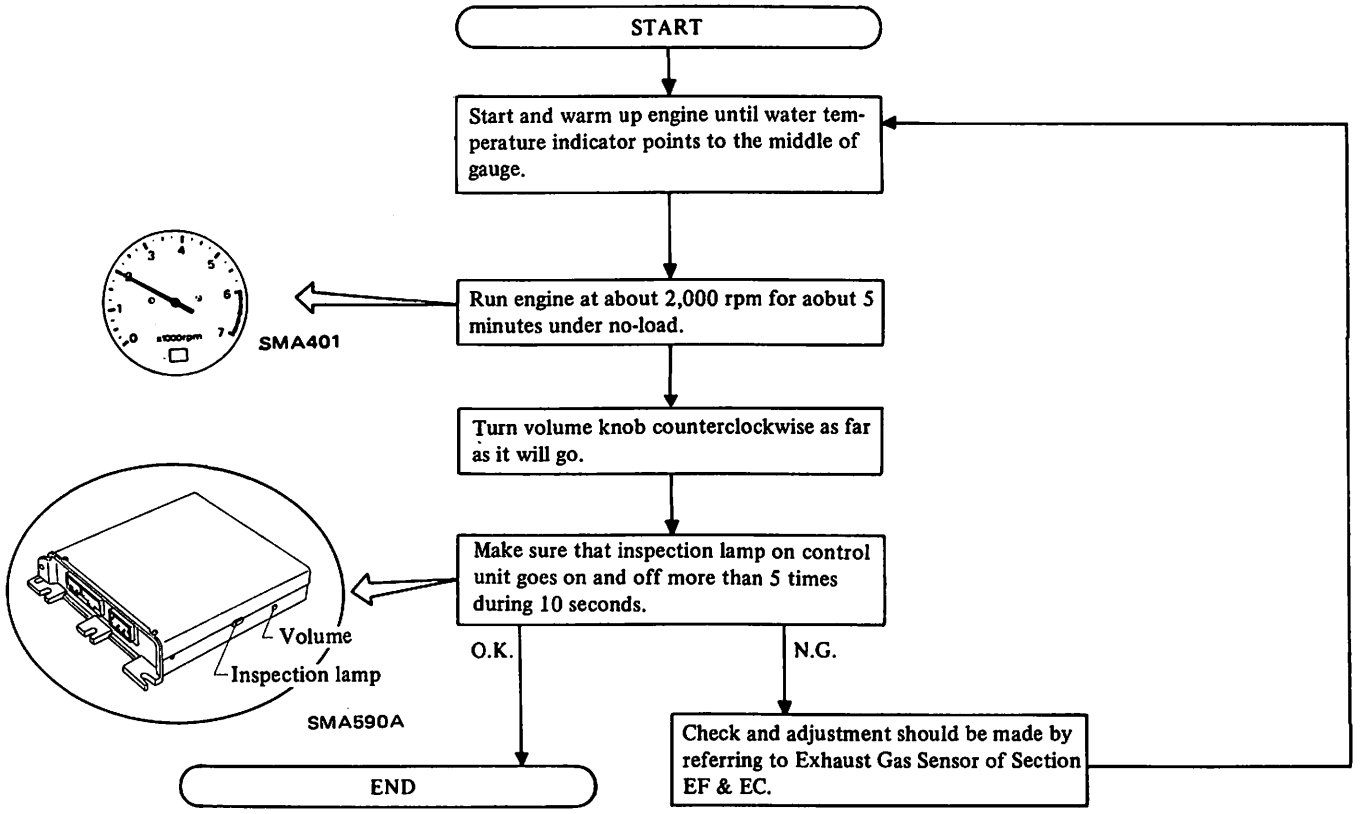
CHECKING EXHAUST GAS SENSOR

Preparation

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

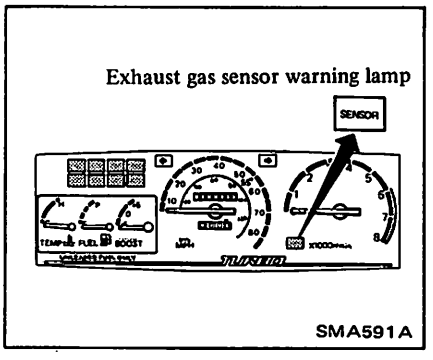
- **Battery**
- **Ignition system**
- **Engine oil and coolant levels**
- **Fuses**
- **EFI component parts**
- **EFI harness connectors**
- **Hoses**
- **Oil filler cap and oil level gauge**
- **Valve clearance, engine compression**

Maintenance procedure



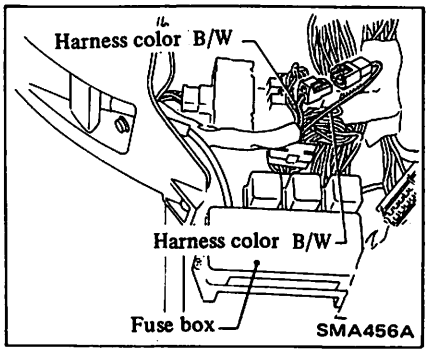
48,000 km (30,000 miles) or 24 Months Service

Exhaust gas sensor should be checked after 48,000 km (30,000 miles) or 24 months of operation.
After car has been operated for 48,000 km (30,000 miles), exhaust gas sensor warning lamp will come on to indicate that sensor should be inspected.



For U.S.A. models

After inspection, disconnect warning lamp harness connector so that warning lamp will not come on thereafter.



If sensor should be checked on the 24th month before 48,000 km (30,000 miles) of operation, also disconnect warning lamp harness connector.

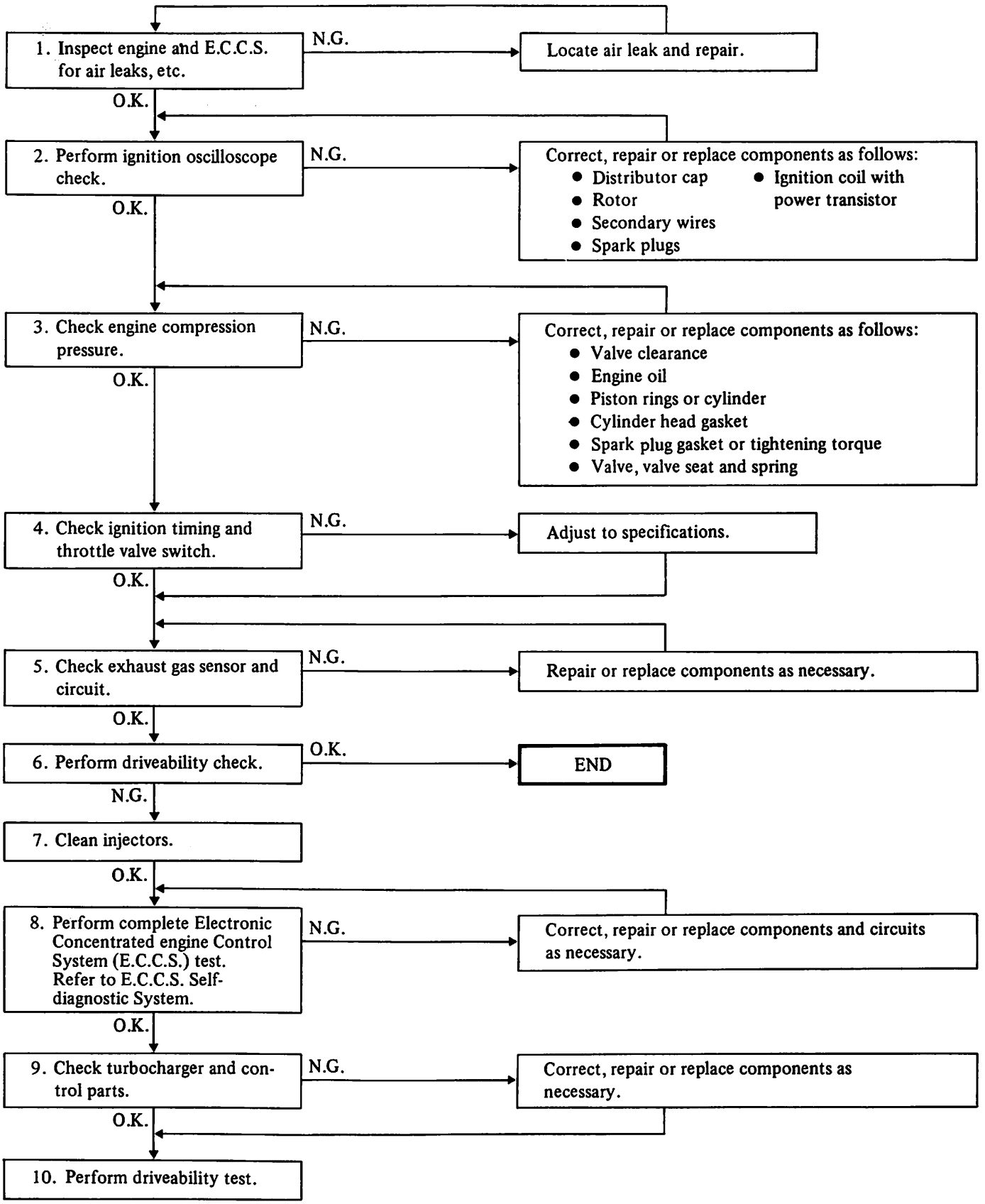
For Canada models

After inspection, diconnect the hold relay so that warning lamp will not come on thereafter.

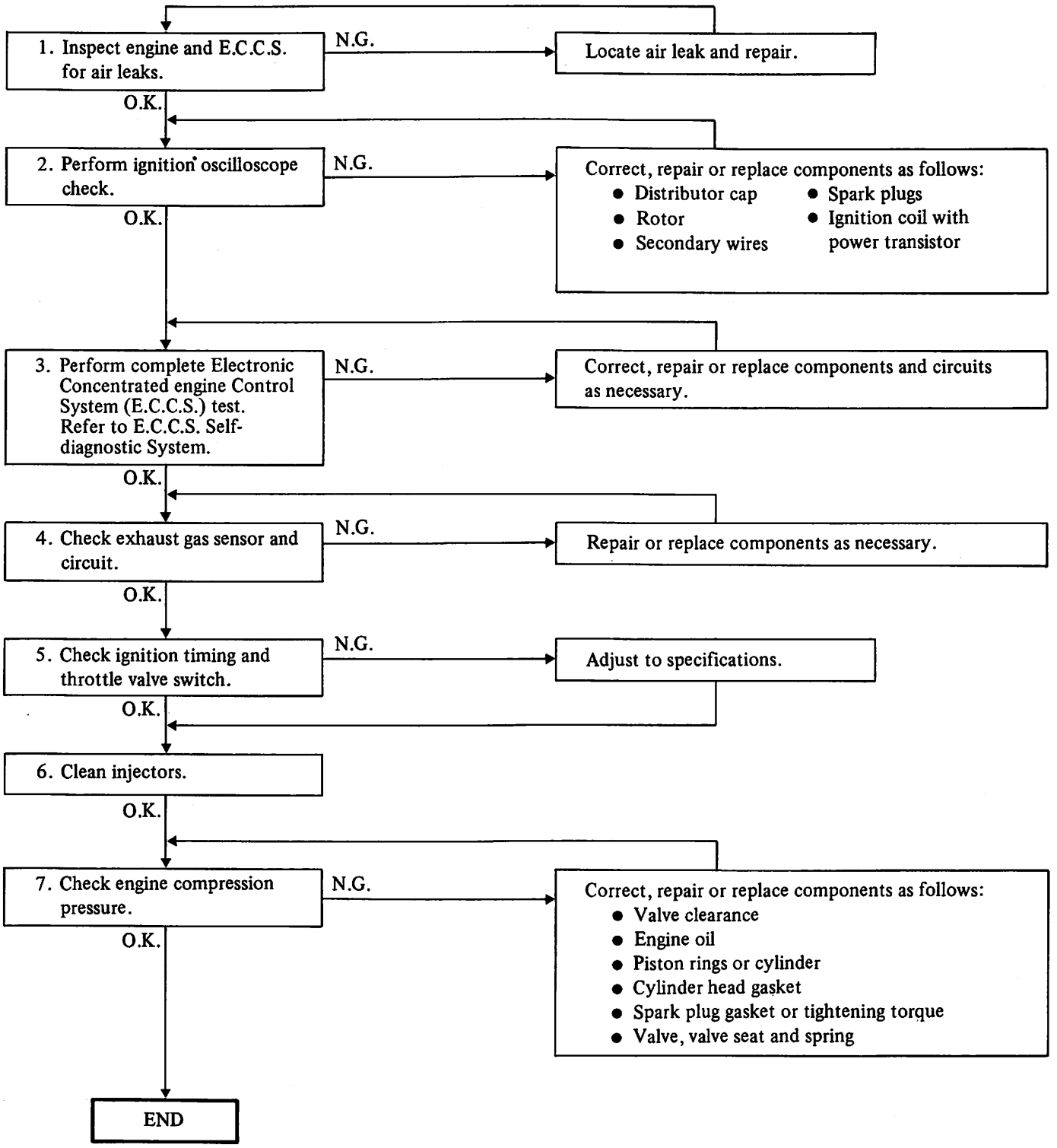
DIAGNOSTIC PROCEDURE FOR PROBLEMS

DIAGNOSTIC PROCEDURE FOR E.C.C.S. ENGINE

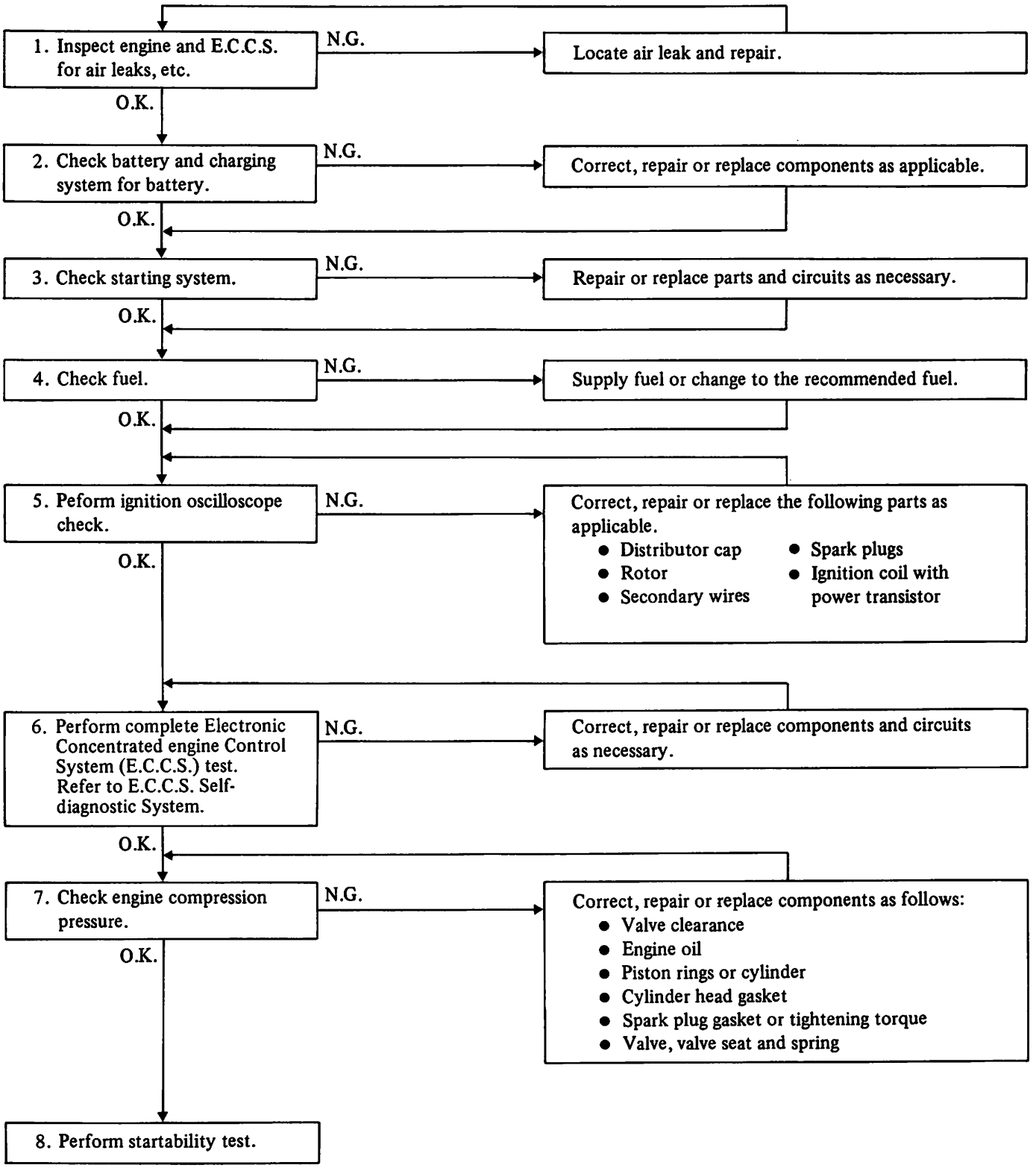
DRIVEABILITY (Hesitation, surging, flat spot, backfire, afterfire, lack of power, run-on, excessive fuel consumption, etc.)



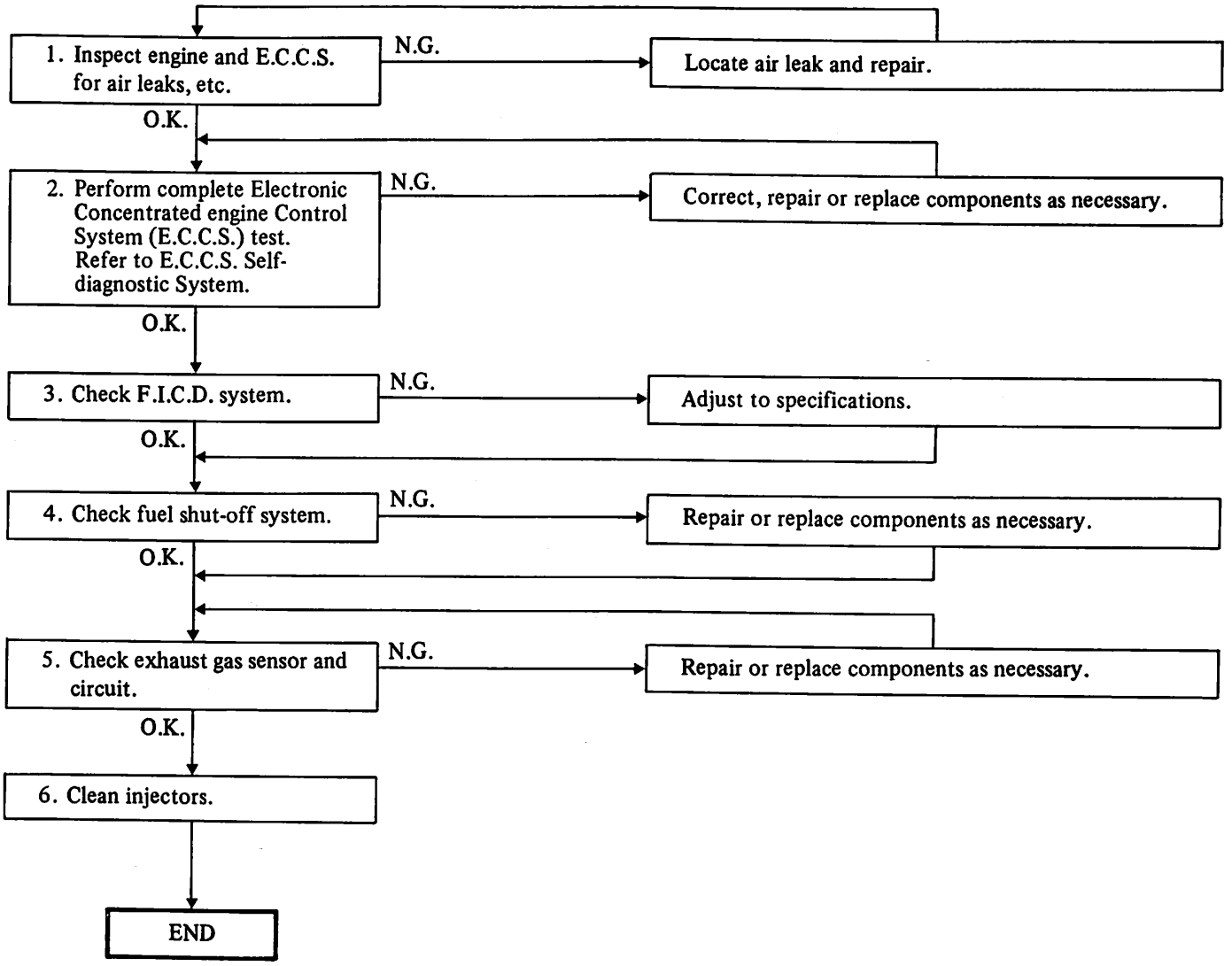
IMPROPER IDLING (Rough idle, no return to idle, high idle, etc.)



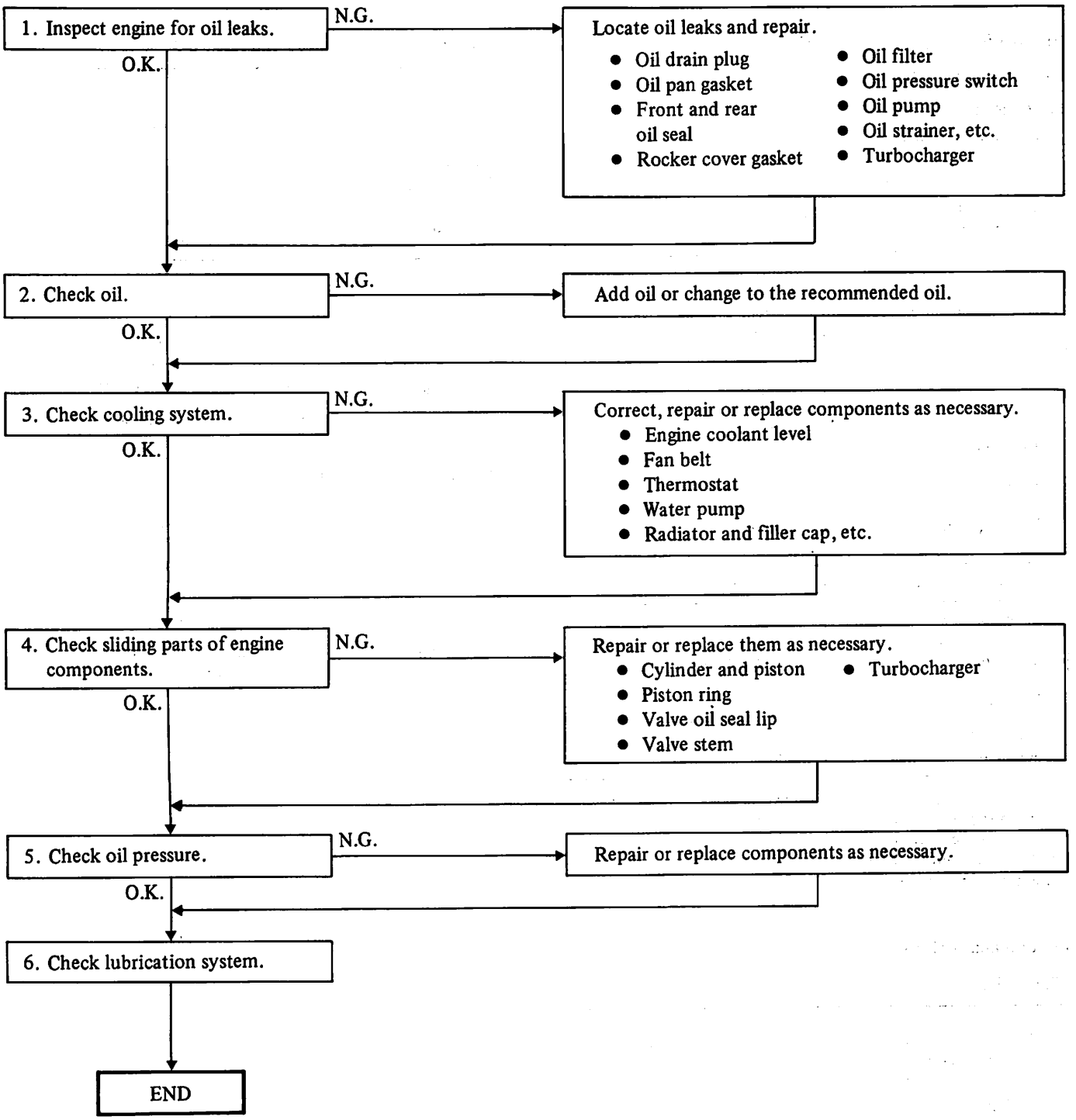
ENGINE STARTABILITY (Hard start, no start, hard restart, no restart, etc.)



ENGINE STALL



EXCESSIVE OIL CONSUMPTION



For diagnostic procedures for overheating and noisy engine, refer to DIAGNOSTIC PROCEDURE FOR CARBURETOR ENGINE.

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

ENGINE MAINTENANCE

INSPECTION AND ADJUSTMENT

Basic mechanical system

Valve clearance mm (in)	Hot	Intake	0.28 (0.011)	
		Exhaust	0.28 (0.011)	
	Cold*1	Intake	0.22 (0.009)	
		Exhaust	0.22 (0.009)	
Drive belt deflection (Cold)			Used*2	New*3
Alternator mm (in)			13 - 17 (0.51 - 0.67)	10 - 14 (0.39 - 0.55)
Air conditioner mm (in)			9 - 11 (0.35 - 0.43)	7 - 9 (0.28 - 0.35)
Power steering mm (in)			7 - 9 (0.28 - 0.35)	6.5 - 8.5 (0.256 - 0.335)
Pushing force N (kg, lb)			98 (10,22)	
Engine compression pressure kPa (kg/cm², psi) Standard			1,089 (11.1, 158)	
Minimum			892 (9.1, 129)	
Differential limit between cylinders			98 (1.0, 14) at 350 rpm	

*1 After checking valve clearance while engine is cold, also check it when engine is hot to see if it remains within the specific range. If it does not readjust it.
*2 Adjust deflection of used belt
*3 Set deflection of new belt

Ignition and fuel system

Spark plugs

Destination	Type			Gap mm (in)
	Standard	Hot	Cold	
All	BPR6ES-11	BPR5ES-11	BPR7ES-11	1.0 - 1.1 (0.039 - 0.043)
High tension cable resistance ohm			Less than 30,000	

Ignition timing, idle speed and idle "CO" %

	All
	Automatic
Ignition timing/idle speed (B.T.D.C. degree/rpm)	15±2°/650±50 (in "D" position)
"CO"% at idle speed	Idle mixture screw is preset and sealed at factory

Emission control system

Unit: kPa (mmH_2O, inH_2O)

Vapor line leakage test	Supplied pressure	3.923 (400, 15.75)
	Pressure variation	Less than 0.245 (25, 0.98)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Valve rocker adjusting nut	16 - 21	1.6 - 2.1	12 - 15
Oil pan drain plug	35 - 47	3.6 - 4.8	26 - 35
Spark plug	20 - 29	2.0 - 3.0	14 - 22

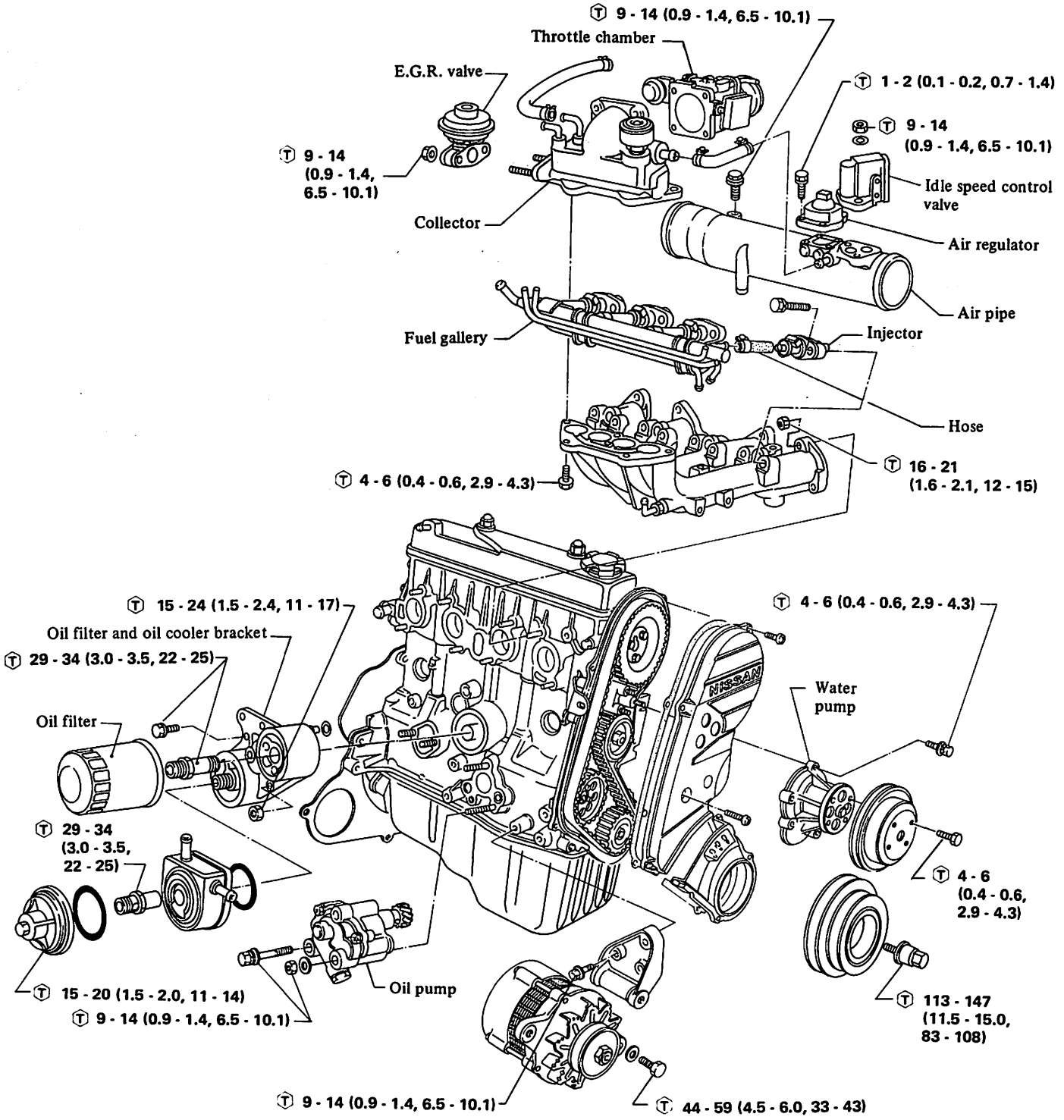
ENGINE MECHANICAL

SECTION EM

CONTENTS

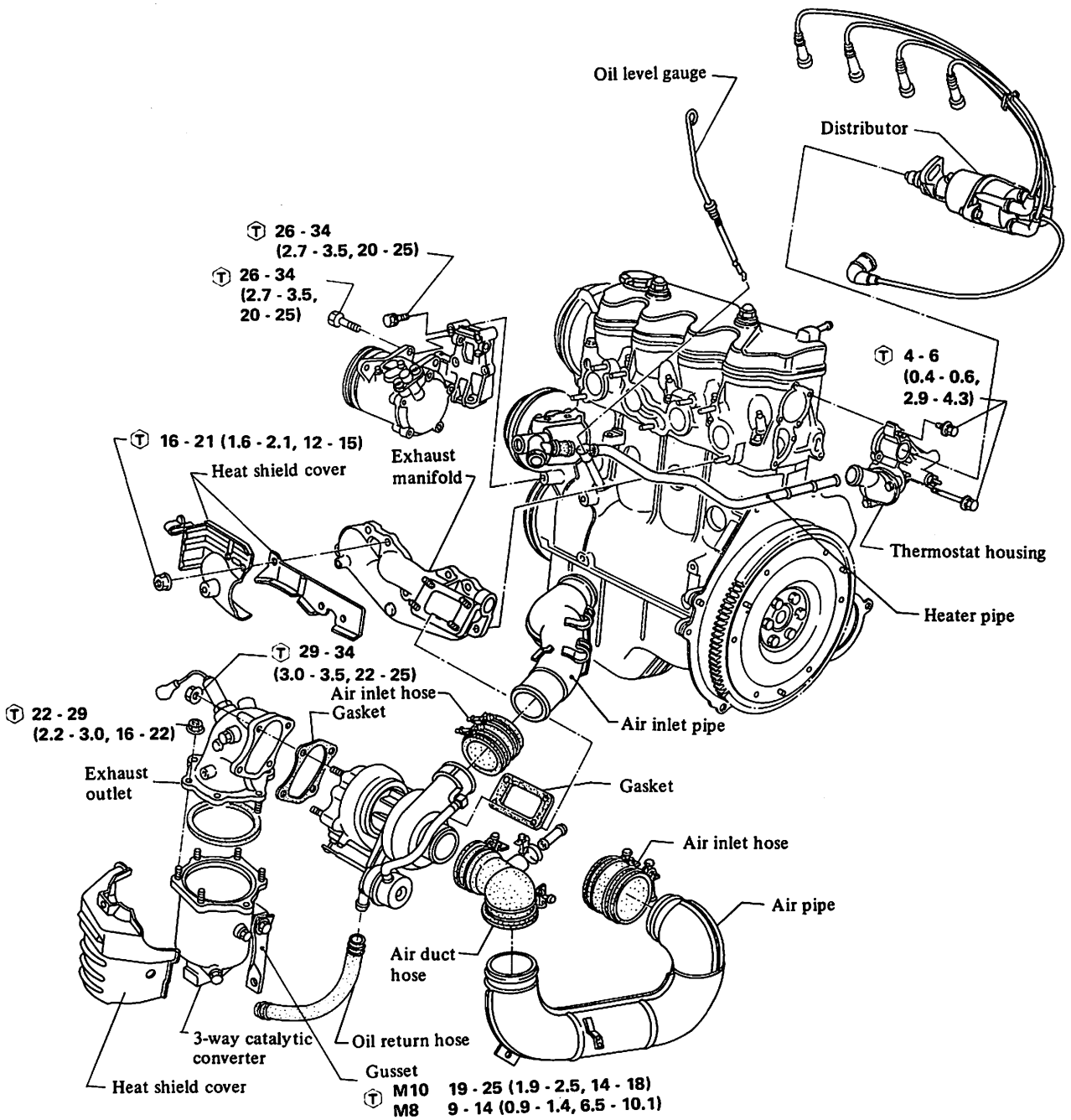
ENGINE COMPONENTS (Outer parts) ..... EM- 2
ENGINE COMPONENTS (Internal parts) ..... EM- 4
ENGINE DISASSEMBLY ..... EM- 6
Engine overall ..... EM- 6
INSPECTION AND REPAIR ..... EM- 7
Cylinder head ..... EM- 7
Crankshaft ..... EM- 7
ENGINE ASSEMBLY ..... EM- 8
Engine overall ..... EM- 8
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... EM- 9
General specifications ..... EM- 9
Inspection and adjustment ..... EM- 9
Tightening torque EM-14

ENGINE COMPONENTS (Outer parts)



Ⓣ : N·m (kg-m, ft-lb)

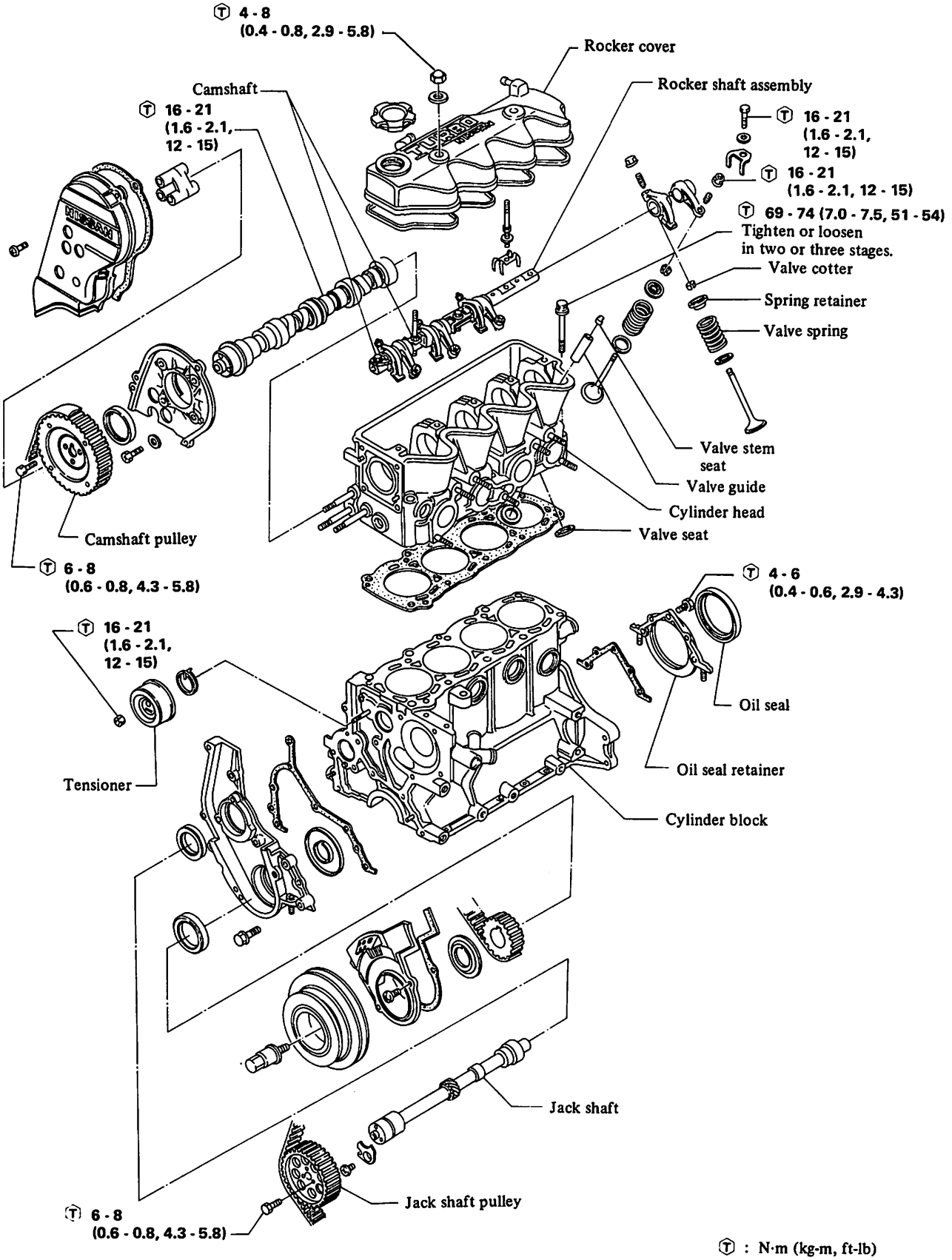
SEM074A



Ⓣ : N·m (kg-m, ft-lb)

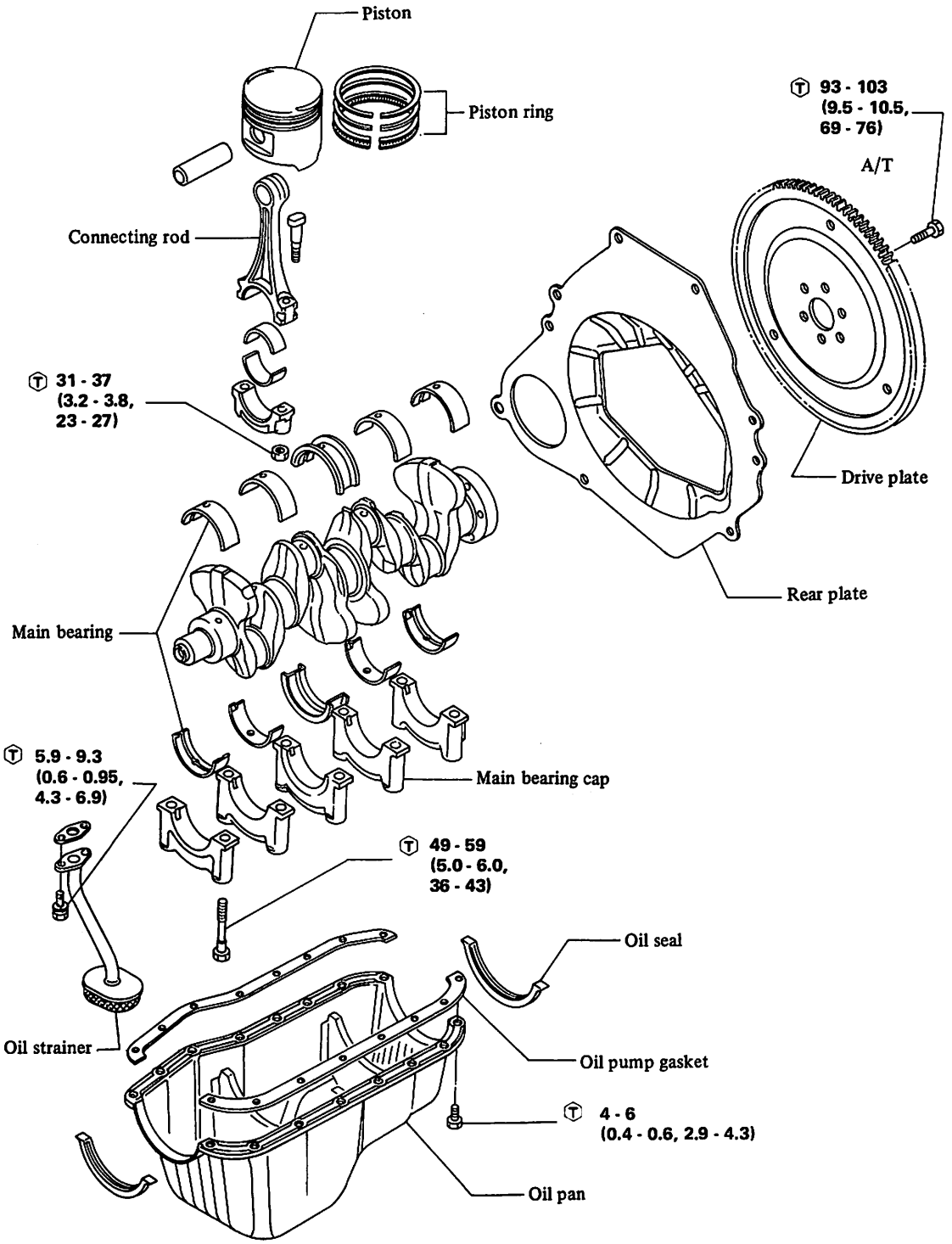
SEM075A

ENGINE COMPONENTS (Internal parts)



Ⓣ : N·m (kg-m, ft-lb)

SEM076A



Ⓣ : N·m (kg-m, ft-lb)

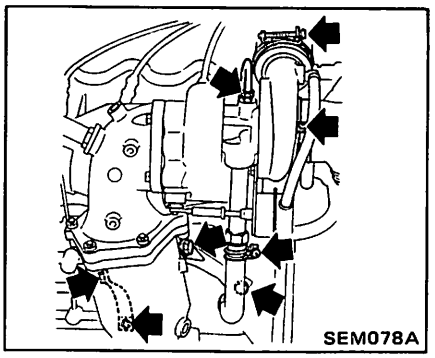
SEM077A

ENGINE DISASSEMBLY

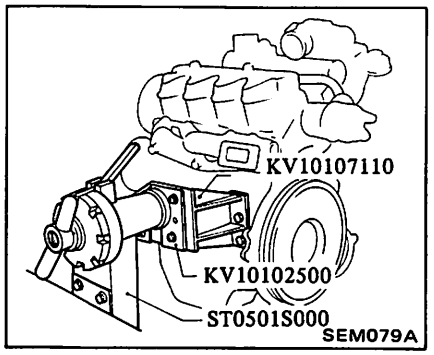
ENGINE OVERALL

MOUNTING ENGINE ON ENGINE STAND

1. Remove transaxle assembly with starter motor.
2. Parts on the left side of the engine
(1) Remove turbocharger cover.
(2) Disconnect the following parts from turbocharger.
- Air duct and inlet air hose
- Oil feed pipe and oil return hose
- Converter gussets



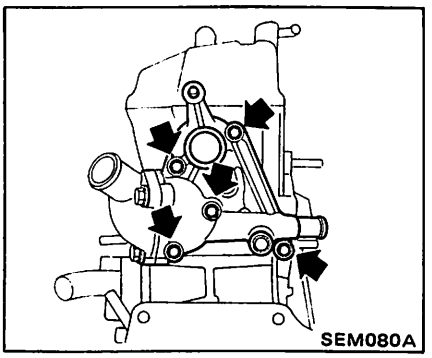
(3) Remove E.G.R. tube.
(4) Remove exhaust manifold with turbocharger.
(5) Remove cooler compressor bracket and engine mounting bracket.
3. Install engine attachment on the engine.
4. Place engine on work stand.



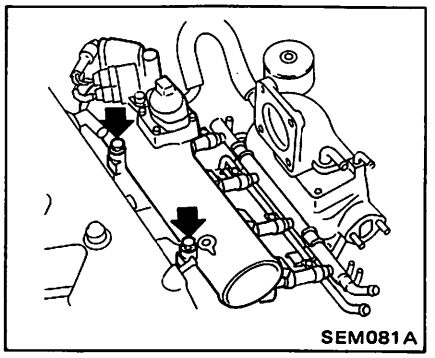
5. Drain engine oil and coolant.

OUTER PARTS

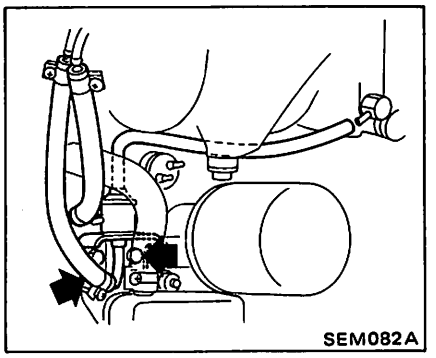
1. Parts at the rear of the engine
(1) Remove distributor together with high tension cable.
(2) Remove thermostat housing.



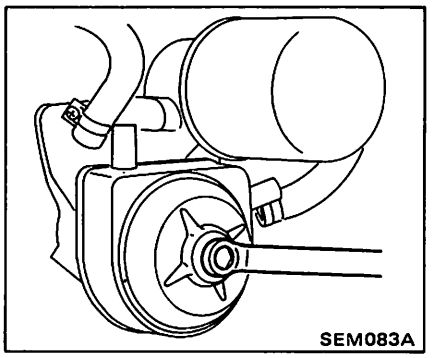
2. Parts on the right side of the engine
(1) Remove throttle chamber and air pipe.



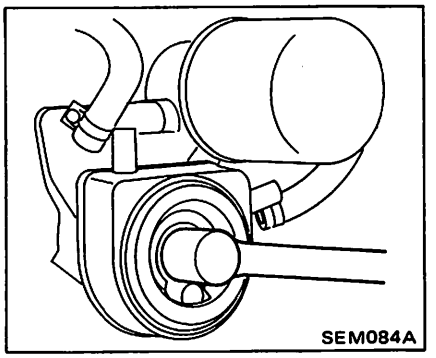
(2) Remove intake manifold gusset, oil cooler hoses and fuel hoses.
(3) Remove intake manifold.
(4) Loosen water pump pulley bolts.
(5) Remove alternator, alternator bracket and drive belt.
(6) Remove oil filter.
(7) Remove oil pump assembly.
(8) Remove pressure regulator.



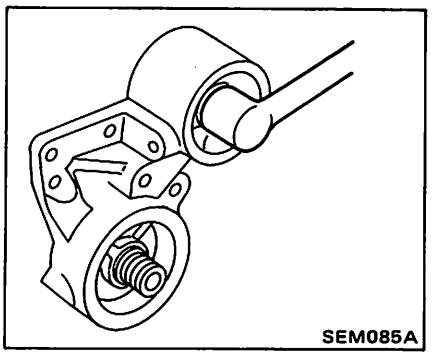
(9) Remove oil cooler cover.



(10) Remove oil cooler assembly.



(11) Remove oil filter and oil filter bracket.

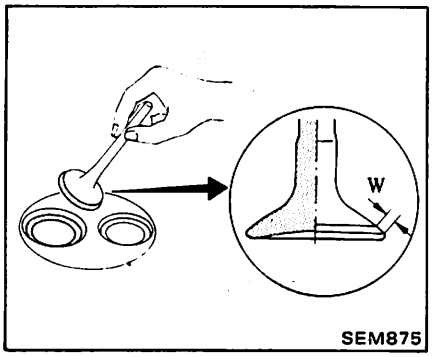


INSPECTION AND REPAIR

CYLINDER HEAD

VALVE SEAT INSERTS

1. Check valve and valve seat inserts for contact.
Coat the valve face with prussian red lead. If contact is wrong, correct valve seat. If the valve red lead appears 360° around face, the valve stem and face are concentric. If not, repair or replace valve.



Valve seat contact W:
Intake
1.4 mm (0.055 in)
Exhaust
1.3 mm (0.051 in)

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

When repairing valve seat, check valve and valve guide for wear beforehand. If worn, replace them. Then correct valve seat.

Replacement

1. Old insert can be removed by heating cylinder head 150 to 160°C (302 to 320°F) in oil.
Then tap the valve insert and remove the valve insert.

Do not damage the cylinder head surface.

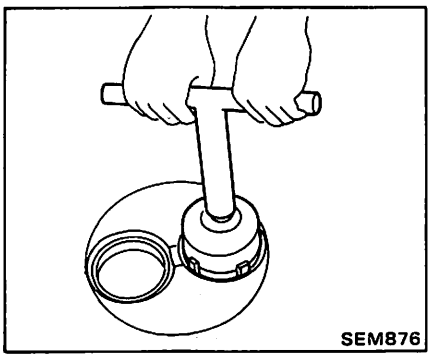
2. Select a suitable valve seat insert and check its outside diameter.
3. Ream the cylinder head recess at room temperature.
4. Heat cylinder head 150 to 160°C (302 to 320°F) in oil.
5. Install valve insert.

When replacing valve insert, valve should also be replaced.

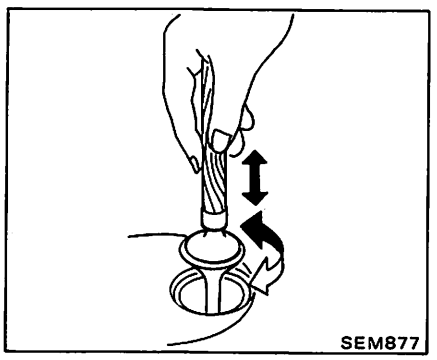
Resurfacing

1. Resurface the valve seat. Refer to S.D.S.

The cutting should be done with both hands for uniform cutting.



2. Apply small amount of fine grinding compound to valve contacting face and put valve into guide.
Lap valve against its seat until proper valve seating is obtained. Remove valve and then clean valve and valve seat.



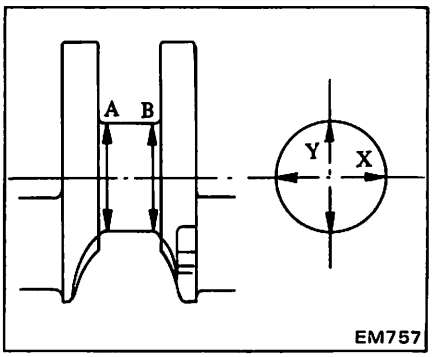
CRANKSHAFT

CRANK JOURNAL AND PIN

1. Repair or replace as required. If faults are minor, correct with fine crocus cloth.
2. Check journals and crank pins with a micrometer for taper and out-of-round. Measurement should be taken along, journals for taper and around journals for out-of-round.

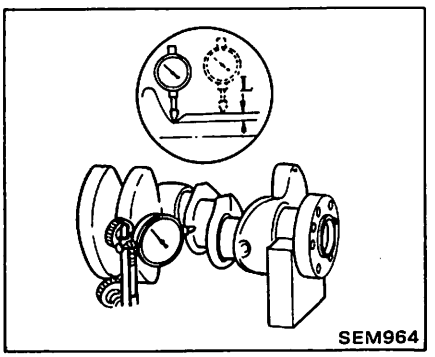
If out-of-round or taper exceeds the specified limit, replace or repair.

Out-of-round (X-Y) and
Taper (A-B):
Less than 0.01 mm (0.0004 in)



a. When regrinding crank pin and crank journal, measure fillet roll. Make sure the measurements exceed the specified limit. If the measurements are lower than the specified limit, do not regrind.

L:
More than 0.13 mm (0.0051 in)



b. Do not grind off fillet roll.
c. Refer to S.D.S. for regrinding crankshaft and available service parts.

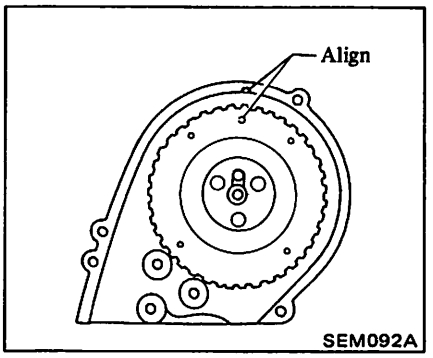
ENGINE ASSEMBLY

ENGINE OVERALL

INTERNAL PARTS

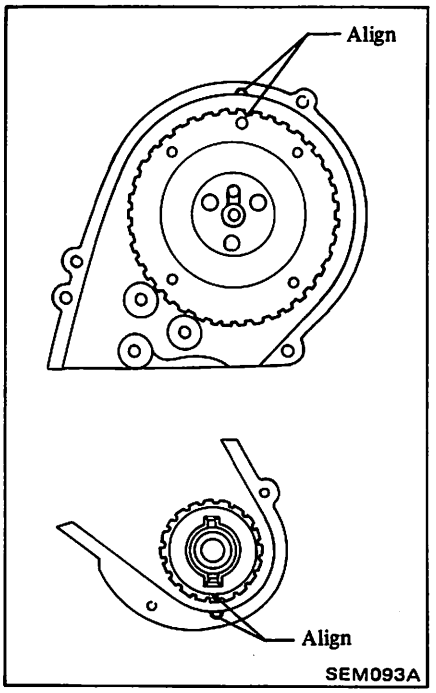
Cylinder head assembly. Install it through gasket by accommodating knock pin of cylinder block as follows:

Align camshaft pulley mark with cylinder head cover mark. This causes valves for No. 1 cylinder to position at top dead center on compression stroke.

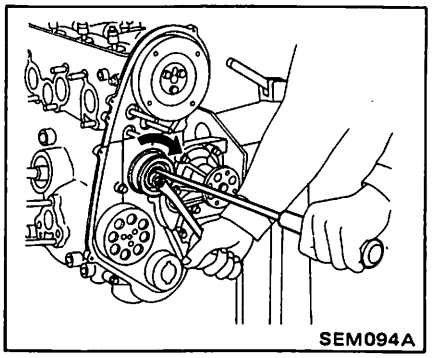


TIMING BELT

1. Ensure that marks on camshaft pulley and cylinder head cover and marks on crankshaft timing pulley and cylinder block cover are properly aligned.



2. Rotate tensioner clockwise about 70 to 80° and temporarily tighten lock nut.



3. Place timing belt on pulleys.

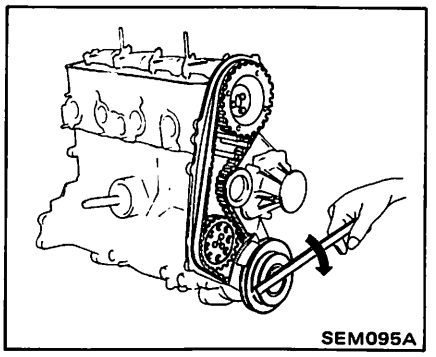
a. When using used belt, be sure to install it with rotating direction mark facing engine rotating direction.

b. Ensure that belt is not loose around jack shaft and camshaft pulleys.

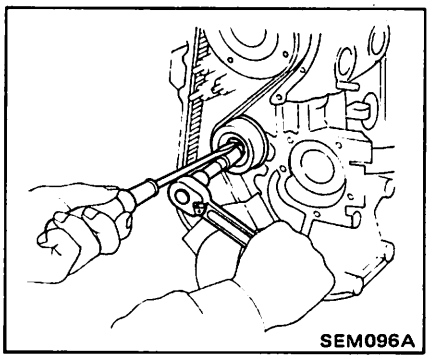
4. Loosen tensioner lock nut so that tensioner pushes on timing belt.
5. Install lower dust cover and crank pulley.

Ⓣ : Crankshaft pulley bolt
113 - 147 N·m
(11.5 - 15.0 kg-m,
83 - 108 ft-lb)

6. Turn crankshaft about a half turn.



7. Tighten nut while preventing tensioner from turning in "free" direction.



Ⓣ : Tensioner lock nut
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

FRONT SIDE PARTS

1. Install water pump pulley.
2. Install spacer and upper dust cover.

LEFT SIDE PARTS

1. Install cooler compressor and engine mounting bracket.
2. Install exhaust manifold with turbocharger.

Ⓣ : Exhaust manifold fixing nut
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

3. Install E.G.R. tube.
4. Install the following parts.

- Air duct and inlet air hose
- Oil feed pipe and oil return hose

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

- Converter gussets

Ⓣ : M8
9 - 14 N·m
(0.9 - 1.4 kg-m,
6.5 - 10.1 ft-lb)
M10
19 - 25 N·m
(1.9 - 2.5 kg-m,
14 - 18 ft-lb)

RIGHT SIDE PARTS

1. Install oil pump assembly with new gasket.

Ⓣ : **Oil pump bolt & nuts**
9 - 14 N·m
(0.9 - 1.4 kg-m,
6.5 - 10.1 ft-lb)

2. Install oil cooler and oil filter bracket.

Ⓣ : **Bracket to cylinder block**
Bolt
29 - 34 N·m
(3.0 - 3.5 kg-m,
22 - 25 ft-lb)
Nut
15 - 24 N·m
(1.5 - 2.4 kg-m,
11 - 17 ft-lb)

Always replace gaskets.

3. Install oil filter stud and oil filter.

Ⓣ : **Oil filter stud**
29 - 34 N·m
(3.0 - 3.5 kg-m,
22 - 25 ft-lb)

4. Install oil cooler assembly.

Ⓣ : **Oil cooler stud**
29 - 34 N·m
(3.0 - 3.5 kg-m,
22 - 25 ft-lb)

5. Install oil cooler cover.

Ⓣ : **Oil cooler cover**
15 - 20 N·m
(1.5 - 2.0 kg-m,
11 - 14 ft-lb)

6. Install pressure regulator.

Ⓣ : **9 - 14 N·m**
(0.9 - 1.4 kg-m,
6.5 - 10.1 ft-lb)

7. Install alternator bracket and alternator.

Ⓣ : **Alternator bracket fixing bolt**
9 - 14 N·m
(0.9 - 1.4 kg-m,
6.5 - 10.1 ft-lb)
Alternator to bracket bolt
44 - 59 N·m
(4.5 - 6.0 kg-m,
33 - 43 ft-lb)
Alternator adjusting bar bolt
9 - 14 N·m
(0.9 - 1.4 kg-m,
6.5 - 10.1 ft-lb)

8. Install intake manifold.

Ⓣ : **Intake manifold fixing nuts**
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

9. Install fuel and water hoses.

10. Install intake manifold gusset.

Ⓣ : **Gusset fixing bolt and nut**
Bolt
15 - 24 N·m
(1.5 - 2.4 kg-m,
11 - 17 ft-lb)
Nut
9 - 14 N·m
(0.9 - 1.4 kg-m,
6.5 - 10.1 ft-lb)

REAR SIDE PARTS

Install thermostat housing with distributor.

Ⓣ : **Thermostat housing fixing bolt**
4 - 6 N·m
(0.4 - 0.6 kg-m,
2.9 - 4.3 ft-lb)

PREADJUSTMENT

1. Adjust valve clearance using cold specification.
2. Adjusting belt deflection.

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

GENERAL SPECIFICATIONS

Cylinder arrangement		4, in-line
Displacement cm³ (cu in)		1,488 (90.80)
Bore and Stroke mm (in)		76 x 82 (2.99 x 3.23)
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

INSPECTION AND ADJUSTMENT

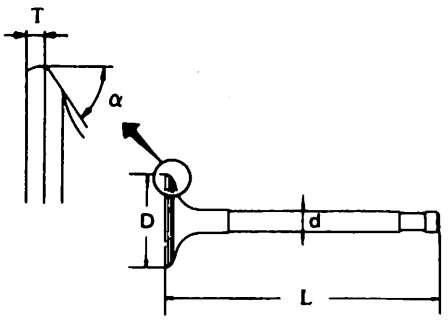
CYLINDER HEAD

Unit: mm (in)

	Standard	Limit
Head surface flatness	Less than 0.05 (0.0020)	0.1 (0.004)

VALVE

Unit: mm (in)



SEM188

Valve head diameter "D"	Intake	37.0 (1.457)
	Exhaust	31.0 (1.220)
Valve length "L"	Intake	119.4 - 119.8 (4.70 - 4.72)
	Exhaust	119.65 - 120.05 (4.71 - 4.73)
Valve stem diameter "d"	Intake	6.970 - 6.985 (0.2744 - 0.2750)
	Exhaust	6.945 - 6.960 (0.2734 - 0.2740)
Valve seat angle "α"	Intake	60°30'
	Exhaust	45°30'
Valve margin "T" limit		0.5 (0.020)
Valve stem end surface grinding limit		0.2 (0.008)
Valve clearance Hot [*Cold]	Intake	0.28 (0.011) [*0.22 (0.009)]
	Exhaust	0.28 (0.011) [*0.22 (0.009)]

*Cold: Used as approximate values during engine assembly, clearances should ultimately be adjusted to the above hot values; refer to section MA for procedures.

Valve spring

Free height mm (in)	46.70 (1.8386)
Pressure height mm/N (mm/kg, in/lb)	30.2/568.61 (30.2/57.98, 1.189/127.85)
Assembled height mm/N (mm/kg, in/lb)	39.2/229.78 (39.2/23.43, 1.543/51.66)
Out of square "S" mm (in)	2.0 (0.079)

Valve guide

Unit: mm (in)

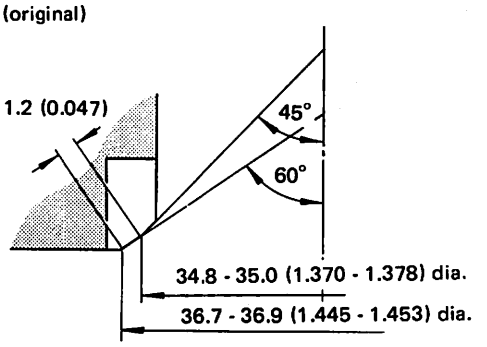
		Standard	Service
Valve guide Outer diameter		12.033 - 12.044 (0.4737 - 0.4742)	12.256 - 12.274 (0.4825 - 0.4832)
Valve guide Inner diameter [Finished size]		7.005 - 7.020 (0.2758 - 0.2764)	
Cylinder head valve guide hole diameter		11.970 - 11.988 (0.4713 - 0.4720)	12.200 - 12.211 (0.4803 - 0.4807)
Interference fit of valve guide		0.045 - 0.074 (0.0018 - 0.0029)	
		Standard	Max. tolerance
Stem to guide clearance	Intake	0.02 - 0.05 (0.0008 - 0.0020)	0.1 (0.004)
	Exhaust	0.045 - 0.075 (0.0018 - 0.0030)	
Valve deflection limit		0.2 (0.008)	

Valve seat

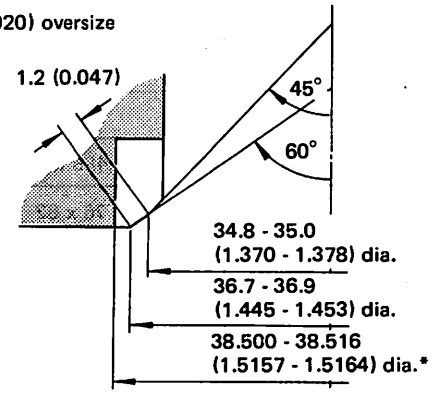
Unit: mm (in)

INTAKE

Standard (original)



0.5 (0.020) oversize



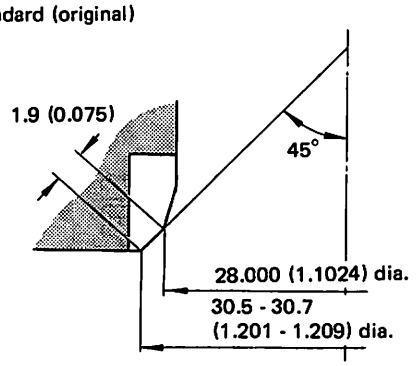
*Cylinder head maching data.

SEM097A

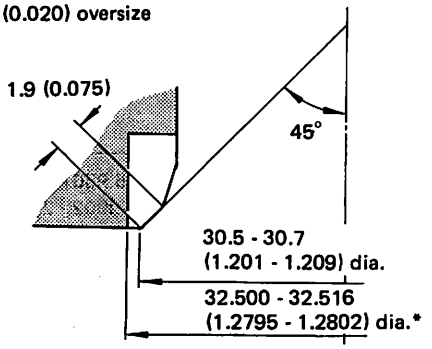
EXHAUST

Unit: mm (in)

Standard (original)



0.5 (0.020) oversize



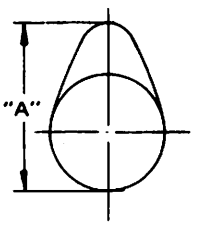
*Cylinder head maching data.

SEM098A

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

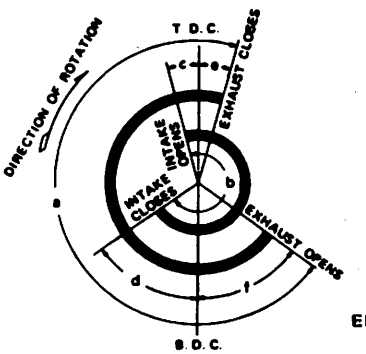
		Standard	Max. tolerance
Camshaft journal to bearing clearance	No. 1,3,5	0.035 - 0.076 (0.0014 - 0.0030)	0.15 (0.0059)
	No. 2, 4	0.078 - 0.119 (0.0031 - 0.0047)	0.20 (0.0079)
Inner diameter of camshaft bearing		42.000 - 42.025 (1.6535 - 1.6545)	–
Outer diameter of camshaft journal	No. 1,3,5	41.949 - 41.965 (1.6515 - 1.6522)	–
	No. 2, 4	41.906 - 41.922 (1.6498 - 1.6505)	
Camshaft bend [T.I.R*]		Less than 0.02 (0.0008)	0.1 (0.004)
Camshaft end play		0.15 - 0.29 (0.0059 - 0.0114)	0.4 (0.016)



EM671

Cam height "A"	Intake	35.884 - 36.134 (1.4128 - 1.4226)
	Exhaust	35.64 - 35.89 (1.4031 - 1.4130)
Wear limit of cam height		0.20 (0.0079)

Valve timing



EM120

Unit: degree

a	b	c	d	e	f
232	232	11	41	6	46

* Total indicator reading

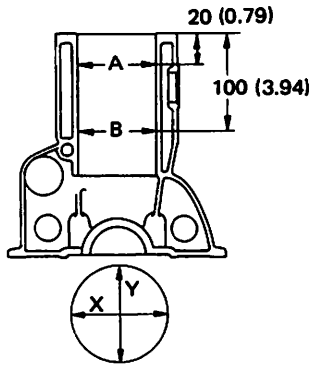
JACK SHAFT AND JACK SHAFT BUSHING

Unit: mm (in)

		Standard	Max. tolerance
Jack shaft journal to bushing clearance	FR	0.027 - 0.109 (0.0011 - 0.0043)	0.15 (0.0059)
	RR	0.028 - 0.110 (0.0011 - 0.0043)	
Inner diameter of jack shaft bushing	FR	32.020 - 32.085 (1.2606 - 1.2632)	
	RR	28.620 - 28.685 (1.1268 - 1.1293)	
Outer diameter of jack shaft journal	FR	31.987 - 32.000 (1.2593 - 1.2598)	
	RR	28.587 - 28.600 (1.1255 - 1.1260)	
Jack shaft end play		0.045 - 0.105 (0.0018 - 0.0041)	

CYLINDER BLOCK

Unit: mm (in)



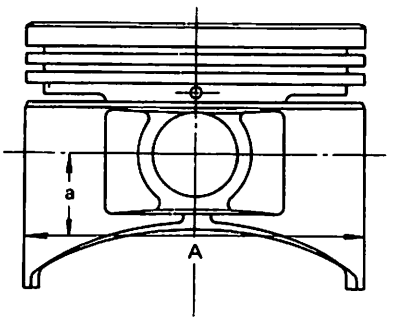
SEM548

		Standard	Wear limit
Surface flatness		Less than 0.05 (0.0020)	0.10 (0.0039)
Cylinder bore	Inner diameter	76.00 - 76.05 (2.9921 - 2.9941)	76.20 (3.0000)
	Out-of-round (X-Y)	Less than 0.015 (0.0006)	–
	Taper (A-B)	Less than 0.02 (0.0008)	–
Difference in inner diameter between cylinders		Less than 0.05 (0.0020)	–

PISTON, PISTON RING AND PISTON PIN

Piston

Unit: mm (in)



SEM646

Piston skirt diameter "A"	Standard		75.950 - 76.000 (2.9902 - 2.9921)
	Service	Standard	75.970 - 76.020 (2.9909 - 2.9929)
		0.50 (0.0197) oversize	76.450 - 76.500 (3.0098 - 3.0118)
"a" dimension			About 17.0 (0.669)
Piston pin hole diameter			19.003 - 19.012 (0.7481 - 0.7485)
Piston clearance to cylinder block			0.040 - 0.060 (0.0016 - 0.0024)

Piston ring

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.040 - 0.073 (0.0016 - 0.0029)	0.2 (0.008)
	2nd	0.030 - 0.063 (0.0012 - 0.0025)	
	Oil	0.075 - 0.12 (0.0030 - 0.0047)	–
Ring gap	Top	0.14 - 0.22 (0.0055 - 0.0087)	1.0 (0.039)
	2nd	0.15 - 0.25 (0.0059 - 0.0098)	
	Oil (rail ring)	0.20 - 0.6 (0.0079 - 0.0236)	

Piston pin

Unit: mm (in)

Piston pin outer diameter	18.995 - 19.000 (0.7478 - 0.7480)
Piston pin to piston clearance	0.008 - 0.012 (0.0003 - 0.0005)
Interference fit of piston pin to connecting rod	0.017 - 0.038 (0.0007 - 0.0015)

CONNECTING ROD

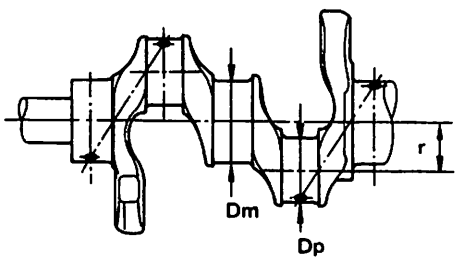
Unit: mm (in)

Center distance		137.5 (5.41)
Bend, torsion [per 100 mm (3.94 in)]	Limit	0.05 (0.0020)
Piston pin bore dia.		18.962 - 18.978 (0.7465 - 0.7472)
Big end play	Standard	0.1 - 0.37 (0.004 - 0.0146)
	Limit	0.5 (0.020)

CRANKSHAFT

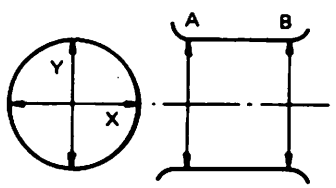
Unit: mm (in)

Main journal dia. "Dm"		49.940 - 49.964 (1.9661 - 1.9671)
Pin journal dia. "Dp"		39.954 - 39.974 (1.5730 - 1.5738)
Center distance "r"		41 (1.61)
Out-of-round (X-Y) and taper (A-B)	Standard	Less than 0.01 (0.0004)
	Limit	0.03 (0.0012)
Bend [T.I.R.]	Standard	Less than 0.05 (0.0020)
	Limit	0.10 (0.0039)
Free end play	Standard	0.05 - 0.18 (0.0020 - 0.0071)
	Limit	0.30 (0.0118)



SEM645

Out-of-round X-Y
Taper A-B



EM715

BEARING

Bearing clearance

Unit: mm (in)

	Standard	Limit
Main bearing clearance		
Nos. 1 and 5	0.031 - 0.076 (0.0012 - 0.0030)	
Nos. 2 and 4	0.029 - 0.088 (0.0011 - 0.0035)	0.10 (0.0039)
No. 3	0.031 - 0.092 (0.0012 - 0.0036)	
Connecting rod bearing clearance	0.016 - 0.058 (0.0006 - 0.0023)	0.10 (0.0039)

Main bearing undersize

Unit: mm (in)

	Crank main journal diameter "Dm"
Standard	49.943 - 49.964 (1.9663 - 1.9671)
Undersize 0.25 (0.0098)	49.701 - 49.714 (1.9567 - 1.9572)

Connecting rod bearing undersize

Unit: mm (in)

	Crank pin journal diameter "Dp"
Standard	39.954 - 39.974 (1.5730 - 1.5738)
Undersize 0.25 (0.0098)	39.704 - 39.724 (1.5631 - 1.5639)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

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

TIGHTENING TORQUE

Enigne outer parts

Unit	N·m	kg-m	ft-lb
Air pipe to intake manifold	9 - 14	0.9 - 1.4	6.5 - 10.1
Air regulator to intake manifold	1 - 2	0.1 - 0.2	0.7 - 1.4
Alternator bracket to cylinder block	9 - 14	0.9 - 1.4	6.5 - 10.1
Alternator adjust bar bolt	9 - 14	0.9 - 1.4	6.5 - 10.1
Alternator to bracket	44 - 59	4.5 - 6.0	33 - 43
Collector to intake manifold	4 - 6	0.4 - 0.6	2.9 - 4.3
Compressor bracket bolt	26 - 34	2.7 - 3.5	20 - 25
Compressor to bracket	26 - 34	2.7 - 3.5	20 - 25
Converter to exhaust manifold	22 - 29	2.2 - 3.0	16 - 22
Crank pulley bolt	113 - 147	11.5 - 15.0	83 - 108
Detonation sensor	25 - 34	2.5 - 3.5	18 - 25
Dust cover screw	4 - 6	0.4 - 0.6	2.9 - 4.3
E.G.R. tube nut	39 - 59	4 - 6	29 - 43
Engine mounting bracket to cylinder block	29 - 39	3.0 - 4.0	22 - 29
Engine mounting bracket to cylinder head	16 - 21	1.6 - 2.1	12 - 15
Exhaust manifold gusset			
M8	9 - 14	0.9 - 1.4	6.5 - 10.1
M10	19 - 25	1.9 - 2.5	14 - 18
Exhaust outlet to exhaust manifold	29 - 34	3.0 - 3.5	22 - 25
Idle control unit to intake manifold	9 - 14	0.9 - 1.4	6.5 - 10.1
Intake & exhaust manifold nut	16 - 21	1.6 - 2.1	12 - 15
Intake manifold gusset			
Bolt	15 - 24	1.5 - 2.4	11 - 17
Nut	9 - 14	0.9 - 1.4	6.5 - 10.1
Oil cooler cover	15 - 20	1.5 - 2.0	11 - 14
Oil cooler & oil filter bracket to block			
Bolt	29 - 34	3.0 - 3.5	22 - 25
Nut	15 - 24	1.5 - 2.4	11 - 17
Oil cooler stud	29 - 34	3.0 - 3.5	22 - 25
Oil filter stud	29 - 34	3.0 - 3.5	22 - 25
Oil pump securing bolt	9 - 14	0.9 - 1.4	6.5 - 10.1
Oil pump securing nut	9 - 14	0.9 - 1.4	6.5 - 10.1
Pressure regulator	9 - 14	0.9 - 1.4	6.5 - 10.1
Spark plug	20 - 29	2.0 - 3.0	14 - 22
Thermostat housing bolt	4 - 6	0.4 - 0.6	2.9 - 4.3
Throttle chamber bolt	15 - 20	1.5 - 2.0	11 - 14
Turbocharger oil feed tube	20 - 29	2.0 - 3.0	14 - 22
Turbocharger to exhaust manifold	29 - 34	3.0 - 3.5	22 - 25
Water pump bolt	4 - 6	0.4 - 0.6	2.9 - 4.3
Water pump pulley bolt	4 - 6	0.4 - 0.6	2.9 - 4.3

Engine internal parts

Unit	N·m	kg-m	ft-lb
Camshaft pulley bolt	6 - 8	0.6 - 0.8	4.3 - 5.8
Connecting rod nut	31 - 37	3.2 - 3.8	23 - 27
Cylinder head bolt			
1st	39 - 44	4.0 - 4.5	29 - 33
2nd	69 - 74	7.0 - 7.5	51 - 54
Cylinder head front cover	4 - 6	0.4 - 0.6	2.9 - 4.3
Drive plate bolt	93 - 103	9.5 - 10.5	69 - 76
Front cover bolt	4 - 6	0.4 - 0.6	2.9 - 4.3
Jack shaft pulley bolt	6 - 8	0.6 - 0.8	4.3 - 5.8
Main bearing cap bolt	49 - 59	5.0 - 6.0	36 - 43
Oil pan bolt & nut	4 - 6	0.4 - 0.6	2.9 - 4.3
Oil pan drain plug	35 - 47	3.6 - 4.8	26 - 35
Oil strainer bolt	5.9 - 9.3	0.6 - 0.95	4.3 - 6.9
Rocker arm lock nut	16 - 21	1.6 - 2.1	12 - 15
Rocker cover nut	4 - 8	0.4 - 0.8	2.9 - 5.8
Rocker shaft bolt	16 - 21	1.6 - 2.1	12 - 15
Tensioner lock nut	16 - 21	1.6 - 2.1	12 - 15

ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

CONTENTS

ENGINE LUBRICATION SYSTEM ..... LC- 2
- Lubrication circuit ..... LC- 2
- Oil pump ..... LC- 3
- Oil filter and oil cooler ..... LC- 5

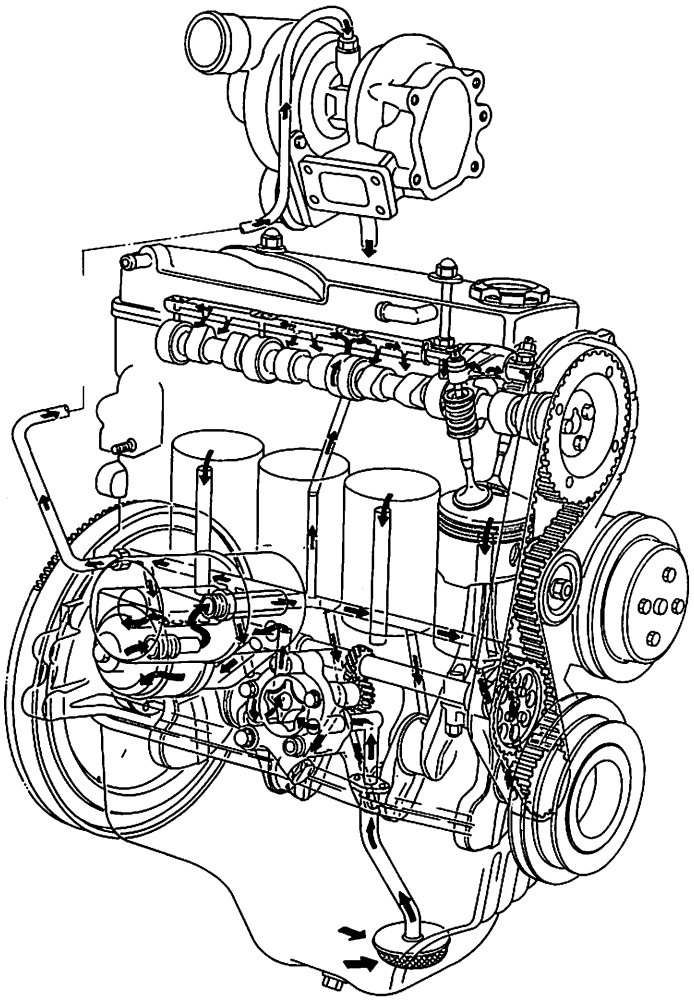
COOLING SYSTEM ..... LC- 6
- Cooling circuit ..... LC- 6
- Water pump ..... LC- 7
- Thermostat ..... LC- 8
- Radiator and cooling fan ..... LC- 9

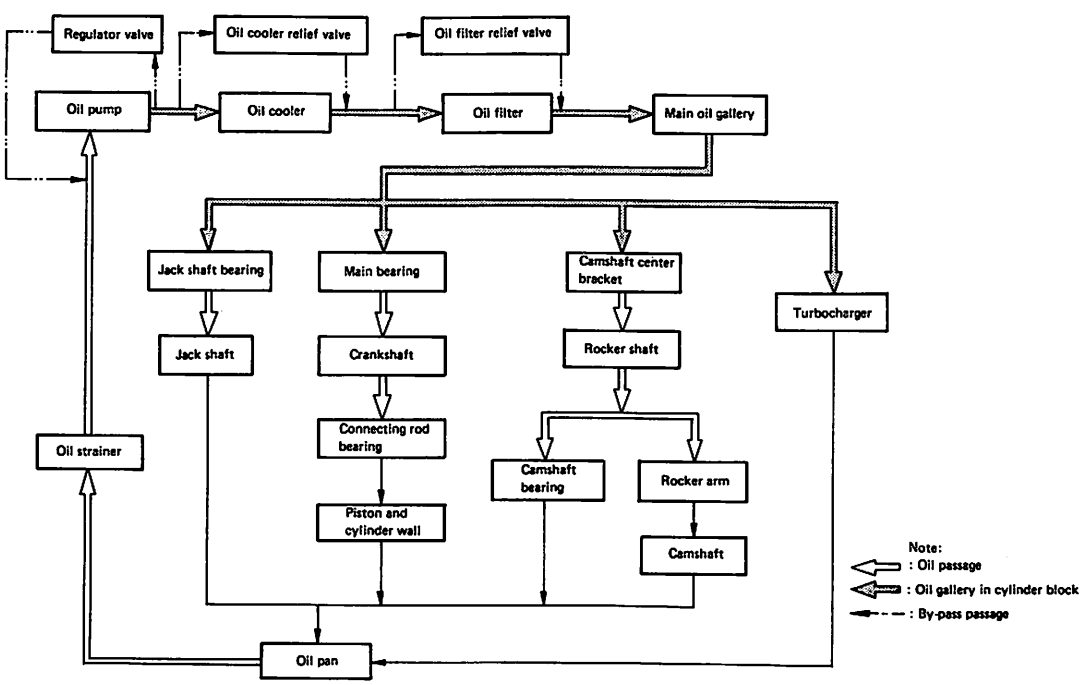
SERVICE DATA AND SPECIFICATIONS (S.D.S.) LC-13
- Engine lubrication system LC-13
- Engine cooling system LC-13

SPECIAL SERVICE TOOLS LC-14

ENGINE LUBRICATION SYSTEM

LUBRICATION CIRCUIT



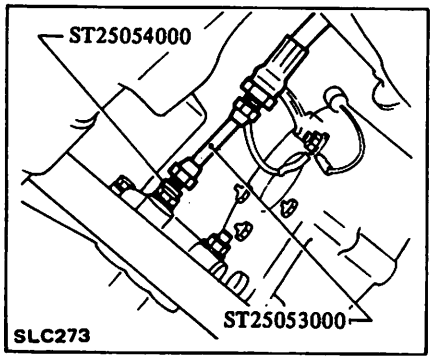


SLC486

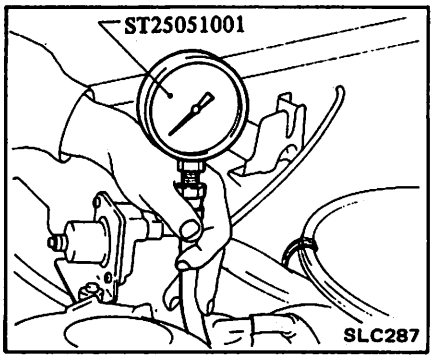
OIL PUMP

OIL PRESSURE CHECK

1. Warm up engine.
2. Remove oil pressure switch.
3. Install pressure gauge and gauge adapter to oil pressure switch hole.



4. Start engine and check oil pressure.



Engine rpm	Discharge pressure kPa (kg/cm², psi)
1,050	196 (2, 28)
1,700	294 (3, 43)
5,150	392 (4, 57)

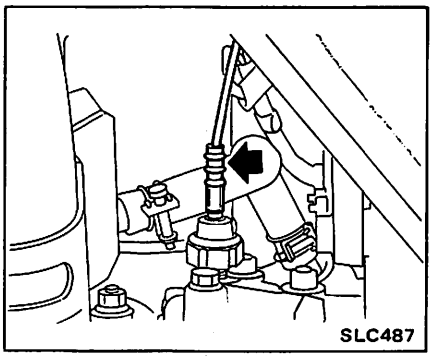
The above table shows data tested when SEA 20W-20 oil is used and oil temperature is between 73 and 83°C (163 and 181°F). Slight difference will be found because of oil grade or oil temperature. If difference is extreme, check oil passage, oil pump, and for oil leaks.

5. Remove pressure gauge and gauge adapter.
6. Install oil pressure switch.

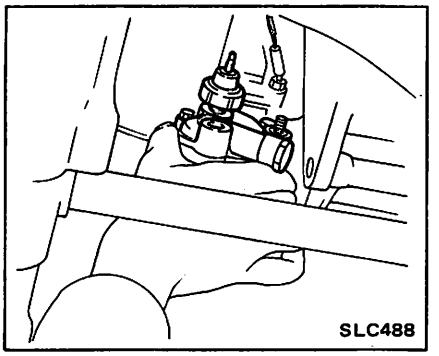
If oil pressure is outside the specifications, check pump for clogged oil passage, leaks, etc.

REMOVAL

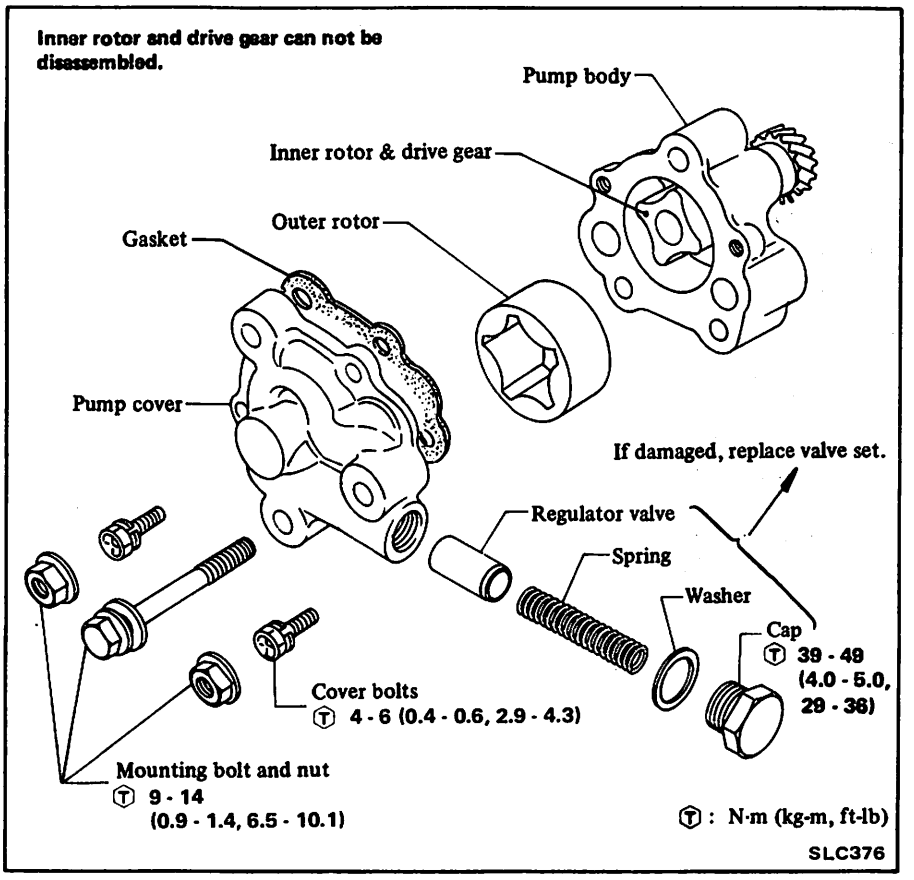
1. Remove alternator lower bolt on oil pump side.
2. Disconnect oil pressure gauge harness.



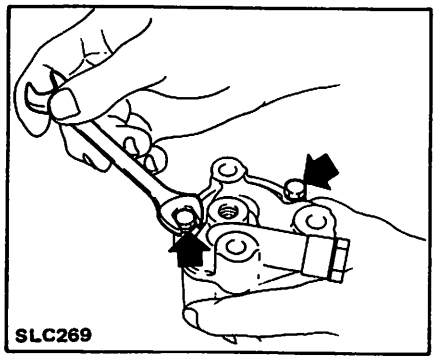
3. Remove oil pump assembly.



DISASSEMBLY AND ASSEMBLY



1. Remove pump cover bolts.

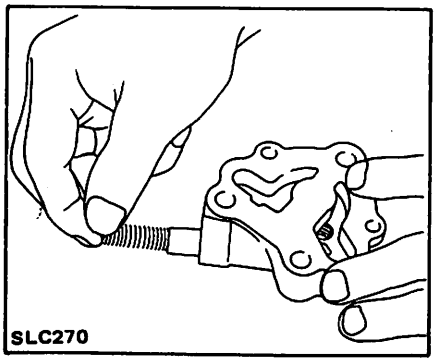


2. Take out outer rotor.

Inner rotor and drive gear cannot be disassembled.

3. Remove regulator valve.

When placing oil pump in a vise, use extreme care not to distort pump body and cover in the jaws.



4. Assemble oil pump in the reverse order of removal.

Use new gasket.

Ⓣ : Regulator valve cap nut
39 - 49 N·m
(4.0 - 5.0 kg-m,
29 - 36 ft-lb)
Oil pump cover bolt
4 - 6 N·m
(0.4 - 0.6 kg-m,
2.9 - 4.3 ft-lb)

INSPECTION

1. Inspect pump body and cover for cracks or excessive wear.
2. Inspect pump rotors for excessive wear.
3. Check inner rotor shaft for looseness in pump body.

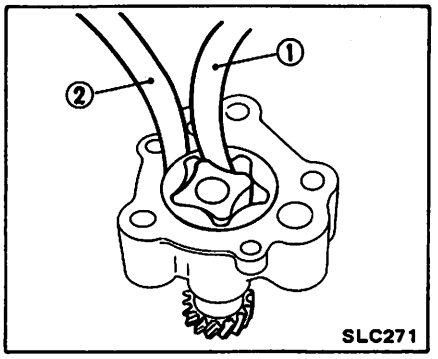
If pump rotors or body are damaged or worn, replacement of the entire oil pump assembly is necessary.

4. Check oil pressure regulator valve sliding surface and vlave spring.

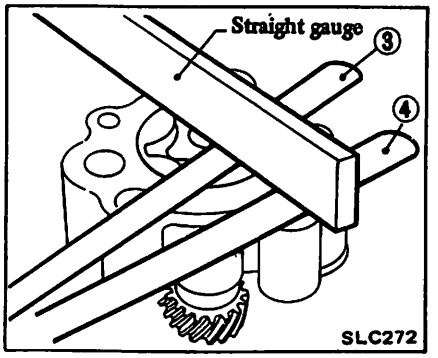
If damaged, replace valve set.

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

Rotor tip clearance ①:
Less than
0.12 mm (0.0047 in)
Outer rotor to body clearance ②:
0.15 - 0.21 mm
(0.0059 - 0.0083 in)



Rotor to straight edge ③:
Less than
0.05 mm (0.0020 in)
Oil pump body to straight edge ④:
Less than
0.02 mm (0.0008 in)



INSTALLATION

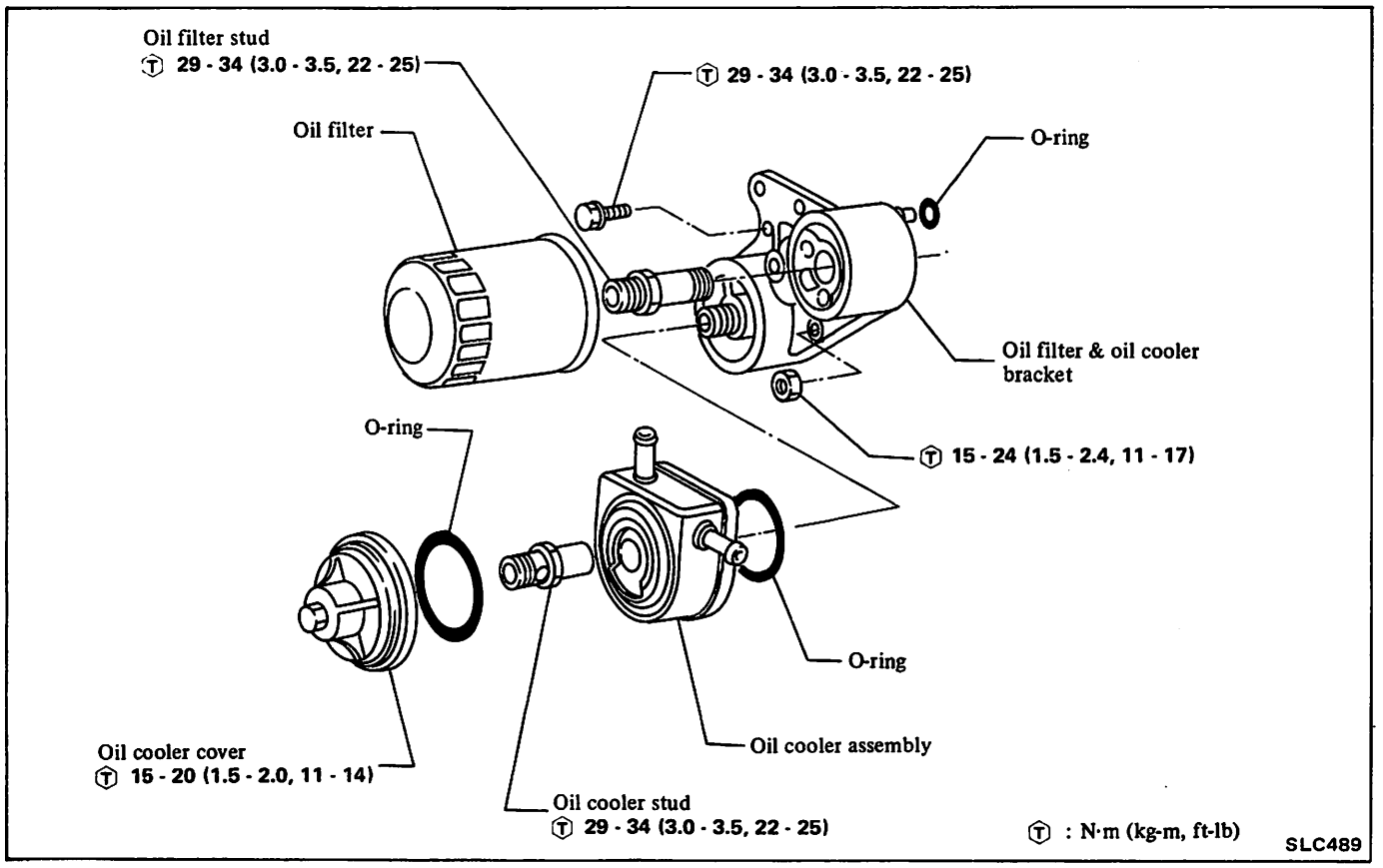
1. Apply engine oil to pump drive gear and shaft.
2. Charge engine oil into pump and turn pump drive gear several times.
3. Using a new gasket, install oil pump assembly.

Ⓣ : Oil pump mounting bolt & nuts
9 - 14 N·m
(0.9 - 1.4 kg-m,
6.5 - 10.1 ft-lb)

4. Refill engine with oil.

After installation, run engine for a few minutes, and check for leaks.

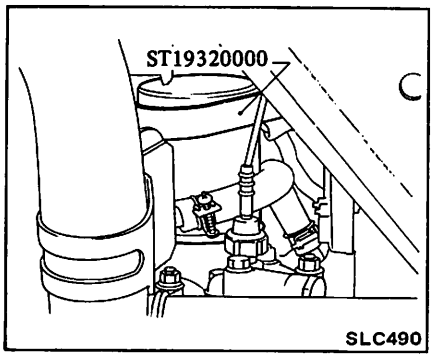
OIL FILTER AND OIL COOLER



OIL FILTER

Replacement

1. Remove oil filter.



2. Install oil fitler.

Hand-tighten only.
Do not use a wrench to tighten the filter.

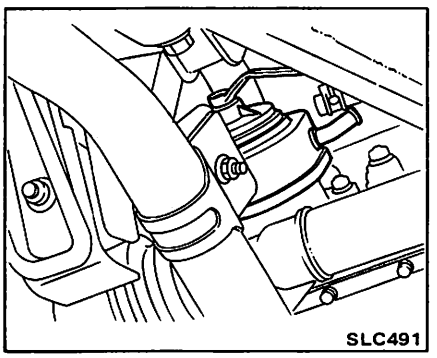
3. Refill with the specified quantity of engine oil.

After installation, run engine for a few minutes, and check for leaks.

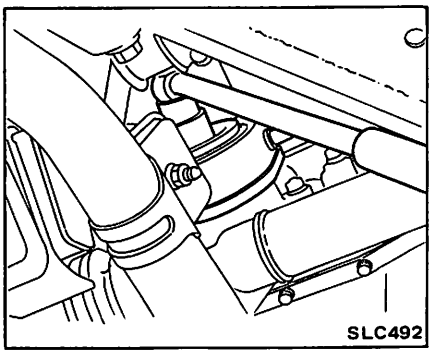
OIL COOLER

Removal

1. Drain about 3 liters (3-1/8 US qt, 2-5/8 Imp qt) of engine coolant.
2. Disconnect water hoses on oil cooler side.
3. Remove oil cooler cover.



4. Remove oil cooler stud.



5. Take out oil cooler.

Installation

Replace O-ring used at oil cooler cover.

1. Install oil cooler.

Ⓣ : Oil cooler stud
29 - 34 N·m
(3.0 - 3.5 kg-m,
22 - 25 ft-lb)

2. Install oil cooler cover.

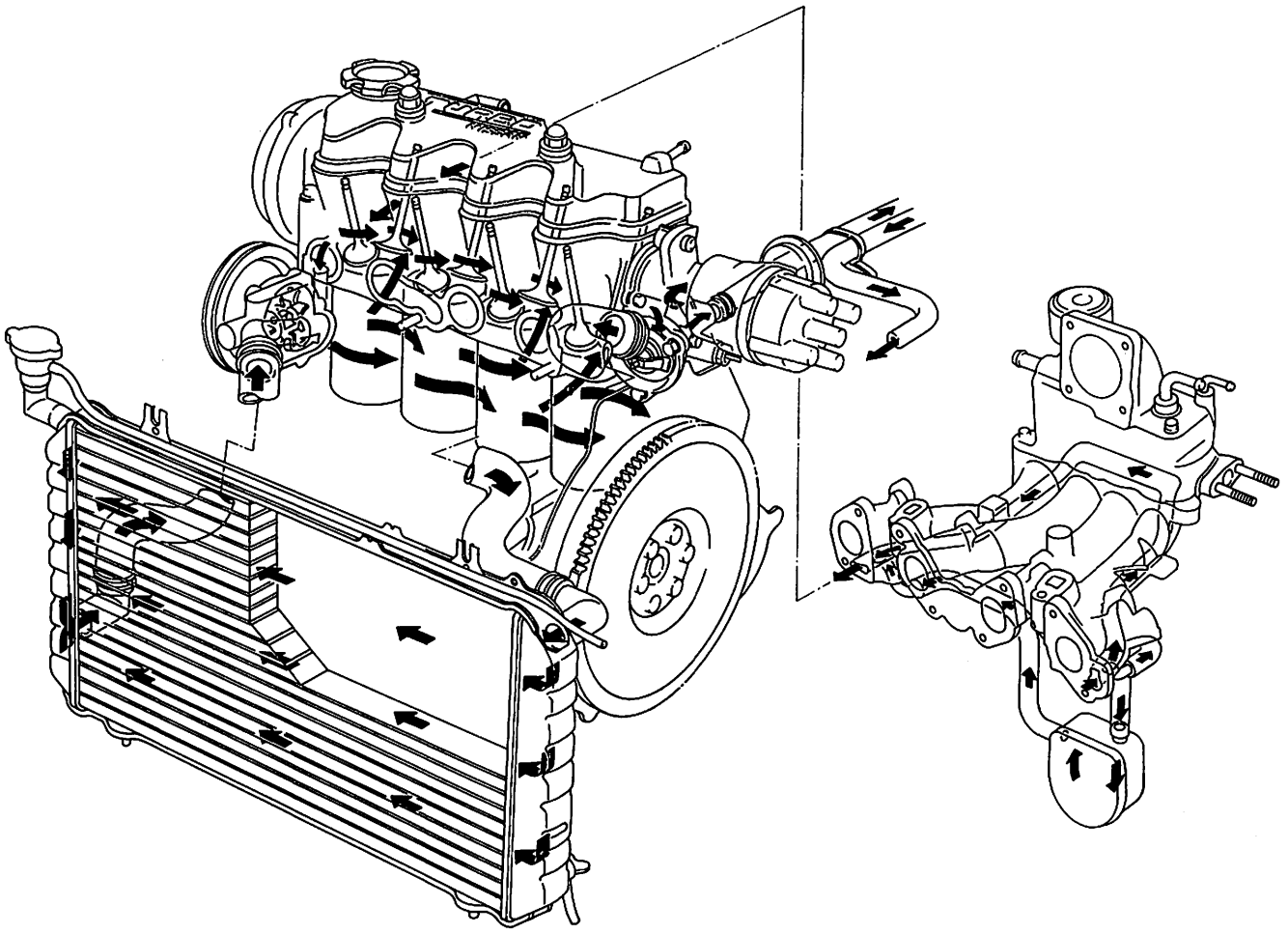
Ⓣ : Oil cooler cover
15 - 20 N·m
(1.5 - 2.0 kg-m,
11 - 14 ft-lb)

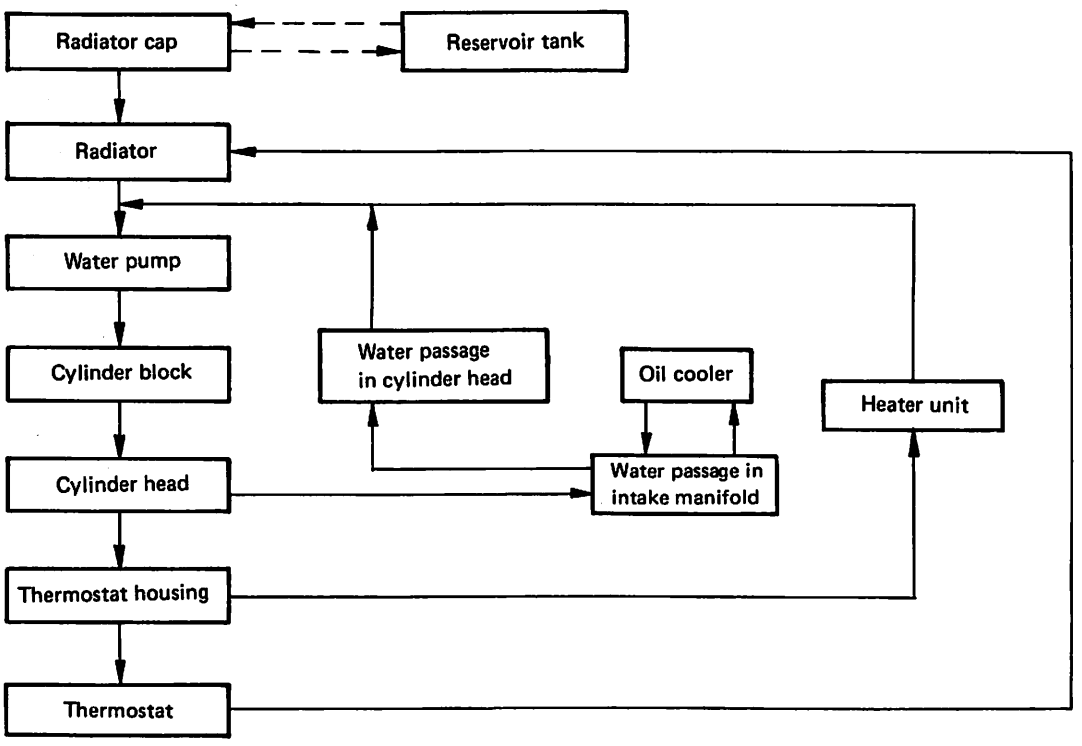
3. Install water hoses.
4. Replenish engine oil and cooling water to the specified quantity.

After installation, run engine for a few minutes, and check for leaks.

COOLING SYSTEM

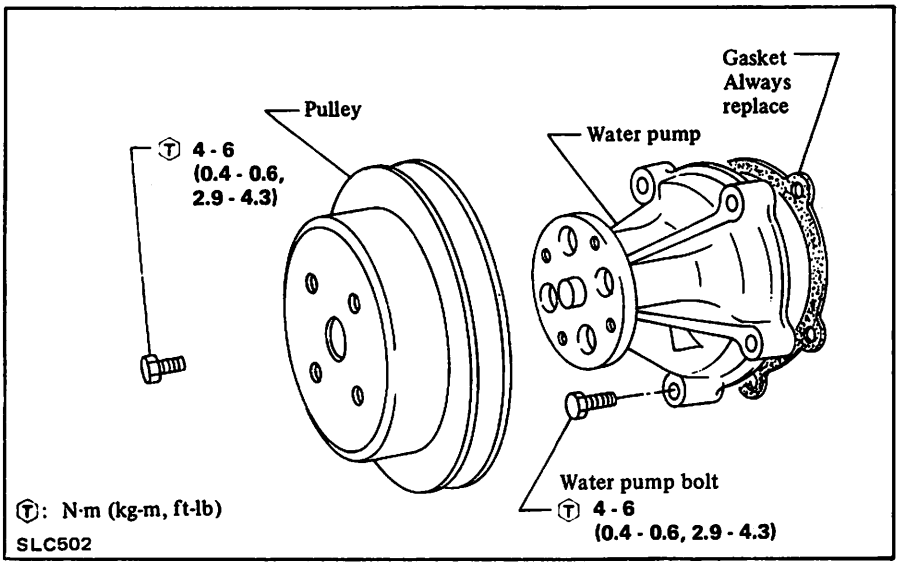
COOLING CIRCUIT





SLC493

WATER PUMP

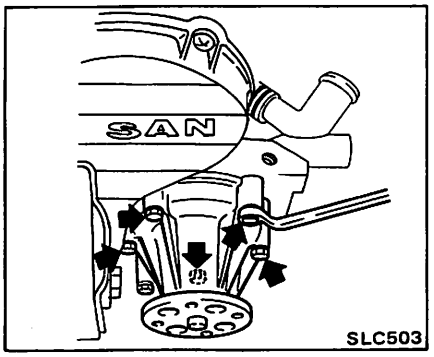


REMOVAL

1. Open radiator drain cock and radiator cap, and drain coolant.

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

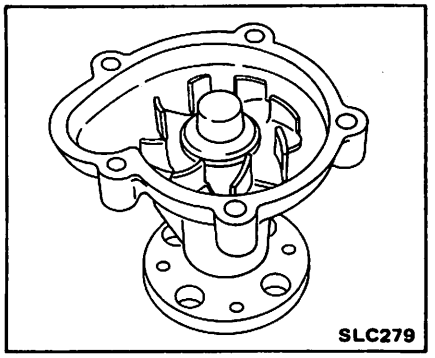
2. Remove water pump (alternator) drive belt.
(1) Loosen alternator securing bolts.
(2) Move alternator toward the engine.
3. Remove water pump pulley.
4. Remove water pump with gasket.



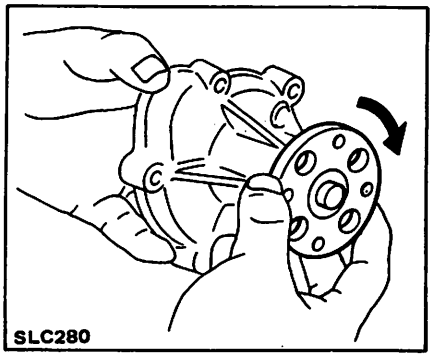
INSPECTION

The water pump cannot be disassembled and should be replaced as a unit.

1. Inspect water pump body and vane for rust or corrosion.



2. Inspect water pump bearing.
Check for excessive end play or rough operation.



INSTALLATION

1. Install water pump, alternator, and drive belts in the reverse order of removal.

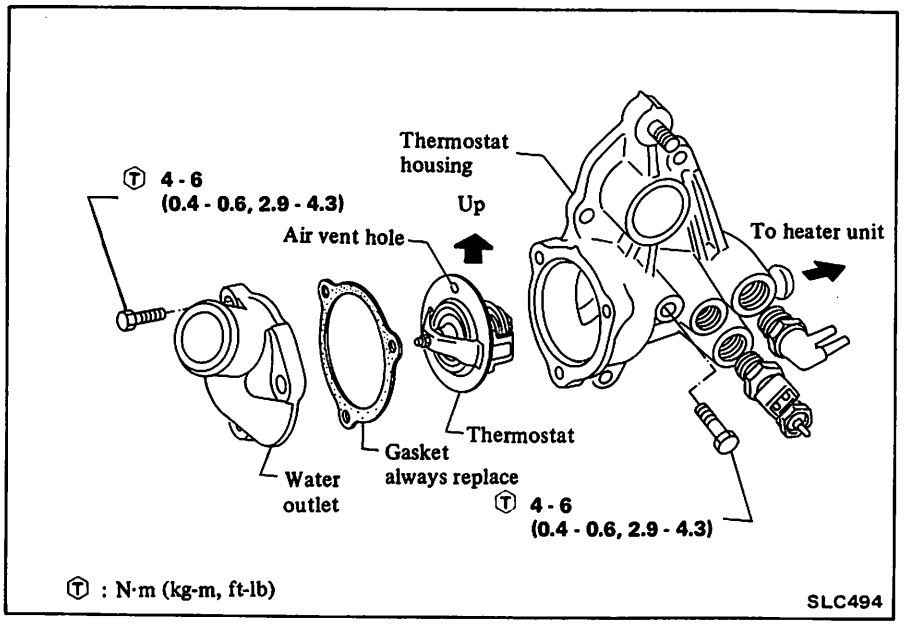
Always use new gasket.

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

2. Adjust drive belt deflection.
Refer to Section MA for drive belt deflection.
3. Fill radiator with coolant.

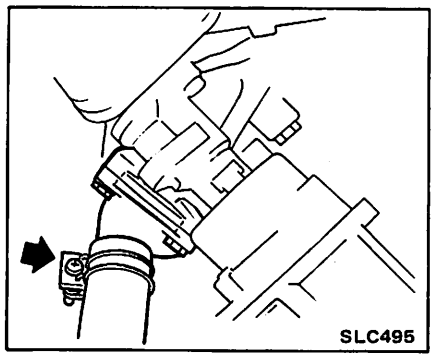
After installation, run engine for a few minutes, and check for leaks.

THERMOSTAT

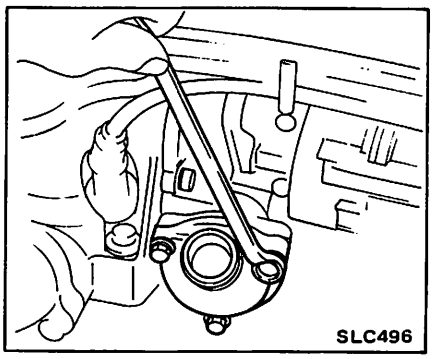


REMOVAL

1. Drain coolant so that its level is below the thermostat housing.
2. Disconnect radiator upper hose on water outlet side.



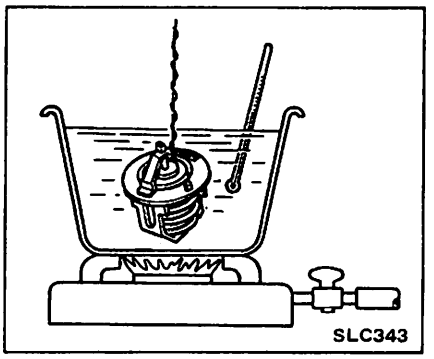
3. Remove water outlet, then remove thermostat with gasket.



INSPECTION

Inspect thermostat for the following and replace if necessary.

1. Valve seating condition at ordinary temperature. It should seat tightly.
2. Valve opening temperature and maximum valve lift. (Refer to S.D.S.)

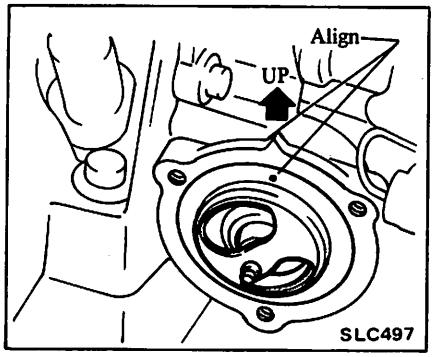


3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

It is necessary to check the new thermostat before installing it.

INSTALLATION

1. Install thermostat to thermostat housing with jiggle valve or air vent facing upward.



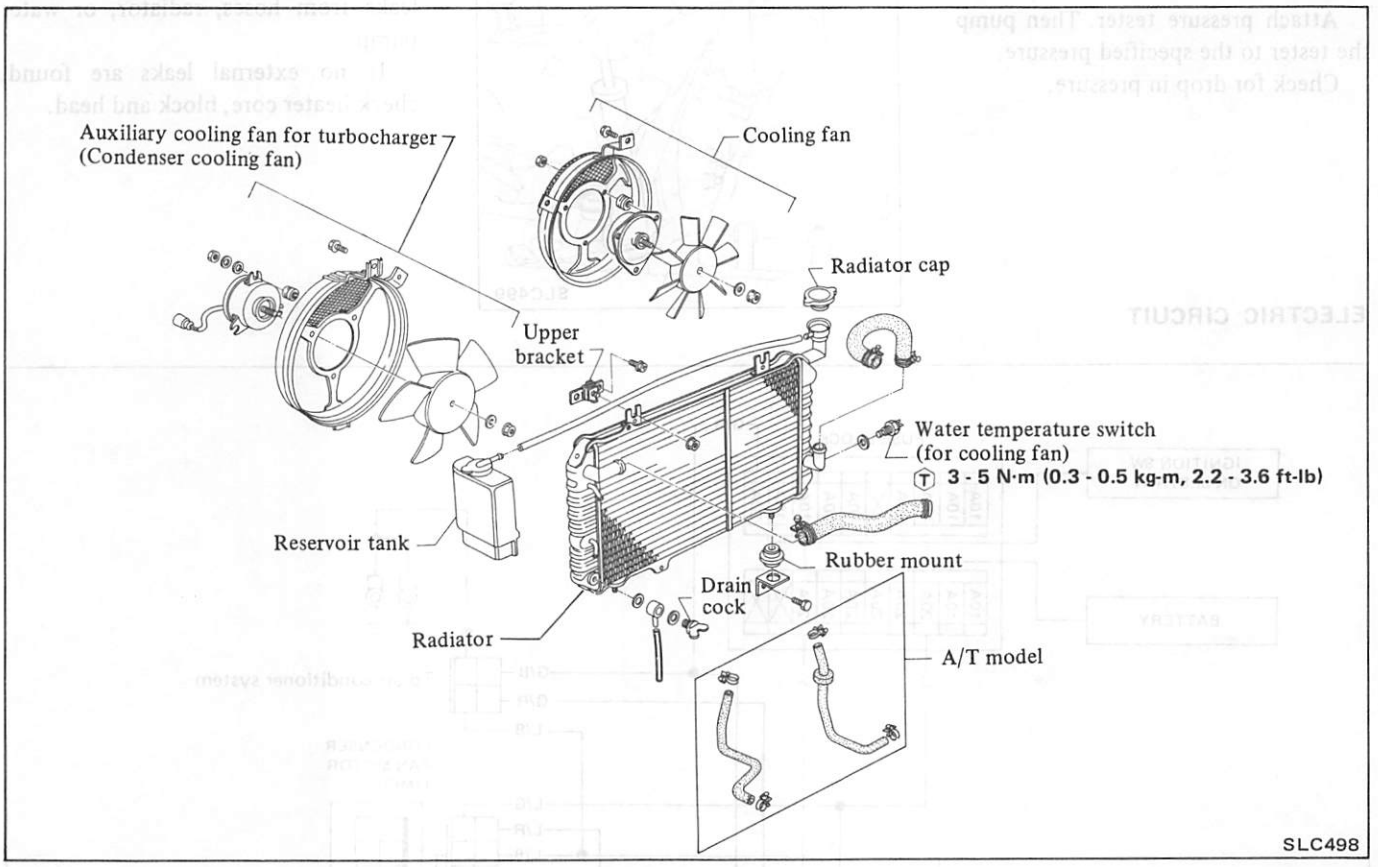
2. Install water outlet together with new gasket.

Ⓣ : Attaching bolt
4 - 6 N·m
(0.4 - 0.6 kg-m,
2.9 0 4.3 ft-lb)

3. Connect radiator upper hose.
4. Fill radiator with coolant.

After installation, run engine for a few minutes, and check for leaks.

RADIATOR AND COOLING FAN



WARNING:

Never remove the radiator cap when engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around cap and carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape and then turn the cap all the way off.

REMOVAL AND INSTALLATION

1. Open radiator drain cock and allow to drain coolant into a suitable container.

WARNING:

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

2. Disconnect radiator upper hose and lower hose.
3. On a car with automatic transaxle, disconnect cooler inlet and outlet hoses from radiator.
4. Remove turbocharger cover.
5. Remove radiator fixing nuts (upper side) and upper mounting brackets.
6. Disconnect water temperature switch wire and remove radiator.
7. Install radiator in the reverse order of removal.
8. Fill radiator with the specified quanity of coolant.

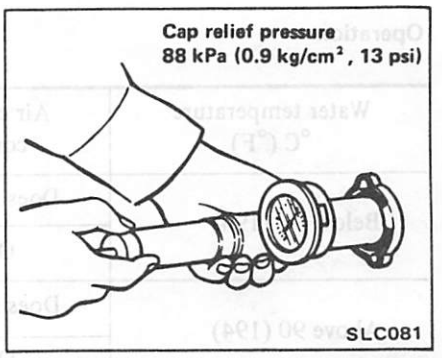
After installation, run engine for a few minutes, and check for leaks.

INSPECTION

Checking radiator cap

Using cap tester, check the radiator cap relief pressure.

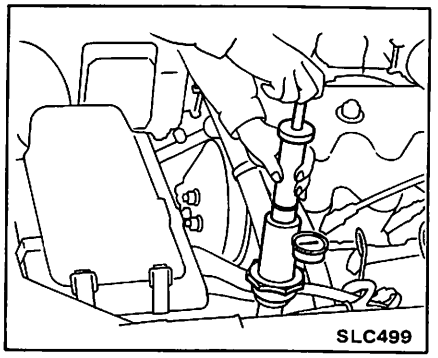
If the pressure gauge drops rapidly and excessively, replace the radiator cap.



Checking cooling system for leaks

Attach pressure tester. Then pump the tester to the specified pressure.

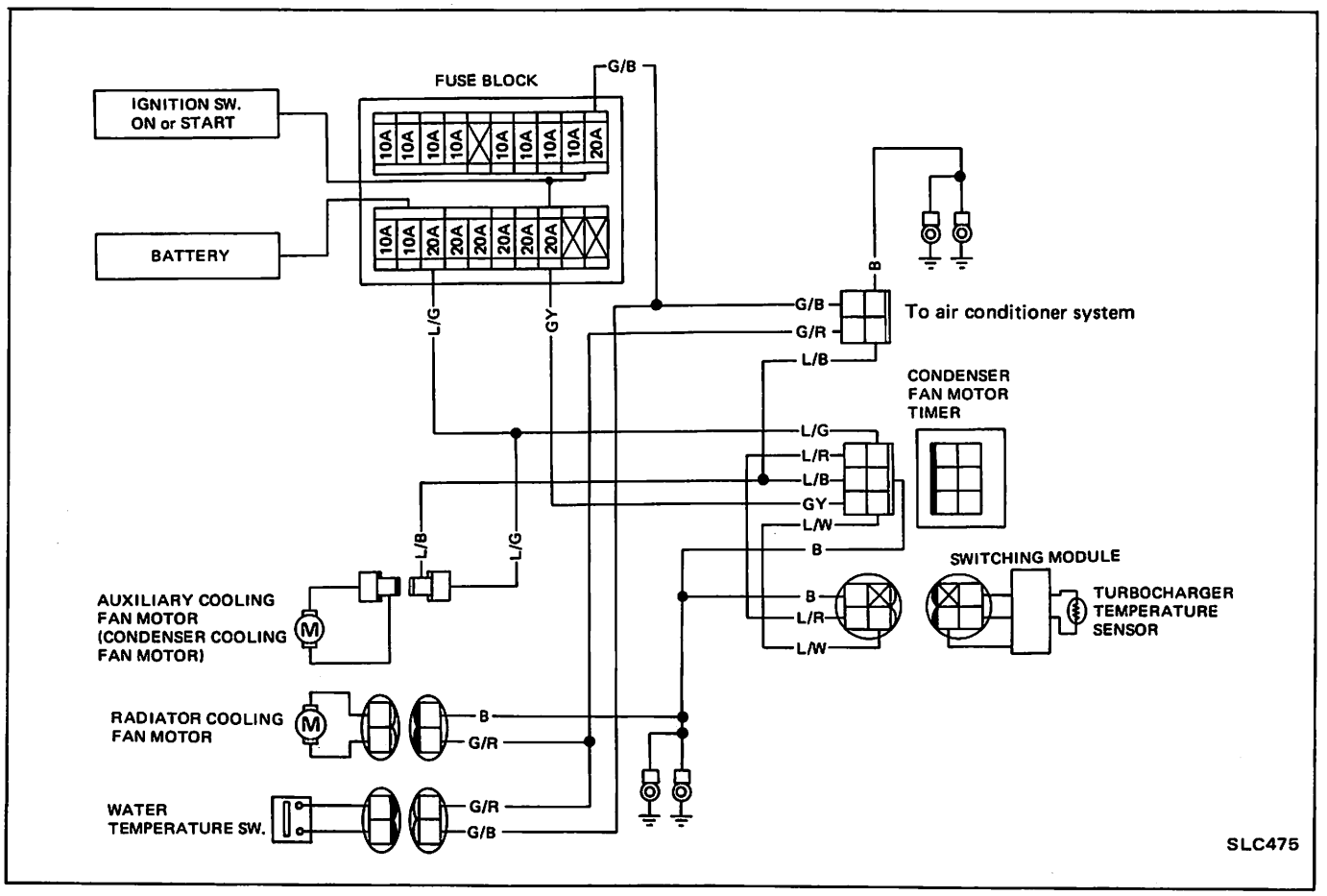
Check for drop in pressure.



If the pressure drops, check for leaks from hoses, radiator, or water pump.

If no external leaks are found, check heater core, block and head.

ELECTRIC CIRCUIT



Operation

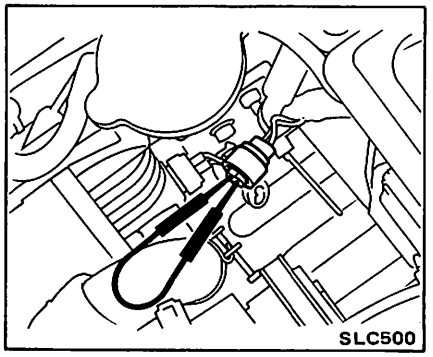
Water temperature °C (°F)	Air conditioner compressor	Radiator cooling fan motor
Below 90 (194)	Does not operate	Does not operate
	Operates	Operates
Above 90 (194)	Does not operate	
	Operates	

On models not equipped with air conditioner, a fan motor does not operate below a water temperature of 90°C (194°F).

RADIATOR COOLING FAN

Inspection

1. Remove battery ground cable and disconnect water temperature switch harness.
2. Connect suitable wire to main harness connection.



3. Connect battery ground cable and turn key switch to "ON" position.
4. Make sure cooling fan is operating. If not, check the following points.

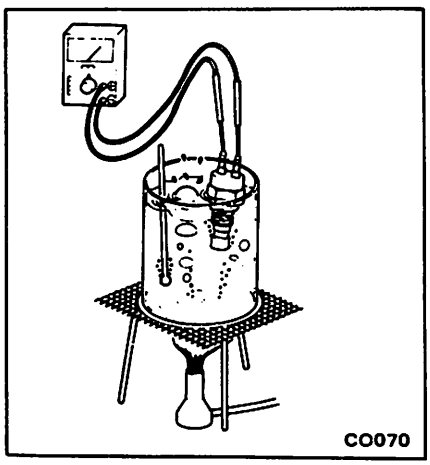
- High and low pressure switch
- Air conditioner switch
- Fan switch

} Refer to HA section.

- Motor relay
- Air conditioner relay

} Refer to EL section.

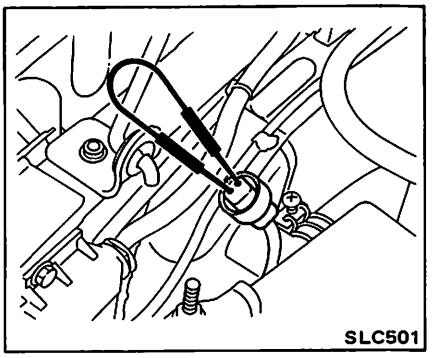
5. If radiator fan fails to operate for cooling system, check water temperature switch to ensure that it is operating properly.



AUXILIARY COOLING FAN
(For turbo cooling and condenser cooling)

Inspection

1. Remove battery ground cable and disconnect switching module connector.
2. Connect suitable wire to main harness connection.



3. Connect battery ground cable and turn ignition switch "ON". Auxiliary cooling fan should not operate.
4. Turn ignition switch "OFF". Auxiliary cooling fan should operate.

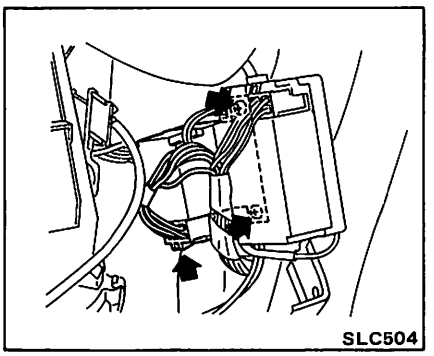
Timer

Condition / Timer operation	Battery voltage (V)	Ambient temperature °C (°F)
3 - 6 minutes	9 - 13	–30 - 80 (–22 - 176) max.
6 minutes	13 - 16	80 (176) min.

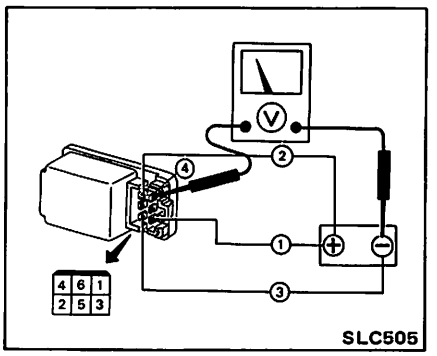
FAN MOTOR TIMER

Inspection

1. Remove battery ground cable and remove fan motor timer.

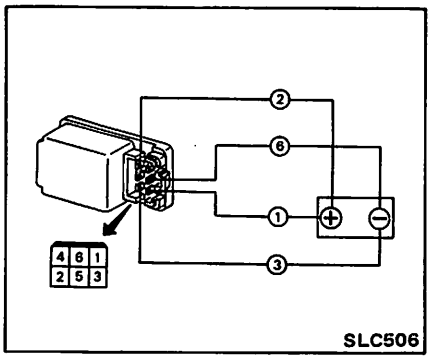


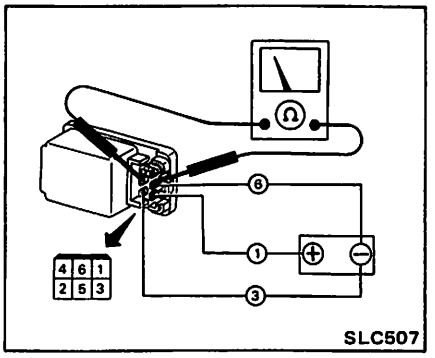
2. Connect positive ⊕ cables of battery to terminals ① and ② and negative ⊖ cable to terminal ③. Check to make sure terminal ④ produces a signal of approximately 11 volts.



3. Connect positive ⊕ cables of battery to terminals ① and ② and negative ⊖ cables to terminals ③ and ⑥.

Then disconnect positive ⊕ cable from terminal ②. Continuity should exist between terminals ⑤ and ⑥ corresponding to the length of timer operation.





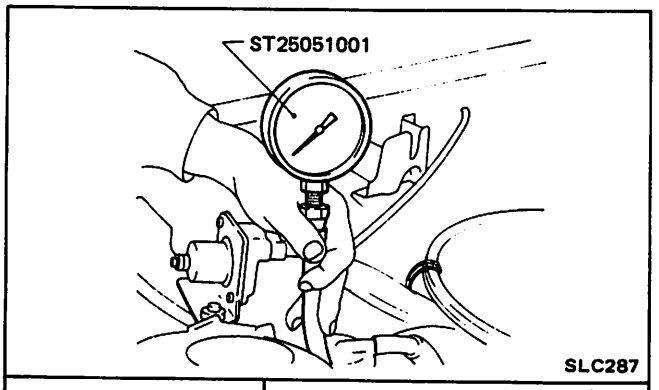
SERVICE DATA AND SPECIFICATIONS (S.D.S.)

ENGINE LUBRICATION SYSTEM

INSPECTION AND ADJUSTMENT

Oil pump

Oil pressure



Engine rpm	Discharge pressure kPa (kg/cm², psi)
1,050	196 (2, 28)
1,700	294 (3, 43)
5,150	392 (4, 57)

Pump unit

Unit: mm (in)

Outer rotor to body clearance ①	Less than 0.12 (0.0047)
Rotor tip clearance ②	0.15 - 0.21 (0.0059 - 0.0083)
Gap between outer rotor and inner rotor ③	Less than 0.05 (0.0020)
Gap between rotor and body ④	Less than 0.02 (0.0008)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Oil pump securing bolt & nuts	9 - 14	0.9 - 1.4	6.5 - 10.1
Oil pump cover bolt	4 - 6	0.4 - 0.6	2.9 - 4.3
Regulator valve cap nut	39 - 49	4.0 - 5.0	29 - 36

ENGINE COOLING SYSTEM

INSPECTION AND ADJUSTMENT

Thermostat

	Frigid type	Standard type	Tropical type
Valve opening temperature °C (°F)	88 (190)	82 (180)	76.5 (170)
Max. valve lift mm/°C (in/°F)	8/100 (0.31/212)	8/95 (0.31/203)	8/90 (0.31/194)

Radiator

Cap relief pressure	kPa (kg/cm², psi)	88 (0.9, 13)
Leakage test pressure	kPa (kg/cm², psi)	157 (1.6, 23)

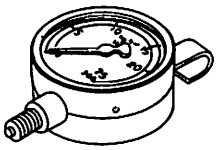
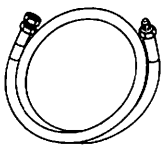
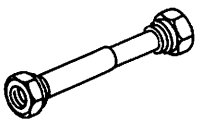
AUXILIARY FAN

Timer Operation \ Condition	Battery Voltage (V)	Ambient temperature °C (°F)
3 - 6 minutes	9 - 13	–30 - 80 (–22 - 176) max.
6 minutes	13 - 16	80 (176) min.

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Water pump securing bolt	4 - 6	0.4 - 0.6	2.9 - 4.3
Water outlet securing bolt	4 - 6	0.4 - 0.6	2.9 - 4.3

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
ST25051001 (J25695-1)	Oil pressure gauge 
ST25052000 (J25695-2)	Hose 
ST25053000 (J25695-3)	Joint pipe 
ST25054000 (J25695-4) or 11025-61501 (Part No.)	Adapter 

ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

CONTENTS

PRECAUTIONS FOR E.C.C.S. ENGINE ..... EF & EC- 2
COMPONENT PARTS LOCATION FOR E.C.C.S. ENGINE ..... EF & EC- 3
ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM FOR E.C.C.S. ENGINE ..... EF & EC- 4
ENGINE AND EMISSION CONTROL SYSTEM CHART FOR E.C.C.S. ENGINE ..... EF & EC- 5
DIAGNOSTIC PROCEDURE FOR PROBLEMS ..... EF & EC- 6
- E.C.C.S. self-diagnostic system .... EF & EC- 6

ELECTRONIC CONCENTRATED ENGINE CONTROL SYSTEM (E.C.C.S.) ..... EF & EC-23
- Outline ..... EF & EC-23
- E.C.C.S. components ..... EF & EC-23
- Throttle valve switch ..... EF & EC-25
- Fuel flow system ..... EF & EC-28
- Air flow system ..... EF & EC-30
- Fuel system pressure check ..... EF & EC-34
- Fuel injection control ..... EF & EC-36
- Electronic ignition timing control ..... EF & EC-38
- Idle speed control ..... EF & EC-39

ELECTRICAL SYSTEM INSPECTION ..... EF & EC-42
- E.C.C.S. circuit diagram ..... EF & EC-42
- E.C.C.S. wiring diagram ..... EF & EC-43
- Preparations for inspection ..... EF & EC-44
- Throttle valve switch tests ..... EF & EC-44
- Air flow meter tests ..... EF & EC-45
- Air temperature sensor tests ..... EF & EC-47
- Water temperature sensor tests .... EF & EC-48
- Exhaust gas sensor circuit tests .... EF & EC-48
- Control unit ground circuit tests .. EF & EC-49
- Air regulator and fuel pump relay tests ..... EF & EC-49
- Injector circuit tests ..... EF & EC-51
- E.F.I. relay ..... EF & EC-53
- Ignition start signal test ..... EF & EC-53

CRANKCASE EMISSION CONTROL SYSTEM ..... EF & EC-54
- Description ..... EF & EC-54
- Inspection ..... EF & EC-54

EXHAUST EMISSION CONTROL SYSTEM ..... EF & EC-55
- Exhaust gas recirculation (E.G.R.) control system ..... EF & EC-55
- Catalytic converter system ..... EF & EC-56

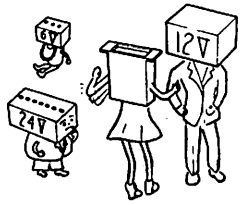
EVAPORATIVE EMISSION CONTROL SYSTEM ..... EF & EC-58
- Description ..... EF & EC-58
- Operation ..... EF & EC-58
- Inspection ..... EF & EC-59

SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... EF & EC-60
- Inspection and adjustment ..... EF & EC-60
- Tightening torque ..... EF & EC-61

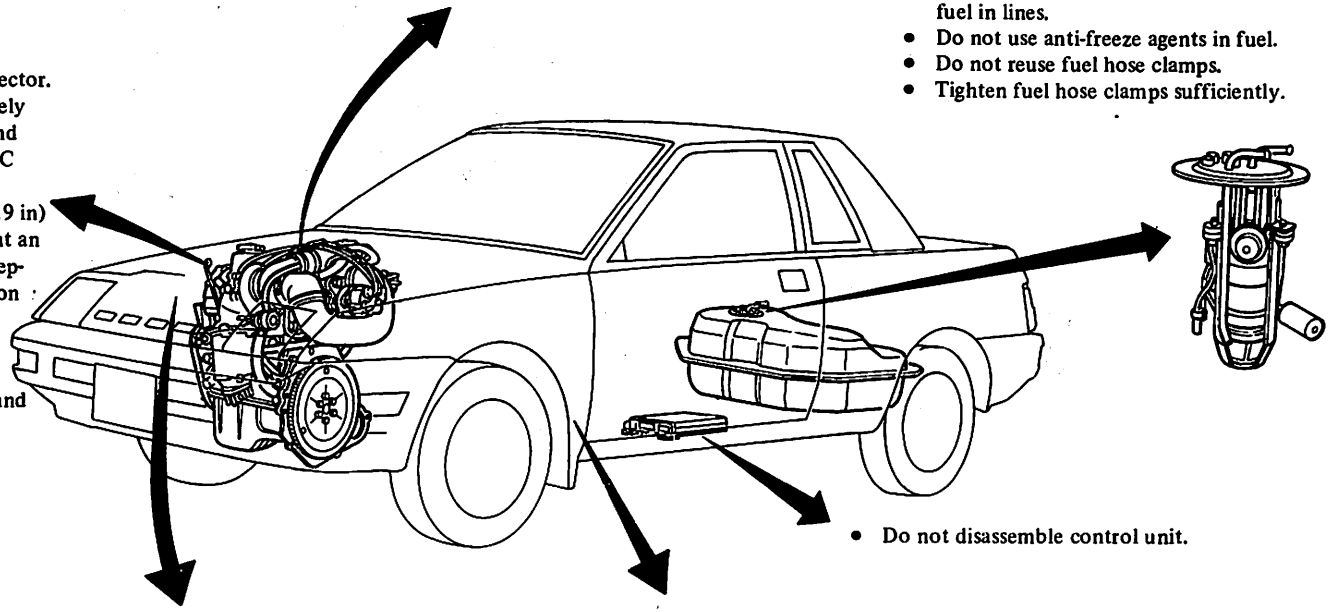
PRECAUTIONS FOR E.C.C.S. ENGINE

Pay close attention to the following points when inspecting or servicing an E.C.C.S. vehicle.

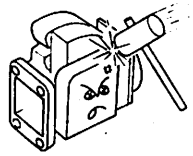
- Always use 12-volt batteries as power source.
- Do not attempt to disconnect battery cables while engine is operating.
- If a receiver-transmitter is installed, route antenna feeder cable along opposite side from E.C.C.S. harness and control unit. Make sure that there is no interference while engine is idling.



- Do not apply battery power directly to injectors.
- Do not operate fuel pump when there is no fuel in lines.
- Do not use anti-freeze agents in fuel.
- Do not reuse fuel hose clamps.
- Tighten fuel hose clamps sufficiently.
- Securely connect E.C.C.S. harness connector. 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.C.C.S. harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an E.C.C.S. system malfunction due to reception of external noise, degraded operation of IC circuit, etc.
- Keep E.C.C.S. parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

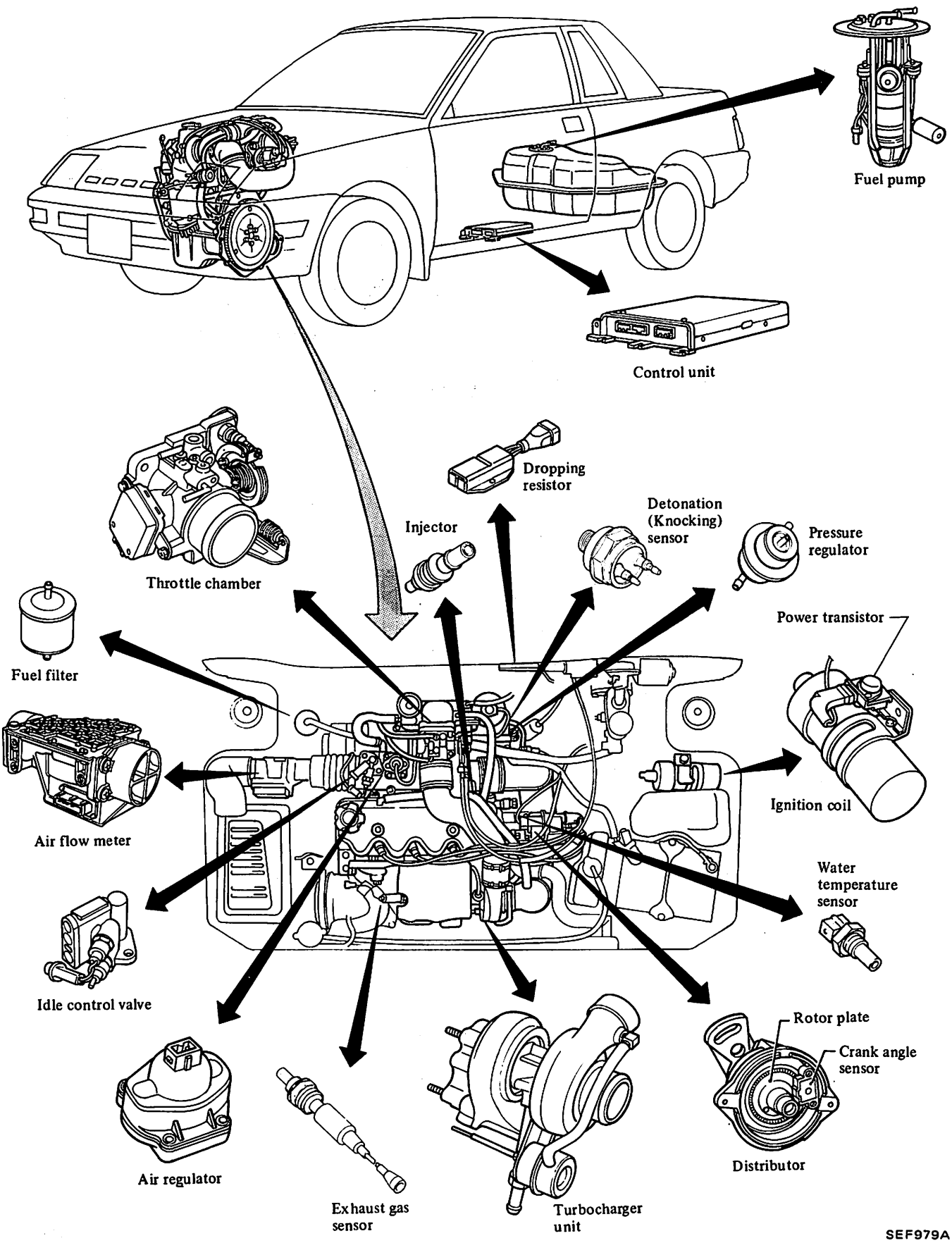


- Do not disassemble control unit.
- Handle air flow meter carefully to avoid damage.
- There should not occur even a slight leak in air intake system.

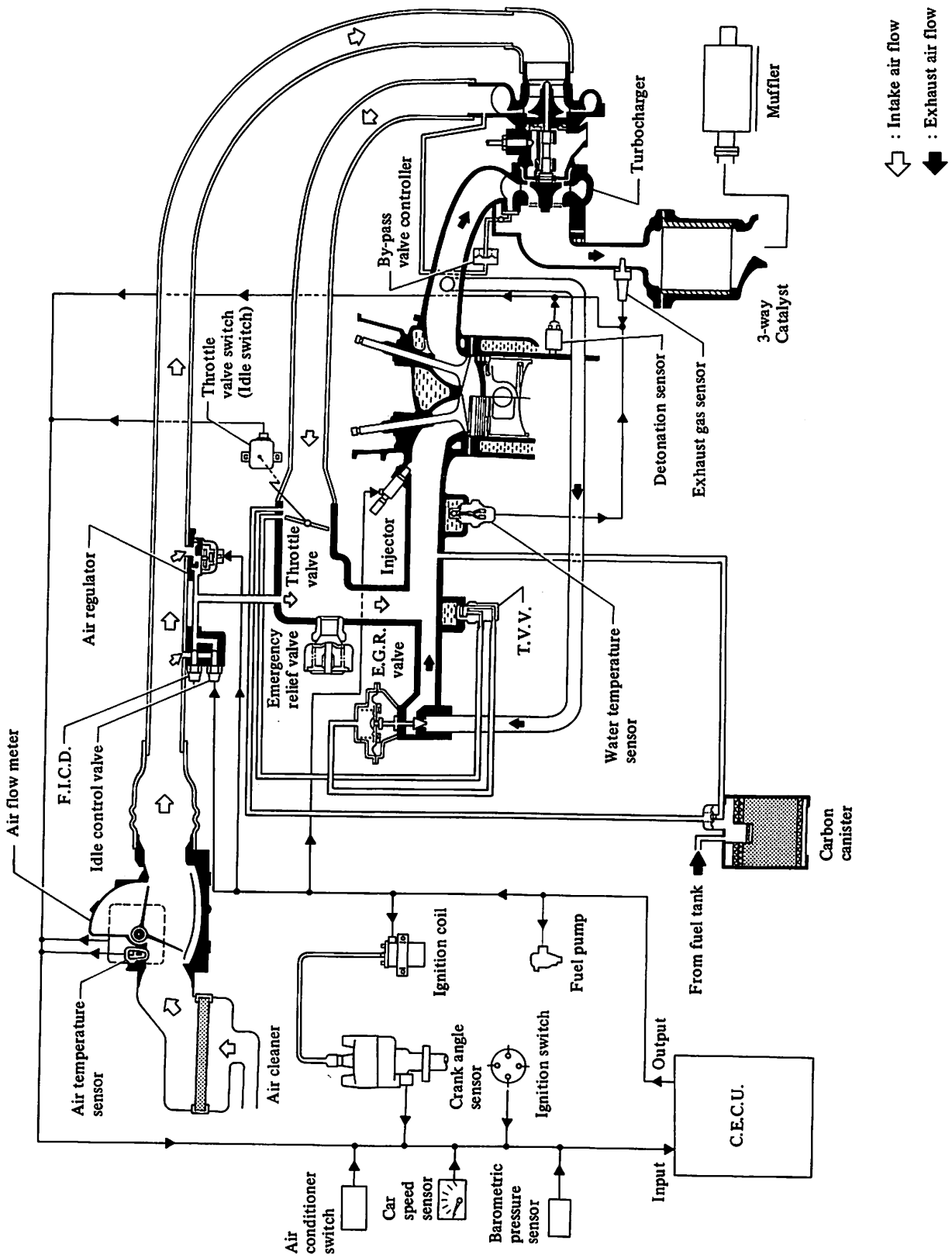


- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.

COMPONENT PARTS LOCATION FOR E.C.C.S. ENGINE

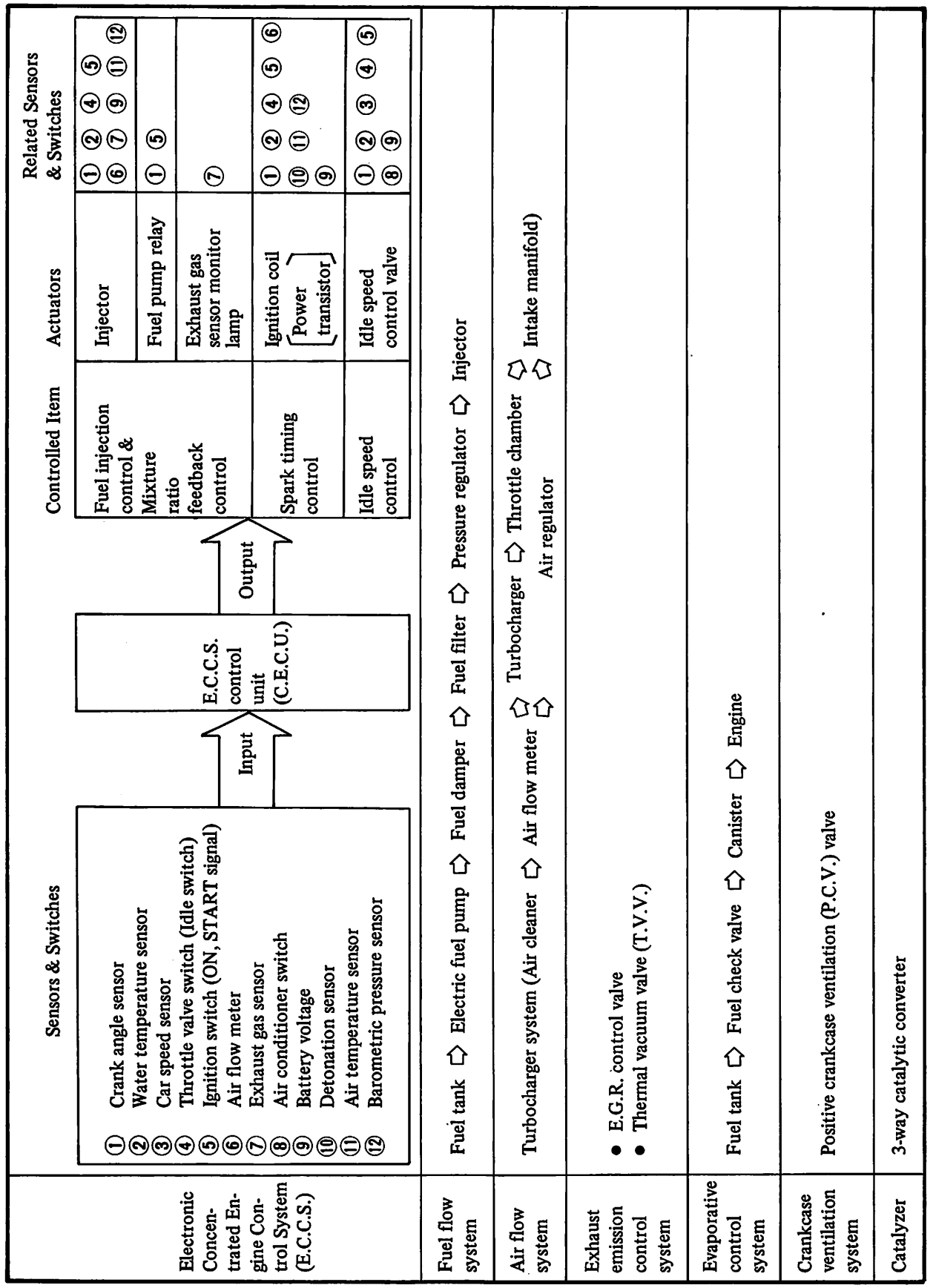


ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM FOR E.C.C.S. ENGINE



SEF980A

ENGINE AND EMISSION CONTROL SYSTEM CHART FOR E.C.C.S. ENGINE



DIAGNOSTIC PROCEDURE FOR PROBLEMS

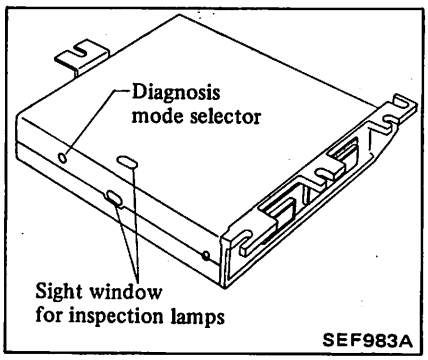
E.C.C.S. SELF-DIAGNOSTIC SYSTEM

Electronic Concentrated engine Control System (E.C.C.S.) controls the engine operating conditions (Fuel injection, Idle rpm, Ignition timing) with the Central Electronic Control Unit (C.E.C.U.), sensors, switches and so forth.

Therefore, when engine malfunctions occur, the causes cannot be found by a visual inspection, etc.

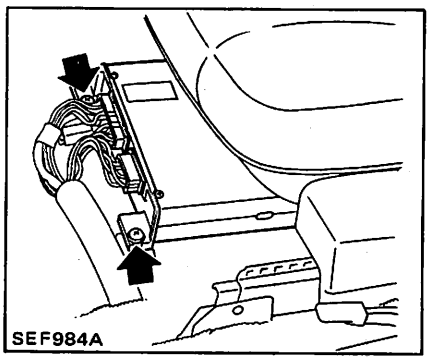
The E.C.C.S. self-diagnostic system monitors several input and output signals that are emitted in response to various engine operating conditions and when the engine stops. Input signals are compared to computerized signal values stored in the C.E.C.U. (Central Electronic Control Unit) while output signals are monitored to ensure they are properly attuned before they are emitted from the C.E.C.U. unit to actuators. In other words, this system analyzes major electrical signals that are transmitted to and emitted from the C.E.C.U. unit. For this reason, if system or unit abnormalities which are not related to these signals are discovered, reference to the "Troubleshooting" chart must be made for remedial action.

A malfunctioning area is determined by the number of blinks of both the red and green light emitting diodes (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.

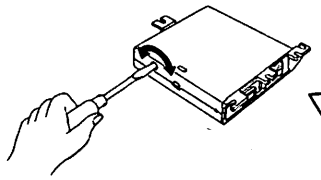


PREPARATIONS

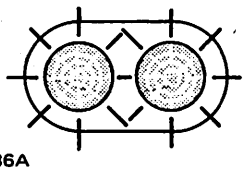
Locate C.E.C.U. in a place so that driver can easily see red and green L.E.D.s (inspection lamps) at a glance.



INSPECTION PROCEDURE



SEF985A



SEF986A

START

Turn diagnosis mode selector fully clockwise.

Turn ignition switch to "ON" position without running and make sure inspection lamps turn "ON" for five seconds.

N.G. → Replace C.E.C.U.

O.K.

- Depress accelerator pedal.
- Turn air conditioner switch: OFF → ON → OFF

To properly diagnose throttle valve switch or air conditioning switch, first turn it on and then off. This is necessary to clear false display "N.G."

Look at the inspection lamps.

Are there any blinks other than Code No. 14 (and Code No. 31 if equipped with Nissan air conditioner)?

N.G. → See Decoding Chart for Inspection Lamp Blinks.

Before diagnosing car speed sensor, operate car at a speed greater than 10 km/h (6 MPH) to clear false signal "N.G." It will be shown in place of code number 14 which refers to a malfunctioning car speed sensor.

O.K.

Start engine and drive vehicle at above 10 km/h (6 MPH).

Look at inspection lamps.

- With Nissan air conditioner Make sure that inspection lamps indicate code No. 44.
- Without Nissan air conditioner. Make sure that inspection lamps indicate code No. 31.

N.G. → See Decoding Chart for Inspection Lamp Blinks.

O.K.

Run engine under various conditions.

Look at inspection lamp.

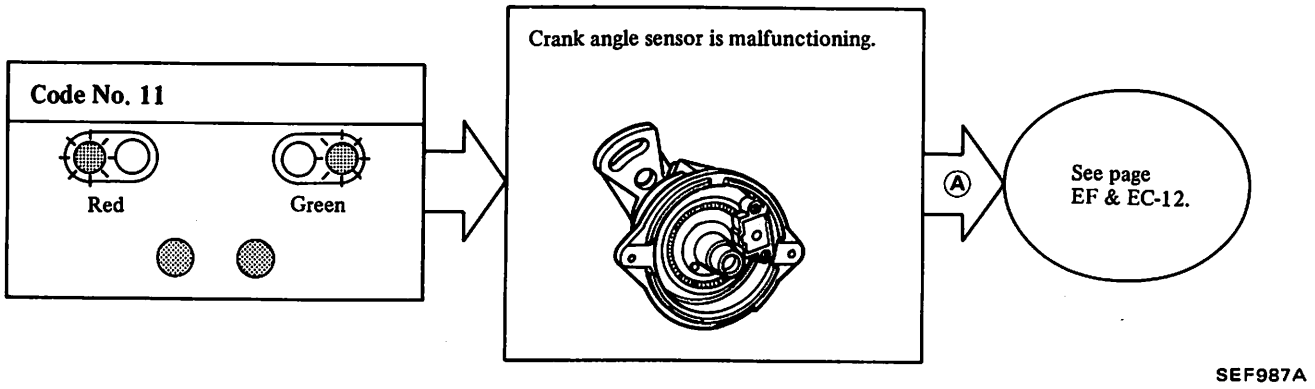
- With Nissan air conditioner Make sure that inspection lamps indicate code No. 44.
- Without Nissan air conditioner. Make sure that inspection lamps indicate code No. 31.

→ See Decoding Chart for Inspection Lamp Blinks.

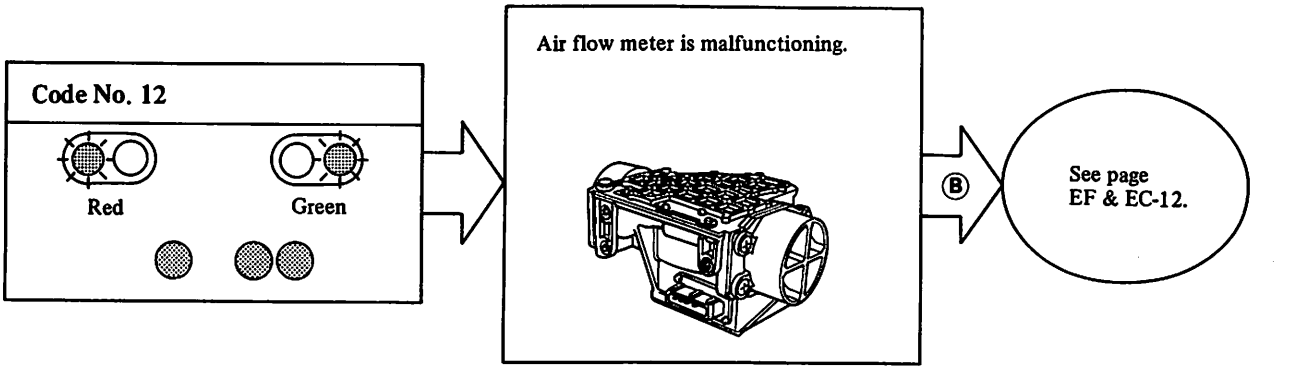
O.K.

END

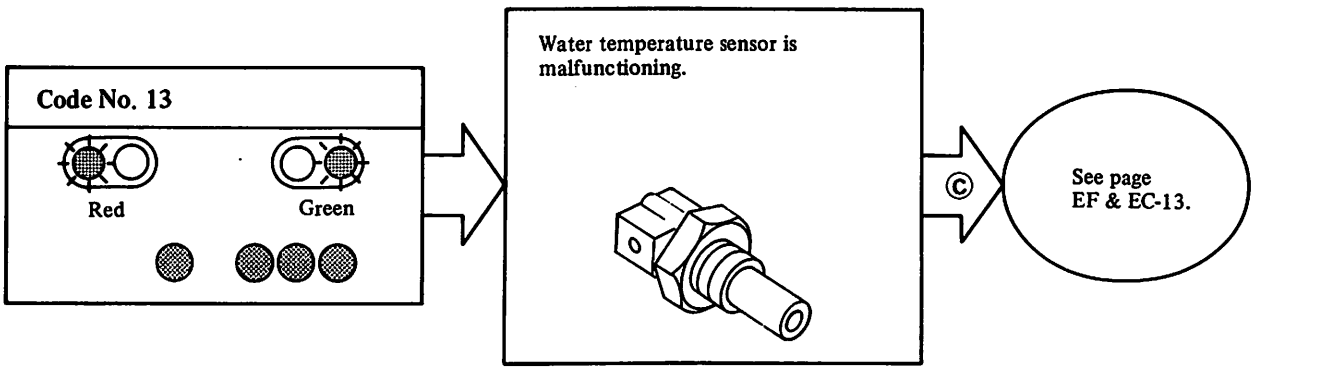
DECODING CHART FOR INSPECTION LAMP BLINKS



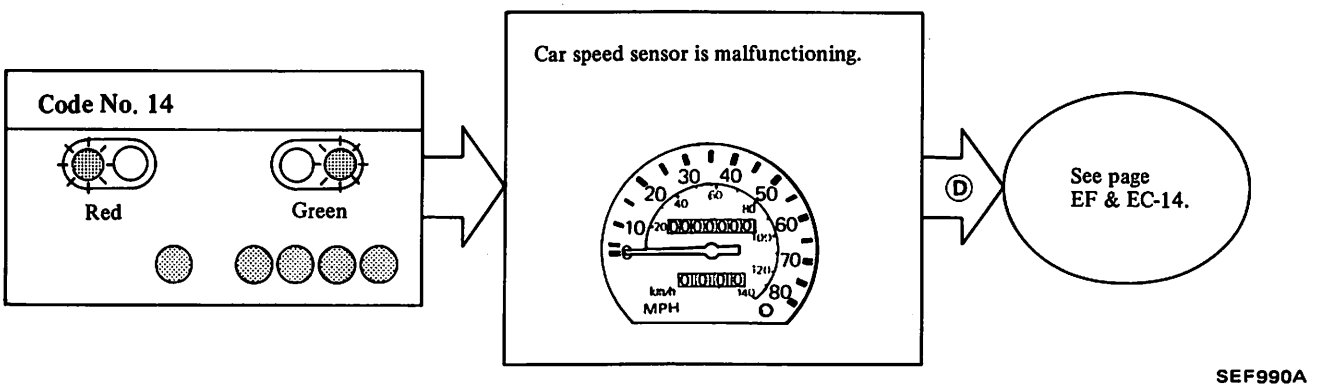
SEF987A



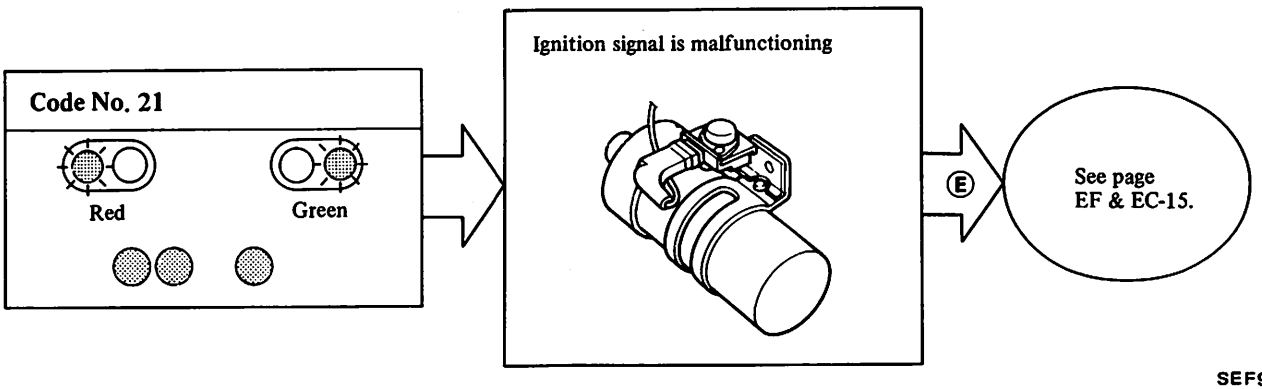
SEF988A



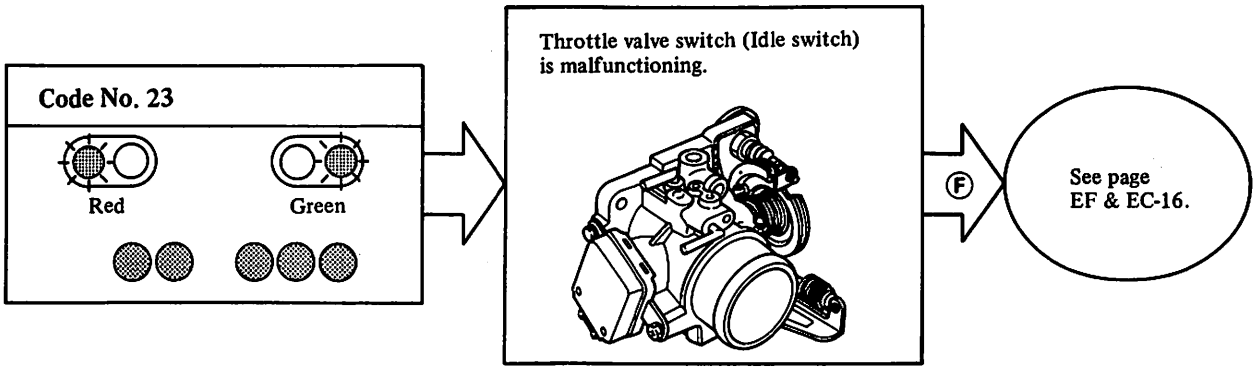
SEF989A



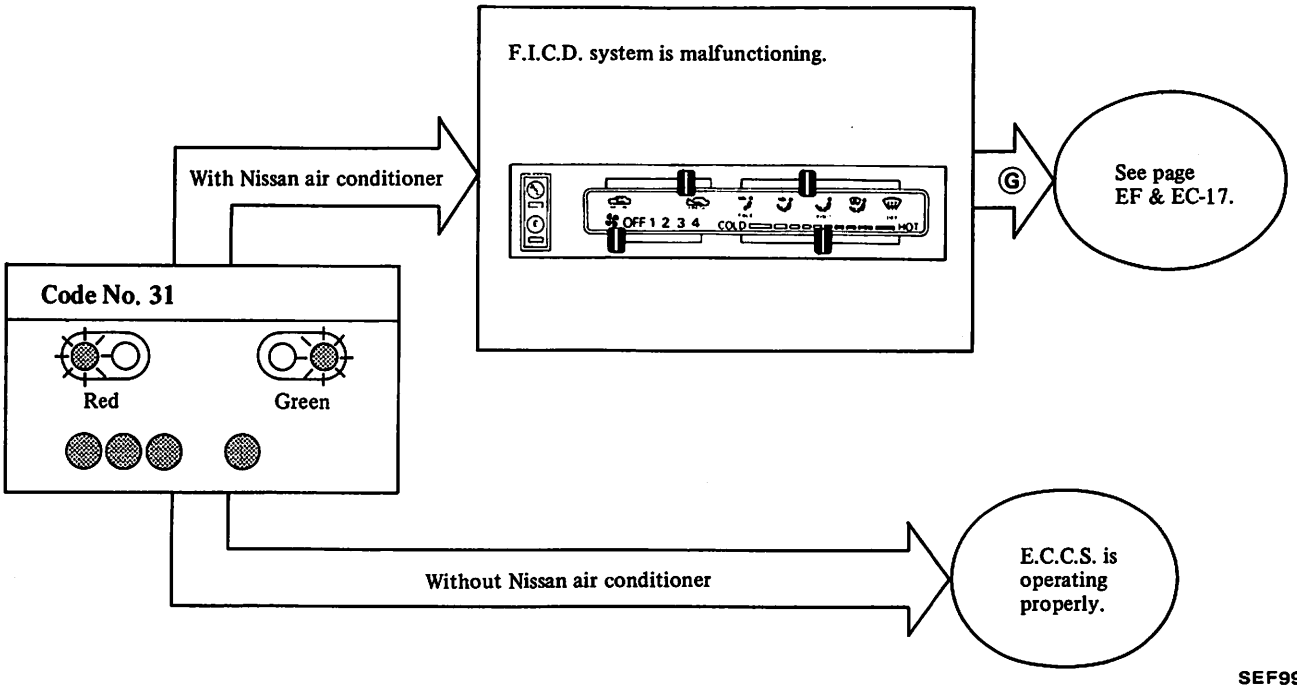
SEF990A



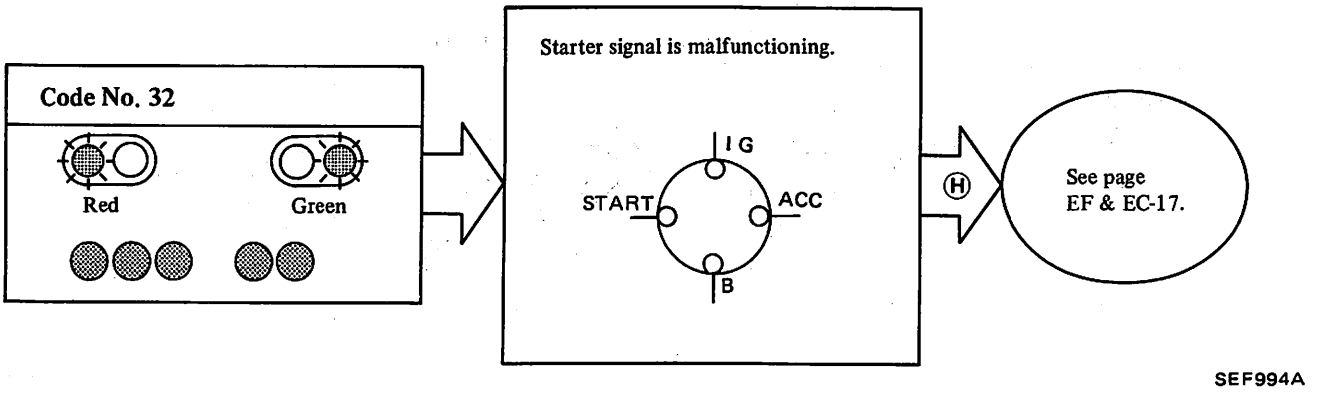
SEF991A



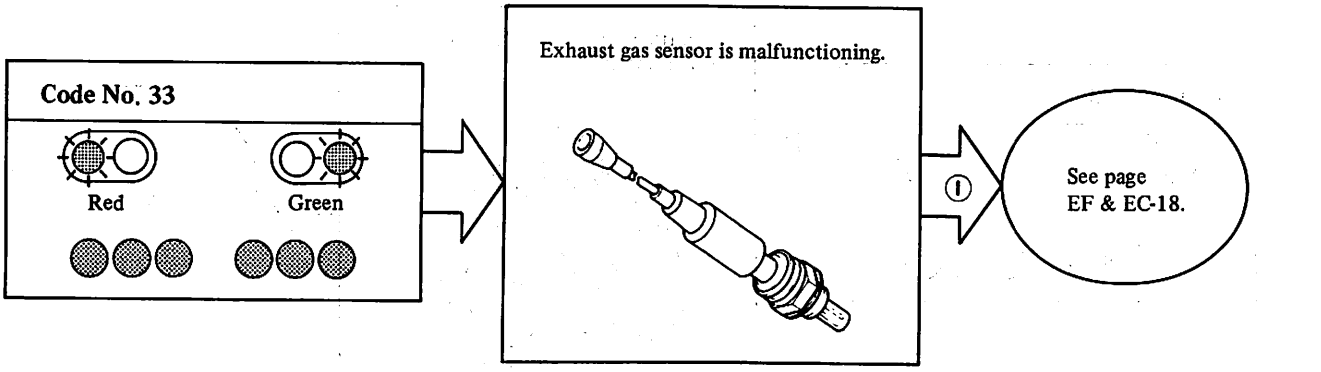
SEF992A



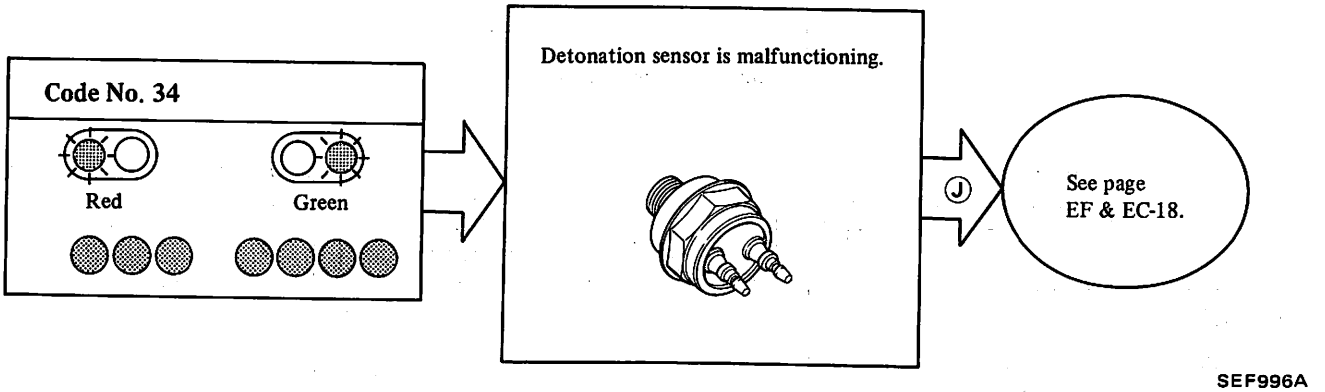
SEF993A



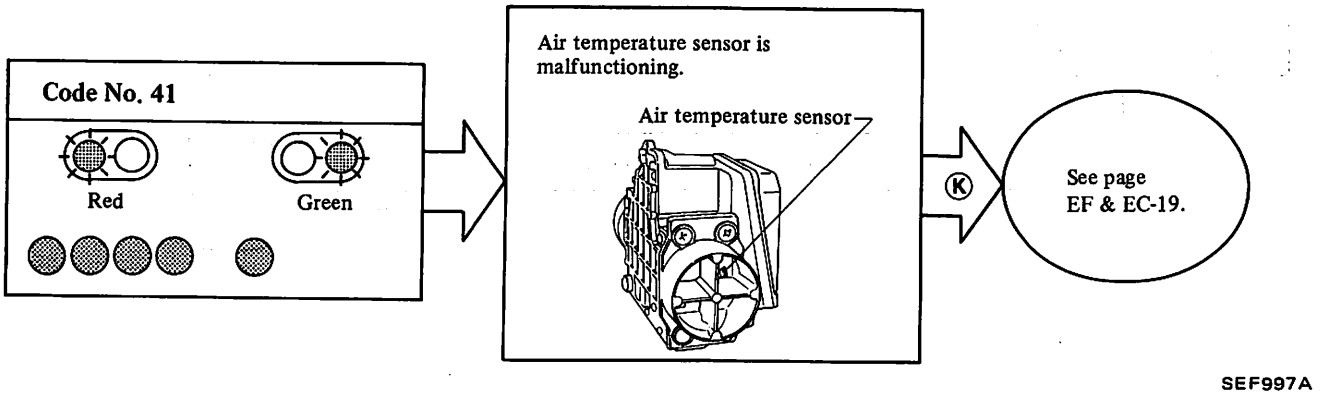
SEF994A



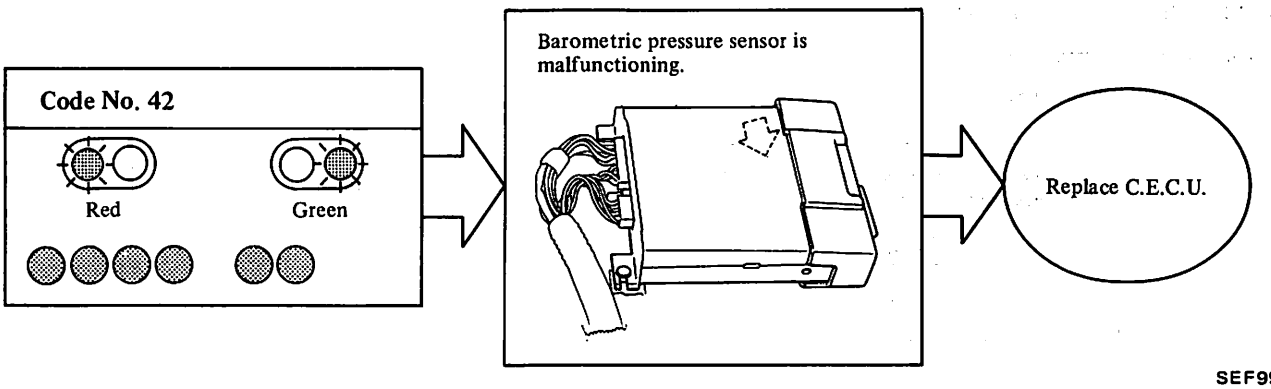
SEF995A



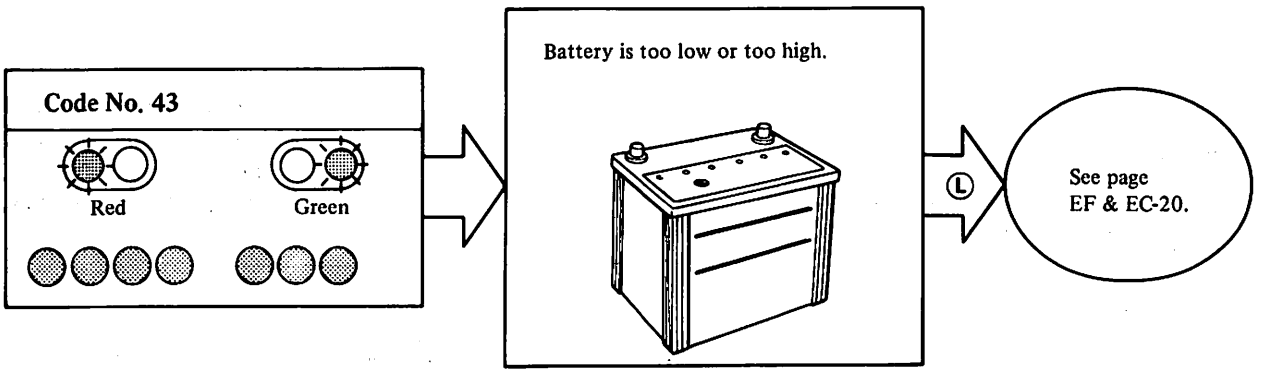
SEF996A



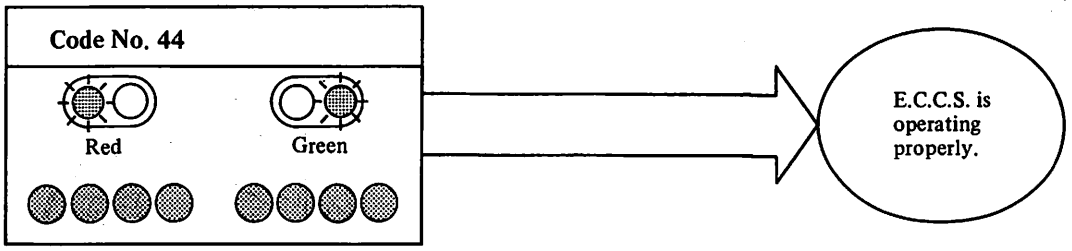
SEF997A



SEF998A



SEF999A

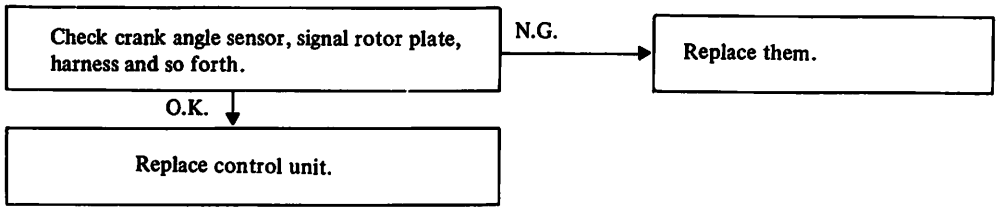


SEF001B

TROUBLE-SHOOTING DIAGNOSIS

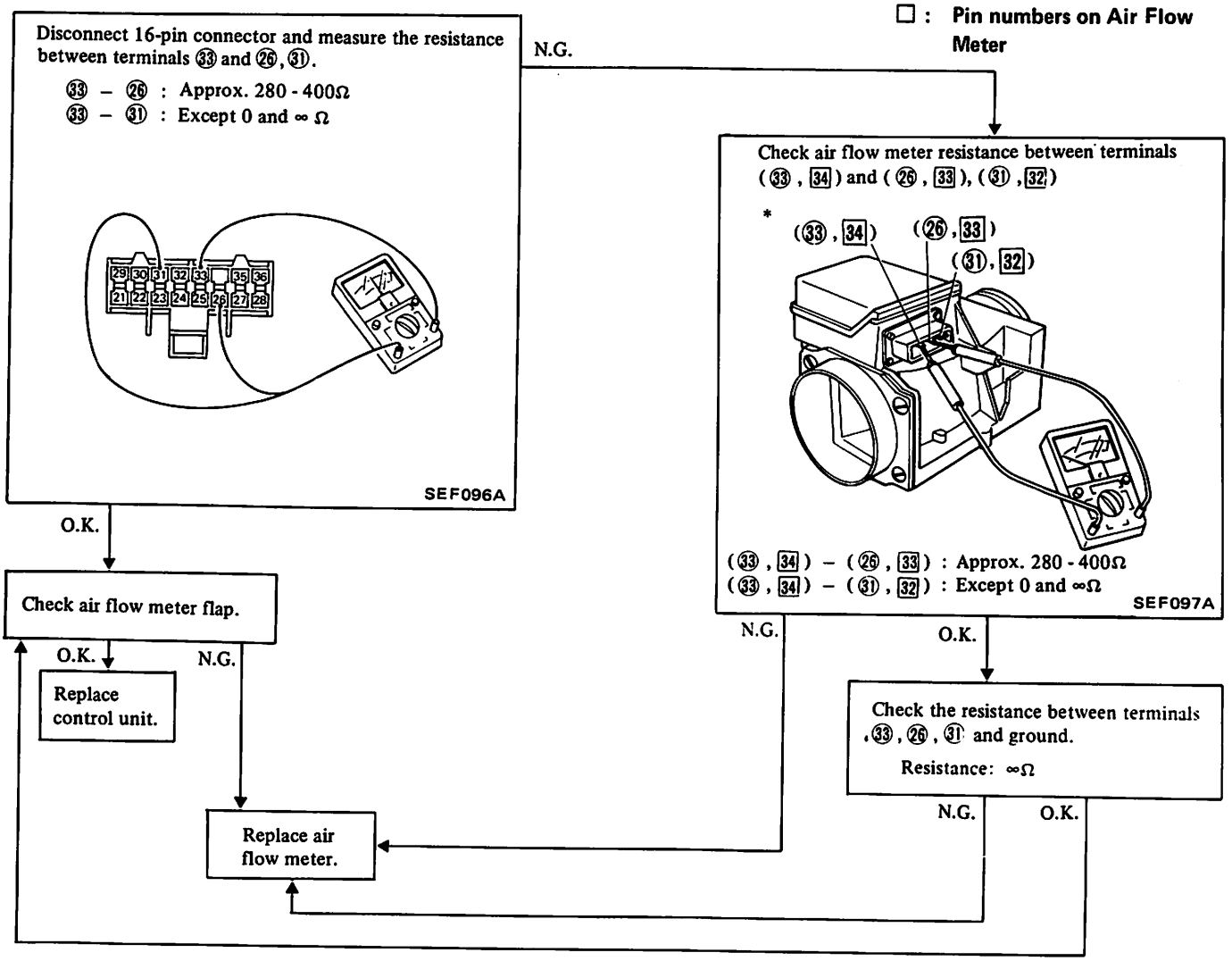
Electronic control system inspection

Ⓐ C.A.S. (Crank angle sensor)



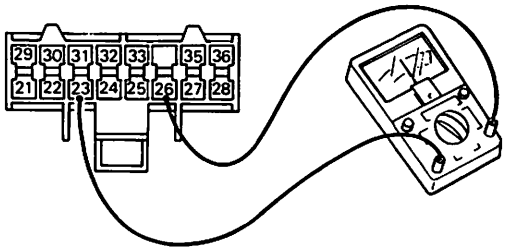
***Note**
Pin numbers between C.E.C.U. and Air Flow Meter do not match.
○ : Pin numbers of C.E.C.U.
□ : Pin numbers on Air Flow Meter

Ⓑ Air flow meter



© Water temperature sensor

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



SEF716A

Cylinder head temperature	Resistance
Above 20°C (68°F)	Below 2.9 kΩ
Below 20°C (68°F)	Above 2.1 kΩ

N.G.

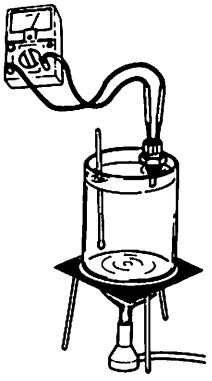
O.K.

Check harness.

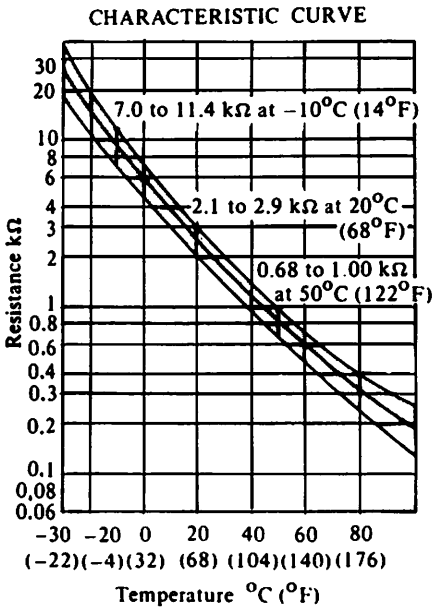
O.K.

Replace control unit.

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



EF329A



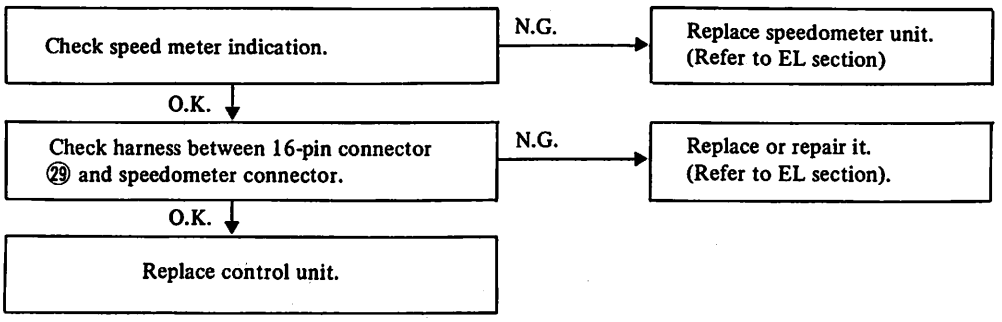
EF334A

O.K.

N.G.

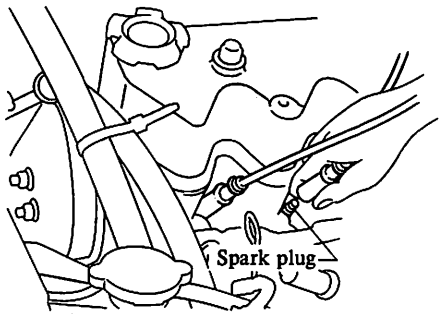
Replace water temperature sensor.

Ⓓ Car speed sensor



Ⓔ IGN. (Ignition system)

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



SEF002B

O.K. → Replace or repair spark plug.

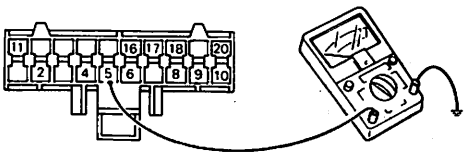
N.G. → Check distributor, ignition coil and high tension cable.

N.G. → Replace or repair them if available.

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

O.K. → Replace power transistor of ignition coil.

N.G. → Disconnect 20-pin connector and measure the resistance between terminal ⑤ and ground.



R: Except 0 or ∞ Ω

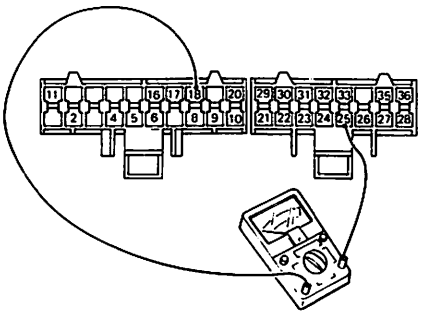
SEF478A

O.K. → Replace control unit.

N.G. → Check harness and replace or correct as necessary.

Ⓕ Idle switch (Throttle valve switch)

Disconnect 20-pin and 16-pin connectors and measure the resistance between ⑱ and ㉕.

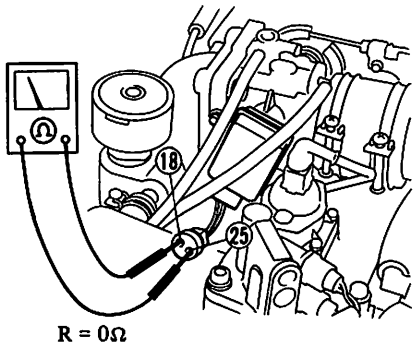


Throttle	Resistance
released	0Ω
depressed	∞Ω

SEF473A

N.G.

Measure the throttle valve switch resistance between ⑱ and ㉕.



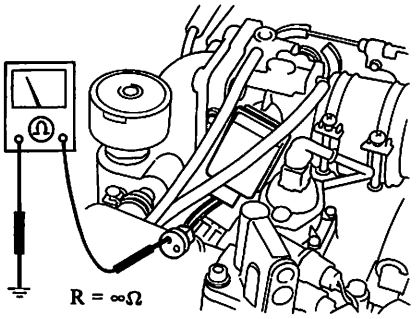
SEF003B

N.G. → Adjust idle switch.

Adjust idle switch. → N.G.

O.K.

Measure the resistance between ⑱, ㉕ and body ground.



SEF004B

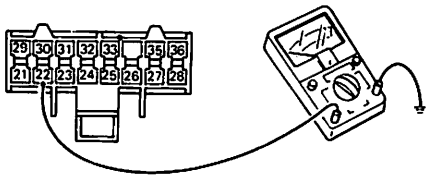
O.K. → Check harness and correct or repair it as necessary.

N.G.

Replace idle switch.

Ⓖ Air conditioner switch

Disconnect 16-pin connector and measure the voltage between ㉒ and body ground.



Air conditioner switch	Voltage
ON	12V
OFF	0V

SEF089A

N.G.

Inspect harness. → N.G. → Correct or replace it.

O.K.

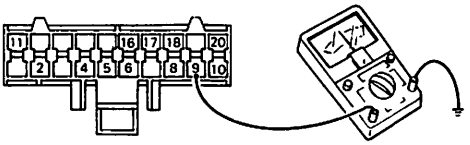
Check air conditioner switch. (Refer to HA section.) → O.K. → Replace control unit.

N.G.

Replace air conditioner switch.

Ⓗ Starter switch

Disconnect 20-pin connector and measure voltage between terminal ⑨ and body ground while cranking engine.



Voltage: Battery voltage

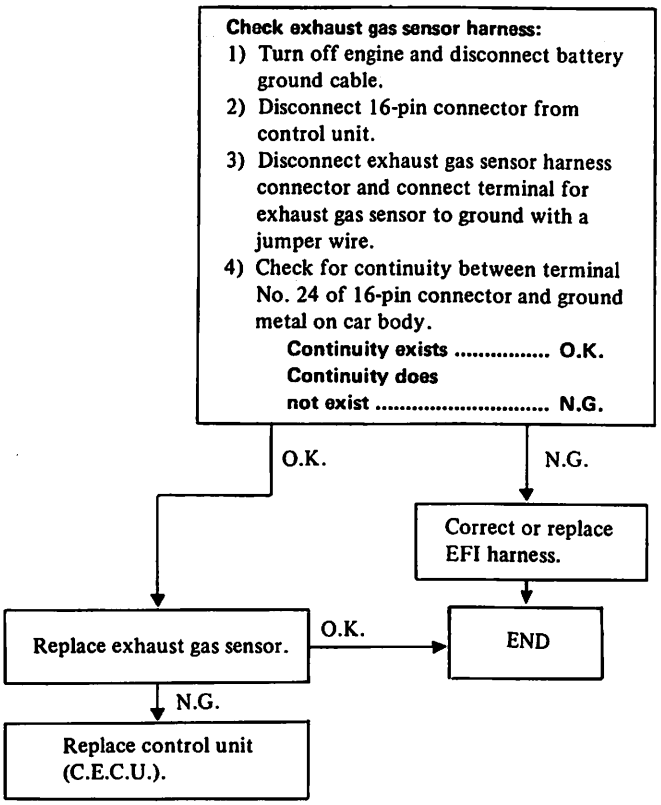
SEF475A

Check starting circuit. (Refer to EL section.) → N.G. → Replace or repair malfunctioning parts or harness.

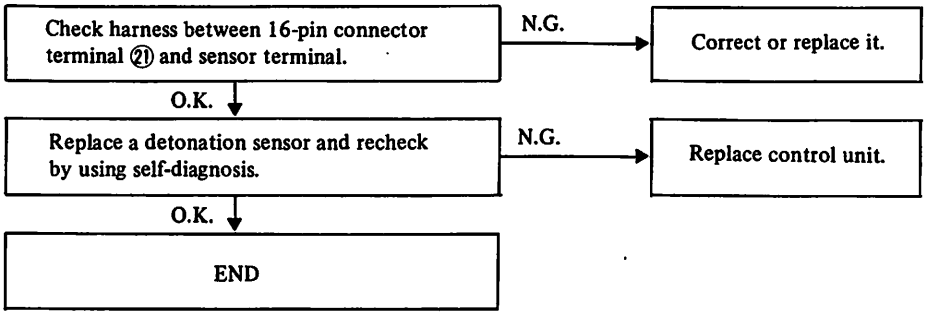
O.K. → Replace or repair battery.

N.G. → O.K. → Replace control unit.

ⓘ Exhaust gas sensor

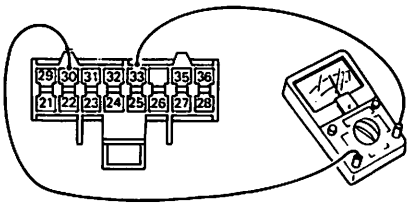


ⓙ Detonation sensor



Ⓚ **Air temperature**

Disconnect 16-pin connector and measure terminals ㉝ and ㉚.



SEF716A

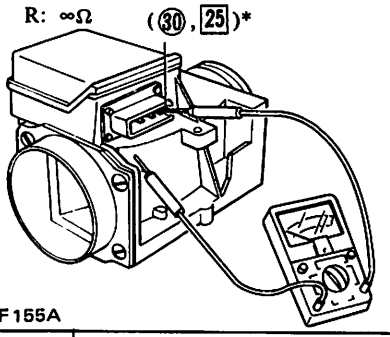
Intake air temperature	Resistance
Above 20°C (68°F)	Below 2.9 kΩ
Below 20°C (68°F)	Above 2.1 kΩ

***Note**
Pin numbers between C.E.C.U. and Air Flow Meter do not match.
○ : Pin numbers of C.E.C.U.
□ : Pin numbers on Air Flow Meter

O.K. → Replace control unit.

N.G. → Check air temperature sensor between terminal (㉚, 25) and ground.

R: ∞Ω (㉚, 25)*



SEF155A

O.K. → Check harness.

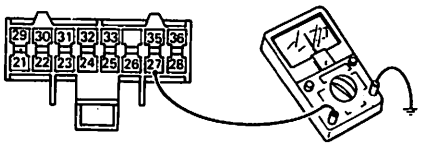
O.K. → Check harness.

N.G. → Replace air temperature sensor as an air flow meter assembly.

N.G. → Replace or correct harness.

Ⓛ Battery

Disconnect 16-pin connector and measure the voltage between terminal ㉗ and body ground.



V: Battery voltage

SEF095A

O.K. → Replace control unit.

N.G. → Check harness and battery.

O.K. → Replace control unit.

N.G. → Replace or correct them as necessary.

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.C.C.S. harness connectors**
- **Vacuum hoses**
- **Air intake system (oil filler cap, oil level gauge, etc.)**
- **Valve clearance, engine compression**

2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".

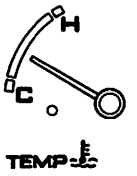
3. On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "D" position.

WARNING:

a. When selector lever is shifted to "D" position, apply parking brake and block both front and rear wheels with chocks.

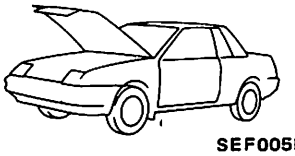
b. Depress brake pedal while accelerating the engine to prevent forward surge of car.

c. After the adjustment has been made, shift the lever to the "N" or "P" position and remove wheel chocks.

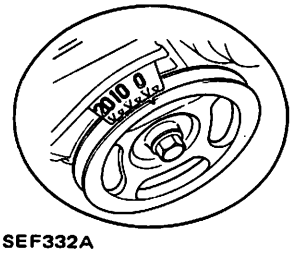


SEF051B

SEF052B



SEF005B



SEF332A

START

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

Open engine hood.
- Run engine at abut 2,000 rpm for about 5 minutes under no-load.

Does engine run smoothly?

N.G.

Check the following parts by using the self-diagnosis
- Air flow meter
- Water temperature sensor
- Air temperature sensor

And also check air flow meter flap operation.

N.G.

Replace them as necessary.

O.K.

Turn off engine and disconnect idle control valve harness connector.

Start engine.

Run engine at idle speed.

O.K.

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

Check idle speed.

Automatic transmission models: 650 ± 50 rpm (in "D" position)

N.G.

Adjust idle speed by turning idle speed adjusting screw.

O.K.

Check ignition timing with a timing light.

15 ± 2° B.T.D.C.

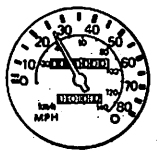
O.K.

N.G.

Adjust ignition timing by turning distributor after loosening bolt which secures distributor.

Ⓐ

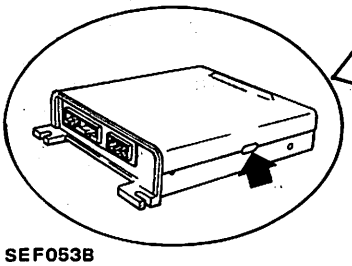
Ⓑ



SEF052B

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

Turn diagnosis mode selector fully counterclockwise.
Make sure that inspection lamp on control unit goes on and off more than 5 times during 10 seconds (2,000 rpm).



SEF053B

O.K.

N.G.

Turn off engine and connect idle control valve harness connector.

END

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 for 16-pin connector and ground metal on car body.

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

O.K.

N.G.

Connect 16-pin connector to control unit and connect battery ground cable.

Correct or replace E.F.I. harness.

Replace exhaust gas sensor.

N.G.

Replace control unit (C.E.C.U.).

O.K.

ELECTRONIC CONCENTRATED ENGINE CONTROL SYSTEM (E.C.C.S.)

OUTLINE

In the Electronic Concentrated Engine Control System (E.C.C.S.), the control unit employs a micro-computer. This micro-computer controls fuel injection, spark timing, idle speed, fuel pump operation and mixture ratio feedback.

It is unnecessary to adjust idle CO%.

Electrical signals from each sensor are fed into the micro-computer and each actuator is controlled by an electrical pulse with a duration that is computed in the micro-computer.

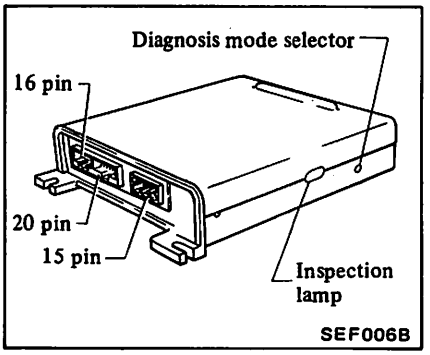
WARNING:

If your car is equipped with electronic controls, use of a transmitter, such as a radio transmitter (but not a receiver, such as a radio) may interfere with unshielded electronic controls and cause them to malfunction. Car manufacturers do not necessarily use electronic controls in the same ways or for the same operations. Examples of vehicle functions which may involve electronic controls include fuel delivery systems, engine timing, brakes, emission control and cruise control. Definite information regarding the type of electronic controls in your car can only be obtained from the manufacturer. Consult your NISSAN/DATSUN dealer regarding the need for modifications to your car's electronic controls before installation or use of a transmitter.

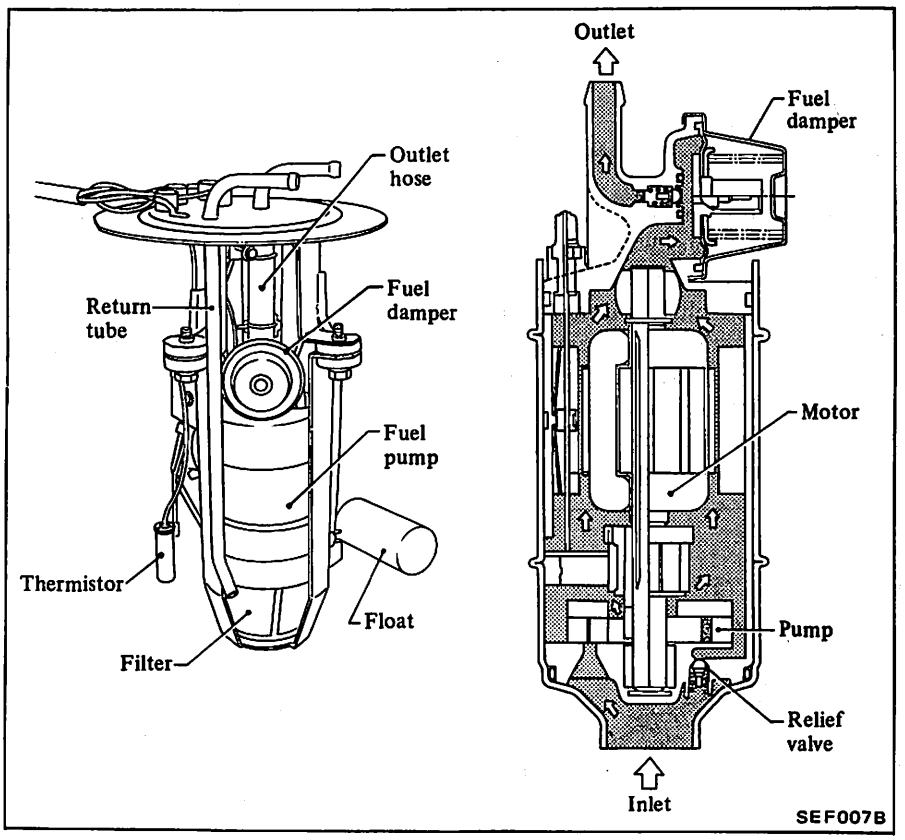
E.C.C.S. COMPONENTS

E.C.C.S. CONTROL UNIT

The E.C.C.S. control unit consists of a micro-computer, connectors for signal input and output and power supply, and inspection lamps and diagnosis mode selector. The control unit controls the quantity of fuel that is injected, ignition timing, idle speed, fuel pump operation, and feedback of the mixture ratio.

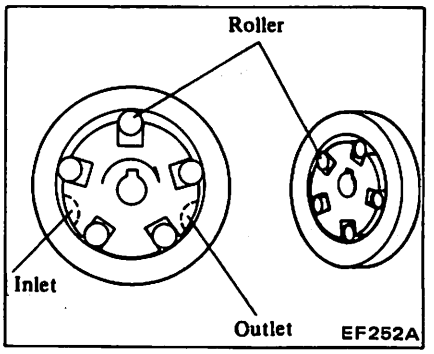


FUEL PUMP



The fuel pump is located in the fuel tank and combined with the fuel tank gauge unit.

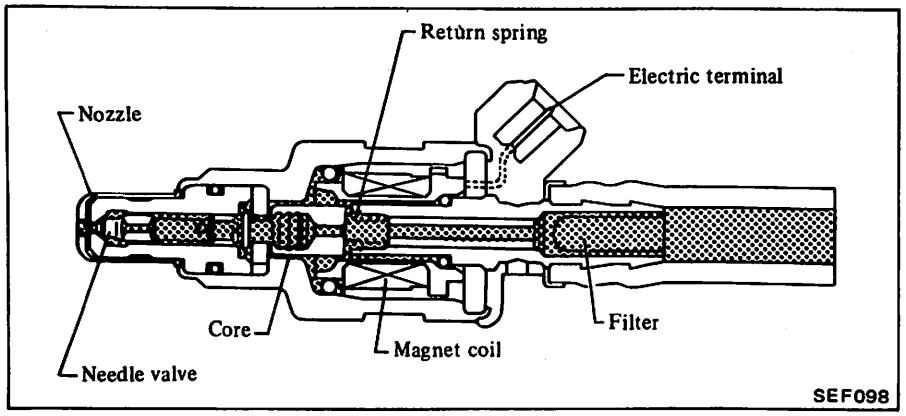
The fuel pump is a wet type pump where the vane rollers are directly coupled to a motor which is filled with fuel.



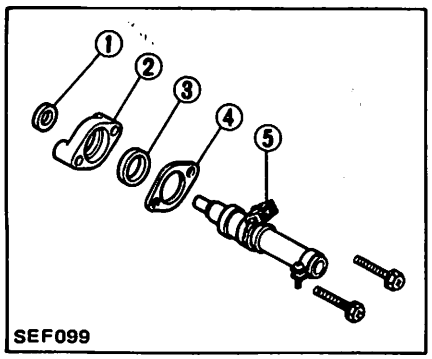
A relief valve in the pump is designed to open when the pressure in the fuel line rises over 422 to 490 kPa (4.3 to 5.0 kg/cm^2, 61 to 71 psi) due to malfunction in the pressure system.
The check valve prevents abrupt drop of pressure in the fuel pipe when stopping the engine.

The fuel damper acts like a shock absorber in fuel flow discharged from the fuel pump. There are not adjustments on this damper.
Change in the pump discharge pressure is monitored by the diaphragm and spring, which vary the volume of the fuel chamber.

INJECTOR



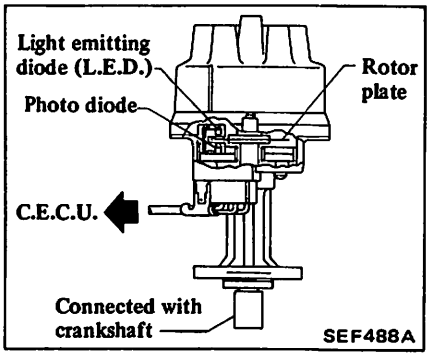
The injector operates on the solenoid valve principle. When an electric signal is applied to the coil built into the injector, the plunger is pulled into the solenoid, thereby opening the needle valve for fuel injection. The quantity of injected fuel is in proportion to the duration of the pulse applied from the control unit.



1 Injector lower rubber insulator
2 Injector lower holder
3 Injector upper rubber insulator
4 Injector upper holder
5 Injector

CRANK ANGLE SENSOR

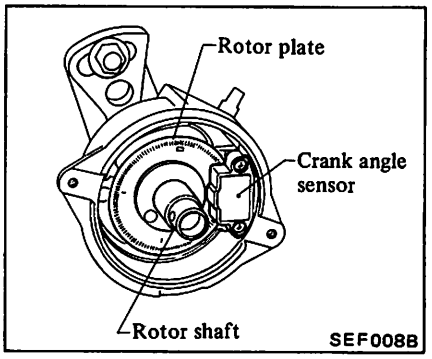
The crank angle sensor detects engine rpms and the crank angle (piston position). It also sends a signal to the control unit to control various operations. This sensor is built into the distributor.



Use care when installing, the crank sensor built in to the distributor as the position of matching mark is different from former model. (Refer to Section EM.)

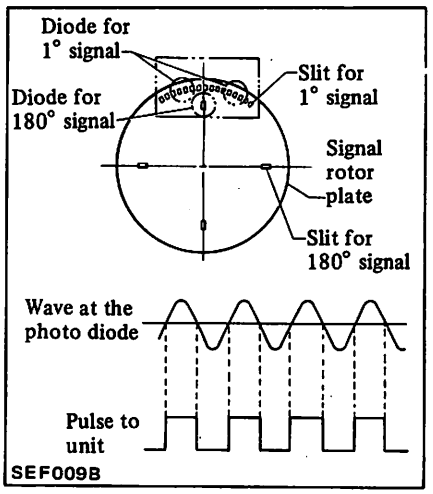
Signal rotor plate

The signal rotor plate has 360 slits at 1° intervals on its outer periphery. It also has six slits at 90° intervals.
These four slits are used to detect the crank angle, that is, the position of each piston. The teeth are used to provide the 1° signal that is necessary to control engine rpms and ignition timing.



Crank angle sensor operation

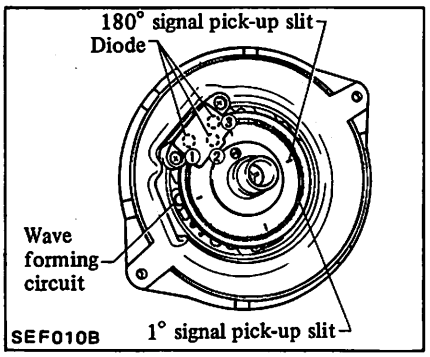
The crank angle sensor has two diodes and a wave forming circuit. When a signal rotor plate passes the space between the Light Emitting Diode (L.E.D.) and Photo Diode, the slit of the signal rotor plate alternately cuts the light which is sent to the photo diode from the L.E.D. This causes an alternative voltage and it is then converted into an on-off pulse by the wave forming circuit, which is sent to the control unit.

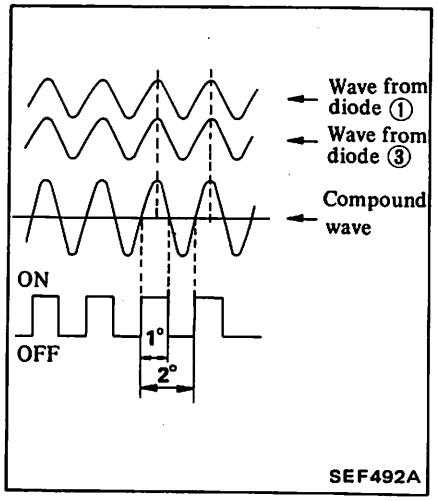


Detection of 1° signal (For detecting of engine rpms and ignition timing control)

Diodes ① and ③ are used to detect the 1° signal which is created by 360 slits on the rotor plate. When a slit reaches the space between the L.E.D. and photo diode, the photo diode receives the light from the L.E.D. and this causes an alternative voltage.

Thus, each wave from each diode is compounded. Then, the compound wave is converted into an on-off pulse. This 1° on-off signal is sent to the control unit.





Detection of 180° signal (For detecting piston T.D.C.)

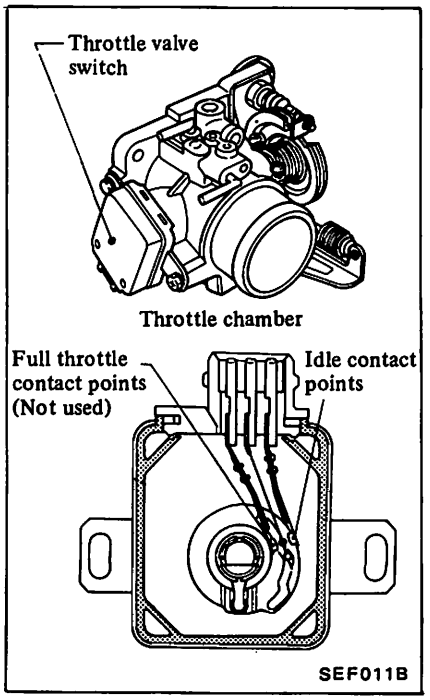
Diode ② is used to detect the 180° signal which is created by 90° slits on the rotor plate. When a slit reaches the space between the L.E.D. and photo diode, the photo diode catches the light from the L.E. D. and this causes an alternative voltage. At this time, a signal on-off pulse is generated. Since engine rpm is twice that of the distributor, the rotor plate has four dits at 90° intervals.

THROTTLE VALVE SWITCH

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

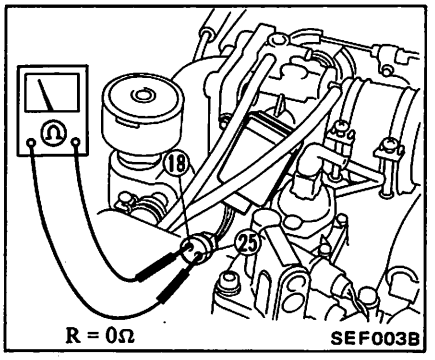
This switch has the idle contact.

The idle contact closes when the throttle valve is positioned at idle and opens when it is at any other position.

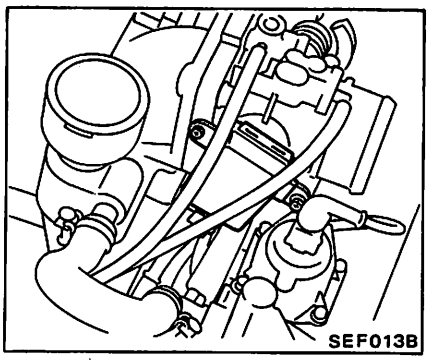


ADJUSTMENT

1. Disconnect throttle valve switch connector.
2. Connect ohmmeter between terminals ⑱ and ㉕ , and make sure continuity exists.



3. Adjust throttle valve switch position, with retaining screw, so that idle switch may be changed from "ON" to "OFF" when engine speed is about 1,100 rpm under no load.



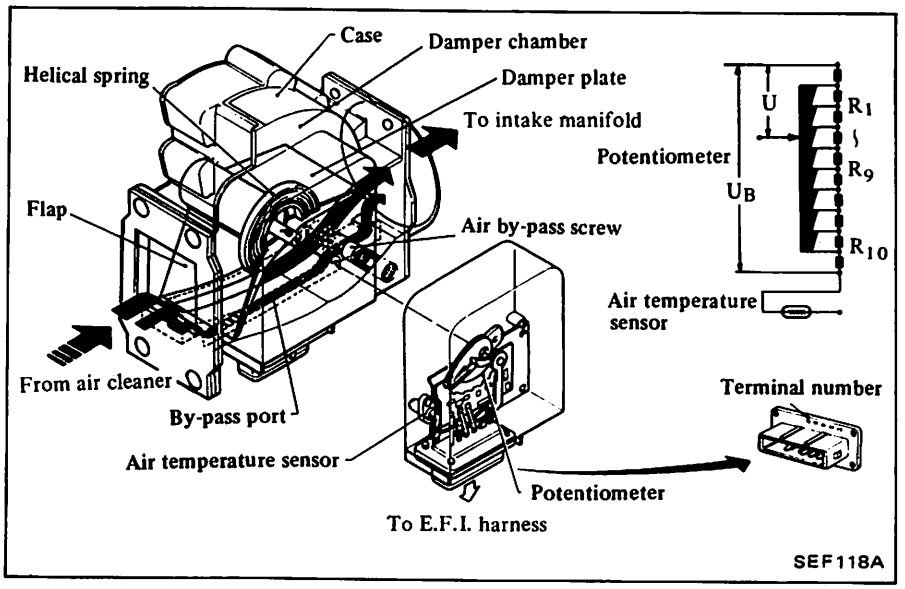
AIR FLOW METER

The air flow meter measures the quantity of intake air, and sends a signal to the control unit so that the base pulse width can be determined for correct fuel injection by the injector. The air flow meter is provided with a flap in the air passage. As the air flows through the passage, the flap rotates and its angle of rotation electronically signals the control unit.

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.



WATER TEMPERATURE SENSOR

The water temperature sensor, built into the thermostat housing, monitors change in water temperature and transmits a signal to increase the pulse duration during the warm-up period.

The temperature sensing unit employs a thermistor which is very sensitive in the low temperature range.

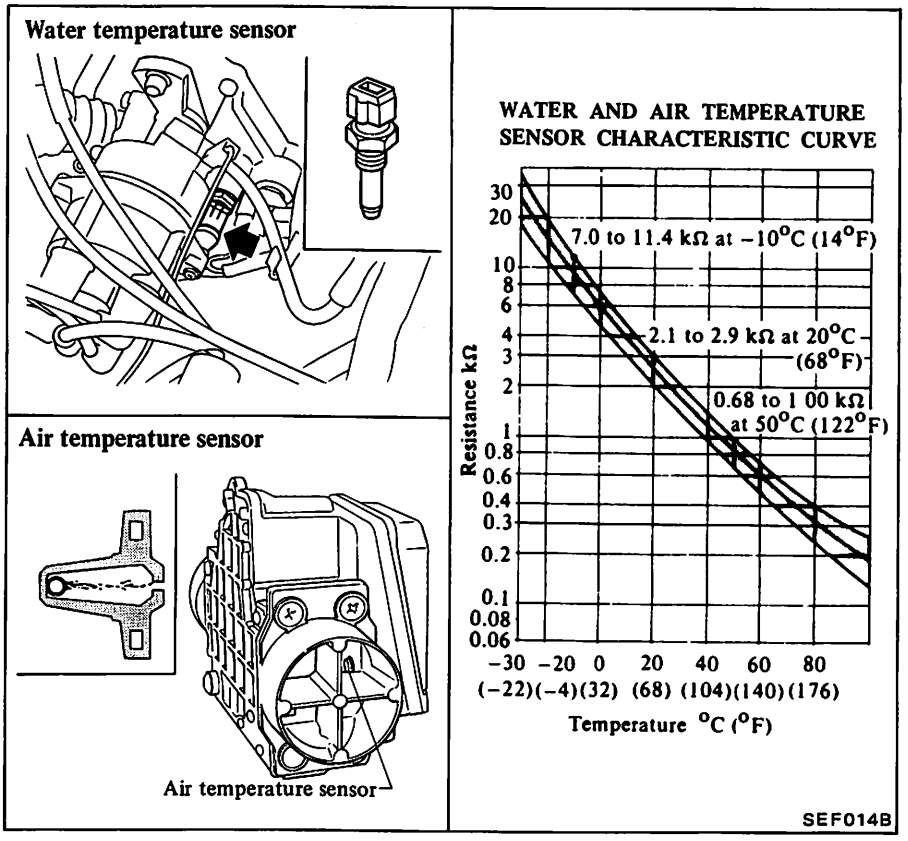
The electrical resistance of the thermistor decreases in response to the temperature rise.

AIR TEMPERATURE SENSOR

The air temperature sensor, built into the air flow meter, monitors change in the intake air temperature and transmits a signal for the fuel enrichment to change the pulse duration.

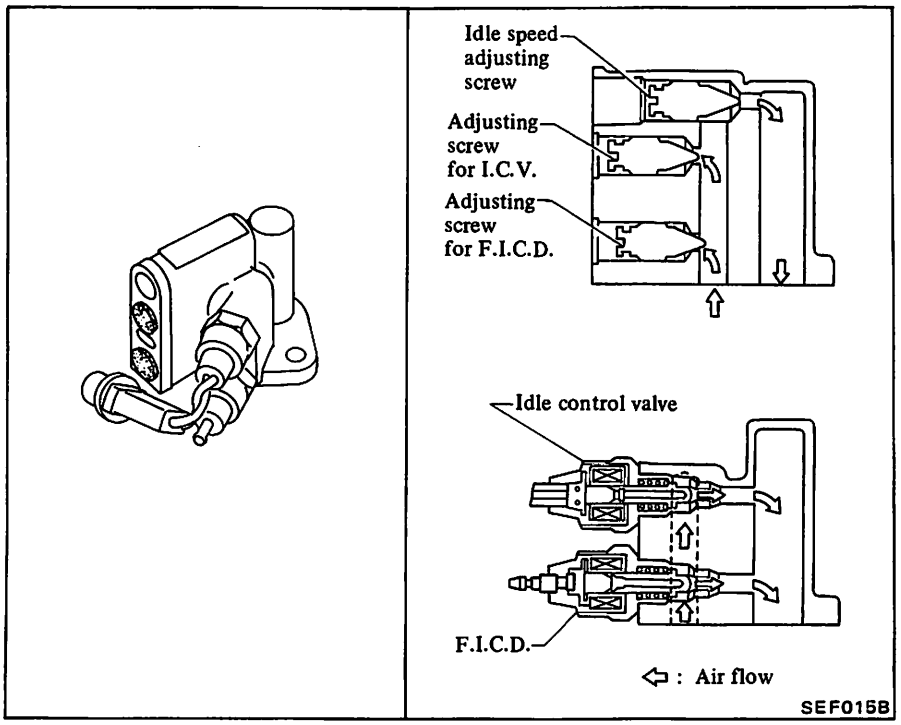
The temperature sensing unit employs a thermistor which is very sensitive in the temperature range.

The electrical resistance of the thermistor decreases in response to air temperature rise.



IDLE CONTROL VALVE

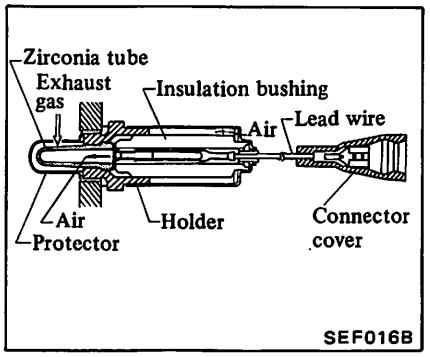
When the idle speed changes because of an increase in electrical load (e.g. the headlamps are turned on), etc., the idle control valve (I.C.V.) is activated to stabilize the idle rpm within the lower and upper limits already stored in the control unit's memory section. However, when the air conditioning is "ON", the idle speed is controlled by the fast idle control device (F.I.C.D.).



BAROMETRIC PRESSURE SENSOR

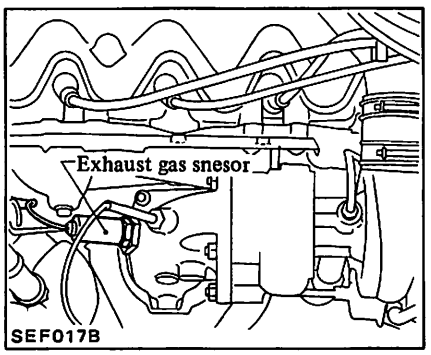
This sensor is built into the control unit and senses the barometric pressure in order to compensate for the density of the intake air.

This sensor cannot be replaced, adjusted or checked as a single unit.
If it malfunctions, replace control unit.



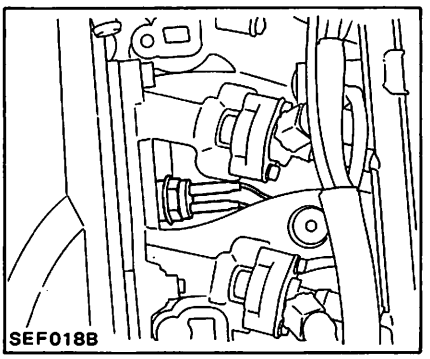
EXHAUST GAS SENSOR

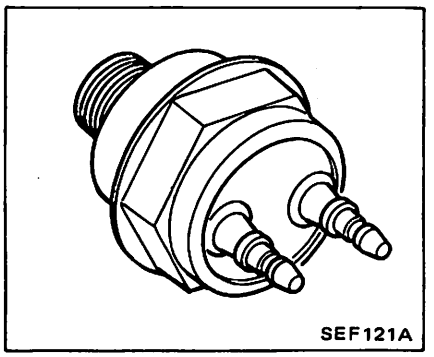
The exhaust gas sensor, which is built into the exhaust manifold, monitors the density of oxygen in the exhaust gas. It consists of closed-end tube made of ceramic zirconia and other components. Porous platinum electrodes cover the tubes inner and outer surfaces. The closed-end of the tube is exposed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



DETONATION SENSOR

The detonation sensor is attached to the cylinder block and senses engine knocking conditions. The sensor monitors the knocking from each combustion chamber and sends an electric signal to the control unit where it is changed to a knocking signal.





PARK/NEUTRAL SWITCH

The park/neutral switch detects the transmission gear selector's position and transmits an electric signal to the control unit.

CAR SPEED SENSOR

The car speed sensor provides a car speed signal to the control unit.
The speed sensor consists of a reed switch, which is installed in the speed meter unit and transforms car speed into a pulse signal.

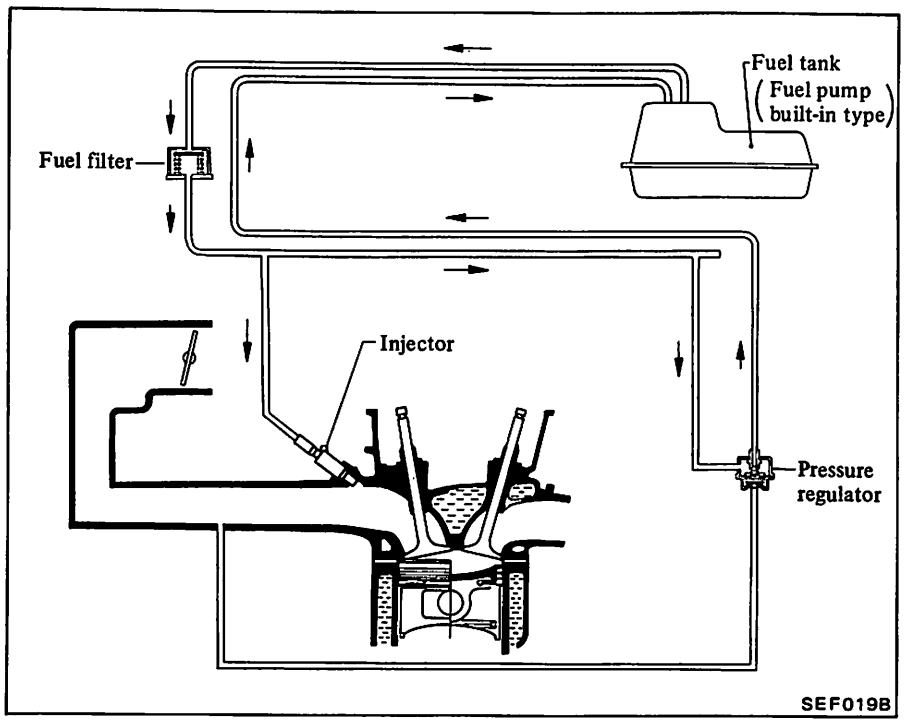
BATTERY VOLTAGE

Battery voltage is sent to the control unit, which then function to compensate the variability in it.

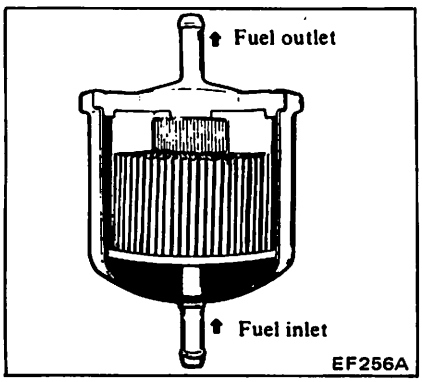
FUEL FLOW SYSTEM

Fuel is drawn from the fuel pump in the fuel tank, from which it is discharged under pressure. As it flows through the mechanical fuel damper, pulsation in the fuel flow is damped. Then, the fuel is filtered in the fuel filter, goes through the fuel line, and is injected into the intake port.

Surplus fuel is led through the pressure regulator and is returned to the fuel tank. The pressure regulator controls the injection pressure in such a manner that the pressure difference between the fuel pressure and the intake manifold vacuum is always 250.1 kPa (2.55 kg/cm², 36.3 psi).

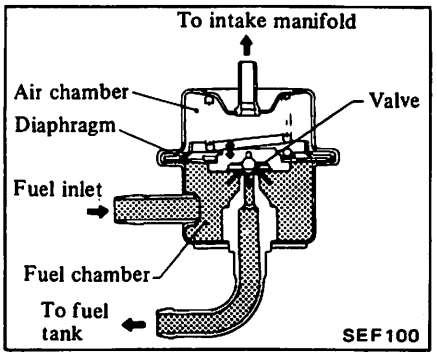


FUEL FILTER

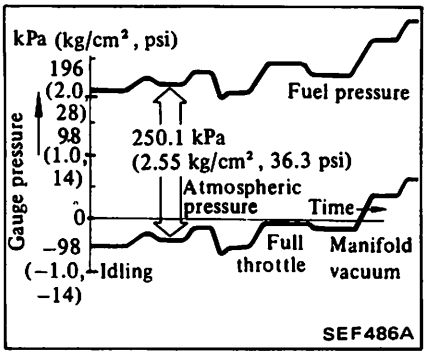


The fuel filter is placed between the fuel damper and the injector, and is used to remove foreign matter in the fuel. Water in the fuel is collected at the bottom of the filter casing.

PRESSURE REGULATOR



The pressure regulator controls the pressure of fuel so that a pressure difference of 250.1 kPa (2.55 kg/cm², 36.3 psi) can be maintained between the fuel pressure and intake manifold vacuum. The pressure regulator is divided into the air chamber and fuel chamber by the diaphragm. Intake manifold vacuum is introduced into the air chamber, thereby keeping differential pressure constant causing excessive fuel to return to the fuel tank through the return side port. This constant differential pressure provides optimum fuel injection in every mode of engine operation.



Inspection

If the fuel pressure is other than that specified, first check the fuel pump and then check the following items:

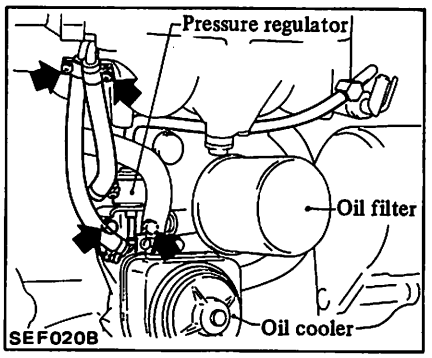
If fuel pressure is too high:

Vacuum hose connected to pressure regulator poorly, clogged fuel return piping, or faulty pressure regulator.

If fuel pressure is too low:

Clogged fuel pump, fuel filter, or fuel tank; leak in the fuel system, or faulty pressure regulator.

Replacement



1. Reduce fuel line pressure to zero.
2. Disengage vacuum tube connecting regulator to intake manifold from pressure regulator.
3. Remove screws securing pressure regulator.

4. Unfasten hose clamps, and disconnect pressure regulator from fuel hose.

Place a rag under pressure regulator to prevent splashing of fuel.

5. To install pressure regulator, reverse the order of removal.
6. For installation of fuel hose, refer to Fuel Hose.

FUEL HOSE

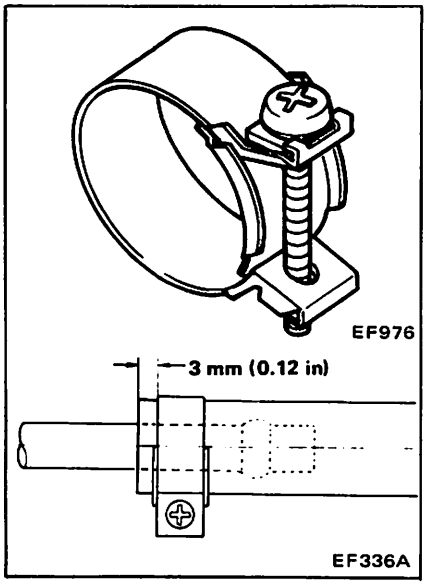
Make sure that all low pressure fuel hoses are fully inserted and are free from undue strain before clamping.

When removing or installing high pressure fuel hose, observe the following.

CAUTION:

a. Do not reuse fuel hose clamps after loosening.
b. Clean dust and dirt from parts with compressed air when assembling.
c. Tighten high pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end or screw position (wider than other portions of clamp) is flush with hose end.

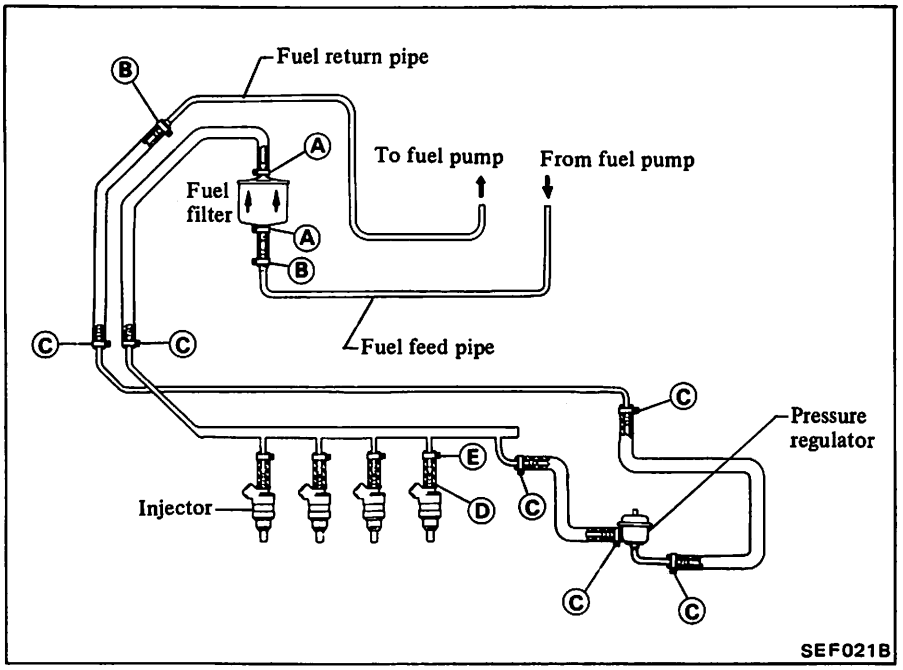
Ⓣ: Fuel hose clamps
1.0 - 1.5 N·m
(0.10 - 0.15 kg-m,
0.7 - 1.1 ft-lb)



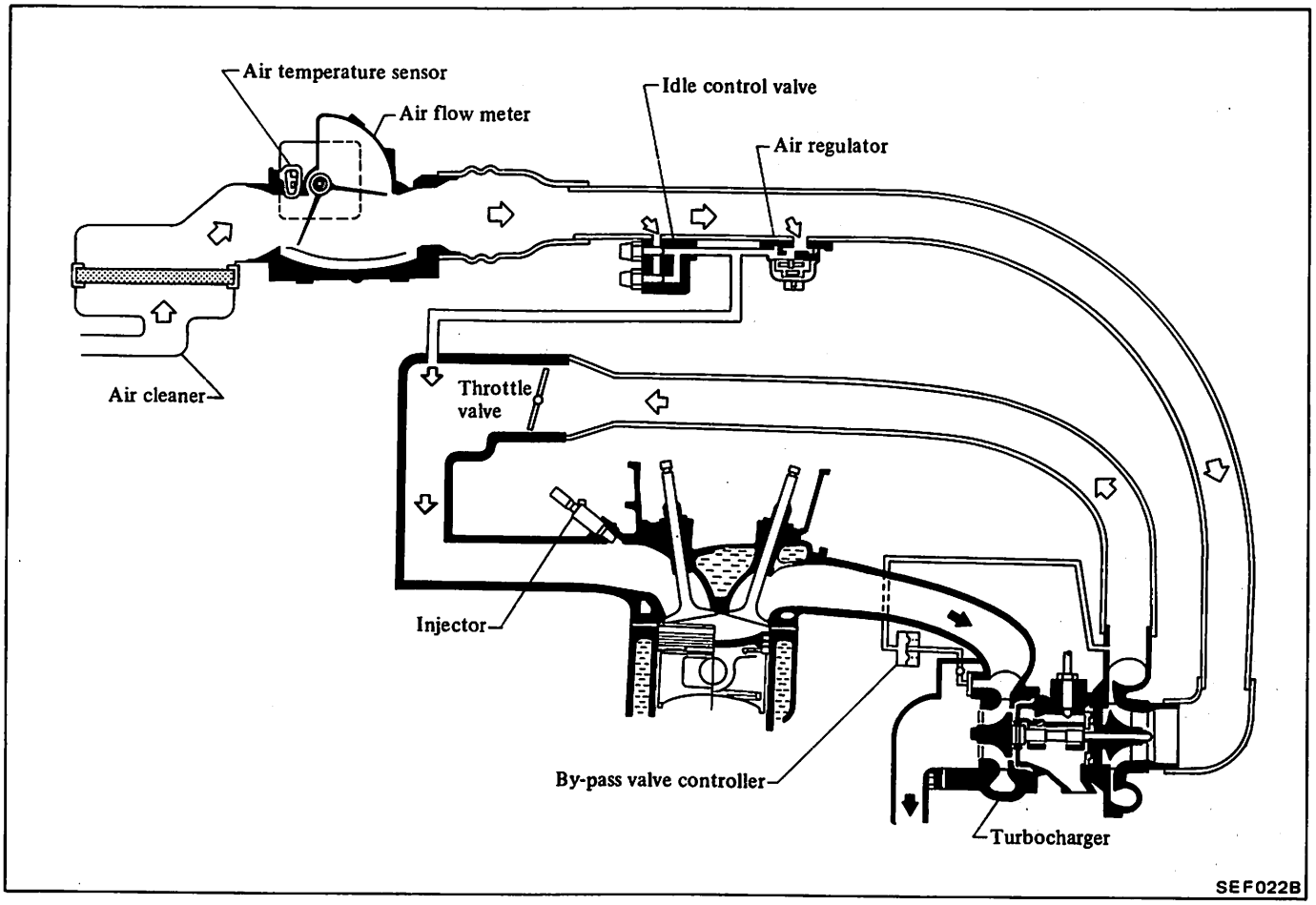
d. When tightening hose clamp, ensure that screw does not come into contact with adjacent parts.

Insert high pressure fuel hoses into their proper positions as instructed below.

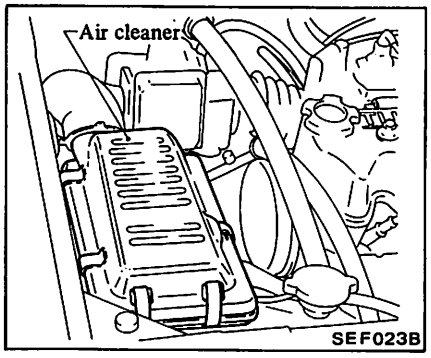
Type Ⓐ: Insert rubber hose until its end contacts unit.
Type Ⓑ: Push end of rubber hose onto fuel pipe until it contacts inner bulge.
Type Ⓒ: Push end of rubber hose onto fuel pipe until it is 33 mm (1.30 in) from end of pipe.
Type Ⓓ: Push end of rubber hose with hose socket onto unit by hand as far as they will go. Clamp is not necessary at this connection.
Type Ⓔ: Push end of injector rubber hose onto fuel pipe until it is 28 mm (1.10 in) from end of pipe.



AIR FLOW SYSTEM



AIR CLEANER

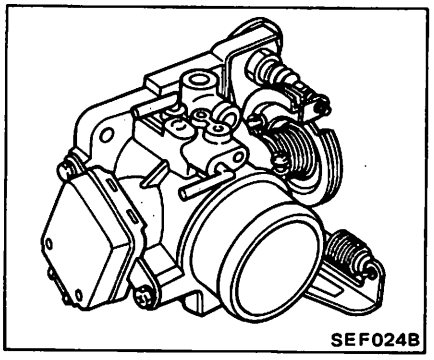


Inspection

Replace filter more frequently under dusty driving conditions.

AIR FLOW METER

Refer to E.C.C.S. COMPONENTS.



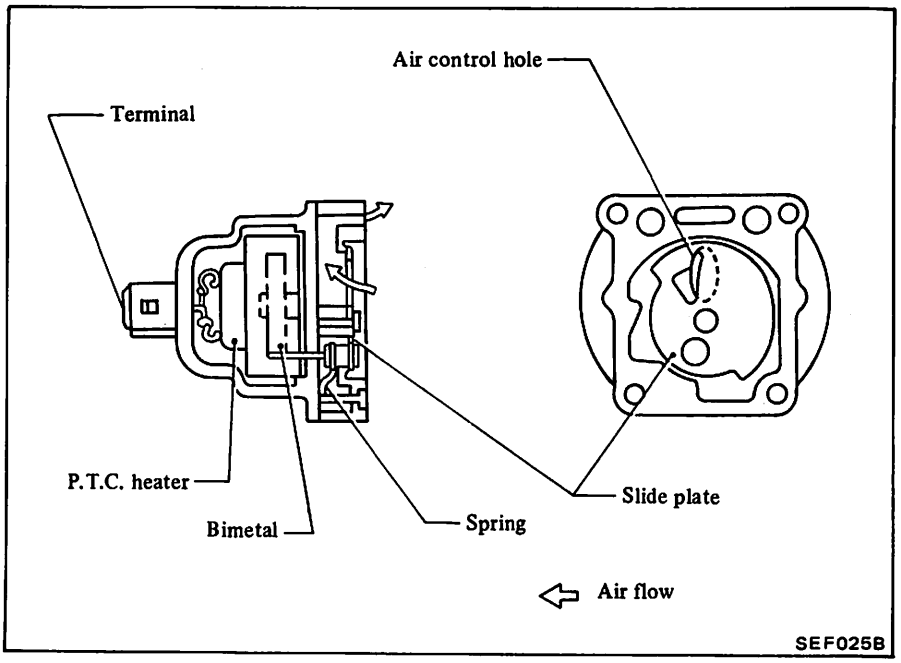
THROTTLE CHAMBER

The throttle chamber, located between the turbocharger and the intake manifold, is equipped with a valve. This valve controls the intake air flow in response to accelerator pedal movement. The rotary shaft of this valve is connected to the throttle valve switch.

AIR REGULATOR

The air regulator by-passes the throttle valve to control the quantity of air for increasing the engine idling speed when starting the engine at a bimetal temperature of below the specified value.

A bimetal (coil type) and a P.T.C. heater are built into the air regulator. When the ignition switch is turned to the "START" position or engine running, electric current flows through the P.T.C. heater, and the bimetal, as it is heated by the heater, begins to move and closes the air passage in a few minutes. The air passage remains closed until the engine is stopped and the bimetal temperature drops to below the specified value.

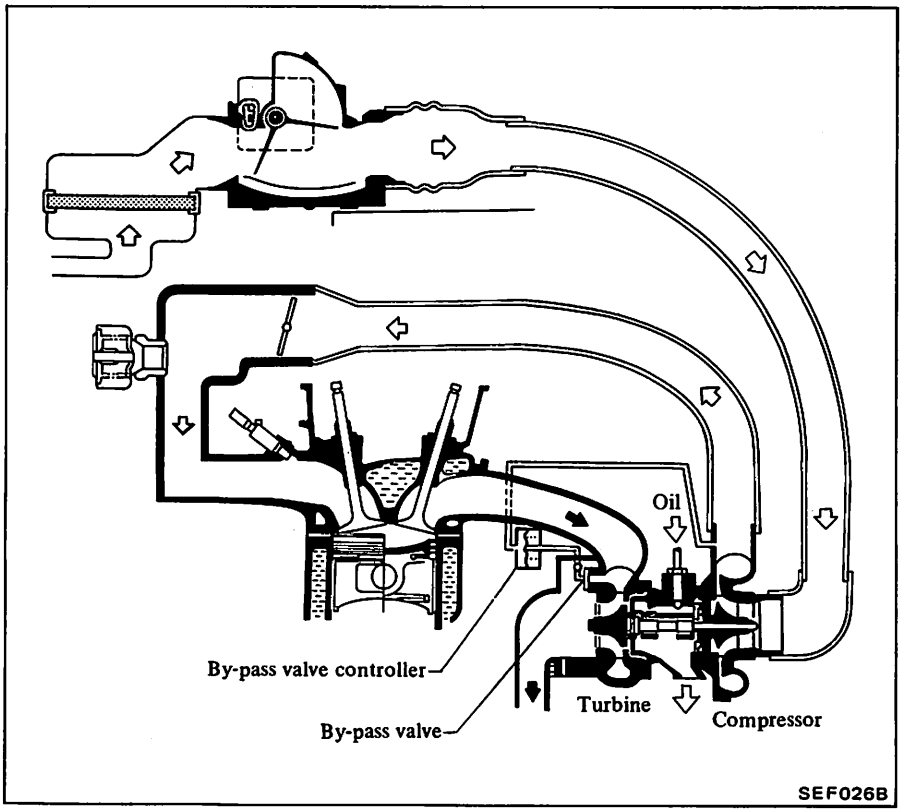


TURBOCHARGER

The turbocharger is installed on the exhaust manifold. This system utilizes exhaust gas energy to rotate the turbine wheel which drives the compressor turbine installed on the other end of the turbine wheel shaft. The compressor supplies compressed air to the engine to increase the charging efficiency so as to improve engine output and torque.

To prevent an excessive rise in the supercharging pressure, a system is adopted which maintains the turbine speed within a certain range by controlling the quantity of exhaust gas that passes through the turbine. This system consists of a by-pass valve controller which detects the supercharged pressure and activates a by-pass valve that allows a part of exhaust gas to be discharged without passing through the turbine.

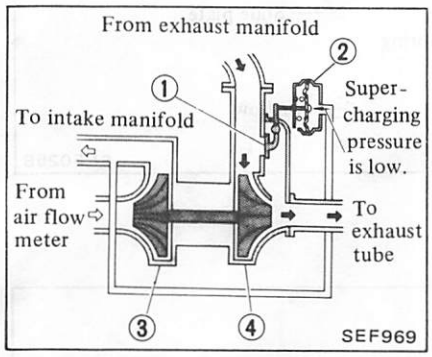
To prevent an abnormal rise in supercharging pressure and possible engine damage in case of a malfunction, an emergency relief valve is provided as a safety device in the intake manifold.



Operation

The by-pass valve controller normally detects the supercharging pressure at the outlet of the compressor housing. All exhaust gas flows through the turbine when the supercharging pressure is below the specified pressure P_0.

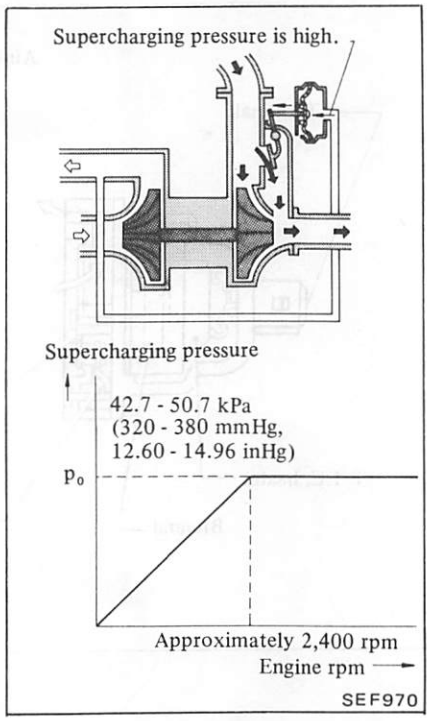
Specified supercharging pressure P_0:
42.7 - 50.7 kPa
(320 - 380 mmHg,
12.60 - 14.96 inHg)



1 By-pass valve
2 By-pass valve controller
3 Turbine
4 Compressor

As the engine speed increases and the supercharging pressure approaches the specified pressure value P_0, it exerts a force on the diaphragm of the by-pass valve controller, thereby opening the by-pass valve.

As the valve opens, part of the exhaust gas by-passes the turbine and goes directly to the exhaust tube. As a result, the turbine speed is kept constant and the supercharging pressure maintained at the specified pressure level.

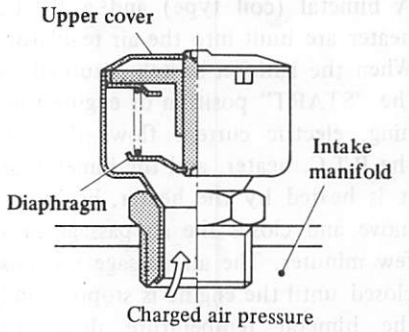


The emergency relief valve operates as follows:

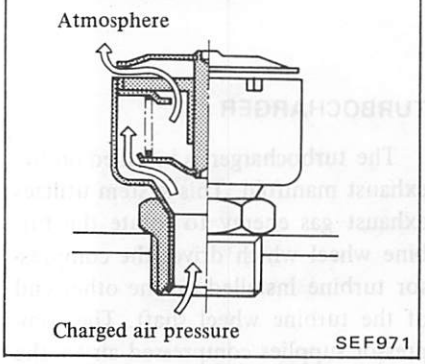
When the pressure in the intake manifold exceeds Pmax, it exerts a force on diaphragm. Then the upper cover, connected to the diaphragm by a shaft, is pushed open, and the excess pressure in the intake manifold is released into the atmosphere.

Pmax:
50.7 - 53.3 kPa
(380 - 400 mmHg,
14.96 - 15.75 inHg)

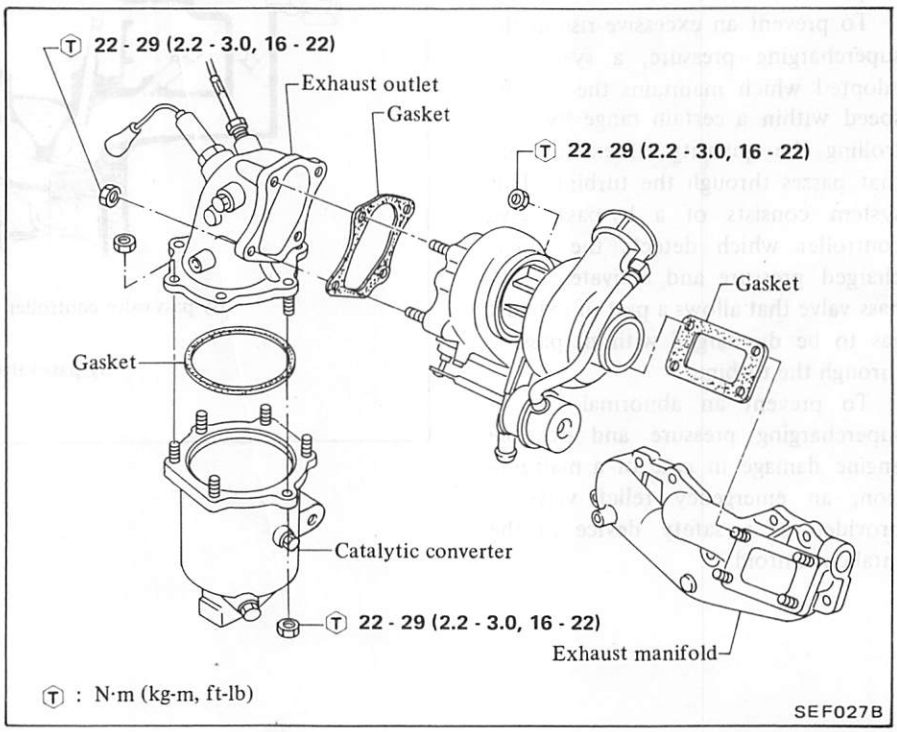
When the pressure in the intake manifold is below P max.



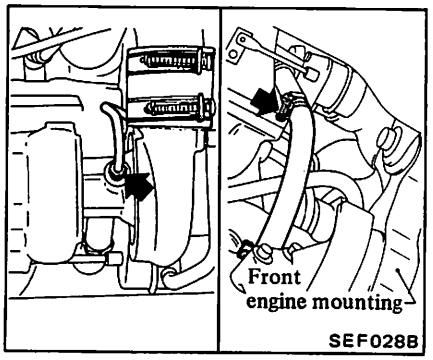
When the pressure in the intake manifold is above P max.



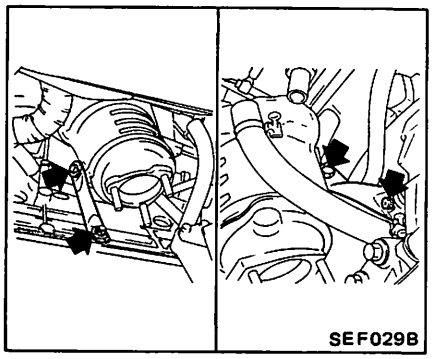
Removal and installation



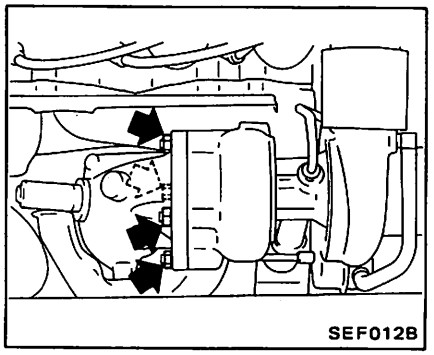
1. Remove heat insulator, inlet tube, air duct hose, suction air pipe and turbocharger temperature sensor.
2. Disconnect exhaust gas sensor harness connector, front tube, oil delivery tube and oil drain pipe.



3. Remove catalyzer supporting bracket.



4. Disconnect exhaust front tube.
5. Remove exhaust outlet and catalyzer as an assembly.



6. Remove turbocharger and exhaust manifold as an assembly.
7. Install in the reverse order of removal.

Disassembly and assembly

Turbocharger should not be disassembled.

Inspection

1. Inspect turbine and compressor wheels for cracks, clogging, deformity or other damage.
2. Revolve wheels to make sure that they turn freely without any abnormal noise.
3. Measure play in axial direction.

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

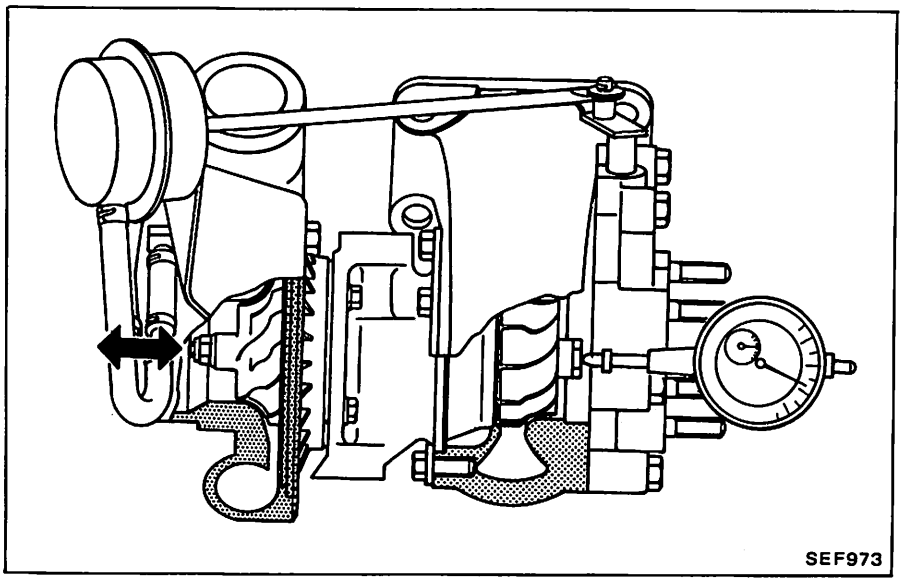
Do not allow wheels to turn when axial play is being measured.

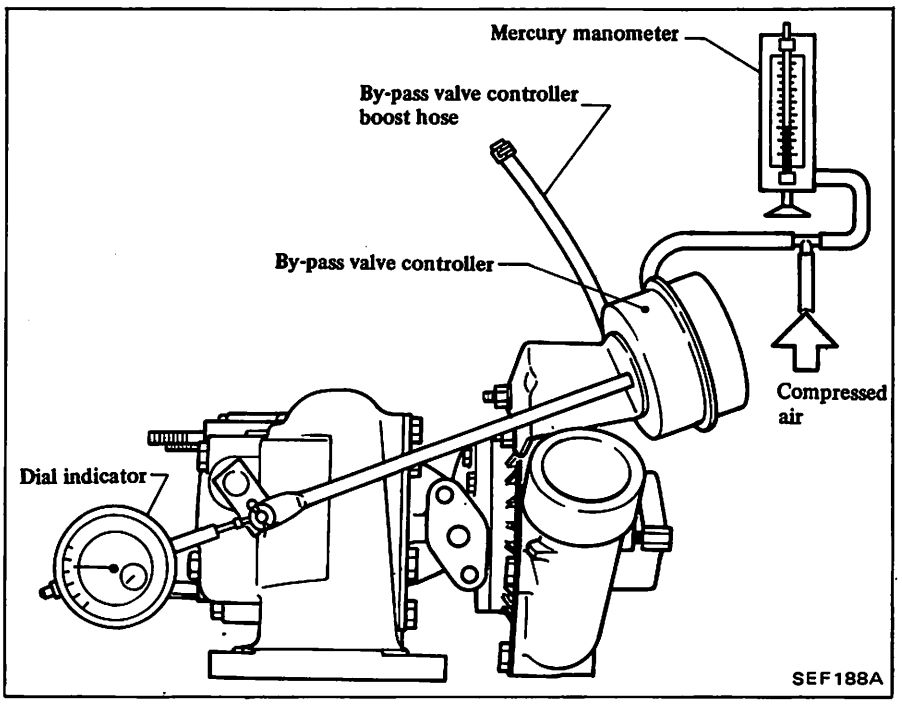
4. Check operation of by-pass valve controller.

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

By-pass valve controller stroke/ pressure:
0.38 mm (0.0150 in)/
41.9 - 47.2 kPa
(314 - 354 mmHg,
12.36 - 13.94 inHg)

5. Move by-pass valve to make sure that it is not sticked or scratched.
6. Always replace turbocharger as an assembly if any of the above items shows abnormalities.



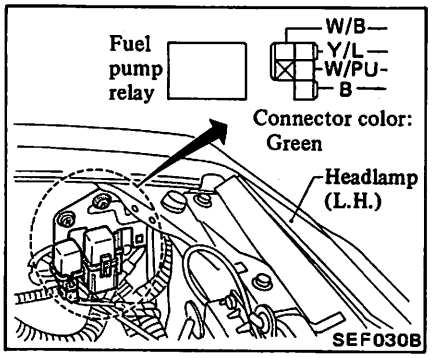


FUEL SYSTEM PRESSURE CHECK

Before disconnecting fuel hose, release fuel pressure from fuel line for safety reasons.

RELEASING FUEL PRESSURE

1. Start the engine.
2. Disconnect harness connector of fuel pump relay while the engine is running.



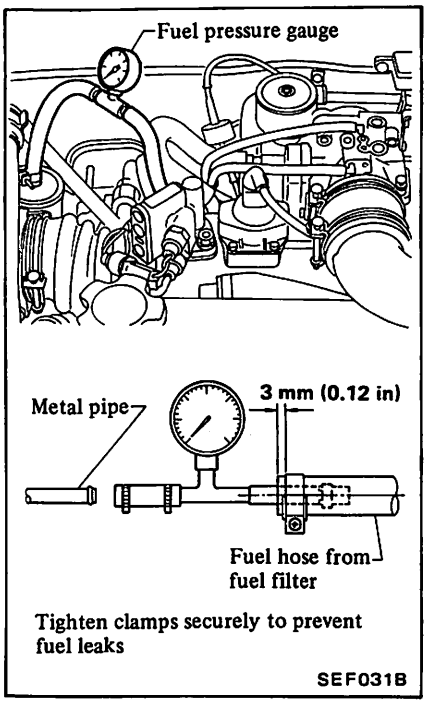
3. After engine stalls, crank the engine two or three times.
4. Turn ignition switch "OFF".
5. Reconnect the harness connector of fuel pump relay.

If engine does not start, remove fuel pump connector and crank the engine for about 5 seconds.

FUEL PRESSURE CHECK

When reconnecting the lines, always use new clamps and be sure to position them correctly.
Use a torque driver to tighten clamps.

1. Install Pressure Gauge (J 25400-34) between fuel filter hose and metal pipe at point shown. For convenience in later tests, position gauge so that it can be read from driver's seat.



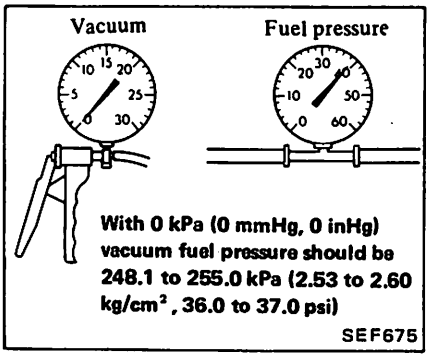
2. Start engine and read fuel pressure gauge.

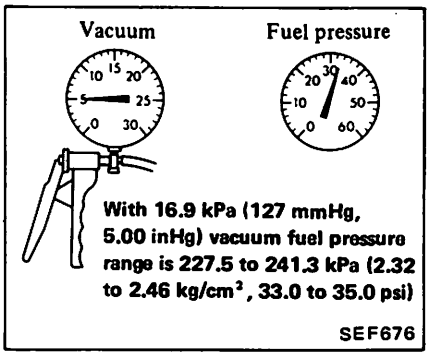
At idling:
Approximately 206 kPa (2.1 kg/cm², 30 psi)
The moment accelerator pedal is fully depressed:
Approximately 255 kPa (2.6 kg/cm², 37 psi)

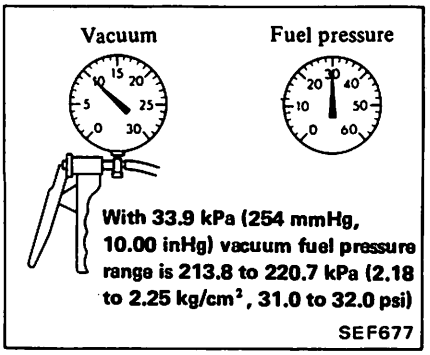
3. If fuel pressure is not as specified, replace pressure regulator, and repeat fuel pressure check.

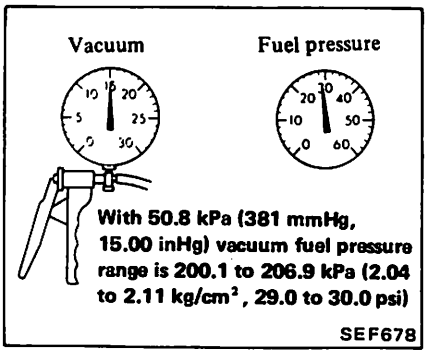
If below the specified value, check for clogged or deformed fuel lines, and if necessary, replace fuel pump as an assembly or check valve.

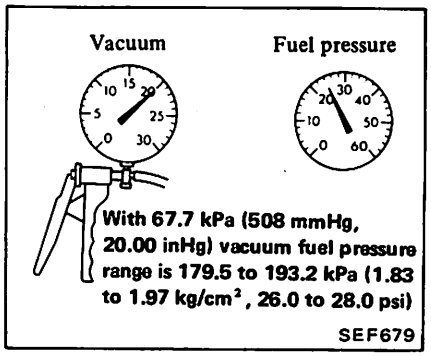
4. Connect variable vacuum source, J 23738 or equivalent to fuel regulator. Disconnect fuel pressure regulator vacuum hose from intake manifold and attach hose to variable vacuum source.
5. Jump fuel pump relay harness connector, W/B and W/PU.
6. Turn key to "ON".
7. Observe fuel pressure readings as vacuum is changed.









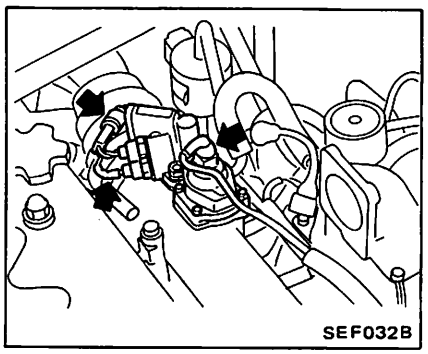


Fuel pressure must decrease as vacuum increases. If results are unsatisfactory, replace pressure regulator.

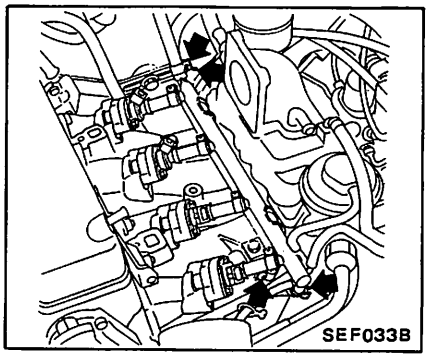
8. Turn key to "OFF".
9. Disconnect variable vacuum source and connect fuel pressure regulator vacuum hose to intake manifold.
10. Reconnect any wires which was disconnected.

REPLACEMENT

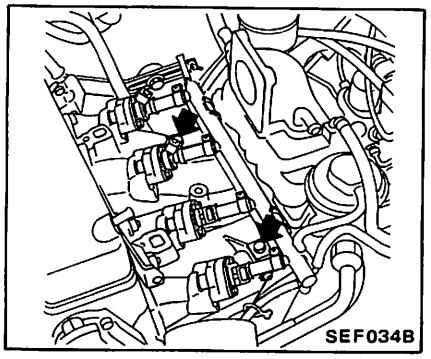
1. Lower fuel pressure.
   Refer to FUEL PRESSURE CHECK.
2. Remove air inlet pipe and hose.
3. Disconnect accelerator wire and throttle wire (A/T).
4. Disconnect throttle valve switch harness connector and remove throttle chamber.
5. Remove P.C.V. valve and hose.
6. Loosen clamps at both ends of air pipe.
7. Disconnect I.C.V. and air regulator harness connectors.



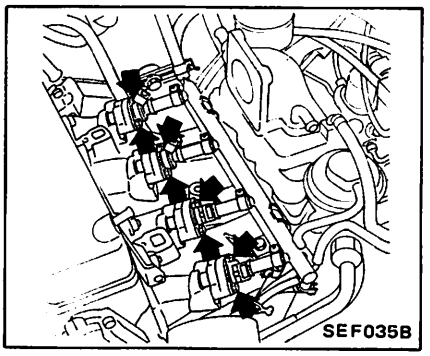
8. Remove air pipe.
9. Disconnect harness connectors from injectors.
10. Remove fuel hoses.



11. Remove bolts securing fuel pipe.



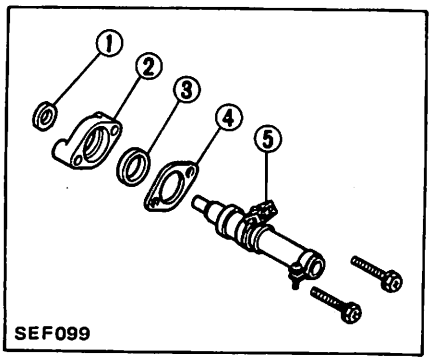
12. Remove screws securing fuel injector.



13. Remove fuel pipe assembly by pulling out fuel pipe and injectors.

14. Unfasten hose clamp on fuel injector and remove fuel injector from fuel pipe.

Place a rag under injector when disconnecting fuel pipe to prevent splashing of fuel.



1 Injector lower rubber insulator
2 Injector lower holder
3 Injector upper rubber insulator
4 Injector upper holder
5 Injector

15. To install injector and fuel pipe, reverse the order of removal.

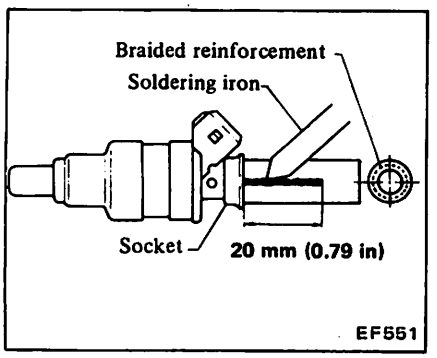
When installing injector, check that there are no scratches or abrasion at lower rubber insulator, and securely install it, making sure it is air-tight.

16. For installation of fuel hose, refer to Fuel Hose.

INJECTOR RUBBER HOSE

If necessary, replace injector rubber hose. Proceed as follows:

Removal



1. On injector rubber hose, measure off a point approx. 20 mm (0.79 in) from socket end.
2. Heat soldering iron (150 watt) for 15 minutes. Cut hose into braided reinforcement from mark to socket end.

Do not feed soldering iron until it touches injector tail piece.

CAUTION:
a. Be careful not to damage socket, plastic connector, etc. with soldering iron.
b. Never place injector in a vise when disconnecting rubber hose.

3. Then pull rubber hose out with hand.

Installation

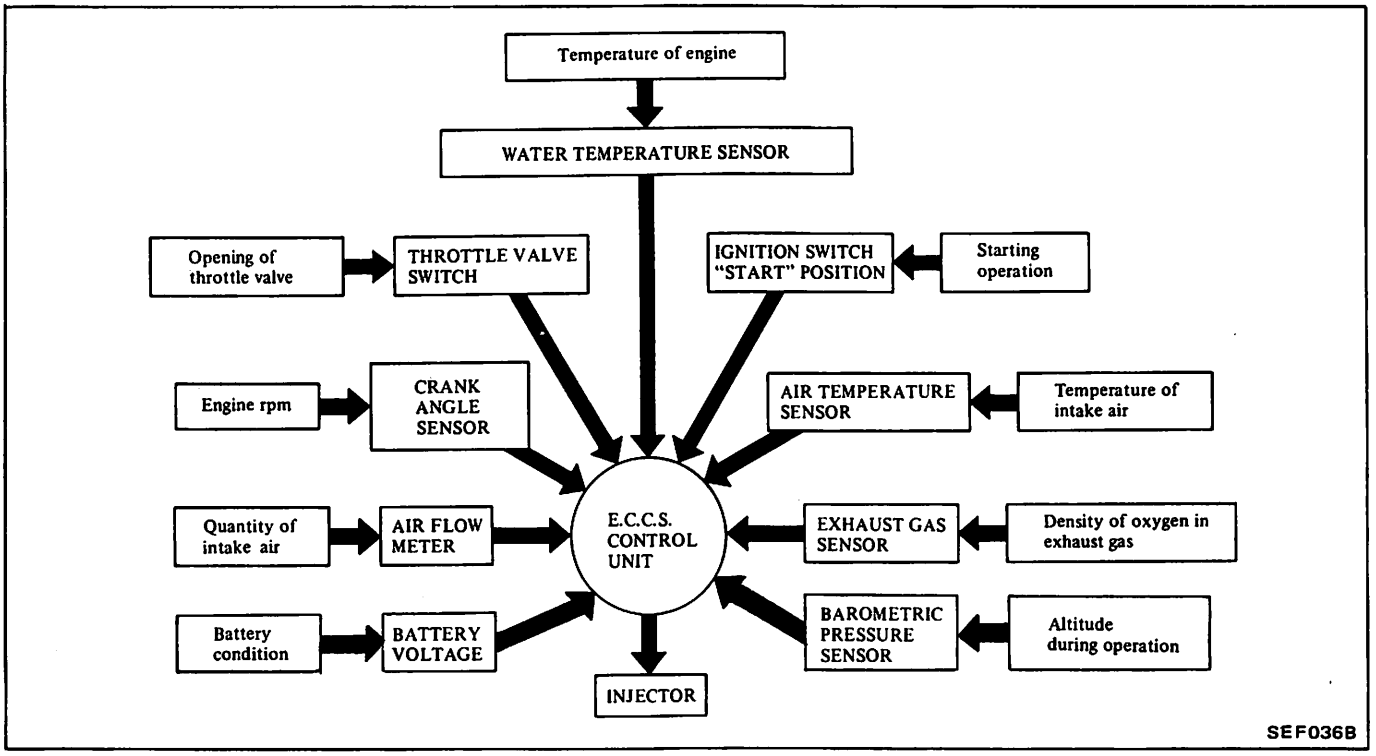
1. Clean exterior of injector tail piece.
2. Wet inside of new rubber hose with fuel.
3. Push end of rubber hose with hose socket onto injector tail piece by hand as far as they will go.

Clamp is not necessary at this connection.

CAUTION:
After properly connecting fuel hose to injector, check connection for fuel leakage.

FUEL INJECTION CONTROL

There are two ways to control fuel injection: open-loop control and closed-loop control. Which one is used depends on the cylinder head temperature, engine rpm, engine load, exhaust gas sensor signal and so forth.



The control unit determines the proper quantity of fuel to be injected from each signal input and then operates the injector. Injections are timed for each rotation of the engine by the crank angle sensor signal and are made simultaneously in every cylinder.

OPEN-LOOP CONTROL

For improved driveability, fuel injection is controlled by open-loop control when the engine is cold, when driving at high speeds or under heavy load and when the fuel shut-off system is in operation. With open-loop control, the mixture ratio is determined by the Central Electronic Control Unit (C.E.C.U.) to correspond to the engine rpm, engine load and engine warm-up conditions.

Open-loop control will activate under the following conditions:

In the following instances, the control unit emits a signal that will return mixture ratio to the best point which will keep a good driving condition.

Starting engine

When starting engine.

Cold engine

- Water temperature is below 30°C (86°F).
- Exhaust gas sensor is not activated.

Driving condition

When driving at high speeds (about 7,200 rpm) or under heavy load.

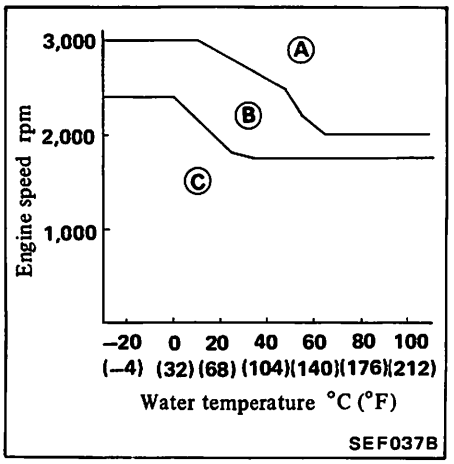
Exhaust gas sensor time monitor

When the time necessary to complete one control cycle takes more than 15 seconds, that is, the time from one rich detection (made by exhaust gas sensor) to the next rich detection.

Fuel shut-off operation

Fuel shut-off is accomplished during deceleration when the engine does not require fuel.

The graph on the right shows the fuel shut off range.

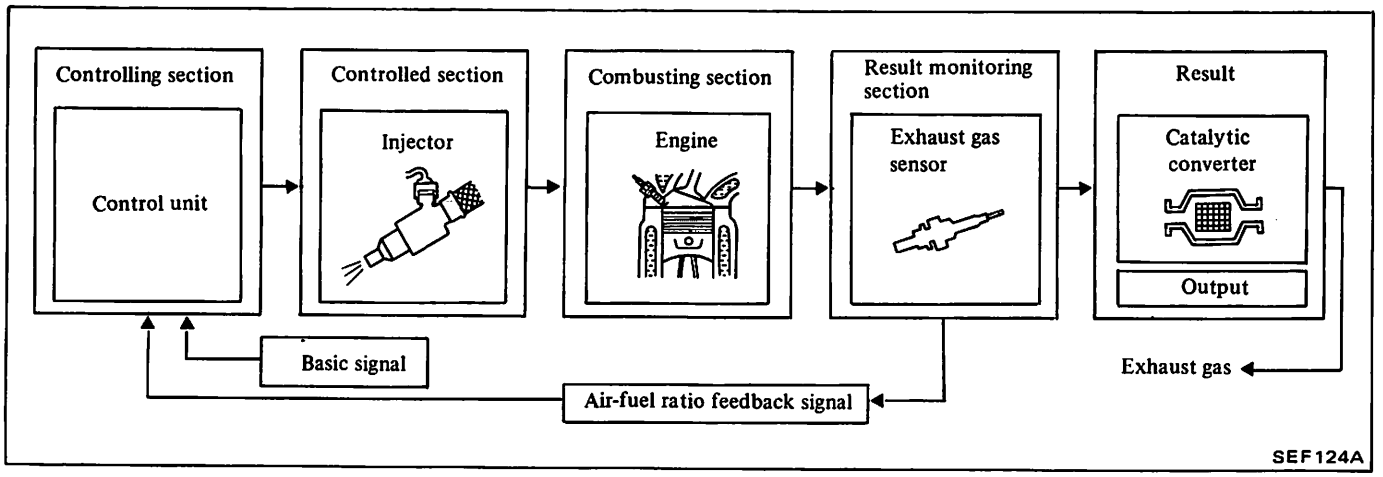


When a transmission gear is in "N" or "P" position, or a clutch is depressed, this system does not operate.

Deceleration from zone "A"	Fuel is shut off; and fuel is injected again in zone "C".
Deceleration from zone "B"	Fuel is not shut off.
Deceleration from zone "C"	Fuel is not shut off.
Engine rpm increased in order of "C", "B", and "A". (Idle switch ON, downhill driving, etc.)	Fuel is not shut off in zones "C" and "B"; in zone "A", fuel is shut off.

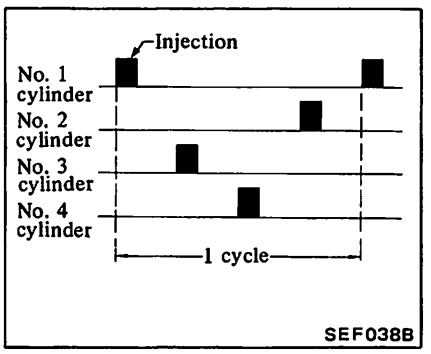
MIXTURE RATIO FEEDBACK CONTROL (Closed-loop control)

This system is designed to control the mixture ratio precisely to the stoichiometric point so that the three-way catalyst can minimize CO, HC and NOx emissions simultaneously. The system uses the oxygen sensor located in the exhaust manifold to give an indication of whether the inlet mixture ratio is richer or leaner than the stoichiometric point. The sensor transmits a nonlinear voltage to the electronic control unit. The control unit adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the narrow window of the three-way catalyst. During engine warm-up period, however, this system becomes open until the sensor reaches the operating temperature.



SEQUENTIAL FUEL INJECTION

Two types of fuel injection systems are used – simultaneous fuel injection and sequential fuel injection. In the former, fuel is injected into all four cylinders simultaneously. In other words, pulse signals of the same width are simultaneously transmitted from the control unit to the four injectors for each cycle of engine operation. In the sequential fuel injection system, fuel is injected into cylinders according to the firing order. In this case, four pulse signals are separately transmitted to the injectors. In this type of fuel injection, pulse width can be altered in one cycle of operation and thus improve driving performance.



Sequential fuel injection takes the place of simultaneous fuel injection when all of the conditions or requirements described below are met. In other cases, fuel is injected in the simultaneous fuel injection mode.

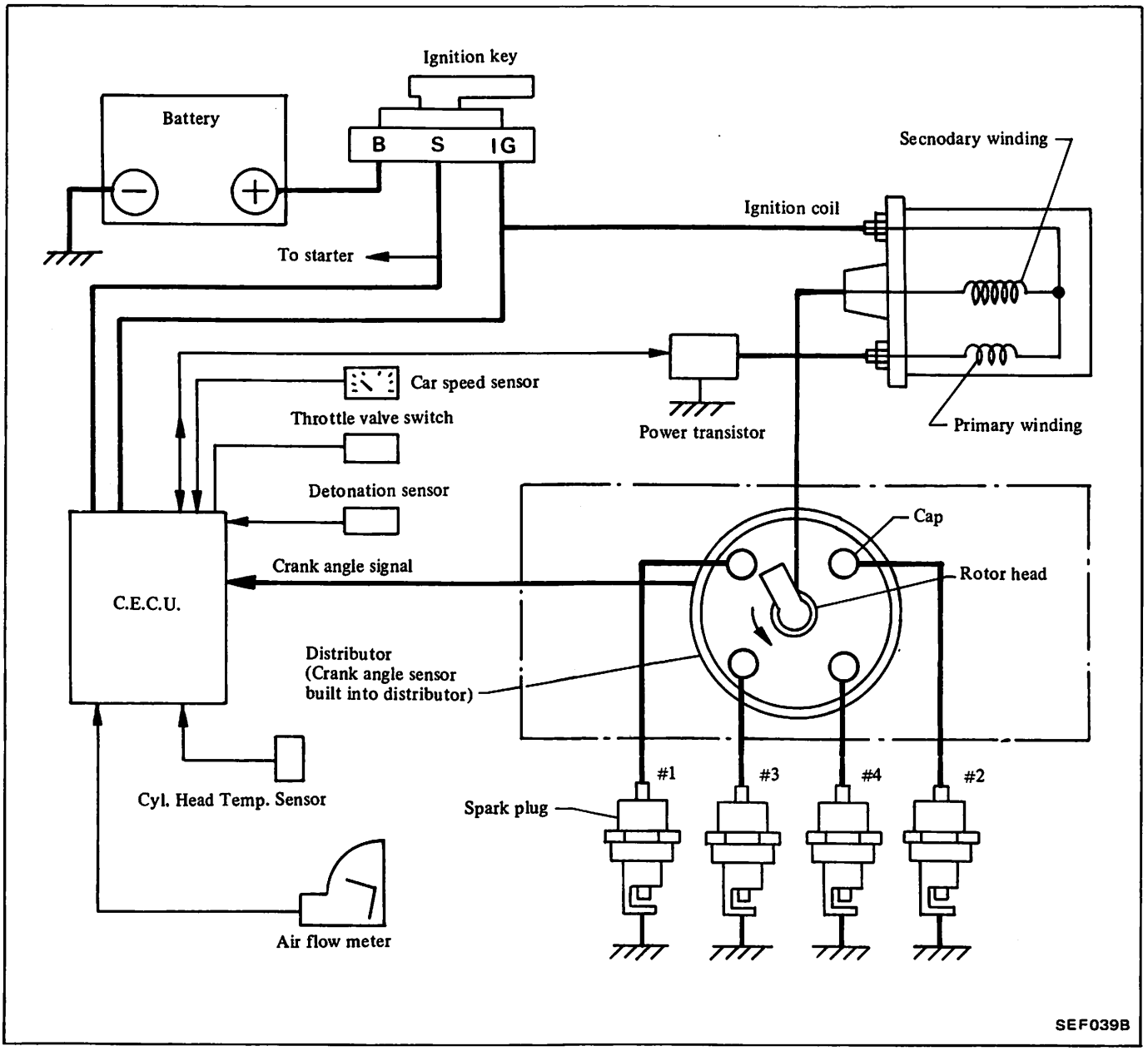
- When the C.E.C.U. is monitoring a crank angle by a signal transmitted from the crank angle sensor, after the "START" signal turns "OFF" when it has been "ON",
- When the water temperature is more than 10°C (50°F) or when eleven seconds have passed after the engine has started, and
- When the crankshaft's angle of rotation is less than 80 degrees while an injection pulse is being emitted in the sequential mode or when it is less than 70 degrees in the simultaneous fuel injection mode.

ELECTRONIC IGNITION TIMING CONTROL

The ignition timing is controlled by the central electronic control unit adjusting to the engine operating conditions: that is, as the best ignition timing in each driving condition has been memorized in the unit, the ignition timing is determined by the electric signal calculated in the unit.

The signals used for the determination of ignition timing are cylinder head temperature, engine rpm, engine load, engine crank angle, detonation sensor and so forth.

Then, the signal from the central electronic control unit is transmitted to the power transistor of the ignition coil, and controls the ignition timing. If there is engine knocking, a detonation sensor monitors its condition and the signal is transmitted to the central electronic control unit. After receiving it, the control unit controls the ignition timing to avoid the knocking condition.

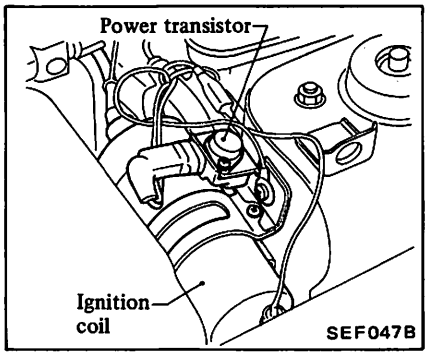


ADJUSTMENT

Ignition timing is automatically controlled by the control unit, and it is usually unnecessary to adjust it.

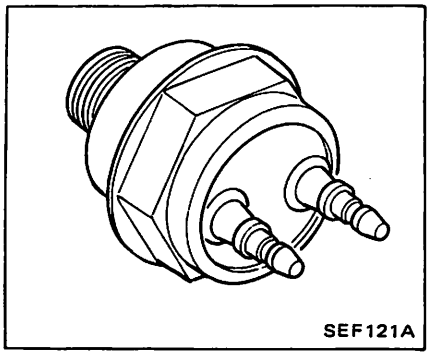
IGNITION COIL

The ignition coil has a built-in power transistor. The signal from the control unit is amplified by the power transistor. This amplified signal is used to connect and disconnect the ignition coil's primary current to generate high voltage across the secondary coil, and thereby create a spark in the spark plug.

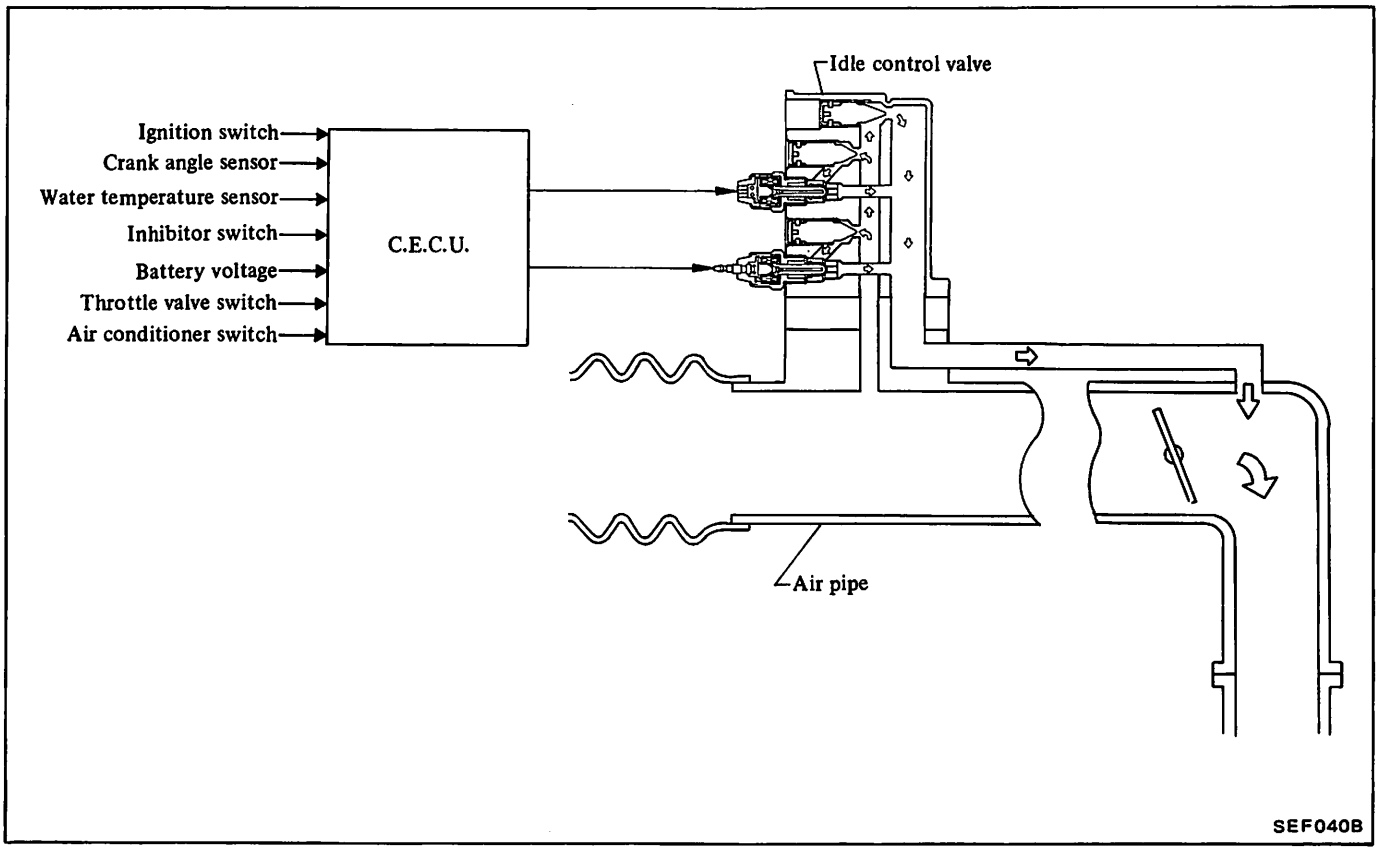


DETONATION SENSOR

The detonation sensor is installed in the side face of the cylinder block. It converts the vibrations caused by pressure in the combustion chamber into electrical signals. If the engine knocks while operating, the abnormal vibration will be detected by the detonation sensor. This signal is then sent to the control unit to retard the ignition timing to prevent further knocking.



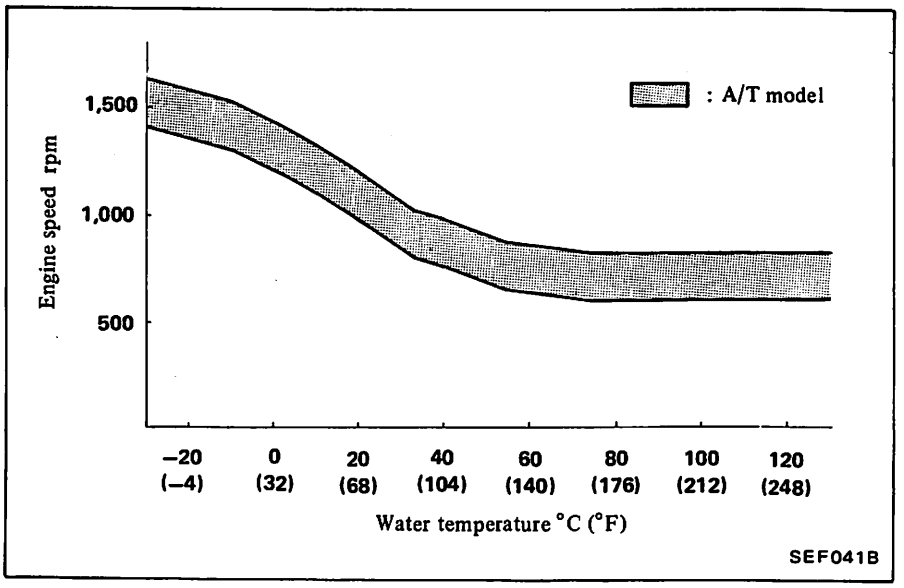
IDLE SPEED CONTROL



The idle speed is compensated by the control unit adjusting to the engine operating conditions. Water temperature and engine rpm are used for the determination of idle speed.

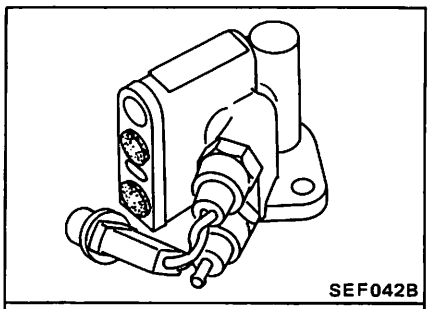
The control unit senses the idle conditions, and determines the appropriate idle speed at each water temperature, and sends the electronic signal to the Idle speed Control Valve (I.C.V.).

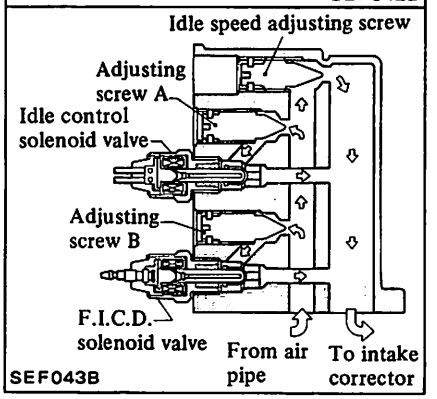
When the idle speed varies out of the specified rpm, the idle control valve is activated to maintain the idle speed within the speed range. This is indicated by hatches in the figure below.



IDLE CONTROL VALVE (I.C.V.)

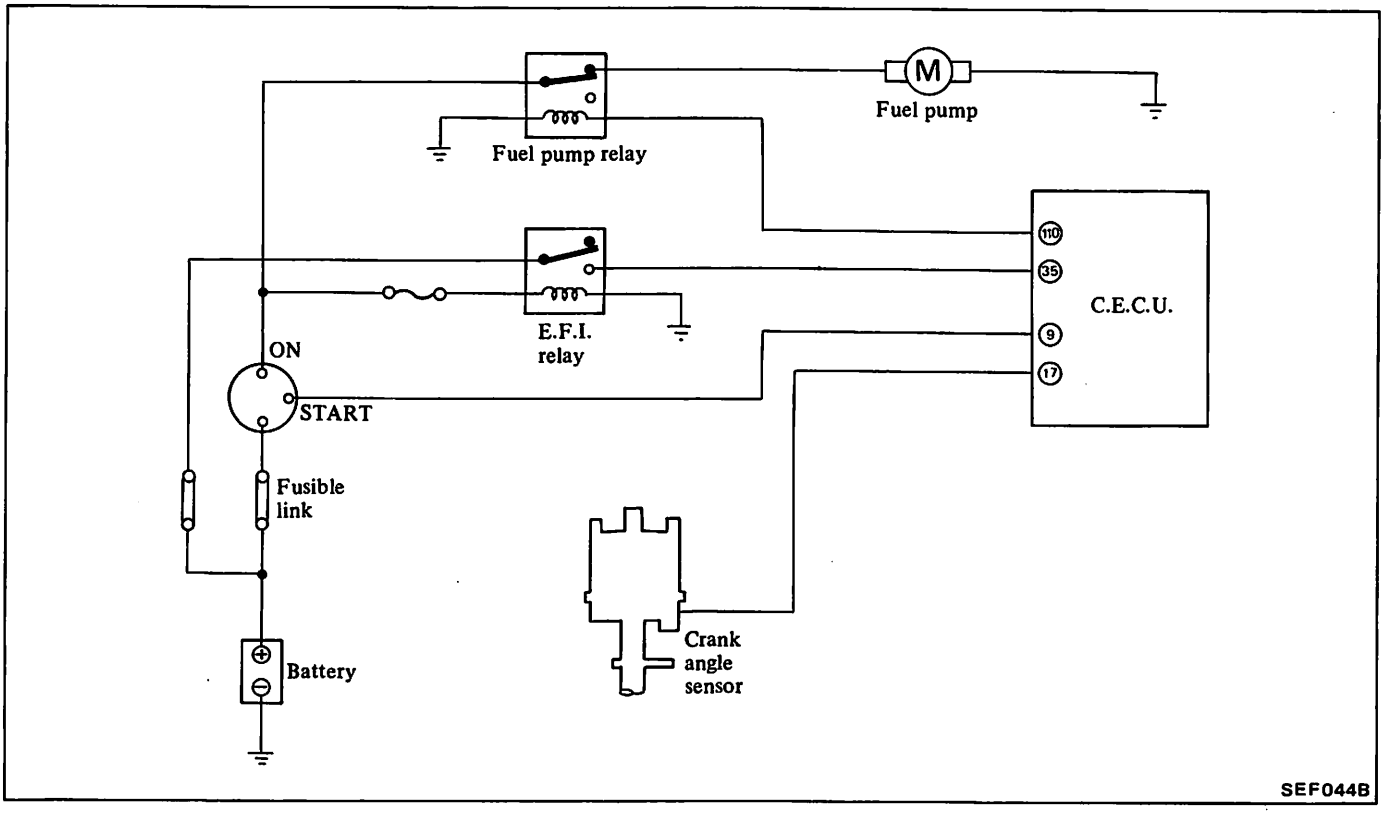
The I.C.V. is attached to the air pipe and sends auxiliary air into the intake collector to increase the idle speed.





FUEL PUMP CONTROL

The fuel pump is controlled by the central electronic control unit according to the engine conditions. The signals from engine crank angle and ignition switch are used for the fuel pump operation.



FUEL PUMP

A relief valve in the pump is designed to open when the pressure in the fuel line rises over 422 to 490 kPa (4.3 to 5.0 kg/cm^2, 61 to 71 psi) due to malfunction in the pressure system.
The check valve prevents abrupt drop of pressure in the fuel pipe when stopping the engine.

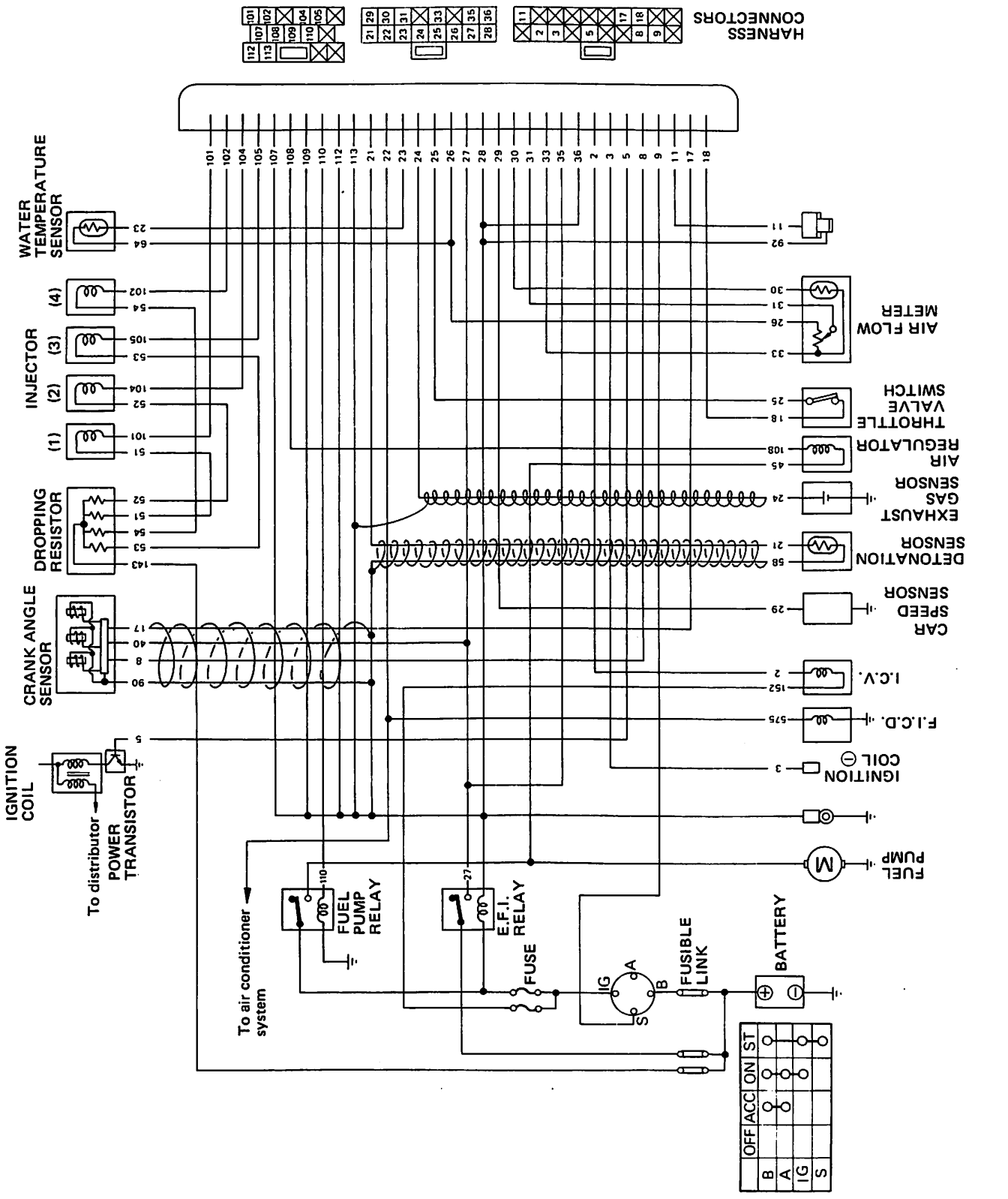
Fuel pump operation

The control unit controls the operation of the fuel pump as follows:

- When a "START" signal is not received by the control unit after the ignition switch has been turned "ON", the fuel pump operates for a period of five seconds.
- While the engine is in operation (or when the control unit receives a 180° signal), the fuel pump continues to operate.
- When the engine stops, the fuel pump automatically stops within 1.0 second.

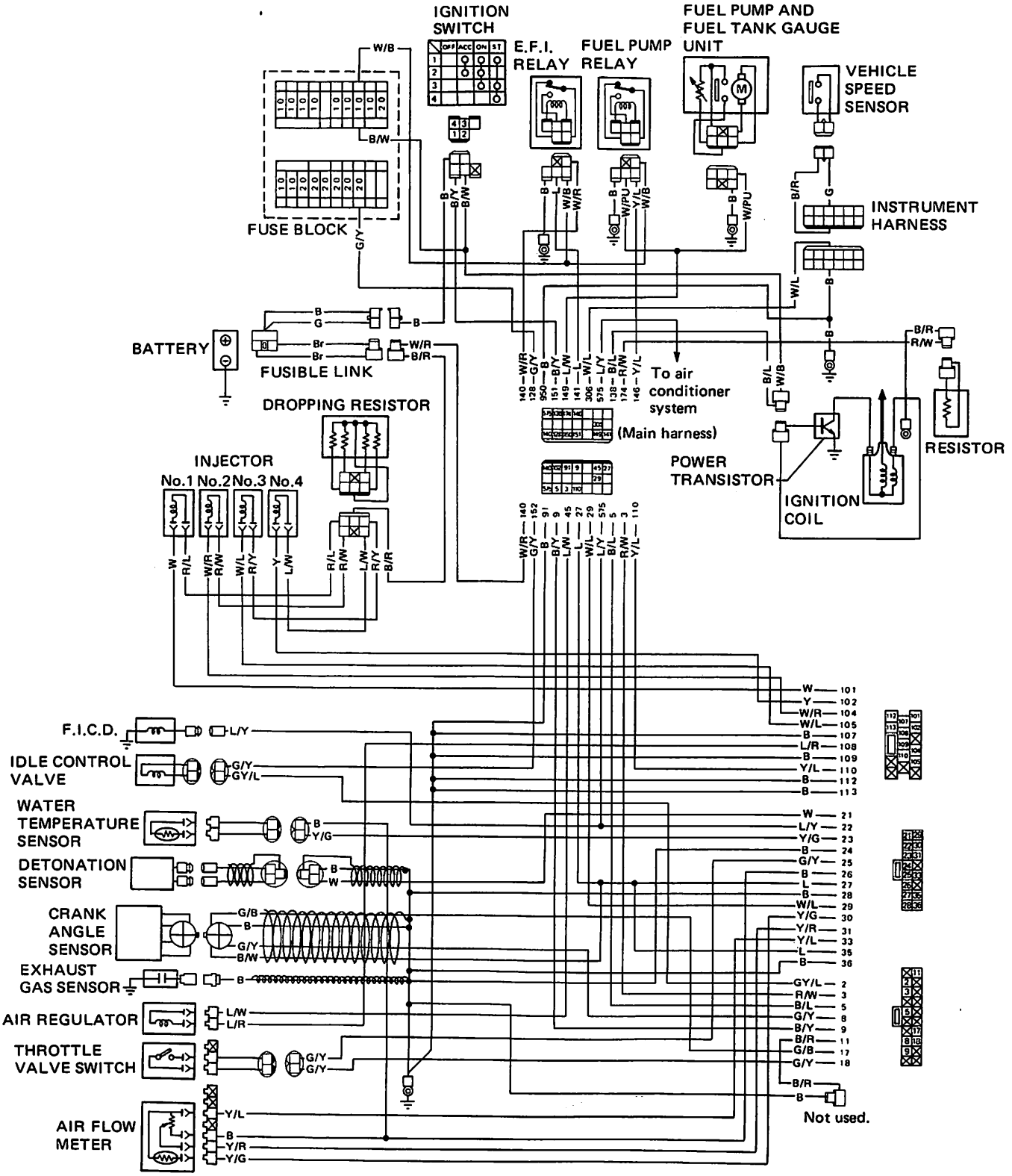
ELECTRICAL SYSTEM INSPECTION

E.C.C.S. CIRCUIT DIAGRAM



SEF045B

E.C.C.S. WIRING DIAGRAM



SEF046B

PREPARATIONS FOR INSPECTION

VEHICLE PREPARATIONS

1. Turn ignition switch to "OFF" position.

CAUTION:
Before disconnecting and connecting electrical connectors, ensure that ignition switch is in the "OFF" position.

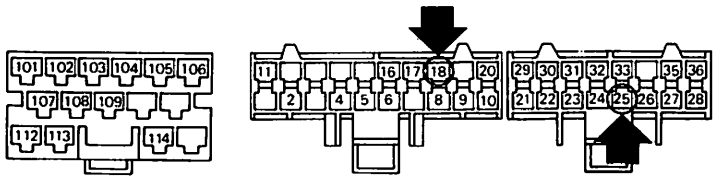
2. Disconnect battery ground cable.
3. Disconnect lead wire from "S" terminal of starter motor.
4. Arrange so that air flow meter flap can be pushed manually from air cleaner side.
5. Disconnect 15-pin, 20-pin and 16-pin E.C.C.S. harness connectors from control unit.

CAUTION:
a. Before disconnecting ECCS harness at 15-pin, 20-pin and 16-pin connectors, ensure that ignition switch is in the "OFF" position.
b. Be extremely careful not to break or bend 15-pin, 20-pin and 16-pin when disconnecting terminal.
Do not touch the circuit tester probe to any unnecessary pin on the 15-pin, 20-pin and 16-pin connectors. Doing so could cause damage to the circuit tester.
c. After inspection or replacement, connect E.C.C.S. harness connectors with control unit securely and make sure that connectors are secured properly. (At this time, a click may be heard.)

THROTTLE VALVE SWITCH TESTS

Test No. 1 Idle contacts

Tester	Leads to Pins (+)	Leads to Pins (−)	Notes	Should Read
Ohmmeter	18	25	Throttle depressed	No continuity
			Throttle released	Continuity

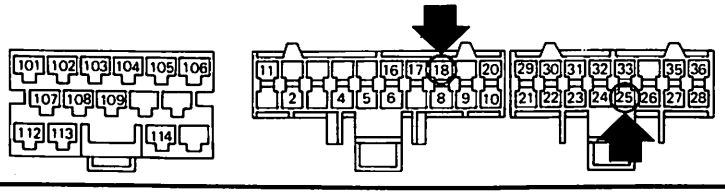


SEF502A

If test is O.K., go to Test No. 2.
If test is not O.K., go to Throttle Valve Switch Adjustment.

Test No. 2 Insulation test

Tester	Leads to Pins (+)	Leads to Pins (−)	Notes	Should Read
Ohmmeter	18 25	Body ground		∞Ω

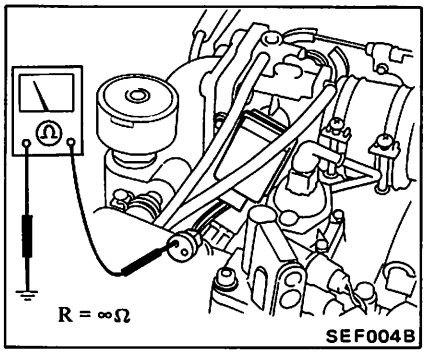


SEF502A

If test is O.K., go to Throttle Valve Switch Adjustment.

If test is not O.K., go to Component Check.

Component check



SEF004B

Connect ohmmeter between engine and terminals ⑱ and ㉕. Ohmmeter reading should be infinite.

If test is O.K., check harness.
If test is not O.K., replace component and retest.

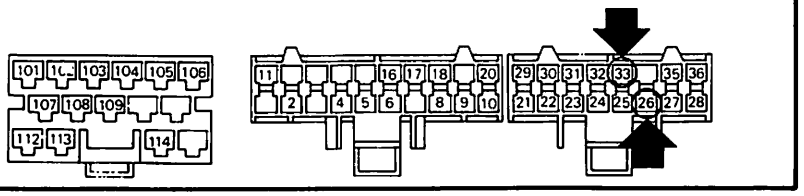
ADJUSTMENT

Refer to THROTTLE VALVE SWITCH.

AIR FLOW METER TESTS

Test No. 1 Air flow meter resistance

Tester	Leads to Pins (+)	Leads to Pins (−)	Notes	Should Read
Ohmmeter	33	26		Approx. 280 to 400Ω



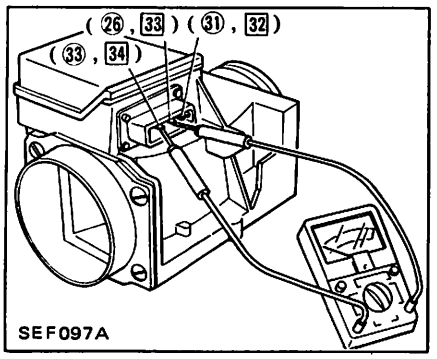
SEF504A

If test is O.K., go to Test No. 2.

If test is not O.K., perform component check.

***Note**
Pin numbers between C.E.C.U. and Air Flow Meter do not match.
○ : Pin numbers of C.E.C.U.
□ : Pin numbers on Air Flow Meter

Component check



SEF097A

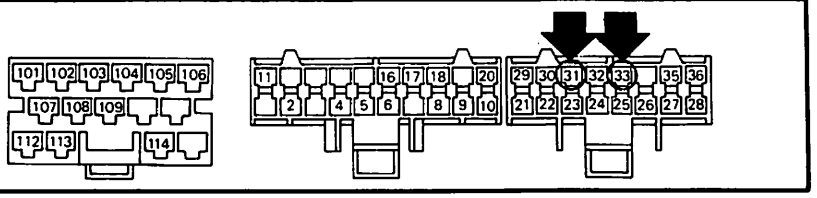
Measure the resistance between terminals (26, 33) and (33, 34). The standard resistance is approximately 280 to 400 ohm.

If test is O.K., check harness.

If test is not O.K., replace component.

Test No. 2 Air flow meter resistance

Tester	Leads to Pins (+)	Leads to Pins (−)	Notes	Should Read
Ohmmeter	33	31		Except 0 and ∞Ω



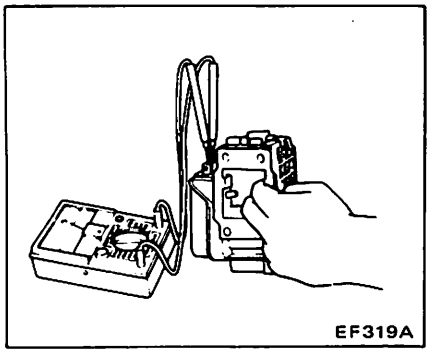
SEF505A

If test is O.K., go to Test No. 3.

If test is not O.K., perform component check.

***Note**
Pin numbers between C.E.C.U. and Air Flow Meter do not match.
○ : Pin numbers of C.E.C.U.
□ : Pin numbers on Air Flow Meter

Component check



EF319A

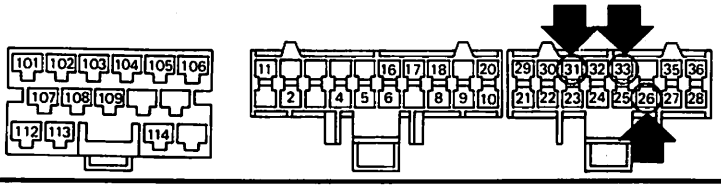
While sliding flap, measure resistance between terminals (33, 34) and (31, 32). If resistance is at any value ohter than 0 and ∞ ohm, air flow meter is normal.

If test is O.K., check harness.

If test is not O.K., replace component.

Test No. 3 Insulation resistance

Tester	Leads to Pins		Notes	Should Read
	(+)	(−)		
Ohmmeter	26 31 33	Body ground		∞Ω



SEF506A

If test is O.K., go to Test No. 4.

If test is not O.K., perform component check.

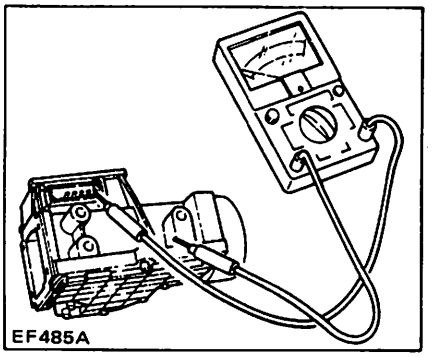
***Note**

Pin numbers between C.E.C.U. and Air Flow Meter do not match.

○ : Pin numbers of C.E.C.U.

□ : Pin numbers on Air Flow Meter

Component check



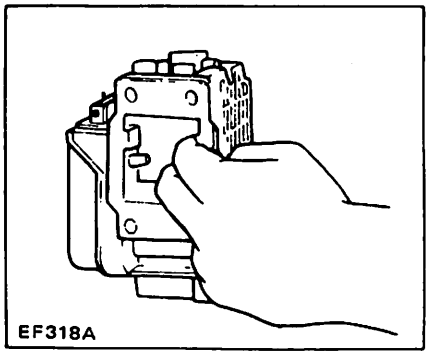
EF485A

Check insulation resistance between the air flow meter body and any one of the terminals (㉖, 33), (㉛, 32) and (㉝, 34). If continuity exists, the air flow meter is out of order.

If test is O.K., check harness.

If test is not O.K., replace component.

Test No. 4 air flow meter flap



EF318A

Fully open the flap by hand to check that it opens smoothly without binding. If it doesn't, it is out of order.

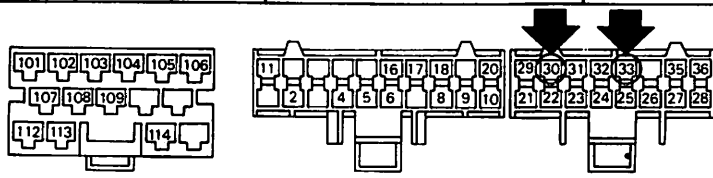
If test is O.K., air flow meter is O.K.

If test is not O.K., replace air flow meter.

AIR TEMPERATURE SENSOR TESTS

Test No. 1 Air Temperature Sensor

Tester	Leads to Pins (+)	Leads to Pins (−)	Notes	Should Read
Ohmmeter	33	30	Intake air temperature 20°C (68°F) or above	Below 2.9 kΩ
			Below 20°C (68°F)	2.1 kΩ or above



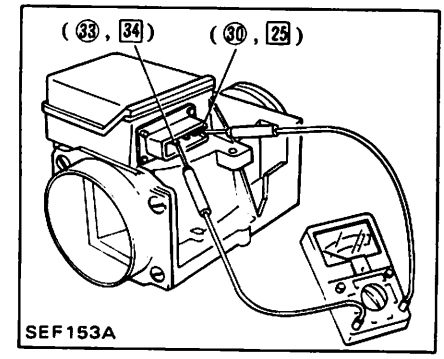
SEF507A

If test is O.K., go to Test No. 2.

If test is not O.K., perform component check.

***Note**
Pin numbers between C.E.C.U. and Air Flow Meter do not match.
○ : Pin numbers of C.E.C.U.
□ : Pin numbers on Air Flow Meter

Component check



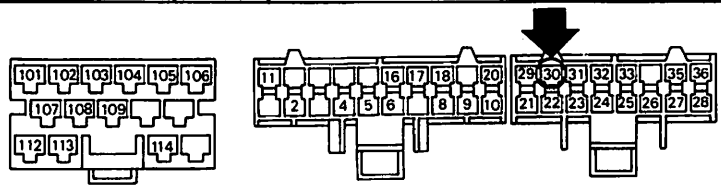
SEF153A

1. Measure the outside air temperature.
2. Measure resistance between terminals (33, 34) and (30, 25) of the air flow meter connector.

If test is O.K., check harness.
If test is not O.K., replace component.

Test No. 2 Insulation Resistance

Tester	Leads to Pins (+)	Leads to Pins (−)	Notes	Should Read
Ohmmeter	30	Body ground		∞Ω



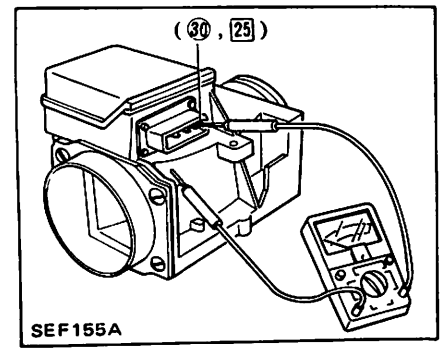
SEF508A

If test is O.K., air temperature sensor is O.K.

If test is not O.K., perform component check.

***Note**
Pin numbers between C.E.C.U. and Air Flow Meter do not match.
○ : Pin numbers of C.E.C.U.
□ : Pin numbers on Air Flow Meter

Component check



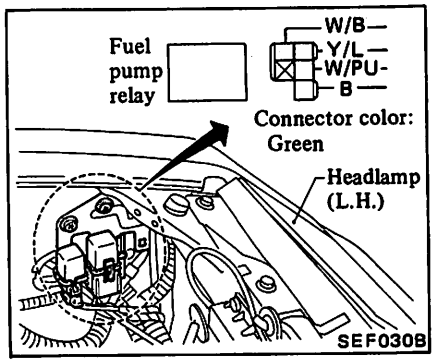
SEF155A

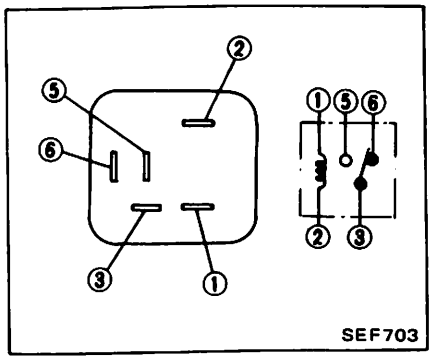
Check insulation resistance between terminal (30, 25) and air flow meter body.

If test is O.K., check harness.
If test is not O.K., replace component.

CHECKING FUEL PUMP RELAY

The fuel pump relay is installed on the relay bracket.





Check terminals	Normal condition	12V direct current is applied between terminals ① and ②
① - ②	Continuity	–
③ - ⑤	No continuity	Continuity
③ - ⑥	Continuity	No continuity

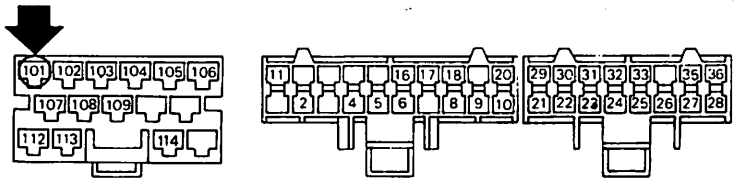
If test is O.K., check harness.
If test is not O.K., replace relay and retest.

INJECTOR CIRCUIT TESTS

CAUTION: Never turn the selecting switch of the tester to the "Ohmmeter" or "Ammeter" position during these tests as it may burn out the injectors and circuit.

Test No. 1 Cylinder No. 1

Tester	Leads to Pins (+)	Leads to Pins (−)	Notes	Should Read
Voltmeter	101	Body ground	Connect battery ground cable.	Battery voltage



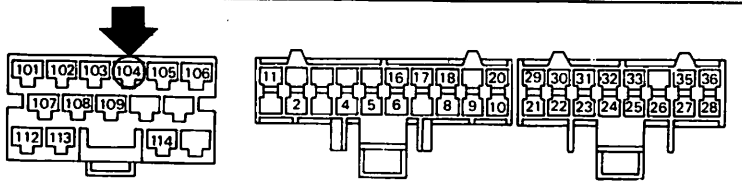
SEF515A

If test is O.K., go to Test No. 2.

If test is not O.K., go to Component Check.

Test No. 2 Cylinder No. 2

Tester	Leads to Pins (+)	Leads to Pins (−)	Notes	Should Read
Voltmeter	104	Body ground		Battery voltage



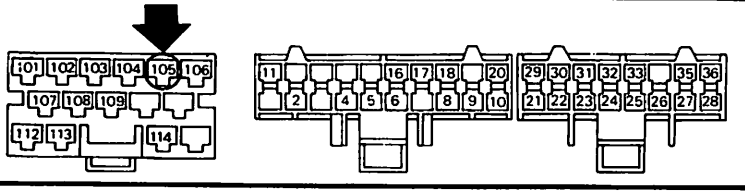
SEF518A

If test is O.K., go to Test No. 3.

If test is not O.K., go to Component Check.

Test No. 3 Cylinder No. 3

Tester	Leads to Pins (+)	Leads to Pins (−)	Notes	Should Read
Voltmeter	105	Body ground		Battery voltage

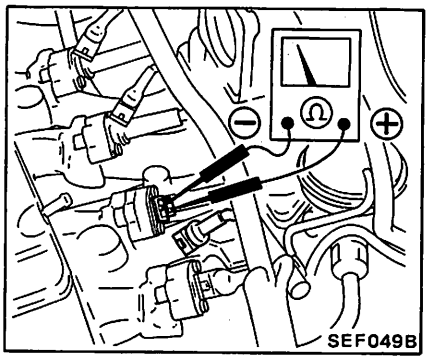


SEF519A

If test is O.K., go to Test No. 4.

If test is not O.K., go to Component Check.

Component check



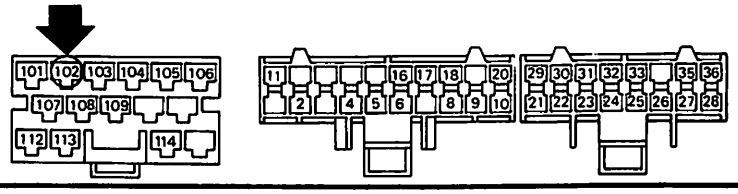
SEF049B

1. Disconnect ground cable from battery.
2. Disconnect electric connectors from injectors.
3. Check continuity between the two terminals. Continuity should exist. If not, injector(s) are faulty.

If test is O.K., go to E.C.C.S. harness Check.

If test is not O.K., replace injector.

Test No. 4 Cylinder No. 4				
Tester	**Leads to Pins**		**Notes**	**Should Read**
Voltmeter	(+)	(−)		Battery voltage
	102	Body ground		



SEF516A

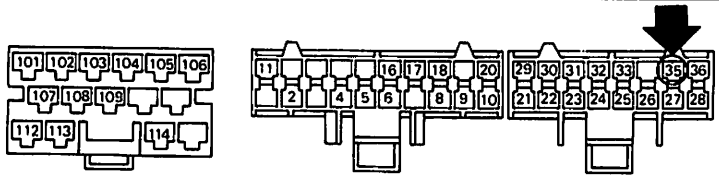
If test is O.K., all injectors are O.K.

If test is not O.K., perform E.C.C.S. harness check.

E.F.I. RELAY

E.F.I. relay test (Control unit power input circuit test)

Tester	Leads to Pins (+)	Leads to Pins (−)	Notes	Should Read
Voltmeter	35	Body ground	1. Connect battery ground cable. 2 Ignition "ON".	Battery voltage

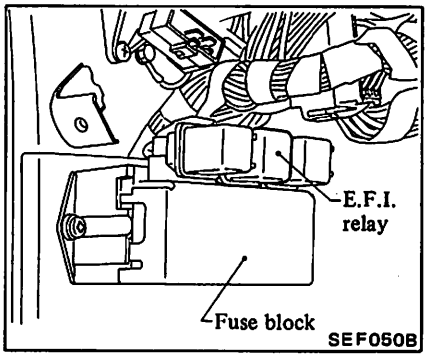


SEF521A

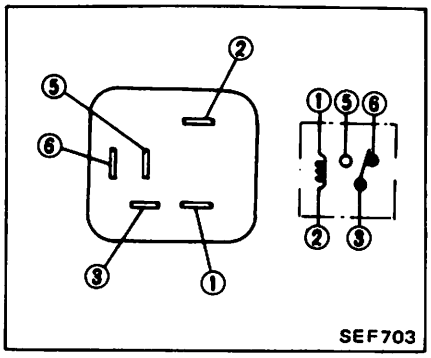
If test is O.K., E.F.I. relay is O.K.

If test is not O.K., perform component check.

Component check



SEF050B



SEF703

Check terminals	Normal condition	12V direct current is applied between terminals ① and ②
① - ②	Continuity	–
③ - ⑤	No continuity	Continuity
③ - ⑥	Continuity	No continuity

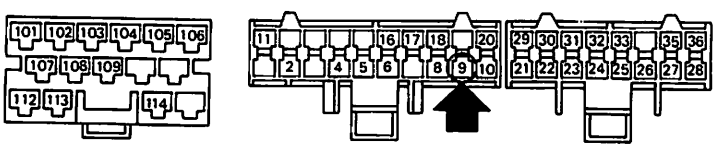
If test is O.K., check harness.

If test is not O.K., replace relay and retest.

IGNITION START SIGNAL TEST

Ignition start signal test

Tester	Leads to Pins (+)	Leads to Pins (−)	Notes	Should Read
Voltmeter	9	Body ground	1. Disconnect starter motor "S" terminal. 2. Connect battery ground cable. 3. Ignition "START".	Battery voltage



SEF523A

If test is O.K., ignition start signal is O.K.

If test is not O.K., inspect ignition coil and harness.

CRANKCASE EMISSION CONTROL SYSTEM

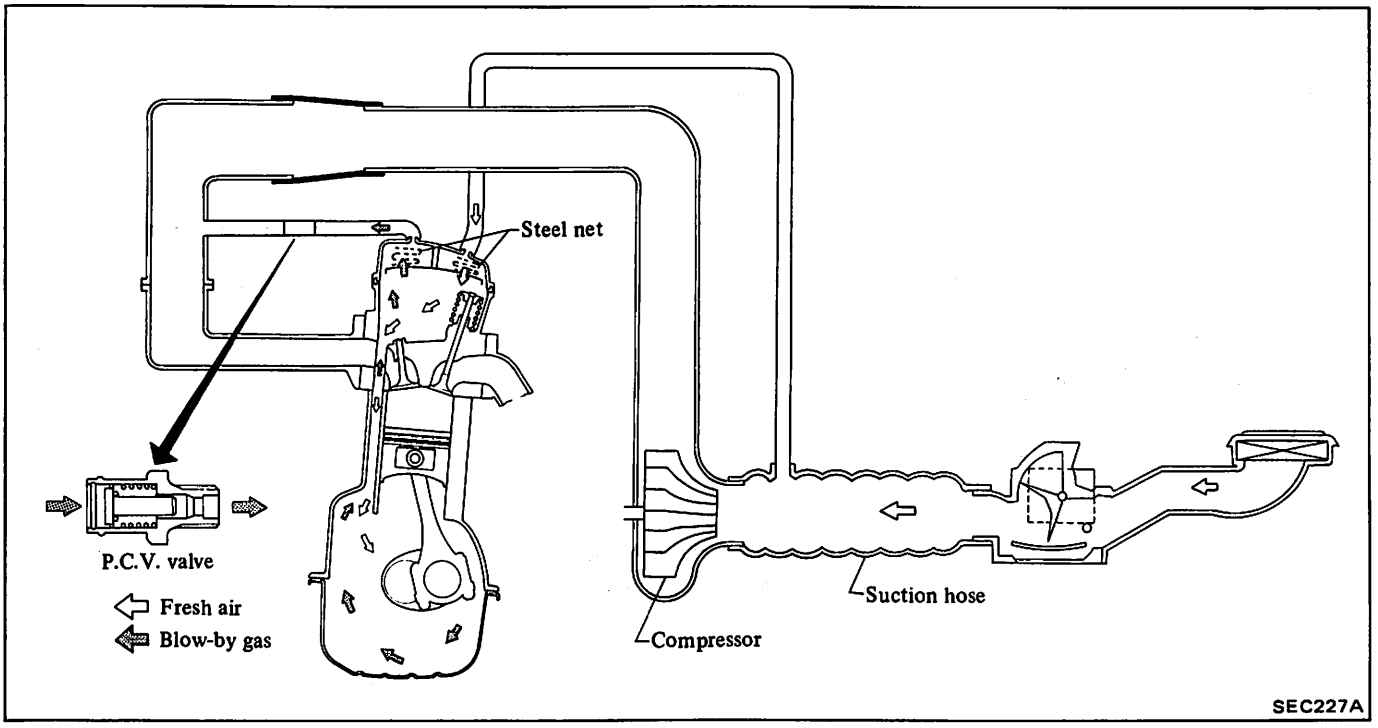
DESCRIPTION

MODEL EQUIPPED WITH TURBOCHARGER

This system returns blow-by gas to both the suction hose and the intake manifold.

Since a vacuum is normally kept in the portion between the air cleaner suction hose, blow-by gas in the rocker cover is sucked into the turbocharger from the suction hose, and is then sent into the intake manifold through the throttle chamber where it is burnt in the engine.

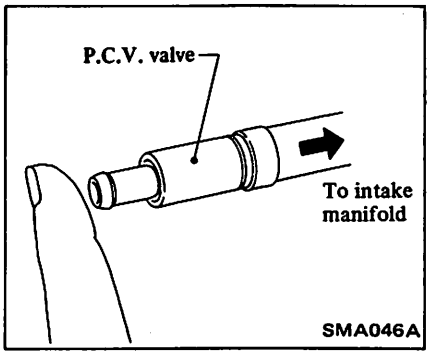
Blow-by gas located in the crankcase flows into the intake manifold through the positive crankcase ventilation (P.C.V.) valve in the blow-by lower hose when vacuum is maintained in the intake manifold. If positive pressure exists in the intake manifold, any blow-by gas in the crankcase is led to the blow-by upper hose, which prevents an abnormal rise in crankcase pressure.



INSPECTION

P.C.V. VALVE

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



VENTILATION HOSES

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air.

If any hose cannot be freed of obstructions, replace.

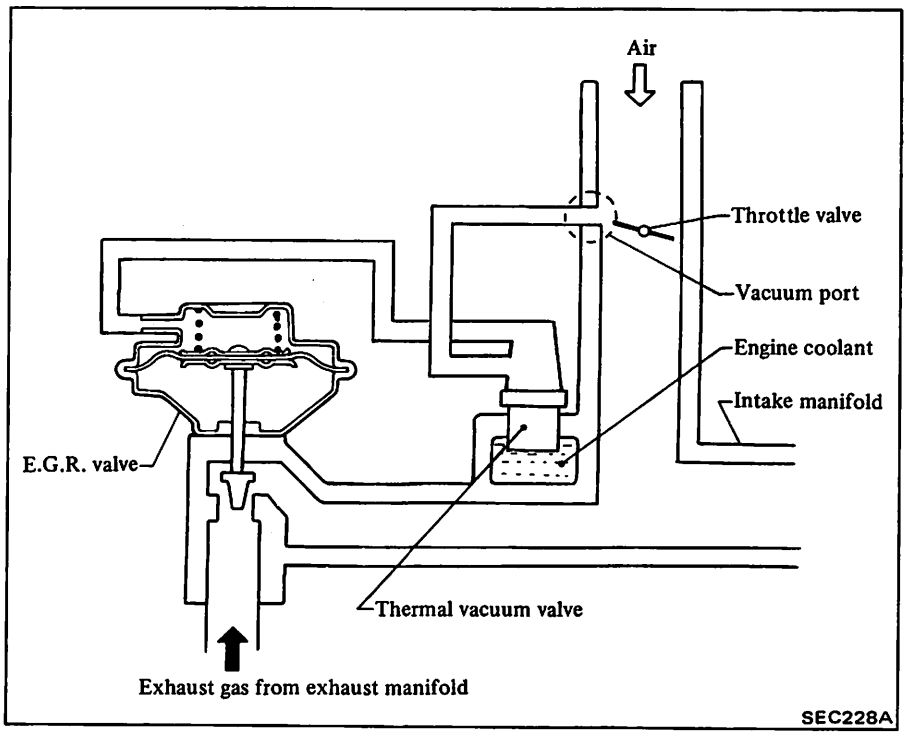
EXHAUST EMISSION CONTROL SYSTEM

EXHAUST GAS RECIRCULATION (E.G.R.) CONTROL SYSTEM

DESCRIPTION

In the exhaust gas recirculation system, a part of the exhaust gas is returned to the combustion chamber to lower the spark flame temperature during combustion. This results in a reduction of the nitrogen oxide (NOx) content in the exhaust gas.

When the E.G.R. control valve is open, some of the exhaust gas is led from the exhaust manifold to the E.G.R. chamber. The exhaust gas is then controlled in quantity by the E.G.R. valve, and is introduced into the intake manifold.



OPERATION

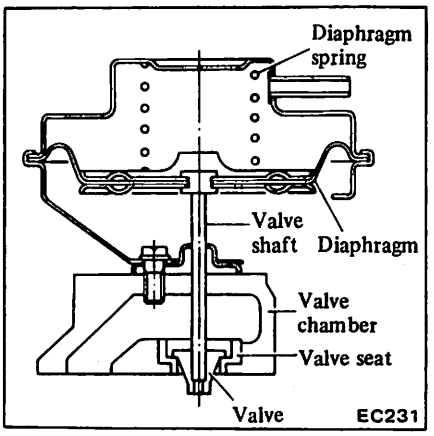
Water temperature °C (°F)	Thermal vacuum valve	E.G.R. system
Below 50 (122)	Closed	Not actuated
Above 50 (122)	Open	Actuated

With the engine at idle or at full throttle, the E.G.R. control valve closes to deactivate the E.G.R. system regardless of water temperature.

E.G.R. control valve

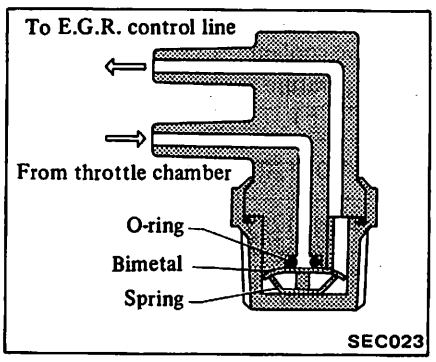
The E.G.R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.

When replacing the E.G.R. valve with a new one, verify that the type number on the new part is the same as that on the former one.



Thermal vacuum valve (2-port bimetal type)

The 2-port type thermal vacuum valve is mounted on the engine thermostat housing. It detects engine coolant temperature by means of a built-in bimetal, and opens or closes the vacuum passage in the thermal vacuum valve. When the vacuum passage is open, the throttle chamber vacuum signal is applied to the diaphragm of the E.G.R. control valve to actuate the valve connected to the diaphragm.



a. Be sure to apply sealer to threads of the valve prior to installing a new valve.

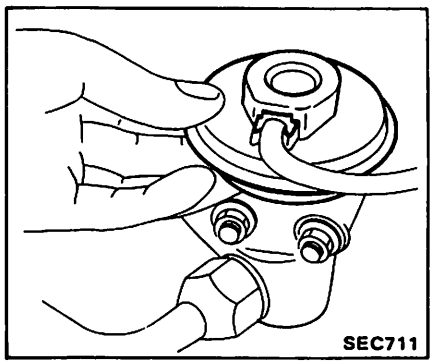
b. When installing a new thermal vacuum valve, be sure that color and shape are correct.

INSPECTION

Entire system

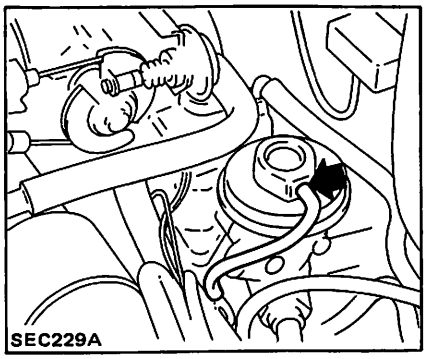
1. Make a thorough visual check of E.G.R. control system. If necessary, wipe away oil to facilitate inspection. If any hoses are cracked or broken, replace.
2. With engine stopped, inspect E.G.R. control valve for any indication of binding or sticking by moving diaphragm of control valve upwards with finger.
3. With engine running, inspect E.G.R. control valve. Place a finger on the diaphragm of E.G.R. control valve to check for valve operation.

Check operation of E.G.R. valve, using the following chart as a guide. Engine speed should always be increased from idle to 3,000 to 3,500 rpm.



Engine coolant temperature °C (°F)	E.G.R. control valve operation
Below 50 (122)	Not actuated
Above 50 (122)	Actuated

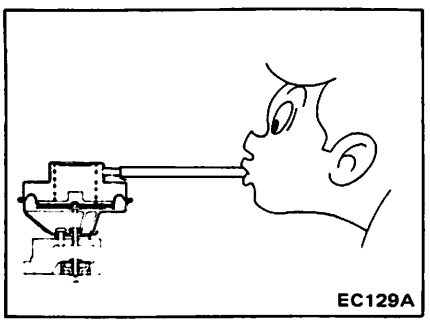
4. If E.G.R. control valve does not operate as indicated above, check as follows:
(1) Disconnect vacuum hose from E.G.R. control valve.
(2) Increase engine speed from idling to 3,000 to 3,500 rpm.
(3) Make sure that thermal vacuum valve is open, and that there is a throttle vacuum at the end of vacuum hose.



(4) If vacuum is weak or nonexistent, replace thermal vacuum valve.
If vacuum is present, check E.G.R. control valve.

E.G.R. control valve

Dismount E.G.R. control valve from engine.
1. Apply vacuum to E.G.R. control valve, referring to the following figure. If the valve moves to full position, it is normal.
Plug hose with vacuum applied.
E.G.R. control valve will remain open for more than 30 seconds after vacuum has cut off.



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

Thermal vacuum valve

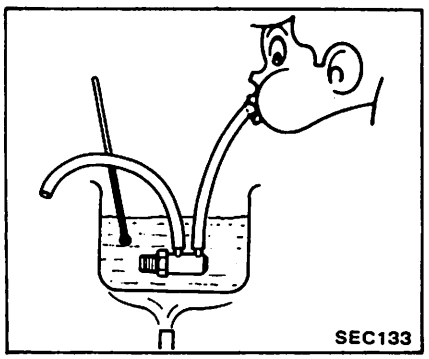
Remove thermal vacuum valve from engine Inhale air from port of E.G.R. system and check to be sure that thermal vacuum valve opens or closes in response to its temperature.

Before dismounting, drain engine coolant about one liter (1-1/8 US qt. 7/8 Imp qt).

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

2-port bimetal type

Water temperature °C (°F)	Valve
Above 50 (122)	Open
Below 50 (122)	Closed



CATALYTIC CONVERTER SYSTEM

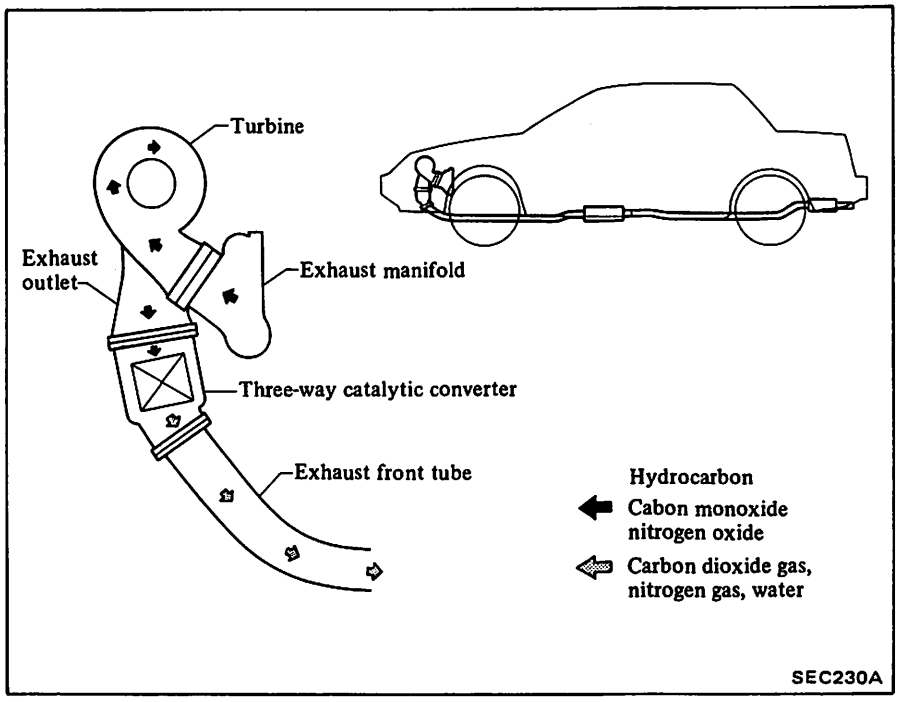
DESCRIPTION

The three-way catalytic converter utilizes a catalyst to accelerate the recombustion of HC and CO and reduce NOx in the exhaust gas, changing them into harmless CO_2, H_2O and N_2.
To accomplish the oxidization and reduction of such harmful contents, the exhaust gas sensor monitors O_2 level, feeds it back to the E.C.C.S. control unit and maintains the mixture ratio to the stoichiometric point at all times.

OPERATION

The exhaust gas from the engine contains unburned, harmful components. The mixture ratio feedback system reduces such harmful components in the exhaust gas. In this system, an exhaust gas sensor monitors the contents of O_2 density to determine the combustion condition and maintains the mixture ratio to the stoichiometric point.

While the mixture ratio is so maintained, the three-way catalytic converter activates to change the harmful components (HC, CO, and NOx) into harmless CO_2, H_2O and N_2. In this way, the catalytic converter cleans the exhaust gas and discharges H_2O, CO_2 and N_2 into the atmosphere.



INSPECTION

Preliminary inspection

Visually check condition of all component parts including hoses, tubes, and wires, replace if necessary. Refer to Mixture Ratio Feedback System for inspection.

Catalytic converter

Check whether catalytic converter in normal or not by observing variation in CO percentage. The checking procedure is as follows:

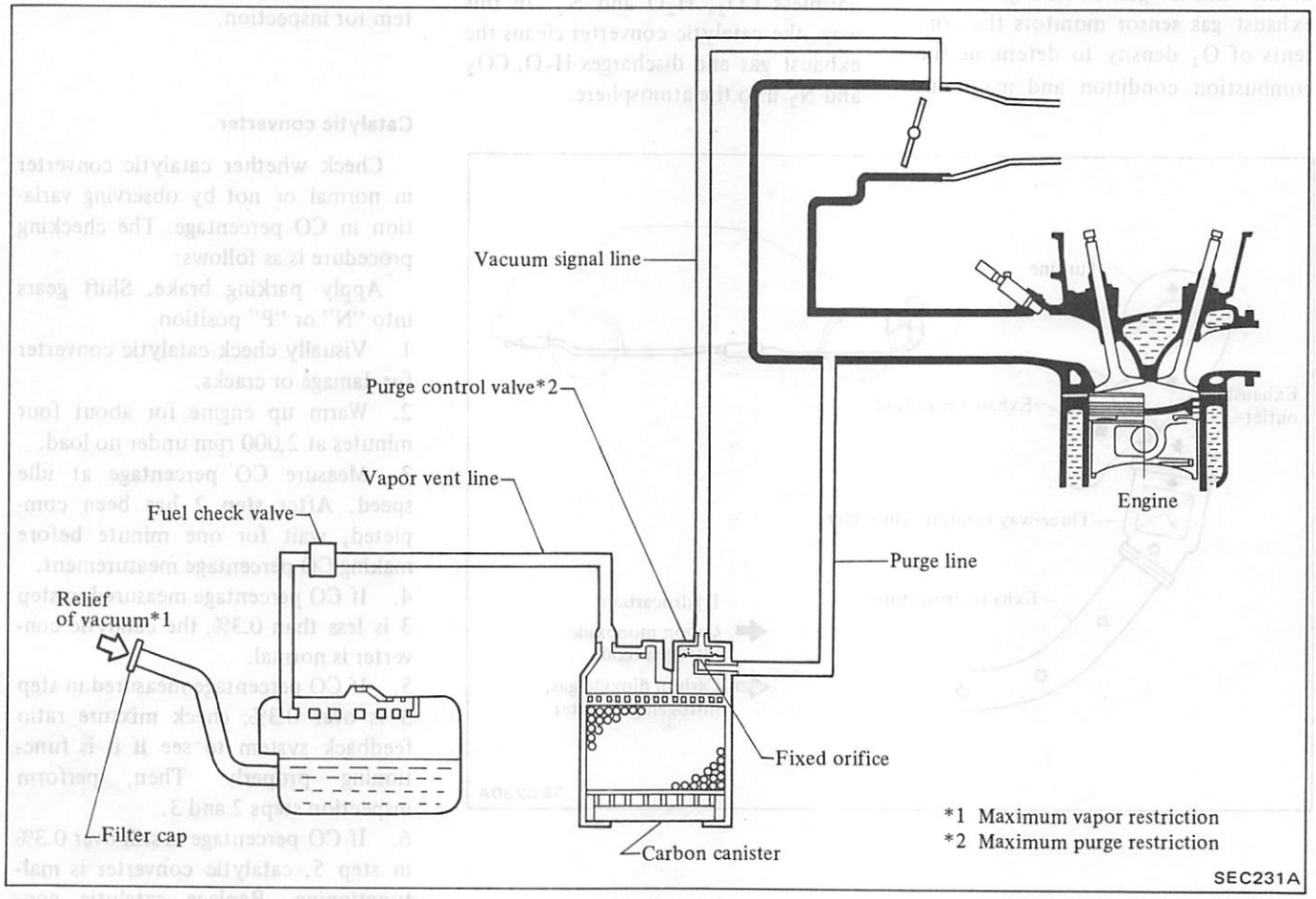
Apply parking brake. Shift gears into "N" or "P" position.

1. Visually check catalytic converter for damage or cracks.
2. Warm up engine for about four minutes at 2,000 rpm under no load.
3. Measure CO percentage at idle speed. After step 2 has been completed, wait for one minute before making CO percentage measurement.
4. If CO percentage measured in step 3 is less than 0.3%, the catalytic converter is normal.
5. If CO percentage measured in step 3 is over 0.3%, check mixture ratio feedback system to see if it is functioning properly. Then, perform inspection steps 2 and 3.
6. If CO percentage is still over 0.3% in step 5, catalytic converter is malfunctioning. Replace catalytic converter.

EVAPORATIVE EMISSION CONTROL SYSTEM

DESCRIPTION

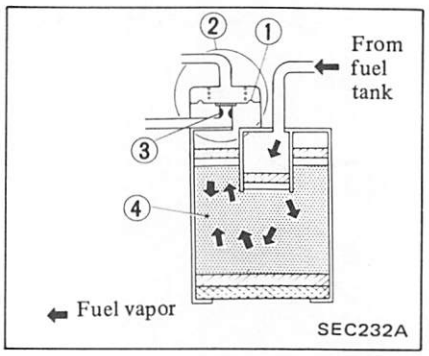
The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.



OPERATION

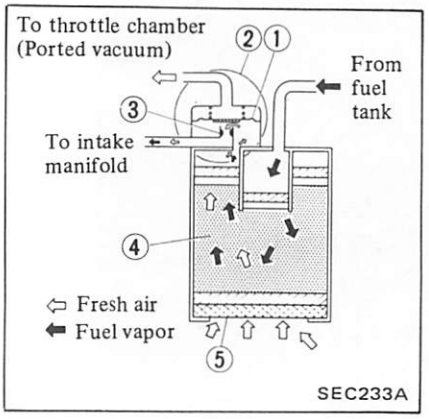
The canister retains the vapor until the canister is purged by the air drawn through the purge line to the intake manifold when the engine is operated. When the engine runs at idle, the purge control valve is closed. As the engine speed increases, and the ported vacuum rises higher, the purge control valve opens and the vapor is sucked into the intake manifold through the fixed orifice. When the engine stops and intake manifold pressure become atmospheric pressure, the purge control valve is closed, and the vapor is retaining again.

(1) Engine does not operate or operates at idle.



1 Diaphragm
2 Purge control valve
3 Fixed orifice
4 Activated carbon

(2) Engine speed increases.

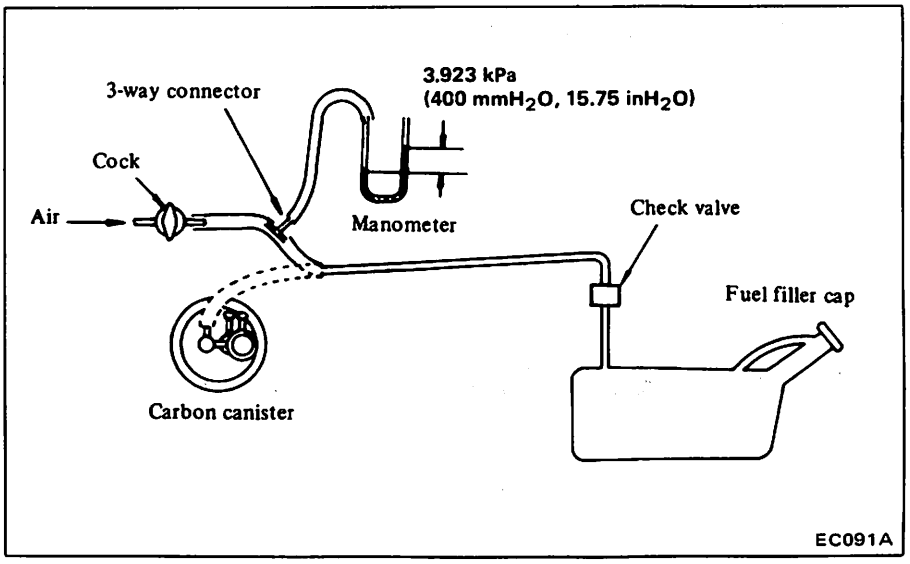


1 Diaphragm
2 Purge control valve
3 Fixed orifice
4 Activated carbon
5 Filter

INSPECTION

FUEL TANK AND VAPOR VENT LINE

1. Check all hoses and fuel tank filler cap.
2. Disconnect the vapor vent line connecting carbon canister to fuel tank.
3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line.
4. 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).



5. Shut the cock completely and leave it unattended.
6. After 2.5 minutes, measure the height of the liquid in the manometer.
7. Variation in height should remain at 0.245 kPa (25 mmH_2O, 0.98 inH_2O).
8. When filler cap does not close completely, the height should drop to zero in a short time.
9. If the height does not drop to zero in a short time when filler cap is removed, the cause is a stuffy hose.

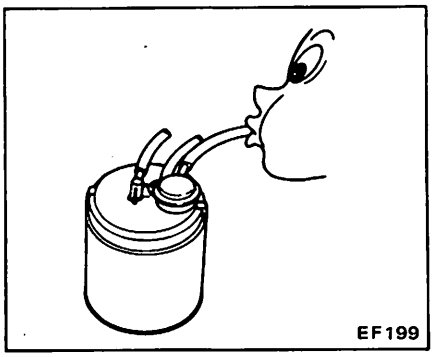
In case the vent line is stuffy the breathing in fuel tank is not thoroughly made thus causing ipsufficient deliver of fuel to engine or vapor lock. It must, therefore, be repaired or replaced.

CARBON CANISTER PURGE CONTROL VALVE

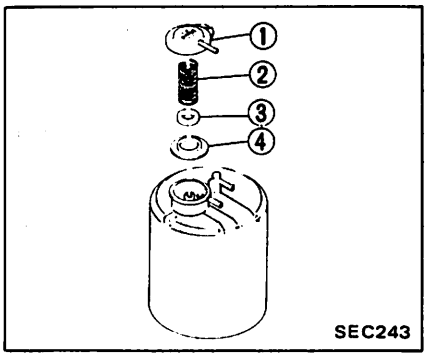
Check for fuel vapor leakage, in the vacuum line, at diaphragm of carbon canister purge control valve.

To check for leakage, proceed as follows:

1. Inhale air into the opening of rubber hose running to vacuum hole in carbon canister and ensure that there is no leak.



2. If there is a leak, remove top cover from purge control valve and check for dislocated or cracked diaphragm. If necessary, replace diaphragm kit (which is made up of a retainer, diaphragm and spring).



1 Cover
2 Diaphragm spring
3 Retainer
4 Diaphragm

FUEL CHECK VALVE

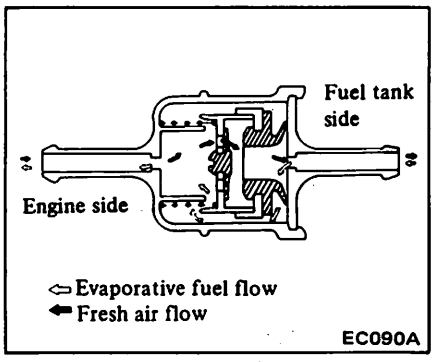
1. Blow air through connector on fuel tank side.

A considerable resistance should be felt at the mouth and a portion of air flow be directed toward the engine.

2. Blow air through connector on engine side.

Air flow should be smoothly directed toward fuel tank.

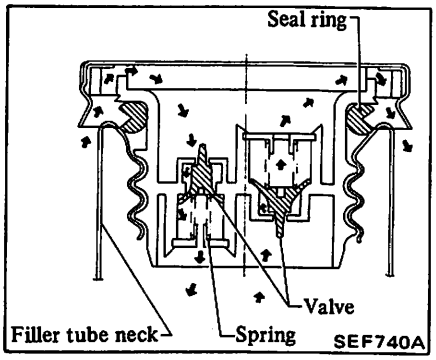
3. If fuel check valve is suspected of not being properly functioning in steps 1 and 2 above, replace.



FUEL TANK VACUUM RELIEF VALVE

Remove fuel filler cap and see it functions properly.

1. Wipe clean valve housing and have it in your mouth.
2. Inhale air. A slight resistance accompanied by valve indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should be disappeared with valve clicks.
3. If valve is clogged, or if no resistance is felt, replace cap as an assembled unit.



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

INSPECTION AND ADJUSTMENT

FUEL PUMP

Cut-off discharge pressure kPa (kg/cm², psi)	422 - 490 (4.3 - 5.0, 61 - 71)

PRESSURE REGULATOR

Regulated pressure kPa (kg/cm², psi)	250.1 (2.55, 36.3)

FUEL PRESSURE

Unit: kPa (kg/cm², psi)

Measuring point: between fuel filter and fuel pipe	
At idling	Approximately 206 (2.1, 30)
The moment accelerator pedal is fully depressed	Approximately 255 (2.6, 37)

FUEL INJECTOR

Coil resistance	Ω	2.35

AIR FLOW METER

Unit: Ω

Potentiometer resistance between terminals (㉝, 34) and (㉖, 33)	Approx. 280 - 400
between terminals (㉝, 34) and (㉛, 32)	Except 0 and ∞

Pin numbers between C.E.C.U. and Air Flow Meter do not match.

○ : Pin numbers of C.E.C.U.

□ : Pin numbers on Air Flow Meter

THROTTLE VALVE SWITCH

Engine speed when idle switch is changed from "ON" to "OFF" rpm	Approximately 1,100

WATER TEMPERATURE SENSOR

Unit: kΩ

Thermistor resistance at −10°C (14°F)	7.0 - 11.4
at 20°C (68°F)	2.1 - 2.9
at 50°C (122°F)	0.68 - 1.0

AIR TEMPERATURE SENSOR

	Unit: kΩ
Thermistor resistance at −10°C (14°F)	7.0 - 11.4
at 20°C (68°F)	2.1 - 2.9
at 50°C (122°F)	0.68 - 1.00

AIR REGULATOR

Air flow quantity [at 20°C (68°F)] m^3 (cu ft)/hr	9 (318)

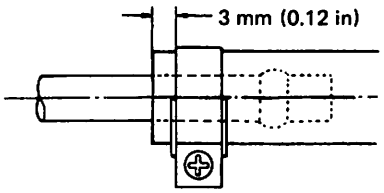
DASH POT

Dash pot touch speed	Approximately 2,300 rpm

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Throttle chamber securing screw	15 - 20	1.5 - 2.0	11 - 14
Exhaust gas sensor	39 - 49	4.0 - 5.0	29 - 36
Fuel hose clamp	1.0 - 1.5	0.10 - 0.15	0.7 - 1.1

Fuel hose clamping position



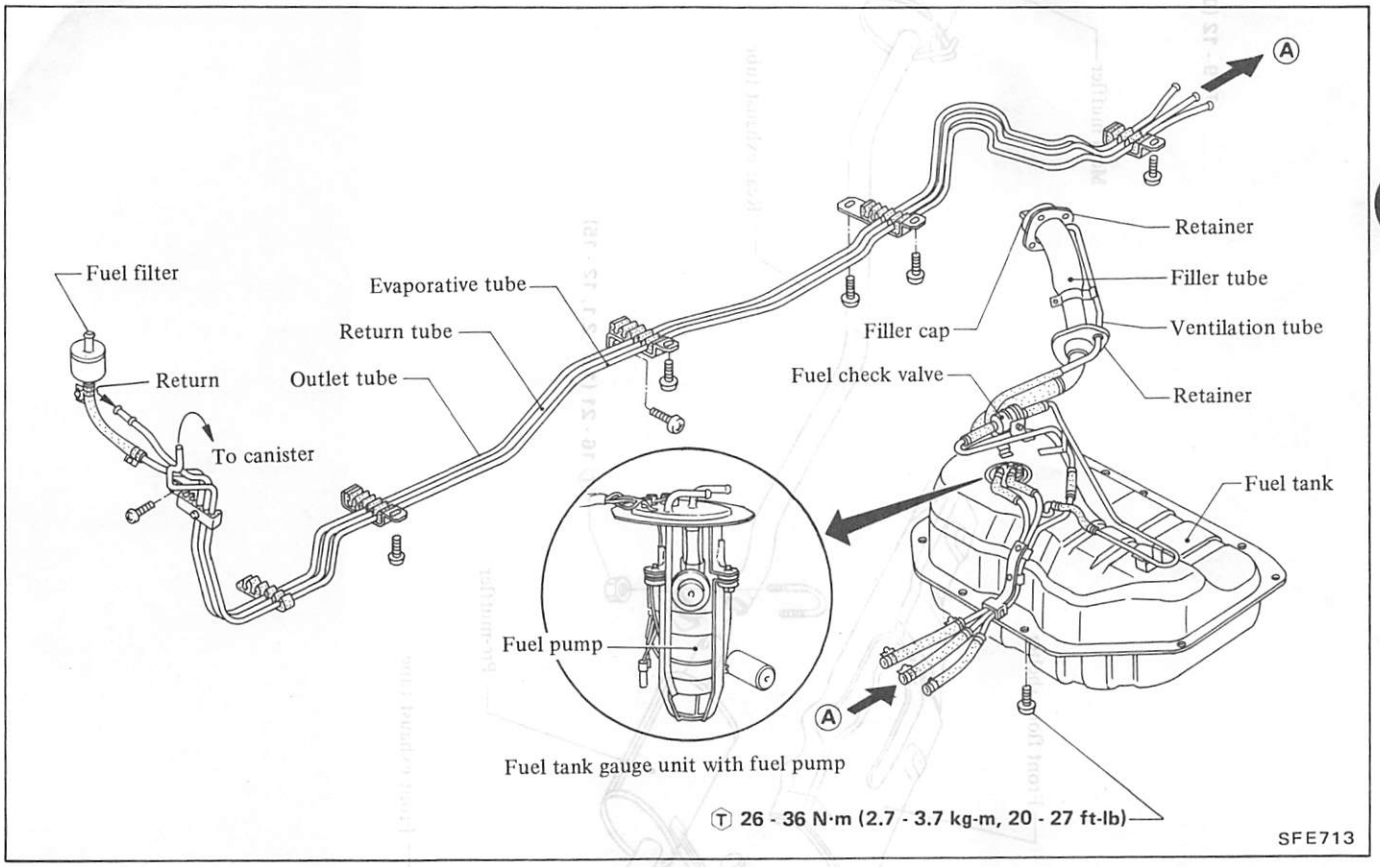
EF336A

E.G.R. tube securing nut	34 - 44	3.5 - 4.5	25 - 33
Thermal vacuum valve	Less than 22	Less than 2.2	Less than 16
Catalytic converter bolt	31 - 42	3.2 - 4.3	23 - 31

ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

SECTION FE

FUEL SYSTEM



PRECAUTIONS

WARNING:

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

a. Put a "CAUTION INFLAMMABLE" sign in the workshop.
b. Be sure to furnish the workshop with a CO_2 fire extinguisher.
c. Be sure to disconnect battery cable before starting work.
d. Put drained fuel in an explosion-proof container and put on lid securely.

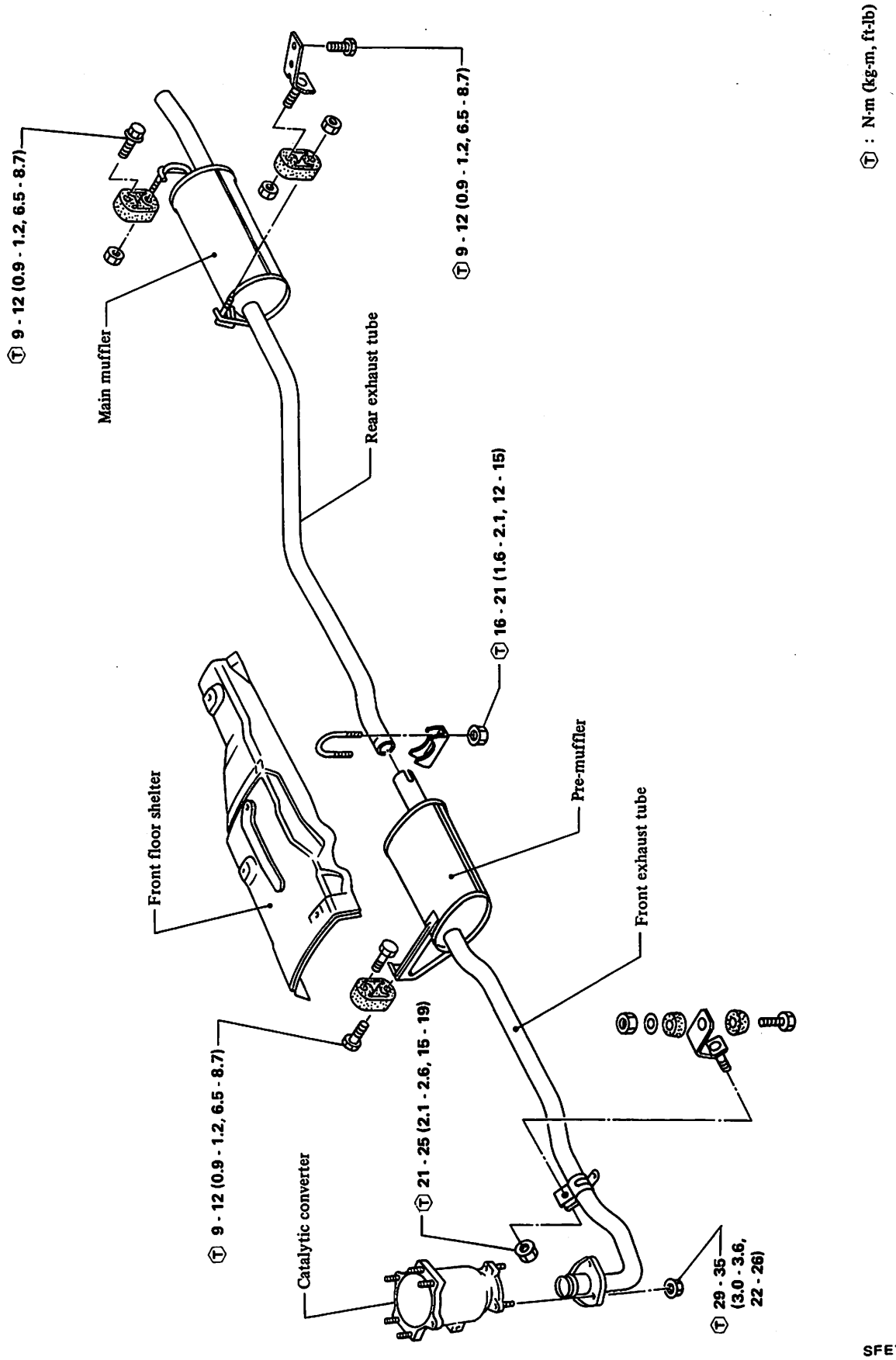
FUEL SYSTEM PARTS

Removal and installation

CAUTION:

Before disconnecting fuel hose, fuel tank gauge unit, fuel filler hose and tube, fuel check valve and fuel tube, release fuel pressure from fuel line to eliminate danger. Refer to REPLACEMENT FUEL FILTER (Section MA).

EXHAUST SYSTEM

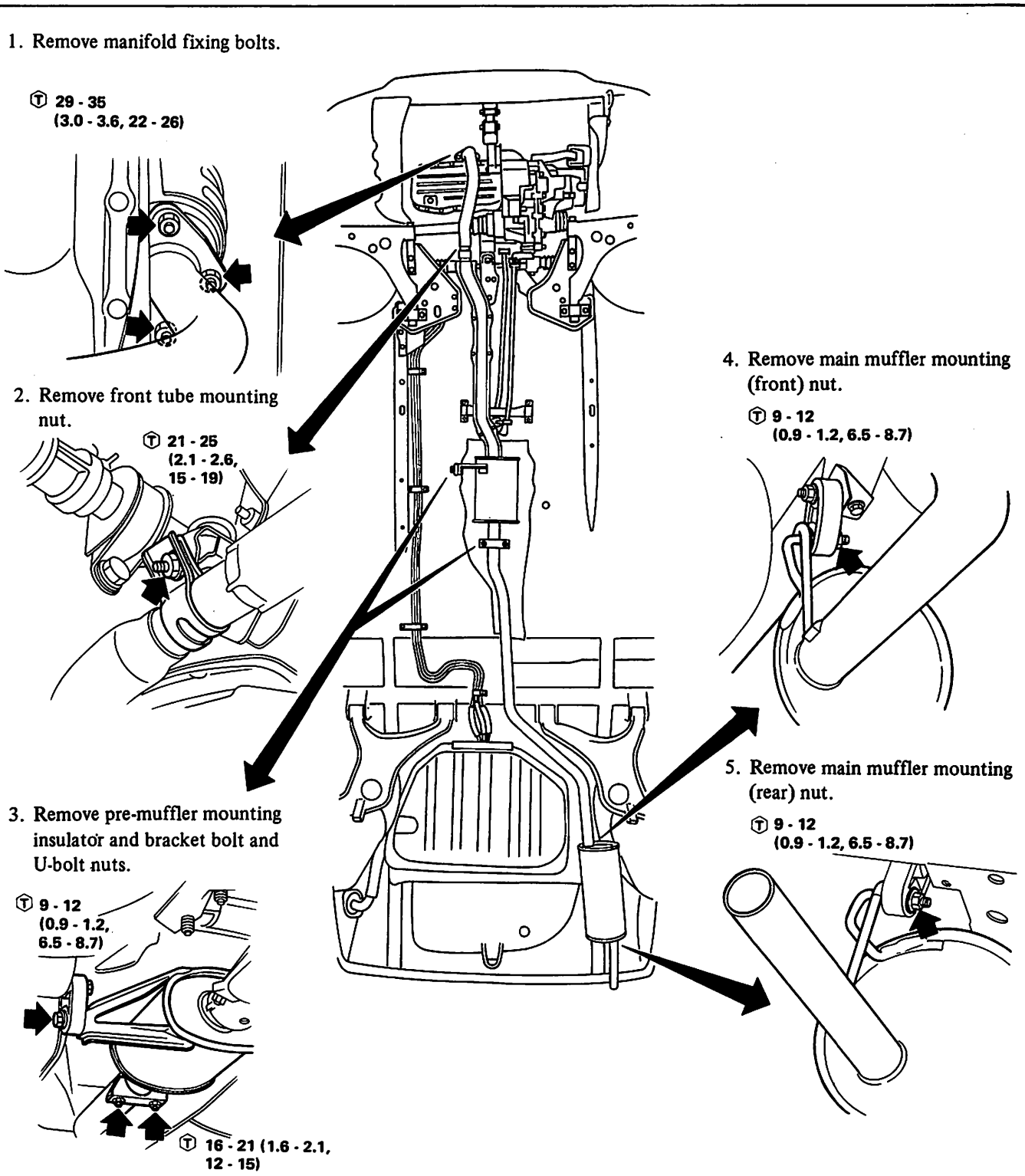


SFE714

EXHAUST TUBE AND MUFFLER ASSEMBLY

REMOVAL AND INSTALLATION

- Remove exhaust tube and muffler assembly in the order of 1 to 5.
- Install in the reverse order of removal.



a. Be careful not to deform mounting rubbers.
b. Install new converter gasket.
c. Keep sufficient clearance between exhaust system parts and adjacent parts.

Ⓣ: N·m (kg-m, ft-lb)

SFE715

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

TIGHTENING TORQUE

FUEL SYSTEM

Unit	N·m	kg-m	ft-lb
Fuel tank mounting bolt	26 - 36	2.7 - 3.7	20 - 27

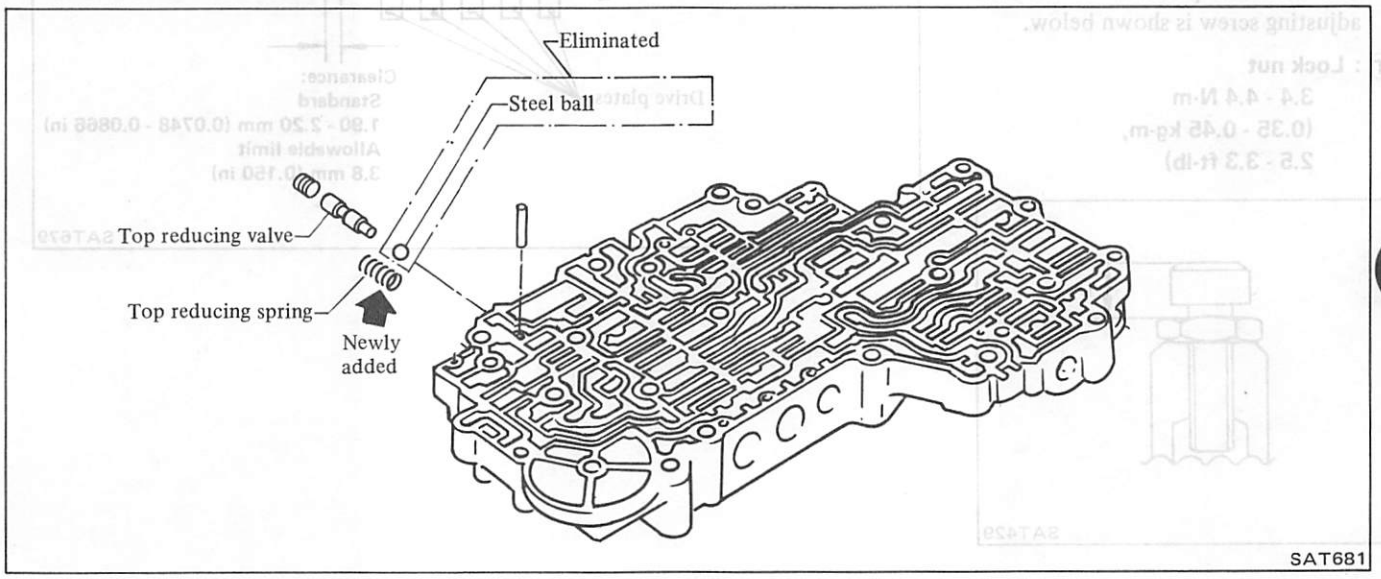
EXHAUST SYSTEM

Unit	N·m	kg-m	ft-lb
Manifold fixing bolt (To catalytic converter)	29 - 35	3.0 - 3.6	22 - 26
Front exhaust tube fixing nut	21 - 25	2.1 - 2.6	15 - 19
Pre-muffler mounting insulator and bracket bolt (nut)	9 - 12	0.9 - 1.2	6.5 - 8.7
U-bolt nut	16 - 21	1.6 - 2.1	12 - 15
Main muffler mounting nut	9 - 12	0.9 - 1.2	6.5 - 8.7

SECTION AT

COMPONENT PARTS

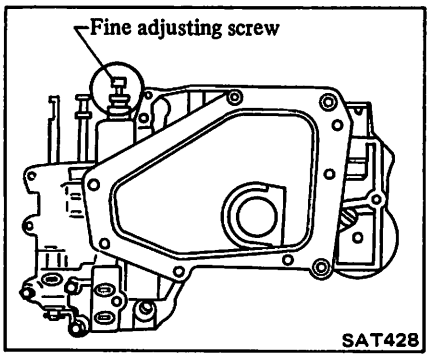
CONTROL VALVE BODY



Valve body spring chart

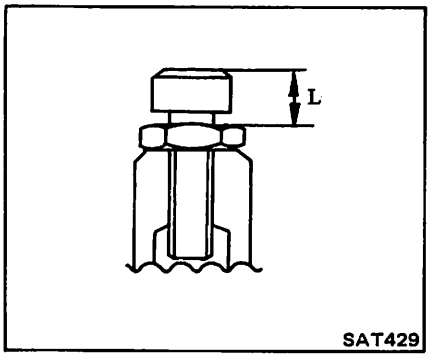
Valve spring	Wire dia. mm (in)	Outer coil dia. mm (in)	No. of active coils	Free length mm (in)	Installed	
					Length mm (in)	Load N (kg, lb)
Top reducing valve	0.75 (0.0295)	6.75 (0.2657)	9	21.4 (0.843)	13.0 (0.512)	14.81 (1.51, 3.33)
Speed cut valve	0.6 (0.024)	5.6 (0.220)	11	23.0 (0.906)	12.0 (0.472)	10.49 (1.07, 2.36)

Fine adjusting screw



- The standard position of the fine adjusting screw is shown below.

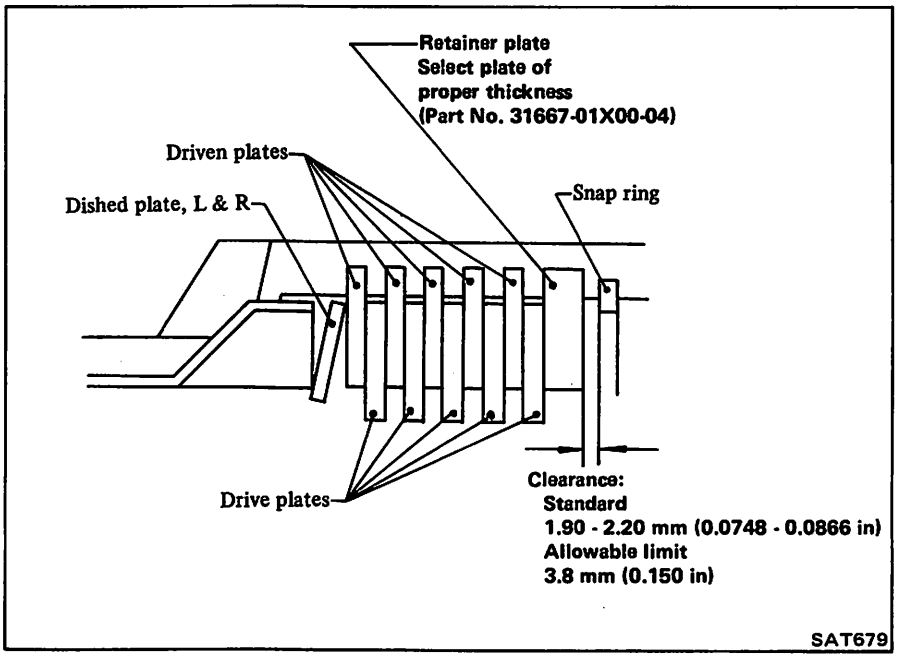
Ⓣ: **Lock nut**
3.4 - 4.4 N·m
(0.35 - 0.45 kg-m,
2.5 - 3.3 ft-lb)



Distance "L":
8.5 - 9.0 mm (0.335 - 0.354 in)

LOW & REVERSE BRAKE

Layout of plates



TROUBLE-SHOOTING AND DIAGNOSES

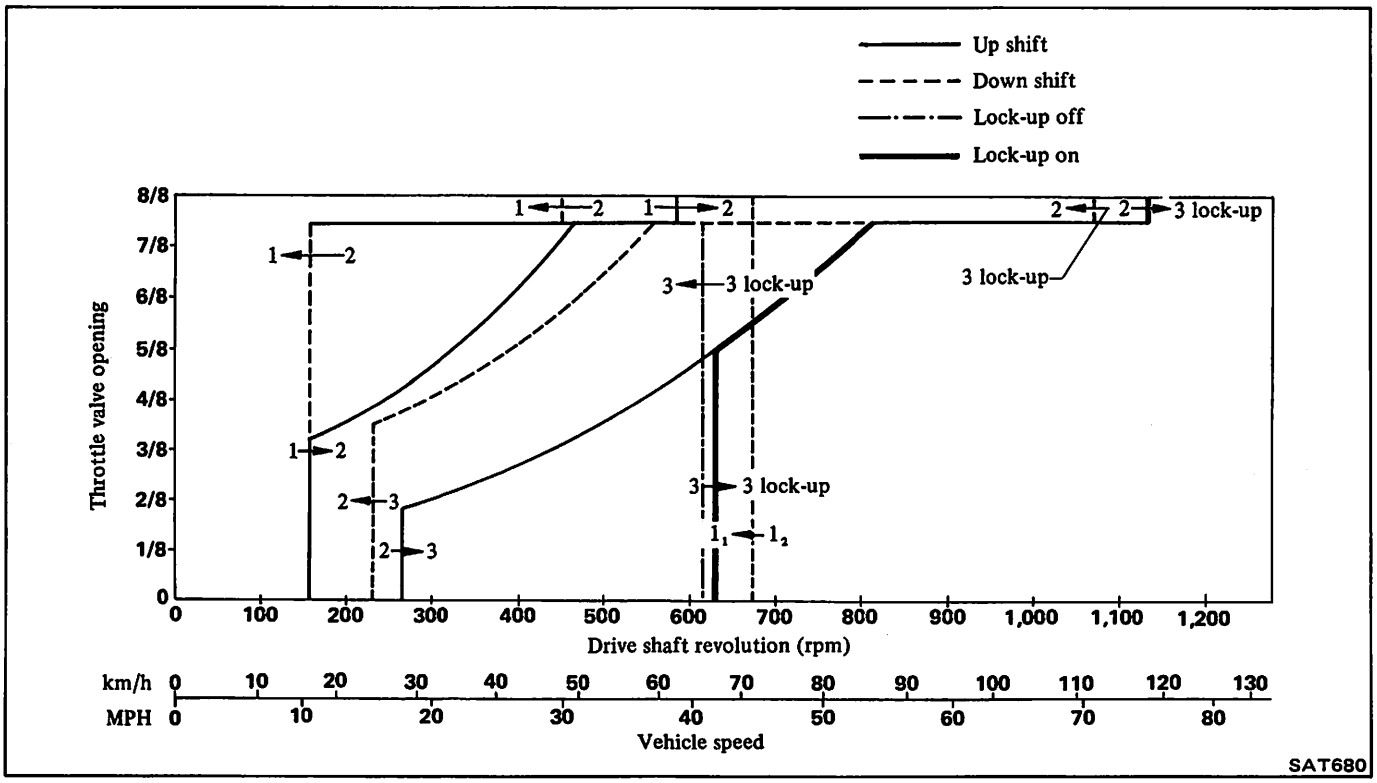
VEHICLE SPEED AND LINE PRESSURE WHEN SHIFTING GEARS

E15ET engine model (11X09)

Throttle position	Throttle Wire length L mm (in)	Gear shift	Vehicle speed km/h (MPH)	Drive shaft revolutions rpm	Line pressure kPa (kg/cm², psi)
Full throttle	29.4 (1.157)	$D_1 \rightarrow D_2$ $(2_1 \rightarrow 2_2)$	57 - 65 (35 - 40)	546 - 623	549 - 696 (5.6 - 7.1, 80 - 101)
		$D_2 \rightarrow D_3$	112 - 123 (70 - 76)	1,065 - 1,170	
		$D_3 \rightarrow D_2$	108 - 115 (67 - 71)	1,035 - 1,098	
		$D_2 \rightarrow D_1$ $(2_2 \rightarrow 2_1)$	41 - 49 (25 - 30)	394 - 473	
		$D_3 \rightarrow 2_2$ $(D_3 \rightarrow 1_1)$	–	–	
		$1_2 \rightarrow 1_1$	–	–	
Half throttle (4/8 open)	14.6 (0.575)	$D_1 \rightarrow D_2$ $(2_1 \rightarrow 2_2)$	22 - 32 (14 - 20)	212 - 307	500 - 647 (5.1 - 6.6, 73 - 94)
		$D_2 \rightarrow D_3$	55 - 65 (34 - 40)	529 - 624	
		$D_3 \rightarrow D_2$	29 - 37 (18 - 23)	276 - 355	
		$D_2 \rightarrow D_1$ $(2_2 \rightarrow 2_1)$	11 - 21 (7 - 13)	110 - 205	
		$D_3 \rightarrow 2_2$ $(D_3 \rightarrow 1_2)$	–	–	549 - 696 (5.6 - 7.1, 80 - 101)
		$1_2 \rightarrow 1_1$	66 - 74 (41 - 46)	631 - 710	500 - 647 (5.1 - 6.6, 73 - 94)
Light throttle (1/8 open)	3.7 (0.146)	$D_1 \rightarrow D_2$ $(2_1 \rightarrow 2_2)$	11 - 21 (7 - 13)	110 - 205	245 - 343 (2.5 - 3.5, 36 - 50)
		$D_2 \rightarrow D_3$	26 - 36 (16 - 22)	254 - 348	
		$D_3 \rightarrow D_2$	22 - 31 (14 - 19)	218 - 297	
		$D_2 \rightarrow D_1$ $(2_2 \rightarrow 2_1)$	11 - 21 (7 - 13)	110 - 205	
		$D_3 \rightarrow 2_2$ $(D_3 \rightarrow 1_2)$	–	–	549 - 696 (5.6 - 7.1, 80 - 101)
		$1_2 \rightarrow 1_1$	–	–	245 - 343 (2.5 - 3.5, 36 - 50)

SHIFT SCHEDULE

E15ET engine model (11X09)



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

GENERAL SPECIFICATIONS

Vehicle model		E15ET engine
Automatic transaxle model		RL3F01A
Stall torque ratio		1.9 : 1
Transaxle gear ratio	1st	2.826
	2nd	1.543
	Top	1.000
	Reverse	2.364
	Final drive	3.167
Number of teeth	Output shaft	24
	Idler gear	28
	Final gear	76
Oil		Automatic transmission fluid "Dexron" type
Oil capacity		6.0 liters (6-3/8 US qt, 5-1/4 Imp qt)

SPECIFICATIONS AND ADJUSTMENT

Vehicle model			E15ET engine	
Automatic transaxle assembly Model code number			11X09	
High-reverse clutch (Front)	Number of drive plates		3	
	Number of driven plates		3	
	Clearance mm (in)	Standard	1.0 - 1.4 (0.039 - 0.055)	
		Allowable limit	2.2 (0.087)	
	Drive plate thickness mm (in)	Standard	1.80 (0.0709)	
		Allowable limit	1.6 (0.063)	
	Thickness of retaining plate		Thickness mm (in)	Part number
			3.4 (0.134)	31537-01X05
			3.6 (0.142)	31537-01X00
			3.8 (0.150)	31537-01X01
			4.0 (0.157)	31537-01X02
			4.2 (0.165)	31537-01X03
			4.4 (0.173)	31537-01X04

Forward clutch (Rear)	Number of drive plates		4	
	Number of driven plates		4	
	Clearance mm (in)	Standard	0.8 - 1.2 (0.031 - 0.047)	
		Allowable limit	2.8 (0.110)	
	Drive plate thickness mm (in)	Standard	1.80 (0.0709)	
		Allowable limit	1.6 (0.063)	
	Thickness of retaining plate		Thickness mm (in)	Part number
			3.6 (0.142)	31537-01X00
			3.8 (0.150)	31537-01X01
			4.0 (0.157)	31537-01X02
			4.2 (0.165)	31537-01X03
			4.4 (0.173)	31537-01X04
Low & reverse brake	Number of drive plates		5	
	Number of driven plates		5	
	Clearance mm (in)	Standard	1.90 - 2.20 (0.0748 - 0.0866)	
		Allowable limit	3.8 (0.150)	
	Drive plate thickness mm (in)	Standard	2.00 (0.0787)	
		Allowable limit	1.8 (0.071)	
	Thickness of retaining plate		Thickness mm (in)	Part number
			3.6 (0.142)	31667-01X00
			3.8 (0.150)	31667-01X01
			4.0 (0.157)	31667-01X02
			4.2 (0.165)	31667-01X03
			4.4 (0.173)	31667-01X04
Brake band Piston size mm (in)		Big dia.	68 (2.68)	
		Small dia.	44 (1.73)	
Identification mark on separator plate (Punch mark on separator plate)			AP	

STALL REVOLUTION

Stall revolution rpm	E15ET engine	2,000 - 2,300

SECTION FA

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

GENERAL SPECIFICATIONS

COIL SPRING

Dimension \ Model		A/T	M/T
Wire diameter	mm (in)	11.6 (0.457)	11.3 (0.445)
Coil diameter (Inside)	mm (in)	110 (4.33)	
Free length	mm (in)	360.3 (14.19)	345.3 (13.59)
Spring constant N/mm (kg/mm, lb/in)		19.61 (2.00, 112.0)	

STRUT ASSEMBLY

Shock absorber type		Double acting hydraulic
Piston rod diameter	mm (in)	18 (0.71)
Piston diameter	mm (in)	25 (0.98)
Stroke	mm (in)	162 (6.38)
Damping force [at 0.3 m (1.0 ft)/sec]		
Expansion	N (kg, lb)	539 - 736 (55 - 75, 121 - 165)
Compression	N (kg, lb)	186 - 304 (19 - 31, 42 - 68)

STABILIZER BAR

Diameter	mm (in)	22 (0.87)

INSPECTION AND ADJUSTMENT

Wheel alignment (Unladen*)		
Camber	degree	–35′ - 1°05′
Caster	degree	45′ - 2°15′
Kingpin inclination	degree	12°10′ - 13°40′
Toe-in	mm (in)	0 - 2 (0 - 0.08)
Side slip (Reference data)	mm/m (in/ft)	Out 3 - In 3 (Out 0.036 - In 0.036)
Standard side rod length	mm (in)	175.9 (6.93)
Front wheel turning angle		
Toe-out turns (Inside/Outside)	degree	20/17°30′
Full turn (Inside/Outside)	degree	40°30′ - 43°30′/31°30′ - 34°30′ 40° - 44°/31° - 35°

*: Tankful of fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools, mats in designed position.

FA

REAR AXLE & REAR SUSPENSION

SECTION RA

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

GENERAL SPECIFICATIONS

COIL SPRING

Wire diameter	mm (in)	11.0 (0.433)
Coil diameter	mm (in)	100 (3.94)
Free length	mm (in)	299.4 (11.79)
Spring constant N/mm (kg/mm, lb/in)		23.05 (2.35, 131.6)
Identification color		White 1, blue 2

SHOCK ABSORBER

Maximum length "L"	mm (in)	552 (21.73)
Stroke	mm (in)	227 (8.94)
Damoing force [at 0.3 m (1.0 ft)/sec.]		
Expansion	N (kg, lb)	490 - 686 (50 - 70, 110 - 154)
Compression	N (kg, lb)	235 - 353 (24 - 36, 53 - 79)

INSPECTION AND ADJUSTMENT

WHEEL BEARING

Axial play	mm (in)	0 (0)
Wheel bearing nut Tightening torque	N·m (kg-m, ft-lb)	39 - 44 (4.0 - 4.5, 29 - 33)
Return angle	degree	90°
Wheel bearing starting torque With new grease seal	N·m (kg-cm, in-lb)	Less than 0.8 (8, 6.9)
As measured at hub bolt	N (kg, lb)	Less than 13.7 (1.4, 3.1)
With used grease seal	N·m (kg-cm, in-lb)	Less than 0.4 (4, 3.5)
As measured at hub bolt	N (kg, lb)	Less than 6.9 (0.7, 1.5)

WHEEL ALIGNMENT

Camber	degree	−1
Toe-in	mm (degree)	0 (0)

SECTION BR

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

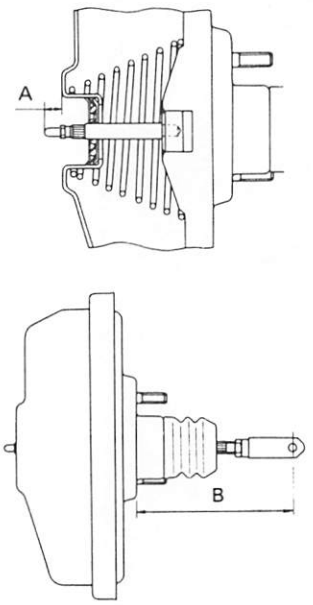
GENERAL SPECIFICATIONS

Rear brake		
Type		LT20A
Cylinder diameter	mm (in)	17.46 (11/16)
Lining width x thickness x length	mm (in)	35 x 4.5 x 195 (1.38 x 0.177 x 7.68)
Drum inner diameter	mm (in)	203.2 (8)
Master cylinder inner diameter	mm (in)	25.4 (1) ..... Large 20.6 (13/16) .... Small
Brake booster type		G20 or M20
Dual proportioning valve Split point kPa (kg/cm², psi) x reducing ratio		1,961 (20, 284) x 0.4
Depressed height [Under force of 490 N (50 kg, 110 lb) with engine running]	mm (in)	More than 80 (3.15) from the floor panel

INSPECTION AND ADJUSTMENT

BRAKE BOOSTER

Maximum vacuum leakage (15 seconds after engine is stopped)	kPa (mmHg, inHg)	3.3 (25, 0.98)
Output rod length "A"	mm (in)	10.375 - 10.425 (0.4085 - 0.4104)
Input rod length "B"	mm (in)	150 (5.91)



SBR445

REAR BRAKE

Unit: mm (in)

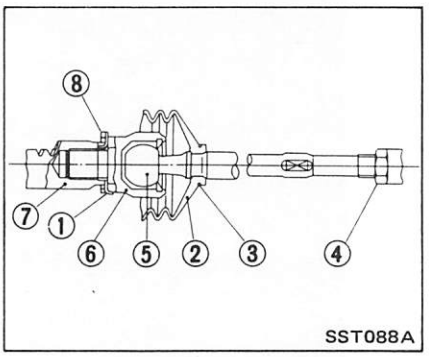
Lining wear limit Minimum thickness	1.5 (0.059)
Drum wear limit Maximum inner diameter	204.5 (8.05)
Out-of-roundness	Less than 0.03 (0.0012)
Radial runout	Less than 0.05 (0.0020)
Taper [Measured at a point 45 mm (1.77 in) from inlet]	Less than 0.04 (0.0016)

SECTION ST

STEERING SYSTEM

MODIFICATION NOTICE :

In order to modify the front wheel turning angle when the wheel is fully turned, a rack spacer has been added to both rack ends of the steering gear (Model: R25S), and the rack stroke has been changed.

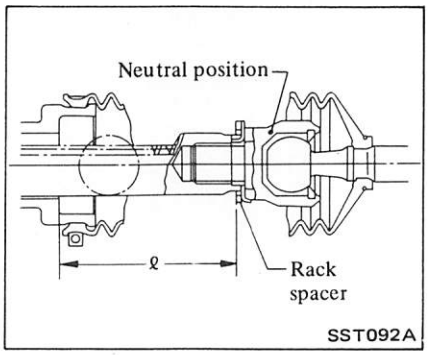


1 Lock plate
2 Boot
3 Boot band
4 Lock nut
5 Inner ball joint
6 Inner socket
7 Rack
8 Rack spacer

SERVICE NOTICE :

- When assembling steering gear and linkage, install rack spacer between rack and tie-rod inner socket.

Rack stroke "ℓ" (both sides):
E15ET engine equipped model
(With rack spacer)
70.0 mm (2.756 in)



- For service procedures, refer to the previously issued Service Manual for the 1983 DATSUN NISSAN PULSAR PULSAR NX model N12 series.

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

GENERAL SPECIFICATIONS

Steering gear type	R25S
Turns of steering wheel (Lock to lock)	3.7
Steering overall ratio	21.55

INSPECTION AND ADJUSTMENT

Front wheel turning angle		
Inner wheel		37° - 41°
Outer wheel		29° - 33°
Steering wheel axial play	mm (in)	0 (0)
Steering wheel play	mm (in)	Less than 35 (1.38)

SECTION HA

HEATER AND AIR CONDITIONER

MODIFICATION NOTICE :

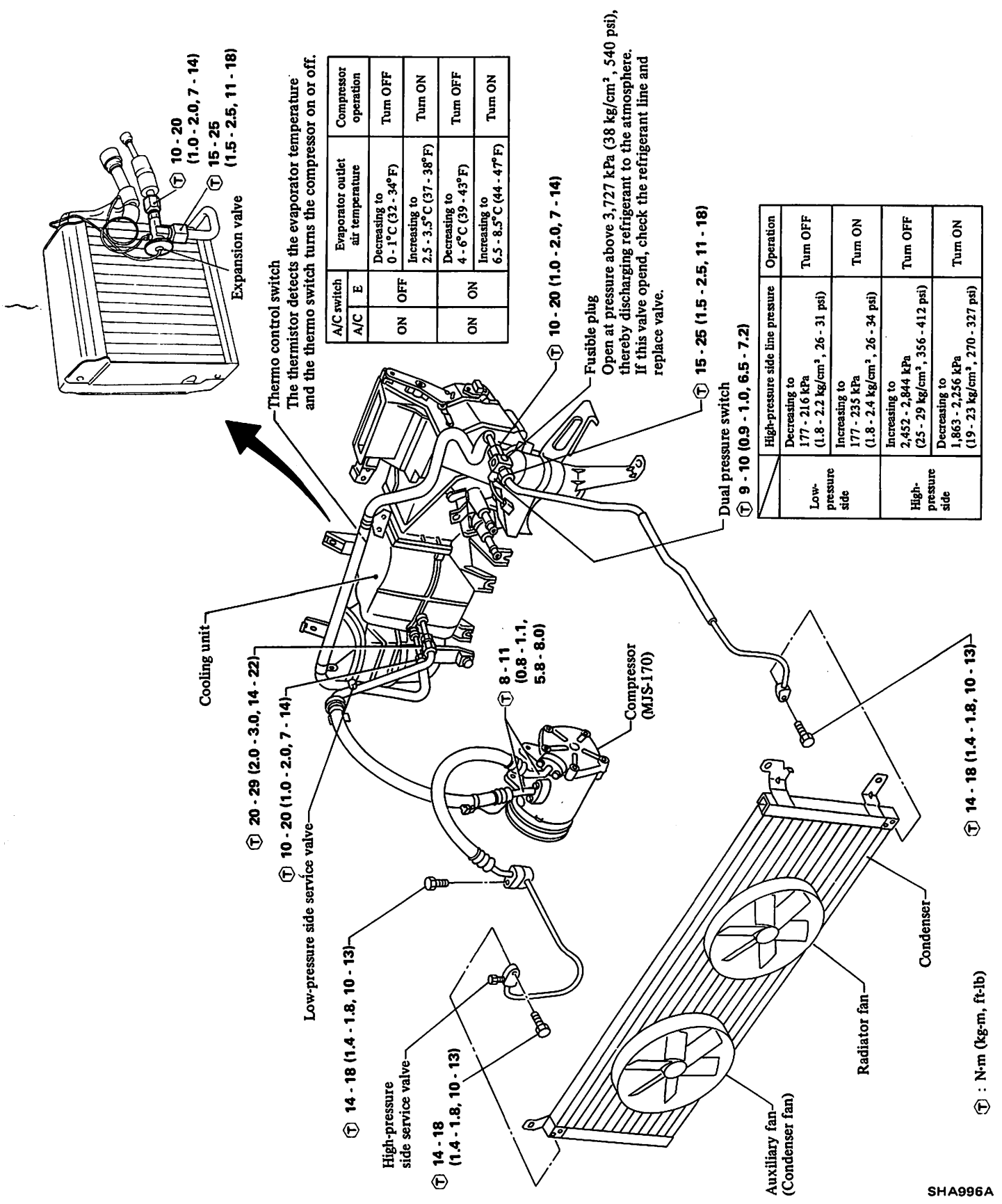
Heater & Air Conditioner system for the turbocharger vehicle is described in this section.
Compared to the former model, this model's modified portions include Refrigerant Line (partially), F.I.C.D., Electrical System and Performance Data.
For other portions, refer to the former N12 Service Manual.

CONTENTS

DESCRIPTION HA-2
Refrigerant line HA-2
Electrical unit location HA-3
ELECTRICAL DIAGRAM HA-4
Schematic HA-4
Wiring diagram HA-5
SERVICE PROCEDURES HA-6
Fast idle control device (F.I.C.D.) HA-6
SERVICE DATA AND SPECIFICATIONS (S.D.S.) HA-6
General specifications HA-6
Inspection and adjustment HA-6
Tightening torque HA-7

DESCRIPTION

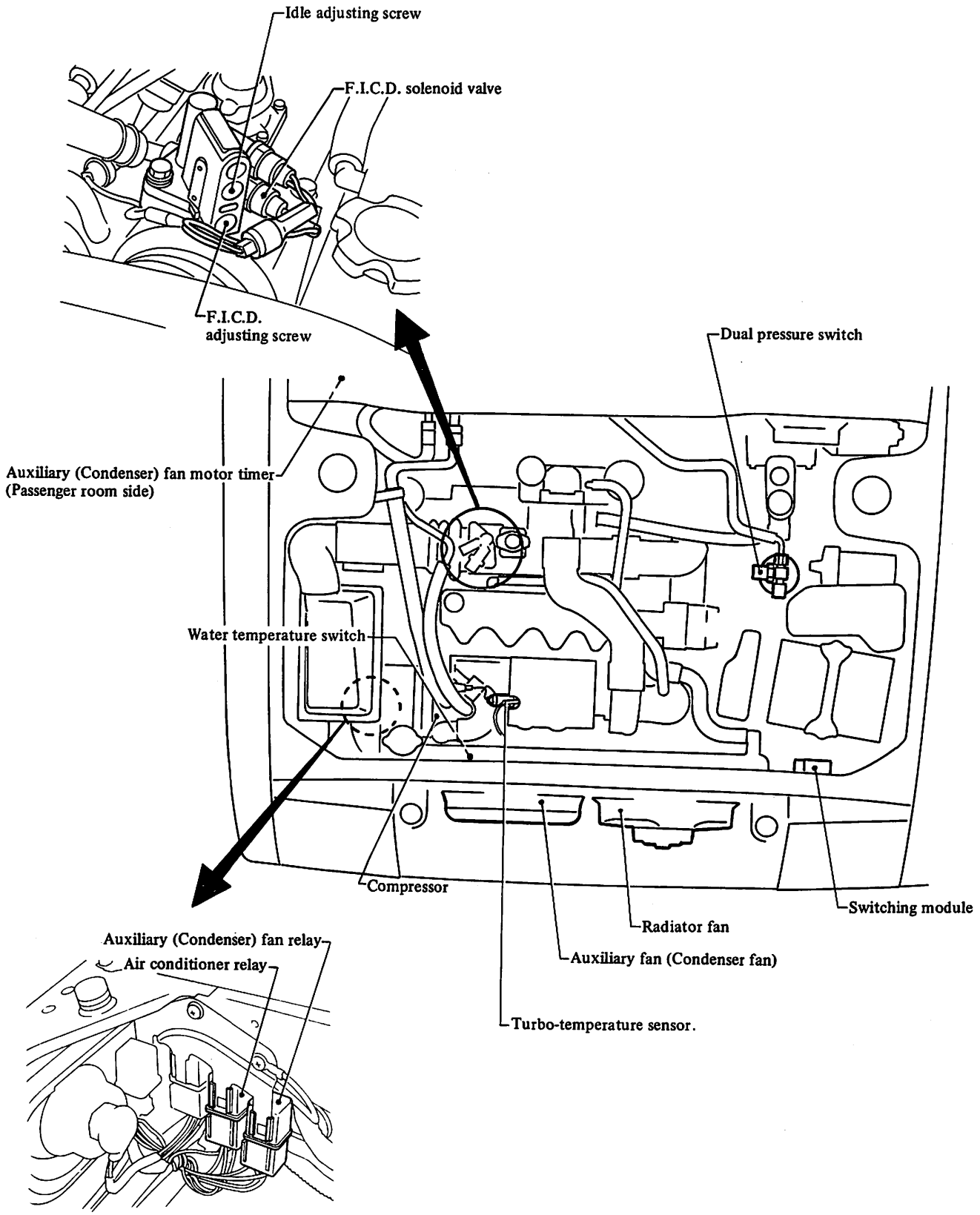
REFRIGERANT LINE



A/C switch		Evaporator outlet air temperature	Compressor operation
A/C	E		
ON	OFF	Decreasing to 0 - 1°C (32 - 34°F)	Turn OFF
		Increasing to 2.5 - 3.5°C (37 - 38°F)	Turn ON
ON	ON	Decreasing to 4 - 6°C (39 - 43°F)	Turn OFF
		Increasing to 6.5 - 8.5°C (44 - 47°F)	Turn ON

	High-pressure side line pressure	Operation
Low-pressure side	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
High-pressure side	Increasing to 2,452 - 2,844 kPa (25 - 29 kg/cm², 356 - 412 psi)	Turn OFF
	Decreasing to 1,863 - 2,256 kPa (19 - 23 kg/cm², 270 - 327 psi)	Turn ON

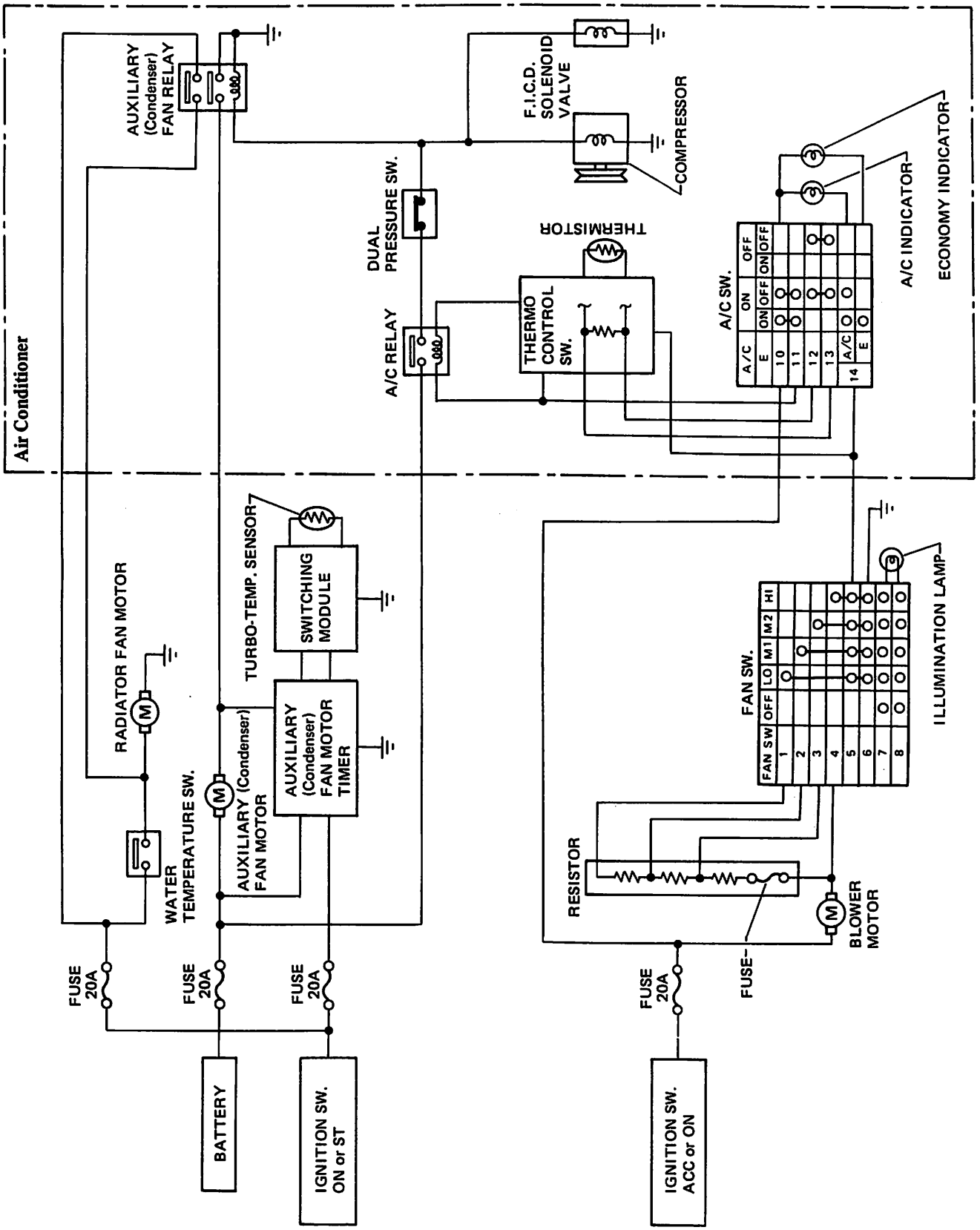
ELECTRICAL UNIT LOCATION



SHA997A

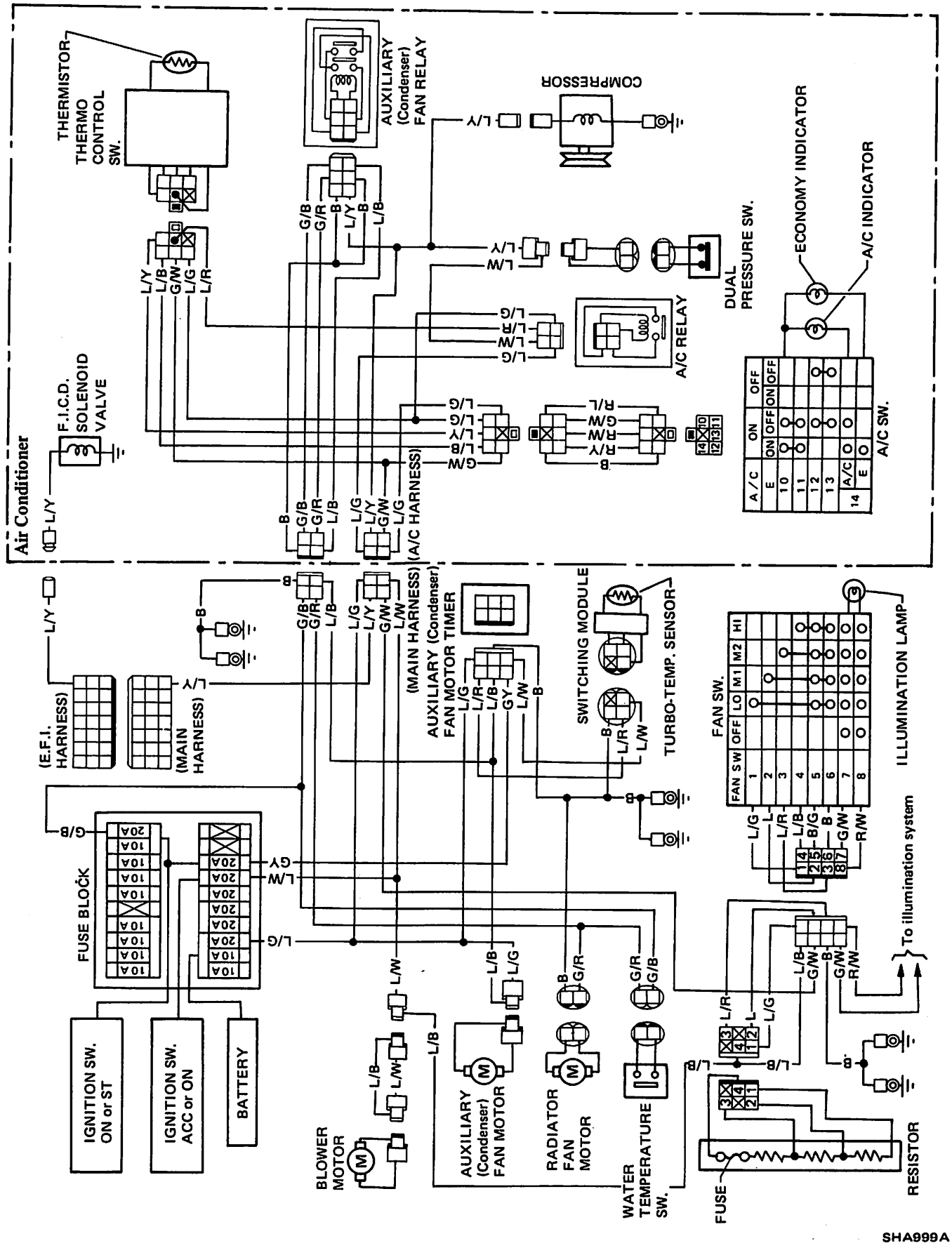
ELECTRICAL DIAGRAM

SCHEMATIC



SHA998A

WIRING DIAGRAM

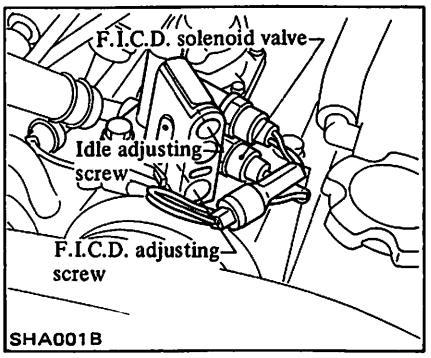


SERVICE PROCEDURES

FAST IDLE CONTROL DEVICE (F.I.C.D.)

ADJUSTMENT OF IDLE SPEED

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 (Air conditioner switch at "A/C" position, fan control lever at "HI" position), make sure that compressor and F.I.C.D. solenoid valve are functioning properly.
4. Set idle speed at the specified value.



Engine idling speed	M/T model	A/T model (at "D" range)
When F.I.C.D. is OFF	750±50 rpm	650±50 rpm
When F.I.C.D. is ON	800±50 rpm	620±40 rpm

When adjusting engine revolution for A/T model, shift position of transmission should be in "D" range, and apply parking brake and tire stoppers.

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

GENERAL SPECIFICATIONS

COMPRESSOR

Model	MJS170
Type	Swash plate
Displacement cm^3 (cu in)/rev.	170 (10.37)
Cylinder bore x stroke mm (in)	40.0 x 22.6 (1.575 x 0.890)
Direction of rotation	Clockwise (viewed from drive end)
Type of driving belt	A type

LUBRICATING OIL

Model	MJS170
Type	SUNISO 5GS
Capacity mℓ (US fl oz, Imp fl oz)	
Total in system	150 (5.1, 5.3)
Residual oil in system after oil return and draining operation	30 (1.0, 1.1)
Amount of oil filled into compressor (Service parts)	150 (5.1, 5.3)

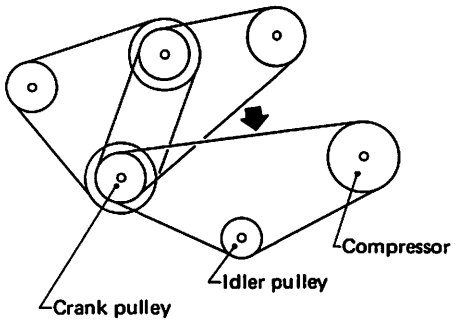
REFRIGERANT

Type		R-12
Capacity	kg (lb)	0.8 - 1.0 (1.8 - 2.2)

INSPECTION AND ADJUSTMENT

BELT TENSION

Measuring point



Fan belt/Applied pressure mm (in)/N (kg, lb)	New: 7 - 9 (0.28 - 0.35)/98 (10, 22) Used: 9 - 11 (0.35 - 0.43)/98 (10, 22)

ENGINE IDLING SPEED

	M/T	A/T
When F.I.C.D. is OFF	750±50 rpm	650±50 rpm (At "D" range)
When F.I.C.D. is ON	800±50 rpm	620±40 rpm (At "D" range)

COMPRESSOR

Model	MJS170
Clutch hub to pulley clearance mm (in)	0.5 - 0.8 (0.020 - 0.031)

TIGHTENING TORQUE

COMPRESSOR AND COMPRESSOR INSTALLATION

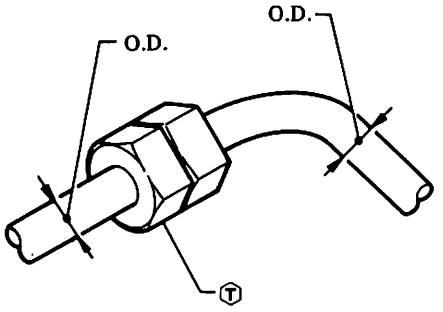
	MJS170		
	N·m	kg-m	ft-lb
Shaft nut	19 - 21	1.9 - 2.1	14 - 15
Rear cover fixing bolt	19 - 21	1.9 - 2.1	14 - 15
Cover plate fixing bolt	15 - 17	1.5 - 1.7	11 - 12
Compressor bracket to cylinder block	30 - 40	3.1 - 4.1	22 - 30
Compressor to compressor bracket	30 - 40	3.1 - 4.1	22 - 30

HIGH AND LOW PRESSURE SWITCH

	N·m	kg-m	ft-lb
High and low pressure switch	9 - 10	0.9 - 1.0	6.5 - 7.2

REFRIGERANT LINE

Union type (pipe to pipe)

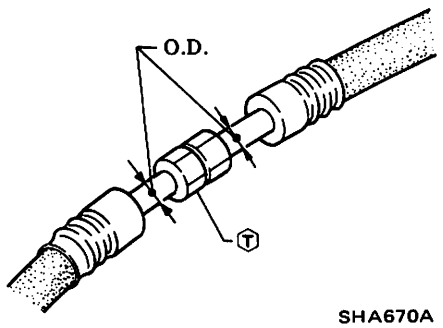


SHA669A

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 - 25	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

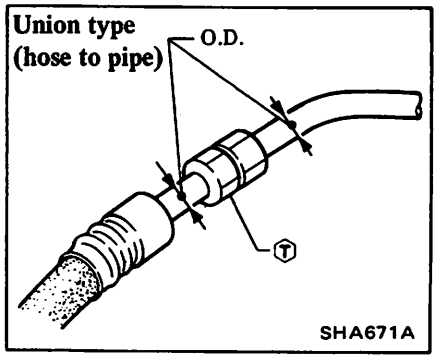
When connecting pipes of different material, use lower tightening torque.

Union type (hose to hose)

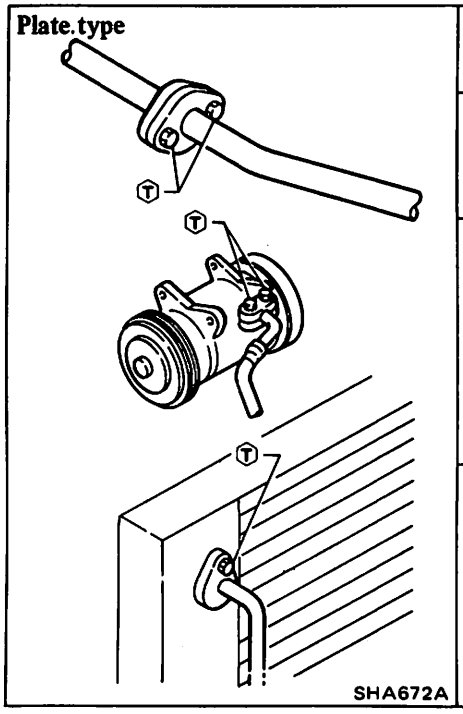


SHA670A

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



- Use tightening torque for flexible hose.



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

SECTION EL

CONTENTS

POWER SUPPLY ROUTING ..... EL- 2
Schematic/Power supply routing ..... EL- 2
BATTERY ..... EL- 3
Service data and specifications (S.D.S.) ..... EL- 3
STARTING SYSTEM ..... EL- 3
Wiring diagram ..... EL- 3
Starter motor ..... EL- 4
Service data and specifications ..... EL- 5
CHARGING SYSTEM ..... EL- 6
Wiring diagram ..... EL- 6
Service data and specifications ..... EL- 6
IGNITION SYSTEM ..... EL- 7
Schematic ..... EL- 7
Wiring diagram ..... EL- 7
Distributor ..... EL- 8
Service data and specifications ..... EL- 9
LIGHTING SYSTEM EL-10
Headlamp EL-10
Exterior lamps EL-11
Illumination lamps EL-13
METERS, GAUGES AND WARNING SYSTEM EL-14
Combination meter EL-14
Meter and gauges EL-15
Warning lamps EL-17
WIPER AND WASHER EL-18
Windshield wiper and washer EL-18
ELECTRICAL ACCESSORIES EL-19
Rear window defogger EL-19
LOCATION OF ELECTRICAL UNITS EL-21
Engine compartment EL-21
Passenger compartment EL-21

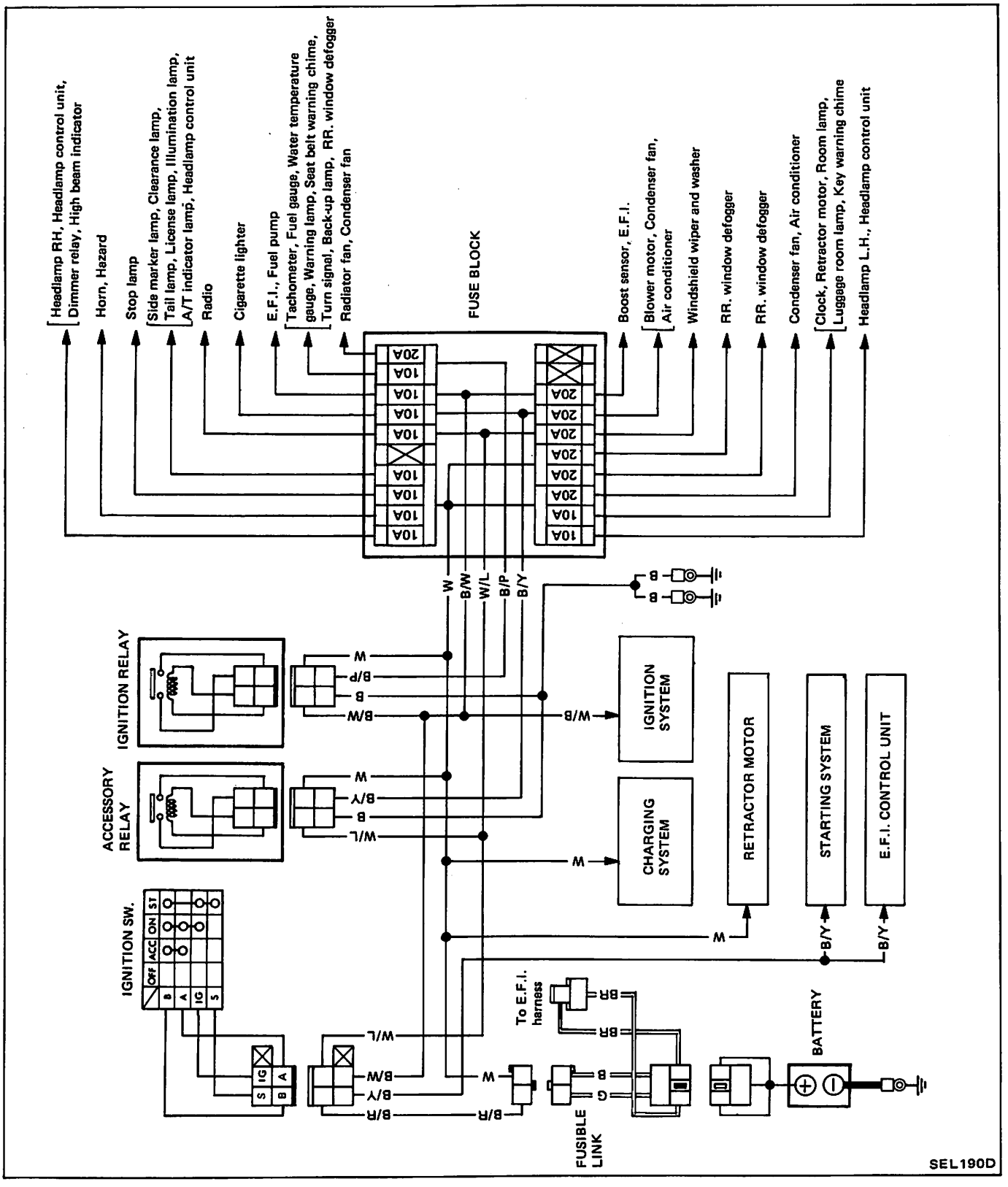
Refer to section EF & EC for:
- ENGINE FUEL & EMISSION CONTROL SYSTEM

Refer to section HA for:
- HEATER
- AIR CONDITIONER

POWER SUPPLY ROUTING

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

SCHEMATIC/POWER SUPPLY ROUTING



BATTERY

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

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

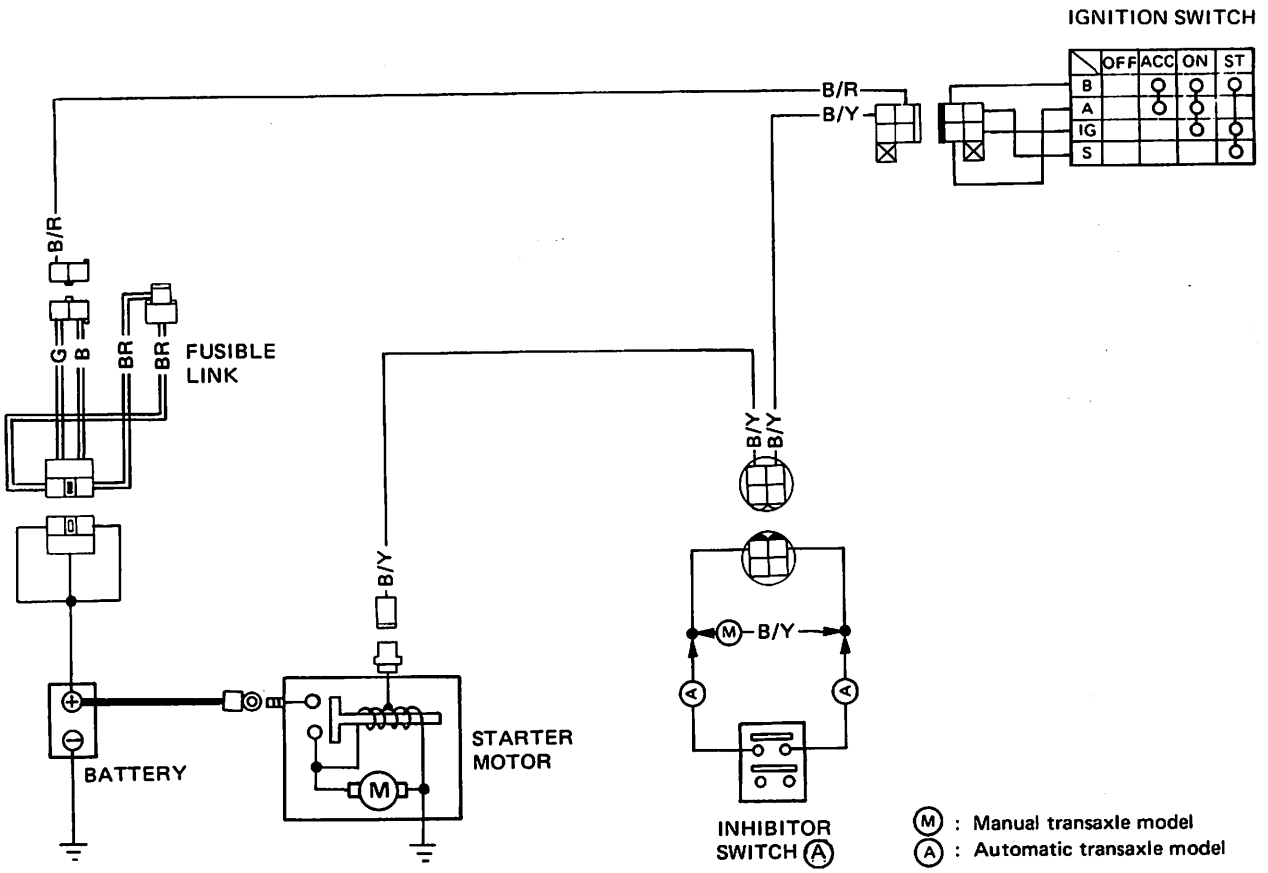
BATTERY

Applied model		U.S.A.	Canada
		All	All
Type		N60LMF	NS70LMF
		Maintenance-free	
Capacity	V-AH	12-60	12-65

STARTING SYSTEM

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

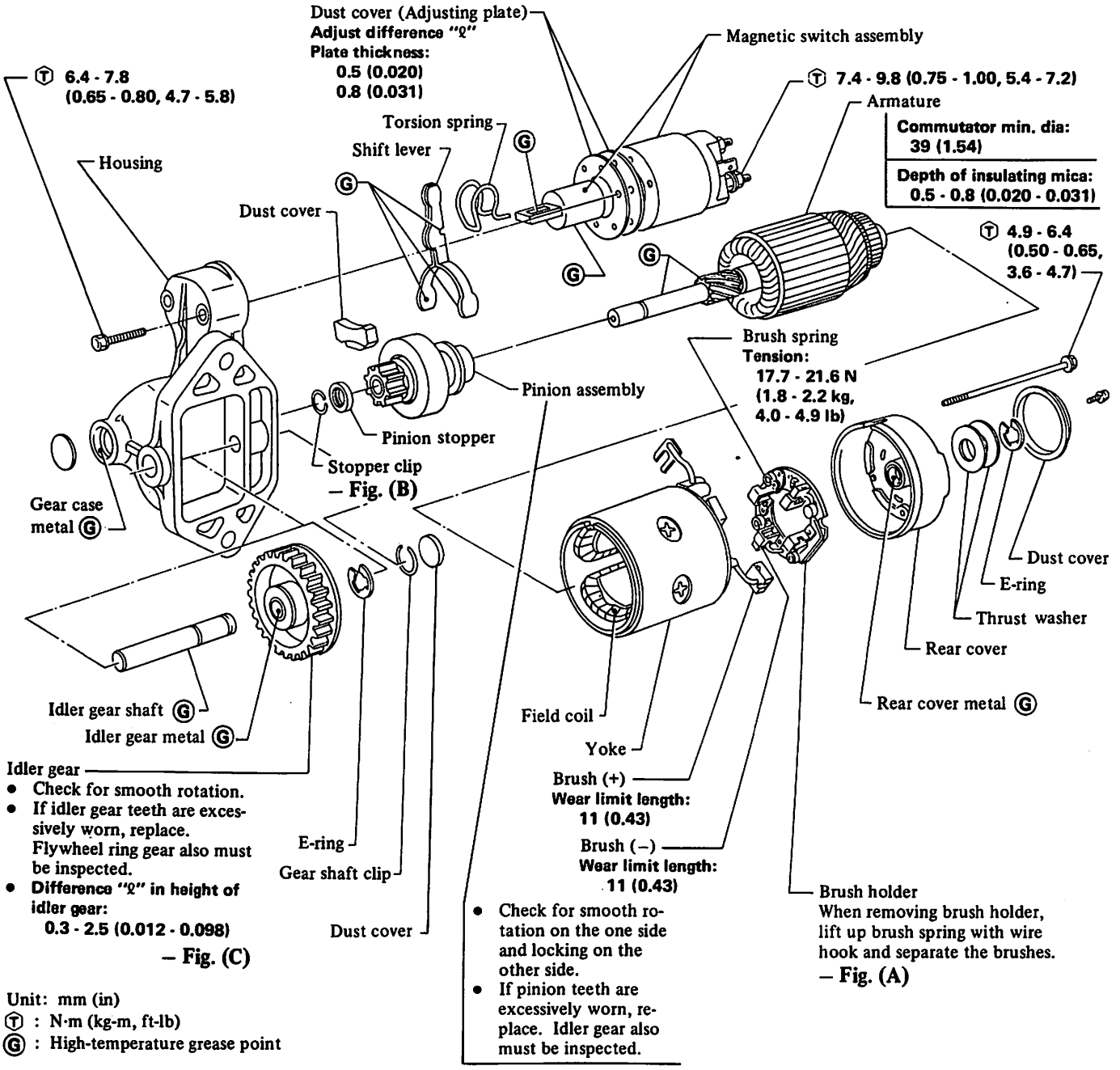
WIRING DIAGRAM



SEL191D

STARTER MOTOR

S114-377, 378



Unit: mm (in)
Ⓣ : N·m (kg-m, ft-lb)
Ⓖ : High-temperature grease point

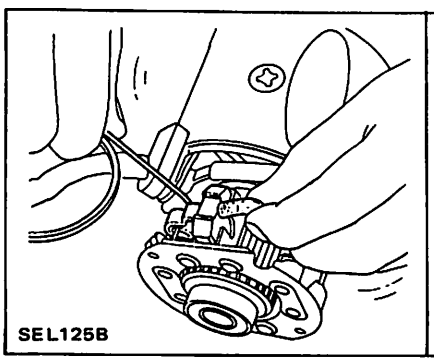


Fig. (A)

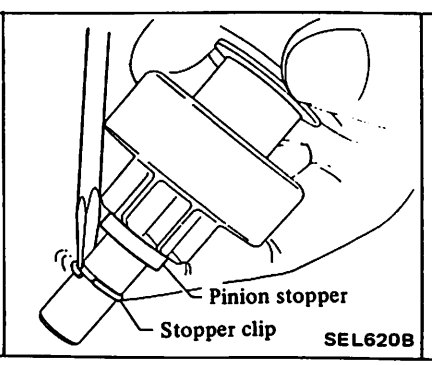


Fig. (B)

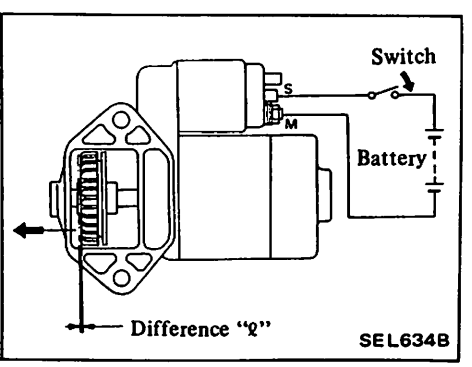


Fig. (C)

SEL246C

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

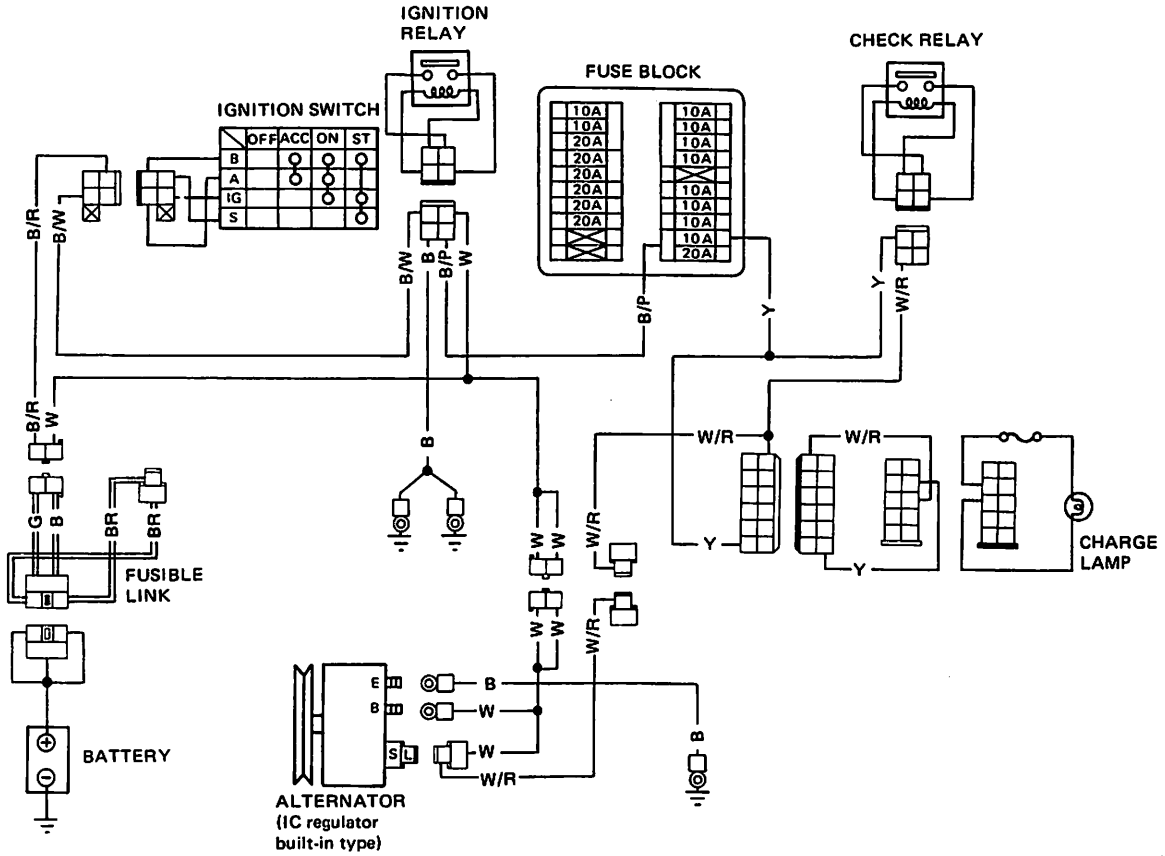
STARTER MOTOR

Type			S114-377	S114-378
			Reduction type	
Applied model			M/T models and U.S.A. A/T models	Canada A/T model and optional for U.S.A. A/T models
System voltage		V	12	12
No load	Terminal voltage	V	11.5	11.5
	Current	A	Less than 60	Less than 60
	Revolution	rpm	More than 2,350	More than 2,000
Outer diameter of commutator		mm (in)	More than 39 (1.54)	More than 39 (1.54)
Minimum length of brush		mm (in)	11 (0.43)	11 (0.43)
Brush spring tension		N (kg, lb)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)
Difference "ℓ"		mm (in)	0.3 - 2.5 (0.012 - 0.098)	0.3 - 2.5 (0.012 - 0.098)

CHARGING SYSTEM

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

WIRING DIAGRAM



SEL193D

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

ALTERNATOR

Type		LR150-125B
Applied model		All
Nominal rating	V-A	12-50
Ground polarity		Negative
Minimum revolution under no-load (When 14 volts is applied)	rpm	Less than 900
Hot output current	A/rpm	More than 42/2,500 More than 50/5,000
Regulated output voltage	V	14.4 - 15.0
Brush wear limit	mm (in)	More than 7.0 (0.276)
Brush spring pressure	N (g, oz)	2.501 - 3.383 (255 - 345, 8.99 - 12.17)
Slip ring outer diameter	mm (in)	More than 30 (1.18)

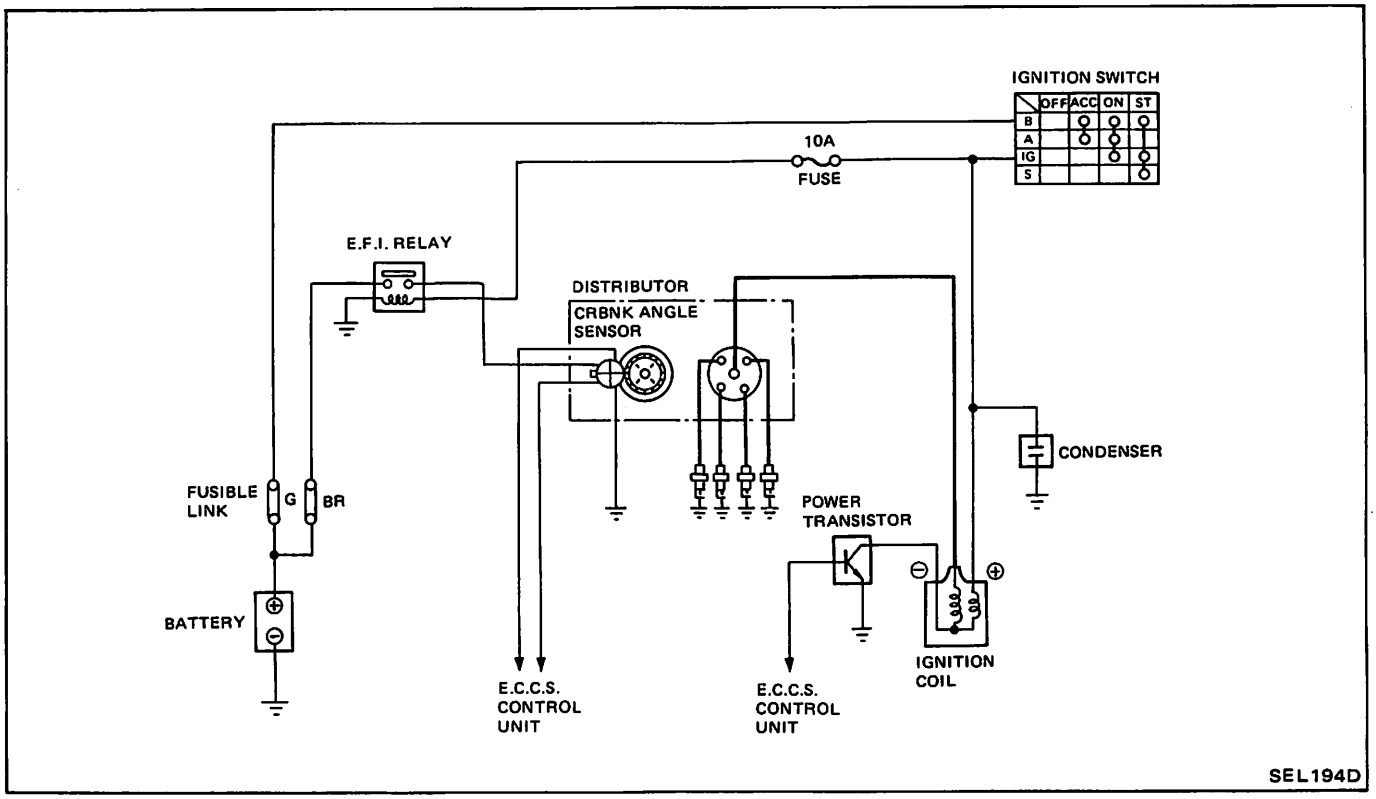
IGNITION COIL

Type		HITACHI make E12-59
Applied model		All
Primary voltage	V	12
Primary resistance [at 20°C (68°F)]	Ω	0.84 - 1.02
Secondary resistance [at 20°C (68°F)]	kΩ	8.2 - 12.4

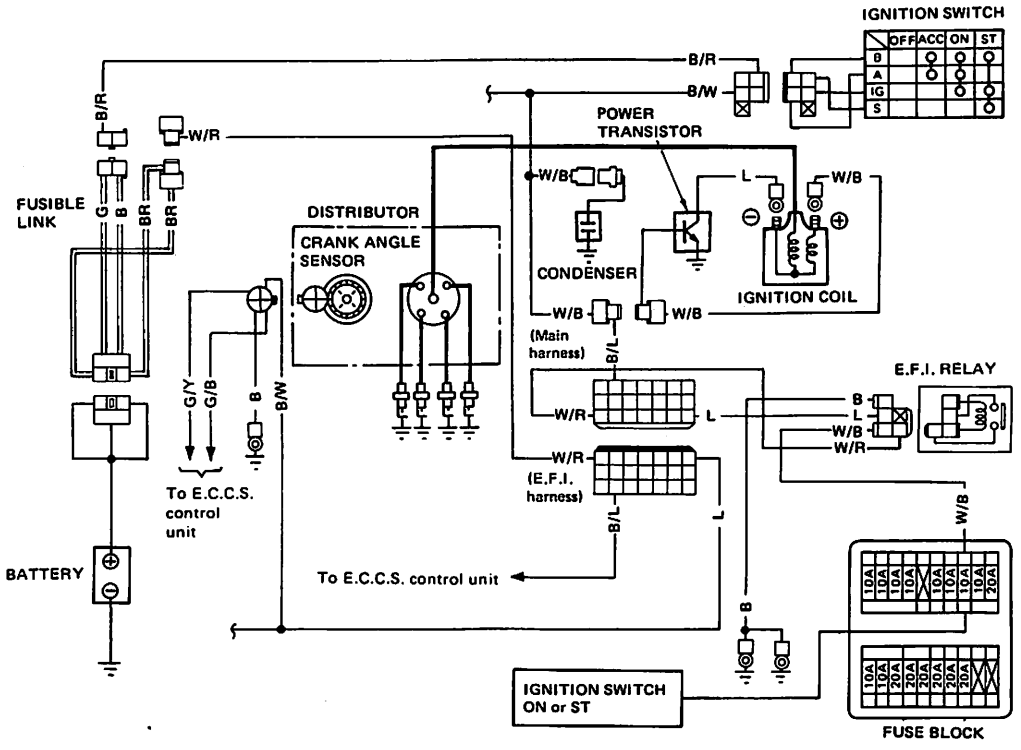
IGNITION SYSTEM

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

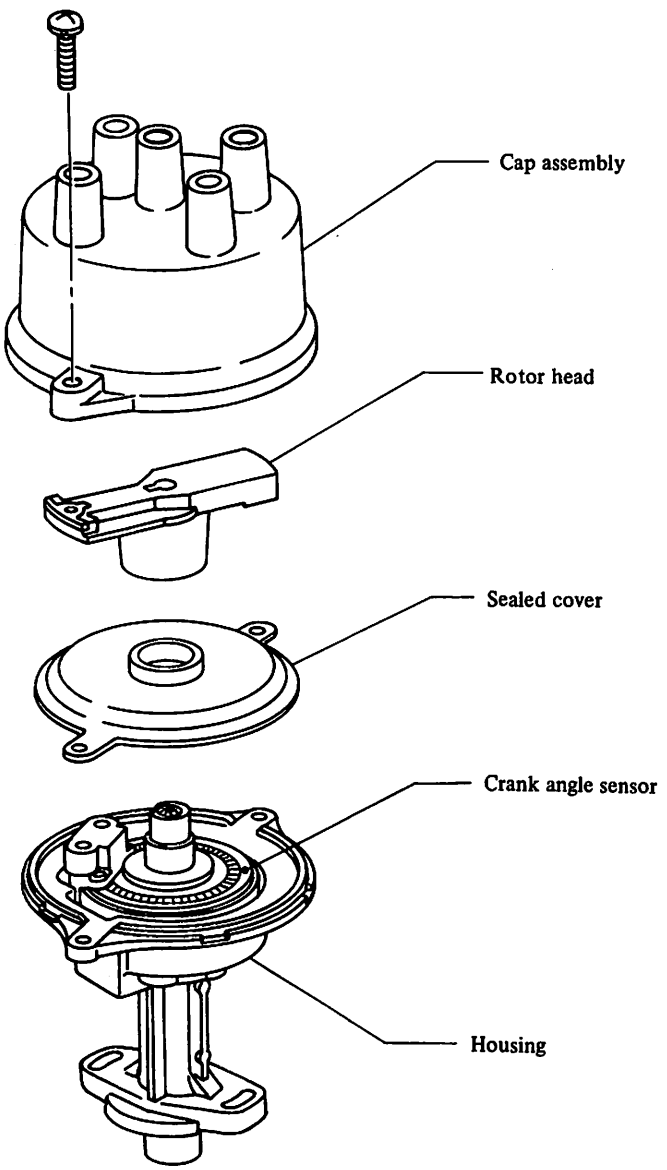
SCHEMATIC



WIRING DIAGRAM



DISTRIBUTOR



SEL196D

CHECKING

Cap and rotor head

Check cap and rotor head for dust, carbon deposits and cracks.

DISASSEMBLY

Cap, sealed cover, rotor head, housing and harness can be disassembled (but not crank angle sensor).

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

DISTRIBUTOR

Type		D4P82-06
Applied model		All
Firing order		1-3-4-2
Rotating direction		Counterclockwise
Cap insulation resistance	MΩ	More than 50
Rotor head insulation resistance	MΩ	More than 50

IGNITION COIL

Type		E12-59
Applied model		All
Primary voltage	V	12
Primary resistance [at 20°C (68°F)]	Ω	0.84 - 1.02
Secondary resistance [at 20°C (68°F)]	kΩ	8.2 - 12.4

SPARK PLUG

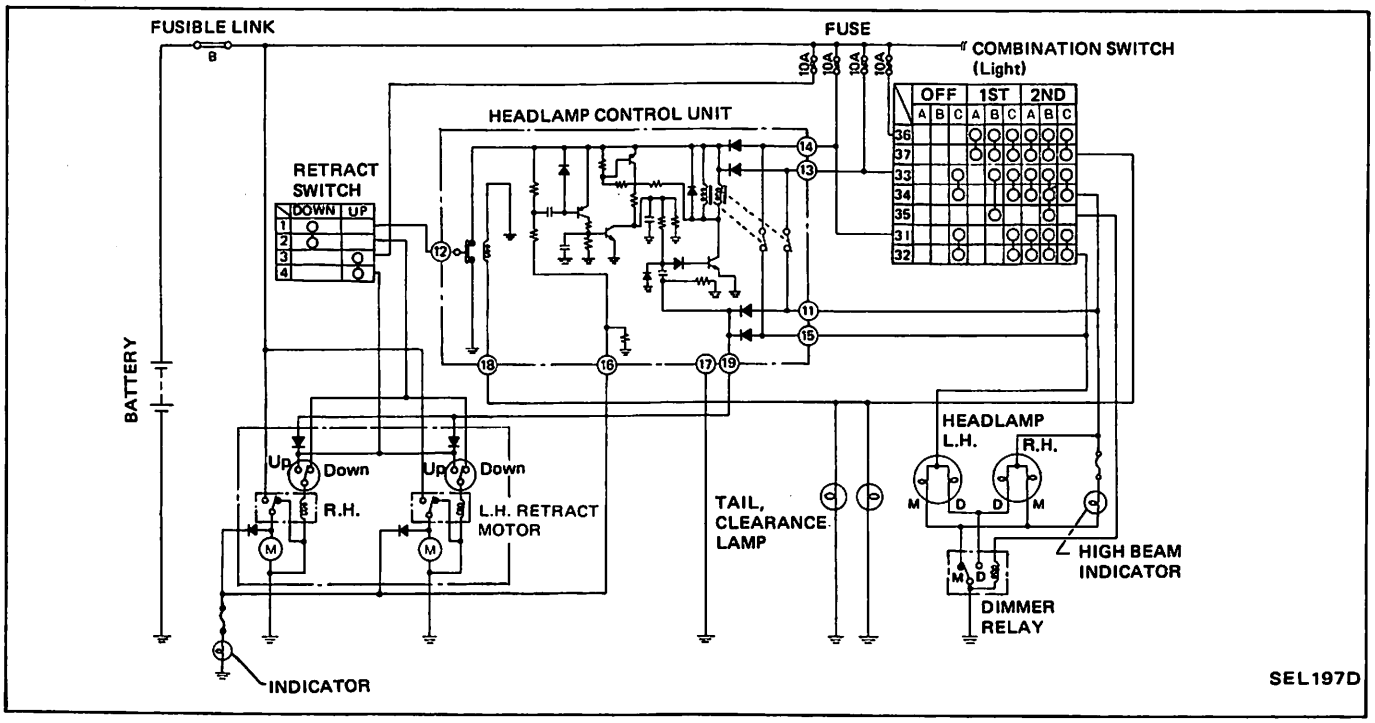
Type	Standard	BPR6ES-11
	Hot	BPR5ES-11
	Cold	BPR7ES-11
Size (Screw dia. x reach)	mm (in)	14 x 19 (0.55 x 0.75)
Plug gap	mm (in)	1.0 - 1.1 (0.039 - 0.043)

LIGHTING SYSTEM

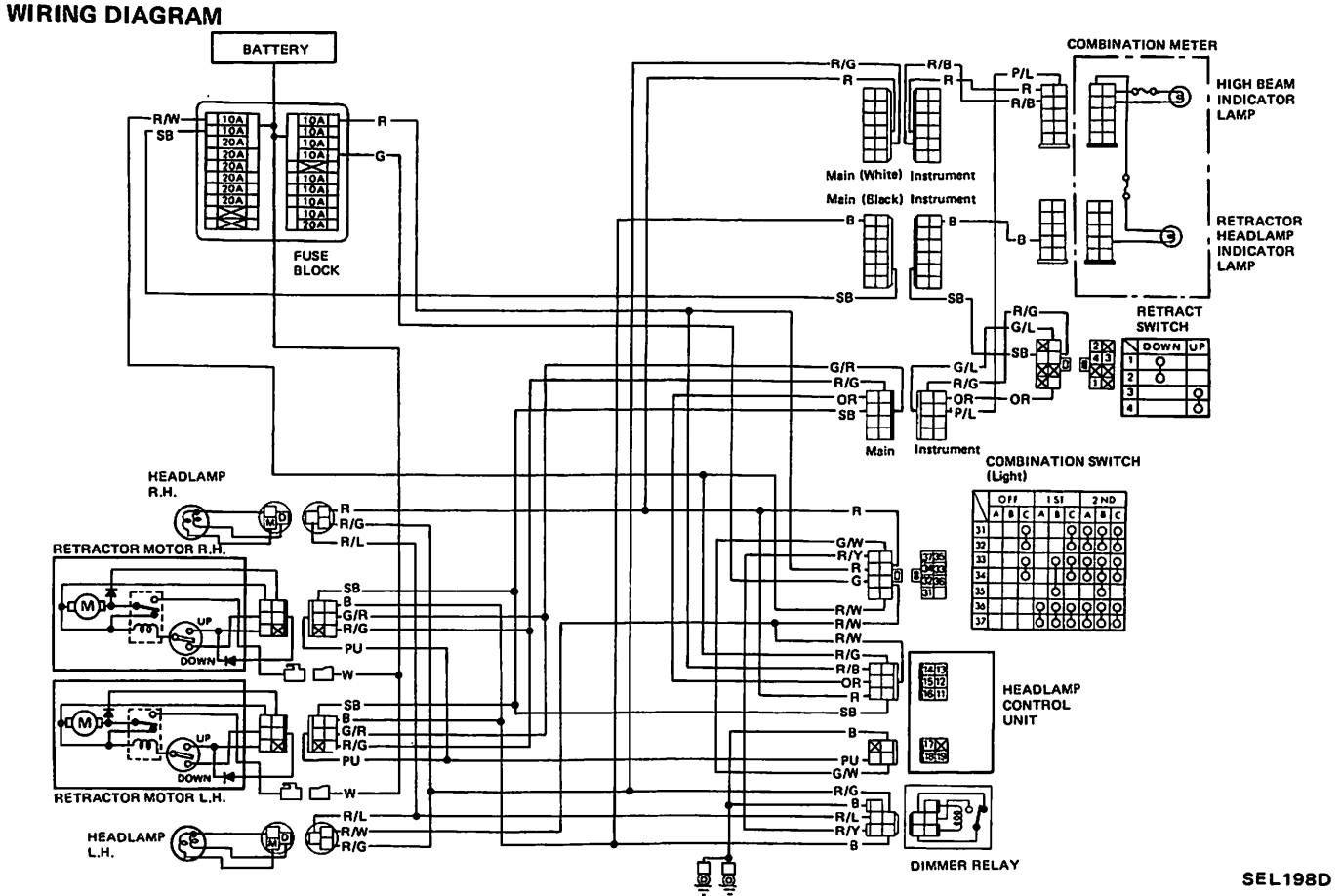
CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

HEAD LAMP

SCHEMATIC

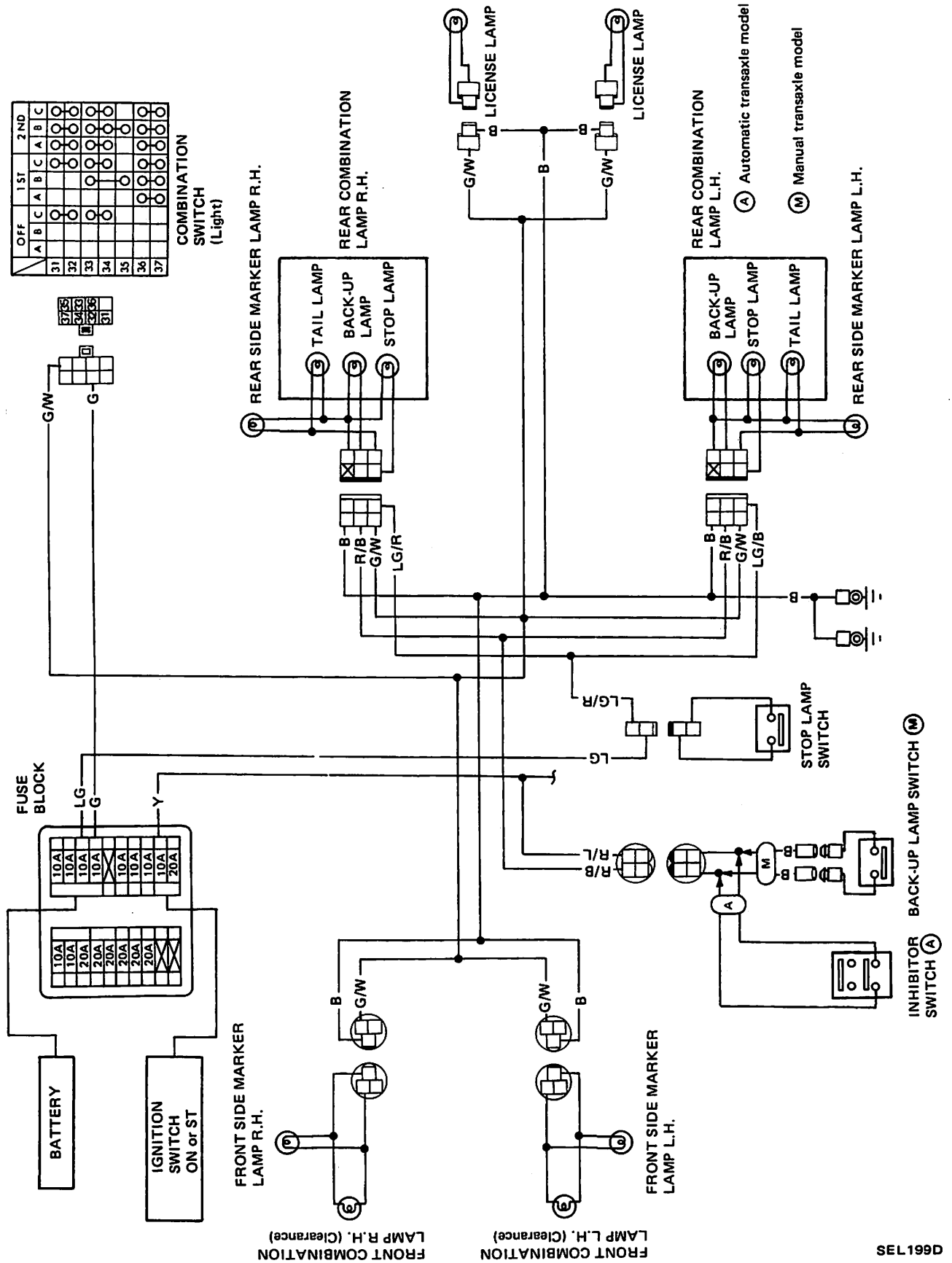


WIRING DIAGRAM

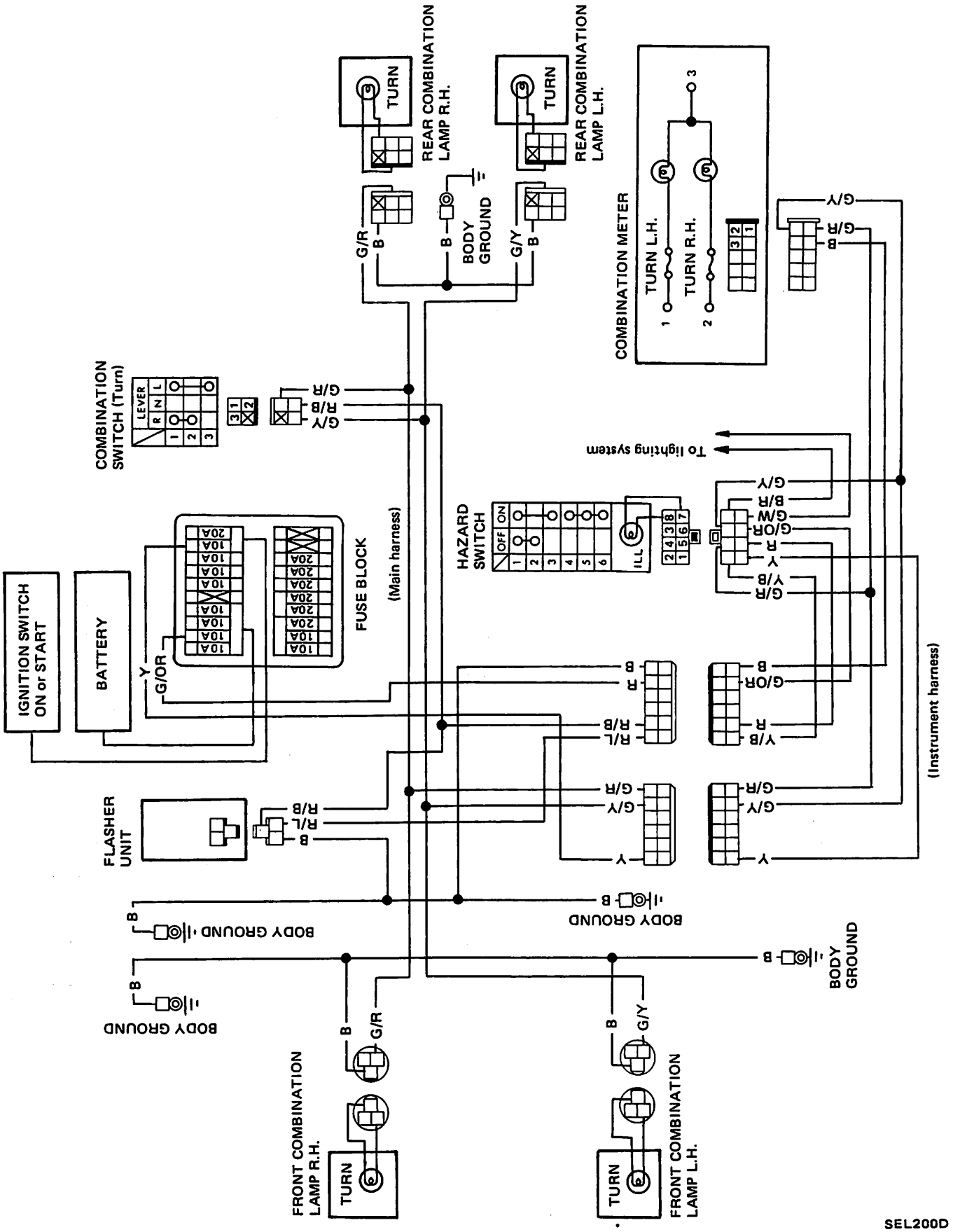


EXTERIOR LAMPS

WIRING DIAGRAM/CLEARANCE, SIDE MARKER, LICENSE, TAIL, STOP AND BACK-UP LAMPS

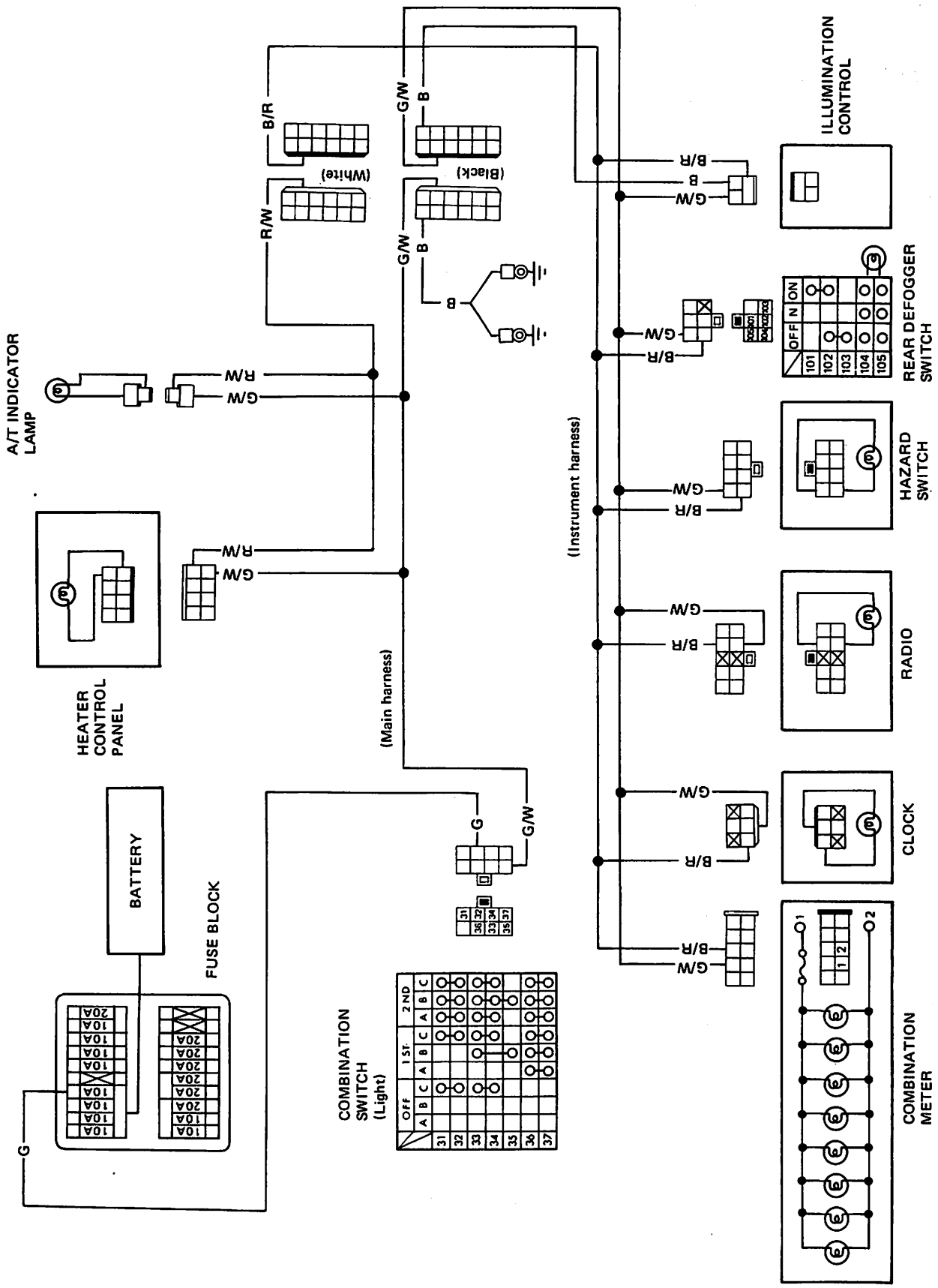


WIRING DIAGRAM/TURN SIGNAL AND HAZARD



ILLUMINATION LAMPS

WIRING DIAGRAM



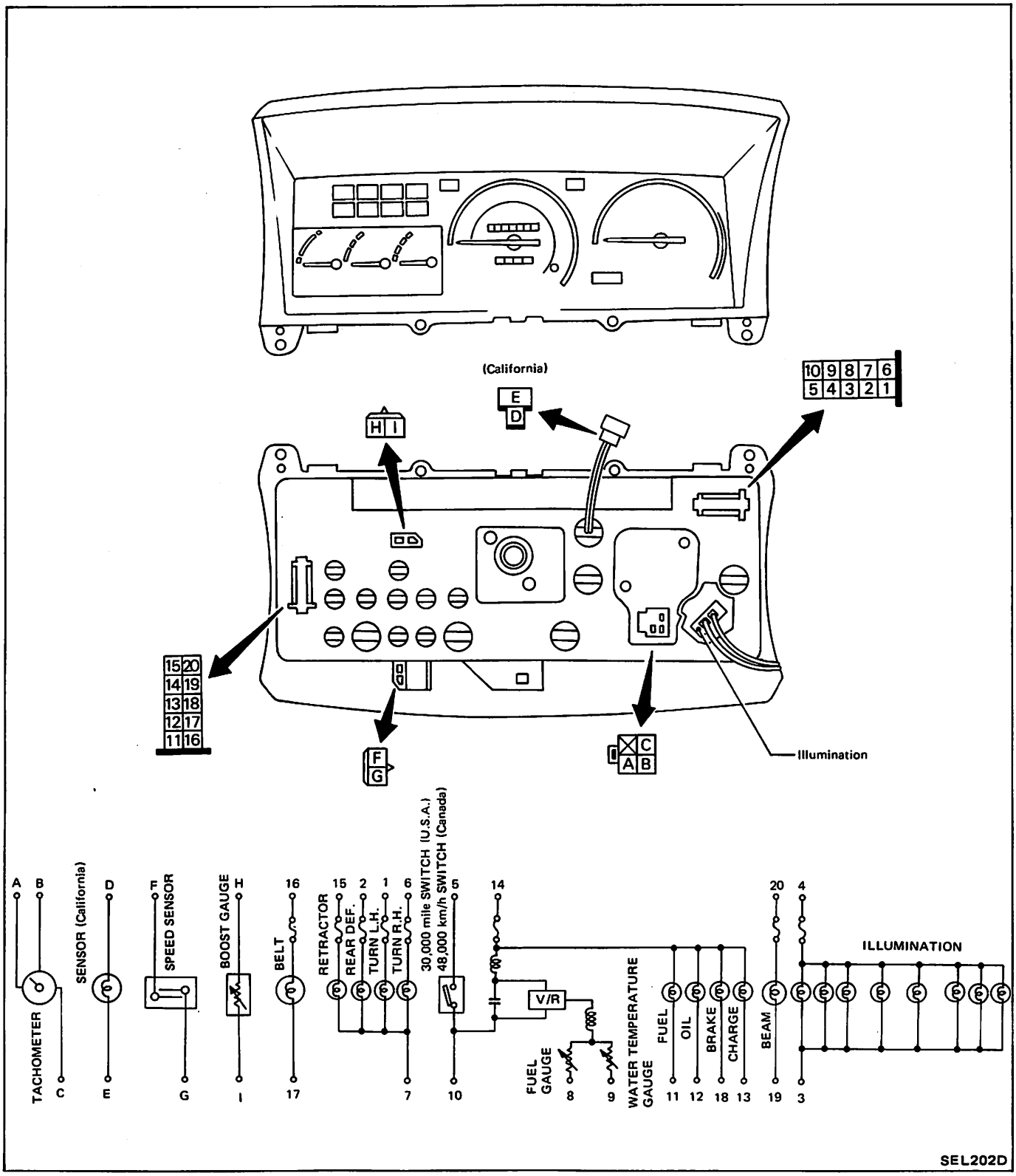
SEL201D

METERS, GAUGES AND WARNING SYSTEM

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

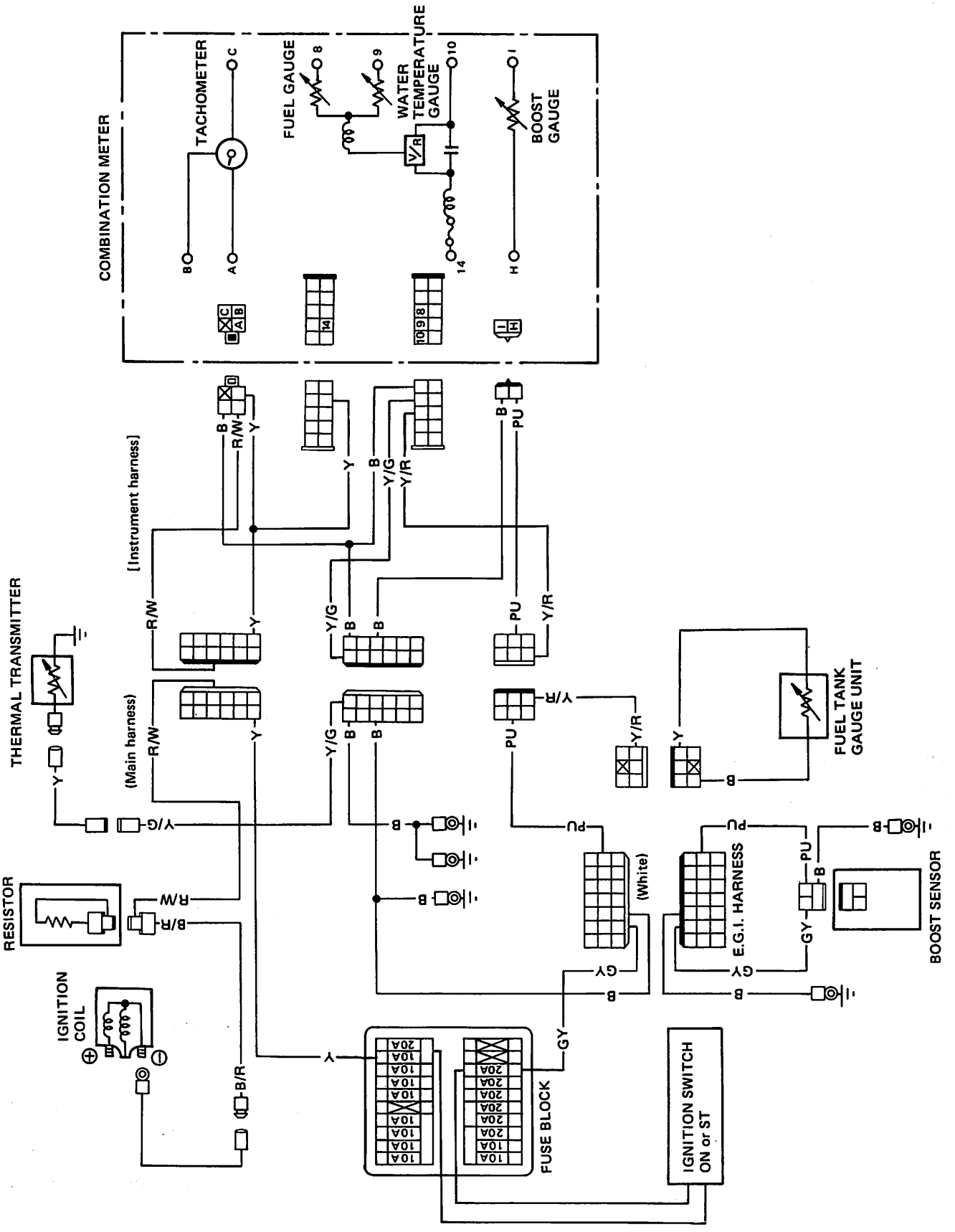
COMBINATION METER

SCHEMATIC/COMBINATION METER



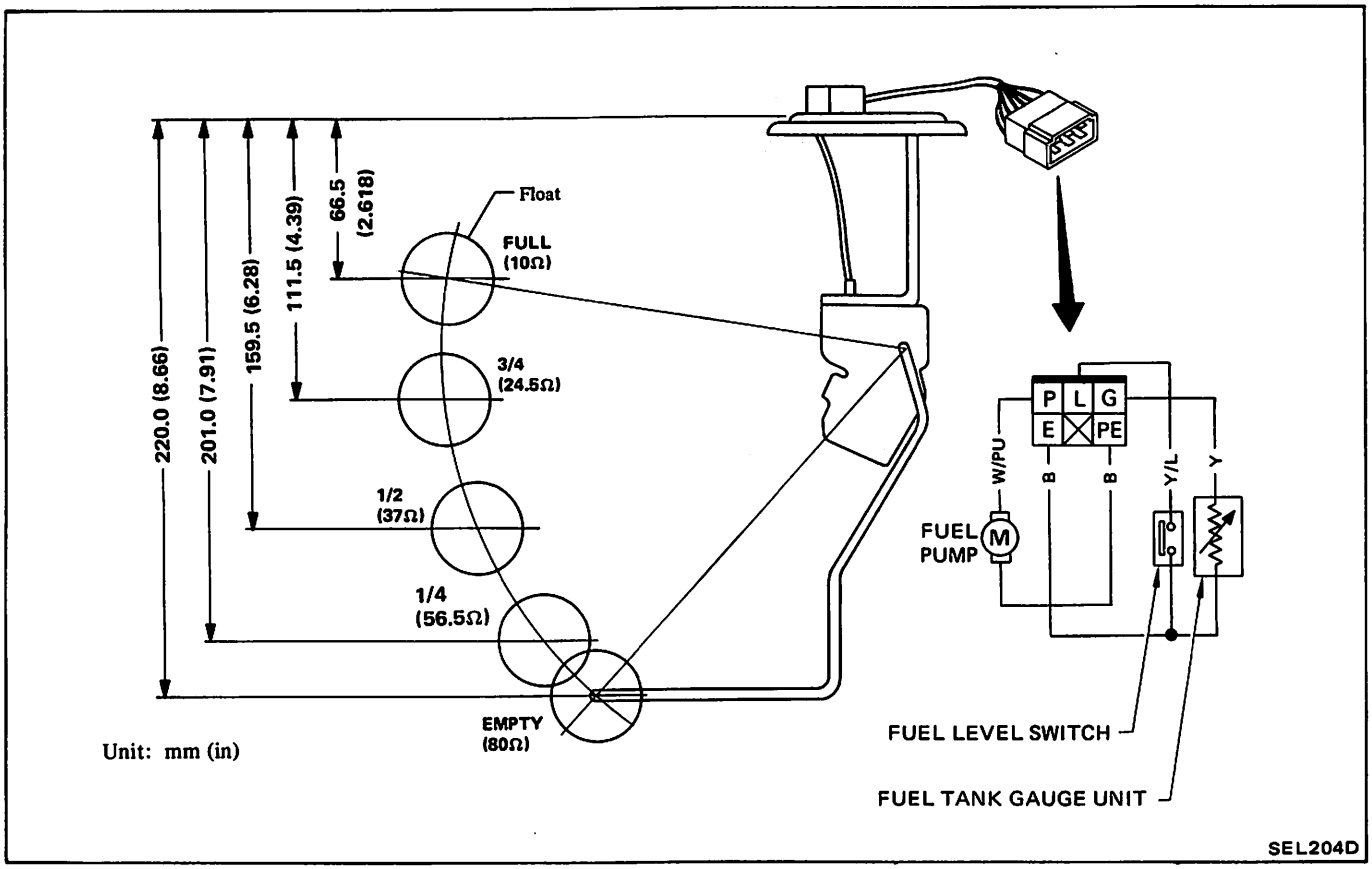
METER AND GAUGES

WIRING DIAGRAM



FUEL TANK GAUGE UNIT

Inspection



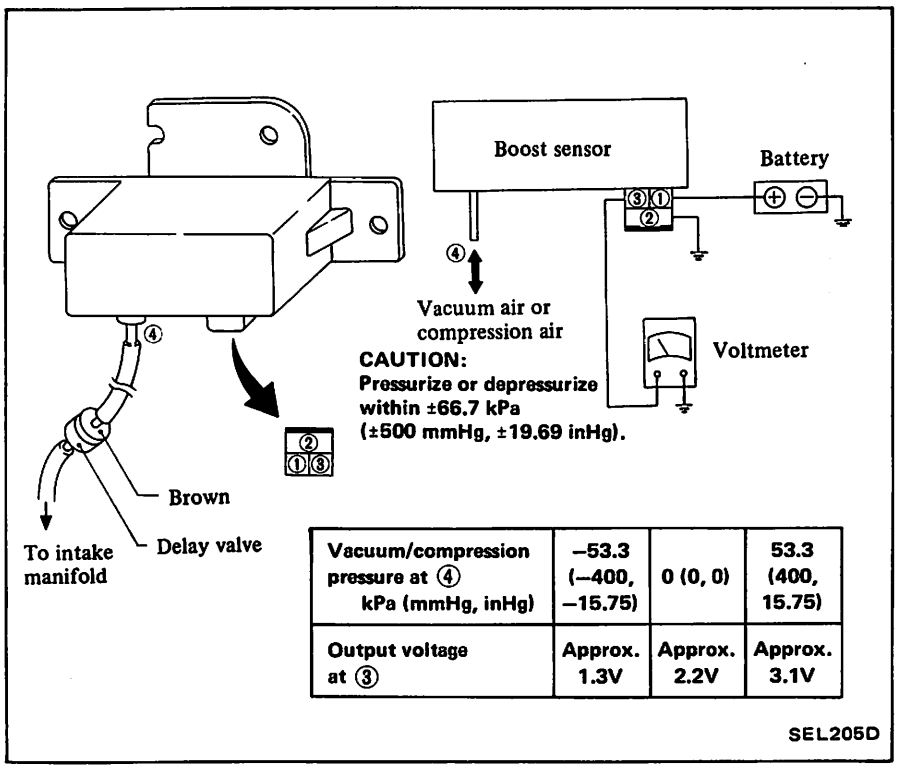
BOOST SENSOR

Location

Boost sensor is attached to the dash upper panel in engine room compartment.

Refer to "LOCATION OF ELECTRICAL UNITS".

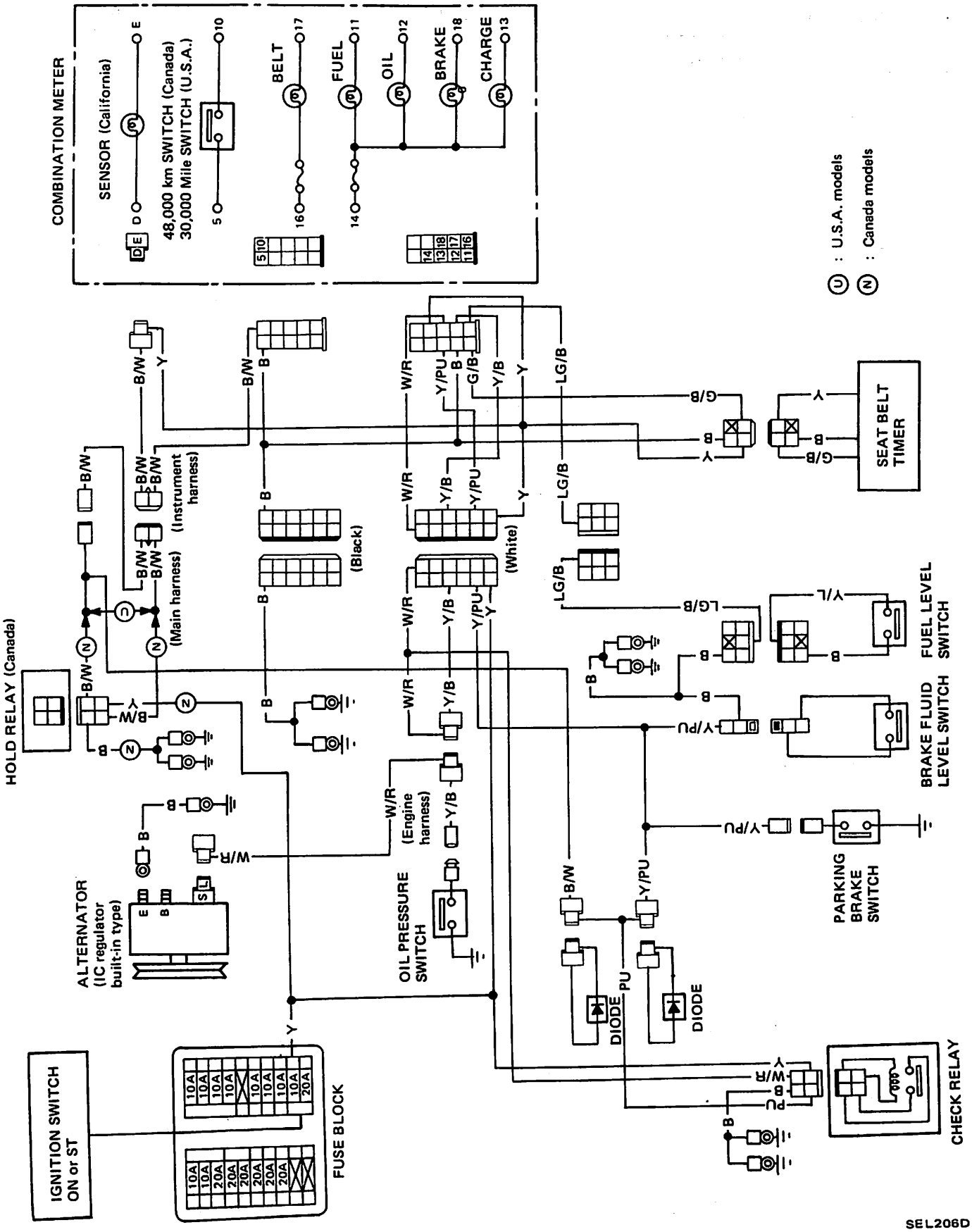
Inspection



Vacuum/compression pressure at ④ kPa (mmHg, inHg)	−53.3 (−400, −15.75)	0 (0, 0)	53.3 (400, 15.75)
Output voltage at ③	Approx. 1.3V	Approx. 2.2V	Approx. 3.1V

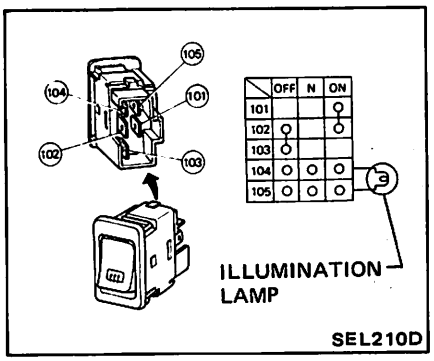
WARNING LAMPS

WIRING DIAGRAM



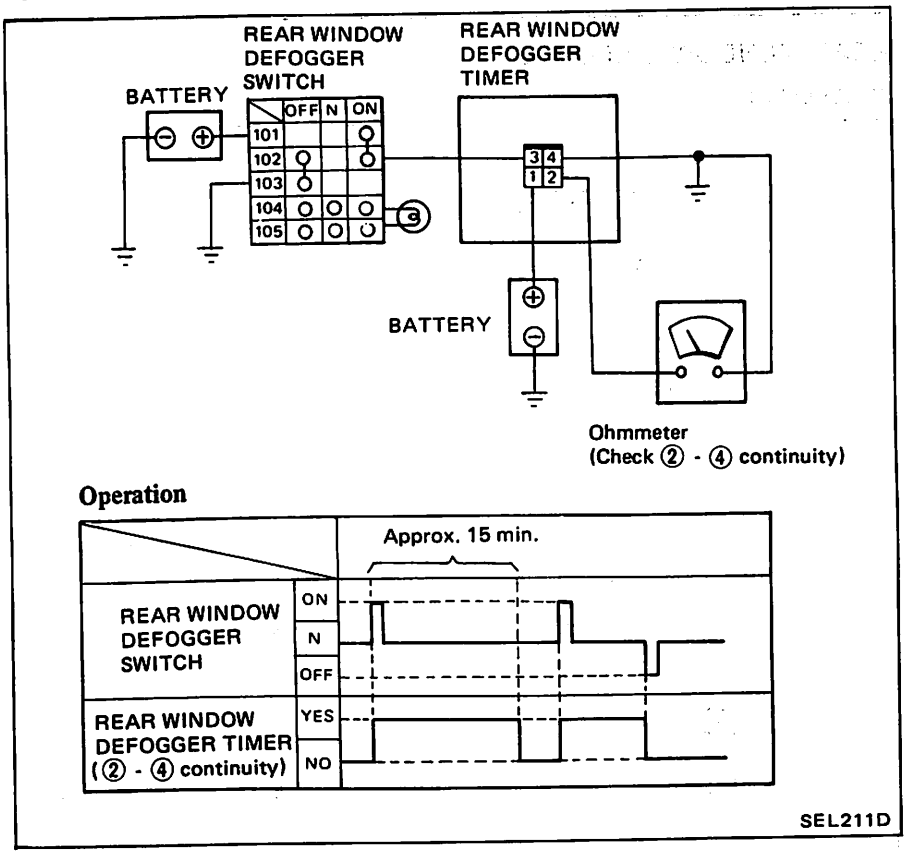
REAR WINDOW DEFOGGER SWITCH

Inspection



REAR WINDOW DEFOGGER TIMER

Operation

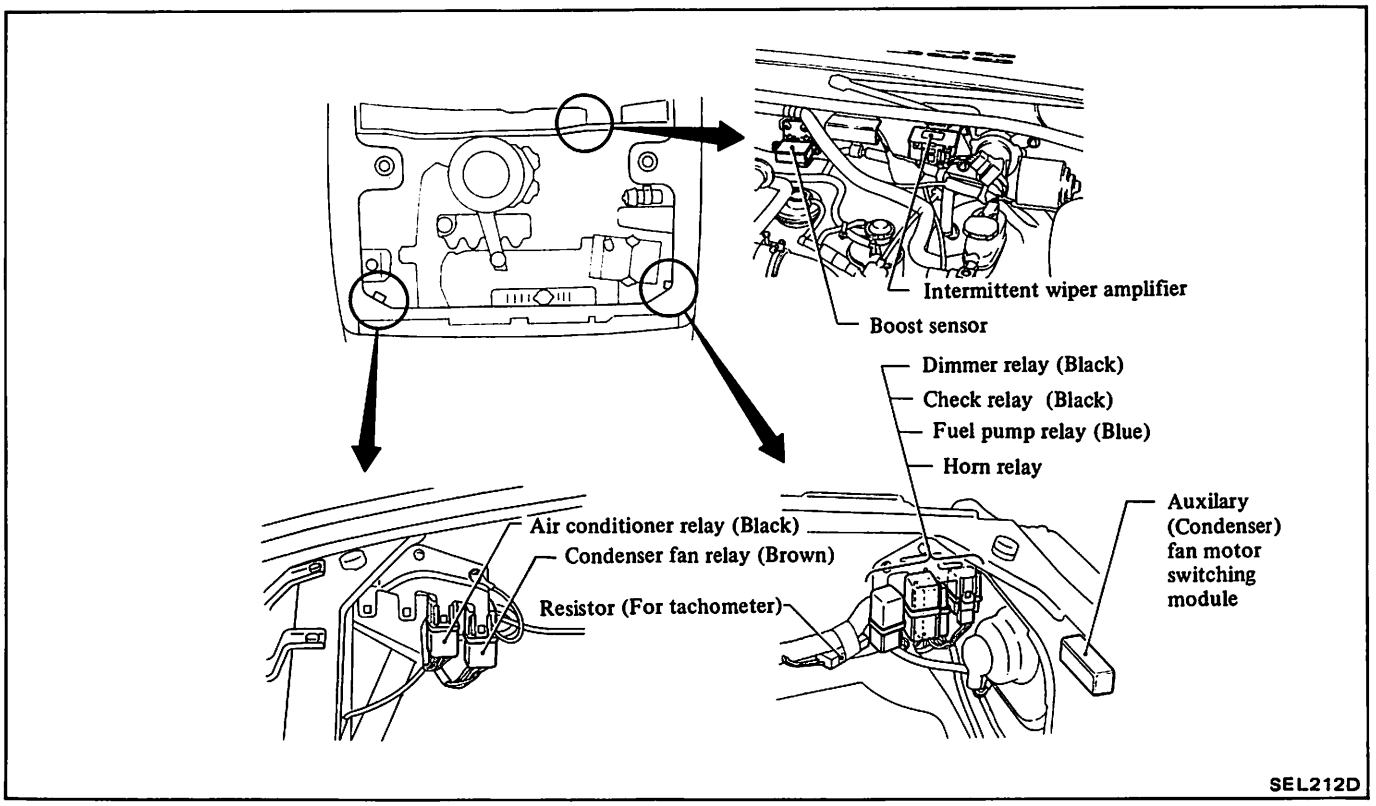


Operation

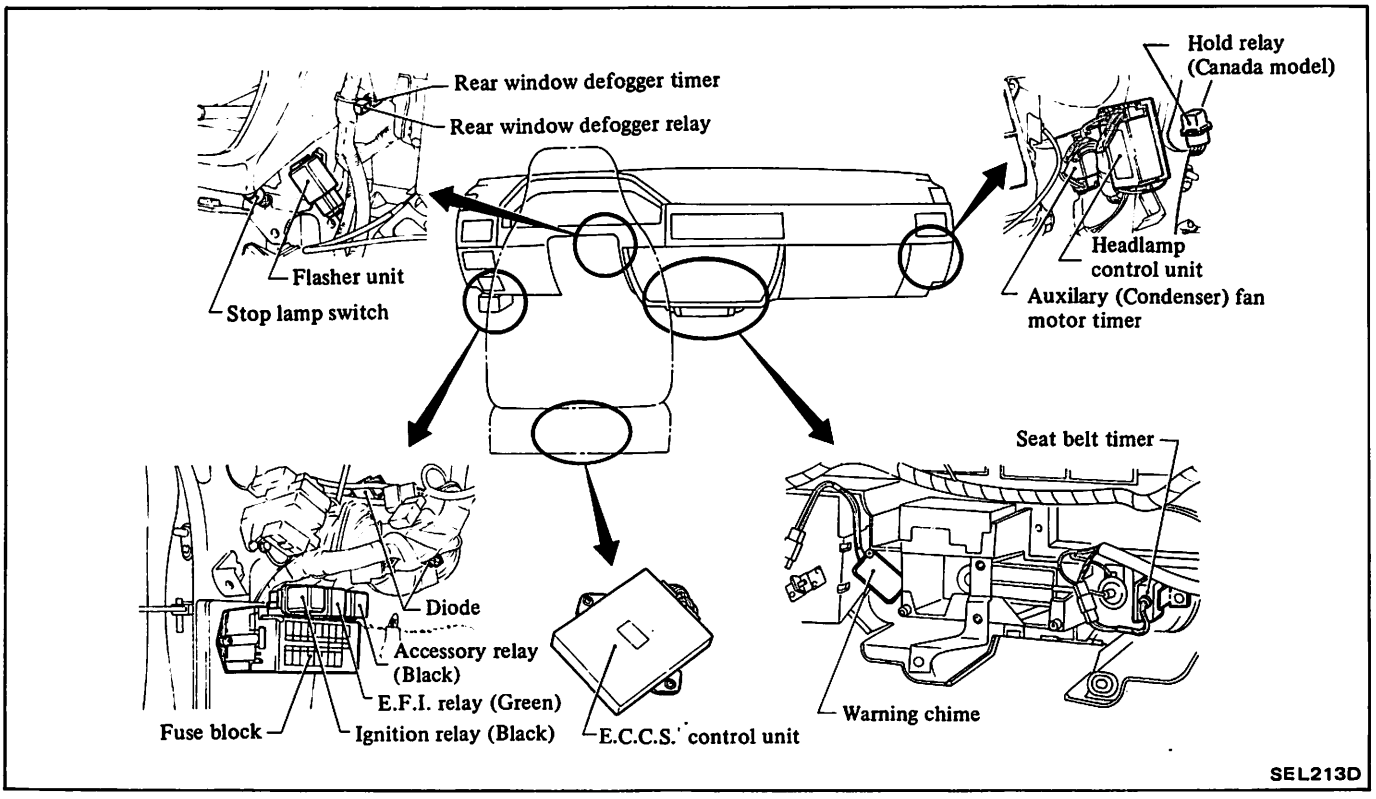
LOCATION OF ELECTRICAL UNITS

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

ENGINE COMPARTMENT



PASSENGER COMPARTMENT



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 : PULSAR NX 1983

ENGINE TUNE-UP DATA

Engine model		E15ET		
Firing order		1-3-4-2		
Ignition timing Idle speed (B.T.D.C. degree/rpm)		15°±2° 650±50*1 (in "D" position)		
CO% at idle speed		Idle mixture screw is preset and sealed at factory.		
Valve clearance (Hot) Intake & exhaust	mm (in)	0.28 (0.011)		
Drive belt deflection (Cold)		Used *2	New *3	
Alternator	mm (in)	13 - 17 (0.51 - 0.67)	10 - 14 (0.39 - 0.55)	
Air conditioner	mm (in)	9 - 11 (0.35 - 0.43)	7 - 9 (0.28 - 0.35)	
Pushing force	N (kg, lb)	98 (10, 22)		
Engine compression pressure Standard	kPa (kg/cm², psi)/rpm	1,089 (11.1, 158)/350		
Minimum		892 (9.1, 129)/350		
Spark plug	Type	BPR6ES-11		
	Gap mm (in)	1.0 - 1.1 (0.039 - 0.043)		
Tightening torque		N-m	kg-m	ft-lb
Valve rocker adjusting nut		16 - 21	1.6 - 2.1	12 - 15
Oil pan drain plug		35 - 47	3.6 - 4.8	26 - 35
Spark plug		20 - 29	2.0 - 3.0	14 - 22

*1: Measure with harness connector for idle control valve disconnected.
*2: Adjust deflection of used belt
*3: Set deflection of new belt

WHEEL ALIGNMENT (Unladen*)

Camber	degree	−35' - 1°05'
Caster	degree	45' - 2°15'
Toe-in	mm (in)	0 - 2 (0 - 0.08)
	degree	0 - 6' (On both sides)
Turning angle Toe-out-turns (Inside/Outside)	degree	20°/17°30'
Inside		40°30' - 43°30'
Outside		31°30' - 34°30'

* Tankful of fuel, radiator coolant and engine oil full. Spare tire, jack, band tools, mats in designed position.

REAR WHEEL BEARING

Tightening torque	N-m (kg-m, ft-lb)	39 - 44 (4.0 - 4.5, 29 - 33)
Return angle	degree	90°

WHEEL AND TIRE

Tire size		175/70SR13
Inflation pressure *	psi (kPa)	26 (180)
Wheel nut tightening torque	N-m (kg-m, ft-lb)	78 - 98 (8 - 10, 58 - 72)

* Tire pressure should be checked when tires are COLD.

BRAKE

Unit: mm (in)

Disc brake Pad minimum thickness	2.0 (0.079)
Rotor repair limit Run out	Less than 0.07 (0.0028)
Parallelism circumferential direction	Less than 0.03 (0.0012)
Minimum thickness	10.0 (0.394)
Drum brake Lining minimum thickness	1.5 (0.059)
Drum repair limit Maximum inner diameter	204.5 (8.05)
Radial runout	Less than 0.05 (0.0020)
Out-of-roundness	Less than 0.03 (0.0012)
Taper	Less than 0.04 (0.0016)

REFILL CAPACITIES

Unit		Liter	US measure
Fuel tank		50	13-1/4 gal
Coolant	With heater	6.0	6-3/8 qt
	Without heater	5.4	5-3/4 qt
	Reservoir tank	0.7	3/4 qt
Engine oil	With oil filter	3.9	4-1/8 qt
	Without oil filter	3.4	3-5/8 qt
Transaxle	Automatic	6.0	6-3/8 qt
Windshield washer tank		1.5	1-5/8 qt
Air conditioning system	Compressor oil	150 mℓ	5.1 fl oz
	Refrigerant	0.8 - 1.0 kg	1.8 - 2.2 lb

EXPORT SERVICE DEPARTMENT
NISSAN MOTOR CO., LTD.
17-1, Ginza 6-Chome, Chuo-ku, Tokyo 104, Japan

Printed in Japan

Edition: March 1983
Printing: March 1983 (010538)
Publication No. SM3E-N12SU0