ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

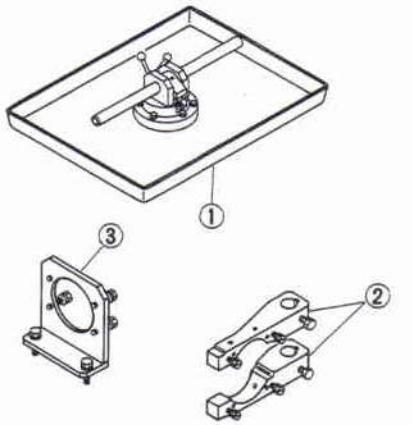
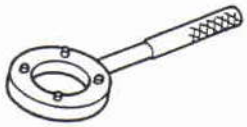
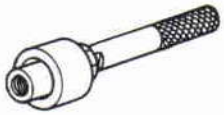
CONTENTS

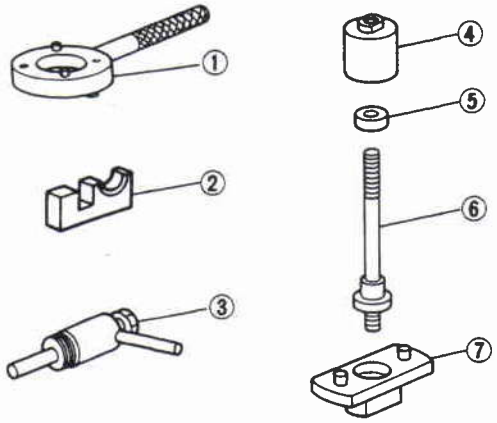
Contents (Cont'd)

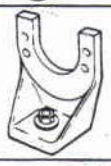
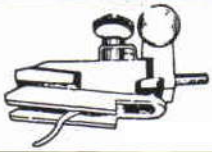
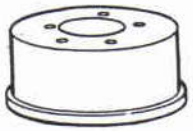
SPECIAL SERVICE TOOL

Tool number Tool name	Description
1612562S00 Level gauge	 Checking fuel level

SPECIAL SERVICE TOOLS
In-line type injection pump

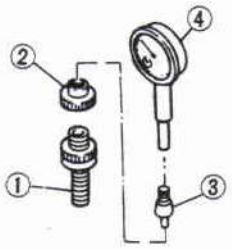
Tool number Tool name	Description
① KV11244852 Universal vise ② KV11244872 Bracket ③ KV11244782 Bracket **PE type: ① + ②** **PES type: ① + ② + ③**	
DK57916432 Timer wrench	
DK57926512 Extractor	
DK57931612 Tappet clamp	
DK57920032 Delivery valve extractor	

Tool number Tool name	Description
DK05790502 ① DK57916432 Timer wrench ② DK57932020 Timer spring support ③ DK57926581 Timer extractor DK57924162 Base assembly ④ DK57924190 Bushing ⑤ DK57924180 Bushing guide ⑥ DK57924170 Bushing guide ⑦ DK57924161 Base	
DK57931210 Tappet holder	
DK57915010 Special wrench	
DK57921012 Tappet insert	
DK57921412 Plunger insert	
DK57915422 Special wrench	
KV11257802 Nozzle holder	

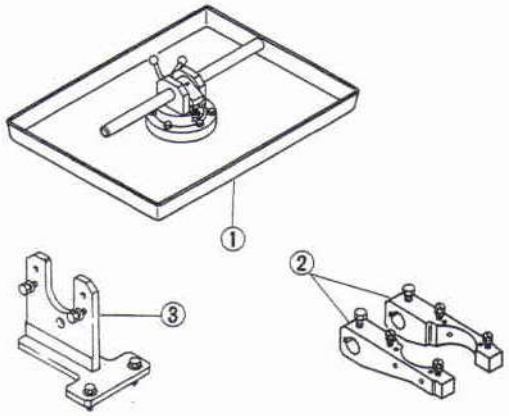
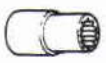
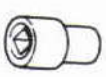
Tool number Tool name	Description
KV11257800 Nozzle	
KV11257805 Injection tube	
KV11205781 Securing stand	
KV11282402 Measuring device	
KV11284019 Timer coupling	
DK57911010 Tappet wrench	
DK05782618 Measuring device	
KV11282433 Measuring device for plunger pre-stroke	
KV11205782 Measuring device	

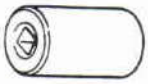
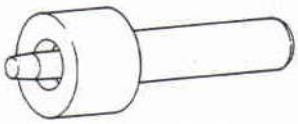
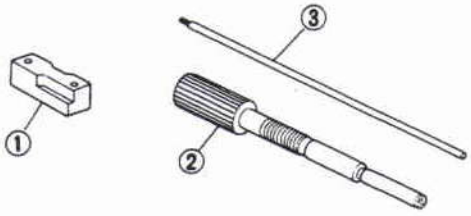
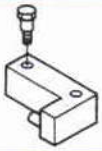
SPECIAL SERVICE TOOLS
VE-type injection pump

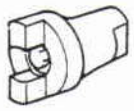
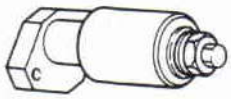
Adjusting device on vehicle

Tool number Tool name	Description
KV11229352 Measuring device (Set length of plunger spring) ① KV11229350 Holder ② KV11229360 Nut ③ KV11229370 Pin ④ KV11254410 Dial gauge	

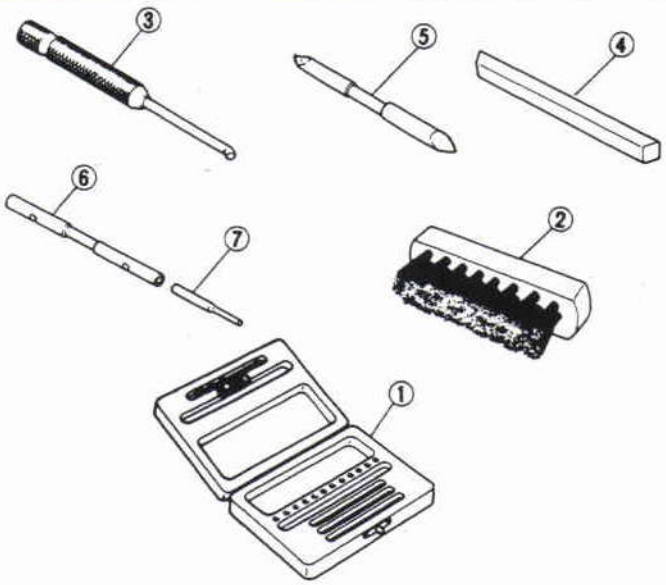
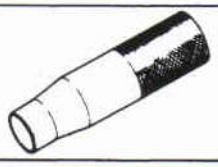
Disassembling and assembling tools

① KV11244852 Universal vise ② KV11244872 Bracket ③ KV11244792 Bracket	
KV11229072 Insert device	
KV11214110 Socket wrench for delivery valve	
KV11214270 Socket wrench for governor pivot bolt	

Tool number Tool name	Description
KV11214260 Socket wrench for regulating valve	
KV11214250 Socket wrench for distributor head plug	
KV11215262 Governor shaft adjusting device	
KV11229542 Feed pump holder	
KV11229852 "MS" measuring device set ① KV11229110 Block gauge ② KV11229820 Dummy shaft ③ KV11229830 Rod	
KV11229752 Block gauge (For high altitude compensator)	
KV11229762 Block gauge (For high altitude compensator)	
KV11229042 "K" & "KF" measuring device	
Adjusting device on pump tester	
KV11281036 Fixing stand	

Tool number Tool name	Description
KV11242442 Coupling	
KV11282815 Measuring device (Timer advance angle)	
KV11205032 Injection pipe [840 mm (33.07 in)]	
KV11229462 Extractor (Disassembling of regulating valve)	
KV11229522 Insert device (Assembling of regulating valve)	
KV11257802 Nozzle holder (Bosch type EF8511-9A)	
KV11257800 Nozzle (Bosch type DN12SD12T)	

SPECIAL SERVICE TOOLS
Injection nozzle

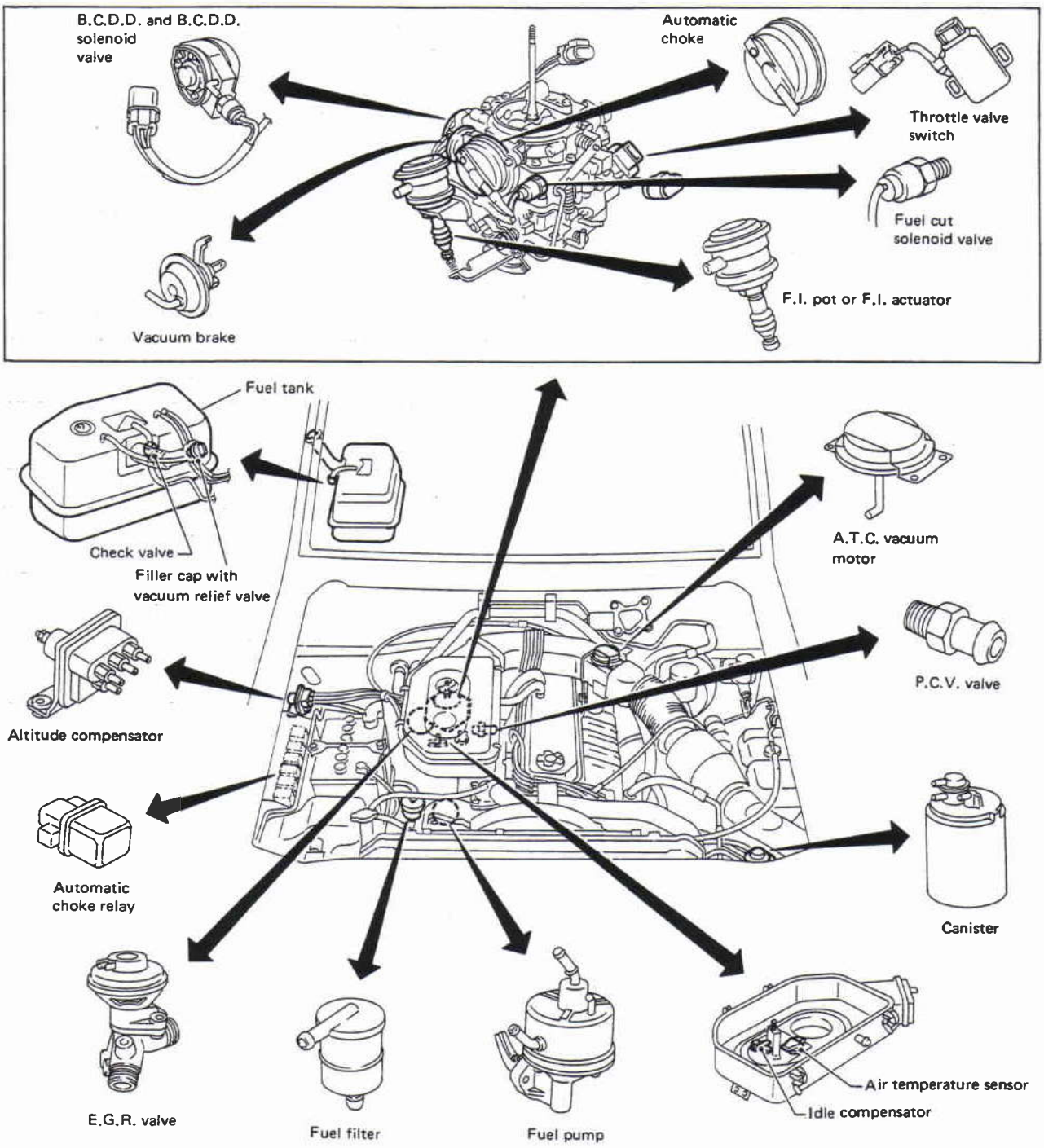
Tool number Tool name	Description
KV11289004 Nozzle cleaning kit ①KV11290012 Box ②KV11290110 Brush ③KV11290122 Nozzle oil sump scraper ④KV11290140 Nozzle needle tip cleaner ⑤KV11290150 Nozzle seat scraper ⑥KV11290210 Nozzle holder ⑦KV11290220 Nozzle hole cleaning needle	
KV11292210 Nozzle centering device	
KV11290632 Nozzle oil sump scraper	
KV11290620 Nozzle seat scraper	

System Application

Destination / System	Model except Australia and Gulf standard models	Australia model		Gulf standard model		Major unit
	M/T	M/T	A/T	M/T	A/T	
Crankcase emission control system	X	X	X	X	X	• P.C.V. valve
Boost controlled deceleration device (B.C.D.D.)	X	X*1	X	X*1	X	• B.C.D.D. unit • B.C.D.D. control solenoid valve • Speed detecting switch (M/T)
Exhaust gas recirculation control system (E.G.R. control system)	–	–	–	–	X	• E.G.R. valve • T.V.V. (2 port-type)
Evaporative emission control system	–	X	X	X	X	• Carbon canister
Automatic temperature control air cleaner system	opt	X	X	opt	opt	• Temperature sensor • Vacuum motor
Automatic choke	–	X	X	–	–	
Fast idle actuator (F.I. actuator)	X*2	X*2	–	X*2	–	• F.I. actuator
Fast idle pot (F.I. pot)	–	–	X*2	–	X*2	• F.I. pot
Altitude compensation system	opt	–	–	opt	opt	• Altitude compensator

X: Available –: Not available opt: Optional
*1: With solenoid valve
*2: With air conditioner model

Component Parts Location



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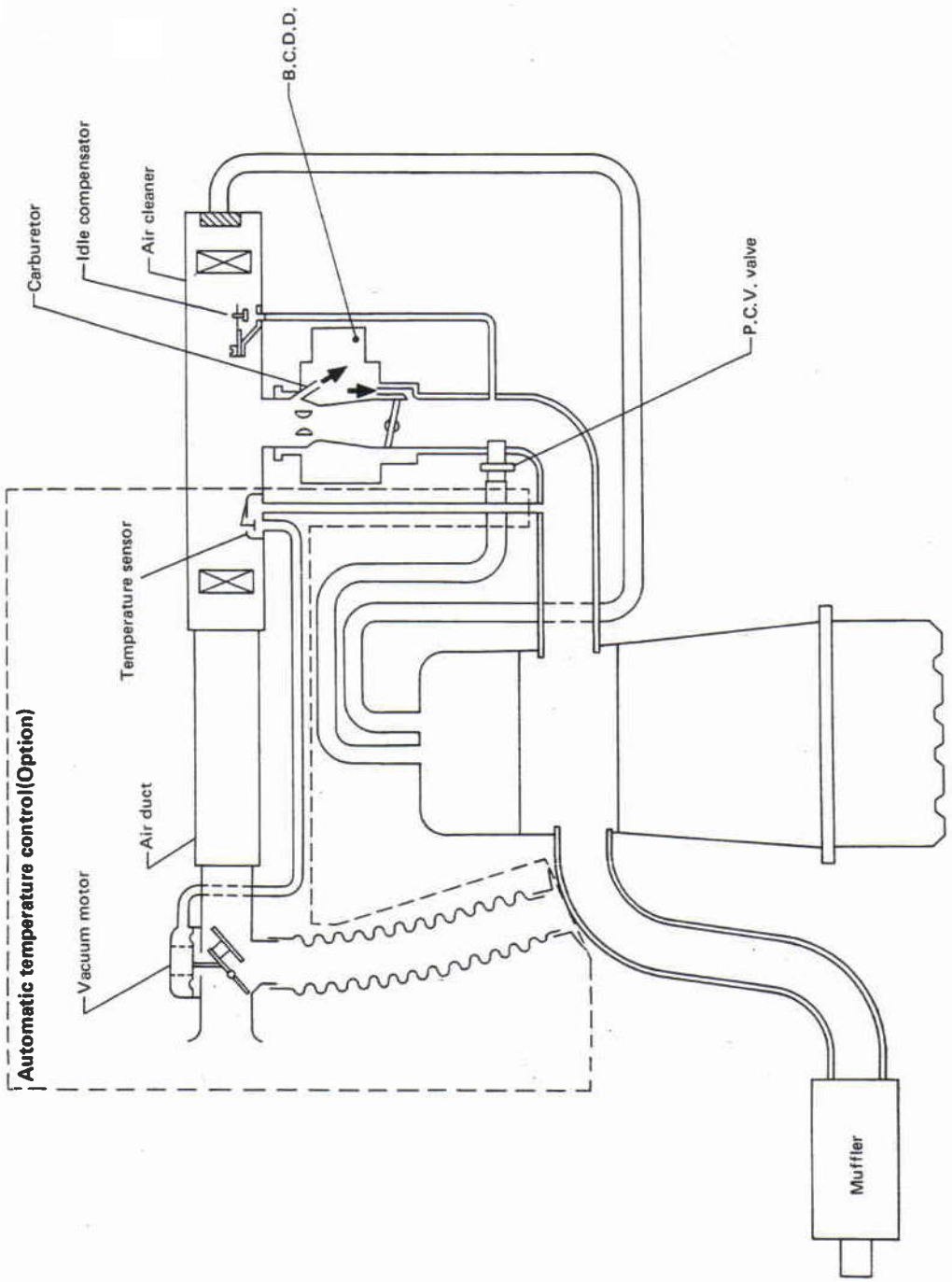
System Diagram

Model except Australia and Gulf standard models



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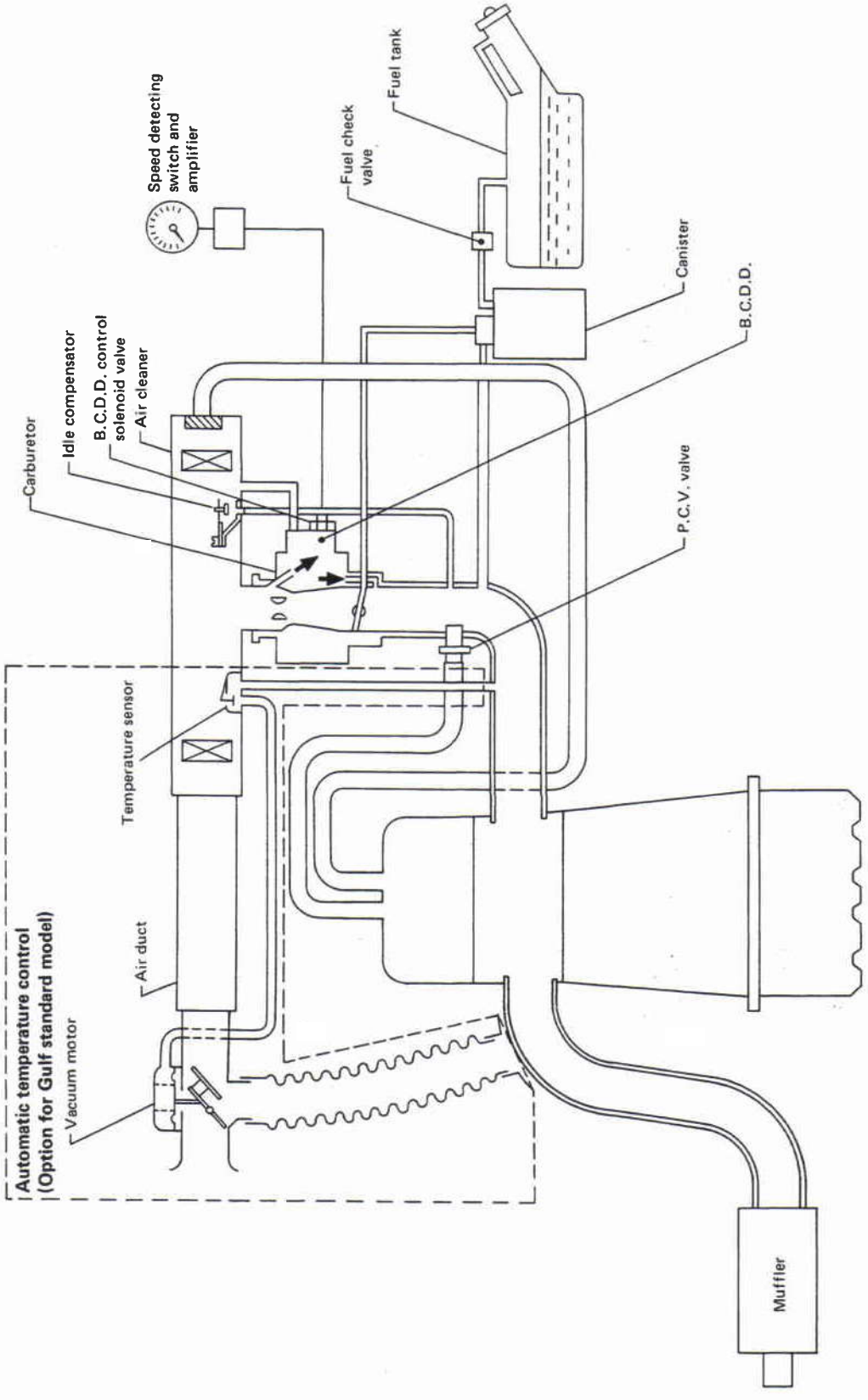
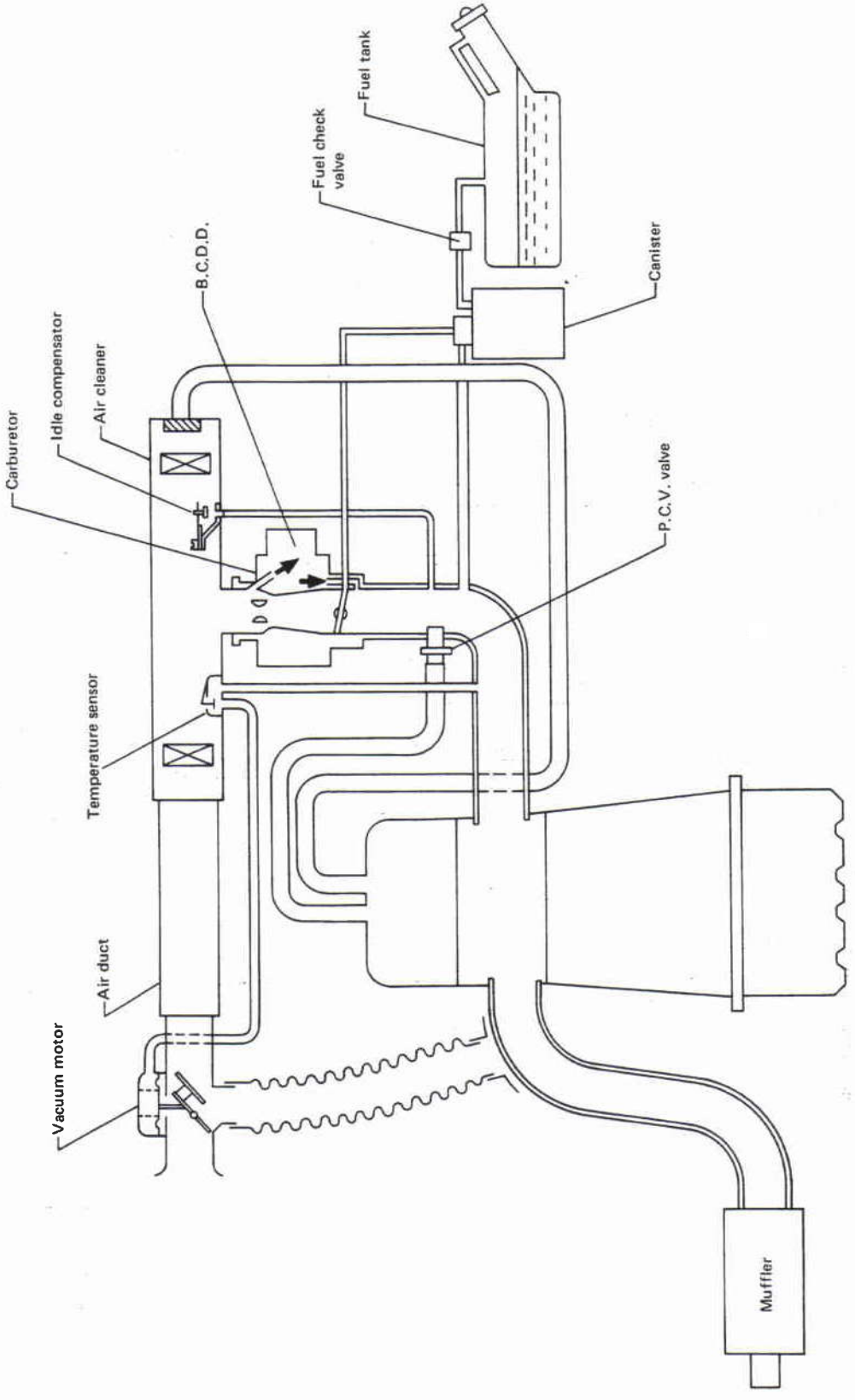
System Diagram (Cont'd)

Australia M/T and Gulf standard M/T model



System Diagram (Cont'd)

Australia A/T model



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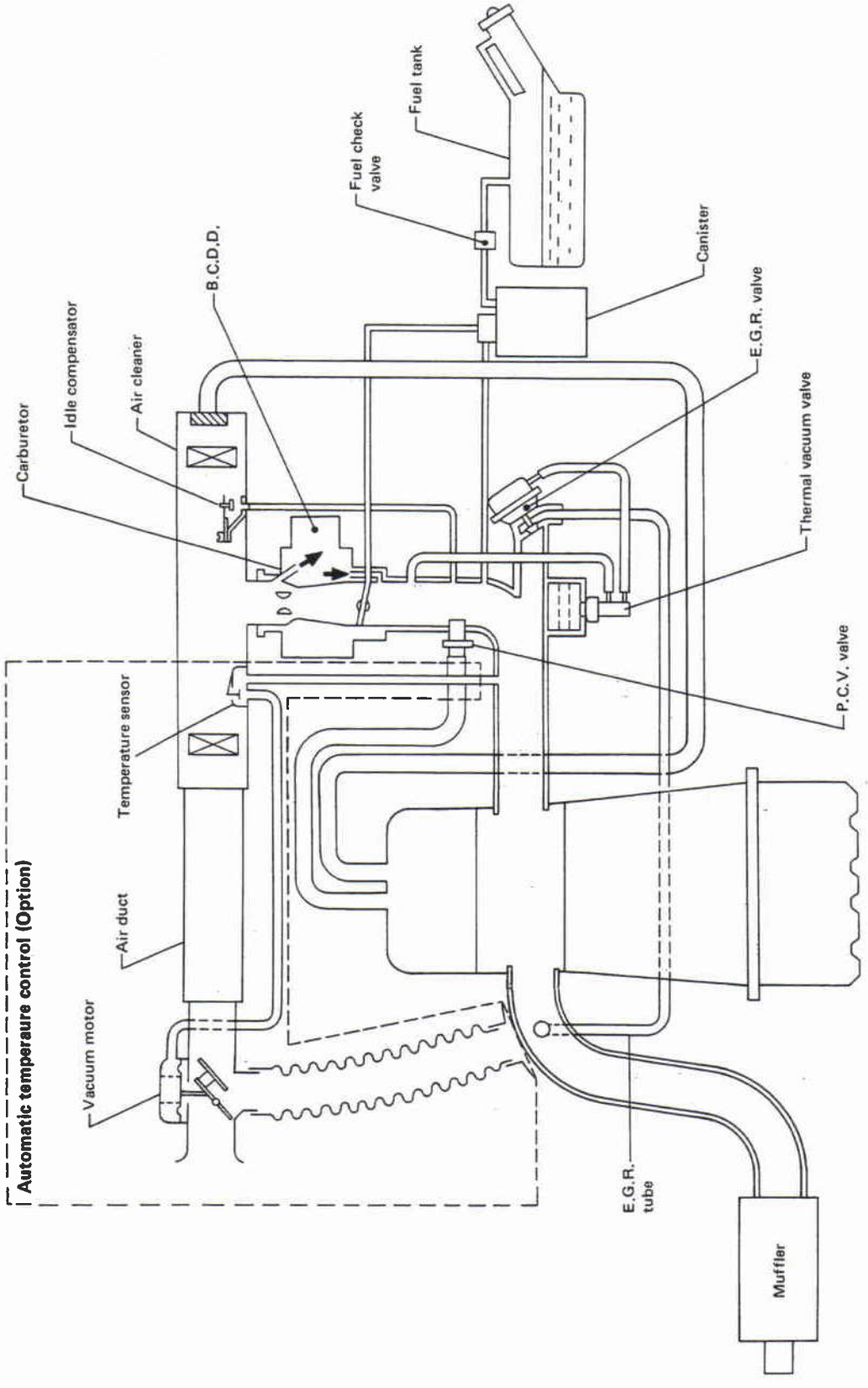
System Diagram (Cont'd)

Gulf standard A/T model



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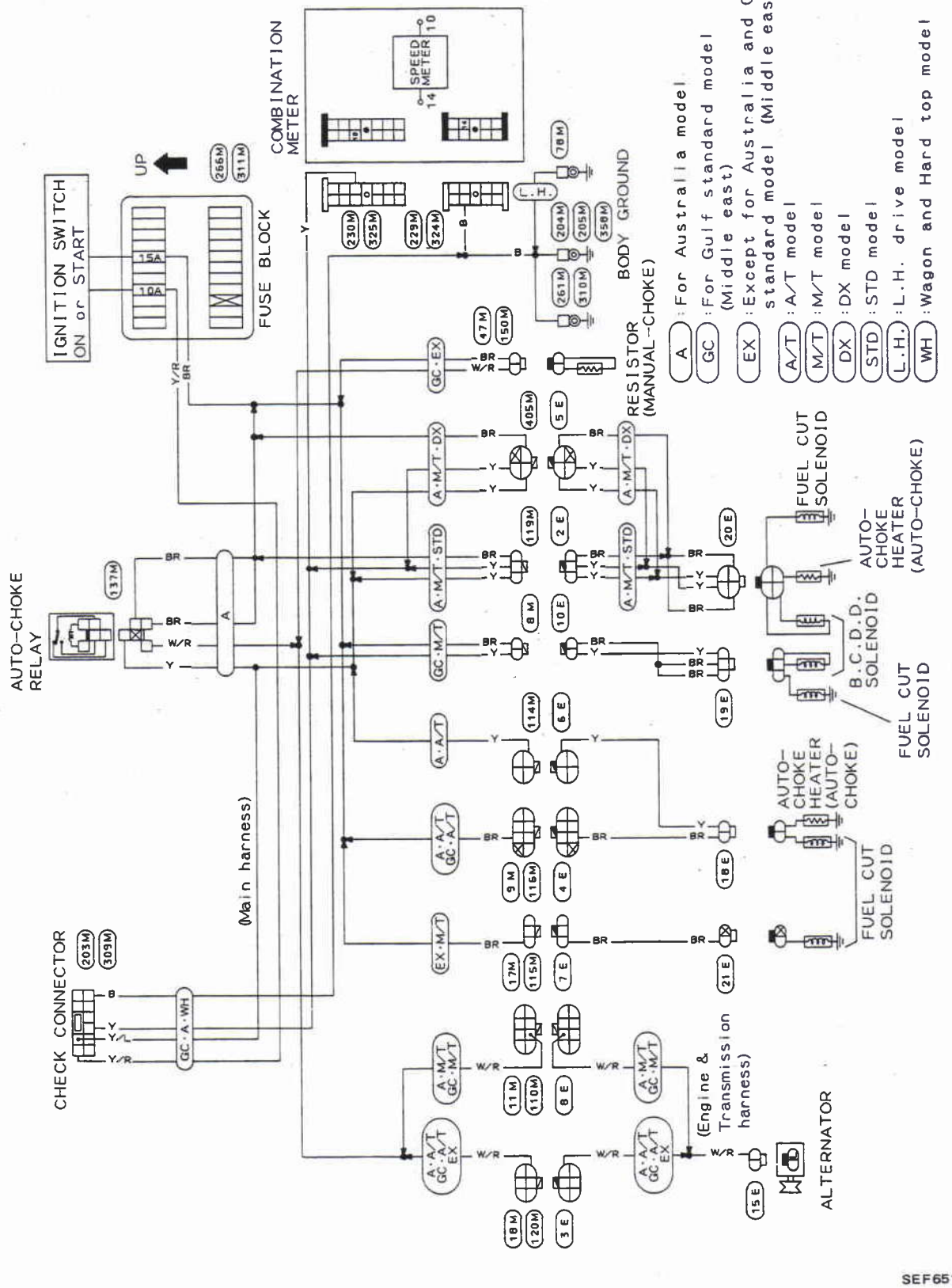
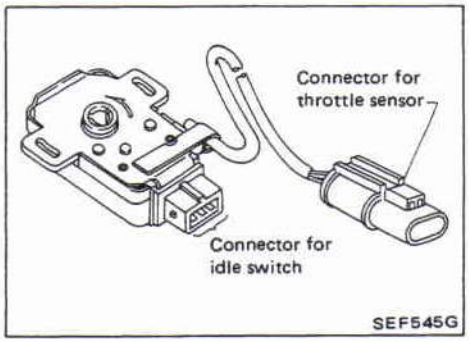
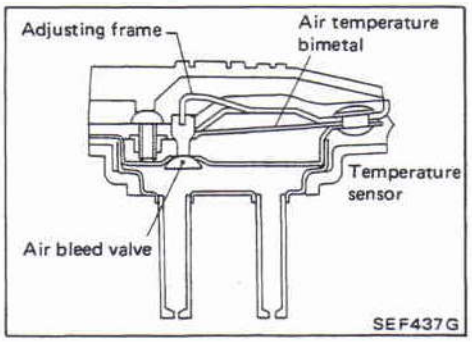
Wiring Diagram





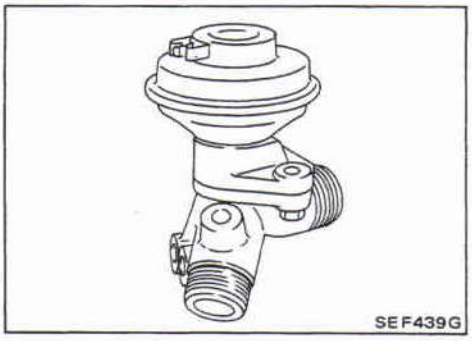
Throttle Sensor & Throttle Valve Switch (Only for control of automatic transmission)

The throttle sensor is attached on the carburetor and actuates in response to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle valve position into output voltage, and emits the voltage signal to the A/T control unit. In addition the sensor detects the opening and closing speed of the throttle valve, and sends the voltage change rate to the A/T control unit. The throttle valve switch actuates in response to accelerator pedal movement.
This switch has idle contact and full throttle contact. The idle contact is used for automatic transmission control. It closes when the throttle valve is positioned at idle and opens when it is at any other position.



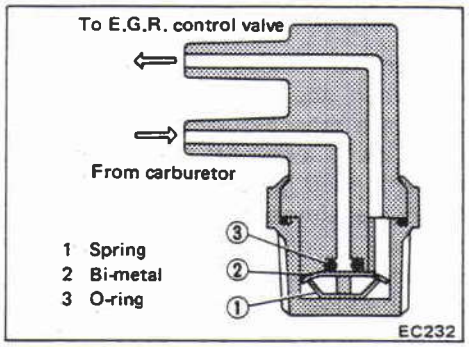
Air Temperature Sensor

The air temperature sensor is a bimetal valve type. It is located inside the air cleaner to detect the temperature of intake air. The bimetal valve closes to prevent fuel from icing during engine warm-up. When the valve closes, the vent valve causes the hot air duct side to activate. Manifold vacuum is then transmitted to the vacuum motor in order to deliver hot air from the hot air duct. As the engine progressively warms up, the valve opens in response to cool air being drawn in from the engine compartment. Manifold vacuum applied to the vacuum motor then begins to discharge into the atmosphere. As a result, the air vent valve closes to shut off the air passage heated by the hot air delivered from the hot air duct.



E.G.R. Control Valve

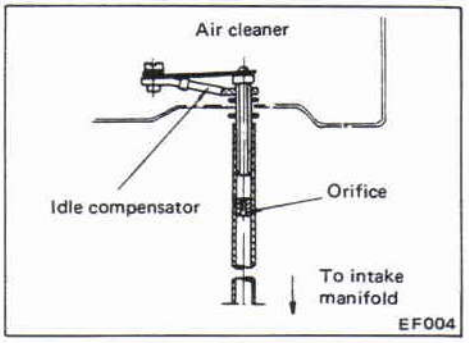
The E.G.R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.



Thermal Vacuum Valve (T.V.V.)

Thermal vacuum valve detects engine coolant temperature by means of a built-in bimetal, and opens or closes the vacuum passage which controls E.G.R. system.

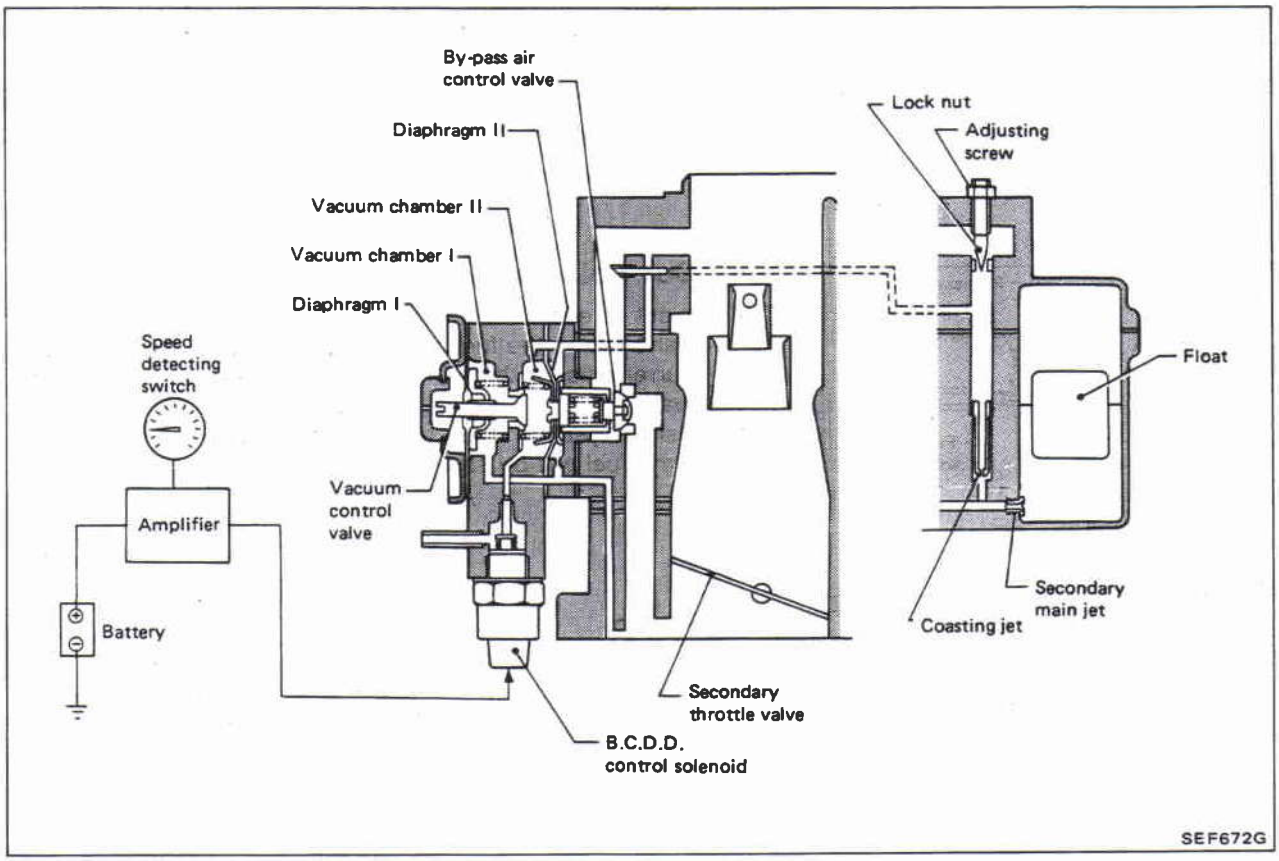
Water temperature °C (°F)	Thermal vacuum valve	E.G.R. system
Below 40 (104)	Closed	Not activated
Above 40 (104)	Open	Activated



Idle Compensator

The idle compensator is basically a thermostatic valve which introduces air directly from the air cleaner to the intake manifold to compensate for abnormal enrichment of mixture in high idle temperatures and to stabilize the engine. The idle compensator is installed on the air cleaner.

B.C.D.D. (Boost Controlled Deceleration Device) Control Valve

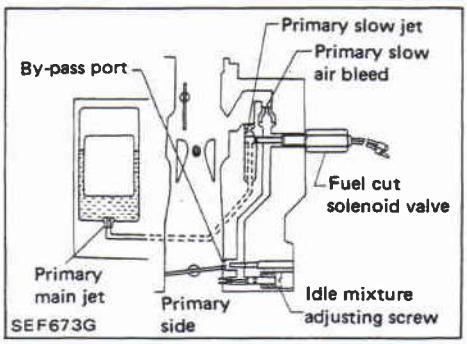


B.C.D.D. (Boost Controlled Deceleration Device) Control Valve (Cont'd)

The B.C.D.D. control valve opens and closes the air by-pass passage of the carburetor. When the throttle valve closes abruptly during deceleration, intake manifold vacuum increases abnormally. This causes engine oil to leak past the piston into the combustion chamber and unburned gases inside the intake manifold to be discharged into the atmosphere in the form of HC. To prevent an abnormal rise in intake manifold pressure and an abrupt decrease in engine speed during deceleration, the air by-pass passage opens to deliver a very small amount of fuel from the coasting jet when intake manifold vacuum pressure reaches the specified level.
The B.C.D.D. control valve is installed on the intake manifold carburetor.

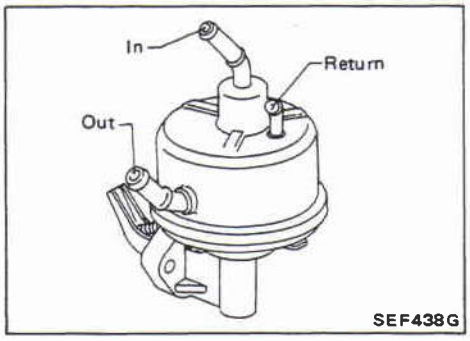
B.C.D.D. Control Solenoid Valve

The B.C.D.D. control solenoid valve stops B.C.D.D. operation when engine speed decreases to such an extent that the vehicle stops. This prevents abrupt movement of the vehicle.



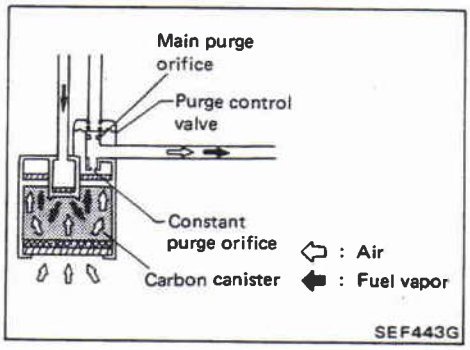
Fuel Cut Solenoid Valve

The fuel cut solenoid valve is attached to the carburetor with its needle valve facing the fuel passage of the primary slow system. When current flows through the fuel cut solenoid valve, the needle valve retracts, allowing the current to flow through the primary slow system. When current does not flow through this system, the fuel will be shut off.



Fuel Pump

The fuel pump is a mechanical type and is mounted on the cylinder block. The end of the pump lever rests on the oil pump. When the cam rotates, the lever moves in a reciprocating motion to deliver fuel from the fuel tank to the carburetor.

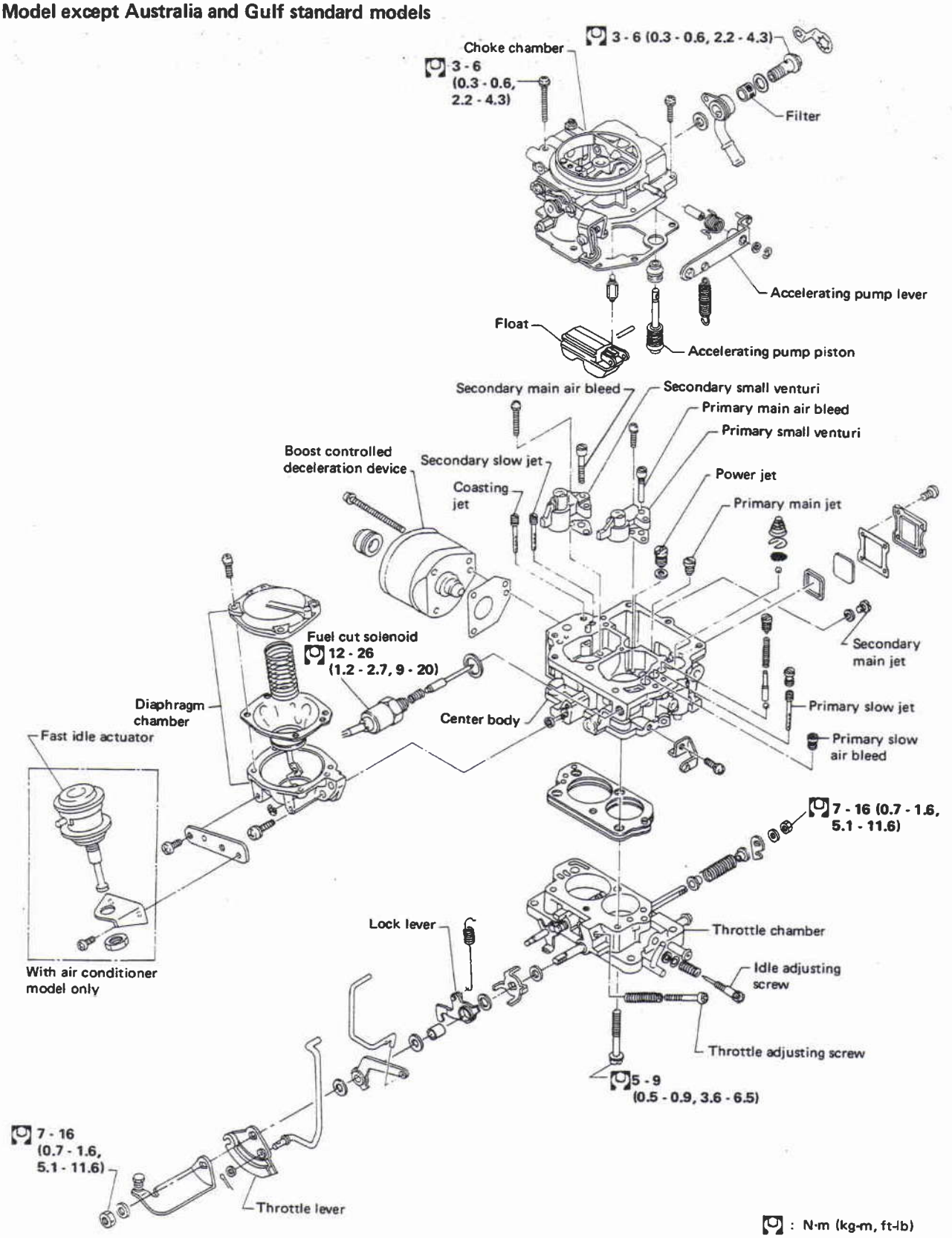


Carbon Canister

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

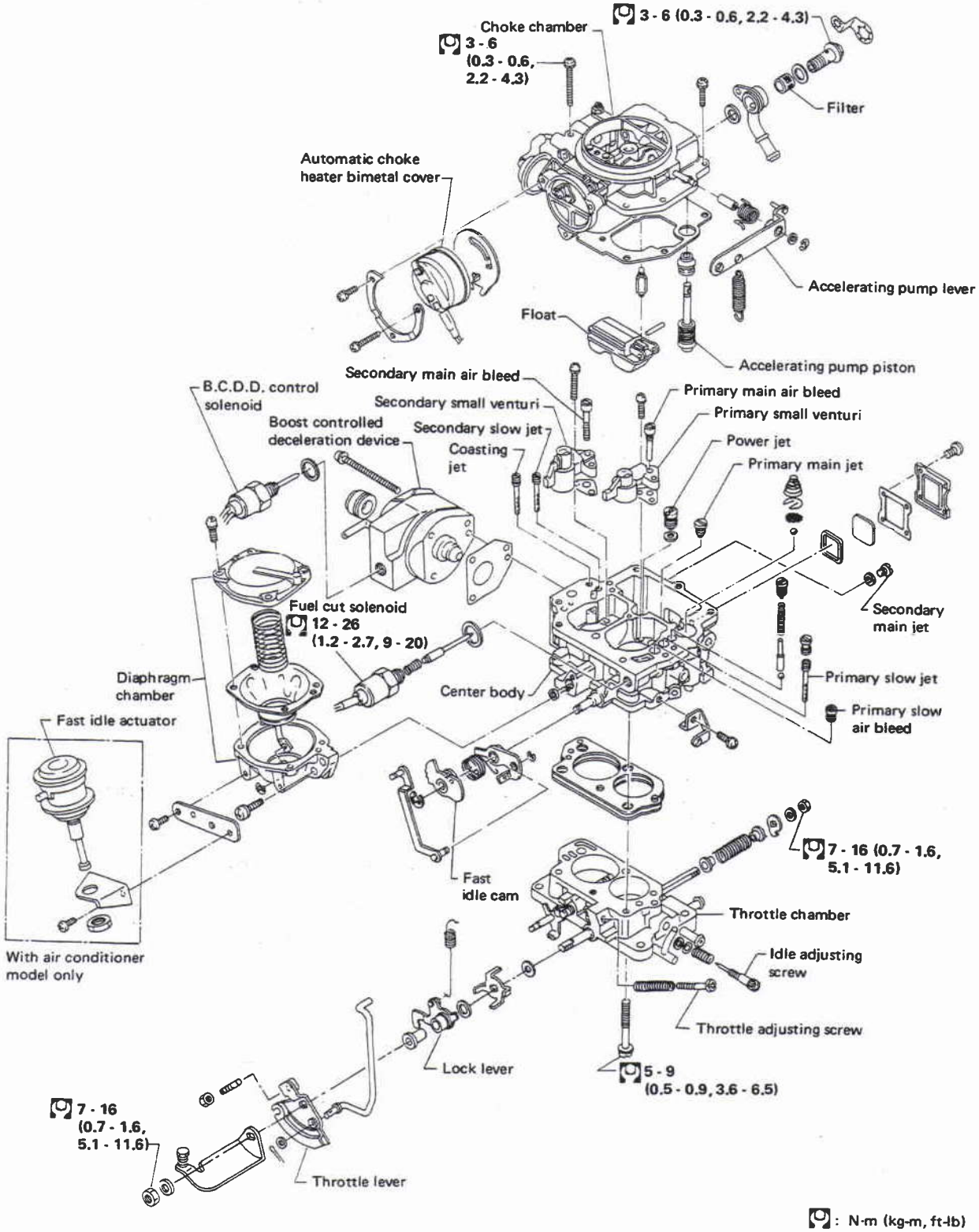
Component Parts

Model except Australia and Gulf standard models



Component Parts (Cont'd)

Australia M/T model



: N·m (kg-m, ft-lb)

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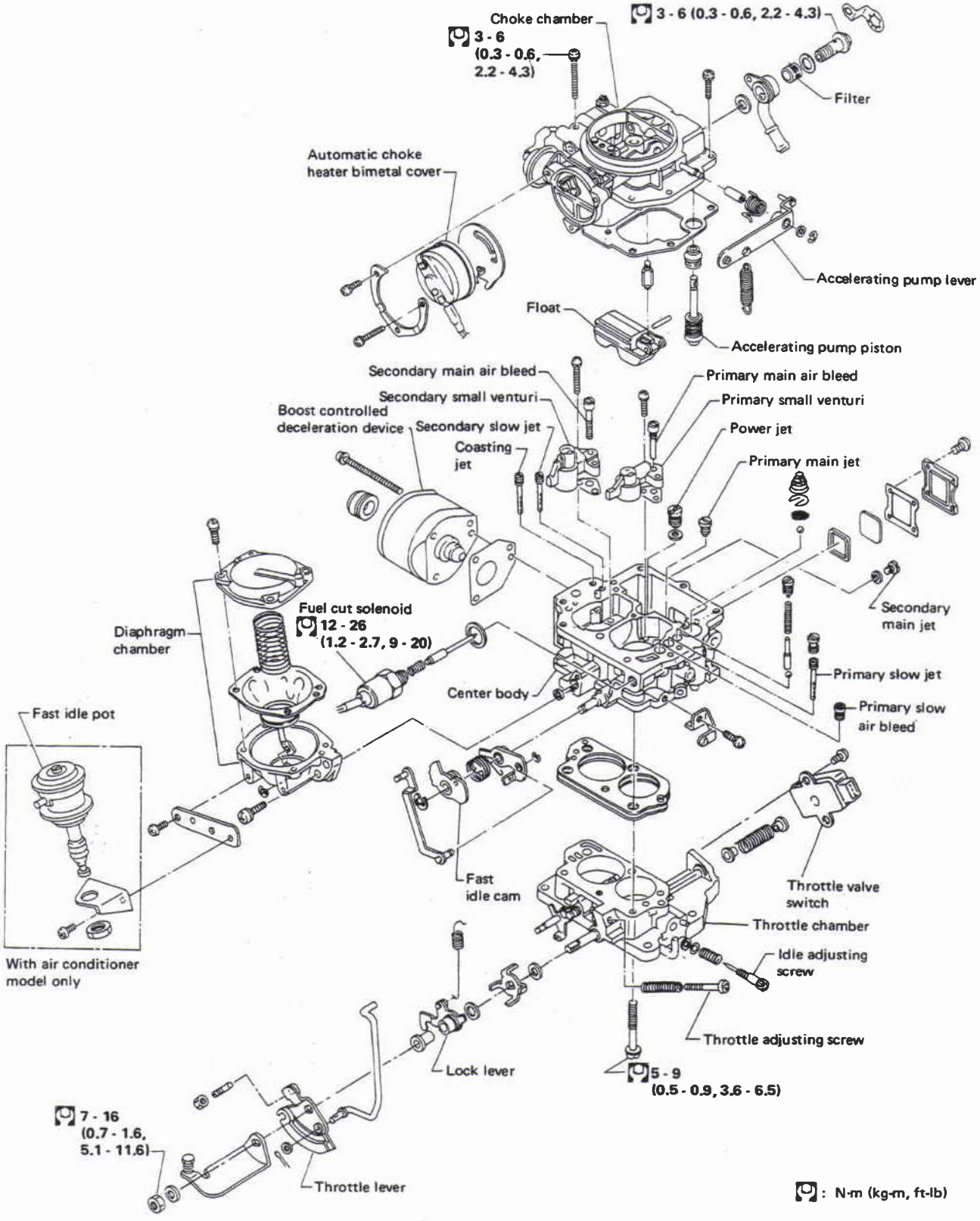
Component Parts (Cont'd)

Australia A/T model



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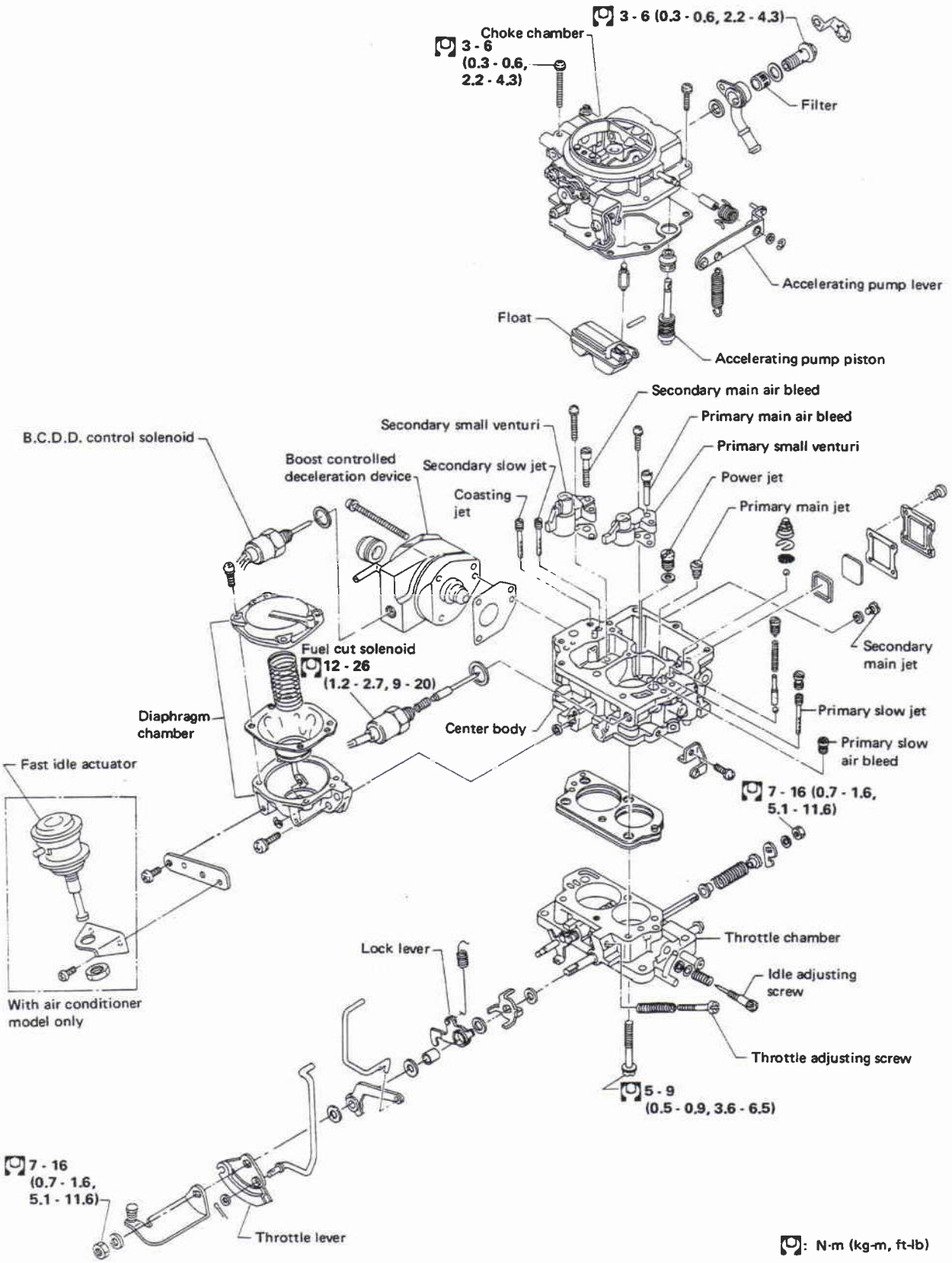
Component Parts (Cont'd)

Gulf standard M/T model



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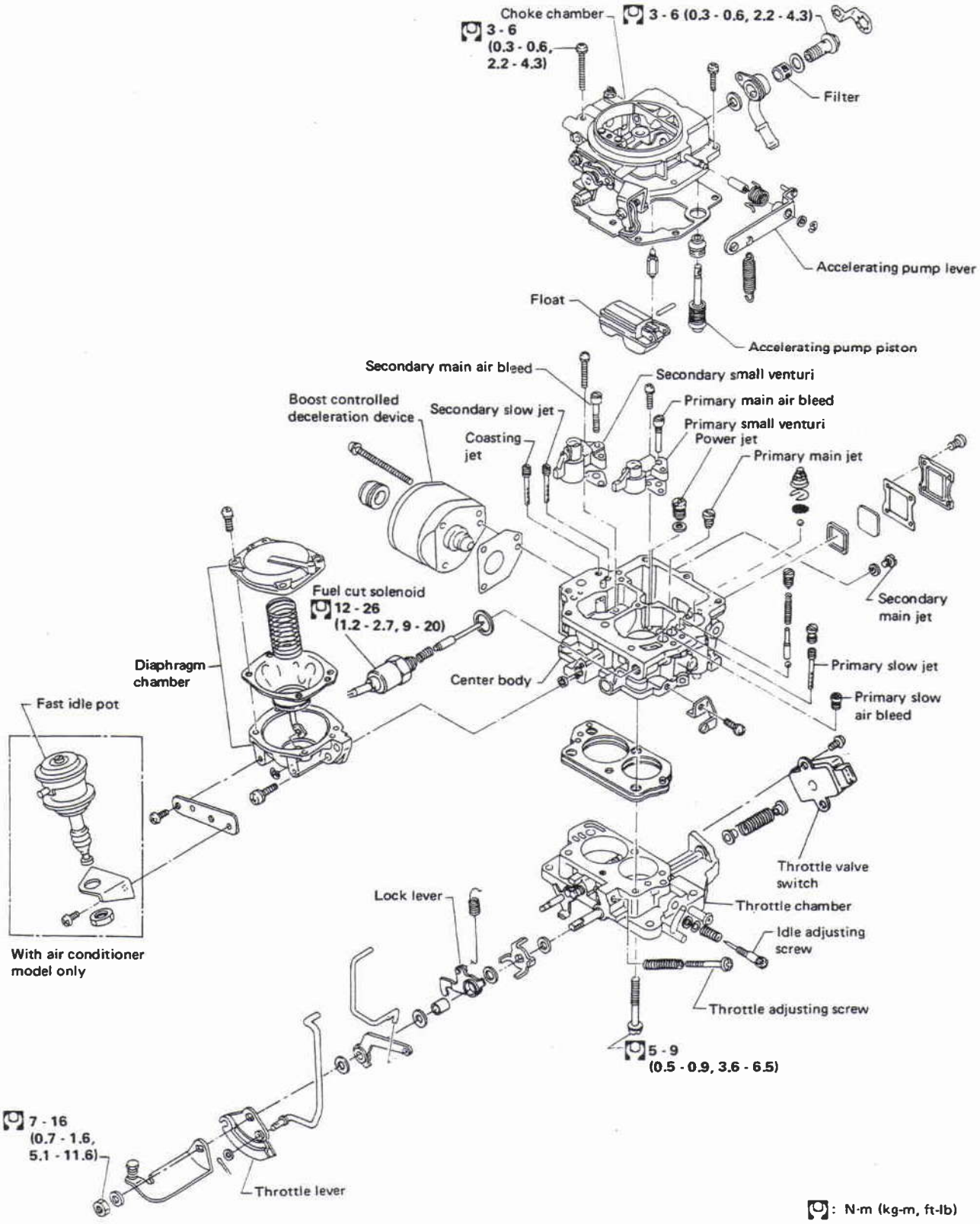
Component Parts (Cont'd)

Gulf standard A/T model



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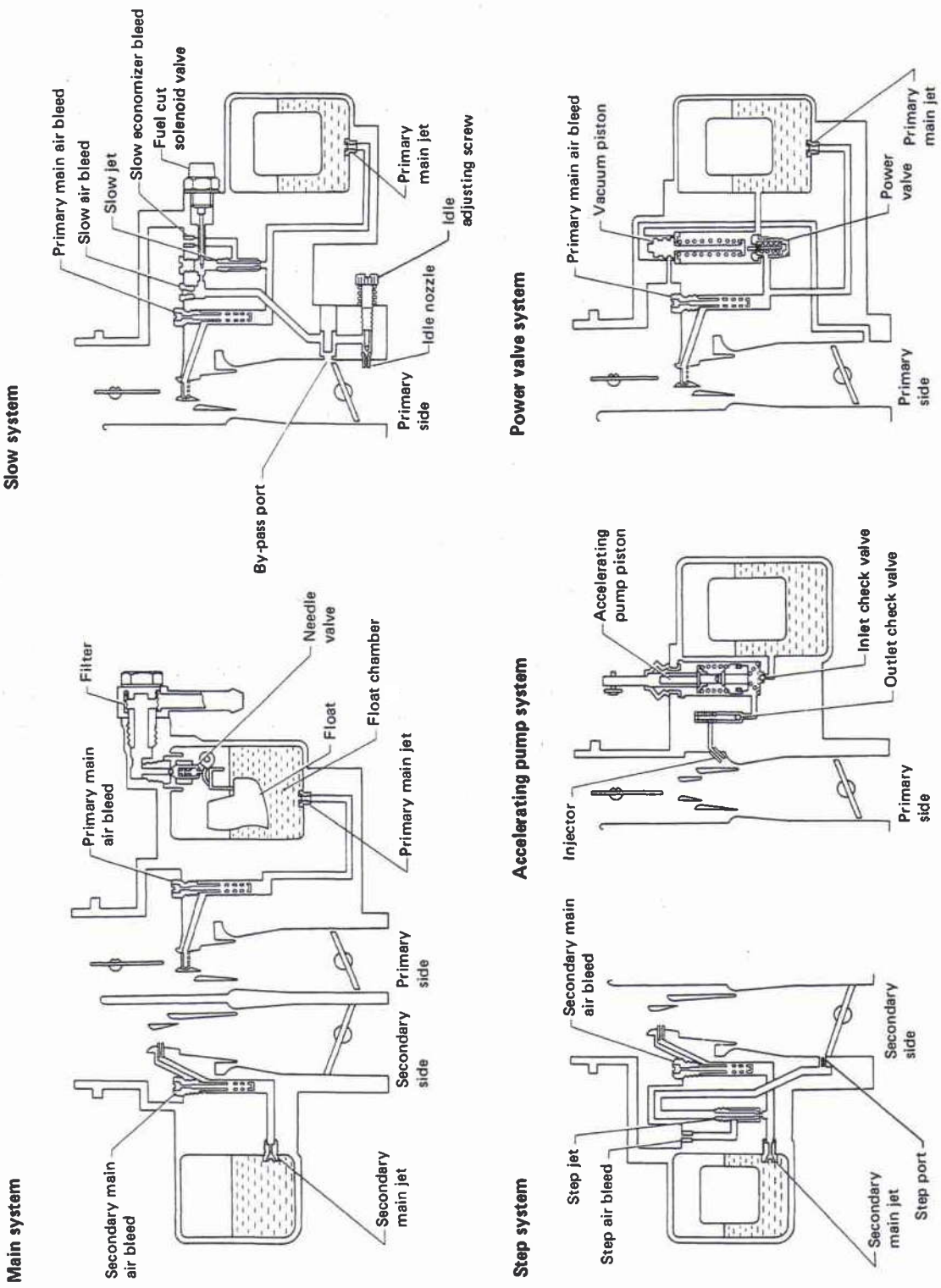
Component Parts (Cont'd)



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Major Service Operation

The perfectly adjusted carburetor delivers the proper fuel and air ratios at all speeds.
The carburetor should be maintained in its original condition in order to continue to deliver the proper ratio.
To maintain accurate carbureting through passages and discharge holes, extreme care must be taken in cleaning.

REMOVAL

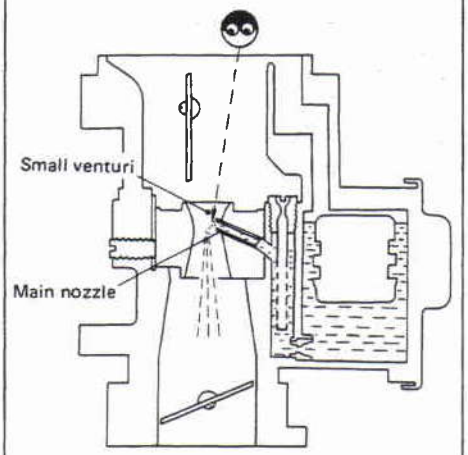
Remove carburetor from engine, taking sufficient care to do the following:
PRECAUTIONS:

a. **When disconnecting fuel lines, do not spill fuel from fuel pipe.**
b. **When removing carburetor, do not drop any nut or bolt into intake manifold.**
c. **Be careful not to bend or scratch any part.**

CLEANING AND INSPECTION

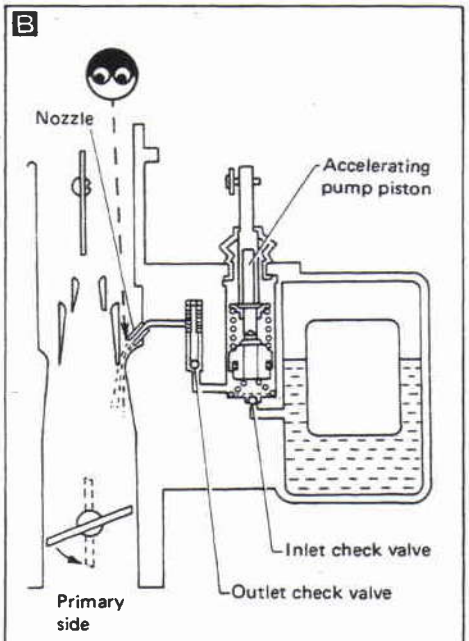
Dirt, gum, water or carbon in or on exterior moving parts of carburetor can cause poor performance. Therefore, clean and inspect carburetor carefully.
Before assembling and installing carburetor, blow the passages and castings with compressed air, then blow all parts dry.
Do not pass drills or wires through calibrated jets or passages as this may enlarge orifice and seriously affect carburetor calibration.

A



SEF547G

B



SEF548G

Fuel Level

INSPECTION

Disconnect ignition wire between distributor and coil.

↓

Disconnect fuel cut solenoid connector of carburetor.

↓

A

Check primary main nozzle to ensure that no fuel is discharging while cranking engine for approximately 3 seconds.

N.G. → Check needle valve for looseness or sticking. If necessary, repair or replace.
Adjust fuel level.

O.K. ↓

B

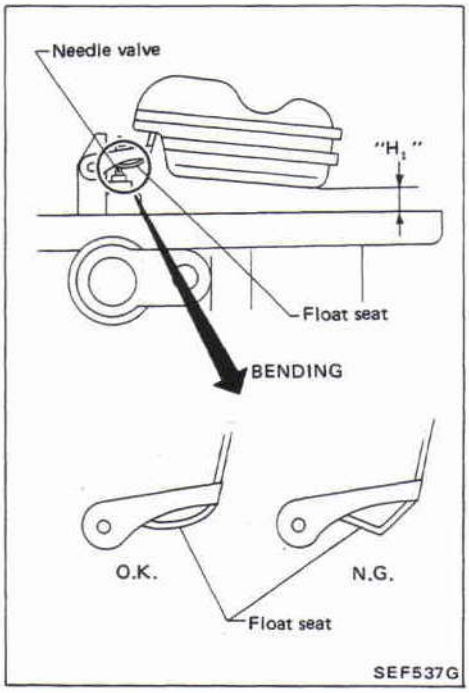
Check that acceleration pump nozzle injects fuel when throttle valve is opened.

N.G. → Check needle valve for looseness or sticking. If necessary, repair or replace.
Adjust fuel level.

O.K. ↓

END

Fuel Level (Cont'd)

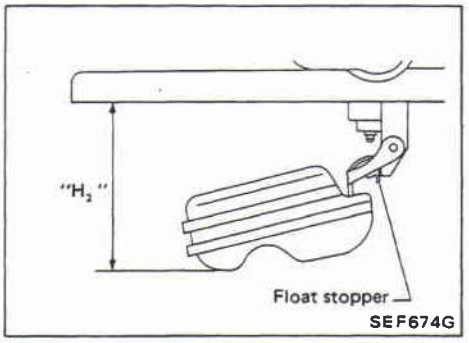


ADJUSTMENT

1. Remove carburetor from engine.
2. Remove float chamber cover from float chamber.
3. Turn carburetor upside down, and fix it horizontally.
4. Raise float fully, then lower it slowly until float seat contacts needle valve, and in this position, check height "H_1".

Height "H_1": 9.5 - 10.5 mm (0.374 - 0.413 in)

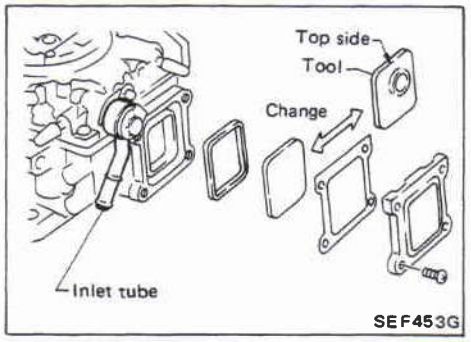
If out of specification, adjust by bending float seat. Make sure needle valve slides smoothly on the float seat.



5. Lower float slowly until float stopper contacts carburetor, and in this position, check height "H_2".

Height "H_2": 47.5 - 48.5 mm (1.870 - 1.909 in)

If out of specification, adjust by bending float stopper.



- If necessary, use Tool to visually check fuel level as follows:

1. Disconnect inlet fuel hose from carburetor, and plug opening.
2. Start engine and wait for it to stop.
3. Install Tool on carburetor, as shown.

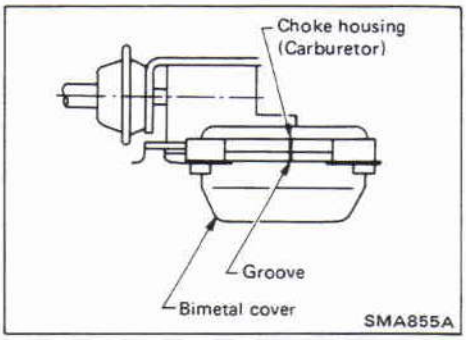
Be careful not to spill fuel.

4. Connect inlet hose to carburetor.
5. Start engine. Visually check fuel level.

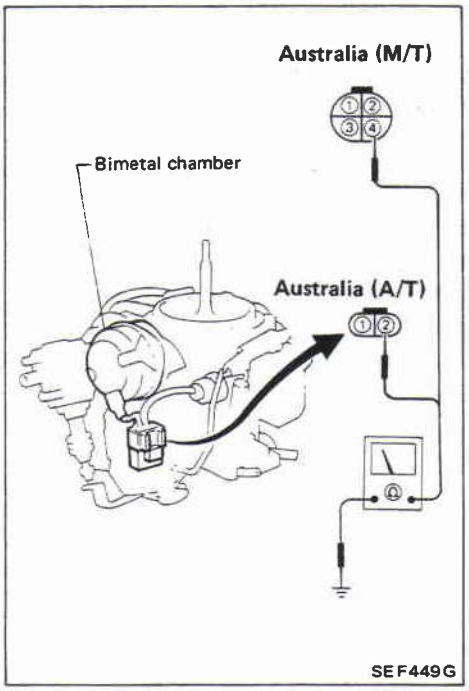
Automatic Choke

MECHANICAL CHECK

1. Before starting engine, fully open throttle valve and ensure that choke valve closes properly.
2. Push choke valve with your finger to check for smooth movement.



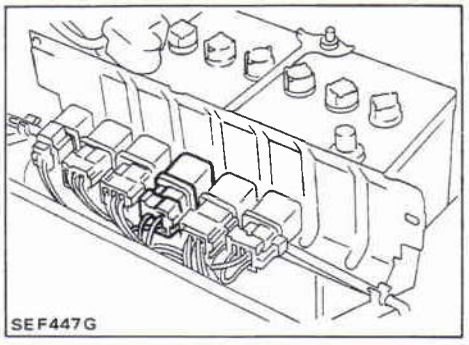
3. Make sure bimetal cover index mark is aligned with the center of choke housing index mark.
4. Check wiring connection, and start engine.
5. After warming up engine, ensure that choke valve is fully open.
   If not, check automatic choke circuit and heater.



AUTOMATIC CHOKE HEATER

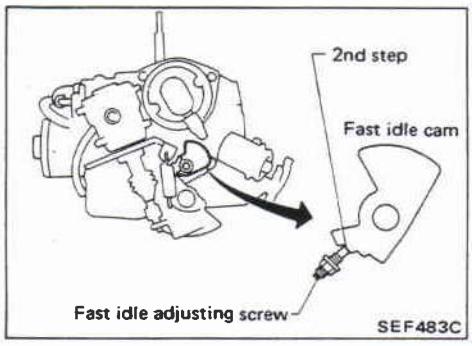
1. Disconnect carburetor harness connector.
2. Check for continuity between choke heater connector terminal ② or ④ and choke housing.

Continuity should exist.



AUTOMATIC CHOKE RELAY

Automatic choke relay is installed in the engine room.
Check relay for proper operation.

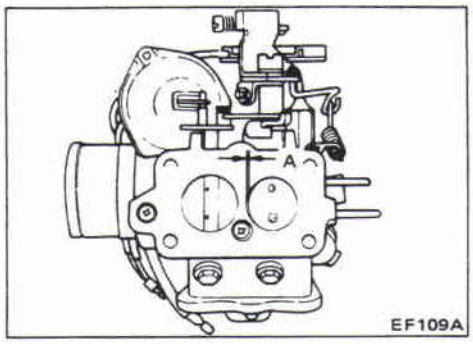


Fast Idle (Automatic Choke Model)

1. Warm up engine. Set fast idle arm on 2nd step of fast idle cam.
2. Check fast idle speed and if out of specification, adjust it by turning fast idle adjusting screw.

Fast idle speed (at 2nd cam step):
M/T: 1,600 - 2,000 rpm
A/T: 1,800 - 2,200 rpm

Make sure that the engine is completely adjusted (idle rpm, ignition timing, etc.) before checking or adjusting fast idle speed.

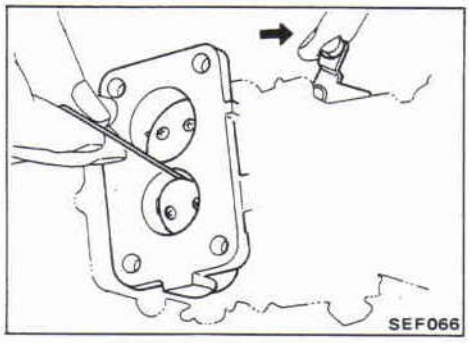


3. If out of specification, remove carburetor and make fast idle adjustments as follows.

1) Place fast idle arm on 2nd step of fast idle cam, in the same manner as in step 1 above.
2) Adjust clearance "A" between primary throttle valve and inner carburetor wall by turning fast idle adjusting screw.

Clearance "A":
M/T: 1.37 ± 0.14 mm (0.0539 ± 0.0055 in)
A/T: 1.64 ± 0.14 mm (0.0646 ± 0.0055 in)

If after adjustment and installation, the fast idle speed is out of specification, check clearance "A" values.



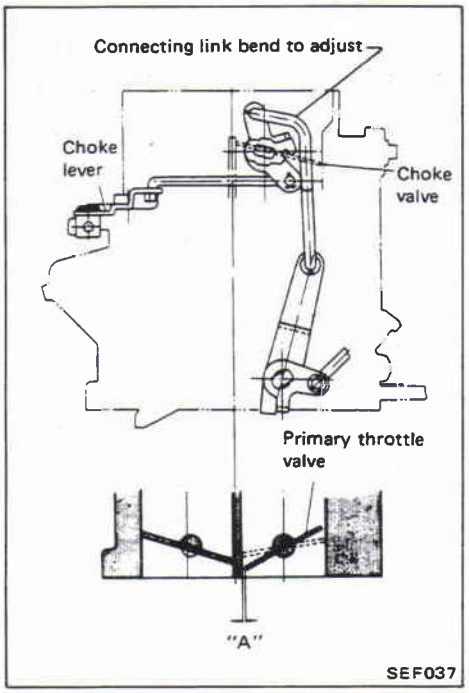
Fast Idle (Manual Choke Model)

Check clearance "A" between primary throttle valve and inner wall by pulling choke lever completely.

Clearance "A":
M/T: 2.25 ± 0.15 mm (0.0886 ± 0.0059 in)
A/T: 2.58 ± 0.15 mm (0.1016 ± 0.0059 in)

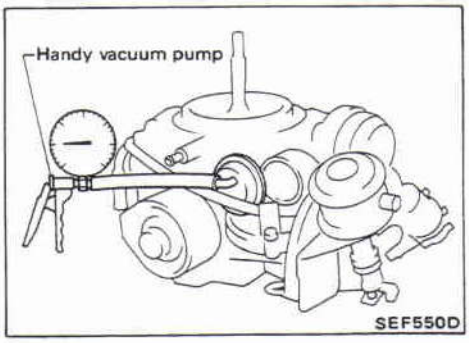
If out of specification, adjust it by bending choke connecting rod.

Fast Idle (Manual Choke Model) (Cont'd)

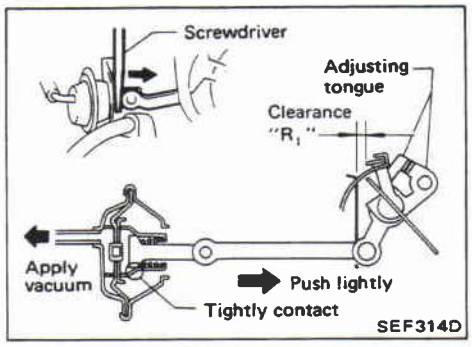


Vacuum Break

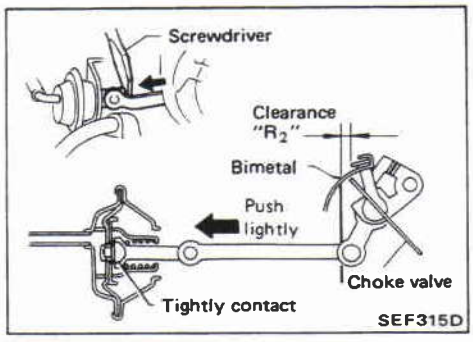
1. With engine cold, visually check that choke valve is fully closed.
2. Apply vacuum to vacuum break diaphragm with a handy vacuum pump.

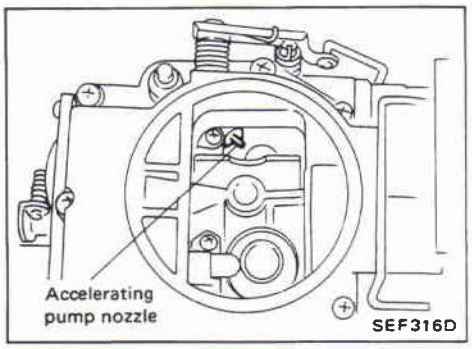


3. Lightly push piston rod in the direction that closes choke valve and check clearance "R_1".
   Clearance "R_1":
   3.25 ± 0.25 mm (0.1280 ± 0.0098 in)
   If out of specification, adjust "R_1" by bending tongue.



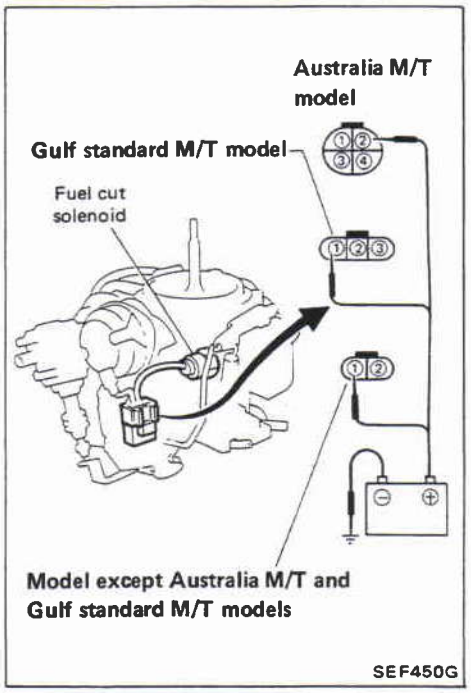
4. Lightly push piston rod toward diaphragm and check clearance "R_2".
   Clearance "R_2":
   5.0 ± 0.5 mm (0.197 ± 0.020 in)
   If out of specification, recheck and adjust clearance "R_1".





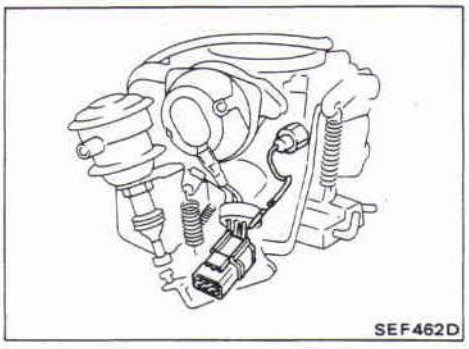
Accelerating Pump

Operate accelerating pump by opening throttle lever with engine stopped. Check that pump nozzle located at primary port injects fuel smoothly without delay.
If it does not inject, check accelerating pump piston or linkage.



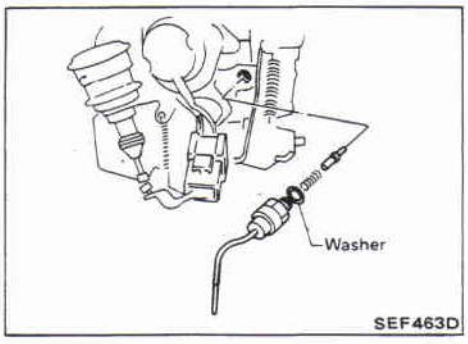
Fuel Cut Solenoid Valve

1. Connect solenoid valve connector to battery.
2. Check "click" sound from solenoid valve when battery is connected and disconnected.



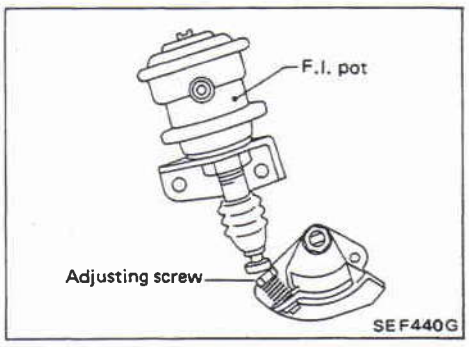
3. If no sound is heard from fuel cut solenoid valve, replace with a new one.

1) Disconnect harness from harness connector.



2) Remove fuel cut solenoid valve from carburetor.
3) Install new fuel cut solenoid valve.

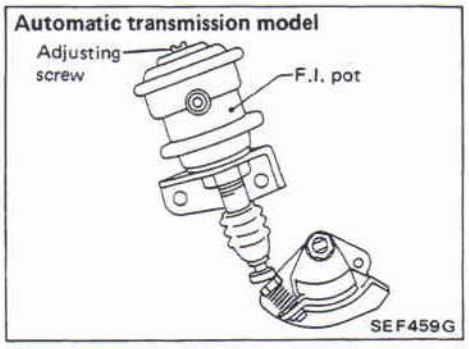
After replacement, start engine and check that fuel cut solenoid is in good condition.

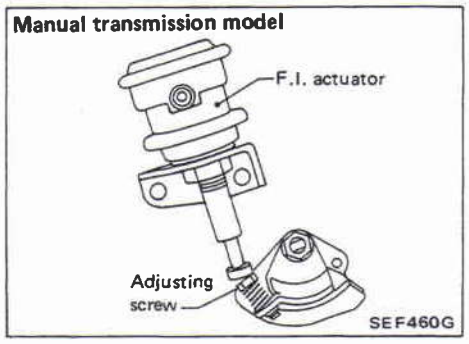


F.I. (Fast Idle) Pot (A/T model only)

DASH POT

1. Warm up engine sufficiently.
2. Check idle speed and mixture ratio.
   Idle speed:
   650 ± 50 rpm (M/T)
   650 ± 50 rpm (A/T in "D" position)
   Idle "CO":
   1.5 ± 0.5%
3. Turn throttle valve by hand, and read engine speed when dash pot just touches stopper lever.
   Dash pot touch speed:
   1,700 ± 100 rpm
4. If out of specifications, adjust it by turning adjusting screw.
5. After adjusting, make sure that engine speed drops smoothly from 2,000 to 1,000 rpm in approximately three seconds.





F.I. Actuator

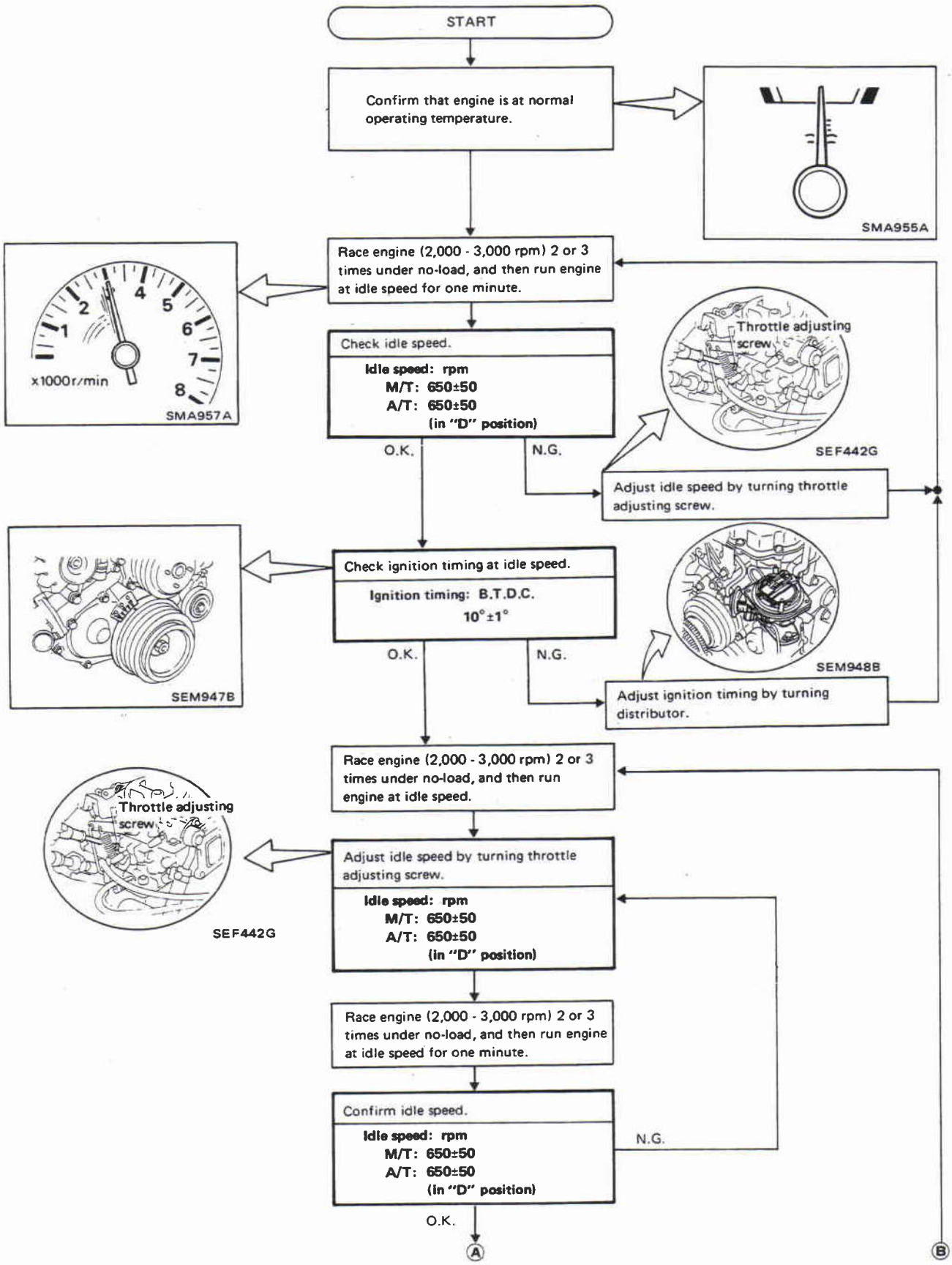
1. Warm up engine sufficiently.
2. Check idle speed and mixture ratio.
   Idle speed:
   650 ± 50 rpm (M/T)
   650 ± 50 rpm (A/T in "D" position)
   Idle "CO":
   1.5 ± 0.5%
3. Turn air conditioner switch "ON", and check idle speed.
   Idle speed (When A/C is "ON"):
   1,100 ± 50 rpm (M/T)
   900 ± 50 rpm (A/T in "N" position)
4. If out of specification, adjust idle speed by turning adjusting screw.

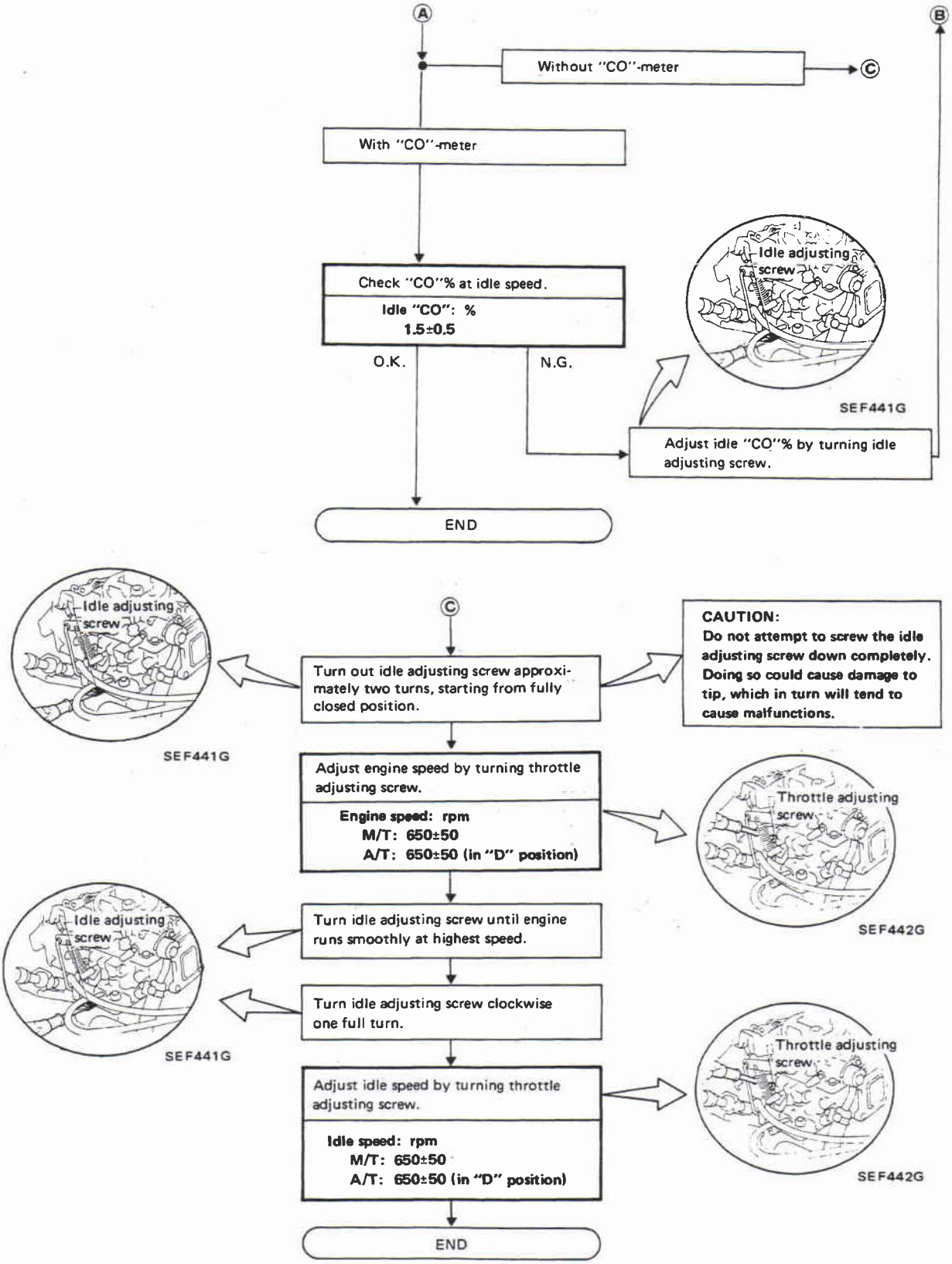
CAUTION:
Do not attempt to screw idle adjusting screw down completely. Doing so could cause damage to tip, which in turn will tend to cause malfunctions.

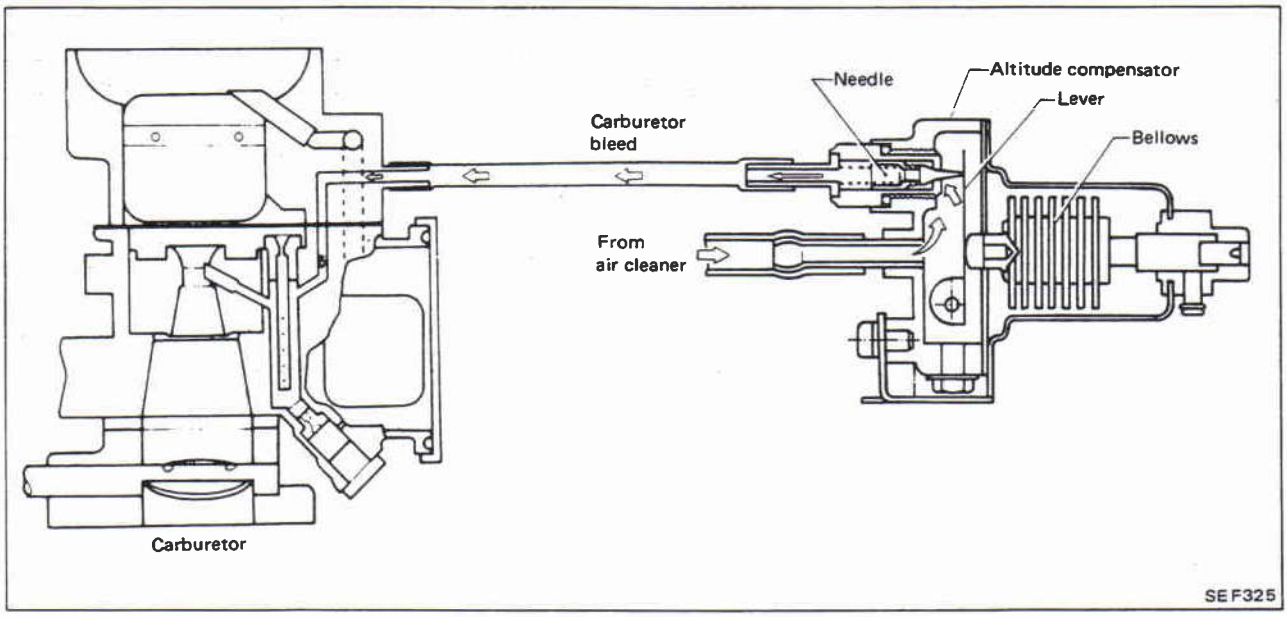
PREPARATION

1. Set shift lever in "Neutral" position (in "N" or "P" position for the automatic transmission). Engage parking brake and lock both front and rear wheels with wheel chocks.
2. Turn off air conditioner and light switch.
3. Use "CO"-meter after it is fully warmed up, and insert "CO"-meter probe into tail pipe more than 0.4 m (1.3 ft).
4. Measure "CO"% with air cleaner installed.
5. During checking and adjusting, make sure that engine is at normal operating temperature.

CHECKING AND ADJUSTING IDLE SPEED, IGNITION TIMING AND MIXTURE RATIO




A
Without "CO"-meter
C
B
With "CO"-meter
Check "CO"% at idle speed.
Idle "CO": %
1.5±0.5
O.K.
N.G.
Idle adjusting screw
SEF441G
Adjust idle "CO"% by turning idle adjusting screw.
END
Idle adjusting screw
SEF441G
C
Turn out idle adjusting screw approximately two turns, starting from fully closed position.
CAUTION:
Do not attempt to screw the idle adjusting screw down completely. Doing so could cause damage to tip, which in turn will tend to cause malfunctions.
Adjust engine speed by turning throttle adjusting screw.
Engine speed: rpm
M/T: 650±50
A/T: 650±50 (in "D" position)
Throttle adjusting screw
SEF442G
Idle adjusting screw
SEF441G
Turn idle adjusting screw until engine runs smoothly at highest speed.
Turn idle adjusting screw clockwise one full turn.
Adjust idle speed by turning throttle adjusting screw.
Idle speed: rpm
M/T: 650±50
A/T: 650±50 (in "D" position)
Throttle adjusting screw
SEF442G
END

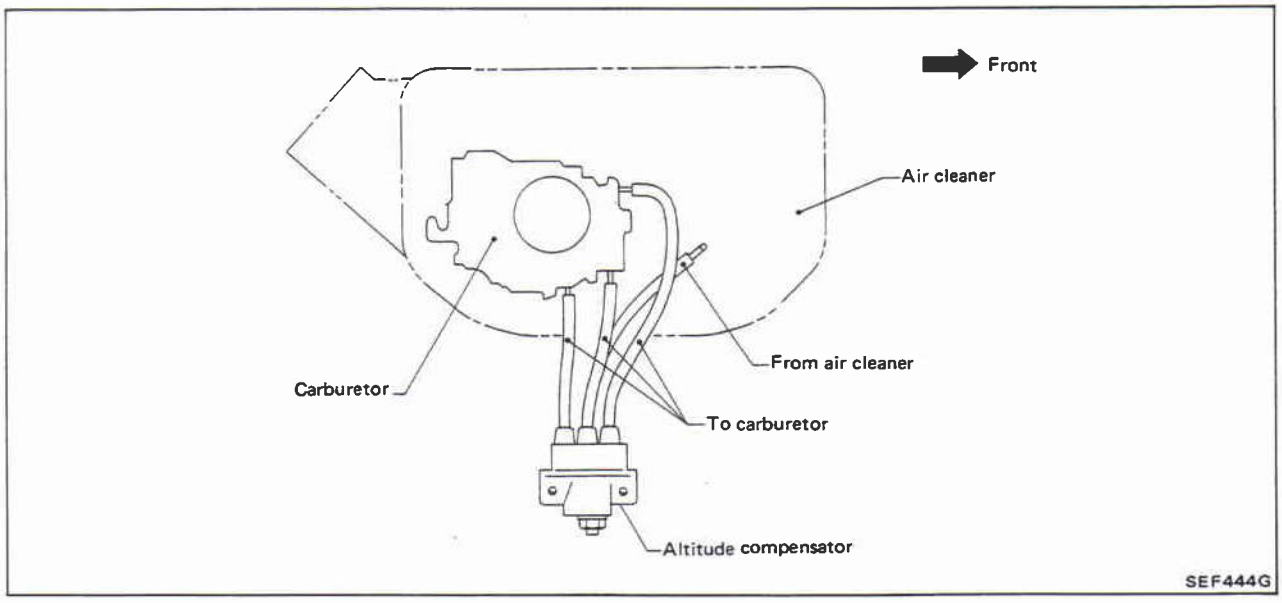


System Description

The higher the altitude, the thinner the density of air. At a higher altitude, therefore, the carburetor produces too rich of an air-fuel mixture.

The altitude compensator automatically corrects air-fuel mixture to an optimum ratio. It operates in the following sequence in high altitudes.

1. The bellows in the altitude compensator extend.
2. The lever attached to the bellows then pushes up the needle.
3. When the needle is pushed up, the air passage becomes wider, allowing a larger amount of air to flow from the altitude compensator to the carburetor.
4. With this additional air in the carburetor, the air-fuel mixture thins to a proper ratio.



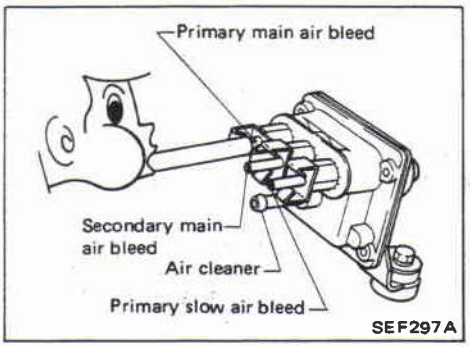
System Inspection

a. The altitude compensator is set to operate above an altitude of approximately 500 m (1,641 ft). It should be carefully checked.

b. When making this check, ensure that all other parts are working properly.

c. The altitude compensator cannot be adjusted; if it is found to be functioning unsatisfactorily, it must be replaced as an assembly.

d. The hoses are color-coded. When connecting them, be sure to align them with the proper color marks on the unit.



COMPENSATOR AT LOW ALTITUDES

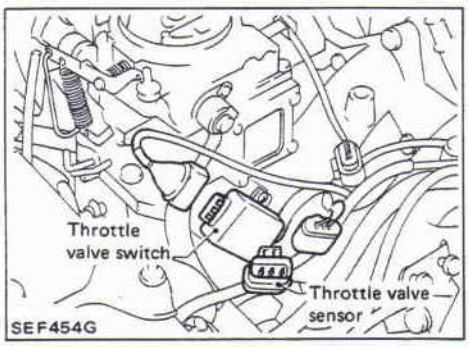
If compensator operates at low altitudes:
When compensator is malfunctioning, check it by sucking or blowing air through the inlet and outlet hoses. If air flows through smoothly, replace the unit as an assembly.

COMPENSATOR AT HIGH ALTITUDES

If compensator does not operate at high altitudes:
When compensator is malfunctioning, check it by sucking or blowing air through the inlet and outlet hoses. If air does not flow through smoothly, replace the unit as an assembly.

Wiring Diagram

Refer to "AT" section.

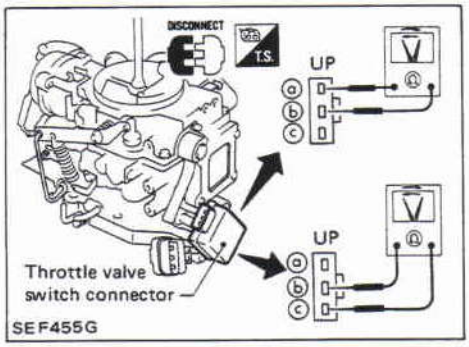


Inspection

THROTTLE VALVE SWITCH

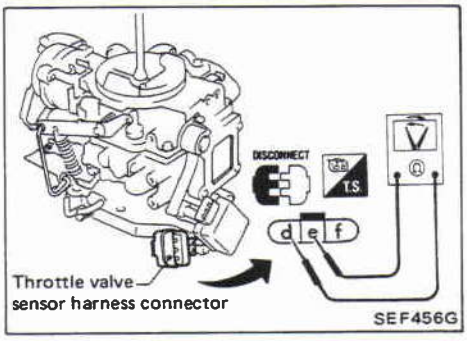
1. Check engine speed during idle switch OFF → ON conversion.

1) Warm up engine sufficiently.
2) Disconnect throttle valve switch and throttle sensor harness connector.
3) Check idle speed.
   650 ± 50 rpm (in "D" position)
   If not correct, adjust by turning throttle adjusting screw.
4) Shift select lever to "N" position, then read idle speed Nat.
5) Manually open throttle valve to about 2,000 rpm, lower engine speed slowly and read the engine speed at which the idle contact turns from OFF to ON.
   (Nat + 250) ± 150 rpm (in "N" position)
   If not correct, adjust by loosening throttle valve switch securing screws and turning throttle valve switch.
6) Reconnect throttle valve switch and throttle sensor harness connector.



2. Check continuity of throttle valve switch.

1) Disconnect throttle valve switch harness connector.
2) Check resistance between terminals ⓐ and ⓑ when throttle valve switch closes fully.
   Resistance:
   Approximately 0 Ω
3) Check resistance between terminals ⓑ and ⓒ when throttle valve switch opens fully.
   Resistance:
   Approximately 0 Ω
   If necessary, replace throttle valve switch.



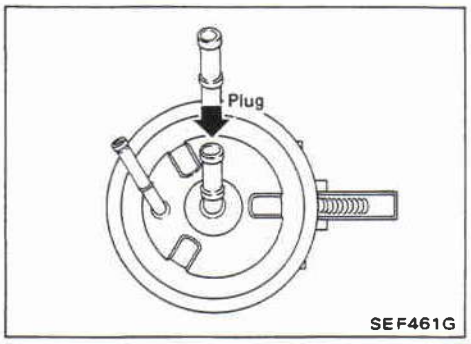
THROTTLE VALVE SENSOR

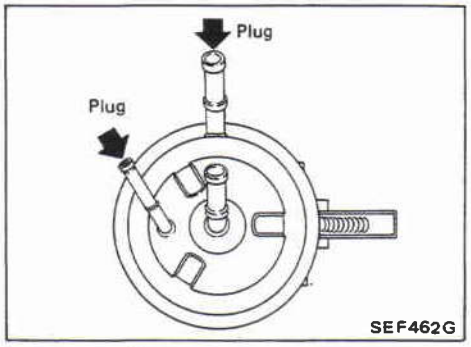
Check resistance of throttle valve sensor.

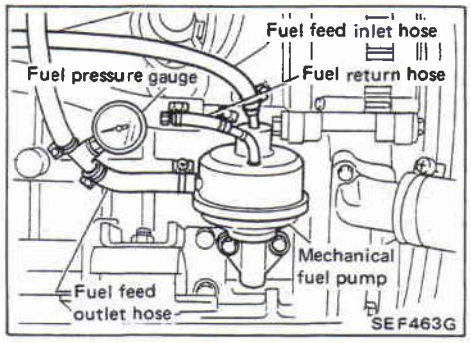
1) Disconnect throttle valve sensor harness connector.
2) Check resistance between ⓓ and ⓔ changes when opening throttle valve manually.

Resistance should change.

If not, replace throttle valve sensor. Check engine speed during idle switch OFF → ON conversion.







Operation

1. Flush pump by immersing it in a fuel bath and operating the rocker arm several times.
2. Drain fuel from fuel pump. Then plug up inlet port with fingers and check that pump arm does not move.
3. Remove finger from inlet port and listen for a suction sound which will confirm that sufficient suction was produced.
4. Plug up outlet port and return port. Once again operate rocker arm. After air pressure has been built up, confirm that the pressure remains for two or three seconds after.
5. Put a finger over the outlet port and again build up pressure in the pump. Then submerse pump in a fuel bath and check for air leaks.

WARNING:

Before starting to work on any part of fuel system, disconnect ground cable from battery. When disconnecting fuel hoses, use a container to catch fuel remaining in the hoses.

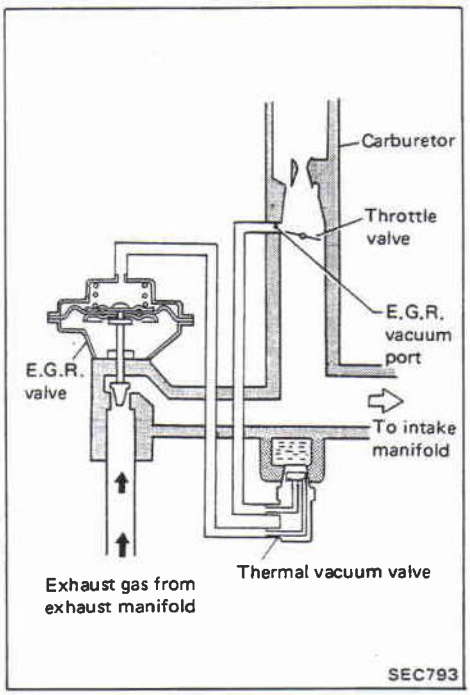
Fuel Pressure

1. Disconnect fuel return hose and plug with a suitable blind plug.
2. Disconnect fuel feed outlet hose and connect fuel pressure gauge between fuel pump and carburetor.
3. Check static fuel pressure with engine running at various speeds.

   Fuel pump static pressure:

   25.5 - 32.4 kPa (0.255 - 0.324 bar, 0.26 - 0.33 kg/cm^2, 3.7 - 4.7 psi)

If out of specification, check for fuel filter clogging or improper fuel pump operation.

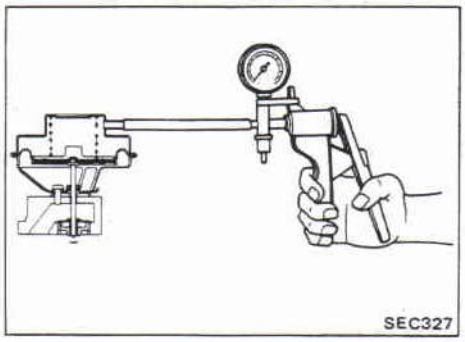


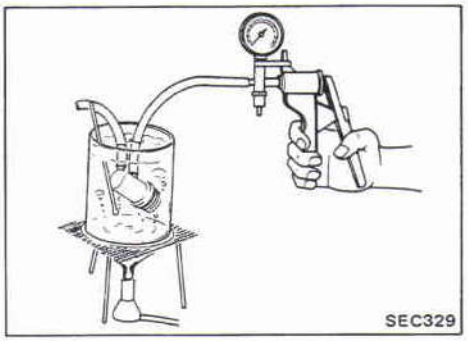
System Description

The exhaust gas recirculating system is provided as a means of emission control. It routes a portion of the exhaust gas into the intake manifold for recombustion, thereby reducing the NOx level. The amount of exhaust gas recirculated depends on the port vacuum which operates the E.G.R. control valve.

1. During idling
   No port vacuum is generated because of low exhaust gas pressure. The vacuum port located upstream of the throttle valve and the E.G.R. valve remains closed.
2. Exhaust gas pressure is less than the pressure of E.G.R. control valve return spring.
   The throttle valve begins to open, generating port vacuum. Hence, the E.G.R. control valve opens.
3. Exhaust gas pressure greater than E.G.R. control valve return spring.
   If the throttle valve opens further, the port vacuum weakens and the E.G.R. control valve begins to close.
4. With throttle valve fully open
   When the throttle valve opens fully, no port vacuum exists and the E.G.R. valve closes.

In addition to the above, a T.V.V. (Thermal Vacuum Valve) is installed in the E.G.R. control vacuum line. This valve closes the vacuum port at low temperatures, thereby keeping the E.G.R. control valve closed.





System Inspection

E.G.R. CONTROL VALVE

1. Supply the E.G.R. control valve with vacuum using a handy vacuum pump.
2. Place a finger on the diaphragm of the valve, and make sure that the diaphragm lifts up and down in response to the vacuum leading to the valve.
   Full open of E.G.R. valve:
   Over –14.7 kPa
   (–147 mbar, –110 mmHg, –4.33 inHg)

T.V.V. (Thermal Vacuum Valve)

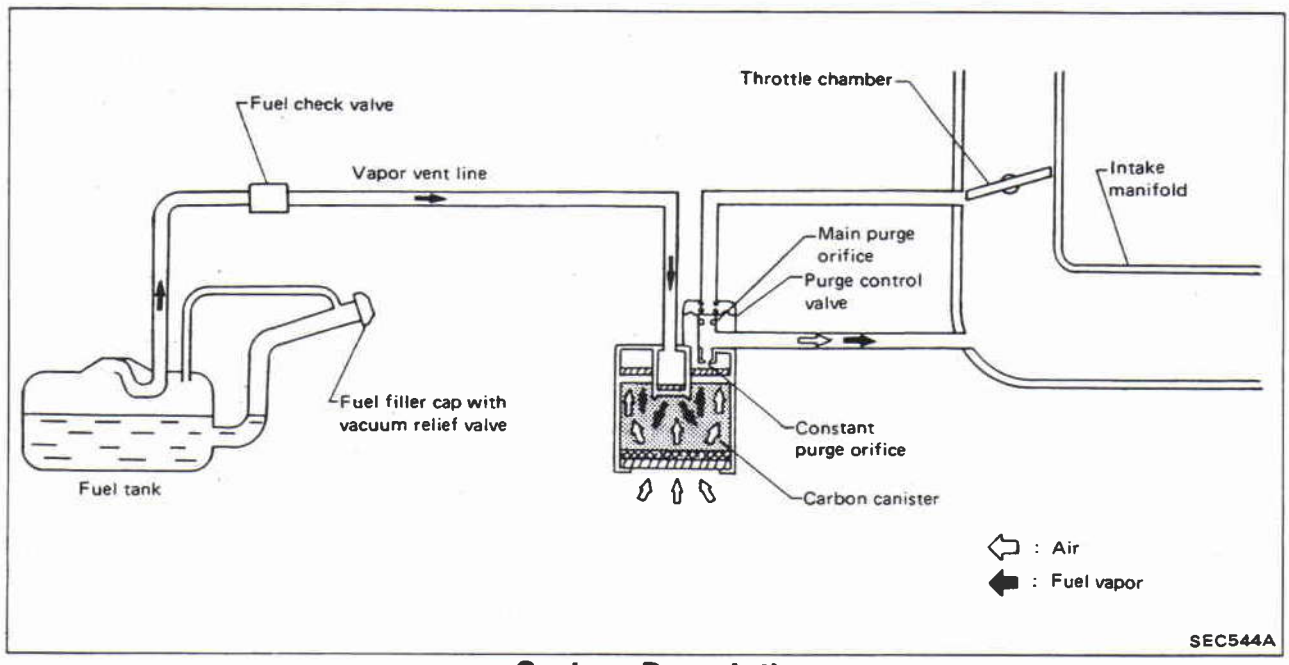
Apply vacuum to thermal vacuum valve and ensure that thermal vacuum valve opens at a temperature of about 50°C (122°F) conducting vacuum passage.

Do not let water enter thermal vacuum valve.

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

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

System Chart



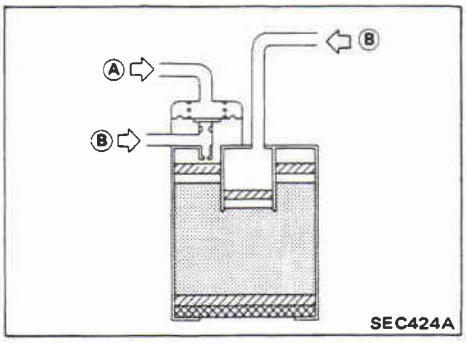
System Description

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.

The fuel vapor from the sealed fuel tank is led into the canister which contains activated carbon, and the vapor is stored there when the engine is not running.

The canister retains the fuel vapor until the canister is purged by the air drawn through the bottom of the canister to the intake manifold when the engine is running. When the engine runs at idle, the purge control valve is closed.

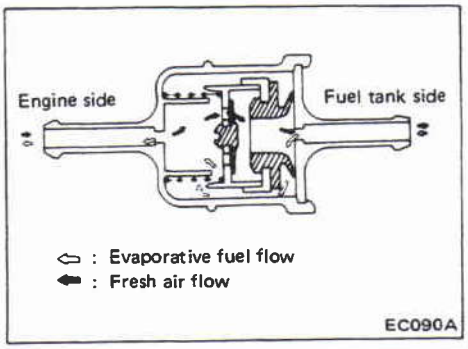
Only a small amount of stored vapor flows into the intake manifold through the constant purge orifice. As the engine speed increases and the throttle vacuum rises higher, the purge control valve opens and the vapor is sucked into the intake manifold through both the main purge orifice and the constant purge orifice.



Carbon Canister

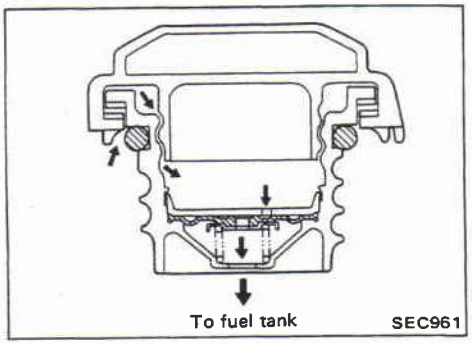
Check carbon canister as follows.

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



Fuel Check Valve

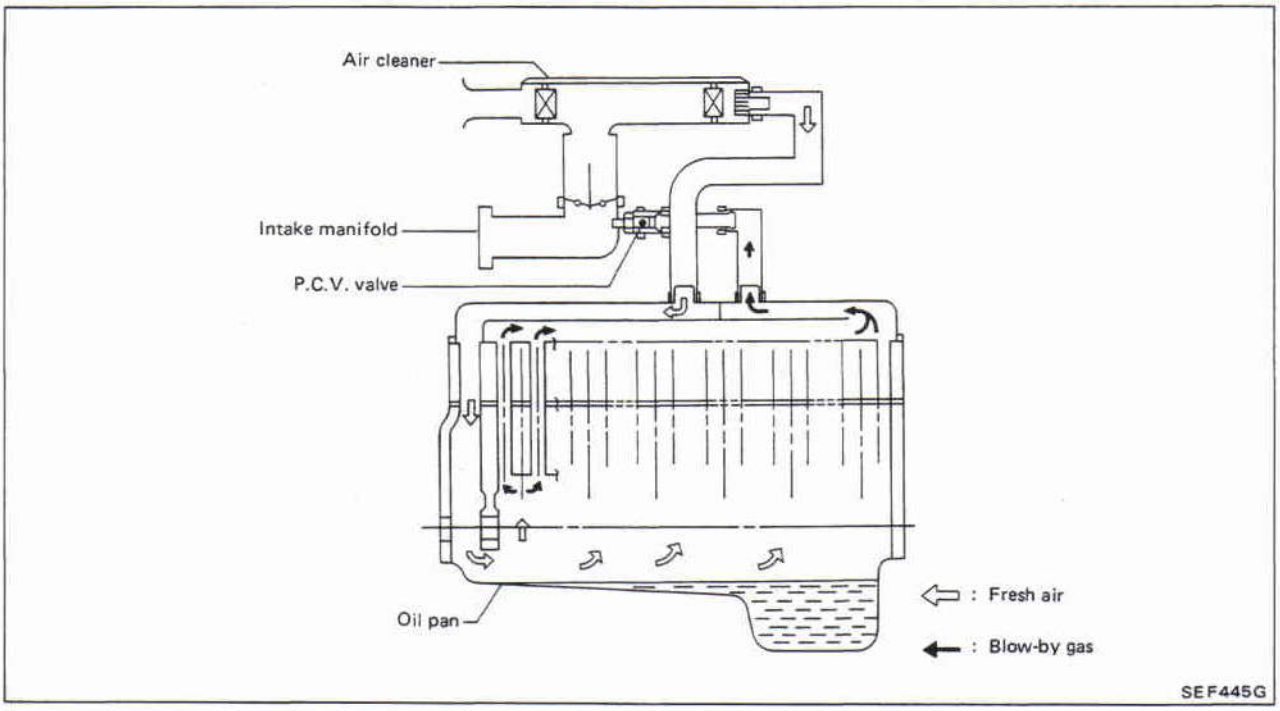
1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt, and a portion of air flow should be directed toward the canister.
2. Blow air through connector on the canister side.
   Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected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

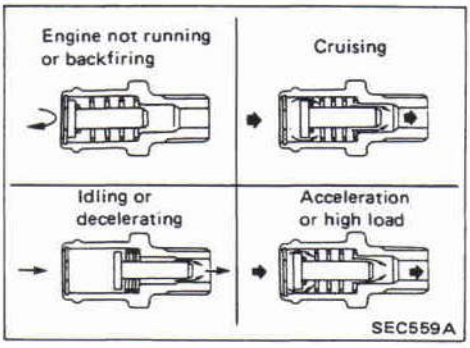


Fuel Tank Vacuum Relief Valve

1. Wipe clean valve housing.
2. Inhale air through fuel filler cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should disappear with valve clicks.
3. If valve is clogged or if no resistance is felt, replace cap as an assembly.

System Description

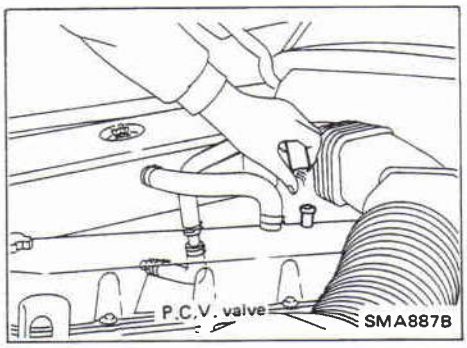




The positive crankcase ventilation (P.C.V.) valve provides crankcase blow-by gas to the intake manifold.

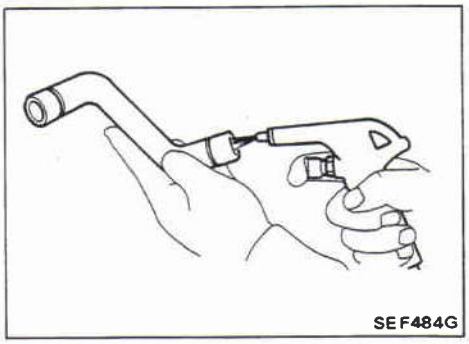
System Inspection

Refer to MA section.



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

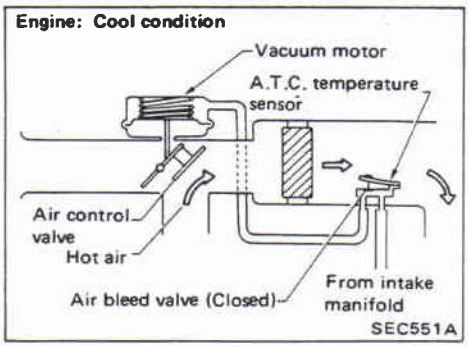
With engine running at idle, remove ventilation hose from P.C.V. valve; if valve is working properly a hissing noise will be heard as air passes through it, and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

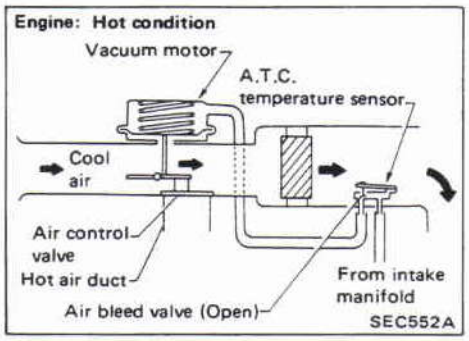


Ventilation Hose

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

TB42





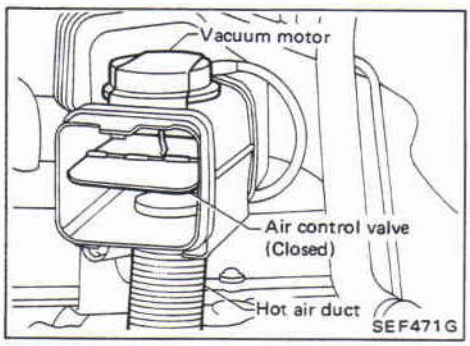
System Description

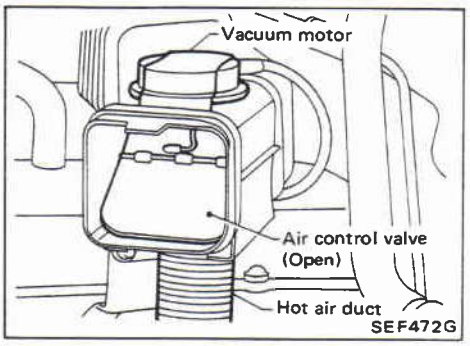
The automatic temperature control system maintains the temperature of air sucked in the carburetor within the constant range, thereby enabling lean setting for carburetor calibration. In addition to this, the automatic temperature control system is effective to improve the warm-up characteristics of the engine and to prevent carburetor from icing.

The automatic temperature control system is controlled by the inlet air temperature and the load condition of the engine. The inlet air temperature is detected by the sensor, installed in the air cleaner, and the vacuum motor is actuated by the intake manifold vacuum.

When the engine is not warmed up sufficiently, since the A.T.C. temperature sensor passes the intake manifold vacuum to the vacuum motor, the motor actuates and hot air is introduced into the air cleaner. In this step, the higher the intake manifold vacuum is, the wider the air control valve opens.

When the engine is warmed up, the A.T.C. temperature sensor releases to the atmosphere the intake manifold vacuum leading to the vacuum motor. Therefore, the vacuum motor deactivates. In this step, the air control valve shuts off hot air, allowing normal temperature air to flow to the air cleaner.





System Inspection

- Engine stall or hesitation
- Increase in fuel consumption
- Lack of power

If these phenomena occur, check A.T.C. system before carrying out inspection of carburetor.

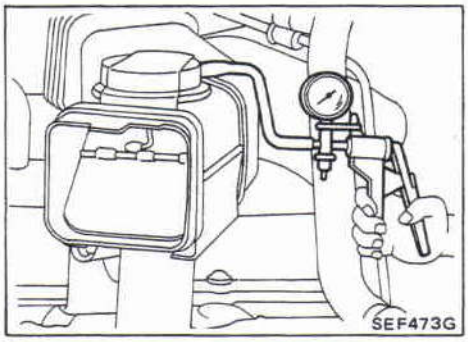
1. Check hoses for cracks, distortion and improper position.
2. Check A.T.C. system for proper function while engine is cool. Check air control valve position.

Air control valve is correct if it is in lower position.

3. Start engine and immediately check air control valve position. If it rises, it is correct.
4. Make sure that air control valve moves up and down when engine speed is quickly increased and decreased.
5. Make sure that air control valve partially rises when engine warm-up advances.

If the above test reveals any problem in the operation of air control valve, carry out the following test:

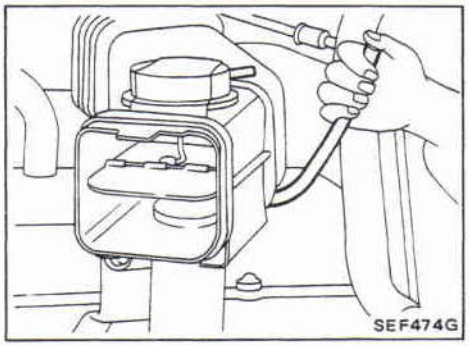
TB42


SEF473G

Vacuum Motor

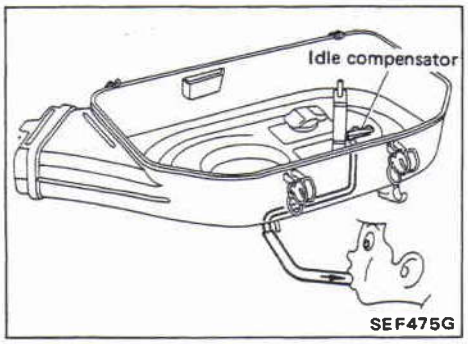
Disconnect inlet vacuum hose of vacuum motor, and connect another hose to the inlet to apply vacuum to vacuum motor. Then, confirm that air control valve moves.

Air control valve operating vacuum:
kPa (mbar, mmHg, inHg)
Opening starts
–9.6 (–96, –72, –2.83)
Full opening
Over –19.5 (–195, –146, –5.75)


SEF474G

Temperature Sensor

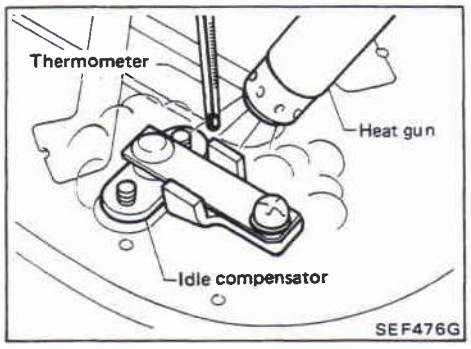
While engine is cool and idling, disconnect inlet vacuum hose of vacuum motor and make sure that intake manifold vacuum is present at the end of the vacuum hose. If vacuum is weak or is nonexistent, check vacuum hose for leakage.
Replace temperature sensor if vacuum hoses are in good condition. After engine warms up, make sure no vacuum exists. If necessary, replace temperature sensor.



SEF475G

Idle Compensator Inspection

1. Remove air cleaner.
2. Suck on the hose to make sure that idle compensator does not open.

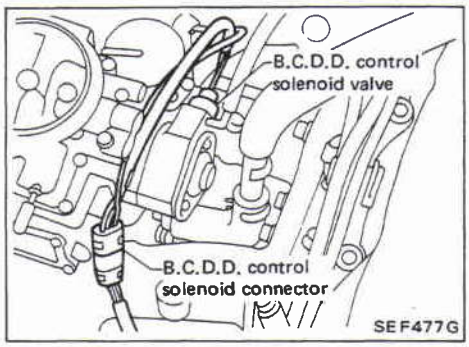


SEF476G

3. Direct warm air to idle compensator with a heat gun. And measure operating temperature of idle compensator.
- **Place thermometer as close as possible to idle compensator sensor.**

4. Idle compensator is in good condition if air flow opens idle compensator when it reaches operating temperature.
- **Take care not to bend or damage bimetals of idle compensator.**

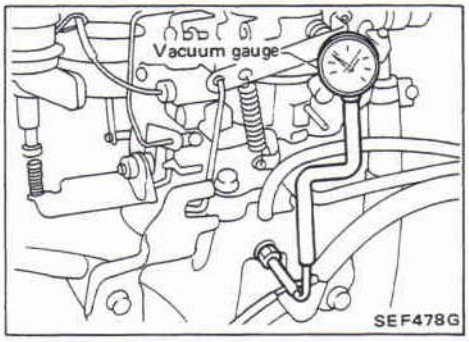
Temperature around idle compensator	°C (°F)
Idle compensator partially opens	65 - 74 (149 - 165)
Idle compensator fully opens	Above 74 (165)



Boost Controlled Deceleration Device (B.C.D.D.) Overall Inspection

1. Disconnect B.C.D.D. control solenoid connector.

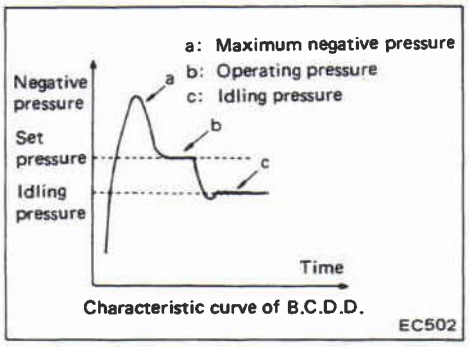
● **This is necessary for Australia M/T and Gulf standard M/T models. For other models, perform inspection and adjustment from item 2.**



2. Fully loosen dash pot adjusting screw, if equipped.

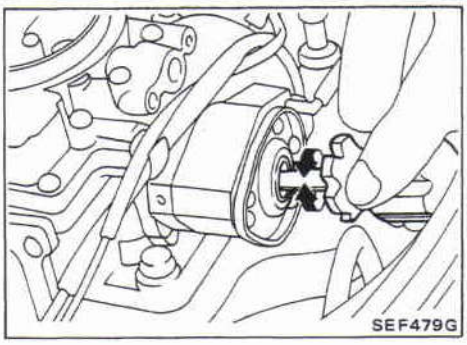
After inspection and adjustment have been made, readjust dash pot touch speed. Refer to EF & EC section.

3. Connect vacuum gauge to intake manifold.



4. Start engine and observe vacuum gauge while racing engine.
5. If B.C.D.D. is in good condition, vacuum gauge will follow the pattern shown in the figure at left.

Set pressure are shown in item 6.



6. If it does not react as described above, adjust operating pressure.

1) Remove rubber cap on B.C.D.D.
2) Racing engine, turn adjusting screw until the specified set pressure is obtained.

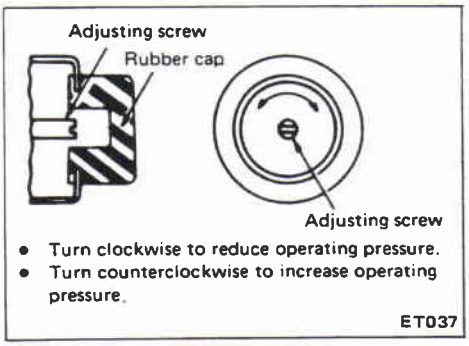
B.C.D.D. set pressure (at sea level):

For Australia M/T and Gulf standard M/T models

–76.0 ± 0.7 kPa (–760 ± 7 mbar, –570 ± 5 mmHg, –22.44 ± 0.20 inHg)

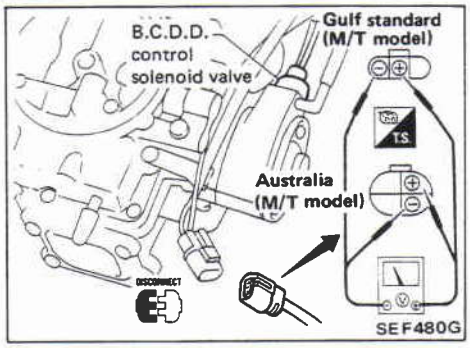
For model except Australia M/T and Gulf standard M/T models

–78.6 ± 0.7 kPa (–786 ± 7 mbar, –590 ± 5 mmHg, –23.23 ± 0.20 inHg)



Boost Controlled Deceleration Device (B.C.D.D.) Overall Inspection (Cont'd)

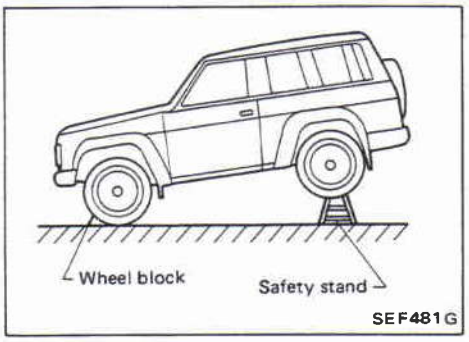
a. Turning adjusting screw one-quarter rotation will cause a change in operation pressure of about 2.7 kPa (27 mbar, 20 mmHg, 0.79 inHg).
b. Do not fit tip of screwdriver tightly into screw slot.



Circuit Check

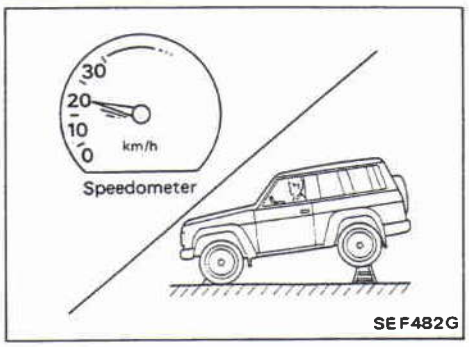
1. Disconnect carburetor harness connector.
2. Turn ignition switch "ON" and check voltage between terminals of B.C.D.D. control solenoid valve at main harness side connector.

Battery voltage should exist.



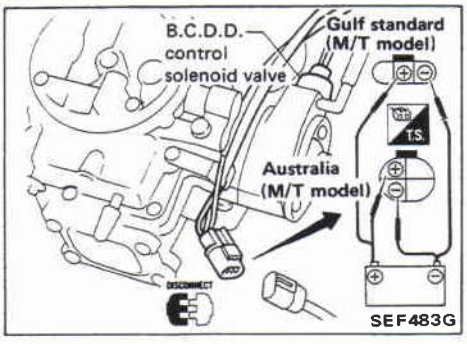
3. Jack up the rear of the vehicle, support with safety stands, block front wheels, and set parking brake.
4. Start engine and drive rear wheels until speedometer indicates 20 km/h (12 MPH) by putting transmission in 1st gear and depressing accelerator pedal.

WARNING:
For safety, do not drive rear wheels, at higher speeds than necessity.



5. Disengage clutch and slowly decelerate without braking.
6. Ensure that voltmeter indicates as follows:
   Below 10 km/h (6 MPH): Battery voltage
   Above 10 km/h (6 MPH): 0 [V]

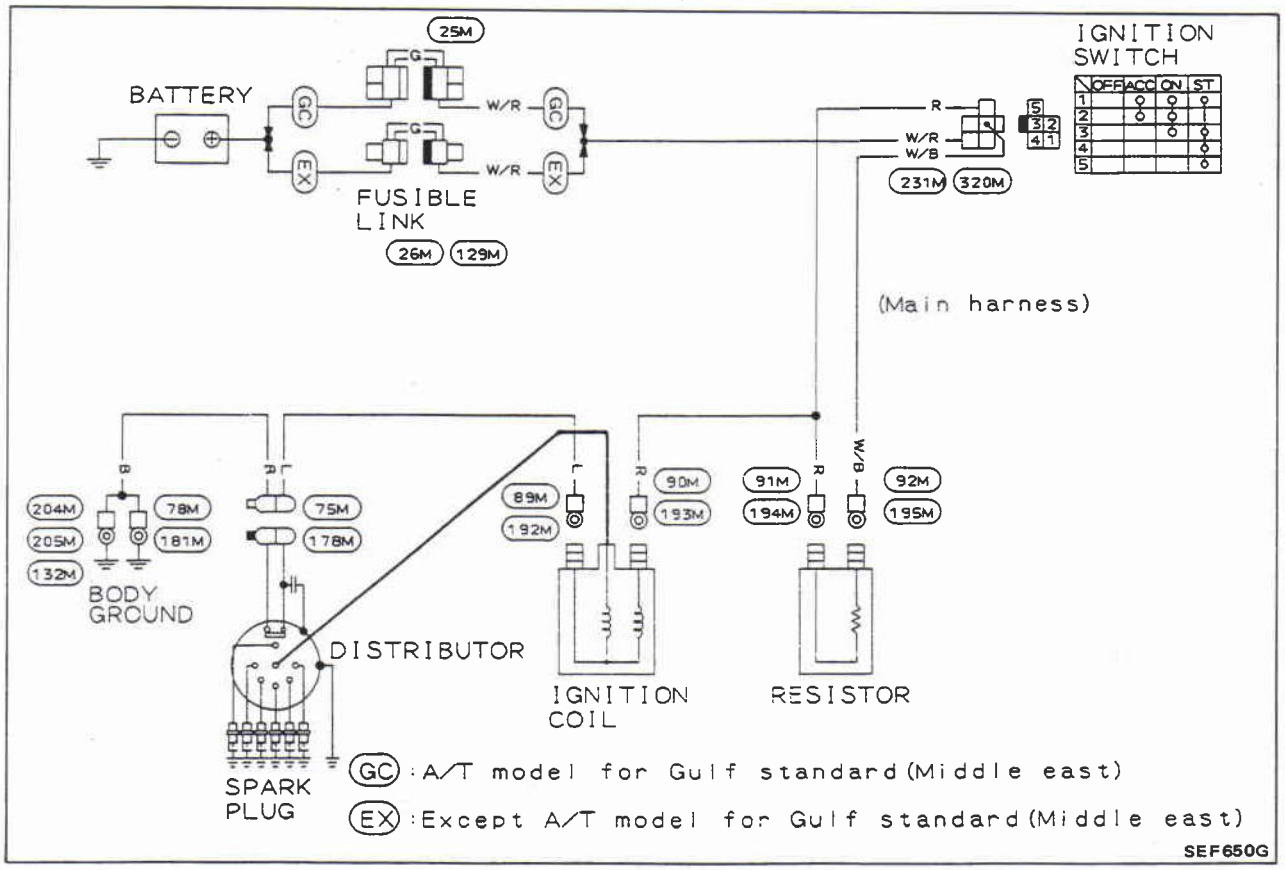
If out of specification, check harness continuity between B.C.D.D. control solenoid valve and ignition switch.



B.C.D.D. Control Solenoid Valve

Check function of B.C.D.D. control solenoid valve after disconnecting its connector. Listen for clicking sound of solenoid valve, applying battery voltage to solenoid valve.

Wiring Diagram



Trouble-shooting

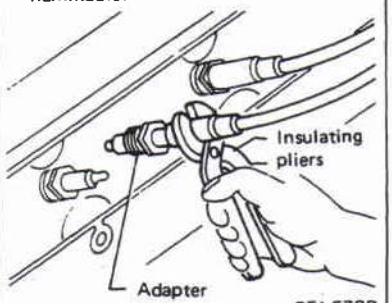
Engine turns erratically.

Engine turns but does not start.

Check ignition timing.
- N.G. → Adjust.
- O.K.

Attach adapter *1 to high tension cable and position tip of adapter approx. 6 mm (0.24 in) away from cylinder block. With adapter held in that position, crank engine to see if spark jumps across gaps between tip and cylinder block at regular intervals.

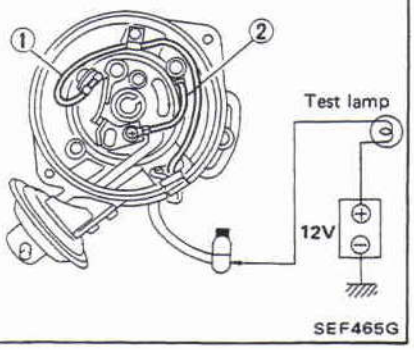
Before cranking, disconnect harness connector to carburetor. Before operation, make sure there is no inflammable.



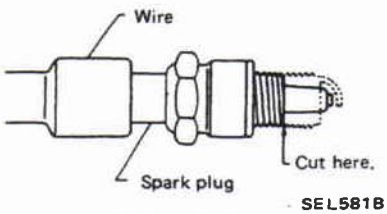
- O.K. → Check for burned or fouled spark plug.
  - N.G. → Clean or replace.
  - O.K. → Check fuel system.
- N.G. → Measure resistance of each high tension cable.
  - O.K. → Check for signs of dirt or burning on distributor cap, rotor head, point, etc.
    - N.G. → Clean or replace.
    - O.K. → Check point gap.
      - N.G. → Adjust or replace.
      - O.K. → Check ignition coil.
        - N.G. → Replace.
        - O.K. → Check condenser using a test lamp.
          - N.G. →
            - Test lamp lights when points open. ... Replace condenser.
            - Test lamp goes out when points close. ... Check lead wires ① and ② for open circuit. If necessary, replace.
          - O.K. → Check fuel system.

WARNING:
When current is flowing, never touch with bare hand high tension cables or any other parts with high voltage. If parts are moist, touching them could cause an electric shock, even if they are insulated. Always wear dry, well-insulated gloves or wrap affected parts with dry cloth before handling.

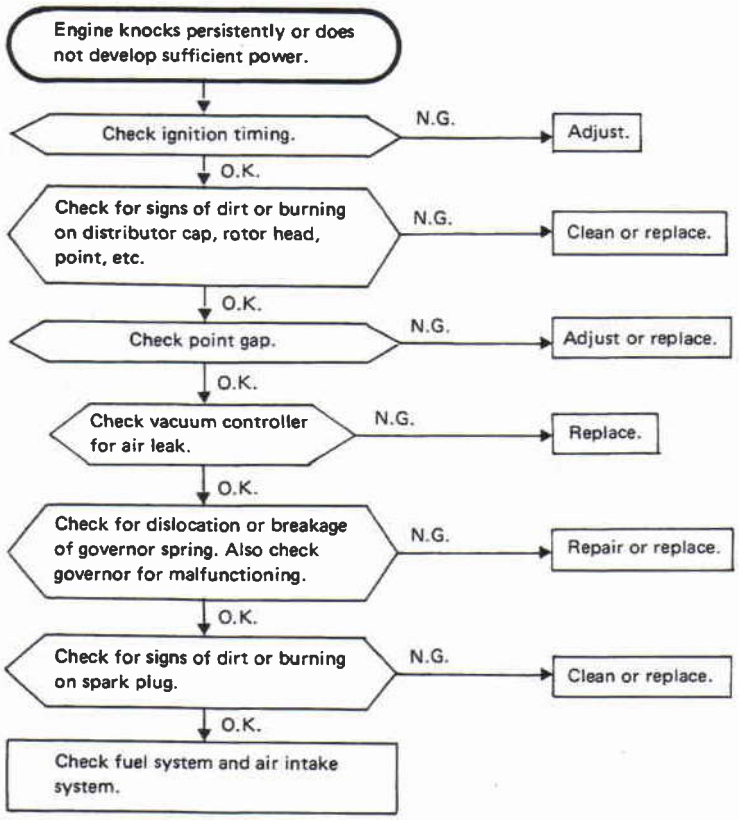
- Test lamp goes out when points open. ... O.K.
- Test lamp lights when points close. ... O.K.



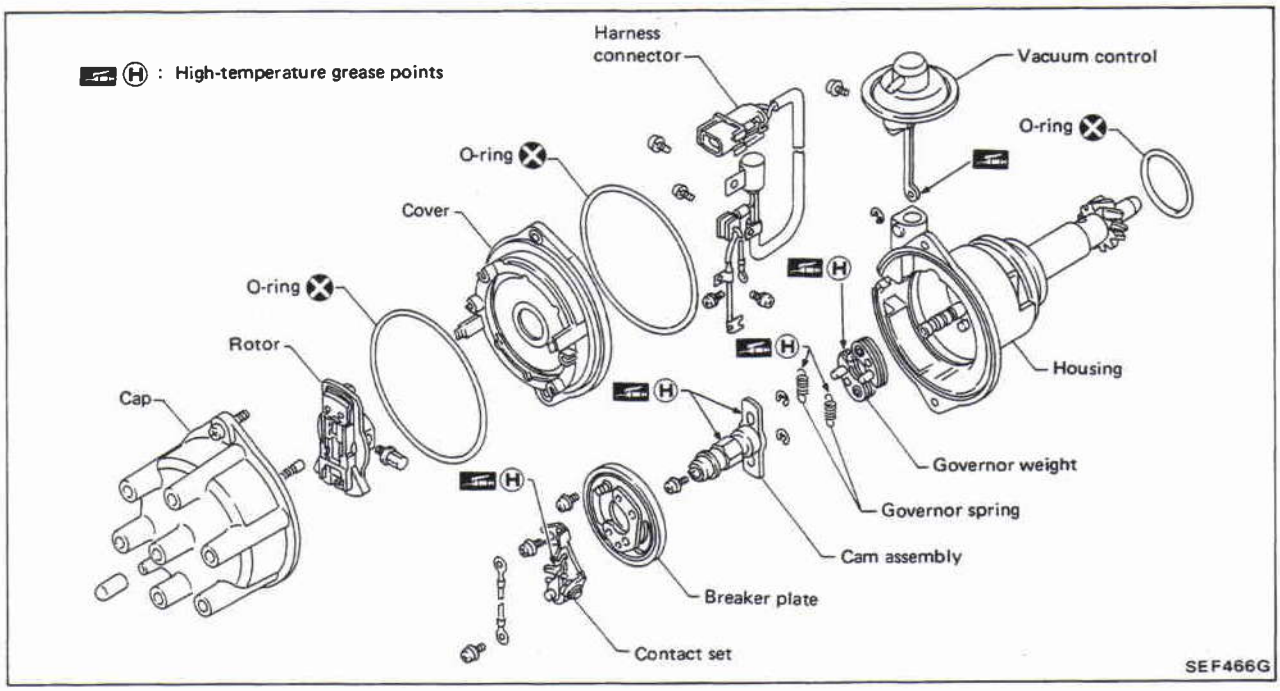
*1:
Preparation of spark plug for checking
Many things can be utilized as an adapter. However, it is recommended that a used spark plug whose threaded portion has been half cut off as shown in the figure be utilized.

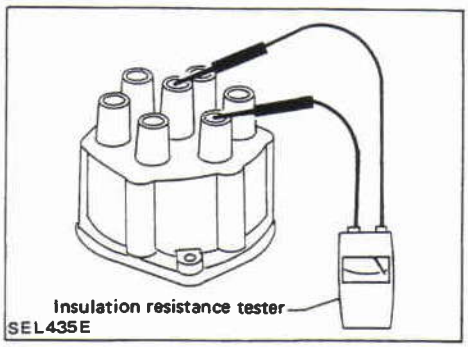


Trouble-shooting (Cont'd)



Construction



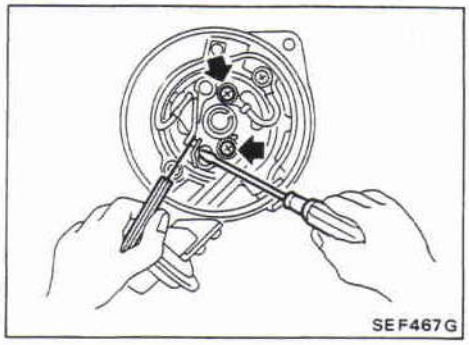


Distributor Component Check

CAP AND ROTOR HEAD

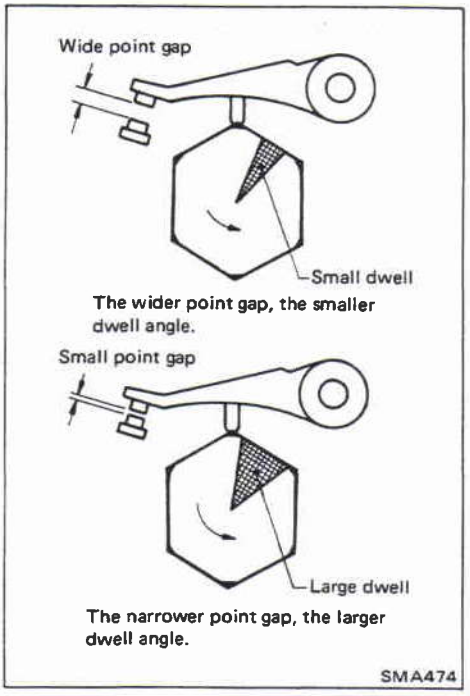
1. Check the cap and rotor head for dust, carbon deposits and cracks.
2. Measure insulation resistance between electrodes on ignition coil and spark plug sides on the cap.
   Insulation resistance:
   More than 50 [MΩ]

- Less than specified value ... Replace.



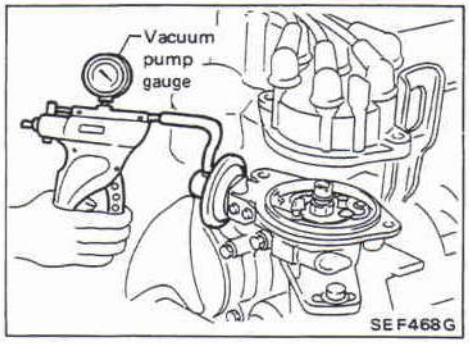
CONTACT POINT

1. Check the point surface.
   Take off any irregularities with fine sandpaper (No. 500 or 600) or with oil stone.
2. Adjust point gap.
   Loosen breaker point set screw and adjust gap with a gap gauge.
   Point gap:
   0.45 - 0.55 mm (0.018 - 0.022 in)



DWELL ANGLE

1. Start engine and warm it up.
2. Run engine at idle speed and measure dwell angle with a dwell meter.
   Dwell angle: 34° - 40°
3. If dwell angle is not within the specified value, turn off engine and adjust point gap.
4. If dwell angle is not within the specified value when point gap is correct, cam lobe is worn. Replace cam.

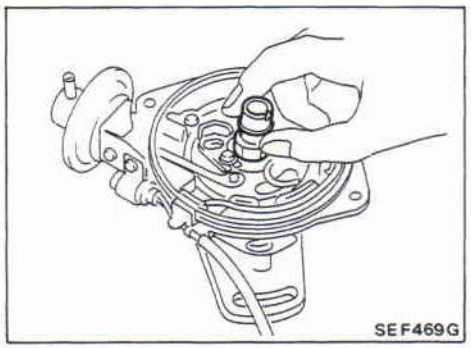


VACUUM ADVANCE

1. Connect vacuum pump gauge to vacuum controller and gradually draw a vacuum while watching breaker plate movement. Check for smooth operation with no evidence of binding.
2. Turn breaker plate right and left to check for freedom of movement.

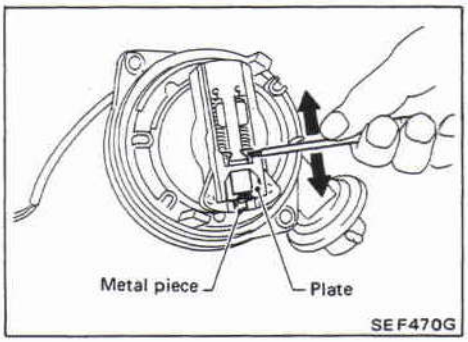
Distributor Component Check (Cont'd)

GOVERNOR ADVANCE



- Turn the head of cam assembly counterclockwise, release it, then check that it returns smoothly to the original position.

ROTOR



- Check that the plate moves smoothly to contact the metal piece. Also check that the spring acts securely.

DISASSEMBLY

Carefully observe the following instructions during disassembly.

- **Put a matchmark across cam and shaft so that original combination can be restored at assembly.**
- **Inscribe a matchmark across spring and mating parts so that spring can be replaced in its original position during assembly.**
  Be careful not to stretch or deform governor spring.

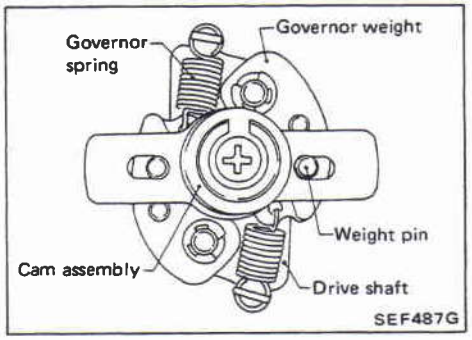
ASSEMBLY

Carefully observe the following instructions.

Grease point

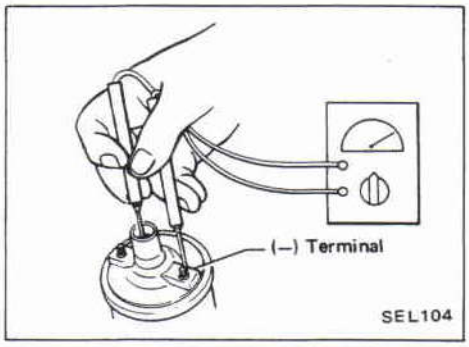
Apply high-temperature grease to:

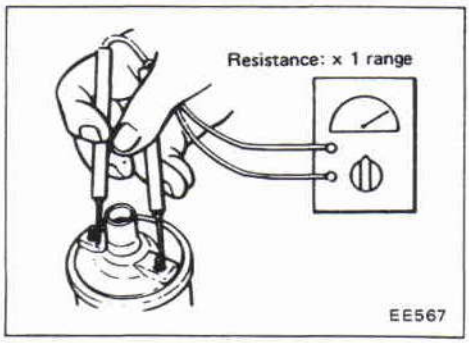
- Governor spring
- Frictional surface of governor weight
- Frictional surface of breaker plate
- Vacuum control shaft
- Cam and cam head



Installation of governor

Install governor springs, governor weights and cam assembly to drive shaft as shown in the figure.





Ignition Coil

1. Measure secondary resistance of ignition coil.
   Resistance: Refer to S.D.S.

2. Measure primary resistance of ignition coil.
   Resistance: Refer to S.D.S.

Spark Plug

Clean and check spark plug gap.
Refer to MA section.

Ignition Wire

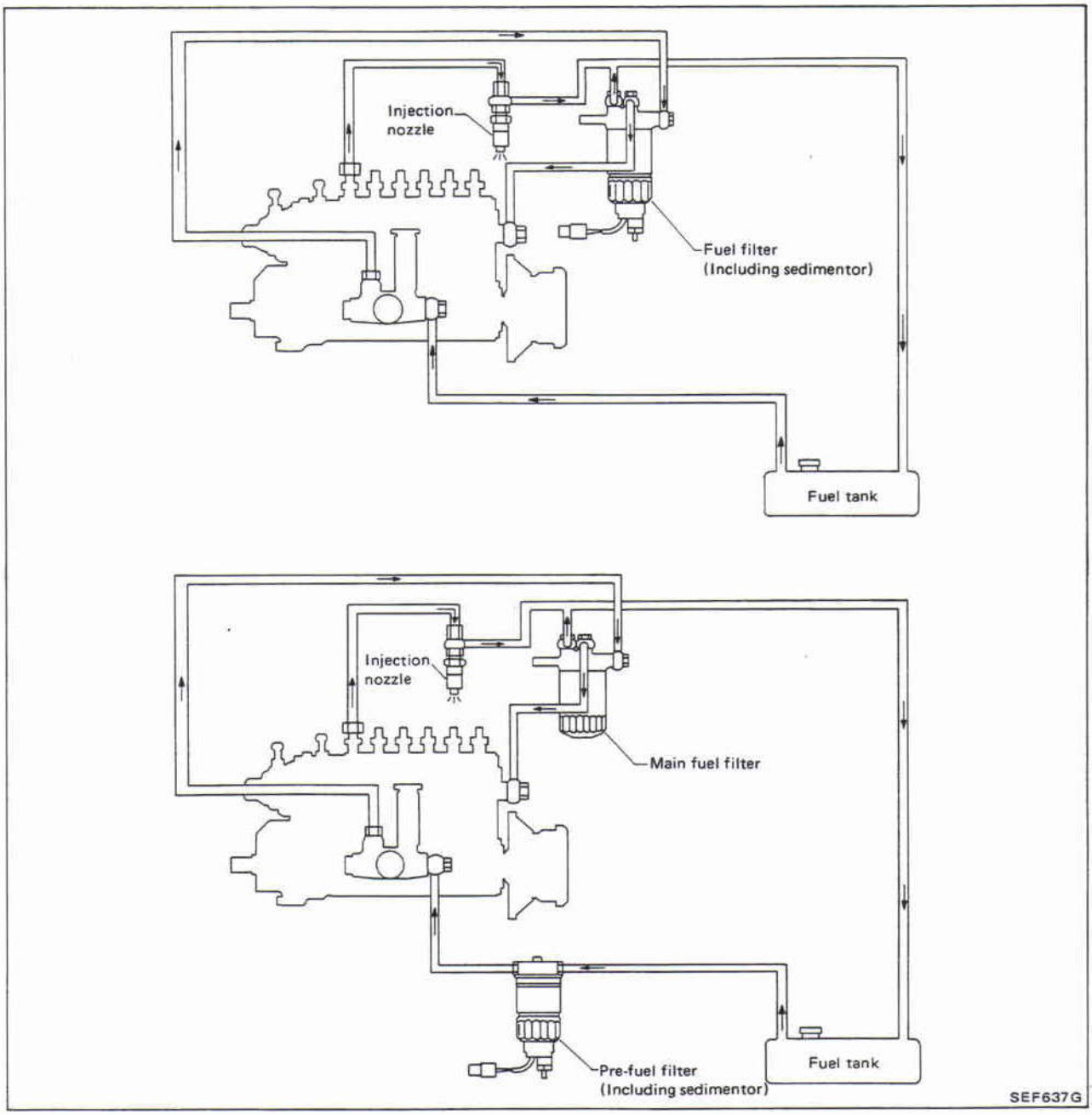
Check ignition wires.
Refer to MA section.

CAUTION:

- Disassembly and assembly of the injection pumps should be done only in service shops authorized by NISSAN or by the pump manufacturer.
- The pump tester is required for servicing the pump.
- Before removing fuel injection pump from vehicle, check closely to make sure that it is definitely malfunctioning.

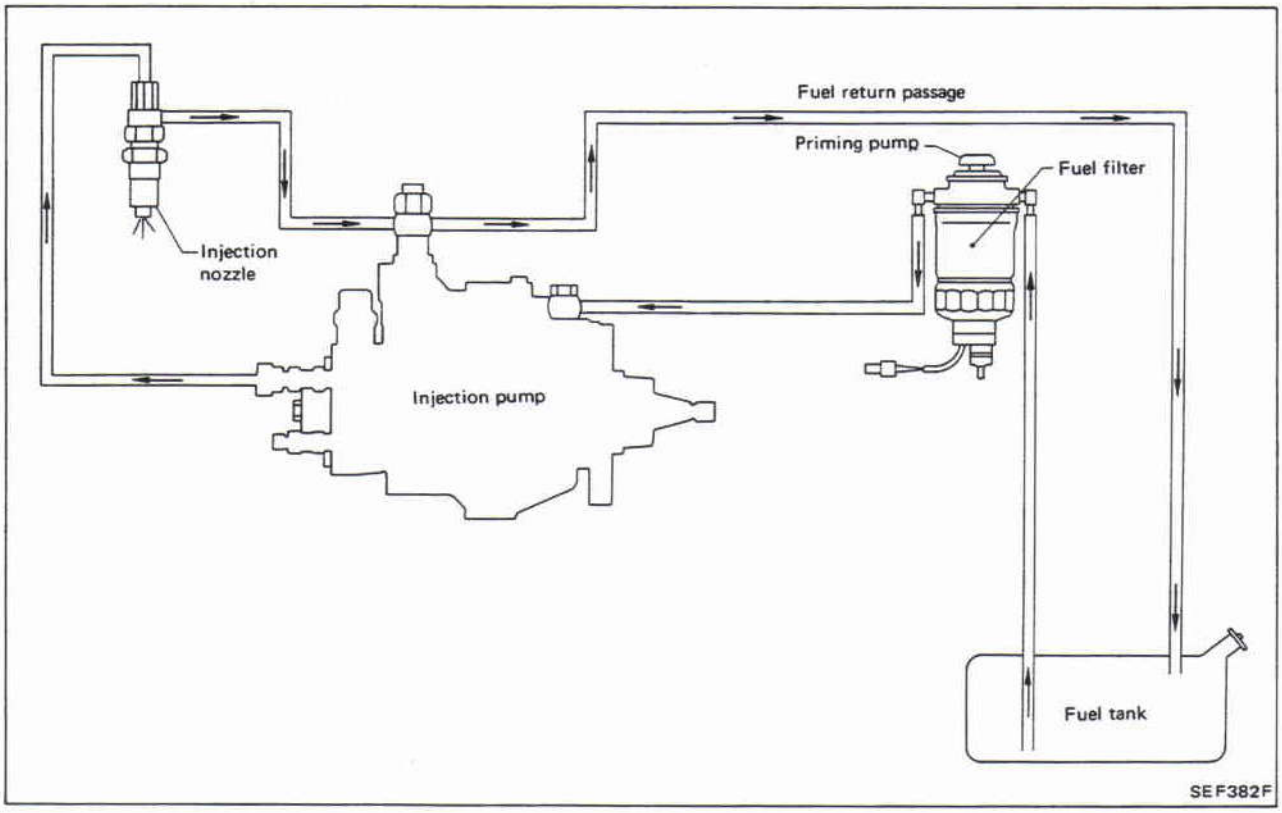
Fuel System

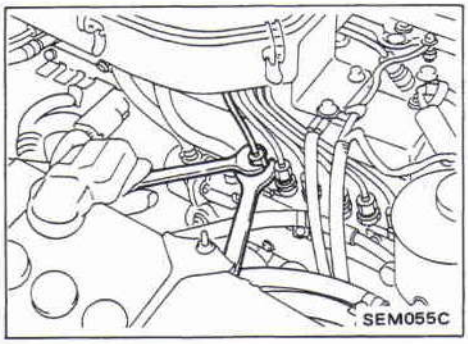
IN-LINE TYPE INJECTION PUMP



Fuel System (Cont'd)

VE-TYPE INJECTION PUMP



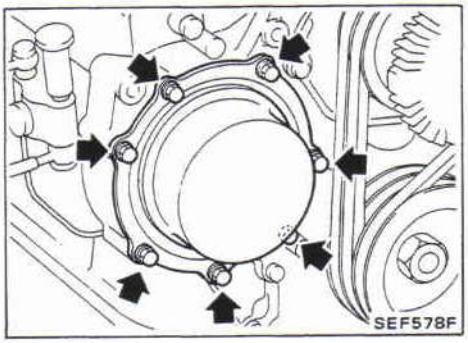


Removal

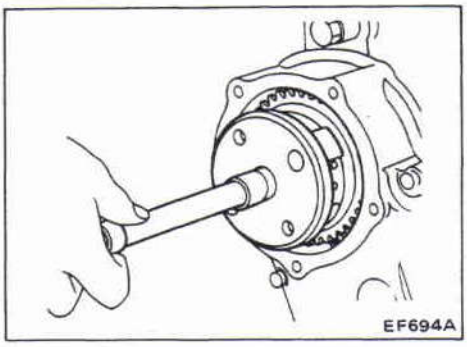
1. Remove injection tube.

Cover the delivery holders of the injection pump and injection nozzle holder assembly with a clean rag to prevent dust entry.

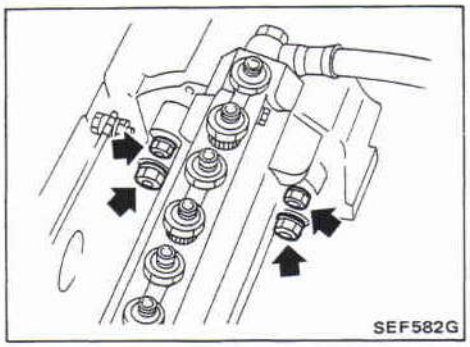
2. Disconnect governor hoses, fuel hoses and engine control wire from injection pump assembly and oil feed pipe (if so equipped).



3. Remove timing gear cover.



4. Remove timer round nut.
5. Remove timer assembly.

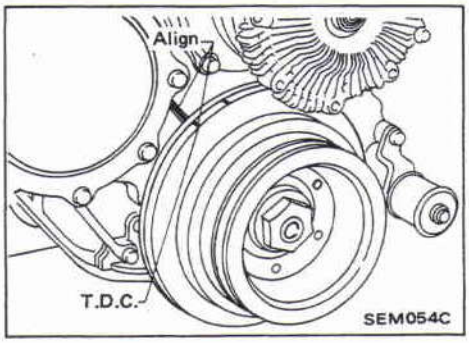


6. Remove injection pump assembly.

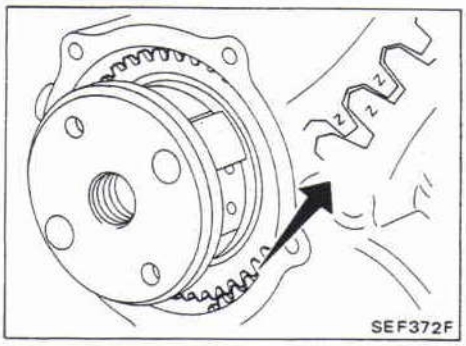
Installation and Adjustment

1. Install injection pump assembly with new gasket temporarily.
2. Install timer assembly.

Align crank pulley and timing gear case cover marks so that No. 1 piston is at top dead center.



Installation and Adjustment (Cont'd)

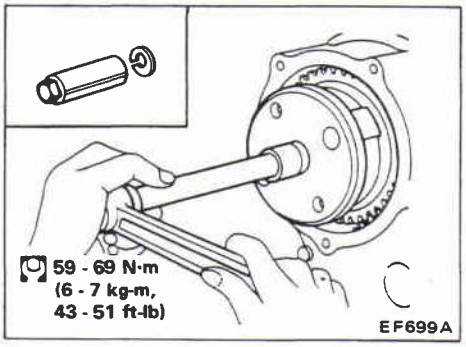


3. Injection pump

(1) Temporarily set injection pump.

(2) Mesh injection pump drive gear with idler gear at "Z" mark and then align gear to key way of injection pump camshaft while turning crank pulley.

Coat key with grease to prevent it from falling into front cover, and lay a rag on front cover.



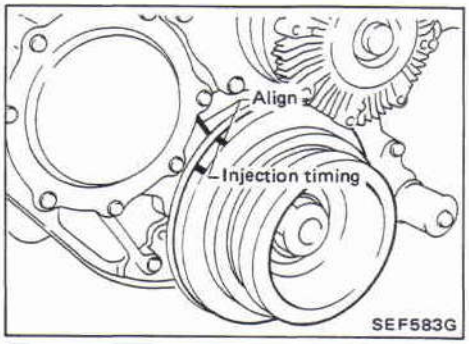
(3) Secure timer assembly with lock washer and round nut.

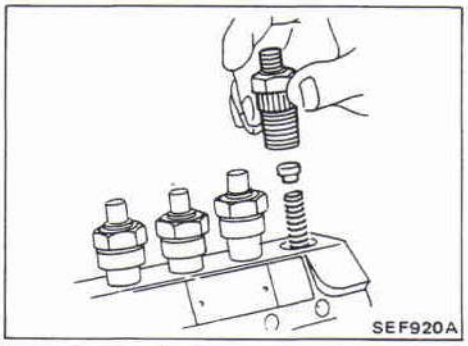
INJECTION TIMING ADJUSTMENT

1. Turn crank pulley in standard rotating direction and set No. 1 piston at applicable B.T.D.C.

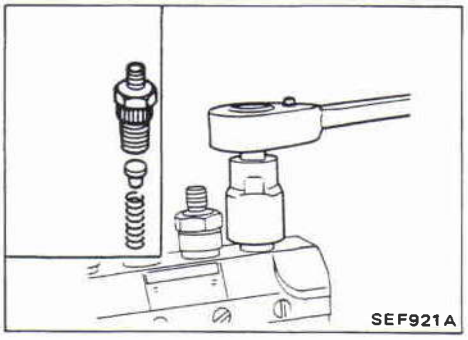
Select the right mark as applicable B.T.D.C.

2. Remove all injection tubes and governor hoses.



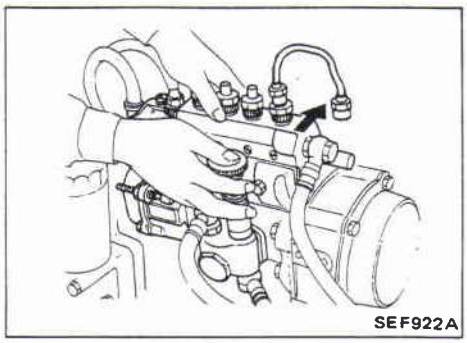


3. Remove No. 1 lock plate and delivery valve holder, and then pull out delivery stopper (if so equipped), delivery valve spring and delivery valve.

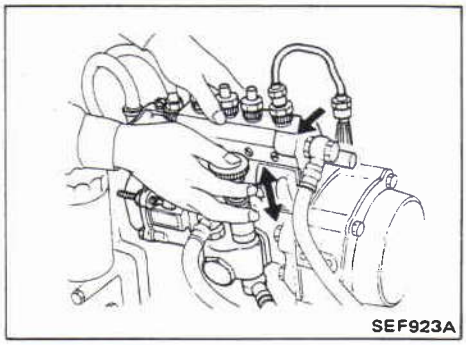


4. Install delivery valve holder without delivery valve spring, delivery valve stopper and delivery valve.

Installation and Adjustment (Cont'd)


SEF922A

5. Connect test tube to the No. 1 delivery valve holder.
6. Push injection pump assembly fully down toward engine side.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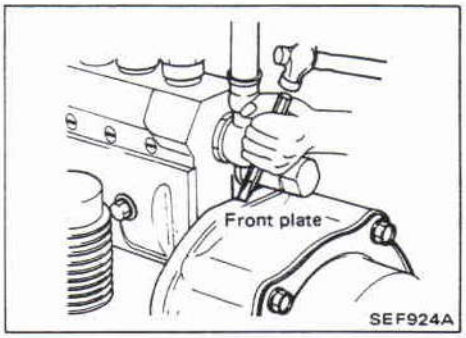
7. While feeding fuel by operating priming pump, slowly move injection pump until fuel flow from No. 1 injection tube stops.
8. Fix injection pump in the position where fuel flow stops.



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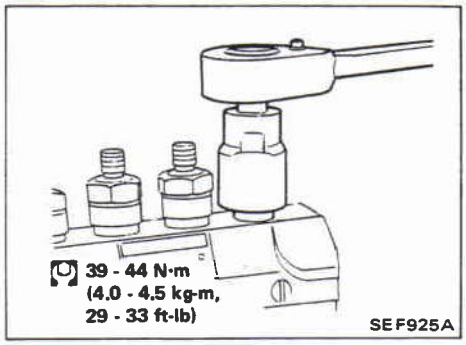
9. Check whether or not the injection timing marks of injection pump and front plate are aligned. If not aligned, stamp a new mark on front plate.



SEF925A

10. Remove No. 1 test tube and delivery valve holder.
11. Install delivery valve spring, delivery valve stopper, delivery valve holder and delivery valve.
12. Install injection tubes, new timing cover gasket and timer cover.

Coat sealant with new timing cover gasket.

13. Connect governor hoses, fuel hoses and engine control wire.
14. Bleed air. Refer to Bleeding Fuel System.

IDLE AND MAXIMUM SPEED ADJUSTMENT

CAUTION:

a. **Do not remove sealing wires unless absolutely necessary.**
b. **Maximum speed adjusting screw is retained by sealing wire and need not be adjusted under normal circumstances. However, if it should become necessary, adjust it with the screw. After adjustment, always wind up with sealing wire.**

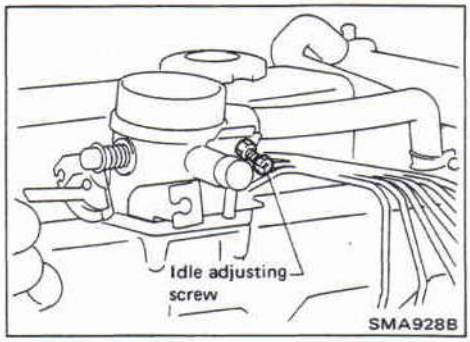
Installation and Adjustment (Cont'd)

Throttle control wire adjustment

1. Make sure that free play is 1 mm (0.04 in) at venturi's throttle lever.
2. If not within the specified range, adjust with wire adjusting nut.
3. After adjusting free play properly, tighten lock nut.

Idle adjustment

Refer to section MA for idle adjustment.



Maximum speed adjustment

Maximum speed adjustment screw is retained by sealing wire and need not be adjusted under normal circumstances. However, if it should become necessary to adjust it, the following procedures should be followed:

1. Start engine and warm it up until coolant temperature indicator points to middle of gauge.
2. Connect tachometer's pick-up to No. 1 fuel injection tube.

To obtain accurate reading of engine rpm, loosen clamp that secures No. 1 fuel injection tubes.

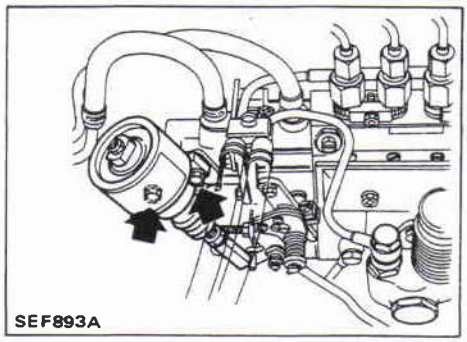
3. To obtain maximum speed, turn the adjusting screw either direction while fully depressing accelerator pedal.

   Maximum engine speed
   (Under no-load):
   4,600± 100 rpm

4. After adjustment, tighten lock nut securely.
5. Wind up with a sealing wire.

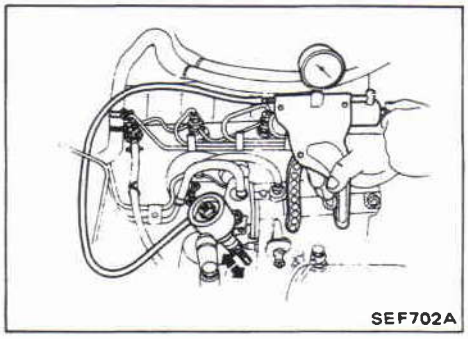
Altitude Compensator (Engine on vehicle)

REMOVAL AND INSTALLATION



1. Remove altitude compensator from bracket.
2. Disconnect vacuum hose and remove bracket from injection pump.
3. Install altitude compensator in the reverse order of removal.

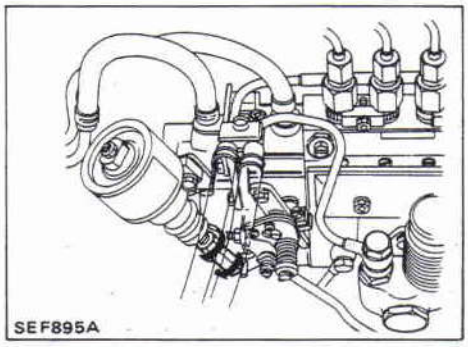
INSPECTION



1. Check for loose connections.
2. Check for altitude compensator movement.

If it does not move, contact a service shop authorized by the pump manufacturer.

Altitude Compensator (Engine on vehicle) (Cont'd)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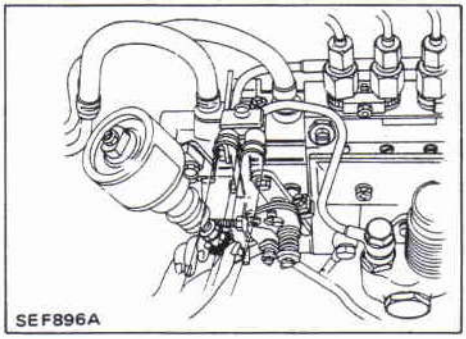

SEF896A

ADJUSTMENT

This adjustment should be performed with injection lever in free position.

1. Loosen lock nut and cap nut of altitude compensator.
2. Turn cap nut touch with injection lever and temporary tighten lock nut.
3. Determining position of cap nut

(1) Precise method

a. Using a barometer, measure atmospheric pressure in areas where vehicles are to be operated.

b. Determine how much the cap nut should be loosened by using the equation below.

$$R = 9.878 \times 10^{-3} \times (760 - P)$$

where

R: Amount of loosening of cap nut (No. of revolutions of cap nut)

P: Measured atmospheric pressure (mmHg)

Reference table

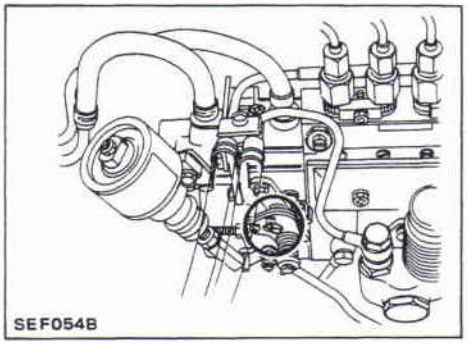
Atmospheric pressure P kPa (mbar, mmHg, inHg)	101.3 (1,013, 760, 29.92)	100.0 (1,000, 750, 29.53)	93.3 (933, 700, 27.56)	86.6 (866, 650, 25.59)	80.0 (800, 600, 23.62)	73.3 (733, 550, 21.65)	66.7 (667, 500, 19.69)
Amount of loosening of cap nut (No. of revolutions of cap nut)	0	0.1 - 0.3	0.4 - 0.8	0.9 - 1.3	1.4 - 1.8	1.9 - 2.3	2.4 - 2.6

Altitude Compensator (Engine on vehicle) (Cont'd)

(2) Expedient method

Determine how much the cap nut should be loosened, according to altitude above sea level.

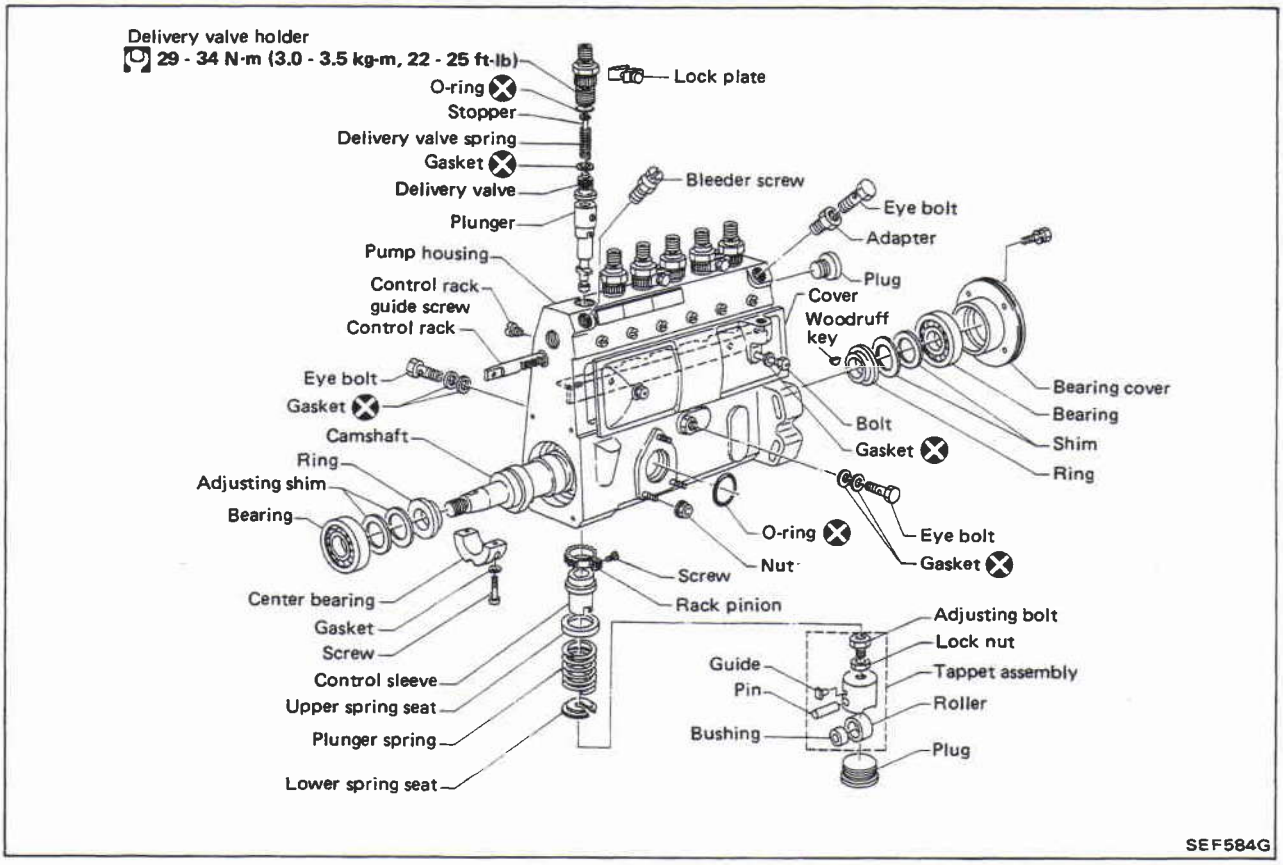
Approximate altitude m (ft)	0 (0)	120 (394)	700 (2,297)	1,300 (4,265)	2,000 (6,562)	2,700 (8,859)	3,400 (11,155)
Amount of loosening of cap nut (No. of revolutions of cap nut)	0	0.1 - 0.3	0.4 - 0.8	0.9 - 1.3	1.4 - 1.8	1.9 - 2.3	2.4 - 2.6



4. Mark cap nut indicating the number of times cap nut should be rotated according to altitudes in which vehicles are to be operated.
5. Tighten lock nut.

Ensure that bolt comes into contact with injection pump lever. If it does not, loosen the bolt and readjust.

Disassembly

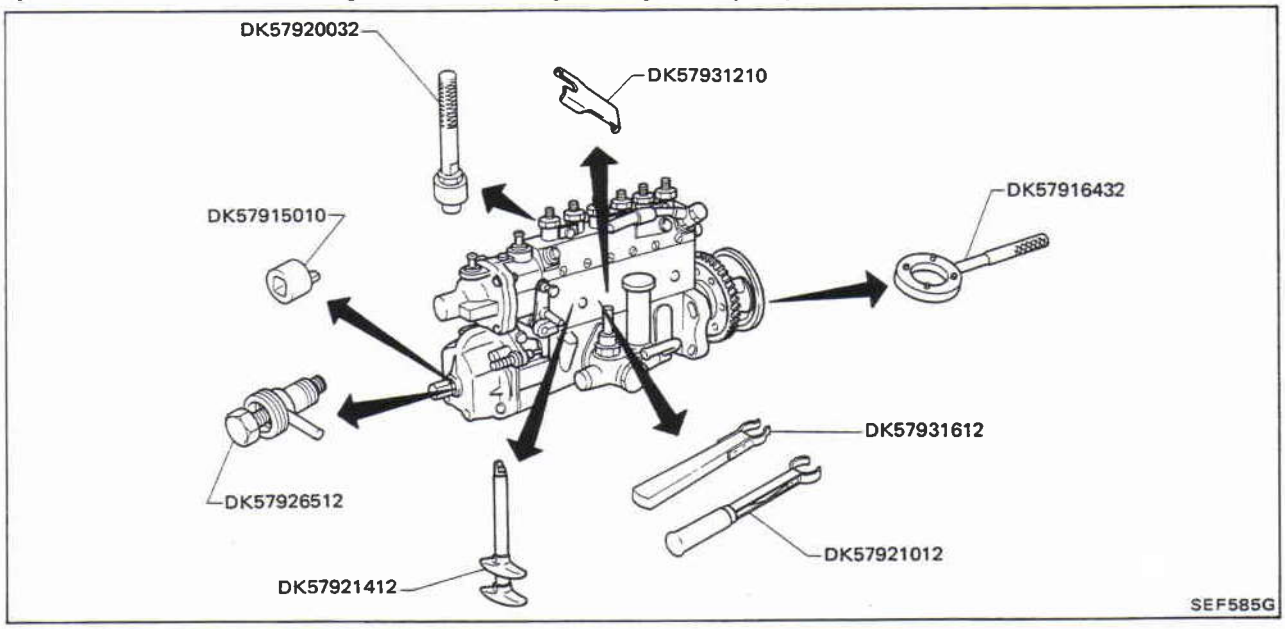


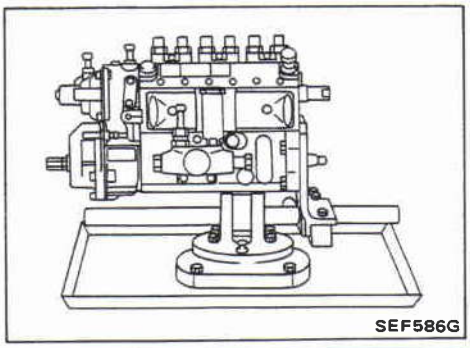
Disassembly (Cont'd)

PREPARATION

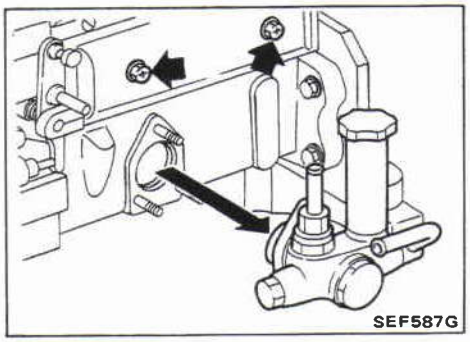
- Before performing disassembly and adjustment, test fuel injection pump and note test results except when testing is impossible.
- Prior to beginning to disassemble fuel injection pump, clean all dust and dirt from its exterior.
- Clean work bench completely, removing all foreign matter.
- Collect only those service tools necessary for disassembling and reassembling.
- Be careful not to bend or scratch any parts.
- Be careful not to mix parts of different cylinders.

Special tools for disassembling and reassembling fuel injection pump



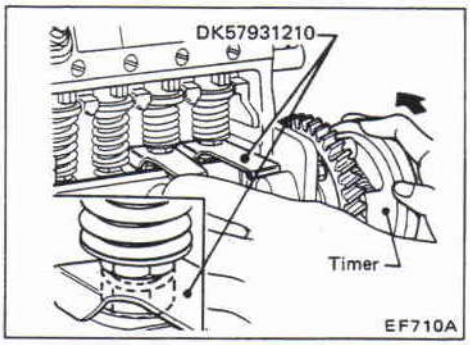


1. Drain injection pump oil.
2. Attach injection pump with Tool.



3. Remove feed pump and cover plate.
4. Check backlash between control rack and control pinion. **Refer to Inspection.**

Disassembly (Cont'd)



5.
(1) Temporarily install timer to injection pump.
(2) Turn timer until tappet is raised to T.D.C. for each cylinder and then install Tool between tappet adjusting bolt and nut.

If Tool cannot be installed, loosen tappet adjusting bolt.

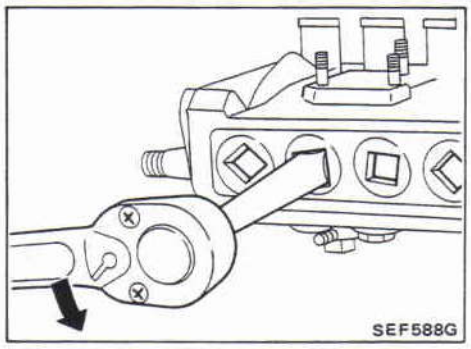
6. Check camshaft end play.

Refer to Inspection.

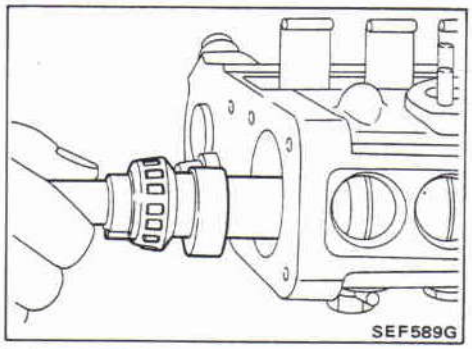
7. Remove mechanical governor cover, diaphragm cover, diaphragm, flyweight and governor housing.

Refer to Governor for removal.

8. Remove plug.



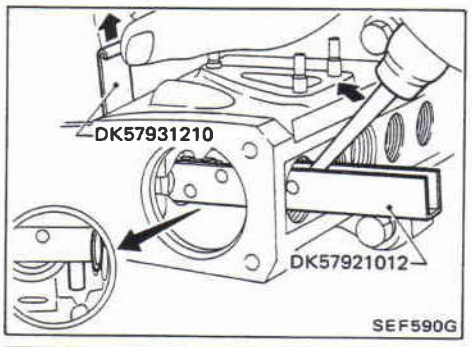
9. Draw out camshaft.



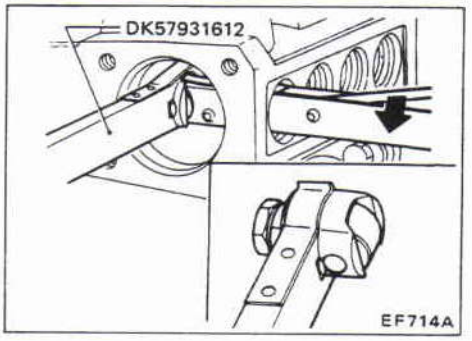
10. Remove Tool DK57931210 by pushing tappet with Tool DK57921012.

CAUTION:

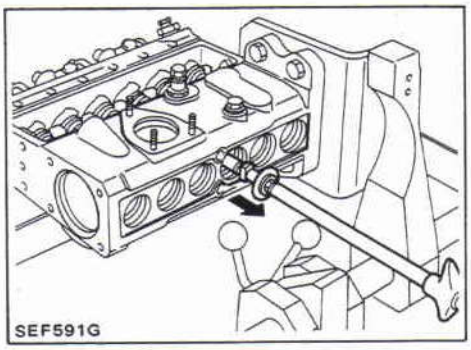
Be careful not to damage housing plug hole threads.



11. Withdraw tappet assembly with Tool DK57931612 from camshaft chamber by loosening Tool DK57921012.



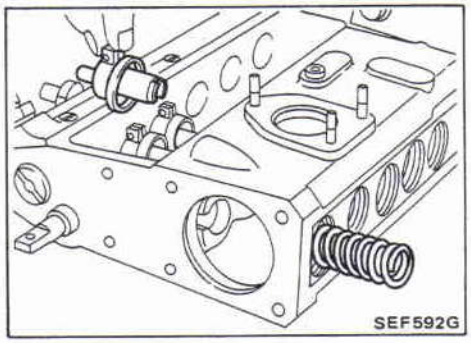
Disassembly (Cont'd)



12. Remove plungers together with lower spring seat with Tool.

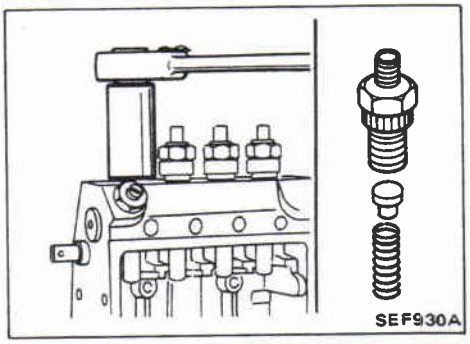
CAUTION:

Lay out plunger and plunger barrel in order in a pan of kerosene or solvent. Do not touch plunger with hand.

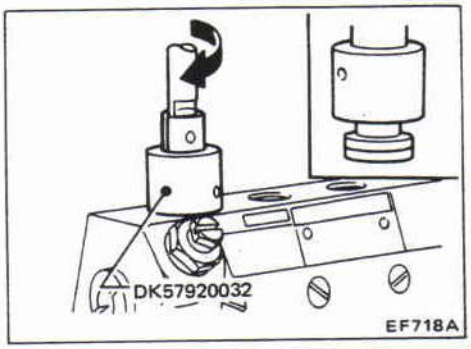


13. Remove plunger spring, upper spring seat and control sleeve assembly.

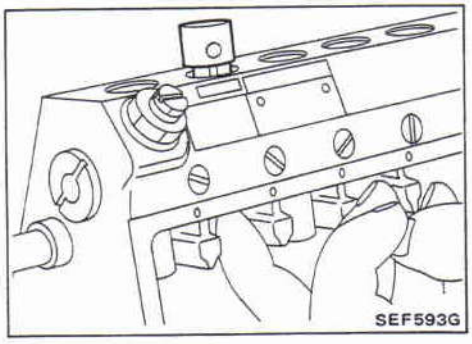
When disassembling control sleeve assembly, put matching mark.



14. Remove lock plate.
15. Remove delivery valve holder and then remove delivery holder spring, and delivery valve stopper.



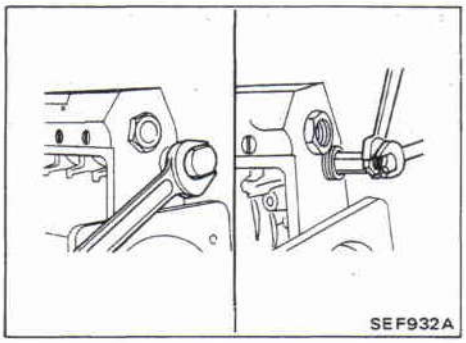
16. Remove delivery valve by threading in Tool.

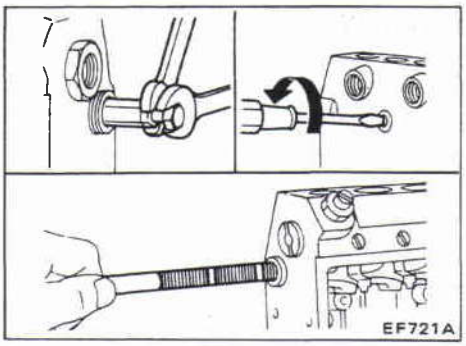


17. Remove plunger barrel by pushing it from below.

Disassembly (Cont'd)

18. Remove cap and bolt and nut on control rack.


SEF932A


EF721A

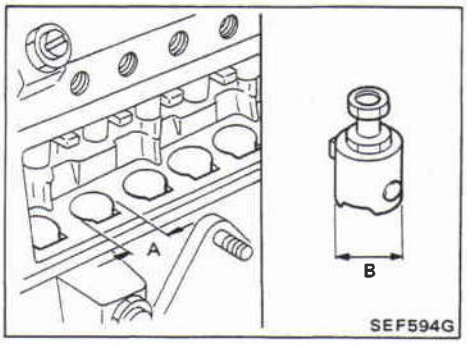
19. Remove control rack guide screw and then draw out control rack.

Inspection

PUMP HOUSING

1. Inspect for damage, cracks, etc.
   If excessively damaged, replace it with a new housing.
2. Check plunger barrel drum surface for proper contact with plunger barrel seating hole. Also, check for damage or cracks.
   If faulty, replace with a new plunger and plunger barrel.
3. Measure tappet to housing clearance. If worn beyond wear limit, replace tappet or housing.

Tappet to housing clearance (A–B):
Limit
0.2 mm (0.008 in)



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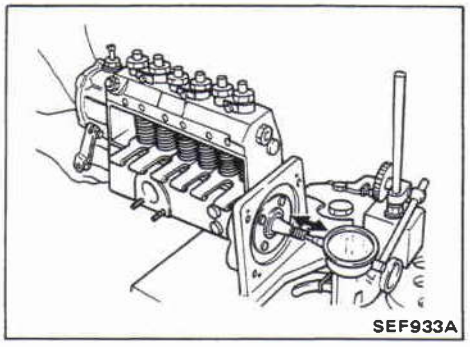

SEF933A

CAMSHAFT

1. Measure cam profile for uneven or excessive wear. If excessively or unevenly worn, replace camshaft with a new one.
2. Check for damage, cracks, etc.
   If excessively damaged, replace it with a new one.
3. Measure camshaft end play by pushing camshaft from timer end so as to move camshaft in shaft direction.

Camshaft end play:
Standard
0 - 0.02 mm (0 - 0.0008 in)
Limit
0.1 mm (0.004 in)

If camshaft end play is over limit, adjust as follows:

(1) Remove bearing inner race from camshaft.
(2) Based upon end play measurement, increase or decrease adjusting shims.

Use the same shim thickness on each end.

(3) Re-install bearing inner race on camshaft.

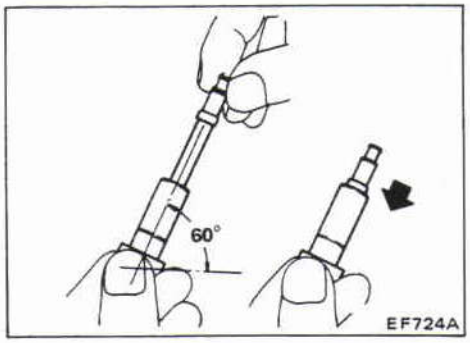
Inspection (Cont'd)

BEARINGS

Check for wear or discoloration. If faulty, replace with a new one.

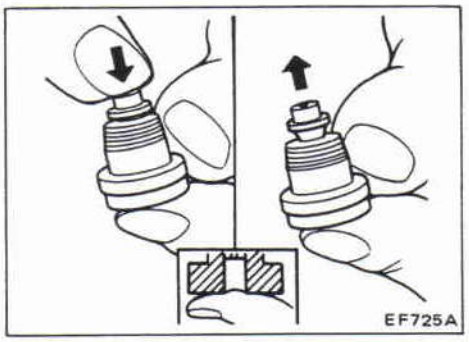
PLUNGER AND PLUNGER BARREL

The operation of the plunger should be checked based on the results of fuel injection volume measurement.



OIL-TIGHTNESS CHECK

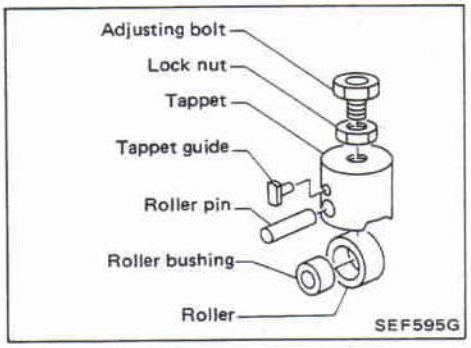
1. Thoroughly clean plunger barrel in clear kerosene or solvent.
2. Tilt it to approximately 60°. Then, let plunger slide down through barrel, making sure that plunger slides smoothly. Repeat this procedure by turning plunger to various positions, making sure that plunger slides smoothly in any of the positions.
   When replacement is required, replace both the plunger and plunger barrel as a set.



DELIVERY VALVE

Air-tightness check

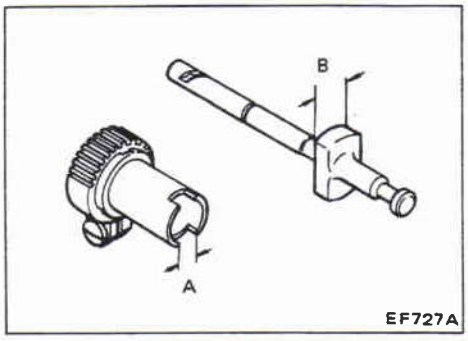
1. Thoroughly clean delivery valve and delivery valve seat in clear kerosene or solvent.
2. Place finger over lower part of valve seat, lightly depress delivery valve with your finger tip, and make sure that valve springs back when released. If valve falls to valve seat, it is not operating properly due to excessive piston wear. If faulty, replace with a new valve and valve seat assembly.



TAPPET

Inspect tappet, roller, roller bushing, and pin for wear or damage. If faulty, replace with new components, as required.

Adjusting bolt head recess wear limit:
0.20 mm (0.0079 in)
Roller end play limit:
0.20 mm (0.0079 in)

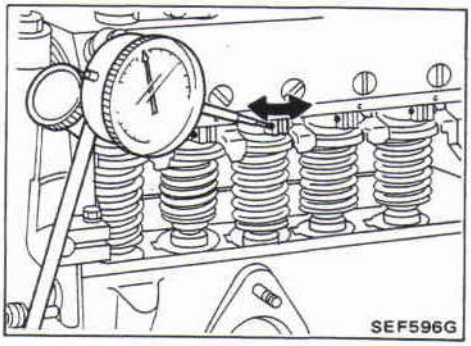


CONTROL RACK AND CONTROL SLEEVE ASSEMBLY

1. Inspect control rack for bending and damage.
   If faulty, repair or replace with a new control rack, as required.
2. Measure control sleeve to plunger lug clearance. If worn excessively, replace control sleeve or plunger, as required.

Control sleeve to plunger lug clearance (A—B):
Limit
0.12 mm (0.0047 in)

Inspection (Cont'd)



3. Measure backlash between control rack and control pinion.

Backlash between control rack and control pinion:
Limit
0.30 mm (0.0118 in)

SPRING

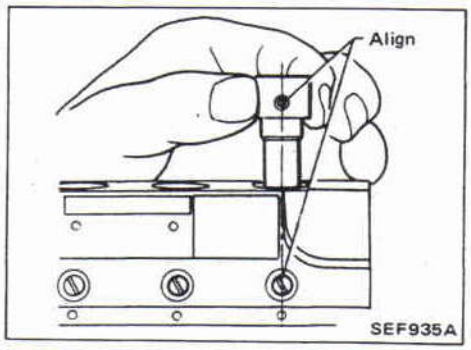
Inspect plunger and delivery valve springs for damage and squareness.

Assembly

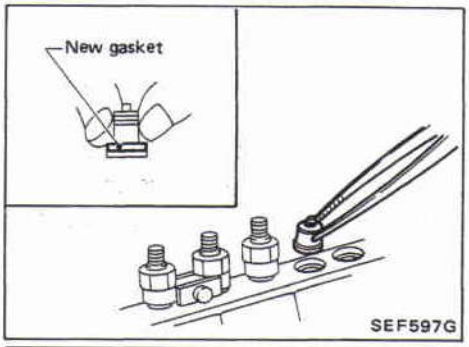
Clean parts thoroughly and apply a thin coat of engine oil to rotating and sliding parts.

Assemble injection pump in the reverse order of disassembly.

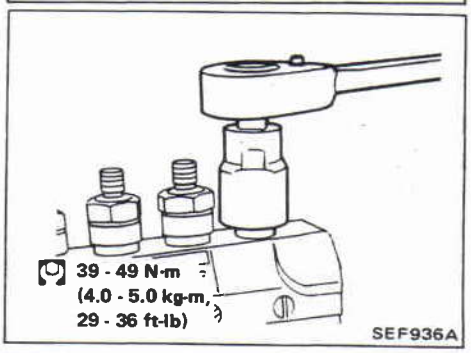
Note the following items.



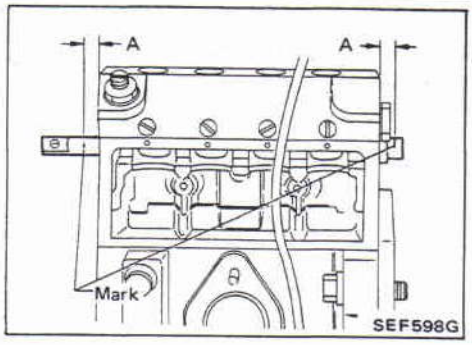
1. Set plunger barrel in position, with hole in barrel aligned with dowel pin of housing.



2. Install delivery valve with new gasket on the plunger barrel.



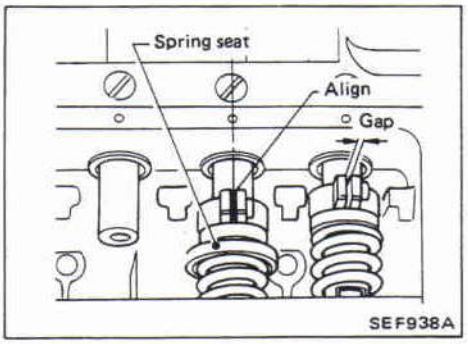
3. Install delivery valve spring delivery valve stopper (if so equipped) and delivery valve holder.



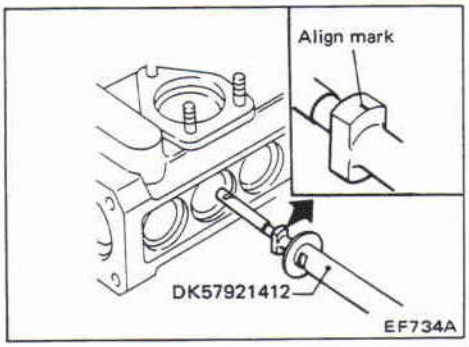
4. Install lock plates.
5.

(1) Set the control rack so that marks on both sides are same distance "A" from each end of pump housing.
(2) Adjust bolt length and tighten lock nut.
(3) Then install control rack guide screw.

Assembly (Cont'd)

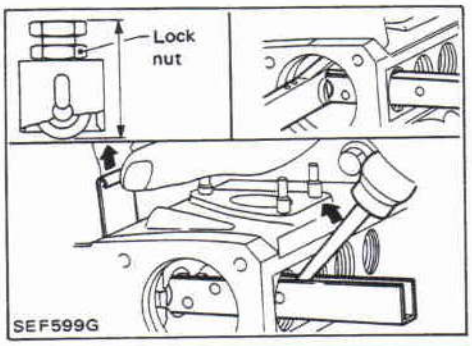


6. Install control sleeve assembly with gap of control sleeve facing straight up. Then install upper spring seats and plunger springs.

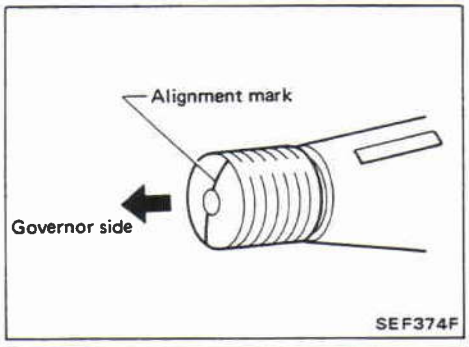


7. Install plunger together with lower spring seat by using Tool with plunger alignment mark facing upward (cover side of pump housing).

Do not use plunger with a barrel from a different cylinder.



8. Install tappet assembly by reversing the removal procedure.



9. Install camshaft so that its alignment mark is toward governor.
10. Install governor housing and then adjust camshaft end play.

Refer to Inspection.

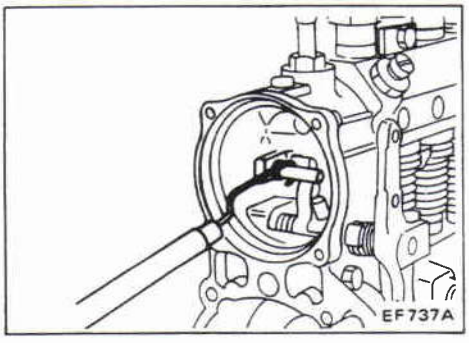
11. Install screw plug on bottom of pump housing.

Seal the plug with sealant.

: Screw plug
54 - 74 N·m
(5.5 - 7.5 kg-m, 40 - 54 ft-lb)

12. Temporarily install timer and remove Tool DK57931210 while turning timer.
13. Measure control rack sliding resistance.

Control rack sliding resistance:
Less than 1.471 N (150 g, 5.29 oz)



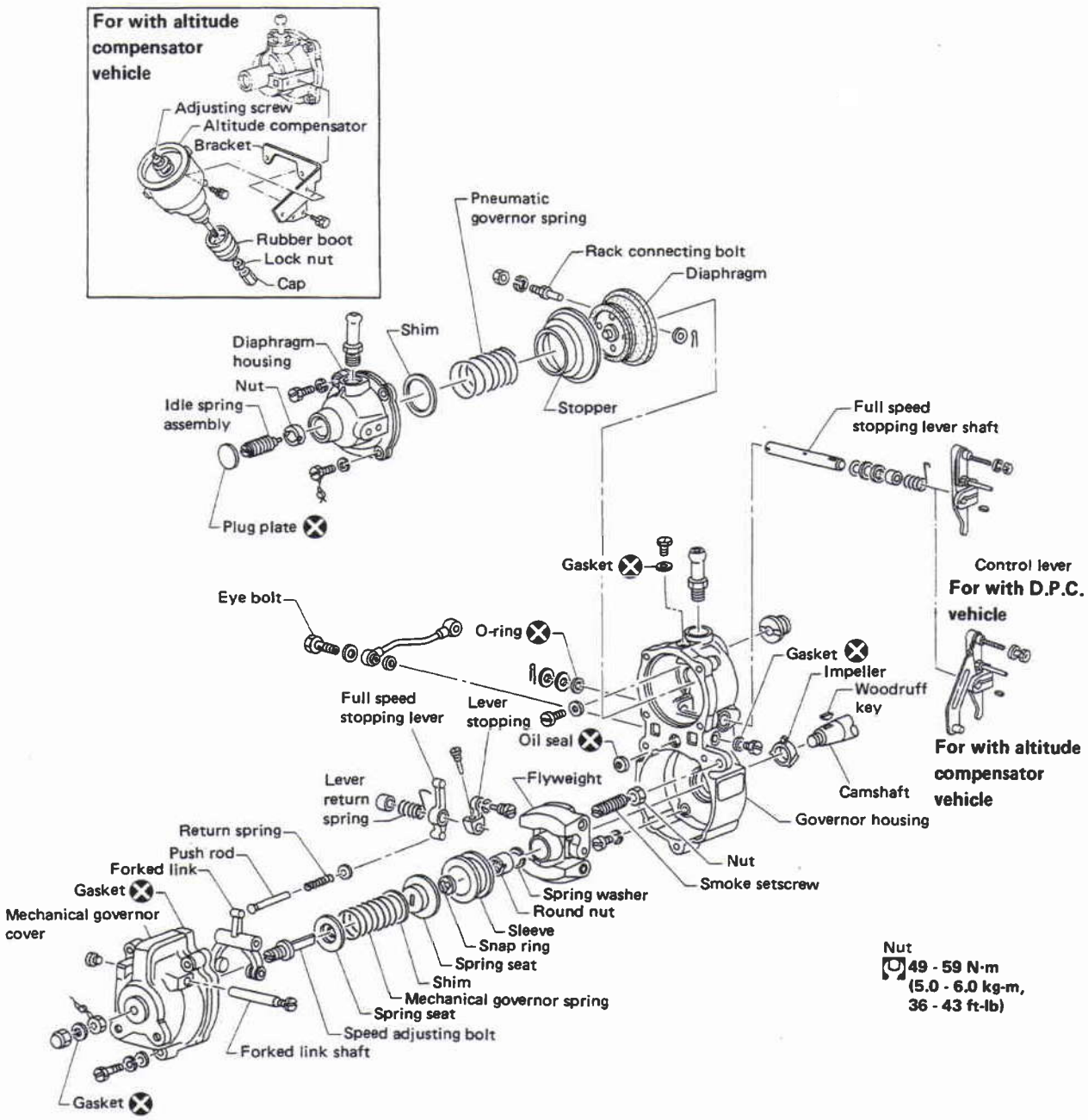
14. Install flyweight, diaphragm, diaphragm cover and mechanical governor cover in that order.

Refer to Governor for installation.

15. Install control rack cap, cover and feed pump.

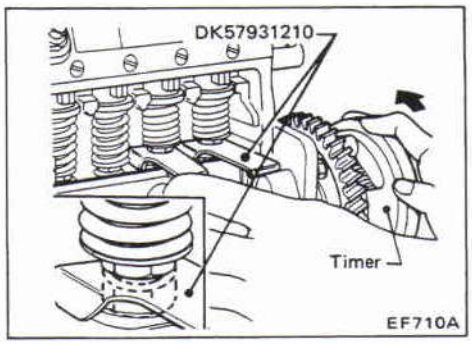
Governor

DISASSEMBLY



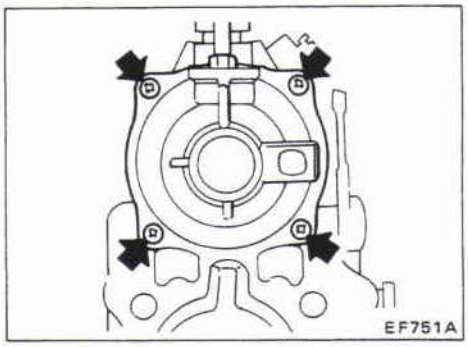
SEF600G

Governor (Cont'd)

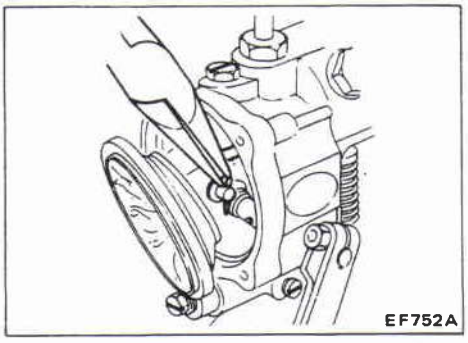


1. Attach injection pump with Tool KV11244852 (Universal vise) and then remove feed pump and cover plate.
2. Install Tool between tappet adjusting bolt and nut.

Refer to Injection pump for tappet holder installation.

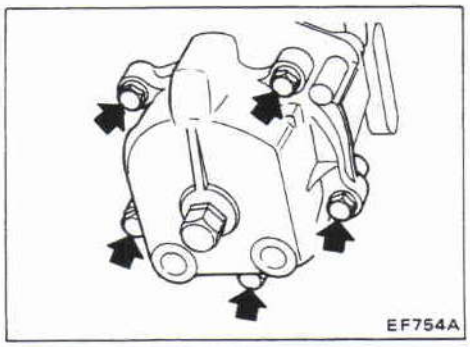


3. Remove diaphragm cover, pneumatic governor spring and shims.



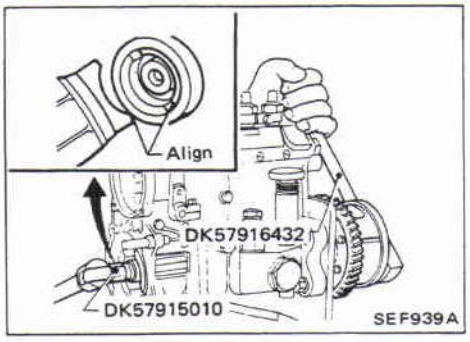
4. Remove diaphragm by pulling cotter pin out with pulling it out from housing.

Be careful not to damage the diaphragm.



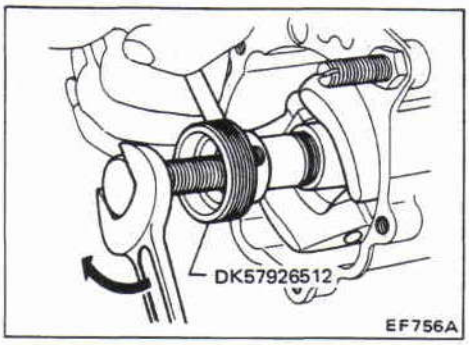
5.

(1) Remove mechanical governor cover gasket, push rod, spring and shim.

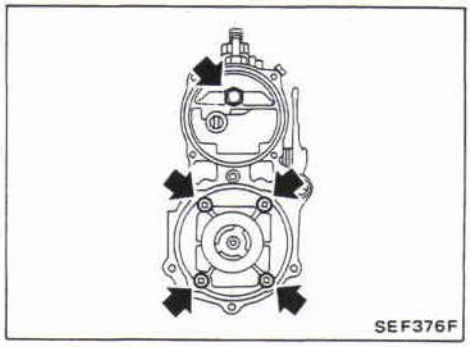


(2) Attach timer and lock camshaft with Tool ST17080000 (DK57916432).
Remove round nut with Tool DK57915010.

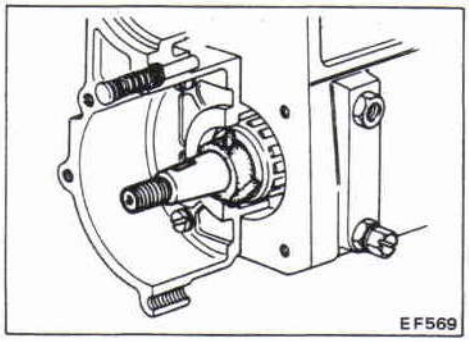
Governor (Cont'd)



(3) Remove flyweight with Tool.



6. Remove governor housing.

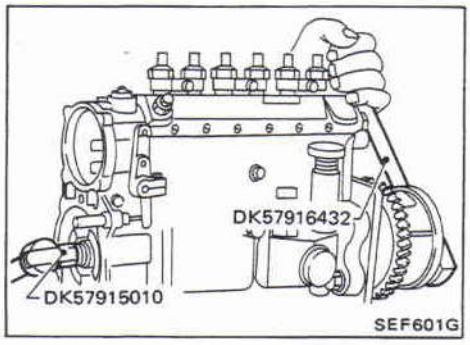


ASSEMBLY

Assemble governor in the reverse order of disassembly, noting following item.

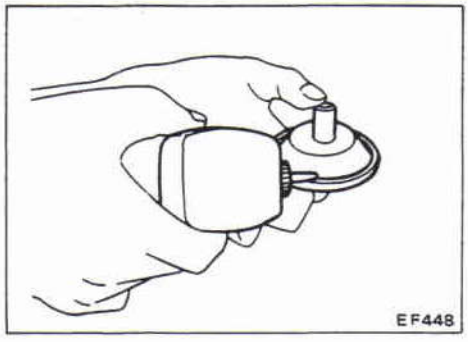
Do not install plate plug until idle adjustment is made.

1. Make sure that impeller is installed to the camshaft with flat blade side toward governor.



2. Apply liquid sealant to new governor cover gasket.

   : **Flyweight round nut**
   49 - 59 N·m
   (5.0 - 6.0 kg-m, 36 - 43 ft-lb)

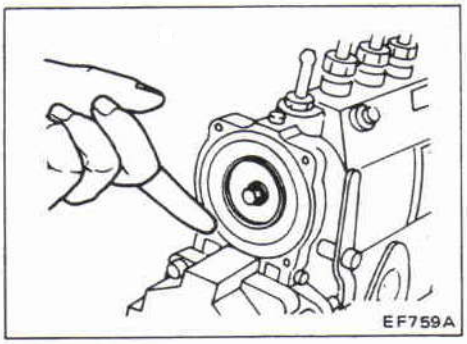


3. Apply diaphragm oil to diaphragm.

CAUTION:

- **Do not allow gasoline to be left on diaphragm.**
- **Use diaphragm oil.**

Governor (Cont'd)



4. Coat caulking part of diaphragm and governor housing with grease. Be careful not to allow grease to get on the diaphragm surface.
5. Adjust injection pump with a pump tester. Refer to "Testing Injection Pump for Governor".

Test

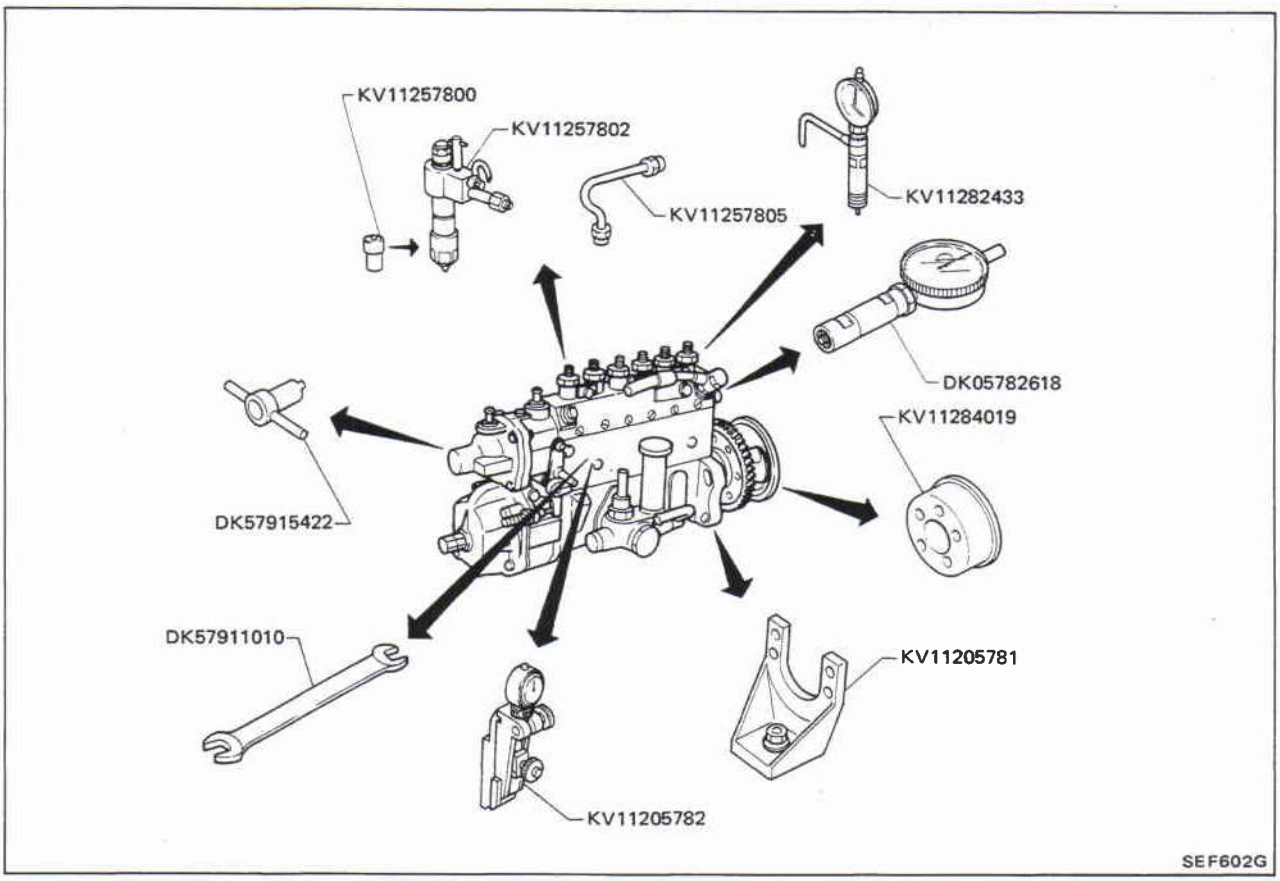
PREPARATION

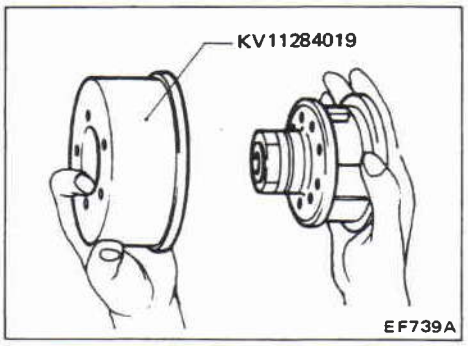
Injection pump test conditions

Nozzle		KV11257800
Nozzle holder		KV11257802
Nozzle starting pressure	kPa (bar, kg/cm^2, psi)	17,162 (171.6, 175, 2,489)
Nozzle tube Inner dia. x outer dia. x length	mm (in)	KV11257805 2.0 x 6.0 x 600 (0.079 x 0.236 x 23.62)
Fuel feed pressure	kPa (bar, kg/cm^2, psi)	147 - 157 (1.47 - 1.57, 1.5 - 1.6, 21 - 23)
Fuel (test oil)		ISO 4113 or SAE Standard Test Oil (SAE J967d)
Fuel temperature	°C (°F)	40 - 45 (104 - 113)
Rotating direction		Right (observed from the drive shaft)
Injection sequence		1-4-2-6-3-5

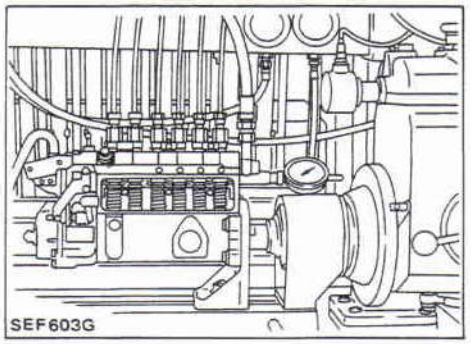
Test (Cont'd)

1. Prepare necessary service tools.





2. Remove fuel feed pump and cover plate.
3. Remove timer drive gear and attach coupling.



4. Install fuel injection pump on the bed of tester with Tool KV11205781. Then attach timer to pump.
5. Connect coupling to tester drive shaft with coupling disc.
6. Connect flexible hose from tester to injection pump.
7. Bleed air from injection pump.

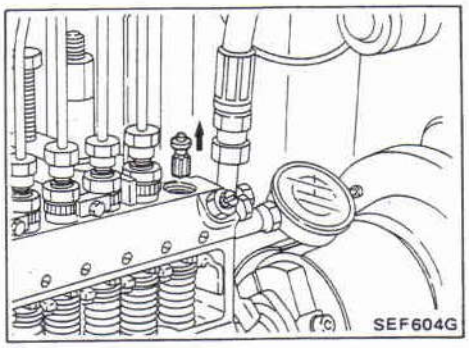
Test (Cont'd)

ADJUSTMENT

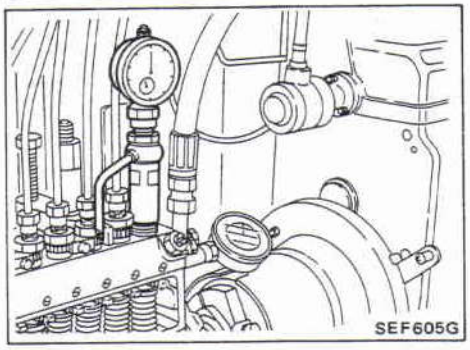
Adjusting injection timing

1. Adjust No. 1 injection timing.

(1) Remove injection tube, delivery valve holder, spring and valve for No. 1 cylinder.


SEF604G

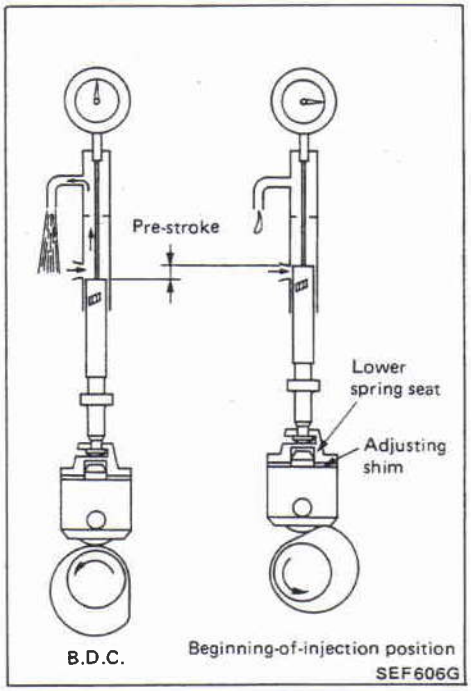
(2) Set a Tool to the pump housing.


SEF605G

(3) Rotate camshaft (pump tester) clockwise, and measure the lift of 1st plunger when fuel flow from the measuring device pipe stops.

Pre-stroke:

Refer to S.D.S.

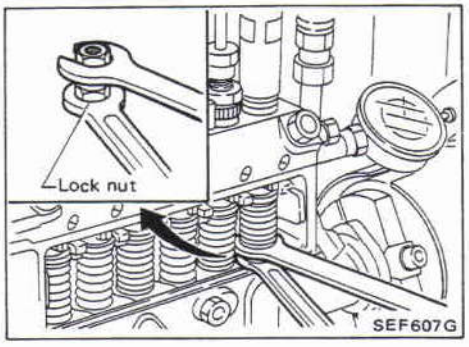


SEF606G

2. If pre-stroke is not within specification, adjust injection timing.

(1) Rotate camshaft until cam reaches T.D.C. position.

(2) Adjust the position of the adjusting bolt so that desired pre-stroke can be obtained.



SEF607G

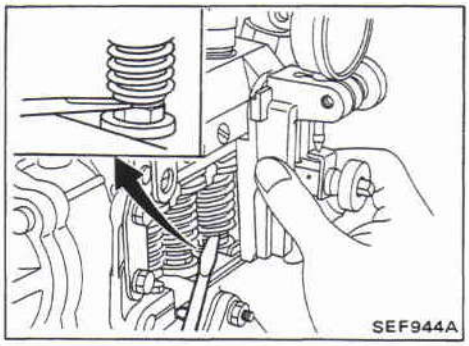
Test (Cont'd)

3. Adjust No. 2 to No. 6 cylinder injection timing.

(1) Set No. 1 cylinder to injection start timing position, and set angle scale on tester flywheel at "0°".

(2) Turn tester flywheel to the angle shown below, and make sure that fuel flow from test nozzle stops.
If pre-stroke (injection timing) is incorrect, adjust the timing by following step 2.

Cylinder No.	1	4	2	6	3	5
Injection starting angle	0	60°±30′	120°± 30′	180°± 30′	240°± 30′	300°± 30′


SEF944A

4. Check top clearance.

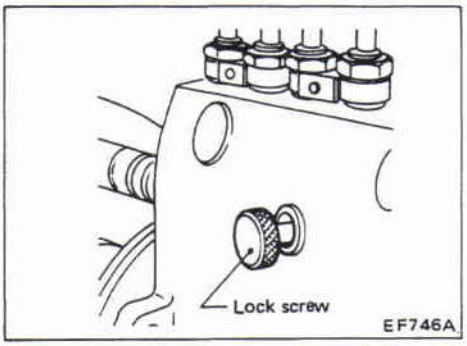
(1) Place the cam for each cylinder in the T.D.C. position.

(2) Insert a screwdriver between the tappet adjusting bolt and lock nut.

(3) Lift the tappet using the screwdriver.

(4) Measure the top clearance using the measuring device.

(5) Ensure the top clearance is 0.3 mm (0.012 in) or more. If the top clearance is less than 0.3 mm (0.012 in) readjust the pre-stroke.



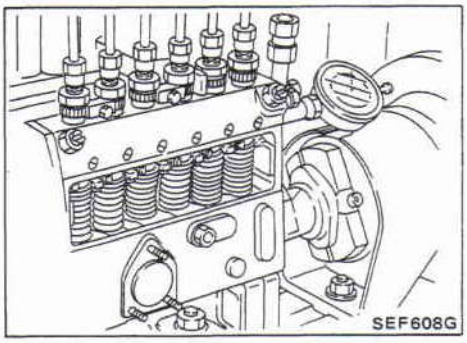
EF746A

Adjusting injection volume

1. Remove control rack guide screw and install lock screw to fix control rack on pump housing.

CAUTION:

Tighten lock screw by hand.


SEF608G

2. Set Tool DK05782618 to control rack.

(1) When setting tool, push control rack fully toward governor side, and align the "0" on measuring device scale.

(2) Take off diaphragm housing together with governor spring. Otherwise, "0" position may not be obtained.

(3) Pull down full control lever toward fuel increasing side, and check the stroke of control rack.

Control rack stroke:
Refer to S.D.S.

Test (Cont'd)

3. Set fuel feed pressure.

Fuel feed pressure:
147 - 157 kPa (1.47 - 1.57 bar, 1.5 - 1.6 kg/cm², 21 - 23 psi)

4.

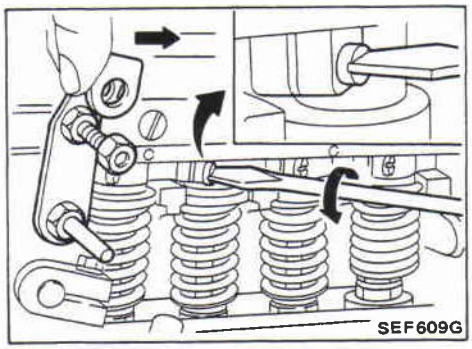
(1) Measure injection volume for each cylinder at rated pump speed and control rack position.

Injection volume:
Refer to S.D.S.

(2) Compute allowable imbalance of fuel injection volume.

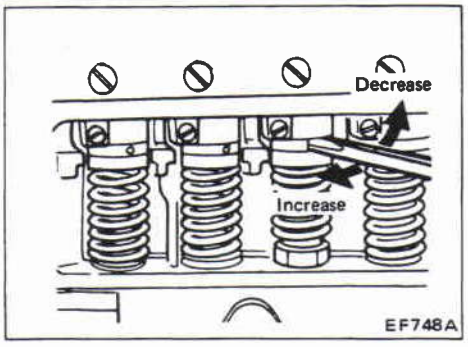
$$\text{Allowable imbalance} = \frac{\left(\begin{array}{l}\text{Max. or min.}\\ \text{injection volume}\\ \text{for each plunger}\end{array}\right) - \left(\begin{array}{l}\text{Mean}\\ \text{injection}\\ \text{volume}\end{array}\right)}{\text{Mean injection volume}} \times 100$$

Allowable imbalance:
Refer to S.D.S.



5. Adjust injection volume so that specified injection volume and allowable imbalance are obtained.

(1) Loosen control pinion clamp screw.



(2) Place suitable tool into hole in control sleeve and adjust by rotating control sleeve.

(3) After adjustment is completed, tightly secure pinion set screw.

(4) Remove lock screw from control rack and reinstall guide screw.

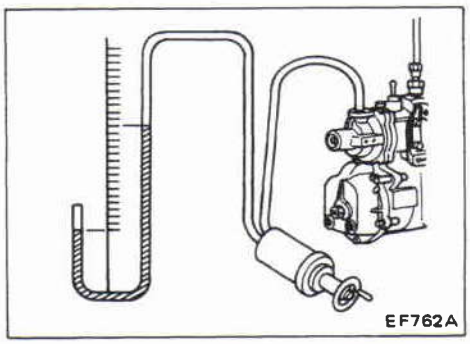
6. Install diaphragm housing and governor spring.

GOVERNOR

Adjustment

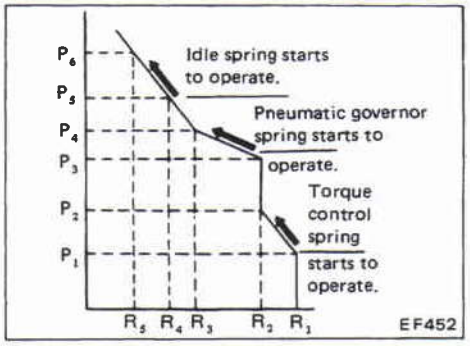
a. **When making a governor performance test, maintain the pump speed at 500 rpm.**
b. **Gradually step up negative pressure when adjusting.**
c. **Test and adjust injection timing and injection volume before testing governor.**

Test (Cont'd)


EF762A

Air-tight test

1. Apply a negative pressure of 4.904 kPa (49.04 mbar, 500 mmH_2O, 19.69 inH_2O) to governor with rack set at position R_1.

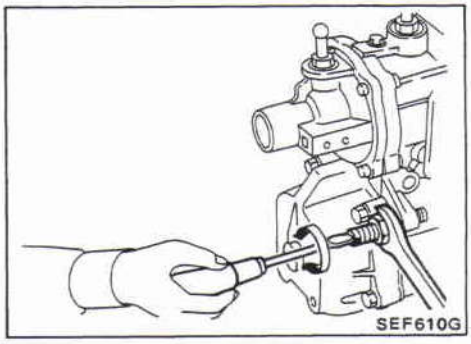


EF452

2. Make sure that negative pressure will not drop below the specified value within 10 seconds.

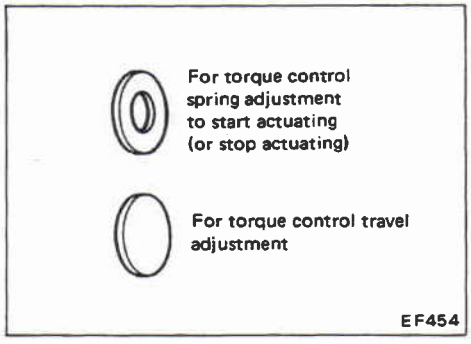
Negative pressure:
4.904 - 4.707 kPa (49.04 - 47.07 mbar, 500 - 480 mmH_2O, 19.69 - 18.90 inH_2O)/ more than 10 seconds

If it drops in less than 10 seconds, check the diaphragm and replace if necessary.


SEF610G

Smoke setscrew adjustment

With no negative pressure applied, adjust the smoke setscrew so that the rack is set at position R_1.



EF454

Torque mechanism adjustment

1. Check that torque control spring starts to actuate at negative pressure P_1 and stops at P_2. In other words, torque control travel is $R_1 - R_2$.

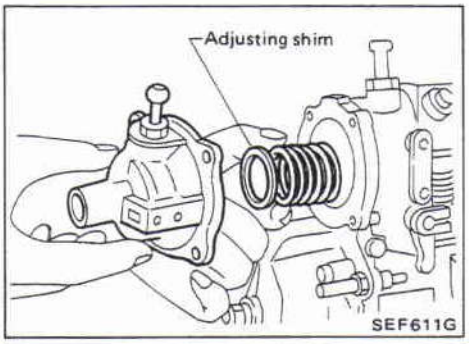
Torque control travel:
Refer to S.D.S.

2. If torque mechanism adjustment is not within the specifications:

(1) Remove diaphragm.
(2) Add or remove shim(s) (two types) as required until correct torque mechanism adjustment is made.

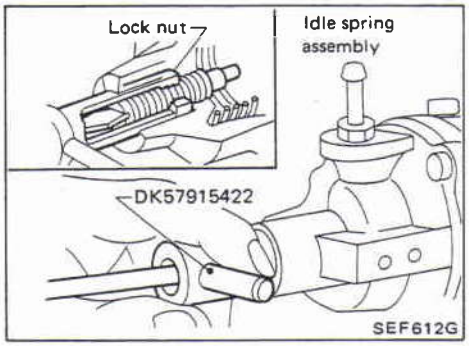
After installing diaphragm, make an air-tight test again.

Test (Cont'd)



High-speed adjustment (Pneumatic governor section)

1. Increase negative pressure. Adjust governor shim until there is a balanced condition between rack position R_2 and negative pressure P_3.
2. Gradually increase negative pressure. Make sure that negative pressure is P_5 when rack is moved to position R_4.



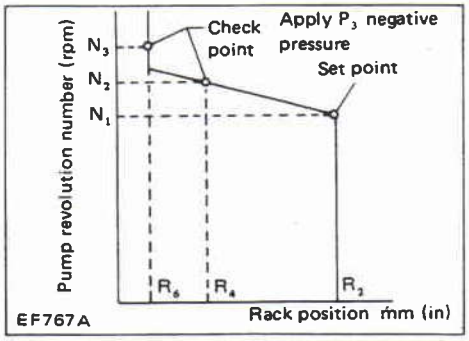
Idle adjustment

1. With negative pressure kept at P_4, turn idle spring screw in with Tool until rack is set at position R_3.
2. Tighten lock nut.
3. Further increase negative pressure. Make sure that negative pressure is P_6 when rack is set at position R_5.

If necessary, replace idle spring as an assembly.

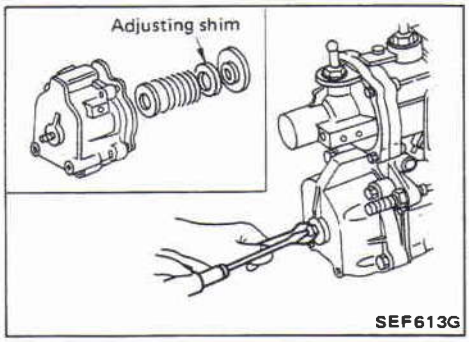
4. Install plate plug.

Apply adhesive to the plug in order to prevent air leaks or the plug from detaching.



High-speed adjustment (Mechanical governor section):

1. With negative pressure kept in condition P_3, increase pump speed.



2. Adjust adjusting bolt of governor spring so that pump speed is N_1 when rack starts to be pulled from R_2.

If above adjustment cannot be made properly by means of adjusting bolt, add or remove mechanical governor spring shim(s).

3. Increase pump speed, and make sure that pump speed is N_2 when rack is set at point R_4.

If pump speed is within specified range, replace mechanical governor spring and readjust.

4. Further increase pump speed, and make sure that rack is set at point R_6 when pump speed is N_3.

a. If rack is not properly set at position R_6, check for wear on part(s) between flyweight and push rod and for proper assembly of pump housing.

b. If necessary, replace push rod.

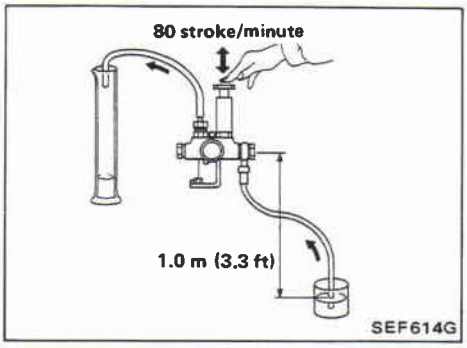
Feed Pump

After installing feed pump, bleed air from system.

TEST

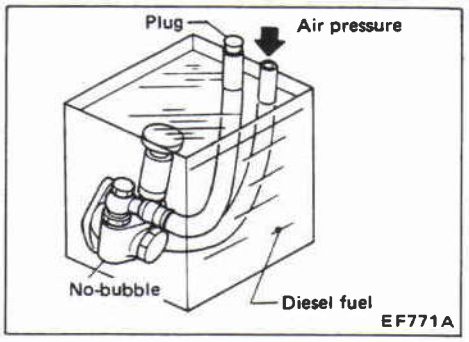
Standard fuel feed volume

The volume of fuel displaced by the feed pump is more than 405 mℓ (14.3 Imp fl oz) for each 15 seconds at 1,000 rpm. The discharge pressure is 333 to 412 kPa (3.33 to 4.12 bar, 3.4 to 4.2 kg/cm², 48 to 60 psi) at 600 rpm.



Pump performance test

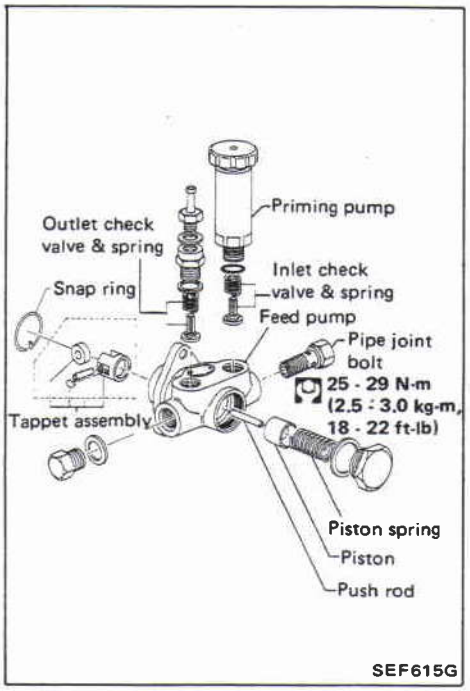
1. Connect a pipe to intake side of feed pump, and set pump so that fuel can be sucked up from fuel level 1.0 m (3.3 ft) below the pump.
2. Operate priming pump at 80 strokes per minute, and make sure that fuel can be sucked up in less than 25 strokes.



Air-tightness test

1. Stop up fuel feed pump discharge port and apply 147 to 196 kPa (1.47 to 1.96 bar, 1.5 to 2.0 kg/cm², 21 to 28 psi) of air pressure to intake side of pump.
2. Immerse pump in kerosene (light oil) and make sure that no air leaks from any of pump connections. If bubbles larger than one grain come from fuel feed pump housing or push rod joint continuously, replace oil seal at push rod or push rod.

   Replace feed pump assembly, if necessary.



INSPECTION

Feed pump housing

1. Check check valve seats. If they are damaged or excessively worn, replace housing.
2. Check push rod hole. If hole is excessively worn, replace housing.

Check valve and check valve spring

1. If seat of check valve is excessively worn or scarred, replace check valve with a new one.
2. If check valve spring is damaged or permanently stressed, replace valve spring.

Piston and piston spring

1. If periphery of piston is excessively worn or scarred, replace piston with a new one.
2. If piston spring is damaged or weakened, replace valve spring.

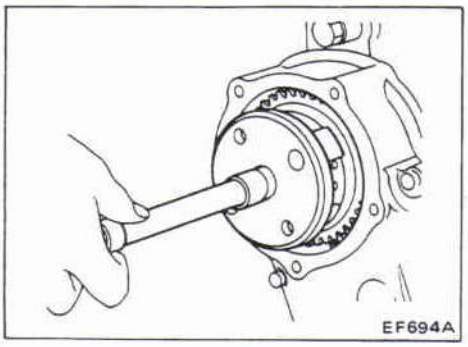
Tappet assembly

1. Tappet

   If periphery of tappet is worn or scarred, replace it with a new one.

Feed Pump (Cont'd)

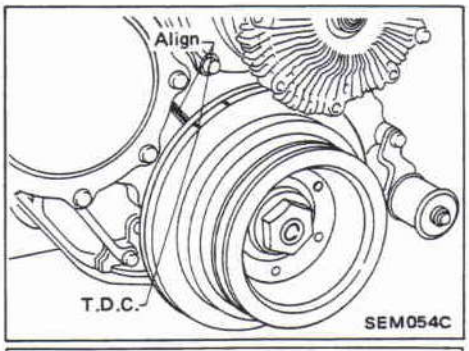
2. Tappet roller
   If periphery of tappet roller is excessively worn or scarred, replace it with a new one.
   Roller to pin clearance:
   Limit
   0.30 mm (0.0118 in)
   Tappet roller outside diameter:
   Wear limit
   14.9 mm (0.587 in)


EF694A

Timer

REMOVAL

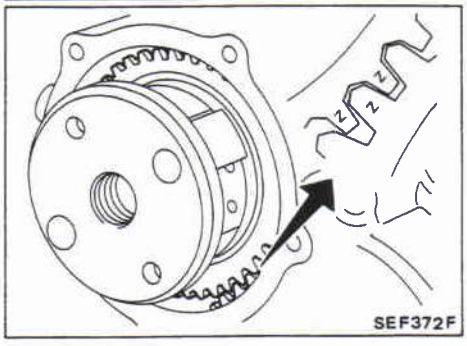
1. Remove timing gear cover.
2. Remove timer round nut.
3. Remove timer assembly by threading in Tool.



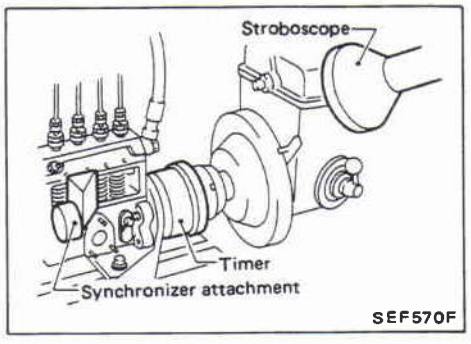
SEM054C

INSTALLATION

1. Align crank pulley and timing gear case cover marks so that No. 1 piston is at top dead center.


SEF372F

2. Mesh injection pump drive gear with idler gear at Z-mark, and then align gear to key way of injection pump camshaft while turning crank pulley.
3. Secure timer assembly with lock washer and round nut.
   ⓞ : **Round nut**
   59 - 69 N·m
   (6 - 7 kg-m, 43 - 51 ft-lb)
4. Install timing gear cover with new gasket sealed.



SEF570F

ADJUSTMENT

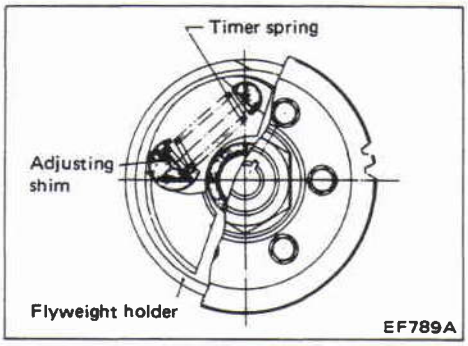
1. Install stroboscope, using cover plate bolts, so that synchronizer lever attachment is applied to tappet.
2. Operate fuel injection pump, turn "ON" switch of stroboscope illuminating dial (angle scale) on flywheel, and measure angular change based on variations in pump speed.

If tester does not have a dial (angle scale):

(1) Attach a dial to timer coupling and mount a pointer on tester drive shaft.

Timer (Cont'd)

(2) Operate fuel injection pump and turn stroboscope "ON" so as to illuminate dial.



3. If advance angle is not within specified range, adjust by changing timer spring shims.

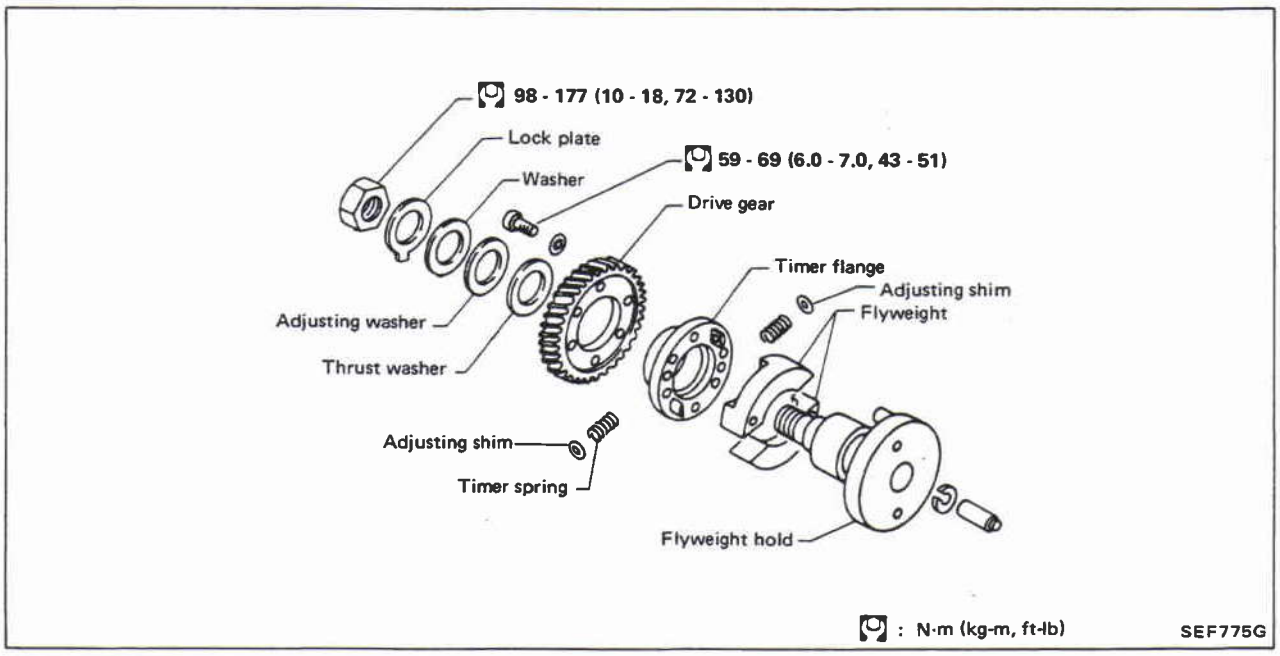
a. When injection timing is retarded, decrease shim thickness.

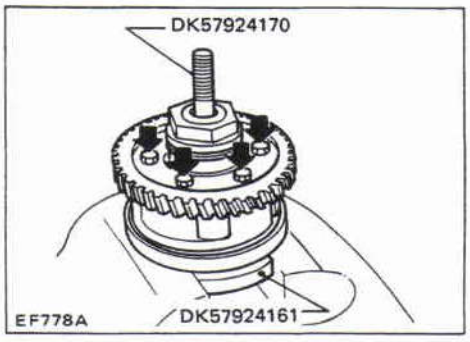
b. When injection timing is advanced, increase shim thickness.

Timer advance curve:

Refer to S.D.S.

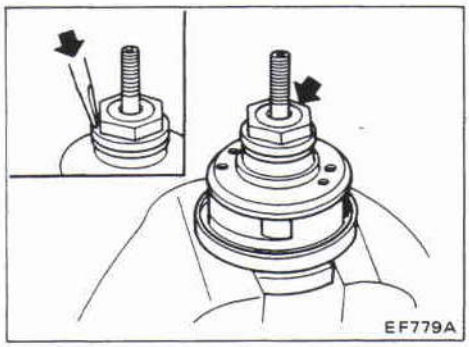
DISASSEMBLY



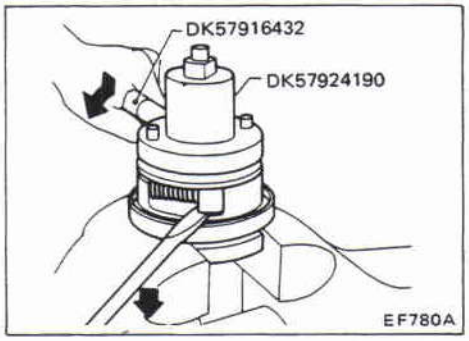


1. Place timer assembly on Tools with flyweight holder hole positioned on base pin.
2. Remove injection pump drive gear.

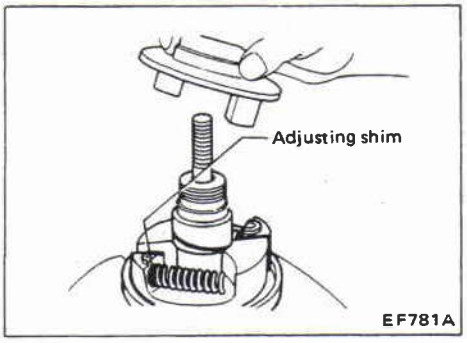
Timer (Cont'd)



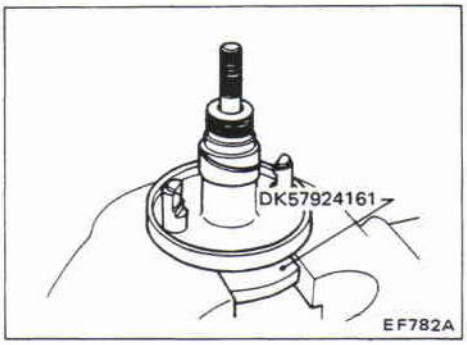
3. Remove nut, lock washer, lock plate, adjusting shim and thrust washer after unbending lock washer.



4. Remove timer flange by prying with lever while pressing spring with Tool DK57916432.

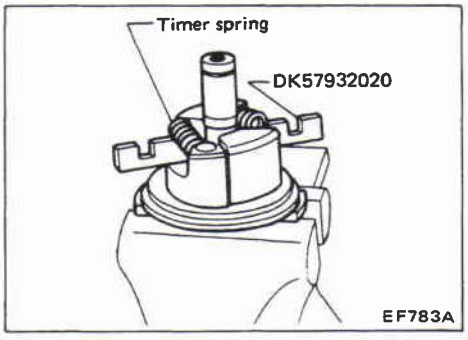


5. Remove timer spring, adjusting shim and flyweight.



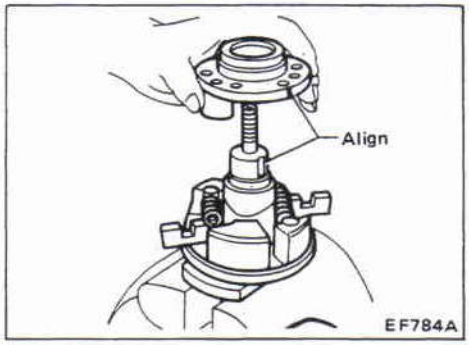
ASSEMBLY

1. Set flyweight holder on Tools with flyweight holder pin hole positioned on base pin.

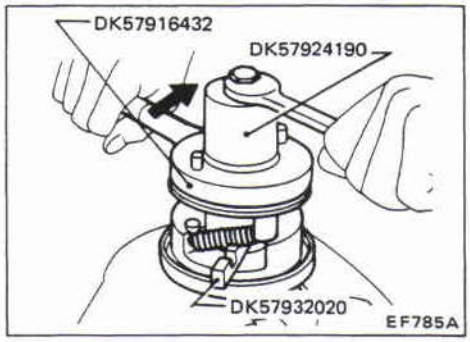


2. Apply grease to flyweight holder pin and flyweight holder hole.
3. Install flyweight and insert Tool under timer spring, positioning spring on flyweight.

Timer (Cont'd)

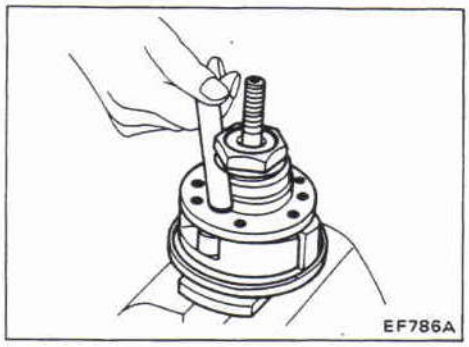


4. Insert suitable adjusting shim into hole at pin part of timer flange.
5. Cover timer flange to flyweight holder by matching notch of flange and key groove of flyweight holder.



6.
(1) Turn Tool DK57916432 in direction to compress timer spring, thread in Tool DK57924190, and then remove Tool DK57932020.
(2) Using a lever, insert timer spring into flange hole, thread in Tool DK57924190 all the way and install flange in its proper position.

Make sure that spring is fully seated in holes in flange and flyweight holder.

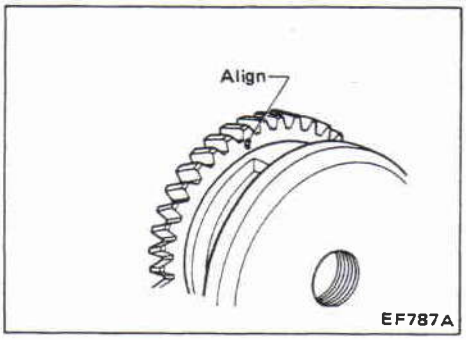


7. Adjust flyweight holder and flange clearance.
(1) Install thrust washer, lock plate and adjusting washer, and completely tighten them with nut.

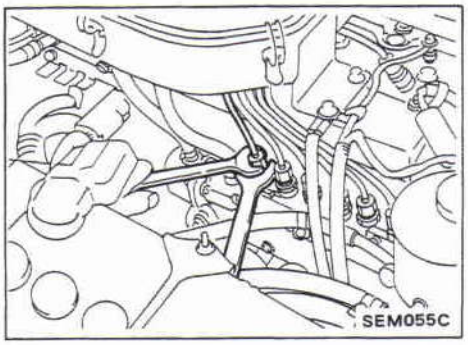
Nut
98 - 177 N·m
(10 - 18 kg-m, 72 - 130 ft-lb)

(2) Measure lock plate and thrust washer clearance. If the clearance is not within specifications, adjust with adjusting washer.

Lock plate and thrust washer clearance:
0.02 - 0.10 mm
(0.0008 - 0.0039 in)



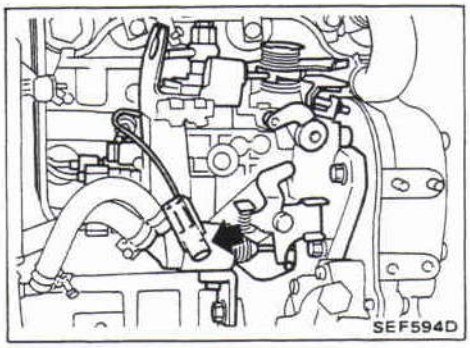
8. Align "O" mark on drive gear with notch in timer flange, and install drive gear.



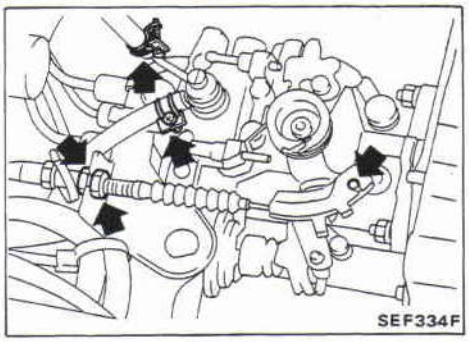
Removal

1. Remove injection tube.

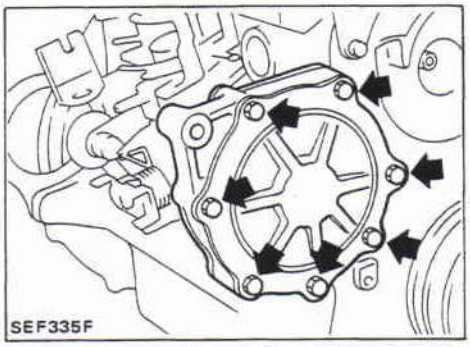
Cover the injection nozzle assembly with a plug to prevent dust entry.



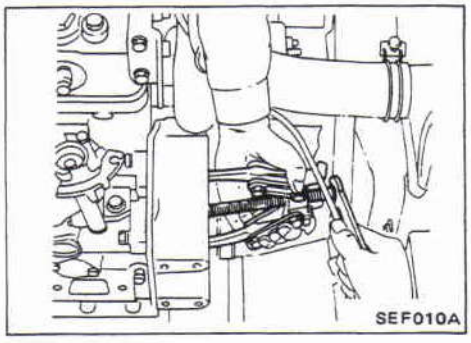
2. Remove fuel cut solenoid wire.



3. Remove accelerator wire and disconnect overflow hose, fuel inlet hose and fuel return hose.

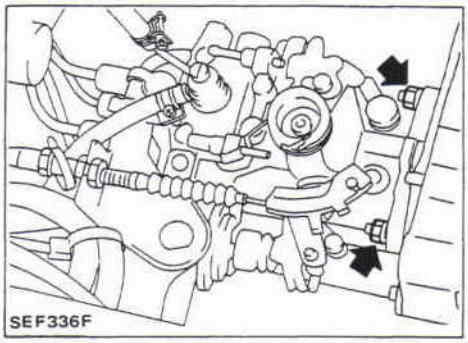


4. Remove injection pump drive gear cover.

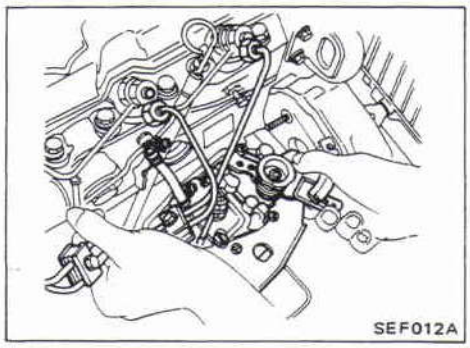


5. Loosen injection pump drive gear nut and remove drive gear by using puller.

Removal (Cont'd)


SEF336F

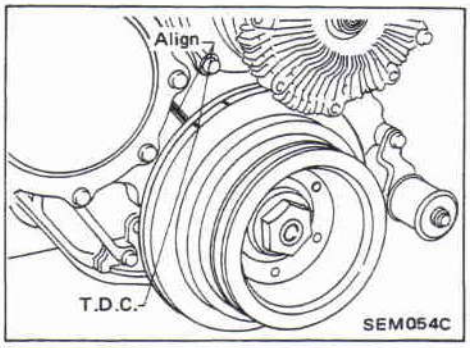
6. Remove injection pump fixing nuts and bolts.


SEF012A

7. Remove injection pump with injection tubes.

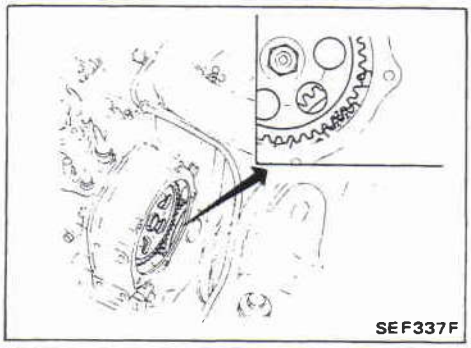
Disconnect injection tube from pump once it is removed.

Installation and Adjustment



SEM054C

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

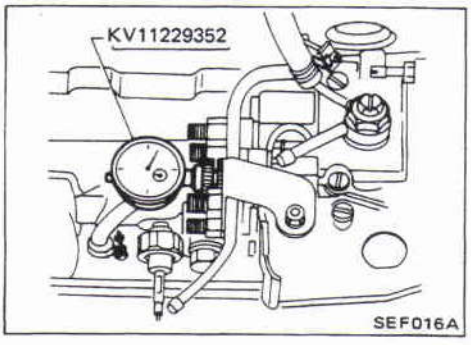

SEF337F

2. Install injection pump.
(1) Temporarily set injection pump so that the flange of pump is aligned with aligning mark on front cover.
(2) Install injection drive gear.

: 59 - 69 N·m (6 - 7 kg-m, 43 - 51 ft-lb)

Make sure that the key does not fall into the front cover.
Make sure that "Z" marks are aligned.

(3) Install drive gear cover with new gasket.



SEF016A

PLUNGER LIFT ADJUSTMENT

1. Remove plug bolt from distributor head and install measuring device.
2. Loosen injection pump mounting nuts and mounting bracket bolt.
3. Plunger lift measurement and adjustment.
(1) Turn crankshaft counterclockwise 20 to 25 degrees from No. 1 piston at T.D.C.
(2) Find dial gauge's needle rest position at step (1) set position, then set the gauge to zero.

Installation and Adjustment (Cont'd)

(3) Turn crankshaft clockwise until No. 1 piston is set at T.D.C.

(4) Read dial gauge indication.

0.74±0.02 mm (0.0291±0.0008 in)
(equivalent to 6° B.T.D.C.)

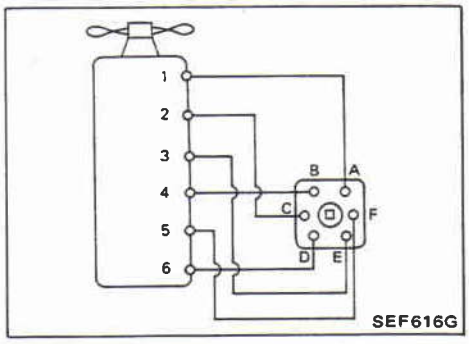
(5) If it is not within the above range, turn pump body until it comes within standard range.

a. **If indication is smaller than the specified value, turn pump body counterclockwise.**

b. **If indication is larger than the specified value, turn pump body clockwise.**

4. Tighten injection pump securely.

: Injection pump fixing bolt
19 - 25 N·m (1.9 - 2.5 kg-m, 14 - 18 ft-lb)
Injection pump to mounting bracket
30 - 41 N·m (3.1 - 4.2 kg-m, 22 - 30 ft-lb)



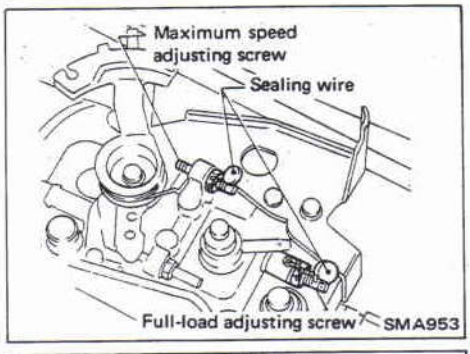
5. Disconnect dial gauge and reinstall plug bolt with new washer.

: 14 - 20 N·m (1.4 - 2.0 kg-m, 10 - 14 ft-lb)

6. Connect injection tubes.

: Flare nut
20 - 25 N·m (2.0 - 2.5 kg-m, 14 - 18 ft-lb)

7. Bleed air from fuel system.



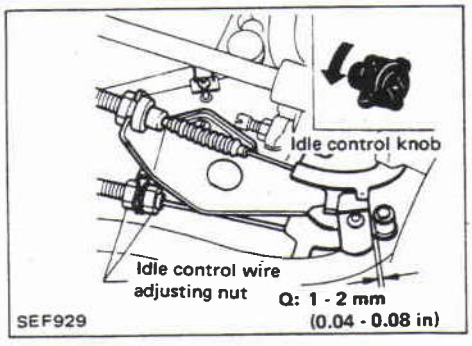
IDLE AND MAXIMUM SPEED ADJUSTMENT

CAUTION:

a. **Do not remove sealing wires unless absolutely necessary.**

b. **Disturbing full-load adjusting screw will change fuel flow characteristics, resulting in an improperly adjusted engine. Readjustment of fuel injection pump should be done using a pump tester.**

c. **If maximum speed adjusting screw is turned in direction that increases control lever angle, engine damage may result.**



Throttle control wire adjustment

1. Turn idle control knob fully counterclockwise.
2. Make sure that clearance between idle control lever pin and fuel injection pump control lever is within the specified range.

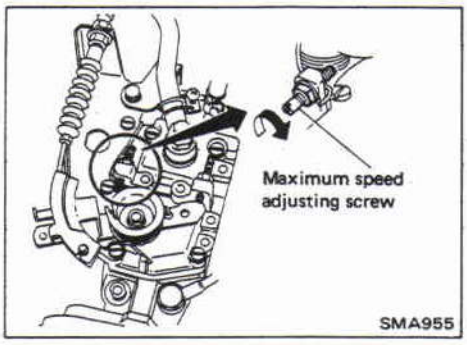
Clearance:
1 - 2 mm (0.04 - 0.08 in)

3. If not within the specified range, adjust with idle control wire adjusting nut.
4. After adjusting clearance, tighten lock nut.

Installation and Adjustment (Cont'd)

Idle adjustment

Refer to MA section.



Maximum speed adjustment

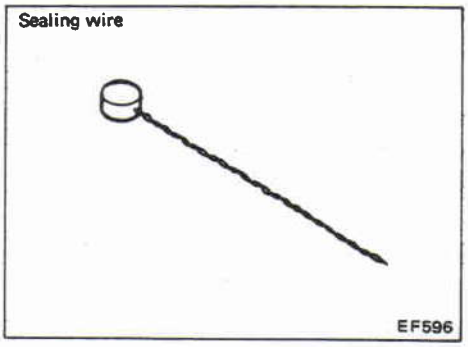
Maximum speed adjusting screw is retained by sealing wire and need not be adjusted under normal circumstances. However, if it becomes necessary to adjust it, the following procedure should be followed:

1. Start engine and warm it up until coolant temperature indicator points to middle of gauge.
2. Connect tachometer's pick-up to No. 1 fuel injection tube.

To obtain accurate reading of engine rpm, remove clamps that secure No. 1 fuel injection tube.

3. Depress accelerator pedal fully under no load and, at this point, read the tachometer indication.

Maximum engine speed (Under no-load):
4,600±100 rpm



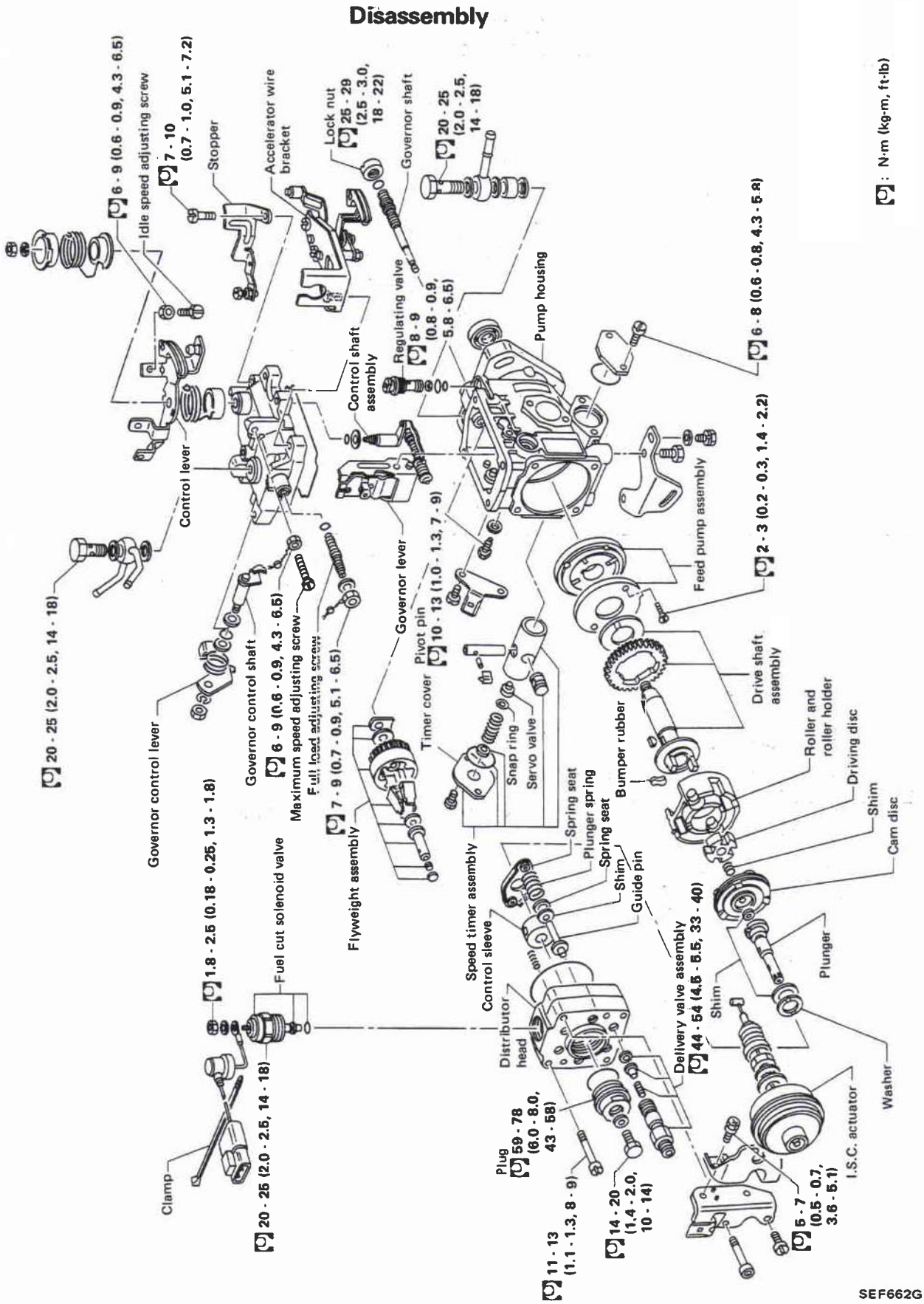
4. If indication is lower than specified maximum engine speed, turn maximum speed adjusting screw counterclockwise 1 or 2 rotations. Then depress accelerator pedal to floor under no load and, at this point, read indication.
5. If indication is still lower than specified speed, repeat step 4 above until specified engine speed is reached.
6. After adjustment, tighten lock nut securely.
7. Wind up with a sealing wire.

Disassembly

PREPARATION

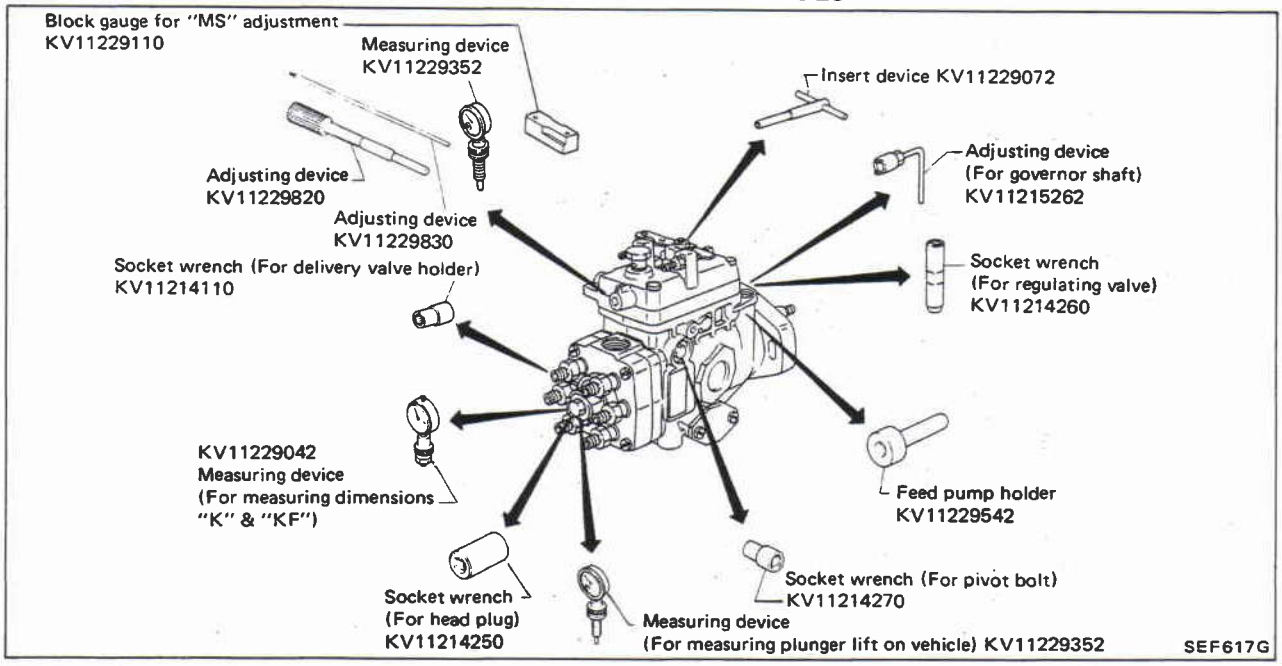
- Before performing disassembly and adjustment, test the fuel injection pump and note test results.
- Prior to beginning disassembly of fuel injection pump, clean all dust and dirt from its exterior.
- Disconnect overflow valve and drain fuel.
- Clean work bench completely, removing all foreign matter.
- Collect only those service tools necessary for disassembling and reassembling.
- Be careful not to bend or scratch any parts.

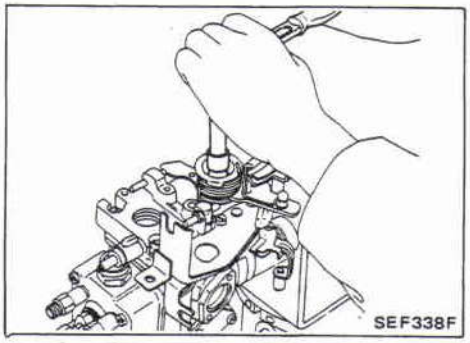
Disassembly



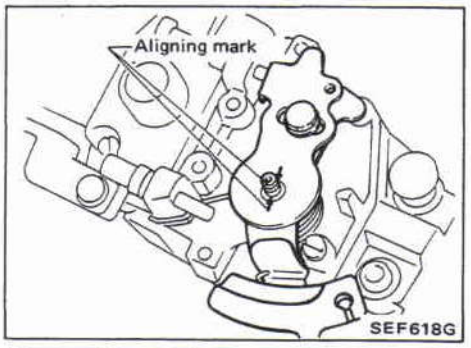
Disassembly (Cont'd)

SPECIAL SERVICE TOOLS

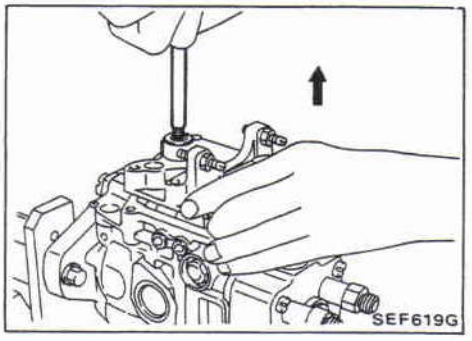




1. Remove governor cover.
(1) Remove nut, spring washer, spring seat and spring from control lever.

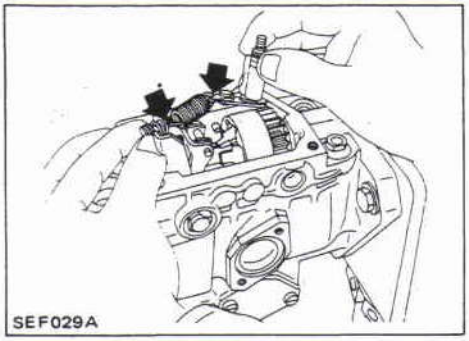


(2) Check aligning marks on control lever and control shaft.

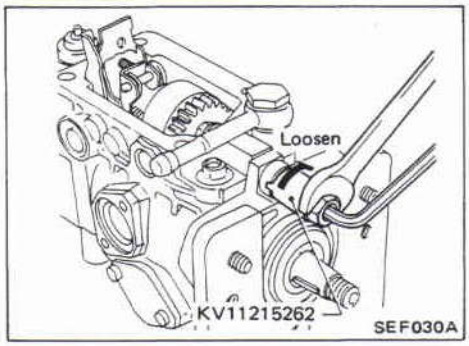


(3) Remove governor cover.

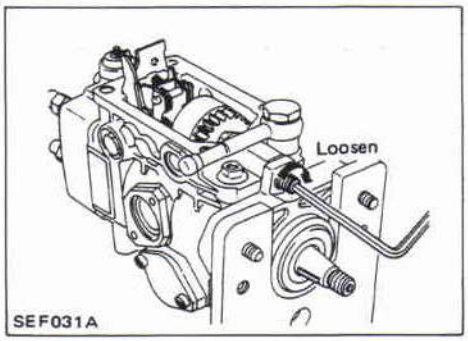
Disassembly (Cont'd)

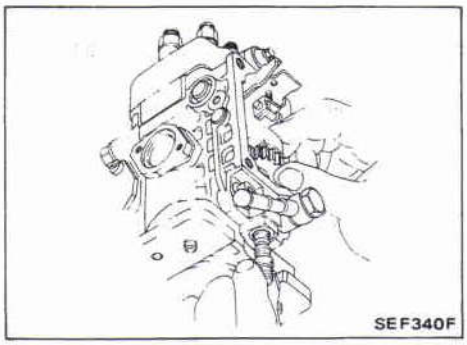


2. Remove control shaft from tension lever.

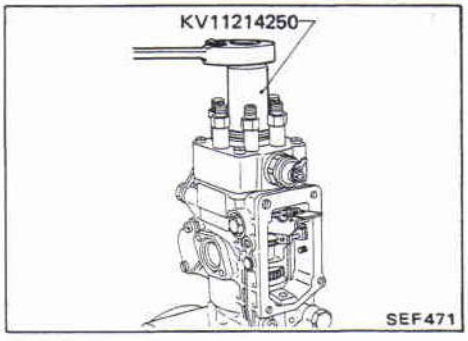


3. Remove governor shaft with special service tool.
Loosen lock nut by turning it clockwise.



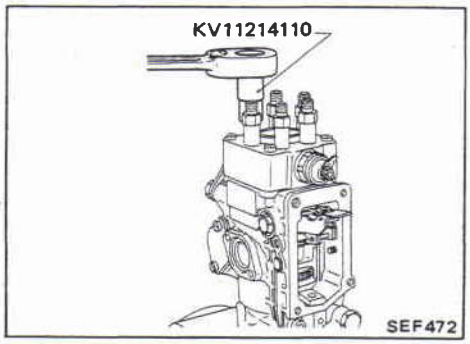


4. Remove governor sleeve, washer and flyweight, along with flyweight holder, then remove washer and shims.



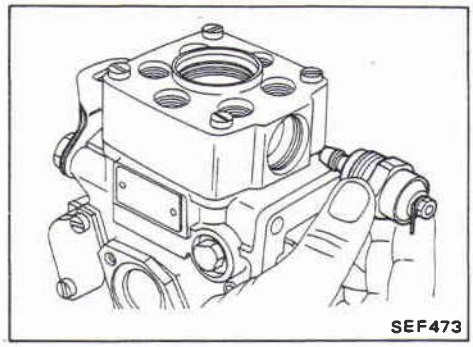
5. Remove plug with special service tool.

Disassembly (Cont'd)

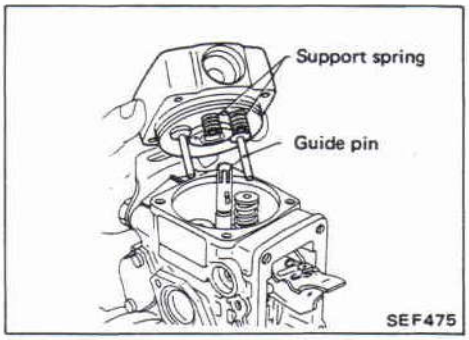


6. Remove delivery valve holder, spring, delivery valve and gasket.

Distributor head has letters (A, B, C, D) stamped on it. Remove lettered parts in alphabetical order and arrange neatly.

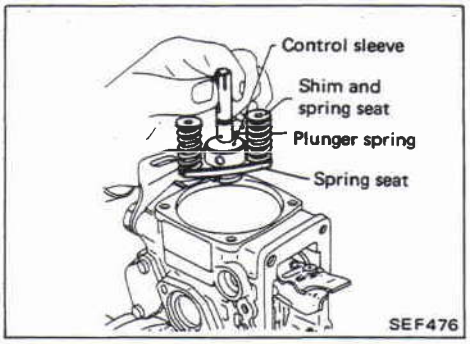


7. Remove fuel cut solenoid valve.



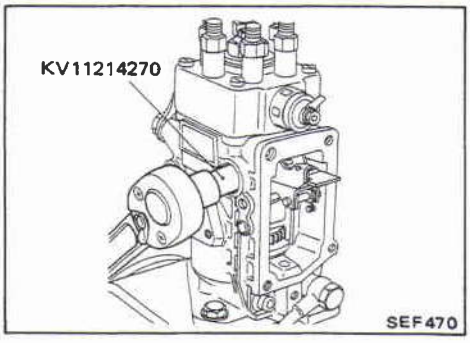
8. Remove distributor head.

Be careful not to drop the two support springs and guide pins.



9. Remove plunger assembly.

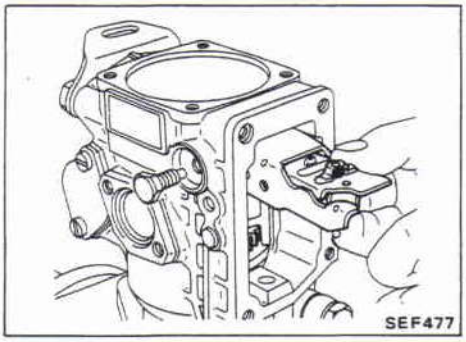
Lift plunger, along with control sleeve, shim, spring seat, plunger spring, washer and shim.



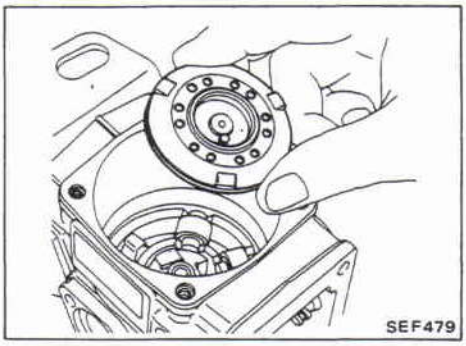
10. Loosen left and right governor pivot bolts.

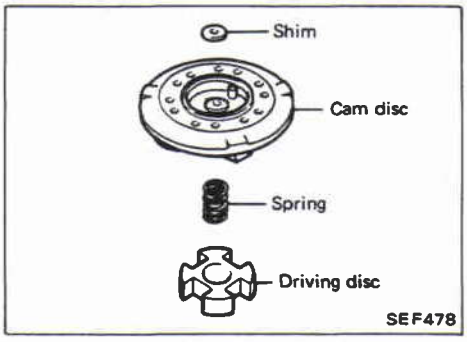
Disassembly (Cont'd)

11. Remove governor pivot bolts and lever assembly.
Avoid pulling on start spring and start idle spring.

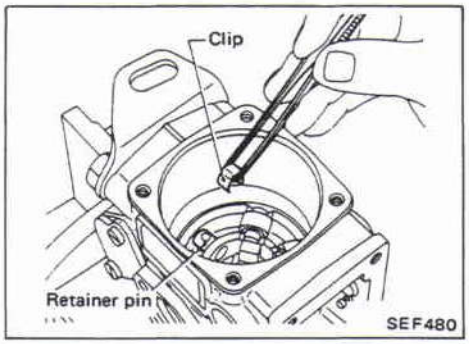


12. Remove shim, cam disc, spring and driving disc.

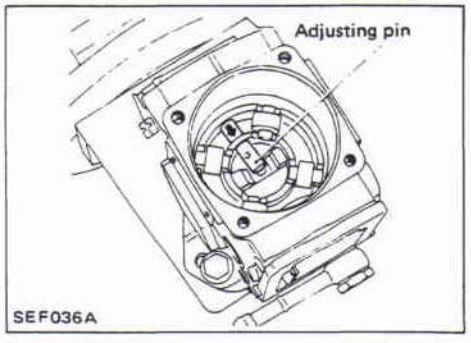




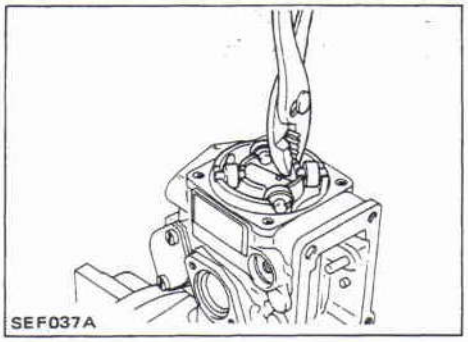
13. Remove clips and pins.



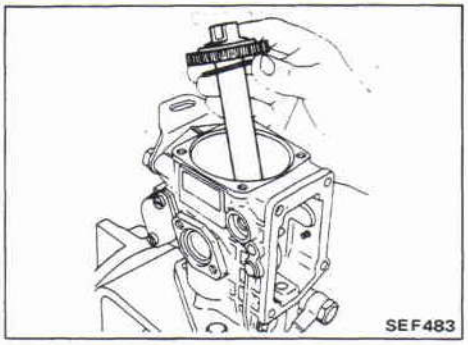
14. Move adjusting pin to center of roller holder, as shown.



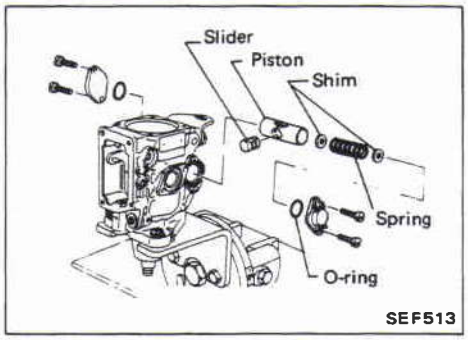
Disassembly (Cont'd)



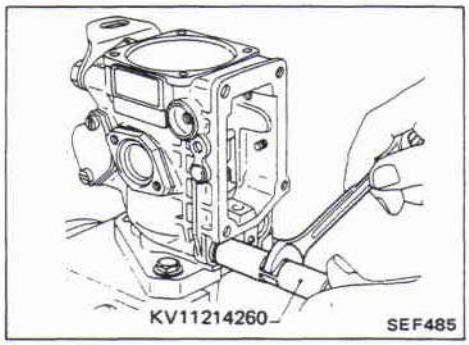
15. Lift out roller holder with rollers without tilting.
Be careful not to drop rollers.



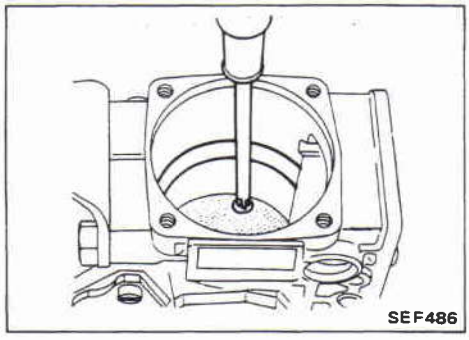
16. Attach oil seal guide onto the drive shaft and then remove drive shaft.
   a. **Be careful not to scratch inner surface of fuel injection pump body.**
   b. **Remove drive gear side key.**
   c. **Be careful not to drop the key.**



17. Remove speed timer cover, O-ring, shims, spring, piston and slider.

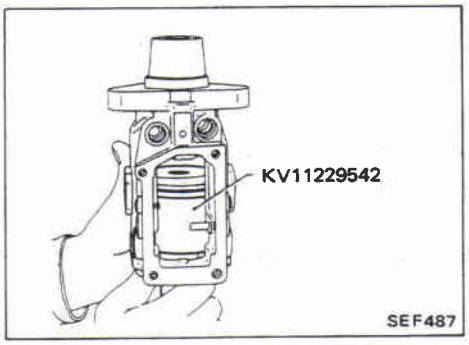


18. Remove regulating valve with special service tool.



19. Loosen screw from feed pump cover.

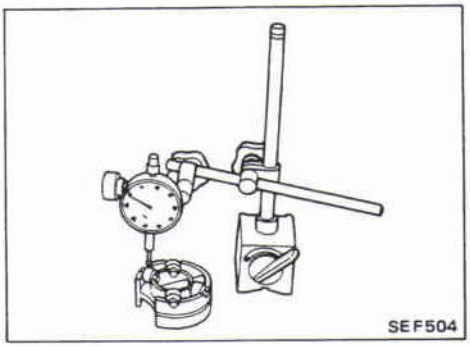
Disassembly (Cont'd)



20. Remove cover and feed pump assembly as a unit.
1) Insert feed pump holder (KV11229542) into fuel injection pump housing.
2) Turn injection pump upside down, as shown.
3) Remove cover and feed pump assembly as a unit.

a. If cover and feed pump assembly are hard to remove or stuck midway, strike the pump body lightly.

b. Do not change positions of vanes.



Inspection

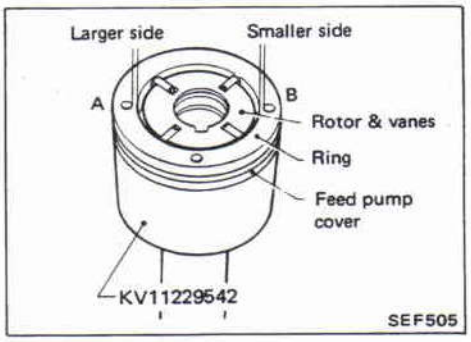
1. Wash all parts completely.
2. Replace worn or damaged parts.
3. Control edge of plunger must be sharp and contact surfaces must not exhibit any noticeable running tracks. If the condition is not good, replace plunger.
4. Check for height of all rollers.

Difference in maximum and minimum roller height should be less than 0.02 mm (0.0008 in).

Assembly

Always replace the following service parts as assembly units.

- Distributor head, control sleeve and plunger
- Feed pump assembly (pump impeller and vanes with eccentric ring)
- Plunger spring kit
- Roller assembly
- Flyweight kit
- Governor lever assembly

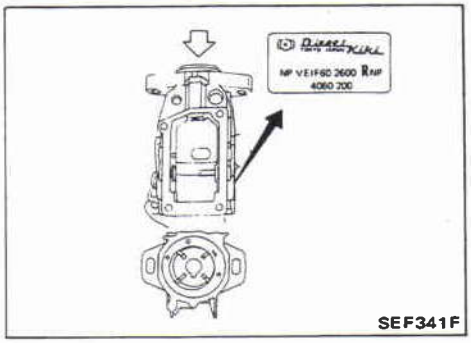


PREPARATION

Dip all movable parts and O-rings in test oil, then clean.

1. Set feed pump cover, rotor with vanes, and ring on special service tool KV11229542.

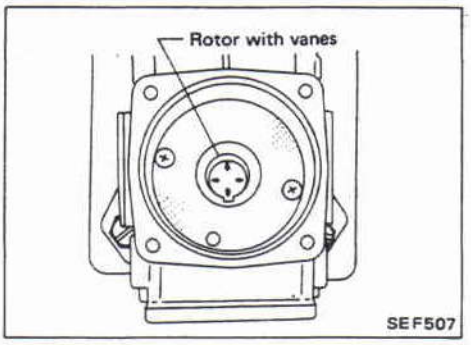
1) Align the three holes in feed pump cover and ring.
2) Do not change positions of vanes.
3) Holes A and B in ring are not equally spaced to inner wall of ring.



2. Install feed pump cover, rotor with vanes, and ring to pump housing.

Be careful to install ring correctly. If left and right are reversed, fuel will not be discharged from feed pump.

Assembly (Cont'd)



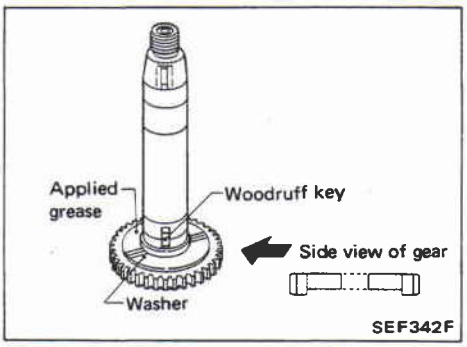
When fuel injection pump rotates in direction "R"

The following description applies to fuel injection pumps that rotate in direction "R".

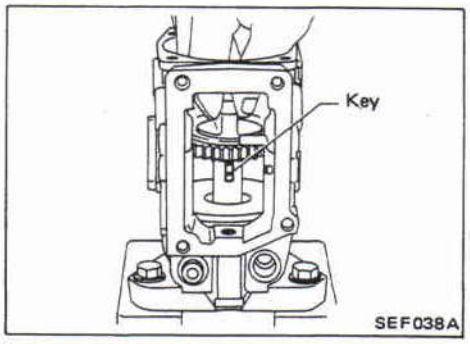
3. Turn fuel injection pump 180°, and remove special service tool KV11229542. Tighten screw to retain pump cover.

a. When tightening screws, be careful not to scratch inner wall of pump housing.

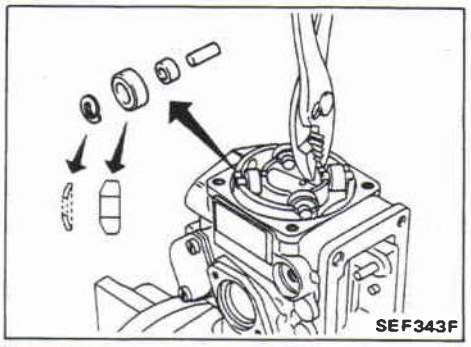
b. After tightening screws, make sure that rotor with vanes moves smoothly.



4. Make sure that drive shaft and gear are assembled properly, as shown.



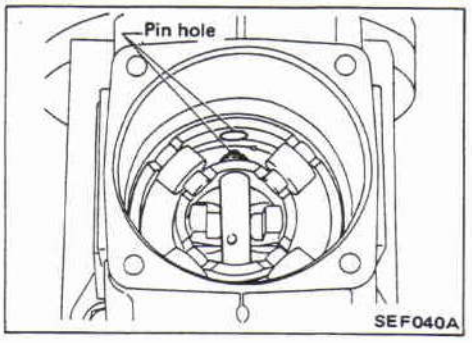
5. Attach oil seal guide onto the drive shaft, then install drive shaft to housing while key in drive shaft engages with key groove in rotor.



6. Set drive shaft's nail parallel to timer.
7. Install roller and holder.

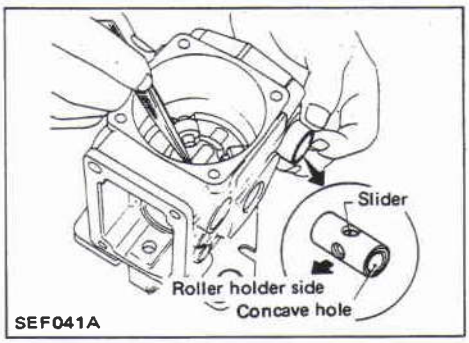
a. Do not interchange roller positions. If they are interchanged, refer to Inspection for correction.

b. Make sure that washer is situated outward of rollers.

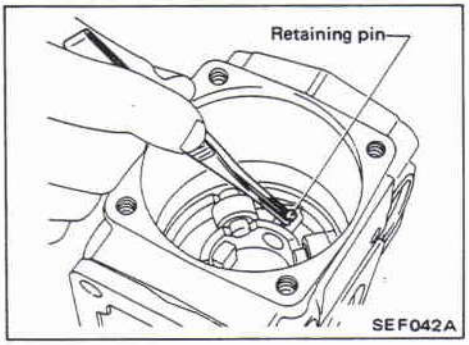


8. Align holder and timer adjusting pin holes.

Assembly (Cont'd)

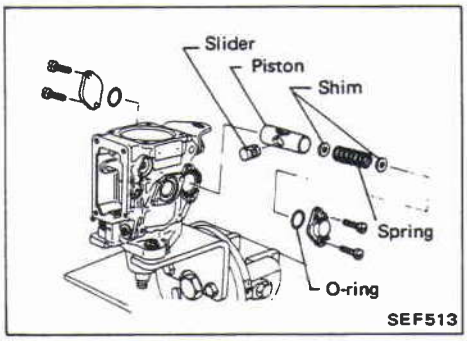


9. Install timer piston and slider as a unit.
a. **Make sure that hole in slider faces towards roller holder.**
b. **Make sure that concave hole in piston is on same side as return hole.**

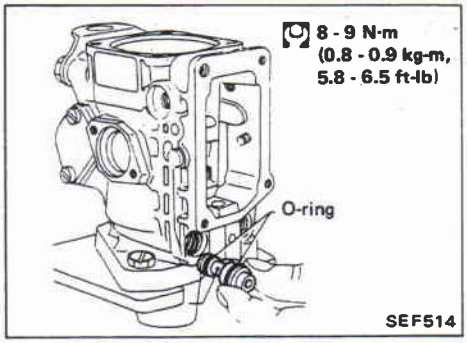


10. Insert timer adjusting pin into timer piston slider, and secure with retaining pin and clip.

Make sure that timer piston moves smoothly.

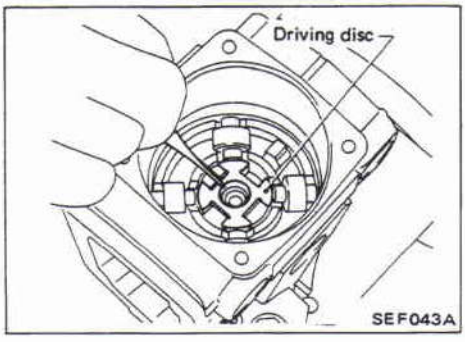


11. Install timer, using a 0.6 mm (0.024 in) thick shim, then install timer spring, shim, O-ring, and cover, in that order.
a. **Use at least one shim on each side of timer spring.**
b. **Use shims that were selected during bench test.**



12. Install regulating valve.

Be careful not to scratch O-rings.



13. Install driving disc with its concave side facing up.

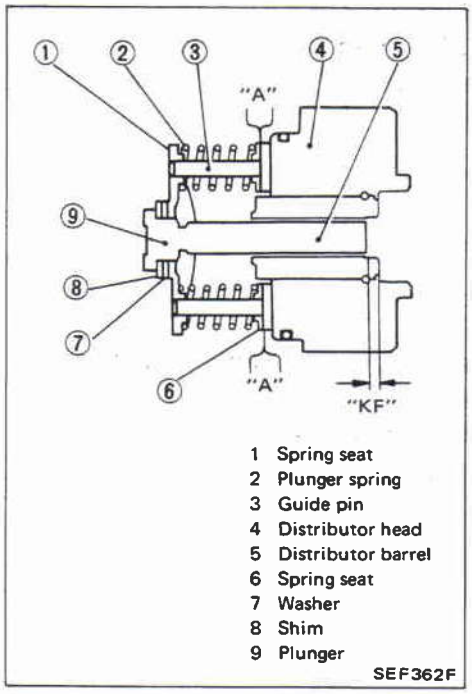
Assembly (Cont'd)

14. Measurement of plunger spring set length (dimension "KF")

Dimension "KF" is the distance between the end face of the distributor barrel and the end face of the plunger.

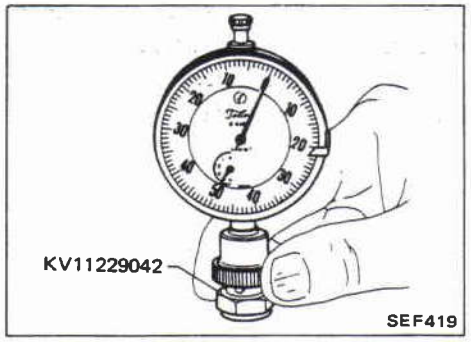
(1) Install distributor head, as shown.

- **Do not insert shim into "A" portion before measuring.**



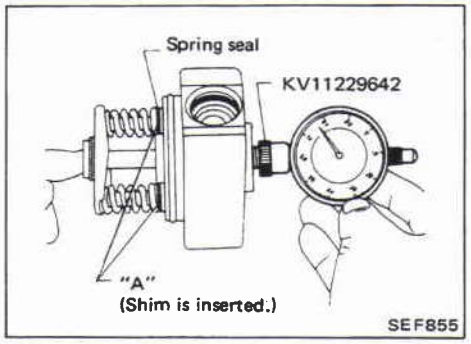
1 Spring seat
2 Plunger spring
3 Guide pin
4 Distributor head
5 Distributor barrel
6 Spring seat
7 Washer
8 Shim
9 Plunger

SEF362F



SEF419

(2) Set dial gauge so that it can compress 0 to 10 mm (0 to 0.39 in), and reset to zero.



SEF855

(3) Apply force (not enough to compress plunger spring) to plunger's bottom in axial direction, and measure dimension "KF" with dial gauge, as shown.

(4) Determine the shim to be used by calculating difference between standard and measured dimensions.

Standard dimension "KF":

5.7 - 5.9 mm (0.224 - 0.232 in)

[Example]

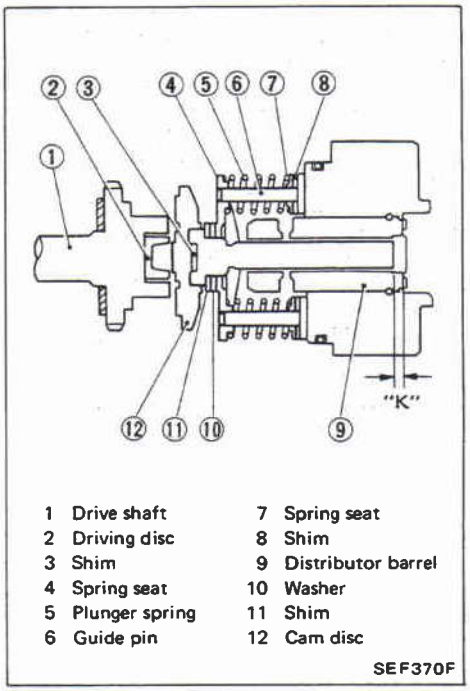
When measured (dial gauge reading) value is 5.2 mm,

5.7 mm – 5.2 mm = 0.5 mm (shim thickness to be used)

Assembly (Cont'd)

a. When there are no shims available of a thickness which matches specified dimensions, use slightly thicker shims.
b. Use selected shim with distributor head in step 14-(3) above.
c. Use the same size shim on each side of distributor head.
d. Shims are available in seven different thicknesses.

Part number	Thickness mm (in)
16882-V0700	0.5 (0.020)
16882-V0701	0.8 (0.031)
16882-V0702	1.0 (0.039)
16882-V0703	1.2 (0.047)
16882-V0704	1.5 (0.059)
16882-V0705	1.8 (0.071)
16882-V0706	2.0 (0.079)



1 Drive shaft
2 Driving disc
3 Shim
4 Spring seat
5 Plunger spring
6 Guide pin
7 Spring seat
8 Shim
9 Distributor barrel
10 Washer
11 Shim
12 Cam disc

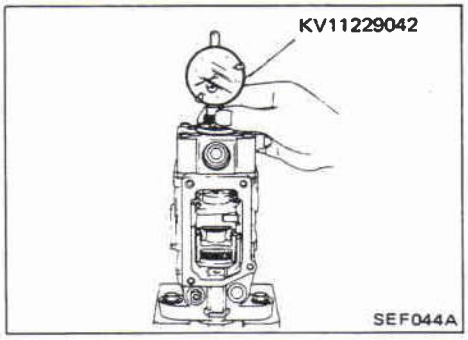
SEF370F

15. Adjustment of plunger dimensions (Measurement of dimension "K")

Dimension "K" is the distance from the end face of the distributor barrel to the end face of the plunger top, when the plunger is at the bottom dead center position.

(1) Install parts as shown.

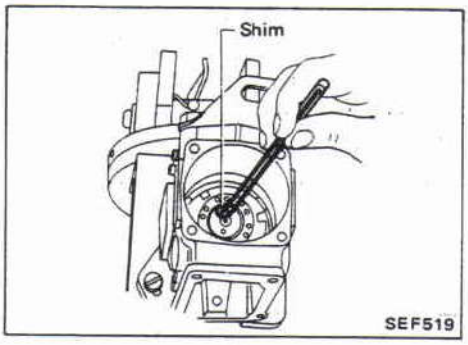
a. Do not install "spring" on driving disc.
b. When inserting plunger and shim into cam disc, make sure that drive pin is situated in groove at bottom of plunger.



(2) Using a dial gauge, measure dimension as shown.

a. Rotate drive shaft so that plunger is set at bottom dead center.
b. Securely mount distributor head with screws.

Assembly (Cont'd)

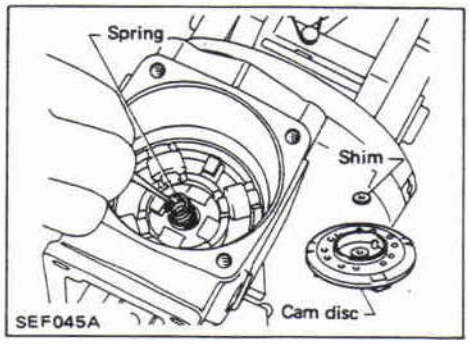


(3) Determine shim to be used by calculating difference between measured (dial gauge reading) value and standard dimension "K", and position that shim on plunger's bottom.

"K" = 3.2 - 3.4 mm
(0.126 - 0.134 in)

a. **When measured value is greater than standard dimension "K", use a thicker shim.**
b. **After shim has been positioned, measure dimension again to ensure that it is correct.**
c. **Shims are available in 25 different thicknesses.**

Part number	Thickness mm (in)	Part number	Thickness mm (in)
16884-V0700	1.92 (0.0756)	16742-R8100	1.96 (0.0772)
16884-V0701	2.00 (0.0787)	16742-R8101	2.04 (0.0803)
16884-V0702	2.08 (0.0819)	16742-R8102	2.12 (0.0835)
16884-V0703	2.16 (0.0850)	16742-R8103	2.20 (0.0866)
16884-V0704	2.24 (0.0882)	16742-R8104	2.28 (0.0898)
16884-V0705	2.32 (0.0913)	16742-R8105	2.36 (0.0929)
16884-V0706	2.40 (0.0945)	16742-R8106	2.44 (0.0961)
16884-V0707	2.48 (0.0976)	16742-R8107	2.52 (0.0992)
16884-V0708	2.56 (0.1008)	16742-R8108	2.60 (0.1024)
16884-V0709	2.64 (0.1039)	16742-R8109	2.68 (0.1055)
16884-V0710	2.72 (0.1071)	16742-R8110	2.76 (0.1087)
16884-V0711	2.80 (0.1102)	16742-R8111	2.84 (0.1118)
16884-V0712	2.88 (0.1134)		



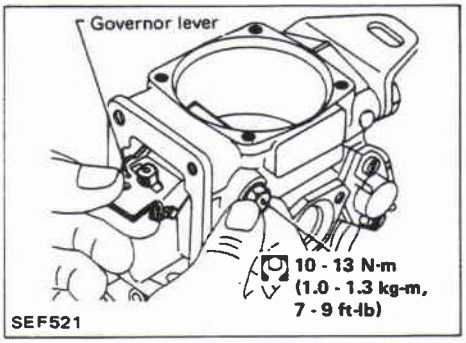
16. Install spring in top of driving disc, then install cam disc and shim.

Make sure cam disc drive pin and drive shaft key way face upwards.

Assembly (Cont'd)

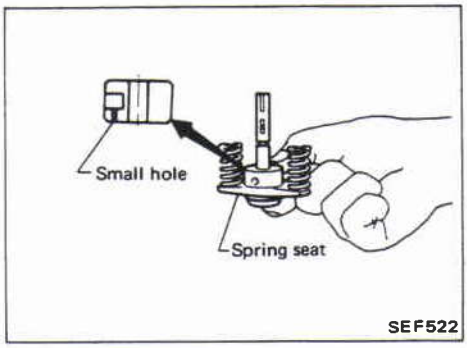
17. Install governor lever.

Avoid pulling on start spring and start idle spring.

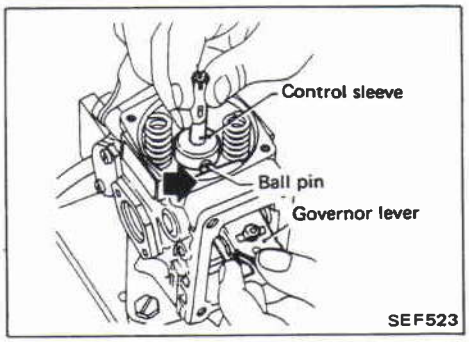


18. Install plunger assembly.

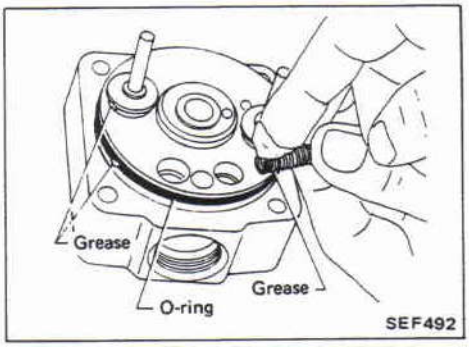
a. **Make sure control sleeve is installed with its small hole facing spring seat side.**



b. **Insert ball pin for governor lever into hole in control sleeve (shown by arrow).**

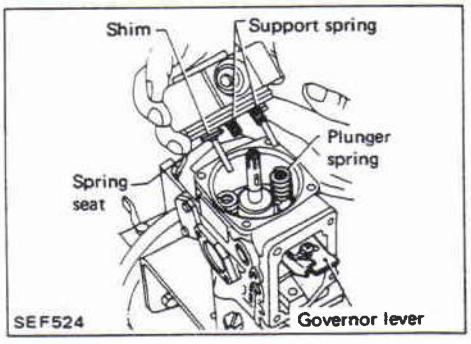


19. Apply a coat of grease to guide pin, shim and spring seat, and attach these parts to distributor head.



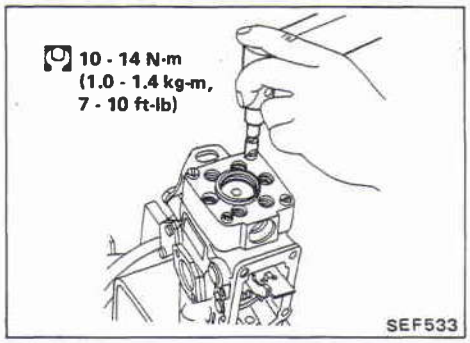
20. Install distributor head.

a. **Always face support spring toward governor lever.**
b. **Be careful not to drop spring.**
c. **Make sure that ball pin for governor lever is inserted properly into hole in control sleeve.**
d. **After installing distributor head, make sure that plunger spring is at guide pin in spring seat.**



Assembly (Cont'd)

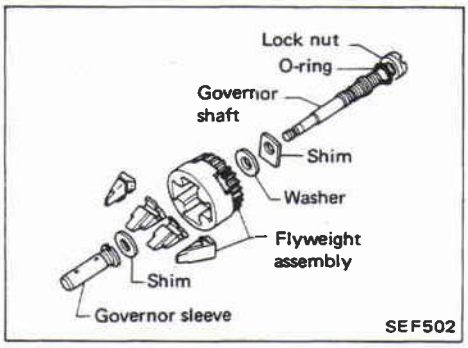
21. Tighten distributor head.

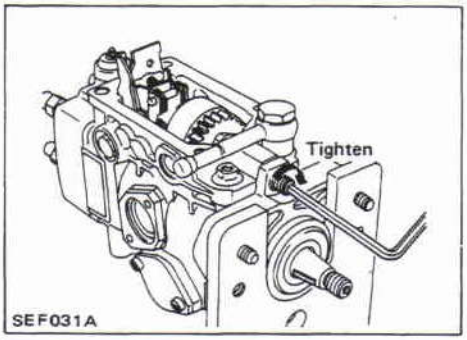


: **Distributor head bolts**
10 - 14 N·m (1.0 - 1.4 kg-m, 7 - 10 ft-lb)

22. Attach flyweight assembly.

When installing governor shaft, be careful not to scratch O-rings.



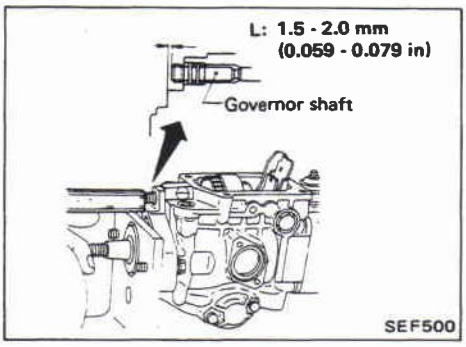


23. Adjust dimension "L".

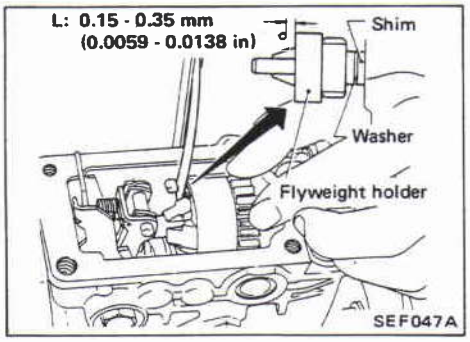
"L":
1.5 - 2.0 mm (0.059 - 0.079 in)

a. **Tighten lock nut to specified torque.**
: **17 - 22 N·m (1.7 - 2.2 kg-m, 12 - 16 ft-lb)**

b. **Governor shaft has a left-hand thread for injection pumps designed to rotate in "R" direction, and a right-hand thread for those rotating in "L" direction.**



Assembly (Cont'd)



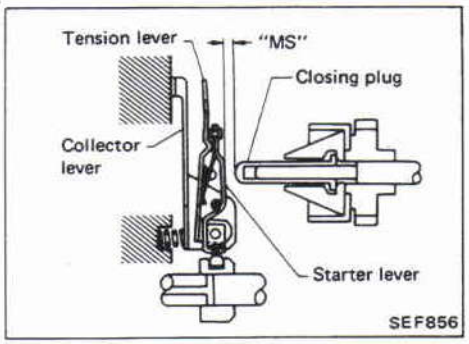
24. Measure axial play of flyweight holder. If it is not within specified range, adjust it by means of shims.

"L":

0.15 - 0.35 mm (0.0059 - 0.0138 in)

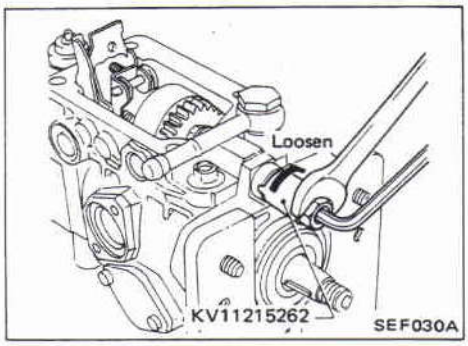
Shims are available in 5 different thicknesses.

Part number	Thickness mm (in)
19208-V0700	1.05 (0.0413)
19208-V0701	1.25 (0.0492)
19208-V0702	1.45 (0.0571)
19208-V0703	1.65 (0.0650)
19208-V0704	1.85 (0.0728)

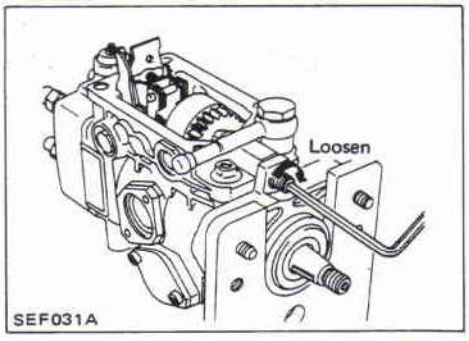


25. Measurement of dimension "MS" (for determining starting amount of fuel injection)

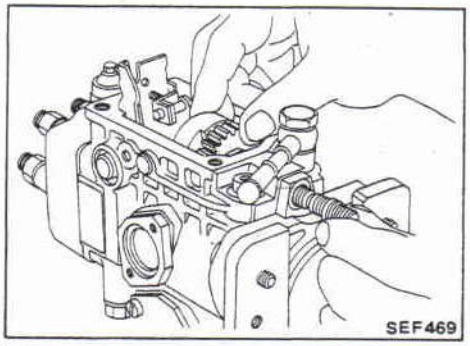
Dimensions "MS" is the distance between closing plug and start lever.



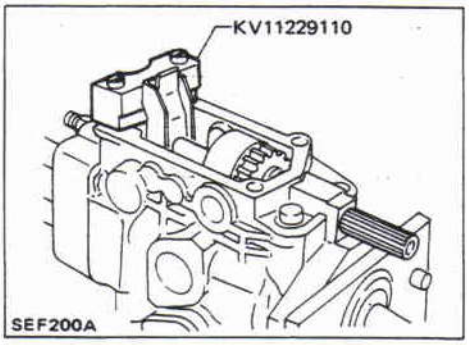
(1) Remove lock nut and governor shaft.



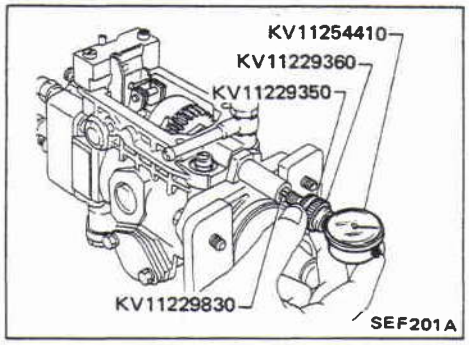
Assembly (Cont'd)



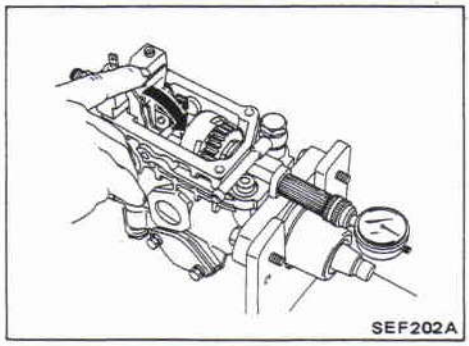
(2) Install special service tool at governor shaft position.



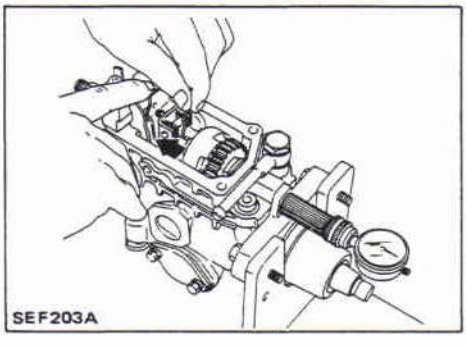
(3) Install special service tool (block gauge) to pump housing.



(4) Install special service tool (dial gauge) with rod.



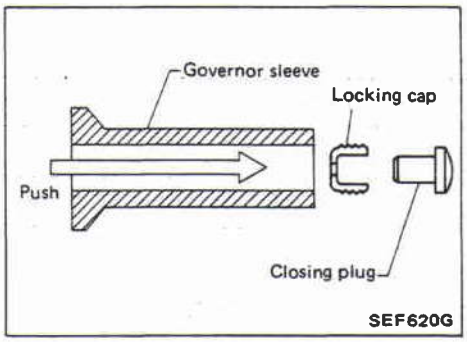
(5) Push governor sleeve against flyweight. Hold governor sleeve in that position and set dial gauge to zero.



(6) Push tension lever until it touches stopper pin. Back governor sleeve up until start lever touches tension lever. At this point read dial gauge.

MS: Refer to S.D.S.

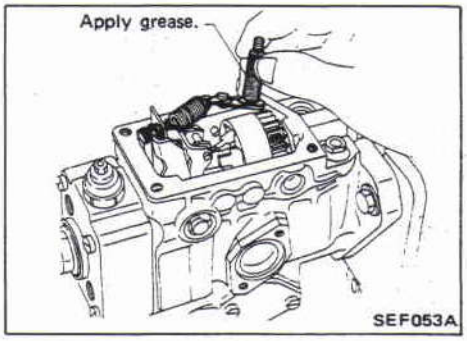
Assembly (Cont'd)



(7) If dial gauge indication is not within this range, replace closing plug and adjust dimension "MS" to that range.

Closing plugs are available in 8 different lengths.

Part number	Length mm (in)
16268-R8100	3.10 (0.1220)
16268-R8101	3.30 (0.1299)
16268-R8102	3.50 (0.1378)
16268-R8103	3.70 (0.1457)
16268-R8104	3.90 (0.1535)
16268-R8105	4.10 (0.1614)
16268-R8106	4.30 (0.1693)
16268-R8107	4.50 (0.1772)



26. Install control lever shaft.

Apply a coat of grease to lever shaft end.

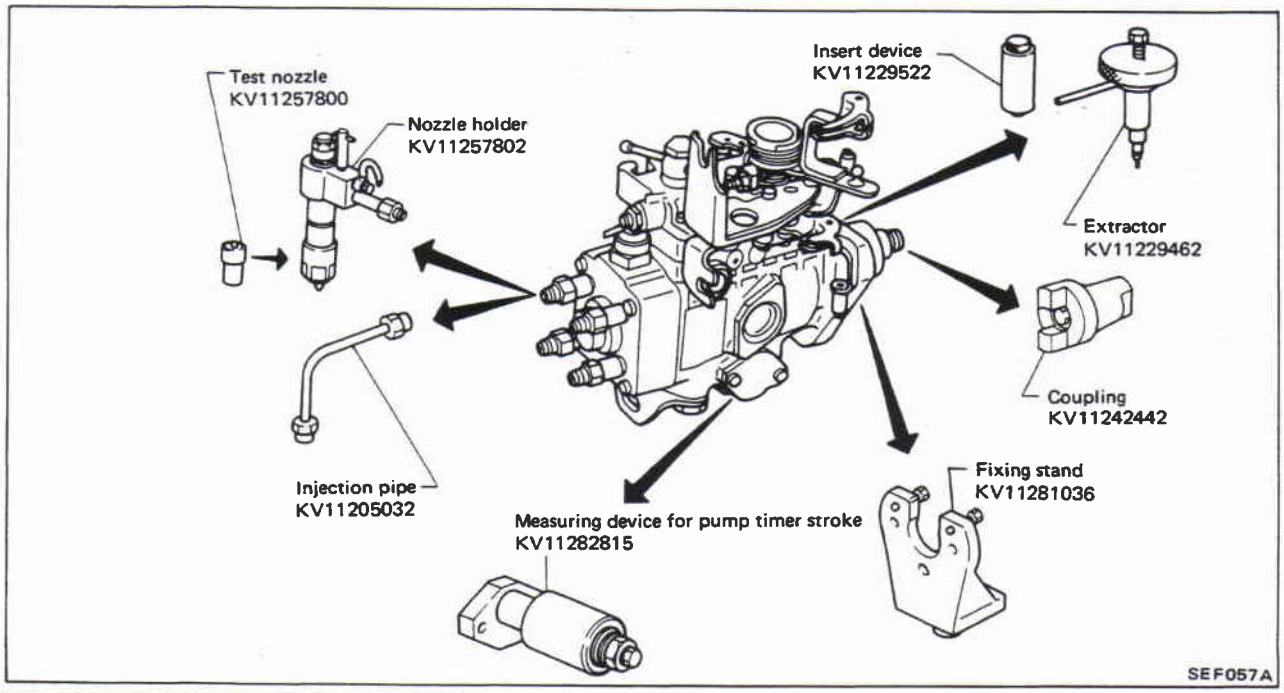
27. Install governor cover.

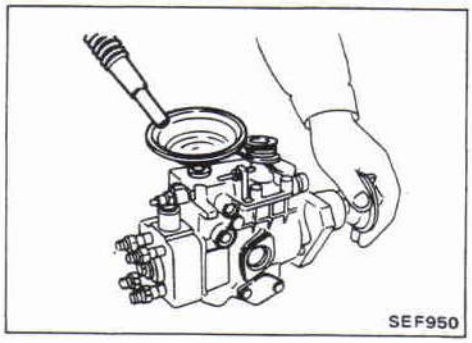
Test

PREPARATION

Nozzle		KV11257805
Nozzle holder		KV11257802
Nozzle starting pressure	kPa (bar, kg/cm^2, psi)	14,711 - 15,201 (147.1 - 152.0, 150 - 155, 2,133 - 2,204)
Nozzle tube Inner dia. x outer dia. x length	mm (in)	KV11205032 2.0 x 6.0 x 840 (0.079 x 0.236 x 33.07)
Fuel feed pressure	kPa (bar, kg/cm^2, psi)	20 (0.20, 0.2, 2.8)
Fuel (test oil)		ISO 4113 or SAE Standard Test Oil (SAE J967d)
Fuel temperature	°C (°F)	45 - 50 (113 - 122)
Rotating direction		Right (observed from the drive shaft)
Injection sequence		1-4-2-6-3-5

1. Prepare necessary service tools.

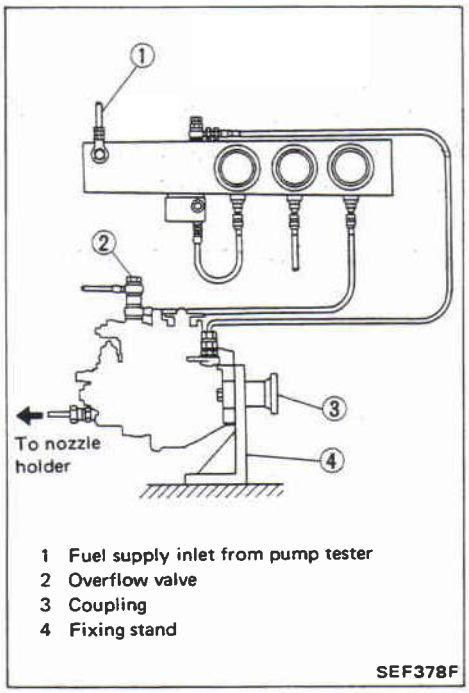




2. Pour test oil into fuel injection pump.
Test oil should be ISO 4113, SAE Standard Test Oil (SAE J967d) or its equivalent.

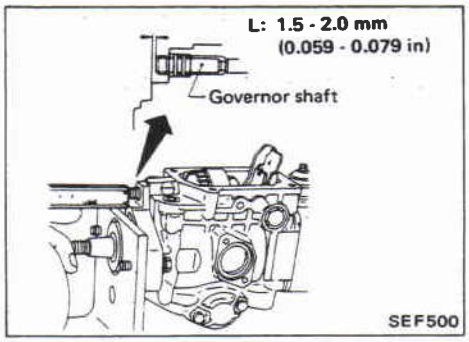
Test (Cont'd)

3. Install fuel injection pump to pump tester.
4. Connect necessary piping.



1 Fuel supply inlet from pump tester
2 Overflow valve
3 Coupling
4 Fixing stand

SEF378F



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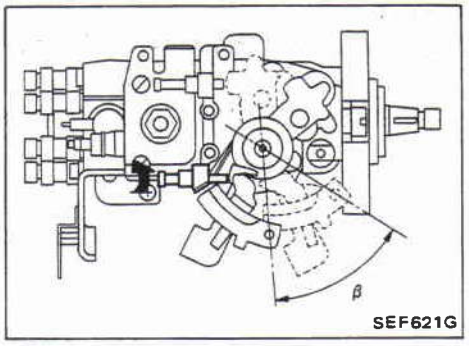
5. Make sure that governor shaft is properly installed.

: Governor shaft lock nut
17 - 22 N·m (1.7 - 2.2 kg-m, 12 - 16 ft-lb)



SEF621G

6. Run fuel injection pump as follows:
(1) Maintain test oil in tank at 45 to 50°C (113 to 122°F).
(2) Set control lever at "full-load" using a spring.

Set maximum speed adjusting screw in position shown, by turning it counterclockwise.

β: Refer to S.D.S.

(3) Furnish specified voltage of 12 volts to fuel-cut solenoid valve to activate it.
(4) Rotate fuel injection pump by hand to see if it moves smoothly.
(5) Rotate fuel injection pump at 300 rpm to make sure that all air inside pump chamber is discharged through overflow valve.
(6) Set feed oil pressure at 20 kPa (0.20 bar, 0.2 kg/cm², 2.8 psi).
(7) Run fuel injection pump at 1,000 rpm for ten minutes.

If fuel leakage, fuel injection failure or unusual noise is noticed, immediately stop pump tester operation and check fuel injection pump for abnormalities.

Test (Cont'd)

ADJUSTMENT

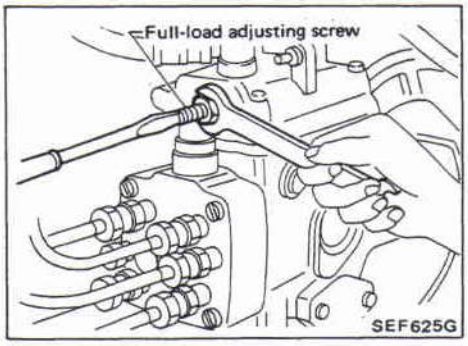
Preadjust full-load delivery

1. Set control lever at "full-load" using a spring.

Set maximum speed adjusting screw in position shown, by turning it counterclockwise. Refer to step 6-(2) in Preparation.

2. Furnish specified voltage of 12 volts to activate fuel cut solenoid valve.
3. Rotate fuel injection pump at 1,100 rpm, and measure amount of fuel injection.

Standard fuel injection:
Refer to S.D.S.



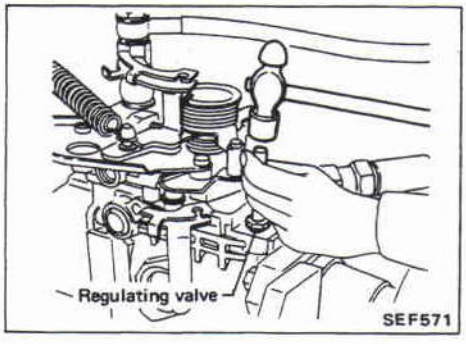
4. If fuel injection is less than standard, adjust it with full-load adjusting screw.

Turn adjusting screw clockwise to increase fuel injection.

Adjustment of feed pump pressure

1. Repeat steps 1 and 2 outlined under "Preadjust Full-Load Delivery" heading.
2. Measure feed pump pressure at specified fuel injection pump rpm.

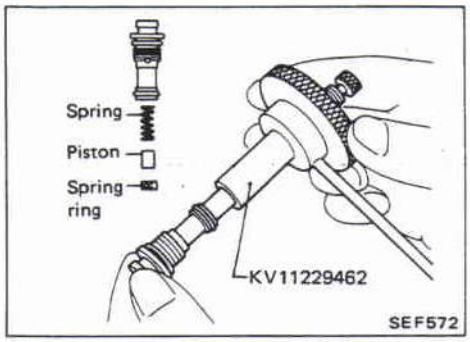
Standard pump pressure:
Refer to S.D.S.



a. When measured pressure is lower than specifications.

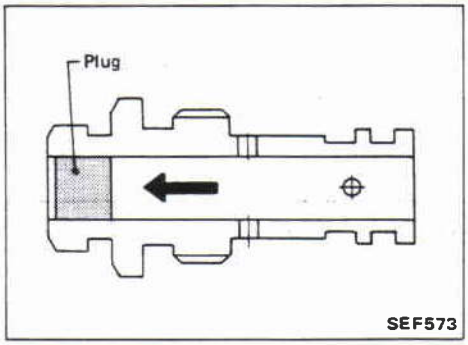
Push in plug that is driven into regulating valve body.
Be careful not to push plug in too far.

Test (Cont'd)



b. When measured pressure is higher than specifications.

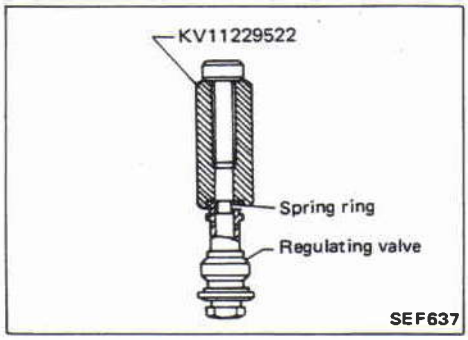
Remove regulating valve from fuel injection pump, and disassemble regulating valve using service tool KV11229462.



Drive plug out until it is flush with end face of regulating valve.

Install spring, piston and spring ring, in that order, to regulating valve.

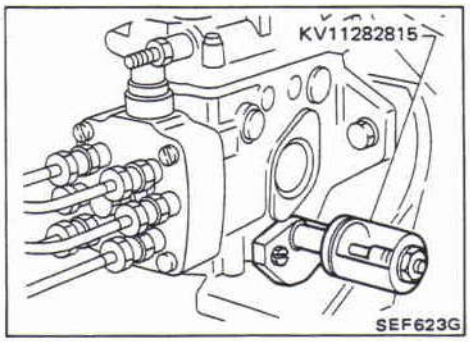
Make sure that spring ring is flush with end face of regulating valve body when it is pushed in.



Attach regulating valve to fuel injection pump.

: **Regulating valve**
8 - 9 N·m
(0.8 - 0.9 kg-m, 5.8 - 6.5 ft-lb)

Adjust supply pump pressure to specifications. Refer to step 2-a.

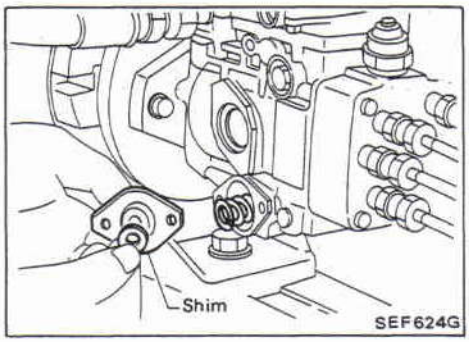


Adjustment of speed timer

1. Repeat steps 1 and 2 outlined under "Preadjust Full-Load Delivery" heading.
2. Remove cover from high-pressure side (side without spring) of timer, and attach service tool KV11282815 to that side.
3. Measure timer piston strokes at specified fuel injection pump rpm indicated below.

Standard timer piston stroke:
Refer to S.D.S.

Test (Cont'd)



4. If timer piston stroke is not within specified range, remove cover from low-pressure side of timer and adjust piston stroke by adding shim(s).

a. Shims (service parts)

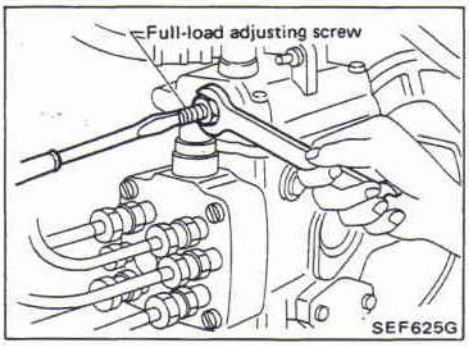
Part number	Thickness mm (in)
16880-V0700	0.6 (0.024)
16880-V0701	0.7 (0.028)
16880-V0702	0.9 (0.035)
16880-V0703	1.0 (0.039)
16880-V0704	1.2 (0.047)
16880-01T00	2.4 (0.094)

b. Make sure that at least one shim is used on each side of timer spring.

Adjustment of fuel injection under full-load

1. Set control lever at "full-load" using a spring.
2. Furnish specified voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel injection at each specified fuel injection pump rpm.

Standard fuel injection:
Refer to S.D.S.



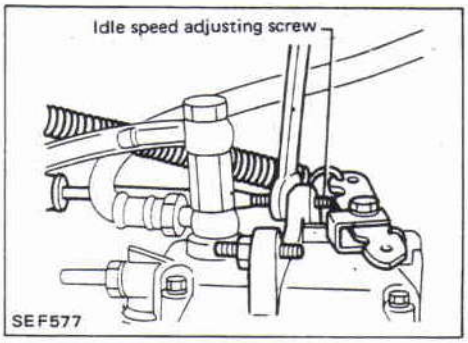
4. If fuel injection is not within standard range, adjust it using full-load adjusting screw.

Adjustment of fuel injection during idle

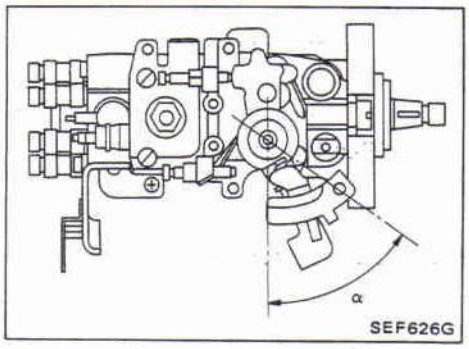
1. Pull spring until control lever touches idle speed adjusting screw.
2. Furnish specified voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel injection at specified fuel injection pump rpm.

Standard fuel injection:
Refer to S.D.S.

Test (Cont'd)



4. If fuel injection is not within specified range, adjust using idle speed adjusting screw.



a. **Tightening this screw will increase fuel injection amount.**
b. **Make sure that control lever angle (α) is set at the specified range.**

   α: Refer to S.D.S.

   If control lever angle is not within specified range, adjust it by repositioning control lever on control shaft. (One serration pitch: 15°)

   After control lever has been repositioned, be sure to measure amount of fuel injection at idle speed again.

Adjustment of fuel injection during start

1. Set control lever at "full-load" by pulling spring.
2. Furnish specified voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel injection at specified fuel injection pump rpm.

Standard fuel injection:

Refer to S.D.S.

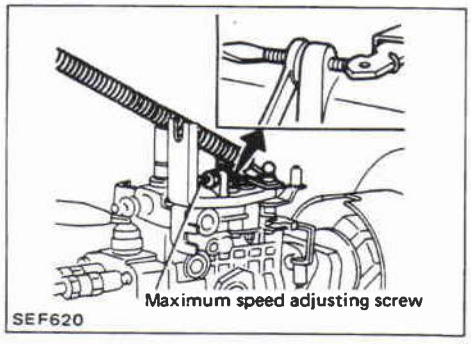
4. If fuel injection is lower than standard, check, "MS" dimension. Refer to step 25 for Injection Pump Assembly.

Adjustment of fuel injection at maximum pump rpm

1. Set control lever at "full-load" by pulling spring.
2. Furnish specified voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel injection at specified fuel injection rpm.

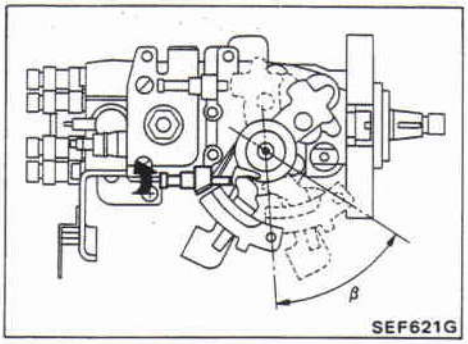
Standard fuel injection:

Refer to S.D.S.



4. If fuel injection is not within standard range, adjust using maximum speed adjusting screw.

Test (Cont'd)



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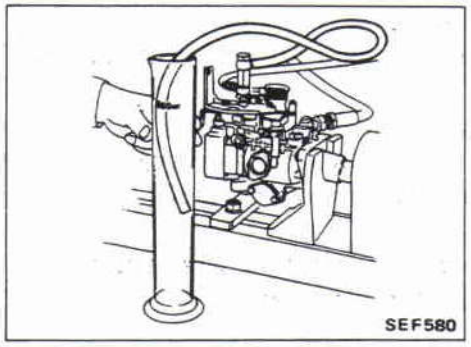
a. **Tightening screw will increase fuel injection.**
b. **Make sure that control lever angle (β) is within the specified range.**

β: Refer to S.D.S.


SEF580

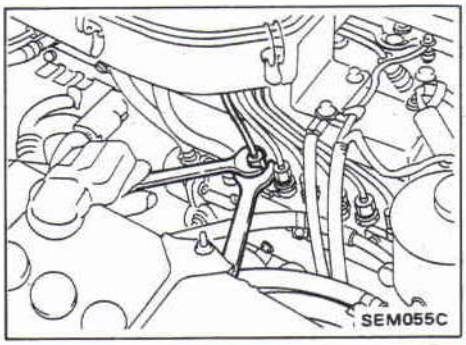
Measurement of overflow amount

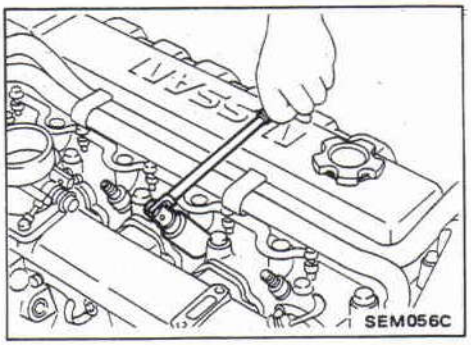
1. Set control lever at "full-load" by pulling spring.
2. Furnish specified voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel overflow at specified fuel injection rpm.

Fuel overflow:
43 - 87 mℓ
(1.51 - 3.06 Imp fl oz)/10 sec. at 1,100 rpm

Operation check of fuel cut solenoid valve

When engine is idling and fuel cut solenoid valve current is OFF, be sure there is no injection. This check has to be done for approx. 5 seconds.





Removal and Installation

1. Remove injection tube assembly.
2. Remove spill tube assembly.

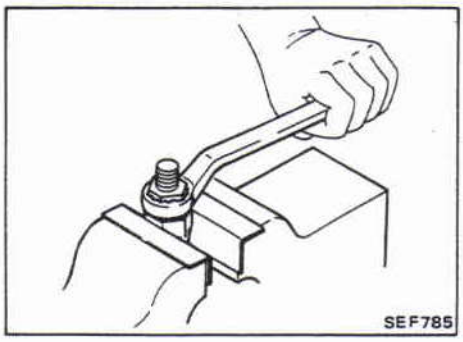
To prevent spill tube from breaking, remove it by gripping nozzle holder.

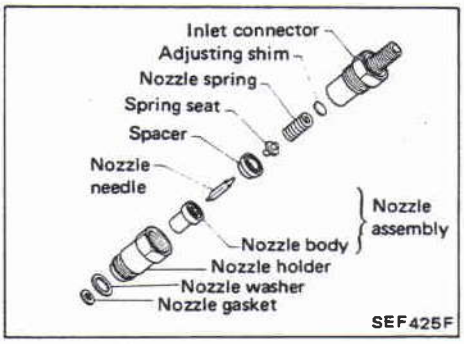
3. Remove injection nozzle assembly using deep socket wrench.
4. Install injection nozzle holder in the reverse order of removal.

Injection nozzle holder to cylinder head
54 - 64 N·m
(5.5 - 6.5 kg-m, 40 - 47 ft-lb)
Spill tube nut
29 - 39 N·m
(3.0 - 4.0 kg-m, 22 - 29 ft-lb)
Injection tube flare nut
20 - 25 N·m
(2.0 - 2.5 kg-m, 14 - 18 ft-lb)

a. **Nozzle gaskets should always be replaced.**
b. **To prevent spill tube from breaking later, spill tube nuts should be tightened gradually in sequence.**

5. Bleed air from fuel system.
   Refer to BLEEDING FUEL SYSTEM.





Disassembly

1. Loosen inlet connector while keeping nozzle top from turning.

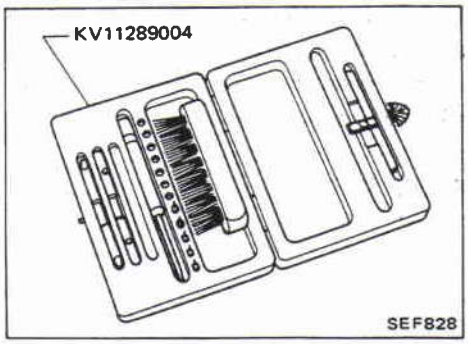
Use vise jaw cover to avoid damaging the nozzle holder body.

2. Arrange all disassembled parts in order shown at left.

Inspection

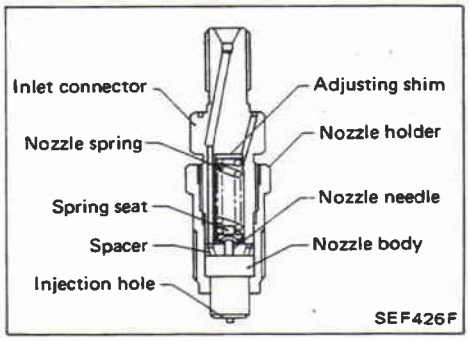
Thoroughly clean all disassembled parts with fresh kerosene or solvent.

- If nozzle needle is damaged or fused, replace nozzle assembly with a new one.
- If end of nozzle needle is seized or excessively discolored, replace nozzle assembly.
- Check nozzle body and distance piece for proper contact. If excessively worn or damaged, replace nozzle assembly or nozzle holder assembly.
- Check distance piece and nozzle holder for proper contact. If excessively worn or damaged, replace nozzle holder assembly.
- Check nozzle spring for excessive wear or damage. If excessively worn or damaged, replace nozzle holder assembly.

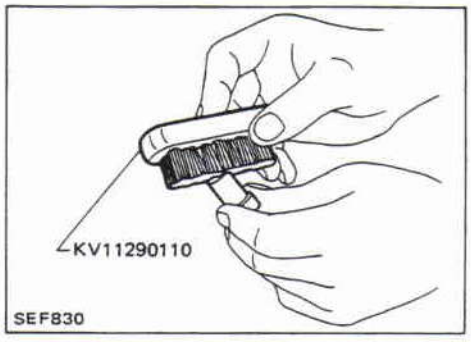


Cleaning

1. Clean nozzle assembly using the nozzle cleaning kit (KV11289004), nozzle oil sump scraper (KV11290632) and nozzle seat scraper (KV11290620).

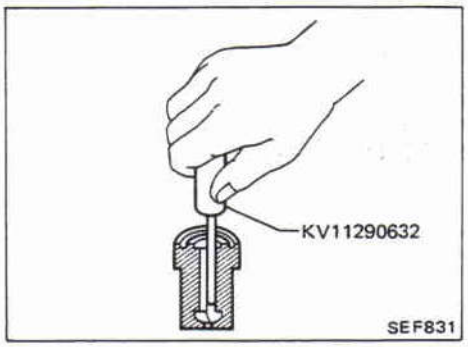


2. Portions which should be cleaned are indicated in the left figure.

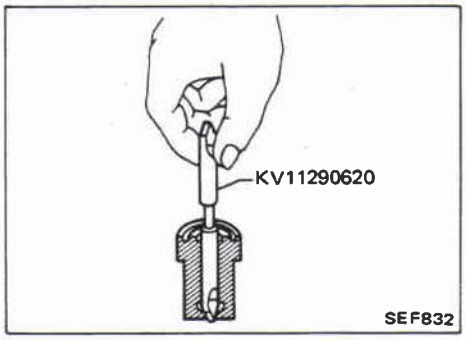


3. Remove any carbon from exterior of nozzle body (except wrapping angle portion) by using Tool.

Cleaning (Cont'd)

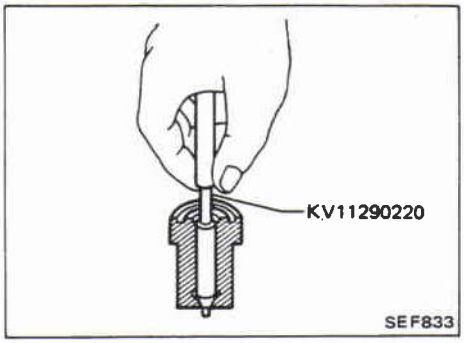


4. Clean fuel sump of nozzle body using Tool.



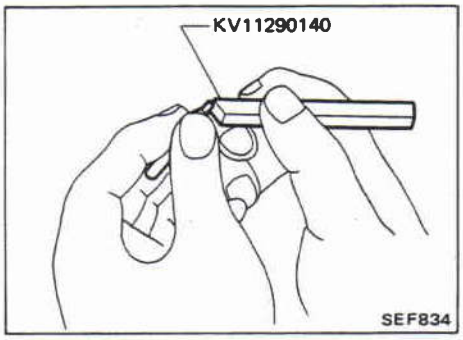
5. Clean nozzle seat by using Tool.

This job should be performed with extra precautions, since efficiency of nozzle depends greatly on a good nozzle seat.

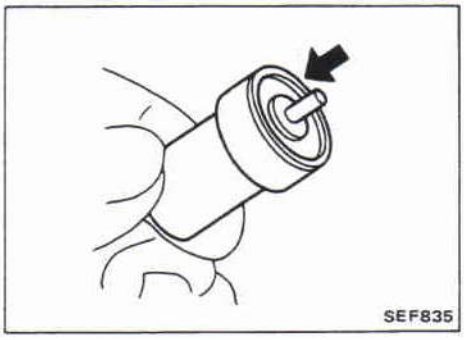


6. Clean spray hole of nozzle body by using Tool.

To prevent spray hole from canting, always clean it by starting with inner side and working towards outside.

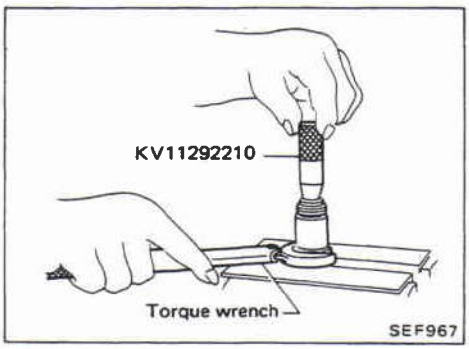


7. Decarbon nozzle needle tip by using Tool.



8. Check needle for proper position.
(1) Pull needle about halfway out from body and then release it.
(2) Needle should sink into body very smoothly from just its own weight.
(3) Repeat this test and rotate needle slightly each time.

If needle fails to sink smoothly from any position, replace both needle and body as a unit.



Assembly

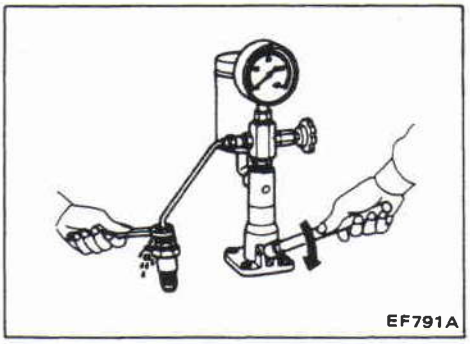
Assemble in the reverse order of disassembly.

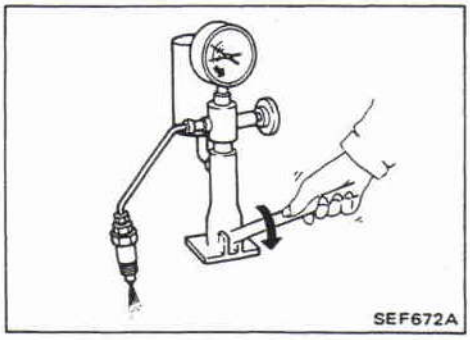
: **Inlet connector to nozzle holder**
29 - 49 N·m
(3.0 - 5.0 kg-m, 22 - 36 ft-lb)

Test and Adjustment

WARNING:

When using nozzle tester, be careful not to allow fuel sprayed from nozzle to come into contact with your hand or body, and make sure that your eyes are properly protected with goggles.





INJECTION PRESSURE TEST

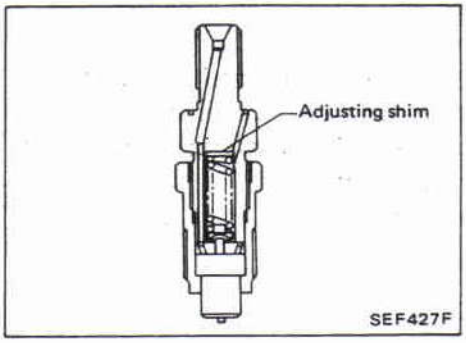
1. Install nozzle to injection nozzle tester and bleed air from flare nut.
2. Pump the tester handle slowly (one time per second) and watch the pressure gauge.
3. Read the pressure gauge when the injection pressure just starts dropping.

Initial injection pressure:

Used **9,807 - 10,297 kPa**
(98.1 - 103.0 bar, 100 - 105 kg/cm², 1,422 - 1,493 psi)

New **10,297 - 11,278 kPa**
(103.0 - 112.8 bar, 105 - 115 kg/cm², 1,493 - 1,635 psi)

New nozzle is required to always check initial injection pressure.



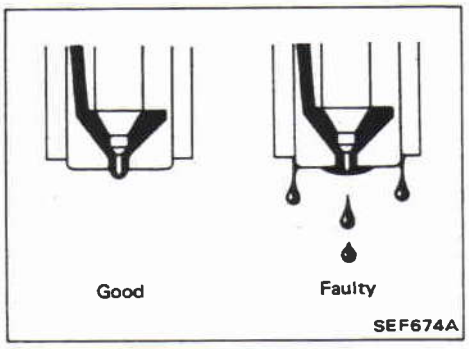
Test and Adjustment (Cont'd)

4. To adjust injection pressure, change adjusting shims.

a. Increasing the thickness of adjusting shims increases initial injection pressure. Decreasing thickness reduces initial pressure.

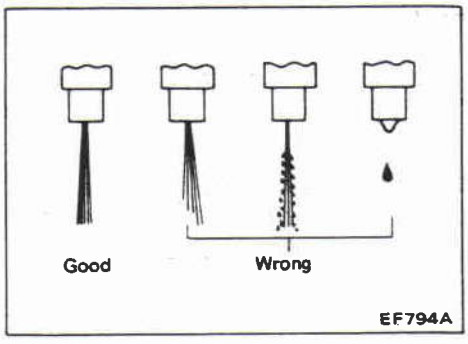
b. A shim thickness of 0.04 mm (0.0016 in) corresponds approximately to a difference of 471 kPa (4.71 bar, 4.8 kg/cm², 68 psi) in initial injection pressure.

Thickness mm (in)	Part number
0.1 (0.004)	16613-43G00
0.2 (0.008)	16613-43G01
0.3 (0.012)	16613-43G02
0.4 (0.016)	16613-43G03
0.5 (0.020)	16613-43G04
0.52 (0.0205)	16613-43G05
0.54 (0.0213)	16613-43G06
0.56 (0.0220)	16613-43G07
0.58 (0.0228)	16613-43G08
0.8 (0.031)	16613-43G09



LEAKAGE TEST

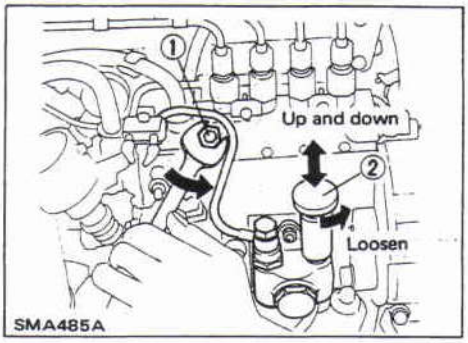
1. Maintain the pressure at about 981 to 1,961 kPa (9.8 to 19.6 bar, 10 to 20 kg/cm², 142 to 284 psi) below initial injection pressure.
2. Check that there is no dripping from the nozzle tip or around the body.
3. If there is leakage, clean, overhaul injection nozzle or replace it.



SPRAY PATTERN TEST

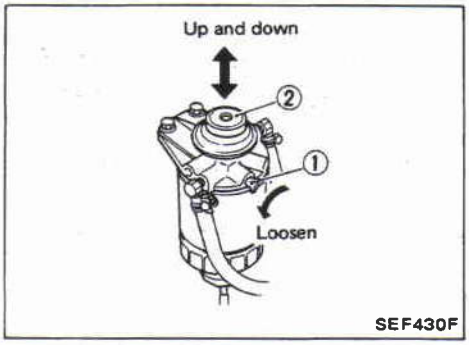
1. Pump the tester handle 4 to 6 times per second or more.
2. Check the spray pattern.
3. If the spray pattern is not correct, clean injection nozzle or replace it.

Air should be bled out of fuel system when injection pump is removed or fuel system is repaired.
Protect pump and engine mounts from fuel splash with rags.
If engine will not start after bleeding air, loosen injection tubes at nozzle side and crank engine until fuel overflows from injection tube. Tighten injection tube flare nuts.
If the engine does not operate smoothly after it has started, race it two or three times.



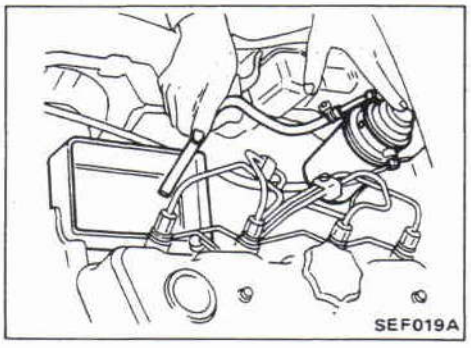
In-line Pump

1. Remove the cap that covers the priming pump ②.
2. Turn the priming pump ② counterclockwise.
3. Loosen the air vent screws ①.
4. Move the priming pump ② up and down until no further air-bleed comes out of the air vent screws ①.
5. Tighten the air vent screws ①.
6. Push and turn the priming pump clockwise.
7. Install the cap.



VE Pump

1. Loosen the air vent screw ①.
2. Move the priming pump ② up and down until no further air-bleed comes out of the air vent screw ①.
3. Tighten the air vent screw ①.
4. Move the priming pump ② up and down until there is suddenly more resistance in the movement.



Checking Priming Pump

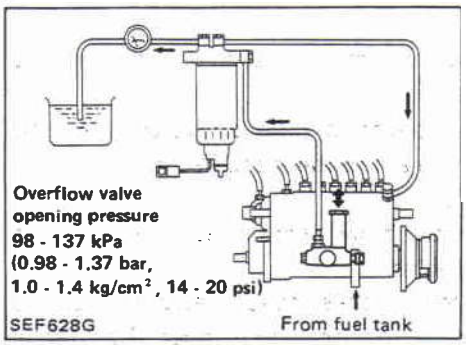
VE PUMP

Before checking priming pump, make sure that fuel filter is filled with fuel.

1. Disconnect fuel return hose.

Place a suitable container beneath hose end.

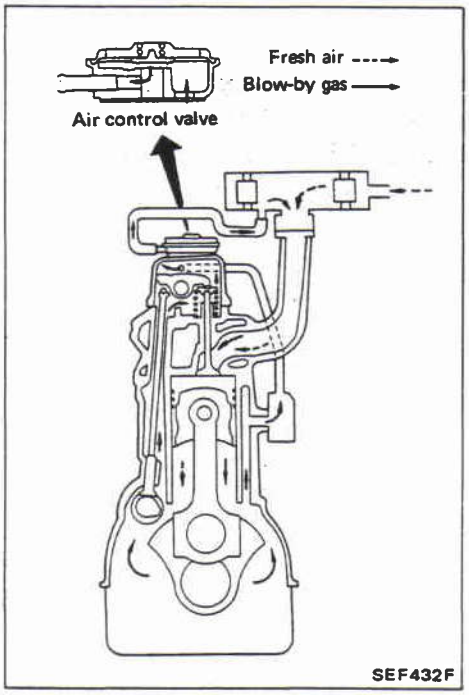
2. Pump priming pump and check that the fuel overflows from the hose end. If not, replace priming pump.



Overflow Valve

IN-LINE PUMP

Attach a pressure gauge to fuel filter discharge port, and check valve opening pressure by operating priming pump. If pressure is not within range of 98 to 137 kPa (0.98 to 1.37 bar, 1.0 to 1.4 kg/cm², 14 to 20 psi), replace overflow valve.



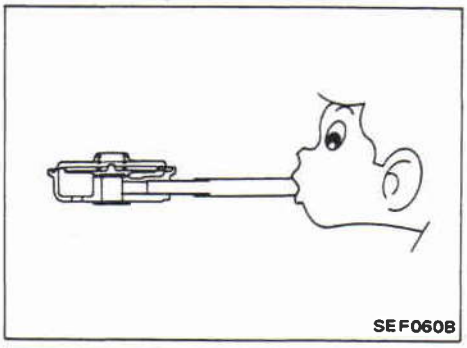
Description

The closed-type crankcase ventilation system is utilized as a crankcase emission control system.

The closed-type crankcase emission control system prevents blow-by gas from entering the atmosphere and keeps the internal crankcase pressure constant.

During the valve operation, the blow-by gas is fed into the intake manifold by the air control valve.

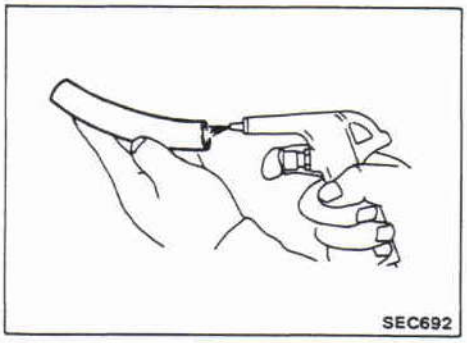
This is activated by the internal rocker cover pressure. When the intake air flow is restricted by the throttle chamber, the internal rocker cover pressure decreases. At this point, the crankcase emission control valve keeps the internal rocker cover pressure constant so that air or dust is not sucked in around the crankshaft oil seal.



Inspection

AIR CONTROL VALVE

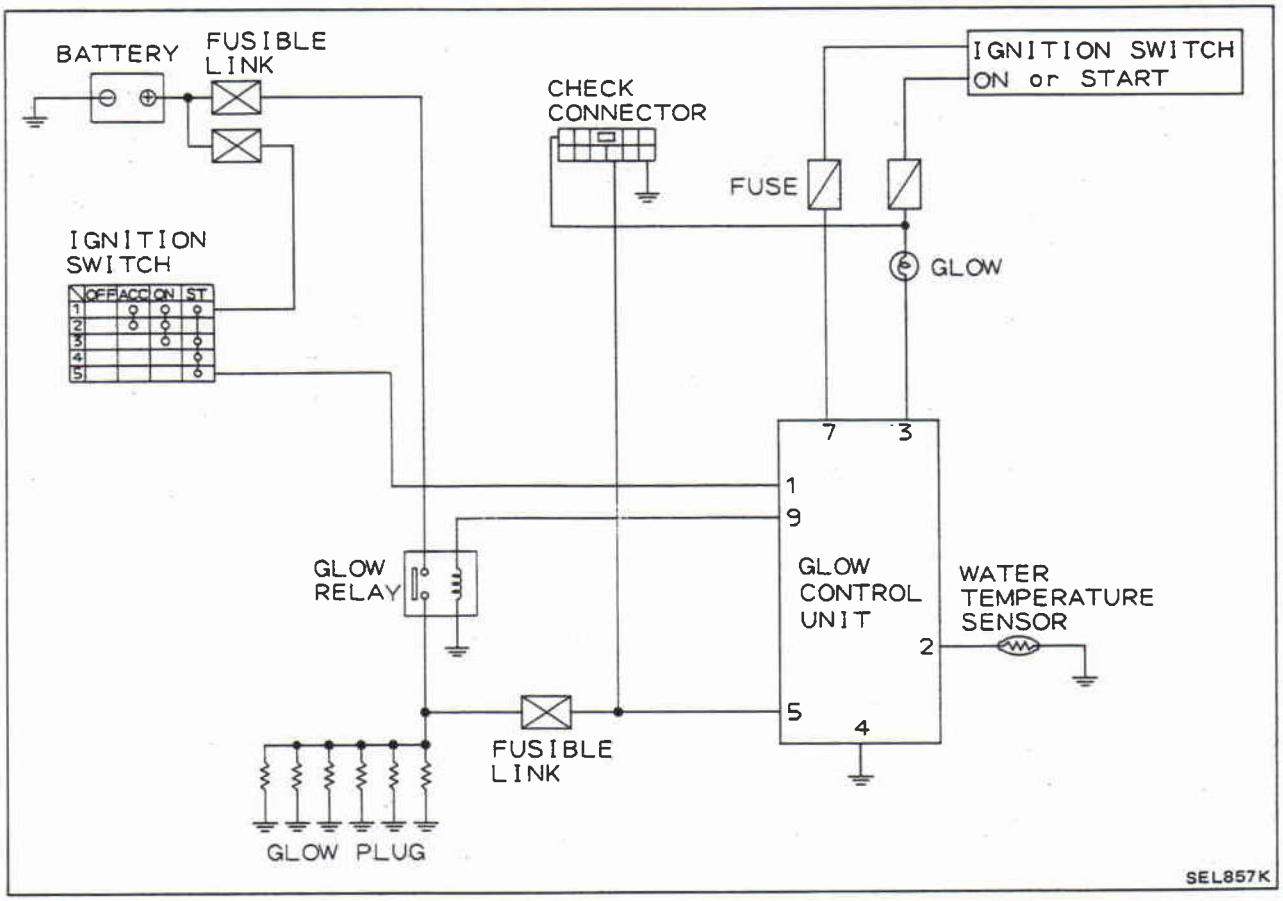
1. Remove rocker cover.
2. Remove control valve from rocker cover.
3. After plugging the center hole with adhesive tape, check that air flows from inlet by blowing air from outlet and that air does not flow by inhaling air.



Ventilation Hose

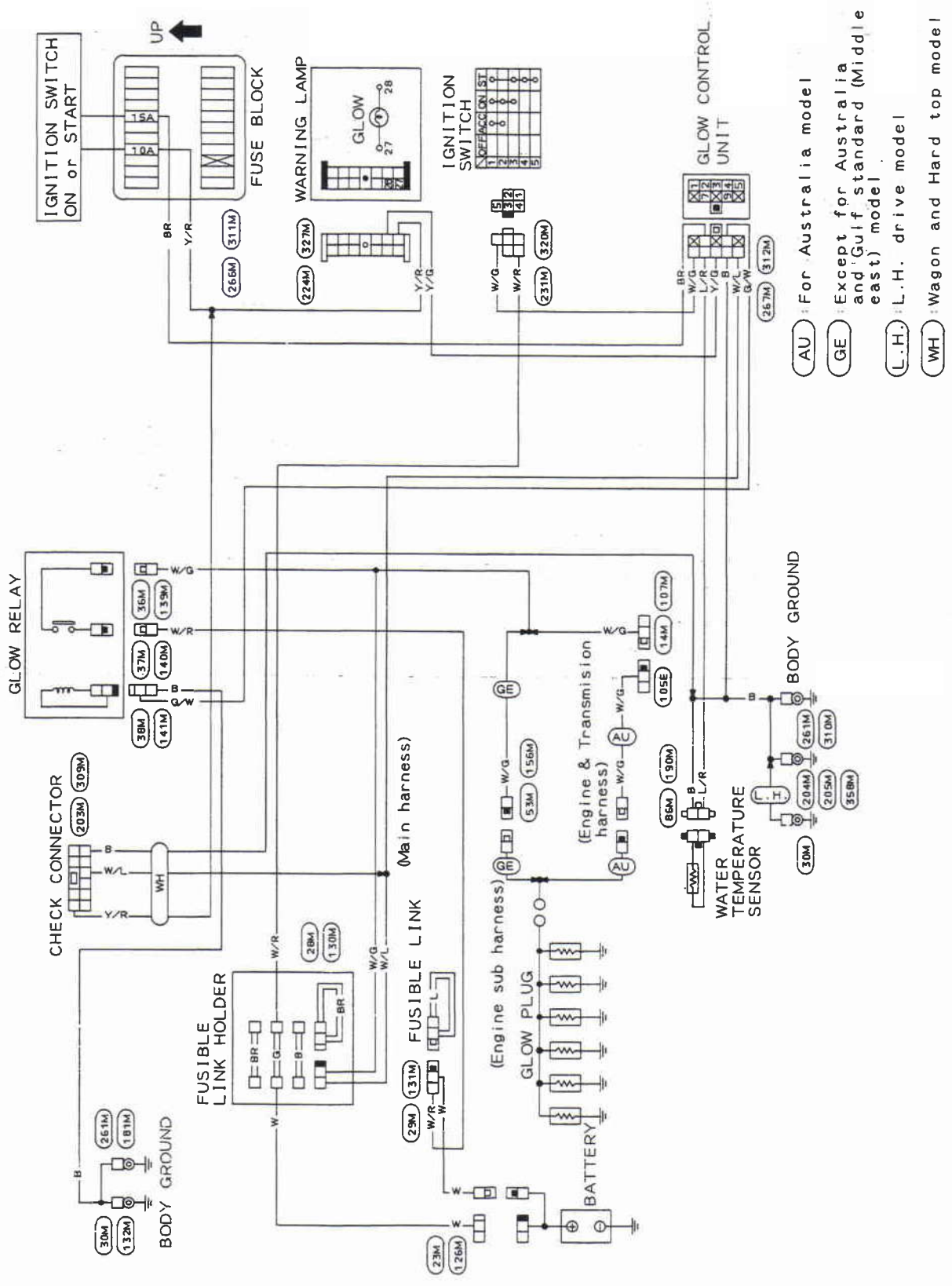
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air.
   If any hose cannot be freed of obstructions, replace.

Schematic



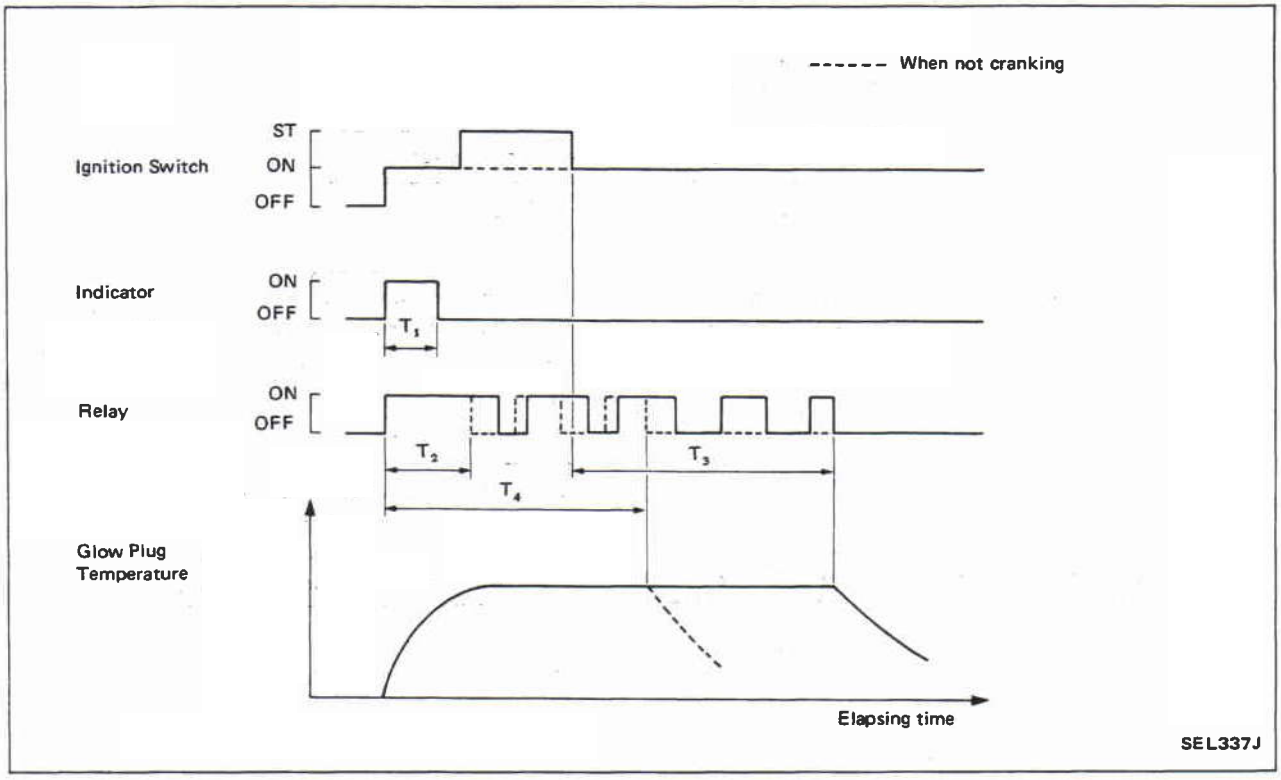
SEL679K

Wiring Diagram



SEL856K

Description



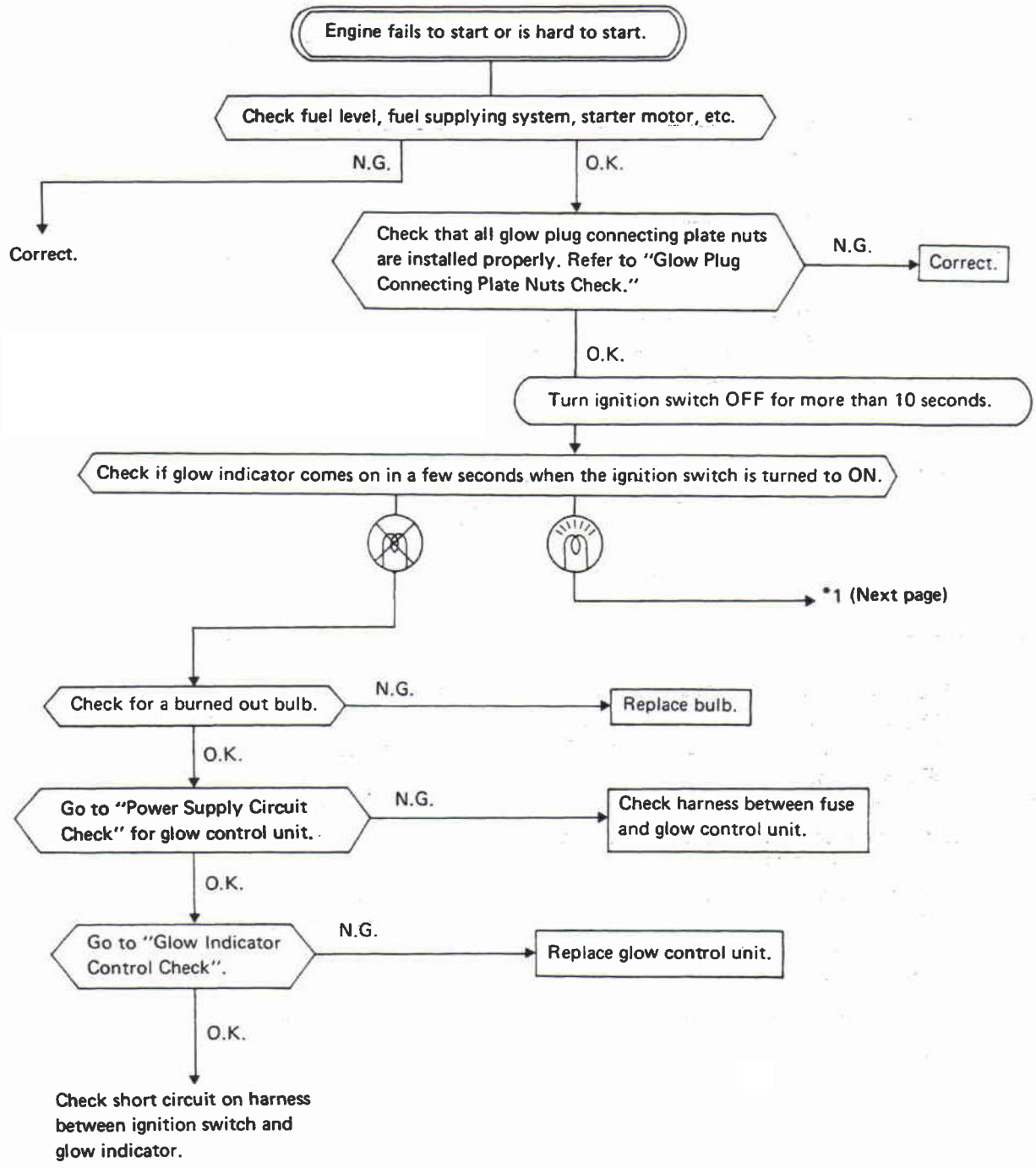
When the ignition switch is turned on, the relay is turned on and the "high-level" electric current flows through the glow plugs and heats them up quickly. After T_1 seconds have passed, the control unit turns off the glow indicator but the relay remains on. The relay chops the electric current when the ignition switch turns to "START" from "ON".

The relay has been chopping for T_3 seconds after the ignition switch has returned to "ON" from "START". When not cranking, the relay chops the electric current while T_4 - T_2 seconds after the ignition switch has turned to "ON" from "OFF".

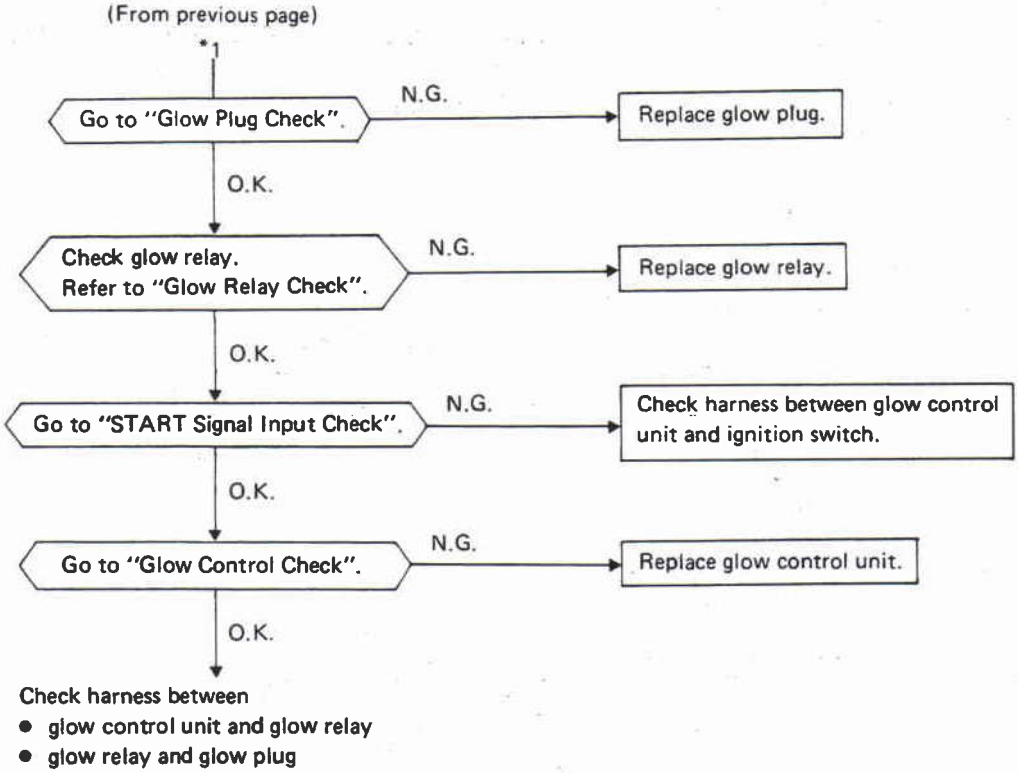
T_1: approx. 2 - 6 [sec.] (Varies with coolant temperature.)
T_2: approx. 3 - 14 [sec.] (Varies with glow plug terminal voltage.)
T_3: approx. 15 [sec.]
T_4: approx. 15 [sec.]

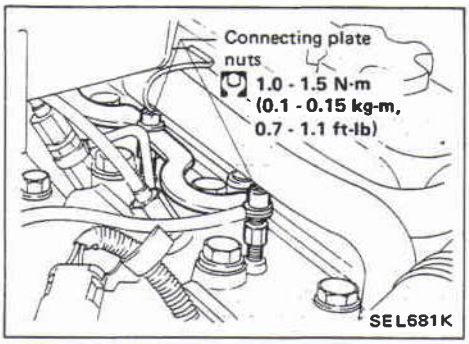
- When the ignition switch is repeatedly turned "ON" and "OFF", T_2 becomes shorter.

Trouble-shooting



Trouble-shooting (Cont'd)

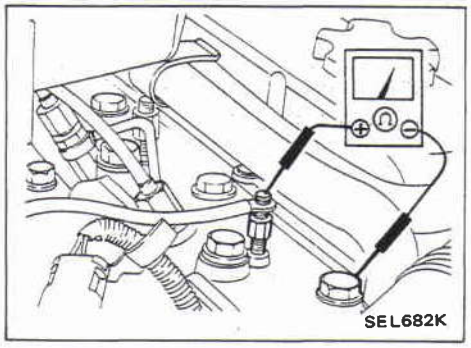




Check

GLOW PLUG CONNECTING PLATE NUTS CHECK

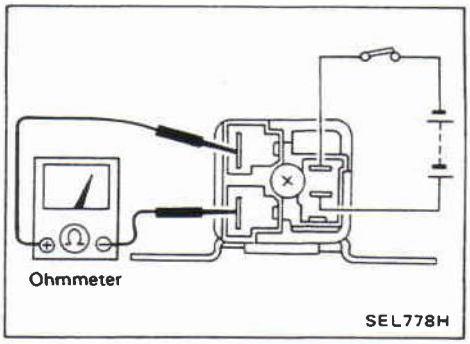
Check that all glow plug connecting plate nuts and harness nut are installed securely.



GLOW PLUG CHECK

Remove glow plug connecting plate and perform continuity test between each glow plug and cylinder head.

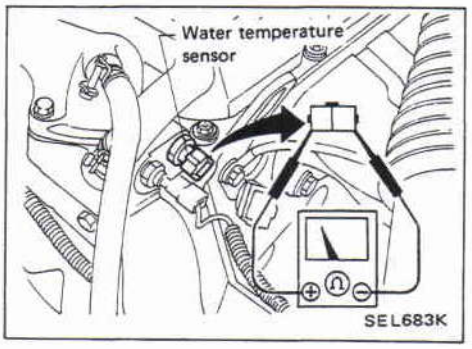
No continuity ... Replace glow plug.



GLOW RELAY CHECK

The glow relay is normally open.

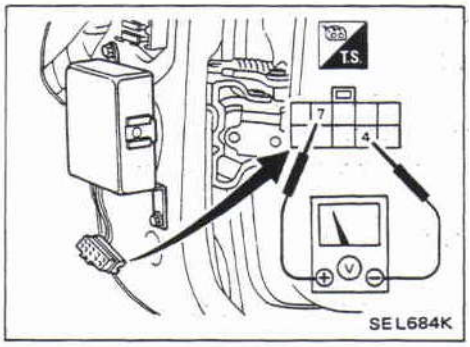
For check, refer to STANDARDIZED RELAY.



WATER TEMPERATURE SENSOR UNIT CHECK

Measure resistance to temperature as shown.

Coolant temp. °C (°F)	Resistance kΩ
−25 (−13)	19
0 (32)	5.6
20 (68)	2.5
40 (104)	1.2



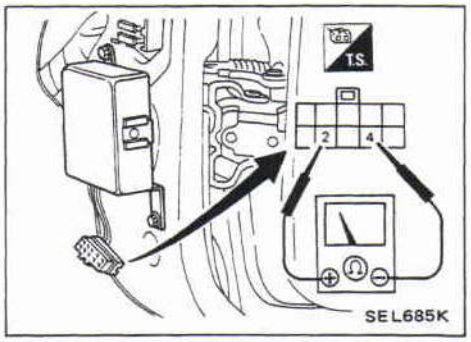
Control Unit Check

POWER SUPPLY CIRCUIT CHECK

Disconnect harness connector from glow control unit and perform voltage check and continuity check.

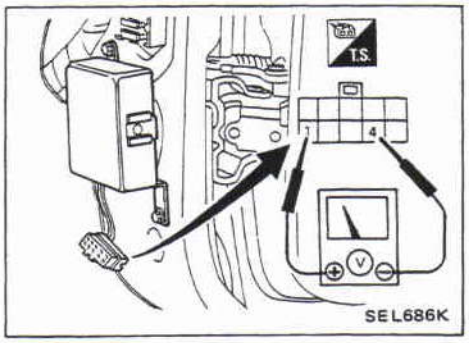
Voltmeter terminals		Ignition switch position		
(+)	(–)	OFF	ACC	ON
⑦	④	0V	0V	Approx. 12V

Ohmmeter terminals		Ignition switch OFF
(+)	(–)	
④	Body ground	Continuity exists



WATER TEMPERATURE SENSOR CIRCUIT CHECK

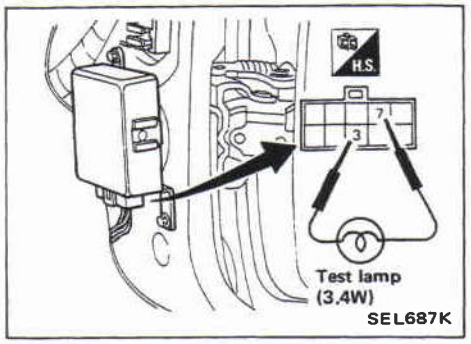
- Check continuity between terminals ② and ④.
  Measure resistance to temperature approximately as shown in "Water temperature sensor check".



START SIGNAL INPUT CHECK

1. Turn ignition switch OFF.
2. Disconnect harness connector from the starter motor's "S" terminal.
3. Check terminal voltage between ① and ④ when the ignition switch is at "START".

Voltage: approx. 12V



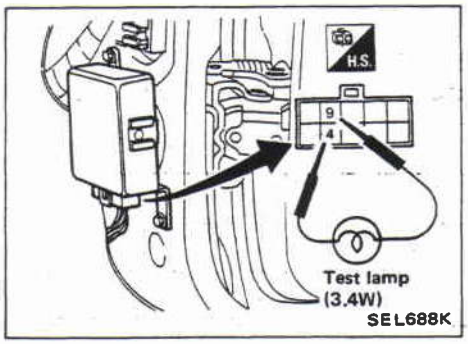
GLOW INDICATOR CONTROL CHECK

1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown.
4. Turn ignition switch to ON and measure the time the test lamp stays lit.

Time the test lamp should stay lit.

Approx. 2 - 6 seconds.
(Varies with coolant temperature)

Control Unit Check (Cont'd)



GLOW CONTROL CHECK

1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown.
4. Turn ignition switch to ON and measure the time the test lamp stays lit.

Time the test lamp should stay lit.

Approx. 3 - 14 seconds.
(Varies with glow plug terminal voltage)

The time will be shortened if ignition switch is OFF only a short time.

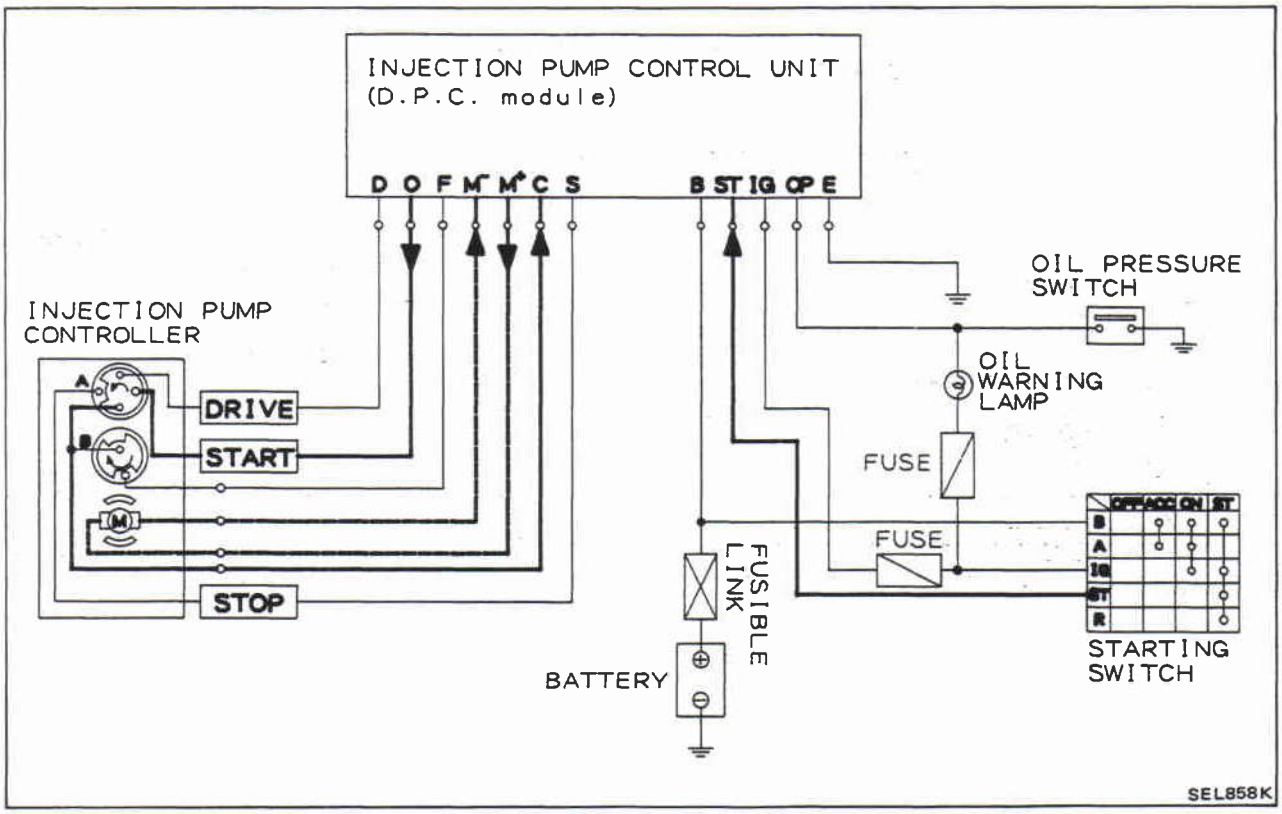
Therefore, when measuring the time, leave ignition switch OFF for more than 1 minute, and then turn ignition switch to ON.

This time, the test lamp came on and went off approx. 1 - 3 times after which it stayed lit.

5. When ignition switch is turned to START and returned to ON, the test lamp comes on and goes off approx. 3 - 6 times.

Description

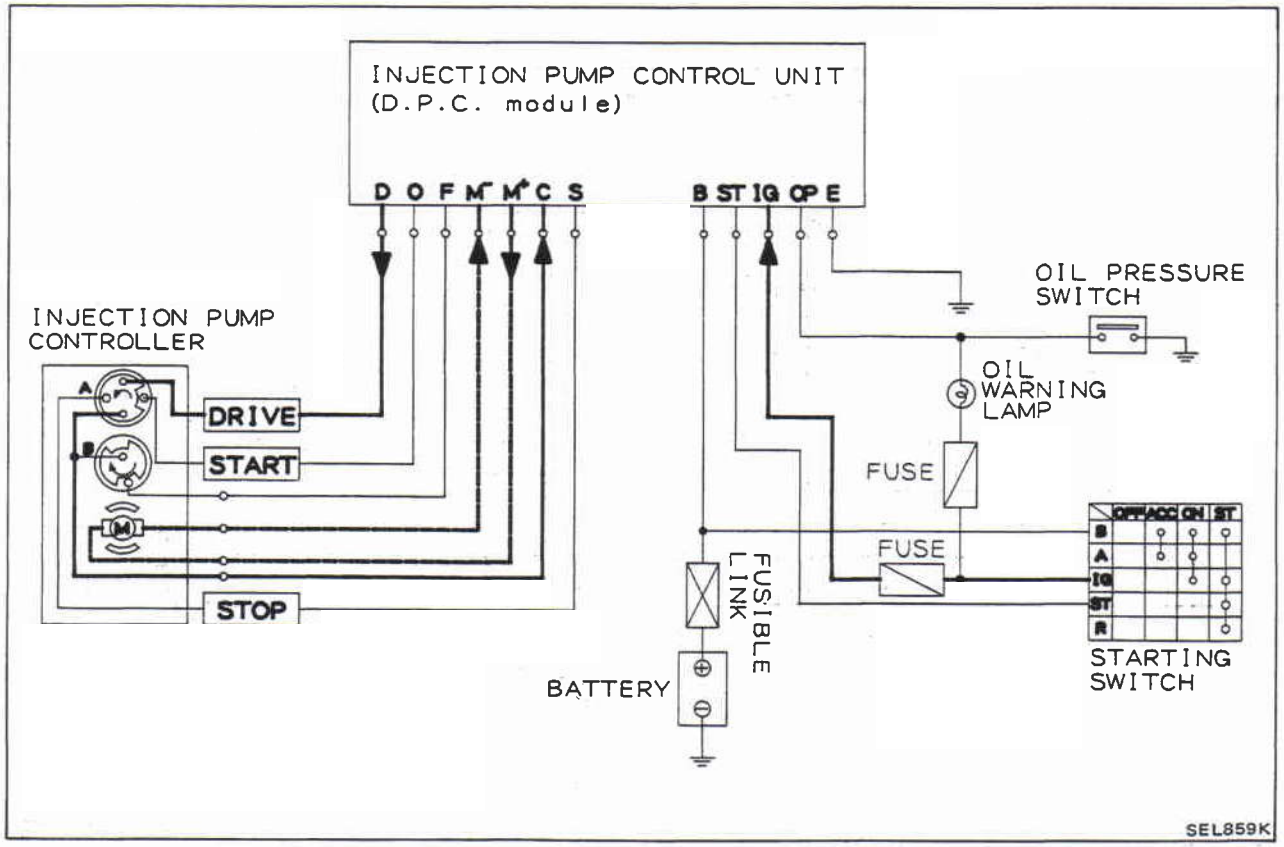
FUEL EXCESS OPERATION



When the starting switch is turned to "START", the fuel injection control unit activates. This permits an electrical current to flow in sequence via rotor A of the fuel injection pump controller, from terminal 0 to rotor A and terminal C, causing the fuel injection controller motor to run.
As the motor runs, rotor A rotates and, when it reaches its start position, current flow between terminal 0 and C is broken, which stops the motor's operation. The controller is thus brought to its START position.

Description (Cont'd)

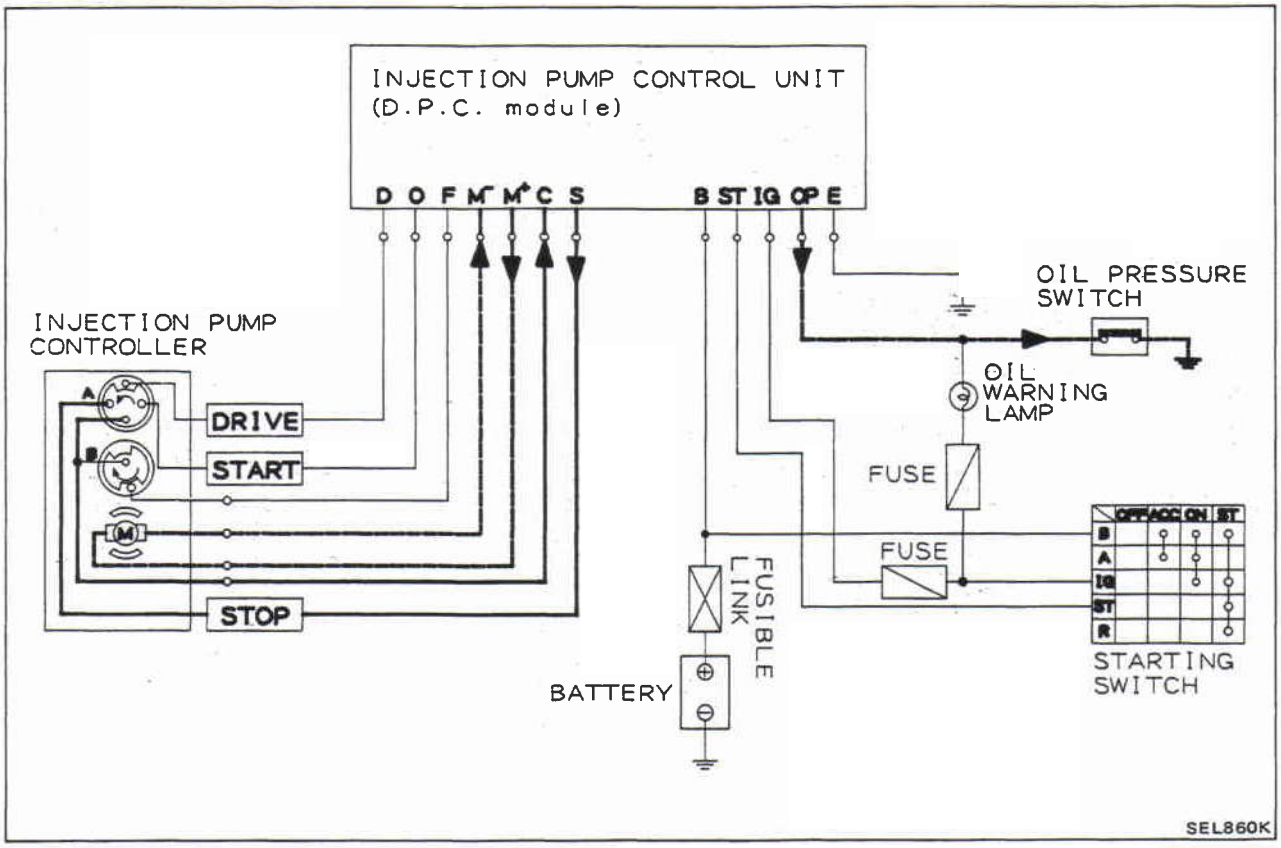
DRIVE OPERATION



When the starting switch is turned from "START" to "ON", the fuel injection pump control unit activates. This permits an electrical current to flow in sequence via rotor A of the fuel injection pump controller, from terminal D to rotor A and terminal C, causing the fuel injection controller motor to run.
As the motor runs, rotor A rotates and, when it reaches its drive position, current flow between terminals D and C is broken, which stops the motor's operation. Thus, the controller is set at its DRIVE position.

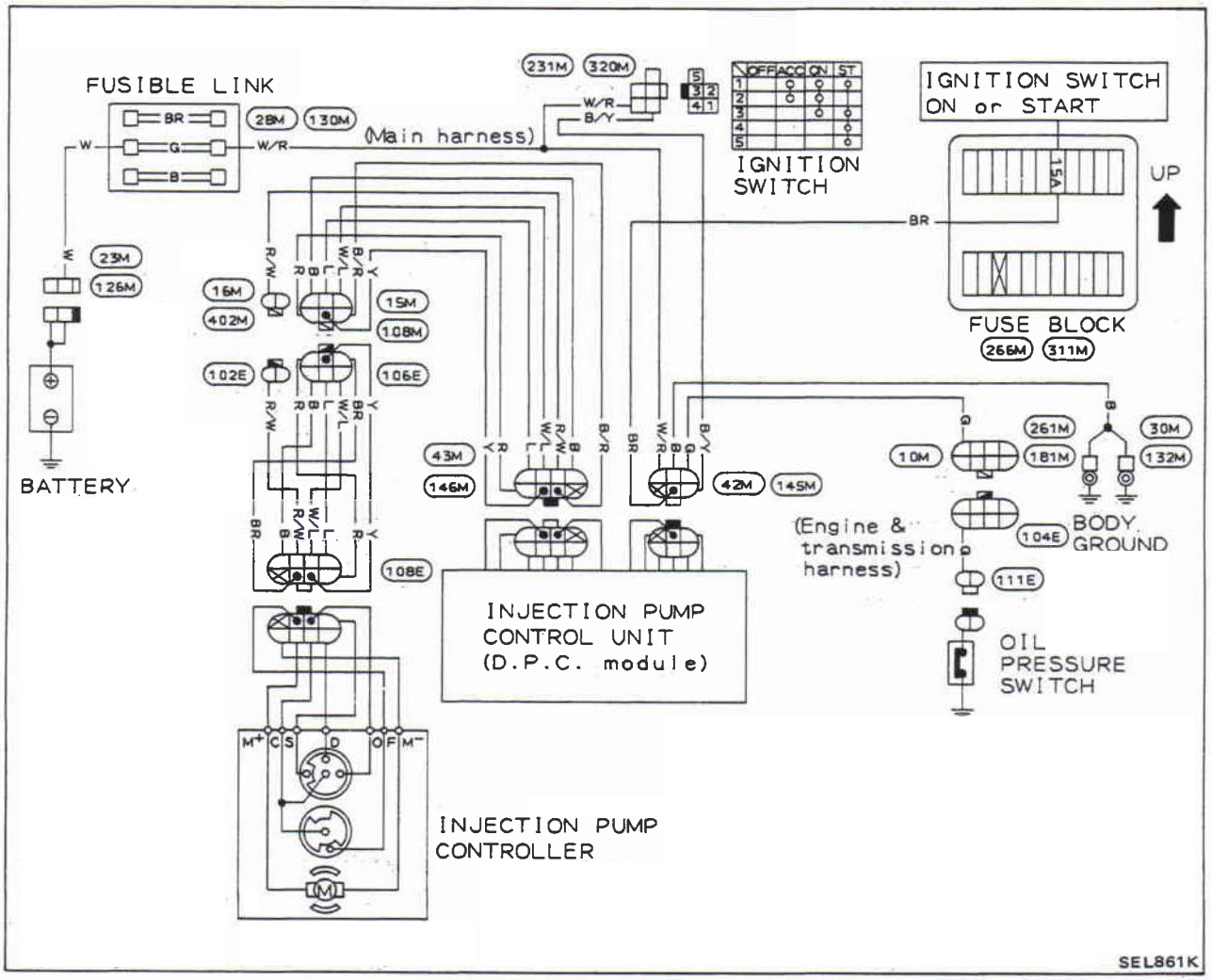
Description (Cont'd)

ENGINE STOP OPERATION



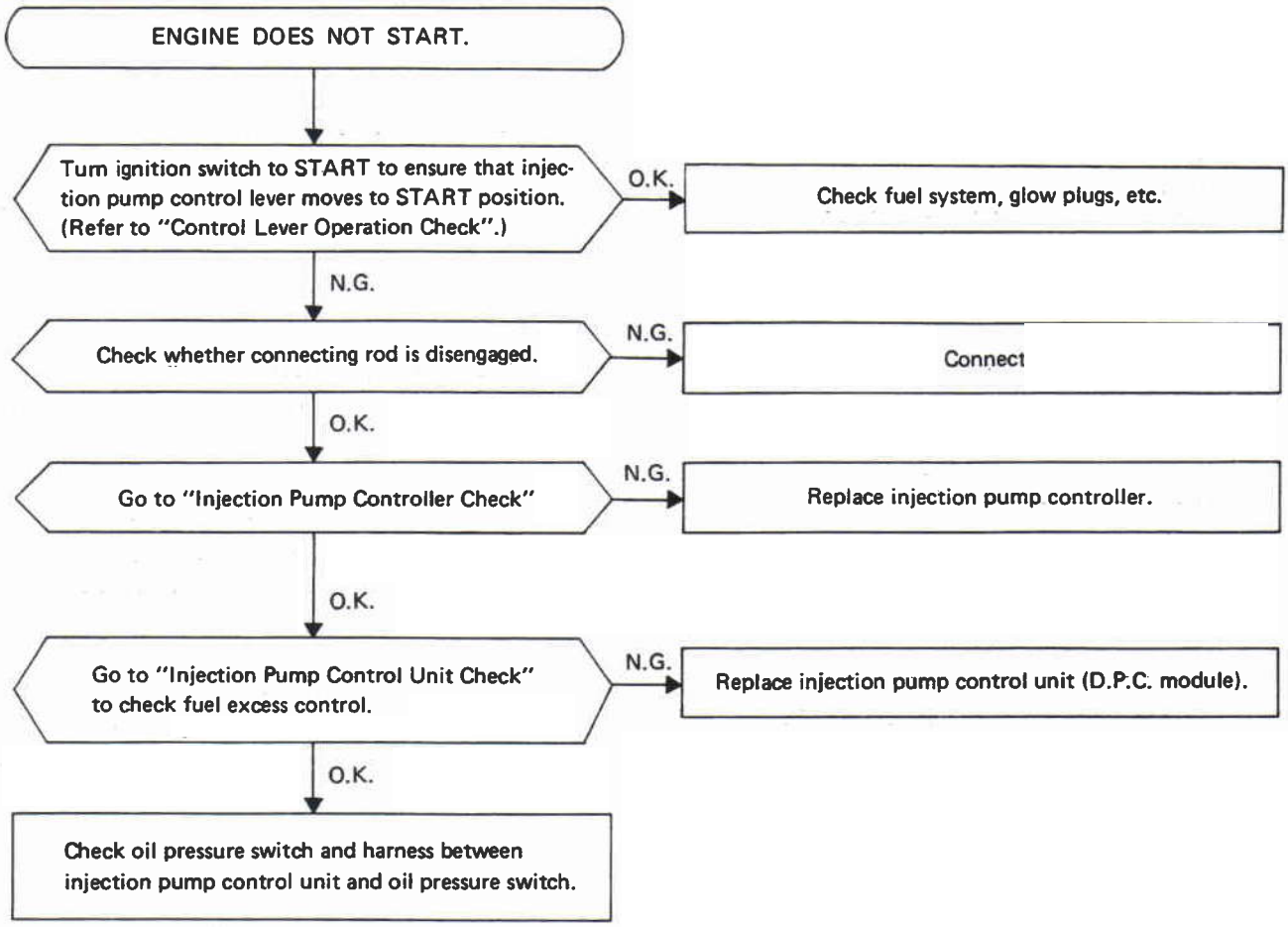
When the ignition switch is turned to "OFF" or when the oil pressure switch turns "ON", the fuel injection pump control unit will activate. When this happens, current flows in sequence through terminal S, rotor A and terminal C, causing the controller's motor to rotate as well as rotor A. As the rotor reaches the stop position, current flow between terminals S and C is broken and the motor will then stop. The controller is thus set at its STOP position.

Wiring Diagram



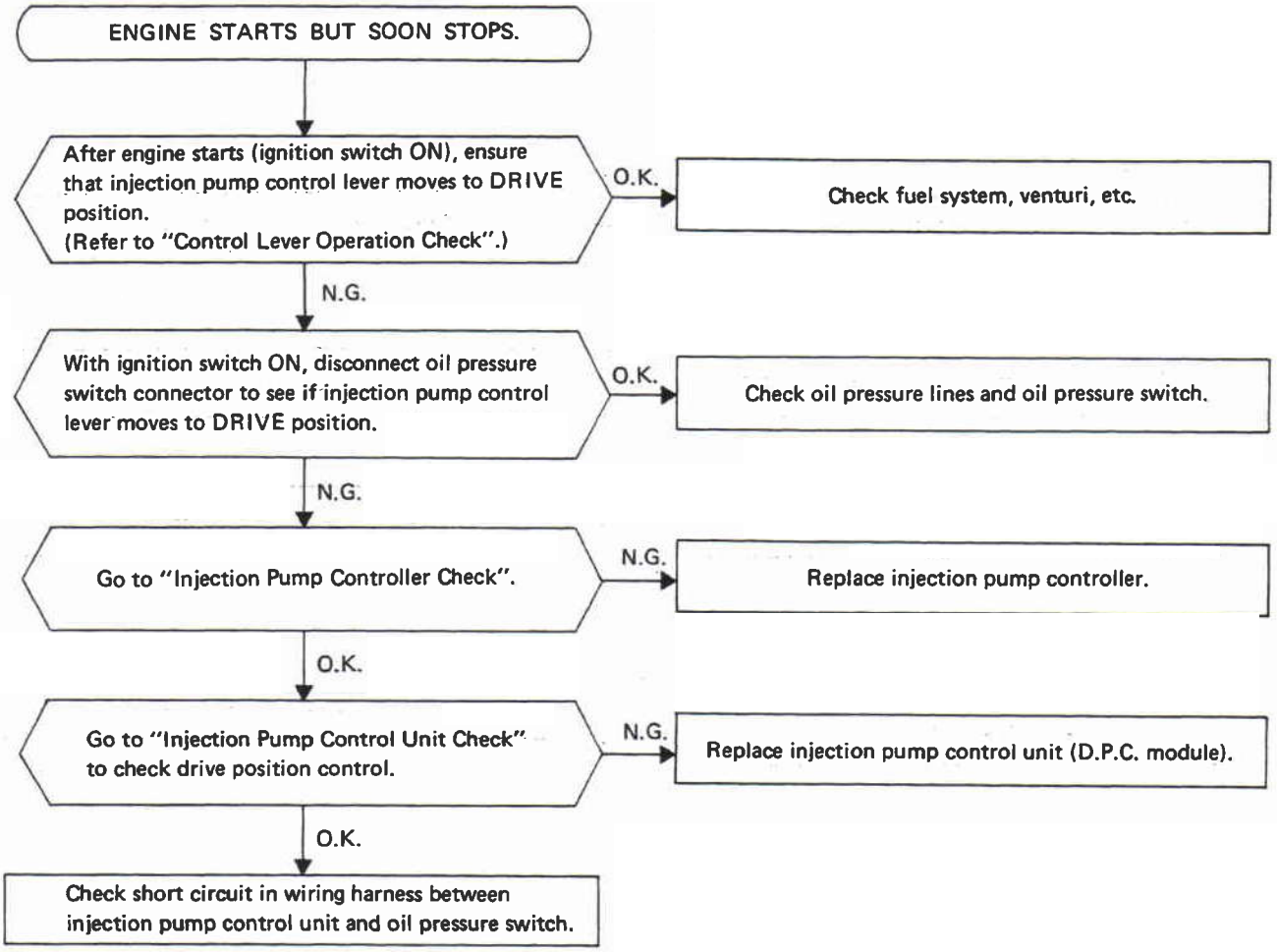
Trouble-shooting

CASE 1



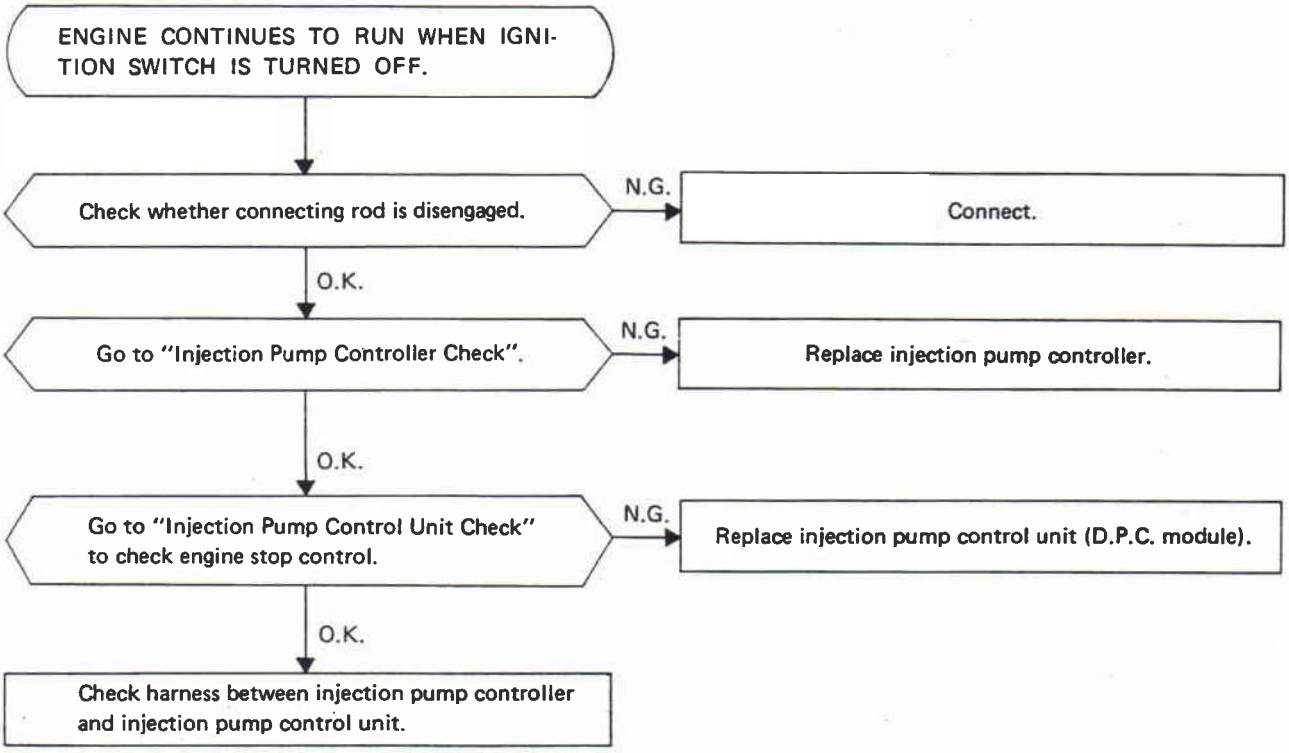
Trouble-shooting (Cont'd)

CASE 2

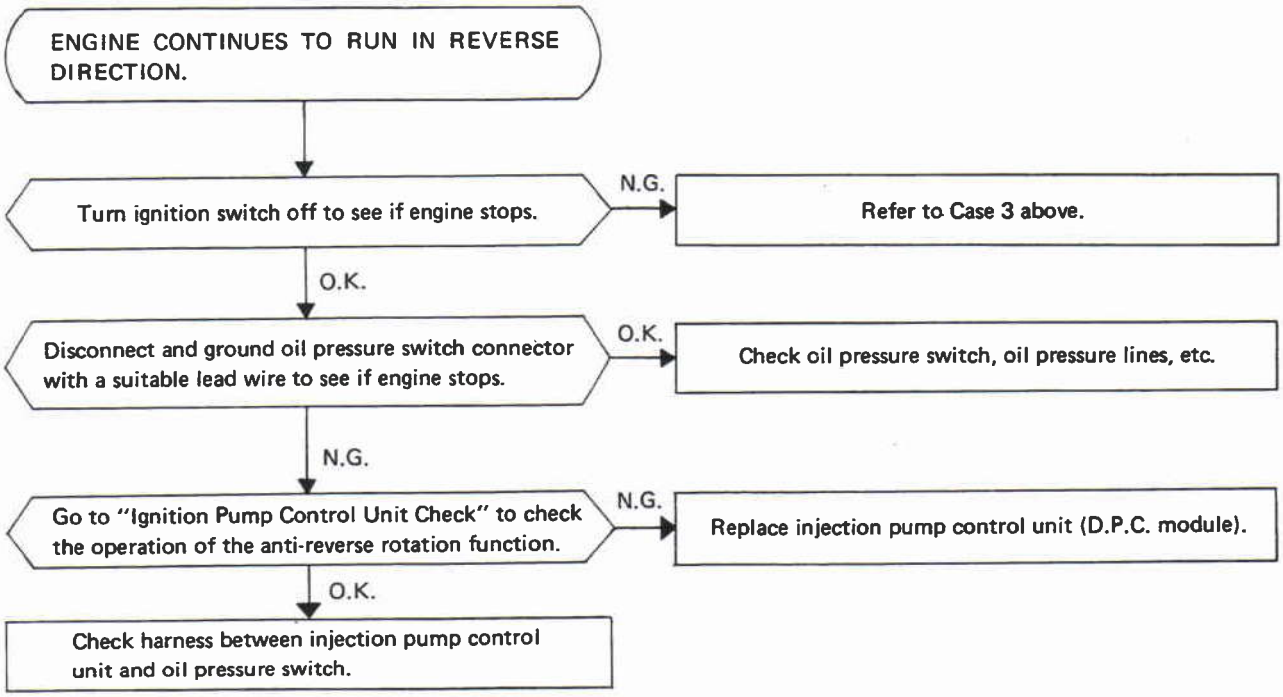


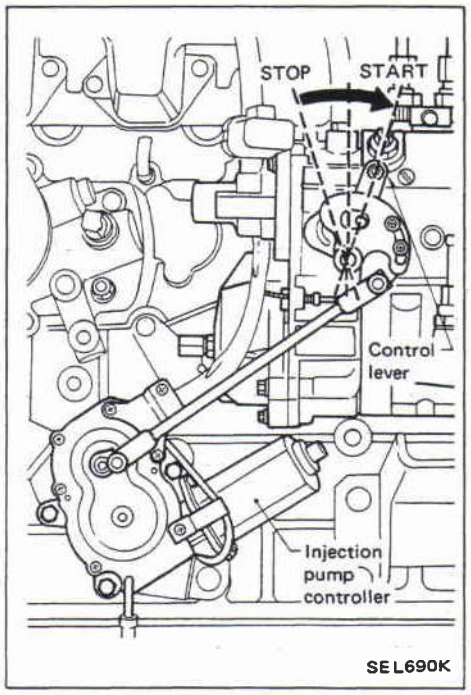
Trouble-shooting (Cont'd)

CASE 3



CASE 4

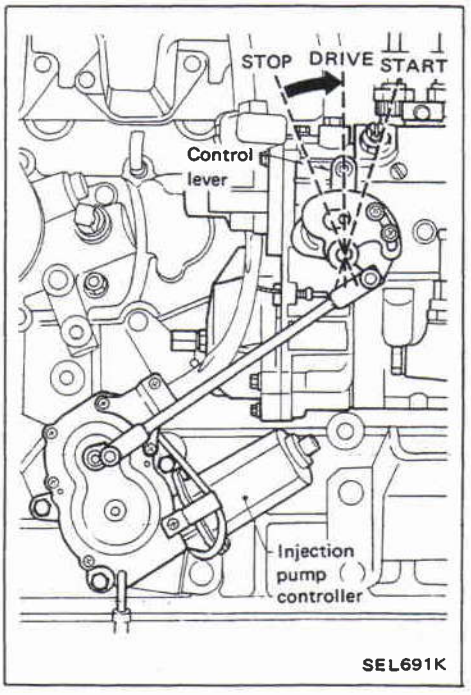




Injection Pump Control Lever Operation Check

(1) "START" OPERATION

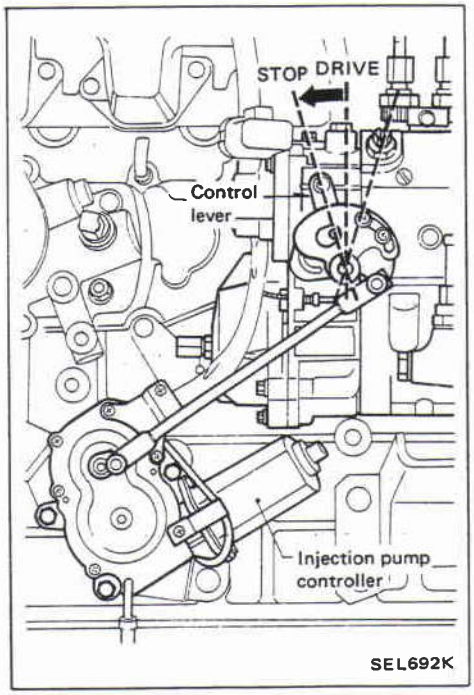
1. Turn ignition switch OFF.
2. Disconnect harness connector from starter motor "S" terminal.
3. Turn ignition key to "START" in order to ensure that injection pump control lever moves to the start position.



(2) "DRIVE" OPERATION

1. Turn ignition switch OFF.
2. Disconnect harness connector from oil pressure switch.
3. Turn ignition key to "ON" to ensure that injection pump control lever moves to the drive position.

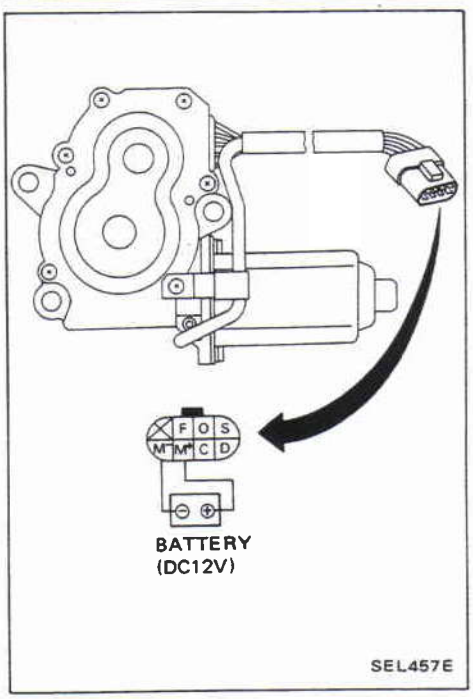
Injection Pump Control Lever Operation Check (Cont'd)



(3) "STOP" OPERATION

1. Turn ignition switch to "OFF" in order to ensure that injection pump control lever moves to the stop position.
2. Start engine. Disconnect and ground oil pressure switch connector with a suitable lead wire to see if injection pump control lever moves to the stop position.

Injection Pump Controller Check



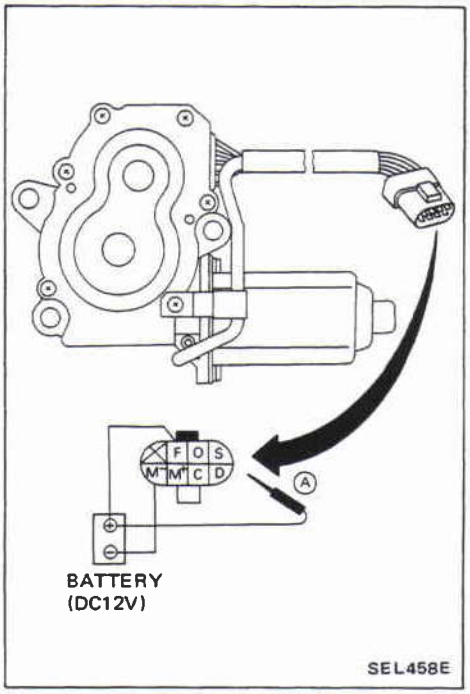
MOTOR CHECK

1. Turn ignition switch OFF.
2. Disconnect harness connector from injection pump controller.
3. Apply battery voltage between terminals (M+) and (M−). Injection pump controller motor should run and control lever should rotate.

If injection pump controller does not work, replace controller.

When replacing controller, be sure to disconnect 6-pin harness connector from injection pump control unit and then reconnect it after installing controller.

Injection Pump Controller Check (Cont'd)

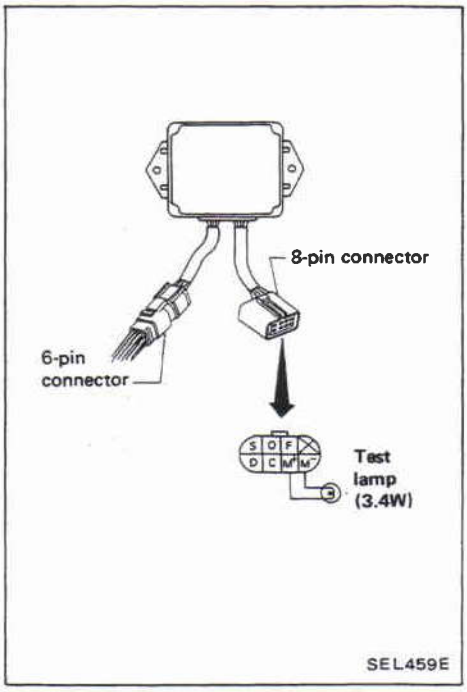


LEVER POSITION CONTROL CHECK

Fabricate adapters, as shown in the following illustration, and connect terminal Ⓐ to each of terminals listed in the table below. Injection pump control lever should stop at corresponding position.

Be careful not to connect lead wire to the wrong terminals as this will damage injection pump controller.

Connect terminal Ⓐ to:	Corresponding position of injection pump control lever
Terminal Ⓞ	START
Terminal Ⓢ	STOP
Terminal Ⓓ	DRIVE

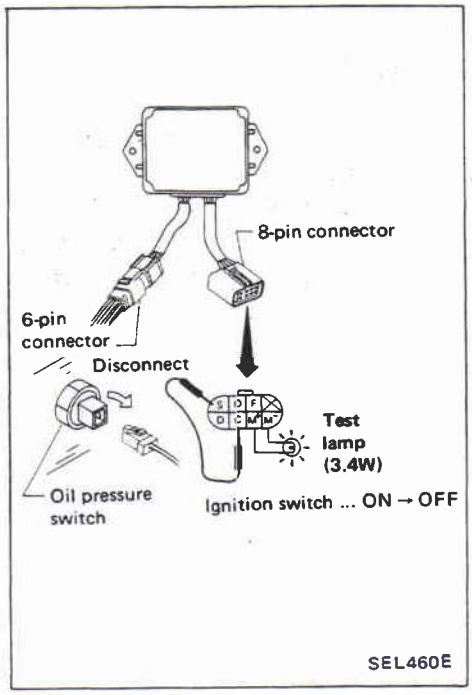


Injection Pump Control Unit (D.P.C. module) Check

PREPARATION FOR CHECK

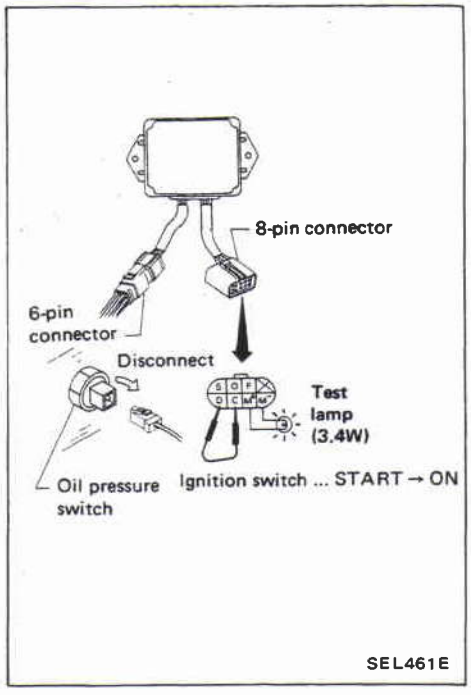
1. Turn ignition switch OFF.
2. Disconnect harness connector from starter motor "S" terminal.
3. Disconnect the 8-pin harness connector from the injection pump control unit.
4. Connect test lamp between terminals Ⓜ+ and Ⓜ− of injection pump control unit.

Injection Pump Control Unit (D.P.C. module) Check (Cont'd)



ENGINE STOP CONTROL CHECK

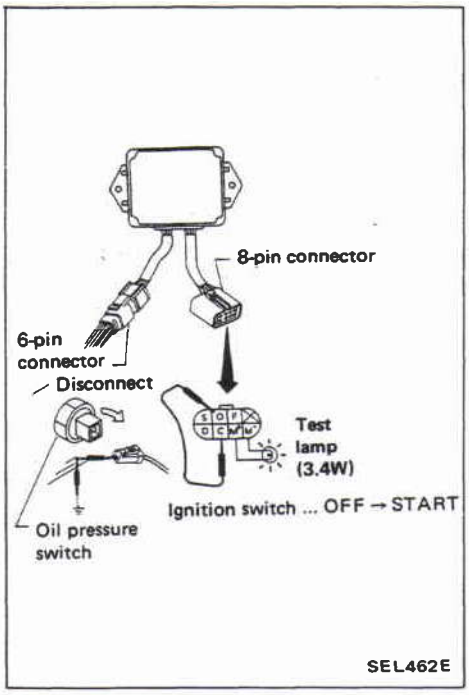
1. Turn ignition switch OFF.
2. Disconnect harness connector from oil pressure switch.
3. Connect a suitable lead wire between terminals Ⓢ and Ⓒ.
4. When ignition switch is turned to "OFF" from "ON", test lamp should come on and go off in about 10 to 20 seconds.
5. Disconnect 6-pin connector and then reconnect it.



DRIVE POSITION CONTROL CHECK

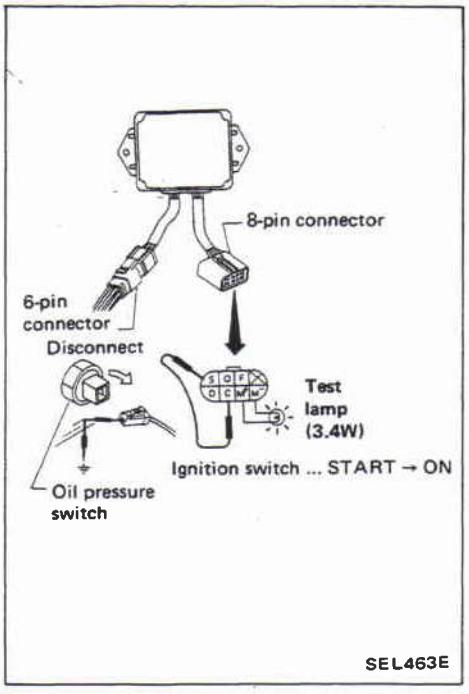
1. Turn ignition switch OFF.
2. Disconnect harness connector from oil pressure switch.
3. Connect a suitable lead wire between terminals Ⓓ and Ⓒ.
4. When ignition switch is turned to "ON" from "START", test lamp should come on and go off in about 10 to 20 seconds.
5. Disconnect 6-pin connector and then reconnect it.

Injection Pump Control Unit (D.P.C. module) Check (Cont'd)



FUEL EXCESS CONTROL CHECK

1. Turn ignition switch OFF.
2. Disconnect harness connector from oil pressure switch and ground it with a suitable lead wire.
3. Connect a suitable lead wire between terminals Ⓞ and Ⓒ.
4. When ignition switch is turned to "START", test lamp should come on and then go off in about 10 to 20 seconds.
5. Disconnect 6-pin connector and then reconnect it.



ANTI-REVERSE ROTATION FUNCTION CHECK

1. Turn ignition switch OFF.
2. Disconnect harness connector from oil pressure switch and ground it with a suitable lead wire.
3. Connect a suitable lead wire between terminals Ⓢ and Ⓒ.
4. When ignition switch is turned to "ON" from "START", test lamp should come on, and then go off in about 10 to 20 seconds.
5. Disconnect 6-pin connector and then reconnect it.

General Specifications

CARBURETOR (Jet and air bleed size)

Carburetor model		Gulf standard model		Australia model		Model except Australia and Gulf standard models	
		M/T	A/T	M/T	A/T	Standard	Tropical
		21J360-25	21J360-26	21J360-23	21J360-24	21J360-27	21J360-28
Throttle chamber bore mm (in)	P	36 (1.42)					
	S	40 (1.57)					
Venturi diameter mm (in)	P	32 (1.26)					
	S	36 (1.42)					
Main jet	P	#142					
	S	#225		#230		#225	
Main air bleed	P	#60					
	S	#80					
Slow jet	P	#54					
	S	#130					
Slow air bleed	P	#180					
	S	#60					
Power jet		#120		#90		#120	

P: Primary S: Secondary #: $\frac{1}{100}$ mm

Main jets for high altitude

Elevation m (ft)	P	S
1,000 (3,300)	#138	#220
2,000 (6,600)	#134	#212
3,000 (9,900)	#130	#205
4,000 (13,200)	#126	#200

Replacement of main jets is not necessary for models equipped with altitude compensation system.

E.G.R. CONTROL VALVE	
kPa (mbar, mmHg, inHg)	
Fully open vacuum	Over −14.7 (−147, −110, −4.33)
VACUUM MOTOR	
kPa (mbar, mmHg, inHg)	
Opening starts	−9.6 (−96, −72, −2.83)
Fully open	Over −19.5 (−195, −146, −5.75)

Inspection and Adjustment

A.T.C. AIR CLEANER

Intake manifold vacuum kPa (mbar, mmHg, inHg)	Atmospheric temperature °C (°F)	
	Below 38 (100)	Above 48 (118)
Below 10.7 (107, 80, 3.15)	Cool air	Cool air
Above 22.7 (227, 170, 6.69)	Hot air	Cool air

IDLE COMPENSATOR

Unit: °C (°F)

Idle compensator partially opens	65 - 74 (149 - 165)
Idle compensator fully opens	Above 74 (165)

FUEL PUMP

Fuel pump capacity mℓ (Imp fl oz)/minute at 1,000 rpm	More than 2,600 (91.5)
Fuel pressure kPa (bar, kg/cm², psi)	25.5 - 32.4 (0.255 - 0.324, 0.26 - 0.33, 3.7 - 4.7)
T.V.V. operation temperature Open °C (°F)	50±3 (122±5.4)
Closed °C (°F)	30 (86)

B.C.D.D.

Model	Australia and Gulf standard models		Model except Australia and Gulf standard models
	M/T	A/T	M/T
B.C.D.D. set pressure (at sea level) kPa (mbar, mmHg, inHg)	−76.0±0.7 (−760±7, −570±5, −22.44±0.20)	−78.6±0.7 (−786±7, −590±5, −23.23±0.20)	

CARBURETOR (Jet and air bleed size)

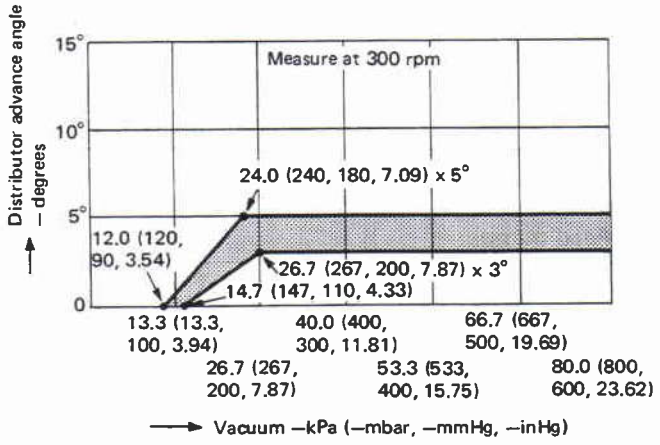
Carburetor model	Gulf standard model		Australia model		Model except Australia and Gulf standard models	
	M/T	A/T	M/T	A/T	Standard	Tropical
	21J360-25	21J360-26	21J360-23	21J360-24	21J360-27	21J360-28
Choke type	Manual choke		Automatic choke		Manual choke	
Fast idle adjustment Fast idle speed (A/T model in "N" position) rpm	1,100±50	900±50	1,100±50	900±50	1,100±50	
Clearance "A" (at 2nd cam step) mm (in)	2.25±0.15 (0.0886 ±0.0059)	2.58±0.15 (0.1016 ±0.0059)	1.37±0.14 (0.0539 ±0.0055)	1.64±0.14 (0.0646 ±0.0055)	2.25±0.15 (0.0886±0.0059)	
Vacuum break adjustment mm (in) Clearance "R_1"	3.25±0.25 (0.1280±0.0098)					
Clearance "R_2"	5.0±0.5 (0.197±0.020)					
F.I. pot adjustment F.I. pot touch speed rpm	–	1,700±100	–	1,700±100	–	
Idle speed (A/T model in "D" position) rpm	650±50					
Idle CO %	1.5					

Inspection and Adjustment (Cont'd)

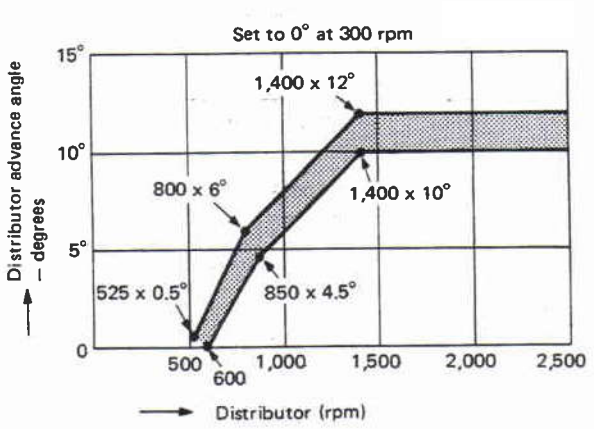
DISTRIBUTOR

Type		T0T00471 [MITSUBISHI make]
Firing order		1-5-3-6-2-4
Rotating direction		Counterclockwise
Point gap	mm (in)	0.45 - 0.55 (0.018 - 0.022)
Cap insulation resistance	MΩ	More than 50
Rotor head insulation resistance	MΩ	More than 50
Cap carbon point length	mm (in)	More than 3 (0.12) protruded length

Distributor spark advance curve



SEF485G



SEF486G

IGNITION COIL

Type		H5-15-49 [HANSHIN make]
Primary voltage	V	12
Primary resistance [at 20°C (68°F)]	Ω	1.08 - 1.32
Secondary resistance [at 20°C (68°F)]	kΩ	9.0 - 13.4

In-line Type Injection Pump

APPLICATION

Destination	Part number	Pump number	Remarks
General areas	16700-06J60	101641-9292	Without high altitude compensator
	16700-06J61	101641-9302	With high altitude compensator

INSPECTION AND ADJUSTMENT

Injection timing

Injection timing	B.T.D.C. 16°

Injection pump

		Standard mm (in)	Limit mm (in)
Pump housing to tappet clearance		0.02 - 0.062 (0.0008 - 0.0024)	0.20 (0.0079)
Control sleeve to plunger trunnion shaft clearance		0.02 - 0.08 (0.0008 - 0.0031)	0.12 (0.0047)
Camshaft end play		0 - 0.02 (0 - 0.0008)	0.10 (0.0039)
Control rack to pinion backlash		0.15 (0.0059)	0.30 (0.0118)
Control rack sliding resistance	Pump rpm = 0	Less than 1.471N (150 g, 5.29 oz)	–
	Pump rpm = 1,000	Less than 0.490N (50 g, 1.76 oz)	–
Injection internal (cam angle)		59°30′ - 60°30′	–
Injection starting timing (pre-stroke: plunger lift from B.D.C.)		2.10 - 2.20 (0.0827 - 0.0866)	–

Camshaft end play adjusting shim	Thickness mm (in)	Part number
	0.10 (0.0039)	16741-37500
	0.12 (0.0047)	16741-37501
	0.14 (0.0055)	16741-37502
	0.16 (0.0063)	16741-37503
	0.18 (0.0071)	16741-37504
	0.30 (0.0118)	16741-37505
	0.50 (0.0197)	16741-37506

Governor

	Thickness mm (in)	Part number
Pneumatic governor spring adjusting shim	0.2 (0.008)	19241-37504
	0.3 (0.012)	19241-37505
	0.5 (0.020)	19241-37500
	1.0 (0.039)	19241-37501
	1.5 (0.059)	19241-37502
	2.0 (0.079)	19241-37503
	2.5 (0.098)	19241-37506
	3.0 (0.118)	19241-37507
Torque control travel adjusting shim	0.1 (0.004)	19227-37500
	0.2 (0.008)	19227-37501
	0.3 (0.012)	19227-37502
	0.5 (0.020)	19227-37503
	1.0 (0.039)	19227-37504
Torque control spring adjusting shim	0.1 (0.004)	19229-37500
	0.2 (0.008)	19229-37501
	0.3 (0.012)	19229-37502
	0.5 (0.020)	19229-37503
	1.0 (0.039)	19229-37504

Feed pump

	Standard mm (in)	Wear limit mm (in)
Roller to pin clearance	0.04 - 0.08 (0.0016 - 0.0031)	0.30 (0.0118)
Roller outer diameter	15.0 (0.591)	14.9 (0.587)
Oil feed rate	405 mℓ (14.3 Imp fl oz) or more within 15 seconds at a pump speed of 1,000 rpm.	
Pumping capacity	Discharge should occur within one minute (60 seconds) with a pump speed of 100 rpm and intake head of 1.0 meter (3.3 ft).	
Oil feed pressure	The time required to develop an oil feed pressure of 333 to 412 kPa (3.33 to 4.12 bar, 3.4 to 4.2 kg/cm², 48 to 60 psi) with a feed pump speed of 600 rpm should be within 30 seconds.	
Pumping capacity (priming pump)	Operate the priming pump at a rate of 60 to 100 strokes per minute and verify that pumping is started within 25 strokes.	

In-line Type Injection Pump (Cont'd)

Timer

Flyweight holder to flange clearance (Lock plate to thrust washer clearance) mm (in)	0.02 - 0.10 (0.0008 - 0.0039)	
	Thickness mm (in)	Part number
Timer spring adjusting shim	0.1 (0.004)	16822-37500
	0.2 (0.008)	16822-Z9000
	0.3 (0.012)	16822-37501
	0.4 (0.016)	16826-99011
	0.5 (0.020)	16822-37502
	0.6 (0.024)	16822-Z9001
	0.7 (0.028)	16822-37506
	0.8 (0.031)	16822-37507
	0.9 (0.035)	16822-37508
	1.0 (0.039)	16822-Z9002
Timer plate bearing adjusting shim	0.10 (0.0039)	16826-99007
	0.12 (0.0047)	16828-99000
	0.14 (0.0055)	16826-99001
	0.16 (0.0063)	16826-99002
	0.18 (0.0071)	16826-99003
	0.20 (0.0079)	16826-99005
	0.30 (0.0118)	16826-99006
	0.50 (0.0197)	16826-99004

Fuel filter

Type	Full-flow, paper type filter
Overflow valve opening pressure kPa (bar, kg/cm^2, psi)	98 - 137 (0.98 - 1.37, 1.0 - 1.4, 14 - 20)

Injection pump calibration data

This data will be introduced later.

VE-Type Injection Pump

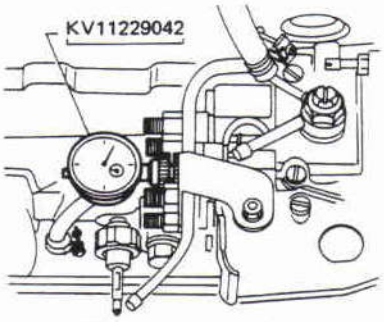
APPLICATION

Destination	Part No.	Pump No.	Remarks
Australia	16700-06J02	104760-4021	M/T without exhaust brake

INSPECTION AND ADJUSTMENT

Injection timing

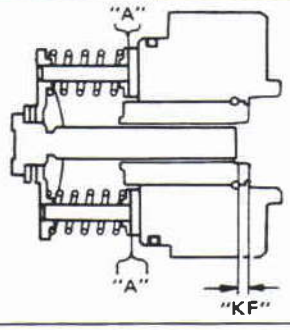
Plunger lift	mm (in)	0.74±0.02 (0.0291±0.0008) (equivalent to 6° B.T.D.C.)



SEF016A

Use of adjustment value and adjusting shim when installing injection pump.

Dimension "KF"	mm (in)	6.5 - 6.7 (0.256 - 0.264)

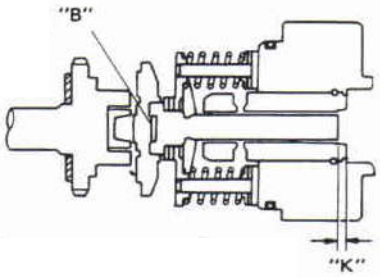


SEF638

Adjusting shim ("A" position)

Part number	Thickness mm (in)
16882-V0700	0.5 (0.020)
16882-V0701	0.8 (0.031)
16882-V0702	1.0 (0.039)
16882-V0703	1.2 (0.047)
16882-V0704	1.5 (0.059)
16882-V0705	1.8 (0.071)
16882-V0706	2.0 (0.079)

Dimension "K"	mm (in)	3.2 - 3.4 (0.126 - 0.134)

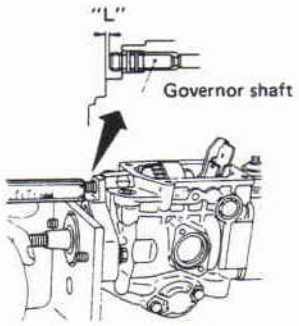


SEF639

Adjusting shim ("B" position)

Part number	Thickness mm (in)	Part number	Thickness mm (in)
16884-V0700	1.92 (0.0756)	16742-R8100	1.96 (0.0772)
16884-V0701	2.00 (0.0787)	16742-R8101	2.04 (0.0803)
16884-V0702	2.08 (0.0819)	16742-R8102	2.12 (0.0835)
16884-V0703	2.16 (0.0850)	16742-R8103	2.20 (0.0866)
16884-V0704	2.24 (0.0882)	16742-R8104	2.28 (0.0898)
16884-V0705	2.32 (0.0913)	16742-R8105	2.36 (0.0929)
16884-V0706	2.40 (0.0945)	16742-R8106	2.44 (0.0961)
16884-V0707	2.48 (0.0976)	16742-R8107	2.52 (0.0992)
16884-V0708	2.56 (0.1008)	16742-R8108	2.60 (0.1024)
16884-V0709	2.64 (0.1039)	16742-R8109	2.68 (0.1055)
16884-V0710	2.72 (0.1071)	16742-R8110	2.76 (0.1087)
16884-V0711	2.80 (0.1102)	16742-R8111	2.84 (0.1118)
16884-V0712	2.88 (0.1134)		

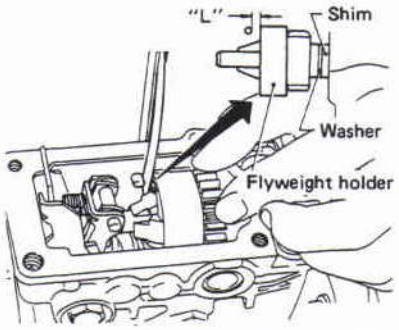
Diemnsion "L"	mm (in)	1.5 - 2.0 (0.059 - 0.079)



SEF500

VE-Type Injection Pump (Cont'd)

Axial play of flyweight holder "L" mm (in)	0.15 - 0.35 (0.0059 - 0.0138)

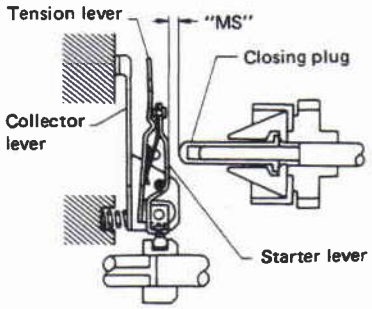


SEF047A

Adjusting shim

Part number	Thickness mm (in)
19208-V0700	1.05 (0.0413)
19208-V0701	1.25 (0.0492)
19208-V0702	1.45 (0.0571)
19208-V0703	1.65 (0.0650)
19208-V0704	1.85 (0.0728)

Dimension "MS" mm (in)	0.9 - 1.1 (0.035 - 0.043)



SEF856

Adjusting closing plug

Part number	Length mm (in)
16268-R8100	3.10 (0.1220)
16268-R8101	3.30 (0.1299)
16268-R8102	3.50 (0.1378)
16268-R8103	3.70 (0.1457)
16268-R8104	3.90 (0.1535)
16268-R8105	4.10 (0.1614)
16268-R8106	4.30 (0.1693)
16268-R8107	4.50 (0.1772)

Injection pump calibration data
This data will be introduced later.