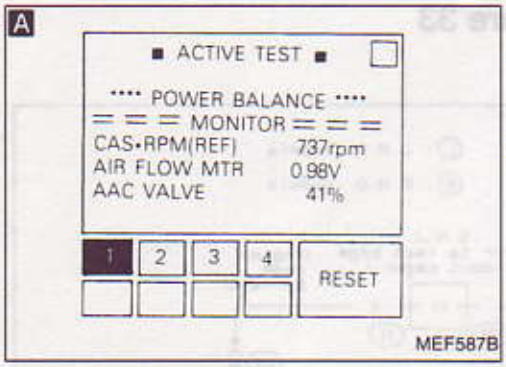
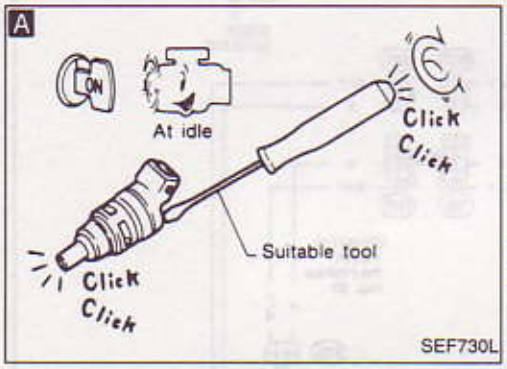
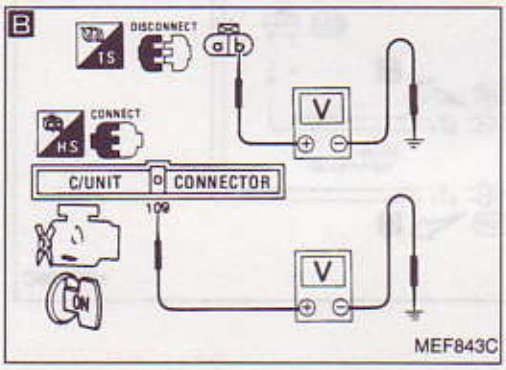
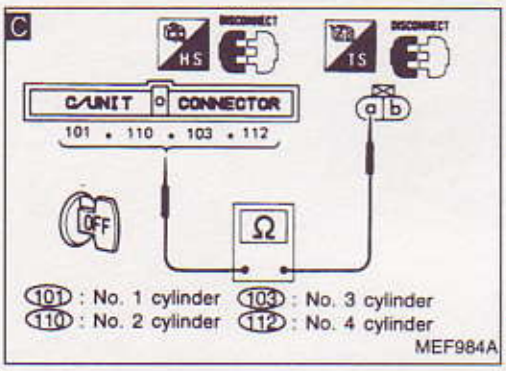
Diagnostic Procedure 32 (Cont'd)









INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine.
2) Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3) Make sure that each circuit produces a momentary engine speed drop.

OR

2) Listen to each injector operating sound.
Clicking noise could be heard.

N.G.

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect injector harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal (b) and ground, E.C.U. terminal (109) and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M8) , (C103)
- Harness connectors (M39) , (E1)
- 10A fuse
- 25A fusible link
- Harness continuity between battery and injector
- Harness continuity between E.C.C.S. relay and E.C.U.

If N.G., repair harness or connectors.

O.K.

C

CHECK OUPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between terminal (a) and E.C.U. terminals (101) , (110) , (103) , (112) .
Continuity should exist.

N.G. → Check the following.
- Harness connectors (M39) , (E1)
- Harness continuity between injector and E.C.U.

If N.G., repair harness or connector.

O.K.

CHECK COMPONENT (Injector).
Refer to "Electrical Components Inspection".
(See page EF & EC-324).

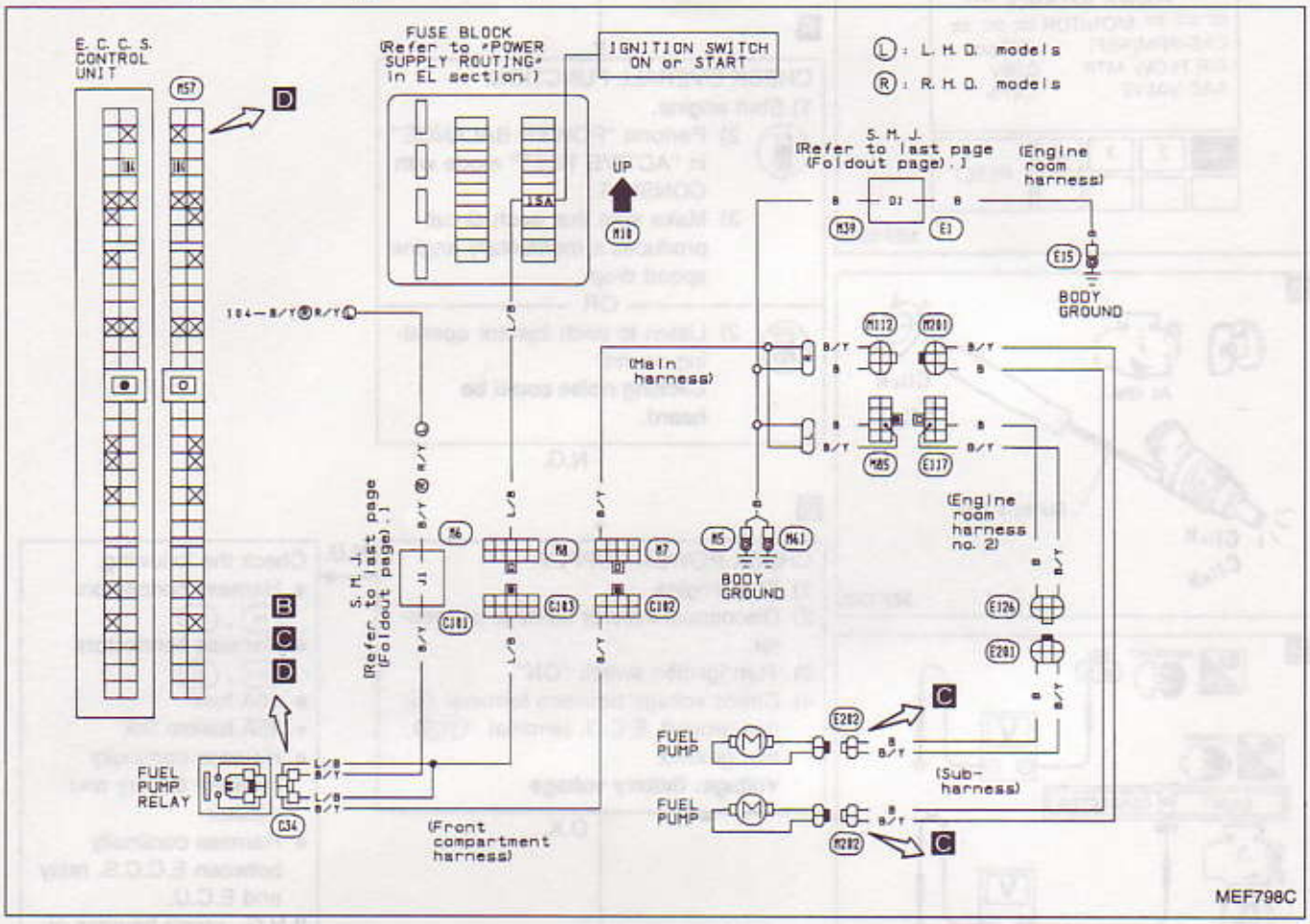
N.G. → Replace injector.

O.K.

Check E.C.U. Pin terminals for damage or the connection of E.C.U. harness connector.

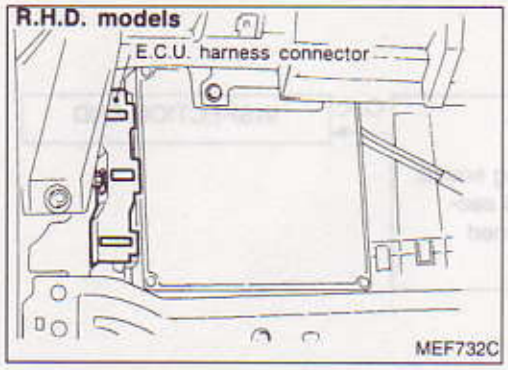
Diagnostic Procedure 33

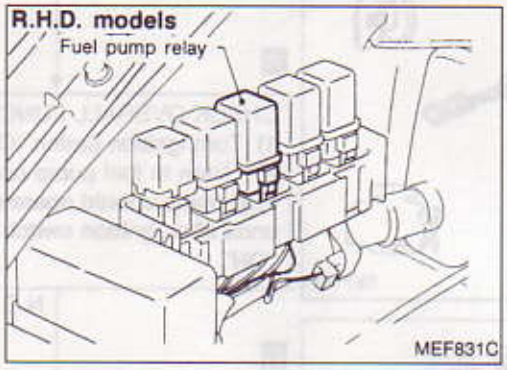
FUEL PUMP (Not self-diagnostic item)

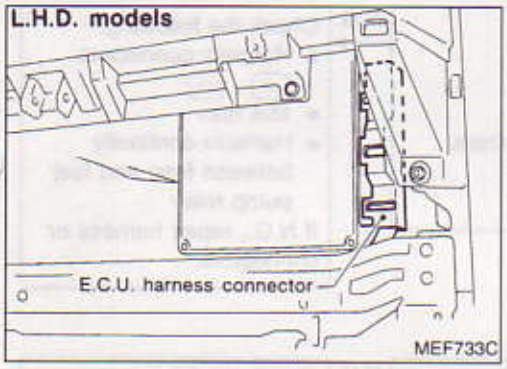


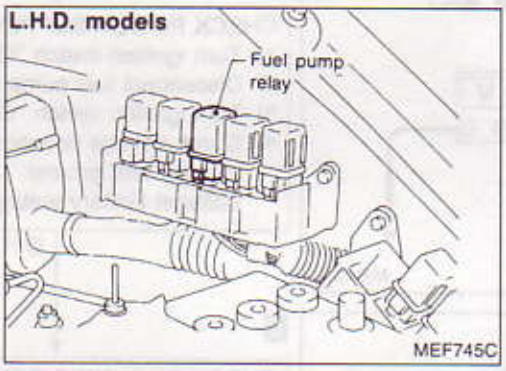
Diagnostic Procedure 33 (Cont'd)

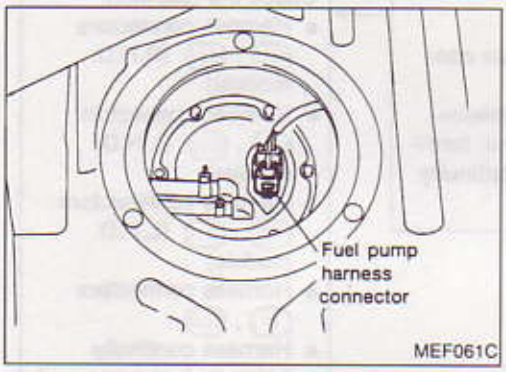
Harness layout





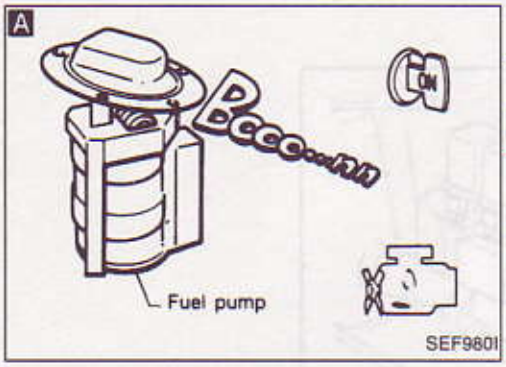






Diagnostic Procedure 33 (Cont'd)

A



SEF980I

INSPECTION START

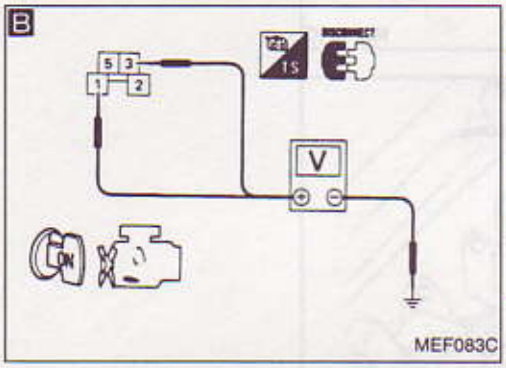
A

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Listen to fuel pump operating sound.
Fuel pump should operate for 5 seconds after ignition switch is turned "ON".

O.K. → INSPECTION END

N.G.

B



MEF083C

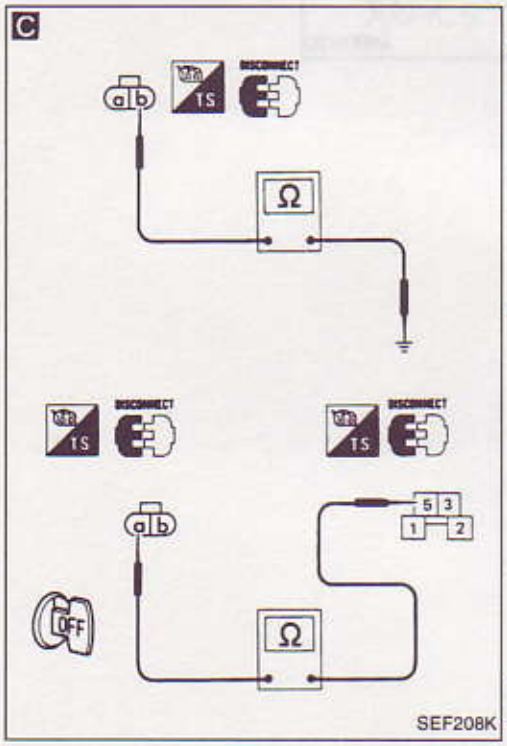
CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump relay.
3) Turn ignition switch "ON".
4) Check voltage between terminals ①, ③ and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M8), (C103)
- 15A fuse
- Harness continuity between fuse and fuel pump relay

If N.G., repair harness or connectors.

O.K.

C



SEF208K

C

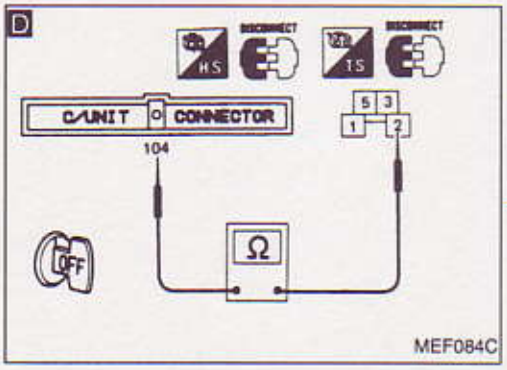
CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump harness connector.
3) Check harness continuity between terminal ⓑ and body ground, terminal ⓐ and terminal ⑤. **Continuity should exist.**

N.G. → Check the following.
- Harness connectors (M112), (M201) (R.H.D. models)
- Harness connectors (E126), (E201) (L.H.D. models)
- Harness connewctors (M85), (E117) (L.H.D. models)
- Harness connectors (M7), (C102)
- Harness continuity between fuel pump and body ground
- Harness continuity between fuel pump and fuel pump relay

If N.G., repair harness or connector.

O.K.

D



MEF084C

D

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal (104) and terminal ②.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (M6), (C101)
- Harness continuity between E.C.U. and fuel pump relay

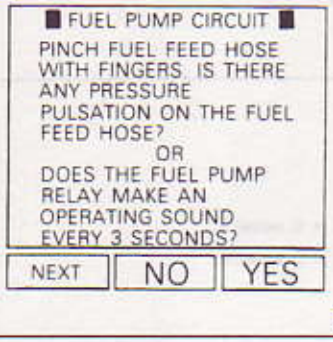
If N.G., repair harness or connectors.

O.K.

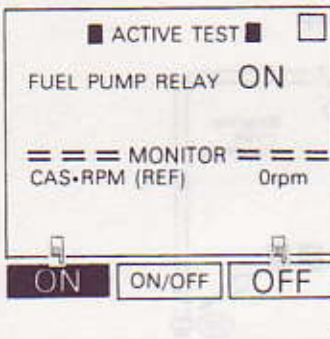
Ⓐ

Diagnostic Procedure 33 (Cont'd)

E



E



Ⓐ

E

CHECK COMPONENT
(Fuel pump relay).

1) Reconnect fuel pump relay, fuel pump harness connector and E.C.U. harness connector.
2) Turn ignition switch "ON".
3) Perform "FUEL PUMP CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

3) Turn fuel pump relay "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

Refer to "Electrical Components Inspection".
(See page EF & EC-324.)

N.G. → Replace fuel pump relay.

O.K.

CHECK COMPONENT
(Fuel pump).
Refer to "Electrical Components Inspection".
(See page EF & EC-324.)

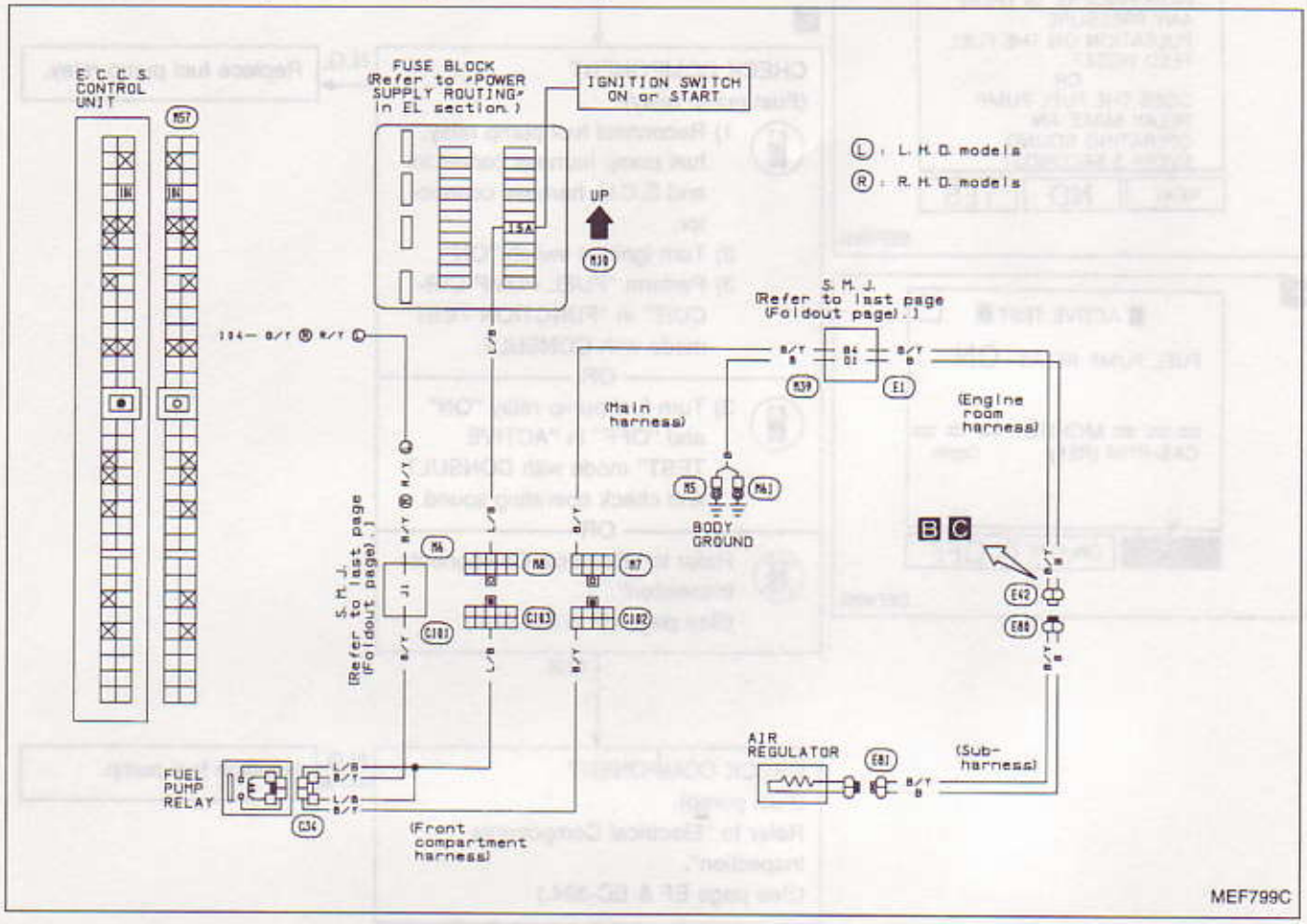
N.G. → Replace fuel pump.

O.K.

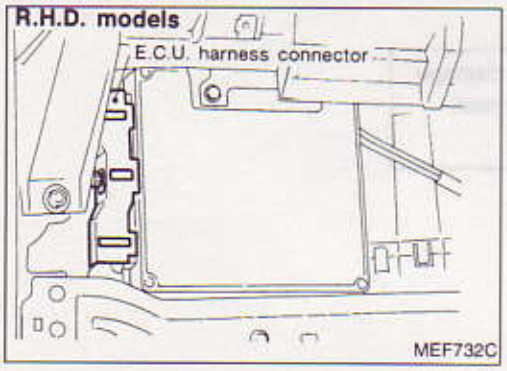
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

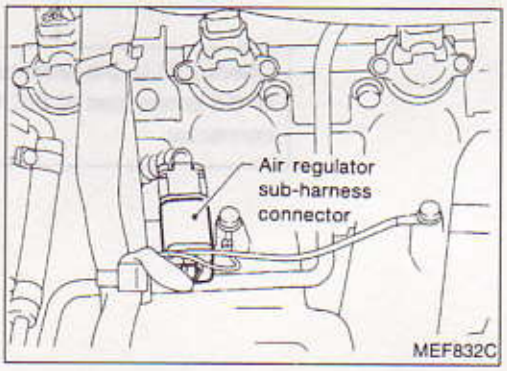
Diagnostic Procedure 34

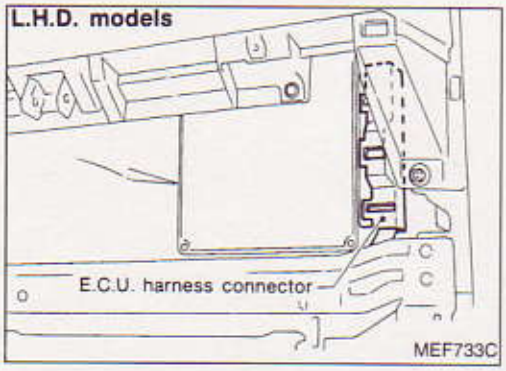
AIR REGULATOR (Not self-diagnostic item)



Harness layout

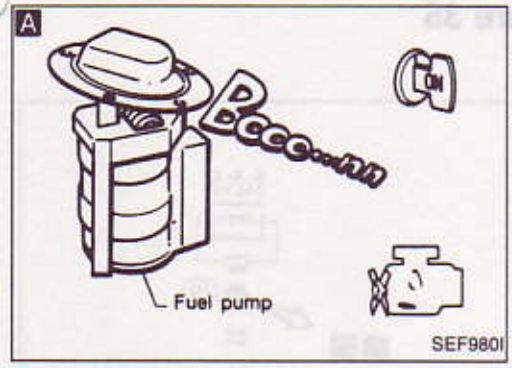




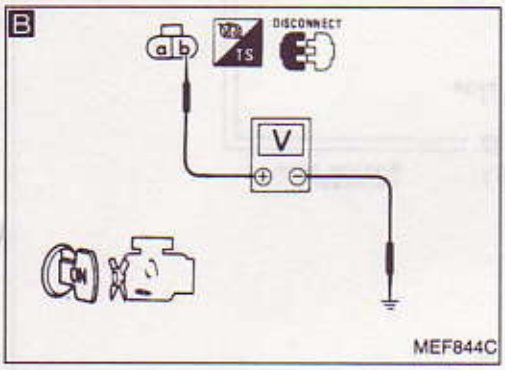


Diagnostic Procedure 34 (Cont'd)

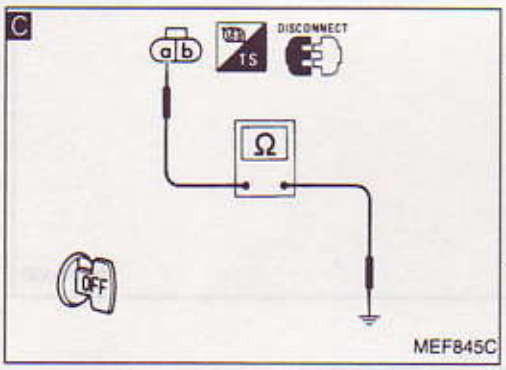
A



B



C



INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Turn ignition switch"ON".
2) Listen to fuel pump operating sound.
Fuel pump should operate for 5 seconds after ignition switch is turned "ON".

N.G. → Check fuel pump control circuit. (See page EF & EC-302.)

O.K.

B

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect air regulator sub-harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal (b) and ground.
Battery voltage should exist for 5 seconds after ignition switch is turned "ON".

N.G. → Check the following.
- Harness connectors (M7) , (C102)
- Harness connectors (M39) , (E1)
- Harness continuity between air regulator sub-harness connector and fuel pump relay

If N.G., repair harness or connectors.

O.K.

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal (a) and ground.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (M39) , (E1)
- Harness continuity between air regulator sub-harness connector and body ground

If N.G., repair harness or connectors.

O.K.

CHECK COMPONENT
(Air regulator).
Refer to "Electrical Components Inspection".
(See page EF & EC-324).

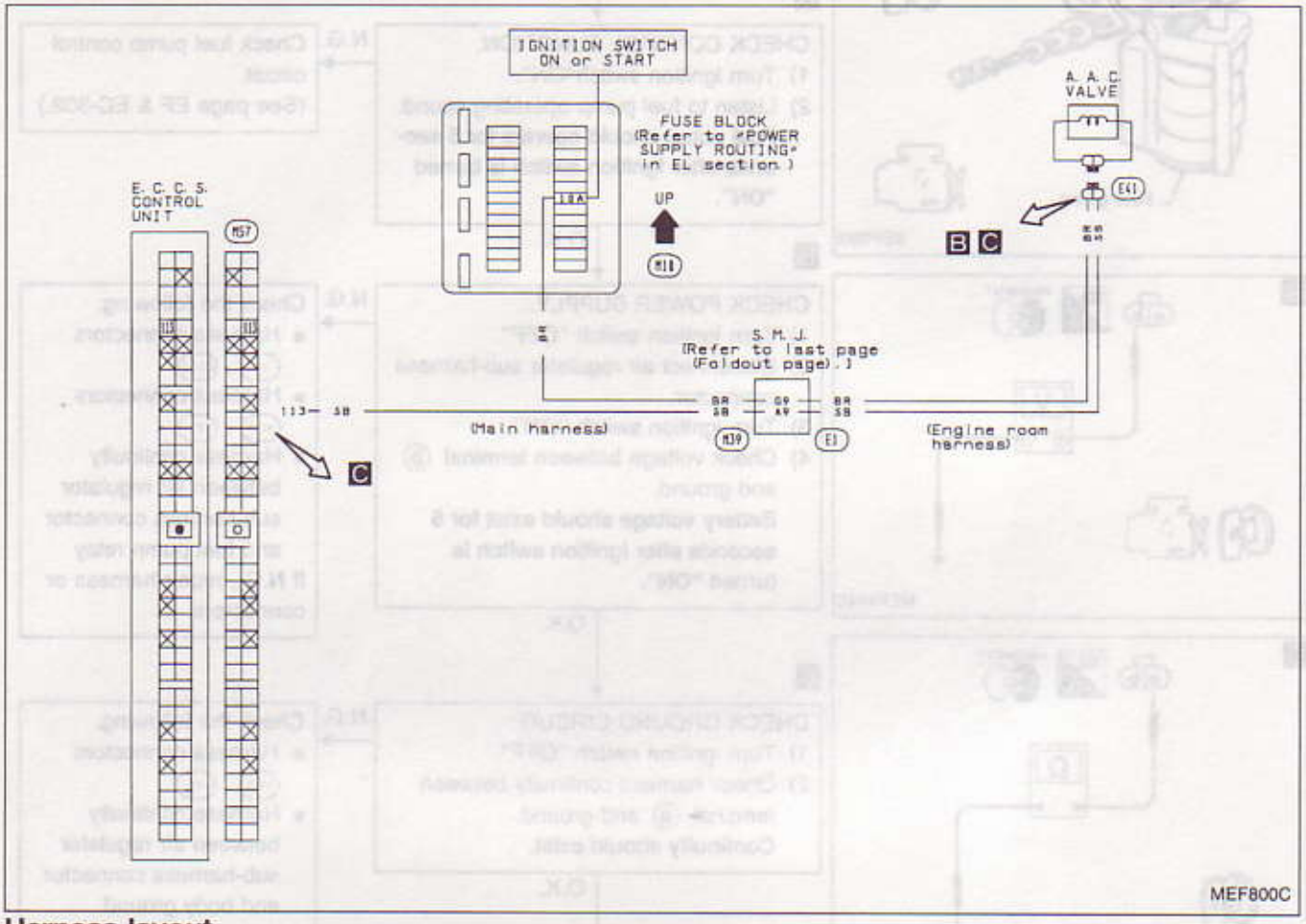
N.G. → Replace air regulator.

O.K.

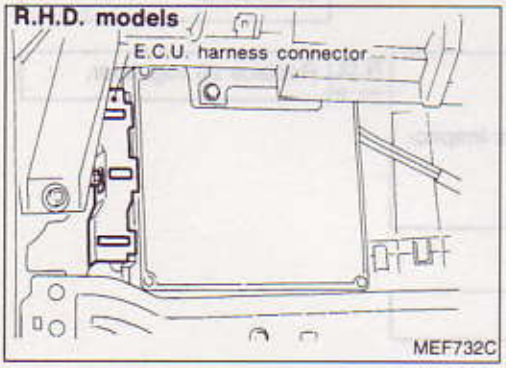
INSPECTION END

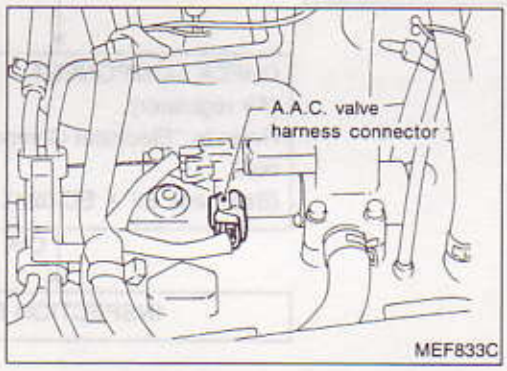
Diagnostic Procedure 35

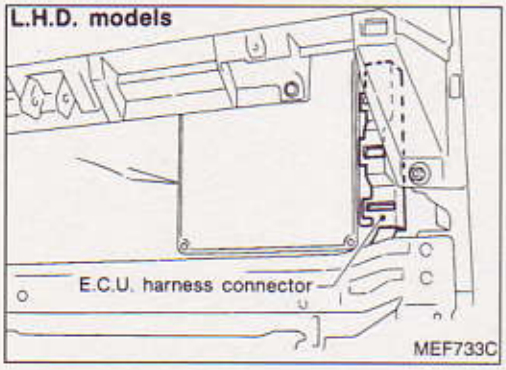
A.A.C. VALVE (Not self-diagnostic item)



Harness layout

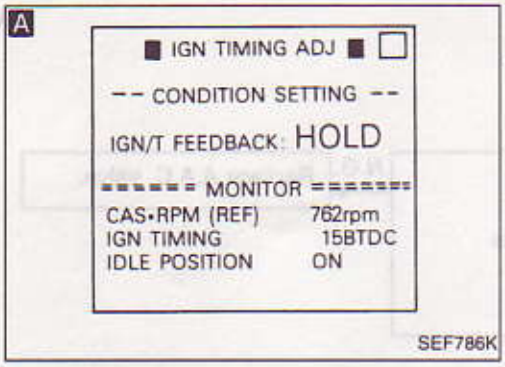






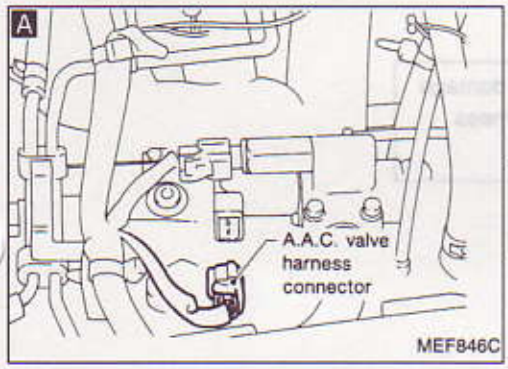
Diagnostic Procedure 35 (Cont'd)

A



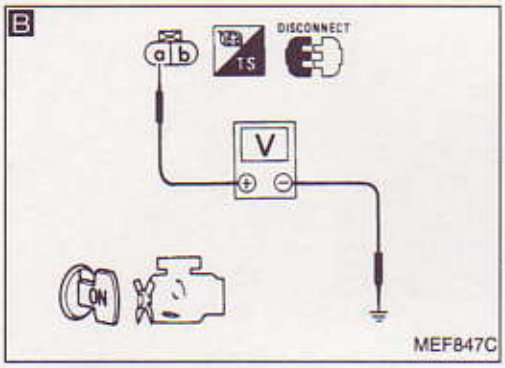
SEF786K

A



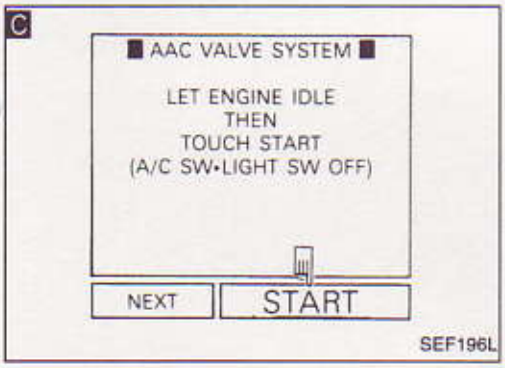
MEF846C

B



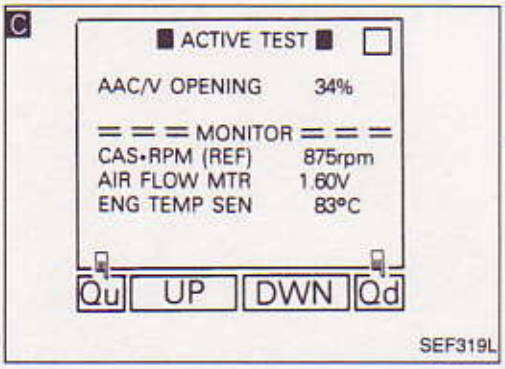
MEF847C

C



SEF196L

C



SEF319L

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check idle speed.
750 ± 50 rpm
3) • Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
• Disconnect A.A.C. valve harness connector.
4) Make sure that idle speed drops.

Drops → INSPECTION END

Does not drop ↓

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect A.A.C. valve harness connector.
3) Turn ignition switch "ON"
4) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following.
• Harness connectors M39 , B1
• 10A fuse
• Harness continuity between A.A.C. valve and fuse
If N.G., repair harness or connectors.

O.K. ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Reconnect A.A.C. valve harness connector.
3) Perform "AAC VALVE SYSTEM" in "FUNCTION TEST" mode with CONSULT.

OR

3) Perform "AAC VALVE OPENING TEST" in "ACTIVE TEST" mode with CONSULT.

OR

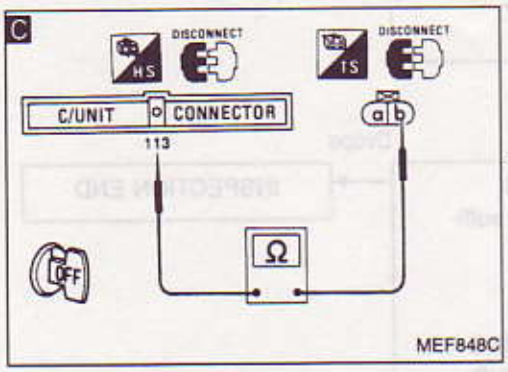
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal 113 and terminal ⓑ.
Continuity should exist.

N.G. → Check the following.
• Harness connectors M39 , B1
• Harness continuity between E.C.U. and A.A.C. valve
If N.G., repair harness or connectors.

O.K. ↓

Ⓐ

Diagnostic Procedure 35 (Cont'd)



Ⓐ

CHECK COMPONENT
(A.A.C. valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-324.)

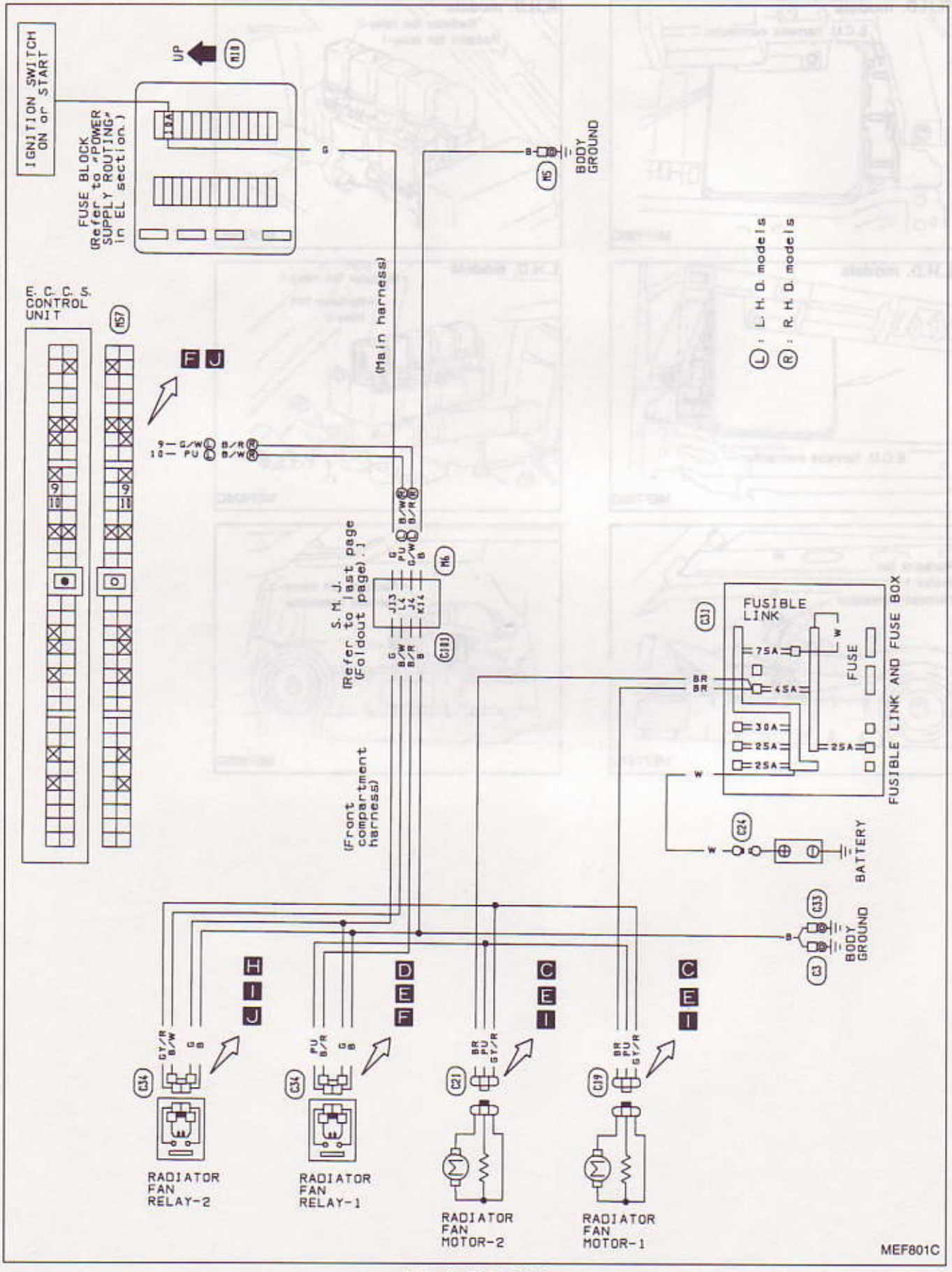
N.G. → Replace A.A.C. valve.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 36

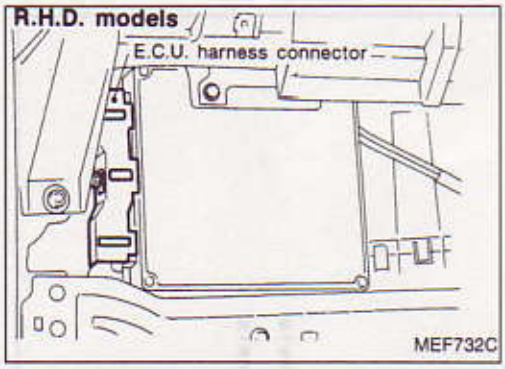
RADIATOR FAN CONTROL (Not self-diagnostic item)



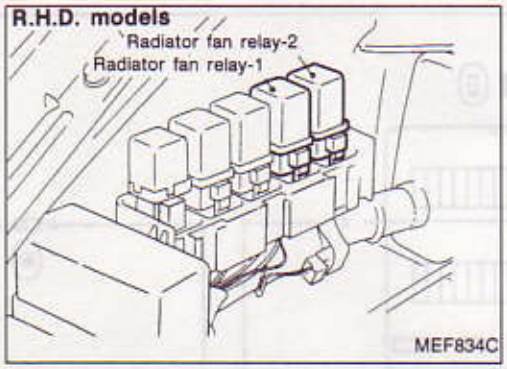
Diagnostic Procedure 36 (Cont'd)

Harness layout

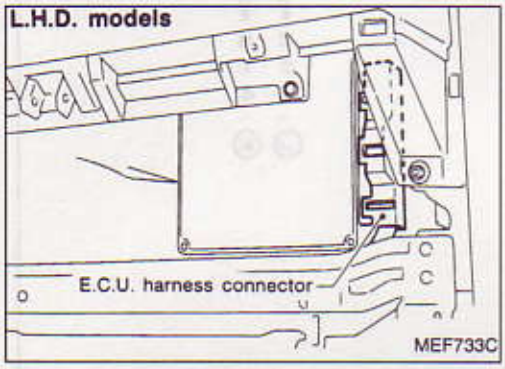
R.H.D. models



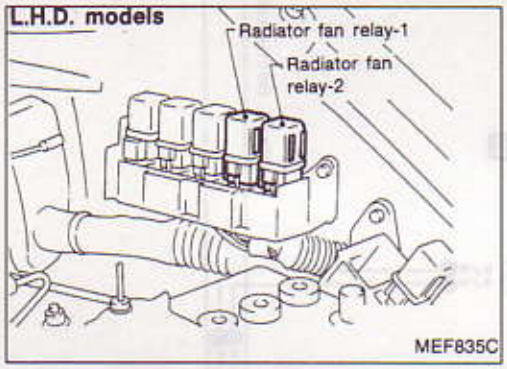
R.H.D. models

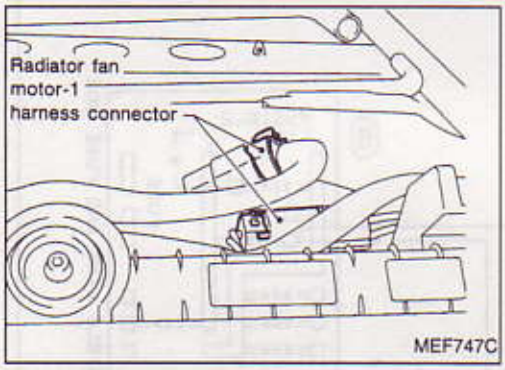


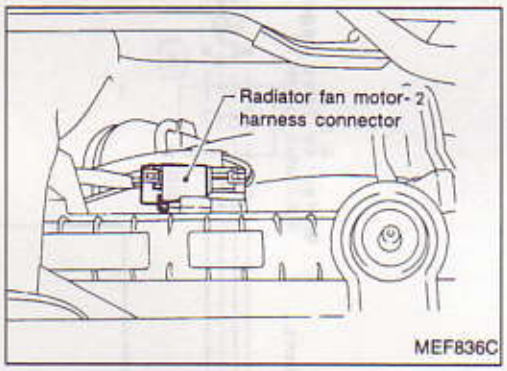
L.H.D. models



L.H.D. models

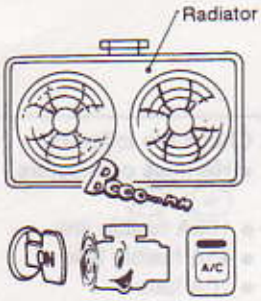




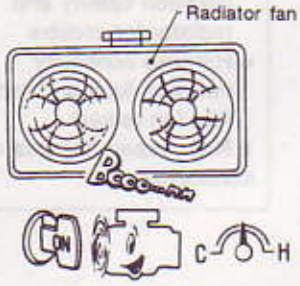


Diagnostic Procedure 36 (Cont'd)

A With air conditioner

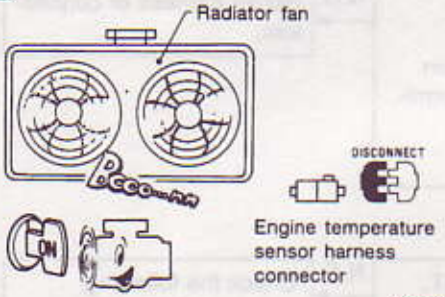


Without air conditioner



MEF768C

B



Engine temperature sensor harness connector

MEF769C

INSPECTION START

A

CHECK RADIATOR FAN LOW SPEED OPERATION.

With air conditioner

1) Start engine.
2) Set temperature lever at full cold position.
3) Turn air conditioner switch "ON".
4) Turn blower fan switch "ON".
5) Run engine at idle for a few minutes with air conditioner operating.
6) Make sure that radiator fan operates at low speed.

Without air conditioner

1) Start engine.
2) Keep engine speed at about 2,000 rpm until engine is warmed up sufficiently.
3) Make sure that radiator fan begins to operate at low speed during warm-up.

N.G. → Check radiator fan low speed control circuit. (Go to PROCEDURE A.)

O.K. ↓

B

CHECK RADIATOR FAN HIGH SPEED OPERATION.

1) Turn air conditioner switch "OFF".
2) Turn blower fan switch "OFF". (Step 1) and 2) are only performed for model with air conditioner.)
3) Stop engine.
4) Disconnect engine temperature sensor harness connector.
5) Restart engine and make sure that radiator fan operates at high speed.

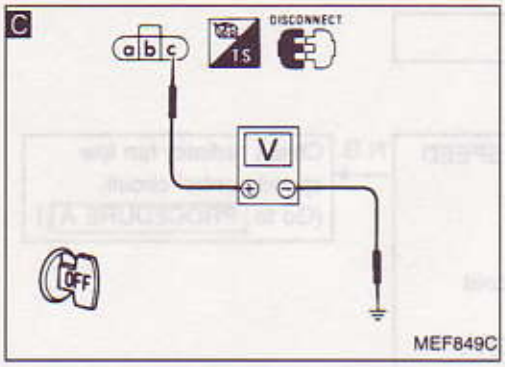
N.G. → Check radiator fan high speed control circuit. (Go to PROCEDURE B.)

O.K. ↓

INSPECTION END

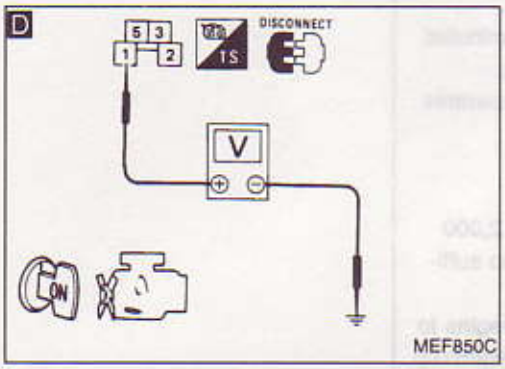
Diagnostic Procedure 36 (Cont'd)

C



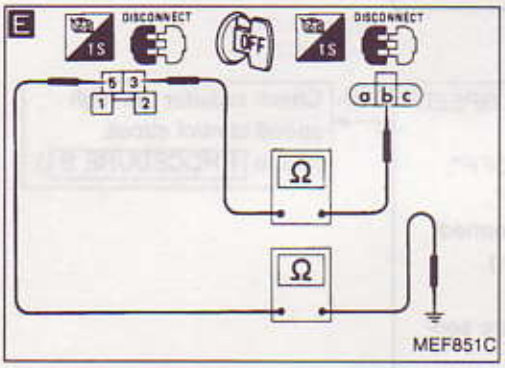
MEF849C

D



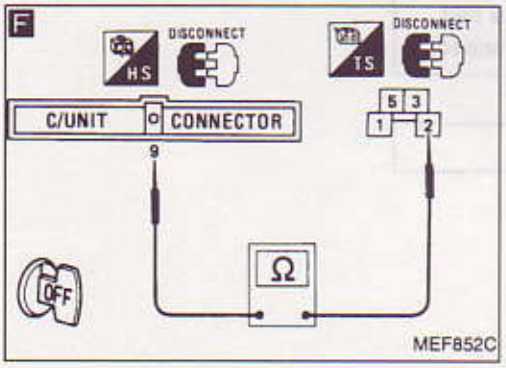
MEF850C

E



MEF851C

F



MEF852C

PROCEDURE A

INSPECTION START

CHECK POWER SUPPLY.
1) Turn air conditioner switch "OFF".
2) Turn blower fan switch "OFF".
(Step 1) and 2) are only performed for model with air conditioner.)
3) Stop engine.
4) Disconnect radiator fan motor-1 harness connector and radiator fan motor-2 harness connector.

C 5) Check voltage between terminal ⓒ and ground.
Voltage: Battery voltage

6) Disconnect radiator fan relay-1.
7) Turn ignition switch"ON".

D 8) Check voltage between terminal ① and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness connectors (M6), (C101)
- 100A fusible link
- 45A fusible link
- 10A fuse
- Harness continuity between battery and radiator fan motors
- Harness continuity between fuse and radiator fan relay-1.

If N.G., repair harness or connectors.

O.K. ↓

E

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓑ and terminal ③, terminal ⑤ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

F

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑨ and terminal ②.
Continuity should exist.

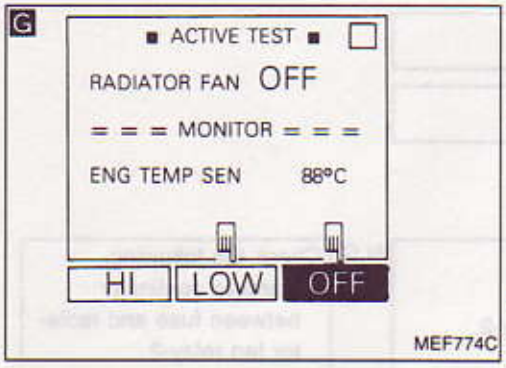
N.G. → Check the following.
- Harness connectors (M6), (C101)
- Harness continuity between E.C.U. and radiator fan relay-1.

If N.G., repair harness or connectors.

O.K. ↓

Ⓐ

Diagnostic Procedure 36 (Cont'd)



Ⓐ

CHECK COMPONENT
(Radiator fan relay-1.)
Refer to "Electrical Components Inspection".
(See page EF & EC-324.)

N.G. → Replace radiator fan relay.

O.K.

G

CHECK COMPONENTS
(radiator fan motors).

1) Reconnect radiator fan relay-1, radiator fan motor harness connectors and E.C.U. harness connector.
2) Start engine.
3) Perform "RADIATOR FAN TEST" in "ACTIVE TEST" mode with CONSULT.

N.G. → Replace radiator fan motors.

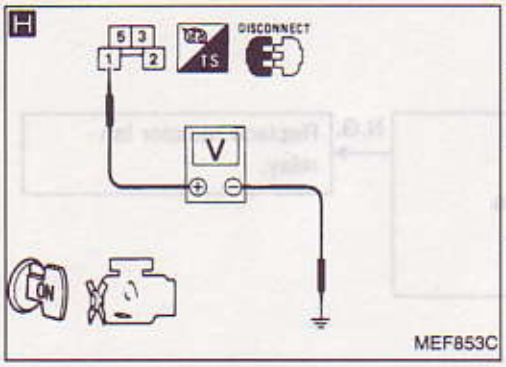
OR

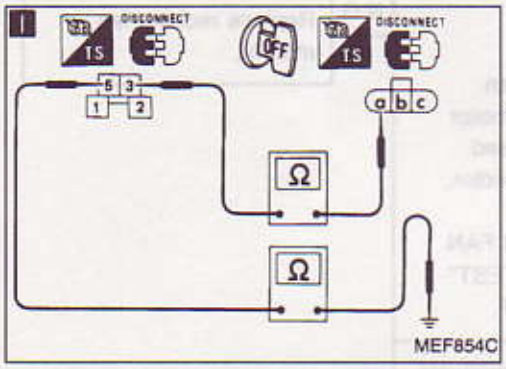
Refer to "Electrical Components Inspection".
(See page EF & EC-324.)

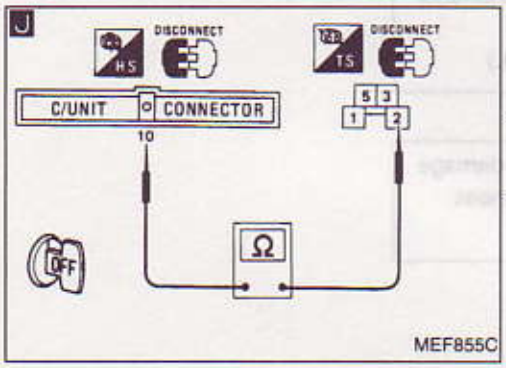
O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 36 (Cont'd)







PROCEDURE B

INSPECTION START

H

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect radiator fan relay-2.
3) Turn ignition switch "ON".
4) Check voltage between terminal ① and ground.
Voltage: Battery voltage

N.G. → Check the following.
- Harness continuity between fuse and radiator fan relay-2

If N.G., repair harness or connectors.

O.K. ↓

I

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect radiator fan motor-1 harness connector and radiator fan motor-2 harness connector.
3) Check harness continuity between terminals ⓐ and terminal ③, terminal ⑤ and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

J

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑩ and terminal ②.
Continuity should exist.

N.G. → Check the following.
- Harness connectors (M6), (C101)
- Harness continuity between E.C.U. and radiator fan relay-2

If N.G., repair harness or connectors.

O.K. ↓

Ⓐ

Diagnostic Procedure 36 (Cont'd)

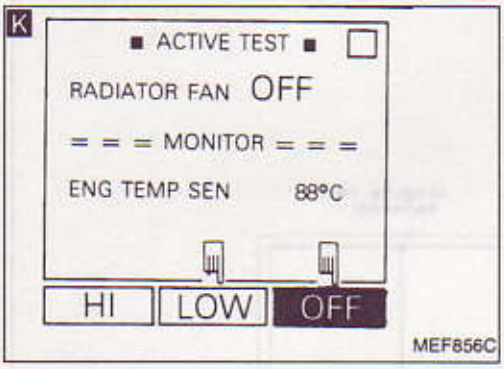
Ⓐ

CHECK COMPONENT
(Radiator fan relay-2).
Refer to "Electrical Components Inspection".
(See page EF & EC-324.)

N.G. → Replace radiator fan relay.

O.K.

K



K

CHECK COMPONENTS
(Radiator fan motors).

1) Reconnect radiator fan relay-2, radiator fan motor harness connectors and E.C.U. harness connector.
2) Start engine.
3) Perform "RADIATOR FAN TEST" in "ACTIVE TEST" mode with CONSULT.

N.G. → Replace radiator fan motors.

OR

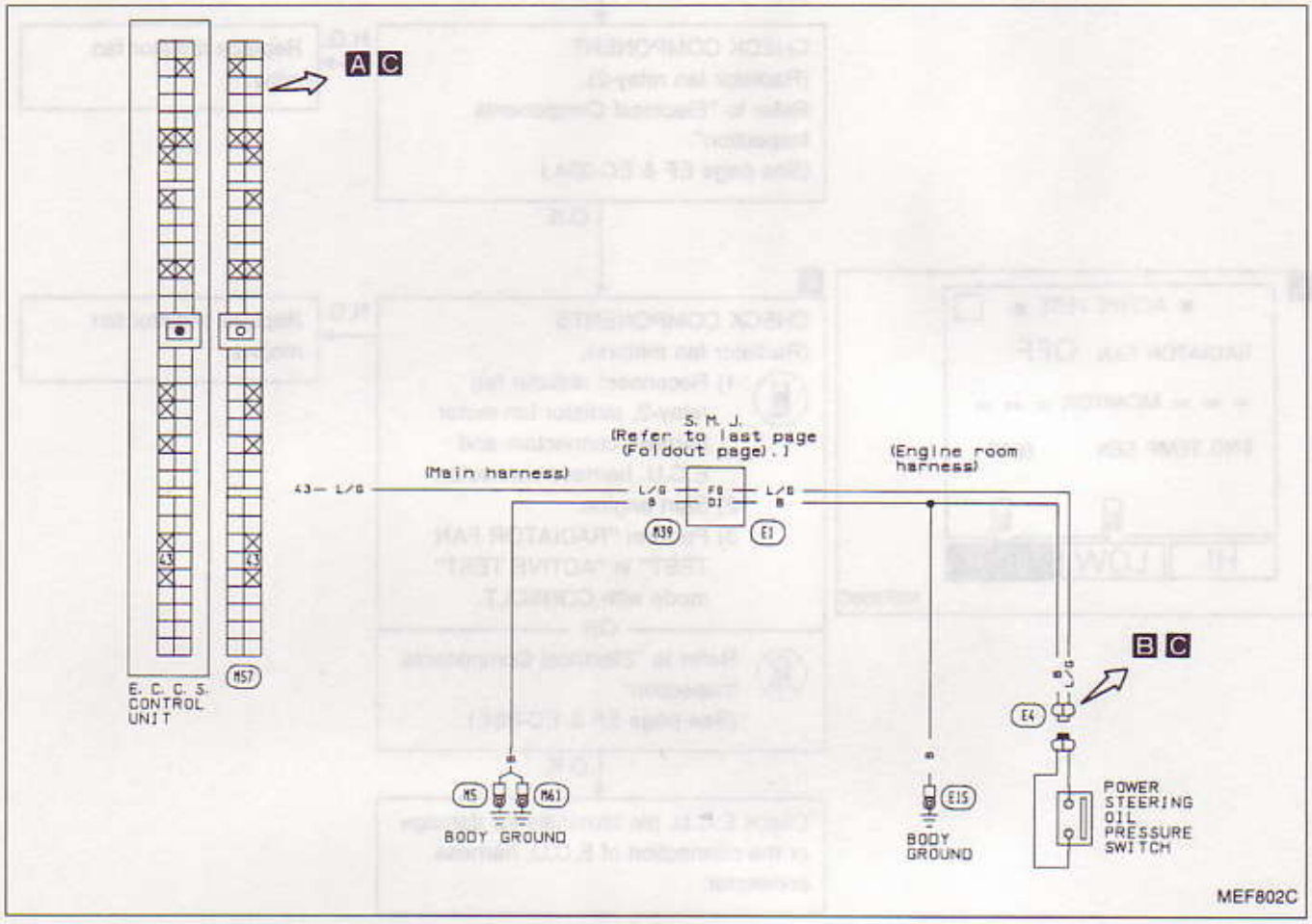
Refer to "Electrical Components Inspection".
(See page EF & EC-324.)

O.K.

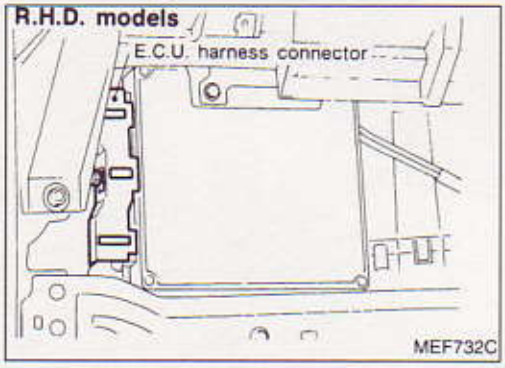
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

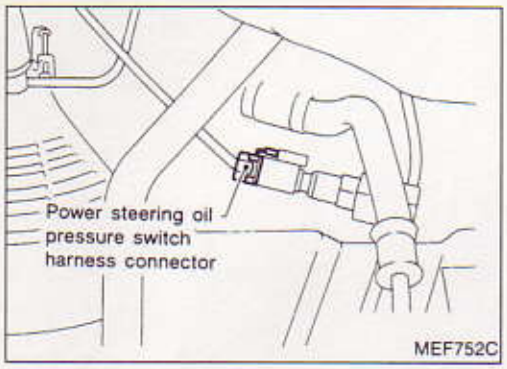
Diagnostic Procedure 37

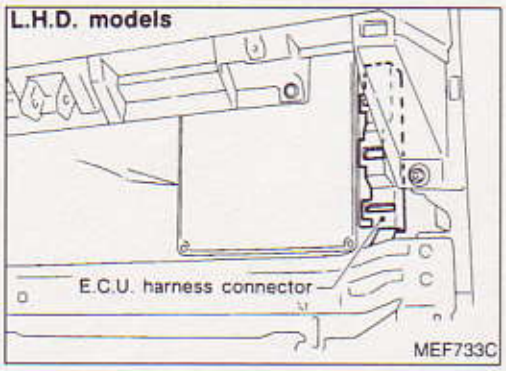
POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)



Harness layout

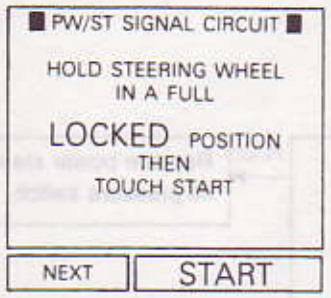






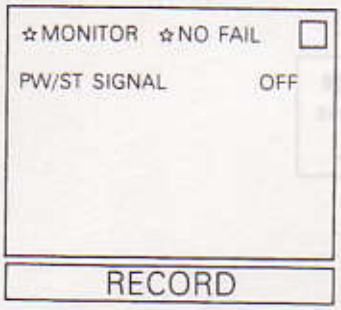
Diagnostic Procedure 37 (Cont'd)

A



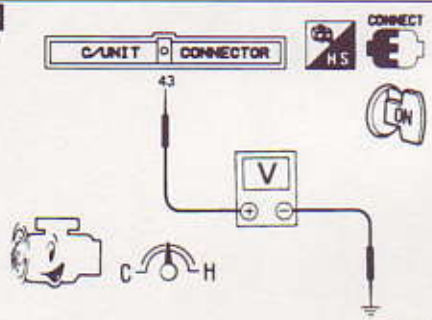
SEF200L

A



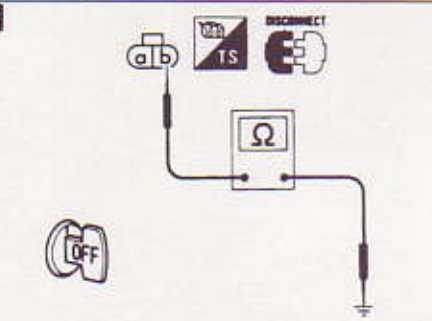
SEF591I

A



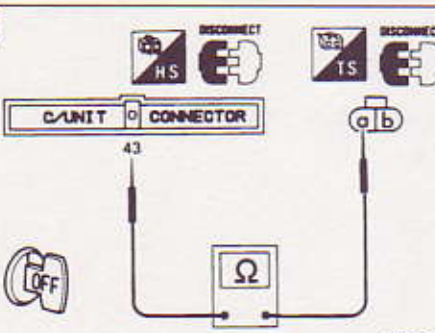
SEF216K

B



SEF217K

C



SEF218K

INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine.
2) Perform "PW/ST SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

O.K. → INSPECTION END

OR

2) Check power steering oil pressure switch signal in "DATA MONITOR" mode with CONSULT.
Steering is neutral: OFF
Steering is turned: ON

OR

2) Check voltage between E.C.U. terminal (43) and ground.
Voltage:
When steering wheel is turned quickly.
Approximately 0V
Except above
Approximately 8V

N.G.

B

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect power steering oil pressure switch harness connector.
3) Check harness continuity between terminal (b) and body ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal (43) and terminal (a).
Continuity should exist.

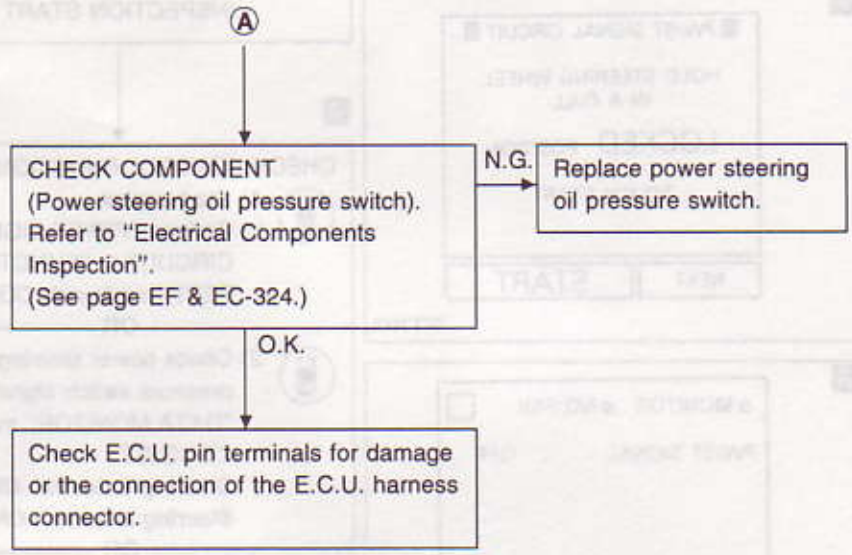
N.G. → Check the following.
- Harness connectors (M39), (E1)
- Harness continuity between E.C.U. and power steering oil pressure switch

If N.G., repair harness or connectors.

O.K.

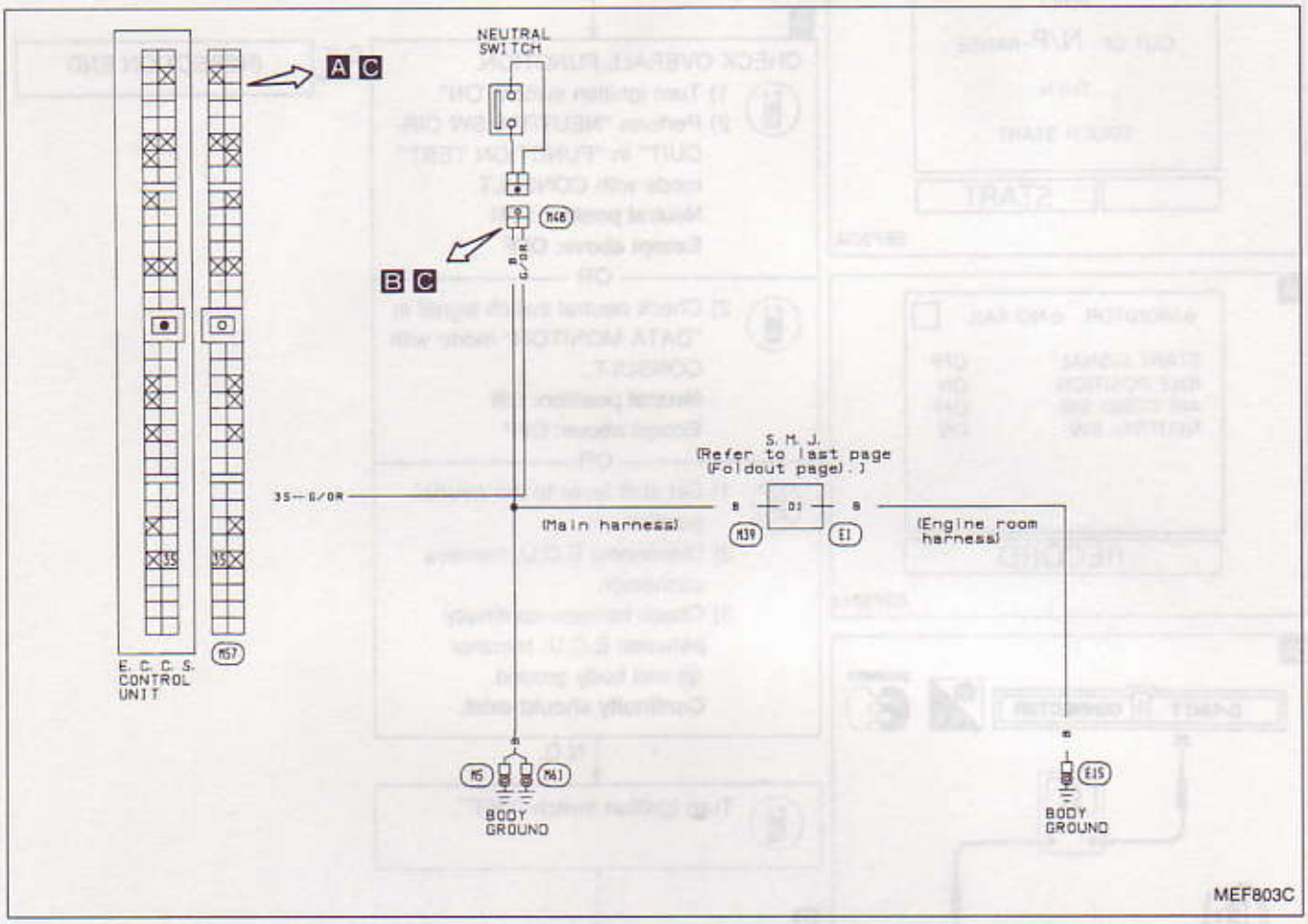
(A)

Diagnostic Procedure 37 (Cont'd)

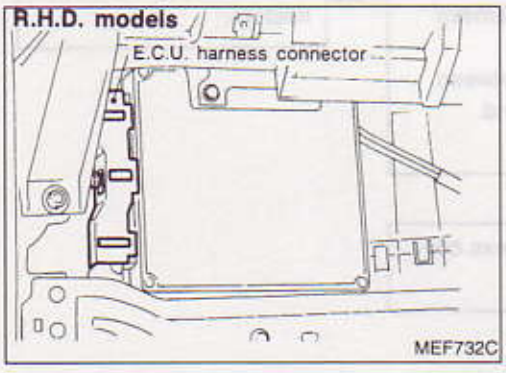


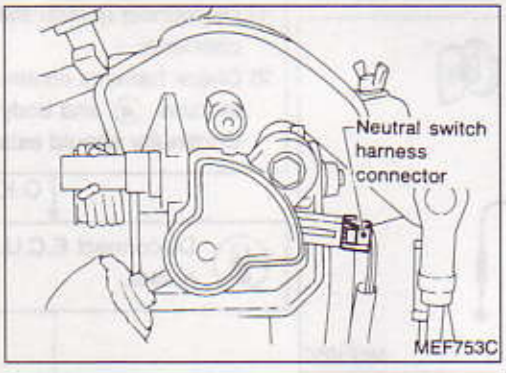
Diagnostic Procedure 38

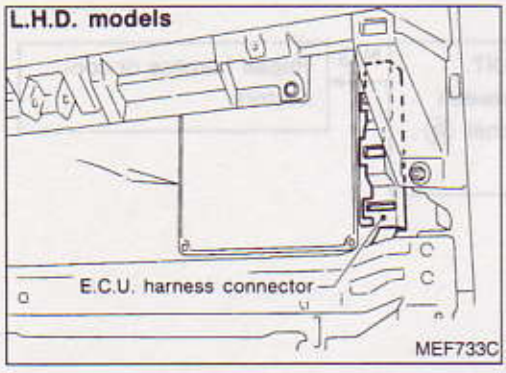
NEUTRAL SWITCH (Not self-diagnostic item)



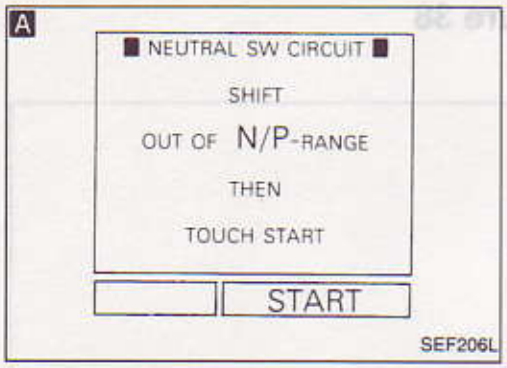
Harness layout

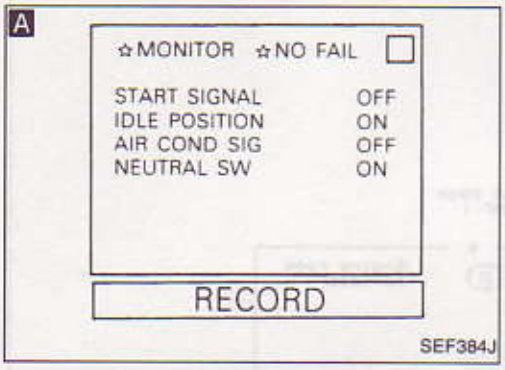


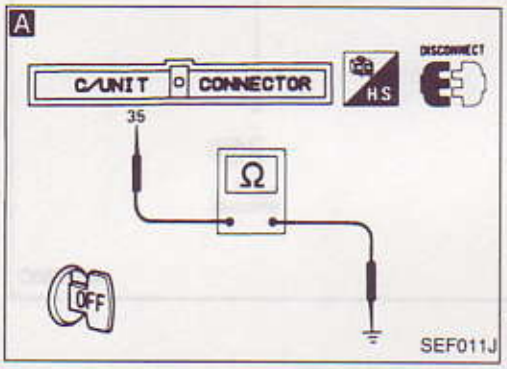


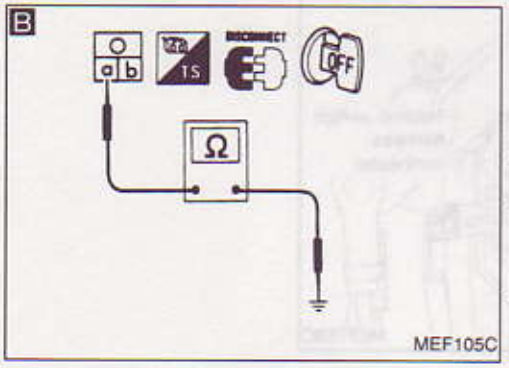


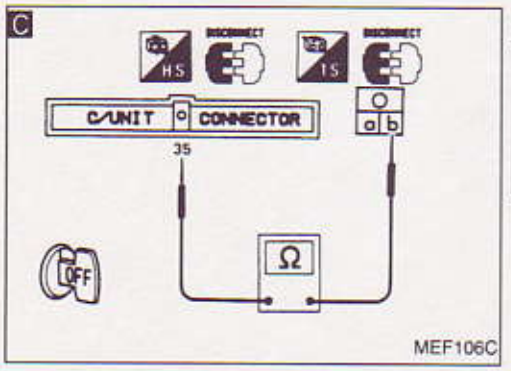
Diagnostic Procedure 38 (Cont'd)











INSPECTION START

A

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Perform "NEUTRAL SW CIRCUIT" in "FUNCTION TEST" mode with CONSULT.
   Neutral position: ON
   Except above: OFF

O.K. → INSPECTION END

OR

2) Check neutral switch signal in "DATA MONITOR" mode with CONSULT.
   Neutral position: ON
   Except above: OFF

OR

1) Set shift lever to the neutral position.
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ㉟ and body ground.
   Continuity should exist.

N.G.

Turn ignition switch "OFF".

B

CHECK GROUND CIRCUIT.

1) Disconnect neutral switch harness connector.
2) Check harness continuity between terminal ⓐ and body ground.
   Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

Disconnect E.C.U. harness connector.

C

CHECK INPUT SIGNAL CIRCUIT.

1) Check harness continuity between E.C.U. terminal ㉟ and terminal ⓑ.
   Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

Ⓐ

Diagnostic Procedure 38 (Cont'd)

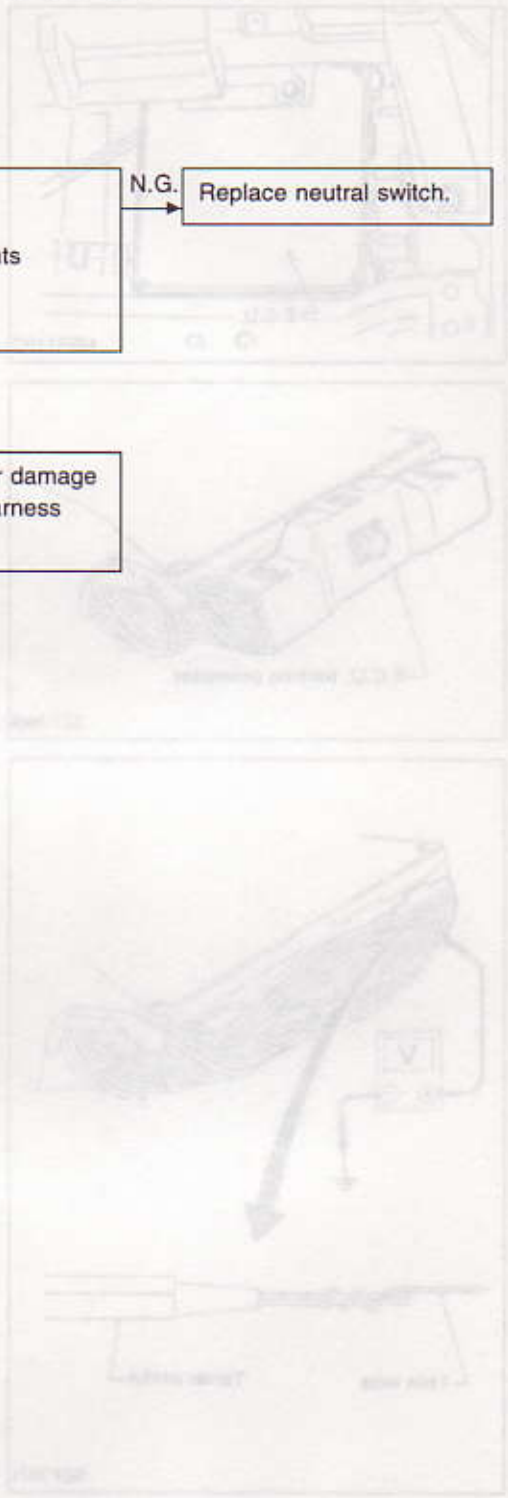
Ⓐ

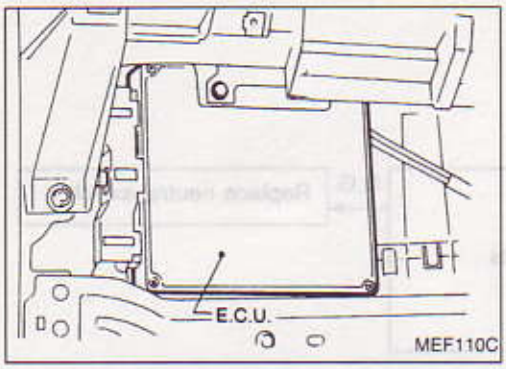
CHECK COMPONENT
(Neutral switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-324.)

N.G. → Replace neutral switch.

O.K.

Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.



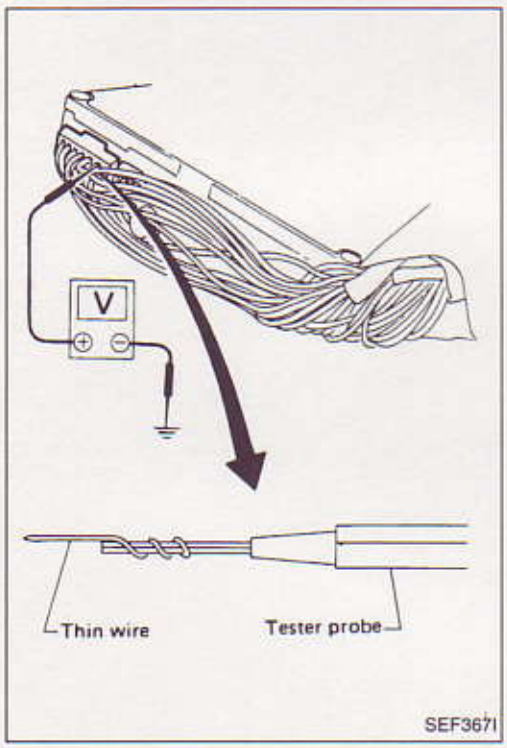


Electrical Components Inspection

E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

1. E.C.U. is located behind the glove box. For this inspection, remove the glove box.

2. Remove E.C.U. harness protector.



3. Perform all voltage measurements with the connectors connected. Extend tester probe as shown to perform tests easily.

Electrical Components Inspection (Cont'd)

E.C.U. inspection table

*Data are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
1	Ignition signal	Engine is running. └Idle speed	0.3 - 0.5V
		Engine is running. └Engine speed is 2,000 rpm	0.8 - 1.0V
3	Ignition check	Engine is running. └Idle speed	Approximately 12V
4	E.C.C.S. relay (Self-shut off)	Engine is running. Ignition switch "OFF" └For a few seconds after turning ignition switch "OFF"	0 - 1V
		Ignition switch "OFF" └In a few seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
9	Radiator fan relay (Low-speed)	Engine is running. └Radiator fan is not operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └Radiator fan is operating.	Approximately 0V
10	Radiator fan relay (High-speed)	Engine is running. └Radiator fan is not operating. └Radiator fan is operating at low-speed.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └Radiator fan is operating at high-speed.	Approximately 0V
11	Air conditioner relay	Engine is running. └Both A/C switch and blower switch are "ON".	0.6 - 0.8V
		Engine is running. └A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)

Electrical Components Inspection (Cont'd)

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
16	Air flow meter	Engine is running. (Warm-up condition) Idle speed	0.8 - 1.2V
		Engine is running. (Warm-up condition) Engine speed is 2,000 rpm.	1.2 - 1.5V
18	Engine temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine water temperature.
19	Exhaust gas sensor	Engine is running. After warming up sufficiently.	0 - Approximately 1.5V
20	Throttle sensor	Ignition switch "ON" Accelerator pedal released	0.45 - 0.55V
		Ignition switch "ON" Accelerator pedal fully depressed	Approximately 4V
22 30	Crank angle sensor (Reference signal)	Engine is running. **Do not run engine at high speed under no-load.**	0.2 - 0.5V
31 40	Crank angle sensor (Position signal)	Engine is running. **Do not run engine at high speed under no-load.**	2.0 - 3.0V
34	Start signal	Ignition switch "ON"	Approximately 0V
		Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
35	Neutral switch	Ignition switch "ON" Neutral position	0V
		Ignition switch "ON" Except the above gear position	Approximately 5V
36	Ignition switch	Ignition switch "OFF"	0V
		Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
37	Throttle sensor power supply	Ignition switch "ON"	Approximately 5V
38 47	Power supply for E.C.U.	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
41	Air conditioner switch	Engine is running. Both air conditioner switch and blower switch are "ON".	Approximately 0V
		Engine is running. Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)

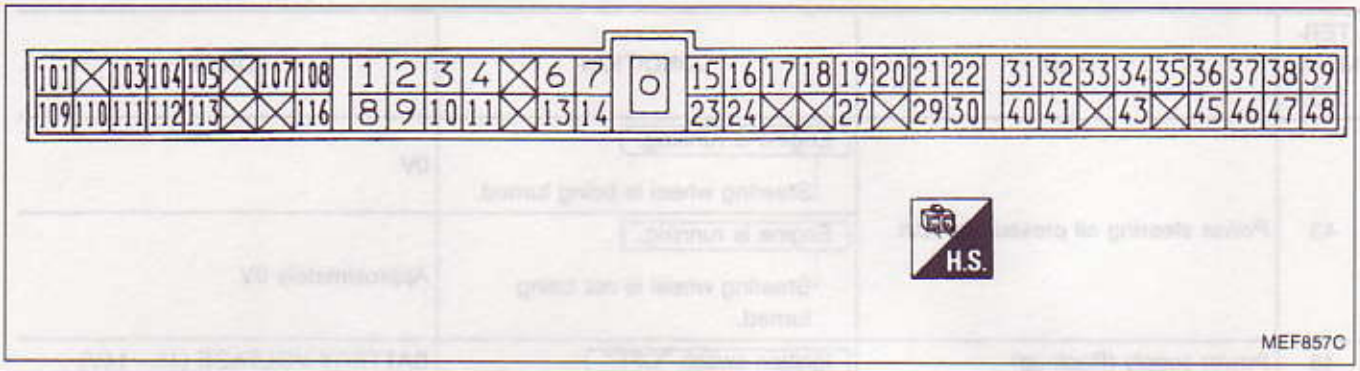
Electrical Components Inspection (Cont'd)

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
43	Power steering oil pressure switch	Engine is running. └Steering wheel is being turned.	0V
		Engine is running. └Steering wheel is not being turned.	Approximately 8V
46	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
101	Injector No. 1	Engine is running	BATTERY VOLTAGE (11 - 14V)
103	Injector No. 3		
110	Injector No. 2		
112	Injector No. 4		
104	Fuel pump relay	Ignition switch "ON" └For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
		Ignition switch "ON" └5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
105	E.G.R. & canister control solenoid valve	Engine is running. (Warm-up condition) └Idle speed	Approximately 0V
		Engine is running. └Engine speed is about 2,500 rpm	BATTERY VOLTAGE (11 - 14V)
113	A.A.C. valve	Engine is running. └Idle speed	7 - 13V
		Engine is running at idle. -Steering wheel is being turned. -Air conditioner is operating. -Rear defogger is "ON". └Headlamp are in high position.	5 - 9V

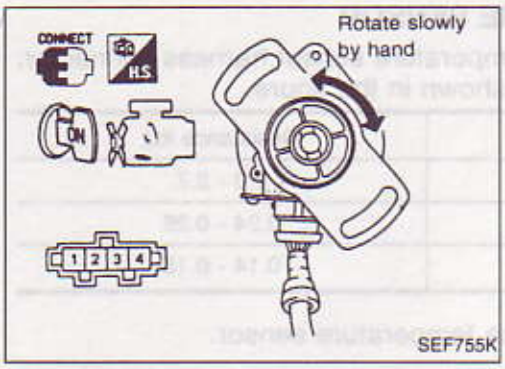
Electrical Components Inspection (Cont'd)

E.C.U. HARNESS CONNECTOR TERMINAL LAYOUT



Electrical Components Inspection (Cont'd)

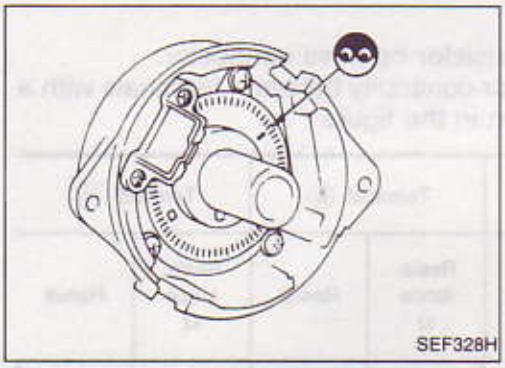
CRANK ANGLE SENSOR



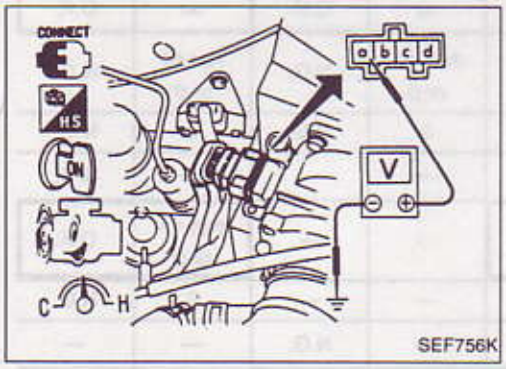
1. Remove distributor from engine. (Crank angle sensor harness connector should remain connected.)
2. Disconnect ignition wires.
3. Turn ignition switch "ON".
4. Rotate distributor shaft slowly by hand and check voltage between terminals ②, ① and ground.

Terminal	Voltage
① (180° signal)	Tester's pointer fluctuates between 5V and 0V.
② (1° signal)	

If N.G., replace distributor assembly with crank angle sensor.



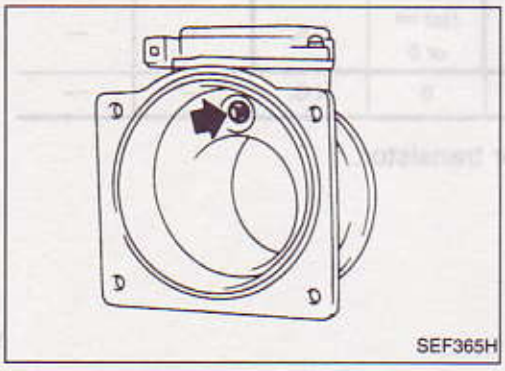
5. Visually check signal plate for damage or dust.



AIR FLOW METER

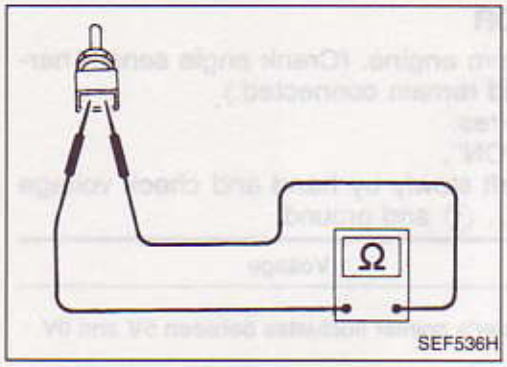
1. Peel air flow meter harness connector rubber as shown in the figure if the harness connector is connected.
2. Turn ignition switch "ON".
3. Start engine and warm it up sufficiently.
4. Check voltage between terminal ⓐ and ground.

Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Less than 1.0
Idle (Engine is warm-up sufficiently.)	1.3 - 1.8



5. If N.G., remove air flow meter from air duct. Check hot wire for damage or dust.

Electrical Components Inspection (Cont'd)

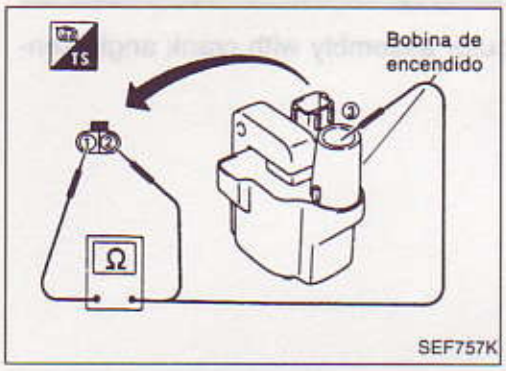


ENGINE TEMPERATURE SENSOR

1. Disconnect engine temperature sensor harness connector.
2. Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
90 (194)	0.24 - 0.26
110 (230)	0.14 - 0.15

If N.G., replace engine temperature sensor.

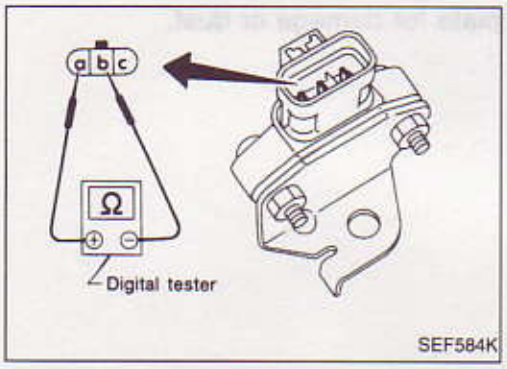


IGNITION COIL

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

Terminal	Resistance
① - ②	Approximately 0.9Ω
① - ③	Approximately 13.0 kΩ

If N.G., replace ignition coil.



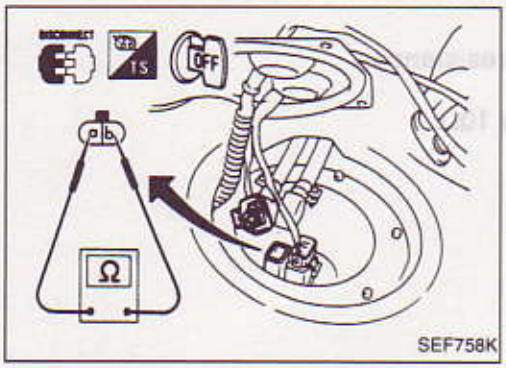
POWER TRANSISTOR

1. Disconnect power transistor harness connector.
2. Check power transistor continuity between terminals with a digital tester as shown in the figure.

⊖ terminal side / ⊕ terminal side	Terminal ⓐ		Terminal ⓑ		Terminal ⓒ	
	Resistance Ω	Result	Resistance Ω	Result	Resistance Ω	Result
Terminal ⓐ	—	—	∞	O.K.	∞	O.K.
	—	—	Not ∞ or 0	N.G.	Not ∞ or 0	N.G.
	—	—	0	N.G.	0	N.G.
Terminal ⓑ	∞	N.G.	—	—	∞	N.G.
	Not ∞ or 0	O.K.	—	—	Not ∞ or 0	O.K.
	0	N.G.	—	—	0	N.G.
Terminal ⓒ	∞	N.G.	∞	N.G.	—	—
	Not ∞ or 0	O.K.	Not ∞ or 0	O.K.	—	—
	0	N.G.	0	N.G.	—	—

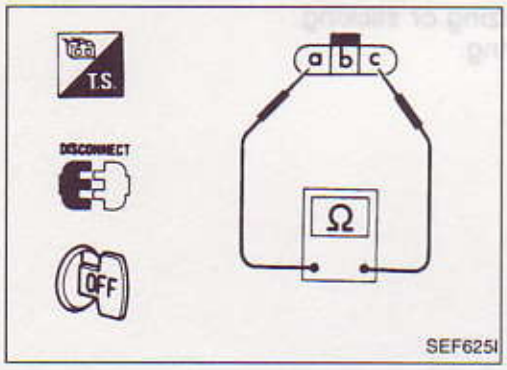
If N.G., replace power transistor.

Electrical Components Inspection (Cont'd)



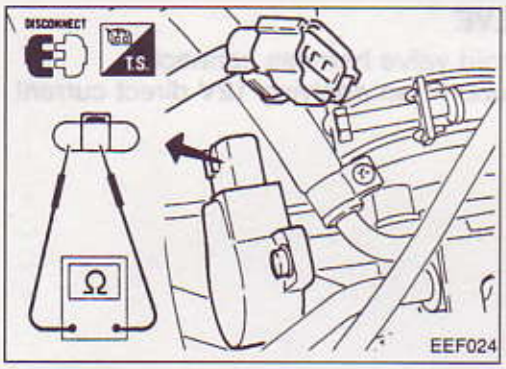
FUEL PUMP

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ⓐ and ⓑ.
   Resistance: Approximately 0.7Ω
   If N.G., replace fuel pump.



EXHAUST GAS SENSOR HEATER

Check resistance between terminals ⓐ and ⓒ.
Resistance: 3 - 1,000Ω
If N.G., replace exhaust gas sensor.



THROTTLE SENSOR

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

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 0.5
Partially released	0.5 - 4
Completely depressed	Approximately 4

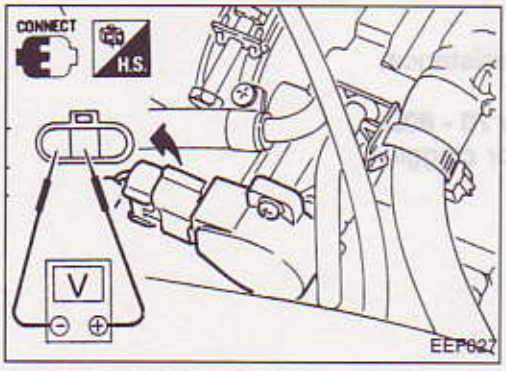
If N.G., replace throttle sensor.

Adjustment

If throttle sensor is replaced or removed, it is necessary to install in proper position, by following the procedure as shown below:

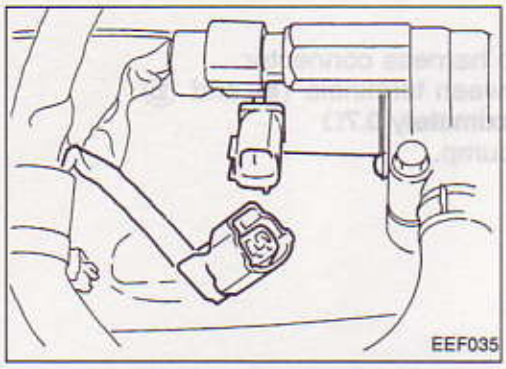
1. Install throttle sensor body in throttle chamber. Do not tighten bolts. Leave bolts loose.
2. Connect throttle sensor harness connector.
3. Start engine and warm it up sufficiently.
4. Perform "THROTTLE SEN ADJ" in "WORK SUPPORT" mode.

   Measure output voltage of throttle sensor using voltmeter.
5. Adjust rotating throttle sensor body so that output voltage is 0.45 to 0.55 V.
6. Tighten mounting bolts.
7. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.



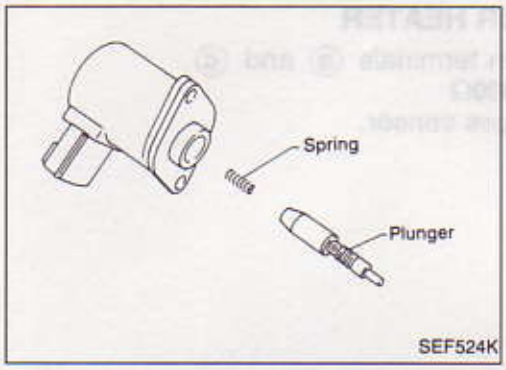
Electrical Components Inspection (Cont'd)

A.A.C. VALVE



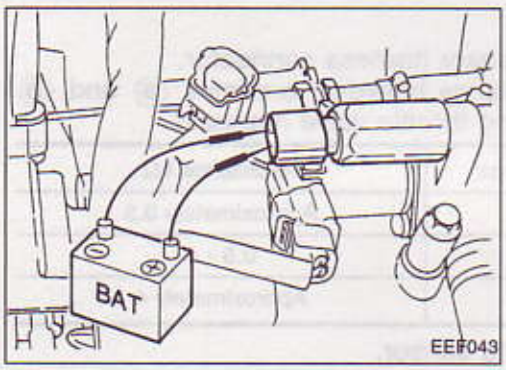
Disconnect A.A.C. valve resistance.

Resistance:
Approximately 10Ω



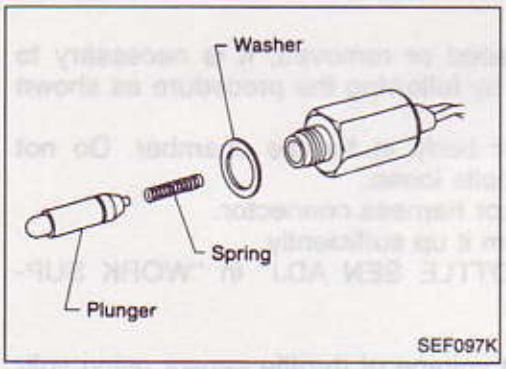
- Check plunger for seizing or sticking.
- Check for broken spring.

F.I.C.D. SOLENOID VALVE



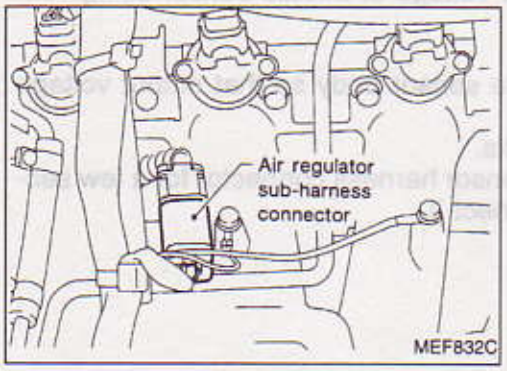
Disconnect F.I.C.D. solenoid valve harness connector.

- Check for clicking sound when applying 12V direct current to terminals.



- Check plunger for seizing or sticking.
- Check for broken spring.

AIR REGULATOR

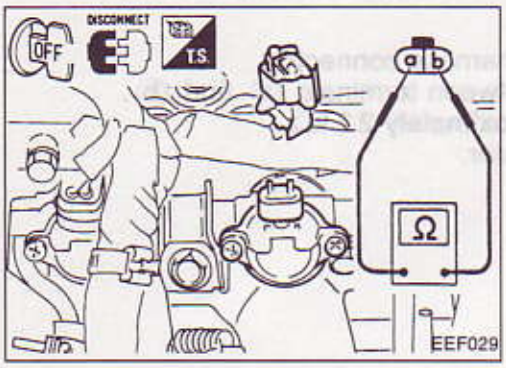


- Check air regulator resistance.

Resistance:
Approximately 70 - 80Ω

- Check air regulator for clogging.

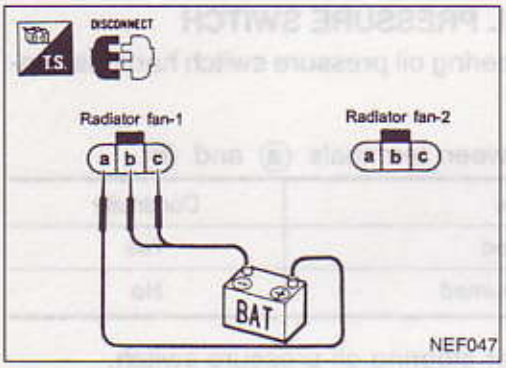
Electrical Components Inspection (Cont'd)



INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.
   Resistance: 10 - 14Ω

If N.G., replace injector.

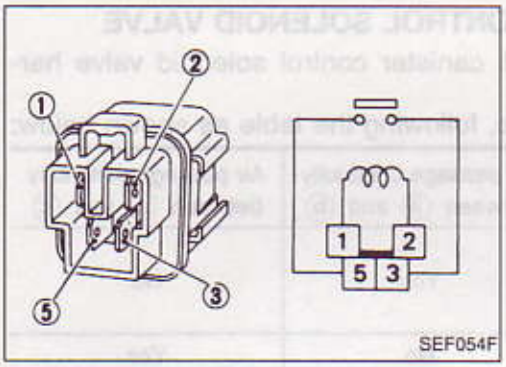


RADIATOR FAN MOTORS

Disconnect radiator fan motor harness connectors and supply radiator fan motor terminals with battery voltage.

Supply battery voltage		Radiator fan operation	Remarks
⊕	⊖		
ⓐ	ⓑ	Low speed	
ⓐ	ⓒ	High speed	

If N.G., replace radiator fan motor.

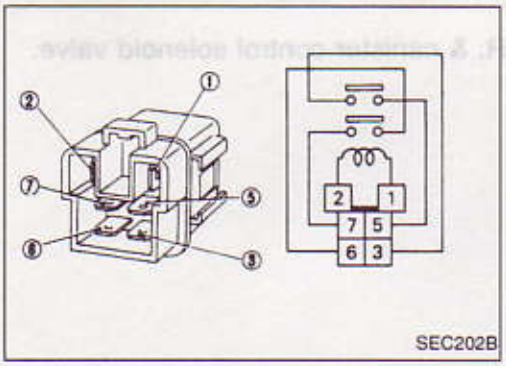


E.C.C.S. RELAY, RADIATOR FAN RELAYS AND FUEL PUMP RELAY

Check continuity between terminals ③ and ⑤.

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

If N.G., replace relay.

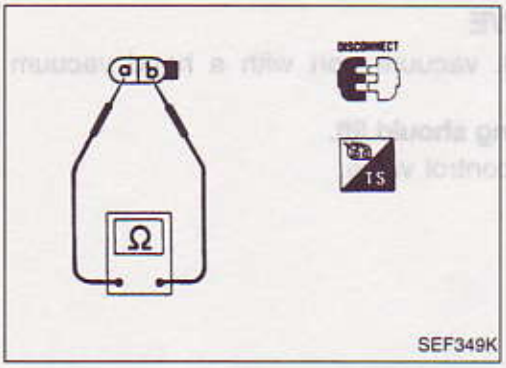


RADIATOR FAN RELAY-2.

Check continuity between terminals ③ and ⑤, ⑥ and ⑦.

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

If N.G., replace relay.



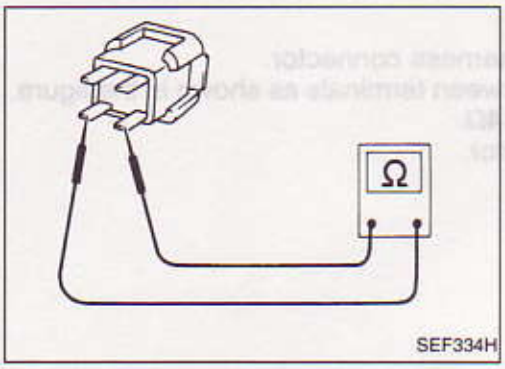
NEUTRAL SWITCH

Check continuity between terminals ⓐ and ⓑ.

Conditions	Continuity
Shift to Neutral	Yes
Shift to other position	No

If N.G., replace relay.

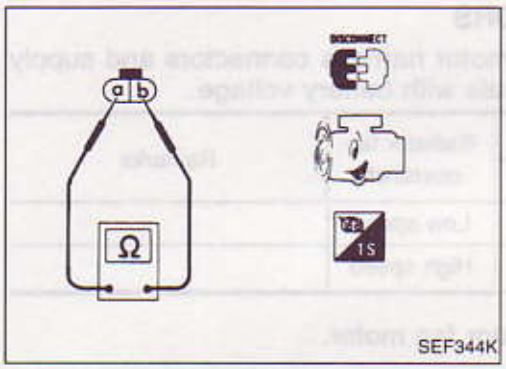
Electrical Components Inspection (Cont'd)



RESISTOR

1. Disconnect resistor harness connector.
2. Check resistance between terminals ⓐ and ⓑ.
   Resistance: Approximately 2.2 kΩ

If N.G., replace resistor.

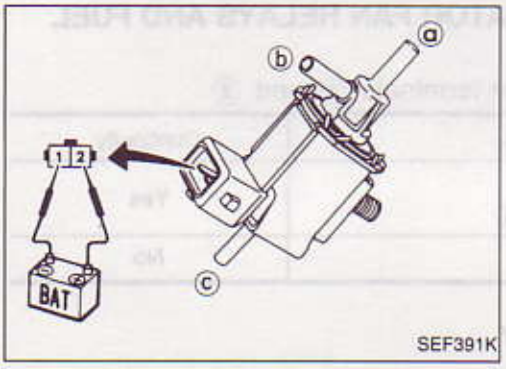


POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector.
2. Start engine.
3. Check continuity between terminals ⓐ and ⓑ.

Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No

If N.G., replace power steering oil pressure switch.

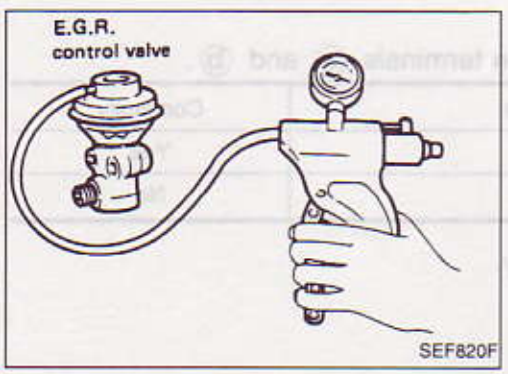


E.G.R. & CANISTER CONTROL SOLENOID VALVE

1. Disconnect E.G.R. & canister control solenoid valve harness connector.
2. Check solenoid valve, following the table as shown below:

Condiions	Air passage continuity between ⓐ and ⓑ	Air passage continuity between ⓐ and ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If N.G., replace E.G.R. & canister control solenoid valve.



E.G.R. CONTROL VALVE

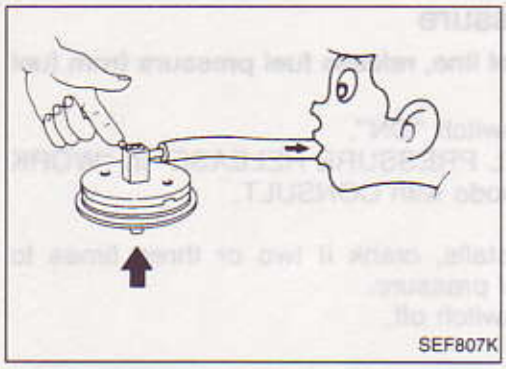
Apply vacuum to E.G.R. vacuum port with a hand vacuum pump.

E.G.R. control valve spring should lift.

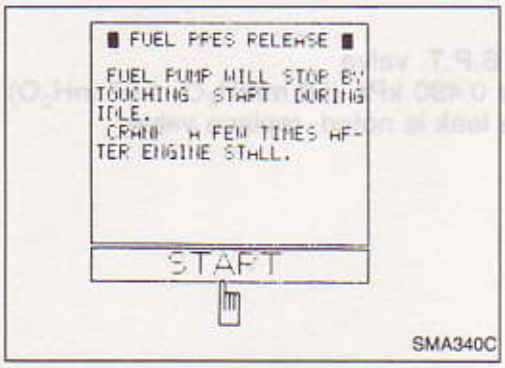
If N.G., replace E..G.R. control valve.

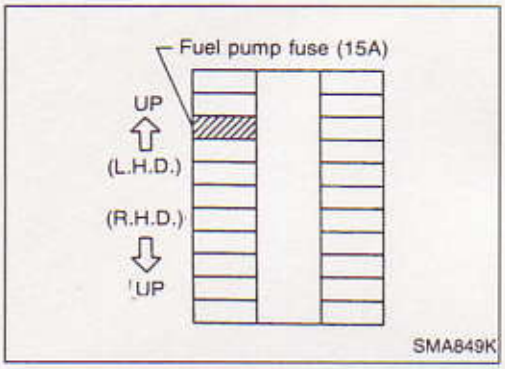
Electrical Components Inspection (Cont'd)

B.P.T. VALVE



Plug one of two ports of B.P.T. valve.
Apply a presssure above 0.490 kPa (50 mmH_2O, 1.97 inH_2O) to check for leakage. If a leak is noted, replace valve.





Releasing Fuel Pressure

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

1. Turn ignition switch "ON".
2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch off.

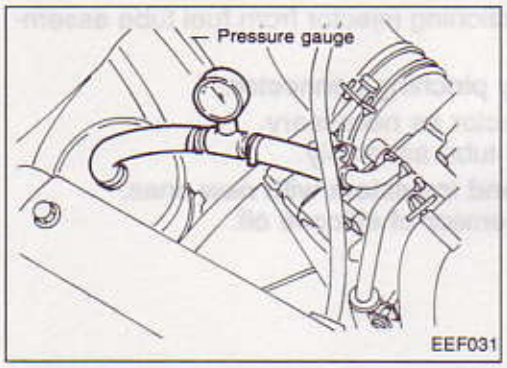
1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump fuse.

Fuel Pressure Check

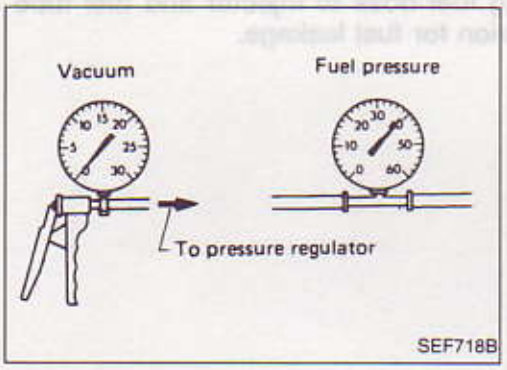
a. When reconnecting fuel line, always use new clamps.
b. Make sure that clamp screw does not contact adjacent parts.
c. Use a torque driver to tighten clamps.
d. Use Pressure Gauge to check fuel pressure.
e. Do not perform fuel pressure check while fuel pressure regulator control system is operating;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

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

Fuel Pressure Check (Cont'd)



5. Read the indication of fuel pressure gauge.
   At idling:
   When fuel pressure regulator valve vacuum hose is connected.
   Approximately 245 kPa (2.45 bar, 2.5 kg/cm^2, 36 psi)
   When fuel pressure regulator valve vacuum hose is disconnected.
   Approximately 294 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)
6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.

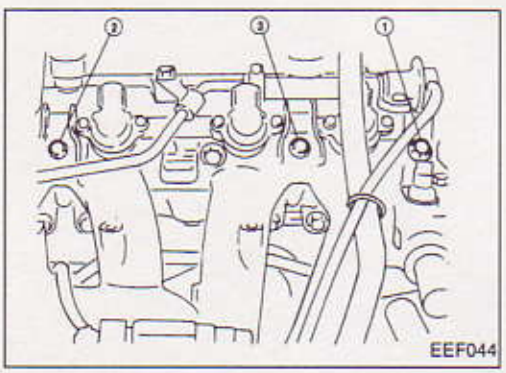


9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

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

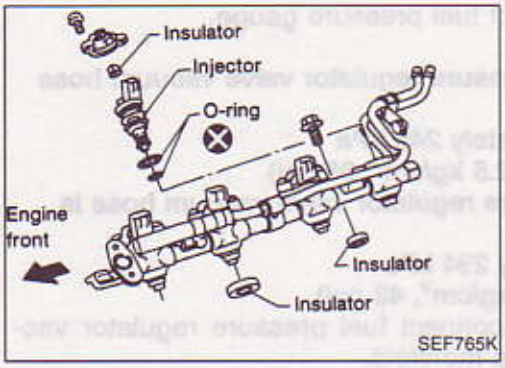
Injector Removal and Installation

1. Release fuel pressure to zero.
2. Disconnect injector harness connectors.
3. Disconnect vacuum hose from pressure regulator.
4. Disconnect fuel hoses from fuel tube assembly.



5. Remove injectors with fuel tube assembly.

Injector Removal and Installation (Cont'd)



6. Push out any malfunctioning injector from fuel tube assembly.

Do not extract injector by pinching connector.

7. Replace or clean injector as necessary.
8. Install injector to fuel tube assembly.

Always replace O-rings and insulators with new ones.
Lubricate O-rings with a smear of silicone oil.

9. Install injectors with fuel tube assembly to intake manifold. Tighten fuel tube bolts to the specified torque.

Tightening procedure:

1) **Tighten all bolts to 9.3 to 10.8 N·m (0.95 to 1.1 kg-m, 6.9 to 8.0 ft-lb).**
2) **Tighten all bolts to 21 to 26 N·m (2.1 to 2.7 kg-m, 15 to 20 ft-lb).**

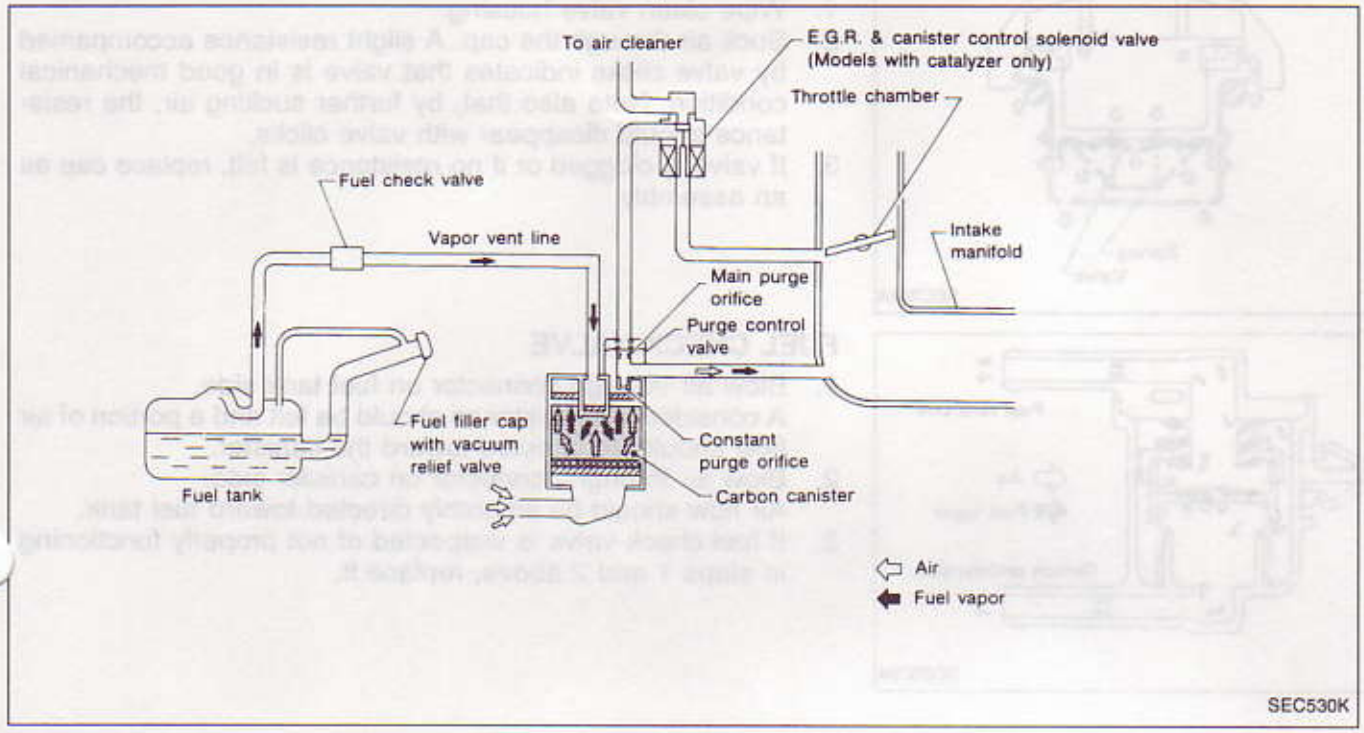
10. Install fuel hoses to fuel tube assembly.

Lubricate fuel hoses with a smear of silicone oil.

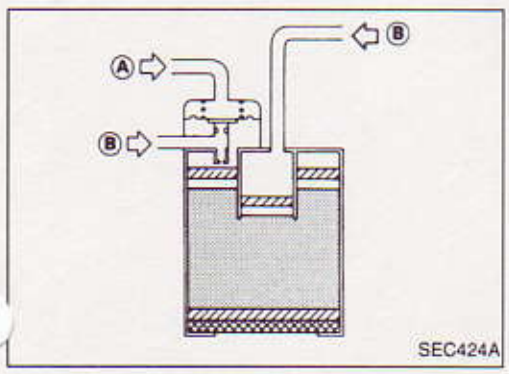
11. Reinstall any parts removed in reverse order of removal.

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

Description



The evaporative emission control system is used to reduce hydrocarbons emitted into 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.

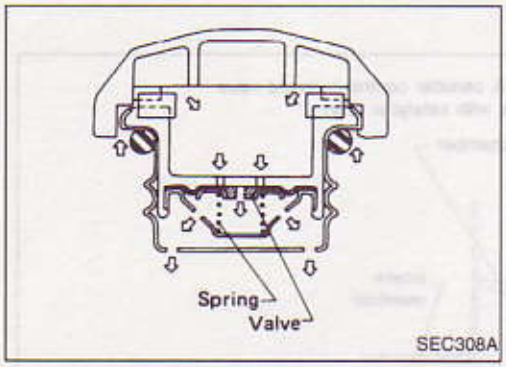


Inspection

CARBON canister

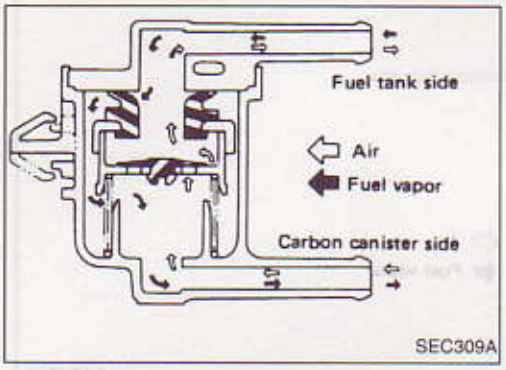
Check carbon canister as follows:
Ⓐ : Blow air and ensure that there is no leakage.
Ⓑ : Blow air and ensure that there is leakage.

Inspection (Cont'd)



FUEL TANK VACUUM RELIEF VALVE

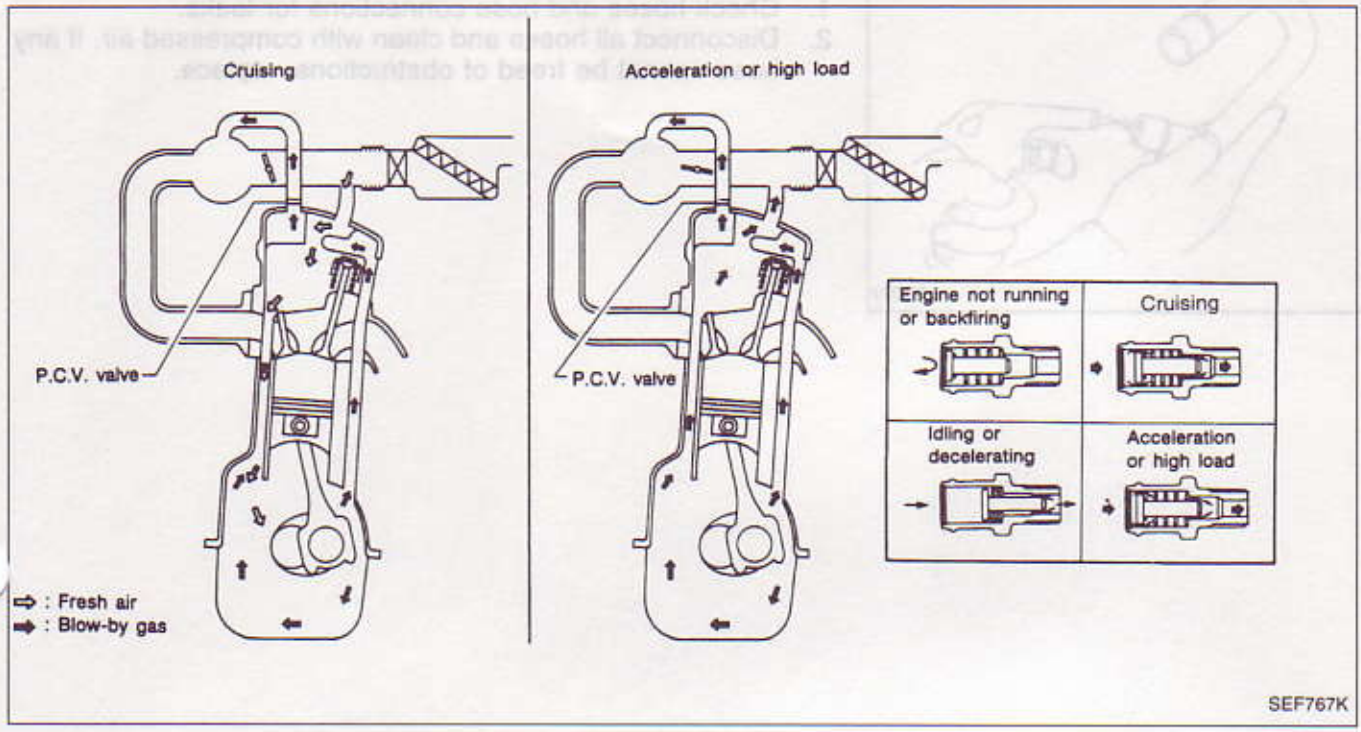
1. Wipe clean valve housing.
2. Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. If valve is clogged or if no resistance is felt,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



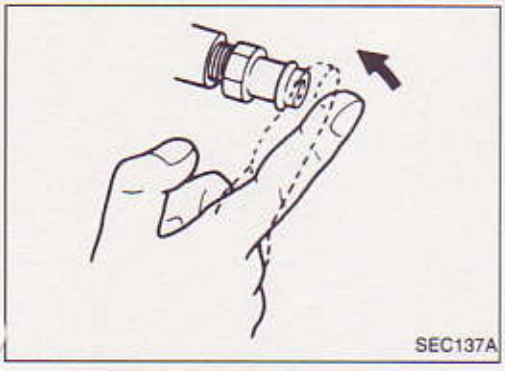
FUEL CHECK VALVE

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 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.

Description



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



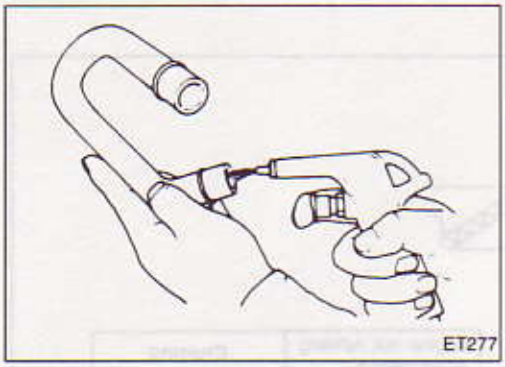
Inspection

P.C.V. (Positive Crankcase Ventilation)

With engine running at idle, remove P.C.V. valve from rocker cover; if the 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.

Inspection (Cont'd)

VENTILATION HOSE


ET277

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

General Specifications

PRESSURE REGULATOR	
Regulated pressure kPa (bar, kg/cm^2, psi)	299.1 (2.991, 3.05, 43.4)

Inspection and Adjustment

Idle speed*1 rpm	
No-load*2 (in "N" position)	750 ± 50
Air conditioner: ON (in "N" position)	850 ± 50
Ignition timing	10° ± 2° B.T.D.C.
Throttle sensor idle position V	0.40 - 0.60

*1: Feedback controlled and needs no adjustments
*2: Under the following conditions:
- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater, fan & rear defogger)

IGNITION COIL

Primary voltage V	12
Primary resistance [at 20°C (68°F)] Ω	Approximately 0.9
Secondary resistance [at 20°C (68°F)] kΩ	Approximately 13.0

AIR FLOW METER

Supply voltage V	Battery voltage
Output voltage V	1.0 - 1.5*

*: Engine is warmed up sufficiently and idling under no-load.

ENGINE TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
90 (164)	0.24 - 0.26
110 (230)	0.14 - 0.15

FUEL PUMP

Resistance Ω	Approximately 0.2

A.A.C. VALVE

Resistance Ω	Approximately 10.0

INJECTOR

Resistance Ω	Approximately 10.0

RESISTOR

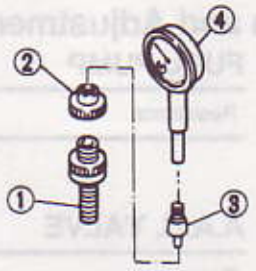
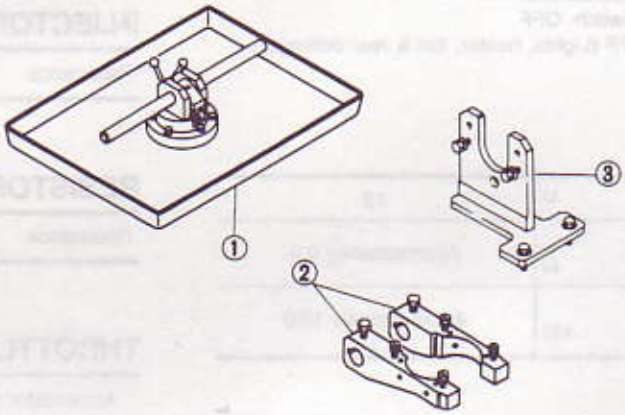
Resistance kΩ	Approximately 2.2

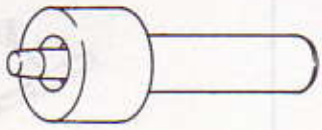
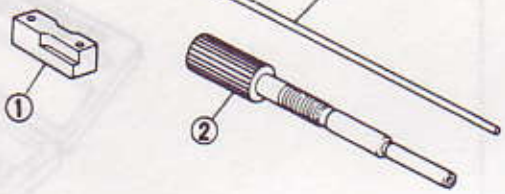
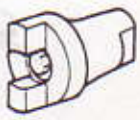
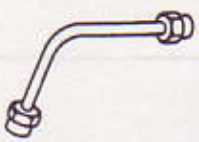
THROTTLE SENSOR

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 0.5
Partially released	0.5 - 4
Completely depressed	Approximately 4

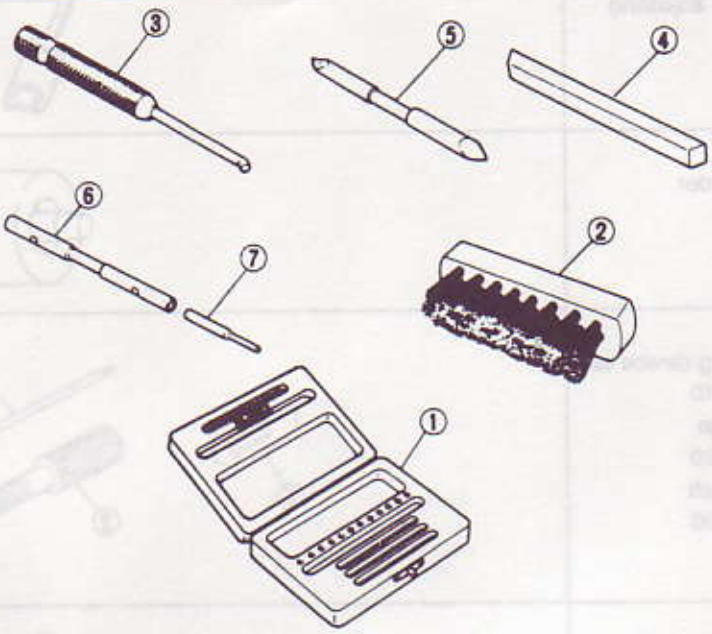
SPECIAL SERVICE TOOLS

Adjusting device on vehicle

Tool number Tool name	Description
KV11229352 Measuring device ① KV11229350 Holder ② KV11229360 Nut ③ KV11229370 Pin ④ KV11254410 Dial gauge	Measuring set lenght of plunger spring 
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	
KV11214260 Socket wrench for regulating valve	
KV11214250 Socket wrench for distributor head plug	

Tool number Tool name	Description
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	
KV11229042 "K" & "KF" measuring device	
Adjusting device on pump tester	
KV11281036 Fixing stand	
KV11242442 Coupling	
KV11282815 Measuring device (for high-pressure side) KV11282819 Measuring device (for low-pressure side)	Measuring timer advance angle 
KV11205032 Injection pipe	 840 mm (33.07 in)

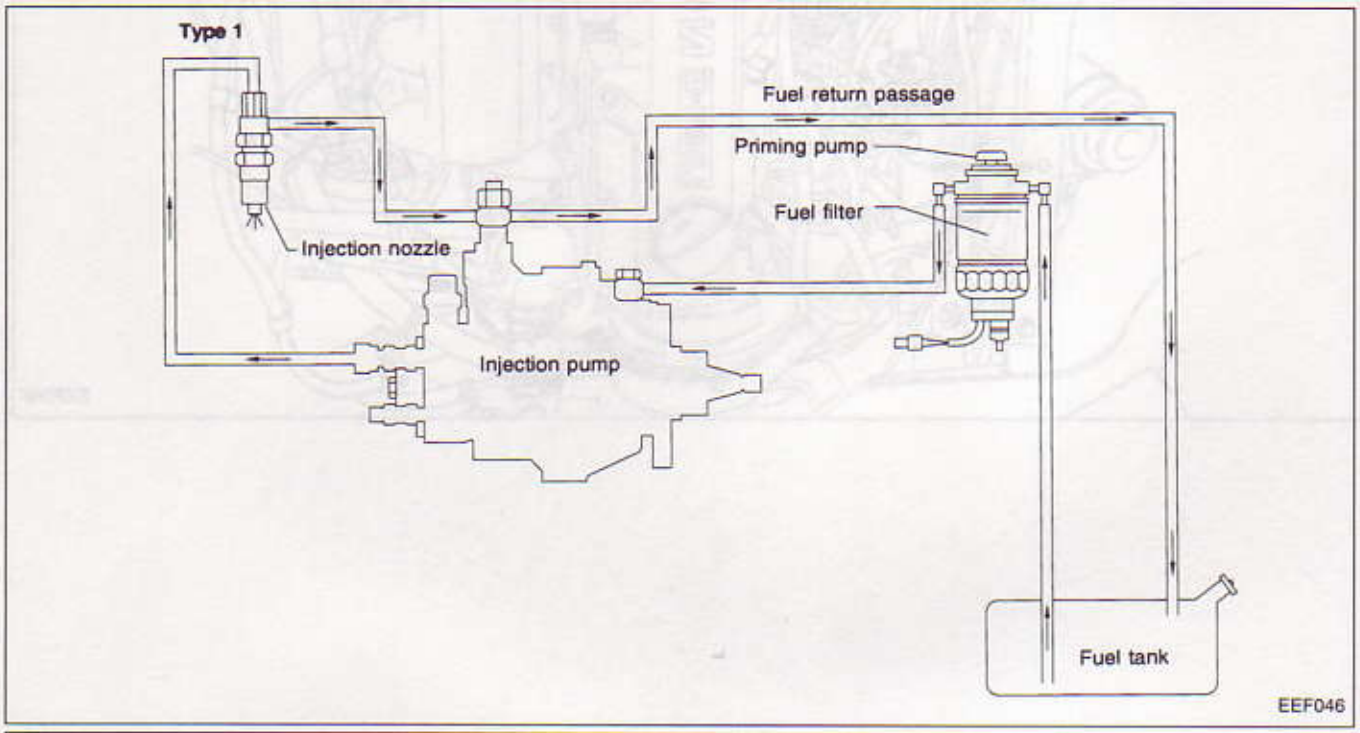
For injection nozzle

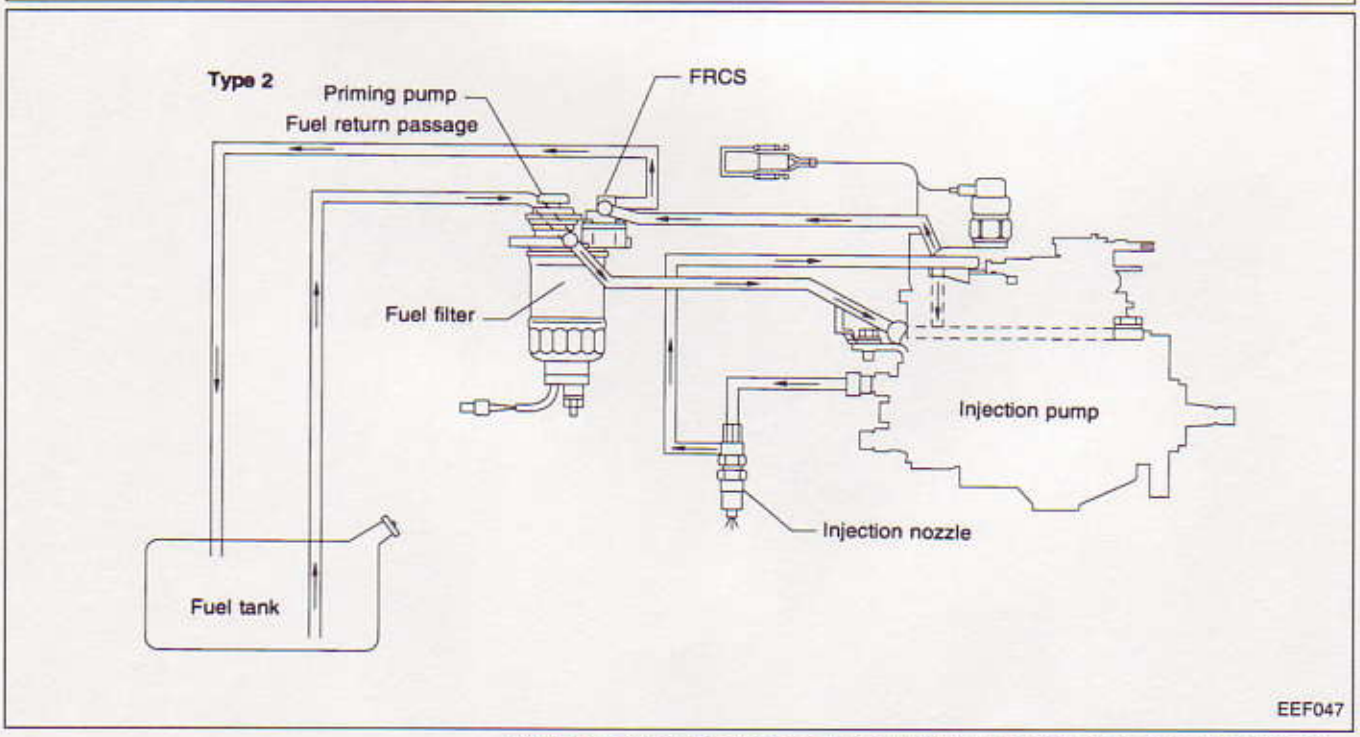
Tool number Tool name	Description
KV11289004 Nozzle cleaning kit ① KV11290012 Box ② KV11290110 Brush ③ KV11290122 Nozzle oil sump scraper ④ KV11290140 Nozzle needle tip cleaner ⑤ KV11290150 Nozzle seat scraper ⑥ KV11290210 Nozzle holder ⑦ KV11290220 Nozzle hole cleaning needle	
KV11292010 Nozzle centering device	
KV11100300 Nozzle holder socket	
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)	

CAUTION:

- **Disassembly and assembly of the injection pump 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.**

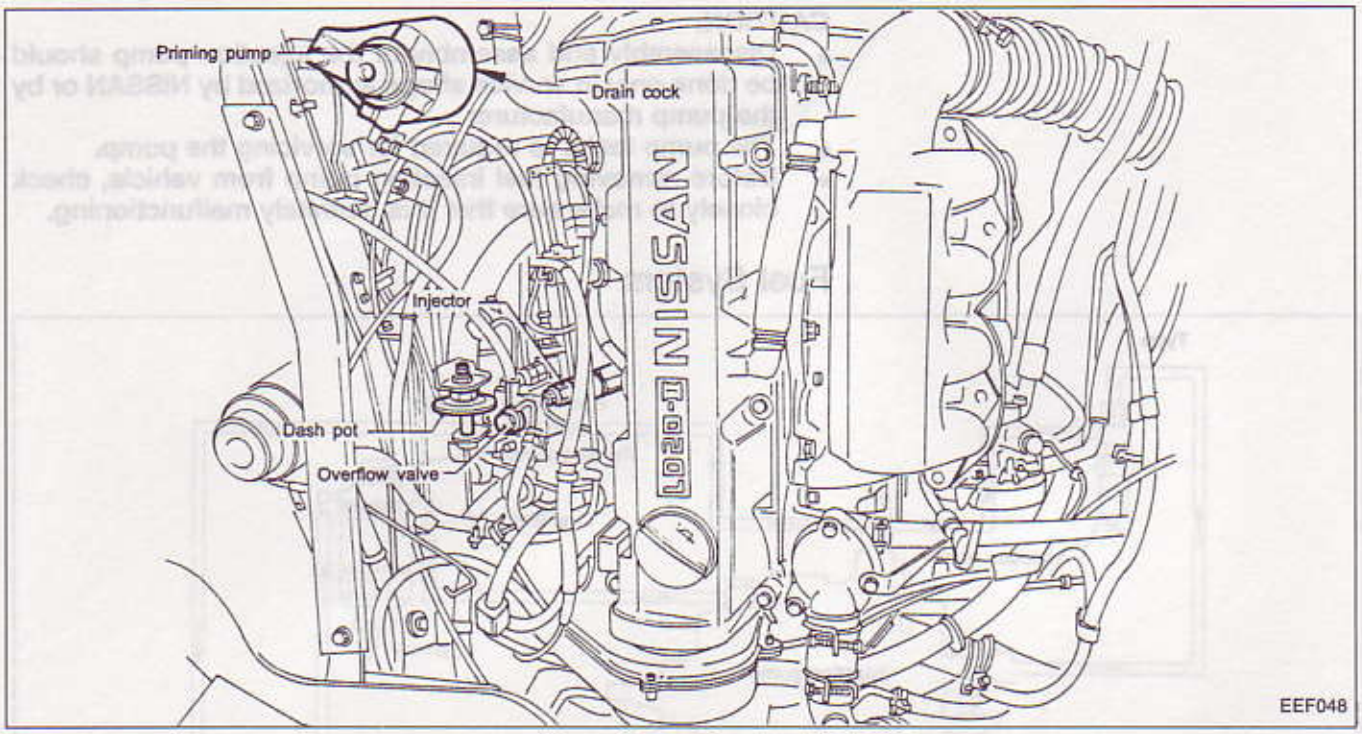
Fuel System

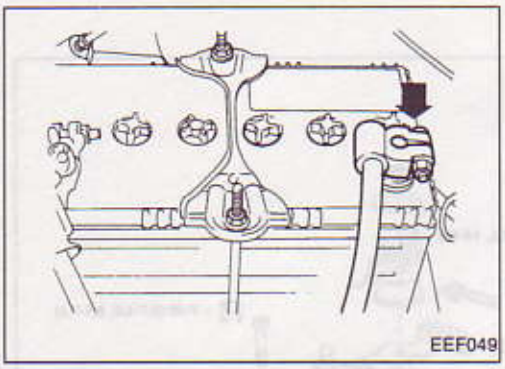




NOTE: Type 2 includes Fuel Return Control System (F.R.C.S.)

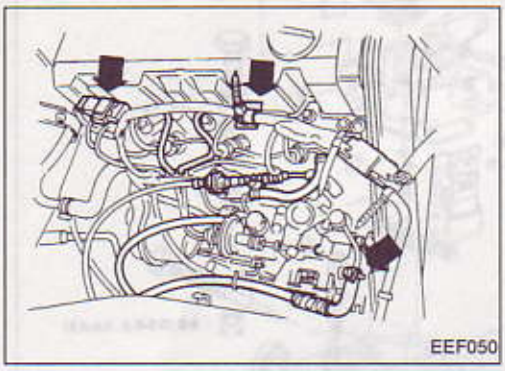
Fuel System (Cont'd)



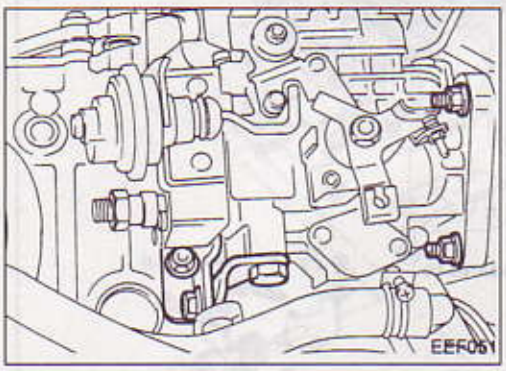

EEF049

Removal

1. Disconnect battery ⊖ cable, fuel cut solenoid valve connector and accelerator wire.
2. Remove engine under cover.
3. Set No. 1 piston at T.D.C. on its compression stroke.
   T.D.C.: White painted mark
4. Remove fuel hoses (supply, return and spill) and injection tubes.

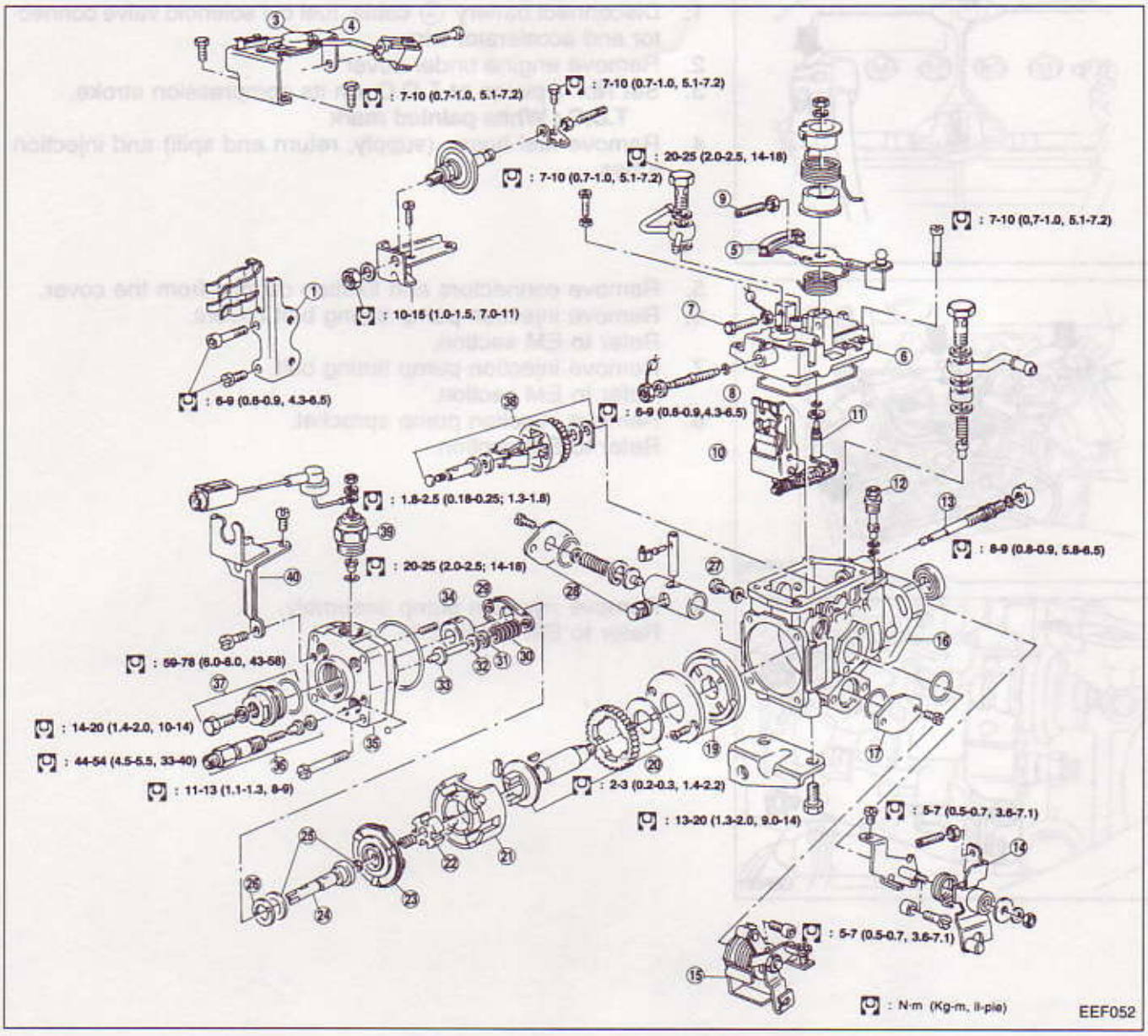

EEF050

5. Remove connectors and fixation clamps from the cover.
6. Remove injection pump timing belt covers.
   Refer to EM section.
7. Remove injection pump timing belt.
   Refer to EM section.
8. Remove injection pump sprocket.
   Refer to EM section.


EEF051

9. Remove injection pump assembly.
   Refer to EM section.

Disassembly



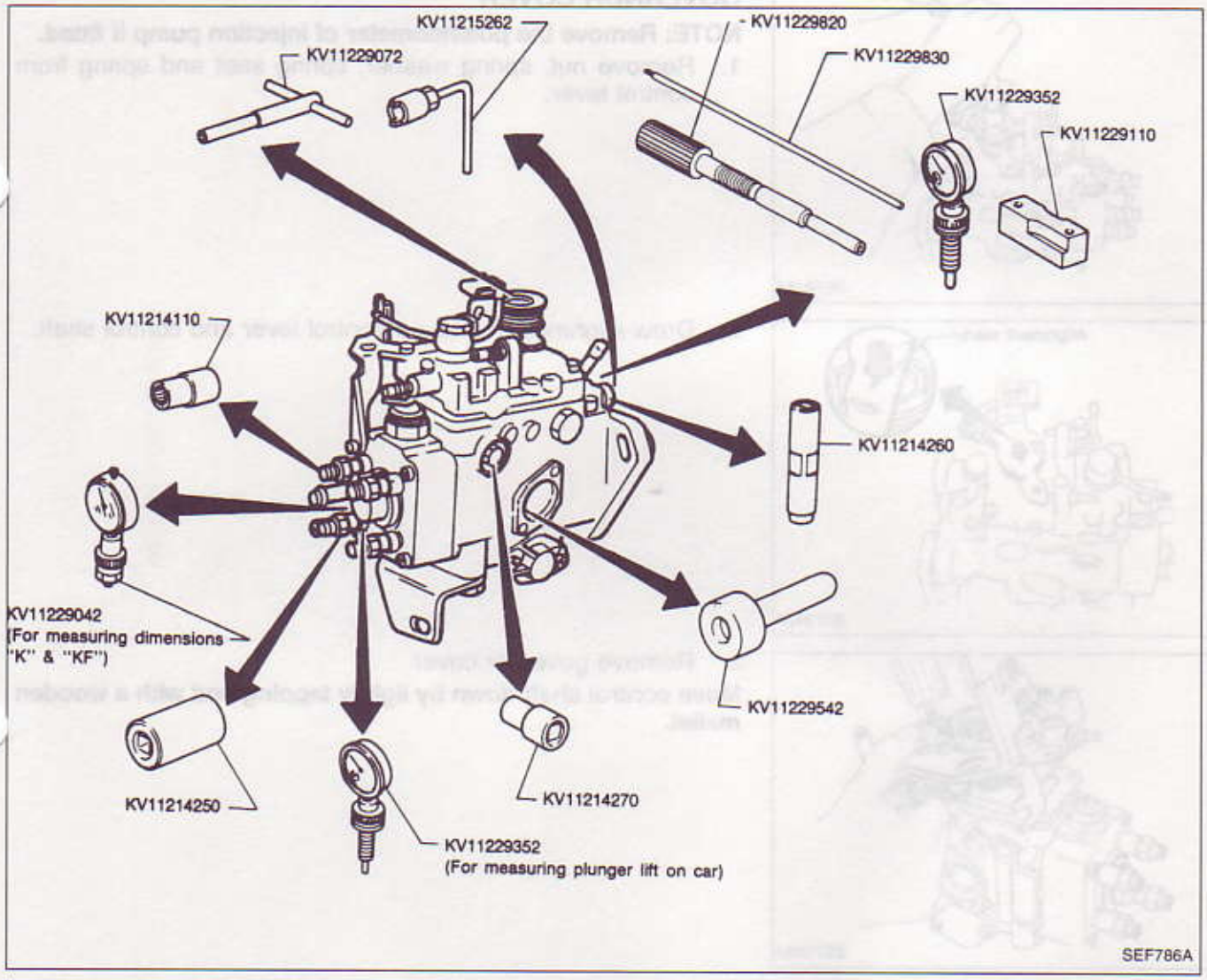
1. Bracket
2. Dash-pot
3. Potentiometer
4. Potentiometer mounting bracket
5. Control lever
6. Pump cover
7. Maximum speed adjusting screw
8. Full load adjusting screw
9. Idle speed adjusting screw
10. Governor lever
11. Control shaft assembly
12. Regulating valve
13. Governor shaft
14. High speed control lever assembly
15. Cold starting device assembly
16. Pump housing
17. Cover plate
18. Inferior bracket
19. Feed pump assembly
20. Driver shaft assembly
21. Roller and roller holder
22. Driving disc
23. Cam disc
24. Plunger
25. Shim
26. Washer
27. Pivot pin
28. Speed timer assembly
29. Spring seat
30. Plunger spring
31. Spring seat
32. Shim
33. Guide pin
34. Control sleeve
35. Distributor head
36. Delivery valve assembly
37. Plug and bolt
38. Flyweight assembly
39. Fuel cut solenoid valve
40. Accelerator wire bracket

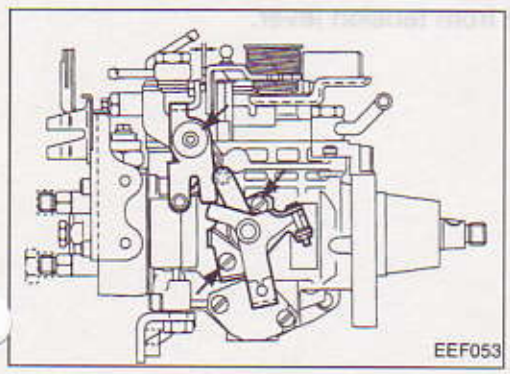
Disassembly (Cont'd)

PREPARATION

- Before performing disassembly and adjustment, test fuel injection pump and note test results.
- Prior to starting 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 those service tools necessary for disassembling and reassembling.
- Be careful not to bend or scratch any parts.

Special tools are needed for disassembling and reassembling fuel injection pump.





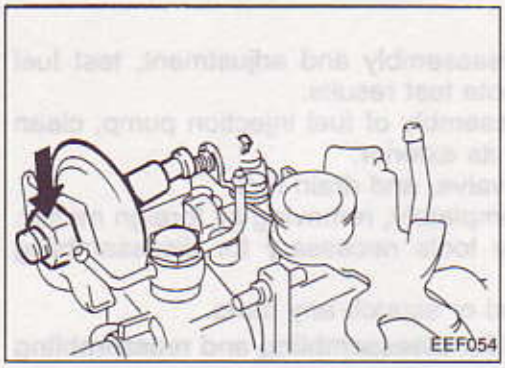
COLD START DEVICE

1. Remove high speed control lever assembly.
2. Remove cold start device assembly.

Never disassemble cold start device linkage.

Disassembly (Cont'd)

DASH-POT

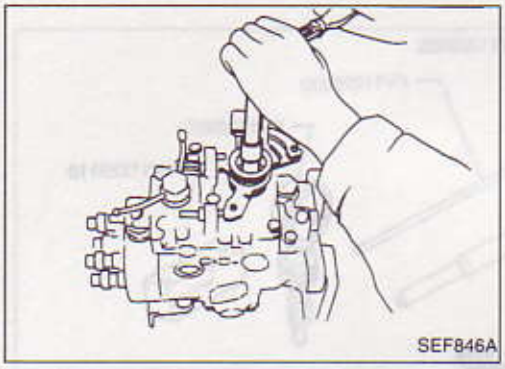

EEF054

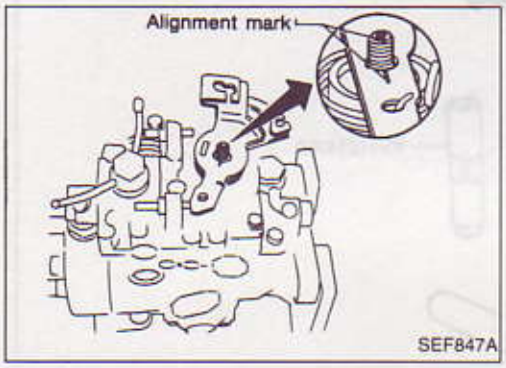
1. Remove dash-pot from injection pump.

GOVERNOR COVER

NOTE: Remove the potentiometer of injection pump if fitted.

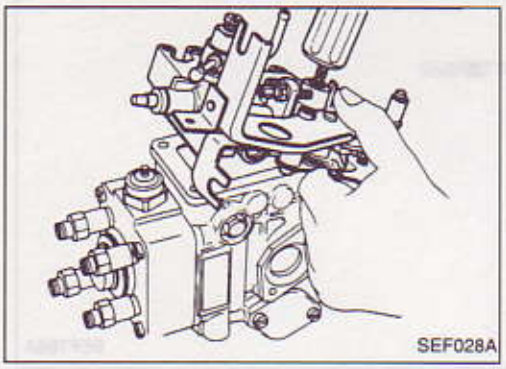
1. Remove nut, spring washer, spring seat and spring from control lever.


SEF846A



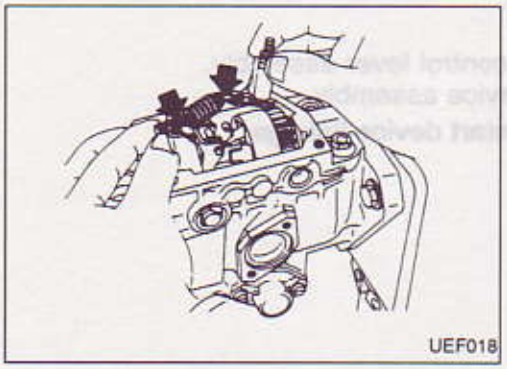
SEF847A

2. Draw alignment marks on control lever and control shaft.


SEF028A

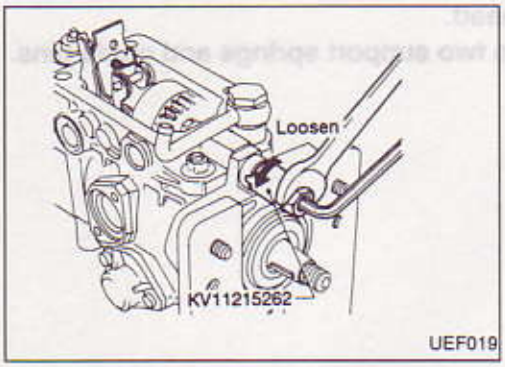
3. Remove governor cover.

Move control shaft down by lightly tapping end with a wooden mallet.


UEF018

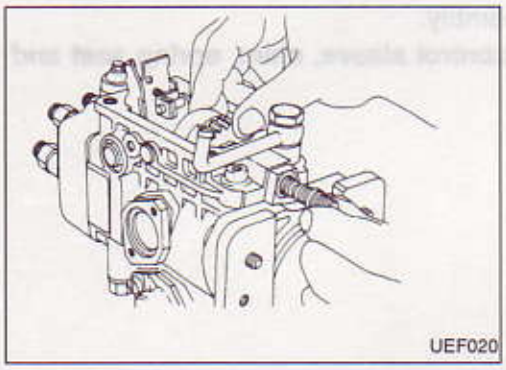
4. Remove control shaft from tension lever.

Disassembly (Cont'd)

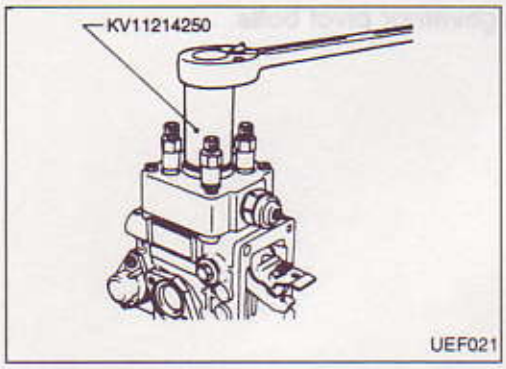


5. Remove governor shaft.

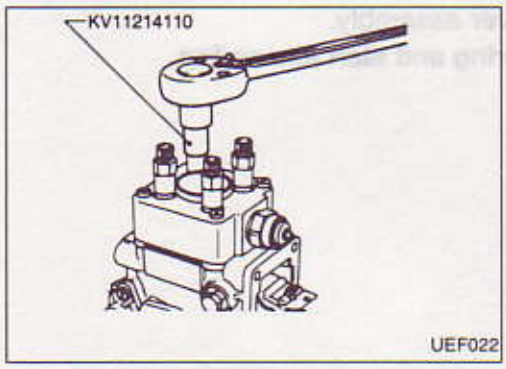
Loosen lock nut by turning it counterclockwise.



6. Remove governor sleeve, washer and flyweight, along with flyweight holder, then remove washer and shim(s).

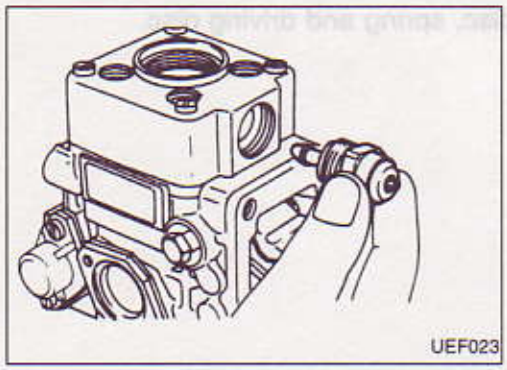


7. Remove plug.



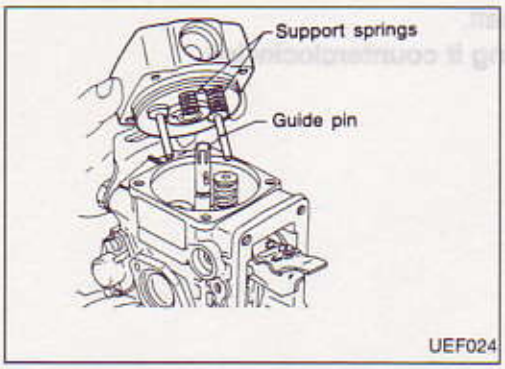
8. Remove delivery holder, spring, delivery valve and gasket.

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



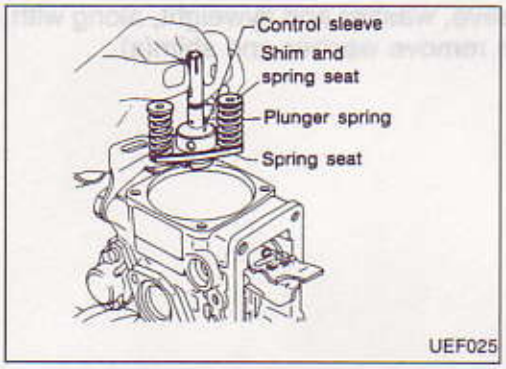
9. Remove fuel cut solenoid valve.

Disassembly (Cont'd)



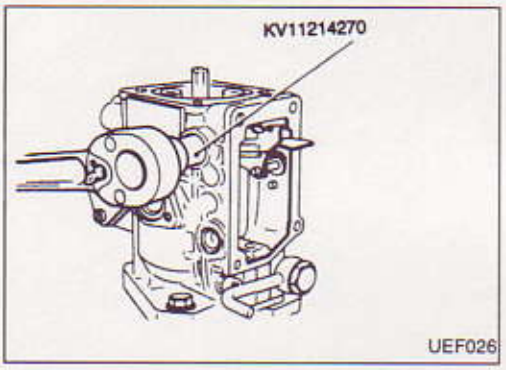
10. Remove distributor head.

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

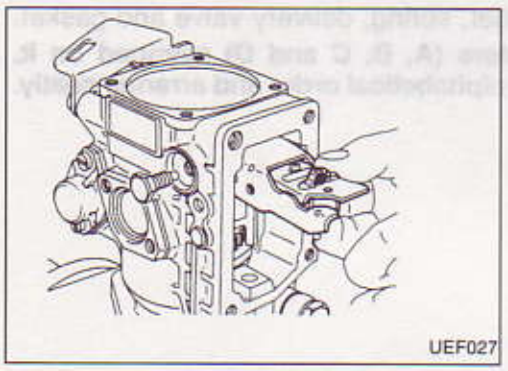


11. Remove plunger assembly.

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

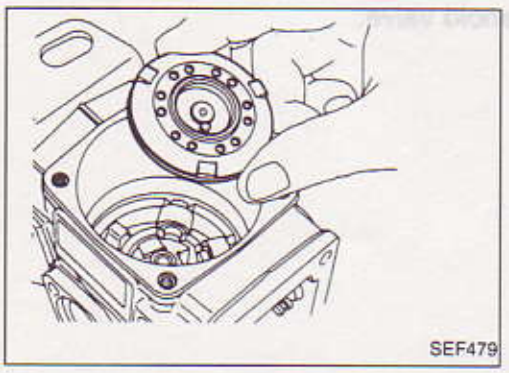


12. Loosen left and right governor pivot bolts.



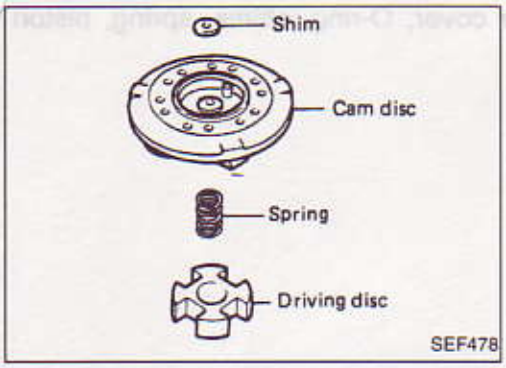
13. Remove governor lever assembly.

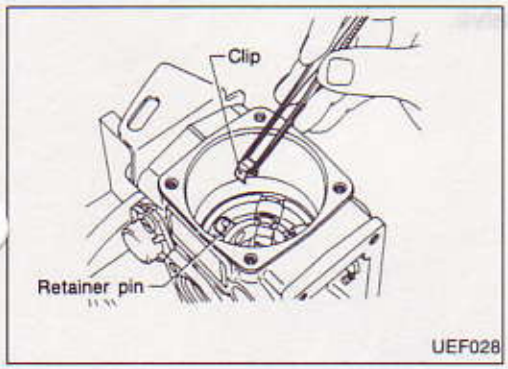
Avoid pulling on start spring and start idle spring.



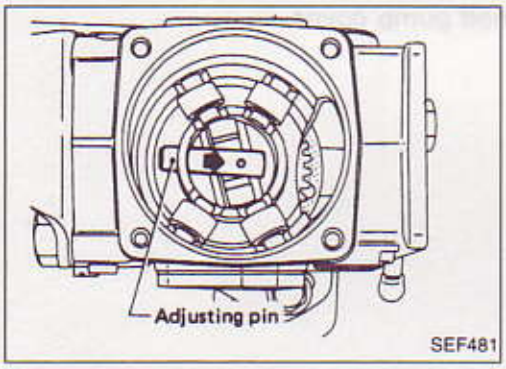
14. Remove shim, cam disc, spring and driving disc.

Disassembly (Cont'd)

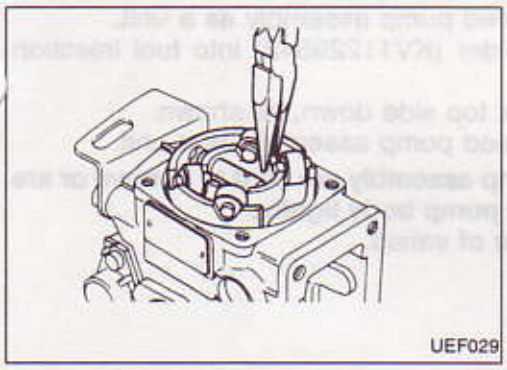




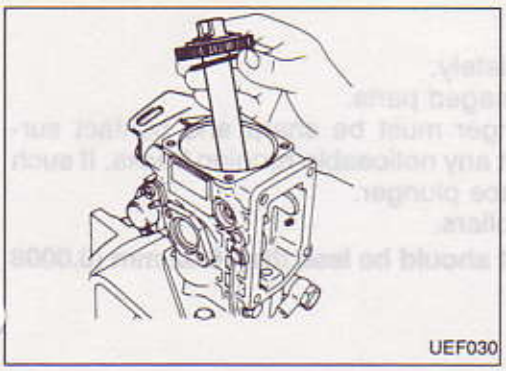
15. Remove clips and pins.



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

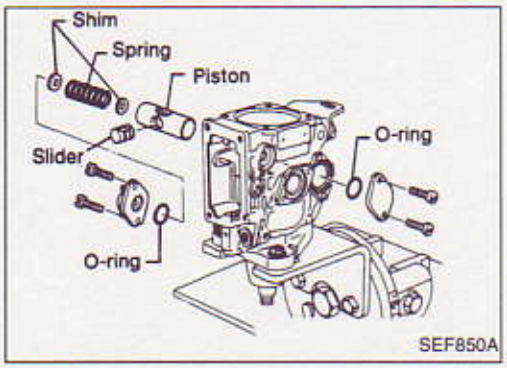


17. Lift out roller holder with rollers without tilting.
Be careful not to drop rollers.

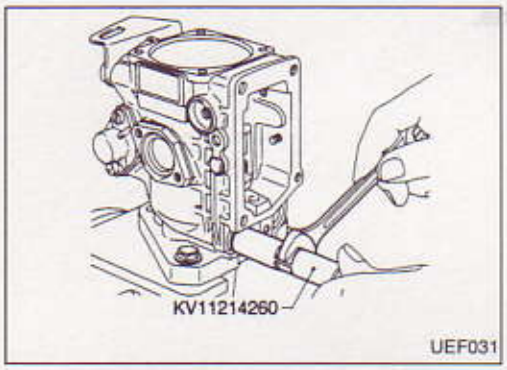


18. Remove drive shaft.
   a. **Be careful not to scratch inner surface of fuel injection pump body.**
   b. **Be careful not to drop the key.**

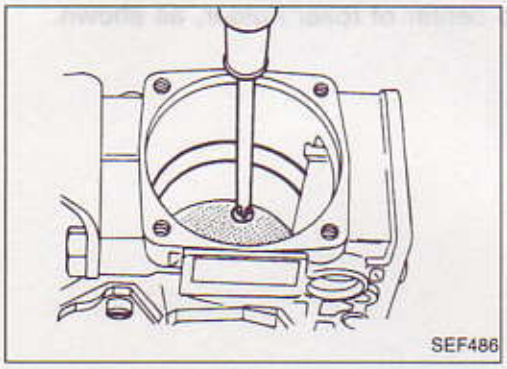
Disassembly (Cont'd)



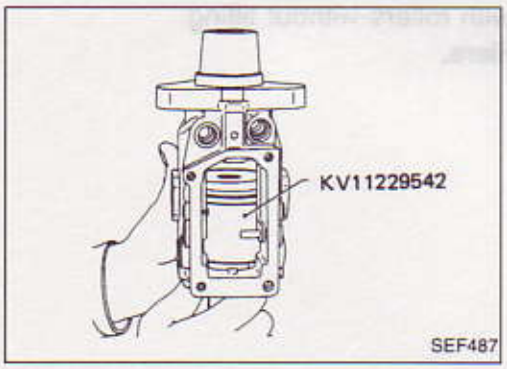
19. Remove speed timer cover, O-ring, shims, spring, piston and slider.



20. Remove regulating valve.



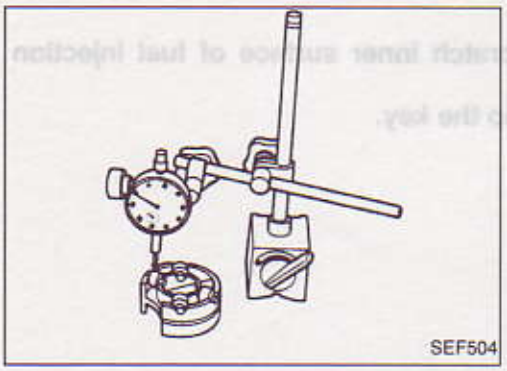
21. Loosen screw from feed pump cover.



22. Remove cover and feed pump assembly as a unit.
(1) Insert feed pump holder (KV11229542) into fuel injection pump housing.
(2) Turn injection pump's top side 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 are stuck midway, strike pump body lightly.

b. Do not move position of vanes.



Inspection

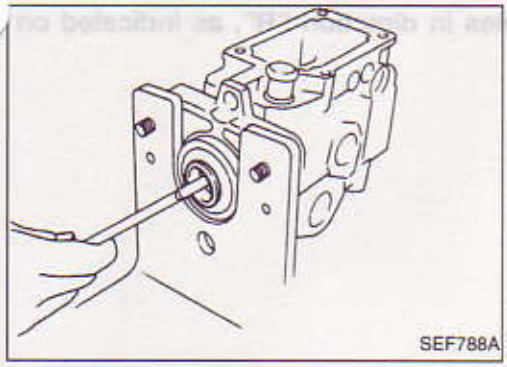
1. Wash all parts completely.
2. Replace worn or damaged parts.
3. Control edge of plunger must be sharp and contact surfaces must not exhibit any noticeable running tracks. If such is not the case, replace plunger.
4. Check height of all rollers.

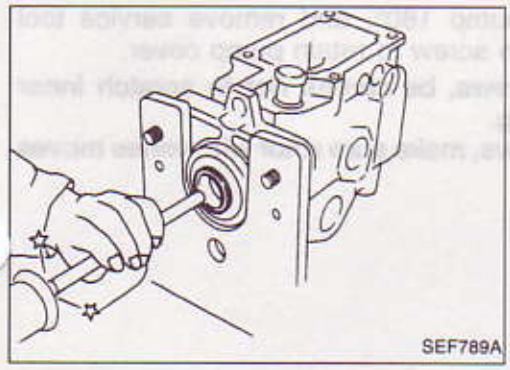
Difference in roller height should be less than 0.02 mm (0.0008 in).

Inspection (Cont'd)

REPLACEMENT OF OIL SEAL

1. Remove oil seal.


SEF788A

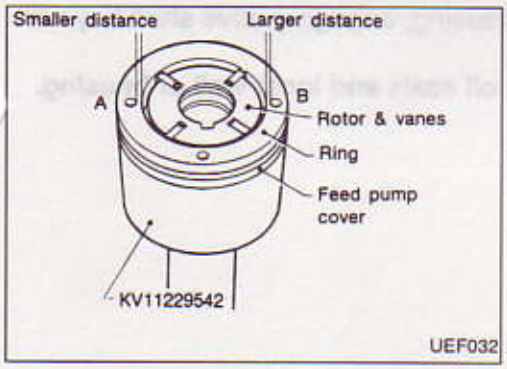

SEF789A

2. Apply grease to oil seal.
3. Install oil seal.

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



UEF032

PREPARATION

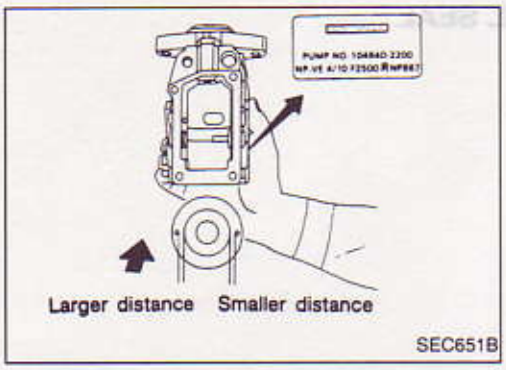
Dip all movable parts and O-rings in test oil and clean.

1. Locate 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.

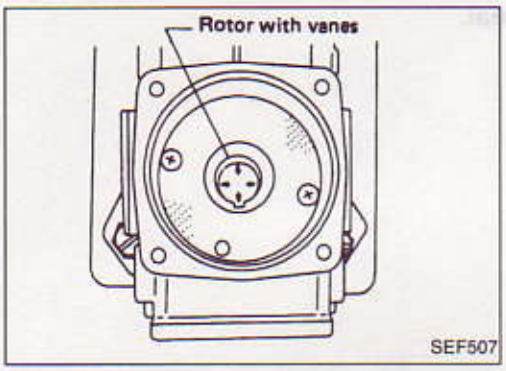
2. Install feed pump cover, rotor with vanes, and ring to pump housing.

Be careful to install liner correctly. If A and B are reversed, fuel will not be discharged from feed pump.

Assembly (Cont'd)



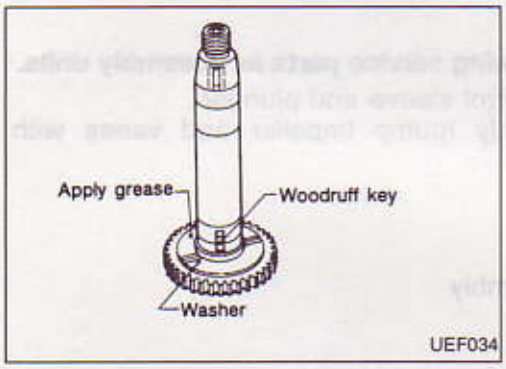
Fuel injection pump rotates in direction "R", as indicated on identification plate.



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

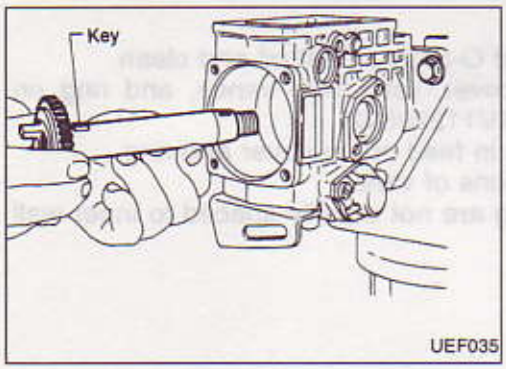
a. When tightening screws, be careful not to scratch inner wall of pump housing.

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



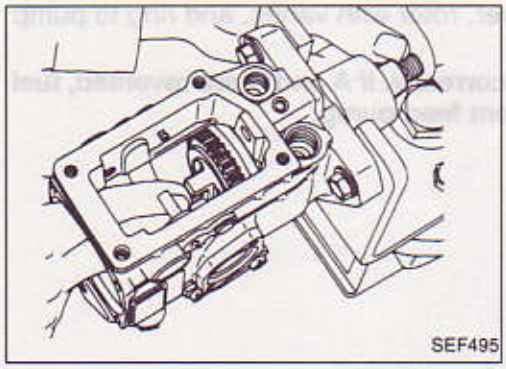
4. Make sure drive shaft and gear are assembled properly, as shown.

Do not forget bumper rubbers.



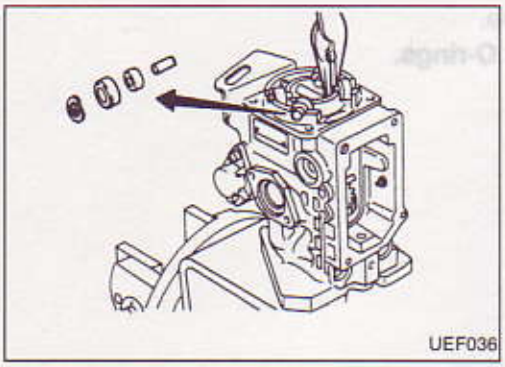
5. Install drive shaft to housing, engaging drive shaft key with key groove in rotor.

Be careful not to scratch oil seals and inner wall of housing.

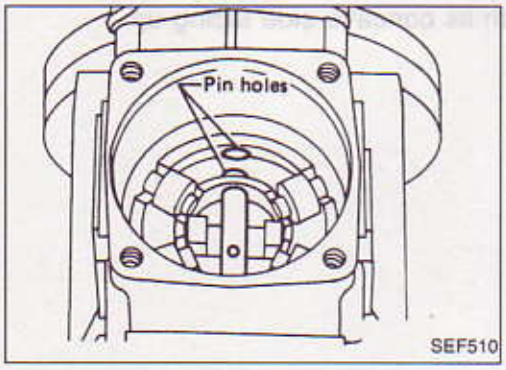


6. Set drive shaft's nail parallel to timer.

Assembly (Cont'd)

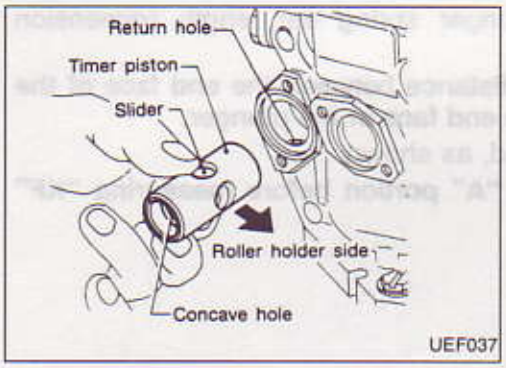

UEF036

7. Install roller and holder.
   a. **Do not interchange roller positions. If they are interchanged, refer to Inspection for correction.**
   b. **Make sure washer is situated outside of rollers.**



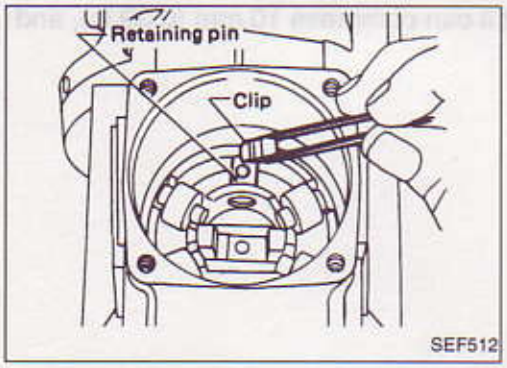
SEF510

8. Align holder and timer adjusting pin holes.



UEF037

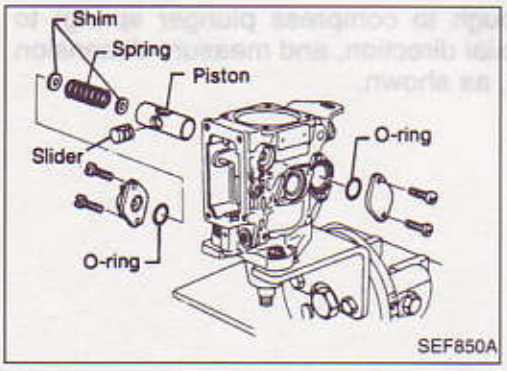
9. Install timer piston and slider as a unit.
   a. **Make sure hole in slider faces towards roller holder.**
   b. **Make sure concave hole in piston is on same side as return hole.**



SEF512

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

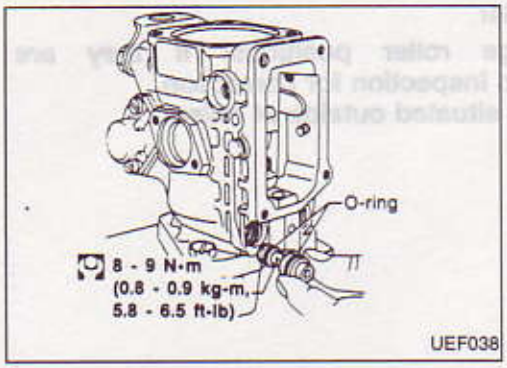
Make sure timer piston moves smoothly.



SEF850A

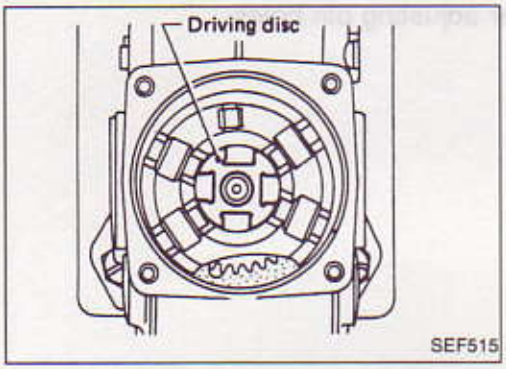
11. Install timer, using a 0.6 mm (0.024 in) thick shim, then install timer spring, shim, O-ring and cover, in that order.
    a. **Use at least one shim on each side of timer spring.**
    b. **Use shims that were selected during bench test.**

Assembly (Cont'd)

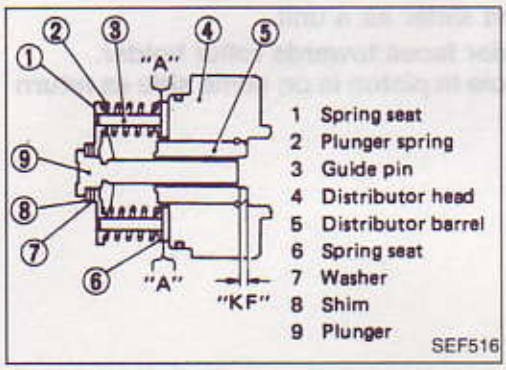


12. Install regulating valve.

Be careful not to scratch O-rings.



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

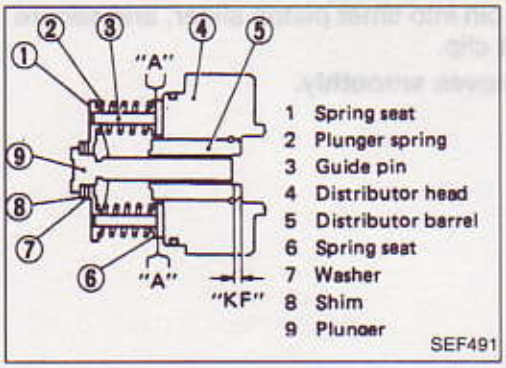


14. Measurement of plunger spring set length (dimension "KF")

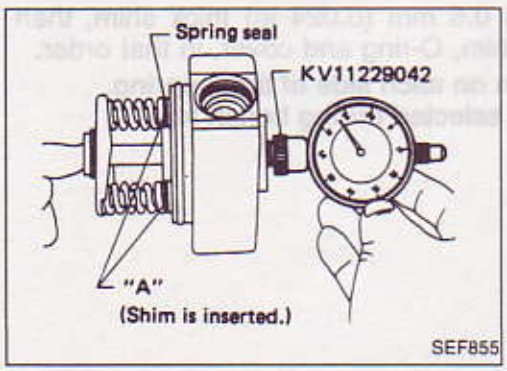
Dimension "KF" is the distance between the end face of the distributor barrel and the end face of the plunger.

(1) Install distributor head, as shown.

Do not insert shim into "A" portion before measuring "KF" dimension.



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



(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.

Assembly (Cont'd)

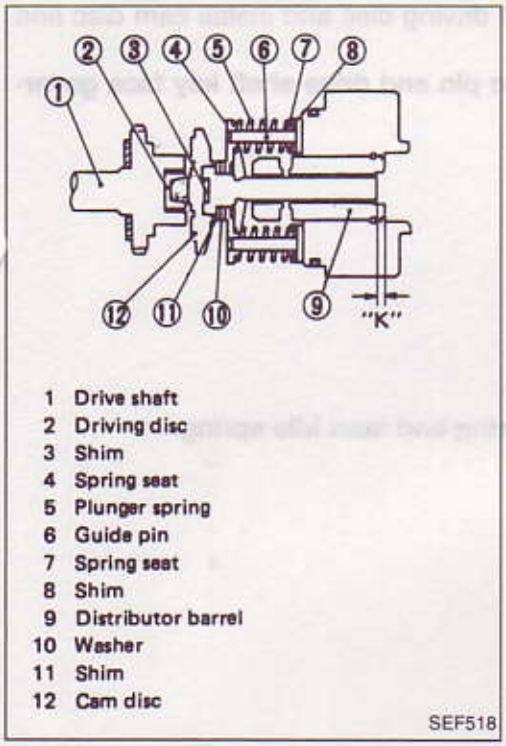
(4) Determine the shims to be used at "A" by calculating difference between standard and measured dimensions.

Refer to S.D.S. for "KF".

[Example]

When measured (dial gauge reading) value is 5.4 mm, "KF" – 5.4 mm = Shim thickness to be used.

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.
c. Use the same size of shim on each side of distributor head.
d. Refer to S.D.S. for available service parts.



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

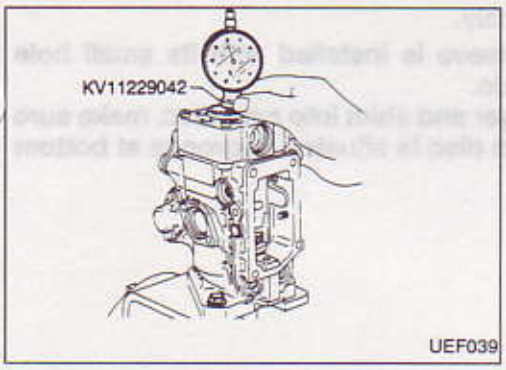
SEF518

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.

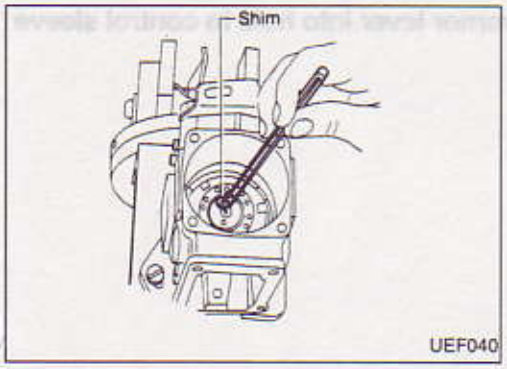
a. Do not install "spring" that is inserted between driving disc and cam disc.
b. When inserting plunger and shim into cam disc, make sure that knock pin of cam disc is situated in groove at bottom of plunger.



UEF039

(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.



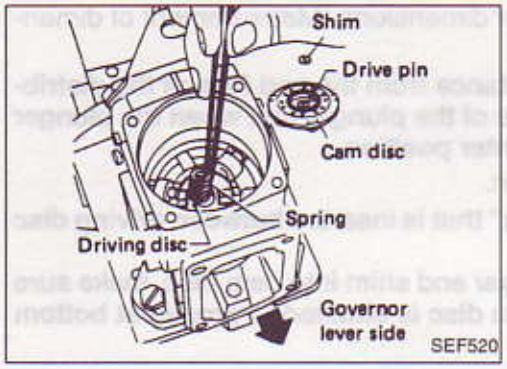
UEF040

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

Refer to S.D.S. for "K".

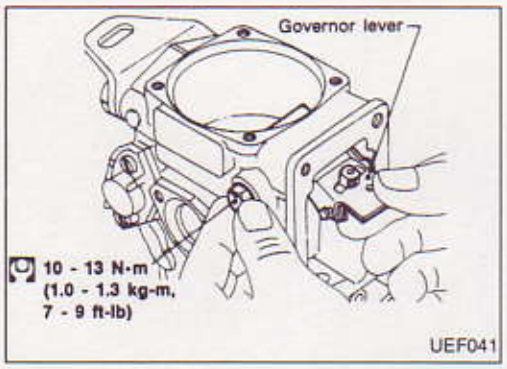
Assembly (Cont'd)

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. Refer to S.D.S. for available service parts.



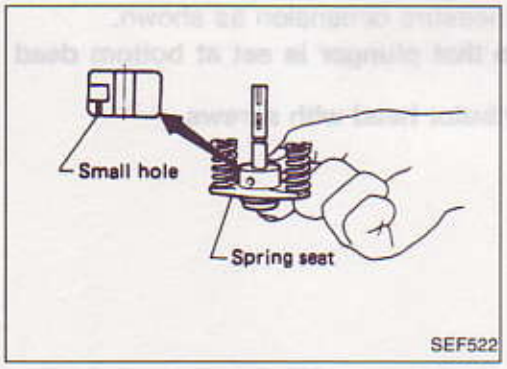
16. Install spring in top of driving disc and install cam disc and shim in that order.

Make sure cam disc drive pin and drive shaft key face governor lever side.



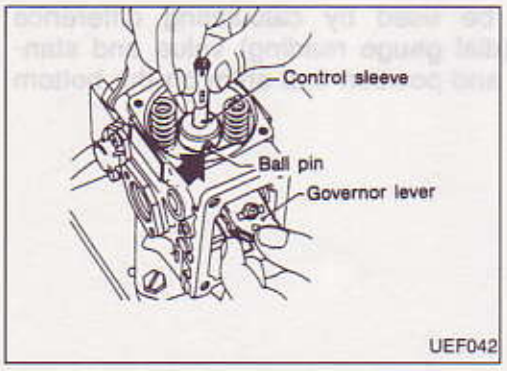
17. Install governor lever.

Avoid pulling on start spring and start idle spring.



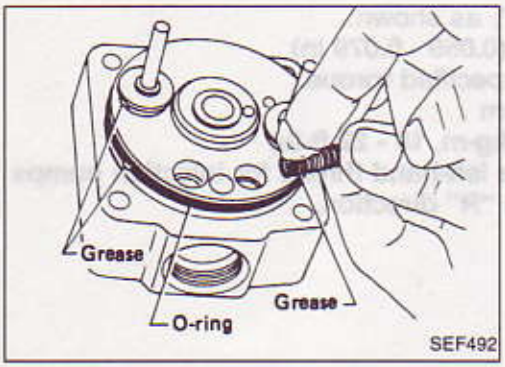
18. Install plunger assembly.

a. Make sure control sleeve is installed with its small hole facing spring seat side.
b. When inserting plunger and shim into cam disc, make sure that knock pin of cam disc is situated in groove at bottom of plunger.

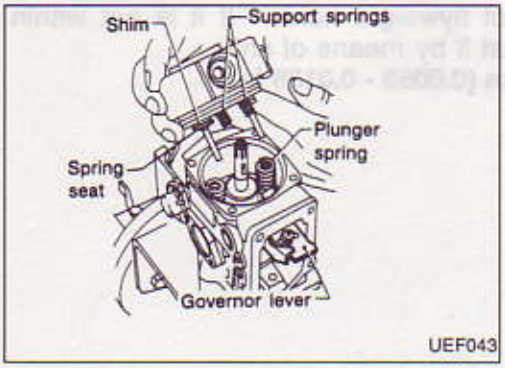


c. Insert ball pin for governor lever into hole in control sleeve (shown by arrow).

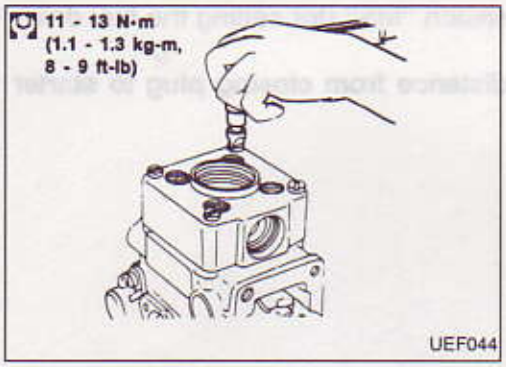
Assembly (Cont'd)



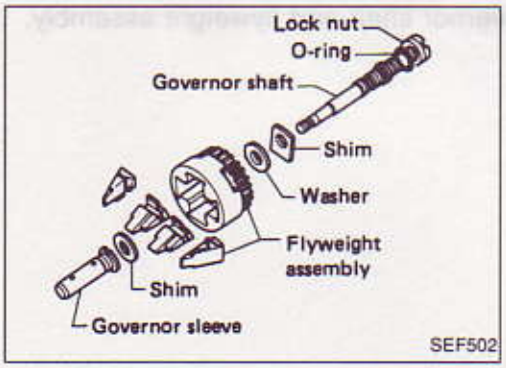
19. Apply a coat of grease to guide pin, shim and spring seat, and attach these parts to distributor head.



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

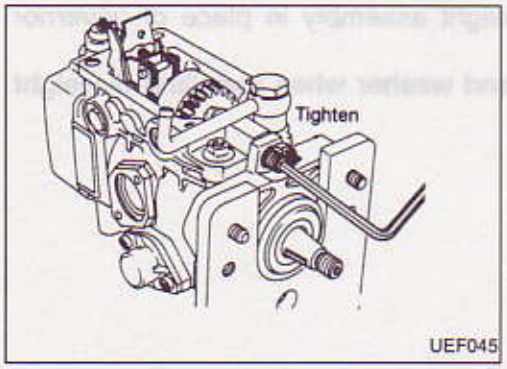


21. Tighten distributor head.

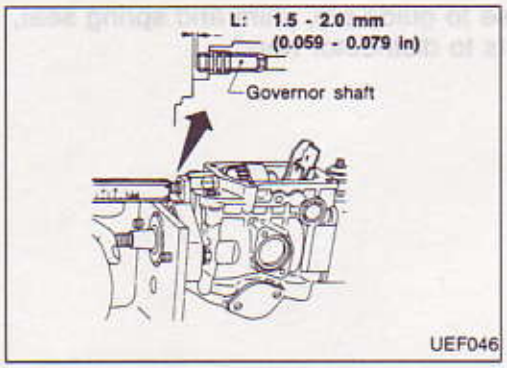


22. Attach flyweight assembly.

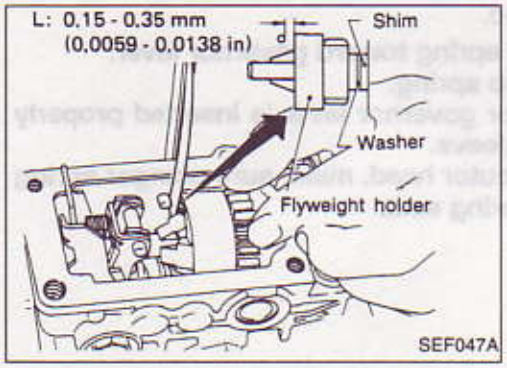
When installing governor shaft, be careful not to scratch O-rings.



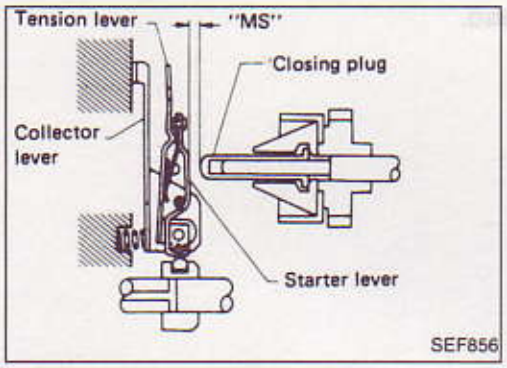
Assembly (Cont'd)



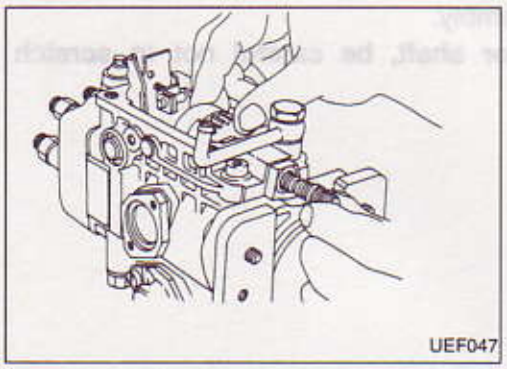
23. Adjust dimension "L", as shown.
    "L": 1.5 - 2.0 mm (0.059 - 0.079 in)
    a. **Tighten lock nut to specified torque.**
       : 25 - 29 N·m
       (2.5 - 3.0 kg-m, 18 - 22 ft-lb)
    b. **Governor shaft has a left-hand thread for injection pumps designed to rotate in "R" direction.**



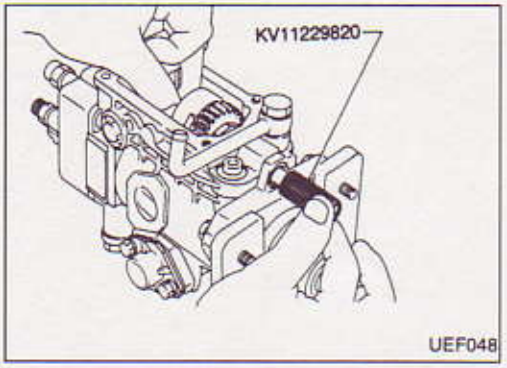
24. Measure axial play of flyweight holder. If it is not within specified range, adjust it by means of shim.
    "L": 0.15 - 0.35 mm (0.0059 - 0.0138 in)



25. Measurement of dimension "MS" (for setting the fuel delivery during starting)
    Dimension "MS" is the distance from closing plug to starter lever.

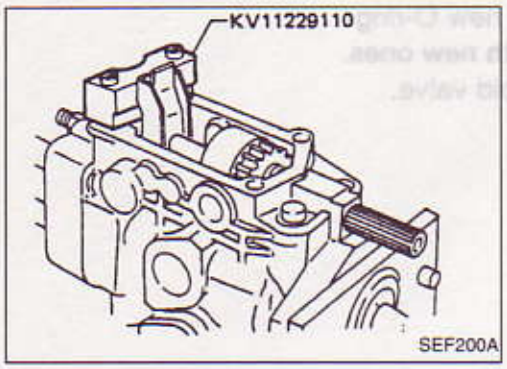


(1) Remove lock nut, governor shaft and flyweight assembly.

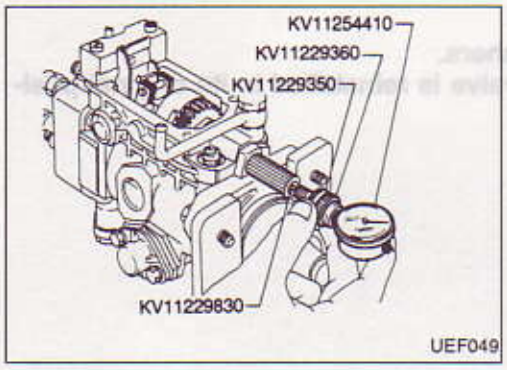


(2) Install Tool and flyweight assembly in place of governor shaft.
Be sure to install shim and washer when installing flyweight assembly.

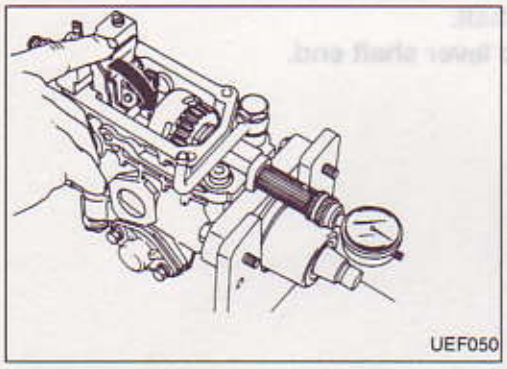
Assembly (Cont'd)



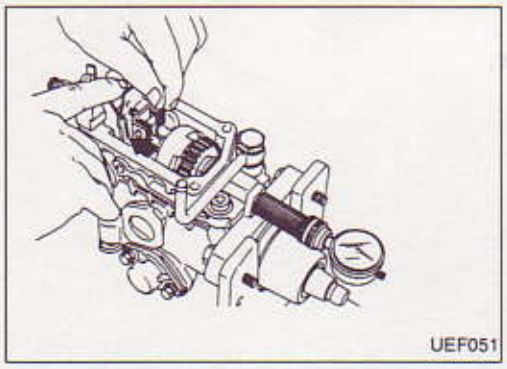
(3) Set Tool, as shown.



(4) Install dial gauge together with rod.

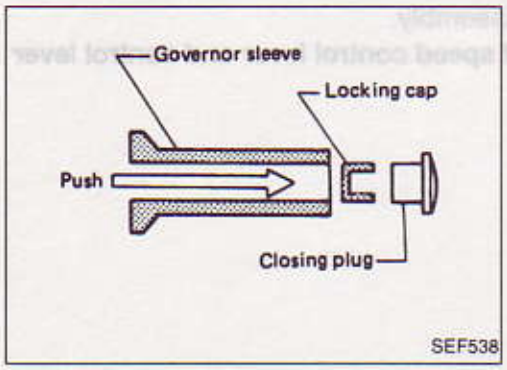


(5) Press governor sleeve to flyweight and set dial gauge to "0".



(6) Push tension lever until it contacts stopper pin. Return governor sleeve until start lever contacts tension lever, and read dial gauge.

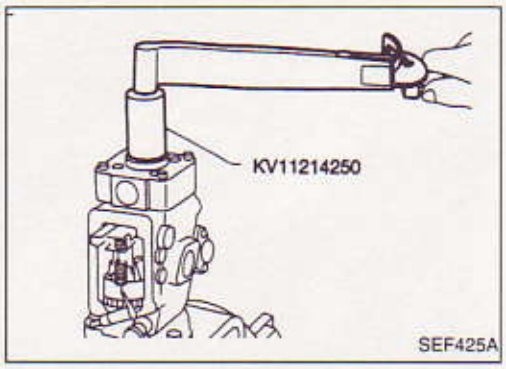
Refer to S.D.S. for dimension "MS" (distance between closing plug and starter lever).



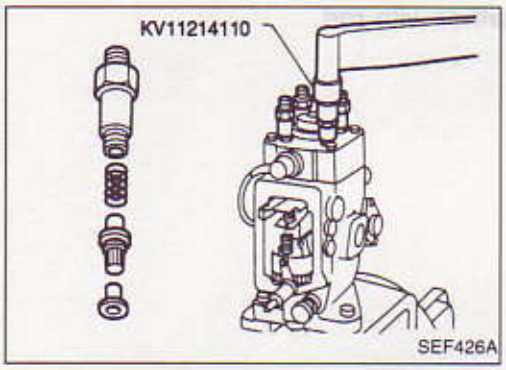
(7) If dial gauge indication is not within the specified range, replace closing plug and adjust dimension "MS" to that range.

Refer to S.D.S. for available service parts.

Assembly (Cont'd)



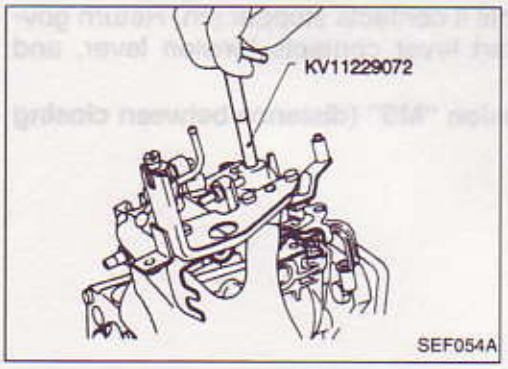
26. Install new plug with new O-ring.
Always replace plugs with new ones.
27. Install fuel cut solenoid valve.



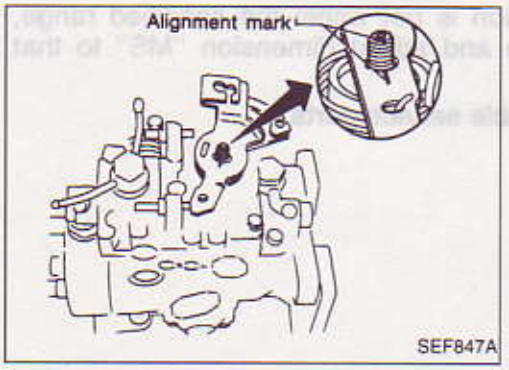
28. Install delivery valve.
a. Always use new washers.
b. Make sure delivery valve is reinstalled in its original position.

29. Install control lever shaft.
Apply a coat of grease to lever shaft end.

GOVERNOR COVER



1. Install governor cover.



2. Install control lever assembly.
Align alignment marks of speed control lever and control lever shaft.

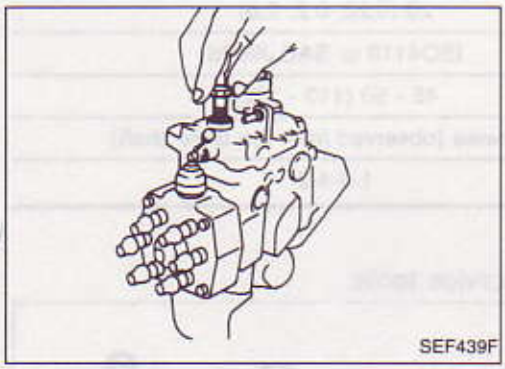
Assembly (Cont'd)

COLD START DEVICE

Install cold start device assembly.

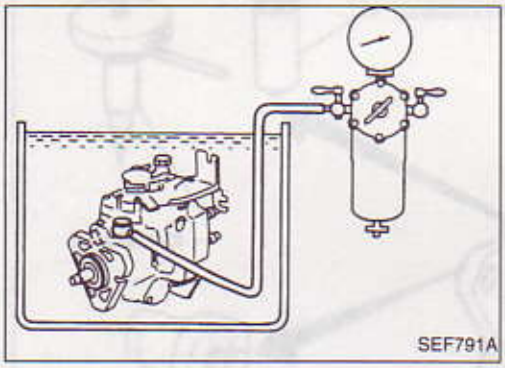
Always use a new O-ring.

: Cold start device fixing bolt
5 - 7 N·m (0.5 - 0.7 kg-m, 3.6 - 5.1 ft-lb)


SEF439F

AIR TIGHTNESS TEST

1. Replace overflow connector with a bolt.


SEF791A

2. Connect an air hose to fuel inlet and immerse fuel injection pump in diesel fuel.

3. Apply air at a pressure of 392 kPa (3.9 bar, 4 kg/cm^2, 57 psi) and check that there are no leaks. If there is any leakage, repair it.

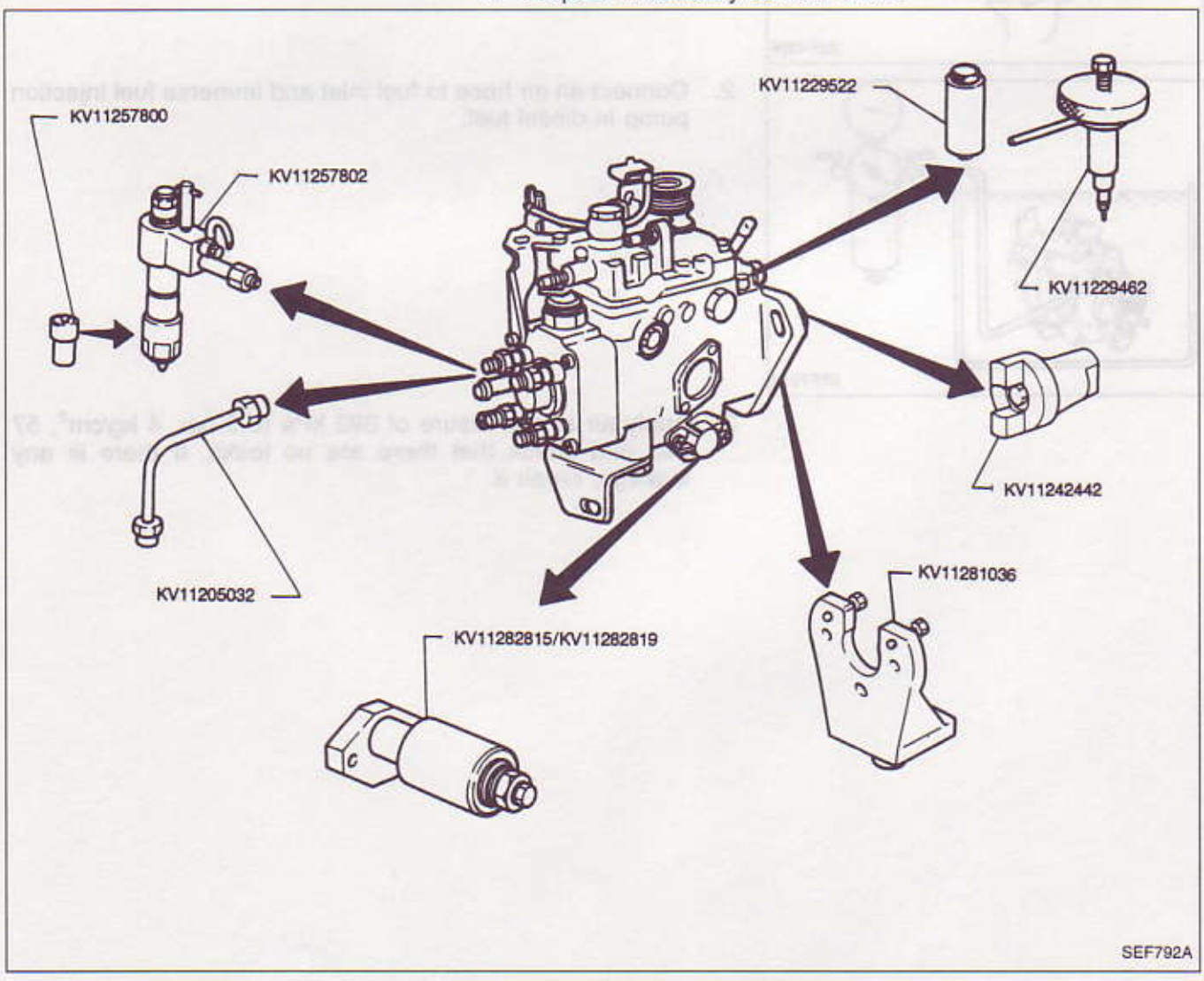
Testing of Injection Pump

PREPARATION

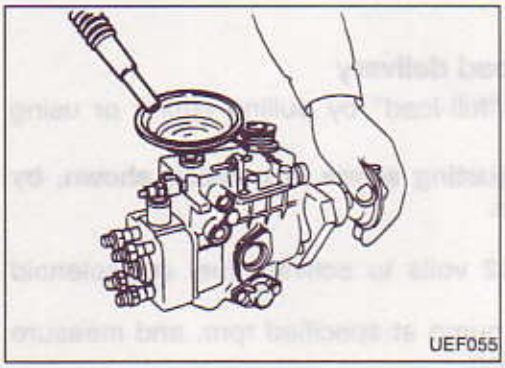
Injection pump test conditions

Nozzle		KV11257800
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		KV11205032
Inner dia. x outer dia. x length	mm (in)	2.0 x 6.0 x 450 (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)		ISO4113 or SAE J967d
Fuel temperature	°C (°F)	45 - 50 (113 - 122)
Rotating direction		Clockwise (observed from the drive shaft)
Injection sequence		1-3-4-2

1. Prepare necessary service tools.

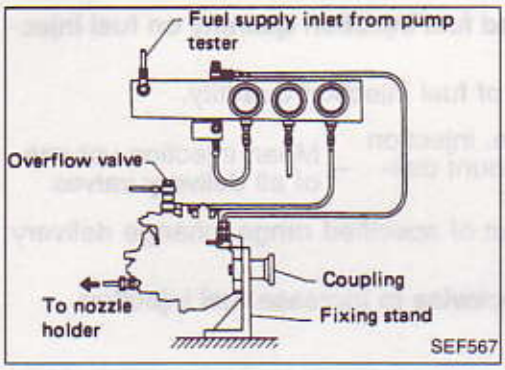


Testing of Injection Pump (Cont'd)


UEF055

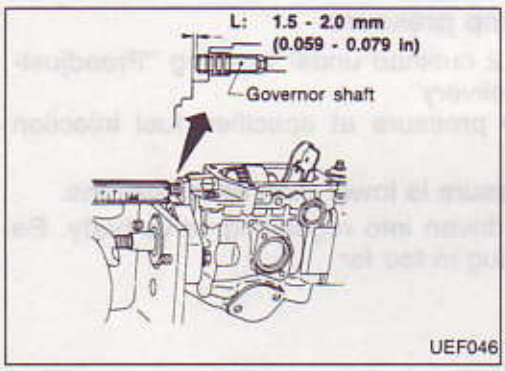
2. Pour test oil into fuel injection pump.

Test oil should be ISO4113, SAE J967d or its equivalent.



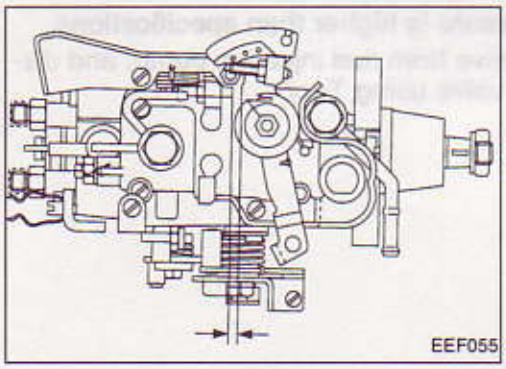
SEF567

3. Install fuel injection pump to pump tester.
4. Connect pump tester tubing.



UEF046

5. Make sure governor shaft is properly installed.


EEF055

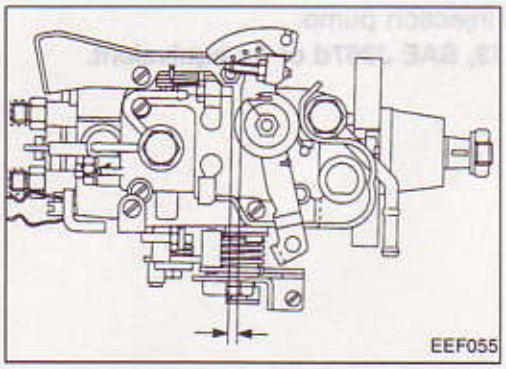
6. Run in fuel injection pump as follows:
(1) Maintain test oil in tank at 45 to 50°C (113 to 122 °F).
(2) Set control lever at "full-load" using a spring.

Set maximum speed adjusting screw in position shown, by turning counterclockwise.
ß: Refer to S.D.S.

(3) Apply 12 volts to activate fuel cut solenoid valve.
(4) Rotate fuel injection pump by hand to see if it moves smoothly.
(5) Rotate fuel injection pump at 300 rpm to make sure all air inside pump chamber is discharged through overflow valve.
(6) Set feed oil pressure at 20 kPa (0.20 bar, 0.2 kg/cm^2, 2.8 psi).
(7) Run in fuel injection pump by rotating it at 1,000 rpm for ten minutes.

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

Testing of Injection Pump (Cont'd)



ADJUSTMENT

Preadjustment of full-load delivery

1. Set control lever at "full-load" by pulling spring or using suitable equipment.

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

ß: Refer to S.D.S.

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

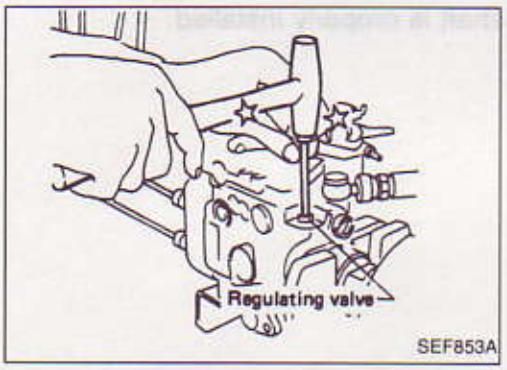
Refer to S.D.S. for full-load fuel injection quantity on fuel injection tester.

4. Calculate imbalance of fuel injection quantity.

$$\text{Imbalance} = \text{Max. or Min. injection volume amount delivery valves} - \text{Mean injection volume of all delivery valves}$$

5. If the imbalance is out of specified range, change delivery valve assembly.

Turn adjusting screw clockwise to increase fuel injection.

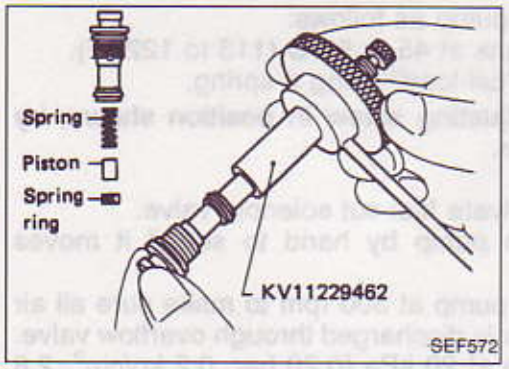


Adjustment of feed pump pressure

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

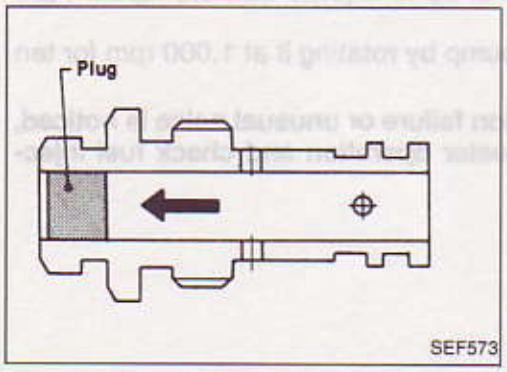
a. When measured pressure is lower than specifications.

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



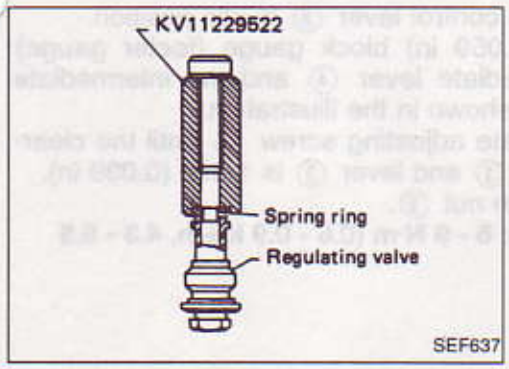
b. When measured pressure is higher than specifications.

(1) Remove regulating valve from fuel injection pump, and disassemble regulating valve using Tool.



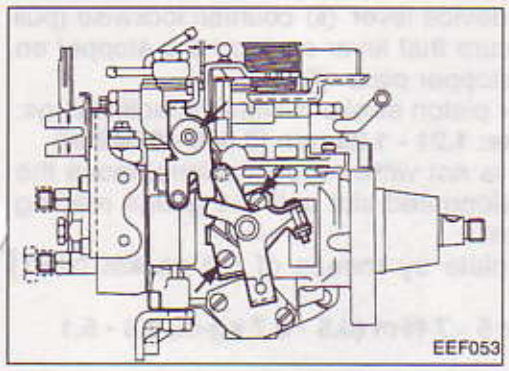
(2) Drive plug out until it is flush with end face of regulating valve.

Testing of Injection Pump (Cont'd)



(3) Install spring, piston and spring ring, in that order, to regulating valve.
Make sure ring is flush with end face of regulating valve body when it is pushed in.
(4) Attach regulating valve to fuel injection pump.
(5) Adjust feed pump pressure to specifications.

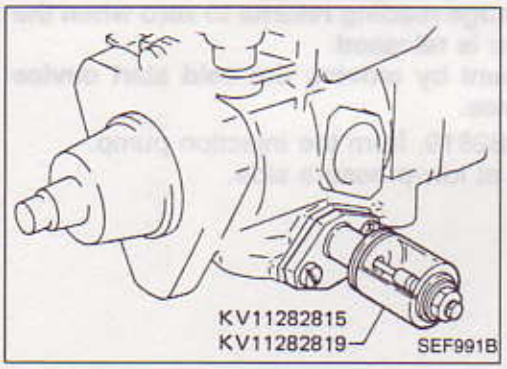
3. Check injection pump condition, referring to inspection value on injection pump tester.



Adjustment of speed timer

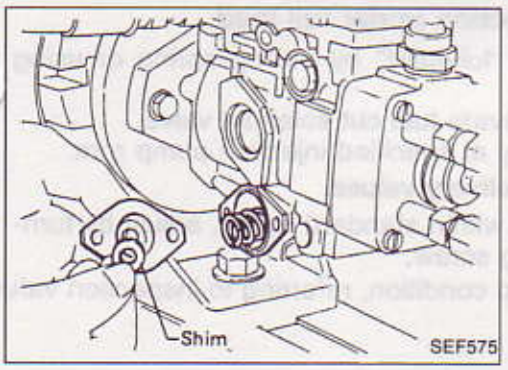
1. Remove cold start device assembly.

Never disassemble cold start device linkage.



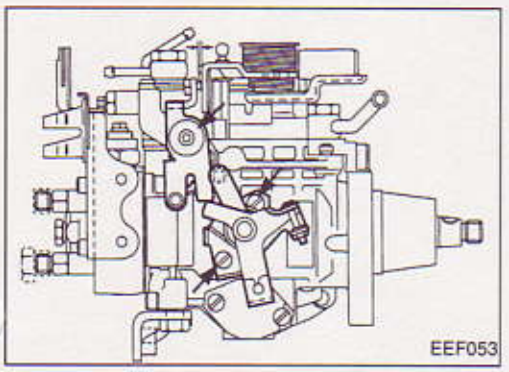
2. Remove cover of timer at high pressure side (side without spring).
3. Install cover of timer in the place of cold start device assembly.
4. Install tool, KV11282815, in the place of timer cover.
5. Measure timer piston strokes at specified fuel injection pump rpm.

Refer to S.D.S. for specified timer piston stroke values.



6. If timer piston stroke is not within specifierd range, remove cover of timer at low pressure side and adjust piston stroke by adding shim(s).

a. Make sure at least one shim is used at each side of timer spring.
b. Refer to S.D.S. for available service parts.

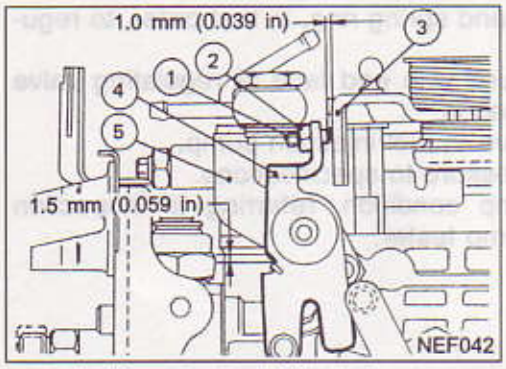


Adjustment of cold start device (timing)

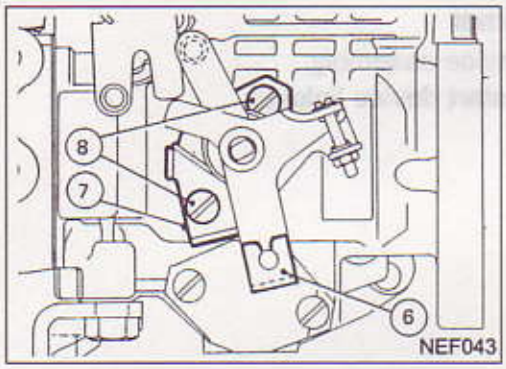
1. Remove cover of timer at low pressure side.
2. Install tool, KV11282819 and set gauge reading to zero.
3. Remove tool, KV11282815, from injection pump.
4. Installcover of timer at high pressure side.
5. Install cold start device assembly in its original position.

Confirm that the gauge reading returns to zero when drive shaft is rotated.

Testing of Injection Pump (Cont'd)



6. Position acceleration control lever ③ in idle position.
7. Insert a 1.5 mm (0.059 in) block gauge (feeler gauge) between the intermediate lever ④ and the intermediate lever bracket ⑤, as shown in the illustration.
8. Adjust the intermediate adjusting screw ① until the clearance between screw ① and lever ③ is 1 mm (0.039 in).
9. Secure screw ① with nut ②.
   Tightening torque: 6 - 9 N·m (0.6 - 0.9 kg-m, 4.3 - 6.5 ft-lb)

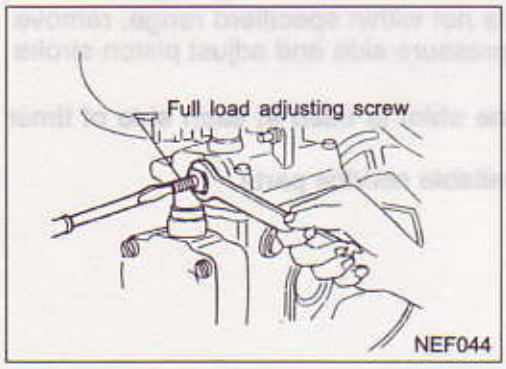


10. Rotate the cold start device lever ⑥ counterclockwise (pull toward X) and make sure that lever contacts the stopper on the cold start device stopper plate ⑦.
11. Confirm that the timer piston stroke is within specifications.
    Timer piston stroke: 1.21 - 1.25 mm (0.048 - 0.049 in)
12. If timer piston stroke is not within specifications, move the stopper plate in the elongated slot until the gauge reading is within specifications.
13. Secure the stopper plate by means of the socket head bolts ⑧.
    Tightening torque: 5 - 7 N·m (0.5 - 0.7 kg-m, 3.6 - 5.1 ft-lb)

a) Make sure that the gauge reading returns to zero when the cold start device lever is released.

b) Confirm the adjustment by moving the cold start device lever two or three times.

14. Remove tool, KV11282819, from the injection pump.
15. Install cover of timer at low-pressure side.



Adjustment of fuel injection under full load

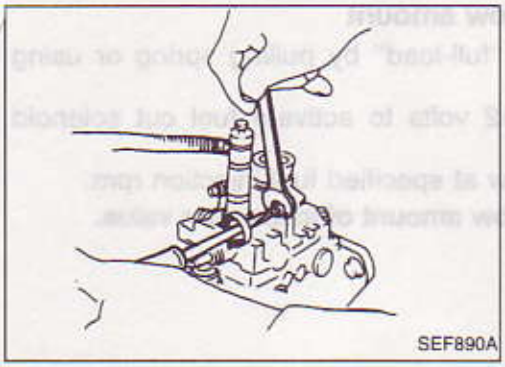
1. Set control lever at "full-load" by pulling spring or using suitable equipment.
2. Apply 12 volts to activate fuel cut solenoid valve.
3. Measure fuel delivery at specified injection pump rpm.

Refer to S.D.S. for fuel delivery values.

4. If fuel delivery is not within standard range, adjust by turning full-load adjusting screw.
5. Check injection pump condition, referring to inspection values.

Testing of Injection Pump (Cont'd)

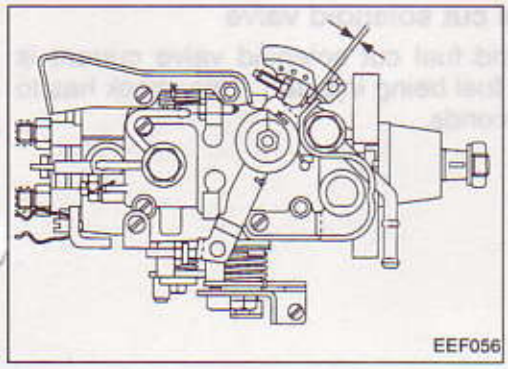
Adjustment of fuel injection during idle


SEF890A

1. Pull spring until idle speed adjusting screw comes into contact with stopper.
2. Furnish voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel injection at specified fuel injection pump rpm.

Refer to S.D.S. for idle fuel injection amount of adjustment value.

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


EEF056

a. Tightening this screw will increase fuel injection amount.
b. Make sure that control lever angle is set at 21 to 29° range. 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.

5. Check injection pump condition, referring to inspection value.

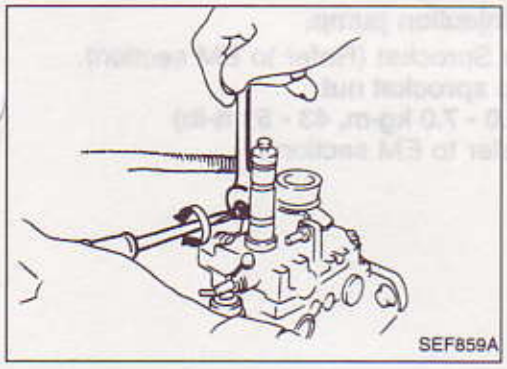
Adjustment of fuel injection during start

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

Refer to S.D.S. for start fuel injection amount of adjustment value.

4. If not within specifications, make sure "MS" dimension is within specification. Refer to step 25 for Injection Pump Assembly.

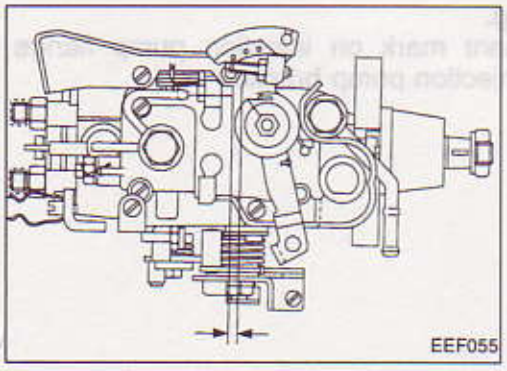
Adjustment of fuel injection at max. pump rpm


SEF859A

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

Refer to S.D.S. for max. pump speed fuel injection adjustment value.

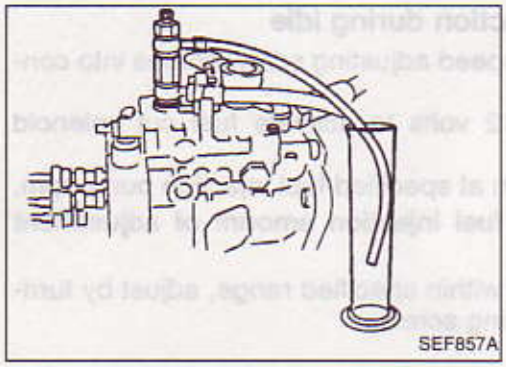
4. If fuel delivery is not within standard range, adjust by turning max. speed adjusting screw.


EEF055

a. Tightening screw will increase fuel injection.
b. Make sure that control lever angle is within 36° to 46° range.

5. Check injection pump condition referring to inspection value.

Testing of Injection Pump (Cont'd)


SEF857A

Measurement of overflow amount

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

Refer to S.D.S. for overflow amount of inspection value.

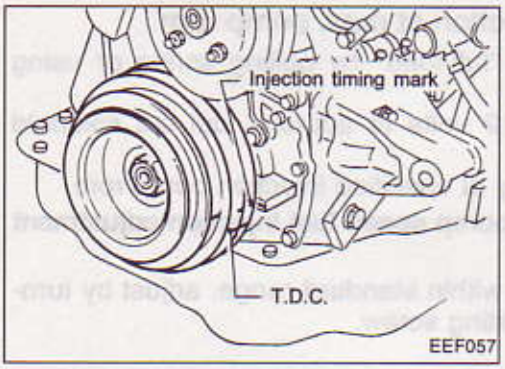
Operation check of fuel cut solenoid valve

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

Installation

Install injection pump assembly in the reverse order of removal, observing the following.

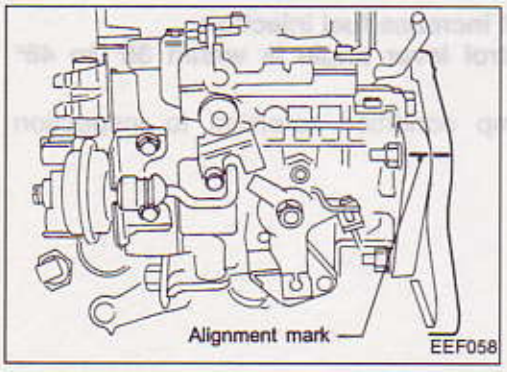
1. Confirm that No. 1 cylinder is set at T.D.C. on its compression stroke.
2. Install injection pump (Refer to EM section).



EEF057

Temporarily tighten fuel injection pump.

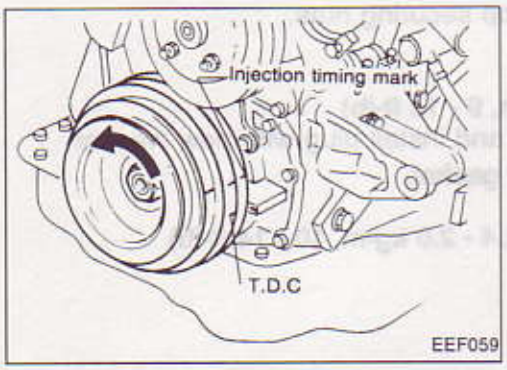
3. Install injection pump Sprocket (Refer to EM section).
   Injection pump sprocket nut
   59 - 69 N·m (6.0 - 7.0 kg-m, 43 - 51 ft-lb)
4. Install timing belt (Refer to EM section).



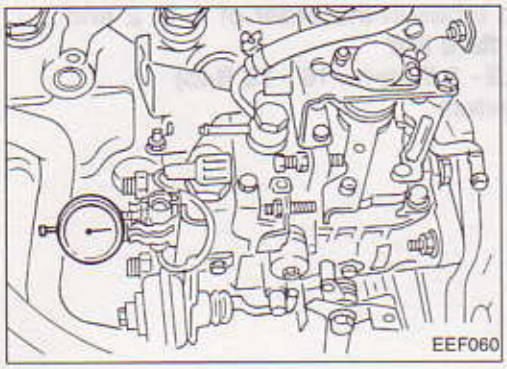
EEF058

5. Adjust injection timing.
   - Confirm that alignment mark on injection pump flange meets the mark on injection pump bracket.

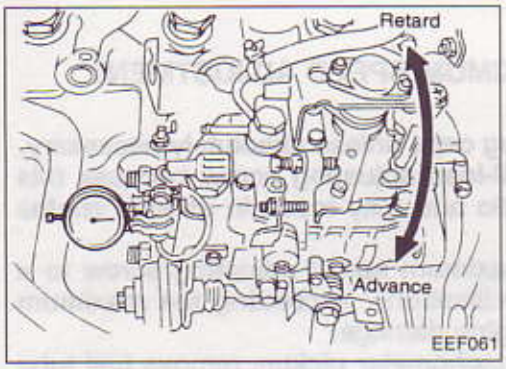
Installation (Cont'd)



(1) Remove the plug bolt from rear side of injection pump and install Tool.
(2) Make sure to loosen pump nuts and bracket bolt.
(3) Turn crankshaft counterclockwise 20 to 25 degrees from No. 1 cylinder Top Dead Center position.



(4) Find the dial gauge needle rest point, then set the gauge to zero.
(5) Turn crankshaft clockwise until No. 1 cylinder is set at Top Dead Center on its compression stroke.
(6) Read dial gauge indication.
Plunger lift:
0.73 ± 0.01 mm (0.0287 ± 0.0004 in)

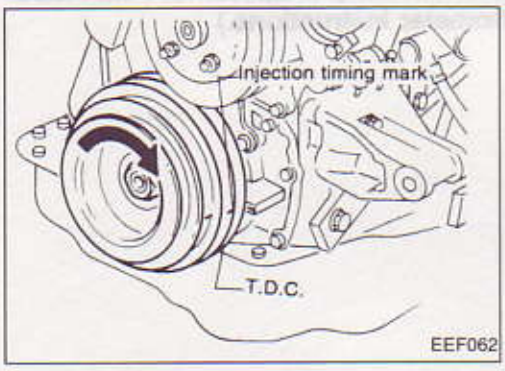


(7) If dial gauge indication is not within the above range, turn pump body until it is.

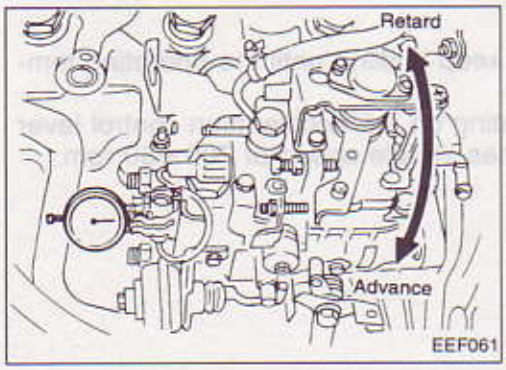
When setting the dial gauge, turn the injection pump counterclockwise and the crankshaft clockwise to eliminate any play.

6. Tighten injection pump securely.

Checking

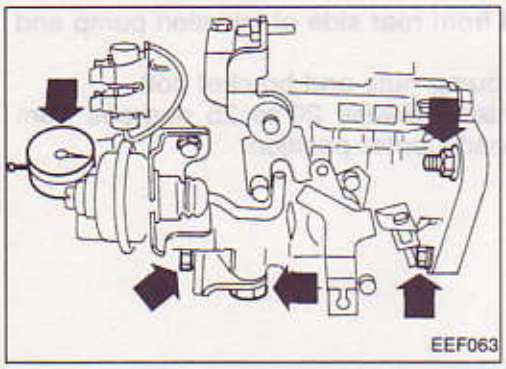


1. Rotate the crankshaft pulley clockwise two turns until the pulley and injection pump timing marks match (with the cylinder No. 1 at TDC on its compression stroke). Slowly rotate the crankshaft pulley so as not to surpass the injection pump housing mark and read plunger lift.
Plunger lift:
0.73 ± 0.01 mm (0.0287 ± 0.0004 in)



2. If gauge reading is not within specified range, loosen the injection pump securing nuts until the pump can be manually rotated. Rotate the pump clockwise and restart the setting operation from point 5.

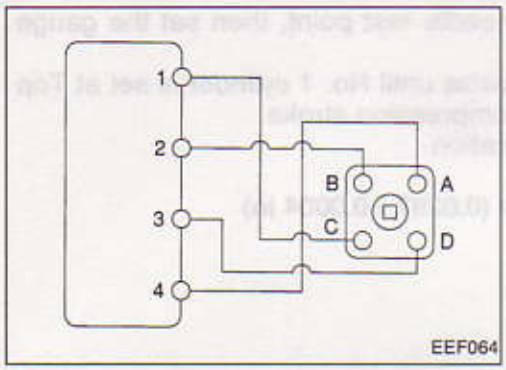
Installation (Cont'd)


EEF063

3. Tighten injection pump securing nuts.
   Nut:
   : 13 - 18 N·m
   (1.3 - 1.8 kg-m, 9 - 13 ft-lb)
4. Remove special tool and install plug with new washer.

Always replace plug bolt gasket.

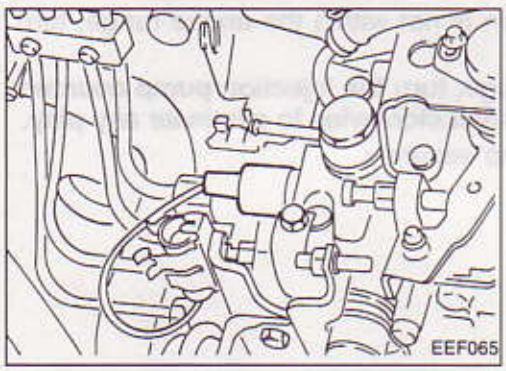
: Plug bolt
14 - 20 N·m (1.4 - 2.0 kg-m, 10 - 14 ft-lb)



EEF064

5. Connect fuel injection tubes in the order of 4, 3, 2 and 1.
   : Injection tube flare nut
   22 - 25 N·m (2.2 - 2.5 kg-m, 16 - 18 ft-lb)
6. Bleed air from fuel system.

Refer to MA section.

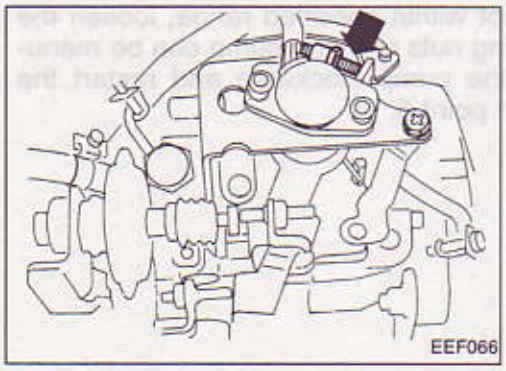

EEF065

Adjustment

IDLE SPEED AND MAXIMUM SPEED ADJUSTMENT

CAUTION:

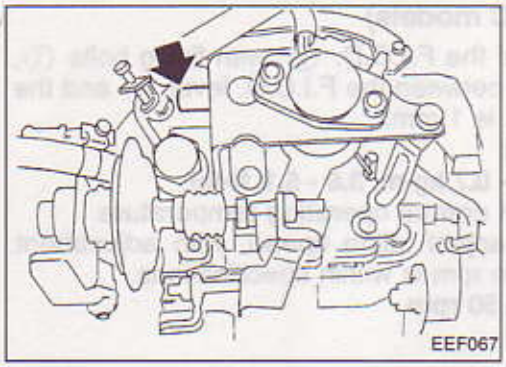
- **Do not remove sealing caps unless absolutely necessary.**
- **Never disturb the full-load adjusting screw because this alters the mixture ratio and may result in serious engine problems.**
- **Do not adjust the maximum speed adjusting screw to a point exceeding specifications; exceeding the maximum speed may cause engine damage.**
- **Before attaching the tachometer pickup, remove fuel tube clamps. (Refer to tachometer instructions.)**


EEF066

Idle speed adjustment

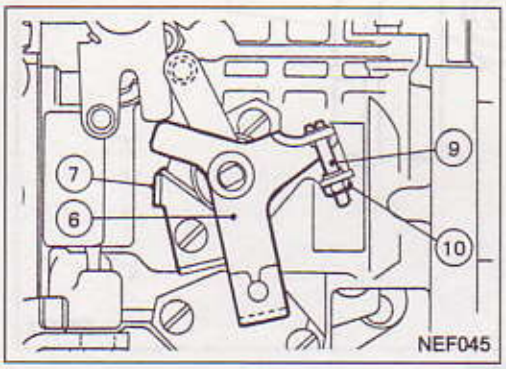
1. Start the engine and keep it idling until the operating temperature is reached.
2. Turn the screw operating on the acceleration control lever until the engine reaches an idle speed of 700 ± 50 rpm.

Adjustment (Cont'd)


EEF067

Maximum speed adjustment

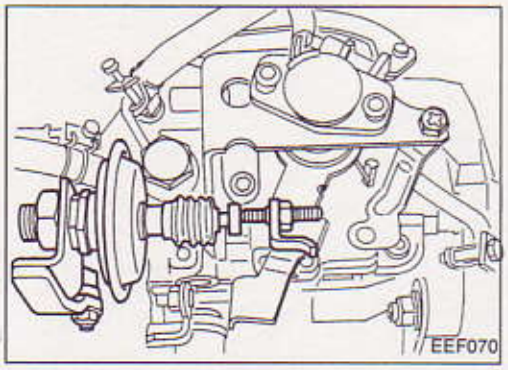
1. Start up engine and warm it up until coolant temperature indicator points to middle of gauge.
2. Connect tachometer pickup to No. 1 fuel injection tube.
   • Refer to the instructions on tachometer.
3. Depress accelerator pedal fully under no-load and read the tachometer indication.
   Maximum engine speed (Under no-load):
   5,200 ± 150 rpm
4. If indication is lower than specified maximum engine speed, adjust using maximum speed adjusting screw.
5. After adjustment, tighten lock nut securely and plug it with a sealing cap.



NEF045

Adjustment of cold start device (rpm)

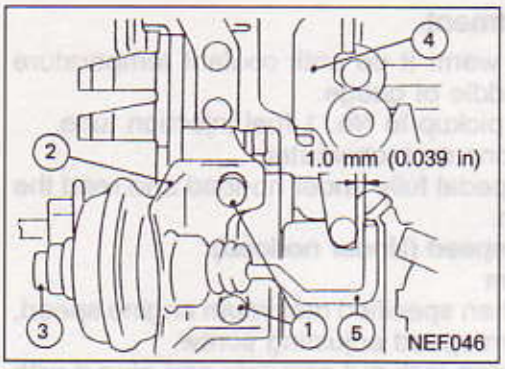
1. Confirm that the intermediate lever is adjusted as described under "Adjustment of cold start device (timing)" in "Testing of injection pump".
2. Rotate the cold start device lever ⑥ counterclockwise (pull toward X) and make sure the lever contacts the stopper on the cold start device stopper plate ⑦.
3. Adjust adjustment screw ⑨ until the engine rpm is within specifications.
   Engine rpm: 1,700 ± 100 rpm
4. Secure screw ⑨ with nut ⑩.
   Tightening torque: 2 - 3 N·m (0.2 - 0.3 kg-m, 1.4 - 2.2 ft-lb)


EEF070

Dashpot adjustment

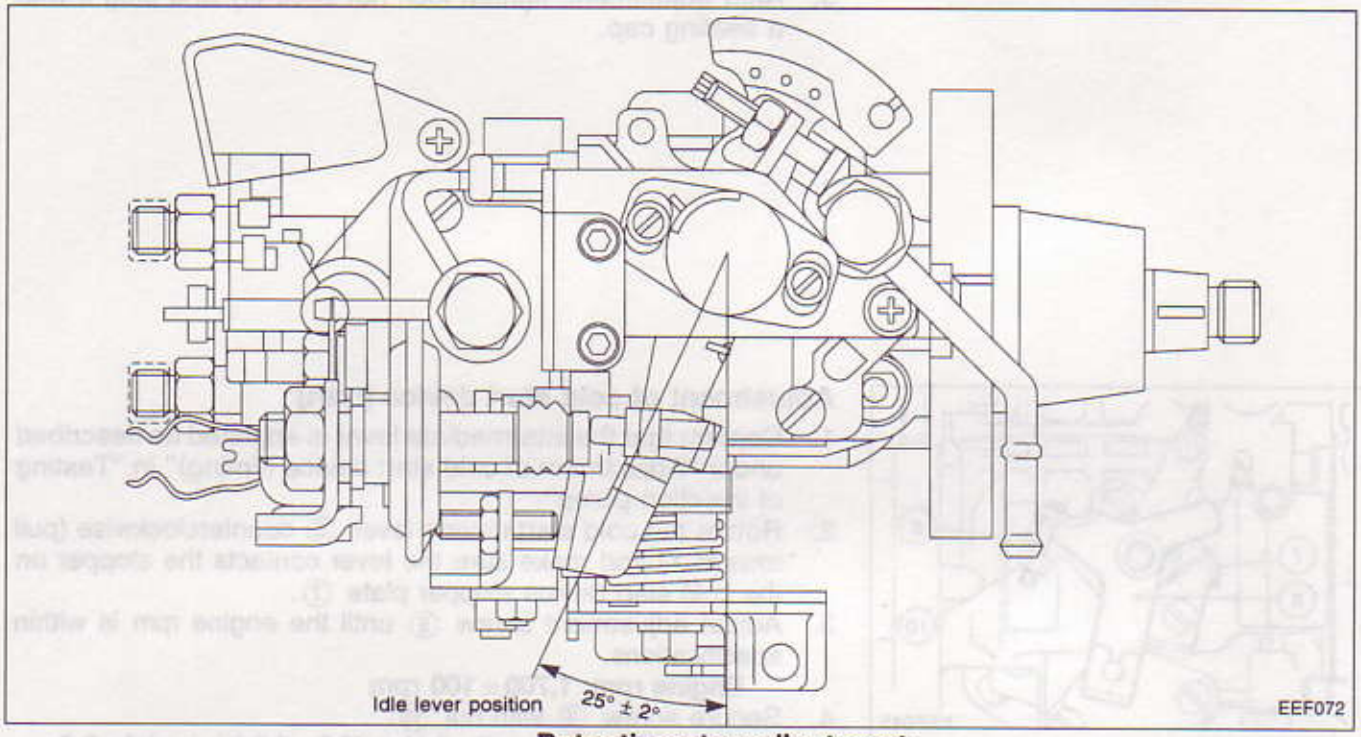
1. Warm up engine until normal operating temperature.
2. Attach tachometer and adjust touchspeed using adjusting screw.
   Touch speed: 1,300 rpm

Adjustment (Cont'd)



F.I.C.D. adjustment (A/C models)

1. Secure the bracket of the F.I.C.D. ②, with fixing bolts ①, so that the clearance between the F.I.C.D. lever ⑤ and the intermediate lever ④ is 1 mm.
   Tightening torque:
   5 - 7 N·m (0.5 - 0.7 kg-m, 3.6 - 5.1 ft-lb)
2. Warm up engine until normal operating temperature. Switch on A/C and adjust idling speed, with adjustment screw ③, until engine rpm is within specifications.
   Engine rpm: 850 ± 50 rpm

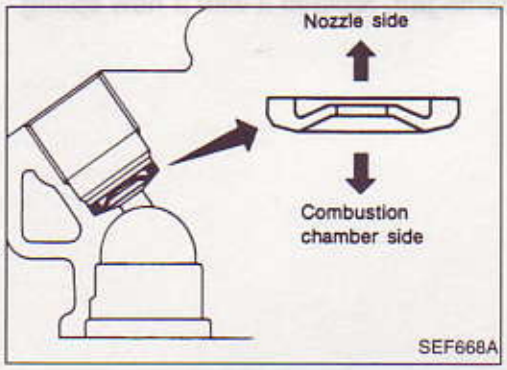


Potentiometer adjustment

Adjust potentiometer's installation position until the output voltage is within specifications.

Refer to S.D.S. for specified output voltage.

CAUTION:
Plug flare nut with a cap or rag so that no dust enters the nozzle. Cover nozzle tip for protection of needle.



Removal and Installation

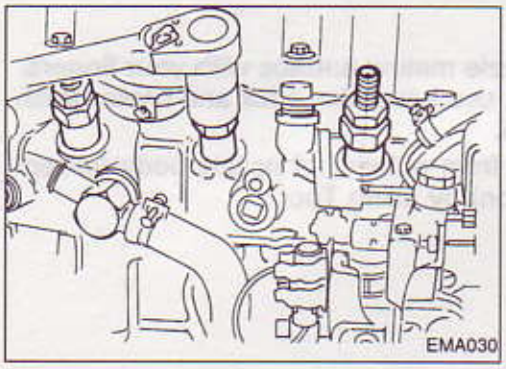
1. Remove fuel injection tube and spill tube.
2. Remove injection nozzle assembly.

Also remove washers from nozzle end.

3. Install injection nozzle in the reverse order of removal.

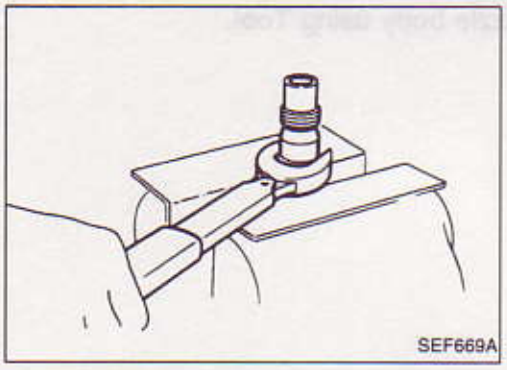
Injection nozzle to engine:
: 59 - 69 N·m
(6.0 - 7.0 kg-m, 43 - 51 ft-lb)
Injection nozzle to tube:
: 22 - 25 N·m
(2.2 - 2.5 kg-m, 16 - 18 ft-lb)
Spill tube:
: 39 - 49 N·m
(4.0 - 5.0 kg-m, 29 - 36 ft-lb)

a. Always clean the nozzle holes.
b. Always use new injection nozzle gasket.
c. Note that small washer should be installed in specified direction.
d. Bleed air from fuel system.

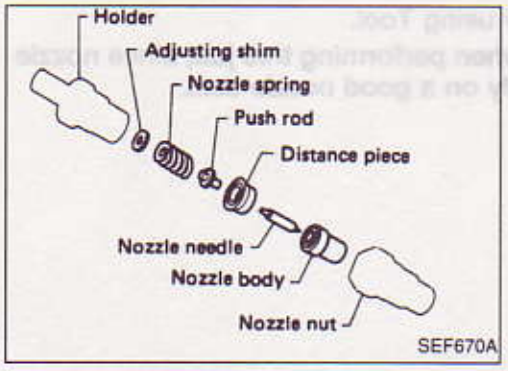


Disassembly

1. Loosen nozzle nut while preventing nozzle top from turning.



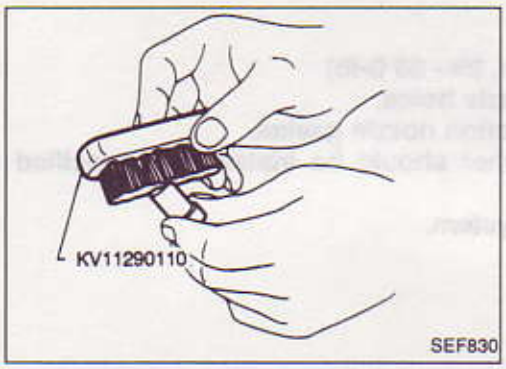
2. Arrange all disassembled parts in the order shown at left.



Inspection

Thoroughly clean all disassembled parts with fresh kerosene or solvent.

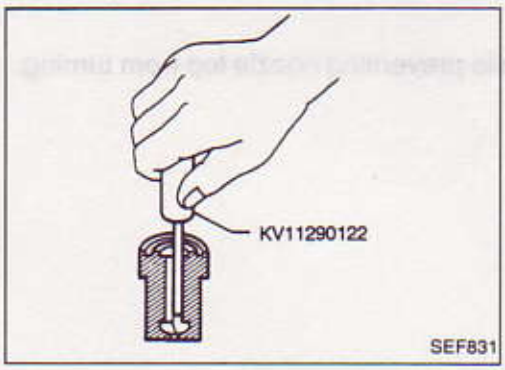
- If nozzle needle is damaged or fused, replace nozzle assembly with a new one.
- If end of nozzle needle is seized or excessively discolored, replace nozzle assembly.
- Check nozzle body and distance piece for proper contact. If excessively worn or damaged, replace nozzle assembly or distance piece.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



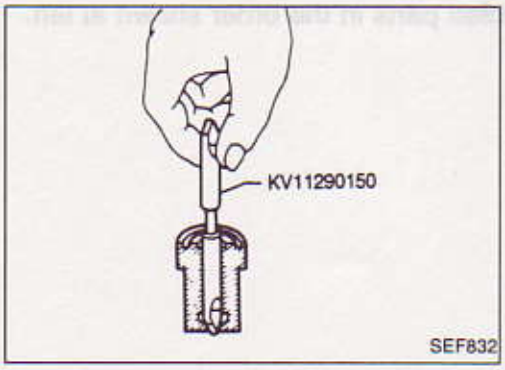
Cleaning

a. Do not touch the nozzle mating surface with your fingers.
b. To wash the nozzles, use a wooden stick and brass brush with clean diesel fuel.

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



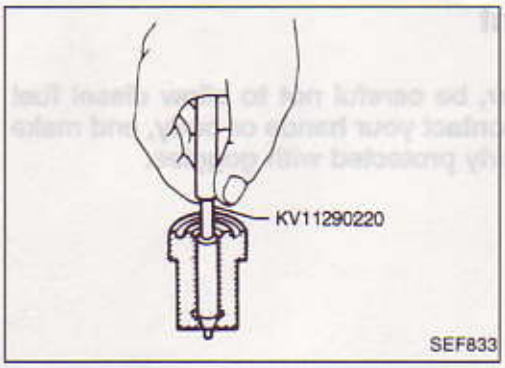
2. Clean oil sump of nozzle body using Tool.



3. Clean nozzle seat by using Tool.

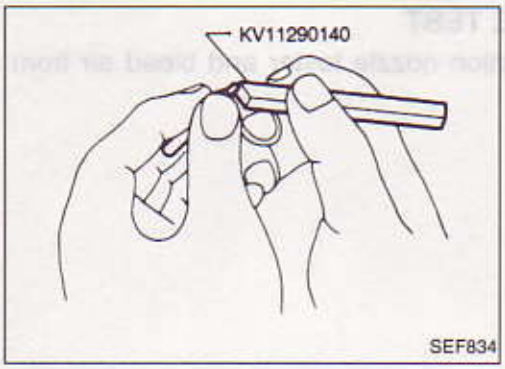
Take extra precautions when performing this job, since nozzle efficiency depends greatly on a good nozzle seat.

Cleaning (Cont'd)

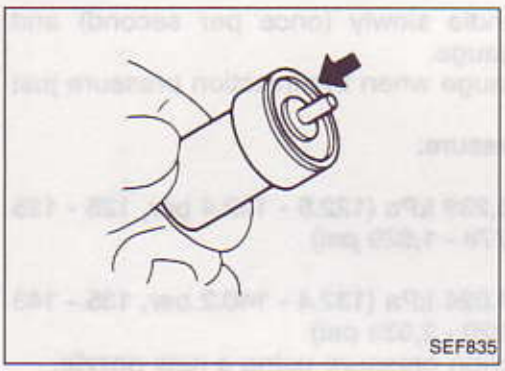


4. Clean spray hole of nozzle body by using Tool.

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

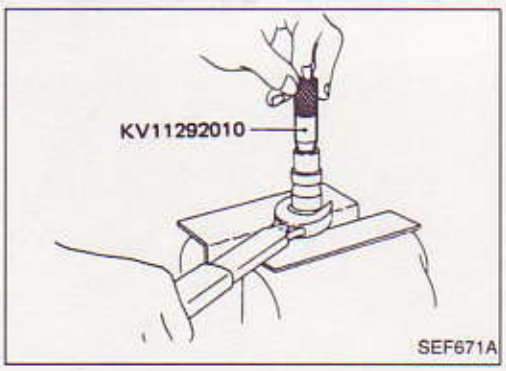


5. Decarbonate nozzle needle tip by using Tool.



6. Check needle sink.
(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

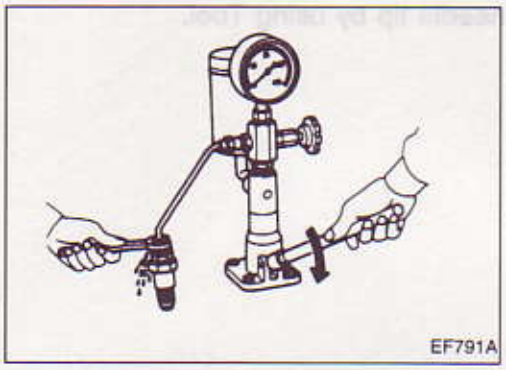
Assembly in the reverse order of disassembly, observing the following.

If nozzle body is not installed properly, Tool cannot be removed and nozzle body may be damaged.

Holder to nozzle nut:
: 78 - 98 N·m
(8.0 - 10.0 kg-m, 58 - 72 ft-lb)

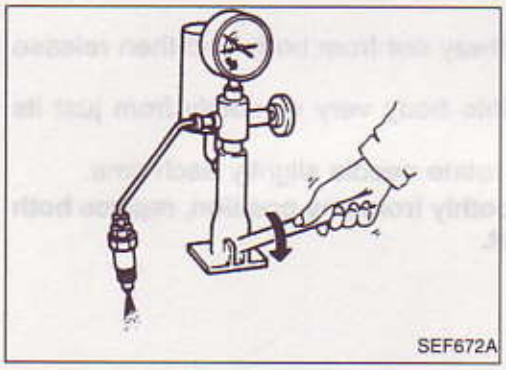
Test and Adjustment

WARNING:
When using nozzle tester, be careful not to allow diesel fuel sprayed from nozzle to contact your hands or body, and make sure your eyes are properly protected with goggles.


EF791A

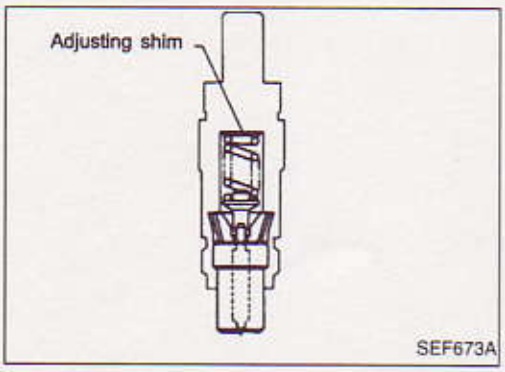
INJECTION PRESSURE TEST

1. Install nozzle to injection nozzle tester and bleed air from flare nut.


SEF672A

2. Pump the tester handle slowly (once per second) and watch the pressure gauge.
3. Read the pressure gauge when the injection pressure just starts dropping.

Initial injection pressure:
Used
12,259 - 13,239 kPa (122.6 - 132.4 bar, 125 - 135 kg/cm^2, 1,778 - 1,920 psi)
New
13,239 - 14,024 kPa (132.4 - 140.2 bar, 135 - 143 kg/cm^2, 1,920 - 2,033 psi)
Always check initial injection pressure using a new nozzle.



SEF673A

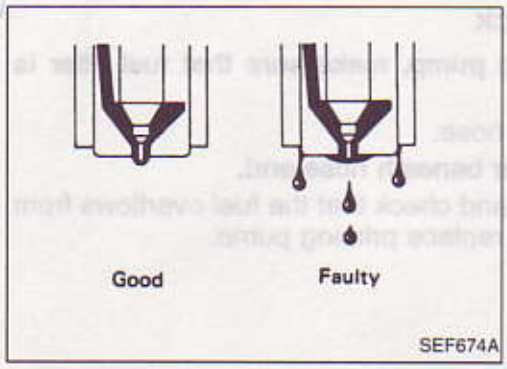
4. To adjust injection pressure, change adjusting shims.

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/cm^2, 68 psi) in initial injection pressure.**

Refer to S.D.S. for adjusting shim.

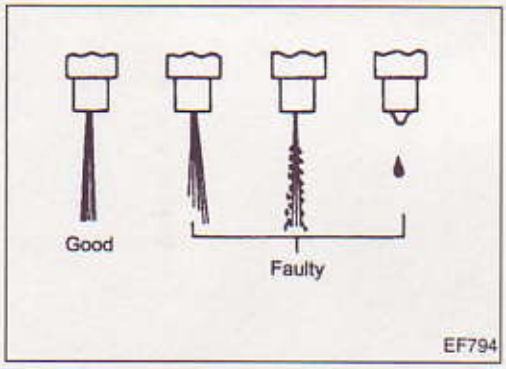
Test and Adjustment (Cont'd)

LEAKAGE TEST

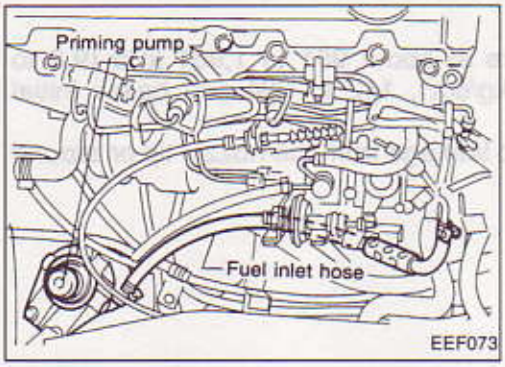


1. Maintain the pressure at about 981 to 1,961 kPa (9.8 to 19.6 bar, 10 to 20 kg/cm^2, 142 to 284 psi) below initial injection pressure.
2. Check that there is no leakage from the nozzle tip or around the body.
3. If there is leakage, clean, overhaul or replace nozzle.

SPRAY PATTERN TEST



1. Pump the tester handle once per second.
2. Check the spray pattern.
3. If the spray pattern is not correct, clean or replace nozzle.



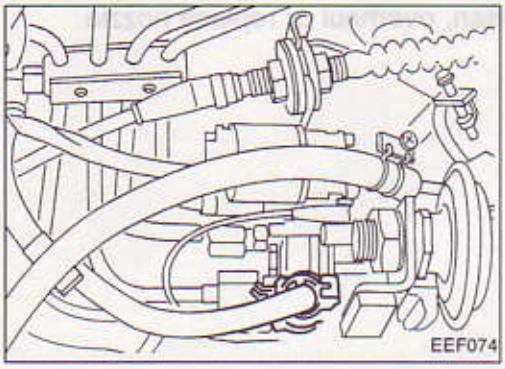
Priming Pump Check

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

1. Disconnect fuel inlet 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.



Fuel Cut Solenoid Valve

1. Disconnect fuel cut solenoid valve harness connector and check voltage.

Ingition switch	Voltage
OFF	0V
ON	Battery voltage

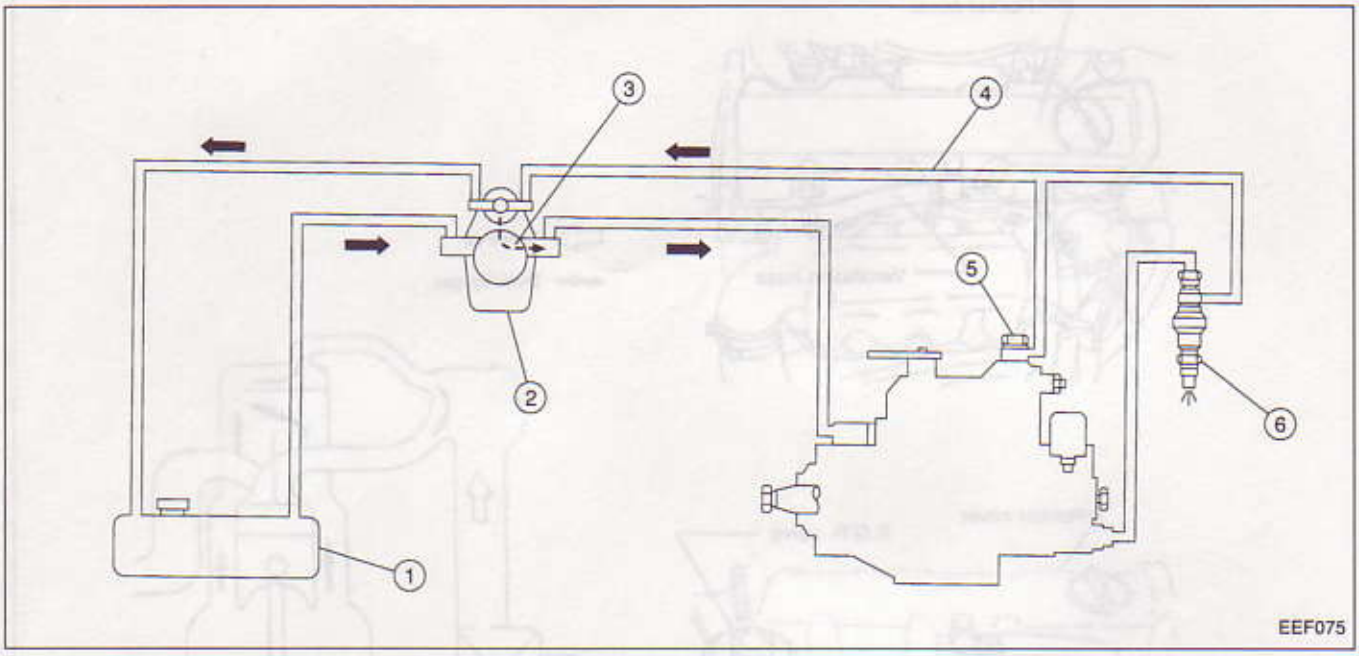
2. Check fuel cut solenoid valve for circuit continuity.
3. Remove fuel cut solenoid valve and check that plunger moves smoothly and that spring is normal.

Cold Start Device

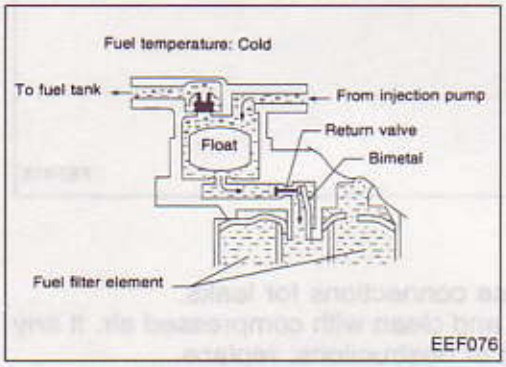
Refer to Fast idle speed adjustment. (Page EF&EC-378)

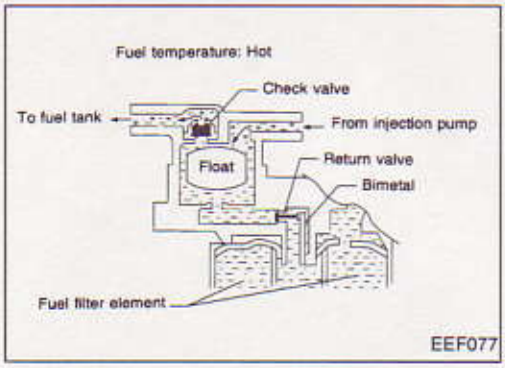
Fuel return control system

- **Models for Europe and cold areas incorporate the fuel return control system.**



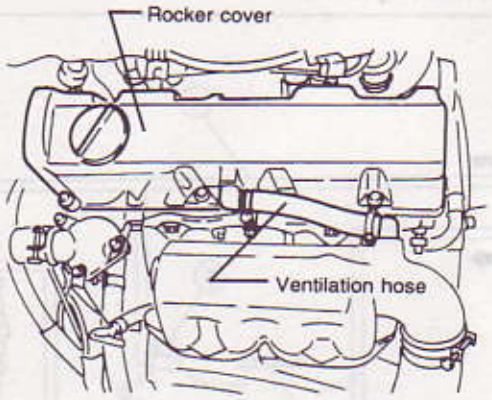
① Fuel tank
② Fuel filter
③ By-pass passage (Fuel temperature is cold)
④ Fuel return passage
⑤ Overflow valve
⑥ Injection nozzle

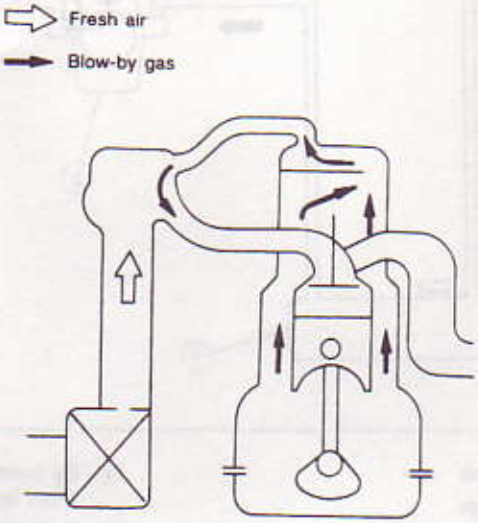


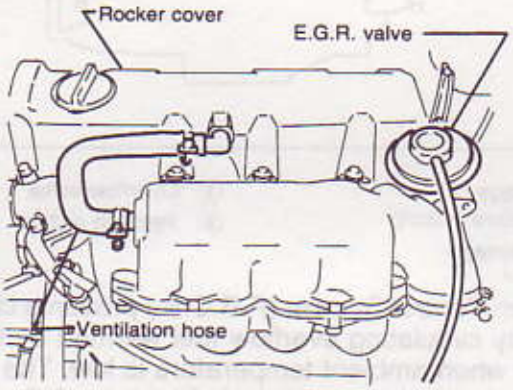


Fuel Return Control System (F.R.C.S.) prevents clogging of the fuel filter by circulating overflow fuel warmed by the fuel injection pump when ambient temperature is low. The float valve in the system prevents trapped air from circulating through the fuel line and the check valve prevents reverse flow of fuel from the fuel tank.
When the fuel temperature is above 30°C (86°F), a bimetal valve activates to stop fuel circulation.

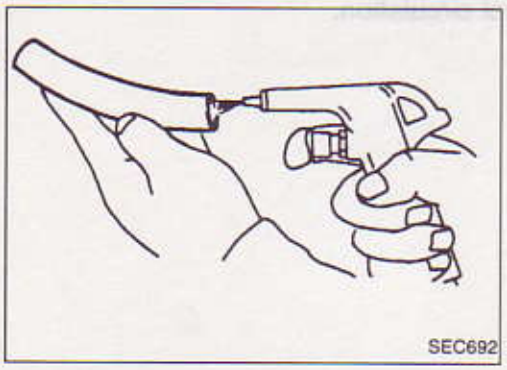
Without E.G.R.







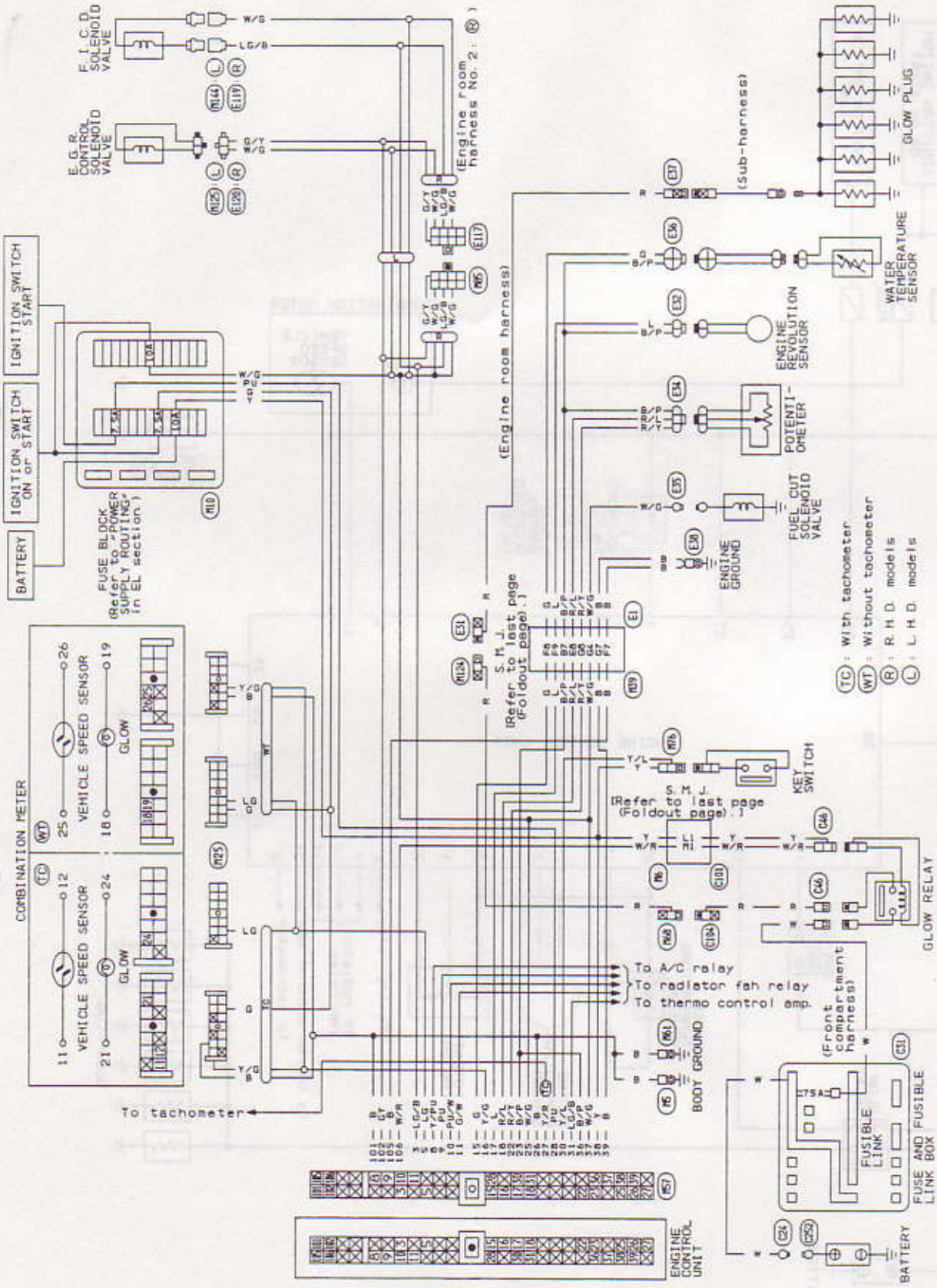
EEF078



Ventilation Hose

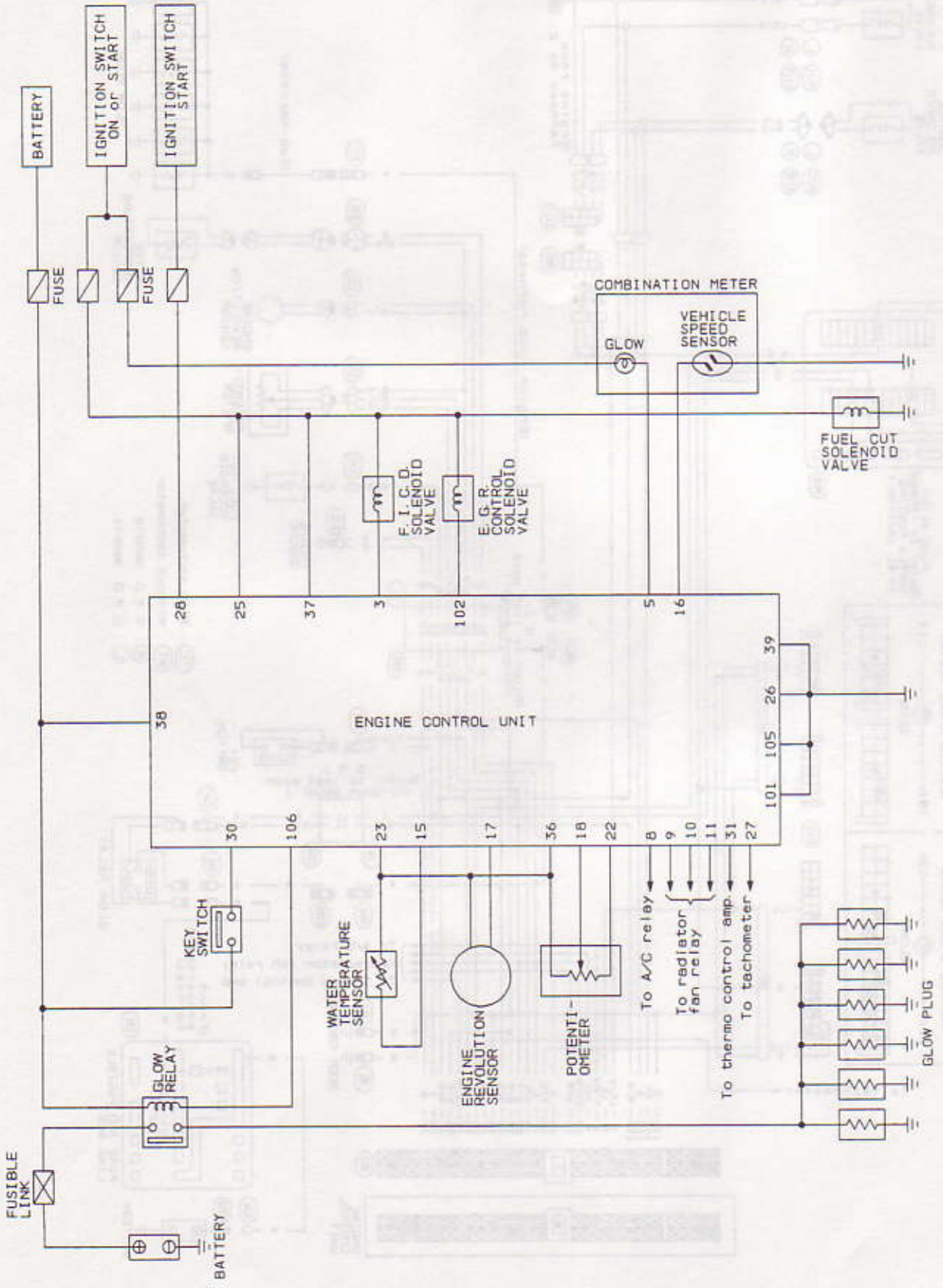
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

Wiring Diagram — With E.G.R. system



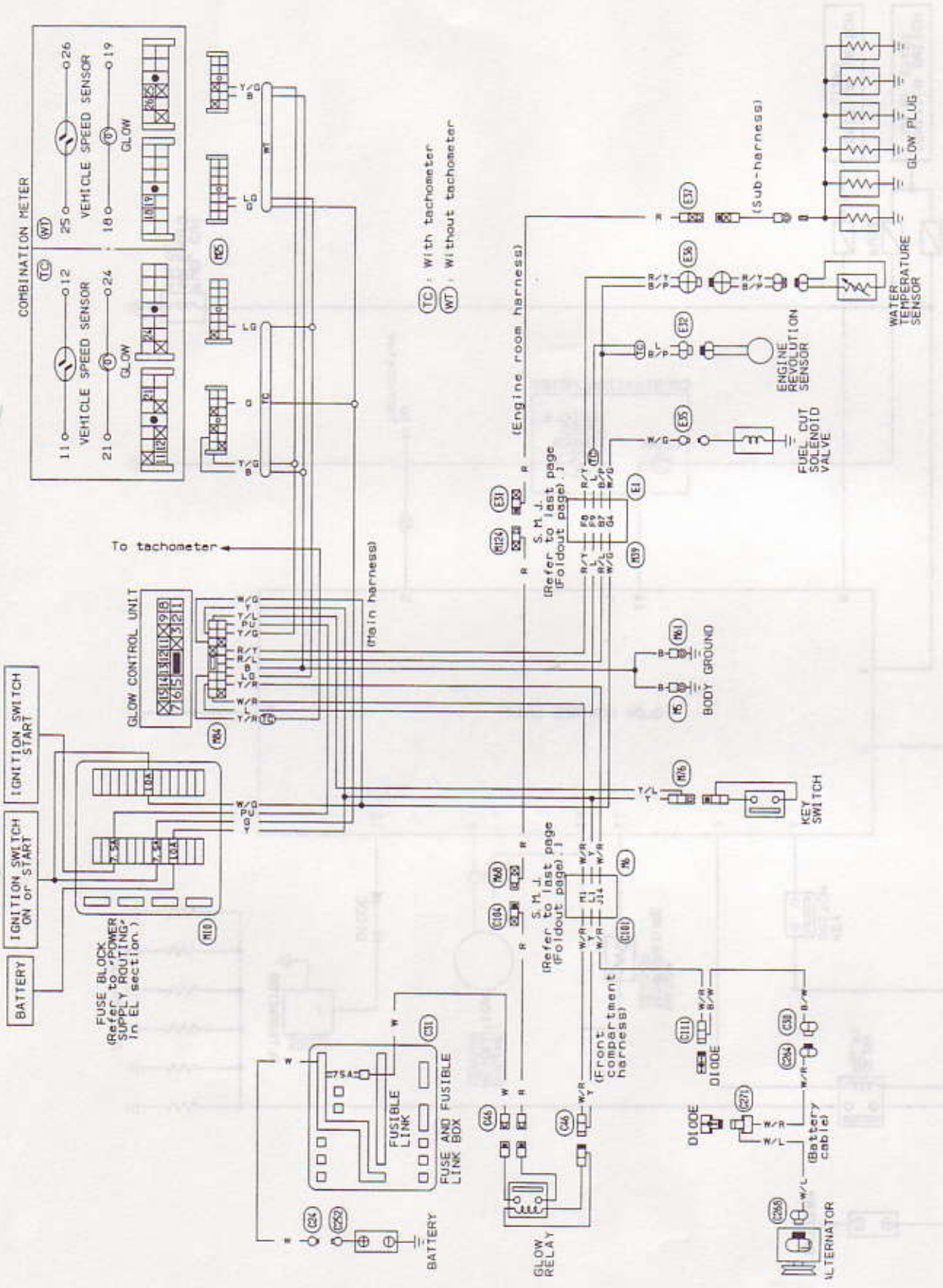
MEF818C

Schematic — With E.G.R. system



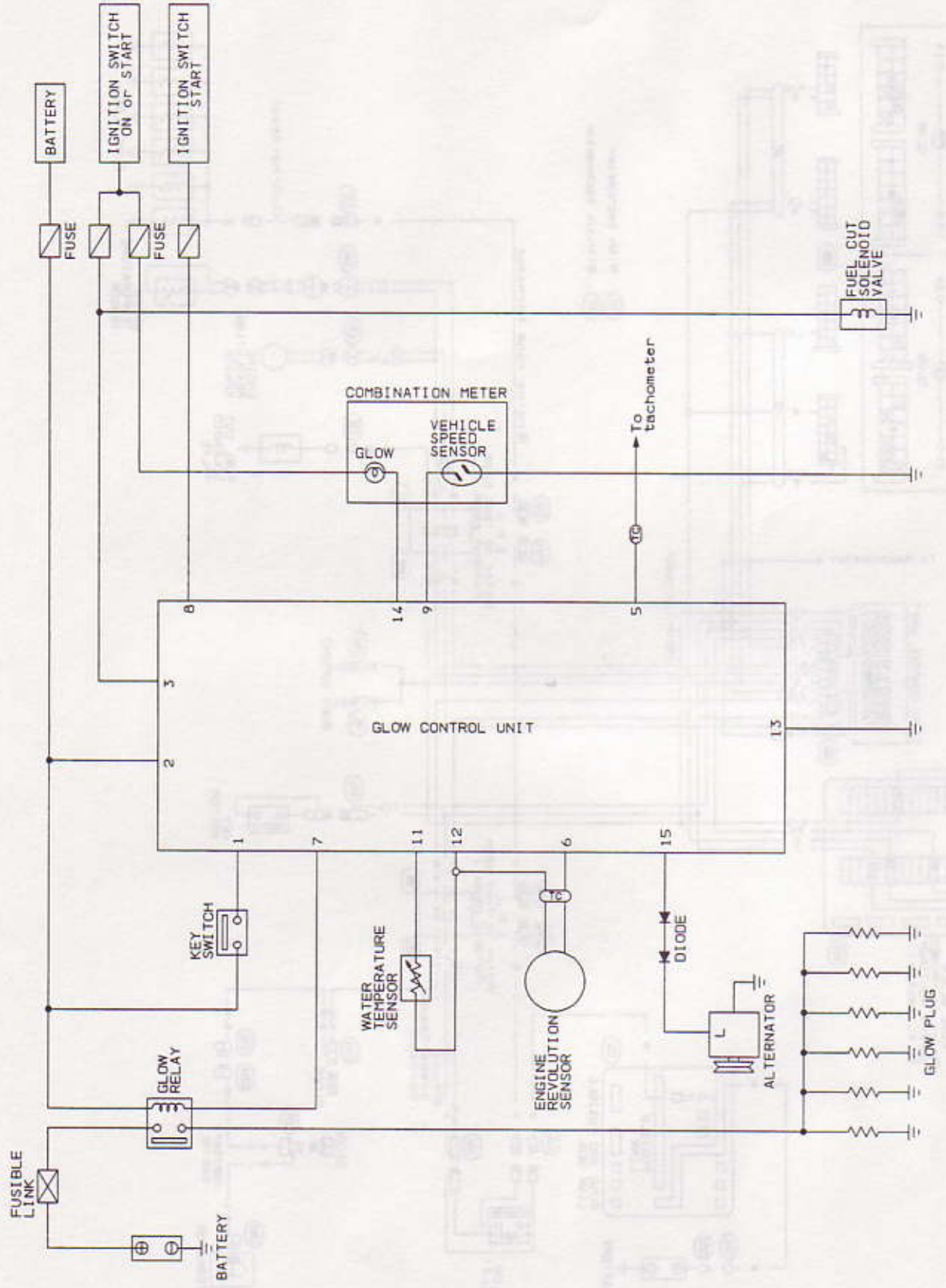
MEF819C

Wiring Diagram — Without E.G.R. system



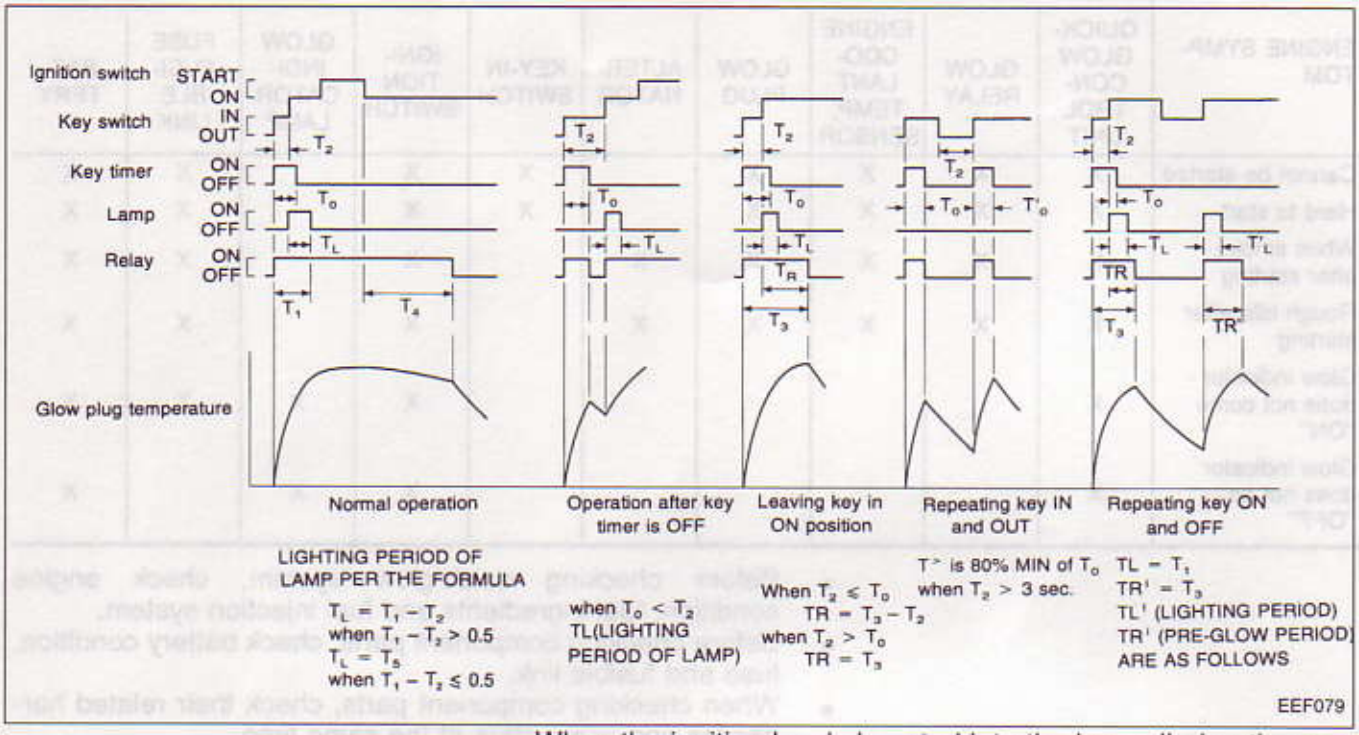
MEF820C

Schematic — Without E.G.R. system



MEF821C

Description



When the ignition key is inserted into the key cylinder, the control unit turns on the relay and "high-level" electric current flows through the glow plugs and heats them up quickly. When the ignition switch is turned on, the control unit turns on the indicator. After T_1 seconds have passed from key in, the control unit turns off the indicator. While cranking, the relay remains on. The relay automatically turns off after T_4 seconds have passed from the engine start.

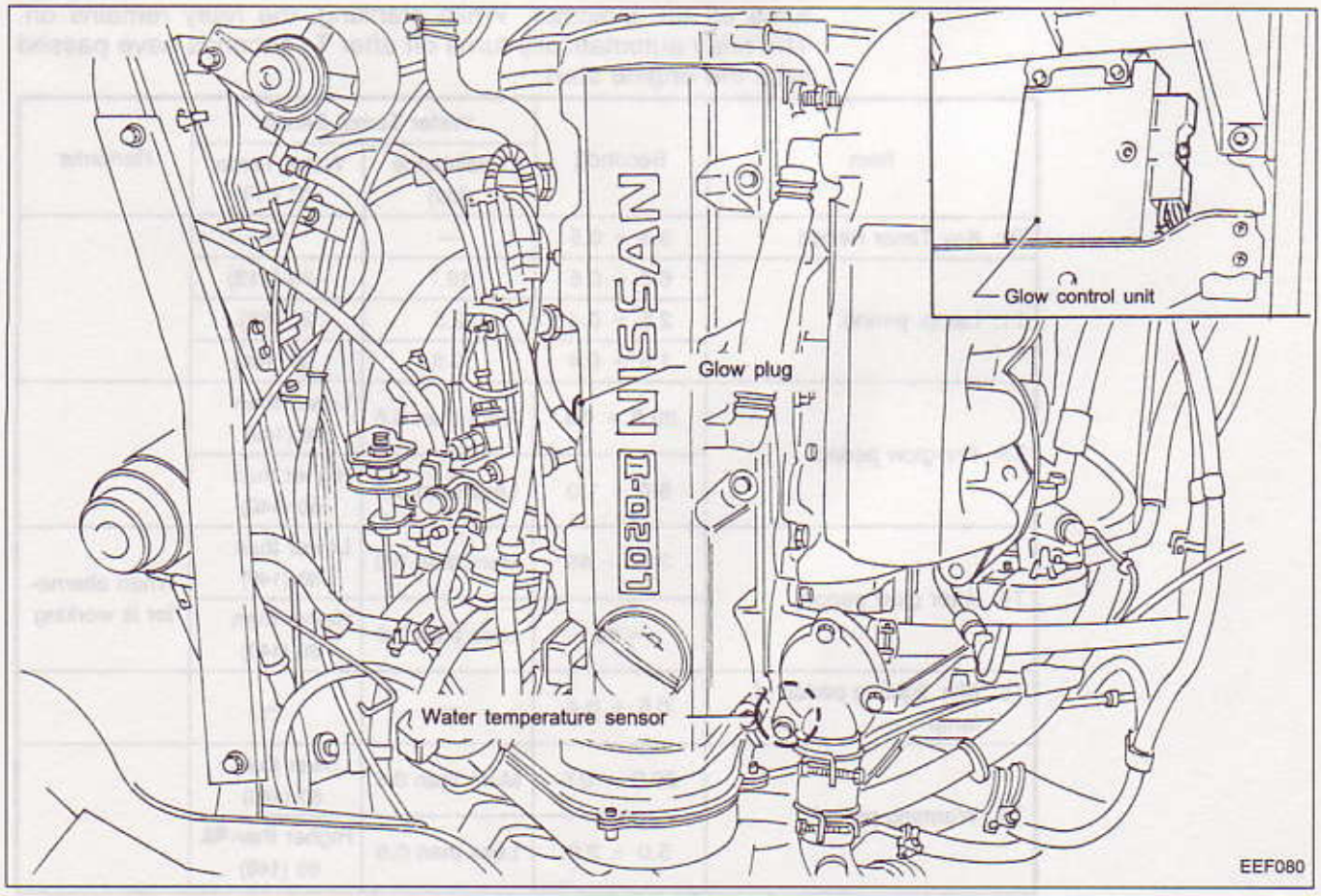
Item	Second	Water Temp. Sensor		Remarks
		Resistance (kΩ)	Water Temp. °C (°F)	
T0: Key Timer Period	3.3 + 0.5	—	—	
T1: Lamp. period.	6.0 + 0.6	19.7	−25 (−13)	
	2.5 + 0.4	2.5	20 (68)	
	1.5 + 0.4	0.6	60 (140)	
T3: Pre-glow period.	20.0 + 0.3	More than 0.6	Lower than 60 (140)	
	5.0 + 1.0	Less than 0.6	Higher than 60 (140)	
T4: After glow period.	300 + 45	More than 0.6	Lower than 60 (140)	When alternator is working
	< 10	Less than 0.6	Higher than 60 (140)	
T5: Min. lighting period of lamp	0.5 + 0.4	—	—	
T6: Warming period.	20.0 + 0.5	More than 0.6	Lower than 60 (140)	
	5.0 + 2.0	Less than 0.6	Higher than 60 (140)	

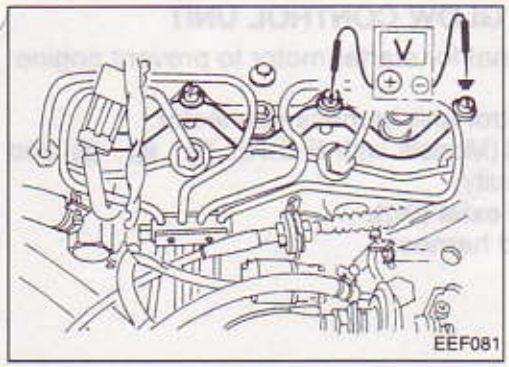
Trouble Diagnosis

ENGINE SYMPTOM	PARTS									
	QUICK-GLOW CONTROL UNIT	GLOW RELAY	ENGINE COOLANT TEMP. SENSOR	GLOW PLUG	ALTERNATOR	KEY-IN SWITCH	IGNITION SWITCH	GLOW INDICATOR LAMP	FUSE FUSIBLE LINK	BATTERY
Cannot be started	X	X	X	X		X	X		X	X
Hard to start	X	X	X	X		X	X		X	X
White smoke after starting	X	X	X	X	X		X		X	X
Rough idle after starting	X	X	X	X	X		X		X	X
Glow indicator does not come "ON"	X						X	X	X	X
Glow indicator does not go "OFF"	X						X	X		X

- Before checking quick-glow system, check engine condition, fuel ingredients and fuel injection system.
- Before checking component parts, check battery condition, fuse and fusible link.
- When checking component parts, check their related harnesses and connectors at the same time.
- Before replacing quick-glow control unit check all other component parts.

Parts Location

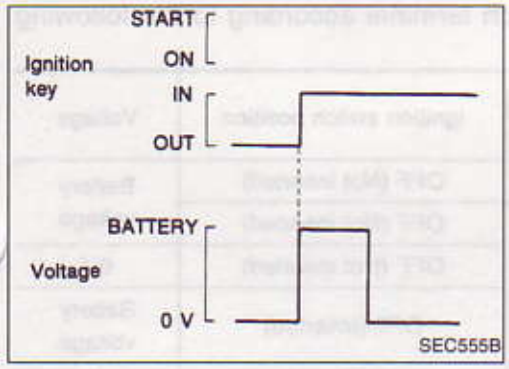




Component Parts Basic Check

ENTIRE SYSTEM CHECK

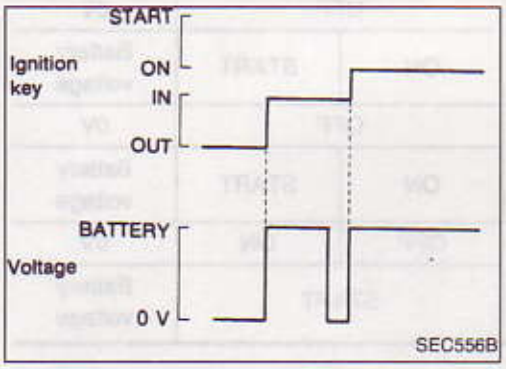
Set voltmeter between glow plug and engine body.



1. Key-in glow system
- Read voltage when ignition key is inserted into ignition switch.

Voltage:

Battery voltage for about 3 seconds



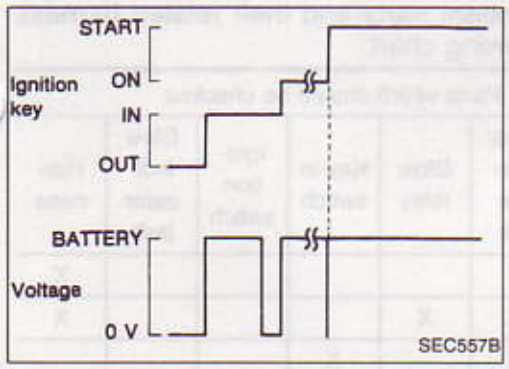
2. Quick-glow (Pre-glow) system
1) Turn ignition switch "ON" 3 or more seconds after key-in.
2) Read voltage

Voltage:

Battery voltage for about 20* seconds

*** Coolant temperature is lower than 60°C (140°F)**

*** Repeating ignition key "ON" and "OFF" may change the time.**

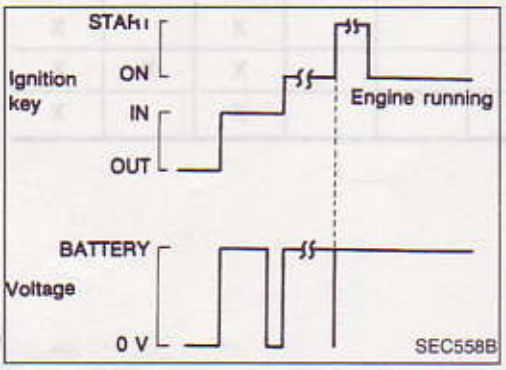


3. Quick-glow (Cranking) system
1) Disconnect "S" terminal for starter motor to prevent engine from cranking.
2) Read voltage when ignition key is turned to "START".

Voltage:

Battery voltage*

*** For about 20 seconds after returning ignition switch to "ON".**



4. After-glow system
1) Connect "S" terminal to starter motor.
2) Start engine and read voltage.

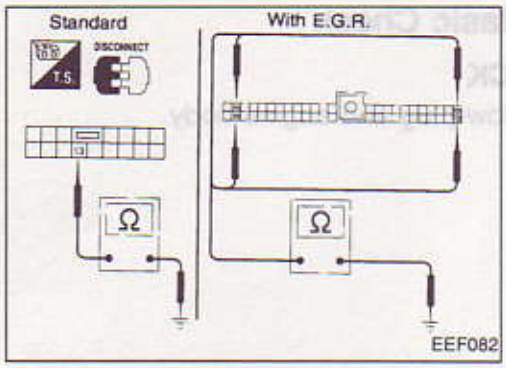
Voltage:

Battery voltage for 5* minutes

*** Coolant temperature is lower than 60°C (140°F).**

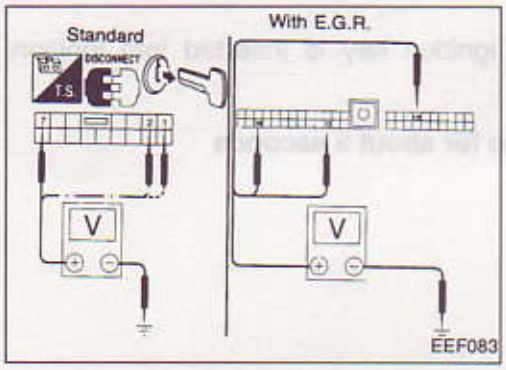
Component Parts Basic Check (Cont'd)

POWER SUPPLY FOR GLOW CONTROL UNIT



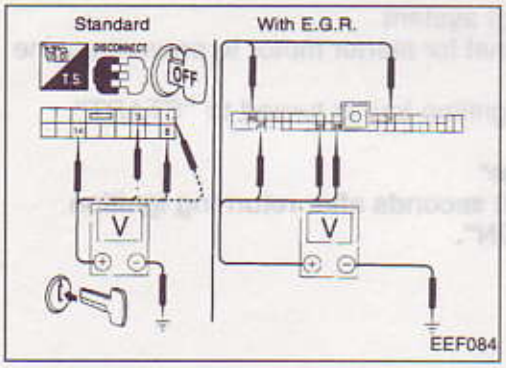
1. Disconnect "S" terminal for starter motor to prevent engine from cranking.
2. Disconnect glow control unit harness connector.
3. Check terminal(s) ⑬ (Models with E.G.R.: ⑩, ⑩⑤, ㉖ and ㊴) for ground continuity.
   Continuity should exist (0Ω).

- If N.G., check ground harness.



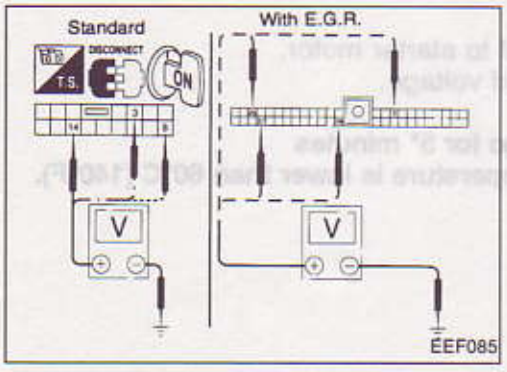
4. Check voltage at each terminal according to the following chart.

Terminal No.		Ignition switch position		Voltage
Standard	With E.G.R.			
②	㊳	OFF (Not inserted)		Battery voltage
⑦	⑩⑥	OFF (Not inserted)		Battery voltage
①	㉚	OFF (Not inserted)		0V
		OFF (Inserted)		Battery voltage
③	㉕ ㊲	OFF		0V
		ON	START	Battery voltage
⑭	⑤	OFF		0V
		ON	START	Battery voltage
⑧	㉘	OFF	ON	0V
		START		Battery voltage

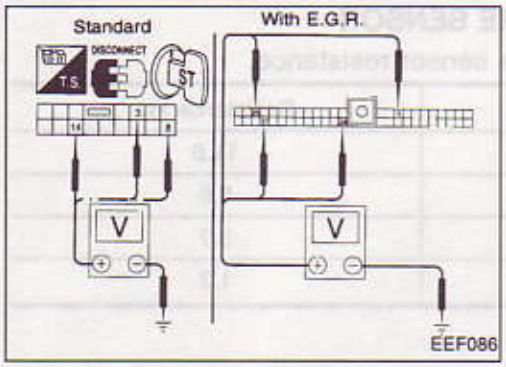


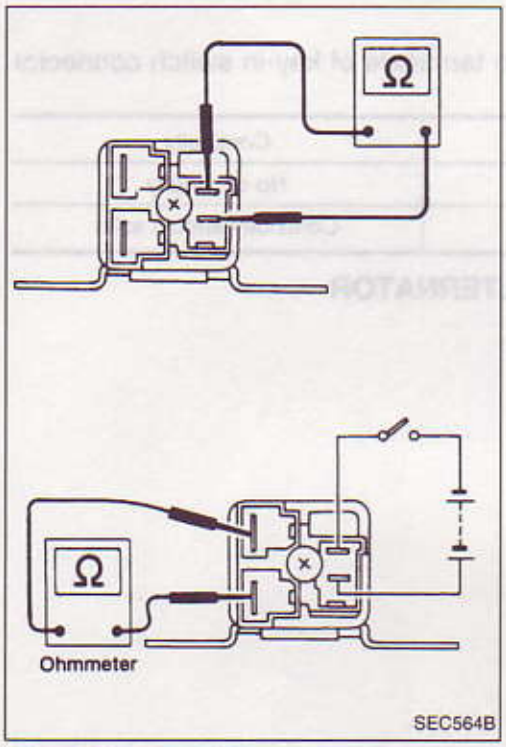
- If N.G., check component parts and their related harness according to the following chart.

Terminal No.		Parts which should be checked						
Standard	E.G.R.	Battery	Fuse/ Fusible link	Glow relay	Key-in switch	Ignition switch	Glow indicator bulb	Harness
②	㉟	X	X					X
⑦	⑩⑥	X	X	X				X
①	㉚	X	X		X			
③	㉕ ㊲	X	X			X		X
⑭	⑤	X	X			X	X	X
⑧	㉘	X	X			X		X



Component Parts Basic Check (Cont'd)

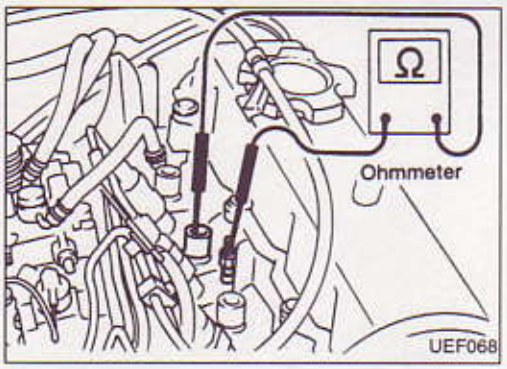




GLOW RELAY

1. Check relay for coil continuity.
   Continuity should exist.
2. Check relay for proper operation.

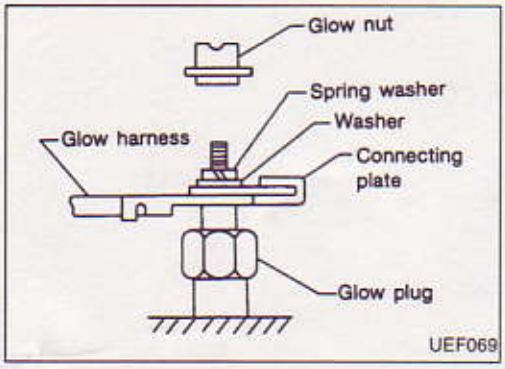
Coil voltage	Continuity	Contact point
0V	No	OFF
12V	Yes	ON



GLOW PLUG

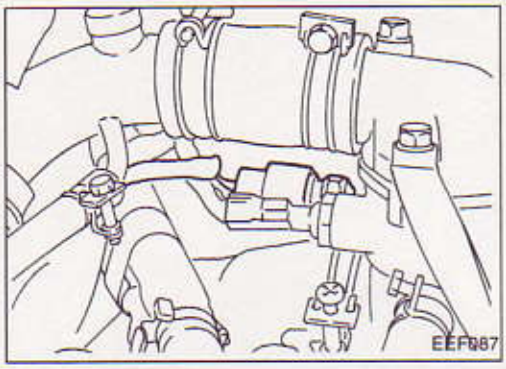
1. Disconnect glow control unit harness connector.
2. Check continuity between ground and terminal ⑤ of glow control unit harness connector.
   Continuity should exist.
3. Remove glow plug connecting plate.
4. Check each glow plug for continuity.
   Continuity should exist:
   Approximately 0.65Ω

- If N.G., replace glow plug.



5. Install glow plug connecting plate securely.

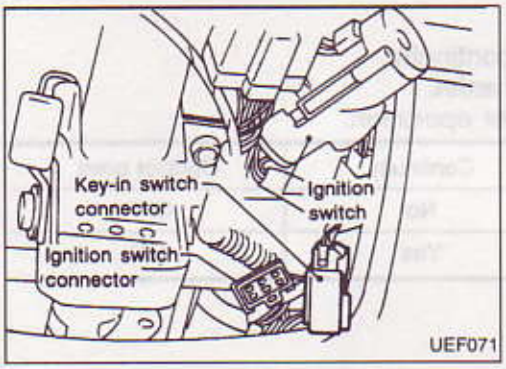
Component Parts Basic Check (Cont'd)



WATER TEMPERATURE SENSOR

Check water temperature sensor resistance.

Coolant temp. °C (°F)	Resistance kΩ
−15 (5)	11.5
0 (32)	5.6
10 (50)	3.7
40 (104)	1.2



KEY-IN SWITCH

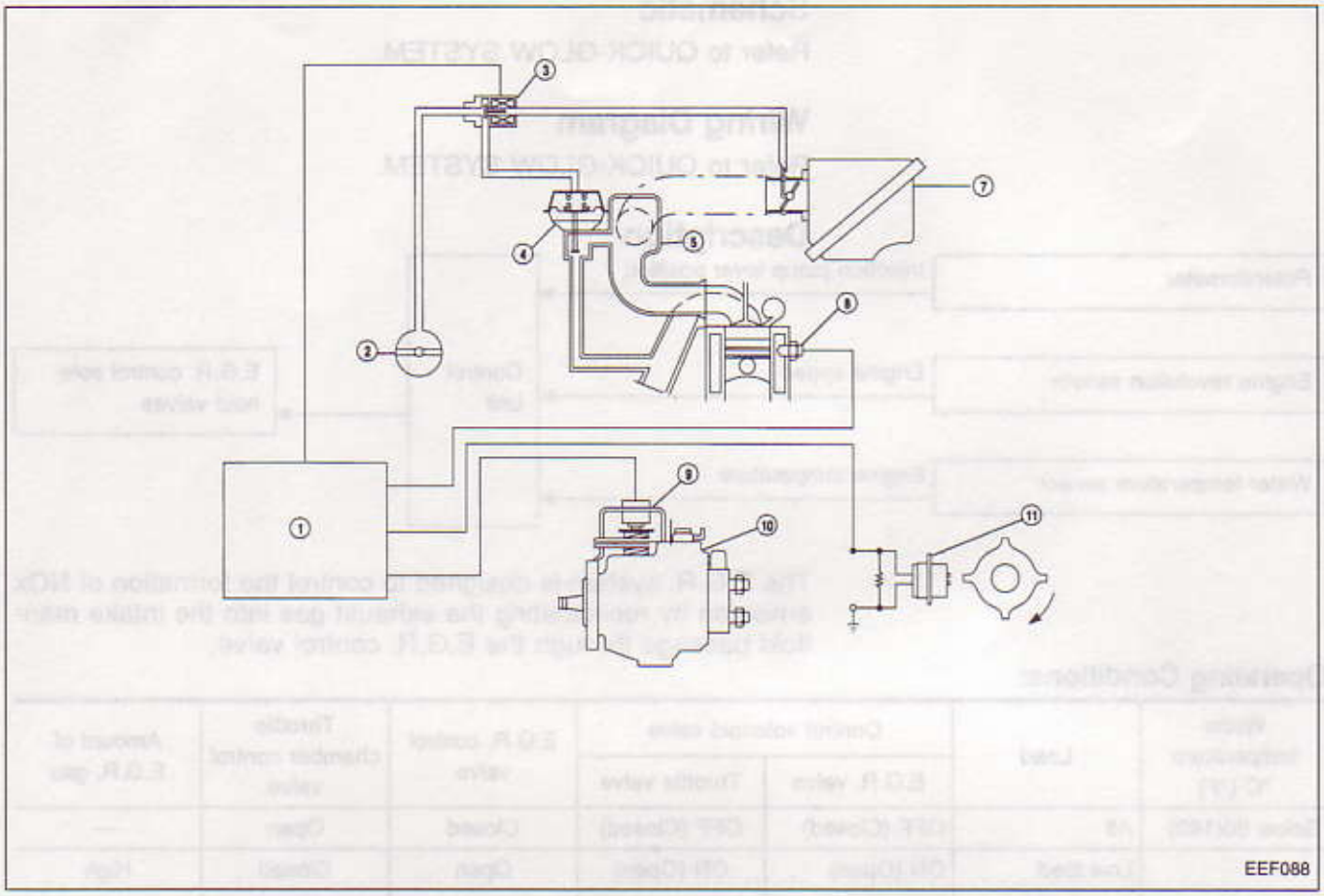
Check continuity between terminals of key-in switch connector at steering column.

Ignition key	Continuity
Not inserted	No continuity
Inserted	Continuity should exist

IGNITION KEY AND ALTERNATOR

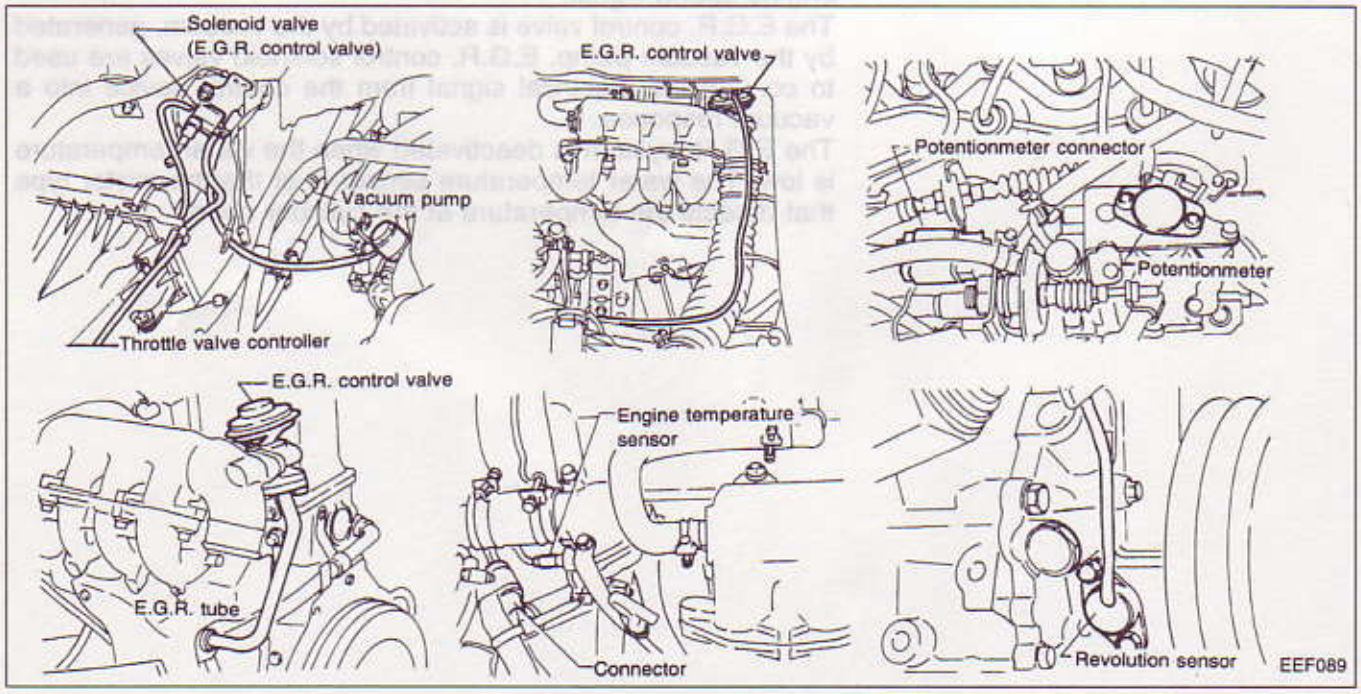
Refer to EL section.

System Diagram



① Control unit
② Vacuum pump
③ Solenoid valve (E.G.R. control valve)
④ E.G.R. control valve
⑤ Intake manifold
⑥ Throttle valve controller
⑦ Air cleaner
⑧ Water temperature sensor
⑨ Potentiometer
⑩ Injection pump
⑪ Revolution sensor

Parts Location



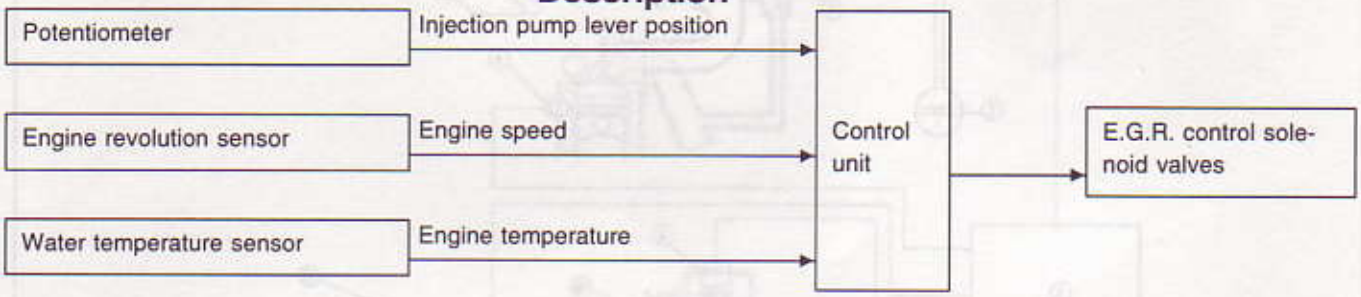
Schematic

Refer to QUICK-GLOW SYSTEM.

Wiring Diagram

Refer to QUICK-GLOW SYSTEM.

Description



The E.G.R. system is designed to control the formation of NOx emission by recirculating the exhaust gas into the intake manifold passage through the E.G.R. control valve.

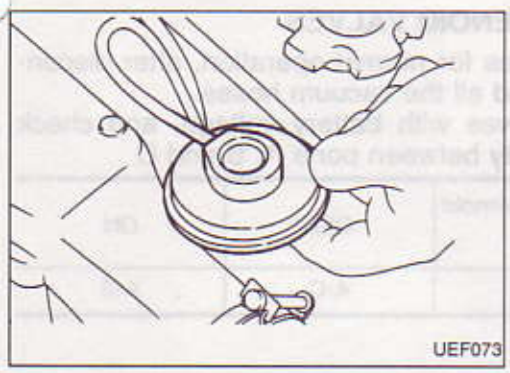
Operating Conditions:

Water temperature °C (°F)	Load	Control solenoid valve		E.G.R. control valve	Throttle chamber control valve	Amount of E.G.R. gas
		E.G.R. valve	Throttle valve			
Below 60(140)	All	OFF (Closed)	OFF (Closed)	Closed	Open	—
Above 60 (140)	Low load	ON (Open)	ON (Open)	Open	Closed	High
	Middle load	ON (Open)	OFF (Closed)	Open	Open	Low
	High load	OFF (Closed)	OFF (Closed)	Closed	Open	—

The engine load signal is detected with the potentiometer installed on the fuel injection pump control lever. The engine revolution sensor located on the oil pump cover produces the engine speed signal.

The E.G.R. control valve is activated by the vacuum, generated by the vacuum pump. E.G.R. control solenoid valves are used to convert the electrical signal from the control device into a vacuum response.

The E.G.R. system is deactivated when the water temperature is low. The water temperature sensor is of the thermistor type that detects the temperature at the cylinder head.

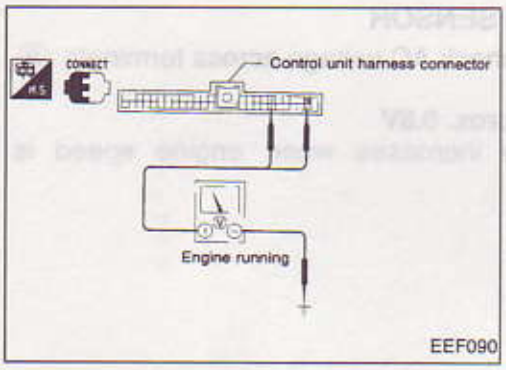

UEF073

Inspection

ENTIRE SYSTEM

1. Check the vacuum hoses for flatting damage and improper connections.
2. Warm up engine sufficiently [water temperature over 60°C (140°F)].
3. Place your finger on E.G.R. control valve diaphragm inside the housing to ensure that the valve functions while racing engine.

- **Take care not to let your finger get caught between diaphragm and E.G.R. control valve body.**
- **Make sure that all harness connectors are connected securely.**

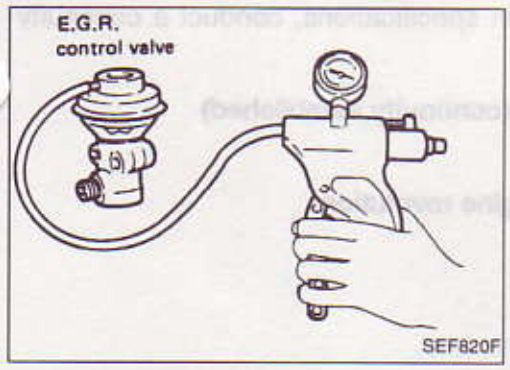


EEF090

CONTROL UNIT OUTPUT SIGNAL

1. Check voltage between control unit terminals ③, ⑩② and ground.

Water temperature °C (°F)	Voltage of control unit terminals ③, ⑩②
Below 60 (140)	Battery voltage
Above 60 (140)	0 - 1V



SEF820F

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 valve diaphragm, and make sure that the diaphragm lifts up and down in response to the vacuum leading to the valve.

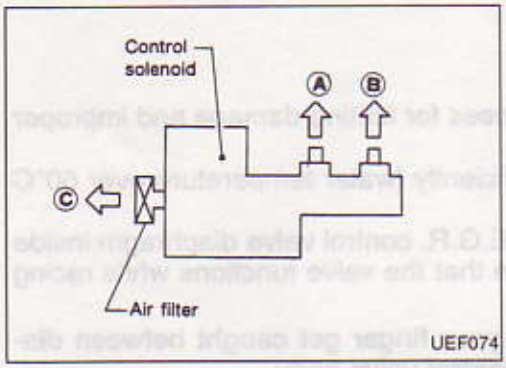
- **Do not supply the valve with an excessively high vacuum.**

THROTTLE CHAMBER CONTROL VALVE

Ensure that throttle chamber control valve is held (closed) at stopper when a vacuum pressure of approximately –13.3 kPa (–133 mbar, –100 mmHg, –3.94 inHg) is applied from a vacuum handy pump to the vacuum port.

Inspection (Cont'd)

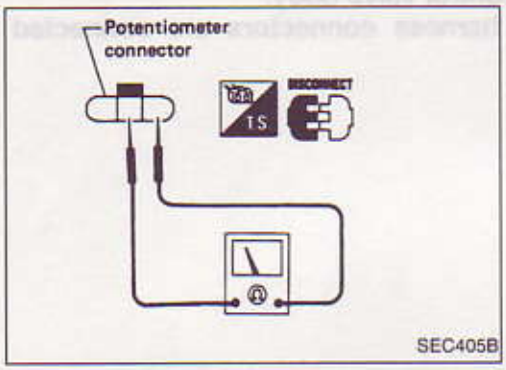
E.G.R. CONTROL SOLENOID VALVES



Check the solenoid valves for normal operation, after disconnecting the connector and all the vacuum hoses.
Supply the solenoid valves with battery voltage, and check whether there is continuity between ports A, B and C.

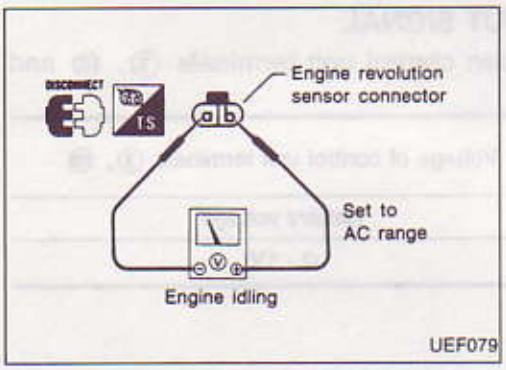
Item \ solenoid	OFF	ON
Continuity	A-C	A-B

POTENTIOMETER



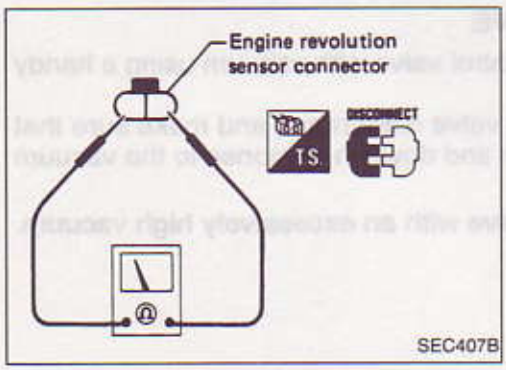
1. Disconnect potentiometer connector and connect ohmmeter as shown.
2. Make sure that the resistance changes when the control lever opening angle of the fuel injection pump is changed.

ENGINE REVOLUTION SENSOR



1. While idling engine, check AC voltage across terminals ⓐ and ⓑ.
   Engine idling: Approx. 0.8V

Check that AC voltage increases when engine speed is increased.



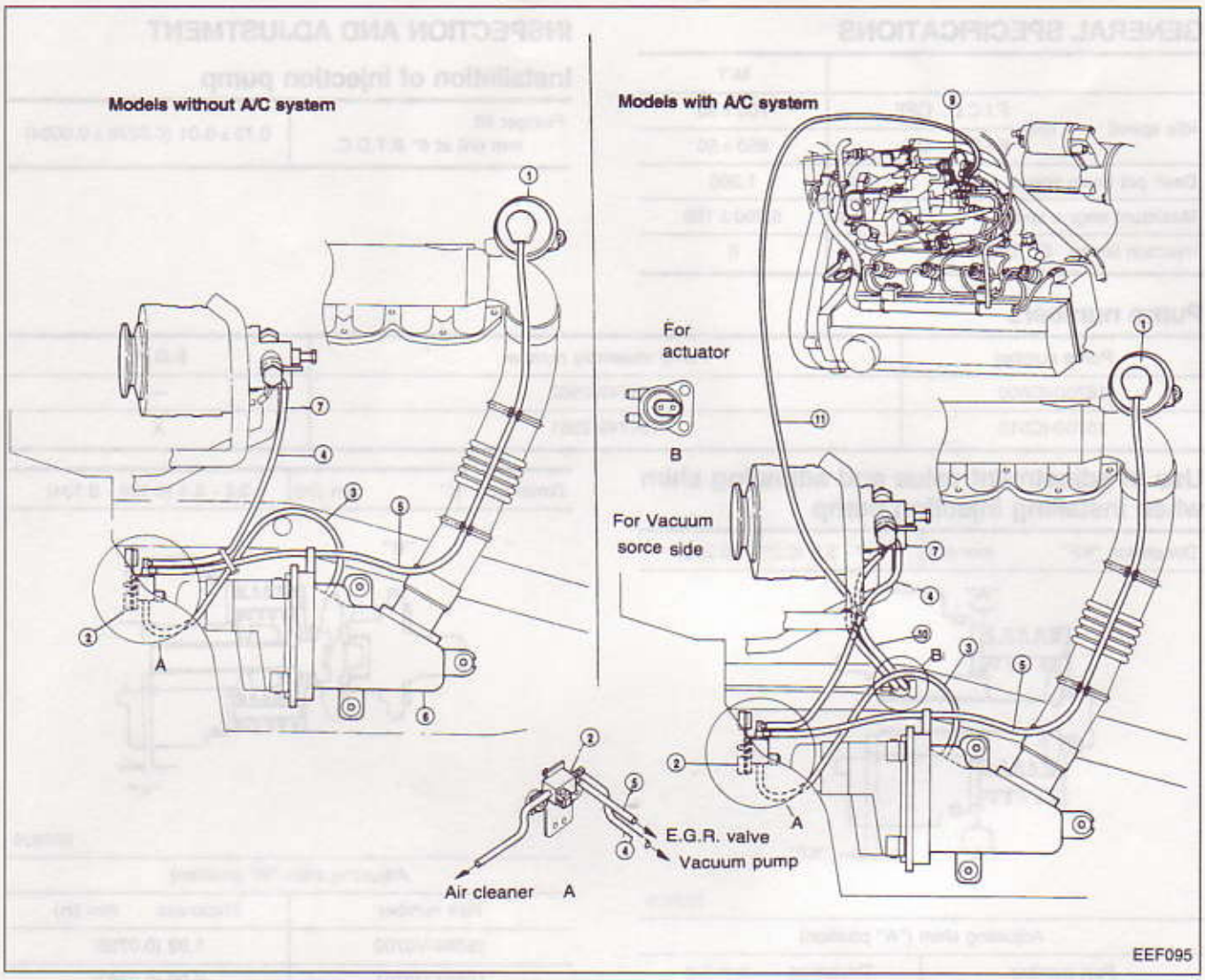
2. If voltage is not within specifications, conduct a continuity test.
   Resistance:
   Approx. 5 kΩ (continuity established)
3. Read pulse.
   Pulse:
   4 pulses/1 engine revolution

WATER TEMPERATURE SENSOR

- Check resistance of water temperature sensor.

Refer to QUICK-GLOW SYSTEM.

System Vacuum Circuit



① E.G.R. control valve
② Solenoid valve (E.G.R. control valve)
③ Hose vacuum of solenoid valve to air cleaner
④ Hose vacuum of pump to solenoid valve
⑤ Hose vacuum of solenoid valve to E.G.R. control valve
⑥ Air cleaner
⑦ Vacuum pump
⑧ Solenoid valve (A/C control valve)
⑨ Actuator (Injection pump)
⑩ Hose vacuum of pump to solenoid valve
⑪ Hose vacuum of solenoid valve to actuator

Injection Pump

GENERAL SPECIFICATIONS

		M/T
Idle speed rpm	F.I.C.D.: OFF	700 ± 50
	F.I.C.D.: ON	850 ± 50
Dash pot touch speed rpm		1,300
Maximum engine speed rpm		5,200 ± 150
Injection timing B.T.D.C.		6

INSPECTION AND ADJUSTMENT

Installation of injection pump

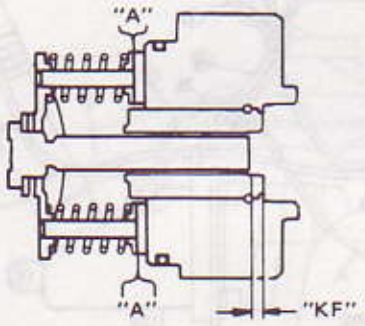
Plunger lift mm (in) at 6° B.T.D.C.	0.73 ± 0.01 (0.0278 ± 0.0004)

Pump numbers

Pump number	Pump assembly number	E.G.R.
16700-IC500	104749-2562	—
16700-IC510	104749-2551	X

Use of adjustment value and adjusting shim when installing injection pump

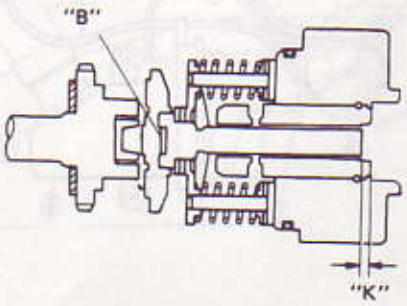
Dimension "KF" mm (in)	5.7 - 5.9 (0.224 - 0.232)



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)

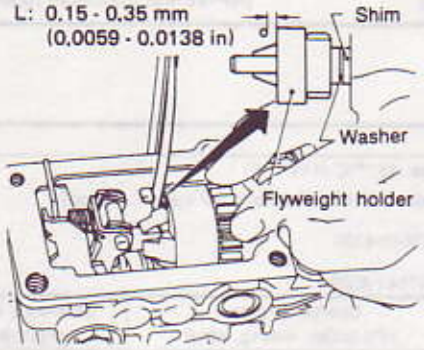


SEF639

Adjusting shim "B" position)	
Part number	Thickness mm (in)
16884-V0700	1.92 (0.0756)
16884-V0701	2.00 (0.0787)
16884-V0702	2.08 (0.0819)
16884-V0703	2.16 (0.0850)
16884-V0704	2.24 (0.0882)
16884-V0705	2.32 (0.0913)
16884-V0706	2.40 (0.0945)
16884-V0707	2.48 (0.0976)
16884-V0708	2.56 (0.1008)
16884-V0709	2.64 (0.1039)
16884-V0710	2.72 (0.1071)
16884-V0711	2.80 (0.1102)
16884-V0712	2.88 (0.1134)

Injection Pump (Cont'd)

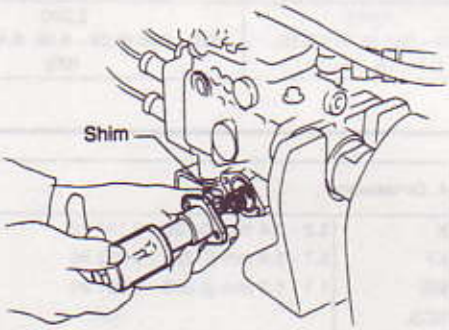
Axial playof flyweight holder "L" mm (in)	0.15 - 0.35 (0.0059 - 0.0138)



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)

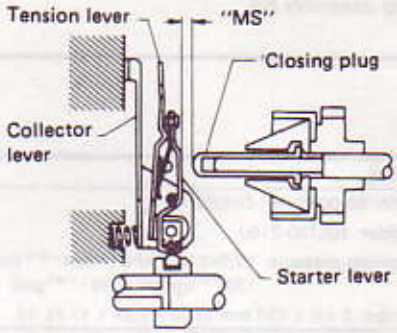


SEF855A

Timer adjusting shim

Parts No.	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)

Dimension "MS" mm (in)	1.1 - 1.3 (0.043 - 0.051)

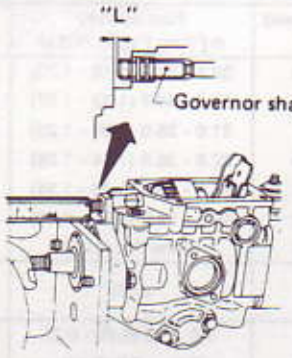


SEF856

Adjusting closing plug

Parts No.	Thickness mm (in)
19207-V0700	7.8 (0.307)
19207-V0701	8.0 (0.315)
19207-V0702	8.2 (0.323)
19207-V0703	8.4 (0.331)
19207-V0704	8.6 (0.339)
19207-V0705	8.8 (0.346)
19207-V0706	9.0 (0.354)
19207-V0707	9.2 (0.362)

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



SEF500

Injection Pump (Cont'd)

Engine model: LD20II

Injection pump assembly No. (Part No.)	104749-2550 (16700 1C510) 104749-2561 (16700 1C500)	[NP-VE4/9F2300RNP1038] [NP-VE4/9F2300RNP1039](★)

1. Test Conditions

1-1 Nozzle: 105780-0060 (NP-DN0SD1510)

1-2 Nozzle holder: 105780-2150

1-3 Nozzle opening pressure: 13,043 $^{+294}$ kPa (130.4 $^{+2.9}$ bar, 133 $^{+3}$ kg/cm^2, 1,891 $^{+43}$ psi)

1-4 Injection tube: 2 x 6 x 450 mm (0.08 x 0.24 x 17.72 in)

1-5 Fuel oil temperature: 45 $^{+5}$°C (113 $^{+9}$°F)

1-6 Supply pump pressure: 20 kPa (0.20 bar, 0.2 kg/cm^2, 2.8 psi)

1-7 Joint assembly: 157641-4720

1-8 Tube assembly: 157641-4020

2. Setting		Pump speed rpm	Settings	Charge air press kPa (mbar, mmHg, inHg)	Difference in delivery mℓ (Imp fl oz)
2-1	Timing device travel	900	1.3 - 1.7 mm (0.051 - 0.067 in)	—	—
2-2	Supply pump pressure	900	314 - 373 kPa (3.14 - 3.73 bar, 3.2 - 3.8 kg/cm^2, 46 - 54 psi)		—
2-3	Full load delivery	1,000	33.4 - 34.4 mℓ (1.18 - 1.21 Imp fl oz)/1,000 st		2.0 (0.07)
2-4	Idle speed regulation	350	6.1 - 8.1 mℓ (0.21 - 0.29 Imp fl oz)/1,000 st	—	2.0 (0.07)
2-5	Start	100	50.0 - 70.0 mℓ (1.76 - 2.46 Imp fl oz)/1,000 st		—
2-6	Full-load speed regulation	2,600	20.3 - 24.3 mℓ (0.71 - 0.86 Imp fl oz)/1,000 st		6.0 (0.21)

3. Test Specifications

3-1	Timing device	N = rpm mm (in)	900 1.2 - 1.8 (0.047 - 0.071)	1,800 5.8 - 7.2 (0.228 - 0.283)	2,300 8.0 - 9.0 (0.315 - 0.354)
3-2	Supply pump	N = rpm kPa (bar, kg/cm^2, psi)	900 314 - 373 (3.14 - 3.73, 3.2 - 3.8, 46 - 54)	1,800 510 - 559 (5.10 - 5.59, 5.2 - 5.8, 74 - 81)	2,300 628 - 686 (6.28 - 6.86, 6.4 - 7.0, 91 - 100)
3-3	Overflow delivery	N = rpm mℓ (Imp fl oz)/10 sec.	900 33.0 - 77.0 (1.16 - 2.71)		

3-4 Fuel injection quantities

Speed control lever position	Pump speed rpm	Fuel delivery mℓ (Imp fl oz)/1,000 st	Charge air press kPa (mbar, mmHg, inHg)
Max. speed	1,000	32.9 - 34.9 (1.16 - 1.23)	—
	400	34.7 - 44.7 (1.22 - 1.57)	
	600	31.0 - 35.0 (1.09 - 1.23)	
	1,800	32.6 - 36.6 (1.14 - 1.28)	
	2,300	34.1 - 38.1 (1.20 - 1.34)	
	2,600	19.8 - 24.8 (0.70 - 0.87)	
	2,800	Below 7.0 (0.25)	
Switch OFF Magnet valve	350	0 (0)	—
Idling	350	5.6 - 8.6 (0.20 - 0.3)	—
	500	Below 3.0 (0.11)	
Partial load(★)	600	11.5 - 20.5 (0.40 - 0.72)	—

3-5 Solenoid: Max. cut-in voltage: 8V, Test voltage: 12 - 14V

4. Dimensions

K	3.2 - 3.4 mm (0.126 - 0.134 in)
KF	5.7 - 5.9 mm (0.224 - 0.232 in)
MS	1.1 - 1.3 mm (0.043 - 0.051 in)
BCS	—
Pre-stroke	—

Control lever angle

α	21 - 29 degree
a	7.8 - 11.9 mm (0.295 - 0.469 in)
β	36 - 46 degree
b	10.9 - 14.6 mm (0.429 - 0.571 in)
γ★	10.5 - 11.5 degree
c	5.6 - 6.1 mm (0.220 - 0.240 in)

(★) Only model 16700 1C500.

Injection Pump (Cont'd)

Dashpot adjustment

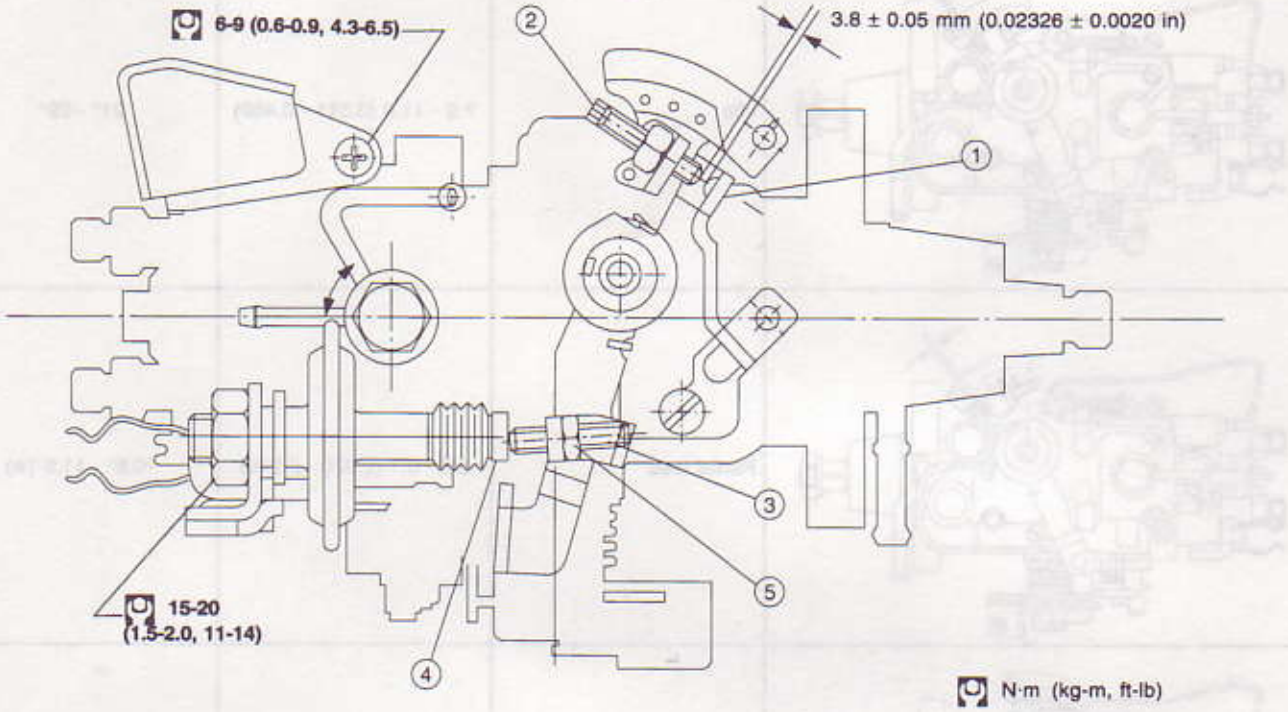
① Insert a block gauge (feeler gauge) of thickness 3.8±0.05 mm (0.1496±0.0020 in) in the gap between the idling stopper bolt ② and the bracket ①.

② With the control lever positioned as described above, adjust the dashpot adjusting screw ③ so that the dashpot adjusting screw and the push rod ④ are in contact. Secure the screw ③ using the nut ⑤. [T=5 - 7 N·m (0.5 - 0.7 kg-m, 3.6 - 5.1 ft-lb)]

Caution:

1) The adjusting screw and the pushrod must move together smoothly.

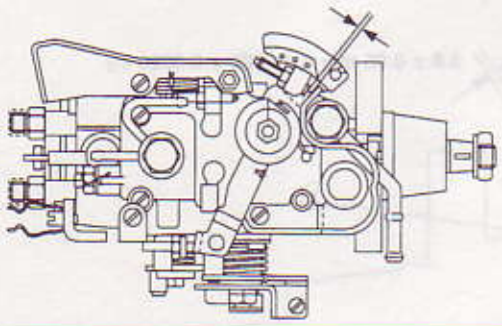
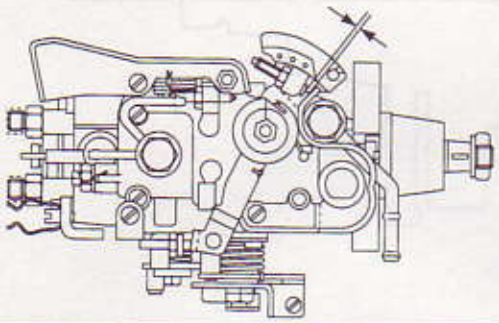
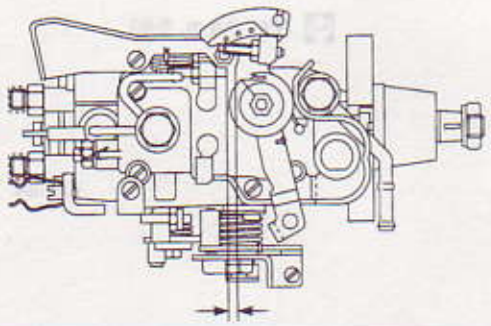
2) Confirm that the control lever returns to the idling position.



Injection Pump (Cont'd)

FUEL CONTROL LEVER ANGLE

Check the protrusions of adjustment screws to determine if the control lever is set at the correct angles for idle and maximum speed.

FIGURE	CONTROL LEVER POSITION	PROJECTION OF SCREW mm (in)	LEVER ANGLE Degree
	Idle	7.9 - 11.9 (0.311 - 0.469)	21° - 29°
	Partial load	5.6 - 6.1 (0.220 - 0.240)	10.5° - 11.5°(★)
	Max. speed	10.9 - 14.6 (0.429- 0.583)	36° - 46°

(★) Only model 16700 1C500.

Injection Pump (Cont'd)

Potentiometer adjustment

Under the following conditions, adjust the potentiometer's installation position so that the output voltage equals the specified value.

Adjustment conditions			Specified value	Remarks
Control lever position	Pump speed rpm	Fuel injection quantity mℓ (Imp fl oz)/1,000 st	Output voltage V	
Aprox. 15.2°	1,000	14.3 - 16.3 (0.50 - 0.57)	6.29 - 6.35 (0.91 - 2.55)	Adjusting point
Idle 0°	—	—	—	Check point
Full speed 41° ± 5'	—	—	Above 9.96	Check point

[Input voltage: 10V]

1. At a pump speed of 14.3 - 16.3 mℓ (0.50 to 0.57 Imp fl oz)/1,000 st, adjust the dummy so that it is against the control lever, and then secure it using the locknut.
2. Then, adjust the potentiometer so that the output is 6.29 - 6.35 V.
3. After making adjustment, remove the dummy bolt and confirm that the potentiometer output voltage is as specified above when the control lever is in the idle position.

Injection Pump (Cont'd)

TIGHTENING TORQUE

UNIT	N·m	kg-m	ft-lb
Cold start device fixing bolt	5 - 7	0.5 - 0.7	3.6 - 5.1
Control shaft to control lever	7 - 10	0.7 - 1.0	5.1 - 7.2
Delivery valve to distributor head	44 - 54	4.5 - 5.5	33 - 40
Delivery valve to tube	22 - 25	2.2 - 2.5	16 - 18
Distributor head to pump housing	11 - 13	1.1 - 1.3	8 - 9
Fast idle control lever adjusting screw nut	6 - 9	0.6 - 0.9	4.3 - 6.5
Feed pump cover to pump housing	2 - 3	0.2 - 0.3	1.4 - 2.2
Fuel cut solenoid valve	20 - 25	2.0 - 2.5	14 - 18
Fuel inlet connector to pump housing	2 - 3	0.2 - 0.3	1.4 - 2.2
Full load adjusting screw lock nut	6 - 9	0.6 - 0.9	4.3 - 6.5
Governor control shaft nut	7 - 10	0.7 - 1.0	5.1 - 7.2
Gpvernor cover to pump housing	7- 10	0.7 - 1.0	5.1 - 7.2
Governor shaft lock nut	25 - 29	2.5 - 3.0	18 - 22
Injection pump pulley nut	59 - 69	6.0 - 7.0	43 - 51
Lock plate lock nut	25 - 34	2.5 - 3.5	18 - 25
Maximum and idle speed adjusting screw lock nut	6 - 9	0.6 - 0.9	4.3 - 6.5
Overflow valve	20 - 25	2.0 - 2.5	14 - 18
Pivot pin to pump housing	10 - 13	1.0 - 1.3	7 - 9
Plug bolt	14 - 20	1.4 - 2.0	10 - 14
Plug to distributor head	59 - 78	6.0 - 8.0	43 - 58
Regulating valve to pump housing	8 - 9	0.8 - 0.9	5.8 - 6.5
Speed timer cover to pump housing	6 - 8	0.6 - 0.8	4.3 - 5.8
Injection pump			
Securing bolt	45 - 60	4.6 - 6.1	33 - 44
Securing nut	13 - 18	1.3 - 1.8	9 - 13
Injection tube			
Flare nut	22 - 25	2.2 - 2.5	16 - 18

Injection Nozzle

INSPECTION AND ADJUSTMENT

Injection nozzle assembly

Unit: kPa (bar, kg/cm², psi)

Initial injection pressure	
New	13,239 - 14,024 (132.4 - 140.2, 135 - 143, 1,920 - 2,033)
Used	12,259 - 13,239 (122.6 - 132.4, 125 - 135, 1,778 - 1,920)

Adjusting shims

Thickness mm (in)	Parts No.
0.50 (0.0197)	16613-V0700
0.54 (0.0213)	16613-V0702
0.58 (0.0228)	16613-V0704
0.62 (0.0244)	16613-V0706
0.66 (0.0260)	16613-V0708
0.70 (0.0276)	16613-V0710
0.74 (0.0291)	16613-V0712
0.78 (0.0307)	16613-V0714
0.82 (0.0323)	16613-V0716
0.86 (0.0339)	16613-V0718
0.90 (0.0354)	16613-V0720
0.94 (0.0370)	16613-V0722
0.98 (0.0386)	16613-V0724
1.00 (0.0394)	16613-V0760

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Injection nozzle to engine	59 - 69	6.0 - 7.0	43 - 51
Injection to tube flare nut	22 - 25	2.2 - 2.5	16 - 18
Spill tube nut	39 - 49	4.0 - 5.0	29 - 36
Nozzle holder to nozzle nut	78 - 98	8.0 - 10.0	58 - 72