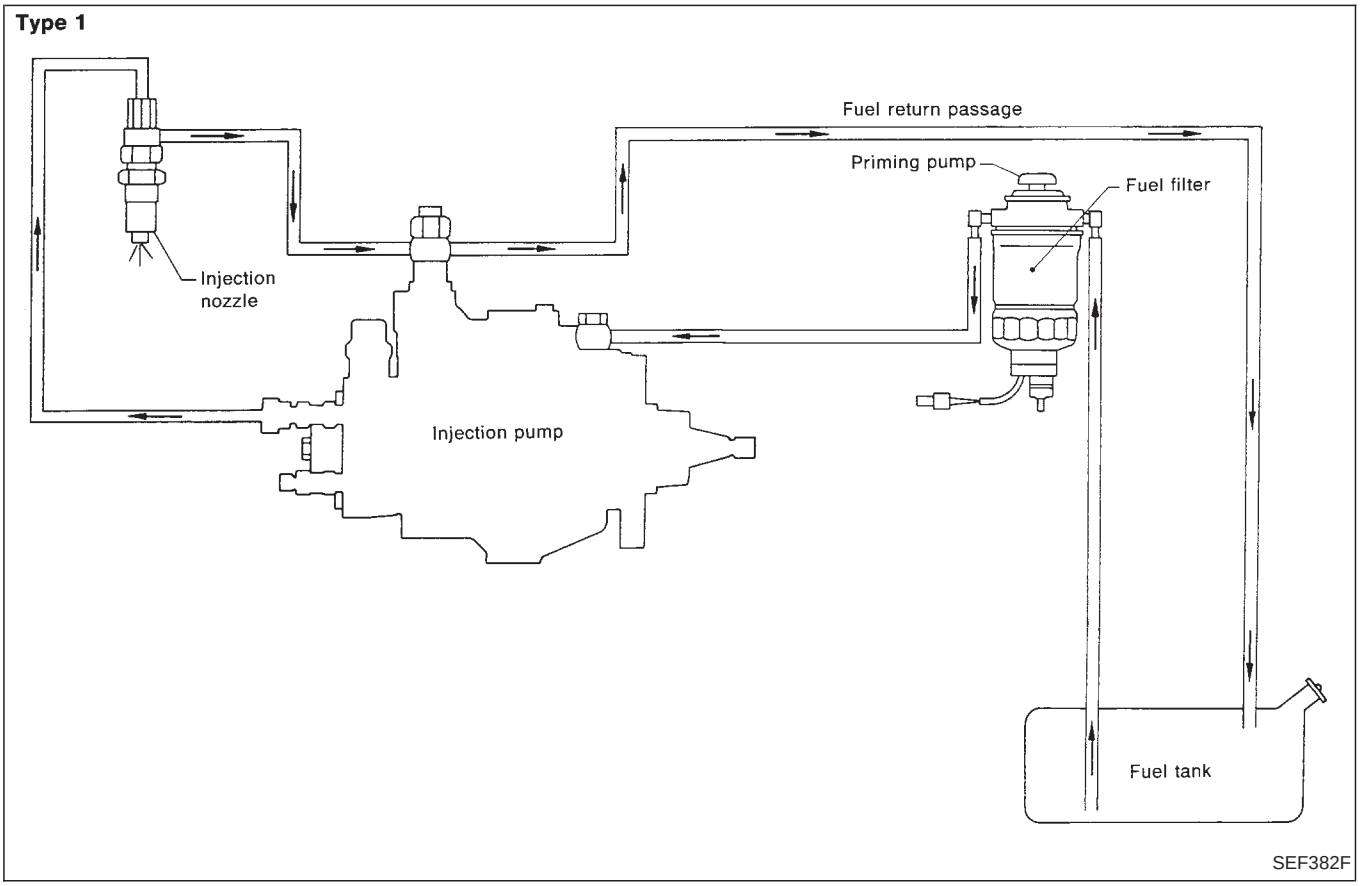
CAUTION:

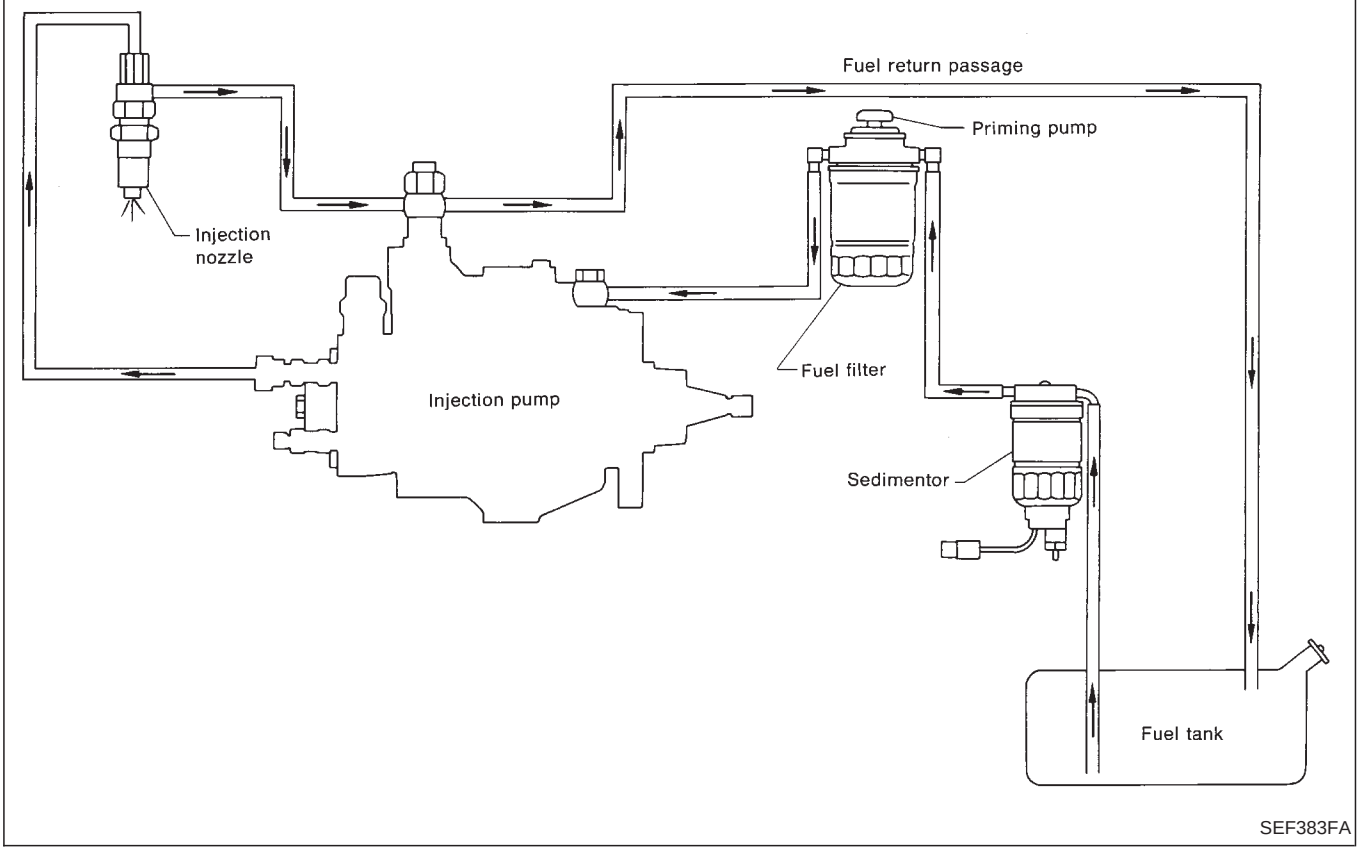
- **Disassembly and assembly of the injection pumps should be done only in service shops authorized by NISSAN or by the pump manufacturer.**
- **The pump tester is required for servicing the pump.**
- **Before removing fuel injection pump from vehicle, check closely to make sure that it is definitely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

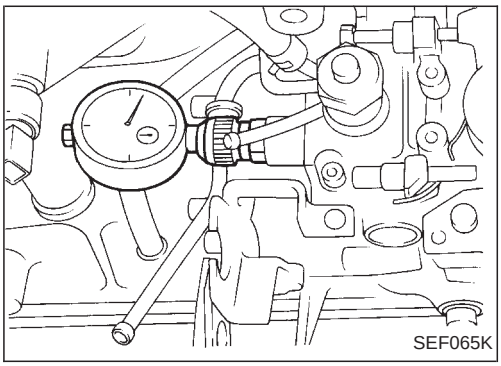
Fuel System



Fuel System (Cont'd)

Type 2




SEF065K

Inspection

PLUNGER LIFT INSPECTION

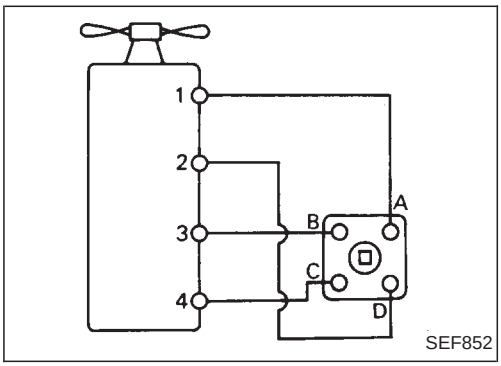
1. Remove injection tubes.
2. Remove plug bolt from distributor head and install dial gauge.
3. Plunger lift measurement

(1) Turn crankshaft counterclockwise 20 to 25 degrees from No. 1 piston at TDC.
(2) Find dial gauge's needle rest position at step (1) set position, then set the gauge to zero.
(3) Turn crankshaft clockwise until No. 1 piston is set at TDC.
(4) Read dial gauge indication.

QD32:
0.42±0.05 mm (0.0165±0.0020 in)
TD27:
For Australia
0.71±0.05 mm (0.0280±0.0020 in)
For Hong Kong
0.51±0.05 mm (0.0201±0.0020 in)
Except for the above
0.65±0.05 mm (0.0256±0.0020 in)

(5) If it is not within the above range, adjust it within adjustment standard range.

Refer to EC-259.



SEF852

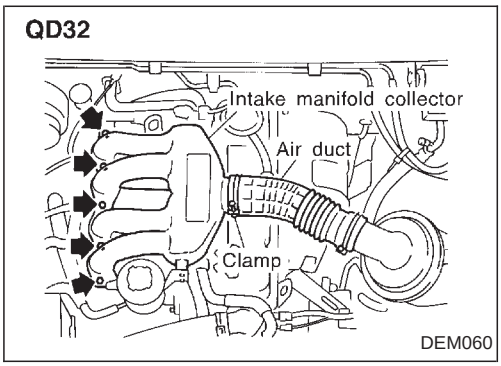
4. Disconnect dial gauge and reinstall plug bolt with new washer.
   : 14 - 20 N·m (1.4 - 2.0 kg-m, 10 - 14 ft-lb)
5. Connect injection tubes.
   Flare nut:
   : 20 - 25 N·m (2.0 - 2.5 kg-m, 14 - 18 ft-lb)
6. Bleed air from fuel system.
   Refer to EC-268.

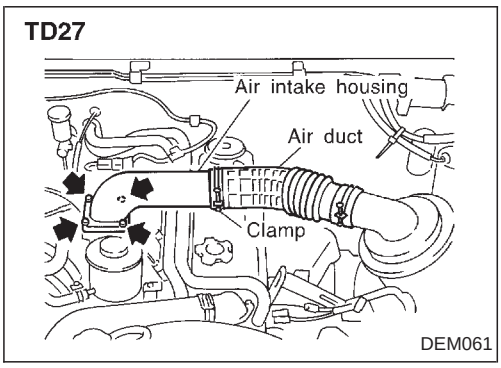
INJECTION PUMP CALIBRATION

Calibrate injection pump on injection pump tester.
Refer to "Injection Pump Calibration Standard" in SDS, EC-311.

Removal

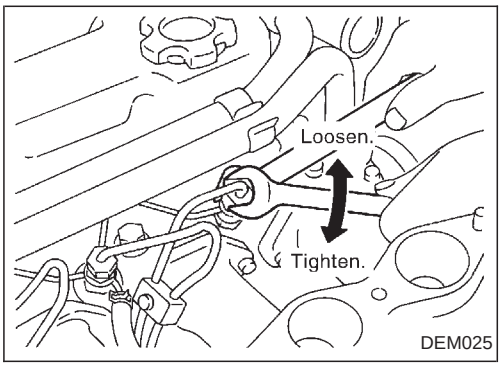
1. Disconnect air duct and intake manifold collector (QD32) or air intake housing (TD27).



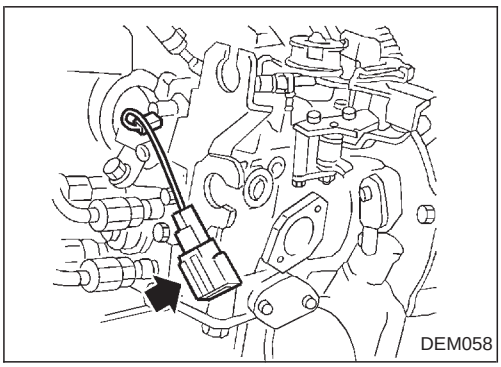


2. Remove injection tube.

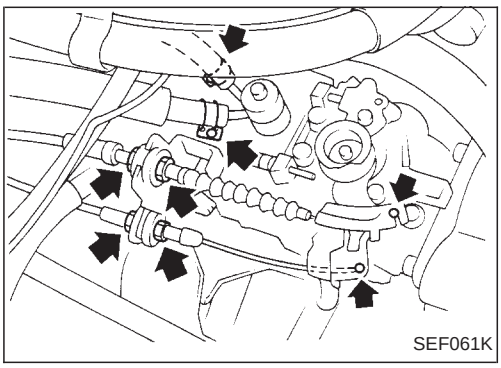
Cover the injection nozzle assembly with a plug to prevent dust entry.



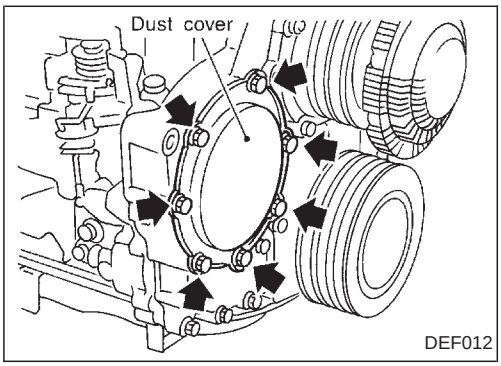
3. Disconnect fuel cut solenoid wire connector.



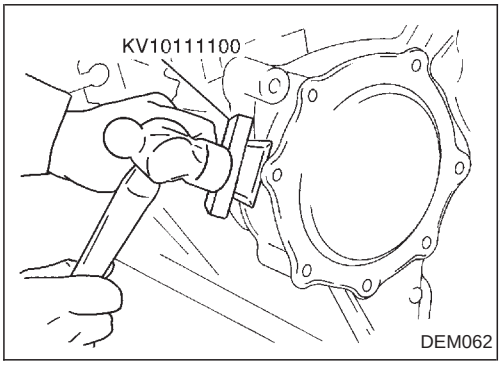
4. Remove accelerator wire and disconnect overflow hose, fuel inlet hose and fuel return hose.



Removal (Cont'd)

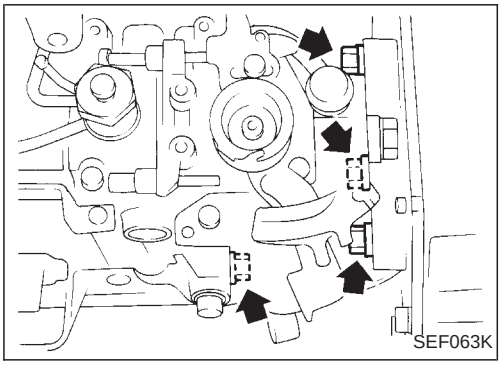


5. Remove injection pump drive gear cover.

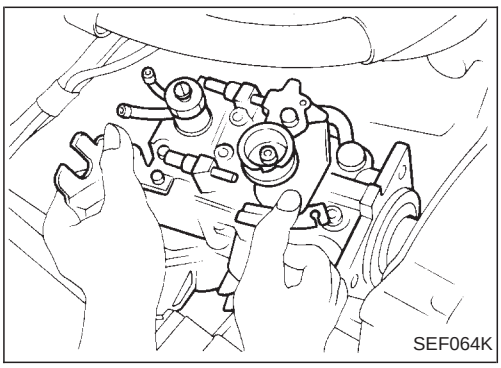


6. Loosen injection pump drive gear nut and remove drive gear by using puller.

7. Remove vacuum pump.
- Remove the eye bolt securing the oil tube. Remove the vacuum pump. Be careful not to bend the oil tube during vacuum pump removal.

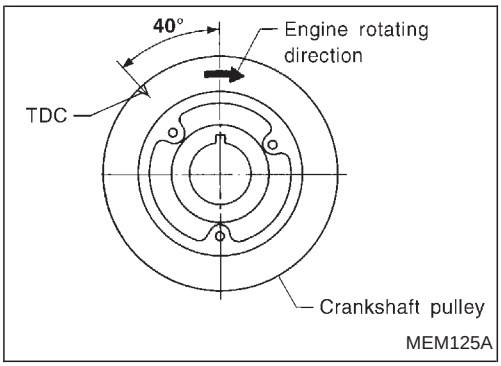


8. Remove injection pump fixing nuts and bolts.



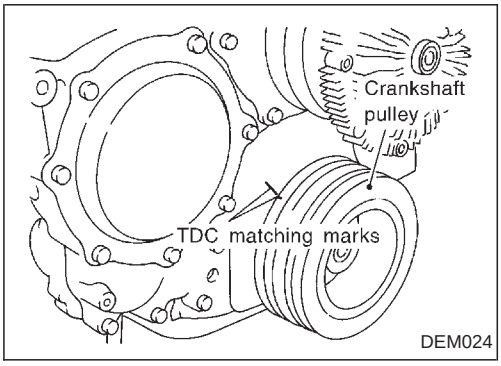
9. Remove injection pump with injection tubes.

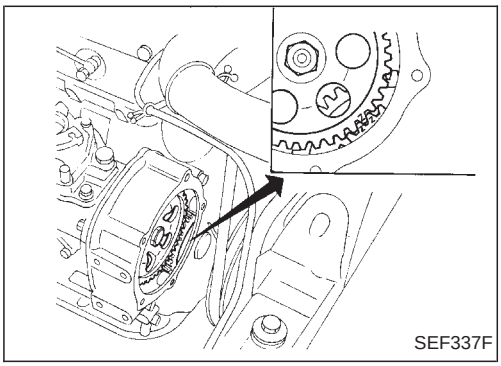
Disconnect injection tube from pump once it is removed.



Installation and Adjustment

1. Confirm that No. 1 piston is set at TDC on its compression stroke.



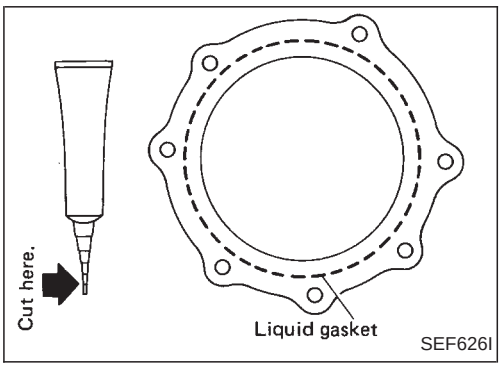


2. Install injection pump.
(1) Temporarily set injection pump so that the flange of pump is aligned with aligning mark on front cover.
(2) Install injection drive gear over the key.

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

Coat key with grease to prevent it from falling into the front cover. Make sure that "Z" marks are aligned.

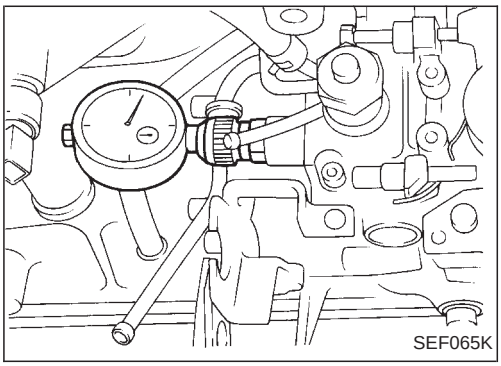
(3) Install drive gear cover while applying a continuous bead of liquid gasket.



- **Be sure liquid gasket is 2.5 to 3.5 mm (0.098 to 0.138 in) wide.**
- **Attach timing gear case cover to timing gear case within 5 minutes after coating.**
- **Wait at least 30 minutes before refilling engine oil.**
- **Use Genuine Liquid Gasket or equivalent.**

Installation and Adjustment (Cont'd)

PLUNGER LIFT ADJUSTMENT


SEF065K

1. Loosen injection pump mounting nuts and mounting bracket bolt.
2. Remove plug bolt from distributor head and install dial gauge.
3. Plunger lift measurement and adjustment
(1) Turn crankshaft counterclockwise 20 to 25 degrees from No. 1 piston at TDC.
(2) Find dial gauge's needle rest position at step (1) set position, then set the gauge to zero.
(3) Turn crankshaft clockwise until No. 1 piston is set at TDC.
(4) Read dial gauge indication.

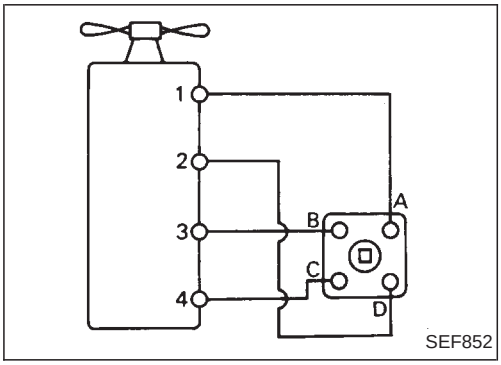
QD32:
0.42±0.02 mm (0.0165±0.0008 in)
TD27:
For Australia
0.71±0.02 mm (0.0280±0.0008 in)
For Hong Kong
0.51±0.02 mm (0.0201±0.0008 in)
Except for the above
0.65±0.02 mm (0.0256±0.0008 in)

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

a. If indication is smaller than the specified value, turn pump body counterclockwise.
b. If indication is larger than the specified value, turn pump body clockwise.

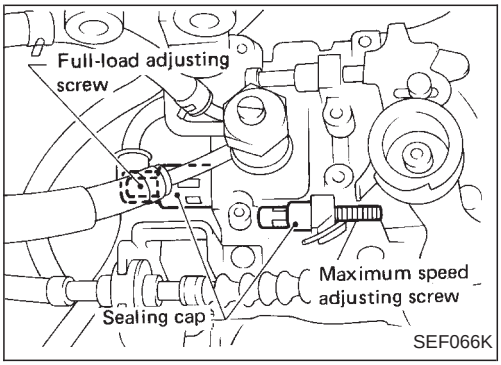
4. Tighten injection pump securely.

Injection pump fixing bolt:
: 20 - 25 N·m (2.0 - 2.5 kg-m, 14 - 18 ft-lb)
Injection pump to mounting bracket:
: 30 - 41 N·m (3.1 - 4.2 kg-m, 22 - 30 ft-lb)



SEF852

5. Disconnect dial gauge and reinstall plug bolt with new washer.
: 14 - 20 N·m (1.4 - 2.0 kg-m, 10 - 14 ft-lb)
6. Connect injection tubes.
Flare nut:
: 20 - 25 N·m (2.0 - 2.5 kg-m, 14 - 18 ft-lb)
7. Bleed air from fuel system.
Refer to EC-268.



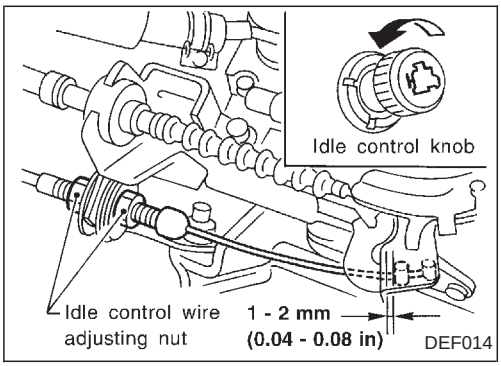
SEF066K

IDLE AND MAXIMUM SPEED ADJUSTMENT

CAUTION:

- **Do not remove sealing wires unless absolutely necessary.**
- **Disturbing full-load adjusting screw will change fuel flow characteristics, resulting in an improperly adjusted engine. Readjustment of fuel injection pump should be done using a pump tester.**
- **If maximum speed adjusting screw is turned in direction that increases control lever angle, engine damage may result.**

Installation and Adjustment (Cont'd)

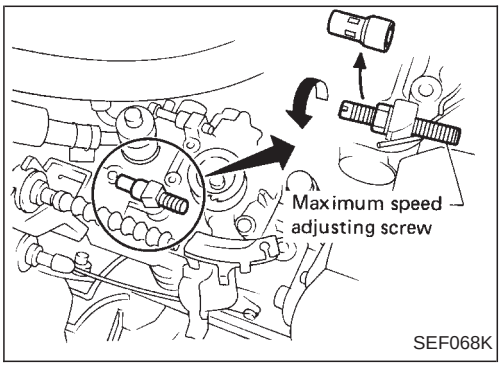


Throttle control wire adjustment

1. Turn idle control knob fully counterclockwise.
2. Make sure that clearance between idle control lever pin and fuel injection pump control lever is within the specified range.
   Clearance:
   1 - 2 mm (0.04 - 0.08 in)
3. If not within the specified range, adjust with idle control wire adjusting nut.
4. After adjusting clearance, tighten lock nut.

Idle adjustment

Refer to "Checking Idle Speed", "ENGINE MAINTENANCE" in MA section.



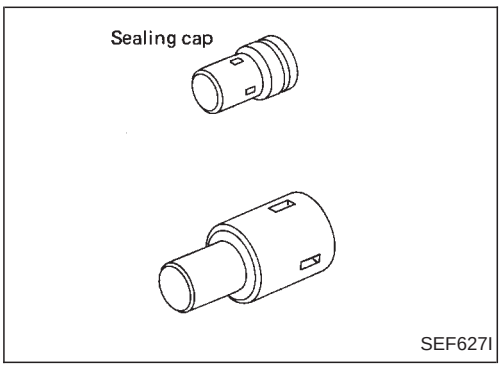
Maximum speed adjustment

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

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

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

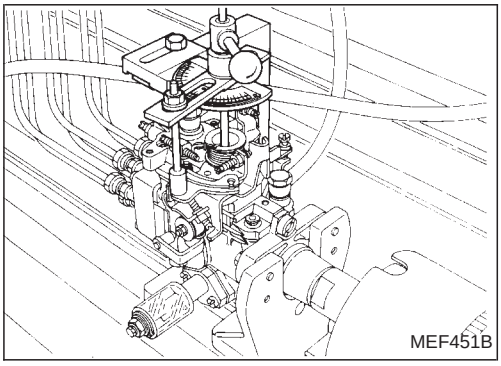
3. Depress accelerator pedal fully under no load and, at this point, read the tachometer indication.
   Maximum engine speed (Under no load):
   QD32
   4,700±100 rpm
   TD27
   $5{,}100^{+50}_{-150}$ rpm



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

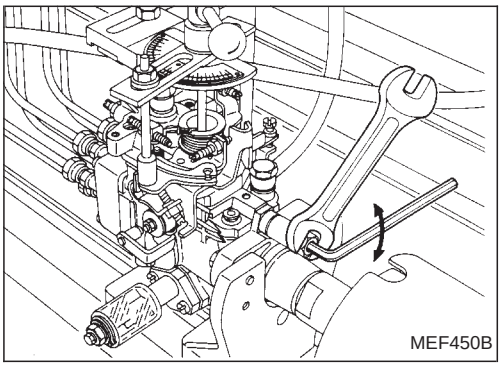
Disassembly

Refer to "VE INJECTION PUMP" in EF section of Service Manual for TD series diesel engine (1st Revision).


MEF451B

Load Timer Adjustment

1. After adjusting the timer stroke, find the control lever position where the injection quantity is as specified and then fix the control lever using the adjusting device (KV11282617).


MEF450B

2. Run the injection pump at the specified speed and then adjust the governor shaft installation position so that the timer stroke is as specified.
   Refer to "Injection Pump Calibration Standard" in SDS for the timer stroke.

Start Q Adjustment Lever

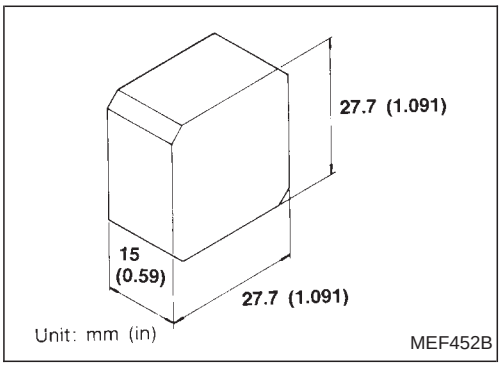
DISASSEMBLY

1. Attach injection pump to bracket using two bolts.
2. Remove start Q adjustment lever by removing nut after marking the installation position.
3. Remove nut and washer from the tip of lever shaft and then remove start Q adjustment lever, spring, washer and O-ring.
4. Remove lever shaft and washer from the inside of governor cover.

INSPECTION

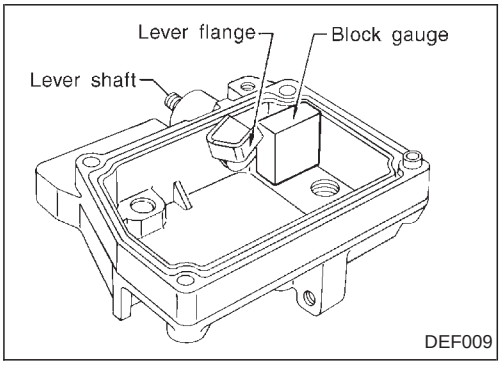
1. Check that lever shaft's sliding surface is not worn, scratched or damaged excessively and that lever shaft's flange is not bent, worn or damaged excessively.
   Replace lever shaft it defective.
2. Inspect the other parts carefully. If they are damaged, worn, rusted or bent excessively they must be replaced.

Start Q Adjustment Lever (Cont'd)

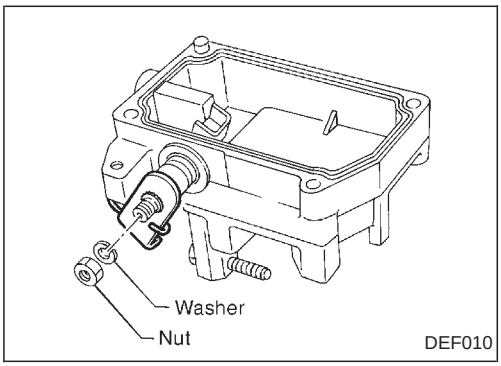


REASSEMBLY

During reassembly of a fuel injection pump equipped with start Q adjustment lever, a block gauge must be used to determine the start Q adjustment lever installation position.

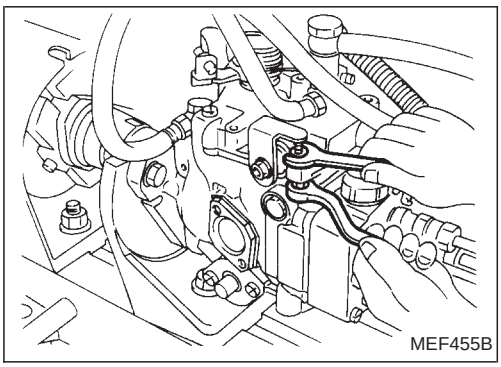


1. Using block gauge, ensure that the distance from the inside face of cover to the tip of lever flange is 27.7 mm (1.091 in). Maintain lever shaft in this position.



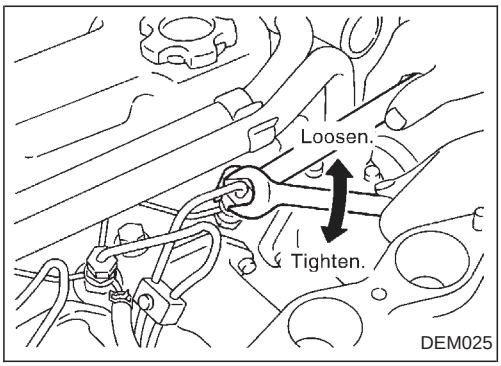
2. Install start Q adjustment lever on lever shaft so that start Q adjustment lever contacts (or almost contacts) the under side of the adjusting bolt base.
   Then, fix start Q adjustment lever on lever shaft using washer and nut.

If start Q adjustment lever cannot be installed as described above, use start Q adjustment lever with differently phased serrations.



ADJUSTMENT

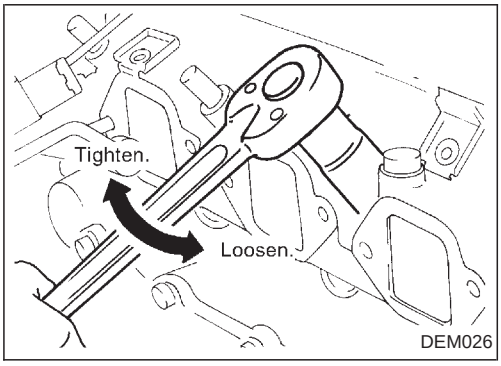
Adjust adjusting bolt on the normal operating side so that the starting injection quantity is as specified.
Refer to "Injection Pump Calibration Standard" in SDS for the starting injection quantity.



Removal and Installation

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

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



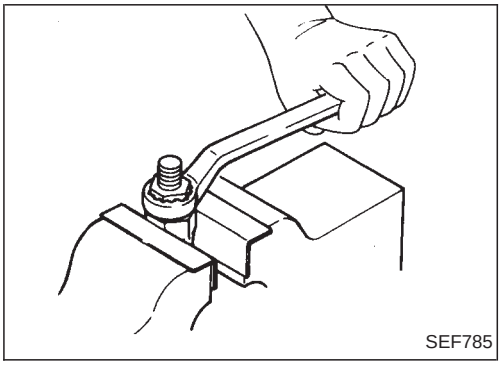
3. Remove injection nozzle assembly using deep socket wrench.
4. Install injection nozzle in the reverse order of removal.

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

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

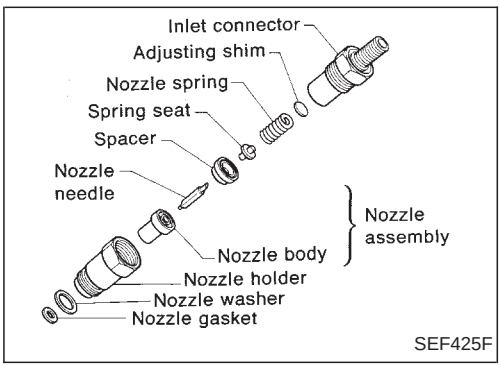
5. Bleed air from fuel system.

Refer to "Bleeding Fuel System", EC-268.



Disassembly

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



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

Inspection

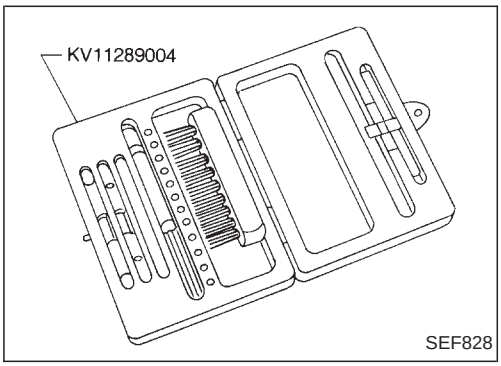
Thoroughly clean all disassembled parts with fresh kerosene or solvent.

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

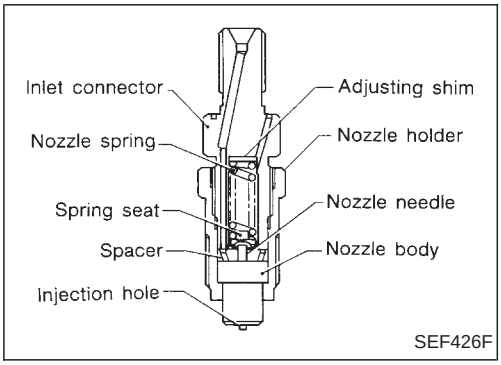
Cleaning

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.

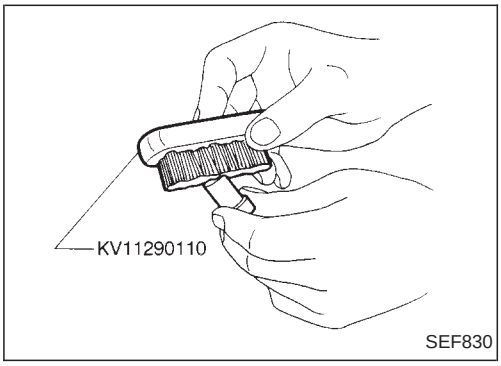
1. Clean nozzle assembly using the Nozzle Cleaning Kit.



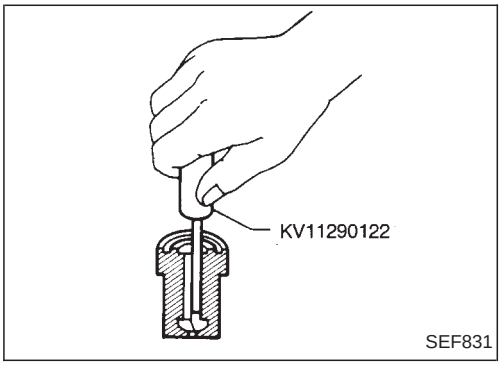
2. Portions which should be cleaned are indicated in the left figure.



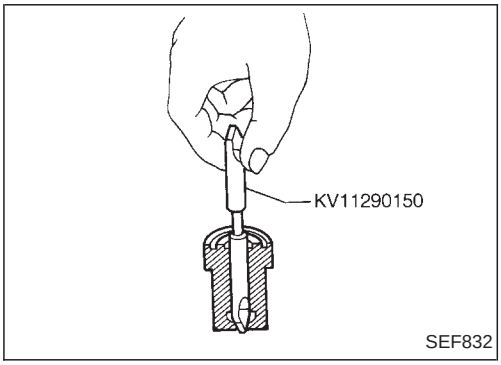
3. Remove any carbon from exterior of nozzle body (except wrapping angle portion) by using Tool.



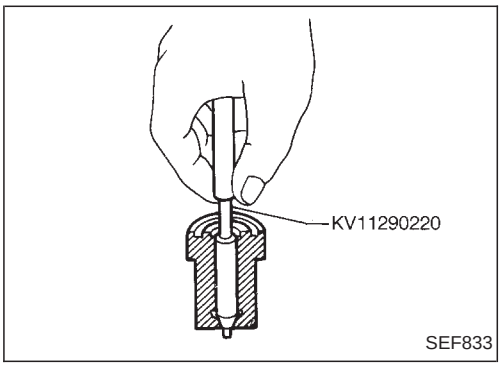
Cleaning (Cont'd)



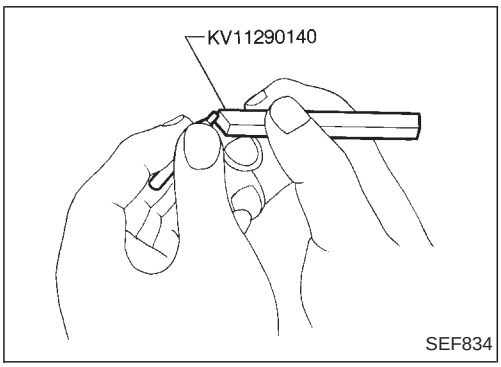
4. Clean fuel sump of nozzle body using Tool.



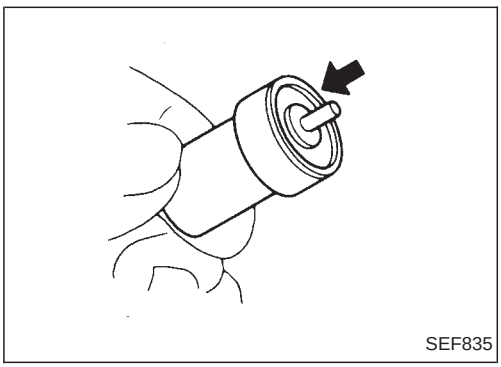
5. Clean nozzle seat by using Tool.
This job should be performed with extra precautions, since efficiency of nozzle depends greatly on a good nozzle seat.



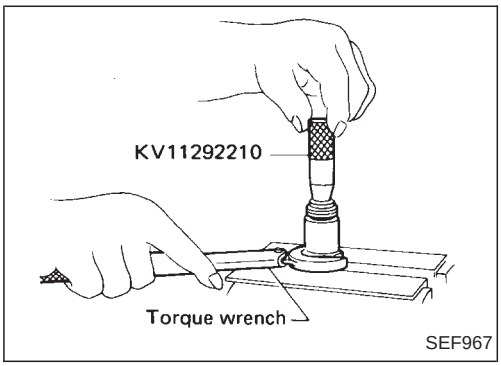
6. Clean spray hole of nozzle body by using Tool.
To prevent spray hole from canting, always clean it by starting with inner side and working towards outside.



7. Decarbon nozzle needle tip by using Tool.



8. Check needle for proper position.
(1) Pull needle about halfway out from body and then release it.
(2) Needle should sink into body very smoothly from just its own weight.
(3) Repeat this test and rotate needle slightly each time.
If needle fails to sink smoothly from any position, replace both needle and body as a unit.



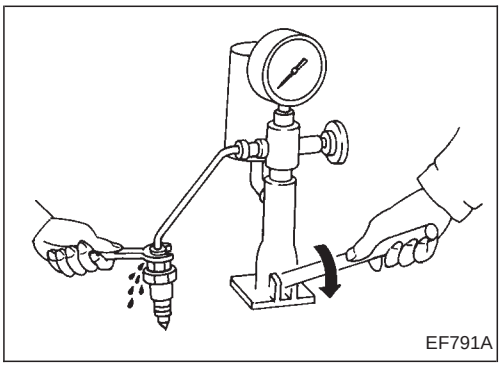
Assembly

Assemble in the reverse order of disassembly.

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

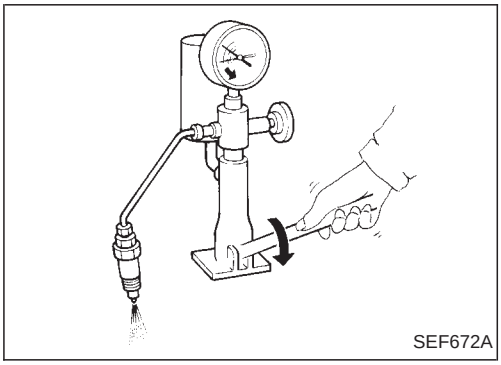
Test and Adjustment

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



INJECTION PRESSURE TEST

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

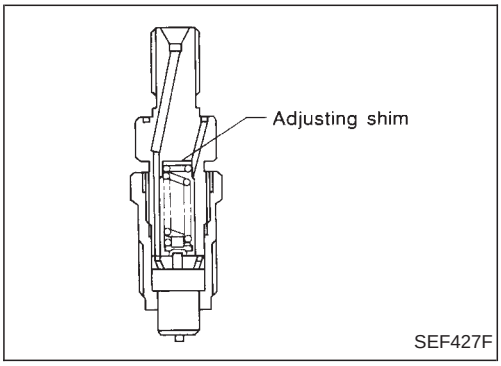


2. Pump the tester handle slowly (one time per second) and watch the pressure gauge.
3. Read the pressure gauge when the injection pressure just starts dropping.

Initial injection pressure:

Used	**9,807 - 10,297 kPa (98.1 - 103.0 bar, 100 - 105 kg/cm^2, 1,422 - 1,493 psi)**
New	**10,297 - 11,278 kPa (103.0 - 112.8 bar, 105 - 115 kg/cm^2, 1,493 - 1,635 psi)**

Always check initial injection pressure using a new nozzle.



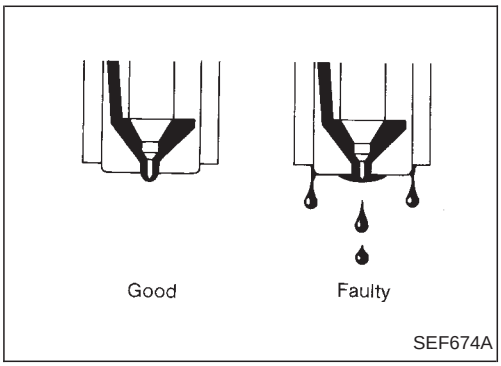
4. To adjust injection pressure, change adjusting shims.

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.

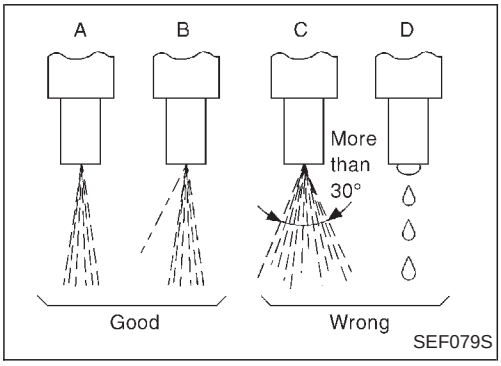
Refer to "Injection Nozzle" in SDS for adjusting shims, EC-310.

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 dripping from the nozzle tip or around the body.
3. If there is leakage, clean, overhaul injection nozzle or replace it.



SPRAY PATTERN TEST

1. Check spray pattern by pumping tester handle one full stroke per second.

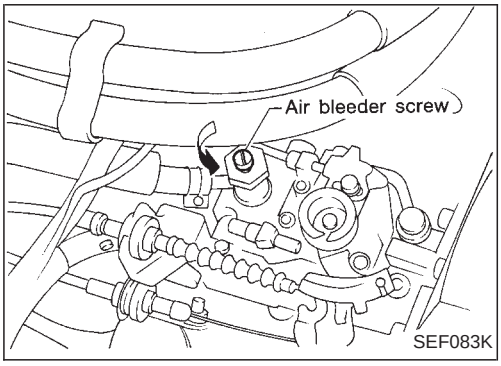
a. If main spray angle is within 30 degrees as shown, injection nozzle is good.

b. It is still normal even if a thin stream of spray deviates from main spray (pattern B).

2. If injection nozzle is not normal, adjust or clean injection nozzle or replace it.

Bleeding Fuel System

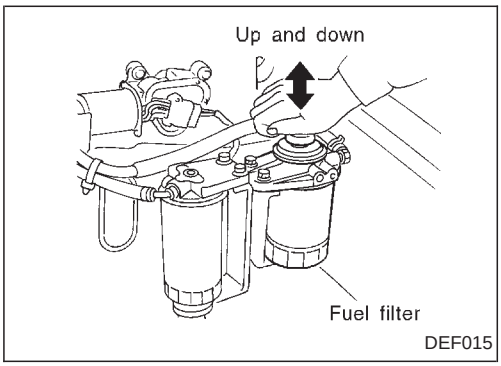
Air should be bled out of fuel system when injection pump is removed or fuel system is repaired.
Protect pump and engine mounts from fuel splash with rags.
If engine will not start after bleeding air, loosen injection tubes at nozzle side and crank engine until fuel overflows from injection tube. Tighten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

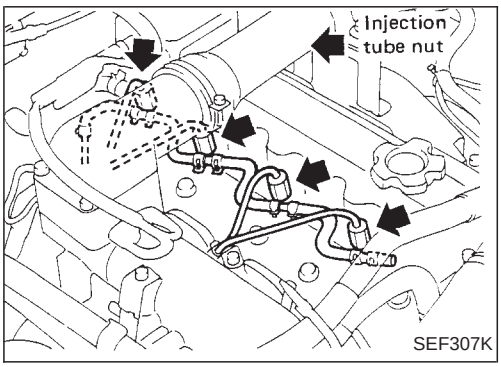


CAUTION:
Wipe up any fuel discharged while bleeding air during each step.

- **Step 1: Fuel filter and injection pump bleeding**

1. Loosen air bleeder screw to injection pump.
2. Move fuel filter priming pump up and down until no further air comes out of air bleeder screw.
3. Tighten air bleeder screw.



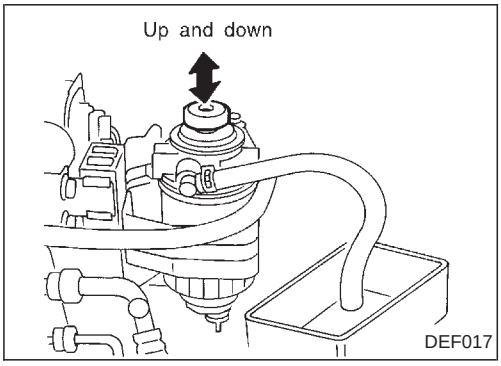


- **Step 2: Fuel injection tube and spill tube air bleeding**

1. Loosen injection tube nuts on nozzle holder side.
2. Move the priming pump up and down until no further air comes out of the injection tube nuts.
3. Tighten the injection tube nuts.
   : 20 - 25 N·m (2.0 - 2.5 kg-m, 14 - 18 ft-lb)

Bleeding Fuel Filter

1. Move the priming pump up and down to bleed air from the fuel filter.
2. When air is completely bled from the fuel pump, priming pump operation becomes noticeably heavy. Stop pump operation.



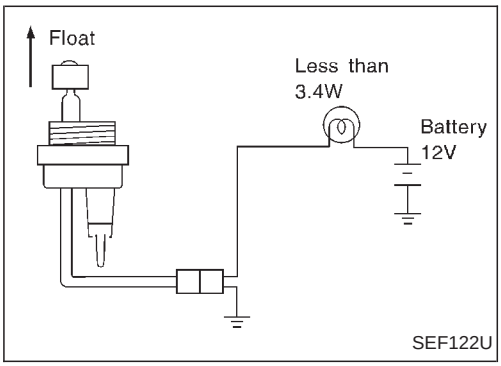
Checking Priming Pump

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

1. Disconnect fuel return hose.

Place a suitable container beneath hose end.

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

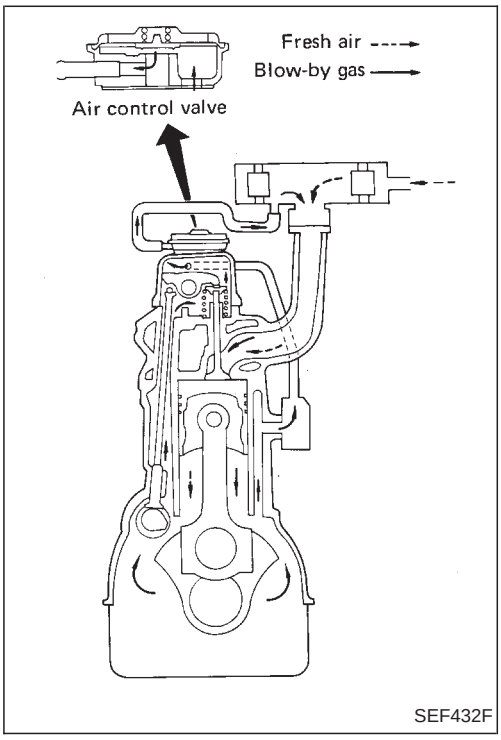


Checking Fuel Filter Switch

1. Remove the connector from filter and fuel filter switch.
2. Turn the key switch “ON”. Lift the float to ensure that the warning lamp turns on.

Fuel filter switch tightening torque:
: 3.9 - 5.9 N·m (0.4 - 0.6 kg-m, 35 - 52 in-lb)

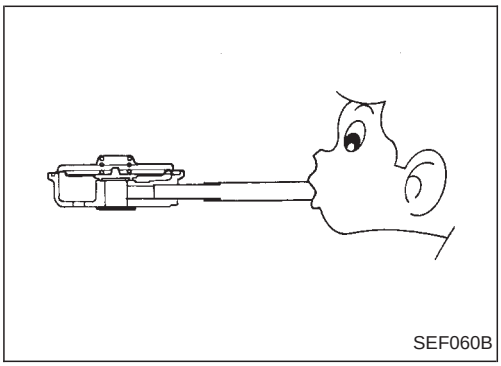
Discard the old O-ring and replace it with a new one.



SEF432F

Description

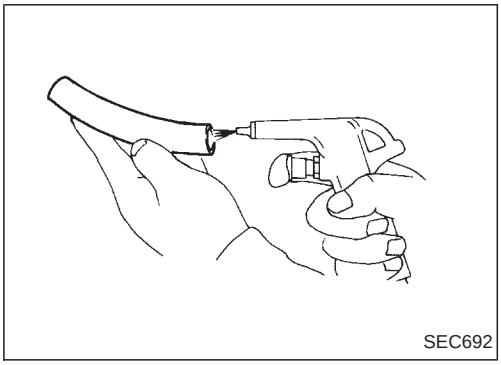
The closed-type crankcase ventilation system is utilized as a crankcase emission control system.
The closed-type crankcase emission control system prevents blow-by gas from entering the atmosphere and keeps the internal crankcase pressure constant.
During the valve operation, the blow-by gas is fed into the intake manifold by the air control valve.
This is activated by the internal rocker cover pressure. When the intake air flow is restricted by the throttle body, the internal rocker cover pressure decreases. At this point, the crankcase emission control valve keeps the internal rocker cover pressure constant so that air or dust is not sucked in around the crankshaft oil seal.


SEF060B

Inspection

AIR CONTROL VALVE

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

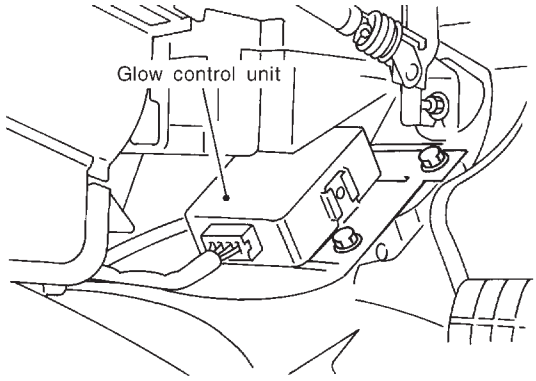

SEC692

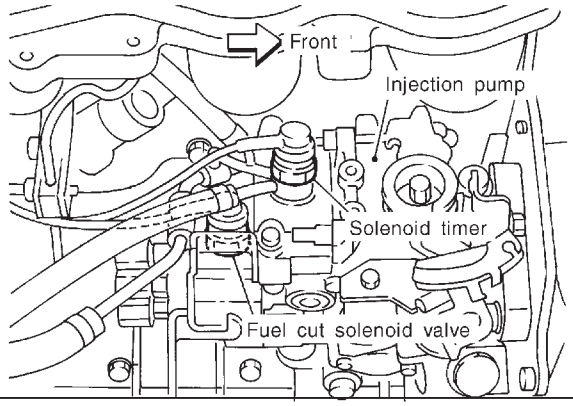
VENTILATION HOSE

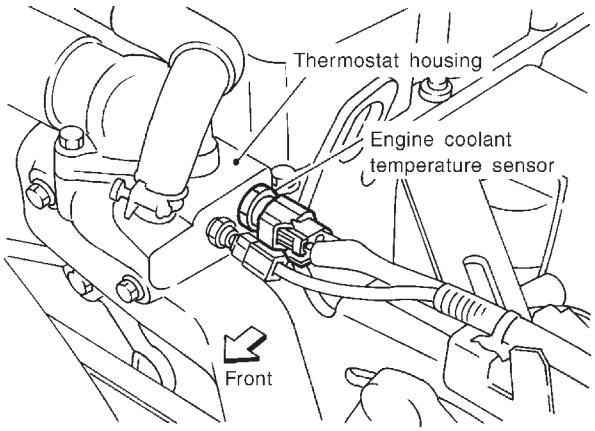
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air.
   If any hose cannot be freed of obstructions, replace.

Component Parts Location

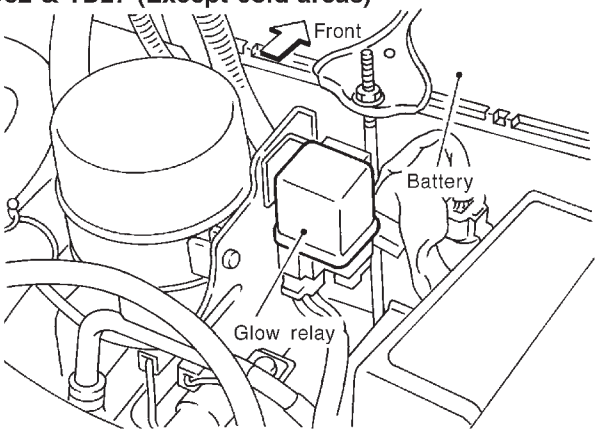
Under instrument panel



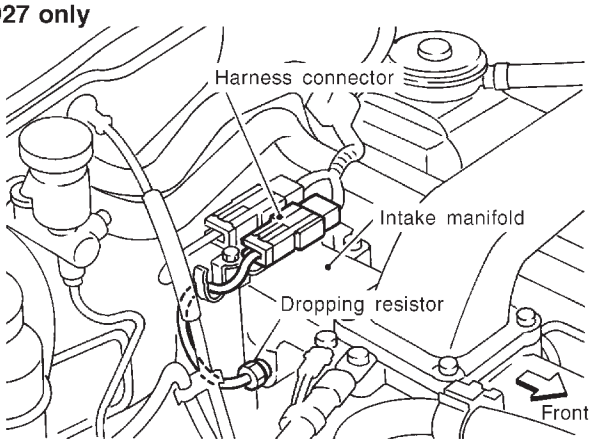




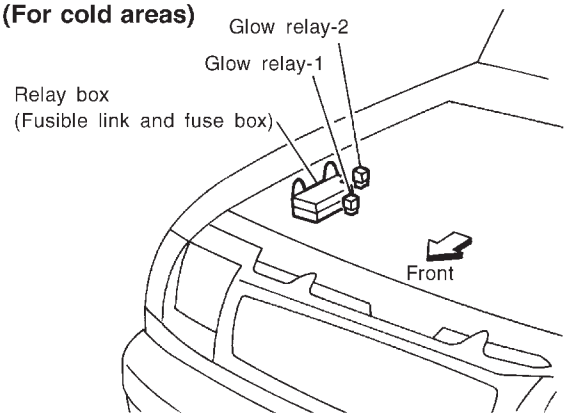
QD32 & TD27 (Except cold areas)



TD27 only



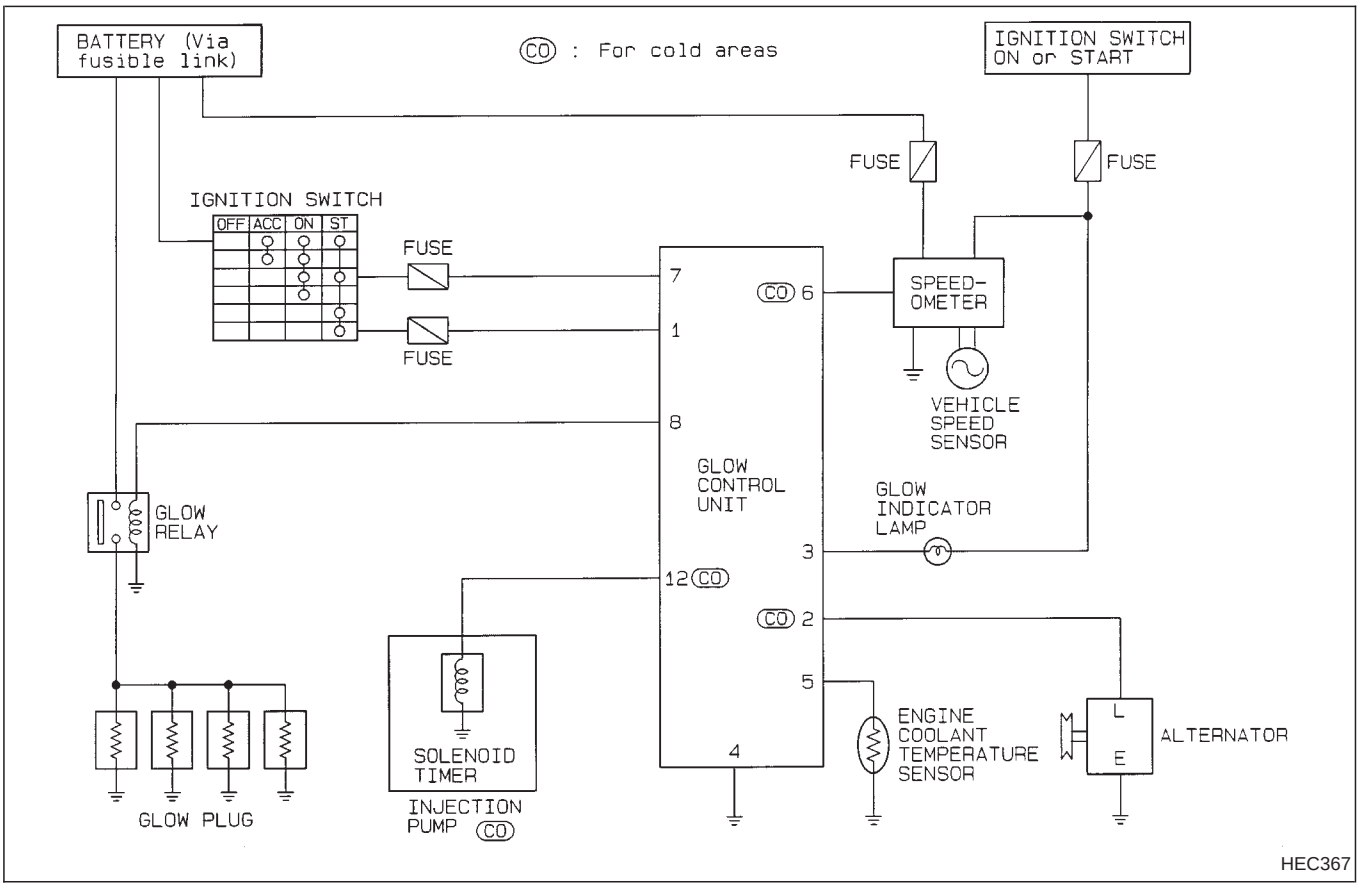
TD27 (For cold areas)



DEF030

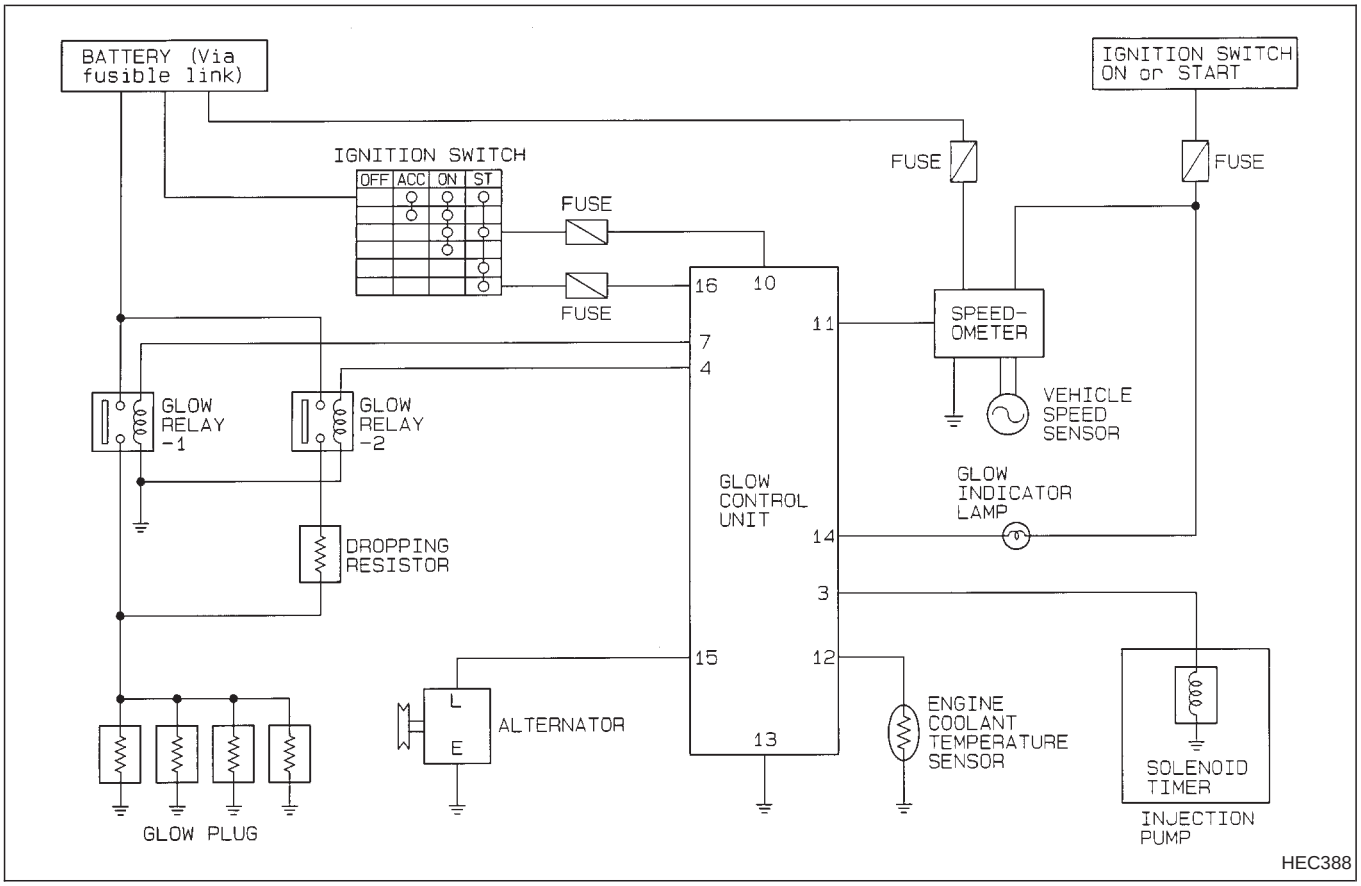
Circuit Diagram

QD ENGINE

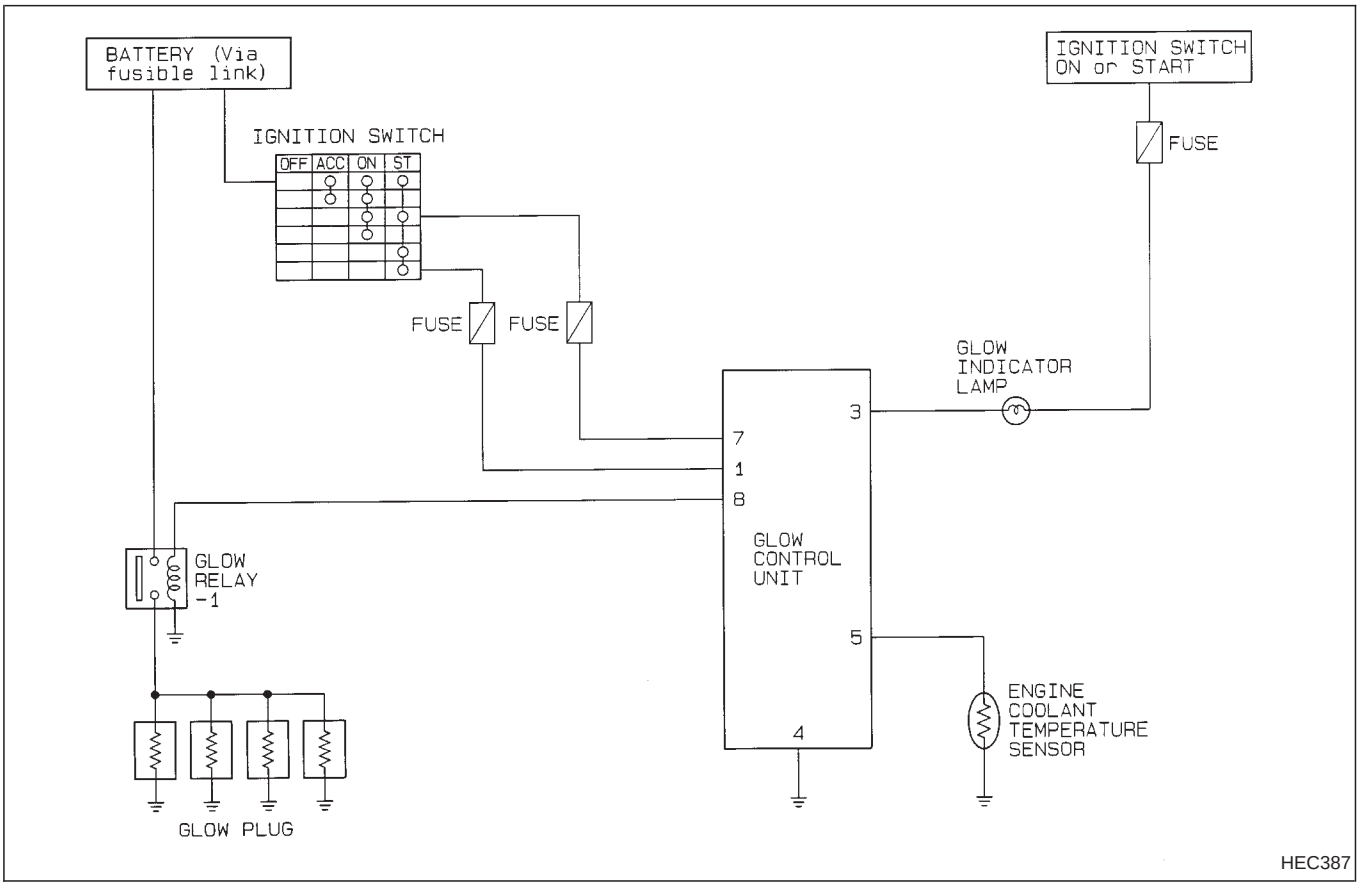


Circuit Diagram (Cont'd)

TD ENGINE FOR COLD AREAS

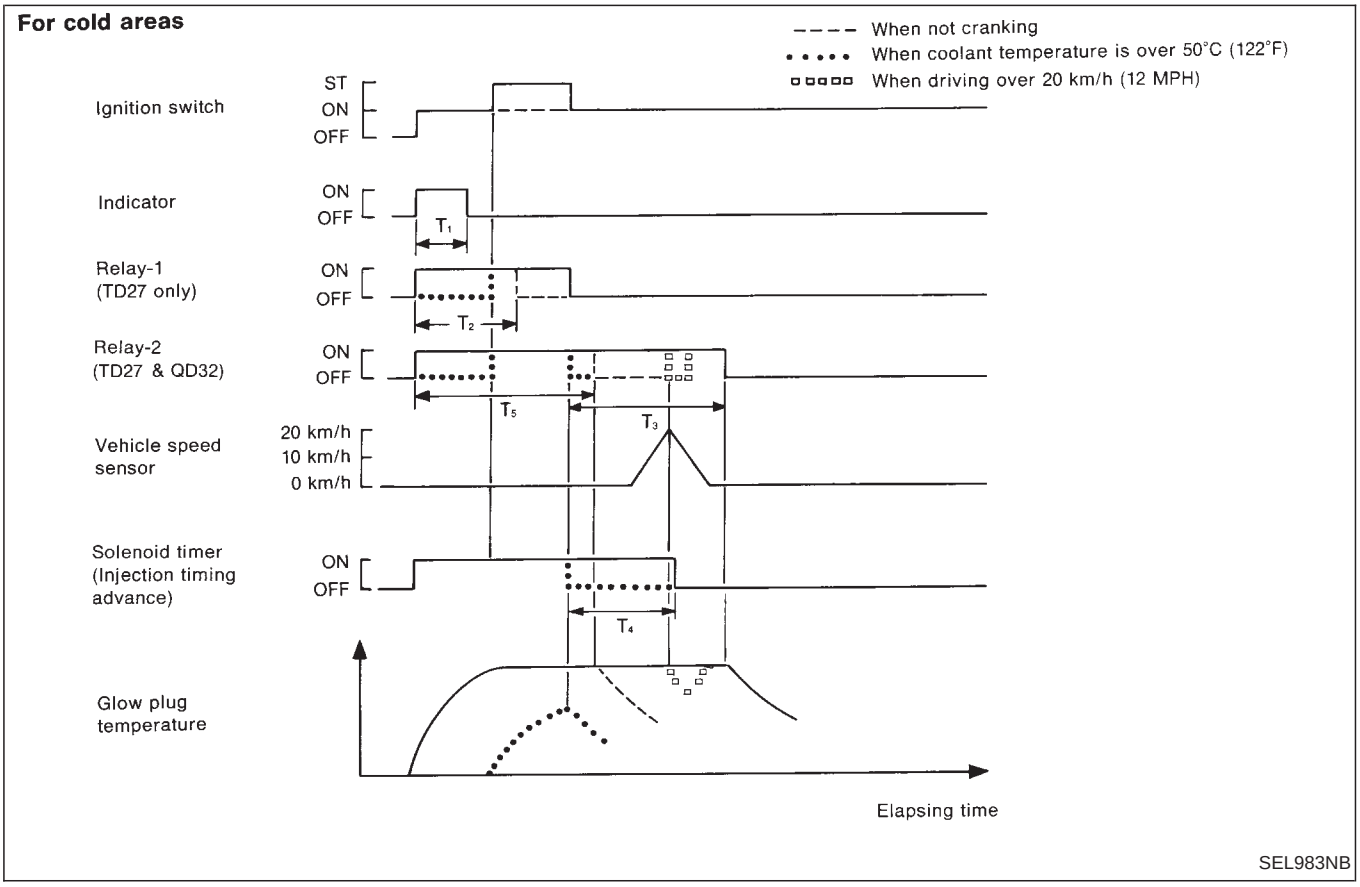


TD ENGINE EXCEPT FOR COLD AREAS



Description

QD AND TD ENGINES



When coolant temperature is lower than 50°C (122°F), the relay-1 and the relay-2 are turned on at the same time that the ignition switch is turned on. From this time, the electric current flows through the glow plugs and heats them up quickly. After T_1 seconds have passed, the control unit turns off the indicator. The relay-1 automatically turns off after it has been on for T_2 seconds or the cranking time, whichever is longer.
The solenoid timer (for advance injection timing) is turned on at the time that the ignition switch is turned to "ON". The relay-2 remains on for T_3 seconds and the solenoid timer remains on for T_4 seconds after the ignition switch has returned to "ON" from "START". The solenoid timer advances injection timing. These features improve the combustion performance of the engine after it has started.
When the coolant temperature is higher than 50°C (122°F), the relay-2 is turned on only during engine cranking for TD27 engine.
When the coolant temperature is higher than 10°C (50°F), the solenoid timer is turned on only during engine cranking.

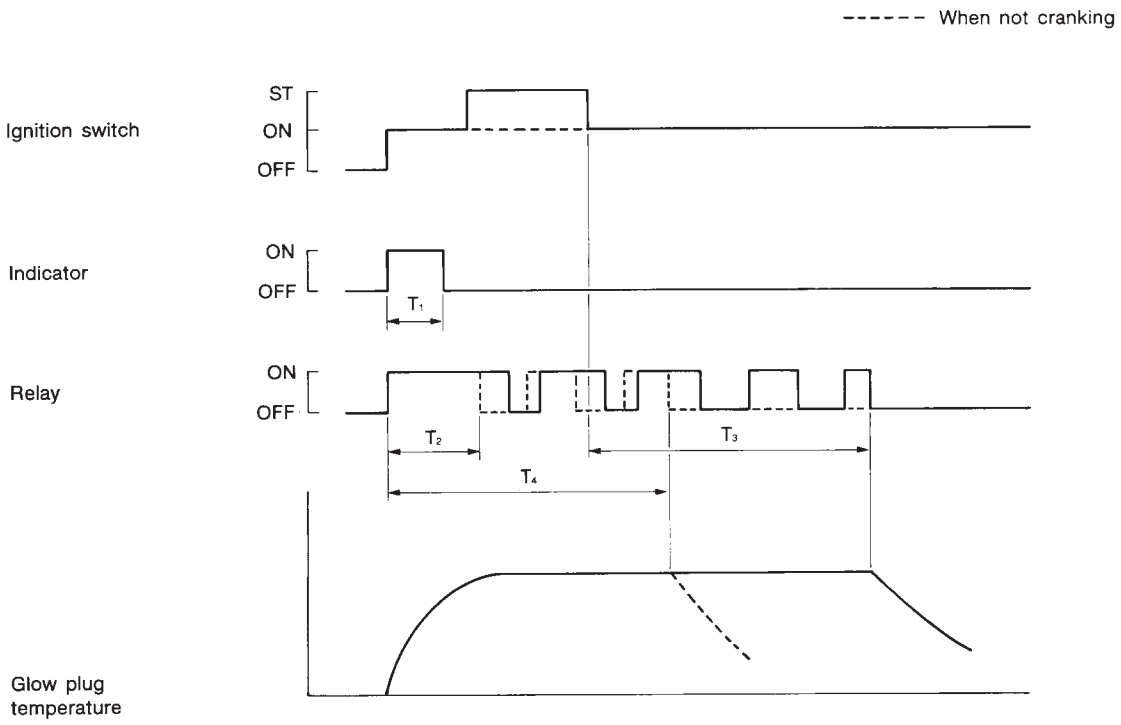
T_1: approx. 2 - 6	[sec.]	(Varies with coolant temperature.)
T_2: approx. 4 - 8	[sec.]	(Varies with coolant temperature.)
T_3: 600	[sec.]	[When coolant temperature is below 50°C (122°F).]
0	[sec.]	[When coolant temperature is over 50°C (122°F).]
T_4, T_5*1: 30	[sec.]	[When coolant temperature is below 10°C (50°F).]
0	[sec.]	[When coolant temperature is over 10°C (50°F).]
T_5*2: 30	[sec.]	[When coolant temperature is below 50°C (122°F).]
5	[sec.]	[When coolant temperature is over 50°C (122°F).]

*1: For TD27 *2: For QD32

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

Description (Cont'd)

Except for cold areas



SEL337JB

When the ignition switch is turned on, the relay is turned on and the electric current flows through the glow plugs and heats them up quickly. After T_1 seconds have passed, the control unit turns off the glow indicator but the relay remains on. The relay chops intermittently the electric current when the ignition switch turns to "START" from "ON".
The relay chops intermittently the electric current for T_3 seconds after the ignition switch has returned to "ON" from "START". When not cranking, the relay chops intermittently the electric current while T_4 - T_2 seconds after the ignition switch has turned to "ON" from "OFF".

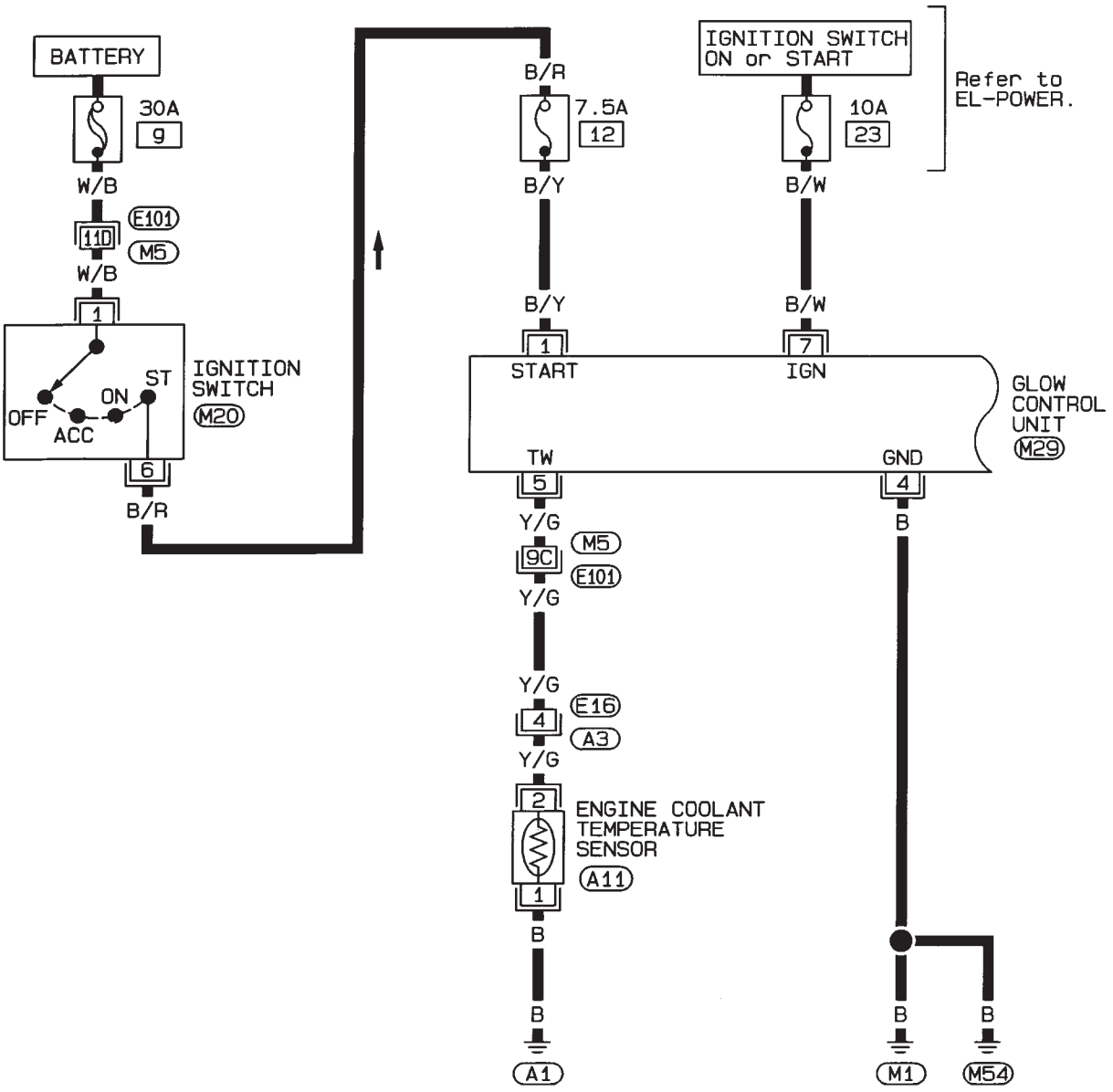
T_1: approx. 2 - 6 [sec.] (Varies with coolant temperature.)
T_2: approx. 4 - 8 [sec.] (Varies with coolant temperature.)
T_3, T_4: 15 [sec.] [When coolant temperature is below 50°C (122°F).]
2 [sec.] [When coolant temperature is over 50°C (122°F).]

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

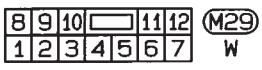
Wiring Diagram

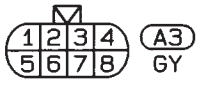
QD ENGINE (LHD)

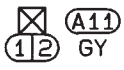
EC-GLOW-01











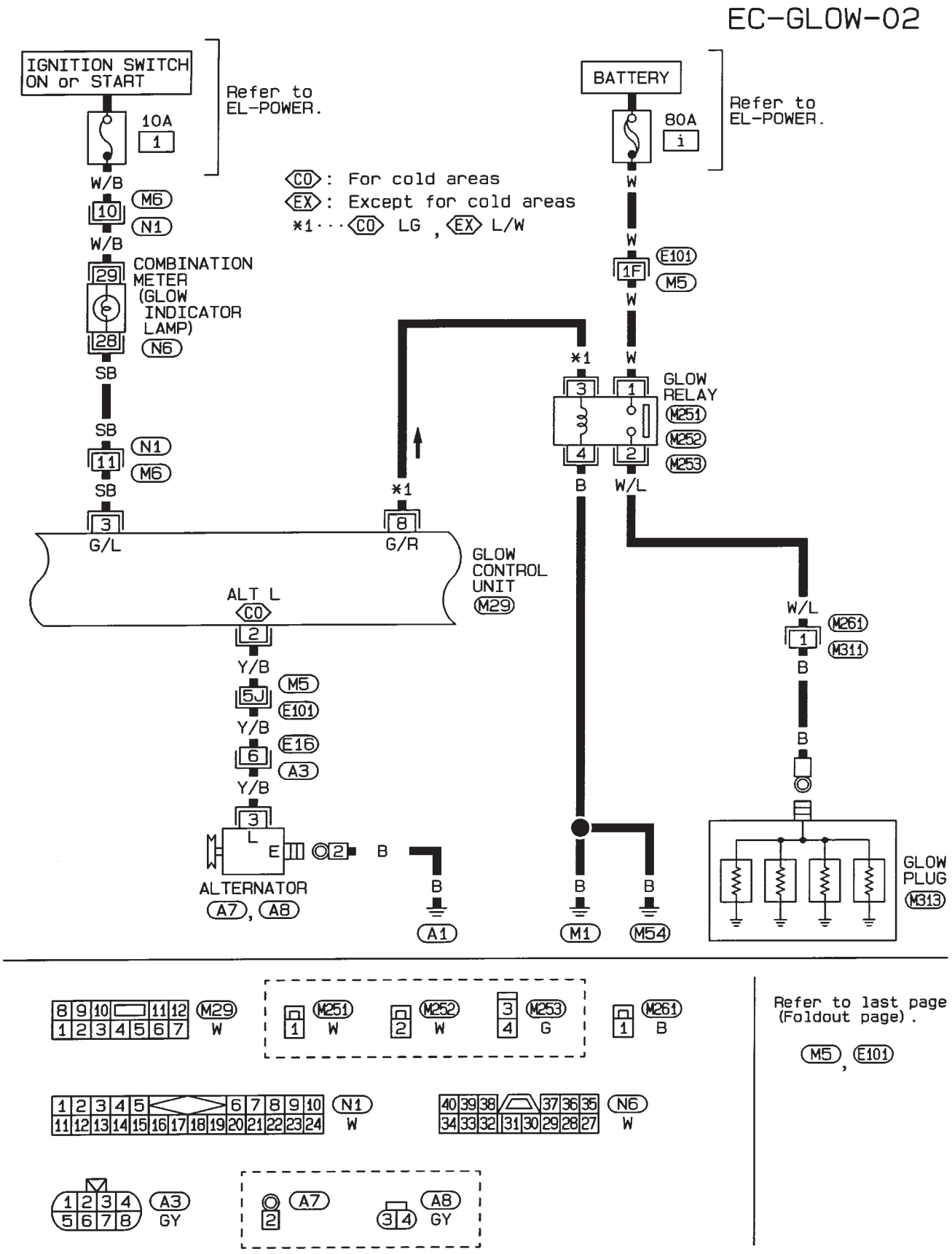
Refer to last page (Foldout page).

M5, E101

HEC368

Wiring Diagram (Cont'd)

QD ENGINE (LHD)

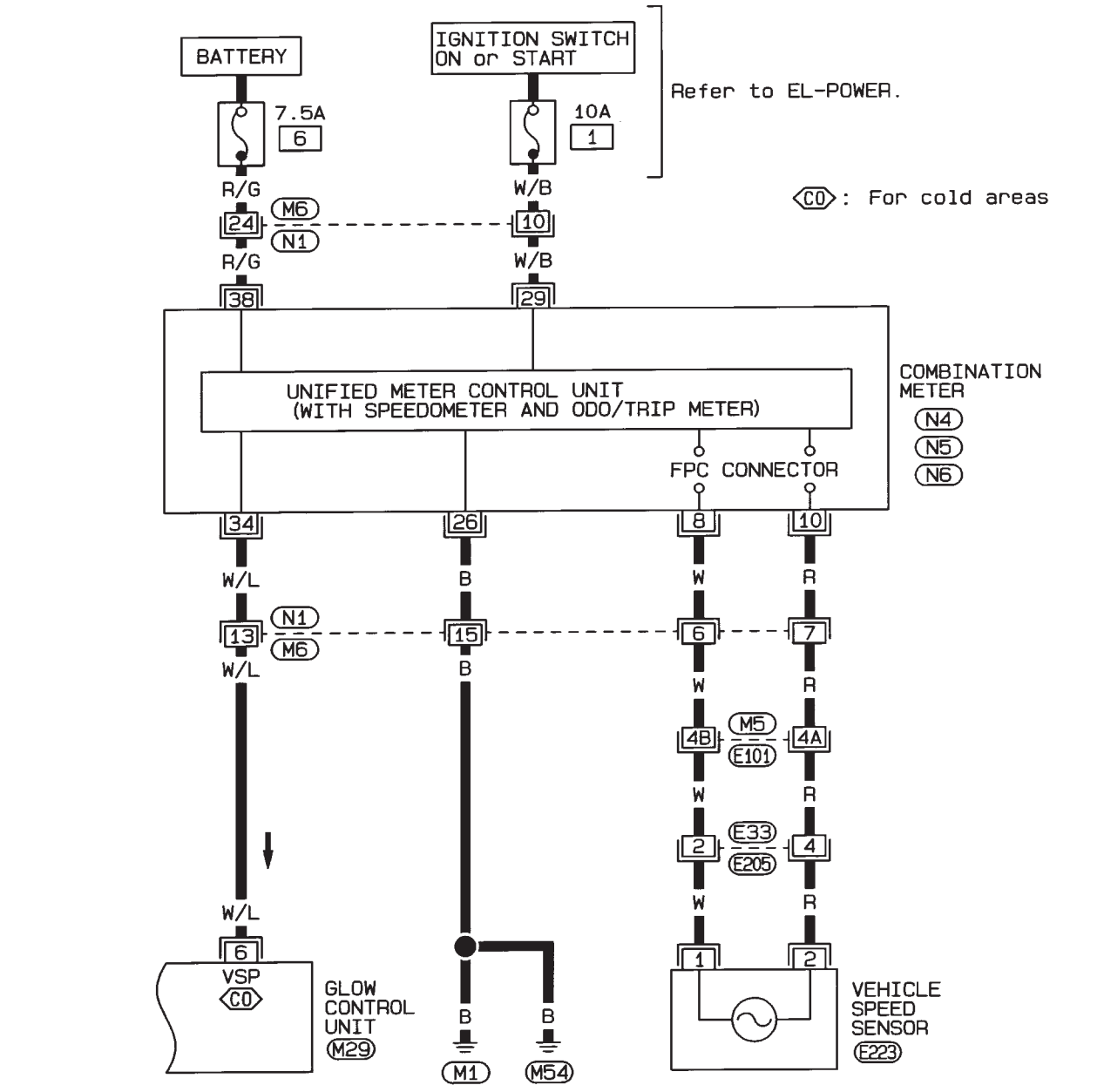


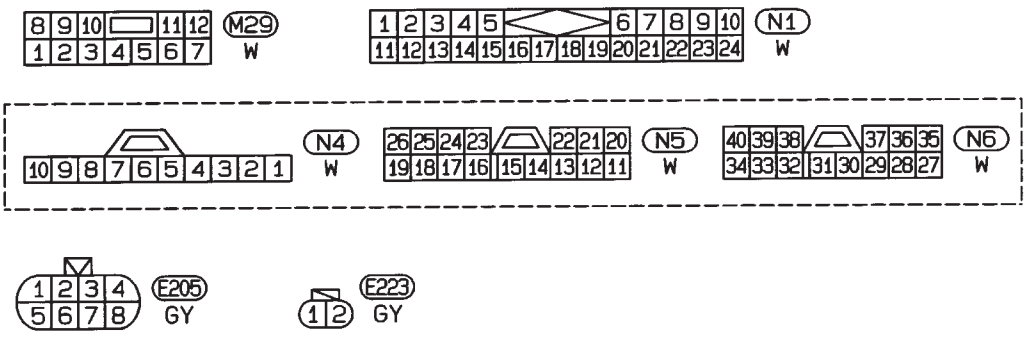
HEC369

Wiring Diagram (Cont'd)

QD ENGINE (LHD)

EC-GLOW-03



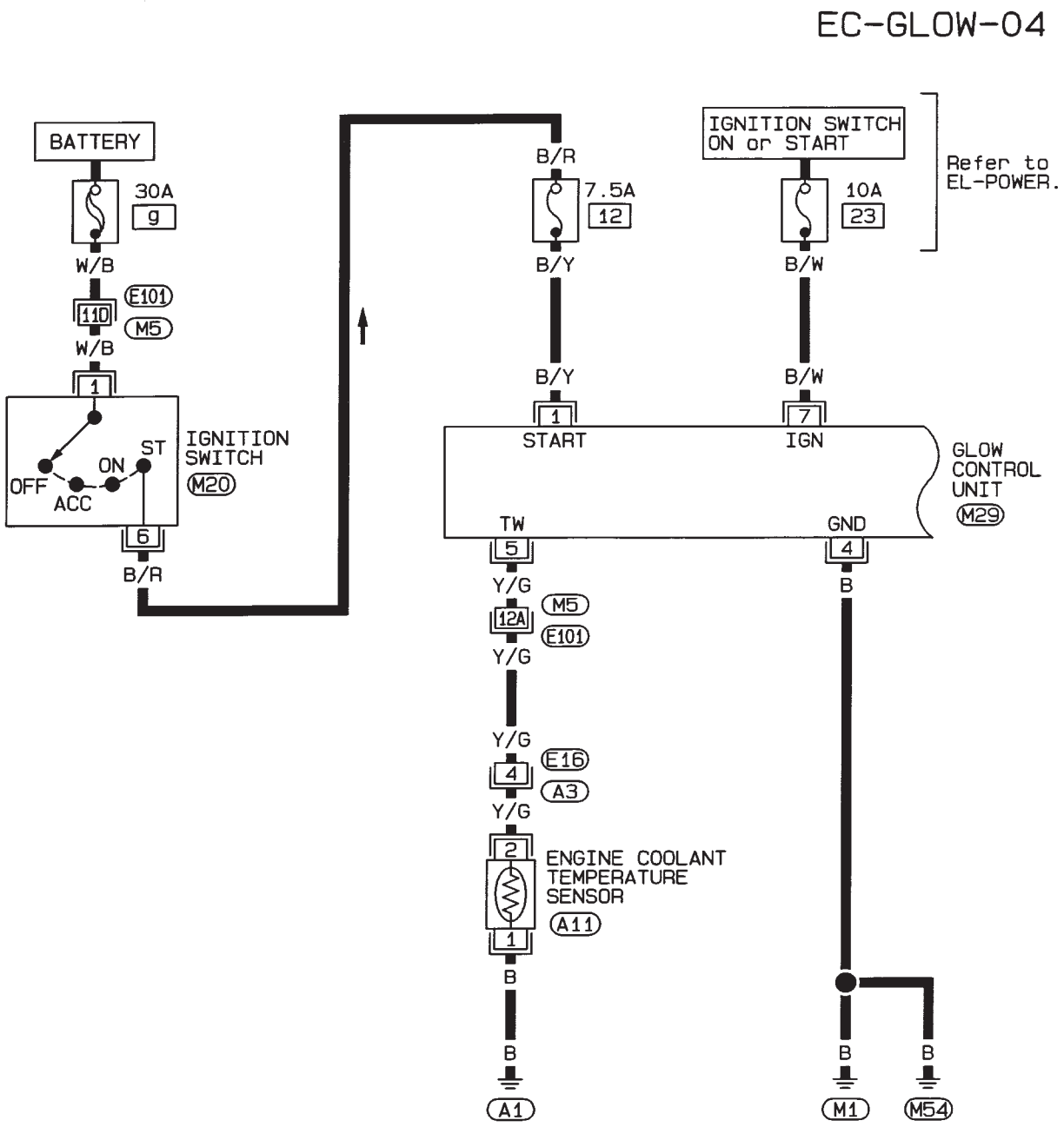


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M5, E101

HEC409

Wiring Diagram (Cont'd)

QD ENGINE (RHD)





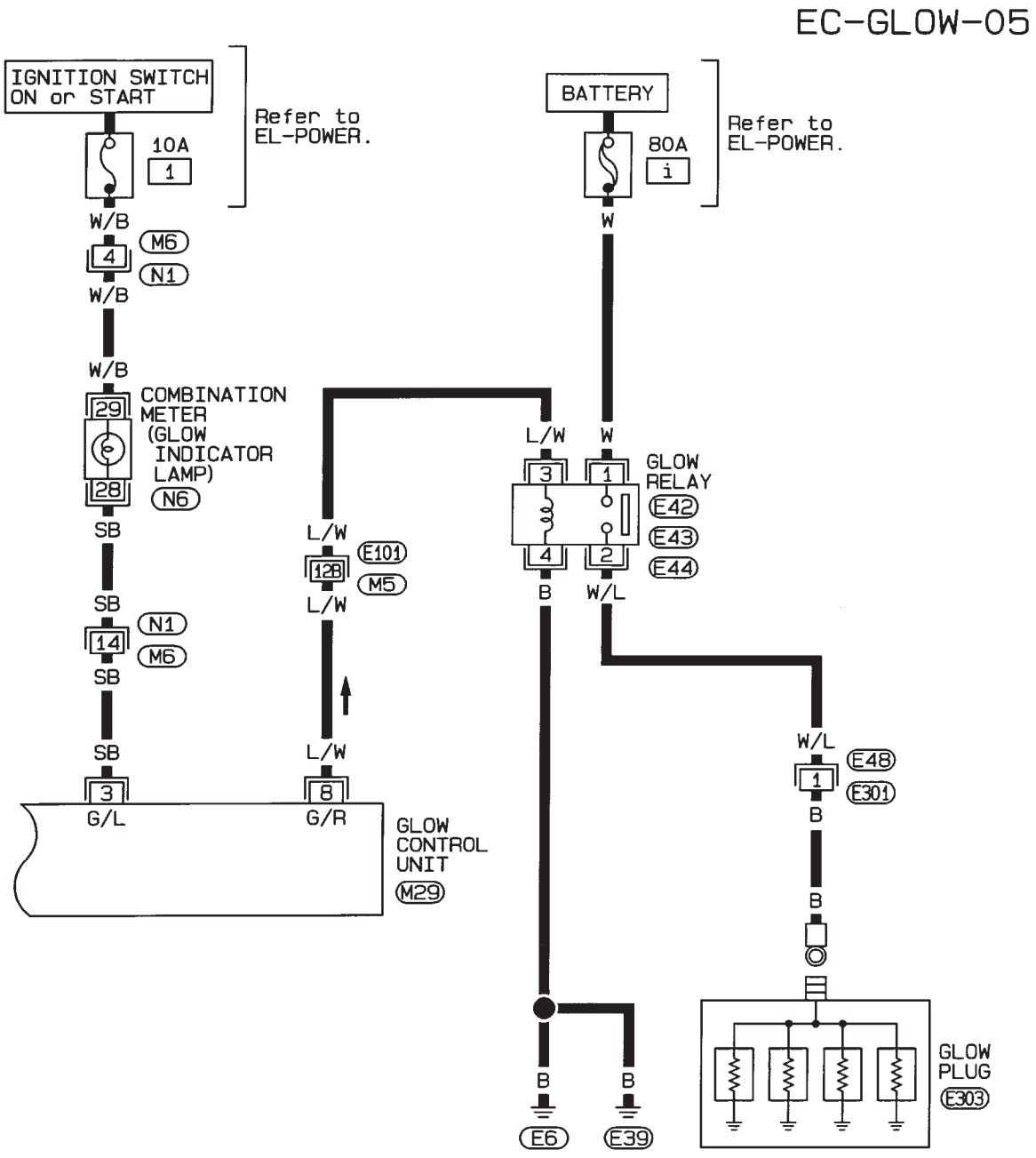
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M5, E101

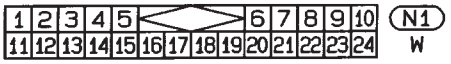
HEC370

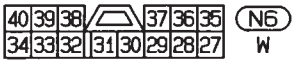
Wiring Diagram (Cont'd)

QD ENGINE (RHD)









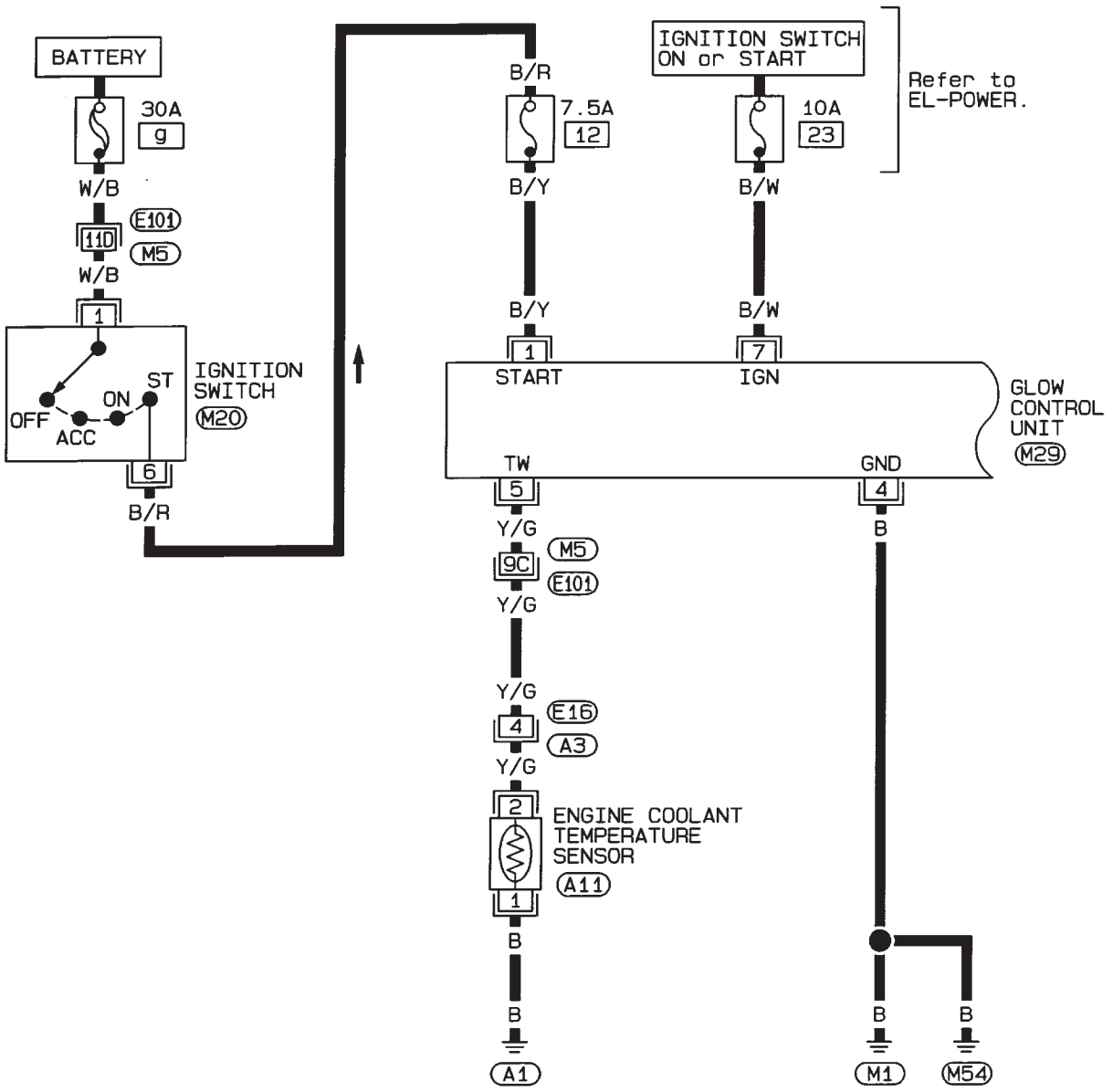
Refer to last page (Foldout page).
M5, E101

HEC371

Wiring Diagram (Cont'd)

TD ENGINE EXCEPT FOR COLD AREAS (LHD)

EC-GLOW-06





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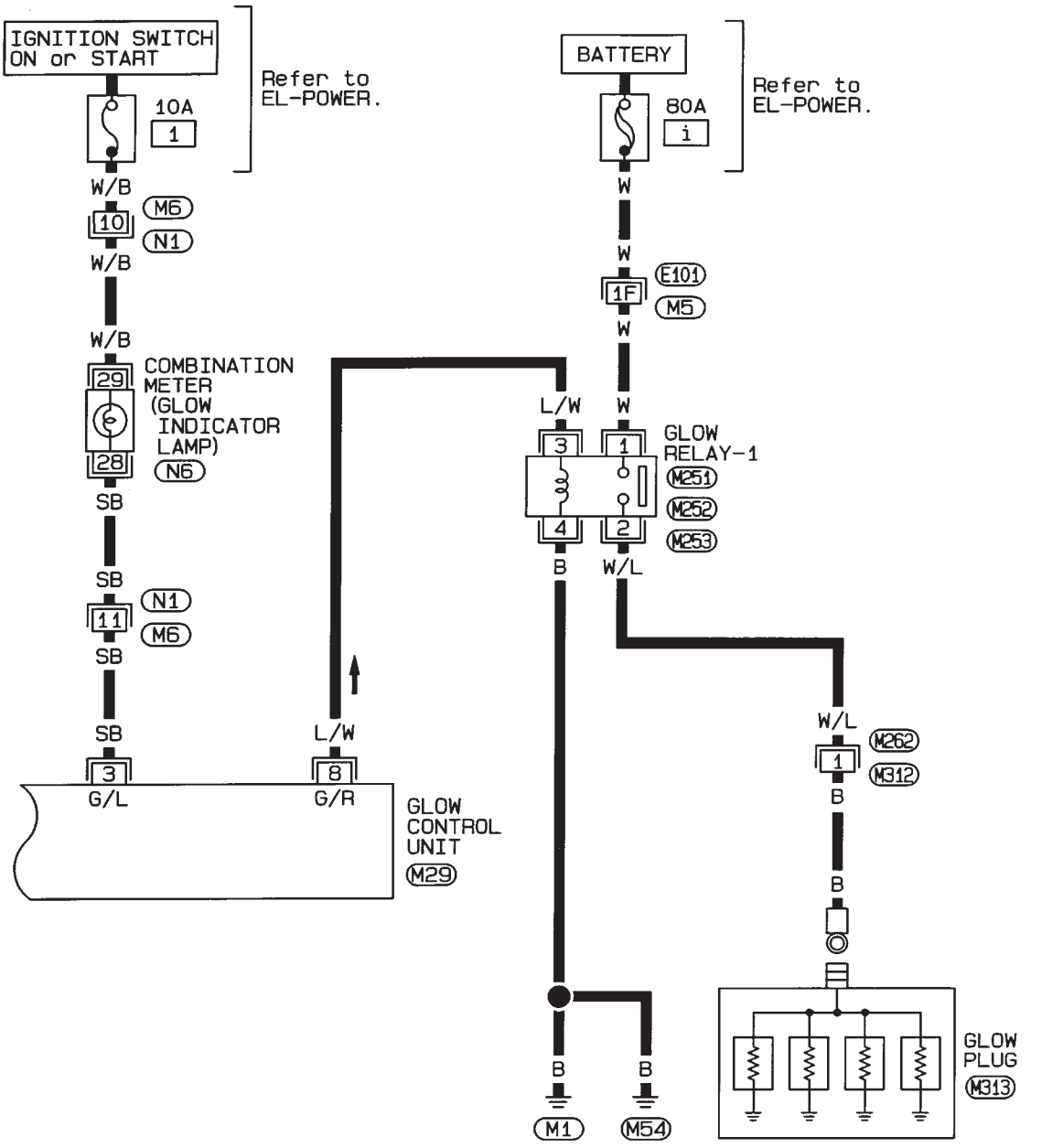
M5, E101

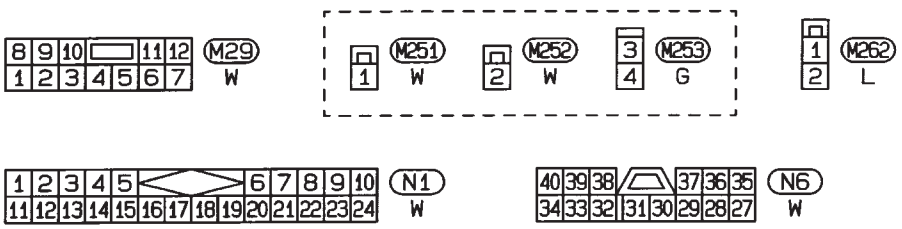
HEC389

Wiring Diagram (Cont'd)

TD ENGINE EXCEPT FOR COLD AREAS (LHD)

EC-GLOW-07





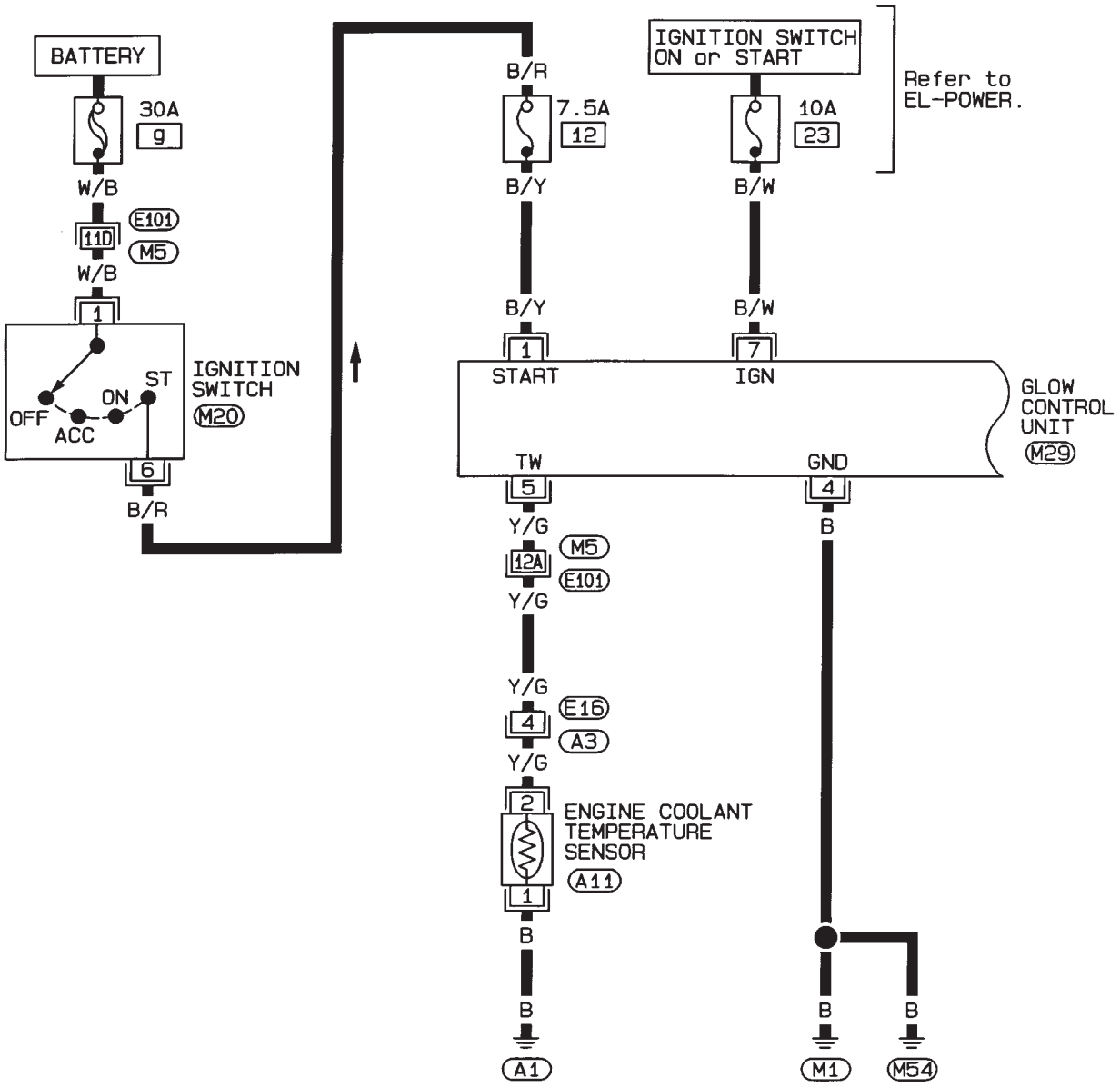
Refer to last page (Foldout page).
M5 , E101

HEC390

Wiring Diagram (Cont'd)

TD ENGINE EXCEPT FOR COLD AREAS (RHD)

EC-GLOW-08





Refer to last page (Foldout page).

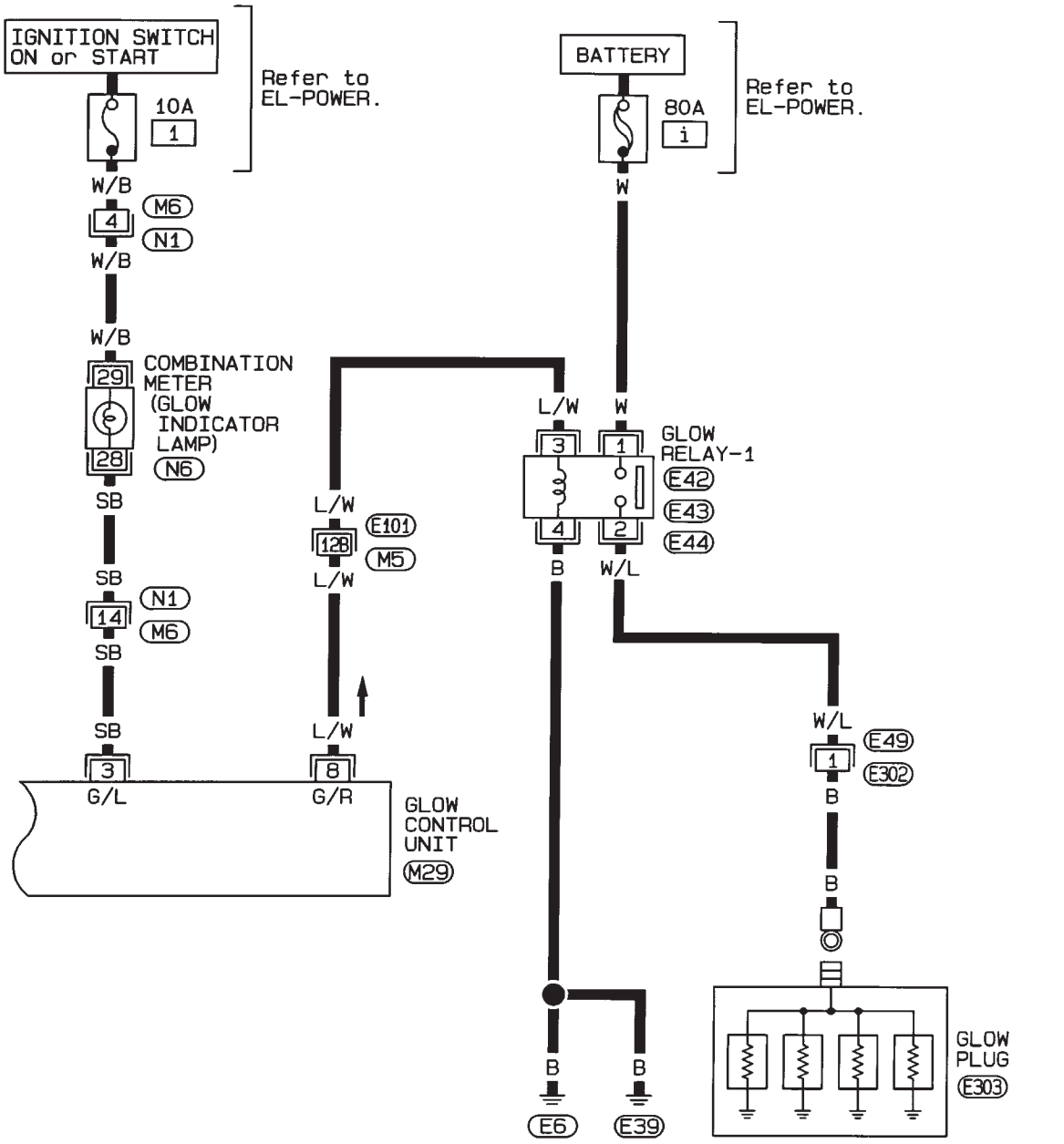
M5, E101

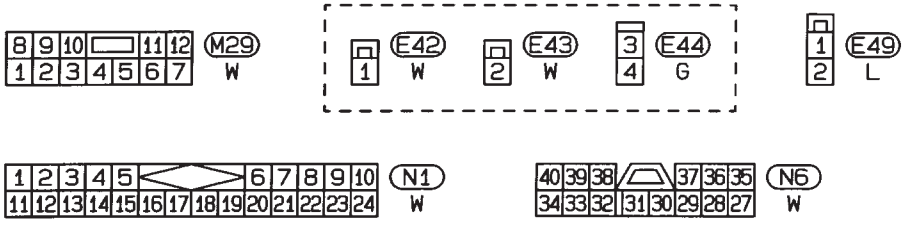
HEC391

Wiring Diagram (Cont'd)

TD ENGINE EXCEPT FOR COLD AREAS (RHD)

EC-GLOW-09





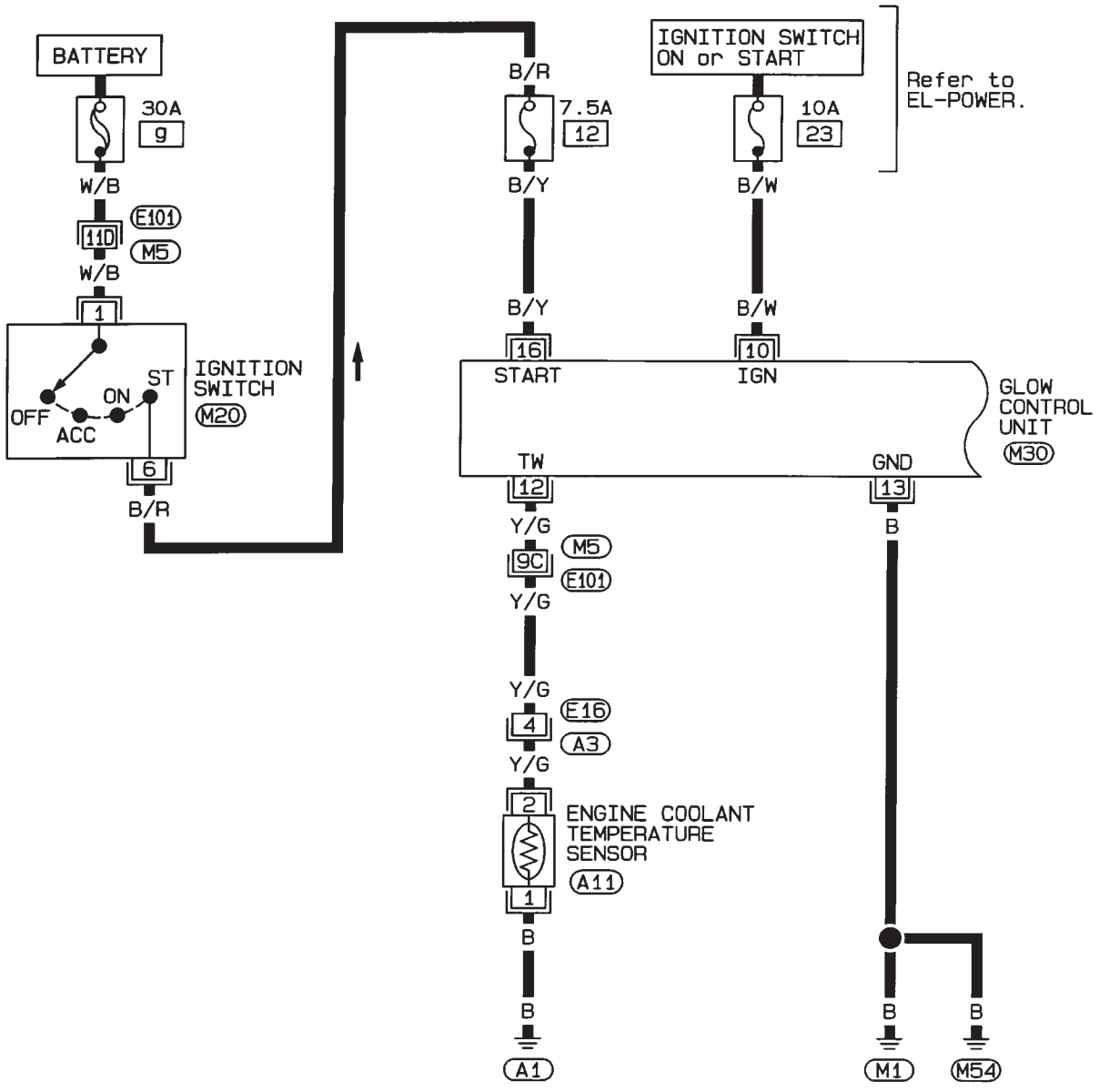
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M5 , E101

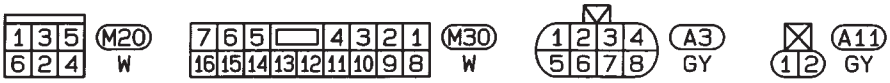
HEC392

Wiring Diagram (Cont'd)

TD ENGINE FOR COLD AREAS (LHD)

EC-GLOW-10





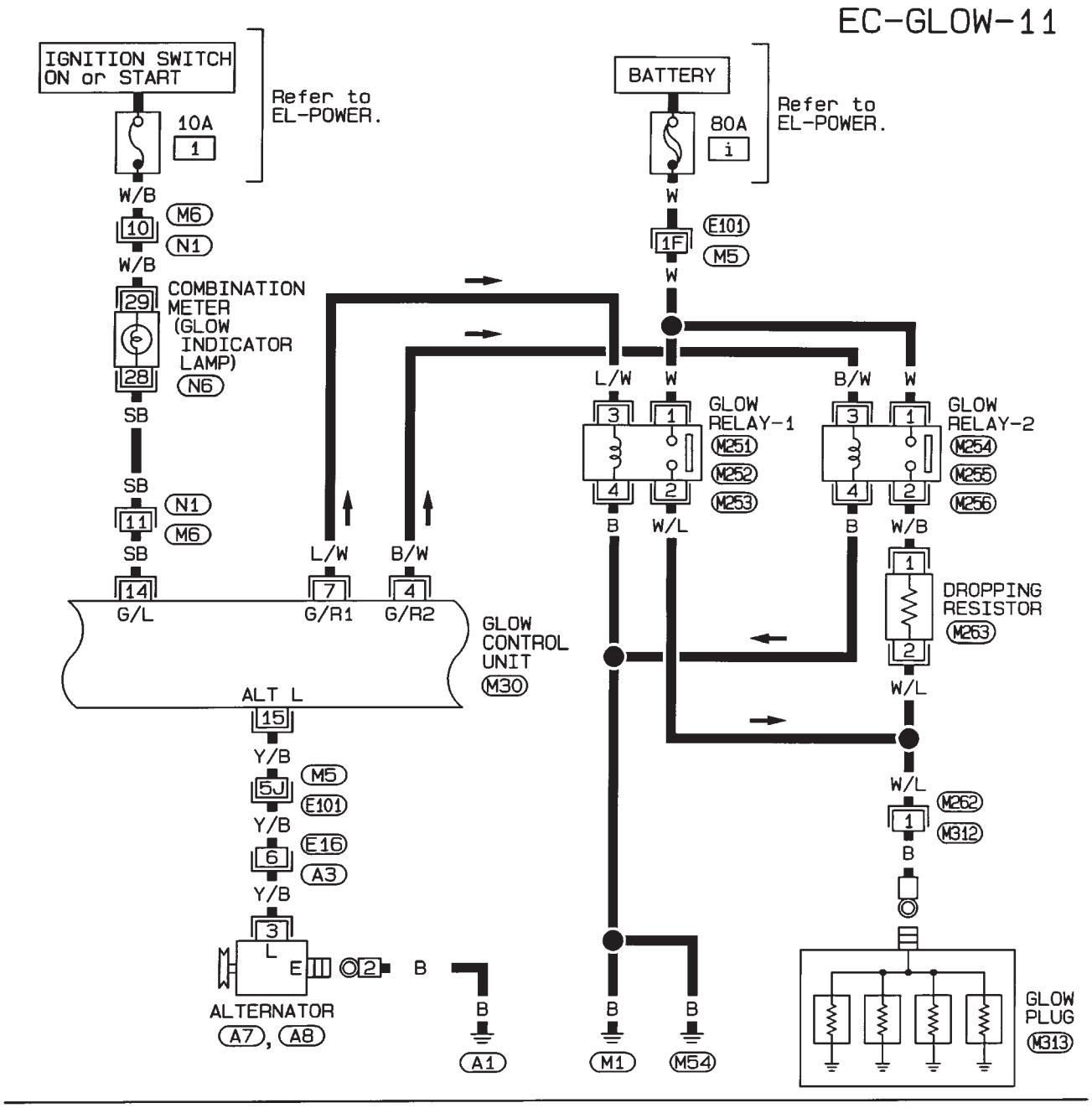
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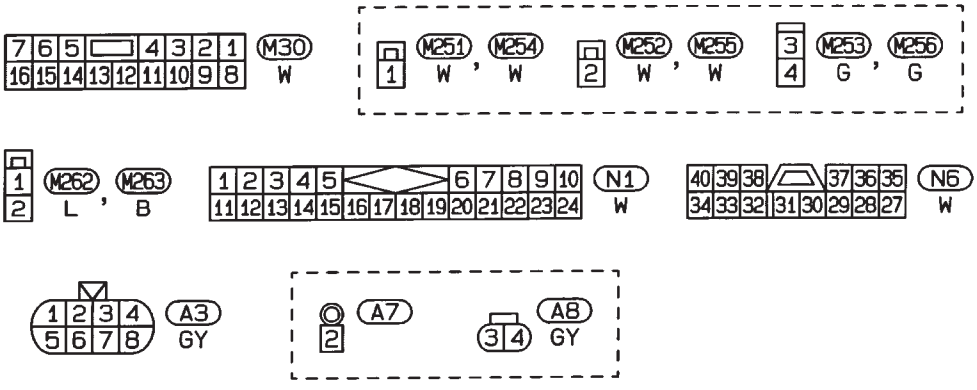
M5, E101

HEC393

Wiring Diagram (Cont'd)

TD ENGINE FOR COLD AREAS (LHD)





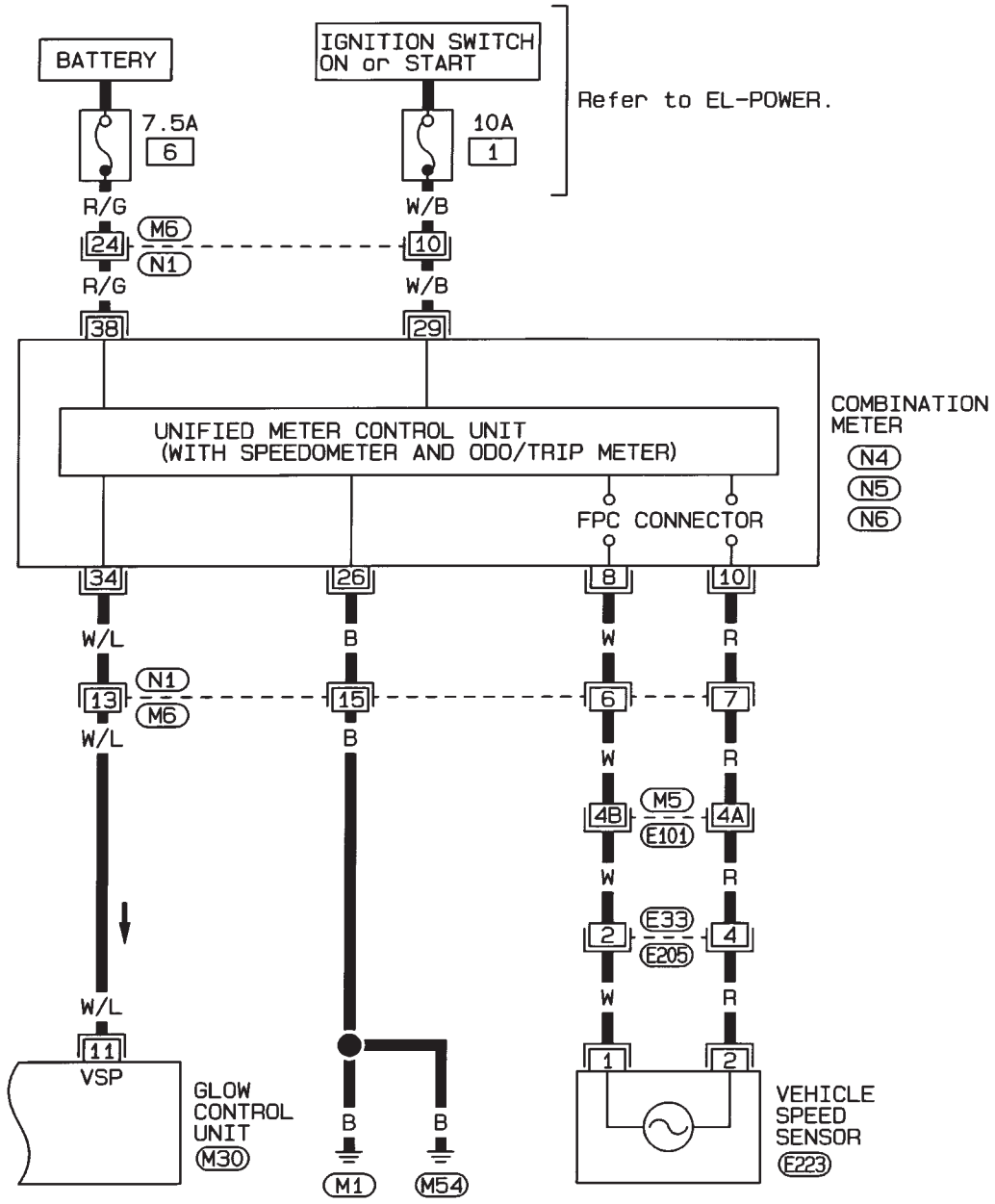
Refer to last page (Foldout page).
M5, E101

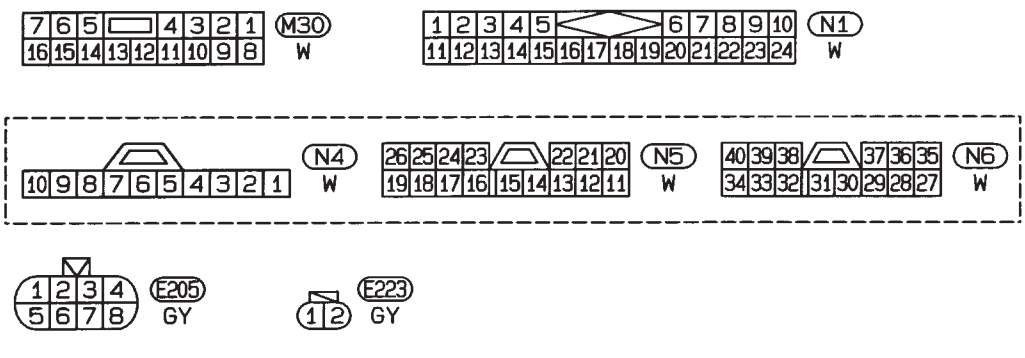
HEC394

Wiring Diagram (Cont'd)

TD ENGINE FOR COLD AREAS (LHD)

EC-GLOW-12

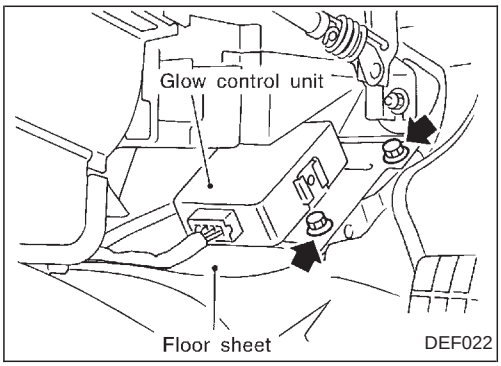




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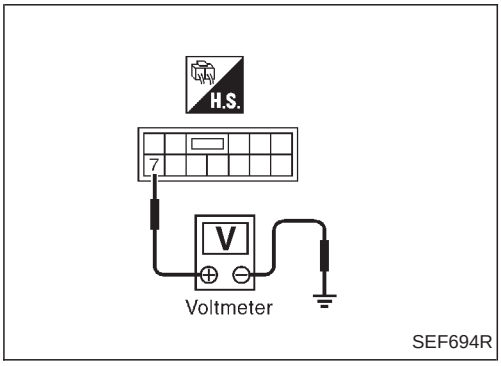
M5, E101

HEC410



Glow Control Unit Circuit Inspection (For Cold Areas)

Roll up the floor sheet. Check the glow control unit.

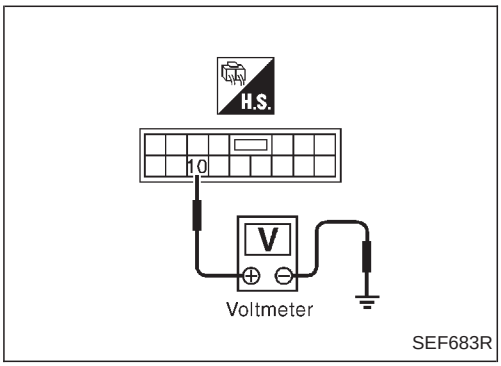


POWER SUPPLY CIRCUIT

QD engine

Turn ignition switch ON and check voltage between terminal ⑦ and body ground.

Voltage: approx. 12V



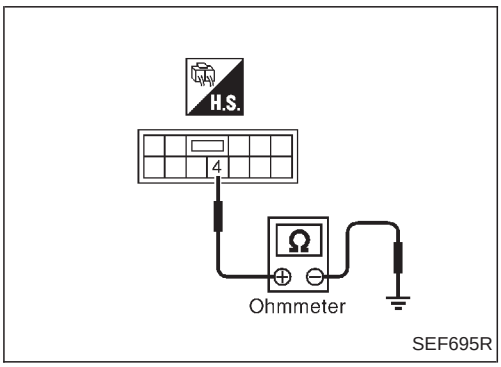
TD engine

Turn ignition switch ON and check voltage between terminal ⑩ and body ground.

Voltage: approx. 12V

GROUND CIRCUIT

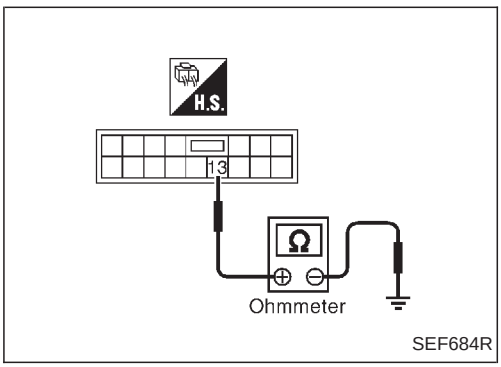
QD engine



Check continuity between terminal ④ and body ground.

Continuity should exist.

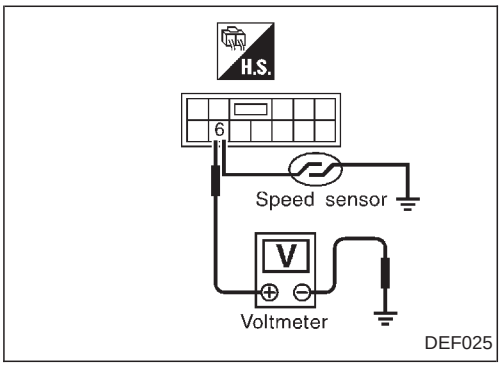
TD engine



Check continuity between terminal ⑬ and body ground.

Continuity should exist.

Glow Control Unit Circuit Inspection (For Cold Areas) (Cont'd)

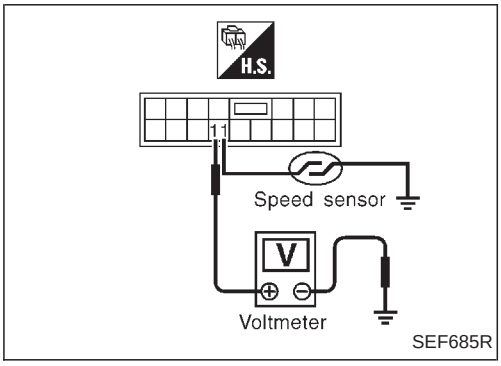


SPEED SENSOR SIGNAL CIRCUIT

QD engine

While running vehicle or lifting rear wheels in 2WD position, check that voltage between terminal ⑥ and body ground fluctuates.

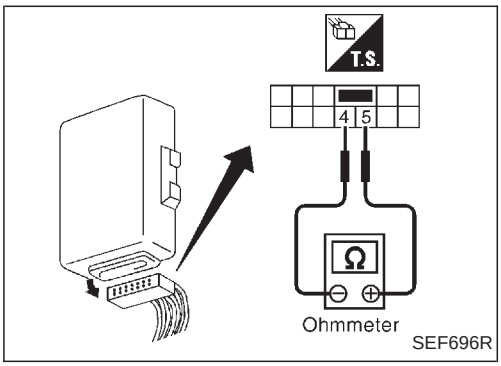
Voltage: approx. 5V



TD engine

While running vehicle or lifting rear wheels in 2WD position, check that voltage between terminal ⑪ and body ground fluctuates.

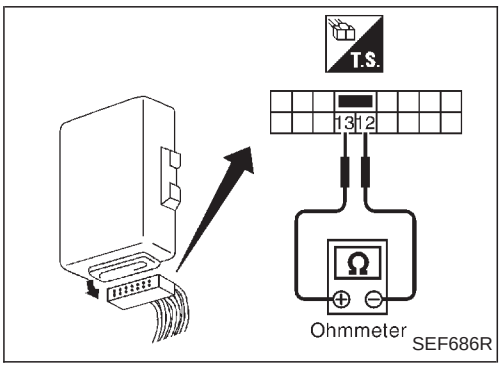
Voltage: approx. 5V



COOLANT TEMPERATURE SENSOR CIRCUIT

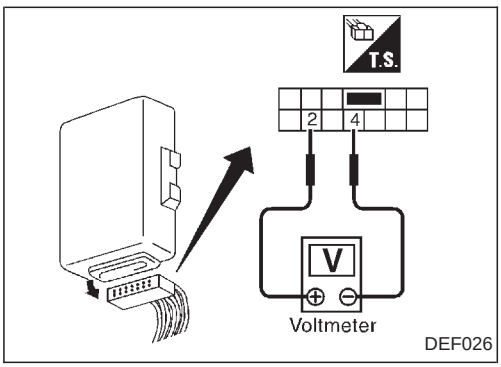
QD engine

Check continuity between terminals ⑤ and ④.
Measure resistance to temperature approximately as shown in "COOLANT TEMPERATURE SENSOR", "Component Inspection", EC-296.



TD engine

Check continuity between terminals ⑫ and ⑬.
Measure resistance to temperature approximately as shown in "COOLANT TEMPERATURE SENSOR", "Component Inspection", EC-296.



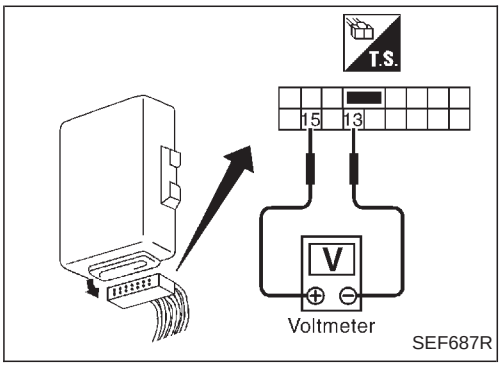
ALTERNATOR'S "L" TERMINAL CIRCUIT

QD engine

1. Turn ignition switch OFF.
2. Disconnect harness connector from glow control unit.
3. Disconnect harness connector from the alternator's "L" terminal.
4. Check terminal voltage between terminals ② and ④ when the ignition switch is turned to ON.

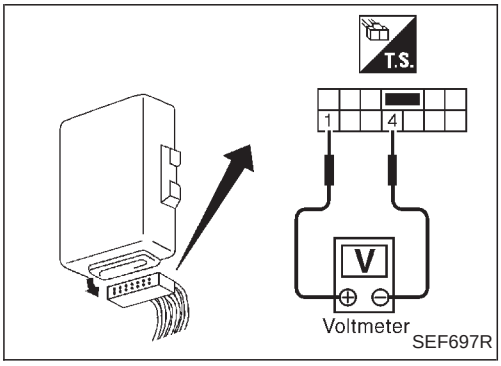
Voltage: approx. 12V

Glow Control Unit Circuit Inspection (For Cold Areas) (Cont'd)



TD engine

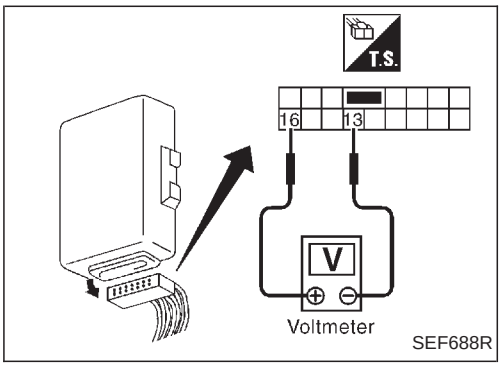
1. Turn ignition switch OFF.
2. Disconnect harness connector from glow control unit.
3. Disconnect harness connector from the alternator's "L" terminal.
4. Check terminal voltage between terminals ⑮ and ⑬ when the ignition switch is turned to ON.
   Voltage: approx. 12V



START SIGNAL INPUT CIRCUIT

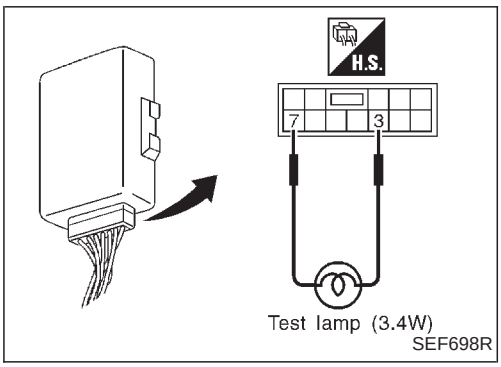
QD engine

1. Turn ignition switch OFF.
2. Disconnect harness connector from the starter motor's "S" terminal.
3. Check terminal voltage between terminals ① and ④ when the ignition switch is at "START".
   Voltage: approx. 12V



TD engine

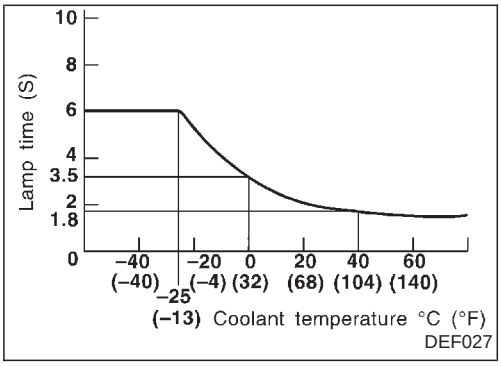
1. Turn ignition switch OFF.
2. Disconnect harness connector from the starter motor's "S" terminal.
3. Check terminal voltage between terminals ⑯ and ⑬ when the ignition switch is at "START".
   Voltage: approx. 12V



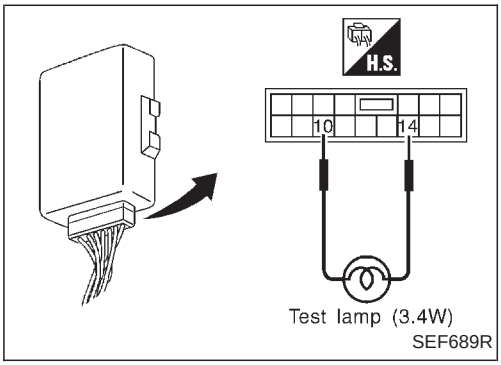
GLOW INDICATOR CONTROL CIRCUIT

QD engine

1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown.
4. Turn ignition switch to ON and measure the time the test lamp stays lit.
   Time the test lamp should stay lit:
   Approx. 2 - 6 seconds
   (The time will vary according to coolant temperature.)



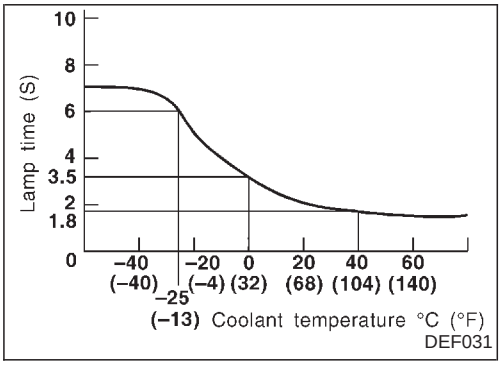
Glow Control Unit Circuit Inspection (For Cold Areas) (Cont'd)



TD engine

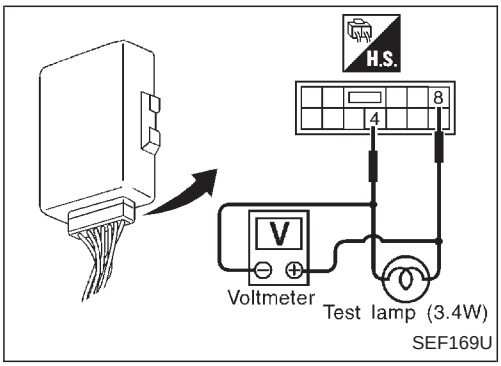
1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown.
4. Turn ignition switch to ON and measure the time the test lamp stays lit.

Time the test lamp should stay lit:
Approx. 2 - 6 seconds
(The time will vary according to coolant temperature.)



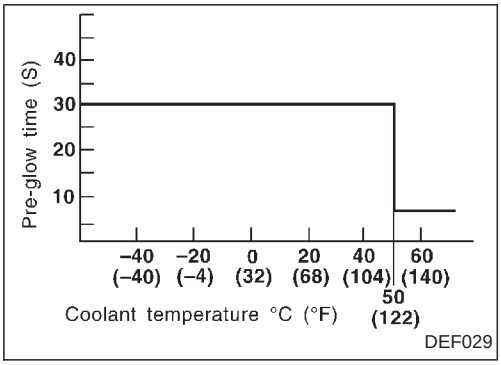
PRE-GLOW CONTROL CIRCUIT

QD engine

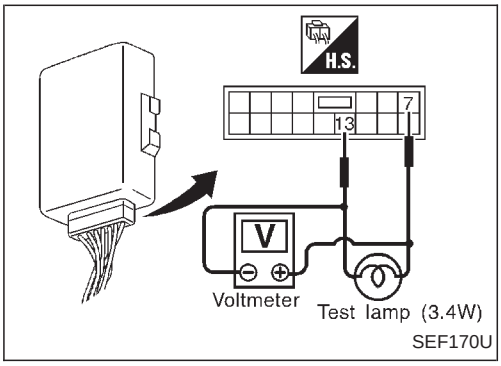


1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown below.
4. Turn ignition switch ON and measure terminal voltage and the time the test lamp stays lit.

Battery voltage should appear for 30 seconds at coolant temperature below 50°C (122°F).
Battery voltage should appear for 5 seconds at coolant temperature over 50°C (122°F).



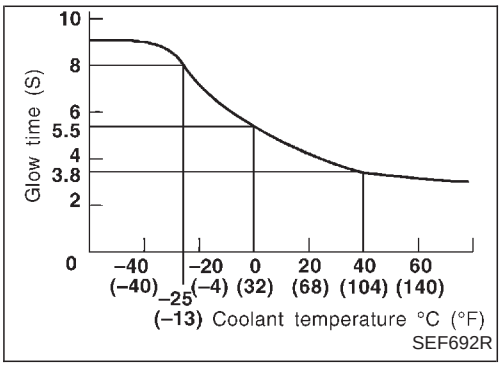
TD engine



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

Battery voltage should appear for 4 to 8 seconds*.
*** (Varies with coolant temperature)**

Glow Control Unit Circuit Inspection (For Cold Areas) (Cont'd)

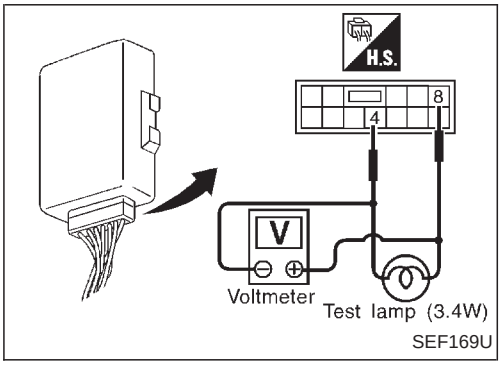


- **The time will be shortened if ignition switch is OFF for only a brief period.**
  Therefore, when measuring the time, leave ignition switch OFF for more than 1 minute, and then turn ignition switch ON.
- **When the coolant temperature is below 10°C (50°F), the battery voltage should appear for 30 seconds.**

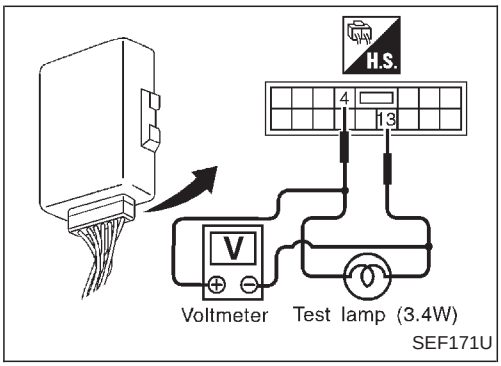
AFTER-GLOW CONTROL CIRCUIT

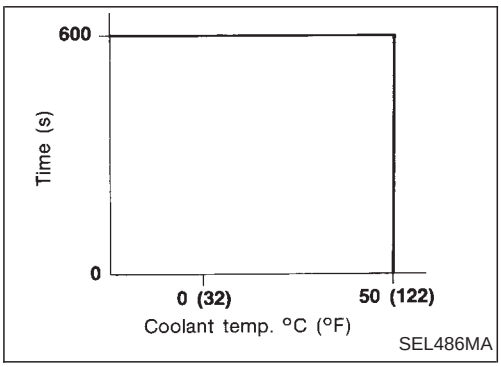
1. Connect test lamp to glow control unit as shown.
2. Turn ignition switch to START and run engine, then measure glow plug terminal voltage and the time the test lamp stays lit.

QD engine

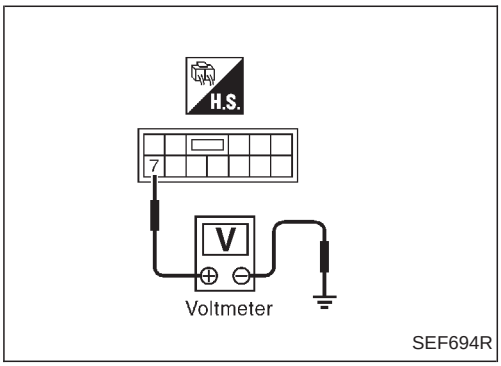


TD engine





Battery voltage should continue for 10 minutes at coolant temperature below 50°C (122°F).
[If vehicle speed is above 20 km/h (12 MPH), glow plug terminal voltage should drop to 0V. If the speed drops below 10 km/h (6 MPH), the battery voltage should appear.]
The voltage should not appear at coolant temperature over 50°C (122°F).



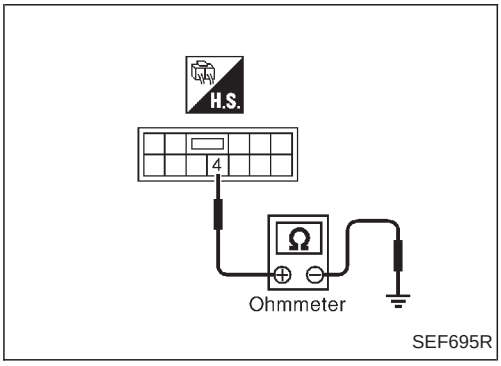
SEF694R

Glow Control Unit Circuit Inspection (Except for Cold Areas)

POWER SUPPLY CIRCUIT

Turn ignition switch ON and check voltage between terminal ⑦ and body ground.

Voltage: approx. 12V

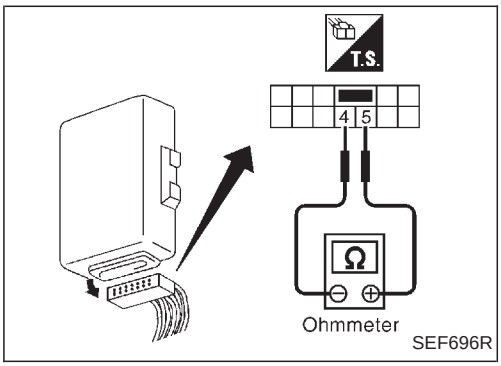


SEF695R

GROUND CIRCUIT

Check continuity between terminal ④ and body ground.

Continuity should exist.

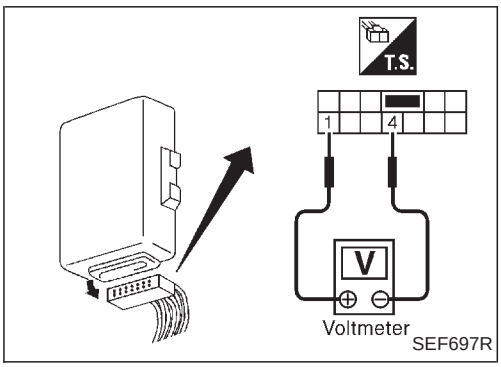


SEF696R

COOLANT TEMPERATURE SENSOR CIRCUIT

Check continuity between terminals ⑤ and ④.

Measure resistance to temperature approximately as shown in "COOLANT TEMPERATURE SENSOR", "Component Inspection", EC-296.



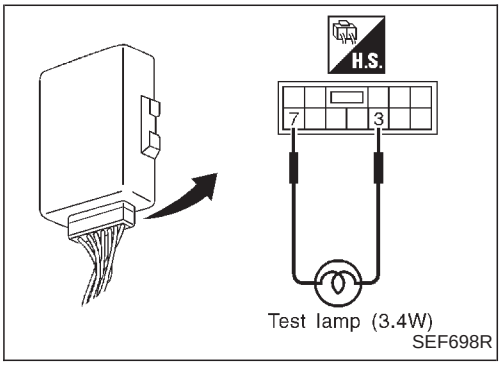
SEF697R

START SIGNAL INPUT CIRCUIT

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

Voltage: approx. 12V

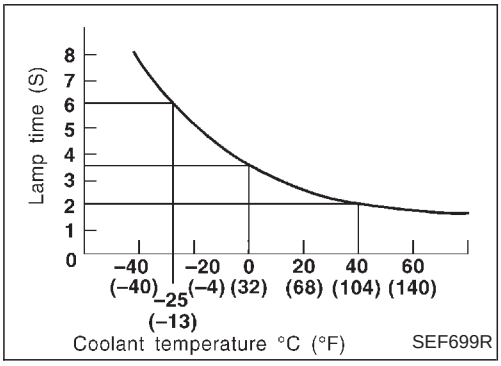
Glow Control Unit Circuit Inspection (Except for Cold Areas) (Cont'd)

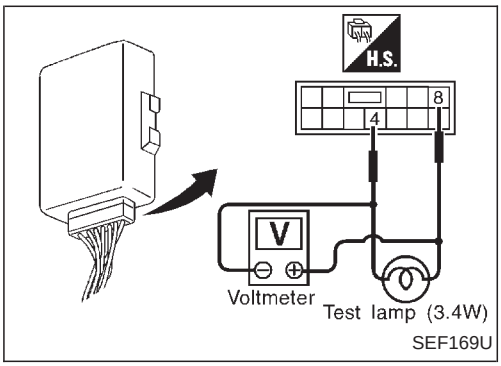


GLOW INDICATOR CONTROL CIRCUIT

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

Time the test lamp should stay lit:
Approx. 2 - 6 seconds
(The time will vary according to coolant temperature.)





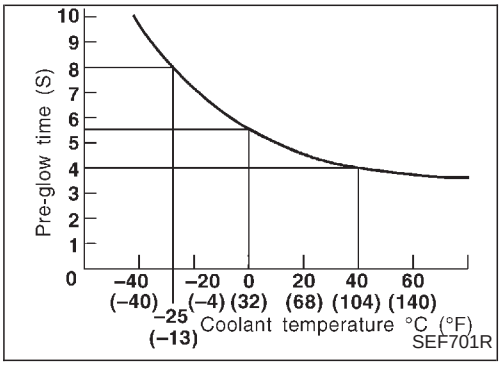
GLOW CONTROL CIRCUIT

Pre-glow control

1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown.
4. Turn ignition switch ON and measure terminal voltage and the times the test lamp turns on and off.

1) At coolant temperature below 50°C (122°F) the battery voltage appears for 15 seconds.

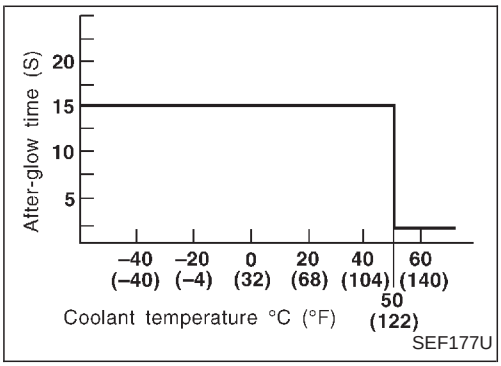
- **Battery voltage should appear for 4 to 8 seconds*, and then be chopped intermittently for the rest time.**
  *** Pre-glow time (Varies with coolant temperature)**



- **The time will be shortened if ignition switch is OFF for only a brief period.**
  Therefore, when measuring the time, leave ignition switch OFF for more than 1 minute, and then turn ignition switch ON.
  The test lamp turns on and off approx. 1 - 3 times after it stayed lit.

2) At coolant temperature over 50°C (122°F) the battery voltage appears for approximately 3 seconds.

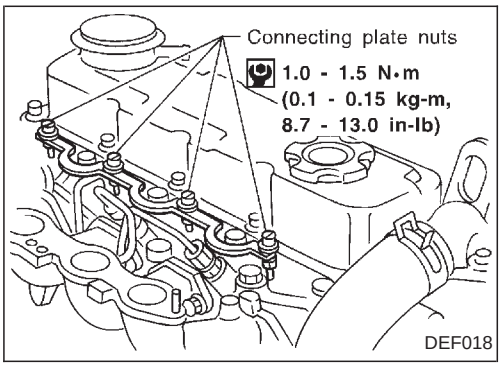
Glow Control Unit Circuit Inspection (Except for Cold Areas) (Cont'd)



After-glow control

1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown in "Pre-glow control".
4. Turn ignition switch to START and return to ON. Measure terminal voltage and count the times the test lamp turns on and off.

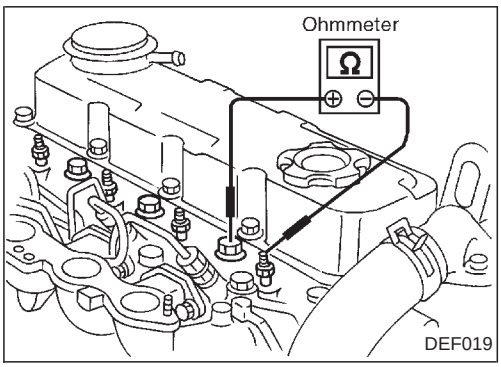
1) At coolant temperature below 50°C (122°F) the battery voltage appears intermittently for 15 seconds. Test lamp turns on and off approx. 3 times.
2) At coolant temperature over 50°C (122°F) the battery voltage appears for 2 seconds.



Component Inspection

GLOW PLUG CONNECTING PLATE NUTS

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

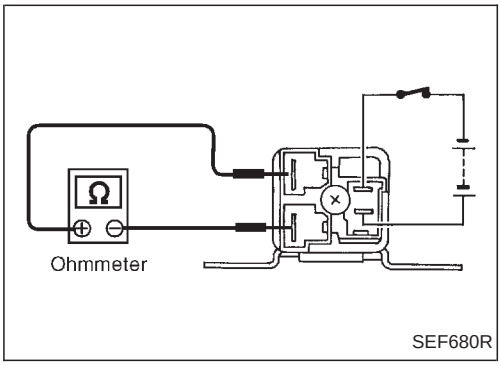


GLOW PLUG

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

No continuity ... Replace glow plug.

Two manufacturer's ceramic glow plugs are provided on QD32 engine for cold areas.
A color mark of orange or blue is put on the glow plug head. Do not mix them in one engine. Do not use if dropped on the floor.

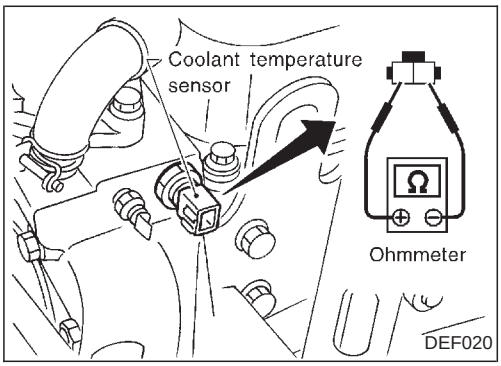


GLOW RELAY

The glow relay is normally open.

Component Inspection (Cont'd)

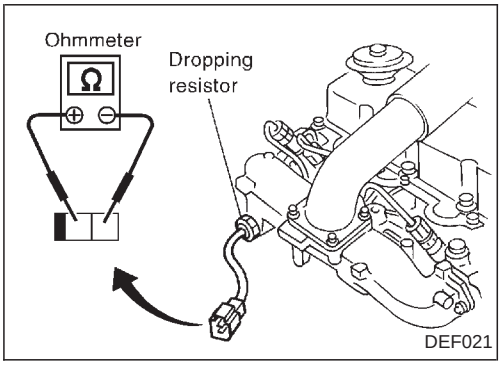
COOLANT TEMPERATURE SENSOR



Disconnect coolant temperature harness connector and measure resistance.

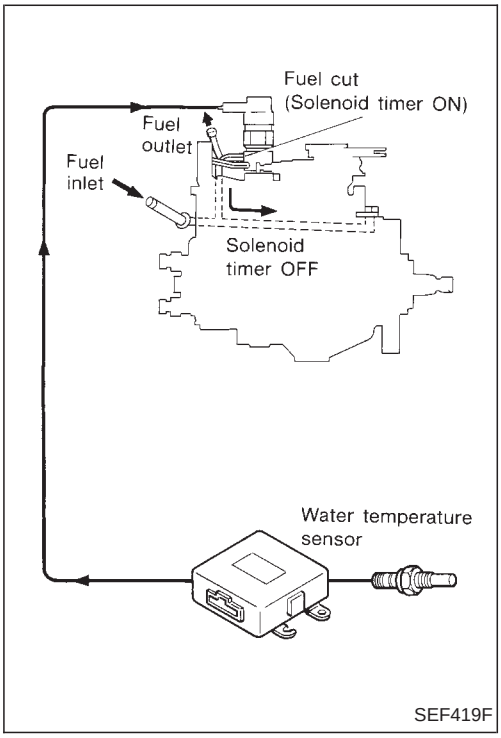
Coolant temp. °C (°F)	Resistance kΩ
−25 (−13)	19
0 (32)	5.6
20 (68)	2.5
40 (104)	1.2

DROPPING RESISTOR (TD27 engine)



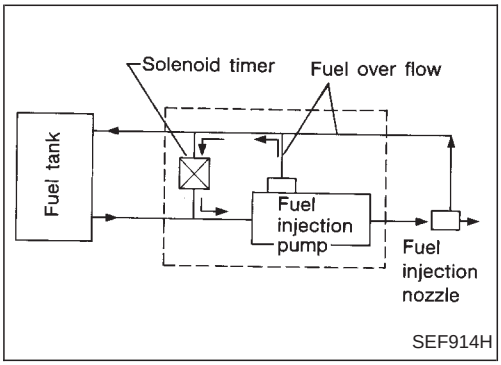
Measure resistance between terminals.

Resistance: approx. 0.27 - 0.31Ω at 20°C (68°F)



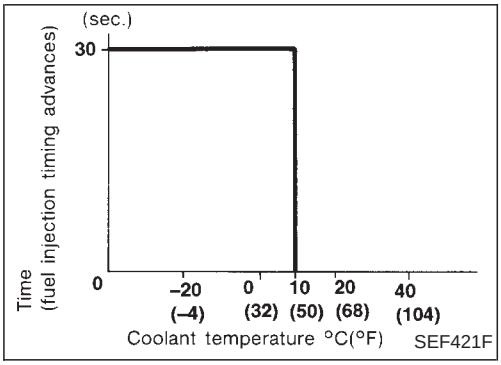
Description

To improve startability, a solenoid timer is used on models for cold areas. Its purpose is to advance fuel injection timing in relation to coolant temperature for a certain period after starting the engine.
This timer is controlled by the signal from the glow control unit. The glow control unit sends a signal to activate the advance mechanism of the fuel injection pump during cold starting.
Refer to “Circuit Diagram”, “QUICK-GLOW SYSTEM”, EC-272.

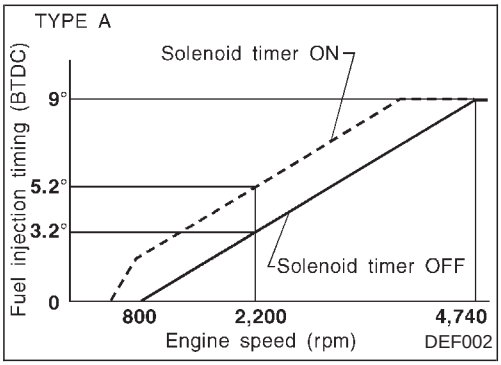


Operation

Part of the fuel in the return line returns to the fuel injection pump inlet, when the solenoid timer is OFF. When cold starting, the solenoid timer comes ON to stop the return of fuel to the inlet. This increases the fuel pressure in the fuel injection pump so that fuel injection timing advances. The duration of fuel injection timing advance varies with changes in coolant temperature.



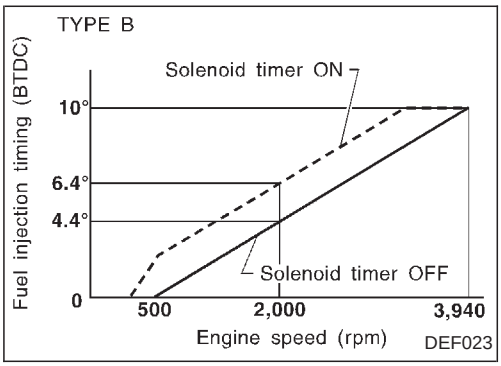
The advance duration of fuel injection timing is 30 seconds (constant) when coolant temperature is below 10°C (50°F). Above 10°C (50°F), fuel injection timing does not advance.
Refer to “Description”, “QUICK-GLOW SYSTEM”, EC-274.



TIMER CHARACTERISTICS

The figures show the differences in fuel injection timing in relation to engine speed when the solenoid timer is both ON and OFF.
When the solenoid timer turns ON, fuel injection timing advances by approximately 2°. Thus, cold engine starting in cold weather is greatly improved.

Operation (Cont'd)



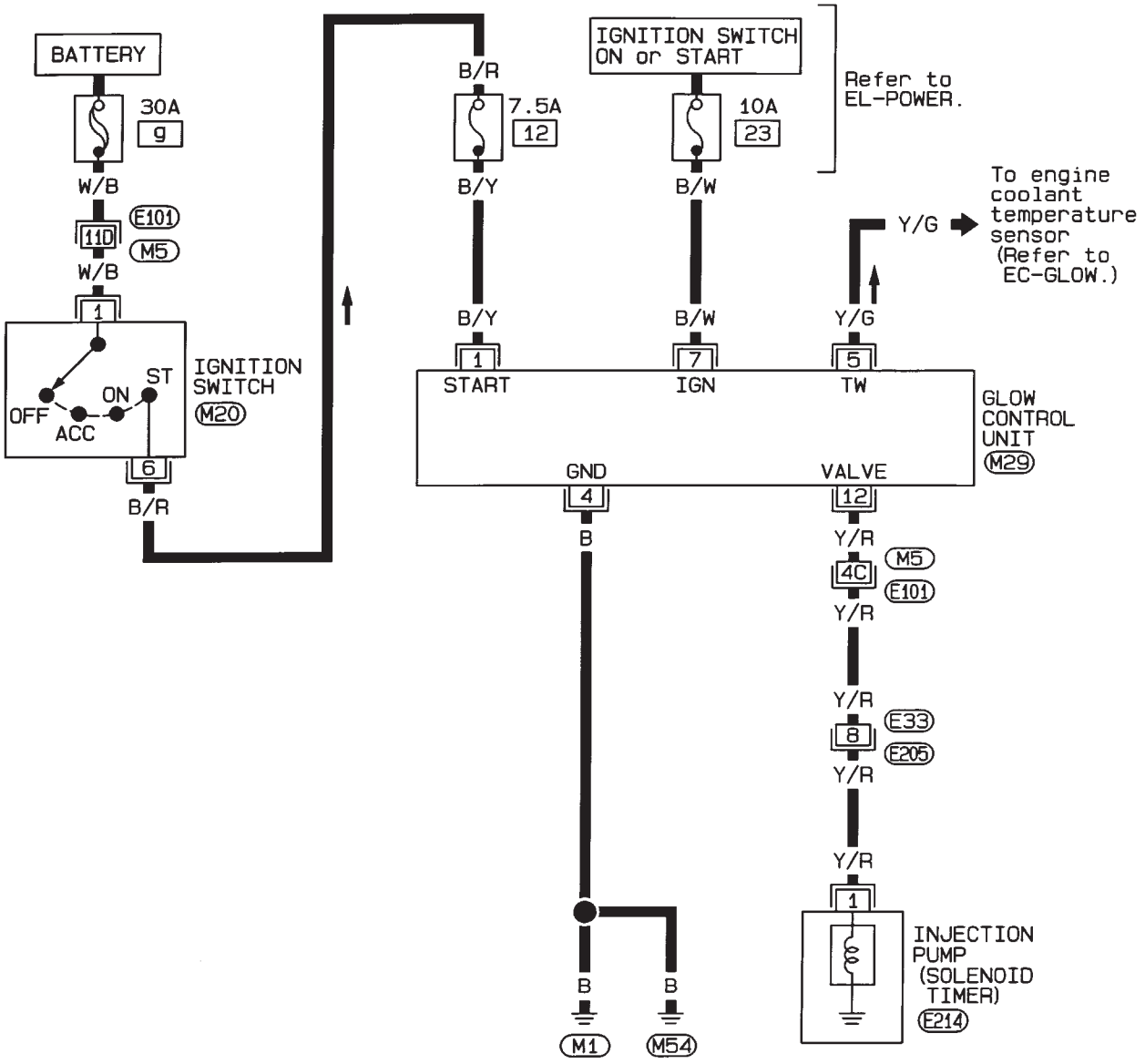
Application:

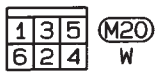
	Part No.	Pump assembly No.	Type
QD32	16700 2S615	104741-4422	B
TD27	16700 2S511	104745-7780	A

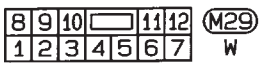
Wiring Diagram

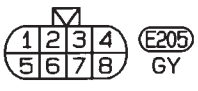
QD ENGINE

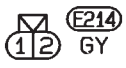
EC-PLA-01











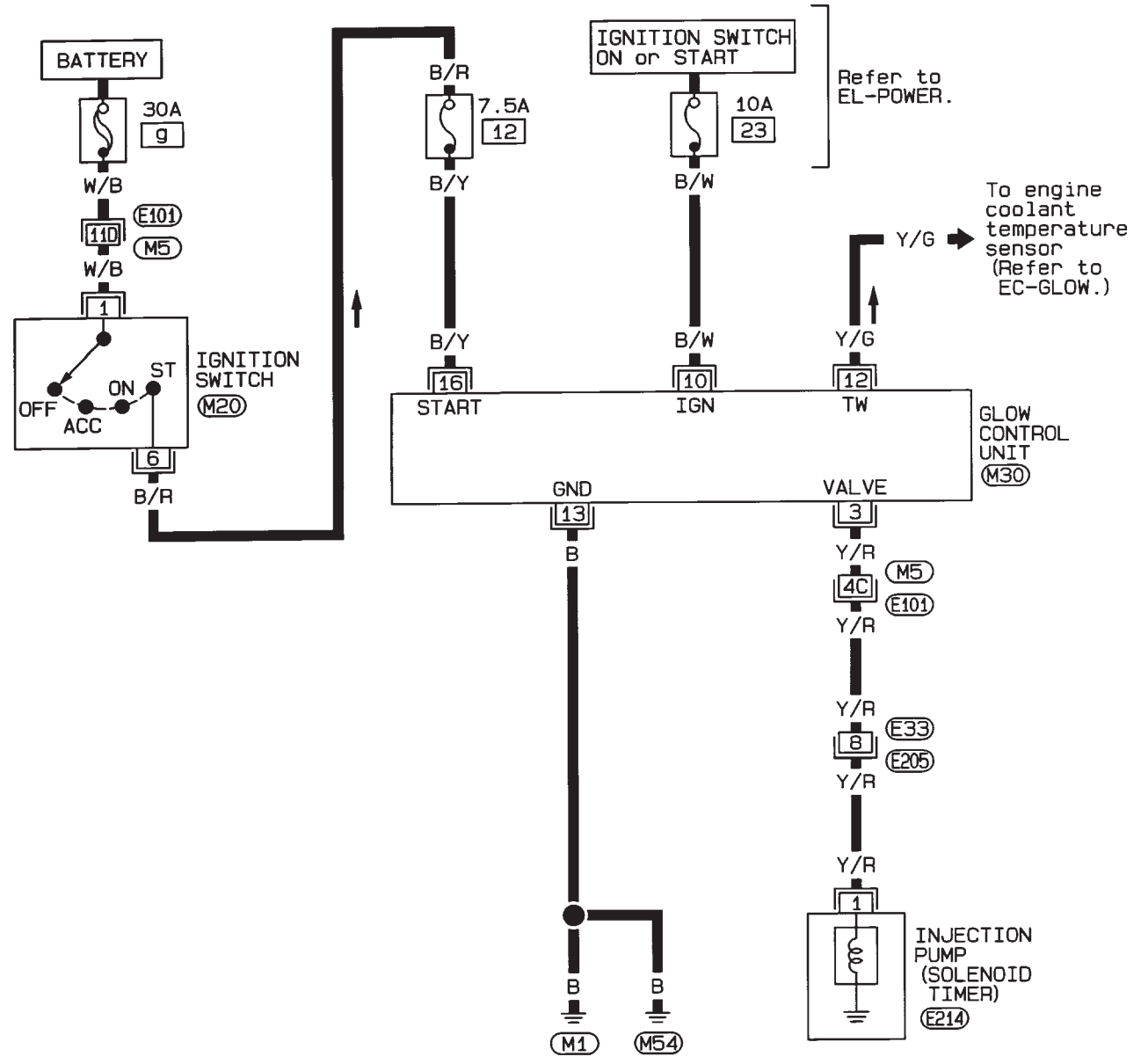
Refer to last page (Foldout page).
M5, E101

HEC372

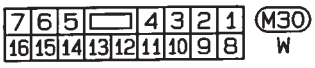
Wiring Diagram (Cont'd)

TD ENGINE

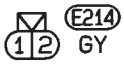
EC-PLA-02







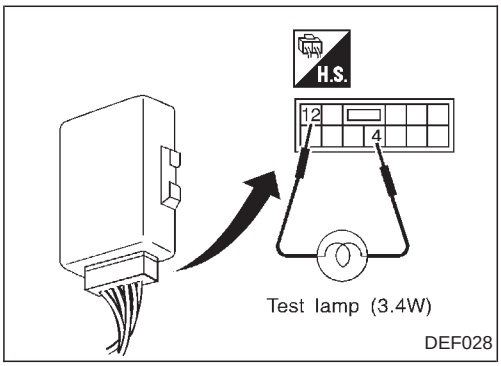




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M5, E101

HEC395



Inspection

SOLENOID TIMER CONTROL CIRCUIT

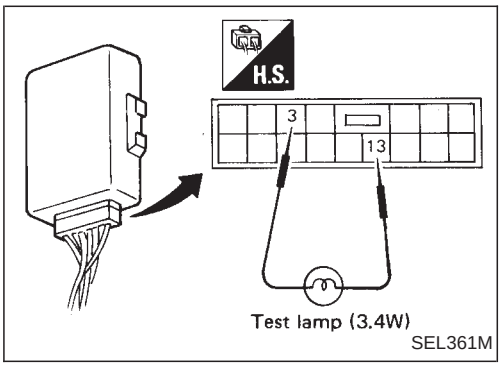
QD engine

1. Connect test lamp to glow control unit as shown.
2. Disconnect the harness connector from starter motor “S” terminal.
3. Make sure that test lamp comes on when ignition switch is turned to START.
4. Measure the time the test lamp stays lit when ignition switch is turned to ON from START.

Time the test lamp should stay lit:

Approx. 30 seconds at coolant temperature below 10°C (50°F)

0 second at coolant temperature over 10°C (50°F)



TD engine

1. Connect test lamp to glow control unit as shown.
2. Disconnect the harness connector from starter motor “S” terminal.
3. Make sure that test lamp comes on when ignition switch is turned to START.
4. Measure the time the test lamp stays lit when ignition switch is turned to ON from START.

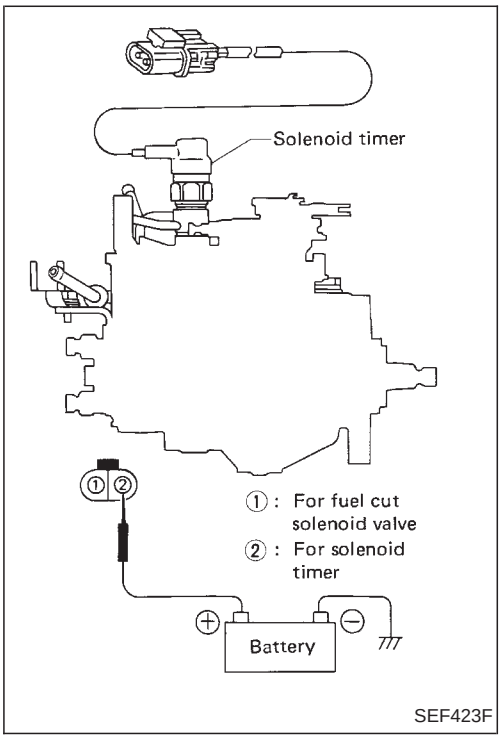
Time the test lamp should stay lit:

Approx. 30 seconds at coolant temperature below 10°C (50°F)

0 second at coolant temperature over 10°C (50°F)

Inspection (Cont'd)

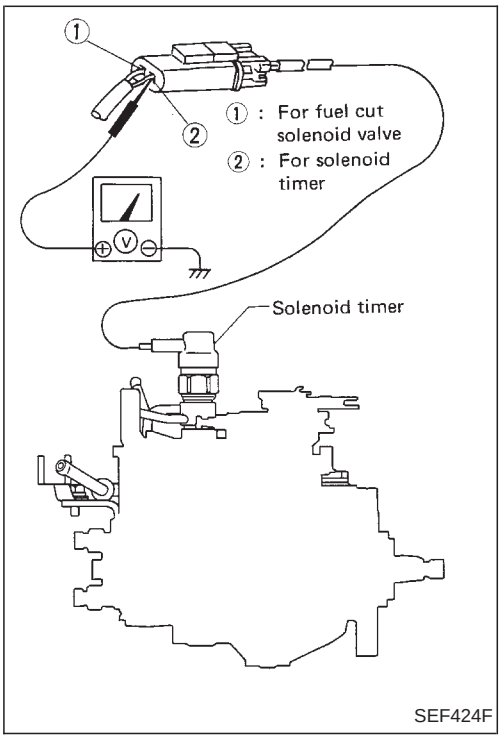
SOLENOID TIMER



SEF423F

1. Disconnect solenoid timer harness and check for "clicking" sound from solenoid when battery is connected and disconnected.
   If solenoid has malfunction, replace it.

After checking, reconnect the connector.



SEF424F

2. Disconnect coolant temperature sensor harness connector.
3. Start engine and check voltage between terminal ② and ground.

Battery voltage should exist for 30 seconds after starting engine.

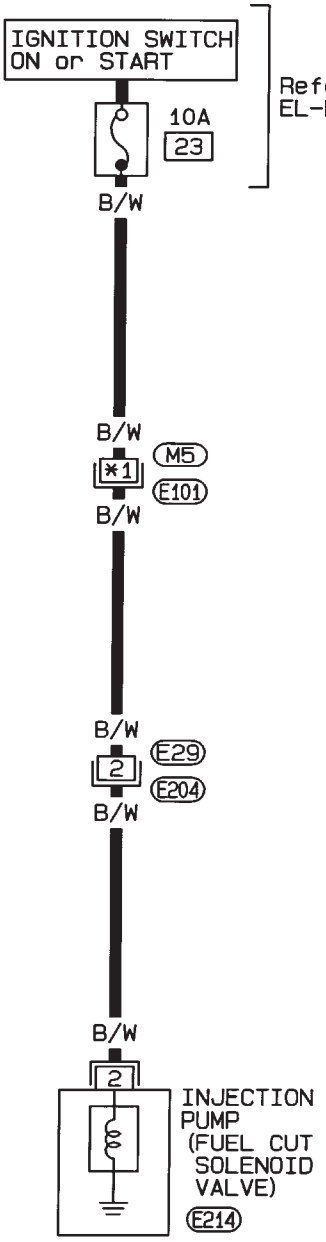
If not, check harness and glow control unit.

TIMER PISTON STROKE (Using pump tester)

Measure timer piston strokes at specified fuel injection pump speed when solenoid timer is on and off.
Refer to "Injection Pump Calibration Standard" in SDS.

Wiring Diagram

EC-FCUT-01



Ⓛ: LHD models
Ⓡ: RHD models
*1···Ⓛ 9B , Ⓡ 11C

E204 1 2 GY

E214 1 2 GY

Refer to last page
(Foldout page).

M5, E101

HEC397

VE-type Injection Pump

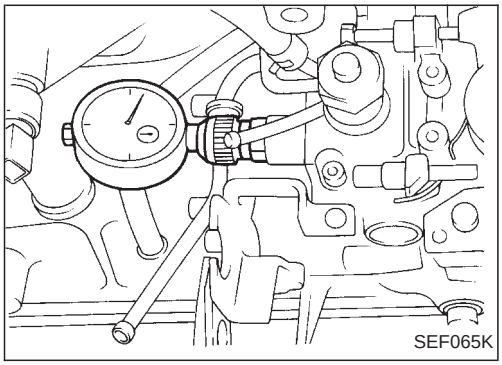
APPLICATION

Engine	Destination	Part No.	Pump assembly No.	Remarks
QD32	Thailand	16700 2S410	104741-4500	
	Australia	16700 2S604	104741-4372	
	Guatemala	16700 2S613	104741-4491	With high altitude compensator (ACS)
	General areas	16700 2S614	104741-4413	For standard models
		16700 2S615	104741-4423	For cold areas/with solenoid timer
		16700 2S616	104741-4432	With high altitude compensator (ACS)
TD27	Australia	16700 2S500	104745-7740	
	General areas	16700 2S510	104745-7770	For standard models
		16700 2S511	104745-7780	For cold areas/with solenoid timer
		16700 2S512	104745-7790	With high altitude compensator (ACS)
	Guatemala	16700 2S513	104745-7800	With high altitude compensator (ACS)
	Hong Kong & Singapore	16700 2S515	104745-7820	

INSPECTION AND ADJUSTMENT

Plunger lift

Engine	Plunger lift at TDC mm (in)		Part No.	Pump assembly No.
	Inspection	Adjustment		
QD32	0.42±0.05 (0.0165 ±0.0020)	0.42±0.02 (0.0165 ±0.0008)	16700 2S410	104741-4500
			16700 2S604	104741-4372
			16700 2S613	104741-4491
			16700 2S614	104741-4413
			16700 2S615	104741-4423
			16700 2S616	104741-4432
TD27	0.71±0.05 (0.0280 ±0.0020)	0.71±0.02 (0.0280 ±0.0008)	16700 2S500	104745-7740
	0.65±0.05 (0.0256 ±0.0020)	0.65±0.02 (0.0256 ±0.0008)	16700 2S510	104745-7770
			16700 2S511	104745-7780
			16700 2S512	104745-7790
			16700 2S513	104745-7800
	0.51±0.05 (0.0201 ±0.0020)	0.51±0.02 (0.0201 ±0.0008)	16700 2S515	104745-7820


SEF065K

Maximum engine speed

Engine	Maximum engine speed (Under no load) rpm
QD32	4,700±100
TD27	$5{,}100^{+150}_{-150}$

Injection Nozzle

INSPECTION AND ADJUSTMENT

Injection nozzle assembly

Unit: kPa (bar, kg/cm^2, psi)

Initial injection pressure	
New	10,297 - 11,278 (103.0 - 112.8, 105 - 115, 1,493 - 1,635)
Used	9,807 - 10,297 (98.1 - 103.0, 100 - 105, 1,422 - 1,493)

Adjusting shims

Thickness mm (in)	Part No.
0.1 (0.004)	16613-65N00
0.2 (0.008)	16613-65N01
0.3 (0.012)	16613-65N02
0.4 (0.016)	16613-65N03
0.5 (0.020)	16613-65N04
0.52 (0.0205)	16613-65N05
0.54 (0.0213)	16613-65N06
0.56 (0.0220)	16613-65N07
0.58 (0.0228)	16613-65N08
0.8 (0.031)	16613-65N09

Injection Pump Calibration Standard

QD32 ENGINE MODEL

Injection pump assembly No.	104741-4500
Part No.	16700 2S410

Pump rotation: Clockwise—viewed from drive side

1. Test conditions

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

1 - 2 Nozzle holder: 105780-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}_{0}$ kPa ($130.4^{+2.9}_{0}$ bar, 133^{+3}_{0} kg/cm^2, $1{,}891^{+43}_{0}$ psi)

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

1 - 5 Fuel oil temperature: 45^{+5}_{0} °C (113^{+9}_{0} °F)

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

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	1,000	3.6±0.2 mm (0.142±0.008 in)		—
2 - 2	Supply pump pressure	1,000	539±20 kPa (5.39±0.20 bar, 5.5±0.2 kg/cm^2, 78±2.8 psi)		—
2 - 3	Full-load delivery	1,000	54.8±0.5 mℓ (1.93±0.02 Imp fl oz)/1,000 st		4.5 (0.16)
2 - 4	Idle speed regulation	375	12.9±2.0 mℓ (0.45±0.07 Imp fl oz)/1,000 st	—	2.0 (0.07)
2 - 5	Start (Full lever)	100	$90.0^{+20.0}_{-15.0}$ mℓ ($3.17^{+0.70}_{-0.53}$ Imp fl oz)*/1,000 st		—
2 - 6	Full-load speed regulation	2,350	17.8±2.0 mℓ (0.63±0.07 Imp fl oz)/1,000 st		—
2 - 7	Load timer adjustment	1,000	2.5±0.2 mm (0.098±0.008 in)		—

3. Test specifications		Solenoid timer				
3 - 1	Timing device	N = rpm mm (in)	600 1.5±0.5 (0.059±0.020)*	1,000 3.6±0.3 (0.142±0.012)	1,800 7.5±0.5 (0.295±0.020)*	2,100 $8.2^{+0.4}_{-0.5}$ ($0.323^{+0.016}_{-0.020}$)
3 - 2	Supply pump	N = rpm kPa (bar, kg/cm^2, psi)		1,000 539±39 (5.39±0.39, 5.5±0.4, 78±6)	1,800 736±59 (7.36±0.59, 7.5±0.6, 107±9)	
3 - 3	Overflow delivery	N = rpm mℓ (Imp fl oz)/min.		1,000 390±130 (13.7±4.6)		

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	54.8±1.0 (1.93±0.04)	—
	500	48.2±3.5 (1.70±0.12)*	
	800	54.1±3.5 (1.90±0.12)*	
	1,500	55.6±3.0 (1.96±0.11)*	
	1,800	57.2±3.0 (2.01±0.11)*	
	2,350	17.8±2.5 (0.63±0.09)	
	2,600	Below 5.0 (0.18)	
Switch OFF Magnet valve	375	0 (0)	—
Idling	375	12.9±2.5 (0.45±0.09)	—
3 - 5 Solenoid	Max. cut-in voltage: 8V Test voltage: 12 - 14V		

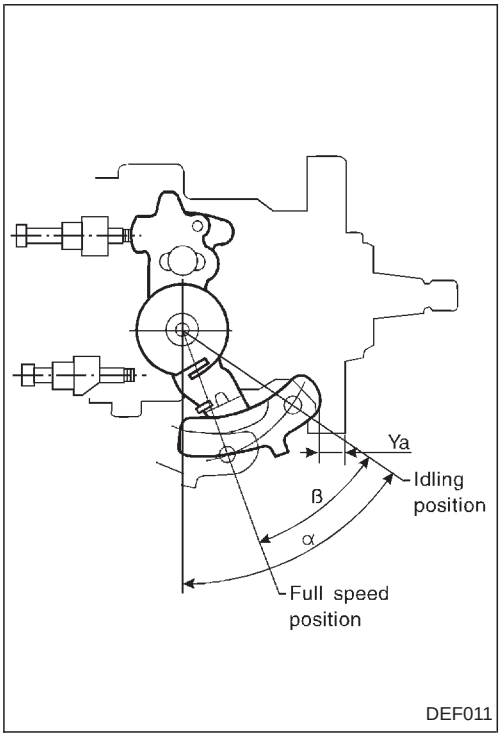
4. Dimensions	
K	3.3±0.1 mm (0.130±0.004 in)
KF	5.62±0.1 mm (0.2213±0.0039 in)
MS	0.9±0.1 mm (0.035±0.004 in)
BCS	—
Pre-stroke	0.1±0.02 mm (0.0039±0.0008 in)
Control lever angle	
α	51.5 - 59.5 degree
β	27.5 - 37.5 degree
γ	—

*: Reference value

Injection Pump Calibration Standard (Cont'd)

Control lever angle measurement position

Measure the control lever angles (α, β).



Load timer adjustment

1. Fix the control lever in the position satisfying the following conditions.
   Pump speed: 1,100 rpm
   Fuel injection quantity: 27.0±0.5 mℓ (0.95±0.02 Imp fl oz)/1,000 st
2. With the control lever positioned as described in 1. above, adjust the governor sleeve so that the timer stroke conforms to the specified values (item 2 - 7).

Control lever position			Specified values	
Pump speed rpm	Fuel injection quantity mℓ (Imp fl oz)/1,000 st	Boost pressure kPa (mbar, mmHg, inHg)	Timer stroke mm (in)	Timer stroke reduction value mm (in)
1,000	27.0±1.0 (0.95±0.04)	—	2.5±0.3 (0.098±0.012)	1.1 (0.043)
1,000	18.0±2.5 (0.63±0.09)*	—	1.4±0.5 (0.055±0.020)*	2.2 (0.087)*

*: Reference value

Injection Pump Calibration Standard (Cont'd)

QD32 ENGINE MODEL

Pump rotation: Clockwise—viewed from drive side

Injection pump assembly No.	104741-4372
Part No.	16700 2S604

1. Test conditions

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

1 - 2 Nozzle holder: 105780-2150

1 - 3 Nozzle opening pressure: 13,043 $^{+294}_{0}$ kPa (130.4 $^{+2.9}_{0}$ bar, 133 $^{+3}_{0}$ kg/cm^2, 1,891 $^{+43}_{0}$ psi)

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

1 - 5 Fuel oil temperature: 45 $^{+5}_{0}$ °C (113 $^{+9}_{0}$ °F)

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

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	1,000	3.6±0.2 mm (0.142±0.008 in)		—
2 - 2	Supply pump pressure	1,000	539±20 kPa (5.39±0.20 bar, 5.5±0.2 kg/cm^2, 78±2.8 psi)		—
2 - 3	Full-load delivery	1,000	56.8±0.5 mℓ (2.00±0.02 Imp fl oz)/1,000 st		4.5 (0.16)
2 - 4	Idle speed regulation	375	12.9±2.0 mℓ (0.45±0.07 Imp fl oz)/1,000 st	—	2.0 (0.07)
2 - 5	Start (Full lever)	100	90.0 $^{+20.0}_{-15.0}$ mℓ (3.17 $^{+0.70}_{-0.53}$ Imp fl oz)*/1,000 st		—
2 - 6	Full-load speed regulation	2,350	17.8±2.0 mℓ (0.63±0.07 Imp fl oz)/1,000 st		—
2 - 7	Load timer adjustment	1,000	2.5±0.2 mm (0.098±0.008 in)		—

3. Test specifications	Solenoid timer				
3 - 1 Timing device	N = rpm mm (in)	600 1.5±0.5 (0.059±0.020)*	1,000 3.6±0.3 (0.142±0.012)	1,800 7.5±0.5 (0.295±0.020)*	2,100 8.2 $^{+0.4}_{-0.5}$ (0.323 $^{+0.016}_{-0.020}$)
3 - 2 Supply pump	N = rpm kPa (bar, kg/cm^2, psi)		1,000 539±39 (5.39±0.39, 5.5±0.4, 78±6)	1,800 736±59 (7.36±0.59, 7.5±0.6, 107±9)	
3 - 3 Overflow delivery	N = rpm mℓ (Imp fl oz)/min.		1,000 390±130 (13.7±4.6)		

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	56.8±1.0 (2.00±0.04)	—
	500	50.2±3.5 (1.77±0.12)*	
	800	56.1±3.5 (1.97±0.12)*	
	1,500	57.6±3.0 (2.03±0.11)*	
	1,800	59.2±3.0 (2.08±0.11)*	
	2,350	17.8±2.5 (0.63±0.09)	
	2,600	Below 5.0 (0.18)	
Switch OFF Magnet valve	375	0 (0)	—
Idling	375	12.9±2.5 (0.45±0.09)	—
3 - 5 Solenoid	Max. cut-in voltage: 8V Test voltage: 12 - 14V		

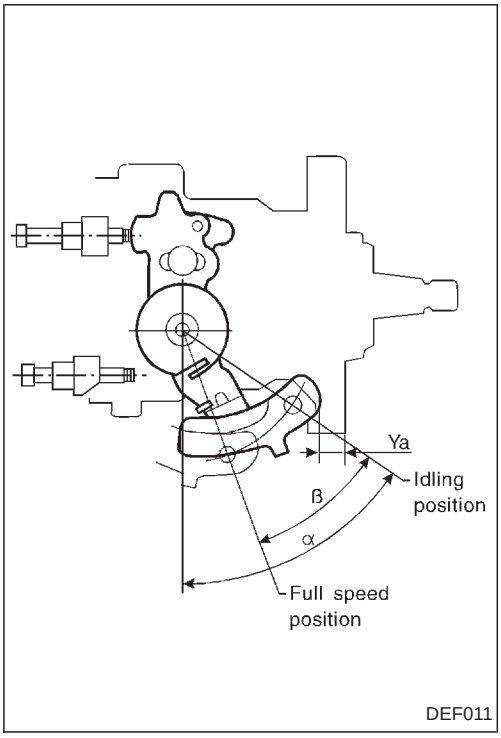
4. Dimensions	
K	3.3±0.1 mm (0.130±0.004 in)
KF	5.62±0.1 mm (0.2213±0.0039 in)
MS	0.9±0.1 mm (0.035±0.004 in)
BCS	—
Pre-stroke	0.1±0.02 mm (0.0039±0.0008 in)
Control lever angle	
α	51.5 - 59.5 degree
β	27.5 - 37.5 degree
γ	—

*: Reference value

Injection Pump Calibration Standard (Cont'd)

Control lever angle measurement position

Measure the control lever angles (α, β).



Load timer adjustment

1. Fix the control lever in the position satisfying the following conditions.
   Pump speed: 1,100 rpm
   Fuel injection quantity: 29.0±0.5 mℓ (1.09±0.04 Imp fl oz)/1,000 st
2. With the control lever positioned as described in 1. above, adjust the governor sleeve so that the timer stroke conforms to the specified values (item 2 - 7).

Control lever position			Specified values	
Pump speed rpm	Fuel injection quantity mℓ (Imp fl oz)/1,000 st	Boost pressure kPa (mbar, mmHg, inHg)	Timer stroke mm (in)	Timer stroke reduction value mm (in)
1,000	29.0±1.0 (1.02±0.04)	—	2.5±0.3 (0.098±0.012)	1.1 (0.043)
1,000	20.0±2.5 (0.70±0.09)*	—	1.4±0.5 (0.055±0.020)*	2.2 (0.087)*

*: Reference value

Injection Pump Calibration Standard (Cont'd)

QD32 ENGINE MODEL

Pump rotation: Clockwise—viewed from drive side

Injection pump assembly No.	104741-4491
Part No.	16700 2S613

1. Test conditions

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

1 - 2 Nozzle holder: 105780-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}_{0}$ kPa ($130.4^{+2.9}_{0}$ bar, 133^{+3}_{0} kg/cm^2, $1{,}891^{+43}_{0}$ psi)

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

1 - 5 Fuel oil temperature: 45^{+5}_{0} °C (113^{+9}_{0} °F)

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

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	1,000	4.4±0.2 mm (0.173±0.008 in)	—	—
2 - 2	Supply pump pressure	1,000	539±20 kPa (5.39±0.20 bar, 5.5±0.2 kg/cm^2, 78±2.8 psi)	—	—
2 - 3	Full-load delivery	1,000	55.3±0.5 mℓ (1.95±0.02 Imp fl oz)/1,000 st	—	4.5 (0.16)
2 - 4	Idle speed regulation	375	12.9±2.0 mℓ (0.45±0.07 Imp fl oz)/1,000 st	—	2.0 (0.07)
2 - 5	Start (Full lever)	100	$90.0^{+20.0}_{-15.0}$ mℓ ($3.17^{+0.70}_{-0.53}$ Imp fl oz)*/1,000 st	—	—
2 - 6	Full-load speed regulation	2,350	17.8±2.0 mℓ (0.63±0.07 Imp fl oz)/1,000 st	—	—
2 - 7	ACS adjustment	1,000	46.8±1.5 mℓ (1.65±0.05 Imp fl oz)/1,000 st	−21.9 (−219, −164, −6.46)	—

3. Test specifications	Solenoid timer				
3 - 1 Timing device	N = rpm mm (in)	600 1.8±0.5 (0.071±0.020)*	1,000 4.4±0.3 (0.173±0.012)	1,800 9.2±0.5 (0.362±0.020)*	2,050 $9.8^{+0.4}_{-0.5}$ ($0.386^{+0.016}_{-0.020}$)
3 - 2 Supply pump	N = rpm kPa (bar, kg/cm^2, psi)		1,000 539±39 (5.39±0.39, 5.5±0.4, 78±6)	1,800 736±59 (7.36±0.59, 7.5±0.6, 107±9)	
3 - 3 Overflow delivery	N = rpm mℓ (Imp fl oz)/min.		1,000 390±130 (13.7±4.6)		

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	55.3±1.0 (1.95±0.04)	—
	500	49.0±3.5 (1.72±0.12)*	
	800	54.1±3.5 (1.90±0.12)*	
	1,500	55.3±3.0 (1.95±0.11)*	
	1,800	57.5±3.0 (2.02±0.11)*	
	2,350	17.8±2.5 (0.63±0.09)	
	2,600	Below 5.0 (0.18)	
Switch OFF Magnet valve	375	0 (0)	—
Idling	375	12.9±2.5 (0.45±0.09)	—
3 - 5 Solenoid	Max. cut-in voltage: 8V Test voltage: 12 - 14V		

4. Dimensions	
K	3.3±0.1 mm (0.130±0.004 in)
KF	5.62±0.1 mm (0.2213±0.0039 in)
MS	0.9±0.1 mm (0.035±0.004 in)
BCS	—
Pre-stroke	0.1±0.02 mm (0.0039±0.0008 in)
Control lever angle	
α	55.5±4.0 degree
β	32.5±5.0 degree
γ	—

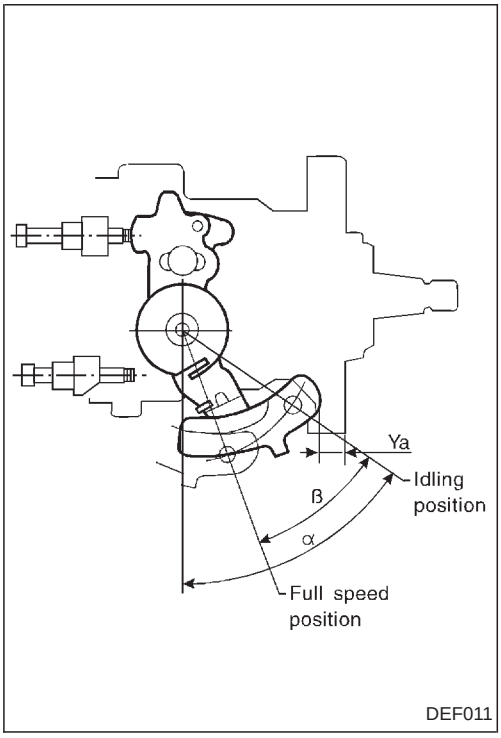
*: Reference value

ACS: High altitude compensator

Injection Pump Calibration Standard (Cont'd)

Control lever angle measurement position

Measure the control lever angles (α, β).



Full-load fuel injection quantity and ACS (high altitude compensator) adjusting procedure at high altitudes

1. Full-load fuel injection quantity adjustment
(1) Remove the ACS cover, the bellows and the adjusting shims.
(2) Perform all adjustments as described in the adjusting specifications, except for ACS adjustment.
2. ACS adjustment
(1) Attach the ACS cover, the bellows and the adjusting shims.
(2) At a pump speed of 1,000 rpm and referring to the value below, use the shims to adjust the fuel injection quantity decrease quantity according to the altitude.

Under the following conditions, adjust the ACS to value as specified.

Pump speed rpm	Altitude m (ft)	Atmospheric pressure kPa (mbar, mmHg, inHg)	Fuel injection q'ty mℓ (Imp fl oz)/1,000 st	Increasing rate (%)	Remarks
1,000	0	0	55.3±0.5 (1.95±0.02)	—	
	[500 (1,600)]	−5.9±3.3 (−59±33, −44±25, −1.73±0.98)	55.3 (1.95)*	Change point	
	2,000 (6,500)	−21.9 (−219, −164, −6.46)	46.8±1.5 (1.65±0.05)	15	
	4,000 (13,000)	−39.7 (−397, −298, −11.73)	37.9 (1.33)*	31	

*: Reference value

Injection Pump Calibration Standard (Cont'd)

QD32 ENGINE MODEL

Pump rotation: Clockwise—viewed from drive side

Injection pump assembly No.	104741-4413
Part No.	16700 2S614

1. Test conditions

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

1 - 2 Nozzle holder: 105780-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}_{0}$ kPa ($130.4^{+2.9}_{0}$ bar, 133^{+3}_{0} kg/cm^2, $1{,}891^{+43}_{0}$ psi)

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

1 - 5 Fuel oil temperature: 45^{+5}_{0} °C (113^{+9}_{0} °F)

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

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	1,000	3.5±0.2 mm (0.138±0.008 in)	—	—
2 - 2	Supply pump pressure	1,000	539±20 kPa (5.39±0.20 bar, 5.5±0.2 kg/cm^2, 78±2.8 psi)		—
2 - 3	Full-load delivery	1,000	55.3±0.5 mℓ (1.95±0.02 Imp fl oz)/1,000 st		4.5 (0.16)
2 - 4	Idle speed regulation	375	12.9±2.0 mℓ (0.45±0.07 Imp fl oz)/1,000 st		2.0 (0.07)
2 - 5	Start (Full lever)	100	$90.0^{+20.0}_{-15.0}$ mℓ ($3.17^{+0.70}_{-0.53}$ Imp fl oz)*/1,000 st		—
2 - 6	Full-load speed regulation	2,350	17.8±2.0 mℓ (0.63±0.07 Imp fl oz)/1,000 st		—

3. Test specifications	Solenoid timer				
3 - 1 Timing device	N = rpm mm (in)	600 1.4±0.5 (0.055±0.020)*	1,000 3.5±0.3 (0.138±0.012)	1,800 7.4±0.5 (0.291±0.020)*	2,050 $8.2^{+0.4}_{-0.5}$ ($0.323^{+0.016}_{-0.020}$)
3 - 2 Supply pump	N = rpm kPa (bar, kg/cm^2, psi)		1,000 539±39 (5.39±0.39, 5.5±0.4, 78±6)	1,800 736±59 (7.36±0.59, 7.5±0.6, 107±9)	
3 - 3 Overflow delivery	N = rpm mℓ (Imp fl oz)/min.	1,000 (O-ring less) 390±130 (13.7±4.6)			

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)	Difference in delivery mℓ (Imp fl oz)
Max. speed	1,000	55.3±1.0 (1.95±0.04)	—	—
	500	49.0±3.5 (1.72±0.12)*		
	800	54.1±3.5 (1.90±0.12)*		
	1,500	55.3±3.0 (1.95±0.11)*		
	1,800	57.5±3.0 (2.02±0.11)*		
	2,350	17.8±2.5 (0.63±0.09)		
	2,600	Below 5.0 (0.18)		
Switch OFF Magnet valve	375	0 (0)	—	—
Idling	375	12.9±2.5 (0.45±0.09)	—	—
3 - 5 Solenoid	Max. cut-in voltage: 8V Test voltage: 12 - 14V			

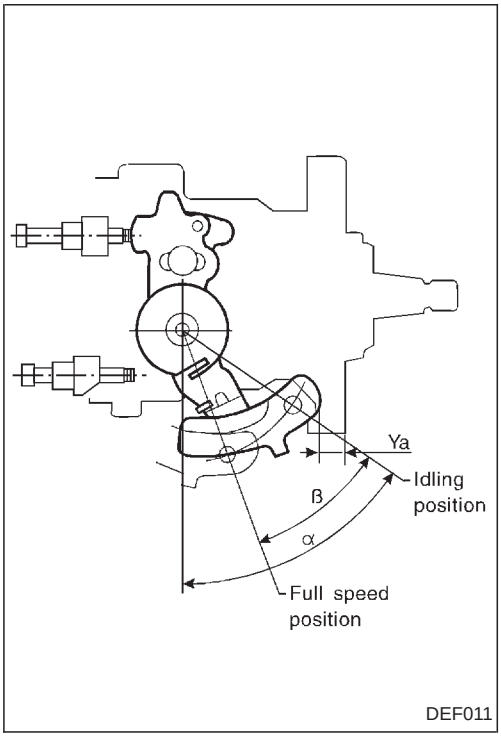
4. Dimensions	
K	3.3±0.1 mm (0.130±0.004 in)
KF	5.62±0.1 mm (0.2213±0.0039 in)
MS	0.9±0.1 mm (0.035±0.004 in)
BCS	—
Pre-stroke	0.1±0.02 mm (0.0039±0.0008 in)
Control lever angle	
α	51.5 - 59.5 degree
β	27.5 - 37.5 degree
γ	—

*: Reference value

Injection Pump Calibration Standard (Cont'd)

Control lever angle measurement position

Measure the control lever angles (α, β).



Injection Pump Calibration Standard (Cont'd)

QD32 ENGINE MODEL

Pump rotation: Clockwise—viewed from drive side

Injection pump assembly No.	104741-4423
Part No.	16700 2S615

1. Test conditions

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

1 - 2 Nozzle holder: 105780-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}_{0}$ kPa ($130.4^{+2.9}_{0}$ bar, 133^{+3}_{0} kg/cm^2, $1{,}891^{+43}_{0}$ psi)

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

1 - 5 Fuel oil temperature: 45^{+5}_{0} °C (113^{+9}_{0} °F)

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

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	1,000	ON 5.0±0.4 mm (0.197±0.016 in)* OFF 3.5±0.2 mm (0.138±0.008 in)		—
2 - 2	Supply pump pressure	1,000	ON 618±39 kPa (6.18±0.39 bar, 6.3±0.4 kg/cm^2, 90±6 psi)* OFF 539±20 kPa (5.39±0.20 bar, 5.5±0.2 kg/cm^2, 78±2.8 psi)		—
2 - 3	Full-load delivery	1,000	53.5±0.5 mℓ (1.88±0.02 Imp fl oz)/1,000 st	—	4.5 (0.16)
2 - 4	Idle speed regulation	375	12.9±2.0 mℓ (0.45±0.07 Imp fl oz)/1,000 st		2.0 (0.07)
2 - 5	Start (Full lever)	100	$90.0^{+20.0}_{-15.0}$ mℓ ($3.17^{+0.70}_{-0.53}$ Imp fl oz)*/1,000 st		—
2 - 6	Full-load speed regulation	2,350	17.8±2.0 mℓ (0.63±0.07 Imp fl oz)/1,000 st		—

3. Test specifications	Solenoid timer	ON	OFF			
3 - 1 Timing device	N = rpm mm (in)	1,000 5.0±0.5 (0.197±0.020)*	750 1.6±0.6 (0.063±0.024)*	1,000 3.5±0.3 (0.138±0.012)	1,800 7.4±0.5 (0.291±0.020)*	2,050 $8.2^{+0.4}_{-0.5}$ ($0.323^{+0.016}_{-0.020}$)
3 - 2 Supply pump	N = rpm kPa (bar, kg/cm^2, psi)			1,000 539±39 (5.39±0.39, 5.5±0.4, 78±6)	1,800 736±59 (7.36±0.59, 7.5±0.6, 107±9)	
3 - 3 Overflow delivery	N = rpm mℓ (Imp fl oz)/min.	1,000 (O-ring) 500±130 (17.6±4.6)				

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	55.3±1.0 (1.95±0.04)	—
	500	49.0±3.5 (1.72±0.12)*	
	800	54.1±3.5 (1.90±0.12)*	
	1,500	55.3±3.0 (1.95±0.11)*	
	1,800	57.5±3.0 (2.02±0.11)*	
	2,350	17.8±2.5 (0.63±0.09)	
	2,600	Below 5.0 (0.18)	
Switch OFF Magnet valve	375	0 (0)	—
Idling	375	12.9±2.5 (0.45±0.09)	—
3 - 5 Solenoid	Max. cut-in voltage: 8V Test voltage: 12 - 14V		

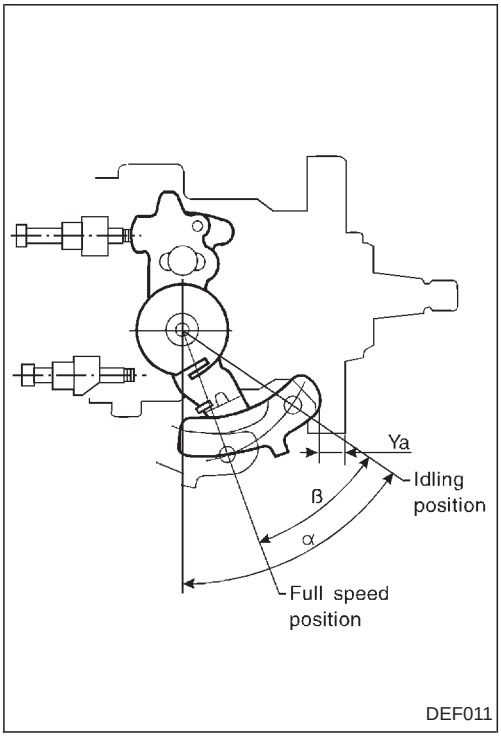
4. Dimensions	
K	3.3±0.1 mm (0.130±0.004 in)
KF	5.62±0.1 mm (0.2213±0.0039 in)
MS	0.9±0.1 mm (0.035±0.004 in)
BCS	—
Pre-stroke	0.1±0.02 mm (0.0039±0.0008 in)
Control lever angle	
α	51.5 - 59.5 degree
β	27.5 - 37.5 degree
γ	—

*: Reference value
ON: Solenoid timer is ON.
OFF: Solenoid timer is OFF.
If there is no designation in the specifications for the Solenoid Timer's ON-OFF position, then the position should be regarded as OFF.

Injection Pump Calibration Standard (Cont'd)

Control lever angle measurement position

Measure the control lever angles (α, β).



Injection Pump Calibration Standard (Cont'd)

QD32 ENGINE MODEL

Injection pump assembly No.	104741-4432
Part No.	16700 2S616

Pump rotation: Clockwise—viewed from drive side

1. Test conditions

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

1 - 2 Nozzle holder: 105780-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}_{0}$ kPa ($130.4^{+2.9}_{0}$ bar, 133^{+3}_{0} kg/cm^2, $1{,}891^{+43}_{0}$ psi)

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

1 - 5 Fuel oil temperature: 45^{+5}_{0} °C (113^{+9}_{0} °F)

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

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	1,000	3.5±0.2 mm (0.138±0.008 in)	—	—
2 - 2	Supply pump pressure	1,000	539±20 kPa (5.39±0.20 bar, 5.5±0.2 kg/cm^2, 78±2.8 psi)	—	—
2 - 3	Full-load delivery	1,000	55.3±0.5 mℓ (1.95±0.02 Imp fl oz)/1,000 st	—	4.4 (0.15)
2 - 4	Idle speed regulation	375	12.9±2.0 mℓ (0.45±0.07 Imp fl oz)/1,000 st	—	2.0 (0.07)
2 - 5	Start (Full lever)	100	$90.0^{+20.0}_{-15.0}$ mℓ ($3.17^{+0.70}_{-0.53}$ Imp fl oz)*/1,000 st	—	—
2 - 6	Full-load speed regulation	2,350	17.8±2.0 mℓ (0.63±0.07 Imp fl oz)/1,000 st	—	—
2 - 7	ACS adjustment	1,000	46.8±1.5 mℓ (1.65±0.05 Imp fl oz)/1,000 st	−21.9 (−219, −164, −6.46)	—

3. Test specifications	Solenoid timer				
3 - 1 Timing device	N = rpm mm (in)	600 1.4±0.5 (0.055±0.020)*	1,000 3.5±0.3 (0.138±0.012)	1,800 7.4±0.5 (0.291±0.020)*	2,050 $8.2^{+0.4}_{-0.5}$ ($0.323^{+0.016}_{-0.020}$)
3 - 2 Supply pump	N = rpm kPa (bar, kg/cm^2, psi)		1,000 539±39 (5.39±0.39, 5.5±0.4, 78±6)	1,800 736±59 (7.36±0.59, 7.5±0.6, 107±9)	
3 - 3 Overflow delivery	N = rpm mℓ (Imp fl oz)/min.		1,000 390±130 (13.7±4.6)		

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	55.3±1.0 (1.95±0.04)	—
	500	49.0±3.5 (1.72±0.12)*	
	800	54.1±3.5 (1.90±0.12)*	
	1,500	55.3±3.0 (1.95±0.11)*	
	1,800	57.5±3.0 (2.02±0.11)*	
	2,350	17.8±2.5 (0.63±0.09)	
	2,600	Below 5.0 (0.18)	
Switch OFF Magnet valve	375	0 (0)	—
Idling	375	12.9±2.5 (0.45±0.09)	—
3 - 5 Solenoid	Max. cut-in voltage: 8V Test voltage: 12 - 14V		

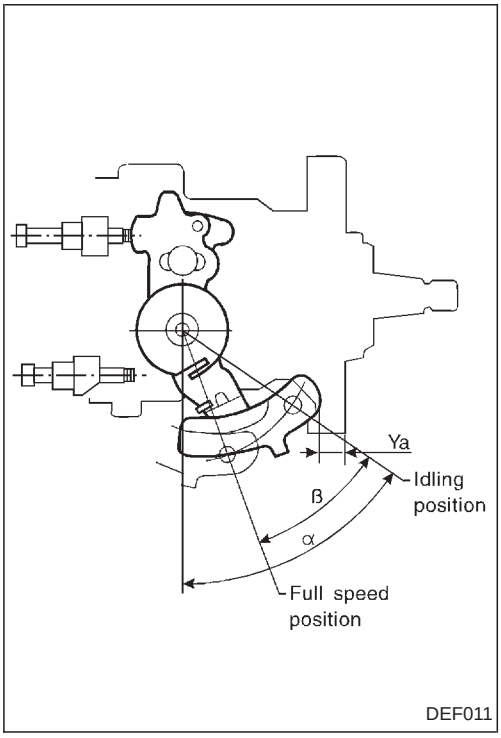
4. Dimensions	
K	3.3±0.1 mm (0.130±0.004 in)
KF	5.62±0.1 mm (0.2213±0.0039 in)
MS	0.9±0.1 mm (0.035±0.004 in)
BCS	—
Pre-stroke	0.1±0.02 mm (0.0039±0.0008 in)
Control lever angle	
α	51.5 - 59.5 degree
β	27.5 - 37.5 degree
γ	—

*: Reference value
ACS: High altitude compensator

Injection Pump Calibration Standard (Cont'd)

Control lever angle measurement position

Measure the control lever angles (α, β).



Full-load fuel injection quantity and ACS (high altitude compensator) adjusting procedure at high altitudes

1. Full-load fuel injection quantity adjustment
(1) Remove the ACS cover, the bellows and the adjusting shims.
(2) Perform all adjustments as described in the adjusting specifications, except for ACS adjustment.
2. ACS adjustment
(1) Attach the ACS cover, the bellows and the adjusting shims.
(2) At a pump speed of 1,000 rpm and referring to the value below, use the shims to adjust the fuel injection quantity decrease quantity according to the altitude.

Under the following conditions, adjust the ACS to value as specified.

Pump speed rpm	Altitude m (ft)	Atmospheric pressure kPa (mbar, mmHg, inHg)	Fuel injection q'ty mℓ (Imp fl oz)/1,000 st	Increasing rate (%)	Remarks
1,000	0	0	55.3±1.0 (1.95±0.04)	—	—
	[500 (1,600)]	−5.9±3.3 (−59±33, −44±25, −1.73±0.98)	55.3 (1.95)*	Change point	—
	2,000 (6,500)	−21.9 (−219, −164, −6.46)	46.8±2.0 (1.65±0.07)	15	—
	4,000 (13,000)	−39.7 (−397, −298, −11.73)	37.9 (1.33)*	31	—

*: Reference value

Injection Pump Calibration Standard (Cont'd)

TD27 ENGINE MODEL

Pump rotation: Clockwise—viewed from drive side

Injection pump assembly No.	104745-7740
Part No.	16700 2S500

1. Test conditions

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

1 - 2 Nozzle holder: 105780-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}_{0}$ kPa ($130.4^{+2.9}_{0}$ bar, 133^{+3}_{0} kg/cm^2, $1{,}891^{+43}_{0}$ psi)

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

1 - 5 Fuel oil temperature: 45^{+5}_{0} °C (113^{+9}_{0} °F)

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

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	1,100	1.9±0.2 mm (0.075±0.008 in)		—
2 - 2	Supply pump pressure	1,100	432±29 kPa (4.32±0.29 bar, 4.4±0.3 kg/cm^2, 63±4 psi)		—
2 - 3	Full-load delivery	1,100	49.9±0.5 mℓ (1.76±0.02 Imp fl oz)/1,000 st		4.0 (0.14)
2 - 4	Idle speed regulation	350	7.1±2.0 mℓ (0.25±0.07 Imp fl oz)/1,000 st	—	2.0 (0.07)
2 - 5	Start (Full lever)	100	$60.0^{+20.0}_{-15.0}$ mℓ ($2.11^{+0.70}_{-0.53}$ Imp fl oz)*/1,000 st		—
2 - 6	Full-load speed regulation	2,550	10.9±2.0 mℓ (0.38±0.07 Imp fl oz)/1,000 st		3.0 (0.11)
2 - 7	Load timer adjustment	1,100	1.2±0.2 mm (0.047±0.008 in)		—

3. Test specifications					
3 - 1 Timing device	N = rpm mm (in)	850 0.5±0.5 (0.020±0.020)*	1,100 1.9±0.3 (0.75±0.012)	1,700 4.4±0.5 (0.173±0.020)*	2,300 $6.1^{+0.4}_{-0.5}$ ($0.240^{+0.016}_{-0.020}$)
3 - 2 Supply pump	N = rpm kPa (bar, kg/cm^2, psi)		1,100 432±39 (4.32±0.39, 4.4±0.4, 63±6)	1,700 559±39 (5.59±0.39, 5.7±0.4, 81±6)*	
3 - 3 Overflow delivery	N = rpm mℓ (Imp fl oz)/min.		1,100 390±130 (13.7±4.6)		

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	1,100	49.9±1.0 (1.76±0.04)	—
	500	41.3±2.5 (1.45±0.09)*	
	2,150	46.3±2.5 (1.63±0.09)*	
	2,350	37.0±5.0 (1.30±0.18)*	
	2.550	10.9±2.5 (0.38±0.09)	
	2,700	Below 5.0 (0.18)	
Switch OFF Magnet valve	350	0 (0) Idle	—
Idling	350	7.7±2.5 (0.27±0.09)	—
3 - 5 Solenoid	Max. cut-in voltage: 8V Test voltage: 12 - 14V		

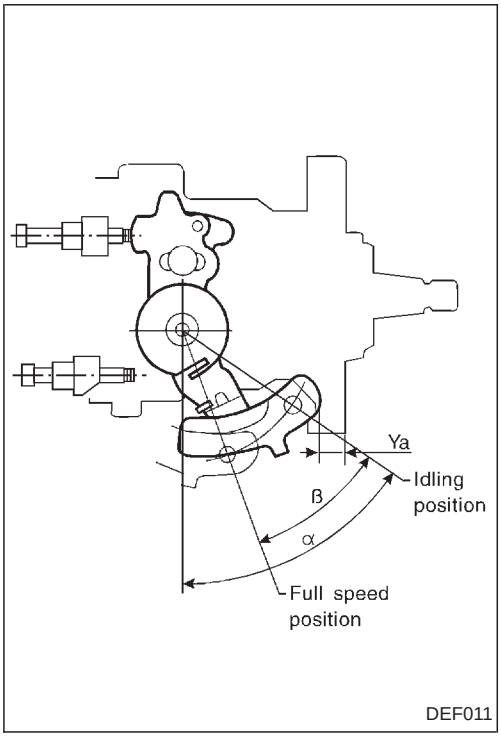
4. Dimensions	
K	3.3±0.1 mm (0.130±0.004 in)
KF	5.8±0.1 mm (0.228±0.004 in)
MS	0.9±0.1 mm (0.035±0.004 in)
BCS	—
Pre-stroke	0.1±0.02 mm (0.0039±0.0008 in)
Control lever angle	
α	21.0 - 29.0 degree
β	31.0 - 41.0 degree
γ	—

*: Reference value

Injection Pump Calibration Standard (Cont'd)

Control lever angle measurement position

Measure the control lever angles (α, β).



Load timer adjustment

1. Fix the control lever in the position satisfying the following conditions.
   Pump speed: 1,100 rpm
   Fuel injection quantity: 31.0±0.5 mℓ (1.09±0.02 Imp fl oz)/1,000 st
2. With the control lever positioned as described in 1. above, adjust the governor sleeve so that the timer stroke conforms to the specified values (item 2 - 7).

Control lever position			Specified values	
Pump speed rpm	Fuel injection quantity mℓ (Imp fl oz)/1,000 st	Boost pressure kPa (mbar, mmHg, inHg)	Timer stroke mm (in)	Timer stroke reduction value mm (in)
1,100	31.0±0.5 (1.09±0.02)	—	1.2±0.3 (0.047±0.012)	0.7 (0.028)
1,100	22.0±2.5 (0.77±0.09)*	—	0.6±0.5 (0.024±0.020)*	1.3 (0.051)*

*: Reference value

Injection Pump Calibration Standard (Cont'd)

TD27 ENGINE MODEL

Pump rotation: Clockwise—viewed from drive side

Injection pump assembly No.	104745-7770
Part No.	16700 2S510

1. Test conditions

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

1 - 2 Nozzle holder: 105780-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}_{0}$ kPa ($130.4^{+2.9}_{0}$ bar, 133^{+3}_{0} kg/cm^2, $1{,}891^{+43}_{0}$ psi)

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

1 - 5 Fuel oil temperature: 45^{+5}_{0} °C (113^{+9}_{0} °F)

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

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	1,700	4.7 - 5.1 mm (0.185 - 0.201 in)	—	—
2 - 2	Supply pump pressure	1,700	549 - 608 kPa (5.49 - 6.08 bar, 5.6 - 6.2 kg/cm^2, 80 - 88 psi)		—
2 - 3	Full-load delivery	1,100	49.8 - 50.8 mℓ (1.75 - 1.79 Imp fl oz)/1,000 st		3.0 (0.11)
2 - 4	Idle speed regulation	350	5.3 - 9.3 mℓ (0.19 - 0.33 Imp fl oz)/1,000 st		2.0 (0.07)
2 - 5	Start	100	45.0 - 80.0 mℓ (1.58 - 2.82 Imp fl oz)/1,000 st		—
2 - 6	Full-load speed regulation	2,350	32.2 - 36.2 mℓ (1.13 - 1.27 Imp fl oz)/1,000 st		—

3. Test specifications

3 - 1 Timing device	N = rpm mm (in)	1,100 2.0 - 3.2 (0.079 - 0.126)	1,700 4.6 - 5.2 (0.181 - 0.205)	2,150 6.0 - 7.2 (0.236 - 0.283)	2,550 6.8 - 7.8 (0.268 - 0.307)
3 - 2 Supply pump	N = rpm kPa (bar, kg/cm^2, psi)		1,700 549 - 608 (5.49 - 6.08, 5.6 - 6.2, 80 - 88)	2,150 647 - 706 (6.47 - 7.06, 6.6 - 7.2, 94 - 102)	
3 - 3 Overflow delivery	N = rpm mℓ (Imp fl oz)/min.	1,100 258 - 522 (9.1 - 18.4)			

3 - 4 Fuel injection quantities

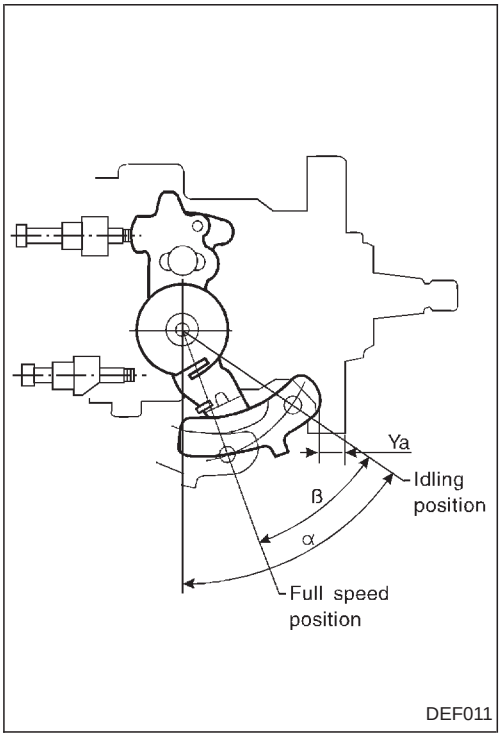
Speed control lever position	Pump speed rpm	Fuel delivery mℓ (Imp fl oz)/1,000 st	Charge air press kPa (mbar, mmHg, inHg)
Max. speed	1,100	49.3 - 51.3 (1.74 - 1.81)	—
	600	48.8 - 52.8 (1.72 - 1.86)	
	2,150	38.7 - 42.9 (1.36 - 1.51)	
	2,350	31.7 - 36.7 (1.12 - 1.29)	
	2,550	5.6 - 14.6 (0.20 - 0.51)	
	2,700	Below 5.0 (0.18)	
Switch OFF Magnet valve	350	0 (0)	—
Idling	350	5.3 - 9.3 (0.19 - 0.33)	—
	450	Below 3.0 (0.11)	
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	0.8 - 1.0 mm (0.031 - 0.039 in)
BCS	—
Pre-stroke	—
Control lever angle	
α	51.5 - 59.5 degree
β	31.0 - 41.0 degree
γ	—

Injection Pump Calibration Standard (Cont'd)

Control lever angle measurement position

Measure the control lever angles (α, β) at hole "A".



Injection Pump Calibration Standard (Cont'd)

TD27 ENGINE MODEL

Pump rotation: Clockwise—viewed from drive side

Injection pump assembly No.	104745-7780
Part No.	16700 2S511

1. Test conditions

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

1 - 2 Nozzle holder: 105780-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}_{0}$ kPa ($130.4^{+2.9}_{0}$ bar, 133^{+3}_{0} kg/cm^2, $1{,}891^{+43}_{0}$ psi)

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

1 - 5 Fuel oil temperature: 45^{+5}_{0} °C (113^{+9}_{0} °F)

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

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	1,100	ON 3.9 - 4.7 mm (0.154 - 0.185 in) OFF 2.4 - 2.8 mm (0.094 - 0.110 in)	—	—
2 - 2	Supply pump pressure	1,100	ON 441 - 520 kPa (4.41 - 5.20 bar, 4.5 - 5.3 kg/cm^2, 64 - 75 psi) OFF 343 - 402 kPa (3.43 - 4.02 bar, 3.5 - 4.1 kg/cm^2, 50 - 58 psi)		—
2 - 3	Full-load delivery	1,100	49.8 - 50.8 mℓ (1.75 - 1.79 Imp fl oz)/1,000 st		3.0 (0.11)
2 - 4	Idle speed regulation	350	5.3 - 9.3 mℓ (0.19 - 0.33 Imp fl oz)/1,000 st		2.0 (0.07)
2 - 5	Start	100	45.0 - 80.0 mℓ (1.58 - 2.82 Imp fl oz)/1,000 st		—
2 - 6	Full-load speed regulation	2,350	32.2 - 36.2 mℓ (1.13 - 1.27 Imp fl oz)/1,000 st		—

3. Test specifications		Solenoid timer	ON		OFF			
3 - 1	Timing device	N = rpm mm (in)	1,100 3.8 - 4.8 (0.150 - 0.189)	1,700 5.7 - 7.3 (0.224 - 0.287)	1,100 2.3 - 2.9 (0.091 - 0.114)	1,700 4.3 - 5.5 (0.169 - 0.217)		2,550 6.8 - 7.8 (0.268 - 0.307)
3 - 2	Supply pump	N = rpm kPa (bar, kg/cm^2, psi)	1,100 441 - 520 (4.41 - 5.20, 4.5 - 5.3, 64 - 75)	1,700 579 - 657 (5.79 - 6.57, 5.9 - 6.7, 84 - 95)	1,100 343 - 402 (3.43 - 4.02, 3.5 - 4.1, 50 - 58)	1,700 481 - 539 (4.81 - 5.39, 4.9 - 5.5, 70 - 78)	2,150 569 - 628 (5.69 - 6.28, 5.8 - 6.4, 82 - 91)	
3 - 3	Overflow delivery	N = rpm mℓ (Imp fl oz)/min.	1,100 258 - 522 (9.1 - 18.4)		—			

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	1,100	49.3 - 51.3 (1.74 - 1.81)	—
	600	48.8 - 52.8 (1.72 - 1.86)	
	2,150	38.7 - 42.9 (1.36 - 1.51)	
	2,350	31.7 - 36.7 (1.12 - 1.29)	
	2,550	5.6 - 14.6 (0.20 - 0.51)	
	2,700	Below 5.0 (0.18)	
Switch OFF Magnet valve	350	0 (0)	—
Idling	350	5.3 - 9.3 (0.19 - 0.33)	—
	450	Below 3.0 (0.11)	
3 - 5 Solenoid	Max. cut-in voltage: 8V Test voltage: 12 - 14V		

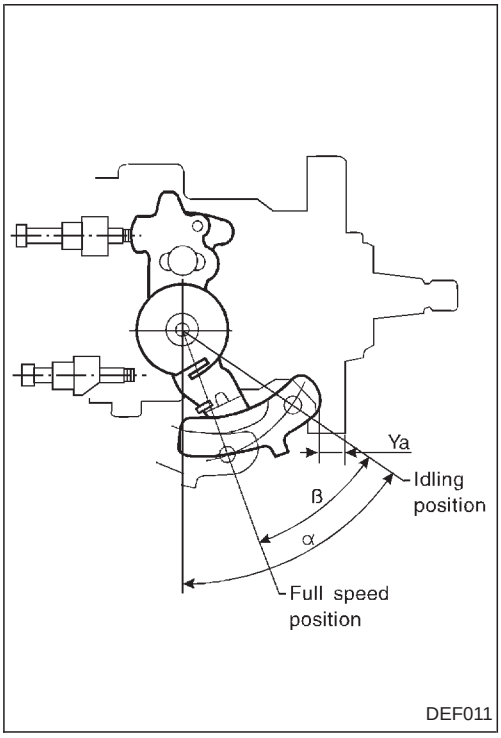
4. Dimensions	
K	3.2 - 3.4 mm (0.126 - 0.134 in)
KF	5.7 - 5.9 mm (0.224 - 0.232 in)
MS	0.8 - 1.0 mm (0.031 - 0.039 in)
BCS	—
Pre-stroke	—
Control lever angle	
α	51.5 - 59.5 degree
β	31.0 - 41.0 degree
γ	—

ON: Solenoid timer is ON.
OFF: Solenoid timer is OFF.
If there is no designation in the specifications for the Solenoid Timer's ON-OFF position, then the position should be regarded as OFF.

Injection Pump Calibration Standard (Cont'd)

Control lever angle measurement position

Measure the control lever angles (α, β).



Injection Pump Calibration Standard (Cont'd)

TD27 ENGINE MODEL

Pump rotation: Clockwise—viewed from drive side

Injection pump assembly No.	104745-7790
Part No.	16700 2S512

1. Test conditions

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

1 - 2 Nozzle holder: 105780-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}_{0}$ kPa ($130.4^{+2.9}_{0}$ bar, 133^{+3}_{0} kg/cm^2, $1{,}891^{+43}_{0}$ psi)

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

1 - 5 Fuel oil temperature: 45^{+5}_{0} °C (113^{+9}_{0} °F)

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

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	1,700	4.7 - 5.1 mm (0.185 - 0.201 in)		—
2 - 2	Supply pump pressure	1,700	549 - 608 kPa (5.49 - 6.08 bar, 5.6 - 6.2 kg/cm^2, 80 - 88 psi)		—
2 - 3	Full-load delivery	1,100	49.8 - 50.8 mℓ (1.75 - 1.79 Imp fl oz)/1,000 st		3.0 (0.11)
2 - 4	Idle speed regulation	350	5.3 - 9.3 mℓ (0.19 - 0.33 Imp fl oz)/1,000 st	—	2.0 (0.07)
2 - 5	Start	100	45.0 - 80.0 mℓ (1.58 - 2.82 Imp fl oz)/1,000 st		—
2 - 6	Full-load speed regulation	2,350	32.2 - 36.2 mℓ (1.13 - 1.27 Imp fl oz)/1,000 st		—
2 - 7	ACS adjustment	1,100	39.7 - 42.7 mℓ (1.40 - 1.50 Imp fl oz)/1,000 st		—

3. Test specifications						
3 - 1 Timing device	N = rpm mm (in)	1,100 2.2 - 3.0 (0.087 - 0.12)	1,700 4.6 - 5.1 (0.181 - 0.201)	2,150 6.0 - 7.2 (0.236 - 0.283)	2,550 6.8 - 7.8 (0.268 - 0.307)
3 - 2 Supply pump	N = rpm kPa (bar, kg/cm^2, psi)		1,700 549 - 608 (5.49 - 6.08, 5.6 - 6.2, 80 - 88)	2,150 647 - 706 (6.47 - 7.06, 6.6 - 7.2, 94 - 102)	
3 - 3 Overflow delivery	N = rpm mℓ (Imp fl oz)/min.	1,100 258 - 522 (9.1 - 18.4)			

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	1,100	49.3 - 51.3 (1.74 - 1.81)	—
	600	48.8 - 52.8 (1.72 - 1.86)	
	1,100	39.2 - 43.2 (1.38 - 1.52)	
	2,150	38.7 - 42.9 (1.36 - 1.51)	
	2,350	31.7 - 36.7 (1.12 - 1.29)	
	2,550	5.6 - 14.6 (0.20 - 0.51)	
	2,700	Below 5.0 (0.18)	
Switch OFF Magnet valve	350	0 (0)	—
Idling	350	5.3 - 9.3 (0.19 - 0.33)	—
	450	Below 3.0 (0.11)	
3 - 5 Solenoid	Max. cut-in voltage: 8V Test voltage: 12 - 14V		

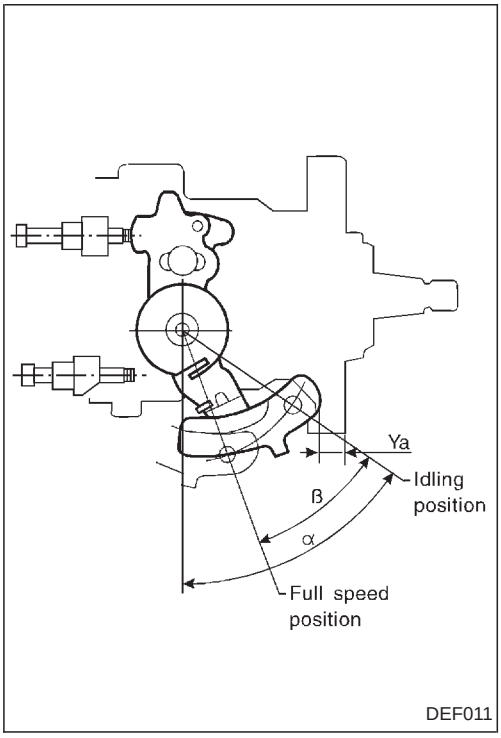
4. Dimensions	
K	3.2 - 3.4 mm (0.126 - 0.134 in)
KF	5.7 - 5.9 mm (0.224 - 0.232 in)
MS	0.8 - 1.0 mm (0.031 - 0.039 in)
BCS	—
Pre-stroke	—
Control lever angle	
α	51.5 - 59.5 degree
β	31.0 - 41.0 degree
γ	—

ACS: High altitude compensator

Injection Pump Calibration Standard (Cont'd)

Control lever angle measurement position

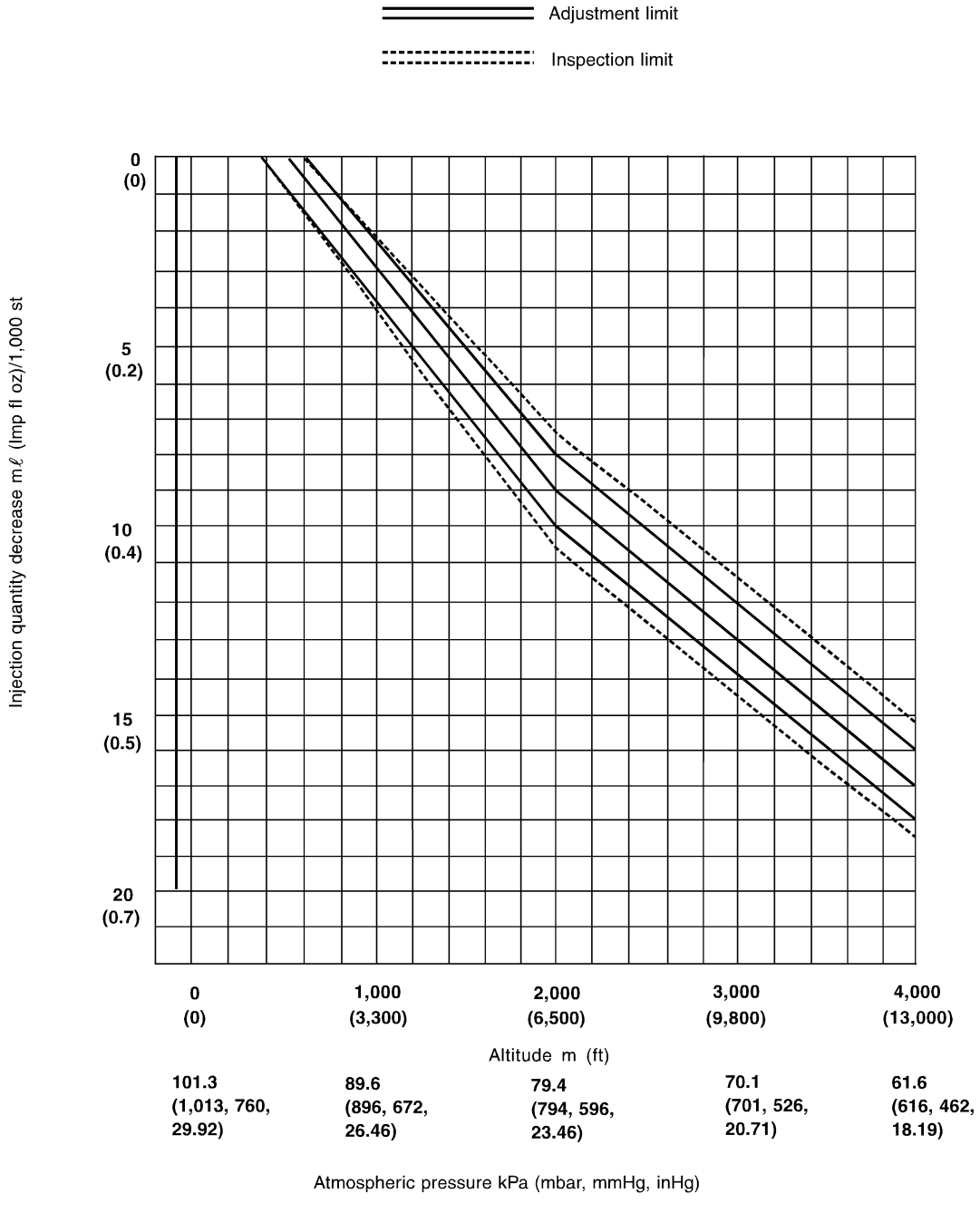
Measure the control lever angles (α, β).



Injection Pump Calibration Standard (Cont'd)

Full-load fuel injection quantity and ACS (high altitude compensator) adjusting procedure at high altitudes

1. Full-load fuel injection quantity adjustment
(1) Remove the ACS cover, the bellows and the adjusting shims.
(2) Perform all adjustments as described in the adjusting specifications, except for ACS adjustment.
2. ACS adjustment
(1) Attach the ACS cover, the bellows and the adjusting shims.
(2) At a pump speed of 1,100 rpm and referring to the graph below, use the shims to adjust the fuel injection quantity decrease quantity according to the altitude.



Injection Pump Calibration Standard (Cont'd)

TD27 ENGINE MODEL

Pump rotation: Clockwise—viewed from drive side

Injection pump assembly No.	104745-7800
Part No.	16700 2S513

1. Test conditions

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

1 - 2 Nozzle holder: 105780-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}_{0}$ kPa ($130.4^{+2.9}_{0}$ bar, 133^{+3}_{0} kg/cm^2, $1{,}891^{+43}_{0}$ psi)

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

1 - 5 Fuel oil temperature: 45^{+5}_{0} °C (113^{+9}_{0} °F)

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

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	1,700	6.5 - 6.9 mm (0.256 - 0.272 in)		—
2 - 2	Supply pump pressure	1,700	549 - 608 kPa (5.49 - 6.08 bar, 5.6 - 6.2 kg/cm^2, 80 - 88 psi)		—
2 - 3	Full-load delivery	1,100	49.8 - 50.8 mℓ (1.75 - 1.79 Imp fl oz)/1,000 st		3.0 (0.11)
2 - 4	Idle speed regulation	350	5.3 - 9.3 mℓ (0.19 - 0.33 Imp fl oz)/1,000 st	—	2.0 (0.07)
2 - 5	Start	100	45.0 - 80.0 mℓ (1.58 - 2.82 Imp fl oz)/1,000 st		—
2 - 6	Full-load speed regulation	2,350	32.2 - 36.2 mℓ (1.13 - 1.27 Imp fl oz)/1,000 st		—
2 - 7	ACS adjustment	1,100	39.7 - 42.7 mℓ (1.40 - 1.50 Imp fl oz)/1,000 st		—

3. Test specifications					
3 - 1 Timing device	N = rpm mm (in)	400 Below 1.0 (0.039)	1,100 2.8 - 4.0 (0.110 - 0.157)	1,700 6.4 - 7.0 (0.252 - 0.276)	2,150 7.6 - 8.6 (0.299 - 0.339)
3 - 2 Supply pump	N = rpm kPa (bar, kg/cm^2, psi)		1,100 402 - 461 (4.02 - 4.61, 4.1 - 4.7, 58 - 67)	1,700 549 - 608 (5.49 - 6.08, 5.6 - 6.2, 80 - 88)	2,150 (647 - 706 (6.47 - 7.06, 6.6 - 7.2, 94 - 102)
3 - 3 Overflow delivery	N = rpm mℓ (Imp fl oz)/min.	1,100 258 - 522 (9.1 - 18.4)			

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	1,100	49.3 - 51.3 (1.74 - 1.81)	—
	600	48.8 - 52.8 (1.72 - 1.86)	
	1,100	39.2 - 43.2 (1.38 - 1.52)	
	2,150	38.7 - 42.9 (1.36 - 1.51)	
	2,350	31.7 - 36.7 (1.12 - 1.29)	
	2,550	5.6 - 14.6 (0.20 - 0.51)	
	2,700	Below 5.0 (0.18)	
Switch OFF Magnet valve	350	0 (0)	—
Idling	350	5.3 - 9.3 (0.19 - 0.33)	—
	450	Below 3.0 (0.11)	
3 - 5 Solenoid	Max. cut-in voltage: 8V Test voltage: 12 - 14V		

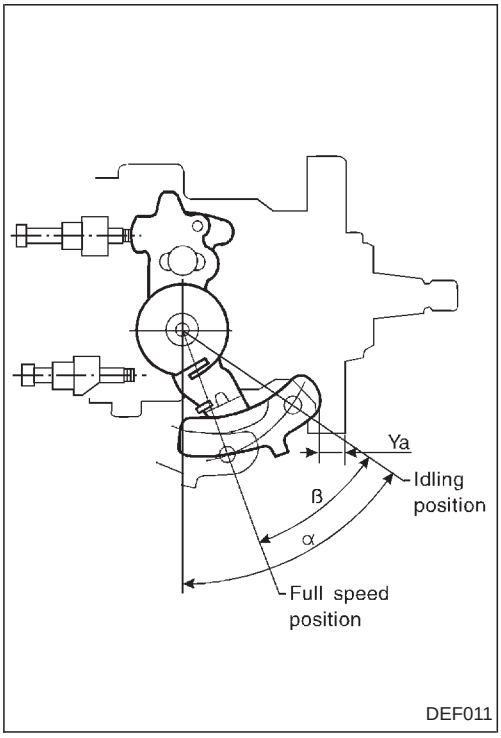
4. Dimensions	
K	3.2 - 3.4 mm (0.126 - 0.134 in)
KF	5.7 - 5.9 mm (0.224 - 0.232 in)
MS	0.8 - 1.0 mm (0.031 - 0.039 in)
BCS	—
Pre-stroke	—
Control lever angle	
α	51.5 - 59.5 degree
β	31.0 - 41.0 degree
γ	—

ACS: High altitude compensator

Injection Pump Calibration Standard (Cont'd)

Control lever angle measurement position

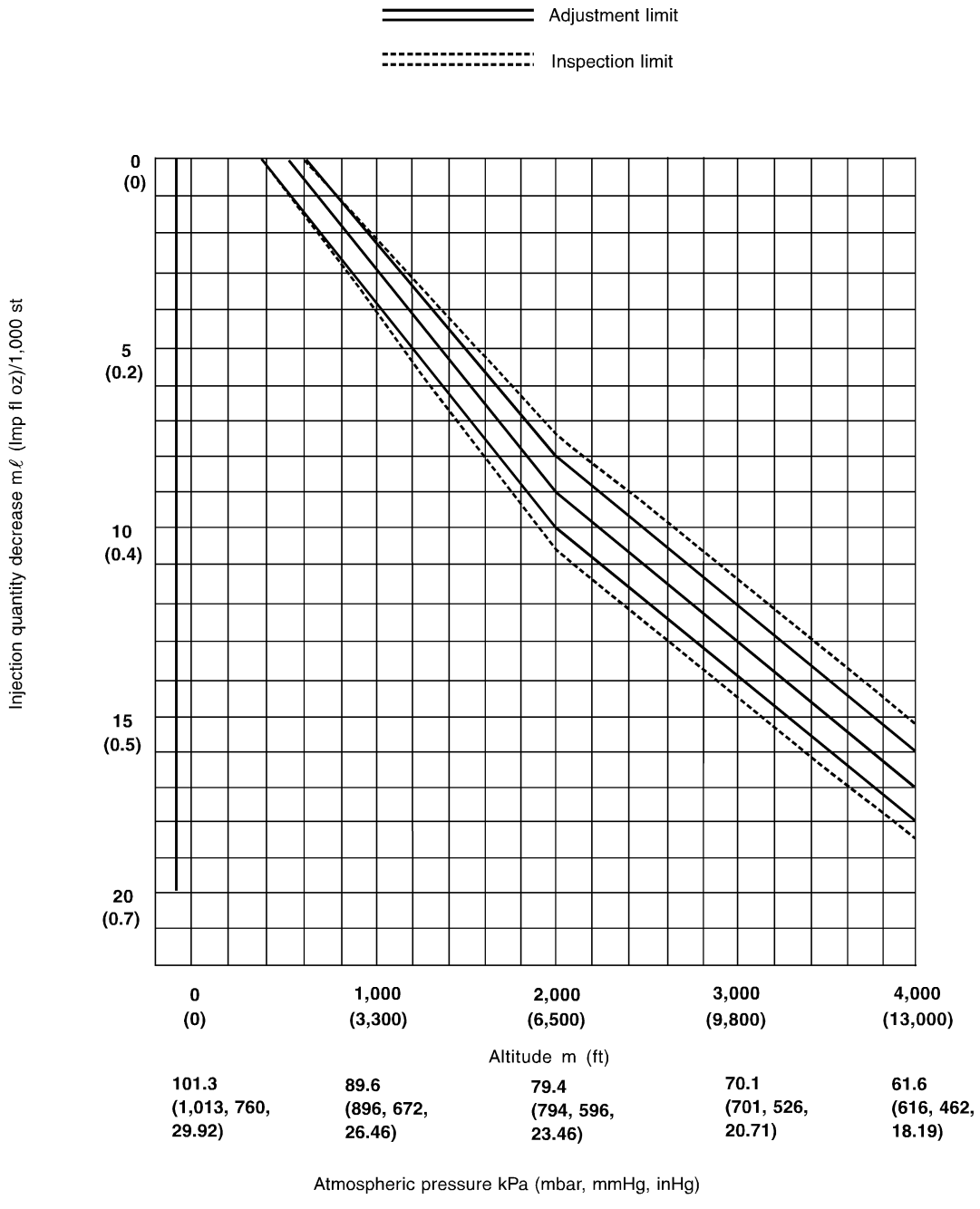
Measure the control lever angles (α, β).



Injection Pump Calibration Standard (Cont'd)

Full-load fuel injection quantity and ACS (high altitude compensator) adjusting procedure at high altitudes

1. Full-load fuel injection quantity adjustment
(1) Remove the ACS cover, the bellows and the adjusting shims.
(2) Perform all adjustments as described in the adjusting specifications, except for ACS adjustment.
2. ACS adjustment
(1) Attach the ACS cover, the bellows and the adjusting shims.
(2) At a pump speed of 1,100 rpm and referring to the graph below, use the shims to adjust the fuel injection quantity decrease quantity according to the altitude.



Injection Pump Calibration Standard (Cont'd)

TD27 ENGINE MODEL

Pump rotation: Clockwise—viewed from drive side

Injection pump assembly No.	104745-7820
Part No.	16700 2S515

1. Test conditions

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

1 - 2 Nozzle holder: 105780-2150

1 - 3 Nozzle opening pressure: $13{,}043^{+294}_{0}$ kPa ($130.4^{+2.9}_{0}$ bar, 133^{+3}_{0} kg/cm^2, $1{,}891^{+43}_{0}$ psi)

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

1 - 5 Fuel oil temperature: 45^{+5}_{0} °C (113^{+9}_{0} °F)

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

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	1,100	4.3±0.2 mm (0.169±0.008 in)		—
2 - 2	Supply pump pressure	1,100	481±29 kPa (4.81±0.29 bar, 4.9±0.3 kg/cm^2, 70±4 psi)		—
2 - 3	Full-load delivery	1,100	44.6±0.5 mℓ (1.57±0.02 Imp fl oz)/1,000 st		3.5 (0.12)
2 - 4	Idle speed regulation	350	7.1±2.0 mℓ (0.25±0.07 Imp fl oz)/1,000 st	—	2.0 (0.07)
2 - 5	Start (Full lever)	100	57.5±5.0 mℓ (2.02±0.18 Imp fl oz)/1,000 st		—
2 - 6	Full-load speed regulation	2,550	15.7±2.0 mℓ (0.55±0.07 Imp fl oz)/1,000 st		—
2 - 7	Load timer adjustment	1,100	3.0±0.2 mm (0.12±0.008 in)		—

3. Test specifications						
3 - 1 Timing device	N = rpm mm (in)	700 2.0±0.4 (0.079±0.016)*	1,100 4.3±0.3 (0.169±0.012)	1,700 7.4±0.5 (0.291±0.020)*	2,200 $9.0^{+0.4}_{-0.5}$ ($0.354^{+0.016}_{-0.020}$)	
3 - 2 Supply pump	N = rpm kPa (bar, kg/cm^2, psi)		1,100 481±39 (4.81±0.39, 4.9±0.4, 70±6)	1,700 628±39 (6.28±0.39, 6.4±0.4, 91±6)*		
3 - 3 Overflow delivery	N = rpm mℓ (Imp fl oz)/min.		1,100 390±130 (13.7±4.6)			

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	1,100	44.6±1.0 (1.57±0.04)	—
	500	40.3±3.0 (1.42±0.11)*	
	850	42.0±2.5 (1.48±0.09)*	
	2,150	42.9±2.5 (1.51±0.09)*	
	2,400	34.0±4.5 (1.20±0.16)*	
	2,550	15.7±3.0 (0.55±0.11)	
	2,800	Below 5.0 (0.18)	
Switch OFF Magnet valve	350	0 (0) Idle	—
Idling	350	7.1±2.5 (0.25±0.09)	—
3 - 5 Solenoid	Max. cut-in voltage: 8V Test voltage: 12 - 14V		

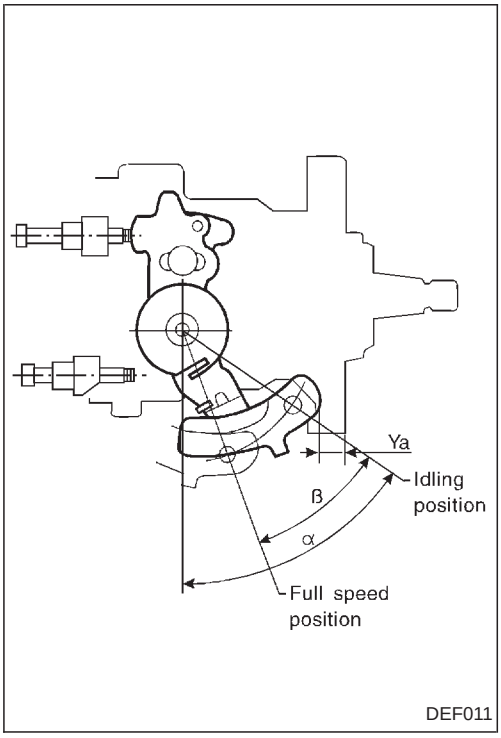
4. Dimensions	
K	3.3±0.1 mm (0.130±0.004 in)
KF	6.36±0.1 mm (0.2504±0.0039 in)
MS	0.9±0.1 mm (0.035±0.004 in)
BCS	—
Pre-stroke	—
Control lever angle	
α	21.0 - 29.0 degree
β	31.0 - 41.0 degree
γ	—

*: Reference value

Injection Pump Calibration Standard (Cont'd)

Control lever angle measurement position

Measure the control lever angles (α, β).



Load timer adjustment

1. Fix the control lever in the position satisfying the following conditions.
   Pump speed: 1,100 rpm
   Fuel injection quantity: 32.0±0.5 mℓ (1.13±0.02 Imp fl oz)/1,000 st
2. With the control lever positioned as described in 1. above, adjust the governor sleeve so that the timer stroke conforms to the specified values (item 2 - 7).

Control lever position			Specified values	
Pump speed rpm	Fuel injection quantity mℓ (Imp fl oz)/1,000 st	Boost pressure kPa (mbar, mmHg, inHg)	Timer stroke mm (in)	Timer stroke reduction value mm (in)
1,100	32.0±0.5 (1.13±0.02)	—	3.0±0.3 (0.118±0.012)	1.3 (0.051)
1,100	22.0±2.5 (0.77±0.09)*	—	1.8±0.5 (0.071±0.020)*	2.5 (0.098)*

*: Reference value