UniCarriers Americas Corporation

SERVICE MANUAL - ENGINE

MODELS 1F1/1F2

QD32 Diesel Engine

SERVICE

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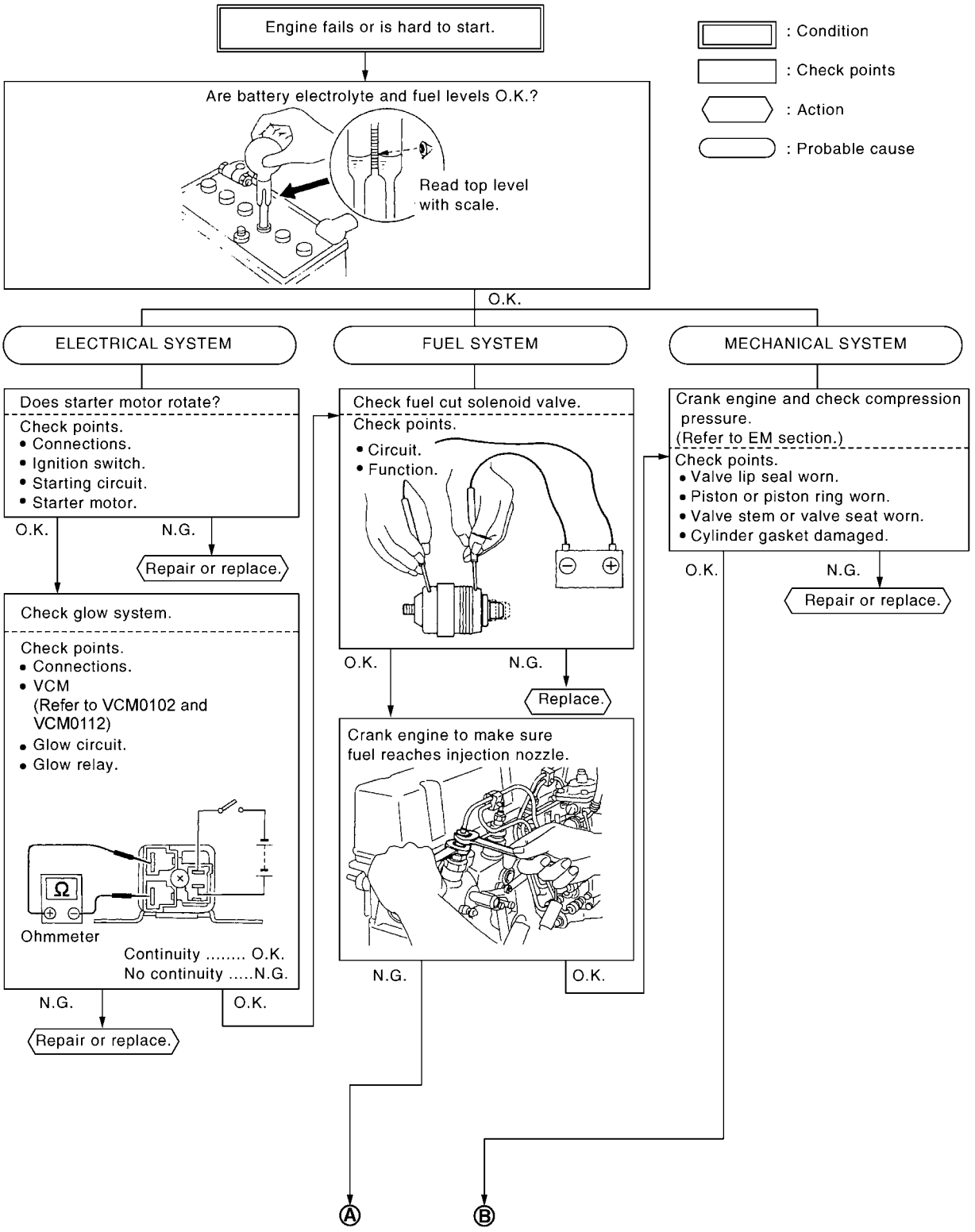
QD32 Diesel Engine
PUBLICATION NO.:
SM45U-QD32E

Standard Bolt Tightening Torque

Upper: Lubricated (Antirust oil is applied to abrasive faces of threads and seating faces)

Lower: No lubrication (Threads and seating faces are completely degreased).

	Thread Size		Unit	4T (Bolt)	7T (Bolt)	9T (Bolt)
	Diameter	Pitch				
Hexagon Head Bolt and Nut	M6	1	Nm	3.82 - 4.41	6.37 - 7.45	9.22 - 10.8
			kg-m	0.39 - 0.45	0.65 - 0.76	0.94 - 1.1
			in/lb	34 - 39	56 - 66	82 - 95
			Nm	5.00 - 6.47	8.43 - 10.8	11.8 - 15.7
			kg-m	0.51 - 0.66	0.86 - 1.1	1.2 - 1.6
			ft/lb, in/lb*	44 - 57*	75 - 95*	9 - 12
	M8	1.25	Nm	9.32 - 10.8	15.7 - 17.7	22.6 - 25.5
			kg-m	0.95 - 1.1	1.6 - 1.8	2.3 - 2.6
			ft/lb, in/lb*	82 - 95*	12 - 13	17 - 19
			Nm	12.7 - 15.7	20.6 - 26.5	29.4 - 37.3
			kg-m	1.3 - 1.6	2.1 - 2.7	3.0 - 3.8
			ft/lb	9 - 12	15 - 20	22 - 27
	M10	1.25	Nm	19.6 - 22.6	32.4 - 38.2	47.1 - 53.9
			kg-m	2.0 - 2.3	3.3 - 3.9	4.8 - 5.5
			ft/lb	14 - 17	24 - 28	35 - 40
			Nm	25.5 - 33.3	43.1 - 54.9	61.8 - 78.5
			kg-m	2.6 - 3.4	4.4 - 5.6	6.3 - 8.0
			ft/lb	19 - 25	32 - 41	46 - 58
		1.5	Nm	18.6 - 21.6	30.4 - 36.3	44.1 - 52
			kg-m	1.9 - 2.2	3.1 - 3.7	4.5 - 5.3
			ft/lb	14 - 16	22 - 27	33 - 38
			Nm	24.5 - 31.4	41.2 - 52	58.8 - 74.5
			kg-m	2.5 - 3.2	4.2 - 5.3	6.0 - 7.6
			ft/lb	18 - 23	30 - 38	43 - 55
Flanged Bolt	M6	1	Nm	4.9 - 5.69	8.14 - 9.51	11.8 - 13.7
			kg-m	0.5 - 0.58	0.83 - 0.97	1.2 - 1.4
			ft/lb, in/lb*	43 - 50*	72 - 84*	9 - 10
			Nm	5.98 - 7.65	9.81 - 12.7	14.7 - 18.6
			kg-m	0.61 - 0.78	1.0 - 1.3	1.5 - 1.9
			ft/lb, in/lb*	53 - 68*	87 - 113*	11 - 14
	M8	1.25	Nm	11.8 - 13.7	19.6 - 23.5	28.4 - 33.3
			kg-m	1.2 - 1.4	2.0 - 2.4	2.9 - 3.4
			ft/lb	9 - 10	14 - 17	21 - 25
			Nm	14.7 - 18.6	24.5 - 31.4	35.3 - 45.1
			kg-m	1.5 - 1.9	2.5 - 3.2	3.6 - 4.6
			ft/lb	11 - 14	18 - 23	26 - 33


Engine fails or is hard to start.
: Condition
: Check points
: Action
: Probable cause
Are battery electrolyte and fuel levels O.K.?
Read top level with scale.
O.K.
ELECTRICAL SYSTEM
FUEL SYSTEM
MECHANICAL SYSTEM
Does starter motor rotate?
Check points.
• Connections.
• Ignition switch.
• Starting circuit.
• Starter motor.
O.K.
N.G.
Repair or replace.
Check glow system.
Check points.
• Connections.
• VCM
(Refer to VCM0102 and VCM0112)
• Glow circuit.
• Glow relay.
Ohmmeter
Continuity ..... O.K.
No continuity .....N.G.
N.G.
O.K.
Repair or replace.
Check fuel cut solenoid valve.
Check points.
• Circuit.
• Function.
O.K.
N.G.
Replace.
Crank engine to make sure fuel reaches injection nozzle.
N.G.
O.K.
Crank engine and check compression pressure.
(Refer to EM section.)
Check points.
• Valve lip seal worn.
• Piston or piston ring worn.
• Valve stem or valve seat worn.
• Cylinder gasket damaged.
O.K.
N.G.
Repair or replace.
Ⓐ
Ⓑ

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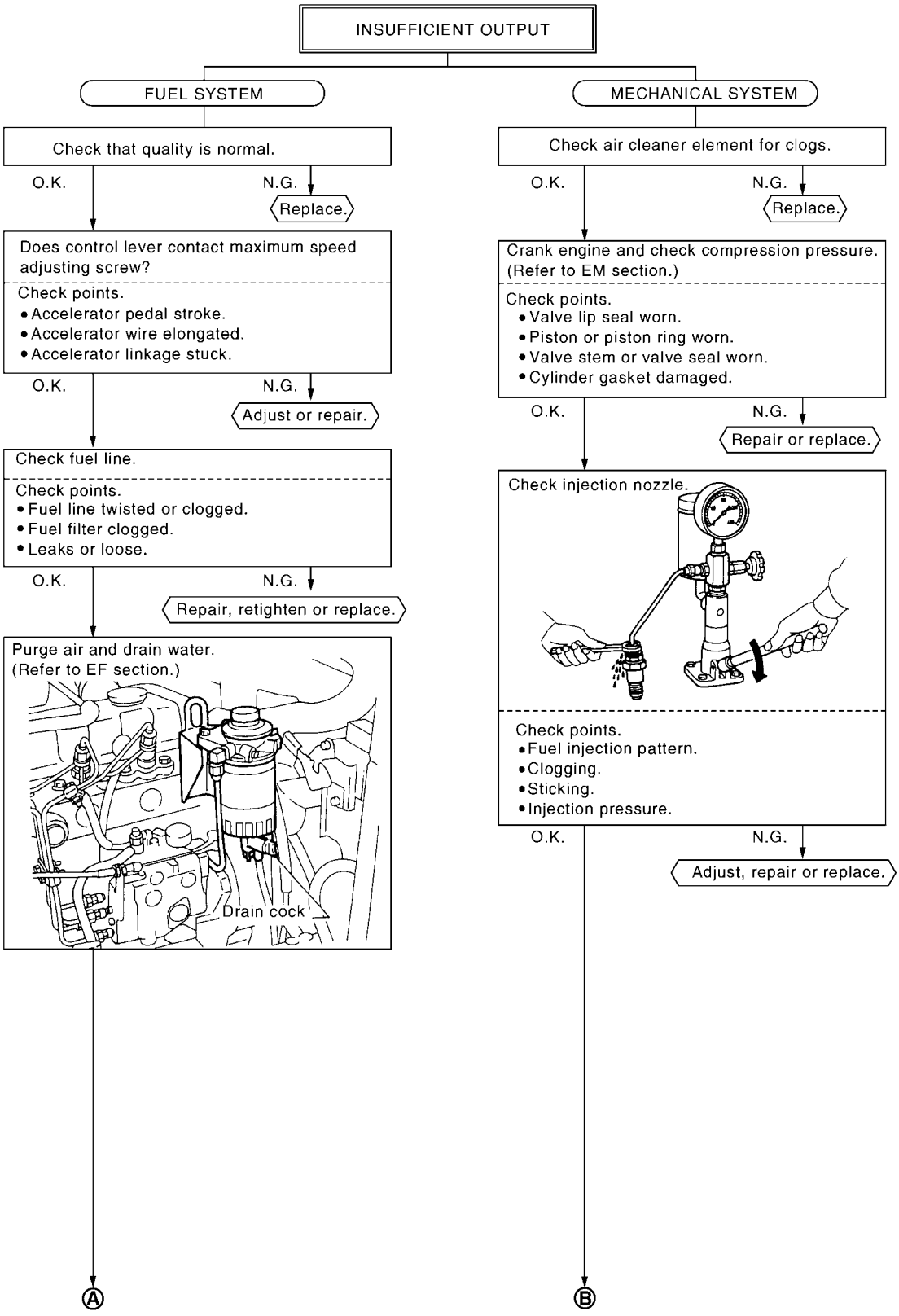
INSUFFICIENT OUTPUT
FUEL SYSTEM
MECHANICAL SYSTEM
Check that quality is normal.
O.K.
N.G.
Replace.
Does control lever contact maximum speed adjusting screw?
Check points.
• Accelerator pedal stroke.
• Accelerator wire elongated.
• Accelerator linkage stuck.
O.K.
N.G.
Adjust or repair.
Check fuel line.
Check points.
• Fuel line twisted or clogged.
• Fuel filter clogged.
• Leaks or loose.
O.K.
N.G.
Repair, retighten or replace.
Purge air and drain water.
(Refer to EF section.)
Drain cock
Check air cleaner element for clogs.
O.K.
N.G.
Replace.
Crank engine and check compression pressure.
(Refer to EM section.)
Check points.
• Valve lip seal worn.
• Piston or piston ring worn.
• Valve stem or valve seal worn.
• Cylinder gasket damaged.
O.K.
N.G.
Repair or replace.
Check injection nozzle.
Check points.
• Fuel injection pattern.
• Clogging.
• Sticking.
• Injection pressure.
O.K.
N.G.
Adjust, repair or replace.
Ⓐ
Ⓑ

ETM0132

ENGINE MECHANICAL

SECTION EM

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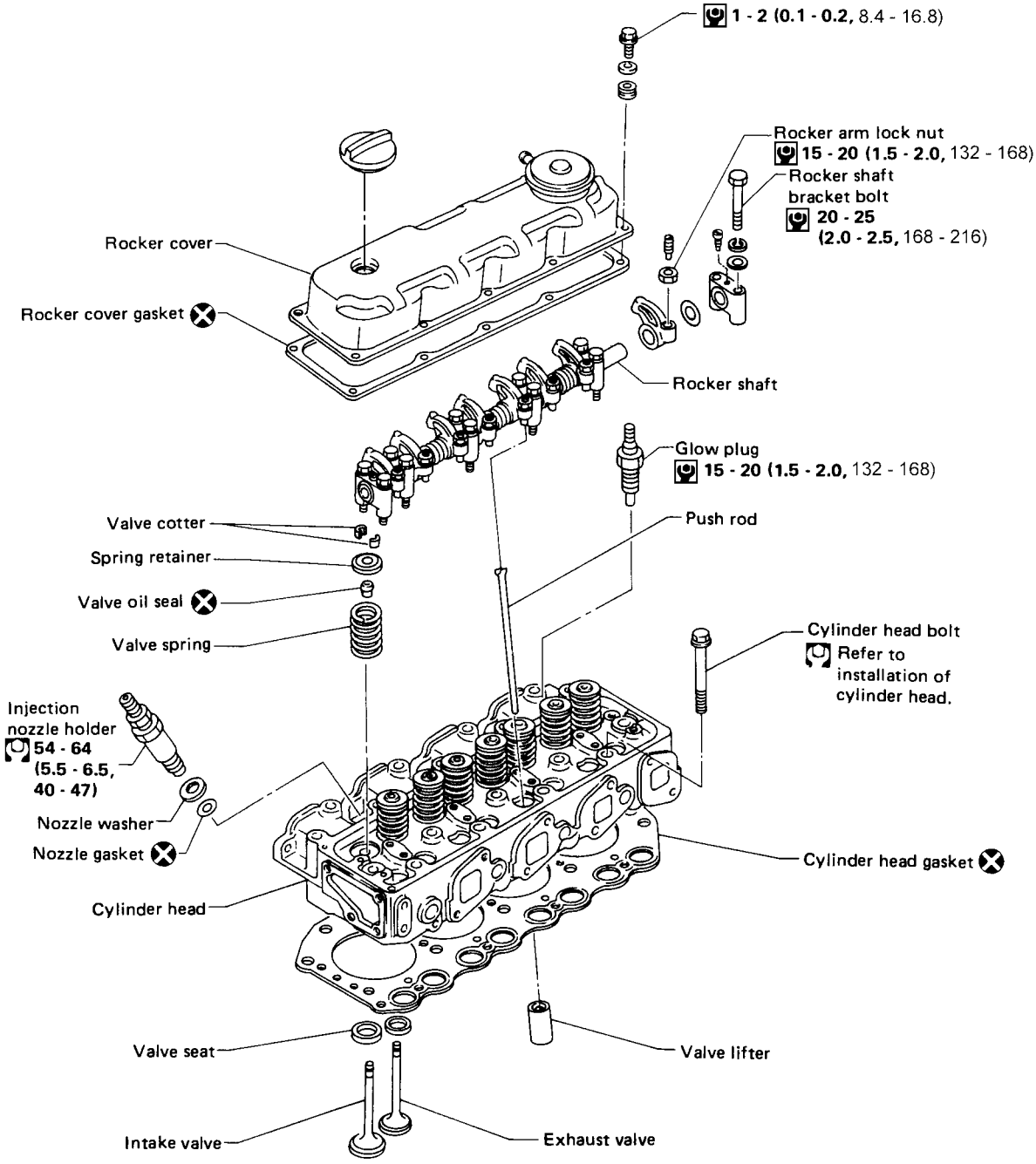
NOTE:

This section contains information and specifications for both carbureted general overseas market (GOM) models, as well as, electronic control models (manufactured in USA.) Therefore, prior to taking any action, ensure the specifications and/or procedures are for the proper fuel delivery system; carbureted or electronic controlled.

Component Parts



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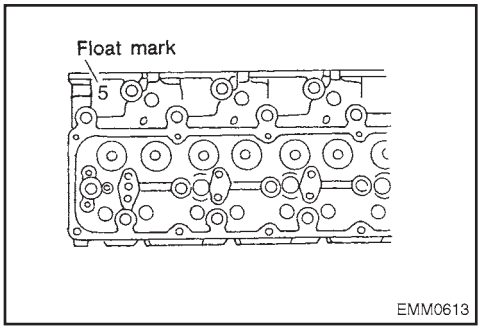
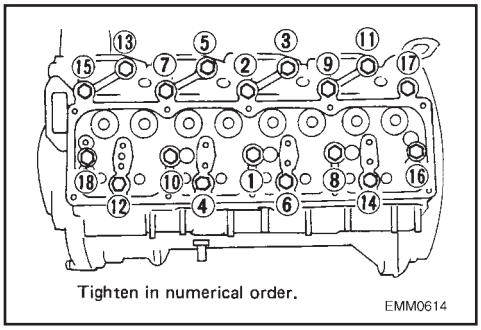
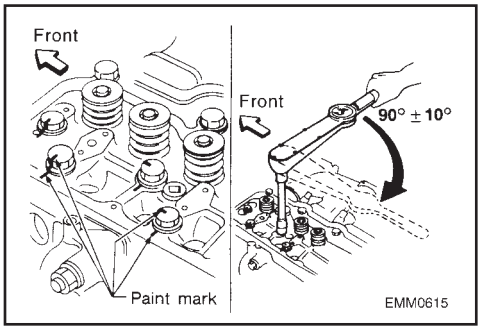
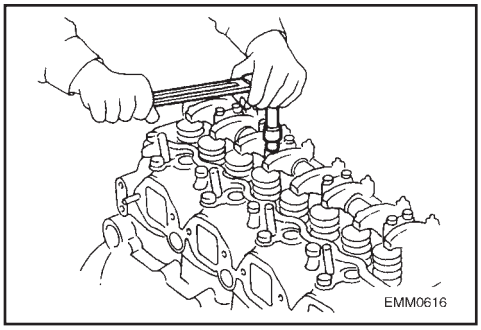








Installation (On-Vehicle Service) (Cont'd)

2. Install the Cylinder Head.

Cylinder Head identification mark:

Identification number (on cylinder head)
Float mark
5

3. Apply oil to the thread portion and seat surface of Bolts and tighten Cylinder Head Bolts using Tool.

⚠ CAUTION

- **Tightening procedure**

  1st:

  Tighten Bolts to 39 - 44 Nm

  (4.0 - 4.5 kg-m, 29 - 33 ft/lb)

  2nd:

  Tighten Bolts to 59 - 64 Nm

  (6.0 - 6.5 kg-m, 43 - 47 ft/lb)

  3rd:

  a. Mark exhaust side of Cylinder Head and Cylinder Head Bolts with paint as shown.

  b. Turn all Bolts 90±10 degrees clockwise.

  c. Check to ensure the paint mark of each Bolt is facing the front of the vehicle.

4. Apply engine oil and install Push Rods.

5. Install the Rocker Shaft Assembly.

Rocker Shaft Bracket Bolt:

: 20 - 25 Nm (2.0 - 2.5 kg-m, 168 - 216 in/lb)

NOTE:

Adjust intake and exhaust Valve clearances temporarily. Refer to ET section.

Inspection and Replacement (Cont'd)

Connecting Rod Bearing Clearance

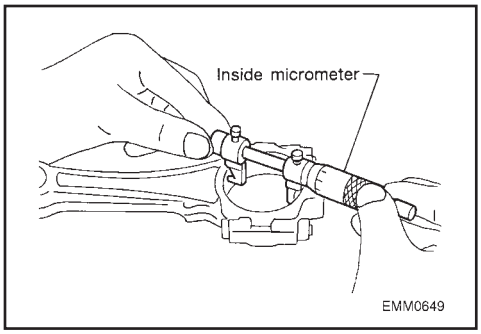
Connecting rod bearing clearance:

Standard

0.035 - 0.081 mm (0.0014 - 0.0032 in)

Limit

Less than 0.15 mm (0.0059 in)



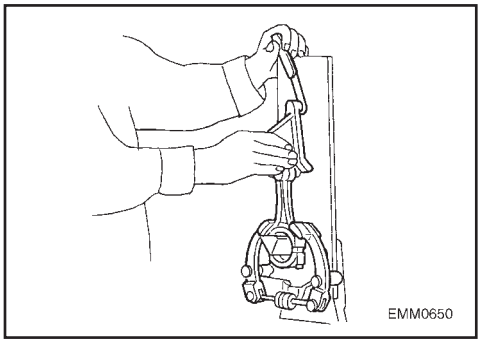
1. Install the Connecting Rod Bearing to the Connecting Rod and Cap.
2. Install the Connecting Rod Cap to the Connecting Rod.

NOTE:

Apply oil to the thread portion of Bolts and seating surface of Nuts.

3. Measure the inside diameter "A" of Bearing.
4. Measure the outside diameter "Dp" of the Pin Journal in the Crankshaft.
5. Calculate the Connecting Rod Bearing clearance.

Connecting Rod Bearing clearance = A - Dp



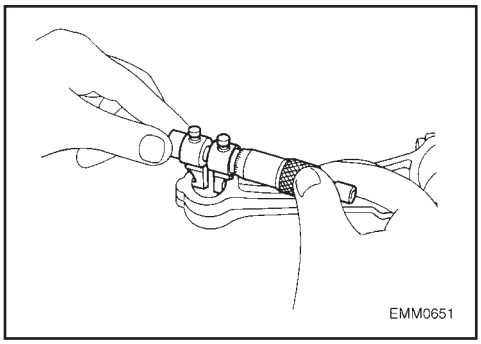
Connecting Rod Bend and Torsion

Bend and torsion:

Limit

0.05 mm (0.0020 in)

per 100 mm (3.94 in) length



Connecting Rod Small End Bushing Clearance

1. Measure the inside diameter "A" of the Connecting Rod Small End Bushings.
2. Measure the outside diameter "D" of the Piston Pin.
3. Calculate the Connecting Rod Small End Bushing clearance.

Connecting rod small end bushing clearance = A - D

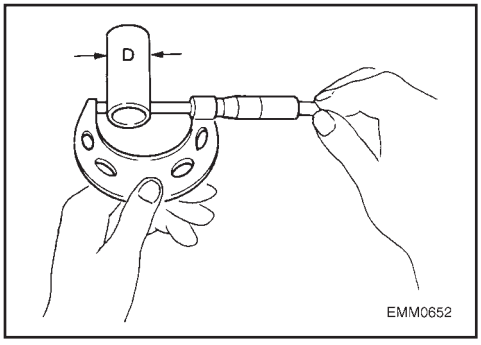
Bushing clearance:

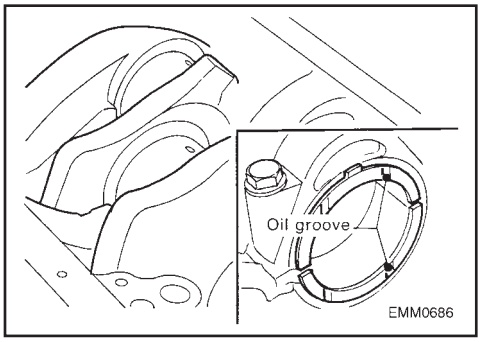
Standard

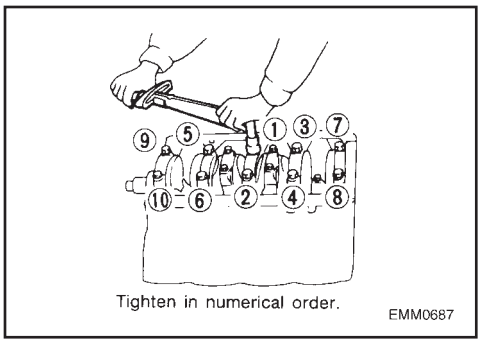
0.025 - 0.045 mm (0.0010 - 0.0018 in)

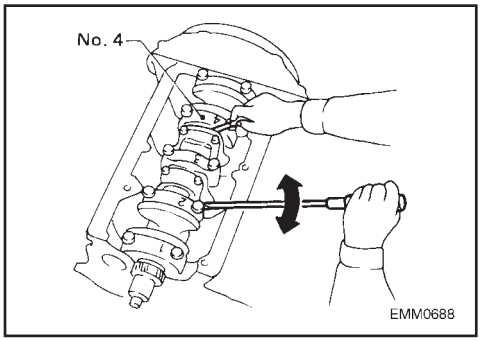
Limit

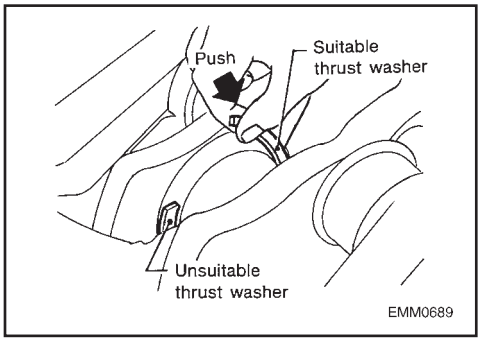
0.15 mm (0.0059 in)











Assembly (Cont'd)

d. Install the Crankshaft Thrust Washer at the 4th Journal from front.

NOTE:

Install the Thrust Washer so the Oil Groove can face the Crankshaft.

e. Tighten the Main Bearing Cap Bolts gradually in stages, starting from two to three separate stages, from center Bearing and moving outward in sequence.

: 167 - 177 Nm (17.0 - 18.0 kg-m, 123 - 130 ft/lb)

f. Measure Crankshaft free end play at No. 4 Bearing.

Crankshaft free end play: mm (in)

Standard

0.055 - 0.140 (0.0022 - 0.0055)

Limit

0.40 (0.0157)

NOTE:

If Crankshaft free end play is beyond the limit, replace No. 4 Main Bearing Thrust Washer. Refer to "SERVICE DATA AND SPECIFICATIONS".

Engine Lubrication System

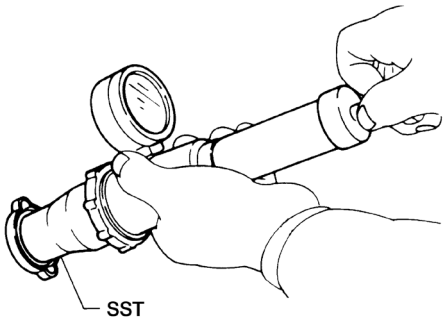
Condition	Probable Cause	Corrective Action
Oil leakage	Damaged or cracked Pump body cover.	Replace.
	Oil leakage from Gasket and Oil Seal.	Replace.
	Oil leakage from Regulator Valve.	Tighten or replace.
	Oil leakage from Blind Plug.	Replace.
Decreased oil pressure	Lack of oil in engine Oil Pan.	Correct.
	Dirty Oil Strainer.	Clean or replace.
	Damaged or worn Pump Rotors.	Replace.
	Malfunctioning Regulator.	Replace.
	Use of poor quality engine oil.	Replace.
Warning lamp remains “on” - engine running	Decreased oil pressure.	Previously mentioned.
	Oil Pressure Switch unserviceable.	Replace.
	Electrical fault.	Check circuit.
Noise	Excessive backlash in Pump Gears.	Replace.

Cooling System Inspection

Checking Hoses

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

Checking Radiator Cap



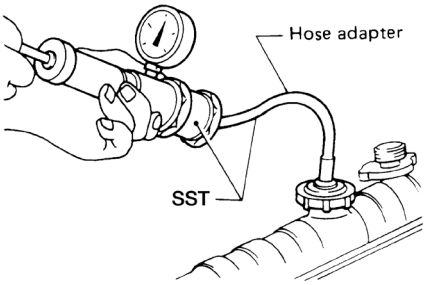
Apply pressure to the Radiator Cap by means of a Cap Tester to confirm pressure capacity.

Radiator Cap relief pressure:

78 - 98 kPa

(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm², 11 - 14 psi)

Checking Cooling System for Leaks



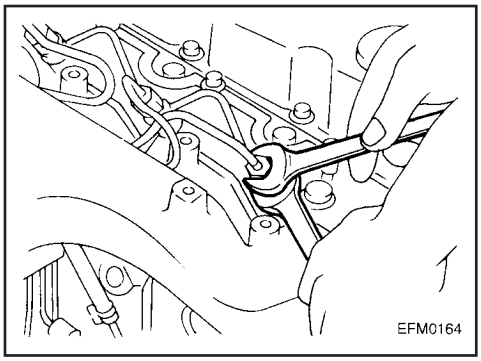
Apply pressure to the cooling system by means of a tester to check for leakage.

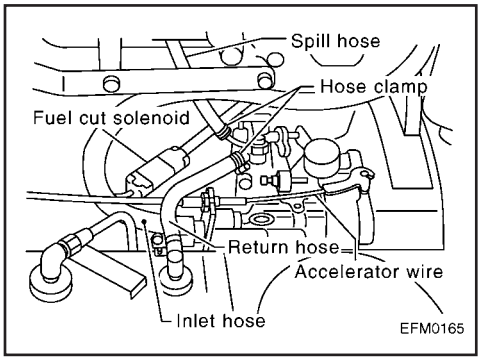
Testing pressure:

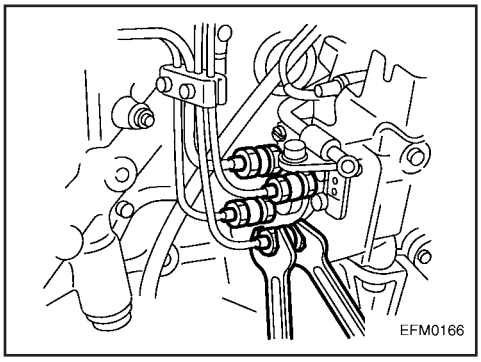
98 kPa (0.98 bar, 1.0 kg/cm², 14 psi)

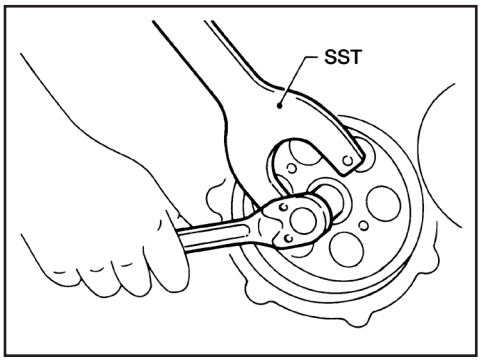
⚠ CAUTION

- **Higher than the specified pressure may cause Radiator damage.**









Removal

1. Remove the Injection Tube.

⚠ CAUTION

- **Cover the Injection Nozzle Assembly with a plug to prevent dust entry.**

2. Remove the Fuel Cut Solenoid Wire.
3. Remove the Accelerator Wire and disconnect the Spill Hose, Fuel Inlet Hose and Fuel Return Hose.
4. Separate the Flare Nut at the Injection Pump.
5. Remove the Dust Cover and loosen the Injection Pump Drive Gear Nut.

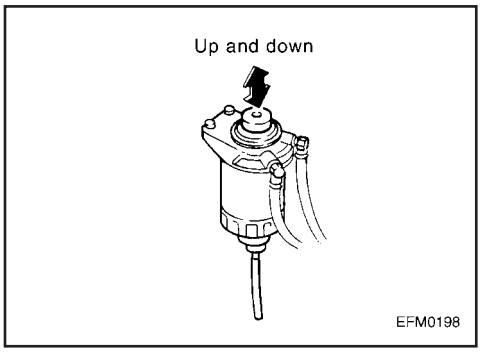
Bleeding Fuel System (Engine on Vehicle)

⚠ CAUTION

- **Air should be bled out of fuel system when the Injection Pump is removed or fuel system is repaired.**
- **Protect the Pump and Engine Mounts from fuel splash with rags.**
- **If the Engine will not start after bleeding air, loosen the Injection Tubes at the Nozzle side and crank the Engine until fuel overflows from Injection Tube. Tighten the Injection Tube Flare Nuts.**

NOTE:

If the Engine does not operate smoothly after it has started, race it two or three times.



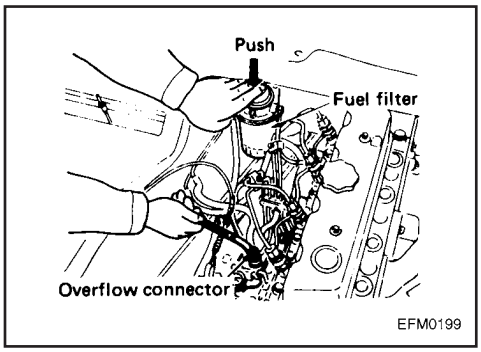
Without Air Vent Screw

Method A

Move the Priming Pump up and down until there is suddenly more resistance in the movement.

Method B

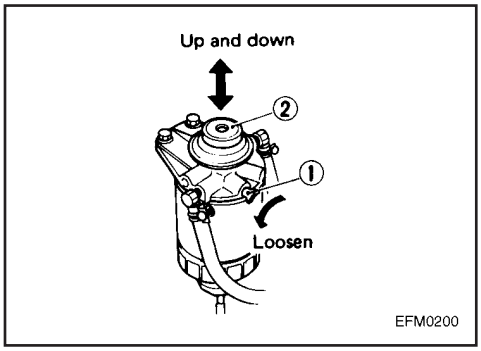
1. Loosen the Injection Pump Bleeder Screw/or disconnect the Return Hose and prime.
2. Make sure fuel overflows at the Bleeder Screw/Tube end, then tighten it/connect the Hose.

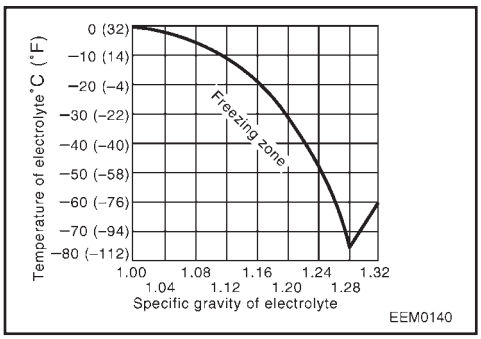


With Air Vent Screw

Method A

1. Loosen the Air Vent Screw (1).
2. Move the Priming Pump (2) up and down until no further airbleed comes out of the Air Vent Screw (1).
3. Tighten the Air Vent Screw (1).
4. Move the Priming Pump (2) up and down until there is suddenly more resistance in the movement.





Charging

CAUTION

- **Carry out charging with negative cable removed.**
- **Do not allow electrolyte temperature to go over 45°C (113°F).**

Clean a corroded terminal with a brush and common baking-soda solution.

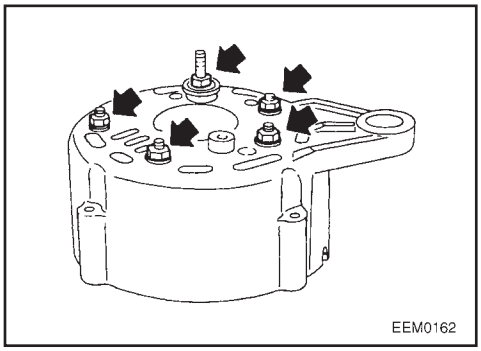
WARNING

- **Keep the Battery away from open flames, arcs, sparks or lit cigarettes while it is being charged.**
- **Have a well-ventilated working area.**
- **When connecting the charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**

Battery Freezing

CAUTION

- **Use extreme caution to avoid freezing a Battery.**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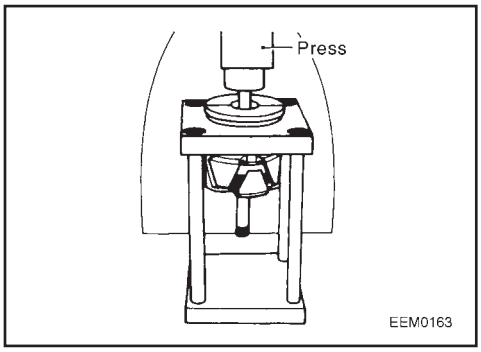

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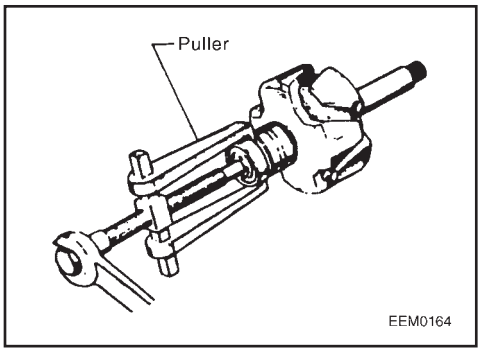

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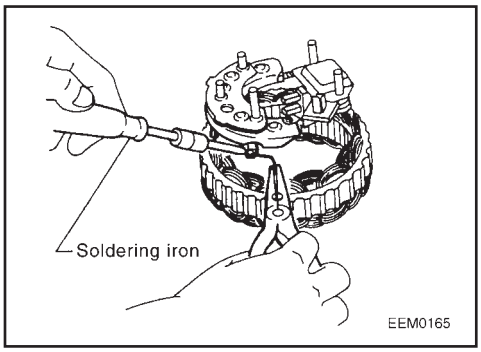

EEM0165

Disassembly (Cont'd)

3. Remove the Attaching Nuts and take out the Stator Assembly.

Rotor

Pull the Rear Bearing off from the Rotor Assembly with a press or Bearing Puller.

Once removed, the Bearing cannot be reused. Replace with a new one.

Stator

Disconnect the Stator Coil Lead Wires from the Diode Terminals