DE12, DE12T & DE12TI & DE12TIS DIESEL ENGINE

Shop Manual

65.99892-8030B

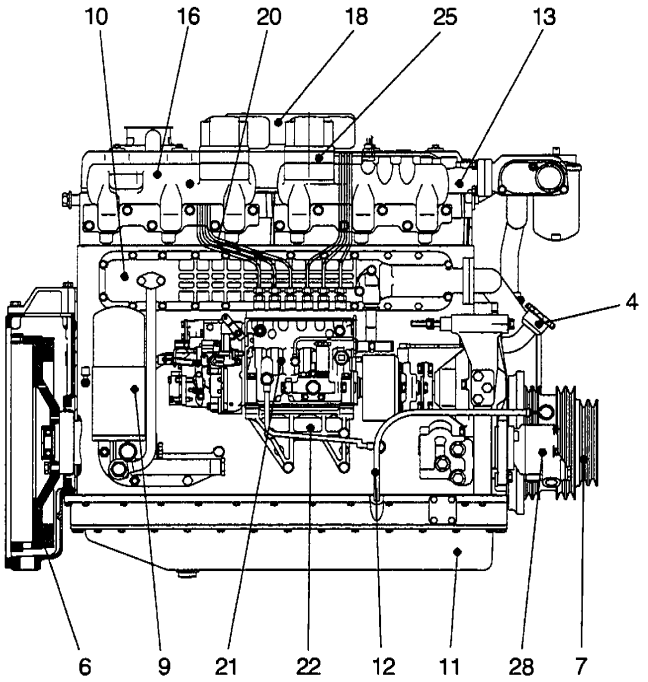
Daewoo reserves the right to improve our products in a continuing process to provide the best possible product to the market place. These improvements can be implemented at any time with no obligation to change materials on previously sold products. It is recommended that consumers periodically contact their distributors for recent documentation on purchased equipment.

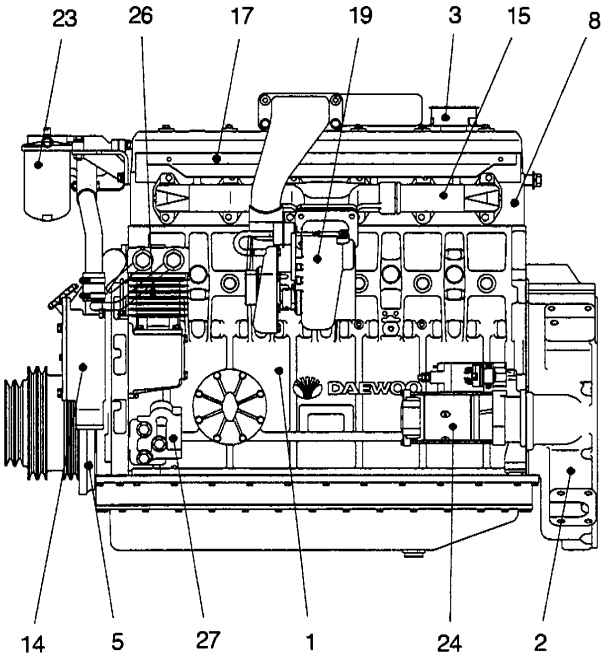
This documentation may include attachments and optional equipment that is not available in your machine's package. Please call your distributor for additional items that you may require.

Illustrations used throughout this manual are used only as a representation of the actual piece of equipment, and may vary from the actual item.

Item				DE12-228	DE12TI-280	DE12TI-310	DE12TIS
Engine	Turbocharger type			-	Exhaust gas driven	←	←
	Intercooler type			-	Air cooled	←	←
	Cooling system	Cooling type		Forced water circulation	←	←	←
		Coolant capacity		19(engine only)	←	←	←
		Water pump type		Centrifugal	←	←	←
		Thermostat type		Wax pellet	←	←	←
Fuel system	Fuel pump type			Plunger	←	←	←
	Fuel filter type			Full flow	←	←	←
	Fuel injection type			Mechanical	←	←	Electronic control
	Inj. pump system	Type		Inline	←	←	←
		Timing		BTDC 8°	BTDC 12°	←	BTDC 1.0°
		Plunger Dia.		12	←	←	←
		Cam lift(mm)		11	12	←	14
	Inj. nozzle	Nozzle mounting		Flange	←	←	←
		Nozzle type		Multi hole	←	←	←
		Orifice	No	5	←	←	←
			Dia.(mm)	0.29	0.33	←	0.29
		Inj. pressure(kg/cm²)		220	130/220	←	163/224
Electric system	Voltage(V)			24V	←	←	←
	Preheat-ing system	Type		Electric	←	←	←
		Voltage(V) - Amp(A)		22-120	←	←	←
	Alternator	Output(V-A)		-	-	-	-
		Regulator		-	-	-	-
	Starter	Type		Reduction	←	←	←
		Output(kW)		24V-6.0kW	←	←	←
	Ignition	Type		Air compression	←	←	←

1.5.3. DE12T- for Bus





1. Cylinder block
2. Flywheel housing
3. Breather
4. Oil filler pipe
5. Vibration damper
6. Flywheel
7. V-pulley
8. Cylinder head
9. Oil filter
10. Oil cooler
11. Oil pan
12. Oil dipstick
13. Cooling water pipe
14. Water pump
15. Exhaust manifold
16. Intake manifold
17. Heat shield
18. Intake stake
19. Turbocharger
20. Injection pipe
21. Injection pump
22. Injection pump bracket
23. Fuel filter
24. Starter
25. Air heater
26. Air compressor
27. Mounting bracket
28. Power steering pump

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2.1.10. Fuel injection pump

1) Check the fuel injection pump housing for cracks or breaks, and replace if damaged.
2) Check and see if the lead seal for idling control and speed control levers have not been removed.

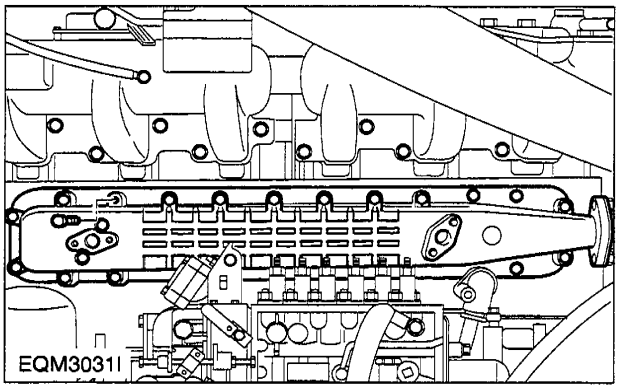
2.1.11. Battery

1) Check the battery for damage or leaking of battery fluid(electrolyte) from cracks on the battery. Replace the battery if damaged.
2) Check battery fluid level and add distilled water if necessary.
3) Measure the specific gravity of the electrolyte in the battery. Recharge the battery if the hydrometer readings are lower than the specified limit(1.12~1.28)

Complaint	Cause	Correction
5) Engine noises	It is important to correctly locate the causes of noise since generally noises may originate from various engine components such as rotating parts, sliding parts, etc.	
(1) Crankshaft	① Oil clearance excessive due to worn bearings or crankshaft	Replace bearings and grind crankshaft
	② Crankshaft worn out-of-round	Grind or replace crankshaft
	③ Restrictions in oil ports and resultant lack of oil supply	Clean oil path
	④ Bearings seized up	Replace bearings and grind crankshaft
(2) Conn. rod and conn. rod bearings	① Conn. rod bearings worn out-of-round	Replace bearings
	② Crank pin worn out-of-round	Grind crankshaft
	③ Conn. rod skewed	Repair or replace
	④ Bearings seized up	Replace bearings and grind crankshaft
	⑤ Restrictions in oil ports and resultant lack of oil supply	Clean oil path
(3) Pistons, piston pins, and piston rings	① Piston clearance excessive due to worn piston and piston rings	Replace pistons and piston rings
	② Piston or piston pin worn	Replace pistons and piston rings
	③ Piston seized up	Replace pistons
	④ Piston poorly seated	Replace pistons
	⑤ Piston rings damaged	Replace piston rings
(4) Others	① Crankshaft and/or thrust bearing worn	Replace thrust bearings
	② Camshaft end play excessive	Replace thrust plate
	③ Idle gear end play excessive	Replace thrust washers
	④ Timing gear backlash excessive	Adjust or replace
	⑤ Valve clearance excessive	Adjust valve clearance
	⑥ Tappets and cams worn	Replace tappets and camshaft
6) Excessive fuel consumption	① Injection timing incorrect	Adjust
	② Volume of fuel injection excessive	Adjust injection pump
	③ Tire under-inflated	Adjust
	④ Gear selection inadequate(frequent use of low gears)	Select gears correctly according to load

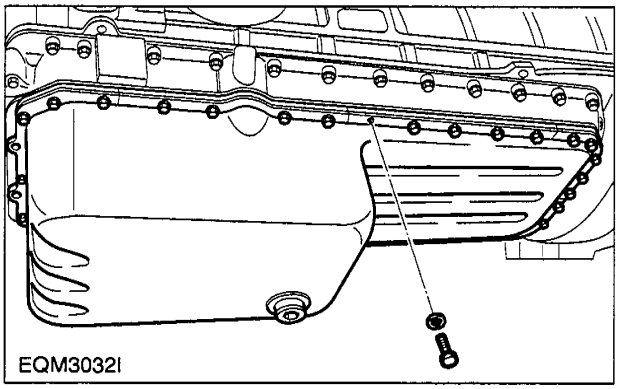
3.1.33. Oil cooler

1) Remove the water pipe connected to the water pump.
2) Unscrew the oil cooler cover fixing bolts and disassemble the oil cooler assembly from the cylinder block.
3) Unscrew the oil cooler fixing bolts and remove the oil cooler from the oil cooler cover.



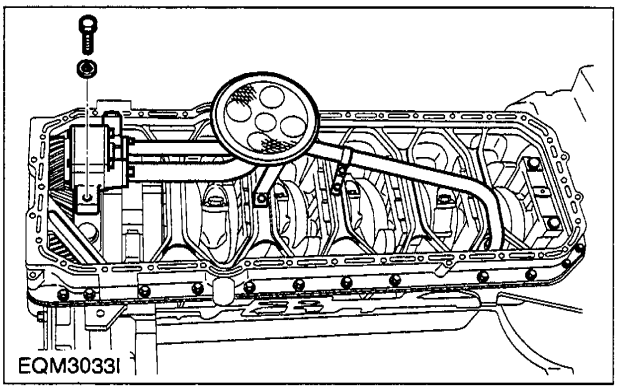
3.1.34. Oil pan

1) Stand the engine with the flywheel housing facing toward the bottom.
2) Release the oil pan fixing bolts, remove the stiffeners, then disassemble the oil pan.



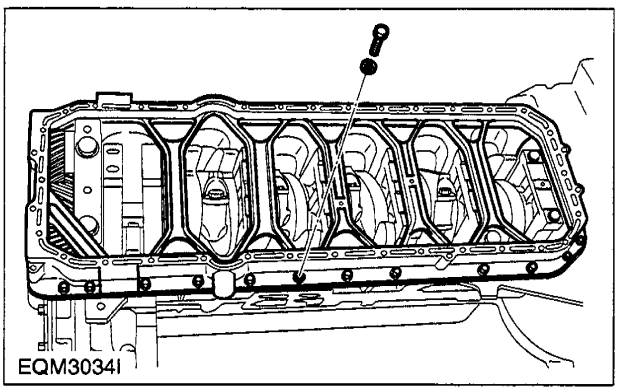
3.1.35. Oil pump and oil pipe

1) Unscrew the oil inlet pipe bracket bolts, releasing the pipe fixing bolts, then disassemble the oil suction pipe assembly.
2) Disassemble the oil pipe feeding oil from the oil pump to the cylinder block.
3) Unscrew the oil pump fixing bolts and disassemble the oil pump.



3.1.36. Ladder frame

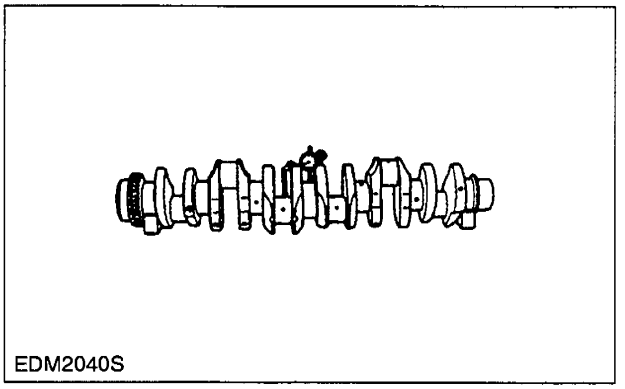
1) Disassemble the ladder frame.



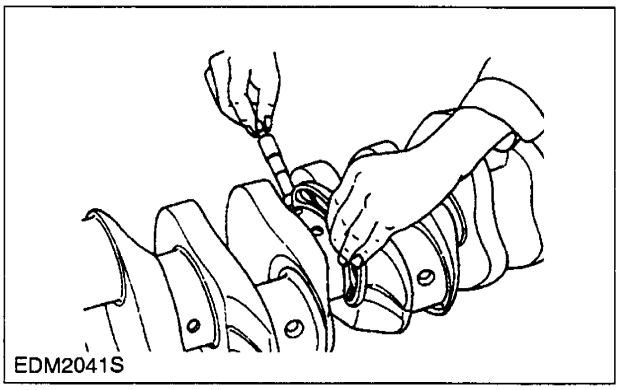
3) Measurement of crankshaft run-out

(1) Support the crankshaft on V-blocks.

(2) Turn the crankshaft with a dial indicator placed on the surface plate and take the amount of crank shaft run-out.



<Figure 3-14> Measuring crank shaft run-out



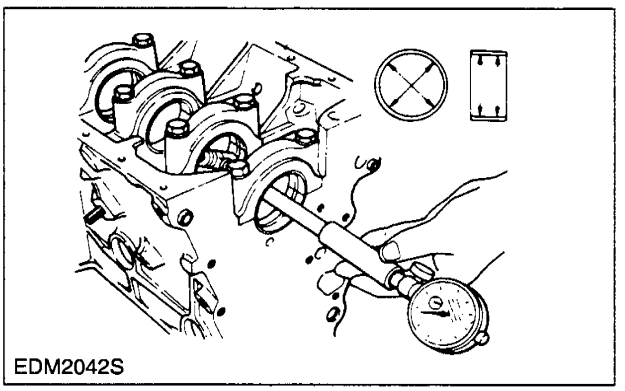
<Figure 3-15> Measuring crank shaft outer diameter

3.2.7. Crank shaft bearing and connecting rod bearing

1) Visually check the crank shaft bearing and connecting rod bearing for scores, uneven wear or damage.

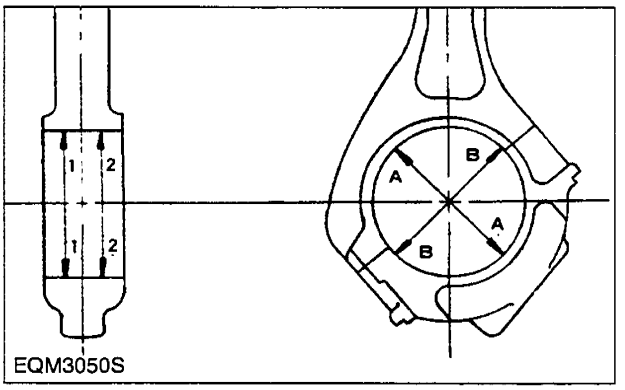
2) Check oil clearance between crankshaft and bearing.

(1) Install the main bearing in the cylinder block, tighten the bearing cap to specified torque, then measure the inside diameter.



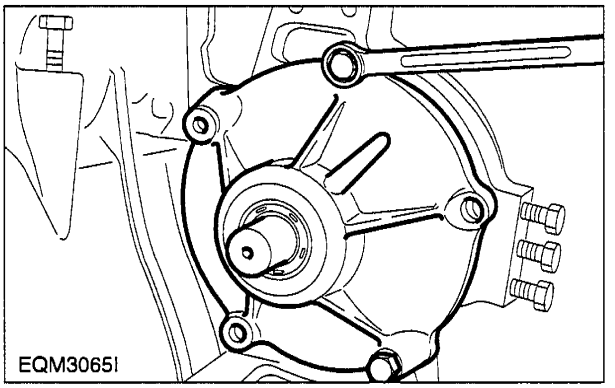
<Figure 3-16> Measuring main bearing inside diameter

(2) Install the connecting rod bearing in the conn. rod bearing cap, tighten the connecting rod cap bolts to specified torque, then measure the inside diameter.



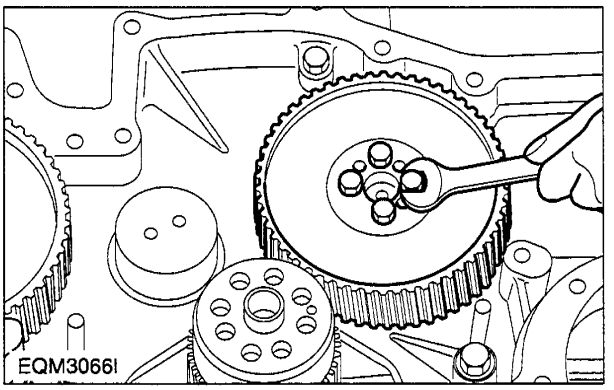
3.3.10. Fuel injection pump drive gear assembly

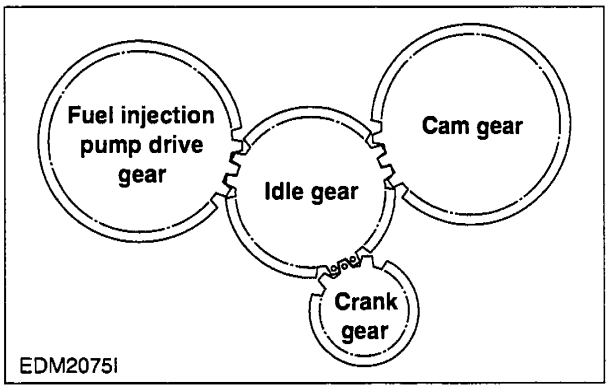
1) Mount gasket by aligning the bolt holes with the pin holes on the bearing housing.
2) Tighten up the fixing bolts in the direction of fuel injection pump.



3.3.11. Timing gear

1) Install the oil pump idle gear onto the No. 7 bearing cap.
2) Install a thrust washer over the cam shaft and assemble the cam gear by aligning it with cam shaft key groove.
3) With the oil port on the idle gear pin facing the cylinder head, install the idle gear pin.
4) Install the idle gear by coinciding the marks impressioned on the crank gear, cam gear, fuel injection pump drive gear, and idle gear.
5) Install a thrust washer on the idle gear and tighten to specified torque (6.2kg•m).
6) Check and adjust the amount of backlash between gears using a feeler gauge. (backlash : 0.1~0.2)

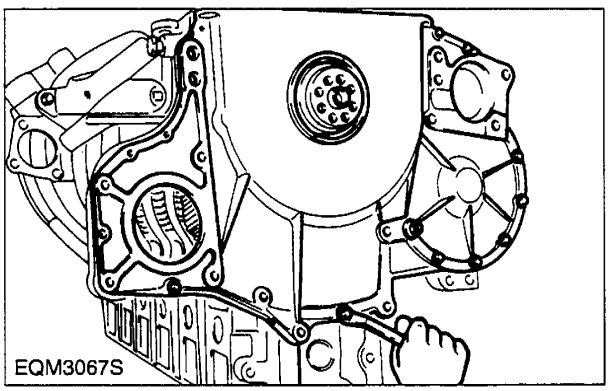




<Timing gear marks>

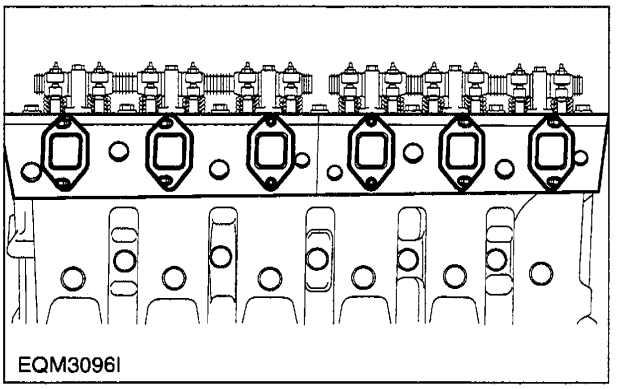
3.3.12. Timing gear case cover

1) Install dowel pin on the timing gear case.
2) Mount a gasket by aligning the fixing bolt holes with those on the gasket.
3) Align the dowel pin with the cover pin hole, then install the cover with a light tap.
4) Tighten the fixing bolts beginning with the oil pan fitting face.



3.3.33. Exhaust manifold

1) Install the exhaust manifold gasket over the stud bolts by aligning the gasket with the exhaust port on the cylinder head so that the face and back of the gasket can be positioned correctly.
2) Semi-assemble the exhaust manifold and install the heat resisting plate.
3) First, install the nuts and then place an additional nut on each of them to prevent looseness.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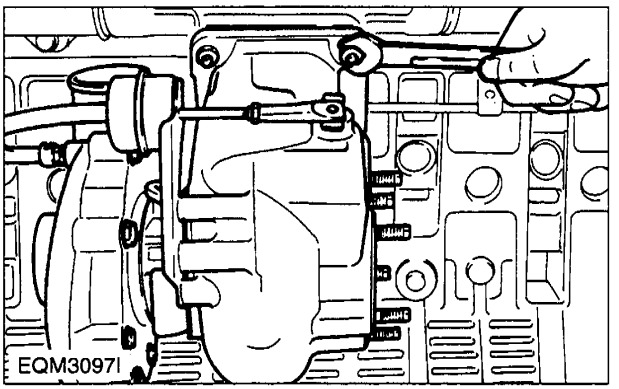
3.3.34. Turbocharger

1) Fit a new gasket over the stud bolts of the exhaust manifold before tightening those turbocharger fixing bolts.
2) Install the oil supply pipe and return pipe.
3) Fit a gasket on the exhaust side of the turbocharger to assemble the exhaust elbow, then install the bracket onto the cylinder block.
4) Semi-assemble the bracket to the intake pipe, connect a rubber hose between the turbocharger and intake pipe using rubber hose, then assemble the bracket completely.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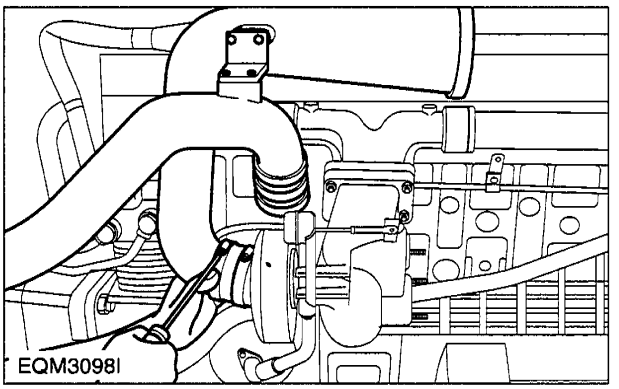
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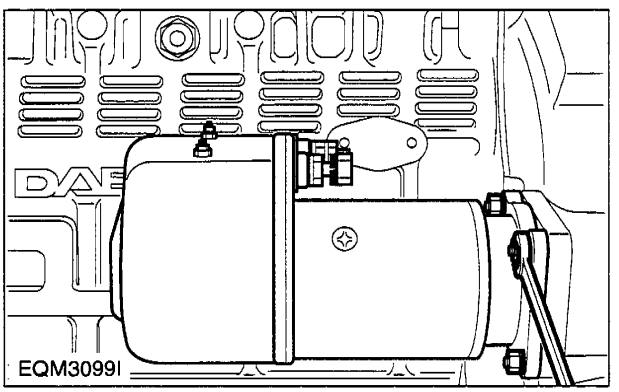
3.3.35. Starter

1) Assemble the starter in position on the flywheel housing.


EQM3099I

4.2.2. Oil pump

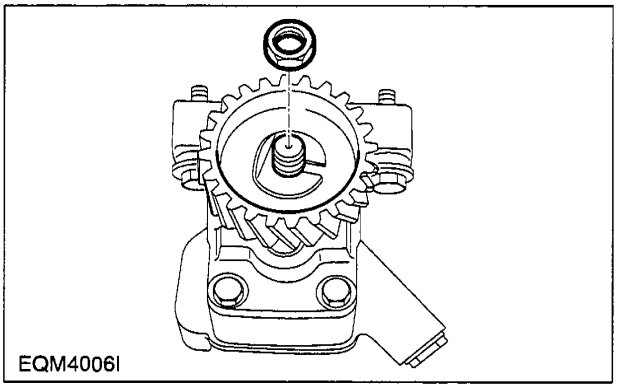
1) Disassembly

(1) Disassembly of oil pump drive gear

a. Unscrew the screw and disassemble the oil relief valve.

b. Loosen the washer for the oil pump drive gear fixing nut and remove the nut.

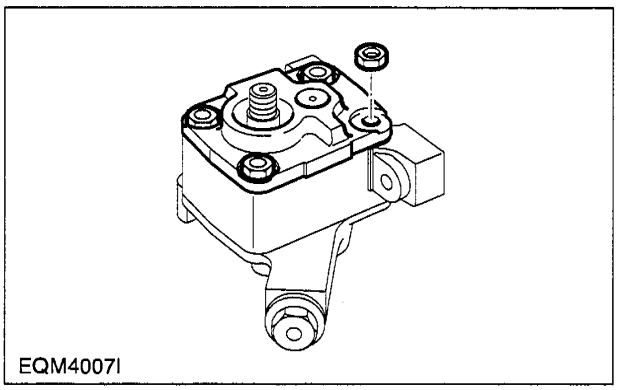
c. Disassemble the drive gear.



<Figure 4-6> Disassembling drive gear

(2) Remove the oil pump cover fixing nuts and disassemble the oil pump cover.

The oil pump cover is fixed with the two dowel pins.



<Figure 4-7> Disassembling pump cover

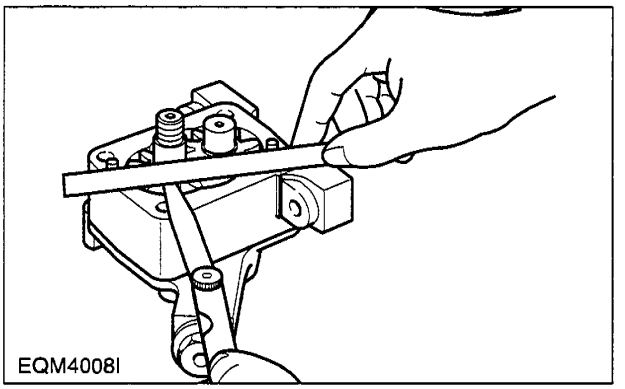
(3) Disassemble the drive gear and driven gear.

2) Inspection and correction

(1) With steel rule and feeler gauge, measure the axial end play of the oil pump gear.

Replace if the measured value is beyond the limit.

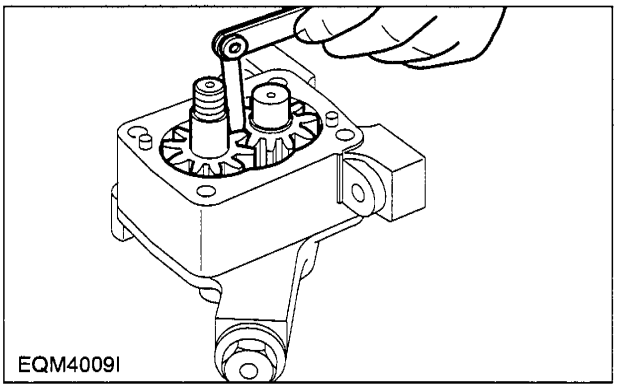
Limit (mm)	0.025~0.089



<Figure 4-8> Measuring end play

(2) With a feeler gauge, measure the amount of back lash between the oil pump drive gear and driven gear.

Replace if the measured value is beyond the limit(0.50~0.64mm).



<Figure 4-9> Measuring gear back lash

3) DE12TI

(1) DE12TI-280

(a) Main data and specifications

Part No. : 65.11101 - 7296

Model : PE6P type

Governor : RFD+D type

Timer : SPG type, range of operation: 3°/700-1100 rpm

Plunger : 65.11125-0010

Delivery valve : 65.11108-6009

Fuel feed pump: 65.12101-7013

Pre-stroke : 4.2±0.05mm

Rotating direction : C.W. at driving gear side

Injection order : 1-5-3-6-2-4

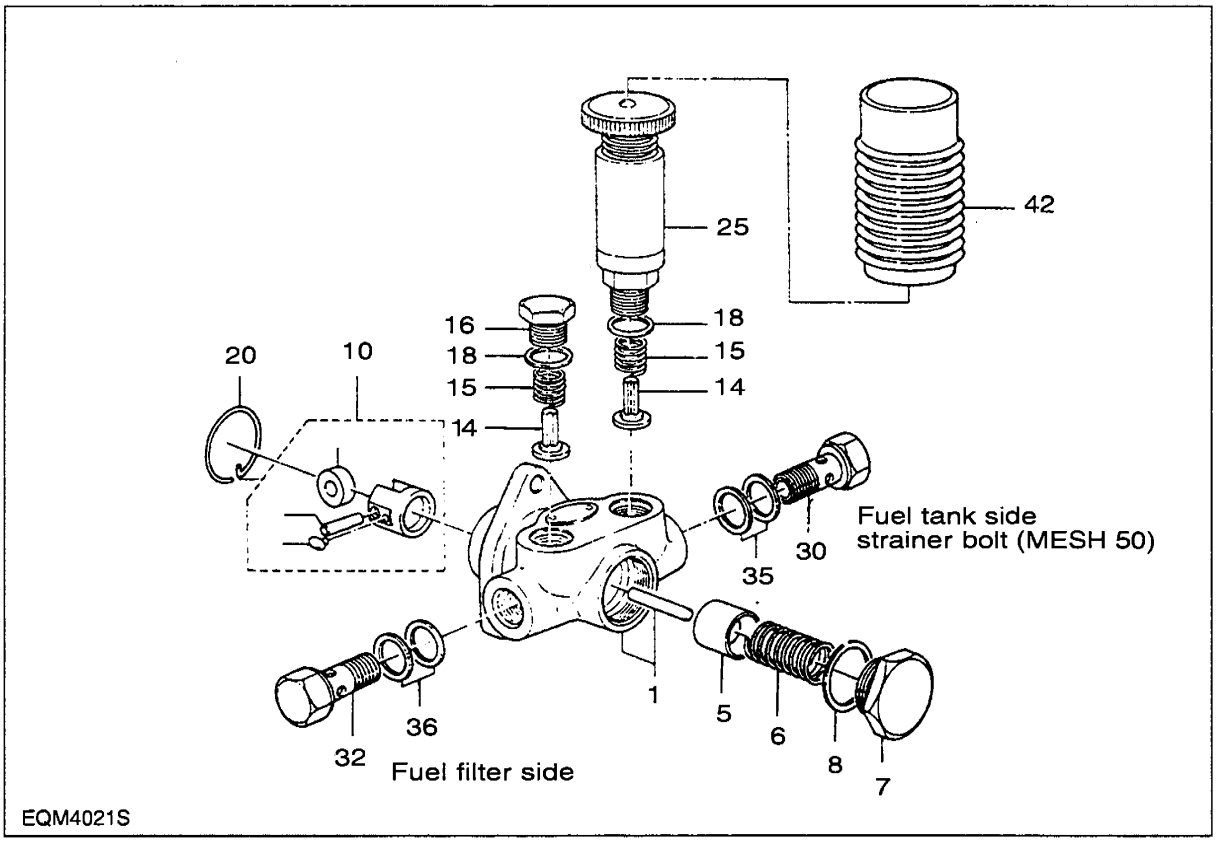
Injection timing : BTDC 12°

(b) Calibration data

Adjusting point	Rack position (mm)	Pump speed (rpm)	Injection volume (mm^3/1,000st)	Variation rate (%)	Basic point	Fixing point	Ref.
A	8.2	1,050	135±2	±2	0		
B	5.1	250	16±1.5	±15			
C	-	100	90 or More	-			
D	8.7	500	150±3	-			
E	7.1	500	(115)±3	-			

	Contents	Specifications	Engine application
Adjusting conditions	Nozzle holder assembly	105780-8140	65.10101-7072
	Nozzle	105780-0000	65.10102-6034
	Nozzle holder	105780-2080	
	Opening pressure	175 kg/cm^2	1st : 160 kg/cm^2, 2nd : 220 kg/cm^2
	Injection pipe	ϕ8 × ϕ3 - 600mm	ϕ6 × ϕ2 - 650mm
	Fuel delivery pressure	1.6 kg/cm^2	
	Fuel temperature	35~45 ℃	

2) Disassembly



<Figure 4-14> Exploded view of fuel feed pump

(1) Clamp the feed pump with a vise and disassemble the plugs(30, 32) and gaskets(35, 36).
(2) Take off the priming pump(25), plug(16), both gaskets(18), spring(15), and check valve(14).
(3) Take off the plug(7), gasket(8), spring(6), and piston(5) on the piston side.
(4) Pull out the snap ring(20) holding the tappet(10).
(5) Disassemble the snap ring, then take off the tappet(10) and push rod(1).

3) Inspection

(1) If the check valve is damaged or scored on its seat face, replace it with a new one.
(2) Inspect the piston and tappet for damage.
(3) Replace the push rod if excessively worn, and replace together with the pump housing if required.
The inspection for wear should be performed in the same procedure as for suction pressure test described below.

4) Reassembly

Reassembly operation is performed in reverse order of disassembly. All the gaskets must be replaced with new ones at reassembly.

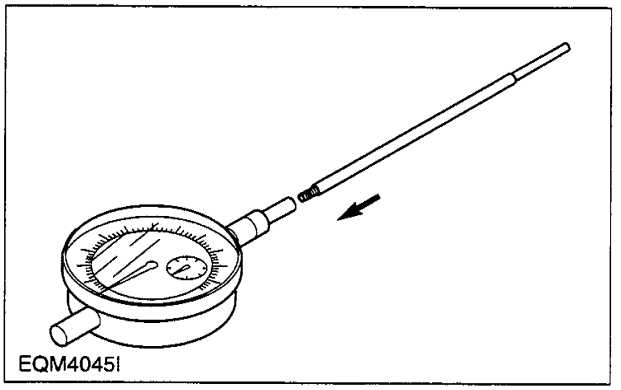
NOTICE

Check the item no. 30 before assembling it whether it is the fuel strainer bolt.
Clean it when fuel filter cartrige is replaceded.

e. Assemble the pin(157892-4200 or 157892-4300) to the dial gauge (157954-3800). (Figure 4-39)

Part No.	L(mm)
157892-4200	160
157892-4300	110

Note: "L" means the length of the pin except the threaded portion.

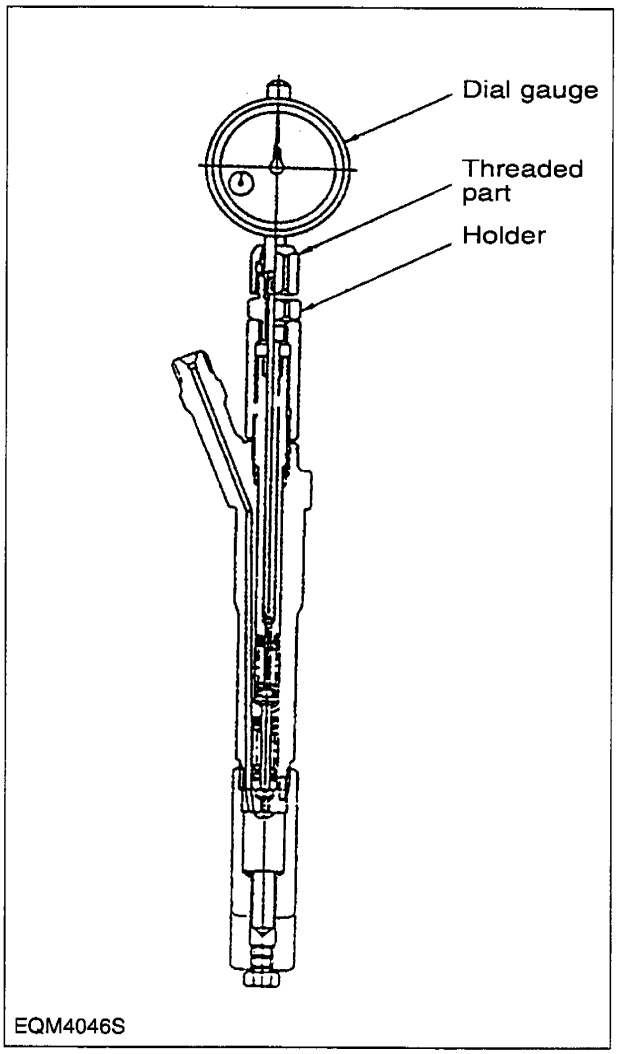


<Figure 4-39> Installing pin

f. Install the dial gauge on the holder assembly so that the pin is brought into contact with the upper end of the push rod, then fix the pin with the nut. (Figure 4-40)

Note 1: Fix the dial gauge so that a stroke of 2mm or so can be measured.

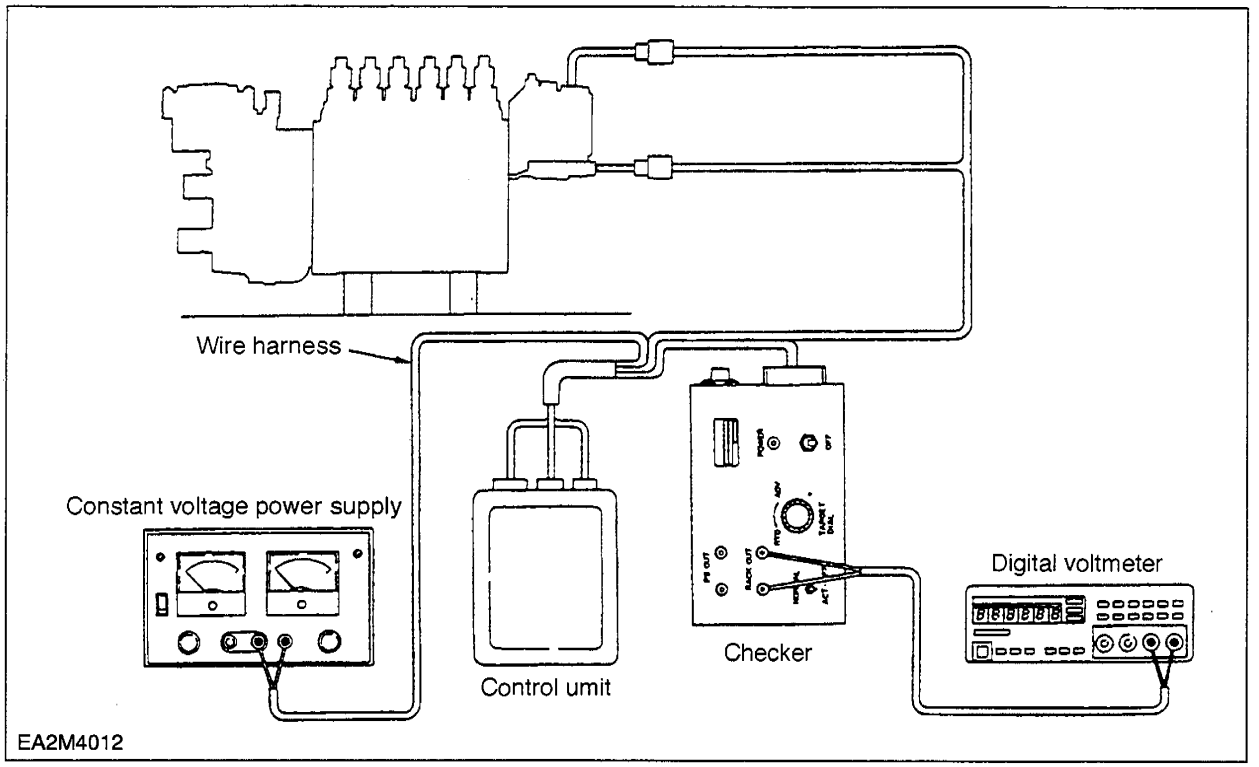
Note 2: Overtightening the nut may cause a sticking of the dial gauge seat.



<Figure 4-40> Installing dial gauge

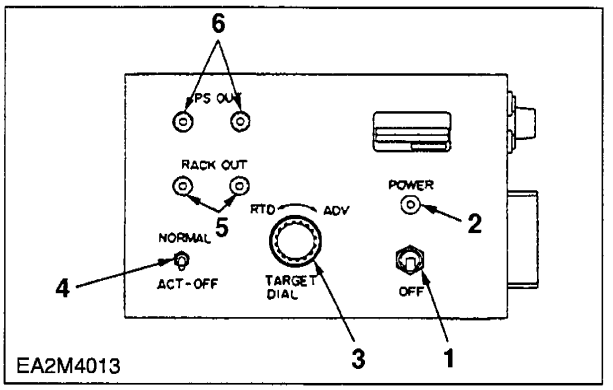
5) Wiring harness

(1) The wiring harness layout is as shown below.



(2) Position each switch on the checker(407980-2090) as shown at left.

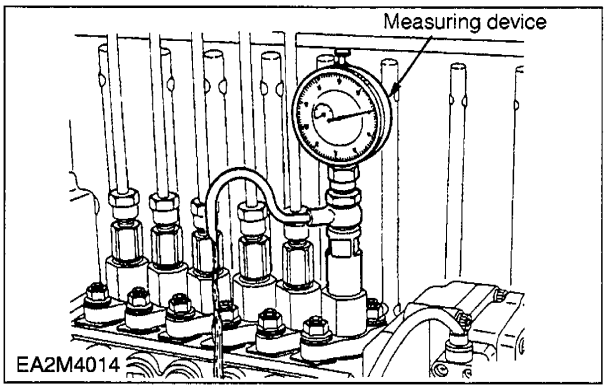
⚠ **COUTION : Leave the power switch OFF to prevent the pre-stroke actuator from overheating.**



(3) Reinstall the measuring device (105782 -4371) on the No.1 cylinder as described in 'Injection timing adjustment'.

(4) Adjust the pump test stand's fuel oil supply pressure to as low a pressure as possible (eg. 20 kPa(0.2 kgf/cm²)).

(5) Turn the pump test stand's flywheel and adjust the No.1 cylinder's lift to 4±0.05mm (refer to pages 50 and 51).



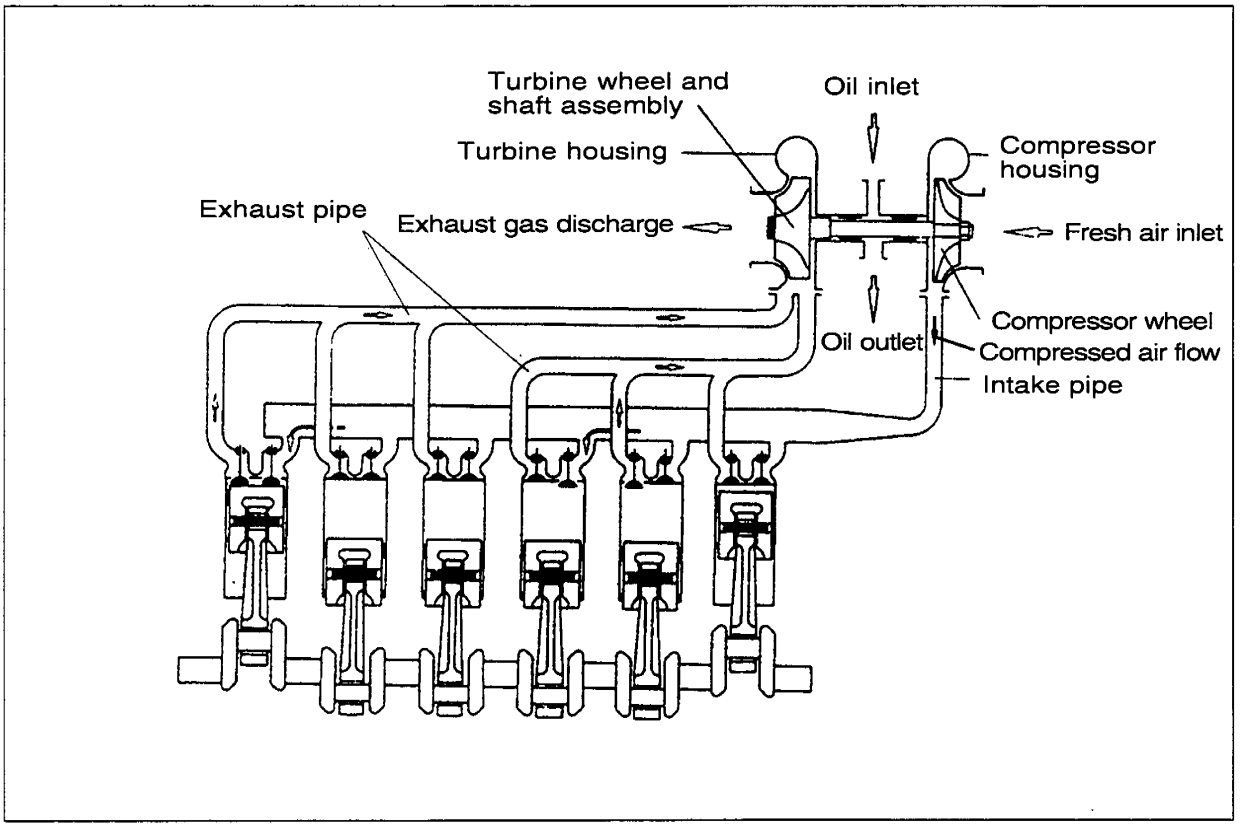
4.4. Turbocharger

4.4.1. Main data and specifications

1) Main data and specifications

Model		Specifications
At maximum output	Air pressure at compressor outlet	About 1,257kg/cm² Gauge
	Air suction volume	About 19.0m³/min
	Speed of turbine revolution	About 95,000rpm
Maximum allowable speed		110,000rpm
Max. allowable temperature of exhaust gas at turbine inlet		750℃
Lubricating system		External oil supply
Weight		14kg

2) Working principle

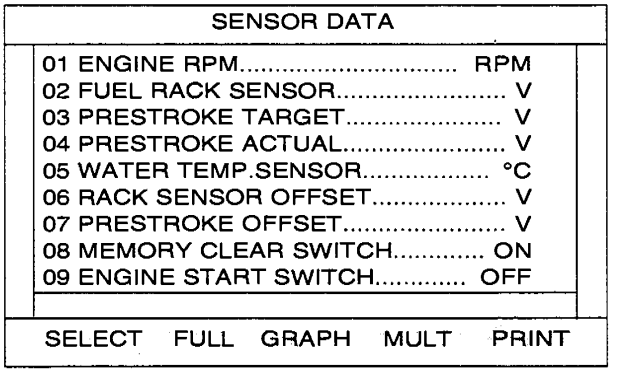


<Figure 4-56> Operating principle of turbocharger

The turbocharger is a system designed to make use of the engine exhaust gas energy to charge high-density air into the cylinders, thereby to increase the engine output.

5.4. Sensor data

If user selects the [SENSOR DATA] at [DIAGNOSIS ITEM SELECT] menu screen then display as follows.



Displayed sensor data can scroll to use the up, down ([↑],[↓]) key.And then regular value of each sensor data is displayed at bottom line of the screen.

At the [SENSOR DATA] screen, operation of each function key is described as follows.

F1 = [SELECT] : Select a sensor for graph - ic view.

F2 = [FULL] : Full screen display for all sensor data.

F3 = [GRAPH] : Graphic view about selected sensor data.

F4 = [MULTI] : Test a volt or resistance or frequency & duty ratio in comparison with displayed sensor data.

F6 = [PRINT] : Print a sensor data.

5.4.1 Sensor data basic application

Current sensor data is displayed on the screen.
User can test and see each sensor data for more exact diagnosis.

5.4.2 [SELECT] function

User can select a sensor to press the [SELECT] F1 function key. And then left Selection indication bar display '*'mark at the same time sensor data displayed on top of the screen.

Selected data is used to graph function or to see concerned sensor's value. If user wants to deselect it then press the [SELECT] F1 function key again.