McCORMICK

CT Series
Service Manual



McCormick CT41 and CT47 Series Tractors

JULY 2007

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General Notices

- When lifting the heavy things, you should use a hoist and wear the safety equipments such as working clothing, protection goggle, gloves, safety footwear etc.
- When arranging the holes, you should use the proper tools but never use the hands.

Notices in Assembling

- Assembling shall be proceeded in reverse order of disassembling and cares should be taken for tightening force or direction when assembling as the special disassembling process has been recorded.
- The spare parts should be replaced with new one.
- When assembling Oil-seal, apply the grease slightly to Operating side.

2. Transmission

Power transition ---------- 3
Dimension (Mechanical) ---------- 4
Dimension (HST) ---------- 5
Clutch Housing ---------- 6
Shuttle lever ---------- 7
Creeper lever ---------- 8
Shuttle and Creeper ---------- 12
Main change and counter gear ---------- 13

Clutch housing (HST) ---------- 16
Hydraulic pipe ---------- 17
HST unit ---------- 18

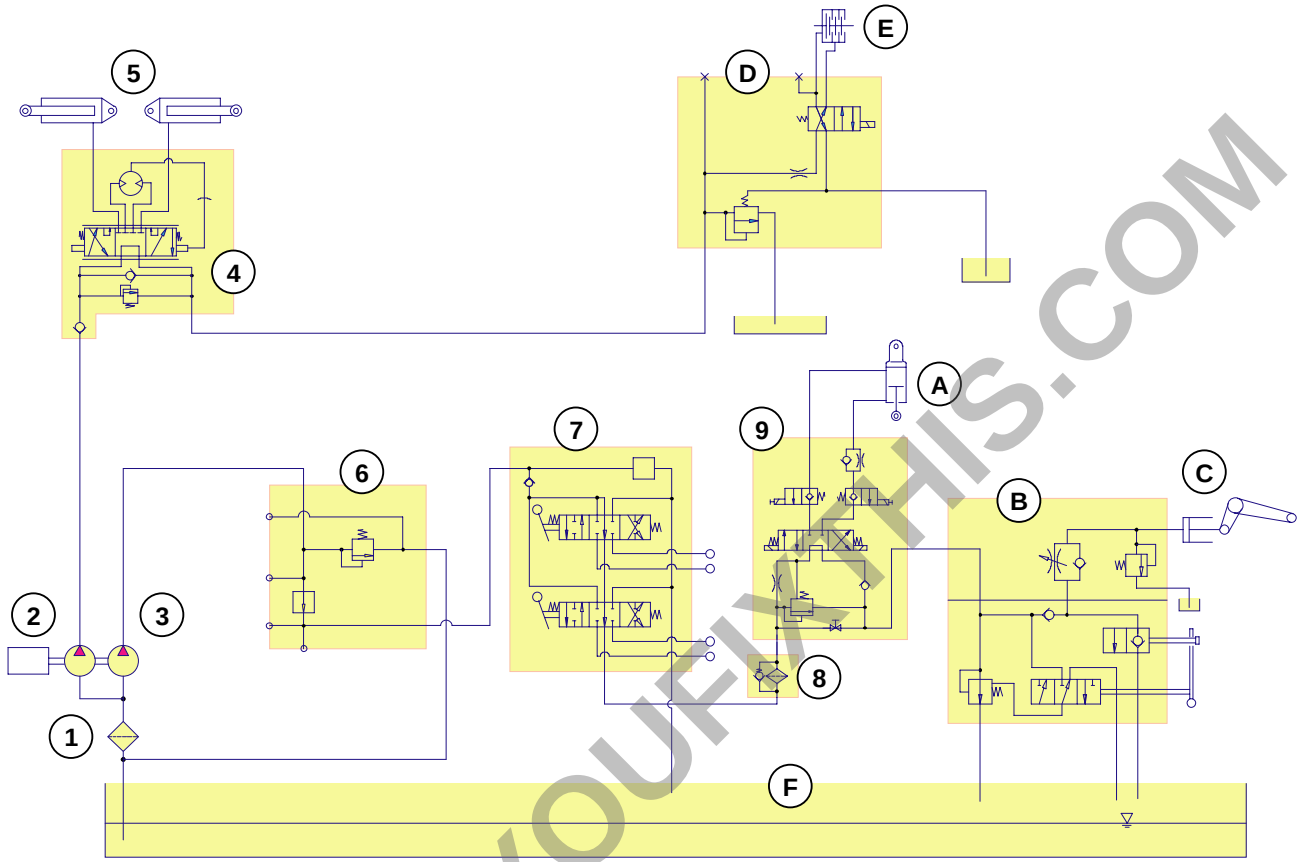
Range ---------- 20
4WD ---------- 23
4WD (Quick Turn) ---------- 27
Final drive ---------- 30

Independent PTO ---------- 36

Final drive shaft ---------- 42

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Hydraulic circuit diagram



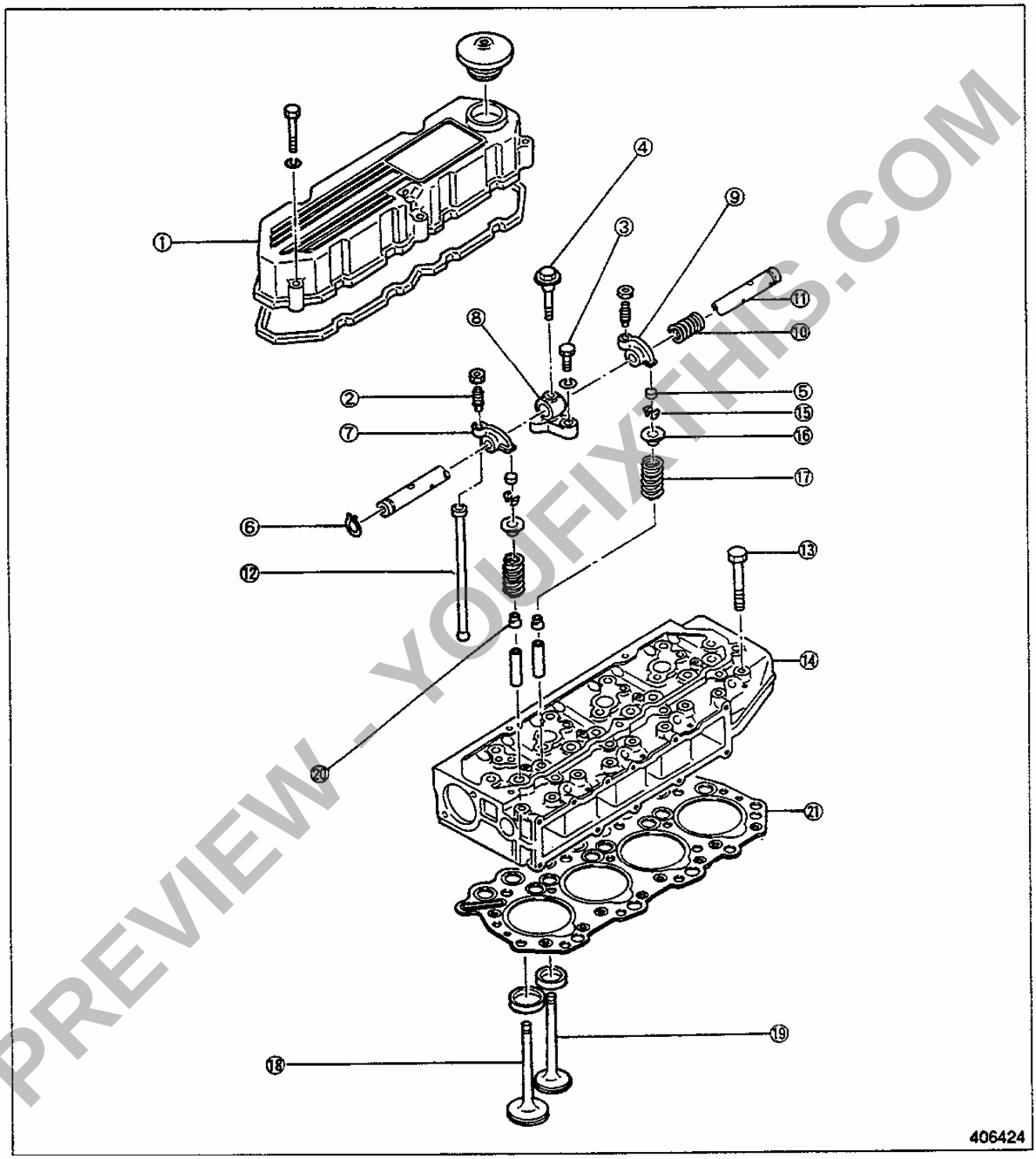
	NAME	R 41	R 47
1	Filter	(45㎛)	
2	Steering Pump	6.0cc/rev @ 2,600rpm	6.0cc/rev @ 2,700rpm
3	Main Pump	12cc/rev @ 2,600rpm	12cc/rev @2,700rpm
4	Steering Unit	62cc/rev, 145kgf/㎠ @ 15Liter/min	
5	Valve block	Relief valve 170~175kgf/㎠ @ 30liter/min	
6	Steering Cylinder	Diameter 35 x Stroke 181	
7	Remote Valve	-	
8	Line Filter	20 ㎛ , Safety valve 7bar	
9	Auto Leveler control	6liter/min	
A	Cylinder	Diameter 50 x Diameter 22.4 X Stroke 130	
B	Safety	Safety Valve 200kgf/㎠	
C	Cylinder	Diameter 80 x Stroke 113	
D	PTO Control	SQ: 15~16kgf/㎠ @ 15liter/min PTO clutch lubrication : 3.2~3.6liter (Diameter ¢ 1.3)	
E	PTO Clutch	-	
F	Oil tank (Transmission)	SAEE80W	

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1. CYLINDER HEAD AND VALVE MECHANISM

1.1 Disassembly



① Rocker cover
② Adjusting screw
③ Bolt (short)
④ Bolt (long)
⑤ Valve cap
⑥ Snap ring
⑦ Inlet valve rocker arm
⑧ Rocker shaft bracket
⑨ Exhaust valve rocker arm
⑩ Rocker shaft spring
⑪ Rocker shaft
⑫ Valve push rod
⑬ Cylinder head bolt
⑭ Cylinder head
⑮ Valve cotters
⑯ Valve retainer
⑰ Valve spring
⑱ Valve (inlet)
⑲ Valve (exhaust)
⑳ Valve stem seal
㉑ Cylinder head gasket

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2. TIGHTENING TORQUES

2.1 Major bolts and nuts

Parts to be fastened	Thread dia. x pitch, mm	Width across flats, mm	Torque		
			kgf·m	lbf·ft	N·m
Cylinder head	M12 x 1.75	19	12.0±0.5	87±4	118±5
Rocker cover	M8 x 1.25	12	1.2±0.1	9±1	12±1
Rocker shaft bracket (long bolt)	M8 x 1.25	12	1.5±0.2	11±1	15±2
Main bearing cap	M12 x 1.75	12	8.5±0.5	61±4	83±5
Connecting rod cap	M10 x 1	14	5.5±0.5	40±4	54±5
Flywheel	M12 x 1.25	17	8.5±0.5	61±4	83±5
Camshaft thrust plate	M8 x 1.25	12	1.2±0.1	9±1	12±1
Front end plate	M8 x 1.25	12	1.2±0.1	9±1	12±1
Timing gear case and cover	M8 x 1.25	12	1.2±0.1	9±1	12±1
Crankshaft pulley	M24 x 1.5	34	40±1	289±7	392±10
Rear housing	M10 x 1.25	14	5.5~6.7	39.8~48.5	54~66
Balancer shaft gear	M10 x 1.25	14	3.0±0.3	22±2	30±3
Oil pan	M8 x 1.25	12	1.7±0.2	12±1	7±2
Oil pan drain plug	M14 x 1.5	22	4.0±0.4	29±3	39±4
Oil filter shaft	M20 x 1.5	—	5.0±0.5	36±4	49±5
Oil filter	M20 x 1.5	—	1.2±0.1	9±1	12±1
Fuel injection nozzle	M20 x 1.5	21	6.0±0.6	43±4	59±6
Fuel leak-off pipe	M12 x 1.5	17	2.3±0.2	17±1	23±2
Fuel injection pump gear (distributor type)	M14 x 1.5	22	8.3±0.5	60±4	81±5
B terminal of starter	M8 x 1.25	12	1.1±0.1	8±1	11±1
Glow plug (body) (terminal)	M10 x 1.25 M4 x 0.7	12 8	1.8±0.2 0.13±0.02	13±1 0.94±0.14	18±2 1.3±0.2
Pressure relief valve	M22 x 1.5	27	5.0±0.5	36±4	49±5
Coolant drain plug	1/4–18NPTF	14	4.0±0.4	29±3	39±4
Fuel injection pipe	M12 x 1.5	19	3.0±0.3	22±2	29±3
Fuel return pipe	M10 x 1.25	14	2.0±0.2	14±1	20±2
Oil pump set bolt	M12 x 1.75	17	3.5±0.4	25±3	34±4
Overheat warning unit (thermoswitch)	M16 x 1.5	19	2.3±0.2	17±1	23±2
Drain plug	M16 x 1.5	24	4.5±0.5	33±4	44±5

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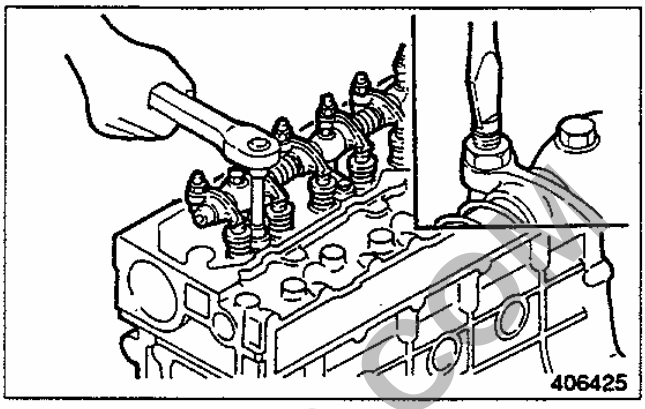
(1) Removing rocker shaft assemblies

(a) Loosen the adjusting screw one turn.

(b) Loosen the bolts, long and short, that hold the rocker shaft bracket to the cylinder head. Be sure to loosen the short bolt first. Remove the rocker shaft assembly from the cylinder head.

⚠ CAUTION

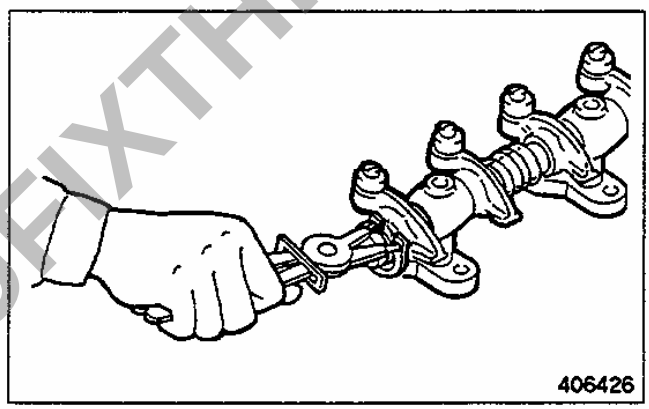
If the long bolt is loosened first, the rocker shaft bracket might suffer damage.



Removing rocker shaft assembly

(2) Disassembling rocker shaft assemblies

The rocker arms must be restored to the rocker shafts from which they were removed during disassembly. After removing the rocker arms, mark them for their rocker shafts to insure the original clearance between the arm and shaft at the time of assembly.



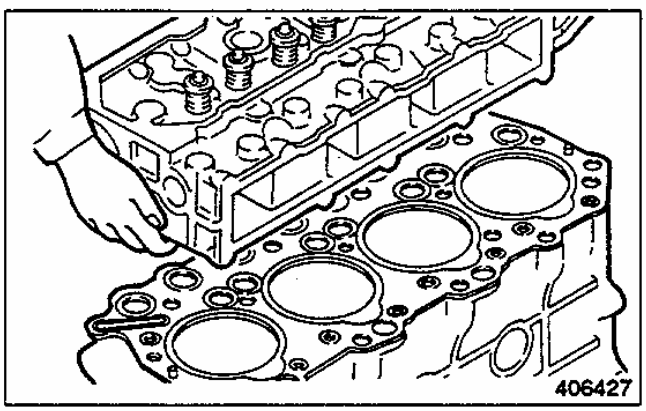
Disassembling rocker shaft assembly

(3) Removing cylinder head

Remove the bolts that hold the cylinder head. Lift off the cylinder head from the crankcase.

NOTE

If any parts of the cylinder head are faulty, check the cylinder head bolts for torque with a torque wrench before removing them.



Removing cylinder head

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	Complaint / Cause	Hard starting: Engine will turn: No exhaust smoke	Hard starting: Engine will turn: Little exhaust smoke	Hard starting: Engine will turn: Excessive exhaust smoke	Hard starting: Cranking speed low	Hard starting: Engine will not turn: Engine can be cranked manually	Hard starting: Engine will not turn: Engine cannot be cranked manually	Glow plug indicator does not glow red	Glow plug indicator glows red	Not enough power: Little exhaust smoke	Not enough power: Excessive white exhaust smoke	Not enough power: Excessive black exhaust smoke	Exhaust smoke abnormal: During idling	Exhaust smoke abnormal: During operation: White	Exhaust smoke abnormal: During operation: Black	Engine knocks excessively	Engine noisy	Engine runs rough	Engine hunts: During idling	Engine hunts: During operation
Fuel system	No fuel to injection pump	○	○	—	—	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—
	Greater variance of fuel injection quantity	—	—	○	—	—	—	—	—	—	—	○	○	—	○	—	—	—	—	—
	Injection pump oil seals defective	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Insufficient injection quantity	○	○	—	—	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—
	Excessive injection quantity	—	—	—	—	—	—	—	—	—	—	—	—	—	○	—	—	—	—	—
	Injection nozzle defective	—	—	○	—	—	—	—	—	—	—	○	○	—	○	—	—	—	○	○
	Excessive fuel return from injection nozzles	—	○	—	—	—	—	—	—	○	—	—	—	—	—	—	—	○	○	—
	Injection timing advanced	—	—	○	—	—	—	—	—	—	○	—	—	○	○	○	—	—	—	—
	Injection timing retarded	—	—	○	—	—	—	—	—	—	—	○	○	—	—	—	—	○	○	—
	Engine speed too low	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	—
	Failure to stop	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Bad quality fuel	—	—	○	—	—	—	—	—	—	○	○	○	○	○	○	○	—	—	—
	Fuel oil viscosity high	○	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lubrication system	Bad quality oil	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Oil viscosity high	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Oil viscosity low	—	—	—	—	—	—	—	—	—	—	—	—	○	—	—	—	—	—	—
	Oil pressure low	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Oil leaks	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Excessive pumping up of oil	—	—	—	—	—	—	—	—	—	—	—	—	○	○	○	—	—	—	—
	Oil filter clogged	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Oil pressure switch or lamp defective	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Air intake system	Not enough air for combustion	—	—	○	—	—	—	—	—	—	—	○	—	—	○	—	—	—	—	—
	Poor compression	—	—	○	—	—	—	—	—	—	○	○	○	○	○	○	○	—	○	○
	High temperature or low barometric pressure at high altitude	—	—	—	—	—	—	—	—	—	—	○	—	—	○	—	—	—	—	—

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2.SPECIFICATIONS

Engine model		S4Q-Y161GT	S4Q2-Y161GT
General	Type	In-line,water-cooled,4-stroke cycle	
	Firing order	1-3-4-2	
	Compression ratio	22	
	Combustion chamber,type	Swirl	
	Weight(dry),kg(lb)	245(540)	
	Number of cylinders	4	
	bore x stroke,mm(in.)	88 x 95(3.46 x 3.74)	88 x 103(3.46 x 4.06)
	Displacement,liter(cu in.)	2.311(141)	2.505(153)
Maximum permissible working angles for oil pickup level in oil pan,longitudinal and lateral		30°	
Fuel system	Injection pump type	Bosch A	
	Injection nozzle,type	Bosch throttle	
	Fuel filter,type	Spin-on	
Lubrication system	Type	Force feed	
	Oil filter,type	Spin-on cartridge of paper-element	
	Capacity,liter(U.S.gal.)	Oil pan:7(1.8),approx. Crankcase:8(2.1),approx.	
Cooling system	Type	Radiator	
	Capacity(water jacket), liter(U.S.gal.)	3.7(0.98)	
Electrical system	Starter,V－kW	12－2.2	
	Alternator,V－A	12－50	
	Battery recommended, V－Ah	12－80D26R	

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2. MEASURING THE COMPRESSION PRESSURE

START BY:

(a) make sure the engine oil, air cleaner, starter and battery are normal

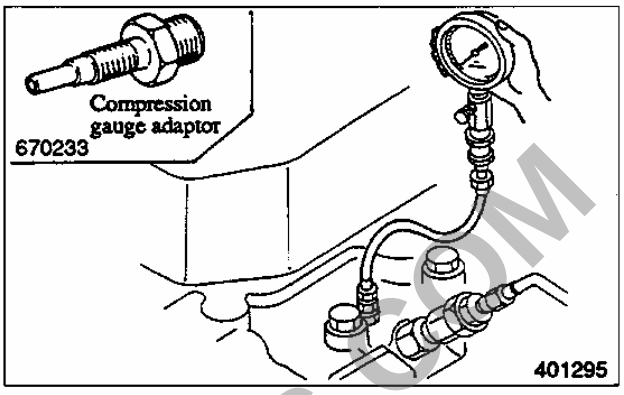
(b) start the engine and allow it to warm up thoroughly

(1) Move the control lever to the stop position.

(2) Remove the glow plugs from all cylinders. Connect compression gauge (33391-02100) to the cylinder on which the compression is to be measured with compression gauge adaptor (30691-21100).

(3) Crank the engine with the starter and, after the gauge pointer stops moving, take a pressure reading from the gauge.

(4) If the reading on the gauge is lower than the repair limit, overhaul the engine.



Measuring compression

⚠ CAUTION

a) Be sure to measure the compression on all cylinders.

b) The compression pressure may vary depending on engine rpm. This makes it necessary to check the engine rpm when measuring the compression.

Unit: kgf/cm² (psi) [kPa]

Item	Assembly standard	Repair limit
Compression	30 (427) [2 940]	26 (370) [2 550]

NOTE

Measure the compression with the engine running at 150 to 200 rpm.

⚠ CAUTION

a) Measure the compression at regular intervals to obtain the data on the gradual change of compression.

b) The compression would be slightly higher than the assembly standard in a new or overhauled engine but it will drop after the break-in period.

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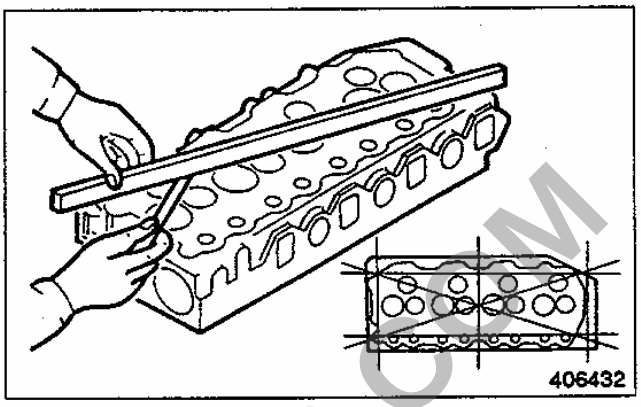
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Cylinder head

Using a heavy accurate straight edge and a feeler gauge, check for warpage in three positions lengthwise, two crosswise and two widthwise, as shown in the illustration. If warpage exceeds the repair limit, reface the head with a surface grinder.

Unit: mm (in.)

Item	Assembly standard	Repair limit
Warpage of bottom face	0.05 (0.0020), maximum	0.20 (0.0079)



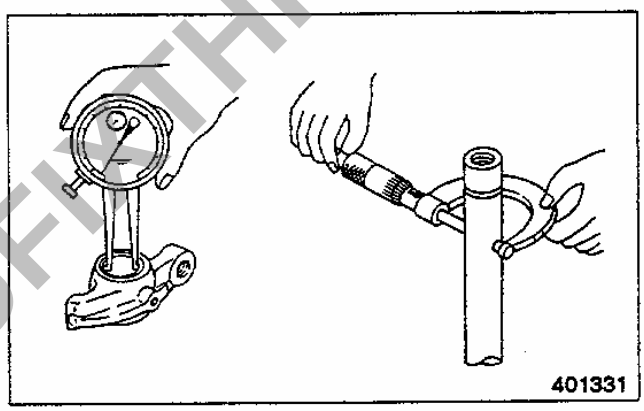
Checking cylinder head for warpage

Rocker arms and rocker shafts

Measure the inside diameter of the rocker arm (bushing bore) and the diameter of the rocker shaft, as shown in the illustration, to check the clearance between the rocker arm and shaft. If the clearance is not correct, within the repair limit, replace the rocker arm. If it exceeds the repair limit, replace both rocker arm and bushing.

Unit: mm (in.)

Item	Nominal size	Assembly standard	Repair limit
Inside diameter of rocker arm (bushing)	19 (0.75)	19.010 to 19.030 (0.74842 to 0.74921)	—
Diameter of rocker shaft	19 (0.75)	18.980 to 19.000 (0.74724 to 0.74803)	—
Clearance between rocker bushing and shaft	—	0.010 to 0.050 (0.00039 to 0.00197)	0.070 (0.00276)



Measuring rocker arm and rocker shaft

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4. MAINTENANCE SCHEDULE

(1) Use the service meter to determine servicing intervals.

(2) The servicing intervals in the schedule are for an average operating conditions. Service the engine earlier than the scheduled intervals if necessary. (The intervals depends on application, operating conditions, and fuel oil and lube oil used in the engine. Adjust the intervals to meet the actual operating conditions.)

(3) Perform service on items at multiples of the original requirement. For example, at Every 250 service hours, also service those items listed under Every 50 service hours and Every 10 service hours.

○	Check, clean, wash or adjust.
●	Change.
Ⓢ	Rely on Mitsubishi dealer if necessary.
*	Items to be serviced after initial 50 hours of operation of a new, reconditioned or long-stored engine.

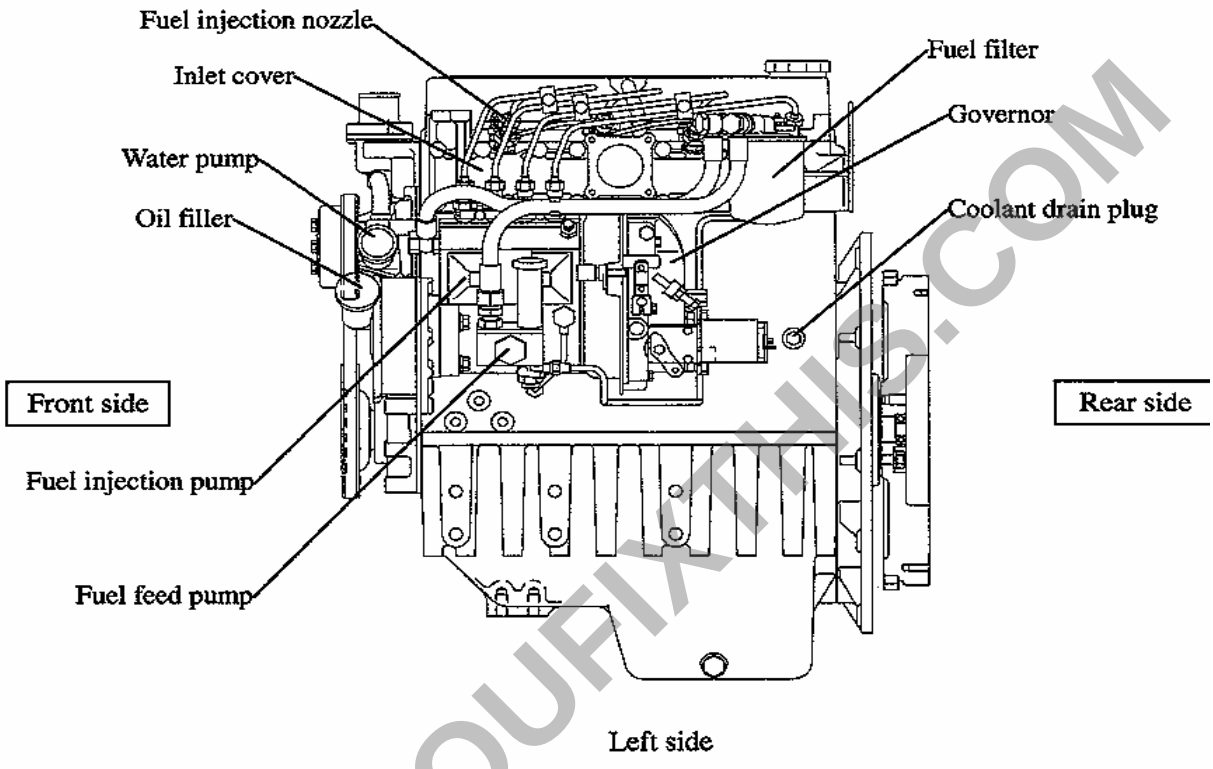
Group	Item		Interval					Remarks
			Every 10 service hours	Every 50 service hours	Every 250 service hours	Every 500 service hours	Every 1000 service hours	
General	Walk-around inspection	Check	○					
	Valve clearance	Check				○		Ⓢ
	Bolts and nuts (cylinder head bolts)	Retighten		*			○	Ⓢ
Lubrication system	Oil pan	Check oil level	○					
		Change oil		*	●			Ⓢ
	Oil filter (cartridge)	Change		*	●			
Fuel system	Fuel tank	Check oil level	○					
		Drain moisture		○				
	Fuel filter	Change				●		
	Injection nozzles	Check				○		Ⓢ
Cooling system	Radiator	Check coolant level	○					
		Change coolant	Every 2 years					
	Radiator fins	Clean			○			
	Fan belt	Check tension				○		
Air inlet system	Air cleaner (paper-element type)	Check indicator		○				Ⓢ
		Clean element				○		
		Change element					●	
Electrical system	Battery	Check electrolyte level and specific gravity		○				Check specific gravity from time to time
	Alternator	Check					○	Ⓢ
	Starter	Check					○	Ⓢ

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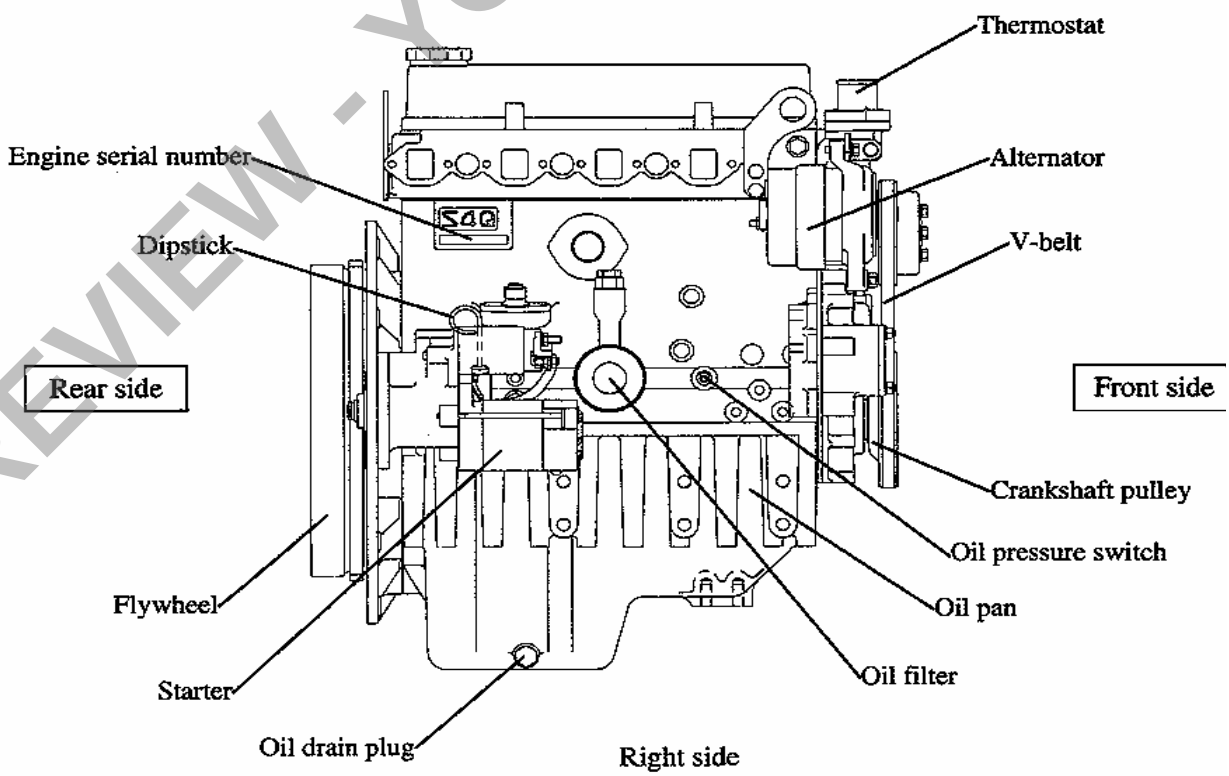
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1. GENERAL

1.1 Typical engine arrangements



Left side



Right side

NOTE: Rotation of crankshaft is counterclockwise when seen from flywheel end.

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