# CK36-CK50 Excavators

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# Section

# 1001

## SAFETY INSTRUCTIONS, GENERAL INFORMATION AND TORQUE SPECIFICATIONS

J I Case


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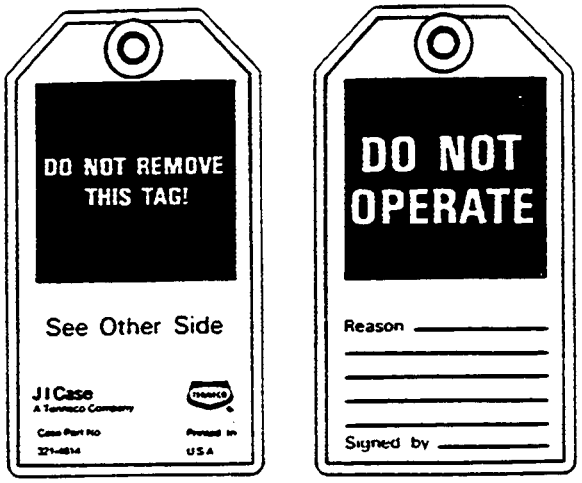
November 1991

Lep 7-55741

# SAFETY

*This symbol means ATTENTION ! BECOME ALERT ! YOUR SAFETY IS INVOLVED. The message that follows the symbol contains important information about safety. Carefully read the message, Make sure you fully understand the causes of possible injury or death.*

To prevent injury always follow the Warning, Caution and Danger notes in this section and throughout the manual.
Put the warning tag shown below on the key for the keyswitch when servicing or repairing the machine. One warning tag is supplied with each machine. Additional tags Part Number 331-4614 are available from your service parts supplier.




B004

*Read the operator's manual to familiarize yourself with the correct control functions.*

*Operate the machine and equipment controls from the seat position only. Any other method could result in serious injury.*

*This is a one man machine, no riders allowed.*

*Before starting engine, study Operator's Manual safety messages. Read all safety signs on machine. Clear the area of other persons. Learn and practise safe use of controls before operating.*
*It is your responsibility to understand and follow manufacturers instrucitons on machine operation, service, and to observe pertinent laws and regulations. Operator's and Service Manuals may be obtained from your J.I. CASE dealer.*

*If you wear clothing that is too loose or do not use the correct safety equipment for your job, you can be injured. Always wear clothing that will not catch on objects. Extra safety equipment that can be required includes hard hat, safety shoes, ear protection, eye or face protection, heavy gloves and reflector clothing.*

*When working in the area of the fan belt with the engine running, avoid loose clothing if possible, and use extreme caution.*

*When doing checks and tests on the equipment hydraulics, follow the procedures as they are written. DO NOT change the procedure.*

*When putting the hydraulic cylinders on this machine through the necessary cycles to check operation or to remove air from a circuit, make sure all people are out of the way.*

*Use insulated gloves or mittens when working with hot parts.*

*Lower all attachments to the ground or use stands to safety support the attachments before you do any maintenance or service.*

*Pin sized and smaller streams of hydraulic oil under pressure can penetrate the skin and result in serious infection. If hydraulic oil under pressure does penetrate the skin, seek medical treatment immediately. Maintain all hoses and tubes in good condition. Make sure all connections are tight. Make a replacement of any tube or hose that is damaged or thought to be damaged. DO NOT use your hand to check for leaks, use a piece of cardboard or wood.*

*When removing hardened pins such as a pivot pin, or a hardened shaft, use a soft head (brass or bronze) hammer or use a driver made from brass or bronze and a steel head hammer.*

*When using a hammer to remove and install pivot pins or separate parts using compressed air or using a grinder, wear eye protection that completely encloses the eyes (approved goggles or other approved eye protectors).*

*Use suitable floor (service) jacks or chain hoist to raise wheels or tracks off the floor. Always block machine in place with suitable safety stands.*

*When servicing or repairing the machine. Keep the shop floor and operator's compartment and steps free of oil, water, grease, tools, etc. Use an oil absorbing material and or shop cloths as required. Use safe practices at all times.*

*Some components of this machine are very heavy. Use suitable lifting equipment or additional help as instructed in this Service Manual.*

*Engine exhaust fumes can cause death. If it is necessary to start the engine in a closed place, remove the exhaust fumes from the area with an exhaust pipe extension. Open the doors and get outside air into the area.*

*When the battery electroyte is frozen, the battery can explode if (1), you try to charge the battery, or (2), you try to jump start and run the engine. To prevent the battery electrolyte from freezing, try to keep the battery at full charge. If you do not follow these instructions, you or others in the area can be injured.*

*Batteries contain acid and explosive gas. Explosions can result from sparks, flames or wrong cable connections. To connect the jumper cables correctly to the battery of this machine see the Operator's Manual. Failure to follow these instructions can cause serious injury or death.*

# GENERAL INFORMATION

## CLEANING

Clean all metal components, except bearings, with steam or white spirit. Do not use caustic soda when steam-cleaning. After cleaning, dry and oil the components. Clean oil lines with compressed air. Clean bearings in kerosene, dry them completely and oil them.

## INSPECTIONS

Carefully examine all disassembled components. Replace all parts showing signs of wear or damage. Light scores and scratches can be removed by honing or with a buffing compound. Fast, abnormal wear of components can be avoided by careful examination and early detection of wear and pitting.

## BEARINGS

Check that bearings run freely. Replace bearings that show signs of too much play or seizing. Clean bearings in a good solvent or kerosene and allow them to dry naturally. DO NOT DRY BEARINGS WITH COMPRESSED AIR.

## NEEDLE BEARINGS

Before installing needle bearings in their housing, remove any metal edges inside or around the housing. When installing bearings with a hydraulic press, grease the inside and the outside of the bearing with petroleum jelly.

## GEARS

Check all gears for signs of damage or wear. Replace damaged or worn gears.

## SEAL RINGS, O RINGS AND FLAT SEALS

Always install new seal rings, O-rings and flat seals, if removed. Lubricate seal rings and O-rings with petroleum jelly.

## SHAFTS

Check all shafts showing signs of damage or wear. Check particularly to make sure that any surface of the shaft in contact with bearings or seal rings is not damaged.

## SERVICE PARTS

Always use genuine CASE service parts. To order service parts, see the Spare Parts Catalog and remember to give the correct reference of the necessary CASE part. No warranty claims will be considered for failures involving parts which are not of CASE origin.

## LUBRICATION

Never use oil or grease which is different from that specified in the Operator's Manual or the Service Manual. No warranty claims will be considered for failures due to the use of wrong oil or grease.

# STANDARD FASTENER TORQUE SPECIFICATIONS

Unless otherwise specified, use the following torque specifications. Lubricate the threads with engine oil or ordinary grease.

| SCREWS / STANDARD SIZE | 4 | 7 | 9 |
|---|---|---|---|
| M6 | 7.8 to 9.3 Nm (5.75 to 6.86 lb ft) | 9.8 to 11.3 Nm (7.23 to 8.33 lb ft) | 12.3 to 14.2 Nm (9.07 to 10.47 lb ft) |
| M8 | 17.7 to 20.6 Nm (13.0 to 15.2 lb ft) | 23.5 to 27.5 Nm (17.34 to 20.29 lb ft) | 29.4 to 34.3 Nm (21.6 to 25.31 lb ft) |
| M10 | 39.2 to 45.1 Nm (28.9 to 33.28 lb ft) | 48,0 to 55.9 Nm (35.42 to 41.25 lb ft) | 60.8 to 70.6 Nm (44.8 to 52.10 lb ft) |
| M12 | 62.8 to 72.6 Nm (46.3 to 53.5 lb ft) | 77.5 to 90.2 Nm (57.19 to 66.56 lb ft) | 103.0 to 117.7 Nm (76.0 to 86.86 lb ft) |
| M14 | 107.9 to 125.5 Nm (79.6 to 92.6 lb ft) | 123.6 to 147.1 Nm (91.2 to 108.5 lb ft) | 166.7 to 196.1 Nm (123.0 to 144.7 lb ft) |
| M16 | 166.7 to 191.2 Nm (123.0 to 141.0 lb ft) | 196.1 to 225.6 Nm (144.7 to 166.49 lb ft) | 259.9 to 304.0 Nm (191.8 to 224.3 lb ft) |
| M18 | 245.2 to 284.4 Nm (180.9 to 209.88 lb ft) | 274.6 to 318.7 Nm (202.6 to 235.2 lb ft) | 343.2 to 402.1 Nm (253.2 to 296.74 lb ft) |
| M20 | 333.4 to 392.2 Nm (246.0 to 289.44 lb ft) | 367.7 to 431.5 Nm (271.36 to 318.44 lb ft) | 490.3 to 568.8 Nm (361.8 to 419.77 lb ft) |

# Section

# 2002

## ENGINE REMOVAL AND INSTALLATION

2002

J I Case

Lep 7-38200E


Printed in England
December 1992

# Removal and Installation

## STEP 1

Park the machine on hard level ground. Lower the attachment to the ground. Release pressure in the hydraulic circuits and stop the engine.

## STEP 2

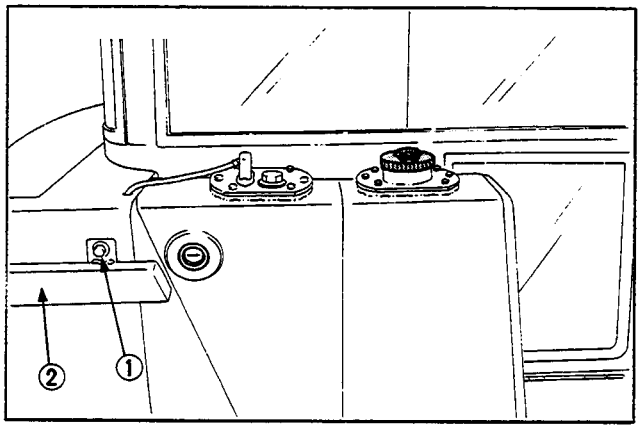
Disconnect the battery, negative (-) terminal first.

**NOTE :** *For installation, install and tighten the positive (+) terminal first.*

## STEP 3

Remove the Cab or Canopy, refer to Section 9004.

## STEP 4



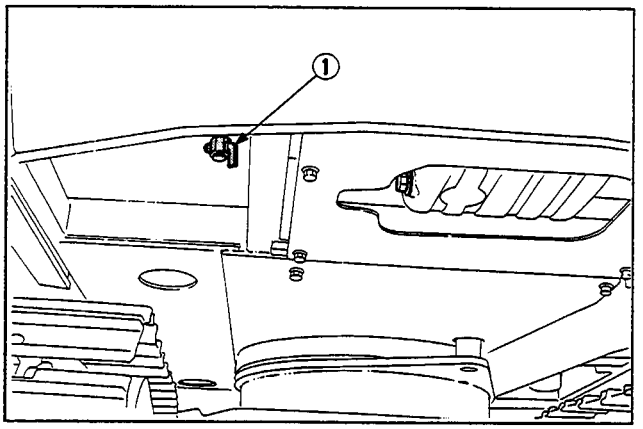

Remove the bolts (1) and the protector (2).

**NOTE :** *For Installation, apply Loctite 271 to the bolts and tighten to a torque of :*
*M12 - 77 to 90 Nm*
*M16 - 166 to 197 Nm*

## STEP 5

Remove the Hydraulic Oil Reservoir, refer to Section 8010.

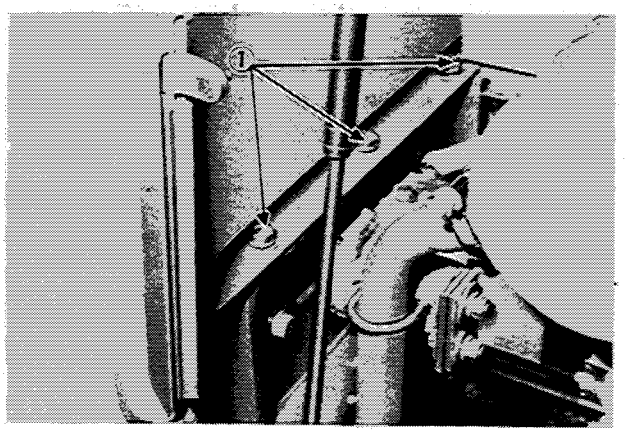
## STEP 6




Put a container with a capacity of a least 8 litres under the radiator drain valve (1) and drain the coolant.

**NOTE :** *For Installation, install coolant to the correct level.*

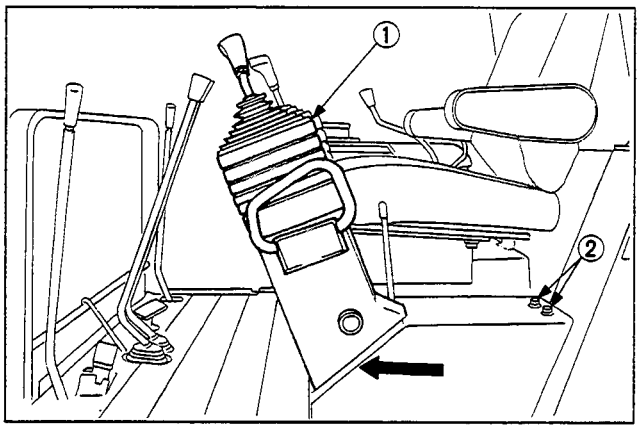
## STEP 7




Remove the hood mounting bolts (1) from the inside of the engine compartment.

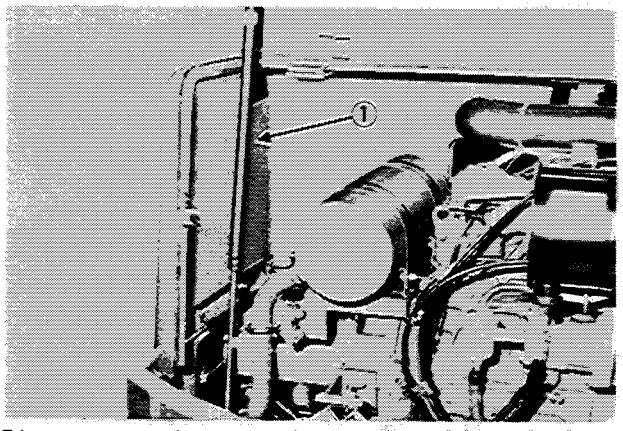
**NOTE :** *For Installation, apply Loctite 271 to the bolts (1) and tighten to a torque of :*
*M10 - 48 to 56 Nm*
*M12 - 77 to 90 Nm*

## STEP 8

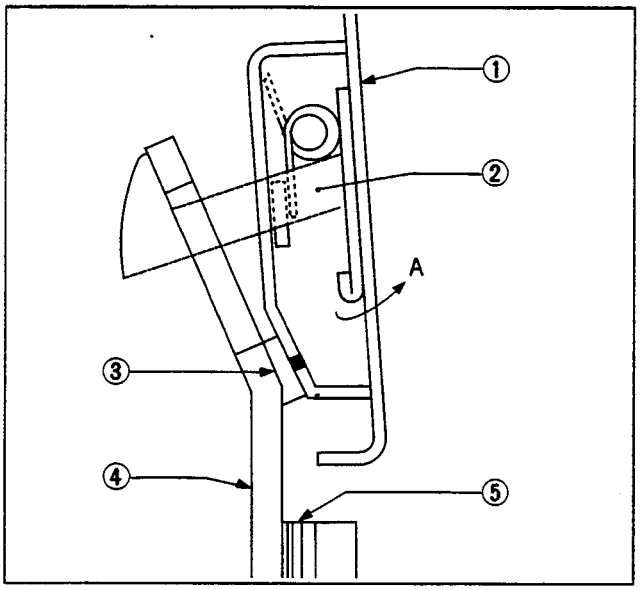



Remove the bolts (2) and slide the control box (1) forwards.

## STEP 9




Disconnect and remove the gas strut (1) on the hood. Support the hood on suitable lifting equipment. Remove the hood.

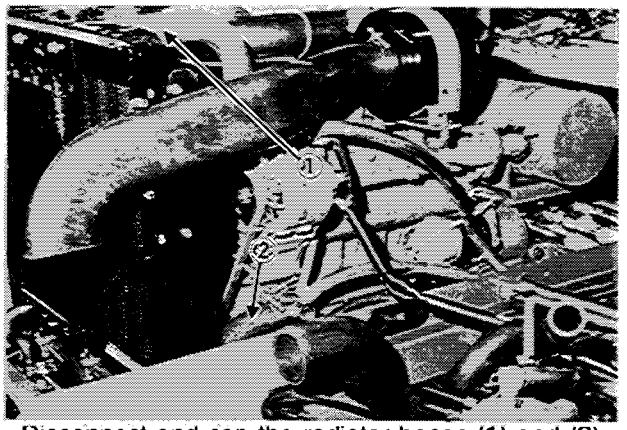



**NOTE :** *When the hood (1) is closed make sure the catch (2) comes in close contact with the bracket (4). When opening the hood (1) make sure the catch (2) easily comes off the bracket (4), if necessary adjust with shims (5).*

## STEP 10

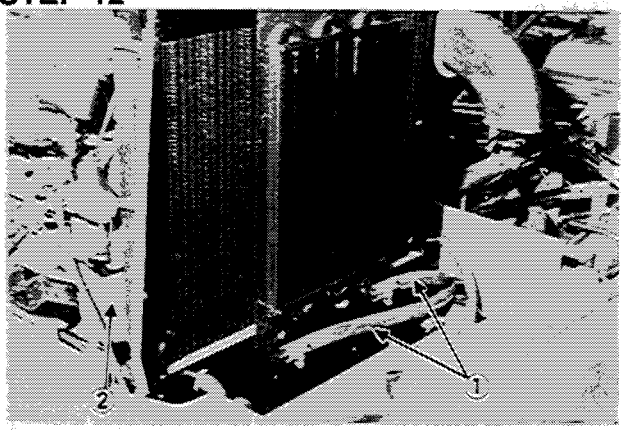
Remove the battery and the fluid level sensor.

## STEP 11



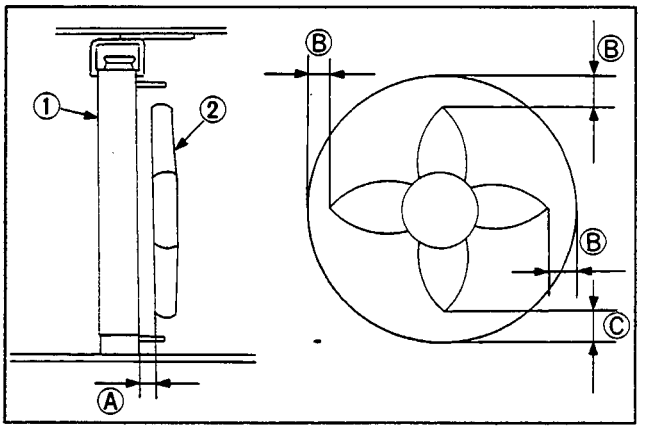

Disconnect and cap the radiator hoses (1) and (2).

## STEP 12




Disconnect and cap the oil cooler hoses (1) and radiator return hose (2).

## STEP 13

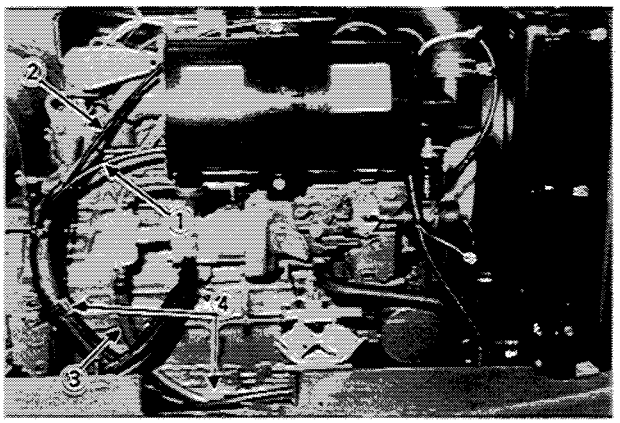



Remove the radiator/oil cooler assembly.

**NOTE :** *For Installation, make sure the radiator (1) and fan (2) have the following clearances :*

*A = 30 mm or more*
*B = 15 mm or more*
*C = 20 mm or more*

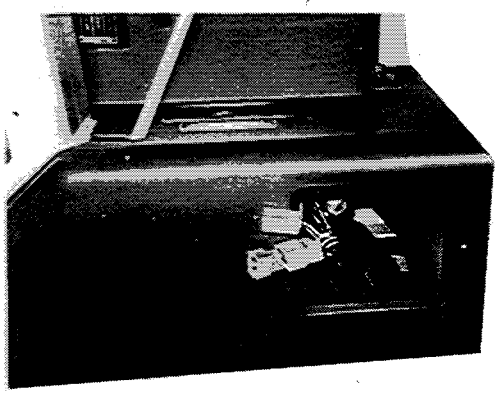
## STEP 14




Disconnect the throttle cable (1), tachometer cable (2), fuel hose (3) and clamp (4).

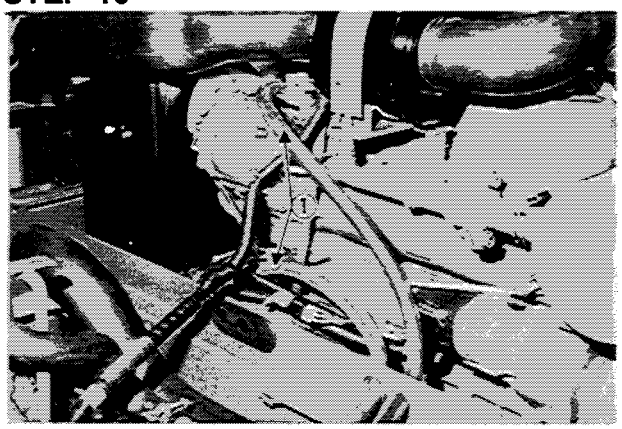
**NOTE :** *For Installation, refer to Section 9003 for throttle cable adjustment.*

## STEP 15



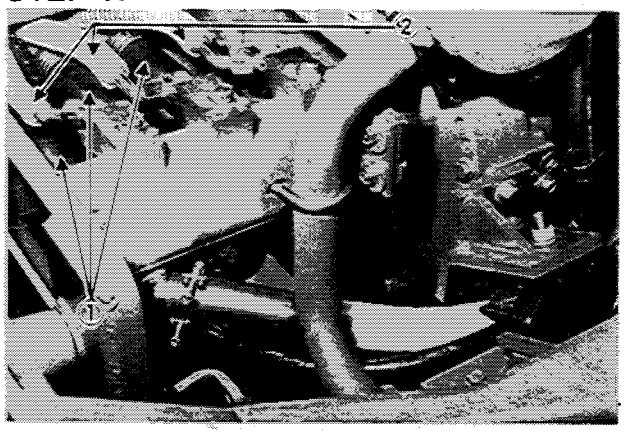
Remove the cover next to the right control lever stand. Disconnect the main electrical harness from the engine.

## STEP 16



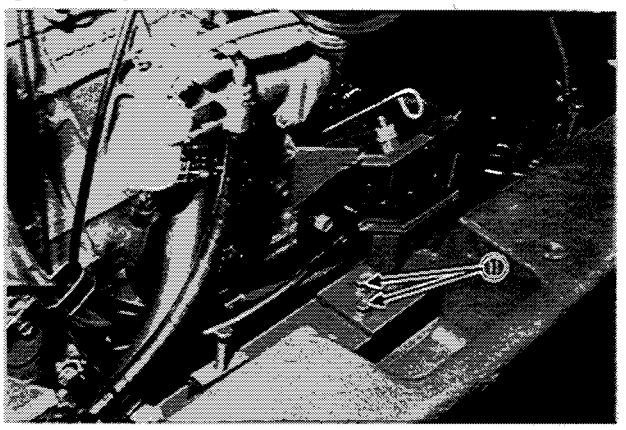

Disconnect and cap the heater hoses (1) (if equipped).

## STEP 17




Disconnect and cap the hoses (1) and (2) from the hydraulic pump.

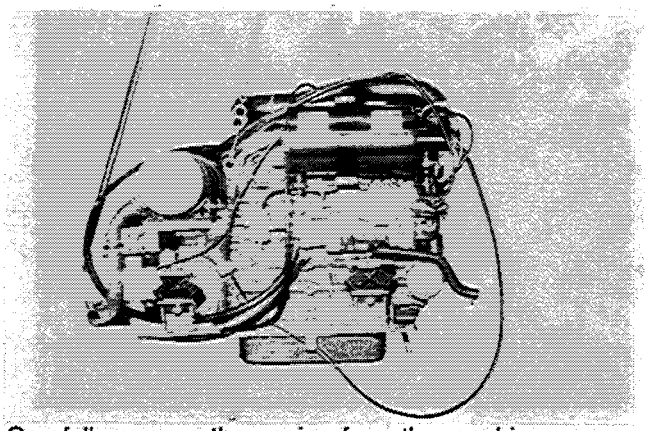
## STEP 18




Support the engine on suitable lifting equipment. Remove the engine mounting bolts (1).

**NOTE :** *For Installation, apply Loctite 271 to the engine mounting bolts and tighten to a torque of :*
*M10 - 48 to 56 Nm*
*M12 - 77 to 90 Nm*
*M14 - 124 to 147 Nm*

## STEP 19



Carefully remove the engine from the machine.

**NOTE :** *For Installation, follow the same procedure in reverse order. Open the heater valve, situated on top of the engine, to allow the coolant to circulate. Start and run the engine for approximately 5 minutes. Stop the engine and check the coolant level, engine oil level and hydraulic oil level. Add coolant or oil if necessary.*

> ⚠ *Never run an engine in a closed building. Proper ventilation is required under all circumstances.*

# Section

# 2010

## ENGINE DISASSEMBLY/ASSEMBLY, LUBRICATION SYSTEM COOLING SYSTEM AND FUEL SYSTEM

J I Case

Lep 7-38210E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This symbol is used throughout this manual to draw attention to important safety messages. Whenever you see this symbol, carefully read the message that follows, since it warns of a risk of serious injury.

# SPECIFICATIONS

## General CK36

| | |
|---|---|
| Make and Model | KUBOTA V1902BH-5 |
| Type | 4 Cylinder, 4 Stroke Cycle |
| Horsepower : SAE | 36.6 HP (27.3 kW) |
| DIN | 33 HP (23.3 kW) |
| Firing Order | 1-3-4-2 |
| Piston Displacement | 1861 $cm^3$ |
| Rated Engine Speed | 2670 rpm |
| Engine Idle Speed | 1000-1200 rpm |
| Engine Oil Capacity | 7.5 Litres |

## General CK50

| | |
|---|---|
| Make and Model | KUBOTA V1902BH-6 |
| Type | 4 Cylinder, 4 Stroke Cycle |
| Horsepower : SAE | 42.7 HP (31.8 kW) |
| DIN | 39 HP (28.7 kW) |
| Firing Order | 1-3-4-2 |
| Piston Displacement | 1861 $cm^3$ |
| Ratged Engine Speed | 3000 rpm |
| Engine Idle Speed | 1000-1200 rpm |
| Engine Oil Capacity | 7.5 Litres |

**NOTE :** *The following specifications are common to CK36 and CK50 Excavators.*

## General

| | |
|---|---|
| Bore and Stroke | 85 x 82 mm |
| Compression Ration | 21:1 |
| Valve Clearance (Cold) | 0.18 to 0.22 mm |
| Direction of Rotation | Counterclockwise (Viewed from Flywheel) |

## Pistons

| | |
|---|---|
| Rings per Piston | 3 |
| Number of Compression Rings | 2 |
| Number of Oil Rings | 1 |

## Main Bearings

| | |
|---|---|
| Number of Bearings | 5 |
| Type | Replaceable |

## Lubrication System

| | |
|---|---|
| Type | Forced Lubrication by Pump |
| Oil Pressure | 2.9 to 4.4 bar (42.7 to 64 psi) |
| Oil Pump | Rotor Type |
| Oil Filter | Cartridge Type |

## Fuel System

| | |
|---|---|
| Fuel Injection Pump | BOSCH K Type Mini |
| Fuel Injection Pump Timing | 23 to 25° before TDC |
| Fuel Injector Opening Pressure | 137 to 147 bar (1990 to 2130 psi) |

## Cylinder Head

| | |
|---|---|
| Warpage | 0.05 mm |
| Top Clearance | 0.7 to 0.9 mm |
| Compression Pressure | 28.4 to 32.4 bar (412 to 469 psi) |
| Minimum | 22.6 bar (327 psi) |

## Valves (Inlet and Exhaust)

| | |
|---|---|
| Valve Clearance (Cold) | 0.18 to 0.22 mm |
| Valve Recess Below Cylinder Head | 1.1 to 1.3 mm (1.6 mm Maximum) |
| Valve Seat Width | 2.1 mm |
| Valve Seat Angle | 45° |
| Valve Stem Diameter | 7.960 tp 7.975 mm |
| Valve Guide I.D | 8.015 to 8.030 mm |
| Clearance between Valve Stem and Valve Guide | 0.04 to 0.07 mm (0.1 mm Maximum) |
| Valve Timing | |
| Inlet Valve - Open | 20° before TDC |
| Inlet Valve - Closed | 45° after BDC |
| Exhaust Valve - Open | 50° before BDC |
| Exhaust Valve - Closed | 15° after TDC |

## Valve Springs

| | |
|---|---|
| Free Length | 41.7 to 42.2 mm (41.2 mm Minimum) |
| Setting Load/Setting Length | 117.4 N/35.12 mm |
| Valve Spring Tilt | 1.0 mm |

## Rocker Arm Assembly

| | |
|---|---|
| Clearance between Rocker Shaft and Rocker Arm | 0.018 to 0.070 mm (0.15 mm Maximum) |
| Rocker Arm Shaft O.D | 13.973 to 13.984 mm |
| Rocker Arm Bushings | 14.002 to 14.043 mm |
| Rocker Arm I.D Bushless Type | 14.002 to 14.043 mm |

## Camshaft

| | |
|---|---|
| Camshaft Lobe Height | |
| Inlet | 33.36 mm (33.31 mm Minimum) |
| Exhaust | 33.36 mm (33.31 mm Minimum) |
| Oil Clearance | 0.05 to 0.091 mm (0.15 mm Maximum) |
| Camshaft Journal O.D | 39.934 to 39.950 mm |
| Camshaft Bearing I.D | 40.00 to 40.025 mm |
| Camshaft Alignment | 0.05 mm (Maximum) |
| Gear Backlash | 0.042 to 0.115 mm (0.15 mm Maximum) |

## Piston and Piston Rings

Piston Bosses I.D.....23.00 to 23.013 mm (23.053 mm Maximum)
Piston Pin O.D.....23.002 to 23.011 mm
Clearance between Piston Pin and Small End Bushings.....0.014 to 0.038 mm (0.15 mm Maximum)
Piston Ring Gap
  Top Ring and Second Ring.....0.30 to 0.45 mm (1.25 mm Maximum)
  Oil Ring.....0.25 to 0.45 mm (1.25 mm Maximum)
Clearance between Second Ring and Ring Groove.....0.093 to 0.120 mm
Clearance between Oil Ring and Ring Groove.....0.020 to 0.052 mm
Oversizes of Pistons and Rings.....0.5 mm

## Connecting Rods

Connecting Rod Alignment.....0.2 mm (0.5 mm Maximum)
Connecting Rod Small End Bushing I.D.....23.025 to 23.040 mm

## Crankshaft

Crankshaft Alignment.....0.02 mm (0.08 mm Maximum)
Oil Clearance between Crankshaft Journal and Bearing 1.....0.040 to 0.118 mm (0.20 mm Maximum)
Oil Clearance between Crankshaft Journal and Bearings 2-3-4-5.....0.040 to 0.104 mm (0.20 mm Maximum)
Crankshaft Journals O.D.....51.921 to 51.940 mm
Crankshaft Bearings I.D.....51.980 to 52.025 mm
Oil Clearance between Crank Pin and Crank Pin Bearing.....0.035 to 0.093 mm (0.20 mm Maximum)
Crank Pin O.D.....43.959 to 43.975 mm
Crank Pin Bearings I.D.....44.010 to 44.052 mm
Undersizes of Crank Pin Bearings.....0.2 mm and 0.4 mm
End Play of Crankshaft.....0.15 to 0.31 mm (0.5 mm Maximum)
Oversizes of Crankshaft Side Metal 1.2.....0.2 mm to 0.4 mm

## Cylinder Liner

Cylinder Liner I.D.....85.0 to 85.022 mm (+ 0.15 mm Maximum)

## Engine Lubrication System

Engine Oil Pressure.....2.9 to 4.4 bar (42.7 to 64 psi)
Oil Pump
  Radial between Outer Rotor and Pump Body.....0.11 to 0.19 mm (0.25 mm Maximum)
  Rotor Lobe Clearance.....0.04 to 0.13 mm (0.20 mm Maximum)
End Clearance between Rotor and Cover.....0.105 to 0.150 mm (0.2 mm Maximum)

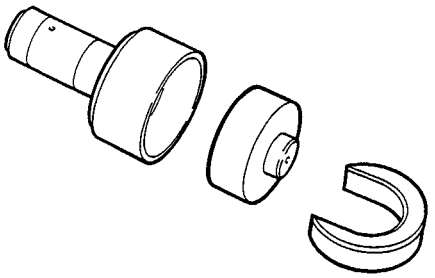
## Cooling System

Thermostat
  Opening Temperature.....80.5 to 83.5°C
  Completely Open.....95°C
Radiator Cap.....0.9 bar (12.8 psi)
Fan Belt Tension.....7 to 9 mm at 98 N

# SPECIAL TORQUES

| | | |
|---|---|---|
| Rocker Cover Nuts | 6.9 to 8.8 Nm | 5.1 to 6.5 lb ft |
| Rocker Assembly Retaining Nuts | 23.5 to 27.5 Nm | 17.4 to 20.3 lb ft |
| Cylinder Head Bolts | 93.2 to 98.1 Nm | 68.7 to 72.3 lb ft |
| Connecting Rod Cap Retaining Bolts (Non-Flange) | 36.3 to 41.2 Nm | 26.6 to 30.4 lb ft |
| Connecting Rod Cap Retaining Bolts (Flange Type) | 44.1 to 49 Nm | 32.5 to 36.2 lb ft |
| Bearing Case to Cylinder Block Bolts (Non-Flange Type) | 63.7 to 68,6 Nm | 47 to 50.6 lb ft |
| Bearing Case to Cylinder Block Bolts (Flange Type) | 68.6 to 73.5 Nm | 50.6 to 54.2 lb ft |
| Flywheel Bolts | 98.1 to 107.9 Nm | 72.3 to 79.6 lb ft |
| Bearing Case Bolts (With Washers) | 29.4 to 34.3 Nm | 21.7 to 25.3 lb ft |
| Bearing Case Bolts (Flange Type) | 36.3 to 41.2 Nm | 26.8 to 30.4 lb ft |

# SPECIAL TOOLS



**1. CRANKSHAFT SLEEVE INSTALLER**
**CAS 2255**

# SHOP EQUIPMENT TOOLS

*1. TORQUE WRENCH, OEM 6474 and OEM 7477*
*2. VALVE SPRING COMPRESSOR OEM 6414*
*3. PISTON RING EXPANDER OEM 6266*
*4. SPRING TESTER OEM 1282*
*5. PISTON RING COMPRESSOR OEM 6269*
*6. PULLER OEM 4212*
*7. COOLING SYSTEM PRESSURE TESTER OEM 1347*
*8. DEPTH MICROMETER CAS 10064-1M*
*9. MICROMETER (0 to 25 mm) OEM 10057M*
*10. MICROMETER (25 to 50 mm) OEM 10058M*
*11. SMALL HOLE GAUGE SET OEM 1023*
*12. DIAL GAUGE CAS 10066-1A and MAGNETIC BASE CAS 10149*
*13. TELESCOPING GAUGE OEM 1015, 1017, 1018, 1019*
*14. CYLINDER BORE GAUGE OEM 10340*

# CYLINDER HEAD

## Removal and Installation

### STEP 1

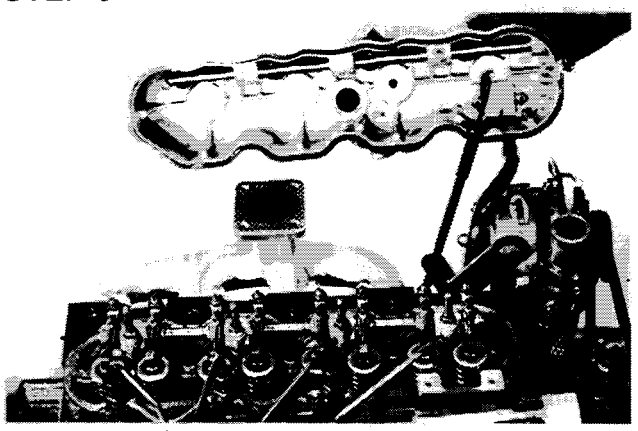
Remove the drain plug and drain the engine oil. Drain the coolant from the cylinder block.

### STEP 2

Remove the air filter assembly and muffler.

NOTE : *For Assembly, install the muffler gasket with the steel side facing the muffler.*

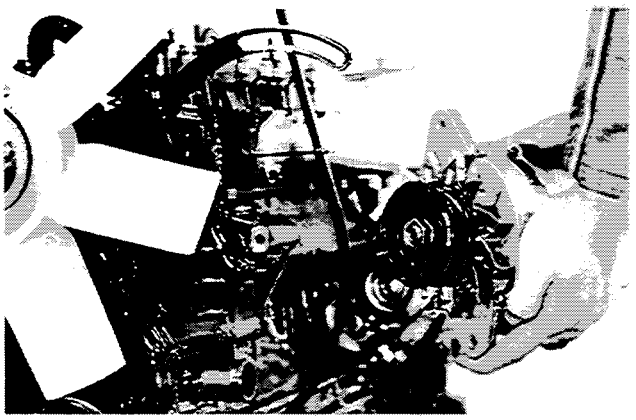
### STEP 3



Remove the rocker cover retaining nuts. Remove the rocker cover and discard the gasket. Disconnect, cap and remove the fuel injector tubes and the leak off hose.

NOTE : *For Installation, tighten the rocker cover nuts to a torque of 6.9 to 8.8 Nm (5.1 to 6.5 lb ft).*

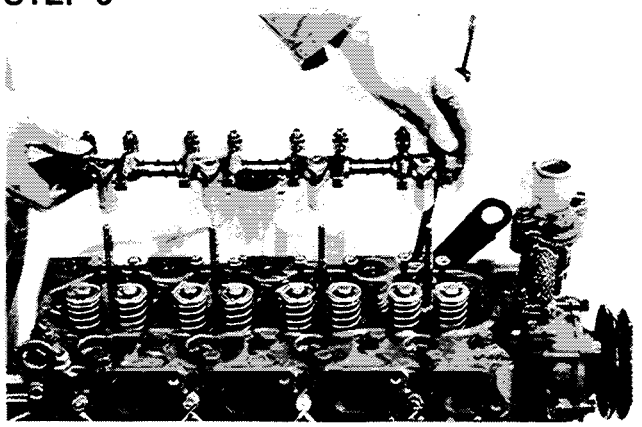
### STEP 4



Remove the alternator and fan belt.

NOTE : *For Installation, tighten the fan belt to a tension of 7 to 9 mm at 6 to 7 KgF.*

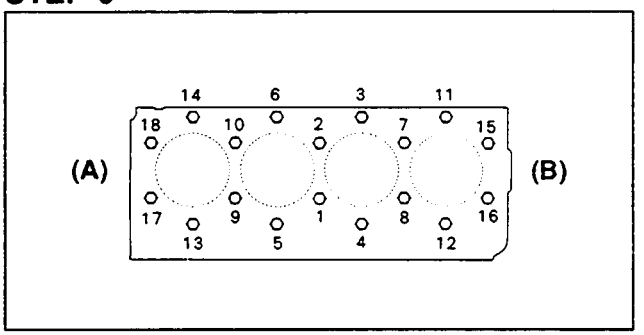
### STEP 5



Remove the rocker assembly retaining nuts and remove the rocker assembly. Remove the push rods.

NOTE : *For Installation, tighten the retaining nuts to a torque of 23.5 to 27.5 Nm (17.4 to 20.3 lb ft).*
*Insert the push rods into the tappets securely.*

### STEP 6



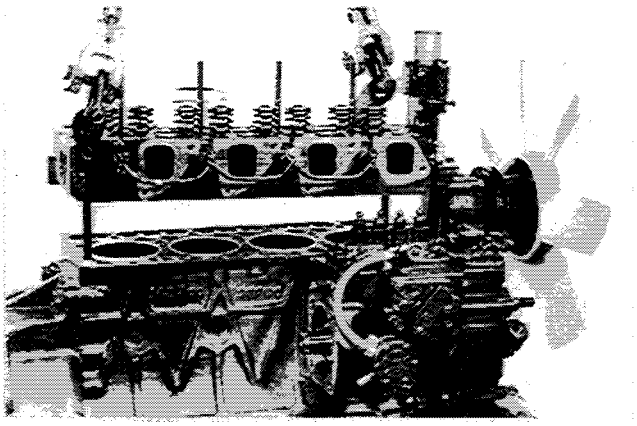

(A) Gear Case (B) Flywheel

Disconnect and cap the coolant hose from the cylinder head. Remove the cylinder head retaining bolts (18 to 1).

NOTE : *For Installation, apply engine oil to each bolt and tighten the cylinder head bolts in sequence to a torque of 93.2 to 98.1 Nm (68.7 to 72.3 lb ft).*

NOTE : *Re-tighten the cylinder head bolts after 30 minutes running.*

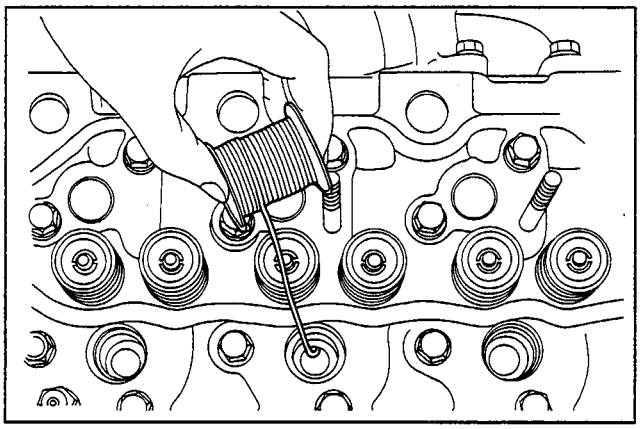
STEP 7



Remove the cylinder head. Remove and discard the cylinder head gasket, shim and O-ring.

**NOTE :** *For Installation, install a new head gasket and O-ring.*

## Checking Top Clearance

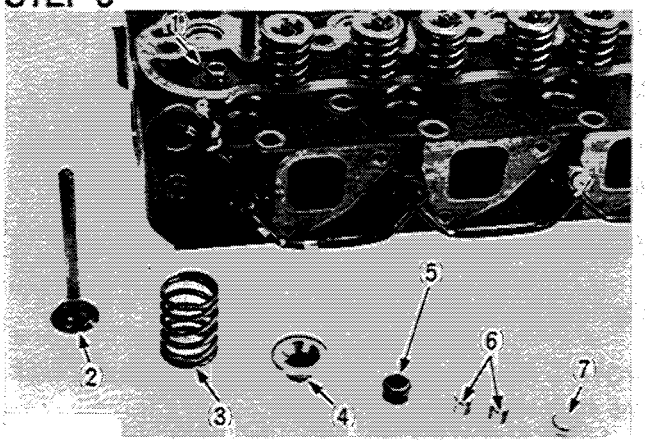


**NOTE :** *On Installation of the cylinder head, remove a injector nozzle holder and carefully insert a fuse wire. Be carefull not to let the fuse wire touch the valves. Rotate the engine by hand one full revolution. Remove the fuse wire and measure where the fuse wire is crushed.*
*This measurement must be 0.7 to 0.9 mm. If the measurement is not within the reference value, adjust by inserting a shim between the cylinder head and the gasket.*

**NOTE :** *For Assembly, follow the same procedure in reverse order.*

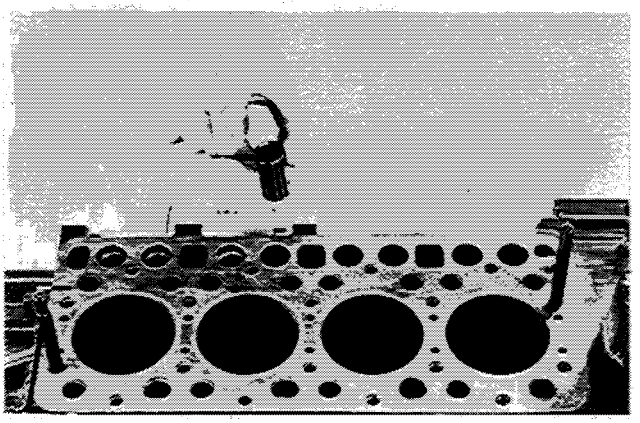
# Disassembly and Assembly

STEP 8




Remove the valve cap (7), use a valve spring compressor to compress the valve spring and remove the collets (6). Remove the valve spring compressor and remove the retainer (4), spring (3) and seal (5), discard the seal (5).

STEP 9

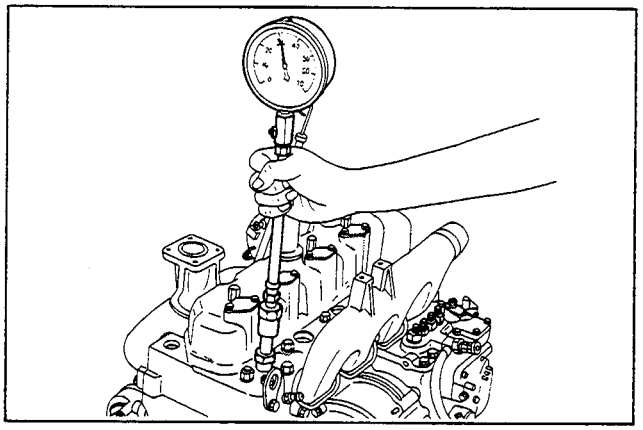


Remove the tappets from the cylinder block.

**NOTE :** *For Assembly, follow the same procedure in reverse order.*

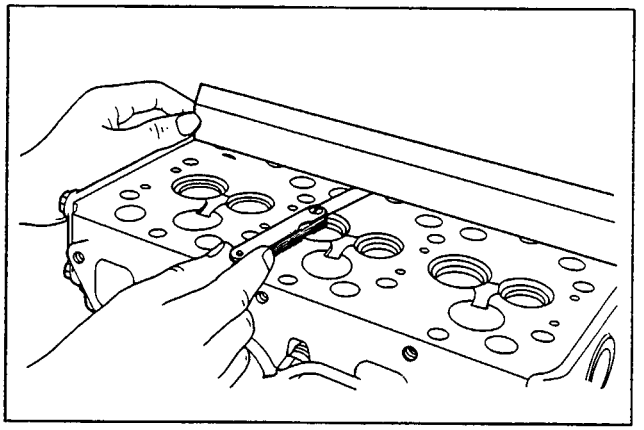
# Inspection and Adjustments

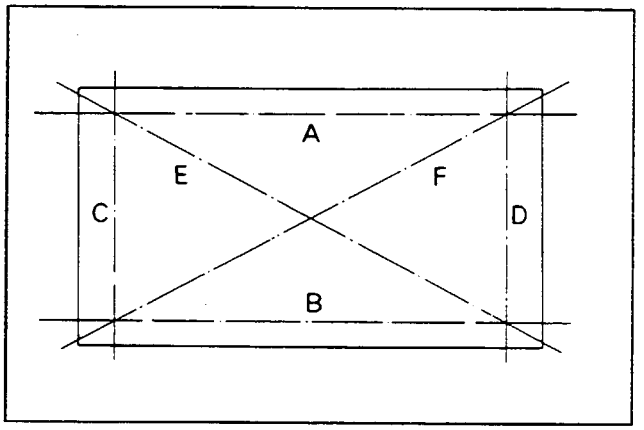
## STEP 1



Warm the engine to working temperature. Stop the engine and remove the air cleaner, exhaust muffler and fuel injectors. Install a compression tester into the cylinder head. Set the speed control lever in the stop position, turn the engine over at 200 to 300 rpm using the starter motor for 5 to 10 seconds. Make a note of the maximum pressure. Measure each cylinder at least three times. The compression pressure must be between 29 to 32 bar (427 to 469 psi). The pressure must not be below 22 to 24 bar (320 to 352 psi), and the difference in compression pressure among cylinders should be less that 10%.

## STEP 2



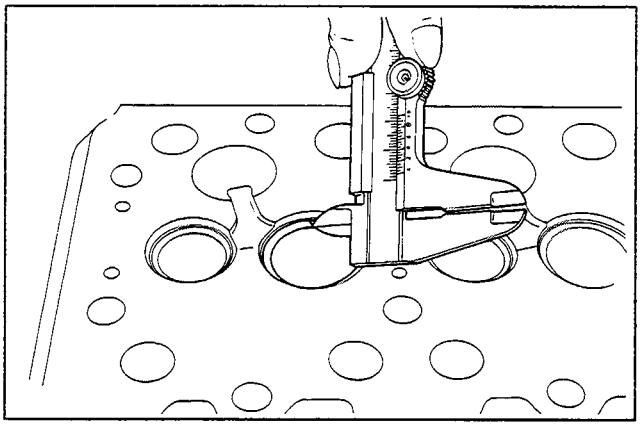


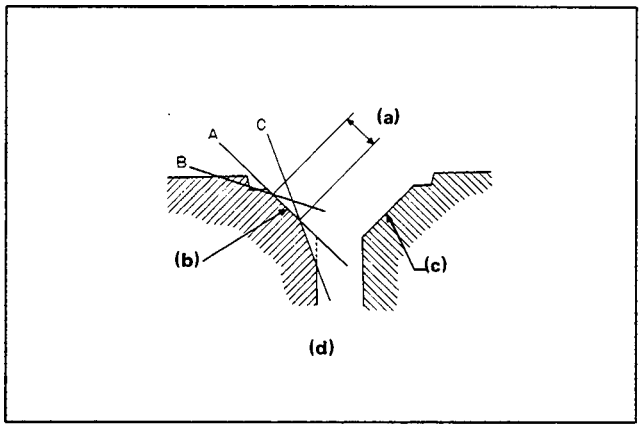

Thoroughly clean the surface of the cylinder head. Check the cylinder surface for warpage using a straight edge and feeler gauge in the positions shown.

**NOTE** : *If the measurement is more than 0.05 mm per 100 mm, the cylinder head must be machined or replaced.*

**IMPORTANT** : *If the cylinder head has been machined, refer to STEPS 3 and 4 to check the valve recess.*

## STEP 3



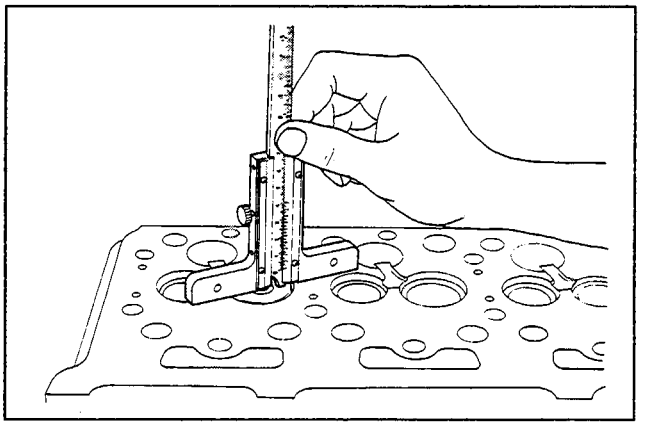



**(A)** How to repair the valve seat
**(a)** Valve contacting width
**(b)** Corrected surface of valve seat
**(c)** Uncorrected surface of valve seat
**(d)** A-45° cutter
B-15° cutter
C-65° or 75° cutter

Clean the valve seat surface. Measure the width of the seat using a set of vernier calipers. The seat width must be 2.1 mm.
To correct the demensions of the valve seat using a valve seat cutter, follow the steps.

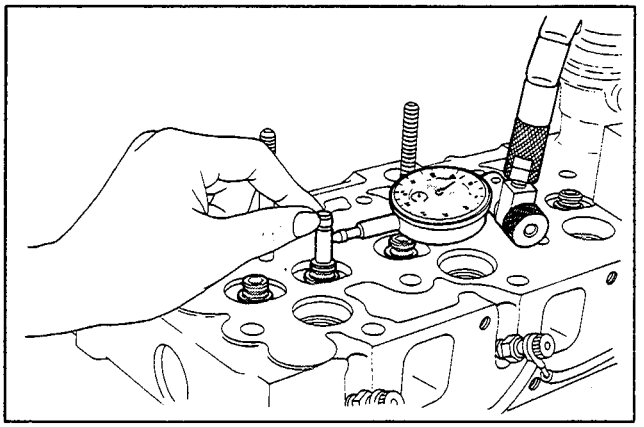
1) Use a cutter suitable for the valve guide and the valve seat. (45° dia. 0.3150)
2) Grind off the front surface of the valve seat by 15°, since the seat surface becomes wider than before.
3) Grind off the rear surface of the seat using 65° or 75° cutter to finish the seat 0.0827 inches wide.
4) Reface the valve.

## STEP 4



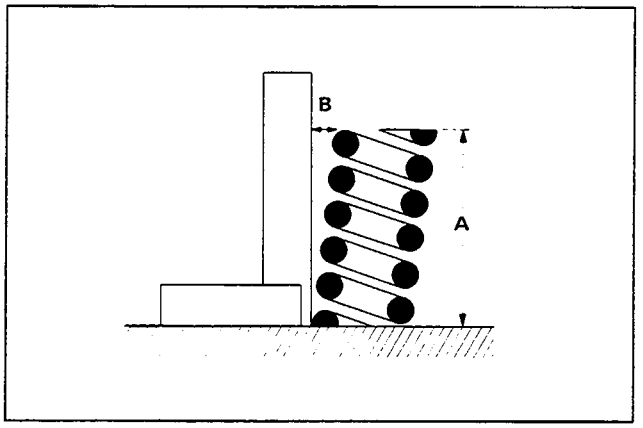
Install the valve into the cylinder head, and using a depth micrometer measure the distance between the surface of the valve and cylinder head. If the measurement is not within specification, replace the valve. If the measurement is still greater than specification, check the valve seat face and correct if necessary.
Valve recess : 0.05 to 0.15 mm (0.4 mm maximum).

## STEP 5



Remove the carbon from the valve guide. Install the valve into the valve guide, and using a dial gauge measure the side to side movement, if the measurement exceeds the allowable limit, replace the stem guide and valve.
Reference Value : 0.04 to 0.07 mm
Allowable Limit : 0.10 mm

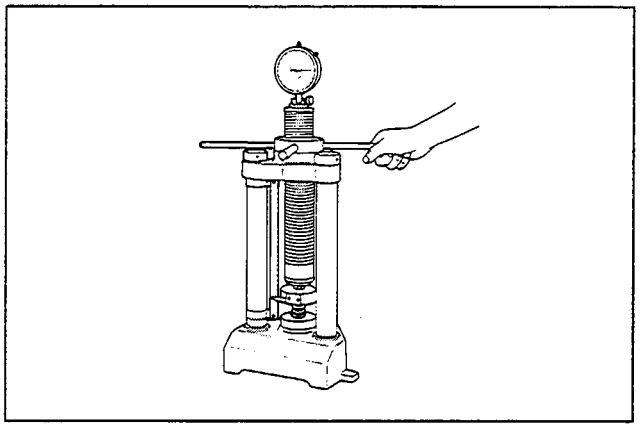
## STEP 6




Measure the free length of the valve spring dimension "A".
Reference Value : 41.7 to 42.2 mm
Allowable Limit : 41.2 mm

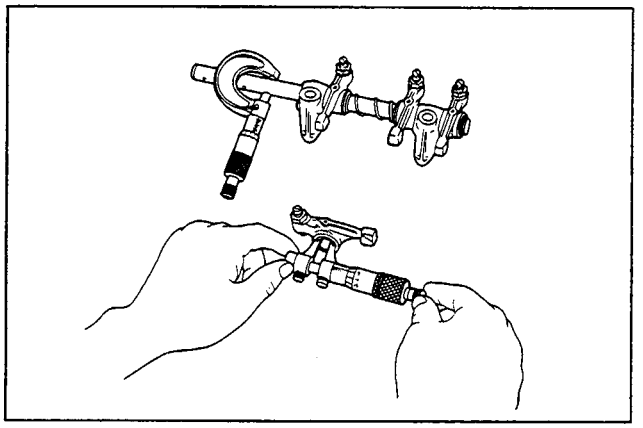
Put a set square against the valve spring and measure dimension "B".
Allowable Limit : 1.0 mm

## STEP 7



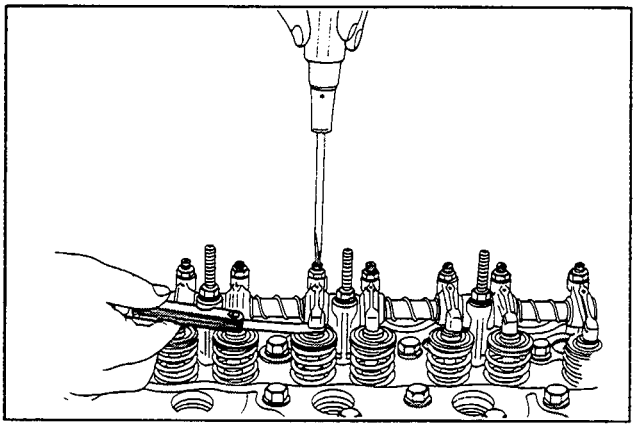
Install the valve spring into a tester and compress to a length of 35.15 mm. Measure the force required to compress the spring.
Reference Value : 117.7 N
Allowable Limit : 100 N

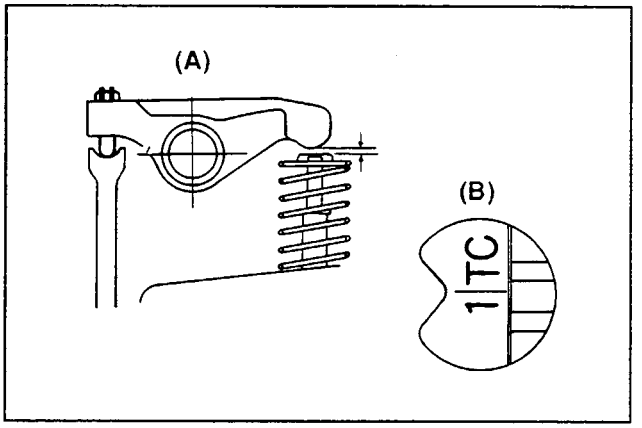
## STEP 8



Measure the ID of the rocker arm and the OD of the rocker shaft, and calculate the oil clearance.
Reference Value : 0.018 to 0.070 mm
Allowable Limit : 0.15 mm
Rocker Arm ID : 13.973 to 13.984 mm
Rocker Shaft OD : 14.002 to 14.043 mm

## STEP 9






**(A)** Valve clearance **(B)** Timing window

With the engine cold remove the rocker cover and discard the gasket. Turn the engine over until the 1 TC or 1.4 TC mark is aligned with the projection in the timing window and No.1 piston is at T.D.C. on the compression stroke.


Suggest:

If the above button click is invalid.

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first, and then click the above link

to download the complete manual.

Thank you so much for reading

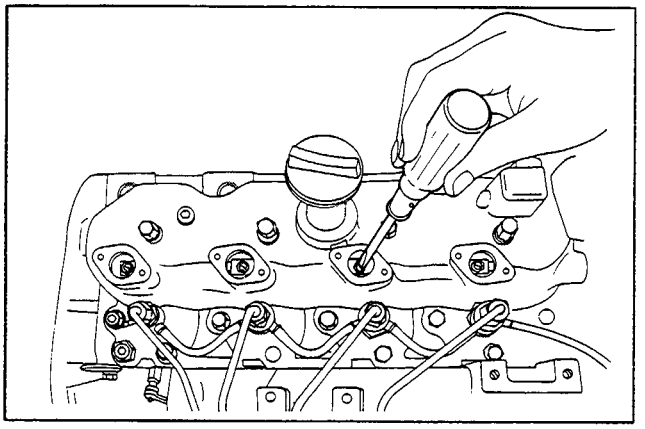
| Cylinder No. | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Intake Valve | ● | ● | | |
| Exhaust Valve | ● | | ● | |

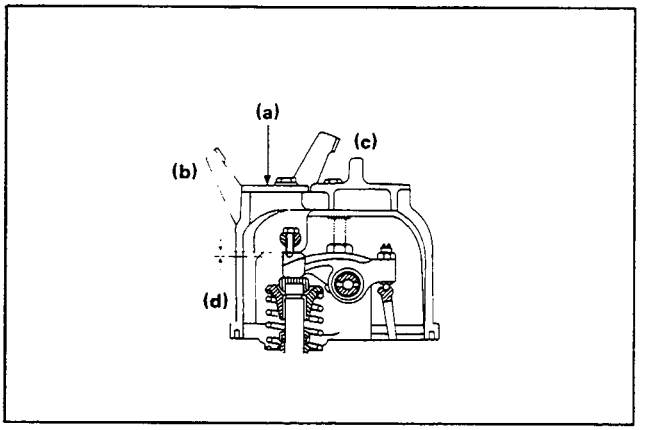
Check the valve clearances shown in the table above. The valve clearance must be 0.18 to 0.22 mm, adjust if necessary.
Turn the engine through 360°.

| Cylinder No. | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Intake Valve | | | ● | ● |
| Exhaust Valve | | ● | | ● |

Check the valve clearances shown in the table above. The valve clearance must be 0.18 to 0.22 mm, adjust if necessary.
Install the rocker cover with a new gasket and tighten the retaining nuts to a torque of 6.9 to 8.8 Nm (5.1 to 6.5 lb ft).

## STEP 10






**(a)** Compression release window cover
**(b)** Compression position
**(c)** Compression release position
**(d)** 0.750 to 1.125 mm

Remove the decompression adjustment covers from the rocker cover. Turn the engine until the valve to be checked is completely closed. Put the decompression lever in the compression position. Adjust the valve clearance to zero by means of the decompression adjusting bolt, then turn the adjusting bolt in by 1 to 1-1/2 turns and tighten the lock nut. Repeat the procedure for the remaining valves then install the adjustment covers.

**NOTE** : *After adjustment, turn the crankshaft by hand and check to see that the valve and the piston should not be in contact with each other because the depression clearance is too small.*
*Reference value : 0.750 to 1.125 mm.*