CASE

PROFESSIONAL PARTNER

SERVICE MANUAL

4JG1 ISUZU ENGINE

9-93710 NA

Issued 04-2005

MAIN DATA AND SPECIFICATIONS

Note:

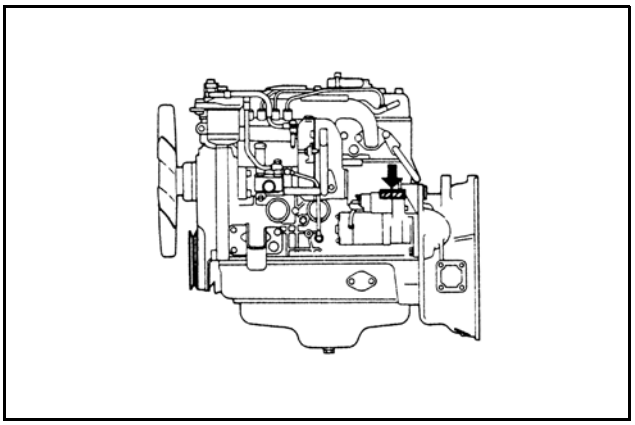
1. These specifications are based on the standard engine.
2. Specifications for items marked with an asterisk (*) will vary according to the type of equipment on which the engine is installed.

If you are unable to locate the data applicable to these specifications, please contact Isuzu Motors LTD through your machine supplier.

Item	Engine Model 4JB1
Engine type	Water cooled, four-cycle, in-line, overhead valve
Combustion chamber type	Direct injection
Cylinder liner type	Dry
No. of cylinders - bore x stroke mm (in)	4 - 95.4 x 107
Total piston displacement cm^3 (cid)	3.059 (186.7)
Compression ratio	18.6
* Engine dimensions mm (in)	739 x 625 x 746
Length x width x height	(29.1 x 24.6 x 29.4)
* Engine weight (Dry) kg (lb)	248 (547)
Fuel injection order	1 - 3 - 4 - 2
Fuel injection timing (B.T.D.C) degreas	16
Specified fuel	Diesel fuel
Injection pump	In-line plunger, Bosch A type
Governor	Variable speed mechanical type
Low idle speed (rpm)	850-1000
Injection nozzle	Multi-hole type
Injection starting pressure MPa (kg/cm^2 /psi)	18.1 (185/2630)
Fuel filter type	Cartridge paper element
Water sediment decanter (if so equipped)	Sediment water level indicating type
Compression pressure MPa (kg/cm^2 /psi)	3.04 (31/441)
Valve clearances (When cold)	
Intake mm (in)	0.40 (0.0157)
Exhaust mm (in)	0.40 (0.0157)
Lubrication method	Pressurized circulation
Oil pump	Trachoid type
Main oil filter type	Cartridge paper element, full flow
Partial oil filler	Not equipped
* Lubricating oil volume lit. (qts)	7.6-9.6 (oil pan)
Oil cooler (if so equipped)	Water cooled built in oil filter
Cooling method	Pressurized forced circulation
Coolant volume (engine only) lit. (qts)	5.0 (5.3)
Water pump	Belt driven impeller type
Thermostat type	Wax pellet type
* Generator V-A	12-50
* Starter V-KW	12-2.2

IDENTIFICATION

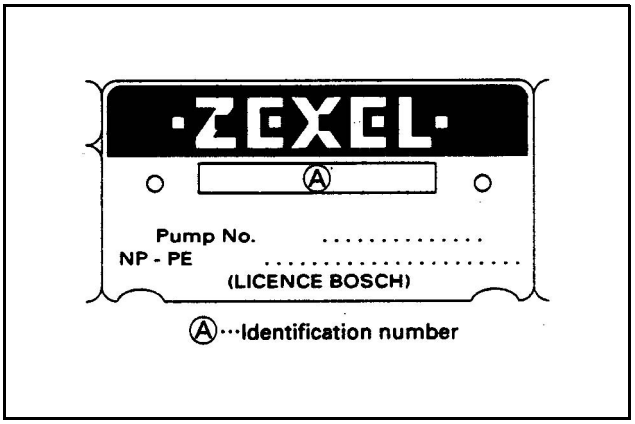
Servicing refers to general maintenance procedures to be performed by qualified service personnel. Maintenance interval such as fuel or oil filter changes should be refered to “INSTRUCTION MANUAL”.



MODEL IDENTIFICATION

Engine Serial Number

The engine number is stamped on the rear left-hand side of the cylinder body.



INJECTION PUMP IDENTIFICATION

Injection Pump Number

Injection volume should be adjusted after referring to the adjustment data applicable to the injection pump installed.

The injection pump identification number (A) is stamped on the injection pump identification plate.

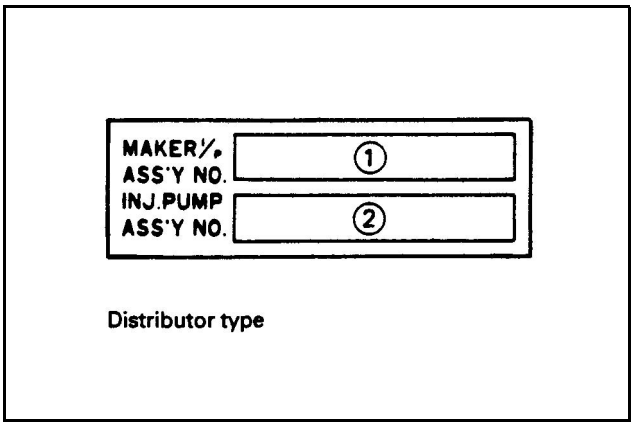
Note:

Always check the identification number before beginning a service operation.

Applicable service data will vary according to the identification number. Use of the wrong service data will result in reduced engine performance and engine damage.

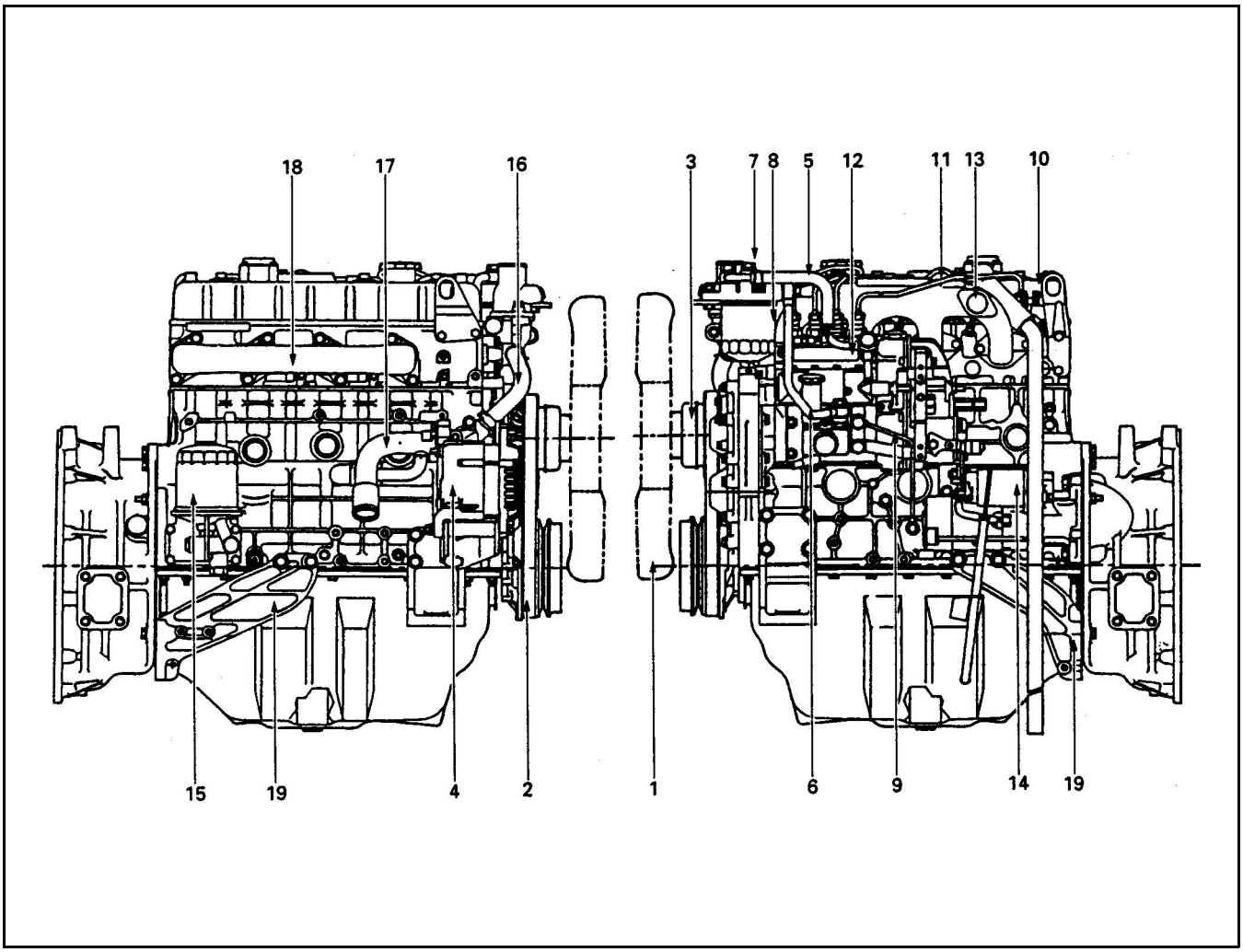
(1) ZEXEL (Manufacturer of the injection pump) identification number

(2) ISUZU parts number



EXTERNAL PARTS DISASSEMBLY STEPS

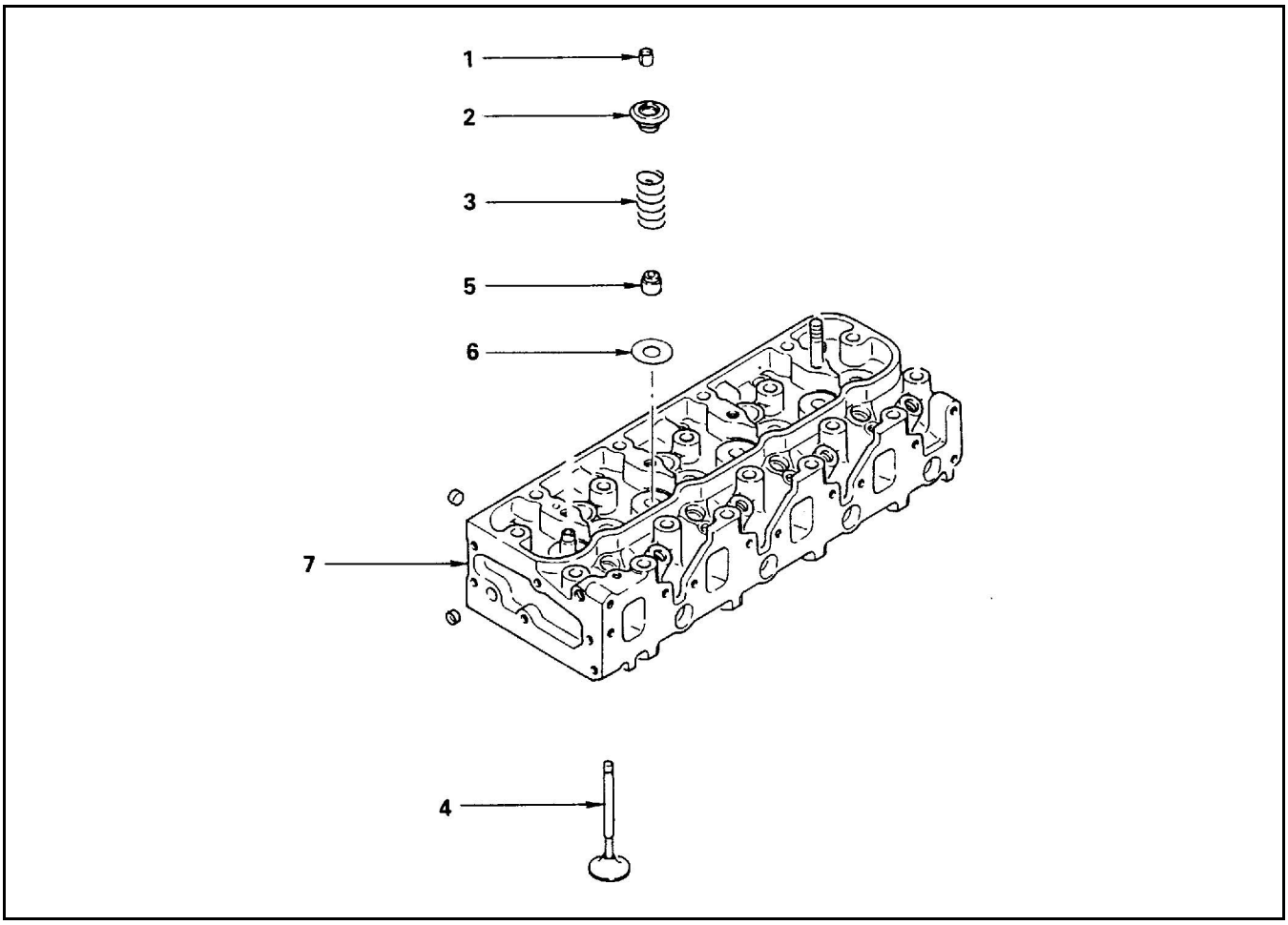
MODEL 4JG1



Disassembly Steps

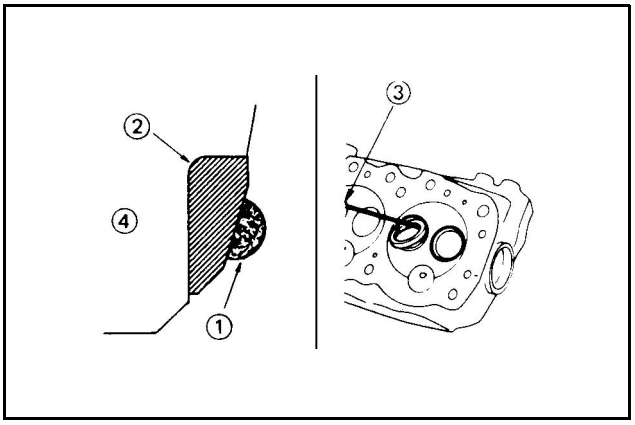
1. Cooling fan and spacer
2. Cooling fan drive belt
3. Cooling fan drive pulley
4. Generator and adjusting plate
5. Fuel pipe (Fuel filter to injection pump)
6. Fuel pipe (Fuel filter to feed pump)
7. Fuel pipe (fuel filter leak off)
8. Fuel filter
9. Oil pipe (injection pump to cylinder body)
10. Fuel leak off pipe
- ▲11. Fuel injection pipe with clip
- ▲12. Injection pump
13. Intake manifold
14. Starter
15. Oil filter
16. Cooling water rubber hose
17. Cooling water intake pipe
- ▲18. Exhaust manifold
19. Stiffner (RH & LH)

CYLINDER HEAD DISASSEMBLY STEPS



Disassembly steps

- ▲**1.** Split collar
- **2.** Valve spring upper seat
- **3.** Valve spring
- ▲**4.** Intake and exhaust valves
- **5.** Valve stem oil seal
- **6.** Valve spring lower washer
- **7.** Cylinder head



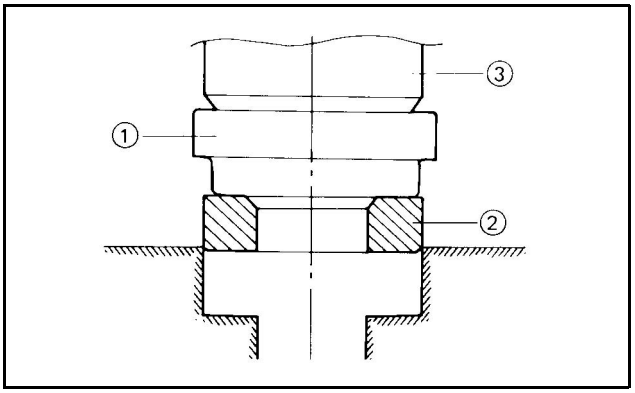
Valve seat insert replacement

Valve seat insert removal

1. Arc weld the entire inside circumference (1) of the valve seat insert (2).
2. Allow the valve seat insert to cool for a few minutes.

   This will cause contraction and make removal of the valve seat insert easier.
3. Use a screwdriver (3) to pry the valve seat insert free.

   Take care not to damage the cylinder head (4).
4. Carefully remove carbon and other foreign material from the cylinder head insert bore.



Valve seat installation

1. Carefully place the driver (1) (having the smaller outside diameter than the valve seat insert) on the valve seat insert (2).

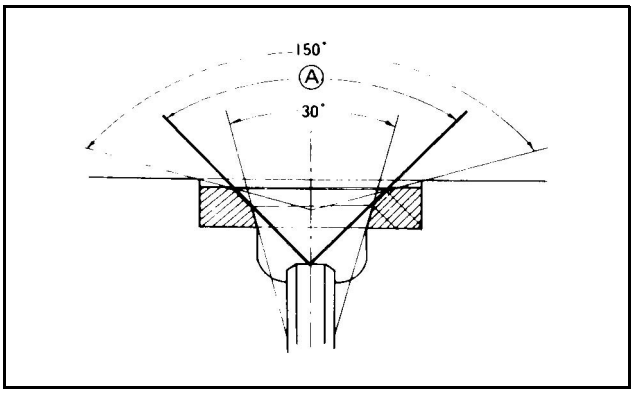
Note:

The smooth side of the driver must contact the valve seat insert.

2. Use a bench press (3) to slowly apply pressure to the driver and press the valve seat insert into place.

Note:

Do not apply an excessive amount of pressure with the bench press. Damage to the valve seat insert will result.



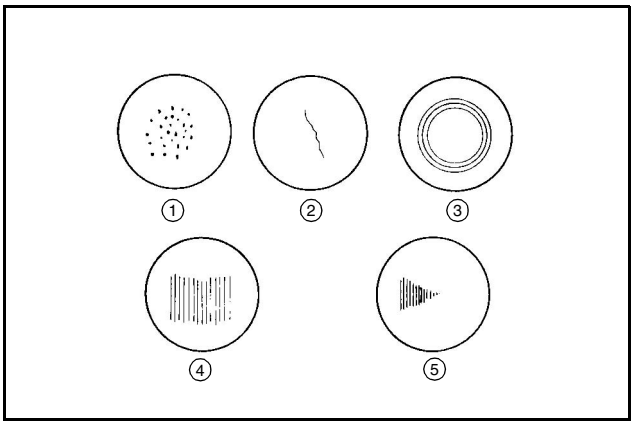
Valve seat insert rectification

1. Remove the carbon deposits from the valve seat insert surface.
2. Use a valve cutter (15°, 30° or 75° blades) to remove scratches and other rough areas.

   This will bring the contact width back to the standard value of 90° (A).

   Remove only the scratches and rough areas. Do not cut away too much. Take care not to cut away unblemished areas of the valve seat surfaces.

TAPPET AND PUSH ROD



Inspect the tappet camshaft contact surfaces for excessive wear, damage and any abnormalities

(1) Pitted

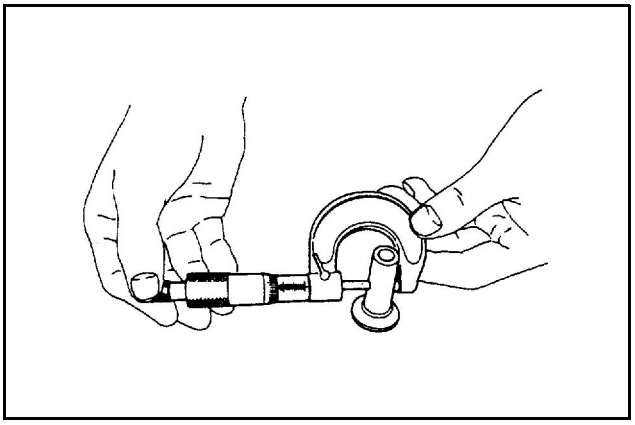
(2) Crack

(3) Normal contact

(4) Irregular contact

(5) Irregular contact

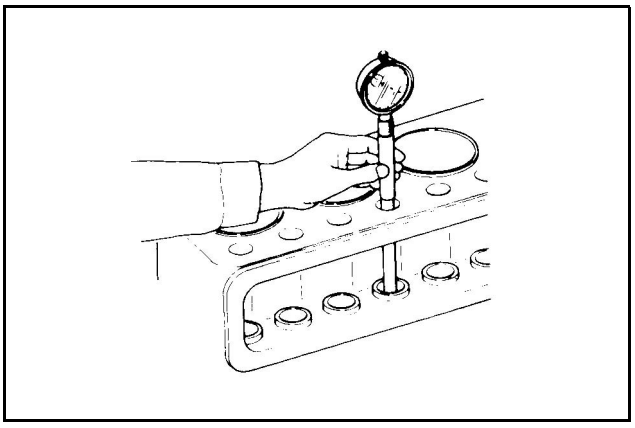
Note:
The tappet surfaces are spherical. Do not attempt to grind them with an oil stone or similar tool in an effort to repair the tappet. If the tappet is damaged, it must be replaced



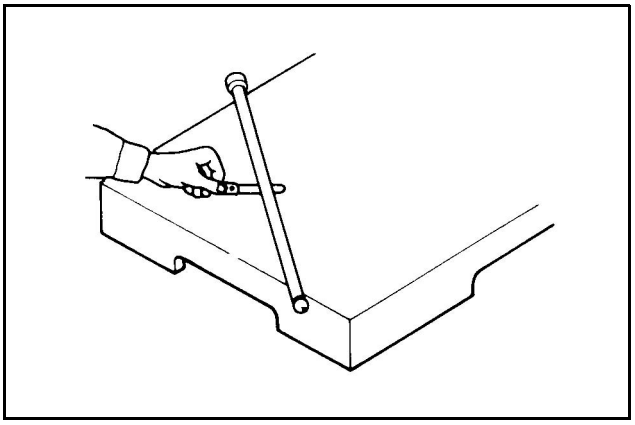
Use a micrometer to measure the tappet diameter

If the measured value is less than the specified limit, the tappet must be replaced.

Tappet outside diameter:
Standard: 12.97 - 12.99 mm (0.510 - 0.511 in)
Limit: 12.95 mm (0.509 in)



Tappet and cylinder body clearance
Standard: 0.03 mm (0.0012 in)
Limit: 0.1 mm (0.0039 in)



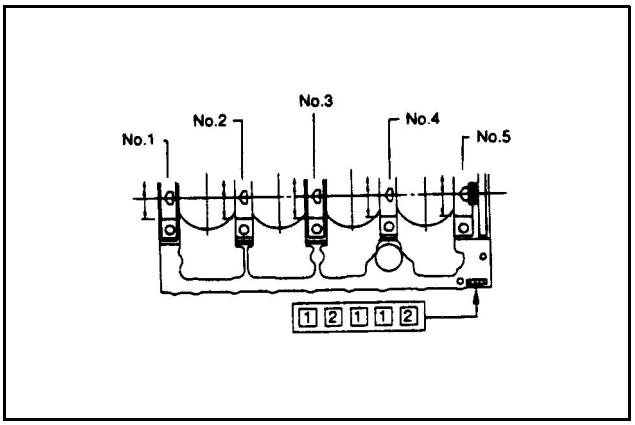
Push rod curvature

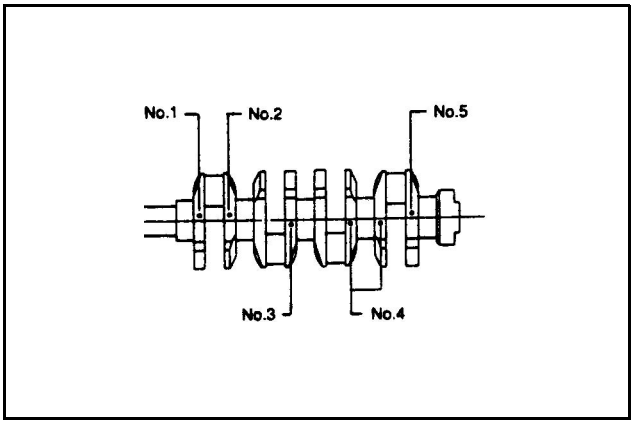
1. Lay the push rod on a surface plate.
2. Roll the push rod along the surface plate and measure the push rod curvature with a thickness gauge.

   If the measured value exceeds the specified limit, the push rod must be replaced.

   Push rod curvature:
   Limit: 0.3 mm (0.012 in)
3. Visually inspect both ends of the push rod for excessive wear and damage. The push rod must be replaced if these conditions are discovered during inspection.

CRANKSHAFT BEARING SELECTION

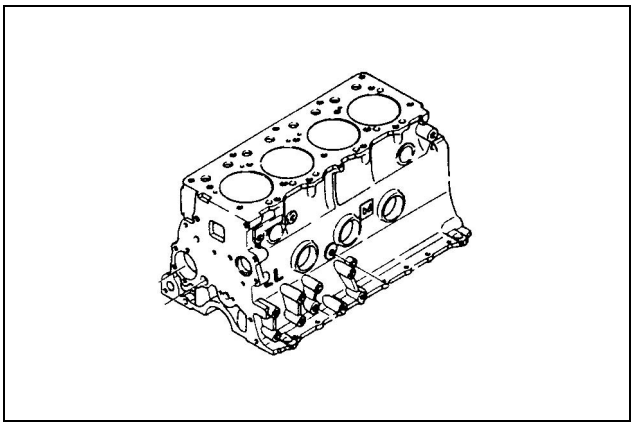




When installing new crankshaft bearings or replacing old bearings, refer to selection table below.

Select and install the new crankshaft bearings, paying close attention to the cylinder body journal hole diameter size mark and the crankshaft journal diameter size mark.

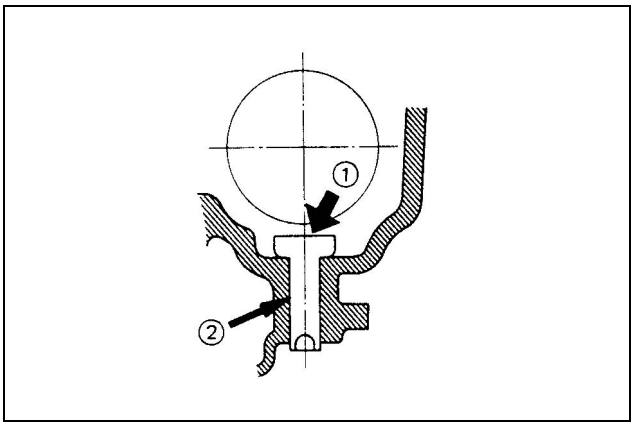
Main bearing Bore diameter mm (in)		Crankshaft Main journal diameter mm (in)		Crankshaft bearing size mark	Oil clearance mm (in)
Size mark	Inside diameter	Size mark	Outside diameter		
1	73.987 - 74.000 (2.9129 - 2.9134)	1 or -	69.927 - 69.932 (2.7530 - 2.7532)	Black	0.035 - 0.061 (0.0014 - 0.0024)
		2 or --	69.922 - 69.927 (2.7528 - 2.7530)	Blue	0.032 - 0.058 (0.0013 - 0.0023)
		3 or ---	69.917 - 69.922 (2.7526 - 2.7528)		0.037 - 0.063 (0.0015 - 0.0025)
2	73.975 - 73.987 (2.9124 - 2.9129)	1 or -	69.927 - 69.932 (2.7530 - 2.7532)	Green	0.031 - 0.056 (0.0012 - 0.0022)
		2 or --	69.922 - 69.927 (2.7528 - 2.7530)		0.036 - 0.048 (0.0014 - 0.0019)
		3 or ---	69.917 - 69.922 (2.7526 - 2.7528)	Black	0.033 - 0.058 (0.0013 - 0.0023)



Important operations

1. Cylinder block

Use compressed air to thoroughly clean the inside and outside surfaces of the cylinder block, the oil holes, and the water jackets.

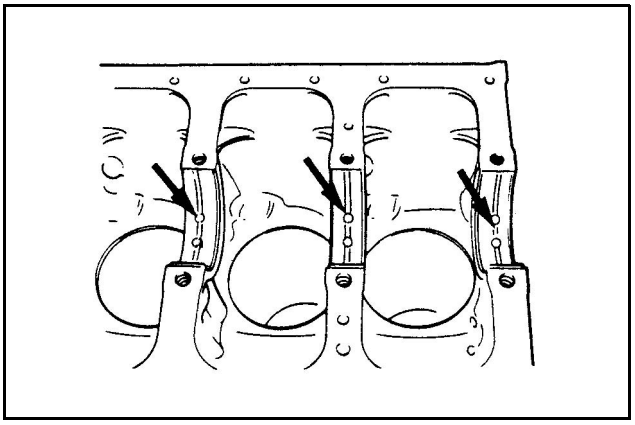


2. Tappet

1. Apply a coat of engine oil to the tappet (1) and the cylinder block tappet insert holes (2).
2. Locate the position mark applied at disassembly (if the tappet is to be reused).

Note:

The tappet must be installed before the camshaft.



3. Crankshaft upper bearing

The crankshaft upper bearings have an oil hole and an oil groove. The lower bearings do not.

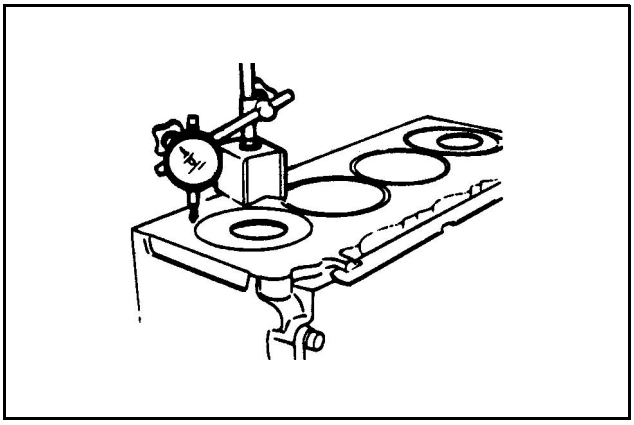
1. Carefully wipe any foreign material from the crankshaft upper bearing and the crankshaft upper bearing fitting surfaces.
2. Locate the position mark applied at disassembly if the removed crankshaft upper bearings are to be reused.

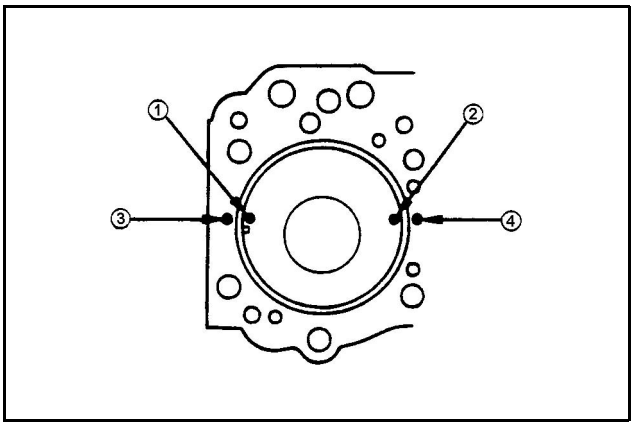
4. Crankshaft

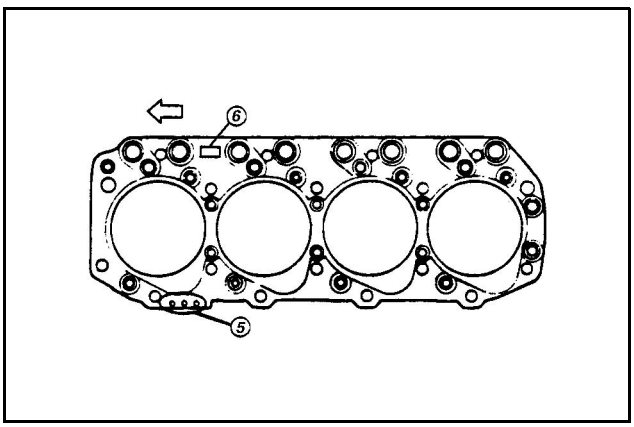
Apply an ample coat of engine oil to the crankshaft journals and the crankshaft bearing surfaces before installing the crankshaft.

Note:

Do not apply engine oil to the bearing back faces and the cylinder block bearing fitting surfaces.







8. Cylinder head gasket

1. Carefully remove carbon deposits and gasket residue from the piston top face and the cylinder body upper face.

2. Use a dial indicator to measure the piston head projection at measuring points (1) and (3) on the piston head and measuring points (2) and (4) on the cylinder body.

   Do this for each cylinder.

3. Note the highest measured value.

   This will determine the cylinder head gasket thickness.

   Piston head projection
   0.758 - 0.913 mm (0.0298 - 0.0359 in)

Piston head projection must be within the range shown in the above table.

4. Select a cylinder head gasket of the appropriate thickness.

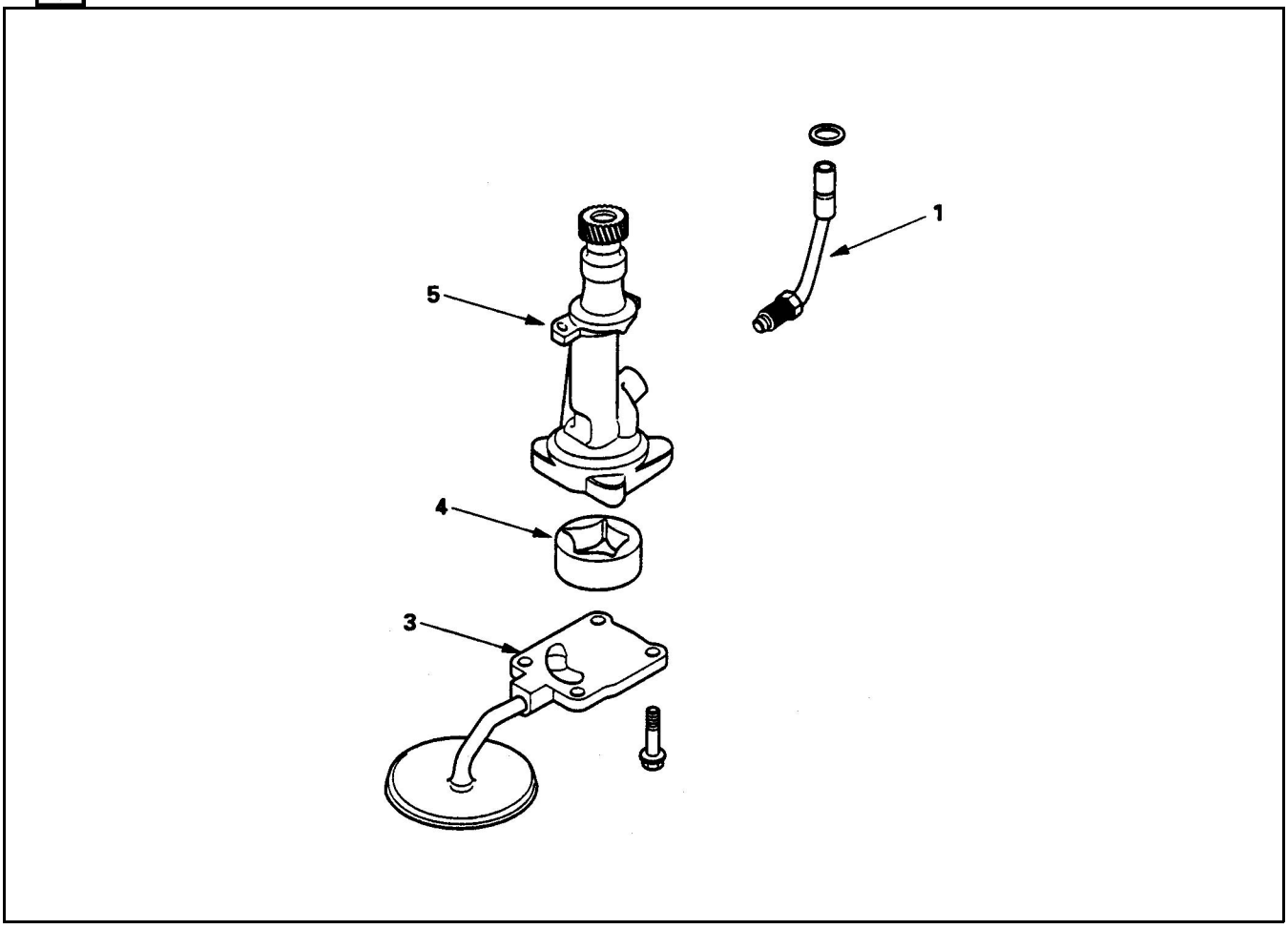
   The difference between the highest measured piston head projection and the lowest measured piston head projection must not exceed mm (in):

Grade Mark (5)		Average piston projection	Gasket thickness (reference)
A	°	0.758 - 0.812 mm (0.0298 - 0.0319 in)	1.60
B	° °	0.813 - 0.858 mm (0.0320 - 0.0337 in)	1.65
C	° ° °	0.859 - 0.914 mm (0.0338 - 0.0359 in)	1.70

5. The cylinder gasket "TOP" mark (6) must be facing up.

OIL PUMP

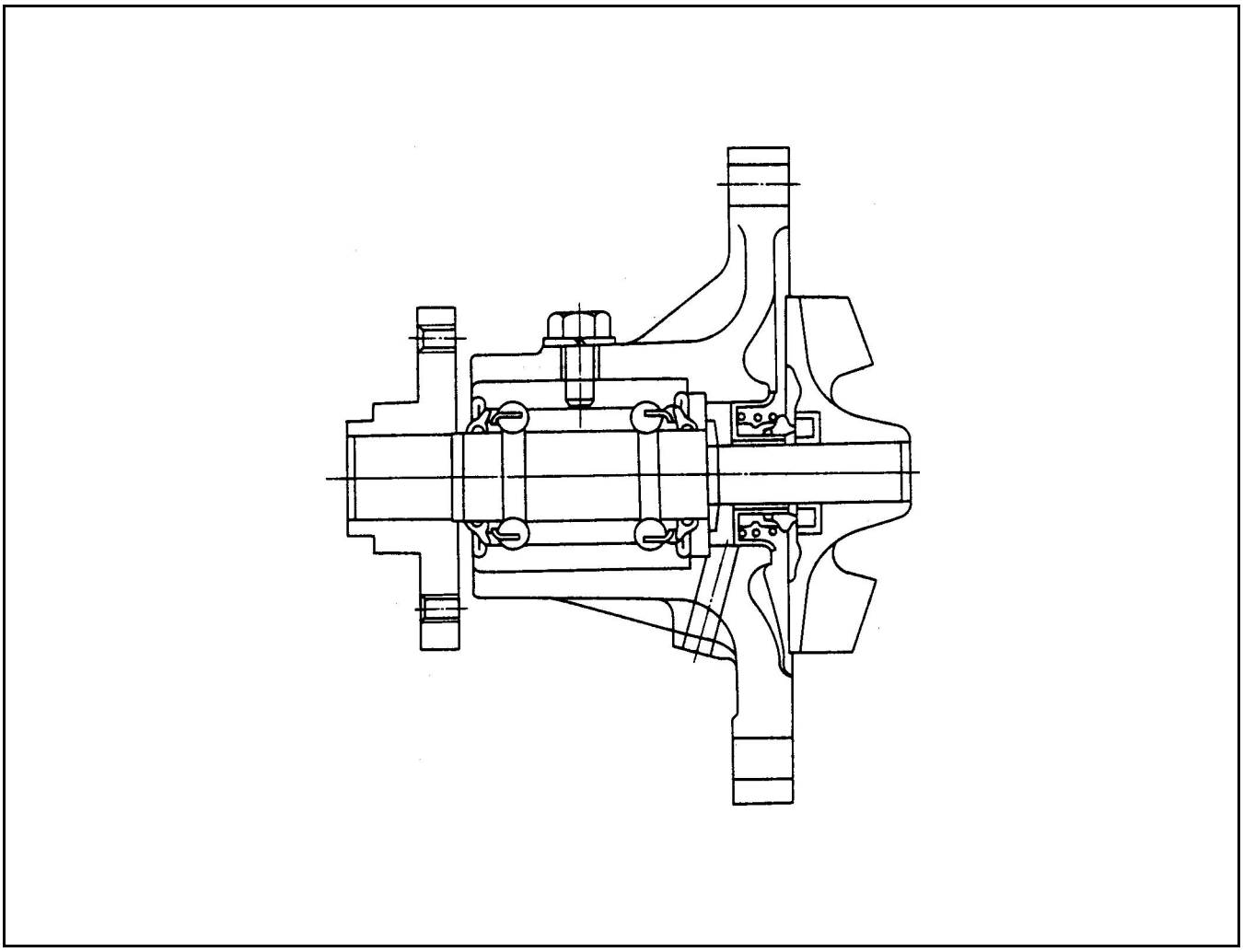
DISASSEMBLY



Disassembly Steps

1. Oil pipe
2. Strainer case
3. Pump cover
4. Vane
5. ▲ Pump body with rotor and pinion

WATER PUMP



A centrifugal type water pump forcefully circulates the coolant through the cooling system.

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EXCESSIVE FUEL CONSUMPTION

CHECK POINT		TROUBLE CAUSE		REMEDY
Fuel system	NG	Fuel leakage	NG	Repair or replace the fuel system related parts
OK				
Air cleaner	NG	Clogged air cleaner element	NG	Clean or replace the air cleaner element
OK				
Idling speed	NG	Poorly adjusted idle speed	NG	Adjust the idle speed
OK				
Injection nozzle	NG	Injection nozzle injection starting pressure too low Incorrect spray pattern	NG	Adjust or replace the injection nozzle
OK				
Fuel injection timing	NG	Fuel injection timing improperly adjusted	NG	Adjust the fuel injection timing
OK				
Injection pump	NG	Defective delivery valve resulting in fuel dripping after fuel injection	NG	Replace the delivery valve
OK				
Turbocharger	NG	Air leakage from the turbocharger intake side	NG	Repair the turbocharger intake side
	NG	Defective turbocharger assembly	NG	Replace the turbocharger assembly
OK				
Valve clearance	NG	Valve clearance improperly adjusted	NG	Adjust the valve clearance
OK				
Compression pressure	NG	Blown out cylinder head gasket Worn cylinder liner Piston ring sticking or broken Improper seating between the valve and the valve seat	NG	Replace the related parts
OK				
Valve spring	NG	Valve spring weak or broken	NG	Replace the valve spring

SPECIAL TOOL LIST

This section will be distributed a later date.