ISUZU

WORKSHOP MANUAL INDUSTRIAL DIESEL ENGINE AA-4BG1T, AA-6BG1 BB-4BG1T, BB-6BG1T MODELS

FOREWORD

This Workshop Manual is designed to help you perform necessary maintenance, service, and repair procedures on applicable Isuzu industrial engines.

Information contained in this Workshop Manual is the latest available at the time of publication.

Isuzu reserves the right to make changes at any time without prior notice.

The Table of Contents at the right hand side of this page shows you the general arrangement of the material in this Workshop Manual. A more detailed Table of Contents precedes each individual section.

The black spot at the right hand side of some pages indicates the first page of a given section.

This Workshop Manual is applicable to 1999 and later models.

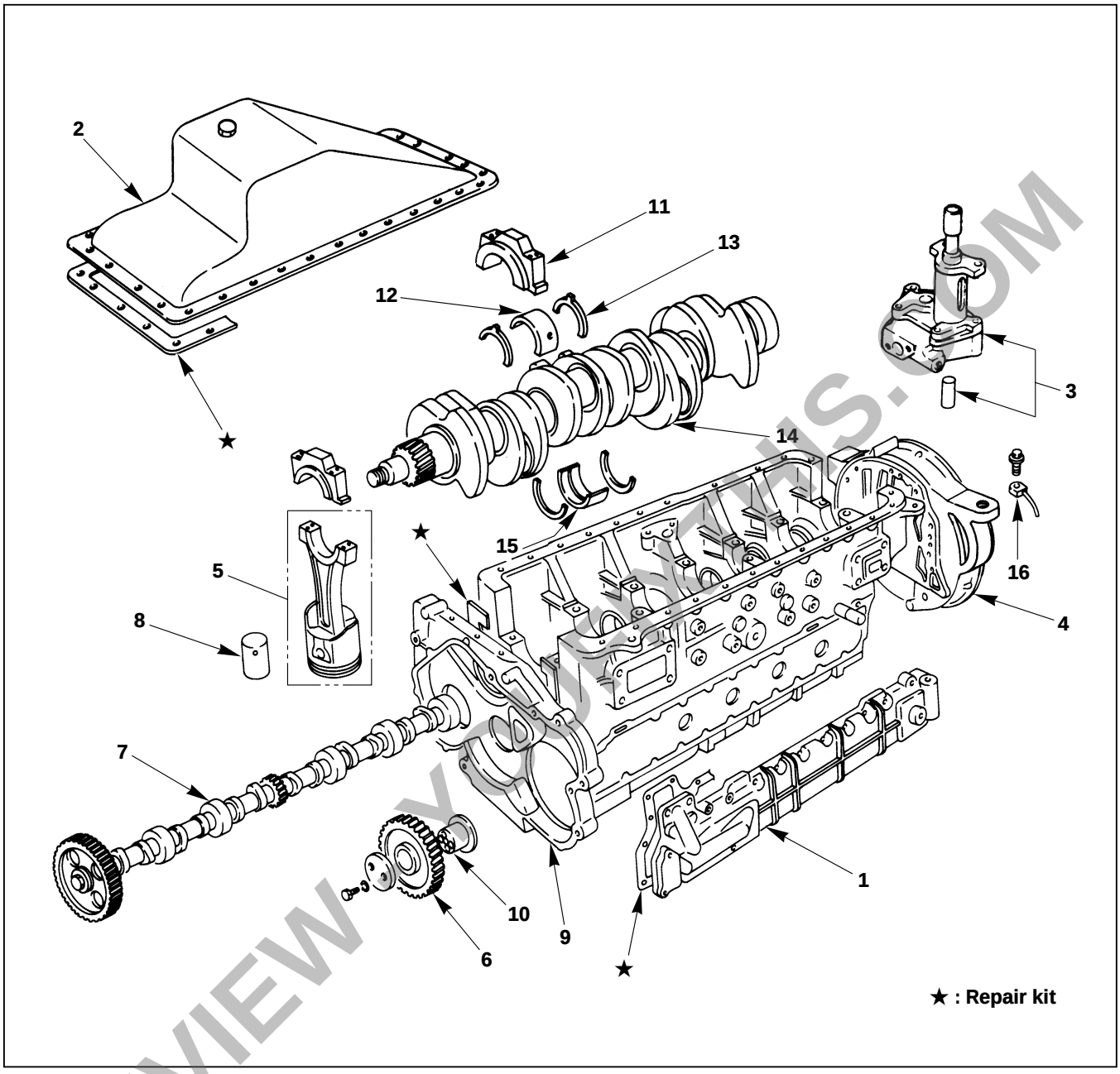
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MAJOR COMPONENTS - II



Disassembly Steps

1. Oil cooler
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14. Crankshaft
15. Crankshaft bearing (upper half)
16. Oiling jet

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TIGHTENING TORQUE SPECIFICATIONS

The tightening torque values given in the table below are applicable to the bolts unless otherwise specified.

STANDARD BOLT

N·m (kgf·m/lb.ft)

Bolt Identification / Bolt Diameter × pitch (mm)		 	
		 	
M 6 × 1.0	3.9–7.8 (0.4–0.8/2.9–5.8)	4.9–9.8 (0.5–1.0/3.6–7.2)	—
M 8 × 1.25	7.8–17.7 (0.8–1.8/5.8–13.0)	11.8–22.6 (1.2–2.3/8.7–16.6)	16.7–30.4 (1.7–3.1/12.3–22.4)
M10 × 1.25	20.6–34.3 (2.1–3.5/5.2–25.3)	27.5–46.1 (2.8–4.7/20.3–33.4)	37.3–62.8 (3.8–6.4/27.5–46.3)
* **M10 × 1.5**	19.6–33.4 (2.0–3.4/14.5–24.6)	27.5–45.1 (2.8–4.6/20.3–33.3)	36.3–59.8 (3.7–6.1/26.8–44.1)
M12 × 1.25	49.1–73.6 (5.0–7.5/36.2–54.2)	60.8–91.2 (6.2–9.3/44.8–67.3)	75.5–114.0 (7.7–11.6/55.7–83.9)
* **M12 × 1.75**	45.1–68.7 (4.6–7.0/33.3–50.6)	56.9–84.4 (5.8–8.6/42.0–62.2)	71.6–107.0 (7.3–10.9/52.8–78.8)
M14 × 1.5	76.5〜115.0 (7.8〜11.7/56.4〜84.6)	93.2–139.0 (9.5–14.2/68.7–103.0)	114.0–.0 (11.6–17.4/83.9–126.0)
* **M14 × 2.0**	71.6–107.0 (7.3–10.9/52.8–78.8)	88.3–131.0 (9.0–13.4/65.1–96.9)	107.0–160.0 (10.9–16.3/78.8–118.0)
M16 × 1.5	104.0–157.0 (10.6–16.0/76.7–115.7)	135.0–204.0 (13.8–20.8/99.8–150.0)	160.0–240.0 (16.3–24.5/118.0–177.0)
* **M16 × 2.0**	100.0–149.0 (10.2–15.2/73.8–110.0)	129.0–194.0 (13.2–19.8/95.5–143.0)	153.0–230.0 (15.6–23.4/113.0–169.0)
M18 × 1.5	151.0–226.0 (15.4–23.0/111.0–166.0)	195.0–293.0 (19.9–29.9/144.0–216.0)	230.0–345.0 (23.4–35.2/169.0–255.0)
* **M18 × 2.5**	151.0–226.0 (15.4–23.0/111.0–166.0)	196.0–294.0 (20.0–30.0/145.0–217.0)	231.0–346.0 (23.6–35.3/171.0–255.0)
M20 × 1.5	206.0–310.0 (21.0–31.6/152.0–229.0)	270.0–405.0 (27.5–41.3/199.0–299.0)	317.0–476.0 (32.3–48.5/234.0–351.0)
* **M20 × 2.5**	190.0–286.0 (19.4–29.2/140.0–211.0)	249.0–375.0 (25.4–38.2/184.0–276.0)	293.0–440.0 (29.9–44.9/216.0–325.0)
M22 × 1.5	251.0–414.0 (25.6–42.2/185.0–305.0)	363.0–544.0 (37.0–55.5/268.0–401.0)	425.0–637.0 (43.3–64.9/313.0–469.0)
* **M22 × 2.5**	218.0–328.0 (22.2–33.4/161.0–242.0)	338.0–507.0 (34.5–51.7/250.0–374.0)	394.0–592.0 (40.2–60.4/291.0–437.0)
M24 × 2.0	359.0–540.0 (36.6–55.0/265.0–398.0)	431.0–711.0 (43.9–72.5/318.0–524.0)	554.0–831.0 (56.5–84.7/409.0–613.0)
* **M24 × 3.0**	338.0–507.0 (34.5–51.7/250.0–374.0)	406.0–608.0 (41.4–62.0/299.0–448.0)	521.0–782.0 (53.1–79.7/384.0–576.0)

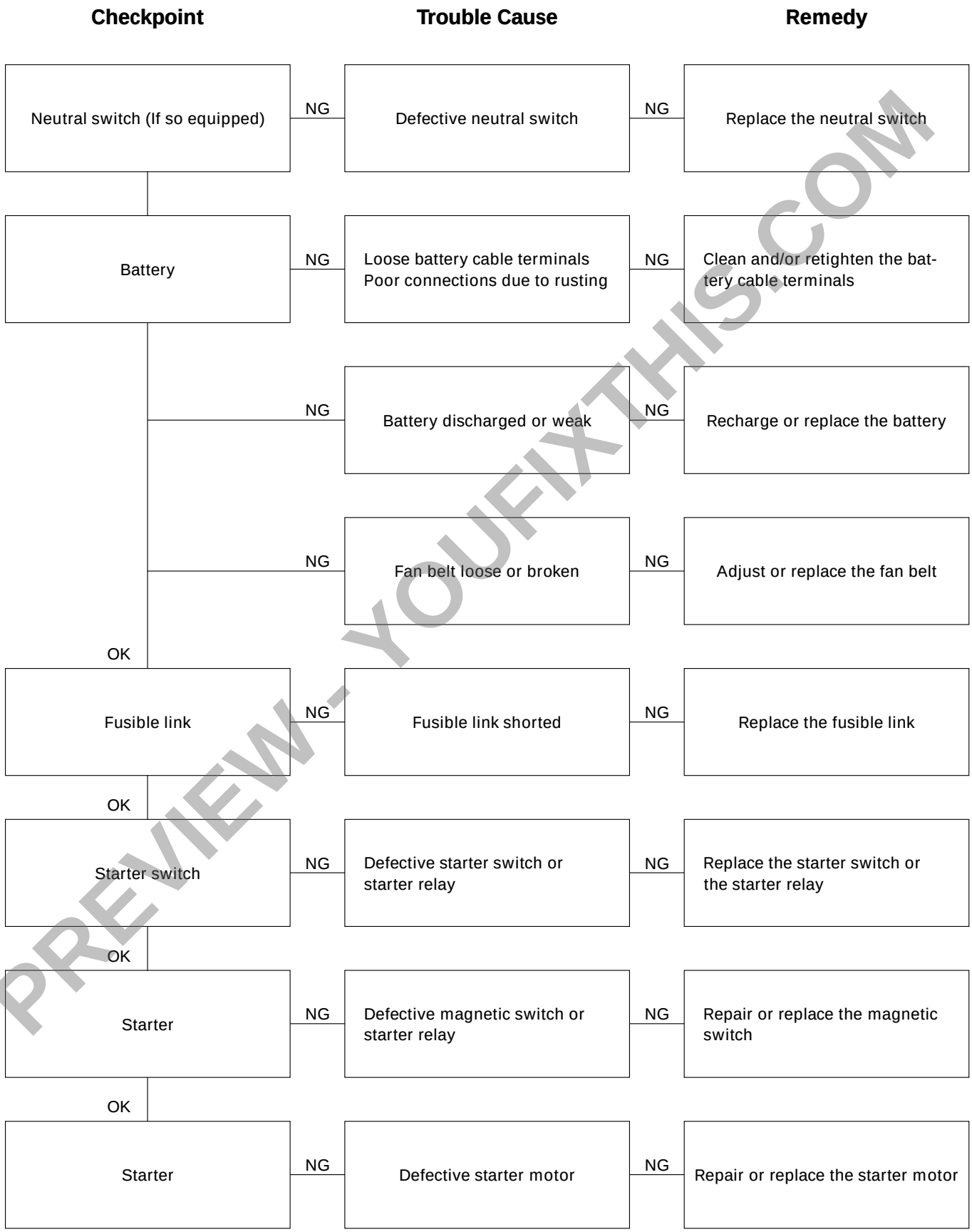
An asterisk (*) indicates that the bolts are used for female threaded parts that are made of soft materials such as casting.

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HARD STARTING

1) STARTER INOPERATIVE



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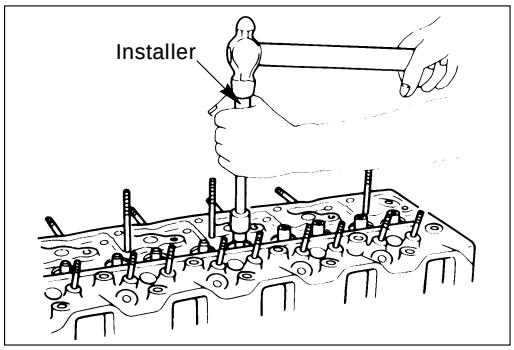
MAIN DATA AND SPECIFICATIONS

Item \ Engine Model		AA-4BG1T	BB-4BG1T
Engine type		Water cooled, four cycle, vertical in-line overhead valve	
Combustion chamber type		Direct injection	
Cylinder liner type		Dry	
No. of cylinders – bore × stroke	mm (in)	4 – 105 × 125 (4.13 × 4.92)	
Total piston displacement	L (cid)	4.329 (464)	
Compression ratio		18.0 to 1	
* Engine dimensions Length × width × height	mm (in)	904 × 684.8 × 907 (35.6 × 27.0 × 35.7)	
* Engine weight (Dry)	kg (lb)	361 (796)	360 (794)
Fuel injection order		1–3–4–2	
Specified fuel		Diesel fuel (ASTM D975 No. 2D)	
Injection pump		In-line plunger, Bosch A type	
* Governor		Mechanical, RSV type	
Injection nozzle		Multi hole	
Injection starting pressure	MPa kgf/cm^2(psi)	18.1 (185/2,630)	
Fuel filter type		Cartridge (spin-on)	
Water sedimentor	(If so equipped)	Sediment/water level indicating type	
Compression pressure (At warm)	MPa kgf/cm^2 (psi)	3.0 (31/441) at 200 min^{-1} at sea level	
Valve clearances (At cold)	Intake mm (in)	0.40 (0.016)	
	Exhaust mm (in)	0.40 (0.016)	
Lubrication method		Pressurized circulation	
Oil pump		Gear type	
Main oil filter type		Full flow, cartridge (spin-on)	
* Lubricating oil volume	L (US gal)	13.2 (3.5)	13.0 (3.4)
Oil cooler		Water cooled integral type	
Cooling method		Pressurized forced circulation	
Coolant volume (engine only)	L (US gal)	8.5 (2.25)	
Water pump		Belt driven impeller type	
Thermostat type		Wax pellet type	
* Generator	V-A	24–40	
* Starter	V-KW	24–4.5	
* Turbocharger manufacturer		MITSUBISHI	MITSUBISHI
* Turbocharger model		TD04H	TD04H

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.

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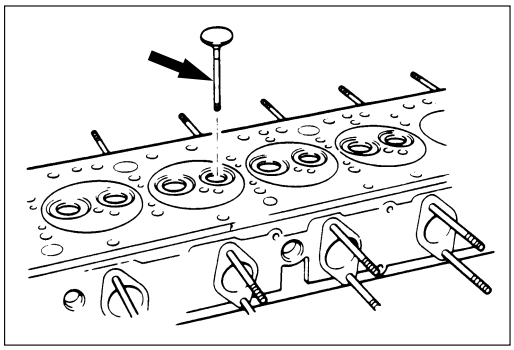


Important Operations

1. Valve Stem Oil Seal

1) Lubricate the oil seals and valve stem sealing areas with engine oil.
2) Use a valve stem oil seal installer to install the oil seal.

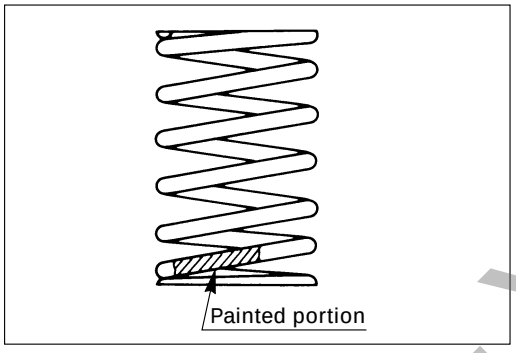
   Valve Stem Oil Seal Installer: 1-85221-005-0



2. Intake and Exhaust Valves

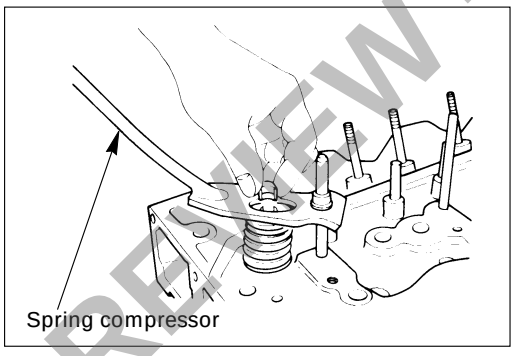
1) Place the cylinder head on a flat wooden surface.
2) Lubricate valve stems with engine oil.
3) Install the valves to the intake or exhaust guides.

   Install the valves to their original lapped valve seats.



4. Intake and Exhaust Valve Springs

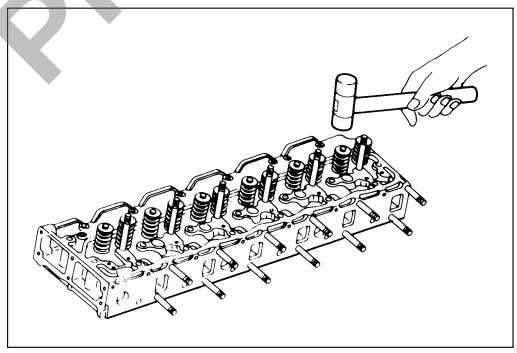
Install the valve springs with their painted end (the close pitched end) facing down.



6. Spring Seat Split Collar

1) Use a spring compressor to push the valve spring into position.
2) Install the spring seat split collar.
3) Set the spring seat split collar by tapping lightly around the head of the collar with a rubber hammer.

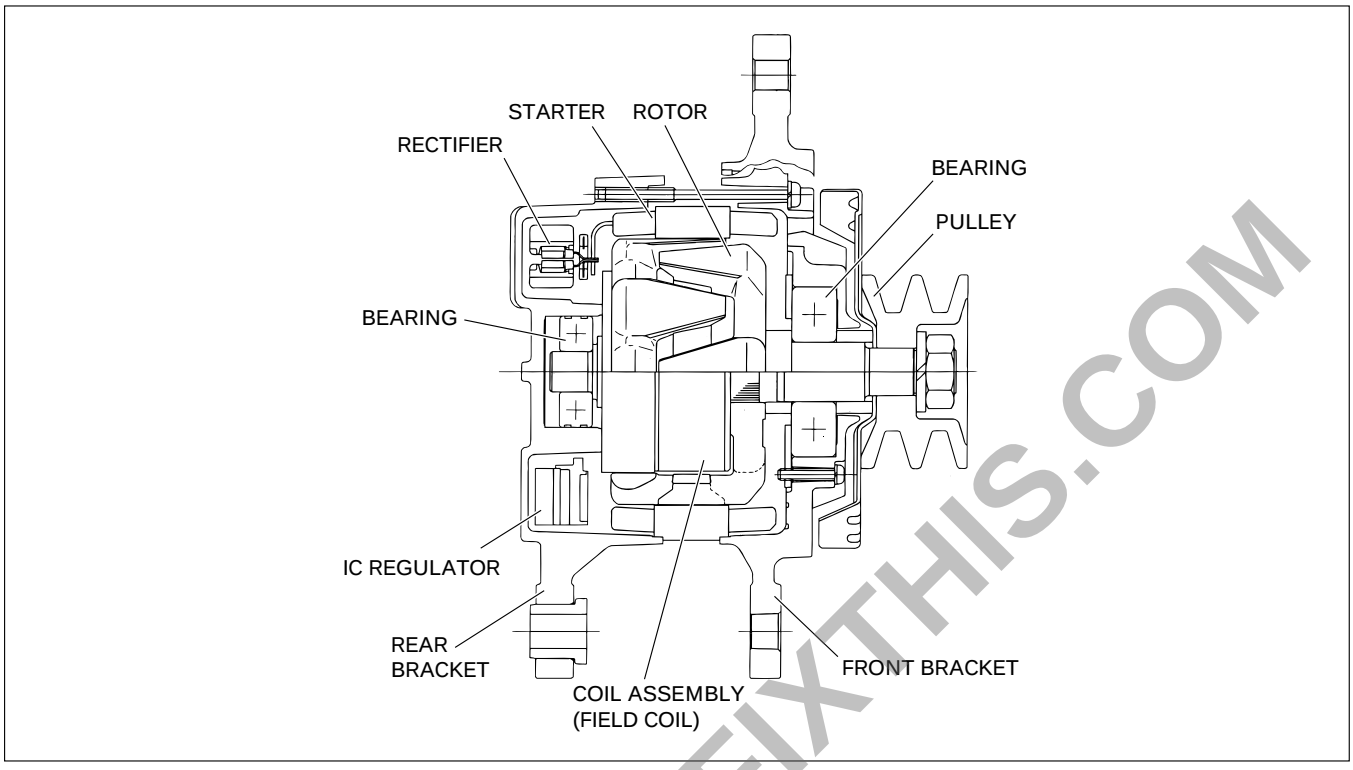
   Spring Compressor: 1-85235-006-0



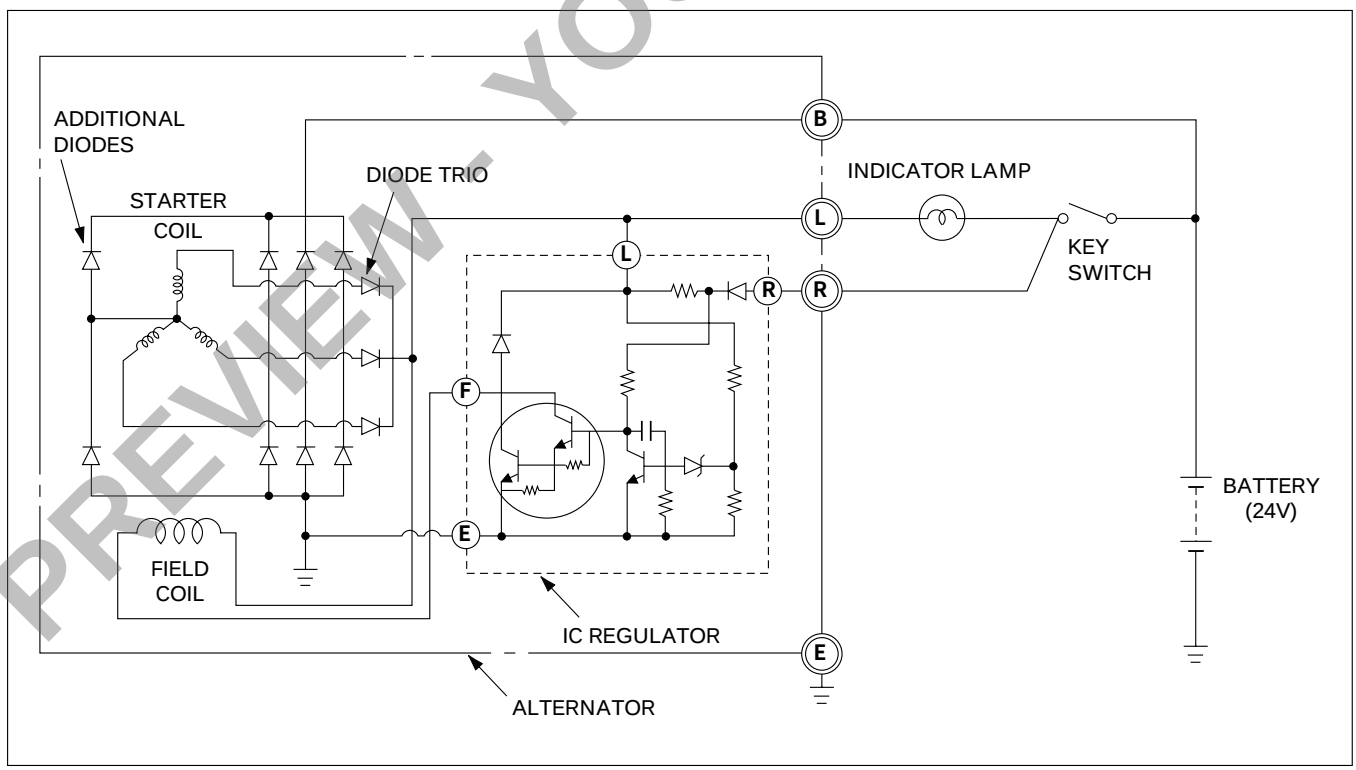
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ALTERNATOR SECTIONAL VIEW



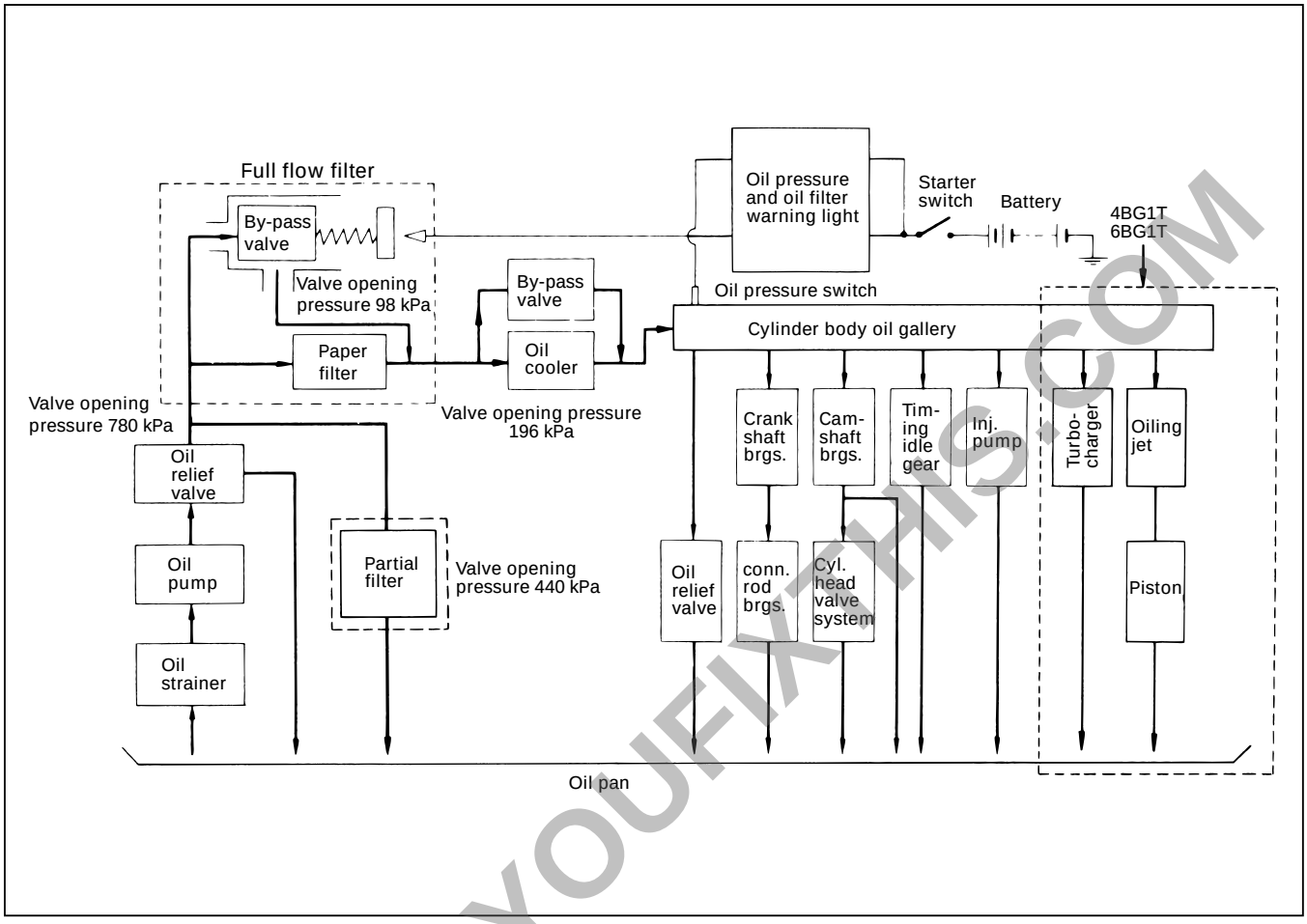
CHARGING CURCUIT



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GENERAL DESCRIPTION



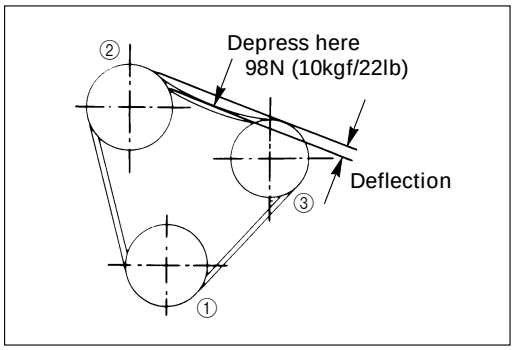
This family of engines uses a normal forced circulation lubricating system.

The gear type oil pump is driven by the camshaft oil pump drive.

The cartridge (spin-on) type oil filter is used.

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COOLING SYSTEM

Cooling Fan Drive Belt

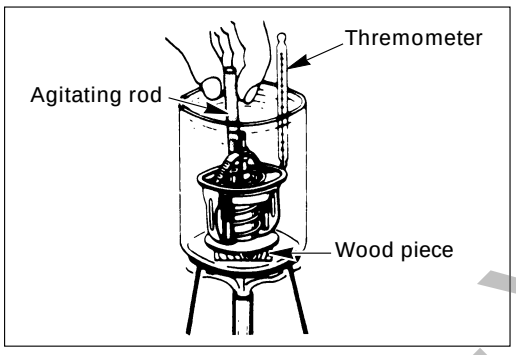
Adjustment

1. Check the cooling fan drive belt for cracking and other damage.
2. Check the drive belt tension by exerting a force of 98N (10kgf/22lb) midway between the fan pulley ② and the alternator ③.
3. Adjust the belt tension by loosening the alternator mounting bolt and the alternator adjusting bolt and pivoting the alternator.

   Be sure to retighten the bolts after adjusting the belt tension.

mm (in)

	4BG1	6BG1
Cooling Fan Drive Belt Deflection	8.0–12.0 (0.3–0.47)	7.0–10.0 (0.28–0.39)



Thermostat

Inspection

Visually inspect the thermostat.

Replace the thermostat if excessive wear or damage is discovered during inspection.

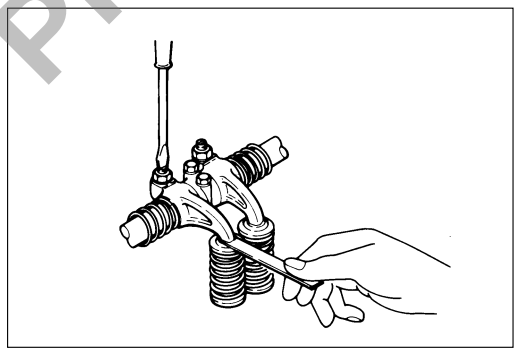
Measure the valve lift.

mm (in)

Amount of Valve Lift at 95°C (203°F)	10.0 (0.39)

°C(°F)

Valve Opening Temperature	80–84 (176–183)



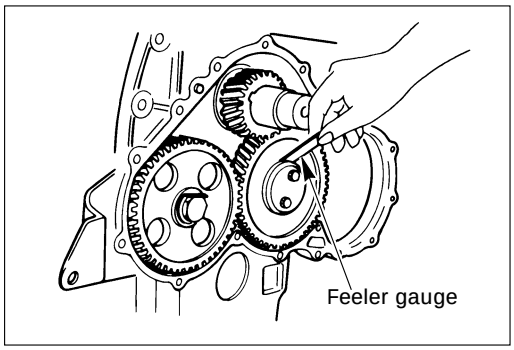
VALVE CLEARANCE AND ADJUSTMENT

Note:

The cylinder head bolts were previously tightened with the "Angular Tightening Method". Therefore, it is not necessary to retighten the cylinder head bolts before adjusting the valve clearance.

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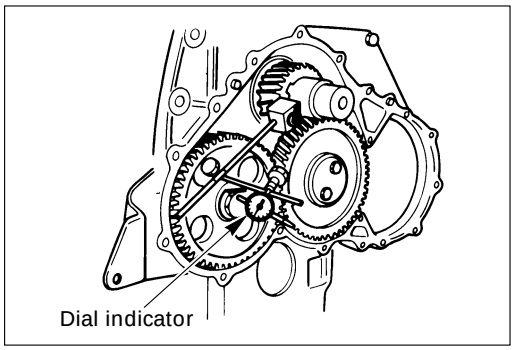
Important Operations

6. Idler Gear

Measure the following points before disassembly.

mm (in)

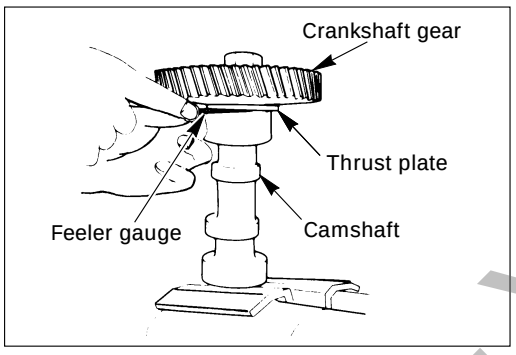
	Standard	Limit
Idler Gear End Play	0.128–0.185 (0.005–0.0070)	0.2 (0.008)



mm (in)

	Standard	Limit
Timing Gears Backlash	0.10–0.17 (0.004–0.007)	0.3 (0.012)

Includes the crankshaft gear, the camshaft gear, and the idler gear.

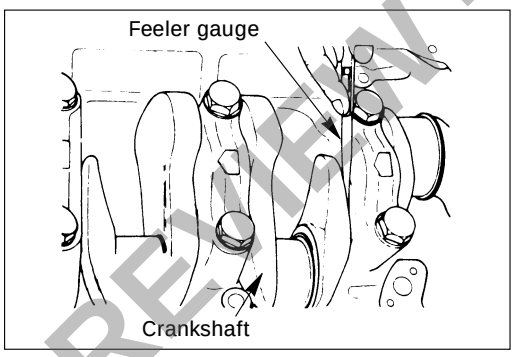


7 Camshaft

Measure the following points before disassembly.

mm (in)

	Standard	Limit
Cam Gear End Play	0.050–0.114 (0.002–0.005)	0.2 (0.008)



11. Crankshaft Bearing Cap

Measure the crankshaft end play at the thrust bearing (center main bearing) before disassembly.

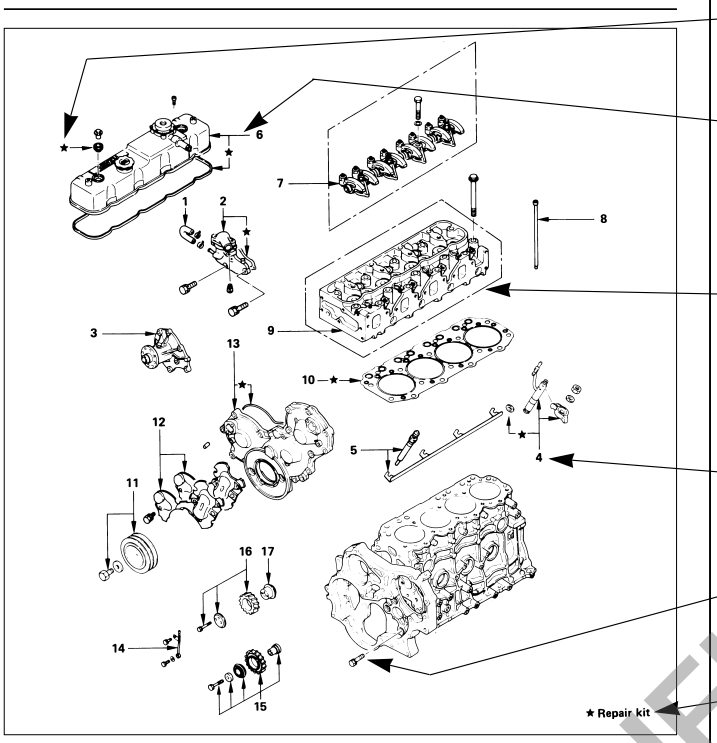
mm (in)

	Standard	Limit
Crankshaft End Play	0.15–0.33 (0.006–0.013)	0.4 (0.016)

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6. Each service operation section in this Workshop Manual begins with an exploded view of the applicable area. A brief explanation of the notation used follows.



Disassembly Steps - 2

1. Water by-pass hose
2. Thermostat housing
3. Water pump
▲ 4. Injection nozzle holder
5. Glow plug and glow plug connector
6. Cylinder head cover
▲ 7. Rocker arm shaft and rocker arm
8. Push rod
▲ 9. Cylinder head
10. Cylinder head gasket
▲ 11. Crankshaft damper pulley with dust seal
12. Timing gear case cover (Option)
13. Timing gear cover
14. Timing gear oil pipe
15. Idler gear "B" and shaft
▲ 16. Idler gear "A"
17. Idler gear shaft

Inverted Engine

Parts marked with an asterisk (*) are included in the repair kit.

Parts within a square frame are to be removed and installed as a single unit.

All parts within an irregularly shaped frame form a single assembly. They are considered a "major component". Individual parts within the irregularly shaped frame are considered "minor components".

The number tells you the service operation sequence.

Removal of unnumbered parts is unnecessary unless replacement is required.

The "* Repair Kit" indicates that a repair kit is available.

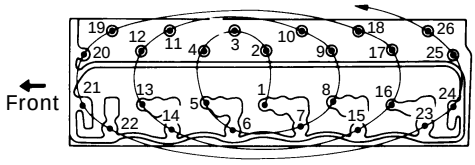
The parts listed under "Reassembly Steps" or "Installation Steps" are in the service operation sequence.

The removal or installation of parts marked with a triangle (▲) is an important operation. Detailed information is given in the text.

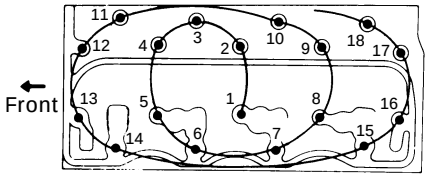
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6B series



4B series



3) Carefully place the cylinder head on the cylinder body.
4) Tighten the cylinder head bolt as follows.
   1) As cylinder head bolts have two kinds of length, install them at proper location.

      The shorter ones (4B series; 4 bolts, 6B series; 6 bolts) must be used at the injection pump side.
   2) Follow the numerical sequence shown in the illustrations.
   3) The cylinder head bolt tightening method vary depending on the gasket type to be used.

For laminated steel type gasket.

Apply molybdenum disulfide grease to the cylinder head bolt threads and setting faces.

Use the Angular Tightening Method.

N·m (kgf·m/lb.ft)

	1st step	2nd step	3rd step
Bolt Torque	69 (7.0/51)	88 (9.0/65)	90°–120°

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