

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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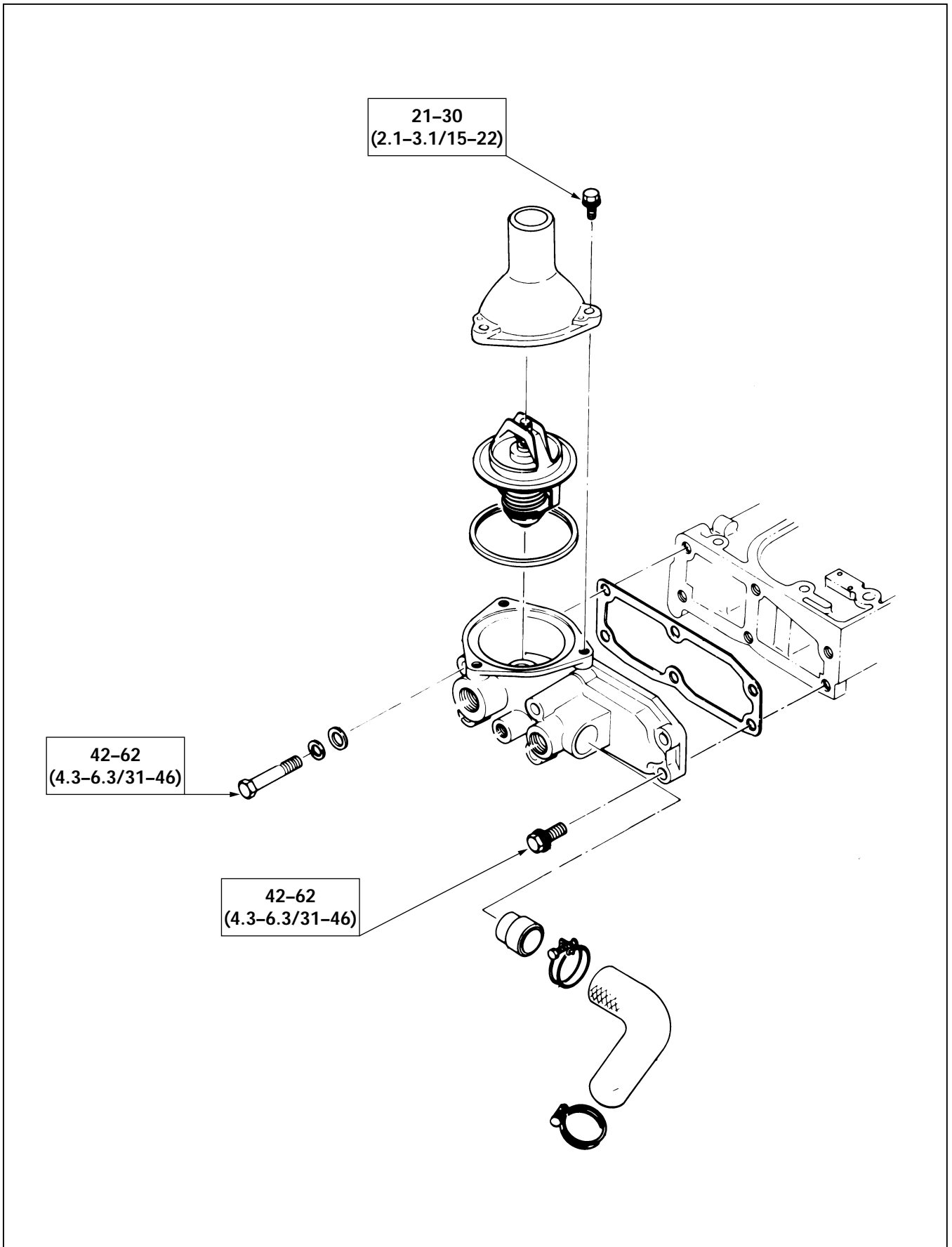


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Thermostat and Thermostat Housing

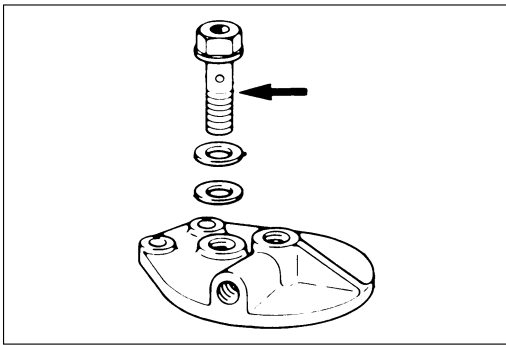
N·m (kgf·m/lb.ft)





Installation

1. Apply a light coat of engine oil to the O-ring.
2. Supply fuel to the new fuel filter.
This will facilitate air bleeding.
3. Turn in the new fuel filter until the filter O-ring is fitted against the sealing face.
4. Use the filter wrench to turn in the fuel filter an additional 2/3 of a turn.

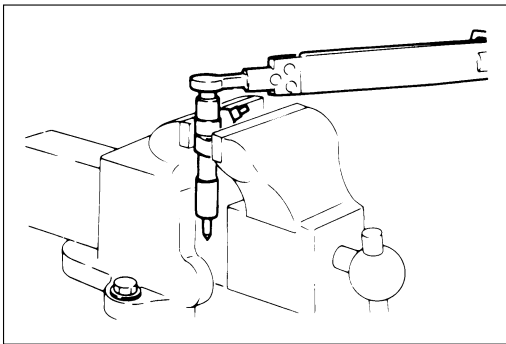


Overflow Valve

Check the overflow valve for clogging.
Check the ball side for suction leakage

kPa (kgf/cm²/psi)

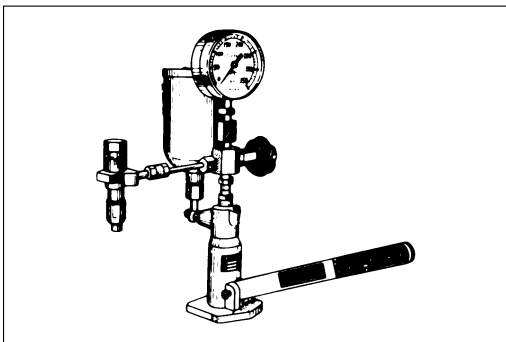
Overflow Valve Opening Pressure (Reference)	147 (1.5/21)
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Injection Nozzle

Inspection procedure

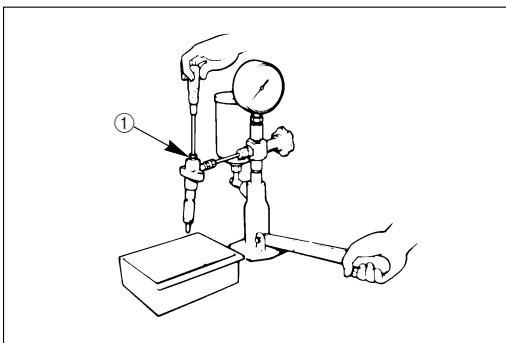
1. Clamp the injection nozzle holder in a vise.
2. Use a wrench to remove the injection nozzle holder cap.
3. Remove the injection nozzle holder from the vise.

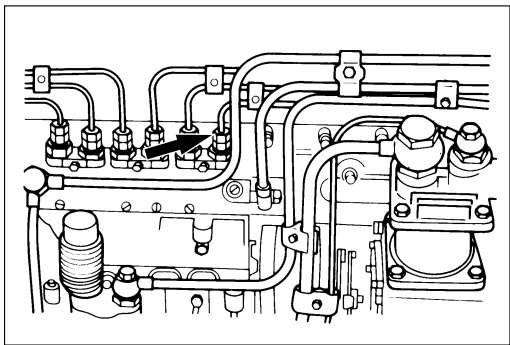


Adjusting Procedure

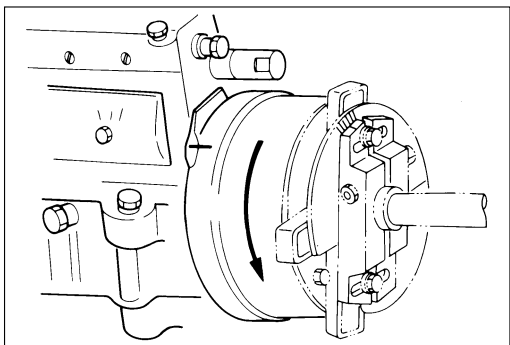
Injection Starting Pressure Check

1. Attach the injection nozzle holder to the injection nozzle tester.
2. Loosen the adjusting screw ①.
3. Check the injection nozzle starting pressure and the spray condition by operating the injection nozzle tester.
4. Adjust the injection nozzle starting pressure.
Turn the adjusting screw clockwise while operating the injection nozzle tester handle.





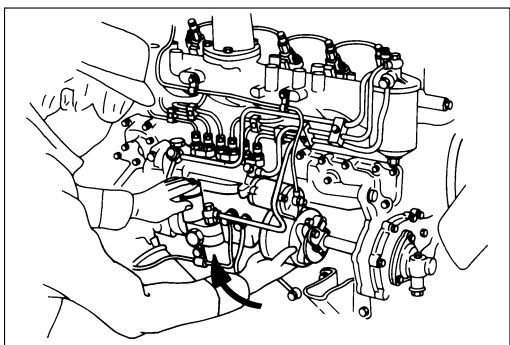
3. Perform the operations described on page 2-10, 11 paragraphs 3, 4, 5, 6.



4. Slowly turn the coupling counterclockwise (viewed from the timing gear case).

At the same time, operate the priming pump to feed fuel to the No. 1 injection pump plunger.

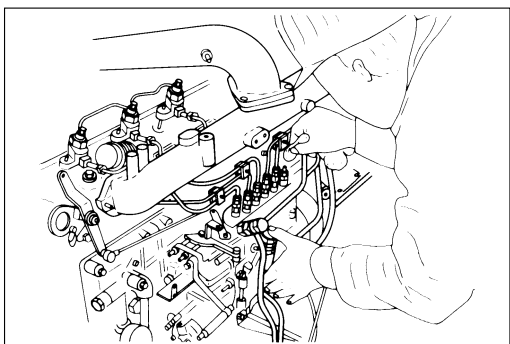
Visually check that fuel is being fed (from the top of the delivery valve holder).



5. Continue to operate the priming pump.

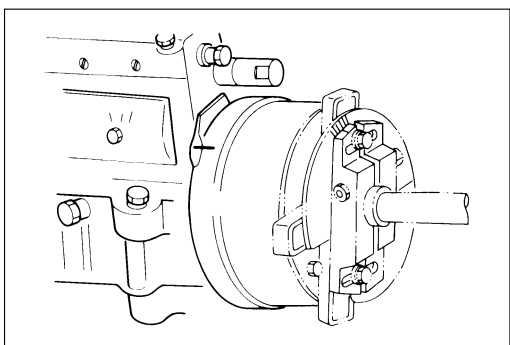
Turn the coupling counterclockwise until the fuel stops flowing from the delivery valve holder.

This is the fuel injection starting point at the No. 1 plunger.



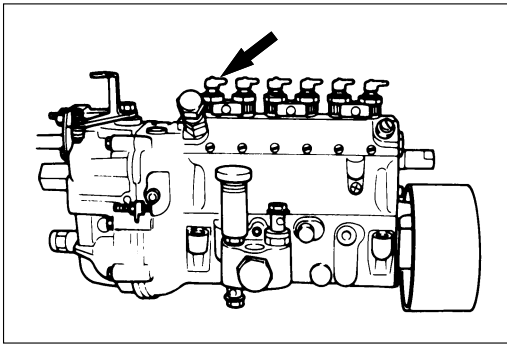
6. Blow out the remaining fuel from the delivery valve holder.

7. Check that there is no fuel being delivered from the priming pump.



8. Retighten two coupling bolts.

9. Perform the operations described on page 2-12 paragraphs 9, 10, 11, 12.



Important Operations

12. Injection Pump with Injection Pump Gear

Use the shipping plugs (or something similar) to seal the injection pump delivery valve ports. This will prevent the entry of foreign material.

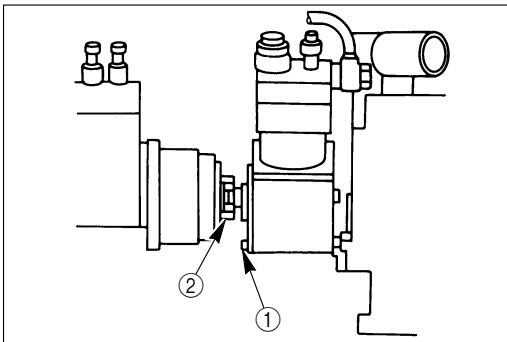
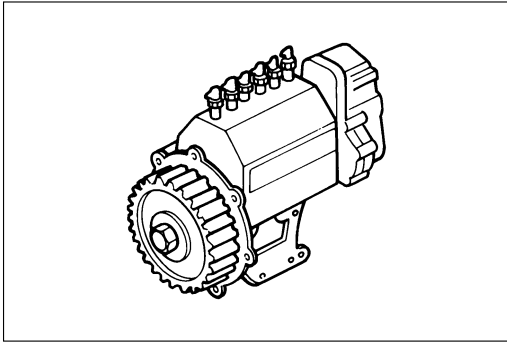
Flange Mounted Injection Pump Removal

- 1) Remove the injection pump flange bolts.
- 2) Pull the injection pump with the injection pump drive gear free.

Refer to the illustration.

Coupling Mounted Injection Pump Removal

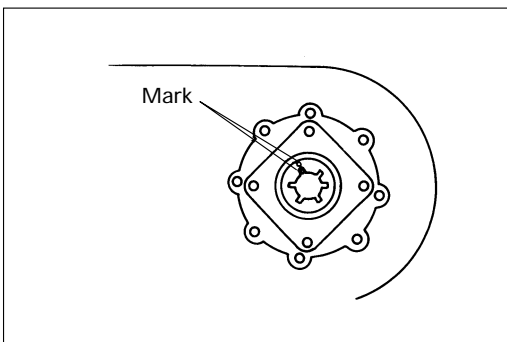
- 1) Remove the two coupling bolts to disconnect the coupling.
- 2) Remove the injection pump mounting bolts.
- 3) Remove either the injection pump bracket bolts or the injection pump fixing bolts.



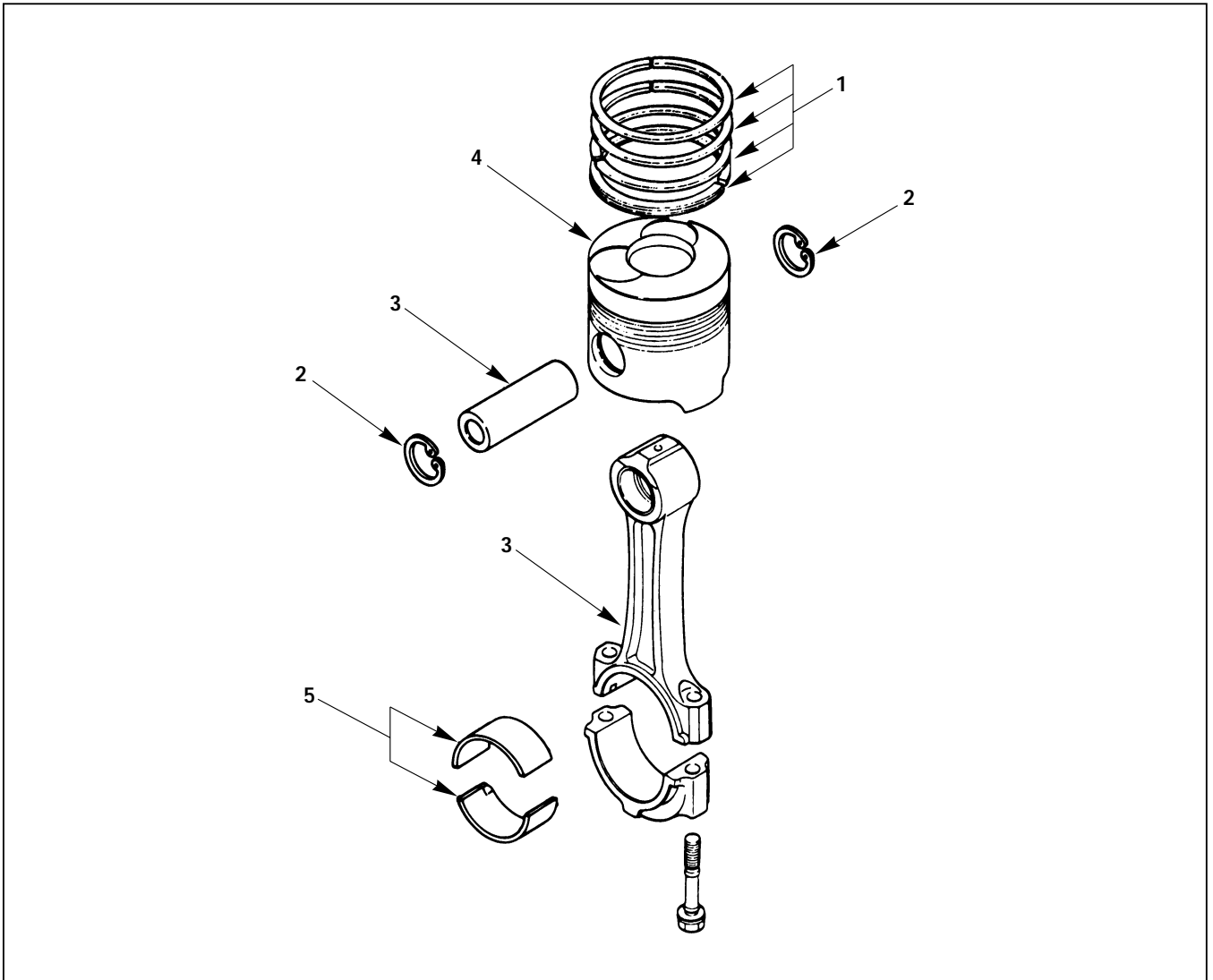
Remove of the Air Compressor (if so equipped)

Before the air compressor is removed the injection pump must be unfastened from the mounting bracket to permit the pump to be moved freely on the mounting bracket.

1. Remove the injection pump coupling bolts ②.
2. Remove the injection pump mounting bolts and shift the pump to the rear about 50 mm (2 in).
3. Remove the air compressor mounting bolts ①.
4. Pull out the compressor to the rear about 50 mm (2 in) to pull out the air compressor crankshaft front end spline from the injection pump drive gear.
5. After removal, visually make sure that the crankshaft end spline and the female spline of the injection pump drive gear shaft have fitting marks. Those marks are important for reassembly.

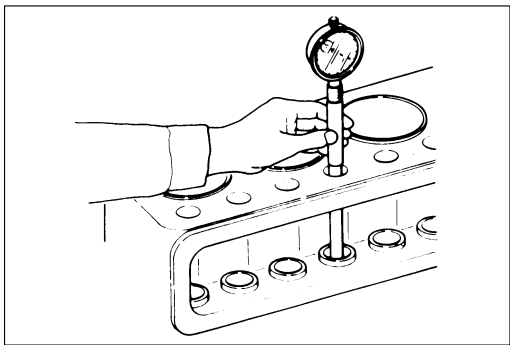


 **PISTON AND CONNECTING ROD
DISASSEMBLY STEPS**



Disassembly Steps

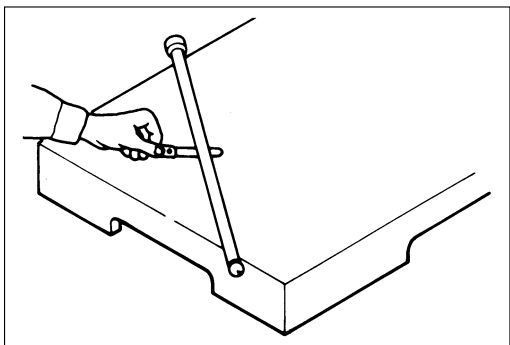
- ▲ 1. Piston rings
- ▲ 2. Snap ring
- ▲ 3. Piston pin and connecting rod
- 4. Piston
- 5. Connecting rod bearing



Use a dial indicator to measure the clearance between the tappet and cylinder body tappet travelling bore.

mm (in)

	Standard	Limit
Tappet and Tappet Travelling Bore Clearance	0.020–0.054 (0.001–0.002)	0.1 (0.004)



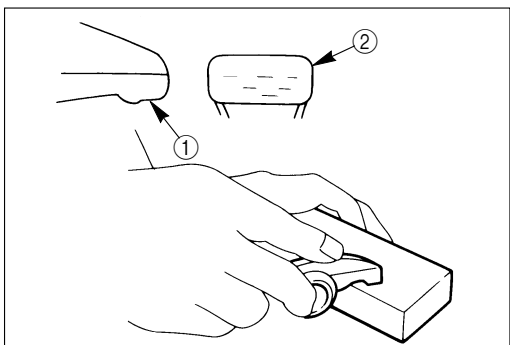
PUSH ROD

Use a filler gauge to measure the valve push rod run out.

Roll the push rod along a smooth flat surface (illustration).

mm (in)

	Limit
Push Rod Run-Out	0.3 (0.012)

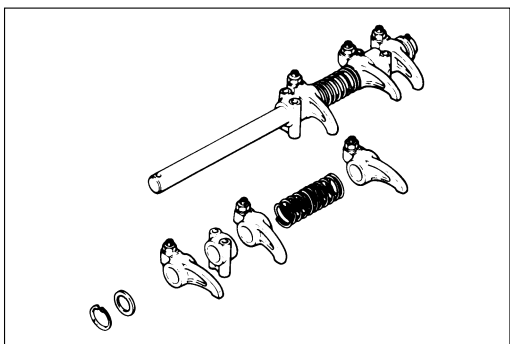


Rocker Arm Correction

Inspect the rocker arm valve stem contact surfaces for ridge ① and scoring ②.

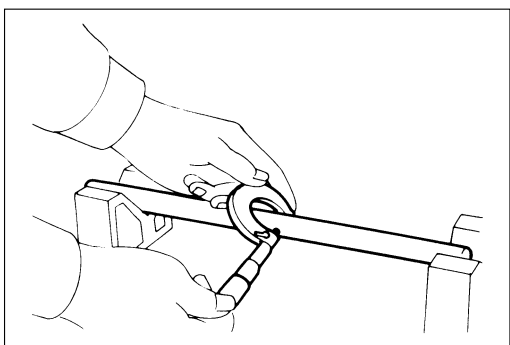
If the surfaces have light ridge or scoring, they may be honed with an oil stone.

If the ridge or scoring is severe, the rocker arm must be replaced.



ROCKER ARM SHAFT AND ROCKER ARM

Inspect all disassembled parts for wear, damage and any abnormalities.



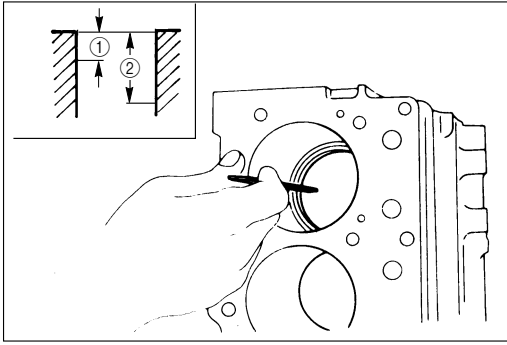
Rocker Arm Shaft Outside Diameter

Use a micrometer to measure the rocker arm outside diameter.

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

mm (in)

	Standard	Limit
Rocker Arm Shaft Diameter	18.98–19.00 (0.747–0.748)	18.85 (0.742)



Piston Ring Gap

1. Insert the piston ring horizontally (in the position it would assume if it were installed to the piston) into the cylinder liner.
2. Use an inverted piston to push the piston ring into the cylinder liner until it reaches either measuring point ① or measuring point ②. Cylinder liner diameter is the smallest at these two points.

Do not allow the piston ring to slant to one side or the other. It must be perfectly horizontal.

Cylinder Liner Measuring Point ①: 10mm (0.39 in)

Cylinder Liner Measuring Point ②: 130mm (5.12 in)

3. Use a feeler gauge to measure the piston ring gap.
If the measured value exceeds the specified limit, the piston ring must be replaced.

Piston Ring Gap

mm (in)

	Standard	Limit
1st Compression Ring	0.35–0.50 (0.014–0.020)	1.5 (0.059)
2nd Compression Ring	0.60–0.75 (0.0236–0.0295)	
3rd Compression Ring	0.60–0.75 (0.0236–0.0295)	
Oil Ring	0.30–0.50 (0.014–0.020)	

Judgement

1. Wait for thirty to forty seconds.

If there is no discoloration after thirty or forty seconds, the crankshaft is usable.

If discoloration appears (the surface being tested will become the color of copper), the crankshaft must be replaced.

2. Clean the surface being tested with clean water or steam immediately after completing the test.

Note:

The ammonium cuprous chloride solution is highly corrosive. Because of this, it is imperative that the surfaces being tested be cleaned immediately after completing the test.



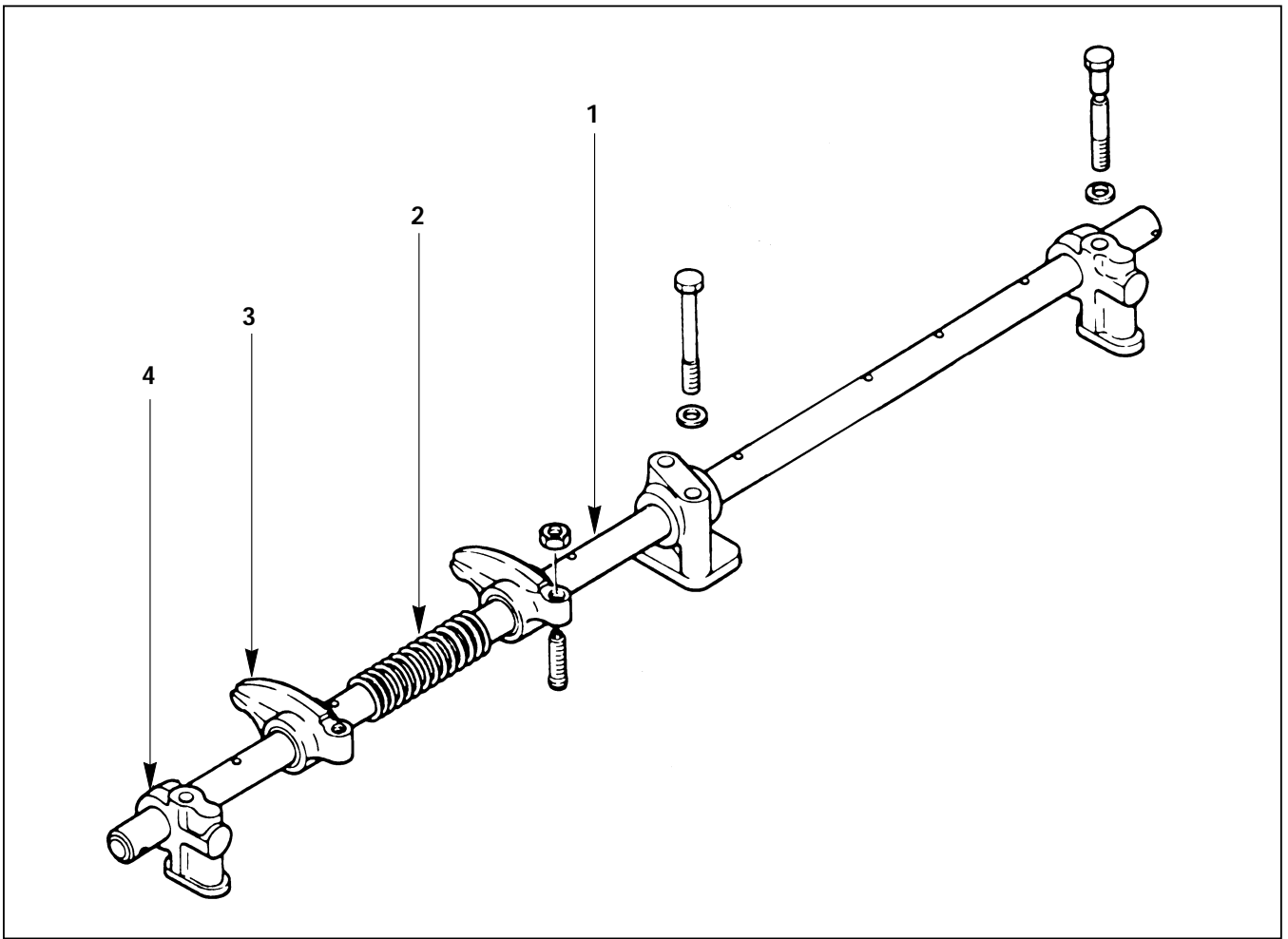
Crankshaft Gear Inspection

Visually inspect the crankshaft gear.

Replace the crankshaft gear if excessive wear or damage is discovered.



ROCKER ARM AND ROCKER ARM SHAFT REASSEMBLY STEPS



Reassembly Steps

- ▲ 1. Rocker arm shaft
- 2. Spring
- 3. Rocker arm
- 4. Bracket



Important Operation

1. Rocker Arm Shaft



The rocker arm shaft must be installed with the oil ports facing up.

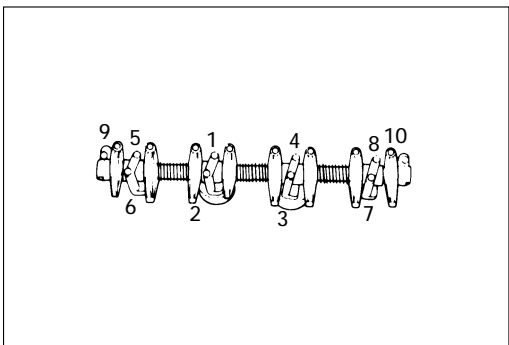
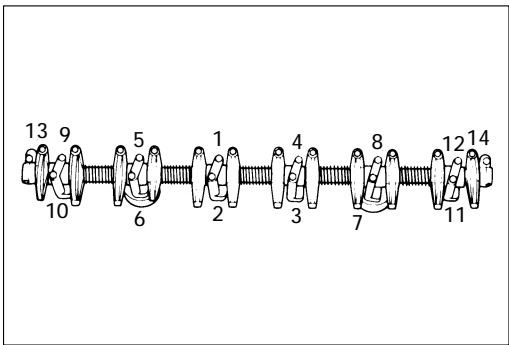
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15. Rocker Arm and Rocker Arm Shaft

- 1) Check that the rocker arm shaft bracket lower surface oil port is free from obstruction.
- 2) Install the rocker arm shaft with the bracket to the cylinder head.
- 3) Tighten the rocker arm bracket bolts to the specified torque a little at a time in the numerical order shown in the illustration.
- 4) Lubricate the rocker arm and the rocker arm shaft with engine oil.

N·m (kgf·m/lb.ft)

Rocker Arm Shaft	6B	25-35 (2.6-3.6/19-26)
Bracket Bolt and Nut Torque	4B	20-29 (2.0-3.0/15-22)

- 5) Adjust the valve clearance.
Refer to MAINTENANCE for the valve clearance adjustment procedure.

9. Crank the engine with the starter (non-ignition operation) for about twenty seconds.

This will prelubricate the engine internal components.

10. Start the engine and allow it to run at 750 to 800 rpm for five minutes.



11. Remove the cylinder head cover while the engine is running.



12. Check that the engine oil is continuously circulating from the oil pump to the valve rockers through the cylinder head.

If there is no oil circulation or if the oil circulation is sluggish, stop the engine and make the appropriate repairs or adjustments.

Reinstall the cylinder head cover.



13. Increase the engine speed to 1,500 rpm to do the engine warming-up operation.



14. Check the engine for oil, fuel, coolant, and air intake leakage.



15. Check for abnormal noise and odor.



16. Check for abnormal electrical charging.



17. Check the engine fastening parts for looseness.



18. When the engine coolant temperature reached to 75°C (167°F) or more, increase the engine speed to 2,000 rpm and allow it to run for twenty minutes.

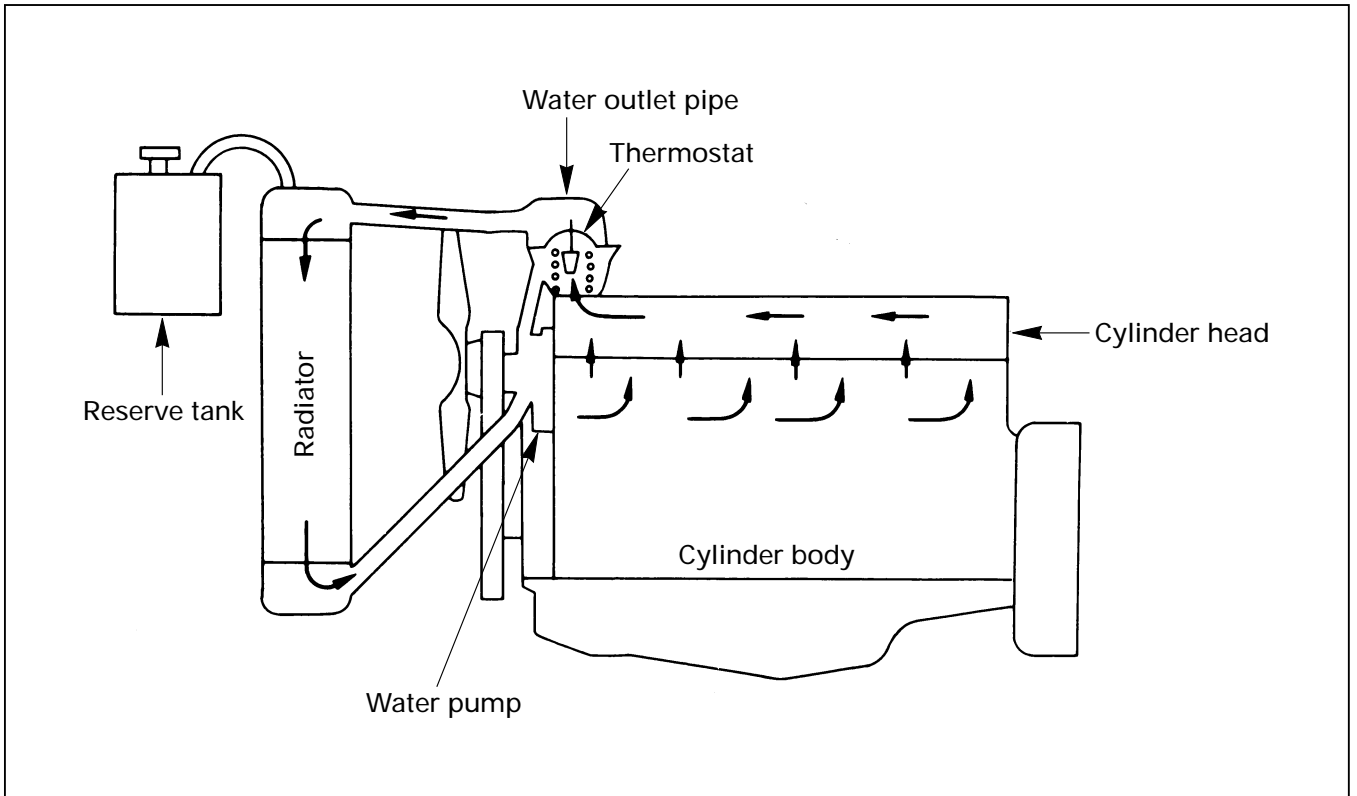
This will give the engine the essential run-in operating time.



19. Adjust the engine operation speed to the specified value.

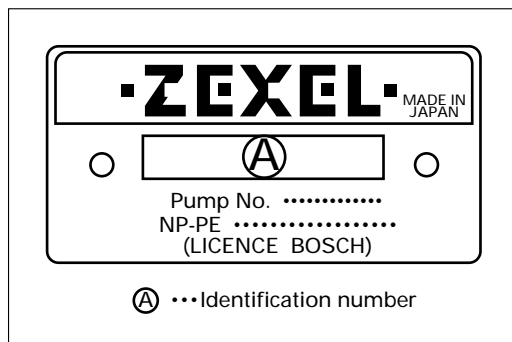
20. Stop the engine to complete the tuning procedure.

GENERAL DESCRIPTION



This family of engines uses a pressurized, forced circulation cooling system with a V-belt driven centrifugal water pump and a wax pellet thermostat with jiggle valve.

INJECTION PUMP CALIBRATION DATA



IDENTIFICATION PLATE AND PRODUCT SERIAL NUMBER

- 1 . Injection pump adjustment and repair should be made by the nearest ZEXEL CORPORATION or ROBERT BOSCH Authorized Service Outlet.
2. When you ask such authorized service outlet the adjustment or repair, the identification Plate and Product Serial Number will give them a necessary clue to get technical data distributed by the manufacturers previously.

Without this data, the Service Outlet will be unable to effectively service your injection pump.

If you are unable to locate the data applicable to your injection pump, please contact ISUZU MOTORS LTD through your machine supplier.

3. Do not remove the Identification Plate and Product Serial Number from the injection pump.

Keep the Identification Plate and Product Serial Number clean at all times. Do not allow it to rust or become illegible.

Note: Examples of test conditions and calibration data are as follows.

TEST CONDITIONS REQUIRED FOR THE FUEL INJECTION AMOUNT ADJUSTMENT

Injection Nozzle		*ZEXEL No.: 105160-5130 Bosch Type No.: NP-DLLA149SM304
Injection Nozzle Holder		ZEXEL No.: 105030-4750
Injection Starting Pressure	MPa (kgf/cm ² /psi)	18.1 (185/2630)
Injection Line Dimensions	mm (in.)	
Inside Diameter		1.8 (0.071)
Outside Diameter		6.0 (0.236)
Length		600.0 (23.6)
Transfer Pump Pressure	kPa (kgf/cm ² /psi)	157 (1.6/23)
Testing Diesel Fuel		ISO4113 or SAE Standard Test Oil (SAEJ967D)
Operating Temperature	°C (°F)	40 – 45 (104 – 113)
Pump Rotation Direction		Clockwise (Viewed from the drive side)

INSPECTION AND REPAIR

Make the necessary adjustments, repairs, and part replacements if excessive wear or damage is discovered during inspection.

Cylinder



Measure the uneven wear of the cylinder bore at the piston skirt position

mm (in)

	Limit
Cylinder Bore Uneven Wear	0.2 (0.0079)



Measure the piston and the cylinder bore clearance.

mm (in)

	Standard	Limit
Piston and Cylinder Bore Clearance	0.1-0.3 (0.0040-0.0118)	1.0 (0.040)

Note:

The piston outside diameter must be taken at the piston skirt positions.



Measure the piston ring grooves and the piston ring clearances.

mm (in)

	Standard	Limit
Piston Ring and Piston Ring Groove Clearance	0.02-0.05 (0.0008-0.0020)	0.15 (0.0059)



Measure the piston ring gaps.

mm (in)

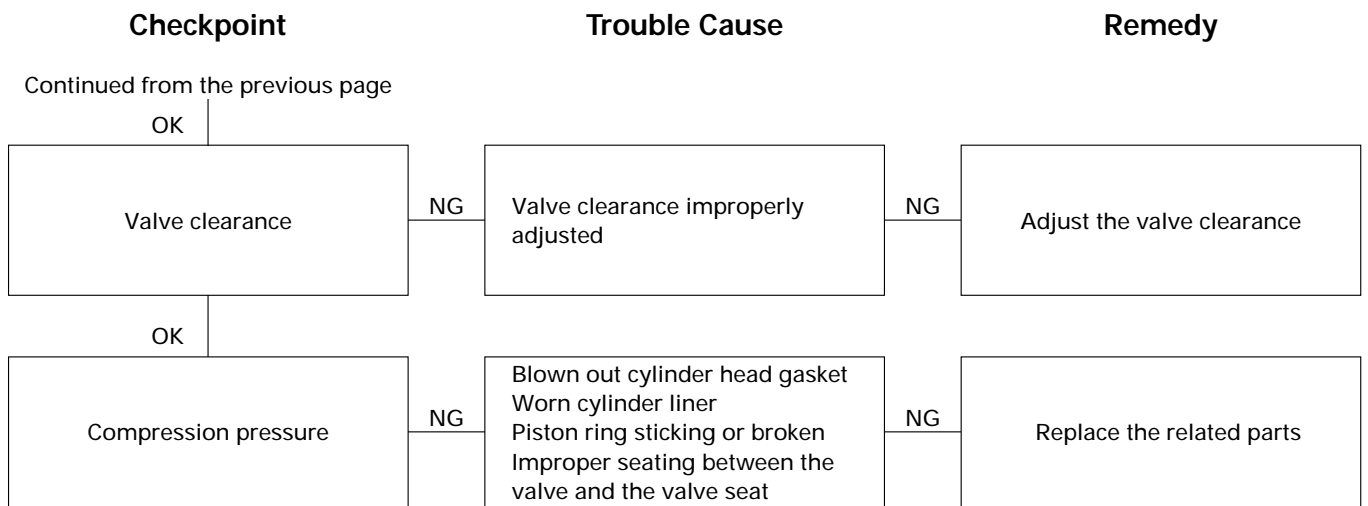
	Standard	Limit
Piston Ring Gap	0.1-0.3 (0.0040-0.0118)	1.0 (0.039)

MAIN DATA AND SPECIFICATIONS

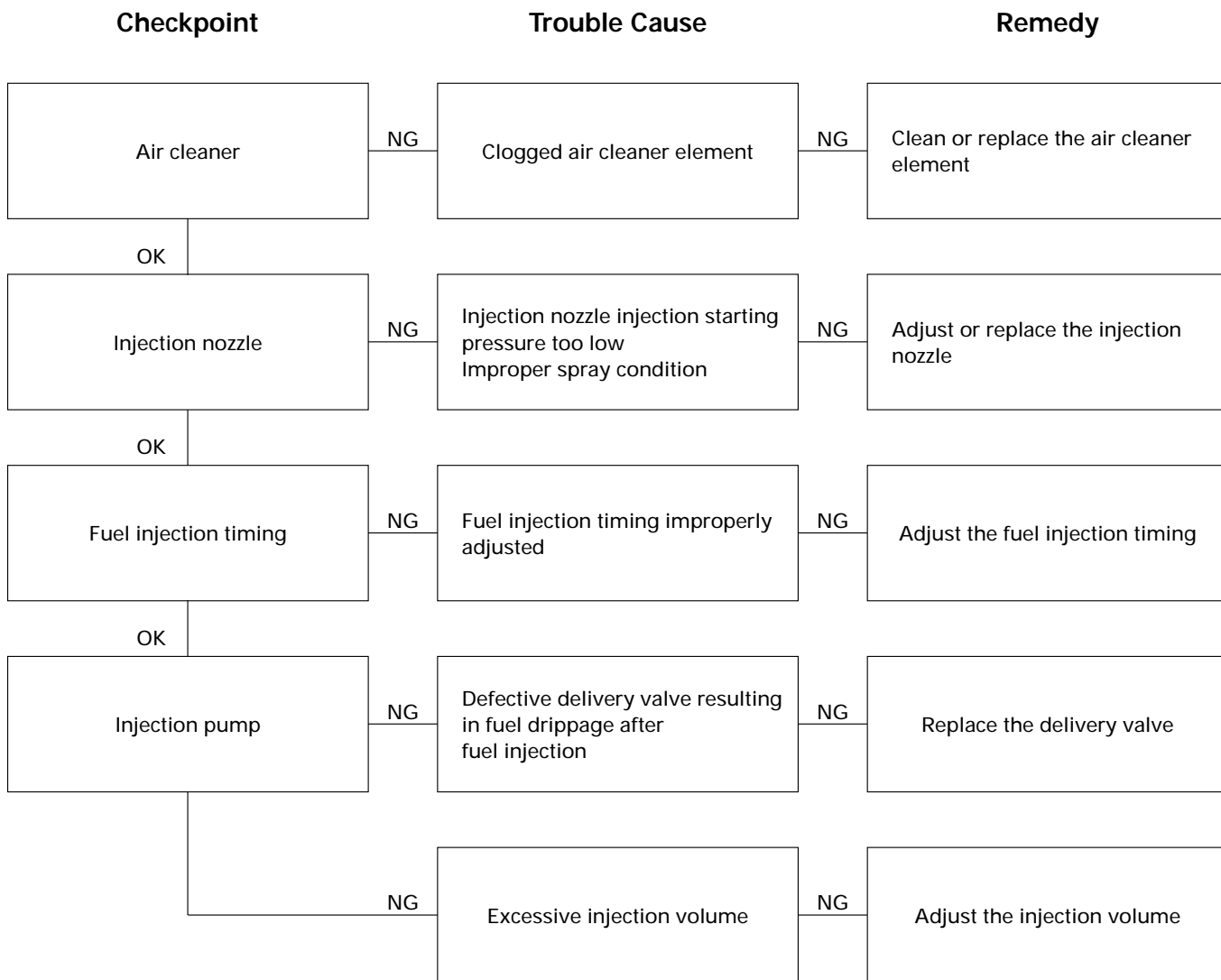
ALTERNATOR

Isuzu Part No.	1-81200-5301
Manufacturer's code No. (MITSUBISHI)	A004T05486
Rated voltage (V)	24
Rated output (A)	50
Rated speed (min ⁻¹)	5000
Rated output at r.p.m (Amp./Volt/min ⁻¹)	50/27/5000
No-load output at 0 Amp. (Volt/min ⁻¹)	24/900
Direction of rotation as viewed from pulley side	Clockwise
Polarity grounded	(—)
Pulley diameter mm (in.)	80 (3.15)
Coil resistance at 20°C Field coil (Ω)	4.4-5.2
Regulator's applicable Isuzu part No. Manufacturer's code No.	1-81260-0170 A866X38282

UNSTABLE LOW IDLING



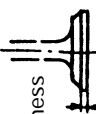
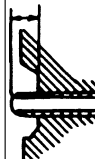
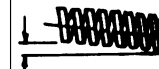
DARK EXHAUST SMOKE



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14-10 REPAIR STANDARDS

Major Category	Name of Part	Inspection Item	Nominal Dimension	Assembly Standard Value	Limit	Repair Procedure	Comments		
Valve System	Valves	Inlet valve stem wear	Dia. 9 (0.3543)		Dia. 8.88 (0.3496)	Replace valve and valve guide together	Measure valve stem at three positions		
		Exhaust valve stem wear							
		Clearance between inlet valve stem and valve guide		0.039 – 0.071 (0.0015 – 0.0028)	0.20 (0.008)	Replace valve and valve guide together			
		Clearance between exhaust valve stem and guide		0.064 – 0.096 (0.0025 – 0.0038)	0.25 (0.0098)				
		Interference between valve guide and cylinder head		0.024 (0.0009)			Apply oil to valve guide and press in		
		Valve thickness	Thickness 	1.5 (0.059)		1.00 (0.039)	Replace valve and valve guide together	Reference value	
		Height of valve guide above cylinder head		14.1 (0.555)					
		Valve stem oil seal lip		Dia. 8.5 (0.335)		Dia. 8.8 (0.346)	Replace oil seal	Don't damage lip.	
		Valve spring	Tension N (kgf/lb) (When compressed to installed length) 44.5mm(1.752in)			142 (14.5/30.9)	127 (13.0/28.7)	Replace valve spring	
			Free height	mm (in)		60.6 (2.39)	58.0 (2.28)		
Inclination 	mm (in)			less than 1.9 (0.075)	2.7 (0.106)				

MEMO

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