## SECTION 01

### 4ZD1 GASOLINE ENGINE

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GENERAL DESCRIPTION

ENGINE

FRONT VIEW

TOP VIEW

LEFT SIDE VIEW

RIGHT SIDE VIEW
LUBRICATING SYSTEM

COOLING SYSTEM
<table>
<thead>
<tr>
<th>Engine model Items</th>
<th>4ZD1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENGINE</strong></td>
<td></td>
</tr>
<tr>
<td>Engine type</td>
<td>Gasoline, Water-cooled, 4-cycle cross-flow</td>
</tr>
<tr>
<td>Valve Mechanism</td>
<td>Single over-head camshaft (belt drive)</td>
</tr>
<tr>
<td>Combustion chamber type</td>
<td>Hemispherical type</td>
</tr>
<tr>
<td>No. of cylinders - Bore x Stroke mm(in.)</td>
<td>4 - 89.3 x 90 (3.52 x 3.54)</td>
</tr>
<tr>
<td>Piston displacement liters (cu.in.)</td>
<td>2.25(138)</td>
</tr>
<tr>
<td>Compression ratio (to 1)</td>
<td>8.3</td>
</tr>
<tr>
<td>Engine dimensions (length x width x height) mm(in.)</td>
<td>676 x 653 x 752 (26.63 x 25.72 x 29.62)</td>
</tr>
<tr>
<td>Engine weight: dry kg (lbs.)</td>
<td>148(326)</td>
</tr>
<tr>
<td><strong>PISTON</strong></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Without T slot</td>
</tr>
<tr>
<td>Material</td>
<td>LO-EX</td>
</tr>
<tr>
<td>Number of rings</td>
<td>2 - 1</td>
</tr>
<tr>
<td>(compression — Oil rings)</td>
<td></td>
</tr>
<tr>
<td><strong>VALVE SYSTEM</strong></td>
<td></td>
</tr>
<tr>
<td>Intake valve open at B.T.D.C. degree</td>
<td>21</td>
</tr>
<tr>
<td>close at A.B.D.C. degree</td>
<td>65</td>
</tr>
<tr>
<td>Exhaust valve open at B.B.D.C. degree</td>
<td>55</td>
</tr>
<tr>
<td>close at A.T.D.C. degree</td>
<td>20</td>
</tr>
<tr>
<td>Valve clearance Intake mm(in.)</td>
<td>0.15/0.20 (0.006/0.008)</td>
</tr>
<tr>
<td>Cold/Hot Exhaust mm(in.)</td>
<td>0.25/0.30 (0.010/0.012)</td>
</tr>
<tr>
<td>Valve head diameter Intake mm(in.)</td>
<td>42.4 (1.67)</td>
</tr>
<tr>
<td>Exhaust mm(in.)</td>
<td>36.0 (1.42)</td>
</tr>
<tr>
<td><strong>IGNITION SYSTEM</strong></td>
<td></td>
</tr>
<tr>
<td>Firing order</td>
<td>1-3-4-2</td>
</tr>
<tr>
<td>Ignition timing</td>
<td>B.T.D.C. degree/rpm</td>
</tr>
<tr>
<td>distributor type</td>
<td>6/800 (Federal), 6/900 (California)</td>
</tr>
<tr>
<td>Type of advance</td>
<td>Full transistorized</td>
</tr>
<tr>
<td>Spark plugs</td>
<td>NGK BPR 6ES-11</td>
</tr>
<tr>
<td>Spark plug size mm(in.)</td>
<td>M14 P=1.25 (0.050)</td>
</tr>
<tr>
<td>Spark gap mm(in.)</td>
<td>1.05 (0.040)</td>
</tr>
<tr>
<td>Items</td>
<td>4ZD1</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td><strong>LUBRICATION SYSTEM</strong></td>
<td></td>
</tr>
<tr>
<td>OIL PUMP</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Trochoid type</td>
</tr>
<tr>
<td>Delivery volume liters/min.(gal./min.)</td>
<td>More than 16.0 (4.223) 34.7 (9.1 59)</td>
</tr>
<tr>
<td>At pump speed rpm</td>
<td>3000</td>
</tr>
<tr>
<td>Pressure of delivery kg/cm²(psi)</td>
<td>4.0 (56.9)</td>
</tr>
<tr>
<td>Oil temperature °C(°F)</td>
<td>50(122)</td>
</tr>
<tr>
<td>Engine oil</td>
<td>SAE30</td>
</tr>
<tr>
<td>Relief valve opening pressure kg/cm²(psi)</td>
<td>4.0 - 5.0 (56.9 - 71.1)</td>
</tr>
<tr>
<td>OIL FILTER</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Cartridge-high-media paper element</td>
</tr>
<tr>
<td>Over-flow valve opening pressure kg/cm²(psi)</td>
<td>0.8 - 1.2 (11.4 - 17.1)</td>
</tr>
<tr>
<td>Oil capacity (qts)</td>
<td>4.9 (5.2)</td>
</tr>
<tr>
<td>Crankcase (less filter)</td>
<td>3.8 (4.0)</td>
</tr>
<tr>
<td>Crankcase (with filter)</td>
<td>4.2 (4.4)</td>
</tr>
<tr>
<td><strong>COOLING SYSTEM</strong></td>
<td></td>
</tr>
<tr>
<td>RADIATOR</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Tubes with corrugated fins</td>
</tr>
<tr>
<td>Filler cap valve opening pressure kg/cm²(psi)</td>
<td>1.05 (14.9)</td>
</tr>
<tr>
<td>WATER PUMP</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Centrifugal limpeller type</td>
</tr>
<tr>
<td>Delivery volume liters/min.(gal./min.)</td>
<td>190(50)</td>
</tr>
<tr>
<td>At pump speed (rpm)</td>
<td>6,000</td>
</tr>
<tr>
<td>Water temperature</td>
<td>Normal</td>
</tr>
<tr>
<td>THERMOSTAT</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Wax-pellet with jiggle valve</td>
</tr>
<tr>
<td>Valve opening temperature °C(°F)</td>
<td>82 (180)</td>
</tr>
<tr>
<td>Valve wide open temperature °C(°F)</td>
<td>95 (203)</td>
</tr>
<tr>
<td>Fan pulley ratio</td>
<td>1.23</td>
</tr>
<tr>
<td>Fan outside diameter — number of blades</td>
<td>Without A/C 330-4 with A/C 3 90-7</td>
</tr>
<tr>
<td>Fan belt type</td>
<td>V-belt</td>
</tr>
<tr>
<td><strong>FUEL SYSTEM</strong></td>
<td></td>
</tr>
<tr>
<td>Carburetor type</td>
<td>2-barrel down draft</td>
</tr>
<tr>
<td>Carburetor model</td>
<td>DFP384 (California only), DCR384 (Federal only)</td>
</tr>
<tr>
<td>Fuel pump type</td>
<td>Mechanical diaphragm</td>
</tr>
<tr>
<td>Fuel filter type</td>
<td>Cartridge-paper element</td>
</tr>
<tr>
<td><strong>AIR CLEANER</strong></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Wet-paper</td>
</tr>
<tr>
<td><strong>BATTERY</strong></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>55D23R</td>
</tr>
<tr>
<td>Voltage (V) -Capacity (amp.)</td>
<td>12 - 60</td>
</tr>
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</table>
## CHARGING SYSTEM

<table>
<thead>
<tr>
<th>Items</th>
<th>Engine model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternator type</td>
<td>Stator diode rectified alternator (4x4, LT1 50—188)</td>
</tr>
<tr>
<td>Voltage-capacity (V-AH)</td>
<td>12-50</td>
</tr>
<tr>
<td>Drive and rotation</td>
<td>V-belt, clockwise viewed from front</td>
</tr>
<tr>
<td>Speed ratio to engine (to 1)</td>
<td>2.14</td>
</tr>
<tr>
<td>Regulator type</td>
<td>IC Integrated in alternator</td>
</tr>
</tbody>
</table>

## STARTER MOTOR

<table>
<thead>
<tr>
<th>Items</th>
<th>Engine model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Magnet shift, reduction type</td>
</tr>
<tr>
<td>Voltage-Output (V-kW)</td>
<td>12 - 1.0</td>
</tr>
<tr>
<td>Gear ratio</td>
<td>9:115</td>
</tr>
</tbody>
</table>
MAJOR PARTS ; FIXING NUTS AND BOLTS

CYLINDER HEAD, CYLINDER AND OIL PAN

- Cylinder Head: 1.95–2.45 (14.1–17.7) kg-m (ft-lbs)
  - Apply engine oil to the thread

- Cylinder: 1.6–2.0 (11.6–14.5) kg-m (ft-lbs)

- Oil Pan: 0.6–1.0 (4.34–7.23) kg-m (ft-lbs)

- 1.4–2.4 (10.1–17.4) kg-m (ft-lbs)

- 8.0–9.0–11.0 (57.8–65.1–79.5) kg-m (ft-lbs)
  - Apply engine oil to the thread

- 0.8–1.2 (5.78–8.7) kg-m (ft-lbs)

- 9–11 (65.1–79.5) kg-m (ft-lbs)
  - Apply engine oil to the thread and seating face of the bolt

- 0.6–1.0 (4.34–7.23) kg-m (ft-lbs)

- 1.5–2.1 (10.8–15.2) kg-m (ft-lbs)
1. Gasket; Cylinder head cover
2. Gasket; Cap, head cover
3. Gasket; Cylinder head
4. Gasket; Oil drain, oil pan
5. Seal; Oil camshaft frt.
6. Gasket; Outlet pipe to inl. manif.
7. Gasket; O-ring, water pipe
8. Gasket; Inlet manifold
9. Gasket; Exh. manifold
10. Seal; Crankshaft front
11. Seal; Crankshaft rear
12. Gasket; Water pump
13. Gasket; Retainer to block
14. Gasket; Adapter to block
15. Gasket; O-ring oil pump
16. Gasket; Heat insulation
17. Repair kit; Head overhaul
18. Gasket; Crank case, fit
19. Gasket; Crank case, rear
20. Gasket; Oil pan
ENGINE ASSEMBLY

REMOVAL AND INSTALLATION

REMOVAL

Removal steps
1. Remove battery cables.
2. Scribe position of the hinges on the engine hood, remove the four bolts attaching the hinges to the engine hood and remove the engine hood.
3. Remove the undercover and drain the cooling system by opening the drain plugs on the radiator and on the cylinder block.
4. Drain the engine oil.

Removal air cleaner
1. Disconnect the PCV hose from the air cleaner body.
2. Disconnect the air hose from the AIR pump.
3. Remove the air duct from air cleaner.
4. Remove the bolts attaching the air cleaner and remove the wing nut attaching the air cleaner.
5. Lift the air cleaner slightly and disconnect the TCA hose (from thermosenser and hot idle compensator to intake manifold), then remove the air cleaner assembly.

Removal of parts at left side of engine
1. Disconnect the TCA hot air hose and remove the manifold cover.
2. Disconnect the generator wiring at the connector.
3. Remove the two nuts connecting the exhaust pipe to the engine exhaust manifold, and disconnect the exhaust pipe.
4. Take the tension off of the clutch control cable by loosening the adjusting nut.
5. Disconnect the heater hoses at heater core tubes.
6. Disconnect the oxygen sensor wiring at the connector. (California only).
7. Disconnect the rubber hose at air switching valve and vacuum switching valve (California only).
8. Remove the engine mounting nut.
Removal of parts at right side of engine

1. Disconnect the cable grounding the cylinder block to the frame.
2. Disconnect the fuel hoses from the carburetor.
3. Pull out the high-tension cable from the ignition coil.
4. Disconnect the vacuum hose from the connector at the rear part of the intake manifold.
5. Disconnect rubber hoses at canister.
6. Disconnect the accelerator control cable from the carburetor.
7. Disconnect the starter motor connections.
8. Disconnect the thermo-unit, oil pressure switch and distributor wiring at the connector.
9. Disconnect rubber hose at vacuum switch (California only).
10. Disconnect the thermo switch wiring at the connector.
11. Disconnect the ground wiring at the connector on the rear part of intake manifold. (California only).
12. Disconnect the EFE heater wiring at the connector.
13. Disconnect the carburetor solenoid valve lead and automatic choke wiring at the connector.
14. Disconnect the back-up light switch and transmission switch wiring at the connector on the rear part of the engine.
15. Remove the engine mounting nut.
16. Raise the engine slightly and remove the left side engine mounting stopper plate.

Removal of parts at front of engine

**NOTICE:** Remove the transmission from the engine before engine removal from vehicle (4 x 4 only). Refer to "Transfer case replacement procedure" section 05B of this manual.

1. Disconnect compressor flex hoses (if equipped).
2. Disconnect the radiator reserve tank pipe at the radiator side.
3. Disconnect the radiator upper and lower hoses from the outlet pipe and from the radiator, respectively.
4. Remove the radiator attaching bolts, and remove radiator.
5. Remove fan blade assembly.

Removal of interior parts

1. Take out the gearshift lever assembly.

Removal of parts under the floor

1. Remove the parking brake return spring and disconnect brake cable.
2. Disconnect the propeller shaft from the transmission. (Refer to "Propeller shaft replacement procedure" section 07 & 07A of this manual.)
3. Remove the clutch return spring.
4. Disconnect the clutch control cable from the clutch lever and remove it from engine stiffener.
5. Remove the front side exhaust pipe bracket from the transmission.
6. Disconnect the mounting clamp of front side exhaust pipe.
7. Disconnect the speedometer cable.
8. Remove the rear speedometer cable.

**NOTICE:** Check that the engine is slightly lifted before removing the rear engine mounting bolts.

**Engine removal**
1. Check to make certain all the parts have been removed or disconnected from the engine.
2. Raise the engine toward front of the vehicle.
3. Remove the transmission assembly from the engine.

**INSTALLATION**

**Installation steps**
To install the engine in the vehicle, reverse the removal procedure.

**Preparation for engine installation**
1. Check harnesses for damage and correct or replace with new ones as necessary.
2. Check the engine mounting rubbers for looseness or damage and tighten or replace with new ones as necessary.

**Steps to be followed after engine installation**
1. Fill the engine cooling system.
2. Fill the engine crankcase with engine oil.
3. Check and adjust clutch pedal free play as necessary.
4. Start and let the engine run at idle and check for leakage.
5. Adjust the following.
   a. Check and adjust fan belt tension as necessary.
   b. Adjust valve clearances.
   c. Adjust ignition timing.
   d. Adjust engine idle.
Disassembly steps

1. Air cleaner assembly
2. Carburator assembly
3. EGR pipe
4. Inlet manifold
5. Distributor assembly

6. Starter motor assembly
7. Oil filter and unit
8. Oil pressure switch
9. Power steering pump and bracket
10. Air conditioning compressor (If so equipped)
Disassembly steps

1. Engine mounting bracket
2. Fan and clutch assembly
3. V-belt; air pump
4. Air pump and bracket "B"
5. V-belt; alternator
6. Generator and bracket
7. Oil pan and oil level gauge
8. O₂ sensor (California only)

* Installation engine assembly to engine stand, then remove the engine hanger.

9. Exhaust manifold
10. Air pump bracket "A"
11. Crankshaft pulley and water pump pulley
12. Water inlet pipe
13. High-tension cord
14. Spark plug
15. Air injection manifold
Disassembly steps

1. Crankshaft pulley bolt  
2. Timing belt cover  
A 3. Timing belt  
A 4. Tension pulley and tension spring  
5. Crankshaft timing pulley  
6. Camshaft timing pulley  
7. Camshaft boss  
A 8. Oil pump and pulley  
9. Water pump  
10. Front plate
Important operations

3. Timing belt

4. Tension pulley and tension spring
   (1) Remove the tension spring.
   (2) Loosen bolt (§), draw the tension pulley fully to the water pump side.
   (3) Remove the timing belt.
   (4) Remove the tension pulley and tension spring.
   (5) Remove the crank timing pulley and guide plate.

6. Camshaft timing pulley

   Apply a detention to the pulley by putting a T-bar wrench or other proper tool over the front-plate fitting bolt and loosen the pulley fitting bolts.

   Note: The timing belt must be off (removed from) the camshaft timing pulley during both removal and installation of the camshaft timing pulley.

8. Oil pump and pulley

   Apply a detent with an inner hex, and loosen the oil pump pulley bolt and remove the pulley.

   Wrench; inner hex = 6 mm
Disassembly steps
A 1. Flywheel
A 2. Rear plate
A 3. Rocker arm bracket and shaft
A 4. Camshaft and oil seal
A 5. Cylinder head and gasket
A 6. Oil pipe assembly
A 7. Front oil seal retainer
A 8. Piston and connecting-rod
A 9. Crankshaft and bearing caps

* : Repair kit
Important operations

1. Flywheel
Hold the crankshaft from turning using wooden bar and remove the flywheel mounting bolts. Remove the flywheel by tapping on it with a plastic hammer. Flywheel is a heavy mass and should be handled carefully so as not to drop it.

3. Rocker arm bracket and shaft
Sequentially loosen and remove the rocker arm shaft tightening nuts from the outermost one, and remove the rocker arm shaft with the bracket as an assembly.

5. Cylinder head and gasket
Loosen the head bolts evenly from the outermost one using an extension bar wrench and thereby remove the cylinder head. Remove also the gasket at this time. Wrench ; inner hex = 10 mm

6. Oil pipe assembly
Remove the oil pipe assembly fitting bolts and draw the pipe out from the cylinder block.
7. Front oil seal retainer
Front oil seal replacement.
Remove the front oil seal with driver.

Attach the oil seal using a special tool
Front oil seal installer : J-26587

8. Piston and connecting-rod
(1) Remove carbon adhering to the upper section of the cylinder bore.

(2) Draw out the piston while pushing the end of the connecting-rod.
(3) Remove the connecting-rod bearing.

9. Crankshaft and bearing caps
Loosen and remove the crankshaft bearing caps in the order indicated in the figure.
Remove the crankshaft.
Disassembly steps
A 1. Piston rings
A 2. Piston pin

3. Piston
4. Connecting-rod with bearing

Important operations
1. Piston rings

Remove the piston rings with a piston ring expander.
2. Piston pin
Remove the piston pin using a piston pin service set piston support with a press.
Remover and installer : J-24086
1. Remover : J-24086-8
2. Bass fixture : J-24086-8
3. Piston support : J-24086-75
Disassembly steps

1. Nut; rocker arm bracket
2. Bolt; rocker arm bracket
3. Spring; rocker arm
4. Shaft; rocker arm
5. Rocker arm
6. Bracket; rocker arm shaft
Disassembly steps

- 1. Split collar
- 2. Upper spring seat
- 3. Valve spring
- 4. Oil controller
- 5. Valve
- 6. Lower spring seat

Important operations

1. Split collars
   Compress the spring with valve spring compressor and remove the split collars.
   When compressing the spring, push the valve up by your hand.
   Valve spring compressor: J-26513-A
INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal condition are found through inspection.

Note: Wash and clean each parts detached to remove all dirt, carbon, contaminated oil, rust, fur and other foreign matters. Ample care should be taken to avoid damage when removing carbon adhering to the piston, cylinder head, valve, and other parts. Employ compressed air to remove foreign matters in the oil hole of each parts, and confirm there is no choking.

CYLINDER HEAD

Visual check
Remove carbon adhering to the lower face while taking care not to damage the valve seat and other parts, and check for cracks and damage.

Distortion of lower face
Make six measurements on the four sides and the diagonals, and if the limit is exceeded make necessary correction or replacement.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
<th>Maximum repairable limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05(0.003) or less</td>
<td>0.2(0.008)</td>
<td>0.4(0.016)</td>
</tr>
</tbody>
</table>

Distortion of manifold face
Make measurement in a manner similar to that for the cylinder head. If the limit is exceeded make necessary correction.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05 (0.002) or less</td>
<td>0.4 (0.016)</td>
</tr>
</tbody>
</table>
Combustion chamber
Remove adhering carbon and inspect the combustion chamber inside, spark plug hole, valve seat insert engagement section and other parts. If there is a crack or considerable damage replace it with a new one.

CYLINDER BODY

Distortion of upper face
Make measurements on the four sides and the diagonals with a straightedge and thickness gauge as shown in the figure. If the limit is exceeded make necessary correction or replacement.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
<th>Maximum repairable limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05(0.002) or less</td>
<td>0.2(0.008)</td>
<td>0.4(0.016)</td>
</tr>
</tbody>
</table>

Cylinder bore
Measure the cylinder bore diameter at points approximately 8 to 70mm from the upper end in directions in line with and at a right angle to the crankshaft.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
<th>Max. bore dia</th>
</tr>
</thead>
<tbody>
<tr>
<td>89.30-89.34 (3.518-3.520)</td>
<td>0.2 (0.008)</td>
<td>90.34 (3.557)</td>
</tr>
</tbody>
</table>

Reboring is necessary if the amount of wear is greater than 0.2mm over standard size, or if scuffing or trace of seizure is noticeable. All cylinder should be rebored even if only one cylinder fails to meet standard. Replace the cylinder block if bore diameter exceeds max. bore dia. specified above.

Remove steps at upper part of cylinder walls with a ridge reamer whenever the engine is overhauled.
Valve seat thickness

Head edge thickness:

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet</td>
<td>1.1 (0.0433)</td>
<td>0.8 (0.0315)</td>
</tr>
<tr>
<td>Exhaust</td>
<td>1.3 (0.0512)</td>
<td>1.0 (0.0394)</td>
</tr>
</tbody>
</table>
**Valve Guide**

**Valve stem diameter**
Set a dial gauge as shown in the figure and measure the clearance between the valve guide and valve stem.

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake</td>
<td>0.023 - 0.056</td>
<td>0.2 (0.0079) or more</td>
</tr>
<tr>
<td></td>
<td>(0.009 - 0.0022)</td>
<td></td>
</tr>
<tr>
<td>Exhaust</td>
<td>0.038 - 0.070</td>
<td>0.25 (0.0097) or more</td>
</tr>
<tr>
<td></td>
<td>(0.0015 - 0.0031)</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** If the clearance between the valve stem outer circumference and valve guide exceeds the limit replace the valve and valve guide as a pair.

**Valve guide replacement**
Hit the valve guide out from the combustion chamber side to the cam side using a valve guide remover.

Valve guide remover: J-26512-1

Apply engine oil to the outer circumference of the valve guide and hit it in, with a valve guide installer, until the top end of the installer hits the cylinder head.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Height of valve guide upper-end from cylinder head upper face (A)</td>
<td>16.1 - 16.3 (0.634 - 0.642)</td>
<td></td>
</tr>
</tbody>
</table>

Valve guide installer: J-26512
J-26512-1
J-26512-2
**Valve seat insert**

Attach a new valve to the cylinder head and measure the amount of sinking from the head surface with a depth gauge. If the limit is exceeded replace the valve seat insert.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 (0.039)</td>
<td>1.7 (0.067)</td>
</tr>
</tbody>
</table>

If the seat contact surface is damaged or made rough or if the wear of the contact width exceeds the limit make necessary correction.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2-1.6 (0.048 - 0.063)</td>
<td>2.0 (0.078)</td>
</tr>
</tbody>
</table>

**Correction of valve seat**

Remove carbon from the seat surface, cut to the minimum extent to remove flaws and roughness of the seat surface with 15°, 45° and 75° valve seat cutters, and thus correct the contact width to a standard value.

Apply compound to the valve seat surface and fit while turning the valve and hitting light. Insure that the whole circumference contacts the valve in the center of the valve seat surface and that the valve seat contact width is a standard value.
Valve seat insert replacement

1. Arc-weld, at several points, a rod to draw it out into the valve seat while taking care to avoid damage to the aluminum apply section.

2. When the cylinder head heated by welding is cooled by air for 2 to 5 minutes, the valve seat shrinks because of local cooling of the valve seat. So give a shock to the welded rod and draw it out.

3. Clean the valve seat press-fit section on the cylinder head side while taking care to avoid damage to it, heat and expand the insert press-fit section using steam or other means, and press fit horizontally the valve seat cooled and contracted with dry ice or other means.

<table>
<thead>
<tr>
<th>Standard fitting interference</th>
<th>mm(in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.08-0.12 (0.0032-0.0047)</td>
</tr>
</tbody>
</table>

FLYWHEEL

Flywheel
Check the flywheel's friction face with the clutch driven plate for cracks and damage.

<table>
<thead>
<tr>
<th></th>
<th>mm(in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Limit</td>
</tr>
<tr>
<td>43.45 (1.711)</td>
<td>42.45 (1.671)</td>
</tr>
</tbody>
</table>

If damage or considerable wear is found in the surfaces of the ring gear teeth, replace it with a new one.

Ring gear replacement
Remove the ring gear by hitting with a hammer through a brass rod placed between it and the hammer.
Heat and expand the ring gear evenly with a gas burner or other means an tap it into the flywheel.

Note: After shrink fitting comfirm that the ring gear is in close contact with the flywheel.

INLET AND EXHAUST MANIFOLD

Inlet manifold
Check the cylinder head fitting face of the intake manifold for distortion.

<table>
<thead>
<tr>
<th>Limit</th>
<th>mm(in.)</th>
<th>0.4 (0.016)</th>
</tr>
</thead>
</table>

Exhaust manifold
Check the cylinder head fitting face of the exhaust manifold for distortion.

<table>
<thead>
<tr>
<th>Limit</th>
<th>mm(in.)</th>
<th>0.4 (0.016)</th>
</tr>
</thead>
</table>
ROCKER ARM SHAFT AND ARM ASSEMBLY

Rocker arm shaft
Visually inspect for damage or other abnormal conditions.

<table>
<thead>
<tr>
<th>Run-out:</th>
<th>mm(in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Limit</td>
</tr>
<tr>
<td>0.2 (0.008) or less</td>
<td>0.4 (0.016)</td>
</tr>
</tbody>
</table>

Make measurement on four rocker arm fitting positions, and if the limit is exceeded replace it with a new one.

<table>
<thead>
<tr>
<th>Diameter:</th>
<th>mm(in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Limit</td>
</tr>
<tr>
<td>20.5 (0.807)</td>
<td>20.35(0.801)</td>
</tr>
</tbody>
</table>

Clearance between rocker arm shaft and rocker arm
Measure the inner diameter of the rocker arm, and if the clearance between it and the outer diameter of the rocker arm shaft exceeds the limit, replace the rocker arm or shaft.

<table>
<thead>
<tr>
<th>Clearance</th>
<th>mm(in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Limit</td>
</tr>
<tr>
<td>0.005-0.045(0.0020-0.0018)</td>
<td>0.2 (0.0078)</td>
</tr>
</tbody>
</table>
When the limit is exceeded in the following inspection, replace the camshaft.

**Camshaft diameter and height of camlobe**

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journal diameter</td>
<td>34.0(1.339)</td>
<td>33.8(1.332)</td>
</tr>
<tr>
<td>Height of camlobe</td>
<td>36.85(1.452)</td>
<td>36.35(1.432)</td>
</tr>
<tr>
<td>Taper</td>
<td>0.05(0.002) or less</td>
<td>0.05(0.002)</td>
</tr>
</tbody>
</table>

**Run out:**

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.05(0.002) or less</td>
<td>0.1(0.004)</td>
</tr>
</tbody>
</table>

**Clearance between journal and bearing**

Tighten the rocker arm shaft bracket with predetermined torque and make measurement.

| Torque          | 2.1-2.3 (15.2-16.6) |

**Clearance between journal and bearing:**

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.065 - 0.110</td>
<td>0.15 (0.0059)</td>
</tr>
<tr>
<td></td>
<td>(0.0026 - 0.0043)</td>
<td></td>
</tr>
</tbody>
</table>

**End play**

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.05 - 0.15</td>
<td>0.2 (0.0079)</td>
</tr>
<tr>
<td></td>
<td>(0.0002 - 0.0059)</td>
<td></td>
</tr>
</tbody>
</table>
Distributor drive gear
Check for wear or damage.

CRANK SHAFT PILOT

Crankshaft pilot bearing and sleeve
Turn the pilot bearing with your finger and check for bearing backlash or abnormal noise.

When an abnormality is noted, remove the pilot bearing using a pilot bearing puller and replace it with a new one.

Pilot bearing remover : J-23097
Sleeve remover : J-33950

Attach the pilot bearing using a pilot bearing installer.

Pilot bearing installer : J-26516-A
Sleeve installer : J-29818
Crankshaft and bearings

Check the faces of the crankshaft journals, crankpins and oil seal fitting faces for wear and damage and oil passages for restrictions.

Check for run-out by turning the crankshaft slowly with the probe of a dial indicator set against the No. 3 journal.

Run out:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.03 (0.0012) or less</td>
<td>0.1 (0.004)</td>
</tr>
</tbody>
</table>

Measure the journal and pin diameters for front and back (I and II shown in the figure) in two directions of A and B.

Crankshaft journal and pin diameter:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit for use</th>
</tr>
</thead>
<tbody>
<tr>
<td>55.920-55.935 (2.2032-2.2038)</td>
<td>55.420 (2.184)</td>
</tr>
<tr>
<td>48.925-48.940 (1.9276-1.9282)</td>
<td>48.425 (1.908)</td>
</tr>
</tbody>
</table>

When the wear of the journal or pin exceeds the limit, replace the crankshaft.

Crankshaft journal and pin taper:

<table>
<thead>
<tr>
<th>Limit for use</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05 (0.002)</td>
</tr>
</tbody>
</table>

When the limit is exceeded correct with a grinder and replace with an undersized bearing.
If the amount of wear is beyond the value specified, correct with crankshaft grinder and install undersize bearings.

### Crankshaft bearing

**Bearing tension free width:**

<table>
<thead>
<tr>
<th></th>
<th>mm (in.)</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cranksaft bearing</td>
<td>More than 59.25 (2.334)</td>
<td></td>
</tr>
<tr>
<td>Connecting-rod bearing</td>
<td>More than 52.25 (2.059)</td>
<td></td>
</tr>
</tbody>
</table>

Attach the bearing normally to the body and bearing caps and tighten the bearing cap with predetermined torque and measure the inner diameter.

| Torque kg-m(ft.lbs.) | 9 - 11 (65.1 - 79.5) |

### Clearance between journals and bearings:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.015 - 0.066</td>
<td>0.12 (0.0047)</td>
</tr>
<tr>
<td>(0.0006 - 0.0026)</td>
<td></td>
</tr>
</tbody>
</table>

Attach the bearing normally to the larger end of the connecting-rod and tighten the connecting-rod cap with predetermined torque and measure the inner diameter.

| Torque kg-m(ft.lbs.) | 5.8 - 6.2 (41.9 - 44.8) |

### Clearance between pins and bearings:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.011 - 0.065</td>
<td>0.12 (0.0047)</td>
</tr>
<tr>
<td>(0.0004 - 0.0026)</td>
<td></td>
</tr>
</tbody>
</table>
Measurement of clearance using plastigage

Clean the journal cap and bearing. Lay a plastigage over the full width of the bearing.

Tighten the bearing cap with predetermined torque.

<table>
<thead>
<tr>
<th>Torque</th>
<th>kg-m(ft.lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9 - 11</td>
</tr>
<tr>
<td></td>
<td>(65.1 - 79.5)</td>
</tr>
</tbody>
</table>

Do not turn the crankshaft

Check the width of plastigage stuck to either crankshaft or bearing against the scale printed on the container of the plastigage.

Measure play at thrust bearing installed on bearing cap No. 3 using a feeler gauge. Crankshaft end play:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.06 - 0.25</td>
<td>0.3 (0.012)</td>
</tr>
<tr>
<td>(0.0024 - 0.0099)</td>
<td></td>
</tr>
</tbody>
</table>
PISTON AND PISTON RING

Pistons
If there is a crack, streak, or considerable wear found in the piston, replace it with a new one.

Clearance between piston and cylinder bore (at Grading piston and measuring position).

If the clearance exceeds the limit, select and use an oversized piston.

<table>
<thead>
<tr>
<th>Standard mm(in.)</th>
<th>0.045 - 0.065</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.0018 - 0.0026)</td>
</tr>
</tbody>
</table>

Reboring Procedure of Cylinder Block

1. Determine size of oversize pistons to be installed according to largest bore diameter.
2. When the oversize is determined, measure the outside diameter of the pistons at a grading point below the upper face of the piston (grading positions) and in a direction at right angles to the crankshaft.

Calculate the cylinder bore diameter to be obtained after reboring by the following formula:

Cylinder bore diameter (after boring) = D + C - H

D: Oversize piston diameter (mm)
C: Piston clearance (0.035 — 0.055 mm)
H: Allowance for honing (0.03 mm or less)

Take measurement in direction at a right angle to the piston pin hole.
Grading position | 42
STD piston | 89.255 - 89.295
0/S piston 0.50 | 89.755 - 89.795
0/S piston 1.00 | 90.255 - 90.295
Allowance for honing | 0.01 - 0.03
Variance of bore diameter | 0.02 or less

(Reference) Grade of cylinder bore and piston (STD size)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Cylinder bore diameter</th>
<th>Piston diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
<td>89.300 - 89.320</td>
<td>89.255 - 89.275</td>
</tr>
<tr>
<td>(C)</td>
<td>89.321 - 89.340</td>
<td>89.276 - 89.295</td>
</tr>
</tbody>
</table>

Piston ring
Remove carbon adhering to the piston ring and inspect the piston ring for damage.

Put the ring in the cylinder, push it in with the head of the piston to the section of minimum inner diameter, and measure the abutment clearance. If the limit is exceeded replace it with a new one.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st compression ring</td>
<td>0.30-0.45 (0.012-0.018)</td>
</tr>
<tr>
<td>2nd compression ring</td>
<td>0.25-0.40 (0.010-0.016)</td>
</tr>
<tr>
<td>Oil ring</td>
<td>0.20-0.70 (0.008-0.028)</td>
</tr>
</tbody>
</table>

Clearance between piston ring and ring groove:
Remove carbon in the gaps between the piston ring grooves and rings, and measure the outer circumference at several points with a thickness gauge.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st compression ring</td>
<td>0.025-0.060 (0.001-0.0024)</td>
</tr>
<tr>
<td>2nd compression ring</td>
<td>0.020-0.055 (0.001-0.0024)</td>
</tr>
</tbody>
</table>
Piston ring tension

Measure the piston ring tension with a piston ring tester. If the tension is beyond the limit replace the piston ring with new one.

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st compression ring</td>
<td>1.11-1.59 (2.448-3.506)</td>
<td>0.8 (1.764)</td>
</tr>
<tr>
<td>2nd compression ring</td>
<td>0.89-1.31 (1.962-2.889)</td>
<td>0.6 (1.323)</td>
</tr>
<tr>
<td>O-ring</td>
<td>3.05-4.35 (6.725-9.592)</td>
<td>2.0 (4.410)</td>
</tr>
</tbody>
</table>

Piston ring size mark

<table>
<thead>
<tr>
<th></th>
<th>1st comp. ring</th>
<th>2nd comp. ring</th>
<th>Oil ring</th>
</tr>
</thead>
<tbody>
<tr>
<td>STD</td>
<td>None</td>
<td>None</td>
<td>Red</td>
</tr>
<tr>
<td>O/S 0.50</td>
<td>50</td>
<td>50</td>
<td>Blue</td>
</tr>
<tr>
<td>O/S 1.00</td>
<td>100</td>
<td>100</td>
<td>Yellow</td>
</tr>
</tbody>
</table>
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**CONNECTING-ROD AND PISTON PIN**

### Connecting-rod and piston pin

**Connecting-rod**

Measure distortion and parallelism between the larger end hole and smaller end hole using a connecting-rod aligner. If the limit is exceeded replace it with a new one.

**Connecting-rod aligner (Per length of 100 mm (3.97 in.))**

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distortion</td>
<td>0.05 or less</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>(0.002 or less)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Parallelism</td>
<td>0.05 or less</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>(0.002 or less)</td>
<td>(0.006)</td>
</tr>
</tbody>
</table>

**Piston pin**

Visually inspect for damage, wear or the abnormal conditions.

**Outside diameter:**

<table>
<thead>
<tr>
<th></th>
<th>mm (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>23.0 (0.906)</td>
</tr>
<tr>
<td>Limit</td>
<td>22.97 (0.905)</td>
</tr>
</tbody>
</table>

**Clearance between piston pin and connecting-rod small end.**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.008 - 0.020</td>
<td>0.05</td>
</tr>
<tr>
<td>(0.0003 - 0.0008)</td>
<td>(0.002)</td>
</tr>
</tbody>
</table>

**Note:** If the limit is exceeded replace the piston pin or connecting-rod to bring the clearance into the standard value range.
TIMING BELT TIMING PULLEY AND TENSION SPRING

INSPECTION AND REPAIR

TIMING BELT

Caution in handling

1. Do not bend in less than 20 mm in radius.

2. Avoid twisting or kinking the belt and keep it free from water, oil, dust and other foreign matter.

Visual check
The belt must be replaced if cracks are found in the side and rear faces.

Also replacement is necessary when abnormal wear is found in the side face.
Replacement is necessary when fabric is found to be cracked or disintegrated.

Replacement is also necessary when cogs are found to have abnormal wear.

Take measurements at 3 — 5 points around the circumference of the belt. The belt must be replaced even if a single measurement is beyond the limit.

<table>
<thead>
<tr>
<th>Limit of rubber hardness (HS)</th>
<th>90</th>
</tr>
</thead>
</table>

Rubber hardness tester

The timing belt is a vital part of the engine and should be maintained properly.
Timing pulley and tension spring

Visual check

If uneven wear, crack or wear exceeding the limit is found in the pulley, replace it with a new one.

Timing pulley

Outside diameter:

<table>
<thead>
<tr>
<th>Pulley</th>
<th>Standard (mm/in.)</th>
<th>Limit (mm/in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crankshaft</td>
<td>65.33 (2.574)</td>
<td>65.23 (2.570)</td>
</tr>
<tr>
<td>Oil pump</td>
<td>113.84 (4.485)</td>
<td>113.74 (4.481)</td>
</tr>
<tr>
<td>Camshaft</td>
<td>132.03 (5.202)</td>
<td>131.93 (5.198)</td>
</tr>
</tbody>
</table>

Tension pulley

Check the roller for excessive wear and damage.
Check to see that the roller rotates smoothly.
Check to see that there is no play in the pulley shaft/fixing plate caulked area.

Outside diameter:

<table>
<thead>
<tr>
<th>Standard (mm/in.)</th>
<th>Limit (mm/in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60.00 (2.364)</td>
<td>59.80 (2.356)</td>
</tr>
</tbody>
</table>

Tension spring

Check for tension:

<table>
<thead>
<tr>
<th>Tension</th>
<th>Set length (mm/in.)</th>
<th>Set force (kg/lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension</td>
<td>78.8 mm (3.105 in.)</td>
<td>23.8 - 25.8 kg (172 - 186 lbs.)</td>
</tr>
</tbody>
</table>

If the set length or set force is out of the specified range, replace the tension spring with a new one.
REASSEMBLY

MINOR COMPONENTS

PISTON AND CONNECTING-ROD ASSEMBLY

Reassembly steps

A 1. Connecting-rod with bearing 
   • 2. Piston 
   A 3. Piston pin 
   • 4. Piston ring

Important operations

1. Connecting-rod
2. Piston

Apply engine oil to the piston and connecting-rod and then touch the piston hole with finger to check if insertion is possible.
Bring the capital letter ISUZU side of the connecting-rod into agreement with the cut-out front mark of the piston.

Insert the piston pin into push rod, then screw these parts into guide rod.

3. Piston pin
Press in the piston pin using a piston pin service set piston support and installer and a press.
Remover and installer : J-24086
1. Installer : J-24086-9
2. Base fixture : J-24086-12
4. Piston support : J-24086-75

4. Piston ring
Install the oil control ring assembly in the order of expander ring, lower side rail and upper side rail.
Assembly the piston rings to the piston so that the T mark is turned up.
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After installation of piston rings, apply engine oil to the circumference of the rings and check that each ring rotates smoothly.

ROCKER ARM SHAFT

Reassembly steps
1. Bracket; rocker arm
2. Shaft; rocker arm
3. Rocker arm
4. Spring; rocker arm
5. Nut; rocker arm bracket

Important operations
2. Shaft; rocker arm
3. Rocker arm

Apply oil sufficiently to the rocker arm and shaft. Place the longer end of the shaft on the exhaust side, the shorter end on the inlet side, and the shaft mark to the front.
Reassembly steps

1. Lower spring seat
2. Oil controller
3. Valve
4. Valve spring
5. Upper spring seat
6. Split collar
Important operation

1. Lower spring seat
2. Oil controller

Install the spring seat (lower) and fit the oil controller in the valve guide.

Note: Be sure to set the inner projection of the oil controller in the head groove of the valve guide.

3. Valve

Apply engine oil to the valve stem and insert it into the valve guide.

4. Valve spring

Install the inner and outer springs with light green colored ends turned to lower seat or install the valve springs with their close pitched end down.

6. Split collars

Compress the spring with the aid of valve spring compressor, then install the valve collars properly.

When compressing the spring, push the valve up by your hand. Valve spring compressor : 26513-A
MAJOR COMPONENTS (1)

Reassembly steps

1. Crankshaft bearing and thrust bearing
2. Crankshaft bearing cap and bearing
3. Piston and connecting-rod
4. Connecting-rod bearing cap and bearing
5. Rear plate
6. Flywheel
7. Oil pipe assembly
8. Front oil seal retainer
9. Cylinder head and gasket
10. Camshaft
11. Rocker arm bracket
12. Rocker arm shaft

*; Repair kit
Important operation

1. Crankshaft, bearing and thrust bearing
Apply engine oil sufficiently to the inner surface of the bearing and place the crankshaft on it.

Note: Assemble with the oil groove of the thrust washer turned outward.

The bearing should be installed correctly in their respective position, install the thrust bearing with the oil grooved side turned outward.

Apply silicon gasket to the fit surface of No. 5 bearing cap and assemble with care to avoid any misalignment between the rear surface of the cylinder body and that of the bearing cap.

2. Crankshaft bearing cap and bearing
Apply engine oil to the threads and seating face of the bolts. Install the bearing caps in sequence of cylinder numbers with the arrow mark pointing to front of engine and semitighten the bolts.

Then retighten the bolts to specification.

<table>
<thead>
<tr>
<th>Torque</th>
<th>kg-m(ftlbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9-11 (65.1-79.5)</td>
</tr>
</tbody>
</table>

After tightening, check to make certain the crankshaft rotates smoothly.
Apply engine oil to the lip of the rear oil seal and set the oil seal in place using an installer.

Crankshaft rear oil seal installer: J-29818

3. Piston and connecting-rod

Fit the bearing into the connecting-rod and bearing cap and apply engine oil. Confirm that the opening portion of the piston ring is positioned as shown in the figure and then apply engine oil to the outer circumference of the piston.

Insert the piston and connecting-rod assembly into cylinder bore with the front mark on the piston turned to the front of engine using the piston ring compressor and hammer handle.

Piston ring compressor: J-8037

4. Connecting-rod bearing cap and bearing

Bring the matching (cylinder) number of the connecting-rod bearing cap into agreement with that of the connecting-rod.

Apply engine oil to the threads, then install and tighten the bolt to specification.

| Torque kg-m(ft.lbs.) | 5.8-6.2 (41.9-44.8) |

After tightening bolt, check to make certain the crankshaft rotates smoothly.
5. Rear plate
Install the rear plate in position by aligning it with dowel on the cylinder body.

| Torque kg-m(ft.lbs.) | 4.0-6.0 (2.89-4.34) |

6. Flywheel
(1) Apply adhesive to the first thread of the bolt.
(2) Attach the flywheel, hold the crankshaft and tighten with predetermined torque diagonally with the pallet of the washer turned outward.
(3) Be sure to replace the flywheel fitting bolts with new ones because they cannot be reused.

| Torque kg-m(ft.lbs.) | 5.5-6.5 (39.8-46.9) |

8. Front oil seal retainer
Apply engine oil to lipped portion of oil seal, then install the front oil seal retainer by aligning it with the dowels on the cylinder body together with gasket. The gasket should be flush with the face of the cylinder face.

9. Cylinder head and gasket
Clean the upper face of the cylinder head and attach the dowels.

Turn the TOP mark of the cylinder head gasket upwards and attach it so as to fit the dowel.
Apply engine oil to the threaded sections of the head bolts and temporarily tighten them in the order indicated in the figure, followed by tightening with predetermined torque.

<table>
<thead>
<tr>
<th>Torque</th>
<th>First step</th>
<th>Final step</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg-m (ft.lbs.)</td>
<td>8.0 (57.8)</td>
<td>9.0-11.0 (65.1-79.5)</td>
</tr>
</tbody>
</table>

10. Camshaft

Apply engine oil sufficiently to the journal of the camshaft and the journal and thrust receivers of the head.

Turn the camshaft mark upward.

11. Rocker arm bracket

Apply silicon gasket beforehand to the front side of the fit surface of No. 1 rocker arm bracket with the cylinder head.

12. Rocker arm shaft

Assemble the rocker arm assembly, with the matchmark turned upward.

Attach the rocker shaft spring and tighten the shaft bracket in the order indicated with predetermined torque.

<table>
<thead>
<tr>
<th>Torque</th>
<th>No. 1 - 10 (Nut)</th>
<th>Bolt</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg-m (ft.lbs.)</td>
<td>2.1-2.3 (15.2-16.6)</td>
<td>0.6-1.0 (4.34-7.23)</td>
</tr>
</tbody>
</table>

After assembly apply enough drops of engine oil around the rocker arm shaft and valve.
Reassembly steps

1. Front plate
2. Water pump
3. Oil pump and pulley
4. Camshaft boss
5. Camshaft timing pulley
6. Crankshaft timing pulley and guide plate
7. Tension pulley and tension spring
8. Timing belt
9. Timing belt cover
10. Crankshaft pulley bolt

*; Repair kit
2. Water pump
Tighten the water pump assembly with predetermined torque.

| Torque kg-m(ftlbs.) | 1.4-2.4(10.1-17.4) |

3. Oil pump and pulley
(1) Apply a generous amounts of engine oil to the rotor, then install the rotor with the chamfered side turned to the cylinder body.

(2) Apply engine oil to the O-ring and insert it into the groove in the housing. Attach the rotor after applying generous amounts of engine oil.

| Torque kg-m(ftlbs.) | 1.4-2.4(10.1-17.4) |

Wrench ; inner hex = 6 mm

(3) Check if it turns smoothly. If not replace the cartridge assembly.

(4) Attach the pulley and tighten with predetermined torque.

| Torque kg-m(ftlbs.) | 6.7-8.7(48.4-62.9) |

5. Camshaft timing pulley
Apply a detention to the pulley by putting a T-bar wrench or other proper tool over the front plate upper fitting bolt and tighten with predetermined torque.

| Torque kg-m(ftlbs.) | 6.7-8.7(48.4-62.9) |
6. Crankshaft timing pulley
Attach the guide plate and assemble with the brim side of the timing pulley turned upward.

7. Tension pulley and tension spring
Insert the tension pulley into stud A, set the tension spring in plate, and temporarily tighten bolt B after pulling it fully to the water pump side.

8. Timing belt
Install the timing belt in the sequence indicated below.

(1) Bring the matchmark of the crankshaft timing pulley into agreement with that of the front oil seal retainer.

(2) Bring the matchmark of the camshaft timing pulley into agreement with that of the front plate. Keep the rocker arm altogether in a free state.

Note: At this point the No. 4 cylinder comes to its compression upper dead center.

(3) Lay the timing belt over the crank pulley, oil pump pulley, cam pulley, and tension pulley in said order while avoiding loosening between them.
(4) Loosen bolt B, tighten the belt by the force of the tension spring, and then tighten bolt B temporarily.

Note: At this point check if the matchmark of the crankshaft is in agreement with that of the camshaft timing pulley.

(5) Temporarily attach the crank pulley. Turn the crankshaft two revolutions in the opposite direction of normal rotation to bring the crankshaft setting mark into agreement with the crankshaft pulley setting mark loosen bolt B and tighten the belt with the tension pulley. Tighten bolt B to the specified torque.

<table>
<thead>
<tr>
<th>Torque</th>
<th>kg·m(ft.lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.4-2.4(10.1-17.4)</td>
</tr>
</tbody>
</table>

9. Timing belt cover (upper and lower)
Attach the timing belt cover and tighten with predetermined torque.

<table>
<thead>
<tr>
<th>Torque</th>
<th>kg·m(ft.lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5-1.0(3.6-7.2)</td>
</tr>
</tbody>
</table>

10. Crankshaft pulley bolt
Apply a detention to the crankshaft and tighten with predetermined torque.

<table>
<thead>
<tr>
<th>Torque</th>
<th>kg·m(ft.lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10.5-13.5(75.9-97.6)</td>
</tr>
</tbody>
</table>

Valve clearance adjustment
Bring either the No. 1 or No. 4 piston to top dead center on the compression stroke. Do this by turning the crankshaft to align mark on crankshaft pulley with timing mark. Hold crankshaft in above position and adjust clearance of the valves indicated.
Adjust the valve clearance in the following manner using a feeler gauge.

<table>
<thead>
<tr>
<th>Valve</th>
<th>Intake (cold)</th>
<th>Exhaust (cold)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.15 (0.006)</td>
<td>0.25 (0.010)</td>
</tr>
</tbody>
</table>

**Cylinder No.**

<table>
<thead>
<tr>
<th>Valve</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake</td>
<td>O</td>
<td>O</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Exhaust</td>
<td>O</td>
<td>•</td>
<td>O</td>
<td>•</td>
</tr>
</tbody>
</table>

**Note:**
- When piston in No. 1 cylinder is at TDC on compression stroke.
- When piston in No. 4 cylinder is at TDC on compression stroke.
Reassembly steps

1. Inlet manifold
2. Oil filter and unit
3. Oil pan
4. Distributor assembly
5. Head cover
6. Starter motor assembly
7. EGR pipe
8. Power steering pump and bracket
9. Aircon compressor (If so equipped)
10. Oil pressure switch
Important operations

1. **Inlet manifold bolt**
   Tighten the intake manifold with predetermined torque.

   | Torque kg-m(ft.lbs.) | 1.9-2.5 (13.7-18.1) |

   Be absolutely certain to apply an adequate amount of silicon gasket to the area indicated by the arrow in the illustration.

3. **Oil pan**
   Install the bolts in sequence commencing with the bolts on center.

   | Torque kg-m(ftlbs.) | 1.5—2.1 (10.8—15.2) |

   Carefully note the position of the crankcase front and rear arches.
   Insert the packing.
   Minimize the packing level as much as possible.
4. Distributor
(1) Move the No. 4 piston (cylinder) to the top dead center position on the compression stroke.
(2) Apply engine oil to the O-ring.
(3) Check to see that the setting marks on the distributor shaft and the cylinder head are aligned.

5. Head cover
Apply silicon gasket to the arched portion of the camshaft bearing cap.
Tighten the head cover with predetermined torque.

<table>
<thead>
<tr>
<th>Torque</th>
<th>kg-m (ft. lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8-1.2</td>
<td>5.78-8.7</td>
</tr>
</tbody>
</table>
Reassembly steps

1. Water inlet pipe
2. Air pump bracket "A"
3. Exhaust manifold
4. Air pump and bracket "B"
5. Generator and bracket
6. Crankshaft pulley and water pump pulley
7. V-belt generator
8. V-belt air pump
9. O₂ Sensor (California only)
10. Air injection manifold
11. Spark plug
12. High-tension cord
13. Fan and clutch assembly
14. Oil level gauge
15. Engine mounting bracket
Important operation

3. Exhaust manifold
Tighten the exhaust manifold with predetermined torque.

<table>
<thead>
<tr>
<th>Torque</th>
<th>kg-m(ftlbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.9-2.5 (13.7-18.1)</td>
</tr>
</tbody>
</table>

9. O₂ Sensor (California)
Apply rubber sealant to the threads before installation.

<table>
<thead>
<tr>
<th>Torque</th>
<th>kg-m(ftlbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.9-4.7 (28.2-34.0)</td>
</tr>
</tbody>
</table>
OIL PUMP

Disassembly steps
1. Nut
2. Oil pump pulley
3. Outer rotor
4. Key
5. Pin (Shaft-Rotor)
6. Inner rotor
7. Shaft
8. Housing
9. Oil seal
INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal condition are found through inspection.

Visually inspect the disassembled parts for wear, damage, or other abnormal conditions.

Insert the vane into the cylinder body and measure the top clearance.

<table>
<thead>
<tr>
<th>mm(in.)</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.04 - 0.09 (0.002 - 0.004)</td>
<td>0.15 (0.006)</td>
</tr>
</tbody>
</table>

Measure the clearance between the slide surfaces of the outer rotor and the cylinder body.

<table>
<thead>
<tr>
<th>mm(in.)</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.24 - 0.36 (0.009 - 0.014)</td>
<td>0.4 (0.016)</td>
</tr>
</tbody>
</table>
Clearance between the outer rotor and the inner rotor

<table>
<thead>
<tr>
<th>mm(in.)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Limit</td>
</tr>
<tr>
<td>0.13 - 0.15</td>
<td>0.2 (0.008)</td>
</tr>
<tr>
<td>(0.005 - 0.006)</td>
<td></td>
</tr>
</tbody>
</table>

**REASSEMBLY**

To assemble, follow the disassembly procedure in reverse order.
WATER PUMP

REMOVAL AND INSTALLATION

Removal steps
1. Bolts
2. Water pump assembly

Installation steps
1. Bolts
2. Water pump assembly
INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.

Visual check

Should any of the following problems occur, the entire water pump should be replaced as a unit.
1. Cracks in the water pump body
2. Water leakage from the seal unit
3. Play or abnormal noise in the bearing
4. Cracks or corrosion in the impeller

Important operation — Installation

1. Bolt

Tighten the water pump assembly with predetermined torque.

<table>
<thead>
<tr>
<th>Torque</th>
<th>kg-m(ft.lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.4-2.4 (10.1-17.4)</td>
</tr>
</tbody>
</table>
RADIATOR

REMOVAL AND INSTALLATION

Removal steps
1. Top hose
2. Bottom hose
3. Hose; surge tank
4. Fan shroud
5. Stay
6. Radiator assembly

Installation steps
To install, follow the removal procedure in reverse order.
Make necessary adjustments, repairs, and part replacements if wear, damage, or other problems are discovered during inspection.

(1) Radiator filler cap
Check the filler cap pressure valve opening pressure using a radiator filler cap tester. If the measurement deviates from the specified range, replace the cap assembly with a new one.

Cap tester : J24460-01

<table>
<thead>
<tr>
<th>Pressure valve</th>
<th>kg/cm²(lb/in²)(psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.8 - 1.2 (12.8 - 17.1)</td>
</tr>
</tbody>
</table>

Check the condition of the vacuum valve at the center part of the valve seat on the filler cap. Replace the cap with a new one if it is found to be rusted or fouled.

<table>
<thead>
<tr>
<th>Negative pressure valve</th>
<th>kg/cm²(psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.04 - 0.05 (0.6 - 0.7)</td>
</tr>
</tbody>
</table>

Check to see if the vacuum valve can be operated smoothly by hand. Clean or replace the valve with a new one if necessary.

(2) Inspection of the radiator for leakage
Check the cooling system for leakage at the following points by applying a pressure of 2 kg/cm² (28.5 psi) with a cap tester:
- Leakage from the radiator
- Leakage from the water pump
- Leakage from the water hoses
- Check the rubber hoses for swelling.

Cap tester : J-24460-01

(3) Radiator core
Thoroughly clean the radiator core to remove deposits of foreign matter from the front face and from between the cooling fins.
If the cooling fins are found to be distorted, make corrections taking care not to damage the joining portions between the fins and the water tubes.

(4) Water hoses
Check the top and bottom hoses for deterioration, swelling, or damage, and replace with new ones as necessary.
THERMOSTAT

Removal steps
1. Bolts
2. Water outlet pipe
3. Outlet pipe packing
4. Thermostat

Installation steps
1. Bolts
2. Water outlet pipe
3. Outlet pipe packing
4. Thermostat
Important operation — Installation

1. Bolts
Tighten the water pump assembly with predetermined torque.

<table>
<thead>
<tr>
<th>Torque (kg-m*ft.lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4-2.4 (10.1-17.4)</td>
</tr>
</tbody>
</table>

INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.

Submerge the thermostat assembly in water. Gradually increase the temperature of the water. Observe and record the temperature of the water at the time the valve first begins to open. Then observe and record the temperature at which the valve becomes fully open.

<table>
<thead>
<tr>
<th>Valve opening temperature</th>
<th>80.5 - 83°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve lift</td>
<td>8 mm or more at 95°C</td>
</tr>
</tbody>
</table>

Note:
1) It should take from three to five minutes for the valve to first begin to open, depending on the initial temperature of the water.

2) Do not directly apply heat to the thermostat during this procedure. Place wooden blocks at the bottom of the hot water container or suspend the thermostat with wire or rope into the container.

3) Frequently stir the hot water to ensure that the temperature is constant throughout the container.
HARD STARTING

**DIAGNOSIS**

**STARTING MOTOR DOES NOT TURN OVER**

- Check battery
  - Run down or under charged
    - Recharge or replace battery
      - Check terminal connection
        - Poorly connected
          - Clean battery post and terminal and connect properly
            - Check starting motor or switch
              - Defective
                - Overhaul or replace
        - Terminal connection OK

**Troubleshooting Procedure**

Turn on headlights and starter switch.

| Headlights go out or dim considerably. | a) Battery undercharged,  
|                                         | b) Starting motor coil circuit shorted,  
|                                         | c) Starting motor parts defective. |
| Headlights stay bright                 | a) Starting motor circuit open,  
|                                         | b) Starting motor coil open,  
|                                         | c) Starting switch defective. |
Spark Test

Remove the high-tension cable from any spark plug. Hold the end of the high-tension cable close to the engine block and while cranking engine, check to see if a spark jumps across the gap.

Be sure to cover the high-tension cable with dry paper, or some other good insulating material to prevent shock before cranking the engine.

| Spark jumps across the gap. | a) Ignition timing incorrect,  
  b) Spark plug defective,  
  c) Fuel not reaching carburetor or engine,  
  d) Engine lacks compression. |
|-----------------------------|--------------------------------------------------------------------|
| No sparking takes place.    | a) Primary coil circuit shorting,  
  b) Distributor air gap incorrect,  
  c) Distributor points burned,  
  d) Primary coil circuit open or loosely connected. |
TROUBLE IN FUEL SYSTEM
Starting motor turns over and spark occurs but engine does not start

Check fuel quantity in tank

Empty
Fuel quantity OK
Fill

Check fuel supply line

Fuel filter clogged
Fuel pipe clogged
Water in fuel supply line
Fuel supply line OK
Replace filter
'Clean or replace
Clean

Check fuel pump

Defective
Fuel pump OK
Replace

Check carburetor

Carburetor choke inoperative
Fuel level in float chamber incorrect
At fault
Carburetor OK
Adjust
Adjust
Overhaul and clean

Check evaporative emission control circuit

Clogged
Check and correct
ENGINE LACKS COMPRESSION

Check spark plug

Spark plug gasket loosely fitted or defective

Tighten to specified torque or replace gasket

Check valve timing

Incorrect

Adjust

Check valve clearance

Incorrect

Adjust

Check exh. and inlet valve

Incorrectly seated

Valve stem seized

Exh. and inlet valve OK

'La'p valve

Replace valve and valve guide

Check valve spring

Weakened

Replace

Check cylinder head gasket

Defective

Replace

Cylinder head gasket OK

Continued on next page
Trouble Shooting Procedure

a) Start and warm up the engine. Remove all spark plugs and apply a few drops of engine oil to the spark plug holes.
b) Connect a tachometer and crank the engine, checking that the cranking speed is 300 rpm or higher.
c) Press the adapter of the cylinder compression gauge onto a spark plug hole hard enough to prevent air leakage.
Crank the engine with the throttle valve wide open and take the highest reading of the compression gauge.
d) Note the reading of the tachometer and the compression gauge.
e) Check the compression in each cylinder by repeating the above procedure. If the variation between cylinders is more than 0.6 kg/cm² (8.53 psi.), perform a cylinder leakage test to determine the cause.
ROUGH ENGINE IDLING

CARBURETOR FAULTY

Check idle speed

Idle adjustment incorrect
- Adjust

Idle speed OK

Check anti-diesel solenoid and valve

Not operating properly
- Correct

Anti-diesel solenoid and valve OK

Check choke system

Out of adjustment
- Correct

Choke system OK

Check level of fuel in float chamber

Incorrect
- Adjust

Level OK

Check jet

Clogged or damaged
- Overhaul carburetor
TROUBLE IN EMISSION CONTROL SYSTEM

Check mixture control valve

Faulty
Replace

Mixture control valve OK

Check coasting fuel cut system

Not operating properly
Coasting fuel cut system OK

Check and correct coasting richer system, and coasting fuel cut system

Check air switching valve

Faulty
Replace

Air switching valve OK

Check EGR valve

Faulty
Replace

EGR valve OK

Check thermal vacuum valve

Faulty (at cold condition)
Replace

Thermal vacuum valve OK

See closed loop emission control system diagnosis in the section of Engine Emission Controls. (California only)
(Cont.)

Check camshaft timing

Incorrect

Readjust
ENGINE LACKS POWER

TROUBLE IN FUEL SYSTEM

Check fuel line

- Water in fuel system
  - Clean
  - Fuel system OK
- Fuel pipe clogged
  - Clean
  - Replace
- Fuel filter clogged or fouled
  - Replace
- Fuel line OK

Check fuel pump

- Inferior quality fuel in fuel system
  - Use fuel of specified octane rating
    - Not working normally
      - Fuel pump OK
      - Replace
  - Fuel pump OK

Check fuel tank

- Fuel tank not sufficiently breathing due to clogged evaporative emission control circuit
  - Clean or replace
  - Fuel tank OK

Check carburetor

- Check device is out of adjustment
  - Correct
- Jet clogged
  - Overhaul and clean
  - Correct
- Level of fuel in float chamber incorrect
  - Carburetor OK

Check mixture control valve

- Defective
  - Replace
  - Mixture control valve OK

Check carburetor vent switching valve

- Defective
  - Carburetor vent switching valve OK
  - See closed loop emission control system diagnosis in the section of Engine Emission Controls. (California only)
TROUBLE IN INTAKE OR EXHAUST SYSTEM

Check air cleaner

- Clogged
  - Replace filter element
  - Check condition of carburetor fitting and gasket
    - Loosely fitted or gasket defective
      - Retighten or replace gasket
    - Carburetor fitting and gasket OK

- Air cleaner OK

Check air intake hose

- Kinked or flattened
  - Replace
  - Check mixture control valve
    - Defective
    - Replace

- Air intake hose OK
IGNITION FAILURE

Refer to hard starting diagnosis guide

Check heat range of spark plug

Inadequate

Install spark plug with adequate heat range

Heat range OK

Check advance in distributor

Out of adjustment

Check angle advancing characteristics and correct as necessary
ENGINE OVERHEATING

Check radiator

Level of cooling water too low
- Replenish

Clogged
- Clean or replace

Filler cap defective
- Replace

Radiator OK

Check fan belt

Loosened, worn or broken
- Adjust or replace

Fan belt OK

Check thermostat

Defective
- Replace

Thermostat OK

Check water pump

Defective
- Correct or replace

Water pump OK

Check level of oil in engine crankcase

Too low or wrong oil in engine
- Change or replenish

Level OK

Check ignition timing

Incorrect
- Adjust

Ignition timing OK

Check exhaust system

Excessive resistance in exhaust system
- Clean exhaust system or replace defective part

Exhaust system OK

Continued on next page
Check mixture condition

- Too lean
  - Adjust carburetor setting
  - Mixture condition OK
  - Check mixture control valve
  - Does not close completely
  - Replace

**ENGINE OVERCOOLING**

- Check radiator

  - Overcooling
  - Radiator OK
  - Install cover in front of radiator
  - Check thermostat
  - Defective
  - Replace
  (Use a thermostat set to open at 82°C (180°F))

**ENGINE LACKS COMPRESSION**

- Refer to hard starting diagnosis
ENGINE NOISY

NOISE FROM CRANK JOURNAL
OR FROM CRANK BEARING
Faulty crank journals and crank bearings usually make a dull noise that becomes more evident when accelerating.

- Check oil clearance between crank journal and crank bearing
  - Excessive due to worn crank journal or crank bearing
    - Replace crank bearing and grind crankshaft
  - Oil clearance OK
    - Check crankshaft for out of round
      - Out of round
        - Grind or replace crankshaft
      - Crankshaft out of round OK
        - Check crank bearing
          - Seized
          - Replace crank bearing and grind or replace crankshaft

Troubleshooting procedure

Short out each spark plug in sequence with a screwdriver with an insulated handle. Locate the cylinder with the defective bearing by listening for abnormal noise that stops when the spark plug is shorted out.
OTHERS

Check tire inflation pressures

Abnormal

Adjust to recommended pressures

Inflation pressures OK

Check brake system

Brake drag

Brake system OK

Adjust

Check clutch

Slipping

Adjust or replace
Troubleshooting procedure

Abnormal noise diminishes when the spark plug on the cylinder with defective parts is shorted out.
Trouble-shooting procedure

Short out each spark plug and listen for a change in engine noise.
**Trouble-shooting procedure**

The slapping sound diminishes when the spark plug on the cylinder with trouble is shorted out.
TIMING BELT NOISE

Check front plate fixing bolts

Loosened

Retighten

Not loosened

Check tension pulley fixing bolt and nut

Loosened

Loosen once and retighten

Check timing belt

Timing belt defective

Check timing pulleys

Timing pulleys defective

Replace timing belt and defective pulleys

Timing pulleys OK

Timing belt OK

Check tension pulley

Tension pulley defective

Replace tension pulley

Tension pulley OK

Replace tension spring
VALVE NOISE

Check valve clearance

Incorrect

Valve clearance OK

Adjust

Check valve and valve guide

Seized

Valve and valve guide OK

Replace valve and valve guide

Check valve spring

Broken

Valve spring OK

Replace

Check valve seat position

Off-positioned

Valve seat position OK

Correct

Check working face or rocker arm and camshaft

Worn or pitted

Replace rocker arm and camshaft
ENGINE KNOCKING

Check ignition timing

Incorrect
Adjust

Check heat range of spark plug

Inadequate heat range
Install spark plug with adequate heat range

Check combustion chamber

Carbon deposits in combustion chamber
Clean

Check fuel

Octane rating too low
Replace fuel

Check selection of transmission gear

Selection of transmission gear wrong
Caution operator on incorrect gear selection

Ignition timing OK
Heat range OK
Combustion chamber OK
Fuel OK
OTHERS

- Check water pump
  - Bearing faulty
  - Replace bearing
  - Water pump OK
  - Check air pump
    - Mechanical trouble in air pump
    - Replace air pump
    - Relief valve leaking
    - Replace relief valve
    - Air pump OK
      - Check drive belt
      - Slipping
      - Adjust tension of drive belt
ABNORMAL COMBUSTION

MIXTURE TOO LEAN

Check carburetor adjustment

Incorrectly adjusted

Adjust

Check carburetor jet

Carburetor jet clogged

Carburetor jet OK

Overhaul carburetor

Check movement of carburetor float

Sticking

Carburetor float OK

Correct

Check carburetor intake manifold

Loose

Gasket defective

Carburetor intake manifold OK

Retighten

Replace gasket

Check fuel supply condition to carburetor

Insufficient

Supply condition OK

Correct or replace

Check anti-dieseling valve

Staying closed

Anti-dieseling valve OK

Correct

See closed loop emission control system diagnosis in the section of Engine Emission Controls (California only)
01-100 4ZD1 GASOLINE ENGINE

MIXTURE TOO RICH

Check carburetor adjustment

Incorrectly adjusted

Adjust

Check carburetor choke valve

Does not open fully

Choke valve OK

Correct linkage or replace choke chamber assembly

Check carburetor air jet

Clogged

Air jet OK

Overhaul carburetor

Check float level

Incorrect

Float level OK

Correct

Check movement of carburetor float

Movement sluggish

Carburetor float OK

Correct

Check air cleaner

Clogged

Air cleaner OK

Replace filter element

Continued on next page
(Cont.)

Check carburetor vent switching valve

- Defective
- Replace

Carburetor vent switching valve OK

See closed loop emission control system diagnosis in the section on Engine Emission Controls. (California only)

TROUBLE IN IGNITION SYSTEM

Check ignition timing

- Incorrect
- Adjust ignition timing

- Ignition timing OK

Check spark plug

- Defective or heat range inadequate
- Clean or install plug with adequate heat range
TROUBLE IN CYLINDER HEAD

Check valve clearance

Correct

Adjust

Valve clearance OK

Check valve seating condition

Valves poorly seated

Correct

Check valve stem

Seized

Replace valve and valve guide

Valve stem OK

Check valve spring

Weakened or broken

Replace

Valve spring OK

Check combustion chamber

Carbon deposits in combustion chamber

Remove carbon
TROUBLE IN AIR INJECTION SYSTEM

Check air pump

Defective
Replace

Air pump OK

Check relief valve

Defective
Replace

Relief valve OK

Check check valve

Defective
Replace

Check valve OK

Check air injection circuit

Leaking
Correct or replace

Air injection circuit OK

See closed loop emission control system diagnosis in the section on Engine Emission Controls. (California only)
ENGINE OIL CONSUMPTION EXCESSIVE

OIL LEAKING

Check head cover

- Oil filler cap loosened
  - Retighten

- Retaining bolts tooosened
  - Retighten

- Head cover gasket broken
  - Replace

- Head cover OK

Check distributor

- Packing broken
  - Replace

- Distributor OK

Check oil filter

- Rubber gasket broken
  - Replace gasket

- Oil filter OK

Check oil filter adapter

- Attaching bolts loosened
  - Retighten

- Gasket broken
  - Replace gasket

- Oil filter adapter OK

Check oil pressure unit (if equipped)

- Loose or broken
  - Retighten or replace

- Oil pressure OK

Continued on next page.
(Cont.)

Check oil pressure switch and oil gallery plug

- Loose or broken
  - Retighten or replace

- Oil pressure switch OK

Check crankcase or oil pan

- Drain plug loose
  - Retighten or replace gasket

- Crankcase or oil pan attaching bolt and / or nut loosened
  - Retighten

- Oil pan gasket broken
  - Replace gasket

- Crankcase or oil pan OK

Check fuel pump

- Retaining nuts loose
  - Retighten

- Fuel pump gasket broken
  - Replace gasket

- Oil leakage from breather pipe
  - Replace fuel pump

- Fuel pump OK

Check lower part of timing cover for dirt

- Dirty
  - Remove timing cover and check crank oil seal (front) and camshaft oil seal
    - Defective
      - Replace oil seal

- Clean OK

Check engine/transmission lower coupling area

- Dirty
  - Lower engine and check crank rear oil seal

- Clean OK
TROUBLE IN PCV SYSTEM

Remove air cleaner cover and check for carburetor oil fouling

Clean

Engine idling stable

No trouble in PCV system

PCV valve bad/replace PCV valve

Dirty

Replace element

Clean

Clear obstructions from PCV valve and PCV hose

Fouled

Engine idling unstable

Check air cleaner element
OIL LEAKING INTO COMBUSTION CHAMBER DUE TO POOR SEAL IN CYLINDER PART

Check cylinder and piston

Worn excessively
Rebore cylinder and replace all pistons

Cylinder and piston OK

Check piston ring installation

Wrong side UP
Correct

Piston ring installation OK

Check piston ring and ring groove

Piston ring sticking
Rebore cylinder and replace all pistons

Piston ring and ring groove worn
Replace all pistons

Piston ring and ring groove OK

Check return port in oil ring

Clogged
Clean piston and replace piston ring
01-108 4ZD1 GASOLINE ENGINE

FUEL CONSUMPTION EXCESSIVE

TROUBLE IN FUEL SYSTEM

Check fuel mixture

Too rich

Engine misfires due to mixture setting too lean

Refer to abnormal combustion diagnosis guide

TROUBLE IN IGNITION SYSTEM

Misfiring or abnormal combustion due to trouble in ignition system

Refer to hard start diagnosis guide
### SPECIAL TOOLS

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