Cylinder Head

- Install the O-ring (1), dowel pins and cylinder head gasket (2).

⚠️ CAUTION

Replace the O-ring (1) and cylinder head gasket (2) with new ones.

- Place the cylinder head on the cylinder (3).

NOTE

When installing the cylinder head (3), keep the cam chain taut.

- Apply engine oil to the bolt threads and both sides of washers.
- Tighten the cylinder head bolts (M10) to the specified two-step torque with a torque wrench sequentially and diagonally.

Tightening torque

Cylinder head bolt (M10) (Initial): 25 N·m (2.5 kgf·m, 18.0 lbf-ft)
Cylinder head bolt (M10) (Final): 42 N·m (4.2 kgf·m, 30.5 lbf-ft)

- After firmly tightening the cylinder head bolts (M10), install the cylinder head bolts (M6) (4).
- Tighten the cylinder head bolts (4) to the specified torque.

Tightening torque

Cylinder head bolt (M6): 10 N·m (1.0 kgf-m, 7.0 lbf-ft)

Camshaft

- Turn the crankshaft clockwise and align the match mark “A” on the crankshaft with the mating surfaces “B” of crankcases.

⚠️ CAUTION

- Pull the cam chain upward, or the chain will be caught between crankcase and cam drive sprocket.
- To adjust the camshaft timing correctly, be sure to align the match mark “A” with the mating surfaces “B” and hold this position when installing the camshafts.
Before replacing the camshafts on cylinder head, apply engine oil to their journals and cam faces.

Apply engine oil to the camshaft journal holders.

**NOTE**

- Before installing the camshaft, check that the tappets are installed correctly.
- The camshafts are identified by the embossed letters.

Pull the cam chain lightly.

- The exhaust camshaft sprocket has an arrow marked “1” “C”. Turn the exhaust camshaft so that the arrow is aligned with the gasket surface of the cylinder head.
- Engage the cam chain with the exhaust camshaft sprocket.

- The other arrow marked “2” “D” should now be pointing straight up. Starting from the roller pin that is directly above the arrow marked “2” “D”, count out 16 roller pins (from the exhaust camshaft side going towards the intake camshaft side).

Engage the 16th roller pin “E” on the cam chain with the marked “3” on the intake sprocket.

**NOTE**

The cam chain should now be on all three sprockets. Be careful not to move the crankshaft until the camshaft journal holders and cam chain tension adjuster are secured.

Install the dowel pins.
• Install the camshaft journal holders.

⚠️ CAUTION
Damage to head or camshaft journal holder thrust surfaces may result if the camshaft journal holders are not drawn down evenly.

NOTE
Each camshaft journal holder is identified with an embossed letter.

• Fasten the camshaft journal holders evenly by tightening the camshaft journal holder bolts lightly, in the ascending order of numbers.

⚠️ CAUTION
The camshaft journal holder bolts are made of a special material and much superior in strength, compared with other types of high strength bolts. Take special care not to use other types of bolts.

NOTE
The ascending order of numbers are indicated on the camshaft journal holders.

• Tighten the camshaft journal holder bolts in the ascending order of numbers to the specified torque.

 Tightening torque
Camshaft journal holder bolt: 10 N·m (1.0 kgf-m, 7.0 lbf-ft)

• Install the oil pipe (1) and tighten the mounting bolts to specified torque.

NOTE
Fit the washer to each oil pipe mounting bolt.

 Tightening torque
Oil pipe mounting bolt: 10 N·m (1.0 kgf-m, 7.0 lbf-ft)

Cam Chain Tension Adjuster
• Retract the push rod by pushing the stopper (1).

• Install a new gasket (2).

⚠️ CAUTION
Use a new gasket to prevent oil leakage.
• Install the cam chain tension adjuster (3) and tighten its mounting bolts.

_Tightening torque_
Cam chain tension adjuster mounting bolt (a): 10 N·m (1.0 kgf-m, 7.0 lbf-ft)

• Install the spring (4).
• Install the gasket (5) and cam chain tension adjuster cap bolt (6).

**NOTE**
Click sound is heard when the cam chain tension adjuster cap bolt is installed.

• Tighten the cam chain tension adjuster cap bolt (6) to the specified torque.

_Tightening torque_
Cam chain tension adjuster cap bolt (b): 23 N·m (2.3 kgf-m, 16.5 lbf-ft)

⚠️ **CAUTION**
After installing the cam chain tension adjuster, check to be sure that the adjuster works properly by checking the slack of cam chain.

• After installing the cam chain tension adjuster, rotate the crankshaft (some turns), and recheck the positions of the camshafts.

Right Crankshaft Cover
• Apply SUZUKI BOND lightly to the mating surfaces at the parting line between the upper and lower crankcases as shown.

⚠️ **NOTE**: Sealant 99000–31140 (SUZUKI BOND No.1207B or equivalent)
• Install the gasket and right crankcase cover (1).

⚠️ CAUTION
Use a new gasket to prevent oil leakage.

Spark Plug
• Install the spark plugs. Refer to "Ignition Coil / Plug Cap and Spark Plug Removal and Installation in Section 1H (Page 1H-3)".

Cylinder Head Cover
• Install a new gasket to the cylinder head cover.

⚠️ CAUTION
Use the new gasket to prevent oil leakage.

• Apply SUZUKI BOND to the cam end caps of the gasket as shown.

.promo: Sealant 99000–31140 (SUZUKI BOND No.1207B or equivalent)

• Apply engine oil to both sides of the gaskets.

⚠️ CAUTION
Use the gaskets with new ones to prevent oil leakage.

• Tighten the cylinder head cover bolts to the specified torque.

Tightening torque
Cylinder head cover bolt: 14 N·m (1.4 kgf-m, 10.0 lbf-ft)

Valve Clearance Inspection and Adjustment
Refer to "Valve Clearance Inspection and Adjustment in Section 0B (Page 0B-6)".
Cylinder Head Cover Inspection
Inspect the cylinder head cover in the following procedures:

1) Remove the cylinder head cover. Refer to “Engine Top Side Disassembly (Page 1D-24)”.

2) Clean and check the gasket grooves “A” and PAIR reed valve gasket mating surfaces “B” of cylinder head cover. If it is damaged, replace the cylinder head cover with a new one.

3) Install the cylinder head cover. Refer to “Engine Top Side Assembly (Page 1D-26)”.

Camshaft Inspection
Refer to “Engine Top Side Disassembly (Page 1D-24)”. Refer to “Engine Top Side Assembly (Page 1D-26)”.

Camshaft Identification
The exhaust camshaft has the embossed letters “EX” and the intake camshaft has the embossed letters “IN”.

Cam Wear
Check the camshaft for wear or damage. Measure the cam height “a” with a micrometer. Replace a camshaft if the cams are worn to the service limit.

Special tool
- 09900–20202 (Micrometer (1/100 mm, 25 – 50 mm))

Cam height “a”
Service limit: (IN) 35.35 mm (1.3917 in)
Service limit: (EX) 35.07 mm (1.3807 in)

Camshaft Runout
Measure the runout using the dial gauge. Replace the camshaft if the runout exceeds the limit.

Special tool
- (A): 09900–20607 (Dial gauge (1/100 mm, 10 mm))
- (B): 09900–20701 (Magnetic stand)
- (C): 09900–21304 (V-block (100 mm))

Camshaft runout (IN & EX)
Service limit: 0.10 mm (0.004 in)

Camshaft Journal Wear
Inspect the camshaft journal wear in the following procedures:

1) Determine whether or not each journal is worn down to the limit by measuring the oil clearance with the camshaft installed in place.
2) Use the plastigauge to read the clearance at the widest portion, which is specified as follows.

Special tool
(A): 09900–22301 (Plastigauge (0.025 - 0.076 mm))
(B): 09900–22302 (Plastigauge (0.051 - 0.152 mm))

3) Install each camshaft journal holder to its original position. Refer to “Engine Top Side Assembly (Page 1D-26)”.

4) Tighten the camshaft journal holder bolts in ascending order of numbers to the specified torque. Refer to “Engine Top Side Assembly (Page 1D-26)”.

**NOTE**

Do not rotate the camshafts with the plastigauge in place.

**Tightening torque**
Camshaft journal holder bolt: 10 N·m (1.0 kgf-m, 7.0 lbf-ft)

5) Remove the camshaft journal holders and measure the width of the compressed plastigauge using the envelope scale.

6) This measurement should be taken at the widest part of the compressed plastigauge.

**Camshaft journal oil clearance (IN & EX)**
Service limit: 0.150 mm (0.0059 in)

7) If the camshaft journal oil clearance exceeds the limit, measure the inside diameter of the camshaft journal holder and the outside diameter of the camshaft journal. Replace the camshaft or the cylinder head depending upon which one exceeds the specification.

Special tool
(C): 09900–20602 (Dial gauge (1/1000 mm, 1 mm))
(D): 09900–22403 (Small bore gauge (18 – 35 mm))

**Camshaft journal holder I.D. (IN & EX)**
Standard: 24.012 – 24.025 mm (0.9454 – 0.9459 in)

Special tool
(E): 09900–20205 (Micrometer (0 – 25 mm))

**Camshaft journal O.D. (IN & EX)**
Standard: 23.959 – 23.980 mm (0.9433 – 0.9441 in)
Camshaft Sprocket Inspection

Inspect the camshaft sprocket in the following procedures:

1) Remove the intake and exhaust camshafts. Refer to “Engine Top Side Disassembly (Page 1D-24)”.  
2) Inspect the teeth of each camshaft sprocket for wear or damage. 
   If they are worn or damaged, replace the sprockets and cam chain as a set.

3) Install the camshafts. Refer to “Engine Top Side Assembly (Page 1D-26)”.

Camshaft Sprocket Removal and Installation

Removal

1) Remove the camshafts. Refer to “Engine Top Side Disassembly (Page 1D-24)”.  
2) Remove the camshaft sprockets (1).

Installation

1) Set the camshaft sprocket to the camshafts.

   NOTE
   Align the arrow mark “3” on camshaft sprocket with the notch “A” on the camshaft.

2) Apply THREAD LOCK SUPER to the threads of the camshaft sprocket bolts and then tighten them to the specified torque.

   NOTE: Thread lock cement 99000–32030 (Thread Lock Cement Super 1303 or equivalent)

   Tightening torque
   Camshaft sprocket bolt (Initial): 16 N·m (1.6 kgf-m, 11.5 lbf-ft)  
   Camshaft sprocket bolt (Final): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)

3) Install the camshafts. Refer to “Engine Top Side Assembly (Page 1D-26)”.

Cam Chain Tension Adjuster Inspection

The cam chain tension adjuster is maintained at the proper tension by an automatically adjusted.

1) Remove the cam chain tension adjuster. Refer to “Engine Top Side Disassembly (Page 1D-24)”.  

2) Check that the push rod slides smoothly when releasing stopper (1). If it does not slide smoothly, replace the cam chain tension adjuster with a new one.

3) Install the cam chain tension adjuster. Refer to “Engine Top Side Assembly (Page 1D-26)

Cam Chain Guide Removal and Installation

Removal
1) Remove the cylinder head cover. Refer to “Engine Top Side Disassembly (Page 1D-24)”. 
2) Remove the cam chain No.2 guide (1) from the cylinder head cover.

3) Remove the cylinder head. Refer to “Engine Top Side Disassembly (Page 1D-24)”.
4) Remove the cam chain No.1 guide (2).

Installation
Install the cam chain guides in the reverse order of removal.

Cam Chain Guide Inspection

Inspect the cam chain guide in the following procedures:

1) Remove the cam chain No.1 and No.2 guides. Refer to “Cam Chain Guide Removal and Installation (Page 1D-37)”. 
2) Check the contacting surface of the cam chain guide. If it is worn or damaged, replace it with a new one.

Cam Chain Tensioner Inspection

Inspect the cam chain tensioner in the following procedures:

1) Separate the crankcases, upper and lower. Refer to “Engine Bottom Side Disassembly (Page 1D-51)”. 
2) Remove the crankshaft assembly from the upper crankcase. Refer to “Engine Bottom Side Disassembly (Page 1D-51)”. 
3) Remove the dampers (1) of the cam chain tensioner and cam chain tensioner (2).
4) Check the contacting surface of the cam chain tensioner. If it is worn or damaged, replace it with a new one.

5) Install the cam chain tensioner and its dampers.
6) Reinstall the crankshaft assembly. Refer to “Engine Bottom Side Assembly (Page 1D-58)”.
7) Reassemble the crankcases, upper and lower. Refer to “Engine Bottom Side Assembly (Page 1D-58)".

Cylinder Head Disassembly and Assembly
Refer to “Engine Top Side Disassembly (Page 1D-24)”. Refer to “Engine Top Side Assembly (Page 1D-26)".

**CAUTION**

Identify the position of each removed part. Organize the parts in their respective groups (i.e., intake, exhaust, No.1 or No.2) so that they can be installed in their original locations.

Disassembly
1) Remove the tappet (1) and shim (2) by fingers or magnetic hand.

2) When compressing the valve spring use a sleeve protector. Cut the sleeve protector as shown in the illustration.

**Special tool**

- **(A): 09919–28610 (Sleeve protector)**

3) Install the sleeve protector between the valve spring and cylinder head.
4) Using the special tools, compress the valve spring and remove the two cotter halves (3) from the valve stem.

**Special tool**

- **(B): 09916–14510 (Valve lifter)**
- **(C): 09916–14521 (Valve spring compressor attachment)**
- **: 09916–84511 (Tweezers)**

5) Remove the valve spring retainer (4) and valve spring (5).
6) Pull out the valve (6) from the combustion chamber side.
7) Remove the oil seal (7) and spring seat (8).

8) Remove the other valves in the same manner as described previously.
9) Remove the water outlet pipes (9).

10) Remove the intake pipes (10).

11) Remove the oil gallery plugs (cylinder head) (11).

Assembly
Assembly is in the reverse order of disassembly. Pay attention to the following points:

- Tighten the oil gallery plugs (cylinder head) to the specified torque.

⚠️ CAUTION
Replace the gasket with new ones.

**Tightening torque**
Oil gallery plug (cylinder head) (a): 10 N·m (1.0 kgf-m, 7.0 lbf-ft)

- Apply grease to O-ring of the intake pipe.

⚠️ CAUTION
Replace the O-rings with new ones.

Grease 99000–25010 (SUZUKI SUPER GREASE A or equivalent)
NOTE
• When replacing the intake pipes, identify the different intake pipes according to each I.D. code “A”.
  (1-17H0 for cylinder #1)
  (2-17H0 for cylinder #2 and #3)
  (4-17H0 for cylinder #4)
• Make sure that the “1 UP” mark faces up.
  (for cylinder #1)
• Make sure that the “4 UP” mark faces up.
  (for cylinder #4)
• Apply engine coolant to O-rings of water outlet pipe.

⚠️ CAUTION
Replace the O-rings with new ones.

• Install the valve spring seat.
• Apply engine oil to the oil seal (1), and press-fit it into position.

⚠️ CAUTION
Do not reuse the removed oil seal.

• Insert the valve, with its stem coated with MOLYBDENUM OIL SOLUTION all around and along the full stem length without any break.

⚠️ CAUTION
When inserting the valve, take care not to damage the lip of the oil seal.

M/O: Molybdenum oil (MOLYBDENUM OIL SOLUTION)

• Install the valve spring with the small-pitch portion “B” facing cylinder head.

<table>
<thead>
<tr>
<th>“B”: Small-pitch portion</th>
<th>“D”: UPWARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>“C”: Large-pitch portion</td>
<td>“E”: Paint</td>
</tr>
</tbody>
</table>
• Put on the valve spring retainer (2), and using the special tools, press down the spring, fit the cotter halves to the stem end, and release the lifter to allow the cotter halves to wedge in between retainer and stem.

⚠️ CAUTION

• Be sure to restore each spring and valve to their original positions.
• Be careful not to damage the valve and valve stem when handling it.

Special tool

- (A): 09916–14510 (Valve lifter)
- (B): 09916–14521 (Valve spring compressor attachment)
- : 09916–84511 (Tweezers)

• Be sure that the rounded lip “F” of the cotter fits snugly into the groove “G” in the stem end.

NOTE

• Apply engine oil to the stem end, shim and tappet before fitting them.
• When seating the tappet shim, be sure the figure printed surface faces the tappet.

Cylinder Head Related Parts Inspection

Refer to “Cylinder Head Disassembly and Assembly (Page 1D-38)”.

Cylinder Head Distortion

1) Decarbonize the combustion chambers.
2) Check the gasket surface of the cylinder head for distortion. Use a straightedge and thickness gauge. Take clearance readings at several places. If readings exceed the service limit, replace the cylinder head.

Special tool

: 09900–20803 (Thickness gauge)

Cylinder head distortion

Service limit: 0.20 mm (0.008 in)
Valve Stem Runout
Support the valve using V-blocks, as shown, and check its runout using the dial gauge. If the runout exceeds the service limit, replace the valve.

Special tool
(A): 09900–20607 (Dial gauge (1/100 mm, 10 mm))
(B): 09900–20701 (Magnetic stand)
(C): 09900–21304 (V-block (100 mm))

Valve stem runout (IN. & EX.)
Service limit: 0.05 mm (0.002 in)

Valve Face Wear
Visually inspect each valve face for wear. Replace any valve with an abnormally worn face. The thickness of the valve face decreases as the face wears. Measure the valve head “a”. If it is out of specification replace the valve with a new one.

Special tool
(A): 09900–20102 (Vernier calipers (1/20 mm, 200 mm))

Valve head thickness “a” (IN. & EX.)
Service limit: 0.5 mm (0.02 in)

Valve Head Radial Runout
Place the dial gauge at a right angle to the valve head face and measure the valve head radial runout. If it measures more than the service limit, replace the valve.

Special tool
(A): 09900–20607 (Dial gauge (1/100 mm, 10 mm))
(B): 09900–20701 (Magnetic stand)
(C): 09900–21304 (V-block (100 mm))

Valve head radial runout (IN. & EX.)
Service limit: 0.03 mm (0.001 in)

Valve Stem Deflection
Lift the valve about 10 mm (0.39 in) “a” from the valve seat. Measure the valve stem deflection in two directions, “X” and “Y”, perpendicular to each other. Position the dial gauge as shown. If the deflection exceeds the service limit, then determine whether the valve or the guide should be replaced with a new one.

Special tool
(A): 09900–20607 (Dial gauge (1/100 mm, 10 mm))
(B): 09900–20701 (Magnetic stand)

Valve stem deflection (IN. & EX.)
Service limit: 0.35 mm (0.014 in)
Valve Stem Wear
Measure the valve stem O.D. using the micrometer. If it is out of specification, replace the valve with a new one. If the valve stem O.D. is within specification but the valve stem deflection is not, replace the valve guide. After replacing the valve or valve guide, recheck the deflection.

Special tool
(A): 09900–20205 (Micrometer (0 – 25 mm))

Valve stem O.D.
Standard (IN.): 4.475 – 4.490 mm (0.1762 – 0.1768 in)
Standard (EX.): 4.455 – 4.470 mm (0.1754 – 0.1760 in)

NOTE
If valve guides have to be removed for replacement after inspecting related parts, carry out the steps shown in valve guide replacement. Refer to “Valve Guide Replacement (Page 1D-44)”.

Valve Spring
The force of the coil spring keeps the valve seat tight. A weakened spring results in reduced engine power output and often accounts for the chattering noise coming from the valve mechanism. Check the valve springs for proper strength by measuring their free length and also by the force required to compress them. If the spring length is less than the service limit or if the force required to compress the spring does not fall within the specified range, replace spring as a set.

Special tool
(A): 09900–20102 (Vernier calipers (1/20 mm, 200 mm))

Valve spring free length (IN. & EX.)
Service limit: 40.4 mm (1.59 in)

Valve spring tension (IN. & EX.)
Standard: 182 – 210 N (18.2 – 21.0 kgf, 40.1 – 46.3 lb-ft)/36.0 mm (1.42 in)

Valve Seat Width
1) Visually check for valve seat width on each valve face. If the valve face has worn abnormally, replace the valve.
2) Coat the valve seat with a red lead (Prussian Blue) and set the valve in place.
3) Rotate the valve with light pressure.

Special tool
(A): 09916–10911 (Valve lapper set)
4) Check that the transferred red lead (blue) on the valve face is uniform all around and in center of the valve face. If the seat width “a” measured exceeds the standard value, or seat width is not uniform remove the seat using the seat cutter. Refer to "Valve Seat Repair (Page 1D-45)".

Valve seat width “a” (IN. & EX.)
Standard: 0.9 – 1.1 mm (0.035 – 0.043 in)

Valve Seat Sealing Condition
1) Clean and assemble the cylinder head and valve components.
2) Fill the intake and exhaust ports with gasoline to check for leaks. If any leaks occur, inspect the valve seat and face for burrs or other things that could prevent the valve from sealing. Refer to "Valve Seat Repair (Page 1D-45)".

**WARNING**
Always use extreme caution when handling gasoline.

**CAUTION**
When refinishing or removing the reamer from the valve guide hole, always turn it clockwise.

Special tool
- 09916–43211 (Valve guide remover/installer)
- 09916–34580 (Valve guide reamer (10.8 mm))
- 09916–34542 (Reamer handle)

**NOTE**
After servicing the valve seats, be sure to check the valve clearance after the cylinder head has been reinstalled. Refer to “Valve Clearance Inspection and Adjustment in Section 0B (Page 0B-6)".
5) Cool down the new valve guides in a freezer for about one hour and heat the cylinder head to 100 – 150 °C (212 – 302 °F) with a hot plate.

⚠️ CAUTION
Do not use a burner to heat the valve guide hole to prevent cylinder head distortion.

6) Apply engine oil to each valve guide and valve guide hole.

7) Drive the guide into the guide hole using the valve guide installer.

⚠️ CAUTION
Failure to oil the valve guide hole before driving the new guide into place may result in a damaged guide or head.

Special tool
- (A): 09916–43211 (Valve guide remover/installer)
- (D): 09916–43220 (Attachment)

8) After installing the valve guides, refinish their guiding bores using the reamer. Be sure to clean and oil the guides after reaming.

Special tool
- (C): 09916–34542 (Reamer handle)
- (E): 09916–33210 (Valve guide reamer (4.5 mm))

NOTE
- Be sure to cool down the cylinder head to ambient air temperature.
- Insert the reamer from the combustion chamber and always turn the reamer handle clockwise.

9) Reassemble the cylinder head. Refer to “Cylinder Head Disassembly and Assembly (Page 1D-38)”.

10) Install the cylinder head assembly. Refer to “Engine Top Side Assembly (Page 1D-26)”.

Valve Seat Repair

The valve seats (1) for both the intake and exhaust valves are machined to two different angles. The seat contact surface is cut at 45°.

<table>
<thead>
<tr>
<th>Intake</th>
<th>Exhaust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seat angle</td>
<td>15°/45°</td>
</tr>
<tr>
<td>Seat width</td>
<td>0.9 – 1.1 mm (0.035 – 0.043 in)</td>
</tr>
<tr>
<td>Valve diameter</td>
<td>23 mm (0.91 in)</td>
</tr>
<tr>
<td>Valve guide I.D.</td>
<td>4.500 – 4.512 mm (0.1772 – 0.1776 in)</td>
</tr>
</tbody>
</table>
CAUTION
• The valve seat contact area must be inspected after each cut.
• Do not use lapping compound after the final cut is made. The finished valve seat should have a velvety smooth finish but not a highly polished or shiny finish. This will provide a soft surface for the final seating of the valve which will occur during the first few seconds of engine operation.

NOTE
After servicing the valve seats, be sure to check the valve clearance after the cylinder head has been reinstalled. Refer to “Valve Clearance Inspection and Adjustment in Section 0B (Page 0B-6)”.

Cylinder Disassembly and Assembly
Refer to “Engine Top Side Disassembly (Page 1D-24)”. Refer to “Engine Top Side Assembly (Page 1D-26)”.

Disassembly
1) Remove the ECT sensor (1) and oil jet (for cam chain tension adjuster) (2).
2) Remove the water inlet connector (3).

Assembly
Assembly is in the reverse order of disassembly. Pay attention to the following points:
• Apply engine coolant to O-ring of water inlet connector.

CAUTION
Replace the O-ring with a new one.

• Tighten the water inlet connector bolts to the specified torque.

CAUTION
Make sure that the “up” mark “A” face up.

Tightening torque
Water inlet connector bolt (a): 10 N·m (1.0 kgf-m, 7.0 lbf-ft)
• Apply engine oil to O-ring and install the oil jet.
• Tighten the ECT sensor to the specified torque.

⚠️ CAUTION
Replace the O-ring (1) and gasket (2) with new ones.

<table>
<thead>
<tr>
<th>Tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECT sensor (b): 18 N·m (1.8 kgf-m, 13.0 lbf-ft)</td>
</tr>
</tbody>
</table>

Cylinder Inspection
Refer to "Engine Top Side Disassembly (Page 1D-24)".
Refer to "Engine Top Side Assembly (Page 1D-26)".

Cylinder Distortion
Check the gasket surface of the cylinder for distortion.
Use a straightedge and thickness gauge. Take clearance readings at several places. If any reading exceeds the service limit, replace the cylinder.

Special tool
(A): 09900–20803 (Thickness gauge)

Cylinder distortion
Service limit: 0.20 mm (0.008 in)

Cylinder Bore
Measure the cylinder bore diameter at six places. If any one of the measurements exceed the limit, overhaul the cylinder and replace the piston with an oversize piston. The remaining cylinders must also be rebored accordingly; otherwise, the imbalance might cause excessive vibration.

Special tool
(A): 09900–20530 (Cylinder gauge set)

Cylinder bore
Standard: 65.500 – 65.515 mm (2.5787 – 2.5793 in)

Piston-to-cylinder Clearance
Refer to “Piston and Piston Ring Inspection (Page 1D-49)”.
Piston Ring Removal and Installation

Removal

1) Draw out the piston pin and remove the piston. Refer to "Engine Top Side Disassembly (Page 1D-24)".
2) Carefully spread the ring opening with your thumbs and then push up the opposite side of the 1st ring (2) to remove it.

**NOTE**
Do not expand the piston ring excessively since it is apt to be broken down.

3) Remove the 2nd ring and oil ring in the same procedure.

Installation

**NOTE**

• When installing the piston ring, be careful not to damage the piston.
• Do not expand the piston ring excessively since it is apt to be broken down.

1) Install the piston rings in the order of the oil ring, second ring and top ring.

a) The first member to go into the of the oil ring groove is a spacer (1). After placing the spacer, fit the two side rails (2).

**CAUTION**
When installing the spacer, be careful so that the both edges are not overlapped.

b) Install the 2nd ring (3) and 1st ring (4) to piston.

**NOTE**

1st ring (4) and 2nd ring (3) differ in shape.

**NOTE**
Face the side with the stamped mark “C” upward when assembling.
2) Position the gaps of the three rings and side rails as shown. Before inserting piston into the cylinder, check that the gaps are so located.

3) Install the piston and piston pin. Refer to "Engine Top Side Assembly (Page 1D-26)".

**Piston and Piston Ring Inspection**

Refer to “Piston Ring Removal and Installation (Page 1D-48)”.

**Piston Diameter**

Measure the piston diameter using the micrometer at 15 mm (0.6 in) “a” from the skirt end. If the piston diameter is less than the service limit, replace the piston.

**Special tool**

(A): 09900–20803 (Thickness gauge)

(B): 09900–20205 (Micrometer (0 – 25 mm))

**Piston diameter**

Service limit: 65.380 mm (2.5740 in)

**Piston-to-cylinder Clearance**

Subtract the piston diameter from the cylinder bore diameter. If the piston-to-cylinder clearance exceeds the service limit, replace both the cylinder and the piston.

**Piston-to-cylinder clearance**

Service limit: 0.120 mm (0.0047 in)

**Piston Ring-to-groove Clearance**

Subtract the piston diameter from the cylinder bore diameter. If the piston-to-cylinder clearance exceeds the service limit, replace both the cylinder and the piston.

**Special tool**

(A): 09900–20803 (Thickness gauge)

(B): 09900–20205 (Micrometer (0 – 25 mm))

**Piston ring-to-groove clearance**

Service limit: (1st): 0.180 mm (0.0071 in)

Service limit: (2nd): 0.150 mm (0.0059 in)

**Piston ring groove width**

Standard: (1st): 1.01 – 1.03 mm (0.040 – 0.041 in)

Standard: (2nd): 0.81 – 0.83 mm (0.032 – 0.033 in)

Standard: (Oil): 1.51 – 1.53 mm (0.059 – 0.060 in)

**Piston ring thickness**

Standard: (1st): 0.97 – 0.99 mm (0.038 – 0.039 in)

Standard: (2nd): 0.77 – 0.79 mm (0.030 – 0.031 in)
Piston Ring Free End Gap and Piston Ring End Gap

Measure the piston ring free end gap using vernier calipers. Next, fit the piston ring squarely into the cylinder and measure the piston ring end gap using the thickness gauge. If any of the measurements exceed the service limit, replace the piston ring with a new one.

Special tool
(A): 09900–20102 (Vernier calipers (1/20 mm, 200 mm))

Piston ring free end gap
Service limit: (1st): 7.2 mm (0.28 in)
Service limit: (2nd): 7.2 mm (0.28 in)

Special tool
(B): 09900–20803 (Thickness gauge)

Piston ring end gap
Service limit: (1st): 0.50 mm (0.020 in)
Service limit: (2nd): 0.50 mm (0.020 in)

Piston Pin and Pin Bore

Measure the piston pin bore inside diameter using the small bore gauge. If either is out of specification or the difference between these measurement is more than the limits, replace the piston.

Special tool
(A): 09900–20602 (Dial gauge (1/1000 mm, 1 mm))
(B): 09900–22401 (Small bore gauge (10 – 18 mm))

Piston pin bore I.D.
Service limit: 14.030 mm (0.5524 in)

Measure the piston pin outside diameter at three positions using the micrometer. If any of the measurements are out of specification, replace the piston pin.

Special tool
(C): 09900–20205 (Micrometer (0 – 25 mm))

Piston pin O.D.
Service limit: 13.980 mm (0.5504 in)
**Engine Bottom Side Disassembly**

**NOTE**

The crankcase must be separated to service the crankshaft and conrod.

**Engine Top Side**

1) Remove the engine assembly. Refer to "Engine Assembly Removal (Page 1D-18)".

2) Disassemble the engine top side (1). Refer to "Engine Top Side Disassembly (Page 1D-24)".

3) Remove the regulator/rectifier bracket (2).

**Starter Motor**

Remove the starter motor (1).

**Clutch**

1) Remove the clutch component parts (1). Refer to "Clutch Removal in Section 5C (Page 5C-12)".

2) Remove the oil pump drive sprocket (2) and chain (3).

3) Remove the thrust washer (4) and washer (5).

**Oil Pump**

1) Remove the spacer (1).

2) Remove the oil pump drive sprocket (2) and chain (3).
4) Remove the snap ring (6).

**NOTE**
Do not drop the snap ring (6) into the crankcase.

Special tool
\[ 09900-06107 \text{ (Snap ring pliers)} \]

5) Remove the oil pump driven gear (7).

6) Remove the pin (8) and washer (9).

**NOTE**
Do not drop the pin (8) and washer (9) into the crankcase.

7) Remove the oil pump (10).

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**Gearshift System**

1) Remove the snap ring (1) and washer (2) from the gearshift shaft.

   Special tool
\[ 09900-06107 \text{ (Snap ring pliers)} \]

2) Remove the gearshift shaft assembly (3) and washer (4).

3) Remove the gearshift cam plate bolt (5) and gearshift cam plate (6).

4) Remove the gearshift cam stopper (7) and gearshift arm stopper (8).

**Generator**

Remove the generator component parts (1). Refer to "Generator Removal and Installation in Section 1J (Page 1J-4)".
**Starter**
Remove the idle gear shaft (1), idle gear (2) and starter driven gear (3). Refer to "Starter Clutch Removal and Installation in Section 1I (Page 1I-10)".

**Water Hose**
Remove the hose clamp plate (1) and water hose (2).

**Water Pump**
Remove the water pump (1).

**Gear Position Switch**
Remove the gear position switch (1).

**Crankcase Breather Cover**
Remove the crankcase breather cover (1).

**Oil Pressure Switch**
1) Remove the oil pressure switch (1).
Oil Filter
Remove the oil filter (1) with the special tool.

Special tool
(A): 09915–40610 (Oil filter wrench)

Oil Pan
Remove the oil pan (1).

Crackcase
1) Remove the crankcase bolts (M6).
2) Remove the crankcase bolts (M8).
3) Loosen the crankcase bolts evenly by shifting the wrench in the descending order of numbers.

Oil Pressure Regulator / Oil Strainer
1) Remove the oil pressure regulator (1).
2) Remove the oil strainer (2).
3) Remove the O-rings (3).
4) Make sure that all of the bolts are removed. Then, tap the sides of the lower crankcase using a plastic hammer to separate the upper and lower crankcase halves and then lift the lower crankcase off of the upper crankcase.

5) Remove the dowel pins and O-rings (1).

Crankshaft / Conrod / Cam Chain
1) Remove the crankshaft assembly (1) from the upper crankcase.
2) Remove the thrust bearings (2).

NOTE
The crankshaft thrust bearings (2) are located between the crankshaft assembly and upper crankcase.

3) Remove the cam chain (3) from the crankshaft.

NOTE
Remove the conrod if necessary. Refer to “Conrod Removal and Installation (Page 1D-67)”.

Cam Chain Tensioner
Remove the dampers (1) and cam chain tensioner (2).

Transmission / Gearshift
Remove the transmission component. Refer to “Transmission Removal in Section 5B (Page 5B-2)”.