

6. CYLINDER HEAD/CYLINDER/PISTON

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CYLINDER HEAD/CYLINDER/PISTON

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## 6. CYLINDER HEAD/CYLINDER/PISTON

### SERVICE INFORMATION

#### GENERAL INSTRUCTIONS

- The cylinder head, cylinder and piston can be serviced with the engine installed in the frame.
- Before disassembly, clean the engine to prevent dust from entering the engine.
- Remove all gasket material from the mating surfaces.
- Do not use a driver to pry between the cylinder and cylinder head, cylinder and crankcase.
- Do not damage the cylinder inside and the piston surface.
- After disassembly, clean the removed parts before inspection. When assembling, apply the specified engine oil to movable parts.

#### SPECIFICATIONS

Item	Standard (mm)		Service Limit (mm)	
	SH10DA	SF10DA	SH10DA	SF10DA
Cylinder head warpage	□		0.10	
Piston O.D.(5mm from bottom of piston)	38.970_	38.955	38.90	
Cylinder-to- piston clearance	0.03_	0.07	0.10	
Piston pin hole I.D.	12.002_	12.008	12.03	
Piston pin O.D.	11.994_	12.0	11.98	
Piston-to-piston pin clearance	0.002_	0.014	0.03	
Piston ring end gap (top/second)	0.10_	0.25	0.40	
Connecting rod small end I.D.	17.005_	17.017	17.03	
Cylinder bore	39.0_	39.025	39.05	

#### TORQUE VALUES

Cylinder head bolt	14.7_	16.66N-m
Exhaust muffler joint lock nut	9.8_	13.72N-m
Exhaust muffler lock bolt	29.4_	35.28N-m
Spark plug	10.78_	16.66N-m

#### TROUBLESHOOTING

##### Compression too low, hard starting or poor performance at low speed

- Leaking cylinder head gasket
- Loose spark plug
- Worn, stuck or broken piston and piston rings
- Worn or damaged cylinder and piston

##### Compression too high, overheating or knocking

- Excessive carbon build-up in cylinder head or on piston head

##### Abnormal noisy piston

- Worn cylinder and piston
- Worn piston pin or piston pin hole
- Worn connecting rod small end bearing

##### Abnormal noisy piston rings

- Worn, stuck or broken piston rings
- Worn or damaged cylinder

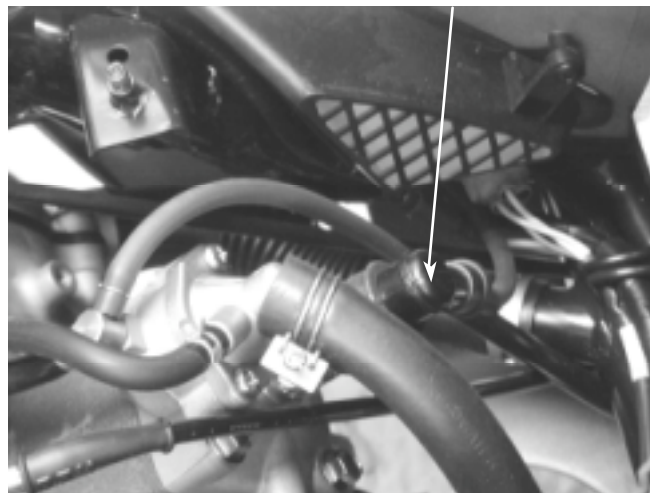
## 6. CYLINDER HEAD/CYLINDER/PISTON

### CYLINDER HEAD

#### REMOVAL < SH10AD >

Remove the rear carrier.  
 Remove the frame body cover. (⇒2-2)  
 Drain the coolant.  
 Disconnect the thermosensor wire from the thermosensor.  
 Disconnect the water hose from the thermostat housing.

Spark Plug Cap

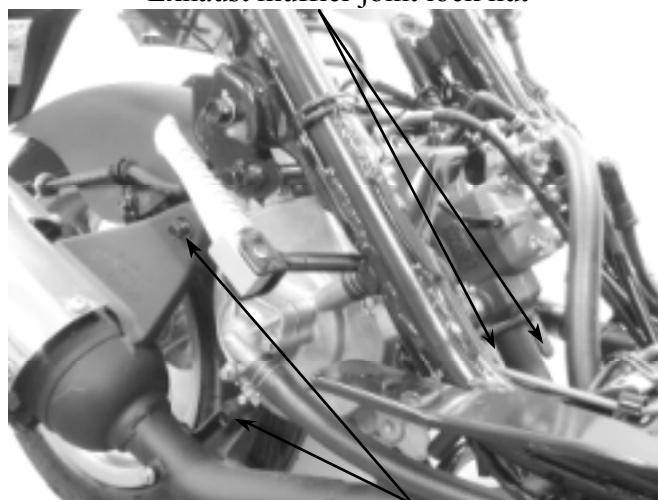


Remove the spark plug cap.  
 Remove the two joint lock nuts on the front of the exhaust muffler and then remove the two exhaust muffler lock bolts.  
 The installation sequence is the reverse of removal.

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When installing the exhaust muffler, first tighten the two nuts on the front and then tighten the two bolts.

Exhaust muffler joint lock nut



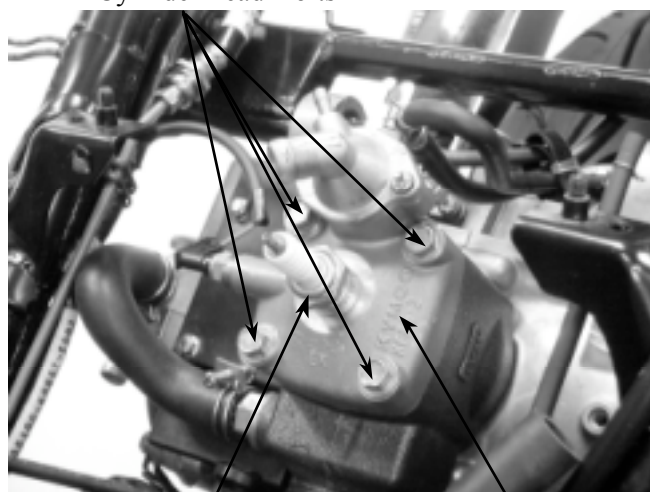
Bolts

Remove the spark plug.  
 Remove the cylinder head bolts and the cylinder head.

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Loosen the bolts diagonally in 2 or 3 times.

Cylinder head Bolts



Spark Plug

Cylinder Head

Remove the cylinder head gasket.

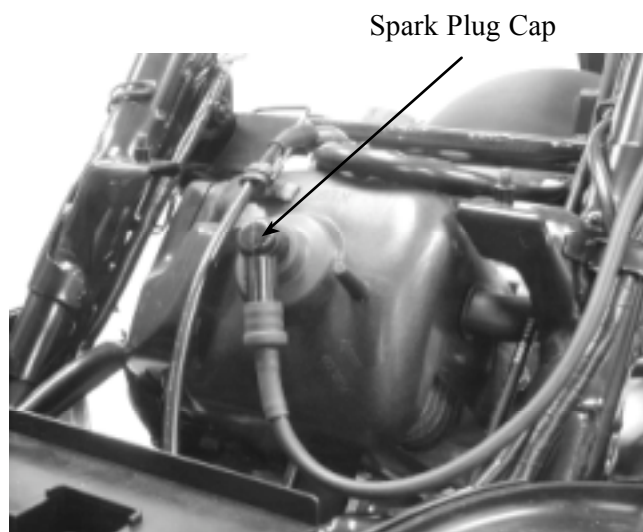
## 6. CYLINDER HEAD/CYLINDER/PISTON

### CYLINDER HEAD

#### REMOVAL < SF10DA >

Remove the rear carrier.

Remove the frame body cover. (⇒2-2)

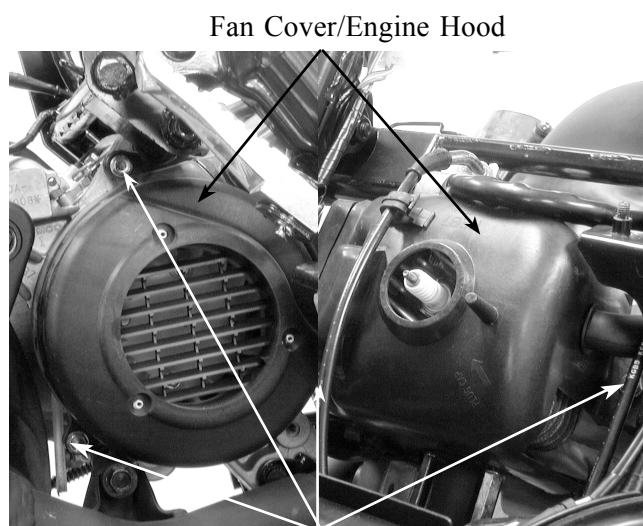


Spark Plug Cap

Remove the spark plug cap.  
Remove the three bolts attaching the fan cover to remove the fan cover.  
Remove the two joint lock nuts on the front of the exhaust muffler and then remove the two exhaust muffler lock bolts.  
Remove the bolt attaching the engine hood to remove the engine hood.  
The installation sequence is the reverse of removal.

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When installing the exhaust muffler, first tighten the two nuts on the front and then tighten the two bolts.



Fan Cover/Engine Hood

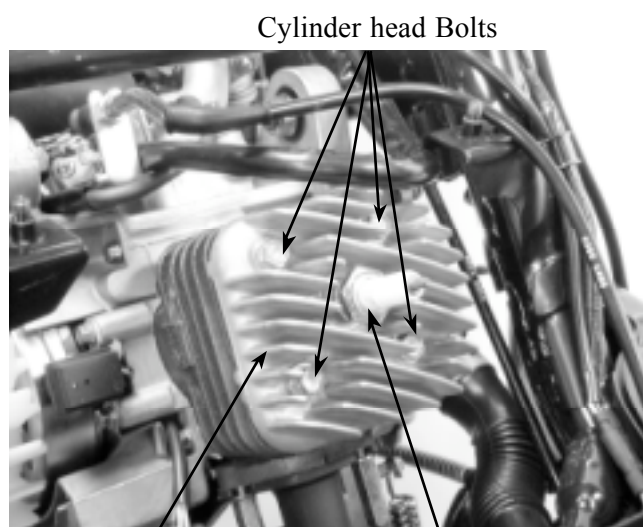
Bolts

Remove the spark plug.  
Remove the cylinder head bolts and the cylinder head.

**\***

Loosen the bolts diagonally in 2 or 3 times.

Remove the cylinder head gasket.



Cylinder head Bolts

Cylinder Head

Spark Plug

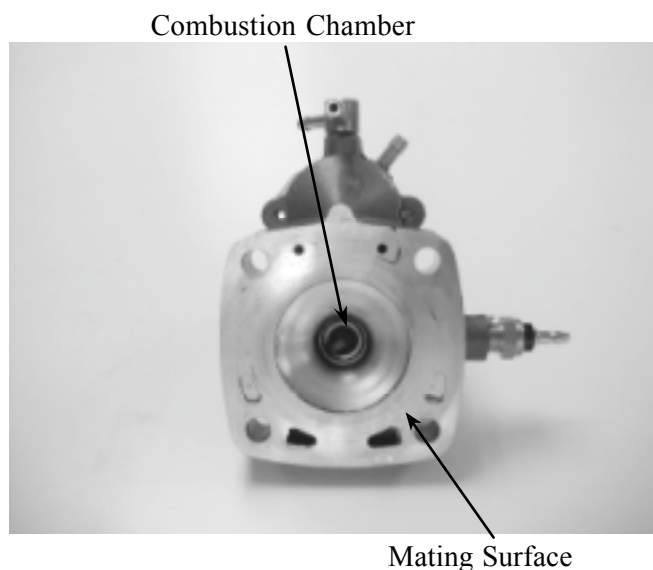
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### COMBUSTION CHAMBER DECARBONIZING

Remove the carbon deposits from the combustion chamber

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Avoid damaging the combustion chamber wall and cylinder mating surface.



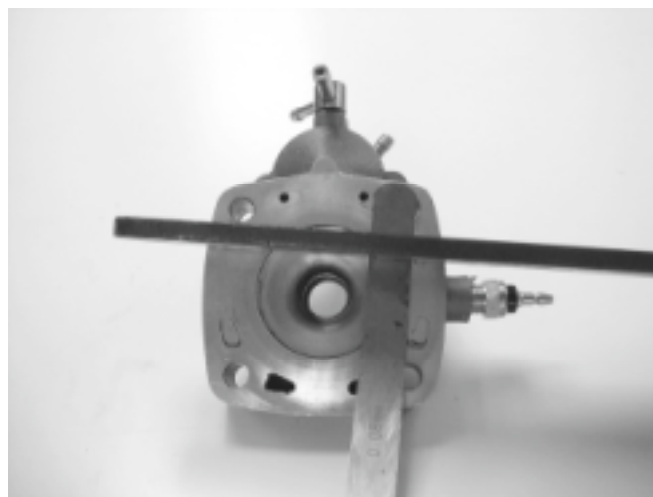
### CYLINDER HEAD INSPECTION

Check the cylinder head for warpage with a straight edge and feeler gauge.

#### Service Limit:

SH10DA: 0.10mm replace if over

SF10DA: 0.10mm replace if over



### CYLINDER HEAD INSTALLATION

Install the cylinder head on the cylinder properly.

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Be careful not to damage the mating surfaces.

Install a new cylinder head gasket onto the cylinder.





## 6. CYLINDER HEAD/CYLINDER/PISTON

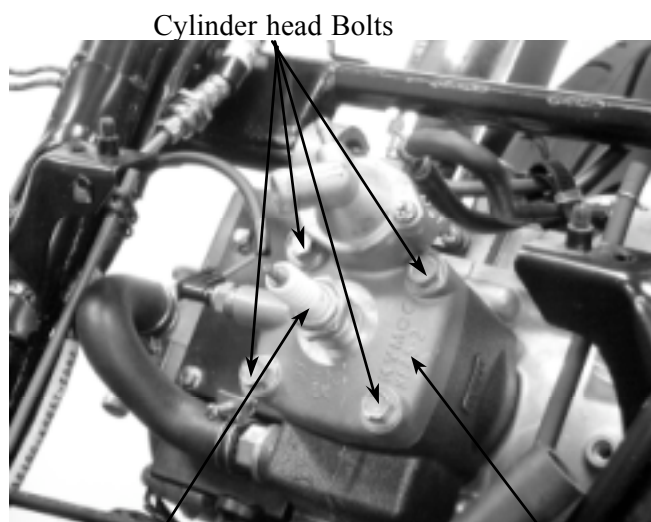
### Cylinder Head Bolts Installation

Install and tighten the cylinder head bolts diagonally in 2 or 3 times.

**Torque:** 14.7\_ 16.66N-m

Install the spark plug.

**Torque:** 10.78\_ 16.66N-m



Cylinder head Bolts

Spark Plug

Cylinder Head

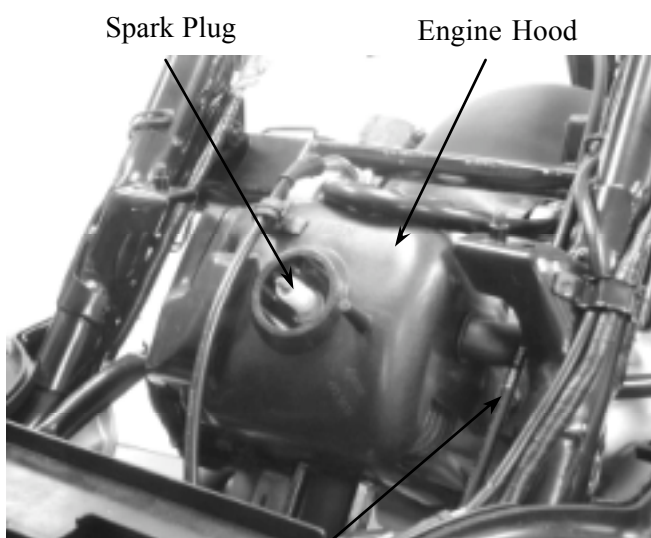
### Engine Hood Installation

Install the engine hood. (⇒6-3)

Install the spark plug cap. (⇒6-3)

Perform the following inspections after installation:

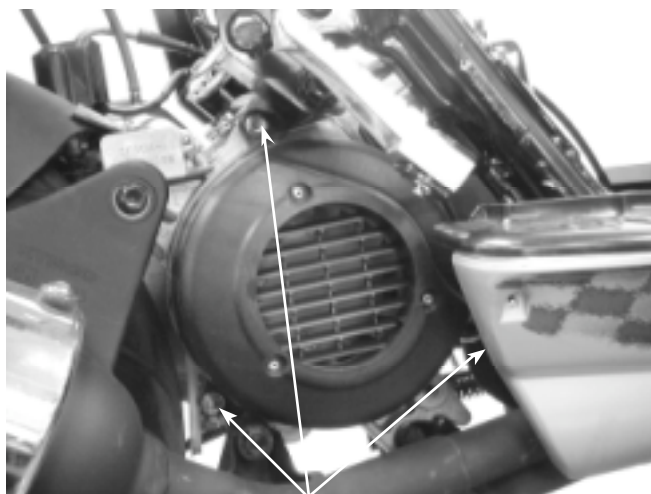
- Compression test
- Abnormal engine noise
- Cylinder air leaks



Spark Plug

Engine Hood

Bolts



Bolts

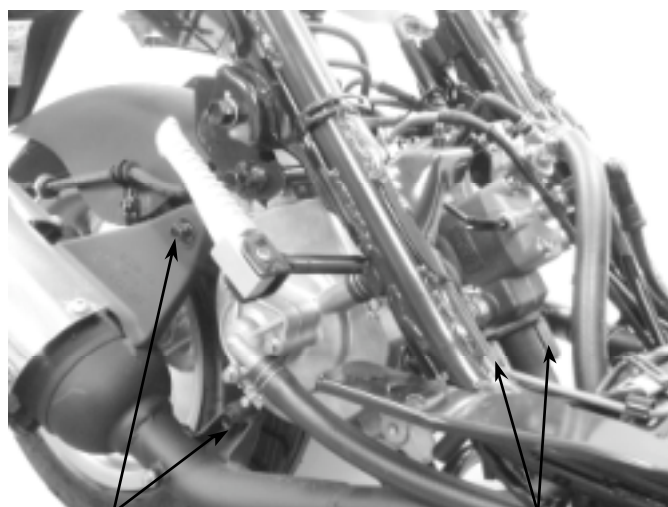
## 6. CYLINDER HEAD/CYLINDER/PISTON

### CYLINDER/PISTON

#### CYLINDER REMOVAL

Remove the met-in box and seat.  
 Remove the frame body cover.  
 Remove the cylinder head. (6-3)  
 Remove the two exhaust muffler joint lock nuts and two exhaust muffler lock bolts.  
 Remove the exhaust muffler.  
 Remove the cylinder.  
 Remove the cylinder gasket.

- \* Do not pry between the cylinder and crankcase or strike the fins.

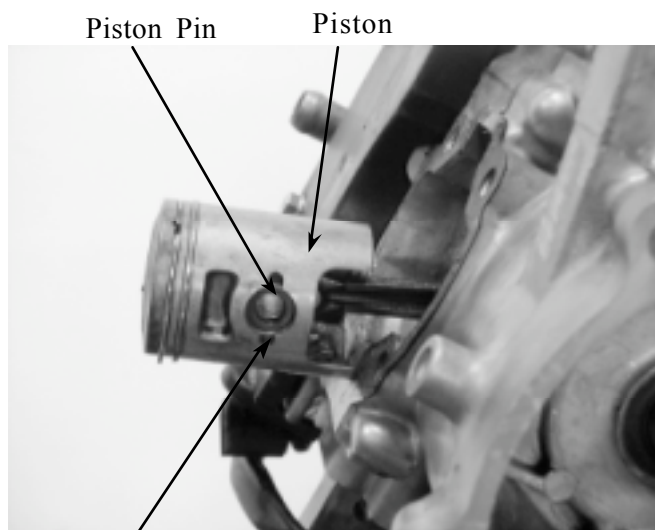


Exhaust Muffler Lock Bolts      Joint Lock Nuts

#### PISTON REMOVAL

Remove the piston pin clip to remove the piston pin and piston.

- \*
- Do not damage or scratch the piston.
  - Do not apply side force to the connect-ing rod when removing the piston pin.
  - Place clean shop towels in the crank-case to keep the piston pin clip from falling into the crankcase.



Piston Pin Clip

Spread each piston ring and remove by lifting it up at a point just opposite the gap.  
 Remove the expander.



## 6. CYLINDER HEAD/CYLINDER/PISTON

### CYLINDER/PISTON INSPECTION

Check the cylinder and piston for wear or damage.

Clean carbon deposits from the exhaust port area.

\* Be careful not to damage the cylinder inside wall.



Measure the cylinder bore at three levels of A, B and C in both X and Y directions. Avoid the port area. Take the maximum figure measured to determine the cylinder bore.

#### Service Limit:

SH10DA: 39.05mm replace if over

SF10DA: 39.05mm replace if over



Inspect the top of the cylinder for warpage.

#### Service Limit:

SH10DA: 0.10mm replace if over

SF10DA: 0.10mm replace if over

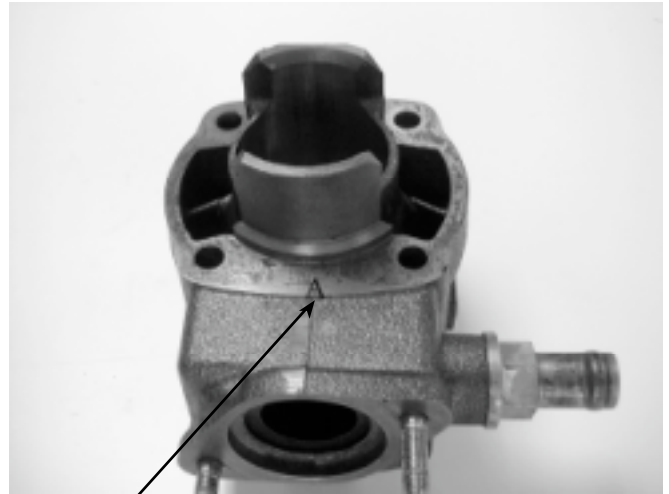




## 6. CYLINDER HEAD/CYLINDER/PISTON

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The cylinder has an A mark or no mark on it. When replacing the cylinder with a new one, use a cylinder having the same mark as the old one.



A Mark

Measure the piston O.D. at a point 5mm from the bottom of the piston skirt.

**Service Limit:**

SH10DA: 38.90mm replace if below

SF10DA: 38.90mm replace if below

Measure the piston-to-cylinder clearance.

**Service Limit:**

SH10DA: 0.10mm replace if over

SF10DA: 0.10mm replace if over



Measure the piston pin hole I.D.

**Service Limit:**

SH10DA: 12.03mm replace if over

SF10DA: 12.03mm replace if over

Measure the piston pin O.D.

**Service Limit:**

SH10DA: 11.98mm replace if below

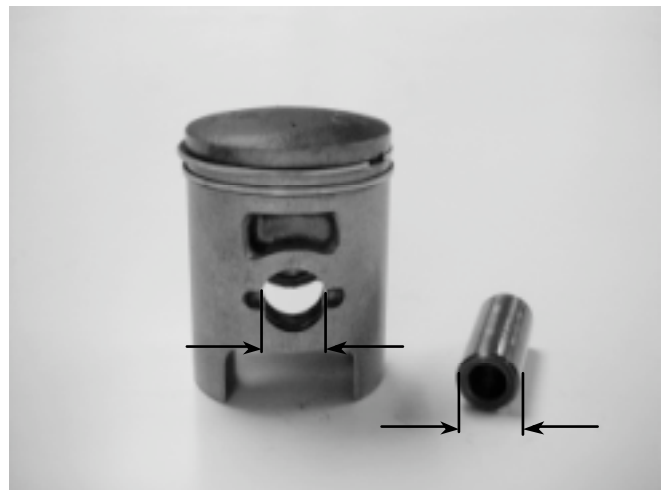
SF10DA: 11.98mm replace if below

Measure the piston-to-piston pin clearance.

**Service Limit:**

SH10DA: 0.03mm replace if over

SF10DA: 0.03mm replace if over



## 6. CYLINDER HEAD/CYLINDER/PISTON

### PISTON RING INSPECTION

Measure each piston ring end gap.

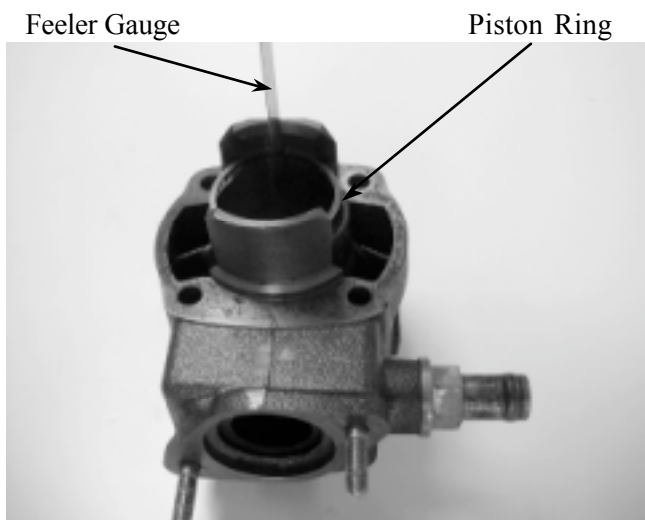
**Service Limits:** Top/Second

SH10DA: 0.40mm replace if over

SF10DA: 0.40mm replace if over

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Set each piston ring squarely into the cylinder using the piston and measure the end gap.



### CONNECTING ROD SMALL END INSPECTION

Install the piston pin and bearing in the connecting rod small end and check for excessive play.

Measure the connecting rod small end I.D.

**Service Limit:**

SH10DA: 17.03mm replace if over

SF10DA: 17.03mm replace if over



### PISTON/CYLINDER INSTALLATION

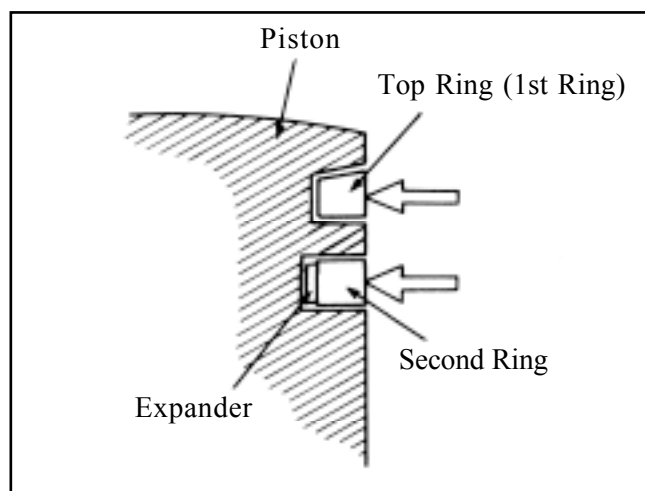
First install the expander in the second ring groove.

Then install the top and second rings in their respective ring grooves.

The piston rings should be pressed into the grooves with even force.

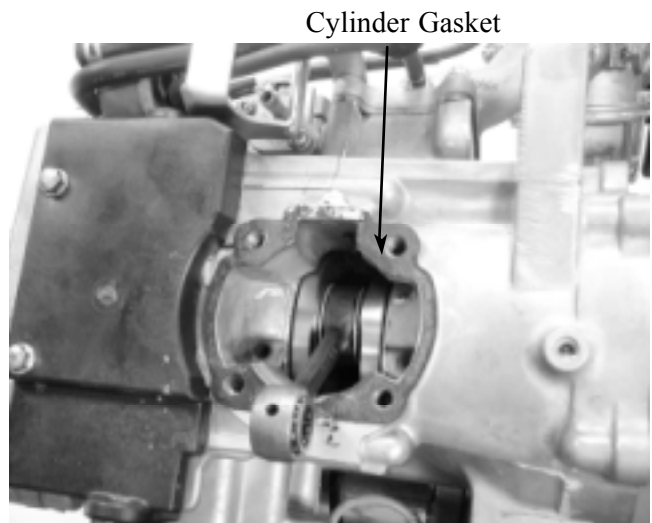
After installation, check and make sure that each ring is flush with the piston at several points around the ring.

A ring that will not compress means that the ring groove has carbon deposits in it and should be cleaned.

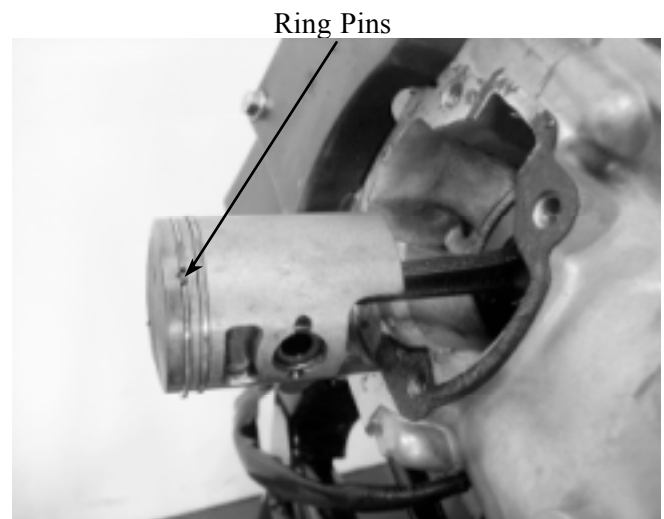


## 6. CYLINDER HEAD/CYLINDER/PISTON

Install a new cylinder gasket on the mating surface between the cylinder and crankcase.



Make sure that the ring end gaps are aligned with the piston ring pins in the ring grooves.



Lubricate the cylinder inside and piston rings with engine oil and install the piston into the cylinder while compressing the piston rings.

\* Be careful not to damage the piston.

Install the cylinder head.

**Torque:** 14.7\_ 16.66N-m

Install the exhaust muffler and tighten the exhaust muffler joint lock nuts.

**Torque:** 9.8\_ 13.72N-m

Tighten the exhaust muffler lock bolts.

**Torque:** 29.4\_ 35.28N-m

Install the frame covers.