

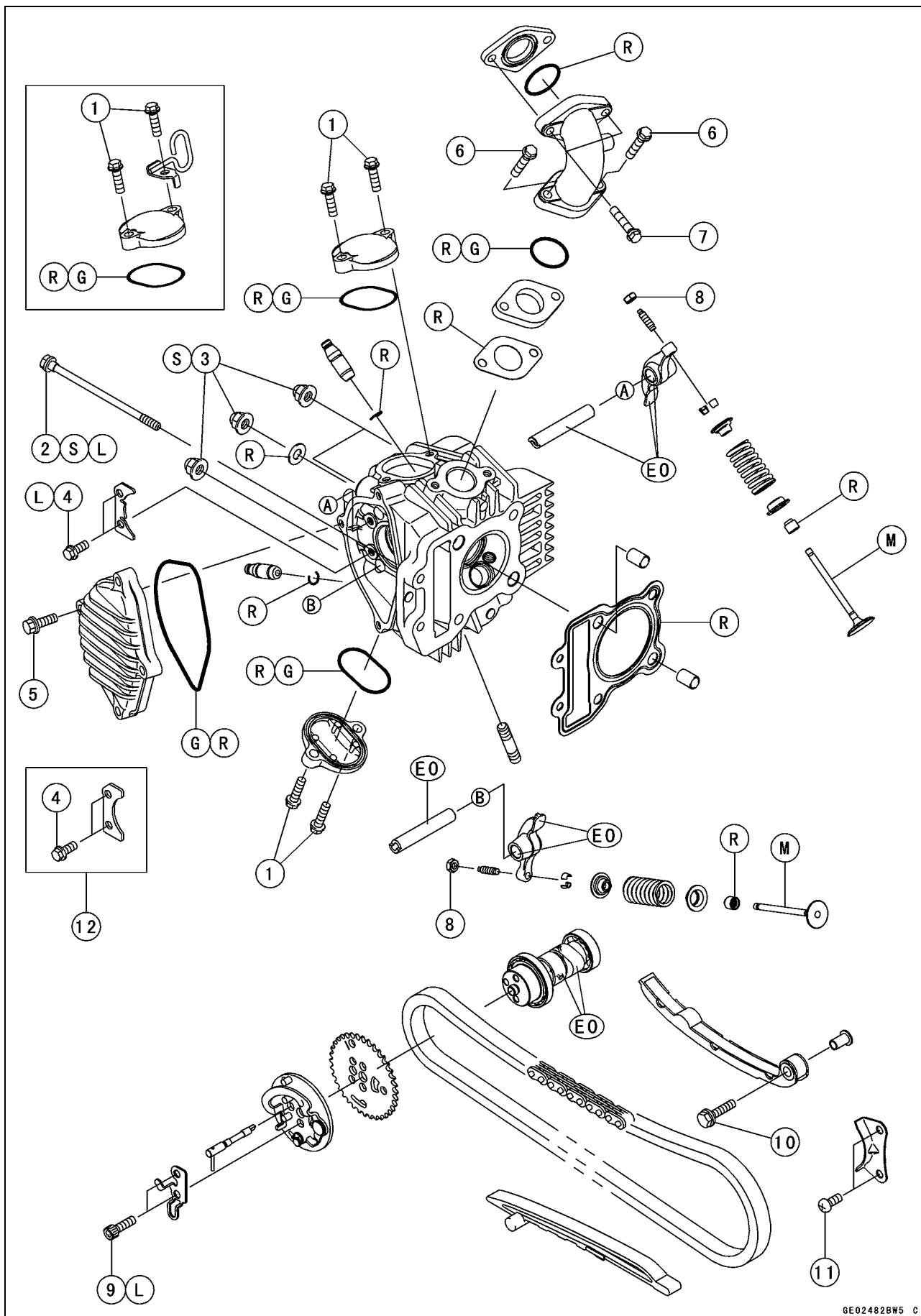
Engine Top End

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4-2 ENGINE TOP END

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Valve Adjusting Cap Bolts	5.2	0.53	46 in·lb	
2	Cylinder Head Bolts	12	1.2	106 in·lb	S, L
3	Cylinder Head Nuts	22	2.2	16	S
4	Rocker Shaft Holder Plate Bolts (KLX110CA/DA Early Models)	5.2	0.53	46 in·lb	
	Rocker Shaft Holder Plate Bolts (KLX110CA/DA Late Models ~)	5.2	0.53	46 in·lb	L
5	Camshaft Sprocket Cover Bolts	5.2	0.53	46 in·lb	
6	Intake Pipe Bolts	5.2	0.53	46 in·lb	
7	Carburetor Holder Bolts	5.2	0.53	46 in·lb	
8	Valve Adjusting Screw Locknuts	8.8	0.90	78 in·lb	
9	Camshaft Sprocket Bolts	12	1.2	106 in·lb	L
10	Camshaft Chain Guide Bolt	5.2	0.53	46 in·lb	
11	Camshaft Chain Plate Screw	5.2	0.53	46 in·lb	

12. KLX110CA/DA Early Models

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

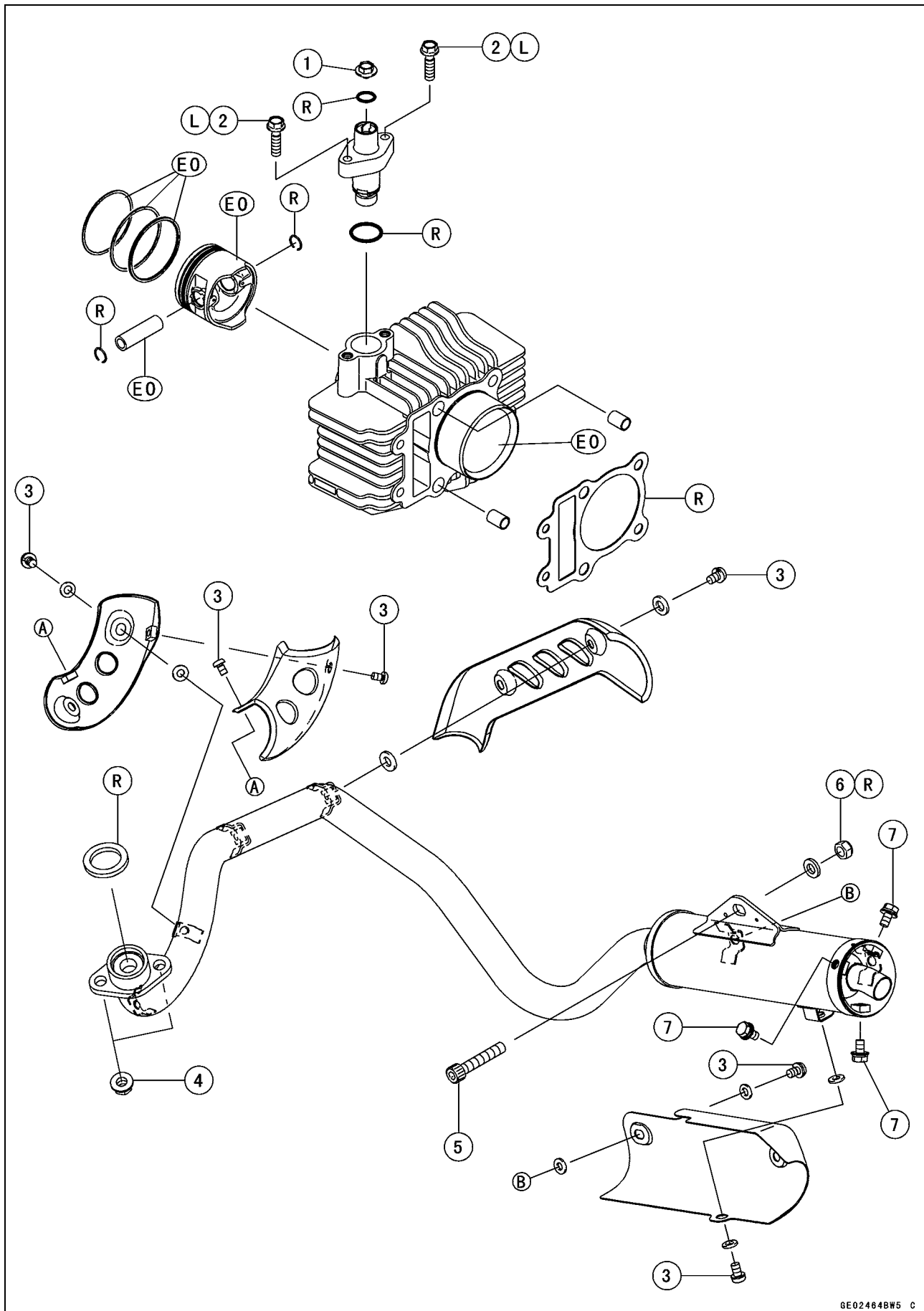
M: Apply molybdenum disulfide grease.

R: Replacement Parts

S: Follow the specific tightening sequence.

4-4 ENGINE TOP END

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Camshaft Chain Tensioner Cap Bolt	5.2	0.53	46 in·lb	
2	Camshaft Chain Tensioner Mounting Bolts	5.2	0.53	46 in·lb	L
3	Muffler Cover Screws	3.0	0.31	27 in·lb	
4	Exhaust Pipe Holder Nuts	16	1.6	12	
5	Muffler Mounting Bolt	9.8	1.0	87 in·lb	
6	Muffler Mounting Nut	30	3.1	22	R
7	Spark Arrester Mounting Bolts	8.8	0.90	78 in·lb	

EO: Apply engine oil.

L: Apply a non-permanent locking agent.

R: Replacement Parts

4-6 ENGINE TOP END

Specifications

Item	Standard	Service Limit
Rocker Arm, Rocker Arm Shaft		
Rocker Arm Inside Diameter	10.000 ~ 10.015 mm (0.3937 ~ 0.3943 in.)	10.05 mm (0.396 in.)
Rocker Arm Shaft Diameter	9.980 ~ 9.995 mm (0.3929 ~ 0.3935 in.)	9.95 mm (0.392 in.)
Camshaft		
Cam Height:		
Exhaust	29.054 ~ 29.168 mm (1.1439 ~ 1.1483 in.)	28.95 mm (1.140 in.)
Inlet	29.017 ~ 29.131 mm (1.1424 ~ 1.1469 in.)	28.92 mm (1.139 in.)
Cylinder Head		
Cylinder Compression (Usable Range):		
Kick	700 ~ 1098 kPa (7.14 ~ 11.2 kgf/cm ² , 102 ~ 159 psi) @5 times	---
Electric Starter	280 ~ 498 kPa (2.86 ~ 5.08 kgf/cm ² , 41 ~ 72 psi) @350 r/min (rpm)	---
Cylinder Head Warp	---	0.03 mm (0.001 in.)
Valve		
Valve Clearance:		
Exhaust	0.08 ~ 0.12 mm (0.003 ~ 0.005 in.)	---
Inlet	0.04 ~ 0.08 mm (0.002 ~ 0.003 in.)	---
Valve Head Thickness:		
Exhaust	0.8 mm (0.031 in.)	0.5 mm (0.020 in.)
Inlet	0.5 mm (0.020 in.)	0.25 mm (0.010 in.)
Valve Stem Bend	TIR 0.01 mm (0.0004 in.) or less	TIR 0.05 mm (0.002 in.)
Valve Stem Diameter:		
Exhaust	4.462 ~ 4.472 mm (0.1757 ~ 0.1761 in.)	4.44 mm (0.1748 in.)
Inlet	4.475 ~ 4.490 mm (0.1762 ~ 0.1768 in.)	4.46 mm (0.1756 in.)
Valve Guide Inside Diameter:		
Exhaust	4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in.)	4.58 mm (0.1803 in.)
Inlet	4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in.)	4.58 mm (0.1803 in.)
Valve Guide Clearance (Wobble Method):		
Exhaust	0.05 ~ 0.08 mm (0.002 ~ 0.003 in.)	0.19 mm (0.0075 in.)
Inlet	0.02 ~ 0.06 mm (0.0008 ~ 0.002 in.)	0.17 mm (0.0067 in.)
Valve Seat Cutting Angle	32°, 45°, 60°, 67.5°	---
Valve Seat Surface:		
Outside Diameter:		
Exhaust	19.9 ~ 20.1 mm (0.783 ~ 0.791 in.)	---
Inlet	22.9 ~ 23.1 mm (0.902 ~ 0.909 in.)	---
Width:		
Exhaust	0.80 ~ 1.15 mm (0.031 ~ 0.045 in.)	---
Inlet	0.80 ~ 1.15 mm (0.031 ~ 0.045 in.)	---
Valve Spring Free Length	36.6 mm (1.441 in.)	35.8 mm (1.409 in.)

Specifications

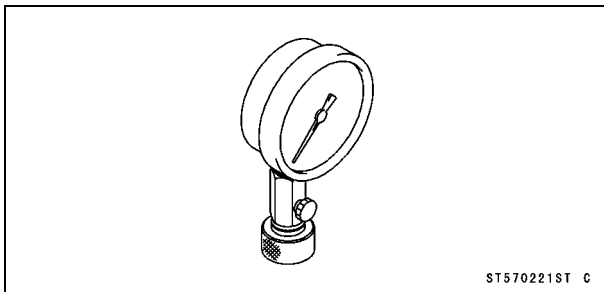
Item	Standard	Service Limit
Cylinder, Piston		
Cylinder Inside Diameter	52.997 ~ 53.009 mm (2.0865 ~ 2.0870 in.)	53.10 mm (2.0905 in.)
Piston Diameter	52.969 ~ 52.981 mm (2.0854 ~ 2.0859 in.)	52.82 mm (2.080 in.)
Piston/Cylinder Clearance	0.010 ~ 0.022 mm (0.00039 ~ 0.00086 in.)	— — —
Over Size Piston and Rings	+0.50 (0.0197 in.) +1.0 (0.0394 in.)	
Piston Ring/Groove Clearance:		
Top	0.020 ~ 0.060 mm (0.0008 ~ 0.0024 in.)	0.16 mm (0.0063 in.)
Second	0.010 ~ 0.050 mm (0.0004 ~ 0.0020 in.)	0.15 mm (0.0059 in.)
Piston Ring Groove Width:		
Top	0.81 ~ 0.83 mm (0.0319 ~ 0.0327 in.)	0.91 mm (0.0358 in.)
Second	0.80 ~ 0.82 mm (0.0315 ~ 0.0323 in.)	0.90 mm (0.0354 in.)
Piston Ring Thickness:		
Top	0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)	0.70 mm (0.0276 in.)
Second	0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)	0.70 mm (0.0276 in.)
Piston Ring End Gap:		
Top	0.10 ~ 0.20 mm (0.0039 ~ 0.0079 in.)	0.6 mm (0.024 in.)
Second	0.30 ~ 0.45 mm (0.0118 ~ 0.0177 in.)	0.8 mm (0.031 in.)
Oil	0.10 ~ 0.60 mm (0.0039 ~ 0.0236 in.)	0.9 mm (0.035 in.)
Piston Pin Diameter	12.995 ~ 13.000 mm (0.5116 ~ 0.5118 in.)	12.96 mm (0.510 in.)
Piston Pin Hole Diameter	13.001 ~ 13.007 mm (0.5118 ~ 0.5121 in.)	13.08 mm (0.515 in.)
Connecting Rod Small End Inside Diameter	13.003 ~ 13.014 mm (0.5119 ~ 0.5124 in.)	13.05 mm (0.514 in.)

4-8 ENGINE TOP END

Special Tools

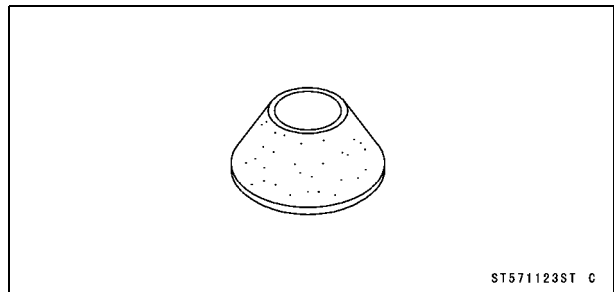
Compression Gauge, 20 kgf/cm²:

57001-221



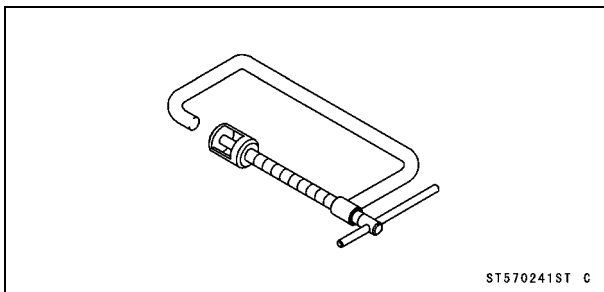
Valve Seat Cutter, 60° - ϕ 30:

57001-1123



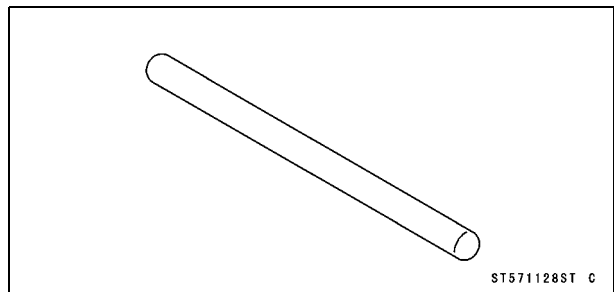
Valve Spring Compressor Assembly:

57001-241



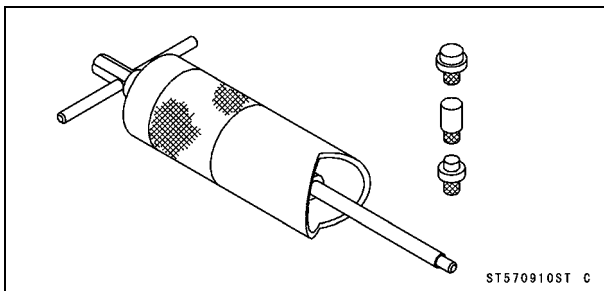
Valve Seat Cutter Holder Bar:

57001-1128



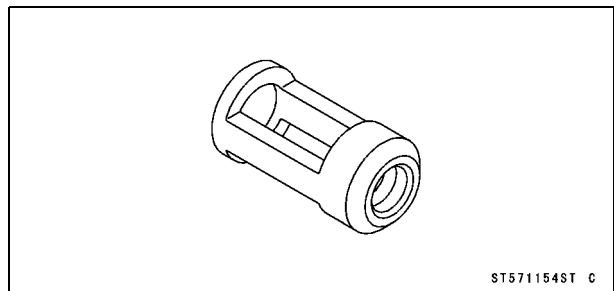
Piston Pin Puller Assembly:

57001-910



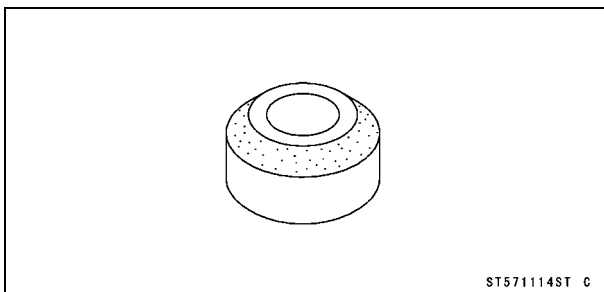
Valve Spring Compressor Adapter, ϕ 20:

57001-1154



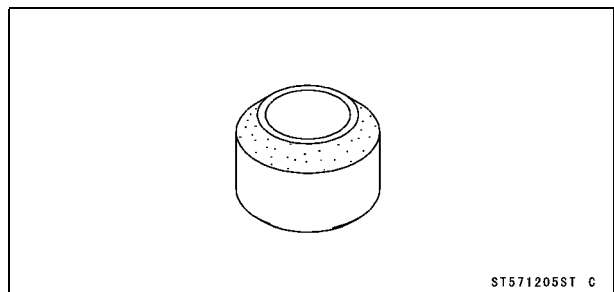
Valve Seat Cutter, 45° - ϕ 27.5:

57001-1114



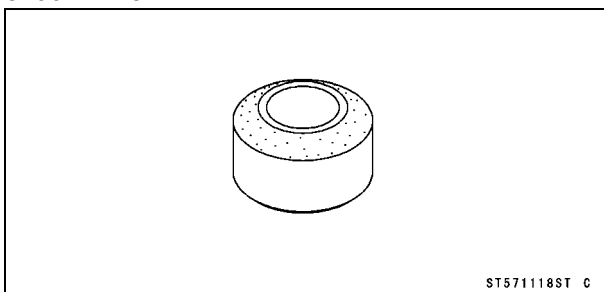
Valve Seat Cutter, 45° - ϕ 22:

57001-1205



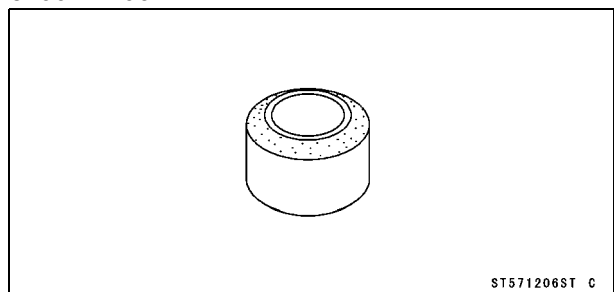
Valve Seat Cutter, 32° - ϕ 25:

57001-1118



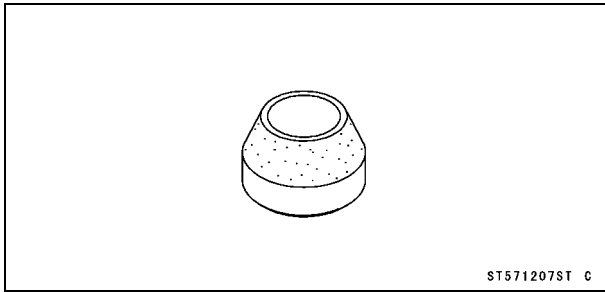
Valve Seat Cutter, 32° - ϕ 22:

57001-1206

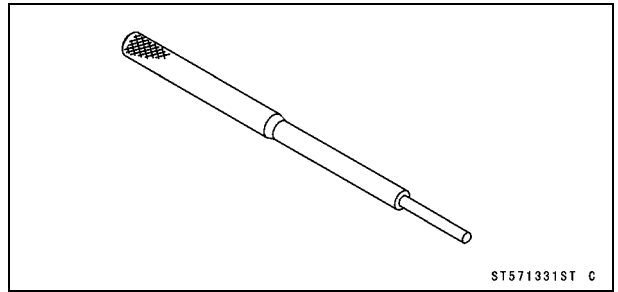


Special Tools

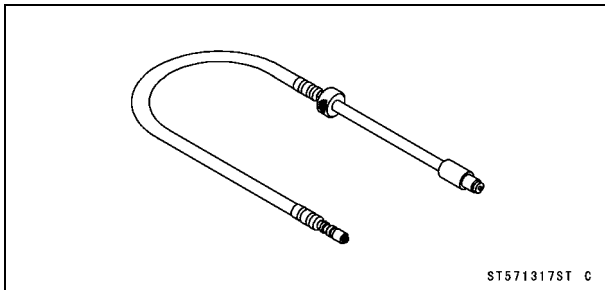
Valve Seat Cutter, 67.5° - ϕ 22:
57001-1207



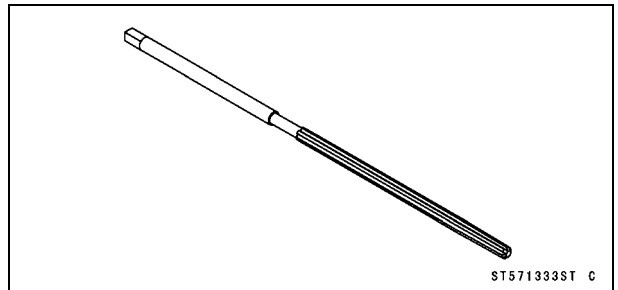
Valve Guide Arbor, ϕ 4.5:
57001-1331



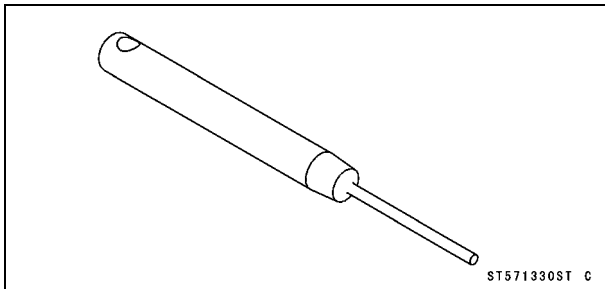
Compression Gauge Adapter, M10 × 1.0:
57001-1317



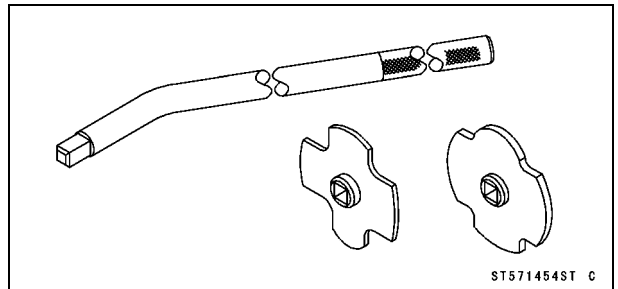
Valve Guide Reamer, ϕ 4.5:
57001-1333



Valve Seat Cutter Holder, ϕ 4.5:
57001-1330



Filler Cap Driver:
57001-1454



4-10 ENGINE TOP END

Camshaft Chain Tensioner

Camshaft Chain Tensioner Removal

NOTICE

This is a non-return type cam chain tensioner. The push rod does not return to its original position once it moves out to take up cam chain slack. Observe all the rules listed below:

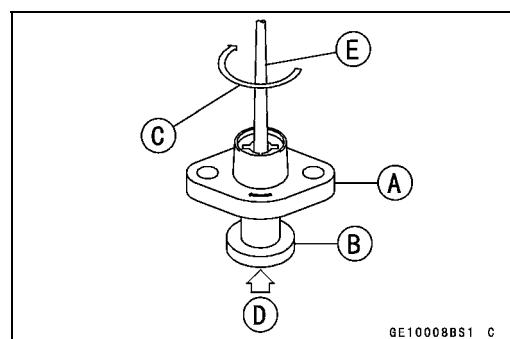
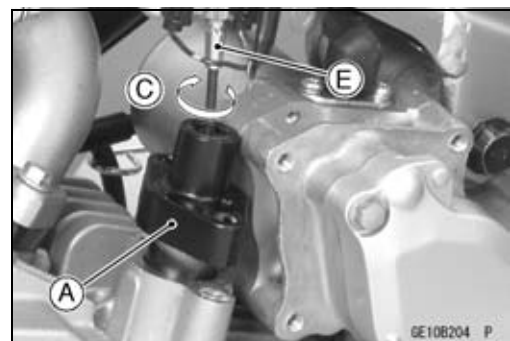
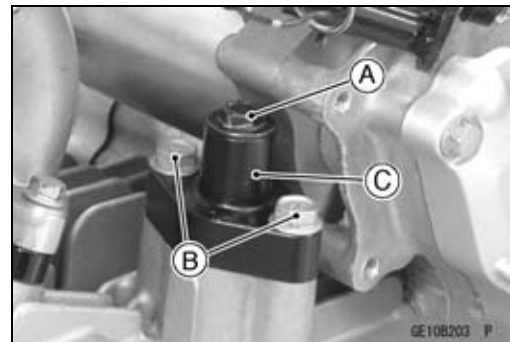
When removing the tensioner, do not take out the mounting bolts only halfway. Retightening the mounting bolts from this position could damage the tensioner and the camshaft chain. Once the bolts are loosened, the tensioner must be removed and reset as described in "Chain Tensioner Installation". Do not turn over the crankshaft while the tensioner is removed. This could upset the cam chain timing, and damage the valves.

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter).
- Remove the choke knob holder for extra clearance.
- Loosen the cap bolt [A] before tensioner removal for later disassembly convenience.
- Unscrew the mounting bolts [B] and remove the camshaft chain tensioner [C].

NOTICE

Do not turn over the crankshaft while the tensioner is removed. This could upset the cam chain timing, and damaging the valves.

- Remove the camshaft chain tensioner [A] while turning the push rod [B] clockwise [C] and compressing [D] it with a standard tip screwdriver [E].



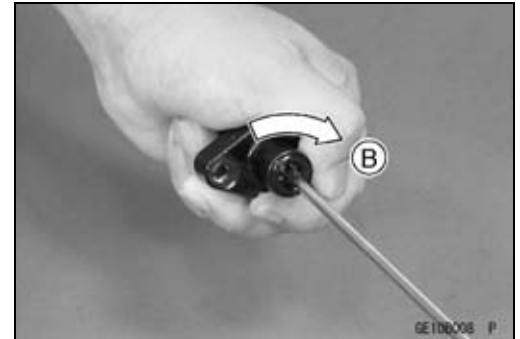
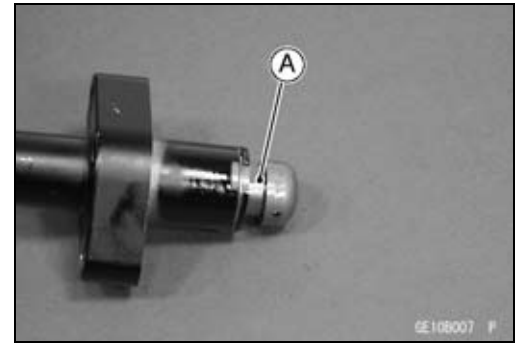
Camshaft Chain Tensioner

Camshaft Chain Tensioner Installation

- Remove the tensioner cap bolt and O-ring.
- While compressing the push rod [A], turn it clockwise [B] with a standard tip screwdriver until the rod protrusion comes to about 10 mm (0.4 in.) from the tensioner body.

NOTICE

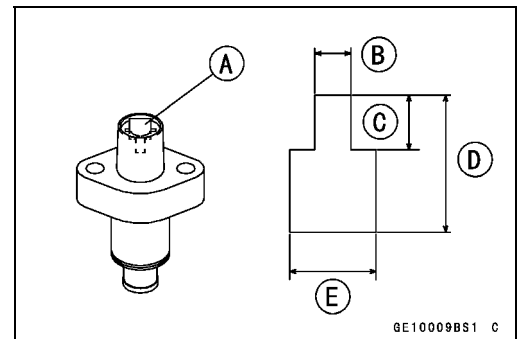
Do not turn the rod counterclockwise at installation. This could detach the rod and the tensioner cannot be reinstalled.



- While holding the rod in position with a suitable push rod holder plate [A], install the tensioner on the cylinder.
 - 4 mm (0.16 in.) [B]
 - 6 mm (0.24 in.) [C]
 - 15 mm (0.60 in.) [D]
 - 9.5 mm (0.37 in.) [E]

NOTE

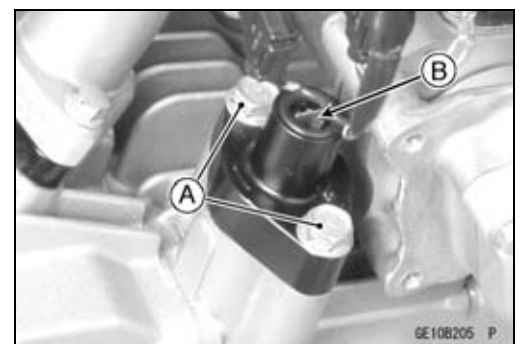
○ To make the procedure easy, use a holder plate to keep the rod from pushing out. A replacement chain tensioner (spare parts) has a holder plate. The holder plate can be made less than 1 mm (0.0394 in.) thick steel plate as shown.



- Apply a non-permanent locking agent to the threads of tensioner mounting bolts [A] and tighten them to the specified torque.

Torque - Camshaft Chain Tensioner Mounting Bolts: 5.2 N·m (0.53 kgf·m, 46 in·lb)

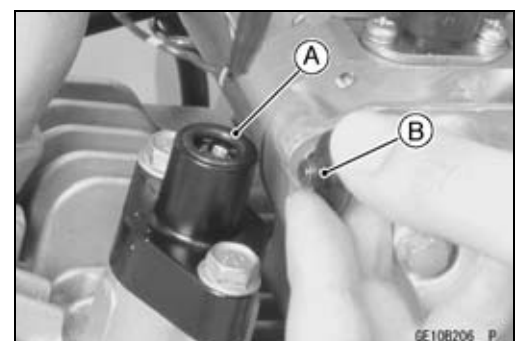
- Take out the holder plate [B].



- Be sure that the new O-ring [A] is properly in place and tighten the cap bolt [B].

Torque - Camshaft Chain Tensioner Cap Bolt: 5.2 N·m (0.53 kgf·m, 46 in·lb)

- Install the fuel tank (see Fuel Tank Installation in the Fuel System chapter).

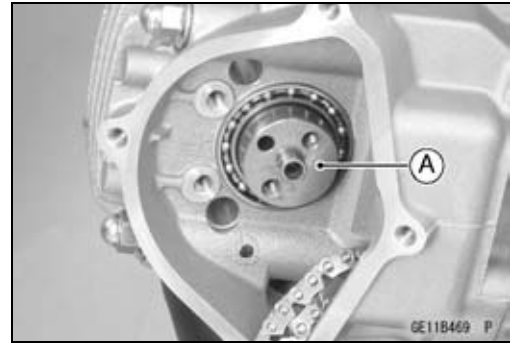


4-12 ENGINE TOP END

Camshaft

Camshaft Removal

- Remove the rocker arms (see Rocker Arm Removal).
- Pull out the camshaft [A].



Camshaft Installation

- Clean the camshaft with high flash-point solvent.
 - Apply clean engine oil to all cam parts.
 - Install the camshaft in the cylinder head.
 - Install the rocker arm.
 - Install the other removed parts.
- Check and adjust the valve clearance.

Camshaft Inspection

- Visually inspect the cam for wear or damage.
- ★ If there is any damage or wear, replace the camshaft.
- Measure the height [A] of each cam.

Cam Height

Standard:

Exhaust 29.054 ~ 29.168 mm (1.1439 ~ 1.1483 in.)

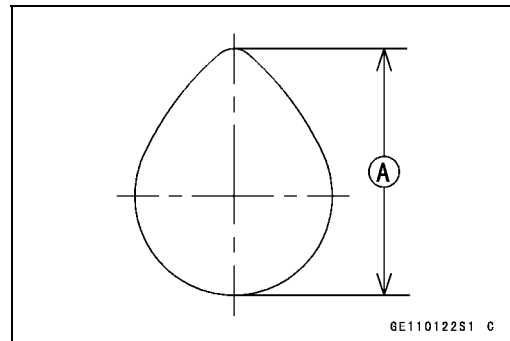
Inlet 29.017 ~ 29.131 mm (1.1424 ~ 1.1469 in.)

Service Limit:

Exhaust 28.95 mm (1.140 in.)

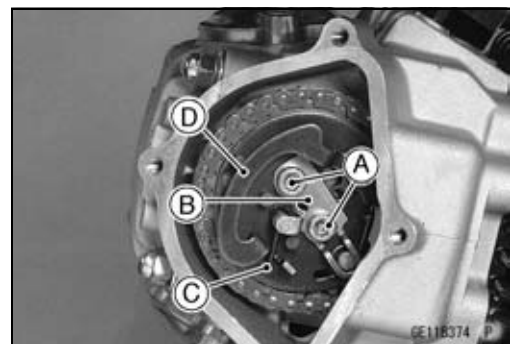
Inlet 28.92 mm (1.139 in.)

- ★ If any cam is worn down past service limit, replace the camshaft.



KACR Removal

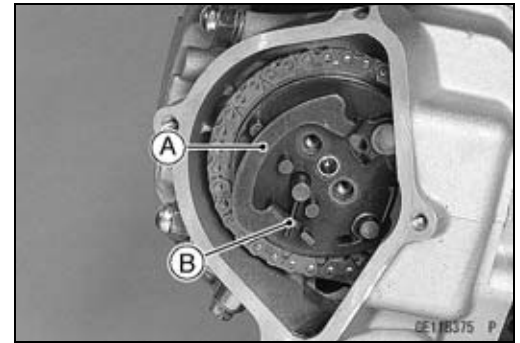
- Remove:
 - Camshaft Sprocket Cover
 - Camshaft Sprocket Bolts [A]
 - Retaining Plate [B]
 - Shaft [C]
 - Weight [D]
- Remove the camshaft sprocket bolts while holding the alternator rotor nut with a wrench.



Camshaft

KACR Installation

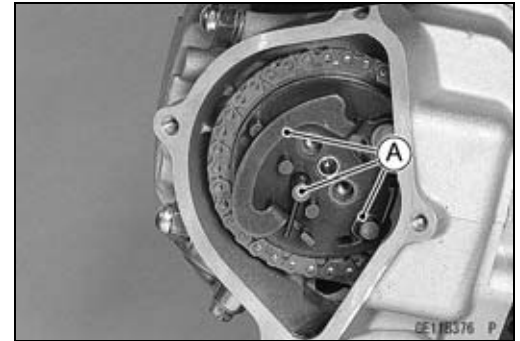
- Install:
 - Weight [A]
- Insert the shaft [B] as shown.
 - Retaining Plate
 - Camshaft Sprocket Bolts
 - Camshaft Sprocket Cover



KACR Inspection

The Kawasaki Automatic Compression Release (KACR) momentarily opens the valve on the compression stroke at very low speed. This allows some of the compression pressure to escape, making it easy to turn over the engine during starting.

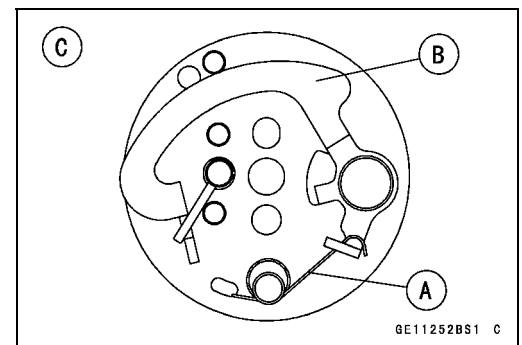
Due to the simplicity of the mechanism, no periodic maintenance is needed. There are only two symptoms of problems with the KACR mechanism [A]: compression is not released during starting, and compression is released during running.



(1) If compression is not released during starting, the weight is not returning to their rest position.

- Remove the KACR unit.
- Visually inspect the spring [A].
- ★ If damaged, deformed, or missing, replace the weight.
- Check that the weight arm [B] move back and forth.
- ★ If the weight do not move smoothly, replace the KACR unit. Also inspect the inlet rocker arm for any damage, and replace the rocker arm if necessary.

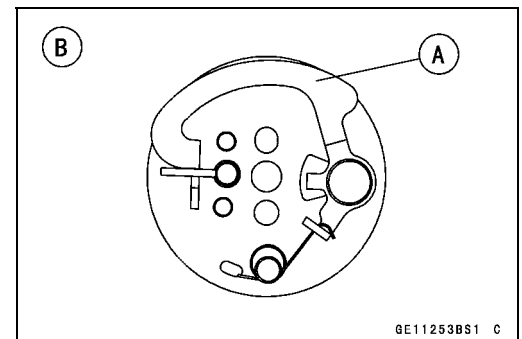
[C] Rest Position (compression is released)



(2) If compression is released while the engine is running, the weights are not swinging out.

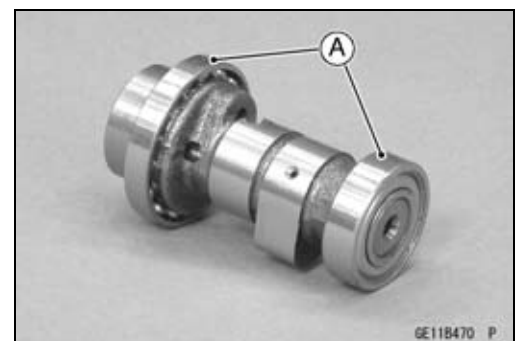
- Check that the weight arm [A] move back and forth.
- ★ If the weight do not move easily from the retracted position, replace the KACR unit. Also inspect the inlet rocker arm for any damage, and replace the rocker arm if necessary.

[B] Running Position (compression is not released)



Camshaft Bearing Inspection

- Visually inspect each camshaft bearing [A].
- ★ If there is any damage replace the camshaft.
- Turn the bearing back and forth while checking for roughness or binding.
- ★ If roughness or binding is found, replace the camshaft.
- ★ If it is noisy, does not spin smoothly, or has any rough spots, replace the camshaft.



4-14 ENGINE TOP END

Camshaft

Camshaft Sprocket Removal

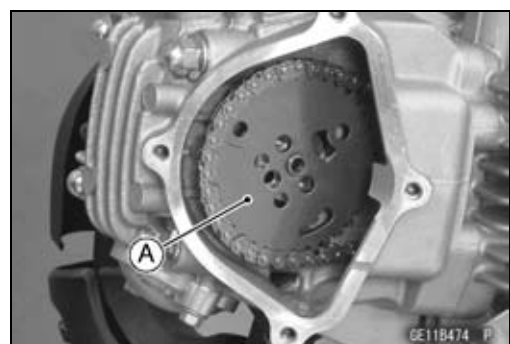
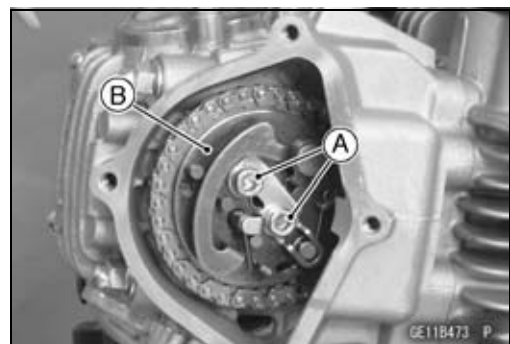
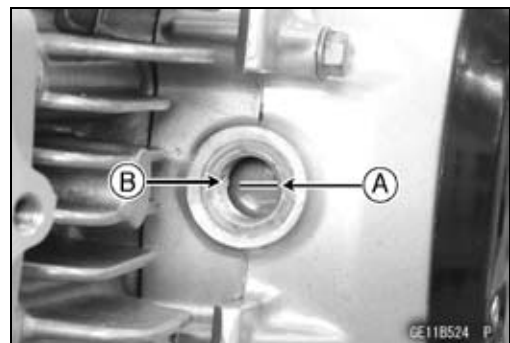
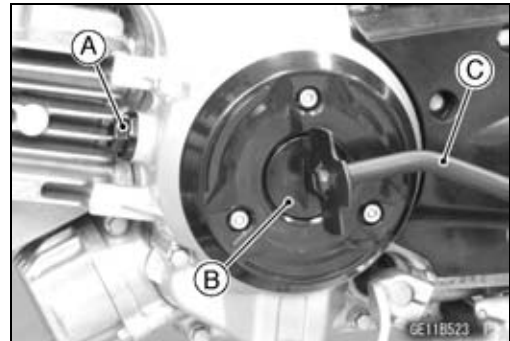
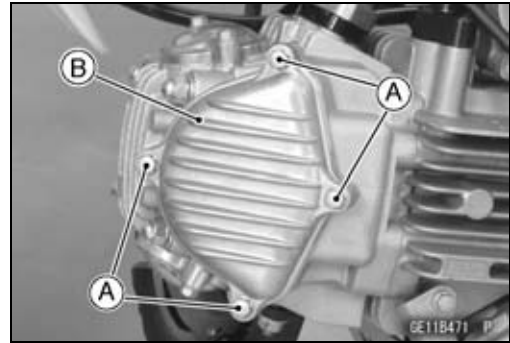
- Remove:
 - Camshaft Sprocket Cover Bolts [A]
 - Camshaft Sprocket Cover [B]

- Remove the timing inspection cap [A] and rotor nut cap [B].
Special Tool - Filler Cap Driver [C]: 57001-1454

- Turn the alternator rotor nut counterclockwise and align the "T" mark line [A] of the rotor with the notch [B] of the alternator cover.
- Remove the camshaft chain tensioner (see Camshaft Chain Tensioner Removal).

- With a wrench on the alternator rotor nut to keep the crankshaft from turning, remove the camshaft sprocket bolts [A].
- Remove the KACR unit [B] (see KACR Removal).

- Remove the camshaft sprocket [A].

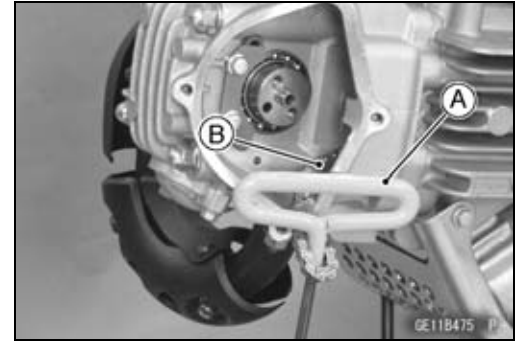


Camshaft

- Use a suitable tool [A] or wire to keep the chain [B] from falling down into the cylinder block.

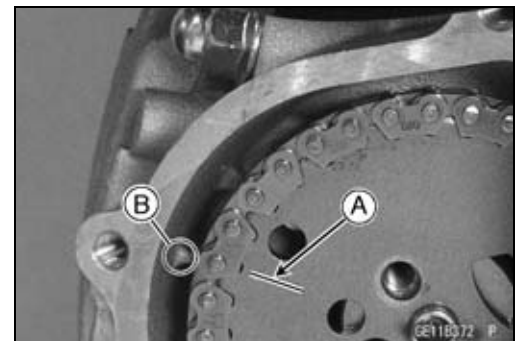
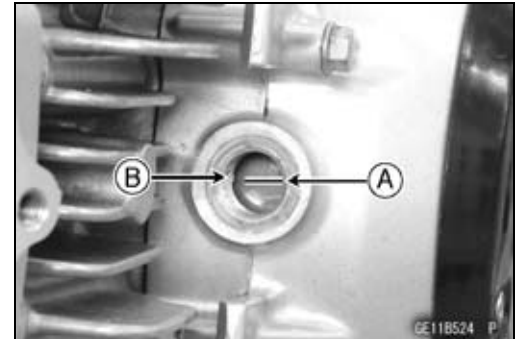
NOTICE

Always pull the camshaft chain taut while turning the crankshaft when the camshaft chain is loose. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.



Camshaft Sprocket Installation

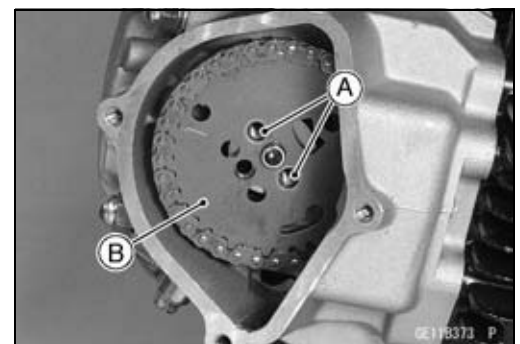
- Position the piston at TDC.
 - Turn the crankshaft counterclockwise and align the “T” mark line [A] of the rotor with the notch [B] of the alternator cover.
 - Remember to pull the camshaft chain taut before rotating the crankshaft.
-
- Pull the lower side of the chain taut and fit it onto the sprocket so that the line [A] on the sprocket aligns with the mark on the sprocket cover mating surface projection [B].



- Fit the sprocket up into place.
- Turn the camshaft so that the cam lobes point downward, while holding the sprocket steady to align the bolt holes [A].
- Install the sprocket [B].
- Install the KACR unit (see KACR Installation).
- Keep the crankshaft from turning by holding a wrench on the alternator rotor nut.
- Apply a non-permanent locking agent to the threads of camshaft sprocket bolts.
- Tighten:

Torque - Camshaft Sprocket Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)

- Install the camshaft chain tensioner (see Camshaft Chain Tensioner Installation).
- Check the camshaft chain timing.
- Turn the crankshaft two turns in the counterclockwise, the crankshaft is at TDC, and re-check the camshaft chain timing.
- ★ If the timing mark is aligned, the camshaft chain timing is correct.



4-16 ENGINE TOP END

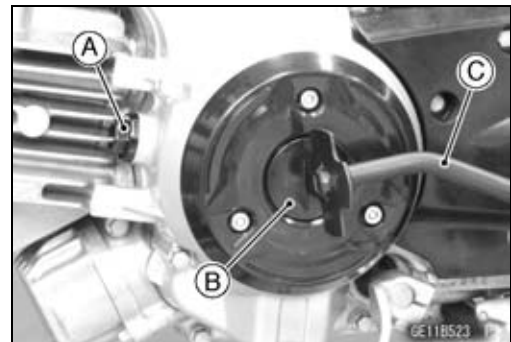
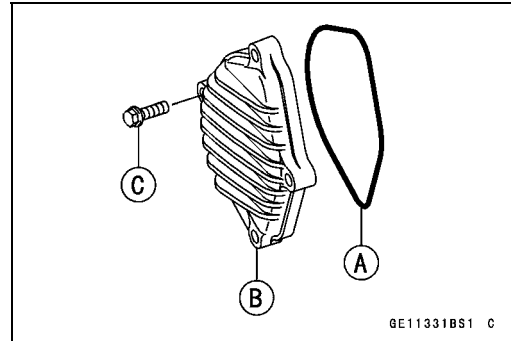
Camshaft

- Apply grease to the new O-ring [A] and install the camshaft sprocket cover [B].
- Tighten:
 - Torque - Camshaft Sprocket Cover Bolts [C]: 5.2 N·m (0.53 kgf·m, 46 in·lb)

NOTICE

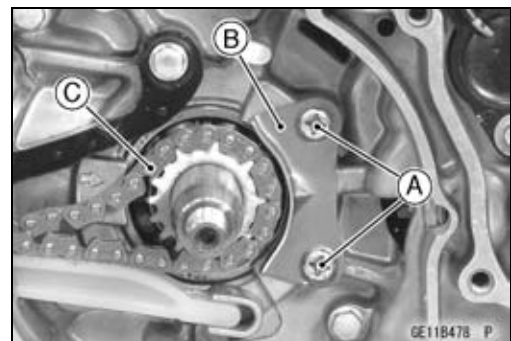
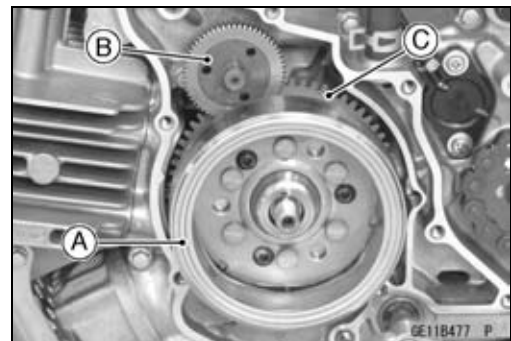
Rotation of the crankshaft with improper camshaft timing could cause the valve to contact each other or the piston, and bend.
If any resistance is felt when turning the crankshaft, stop immediately, and check the camshaft chain timing.

- Install the other removed parts.
 - Tighten:
 - Torque - Timing Inspection Cap [A]: 2.4 N·m (0.24 kgf·m, 21 in·lb)
 - Alternator Rotor Nut Cap [B]: 2.4 N·m (0.24 kgf·m, 21 in·lb)
- Special Tools - Filler Cap Driver [C]: 57001-1454



Camshaft Chain Removal

- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove
 - Camshaft Sprocket (see Camshaft Sprocket Removal)
 - Cylinder Head (see Cylinder Head Removal)
 - Alternator Rotor [A] (see Alternator Rotor Removal in the Electrical System chapter)
 - Woodruff Key
 - Torque Limiter [B]
 - Starter Motor Clutch Gear [C]
- Remove:
 - Screws [A]
 - Camshaft Chain Holder [B]
 - Camshaft Chain [C]



Camshaft

Camshaft Chain Installation

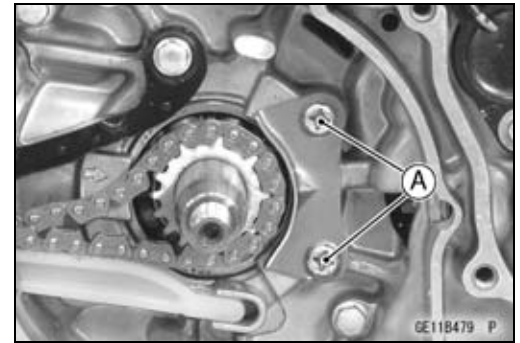
- Install the camshaft chain to the crankshaft, and pull up it through camshaft chain hole of the cylinder.
- Keep the chain.
- Install the camshaft chain holder.
- Tighten:

Torque - Camshaft Chain Plate Screws [A]: 5.2 N·m (0.53 kgf·m, 46 in·lb)

- Install the other removed parts (see appropriate chapters).

Camshaft Chain Guide Wear Inspection

- Visually inspect the guides.
- ★ If the rubber is damaged, replace the guide.

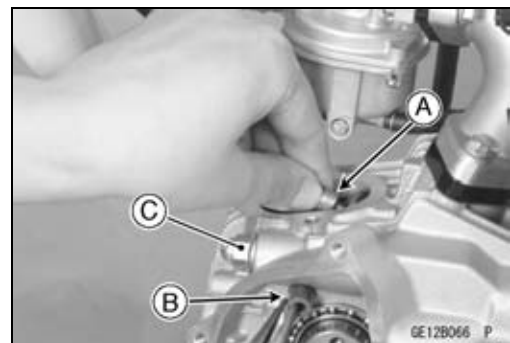
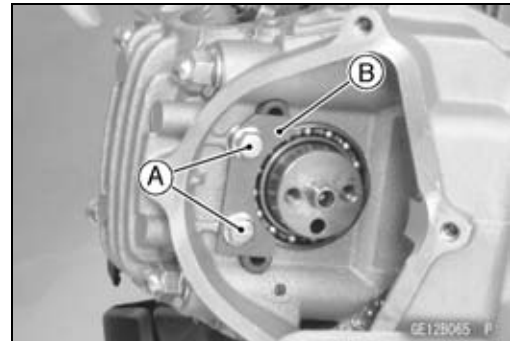
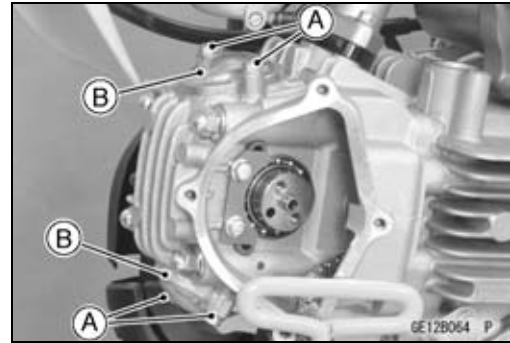


4-18 ENGINE TOP END

Rocker Arm, Rocker Arm Shaft

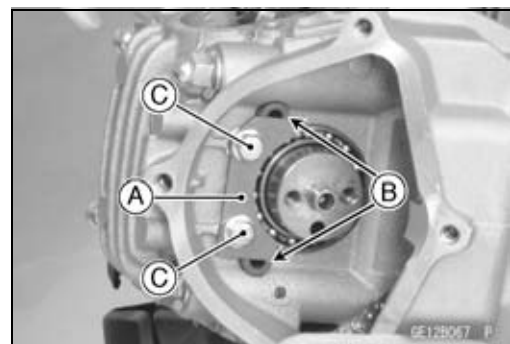
Rocker Arm Removal

- Remove:
 - Camshaft Sprocket (see Camshaft Sprocket Removal)
 - Valve Adjusting Cover Bolts [A]
 - Valve Adjusting Covers [B]
- Remove:
 - Rocker Shaft Holder Plate Bolts [A]
 - Rocker Shaft Holder Plate Stopper [B]
- While holding the rocker arm [A] with hand, pull out the rocker arm shaft [B] and take off the rocker arm.
- Mark and record the rocker arm locations so that the rocker arm can be reinstalled in their original positions.
- When it is difficult to pull out the shaft, loosen the cylinder head nut [C].



Rocker Arm Installation

- Clean the rocker arms and rocker arm shafts with high flash-point solvent.
- Apply a clean engine oil to the rocker arm shaft outside and rocker arm cam parts.
- Turn the camshaft so that the cam lobes point downward.
- Install the each rocker arm shaft, running it through each rocker arm.
- Install the rocker shaft holder plate [A] so that the rocker arm shaft protrusion [B] face each other.
- Apply a non-permanent locking agent to the rocker shaft holder plate bolts [C] (KLX110CA/DA Late Models ~).
- Tighten:
 - Torque - Rocker Shaft Holder Plate Bolts: 5.2 N·m (0.53 kgf·m, 46 in·lb)**
- Install the camshaft sprocket.
- Check and adjust the valve clearance (see Valve Clearance Inspection in the Periodic Maintenance chapter).



NOTICE

When install the valve adjusting covers, be careful not to drop the O-rings from the cover grooves. If the O-ring is installed improperly, oil will leak.

Rocker Arm, Rocker Arm Shaft

Rocker Arm & Arm Shaft Wear Inspection

- Visually inspect the area on the rocker arm where the cam rubs.
- ★ If there is any damage or uneven wear, replace the rocker arm.
- Measure the inside diameter [A] of each rocker arm with a cylinder gauge.

Rocker Arm Inside Diameter

Standard: 10.000 ~ 10.015 mm (0.3937 ~ 0.3943 in.)

Service Limit: 10.05 mm (0.396 in.)

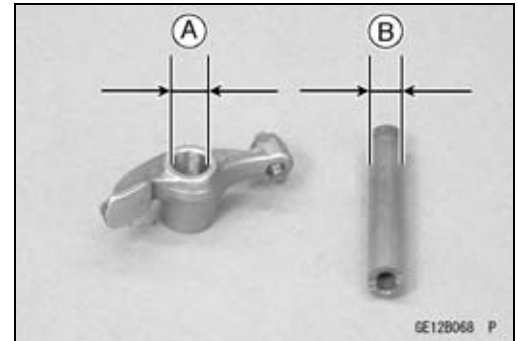
- ★ If it exceeds the service limit, replace the rocker arm.
- Measure the diameter [B] of each rocker arm shaft where the rocker arm fits.

Rocker Arm Shaft Diameter

Standard: 9.980 ~ 9.995 mm (0.3929 ~ 0.3935 in.)

Service Limit: 9.95 mm (0.392 in.)

- ★ If the diameter is less than the service limit, replace the rocker arm shaft.



4-20 ENGINE TOP END

Cylinder Head

Compression Measurement

- Warm up the engine thoroughly.
- Stop the engine.
- Remove the spark plug (see Spark Plug Cleaning and Inspection in the Periodic Maintenance chapter).
- Attach compression gauge and adapter firmly into the spark plug hole.

Special Tools - Compression Gauge, 20 kgf/cm²: 57001-221 [A]

Compression Gauge Adapter, M10 × 1.0: 57001-1317 [B]



- With the throttle fully open, turn the engine over sharply with the kick starter several times until the compression gauge stops rising; the compression is the highest reading obtainable.

Cylinder Compression

Usable Range: 700 ~ 1098 kPa (7.14 ~ 11.2 kgf/cm², 102 ~ 159 psi) @5 times

- Using the starter motor, turn the engine over with the throttle fully open until the compression gauge stops rising; the compression is the highest reading obtainable.

Cylinder Compression

Usable Range: 280 ~ 498 kPa (2.86 ~ 5.08 kgf/cm², 41 ~ 72 psi) @350 r/min (rpm)

The following table should be consulted if the obtainable compression reading is not within the usable range.

Problem	Diagnosis	Remedy (Action)
Cylinder compression is higher than usable range	Carbon accumulation on piston and in combustion chamber possibly due to damaged valve stem oil seal and/or damaged piston oil rings (This may be indicated by white exhaust smoke).	Remove the carbon deposits and replace damaged parts if necessary.
	Incorrect cylinder head gasket, cylinder base gasket thickness.	Replace to gasket with a standard part.
	Damaged KACR spring.	Replace the spring.
	KACR weight do not move smoothly.	Replace the KACR unit.
Cylinder compression is lower than usable range	Gas leakage around cylinder head.	Replace damaged gasket and check cylinder head warp.
	Bad condition of valve seating.	Repair if necessary.
	Incorrect valve clearance.	Adjust the valve clearance.
	Incorrect piston/cylinder clearance.	Replace the piston and/or cylinder
	Piston seizure.	Inspect the cylinder (and liner) and replace/repair the cylinder and/or piston as necessary.
	Bad condition of piston ring and/or piston ring grooves.	Replace the piston and/or the piston rings.
KACR weight do not move smoothly.	Replace the KACR unit.	

- Remove the compression gauge and adapter, and install the spark plug.

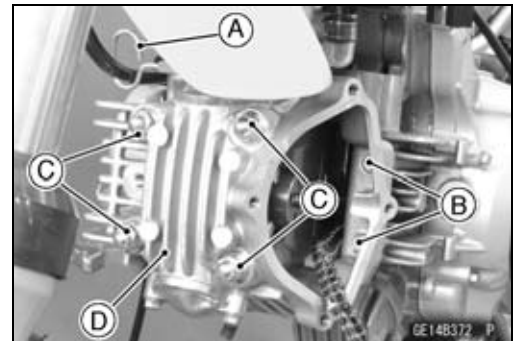
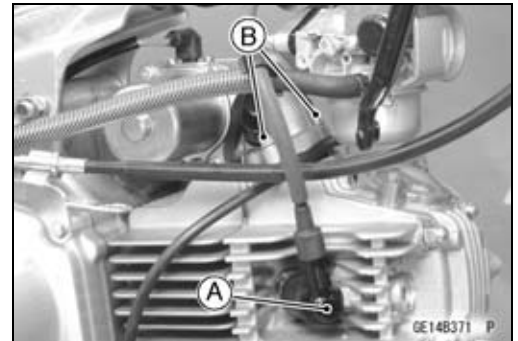
Torque - Spark Plug: 13 N·m (1.3 kgf·m, 115 in·lb)

Cylinder Head

Cylinder Head Removal

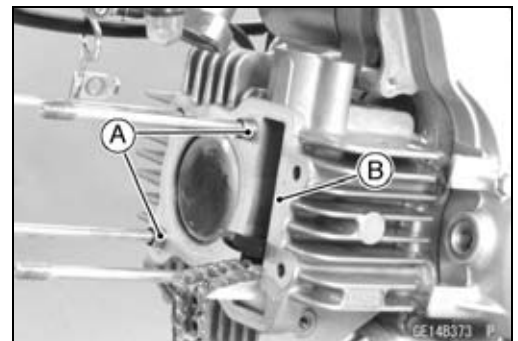
- Remove:
 - Muffler (see Muffler Removal)
 - Oil Pipe (see Oil Pipe Removal in the Engine Lubrication System chapter)
 - Spark Plug Cap [A]
 - Intake Pipe Bolts [B]
 - Insulator

- Remove:
 - Camshaft Sprocket (see Camshaft Sprocket Removal)
 - Clamp [A] (KLX110D Models)
- Remove the cylinder head bolts [B] first, then remove the nuts [C], and take off the cylinder head [D].



Cylinder Head Installation

- Check to see that the two dowel pins [A] are in place on the cylinder.
- Install a new cylinder head gasket [B].



- Fit the cylinder head onto the cylinder block using a screwdriver or wire to keep the chain from falling down into the cylinder block.
- Apply a non-permanent locking agent to the cylinder head bolts.
- Tighten the cylinder head nuts and bolts following the tightening sequence as shown.
- The cylinder head nut [A] has gasket.

First Torque -

Cylinder Head Bolts: 5.9 N·m (0.60 kgf·m, 52 in·lb)

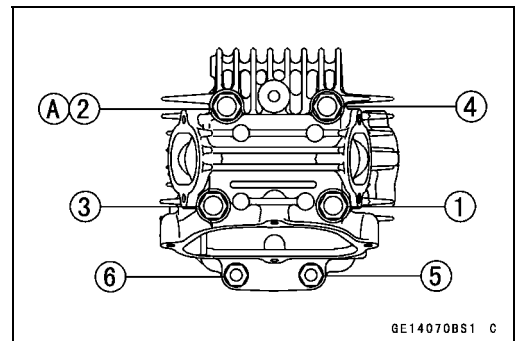
Cylinder Head Nuts: 13 N·m (1.3 kgf·m, 113 in·lb)

Final Torque -

Cylinder Head Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)

Cylinder Head Nuts: 22 N·m (2.2 kgf·m, 16 ft·lb)

- Install the camshaft sprocket (see Camshaft Sprocket Installation).
- Install the other removed parts (see appropriate chapters).



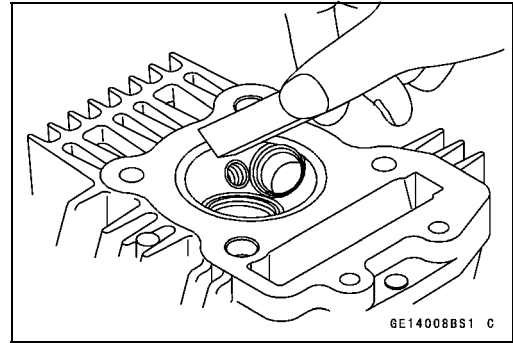
GE14070BS1 C

4-22 ENGINE TOP END

Cylinder Head

Cylinder Head Cleaning

- Scrape out any carbon, and wash the head with high flash-point solvent.



Cylinder Head Warp Inspection

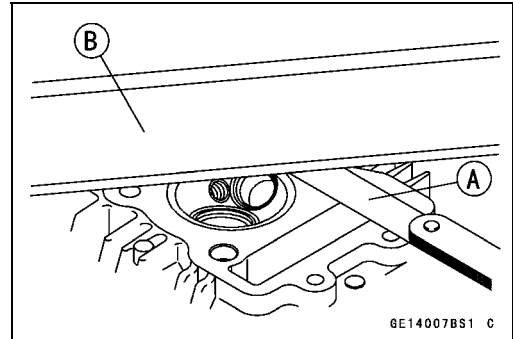
- Lay a straightedge across the lower surface of the cylinder head at several positions.
- Use a thickness gauge [A] to measure the space between the straightedge [B] and the cylinder head.

Cylinder Head Warp

Standard: ---

Service Limit: 0.03 mm (0.001 in.)

- ★ If the cylinder head is warped more than the service limit, replace it.
- ★ If the cylinder head is warped less than the service limit, repair the head by rubbing the lower surface on emery paper secured to a surface plate (first No. 200, then No. 400).



Valves

Valve Clearance Inspection

- Refer to Valve Clearance Inspection in the Periodic Maintenance chapter.

Valve Clearance Adjustment

- Refer to Valve Clearance Adjustment in the Periodic Maintenance chapter.

Valve Removal

- Remove:
 - Cylinder Head (see Cylinder Head Removal)
 - Camshaft (see Camshaft Removal)
- Using the valve spring compressor assembly to press down the valve spring retainer, remove the split keeper.

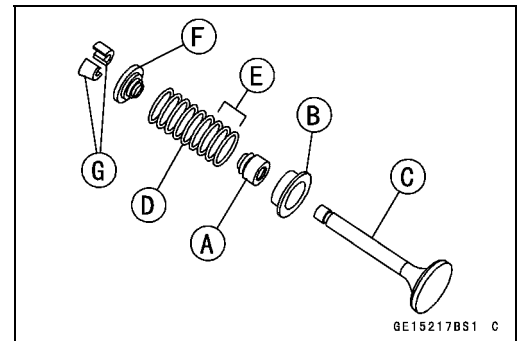
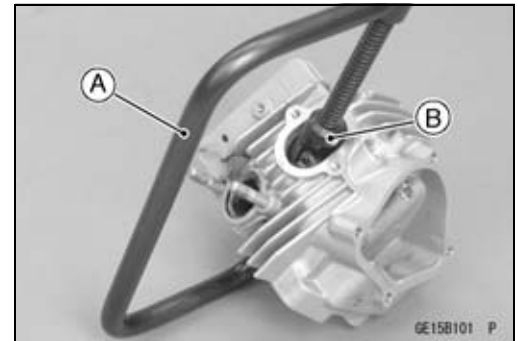
Special Tools - Valve Spring Compressor Assembly: 57001-241 [A]

Valve Spring Compressor Adapter, ϕ 20: 57001-1154 [B]

- Remove the tool and then remove the spring retainer, spring, and spring seat.
- Push out the valve.
- Pull off the valve stem oil seal.

Valve Installation

- Replace the valve stem oil seal [A].
- Push a new valve stem oil seal into place.
- ★ If a new valve is to be used, check the valve to guide clearance.
- ★ If there is too much clearance, install a new valve guide.
- Check the spring seat [B].
- Apply a thin coat of molybdenum disulfide grease to the valve stem [C].
- Install spring [D] so that the closed coil end [E] faces downwards, white paint faces upward.
- Install the spring retainer [F] press it down with the valve spring compressor assembly, and put on the split keepers [G].
- After making sure that the split keepers and valve stem are all properly fitted, remove the tool.
- Install:
 - Camshaft (see Camshaft Installation)
 - Rocker Arm & Rocker Arm Shaft (see Rocker Arm Installation)
 - Cylinder Head (see Cylinder Head Installation)
- Check the valve clearance, and adjust if necessary.



4-24 ENGINE TOP END

Valves

Valve Guide Removal

- Remove:
 - Valve (see Valve Removal)
 - Valve Stem Oil Seal
- Heat the area around the valve guide to 120 ~ 150°C (248 ~ 302°F).

NOTICE

Do not heat the cylinder head with a torch. This will warp the cylinder head. Soak the cylinder head and heat the oil.

- Hammer lightly on the valve guide arbor [A] to remove the guide from the top of the head.

Special Tool - Valve Guide Arbor, ϕ 4.5: 57001-1331

Valve Guide Installation

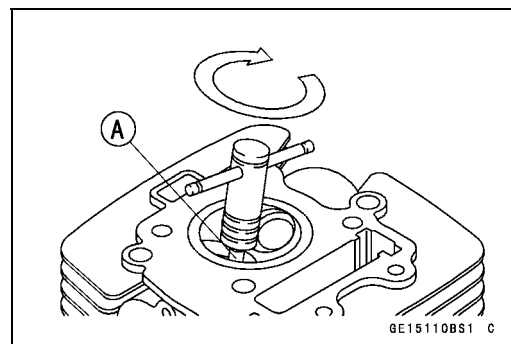
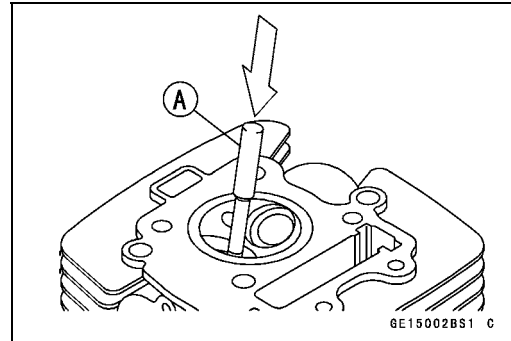
- Valve guides are identical.
- Apply engine oil to the valve guide outer surface before installation.
- Heat the area around the valve guide hole to about 120 ~ 150°C (248 ~ 302°F).

NOTICE

Do not heat the cylinder head with a torch. This will warp the cylinder head. Soak the cylinder head and heat the oil.

- Drive the valve guide in from the top of the cylinder head until the circlip stops the guide from going in too far.
- Allow the cylinder head to cool.
- Ream the valve guide with the valve guide reamer [A] even if the old guide is reused.

Special Tool - Valve Guide Reamer, ϕ 4.5: 57001-1333



Valves

Valve Seat Inspection

- Remove the valve (see Valve Removal).
- Check the valve seat surface [A] between the valve [B] and valve seat [C].
- Measure the outside diameter [D] of the seating pattern on the valve seat.
- ★ If the outside diameter is too large or too small, repair the seat (see Valve Seat Repair).

Valve Seat Surface Outside Diameter

Standard:

Exhaust 19.9 ~ 20.1 mm (0.783 ~ 0.791 in.)

Inlet 22.9 ~ 23.1 mm (0.902 ~ 0.909 in.)

NOTE

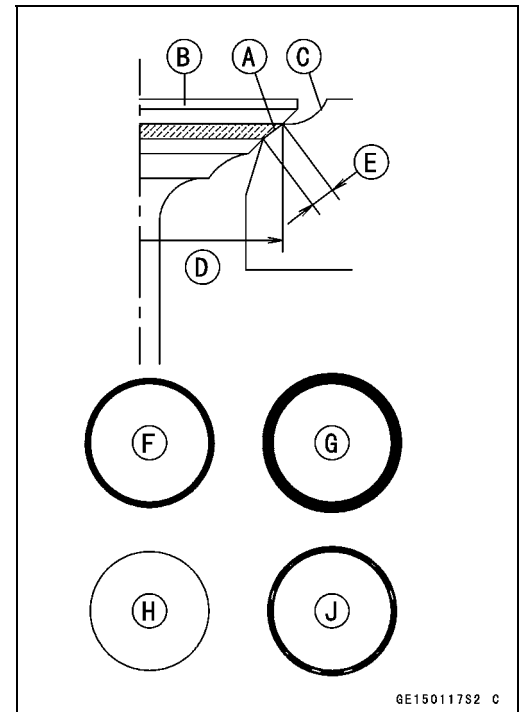
- The valve stem and guide must be in good condition or this check will not be valid.
- ★ If the valve seating pattern is not correct, repair the seat.
- Check the seating surface width of the valve seat.
- Measure the seat width [E] of the portion where there is no build-up carbon (white portion) of the valve seat with a vernier caliper.
- Good [F]
- ★ If the width is too wide [G], too narrow [H] or uneven [J], repair the seat (see Valve Seat Repair).

Valve Seat Width

Standard:

Exhaust 0.80 ~ 1.15 mm (0.031 ~ 0.045 in.)

Inlet 0.80 ~ 1.15 mm (0.031 ~ 0.045 in.)



4-26 ENGINE TOP END

Valves

Valve Seat Repair

- Repair the valve seat with the valve seat cutters.
Special Tools - Valve Seat Cutter Holder, $\phi 4.5$: 57001-1330
Valve Seat Cutter Holder Bar: 57001-1128

Inlet

- Special Tools - Valve Seat Cutter, $45^\circ - \phi 27.5$: 57001-1114
Valve Seat Cutter, $32^\circ - \phi 25$: 57001-1118
Valve Seat Cutter, $60^\circ - \phi 30$: 57001-1123

Exhaust

- Special Tools - Valve Seat Cutter, $32^\circ - \phi 22$: 57001-1206
Valve Seat Cutter, $45^\circ - \phi 22$: 57001-1205
Valve Seat Cutter, $67.5^\circ - \phi 22$: 57001-1207

★If the manufacturer’s instructions are not available, use the following procedure.

Seat Cutter Operating Care

1. This valve seat cutter is developed to grind the valve for repair. Therefore the cutter must not be used for other purpose than seat repair.
2. Do not drop or shock the valve seat cutter, or the diamond particles may fall off.
3. Do not fail to apply engine oil to the valve seat cutter before grinding the seat surface. Also wash off ground particles sticking to the cutter with washing oil.

NOTE

○Do not use a wire brush to remove the metal particles from the cutter. It will take off the diamond particles.

4. Setting the valve seat cutter holder in position, operate the cutter in one hand. Do not apply too much force to the diamond position.

NOTE

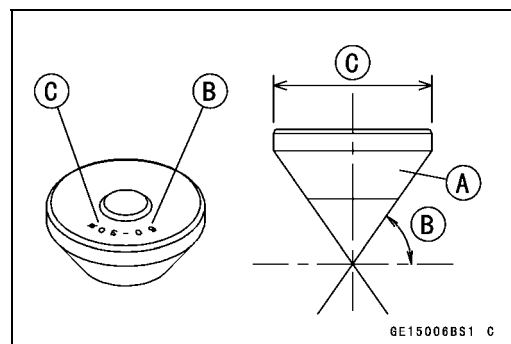
○Prior to grinding, apply engine oil to the cutter and during the operation, wash off any ground particles sticking to the cutter with washing oil.

5. After use, wash the cutter with washing oil and apply a thin layer of engine oil before storing.

Marks Stamped on the cutter

The marks stamped on the back of the cutter [A] represent the following.

- 60° Cutter angle [B]
- 30ϕ Outer diameter of cutter [C]



Valves

Operating Procedures

- Clean the seat area carefully.
- Coat the seat with machinist's dye.
- Fit a 45° cutter [A] to the holder [B] and slide it into the valve guide.
- Press down lightly on the handle [C] and turn it right or left. Grind the seating surface only until it is smooth.

NOTICE

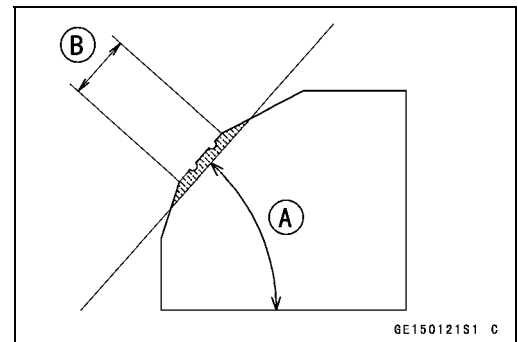
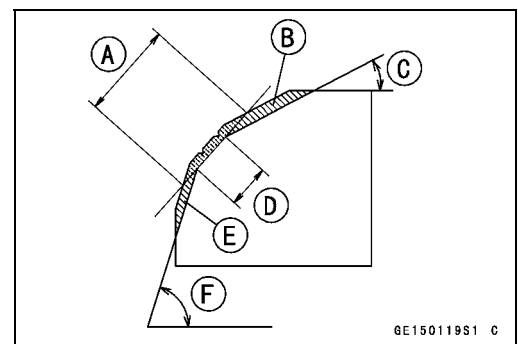
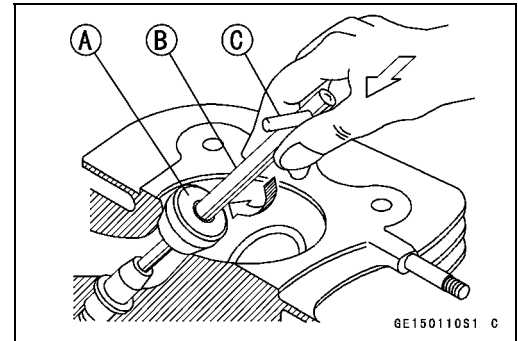
Do not grind the seat too much. Overgrinding will reduce valve clearance by sinking the valve into the head. If the valve sinks too far into the head, it will be impossible to adjust the clearance, and the cylinder head must be replaced.

- Valve seat area form is as follows:
Widened Width [A] of engagement by machining with 45° cutter
Ground Volume [B] by 32° cutter
32° [C]
Correct Width [D]
Ground Volume [E] by 60° cutter
60° [F]

- Measure the outside diameter of the seating surface with a vernier caliper.
- ★ If the outside diameter of the seating surface is too small, repeat the 45° grind [A] until the diameter is within the specified range.
Original Seating Surface [B]

NOTE

- Remove all pittings of flaws from 45° ground surface.
- After grinding with 45° cutter, apply thin coat of machinist's dye to seating surface. This makes seating surface distinct and 32° and 60° grinding operation easier.
- When the valve guide is replaced, be sure to grind with 45° cutter for centering and good contact.



4-28 ENGINE TOP END

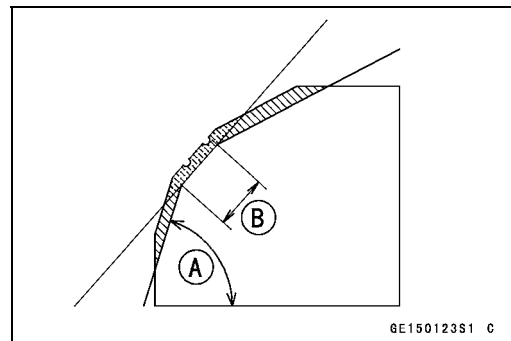
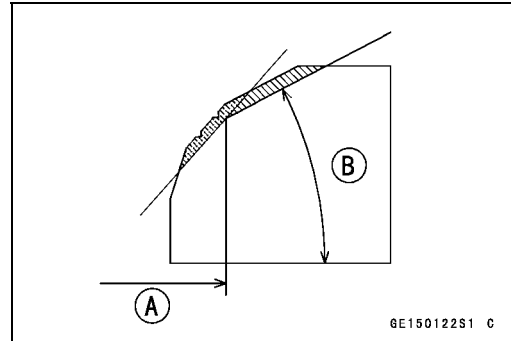
Valves

- ★ If the outside diameter of the seating surface is too large, make the 32° grind described below.
- ★ If the outside diameter [A] of the seating surface is within the specified range, measure the seat width as described below.
- Grind the seat at a 32° angle [B] until the seat outside diameter is within the specified range.
- To make the 32° grind, fit a 32° cutter into the holder, and slide it into the valve guide.
- Turn the holder one turn at a time while pressing down very lightly. Check the seat after each turn.

NOTICE

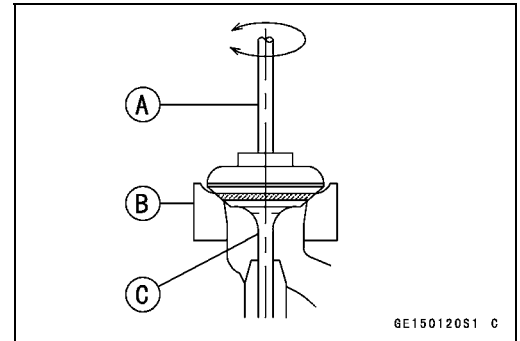
The 32° cutter removes material very quickly. Check the seat outside diameter frequently to prevent overgrinding.

- After making the 32° grind, return to the seat outside diameter measurement step above.
 - To measure the seat width, use a vernier caliper to measure the width of the 45° angle portion of the seat at several places around the seat.
 - ★ If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then return to the seat outside diameter measurement step above.
 - ★ If the seat width is too wide, make the 60° [A] grind described below.
 - ★ If the seat width is within the specified range, lap the valve to the seat as described below.
 - Grind the seat at a 60° angle until the seat width is within the specified range.
 - To make the 60° grind, fit 60° cutter into the holder, and slide it into the valve guide.
 - Turn the holder, while pressing down lightly.
 - After making the 60° grind, return to the seat width measurement step above.
- Correct Width [B]



Valves

- Lap the valve to the seat using a lapper, once the seat width and outside diameter are within the ranges specified above.
- Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.
- Spin the valve against the seat until the grinding compound produces a smooth, matched surface on both the seat and the valve.
- Repeat the process with fine grinding compound.
 - [A] Lapper
 - [B] Valve Seat
 - [C] Valve
- The seating area should be marked about in the middle of the valve face.
- ★ If the seat area is incorrect place on the valve, be sure to check the valve is the correct part. If it is, it may have been refaced too much replace the valve.
- Be sure to remove all grinding compound before assembly.
- When the engine is assembled, be sure to adjust the valve clearance (see Valve Clearance Adjustment in the Periodic Maintenance chapter).



Valve Head Thickness Inspection

- Measure the thickness of valve head.

Valve Head Thickness [A]

Standard:

Exhaust valve 0.8 mm (0.031 in.)

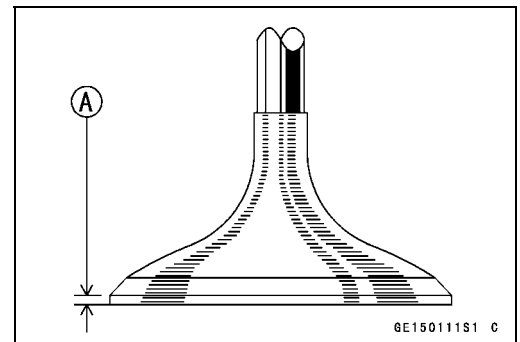
Inlet valve 0.5 mm (0.020 in.)

Service Limit:

Exhaust valve 0.5 mm (0.020 in.)

Inlet valve 0.25 mm (0.010 in.)

- ★ If it is under the service limit, replace the valve.



Valve Stem Bend Inspection

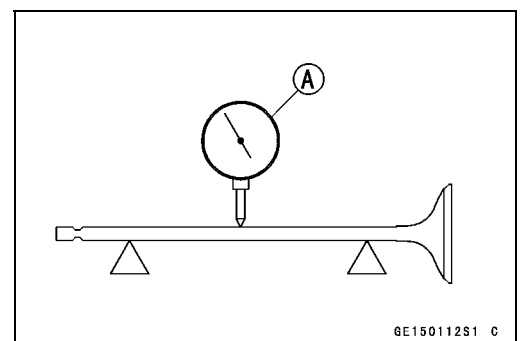
- Support the valve at both ends of the straight stem portion, and set a dial gauge against the center of the stem.
- Turn the valve and read the variation in the dial gauge [A].

Valve Stem Bend

Standard: TIR 0.01 mm (0.0004 in.) or less

Service Limit: TIR 0.05 mm (0.002 in.)

- ★ If it is bent over the service limit, replace the valve.



4-30 ENGINE TOP END

Valves

Valve Stem Diameter Inspection

- Measure the diameter of the valve stem.

Valve Stem Diameter [A]

Standard:

Exhaust valve 4.462 ~ 4.472 mm (0.1757 ~ 0.1761 in.)

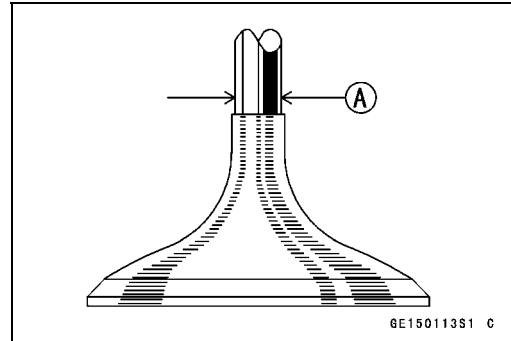
Inlet valve 4.475 ~ 4.490 mm (0.1762 ~ 0.1768 in.)

Service Limit:

Exhaust valve 4.44 mm (0.1748 in.)

Inlet valve 4.46 mm (0.1756 in.)

- ★ Replace the valve if the stem is worn to less than the service limit.



Valve Guide Inside Diameter Inspection

If a small bore gauge and micrometer are available, measure the valve guide as follows.

- Measure the inside diameter [A] of the valve guide. Since the guide wears unevenly, measure the diameter at four places up and down the guide.

Valve Guide Inside Diameter

Standard:

Exhaust 4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in.)

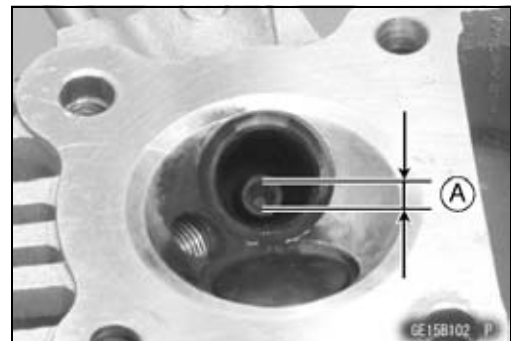
Inlet 4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in.)

Service Limit:

Exhaust 4.58 mm (0.1803 in.)

Inlet 4.58 mm (0.1803 in.)

- ★ If any measurement exceeds the service limit, replace the valve guide.



Valve to Guide Clearance Measurement

If a small bore gauge is not available, inspect the valve guide wear by measuring the valve to valve guide clearance with the wobble method as indicated below.

- Insert a new valve [A] into the valve guide [B] and set a dial gauge against the stem perpendicular to it as close as possible to the cylinder head mating surface.
- Move the stem back and forth [C] to measure valve/valve guide clearance.

Valve/Valve Guide Clearance (Wobble Method)

Standard:

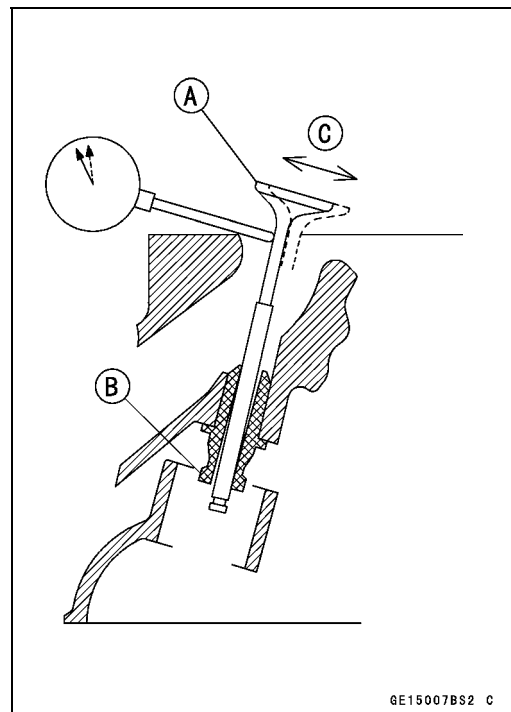
Exhaust 0.05 ~ 0.08 mm (0.002 ~ 0.003 in.)

Inlet 0.02 ~ 0.06 mm (0.0008 ~ 0.002 in.)

Service Limit:

Exhaust 0.19 mm (0.0075 in.)

Inlet 0.17 mm (0.0067 in.)



Valves

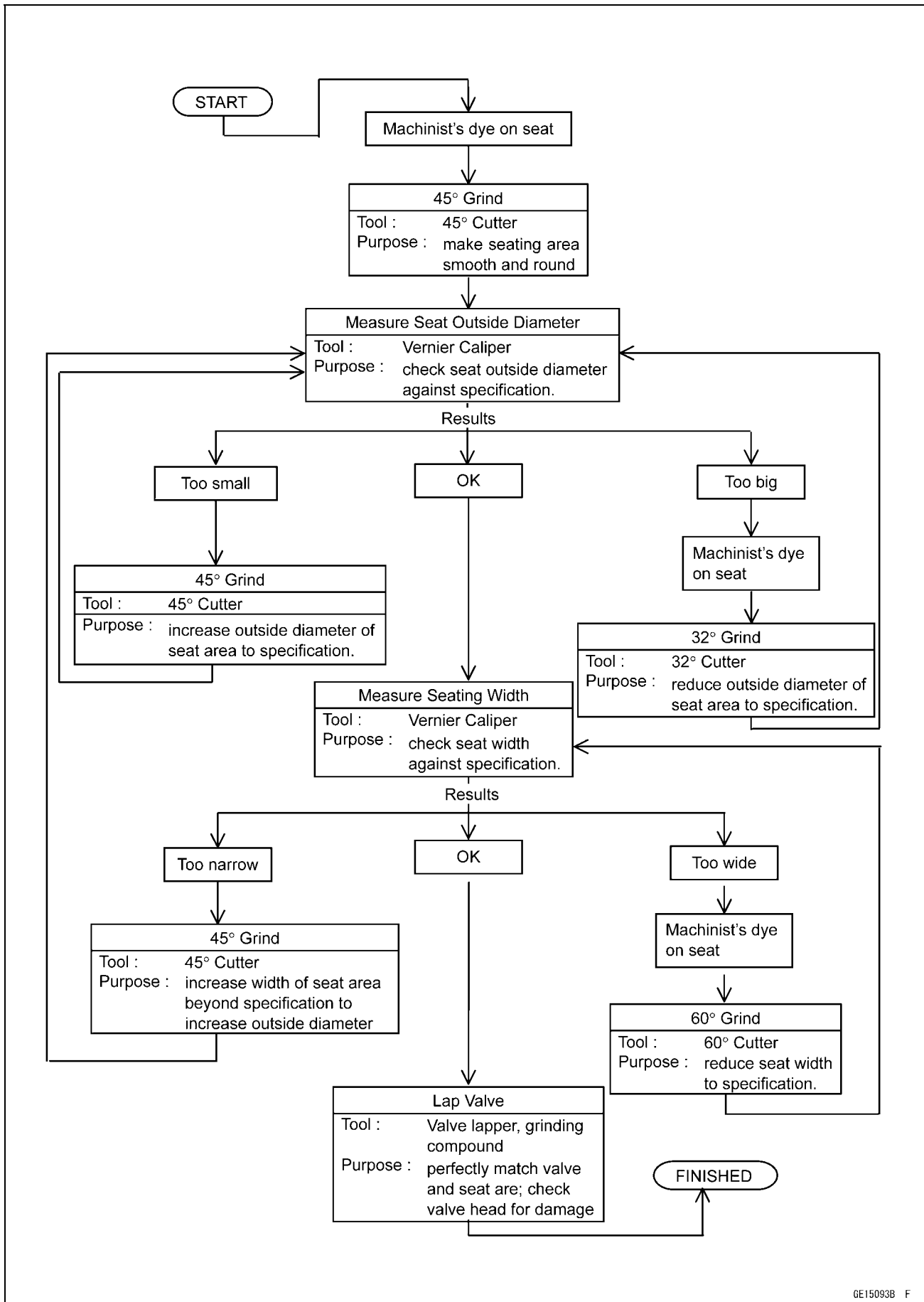
- Repeat the measurement in a direction at a right angle to the first.
- ★ If the reading exceeds the service limit, replace the guide.

NOTE

- *The reading is not actual valve/valve guide clearance because the measuring point is above the guide.*

4-32 ENGINE TOP END

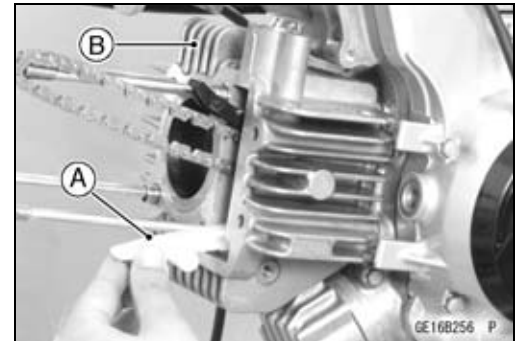
Valves



Cylinder, Piston

Cylinder Removal

- Remove:
 - Cylinder Head (see Cylinder Head Removal)
 - Lower Camshaft Chain Guide [A]
- Tap the cylinder [B] lightly with a plastic mallet to separate from the crankcase.
- Remove the cylinder base gasket.

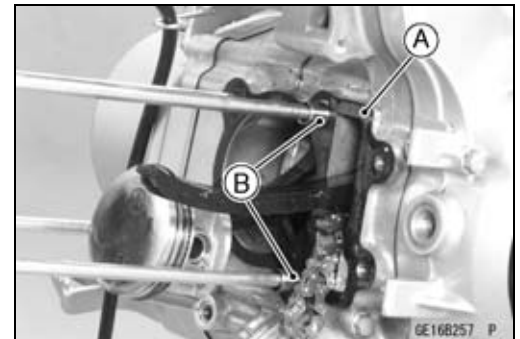


Cylinder Installation

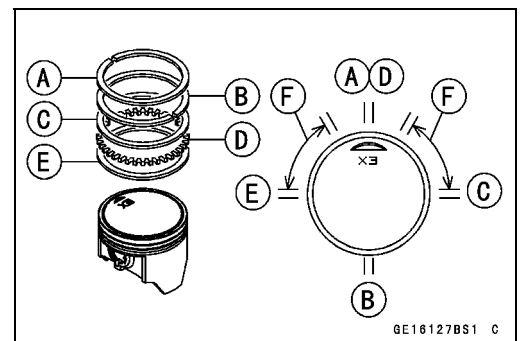
NOTE

○ If the cylinder block is replaced with a new one, piston to cylinder clearance must be checked against the specified value.

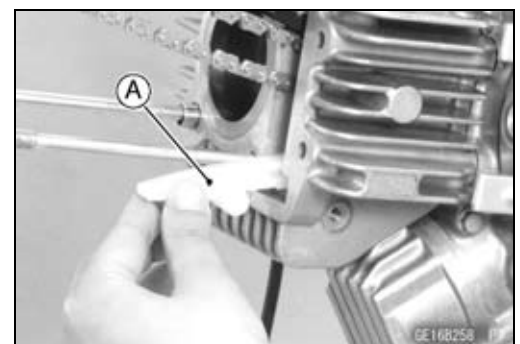
- Install a new cylinder base gasket [A] and be sure that two dowel pins [B] are properly fitted in the crankcase.



- Pull the camshaft chain taut top avoid kinking it and use a wrench on the crankshaft to set the piston at BDC.
- Position the piston ring opening as follows.
 - Top Ring [A]
 - Second Ring [B]
 - Upper Oil Ring Steel Rail [C]
 - Oil Ring Expander [D]
 - Lower Oil Ring Steel Rail [E]
 - 30 ~ 90° [F]



- Apply engine oil to the piston rings and the cylinder inside surface.
- Pull the camshaft chain up through the cylinder and insert a screwdriver to keep the chain from falling back into the engine.
- Place the upper camshaft chain guide inside the cylinder blocks.
- Fit the bottom of the cylinder over the piston rings, pressing in on opposite sides of the rings as necessary. Take care that the rings do not slip out of their proper positions.
- Insert the lower camshaft chain guide [A] all the way down.
- Install the cylinder head (see Cylinder Head Installation).

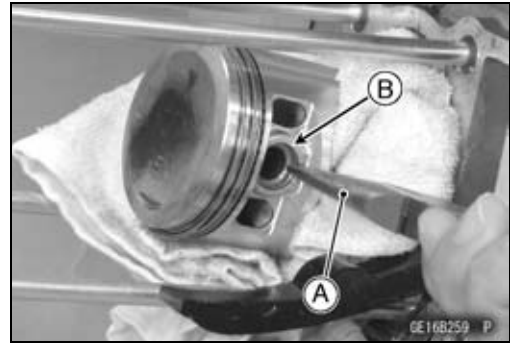


4-34 ENGINE TOP END

Cylinder, Piston

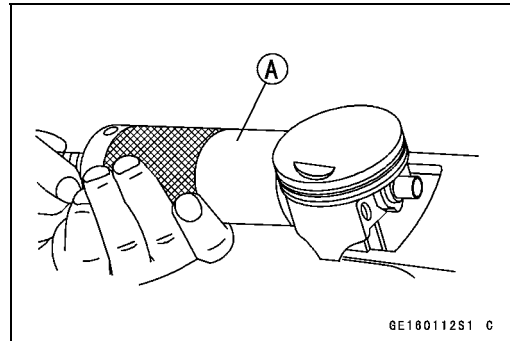
Piston Removal

- Remove the cylinder (see Cylinder Removal).
- Wrap a clean cloth around the base of the piston.
- Use the plier [A] and remove the snap ring [B].

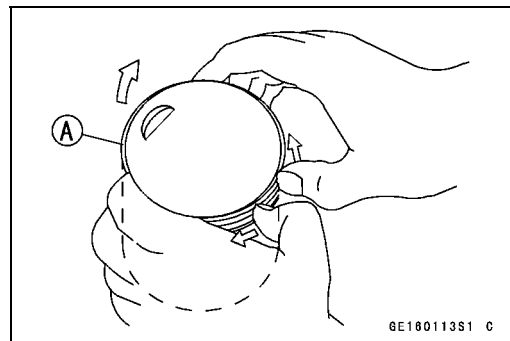


- Remove the piston by pushing the piston pin and pulling it out. Use the piston pin puller assembly [A] if the pin is tight.

Special Tool - Piston Pin Puller Assembly: 57001-910



- Remove the piston rings [A]. Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring to remove it.

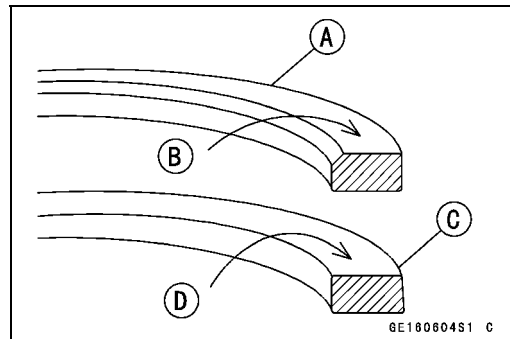
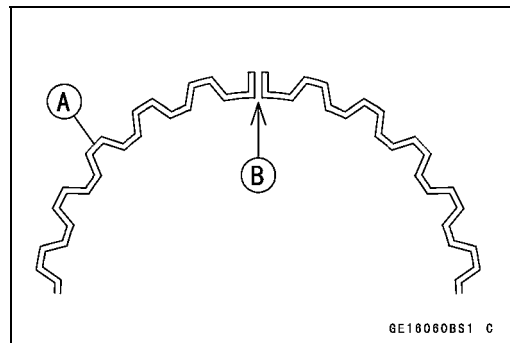


Piston Installation

NOTE

○The oil ring rails have no "top" or "bottom".

- Install the oil ring expander [A] in the bottom piston ring groove so that the ends [B] but together, never overlap.
- Install the oil ring steel rails, one above the expander and one below it.
- Spread the rail with your thumbs, but only enough to fit the rail over the piston.
- Release the rail into the bottom piston ring groove.
- Do not mix up the top ring and second ring.
- Install the top ring [A] so that the "O" mark [B] faces up.
- Install the second ring [C] so that the "N" mark [D] faces up.



Cylinder, Piston

NOTE

○If a new piston is used, check piston to cylinder clearance (see *Piston/Cylinder Clearance Inspection*), and use new piston rings.

- Install the piston so that the “EX” mark [A] on the piston toward exhaust side.

- Fit a new piston snap ring into the side of the piston so that the ring opening [A] does not coincide with the slit [B] of the piston pin hole.
- When installing a piston pin snap ring, compress it only enough to install it no more.

NOTICE

Do not reuse snap rings, as removal weakens and deforms them. They could fall out and score the cylinder wall.

Cylinder Inside Diameter Measurement

- Since there is a difference in cylinder wear in different directions, take a side to side and a front to back measurement at each of the three locations (total of six measurements) shown in the figure.
- ★ If any of the cylinder inside diameter measurements exceeds the service limit, the cylinder will have to be bored to oversize and then honed.

Cylinder Inside Diameter

Standard: 52.997 ~ 53.009 mm (2.0865 ~ 2.0870 in.) and less than 0.01 mm (0.0004 in.) difference between any two measurements

Service Limit: 53.10 mm (2.0905 in.) or 0.05 mm (0.002 in.) difference between any two measurements

10 mm (0.39 in.) [A]

60 mm (2.4 in.) [B]

20 mm (0.79 in.) [C]

Piston Wear Inspection

- Measure the outside diameter [A] of the piston 3.8 mm [B] up from the bottom of the piston at a right angle to the direction of the piston pin.

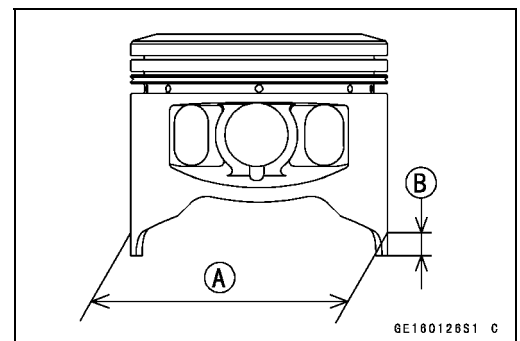
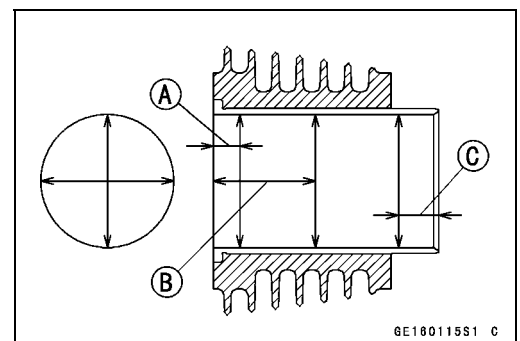
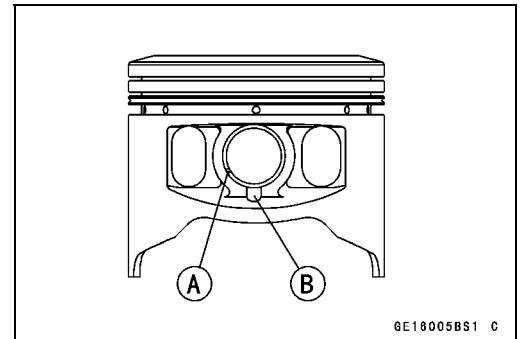
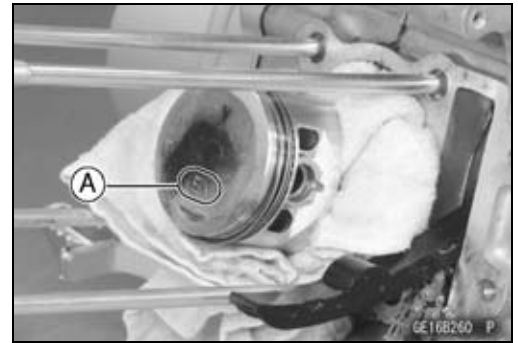
Piston Diameter

Standard: 52.969 ~ 52.981 mm (2.0854 ~ 2.0859 in.)

Service Limit: 52.82 mm (2.080 in.)

NOTE

○Abnormal wear such as a marked diagonal pattern across the piston skirt may mean a bent connecting rod or crankshaft.



4-36 ENGINE TOP END

Cylinder, Piston

Piston/Cylinder Clearance Inspection

The most accurate way to find the piston clearance is by making separate piston and cylinder diameter measurements and then computing the difference between the two values. Measure the piston diameter as just described, and measure the cylinder diameter at the very bottom of the cylinder.

Piston/Cylinder Clearance

Standard: 0.010 ~ 0.022 mm (0.00039 ~ 0.00086 in.)

NOTE

○ *Whenever the piston or cylinder has been replaced with a new one, the motorcycle must be broken in the same as with a new machine.*

Boring, Honing Performance

When boring and honing a cylinder, note the following:

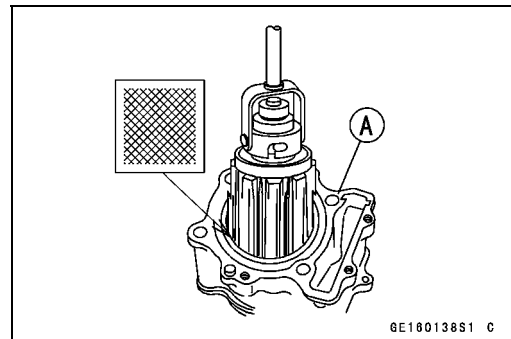
○ There are two sizes of oversize pistons available. Oversize pistons require oversize rings.

Oversize Pistons and Rings

0.50 mm (0.0197 in.) Oversize

1.0 mm (0.0394 in.) Oversize

- Before boring a cylinder [A], first measure the exact diameter of the oversize piston, and then, according to the standard clearance in the specifications section, determine the rebore diameter. However, if the amount of boring necessary would make the inside diameter greater than 1.0 mm (0.0394 in.) oversize, the cylinder block must be replaced.
- Cylinder inside diameter must not vary more than 0.01 mm (0.0004 in.) at any point.
- Be wary of measurements taken immediately after boring since the heat affects cylinder diameter.
- In the case of a rebored cylinder and oversize piston, the service limit for the cylinder is the diameter that the cylinder was bored to plus 0.1 mm (0.004 in.) and the service limit for the piston is the oversize piston original diameter minus 0.20 mm (0.0079 in.). If the exact figure for the rebored diameter is unknown, it can be roughly determined by measuring the diameter at the base of the cylinder.



Cylinder, Piston

Piston Ring End Gap Inspection

- Place the piston ring [A] inside the cylinder, using the piston to locate the ring squarely in place. Set it close to the bottom of the cylinder, where cylinder wear is low.
- Measure the gap [B] between the ends of the ring with a thickness gauge.

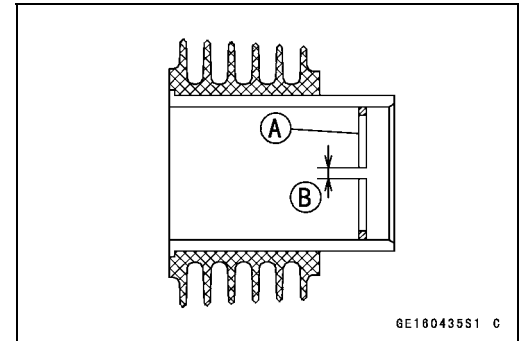
Piston Ring End Gap

Standard:

Top	0.10 ~ 0.20 mm (0.0039 ~ 0.0079 in.)
Second	0.30 ~ 0.45 mm (0.0118 ~ 0.0177 in.)
Oil	0.10 ~ 0.60 mm (0.0039 ~ 0.0236 in.)

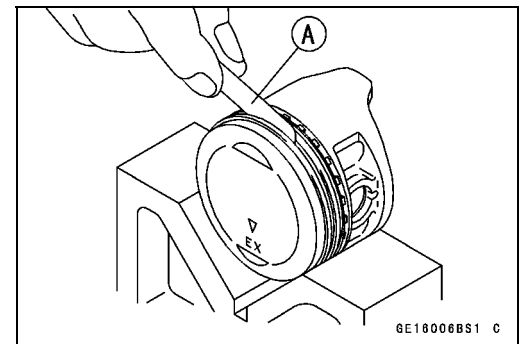
Service Limit:

Top	0.6 mm (0.024 in.)
Second	0.8 mm (0.031 in.)
Oil	0.9 mm (0.035 in.)



Piston Ring, Piston Ring Groove Inspection

- Visually inspects the piston rings and the piston ring grooves.
- ★ If the rings are worn unevenly or damaged, they must be replaced.
- ★ If the piston ring grooves are worn unevenly or damaged, the piston must be replaced and fitted with new rings.
- Check for uneven groove wear by inspecting the ring seating.
- ★ The rings should fit perfectly parallel to the groove surfaces. If not, the piston must be replaced.
- With the piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring groove clearance.



4-38 ENGINE TOP END

Cylinder, Piston

Piston Ring/Groove Clearance

Standard:

Top	0.020 ~ 0.060 mm (0.0008 ~ 0.0024 in.)
Second	0.010 ~ 0.050 mm (0.0004 ~ 0.0020 in.)

Service Limit:

Top	0.16 mm (0.0063 in.)
Second	0.15 mm (0.0059 in.)

Piston Ring Thickness

Standard:

Top	0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)
Second	0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)

Service Limit:

Top	0.70 mm (0.0276 in.)
Second	0.70 mm (0.0276 in.)

Piston Ring Groove Width

Standard:

Top	0.81 ~ 0.83 mm (0.0319 ~ 0.0327 in.)
Second	0.80 ~ 0.82 mm (0.0315 ~ 0.0323 in.)

Service Limit:

Top	0.91 mm (0.0358 in.)
Second	0.90 mm (0.0354 in.)

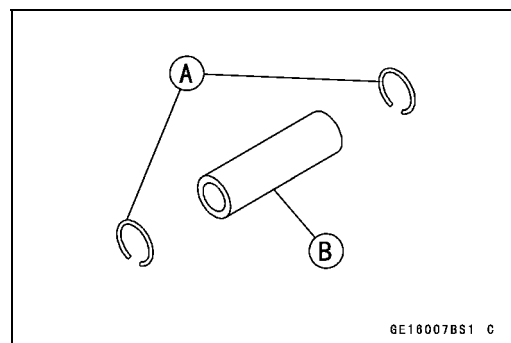
- ★ If the clearance exceeds the service limit, remove the piston rings, and measure the thickness of the piston rings and the width of the ring grooves. If the ring has worn down to less than the service limit, replace the ring, if the groove width exceeds the service limit replace the piston.

NOTE

- These tables apply to oversize pistons and rings as well as standard pistons and rings.

Piston, Piston Pin, Connecting Rod Wear Inspection

- Visually inspect the snap rings [A] are fitted in place.
- ★ If the ring shows weakness or deformation, replace the ring. Also if the pin hole groove shows excessive wear, replace the piston.
- Visually inspect the piston pin hole and connecting rod small end hole.
- ★ If the piston pin hole shows uneven wear, replace the piston.
- ★ If the rod small end hole shows uneven wear, replace the rod, or crankshaft assembly.
- Visually inspect the outer surface of the piston pin [B].
- ★ If the pin shows color change or stepped wear, replace the pin.



Cylinder, Piston

Piston, Piston Pin, Connecting Rod Inspection

- Measure the inside diameter of both piston pin holes in the piston.

Piston Pin Hole Inside Diameter [A]

Standard: 13.001 ~ 13.007 mm (0.5118 ~ 0.5121 in.)

Service Limit: 13.08 mm (0.515 in.)

- ★ If either piston pin hole diameter exceeds the service limit, replace the piston.
- Measure the diameter of the piston pin.

Piston Pin Diameter [B]

Standard: 12.995 ~ 13.000 mm (0.5116 ~ 0.5118 in.)

Service Limit: 12.96 mm (0.0510 in.)

- ★ If the piston pin diameter is less than the service limit at any point, replace the piston pin.

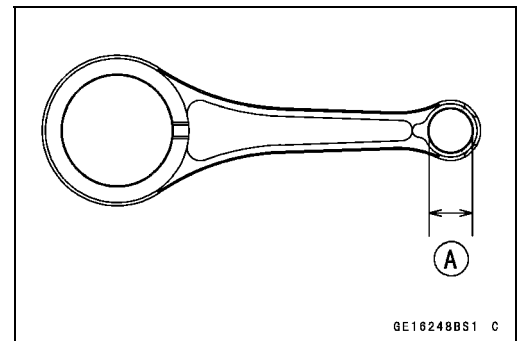
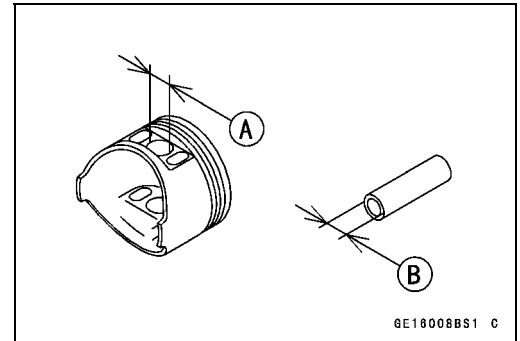
- ★ Measure the inside diameter [A] of the connecting rod small end.

Connecting Rod Small End Inside Diameter

Standard: 13.003 ~ 13.014 mm (0.5119 ~ 0.5124 in.)

Service limit: 13.05 mm (0.514 in.)

- ★ If the diameter exceeds the service limit, replace the connecting rod.

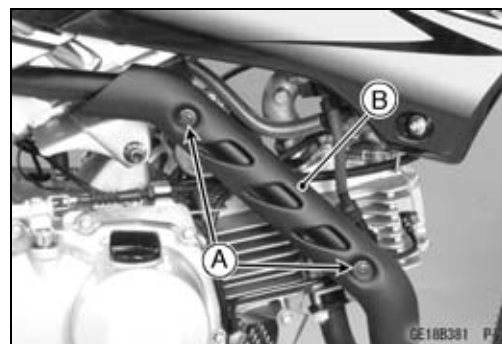
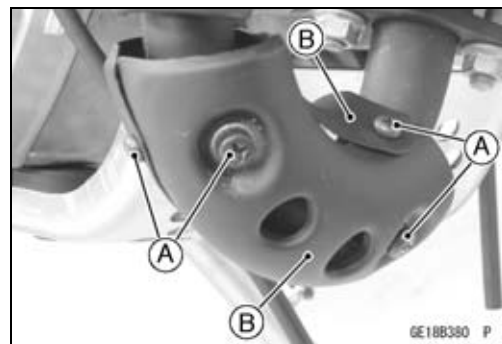


4-40 ENGINE TOP END

Muffler

Muffler Removal

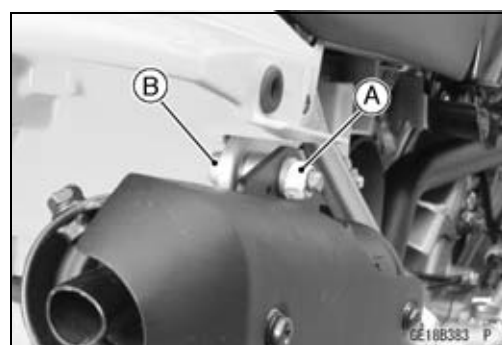
- Remove:
 - Right Side Cover (see Side Cover Removal in the Frame chapter)
 - Screws [A]
 - Exhaust Pipe Covers [B]



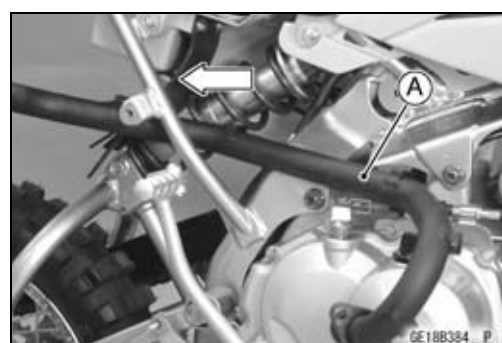
- Remove the exhaust pipe holder nuts [A].



- Remove the muffler mounting nut [A] and bolt [B].



- Remove the muffler assembly [A] rearward.



Muffler

Muffler Installation

- Installation is the reverse of removal; note the following.
- Replace the gasket with a new one.
- Tighten:

Torque - Exhaust Pipe Holder Nuts: 16 N·m (1.6 kgf·m, 12 ft·lb)

- Replace the muffler mounting nut [B] with a new one.
- Tighten the muffler mounting bolt [A] and nut in the following procedure.
- Install the muffler mounting bolt to the frame [C] and tighten it to the specified torque.

Torque - Muffler Mounting Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Install the muffler [D] and tighten the nut to the specified torque.

Torque - Muffler Mounting Nut: 30 N·m (3.1 kgf·m, 22 ft·lb)

- Loosen the nut, and tighten the nut again to the specified torque.
- Thoroughly warm up the engine, wait until the engine cools down, and then retighten the bolt and nuts.

Spark Arrester Cleaning

- Refer to the Spark Arrester Cleaning in the Periodic Maintenance chapter.

