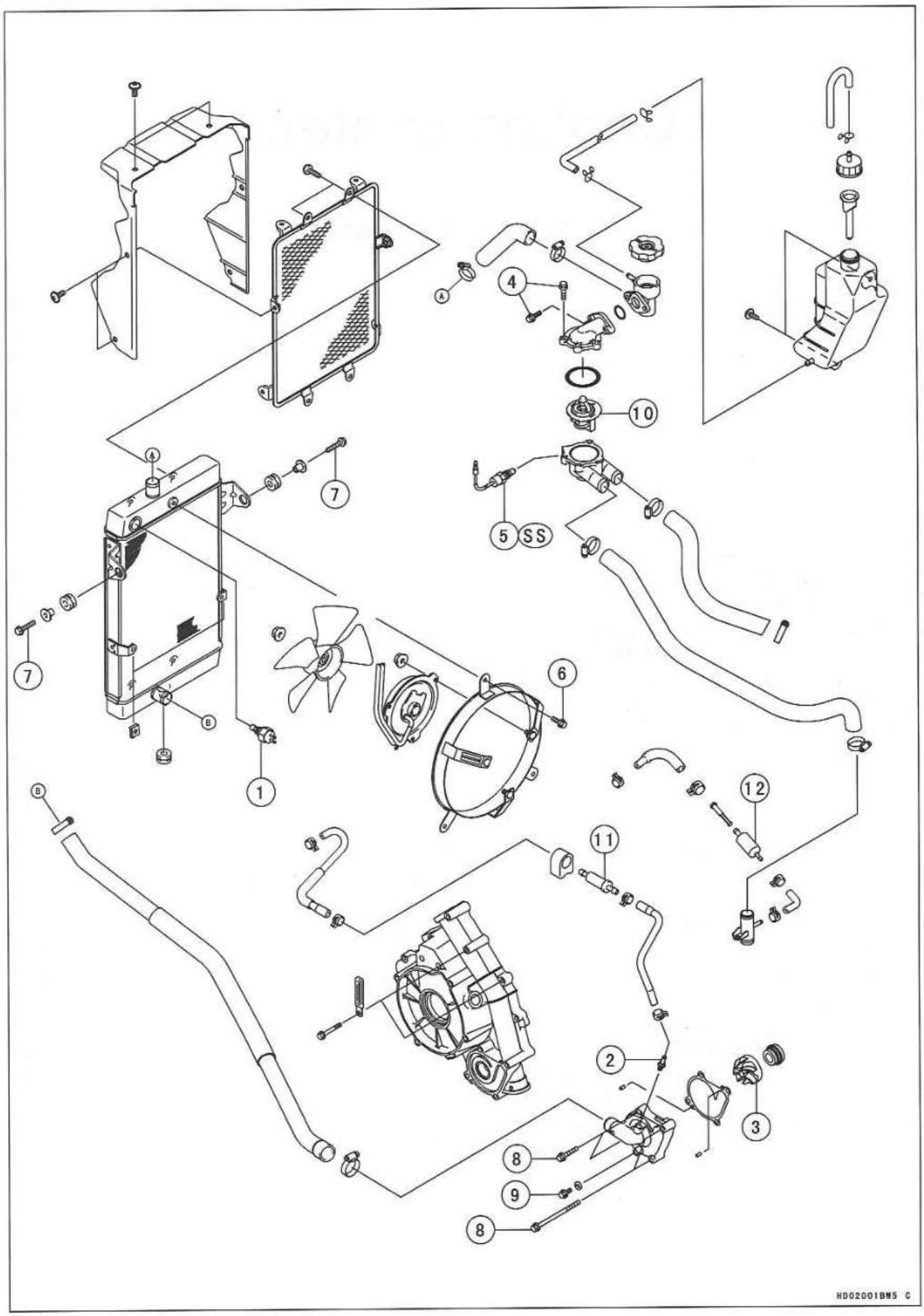
Cooling System

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Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Radiator Fan Switch	18	1.8	13	
2	Water Pump Fitting Bolt	9.8	1.0	87 in·lb	
3	Water Pump Impeller	7.8	0.80	69 in·lb	
4	Thermostat Housing Cover Bolts	8.8	0.90	78 in·lb	
5	Coolant Temperature Warning Light Switch	7.8	0.80	69 in·lb	SS
6	Radiator Fan Assembly Bolts	8.8	0.90	78 in·lb	
7	Radiator Mounting Bolts	8.8	0.90	78 in·lb	
8	Water Pump Cover Bolts	8.8	0.90	78 in·lb	
9	Coolant Drain Plug	8.8	0.90	78 in·lb	

10. Thermostat
11. Coolant Valve
12. Coolant Filter

SS: Apply silicone sealant (Kawasaki Bond: 56019–120).

4-4 COOLING SYSTEM

Coolant Flow Chart

Permanent type antifreeze is used as a coolant to protect the cooling system from rust and corrosion. When the engine starts, the water pump (coupled with the oil pump) turns and the coolant circulates.

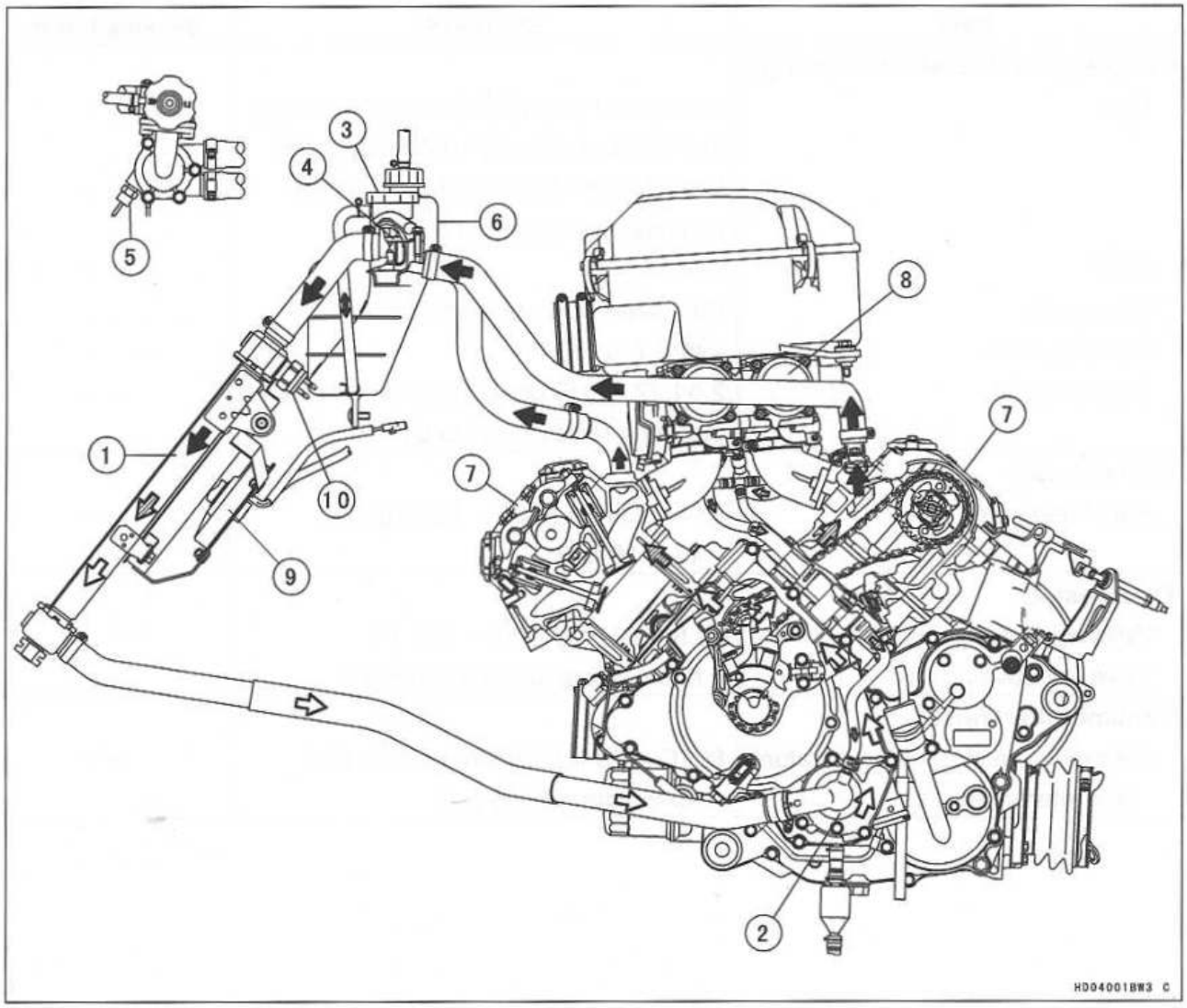
The thermostat is a wax pellet type which opens or closes with coolant temperature changes. The thermostat continuously changes its valve opening to keep the coolant temperature at the proper level. When coolant temperature is below 69.5 ~ 72.5 °C (157 ~ 162 °F) , the thermostat closes so that the coolant flow is restricted through the air bleeder hole, causing the engine to warm up more quickly. When coolant temperature is more than 69.5 ~ 72.5 °C (157 ~ 162 °F), the thermostat opens and the coolant flows. When the coolant temperature goes up beyond 96 ~ 100 °C (205 ~ 212 °F), the radiator fan switch conducts to operate the radiator fan. The radiator fan draws air through the radiator core when there is not sufficient air flow such as at low speeds. This increases up the cooling action of the radiator. When the temperature is below 91 ~ 95 °C (195 ~ 203 °F), the fan switch opens and the radiator fan stops.

In this way, this system controls the engine temperature within narrow limits where the engine operates most efficiently even if the engine load varies.

The system is pressurized by the radiator cap to suppress boiling and the resultant air bubbles which can cause engine overheating. As the engine warms up, the coolant in the radiator and the water jacket expands. The excess coolant flows through the radiator cap and hose to the reserve tank to be stored there temporarily. Conversely, as the engine cools down, the coolant in the radiator and the water jacket contract, and the stored coolant flows back to the radiator from the reserve tank.

The radiator cap has two valves. One is a pressure valve which holds the pressure in the system when the engine is running. When the pressure exceeds 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 14 ~ 18 psi), the pressure valve opens and releases the pressure to the reserve tank. As soon as pressure escapes, the valve closes, and keeps the pressure at 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 14 ~ 18 psi). When the engine cools down, another small valve (vacuum valve) in the cap opens. As the coolant cools, the coolant contracts to form a vacuum in the system. The vacuum valve opens and allows the coolant from the reserve tank to enter the radiator.

Coolant Flow Chart



1. Radiator
2. Water Pump
3. Radiator Cap
4. Thermostat
5. Coolant Temperature Warning Light Switch
6. Reserve Tank
7. Cylinder, Cylinder Head
8. Carburetor
9. Radiator Fan
10. Radiator Fan Switch

Black Painted Arrow: Hot Coolant
White Painted Arrow: Cold Coolant

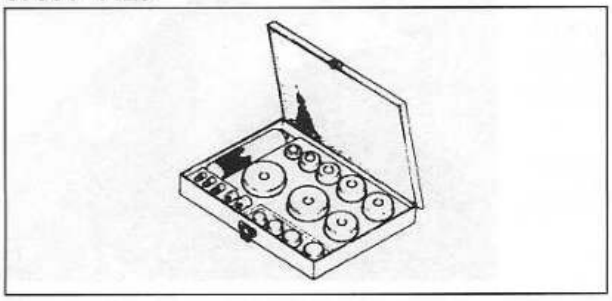
4-6 COOLING SYSTEM

Specifications

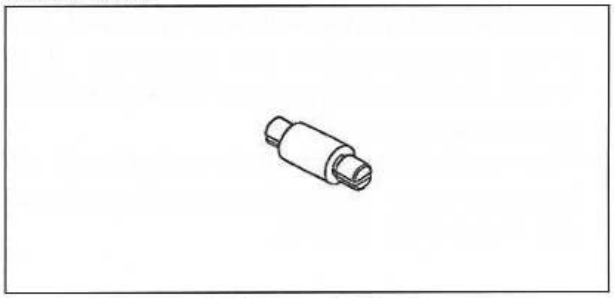
Item	Standard	Service Limit
Coolant provided when shipping:		
Type	Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)	– – –
Color	Green	– – –
Mixed ratio	Soft water 50%, coolant 50%	– – –
Freezing point	–35°C (–31°F)	– – –
Total amount	2.5 L (2.64 US qt) (reserve tank full level including radiator and engine)	– – –
Radiator cap:		
Relief pressure	93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 14 ~ 18 psi)	– – –
Thermostat:		
Valve opening temperature	69.5 ~ 72.5 °C (157 ~ 162 °F)	– – –
Valve full opening lift	8 mm or more @ 85 °C (185 °F)	– – –
Coolant Filter/Valve:		
Coolant valve closing temperature (for reference)	80 °C (176 °F) or more @ 24.5 kPa (0.25 kgf/cm², 3.6 psi)	– – –

Special Tools and Sealant

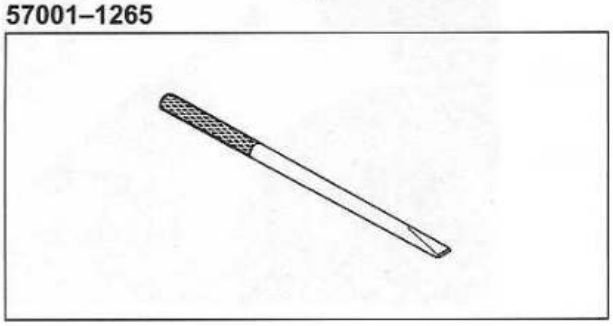
Bearing Driver Set :
57001–1129



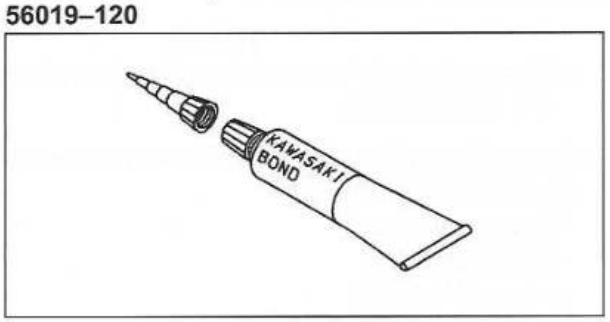
Bearing Remover Head, ϕ10 x ϕ12 :
57001–1266



Bearing Remover Shaft, ϕ9 :
57001–1265



Kawasaki Bond (Silicone Sealant) :
56019–120



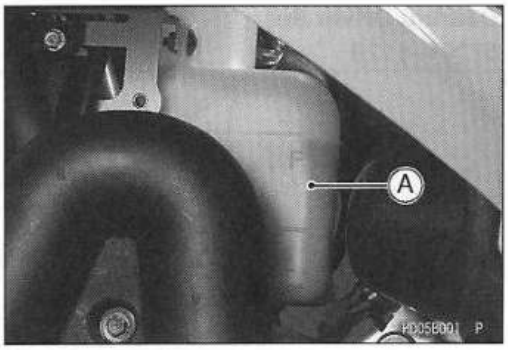
Coolant

Coolant Deterioration Inspection

- Visually inspect the coolant in the reserve tank [A].

★If whitish cotton-like wafts are observed, aluminum parts in the cooling system are corroded. If the coolant is brown, iron or steel parts are rusting. In either case, flush the cooling system.

★If the coolant gives off an abnormal smell, check for cooling system leak. It may be caused by exhaust gas leaking into the cooling system.

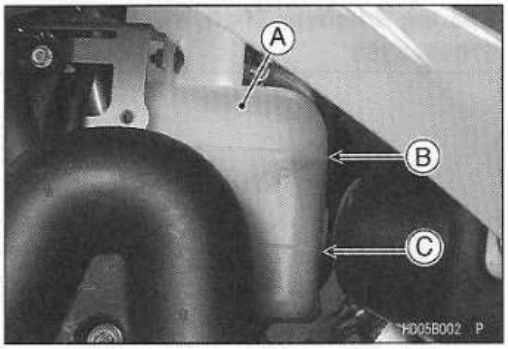


Coolant Level Inspection

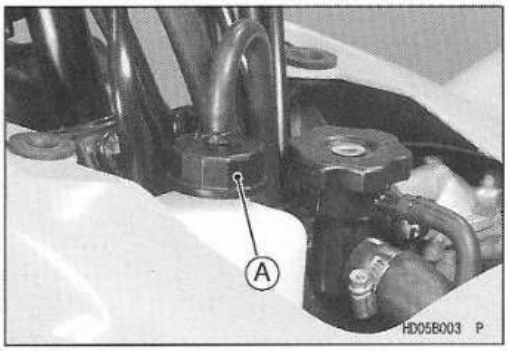
NOTE

o *Check the level when the engine is cold (room or ambient temperature).*

- Check the coolant level in the reserve tank with the vehicle held perpendicularly.
  Reserve Tank [A]
  F (full) Mark [B]
  L (low) Mark [C]

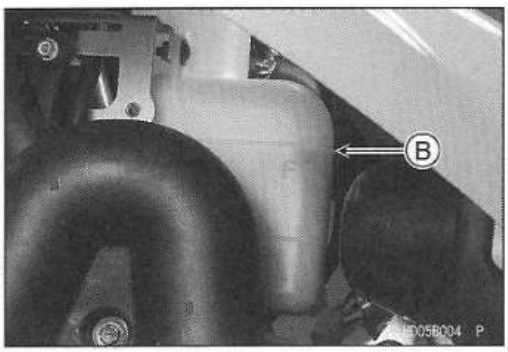


★If the coolant level is lower than the L mark, Remove the upper front cover and reserve tank cap [A], then add coolant to the F mark [B].



CAUTION

For refilling, add the specified mixture of coolant and soft water. Adding water alone dilutes the coolant and degrades its anticorrosion properties. The diluted coolant can attach the aluminum engine parts. In an emergency, soft water can be added. But the diluted coolant must be returned to the correct mixture ration within a few days.
If coolant must be added often, or the reserve tank has run completely dry; there is probably leakage in the cooling system. Check the system for leaks.



Coolant Draining

- Refer to the Cooling System in the Periodic Maintenance chapter.

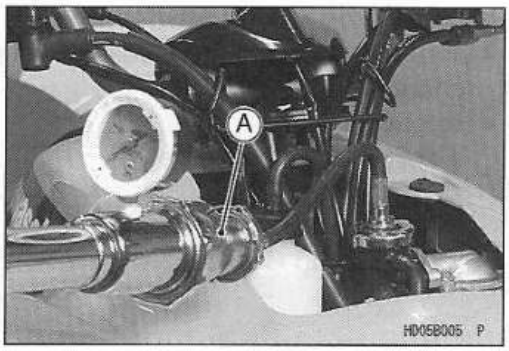
Coolant Filling

- Refer to the Cooling System in the Periodic Maintenance chapter.

Coolant

Pressure Testing

- Remove the upper front cover and radiator cap, then install a cooling system pressure tester [A] on the radiator filler neck.



NOTE

o *Wet the cap sealing surfaces with water or coolant to prevent pressure leakage.*

- Build up pressure in the system carefully until the pressure reaches 123 kPa (1.25 kgf/cm², 18 psi).

CAUTION

During pressure testing, do not exceed the pressure for which the system is designed. The maximum pressure is 123 kPa (1.25 kgf/cm², 18 psi).

- Watch the gauge for at least 6 seconds.

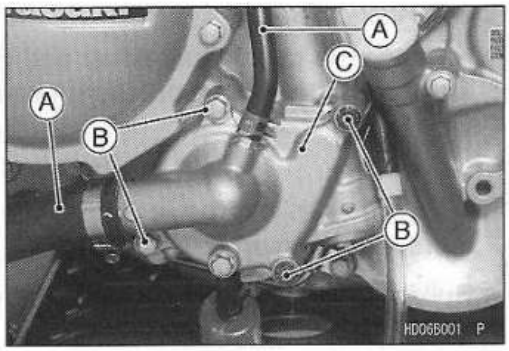
★If the pressure holds steady, the system is alright.

★If the pressure drops soon, check for leaks.

Water Pump

Water Pump Cover Removal

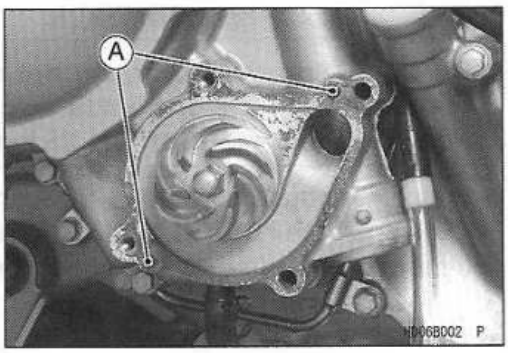
- Drain the coolant (see Cooling System in Periodic Maintenance chapter).
- Remove:
  Foot Guards (Left Side)
  Cooling Hoses [A]
  Water Pump Cover Bolts [B]
  Water Pump Cover [C]



Water Pump Cover Installation

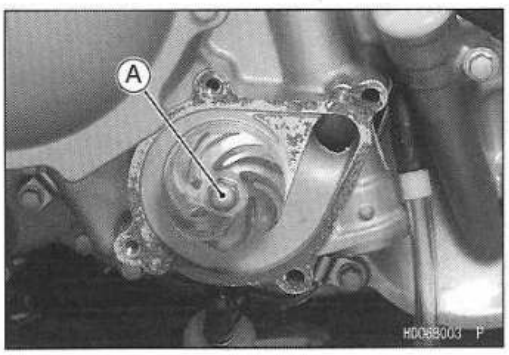
- Install:
  Knock Pins [A]
  New Gasket
- Tighten:

Torque - Water Pump Cover Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)



Impeller Removal

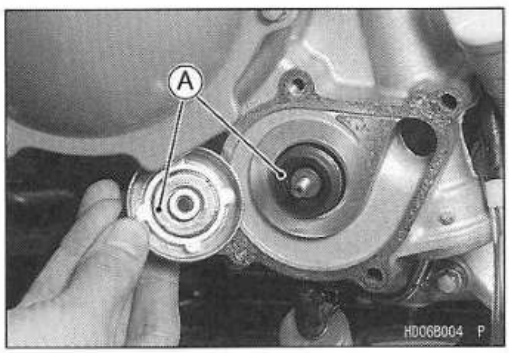
- Drain the coolant (see Cooling System in Periodic Maintenance chapter).
- Remove the water pump cover (see Water Pump Cover Removal).
- Loosen the water pump impeller [A] counterclockwise.



Water Pump Impeller Installation

- Apply a small amount of coolant on the sliding surface [A] of the mechanical seal and the sealing seat.
- Install the impeller on the water pump shaft and tighten the impeller.

Torque - Water Pump Impeller: 7.8 N·m (0.80 kgf·m, 69 in·lb)

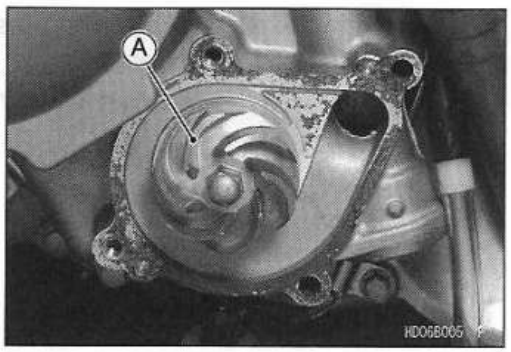


Water Pump

Water Pump Impeller Inspection

- Visually inspect the impeller [A].

★If the surface is corroded or the blades are damaged, replace the impeller.



Mechanical Seal Replacement

- Remove:

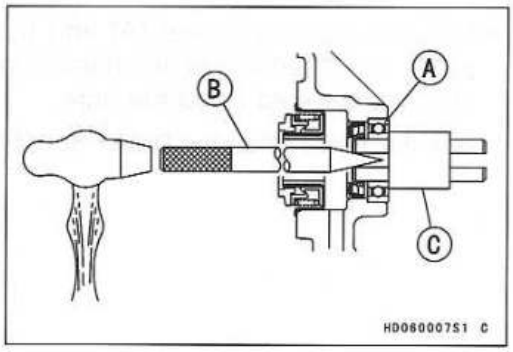
  Water Pump Impeller (see Water Pump Impeller Removal)

  Alternator Cover (see Electrical System chapter)

- Take the bearing [A] out of the alternator cover, using the bearing remover.

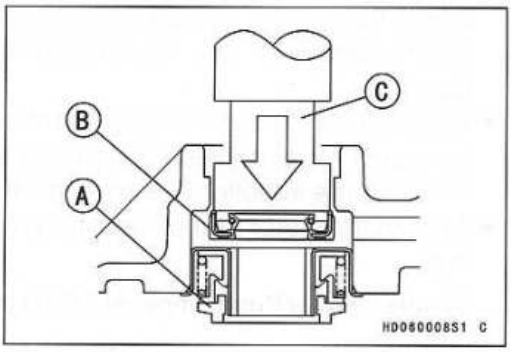
Special Tools - Bearing Remover Shaft, ϕ9: 57001–1265 [B]

Bearing Remover Head, ϕ10 x ϕ12: 57001–1266 [C]



- Press out the mechanical seal [A] and oil seal [B] from the inside of the alternator cover with the bearing driver set [C].

Special Tool - Bearing Driver Set: 57001–1129



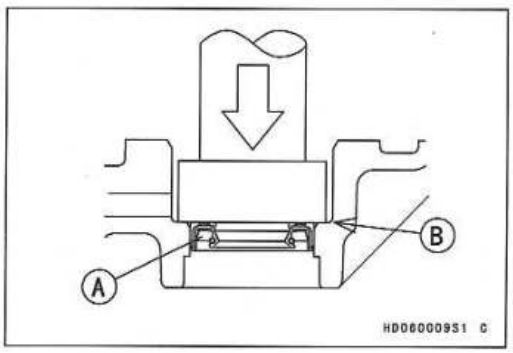
CAUTION

If either the mechanical seal, oil seal, or the ball bearing is removed, make sure to replace all of them simultaneously with a new one.

Be careful not to block the inspection hole with the oil seal. If the inspection hole is blocked, the coolant may pass through the oil seal and flow into the crankcase.

- Apply heat-resistance grease on the oil seal lip.
- From outside the alternator cover, press and insert the oil seal [A] flush [B] in the direction as shown.

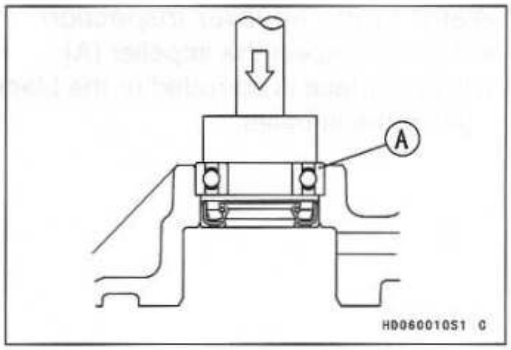
Special Tool - Bearing Driver Set: 57001–1129



Water Pump

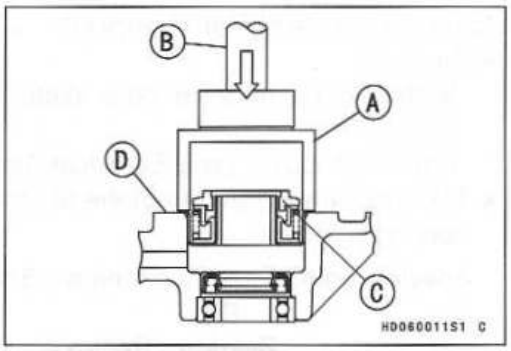
- From inside the alternator cover, press and insert the ball bearing [A] until it is bottomed.

Special Tool - Bearing Driver Set: 57001–1129



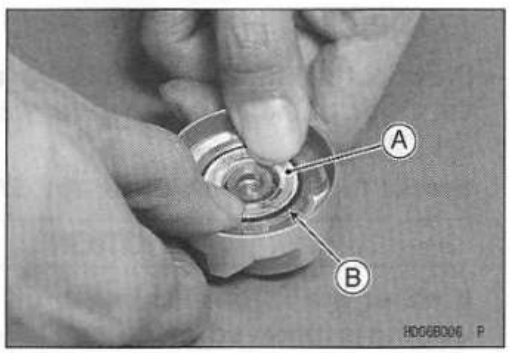
- Using a suitable socket [A] and the bearing driver [B], press and insert a new mechanical seal [C] until its flange stops at the step [D] of the hole.

Special Tool - Bearing Driver Set: 57001–1129



- Clean the sliding surface of a new mechanical seal with a high flash-point solvent, and apply a little coolant to the sliding surface to give the mechanical seal initial lubrication.
- Apply coolant to the surfaces of the rubber seal and sealing seat [A], and press the rubber seal [B] and sealing seat into the impeller by hand until the seat bottoms out.
- Tighten the water pump impeller by turning the bolt clockwise.

Torque - Water Pump Impeller: 7.9 N·m (0.80 kgf·m, 69 in·lb)



Radiator

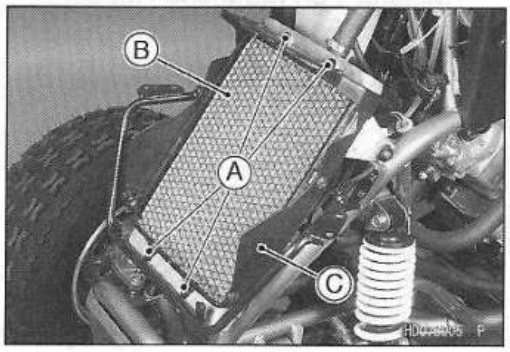
Radiator Removal

⚠ WARNING

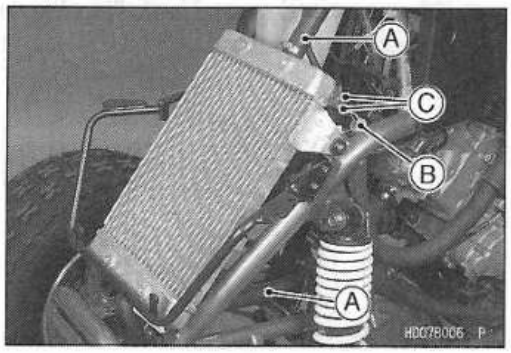
The radiator fan is connected directly to the battery. The radiator fan may start even if the ignition switch is off. NEVER TOUCH THE RADIATOR FAN UNTIL THE RADIATOR FAN CONNECTOR IS DISCONNECTED. TOUCHING THE FAN BEFORE THE CONNECTOR IS DISCONNECTED COULD CAUSE INJURY FROM THE FAN BLADES.

- Drain the coolant (see Cooling System in the Periodic Maintenance chapter).

- Remove:
  Front Fender (see Frame chapter)
  Radiator Cover (see Frame chapter)
  Radiator Screen Mounting Screws [A]
  Radiator Screen [B] (With the Shroud [C])



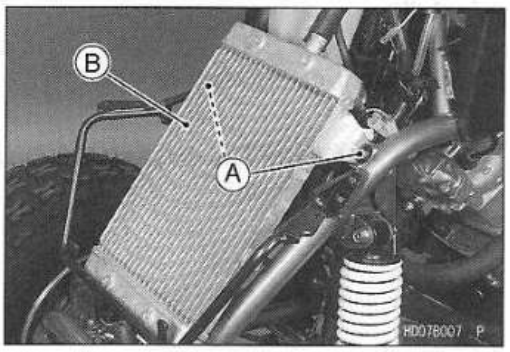
- Remove:
  Radiator Hoses [A]
  Radiator Fan Wire Connector [B]
  Radiator Fan Switch Connectors [C]



- Remove:
  Radiator Mounting Bolts [A]
  Radiator [B]

CAUTION

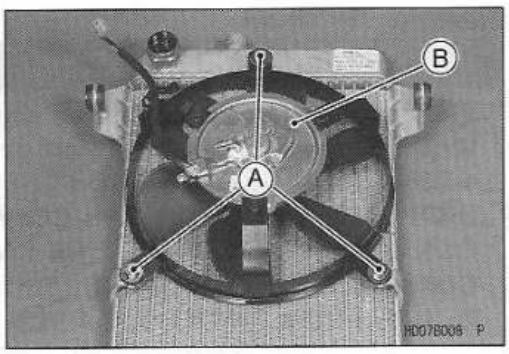
Do not touch the radiator core. This could damage the radiator fins, resulting in loss of cooling efficiency.



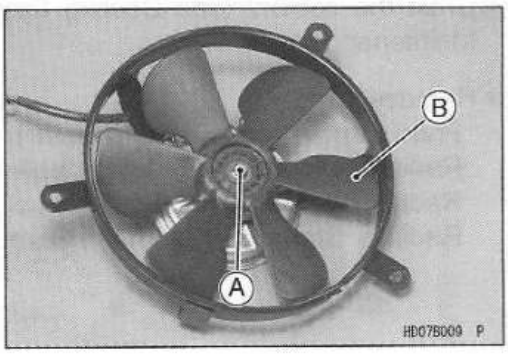
Radiator

Radiator Fan Removal

- Remove:
  Radiator (see Radiator Removal)
  Radiator Fan Assembly Bolts [A]
  Fan Assembly [B]

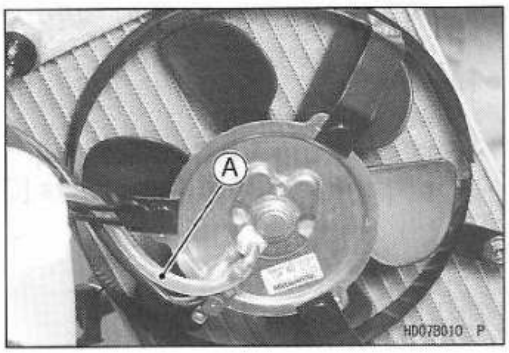


- Remove:
  Radiator Fan Mounting Nut [A]
  Radiator Fan [B]



NOTE

o *When removing and installing the fun motor tube [A], do not crush the tube.*



Radiator Fan Installation

- Install:
  Radiator Fan
  Radiator Fan Assembly
- Tighten:

Torque - Radiator Fan Assembly Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

Radiator

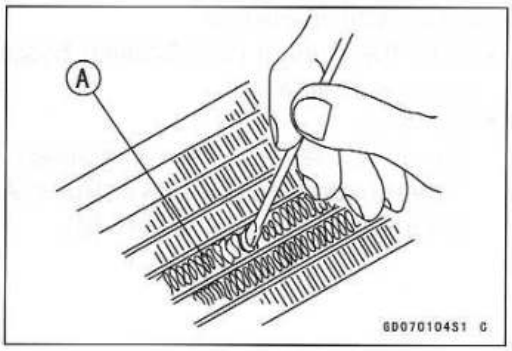
Radiator Inspection

- Check the radiator core.

★If there are obstructions to air flow, remove the radiator and remove obstructions.

★If the corrugated fins [A] are deformed, carefully straighten them.

★If the air passages of the radiator core are blocked more than 20% by unremovable obstructions or irreparably deformed fins, replace the radiator with a new one.



Radiator Cleaning

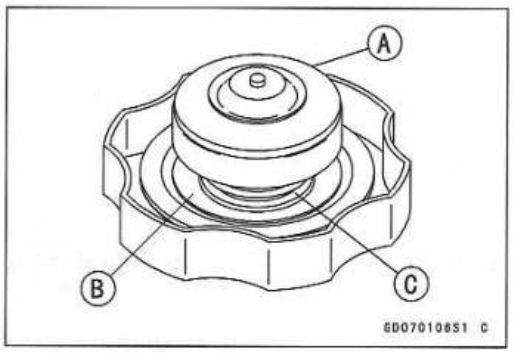
- Refer to the Cooling System in the Periodic Maintenance chapter.

Radiator Cap Inspection

- Check the condition of the top and bottom valve seals of the radiator cap.

★If any one of them shows visible damage, replace the cap.

Bottom Valve Seal [A]
Top Valve Seal [B]
Valve Spring [C]



- Install the cap [A] on a cooling system pressure tester [B].

NOTE

o *Wet the cap sealing surfaces with water or coolant to prevent pressure leakage.*

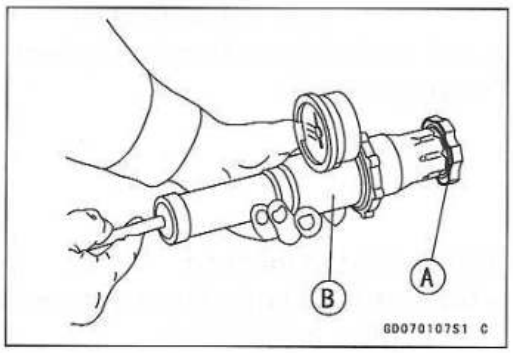
- Watching the pressure gauge, slowly pump the pressure tester to build up the pressure. The relief valve opens, indicated by the gauge hand flicks downward.

o The relief valve must open within the relief pressure range in the table below and the gauge hand must remain within the specified range at least 6 second.

Radiator Cap Relief Pressure

Standard: 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 14 ~ 18 psi)

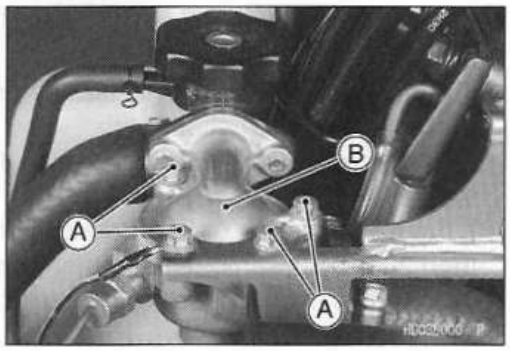
★If the cap cannot hold the specified pressure, or if it holds too much pressure, replace it with a new one.



Thermostat

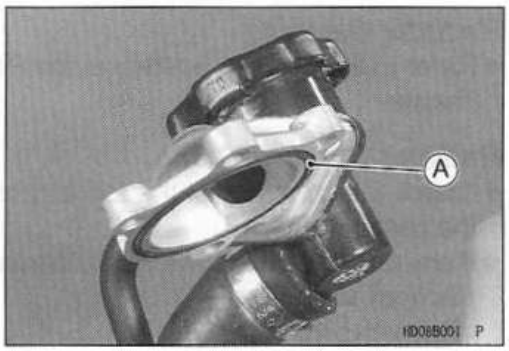
Thermostat Removal

- Drain the coolant (see Cooling System in Periodic Maintenance chapter).
- Remove:
  Front Fender (see Frame chapter)
  Thermostat Housing Cover Bolts [A]
  Thermostat Housing Cover [B]



Thermostat Installation

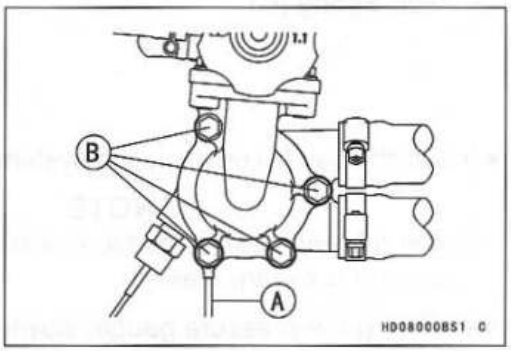
- Be sure to install the O-ring [A] on the housing cover.



- Install the ground wire terminal [A] as shown.
- Tighten:

Torque - Thermostat Housing Cover Bolts [B]: 8.8 N·m (0.90 kgf·m, 78 in·lb)

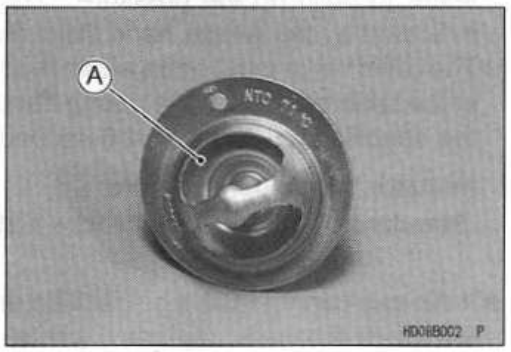
- Add coolant (see Cooling System in Periodic Maintenance chapter).



Thermostat Inspection

- Remove the thermostat, and inspect the thermostat valve [A] at room temperature.

★If the valve is open, replace the valve with a new one.



Thermostat

- To check valve opening temperature, suspend the thermostat [A] and an accurate thermometer [B] in a container of water with the heat-sensitive portions [C] in almost the same depth.

NOTE

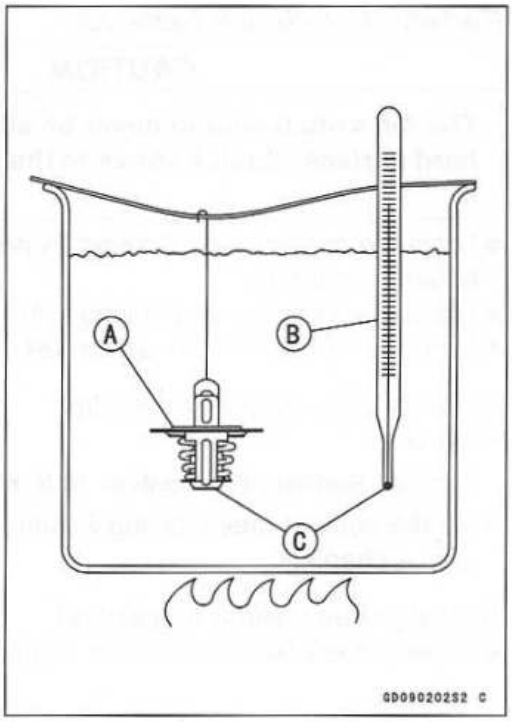
o *The thermostat must be completely submerged and the thermostat and thermometer must not touch the container sides or bottom.*

- Gradually raise the temperature of the water while stirring the water gently for even temperature.

★If the measurement is out of the range, replace the thermostat.

Thermostat Valve Opening Temperature

69.5 ~ 72.5 °C (157 ~ 162 °F)

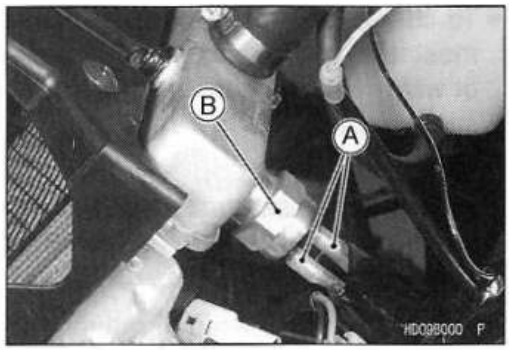


Radiator Fan Switch

Radiator Fan Switch Removal

CAUTION

The fan switch should never be allowed to fall on a hard surface. Such a shock to the part can damage it.



- Drain the coolant (see Cooling System in Periodic Maintenance chapter).
- Disconnect the fan switch leads [A].
- Remove the radiator fan switch [B].

Radiator Fan Switch Installation

- Tighten:

Torque - Radiator Fan Switch: 18 N·m (1.8 kgf·m, 13 ft·lb)

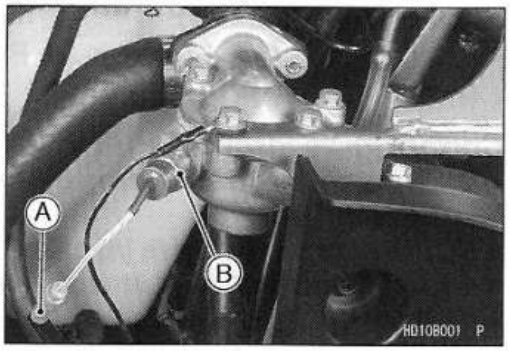
- Fill the coolant (see Cooling System in Periodic Maintenance chapter).

Radiator Fan Switch Inspection

- Refer to the Electrical System chapter.

Coolant Temperature Warning Light Switch

Coolant Temperature Warning Light Switch Removal



CAUTION

The coolant temperature warning light switch should never be allowed to fall on a hard surface. Such a shock to the part can damage it.

- Drain the coolant (see Cooling System in Periodic Maintenance chapter).
- Disconnect the switch lead [A].
- Remove the switch [B].

Coolant Temperature Warning Light Switch Installation

- Apply silicone sealant to the threads of the switch and tighten it.

Sealant - Kawasaki Bond (Silicone Sealant): 56019–120

Torque - Coolant Temperature Warning Light Switch: 7.8 N·m (0.80 kgf·m, 69 in·lb)

- Fill the coolant (see Cooling System in Periodic Maintenance chapter).

Coolant Temperature Warning Light Switch Inspection

- Refer to the Electrical System chapter.

Coolant Filter/Valve

Coolant Filter Cleaning

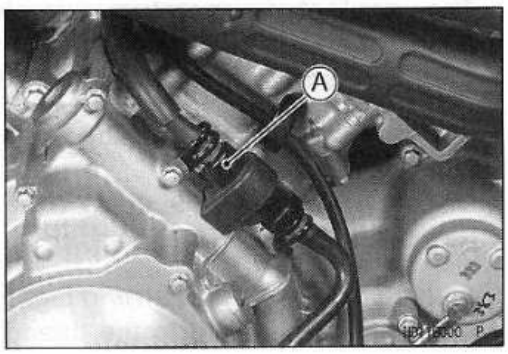
- Refer to the Cooling System in the Periodic Maintenance chapter.

Coolant Valve Inspection

- Drain the coolant (see Cooling System in Periodic Maintenance chapter).
- Remove the coolant valve [A] on the engine left side.
- Inspect the coolant valve at room temperature.

★If the valve is closed, replace the valve with a new one.

○ To check valve opening just blow through the valve.



Valve Closing Temperature (for reference)

Standard: 80°C (176°F) or more at 24.5 kPa (0.25 kgf/cm², 3.6 psi)

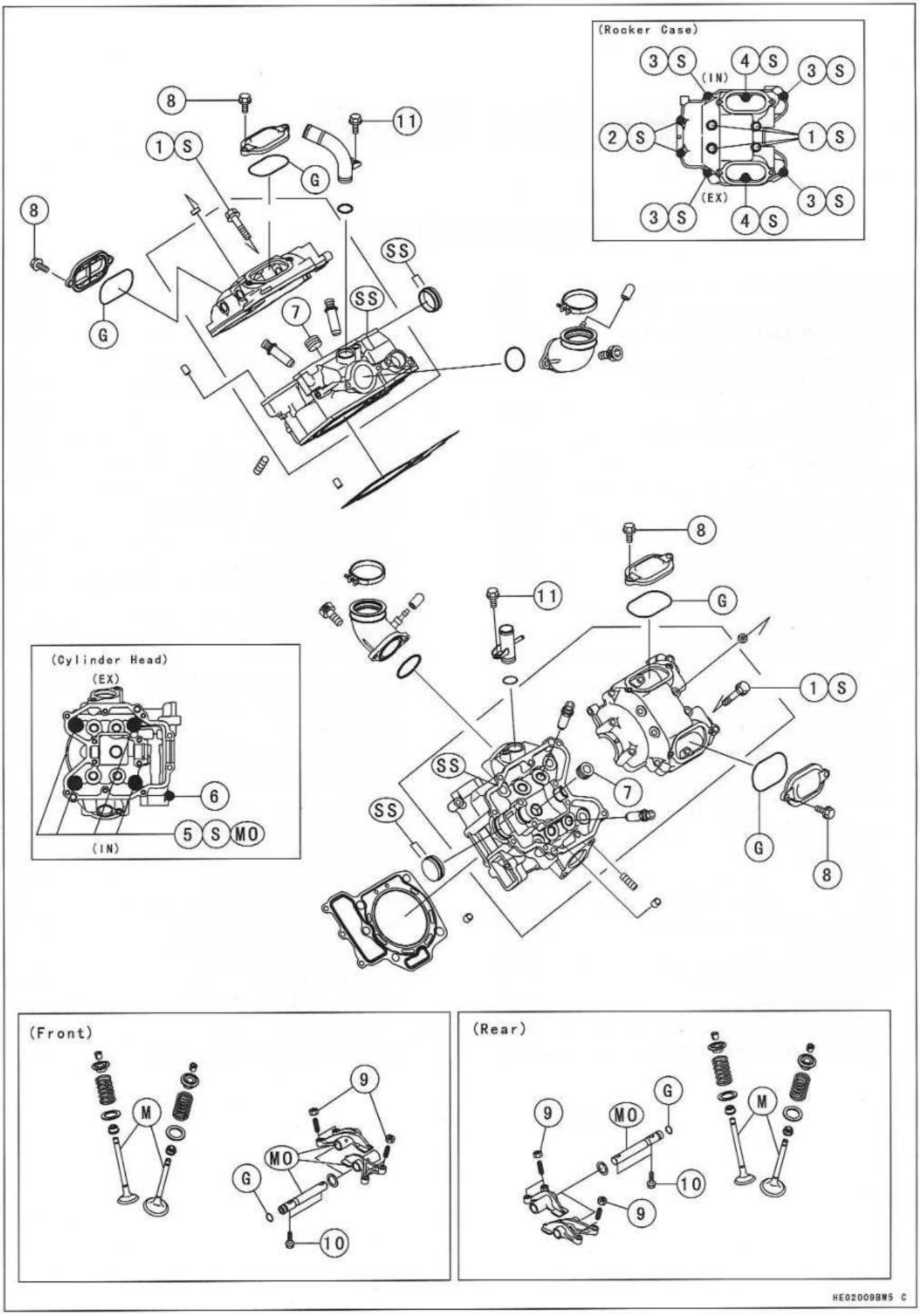
Engine Top End

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5-2 ENGINE TOP END

Exploded View

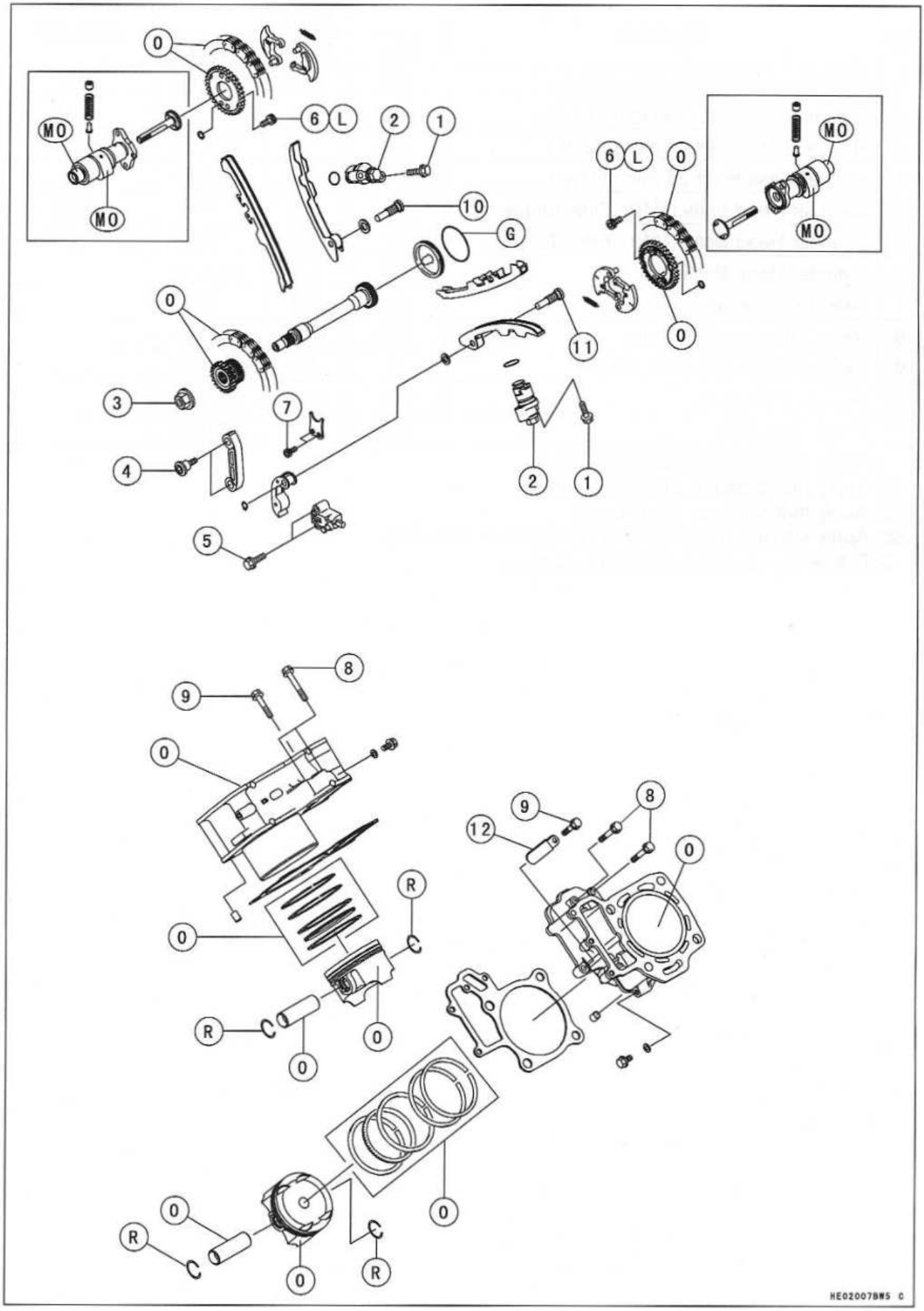


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rocker Case Bolts 55 mm (2.2 in.)	8.8	0.90	78 in·lb	S
2	Rocker Case Bolts 130 mm (5.1 in.)	9.8	1.0	87 in·lb	S
3	Rocker Case Bolts 30 mm (1.2 in.)	9.8	1.0	87 in·lb	
4	Rocker Case Bolts 25 mm (1.0 in.)	9.8	1.0	87 in·lb	S
5	Cylinder Head Bolts (M10), First Torque	25	2.5	18	S,MO
5	Cylinder Head Bolts (M10), Final Torque	49	5.0	36	S
6	Cylinder Head Bolts (M6)	9.8	1.0	87 in·lb	
7	Cylinder Head Jacket Plugs	20	2.0	14	
8	Valve Adjusting Cap Bolts	8.8	0.90	78 in·lb	
9	Valve Adjusting Screw Locknuts	12	1.2	104 in·lb	
10	Rocker Shaft Bolts	8.8	0.90	78 in·lb	
11	Water Pipe Bolts	9.8	1.0	87 in·lb	

G: Apply grease for oil seal and O-ring.
M: Apply molybdenum disulfide grease.
MO: Apply molybdenum disulfide oil.
SS: Apply silicone sealant (Kawasaki Bond: 56019–120)
S: Follow the specific tightening sequence.

Exploded View

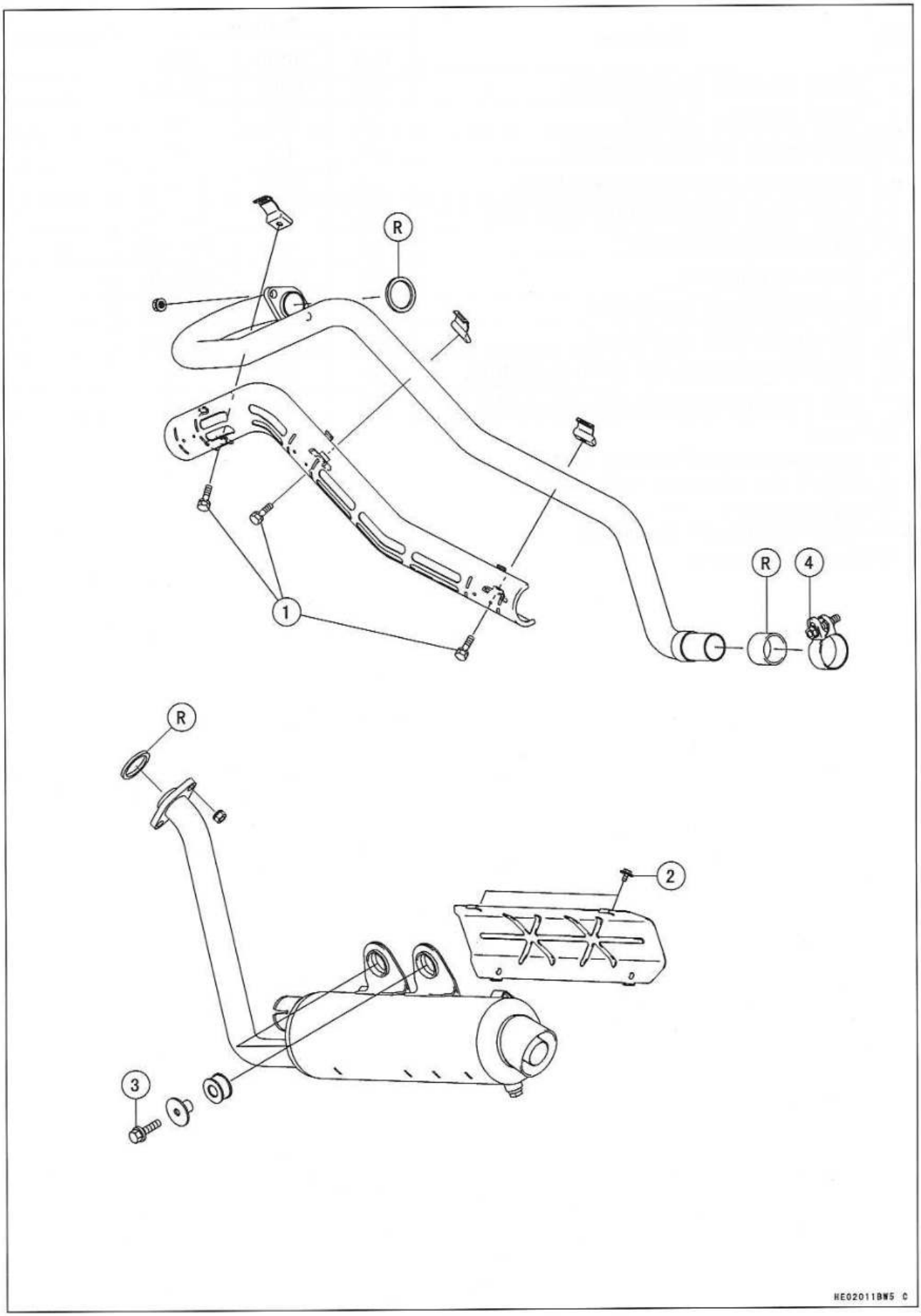


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Chain Tensioner Mounting Bolts	8.8	0.90	78 in·lb	
2	Chain Tensioner Cap Bolt	22	2.2	16	
3	Intermediate Shaft Sprocket Nut	44	4.5	33	
4	Intermediate Shaft Chain Guide Bolts	8.8	0.90	78 in·lb	
5	Intermediate Shaft Chain Tensioner Bolts	8.8	0.90	78 in·lb	
6	Camshaft Sprocket Bolts	12	1.2	104 in·lb	L
7	Position Plate Bolts	8.8	0.90	78 in·lb	
8	Cylinder Bolts 40 mm (1.6 in.)	9.8	1.0	87 in·lb	
9	Cylinder Bolts 30 mm (1.2 in.)	9.8	1.0	87 in·lb	
10	Front Cylinder Camshaft Chain Guide Bolt	20	2.0	14	
11	Rear Cylinder Camshaft Chain Guide Bolt	20	2.0	14	

12. Clamp
G: Apply grease for oil seal and O-ring.
L: Apply a non-permanent locking agent.
O: Apply engine oil.
MO: Apply molybdenum disulfide oil.
R: Replacement parts

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Exhaust Pipe Cover Bolts	8.8	0.90	78 in·lb	
2	Muffler Cover Bolts	8.8	0.90	78 in·lb	
3	Muffler Mounting Bolts	20	2.0	14	
4	Exhaust Pipe Clamp Bolt	8.8	0.90	78 in·lb	

R: Replacement parts

Specifications

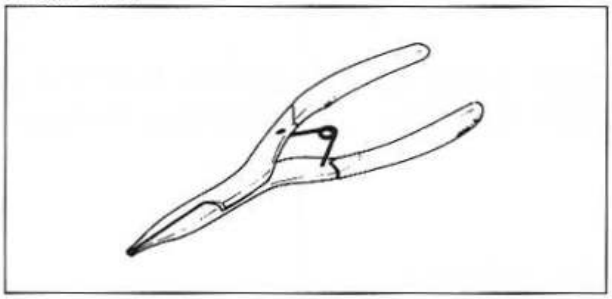
Item	Standard	Service Limit
Rocker Case:		
Rocker arm inside diameter	12.000 ~ 12.018 mm (0.4724 ~ 0.4731 in.)	12.05 mm (0.474 in.)
Rocker shaft diameter	11.973 ~ 11.984 mm (0.4714 ~ 0.4718 in.)	11.95 mm (0.470 in.)
Camshafts:		
Cam height:		
Exhaust	35.363 ~ 35.477 mm (1.3932 ~ 1.3967 in.)	35.26 mm (1.388 in.)
Inlet	35.622 ~ 35.736 mm (1.4024 ~ 1.4069 in.)	35.52 mm (1.398 in.)
Camshaft bearing clearance:		
ϕ18	0.016 ~ 0.052 mm (0.0006 ~ 0.0020 in.)	0.14 mm (0.0055 in)
ϕ22	0.020 ~ 0.062 mm (0.0008 ~ 0.0024 in.)	0.15 mm (0.0059 in.)
Camshaft journal diameter:		
ϕ18	17.966 ~ 17.984 mm (0.7073 ~ 0.7080 in.)	17.94 mm (0.706 in.)
ϕ22	21.959 ~ 21.980 mm (0.8645 ~ 0.8653 in.)	21.93 mm (0.863 in.)
Camshaft bearing inside diameter:		
ϕ18	18.000 ~ 18.018 mm (0.7087 ~ 0.7094 in.)	18.08 mm (0.712 in.)
ϕ22	22.000 ~ 22.021 mm (0.8661 ~ 0.8670 in.)	22.08 mm (0.870 in.)
Camshaft runout	TIR 0.02 mm (0.0008 in.) or less	TIR 0.1 mm (0.0039 in.)
KACR (Kawasaki Automatic Compression Release):		
KACR operating engine speed	760 ± 30 r/min (rpm)	– – –
Cylinder Head:		
Cylinder compression (usable range)		
Electric starter	290 ~ 520 kPa (3.0 ~ 5.3 kgf/cm², 43 ~ 75 psi) @ 290 r/min (rpm)	– – –
Cylinder head warp	– – –	0.05 mm (0.002 in.)
Valve:		
Valve clearance:		
Exhaust	0.20 ~ 0.25 mm (0.0079 ~ 0.0098 in.)	– – –
Inlet	0.10 ~ 0.15 mm (0.0039 ~ 0.0059 in.)	– – –
Valve head thickness:		
Exhaust	0.8 mm (0.031 in.)	0.5 mm (0.020 in.)
Inlet	0.5 mm (0.020 in.)	0.3 mm (0.012 in.)
Valve stem bend	– – –	TIR 0.05 mm (0.002 in.)
Valve stem diameter:		
Exhaust	4.955 ~ 4.970 mm (0.1951 ~ 0.1957 in.)	4.94 mm (0.1945 in.)
Inlet	4.975 ~ 4.990 mm (0.1959 ~ 0.1965 in.)	4.96 mm (0.1953 in.)
Valve guide inside diameter:		
Exhaust	5.000 ~ 5.012 mm (0.1969 ~ 0.1973 in.)	5.08 mm (0.20 in.)
Inlet	5.000 ~ 5.012 mm (0.1969 ~ 0.1973 in.)	5.08 mm (0.20 in.)

Specifications

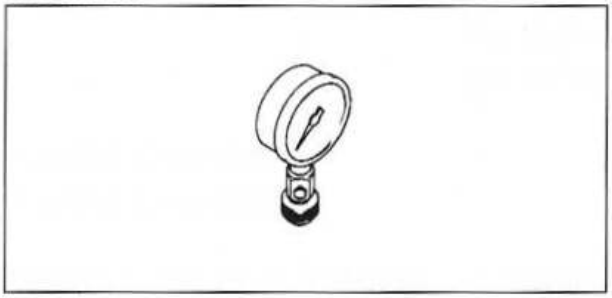
Item	Standard	Service Limit
Valve/valve guide clearance (wobble method):		
Exhaust	0.09 ~ 0.17 mm (0.0035 ~ 0.0067 in.)	0.34 mm (0.0133 in.)
Inlet	0.03 ~ 0.11 mm (0.0012 ~ 0.0043 in.)	0.28 mm (0.0110 in.)
Valve seat cutting angle	45°, 32°, 60°	– – –
Valve seating surface:		
Outside diameter:		
Exhaust	25.2 ~ 25.4 mm (0.992 ~ 1.000 in.)	– – –
Inlet	29.4 ~ 29.6 mm (1.157 ~ 1.165 in.)	– – –
Width:		
Exhaust	0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)	– – –
Inlet	0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)	– – –
Valve spring free length:		
Exhaust	41.3 mm (1.626 in.)	39.5 mm (1.555 in.)
Inlet	41.3 mm (1.626 in.)	39.5 mm (1.555 in.)
Cylinder, Piston:		
Cylinder inside diameter	81.994 ~ 82.006 mm (3.2281 ~ 3.2286 in.)	82.09 mm (3.232 in.)
Piston diameter	81.949 ~ 81.964 mm (3.2263 ~ 3.2269 in.)	81.80 mm (3.220 in.)
Piston/cylinder clearance	0.030 ~ 0.057 mm (0.0012 ~ 0.0022 in.)	– – –
Piston ring/groove clearance:		
Top	0.040 ~ 0.080 mm (0.0016 ~ 0.0032 in.)	0.18 mm (0.0071 in.)
Second	0.030 ~ 0.070 mm (0.0012 ~ 0.0028 in.)	0.17 mm (0.0067 in.)
Piston ring groove width:		
Top	1.030 ~ 1.050 mm (0.0405 ~ 0.0413 in.)	1.13 mm (0.0445 in.)
Second	1.020 ~ 1.040 mm (0.0402 ~ 0.0409 in.)	1.12 mm (0.0441 in.)
Piston ring thickness:		
Top	0.97 ~ 0.99 mm (0.0382 ~ 0.0390 in.)	0.9 mm (0.035 in.)
Second	0.97 ~ 0.99 mm (0.0382 ~ 0.0390 in.)	0.9 mm (0.035 in.)
Piston ring end gap:		
Top	0.20 ~ 0.30 mm (0.0079 ~ 0.0118 in.)	0.60 mm (0.0236 in.)
Second	0.30 ~ 0.45 mm (0.0118 ~ 0.0177 in.)	0.75 mm (0.0295 in.)
Oil	0.20 ~ 0.70 mm (0.0079 ~ 0.0276 in.)	1.00 mm (0.0394 in.)

Special Tools and Sealant

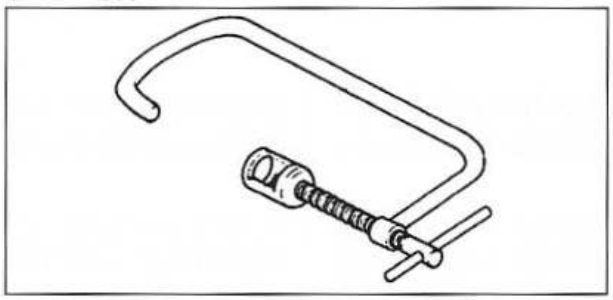
Outside Circlip Pliers :
57001–144



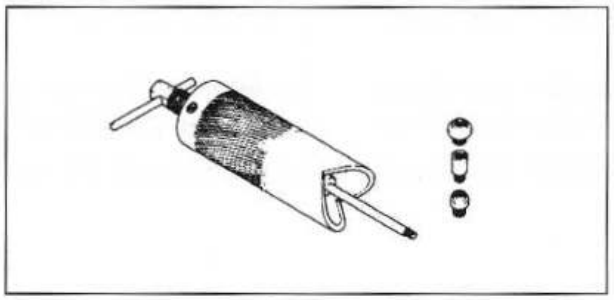
Compression Gauge :
57001–221



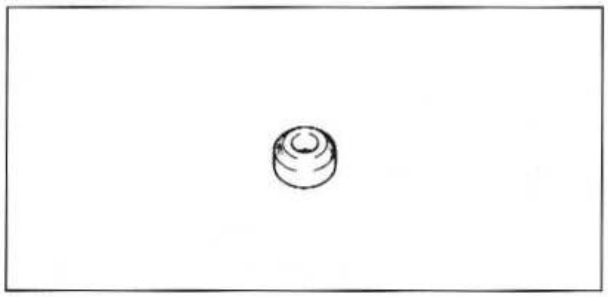
Valve Spring Compressor Assembly :
57001–241



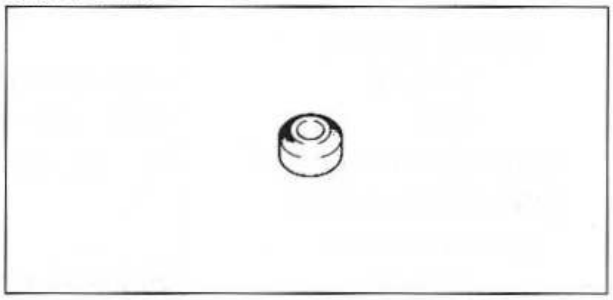
Piston Pin Puller Assembly :
57001–910



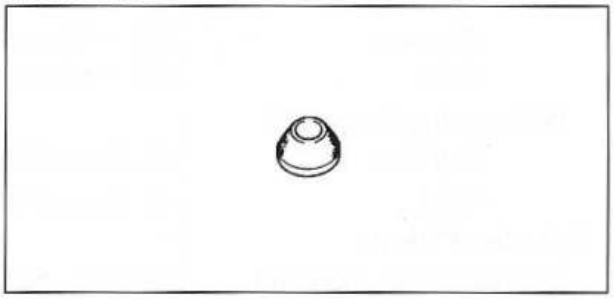
Valve Seat Cutter, 45° – ϕ27.5 :
57001–1114



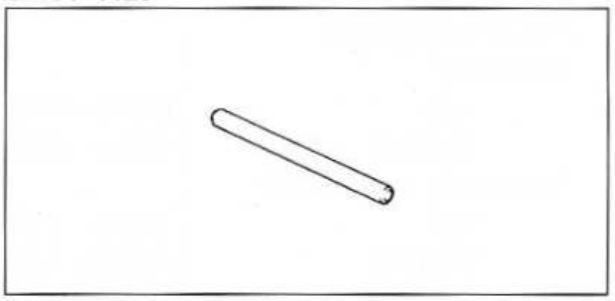
Valve Seat Cutter, 32° – ϕ28 :
57001–1119



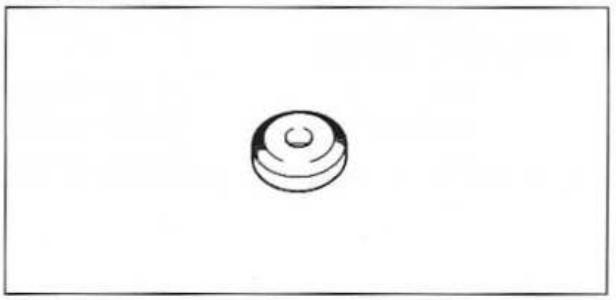
Valve Seat Cutter, 60° – ϕ30 :
57001–1123



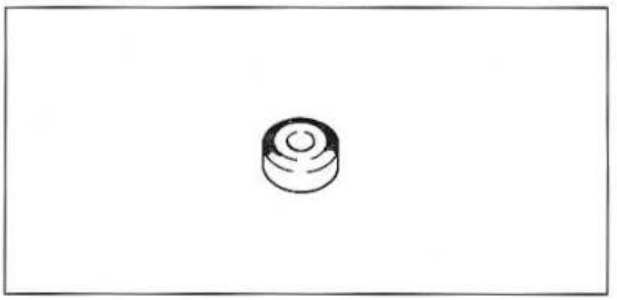
Valve Seat Cutter Holder Bar :
57001–1128



Valve Seat Cutter, 45° – ϕ30 :
57001–1187

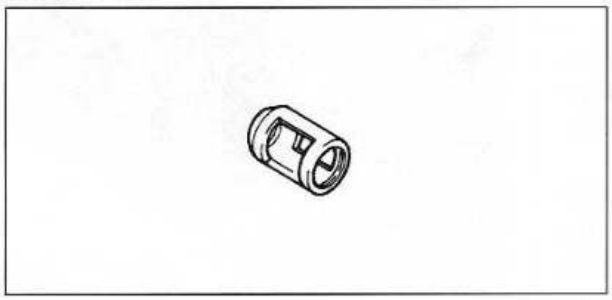


Valve Seat Cutter, 32° – ϕ33 :
57001–1199

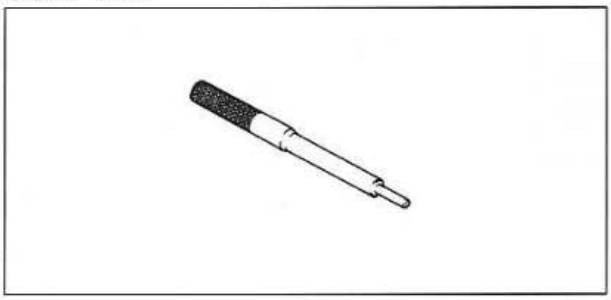


Special Tools and Sealant

Valve Spring Compressor Adapter, ϕ22 :
57001–1202



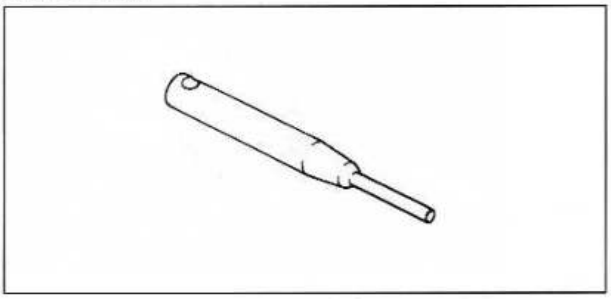
Valve Guide Arbor, ϕ5 :
57001–1203



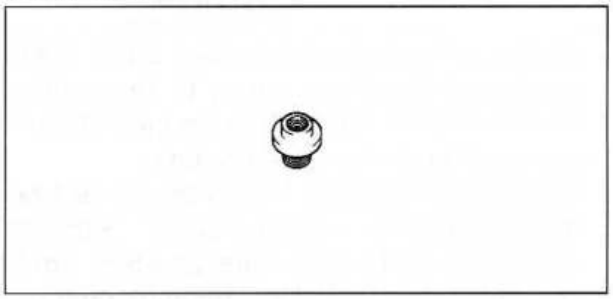
Valve Guide Reamer, ϕ5 :
57001–1204



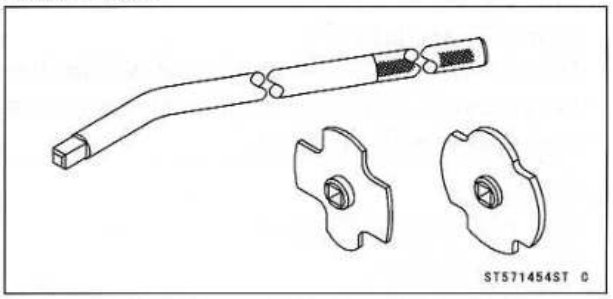
Valve Seat Cutter Holder, ϕ5 :
57001–1208



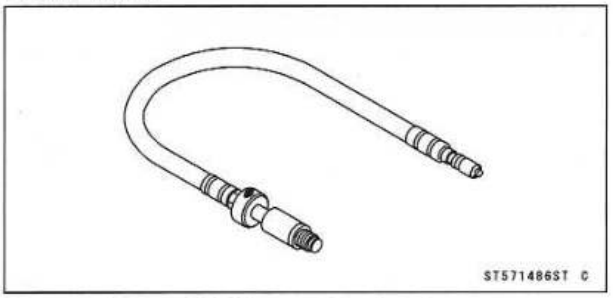
Piston Pin Puller Adapter :
57001–1211



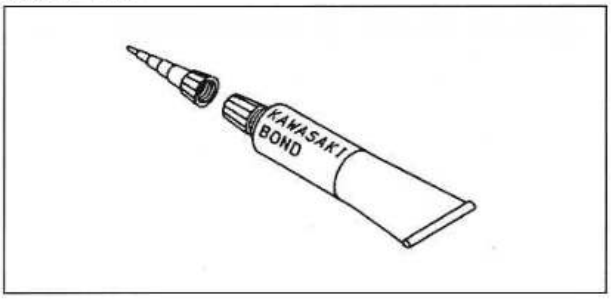
Filter Cap Driver:
57001–1454



Compression Gauge Adapter, M10 × 1.0 :
57001–1486



Kawasaki Bond (Silicone Sealant) :
56019–120

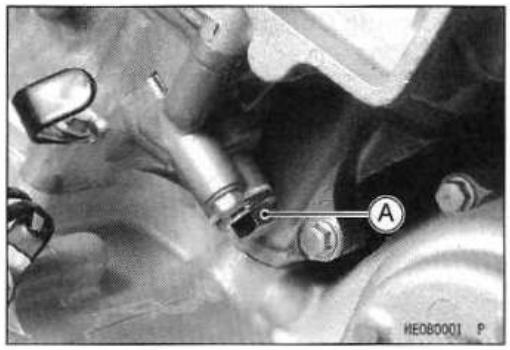


Camshaft Chain Tensioner

Camshaft Chain Tensioner Removal

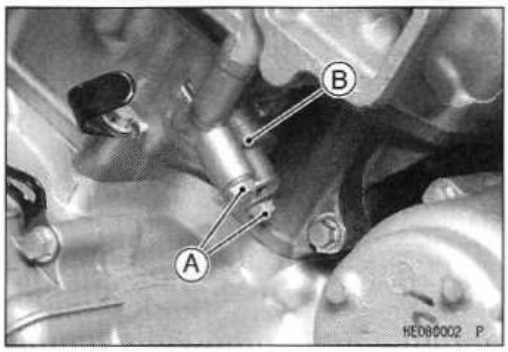
CAUTION

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 partway. 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 "Camshaft 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.



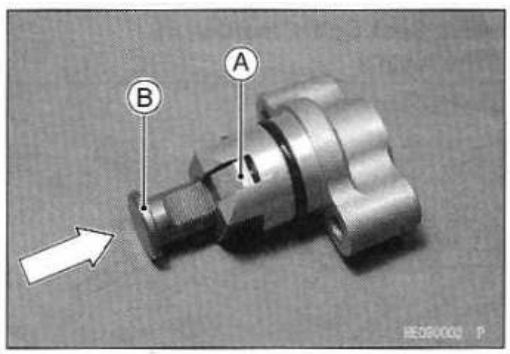
- Remove:
  Cap Bolt [A] and Washer
  Pin and Spring

- Remove:
  Tensioner Mounting Bolts [A]
  Camshaft Chain Tensioner [B]



Camshaft Chain Tensioner Installation

- Push the stopper [A] to release the ratchet and push the push rod [B] into the tensioner body.

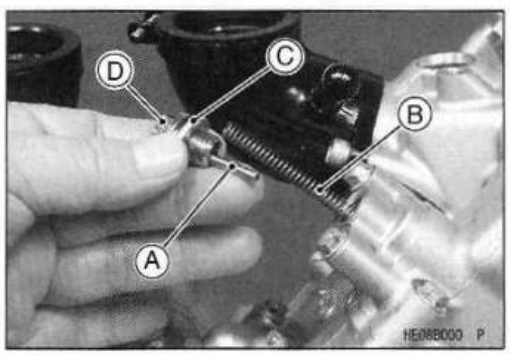


- Tighten:

Torque - Chain Tensioner Mounting Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

- Install:
  Pin [A] and Spring [B]
  Washer [C] and Chain Tensioner Cap Bolt [D]
- Tighten:

Torque - Chain Tensioner Cap Bolt: 22 N·m (2.2 kgf·m, 16 ft·lb)



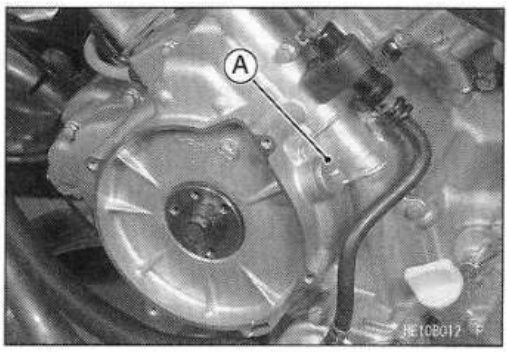
Rocker Case

Rocker Case Removal

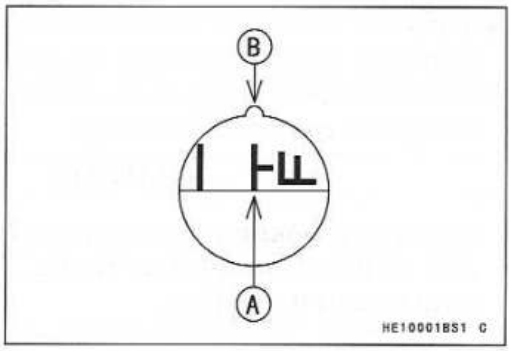
Front Rocker Case:

- Remove:
  Air Cleaner Cover (see Frame chapter)
  Front Fender (see Frame chapter)
  Side Inner Cover (see Frame chapter)
  Timing Inspection Plug [A]
  Valve Adjusting Caps
  Converter Intake Duct, Exhaust Duct (see Converter System)

Special Tool - Filler Cap Driver: 57001–1454



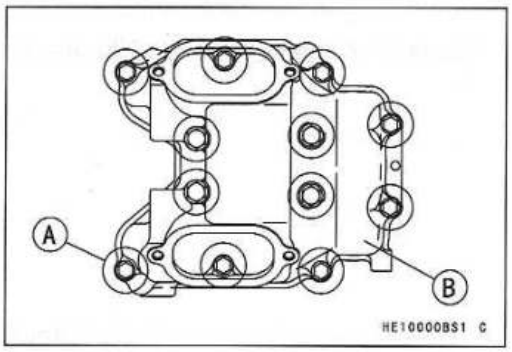
- Using a wrench on the alternator bolt, turn the crankshaft counterclockwise until "T-F" mark [A] is aligned with the notch [B] in the inspection window, and the cam lobes are pointing away from the rocker arms: the end of the compression stroke.



CAUTION

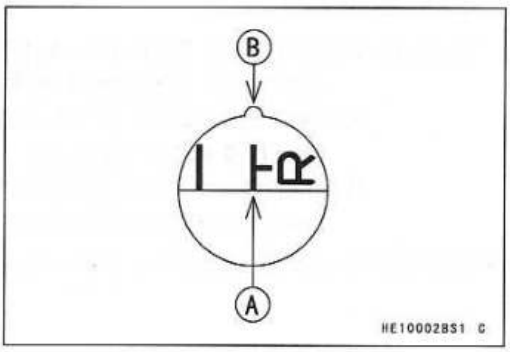
Be sure to position the crankshaft at TDC of the end of the compression stroke when removing or installing the rocker case. The rocker arms could bend the valves.

- Remove:
  Front Camshaft Chain Tensioner (see Camshaft Chain Tensioner Removal)
  Rocker Case Bolts [A]
  Front Rocker Case [B]
- Lift the rocker case clear of the dowel pins in the cylinder head and slide the rocker case out of the frame.



Rear Rocker Case:

- Remove:
  Front Rocker Case (see this section)
  Converter Exhaust Joint Duct
- Using a wrench on the alternator bolt, turn the crankshaft **counterclockwise** (270°) until "T-R" mark [A] is aligned with the notch [B] in the inspection window, and the cam lobes are pointing away from the rocker arms: the end of the compression stroke.

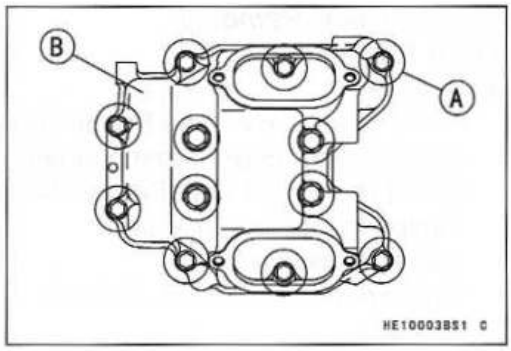


CAUTION

Be sure to position the crankshaft at TDC of the end of the compression stroke when removing or installing the rocker case. The rocker arms could bend the valves.

Rocker Case

- Remove:
  Rear Camshaft Chain Tensioner (see Camshaft Chain Tensioner Removal)
  Rocker Case Bolts [A]
  Rear Rocker Case [B]
- Lift the rocker case clear of the dowel pins in the cylinder head and slide the rocker case out of the frame.



Rocker Case Installation

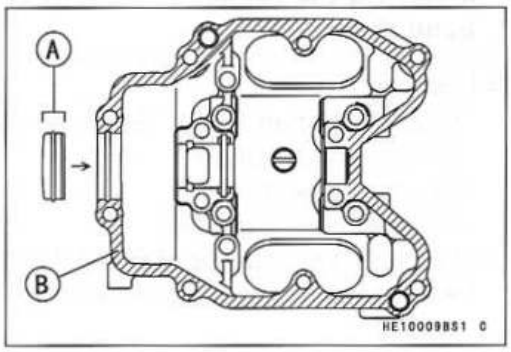
- Install the rear camshaft and then the front camshaft (see Camshaft Installation in this chapter).
- Check that the crankshaft is positioned at TDC and at the end of the compression stroke.

CAUTION

Be sure to position the crankshaft is at TDC of the end of the compression stroke. The rocker arms could bend the valves.

- Apply silicone sealant to the outer surface of the cap [A] and the cylinder head upper surface [B] as shown.

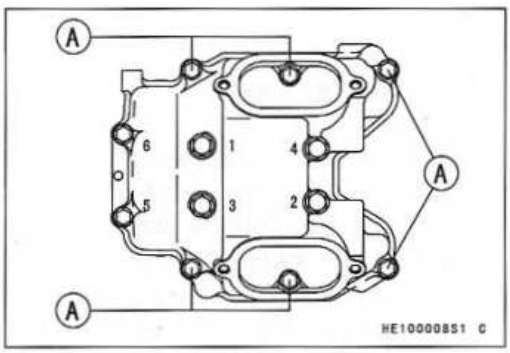
  Sealant - Kawasaki Bond (Silicone Sealant): 56019–120



- Tighten the rocker case bolts following the tightening sequence shown.

  Torque - Rocker Case Bolts [1 ~ 4, L=55 mm (2.2 in.) with washers]: 8.8 N·m (0.90 kgf·m, 78 in·lb)
  Rocker Case Bolts [5 ~ 6, L=130 mm (5.1 in.)]: 9.8 N·m (1.0 kgf·m, 87 in·lb)
  Rocker Case Bolts [A] [L=30 mm (1.2 in.), L=25 mm (1.0 in.)]: 9.8 N·m (1.0 kgf·m, 87 in·lb)

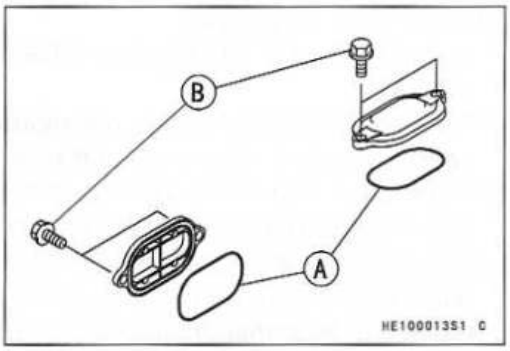
- Check the valve clearance and adjust it if necessary.



Rocker Case

- Apply grease to the O-ring [A].
- Tighten:

Torque - Valve Adjusting Cap Bolts [B]: 8.8 N·m (0.90 kgf·m, 78 in·lb)

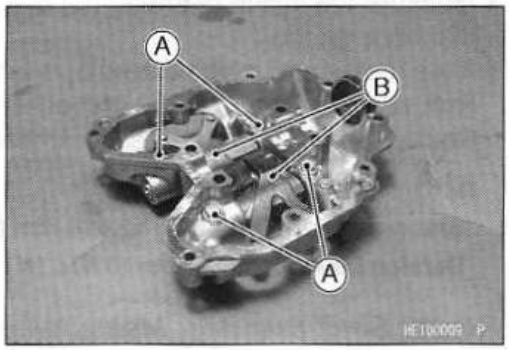


Rocker Arm Removal

- Remove:
  Rocker Case Rocker Shaft Bolts [A] (see Rocker Case Removal)
  Rocker Shaft [B]
  Washers

○ Mark and record the rocker arm location so it can be installed in the original position.

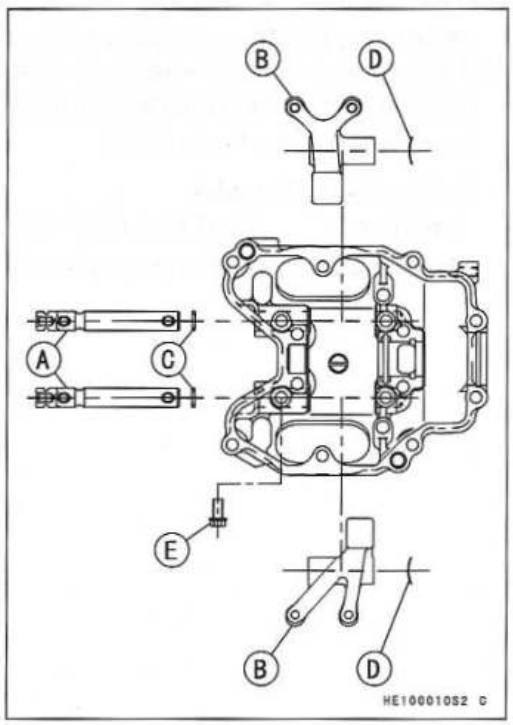
○ The rocker arms come off with the rocker shafts.



Rocker Arm Installation

- Apply molybdenum disulfide oil:
  Rocker Shaft [A]
  Hole in Rocker Arm [B]
- Apply grease to the O-rings [C].
- Install:
  Wave Washers [D] (as shown)
  Rocker Arms (as shown)
  Rocker Shafts and O-rings
- Tighten:

Torque - Rocker Shaft Bolts [E]: 8.8 N·m (0.90 kgf·m, 78 in·lb)



Rocker Case

Rocker Arm Inspection

- Inspect the area [A] on the rocker arm where the cam rubs.

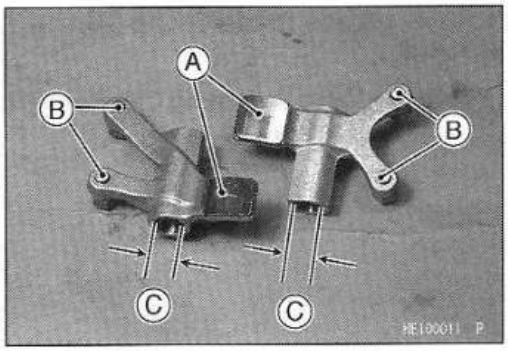
★If the rocker arm is scored, discolored or otherwise damaged, replace it. Also inspect the camshaft lobes.

- Inspect the end of the valve clearance adjusting screws [B] where it contacts the valve stem.

★If the end of the adjusting screw is mushroomed or damaged in any way, or if the screw will not turn smoothly, replace it. Also inspect the end of the valve stem.

- Measure the inside diameter [C] of the rocker arm with a dial bore gauge.

★If the rocker arm inside diameter is larger than the service limit, replace it. Also check the rocker shaft diameter (see Rocker Shaft Diameter Measurement).



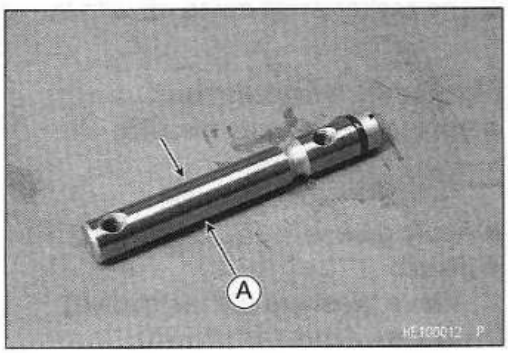
Rocker Arm Inside Diameter

Standard:	**12.000 ~ 12.018 mm (0.4724 ~ 0.4731 in.)**
Service Limit:	**12.05 mm (0.474 in.)**

Rocker Shaft Diameter Measurement

- Measure the diameter [A] of the rocker shaft where the rocker arm pivots on it with a micrometer.

★If the rocker shaft diameter is smaller than the service limit, replace it. Also check the rocker arm inside diameter (see Rocker Arm Inspection).



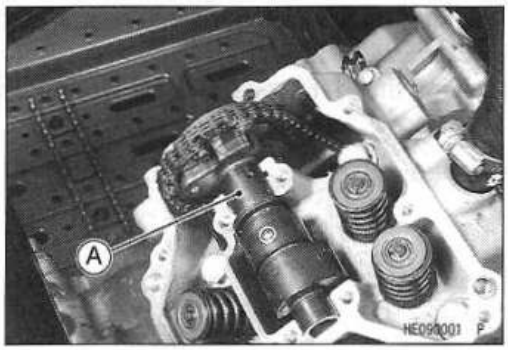
Rocker Shaft Diameter

Standard:	**11.973 ~ 11.984 mm (0.4714 ~ 0.4718 in.)**
Service Limit:	**11.95 mm (0.470 in.)**

Camshaft

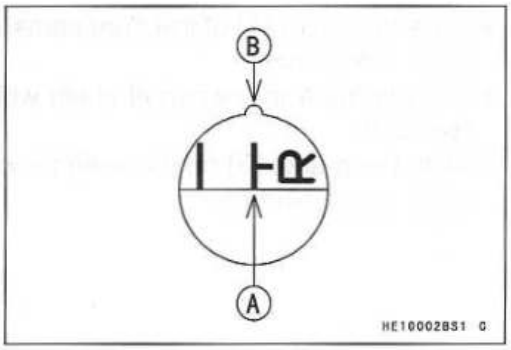
Camshaft Removal

- Remove:
  Both Camshaft Chain Tensioners (see Camshaft Chain Tensioner Removal)
  Both Rocker Cases (see Rocker Case Removal)
  Both Camshafts [A]
- Support the chain using a suitable tool.

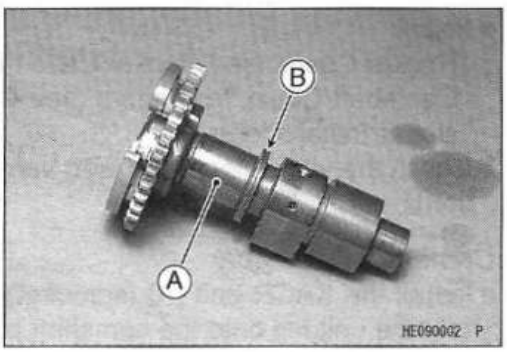


Camshaft Installation

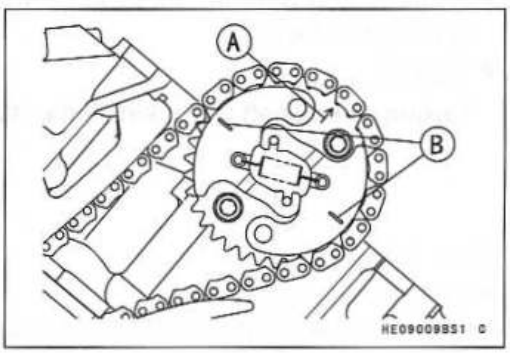
- Using a wrench on the alternator bolt, turn the crankshaft **clockwise** until "T-R" mark [A] is aligned with the notch [B] in the inspection window.



- The rear camshaft [A] has a groove [B].
- First, install the rear camshaft.



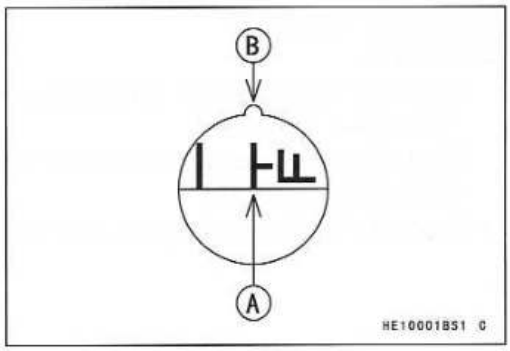
- Face the arrow [A] of the rear camshaft sprocket upward (left side view).
- Engage the rear camshaft chain with the rear camshaft sprocket.
- Align the marks [B] on the weights with the rear cylinder head upper surface.



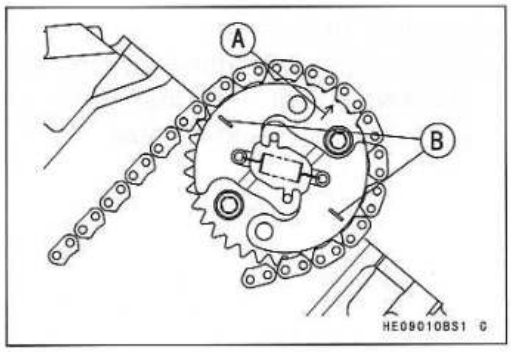
Camshaft

- Using a wrench on the alternator bolt, turn the crankshaft **clockwise** 270°.

○ Align the "T-F" mark [A] with the notch [B] in the inspection window.



- Face the arrow [A] of the front camshaft sprocket upward (right side view).
- Engage the front camshaft chain with the front camshaft sprocket.
- Align the marks [B] on the weights with the front cylinder head upper surface.

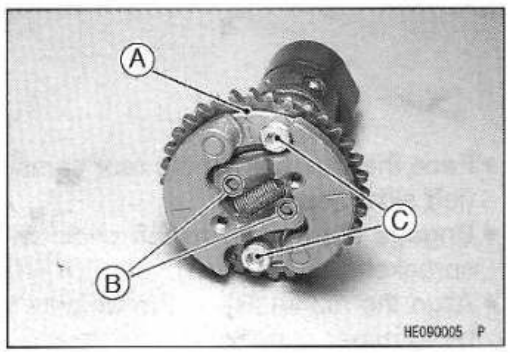


- Install:
  Rocker Cases (see Rocker Case Installation)
  Camshaft Chain Tensioners (see Camshaft Chain Tensioner Installation)
- Check the valve clearance (see Valve Clearance Inspection).

Camshaft Assembly

- Install the KACR unit [A] (sprocket) on the camshaft so that the unit fits onto the camshaft pins [B].
- Apply a non-permanent locking agent to the camshaft sprocket bolts [C].
- Tighten:

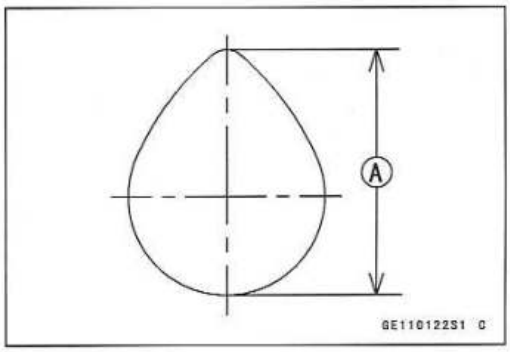
Torque - Camshaft Sprocket Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)



Cam Wear

- Remove the camshaft.
- Measure the height [A] of the cam with a micrometer.

★If the cams are worn past the service limit, replace the camshaft.



Cam Height

	Standard	Service Limit
Exhaust	35.363 ~ 35.477 mm (1.3932 ~ 1.3967 in.)	35.26 mm (1.388 in.)
Inlet	35.622 ~ 35.736 mm (1.4024 ~ 1.4069 in.)	35.52 mm (1.398 in.)

Camshaft

Camshaft Bearing Wear

○ The journal wear is measured using plastigage (press gauge), which is inserted into the clearance to be measured. The plastigage indicates the clearance by the amount it is compressed and widened when the parts are assembled.

- Cut strips of plastigage to journal width. Place a strip on each journal parallel to the camshaft with the camshaft installed in the correct position so that the plastigage will be compressed between the journal and rocker case.
- Install the rocker case, tightening the bolts in the correct sequence to the specified torque (see Rocker Case Installation).

NOTE

○ *Do not turn the camshaft when the plastigage is between the journal and rocker case.*

- Remove the rocker case and measure the plastigage width [A] to determine the clearance between the journal and the rocker case. Measure the widest portion of the plastigage.



Camshaft Bearing Clearance (ϕ18)

Standard: **0.016 ~ 0.052 mm (0.0006 ~ 0.0020 in.)**

Service Limit: **0.14 mm (0.0055 in.)**

Camshaft Bearing Clearance (ϕ22)

Standard: **0.020 ~ 0.062 mm (0.0008 ~ 0.0024 in.)**

Service Limit: **0.15 mm (0.0059 in.)**

★ If any clearance exceeds the service limit, measure the diameter of the camshaft journal.

Camshaft Journal Diameter (ϕ18)

Standard: **17.966 ~ 17.984 mm (0.7073 ~ 0.7080 in.)**

Service Limit: **17.94 mm (0.706 in.)**

Camshaft Journal Diameter (ϕ22)

Standard: **21.959 ~ 21.980 mm (0.8645 ~ 0.8653 in.)**

Service Limit: **21.93 mm (0.863 in.)**

★ If the camshaft journal diameter is less than the service limit, replace the camshaft with a new one and measure the clearance again.

★ If the clearance still remains out of the limit, replace the cylinder head and the rocker case.

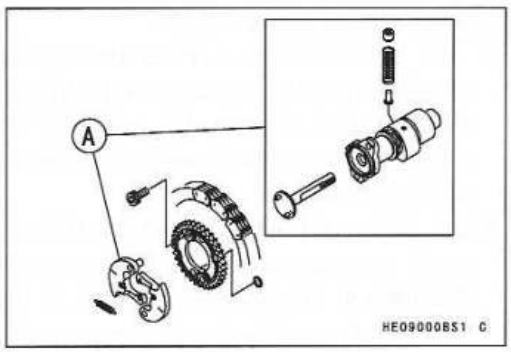
CAUTION
The cylinder head and rocker case are machined as a set, and must be replaced as a set.

Camshaft

KACR Inspection

The Kawasaki Automatic Compression Release (KACR) momentarily opens the exhaust valves on the compression stroke at very low speeds. 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 weights are not returning to their rest position.

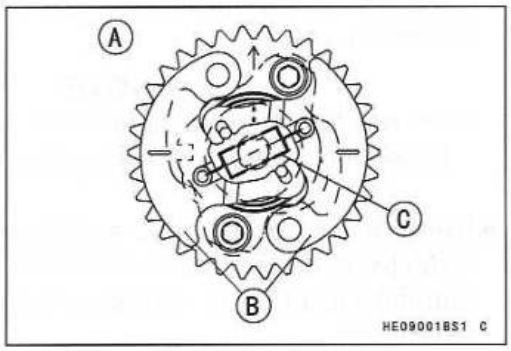
- Remove the camshaft (see Camshaft Removal).
- Remove the KACR unit.
- Visually inspect the spring.

★If damaged, deformed, or missing, replace the spring.

- Remove the spring and move the weights back and forth.

★If the weights do not move smoothly, replace the KACR unit. Also inspect the exhaust rocker arm for any damage, and replace the rocker arm if necessary.

[A] Rest Position (compression is released)
[B] Weights
[C] Spring

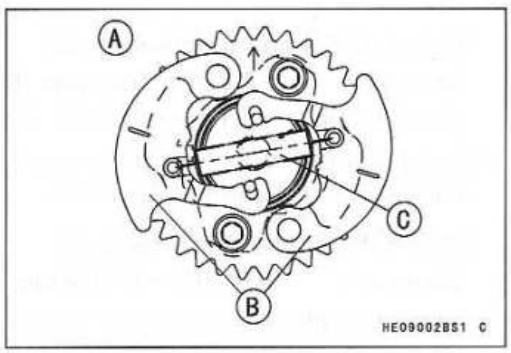


(2) If compression is released while the engine is running, the weights are not swinging out.

- Remove the spring and move the weights back and forth.

★If the weights do not move easily from the retracted position, replace the KACR unit. Also inspect the exhaust rocker arm for any damage, and replace the rocker arm if necessary.

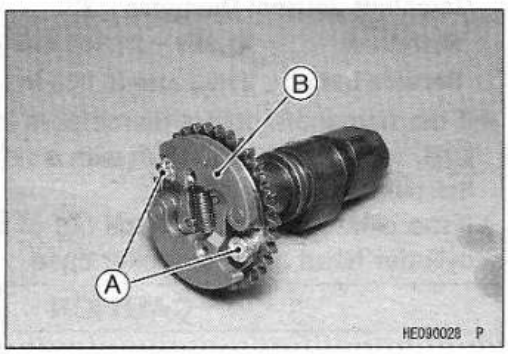
[A] Running Position (compression is not released)
[B] Weights
[C] Spring



KACR Removal

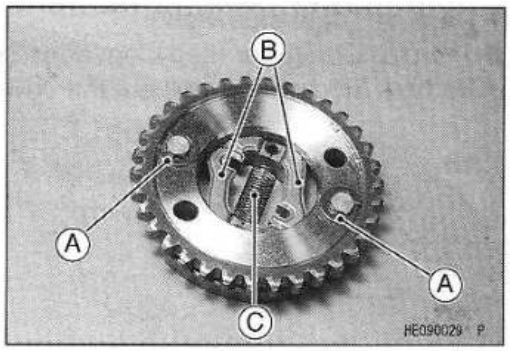
- Remove:

Camshaft (see Camshaft Removal)
Camshaft Sprocket Bolts [A]
KACR Unit [B]



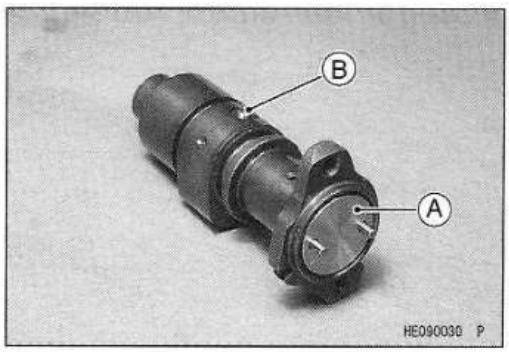
Camshaft

- Remove:
  Circlips [A]
  Weights [B]
  Spring [C]



NOTE

o Do not remove the shaft [A] and pin [B].
o If the parts are removed, they cannot be reinstalled.



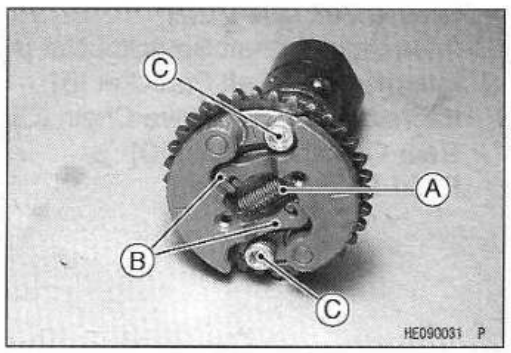
KACR Installation

- Install:
  Weights
  Circlips
  Spring [A]

o Hook the spring from the outside with the open side of the hook inwards.

- Install:
  KACR Unit
- Hook the arms [B] on the pins.
- Apply a non-permanent locking agent to the camshaft sprocket bolts [C] and tighten them.

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

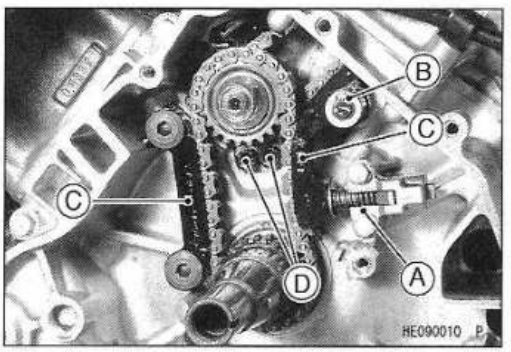


Camshaft Chain Removal

- Remove (left side view):
  Rear and Front Camshafts (see Camshaft Removal)
  Alternator Rotor (see Electrical System chapter)
  Oil Pump (see Engine Lubrication System chapter)
  Intermediate Shaft Chain Tensioner [A]
  Circlip [B] and Washer

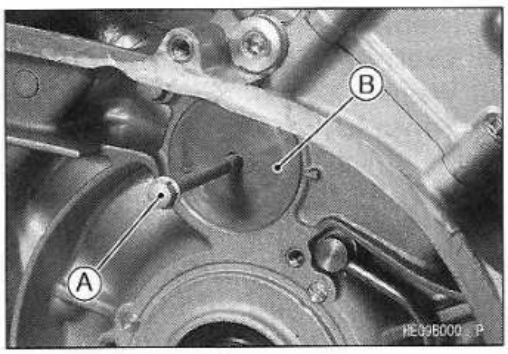
Special Tool - Outside Circlip Pliers: 57001–144

- Remove:
  Intermediate Shaft Chain Guides [C]
  Position Plate Bolts [D] and Position Plate

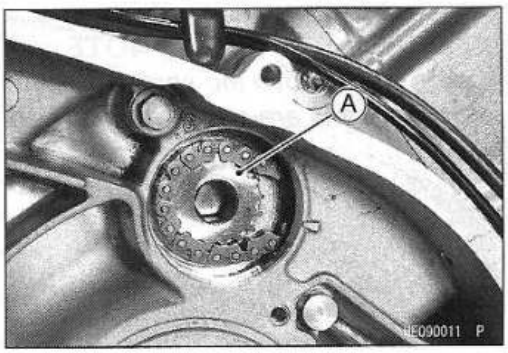


Camshaft

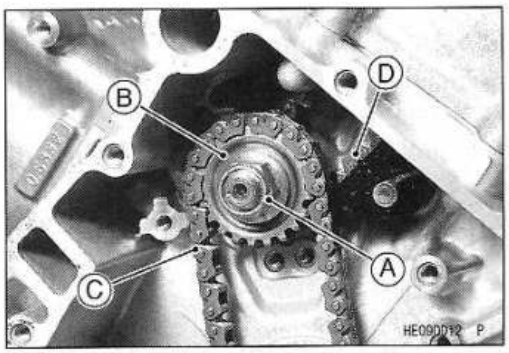
- Remove (right side view):
  Torque Converter (see Converter System chapter)
- Using a M6 bolt [A], pull out the cover [B].



- Using an Allen wrench, hold the intermediate shaft [A].



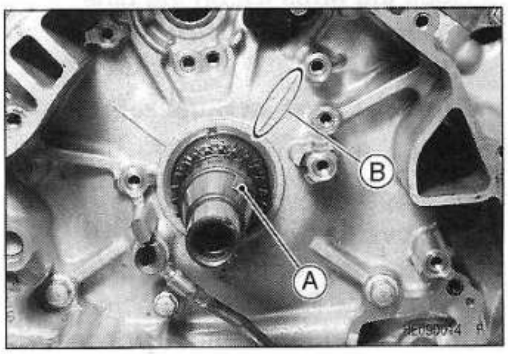
- Remove (left side view):
  Intermediate Shaft Sprocket Nut [A]
  Intermediate Shaft Sprocket [B]
  Intermediate Shaft Drive Chain [C]
  Rear Camshaft Chain [D]
  Front Camshaft Chain



Camshaft Chain Installation

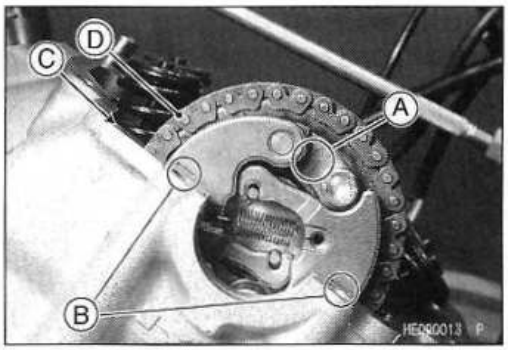
Rear Camshaft Chain:

- Align the key groove [A] on the crankshaft with the embossed line [B] on the crankcase (left side view).

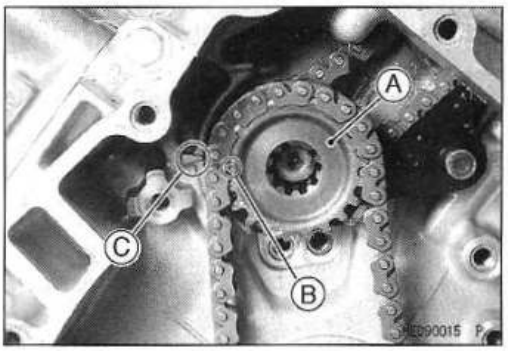


Camshaft

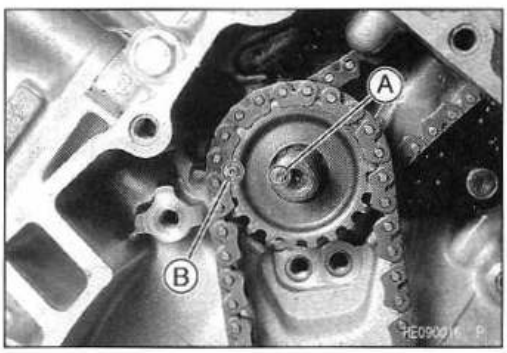
- Face the arrow [A] of the rear camshaft sprocket upward.
- Align the marks [B] on the weights with the rear cylinder head upper surface [C].
- Place the rear camshaft chain [D] onto the rear camshaft sprocket.



- Engage the camshaft and intermediate shaft chains on the intermediate shaft sprocket [A] (left side view).
- Align the punch mark [B] on the intermediate shaft sprocket with the embossed mark [C] on the crankcase.

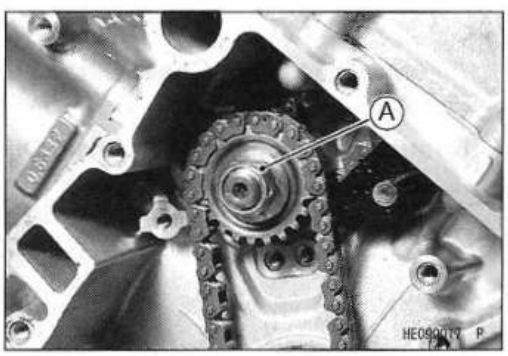


- Install the intermediate shaft and align the punch mark [A] on the intermediate shaft with the punch mark [B] on the intermediate sprocket nut.



- Using an Allen wrench, hold the intermediate shaft.
- Tighten:

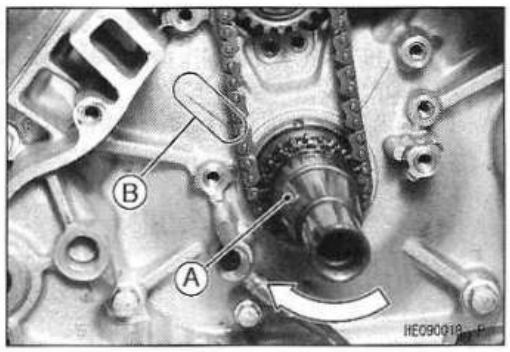
Torque - Intermediate Shaft Sprocket Nut [A]: 44 N·m (4.5 kgf·m, 33 ft·lb)



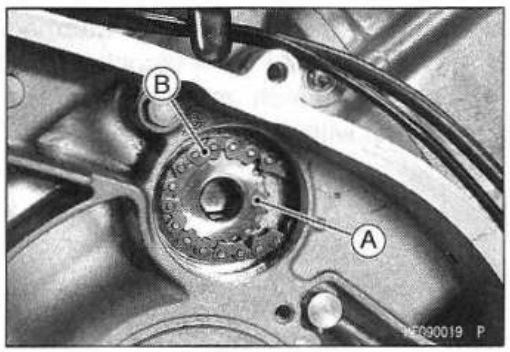
Camshaft

Front Camshaft Chain:

- Rotate the crankshaft **clockwise** 270°.
- Align the key groove [A] on the crankshaft with the embossed line [B] on the crankcase.

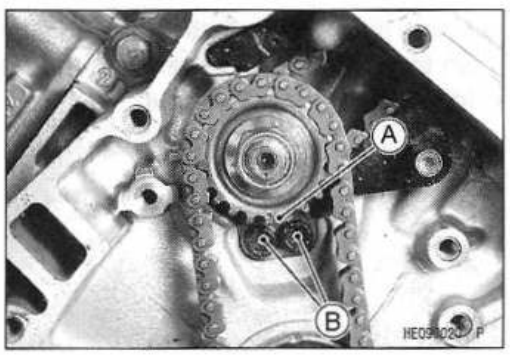


- Move the intermediate shaft [A] to the right side of the engine.
- Engage the front camshaft chain [B] with the sprocket on the intermediate shaft.



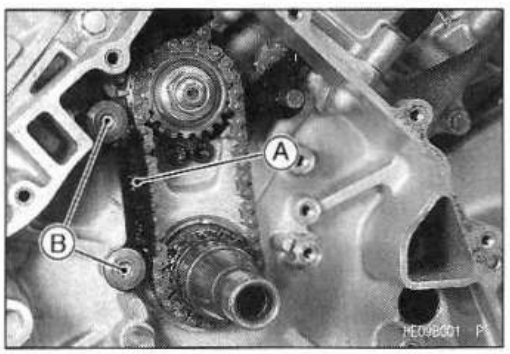
- Install (left side view):
  Position Plate [A]
- Tighten:

Torque - Position Plate Bolts [B]: 8.8 N·m (0.90 kgf·m, 78 in·lb)



- Install:
  Intermediate Shaft Chain Guide [A] (front)
- Tighten:

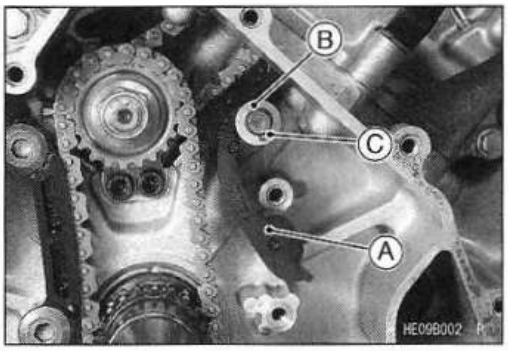
Torque - Intermediate Shaft Chain Guide Bolts [B]: 8.8 N·m (0.90 kgf·m, 78 in·lb)



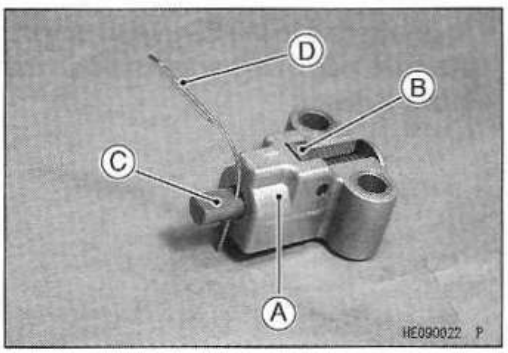
Camshaft

- Install:
  Intermediate Shaft Chain Guide [A] (Rear)
  Washer [B]
  Circlip [C]

  Special Tool - Outside Circlip Pliers: 57001–144

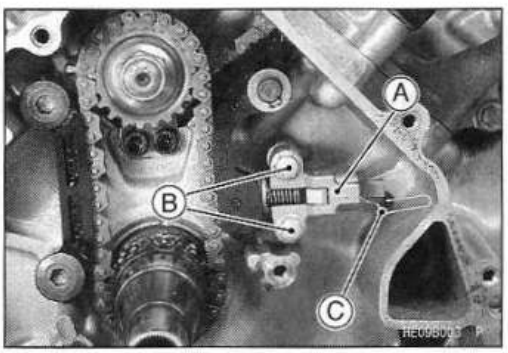


- Install the intermediate shaft chain tensioner [A] as follows:
- Release the stopper [B] and push the push rod [C] into the tensioner body.
- Insert a wire [D] into the rod hole to hold the rod in place.

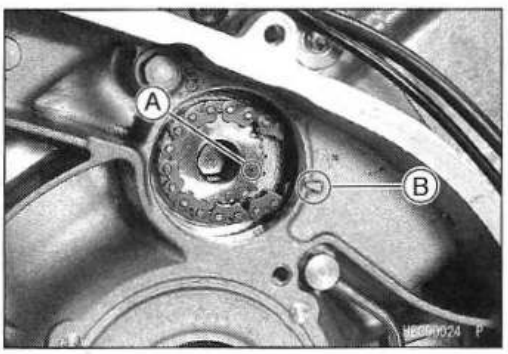


- Install:
  Intermediate Shaft Chain Tensioner [A]
- Tighten:

  Torque - Intermediate Shaft Chain Tensioner Bolts [B]: 8.8 N·m (0.90 kgf·m, 78 in·lb)
- Remove the wire [C] to free the push rod.

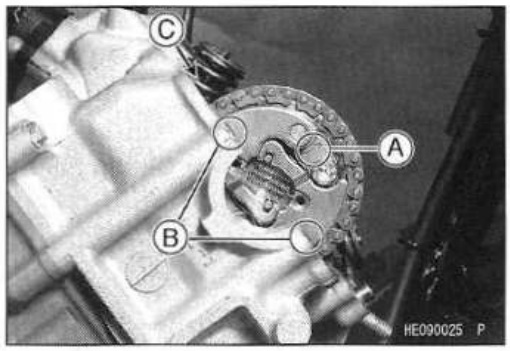


- Confirm that the punch mark [A] on the intermediate shaft sprocket (Right Side) is aligned with the embossed mark [B] on the crankcase.

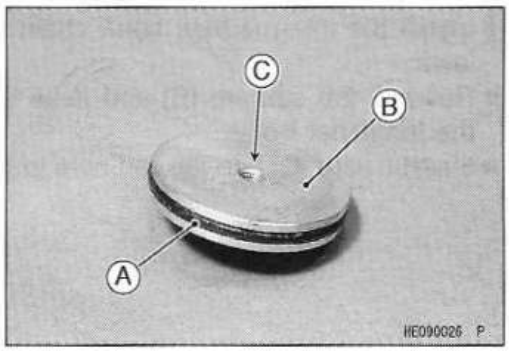


Camshaft

- Face the arrow mark [A] upward.
- Align the marks [B] on the weights with the front cylinder head upper surface [C].
- Place the front camshaft chain on the front camshaft sprocket.



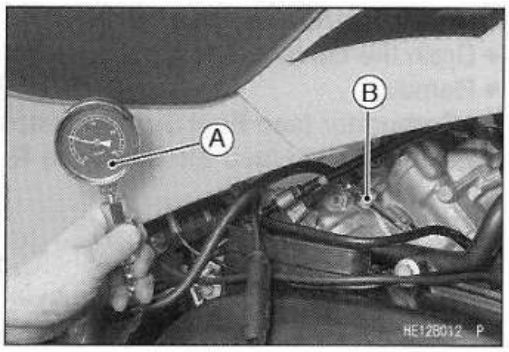
- Apply grease to the O-ring [A] and install the cover [B] into the right side of the crankcase so that the tapped hole [C] faces outward.



- Install:
  Both Rocker Cases (see Rocker Case Installation)
  Both Camshaft Chain Tensioners (see Camshaft Chain Tensioner Installation)
- Check the valve clearances (see Valve Clearance Inspection).

Cylinder Head

Cylinder Compression Measurement



NOTE

o *Use the battery which is fully charged.*

- Warm up the engine thoroughly, and stop the engine.
- Remove the spark plug (see Electrical System chapter).
- Attach the compression gauge [A] and adapter [B] firmly into the spark plug hole.

Special Tools - Compression Gauge: 57001-221
Compression Gauge Adapter, M10 × 1.0: 57001-1486

- Hold the throttle wide open and crank the engine with the electric starter or the recoil starter several times.

When the gauge stops rising, stop cranking and read the gauge.

Cylinder Compression (Usable Range)
Electric Starter: 290 ~ 520 kPa (3.0 ~ 5.3 kgf/cm², 43 ~ 75 psi) @290 r/min (rpm)

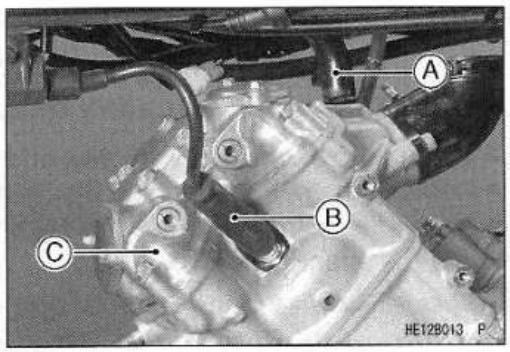
The following table should be consulted if the obtainable compression reading is not within the usable range.

Problem	Diagnosis	Remedy (Action)
Cylinder compression is higher than usable range	Carbon accumulation on piston, cylinder head, 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 thickness.	Replace the gasket with a standard part.
	Damaged or missing compression release cam spring	Replace the spring.
	Compression release weights do not move smoothly.	Replace the compression release 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 Piston seizure.	Replace the piston and/or cylinder
		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.
	Compression release weights do not move smoothly	Replace the compression release unit

Cylinder Head

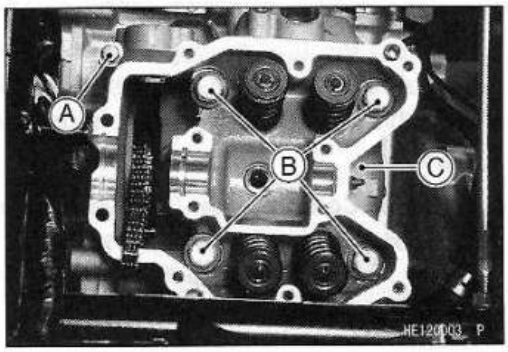
Cylinder Head Removal

- Drain the coolant (see Cooling System chapter).
- Remove:
  Carburetor (see Fuel System chapter)
  Exhaust Pipe (see Exhaust Pipe Removal)
  Water Pipe [A]
  Spark Plug Cap [B]
  Rocker Case [C]
  Camshaft (see Camshaft Removal)
  Exhaust Pipe (see Exhaust System)



- Remove:
  Cylinder Head Bolt (M6) [A]
  Cylinder Head Bolts (M10) [B] and Washers
  Cylinder Head [C] and Gasket

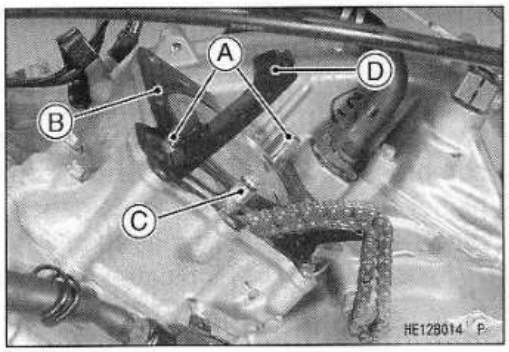
o Lift the cylinder head to clear the dowel pins in the cylinder, and slide the cylinder head out of the frame.



Cylinder Head Installation

- Install:
  Dowel Pins [A]
  New Cylinder Head Gasket [B]
  Oil Pipe [C]
  Camshaft Chain Guides [D]
- Tighten:

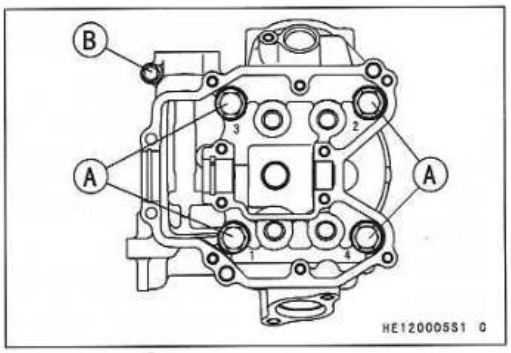
Torque - Front Cylinder Camshaft Chain Guide Bolt: 20 N·m (2.0 kgf·m, 14 ft·lb)



- Apply molybdenum disulfide oil to the threads and seating surface of the cylinder head bolts and both sides of the washers.
- Tighten the cylinder head bolts following the tightening sequence as shown.

First Torque - Cylinder Head Bolts (M10) [A]: 25 N·m (2.5 kgf·m, 18 ft·lb)

Final Torque - Cylinder Head Bolts (M10) [A]: 49 N·m (5.0 kgf·m, 36 ft·lb)



- Tighten the cylinder head bolts (M6).

Torque - Cylinder Head Bolts (M6) [B]: 9.8 N·m (1.0 kgf·m, 87 in·lb)

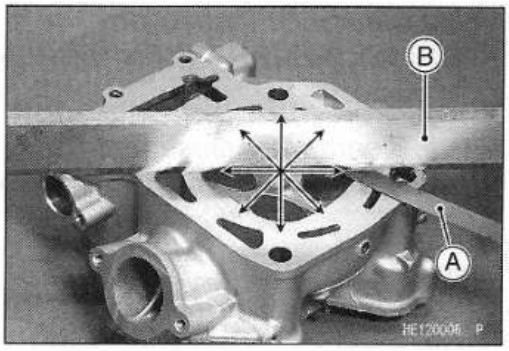
Cylinder Head Cleaning

- Remove the cylinder head (see Cylinder Head Removal).
- Scrape the carbon out of the combustion chamber and exhaust port with a suitable tool.
- Wash the head with a high flash-point solvent.
- Blow out any particles which may obstruct the oil passage in the cylinder head using compressed air.

Cylinder Head

Cylinder Head Warp

- Clean the cylinder head (see Cylinder Head Cleaning).
- Lay a straightedge across the lower surface of the cylinder head.
- Use a thickness gauge [A] to measure the space between the straightedge [B] and the head at several locations.



Cylinder Head Warp

Service Limit: 0.05 mm (0.002 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 lapping the lower surface with emery paper secured to a surface plate (first No. 200, then No. 400).

Valves

Valve Clearance Inspection

- Refer to the Engine Top End in the Periodic Maintenance chapter.

Valve Clearance Adjustment

- Refer to the Engine Top End in the Periodic Maintenance chapter.

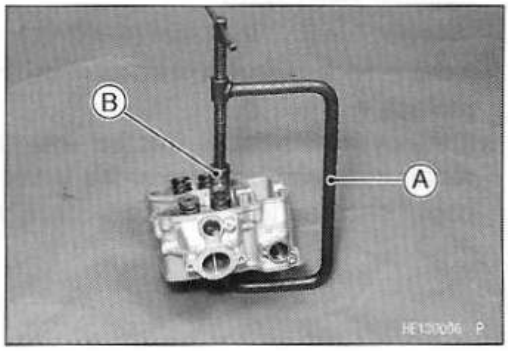
Valve Removal

- Remove the cylinder head (see Cylinder Head Removal).

o Mark and record the valve location so it can be installed in the original position.

- Using the valve spring compressor assembly, remove the valve.

Special Tools - Valve Spring Compressor Assembly: 57001–241 [A]
Valve Spring Compressor Adapter, ϕ22: 57001–1202 [B]



Valve Installation

- Replace the valve stem oil seal.

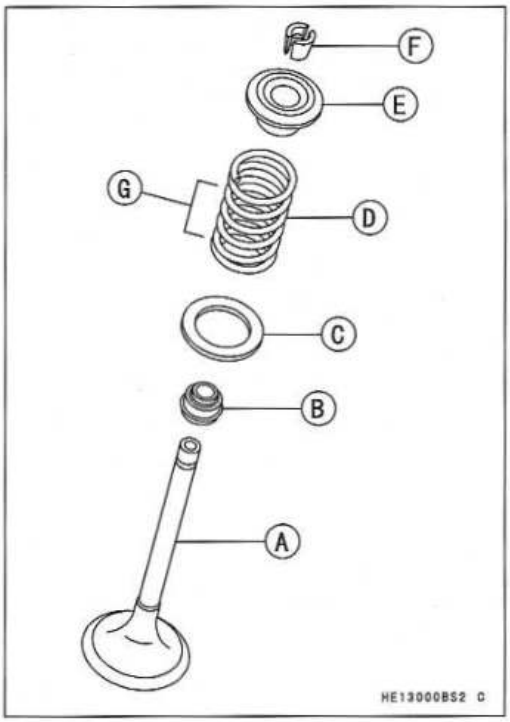
★If a new valve is to be used, check the valve-to-guide clearance (see this chapter).

★If there is too little clearance, ream the valve guide (see Valve Guide Installation).

★If there is too much clearance, install a new valve guide (see Valve Guide Removal and Valve Guide Installation).

- Check the valve seat (see Valve Seat Inspection).
- Apply a thin coat of molybdenum disulfide grease to the valve stem.
- Install each spring so that the closed coil end faces downwards.

o The green paint on the spring faces upwards.



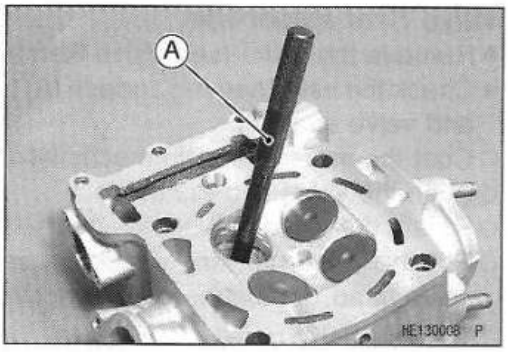
Valve Stem [A]
Oil Seal [B]
Spring Seat [C]
Spring [D]
Retainer [E]
Split Keepers [F]
Closed Coil End [G]

Valves

Valve Guide Removal

- Remove:
  Valve (see Valve Removal)
  Valve Stem Oil Seal
- Hammer lightly on the valve guide arbor [A] to remove the guide from the top of the head.

Special Tool - Valve Guide Arbor, ϕ5 : 57001-1203



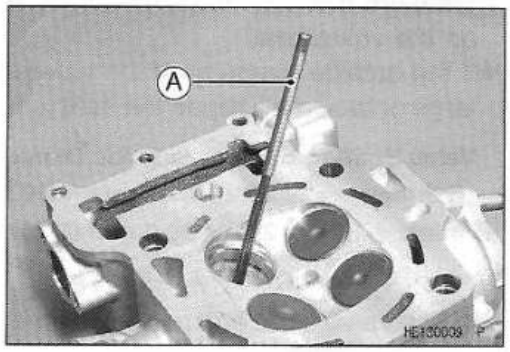
Valve Guide Installation

- Lightly oil the valve guide outer surface.
- Using the valve guide arbor, drive the valve guide until its flange touches the cylinder head.

Special Tool - Valve Guide Arbor, ϕ5 : 57001–1203

- Ream the valve guide with the valve guide reamer [A] , if may be necessary to ream the guide even if the old guide is reused.

Special Tool - Valve Guide Reamer, ϕ5 : 57001-1204

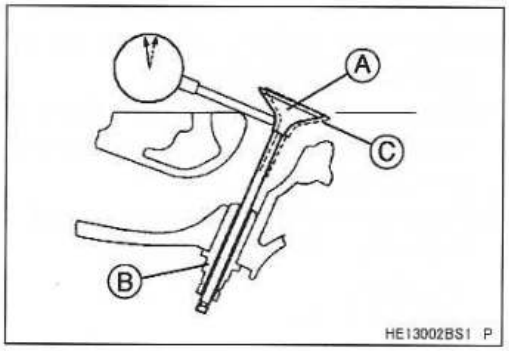


Valve-to-Guide Clearance Measurement

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

Valve/Valve Guide Clearance (Wobble Method)

	Standard	Service Limit
Exhaust:	**0.09 ~ 0.17 mm**	**0.34 mm**
	(0.0035 ~ 0.0067 in.)	**(0.0133 in.)**
Inlet:	**0.03 ~ 0.11 mm**	**0.28 mm**
	(0.0012 ~ 0.0043 in.)	**(0.0110 in.)**

Valves

Valve Seat Inspection

- Remove the valve (see Valve Removal).
- Check the valve seating surface [A] between the valve [B] and valve seat [C].

o Coat the valve seat with machinist's dye.
o Push the valve into the guide.
o Rotate the valve against the seat with a lapping tool.
o Pull the valve out, and check the seating pattern on the valve head. It must be the correct width and even all the way around.

- Measure the outside diameter [D] of the seating pattern on the valve seat.

★If the outside diameter of the valve seating pattern is too large or too small, repair the seat (see Valve Seat Repair).

Valve Seating Surface Outside Diameter

Exhaust:	**25.2 ~ 25.4 mm (0.992 ~ 1.000 in.)**
Inlet:	**29.4 ~ 29.5 mm (1.157 ~ 1.165 in.)**

NOTE

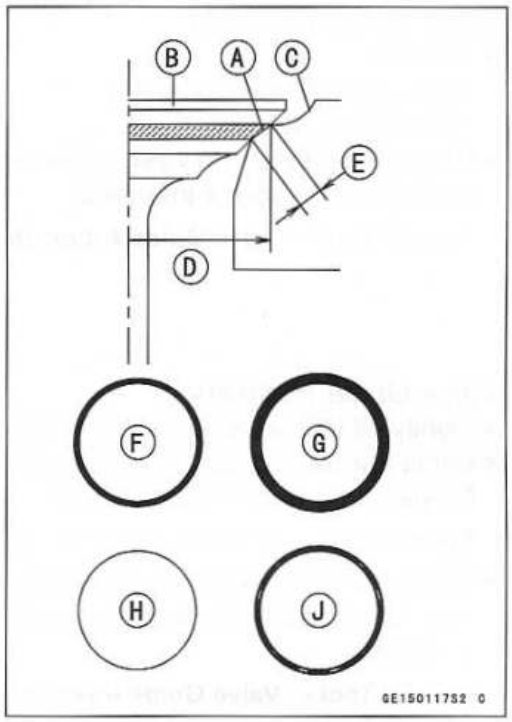
o *The valve stem and guide must be in good condition, or this check will not be valid.*

★If the valve seating pattern is not correct, repair the seat (see Valve Seat Repair).

- Measure the seat width [E] of the portion where there is no build-up carbon (white portion) of the valve seat with vernier calipers.

★If the width is too wide, too narrow or uneven, repair the seat (see Valve Seat Repair).

[F] Good
[G] Too Wide
[H] Too Narrow
[J] Uneven



Valve Seating Surface Width

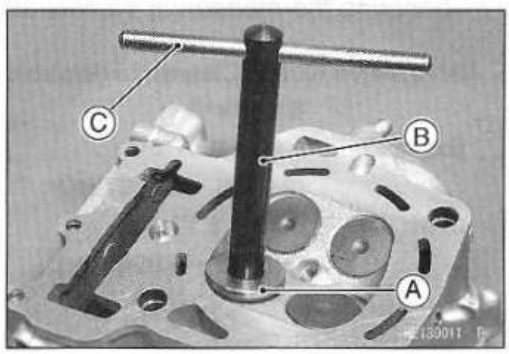
Exhaust:	**0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)**
Inlet:	**0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)**

Valve Seat Repair (Valve Lapping)

- Using the valve seat cutters [A], repair the valve seat.

Special Tools - Valve Seat Cutters:
Exhaust Valves:
Valve Seat Cutter, 45° - φ27.5: 57001-1114
Valve Seat Cutter, 32° - φ28: 57001-1119
Valve Seat Cutter, 60° - φ30: 57001-1123
Inlet Valves:
Valve Seat Cutter, 45° - φ30: 57001-1187
Valve Seat Cutter, 32° - φ33: 57001-1199
Valve Seat Cutter, 60° - φ30: 57001-1123
Holder & Bar:
Valve Seat Cutter Holder, φ5: 57001-1208 [B]
Valve Seat Cutter Holder Bar: 57001-1128 [C]

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



Valves

Seat Cutter Operation Care:

1. This valve seat cutter is developed to grind the valve seat for repair. Therefore the cutter must not be used for other purposes 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

o *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 portion.

NOTE

o *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.*

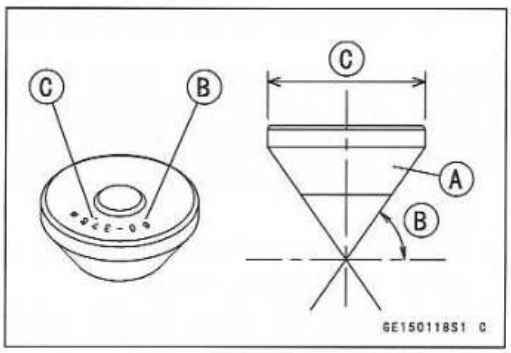
5. After use, wash it with washing oil and apply thin layer of engine oil before storing.

Marks Stamped on the Cutter:

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

60° ..... Cutter angle [B]

37.5ϕ ..... Outer diameter of cutter [C]



Operating Procedures:

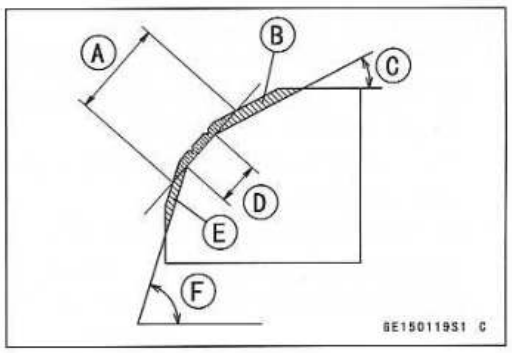
- Clean the seat area carefully.
- Coat the seat with machinist's dye.
- Fit a 45° cutter into the holder and slide it into the valve guide.
- Press down lightly on the handle and turn it right or left. Grind the seating surface only until it is smooth.

CAUTION

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.

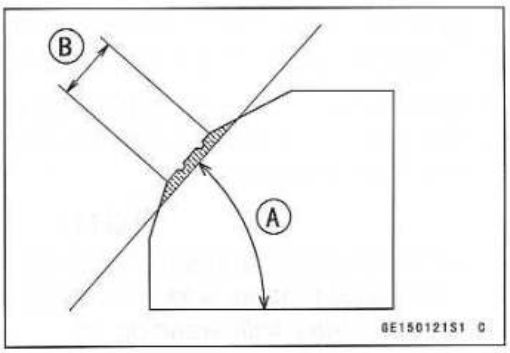
Valves

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 vernier calipers.

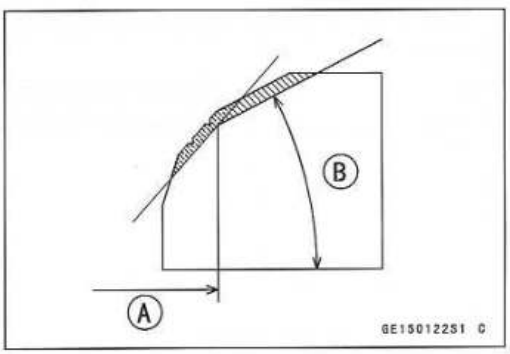
★If the outside diameter of the seating surface is too small, repeat the 45° grind [A] until the diameter is within the specified range.
Original Seating Surface [B]



NOTE

- o *Remove all pittings of flaws from 45° ground surface.*
- o *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.*
- o *When the valve guide is replaced, be sure to grind with 45° cutter for centering and good contact.*

★If the outside diameter [A] of the seating surface is too large, make the 32° grind described below.
★If the outside diameter 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 O.D. is within the specified range.

o 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.

CAUTION

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

o After making the 32° grind, return to the seat O.D. measurement step above.

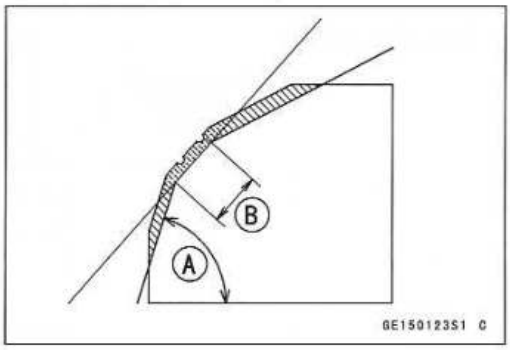
- To measure the seat width, use vernier calipers to measure the width of the 45° angle portion of the seat at several places around the seat.

★If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then return to the seat O.D. measurement step above.

Valves

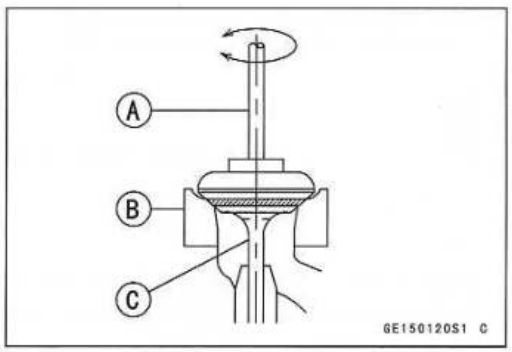
★If the seat width is too wide, make the 60° [A] grind described below.
★If the seat width is within the specified range, lap the valve to the seat as described below.
- Grind the seat at a 60° angle until the seat width is within the specified range.

o To make the 60° grind, fit 60° cutter into the holder, and slide it into the valve guide.
o Turn the holder, while pressing down lightly.
o After making the 60° grind, return to the seat width measurement step above.
Correct Width [B]



- Lap the valve to the seat, once the seat width and O.D. are within the ranges specified above.

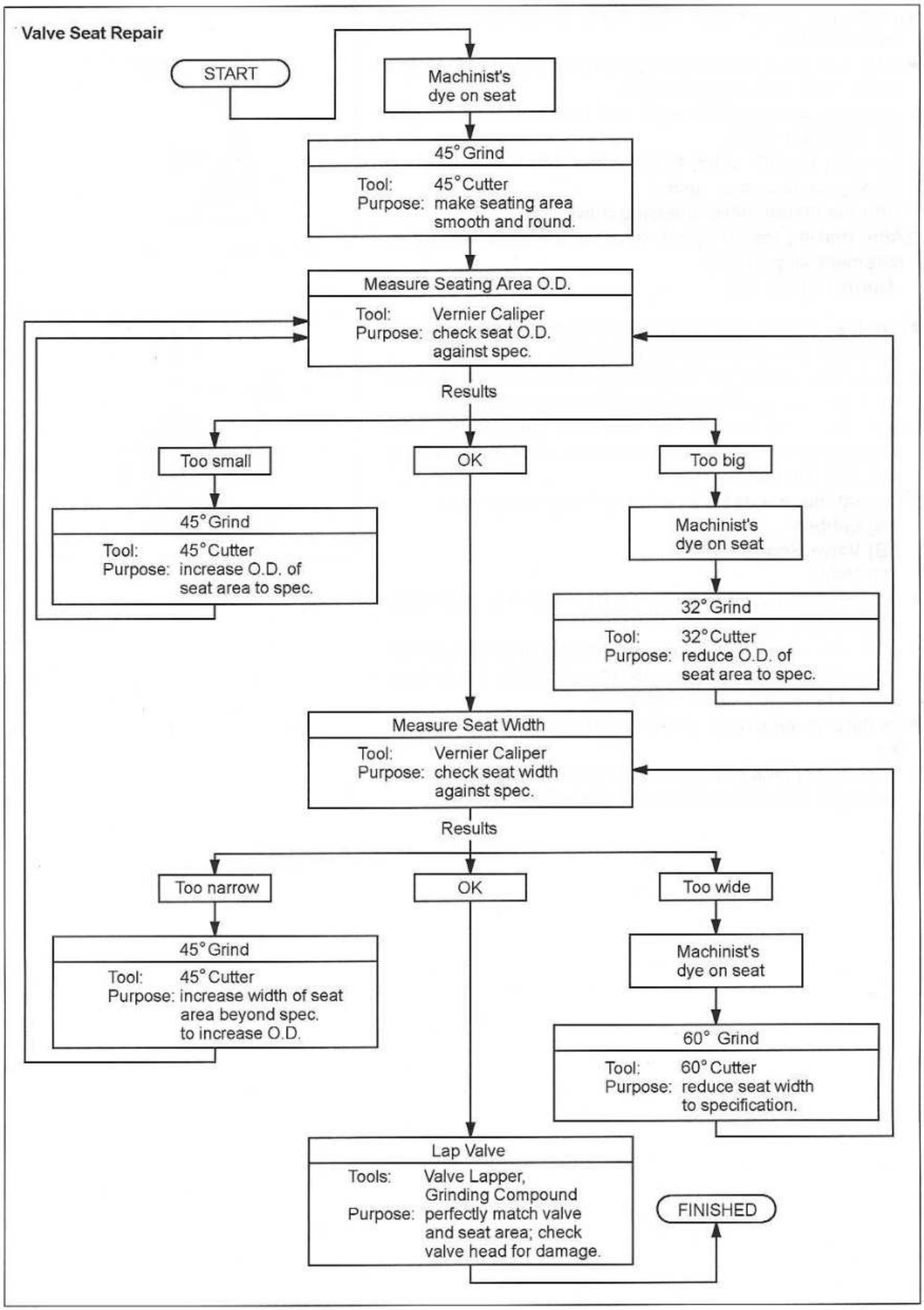
o Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.
o Spin the valve against the seat until the grinding compound produces a smooth, matched surface on both the seat and the valve.
o Repeat the process with a fine grinding compound.
[A] Lubber
[B] Valve Seat
[C] Valve



- The seating area should be marked about in the middle of the valve face.

★If the seat area is not in the right place on the valve, check to be sure the valve is the correct part. If it is, it may have been refaced too much; replace it.
- 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).

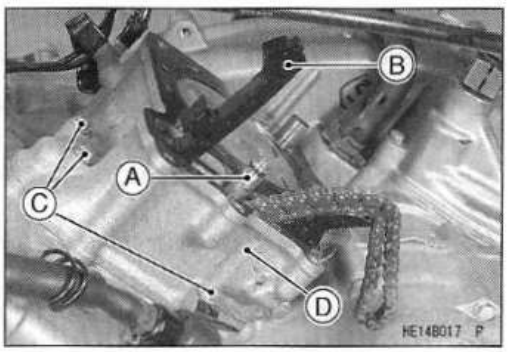
Valves


Valve Seat Repair
START
Machinist's dye on seat
45° Grind
Tool: 45° Cutter
Purpose: make seating area smooth and round.
Measure Seating Area O.D.
Tool: Vernier Caliper
Purpose: check seat O.D. against spec.
Results
Too small
OK
Too big
45° Grind
Tool: 45° Cutter
Purpose: increase O.D. of seat area to spec.
Machinist's dye on seat
32° Grind
Tool: 32° Cutter
Purpose: reduce O.D. of seat area to spec.
Measure Seat Width
Tool: Vernier Caliper
Purpose: check seat width against spec.
Results
Too narrow
OK
Too wide
45° Grind
Tool: 45° Cutter
Purpose: increase width of seat area beyond spec. to increase O.D.
Machinist's dye on seat
60° Grind
Tool: 60° Cutter
Purpose: reduce seat width to specification.
Lap Valve
Tools: Valve Lapper, Grinding Compound
Purpose: perfectly match valve and seat area; check valve head for damage.
FINISHED

Cylinder and Piston

Cylinder Removal

- Remove:
  Cylinder Head (see Cylinder Head Removal)
  Oil Pipe [A]
  Chain Guide [B]
  Cylinder Bolts [C]
  Cylinder [D]
  Cylinder Base Gasket

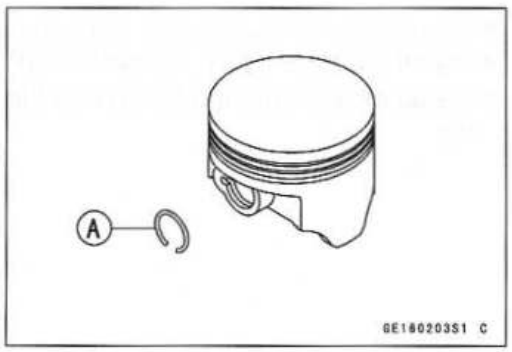


Piston Removal

- Remove the cylinder block (see Cylinder Removal).
- Place a piece of clean cloth under the piston and remove the piston pin snap rings [A] from the outside of each piston.

CAUTION

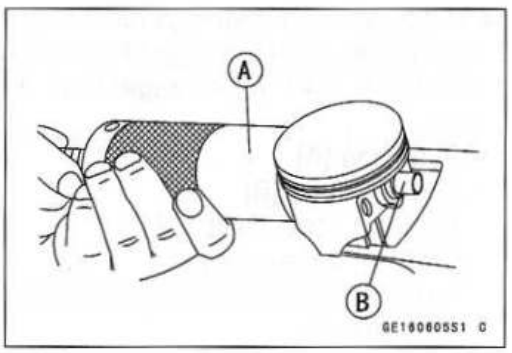
Do not reuse snap rings, as removal weakens and deforms them. They could fall out and score the cylinder wall.



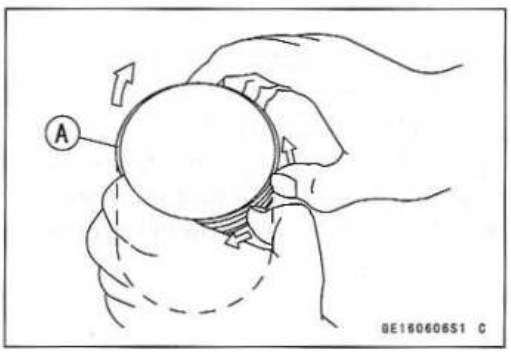
- Using the piston pin puller assembly (special tool), remove the piston pins.

Special Tools - Piston Pin Puller Assembly [A]: 57001-910
Piston Pin Puller Adapter [B]: 57001-1211

- Remove the piston.



- Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.
- Remove the 3-piece oil ring with your thumbs in the same manner.



Cylinder, Piston Installation

NOTE

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

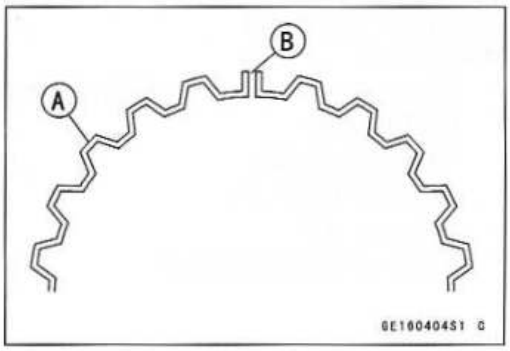
Cylinder and Piston

NOTE

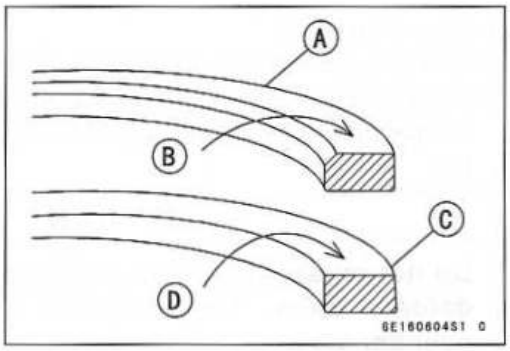
o The oil ring rails have no "top" or "bottom".

- Install the oil ring expander [A] in the bottom piston ring groove so the ends [B] butt together.
- Install the oil ring steel rails, one above the expander and one below it.

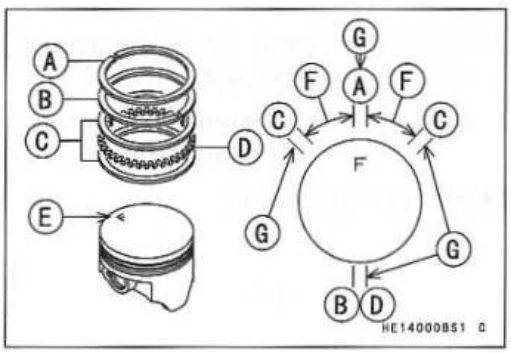
o Spread the rail with your thumbs, but only enough to fit the rail over the piston.
o Release the rail into the bottom piston ring groove.



- Do not mix up the top ring and second ring.
- Install the top ring [A] so that the "**R**" mark [B] faces up.
- Install the second ring [C] so that the "**RN**" mark [D] faces up.



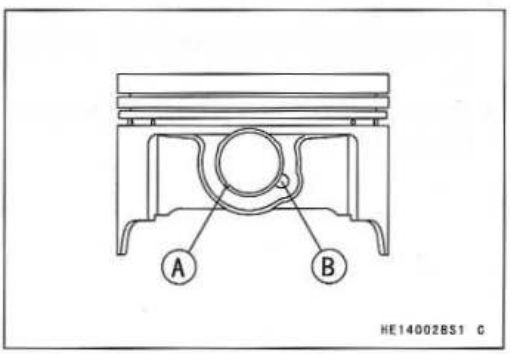
- The piston ring openings must be positioned as shown in the figure. The openings of the oil ring steel rails must be about 30 ~ 40° [F] of angle from the opening of the top ring.
  Top Ring [A]
  Second Ring [B]
  Oil Ring Steel Rails [C]
  Oil Ring Expander [D]
  F mark [E] must be faced toward Front Side for front and rear pistons
  Opening Positions [G]



- Fit a new piston pin 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.

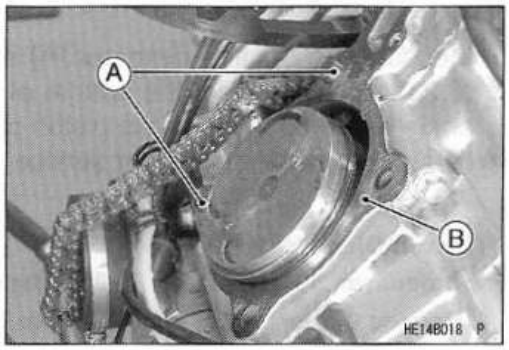
o When installing the piston pin snap ring, compress it only enough to install it and no more.

- Apply engine oil to the cylinder bore and, piston skirt.



Cylinder and Piston

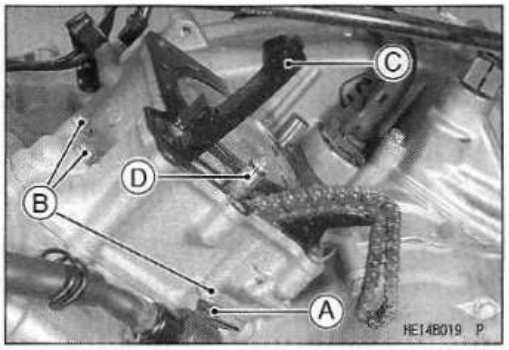
- Install:
  Dowel Pins [A]
  New Cylinder Base Gasket [B]



- Install:
  Cylinder
  Clamp [A] (rear only)
- Tighten:

Torque - Cylinder Bolts [B]: 9.8 N·m (1.0 kgf·m, 87 in·lb)

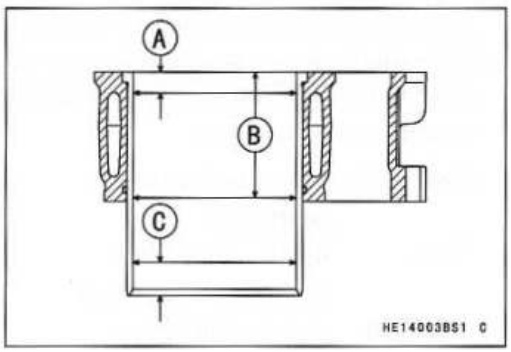
- Install:
  Chain Guide [C]
  Oil Pipe [D]



Cylinder Wear

- 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, replace the cylinder.
10 mm (0.4 in.) [A]
60 mm (2.4 in.) [B]
20 mm (0.8 in.) [C]



Standard: **81.994 ~ 82.006 mm (3.2281 ~ 3.2286 in.), and less than 0.01 mm (0.0004 in.) difference between any two measurements.**

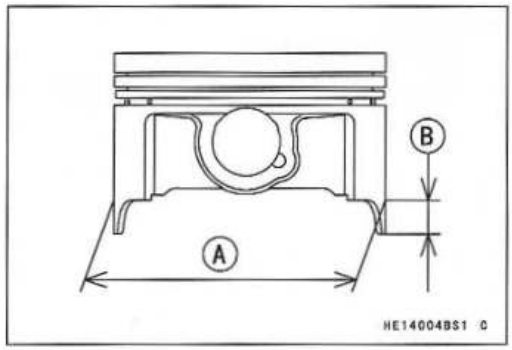
Service Limit: **82.09 mm (3.232 in.), or more than 0.05 mm (0.0020 in.) difference between any two measurements.**

Cylinder and Piston

Piston Wear

- Measure the outside diameter [A] of each piston 5 mm (0.20 in.) [B] up from the bottom of the piston at a right angle to the direction of the piston pin.

★If the measurement is under service limit, replace the piston.



Piston Diameter

Standard:	**81.949 ~ 81.964 mm (3.2263 ~ 3.2269 in.)**
Service Limit:	**81.80 mm (3.220 in.)**

Piston/Cylinder Clearance

- Subtract the piston diameter from the cylinder inside diameter to get the piston/cylinder clearance.

Piston/Cylinder Clearance

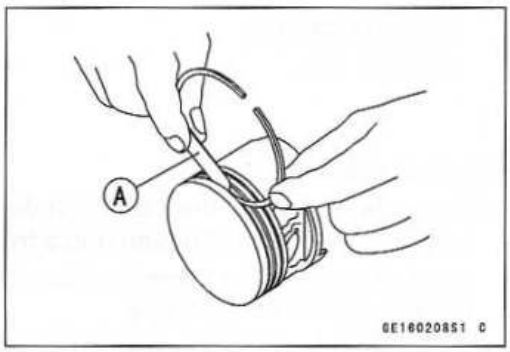
Standard:	**0.030 ~ 0.057 mm (0.0012 ~ 0.0022 in.)**

Piston Ring, Piston Ring Groove Wear

- Check for uneven groove wear by inspecting the ring seating.

★The rings should fit perfectly parallel to groove surfaces. If not, replace the piston and all the piston rings.

- With the piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring/groove clearance.



Piston Ring/Groove Clearance

	Standard:	Service Limit:
Top:	**0.040 ~ 0.080 mm (0.0016 ~ 0.0032 in.)**	**0.18 mm (0.0071 in.)**
Second:	**0.030 ~ 0.070 mm (0.0012 ~ 0.0028 in.)**	**0.17 mm (0.0067 in.)**

★If the piston ring groove clearance is greater than the service limit, measure the ring thickness and groove width as follows to decide whether to replace the rings, the piston or both.

Piston Ring Groove Width

- Measure the piston ring groove width.

○ Use a vernier caliper at several points around the piston.

Piston Ring Groove Width

	Standard	Service Limit
Top:	**1.030 ~ 1.050 mm (0.0405 ~ 0.0413 in.)**	**1.13 mm (0.0445 in.)**
Second:	**1.020 ~ 1.040 mm (0.0402 ~ 0.0409 in.)**	**1.12 mm (0.0441 in.)**

★If the width of any of the two grooves is wider than the service limit at any point, replace the piston.

Cylinder and Piston

Piston Ring Thickness

- Measure the piston ring thickness.

○ Use a micrometer to measure at several points around the ring.

Piston Ring Thickness

	Standard	Service Limit
Top:	0.97 ~ 0.99 mm	0.9 mm
	(0.0382 ~ 0.0390 in.)	(0.035 in.)
Second:	0.97 ~ 0.99 mm	0.9 mm
	(0.0382 ~ 0.0390 in.)	(0.035 in.)

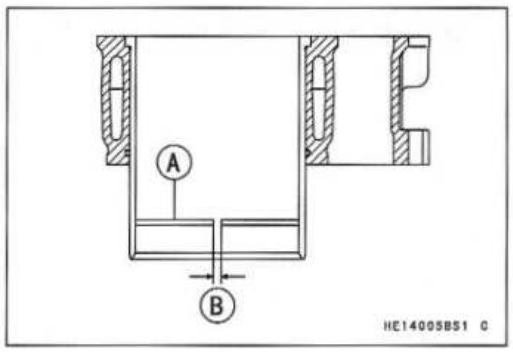
★If any of the measurements is less than the service limit on either of the rings, replace all the rings.

NOTE

○ *When using new rings in a used piston, check for uneven groove wear. The rings should fit perfectly parallel to the groove sides. If not, replace the piston.*

Piston Ring End Gap

- 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	Service Limit
Top:	0.20 ~ 0.30 mm	0.60 mm
	(0.0079 ~ 0.0118 in.)	(0.0236 in.)
Second:	0.30 ~ 0.45 mm	0.75 mm
	(0.0118 ~ 0.0177 in.)	(0.0295 in.)
Oil:	0.20 ~ 0.70 mm	1.00 mm
	(0.0079 ~ 0.0276 in.)	(0.0394 in.)

★If the end gap of either ring is greater than the service limit, replace all the rings.

Exhaust System

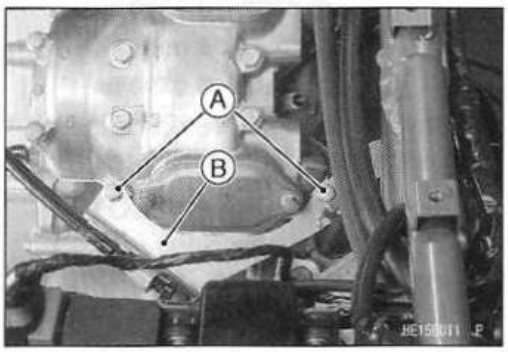
This vehicle is equipped with a spark arrester approved for off-road use by the U.S. Forest Service. It must be properly maintained to ensure its efficiency. In accordance with the Periodic Maintenance Chart, clean the spark arrester.

Spark Arrester Cleaning

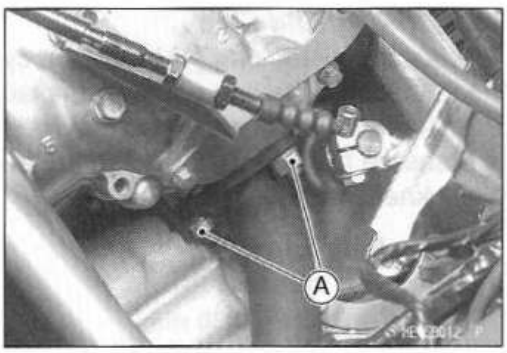
- Refer to the Engine Top End in the Periodic Maintenance chapter.

Muffler and Exhaust Pipe Removal

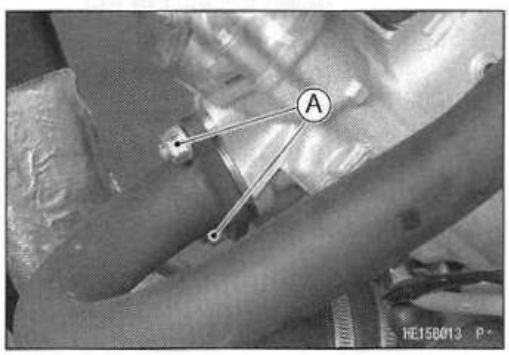
- Remove:
  Rear Fender (see Frame chapter)
  Battery and Battery Case (see Electrical System)
  Left Side Inner Cover
  Rocker Case Bolts [A]
  Cable Holder [B]



Rear Exhaust Pipe Nuts [A]

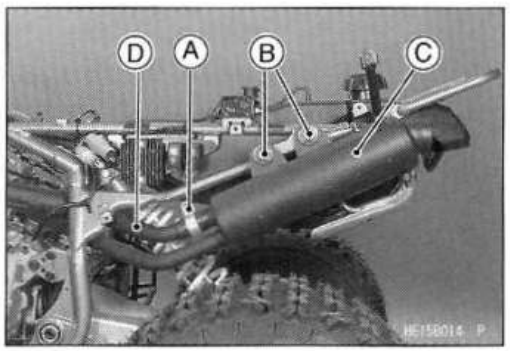


- Remove:
  Front Exhaust Pipe Nuts [A]



Exhaust System

- Remove:
  Muffler Clamp Bolt [A]
  Muffler Mounting Bolts [B]
  Muffler [C] and Rear Exhaust Pipe
  Front Exhaust Pipe [D]



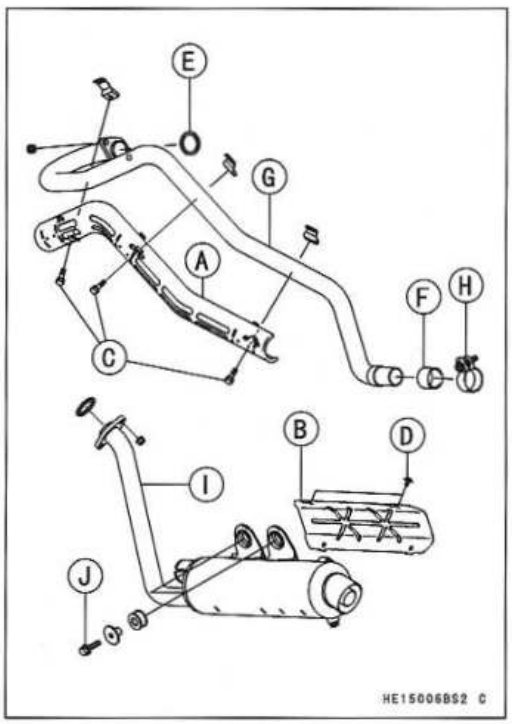
Muffler and Exhaust Pipe Installation

- If the exhaust pipe cover [A] or muffler cover [B] were removed, tighten them.

Torque - Exhaust Pipe Cover Bolts [C]: 8.8 N·m (0.90 kgf·m, 78 in·lb)
Muffler Cover Bolts [D]: 8.8 N·m (0.90 kgf·m, 78 in·lb)
Exhaust Pipe Clamp Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)

- Replace the exhaust pipe holder gaskets [E] and clamp gasket [F] with new ones.
- Install (But do not tighten the following nuts and bolts.):
  Front Exhaust Pipe [G], Clamp [H], Muffler and Nuts
  Rear Exhaust Pipe [I] and Nuts
  Muffler Mounting Bolts [J]
- Tighten:
  Exhaust Pipe Holder Nuts evenly
  Muffler Clamp Bolt

Torque - Muffler Mounting Bolts: 20 N·m (2.0 kgf·m, 14 ft·lb)
Rocker Case with Cable Holder Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



Exhaust System Inspection

- Before removing the exhaust system, check for signs of leakage at the exhaust pipe gasket in the cylinder head and at the muffler clamp.

★If there are signs of leakage around the exhaust pipe gasket, it should be replaced. If the muffler-to-exhaust pipe joint leaks, tighten the clamp.

- Remove the exhaust pipe and muffler (see Exhaust Pipe and Muffler Removal).
- Inspect the gasket for damage and signs of leakage.

★If the gasket is damaged or has been leaking, replace it.

- Check the exhaust pipe and muffler for dents, cracks, rust and holes.

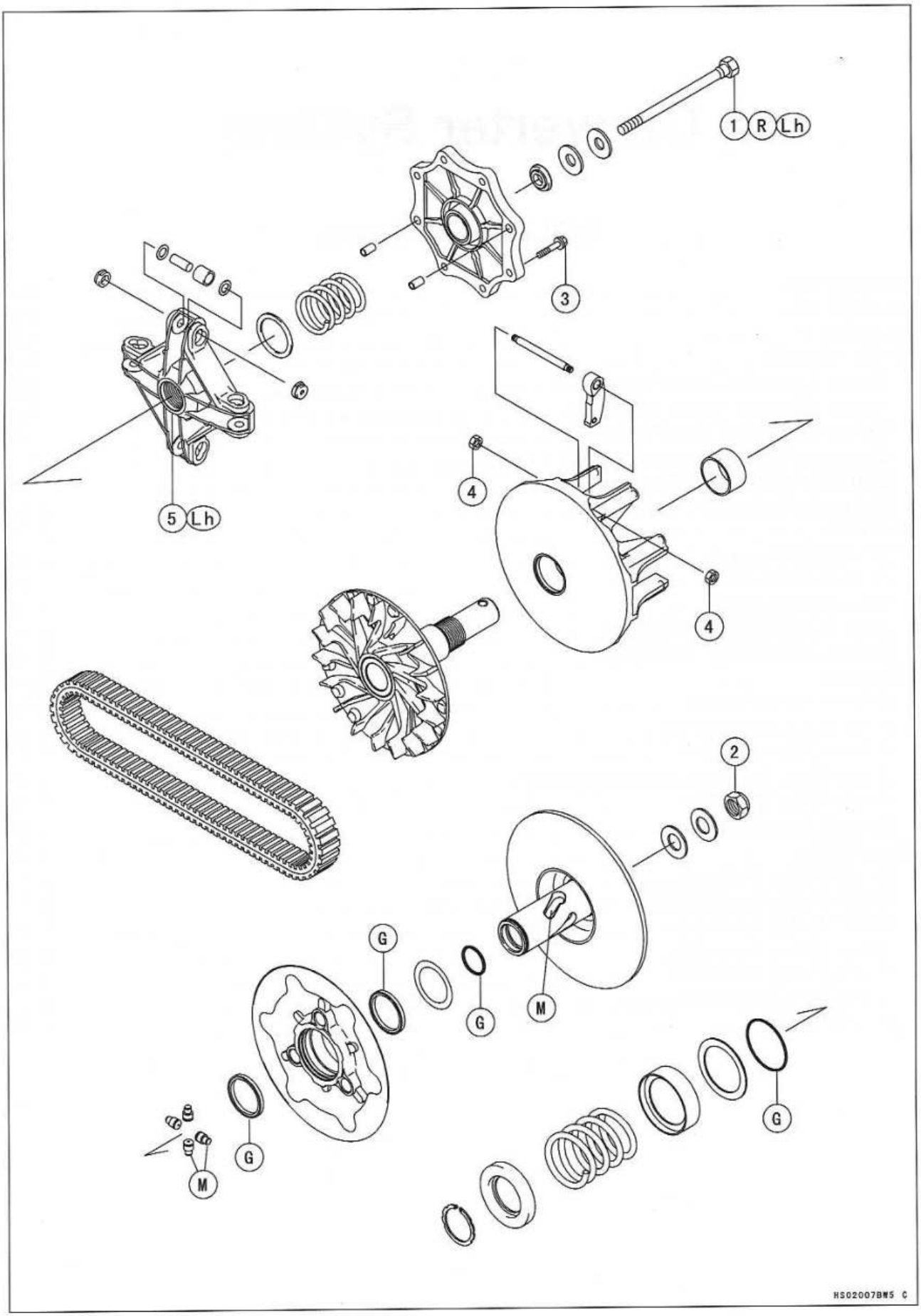
★If the exhaust pipe or muffler is damaged or has holes, it should be replaced for best performance and least noise.

Converter System

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Exploded View

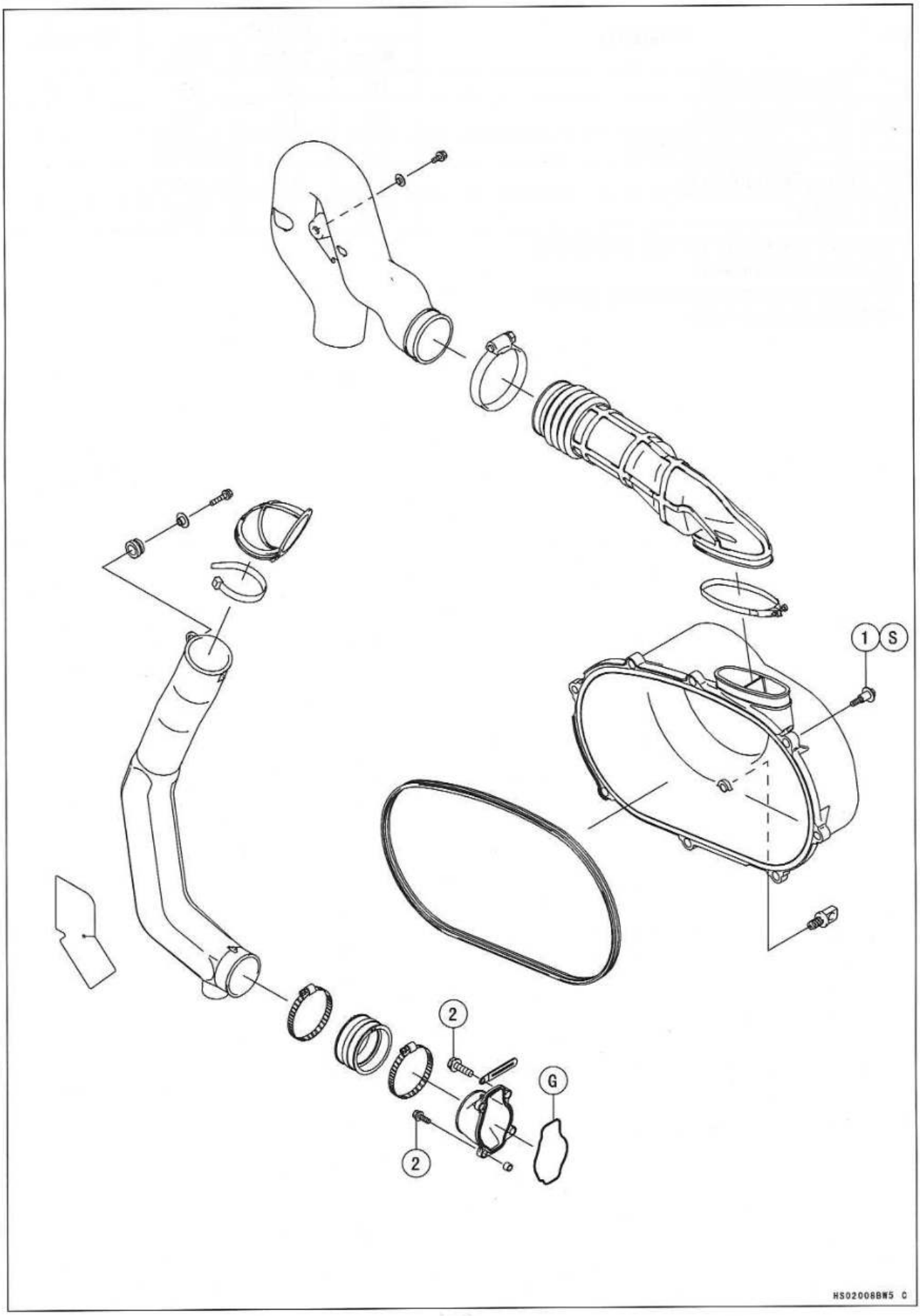


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Drive Pulley Bolt	93	9.5	69	Lh, R
2	Driven Pulley Nut	93	9.5	69	
3	Drive Pulley Cover Bolts	13	1.3	113 in·lb	
4	Ramp Weight Nuts	6.9	0.70	61 in·lb	
5	Spider	275	28	203	Lh

G: Apply grease for oil seal and O-ring.
Lh: Left-hand Threads
M: Apply molybdenum disulfide grease.
R: Replacement Parts

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Converter Cover Bolts	8.8	0.90	78 in·lb	S
2	Joint Duct Bolts	8.8	0.90	78 in·lb	

G: Apply grease for oil seal and O-ring.
S: Follow the specific tightening sequence.

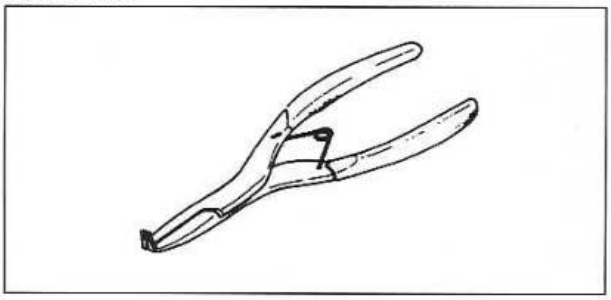
6-6 CONVERTER SYSTEM

Specifications

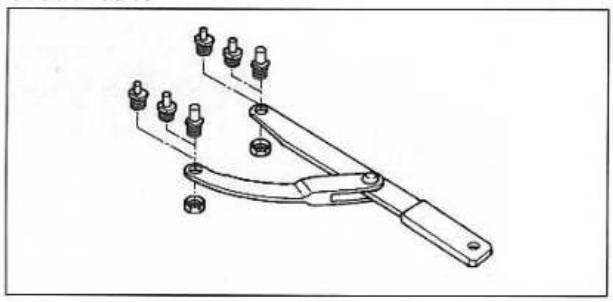
Item	Standard	Service Limit
Drive Belt:		
Belt deflection	22 ~ 27 mm (0.87 ~ 1.06 in.)	– – –
Belt height (Parallel portion)	1.16 ~ 3.48 mm (0.046 ~ 0.137 in.)	0.64 mm (0.0252 in.)
Drive Pulley:		
Cover bushing inside diameter	27.985 ~ 28.085 mm (1.1018 ~ 1.1057 in.)	28.12 mm (1.107 in.)
Sheave bushing inside diameter	37.985 ~ 38.085 mm (1.4955 ~ 1.4994 in.)	38.12 mm (1.501 in.)
Shoe side clearance	0.15 ~ 0.30 mm (0.0059 ~ 0.0118 in.)	– – –
Spring free length	60.4 mm (2.38 in.)	– – –
Driven Pulley:		
Sheave bushing inside diameter	40.000 ~ 40.039 mm (1.5748 ~ 1.5763 in.)	40.079 mm (1.5779 in.)
Spring free length	99.5 mm (3.92 in.)	– – –

Special Tools

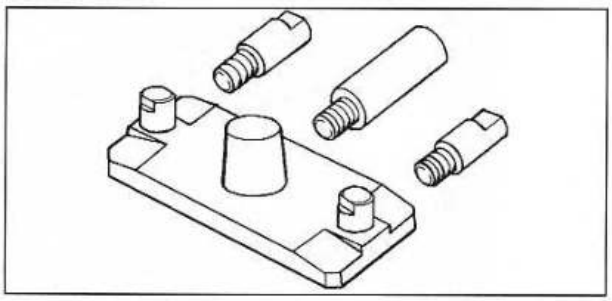
Circlip Pliers :
57001–154



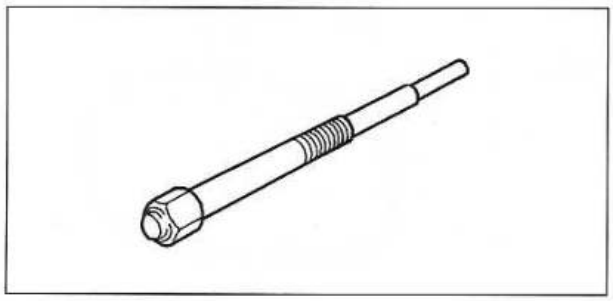
Flywheel & Pulley Holder :
57001–1343



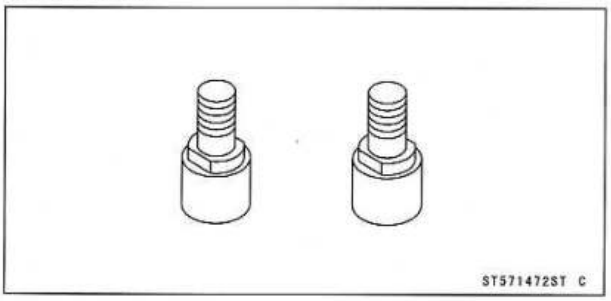
Drive & Driven Pulley Holder :
57001–1412



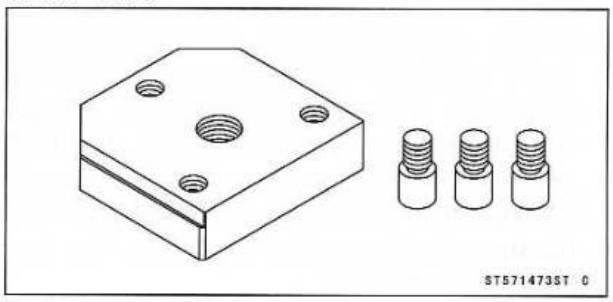
Drive Pulley Puller Bolt :
57001–1429



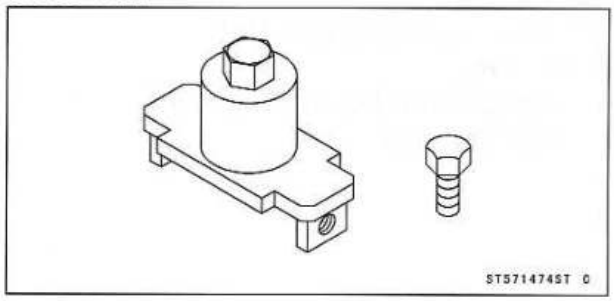
Pulley Holder Attachment :
57001–1472



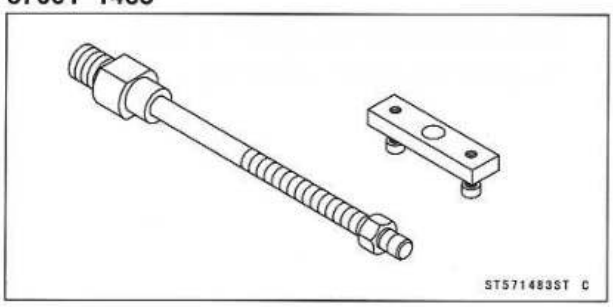
Drive Pulley Holder :
57001–1473



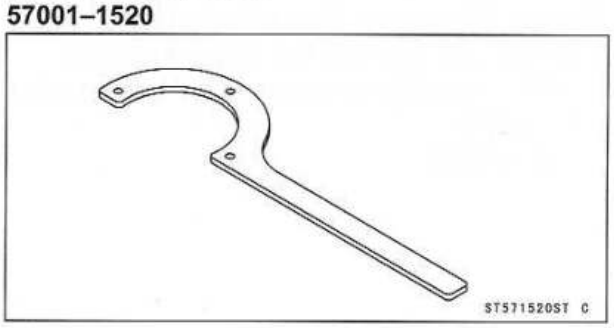
Drive Pulley Wrench :
57001–1474



Spring Holder Set :
57001–1483



Drive Pulley Holder :
57001–1520



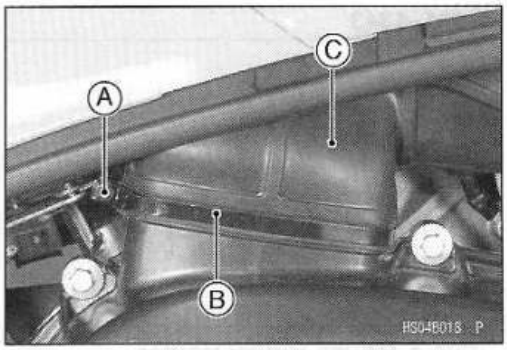
Torque Converter

⚠ WARNING

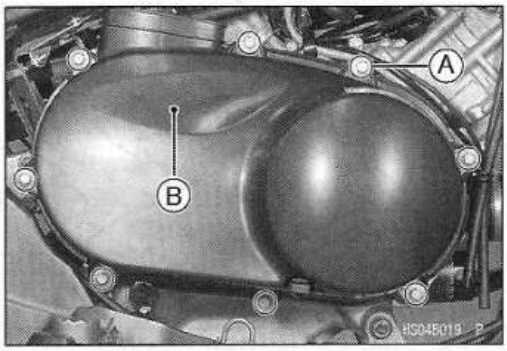
Excessive imbalance or operating rpm could cause torque converter pulley failure resulting in severe injury or death. The pulleys of the belt drive torque converter are precision balanced components designed to operate within certain rpm limits. Disassembly/assembly and servicing procedures of the pulley assemblies must be followed closely. Modifications to the engine or pulleys that increase rpm may cause failure.

Torque Converter Cover Removal

- Turn the ignition switch OFF.
- Remove:
  Clamp Screw [A] and Clamp [B]
  Joint Duct [C]



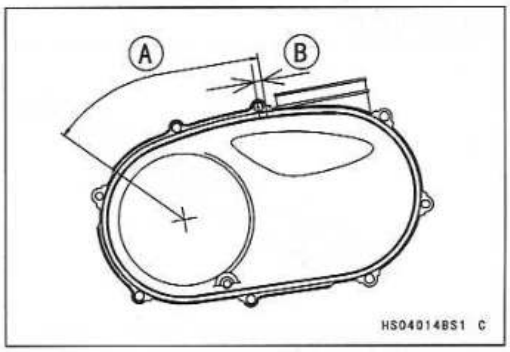
- Remove:
  Torque Converter Cover Bolts [A]
  Torque Converter Cover [B]



Torque Converter Cover Installation

- Fit the trim seal into the converter cover.

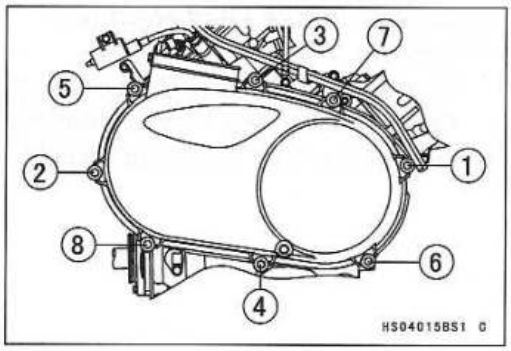
o Set trim seal juncture in area [A] when insert trim seal in the cover.
  10 mm [B]



Torque Converter

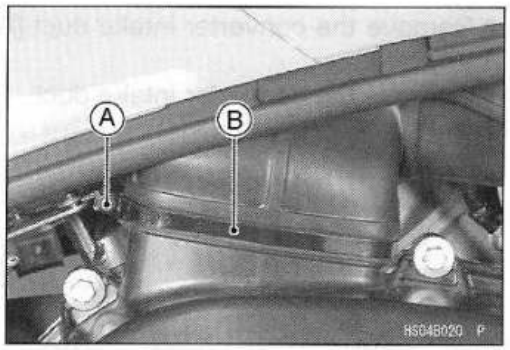
- Tighten the cover bolts following the tightening sequence as shown.

Torque - Converter Cover Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

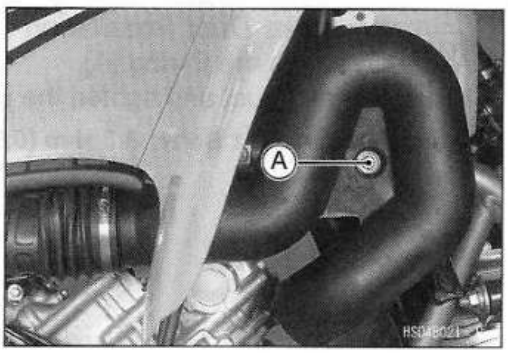


Converter Exhaust Duct Removal

- Remove:
  Clamp Screw [A]
  Clamp [B]
- Remove the idle adjuster from the converter exhaust duct.



- Remove the duct mounting bolt [A] and collar.
- Remove the converter exhaust duct.



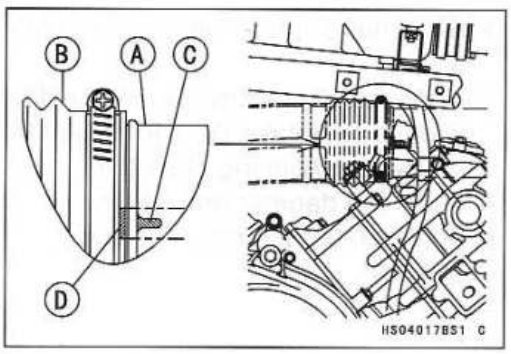
Converter Exhaust Duct Installation

- Install the converter exhaust duct, collar and tighten the duct mounting bolt.
- Install the converter exhaust duct [A] in the joint duct [B] as shown.

○ When installing converter exhaust duct, fit to aligning mark.
  Converter Exhaust Duct Aligning Mark [C]
  Joint Duct Aligning Mark [D]

○ When installing joint duct, do not twist and deformation.

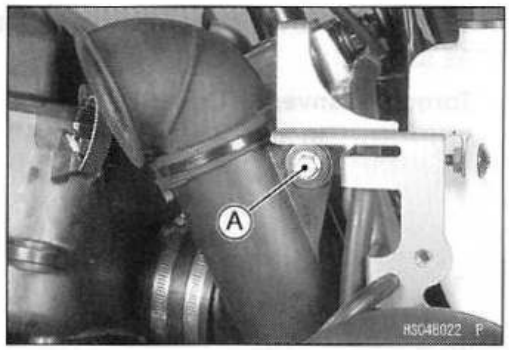
- Install the joint duct to the converter cover.
- Install the clamp and tighten the clamp screw.
- Install the idle adjuster to the converter exhaust duct.
- Adjust the idle speed (see Periodic Maintenance chapter).



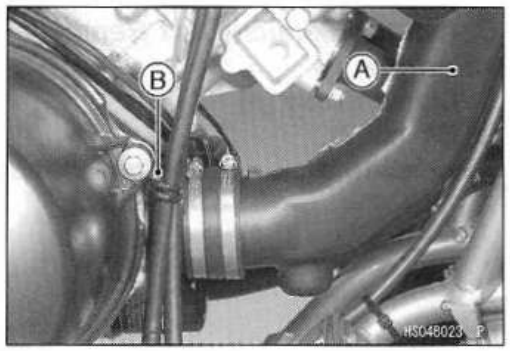
Torque Converter

Converter Intake Duct Removal

- Remove:
  Seat and Air Cleaner Cover (see Frame chapter)
  Front Fender (see Frame chapter)
- Remove the duct mounting bolt [A], collar and damper.



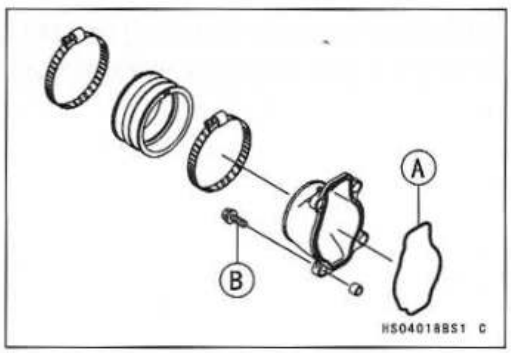
- Remove the converter intake duct [A] from the joint duct [B].
- Remove the converter intake duct.



Converter Intake Duct Installation

- Apply grease to the O-ring [A].
- Install the joint duct and tighten the joint duct bolts [B].

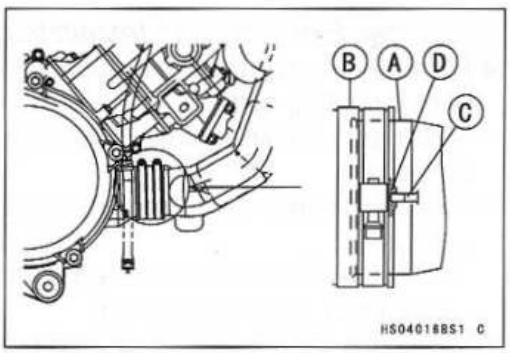
Torque - Joint Duct Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)



- Install the converter intake duct [A] in the joint duct [B] as shown.

o When installing converter intake duct, fit to aligning mark.
  Converter Intake Duct Aligning Mark [C]
  Joint duct Aligning Mark [D]

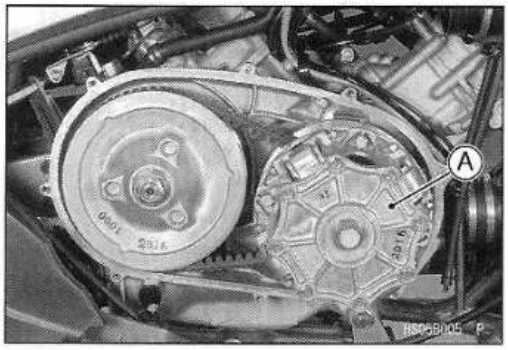
- Install the damper and collar.
- Tighten the duct mounting bolt.



Drive Belt

Drive Belt Removal

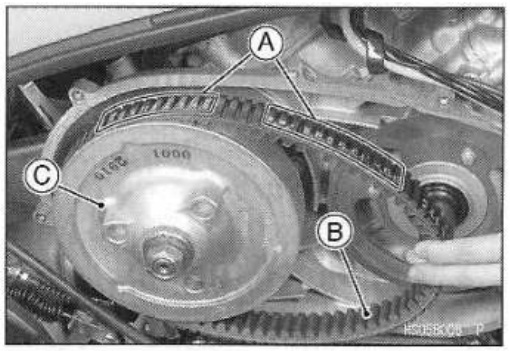
- Remove the drive pulley [A] (see Drive Pulley Removal).



NOTE

o *Before removing the drive belt, observe the direction of the informations [A] (Such as manufacturers name and arrow marks) printed on the belt so that it may be reinstalled on the pulleys as originally.*

- Lift the drive belt [B] off the driven pulley [C].

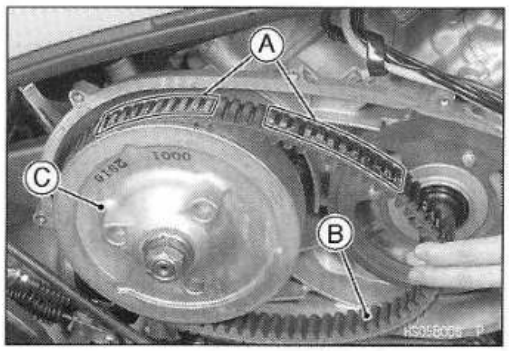


Drive Belt Installation

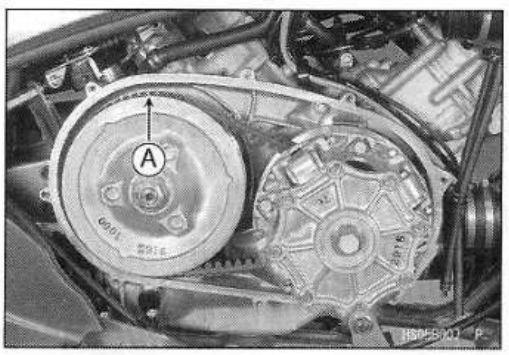
NOTE

o *Be sure the printed information faces the same direction so the belt rotates in the same direction as originally installed. When installing a new belt, install it so the printed information [A] can be read from beside the vehicle.*

- Installation is basically the reverse of removal.
- Loop the belt [B] over the driven pulley [C].
- Install the drive pulley (see Drive Pulley Installation).



- Put the transmission in neutral, and rotate the driven pulley to allow the belt to return to the top [A] of the sheaves, before measuring belt deflection.



Drive Belt Inspection

- Refer to the Converter System in the Periodic Maintenance chapter.

Drive Belt Deflection Inspection

- Refer to the Converter System in the Periodic Maintenance chapter.

Drive Belt

Drive Belt Deflection Adjustment

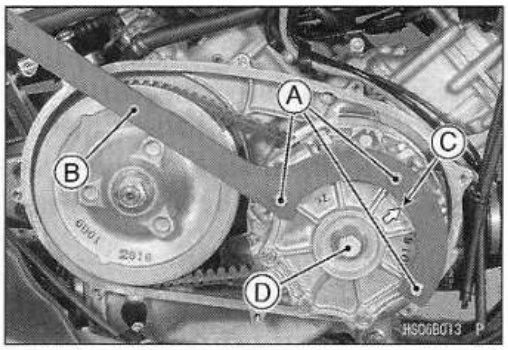
- Refer to the Converter System in the Periodic Maintenance chapter.

Drive Pulley

Drive Pulley Removal

- Remove:
  Torque Converter Cover (see Torque Converter Cover Removal)
- Be sure to remove the three cover bolts [A] in the positions shown and install the drive pulley holder [B] in the position shown. Note the holder's relative position to the arrow mark [C].
- Tighten the three bolts.

Torque - Drive Pulley Cover Bolts: 13 N·m (1.3 kgf·m, 113 in·lb)



CAUTION

Be sure to install three bolts in the specified positions shown. Otherwise, the tapped holes will be damaged.

Special Tool - Drive Pulley Holder: 57001–1520

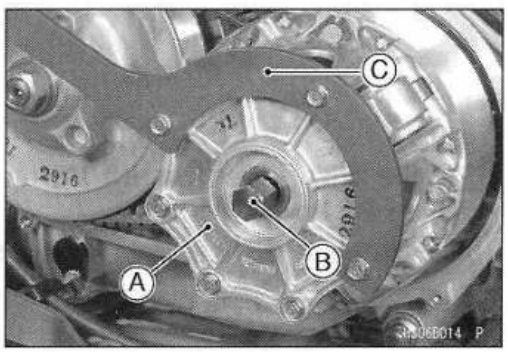
- Loosen the drive pulley bolt [D] (left-hand threads), holding the drive pulley with the drive pulley holder.
- Remove the drive pulley bolt, two washers and the stepped washer, but do not remove the drive pulley holder yet.

NOTE

o *The drive pulley bolt has left-hand threads. Turn the wrench clockwise for loosening.*

- Remove the drive pulley [A] from the crankshaft by screwing the drive pulley puller bolt [B] clockwise, while holding the drive pulley with the drive pulley holder [C].

Special Tool - Drive Pulley Puller Bolt: 57001–1429

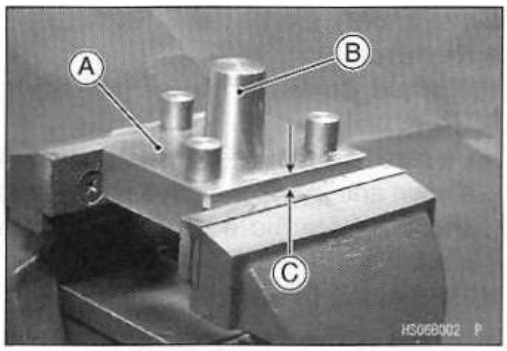


Drive Pulley

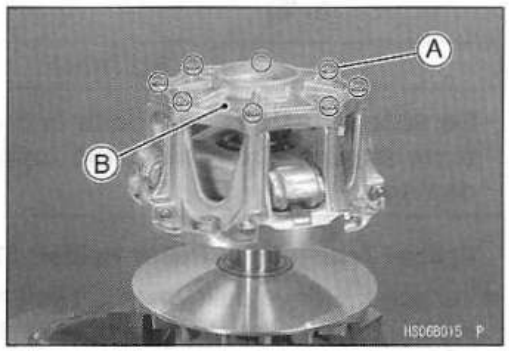
Drive Pulley Disassembly

- Hold the drive pulley holder [A] and drive & driven pulley holder [B] in a vise so that the upper surface on the holder is 7 mm (0.28 in.) [C] above the vise.

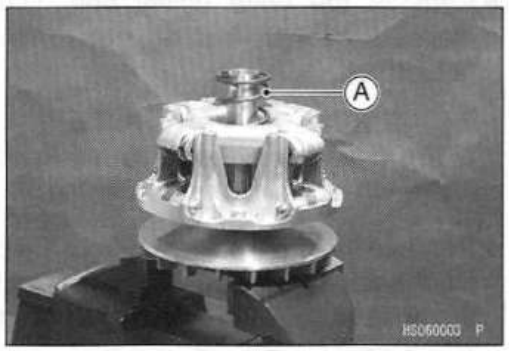
Special Tools - Drive & Driven Pulley Holder: 57001–1412
Drive Pulley Holder: 57001–1473



- Set the pulley onto the pulley holder.
- Remove:
  Drive Pulley Cover Bolts [A]
  Drive Pulley Cover [B]



- Remove:
  Spring [A]
  Spacer



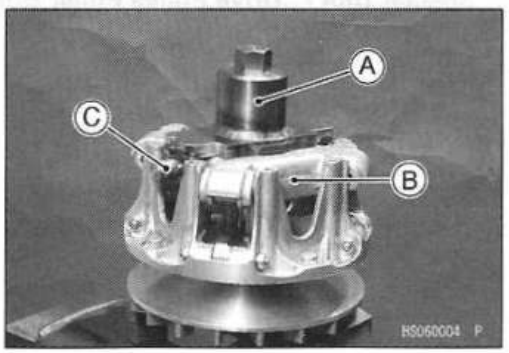
- Put the drive pulley wrench [A] on the spider [B] and tighten the bolt [C].

Special Tool - Drive Pulley Wrench: 57001–1474

- Turn the wrench clockwise and remove the spider with the movable sheave.

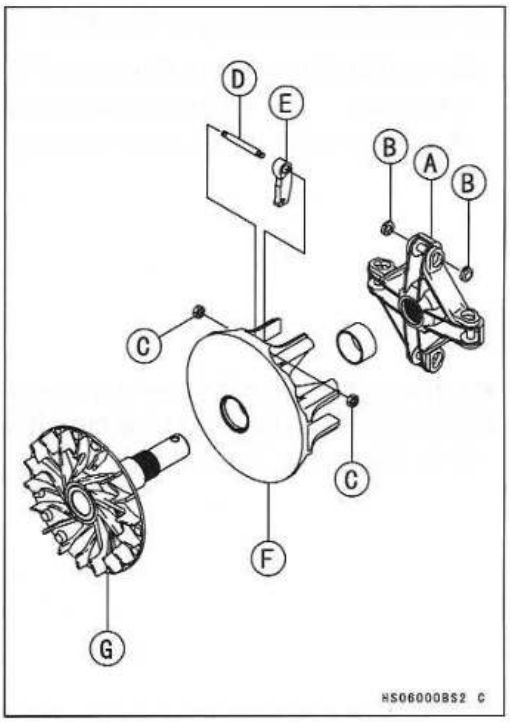
NOTE

o *The spider has left-hand threads. Turn the wrench clockwise for loosening.*



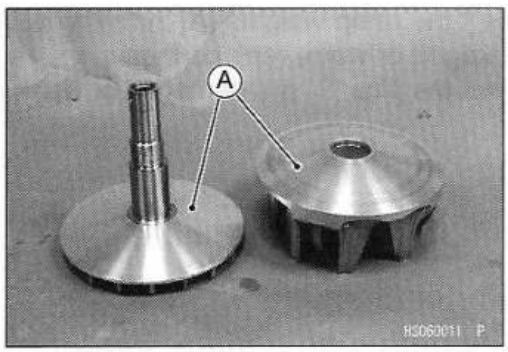
Drive Pulley

- Remove:
  Spider [A]
  Shoes [B]
  Nuts [C]
  Ramp Weight Pin [D]
  Ramp Weight [E]
  Movable Sheave [F]
  Fixed Sheave [G]



Drive Pulley Inspection

★If the sheave surfaces [A] appear damaged, replace the sheaves.

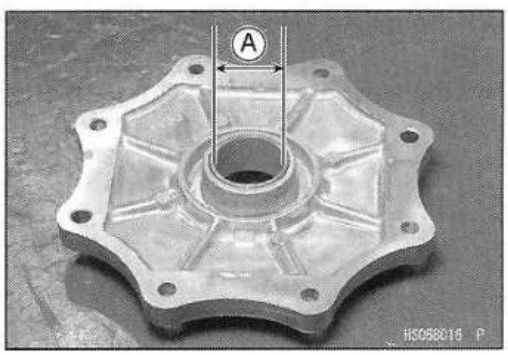


★If the cover bushing is damaged or worn, replace the drive pulley cover.

Cover Bushing Inside Diameter [A]

Standard: **27.985 ~ 28.085 mm (1.1018 ~ 1.1057 in.)**

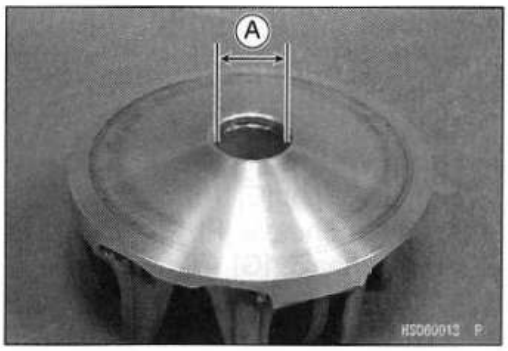
Service Limit: **28.12 mm (1.107 in.)**



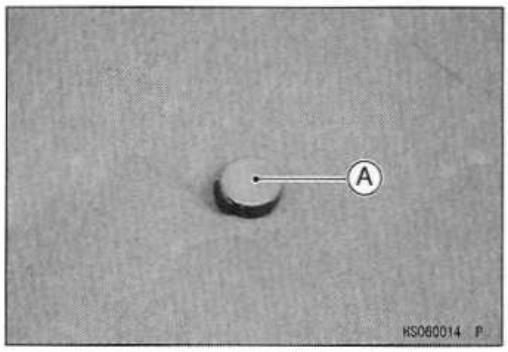
Drive Pulley

★If the sheave bushing is damaged or worn, replace it.

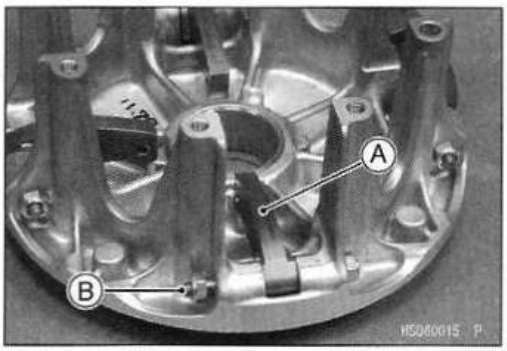
Sheave Bushing Inside Diameter [A]
Standard: 37.985 ~ 38.085 mm (1.4955 ~ 1.4994 in.)
Service Limit: 38.12 mm (1.501 in.)



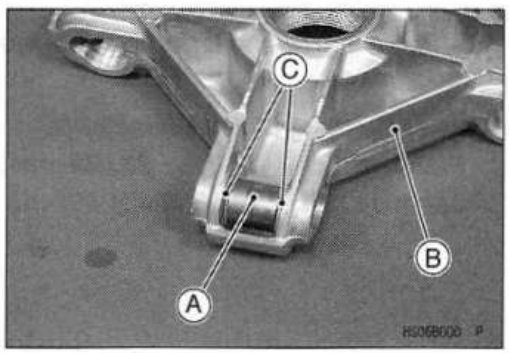
★If the spider shoes [A] are damaged, replace them.
- Check the spider shoe side clearance (see Spider Shoe Side Clearance Inspection).



★If the ramp weights [A] in the movable sheave are damaged or worn, replace them.
★If the pins [B] are damaged or worn, replace them.



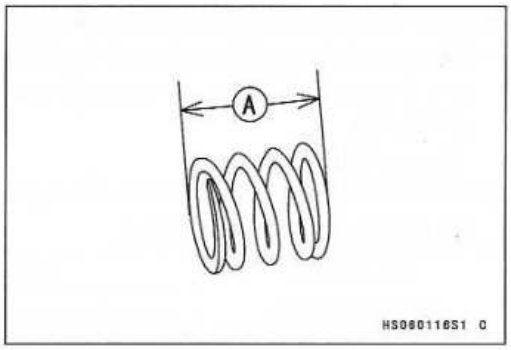
★If the rollers [A] are damaged or worn, replace the spider [B].
★If the washers [C] are damaged or worn, replace the spider.



Drive Pulley

★If the spring is worn or damaged, replace the spring.

Spring Free Length [A]
Standard: 60.4 mm (2.38 in.)

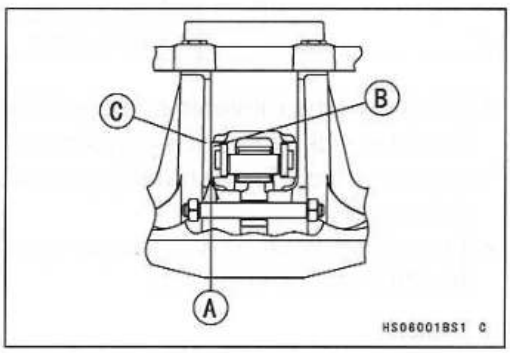


Spider Shoe Side Clearance Adjustment

- Remove:
  Drive Pulley (see Drive Pulley Removal)
  Drive Pulley Cover and Spring (see Drive Pulley Disassembly)
- Temporarily install:
  Dowel Pins (2)
  Drive Pulley Cover
  Two Bolts (at dowel pins)
- Turn the movable sheave clockwise.
- Measure the resulting clearance [A] between the shoe [B] and the post [C] on the movable sheave at all four arms.

Shoe Side Clearance
Standard: 0.15 ~ 0.30 mm (0.0059 ~ 0.0118 in.)

★If any of the measurements are greater than the maximum, replace all shoes with standard shoes (see Drive Pulley Disassembly).



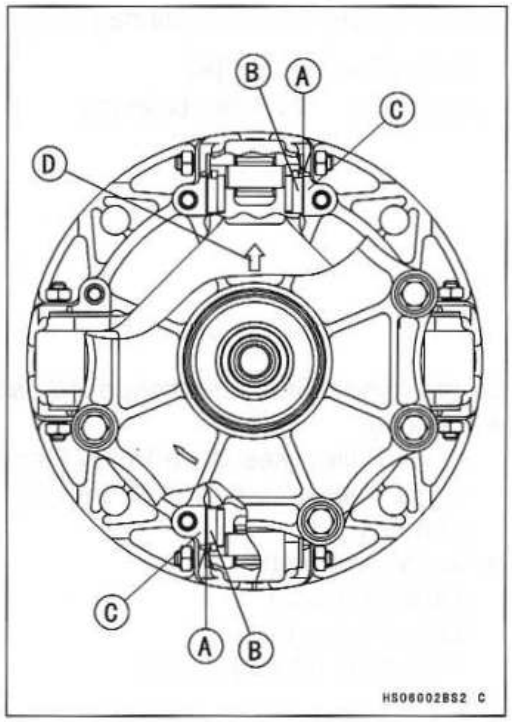
Drive Pulley

- Turn the movable sheave clockwise.
- Measure the resulting clearance [A] between the shoe [B] and the post [C] on the movable sheave at two positions as shown.

  Arrow Mark [D]

★If the clearance is not within the specified range, adjust it according to following chart.

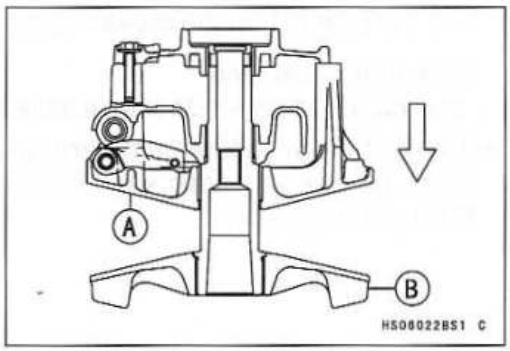
Clearance Measurement	Present Shoes	
	Part Number	Thickness
Less than 0.15 mm (0.0059 in.)	49048-1087	7.2 mm (0.283 in.)
	49048-1088	7.3 mm (0.287 in.)
0.15 ~ 0.30 mm (0.0059 ~ 0.0118 in.) (standard clearance)	no change 49048-1089	7.4 mm (0.291 in.)
Over 0.30 mm (0.0118 in.)	49048-1090	7.5 mm (0.295 in.)
	49048-1091	7.6 mm (0.299 in.)
	49048-1092	7.7 mm (0.303 in.)
	49048-1093	7.8 mm (0.307 in.)
	49048-1094	7.9 mm (0.311 in.)
	49048-1095	8.0 mm (0.315 in.)



- Check that the movable sheave [A] moves smoothly, after the shoe side clearance adjustment.

○ The movable sheave must move freely towards the fixed sheave [B].

★If the movable sheave does not move smoothly, readjust the shoe side clearance.

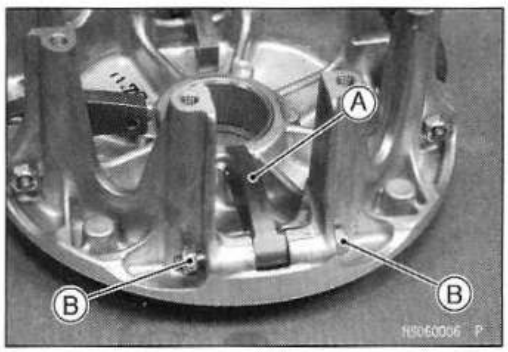


Drive Pulley Assembly

- Install the ramp weight [A] as shown.
- Tighten:

Torque - Ramp Weight Nuts [B]: 6.9 N·m (0.70 kgf·m, 61 in·lb)

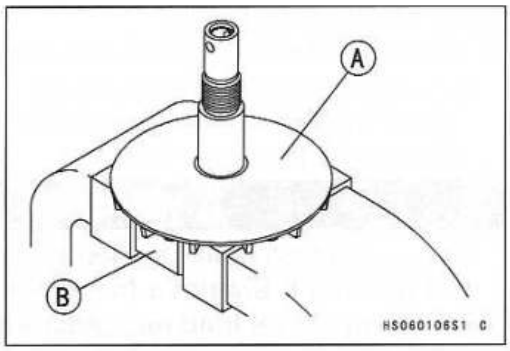
- Check that the ramp weights swing smoothly.



Drive Pulley

- Hold the fixed sheave [A] with the drive pulley holder [B] in a vise.

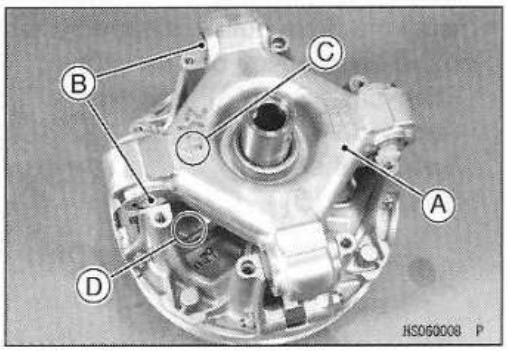
  Special Tool - Drive Pulley Holder: 57001–1473



- Clean the threads of the fixed sheave and spider.
- Install:
  Movable Sheave
  Spider [A] and Shoes [B]

  ○ Align the arrow [C] on the spider with the arrow [D] on the movable sheave.

  ○ Insert the guides so that the rubber side (small diameter) faces inward.



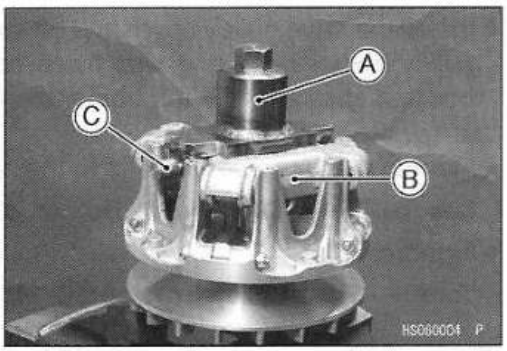
- Put the drive pulley wrench [A] on the spider [B] and tighten the bolt [C].

  Special Tool - Drive Pulley Wrench: 57001–1474

- Turn the wrench counterclockwise for tightening.

  Torque - Spider: 275 N·m (28 kgf·m, 203 ft·lb)

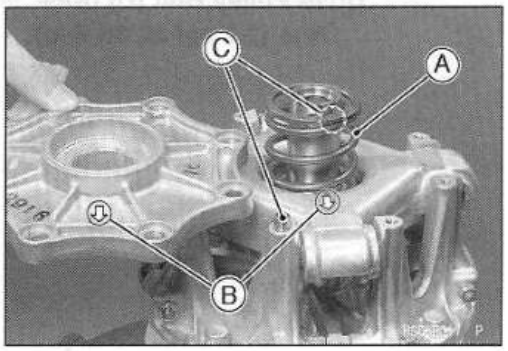
- Remove the drive pulley wrench.



- Install the spacer.
- Put the spring [A] in the groove of the spider.
- Align the arrows [B] on the drive pulley cover and spider.
- Install:
  Dowel Pins [C]
  Drive Pulley Cover
- Tighten:

  Torque - Drive Pulley Cover Bolts: 13 N·m (1.3 kgf·m, 113 in·lb)

- Clean the surface of the sheaves with an oil-less cleaning fluid.



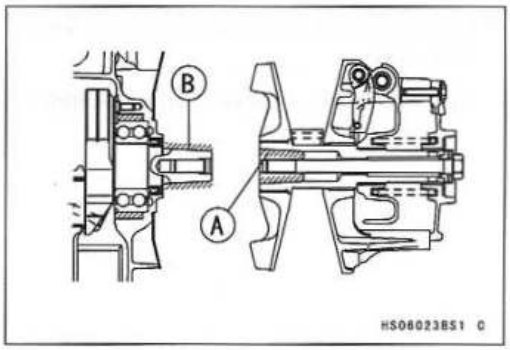
Drive Pulley

Drive Pulley Installation

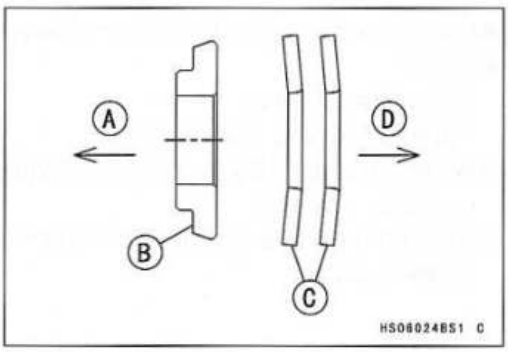
- Clean the following portions with an oil-less cleaning fluid such as trichloroethylene or acetone.
  Fixed Sheave Tapered Portion [A]
  Crankshaft Tapered Portion [B]

⚠ WARNING

These cleaning fluids are usually highly flammable and harmful if breathed for prolonged periods. Be sure to heed the fluid manufacturer's warnings.



- Install the drive pulley, stepped washer and two washers on the drive pulley bolt as shown.
  Crankcase Side [A]
  Stepped Washer [B]
  Two Washer [C]
  Bolt Head [D]

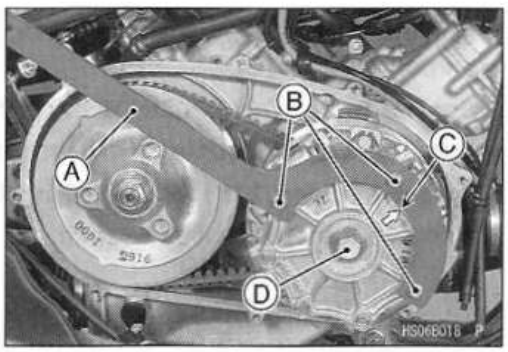


- Install the drive pulley cover and be sure to install the drive pulley holder [A] along with three cover bolts [B] in the position shown. Note the holder's relative position to the arrow mark [C].
- Tighten the three cover bolts to the specified torque.

Special Tool - Drive Pulley Holder: 57001–1520

- Tighten:

Torque - Drive Pulley Cover Bolts: 13 N·m (1.3 kgf·m, 113 in·lb)
Drive Pulley Bolt [D] (New, left-hand threads): 93 N·m (9.5 kgf·m, 69 ft·lb)

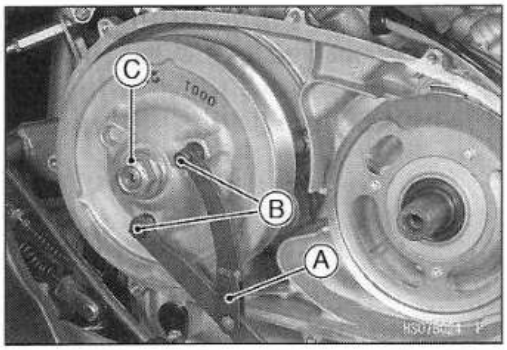


Driven Pulley

Driven Pulley Removal

- Remove:
  Torque Converter Cover (see Torque Converter Cover Removal)
  Drive Pulley (see Drive Pulley Removal)
  Drive Belt (see Drive Belt Removal)
- Using a flywheel & pulley holder [A] and pulley holder attachments [B], remove the driven pulley nut [C] and washers. (Nut has R/H threads.)

  Special Tools - Flywheel & Pulley Holder: 57001–1343
  Pulley Holder Attachment: 57001–1472



- Remove:
  Driven Pulley

Driven Pulley Disassembly

- Hold the drive & driven pulley holder [A] in a vise.

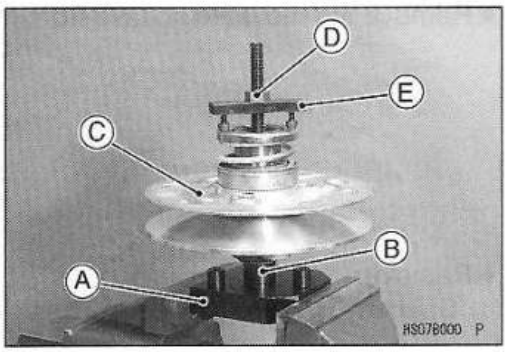
  Special Tool - Drive & Driven Pulley Holder: 57001–1473

- Screw the guide bar [B] of the spring holder set into the holder.

  Special Tool - Spring Holder Set: 57001–1483

- Put the driven pulley [C] on the guide bar.
- Tighten the nut [D], and compress the spring with the spring holder [E] of the spring holder set.

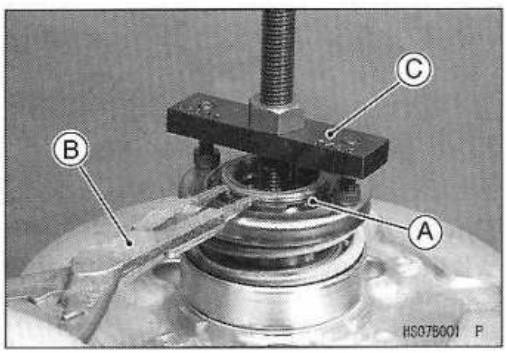
  Special Tool - Spring Holder Set: 57001–1483



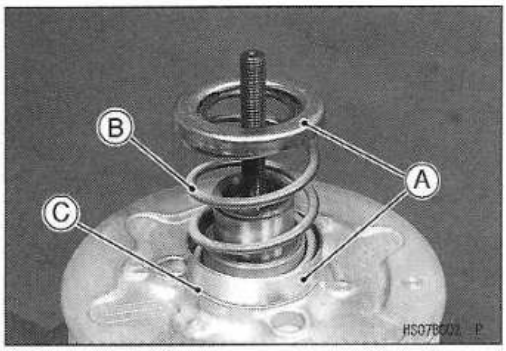
- Remove the circlip [A] with circlip pliers [B].

  Special Tool - Circlip Pliers: 57001–154

- Remove the nut and spring holder [C].

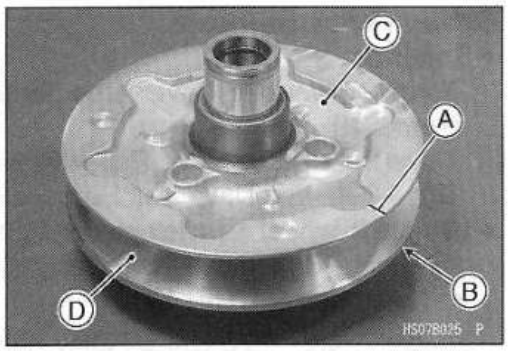


- Remove:
  Spring Seats [A]
  Spring [B]
  Thrust Plate [C]

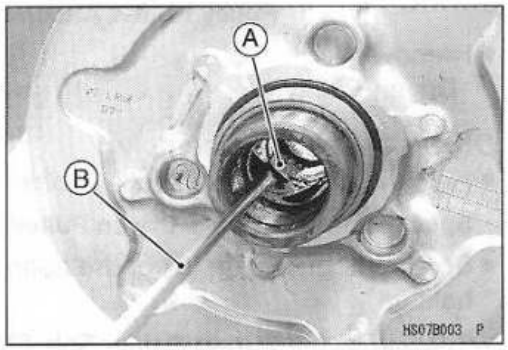


Driven Pulley

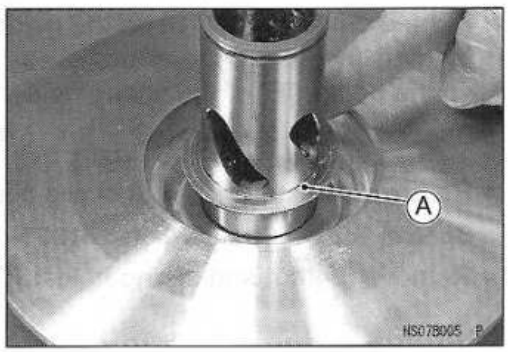
- Make match–marks [A] and [B] on the sheaves so that it can be installed later in the same position.
  Movable Sheave [C]
  Fixed Sheave [D]



- Wipe off the molybdenum disulfide grease.
- Remove the four pins [A] with a thin standard tip screwdriver [B].
- Remove the movable sheave from the fixed sheave.

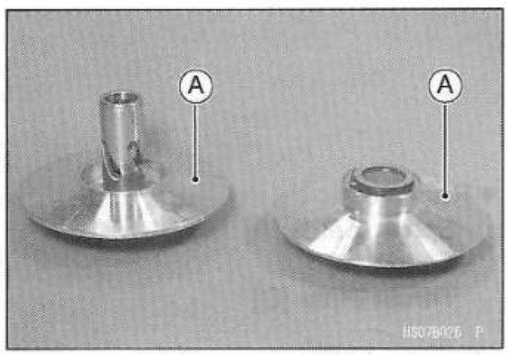


- Remove:
  Spacer(s) [A] (for Drive Belt Deflection Adjustment)



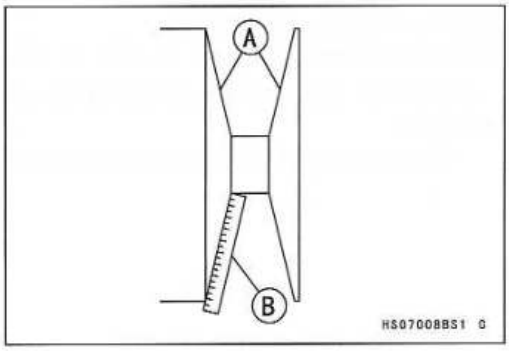
Driven Pulley Inspection

★If the sheave surfaces [A] appear damaged, replace the sheaves.



Driven Pulley

- Replace the sheave with uneven wear on the belt contacting surfaces.
  Sheave Surface [A]
  Straight Edge [B]

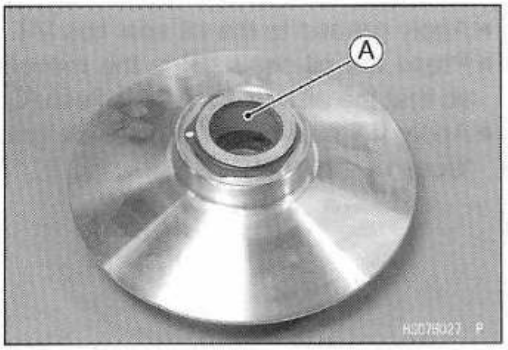


★If the sheave bushings [A] are damaged or worn, replace the movable sheave.

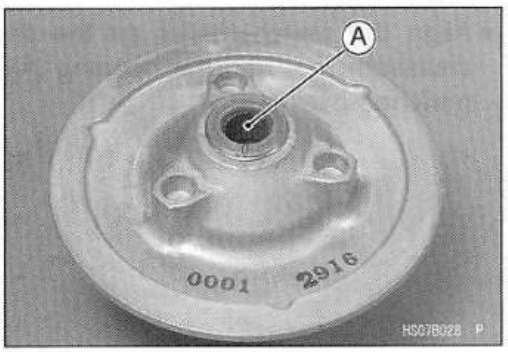
Sheave Bushing Inside Diameter
Standard: 40.000 ~ 40.039 mm (1.5748 ~ 1.5763 in.)
Service Limit: 40.079 mm (1.5779 in.)

- Inspect seals for damage.

★If seals are damaged, replace the movable sheave.



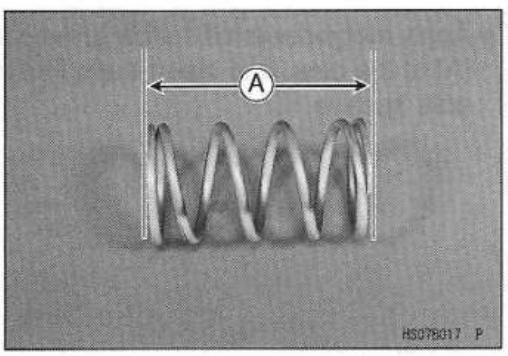
★If the splines [A] are damaged or worn, replace the fixed sheave.



★If the spring is damaged or worn, replace the spring.

Spring Free Length [A]
Standard: 99.5 mm (3.92 in.)

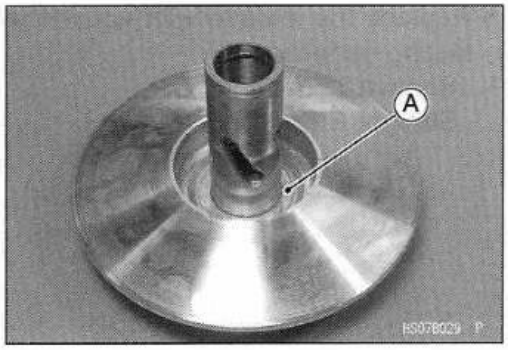
★If the spring coils are distorted, replace the spring.



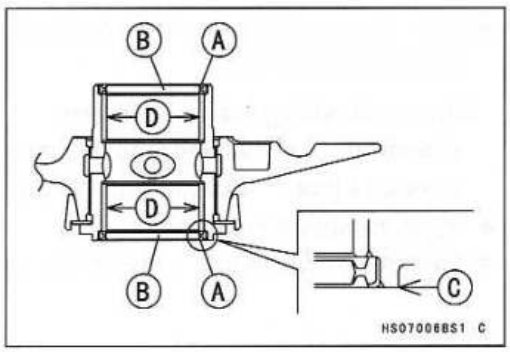
Driven Pulley

Driven Pulley Assembly

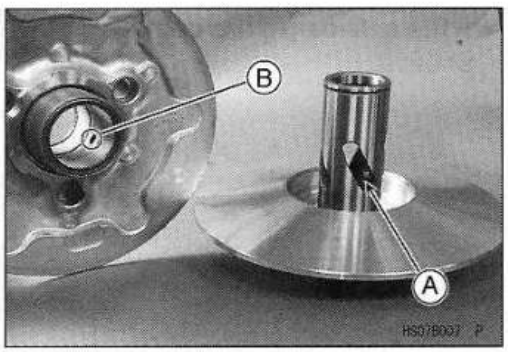
- Clean off any grease or dirt on the movable and fixed sheaves, and dry them with a clean cloth.
- Install:
  Spacers [A] (for Drive Belt Deflection Adjustment)



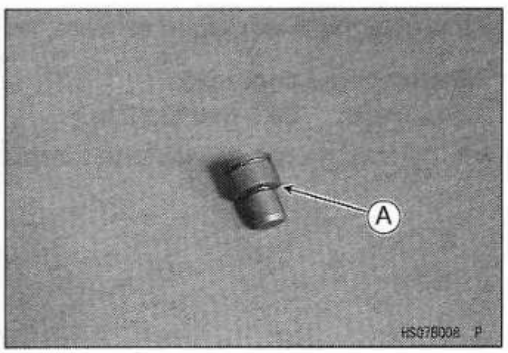
- Apply grease to the oil seal lips [A].
- Press the oil seals [B] in the movable sheave assembly so that the oil seal surface is flush [C] with the sleeve end.
- Apply [D] molybdenum disulfide grease to the inner surfaces of the bushings.



- Align the match–marks on the sheaves, made when disassembled, and the opening [A] and hole [B] will be matched easily.



- Apply molybdenum disulfide grease to the seating surface [A] of the pins, and insert them into the holes in the movable sheave.

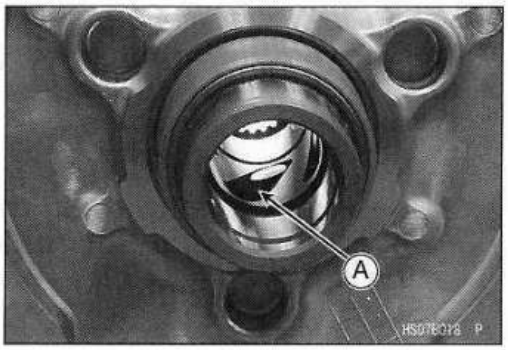


Driven Pulley

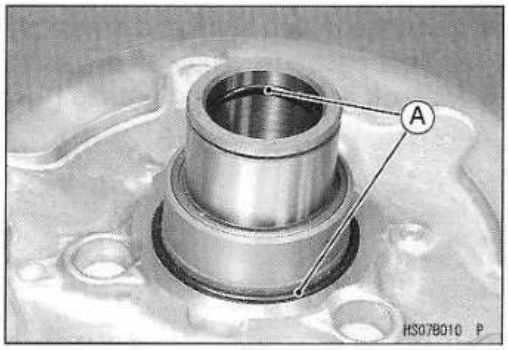
- Draw the movable sheave onto the fixed sheave, and apply molybdenum disulfide grease of 1 g (0.035 oz) to all openings [A].

NOTE

o *Do not heap up the grease out of the openings.*



- Check that the O-rings [A] are in good condition.
★If any of the O-rings are damaged, replace them.
- Apply grease to the O-rings.



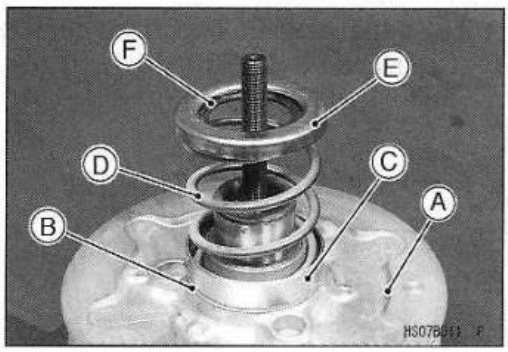
- Hold the drive pulley holder in a vise.

Special Tool - Drive Pulley Holder: 57001- 1473

- Screw the guide bar of the spring holder set into the holder.

Special Tool - Spring Holder Set: 57001-1483

- Put the driven pulley [A] onto the guide bar.
- Put the thrust plate [B] so that the alloy side (gray) faces the movable sheave.
- Install:
  Spring Seat [C]: 18.5 mm (0.728 in.)
  Spring [D]
  Spring Seat [E]: 9.3 mm (0.366 in.)
  Circlip [F]



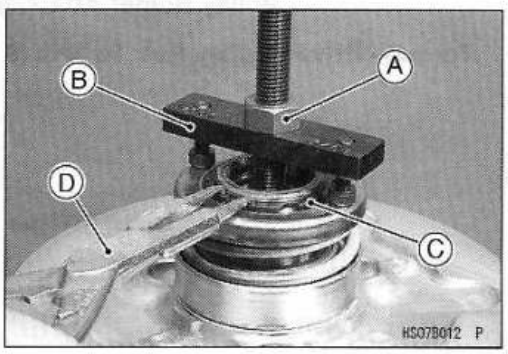
- Tighten the nut [A], and compress the spring with the spring holder [B].

Special Tool - Spring Holder Set: 57001-1483

- Install the circlip [C] with the circlip pliers [D].

Special Tool - Circlip Pliers: 57001-154

- Remove the driven pulley from the spring holder set.
- Clean the surface of the sheaves with an oil-less cleaning fluid.



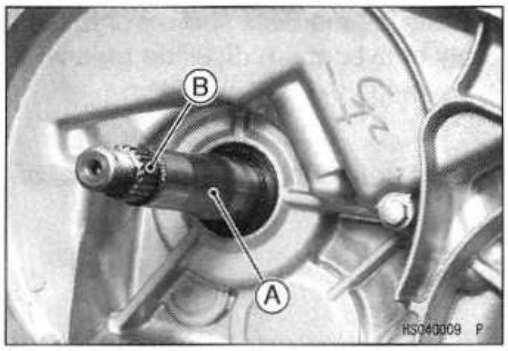
Driven Pulley

Driven Pulley Installation

- Clean the transmission driven shaft [A].
- Install:
  Driven Pulley

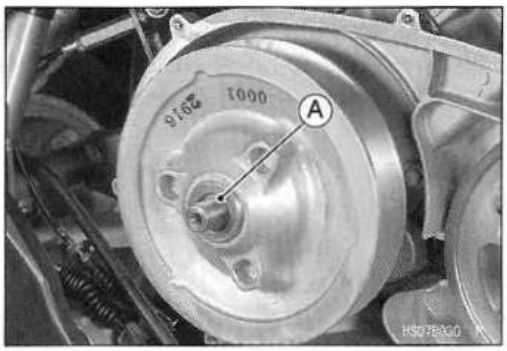
NOTE

o *When engaging the spline on the driven pulley with the spline [B] on the shaft, do not damage the pulley's spline. If any damage occurs, remove it with a file.*

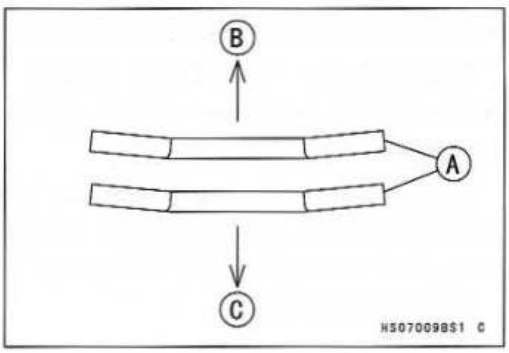


- Clean the driven shaft and driven pulley ends to open the air vent passage. Wipe off any extra grease.

o Wipe off any protruding grease [A].



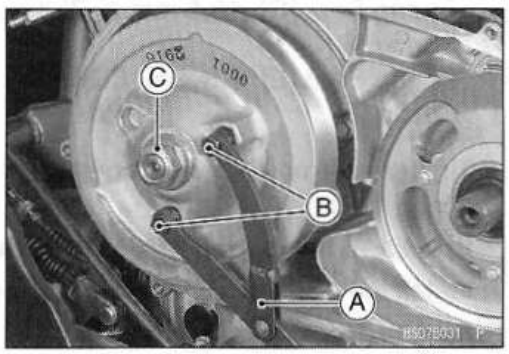
- Install the washers [A] on the shaft as shown.
  Crankcase Side [B]
  Bolt Head [C]



- Using a flywheel & pulley holder [A] and pulley holder attachments [B], tighten the driven pulley nut [C].

Special Tools - Flywheel & Pulley Holder: 57001–1343
Pulley Holder Attachment: 57001–1472

Torque - Driven Pulley Nut: 93 N·m (9.5 kgf·m, 69 ft·lb)



High Altitude Setting Information

Specifications

Altitude	Carburetor
	Main Jet
0 ~ 500 m (0 ~ 1 600 ft)	Front: #135 P/No. (92063-1014) (STD) Rear: #140 P/No. (92063-1013) (STD)
500 ~ 1 500 m (1 600 ~ 4 900 ft)	Front: #132 P/No. (92063-1076) Rear: #138 P/No. (92063-1015)
1 500 ~ 2 500 m (4 900 ~ 8 200 ft)	Front: #130 P/No. (92063-1075) Rear: #135 P/No. (92063-1014)
2 500 ~ 3 500 m (8 200 ~ 11 500 ft)	Front: #128 P/No. (92063-1074) Rear: #130 P/No. (92063-1075)
3 500 ~ 4 500 m (11 500 ~ 14 800 ft)	Front: #120 P/No. (92063-1073) Rear: #125 P/No. (92063-1069)

★There is not high altitude setting for belt converter.