

# 8. CARBURETOR

---



## CARBURETOR

---

DIAPHRAGM AND PISTON OPERATION -----	8-1
SLOW SYSTEM -----	8-2
COASTING ENRICHMENT SYSTEM -----	8-2
MAIN SYSTEM -----	8-4
AUTO-ENRICHENER (AUTO-CHOKE) SYSTEM-----	8-5
FLOAT SYSTEM -----	8-6
ACCELERATOR PUMP SYSTEM -----	8-7
INSPECTION-----	8-9



## 8. CARBURETOR

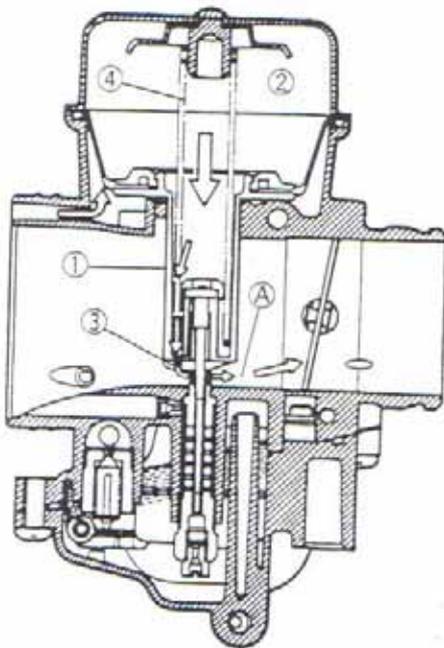
---

### 8-1 DIAPHRAGM AND PISTON OPERATION

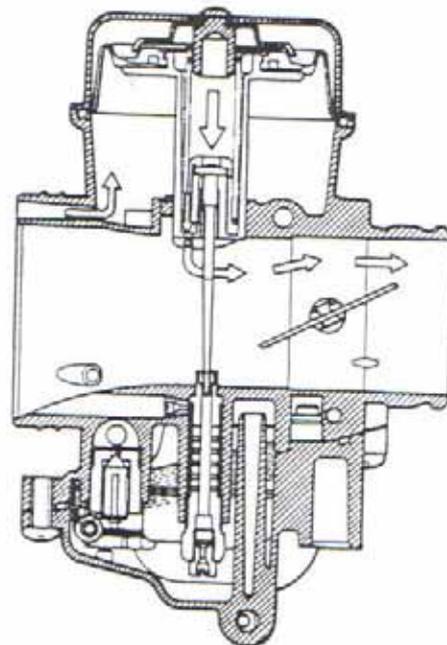
The carburetor is a variable-venturi type, whose venturi cross sectional area is increased or decreased automatically by the piston valve<sup>①</sup>. The piston valve moves according to the negative pressure present on the downstream side of the venturi <sup>A</sup>. Negative pressure is admitted into the diaphragm chamber <sup>②</sup> through an orifice <sup>③</sup> provided in the piston valve<sup>①</sup>.

rising negative pressure overcomes the spring <sup>④</sup> force, causing the piston valve <sup>①</sup> to rise into the diaphragm chamber and prevent the air velocity from increasing. Thus, air velocity in the venturi passage is kept relatively constant for improved fuel atomization and precise air/fuel mixture.

LOWER POSITION OF  
THE PISTON VALVE



UPPER POSITION OF  
THE PISTON VALVE



NEGATIVE  
PRESSURE →

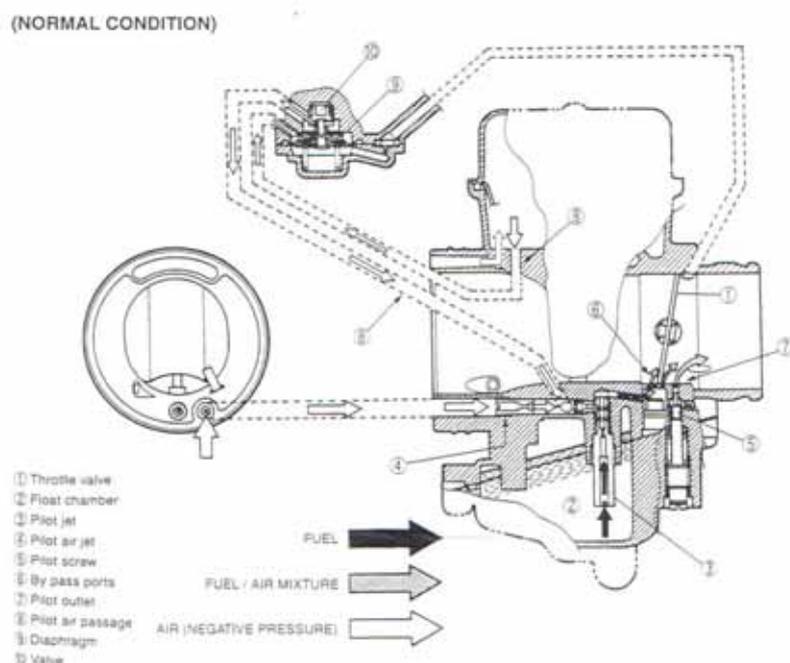
## 8. CARBURETOR

### 8-2 SLOW SYSTEM

This system supplies fuel during engine operation when the throttle valve ① is closed or slightly opened. The fuel from the float chamber ② is metered by the pilot jet ③ where it mixes with air coming in through the pilot air jet ④. This mixture, rich with fuel, then goes up through the pilot passage to the pilot screw ⑤. Part of the mixture is discharged into the main bore through bypass ports ⑥. The mixture is metered by the pilot screw ⑤ and sprayed into the main bore through the pilot outlet port ⑦.

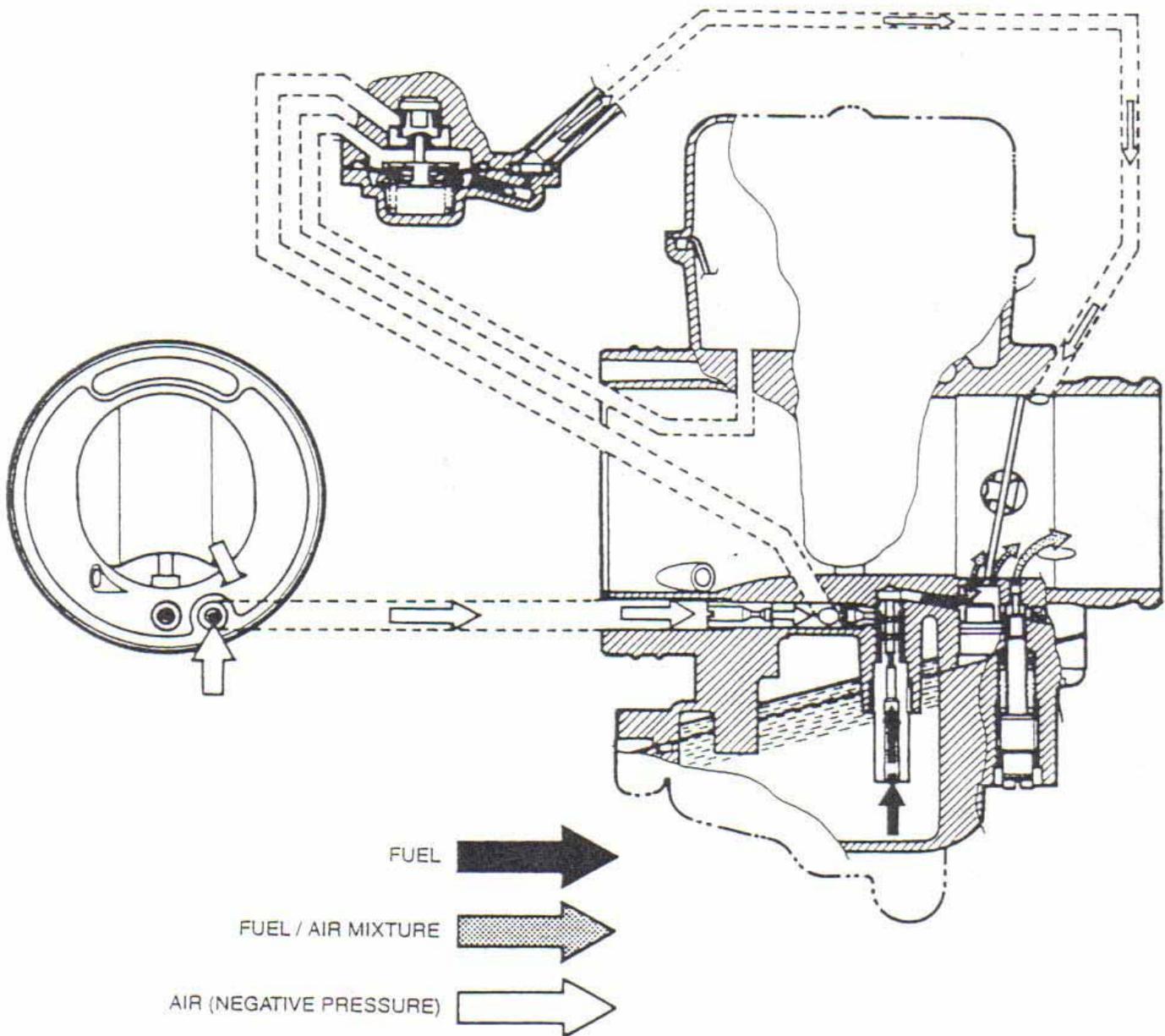
### 8-3 COASTING ENRICHMENT SYSTEM

The coasting enrichment system is included in the slow system. At the normal running operation, joining of the air from upper part of the carburetor inlet side to pilot air passage ⑧ which obtains proper fuel/air mixture ratio. But if the throttle valve is closed suddenly, a large negative pressure generated in the cylinder which is applied to the diaphragm ⑨. The valve ⑩ which interlocks with the diaphragm ⑨ closes an air passage ⑧, thus, the fuel/air mixture ratio by controlling air flow in the pilot circuit.



# 8. CARBURETOR

(LARGE NEGATIVE PRESSURE GENERATED CONDITION)

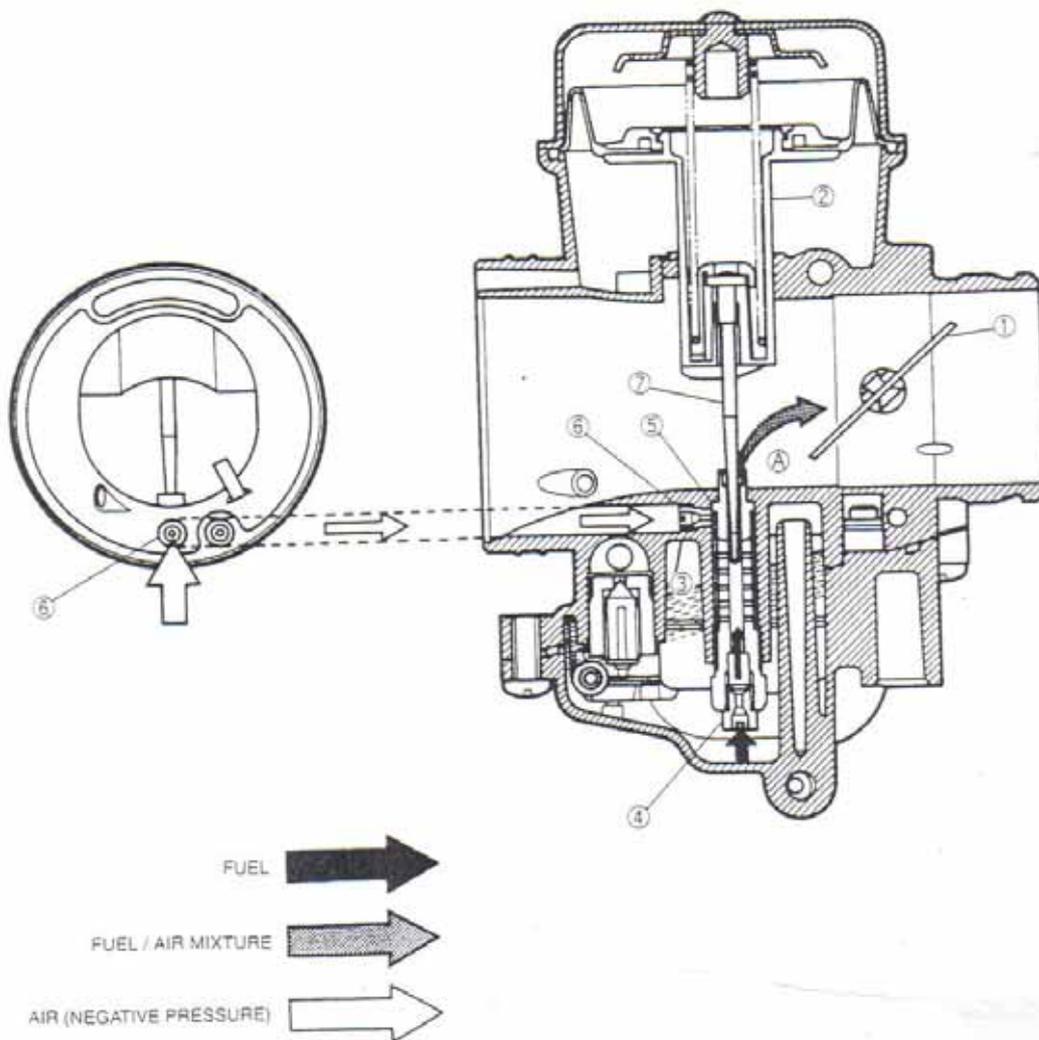


## 8. CARBURETOR

### 8-4 MAIN SYSTEM

As the throttle valve ① is opened, engine speed rises and negative pressure in the venturi **A** increases. This causes the piston valve ② to move upward. The fuel in the float chamber ③ is metered by the main jet ④. The metered fuel enters the needle jet ⑤, mixes with the air admitted through the main air jet ⑥ and forms an emulsion. The emulsified fuel then passes through the clearance between the needle jet ⑤ and jet needle ⑦ and is discharged into the venturi **A**, where it meets the main air stream being drawn by the engine.

Mixture proportioning is accomplished in the needle jet ⑤. The clearance through which the emulsified fuel must flow ultimately depends on throttle position.



## 8. CARBURETOR

### 8-5 AUTO-ENRICHENER (AUTO-CHOKE) SYSTEM

The automatic enrichener (automatic choke) device consists of the PTC heater **A**, the thermo-wax **B** and the plunger/needle **1**. When the thermo-wax **B** is cold, the plunger/needle **1** moves upward, Fuel is drawn into the enrichener circuit from the float chamber **2**. Enrichener jet **3** meters this fuel, which then flows into fuel pipe **4** and mixes with the air coming From the upper part of the float chamber **5**. The mixture, rich in fuel content, reaches upper part of The fuel pipe and mixes again with the air coming through a passage extending from main bore **6**. The two successive mixings of fuel with air are such that proper fuel/air mixture for starting is produced when the mixture is sprayed out through outlet port **7** into the main bore.

#### NOTE:

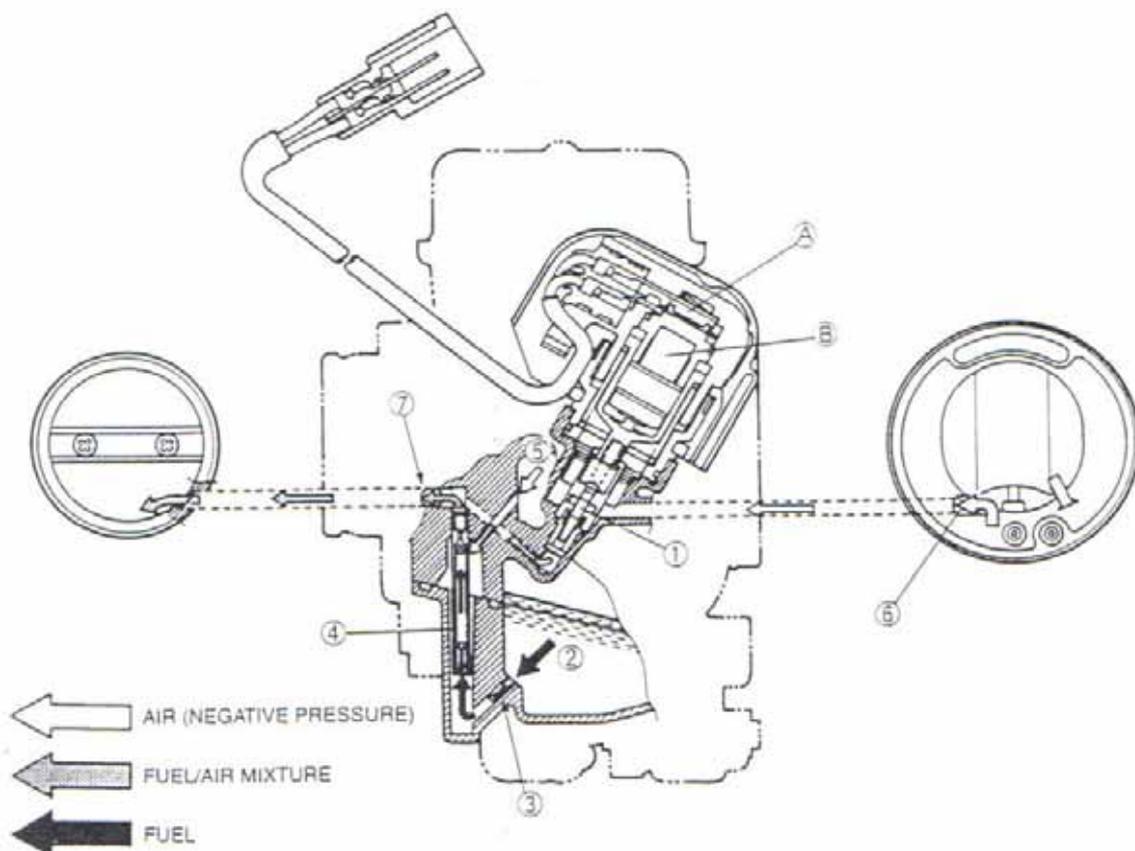
An enrichener is operated almost the same way as a choke.

When the engine is cold:

The automatic enrichener passage is always open as the thermo-wax remains atmospheric temperature.

When the engine is started:

According to the PTC heater temperature, the thermo-wax gradually expands and closes enrichener passage by the needle of the plunger.



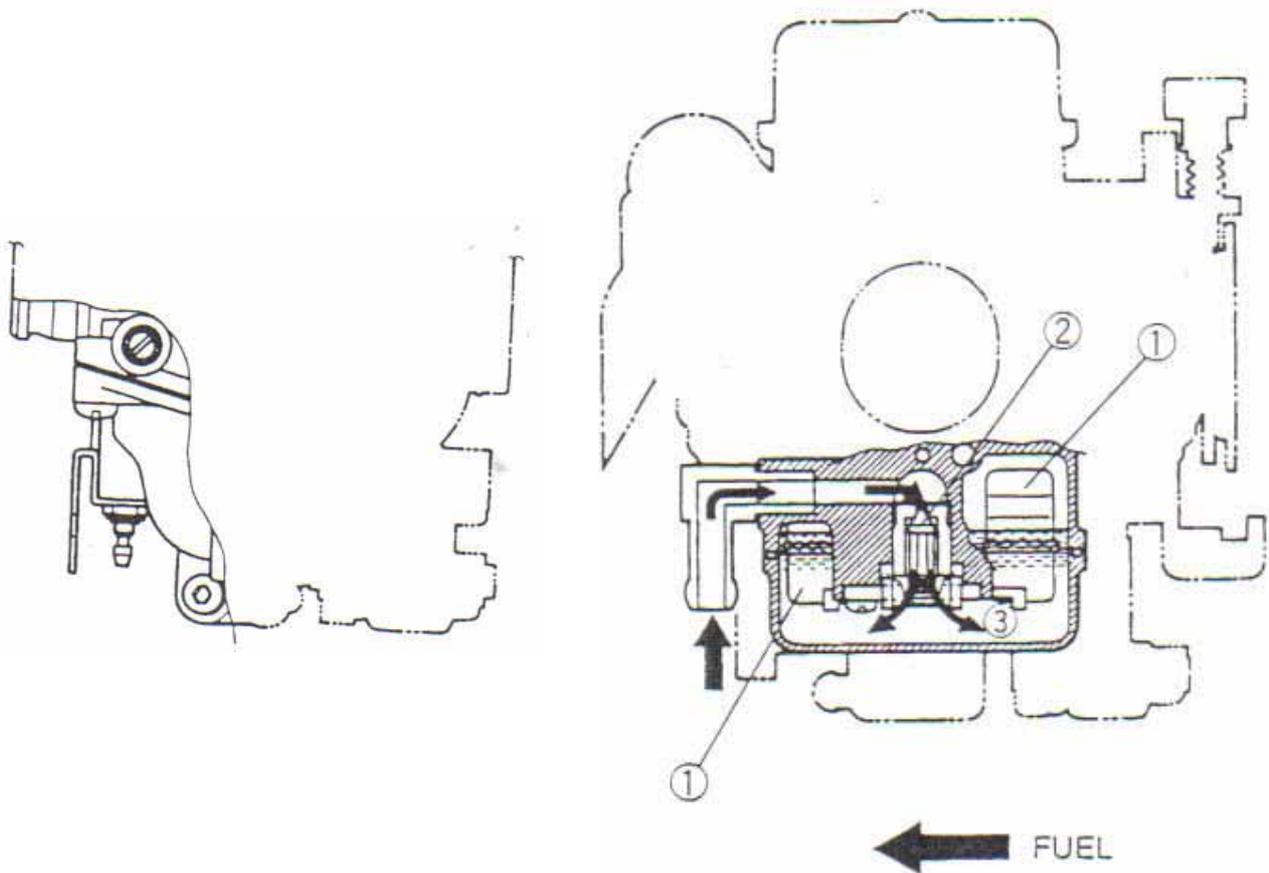
## 8. CARBURETOR

### 8-6 FLOAT SYSTEM

The float ① and needle valve ② work in conjunction with one another. As the float chamber ③, the float ① rises and the needle valve ② pushes up against the valve seat. When this occurs, no fuel enters the float chamber ③.

As the fuel level falls, the float ① lowers and the needle valve ② unseats itself; admitting fuel into the float chamber ③.

In this manner, the needle valve ② admits and shuts off fuel to maintain the appropriate fuel level inside the float chamber ③.

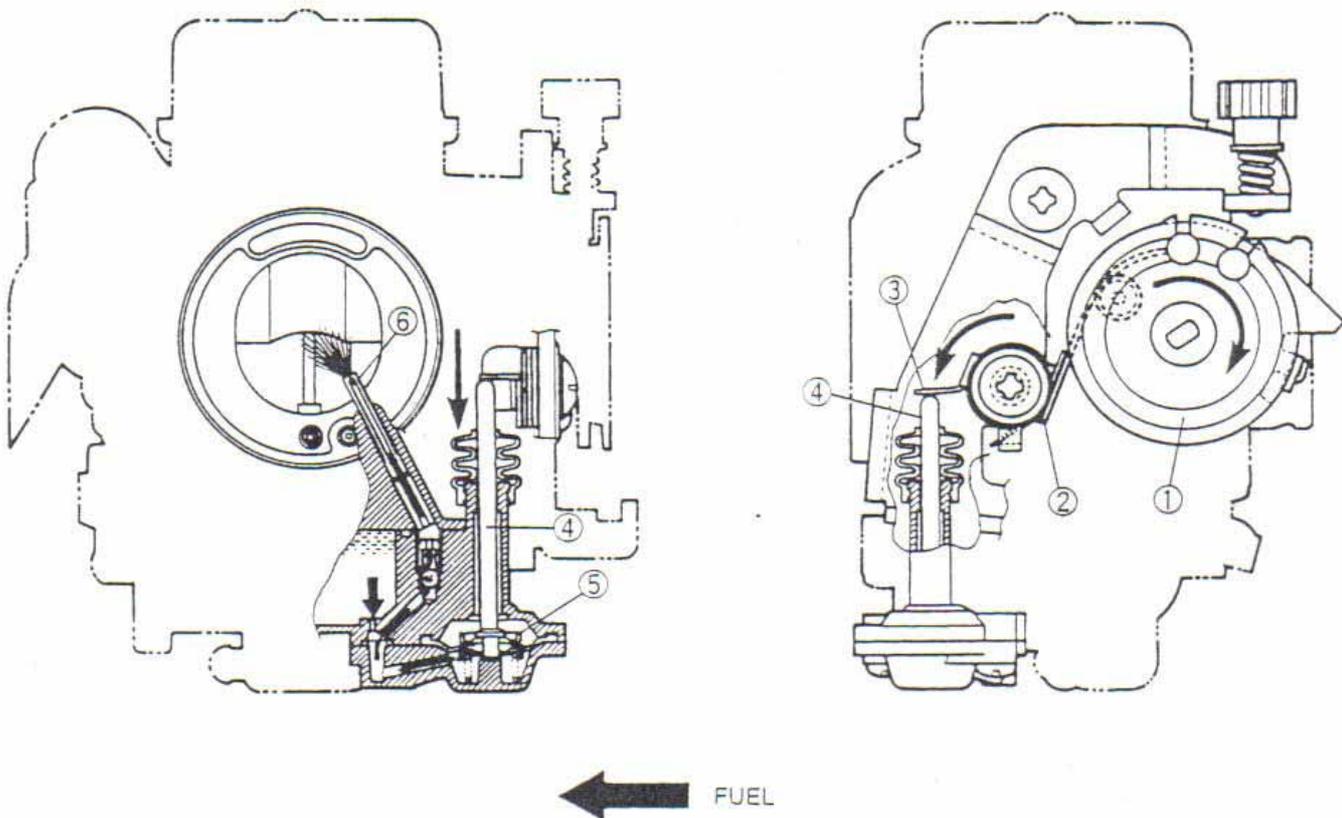


## 8. CARBURETOR

### 8-7 ACCELERATOR PUMP SYSTEM

This system works only when the rider opens throttle grip quickly as pump send the necessary amount of fuel to the carburetor bore for correcting fuel/air mixture ratio. When the rider open the throttle grip quickly, the intaken air volume becomes large and air velocity at the bottom of the throttle valve (piston valve) is slow and sucking volume of fuel is less.

The throttle valve lever ① pulls lever ② with the cable, and lever ③ turns and pushes rod ④. The rod ④ pushes plunger ⑤. This plunger pushes out the fuel through outlet pipe ⑥, spraying fuel into the main bore.



## 8. CARBURETOR

### 8-8 INSPECTION

Check the following parts for damage and clogging.

- \* Pilot jet
- \* Main jet
- \* Main air jet
- \* Pilot air jet No.1 & No.2
- \* Needle jet holder
- \* Float
- \* Jet needle
- \* Piston valve
- \* Starter jet
- \* Gaskets and O-rings
- \* Pilot outlet and bypass

if any abnormal con  
damage or clogging  
one.

### CARBURETOR CLEANING

#### !WARNING

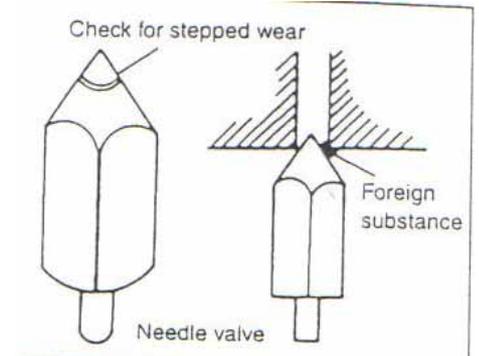
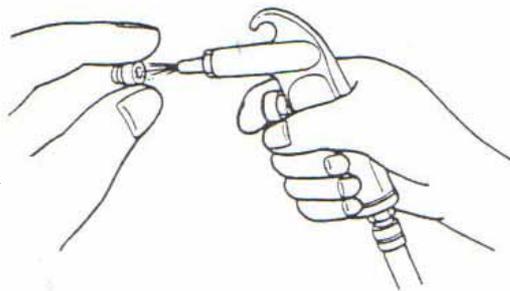
Some carburetor cleaning chemicals, especially diptype soaking solutions, are very corrosive and must be handled carefully. Always follow the

- Clean all jets with a spray-type carburetor cleaner and dry them using compressed air.
- Clean all circuits of the carburetor thoroughly-not just the perceived problem area. Clean the circuits in the carburetor body with a spray-type cleaner and allow each circuit to soak, if necessary, to loosen dirt and varnish. Blow the body dry using compressed air.

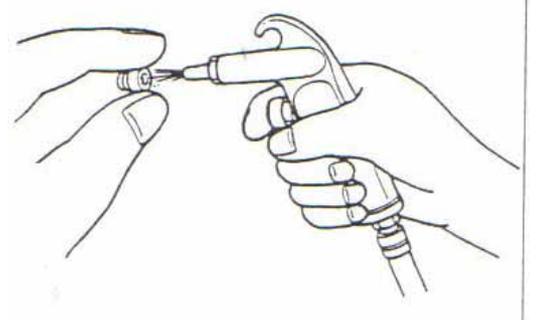
#### !CAUTION

Do not use a wire to clean the jets or passageways. A wire can damage the jets and passageways, if the components cannot be cleaned with a spray cleaner it may be necessary to use a dip-type cleaning solution and allow them to soak. Always follow The chemical manufacturer's instructions for proper use and cleaning of the carburetor components.

- after cleaning, reassemble the carburetor with new seals and gaskets.



lean. If  
a new



## 8. CARBURETOR

### AUTO-ENRICHENER INSPECTION

- Disconnect the lead wire coupler①.
- Remove the cover②.
- Connect the positive ⊕ terminal of a 12V battery to Yellow/white lead and the negative ⊖ terminal to Black/White.
- Check that the auto-enrichener section ③ (PTC heater built-in area) is heated in 5 minutes after the battery has been connected.

### NOTE:

To inspect the function, check for change of temperature from the cold condition.

### !CAUTION

Do not attempt to disassemble the auto-enrichener for the purpose of checking temperature.

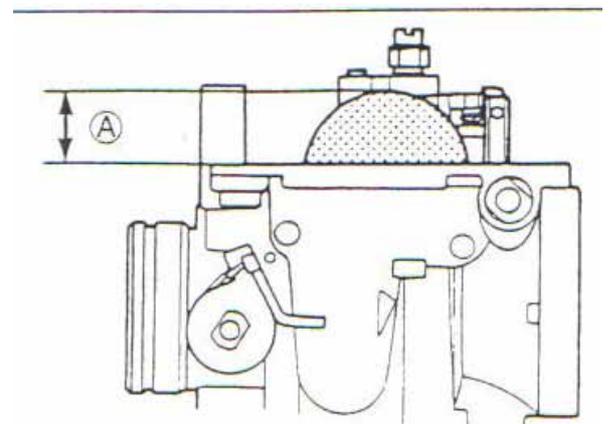
### FLOAT HEIGHT ADJUSTMENT

To check the float height, turn the carburetor upside down.

Measure the float height **A** while the float arm is just contacting the needle valve using vernier calipers. Bend the tongue as necessary to bring the float height **A**

To the specified level.

Float height **A**:  $20.8 \pm 1.0\text{mm}$



**9. A.C. GENERATOR/STARTER CLUTCH BR & M2 250 ENGINE**

---

---

**A.C. GENERATOR/STARTER CLUTCH**

---

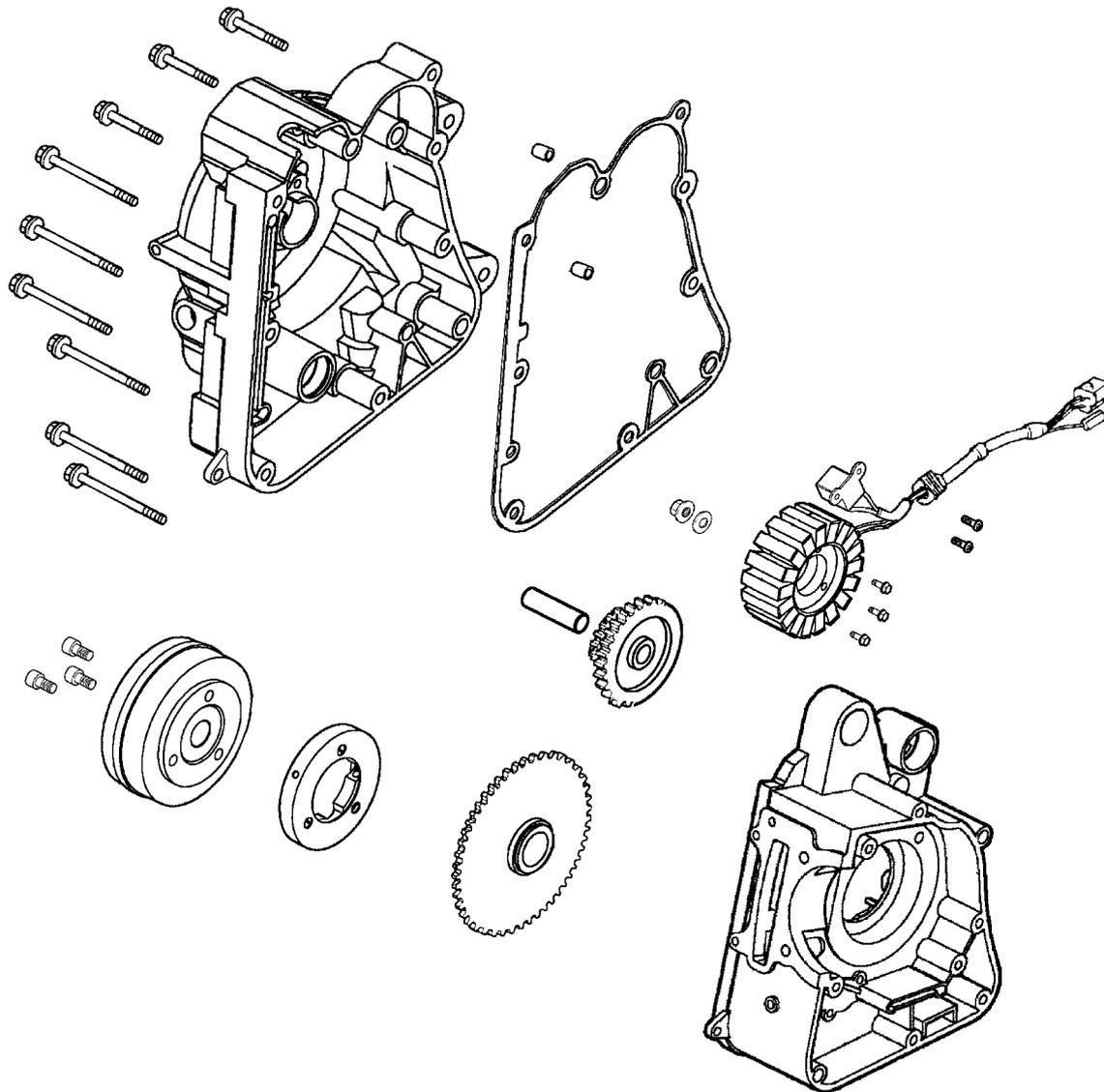
SCHEMATIC DRAWING -----	9-1
SERVICE INFORMATION-----	9-2
TROUBLESHOOTING-----	9-2
RIGHT CRANKCASE COVER REMOVAL -----	9-3
STATOR REMOVAL-----	9-3
FLYWHEEL REMOVAL -----	9-3
STARTER CLUTCH-----	9-4
FLYWHEEL INSTALLATION -----	9-5
STATOR INSTALLATION-----	9-6
RIGHT CRANKCASE COVER INSTALLATION -----	9-6



**9. A.C. GENERATOR/STARTER CLUTCH** BR & M2 250 ENGINE

---

**SCHEMATIC DRAWING**



## **9. A.C. GENERATOR/STARTER CLUTCH BR & M2 250 ENGINE**

---

### **SERVICE INFORMATION**

#### **GENERAL INSTRUCTIONS**

- All servicing operations and inspections in this section can be made with the engine installed.
- Drain the coolant before removing the right crankcase cover.
- Be careful not to drain the coolant when the engine temperature is high. (Perform this operation when the engine is cold.)
- Drain the coolant into a clean container.
- Drain the engine oil into a clean container before removing the right crankcase cover.
- When the right crankcase cover is installed, fill with the recommended engine oil and coolant. Then, bleed air from the water jacket.
- Refer to page 18-4 for A.C. generator inspection.

#### **SPECIFICATIONS**

Engine oil: SAE15W/40#  
API-SG/CD

Oil capacity at change: 0.9 liter

Coolant: distilled water + coolant concentrate

Coolant capacity: 1165cc

#### **SPECIAL TOOLS**

Flywheel puller  
Flywheel holder

#### **SPECIFICATIONS**

Item	Standard (mm)	Service Limit (mm)
Starter driven gear I.D.	22.026~22.045	22.15mm
Starter driven gear O.D.	42.195~42.208	41.5mm

#### **TORQUE VALUES**

Flywheel nut : 34.3~44.1N-m

#### **TROUBLESHOOTING**

Refer to page 1-27 for A.C. generator troubleshooting.

##### **Starter motor rotates but engine does not start**

- Faulty starter clutch
- Starter motor rotates reversely
- Weak battery

# 9. A.C. GENERATOR/STARTER CLUTCH BR & M2 250 ENGINE

## RIGHT CRANKCASE COVER REMOVAL

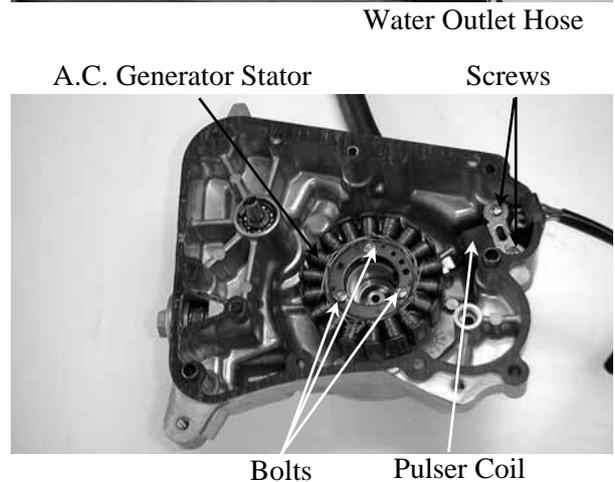
Disconnect the water hoses from the right crankcase cover.  
Remove the nine bolts attaching the right crankcase cover and the cover.



## STATOR REMOVAL

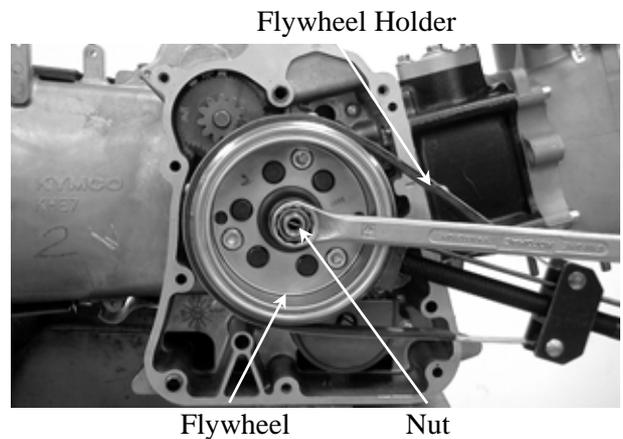
Remove the two pulser coil attaching screws and the pulser coil.  
Remove the three A.C. generator stator bolts and the stator.

\* When removing the pulser coil and stator, be careful not to damage them to avoid shorted or broken wire.

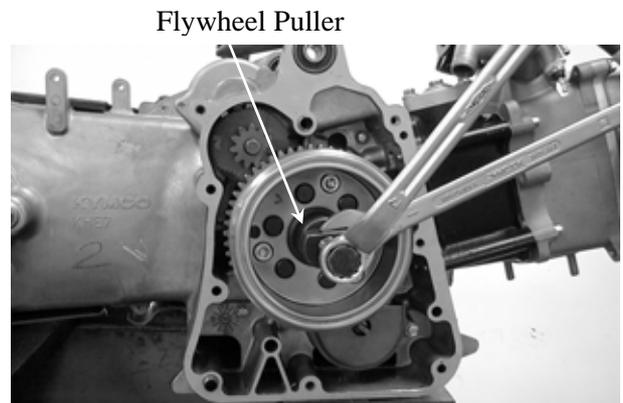


## FLYWHEEL REMOVAL

Hold the flywheel with a flywheel holder and remove the flywheel nut.



Remove the flywheel with a flywheel puller.

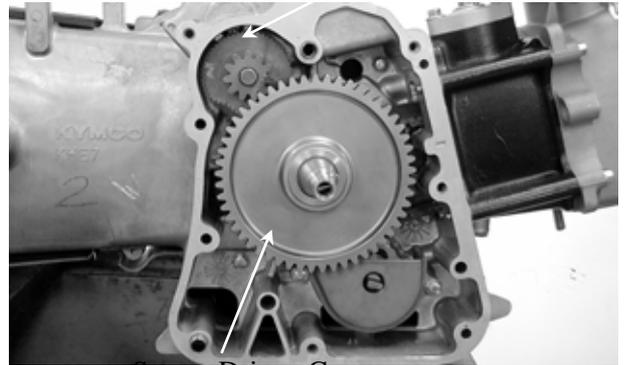


## **9. A.C. GENERATOR/STARTER CLUTCH BR & M2 250 ENGINE**

### **STARTER CLUTCH**

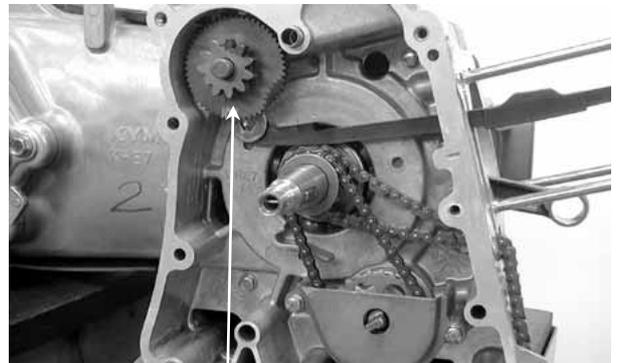
#### **REMOVAL**

Remove the starter driven gear.



Starter Driven Gear

Remove the starter idle gear and shaft.



Starter Idle Gear

#### **INSPECTION**

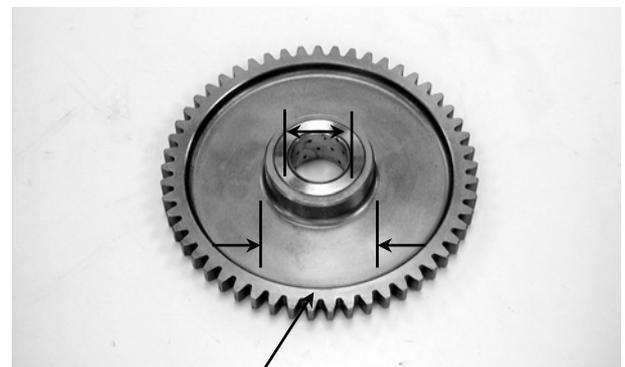
Inspect the starter driven gear for wear or damage.

Measure the starter driven gear I.D. and O.D.

#### **Service Limits:**

**I.D.** : 22.15mm replace if over

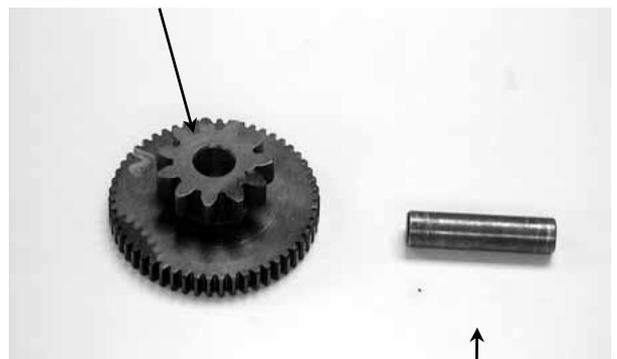
**O.D.** : 41.50mm replace if below



Starter Driven Gear

Starter Idle Gear

Inspect the starter idle gear and shaft for wear or damage.



**9. A.C. GENERATOR/STARTER CLUTCH BR & M2 250 ENGINE**

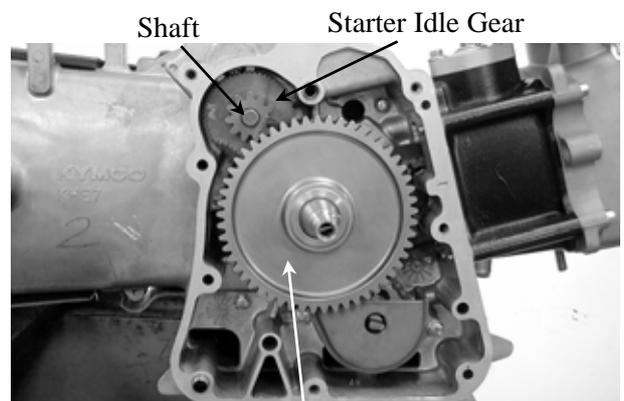
Shaft

Remove the starter one-way clutch rollers, plungers and springs.



**INSTALLATION**

Install the starter driven gear onto the crankshaft.  
Install the starter idle gear and shaft.



Starter Driven Gear

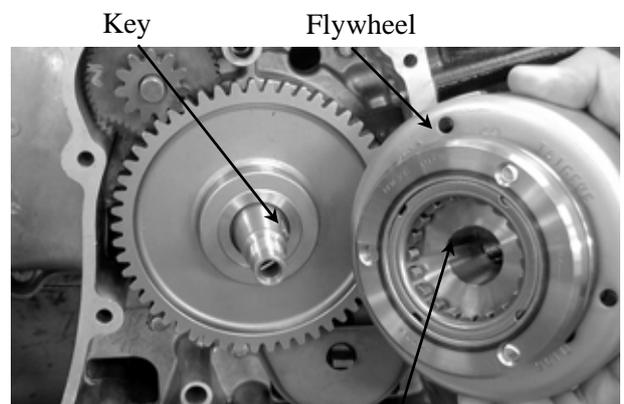
**FLYWHEEL INSTALLATION**

Install the flywheel onto the crankshaft by aligning the key on the crankshaft with the groove in the flywheel.

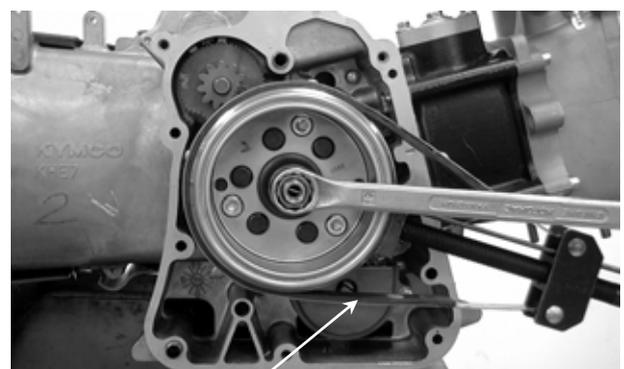
- \* • Before installation, check and make sure that the inside of the flywheel is not contaminated.

Hold the flywheel with the flywheel holder and tighten the flywheel nut.

**Torque:** 34.3~39.2N-m



Groove



Flywheel Holder

## 9. A.C. GENERATOR/STARTER CLUTCH BR & M2 250 ENGINE

### STATOR INSTALLATION

Install the A.C. generator stator on the right crankcase cover and secure it with the three bolts.

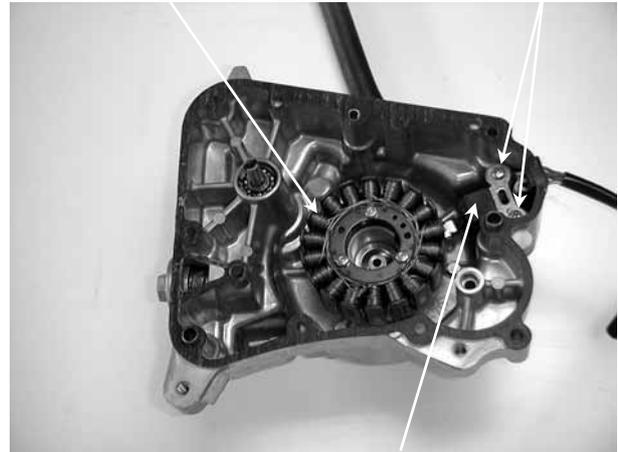
Install the pulser coil on the right crankcase cover and secure it with the two screws.

Install the wire grommet in the groove in the right crankcase cover securely.

\* Be sure to route the stator wire under the pulser coil.

A.C. Generator Stator

Screws

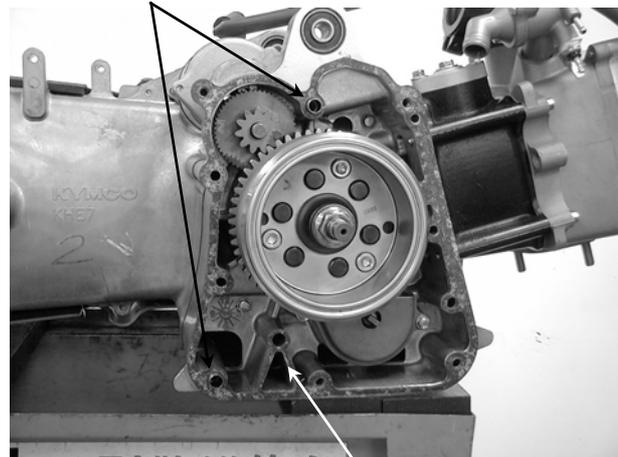


Pulser Coil

### RIGHT CRANKCASE COVER INSTALLATION

Install the two dowel pins and a new gasket.

Dowel Pins



Gasket

Install the right crankcase cover over the crankcase, aligning the water pump shaft groove with the oil pump shaft.

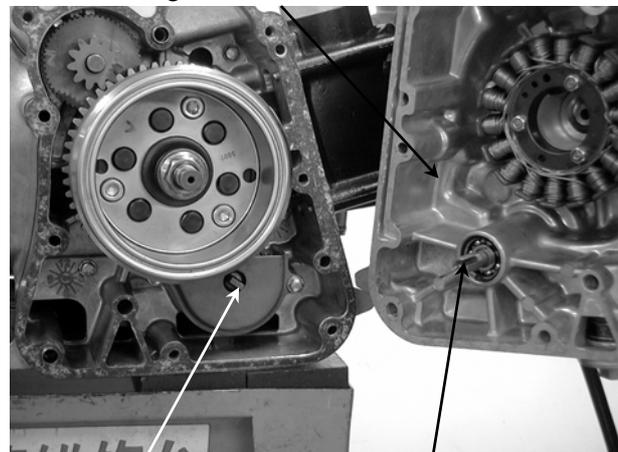
Tighten the nine right crankcase cover bolts. Connect the water hoses to the right crankcase cover.

Add the recommended engine oil. (⇒3-3)

Fill the cooling system with the specified coolant. (⇒1-9)

\* Be sure to bleed air from the water jacket after filling the coolant.

Right Crankcase Cover



Oil Pump Shaft

Water Pump Shaft

# 10. CRANKCASE/CRANKSHAFT

---

---

---

---

---

---

---

---

## CRANKCASE/CRANKSHAFT

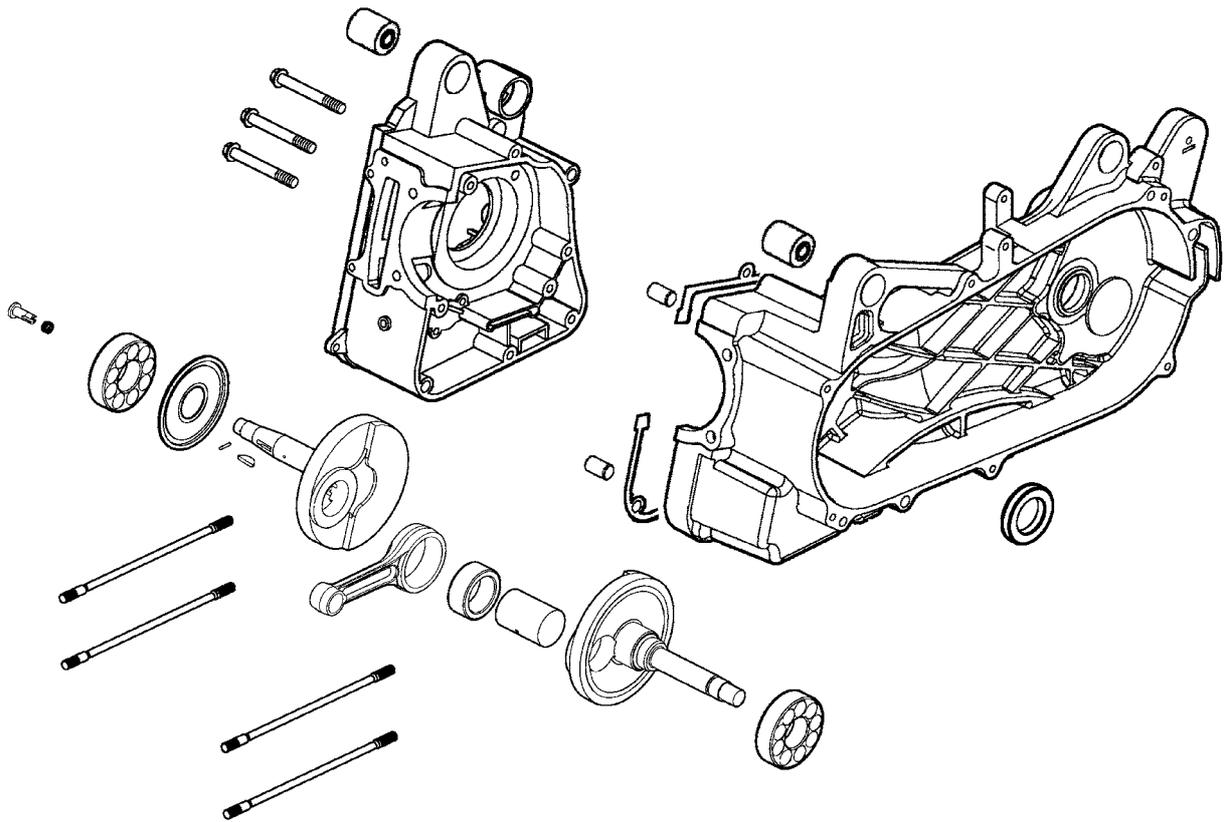
---

SCHEMATIC DRAWING -----	10-1
SERVICE INFORMATION-----	10-2
TROUBLESHOOTING-----	10-2
CRANKCASE SEPARATION -----	10-3
CRANKSHAFT INSPECTION-----	10-4
CRANKCASE ASSEMBLY -----	10-5

# 10. CRANKCASE/CRANKSHAFT

---

## SCHEMATIC DRAWING



# 10. CRANKCASE/CRANKSHAFT

## SERVICE INFORMATION

### GENERAL INSTRUCTIONS

- This section covers crankcase separation to service the crankshaft. The engine must be removed for this operation.
- When separating the crankcase, never use a driver to pry the crankcase mating surfaces apart forcibly to prevent damaging the mating surfaces.
- When installing the crankcase, do not use an iron hammer to tap it.
- The following parts must be removed before separating the crankcase.
  - Cylinder head (⇒4-4)
  - Cylinder/piston (⇒5-3)
  - Right crankcase cover/drive and driven pulley (⇒6-3)
  - A.C. generator/starter clutch (⇒9-3)
  - Rear wheel/rear shock absorber
  - Starter motor
  - Oil pump (⇒3-4)

### SPECIFICATIONS

	Item	Standard (mm)	Service Limit (mm)
Crankshaft	Connecting rod big end side clearance	0.15~0.35	0.6
	Connecting rod big end radial clearance	0.~0.008	0.05
	Runout	—	0.10

### TORQUE VALUES

- Crankcase bolt 7.8~10.8N-m
- Cam chain tensioner slipper bolt 7.8~11.8N-m

### SPECIAL TOOL

Gear remover

### TROUBLESHOOTING

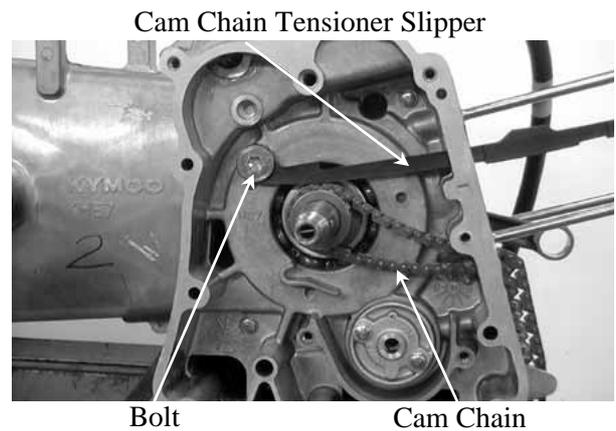
#### Excessive engine noise

- Excessive bearing play
- Excessive crankpin bearing play
- Worn piston pin and piston pin hole

# 10. CRANKCASE/CRANKSHAFT

## CRANKCASE SEPARATION

Remove the cam chain tensioner slipper bolt.  
Remove the cam chain tensioner slipper and cam chain.  
Remove the three right crankcase attaching bolts.



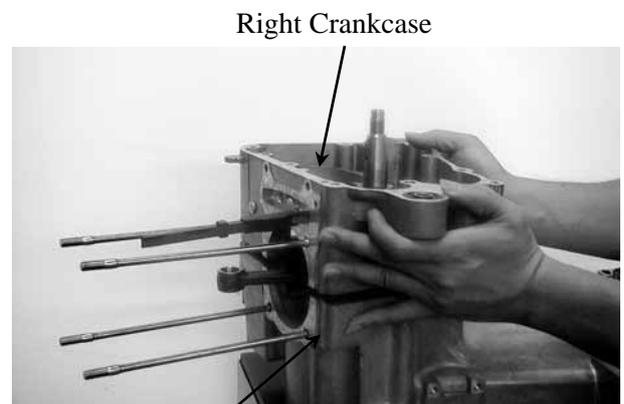
Remove the left crankcase.



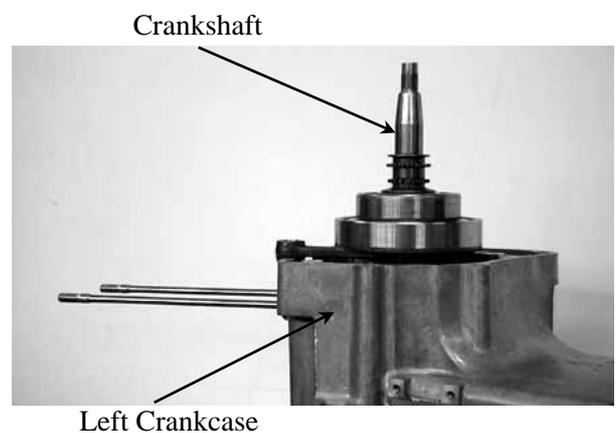
Place the crankcase with the left crankcase down and remove the right crankcase from the left crankcase.

- \* • Never use a driver to pry the crankcase mating surfaces apart.

Remove the gasket and dowel pins.



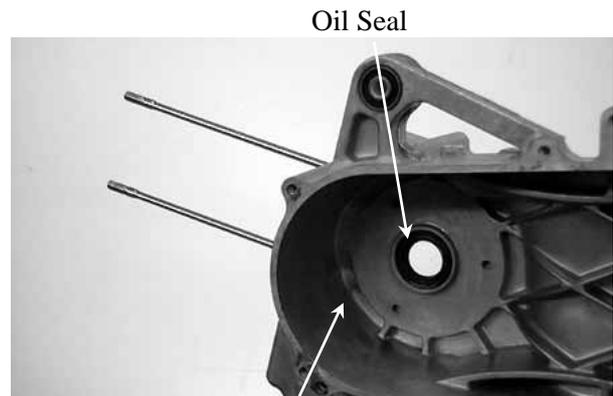
Remove the crankshaft from the left crankcase.



## 10. CRANKCASE/CRANKSHAFT

---

Remove the oil seal from the left crankcase.

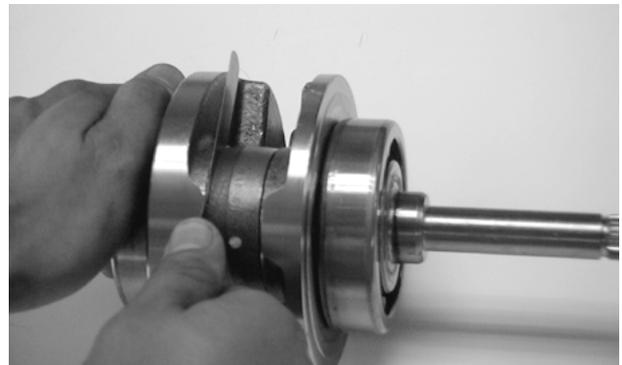


Left Crankcase

### CRANKSHAFT INSPECTION

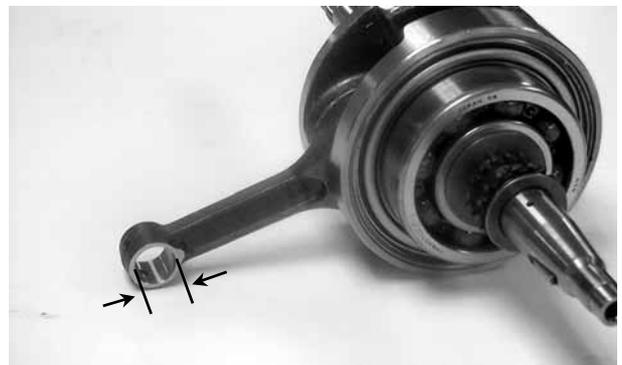
Measure the connecting rod big end side clearance.

**Service Limit:** 0.6mm replace if over



Measure the connecting rod small end I.D.

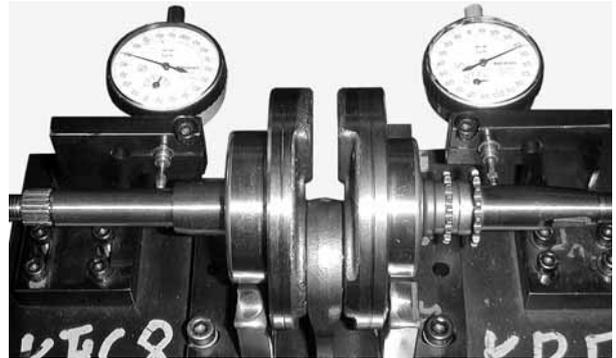
**Service Limit:** 17.06mm replace if over



# 10. CRANKCASE/CRANKSHAFT

Measure the crankshaft runout.

**Service Limit:** 0.10mm replace if over

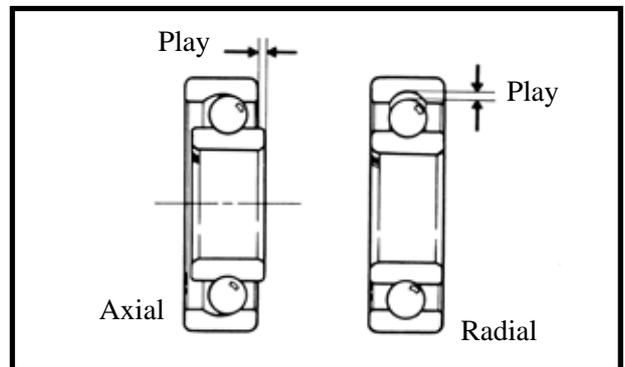


Measure the crankshaft bearing play.

**Service Limits:**

Axial : 0.20mm replace if over

Radial: 0.05mm replace if over



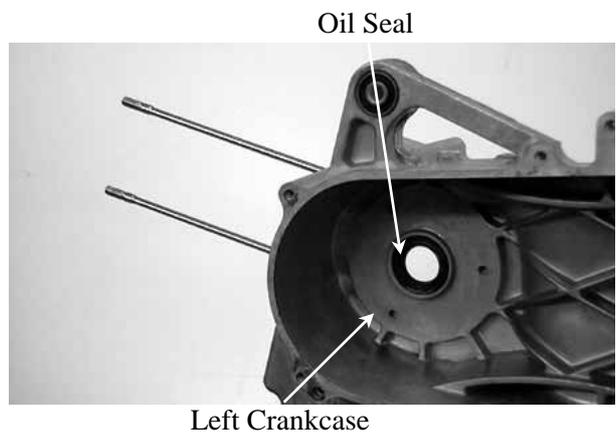
## CRANKCASE ASSEMBLY

Clean off all gasket material from the crankcase mating surfaces.

- \* Avoid damaging the crankcase mating surfaces.



Install a new oil seal into the left crankcase.



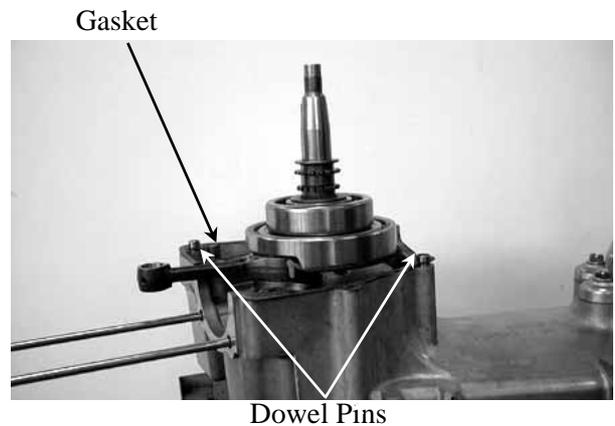
## 10. CRANKCASE/CRANKSHAFT

Place the left crankcase down and install the crankshaft into the left crankcase.

- \* • Avoid damaging the oil seal.
- Apply grease to the lip of the oil seal.

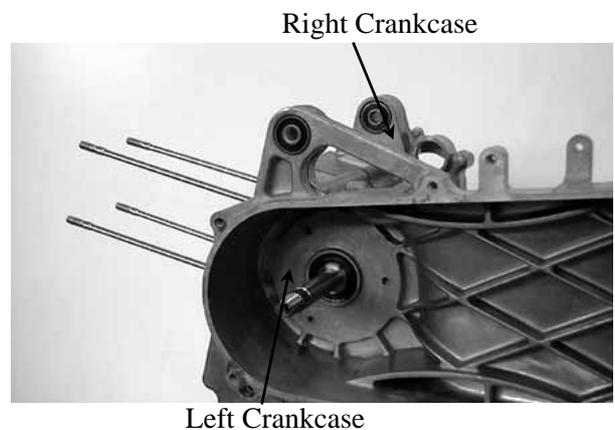


Install the two dowel pins and a new gasket.



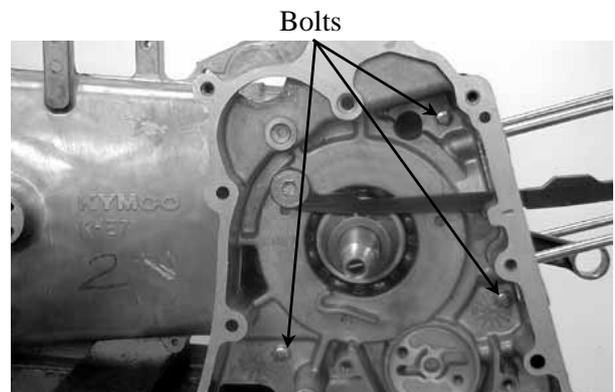
Place the right crankcase over the crankshaft and onto the left crankcase.

- \* • Install the right crankcase squarely and do not tap it with an iron or plastic hammer.



Install and tighten the right and left crankcase attaching bolts.

**Torque:** 7.8~10.8N-m



## 10. CRANKCASE/CRANKSHAFT

---

Install the cam chain.  
Install the cam chain tensioner slipper.  
Install and tighten the cam chain tensioner slipper bolt.

**Torque:** 7.8~11.8N-m



Cam Chain Tensioner Slipper

Bolt

# **11. COOLING SYSTEM**

---

---

---

---

---

---

---

## **COOLING SYSTEM**

---

SCHEMATIC DRAWING -----	11- 1
SERVICE INFORMATION-----	11- 2
TROUBLESHOOTING-----	11- 2
COOLING SYSTEM TESTING-----	11- 4
RADIATOR -----	11- 4
WATER PUMP -----	11-15
THERMOSTAT-----	11-16



# 11. COOLING SYSTEM

---

## SERVICE INFORMATION

### GENERAL INSTRUCTIONS

- The water pump must be serviced after removing the engine. Other cooling system service can be done with the engine installed in the frame.
- The engine must be cool before servicing the cooling system.  
When the coolant temperature is over 100°C, never remove the radiator cap to release the pressure because the boiling coolant may cause danger.
- Avoid spilling coolant on painted surfaces because the coolant will corrode the painted surfaces.  
Wash off any spilled coolant with fresh water as soon as possible.
- After servicing the system, check for leaks with a cooling system tester.

### SPECIAL TOOL

Mechanical seal driver

### TORQUE VALUES

Water pump impeller	9.8~13.7N-m
Water pump cover bolt	7.8~11.8N-m

### TROUBLESHOOTING

#### Engine temperature too high

- Faulty temperature gauge or thermosensor
- Faulty radiator cap
- Faulty thermostat
- Insufficient coolant
- Passages blocked in hoses or water jacket
- Clogged radiator fins
- Passages blocked in radiator
- Faulty water pump

#### Temperature gauge pointer does not register the correct coolant temperature

- Faulty temperature gauge or thermosensor
- Faulty thermostat

#### Coolant leaks

- Faulty pump mechanical (water) seal
- Deteriorated O-rings
- Damaged or deteriorated water hoses

# 11. COOLING SYSTEM

## SPECIFICATIONS

Radiator cap relief pressure		0.9±0.15kg/cm <sup>2</sup>	
Thermostat temperature	Begins to open	80±2°C	
	Full-open	90°C	
	Valve lift	3.5~4.5mm	
Coolant capacity		Total system 1165cc	Radiator: 825cc Reserve tank: 340cc

## COOLANT GRAVITY

Temp. °C \ Coolant concentration	0	5	10	15	20	25	30	35	40	45	50
5%	1.009	1.009	1.008	1.008	1.007	1.006	1.005	1.003	1.001	0.009	0.997
10%	1.018	1.107	1.017	1.016	1.015	1.014	0.013	1.011	1.009	1.007	1.005
15%	1.028	1.027	1.026	1.025	1.024	1.022	1.020	1.018	1.016	1.014	1.012
20%	1.036	1.035	1.034	1.033	1.031	1.029	1.027	1.025	1.023	1.021	1.019
25%	1.045	1.044	1.043	1.042	1.040	1.038	1.036	1.034	1.031	1.028	1.025
30%	1.053	1.051	1.051	1.049	1.047	1.045	1.043	1.041	1.038	1.035	1.032
35%	1.063	1.062	1.060	1.058	1.056	1.054	1.052	1.049	1.046	1.043	1.040
40%	1.072	1.070	1.068	1.066	1.064	1.062	1.059	1.056	1.053	1.050	1.047
45%	1.080	1.078	1.076	1.074	1.072	1.069	1.056	1.063	1.062	1.057	1.054
50%	1.086	1.084	1.082	1.080	1.077	1.074	1.071	1.068	1.065	1.062	1.059
55%	1.095	1.093	1.091	1.088	1.085	1.082	1.079	1.076	1.073	1.070	1.067
60%	1.100	1.098	1.095	1.092	1.089	1.086	1.083	1.080	1.077	1.074	1.071

## COOLANT MIXTURE (WITH ANTI-RUST AND ANTI-FREEZING EFFECTS)

Freezing Point	Mixing Rate	SIGMA Coolant Concentrate	Distilled Water
-9°C	20%		
-15°C	30%	360cc	825cc
-25°C	40%		
-37°C	50%		
-44.5°C	55%		

### Cautions for Using Coolant:

- Use coolant of specified mixing rate. (The mixing rate of 360cc SIGMA coolant concentrate + 825cc distilled water is 30%.)
- Do not mix coolant concentrate of different brands.
- Do not drink the coolant which is poisonous.
- The freezing point of coolant mixture shall be 5°C lower than the freezing point of the riding area.

# 11. COOLING SYSTEM

## COOLING SYSTEM TESTING

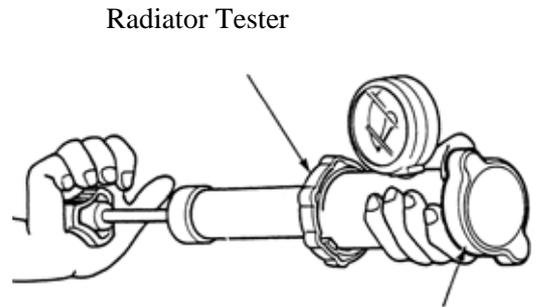
### RADIATOR CAP INSPECTION

Install the radiator cap onto the radiator tester and apply specified pressure to it. It must hold specified pressure for at least six seconds.

- \* Apply water to the cap sealing surface before testing.

#### Radiator Cap Relief Pressure:

$0.9 \pm 0.15 \text{ kg/cm}^2$



Radiator Cap

Install the radiator tester onto the radiator and apply specified pressure to it. It must hold specified pressure for at least six seconds.

Check the water hoses and connectors for leaks.

- \* The test pressure should not exceed  $1.05 \text{ kg/cm}^2$ . Excessive pressure can damage the radiator and its hose

## RADIATOR

### RADIATOR INSPECTION

Remove the front upper cover. (⇒2-5)

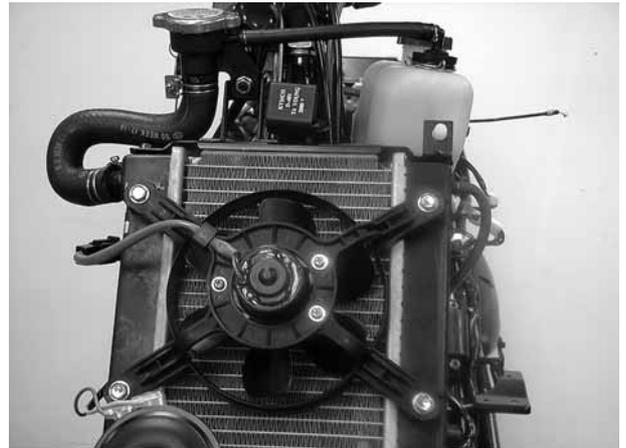
Remove the front lower cover. (⇒2-5)



## 11. COOLING SYSTEM

Inspect the radiator soldered joints and seams for leaks.

Blow dirt out from between core fins with compressed air. If insects, etc., are clogging the radiator, wash them off. Carefully straighten any bent fins.



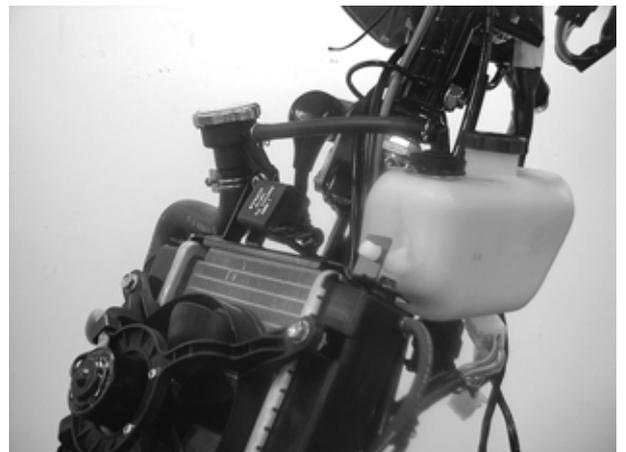
### RADIATOR REMOVAL

Drain the coolant. (⇒3-9)

Disconnect the air vent tube from the radiator filler.

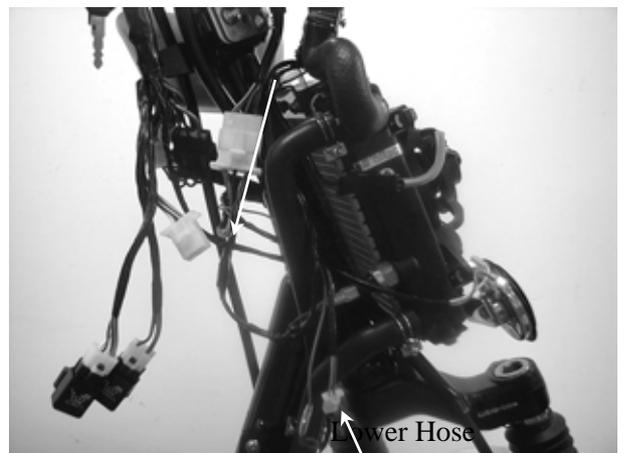
Remove the overflow tube clamp and disconnect the overflow tube.

Overflow Tube



Upper Hose

Loosen the hose band and disconnect the upper hose and lower hose from the radiator.

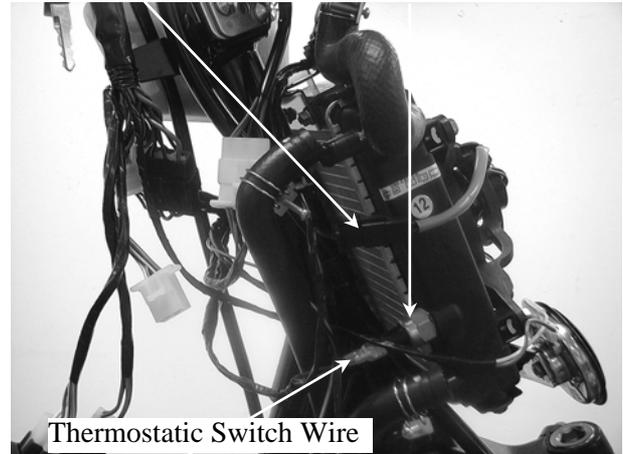


Lower Hose

# 11. COOLING SYSTEM

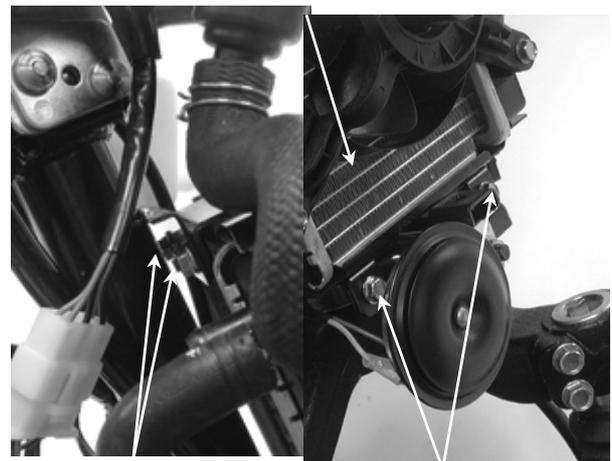
Disconnect the thermostatic switch wire coupler.  
Disconnect the fan motor wire coupler.

Fan Motor Wire Coupler    Thermostatic Switch



Remove the two bolts and two nuts on the radiator.

Radiator



Nuts

Bolts

Fan/Shroud

## **RADIATOR DISASSEMBLY**

Remove the four bolts and then remove the fan/shroud from the radiator.



# 11. COOLING SYSTEM

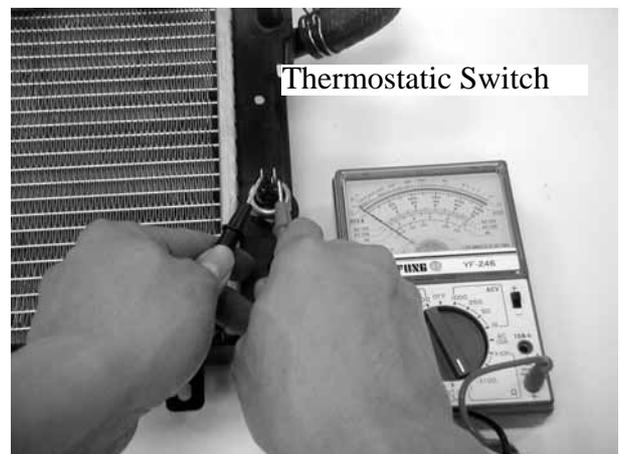
Check fan motor by battery.



Fan Motor

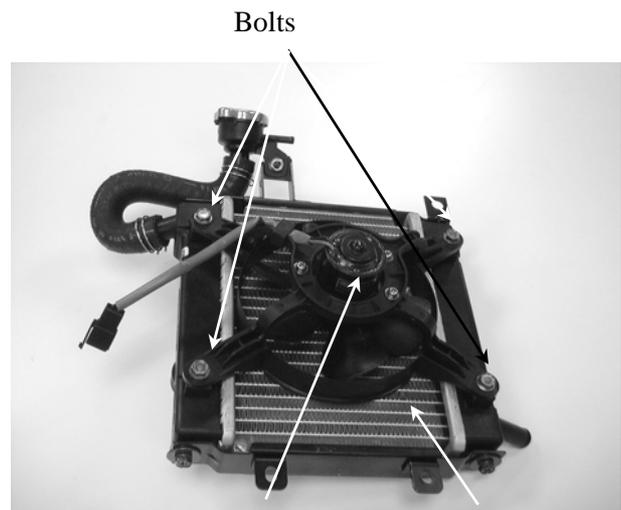
### CHECK THERMOSTATIC SWITCH

When coolant temperature lower then 85~90°C the thermostatic switch OFF.  
When coolant temperature over 85~90°C the thermostatic switch ON.



Thermostatic Switch

Install the fan shroud on the radiator with the four bolts.



Fan Shroud

Radiator

# 11. COOLING SYSTEM

Radiator

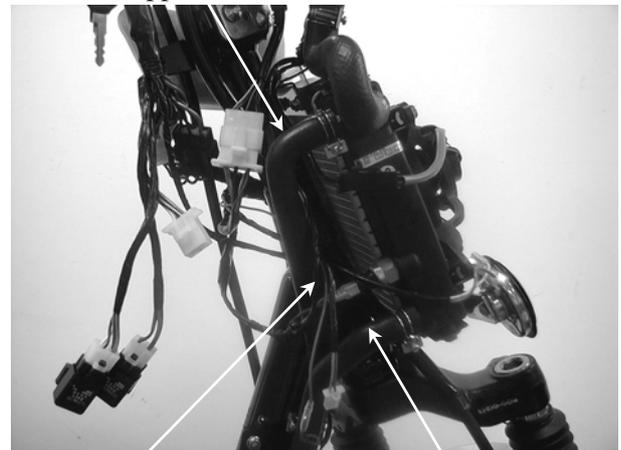
## RADIATOR INSTALLATION

Install the radiator on the radiator bracket with the two bolts and two nuts.



Connect the upper and lower hoses and secure them with hose bands.  
Connect the thermostatic switch wire and fan motor wire couplers.

Upper Hose



Thermostatic Switch Wire

Lower Hose

Connect the overflow tube and secure with the tube clamp.  
Fill the radiator with coolant. (⇒3-9)  
Connect the vent tube to the radiator filler.  
After installation, check for coolant leaks.

- If you want to refill the coolant, the following procedure must be checked.
1. Please make the radiator filler and the air vent tube to be separated.
  2. Then start the engine, filled in the coolant till the coolant flowed out from the air vent tube.
  3. Put the air vent tube on.

Overflow Tube



Air Vent Tube

# 11. COOLING SYSTEM

---

Install the front upper cover.

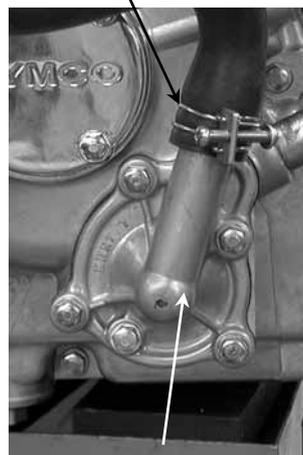


## WATER PUMP

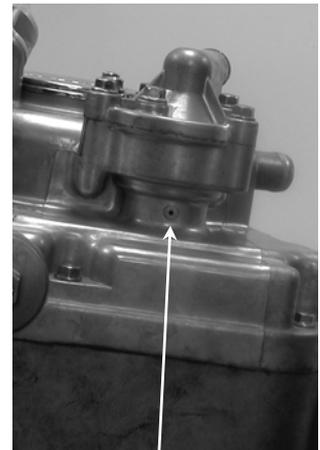
### MECHANICAL SEAL (WATER SEAL) INSPECTION

Inspect the telltale hole for signs of mechanical seal coolant leakage. If the mechanical seal is leaking, remove the right crankcase cover and replace the mechanical seal.

Right Crankcase Cover



Water Pump



Telltale Hole

### WATER PUMP/IMPELLER REMOVAL

Remove the coolant inlet hose and outlet hose.

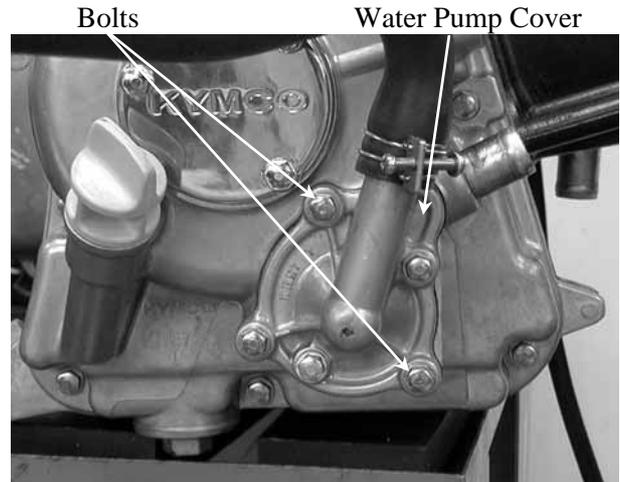
Outlet Hose



Inlet Hose

# 11. COOLING SYSTEM

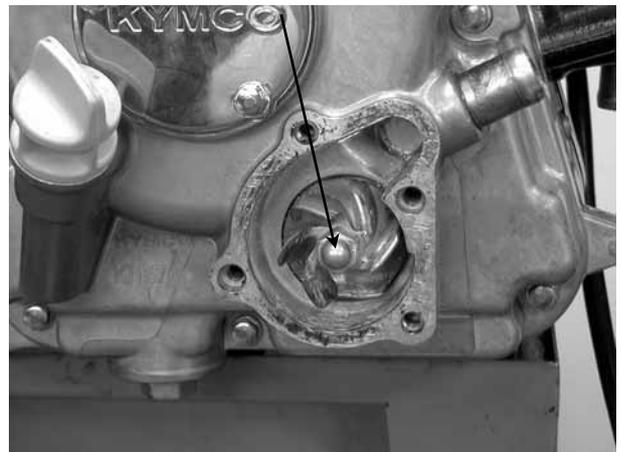
Remove the four bolts and the water pump cover, gasket and 2 dowel pins.



Remove the water pump impeller.

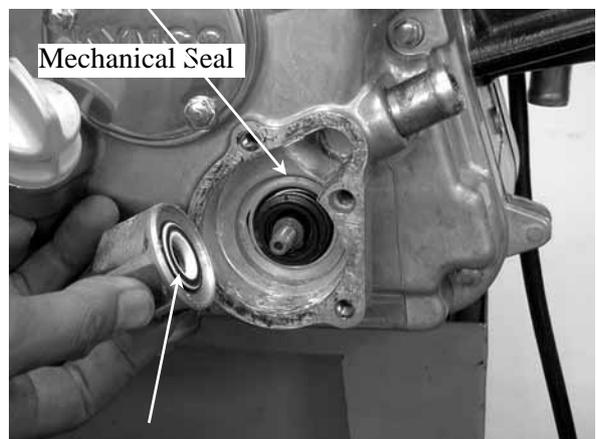
Impeller (Left Hand Threads)

\* The impeller has left hand threads.



Inspect the mechanical (water) seal and seal washer for wear or damage.

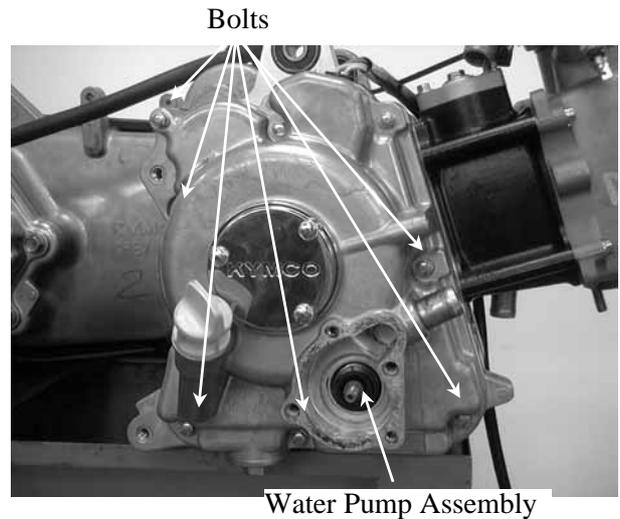
\* The mechanical seal and seal washer must be replaced as a set.



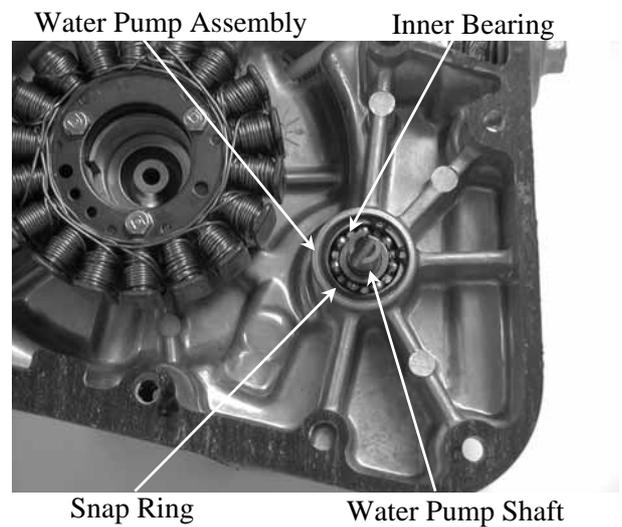
# 11. COOLING SYSTEM

## WATER PUMP SHAFT REMOVAL

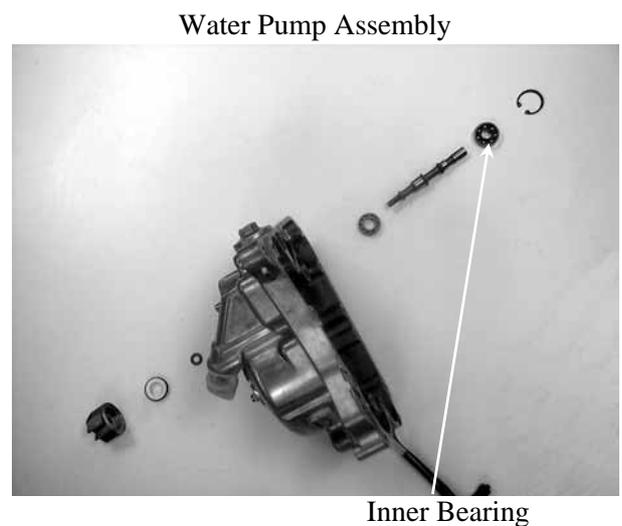
Disconnect the water hose from the right crankcase cover.  
Remove the eight bolts attaching the right crankcase cover.



Remove the water pump bearing snap ring from the water pump assembly.  
Remove the water pump shaft and inner bearing.



Remove the water pump shaft outer bearing.



# 11. COOLING SYSTEM

## MECHANICAL SEAL REPLACEMENT

Drive the mechanical seal out of the water pump assembly from the inside.

Water Pump Assembly



Drive in a new mechanical seal using a mechanical seal driver.

- \* Apply sealant to the right crankcase cover fitting surface of a new mechanical seal and then drive in the mechanical seal.

Mechanical Seal Driver



Outer Bearing

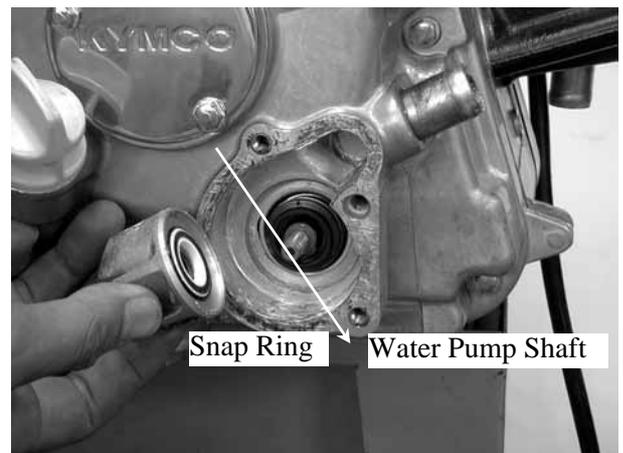


## WATER PUMP SHAFT INSTALLATION

Drive a new water pump shaft outer bearing into the water pump assembly from the inside.

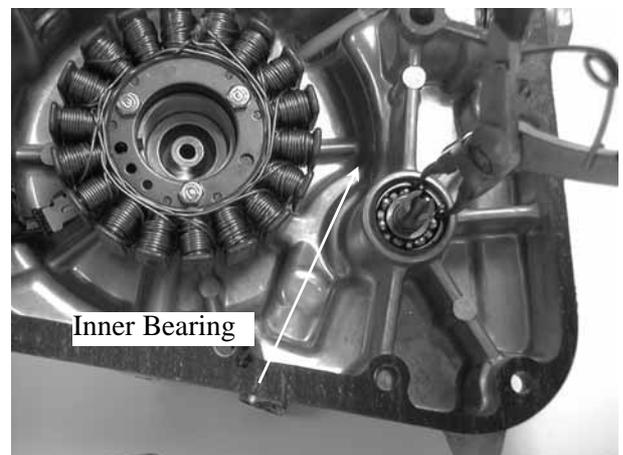
# 11. COOLING SYSTEM

Install the water pump shaft and shaft inner bearing into the waster pump assembly. Install the snap ring to secure the inner bearing properly.



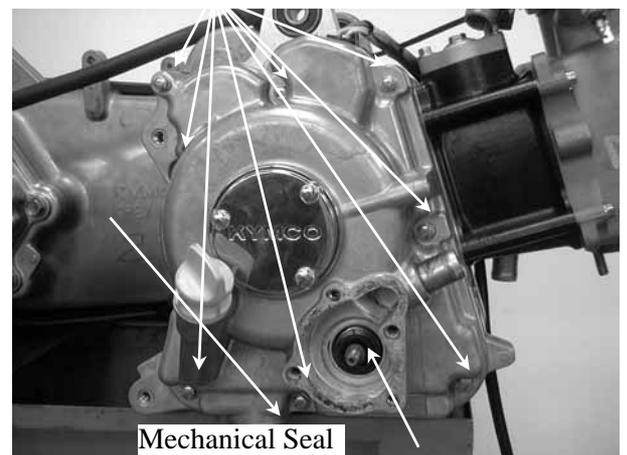
Install the dowel pins and a new gasket and then install the water pump assembly to the right crankcase cover. Tighten the eight bolts to secure the right crankcase cover.

\* When installing the water pump assembly, aligning the groove on the water pump shaft with the tab on the oil pump shaft.



## WATER PUMP/IMPELLER INSTALLATION

When the mechanical seal is replaced, a new seal washer must be installed to the impeller.



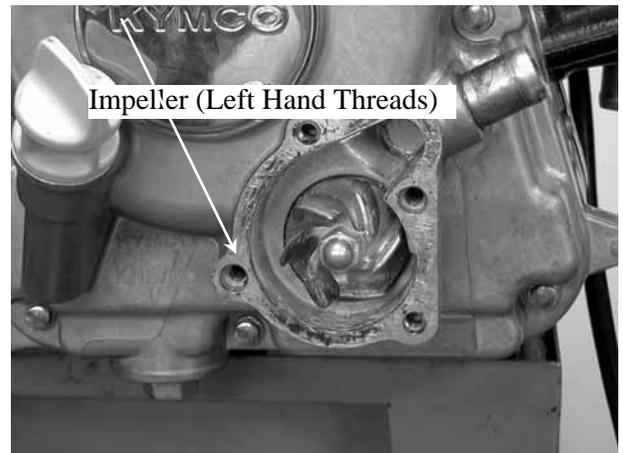
Water Pump Assembly

# 11. COOLING SYSTEM

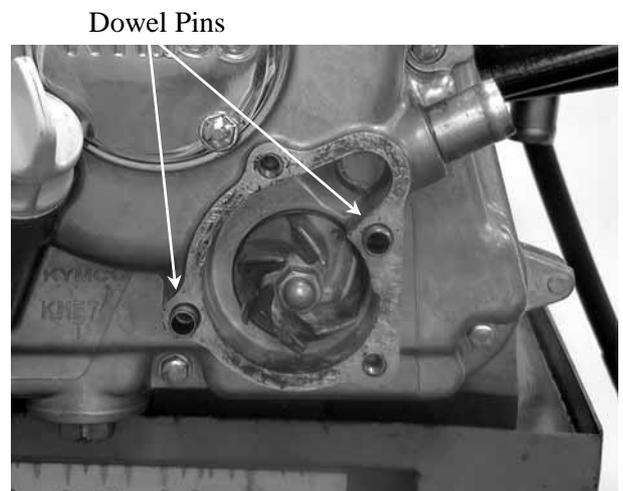
Install the impeller onto the water pump shaft.

**Torque:** 9.8~13.7N-m

\* The impeller has left hand threads.

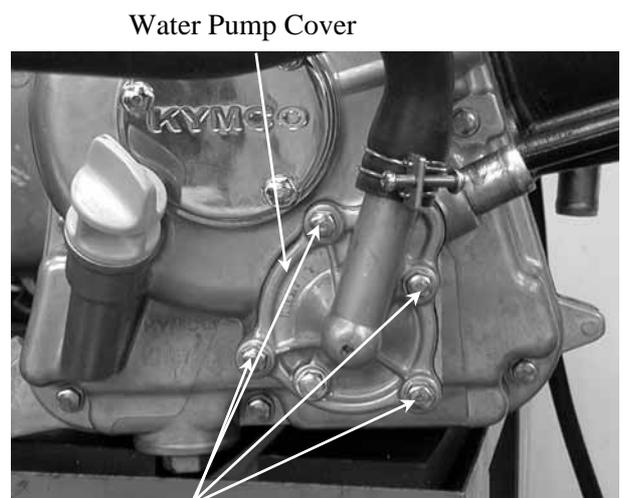


Install the two dowel pins and a new gasket.



Install the water pump cover and tighten the 4 bolts.

**Torque:** 7.8~11.8N-m



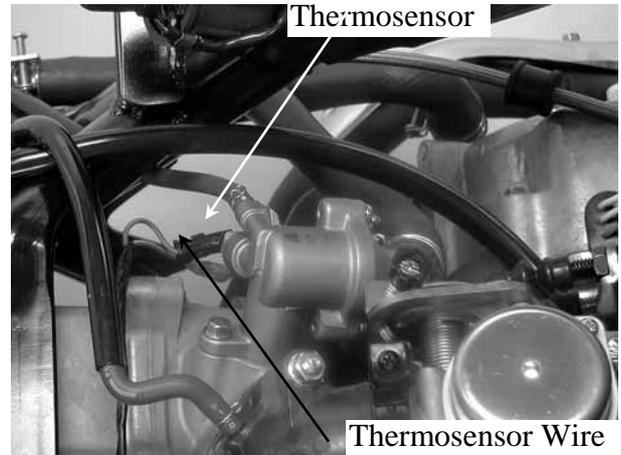
Bolts

# 11. COOLING SYSTEM

## THERMOSENSOR

### THERMOSENSOR REMOVAL

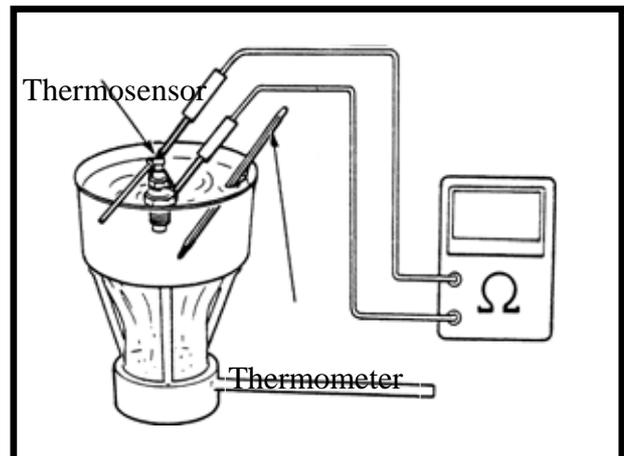
- Remove the seat, met-in box and center cover.
- Drain the coolant.
- Disconnect the thermosensor wire.
- Remove the thermosensor.



### THERMOSENSOR INSPECTION

Suspend the thermosensor in a pan of water over a burner and measure the resistance through the sensor as the water heats up.

Temperature(°C)	50	80	100	120
Resistance(Ω)	154	52	27	16



Thermosensor Wire

### THERMOSENSOR INSTALLATION

- Apply 3-BOND No. 1212 sealant or equivalent to the thermosensor threads and install it into the thermostat housing.
- Connect the thermosensor wire.
- Fill the radiator with coolant. (⇒3-9)
- Install the center cover, met-in box and seat. (⇒2-3)

\* Be sure to bleed air from the cooling system.



# 11. COOLING SYSTEM

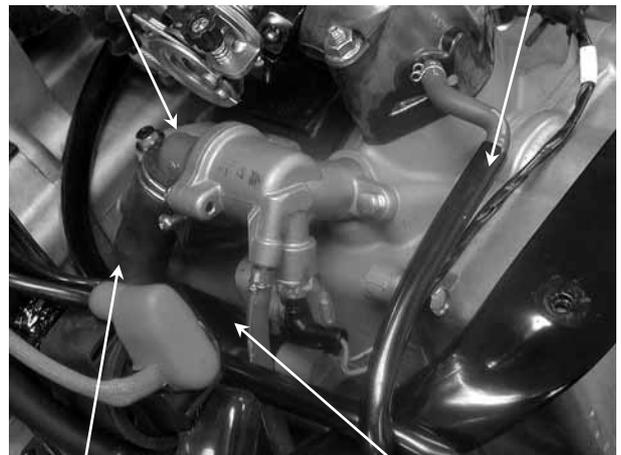
## THERMOSTAT

### THERMOSTAT REMOVAL

Remove the seat, met-in box and center cover.  
Drain the coolant.  
Disconnect the thermosensor wire from the thermosensor.  
Disconnect the water hose from the thermostat housing.  
Disconnect the air vent tube from the thermostat housing.  
Remove the mounting bolt and the thermostat housing from the cylinder head.

Thermostat

Bolt



Water Hose

Air Vent Tube

Remove the two bolts and separate the thermostat housing halves.

Bolts



Thermostat

Remove the thermostat from the thermostat housing.

Thermostat



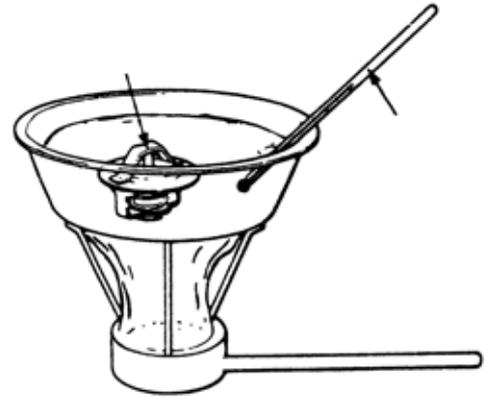
# 11. COOLING SYSTEM

## THERMOSTAT INSPECTION

Suspend the thermostat in a pan of water over a burner and gradually raise the water temperature to check its operation.

### Technical Data

Begins to open	80±2°C
Full-open	90°C
Valve lift	3.5 ~ 4.5mm



Thermometer

- \* Do not let the thermostat touch the pan as it will give a false reading.
- \* Replace the thermostat if the valve stays open at room temperature.
- \* Test the thermostat after it is opened for about 5 minutes and holds the temperature at 70°C.



Thermostat Housing

## THERMOSTAT INSTALLATION

The installation sequence is the reverse of removal.

- \* Replace the O-ring with a new one and apply grease to it.

Thermostat



Fill the cooling system with the specified coolant. (⇒3-9)

# 1. INSPECTION/ADJUSTMENT

---

1

---

## INSPECTION/ADJUSTMENT

---

SERVICE INFORMATION-----	1-1
MAINTENANCE SCHEDULE-----	1-2
FUEL LINE/FUEL FILTER-----	1-3
THROTTLE OPERATION-----	1-3
ENGINE OIL -----	1-4
AIR CLEANER -----	1-5
SPARK PLUG-----	1-5
VALVE CLEARANCE -----	1-6
CARBURETOR IDLE SPEED -----	1-6
CYLINDER COMPRESSION -----	1-7
FINAL REDUCTION GEAR OIL -----	1-8
DRIVE BELT -----	1-8
HEADLIGHT AIM -----	1-9
CLUTCH SHOE WEAR -----	1-9
COOLING SYSTEM-----	1-9
BRAKE SYSTEM -----	1-10
NUTS/BOLTS/FASTENERS -----	1-11
WHEELS/TIRES -----	1-11
STEERING HANDLEBAR -----	1-11
SUSPENSION-----	1-11



# 1. INSPECTION/ADJUSTMENT

## MAINTENANCE SCHEDULE

Perform the periodic maintenance at each scheduled maintenance period.

I: Inspect, and Clean, Adjust, Lubricate or Replace if necessary.

A: Adjust C: Clean R: Replace T: Tighten

Item	Frequency	Whichever comes first ⇔ ↓	Regular Service Mileage (km)					
			1000	2000	4000	6000	8000	10000
Engine oil			R New motorcycle 300km	R	R	R	R	R
Engine oil filter screen					C		C	
Fuel filter screen								R
Gear oil	Note 3		R New motorcycle 300km		R			R
Valve clearance				A	A		A	
Carburetor					I		I	
Air Cleaner	Note 2,3		I		R			R
Spark plug			Clean at every 3000km and replace if necessary					
Brake system			I	I	I	I	I	I
Drive belt							I	
Suspension					I		I	
Nut, bolt, fastener							I	
Tire					I		I	
Steering head bearing			I			I	I	
Brake fluid			Perform pre-ride inspection daily					
Radiator coolant			Replace every year or at every 10000km (R)					
Radiator core						I		I
Radiator cap						I		I
Brake lever					I			I
Brake pad wear					I			I
Shock absorber					I			I

• In the interest of safety, we recommend these items be serviced only by an authorized KYMCO motorcycle dealer.

Note: 1. For higher odometer readings, repeat at the frequency interval established here.

2. Service more frequently when riding in dusty or rainy areas.

3. Service more frequently when riding in rain or at full throttle.

# 1. INSPECTION/ADJUSTMENT

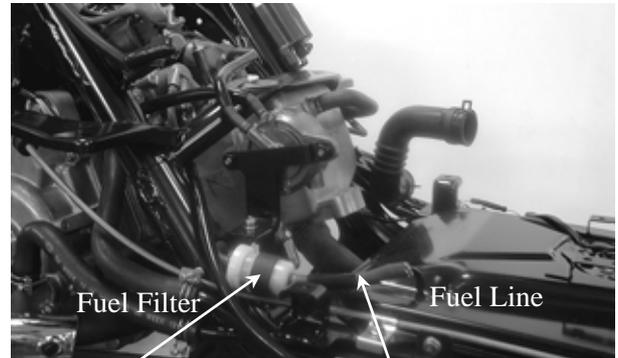
## FUEL LINE/FUEL FILTER

Remove the center cover.

Check the fuel lines and replace any parts, which show signs of deterioration, damage or leakage.

Check for dirty or clogged fuel filter and replace with a new one if it is clogged.

- \* • Do not smoke or allow flames or sparks in your working area.



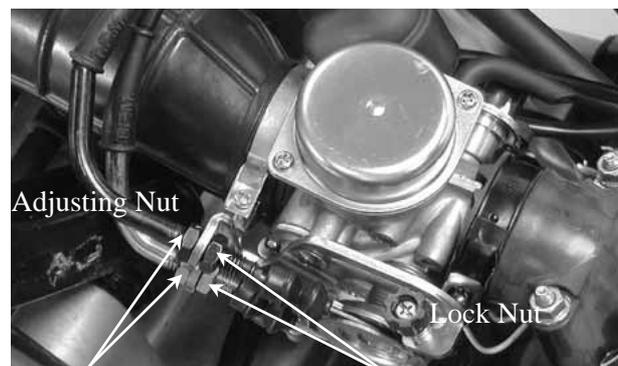
## THROTTLE OPERATION

Check the throttle grip for smooth movement.  
Measure the throttle grip free play.

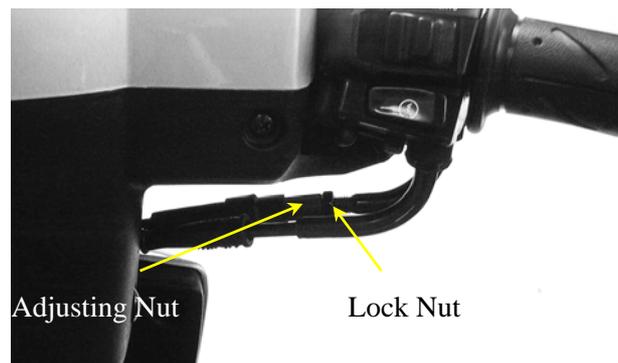
**Free Play:** 2~6mm



Major adjustment of the throttle grip free play is made with the adjusting nut at the carburetor side. Adjust by loosening the lock nut and turning the adjusting nut.



Minor adjustment is made with the adjusting nut at the throttle grip side. Slide the rubber cover out and adjust by loosening the lock nut and turning the adjusting nut.



# 1. INSPECTION/ADJUSTMENT

## ENGINE OIL

### OIL LEVEL INSPECTION

Stop the engine and support the motorcycle upright on level ground.  
Wait for 2~3 minutes and check the oil level with the dipstick. Do not screw in the dipstick when making this check.



### OIL CHANGE

- \* Drain the oil while the engine is warm.

Remove the oil drain bolt to drain the engine oil.  
Install the aluminum washer and tighten the oil drain bolt.

**Torque:** 14.7N-m

- \* Replace the aluminum washer with a new one if it is deformed or damaged.

Pour the recommended oil through the oil filler hole.

### Oil Capacity:

At disassembly: 1.1 liter

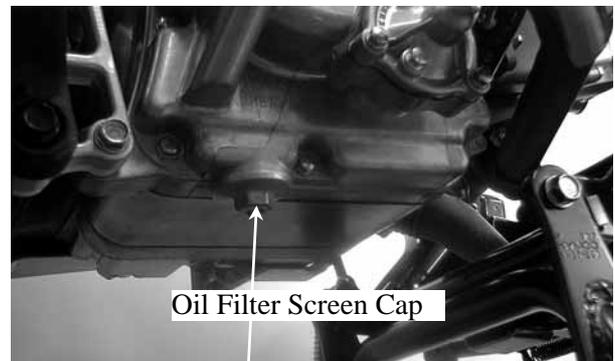
At change: 0.9 liter

### Recommended Oil:

SAE: 15W40#

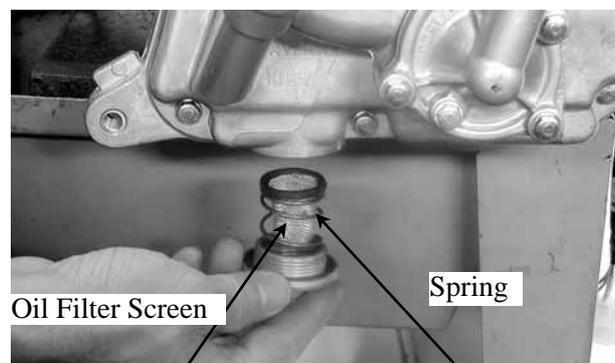
API: SG/CD

Start the engine and check for oil leaks.  
Stop the engine and recheck the oil level.



### OIL FILTER SCREEN INSPECTION

Drain the engine oil.  
Remove the oil filter screen and spring.  
Clean the oil filter screen.  
Install the oil filter screen, spring, and filter screen cap.  
Fill the engine with recommended engine oil.



# 1. INSPECTION/ADJUSTMENT

## AIR CLEANER

Remove the eight air cleaner case cover screws and the cover.



Remove the air cleaner element.  
Check the element and replace it if it is excessively dirty or damaged.

Air Cleaner Element

## CHANGE INTERVAL

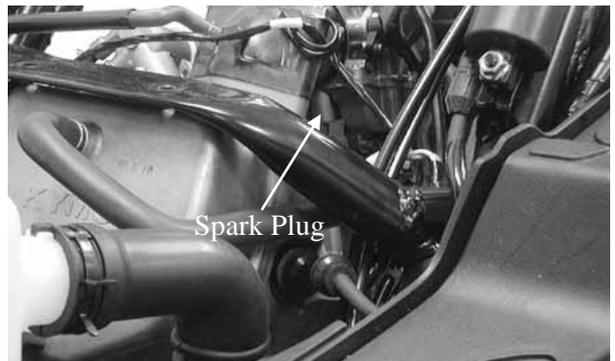
More frequent replacement is required when riding in unusually dusty or rainy areas.

- \* 
  - The air cleaner element has a viscous type paper element. Do not clean it with compressed air.
  - Be sure to install the air cleaner element and cover securely.



## SPARK PLUG

Remove the frame center cover.  
Remove the spark plug cap and spark plug.  
Check the spark plug for wear and fouling deposits.  
Clean any fouling deposits with a spark plug cleaner or a wire brush.



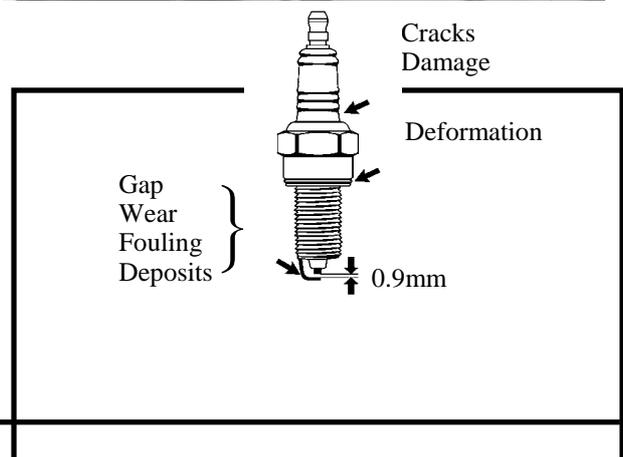
**Specified Spark Plug:** NGK: DP7EA9

Measure the spark plug gap.

**Spark Plug Gap:** 0.9mm

- \* 
  - When installing, first screw in the spark plug by hand and then tighten it with a spark plug wrench.

**Torque:** 7.8~9.8N-m



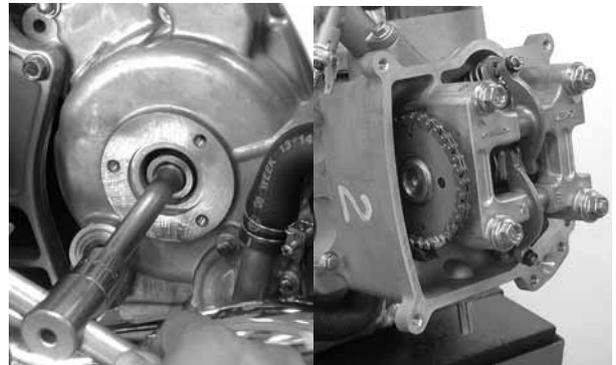
# 1. INSPECTION/ADJUSTMENT

## VALVE CLEARANCE

- \* • Inspect and adjust valve clearance while the engine is cold (below 35°C).

Remove the cylinder head cover.

Turn the A.C. generator flywheel to the top dead center (TDC) on the compression stroke so that the “T” mark on the flywheel aligns with the index mark on the left crankcase cover.



Inspect and adjust valve clearance.

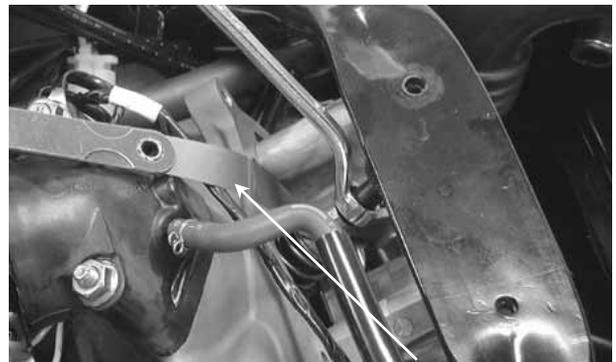
**Valve Clearance:** IN: 0.1mm  
EX: 0.1mm

Loosen the lock nut and adjust by turning the adjusting nut

Special

Valve Wrench

- \* • Check the valve clearance again after the lock nut is tightened.



Throttle Stop Screw      Valve Wrench

## CARBURETOR IDLE SPEED

- \* • The engine must be warm for accurate idle speed inspection and adjustment.

Lift up the seat and remove the inspection cover.

Warm up the engine before this operation. Start the engine and connect a tachometer. Turn the throttle stop screw to obtain the specified idle speed.

**Idle Speed:** 1450±50rpm

When the engine misses or run erratic, adjust the pilot screw.



# 1. INSPECTION/ADJUSTMENT

---

## CYLINDER COMPRESSION

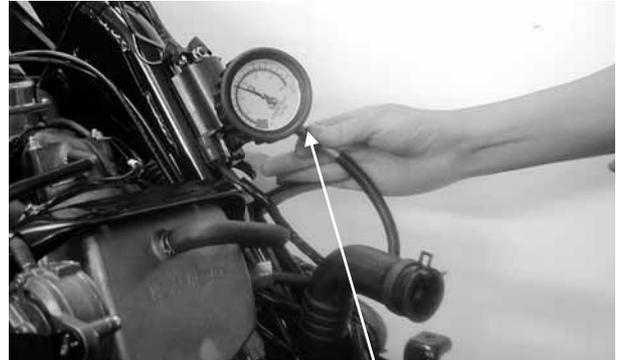
Warm up the engine before compression test.  
Remove the center cover and spark plug cap.  
Remove the spark plug.  
Insert a compression gauge.  
Open the throttle valves fully and pushes the starter button to test the compression.

**Compression:**  $16.5 \pm 2 \text{kg/cm}^2$

If the compression is low, check for the following:

- Leaky valves
- Valve clearance too small
- Leaking cylinder head gasket
- Worn pistons
- Worn piston/cylinder

If the compression is high, it indicates that carbon deposits have accumulated on the combustion chamber and the piston head.



# 1. INSPECTION/ADJUSTMENT

---

## FINAL REDUCTION GEAR OIL

- \* Place the motorcycle on its main stand on level ground.

Stop the engine and remove the oil checks bolt.

The oil level shall be at the oil check blowhole.

If the oil level is low, add the recommended oil SAE90# to the proper level.

Install the oil check bolt.

- \* Make sure that the sealing washer is in good condition.

## OIL CHANGE

Remove the oil check bolt.

Remove the oil drains bolt and drain the oil thoroughly.

Install the oil drain bolt.

**Torque:** 9.8N-m

- \* Make sure that the sealing washer is in good condition.

Fill the final reduction with the recommended oil SAE90#.

### **Gear Oil Capacity:**

At disassembly : 200cc

At change : 180cc

Reinstall the oil check bolt and check for oil leaks.

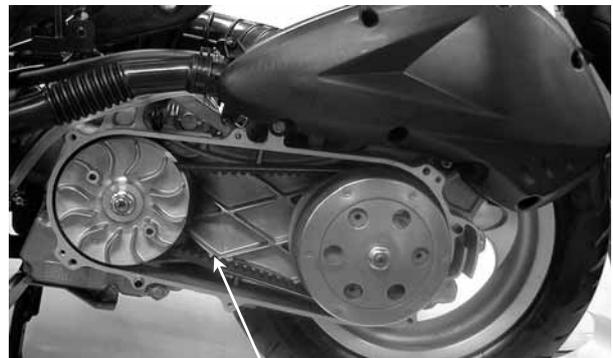
## DRIVE BELT

Remove the left crankcase cover.

Inspect the drive belt for cracks or excessive wear.

Replace the drive belt with a new one if necessary and in accordance with the Maintenance Schedule.

Oil Drain Bolt/Sealing Washer



Drive Belt

# 1. INSPECTION/ADJUSTMENT

## HEADLIGHT AIM

Turn the ignition switch ON.  
Turn on the headlight switch.  
Adjust the headlight aim by turning the headlight aim adjusting bolt.

## CLUTCH SHOE WEAR

Start the engine and check the clutch operation by increasing the engine speed gradually.  
If the motorcycle tends to creep or the engine stalls, check the clutch shoes for wear and replace if necessary.



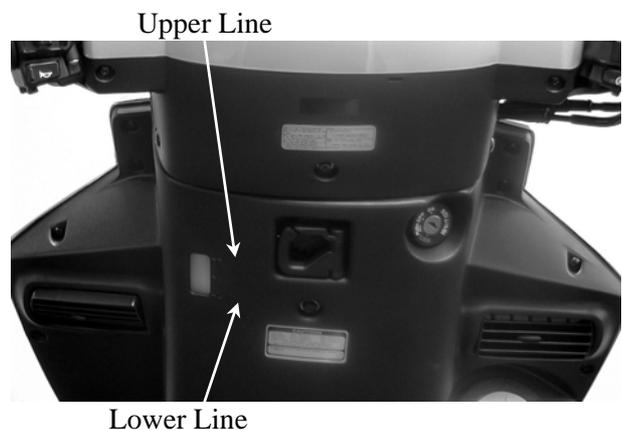
## COOLING SYSTEM

### COOLANT LEVEL INSPECTION

Place the motorcycle on its main stand on level ground.  
Check the coolant level of the reserve tank and the level should be between the upper and lower level lines.

If necessary, fill the reserve tank with recommended coolant to the "F" level line.  
**Recommended Coolant:** SIGMA Coolant  
(Standard Concentration 30%)

- \* The coolant level does not change no matter the engine is warm or cold. Fill to the "F" (upper) line.

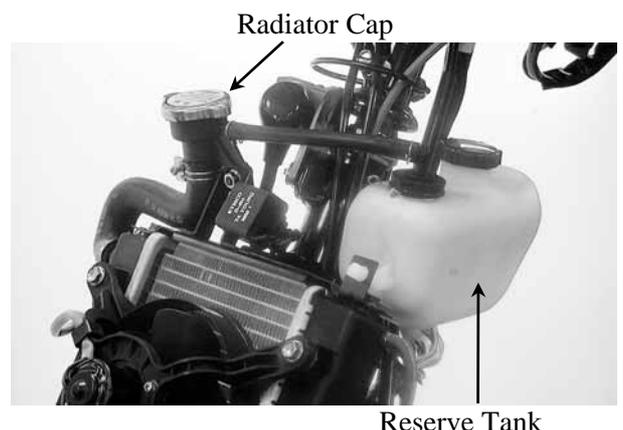


### COOLANT REPLACEMENT

- \* Perform this operation when the engine is cold.

Remove the front cover.  
Remove the radiator cap.  
Remove the drain bolt to drain the coolant and tilt the motorcycle to the right and the coolant will drain more easily.  
Drain the coolant in the reserve tank.  
Reinstall the drain bolt.  
Fill the radiator with the specified coolant.

- 9 \* The coolant freezing point should be 5 °C lower than the temperature of the riding area.



# 1. INSPECTION/ADJUSTMENT

Coolant capacity : 1165cc

Radiator capacity : 825cc

Reserve tank capacity : 340cc

Start the engine and check if there are no bubbles in the coolant and the coolant level is stable. Reinstall the radiator cap.

If there are bubbles in the coolant, bleed air from the system.

Fill the reserve tank with the recommended coolant up to the upper line.

## BRAKE SYSTEM

### BRAKE LEVER

Measure the front and rear brake lever free plays.



### BRAKE FLUID

Turn the steering handlebar upright and check if the front/rear brake fluid level is at the upper limit. If the brake fluid is insufficient, fill to the upper limit.

**Specified Brake Fluid:** DOT-3

- The brake fluid level will decrease if the brake pads are worn.



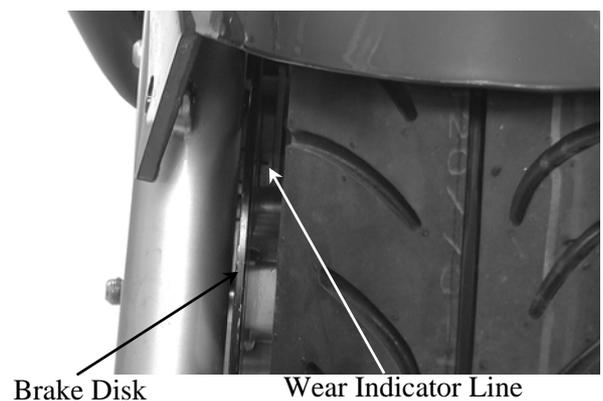
### BRAKE DISK/BRAKE PAD

Check the brake disk surface for scratches, unevenness or abnormal wear.

Check if the brake disk rubout is within the specified service limit.

Check if the brake pad wear exceeds the wear indicator line.

- Keep grease or oil off the brake disk to avoid brake failure.



# 1. INSPECTION/ADJUSTMENT

---

## NUTS/BOLTS/FASTENERS

Check all important chassis nuts and bolts for looseness.

Tighten them to their specified torque values if any looseness is found.

## WHEELS/TIRES

Check the tires for cuts, imbedded nails or other damages.

Check the tire pressure.

- \* 

• Tire pressure should be checked when tires are cold.
--

Tire Pressure

	1 Rider	2 Riders
Front	1.75kg/cm <sup>2</sup>	1.75kg/cm <sup>2</sup>
Rear	2.00kg/cm <sup>2</sup>	2.25kg/cm <sup>2</sup>

## STEERING HANDLEBAR

Raise the front wheel off the ground and check that the steering handlebar rotates freely.

If the handlebar moves unevenly, binds, or has vertical movement, adjust the steering head bearing.

## SUSPENSION

Check the action of the front/rear shock absorbers by compressing them several times. Check the entire shock absorber assembly for oil leaks looseness or damage.

Jack the rear wheels off the ground and move the rear wheel sideways with force to see if the engine hanger bushings are worn.

Replace the engine hanger bushings if there is any looseness.

## 2. INSPECTION/ADJUSTMENT

---

2

---

### INSPECTION/ADJUSTMENT

---

SERVICE INFORMATION -----	2- 1
MAINTENANCE SCHEDULE -----	2- 2
FUEL LINE/FUEL FILTER -----	2- 3
THROTTLE OPERATION -----	2- 3
ENGINE OIL -----	2- 4
AIR CLEANER -----	2- 5
SPARK PLUG -----	2- 5
VALVE CLEARANCE -----	2- 6
CARBURETOR IDLE SPEED -----	2- 6
CYLINDER COMPRESSION -----	2- 7
FINAL REDUCTION GEAR OIL -----	2- 8
DRIVE BELT -----	2- 8
HEADLIGHT AIM -----	2- 9
CLUTCH SHOE WEAR -----	2- 9
COOLING SYSTEM -----	2- 9
BRAKE SYSTEM -----	2-10
NUTS/BOLTS/FASTENERS -----	2-11
WHEELS/TIRES -----	2-11
STEERING HANDLEBAR -----	2-11
SUSPENSION -----	2-11

## 2. INSPECTION/ADJUSTMENT

### SERVICE INFORMATION

#### GENERAL

**⚠ WARNING**

- Before running the engine, make sure that the working area is well ventilated. Never run the engine in a closed area. The exhaust contains poisonous carbon monoxide gas, which may cause death to people.
- Gasoline is extremely flammable and is explosive under some conditions. The working area must be well ventilated and do not smoke or allow flames or sparks near the working area or fuel storage area.

#### SPECIFICATIONS

##### ENGINE

Throttle grip free play : 2 6mm  
 Spark plug : NGK: DPR7EA-9  
 Spark plug gap : 0.9mm  
 Valve clearance : IN: 0.1mm EX: 0.1mm  
 Idle speed : 1450±50rpm

Engine oil capacity: Cylinder compression : 16.5±2kg/cm<sup>2</sup>  
 At disassembly : 1.1 liter Ignition timing : repeatedly  
 At change : 0.9 liter Coolant capacity : 1165cc  
 Gear oil capacity : Radiator capacity : 825cc  
 At disassembly : 0.20 liter Reserve tank capacity : 340cc  
 At change : 0.18 liter

#### TIRE FOR BR-250

	Off road	On road
Front	0.3kg/cm <sup>2</sup>	0.5kg/cm <sup>2</sup>
Rear	0.3kg/cm <sup>2</sup>	0.5kg/cm <sup>2</sup>

#### TIRE SPECIFICATION:

Front : 19x7-8 on road or 20x7-8 off road  
 Rear : 255/60-10 on road of 22\*10-10 off road

#### TORQUE VALUES

Front axle nut : 14.8 68.6N-m  
 Rear axle nut : 107.8 127.4N-m

## 2. INSPECTION/ADJUSTMENT

### MAINTENANCE SCHEDULE

Perform the periodic maintenance at each scheduled maintenance period.

I: Inspect, and Clean, Adjust, Lubricate or Replace if necessary.

A: Adjust C: Clean R: Replace T: Tighten

Item	Frequency	Whichever comes first ⇨ ↓	Regular Service Mileage (km)					
			1000	2000	4000	6000	8000	10000
Engine oil			R New motorcycle 300km	R	R	R	R	R
Engine oil filter screen					C		C	
Fuel filter screen								R
Gear oil	Note 3		R New motorcycle 300km		R			R
Valve clearance				A	A		A	
Carburetor					I		I	
Air Cleaner	Note 2,3		I		R			R
Spark plug			Clean at every 3000km and replace if necessary					
Brake system			I	I	I	I	I	I
Drive belt							I	
Suspension					I		I	
Nut, bolt, fastener							I	
Tire					I		I	
Steering head bearing			I			I	I	
Brake fluid			Perform pre-ride inspection daily					
Radiator coolant			Replace every year or at every 10000km (R)					
Radiator core						I		I
Radiator cap						I		I
Brake lever					I			I
Brake pad wear					I			I
Shock absorber					I			I

- In the interest of safety, we recommend these items be serviced only by an authorized KYMCO motorcycle dealer.

Note: 1. For higher odometer readings, repeat at the frequency interval established here.

2. Service more frequently when riding in dusty or rainy areas.

3. Service more frequently when riding in rain or at full throttle.

## 2. INSPECTION/ADJUSTMENT

### FUEL LINE/FUEL FILTER

Remove the center cover.

Check the fuel lines and replace any parts, which show signs of deterioration, damage or leakage. Check for dirty or clogged fuel filter and replace with a new one if it is clogged.

✱

- Do not smoke or allow flames or sparks in your working area.



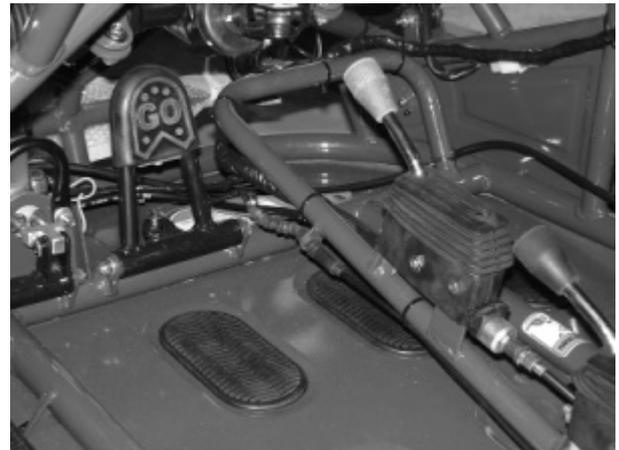
Fuel Filter

Fuel Line

### THROTTLE OPERATION

Check the throttle grip for smooth movement. Measure the throttle grip free play.

**Free Play:** 2 – 6mm



Major adjustment of the throttle grip free play is made with the adjusting nut at the carburetor side. Adjust by loosening the lock nut and turning the adjusting nut.



Minor adjustment is made with the adjusting nut at the throttle grip side.

Slide the rubber cover out and adjust by loosening the lock nut and turning the adjusting nut.

### ENGINE OIL

## 2. INSPECTION/ADJUSTMENT

### OIL LEVEL INSPECTION

Stop the engine and support the motorcycle upright on level ground.  
 Wait for 2-3 minutes and check the oil level with the dipstick. Do not screw in the dipstick when making this check.

### OIL CHANGE

- \* • Drain the oil while the engine is warm.

Remove the oil drain bolt to drain the engine oil. Install the aluminum washer and tighten the oil drain bolt.

**Torque:** 14.7N-m

- \* • Replace the aluminum washer with a new one if it is deformed or damaged.

Pour the recommended oil through the oil filler hole.

#### Oil Capacity:

At disassembly: 1.1 liter

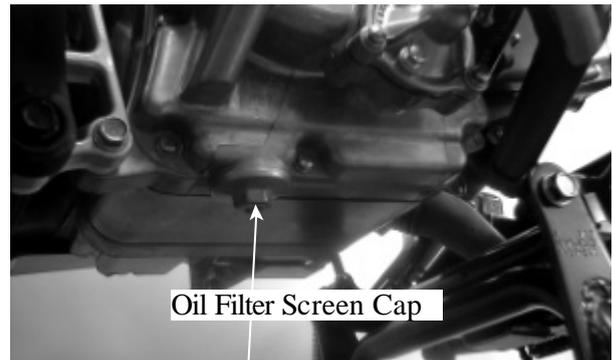
At change: 0.9 liter

#### Recommended Oil:

SAE: 15W40#

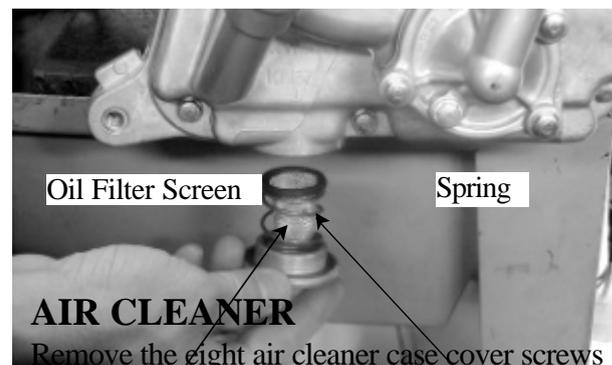
API: SG/CD

Start the engine and check for oil leaks.  
 Stop the engine and recheck the oil level.



### OIL FILTER SCREEN INSPECTION

Drain the engine oil.  
 Remove the oil filter screen and spring.  
 Clean the oil filter screen.  
 Install the oil filter screen, spring, and filter screen cap.  
 Fill the engine with recommended engine oil.



## 2. INSPECTION/ADJUSTMENT

Remove the air cleaner element.  
Check the element and replace it if it is excessively dirty or damaged.

### CHANGE INTERVAL

More frequent replacement is required when riding in unusually dusty or rainy areas.

- \* The air cleaner element has a viscous type paper element. Do not clean it with compressed air.
- \* Be sure to install the air cleaner element and cover securely.



### SPARK PLUG

Remove the frame center cover.  
Remove the spark plug cap and spark plug.  
Check the spark plug for wear and fouling deposits.  
Clean any fouling deposits with a spark plug cleaner or a wire brush.



**Specified Spark Plug:** NGK: DP7EA-9

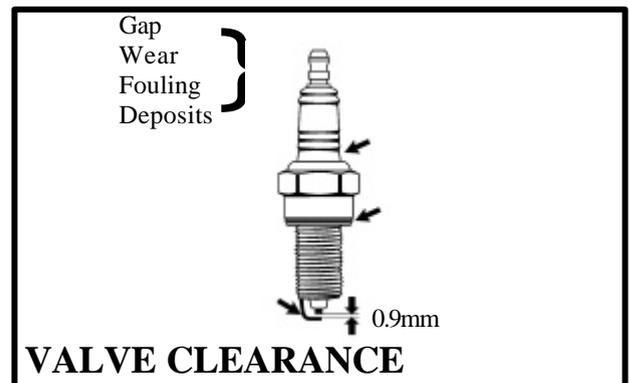
Measure the spark plug gap.

**Spark Plug Gap:** 0.9mm

- \* When installing, first screw in the spark plug by hand and then tighten it with a spark plug wrench.

**Torque:** 7.8 9.8N-m

Deformation



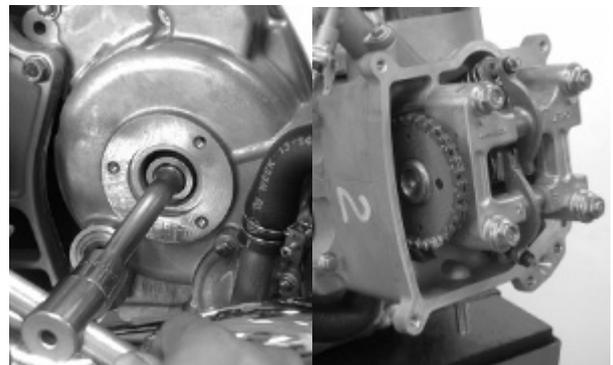
- \* Inspect and adjust valve clearance while the engine is cold (below 35 °C).



## 2. INSPECTION/ADJUSTMENT

Remove the cylinder head cover.

Turn the A.C. generator flywheel to the top dead center (TDC) on the compression stroke so that the "T" mark on the flywheel aligns with the index mark on the left crankcase cover.



Inspect and adjust valve clearance.

**Valve Clearance:** IN: 0.1mm  
EX: 0.1mm

Loosen the lock nut and adjust by turning the adjusting nut

**Special**

Valve Wrench

- \* • Check the valve clearance again after the lock nut is tightened.

### CARBURETOR IDLE SPEED

- \* • The engine must be warm for accurate idle speed inspection and adjustment.

Lift up the seat and remove the inspection cover. Warm up the engine before this operation. Start the engine and connect a tachometer. Turn the throttle stop screw to obtain the specified idle speed.

**Idle Speed:** 1450±50rpm

When the engine misses or run erratic, adjust the pilot screw.



Remove the center cover and spark plug cap.

## 2. INSPECTION/ADJUSTMENT

Remove the spark plug.

Insert a compression gauge.

Open the throttle valves fully and pushes the starter button to test the compression.

**Compression:**  $16.5 \pm 2 \text{kg/cm}^2$

If the compression is low, check for the following:

Leaky valves

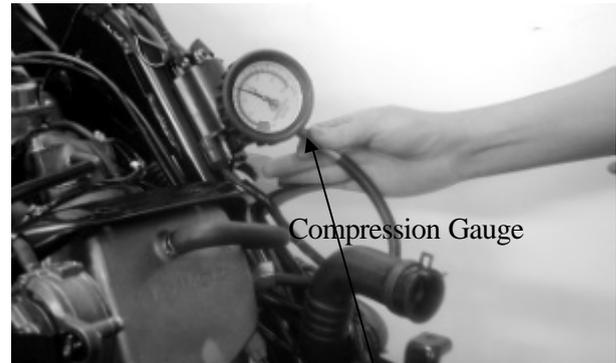
Valve clearance to small

Leaking cylinder head gasket

Worn pistons

Worn piston/cylinder

If the compression is high, it indicates that carbon deposits have accumulated on the combustion chamber and the piston head.



## 2. INSPECTION/ADJUSTMENT

### FINAL REDUCTION GEAR OIL

- \* Place the motorcycle on its main stand on level ground.

Stop the engine and remove the oil check bolt. The oil level shall be at the oil check blowhole. If the oil level is low, add the recommended oil SAE90# to the proper level.

Install the oil check bolt.

- \* Make sure that the sealing washer is in good condition.

### OIL CHANGE

Remove the oil check bolt.  
Removes the oil drains bolt and drain the oil thoroughly.  
Install the oil drain bolt.  
**Torque:** 9.8N-m

- \* Make sure that the sealing washer is in good condition.

Fill the final reduction with the recommended oil SAE90#.

#### Gear Oil Capacity:

At disassembly : 200cc

At change : 180cc

Reinstall the oil check bolt and check for oil leaks.

### DRIVE BELT

Remove the left crankcase cover.  
Inspect the drive belt for cracks or excessive wear.  
Replace the drive belt with a new one if necessary and in accordance with the Maintenance Schedule.

Oil Drain Bolt/Sealing Washer



### HEADLIGHT AIM

Turn the ignition switch ON.

## 2. INSPECTION/ADJUSTMENT

Turn on the headlight switch.  
Adjust the headlight aim by turning the headlight aim adjusting bolt.

### CLUTCH SHOE WEAR

Start the engine and check the clutch operation by increasing the engine speed gradually.  
If the motorcycle tends to creep or the engine stalls, check the clutch shoes for wear and replace if necessary.

### COOLING SYSTEM

#### COOLANT LEVEL INSPECTION

Place the motorcycle on its main stand on level ground.  
Check the coolant level of the reserve tank and the level should be between the upper and lower level lines.

If necessary, fill the reserve tank with recommended coolant to the "F" level line.

**Recommended Coolant:** SIGMA Coolant  
(Standard Concentration 30%)

- \* 
  - The coolant level does not change no matter the engine is warm or cold. Fill to the "F" (upper) line.

#### COOLANT REPLACEMENT

- \* 
  - Perform this operation when the engine is cold.

Remove the front cover.  
Remove the radiator cap.  
Remove the drain bolt to drain the coolant and tilt the motorcycle to the right and the coolant will drain more easily.  
Drain the coolant in the reserve tank.  
Reinstall the drain bolt.  
Fill the radiator with the specified coolant.

- \* 
  - The coolant freezing point should be 5 lower than the temperature of the riding area.



Reserve Tank

Coolant capacity : 1165cc  
Radiator capacity : 825cc  
Reserve tank capacity : 340cc

## 2. INSPECTION/ADJUSTMENT

Start the engine and check if there are no bubbles in the coolant and the coolant level is stable. Reinstall the radiator cap.  
If there are bubbles in the coolant, bleed air from the system.  
Fill the reserve tank with the recommended coolant up to the upper line.



### **BRAKE SYSTEM**

#### **BRAKE PAD**

Measure the brake pad free plays.

#### **BRAKE FLUID**

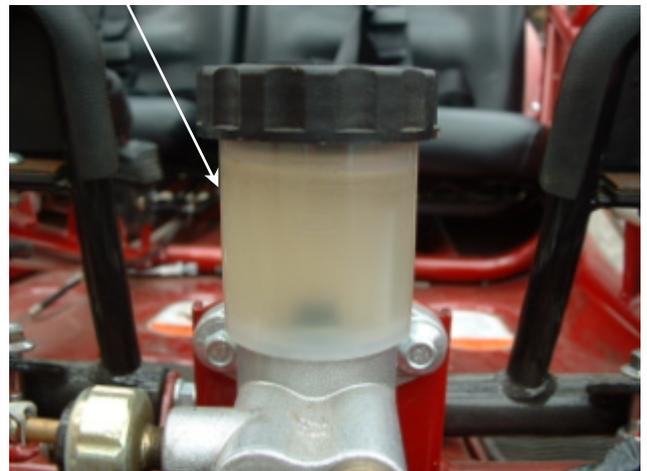
Turn the steering handlebar upright and check if the front/rear brake fluid level is at the upper limit.  
If the brake fluid is insufficient, fill to the upper limit.

**Specified Brake Fluid:** DOT-3

- \* 

<ul style="list-style-type: none"><li>• The brake fluid level will decrease if the brake pads are worn.</li></ul>
---

Brake Reservoir



#### **BRAKE DISK/BRAKE PAD**

Check the brake disk surface for scratches, unevenness or abnormal wear.  
Check if the brake disk rubout is within the specified service limit.  
Check if the brake pad wear exceeds the wear indicator line.

- \* 

<ul style="list-style-type: none"><li>• Keep grease or oil off the brake disk to avoid brake failure.</li></ul>
---

### **NUTS/BOLTS/FASTENERS**

Check all important chassis nuts and bolts for looseness.  
Tighten them to their specified torque values if any looseness is found.

## 2. INSPECTION/ADJUSTMENT

---

### WHEELS/TIRES

Check the tires for cuts, imbedded nails or other damages.

Check the tire pressure.

\*

- Tire pressure should be checked when tires are cold.



### STEERING HANDLEBAR

Raise the front wheel off the ground and that the steering handlebar rotates freely. If the handlebar moves unevenly, binds, or has vertical movement, adjust the steering head bearing.



### SUSPENSION

Check the action of the front/rear shock absorbers by compressing them several times. Check the entire shock absorber assembly for oil leaks, looseness, or damage.

Jack the rear wheels off the ground and move the rear wheel sideways with force to see if the engine hanger bushings are worn.

Replace the engine hanger bushings if there is any looseness.

### 3. LUBRICATION SYSTEM

---

---

## LUBRICATION SYSTEM

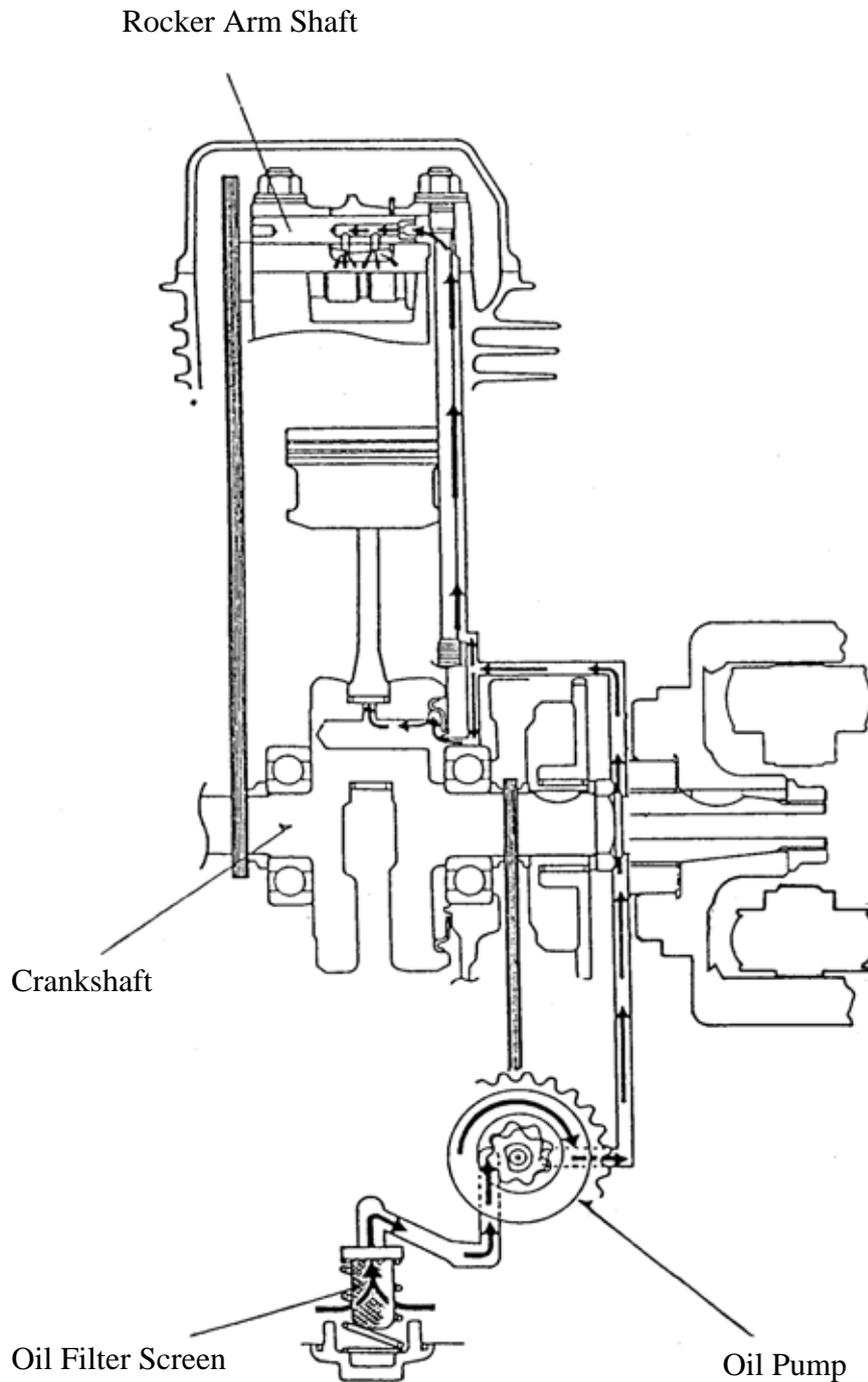
---

LUBRICATION SYSTEM DIAGRAM -----	3-1
SERVICE INFORMATION-----	3-2
TROUBLESHOOTING-----	3-2
ENGINE OIL/OIL FILTER -----	3-3
OIL PUMP REMOVAL -----	3-4
OIL PUMP DISASSEMBLY -----	3-4
OIL PUMP INSPECTION-----	3-5
OIL PUMP ASSEMBLY -----	3-5
OIL PUMP INSTALLATION -----	3-6

### 3. LUBRICATION SYSTEM

---

#### LUBRICATION SYSTEM



### 3. LUBRICATION SYSTEM

---

#### SERVICE INFORMATION

##### GENERAL INSTRUCTIONS

- The maintenance of lubrication system can be performed with the engine installed in the frame.
- Drain the coolant before starting any operations.
- Use care when removing and installing the oil pump not to allow dust and foreign matters to enter the engine and oil line.
- Do not attempt to disassemble the oil pump. The oil pump must be replaced as a set when it reaches its service limit.
- After the oil pump is installed, check each part for oil leaks.

##### SPECIFICATIONS

##### OIL PUMP

	Standard (mm)	Service Limit (mm)
Inner rotor-to-outer rotor clearance	0.15	0.20
Outer rotor-to-pump body clearance	0.15~0.20	0.25
Rotor end-to-pump body clearance	0.04~0.09	0.12

##### ENGINE OIL

Engine Oil Capacity	At disassembly: 1.1 liter    At change: 0.9 liter
Recommended Oil	SAE15W40#    API: SG/CD

##### TROUBLESHOOTING

###### Oil level too low

- Natural oil consumption
- Oil leaks
- Worn piston rings
- Worn valve guide
- Worn valve guide seal

###### Poor lubrication pressure

- Oil level too low
- Clogged oil filter or oil passage
- Faulty oil pump

###### Oil contamination

- Oil not changed often enough
- Faulty cylinder head gasket
- Loose cylinder head bolts

### 3. LUBRICATION SYSTEM

#### ENGINE OIL/OIL FILTER

- \* Place the motorcycle upright on level ground for engine oil level check.
- \* Run the engine for 2~3 minutes and check the oil level after the engine is stopped for 2~3 minutes.

Remove the oil dipstick and check the oil level with the oil dipstick.  
If the level is near the lower level, fill to the upper level with the recommended engine oil.

#### OIL CHANGE

- \* The engine oil will drain more easily while the engine is warm.

Remove the oil drain bolt located at the left side of the engine to drain the engine oil.  
After the oil has been completely drained, install the aluminum washer and tighten the oil drain bolt.

**Torque:** 14.7N-m

Pour the recommended oil through the oil filler hole.



Oil Drain Bolt

#### OIL FILTER SCREEN

Drain the engine oil.

Remove the oil filter screen cap.

Remove the oil filter screen and spring.

Check the oil filter screen for clogging or damage and replace if necessary. Check the filter screen O-ring for damage and replace if necessary.

Install the oil filter screen, spring, O-ring and filter screen cap.

**Torque:** 14.7N-m

Recommended Oil: SAE15W40# API: SG/CD

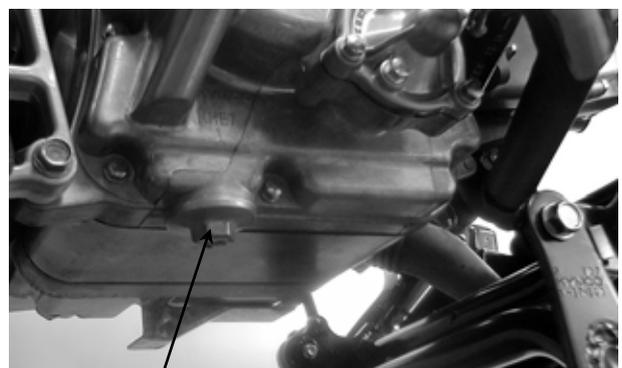
Oil Capacity:

At disassembly: 1.1 liter

At change: 0.9 liter

Start the engine and check for oil leaks.

Start the engine and let it idle for few minutes, then recheck the oil level.



Oil Filter Screen Cap

### 3. LUBRICATION SYSTEM

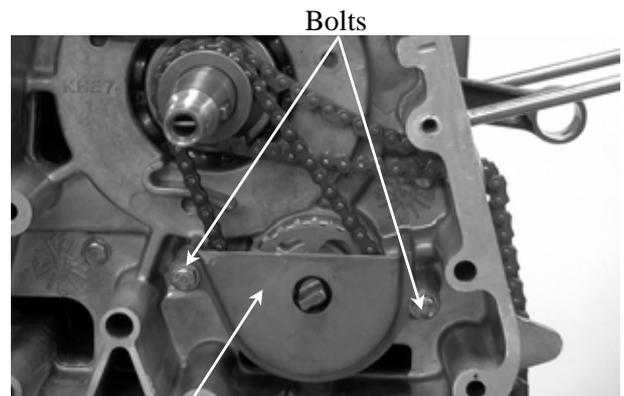
#### OIL PUMP REMOVAL

First drain the coolant.

Remove the right crankcase cover. (⇒9-3)

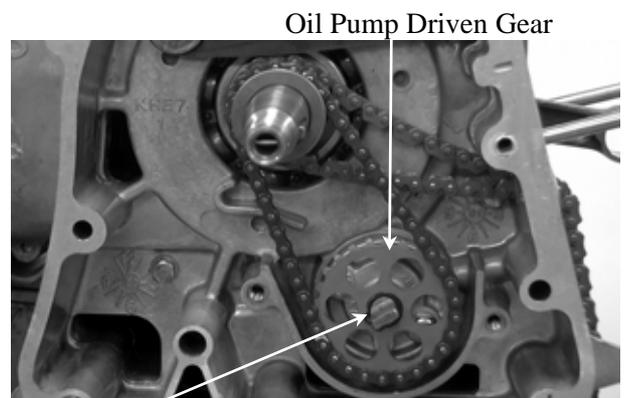
Remove the A.C. generator starter driven gear. (⇒9-4)

Remove the attaching bolt and oil separator cover.



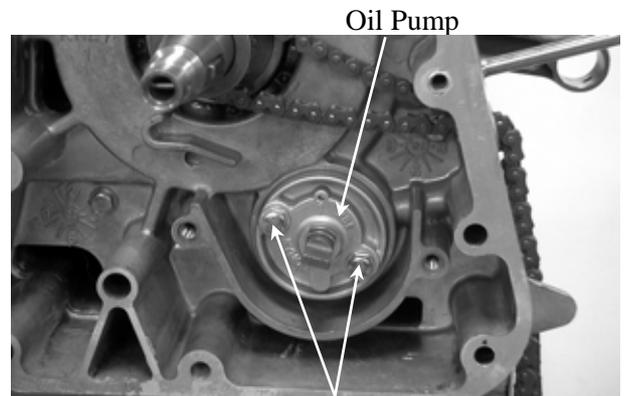
Oil Separator Cover

Pry the circlip off and remove the oil pump driven gear, then remove the oil pump drive chain.



Circlip

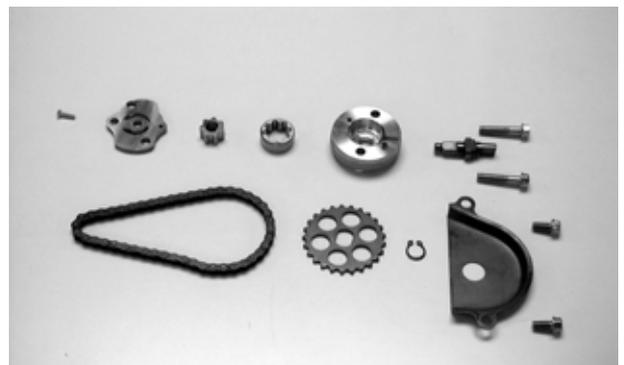
Remove the two oil pump bolts to remove the oil pump.



Bolts

#### OIL PUMP DISASSEMBLY

Remove the screw and disassemble the oil pump as shown.

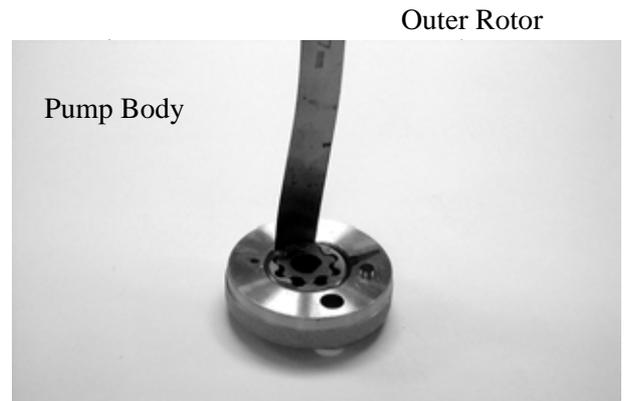


### 3. LUBRICATION SYSTEM

#### OIL PUMP INSPECTION

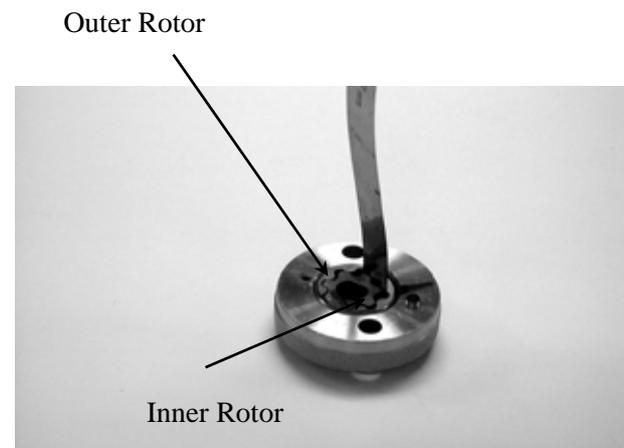
Measure the pump body-to-outer rotor clearance.

**Service Limit:** 0.25mm replace if over



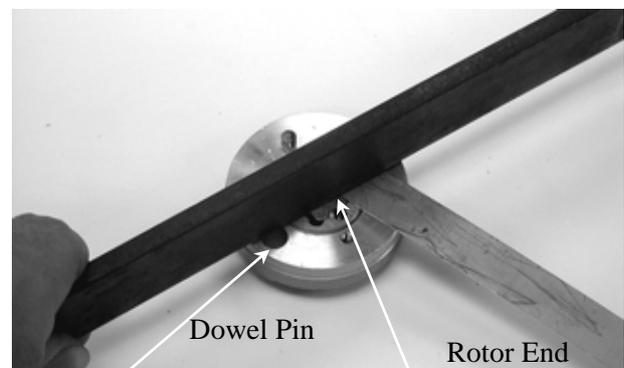
Measure the inner rotor-to-outer rotor clearance.

**Service Limit:** 0.20mm replace if over



Measure the rotor end-to-pump body clearance.

**Service Limit:** 0.12mm replace if over



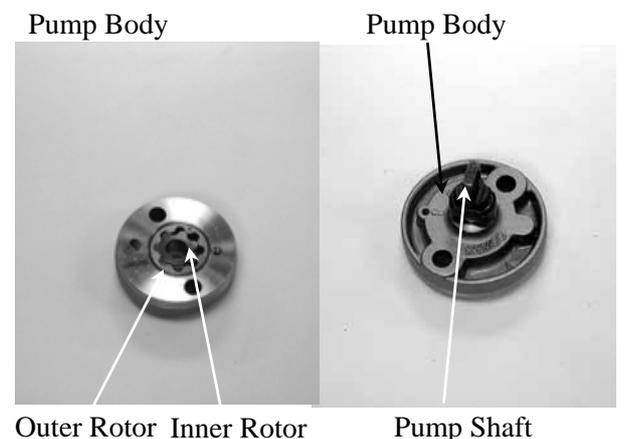
#### OIL PUMP ASSEMBLY

Install the outer rotor, inner rotor and pump shaft into the pump body.

\* Insert the pump shaft by aligning the flat on the shaft with the flat in the inner rotor. Install the dowel pin.

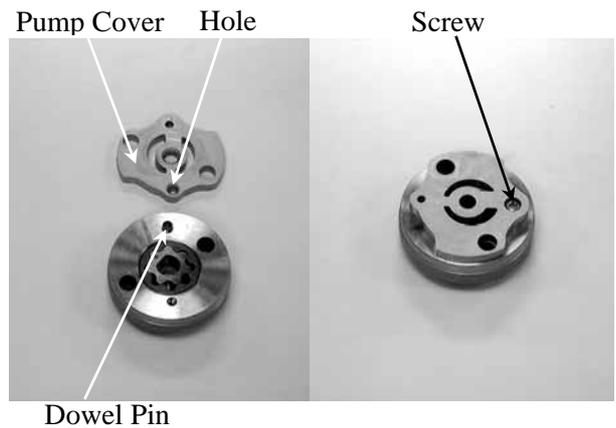
There is one mark on the surface of the inner rotor and outer rotor.

The mark is upside.



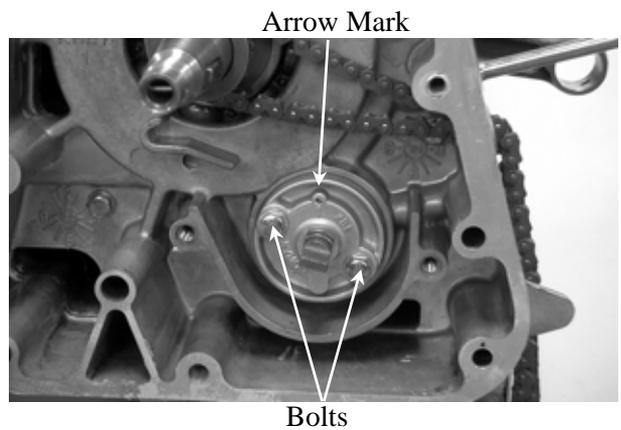
### 3. LUBRICATION SYSTEM

Install the pump cover by aligning the hole in the cover with the dowel pin.  
Tighten the screw to secure the pump cover.  
Make sure that the pump shaft rotates freely without binding.

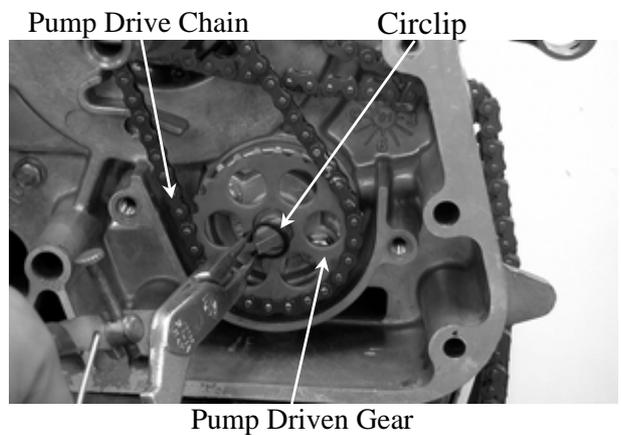


#### OIL PUMP INSTALLATION

Install the oil pump and oil separator and tighten the two bolts.  
Make sure that the pump shaft rotates freely.  
The arrow of oil pump is upside.



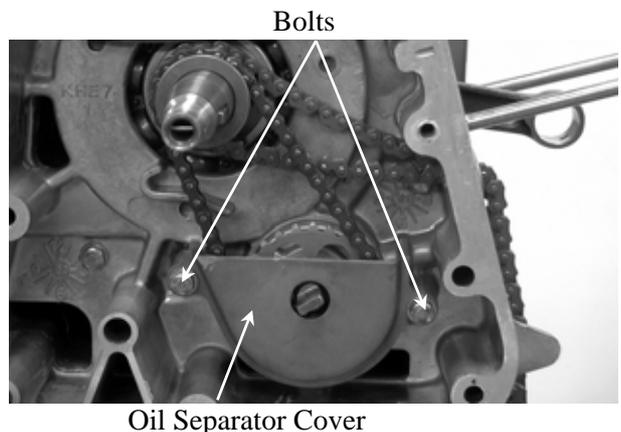
Install the pump drive chain and driven gear, then set the circlip securely on the pump shaft.



Install the oil separator cover properly.

\* Fit the tab of the separator cover into the slit in the separator.

Install the A.C. generator starter driven gear.  
(⇒9-5)



# 4. CYLINDER HEAD/VALVES

---

---

## CYLINDER HEAD/VALVES

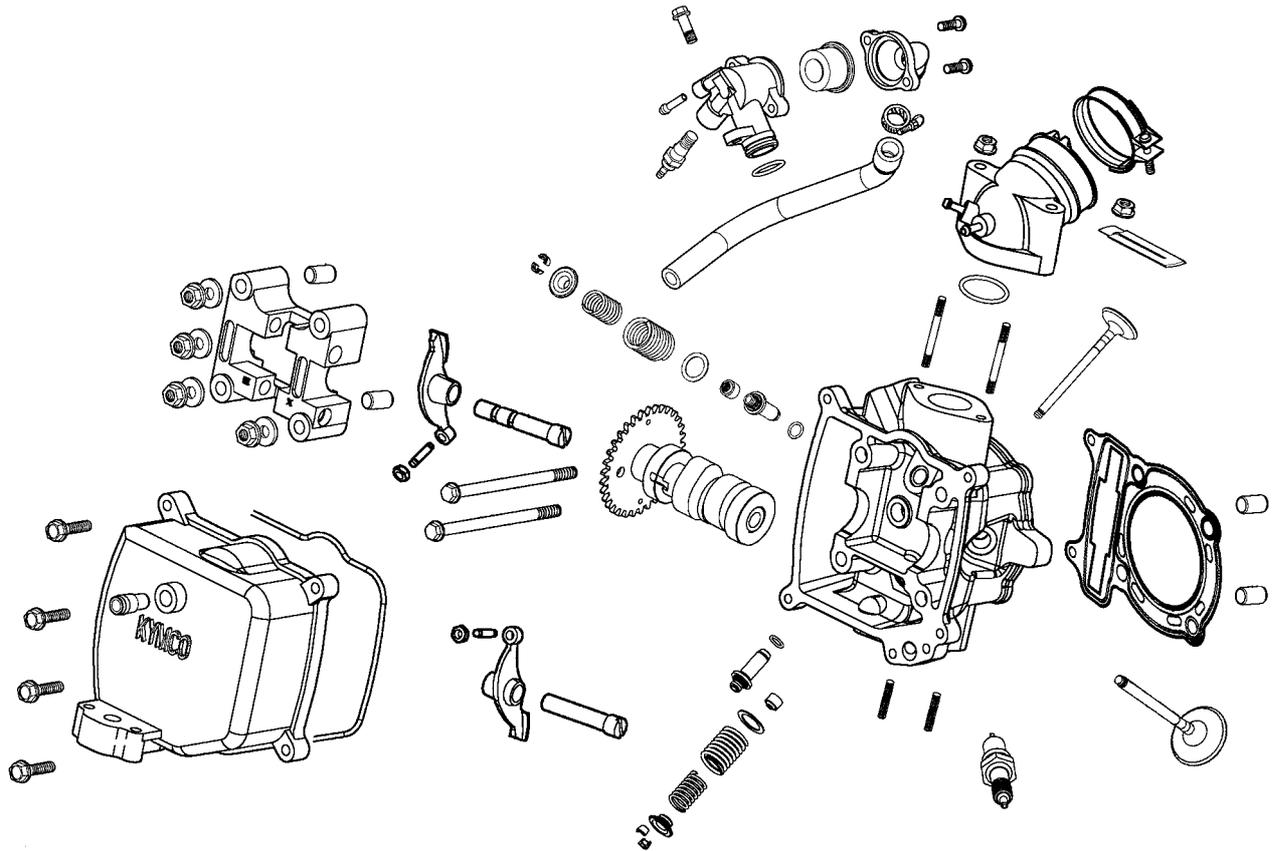
---

SCHEMATIC DRAWING -----	4- 1
SERVICE INFORMATION-----	4- 2
TROUBLESHOOTING-----	4- 3
CYLINDER HEAD COVER REMOVAL -----	4- 4
CAMSHAFT REMOVAL -----	4- 4
CYLINDER HEAD REMOVAL -----	4- 6
CYLINDER HEAD DISASSEMBLY -----	4- 7
CYLINDER HEAD ASSEMBLY -----	4- 8
CYLINDER HEAD INSTALLATION -----	4- 9
CAMSHAFT INSTALLATION -----	4-10
CYLINDER HEAD COVER INSTALLATION -----	4-11

# 4. CYLINDER HEAD/VALVES

---

## SCHEMATIC DRAWING



## 4. CYLINDER HEAD/VALVES

### SERVICE INFORMATION

#### GENERAL INSTRUCTIONS

- The cylinder head can be serviced with the engine installed in the frame. Coolant in the radiator and water jacket must be drained first.
- When assembling, apply molybdenum disulfide grease or engine oil to the valve guide movable parts and valve arm sliding surfaces for initial lubrication.
- The valve rocker arms are lubricated by engine oil through the cylinder head engine oil passages. Clean and unclog the oil passages before assembling the cylinder head.
- After disassembly, clean the removed parts and dry them with compressed air before inspection.
- After removal, mark and arrange the removed parts in order. When assembling, install them in the reverse order of removal.

SPECIFICATIONS		Standard (mm)	
		Service Limit (mm)	
Item		SH50CA	
Valve clearance (cold)	IN	0.10	—
	EX	0.10	—
Cylinder head compression pressure		15kg/cm <sup>2</sup>	—
Cylinder head warpage		—	0.05
Camshaft cam height	IN	34.2987	34.14
	EX	34.1721	34.02
Valve rocker arm I.D.	IN	10.00~10.015	10.10
	EX	10.00~10.015	10.10
Valve rocker arm shaft O.D.	IN	9.972~9.987	9.9
	EX	9.972~9.987	9.9
Valve seat width	IN	1.2	1.8
	EX	1.2	1.8
Valve stem O.D.	IN	4.990~4.975	4.925
	EX	4.970~4.955	4.915
Valve guide I.D.	IN	5.00~5.012	5.03
	EX	5.00~5.012	5.03
Valve stem-to-guide clearance	IN	0.010~0.037	0.08
	EX	0.030~0.057	0.10

#### TORQUE VALUES

Cylinder head cap nut	19.6N-m	Apply engine oil to threads
Valve clearance adjusting nut	8.8N-m	Apply engine oil to threads
Cylinder head cover bolt	7.8~11.8N-m	

#### SPECIAL TOOLS

Valve spring compressor	
Valve seat cutter, 24.5mm	45° IN-EX
Valve seat cutter, 25mm	Plane cutter 37.5° EX
Valve seat cutter, 22mm	Plane cutter 37.5° EX
Valve seat cutter, 26mm	Plane cutter 63.5° IN/EX
Cutter clip	
Valve guide driver	
Valve guide reamer	

## 4. CYLINDER HEAD/VALVES

---

### TROUBLESHOOTING

- The poor cylinder head operation can be diagnosed by a compression test or by tracing engine top-end noises.

#### Poor performance at idle speed

- Compression too low

#### Compression too low

- Incorrect valve clearance adjustment
- Burned or bent valves
- Incorrect valve timing
- Broken valve spring
- Poor valve and seat contact
- Leaking cylinder head gasket
- Warped or cracked cylinder head
- Poorly installed spark plug

#### Compression too high

- Excessive carbon build-up in combustion chamber

#### White smoke from exhaust muffler

- Worn valve stem or valve guide
- Damaged valve stem oil seal

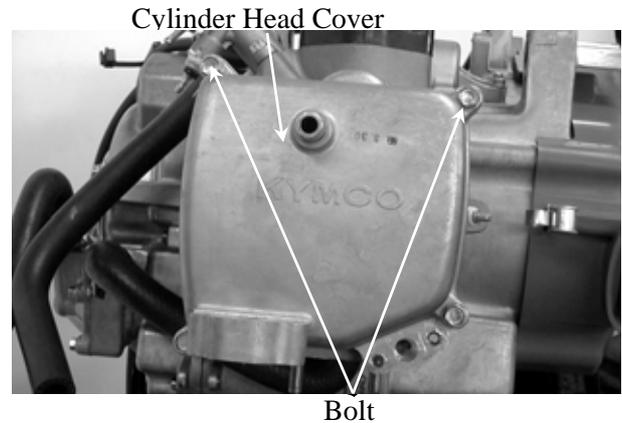
#### Abnormal noise

- Incorrect valve clearance adjustment
- Sticking valve or broken valve spring
- Damaged or worn camshaft
- Worn cam chain tensioner
- Worn camshaft and rocker arm

## 4. CYLINDER HEAD/VALVES

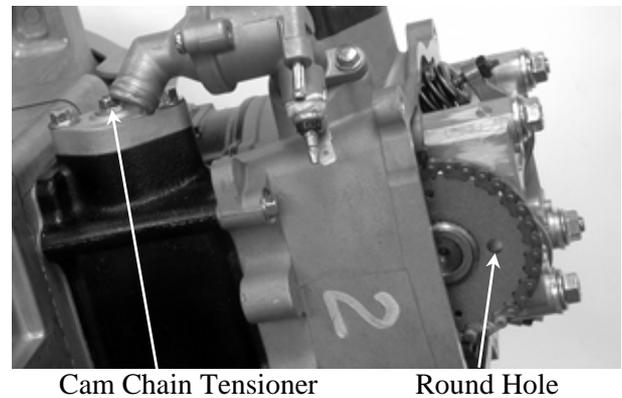
### CYLINDER HEAD COVER REMOVAL

Remove the center cover.)  
 Remove the met-in box.  
 Remove the cylinder head cover four bolts  
 and then remove the cylinder head cover.



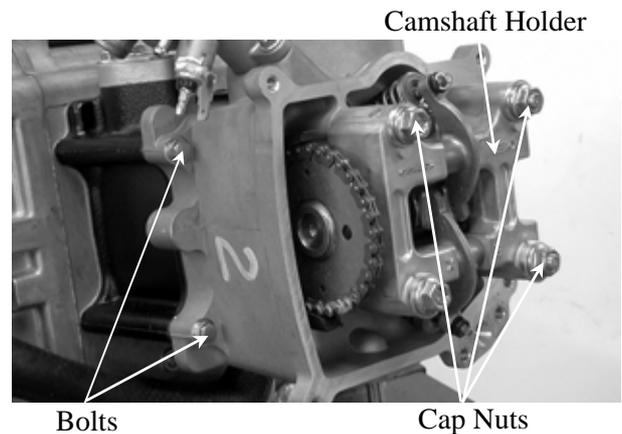
### CAMSHAFT REMOVAL

Turn the A.C. generator flywheel so that the "T" mark on the flywheel aligns with the index mark on the crankcase.  
 Hold the round hole on the camshaft gear facing up and the location is the top dead center on the compression stroke.  
 Remove the two bolts attaching cam chain tensioner and the tensioner.

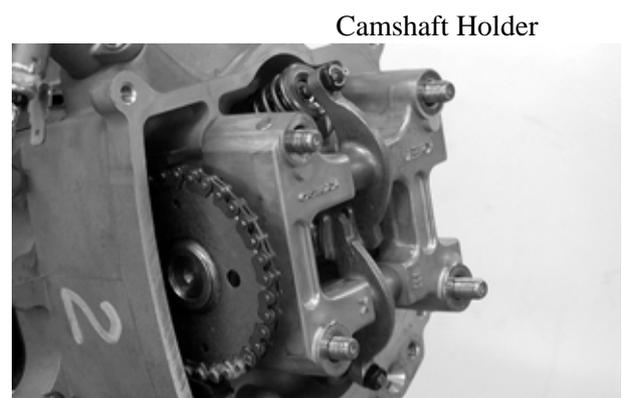


First remove the two bolts between the cylinder head and cylinder.  
 Then, remove the four cap nuts attaching the cylinder head.

- \* •Diagonally loosen the cylinder head cap nuts in 2 or 3 times.



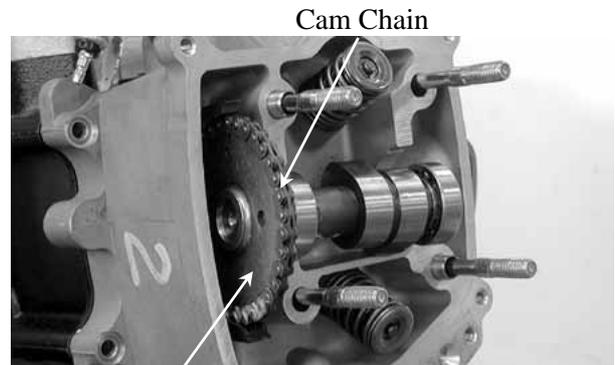
Remove the camshaft holder and dowel pins.



## 4. CYLINDER HEAD/VALVES

---

Remove the camshaft gear from the cam chain to remove the camshaft.



### **CAMSHAFT INSPECTION**

Check each cam lobe for wear or damage. Measure the cam lobe height.

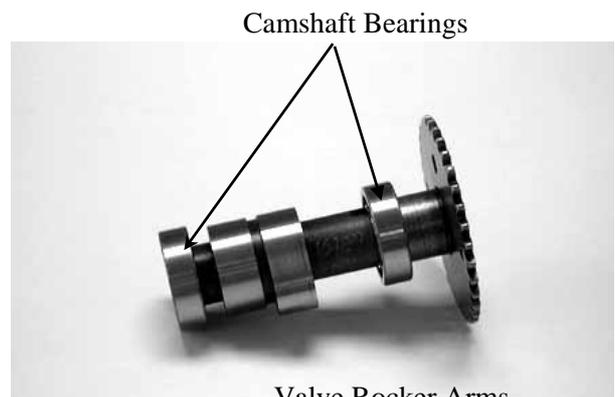
#### **Service Limits:**

IN: 34.14mm replace if below

EX:34.02mm replace if below

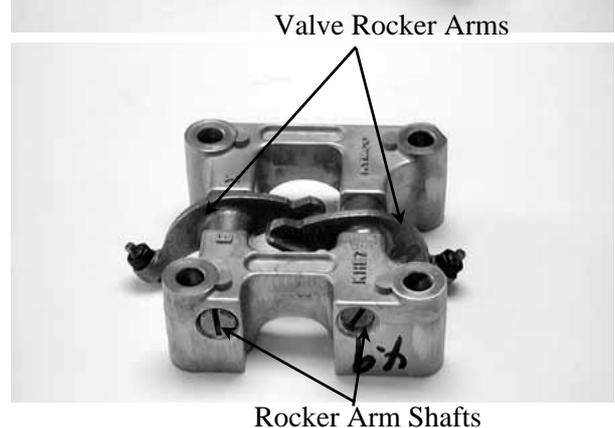


Check each camshaft bearing for play or damage. Replace the camshaft assembly with a new one if the bearings are noisy or have excessive play.



### **CAMSHAFT HOLDER DISASSEMBLY**

Remove the valve rocker arms.

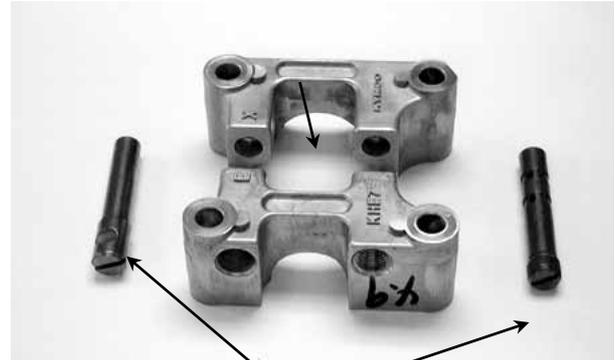


## 4. CYLINDER HEAD/VALVES

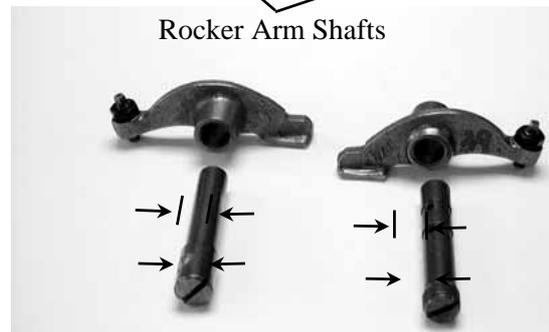
### CAMSHAFT HOLDER INSPECTION

Inspect the camshaft holder, valve rocker arms and rocker arm shafts for wear or damage.

\* If the valve rocker arm contact surface is worn, check each cam lobe for wear or damage.



Rocker Arm Shafts



Measure the I.D. of each valve rocker arm.

**Service Limits:** IN: 10.10mm replace if over  
EX: 10.10mm replace if over

Measure each rocker arm shaft O.D.

**Service Limits:** IN: 9.90mm replace if below  
EX: 9.90mm replace if below

### CYLINDER HEAD REMOVAL

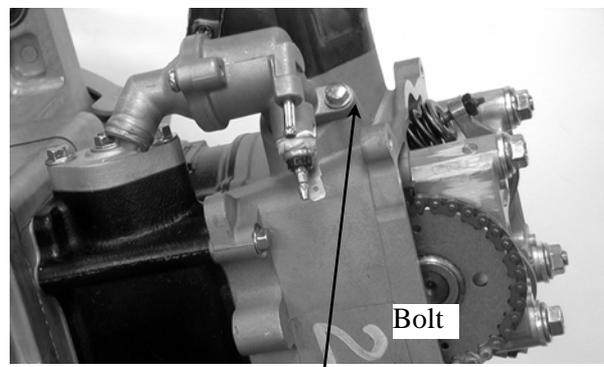
First drain the coolant from the radiator and water jacket, then remove the thermostat water hose.

Remove the camshaft. (⇒4-4)

Remove the carburetor and intake manifold.

Remove the bolt attaching the thermostat housing and the thermostat housing.

Remove the cylinder head.



Bolt

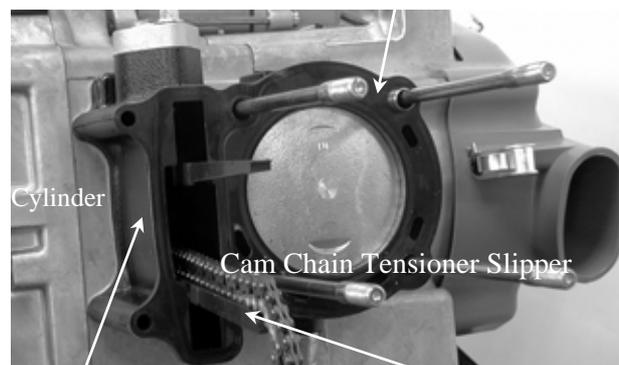
Cylinder Head Gasket

Remove the dowel pins and cylinder head gasket.

Remove the cam chain guide.

Remove all gasket material from the cylinder head mating surface.

\* Be careful not to drop any gasket material into the engine.



Cylinder

Cam Chain Tensioner Slipper

## 4. CYLINDER HEAD/VALVES

---

### CYLINDER HEAD DISASSEMBLY

Remove the valve spring cotters, retainers, springs, spring seats and valve stem seals using a valve spring compressor.

- \* Be sure to compress the valve springs with a valve spring compressor.
- \* Mark all disassembled parts to ensure correct reassembly.



Remove carbon deposits from the exhaust port and combustion chamber.

- \* Be careful not to damage the cylinder head mating surface.



## 4. CYLINDER HEAD/VALVES

### INSPECTION

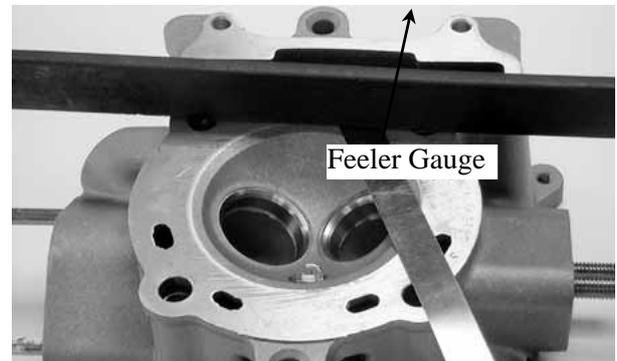
#### CYLINDER HEAD

Check the spark plug hole and valve areas for cracks.

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

**Service Limit:** 0.05mm repair or replace if over

Straight Edge



#### VALVE SPRING FREE LENGTH

Measure the free length of the inner and outer valve springs.

#### Service Limits:

Inner (IN, EX) : 29.5mm replace if below

Outer (IN, EX): 39.5mm replace if below



#### VALVE /VALVE GUIDE

Inspect each valve for bending, burning, scratches or abnormal stem wear.

Check valve movement in the guide.

Measure each valve stem O.D.

**Service Limits:** IN: 4.925mm replace if below

EX: 4.925mm replace if below

#### CYLINDER HEAD ASSEMBLY

Install the valve spring seats and stem seals.

Lubricate each valve stem with engine oil and insert the valves into the valve guides.

Be sure to install new valve stem seals.

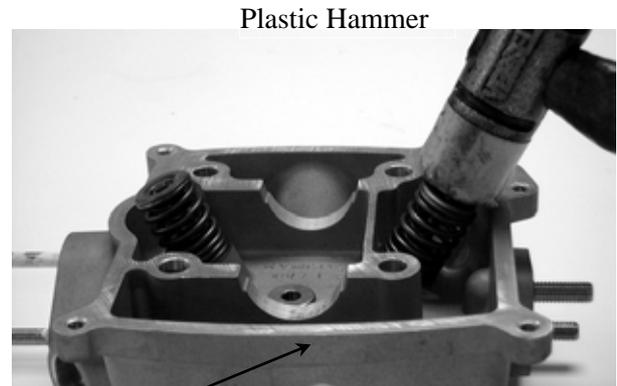


Valve Spring Compressor

## 4. CYLINDER HEAD/VALVES

Tap the valve stems gently with a plastic hammer to firmly seat the cotters.

\* Be careful not to damage the valves.

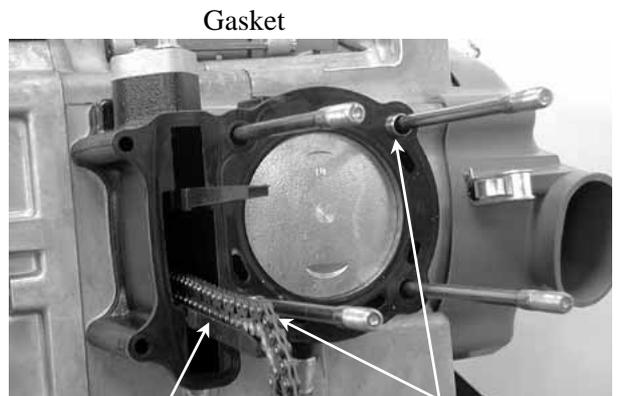


Plastic Hammer

Cylinder Head

### CYLINDER HEAD INSTALLATION

Install the cam chain guide.  
Install the dowel pins and a new cylinder head gasket.

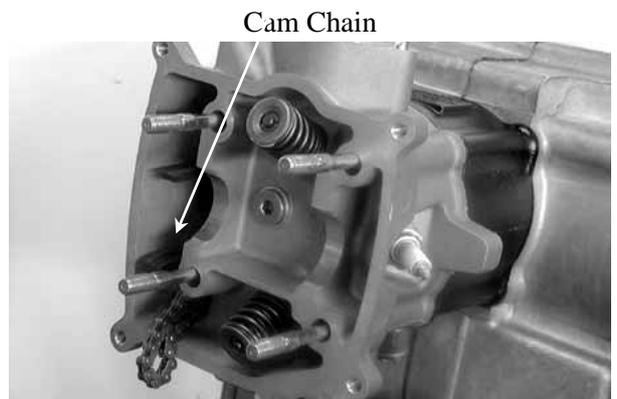


Gasket

Cam Chain Guide

Dowel Pins

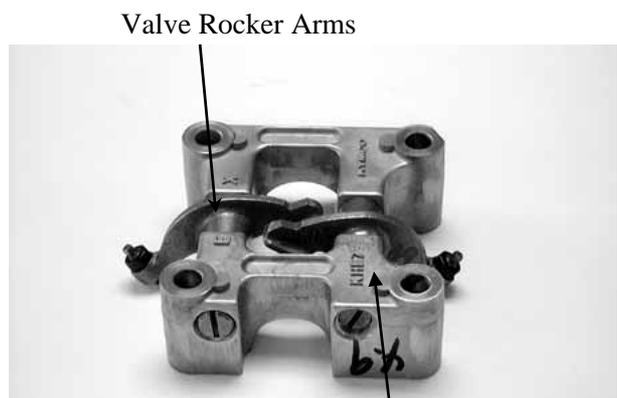
Install the cylinder head and take out the cam chain



Cam Chain

Assemble the camshaft holder.  
First install the intake and exhaust valve rocker arms; then install the rocker arm shafts.

- \* • Install the exhaust valve rocker arm shaft on the "EX" side of the camshaft holder and the exhaust rocker arm shaft is shorter.
- Clean the intake valve rocker arm shaft off any grease before installation.
- Align the cutout on the exhaust valve rocker arm shaft with the bolt of the camshaft holder.



Valve Rocker Arms

Camshaft Holder

## 4. CYLINDER HEAD/VALVES

### CAMSHAFT INSTALLATION

Turn the A.C. generator flywheel so that the "T" mark on the flywheel aligns with the index mark on the crankcase.

Keep the round hole on the camshaft gear facing up and align the punch marks on the camshaft gear with the cylinder head surface (Position the intake and exhaust cam lobes down.) and install the cam chain over the camshaft gear.

Install the dowel pins.

Install the camshaft holder, washers and nuts on the cylinder head.

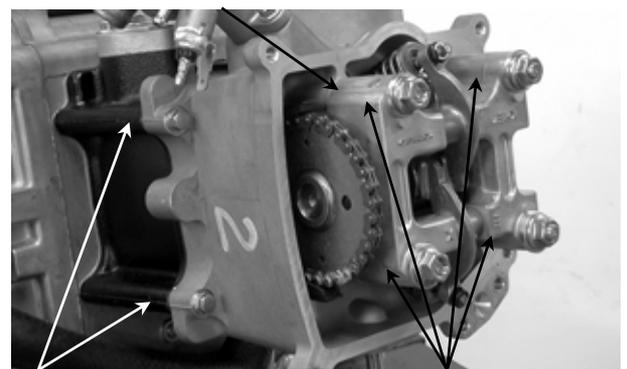
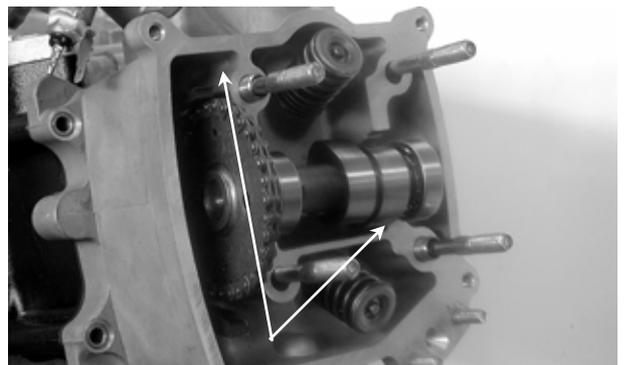
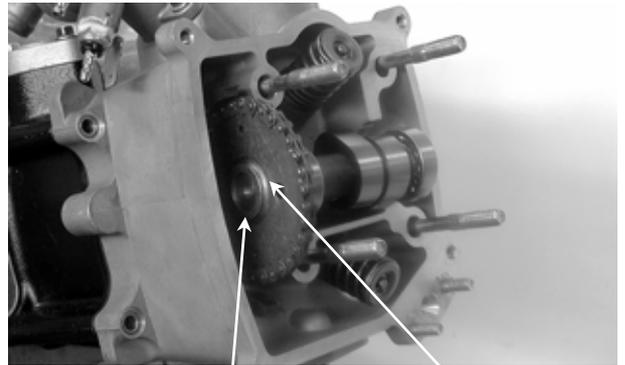
Tighten the four cylinder head nuts and the two bolts between the cylinder head and cylinder.

**Torque:** Cylinder head cap nut: 19.6N-m  
Cylinder & cylinder head bolt: 7.8 ~ 11.8N-m

- \* 

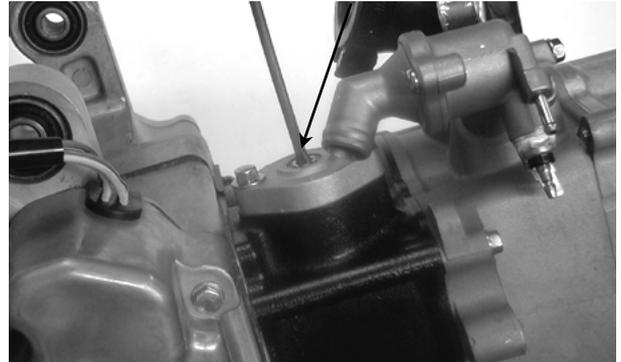
<ul style="list-style-type: none"><li>• Apply engine oil to the threads of the cylinder head cap nuts.</li><li>• Diagonally tighten the cylinder head cap nuts in 2~3 times.</li><li>• First tighten the cylinder head cap nuts and then tighten the bolts between the cylinder and cylinder head to avoid cracks.</li></ul>
--

Punch Marks



## 4. CYLINDER HEAD/VALVES

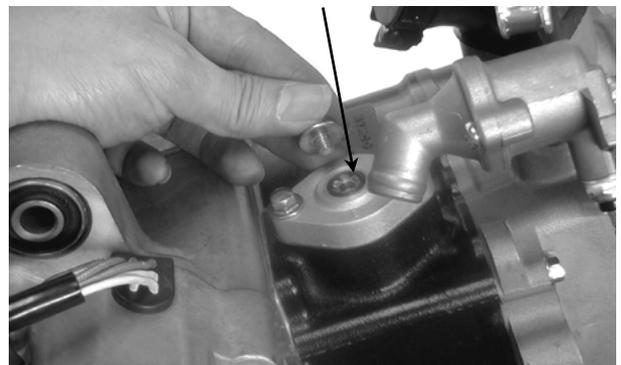
Turn the cam chain tension screw counter clockwise to release it.



Apply engine oil to a new O-ring and install it.

Tighten the cam chain tension cap screw.

\* Be sure to install the gasket into the groove properly.



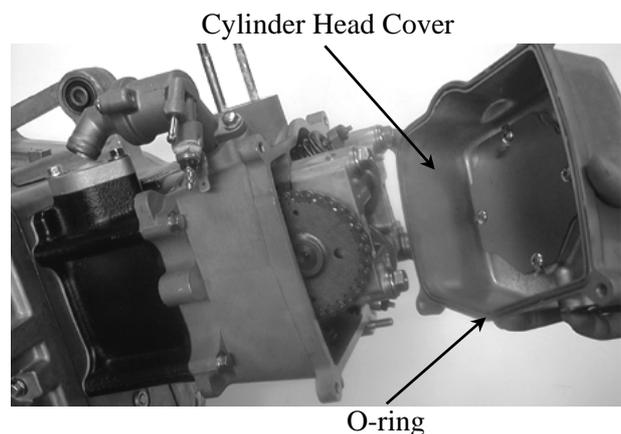
### CYLINDER HEAD COVER INSTALLATION

Adjust the valve clearance. (⇒1-6)  
Install a new cylinder head cover O-ring and install the cylinder head cover.

\* Be sure to install the O-ring into the groove properly.

Install and tighten the cylinder head cover bolts.

**Torque:** 7.8~11.8N-m



# 5. CYLINDER/PISTON

---

---

---

---

---

---

---

---

---

## CYLINDER/PISTON



SCHEMATIC DRAWING .....	5-1
SERVICE INFORMATION.....	5-2
TROUBLESHOOTING.....	5-2
CYLINDER REMOVAL .....	5-3
PISTON REMOVAL.....	5-3
PISTON INSTALLATION.....	5-7
CYLINDER INSTALLATION .....	5-7



# 5. CYLINDER/PISTON

## SERVICE INFORMATION

### GENERAL INSTRUCTIONS

- The cylinder and piston can be serviced with the engine installed in the frame.
- When installing the cylinder, use a new cylinder gasket and make sure that the dowel pins are correctly installed.
- After disassembly, clean the removed parts and dry them with compressed air before inspection.

### SPECIFICATIONS

Item		Standard (mm)		
		SH50	Service Limit (mm)	
Cylinder	I.D.	72.7500~72.7015	72.80	
	Warpage	0.01	0.05	
	Cylindricity	0.01	0.05	
	True roundness	0.01	0.05	
Piston, piston ring	Ring-to-groove clearance	top	0.2	0.09
		Second	0.015~0.050	0.09
	Ring end gap	top	0.1~0.25	0.50
		Second	0.15~0.30	0.50
		Oil side rail	0.25~0.7	—
	Piston O.D.	72.67~72.69	72.6	
	Piston O.D. measuring position	9mm from bottom of skirt	9mm from bottom of skirt	
	Piston-to-cylinder clearance	0.010~0.040	0.01	
Piston pin hole I.D.	17.002~17.008	17.04		
Piston pin O.D		16.994~17.000	16.96	
Piston-to-piston pin clearance		0.002~0.014	0.02	
Connecting rod small end I.D. bore		17.016~17.034	17.06	

## TROUBLESHOOTING

- When hard starting or poor performance at low speed occurs, check the crankcase breather for white smoke. If white smoke is found, it means that the piston rings are worn, stuck or broken.

### Compression too low or uneven compression

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

### Compression too high

- Excessive carbon build-up in combustion chamber or on piston head

### Excessive smoke from exhaust muffler

- Worn or damaged piston rings
- Worn or damaged cylinder and piston

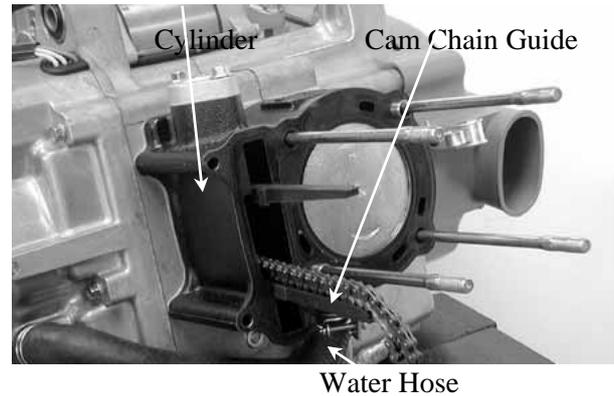
### Abnormal noisy piston

- Worn cylinder, piston and piston rings
- Worn piston pin hole and piston pin
- Incorrectly installed piston

## 5. CYLINDER/PISTON

### CYLINDER REMOVAL

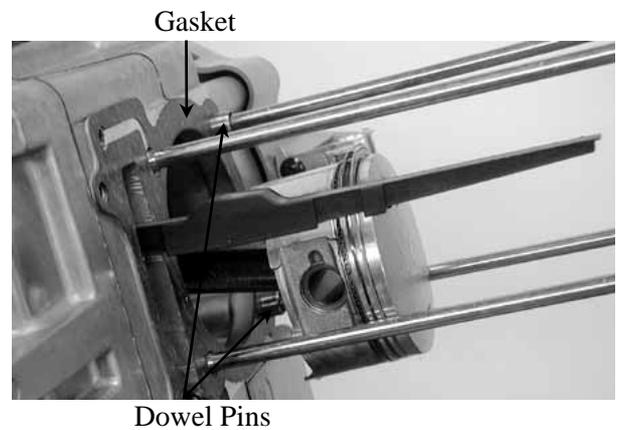
Remove the cylinder head. (⇒4-7)  
Remove the water hose from the cylinder.



Remove the cam chain guide.  
Remove the cylinder.



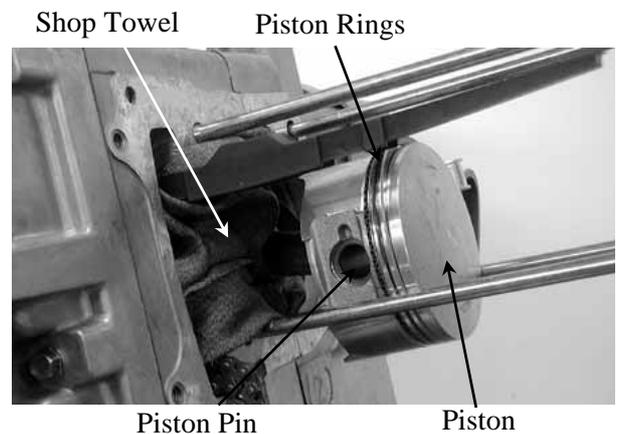
Remove the cylinder gasket and dowel pins.  
Clean any gasket material from the cylinder surface.



### PISTON REMOVAL

Remove the piston pin clip.  
Press the piston pin out of the piston.

\* Place a clean shop towel in the crankcase to keep the piston pin clip from falling into the crankcase.



## 5. CYLINDER/PISTON

---

Inspect the piston, piston pin and piston rings.  
Remove the piston rings.

- \* Take care not to damage or break the piston rings during removal.

Clean carbon deposits from the piston ring grooves.



Install the piston rings onto the piston and measure the piston ring-to-groove clearance.

**Service Limits:**

**Top:** 0.09mm replace if over

**2nd:** 0.09mm replace if over



Remove the piston rings and insert each piston ring into the cylinder bottom.

- \* Use the piston head to push each piston ring into the cylinder.

Measure the piston ring end gap.

**Service Limit:** 0.5mm replace if over



Measure the piston pin hole I.D.

**Service Limit:** 17.04mm replace if over



## 5. CYLINDER/PISTON

Measure the piston pin O.D.

**Service Limit:** 16.96mm replace if below



Measure the piston O.D.

- \* Take measurement at 9mm from the bottom and 90° to the piston pin hole.

**Service Limit:** 72.60mm replace if below

Measure the piston-to-piston pin clearance.

**Service Limit:** 0.02mm replace if over



### CYLINDER INSPECTION

Inspect the cylinder bore for wear or damage. Measure the cylinder I.D. at three levels of top, middle and bottom at 90° to the piston pin (in both X and Y directions).

**Service Limit:** 72.80mm repair or replace if Over



Measure the cylinder-to-piston clearance.

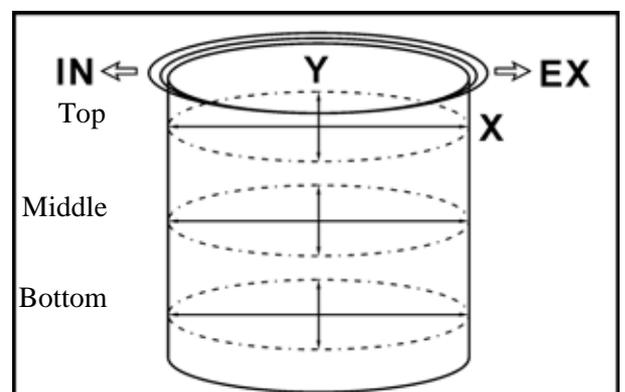
**Service Limit:** 0.1mm repair or replace if Over

The true roundness is the difference between the values measured in X and Y directions. The cylindricity (difference between the values measured at the three levels) is subject to the maximum value calculated.

**Service Limits:**

**True Roundness:** 0.09mm repair or replace if over

**Cylindricity:** 0.09mm repair or replace if over



## 5. CYLINDER/PISTON

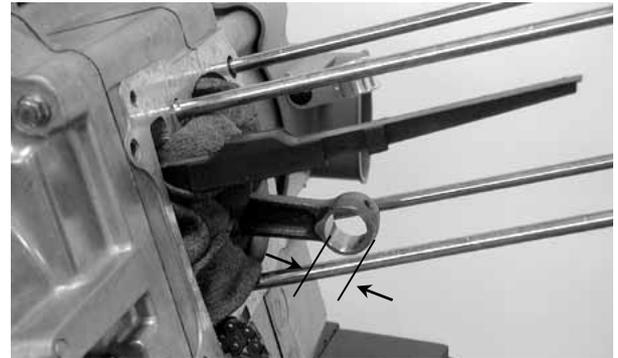
Inspect the top of the cylinder for warpage.

**Service Limit:** 0.05mm repair or replace if over



Measure the connecting rod small end I.D.

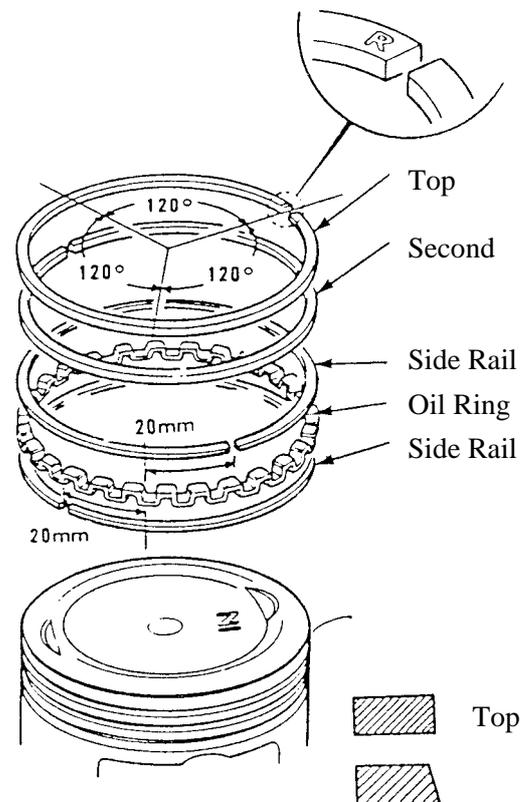
**Service Limit:** 17.06mm replace if over



### PISTON RING INSTALLATION

Install the piston rings onto the piston.  
Apply engine oil to each piston ring.

- \*
- Be careful not to damage the piston and piston rings during assembly.
  - All rings should be installed with the markings facing up.
  - After installing the rings, they should rotate freely without sticking.
  - Stagger the ring end gaps as the figure shown.



## 5. CYLINDER/PISTON

### PISTON INSTALLATION

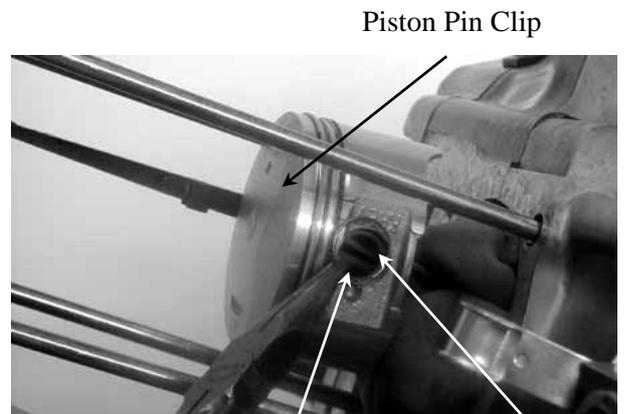
Remove any gasket material from the crankcase surface.

- \* Be careful not to drop foreign matters into the crankcase.



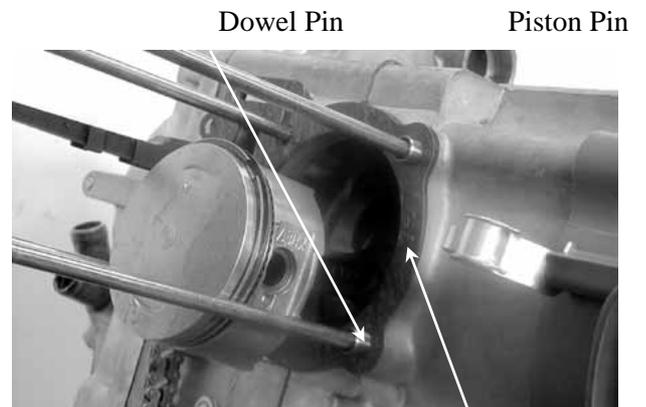
Install the piston, piston pin and a new piston pin clip.

- \* Position the piston "IN" mark on the intake valve side.
- \* Place a clean shop towel in the crankcase to keep the piston pin clip from falling into the crankcase.



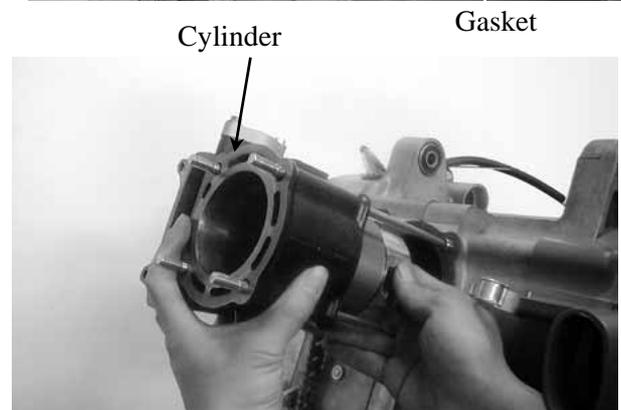
### CYLINDER INSTALLATION

Install the dowel pins and a new cylinder gasket on the crankcase.



Coat the cylinder bore, piston and piston rings with clean engine oil. Carefully lower the cylinder over the piston by compressing the piston rings.

- \* Be careful not to damage or break the piston rings.
- \* The piston ring end gaps should not be parallel with or at 90° to the piston pin.

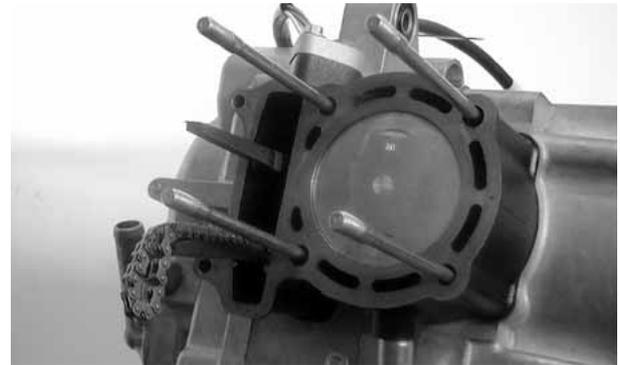


## 5. CYLINDER/PISTON

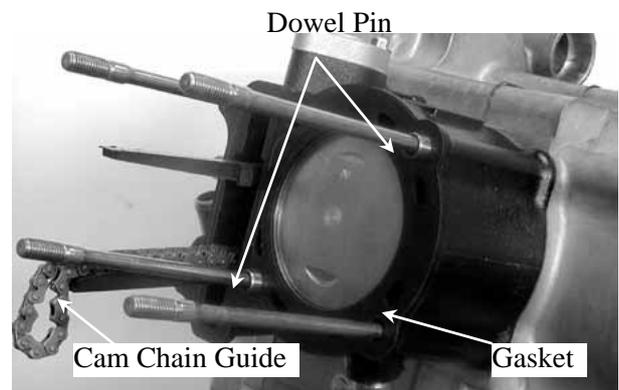
---

Install the cam chain guide.

- \* • Insert the tab on the cam chain guide into the cylinder groove.



Install the cylinder gasket and dowel pins.  
Connect the water hose to the cylinder.  
Install the cylinder head. (⇒4-9)  
Tighten the cylinder base bolt.



**6. DRIVE AND DRIVEN PULLEYS/  
KICK STARTER**

---

BR & M2 250 ENGINE

---

---

---

---

---

---

---

**DRIVE AND DRIVEN PULLEYS/  
KICK STARTER**

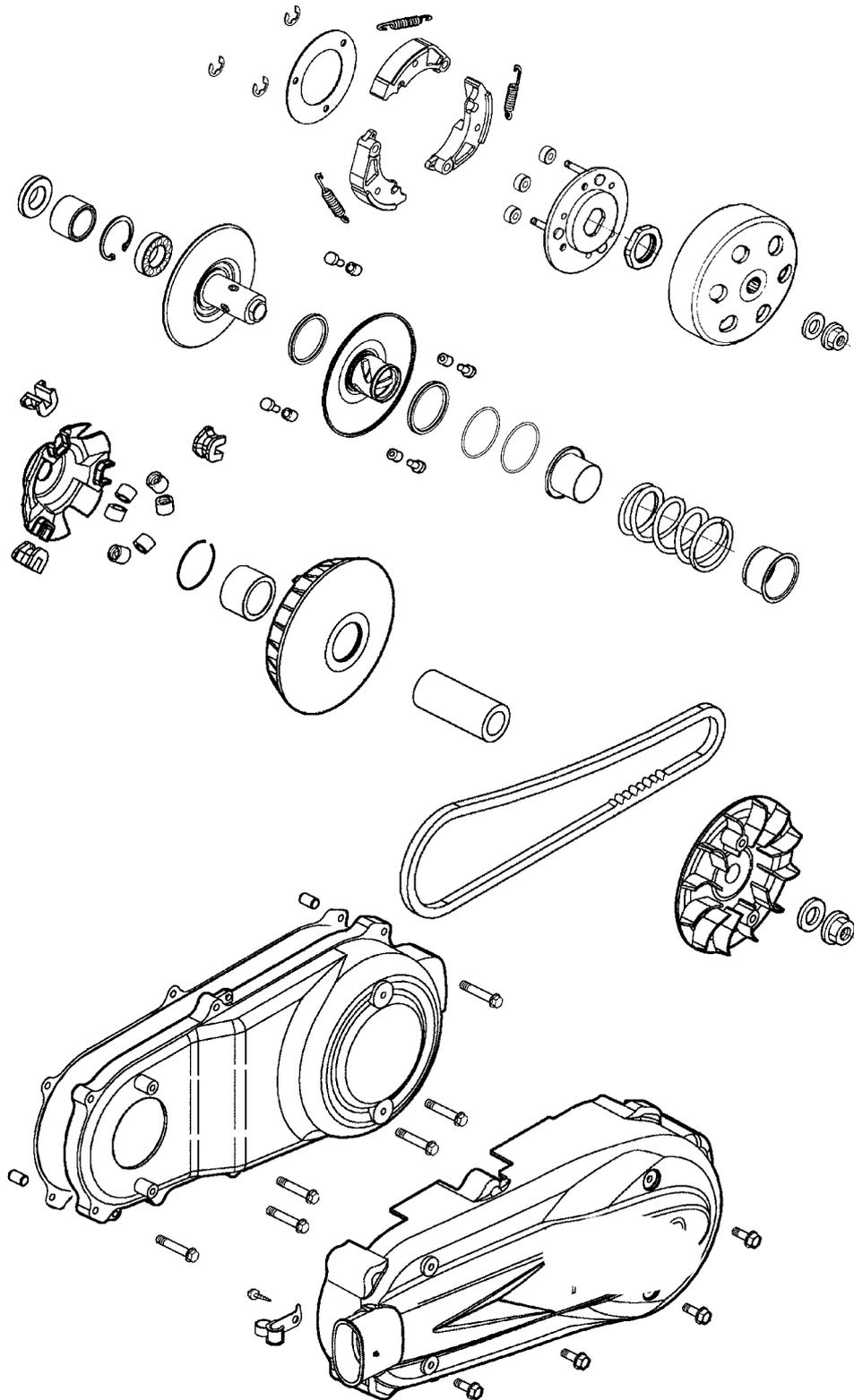
---

SCHEMATIC DRAWING -----	6- 1
SERVICE INFORMATION-----	6- 2
TROUBLESHOOTING-----	6- 2
LEFT CRANKCASE COVER -----	6- 3
DRIVE PULLEY -----	6- 4
CLUTCH/DRIVEN PULLEY-----	6- 8

# 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

BR & M2 250 ENGINE

## SCHEMATIC DRAWING



# 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

**BR & M2 250 ENGINE**

## SERVICE INFORMATION

### GENERAL INSTRUCTIONS

- The drive pulley, clutch and driven pulley can be serviced with the engine installed.
- Avoid getting grease and oil on the drive belt and pulley faces. Remove any oil or grease from them to minimize the slipping of drive belt and drive pulley.

### SPECIFICATIONS

Item	Standard (mm)	Service Limit (mm)
Movable drive face bushing I.D.	40.000~40.025	40.06
Drive face collar O.D.	39.965~39.955	39.85
Drive belt width	23.6~24.4	25.5
Clutch lining thickness	3.963~4.037	2.0
Clutch outer I.D.	153.0~153.2	153.5
Driven face spring free length	131	130.5
Driven face O.D.	26.960~26.974	26.90
Movable driven face I.D.	27.060~27.090	27.13
Weight roller O.D.	18.9~19.00	18.00

### TORQUE VALUES

Drive face nut	49.0~58.8N-m
Clutch outer nut	49.0~58.8N-m
Clutch drive plate nut	49.0~58.8N-m

### SPECIAL TOOLS

Universal holder	Clutch spring compressor
Bearing driver	Lock nut wrench, 39mm
	Kick starter spring remover

### TROUBLESHOOTING

#### Engine starts but motorcycle won't move

- Worn drive belt
- Broken ramp plate
- Worn or damaged clutch lining
- Broken driven face spring

#### Lack of power

- Worn drive belt
- Weak driven face spring
- Worn weight roller
- Faulty driven face

#### Engine stalls or motorcycle creeps

- Broken clutch weight spring

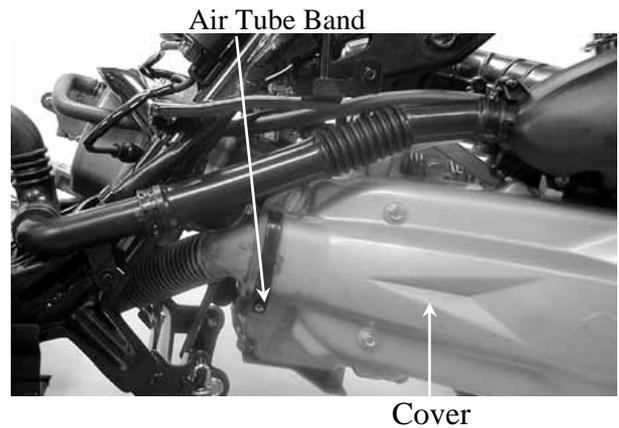
## 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

**BR & M2 250 ENGINE**

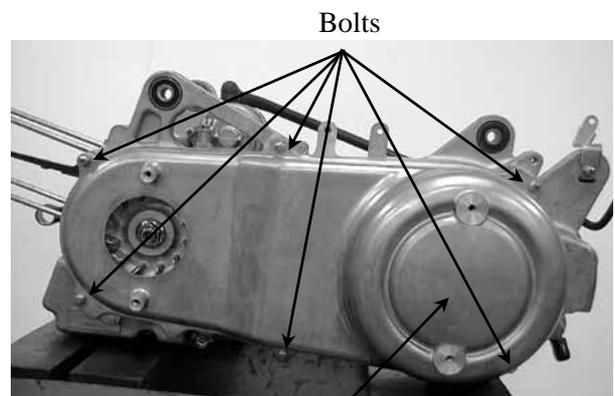
### LEFT CRANKCASE COVER

#### REMOVAL

Loosen the drive belt air tube band screw.  
Remove the four bolts on the left crankcase surface cover.

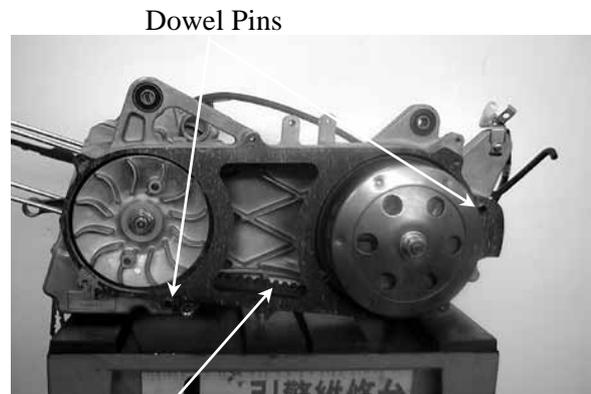


Remove the left crankcase cover bolts and left crankcase covers.  
Remove the seal rubber and dowel pins.

**Left Crankcase Cover**

#### INSTALLATION

Install the dowel pins and the seal rubber.

**Seal Rubber**

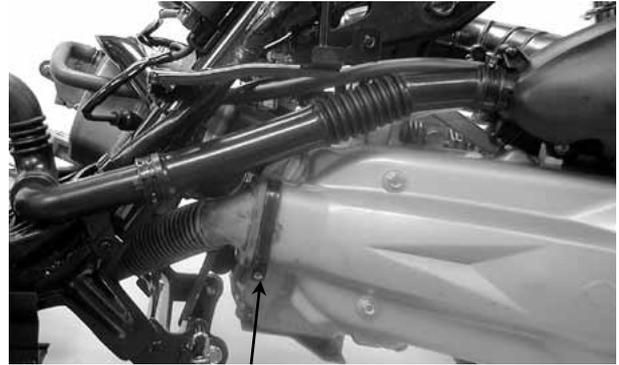
Install the left crankcase cover.  
Install the cable clamp to the specified location. Install and tighten the left crankcase cover bolts.

**Bolts**

## 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

**BR & M2 250 ENGINE**

Install the drive belt air tube and tighten the tube band screw.



Tube Band Screw

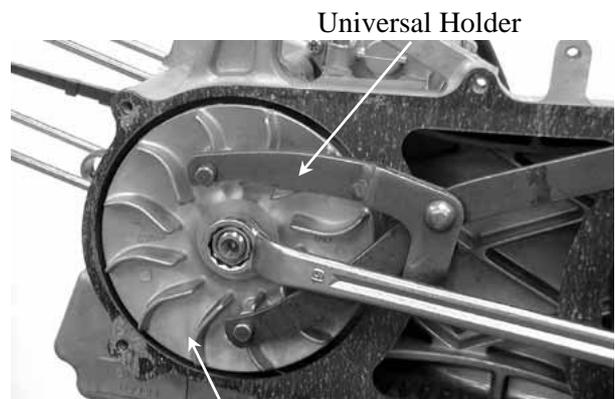
### DRIVE PULLEY

#### REMOVAL

Remove the left crankcase cover.  
Hold the drive pulley using an universal holder and remove the drive face nut and washer.  
Remove the drive pulley face.

Special

Universal Holder

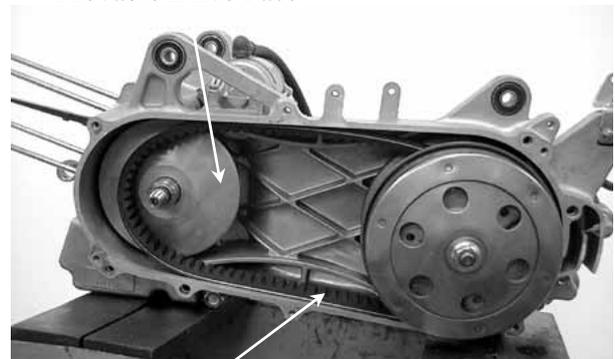


Universal Holder

Drive Pulley Face

Remove the drive belt from the movable drive face.

Movable Drive Face



Drive Belt

#### INSPECTION

Check the drive belt for cracks, separation or abnormal or excessive wear.  
Measure the drive belt width.

**Service Limit:** 18.0mm replace if below

- \* Use specified genuine parts for replacement.

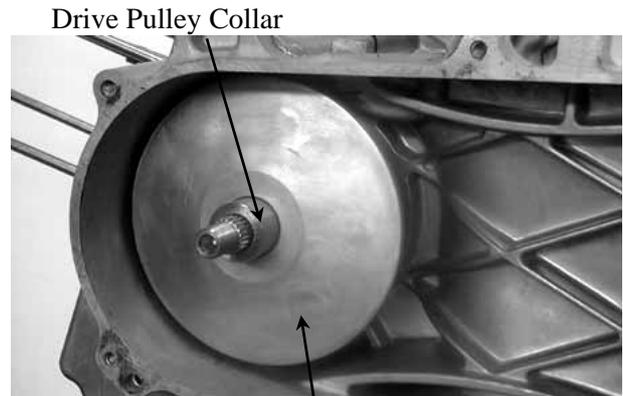


## 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

---

BR & M2 250 ENGINE

Remove the movable drive face assembly.  
Remove the drive pulley collar.



Drive Pulley Collar

Movable Drive Face Assembly

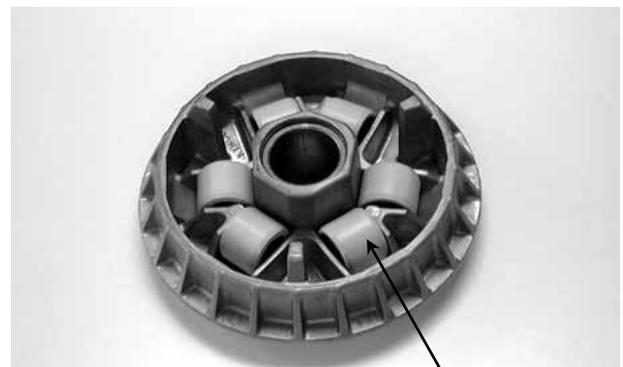
### DISASSEMBLY

Remove the ramp plate.



Ramp Plate

Remove the weight rollers.

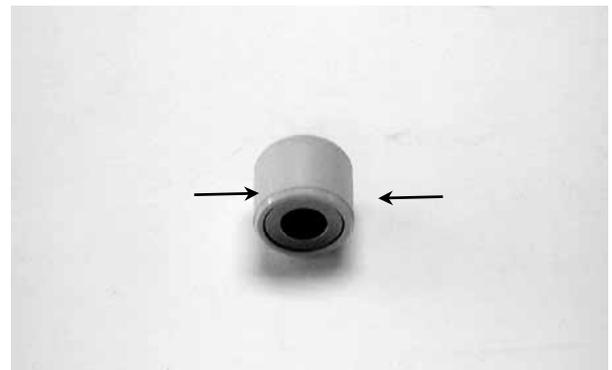


Weight Roller

### INSPECTION

Check each weight roller for wear or damage.  
Measure each weight roller O.D.

**Service Limit:** 18.00mm replace if below



## 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

BR & M2 250 ENGINE

Measure the movable drive face bushing assembly I.D.

**Service Limit:** 27.13mm replace if over

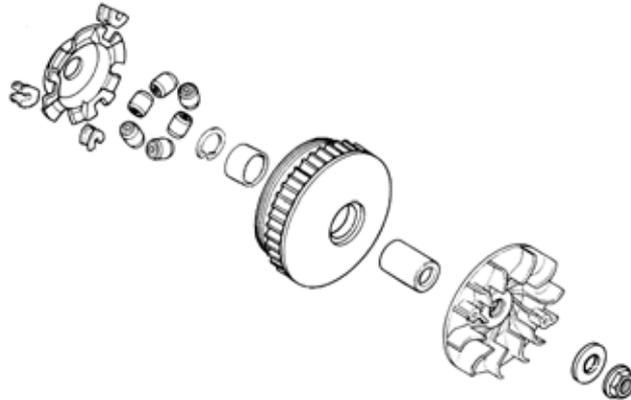


Check the drive pulley collar for wear or damage.  
Measure the O.D. of the drive pulley collar sliding surface.

**Service Limit:** 26.90mm replace if below



### ASSEMBLY



Install the weight rollers into the movable drive face.

- \* The direction of all weight rolls is same. The color side is towards to clockwise.



Weight Roller

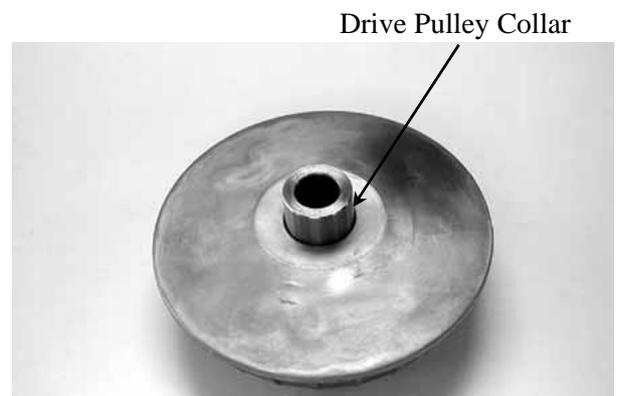
## 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

BR & M2 250 ENGINE

Install the ramp plate.

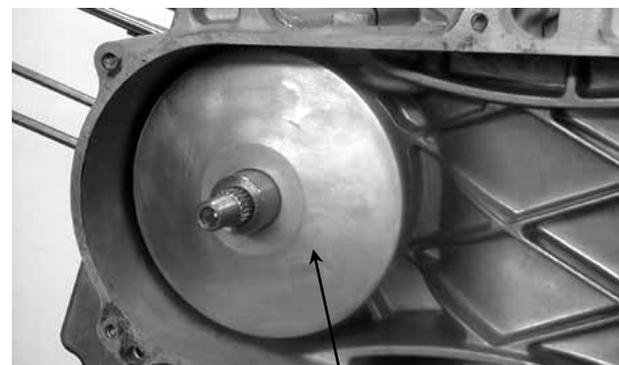


Insert the drive pulley collar into the movable drive face.



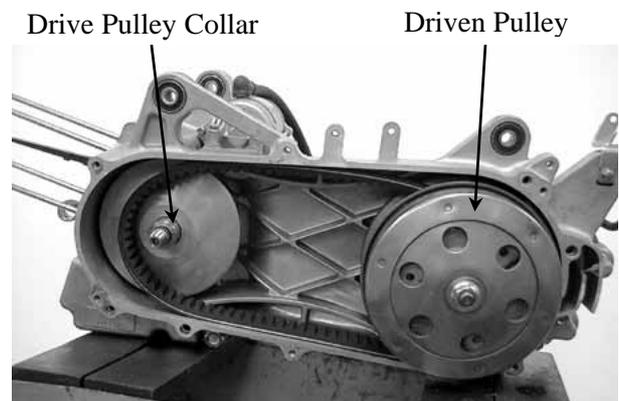
### INSTALLATION

Install the movable drive face onto the crankshaft.



Movable Drive Face Assembly

Lay the drive belt on the driven pulley.  
Set the drive belt on the drive pulley collar.

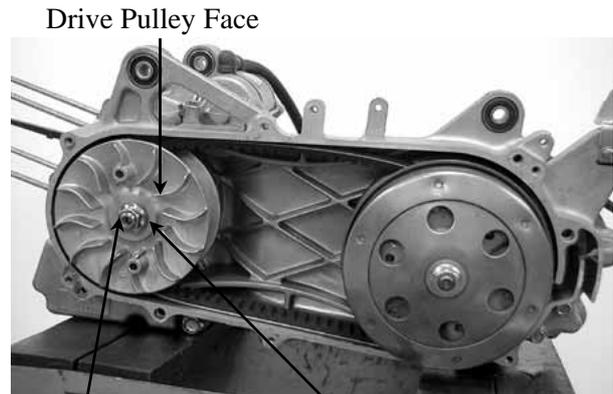


Drive Belt

## 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

BR & M2 250 ENGINE

Install the drive pulley face, washer and drive face nut.



Drive Face Nut      Washer

Hold the drive pulley with the universal holder and tighten the drive face nut.

**Torque:** 49.0~58.5N-m

Special

Universal Holder

- \* Do not get oil or grease on the drive belt or drive pulley faces.



Drive Pulley

### CLUTCH/DRIVEN PULLEY

Remove the left crankcase cover. (⇒6-3)

Remove the drive pulley and drive belt. (⇒6-4)

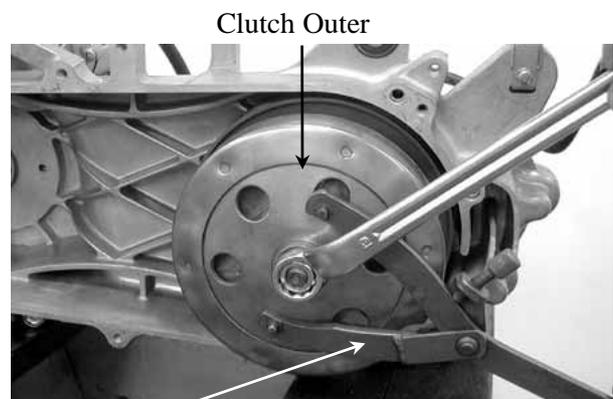
(⇒6-4)

Hold the clutch outer with the universal holder and remove the clutch outer nut.

Special

Universal Holder

Remove the clutch outer.

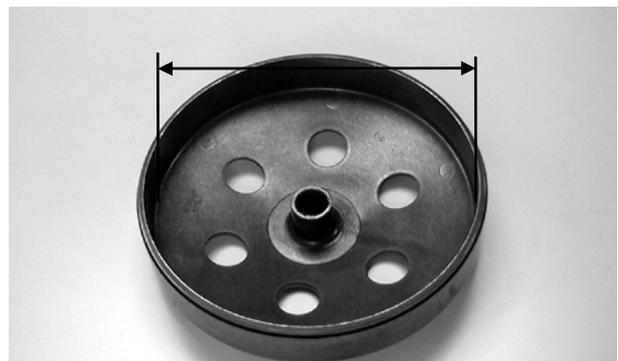


Universal Holder

### INSPECTION

Inspect the clutch outer for wear or damage. Measure the clutch outer I.D.

**Service Limit:** 153.5mm replace if over



## 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

BR & M2 250 ENGINE

Check the clutch shoes for wear or damage.  
Measure the clutch lining thickness.

**Service Limit:** 2.0mm replace if below



### CLUTCH/DRIVEN PULLEY DISASSEMBLY



Hold the clutch/driven pulley assembly with  
the clutch spring compressor.

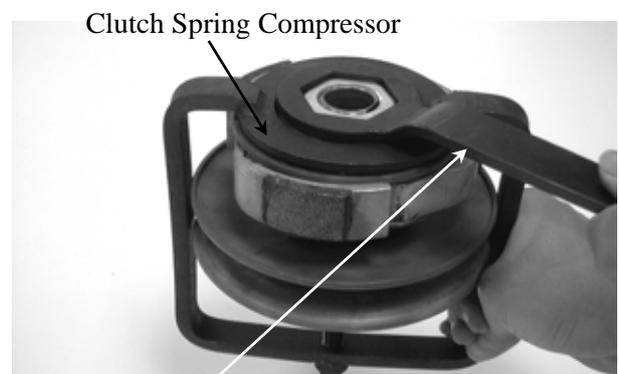
- \* Be sure to use a clutch spring compressor to avoid spring damage.

Special

Clutch Spring Compressor

Set the tool in a vise and remove the clutch  
drive plate nut.

Lock Nut Wrench, 39mm



Lock Nut Wrench

Loosen the clutch spring compressor and  
disassemble the clutch/driven pulley  
assembly.

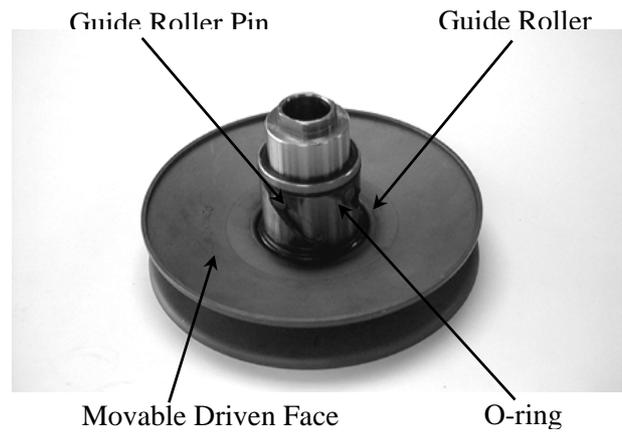
Remove the seal collar.



## 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

**BR & M2 250 ENGINE**

Pull out the guide roller pins and guide rollers.  
Remove the movable driven face from the  
driven face.

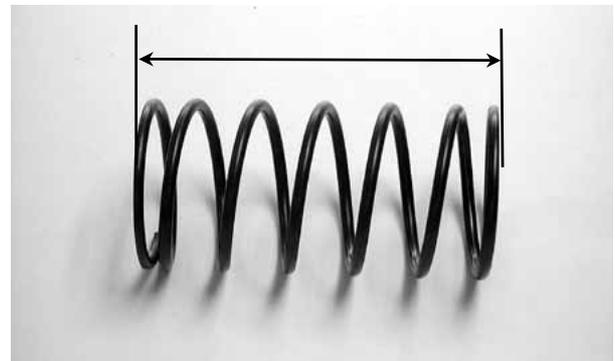


Remove the oil seal from the movable driven  
face.



### INSPECTION

Measure the driven face spring free length.  
**Service Limit:** 130.5mm replace if below



Check the driven face assembly for wear or  
damage.

Measure the driven face O.D.

**Service Limit:** 39.92mm replace if below



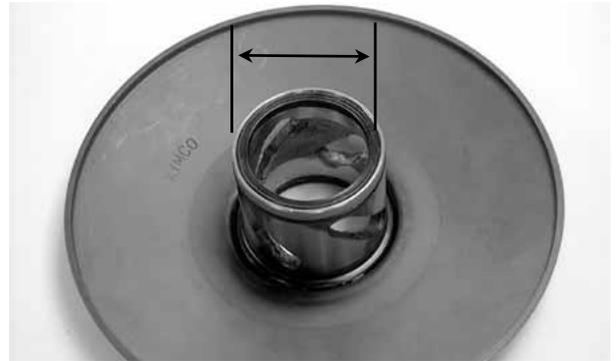
## 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

BR & M2 250 ENGINE

Check the movable driven face for wear or damage.

Measure the movable driven face I.D.

**Service Limit:** 40.05mm replace if over

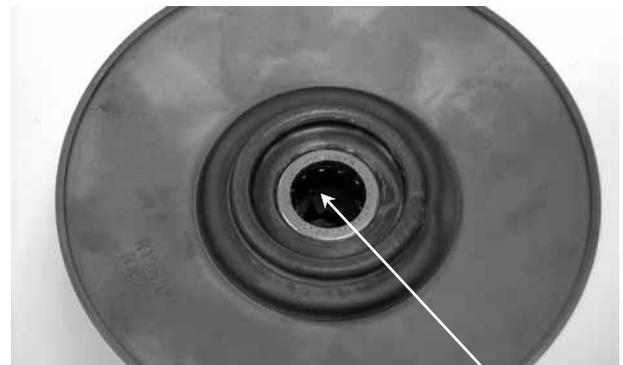


### DRIVEN PULLEY FACE BEARING REPLACEMENT

Check the bearings for play and replace them if they have excessive play.

Drive the inner needle bearing out of the driven pulley face.

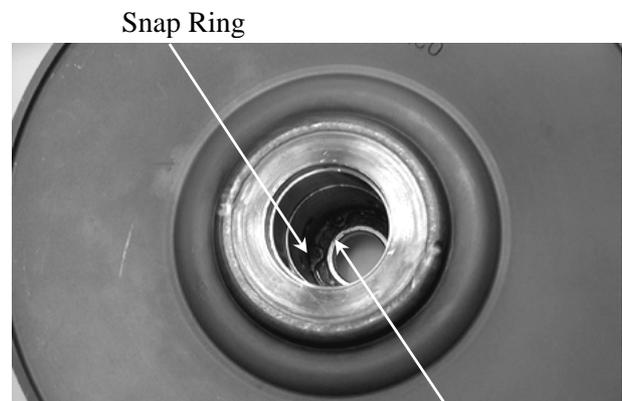
- \* Discard the removed bearing and replace with a new one.



Inner Bearing

Remove the snap ring and drive the outer bearing out of the driven face.

- \* Discard the removed bearing and replace with a new one.



Outer Bearing

Apply grease to the outer bearing.  
Drive a new outer bearing into the driven face with the sealed end facing up.

Special

Bearing Driver

Seat the snap ring in its groove.  
Apply grease to the driven face bore areas.

- \* Pack all bearing cavities with 9~9.5g grease.

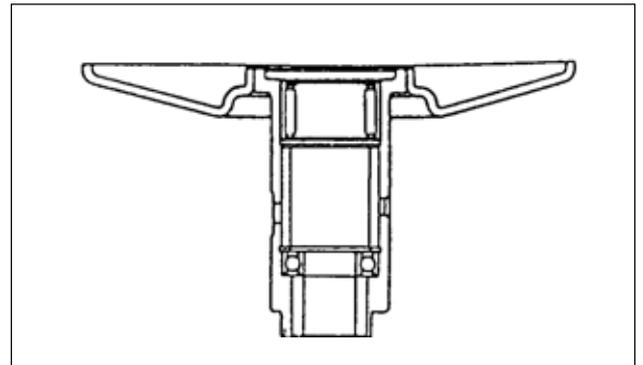
## 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

**BR & M2 250 ENGINE**

Press a new needle bearing into the driven face.

Special

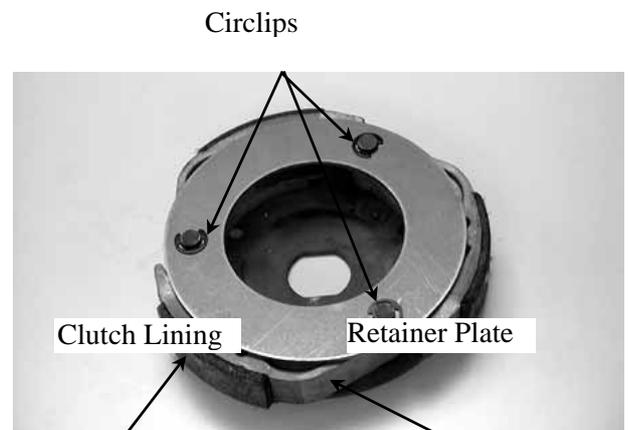
Bearing Driver



### CLUTCH DISASSEMBLY

Remove the circlips and retainer plate to disassemble the clutch.

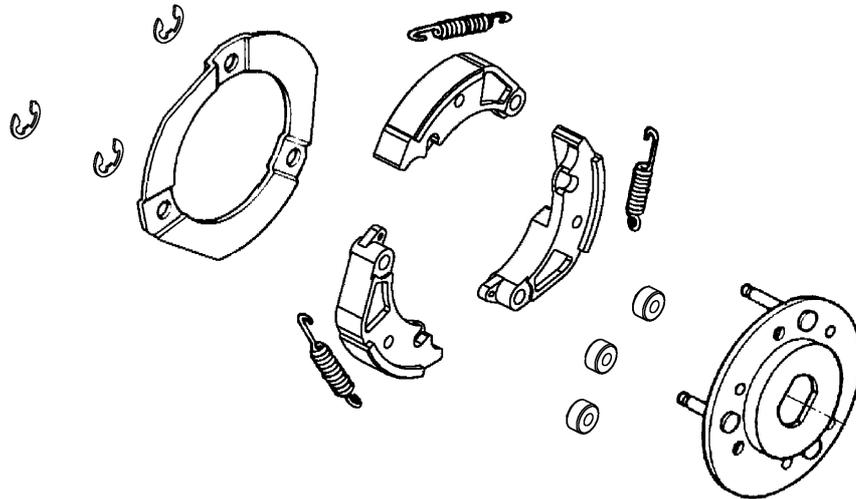
- \* • Keep grease off the clutch linings.



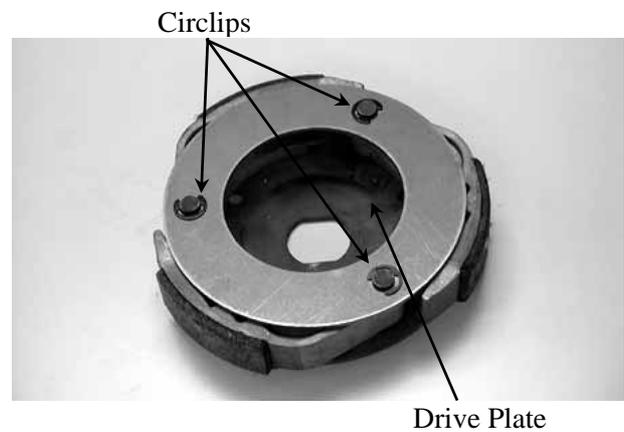
## 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

BR &amp; M2 250 ENGINE

### CLUTCH ASSEMBLY

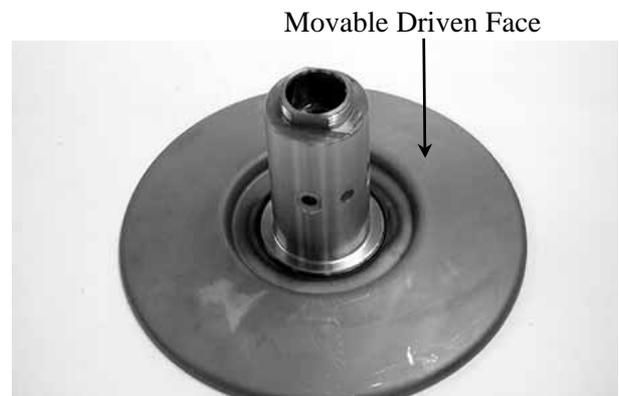


Install the damper rubbers on the drive plate pins.  
Install the clutch weights/shoes and clutch springs onto the drive plate.  
Install the retainer plate and secure with the circlips.



### CLUTCH/DRIVEN PULLEY ASSEMBLY

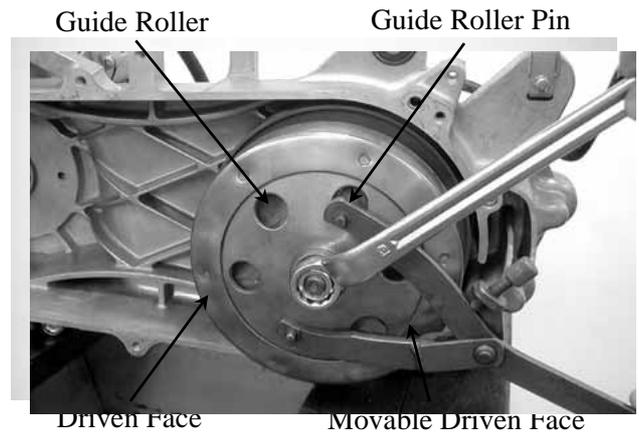
Clean the pulley faces and remove any grease from them.  
Apply grease to the O-rings and install them onto the moveable driven face.



## 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

BR & M2 250 ENGINE

Install the movable driven face onto the driven face.  
Apply grease to the guide rollers and guide roller pins and then install them into the holes of the driven face.



Install the seal collar.  
Remove any excessive grease.

- \* • Be sure to clean the driven face off any grease.

Set the driven pulley assembly, driven face spring and clutch assembly onto the clutch spring compressor.

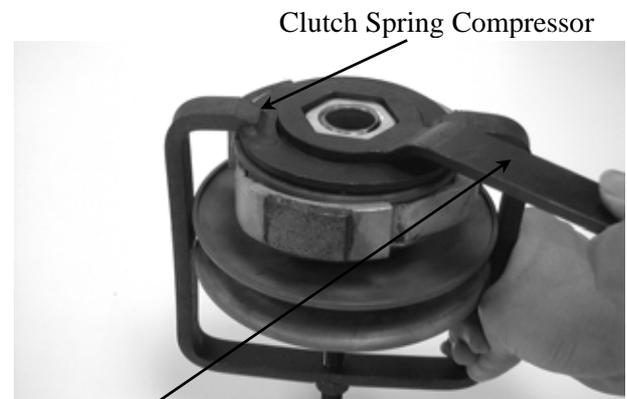
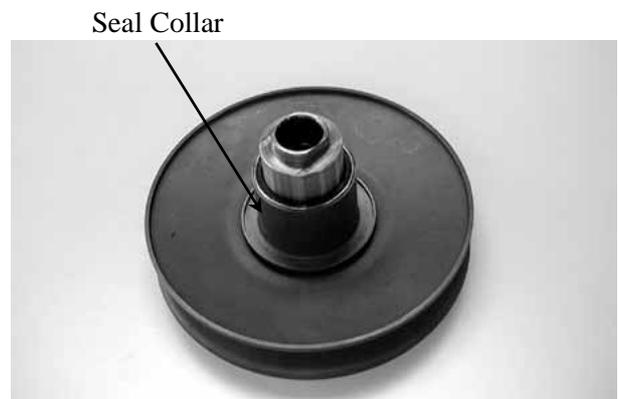
- \* • Align the flat surface of the driven face with the flat on the clutch drive plate.

Compress the tool and install the drive plate nut.

Set the tool in a vise and tighten the drive plate nut to the specified torque.

**Torque:** 49.0~58.8N-m

- \* • Be sure to use a clutch spring compressor to avoid spring damage.



Lock Nut Wrench

**Special**

Clutch Spring Compressor  
Outer Driver, 39mm

### INSTALLATION

Install the clutch/driven pulley onto the drive shaft.

- \* • Keep grease off the drive shaft.



Clutch/Driven Pulley

## 6. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

---

**BR & M2 250 ENGINE**

Install the clutch outer.  
Hold the clutch outer with the universal  
holder.

Install and tighten the clutch outer nut.

**Torque:** 49.0~58.8kg-m

Special

Universal Holder

Install the drive belt. (⇒6-7)

Install the left crankcase cover. (⇒6-3)

Clutch Outer



# 7. FINAL REDUCTION

---

---

---

---

---

---

---

---

## FINAL REDUCTION

---

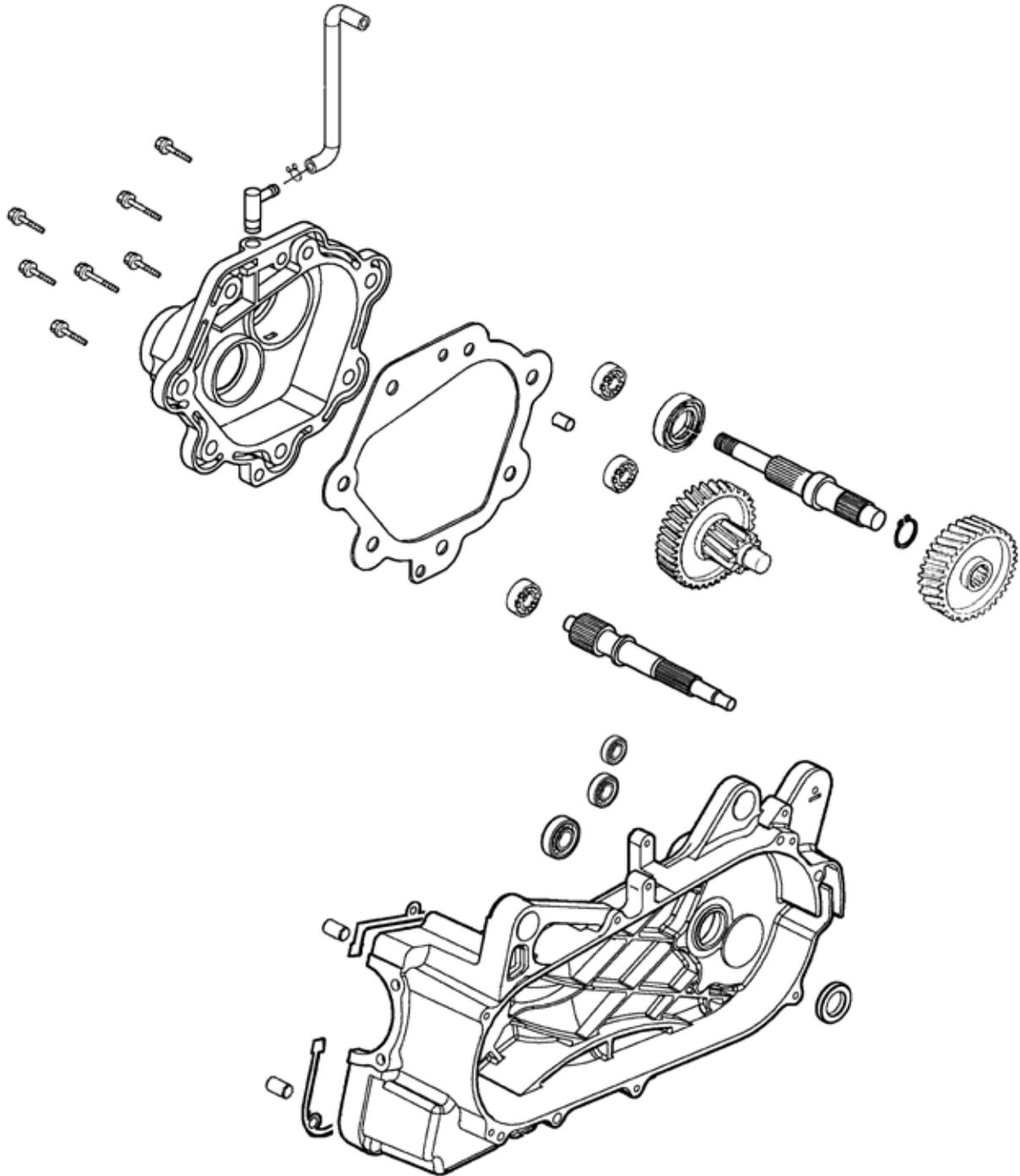
SCHEMATIC DRAWING -----	7-1
SERVICE INFORMATION-----	7-2
TROUBLESHOOTING-----	7-2
FINAL REDUCTION DISASSEMBLY -----	7-3
FINAL REDUCTION INSPECTION-----	7-3
FINAL REDUCTION ASSEMBLY -----	7-6



# 7. FINAL REDUCTION

---

## SCHEMATIC DRAWING



## 7. FINAL REDUCTION

---

### SERVICE INFORMATION

#### GENERAL INSTRUCTIONS

- The servicing operations of this section can be made with the engine installed.
- When replacing the drive shaft, use a special tool to hold the bearing inner race for this operation.

#### SPECIFICATIONS

Specified Oil: SAE 90#

Oil Capacity:

At disassembly : 0.2 liter

At change : 0.18 liter

#### TORQUE VALUES

Transmission case cover bolt 25.5~31.4N-m

Oil check bolt 9.8~14.7N-m

#### SPECIAL TOOLS

Bearing remover, 12mm

Bearing remover, 15mm

Pilot, 12mm

Pilot, 15mm

#### TROUBLESHOOTING

##### Engine starts but motorcycle won't move

- Damaged transmission
- Seized or burnt transmission

##### Abnormal noise

- Worn, seized or chipped gears
- Worn bearing

##### Oil leaks

- Oil level too high
- Worn or damaged oil seal

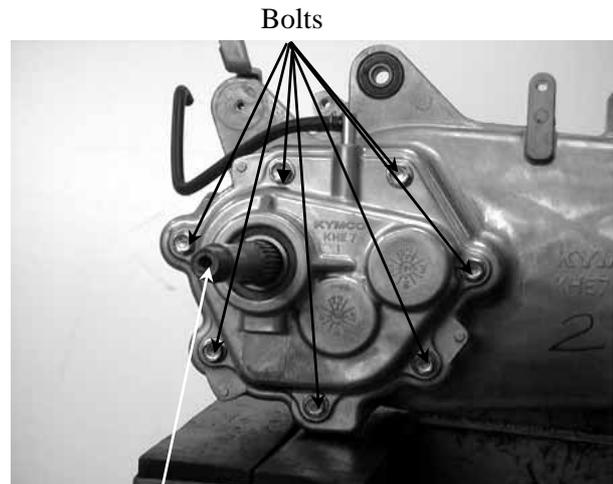
## 7. FINAL REDUCTION

---

### FINAL REDUCTION DISASSEMBLY

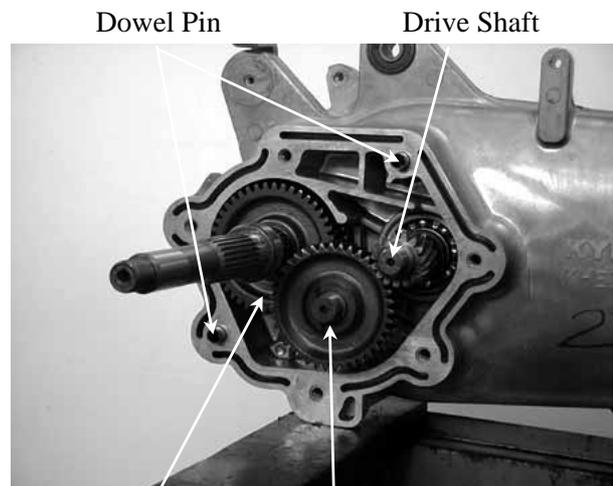
Remove the exhaust muffler.  
Remove the rear brake caliper.  
Remove the right rear shock absorber.

Remove the rear fork.  
Remove the rear wheel.  
Remove the left crankcase cover. (⇒6-3)  
Remove the clutch/driven pulleys. (⇒6-4)  
Drain the transmission gear oil into a clean container.  
Remove the transmission case cover attaching bolts.



Final Shaft

Remove the transmission case cover.  
Remove the gasket and dowel pins.  
Remove the final gear and countershaft.



Final Gear      Countershaft

### FINAL REDUCTION INSPECTION

Inspect the countershaft and gear for wear or damage.



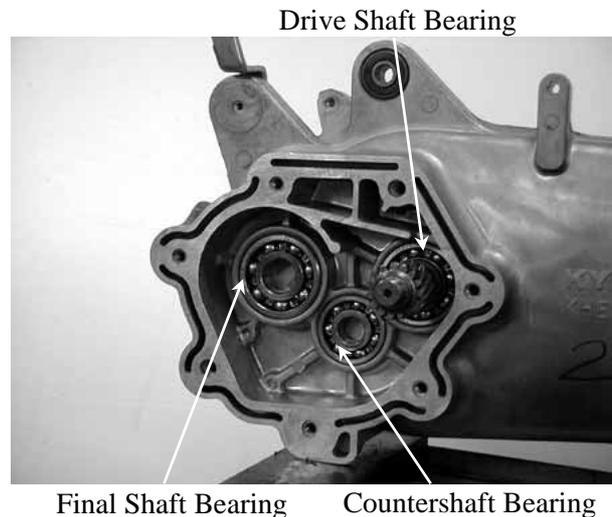
Countershaft

## 7. FINAL REDUCTION

Inspect the final gear and final shaft for wear, damage or seizure.



Check the left crankcase bearings for excessive play and inspect the oil seal for wear or damage.



Inspect the drive shaft and gear for wear or damage.  
Check the transmission case covers bearings for excessive play and inspect the final shaft bearing oil seal for wear or damage.

\* Do not remove the transmission case cover except for necessary part replacement. When replacing the drive shaft, also replace the bearing and



Final Shaft

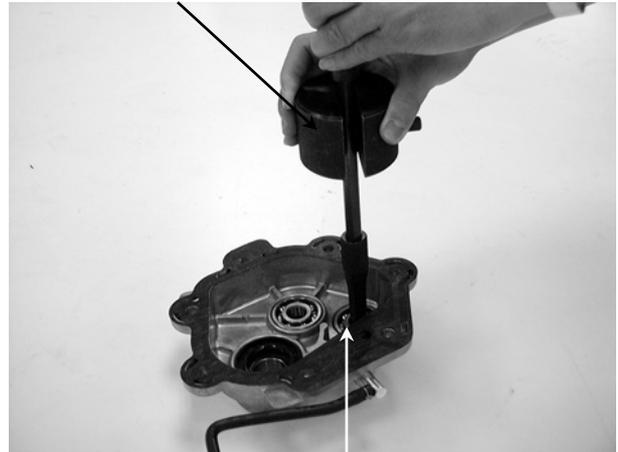
## 7. FINAL REDUCTION

---

### BEARING REPLACEMENT (TRANSMISSION CASE COVER)

Remove the transmission case cover bearings using the bearing remover.  
Remove the final shaft oil seal.

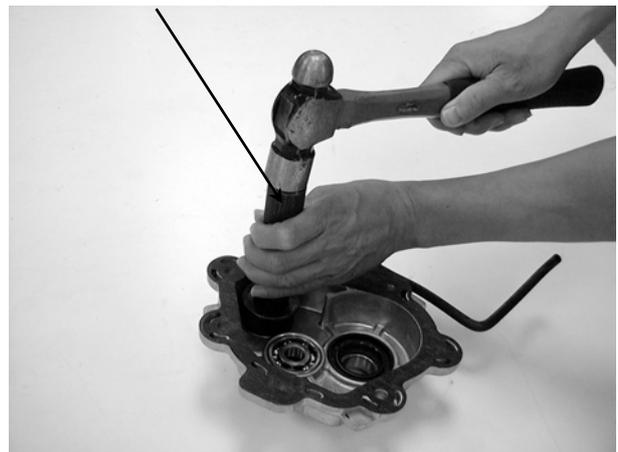
Bearing Remover, 15mm



Drive Shaft Bearing

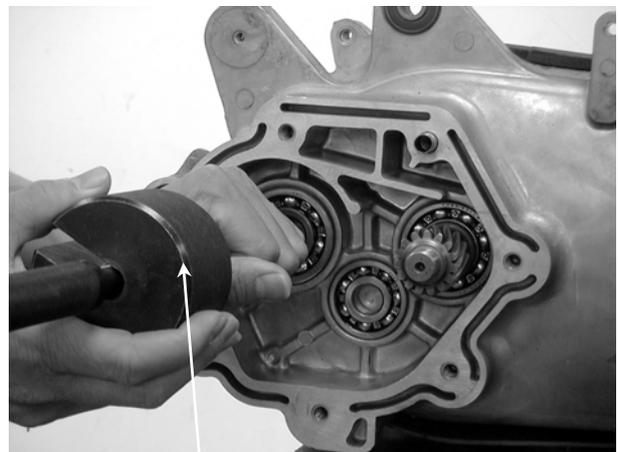
Drive new bearings into the transmission case cover.

Pilot, 15mm



### BEARING REPLACEMENT (LEFT CRANKCASE COVER)

Remove the drive shaft.  
Remove the drive shaft oil seal.  
Remove the left crankcase bearings using the bearing remover.



Bearing Remover

## 7. FINAL REDUCTION

---

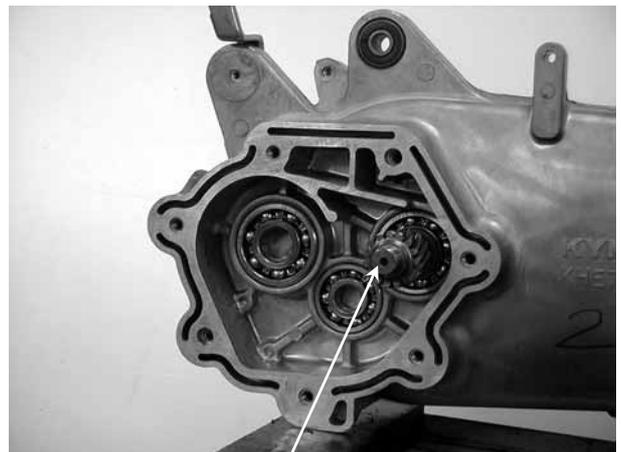
Drive new bearings into the left crankcase.  
Install a new drive shaft oil seal.



Pilot

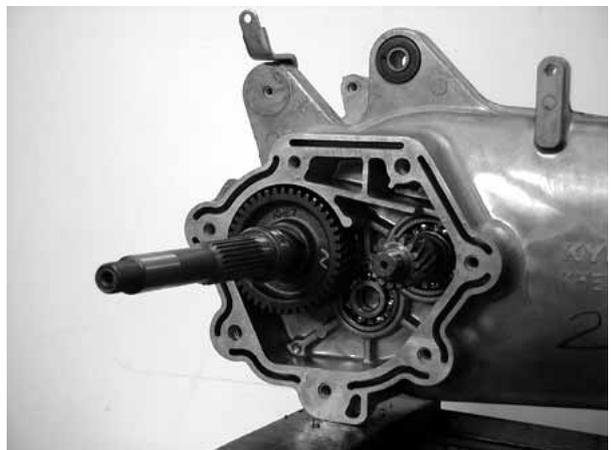
### FINAL REDUCTION ASSEMBLY

Install the drive shaft into the left crankcase.



Drive Shaft

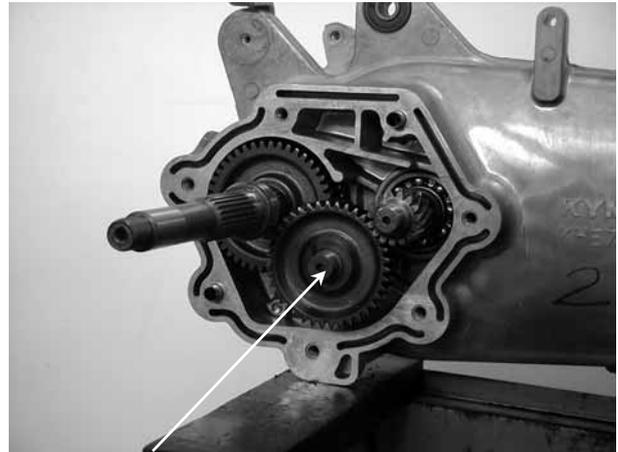
Install the final gear and final shaft into the left crankcase.



## 7. FINAL REDUCTION

---

Install the countershaft and gear into the left crankcase.  
Install the resin washer onto the counter-shaft.  
Install the dowel pins and a new gasket.



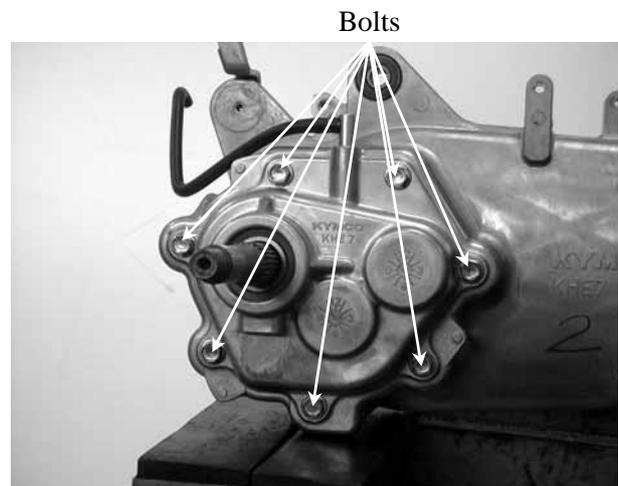
Countershaft

Install the transmission case cover.



Transmission Case Cover

Install and tighten the transmission case cover bolts.  
Install the clutch/driven pulley.  
Install other removed parts in the reverse order of removal.



Bolts

## 7. FINAL REDUCTION

---

After installation, fill the transmission case with the specified oil.

\*

- Place the motorcycle on its main stand on level ground.
- Check the oil-sealing washer for wear or damage.

**Specified Gear Oil:** SAE90#

**Oil Capacity:**

At disassembly : 0.2 liter

At change : 0.18 liter

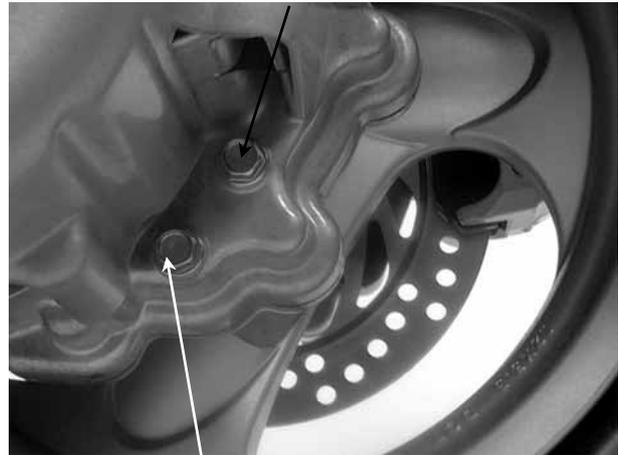
Install and tighten the oil check bolt.

**Torque:** 9.8~14.7N-m

Start the engine and check for oil leaks.

Check the oil level from the oil check bolt hole and add the specified oil to the proper level if the oil level is low.

Oil Check Bolt Hole/Oil Filler



Drain Bolt