Forward

This service manual contains the technical data of each component inspection and repair for the RK1.
The manual is shown with illustrations and focused on “Service Procedures”, “Operation Key Points”, and “Inspection Adjustment” so that provides technician with service guidelines.

If the style and construction of the ENGINE OR ANYTHING are different from that of the photos, pictures shown in this manual, the actual vehicle shall prevail. Specifications are subject to change without notice.

This manual that contains all data, illustration, indication and specifications is based on current production information. We reserve the right to make changes at any time without notice and without incurring any obligation whatever. No part of this manual can be duplicated by any means without written permission.

Service Department

How to Use This Manual

This service manual describes basic information of different system parts and system inspection & service for RK1.

In addition, please refer to the manual contents in detailed for the model you serviced in inspection and adjustment.

The first chapter covers general information and trouble diagnosis.

The second chapter covers service maintenance and special service tools information.

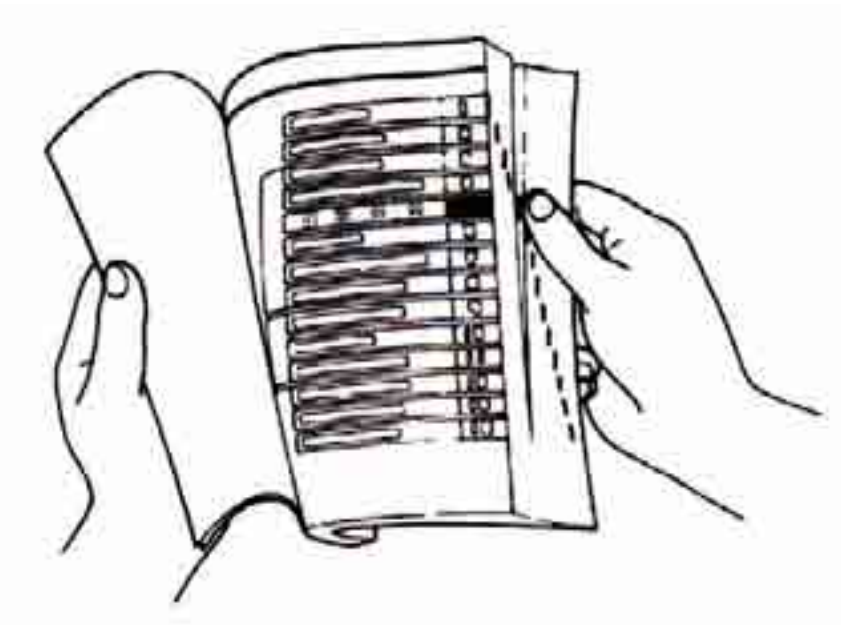
The third to the eleventh chapters cover engine, fuel systems and driving systems.

The twelfth to fifteenth chapters are contained the parts set of assembly body.

The sixteenth chapter is electrical equipment.

The seventh chapter is for wiring diagram.

Please see index of content for quick having the special parts and system information.



Contents

Symbols And Marks

Symbols and marks are used in this manual to indicate what and where the special service are needed, in case supplemental information is procedures needed for these symbols and marks, explanations will be added to the text instead of using the symbols or marks.

Warning	Means that serious injury or even death may result if procedures are not followed.
Caution	Means that equipment damages may result if procedures are not followed.
Engine oil	Limits to use SAE 10W-30 API SG class oil. Warranty will not cover the damage that caused by not apply with the limited engine oil. (Recommended oil: KING MATE G-3 oil)
Grease	King Mate G-3 is recommended. (KING MATE G-3)
Gear oil	King Mate gear oil (HYPOID GEAR OIL) is recommended. (SAE 85W-140)
Locking sealant	Apply sealant, medium strength sealant should be used unless otherwise specified.
Oil seal	Apply with lubricant.
Renew	Replace with a new part before installation.
Brake fluid	Use recommended brake fluid “DOT3” or “WELLRUN” brake fluid.
Special tools	Special service tools.
correct	Meaning correct installation.
wrong	Meaning wrong installation.
Indication	Indication of components.
directions	Indicates position and operation directions.
	Components assembly directions each other.
	Indicates where the bolt installation direction, --- means that bolt cross through the component (invisibility).

1. General Information/Trouble Diagnosis

General safety

Carbon monoxide

If you must run your engine, ensure the place is well ventilated. Never run your engine in a closed area. Run your engine in an open area, if you have to run your engine in a closed area, be sure to use an extractor.

Caution

Exhaust contains toxic gas which may cause one to lose consciousness and even result in death.

Gasoline

Gasoline is a low ignition point and explosive material. Work in a well-ventilated place, no flame or spark should be allowed in the work place or where gasoline is being stored.

Caution

Gasoline is highly flammable, and may explode under some conditions, keep it away from children.

Used engine oil

Caution

Prolonged contact with used engine oil (or transmission oil) may cause skin cancer although it might not be verdict.
We recommend that you wash your hands with soap and water right after contacting.
Keep the used oil beyond reach of children.

Hot components

Caution

Components of the engine and exhaust system can become extremely hot after engine running. They remain very hot even after the engine has been stopped for some time. When performing service work on these parts, wear insulated gloves and wait until cooling off.

Battery

Caution

- Battery emits explosive gases; flame is strictly prohibited. Keep the place well ventilated when charging the battery.
- Battery contains sulfuric acid (electrolyte) which can cause serious burns so be careful do not be spray on your eyes or skin. If you get battery acid on your skin, flush it off immediately with water. If you get battery acid in your eyes, flush it off immediately with water, then go to hospital to see an ophthalmologist.
- If you swallow it by mistake, drink a lot of water or milk, and take some laxative such as castor oil or vegetable oil, and then go to see a doctor.
- Keep electrolyte beyond reach of children.

Brake shoe

Do not use an compressed air or a dry brush to clean components of the brake system, use a vacuum cleaner or the equivalent to avoid asbestos dust flying.

Caution

Inhaling asbestos dust may cause disorders and cancer of the breathing system.

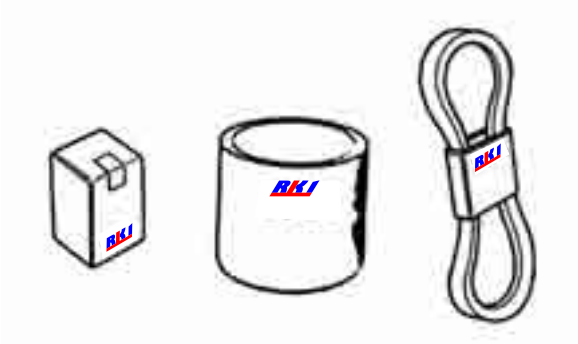
Brake fluid

Caution

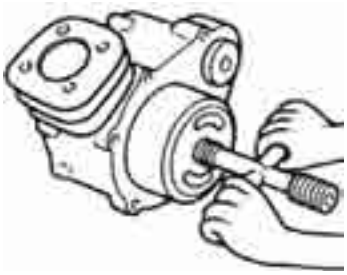
Spilling brake fluid on painted, plastic, or rubber parts may cause damage to the parts. Place a clean towel on the above-mentioned parts for protection when servicing the brake system. Keep brake fluid beyond reach of children.

Service Precautions

- Always use with RK1 genuine parts and recommended oils. Using non-designed parts for RK1 motorcycle may damage the motor-Cycle.



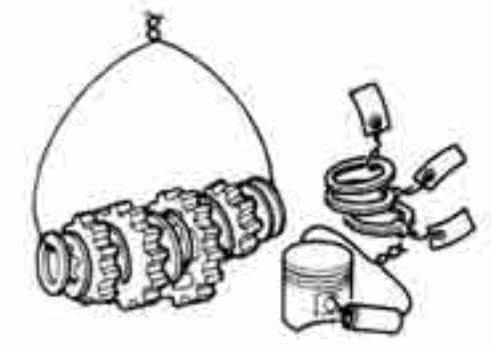
- Special tools are designed for remove and install of components without damaging the parts being worked on. Using wrong tools may result in parts damaged.



- When servicing this motorcycle, use only metric tools. Metric bolts, nuts, and screws are not interchangeable with the English system, using wrong tools and fasteners may damage this vehicle.
- Clean the outside of the parts or the cover before removing it from the motorcycle. Otherwise, dirt and deposit accumulated on the part's surface may fall into the engine, chassis, or brake system to cause a damage.
- Wash and clean parts with high ignition point solvent, and blow dry with compressed air. Pay special attention to O-rings or oil seals because most cleaning agents have an adverse effect on them.

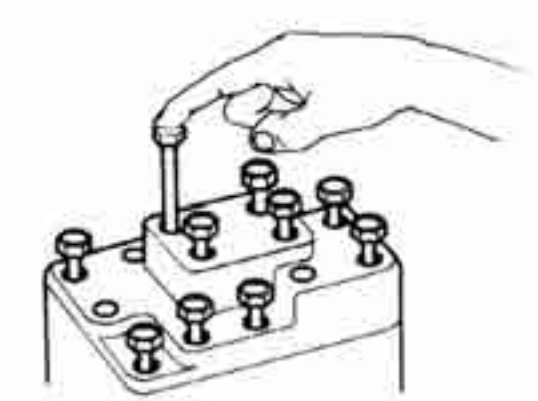
- Never bend or twist a control cable to prevent stiff control and premature worn out.

- Rubber parts may become deteriorated when old, and prone to be damaged by solvent and oil. Check these parts before installation to make sure that they are in good condition, replace if necessary.
- When loosening a component which has different sized fasteners, operate with a diagonal pattern and work from inside out. Loosen the small fasteners first. If the bigger ones are loosen first, small fasteners may receive too much stress.
- Store complex components such as transmission parts in the proper assemble order and tie them together with a wire for ease of installation later.

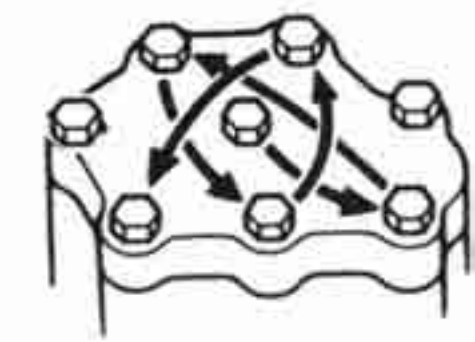


- Note the reassemble position of the important components before disassembling them to ensure they will be reassembled in correct dimensions (depth, distance or position).
- Components not to be reused should be replaced when disassembled including gaskets metal seal rings, O-rings, oil seals, snap rings, and split pins.

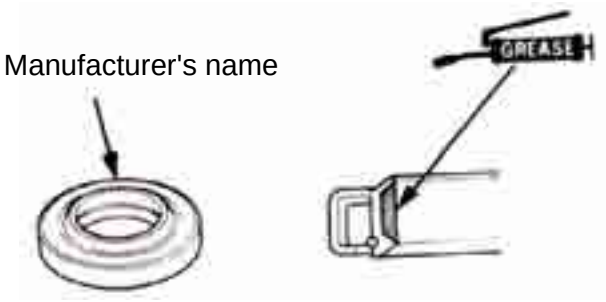
- The length of bolts and screws for assemblies, cover plates or boxes is different from one another, be sure they are correctly installed. In case of confusion, Insert the bolt into the hole to compare its length with other bolts, if its length out side the hole is the same with other bolts, it is a correct bolt. Bolts for the same assembly should have the same length.



- Tighten assemblies with different dimension fasteners as follows: Tighten all the fasteners with fingers, then tighten the big ones with special tool first diagonally from inside toward outside, important components should be tightened 2 to 3 times with appropriate increments to avoid warp unless otherwise indicated. Bolts and fasteners should be kept clean and dry. Do not apply oil to the threads.

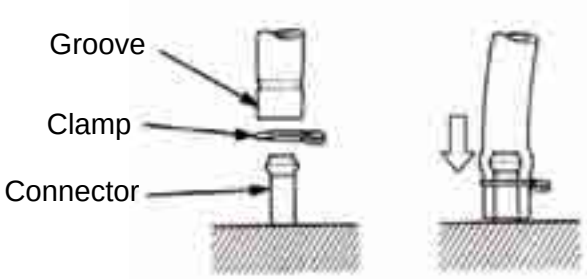


- When oil seal is installed, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.

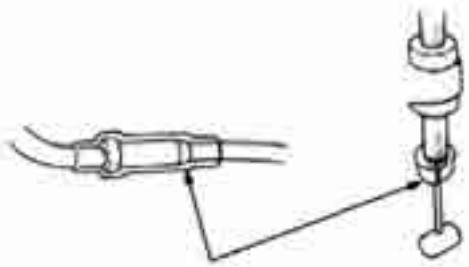


- Remove residues of the old gasket or sealant before reinstallation, grind with a grindstone if the contact surface has any damage.

- The ends of rubber hoses (for fuel, vacuum, or coolant) should be pushed as far as they can go to their connections so that there is enough room below the enlarged ends for tightening the clamps.

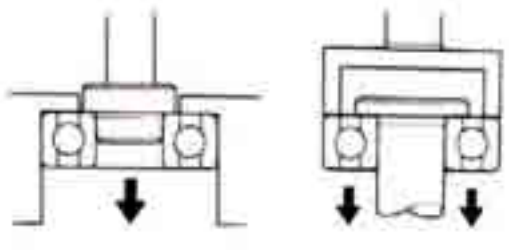


- Rubber and plastic boots should be properly reinstalled to the original correct positions as designed.



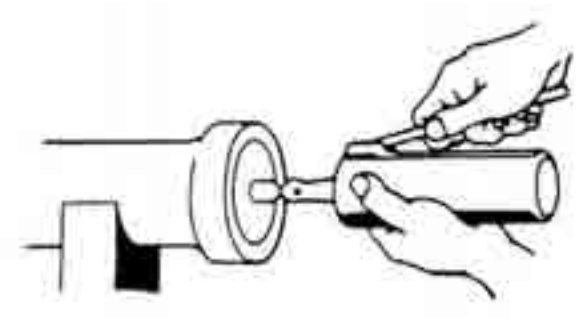
Boots

- The tool should be pressed against two (inner and outer) bearing races when removing a ball bearing. Damage may result if the tool is pressed against only one race (either inner race or outer race). In this case, the bearing should be replaced. To avoid damaging the bearing, use equal force on both races.

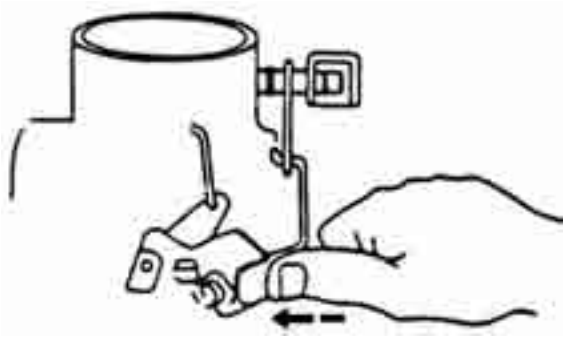


Both of these examples can result in bearing damage.

- Lubricate the rotation face with specified lubricant on the lubrication points before assembling.

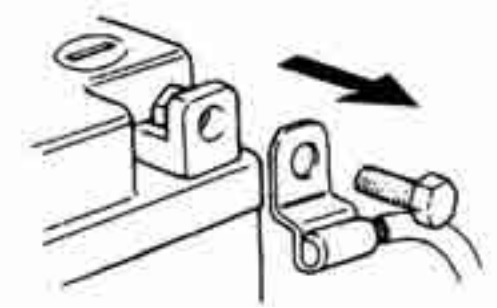


- Check if positions and operation for installed parts is in correct and properly.

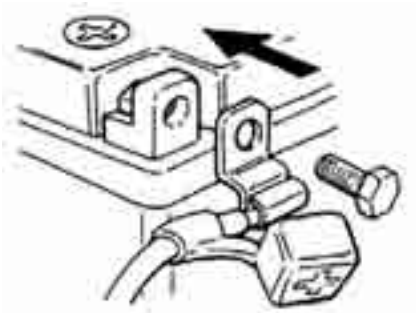


- Note that do not let parts fall down.

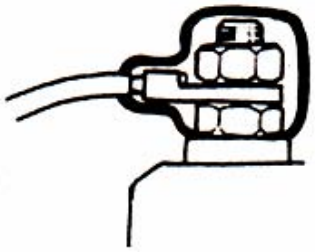
- Before battery removal operation, it has to remove the battery negative (-) cable firstly. Notre tools like open-end wrench do not contact with body to prevent from circuit short and create spark.



- After service completed, make sure all connection points is secured.
  Battery positive (+) cable should be connected firstly.
  And the two posts of battery have to be greased after connected the cables.

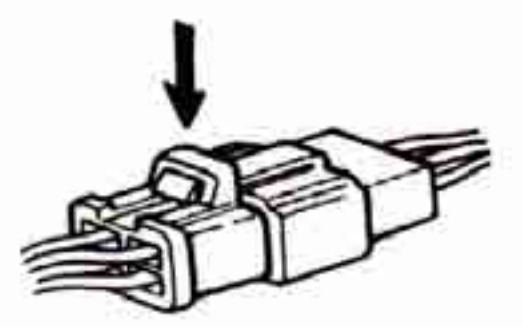


- Make sure that the battery post caps are located in properly after the battery posts had been serviced.



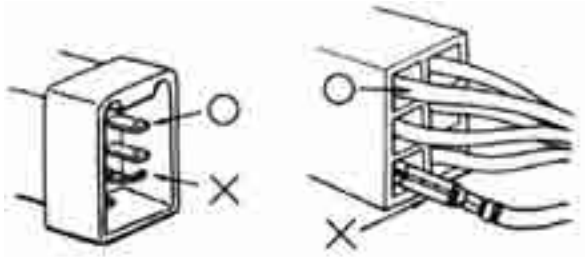
- If fuse burned, it has to find out the cause and solved it. And then replace with specified capacity fuse.

- When separating a connector, it locker has to be unlocked firstly. Then, conduct the service operation.

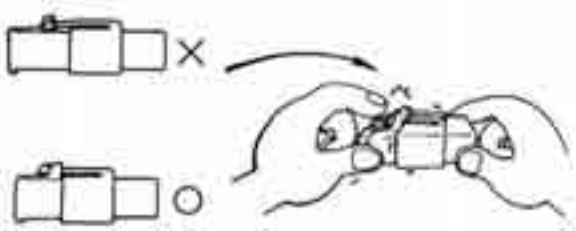


- Do not pull the wires as removing a connector or wires. Hold the connector body.

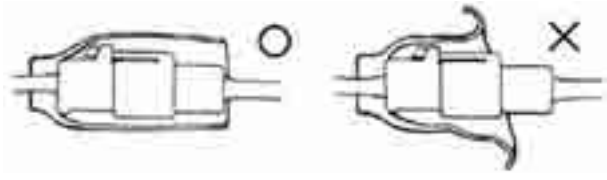
- Make sure if the connector pins are bent, extruded or loosen.



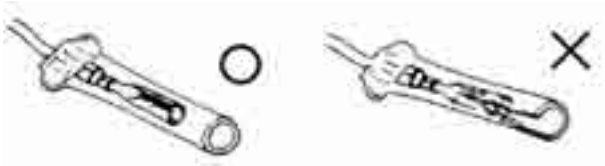
- Insert the connector completely.
  If there are two lockers on two connector sides, make sure the lockers are locked in properly.
  Check if any wire loose.



- Check if the connector is covered by the twin connector boot completely and secured properly.

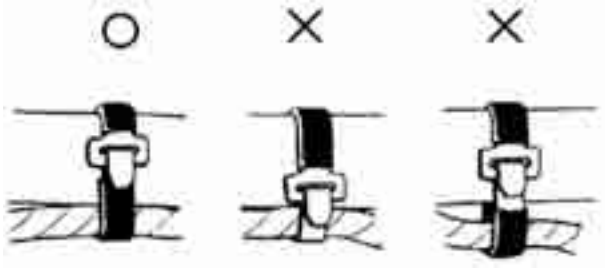


- Before terminal connection, check if the boot is crack or the terminal is loose.

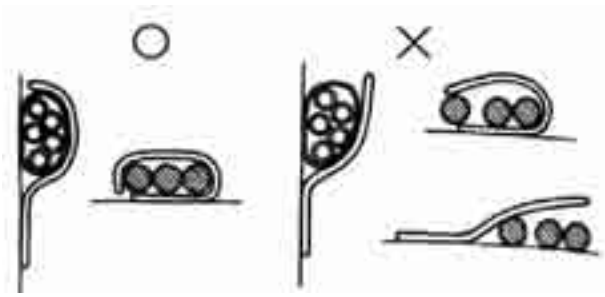


- Insert the terminal completely.
  Check if the terminal is covered by the boot.
  Do not let boot open facing up.

- Secure wires and wire harnesses to the frame with respective wire bands at the designated locations. Tighten the bands so that only the insulated surfaces contact the wires or wire harnesses.

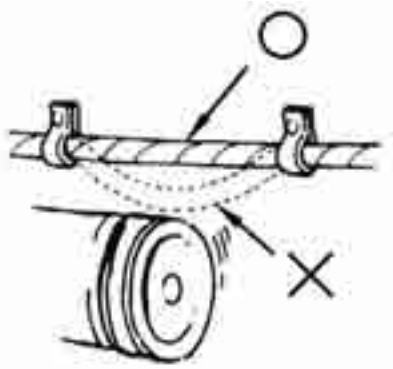


- Wire band and wire harness have to be clamped secured properly.

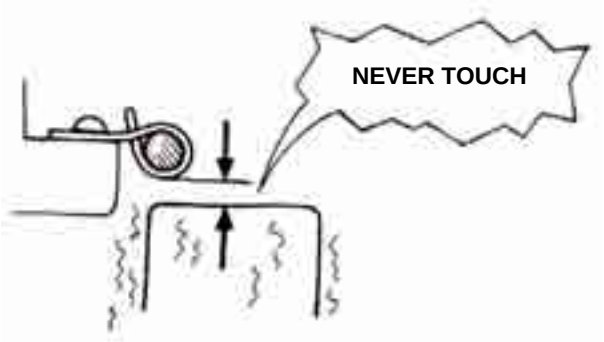


- Do not squeeze wires against the weld or its clamp.

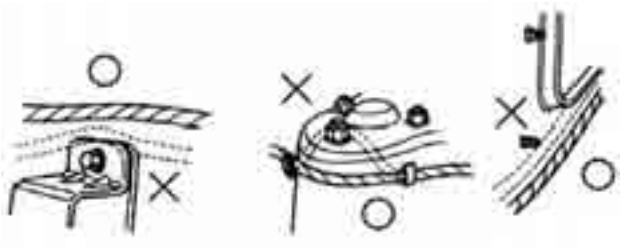
- Do not let the wire harness contact with rotating, moving or vibrating components as routing the harness.



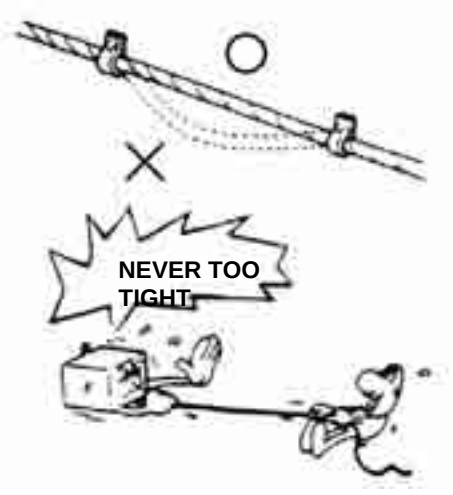
- Keep wire harnesses far away from the hot parts.



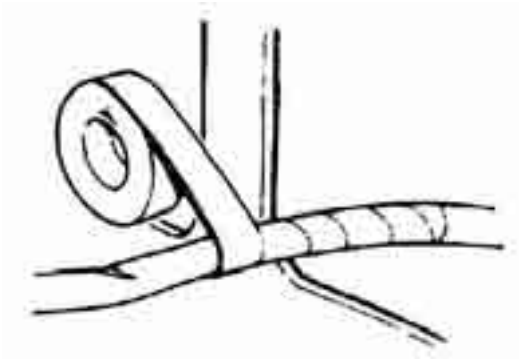
- Route wire harnesses to avoid sharp edges or corners and also avoid the projected ends of bolts and screws.



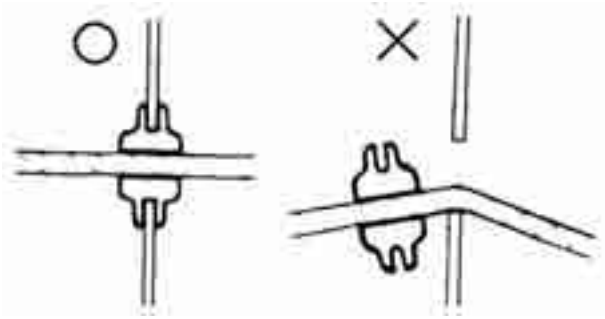
- Route harnesses so that they neither pull too tight nor have excessive slack.



- Protect wires or wire harnesses with electrical tape or tube if they contact a sharp edge or corner. Thoroughly clean the surface where tape is to be applied.



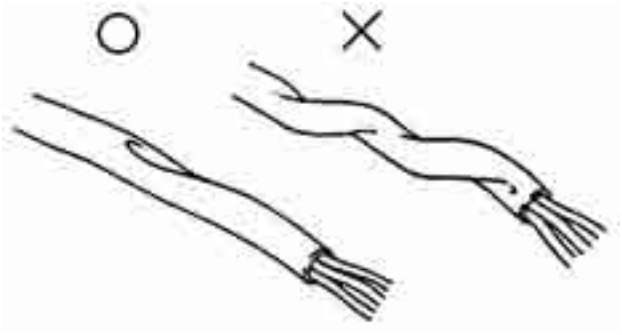
- Secure the rubber boot firmly as applying it on wire harness.



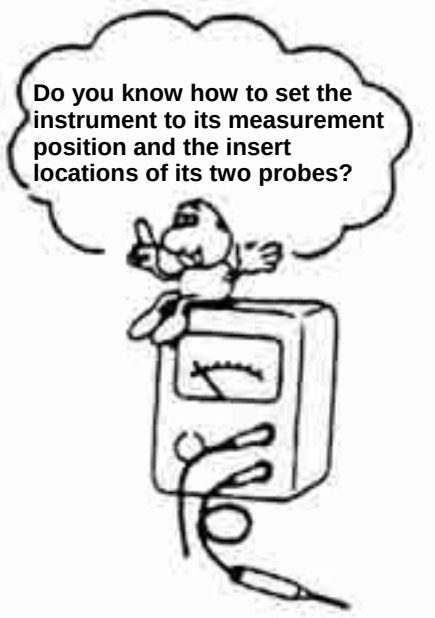
- Never use wires or harnesses which insulation has been broken. Wrap electrical tape around the damaged parts or replace them.

- Never clamp or squeeze the wire harness as installing other components.

- Do not let the wire harness been twisted as installation.



- Before operating a test instrument, operator should read the operation manual of the instrument. And then, conduct test in accordance with the instruction.



- With sand paper to clean rust on connector pins/terminals if found. And then conduct connection operation later.

Torque Values (Engine)

Item	Q'ty	Thread Dia. (mm)	Torque Value(Kg-m)	Remarks
Cylinder head bolts	4	6	1.0~1.4	
Cylinder head nuts	4	8	2.0~2.4	
Cylinder/cylinder head two-ends bolts	4	8	0.7~1.1	Tighten to crankcase
Cylinder head left bolts	4	6	1.0~1.4	
Valve adjustment fixing nuts	4	5	0.7~1.1	Apply oil to thread
Cylinder head left cover bolts	2	6	1.0~1.4	
Spark plug	1	10	1.0~1.2	
Carburetor heat protector connecting nuts	2	6	0.7~1.1	
Engine oil draining plug	1	12	3.5~4.5	
Engine oil strainer cap	1	30	1.0~2.0	
Gear oil draining plug	1	8	0.8~1.2	
Gear oil filling bolt	1	10	1.0~1.4	
Oil pump screws	3	3	0.1~0.3	
Engine left side cover bolts	8	6	1.0~1.5	Rubber washer attached
Camshaft chain tensioner bolt	1	6	0.35~0.5	Hex socket bolt
Camshaft chain adjuster bolts	1	6	0.8~1.2	
Clutch driving plate nut	1	28	5.0~6.0	
Clutch outer bracket nut	1	12	5.0~6.0	
Driving disk nut	1	12	5.0~6.0	
Flywheel nut	1	12	5.0~6.0	
One-way clutch tighten bolts	3	6	1.0~1.4	Apply locking sealant
One-way clutch nut	1	22	9.0~10.0	Apply oil to thread
Crankcase bolts/right crank cover bolt	12	8	1.5~2.0	
Exhaust pipe bolts	2	8	3.0~3.6	
Exhaust pipe connection nut	2	7	0.5~1.0	

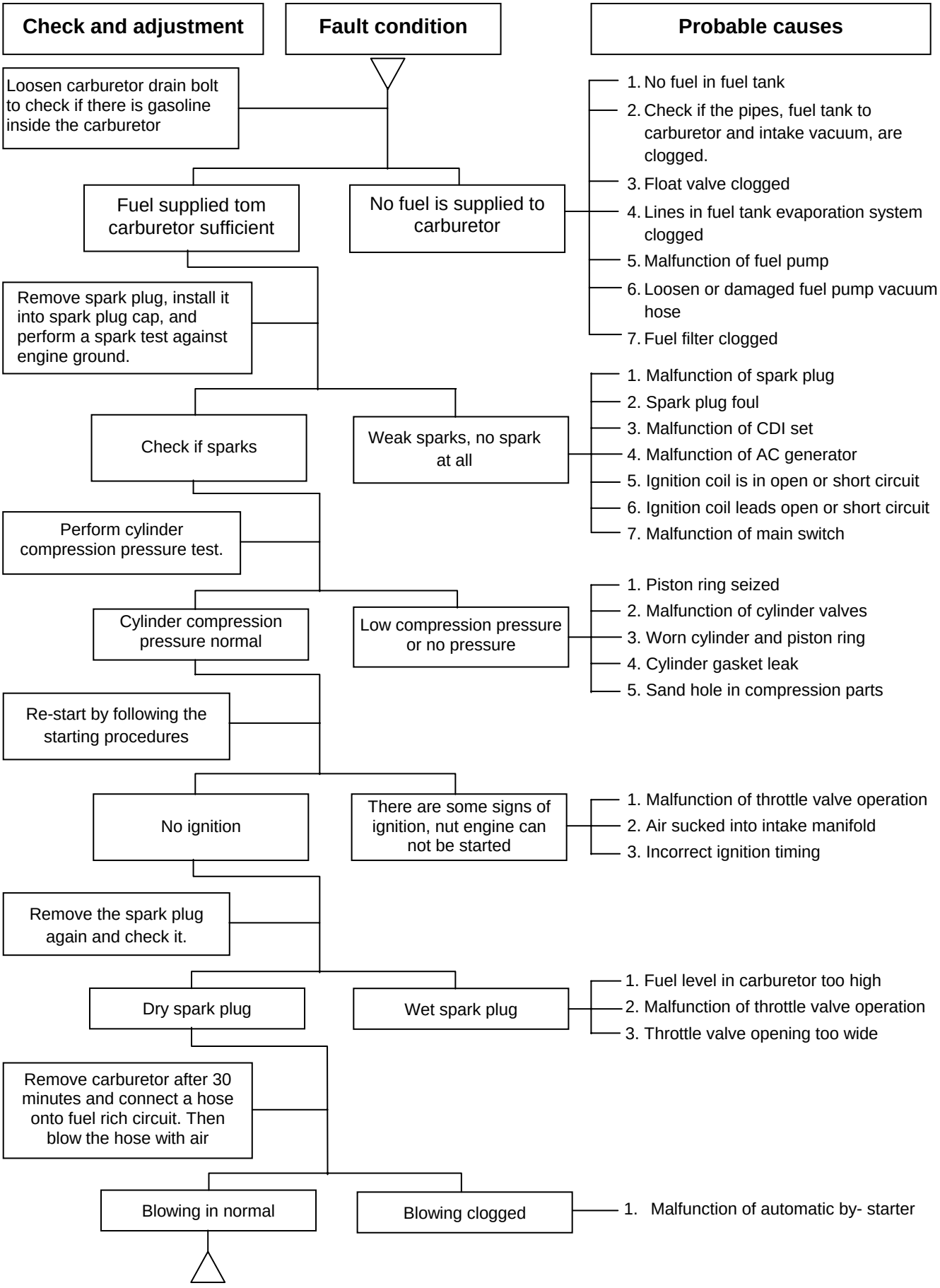
The torque values listed in above table are for more important tighten torque values. Please see standard values for not listed in the table.

Standard Torque Values for Reference

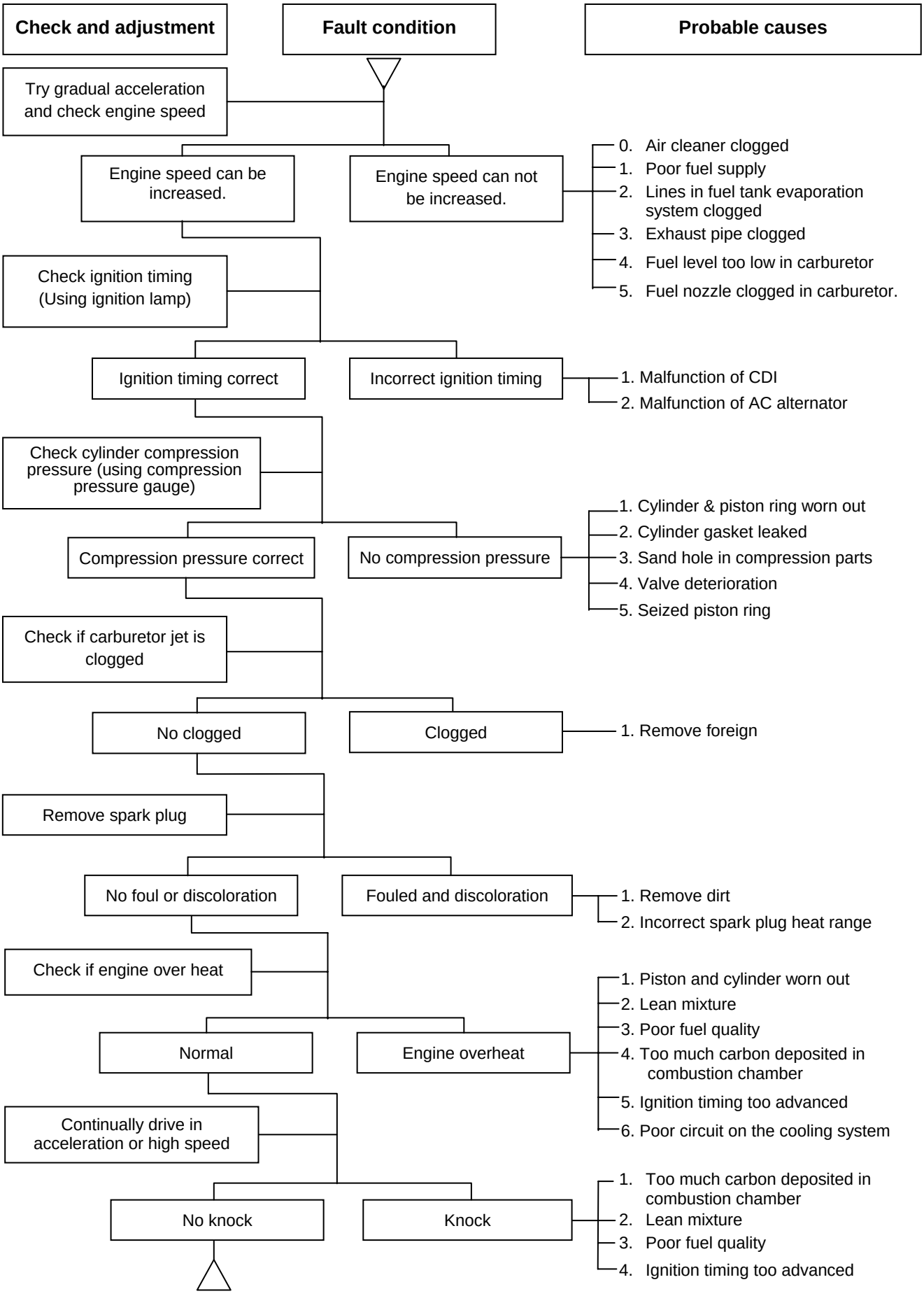
Type	Tighten Torque	Type	Tighten Torque
5mm bolt、nut	0.45~0.60 kgf-m	3mm screw	0.05~0.08 kgf-m
6mm bolt、nut	0.80~1.20 kgf-m	4mm screw	0.10~0.15 kgf-m
8mm bolt、nut	1.80~2.50 kgf-m	5mm screw	0.35~0.50 kgf-m
10mm bolt、nut	3.00~4.00 kgf-m	6mm screw、SH nut	0.70~1.10 kgf-m
12mm bolt、nut	5.00~6.00 kgf-m	6mm bolt、nut	1.00~1.40 kgf-m
		8mm bolt、nut	2.40~3.00 kgf-m
		10mm bolt、nut	3.50~4.50 kgf-m

Troubles Diagnosis

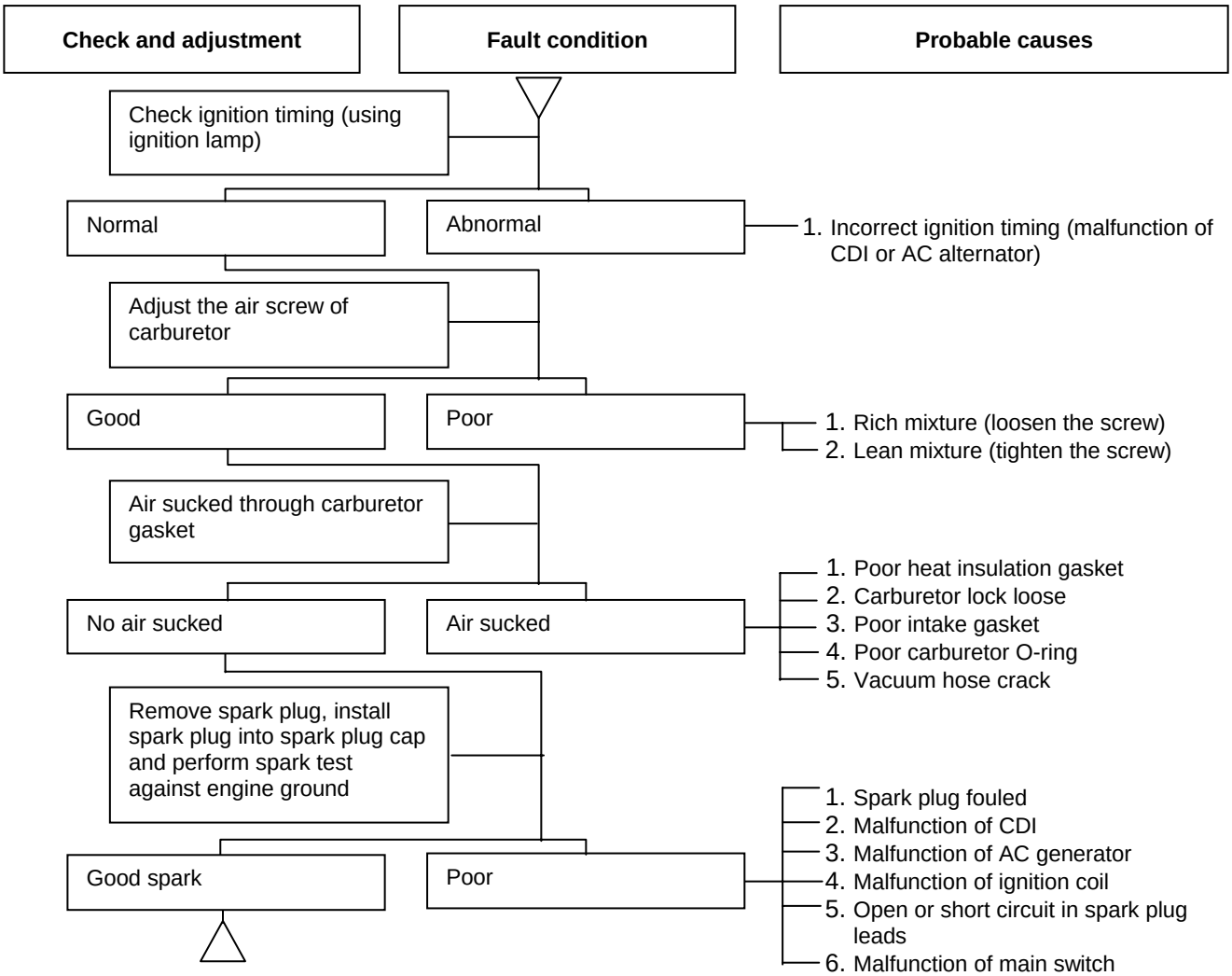
A. Engine hard to start or can not be started



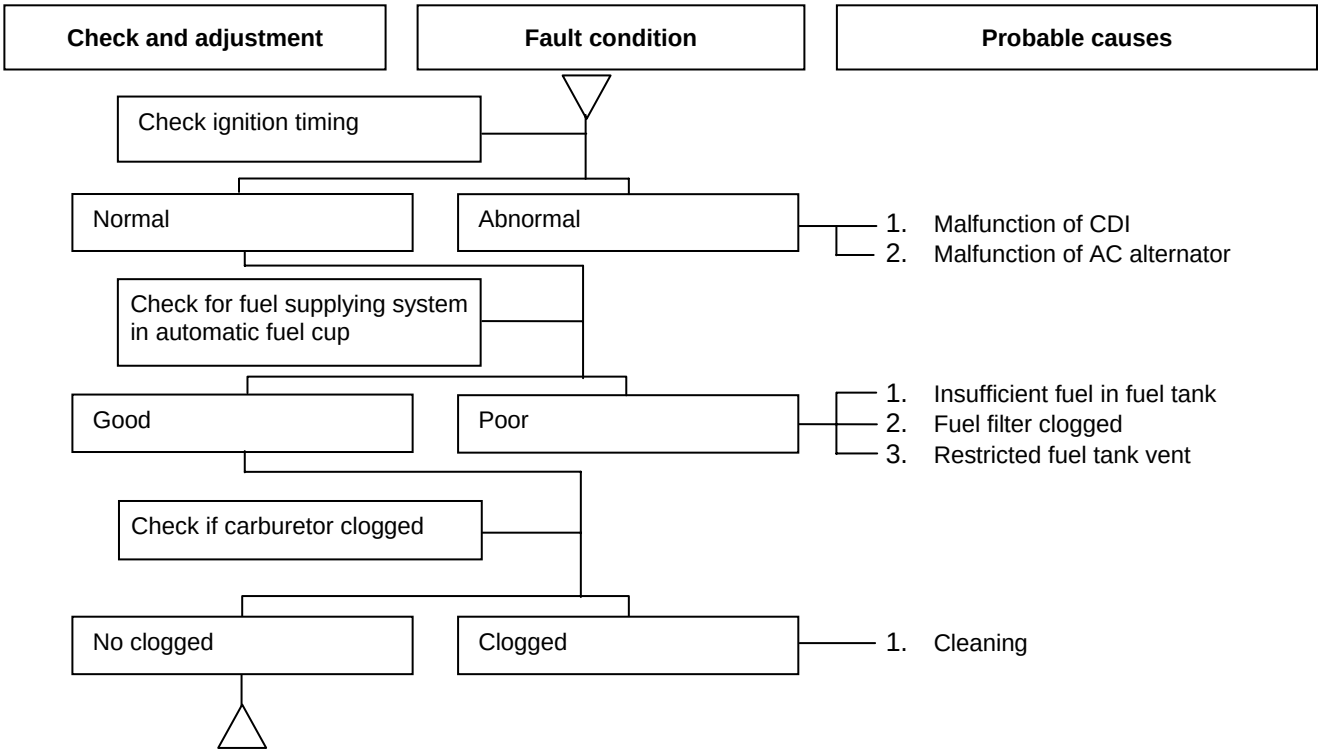
B. Engine run sluggish (Speed does not pick up, lack of power)



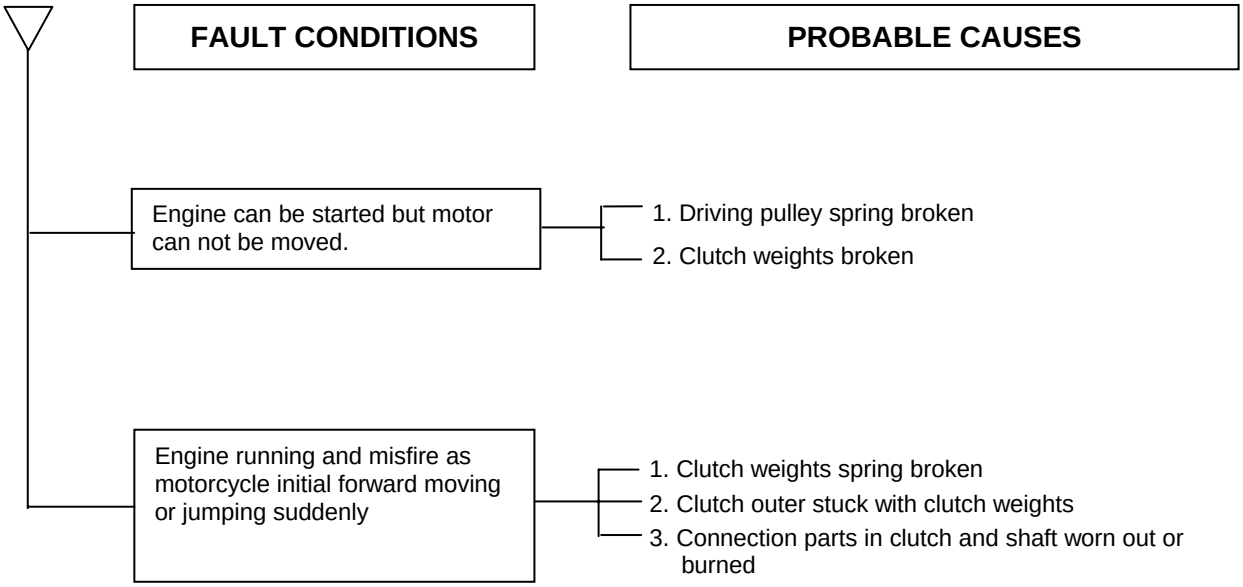
C. Engine runs sluggish (especially in low speed and idling)



D. Engine runs sluggish (High speed)



E. Clutch, driving and driving pulley

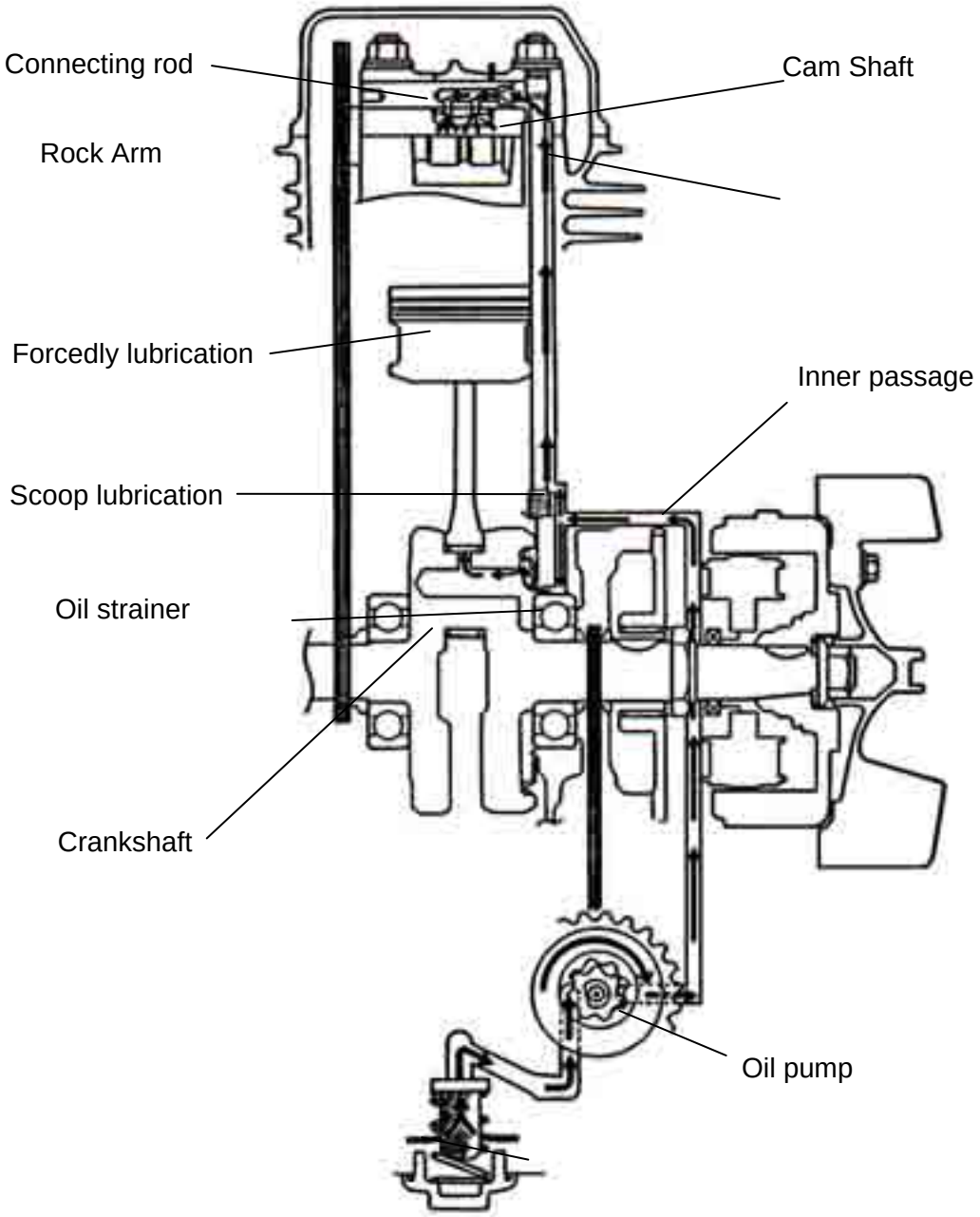


Precautions In Operation

Specification

Engine Oil	Capacity	1000 c.c.
	Change	850c.c.
Spark plug		C8E
“F” Mark in idling speed		BTDC 13 º / 1700 rpm
Full timing advanced		BTDC 27º / 8000 rpm
Idling speed		1600±100rpm

Mechanism Illustration



3. Lubrication System

Operational Precautions:

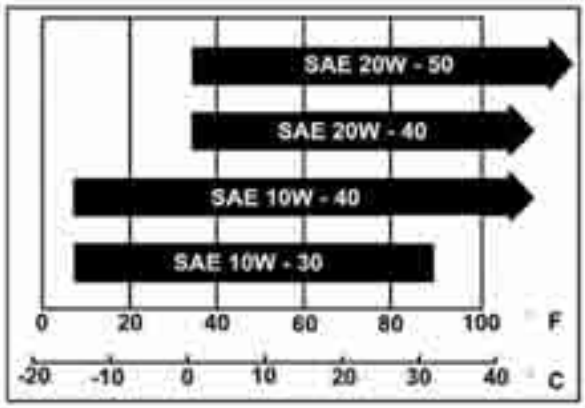
General Information

● This chapter contains maintenance operations for the engine oil pump, engine oil and gear oil.

Specifications

Engine oil quantity	Disassembly	1000 c.c.
	Replacement	800 c.c
Oil viscosity	SAE 10W-30 or equivalent (Recommended King-Mate serial oils)	
Gear Oil	Disassembly	110 c.c.
	Replacement	100 c.c.
Oil viscosity of gear oil	SAE 85W-140 (Recommended King-Mate gear oil series HYPOID GEAR OIL)	

Oil viscosity



unit: mm

Items		Standard (mm)	Limit (mm)
Oil pump	Inner rotor clearance	-	0.12
	Clearance between outer rotor and body	-	0.12
	Clearance between rotor side and body	0.05~0.10	0.20

Torque value

Engine oil drain plug	3.5~4.5 kgf-m
Engine oil filter cover	1.3~1.7 kgf-m
Gear oil drain plug	0.8~1.2 kgf-m
Gear oil filling bolt	1.0~1.4 kgf-m
Oil pump connection screw	0.1~0.3 kgf-m

Trouble Diagnosis

Low engine oil level

- Oil leaking
- Valve guide or seat worn out
- Piston ring worn out

Dirty oil

- No oil change in periodical
- Cylinder head gasket damage
- Piston ring worn out

Low Oil Pressure

- Low engine oil level
- Clogged in oil strainer, circuits or pipes
- Oil pump damage

Engine Oil
Turn off engine, and park the motorcycle in flat surface with main stand. Check oil level with oil dipstick after 3-5 minutes.
Do not screw the dipstick into engine as checking.
If oil level is nearly low level, fill out recommended oil to upper level.

Oil Replacement

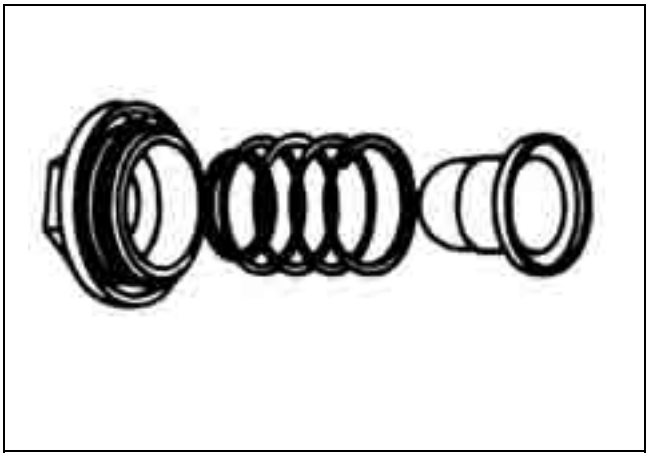
⚠ Caution

> Drain oil as engine warmed up so that make sure oil can be drained smoothly and completely.

Place an oil pan under the motorcycle, and remove oil strainer cap.
Make sure if the aluminum washer of the draining bolt is damaged. If so, replace it with new one.
Install the drain bolt and tighten it.
Torque value: 3.5~4.5 kgf-m

Cleaning Engine Oil Strainer

Remove the oil strainer cap.
Remove oil strainer and spring.
Clean oil strainer. (Recommended using compressed air to clean dirty foreign.)
Check if the strainer and O-ring of the oil strainer are broken. Replace with new one if found.
Install the oil strainer and spring.
Install the oil strainer cap and tighten it.
Torque value: 1.3~1.7 kgf-m
Fill out oil to the oil filler. (Oil viscosity SAE 10W-30) (Recommended King-Mate serial oils)



Engine oil quantity: Replacement 800 c.c.
After oil replaced, insert ignition key into the re-set bottom under instrument panel so that the oil indicator is changed from red to green and set oil replacement mileage to zero.
Install dipstick, start the engine for running several minutes.
Turn off engine, and check oil level again if within standard level after 3-5 minutes.
Check if engine oil leaks.

Oil Pump Removal

Remove the alternator (refer to chapter 10).

Remove the engine right cover.

Remove the one-way clutch and starting gear (nut x 1).

Make sure that the pump axle can be rotated freely.

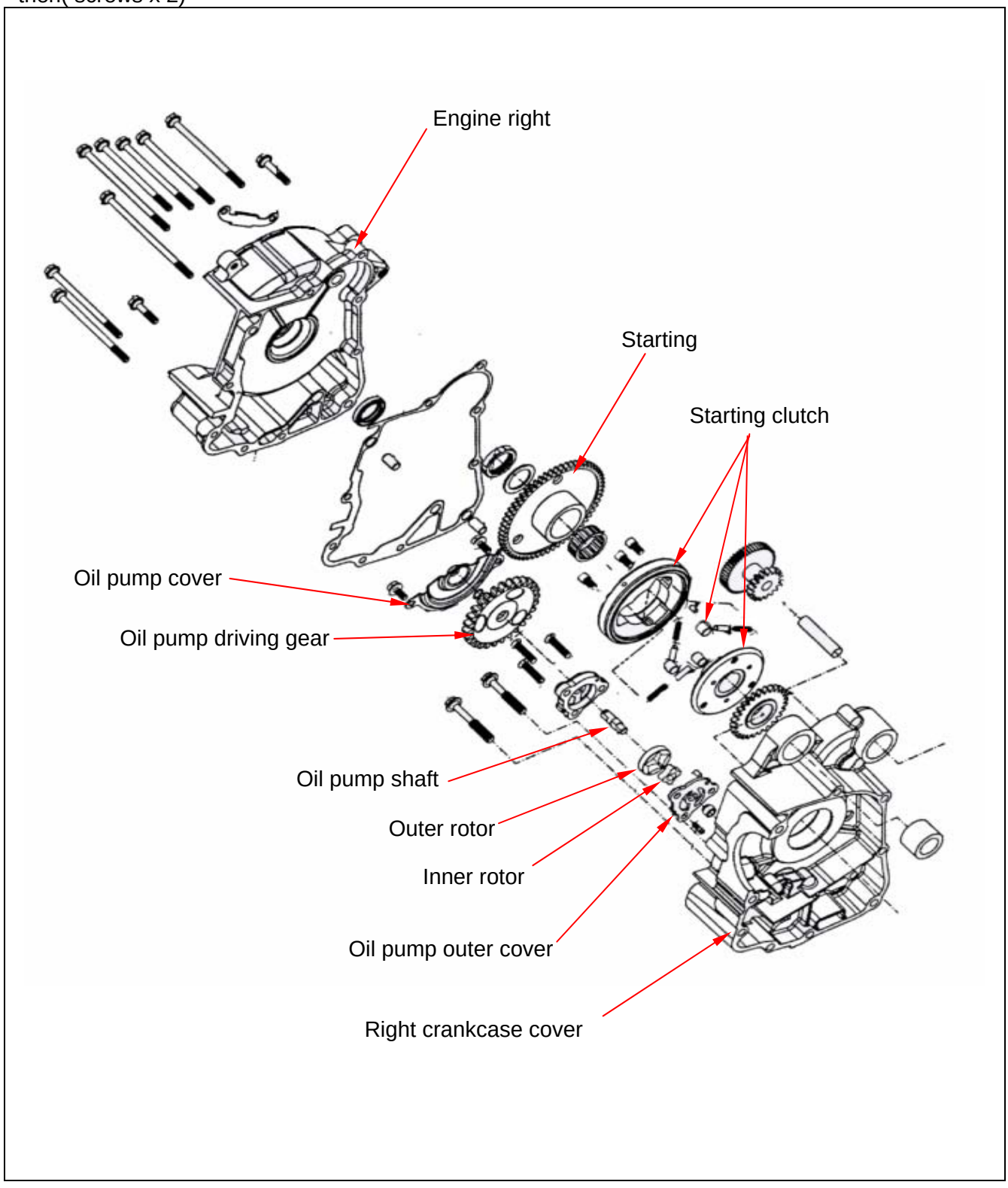
Remove the oil pump cover(screws x 2) then(screws x 2)

the oil pump driving gear clamp and the gear.

Remove oil pump body screws (3 screws).

Oil Pump Disassembly

Remove the screws on oil pump cover and disassemble the pump as illustration shown.



Oil Pump Inspection

Check the clearance between oil pump body and outer rotor.
Limit：below 0.12mm

Check clearance between inner and outer rotors.
Limit: below 0.12mm

Check clearance between rotor side face and pump body.
Limit: below 2.0 mm

Oil Pump Re-assembly

Install inner and outer rotors into the pump body. Align the indent on driving shaft with that of inner rotor.　Install the driving shaft.
Install the oil pump cover and fixing pin properly and then tighten screw. (1 screw)

Install driving gear and clamp.

Caution

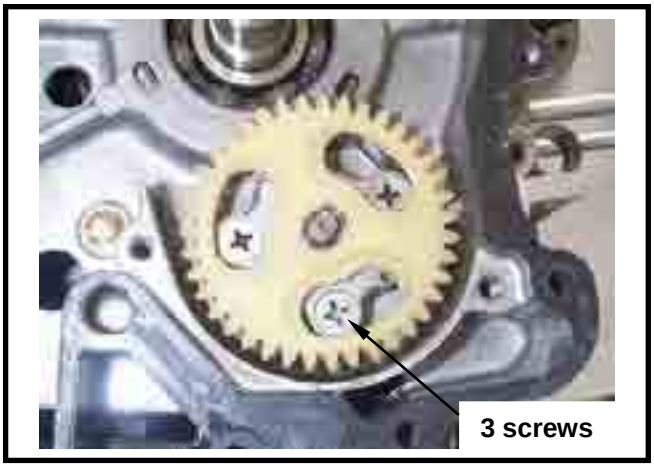
Install the oil pump cover and fixing pin properly.

Oil Pump Installation

Install the oil pump (3 screws).

Caution

The elliptical hole on the driving gear is not match with the screw hole. Thus, the elliptical hole has to align with the screw hoe before tightening it.



Install oil pump outer cover (2 bolts).

Install the starting gear and the alternator. (Refer to chapter 10)

Precautions In Operation

General Information

⚠ Warning

Gasoline is a low ignition point and explosive materials, so always work in a well-ventilated place and strictly prohibit flame when working with gasoline.

⚠ Cautions

- Do not bend or twist throttle valve cable. Damaged cable will make unstable drive ability.
- When disassembling fuel system parts, pay attention to O-ring position, replace with new one as re-assembly
- There is a drain screw in the float chamber for draining residual gasoline.
- Do not disassemble automatic by-starter and air cut-off valve arbitrarily.

Specification

Item	Specification
Carburetor diameter	22.100mm
I.D. number	045 A
Fuel level	14.8 mm
Main injector	# 108
Idle injector	# 35
Idle speed	1600±100 rpm
Fuel quantity adjustment screw	1 1/2 turns

Torque value

Fuel valve tightening nut: 1.5~2.0 Kgf-m

Tool

Special service tools

Vacuum/air pressure pump

General service tools

Fuel level gauge

4. FUEL INJECTION SYSTEM

Trouble Diagnosis

Poor engine start
- No fuel in fuel tank
- Clogged fuel tube
- Too much fuel in cylinder
- No spark from spark plug (malfunction of ignition system)
- Clogged air cleaner
- Malfunction of automatic by-starter
- Malfunction of throttle valve operation

Stall after started
- Malfunction of automatic by-starter
- Incorrect ignition timing
- Malfunction of carburetor
- Dirty engine oil
- Air existing in intake system
- Incorrect idle speed

Rough idle
- Malfunction of ignition system
- Incorrect idle speed
- Malfunction of carburetor
- Dirty fuel

Intermittently misfire as acceleration
- Malfunction of ignition system

Late ignition timing
- Malfunction of ignition system
- Malfunction of carburetor

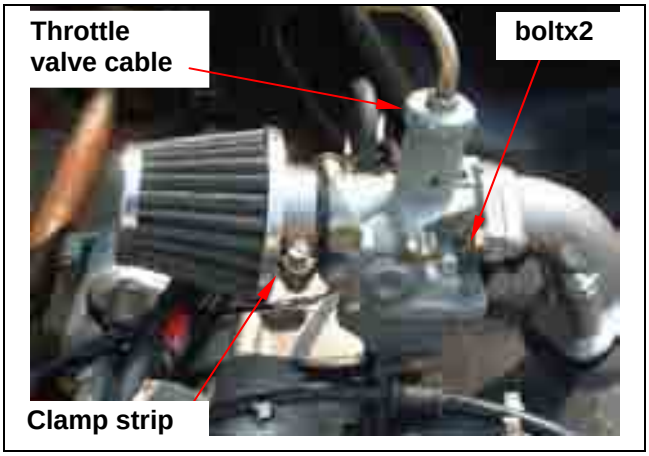
Power insufficiency and fuel consuming
- Fuel system clogged
- Malfunction of ignition system

Mixture too lean
- Clogged fuel injector
- Vacuum piston stick and closed
- Malfunction of float valve
- Fuel level too low in float chamber
- Clogged fuel tank cap vent
- Clogged fuel filter
- Obstructed fuel pipe
- Clogged air vent hose
- Air existing in intake system

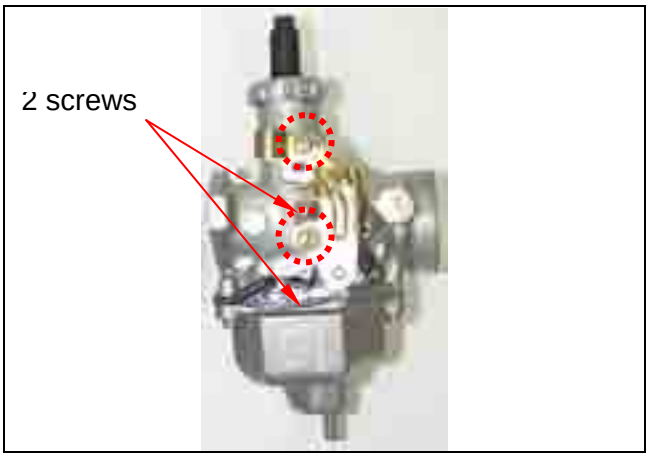
Mixture too rich
- Clogged air injector
- Malfunction of float valve
- Fuel level too high in float chamber
- Malfunction of automatic by-starter
- Dirty air cleaner

Carburetor Removal

Remove Throttle valve cable
Release the clamp strip of carburetor.
Remove air cleaner assembly.



Removal
Remove the o chokes bracket (screw×2))

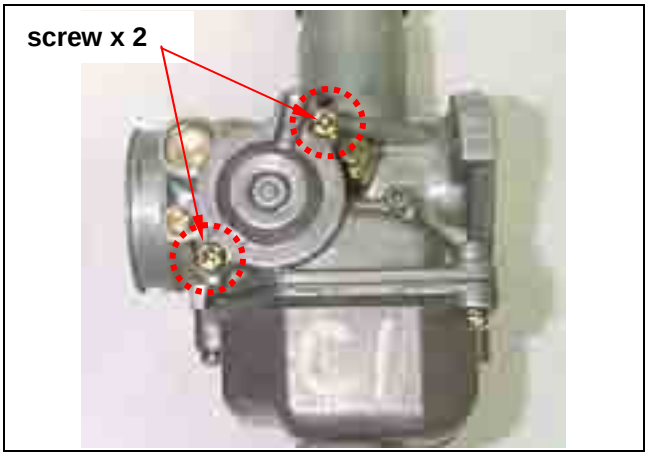


left-handed the throttle cap.
Remove the compress spring and throttle valve.

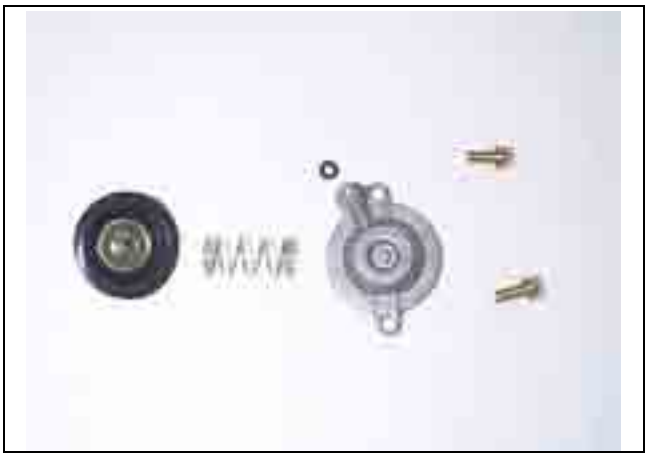
Remove fuel needle, and needle clamp from the throttle valve.
Check if the throttle valve for wear out, crack or other damage.

Air Cut-off Valve

Remove of the air cut-off valve and its cover. (screw x 2)



Remove the spring and vacuum diaphragm. Check if the diaphragm for deterioration or crack.



Installation

Install the valve as reverse order of removal.

⚠ Cautions

Do not damage the vacuum diaphragm or in opposite installation direction.

Float Chamber

Disassembly

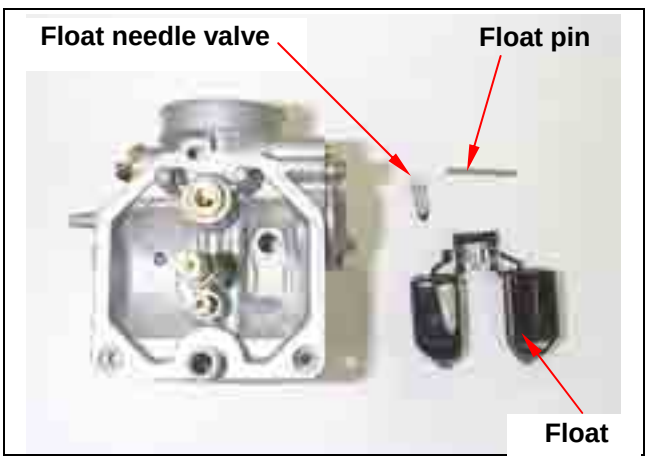
Remove mounting screws and then the float (screw x 3)

Checking

Check float needle valve and valve seat for drop difference damage, wear out, dirty or clogged.

⚠ Cautions

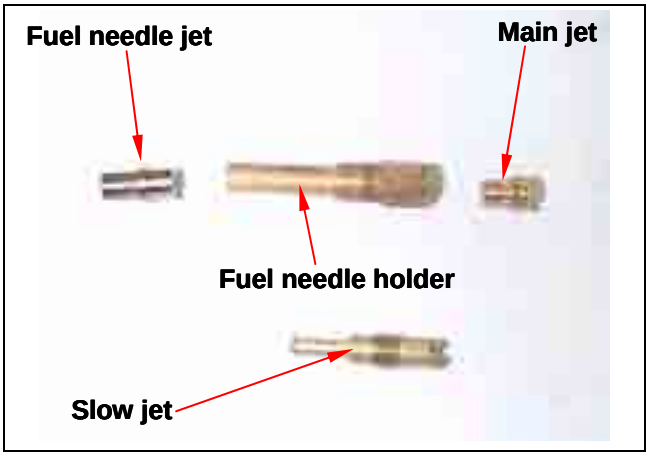
In case of worn out or dirt, the float valve and valve seat will not tightly close causing fuel level to increase and as a result, fuel flooding. A worn out or dirty float valve must be replaced with a new a new one.



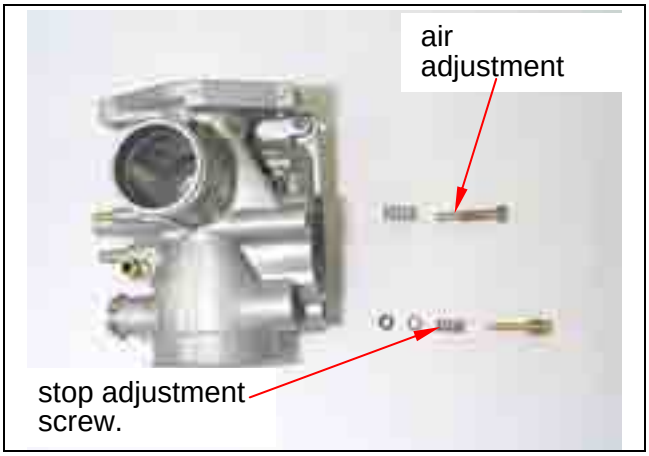
Remove main jet, fuel needle jet holder, fuel needle jet, slow jet, air and stop adjustment screw.

Cautions

- Take care not to damage jets and adjust screw.
- Before removing adjustment screw, turn it all the way down and note the number of turns.
- Do not turn adjustment screw forcefully to avoid damaging valve seat face.



Clean jets with cleaning fluid.
Then use compressed air to blow dirt off.
Blow carburetor body passages with compressed air.



Installation

Install main jet, fuel needle jet seat, fuel needle jet, slow speed jet and air、stop adjustment screw.

Cautions

Set the adjustment screw in according to number of turns noted before it was removed.

Install the float valve, float, and float pin.

Checking Fuel Level

Cautions

- Check again to ensure float valve, float for proper installation.
- To ensure correct measurement, position the float meter in such a way so that float chamber face is vertical to the main jet.

Fuel level: 14.8 mm

Installation Of Carburetor

Install carburetor in the reverse order of removal.
Following adjustments must be made after installation.

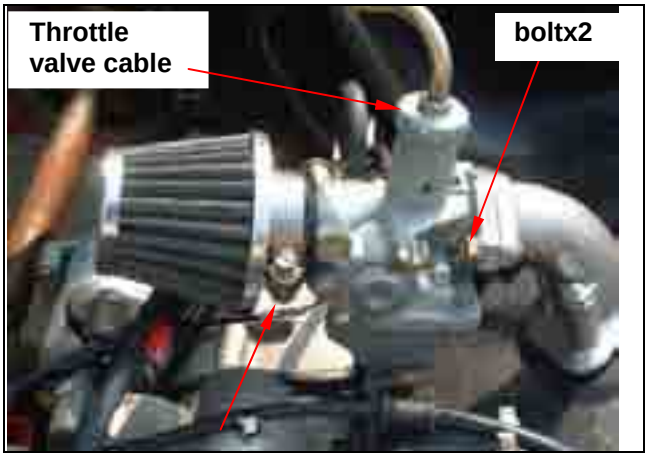
- Throttle valve cable clearance adjustment
- Idle speed adjustment

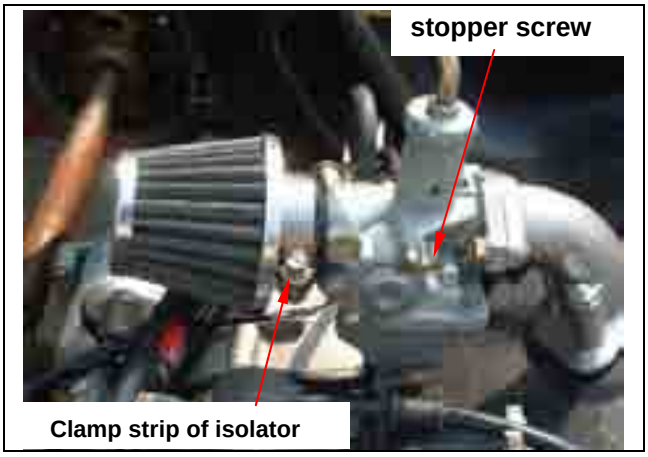
Idle Speed Adjustment

Caution

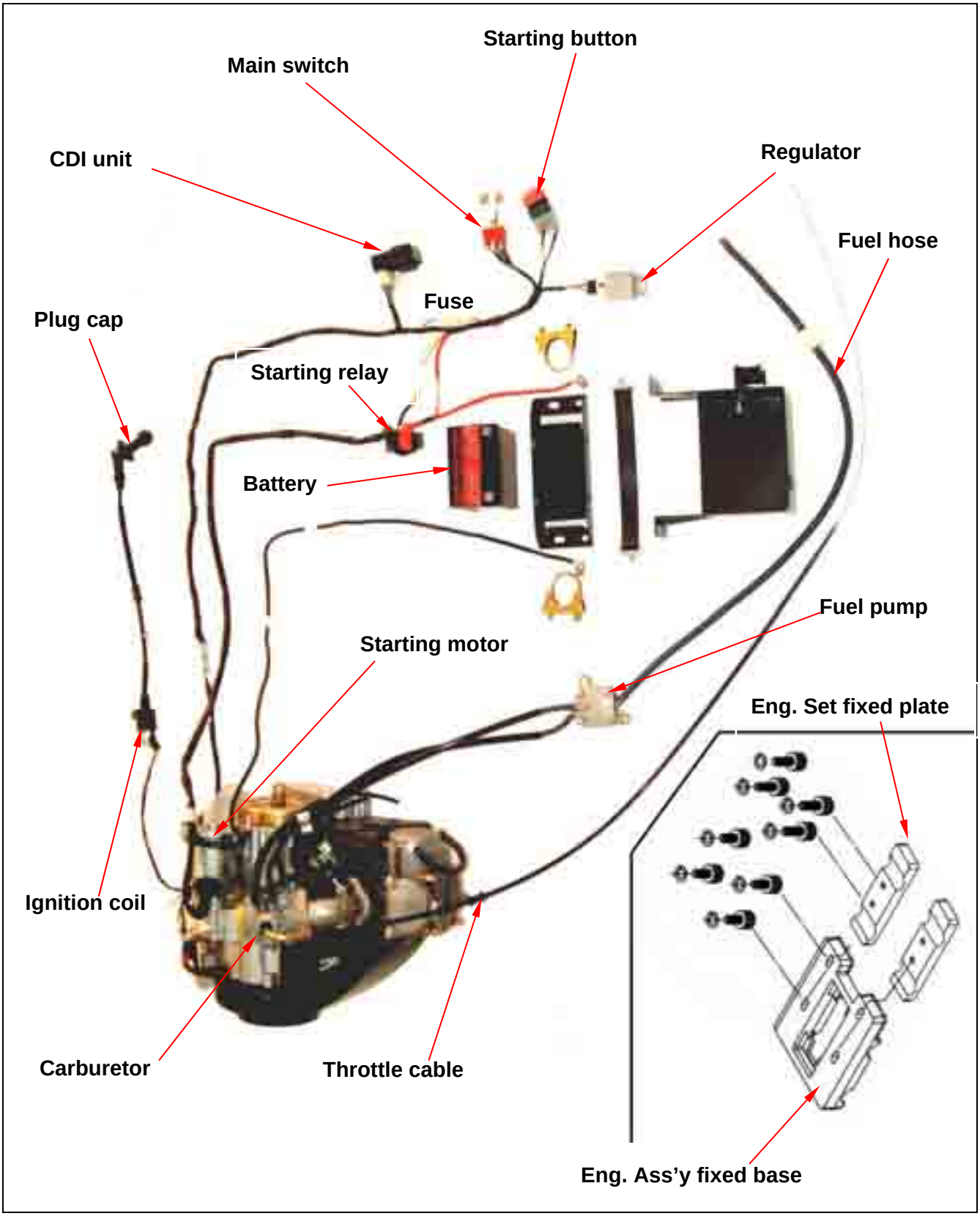
- Fuel amount adjust screw was set at factory, so no adjustment is needed. Note the number of turns it takes to screw it all the way in for ease of installation.
- Never screw in forcedly to avoid damaging the screw seat.
- The main stand must be used to support the motorcycle to perform the

Use a tachometer when adjusting engine RPM.
Screw in adjustment screw gently, then back up to standard turns.
Standard turns: 1 1/2±3/4 turns
Warm up engine, adjust throttle valve stopper screw to standard RPM.
Idle speed rpm: 1700±100 rpm
Connect the sampling hose of exhaust analyzer to exhaust front end. Press test key on the analyzer.
Adjust the air volume adjustment screw and read CO reading on the analyzer.
CO standard value: 1.0~1.5 %
Accelerate in gradual increments, make sure both rpm and CO value are in standard values after engine running in stable. If rpm and CO value fluctuated, repeat the procedures described above for adjusting to standard value.





Mechanism Illustration



5. REMOVAL OF ENGINE

Operational Precautions

General Information

- Engine must be supported by a bracket or adjustable tool in height.
- The following parts can be serviced with the engine installed on the frame.
  1. Throttle valve
  2. Driving disk, driving belt, clutch, and transporting disk
  3. Final reduction gear mechanism

Specification

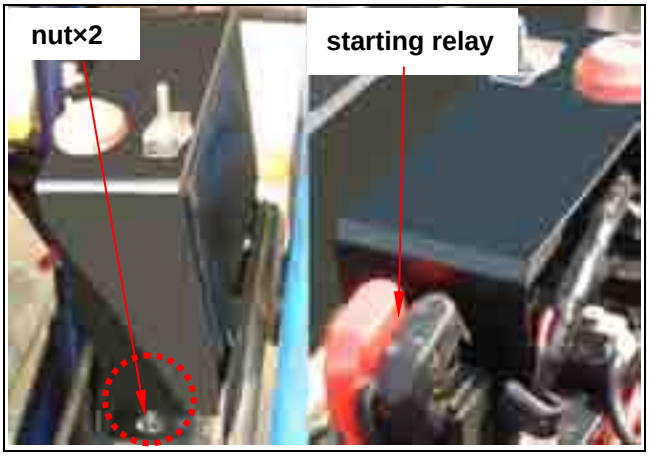
Item		Specification
Engine Oil Capacity	Replacement	800 c.c.
	Disassemble	1000 c.c.
Gear Oil Capacity	Replacement	100 c.c.
	Disassemble	110 c.c.

Torque Values

	2.9~3.5 kgf-m
Nut of rear wheel axle	11.0~13.0 kgf-m
Nut of exhaust connection	0.5~1.0 kgf-m
Bolt of exhaust fixed	3.0~3.6 kgf-m
Bolt of rear bracket	3.0~3.6 kgf-m

Engine Removal

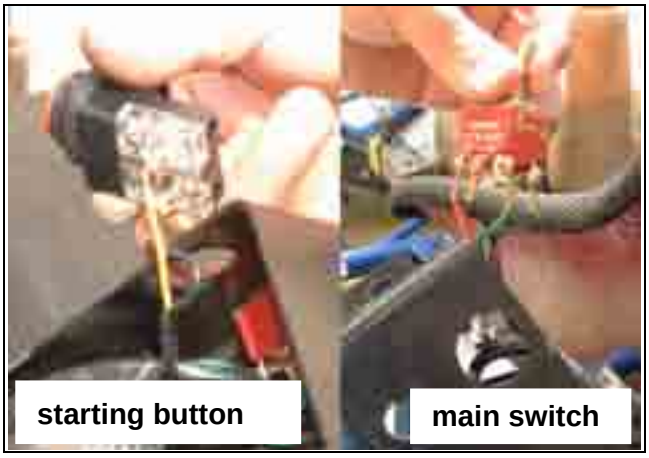
Remove the starting relay cable.
Remove the battery box and battery box.(nut×2)



Remove the battery negative (-) cable.
Remove the battery positive (+) cable.

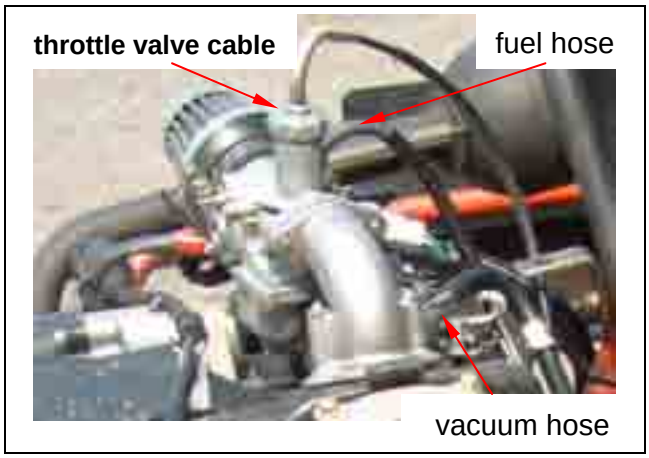
Remove the connector of CDI wire and regulator . wire

Remove the main switch and starting button wire.

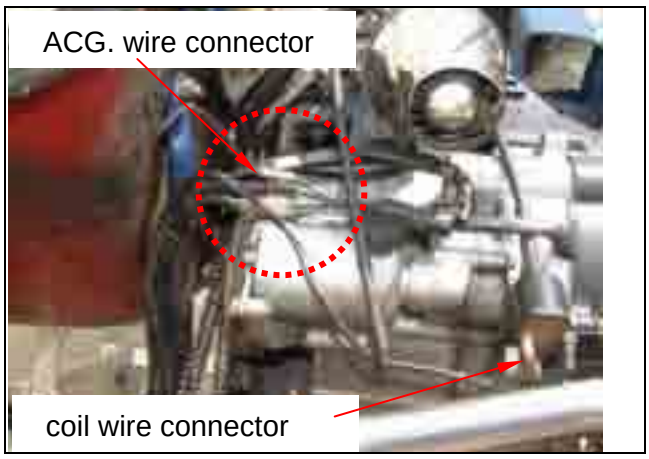


5. REMOVAL OF ENGINE

Remove the throttle valve cable.
Remove fuel hose, vacuum hose.



Remove the connector of ACG. wire and Ignition coil

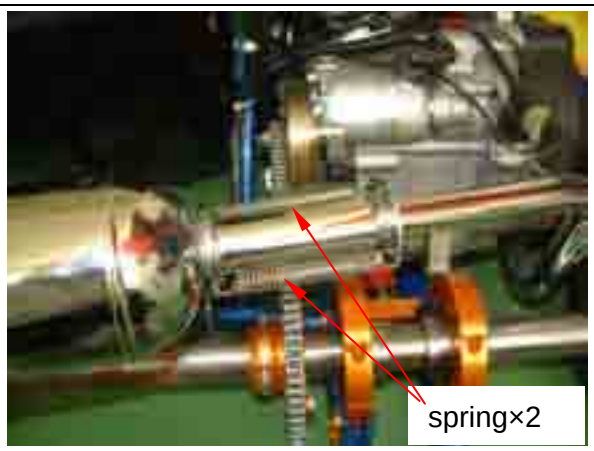


Remove the cap nut (cap nut x 2) from the front end of EXH. Pipe.

Remove bolt of the EXH. Pipe stay (bolt×1).

NSTALL
Install according to the reverse procedure of remove

Remove the connector between EXH. Pipe and Muffler with spring(spring×2)

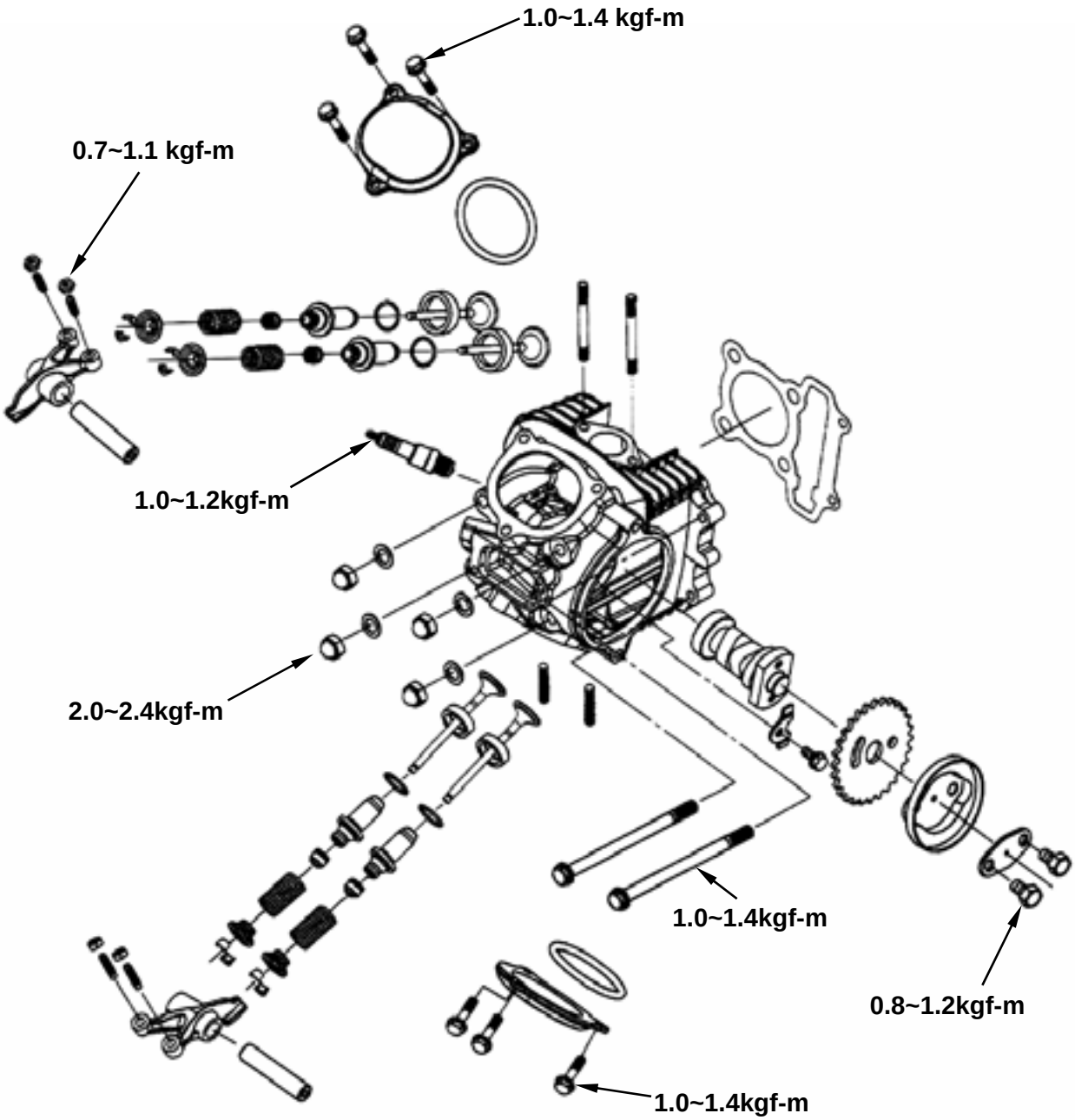


Remove the ENG. Seat fixed plate
And remove the ENG. (bolt×4)

INSTALL
Install according to the reverse procedure of remove

NOTES

Mechanism Illustration



6. Cylinder Head/Valve

Precautions In Operation

General Information

- This chapter is contained maintenance and service for cylinder head, valve, and camshaft as well as rocker arm.
- Cylinder head service cannot be carried out when engine is in frame.

Specification **Unit: mm**

Item			Standard	Limit
Compression pressure			12 ± 2 kg/cm²	-
Camshaft	Height of cam lobe	Intake	27.020~27.180	26.702
		Exhaust	26.470~26.630	26.152
Rocker arm	ID of valve rocker arm		10.000~10.015	10.100
	OD of valve rocker arm shaft		10.966~10.984	10.910
Valve	OD of valve stem	Intake	4.975~4.990	4.900
		Exhaust	4.950~4.975	4.900
	Guide seat		5.000~5.012	5.030
	Clearance between valve stem and guide	Intake	0.010~0.037	0.080
		Exhaust	0.025~0.062	0.100
	Free length of valve spring		32.400	29.500
	Valve seat width		1.000	1.600
Connection Flatness of cylinder head			-	0.050

Torque Value

Cylinder head bolt	1.0~1.4kgf-m
Cylinder head bolt (LH)	1.0~1.4kgf-m
Cylinder head Nut	1.8~2.2kgf-m (apply with oil on bolt thread & seat)
Sealing bolt of timing chain auto-tensioner	0.8~1.2kgf-m
Bolt of timing chain auto-tensioner	1.0~1.4kgf-m
Timing gear cover bolts	0.7~1.1kgf-m (apply with oil on bolt thread & seat)
Spark plug	1.0~1.4kgf-m

Tools

Special service tools

Valve reamer: 5.0mm
Valve guide driver: 5.0mm
Valve spring compressor

Troubleshooting

Engine performance will be effected by troubles on engine top-end. The troubles usually can be determinated or by performing cylinder compression test and judging the abnormal noise generated.

Rough Idle

- Low compression pressure

Low compression pressure

1. **Valve**
   - Improper valve adjustment
   - Burnt or bended valve
   - Improper valve timing
   - Valve spring damaged
   - Valve carbon
   - Poor sealing on valve seat
   - Improper spark plug installation

2. **Cylinder head**
   - Cylinder head gasket leaking or damage
   - Tilt or crack cylinder surface

3. **Piston**
   - Piston ring worn out

High compression pressure

- Too much carbon deposit on combustion chamber or piston head

Noise

- Improper valve clearance adjustment
- Burnt valve or damaged valve spring
- Camshaft wear out or damage
- Cam chain wear out or looseness
- Auto-tensioner wear out or damage of cam chain
- Camshaft sprocket wear out
- Rocker arm or rocker arm shaft wear out

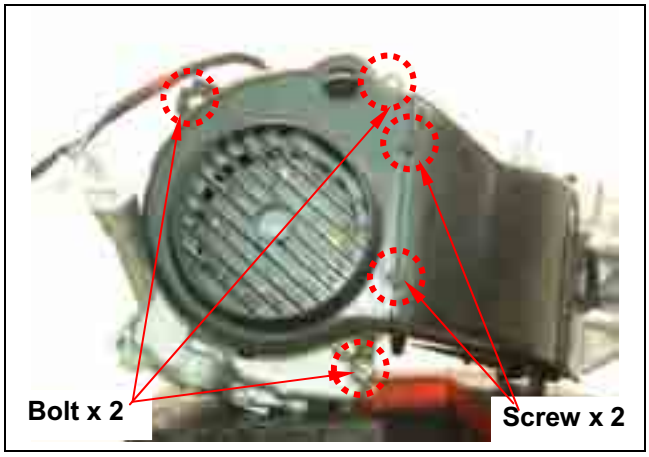
White smoke

- Valve guide or valve stem wear out
- Valve stem seal wear out

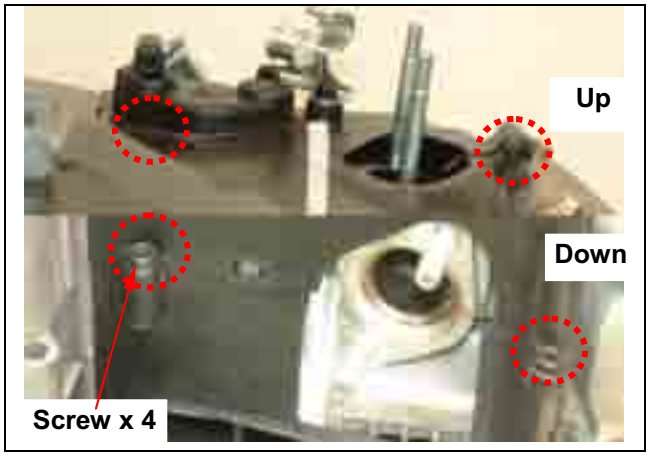
Cylinder Head Removal

Remove:

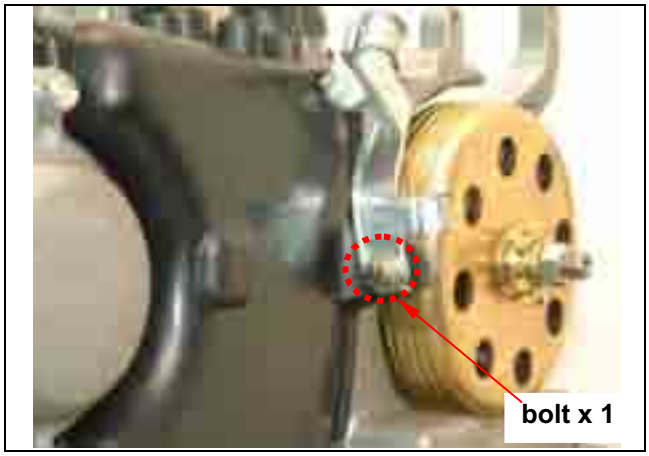
Remove the cooling fan cover. (screw x 2, bolt x 3)



Remove the right cover of engine. (screw x 4)

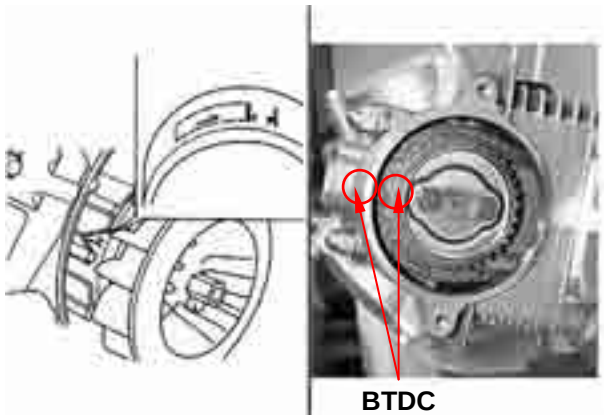


Remove the left cover of engine. (bolt x 1)



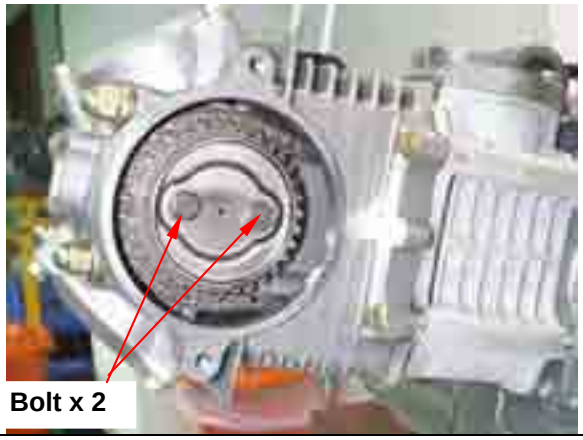
Remove the cover of cylinder head.
Remove the spark plug.

Turn the flywheel in counter clockwise motion with T type wrench until the “T” mark on flywheel aligned with the mark on the crankcase so that the hole on the camshaft sprocket is forward up and piston is at TDC position.



Loosen the screw cap of camshaft chain tensioner and remove O-ring.
With a flat screwdriver to tighten the screw of camshaft chain tensioner in a clockwise motion for release tensioner.

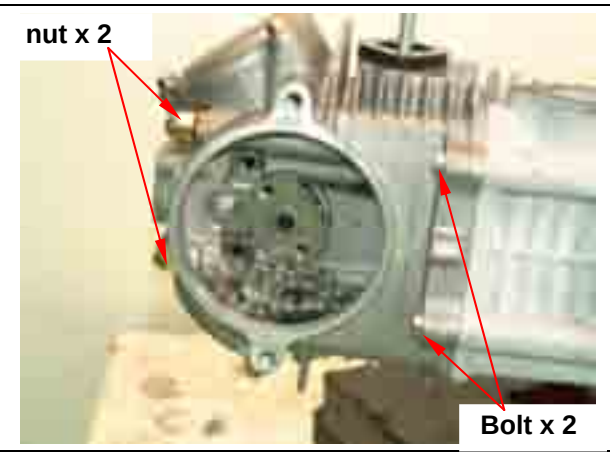
Remove the cam sprocket. (bolt x2)



Remove the left bolt (bolt x2) of cylinder head firstly, and then remove the 4 nuts & washers from the cylinder head top-end.
Pry out the chain and take out the sprocket.
Then, remove the cylinder head.

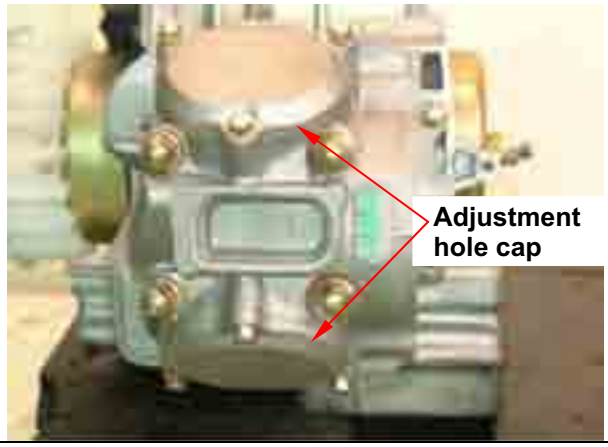
Caution

- Loosen the nuts diagonally by 2-3 sequences.
- Do not let the chain fall into the crankcase after removed the sprocket.

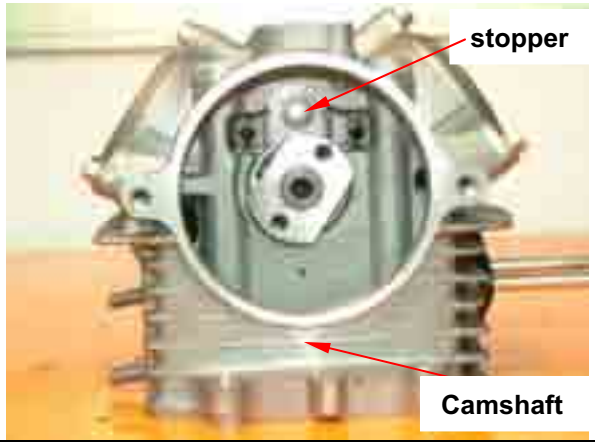


6. Cylinder Head/Valve

Cylinder Head Disassembly
Remove the adjustment hole cap for the EX & IN valve clearance. (bolt x 6)



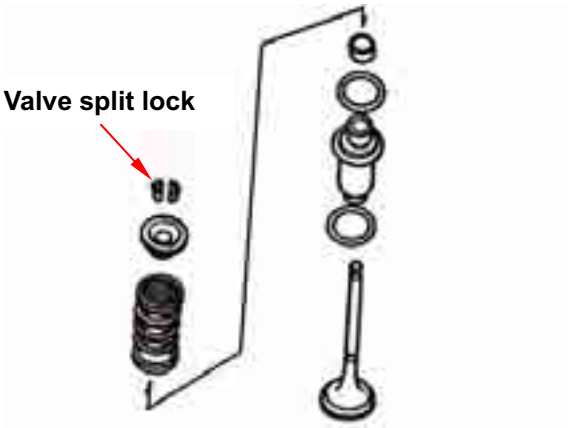
Firstly, remove the camshaft stopper, and then drive a 6mm bolt into camshaft. Finally, remove the camshaft and rocker arm.



Use a valve compressor to press the valve spring.
After removed valve split locks, release the compressor and then take out spring retainer, valve spring and valves.

⚠ Caution

In order to avoid loosing spring elasticity, do not press the spring too much. Thus, press length is based on the valve split locks in which can be removed.



Special Service Tool: Valve spring compressor

Or with the valve spring remover/installer to compress the valve spring directly. Then, remove the valve and valve spring.

⚠ Caution

In order to avoid damaging the valve stem and the cylinder head, in the combustion chamber place a rag between the valve spring remover/installer as compressing the valve spring directly.

Special Service Tool: Valve spring remover/ installer.

Remove valve, valve stem and valve spring.

Cylinder Head Inspection

Camshaft

Inspect cam lobe height for damaged.

Service Limit:

IN: Replacement when less than 26.702mm

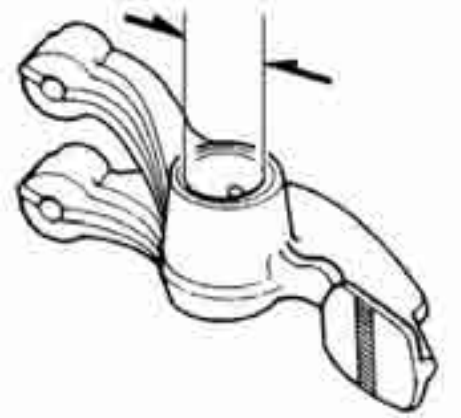
EX: Replacement when less than 26.152mm

Inspect the camshaft bearing for looseness or wear out. If any, replace whole set of camshaft and bearing.

Rocker Arm

Measure the cam rocker arm I.D.

Service Limit: Replace when it is less than 10.100 **mm.**



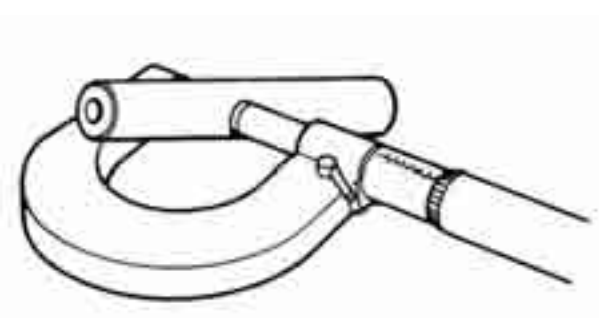
Rocker Arm Shaft

Measure the active O.D. of the cam rocker arm shaft and cam rocker arm.

Service Limit: Replace when it is less than 10.910 mm.

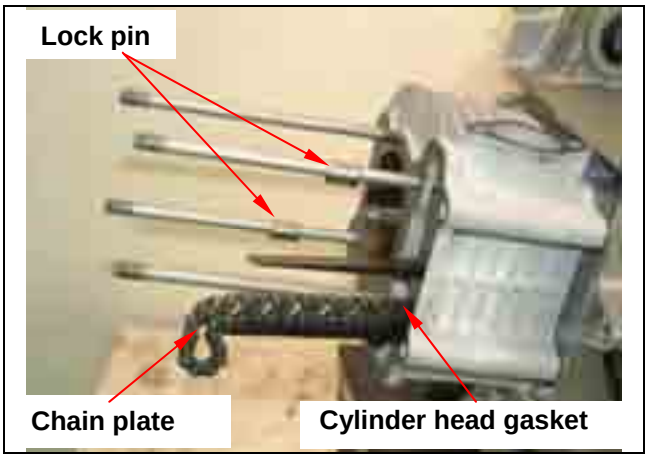
Calculate the clearance between the rocker arm shaft and the rocker arm.

Service Limit: Replace when it is less than 0.10 mm.



6. Cylinder Head/Valve

Remove cylinder head gasket and 2 lock pins.
Remove chain plate.
Clean up residues from the matching surfaces of cylinder and cylinder head.



⚠ Caution

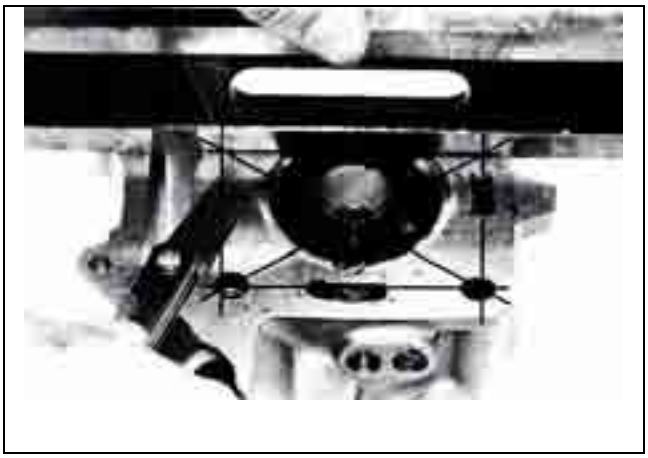
- Do not damage the matching surfaces of cylinder and cylinder head.
- Avoid residues of gasket or foreign materials falling into crankcase as cleaning.

Remove valve stem guide seal.
Clean carbon deposits in combustion chamber.
Clean residues and foreign materials on cylinder head matching surface.

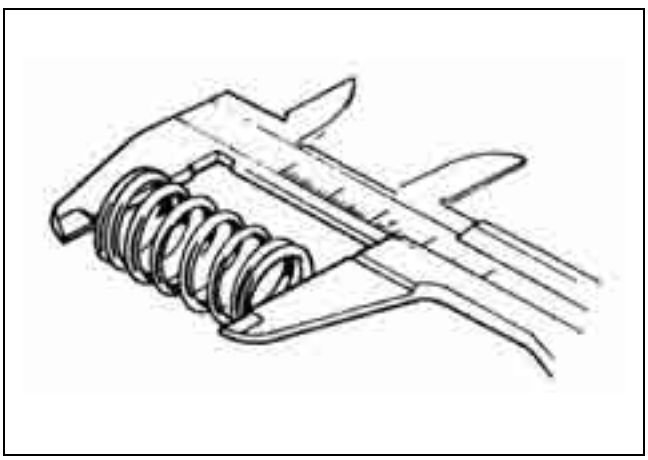
⚠ Caution

Do not damage the matching surface of cylinder head.

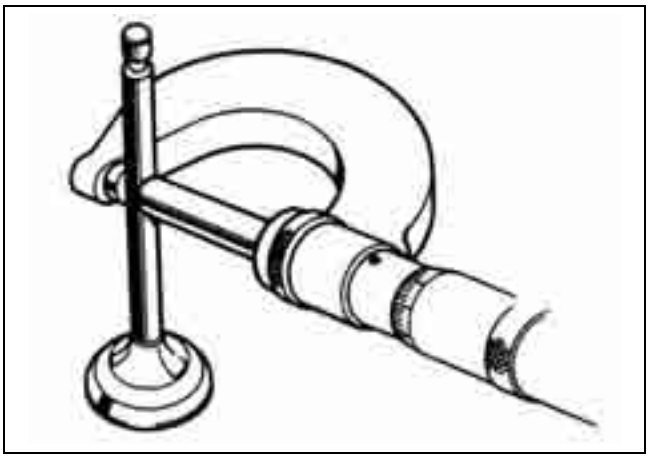
Cylinder Head
Check if spark plug and valve holes are crack.
Measure cylinder head plane with a straightedge and flat feeler gauge.
Service limit: 0.5 mm



Valve Spring Free Length
Measure the free length of intake and exhaust valve springs.
Service limit: 29.500 mm



Valve Stem
Check if valve stems are bend, crack or burn.
Check the operation condition of valve stem in valve guide, and measure & record the valve stem outer diameter.
Service Limit: IN→4.90 mm
EX→4.90 mm

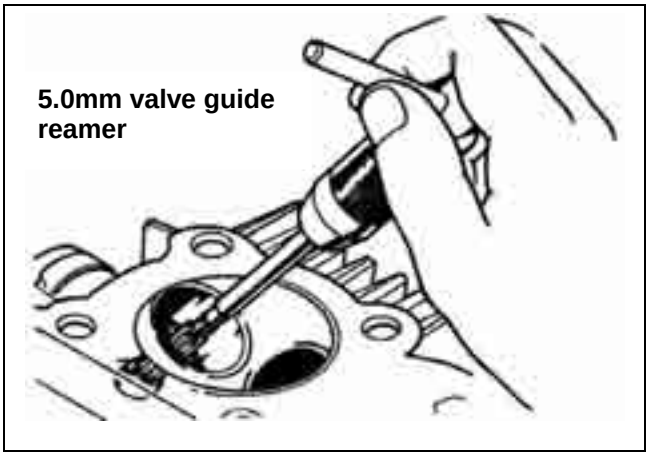


Valve Guide

⚠ Caution

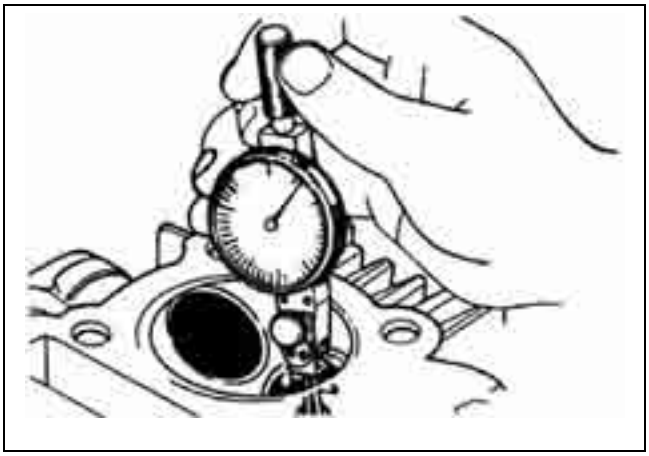
Before measuring the valve guide, clean carbon deposits with reamer.

Special Service Tool: 5.0mm valve guide reamer
Measure and record each valve guide inner diameters.
Service limit: 5.03 mm
The difference that the inner diameter of valve guide deducts the outer diameter of valve stem is the clearance between the valve stem and valve guide.
Service Limit:5.03 mm



⚠ Caution

If clearance between valve stem and valve guide exceeded service limit, check whether the new clearance that only replaces new valve guide is within service limit or not. If so, replace valve guide.



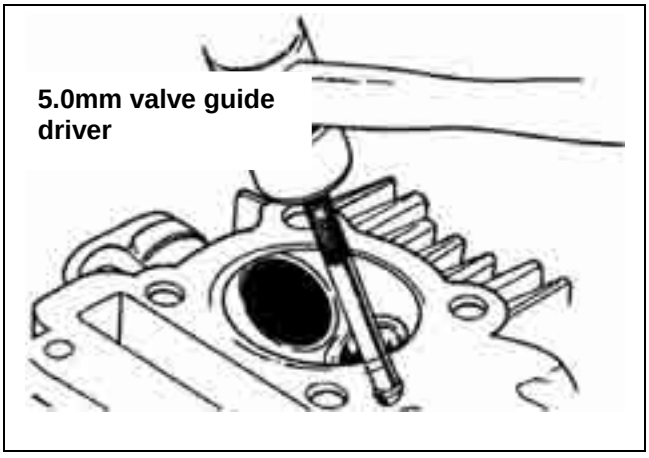
Correct it with reamer after replacement.
If clearance still exceeds service limit after replaced valve guide, replace valve stem too.

⚠ Caution

It has to correct valve seat when replacing valve guide.

Valve Stem Replacement

Heat up cylinder head to 100~150℃ with heated plate or toaster.



⚠ Caution

- Do not let torch heat cylinder head directly. Otherwise, the cylinder head may be deformed as heating it.
- Wear on a pair of glove to protect your hands when operating.

Hold the cylinder head, and then press out old valve guide from combustion chamber side.
Tool: Valve guide driver: 5 mm

Caution

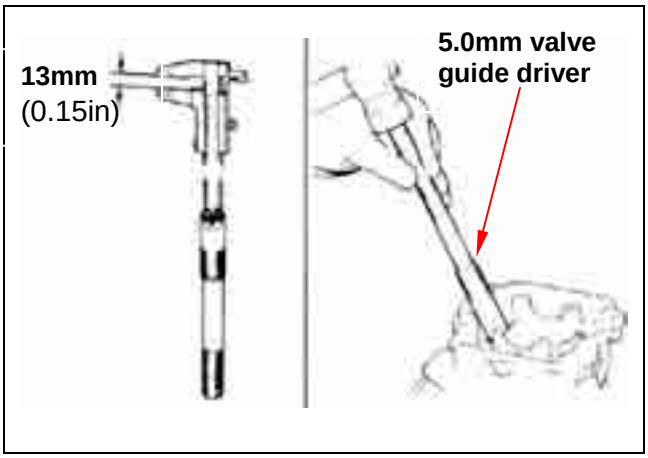
- Check if new valve guide is deformation after pressed it in.
- When pressing in the new valve guide, cylinder head still have to be kept in 100~150℃.

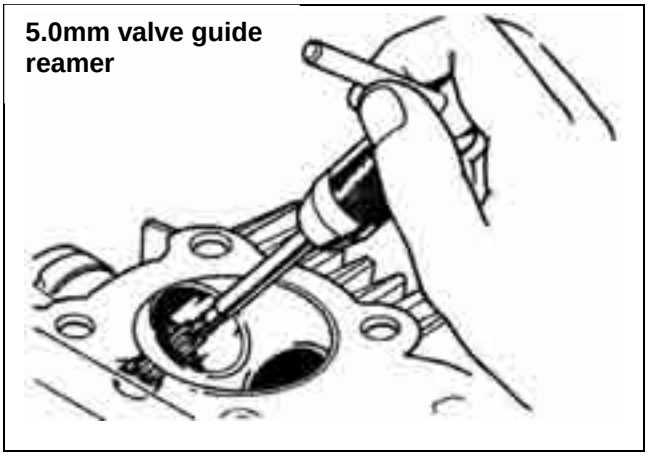
Adjust the valve guide driver and let valve guide height is in 13mm.
Press in new valve guide from rocker arm side.
Tool: Valve guide driver: 5 mm
Wait for the cylinder head cooling down to room temperature, and then correct the new valve guide with reamer.

Caution

- Using cutting oil when correcting valve guide with a reamer.
- Turn the reamer in same direction when it be inserted or rotated.

Correct valve seat, and clean up all metal residues from cylinder head.
Tool: Valve guide reamer 5 mm



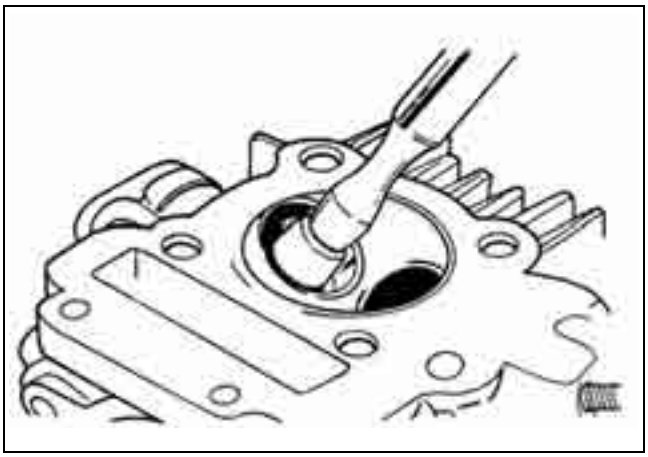


Valve Seat Inspection And Service

Clean up all carbon deposits onto intake and exhaust valves.
Apply with emery slightly onto valve contact face.
Grind valve seat with a rubber hose or other manual grinding tool.

Caution

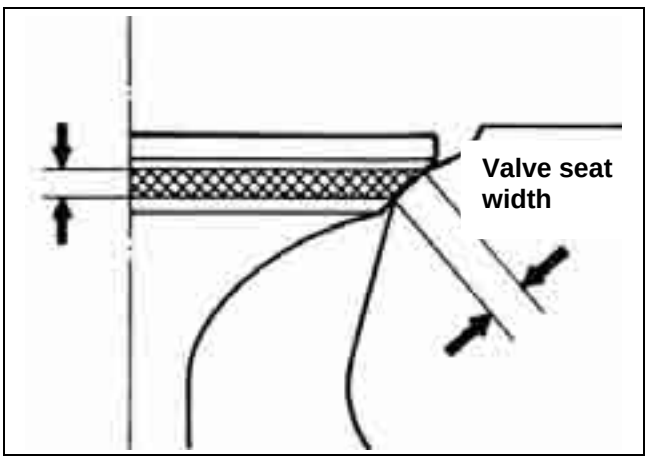
- Do not let emery enter into between valve stem and valve guide.
- Clean up the emery after corrected, and apply with red paint onto contact faces of valve and valve seat.



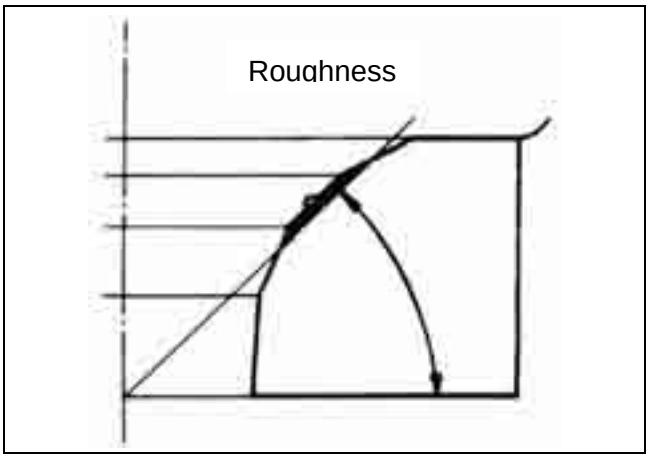
Remove the valve and check its contact face.

Caution

- Replace the valve with new one if valve seal is roughness, wear out, or incomplete contacted with valve seat.
- If the valve and the valve seat still can not be matched sealing after grinded, replace it with new one.



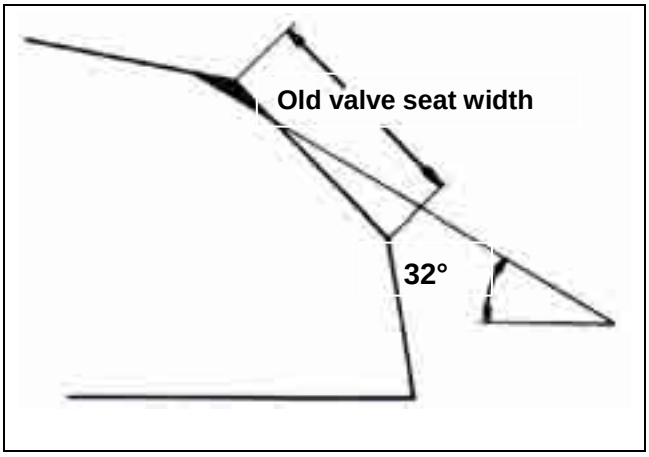
Valve Seat Inspection
If the valve seat is too width, narrow or rough, correct it.
Valve seat width
Service limit: 1.6 mm
Check the contact condition of valve seat.
Valve Seat Grinding
The worn valve seat has to be grinded with valve seat chamfer cutter.
Use 45° valve seat chamfer cutter to cut any rough or uneven surface from valve seat.



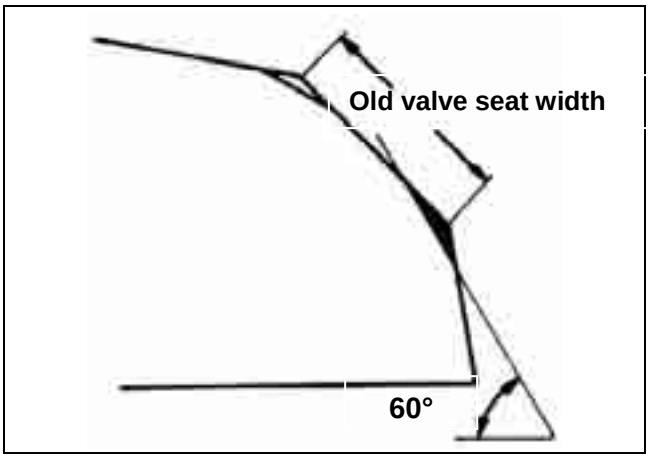
Caution

After valve guide had been replaced, it has to be grinded with 45° valve seal chamfer cutter to correct its seat face.

Use 32° cutter to cut a quarter upper part out.



Use 60° cutter to cut a quarter lower part out.
Remove the cutter and check new valve seat.

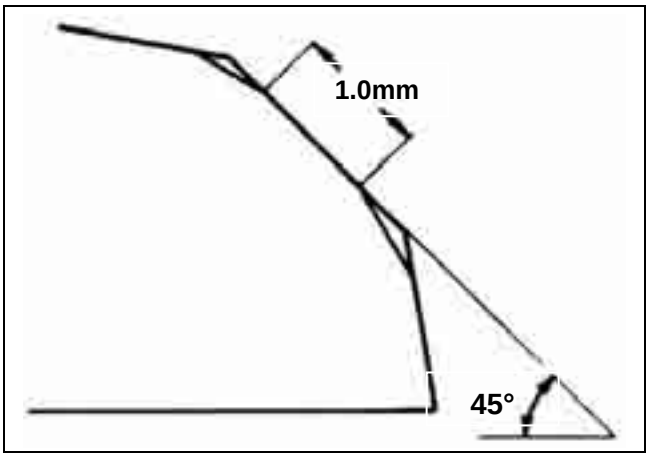


Use 45° cutter to grind the valve seat to specified width.

Caution

Make sure that all roughness and uneven faces had been grinded.

Grind valve seat again if necessary.

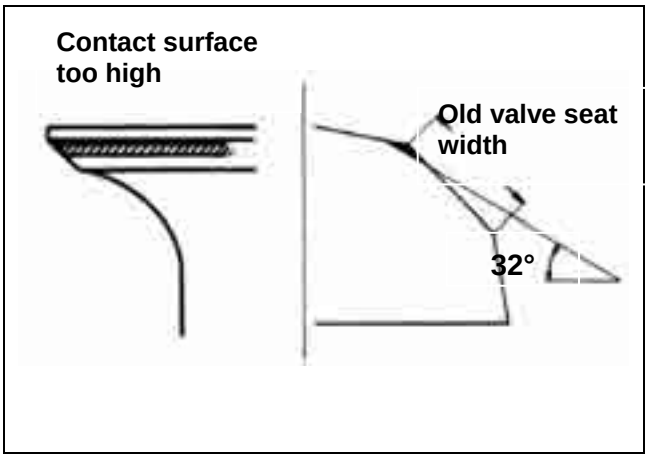


Coat the valve seat surface with red paint.
Install the valve through valve guide until the valve contacting with valve seat, slightly press down the valve but do not rotate it so that a seal track will be created on contact surface.

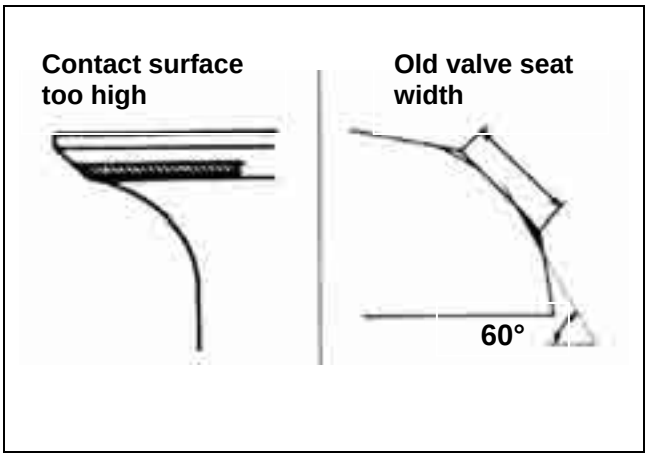
Caution

The contact surfaces of valve and valve seat are very important to the valve sealing capacity.

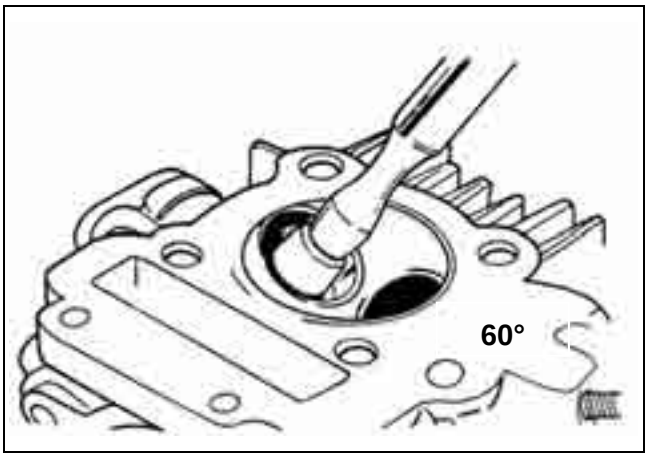
If the contact surface too high, grind the valve seat with 32° cutter.
Then, grind the valve seat to specified width.



If the contact surface too low, grind the valve seat with 60° cutter.
Then, grind the valve seat to specified width.



After the valve seat grinded, coat valve seat surface with emery and then slightly press the grinded surface.
Clean up all emery coated onto cylinder and valve after grinded.

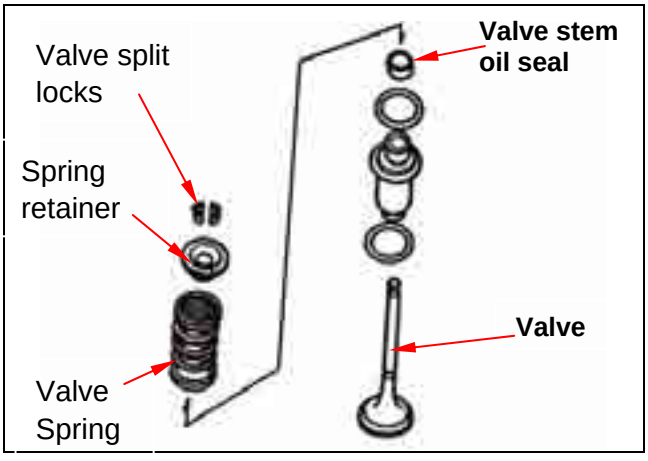


Cylinder Head Reassembly

Lubricate valve stem with engine oil, and then insert the valve into valve guide.
Install new valve stem oil seal.
Install valve springs and retainers.

Caution

The closed coils of valve spring should face down to combustion chamber.



Use valve spring compressor to press valve spring.
Install valve split locks and release the valve compressor.

Caution

In order to avoid loosing spring elasticity, do not press the spring too much. Thus, press length is based on the valve split locks in which can be removed.

Special Service Tool: Valve spring compressor
Tool number：1471110/20

Or with the valve spring remover/installer to install valve and spring.
Firstly, install valve spring, retainers onto the valve as assembling.

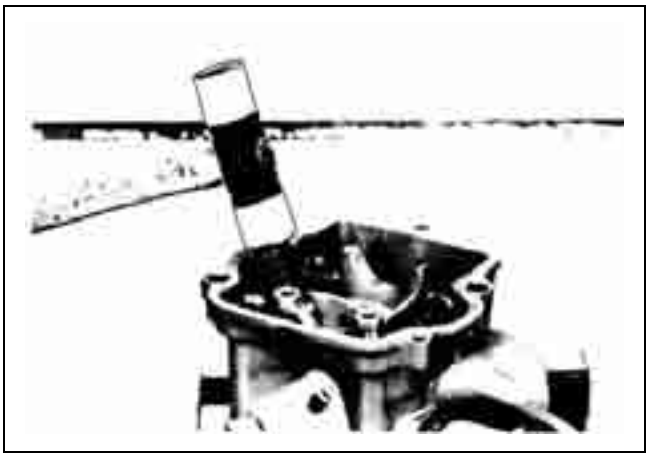
Caution

In order to avoid damaging the valve stem and the cylinder head, in the combustion chamber place a rag between the valve spring remover/installer as compressing the valve spring directly.

With the valve spring remover/installer, compress the valve spring directly. Then, remove the valve and valve spring.

Special Service Tool: Valve spring remover/ installer.

Tap valve stem to make valve retainer and valve stem sealing properly.



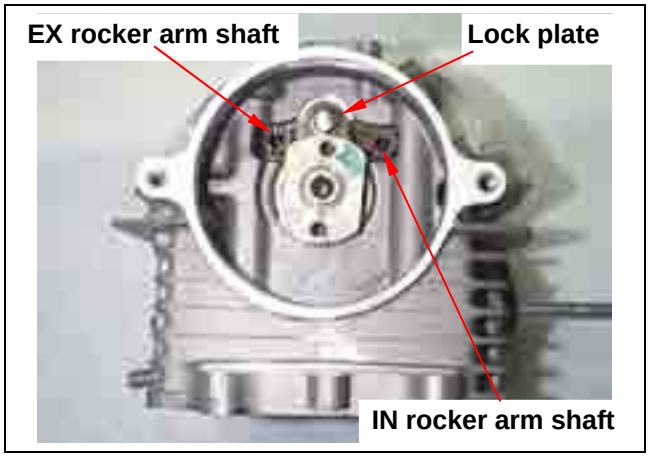
Caution

Place and hold cylinder head on to working table and place a rag against onto the valve so that can prevent damage valve stem and cylinder head.

Install the camshaft onto the cylinder head and then the rocker arm and the rocker arm shaft. Lock the lock plate after rotate the rocker arm shaft to properly position.

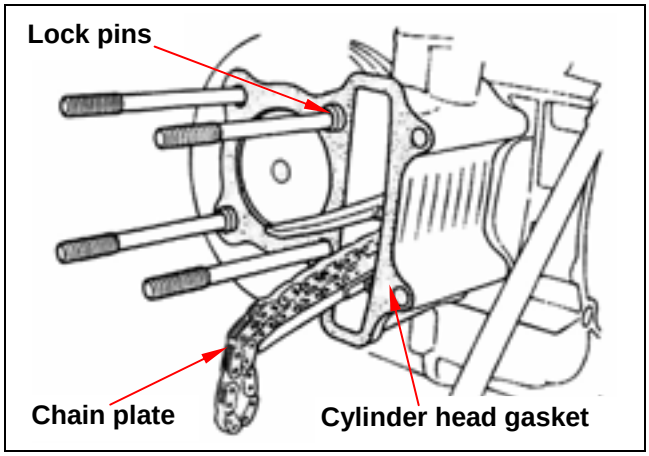
Caution

There is different shapes on the top-end of rocker arm shaft. The machined surface on the rocker arm shaft has to face toward exhaust side, and then the larger surface has to align with the bolt hole of cylinder

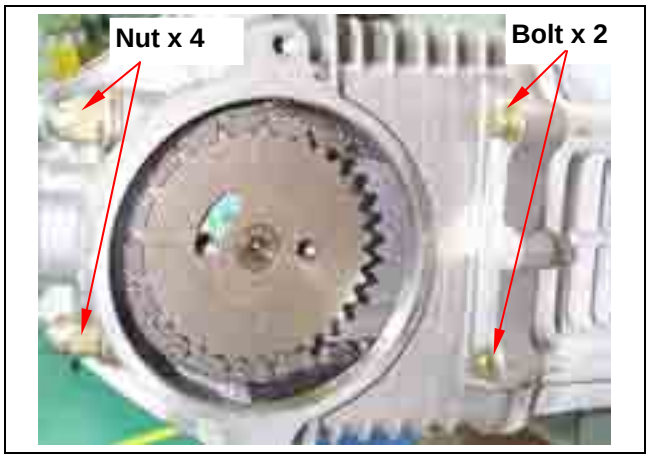


Cylinder Head Installation

Install the lock pins and new cylinder head gasket onto the cylinder head.
Install the camshaft chain plate.



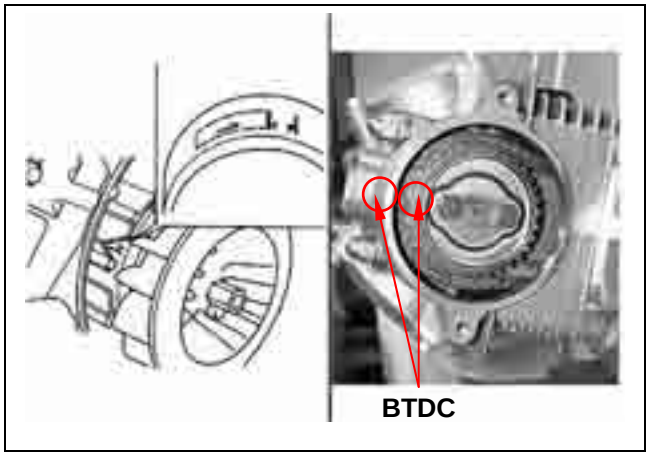
Install the cylinder head.
Tighten the 4 nuts onto the cylinder head top-end, and then the 2 cylinder head mounting bolts on its side.
Torque value: 2.0~2.4 kgf-m



Caution

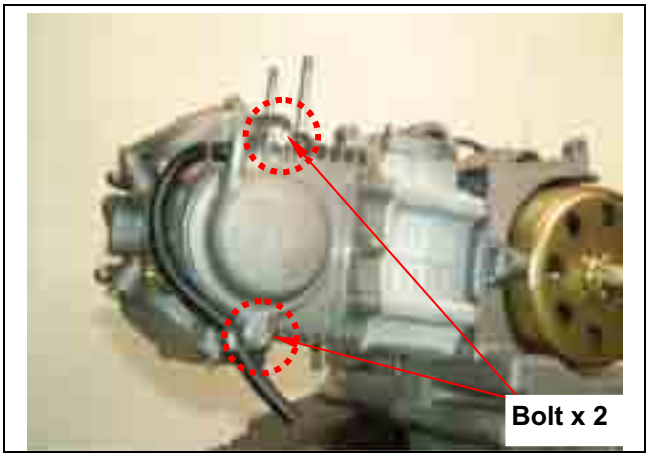
This model is equipped with precious 4 valves mechanism so tighten torque can not be over the limited value and tightening the bolts diagonally by 2-3 sequences. It can prevent from cylinder head deformation and then cause noise or leaking problems so that effect motorcycle's performance.

With T type wrench to turn crankshaft in a clockwise motion so that the "T" mark on the alternator flywheel aligns with the mark on crankcase. (piston is at TDC position)
Place the TDC marks of the cam sprocket at same level of the top-end of cylinder head. The other single hole of the cam sprocket is in upward. Then, install the cam chain onto the cam sprocket.



Install the spark plug and tighten it.
Torque value: 1.0~1.2 kgf-m

ighten the cylinder head right side cover. (bolt x 2)

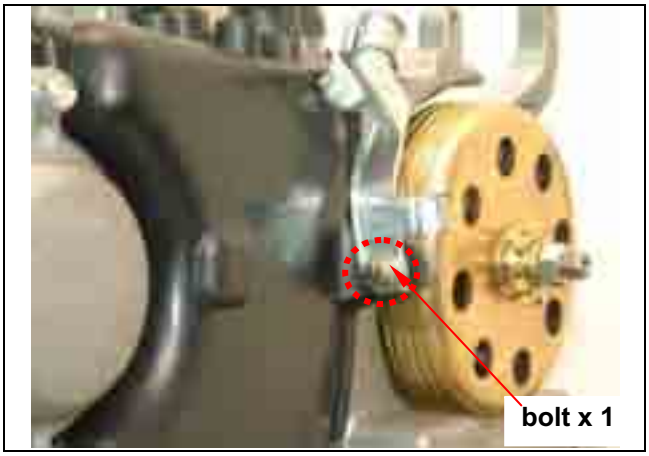


With flat screwdriver, turn the cam sprocket tensioner in counter-clockwise motion so that the tensioner is pushed out to contact the cam chain plate tightly. Apply with oil onto a new O-ring and then install it onto the tensioner hole. Tighten the bolt cap of the tensioner adjustment hole.

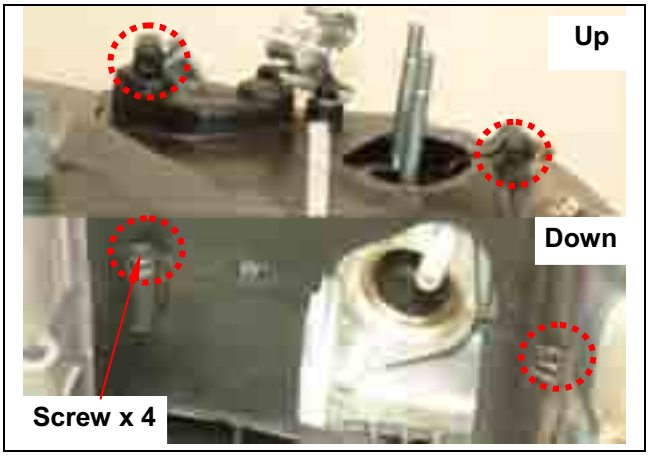
Caution

The O-ring must be installed into glove.

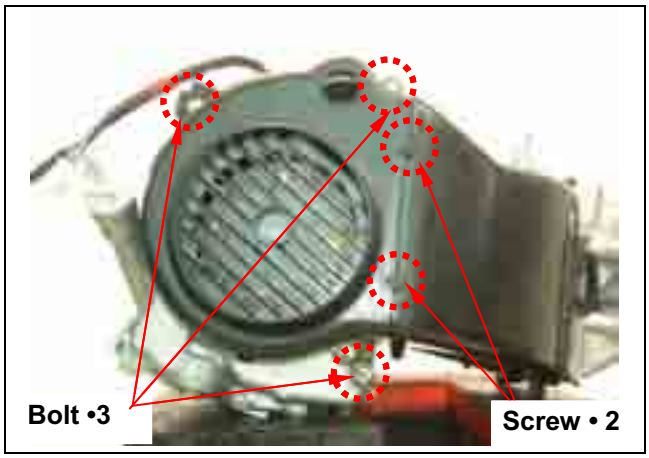
Install the left-side cover of the engine body. (bolt x 1)



Install the right-side cover of the engine body. (screw x 4)



Install the cooling fan cover. (screw x2, bolt x 3)



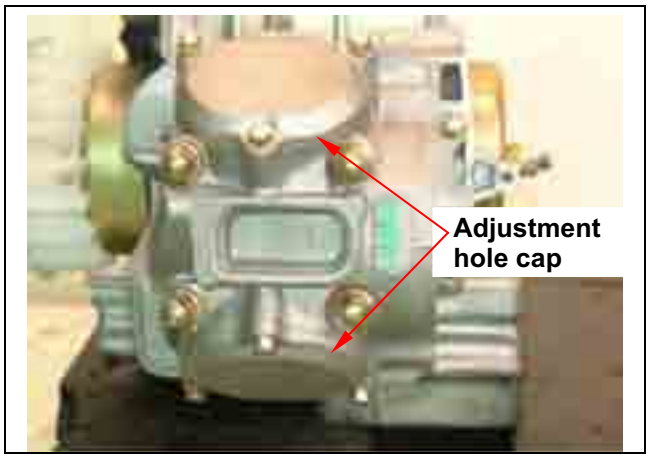
Valve Clearance Adjustment

Loosen valve clearance adjustment nuts and bolts located on valve rocker arm.
Measure and adjust valve clearance with feeler gauge.
After valve clearance had been adjusted to standard value, hold adjustment bolt and then tighten the Adjustment nut.

Standard Value: IN 0.12 ± 0.02 mm.
EX 0.12 ± 0.02 mm

Install the valve clearance adjustment hole cap. (bolt x3)

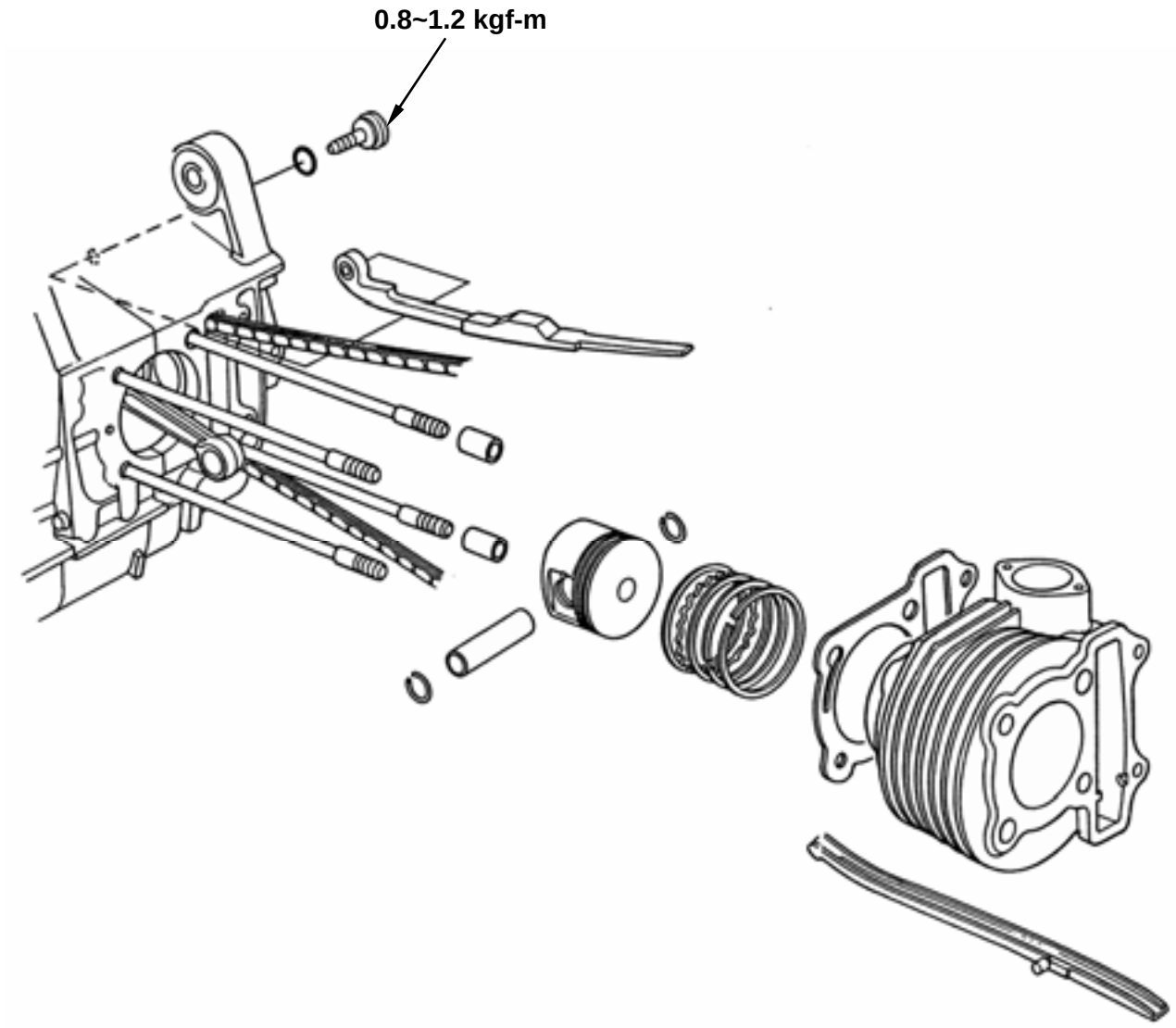
Start the engine after assembly. Remove the intake valve adjustment hole cap and make sure that engine oil flows onto the cylinder head.
Stop the engine after confirmed, and then install the intake valve adjustment hole cap.
Install the seat cushion and the central cover.



Caution

- The cylinder components will be serious wear out if lubricant did not flow onto the cylinder head. So it has to be confirmed.
- It has to be in idle speed when conduct this procedure. Never increase engine speed in high RPM.

Mechanism Illustration



7. Cylinder/Piston

Precautions In Operation

General Information

Both cylinder and piston service cannot be carried out when engine mounted on frame.

Specification **Unit: mm**

Item			Standard	Limit
Cylinder	ID		57.4mm	57.5
	Bend/wrapage		—	0.050
	Cylindrical roundness		—	0.050
	Cylindrical roundness		—	0.050
Piston/Piston ring	Clearance between piston rings	Top ring	0.025~0.060	0.090
		2nd ring	0.015~0.050	0.090
	Ring-end gap	Top ring	0.100~0.250	0.500
		2nd ring	0.250~0.400	0.650
		Oil ring side rail	0.200~0.800	—
	OD of piston		57.370~57.390	57.300
	Piston OD measurement position		Lower-end up 9 mm of piston skirt	—
	Clearance between piston and cylinder		0.010~0.040	0.100
	ID of piston pin boss		15.002~15.008	15.040
OD of piston pin			14.994~15.000	14.960
Clearance between piston and piston pin			0.002~0.014	0.020
ID of connecting rod small-end			15.016~15.034	15.060

Trouble Diagnosis

Low Or Unstable Compression Pressure

- Cylinder or piston ring worn out

High Compression Pressure

- Carbon deposit onto the piston & combustion chamber

Knock or Noise

- Cylinder or piston ring worn out
- Carbon deposits on cylinder head top-side
- Piston pin hole and piston pin wear out

Smoking in Exhaust Pipe

- Piston or piston ring worn out
- Piston ring installation improperly
- Cylinder or piston damage

Engine Overheat

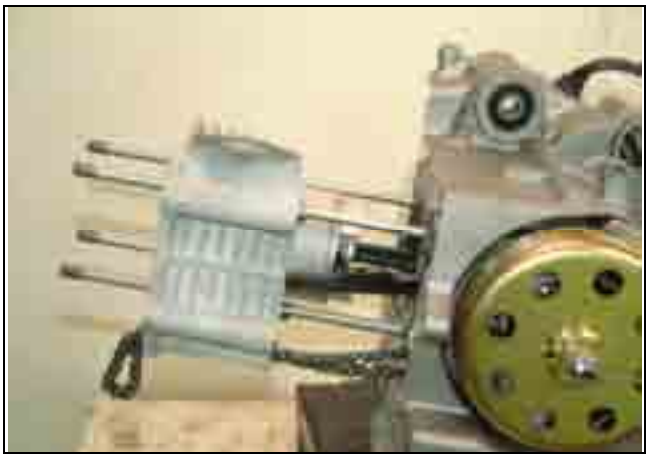
- Carbon deposits on cylinder head top side

Cylinder Removal

Remove cylinder head. (refer to chapter 6)
Remove 2 bolts and then take out the cam chain auto-tensioner.

Remove cam chain plate.

Remove cylinder.



Remove cylinder gasket and lock pins.
Clean the residues attached onto the matching surfaces of cylinder and crankcase.

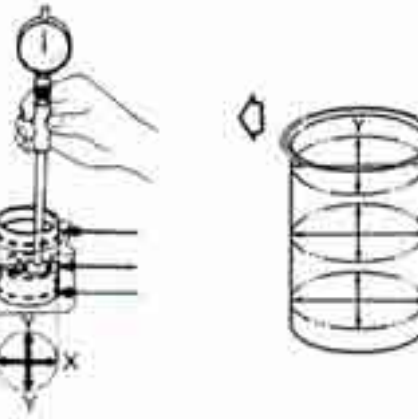
Cover the holes of crankcase and cam chain with a piece of cloth.
Clean up all residues or foreign materials from the two matching surfaces of cylinder and crankcase.

Caution

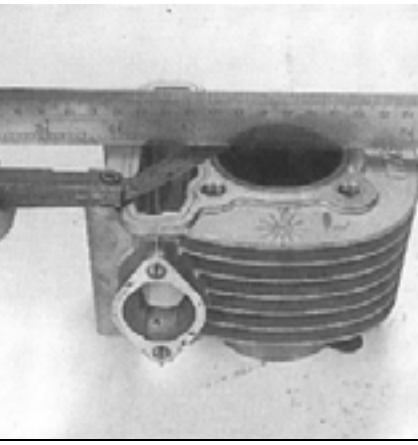
To soap the residues into solvent so that the residues can be removed more easily.

Cylinder Inspection

Check if the inner diameter of cylinder is worn out or damaged.
In the 3 positions (top, center and bottom) of cylinder, measure the X and Y direction values respective in the cylinder.
Service limit: 52.50 mm
Calculate both the real roundness (the difference between X and Y motion values) and the cylindrical roundness (the difference in the top, center or bottom positions of X or Y motion values.) Then, determinate by the max. value.
Service limit:
Real roundness: correct or replace as over 0.05 mm
Cylindrical roundness: correct or replace as over 0.05 mm



Check Cylinder Wrapage.
Service limit: correct or replace as over 0.05 mm



Piston Removal
Plug crankcase opening with a cleaning cloth to prevent from piston pin snap ring or other parts falling into crankcase when disassembling.
Hold another snap ring with pliers.
Push out the piston pin from the side that not removed the snap ring.

Remove piston rings.

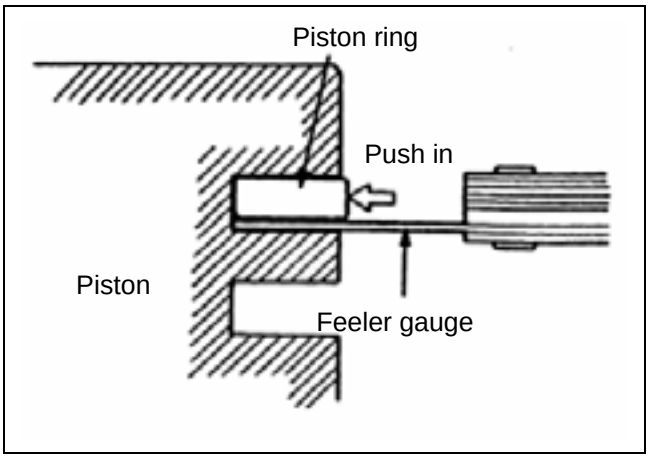
Caution

Pay attention to remove piston rings because they are fragile.

Disassemble the piston rings.
Check if the piston rings are damaged or its grooves are worn.
Clean out the carbon deposit around the piston ring groove.

Piston Inspection

Install the piston rings and then measure clearance between piston ring and its grooves.
Service Limit:
Top ring: replace if over 0.09 mm
2nd ring: replace if over 0.09 mm

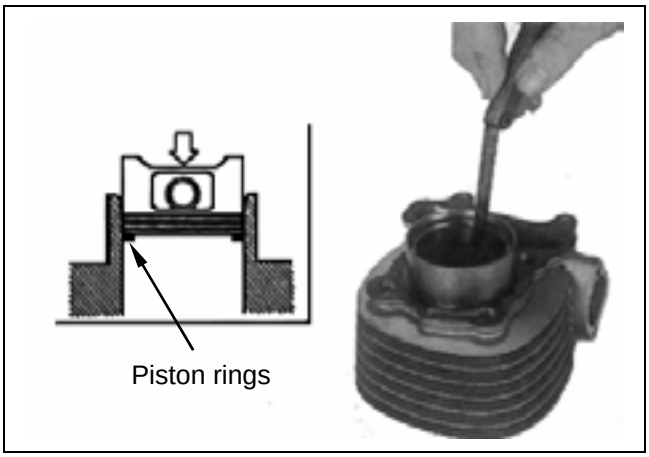


Take out the piston rings and place them respective into cylinder below 20mm of cylinder top. Measure each piston ring gaps.

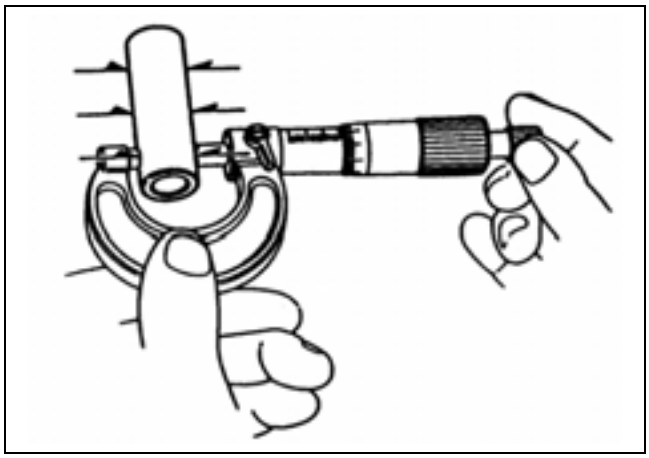
Caution

Push the piston rings into cylinder with piston top-end in parallel motion.

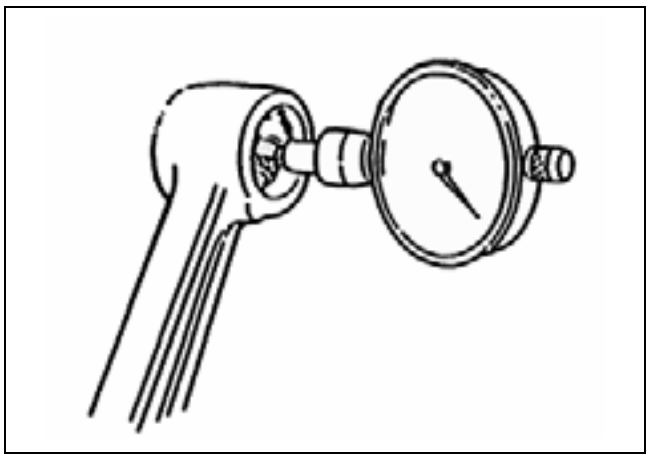
Top ring: replace if over 0.5 **mm**
2nd ring: replace if over 0.65 **mm**



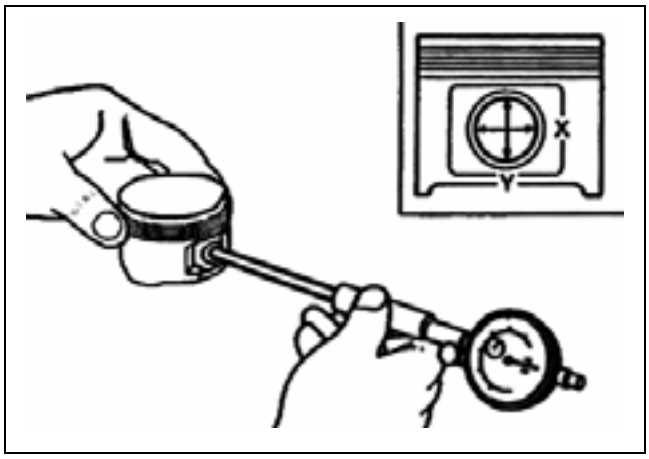
Measure the outer diameter of piston pin.
Service Limit: 14.960 mm



Measure the inner diameter of connecting rod small end.
Service Limit: 15.060 mm



Measure the inner diameter of piston pin boll.
15.040 mm

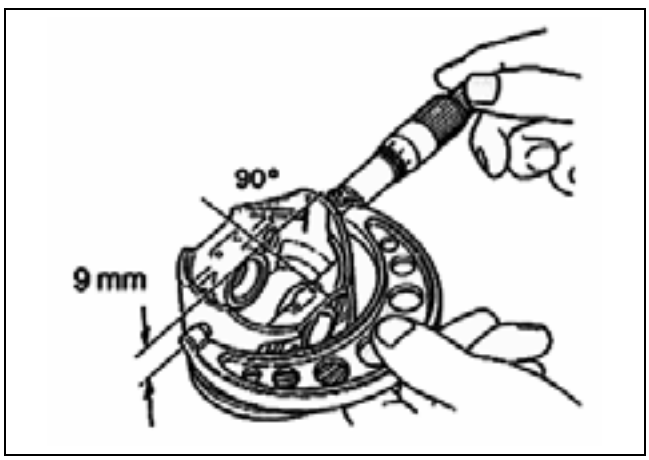


Measure piston outer diameter.

Caution

The measurement position is 10 mm distance from piston bottom side, and 90° to piston pin.

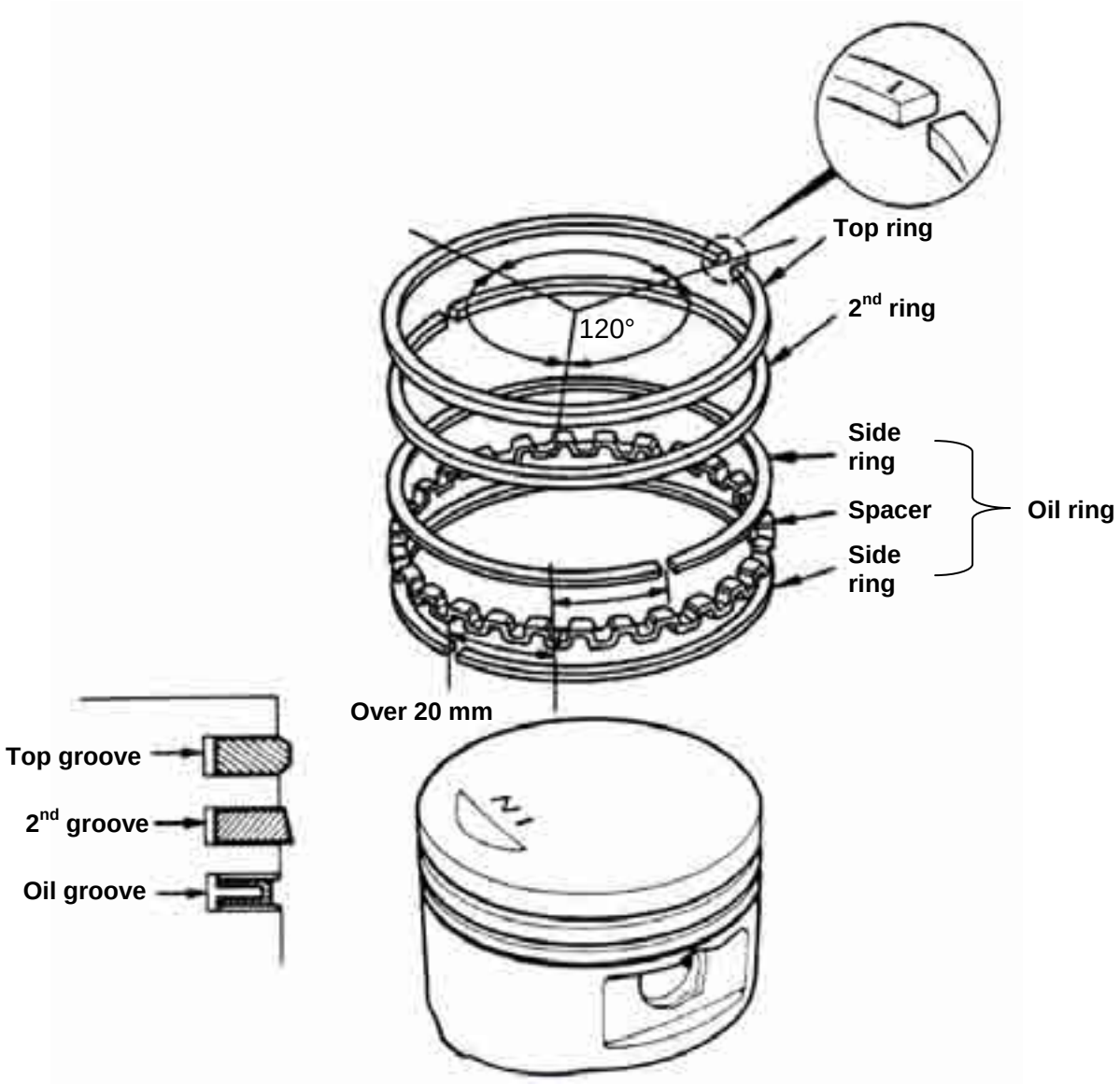
Service limit: 57.300 mm
Compare measured value with service limit to calculate the clearance between piston and cylinder.



Piston Ring Installation
Clean up piston top, ring groove, and piston shirt.
Install the piston ring onto piston carefully.
Place the openings of piston ring as diagram shown.

⚠ Caution

- Do not damage piston and piston rings as installation.
- All marks on the piston rings must be forwarded to up side.
- Make sure that all piston rings can be rotated freely after installed.



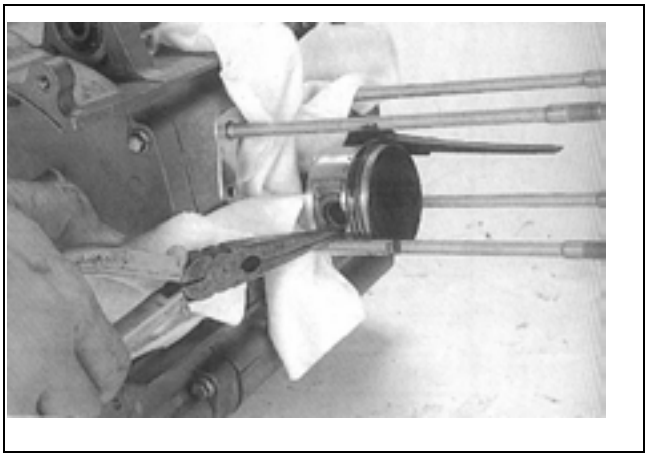
Piston Installation

Install piston and piston pin, and place the IN marks on the piston top side forward to intake valve.

Install new piston pin snap ring.

Caution

- Do not let the opening of piston pin snap ring align with the opening piston ring.
- Place a piece of cloth between piston skirt section and crankcase in order to prevent snap ring from falling into crankcase as operation.

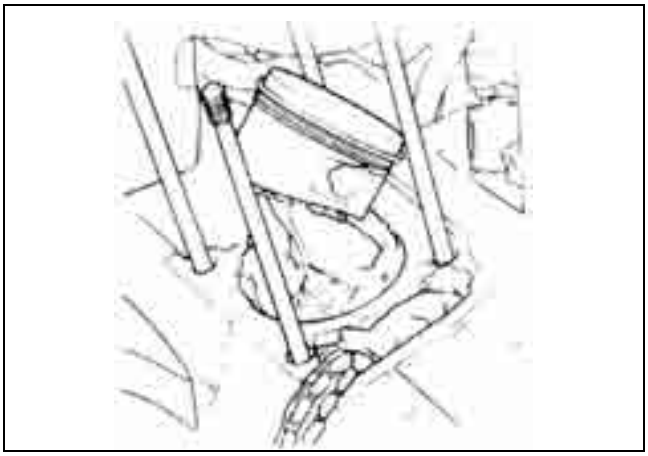


Cylinder Installation

Clean up all residues and foreign materials on the matching surface of crankcase. Pay attention to not let these residues and foreign materials fall into crankcase.

Caution

To soap the residues into solvent so that the residues can be removed more easily.



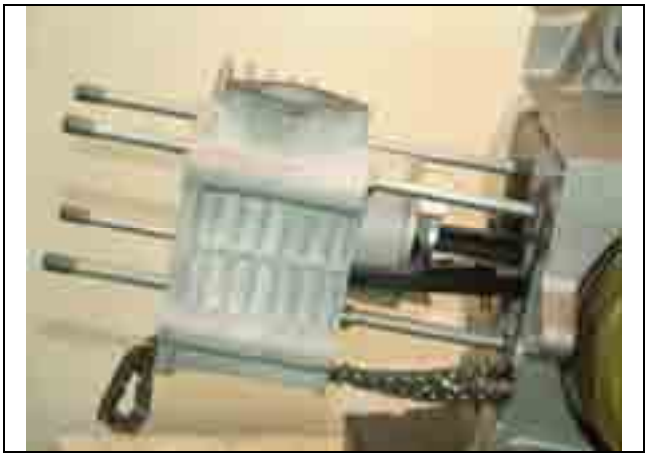
Install 2 lock pins and new gasket.

Coat engine oil to inside of cylinder, piston and piston rings.

Care to be taken when installing piston into cylinder. Press piston rings in one by one as installation.

Caution

Do not push piston into cylinder forcefully because this will cause the piston and the piston rings to be damaged.

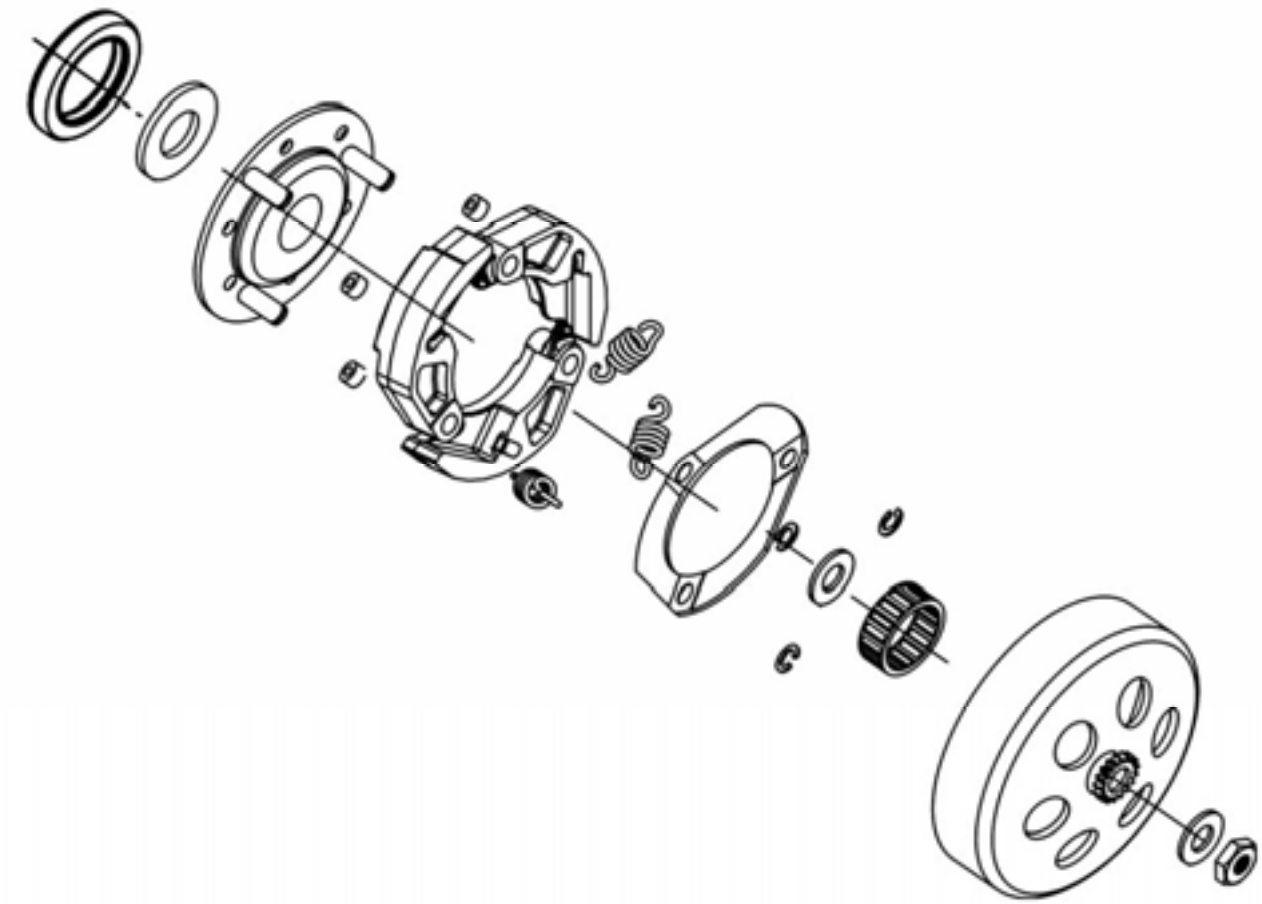


Install the cam chain plate, the cylinder gasket and lock pins.

Install cylinder head. (refer to Chapter 6)

Install the cam chain auto-tensioner. (2 bolts)

Mechanism Illustration



8. Driving System

Maintenance Description

PRECAUTIONS IN OPERATION

- Driving pulley, clutch, and driven pulley can be serviced on the motorcycle.
- Driving belt and driving pulley surface must be free of grease.

Specification **Unit: mm**

ID: Inner Diameter
OD: Outer diameter

Torque value

Sliding pulley nut: 5.0~6.0 kgf-m
Clutch jacket nut: 5.0~6.0 kgf-m
driving pulley nut: 5.0~6.0 kgf-m

Special Service Tools

Clutch spring compressor
Bearing puller (inner type)
Clutch mounting nut wrench
Universal fixture

Trouble Diagnosis

Engine can be started but motorcycle can not be moved

1. Worn driving Belt
2. Worn tilt plate
3. Worn or damaged clutch lining
4. Broken driven pulley

Shudder or misfire when driving

1. Broken clutch lining
2. Worn clutch lining

Insufficient horsepower or poor high speed performance

1. Worn driving belt
2. Insufficient spring capacity of driven pulley
3. Worn roller
4. Driven pulley operation un-smoothly

Remove / Installation

Remove:

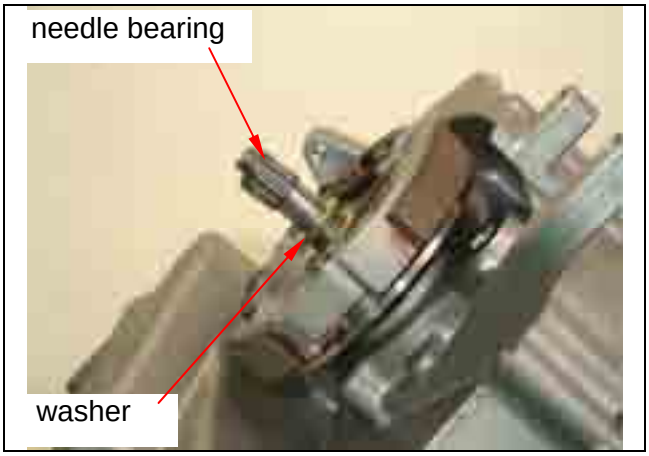
Remove 1 nut of the clutch outer comp.

Remove the clutch outer comp.

Remove the needle bearing and washer of the crank shaft.

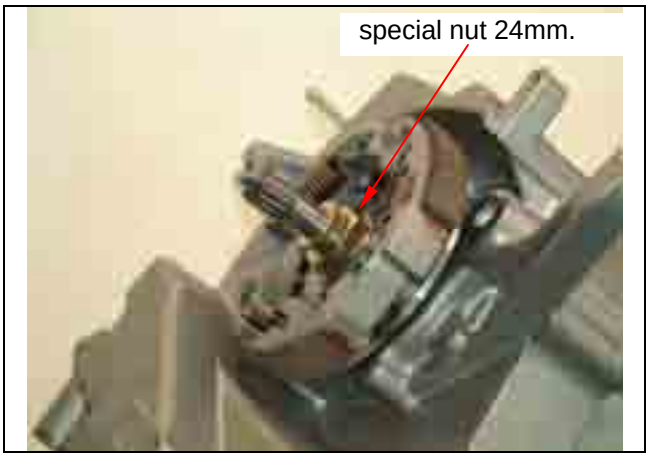
Caution

Needle bearing has to lubricate with lubricating oil once two hour or will cause damage



I

Remove the special nut 24mm.



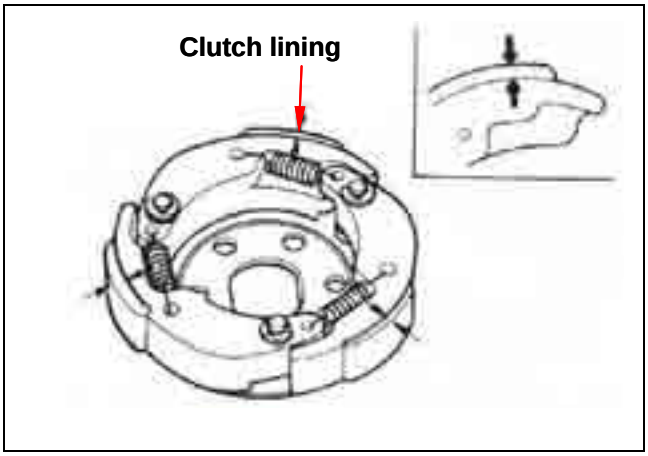
Remove the clutch weight with special tool.
Special tool number：1120100-G5

INSTALL
Install according to the reverse procedure of remove

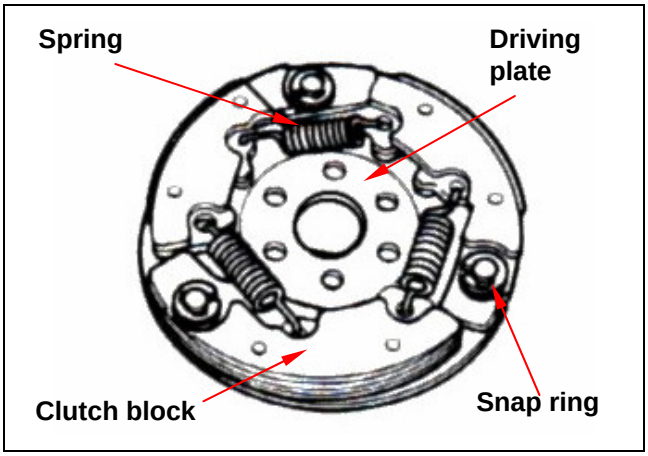
Caution

Install clutch weight with lubricating oil on the crank shaft, otherwise the crankshaft will be damaged

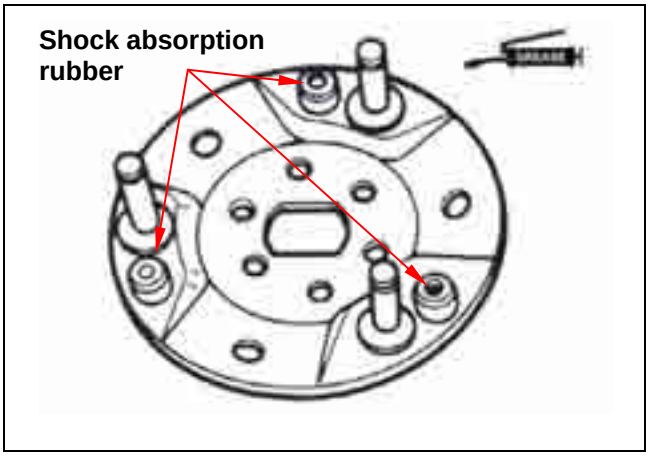
Clutch lining
Measure each clutch lining thickness. Replace it if exceeds service limit.
Service limit: 2.0 mm



Clutch Block Replacement
Remove snap and washer, and the remove clutch block and spring from driving plate. Check if spring is damage or insufficient elasticity.



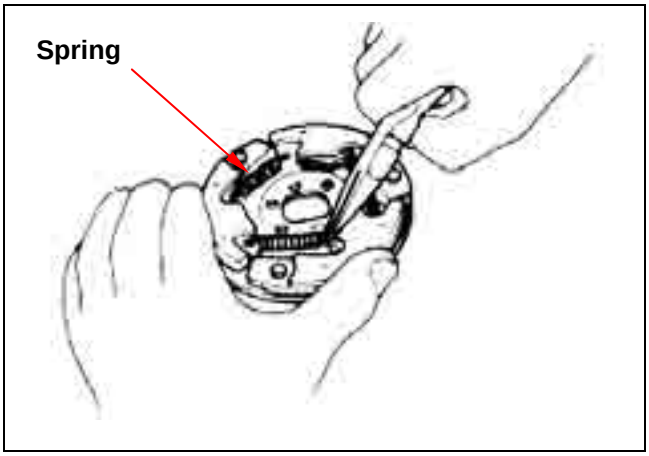
Check if shock absorption rubber is damage or deformation. Replace it if necessary.
Apply with grease onto setting pins.



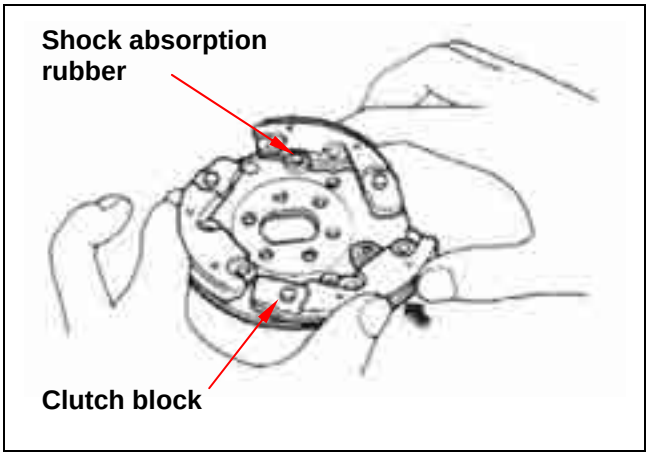
Apply with grease onto setting pins. But, the clutch block should not be greased. If so, replace it.
Install new clutch block onto setting pin and then push to specified location.

Caution

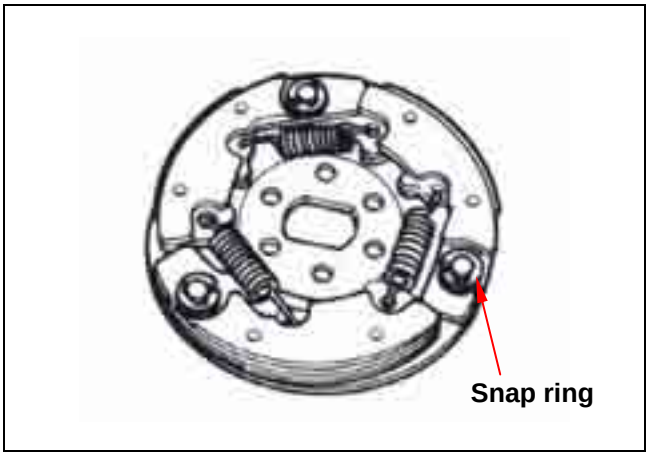
- Grease or lubricant will damage the clutch block and effect the block's connection capacity.



Install the spring snap into groove with pliers.

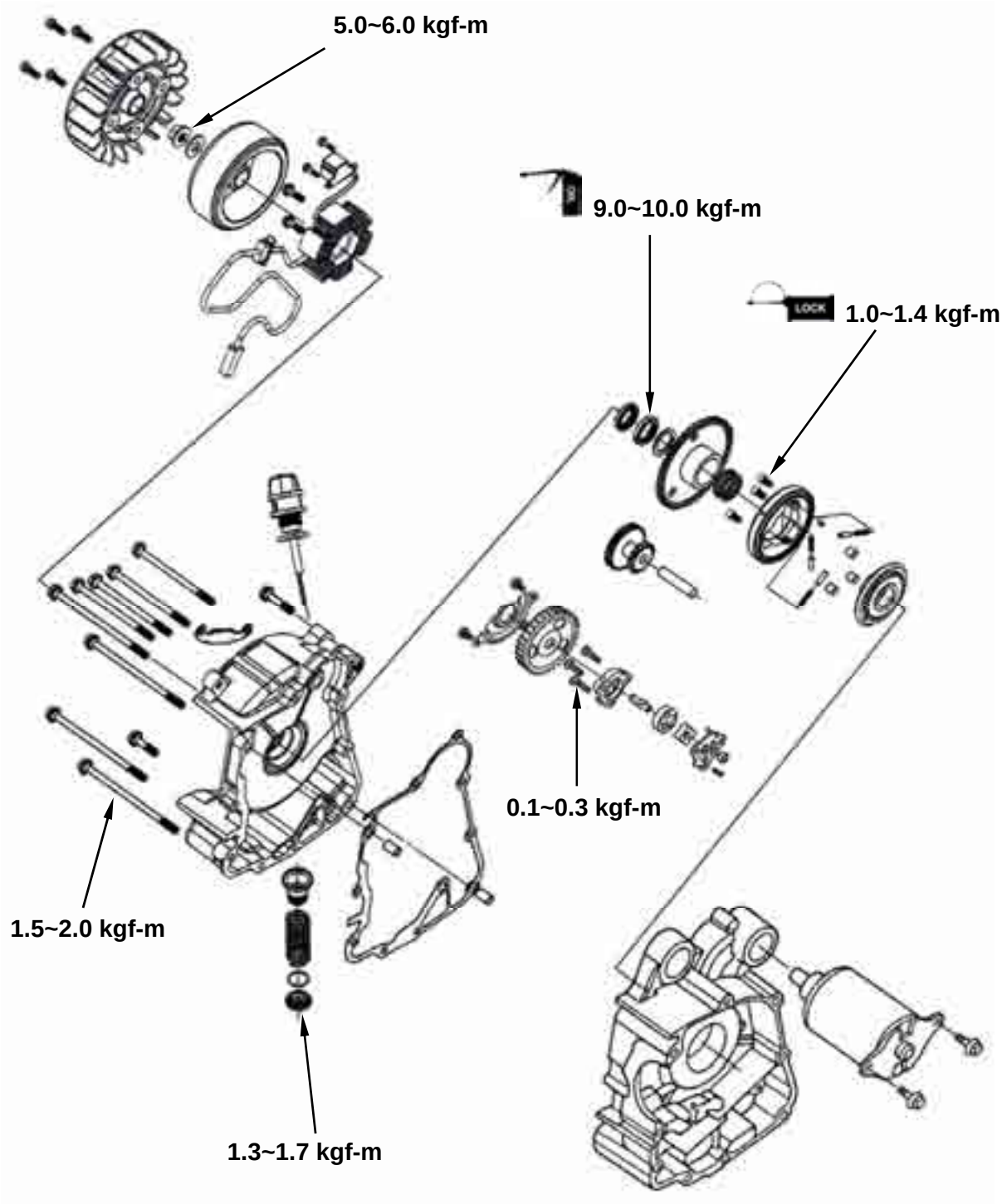


Install snap ring and mounting plate onto setting pin.



NOTE:

Mechanism Illustration



9. Alternator/Starting Clutch

Precautions in Operation

General information

- Refer to chapter 5: Engine removal and installation
- Refer to chapter 1: The troubleshooting and inspection of alternator
- Refer to chapter 16: The service procedures and precaution items of starter motor

Specification **Unit: mm**

Item	Service Limit
ID of starting clutch gear	32.06mm
OD of starting clutch flange	27.94mm
ID of starting reduction gear	10.05mm
OD of starting reduction gear shaft	9.94mm

Torque value:

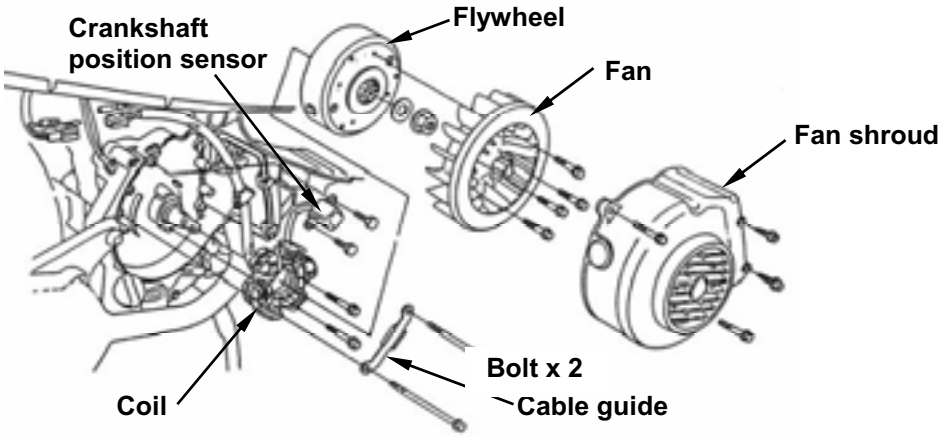
Flywheel nut	5.0~6.0 kgf-m
Bolt 8mm	1.5~2.0 kgf-m
Oil screen cover	1.3~1.7 kgf-m
Starting clutch mounting bolt	9.0~10.0 kgf-m with oil on the thread
Starting clutch hex socket bolt	1.0~1.4 kgf-m with adhesive

Special service tools

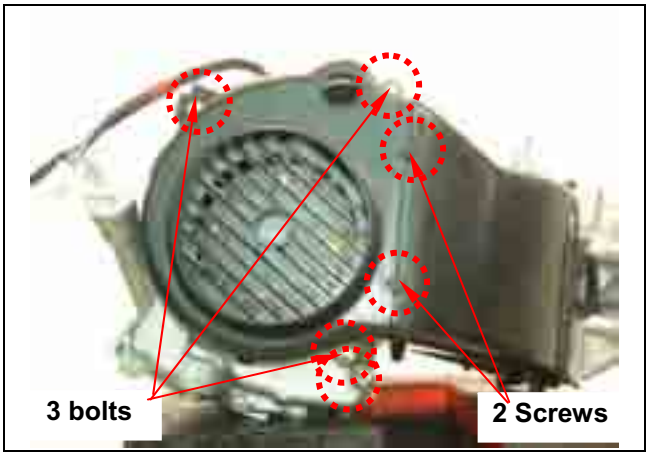
Flywheel puller

Universal fixture

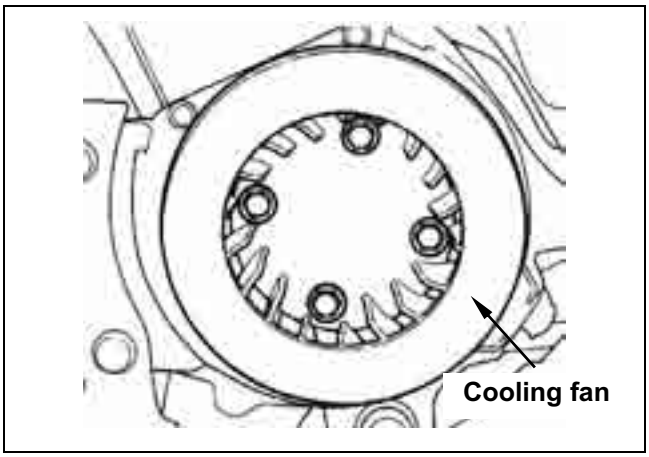
Alternator Removal



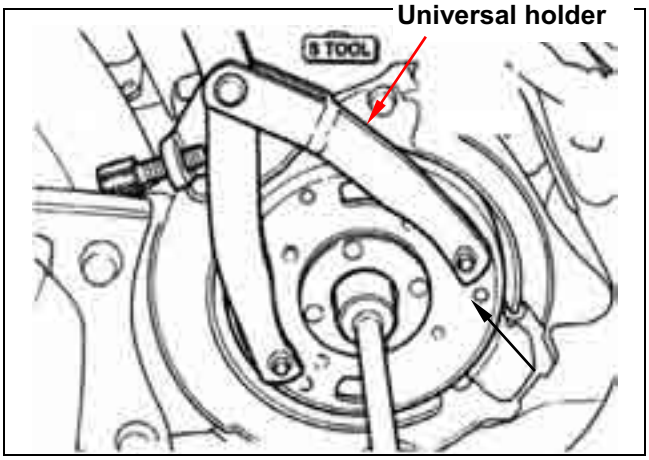
Remove:
Remove the cooling fan cover. (screw x 2, bolt x 3)



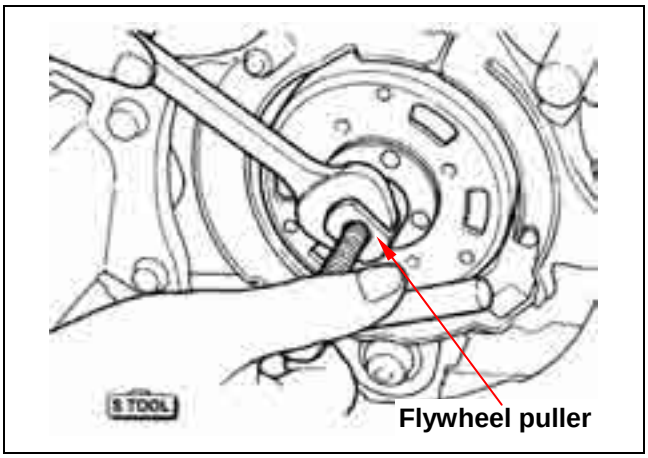
Remove the cooling fan. (bolt x 4)



Hold the flywheel with the universal fixture.
Special service tool: universal holder
Special tool number 2210100.



Remove the flywheel with the flywheel puller.
Special service tools: Flywheel puller
Special tool number：3110000.

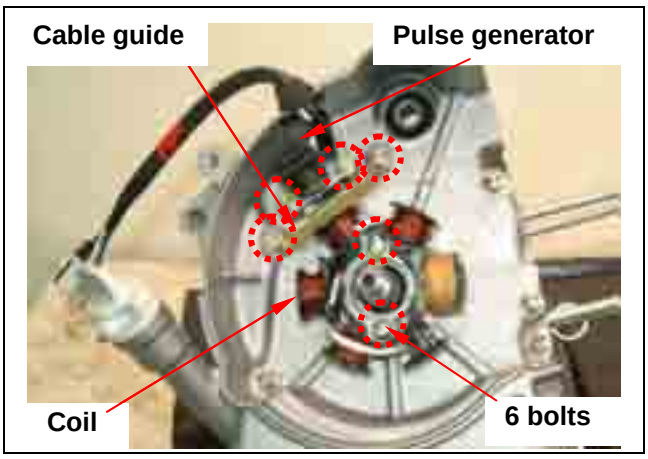


Alternator Coil Set Removal

Remove the couplers of the alternator and pulse generator.
Remove the 6 bolts for the pulse generator, the alternator coil and cable guide. Then, remove the alternator assembly.

Caution

Do not damage the alternator coil.



Right Crankcase Cover Removal

Remove the right crankcase cover. (bolt x 7)
Remove setting pin and gasket.
Remove the gasket or foreign materials on the connection surfaces of both the cover and crankcase.

Caution

Do not damage the connection surfaces.

Starting Clutch

Starting Clutch Removal

Hold the starting driven gear with the universal fixture.

Remove the 22mm anti-loosen mounting nut and gasket.

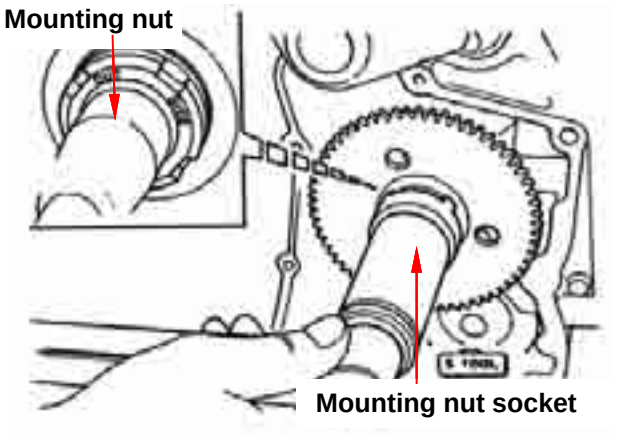
Special service tools: lock nut socket

Special tool number：9020100.

Universal fixture

⚠ Caution

The mounting nut is left-turn thread.



Remove the starting driven gear.

Remove starting clutch, starting idle-gear, and shaft.

Starting Clutch Inspection

Install the starting clutch onto the starting driven gear.

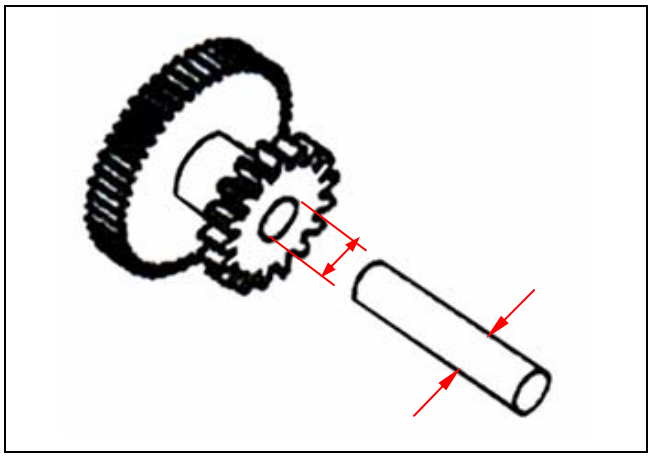
Hold the starting clutch and turn the starting driven gear.

The starting driven gear should can be turned in the motion of C.W. and can not be turned in C.C.W.

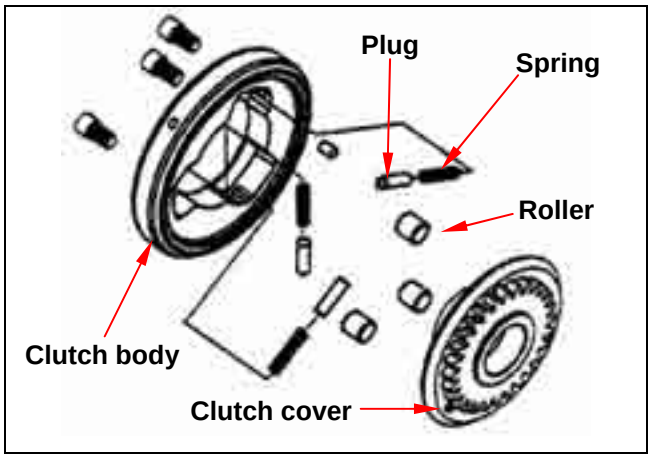
Check the starting driven gear for wear or damage.
Measure the ID of the starting clutch gear.
Service Limit:
ID: 32.06 mm or less

Check the starting idle gear and shaft for wear or damage.
Measure the ID of the starting idle gear.
Service Limit:
ID: 10.05 mm or less

Measure the OD of the starting idle gear.
Service Limit:
OD: 9.94 mm or more



Disassembly
Remove the hex blots (bolt x 3) inside the starting clutch.
Separate the clutch body and the clutch cover.
Remove the rollers, plugs, and springs on the one way clutch.
Check each rollers and plugs for wear or damage.
Install rollers, plugs and springs.



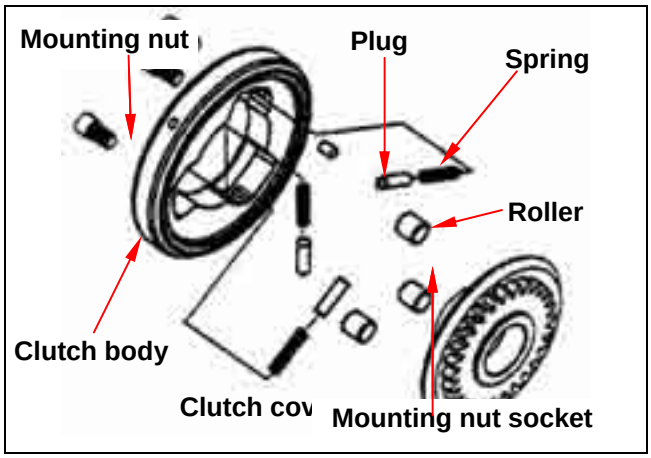
Measure the OD of the starting clutch cover.
Service Limit:
OD: 27.94 mm or more

Installation
Install the components in the reverse procedures of removal.

Caution

Add adhere seal onto the thread of hex socket bolt.

Torque value: 1.0~1.4 kgf-m



Starting clutch Installation
Install idle gear shaft and idle gear.
Install starting clutch.

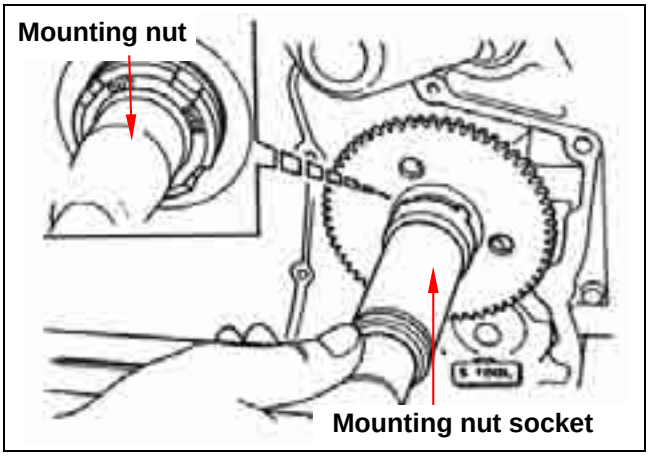
Install the starting driven gear onto the starting clutch.

Hold the starting driven gear with the universal fixture.
Tighten the 22mm anti-loosen mounting nut and gasket.

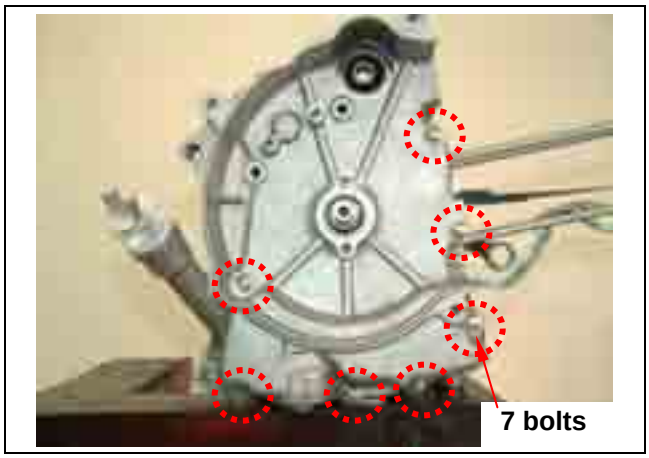
Caution

Add engine oil onto the thread of mounting nut.

Special service tools:
Anti-loosen mounting nut socket
Universal fixture.
Torque value: 9.0~10.0 kgf-m



Right Crankcase Cover Installation
Install setting pin and new gasket on the crankcase.
Replace the right crankshaft oil seal of the crankcase and apply some oil onto the oil seal lip.
Install right crankcase cover onto the right crankcase. (bolt x 7)
Torque value: 1.5~2.0 kgf-m

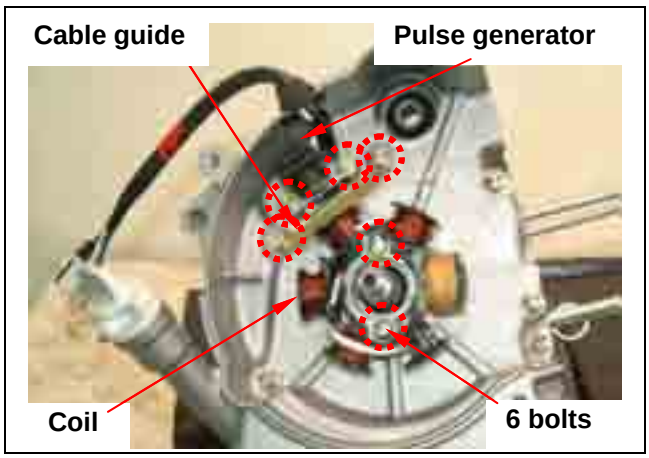


Mounted Coil Set Installation

Install the coil set onto right crankcase cover. (screw x 2)
Install crankshaft position sensor. (screw x 2)
Tighten the cable guide. (screw x 2)
Torque: 1.5~2.0 kgf-m
Tie the wire harness hose onto the indent of crankcase.

Caution

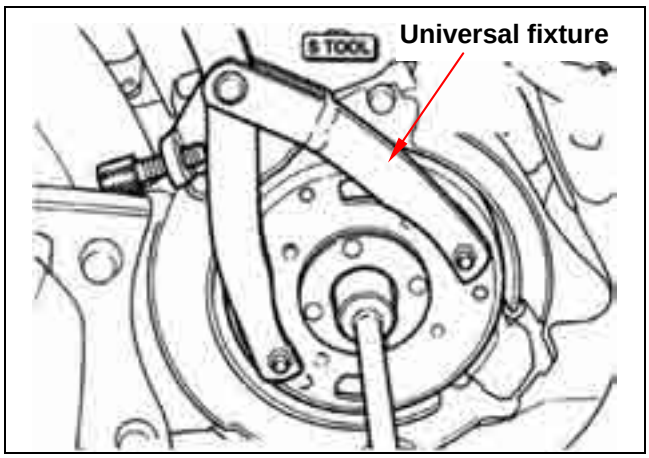
Make sure that the wire harness is placed under the crankshaft position sensor.



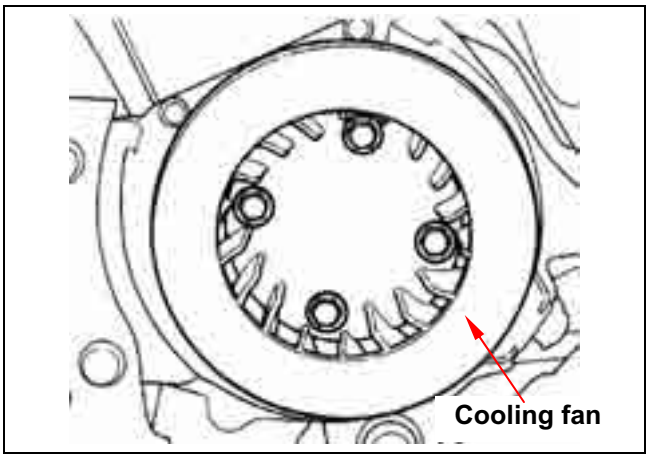
Connect the connectors of alternator and crankshaft position sensor.

Flywheel Installation

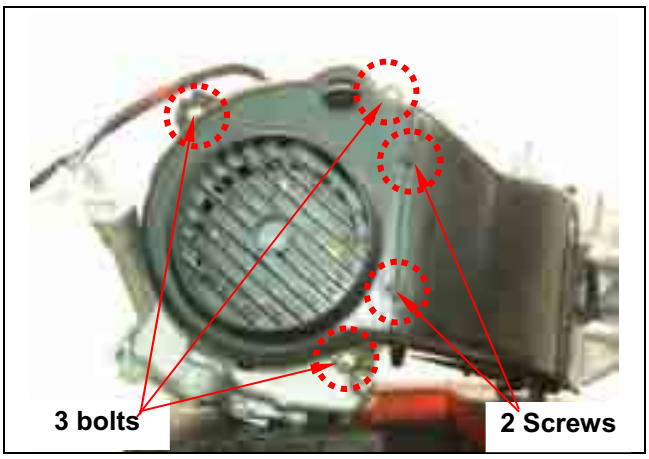
Make sure that there is no magnetic powder. If so, clean up it.
Align insert on crankshaft with the flywheel groove, and then install the flywheel.
Hold the flywheel with flywheel holder, and tighten its nut.
Torque value: 5.0~6.0 kgf-m
Special service tool:
Universal fixture



Install the cooling fan. (bolt x 4)

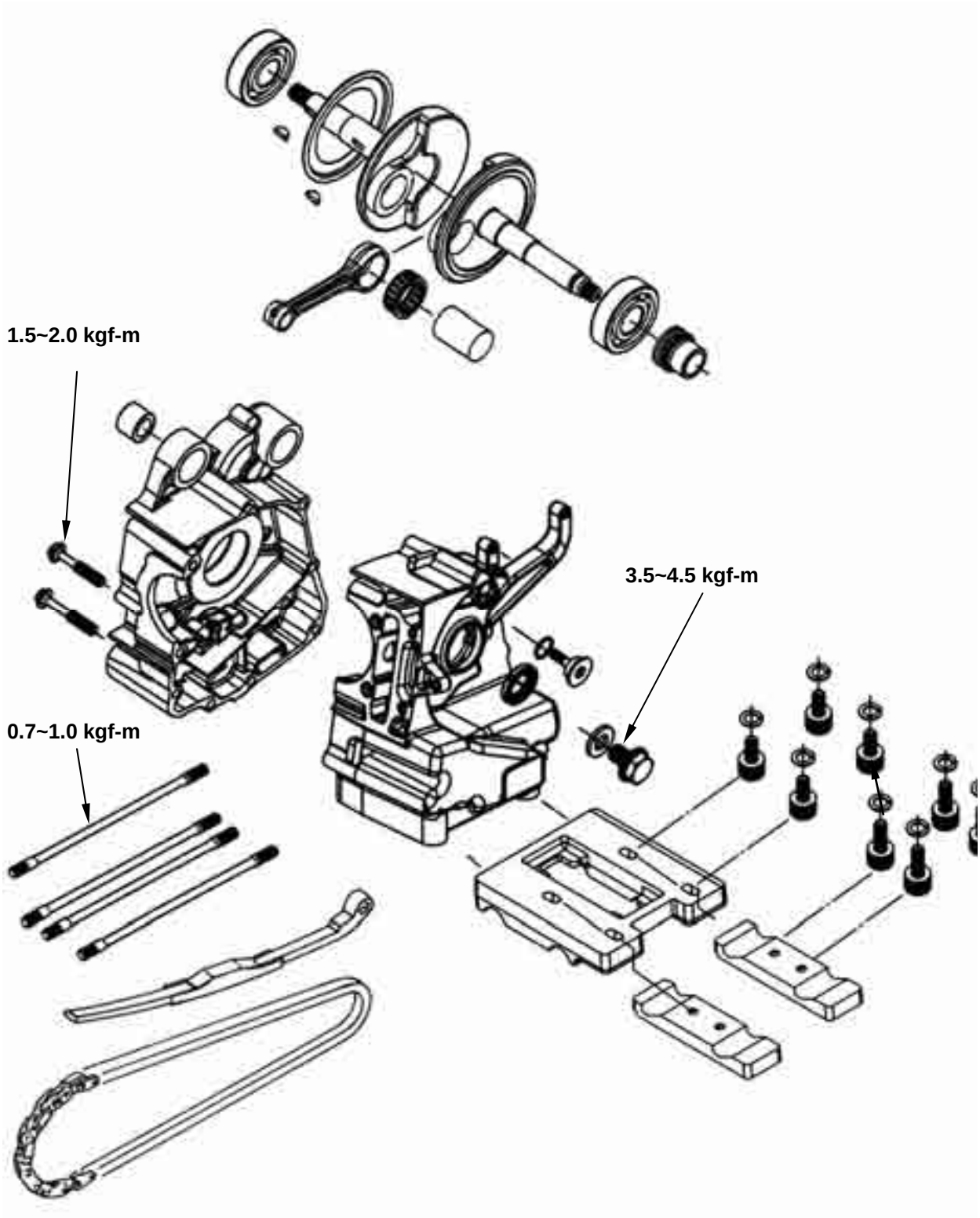


Install the cooling fan shroud. (screw x 2)
Install the rear bracket mounting bolts. (bolt x 3)



NOTE:

Mechanism Illustration



10. Crankcase/Crankshaft

Operational precautions

General Information

- This Section contains descriptions concerning disassembly of the crankcase so that the crankshaft can be serviced.
- Complete following operations before disassembling crankcase.

Engine	Chapter 5
Cylinder head	Chapter 6
Cylinder/ piston	Chapter 7
Start motor	Chapter 16

- If the crankshaft bearing or timing sprocket need be replaced, then the crankshaft set have to replaced.

Specification **Unit: mm**

Item	Standard	Limit
Left, right clearance of the big end of the connecting rod	0.100~0.300	0.550
Right angle clearance of the big end of the connecting rod	0.000~0.008	0.050
Run-out	—	0.100

Torque value

Bolts for crankcase	:	1.5~2.0 kgf-m
Bolts for cylinder/cylinder head	:	0.7~1.0 kgf-m
Engine oil draining plug	:	3.5~4.5 kgf-m
Bolts for cam chain tensioner	:	0.8~1.2 kgf-m

Special Service Tools

Crankcase remover/set
Crankshaft installation puller
Inner type bearing puller
Outer type bearing puller
Bearing pressing tools
Oil seal pressing tools

Trouble diagnosis

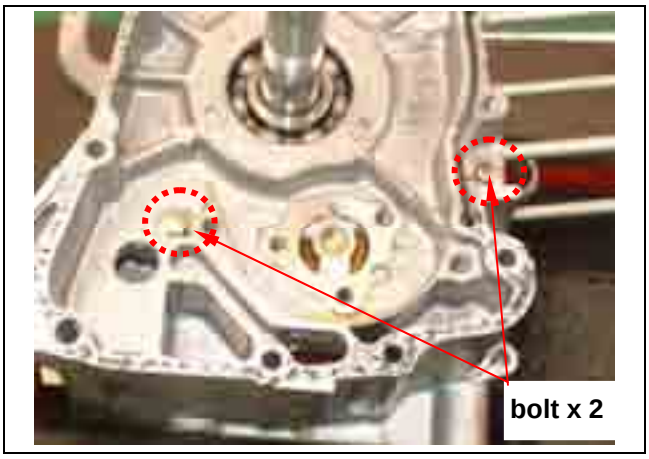
Engine noise

- Loose crankshaft bearing
- Loose crankshaft pin bearing
- Wear piston pin or piston pin hole

Disassembly Of Crankcase

Remove the cam chain tensioner (hex socket bolt x 1) from the left crankcase side.

Remove the 2 bolts from the right side of crankcase, and then remove the right crankcase.

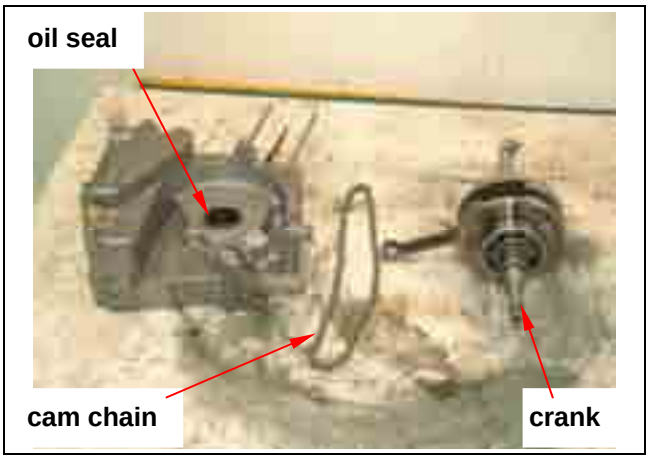


Remove the crankshaft from the left crankcase.
Remove the cam chain.
Remove the gasket and setting pin. (bolt x 2)
Scrape gasket residues off the crankcase contact surface.

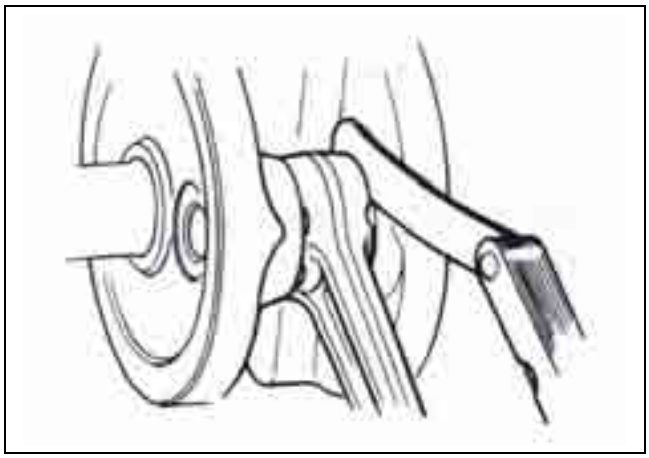
Caution

- Check if the right & left bearings are press-in the crankshaft.
- Do not damage contact surface of the crankcase.
- Soap the gasket residues into solvent and the residues will be removed easily.

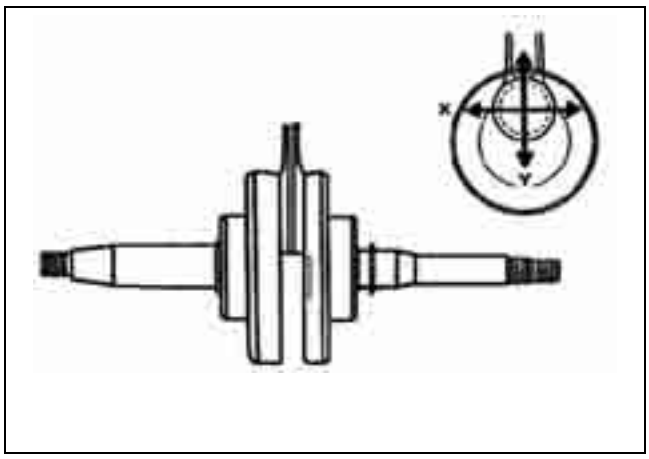
Remove oil seal from the left crankcase side.



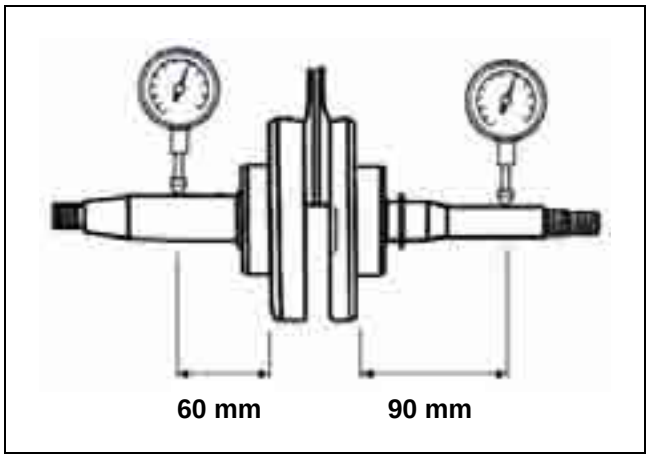
Crankshaft Inspection
Measure left and right clearance of connecting rod big end.
Service limit: Replace when it is more than 0.55 mm



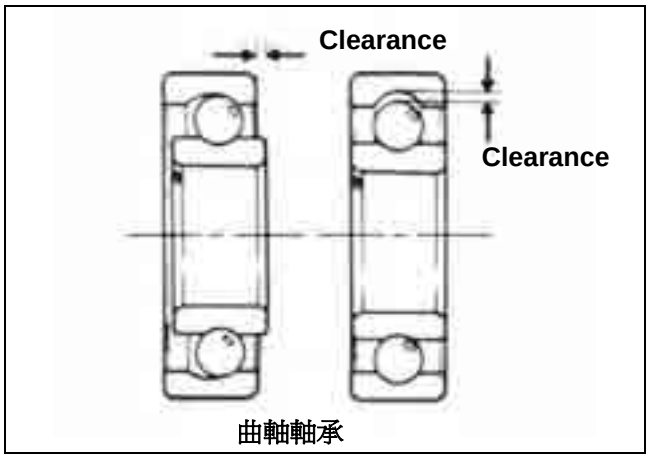
Measure the radical clearance of the big end at the vertical directions.
Service limit : 0.05 mm



Place the crankshaft onto a V-block and measure run-out of the crankshaft with dial gauge.
Service limit: 0.10 mm



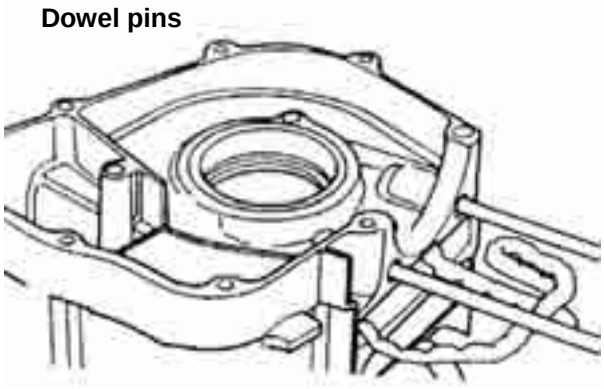
Bearing Inspection
Rotate the bearing with fingers and make sure the bearing can be rotated smoothly and quietly.
Check if the inner ring is connected onto the crankshaft tightly.
Replace crankshaft as a set when noise or looseness is detected.



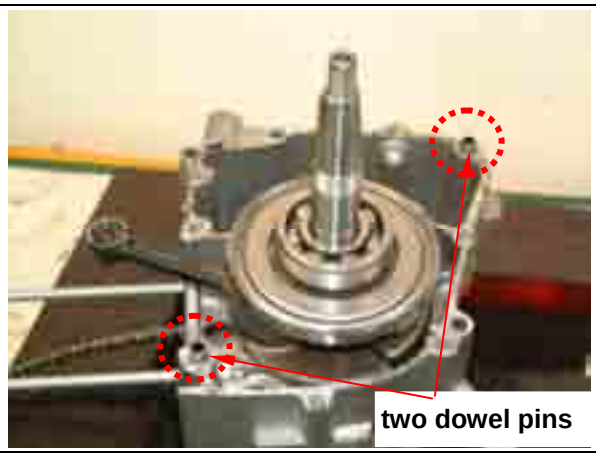
Assembly Of Crankcase
Install cam chain into the chain hole of the left crankcase, and then split out the cam chain.

Caution

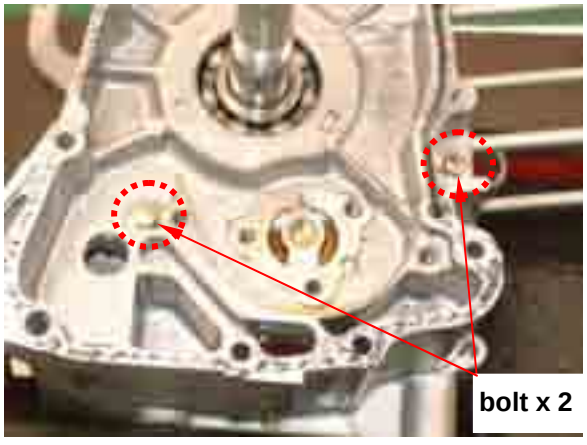
Do not damage the cam chain as installing the crankshaft.



Install crankshaft into the left crankcase and then install two dowel pins and new crankcase gasket.



Install the right crankcase and tighten the crankcase bolts. (bolt x 2)
Torque value: 1.5~2.0 kgf-m



Install the cam chain tensioner.
Install a new O-ring onto the mounting bolt of the chain tensioner.
Apply some oil on the O-ring and tighten the bolt.
Torque value: 0.8~1.2 kgf-m

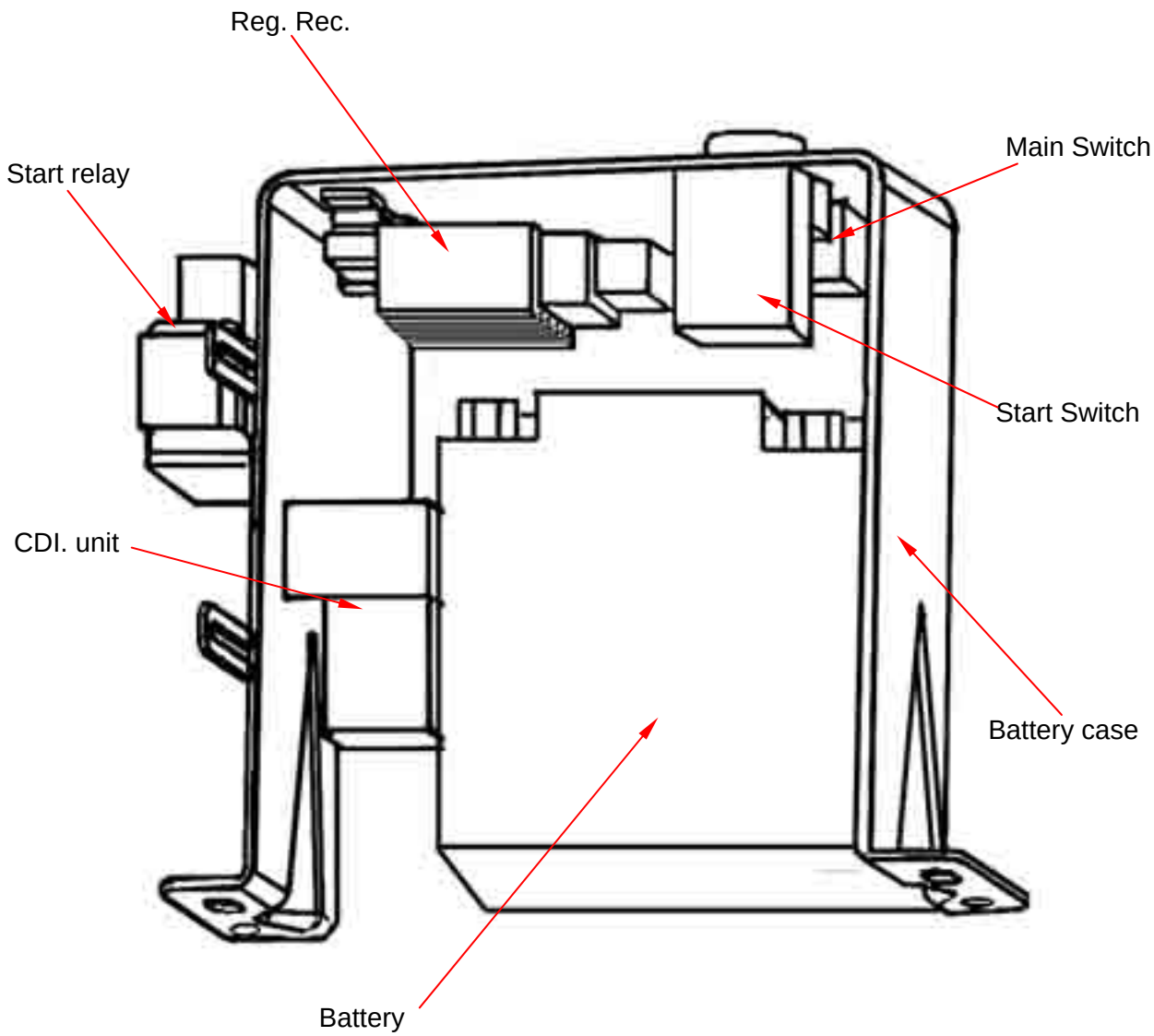
Caution

The O-ring must be installed into the bolt's groove.

Apply with some grease onto the oil seal lip and then install it onto the left crankcase.

Press-fit the oil seal to specified position with the oil seal installer (25x40x8).
Special service tools: the oil seal installer(25x40x8)
Special tools number：9121600

Mechanism Illustration



11. Electrical Equipment

Precautions In Operation

Charging System

- When remove the battery, the disconnection sequence of cable terminals shall be strictly observed. (First disconnect the negative cable terminal, next, the positive cable terminal.)
- MF (Maintenance Free) battery does not need to check, add electrolyte or distilled water.
- Battery must be taken out from scooter when charging the battery. But do not open the battery caps.
- Do not quick charge the battery unless in emergency.
- A voltmeter must be used when checking battery charging condition.
- Battery can be charged or discharged alternately. To set a discharged battery idle for a prolonged period will shorten its service life and reduce its capacity. Usually, battery's capacity will reduce after 1~2 years. After low capacity battery was charged, its voltage will increase. If it connects to an additional load, the voltage will reduce suddenly, and then go up again.
- Over-charged battery. Usually, the over-charged battery can be seen externally. If a short circuit occurred inside the battery, there will be no voltage on the terminals of battery if voltage regulator does not operate. Then, the battery's voltage will be too high that may reduce battery's life.
- The battery will be self-discharged if it was set idle for a long time. An idle battery must be charged about every 2months.
- A new battery filled with electrolyte will generate a voltage after filled out electrolyte. The voltage should be in 12.5V or more after 10 minutes. When electrolyte is not enough, the battery must be filled with electrolyte and then charged to prolong the battery's life-span.
- Please check electrical device according to the procedure of diagnosis chart.
- Do not disconnect and connect the connector of electrical devices when current is passing these devices because this will generate high voltage and the electrical components in the voltage-current regulator will be damaged. The ignition switch must be turned OFF before performing any work.
- Please do not replace with traditional type battery as replacement.
- Please refer to the removal instruction when removing the alternator and the pulse generator.

Ignition System

- Please follow the procedure of trouble diagnosis chart to check ignition system.
- The ignition system equipped with a auto-advanced timing device in CDI unit. Thus, ignition timing need not to be adjusted. In case of incorrect ignition timing occurred, check the CDI unit or alternator system. It has to check the ignition timing with the ignition timing lamp if replaced these components.
- Do not hang or impact the CDI unit of ignition system because the major faulty of CDI unit is caused by impact. Therefore, take care when disassembling.
- Most of ignition system problems were resulted from poor connecting connector. Please check the connectors first when servicing.
- Make sure that the heat range of spark plug is suitable. Improper spark plug is the main cause of poor engine operation or combustion.
- Inspection procedures in this manual are based on Max. voltage. This manual also contains methods of how to check ignition coil resistance and component operation.
- Please follow the continuity chart to check ignition switch.

Starting System

- Starting motor can be removed directly from engine.
- Please refer to chapter 10 for starting clutch removal procedures.

Specification

Charging System

Items			Specification
Battery	Capacity/type		YTX5A-B8.5Ah
	Charging rate		STD:0.5A/5~10hrs, emergency charging: 5A/0.5hrs
	Voltage (20℃)	Full charged	13.1V
		Under charged	12.3V
Alternator	Capacity		14~18 V-A
	Lighting coil resistance (20℃)		Between yellow-green: 0.1-0.8Ω
	Charging coil resistance (20℃)		Between white-green: 0.2-1.0Ω
Leaking current			Less 1mA
RPM for starting charging			1700 rpm(headlamp ON)
Voltage controlled by regulator			12.0±0.5 V
Resistor	Resistance (20℃) 20W5.9Ω		7.0~8.0Ω
	Resistance (20℃) 5W5Ω		4.5~5.5Ω

Ignition System

Item		Specification
Spark plug	Standard	NGK C8E (Recommended usage)
	Spark plug gap	0.6~0.7 mm
Ignition coil resistance (20℃)	Primary	0.21±10%Ω
	Secondary	With plug cap : 3~5 KΩ
		Without plug cap : 7~12 KΩ
Ignition timing	"F" Mark	Before TDC 13 ° /1000 rpm
	Timing advanced charactor	Before TDC 28° / 4000 rpm
		Before TDC 27° / 8000 rpm
Pulse generator resistance (20℃)		50~200 Ω
Exciting coil resistance (20℃)		400~800 Ω
Ignition coil-primary max. voltage		95~400 V
Pulse generator voltage		1.7 V above
Exciting coil voltage		95~400 V

Starting System

Item		Specification
Start motor	Type	DC TYPE
	Capacity	0.5 KW

Trouble diagnosis

No power supply
- Dead battery
- Disconnect battery cable
- Fuse burned out
- Faulty ignition switch

Low voltage
- Weak battery
- Loose battery connection
- Charging system failure
- Voltage-current regulator failure

Start motor does not work
- The fuse is blown
- The battery is not fully charge
- Poor main switch
- Poor start switch
- The front and rear brake switches do not operate correctly
- Starter relay is out of work
- The ignition coil is poorly connected, open or short-circuited
- The start motor is out of work

Intermittent power supply
- Loose charging system connection
- Loose battery cables
- Loose connection or short-circuit in discharging system
- Loose connection or short-circuit in lighting system

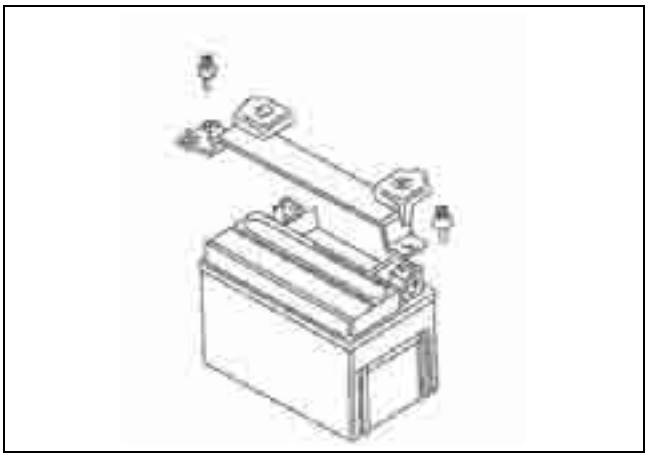
Charging system failure
- burn Fuse
- Loose, broken or shorted wire or wire connection
- Faulty voltage regulator
- Faulty alternator

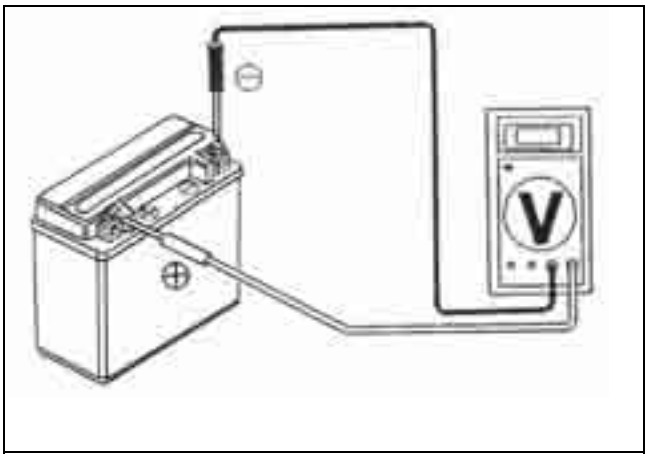
Weak start motor
- Poor charging system
- The battery is not fully charged
- Poor connection in the windings
- The motor gear is jammed by foreign material

Starter motor is working, but engine does not crank
- Poor start motor pinion
- The start motor run in reverse direction
- Poor battery

Battery

Removal
Remove the rubber carpet.
Remove the battery cap. (screw x 3)
Remove the battery mounting bracket. (bolt x 2)
Firstly, remove the negative(-) post, and remove the positive (+) post.
Remove the battery.

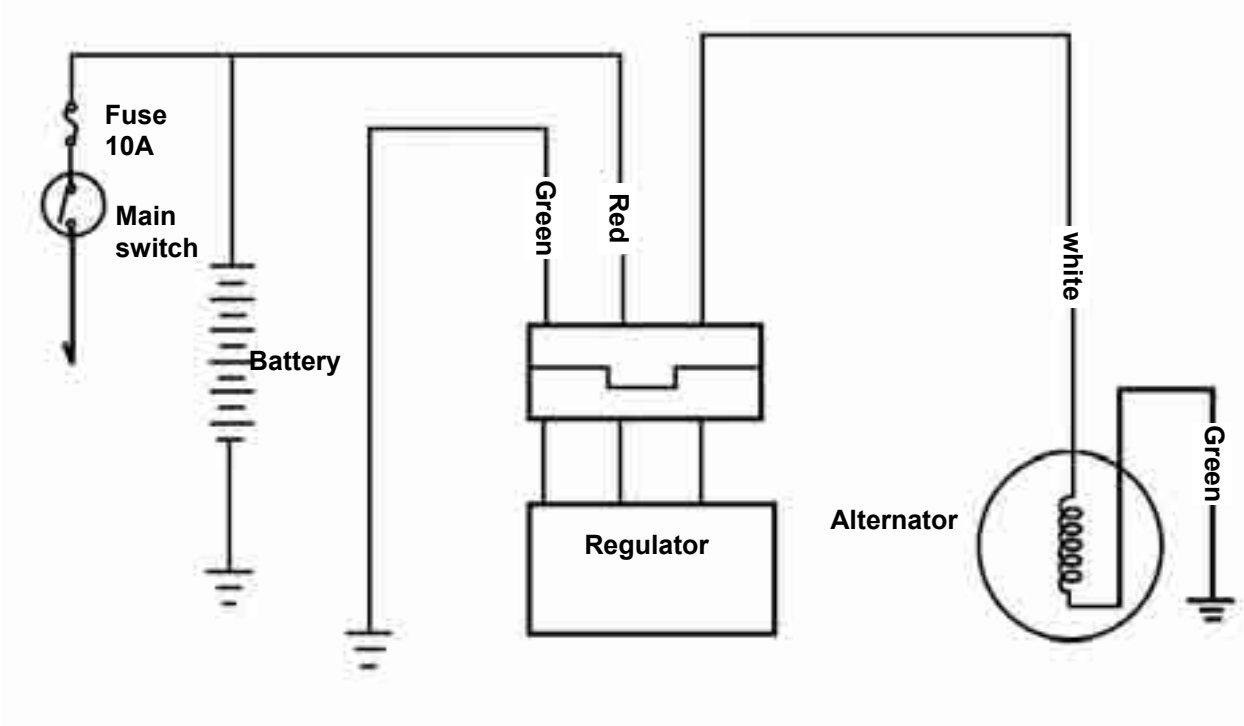




Voltage Inspection
Measure the voltage with a digital voltage meter.
Voltage Value:
Fully charged: 13.0~13.2V at 20℃
undercharged: less 12.3V at 20℃

Charging system

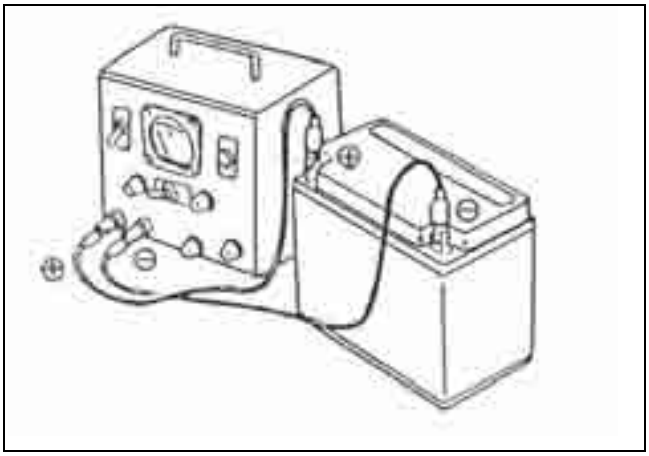
Charging wire circuit



Charging

Connect the battery charger's positive (+) terminal to battery's positive (+) post.
Connect the battery charger's positive (-) terminal to battery's positive (-) post.

	Standard	Max
Charging current	0.5A	5.0A
Charging time	5~10H	0.5H



Warning

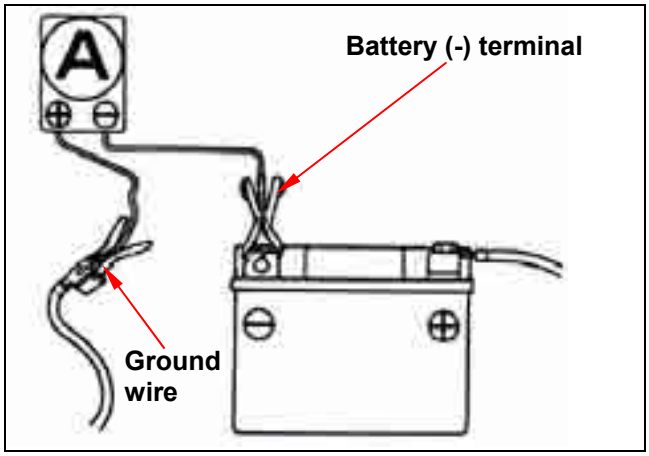
- Strictly keep flames away from a charging battery.
- The charging ON/OFF is controlled by the charger's switch. Do not control the charging by battery jump wires.

Caution

- Quick charge a battery should be used only in an emergency.
- Make sure the current and charging time of above description.
- The battery will be damaged by too much current or too rush charging.

After installing the battery, coat the terminals with clean grease.

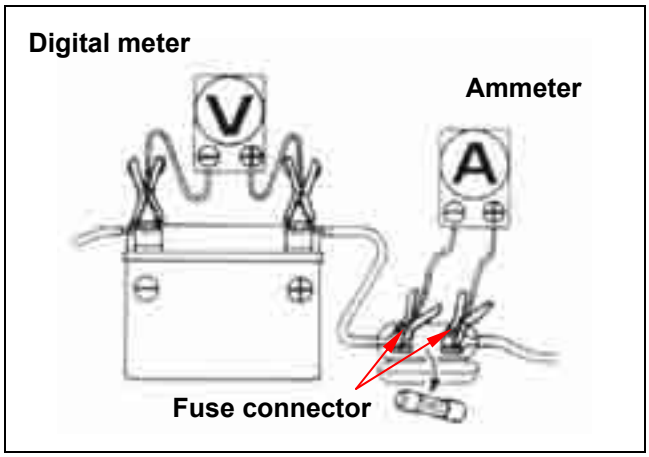
Current Leakage Test
Current Leakage Inspection
Turn the main switch to OFF position, and remove the negative cable terminal (-) from the battery.
Connect an ammeter between the negative cable terminal and the battery negative terminal (as shown on left diagram).



Caution

- In the current leakage test, set the current range at larger scale, then gradually decrease to the lower scale as the test process goes to avoid possible damage to the ammeter and the fuse.
- Do not turn the main switch to ON position during test.

If the leaked current exceeds the specified value, it may indicate a short circuit.
Allowable current leakage: Less than 1 mA
Disconnect each cable one by one and take measurement of the current of each cable to locate the short circuit.



Charging Voltage/Current Inspection

Caution

- Before conducting the inspection, be sure that the battery is fully charged. Use a fully charged battery having a voltage larger than 13.0 V. If undercharged, the current changes dramatically.
- While starting the engine, the starter motor draws large amount of current from the battery. Thus, do not start the engine with battery.

After the engine is warmed up, replace original battery with a fully charged battery.
Connect a digital voltmeter to the battery terminals.
Connect an ammeter between both ends of the main fuse.

Caution

When the probe is reversibly connected, use a voltmeter having an indication that the current flows from the positive or the negative direction and the measurement should be at zero, ammeter at one direction only.

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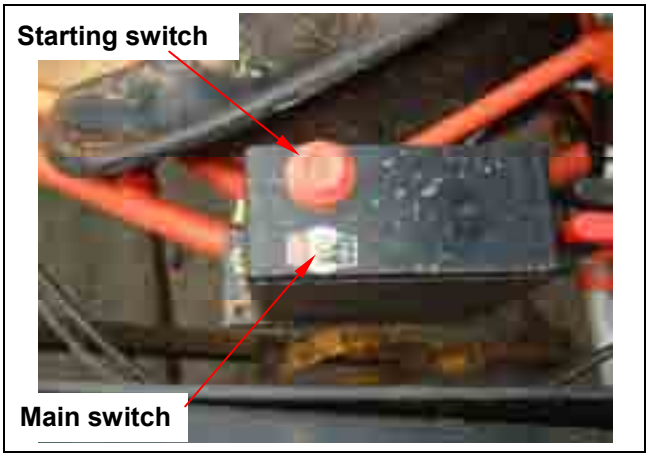


Caution

- Do not use short-circuit cable.
- It is possible to measure the current by connecting an ammeter between the battery positive terminal and the cable position terminal, however, while the starter motor is activated, the surge current of the motor draws from the battery may damage the ammeter.
- The main switch shall be turned to OFF position during the process of inspection. Never tamper with the ammeter and the cable while there is current flowing through. It may damage the ammeter.

Connect a tachometer.
Accelerate the engine gradually to the specified revolution per minute and measure the charging voltage/current.
Charging Current: 4.8A/1600 rpm
Control Charging Voltage:
12.0±0.5 V / 1700 rpm

Caution

To replace the old battery, use a new battery with the same current and voltage.

The following problems are related to the charging system, follow the instructions provided in the checking list to correct it if any one of the problems takes place.

(1) The charging voltage can not exceed the voltage between two battery terminals and the charging current is in the discharging direction.

(2) The charging voltage and current are too much higher than the standard values.

The following problems are not related to the charging system; correct it if any by following steps indicate in the checking list.

(1) The standard charging voltage and current can only reach when the revolution of the engine exceeds the specified rpm.

- Bulbs used exceed their rate and consume too much power.
- The replacement battery is aged and does not have enough capacity.

(2) The charging voltage is normal, but the current is not.

- The replacement battery is aged and does not have enough capacity.
- Battery used do not have enough electricity or is over charged.
- The fuse of the ammeter is blown.
- The ammeter is improperly connected.

(3) The charging current is normal, but the voltage is not.

- The fuse of the voltmeter is blown.

REGULATOR INSPECTION

Disconnect the 3P connector of the regulator.

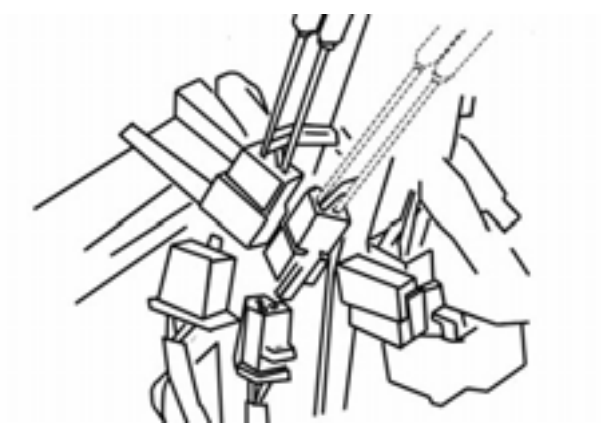
Item	Measurement point	Standard Value
Main switch connection wire	**R~B**	Battery voltage (ON)
Battery connection wire	**R~G**	Battery voltage

Check the parts onto the abnormal wire circuit if the measured values are not within standards.
If the parts is OK, then it is the wire circuit abnormal.
Replace the regulator if both checks are OK.

CHARGING COIL INSPECTION

Caution

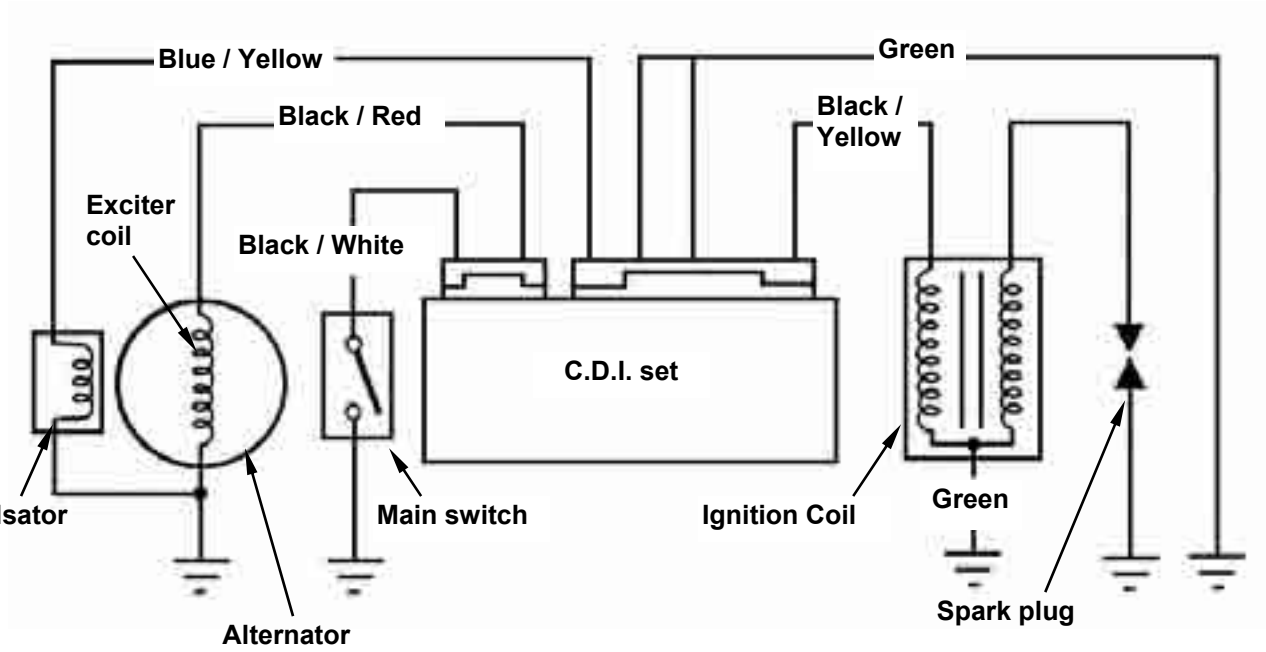
The coil need not be removed from engine as conduct this test.



At the alternator side from the regulator connector, measure the resistor between green and white wires.
Standard value: 0.16~0.8Ω

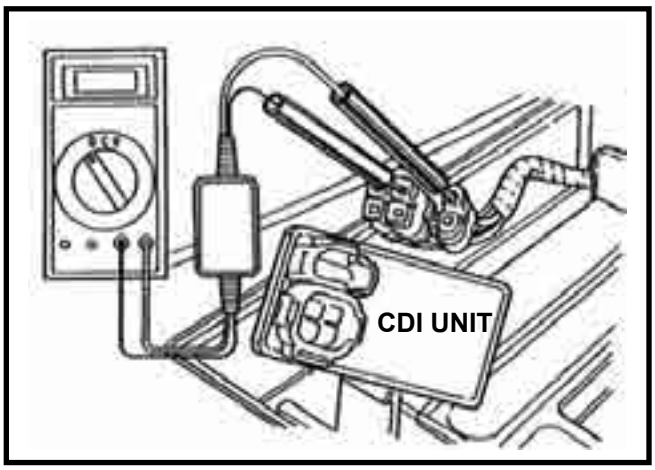
Ignition System

Ignition System Circuit



CDI UNIT
Removal

Remove the battery cover, then the CDI unit can be removed from the battery cover.



Check

Disconnect the connector from the CDI unit.
Make the following inspection at each terminal of the harness side connector.

ITEM		Measure at:	Standard (at 20C)
Main Switch		Black/white-green	Continuity as main switch OFF
Exciter Coil		Black/Red-Green	400 ~800Ω
Pulse Generator		Blue/Yellow-green	50 ~200Ω
Ignition Coil	Primary	Black/yellow-green	0.21Ω±10%
	Secondary	Green-high voltage cable -w/o Cap	3~5KΩ
		Green-high voltage cable - w/ Cap	7~12KΩ

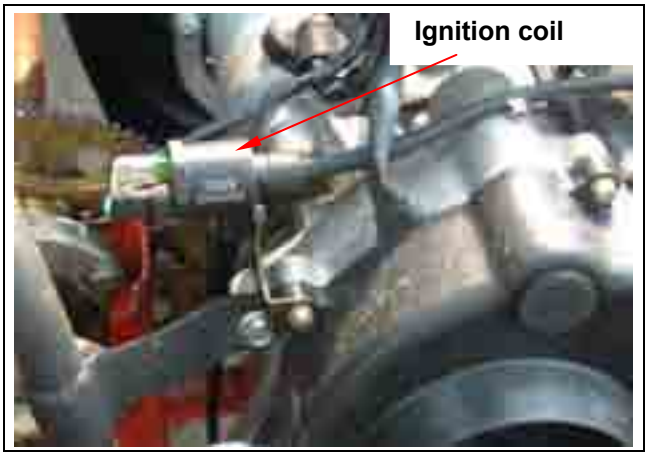
IGNITION COIL

Removal

Remove spark plug cap.
Remove the primary coil wire of ignition coil.
Remove the fix bolts for the ignition coil, and remove the coil.
Install the coil in reverse order of removal.

Caution

Install primary coil with black/yellow lead connected to black connector and green lead connected to green connector.

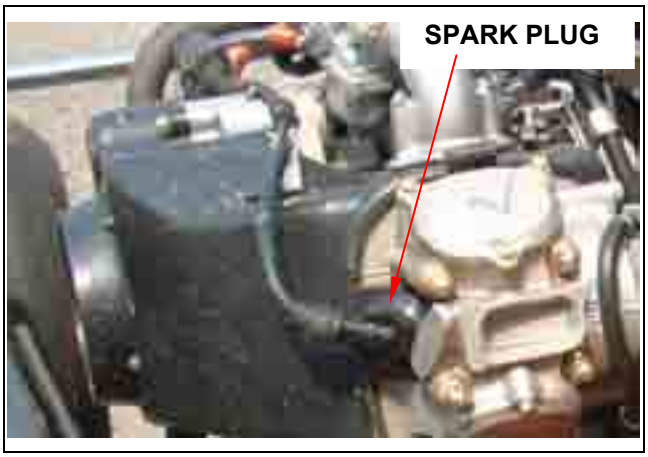


Spark plug confirmation

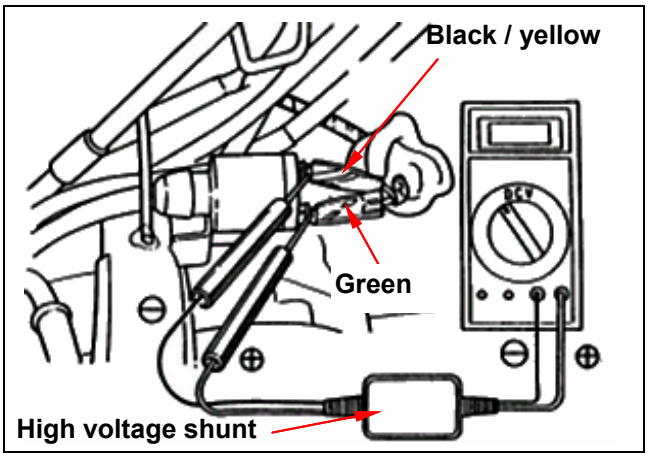
Remove the spark plug and install a good plug into plug cap, and then ground it to engine ground.
Make sure its spark condition. If it is in not good or burnt spark plug, replace the spark plug with new one.

Caution

- Make sure each wire connection is correct, and test as required. Even the wire connection is in correct, sometimes, it might not be tested occurred.



Connect the high voltage shunt with a multi-meter or input a resistor in the 10M 10CV of voltage meter.
Connect ignition coil wires, and connect a shunt between primary terminal (black/yellow and green) and frame ground.
Press the starting motor button, or starting lever to test the max. primary voltage of ignition coil.
Connection: connect (+) terminal to green side, and (-) to black/yellow side.
Min. voltage: Above 95 V.

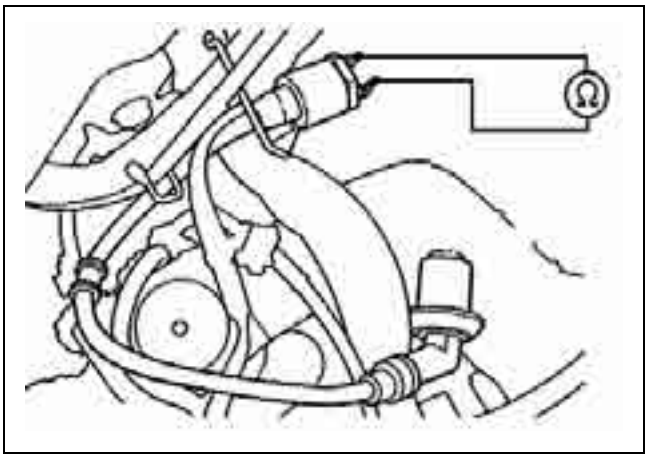


Caution

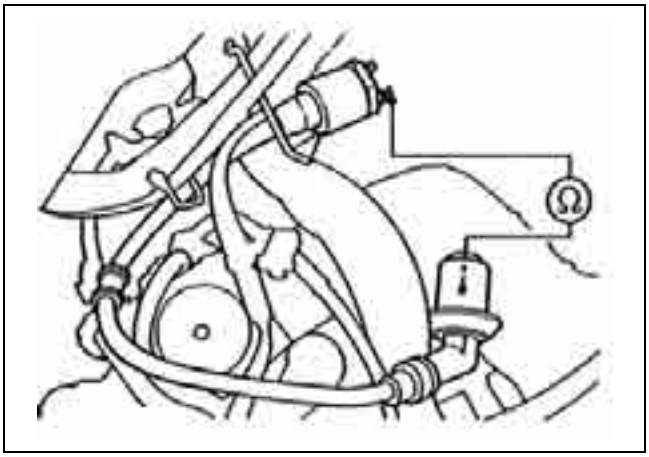
Do not touch metal parts on the test probe with fingers to avoid electric shock.

Primary coil check

Disconnect the primary coil connector and check the resistance between primary coil terminals.
Standard: 0.21Ω±10%Ω(at 20℃)
Primary coil is good if resistance within standard.
Primary coil is broken if resistance is infinite.
Replace the coil.



Secondary coil
Attached the spark plug cap, measure the resistance between plug cap side and green terminal.
Standard value: 7-12 kΩ(20℃)
Remove the spark plug cap, measure the resistance between plug cap side and green terminal.
Standard value: 3-5 kΩ(20℃)
Secondary coil is good if resistance within standard.
Secondary coil is broken if resistance is infinite.
If the spark plug cap attached and the measured value is exceed standard value, it means the spark plug cap is in not good.



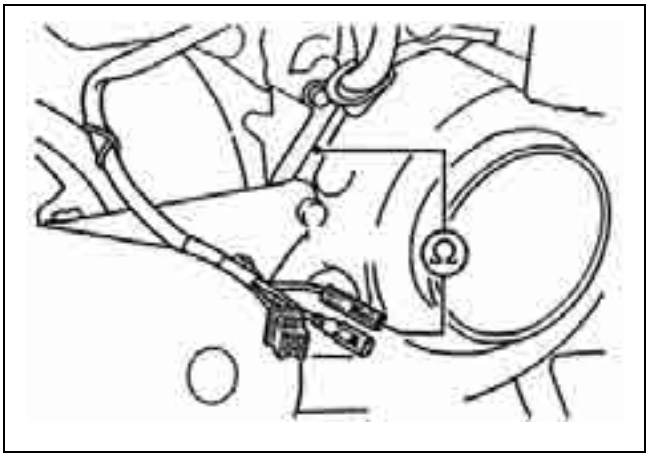
Replacement
Remove the ignition coil bolt to replace the ignition coil if necessary.

PULSATOR

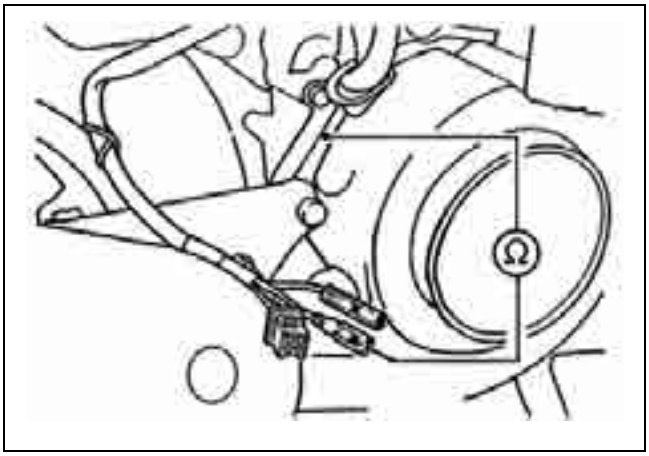
Caution

Checking pulsator can be done on engine. But, the spark plug must be installed onto the cylinder head, and cylinder compression pressure must be in normal condition.

Check
Remove the pulsator connector.
Measure the resistance between blue/yellow terminal on engine side and frame ground.
Standard: 50-200Ω(20℃)
Replace the alternator if the measured value exceeds standard value.

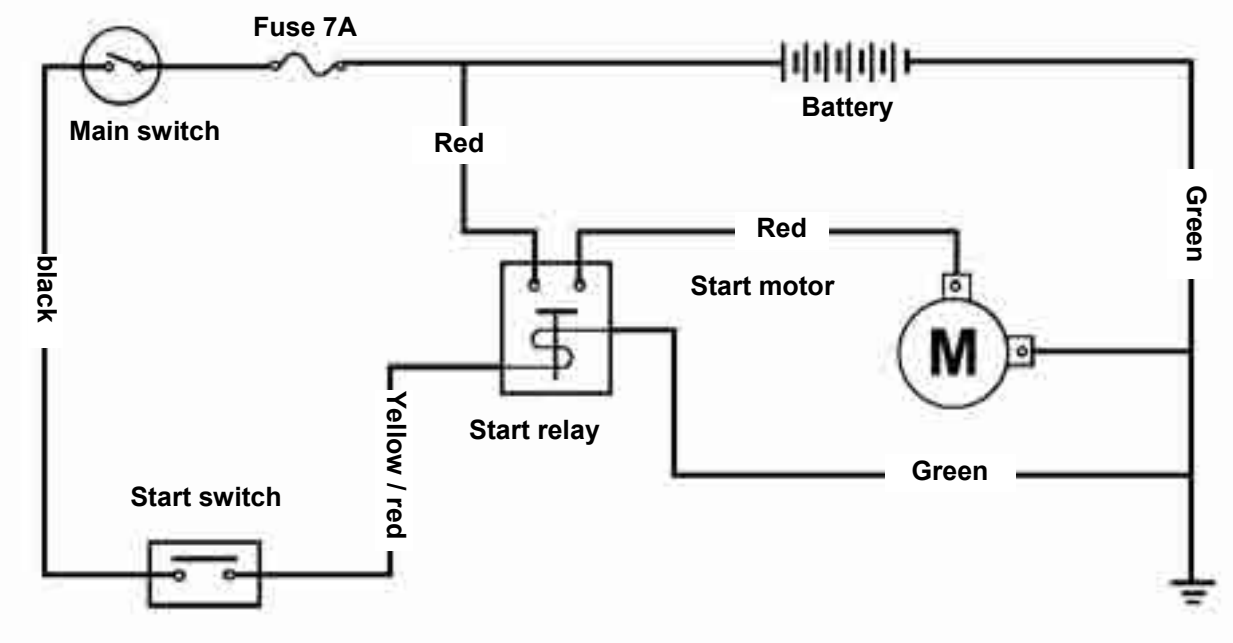


Exciting coil
Remove the exciting coil connector.
Measure the resistance between black/red wire on engine side and frame ground.
Standard: 400-800Ω(20℃)
Replace the alternator if the measured value exceeds the standard value.



Starting System

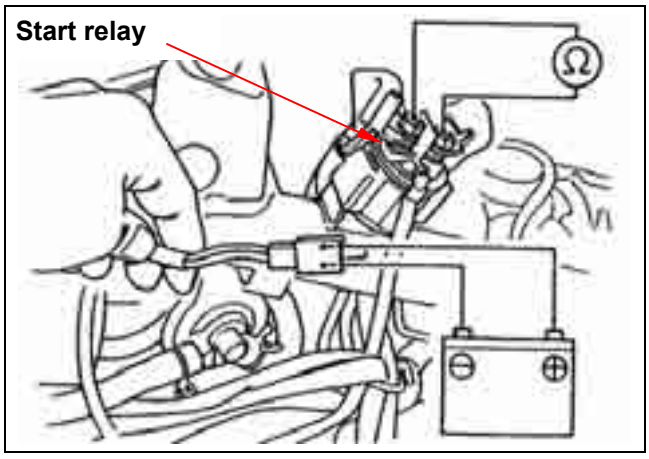
Starting Circuit



Start Relay Inspection

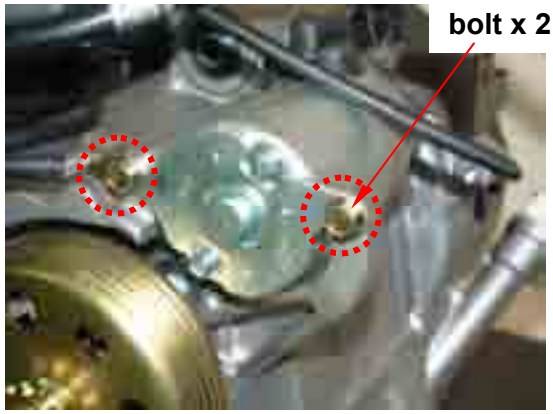
Turn main switch to "on", Then press start button to check if there a click sound. It is normal if there is a click sound.

Disconnect the battery negative (-) terminal.
Remove the battery positive (+) connection and starting motor wires from the start relay large pin.
Remove the power control connector of the start relay.
Connect a Ohmmeter between the start relay large pins.
Connect the green/yellow wire to battery positive (+) terminal, and the green/yellow wire to battery negative (-) terminal.
Check the continuity between the start relay large pins.
If it is not continuity, then replace the start relay.



START MOTOR REMOVAL
Remove starting motor wire from the big terminal of start relay.

Remove the start motor mounting (bolt x 2)



Remove the starting motor.

Starting Motor Installation
Install the motor and other components in reverse procedure of removal.

Switch

Main Switch

Inspection

Disconnect main switch leads connector.
Check connector terminals for continuity.

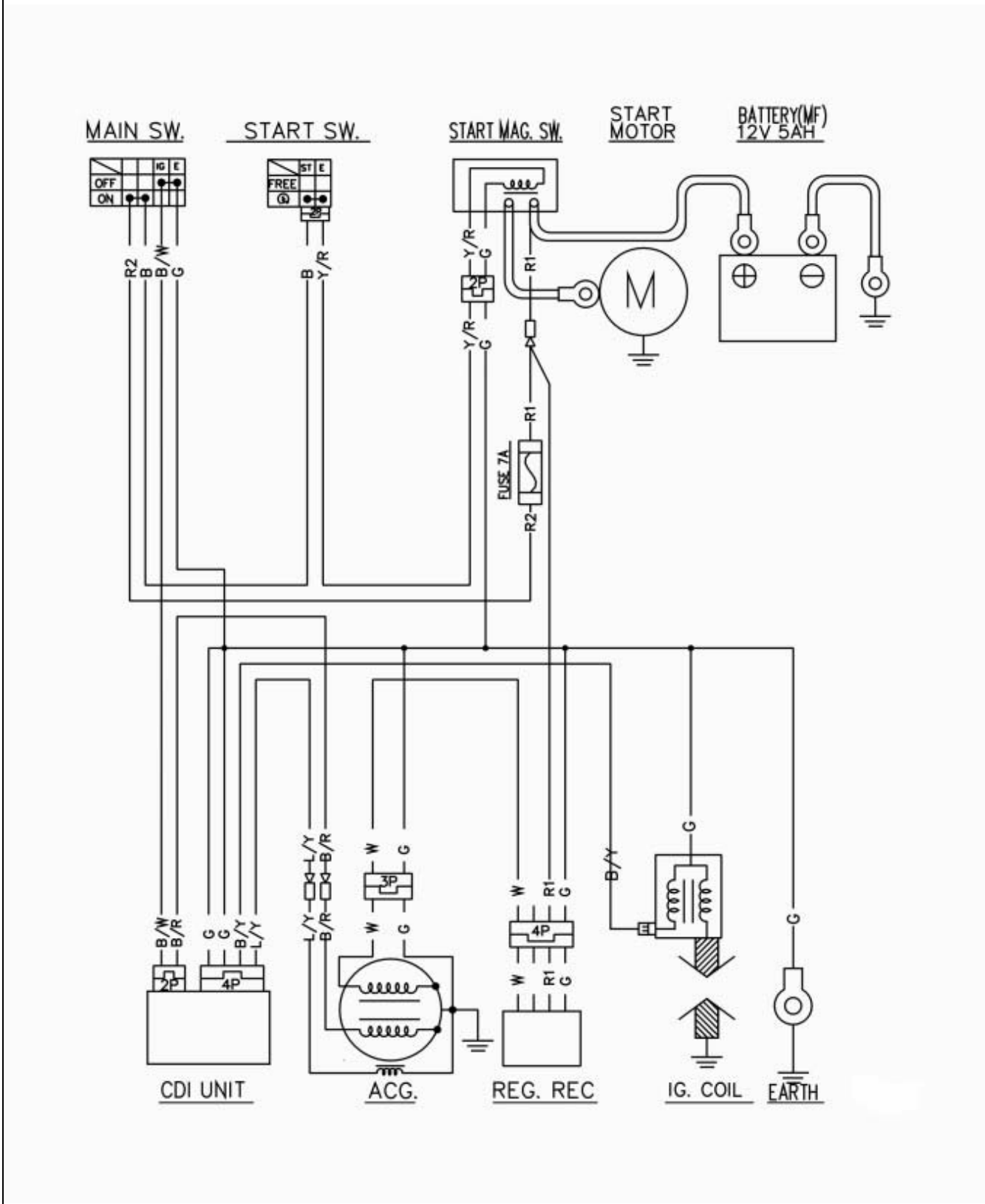
Pin / Location	BAT1	BAT2	IG	E
OFF			●	●
ON	●	●		
Wire color	Red	Black	Black/ White	Green

Remove the main switch connector and nut.
Remove the main switch.
I
Install the main switch and other components in reverse procedure of removal.

STARING MOTOR BUTTON

Pin / Location	BAT2	E
FREE		
PUSH BUTTON	●	●
Wire color	Black	Yellow/Red

RK1 Wiring Diagram



13. Wiring Diagram

NOTE: