PA12B

PA12C

SERVICE MANUAL

Foreword

This service manual contains the technical data of each component inspection and repair for the SANYANG PA12B & PA12C series motorcycle. 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 motorcycle, PA12B & PA12C series motorcycle, are different from that of the photos, pictures shown in this manual, you should follow the actual vehicle layout. Specifications may be changed without notice.

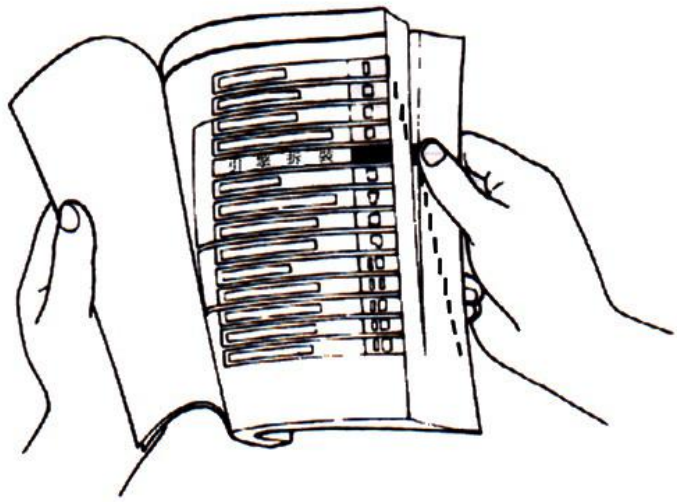
Service Department

SANYANG INDUSTRY CO., LTD.

How To Use This Manual

This service manual describes basic information of individual parts and system inspection & service for SANYANG PA12B&PA12C series motorcycle. In addition, please refer to the manual contents for detailed information for the model year.

The first chapter covers general information and trouble diagnosis.
The second chapter covers service maintenance information and special tools manual.
The third to the 9th chapters cover engine and driving systems.
The 10th to the 12th chapters contain the parts of vehicle frame.
The 13th chapter is electrical appliances.
The 15th chapter is wiring diagram.
Please see index of content for brief information and quick guide.



There are 4 buttons, “Foreword”, “Contents”, “How to Use This Manual” and “Mechanical Layout” on the PDF version homepage, and can access these items by clicking of the mouse.

If technician wants to see the content of one specific chapter, click on the title of each chapter on the Index page. There are two buttons on the upper part of each page, “Homepage” and “contents”. The user can click on the “Homepage” button or the “Contents” button to go back to the homepage or contents index. Therefore, to check one paragraph inside the chapter, click on the paragraph index to go to the desired paragraph. In addition, there is a “To This Chapter Contents” button at the upper side of each page, by clicking the button; you can go back to the paragraph selection index of this specific chapter.

Homepage

SYM

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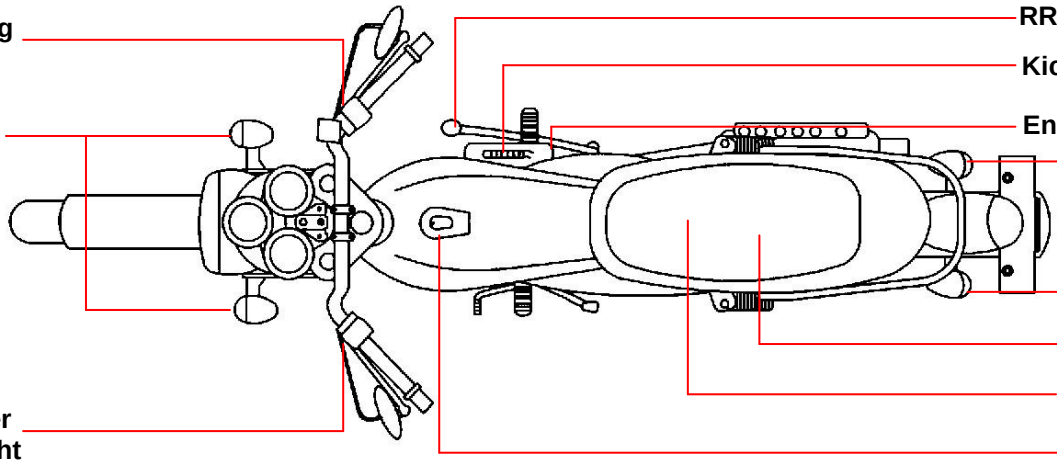
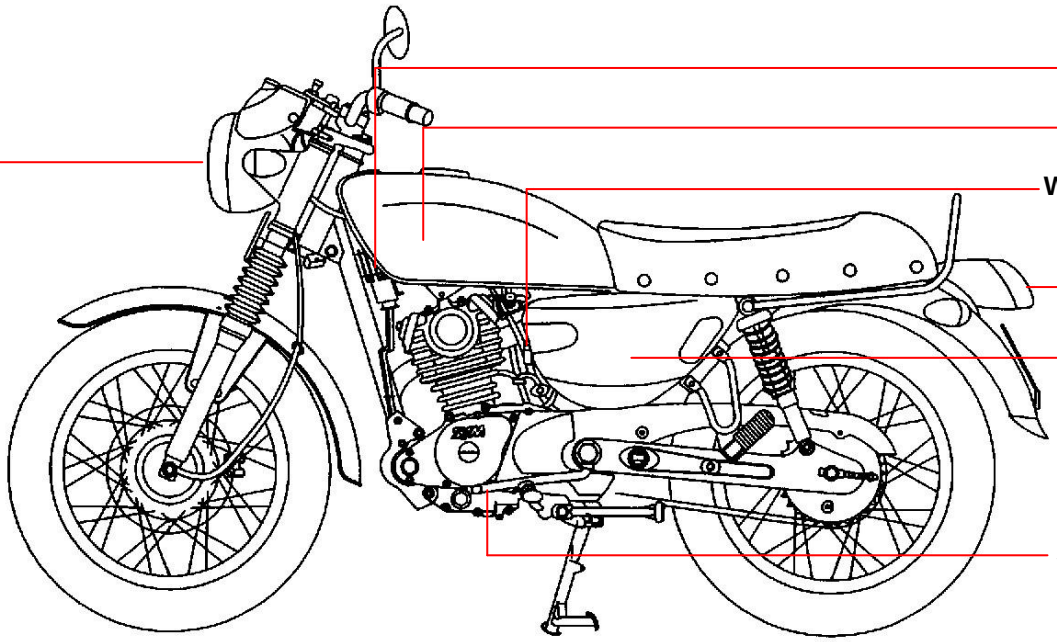
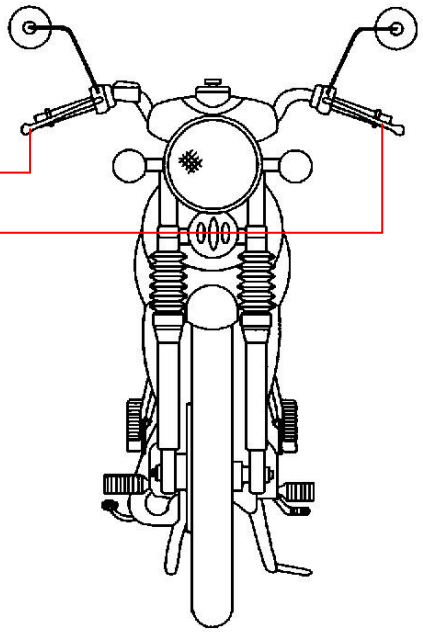
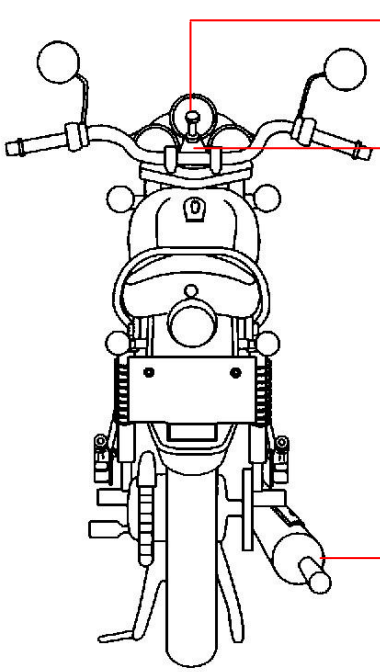
Mechanical Layout









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: Bramax G-3 oil)
Grease	King Mate G-3 is recommended.
Gear oil	King Mate gear oil serials are recommended. (Bramax HYPOID GEAR OIL # 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 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 go through the component (invisibility).

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 ventilator.

⚠ 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 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 verified.
We recommend you to 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 the vehicle is cooling down.

Battery

⚠ Caution

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

Brake shoe

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

⚠ Caution

Inhaling brake shoe or pad ash may cause disorders and cancer of the breathing system

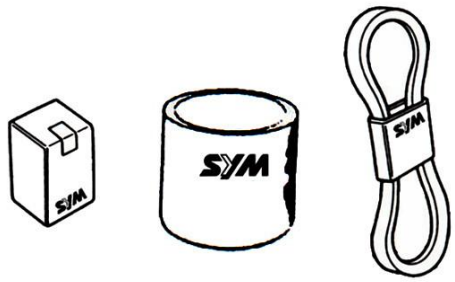
Brake fluid

⚠ Caution

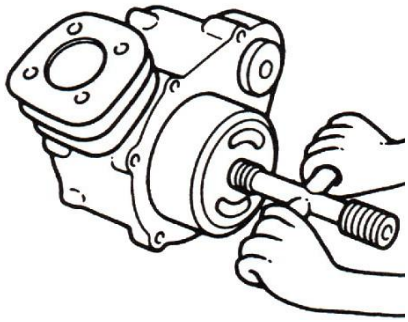
Spilling brake fluid on painted, plastic, or rubber parts may cause damage to the parts. Place a clean towel on the above-mentioned parts for protection when servicing the brake system. Keep the brake fluid beyond reach of children.

Service Precautions

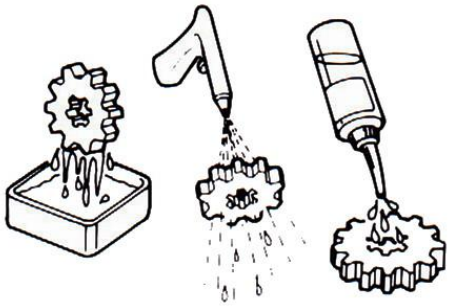
- Always use with SANYANG genuine parts and recommended oils. Using non-genuine parts for SANYANG vehicle may damage it.



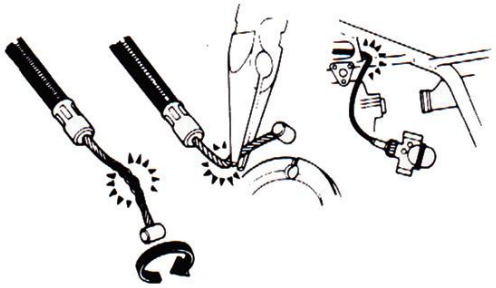
- Special tools are designed for remove and install of components without damaging the part. Using wrong tools may result in damage.



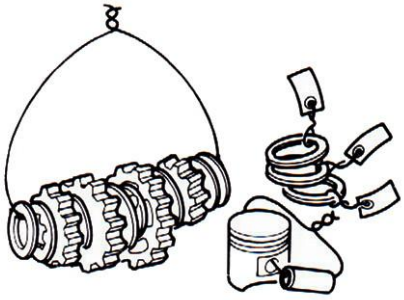
- When servicing this bike, use only metric tools. Metric bolts, nuts, using wrong tools and fasteners may damage this vehicle.
- Clean the outside of the parts or the cover before removing it from the bike. Otherwise, dirt and deposit accumulated on the part's surface may fall into the engine, chassis, or brake system, and cause 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.



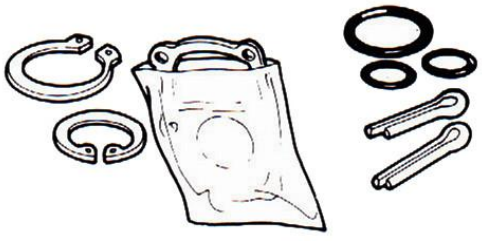
- Never bend or twist a control cable to prevent unsmooth control and premature worn out.



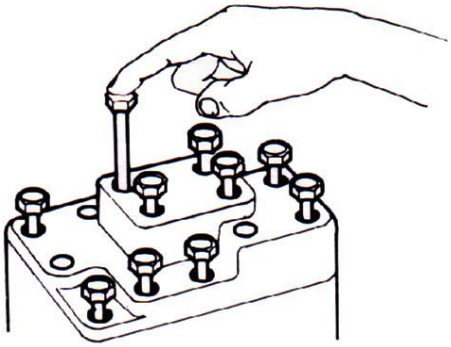
- Rubber parts may become deteriorated when old, and easy to be damaged by solvent and oil. Check these parts before installation to make sure that they are in good condition, replace if necessary.
- When loosening a component, which has different sized fasteners, operate with a diagonal pattern and 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.



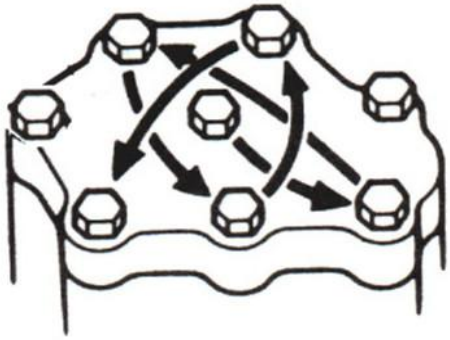
- Note the reassemble position of the important components before disassembling them to ensure they will be reassembled in correct dimensions (depth, distance or position).
- Components not to be reused should be replaced when disassembled including gaskets metal seal rings, O-rings, oil seals, snap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



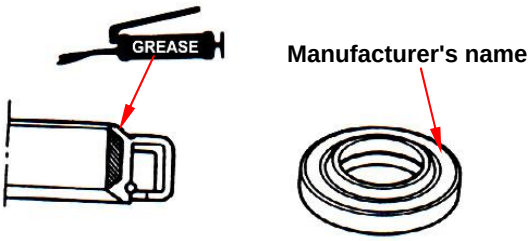
- The length of bolts and screws for assembly, cover plates or boxes is different from one another, make sure they are correctly installed. In case of confusion, Insert the bolt into the hole to compare its length with other bolts, if its length out side the hole is the same with other bolts, it is a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



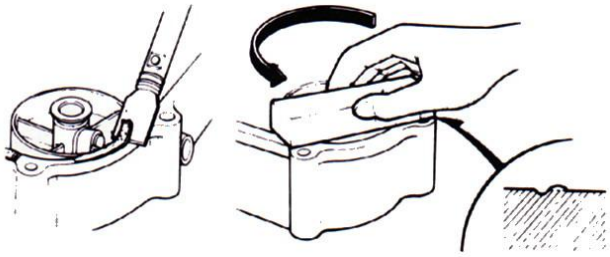
- Tighten assemblies with different dimension fasteners as follows: Tighten all the fasteners with fingers, then tighten the big ones with special tool first diagonally from inside toward outside, important components should be tightened 2 to 3 times with appropriate increments to avoid warp unless otherwise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



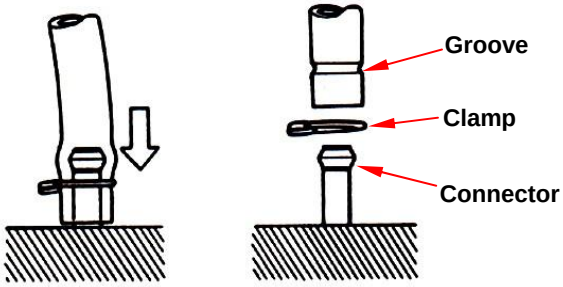
- When oil seal is installed, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, and check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.



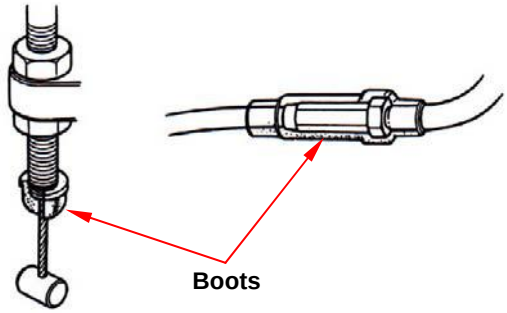
- Remove residues of the old gasket or sealant before reinstallation, grind with a grindstone if the contact surface has any damage.



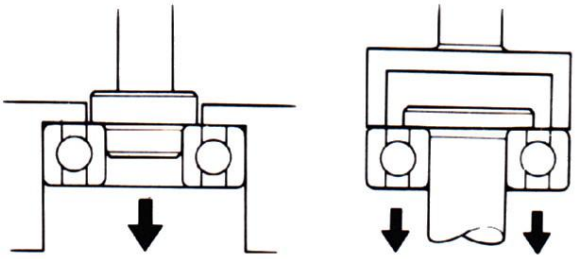
- The ends of rubber hoses (for fuel, vacuum, or coolant) should be pushed as far as they can go to their connections so that there is enough room below the enlarged ends for tightening the clamps.



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

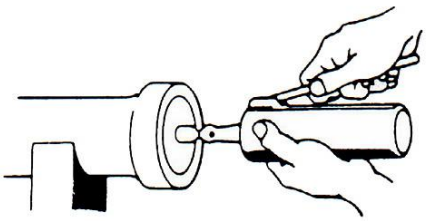


- The tool should be pressed against two (inner and outer) bearing races when removing a ball bearing. Damage may result if the tool is pressed against only one race (either inner race or outer race). In this case, the bearing should be replaced. To avoid damaging the bearing, use equal force on both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

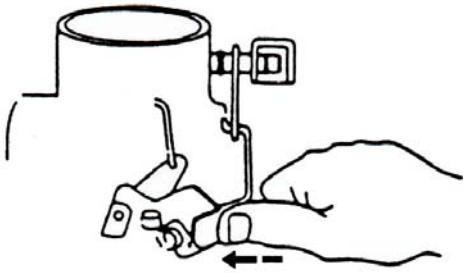


Both of these examples can result in bearing damage.

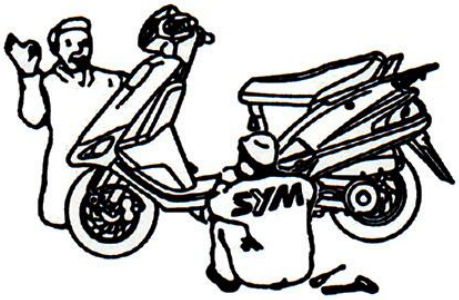
- Lubricate the rotation face with specified lubricant on the lubrication points before assembling.



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

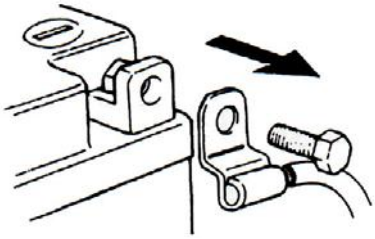


- Make sure service safety each other when conducting by two persons.

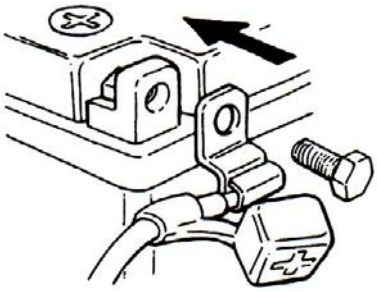


- Note that do not let parts fall down.

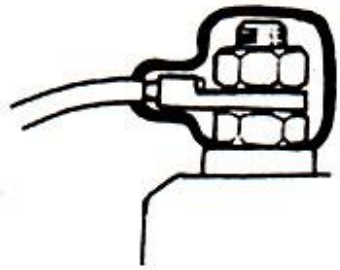
- Before battery removal operation, you have to remove the battery negative (-) cable first. Avoid using tools like open-end wrench, which may contact with body or create spark.



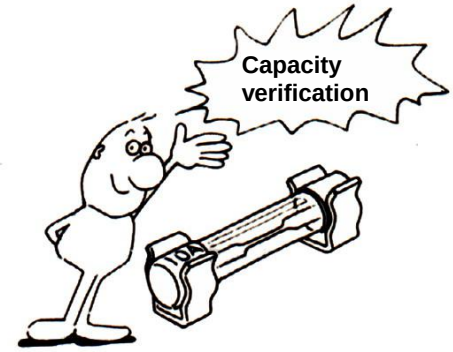
- After service completed, make sure all connection points is secured.
  Battery positive (+) cable should be connected firstly.
- And the two posts of battery have to be greased after connected the cables.



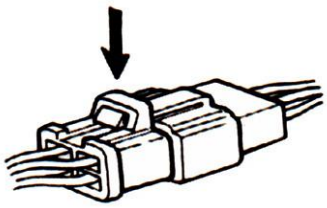
- Make sure that the battery post caps are located in properly after the battery posts had been serviced.



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

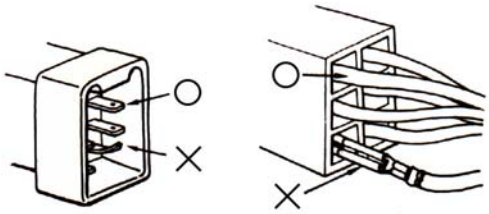


- When separating a connector, it locker has to be unlocked first. Then, conduct the service operation.



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

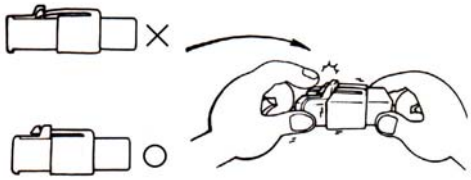
- Make sure if the connector pins are bent, extruded or loosen.



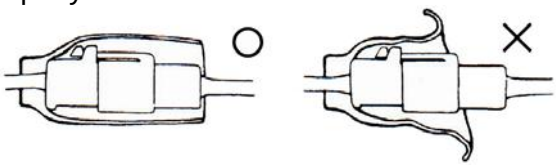
- Insert the connector completely.

  If there are two lockers on two connector sides, make sure the lockers are locked in properly.

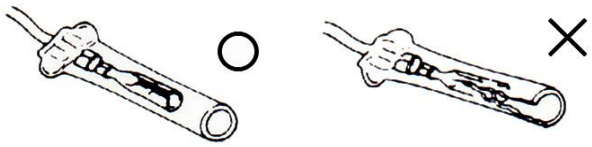
  Check if any wire loose.



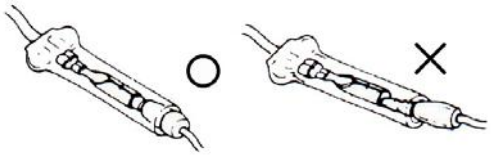
- Check if the connector is covered by the twin connector boot completely and secured properly.



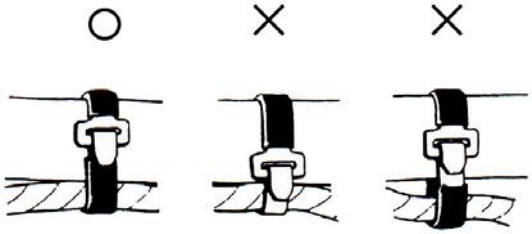
- Before terminal connection, check if the boot is crack or the terminal is loose.



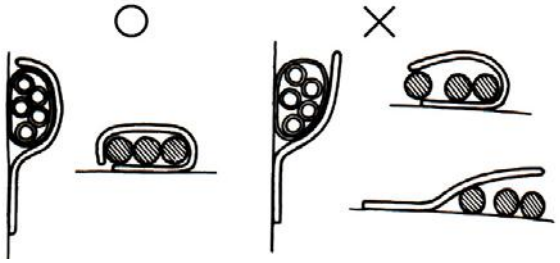
- Insert the terminal completely.
  Check if the boot covers the terminal.
  Do not let boot open facing up.



- 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.

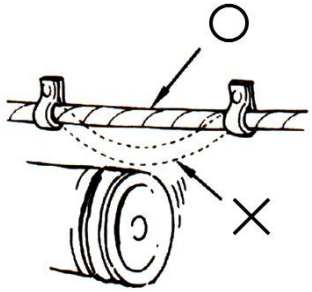


- Wire band and wire harness have to be clamped secured properly.

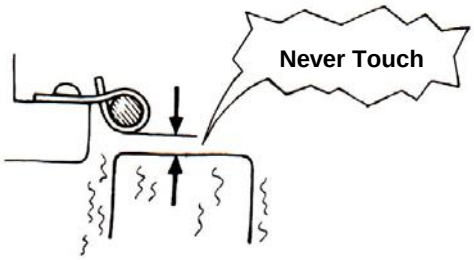


- Do not squeeze wires against the weld or its clamp.

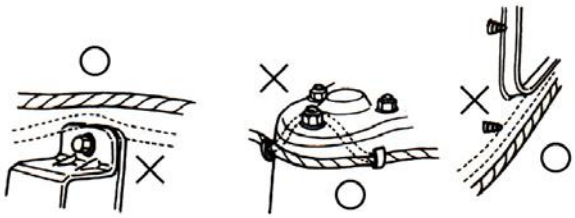
- Do not let the wire harness contact with rotating, moving or vibrating components when routing the harness.



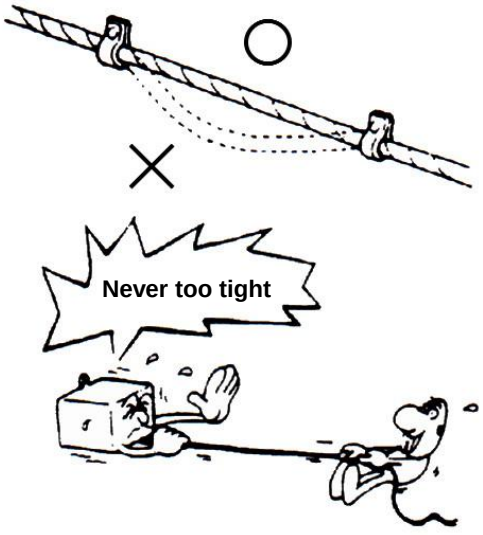
- Keep wire harnesses far away from the hot parts.



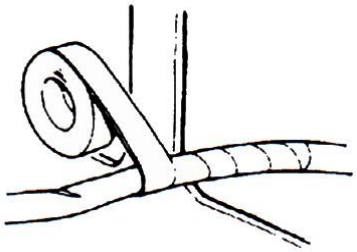
- Avoid wire harnesses from sharp edges or corners, and also avoid the jutted-out ends of bolts and screws.



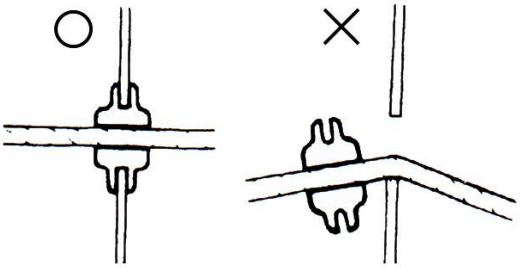
- Route harnesses so that they neither pull too tight nor have excessive slack.



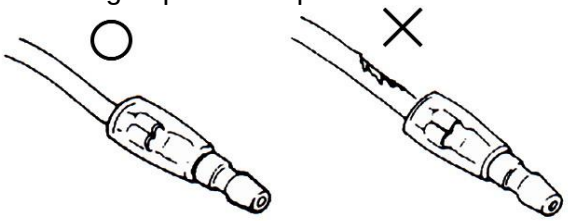
- Protect wires or wire harnesses with electrical tape or tube if they contact a sharp edge or corner. Thoroughly clean the surface where tape is to be applied.



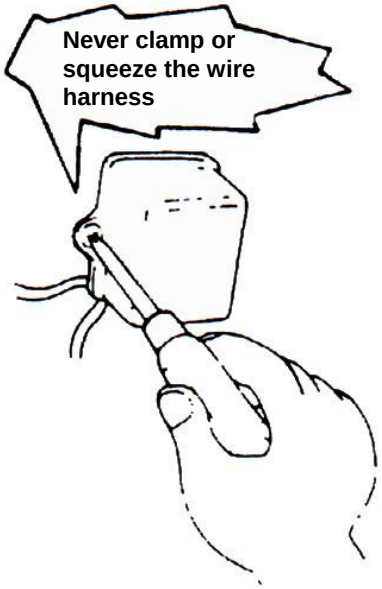
- Secure the rubber boot firmly as applying it on wire harness.



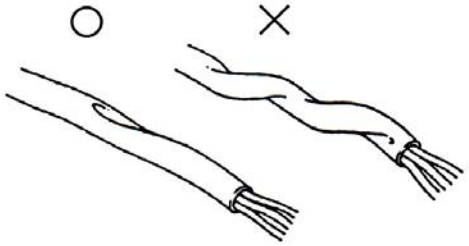
- Never use wires or harnesses which insulation has been broken. Wrap electrical tape around the damaged parts or replace them.



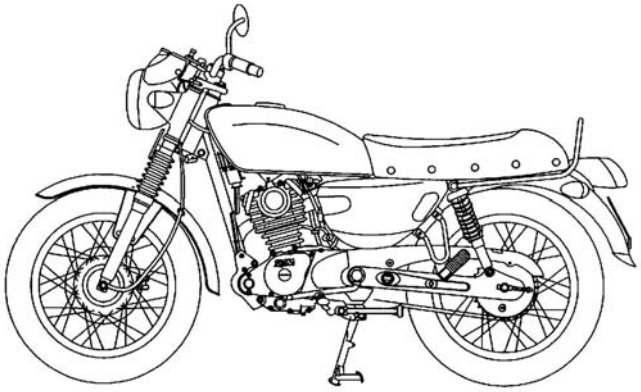
- Never clamp or squeeze the wire harness when installing other components.



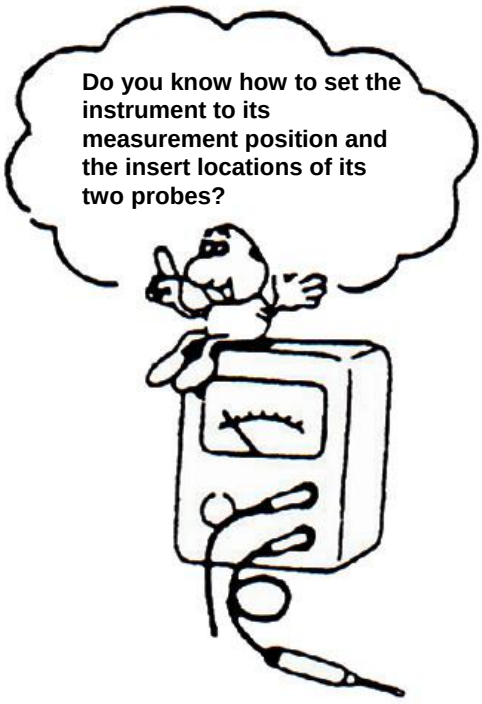
- Do not let the wire harness been twisted when installation.



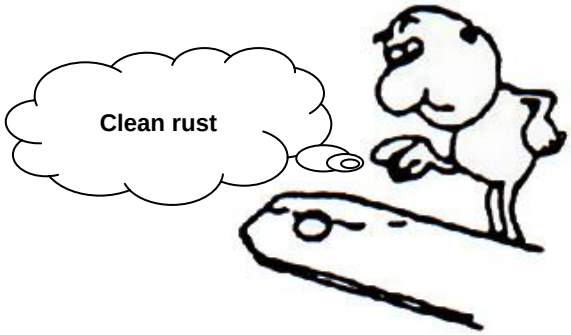
- Wire harnesses routed along the handlebar should not be pulled too tight or have excessive slack, use rubber covering against adjacent or surrounding parts in all steering perimeters.



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



- Use sand paper to clean connector pins/terminals if rust is found. And then continue the connection operation.



Specifications

MAKER			SANYANG	MODEL		PA12B
Dimension	Overall Length		**1910 mm**	Suspension System	Front	**TELESCOPIC FORK**
	Overall Width		**760 mm**		Rear	**SWING ARM**
	Overall Height		**1030 mm**	Tire Specifications	Front	**2.75-18-4PR**
	Wheel Base		**1210 mm**		Rear	**3.00-17-4PR**
Weight	Curb Weight	Front	**53 kg**	Brake System	Front	**DISK (ø 240 mm)**
		Rear	**70 kg**			
		Total	**123 kg**		Rear	**DRUM (ø 130 mm)**
	Passengers/Weight		**Two / 110 kg**	Performance	Max. Speed	**Above 94 km/hr**
	Total Weight	Front	**75 kg**		Climb Ability	**Below 28˚**
		Rear	**158 kg**	Reduction	Primary Reduction	**4.06**
		Total	**233 kg**		Secondary Reduction	**2.73**
Engine	Type		Air cooled 4-stroke gasoline engine		Clutch	**wet mutiplate**
	Installation and arrangement		**Vertical, below center, incline 15˚**		Transmission	**5 speed, circulated**
	Fuel Used		**Above 92 unleaded**	Speedometer		**0 ~ 140 km/hr**
	Cycle/Cooling		**4-stroke/ forced air cooled**	Horn		**80~112 dB/A**
	Cylinder	Bore	**Ø 56.5 mm**	Muffler		**Expansion & Pulse Type**
		Stroke	**49.5 mm**	Exhaust Pipe Position and Direction		**Right side, and Backward**
		Number/Arrangement	**SINGLE CYLINDER**	Lubrication System		**forced and wet sump**
	Displacement		**124 cc**	Exhaust Concentration	Solid Particulate	**-**
	Compression Ratio		**9: 1**		CO	**Below 3.0 %**
	Max. HP		**12.5 ps / 9500 rpm**		HC+Nox	**Below 2000 PPM**
	Max. Torque		**1.0 kg-m / 7500 rpm**	E.E.C.		√
	Ignition		**C.D.I.**	P.C.V.		√
	Starting System		**kick & electrical starter**	Catalytic reaction control system		√

MAKER			SANYANG	MODEL		PA12C
Dimension	Overall Length		1940 mm	Suspension System	Front	TELESCOPIC FORK
	Overall Width		715 mm		Rear	SWING ARM
	Overall Height		1085 mm	Tire Specifications	Front	2.75-18-4PR
	Wheel Base		1235 mm		Rear	3.00-17-4PR
Weight	Curb Weight	Front	52.5 kg	Brake System	Front	DISK (ø 240 mm)
		Rear	66 kg			
		Total	118.5 kg		Rear	DRUM (ø 130 mm)
	Passengers/Weight		Two / 110 kg	Performance	Max. Speed	Above 94 km/hr
	Total Weight	Front	75 kg		Climb Ability	Below 28˚
		Rear	158 kg	Reduction	Primary Reduction	4.06
		Total	228.5 kg		Secondary Reduction	2.73
Engine	Type		Air cooled 4-stroke gasoline engine		Clutch	wet mutiplate
	Installation and arrangement		Vertical, below center, incline 15˚		Transmission	5 speed, circulated
	Fuel Used		Above 92 unleaded	Speedometer		0 ~ 140 km/hr
	Cycle/Cooling		4-stroke/ forced air cooled	Horn		80~112 dB/A
	Cylinder	Bore	Ø 56.5 mm	Muffler		Expansion & Pulse Type
		Stroke	49.5 mm	Exhaust Pipe Position and Direction		Right side, and Backward
		Number/Arrangement	SINGLE CYLINDER	Lubrication System		forced and wet sump
	Displacement		124 cc	Exhaust Concentration	Solid Particulate	-
	Compression Ratio		9: 1		CO	Below 3.0 %
	Max. HP		12.5 ps / 9500 rpm		HC+Nox	Below 2000 PPM
	Max. Torque		1.0 kg-m / 7500 rpm	E.E.C.		√
	Ignition		C.D.I.	P.C.V.		√
	Starting System		kick & electrical starter	Catalytic reaction control system		√

Torque Values

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

Standard Torque Values for Reference

Type	Tighten Torque	Type	Tighten Torque
5 mm bolt、nut	0.45~0.6kgf-m	4 mm screw	0.10~0.15kgf-m
6 mm bolt、nut	0.8~1.2kgf-m	5 mm screw	0.35~0.5kgf-m
8 mm bolt、nut	1.8~2.5kgf-m	6 mm screw、SH nut	0.7~ 1.10kgf-m
10 mm bolt、nut	3.0~4.0kgf-m	6 mm bolt、nut	1.0 0~1.40kgf-m
12 mm bolt、nut	5.0~6.0kgf-m	8 mm bolt、nut	2.40 ~3.00kgf-m
3 mm screw	0.05~0.08kgf-m	10 mm bolt、nut	3.50~4.50kgf-m

Engine Torque Values

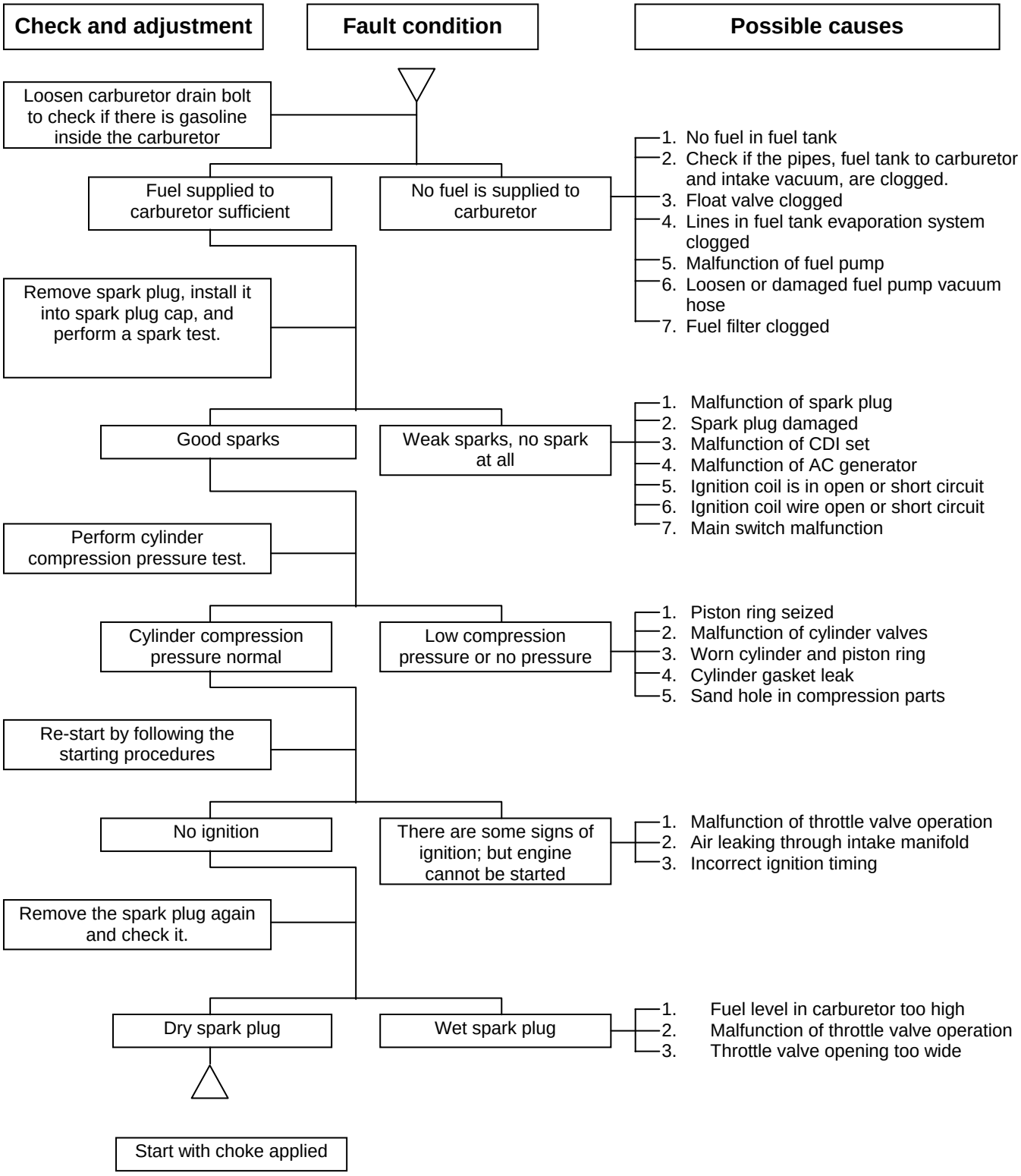
Item	Q'ty	Thread Dia. (mm)	Torque Value(kgf-m)	Remarks
Cylinder head nut	4	8	2.8~3.0	
Cylinder head left bolt	1	6	0.8~1.2	
Cylinder stud bolt	4	8	0.7~1.0	
Cylinder head side cover bolt	2	6	0.8~1.2	
Cylinder head cover bolt	2	30	1.3~1.7	
Cylinder head stud bolt (inlet pipe)	2	6	1.0~1.4	
Cylinder head stud bolt (EX. pipe)	2	8	2.4~3.0	
Air inject pipe bolt	4	6	1.0~1.4	
Air inject reed valve bolt	2	3	0.07~0.09	
Tappet adjustment screw nut	4	5	0.7~1.1	Apply oil to thread
Spark plug	1	10	1.0~1.2	
Tensioner lifter bolt	2	6	1.0~1.4	
Carburetor insulator bolt	2	6	0.7~1.1	
Oil pump screw	2	6	0.3~0.4	
	1	7	1.0~1.4	
Engine left cover bolt	9	6	1.1~1.5	
Engine oil draining bolt	1	12	3.5~4.5	
Engine oil strainer cap	1	30	1.3~1.7	
Mission draining bolt	1	8	0.8~1.2	
Mission filling bolt	1	10	1.0~1.4	
Clutch driving plate nut	1	28	5.0~6.0	
Clutch outer nut	1	14	5.0~6.0	
Drive face nut	1	14	8.5~10.5	
ACG. Flywheel nut	1	14	5.0~6.0	
Crankcase bolt	7	6	0.8~1.2	
Mission case bolt	7	8	2.6~3.0	
Muffler mounting bolt	3	10	3.2 ~3.8	
Muffler mounting nut	2	8	1.0 ~1.2	

Frame Torque Values

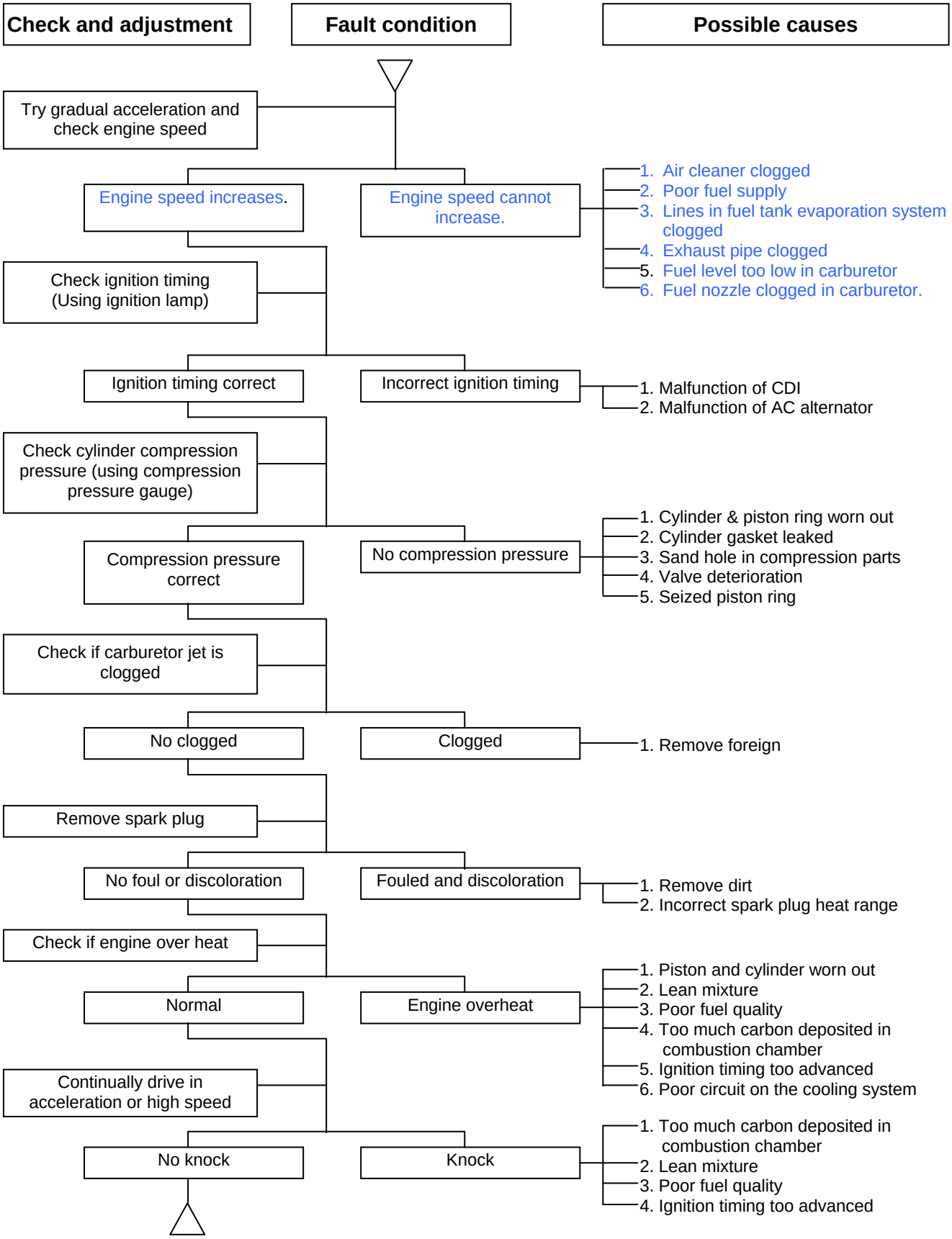
Item	Q'ty	Thread Dia. (mm)	Torque Value (Kg-m)	Remarks
Mounting bolt for steering handle post	4	8	3.0~3.5	
Lock nut for steering stem	1	BC1	1.0~2.0	
Steering top cone race	1	BC1	2.0~3.0	
Front wheel axle nut	1	12	5.0~7.0	
Rear wheel axle nut	1	16	11.0~13.0	
Front cushion mounting bolt	4	10	3.5~4.5	
Rear cushion upper connection bolt	1	10	3.5~4.5	
Rear cushion under connection bolt	1	8	2.4~3.0	
Rear fork mounting bolt	2	10	4.0~5.0	
Brake hose bolt	2	10	3.0~4.0	
Brake air-bleeding valve	1	6	0.8~1.0	
Front brake disc mounting bolt	5	8	4.0~4.5	
Rear brake disc mounting bolt	5	8	4.0~4.5	
Brake clipper mounting bolt	2	8	2.9~3.5	
Engine hanger link bolt	2	12	7.5~9.5	On frame side
Engine hanger link nut	1	12	7.5~9.5	On engine side
Main standard nut	1	10	4.0~5.0	
Air cleaner bolts	2	6	1.0~1.4	

Troubles Diagnosis

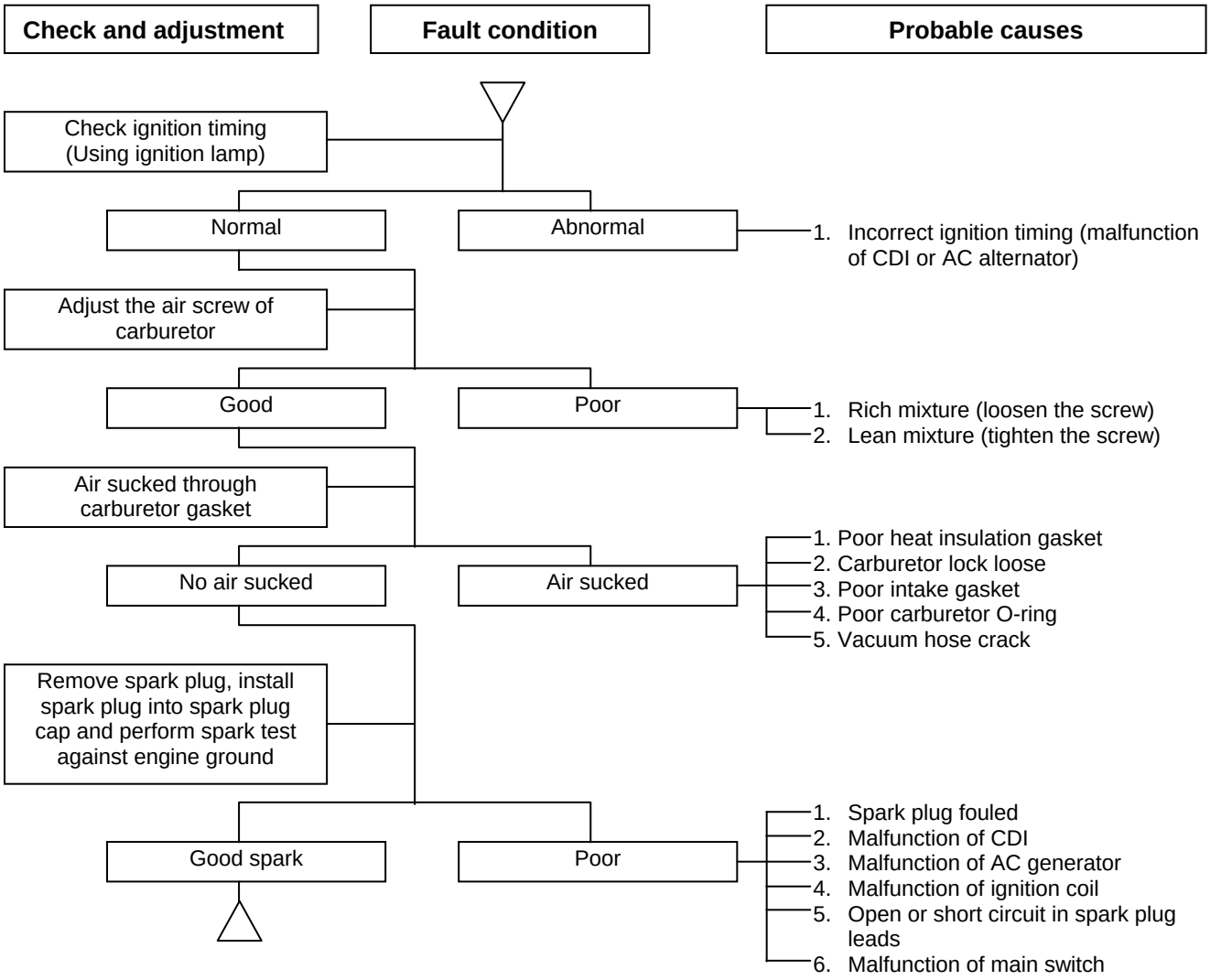
A. Engine hard to start or can not be started



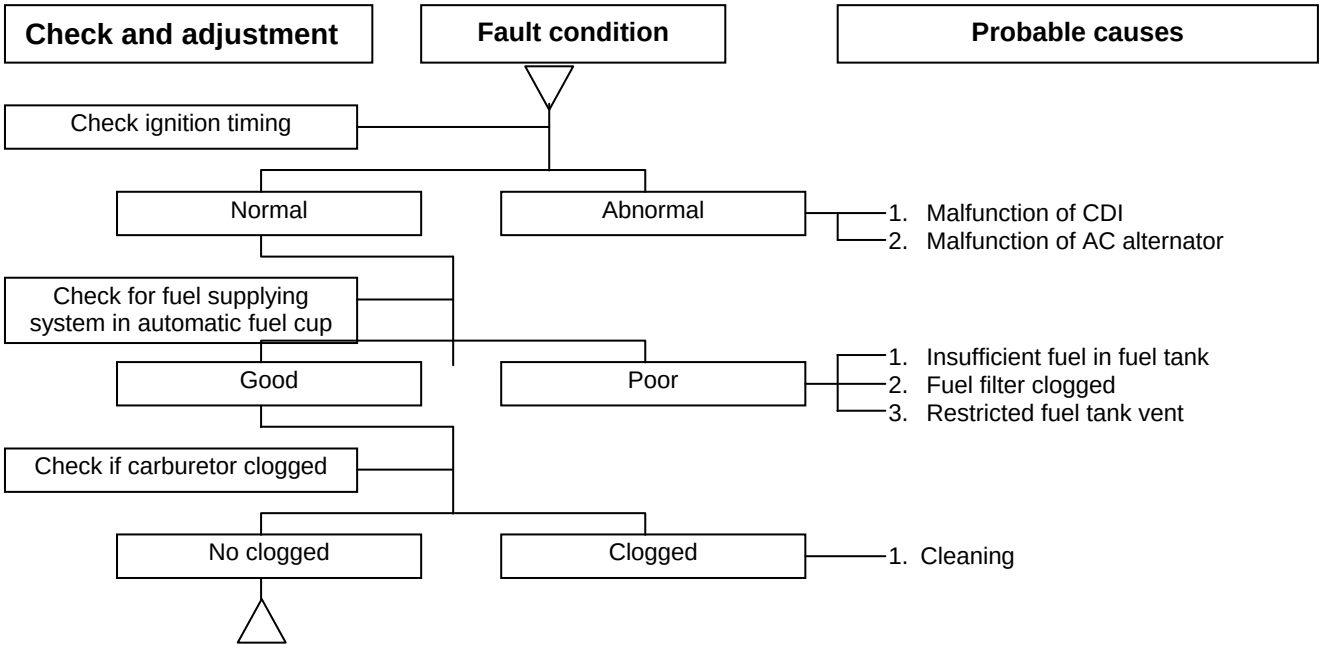
B. Engine run sluggish (Speed does not pick up, lack of power)



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

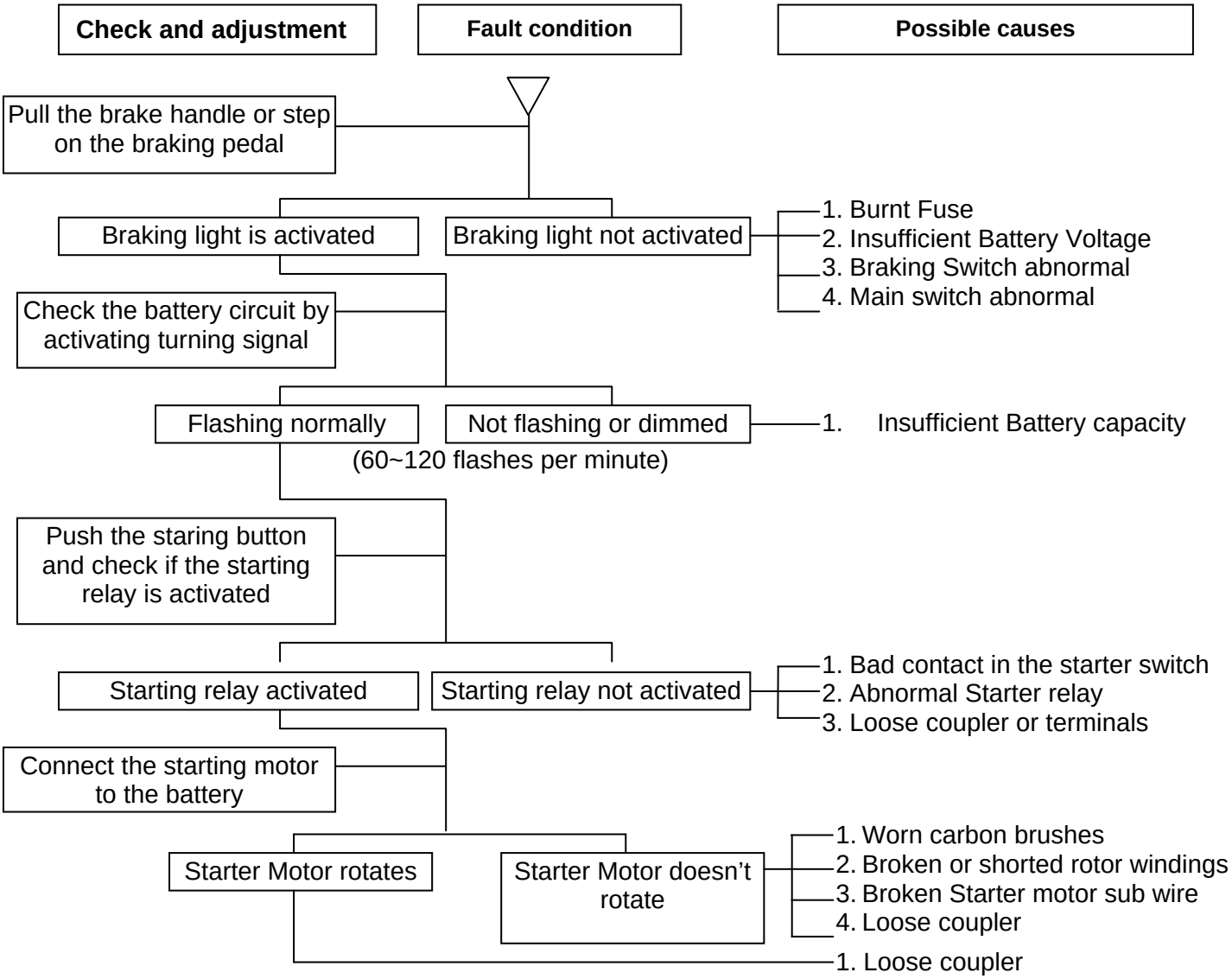


D. Engine runs sluggish (High speed)

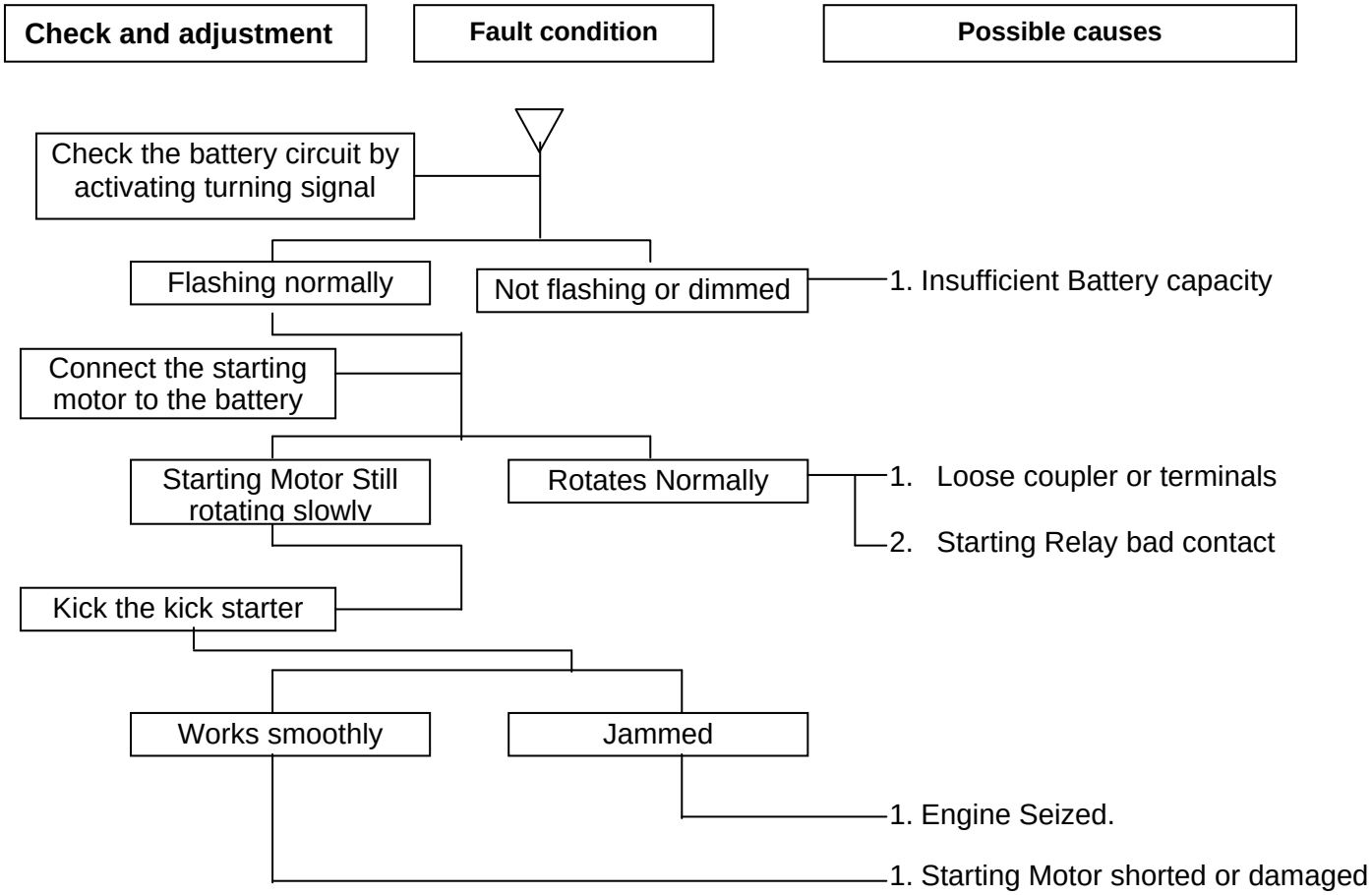


E. Starter Motor Malfunction

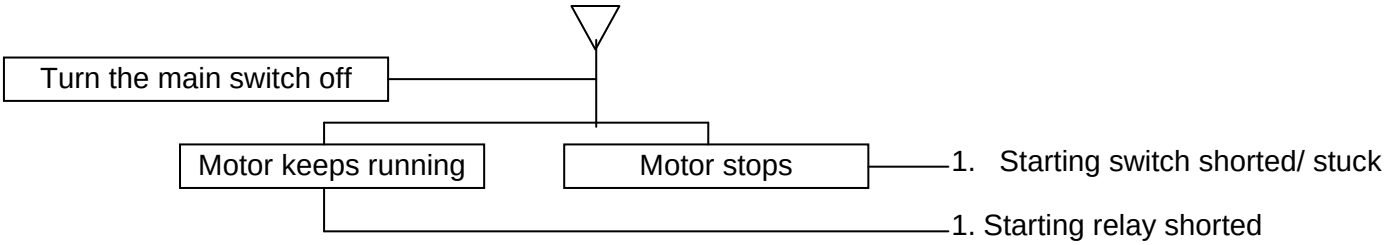
1. Starter Motor doesn't rotate



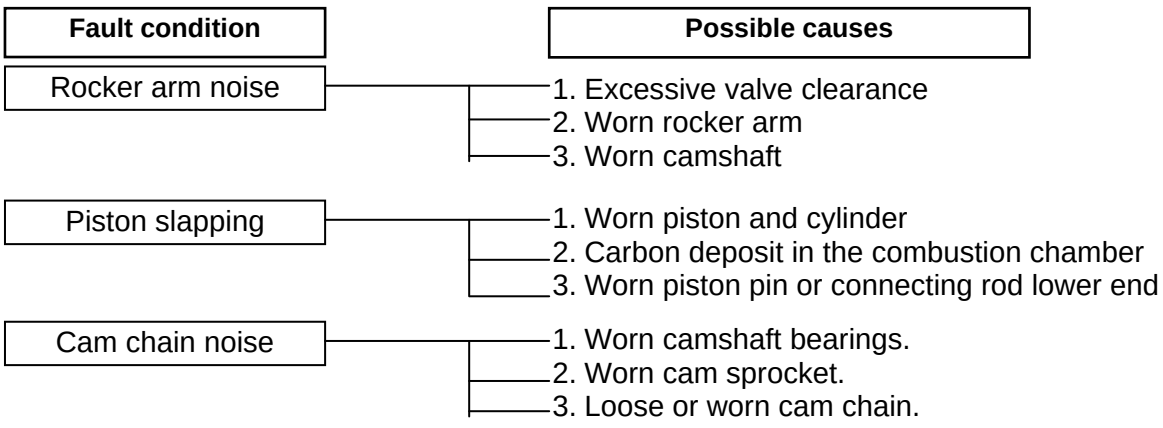
2. Starting Motor rotates slowly or spins without engagement with crankshaft



3. Starter motor won't stop rotating

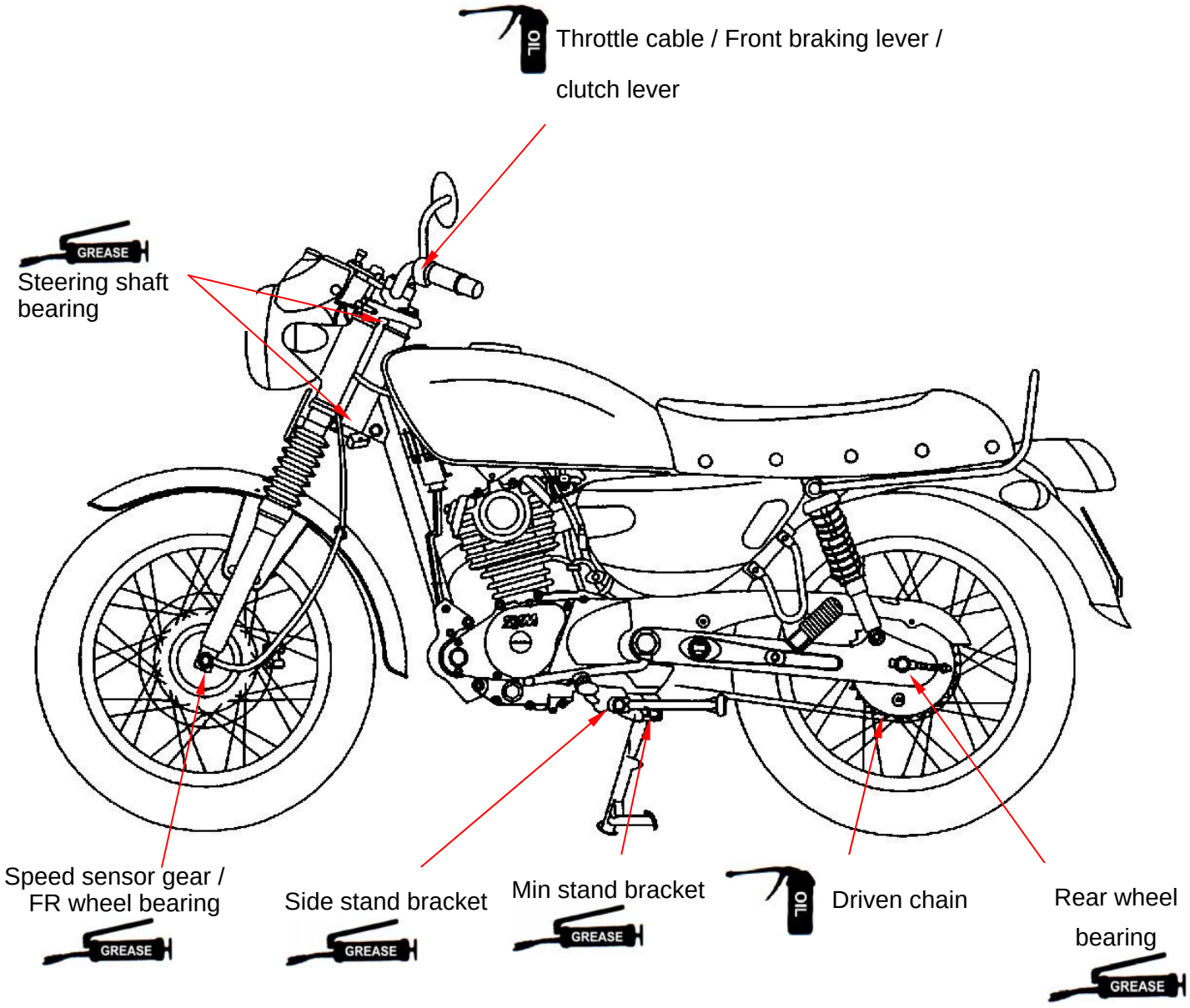


F. Abnormal Engine Noise



Clutch knocking	1. Excessive clutch plate clearance
Transmission gear noise	1. Worn or deteriorated rear wheel damping rubber. 2. Gear surface worn 3. Worn transmission gear set

Lubrication Points



Note:

Precautions in Operation

Specification

Items		Specification
Fuel tank capacity	Capacity	9300 c.c.
	Reserve	700 c.c.
Engine oil	Capacity	1200 c.c.
	Exchange	1000 c.c.
Throttle grip free play		2~6 mm
Spark Plug		NGK D7EA
Spark plug gap		0.6~0.7 mm
Ignition timing		BTDC 10º / 1500 rpm
Ignition advance		BTDC 34º / 4000 rpm
Idle speed		1500±100 rpm
Cylinder compression pressure		12±1 kgf/cm²
Valve clearance	Intake/ex	0.05±0.02 mm
Tire size	FR/RR wheel	2.75-18-42P / 3.00-17-45P
Tire pressure (Cold)	Single ride	Front：1.8 kg/cm² / Rear：2.0 kg/cm²
	Tandem ride	Front：1.8 kg/cm² / Rear：2.4 kg/cm²
Battery	Type	12N7A (12V 7Ah)
Front brake lever clearance		10~20 mm
Rear brake pedal clearance		20~30 mm

Periodical Maintenance Schedule

NO	Items	Initial 300KM	1 month or every 1000KM	3 months or every 3000KM	6 months or every 6000KM	1 year or every 12000KM
1	☆Air filter element	I		C	C	R
2	☆AICV filter	I		C	C	R
3	☆Gasoline filter	I			I	R
4	☆Engine oil filter	C			C	C
5	☆Engine oil replacement	R	Exchange every 1000 km			
6	Tire pressure	I	I			
7	Battery Inspection	I	I			
8	Brake lever free play check	I	I			
9	Steering handle integrity check	I	I			
10	Shock absorber performance check	I		I		
11	Bolts tightening check	I	I			
12	Check the engine for oil leakage	I	I			
13	☆Spark plug inspection or replacement	I		I	R	
14	☆Change gear oil	R	Exchange every 5000 km			
15	Lubrication of the whole bike				L	
16	Exhaust pipe	I	I			
17	☆Ignition timing	I	I			
18	☆Idle emission check	A	I	A		
19	☆Throttle operation	I		I		
20	☆Engine bolts torque	I		I		
21	☆Transmission / Chain	I	I/L			R
22	☆Clutch free play inspection	I	I			
23	Light/ electrical system/ instrument readings.	I	I			
24	Main stand/ side stand springs.	I			I	
25	Fuel lines	I		I		
27	Cam chain	I		I		
28	☆Valve clearance	I		A		
29	☆PCV system integrity	I		C		
30	☆Crankcase blow-by over-flow pipe	I	Drain every 2000km			
31	☆Second air injection system (filter)	I		I	C	
32	☆E.E.C. Device check			I		

Note：I- inspection A- Adjust R- Replace C-Clean L-Lubrication

Please have your periodical maintenance data recorded by your SYM Authorized Dealer to maintain the motorcycle in excellent condition. The above maintenance schedule is established by taking the monthly 1,000 kilometers as a reference. Whichever- time or mileage- comes first will be regarded as an index for maintenance.

Remark： **These marks "☆" in the schedule are emission control items. According to EPA regulations, these item checks must be performed periodically following the use r manual instructions. It's prohibited to adjust or repair these emission control items by unauthorized people. Otherwise, SYM is no responsible.**

1. Clean or replace the air cleaner element more often when the motorcycle is operated on dusty roads or in the Heavily- polluted environment.
2. Maintenance should be performed more often if the motorcycle is frequently operated in high speed and after the motorcycle has accumulated a higher mileage.
3. Preventive maintenance：
   a. Ignition system—Perform maintenance or check when continuous abnormal ignition, misfire, after-burn, overheating occur.
   b. Carbon deposit removal—Remove carbon deposits in cylinder head, piston heads, exhaust system when power is decreasing.
   c. Replace worn out pistons, cylinder head.

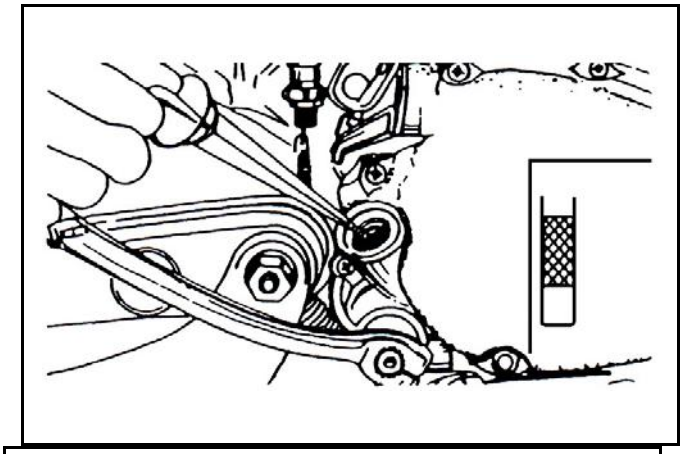
Lubrication System

Engine oil quantity

⚠ Caution

- Turn off engine, and park the motorcycle in flat surface with main stand.
- Check oil level with oil dipstick. (Do not screw the dipstick into engine when checking.)

If oil level is near lower limit, fill in the recommended engine oil to upper limit.



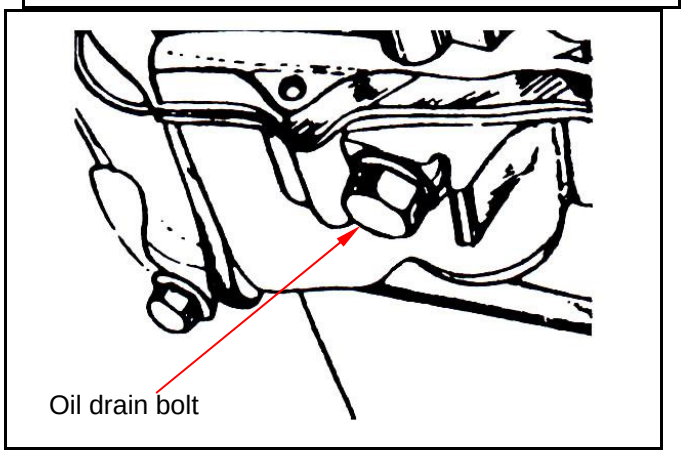
Exchange the engine oil

Engine off and disassemble the oil dipstick.

Remove the oil drain bolt under the crankcase to drain the engine oil.

After completely drain the engine oil, clean the drain bolt and the washer. If the washer is deformed or cracked, please change a new one

Engine oil drain bolt torque：**3.5~4.5kgf-m**



⚠ Caution:

- Warm up the engine before drain oil, that will make engine oil easily drained thoroughly

Fill in the engine oil to the standard quantity.

Add oil to crankcase (oil viscosity SAE 10W-30) Recommended using Bramax series engine oil.

Engine oil exchange volume

Full disassembly：1200 c.c.

Regular exchange：1000c.c.

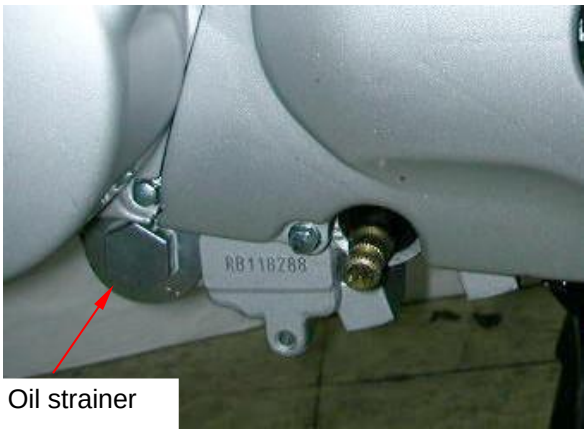
Install the dipstick, run the engine for several minutes.

Turn off the engine, and check oil level again.

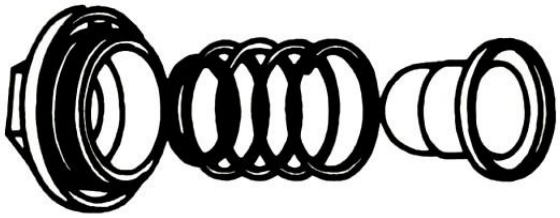
Check if engine oil leaks.

Engine Oil Strainer Cleaning

Drain engine oil completely.
Remove oil strainer and spring.
Clean oil strainer.
Check if O-ring is deformed or damaged.
If not, it can be re-used.
Install oil strainer and spring.
Install oil strainer cap.
Torque value：1.3~1.7kgf-m



Oil strainer



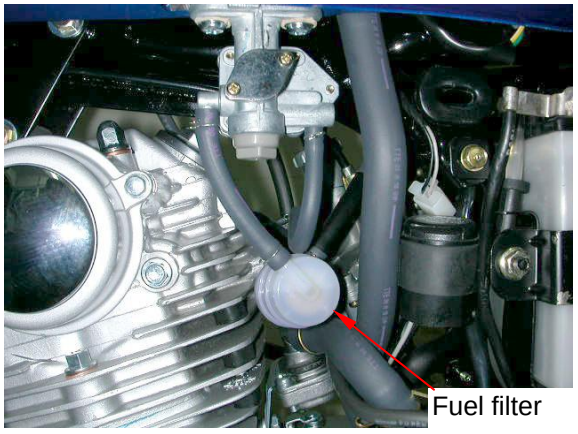
Fuel System

Fuel Lines

Check all fuel lines, and replace when they are deteriorated, damaged or leaking.

⚠ Caution

- Gasoline is a highly flammable substance, so any source of fire or spark is strictly prohibited when operation.



Fuel filter cleaning

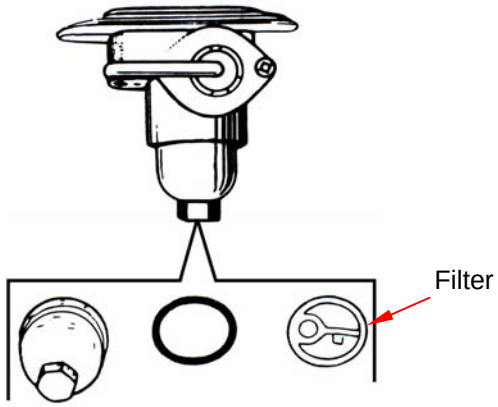
⚠ Warning:

- Any source of fire or spark is strictly prohibited when operation.

If gasoline filter is clogged, please drain all the gasoline into a clean container, and wash the fuel tank.

After the cleaning of filter and fuel tank, refill the tank with clean gasoline.

Check the fuel line for leakage.

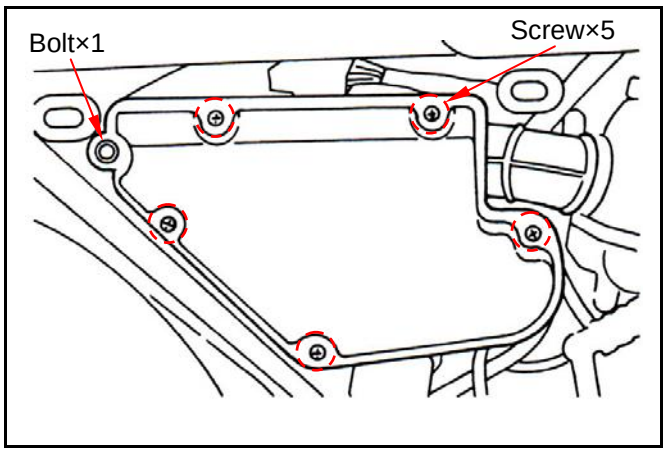


Air Filter

Air filter element

Remove the right side cover.

Remove the air filter cover (5 Screws, 1 Bolt)



Remove the air filter element

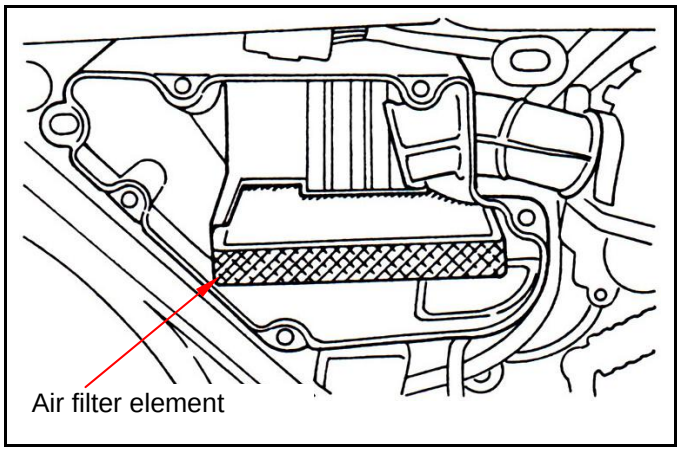
Check the filter element for dirty or damaging.

Wash the air cleaner filter with high flash point solvent (for example, kerosene or diesel)

Squeeze out the cleaning solvent thoroughly, soak the element into gear oil, and squeeze out the excessive.

Re-install the filter and the cover.

If the air cleaner filter element is too dirty or damaged, please exchange with new parts.



⚠ Caution:

- Never use gasoline or other low-flash point solvent for cleaning the element.

Throttle Operation

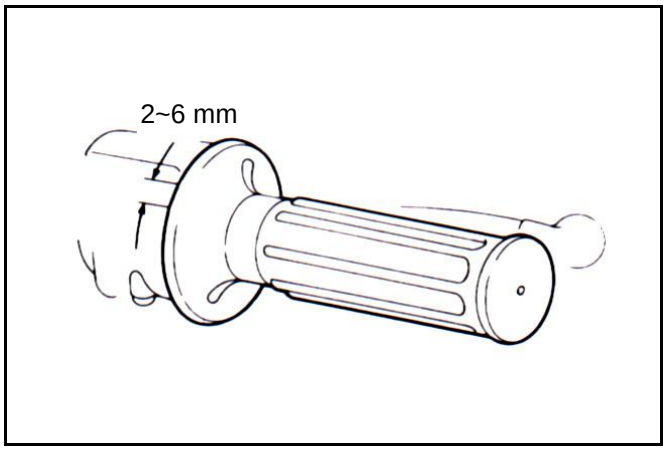
Operate the throttle grip to see if the throttle cable is going smoothly.

If the throttle cable is deteriorated, twisted or damaged, please exchange it.

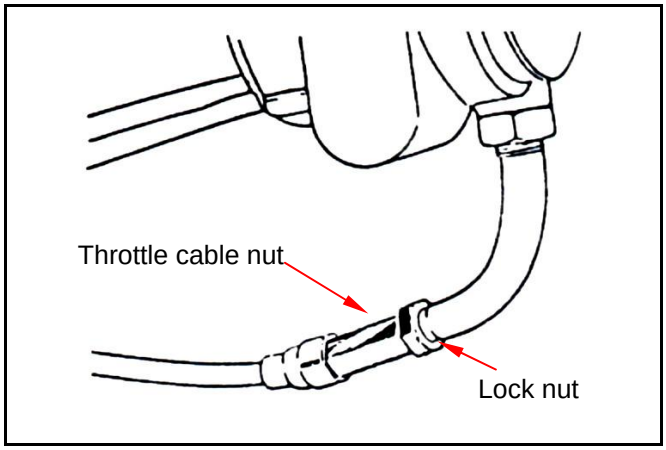
If the cable is not going smoothly, apply some lubrication oil onto it.

Measure the free play of the throttle grip, through the inner side flange of it.

Free play：2~6 mm



Please loosen the lock nut and adjust the throttle cable nut to reach the normal free play.



PCV System

Unplug the drain tube, and leak the deposit off.

Drain the tube every 2,000 km.

⚠ Caution:

- Under rainy or full- throttle situation, the maintenance period should be shortened. You can check the deposit amount through the transparent tubes.

Valve Clearance Adjustment

⚠ Caution:

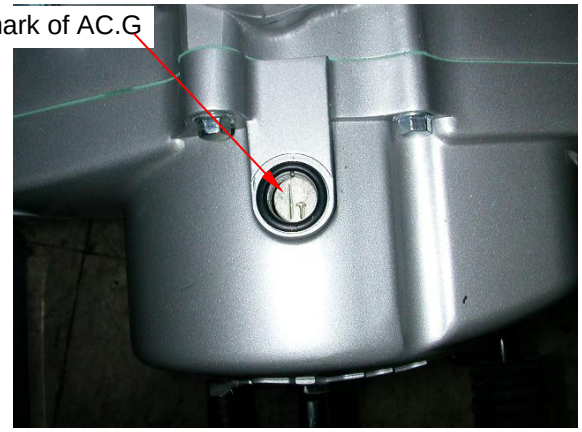
- The valve clearance should be adjusted when the engine is cold. (Under 35 degrees Celsius)

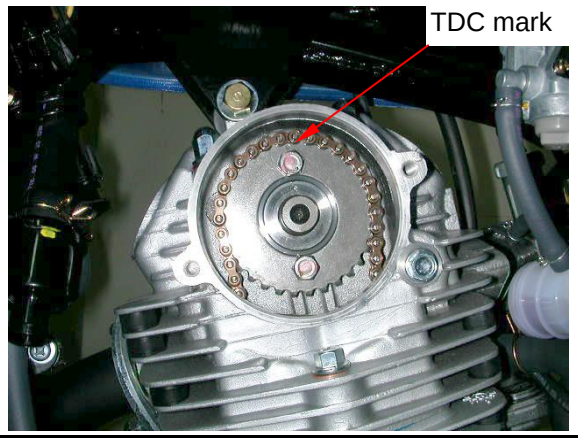
Remove the valve clearance-adjusting cap.

Remove the cylinder head side cover.

Remove the timing inspection cap and the AC.G cap on the crankcase L cover.

Use a T socket wrench to rotate the crankshaft counterclockwise. Align the “T” mark on the AC.G flywheel with the crankcase sign, and simultaneously, the cam- chain sprocket TDC mark aligning with the cylinder head mark (That means the piston is in the upper end of compression stroke)



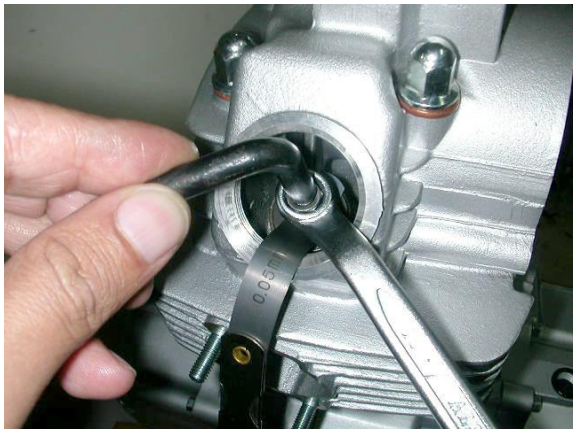


Valve clearance inspection and adjustment.

Check the intake and exhaust valve clearance by inserting the feeler gauge between the adjusting screw and the lock nut.

Valve clearance：

IN	**0.05±0.02 mm**
EX	**0.05±0.02 mm**



Adjust by loosening the lock nut first, and turning the adjusting screw until you feel slight drag on the feeler gauge.

Hold the adjusting screw and tighten the lock nut.

⚠ Caution:

- Check the valve clearance after the adjustment.

Install the valve clearance-adjusting cap, cylinder head side cover, and the timing inspection cap and the AC.G cap on the crankcase L cover.

⚠ Caution:

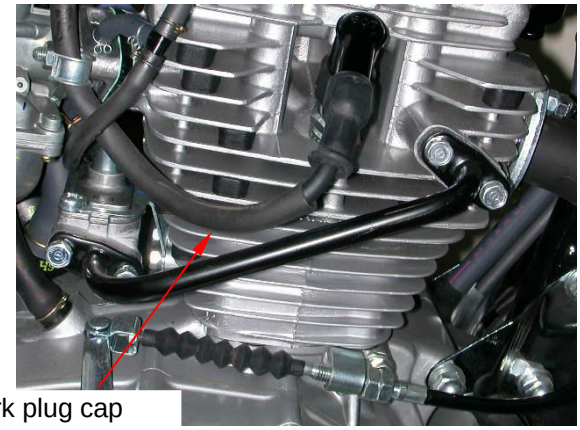
- Before installing the O-ring, you should check if the O-ring is damaged, and apply some oil on it to prevent damage when assembly.

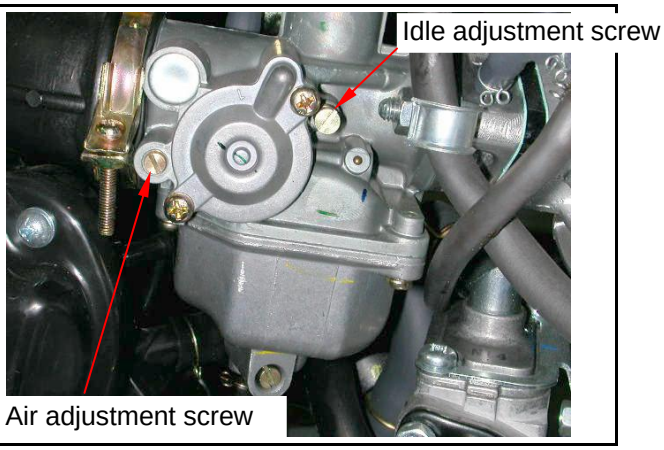
Idle Adjustment

⚠ Caution:

- You should finish all the other configurations before idle speed adjustment.
- The engine must be fully warmed before idle adjustment.

Use the main stand of the bike, and warm up the engine.
Clip on the RPM sensor (Clip the RPM sensor clamp on the spark plug cap wire)
Turn the idle adjusting screw to reach the recommended idle RPM.
Recommended idle RPM：1500±100rpm


Spark plug cap



Emission adjustment in idle speed
Warm up the engine for around 10 minutes and then conduct this adjustment.
Connect the tachometer onto engine.
Adjust the throttle valve stopper screw and let engine runs in 1500±100 rpm.
Insert the exhaust sampling pipe of exhaust analyzer into the front section of exhaust pipe.
Adjust the air adjustment screw so that emission value in idle speed is within standard.
Slightly accelerate the throttle valve and release it immediately. Repeat this for 2~3 times.
Read engine RPM and value on the exhaust analyzer. Repeat step 2 to step 4 procedures until measured value within standard.
Emission standard CO: 3. 0 %↓
HC: 2,000 P.P.M.↓

Ignition System

Ignition timing

⚠ Caution:

- C.D.I ignition system is set by manufacturer so it cannot be adjusted.
- Ignition timing check procedure is for checking whether CDI function is normal or not.

Remove ignition timing hole cap located in front upper side of crankcase left cover.

Connect tachometer and ignition lamp and start the engine.

When engine runs in idle speed, if the “F” mark meets with the ignition lamp. Then, it means that ignition timing is correct.

Increase engine RPM to check ignition advance degree. If the illustrated indent is within the ignition advance degrees, it means that the ignition advance degree is in normal. If ignition timing is incorrect, check CDI set, pulse rotor and pulse generator. Replace defective parts if malfunction is found.

Standard idle：1500±100rpm
Ignition Advance：4000±100rpm

Spark Plug

Recommended spark plug: **D7EA**

Remove spark plug cap.

Clean dirt around the spark-plug hole.

Remove spark plug.

Measure spark plug ignition gap.

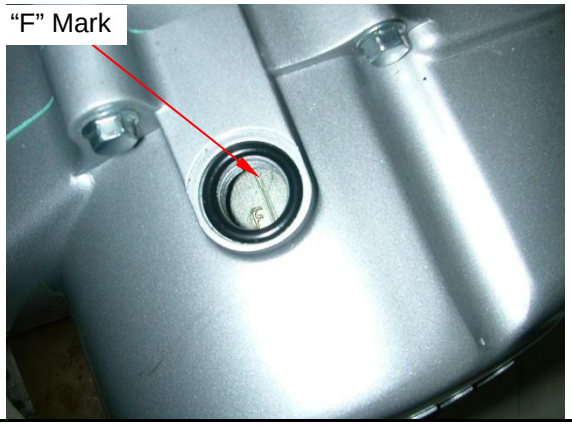
Spark plug gap：0.6~0.7 mm

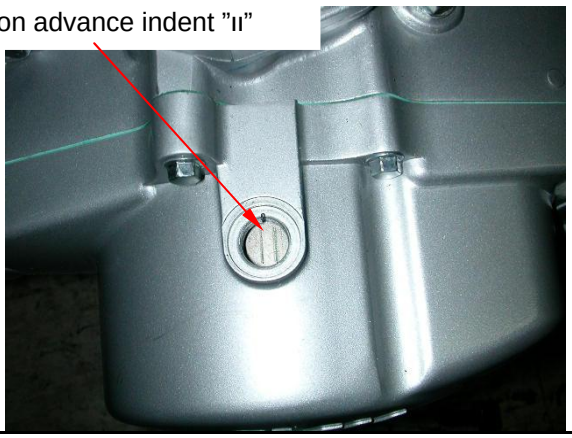
Carefully bend ground electrode of the plug to adjust the gap if necessary.

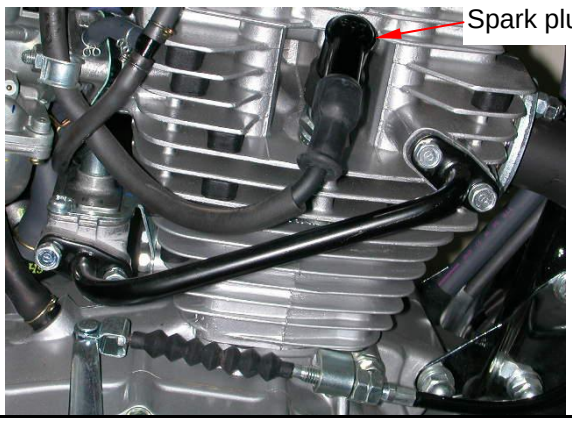
Hold spark plug and install the spark plug by screwing it with hand, after tightening the plug by hands, use plug socket to tighten it to the standard torque value.

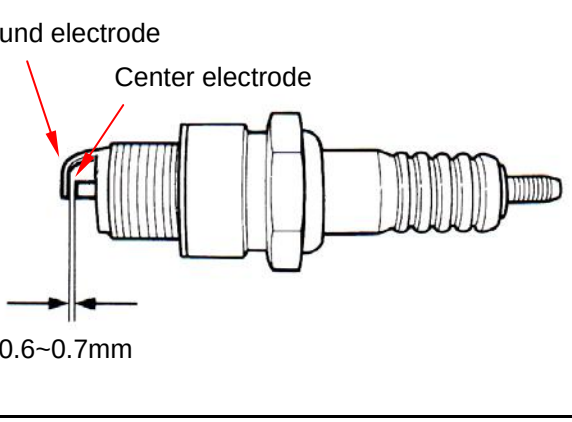
Standard torque：1.0~1.2kgf-m

Re- install the spark plug cap.









Cylinder Compression Test

Warm up engine and turn it off.

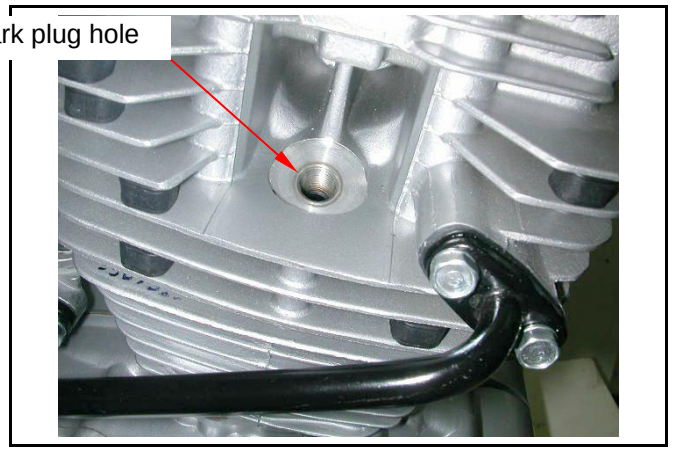
Remove spark plug cap and spark plug.

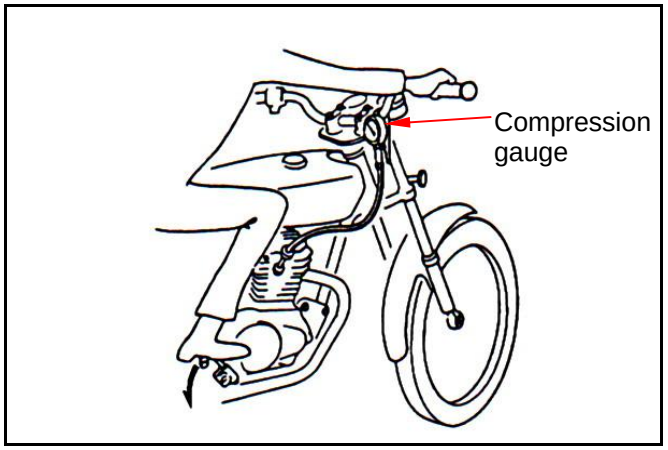
Install compression gauge into the spark plug hole, full open the throttle, and kick the kick starter for several times.

⚠ Caution:

Rotate the engine until the reading in the gauge gains no more.

- Usually, the highest-pressure reading will appear in 4~7 seconds.





Compression pressure：12 ±1 Kg/cm²

Check the following items if the pressure reading is too low:

- Incorrect valve clearance.
- Valve leaking.
- Cylinder head leaking, piston, piston ring and cylinder worn out.

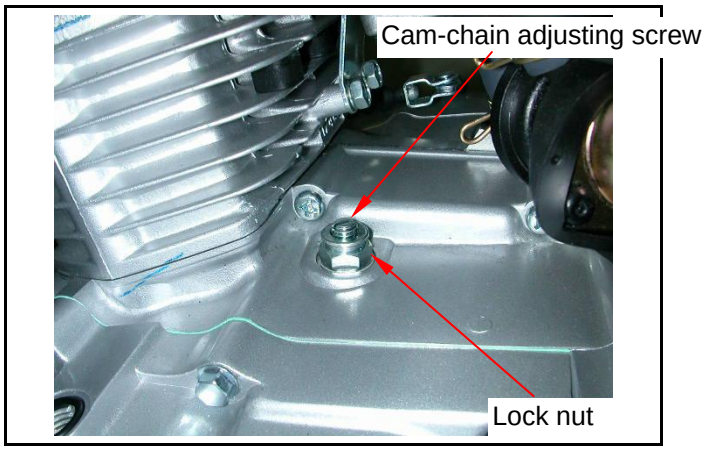
If the pressure is too high, it means carbon deposits in combustion chamber or piston head.

Cam Chain Adjustment

Start the engine, and let the engine idle.

Remove the rubber cap of the adjusting screw and loosen the lock nut. Turn the adjusting screw in or out to find a most silent cam chain setting.

If you want to tighten the chain, turn the screw counterclockwise, or turn the screw clockwise to loosen the cam chain. After finding a best set of cam chain, tighten the lock nut and re-install the rubber cap.

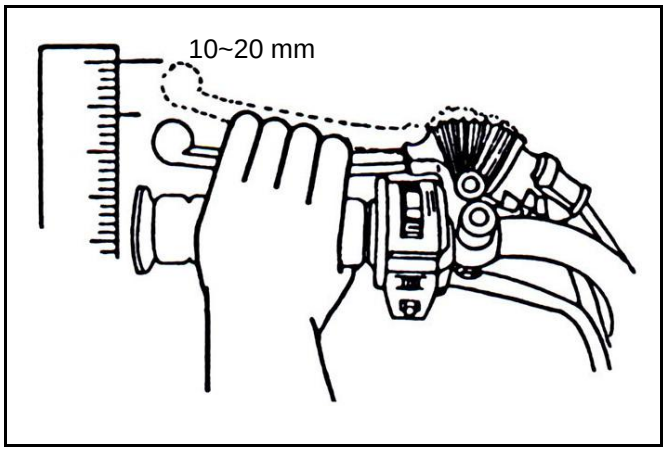


Clutch Adjustment

Clutch lever free play inspection

Slightly pull the clutch lever to check the free play before clutch disengagement.

Free play：10~20 mm



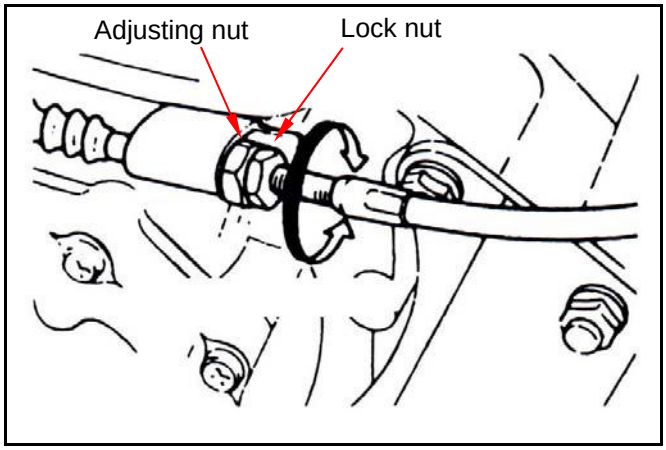
Clutch lever free play adjustment

Before adjusting the clutch lever free play, please loosen the lock nut first. Then turn the adjusting screw to achieve the recommended clutch free play.

If you want to decrease the free play of clutch lever, turn it clockwise. If you want to increase the free play, turn it counterclockwise.

After adjustment, tighten the adjusting nut with lock nut.

Lubricate the clutch cable.



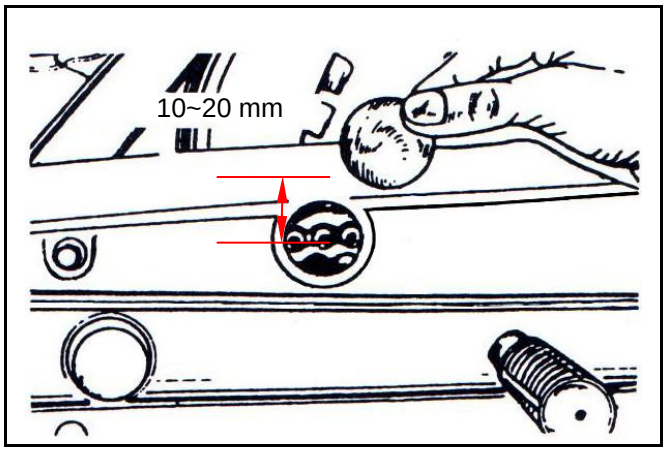
Drive Chain Adjustment

Drive chain inspection.

Place the bike on its main-stand with its neutral gear.

Check the drive chain slack by moving the chain up and down by fingers, and measure the amount of chain slack.

Standard chain slack：10~20 mm



⚠ Caution:

- Because the front and rear sprocket has different wearing situation, so please rotate the rear wheel to find the minimum chain slack for the measurement.

Drive chain adjustment

If you need to adjust the chain slack, please loosen the rear axle nut and sleeve nut first.

Turn the left side and the right side adjusting nut evenly to make the chain slack within the standard range. (Turn the nuts clockwise to tighten the chain, or counterclockwise to loosen the chain)

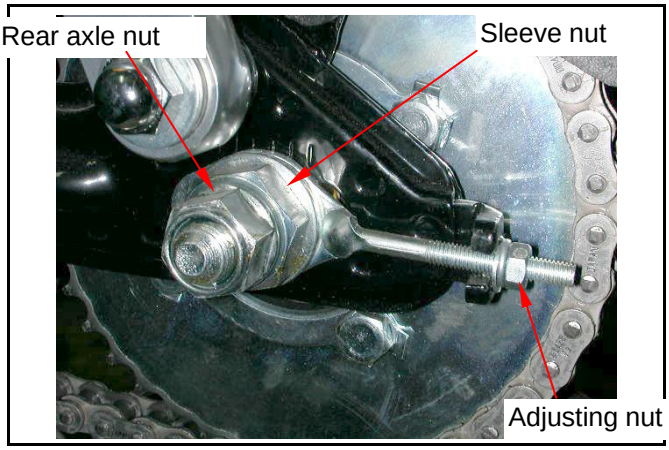
Tighten the sleeve nuts, then the rear axle nut.

Torque value：4.0~5.0kgf-m

After tightening the rear axle nut, please check the sleeve nuts to prevent them from loosening.

Check the chain slack again, and make sure the rear wheel rotates smoothly.

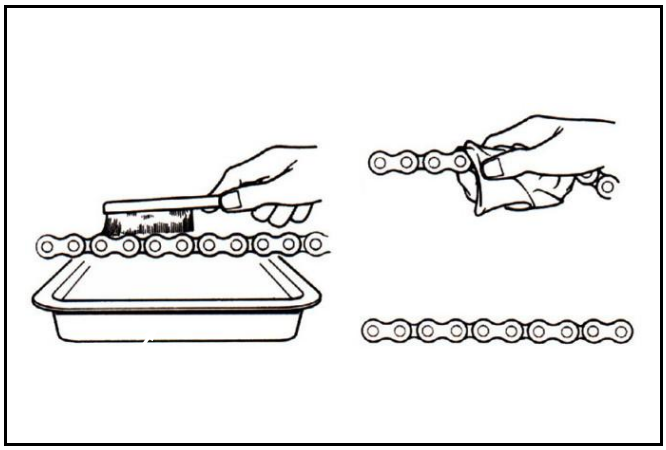
If the chain is too dirty, use high-flash point solvents to clean the chain. (Kerosene or Diesel.)



⚠ Caution:

- Don’t use gasoline when cleaning the chain. The gasoline will damage the O-ring in the chain.

After cleaning, lubricate the chain with chain lubricant.



Steering Mechanism

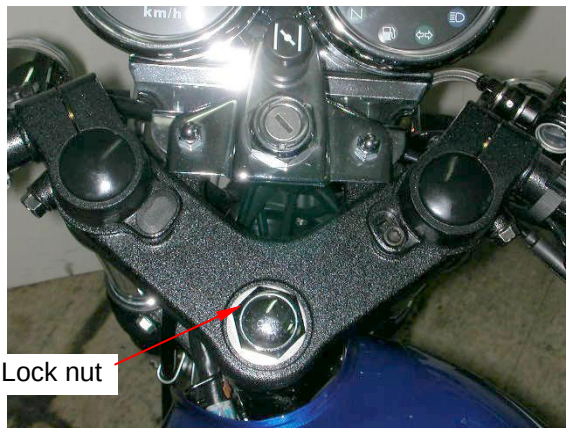
⚠ Caution:

- Check all wires and cables if they are interfered with the rotation of steering handle bar.

Lift the front wheel off the ground.

Turn handle from right to left and check if turning is smoothly.

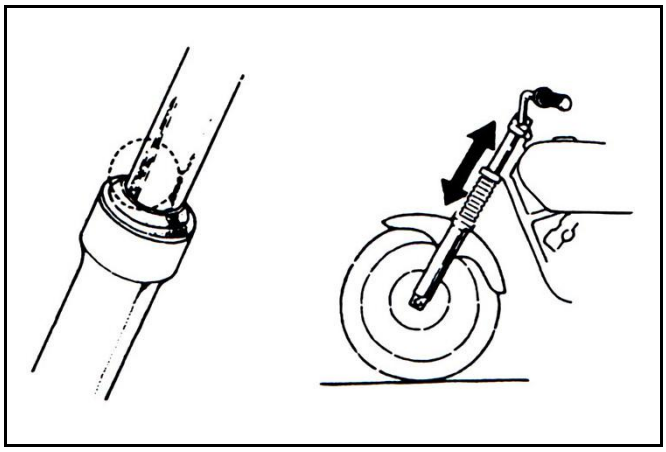
If handle is uneven or bending, or the handle can be lifted through vertical direction, adjust the handle top bearing.



Suspension System

Caution:

- Do not ride the motorcycle with poor cushion.
- Looseness, wear or damage cushion will make poor stability and maneuverability.



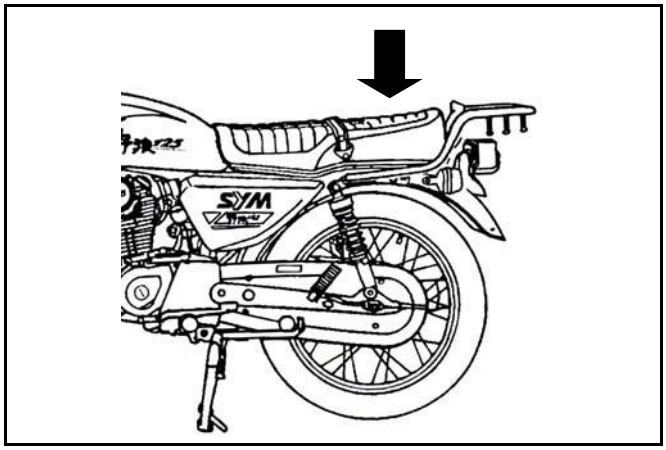
Front cushion

Press down the front cushion for several times to check its integrity.

Check if any oil leaks or damage found.

Replace relative parts if damage found.

Tighten all nuts and bolts.



Rear Cushion

Press down the rear cushion for several times to check its integrity.

Check if any oil leaks or damage found.

Replace rear cushion if any damage found.

Park motorcycle with main stand.

Move the rear wheel sideways forcefully to see if the swing arm bushing and pivot nut are loosened.

Tighten all nuts and bolts.

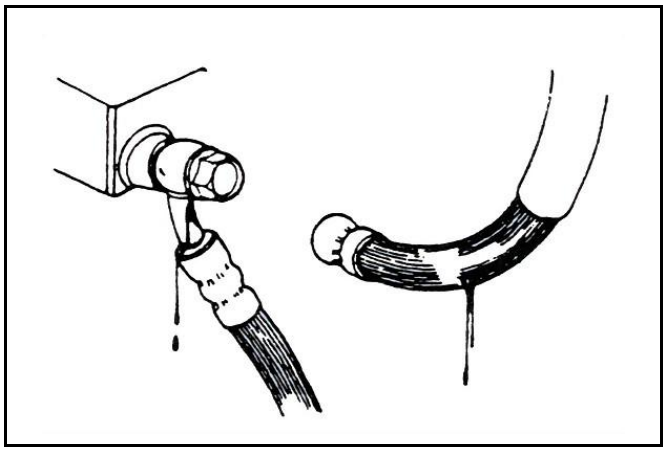
Disk Brake System

Brake System Hose

Check the brake hoses for corrosion or brake fluid leaking.

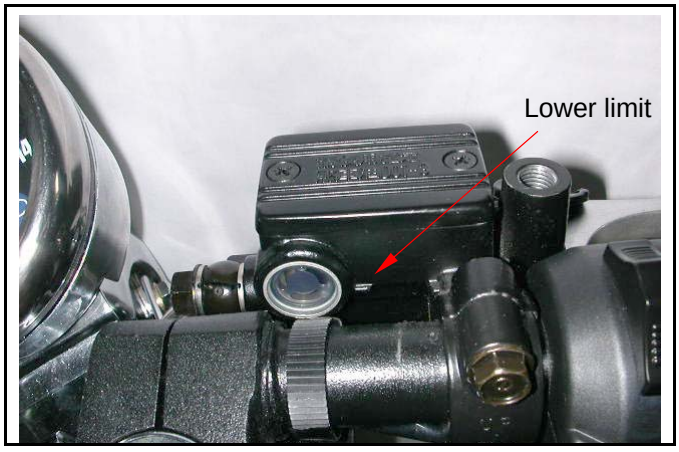
Brake Fluid

Check brake fluid level in the brake fluid reservoir. If the level is lower than the LOWER limit, add brake fluid to UPPER limit. Also check brake system for leaking if low brake fluid level found.



⚠ Caution:

- In order to prevent the brake fluid overflow by accidental shaking of the steering handle, keep the reservoir in horizontal position and hold the steering handle firmly. Don't take off the brake fluid cap before keeping the steering handle steady.
- Do not operate the brake lever after the cap had been removed. Otherwise, the brake fluid will spray out.
- Do not mix non-compatible brake fluid together.

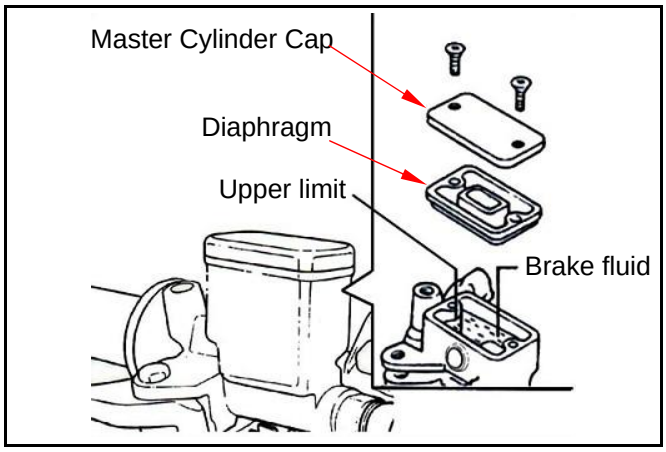


Air Bleed Operation

Connect a transparent hose to draining valve. Hold the brake lever and turn the air-bleeding valve open. Perform this operation several times until there is no air bubble inside the transparent hoses.

⚠ Caution:

- Before closing the air bleed valve, do not release the brake lever.

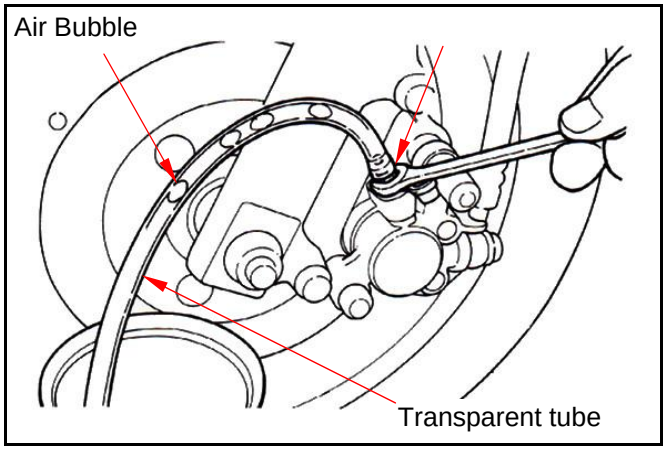


Add Brake Fluid

Add brake fluid to UPPER limit lever. Recommended brake fluid: DOT3 or DOT4 WELL RUN brake fluid.

⚠ Caution:

- Never mix or use dirty brake fluid to prevent braking system deterioration or reducing brake performance.



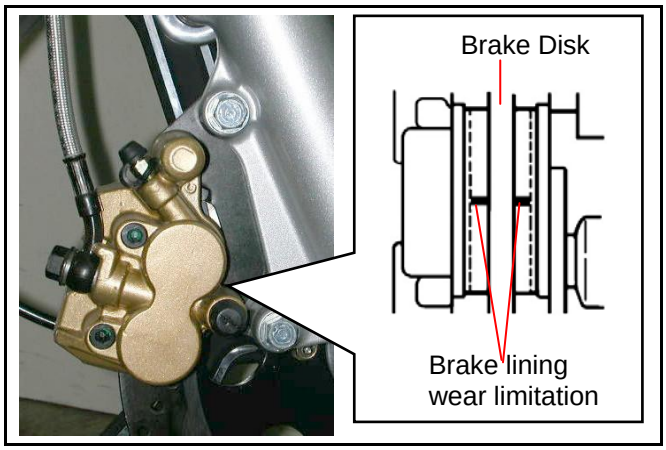
Brake Lining Wear

The indent mark on brake lining is the wear limitation.

If the wear limit mark approximates the edge of brake disc, replace the brake lining.

⚠ Caution:

- It is not necessary to remove brake hose when replacing the brake lining.



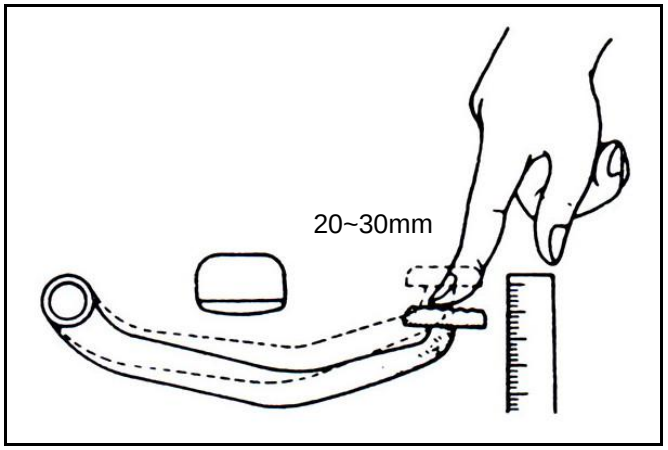
Drum Brake System

Rear brake pedal free play

Press down the brake pedal slightly, and measure the free play before brake engagement.

Free play：20~30 mm

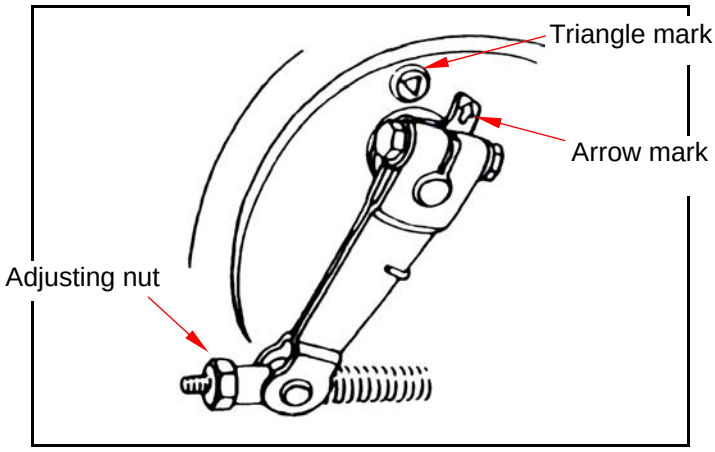
Turn the brake-adjusting nut clockwise to decrease the free play. Or turn the nut counterclockwise to increase the free play.



Brake lining inspection

When pulling the brake lever, if the arrow mark on the braking arm reaches the triangle mark on the brake panel, it means that the brake lining needs to be changed.

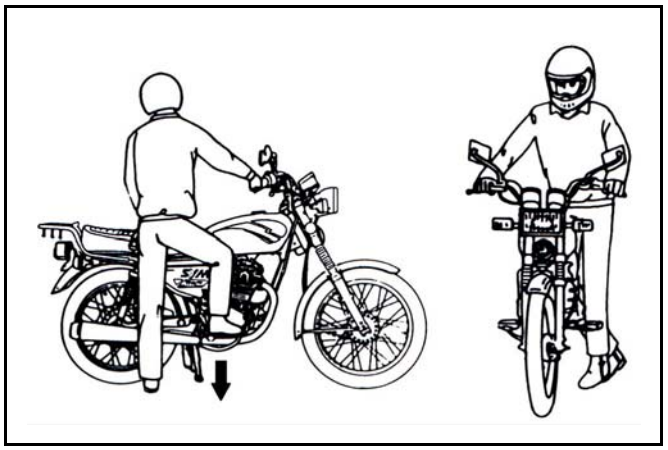
Please refer to Chapter 11 and 12 for brake lining exchange process.



Brake system integrity check

⚠ Caution:

- After changing the brake lining or the brake fluid, you must check the brake system to see if it works well or not.



Tire

Check the pressure of the tire to see if it's in the specified pressure range.

⚠ Caution:

- Tire pressure check should be done when the tire is cold.

Specified tire pressure range

Tire pressure		FR	RR
Tire pressure when cold (Kg/cm²)	Single ride	1.8	2.0
	With passenger	1.8	2.4

Specified tire：

Front wheel：2.75-18-42P

Rear wheel：3.00-17-45P

Check if tire surface is ticked with nails, stones or other objects.

Check if front and rear tires pressure is normal.

If the wearing of the tire thread reaches triangle TWI mark index, the tire also have to be changed.

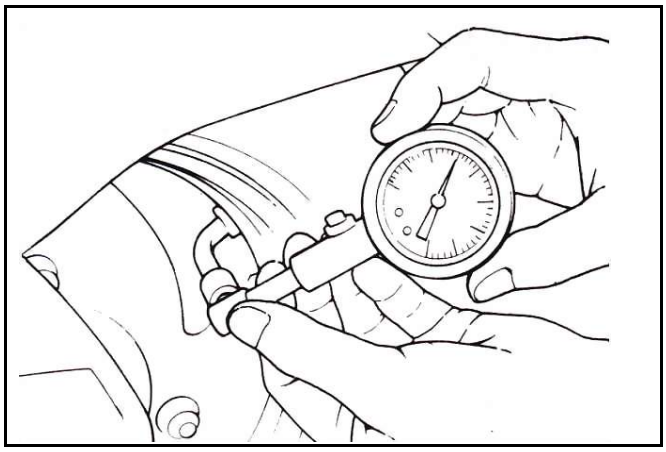
Measure tire thread depth from tire central surface, and if the depth is not enough, please change the tire.

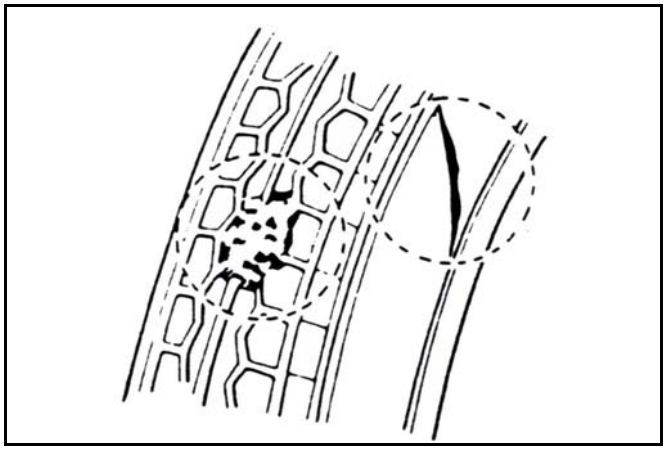
Front tire thread：1.5 mm

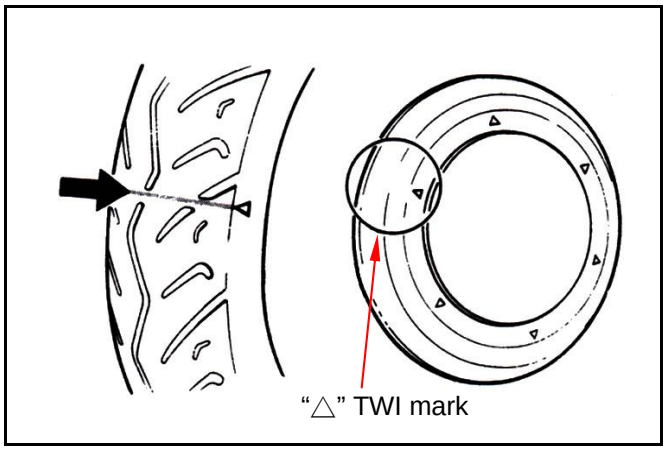
Rear tire thread：2.0 mm

⚠ Caution:

- The triangle TWI mark index is located along the tire wall.



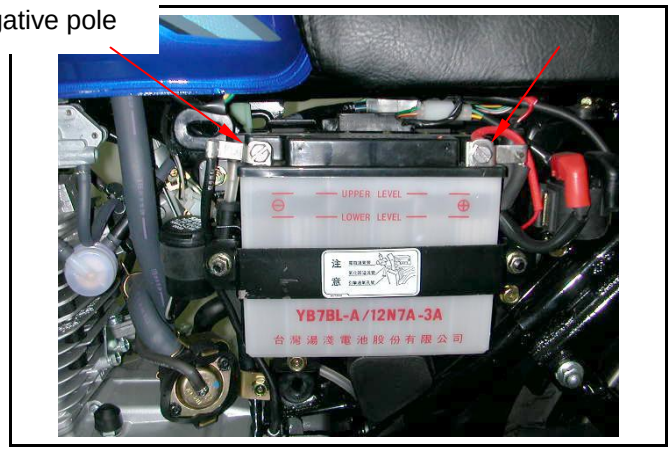




Battery

Battery removal

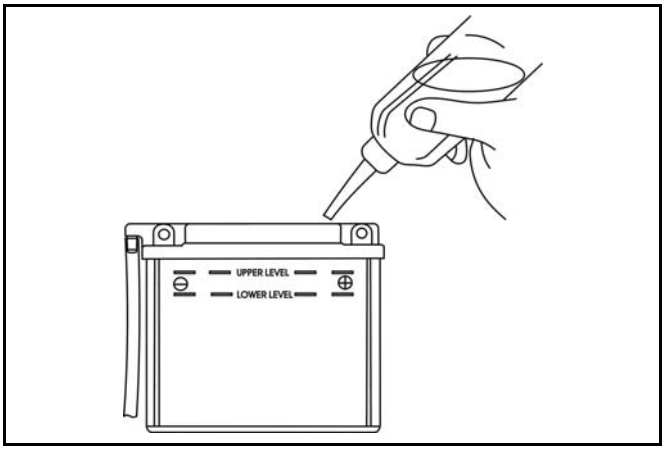
Remove the left side cover.
Remove the 〝—〞 negative pole first, then remove the 〝＋〞 positive pole.
Unplug the ventilation tube
Remove the battery holder and take out the battery.



If the battery liquid level is too low, please remove the top plug, and fill in distilled water to the upper limit.

⚠ Caution:

- Don't fill in too much distilled water, or the electrolyte may overflow and corrode the frame.
- Only distilled water is allowed. If any impure water is filled in, it will shorten the battery life.

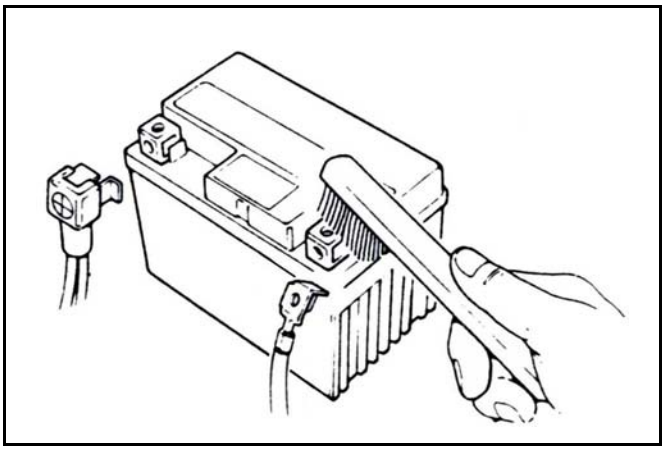


⚠ Warning:

- The electrolyte contained sulfuric acid. Please avoid touching the eyes, skin, or clothes. If any contact by accident, please flush with plenty of water.

If there is some rust on battery posts, clean it with steel brush

Install the battery in the reverse procedures of removal



⚠ Caution:

- If the rust on the posts is very serious, spray some hot water on them. Then, more easily you can remove the rust by steel brush.
- Apply some grease on the posts after cleaning rust to prevent from happening again.

Headlight Adjustment

Turn on main switch. Loosen the headlight adjustment screw to adjust headlight beam height.

⚠ Caution:

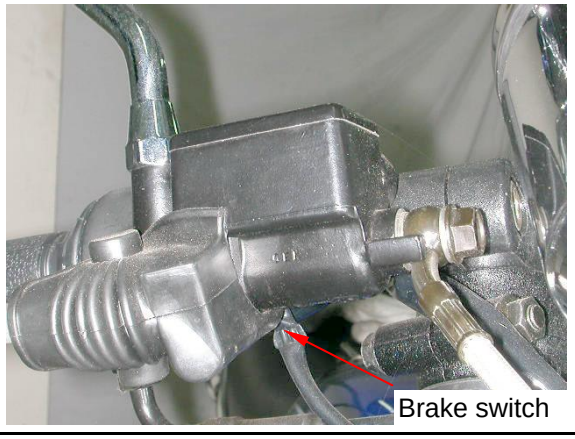
- The factory setting of the beam height is consistent with government orders.
- Improper headlight beam setting will make driver in the opposite lane dazzled and cause danger.

Brake Switch

Inspection on the brake switch

When brake lever is pulled, brake switch will light up the brake lamp.

Make sure that electrical starter can be activated only under braking condition.



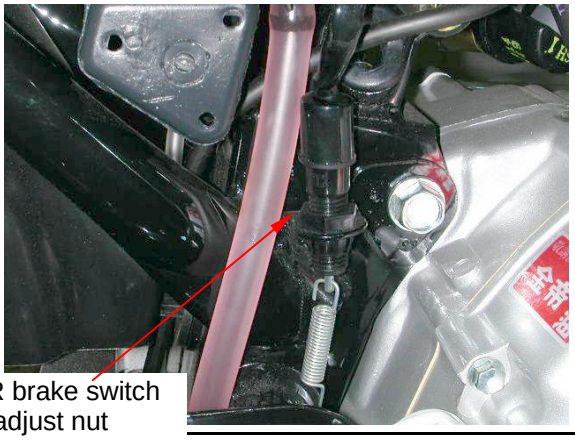
Adjustment of rear brake switch.

Turn on the main switch.

When the brake pedal is stepped down for 20mm，the brake lamp should be activated.

If the brake lamp is not activated or activated too early, please adjust through the rear-brake-switch adjusting nut.

Turning clockwise will decrease the free play, and counterclockwise to increase the free play.



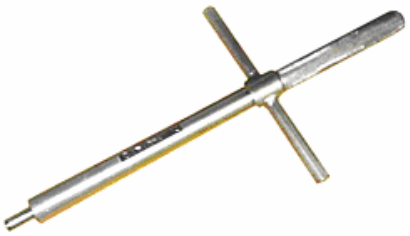
Nuts, Bolts Tightness

Apply periodical maintenance in according with the Periodical Maintenance Schedule.

Check if all the bolts and nuts on the frame are tightened well.

Check all fixing pins, snap rings, hose (pipe) clamps, and wire holders for security.

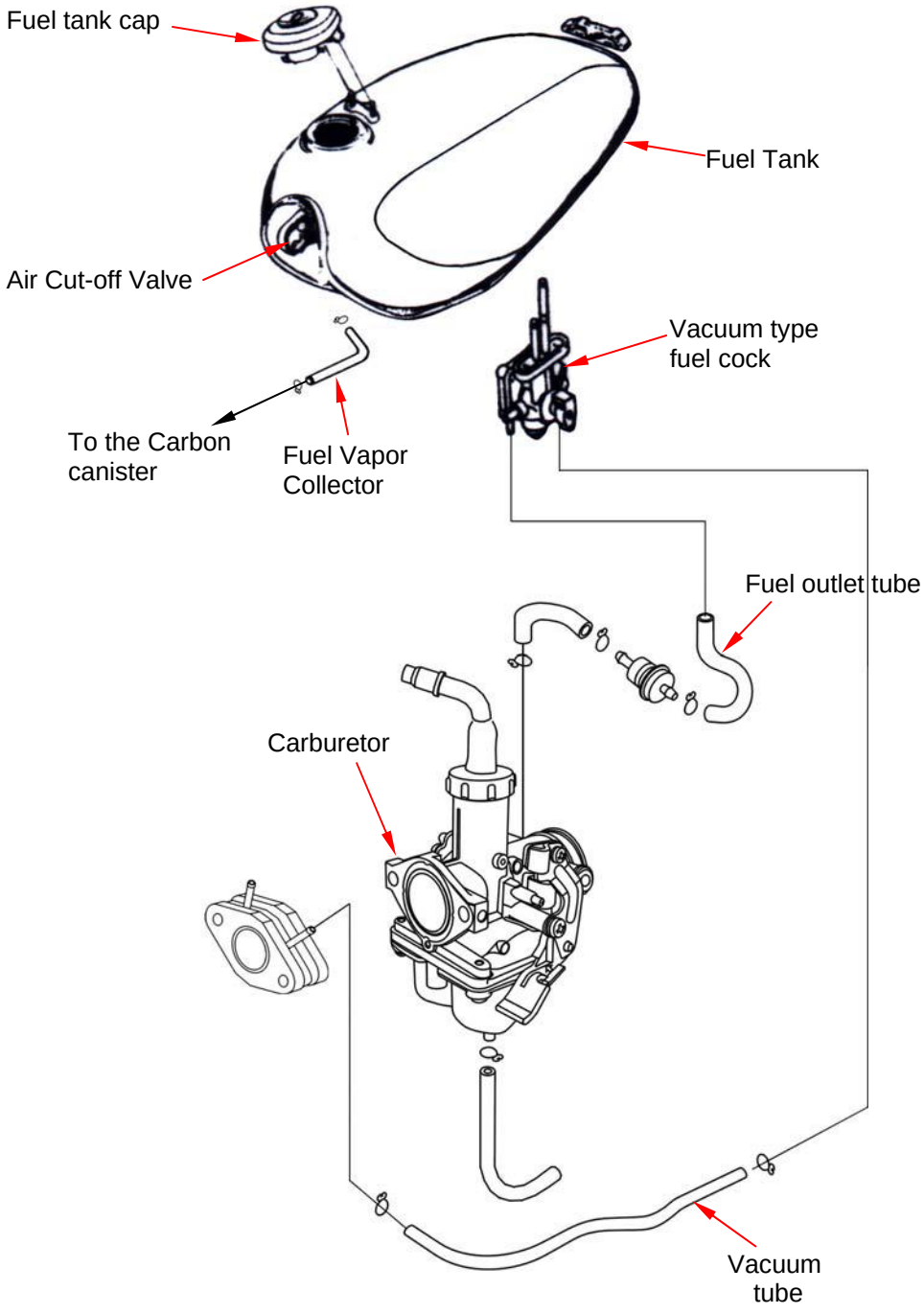
Special Tools

		
Name: Rocker arm shaft disassemble tool SY No.: SYM-1445100	Name: Valve cover wrench SY No.: SYM-1236100	Name: Valve remove and assemble tool SY No.: SYM-1471110/20
		
Name: Valve spring compressor SY No.: SYM-1471100	Name: Tappet adjusting wrench SY No.: SYM-9001200	Name: TAPPET ADJUSTING TOOLS SY No.: SYM-9001210
		 (20*32*6)
Name: ACG Puller SY No.: SYM-3111000	Name: Oil pump fix nut socket SY No.: SYM-9023100-SY125	Name: 20*32*6 oil seal driver SY No.: SYM-9120200
 (6204)	 (6301)	 (6203/6004UZ)
Name: 6204 Bearing Driver SY No.: SYM-9110400	Name: 6301 Bearing Driver SY No.: SYM-9610000	Name: 6203/6004UZ bearing Driver SY No.: SYM-9620000

					
Name	Inner bearing puller set	Name	Outer bearing puller	Name	Steering Nut Wrench
SY No.	SYM-6204025	SY No.	SYM-6204001	SY No.	SYM-5320000
					
Name	Crankcase bush puller 30mm	Name	Electrical Gauge	Name	
SY No.	SYM-1120310	SY No.	SYM-HE07007-01	SY No.	

Note:

Mechanism Diagram



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.

Caution

- Do not bend off throttle cable. Damaged throttle 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 air cut valve arbitrarily.

Specification

Item	Specification
Carburetor diameter	Ø 35 mm
I.D. number	PTG043B
Fuel level	14.8 mm
Main injector	# 98
Idle injector	# 35
Idle speed	1500±100 rpm
Throttle handle clearance	2~6 mm
Pilot screw	1 1/2 turns

Torque Value:

Carburetor holding nut: 0.7~1.1kgf-m

Special service tools

Vacuum/air pressure pump

General Tool

Float Chamber fuel level gauge

Troubleshooting

Engine won't start
- No fuel in fuel tank
- Clogged fuel tube
- Excessive fuel in cylinder
- No spark from spark plug (malfunction of ignition system)
- Clogged air cleaner
- Malfunction of carburetor chock
- Throttle cable damaged

Engine stall after started
- Malfunction of carburetor chock
- Incorrect ignition timing
- Malfunction of carburetor
- Improper engine oil
- Air leakage into inlet manifold
- Incorrect idle speed settings.

Unstable Idle speed
- Abnormal ignition system
- Incorrect idle settings.
- Abnormal carburetor
- Impure fuel

Misfire when accelerates
- Malfunction of ignition system.

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

Weak engine power
- Fuel system clogged
- Malfunction of ignition system

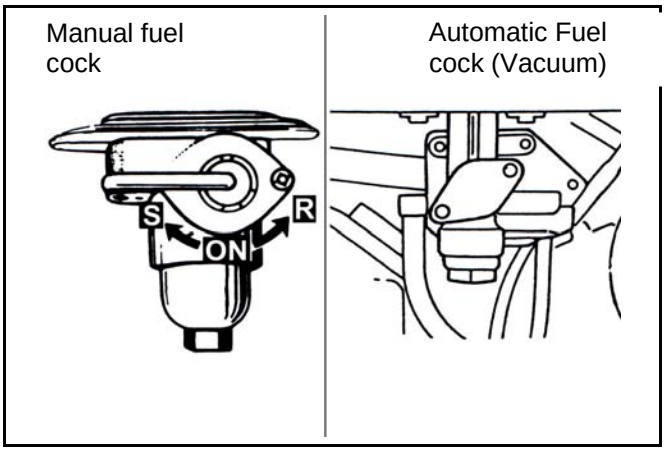
Fuel / Air Mixture too lean
- Clogged carburetor jet
- Carburetor parts stick and closed
- Malfunction of float valve
- Fuel level too low in float chamber
- Clogged fuel tank cap vent
- Clogged fuel filter
- Obstructed fuel pipe
- Clogged air vent hose
- Air leakage into inlet manifold

Fuel /Air Mixture too rich
- Clogged air injector
- Malfunction of float valve
- Fuel level too high in float chamber
- Malfunction of carburetor chock
- Dirty air cleaner

Carburetor Removal

Removal

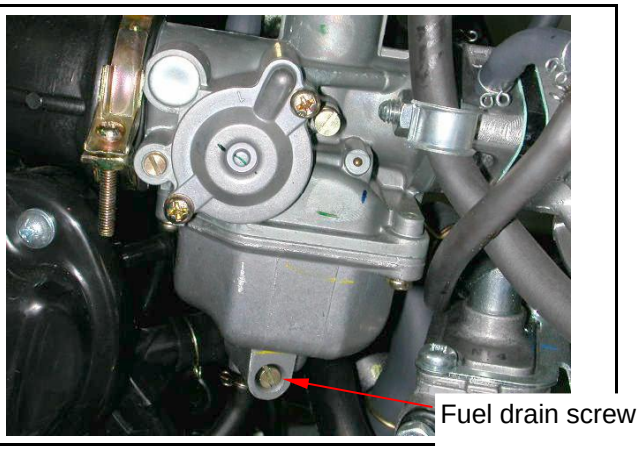
Turn the fuel cock switch to the S position (If the fuel cock is vacuum type, it won't be necessary)



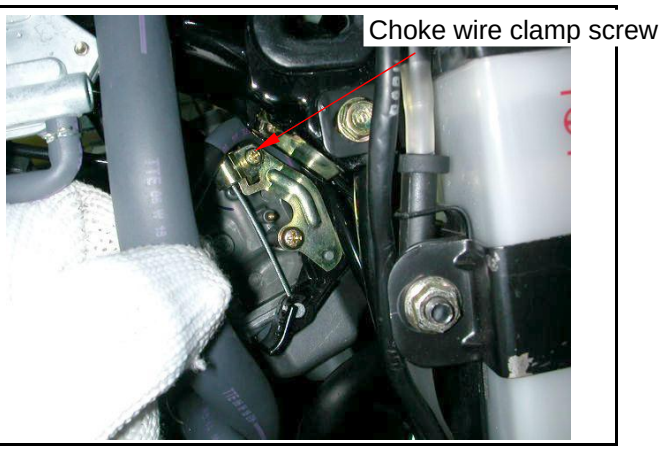
Put a container near the fuel drain screw, and loosen it. Drain all the fuel of the float chamber

Warning

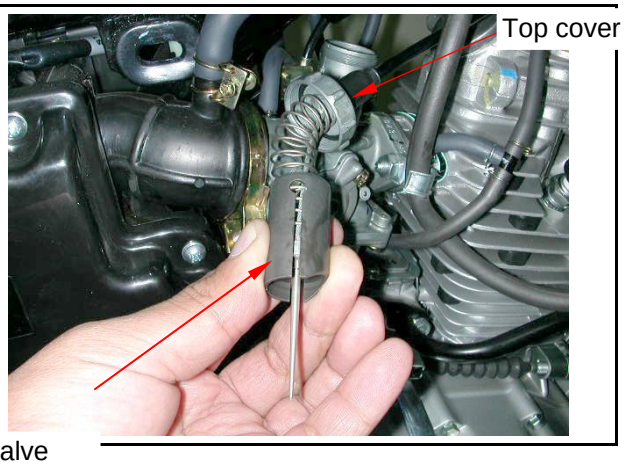
- Gasoline should stay away from fire, and avoid getting on the frame. If gasoline gets on the frame, please wash it off immediately.



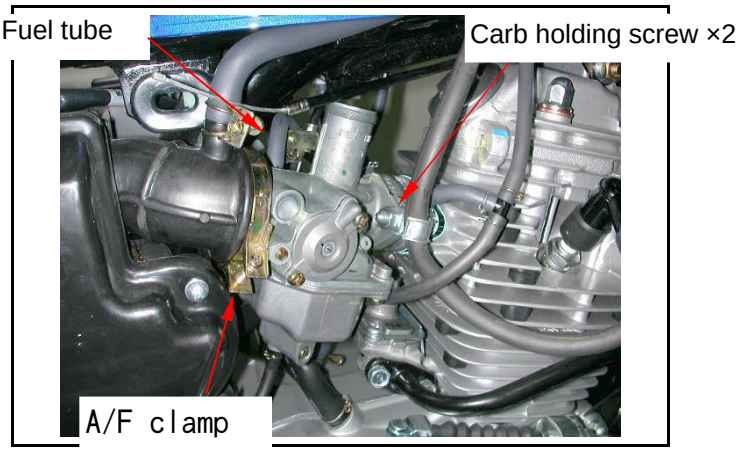
Loosen the choke wire clamp screw, and remove the choke wire.



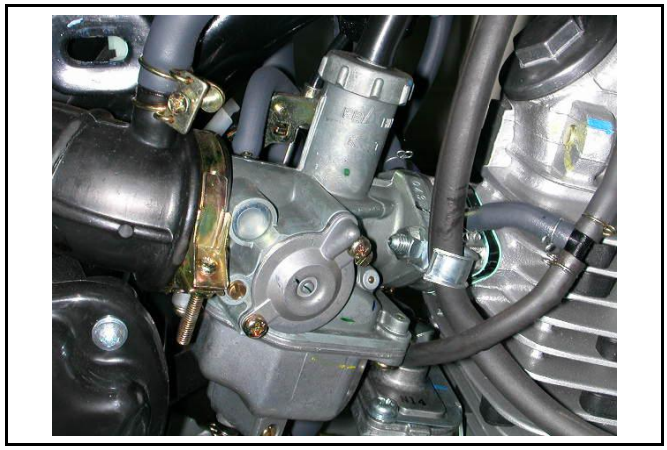
Remove the carburetor top cover by turning it counterclockwise. Remove the top cover, throttle cable, and throttle valve.



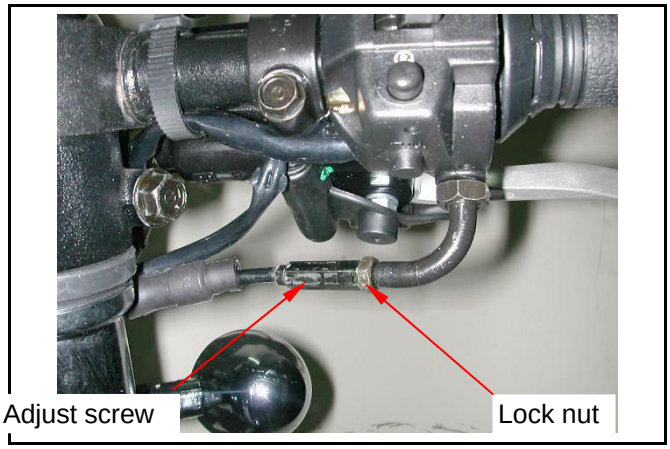
Remove the carburetor fuel tube. Loosen the clamp from the air- cleaner side, and unplug the fuel tube. Remove the carburetor holding nuts.
Remove the carburetor.



Installation
Install as the reversed order of removal procedures.
Torque value：
Carburetor holding nuts: 0.7~1.1kgf-m



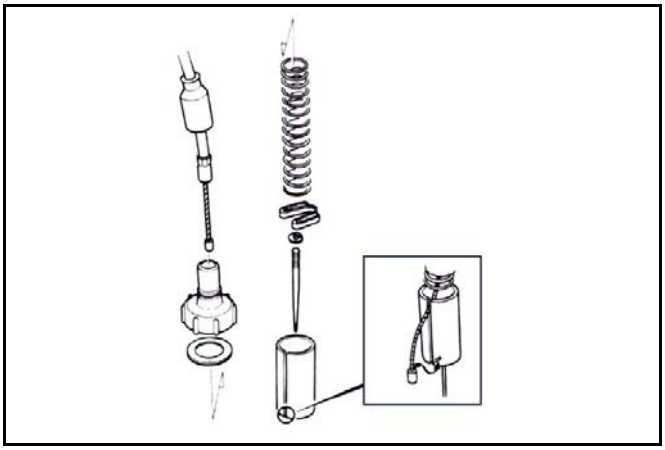
After installation, the following adjustment is required:
- Throttle cable free play.
- Idle speed adjustment.



Throttle Valve

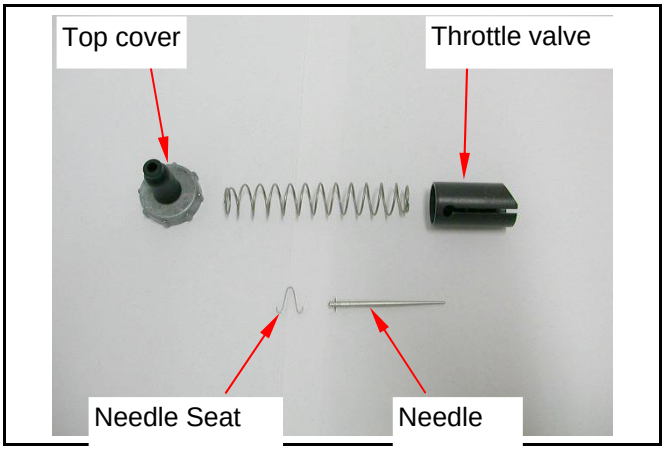
Disassembly

Compress the throttle spring and disassemble the throttle cable, and the spring.



Disassemble the needle seat and the needle from the throttle valve.

Check the throttle valve and the needle to see if they are damaged or not.



Installation

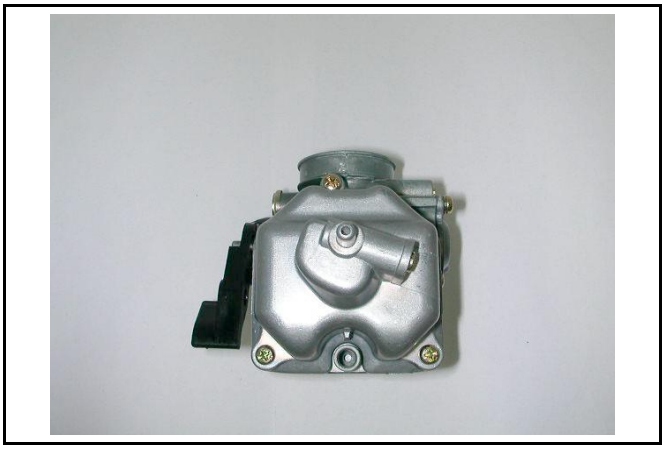
Install as reversed order of removal procedures.

Float Chamber/ Jet Set

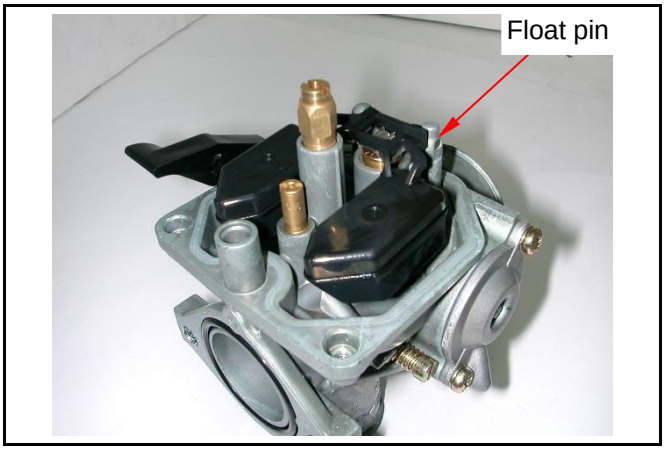
Remove 2 mounting screws and remove float chamber cover.

Warning

- Please fill the gasoline in float chamber into the fuel tank.



Remove the fuel level plate, float pin, float and float valve.



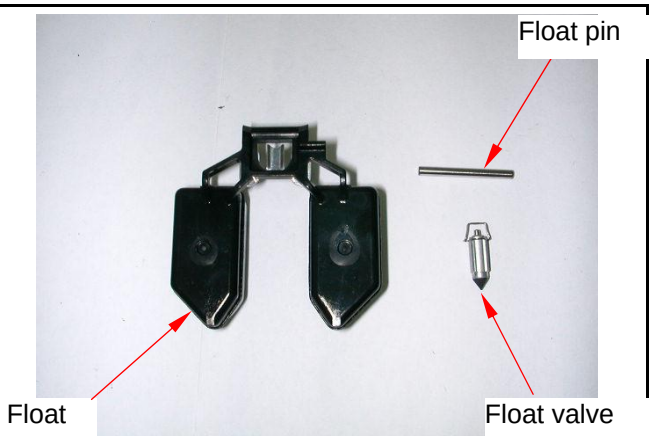
Inspection

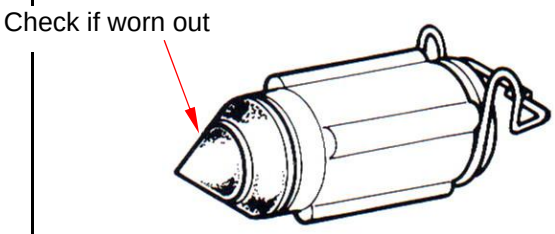
Check the float valve and valve seat to see if any damage or blocking.

Check float valve for wearing, and check valve seat face for wear, dirt.

Caution

- In case of worn out or dirty, the float valve and valve seat will not close tightly. The fuel will overflow. A worn out or dirty float valve must be replaced with a new one to fix the problem.

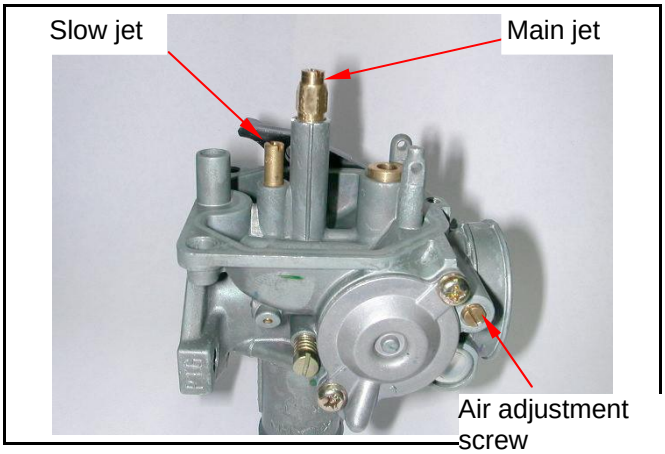




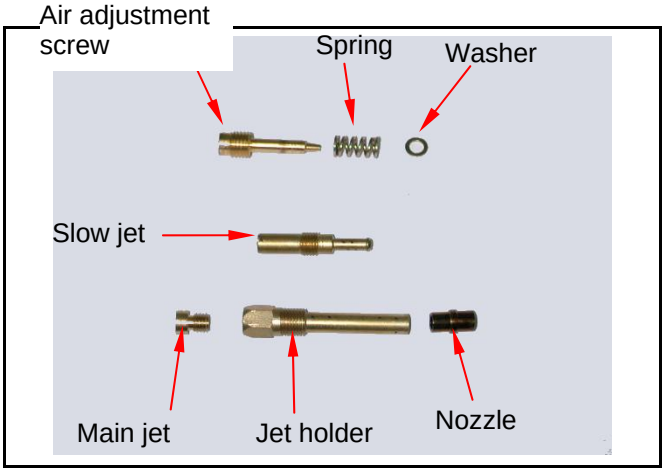
Remove main jet, needle jet holder, needle jet, slow jet and air adjustment screw.

Caution

- Be careful not to damage jets and adjust screw.
- Before removing adjustment screw, turn it all the way in and record the number of circles.
- Do not turn adjust screw forcefully, or the valve seat may be damaged.
- When airscrew is removed, please also take out the inner washer with it.

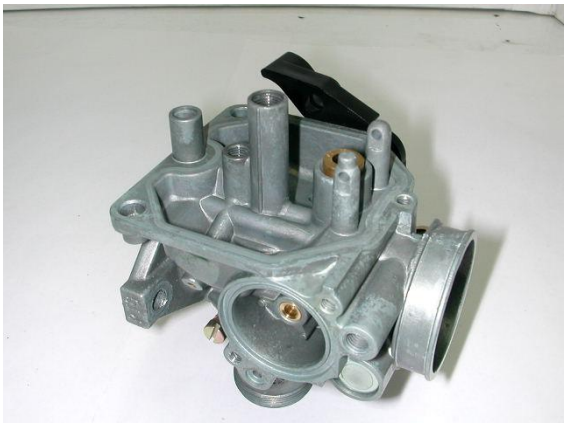


Clean jets with Carburetor conditioner. Then use compressed air to blow the dirt off.



Assemble

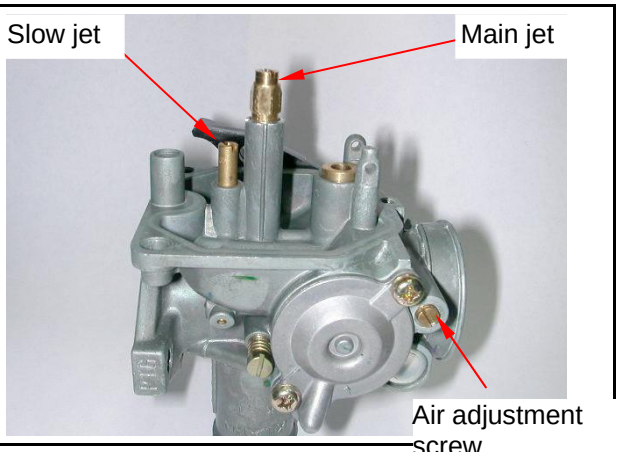
Before assembling, please blow the fuel passages with compressed air.



Assemble the main jet, jet holder, nozzle, slow jet, and the air screw.

⚠ Caution

- Please assemble the air screw with the same setting circles as removal.



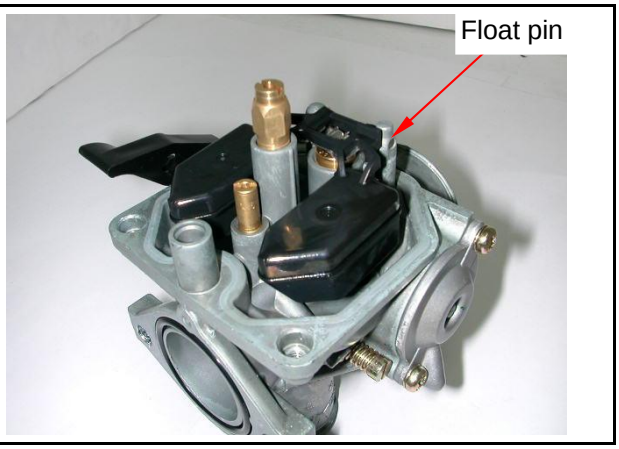
Assemble the float valve, float, float pin. After confirming the fuel level, assemble the float chamber cover (3 screws).

Checking fuel level

⚠ Caution

- Check the float valve and float for proper installation.
- To get the correct reading, position the float meter in the way that float chamber face is vertical to the main jet.

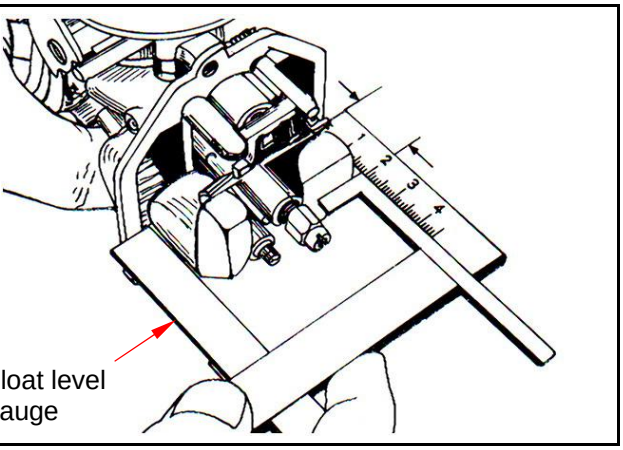
Fuel level：14.8mm



Carburetor Installation

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

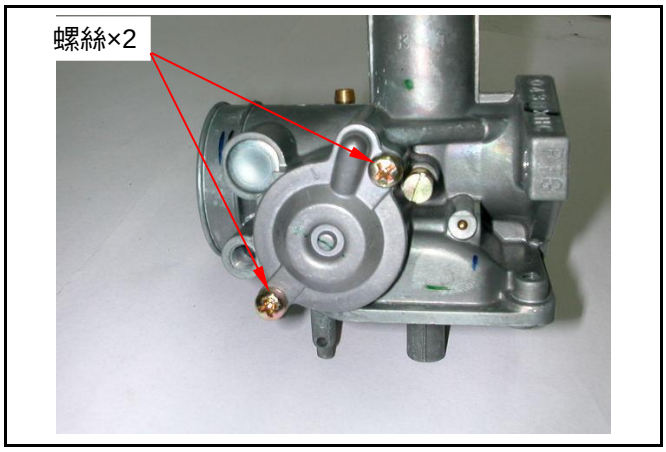
- Throttle cable free play adjustment.
- Idle adjustment



Air Cut-off Valve

Removal

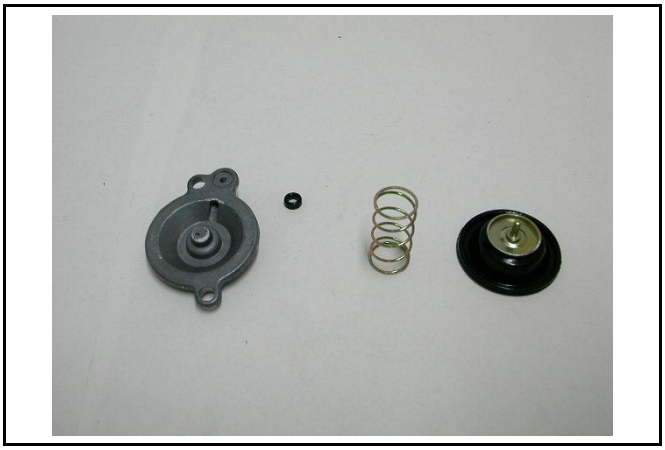
Removal the throttle cable seat (2 screws)



Remove the screws (2 screws) of the air cut-off valve and the cover.

Remove the spring and vacuum diaphragm

Check the diaphragm to see if deterioration or crack found.

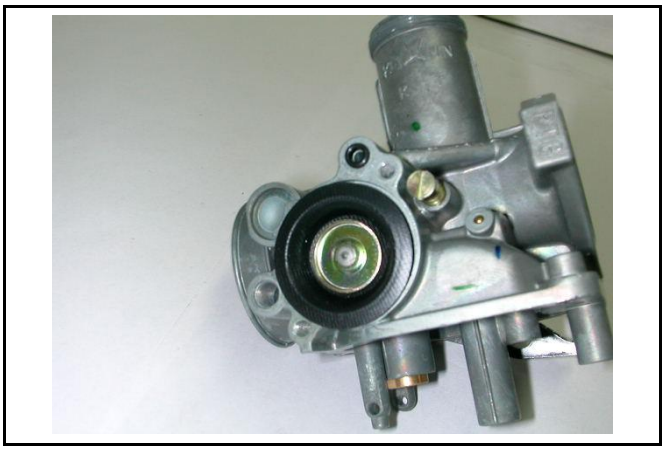


Install

Install the valve as reverse order of removal.

Caution

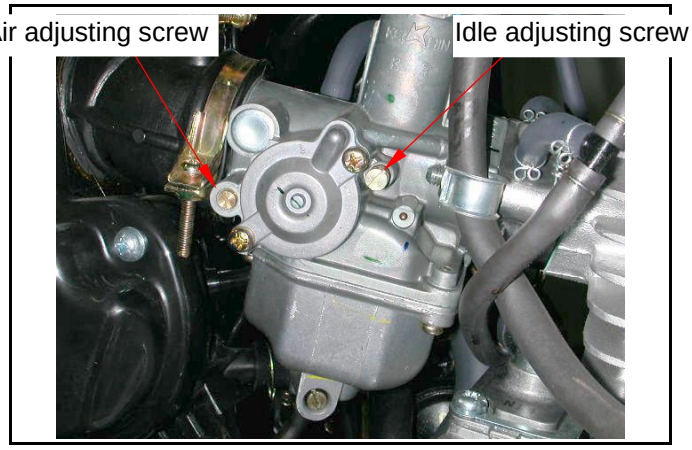
- Do not damage the vacuum diaphragm or in opposite installation direction.



Idle Speed Adjustment

⚠ Caution

- Air-screw was set at factory, so no adjustment is needed. For easy installation, count the number of circles it takes to screw the air-screw to the bottom.
- The idle adjustment process must be done while the bike is on its main stand.



Use a tachometer while adjusting engine RPM.

Screw in air adjustment screw gently, then back up to standard circles.

Standard setting：1 ½ circles

Warm up engine fully; adjust the throttle stopper screw of throttle valve to achieve the standard idle RPM.

Standard idle RPM：1500rpm±100

Connect the hose of exhaust analyzer to exhaust front end. Press test key on the analyzer.

Adjust the air adjustment screw and read CO reading on the analyzer.

The standard value of CO emission：

1.0~1.5 %

Gradually increase the throttle, make sure rpm and CO value are within the standard range after engine running stable. If rpm and CO value fluctuated, repeat the procedures above for achieving the standard value.

Fuel Tank

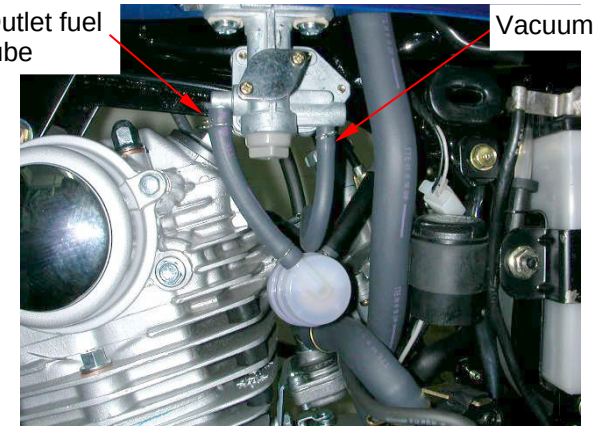
Fuel tank removal

Manual fuel cock

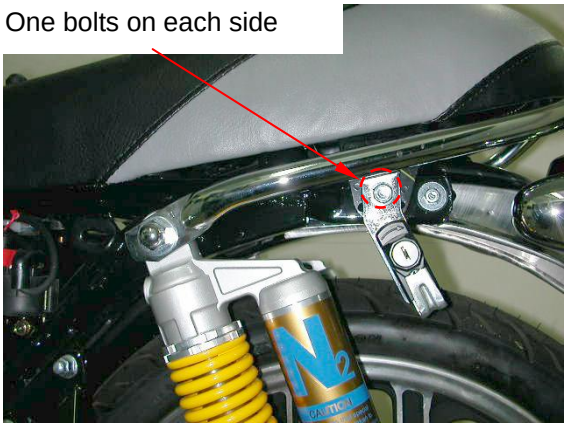
Turn off the fuel cock switch, and disassemble the outlet fuel tube.

Vacuum operated automatic fuel cock

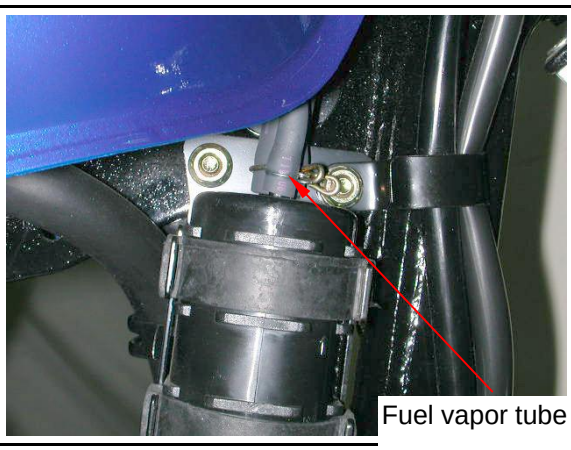
Disassemble the outlet fuel tube and the vacuum tube.



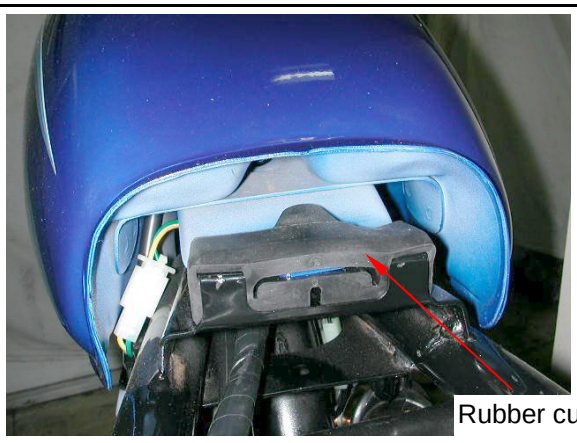
Remove the seat(Bolts×2) ◦



Disassemble the fuel-vapor tube to the carbon canister.



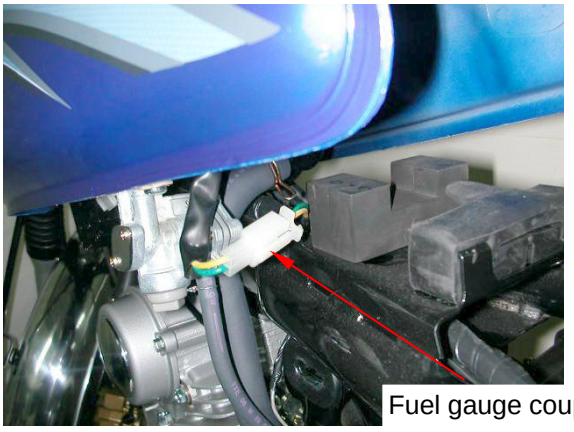
Take out the fixing rubber cushion behind the fuel tank.



Slightly pull the fuel tank back toward the tail of the bike. This will help the fuel tank to separate from the frame.
Disassemble the fuel gauge coupler.
Remove the fuel tank.

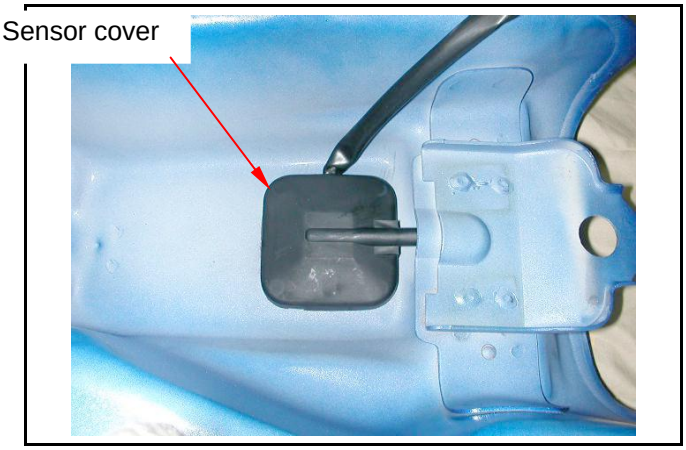
Caution

- If the fuel tank is broken or leaking, please change a new one immediately.

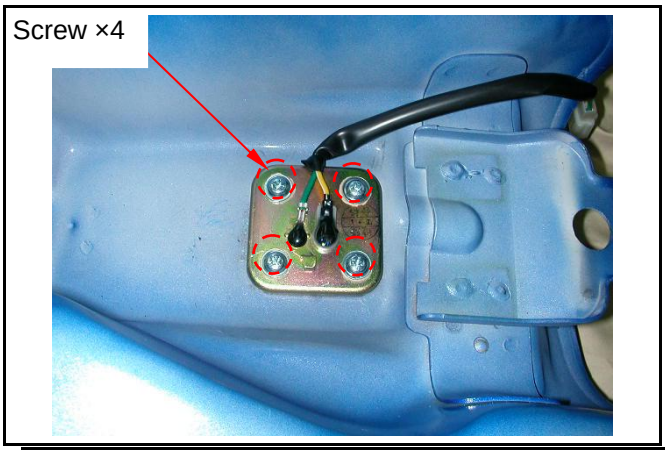


Fuel amount warning sensor/ Fuel gauge disassembly.

Remove the protective cover of fuel amount warning sensor or Fuel gauge sensor.



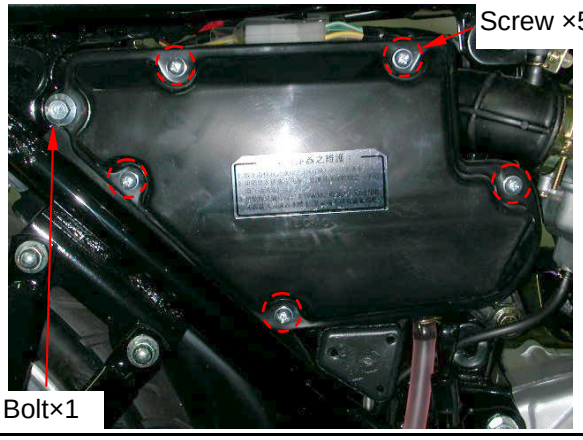
Remove the holding screws (screw ×4)



Take out the fuel amount warning sensor or fuel gauge sensor.
Please refer to the 13th chapter for the detailed inspection for the gauges.

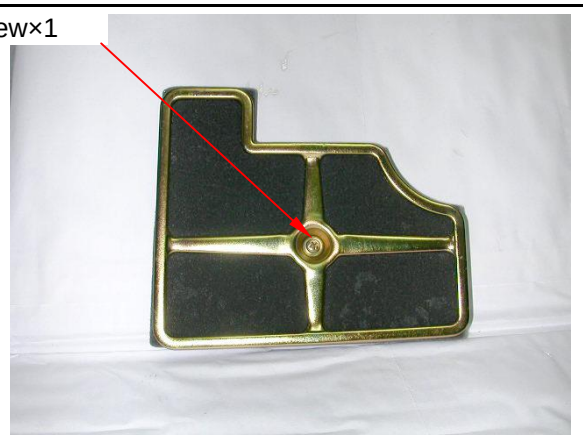
Air Cleaner

Remove the air filter cover
(Screw x 5, bolt x 1)



Remove the air filter element.

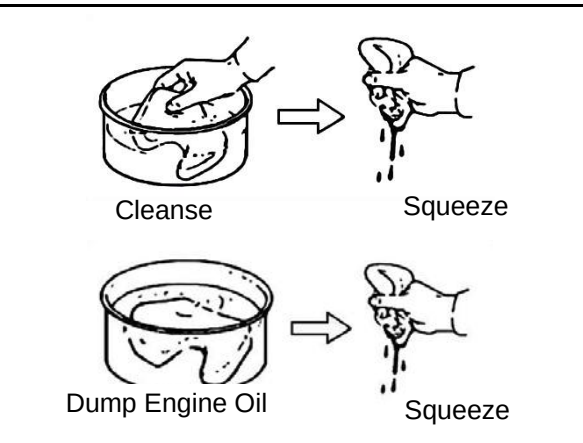
Remove the air filter holding plate and take out the air filter element. (Screw×1) ◦



Wash the air filter element with non-flammable or high flash-point solvent. (Like kerosene or diesel)
After washing, squeeze it and dump into motor oil, and squeeze again.
Install the holding plate and the air filter cover
If the element is too dirty or damaged, please change a new one.

⚠ Caution

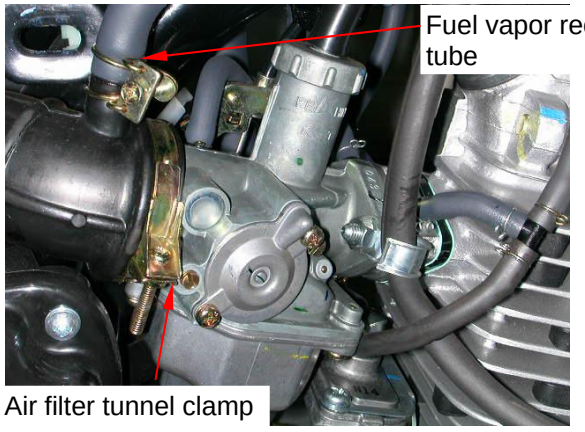
- Don't use gasoline or other flammable solvents to clean the element.



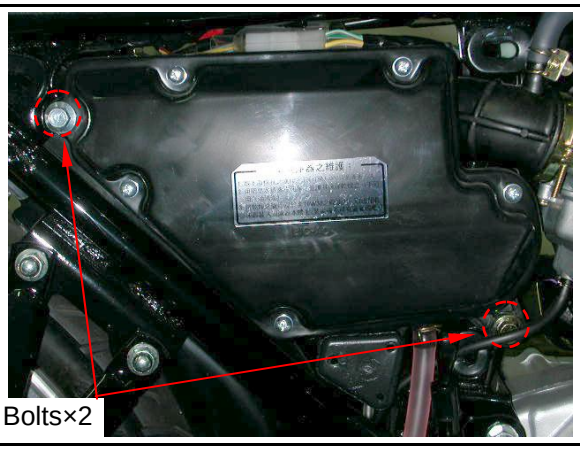
Installation

Install as reverse order of removal. ◦

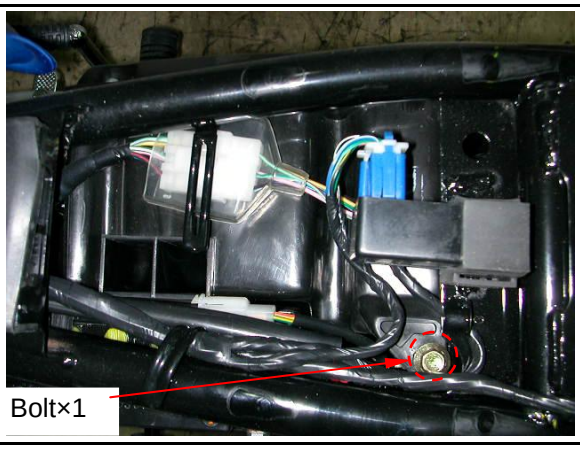
Air filter assembly removal
Remove the right body cover
Remove the cushion.
Loosen and remove t he air filter tunnel clamp and unplug the fuel vapor recycle tube.



Remove the air filter box mounting bolts. (Bolts X 2)

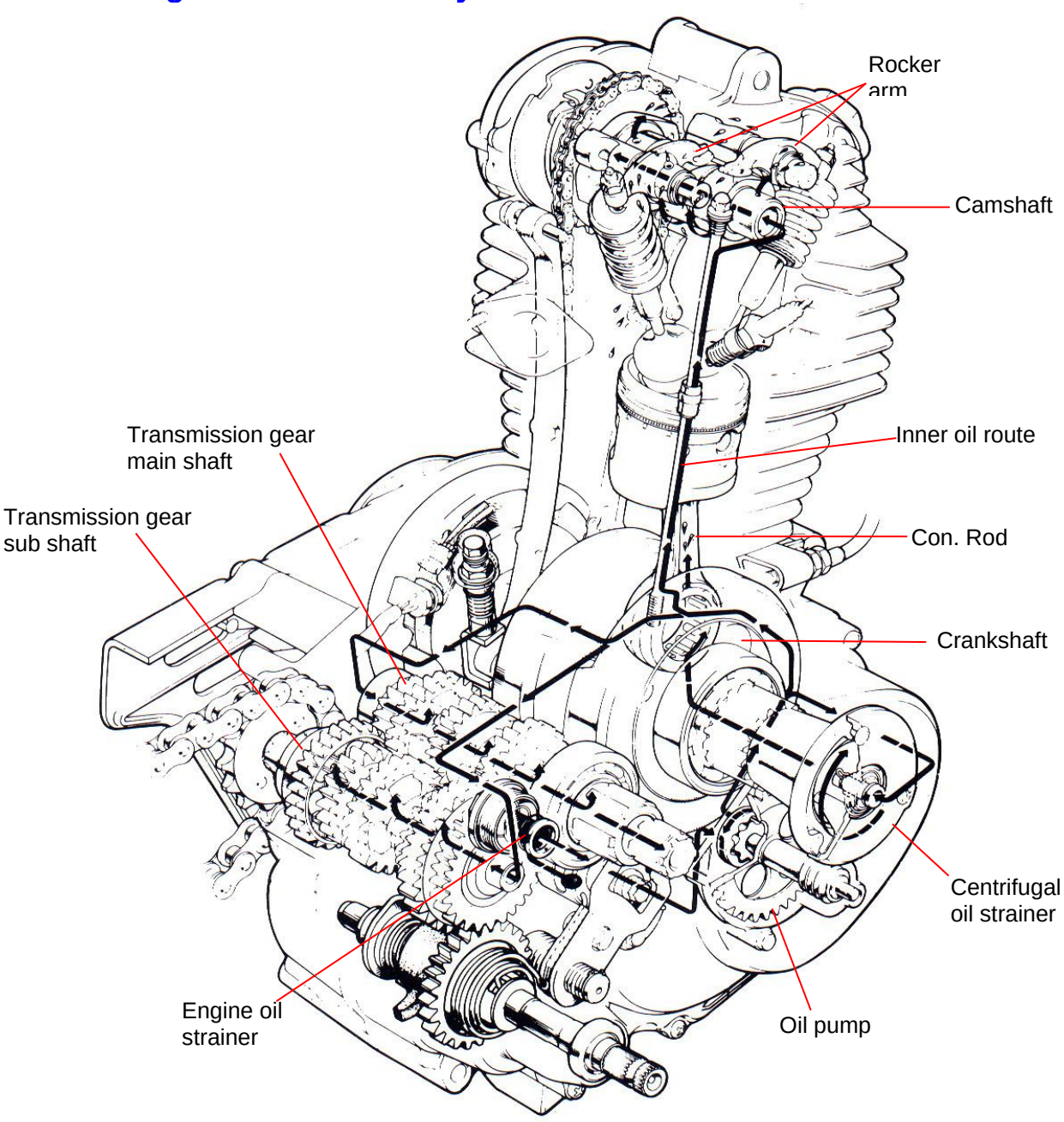


Remove the air filter box upper mounting bolt (bolt×1) ◦
Remove the air filter assembly.

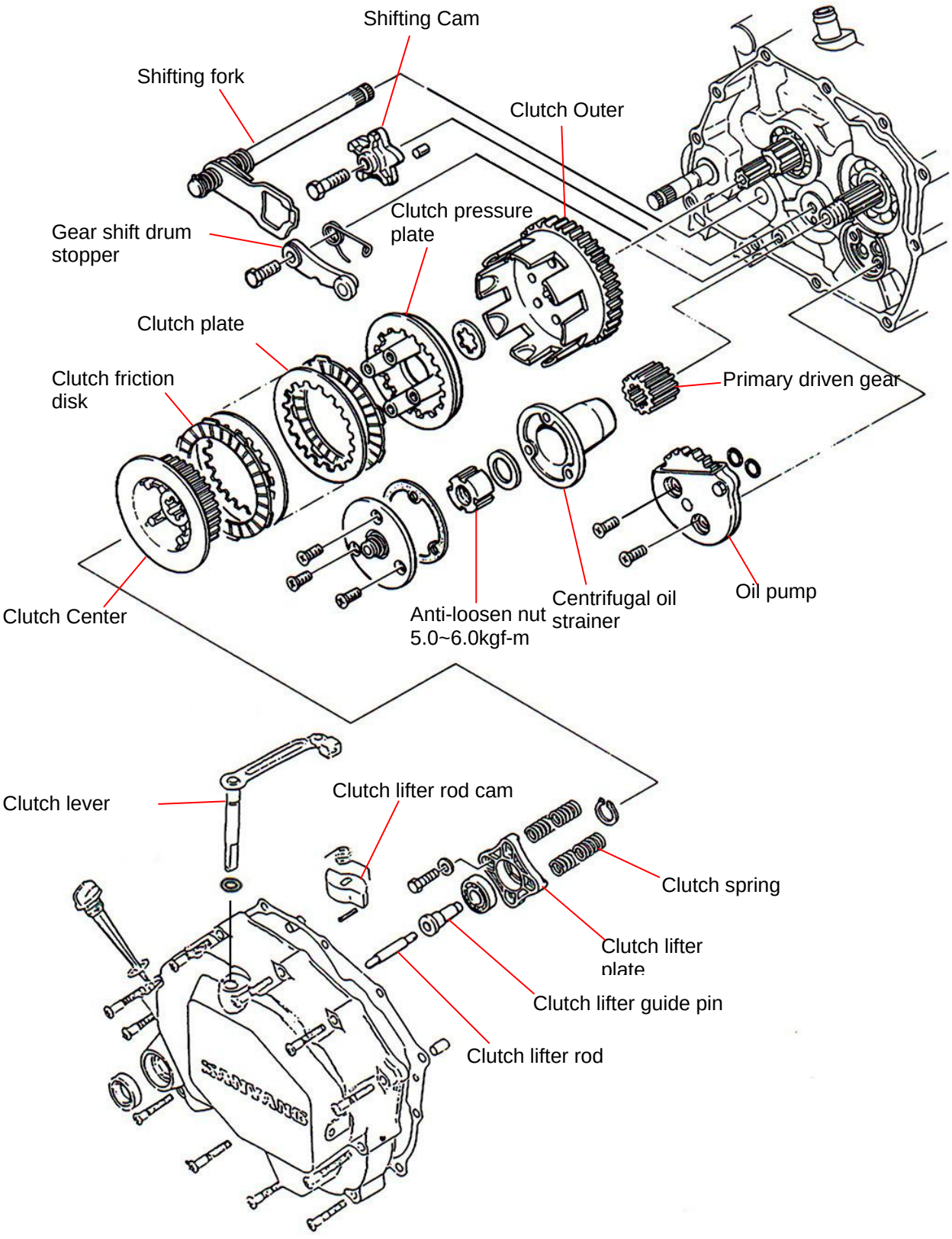


Installation
Install as the reversed order of removal.

Mechanism Diagram-Lubrication system



Mechanism Diagram – clutch/transmission



Precautions in Operation

General information

- This chapter covers the engine oil pump and the oil exchange, also the disassembly and the shifting linkage is covered. All these operations can be done while the engine is still on the bike.

Specification

Engine oil quantity：

Full disassembly：1200 c.c.

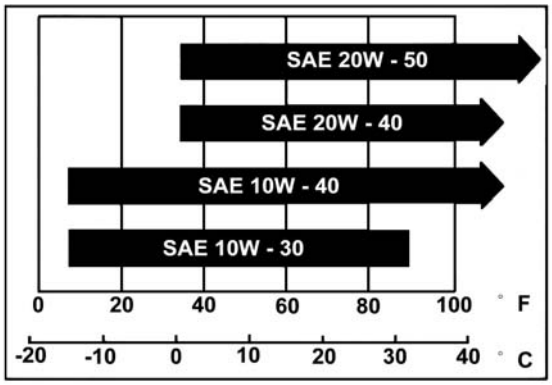
Regular maintenance：1000 c.c.

Recommended engine oil viscosity:

SAE 10W-30

(The Bramax series oil is recommended)

Engine Oil viscosity



Measurement: mm

Item		Standard	Service Limit
Oil pump	Clearance between inner rotor and outer rotor	0.30	0.35
	Clearance between outer rotor and the pump body	0.30~0.36	0.40
	Rotor to pump cover clearance	0~0.06	0.11
Clutch	Lever free play	10~20	-
	Spring free length	35.50	32.40
	Friction disk thickness	3.00	2.50
	Clutch plate warp	0	0.20

Torque value:

Oil drain bolt: 1.5~2.5kgf-m

Oil strainer cover: 1.5~3.0kgf-m

Oil pump cover bolts: 0.4~0.6kgf-m

Oil pump screw: 0.3~0.4kgf-m

Centrifugal strainer cover screw: 0.3~0.4kgf-m

Centrifugal strainer nut: 5.0~6.0kgf-m

R. Crank case bolts: 0.8~1.2kgf-m

Special Tools

Centrifugal oil strainer nut socket wrench: SYM-9023100-SY125

Cylinder head/ oil strainer cover wrench: SYM-ALL23461

Troubleshooting

Insufficient engine oil
- Oil leaks
- Valve guides or seals worn out.
- Worn piston rings.

Insufficient oil pressure
- Insufficient oil amount.
- Clogged oil strainer, oil route, oil tubes
- Abnormal oil pump

Engine oil dirty
- It's not exchanged properly on time.
- Cylinder head gasket damaged.
- Worn piston rings.

Clutch slips when accelerating
- Insufficient clutch free play.
- Worn clutch disks
- Weak clutch springs.

Unable to disengage the clutch, or the bike trembles while clutch disengaged
- Excessive clutch free play settings.
- Warped clutch plates.

Excessive clutch lever pulling force
- Twisted or insufficiently lubricated clutch cable
- Damaged clutch cable
- Clutch lifter mechanism damaged.

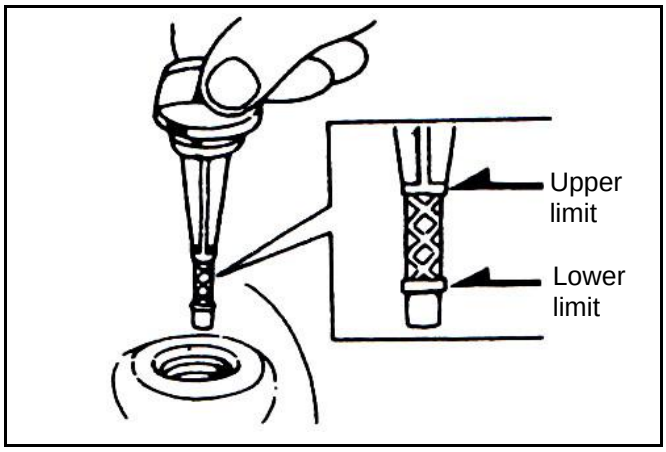
Hard to shift gear
- Excessive clutch free play settings.
- Twisted or bent shifting forks.

Gearshift pedal won't return
- Broken or weak return spring.
- Bent shift spindle.

Gear jumps out
- Broken stopper arm spring.
- Bent shift spindle.

Engine Oil

Turn off engine, and park the scooter on flat surface with main stand.
Check oil level with oil dipstick.
Do not screw the dipstick in while checking.
If oil level is low, fill into recommended oil to reach the upper limit.

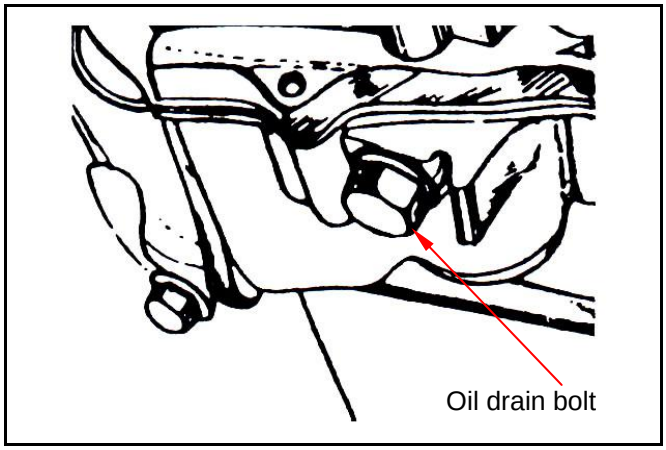


Oil Change

⚠ Caution

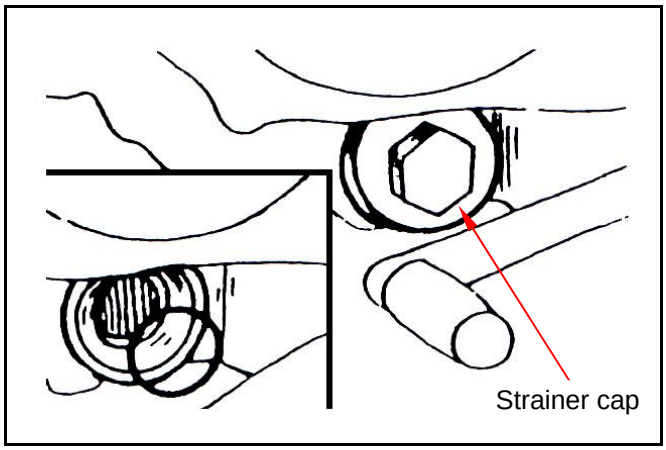
- Drain oil when the engine is fully warmed up, so the oil can be drained completely.

Place an oil basin under the bike, and remove oil drain bolt.
After all oil is drained, make sure washer can be re-used, and re-install oil drain bolt.
If the Oil drain bolt washer is damaged, it should be replaced.
Torque value：1.5~2.5kgf-m

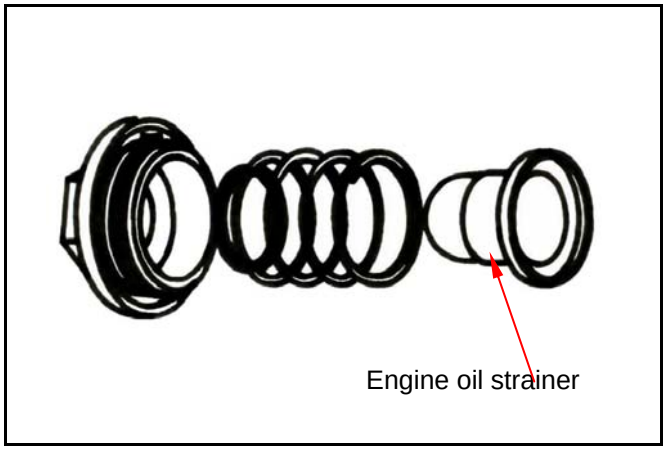


Engine Oil Strainer Cleaning

Drain engine oil out.
Remove oil strainer and spring.
Clean oil strainer with compressed air.
Check if O-ring can be re-used. If it's damaged, please change a new one.
Install oil strainer and spring.
Install oil strainer cap.
Torque value：1.5~3.0kgf-m

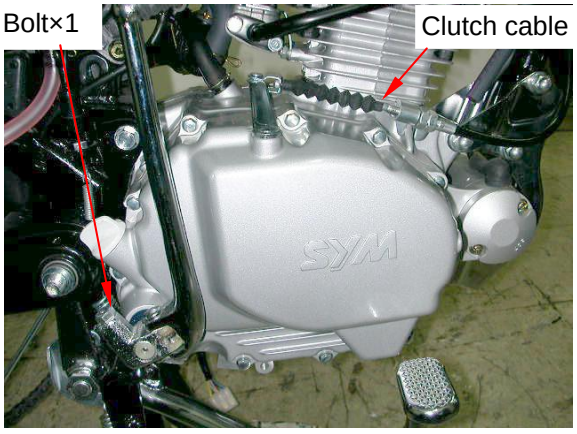


Fill in engine oil (oil viscosity SAE 10W-30)
Recommended using Bramax series oil.
Engine oil capacity: 1000c.c. Regular exchange.
Install dipstick, run the engine for several minutes. Then turn off engine, and check oil level again.
Check if engine oil leaks.

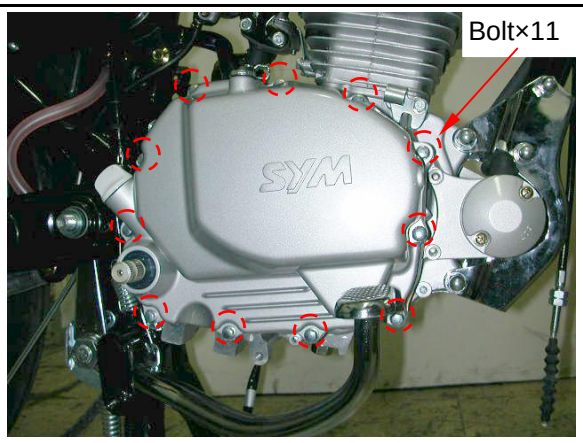


Oil Pump Removal / Inspection

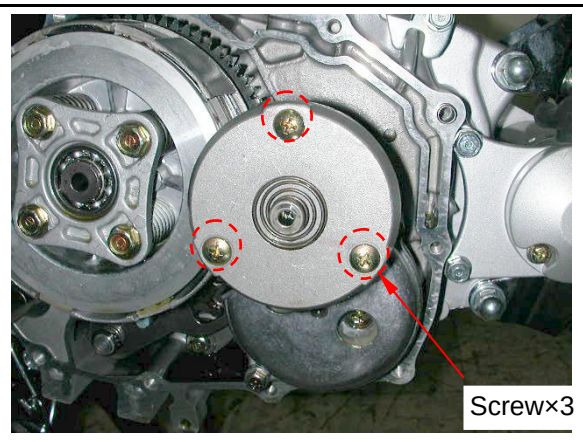
Drain all the engine oil.
Disassemble the kick-starter, exhaust muffler
Disassemble the kick-starter lever (bolt×1)



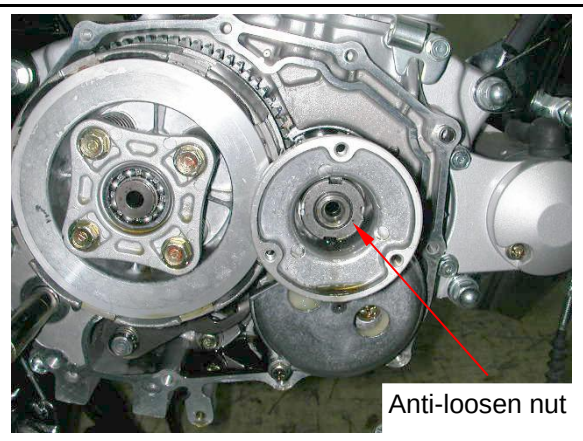
Remove the engine R case(bolts×11)。



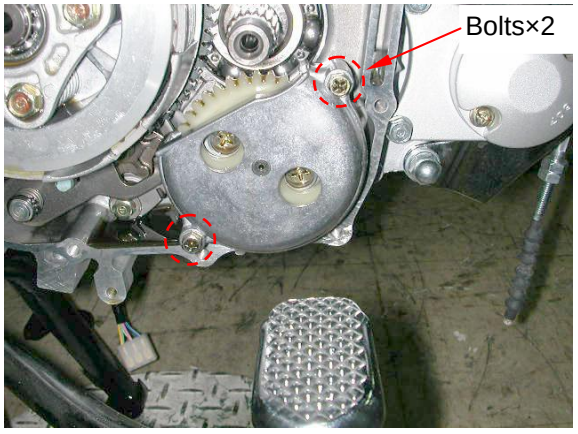
Remove the centrifugal oil strainer cover. (screw×3)。



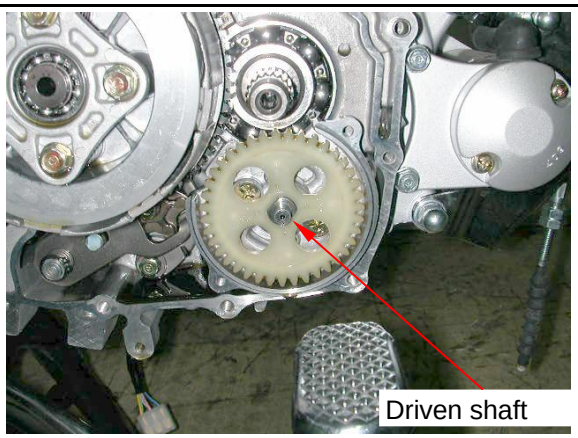
Remove the centrifugal oil strainer anti-loosen nut, and remove the oil strainer.
Special tool：
Centrifugal oil strainer special nut socket**:**
SYM-9023100-SY125



Remove the initial driven gear
Remove the oil pump gear protective cover (bolts×2)



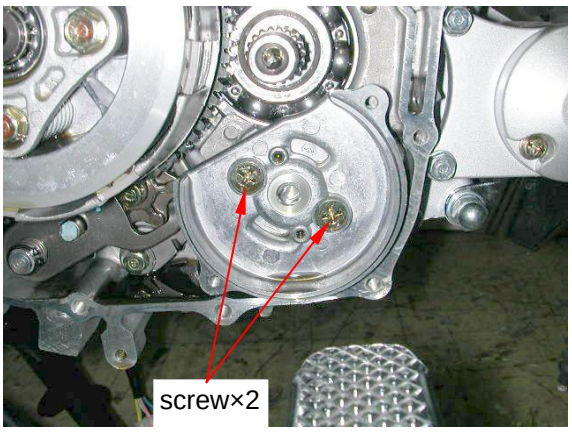
Remove the driven gear and driven shaft.



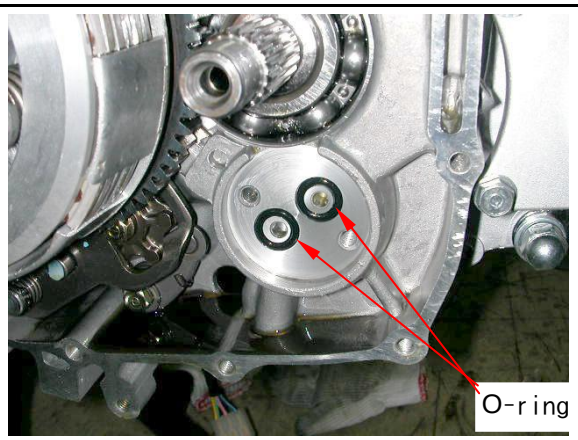
Remove the oil pump(screw×2)。

⚠ Caution

- It's recommended to remove the oil pump holding screw with impact screw driver.

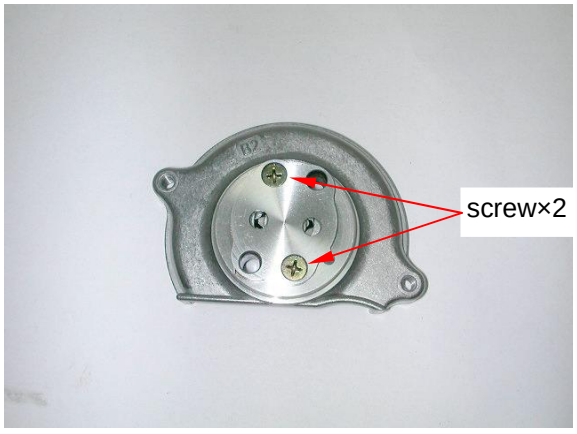


Remove the two O-rings on the oil pump seat.



Oil pump disassembly

Remove the oil pump cover(screw×2)。

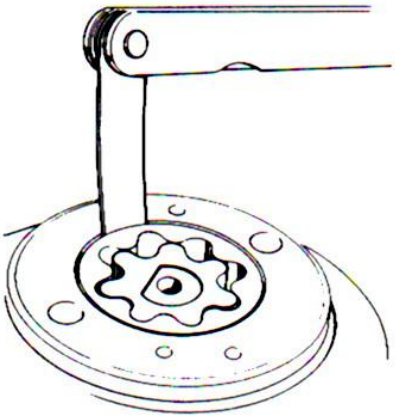


Remove the oil pump cover and the gasket.

Oil Pump Inspection

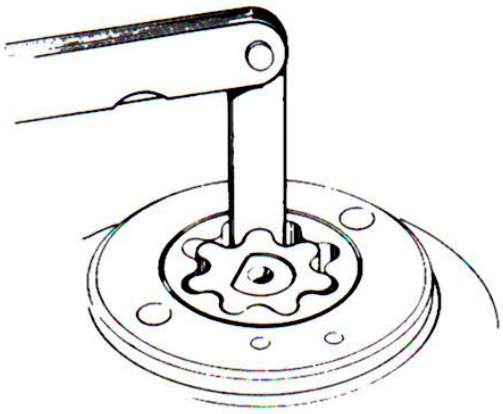
Check the clearance between oil pump body and outer rotor.

Service limit: under 0.35 mm

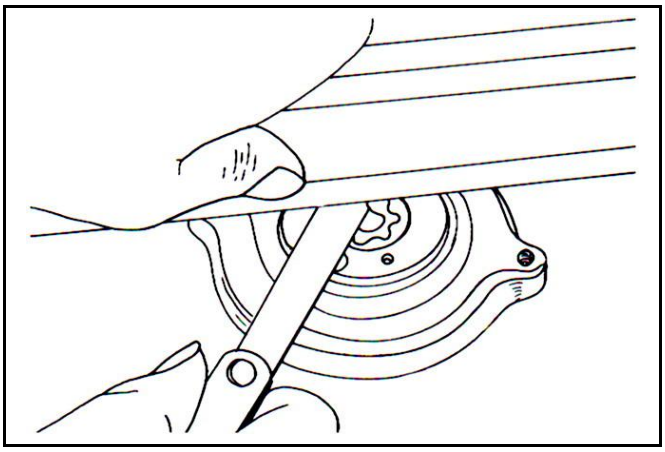


Check clearance between inner and outer rotors.

Service limit: under 0.40 mm

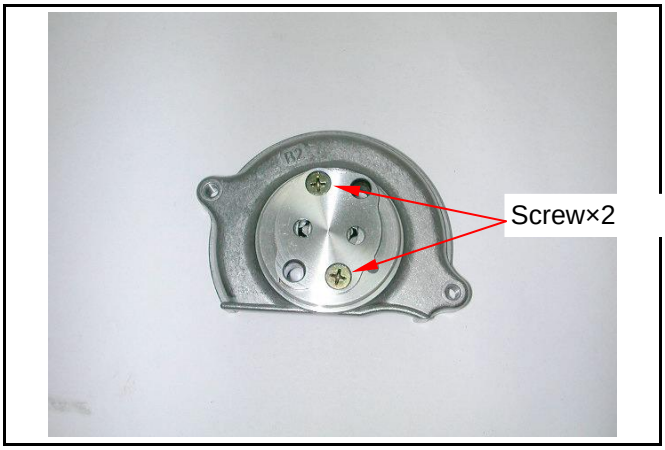


Check the unevenness between rotor face and pump body
Service limit: 0.11 mm

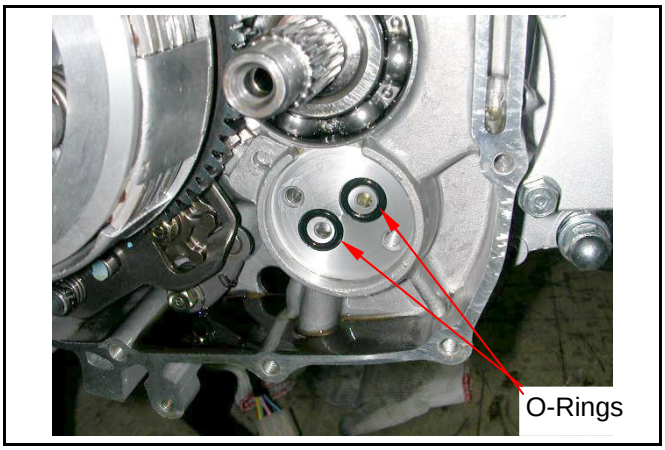


Oil Pump Assembly / Installation

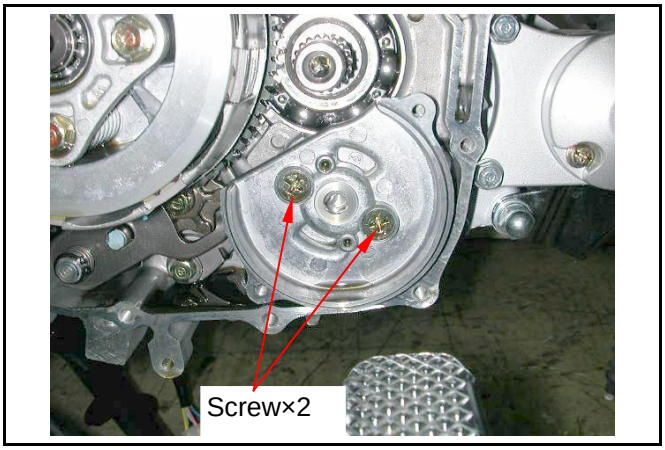
Install inner and outer rotors into the pump body.
Align the pump cover and the gasket and assemble it properly. Then tighten the holding screws. (Screw×2)。



Install new O-rings.



Install the oil pump(screw×2)。
Torque value：0.3~0.4kgf-m

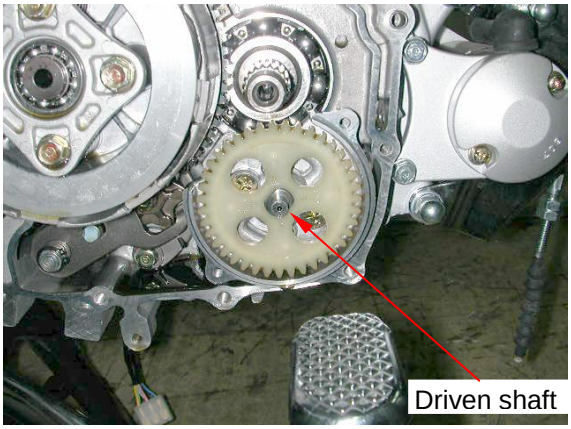


Match the driven shaft indent with the inner rotor indents, and assemble the driven shaft.

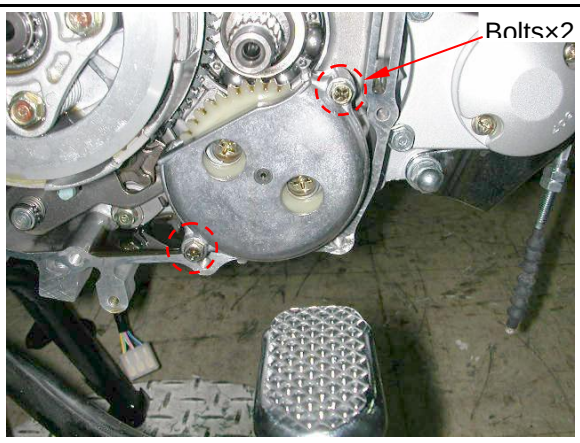
Make sure that oil pump shaft can be rotated freely. Then assemble the driven gear.

⚠ Caution

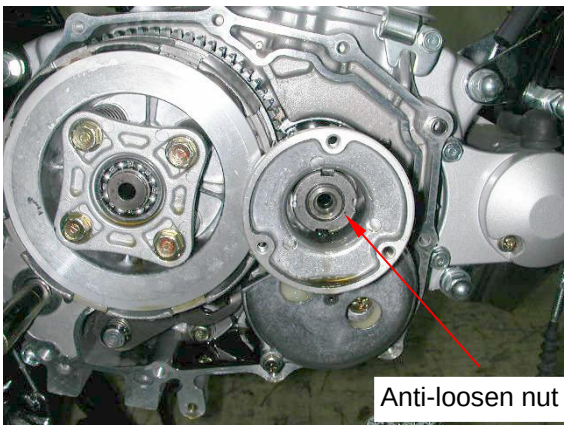
- Make sure that oil pump can rotate smoothly.



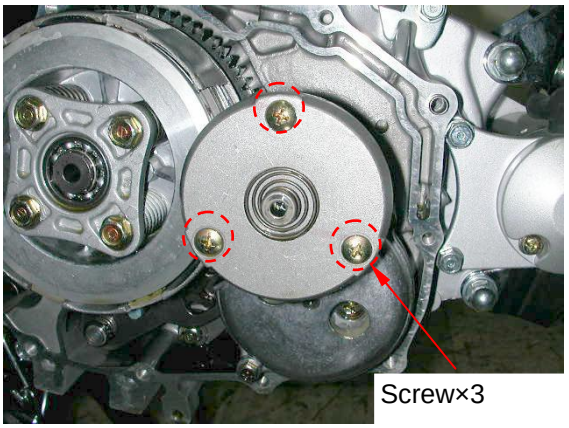
Install the oil pump gear protective cover. (Bolt×2)
Torque value：0.4~0.6kgf-m



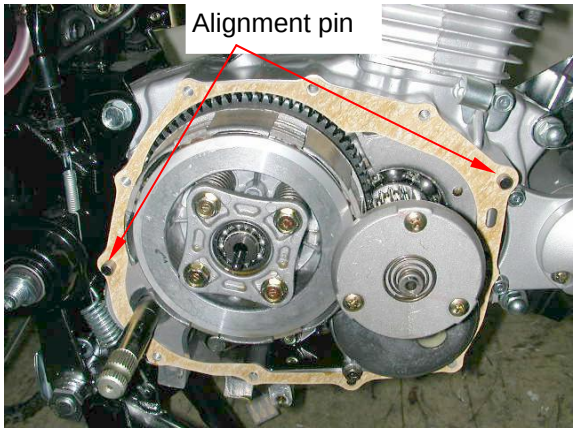
Install the centrifugal oil strainer, and tighten the anti-loosen nut.
Torque value：5.0~6.0kgf-m
Special tool：
Centrifugal oil strainer special nut socket**:**
SYM-9023100-SY125



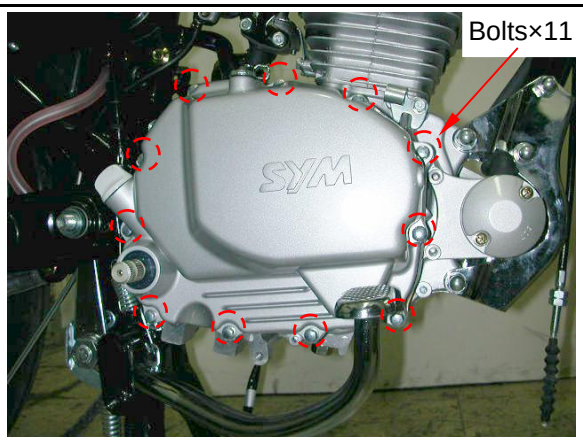
Install the centrifugal oil strainer cover. (screw×3) ◦
Torque Value：0.3~0.4kgf-m



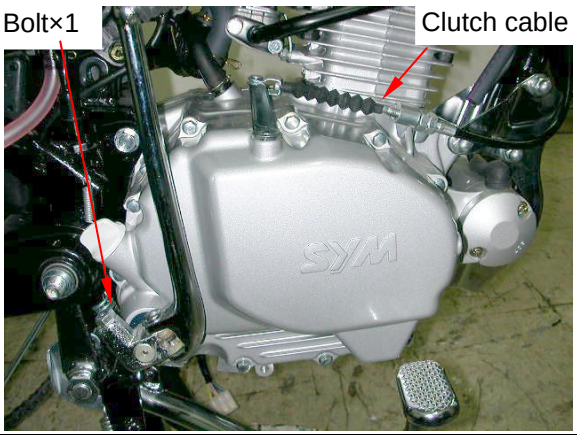
Install the alignment pin and a new right crankcase gasket.



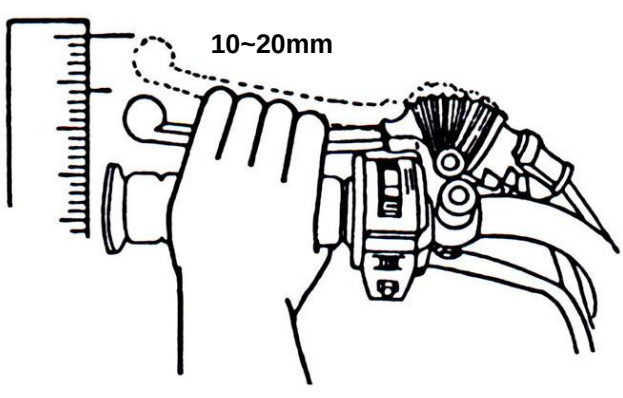
Install the right crankcase cover. (Bolt X 11)
Torque Value：0.8~1.2kgf-m



Assemble the clutch cable.
Assemble the kick-starter, lever, and the exhaust pipe.
Fill in the specified engine oil.

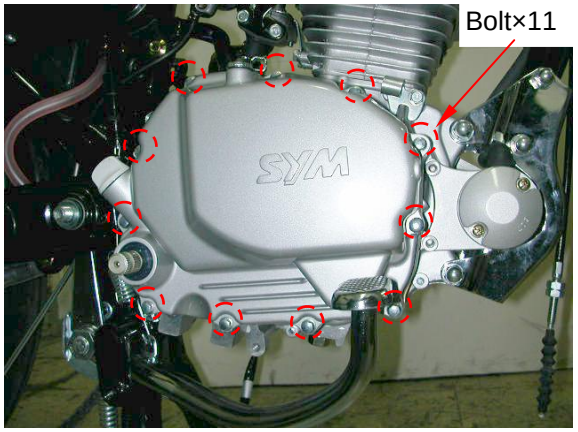


Adjust the clutch lever free play.
Free play：10~20mm

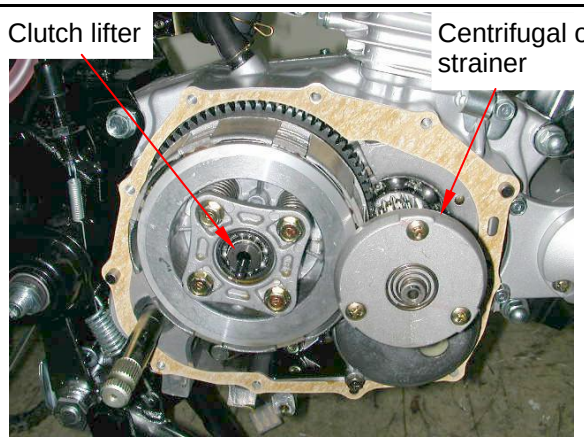


Clutch Disassembly

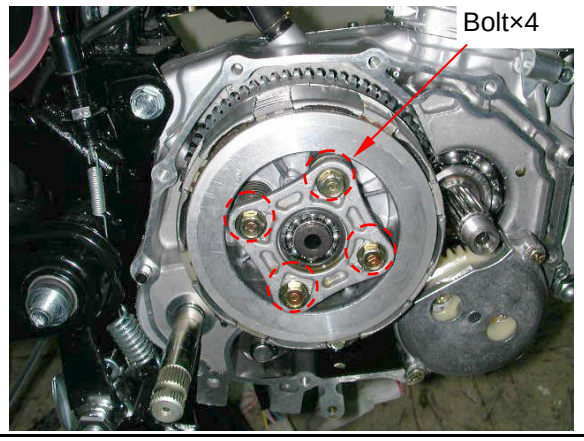
Drain all the engine oil.
Remove the kick-starter lever, exhaust pipe.
Remove the clutch cable.
Disassemble the right crankcase cover (Bolt×11)



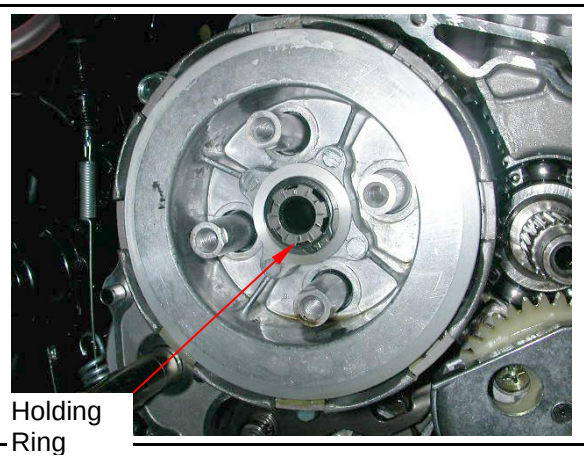
Disassemble the clutch lifter.
Disassemble the centrifugal engine oil strainer cover. (Screw×3)。
Remove the centrifugal oil strainer anti-loosen nut, and remove the strainer.
Special tool：
Centrifugal oil strainer special nut socket**:**
SYM-9023100-SY125



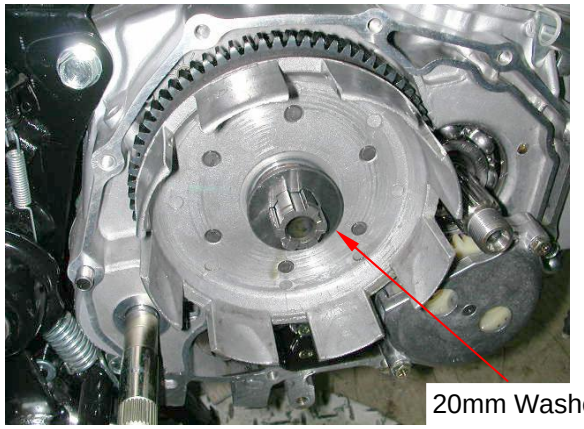
Remove the clutch lifter plate holding bolts. (Bolts X 4) Remove the lifter plate and spring.



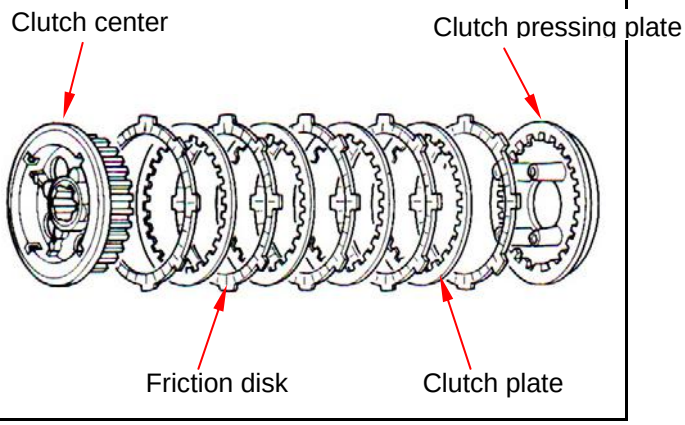
Remove the 20 mm holding ring.
Disassemble the clutch center, friction disks, clutch plates, and pressing plate.



Turn the 20mm washer to match the indent on the main shaft with that on the washer. Remove the washer and disassemble the clutch outer



Disassemble the clutch center, clutch plates, clutch friction disks, and the pressing plate.

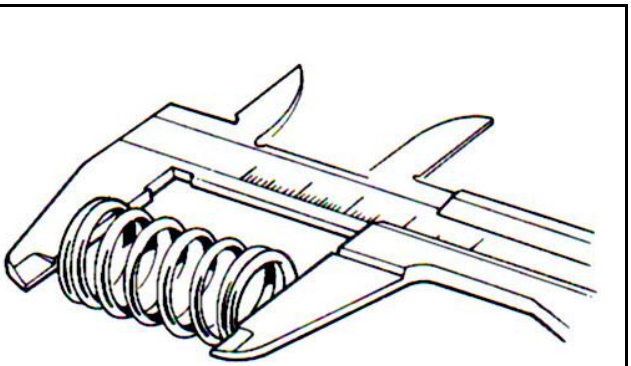


Clutch Inspection

Clutch spring inspection

Measure the free length of the four clutch springs.

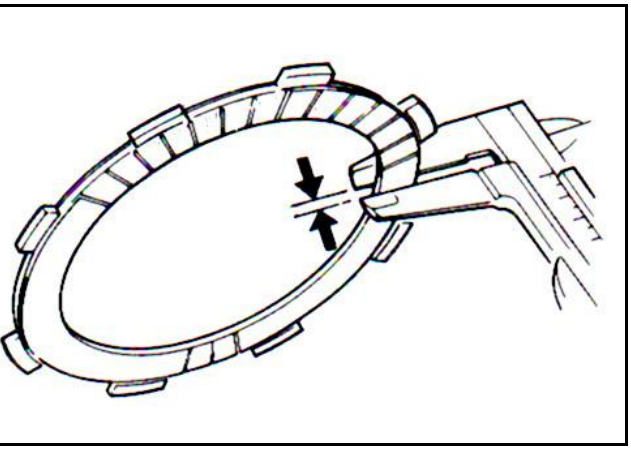
Service limit：Above 32.4mm



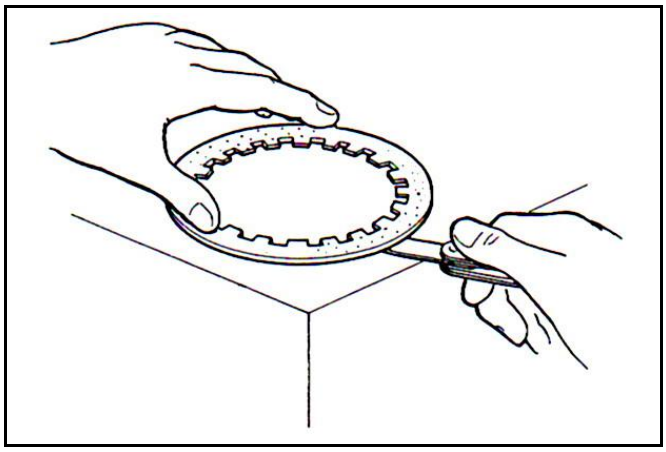
Clutch friction disk inspection

Measure the thickness of each clutch friction disk. If it's under service limit or it's damaged, please replace with a new one.

Service Limit：Above 2.5mm



Clutch plate inspection
Use a feeler gauge to measure the warp of each clutch plate.
Service limit：under 0.2mm



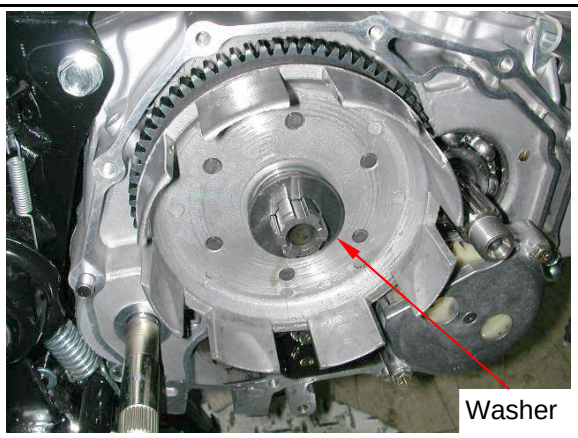
Clutch outer inspection
Check the clutch outer to see if any cracks or damage can be found.

Clutch Installation

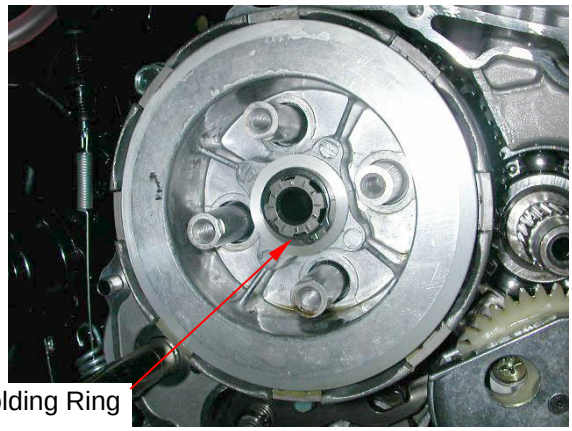
Install the clutch outer and the 20mm washer.

⚠ Caution

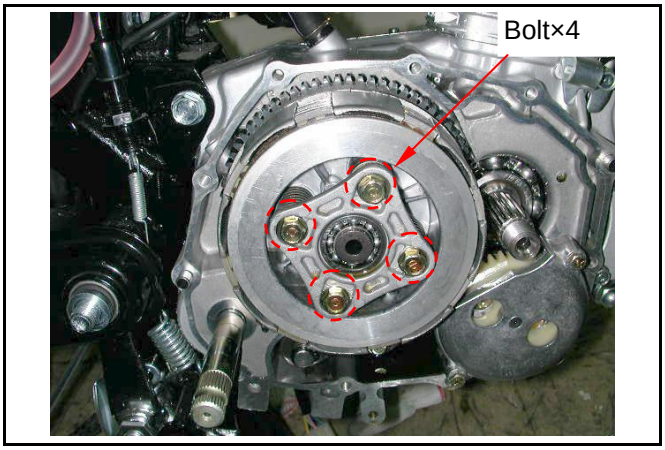
- You can slightly rotate or sway the 20mm washer to make it fit into the main shaft groove.



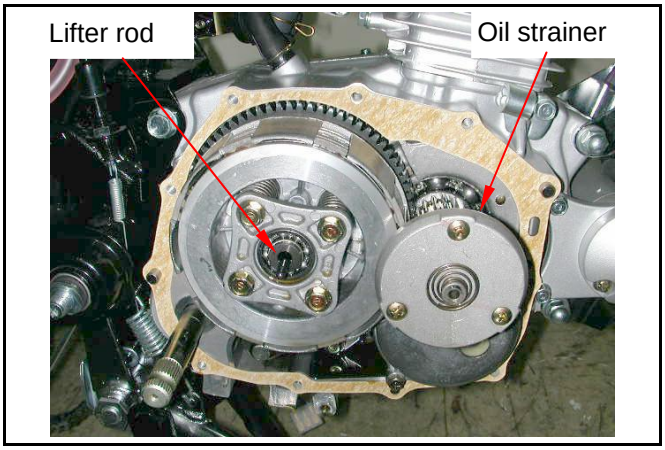
Install the clutch pressing plate, friction disks, clutch plates, and the clutch center. Then install the 20mm holding ring.



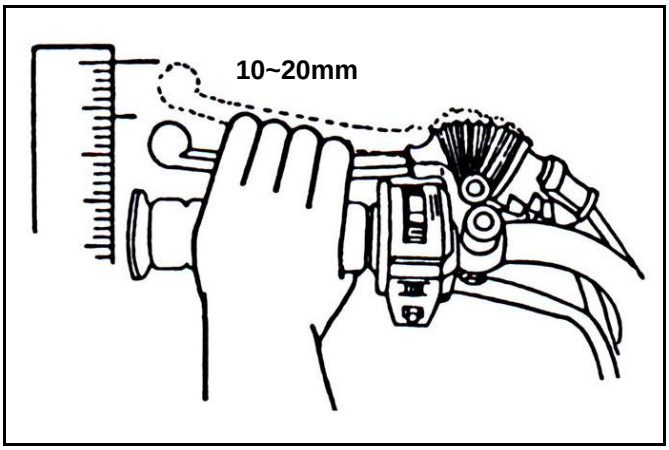
Install the clutch spring, lifter plate, and tighten the holding bolts. (Bolt X 4)



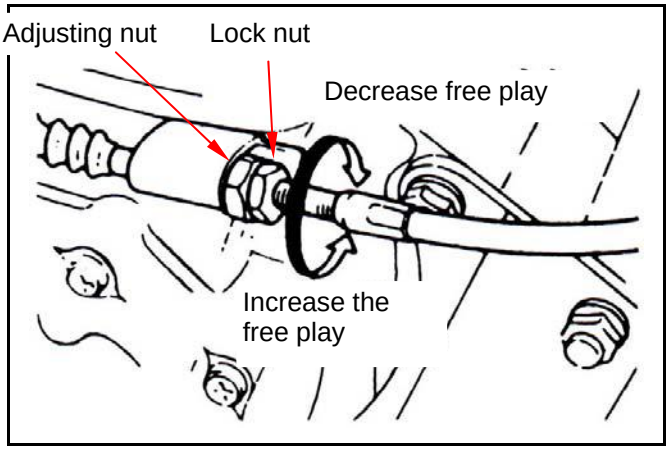
Install the lifter rod.
Install the centrifugal oil strainer
Assemble the right crankcase cover.
(Bolt X 11)
Connect the clutch cable
Install the Kick-starter, kick-starter lever, and exhaust pipe.
Fill in specified engine oil.



Turn the adjustment nut to optimize the clutch free play.
Free play：10~20mm



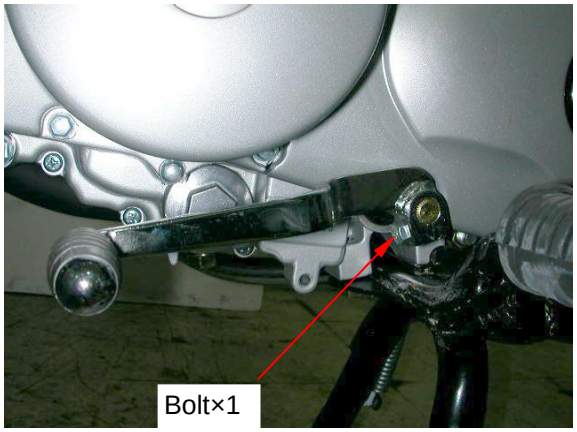
After achieving the correct free play, tighten the adjusting nut and the lock nut.



Gear Shift Linkage Mechanism

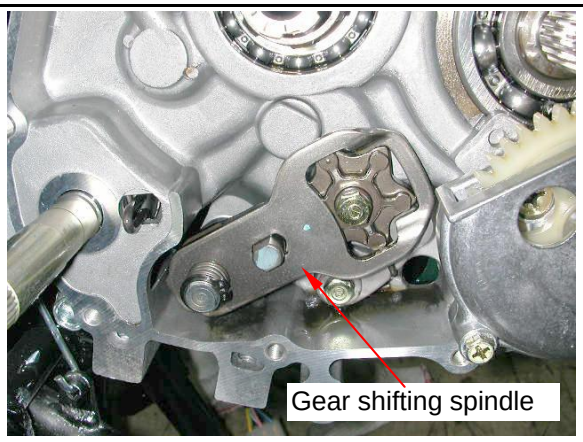
Gearshift linkage disassembly

Remove the shifting lever. (Bolt X 1)

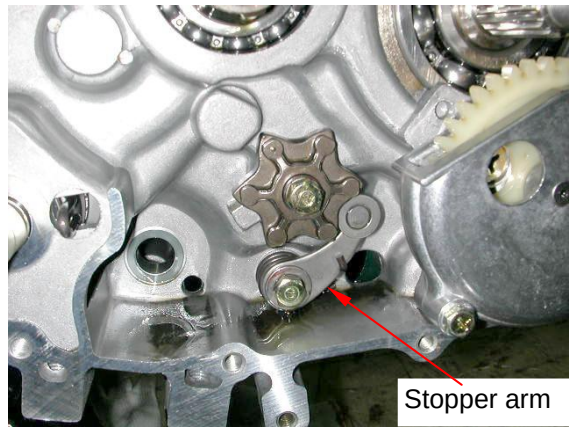


Drain all the engine oil.
Disassemble the kick-starter, exhaust pipe, and the starting lever.
Disassemble the clutch cable
Remove the right crankcase cover.
Remove the clutch lifter rod.
Remove the centrifugal oil strainer.
Remove the clutch outer.

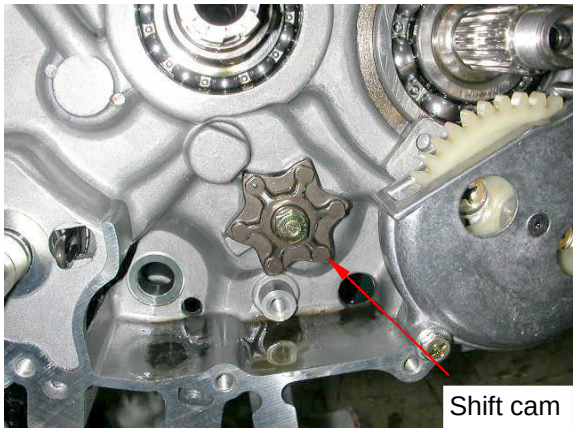
Take out the gear shifting spindle.



Remove the shifting drum stopper arm and the return spring. (Bolt×1) ◦



Disassemble the shifting cam. (Bolt×1)
Remove the 4×10mm alignment pin.

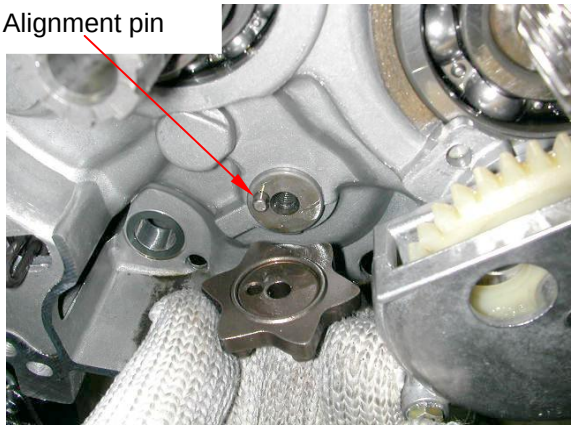


Inspection
Check the shifting spindle and the fork assembly to see if any damage.

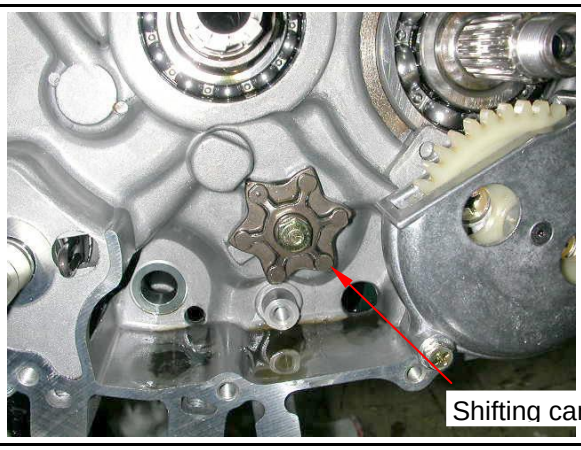
Check the shifting drum stopper arm and the return spring to see if any damage or worn.

Check the gear shifting cam to see if any worn or damage can be found.

Gear shift linkage mechanism installation
Install the shifting cam by matching the 4×10mm alignment pin.



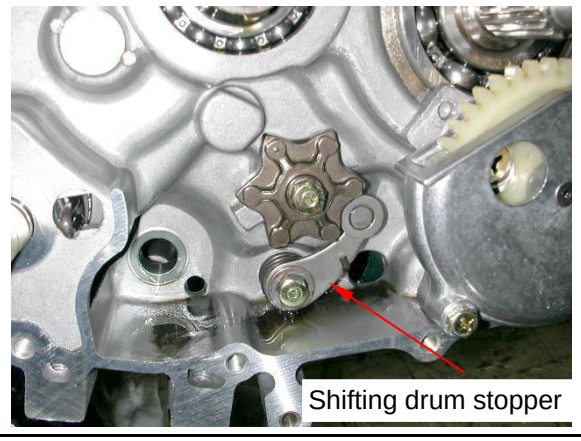
Tighten the holding bolt for shifting cam. (BoltX1)
Torque value：0.8~1.2kgf-m



Assemble the shifting drum stopper and the return spring. (Bolt X 1)
Torque value：0.8~1.2kgf-m

⚠ Caution

- Check if the stopper is working smoothly after assembly.

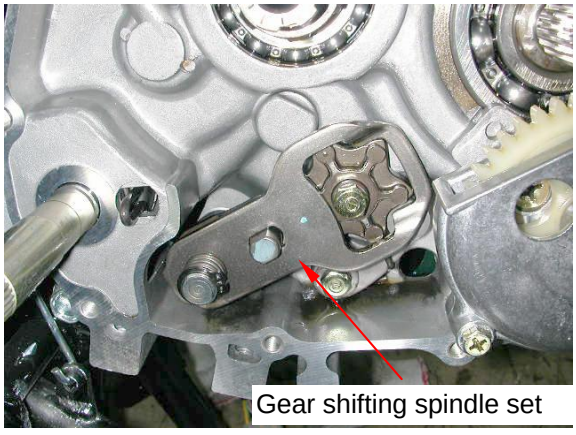


Assemble the gear shifting spindle and the fork. Then install the shifting pedal. (Bolt X1)

⚠ Caution

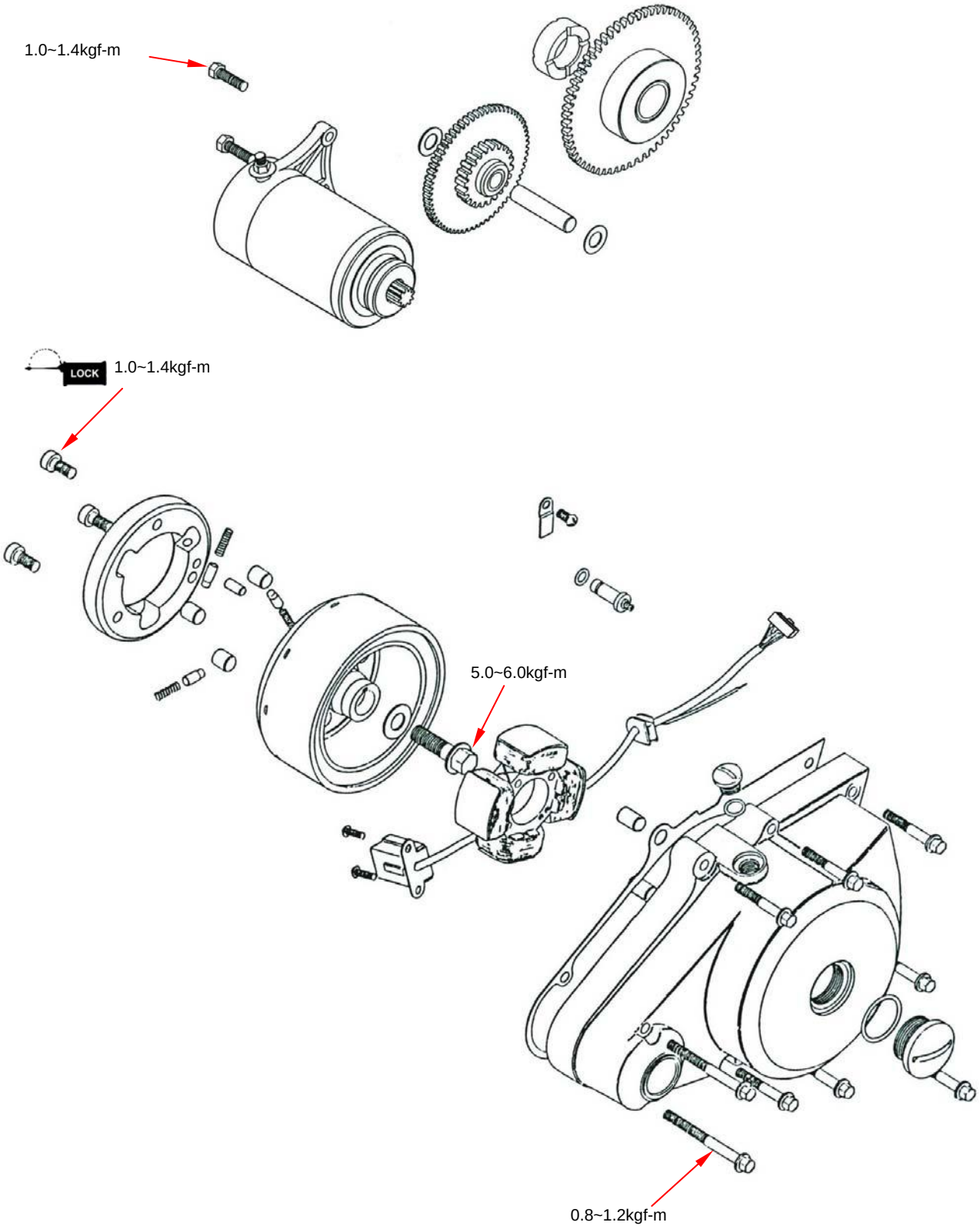
- The return spring of the shifting spindle should be matched and fixed on the crankcase convex.

Assemble the clutch, centrifugal oil strainer, and clutch lifter.
Assemble the alignment pin and another new right crankcase gasket, then the right crankcase cover.
Connect the clutch cable, and adjust the clutch free play.
Assemble the kick-starter, kick-starter lever, and the exhaust pipe.
Fill in specified engine oil.



5

Mechanism Illustration



Precautions in Operation

General Information

- For engine troubleshooting and inspection, please refer to the first chapter.
- Starting Motor repairing process and cautions, please refer to Chapter 13th.

Specifications

measurement：mm

Item	Service Limit
Start Driven Gear exterior diameter	54.060
Starting Clutch interior diameter	54.940

Torque Value

Flywheel Bolt	5.0~6.0kgf-m
R crankcase cover bolts	0.8~1.2kgf-m
Starting clutch inner-hexagon bolts	1.0~1.4kgf-m with screw adhesive

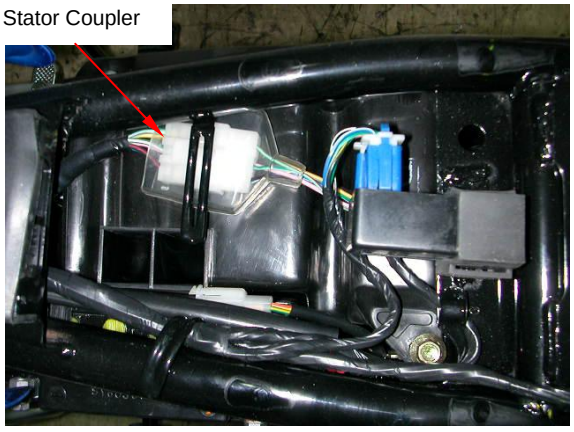
Special Tool

Flywheel puller	SYM-3111000

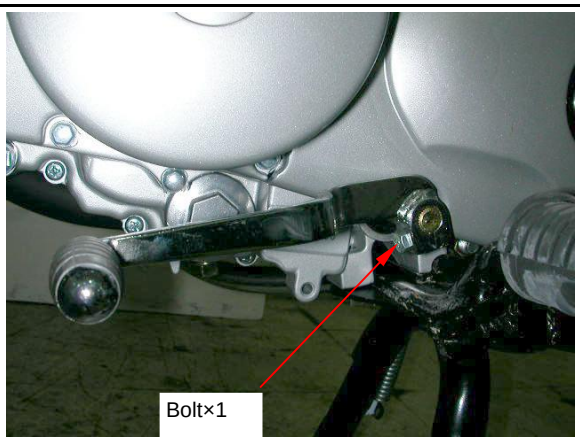
ACG Stator Disassembly

ACG Stator Disassembly

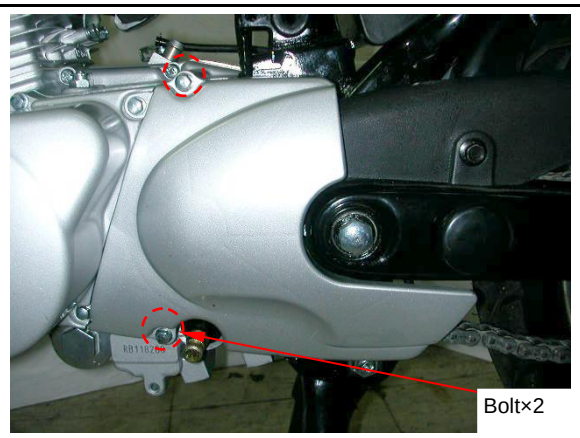
Remove the seat (bolts×2).
Remove the ACG coupler.



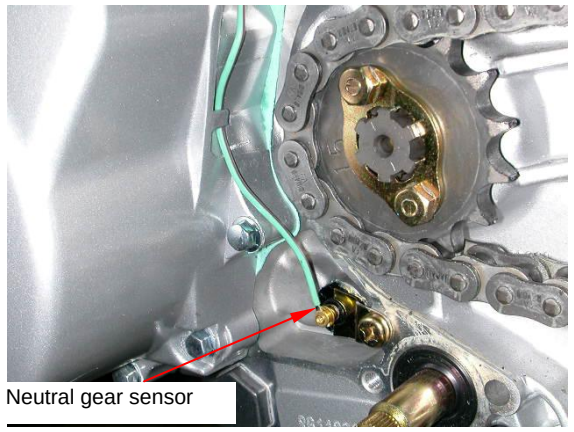
Remove the gear shift pedal (Bolt×1) ◦



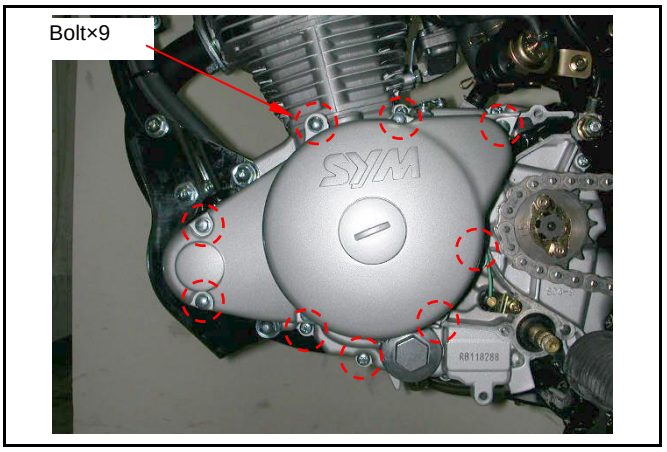
Remove the left crankcase chain cover (Bolts ×2).



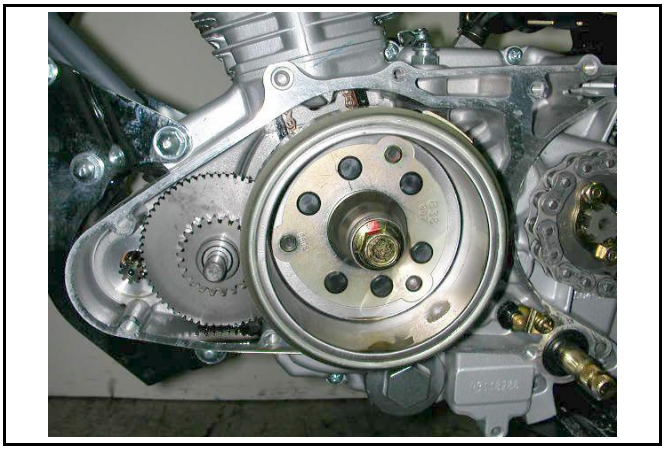
Remove the neutral gear sensor and the wiring.



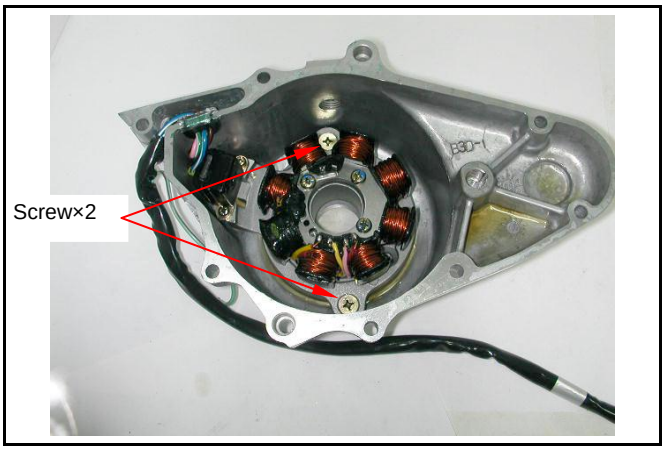
Remove the left crankcase cover(Bolt×9) ◦



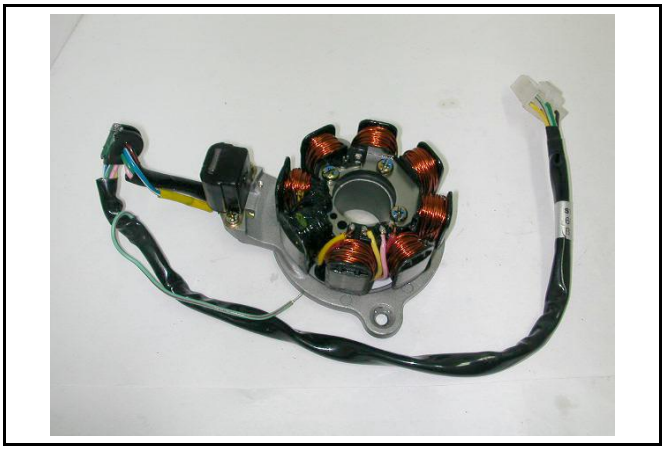
Remove foreign objects and gasket residue on the interface of crankcase and cover.



Remove the ACG stator holding screws (screw×2).



Remove the stator composition.



ACG stator inspection

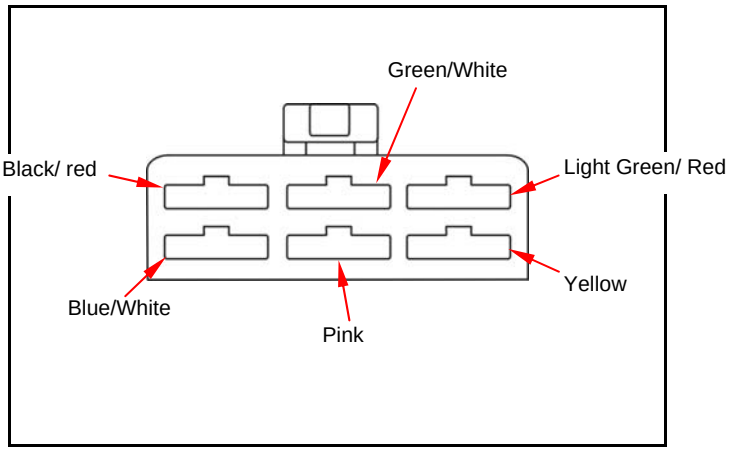
Check the following circuit for electricity conductivity.

Yellow ~ Pink 0.9Ω±10%

Black/White ~ Grounding 420Ω±10%

Green/White ~ Blue/White 105Ω±10%

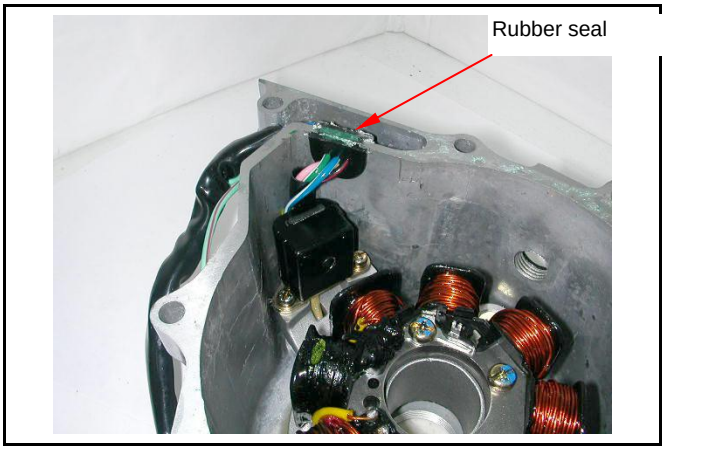
Light Green/ Red (for the neutral gear sensor)



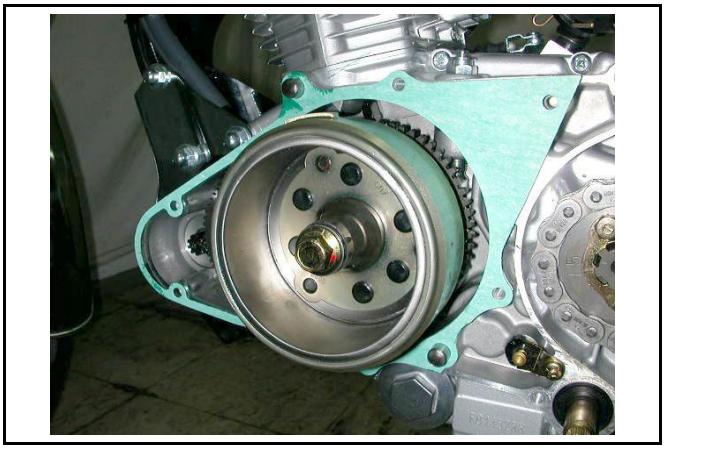
ACG Stator assembly

Assemble the ACG stator holding screws. (Screw×2) ◦

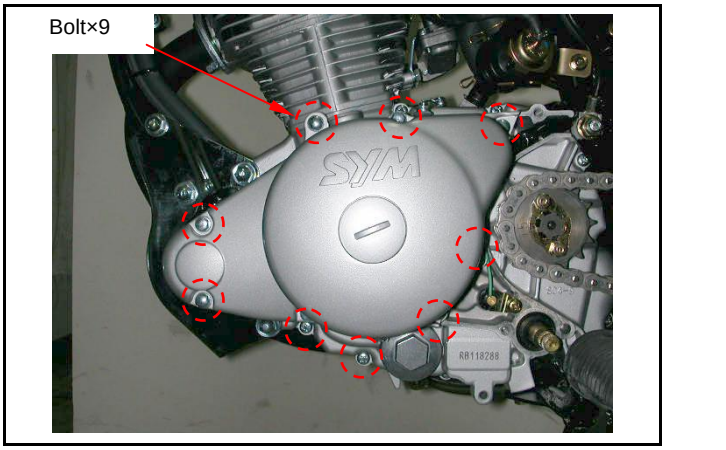
Assemble the stator wire correctly onto the L-crankcase cover with the rubber seal.



Insert the dowel pin, set the L crankcase cover gasket to the correct position.



Assemble the L crankcase cover (Bolt×9).

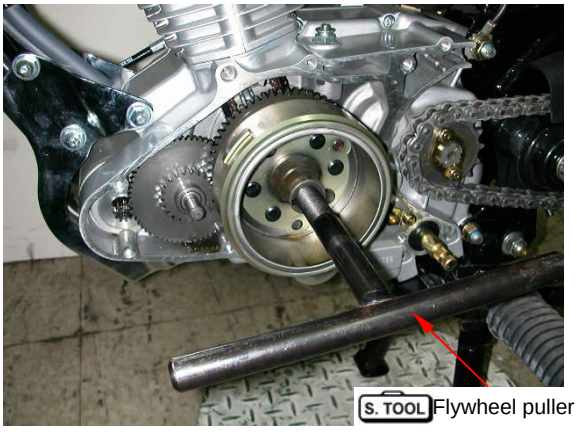


ACG Flywheel/ Starter Clutch

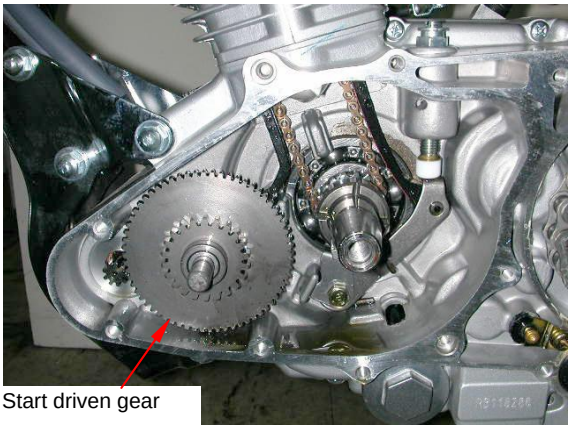
ACG Flywheel/ Starting clutch disassembly

Remove the flywheel with special tool-Flywheel puller, starting clutch, and the start driven gear.

Special Tool：
ACG Flywheel puller SYM-3111000

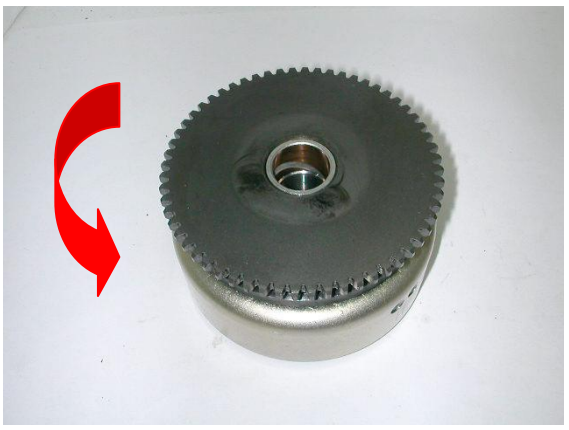


Remove the start driven gear, and its shaft.



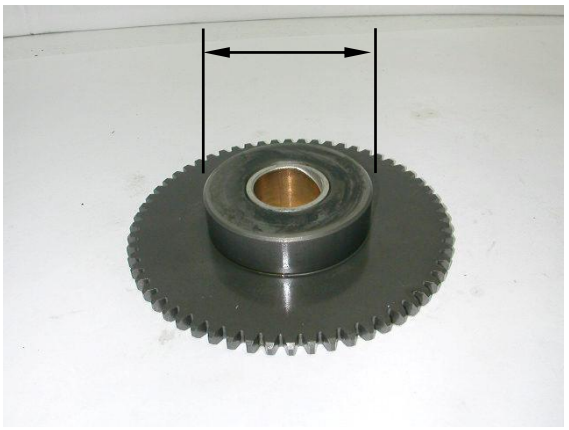
Inspection on starting clutch

Assemble the start driven gear onto the starting clutch.
Hold the starting clutch and turn the start driven gear.
Start driven gear should only be able to turn counterclockwise.

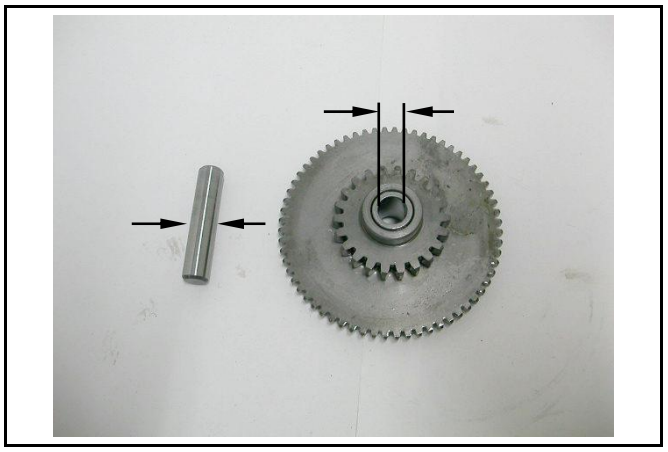


Check if the start gear is worn or damaged.
Measure the exterior diameter of the start driven gear

Service limit：
Exterior diameter： over 54.06 mm



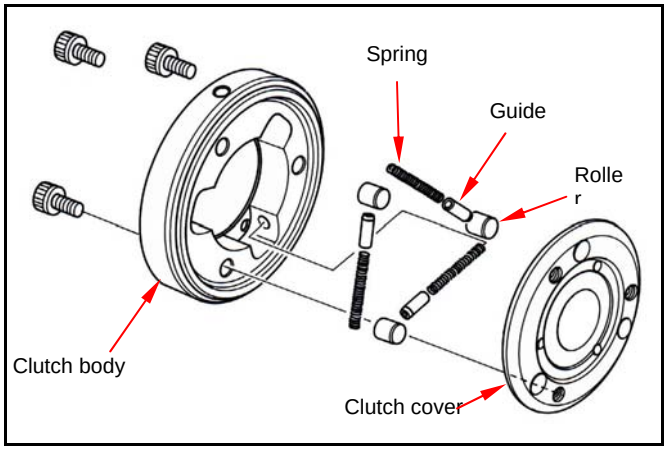
Check if the start driven gear is damaged or worn.
Measure the inner diameter of start driven gear.
Service limit：
Inner diameter：under 10.05 mm



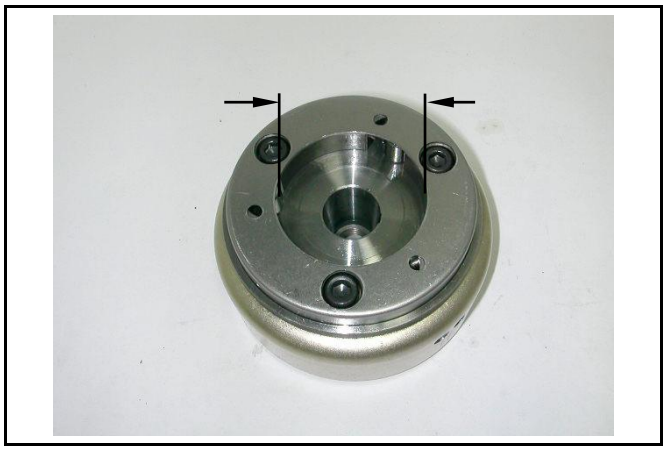
Measure the exterior diameter of the start driven gear shaft.
Service limit：
Over 9.94 mm

Disassembly

Remove the start clutch inner-hexagon bolts. (Bolt×3).
Separate the clutch body and the clutch cover.
Disassemble the clutch rollers, guides, and springs.
Check if the rollers and the guides are worn or damaged.
Assemble the rollers, guides, and springs.



Measure the starting clutch body inner diameter.
Service limit：
Inner diameter：over 54.94 mm



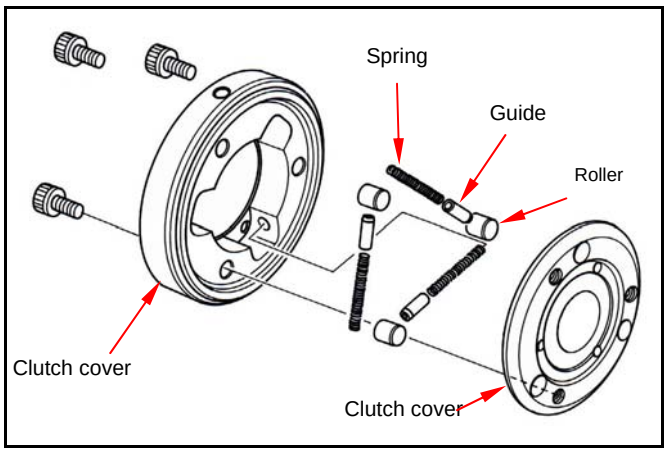
Assembly

Assemble in the reversed process of disassembly.

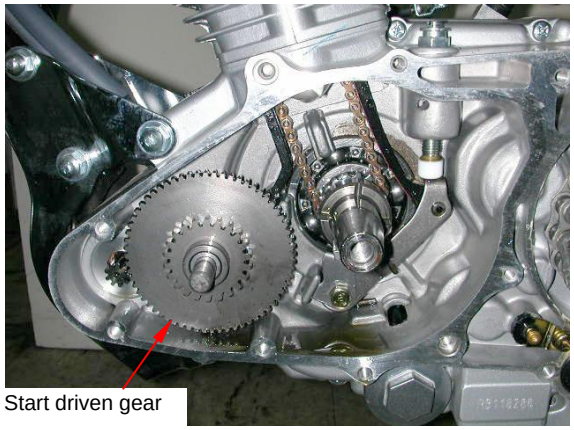
⚠ Caution

- Apply some screw- adhesive on the thread of inner-hexagon bolts.

Torque Value：1.0~1.4kgf-m

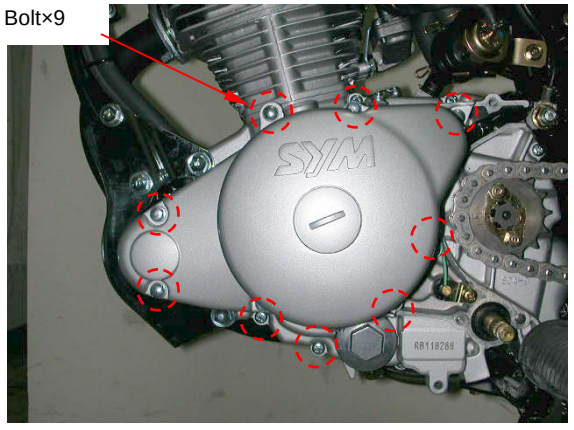


ACG flywheel/ Start clutch assembly
Assemble the start driven gear and its gear shaft.

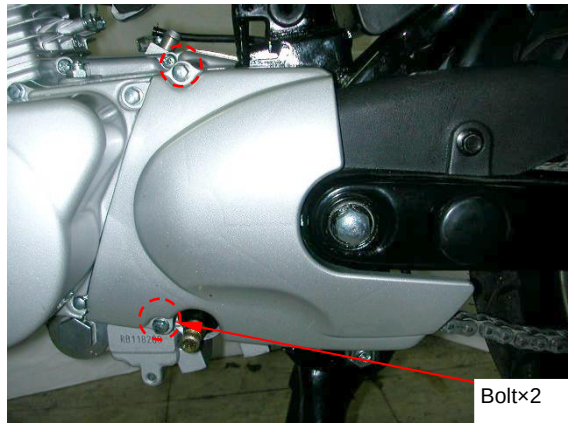


Install the ACG flywheel, start clutch, and start gear. Tighten the ACG flywheel (Bolt×1).
Torque Value：5.0~6.0kgf-m

Insert the dowel pin, set the L crankcase cover gasket to the correct position. Assemble the R crankcase cover onto the R crankcase. (Bolt×9).
Torque Value：1.5~2.0kgf-m



Assemble the left crankcase chain cover (Bolt×2).



Precautions in Operation

General information

- During maintenance of a removed engine, you need to use an adjustable rack or cart to support the engine.
- The following parts can be repaired with the engine staying on the frame:
  1. Carburetor
  2. AC generator
  3. Starting clutch
  4. Clutch
  5. Transmission mechanism
- You must remove the engine for repairing the following parts:
  1. Piston
  2. Crankshaft
  3. Transmission mechanism
  4. Cam-chain tensioner.
  5. Camshaft and Rocker arm.
  6. Kick starter mechanism.

Specification

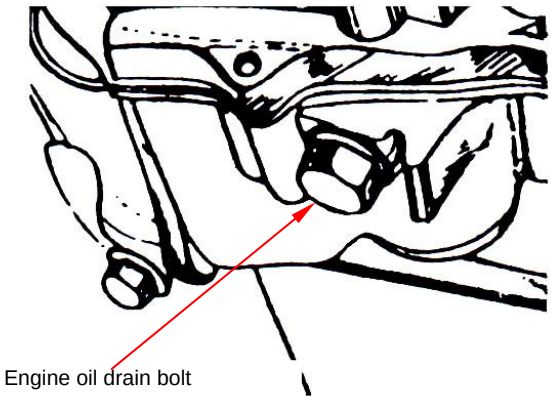
Model		Specification
Engine oil capacity	Regular exchange	800 c.c.
	Fully disassembly	1000 c.c.

Torque value

Engine suspension nut (the upper part of engine and frame) 2.4~3.0kgf-m
Engine hanger nut (the front end of the frame) 2.4~3.0kgf-m
Engine assembly nut (the front part of engine and engine hanger) 2.4~3.0kgf-m
Engine assembly nut (the back part of the engine and frame) 4.5~5.5kgf-m
L crankcase chain cover bolts 0.8~1.2kgf-m
Driven sprocket bolts 0.8~1.2kgf-m
Kick-starter holding bolt 2.2~3.0kgf-m

Engine Removal

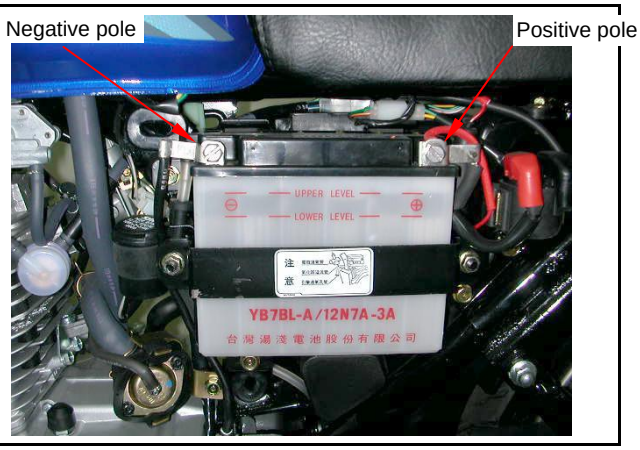
Drain all the engine oil out.



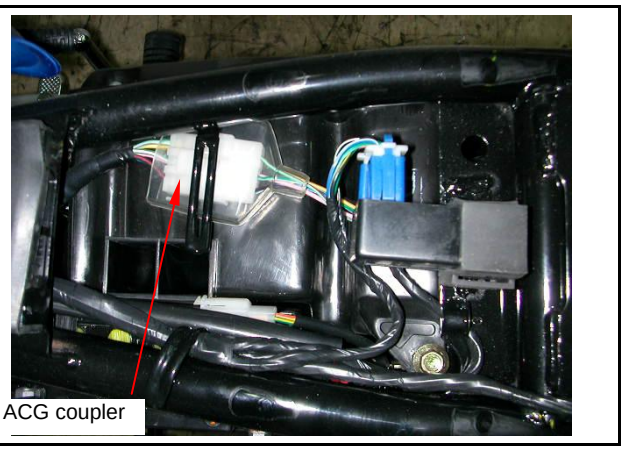
Remove the left body cover.
Remove the battery cable, first negative then positive pole.
Remove the battery

Caution

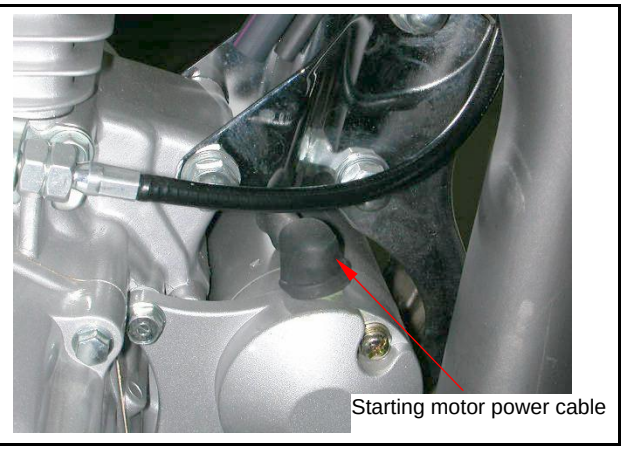
- To prevent short circuit, always connect the positive pole before the negative one.



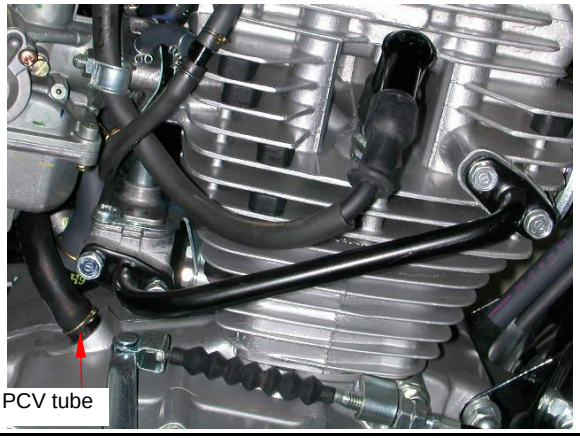
Remove the seat cushion, separate the wire band, and remove the AC.G coupler.



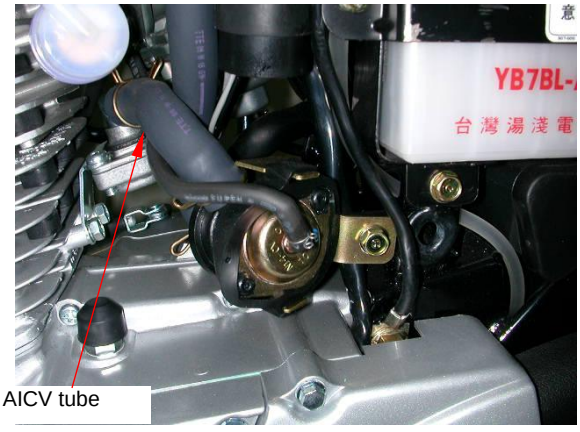
Remove the starting motor power cable.



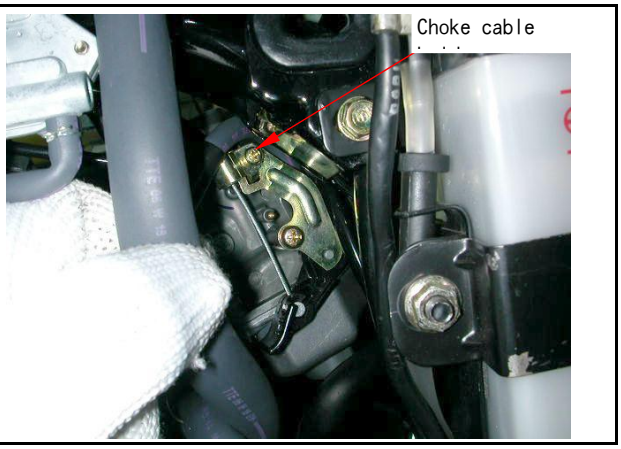
Remove the PCV tube.



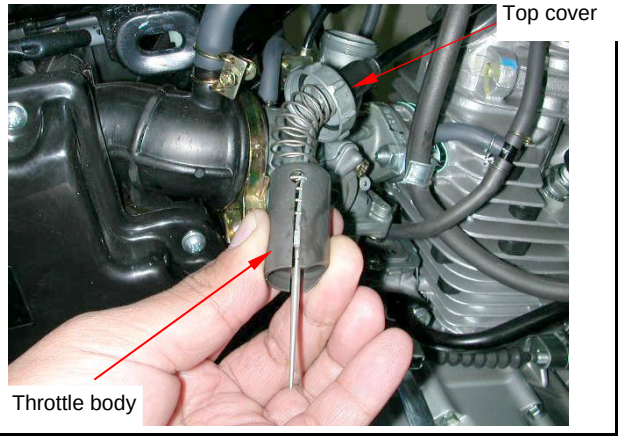
Remove the AICV tube.



Loosen the choke cable holder screw (screwX1), and remove the choke cable.

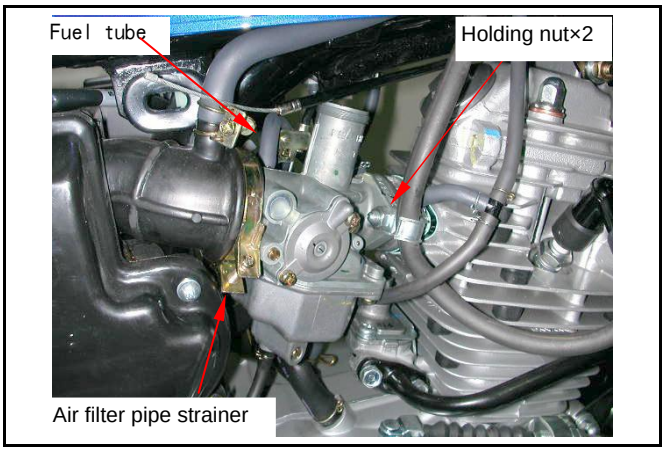


Disassemble the carburetor top cover by turning counterclockwise. Then remove the top cover, throttle cable, and the throttle body.

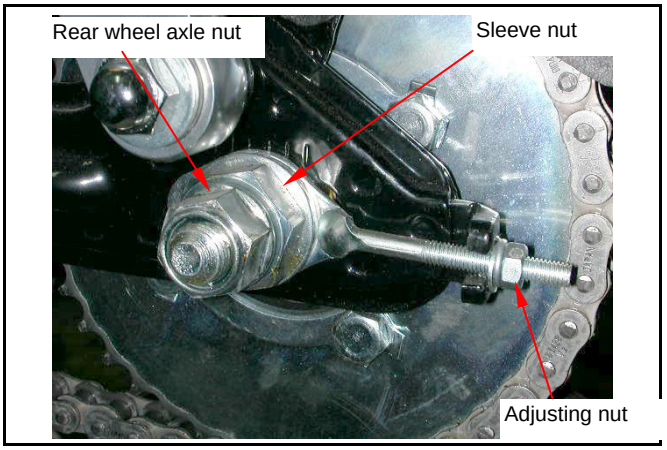


6. Engine Removal

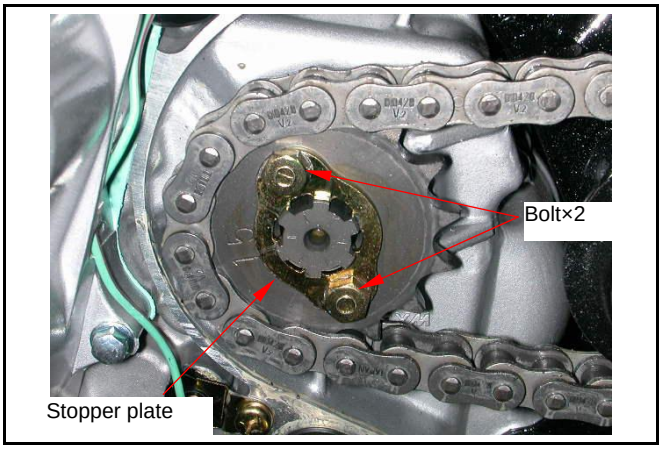
Remove the fuel tube of carburetor.
Loosen the air filter pipe strainer, and separate the pipe.
Remove the carburetor holding nuts. (Nut X 2)
Remove the carburetor.



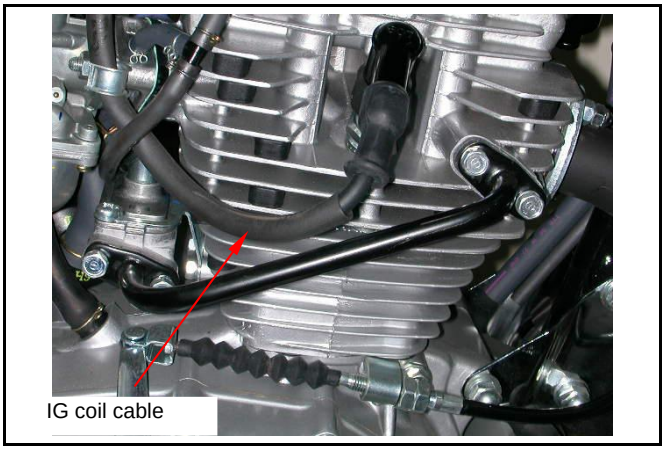
Loosen the rear wheel axle nut, and the sleeve nut. Then loosen the adjusting nut and push the rear wheel forward.



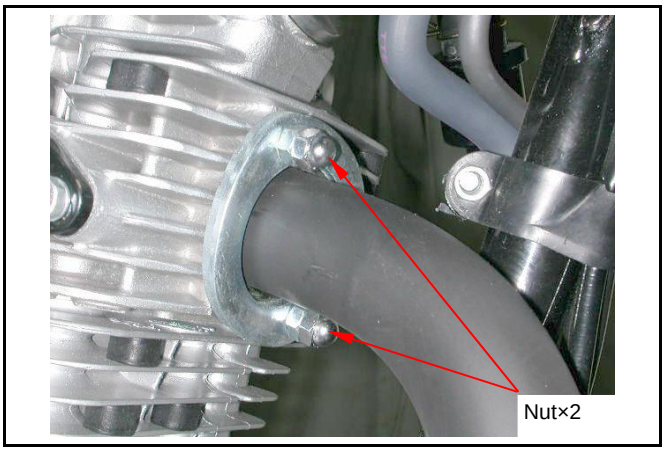
Remove the L crankcase chain cover. Remove the driving sprocket holding bolts. (Bolt X 2). Turn slightly and take out the stopping plate, then remove the driving sprocket and chain.



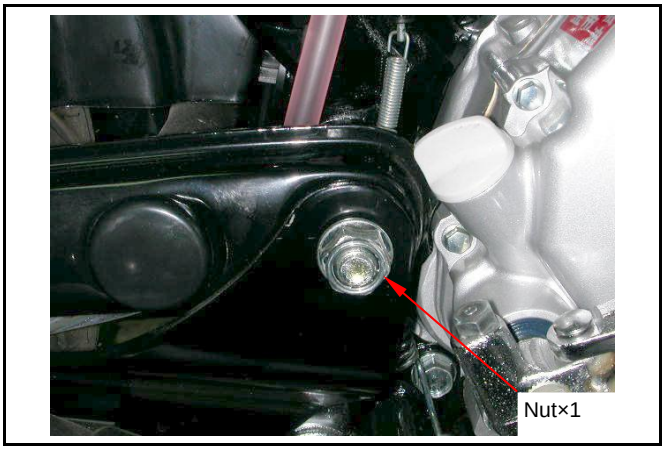
Remove the spark plug cap and the cable.



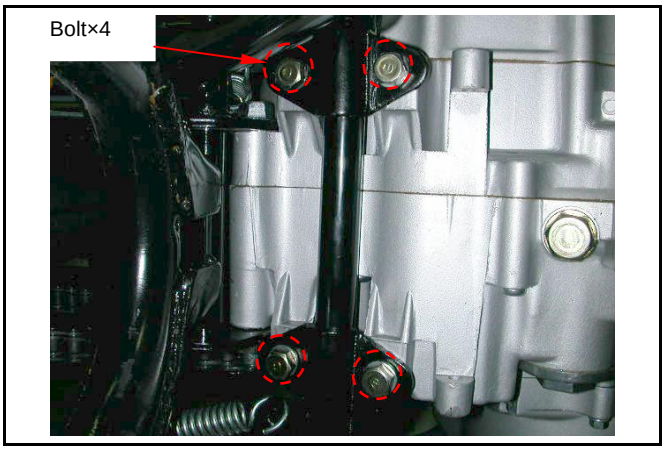
Remove the front exhaust pipe holding nuts. (Nut X 2)



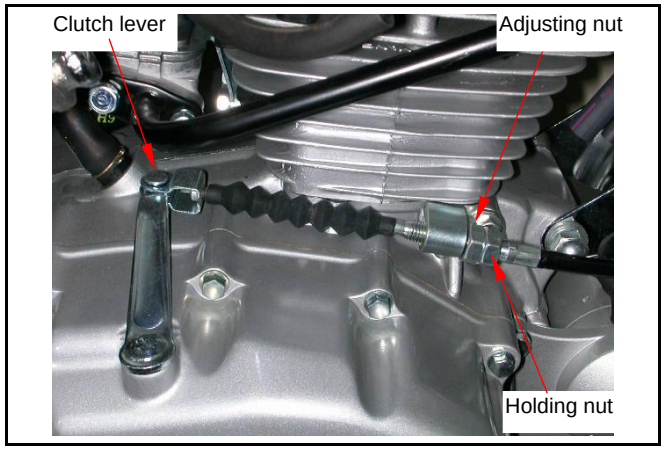
Remove the rear exhaust pipe holding nuts. (Nut X 2)
Remove the exhaust pipe.



Remove the footrest (bolt×4)

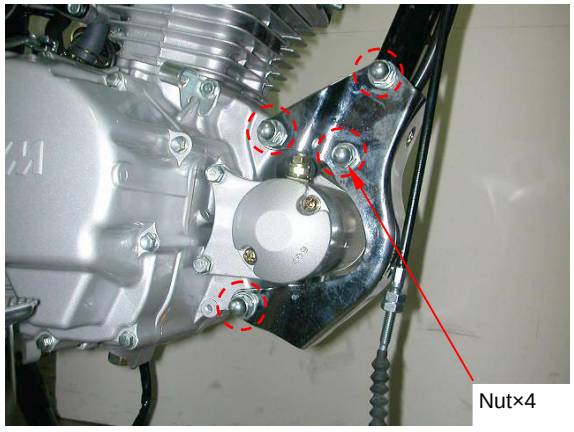


Loosen the clutch cable holding nut and adjusting nut. Pull the clutch lever and release the clutch cable.

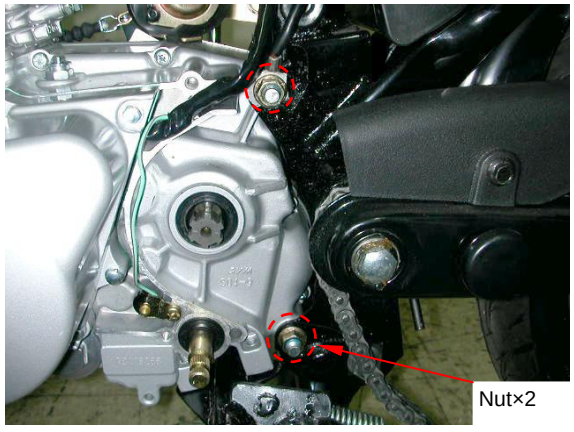


6. Engine Removal

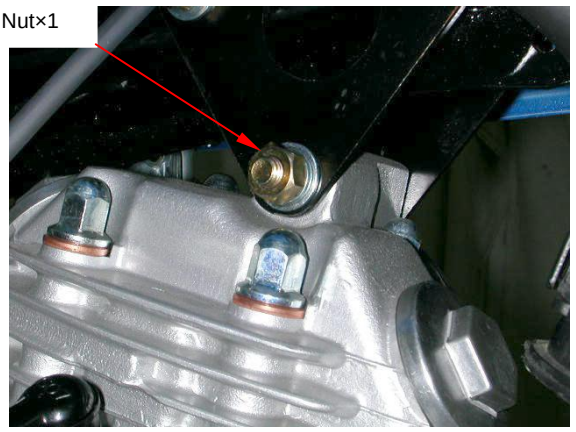
Settle the engine on a rack.
Remove the engine front hanger.
(Nut X 4)



Remove the engine rear holding bolts.
(Nut X 2, bolt X 2)



Remove the engine upper holding nut.
(Nut X1, bolt×1)
Pull out the bolt and remove the engine.

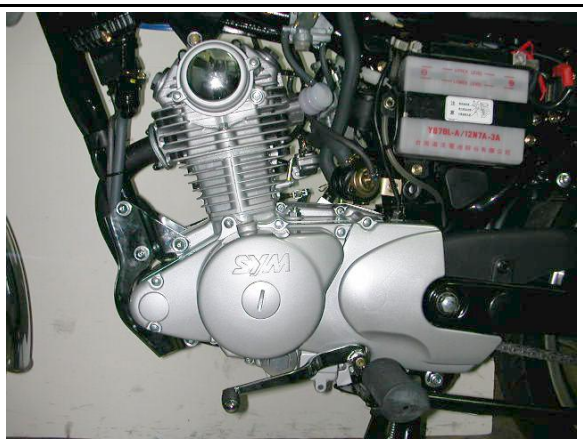


Engine Installation

Assemble the engine in the reversed procedure of disassembly

Caution

- When assembly, always pay attention to the possible injuries.
- All the wires and cables can't be bent or pressed.
- Please align the wires and cables in accordance with the setting diagram.

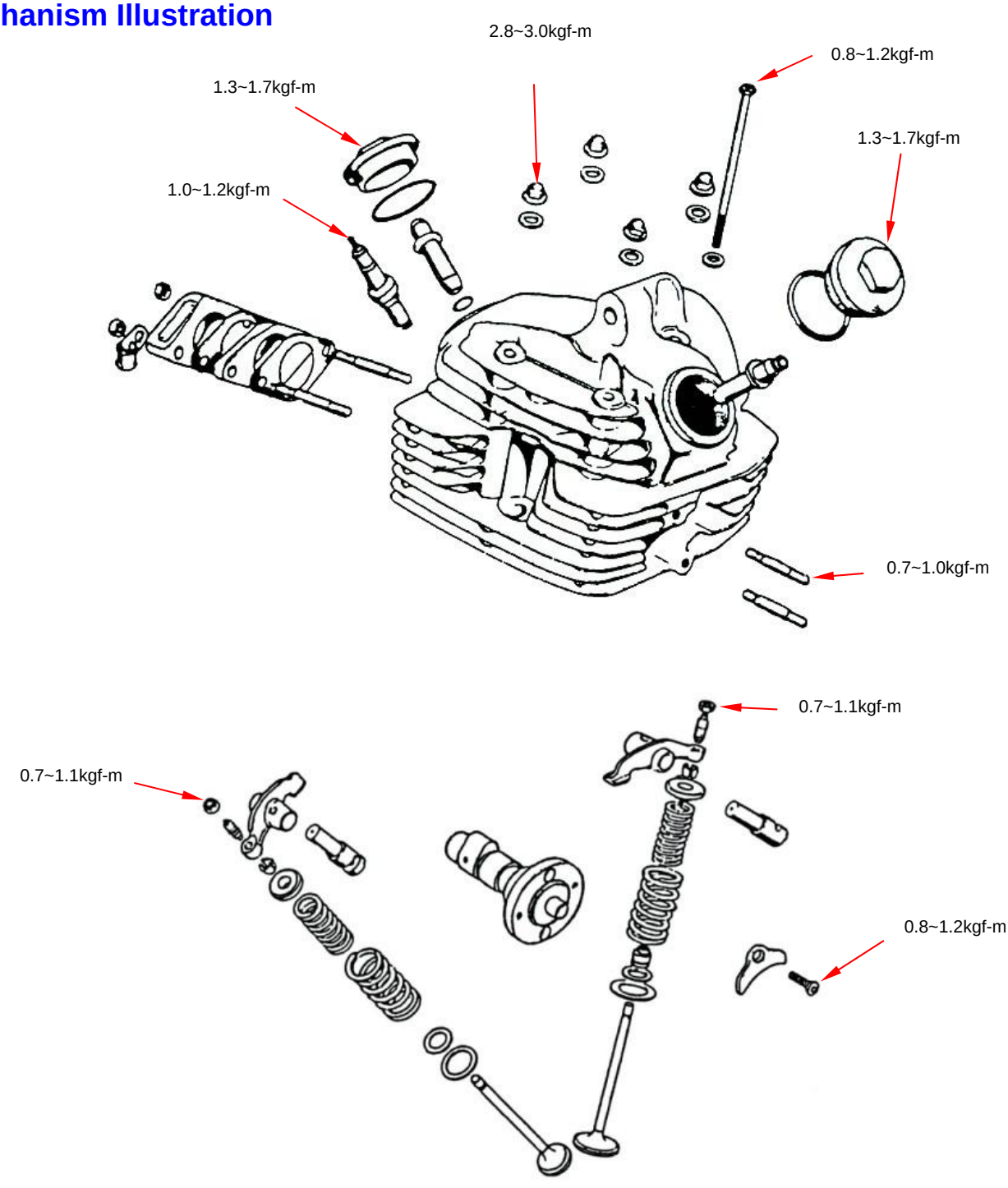


Torque value：

Please refer to the General information in the head of this chapter.

Note:

Mechanism Illustration



Precautions in Operation

General Information

This chapter includes the repair information of cylinder head, valve, camshaft, and rocker arm.
The engine must be removed before the repairing of Cylinder head.

Specification

Measurement unit :mm

Subject			Specification	
			Standard	Service Limit
Valve Clearance (IN/EX valve when engine is cold)			0.05 ± 0.02	—
Compression pressure			12 ± 1 kg/cm²	—
Camshaft	Cam Lift	IN	31.983	30.800
		EX	31.119	30.020
Rocker Arm	Inner Diameter		12.000~12.018	12.100
	Outer Diameter		11.984~11.966	12.000
Valve Guide	Valve stem outer diameter	IN	5.450~5.465	5.420
		EX	5.430~5.455	5.400
	Valve guide	IN	5.4750~5.485	5.500
		EX	5.4750~5.485	5.500
	Clearance between Valve stem and guide	IN	0.010~0.035	0.080
		EX	0.030~0.055	0.100
	Valve seat width		1.200	1.600
Warpage/clearance between cylinder head and cylinder.			—	0.050

Torque Value

Cylinder head nuts 2.8~3.0kgf-m
Cylinder head left bolts 0.8~1.2kgf-m
Cylinder head side cover bolts 0.8~1.2kgf-m
Cam chain sprocket bolt 0.8~1.2kgf-m
Rocker arm shaft setting plate bolts 0.8~1.2kgf-m
Cylinder head tensioner bolt 1.0~1.4kgf-m
Tappet adjusting cap 1.3~1.7kgf-m
Valve adjusting holding nut 0.7~1.1kgf-m
(Apply engine oil on threads and seats.)
Spark plug 1.0~1.2kgf-m

Special tools

Valve Guide reamer 5.0mm SYM-1471110/20
Valve Guide driver 5.0mm
Rocker arm shaft/ Camshaft Disassemble tool SYM-1445100
Valve Spring Compressor SYM-1471100
Valve Spring Assemble/Disassemble Tool
Cylinder Head/ Engine Oil Strainer Cap Wrench SYM-ALL23461
Valve Clearance Adjustment Wrench SYM-9001200

Troubleshooting

Engine performance will be affected by troubles on cylinder-head perimeter parts. The trouble usually can be determined or by performing cylinder compression test or judging the abnormal noise.

Poor Idling

Compression pressure is too low.

Low compression pressure

1. **Valve**
   - Improper valve clearance adjustment
   - Burnt or bent valve
   - Improper valve timing
   - Valve spring damage
   - Valve carbon deposit.
   - Valve seat warpage
   - Spark plug not tightened of badly assembled.

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

3. **Piston**
   - Piston rings worn out.

High compression pressure

- Too much carbon deposit on combustion chamber or piston head

Abnormal noise

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

Smoke from exhaust pipe:

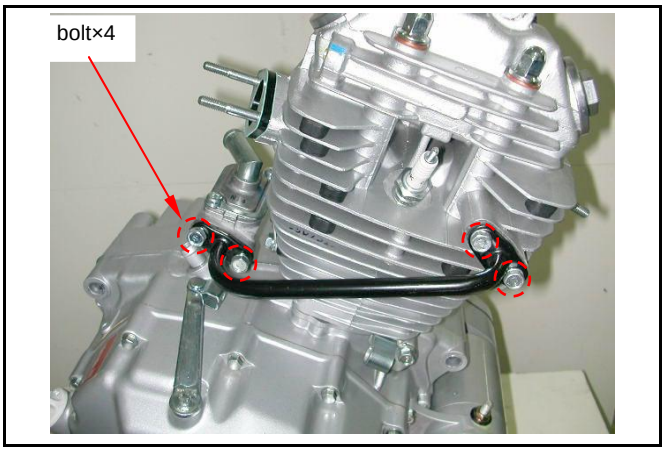
- Valve guide or stem worn
- Valve guide oil seal worn

Cylinder Head

Cylinder Head Removal

Remove engine. (Refer to chapter 6)

Remove the AI tube on the left side of the engine (bolt×4)



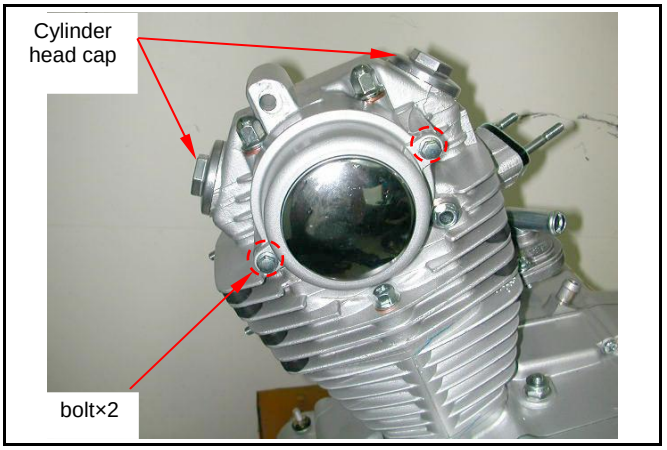
Remove the cylinder head cap with the cylinder head cap wrench

Special Tool：

Cylinder head cap wrench

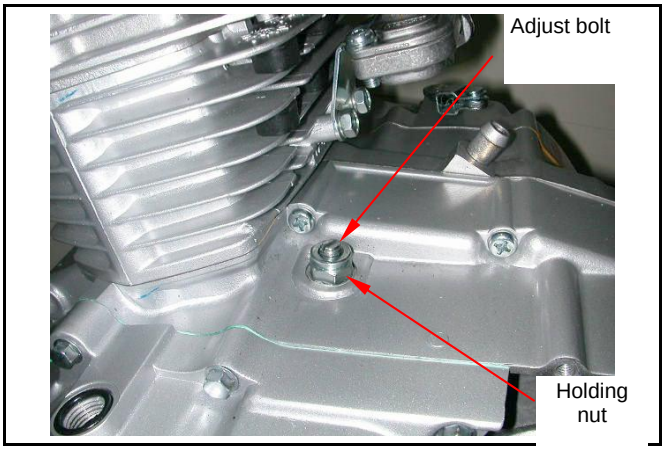
SY-ALL12361

Remove the cylinder head side cover (bolt×2) ◦



Disassemble the timing-inspecting hole cap, and the ACG cap. Match the TDC mark “T”

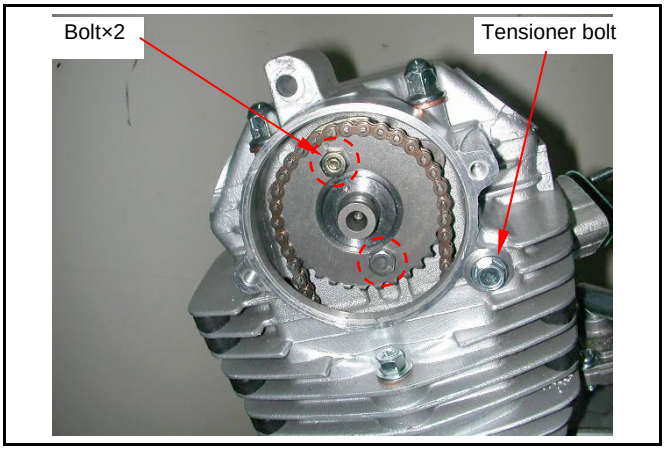
Loosen the cam-chain adjuster bolt



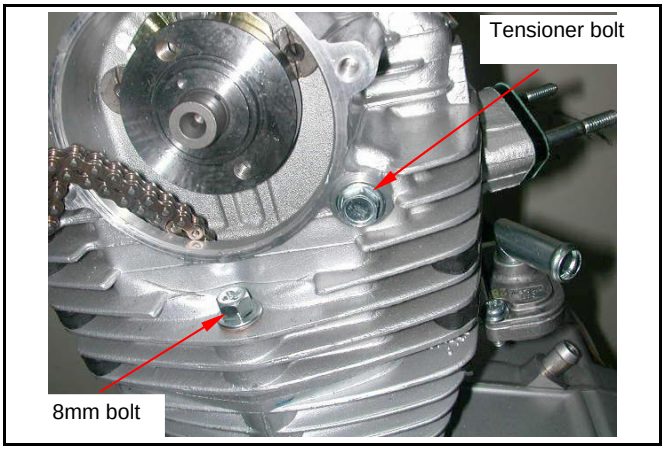
Remove the cam-chain sprocket (bolt×2)

Caution

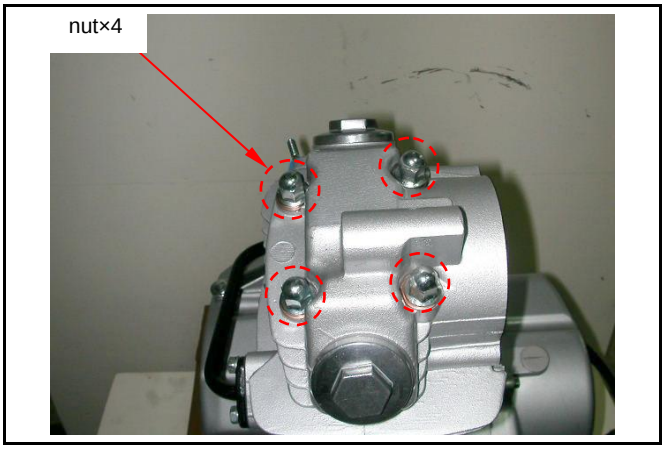
- After removing the sprocket, you must pull cam-chain out to prevent it from falling into the crankcase.



Remove the 8mm bolt on the left side of the cylinder head, then remove the cam-chain tensioner holding bolt



Disassemble the cylinder head holding nut (nut × 4)
Then remove the cylinder head



Clean up residues from the matching surfaces of cylinder and cylinder head

Caution

- Don't damage the matching surfaces of cylinder and cylinder head
- Avoid residues of gasket or foreign materials falling into crankcase when cleaning.

Camshaft

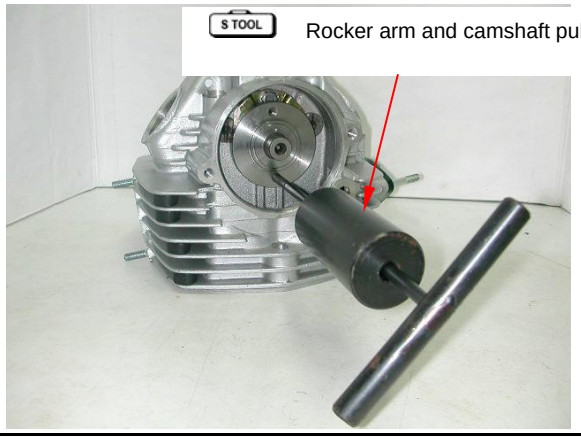
Camshaft Removal

Screw in a 5mm bolt or use the **Rocker arm and camshaft puller** to pull out the rocker arm and the camshaft.

Special tool：

Rocker arm and camshaft puller

SYM-1445100

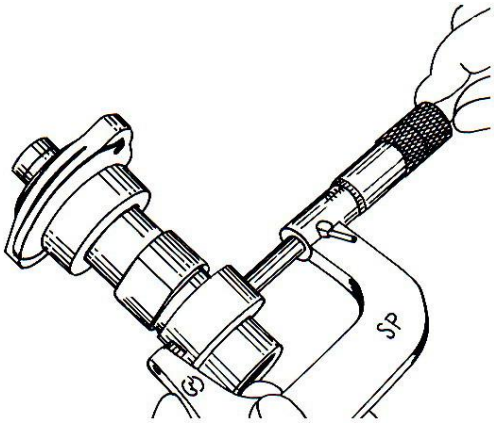


Camshaft Inspection

Check the camshaft for any wearing or loosen, also the bearing on the camshaft.

Service Limit：Intake 30.8mm

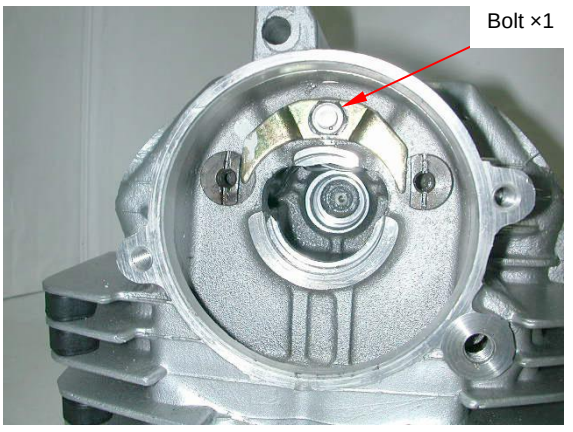
Exhaust 30.02m



Valve Rocker Arm

Rocker arm Disassembly

Disassemble the Rocker arm shaft holding plate (bolt×1)

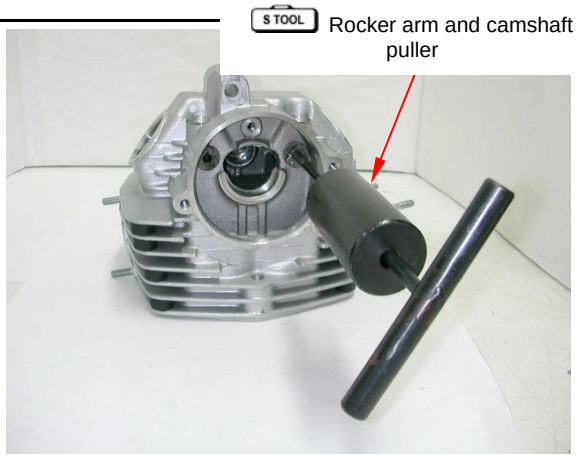


Use **Rocker arm / camshaft puller** to pull out the rocker arm shaft.

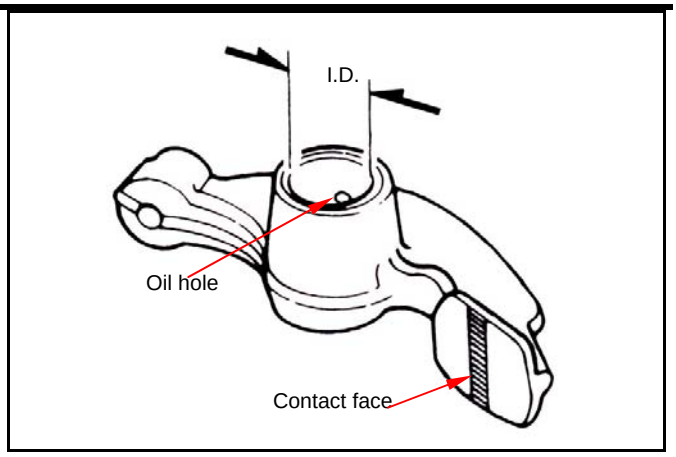
Special tool：

Rocker arm and camshaft puller

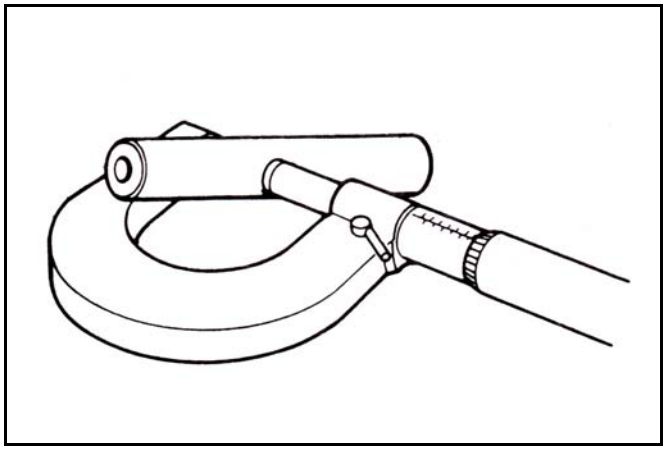
SYM-1445100



Rocker Arm
Measure the cam rocker arm Inner Diameter for wear or damage. Also check if the oil hole is clogged?
Rocker arm I.D. Service Limit：Replace when it's over 12.1mm

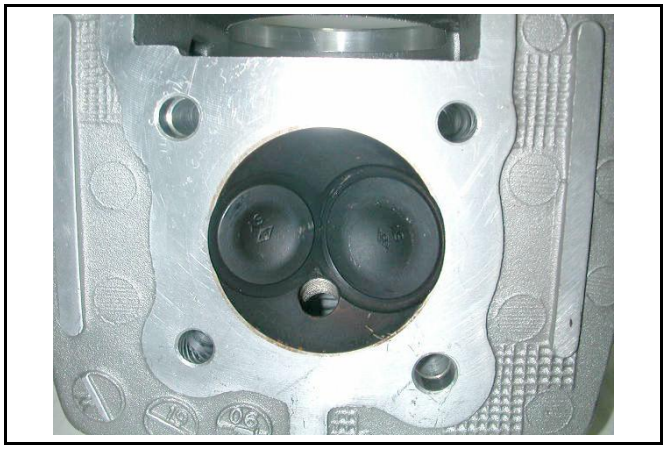


Rocker Arm Shaft Inspection
Measure the active O.D. of the cam rocker arm shaft and cam rocker arm.
Service Limit: Replace when it is less than 12 mm.

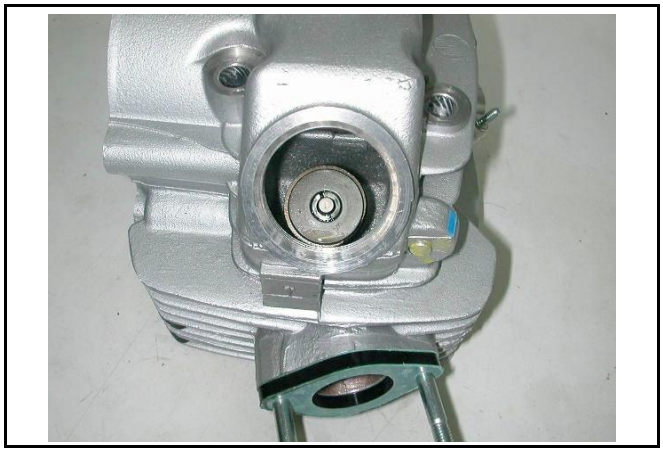


Valve

Valve Disassembly
Clear the carbon deposit inside the combustion chamber.



Use the valve spring compressor to compress the spring, remove the valve cotter, and take out the cotters, spring, and the spring retainers.

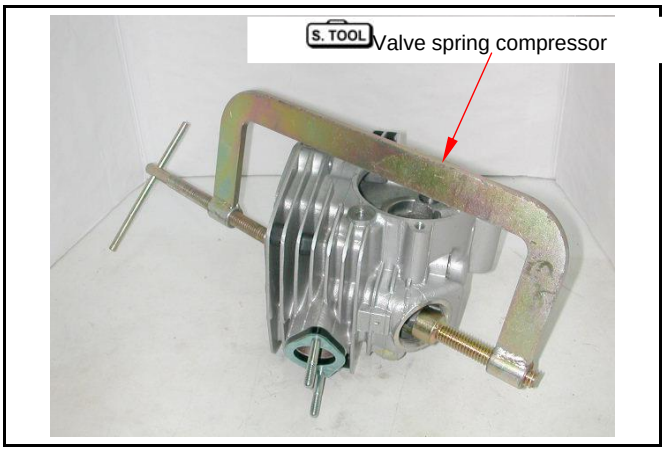


Special tool：

Valve spring compressor　SYM-1471100

Caution

- Do not over compress the valve spring.
- When removing the carbon deposit, beware not to damage the components inside the combustion chamber.



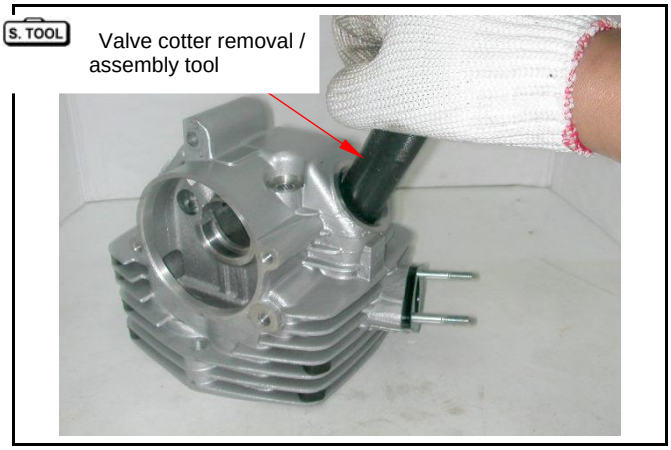
Valve cotter removal / assembly tool is recommended when removing the valve spring

Special tool：

Valve cotter removal / assembly tool SYM-1471110/20

Caution

- 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.



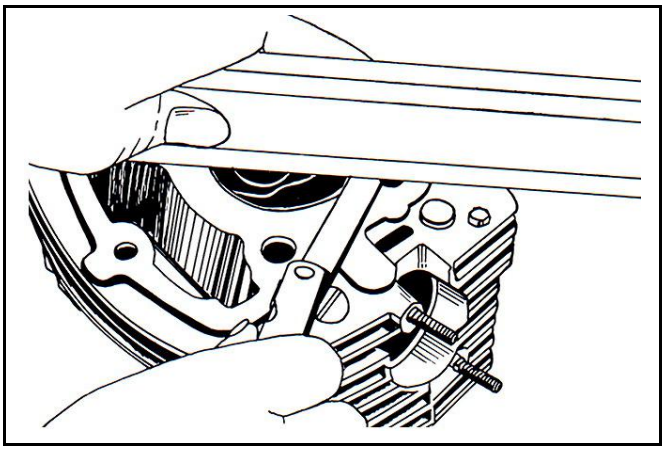
Cylinder Head Inspection

Clean the gasket residue on the matching surface.

Check if the cylinder head has any cracks.

Measure cylinder head warp with a straightedge and thickness gauge.

Service Limit：0.05mm



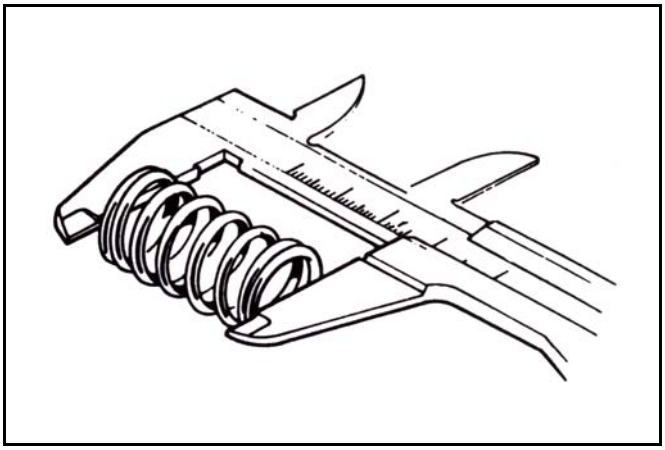
Valve Spring Free Length

Measure the free length of intake and exhaust valve spring.

Service Limit：

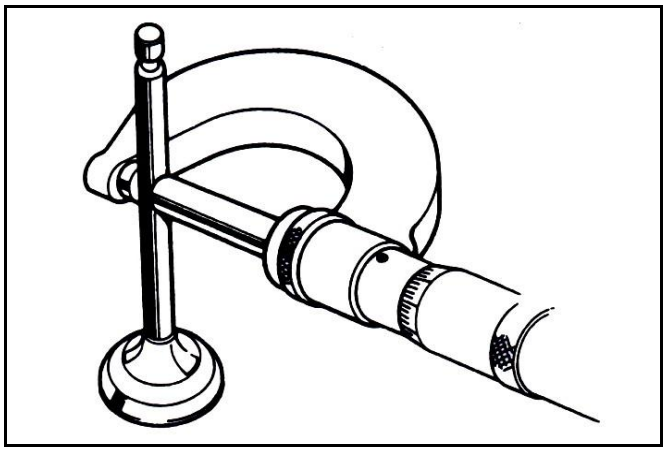
Outer spring: Under 39.7mm

Inner Spring: Under 32.5mm



Valve Stem Inspection

Check if valve stem is bent, cracked or burnt. Check the operation condition of valve stem in valve guide, and measure the valve stem outer diameter.



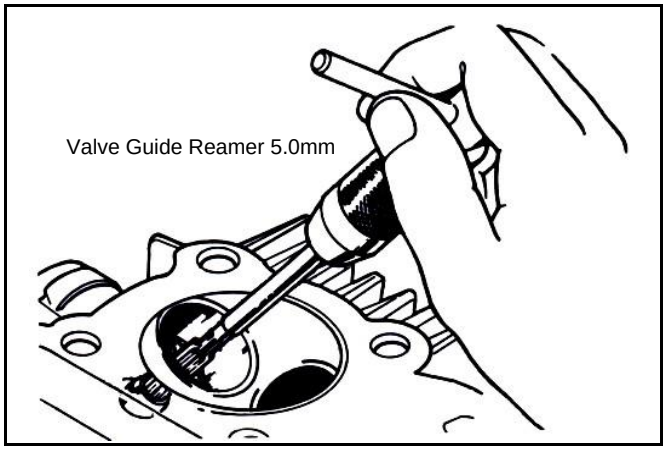
Service Limit:
Intake valve: Under 5.42mm
Exhaust valve: Under 5.40mm

Valve Guide Inspection

Caution

- Clear all the carbon deposit with reamer before measuring the valve guides**.**

Special tool: Valve Guide Reamer 5.0mm

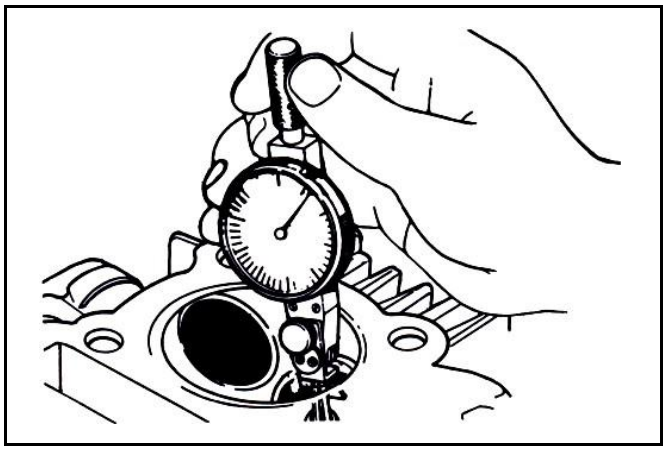


Measure and record each valve guide inner diameters.

Service Limit：5.50mm

The difference that the inner diameter of valve guide deducts the outer diameter of valve stem is the clearance value between the valve stem and valve guide.

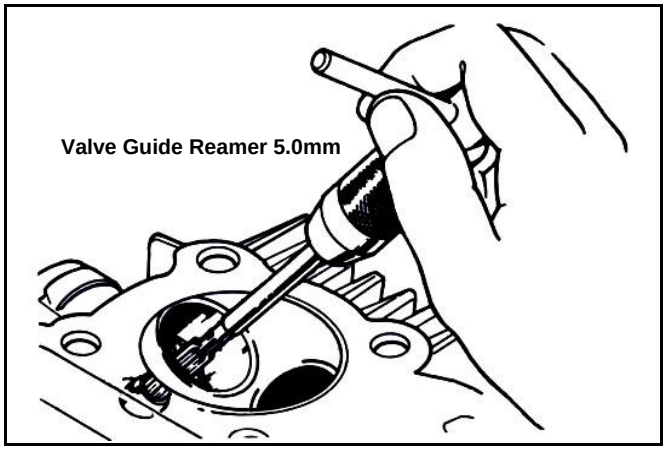
Service Limit：
Intake: Over 0.08mm
Exhaust: Over 0.10mm



Caution

- If clearance is over service limit, check if only replaces new valve guide will fix the clearance into service limit or not. If yes, replace valve guide only.

Fix the guides with reamer after replacement. If clearance still exceeds service limit after replacing valve guides, please also replace valve stem too.



Caution

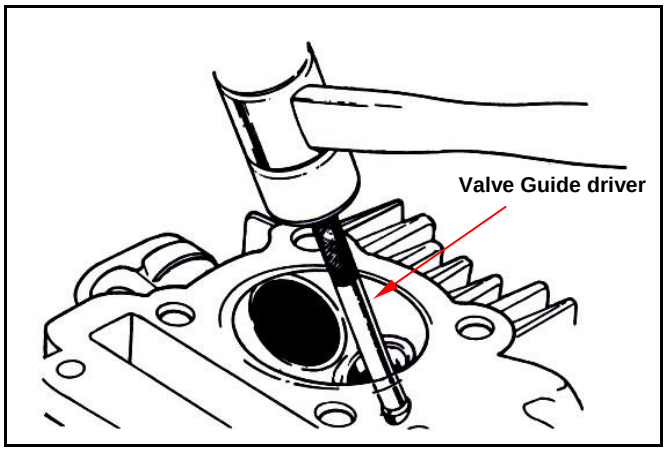
- Fix the valve seat when replacing valve guides.

Valve Guide Replacement

Heat the cylinder head with heated plate or toaster till the temperature reaches 100~150 ℃.

Caution

- Do not use flame to heat the cylinder head directly. Otherwise, the cylinder head will be deformed.
- Wear on a pair of heat-isolation glove to protect your hands when operating.

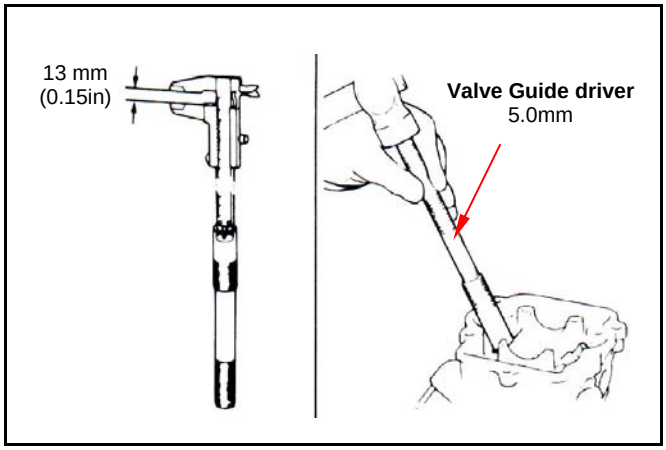


Hold the cylinder head, and then press out old valve guide from combustion chamber side.

Tool: Valve guide driver: 5.0 mm

Caution

- Check if new valve guide is deformed when pressed it in.
- When pressing in the new valve guide, cylinder head still have to maintain 100~150℃.



Adjust the valve guide driver and let valve guide height be 13 mm.

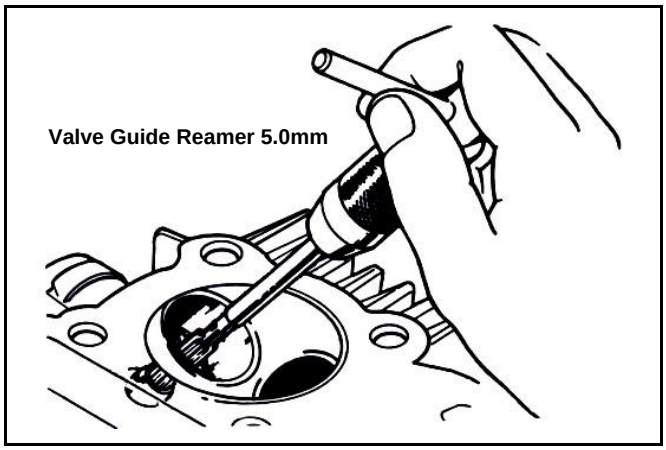
Press in new valve guide from rocker arm side.

Tool: Valve guide driver: 5.0 mm

Wait until cylinder head is cooled down to room temperature, and then fix the new valve guide with reamer.

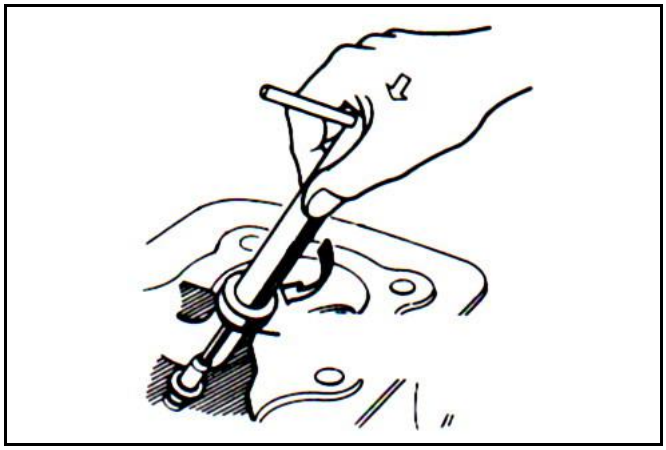
Caution

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



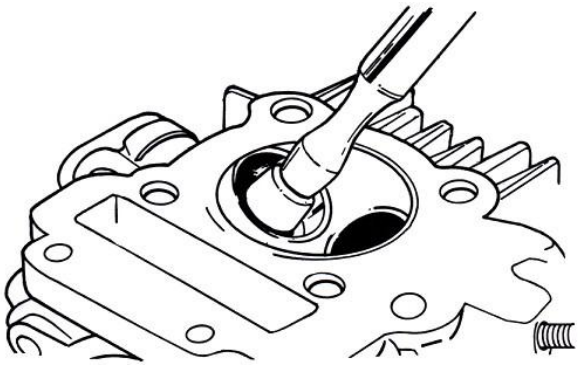
Correct the valve seat, and clean up all metal residues from cylinder head.

Special tool：Valve Guide Reamer 5.0mm



Valve Seat Inspection and Refacing

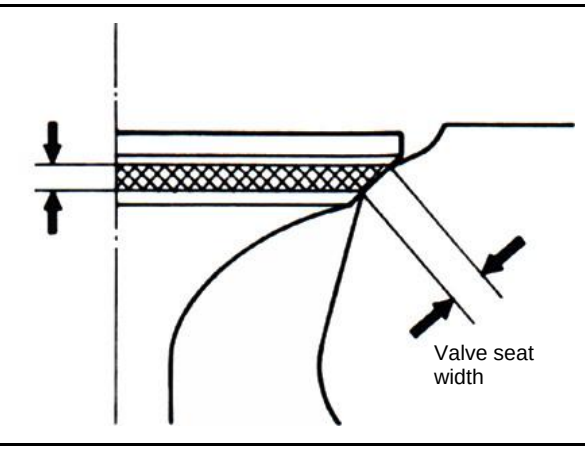
Clean up all carbon deposits onto intake and exhaust valves.
Apply with emery slightly onto valve contact face. Grind valve seat with a rubber hose or other manual grinding tool.



Remove the valves and check if the contact face is even or not.

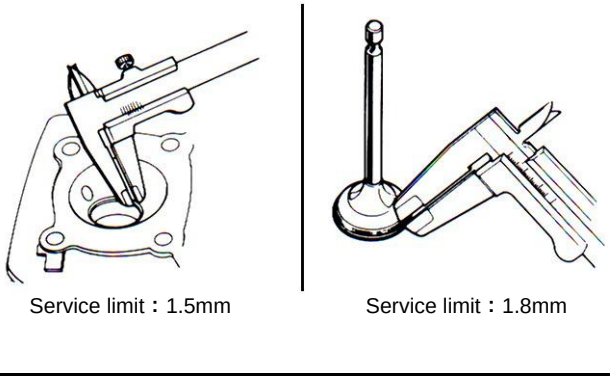
Caution

- The valve can not be ground. If the valve is burned, worn, or its contact face is uneven, replace it.
- If the valve contacts the valve seat unevenly after grinding, replace it.



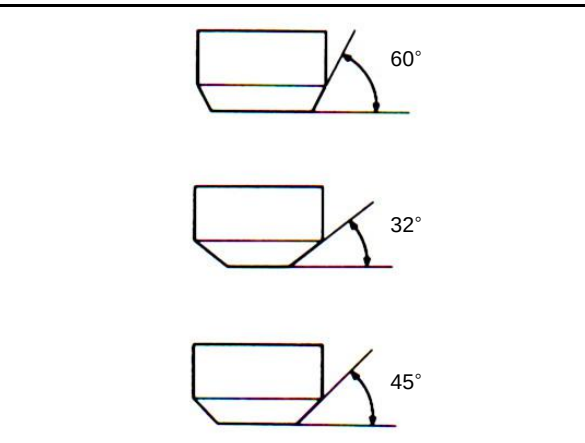
Check the contact condition of the valve seat.
If the valve seat is too wide, too narrow, or worn, refinish it.

Service limit：Valve seat width: 1.6 mm
Valve contact face width: 1.8 mm



Valve seat grinding

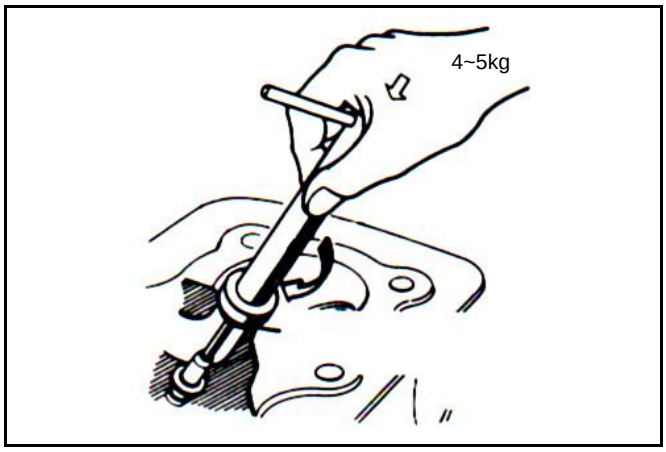
Please use the valve seat cutter and follow the instruction to grind the valve seat.



Rotate the valve seat cutter clockwise and counterclockwise with 4 to 5 kg pressure in order to fix the uneven part.

Caution

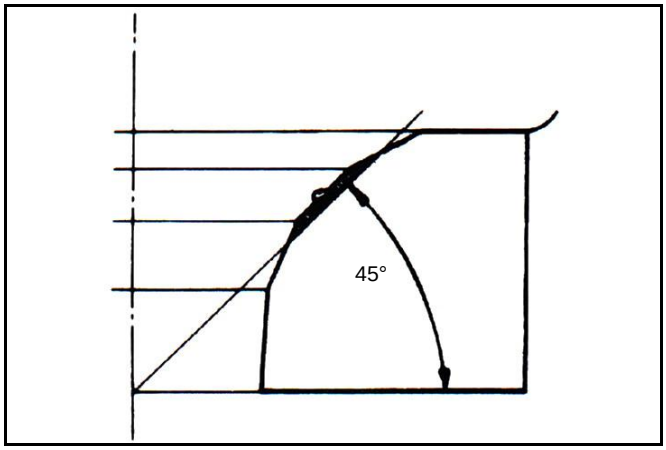
- Apply motor oil to the contact face while grinding it.



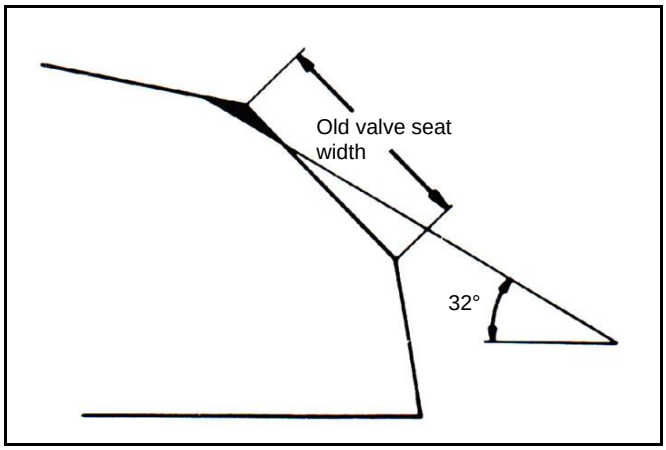
Use the 45 degree valve seat cutter to remove any roughness on the valve seat.

Caution

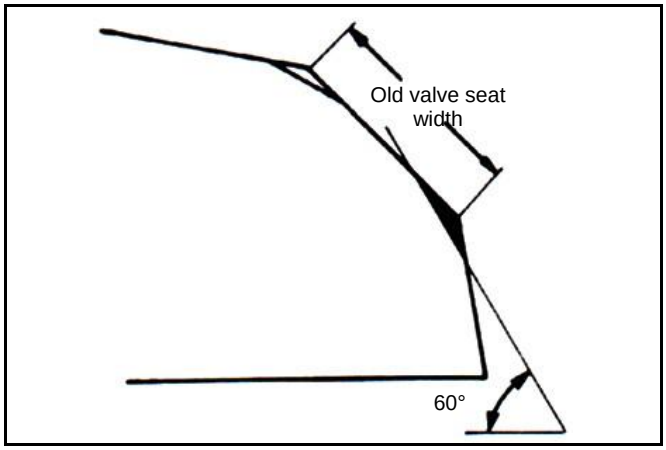
- Use the 45 degree valve seat cutter to grind the seat after changing the valve guide.



Use the 32 degree cutter to remove the upper 1/4 part of the valve seat.



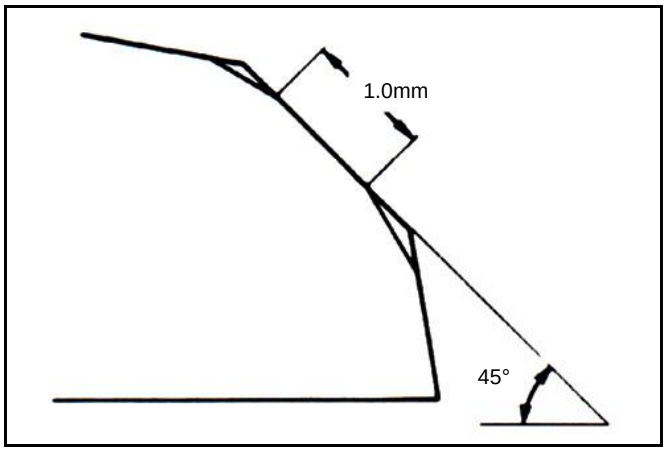
Use the 60 degree cutter to remove the bottom 1/4 part of the seat and check the new valve seat.



Use the 45 degree cutter and cut the seat to the proper width.

Caution

- Confirm that all roughness is removed.

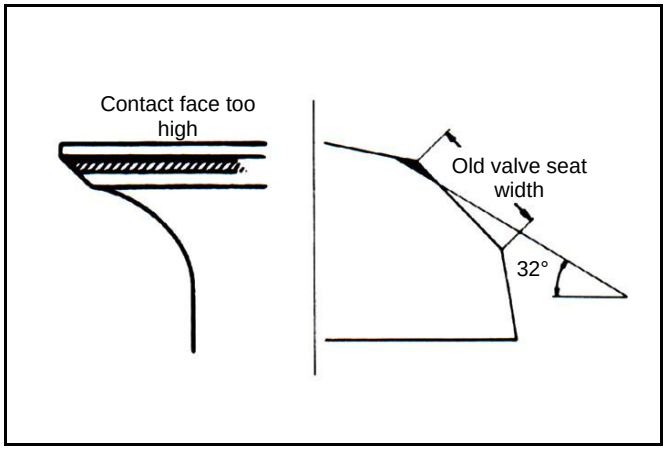


Coat the valve seat surface with red paint.
Install the valve through valve guide until the valve contacting with valve seat, slightly press down the valve but do not rotate it so that a seal track will be created on contact surface.

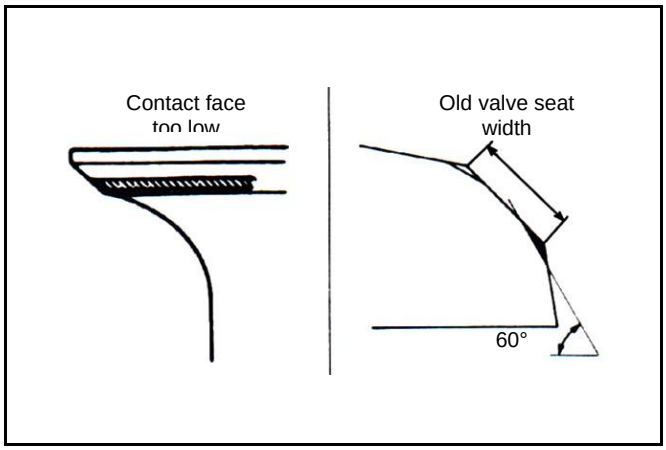
Caution

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

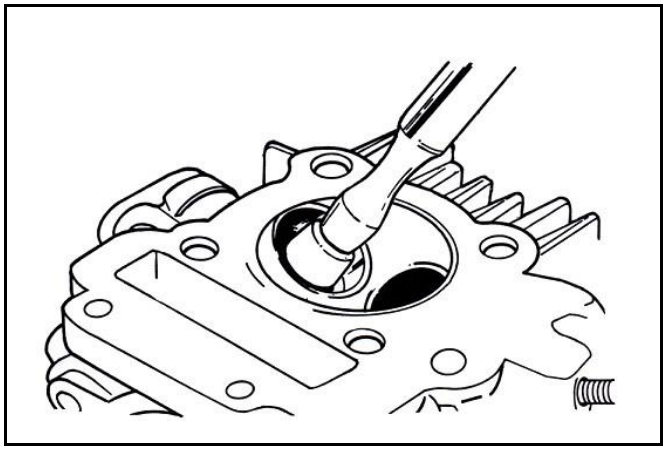
If the contact face on the valve is too high, cut the valve seat with the 32 degree cutter.
Then cut the valve seat to the proper width with the 45 degree cutter.



If the contact face on the valve is too low, cut the valve seat with the 60 degree cutter.
Then cut the valve seat to the proper width with the 45 degree cutter.



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



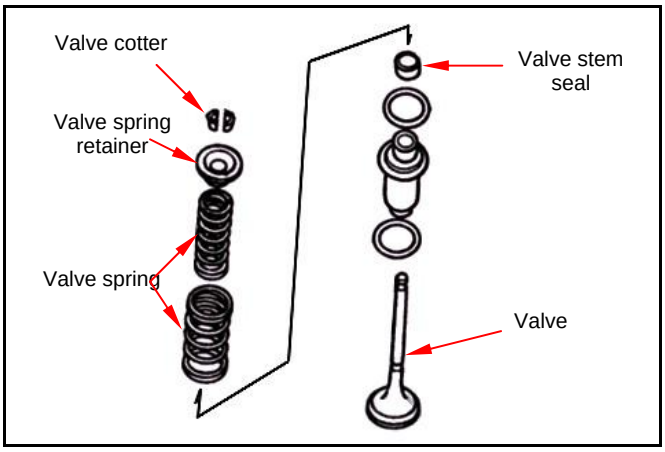
Cylinder Head Assembly

Install the valve by using valve installer or valve spring compressor.

Special tool：

Valve remove / install tool SYM-1471120

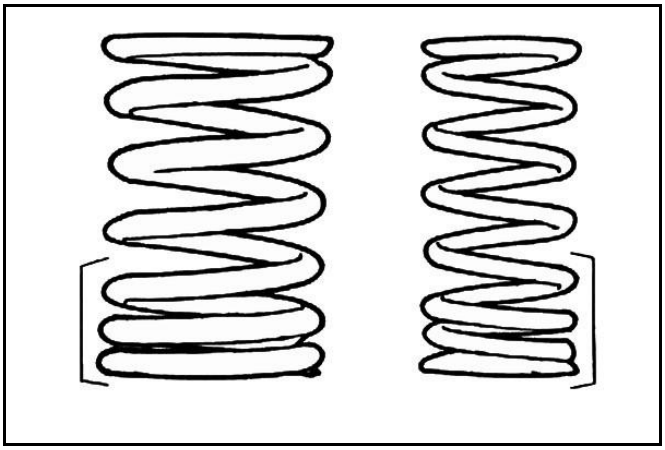
Valve spring compressor SYM-1471100



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.

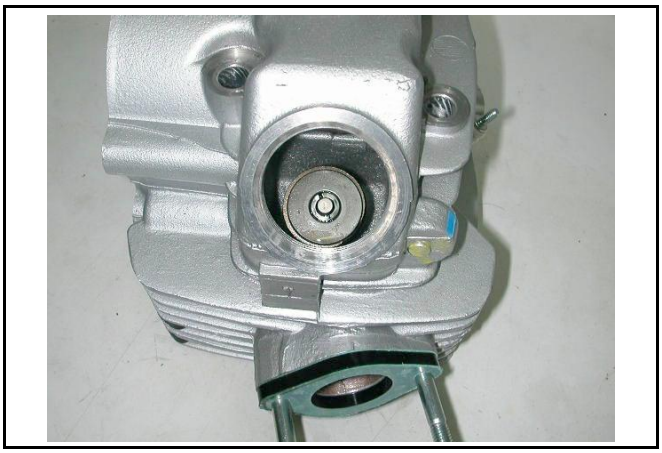
Lubricate valve stem with engine oil, and then insert the valve into valve guide.
Install new valve stem oil seal.
Install valve springs and retainers.



Caution

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

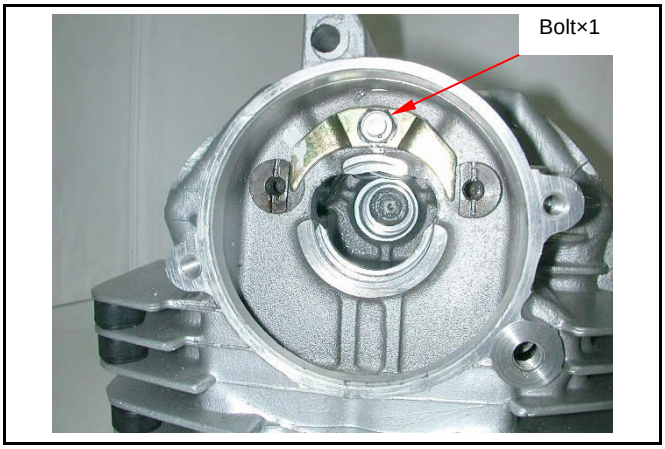
Tap the valve stems gently with a plastic hammer to make sure valve retainer and valve cotter is settled.



Caution

- Place and hold cylinder head on to working table so that can prevent from valve damaged.

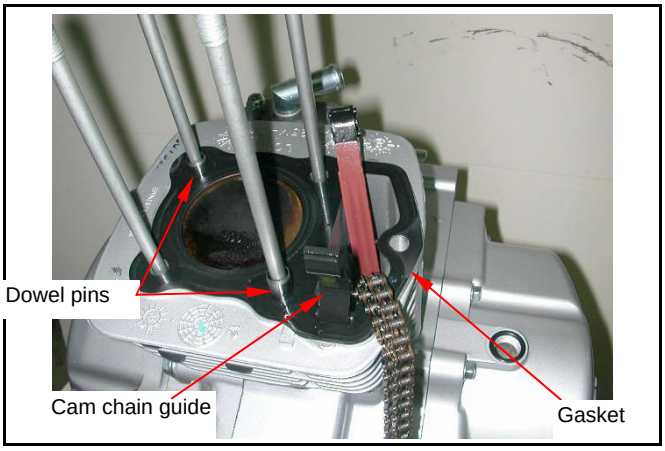
Install camshaft into cylinder head.
Install valve rocker arm, rocker arm shaft and rocker arm shaft setting plate.



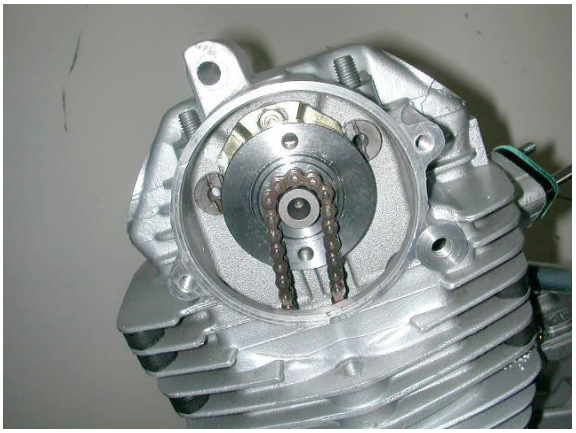
Torque value：0.8~1.2kgf-m

Cylinder Head Installation

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



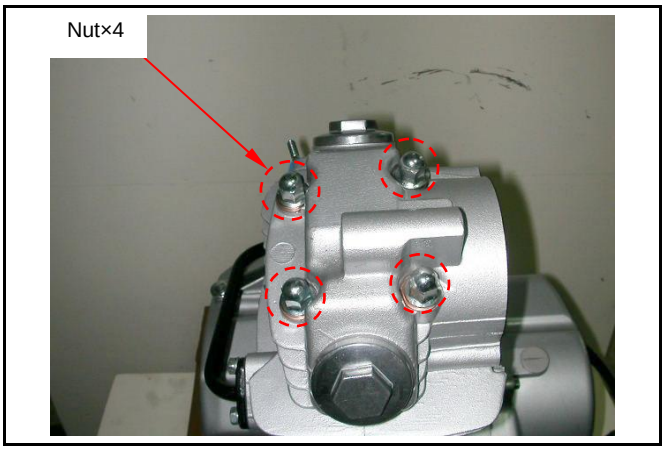
Install the cylinder head. Lubricate the cam shaft and install it onto the cylinder head.
Install the cam chain onto the cam shaft.



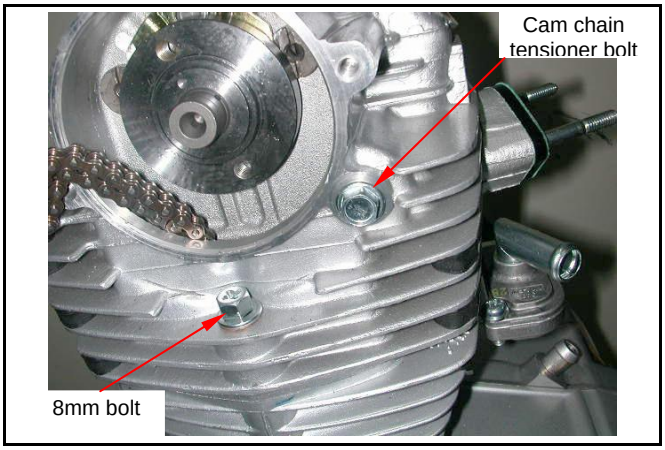
Tighten the cylinder head upper nuts.
Torque value：
Cylinder head upper nut　2.8~3.0kgf-m

Caution

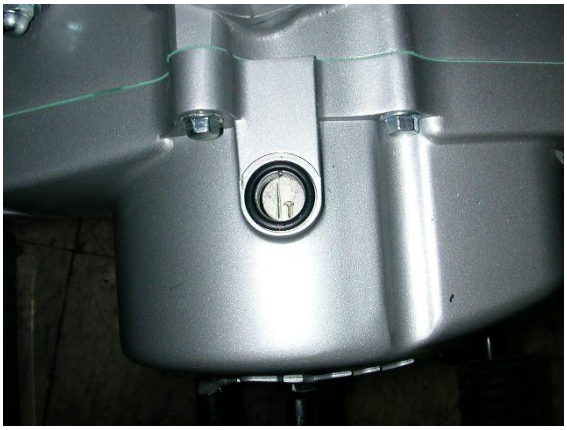
- Tighten the cylinder head nuts in diagonally opposite sequence.
- Do not exceed the specified torque value to prevent cylinder head warpage, abnormal noise, leakage or weakening of engine performance.



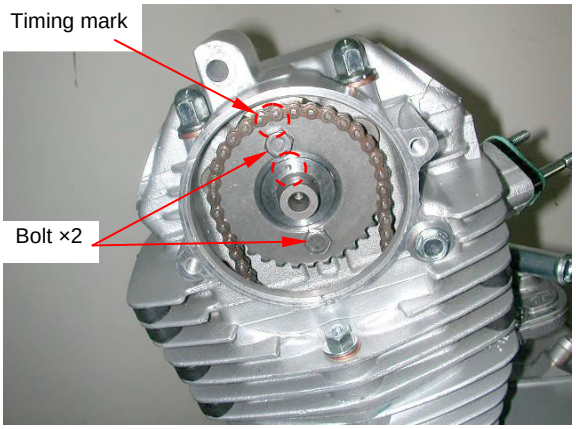
Tighten the cylinder head bolt on the left side.
Torque value：
Cylinder head left side bolt　0.8~1.2kgf-m
Loosen the cam chain tensioner adjusting bolt.
Align and tighten the cam chain tensioner.
Torque value：1.0~1.4kgf-m



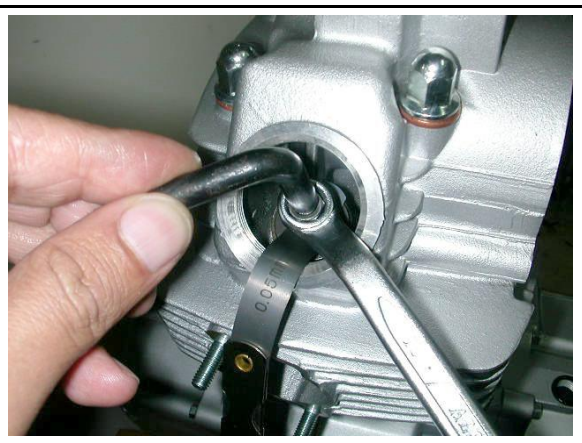
Use a T type wrench to rotate the crankshaft clockwise and align the “T” mark on the flywheel with the index mark on the left crankcase cover.



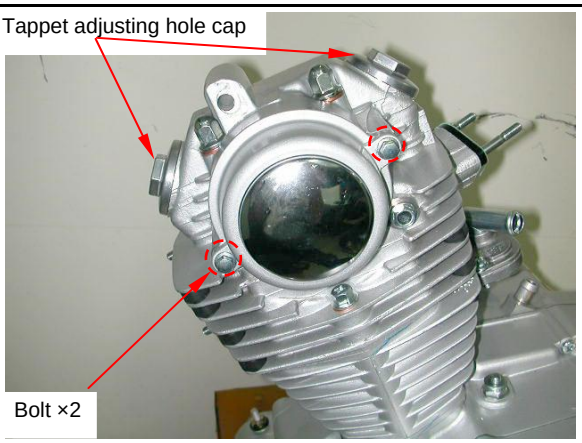
Install the cam chain sprocket and align the timing mark with the index mark on the cylinder head. Install the cam chain onto the sprocket.
Torque value：1.8~2.2kgf-m



Adjust the valve clearance.
Standard value：0.05 ± 0.02mm



Install the cylinder head side cover (bolt×2).
Torque value：0.8~1.2kgf-m
Install the tappet adjusting hole caps.
Adjust the cam chain tightness.
Reinstall the engine in the reverse order of uninstall (refer to 6th chapter).



Caution

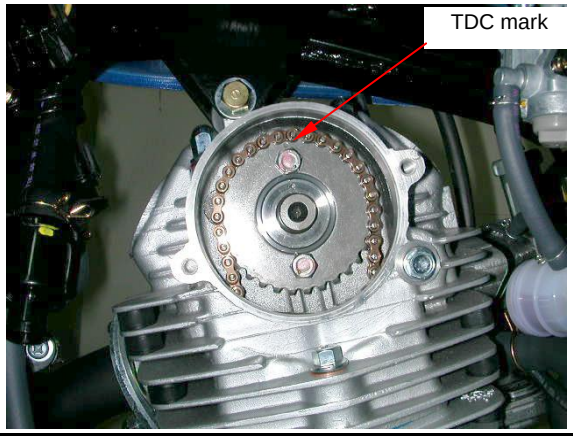
- Be careful when installing engine.
- Do not or press any wire or tube.

Valve Clearance Adjustment

⚠ Caution

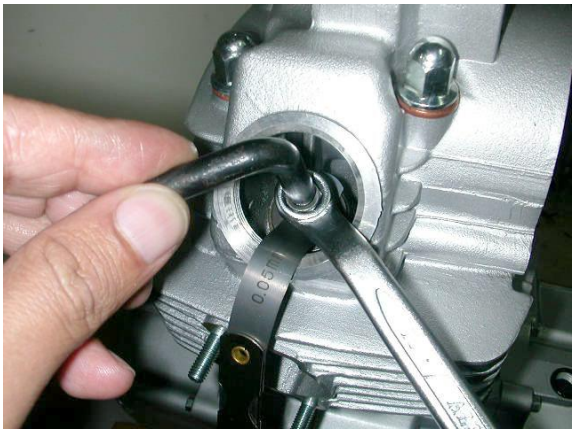
- Inspect and adjust the valve clearance when the engine is cool (under 35°C).

Remove the tappet adjusting hole cap.
Remove the cylinder head side cover.
Use a T type wrench to rotate the crankshaft clockwise and align the “T” mark on the flywheel with the index mark on the left crankcase cover and the timing mark on the sprocket with the index mark on the cylinder head (piston is at top dead center on the compression stroke).



Valve clearance inspection / adjustment
Inspect and adjust valve clearance with thickness gauge.

Valve clearance：IN 0.05±0.02 mm
EX 0.05±0.02 mm



Loosen the fixing nut and rotate the adjusting bolt to adjust valve clearance.
Fasten the adjusting bolt and tighten the fixing nut when the standard value is reached.

⚠ Caution

- Confirm the valve clearance reach the standard value when the fixing nut is tightened.

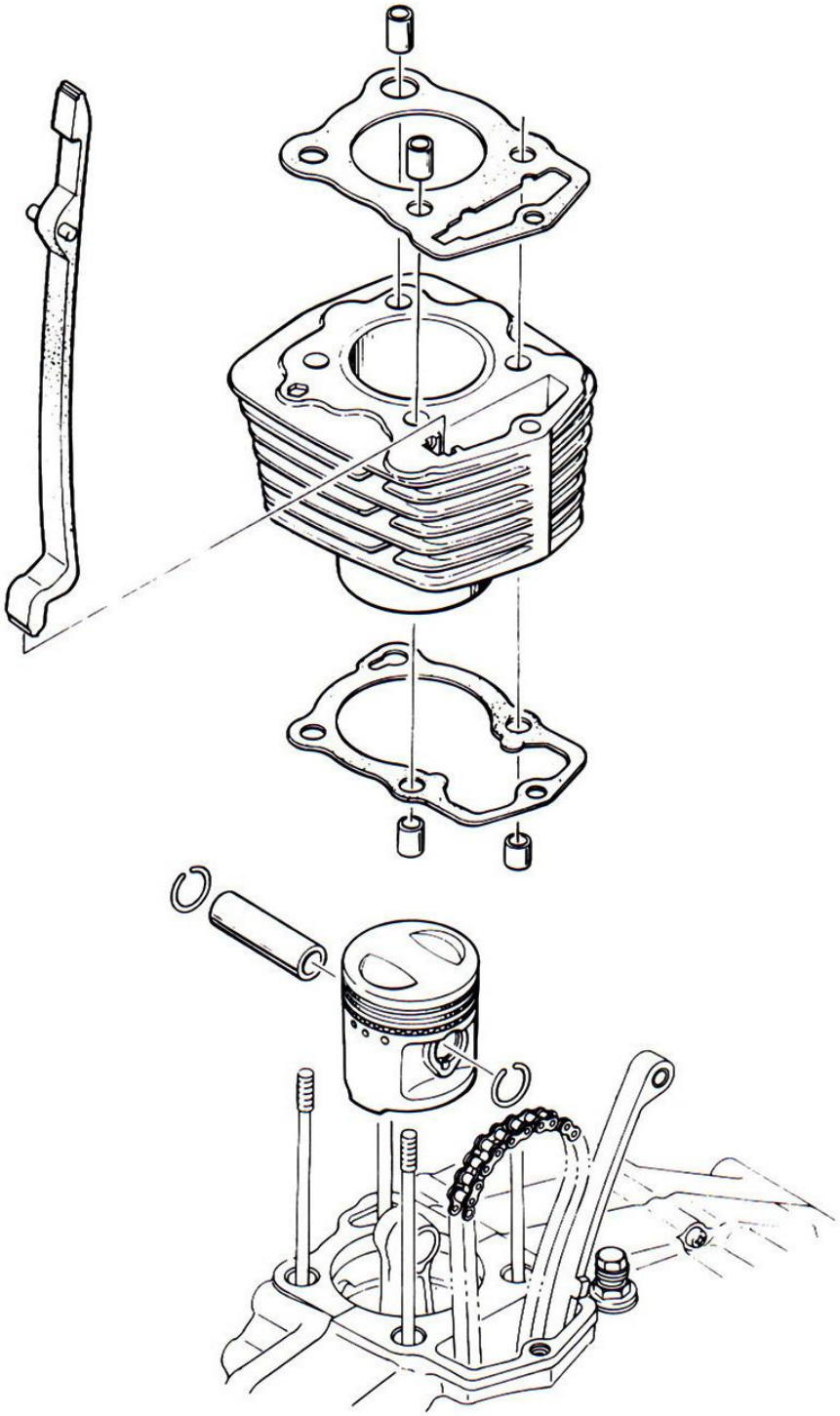
Install the tappet adjusting hole cap, cylinder head side cover, timing inspecting hole cap and ACG cap.

⚠ Caution

- Check for any damage on the O ring and coat it with engine oil before installing the tappet adjusting hole cap, cylinder head side cover, timing inspecting hole cap and ACG cap.

Note:

Mechanism Illustration



Precautions in Operation

General Information

- The engine must be removed from the frame before the repairing of the cylinder and the piston.

Specification

Measurement unit : mm

Subject			Specification	
			Standard	Service Limit
Cylinder	Cylinder Inside Diameter		56.000~56.010	56.100
	Warpage		—	0.050
	Taper		—	0.050
	Out of round		—	0.050
Piston/ Piston Ring	Piston Ring/ Groove Clearance	Top Ring	0.025~0.055	0.130
		Second Ring	0.015~0.045	0.120
	Piston Ring End Gap	Top Ring	0.150~0.350	0.500
		Second Ring	0.150~0.350	0.500
		Oil Ring	0.200~0.500	—
	Piston Ring Thickness	Top Ring	1.475~1.490	1.460
		Second Ring	1.475~1.490	1.460
	Piston Outside Diameter		55.970~55.990	55.8700
	Piston Outside Diameter Measure Point		10mm up from the bottom of the piston	
	Piston/ Cylinder Clearance		0.020~0.050	0.110
	Piston Pin Hole Inside Diameter		15.002~15.008	15.050
Piston Pin Outside Diameter			14.994~15.000	14.850
Piston/ Piston Pin Clearance			0.002~0.014	0.020
Connecting Rod Small End Inside Diameter			15.010~15.028	15.070

Troubleshooting

Low Compression or Instability

Worn cylinder or piston rings

Over High Compression

Excessive carbon built-up on the piston or combustion chamber

Knocking or Abnormal Noise

Worn piston or cylinder

Excessive carbon built-up on the top of the piston

Worn Piston Pin and Piston Pin Hole

Excessive Smoke

Worn cylinder or piston or piston rings

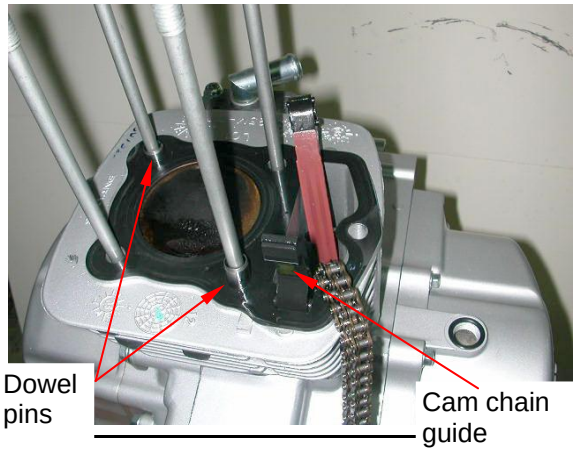
Improper piston rings installation

Overheating

Excessive carbon built-up on the top of the piston

Cylinder Removal / Inspection

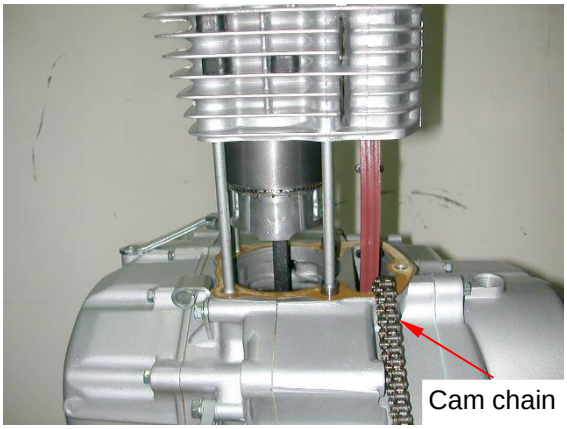
Remove the cylinder head (refer to chapter 7).
Remove the cylinder head gasket and the dowel pins
Remove the cam chain guide



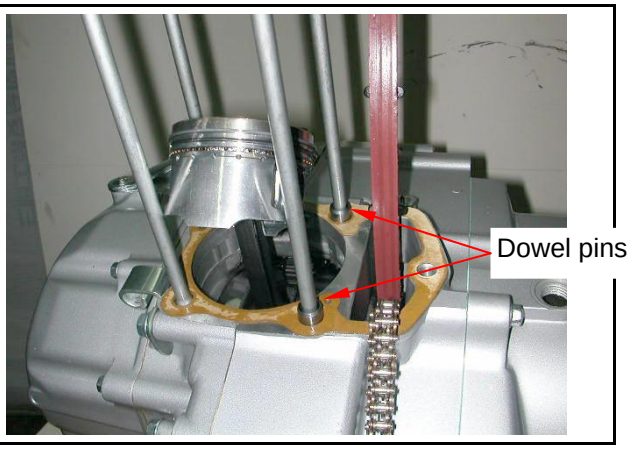
Remove the cylinder.

Caution

- Prevent the camshaft chain from falling into the crankcase when removing the cylinder.



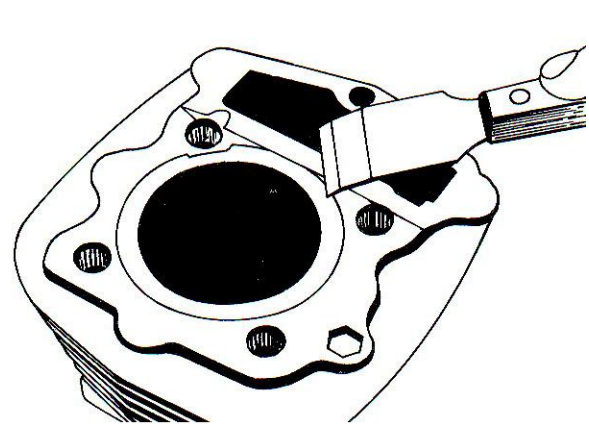
Remove the cylinder gasket and dowel pins.



Clean all the gasket material from the contact surface.

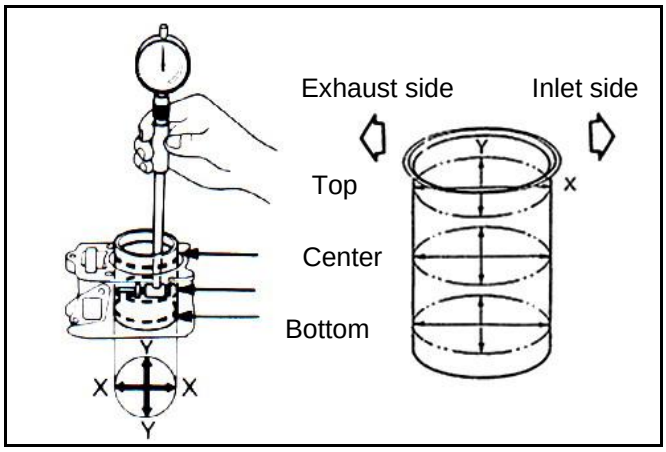
Note

- Use solvent to wet the gasket material in order to remove it more easily.
- Do not damage the contact surface during operation.

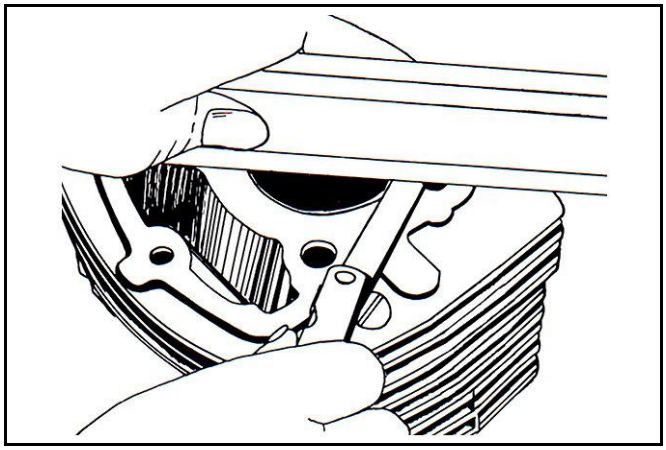


Cylinder Inspection

Check if the inner diameter of cylinder is worn out or damaged.
Measure the cylinder inner diameter in X and Y axis at three levels.
Service limit：37.50　mm
Calculate the taper and out of round at three levels in X and Y axis. Take the maximum value to determine.
Service limit：
Out of round：0.05 mm
Taper：0.05 mm



Measure the cylinder upper surface for warpage.
Service limit：0.05mm



Piston Removal / Inspection

Block the crankcase and camshaft chain hole with a clean cloth in order to prevent the piston pin clip falling into the crankcase

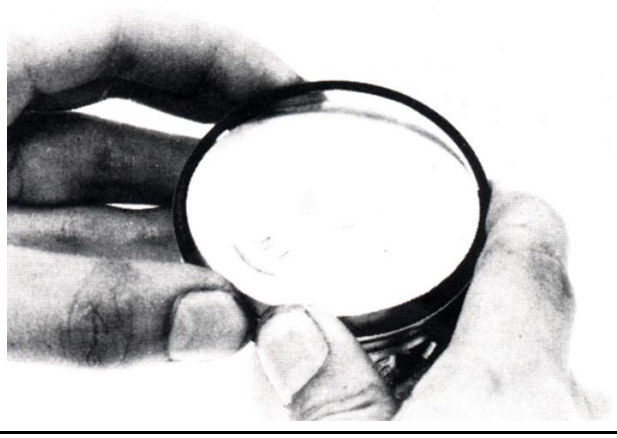
Cover the holes of crankcase and cam chain with a piece of clean rag.
Remove the piston pin circlip and remove the piston pin and piston.

Remove the piston rings

⚠ Note

- Piston rings are easy to break, please be careful during operation

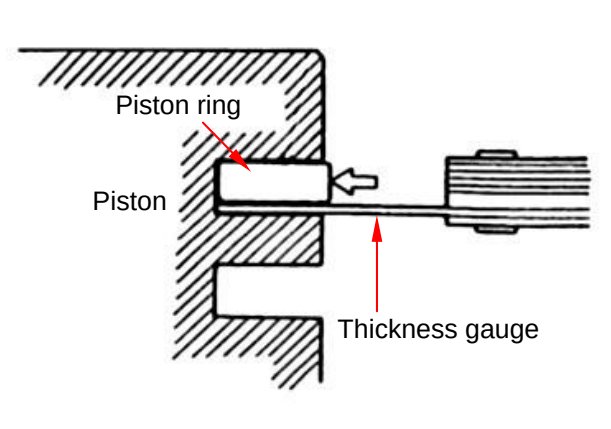
Check if the piston rings are damaged or its grooves are worn. Clean the carbon deposit.



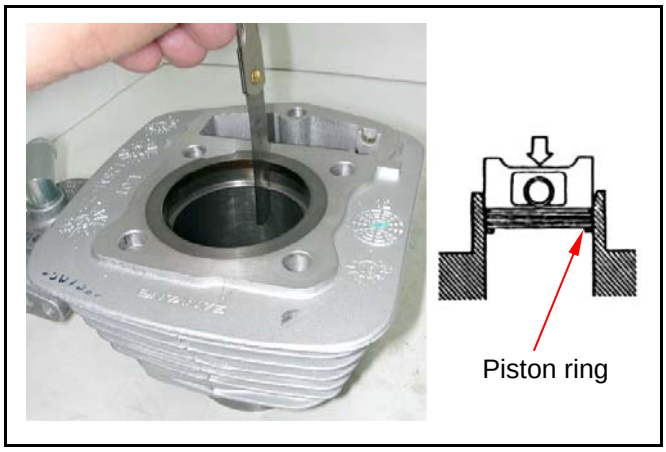
Measure the clearance between piston rings and ring grooves.

Service limit：

Top groove: 0.13 mm
Second groove: 0.12 mm



Place piston rings respective into cylinder below 20 mm of cylinder top. In order to keep the piston rings in horizontal level in cylinder, push the rings with piston.
Measure the piston ring end gap.



Caution

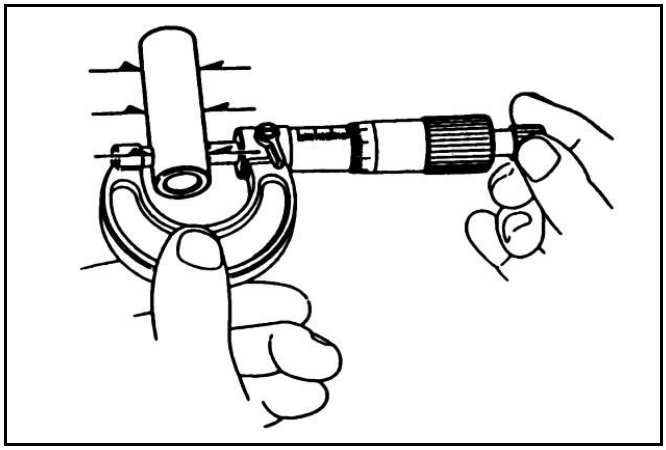
- Use the piston head to push the piston ring squarely into the cylinder.

Service limit：

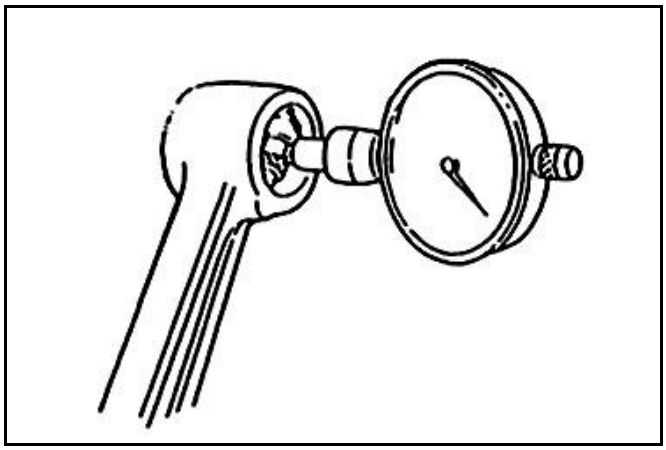
Top ring：0.5 mm

Second ring：0.5 mm

Measure the piston pin outer diameter.
Service limit：14.85mm

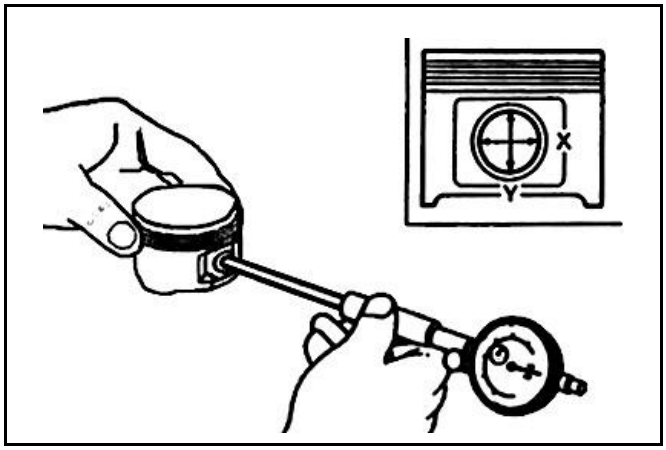


Measure the conrod small end inner diameter.
Service limit：15.07mm



Measure the inner diameter of piston pin hole.
Service limit：15.05mm

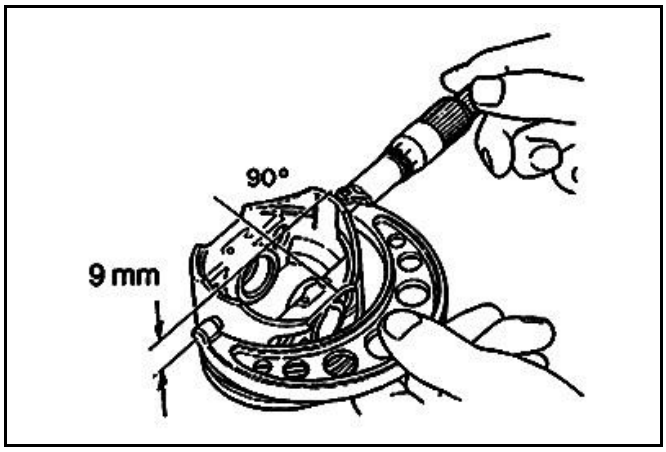
Calculate the clearance between the piston pin and its hole.
Service limit：0.02mm



Measure the outer diameter of piston pin.

⚠ Caution

- Measure the piston outer diameter in the direction perpendicular to the piston pin axis.

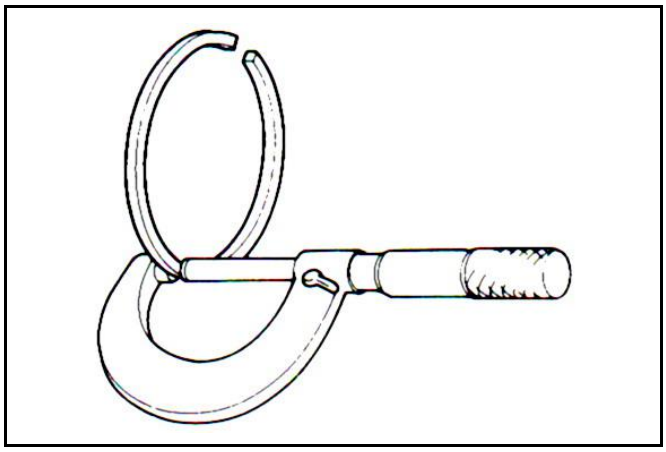


Service limit：55.87mm

Compare the measured value with service limit to calculate the clearance between the piston and cylinder.

Measure the piston ring thickness.

Service limit：1.46mm

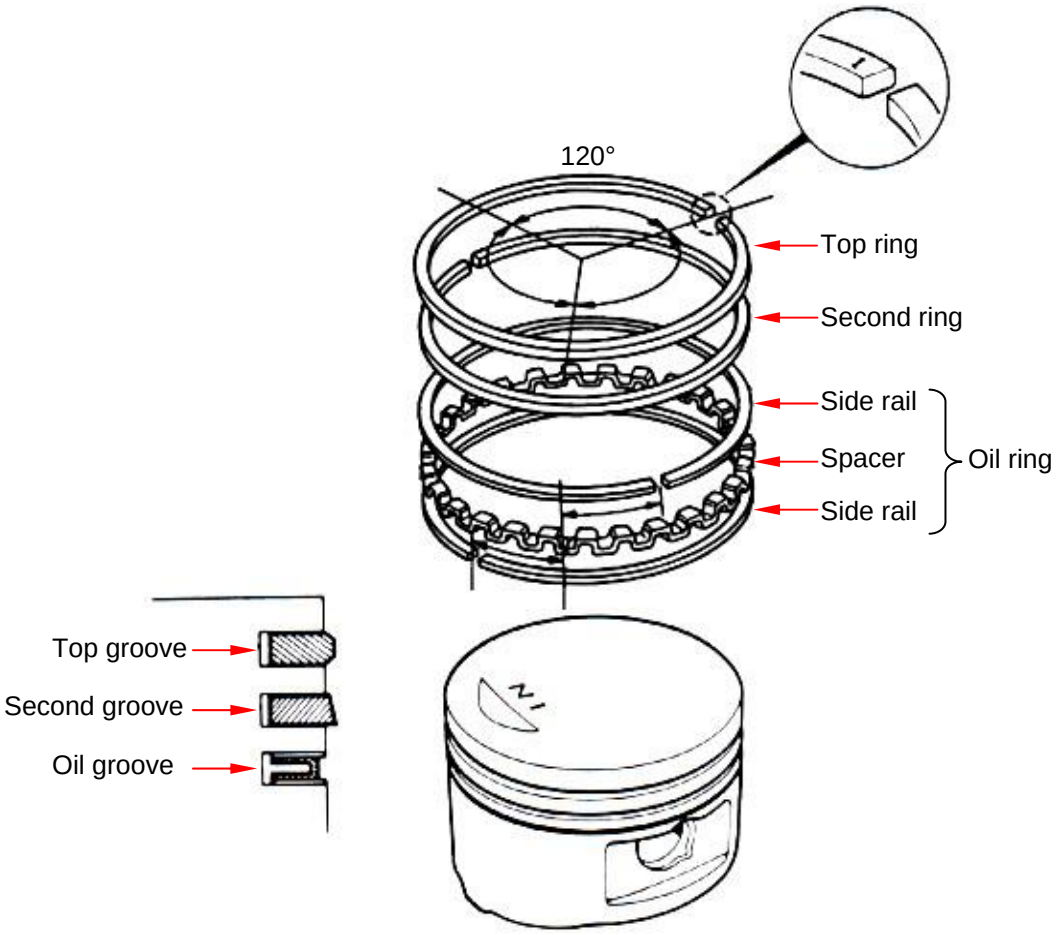


Piston Rings Installation

Clean up the piston top, ring groove, and piston surface.
Install the piston ring onto piston carefully.
Place the openings of piston ring as diagram shown.

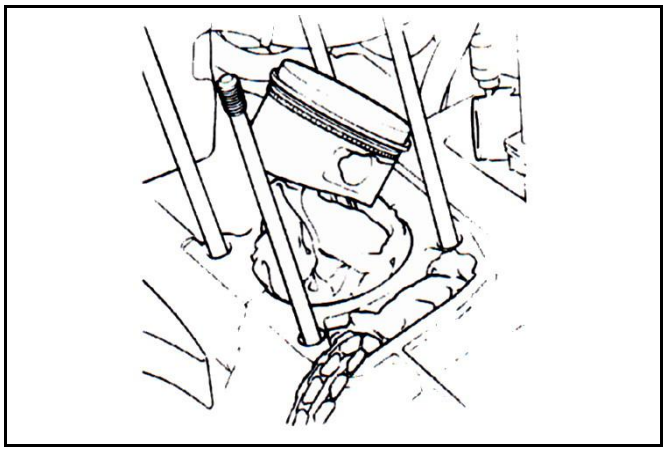
Caution

- Do not damage the 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 installation.



Piston Installation

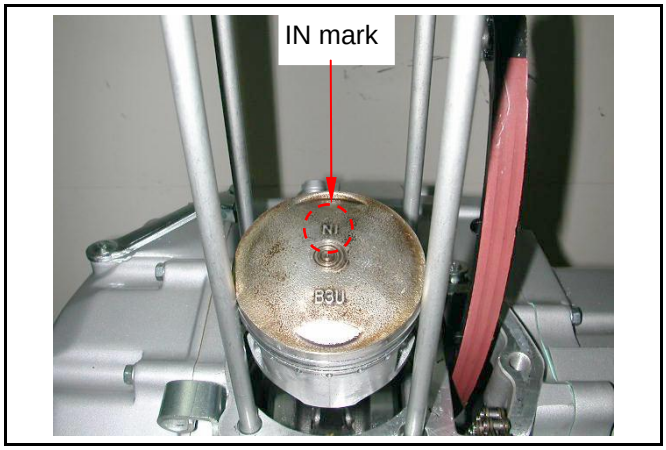
Place a piece of clean rag under the piston. Clean all the gasket material from the contact surface.



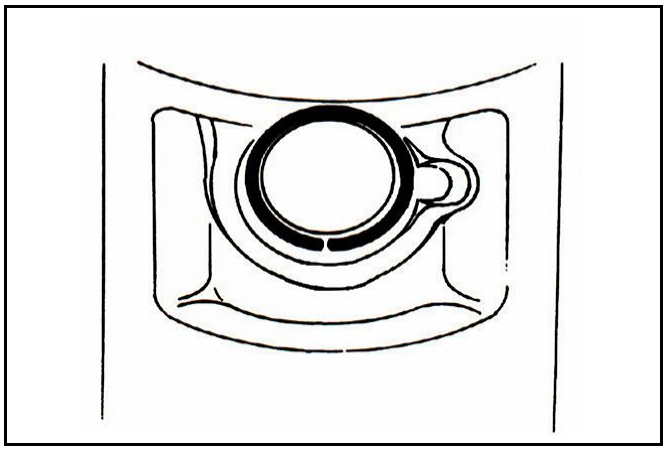
Caution

- Use solvent to wet the gasket material in order to remove it more easily.

Install piston and piston pin and make the IN mark facing forward



Install the new piston pin snap ring

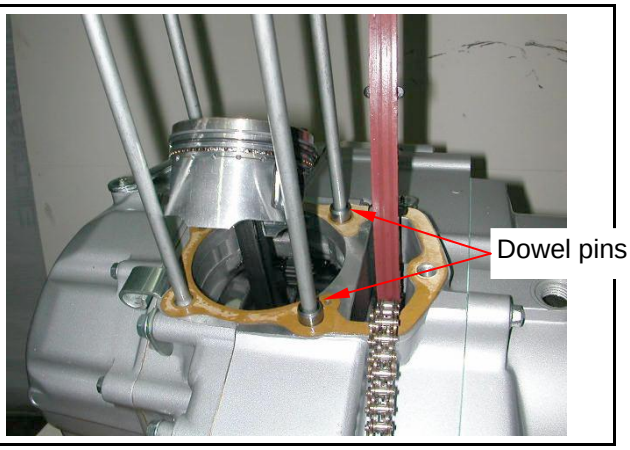


Note

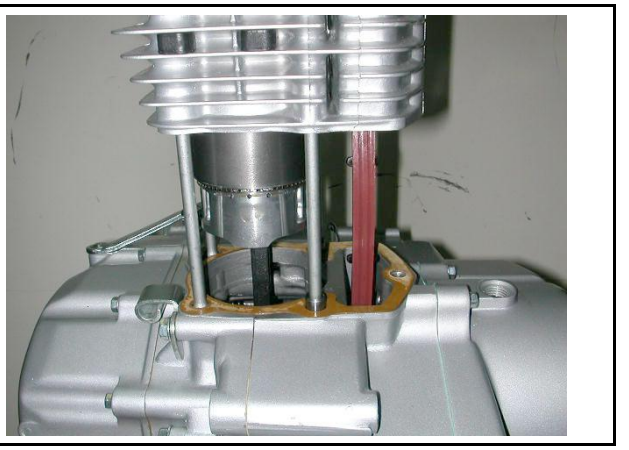
- Do not make the piston pin snap ring opening coincide with the slit of the piston pin hole
- Place a clean cloth between the piston and the crankcase to prevent the piston pin snap ring falling into the crankcase

Cylinder Installation

Install the dowel pins and the new cylinder gasket.



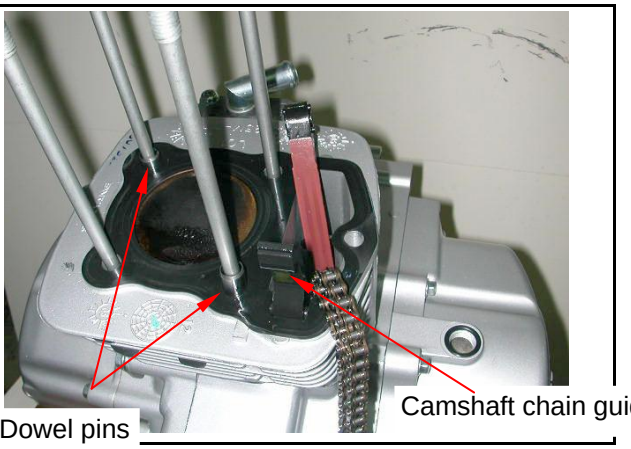
Apply clean motor oil to the cylinder bore, piston and piston rings.
Install the cylinder carefully.
Press the piston rings if necessary.



Note

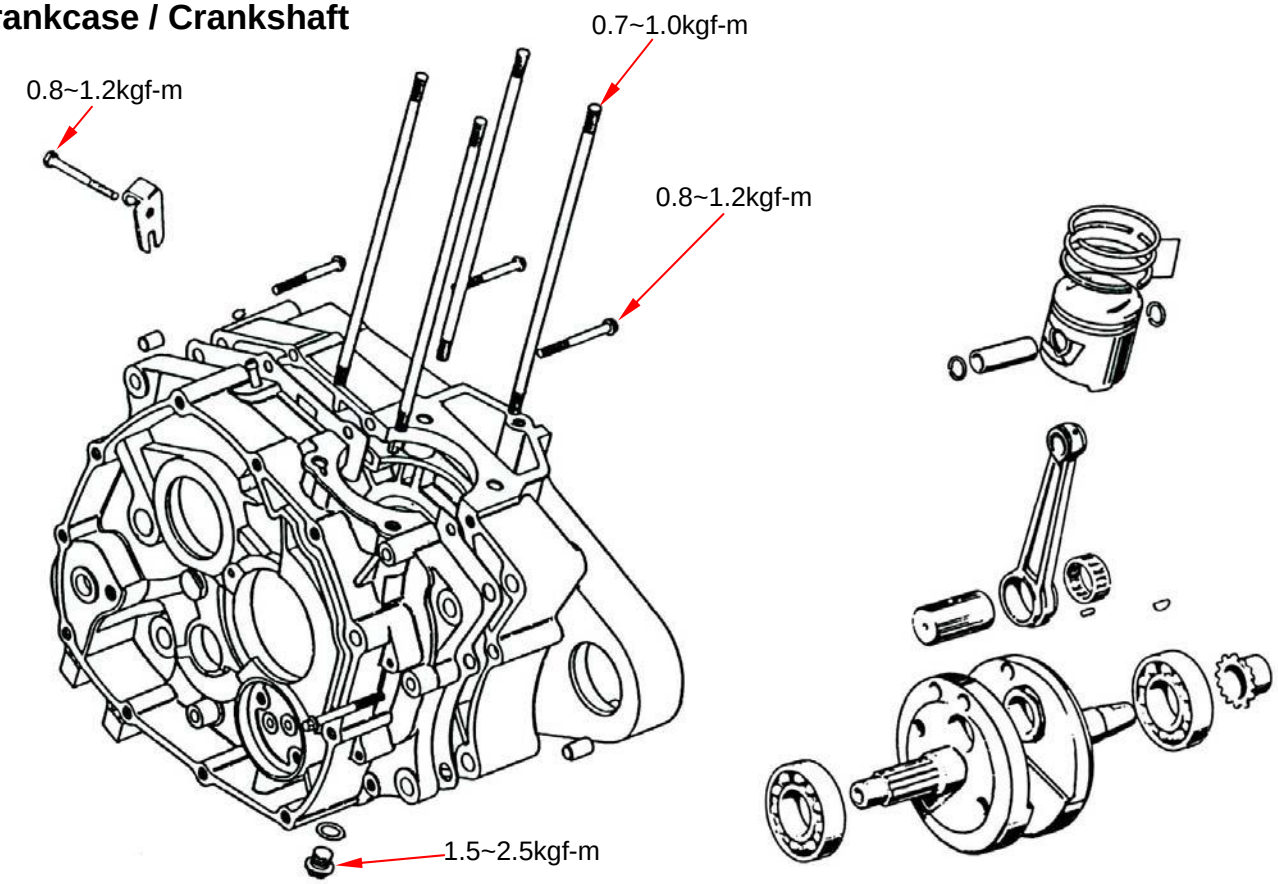
- Do not push the piston into the cylinder forcefully because the piston and piston rings will be damaged.

Install the cam chain guide, dowel pins and cylinder head gasket.
Install the cylinder head (refer to chapter 7).

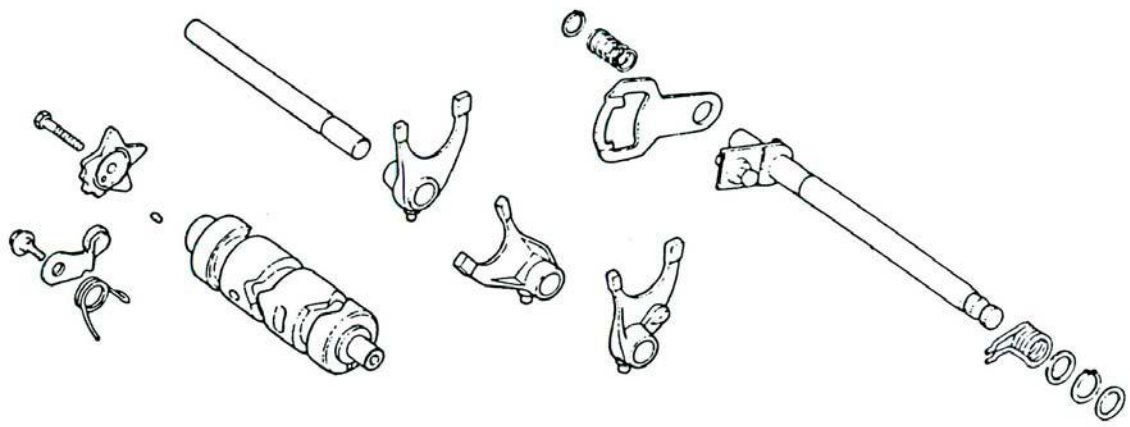


Mechanism Diagram

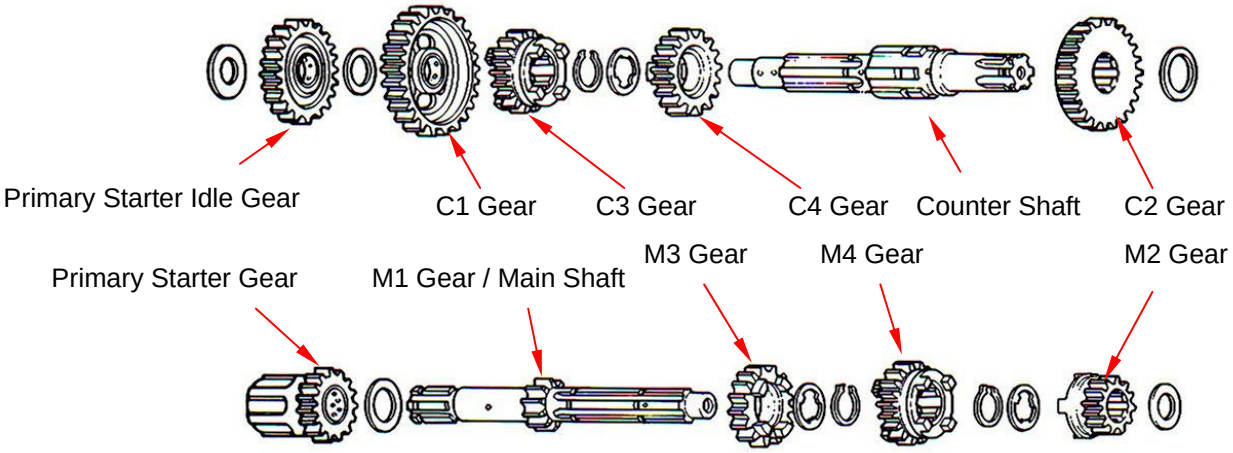
Crankcase / Crankshaft



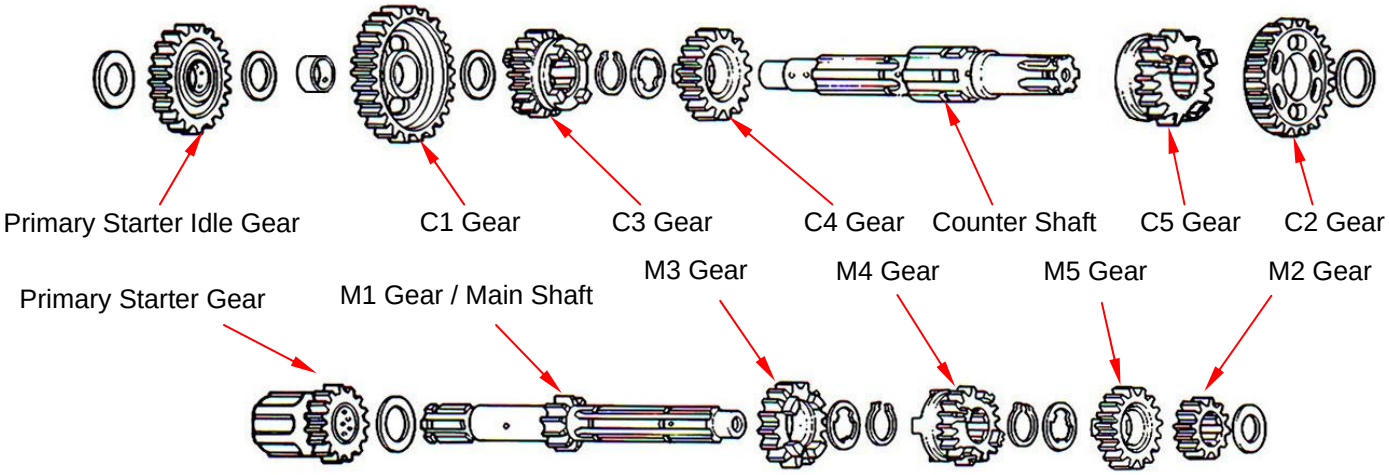
Transmission



Four-Speed Gear



Five-Speed Gear



Precautions in Operation

General Information

- This Section concerns disassembly of the crankcase and transmission system for repair purpose.
- The following components need to be removed before disassembling the crankcase.

Engine	Chapter 6
Cylinder Head	Chapter 7
Cylinder / Piston	Chapter 8
Clutch / Oil Pump / Gear Shift Spindle	Chapter 4
ACG / Starter Clutch / Starter Motor	Chapter 5

- The crankshaft should be replaced as a unit if the timing sprocket on the crankshaft needs to be replaced.

Specification

Unit : mm

Item		Standard	Service Limit
Crankshaft	Conrod big end side clearance	0.050~0.300	0.600
	Conrod big end vertical clearance	0.004~0.012	0.050
	Run-out	—	0.100
	Conrod small end inner diameter	15.010~15.028	15.080
Gear shift fork	Inner diameter	12.000~12.018	12.050
	Claw thickness	4.930~5.000	4.700
Shift fork shaft	Outer diameter	11.976~11.994	11.960
Kick starter	Kick starter spindle outer diameter	24.859~24.880	24.800
	Kick starter pinion inner diameter	24.900~24.921	24.960

Torque Value

Crankcase bolt	0.8~1.2kgf-m
Cylinder / cylinder head bolt	0.7~1.0kgf-m
Engine oil drain bolt	1.5~2.5kgf-m
Cam chain tensioner bolt	0.8~1.2kgf-m

Special Tools

Inner bearing puller	SYM-6204020
Bearing driver 6204	SYM-9110400
Bearing driver 6301	SYM-9610000
Bearing driver 6203/6004	SYM-9620000

Troubleshooting

Excessive engine noise

- Worn connecting rod big end
- Worn crankshaft bearing
- Worn piston pin or piston pin hole

Hard to shift gear

- Bent shift fork
- Bent shift fork shaft
- Bent shift fork claw

Transmission jumps out of gear

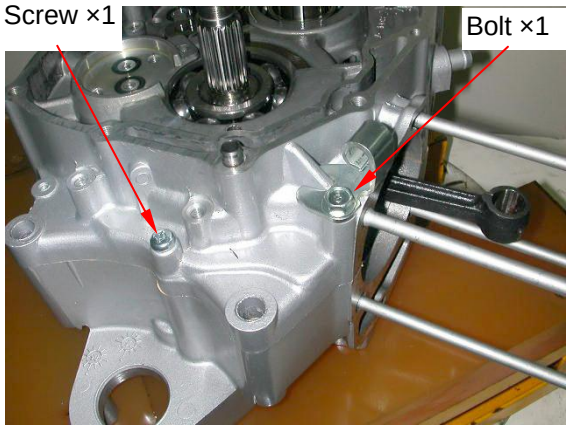
- Worn gear teeth
- Bent or damaged shift fork
- Bent shift fork shaft

Excessive gear noise

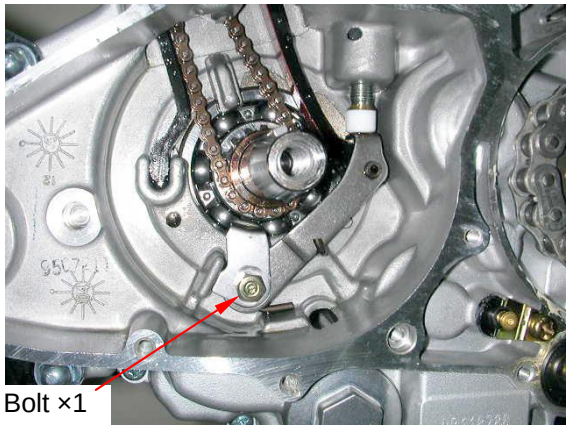
- Worn gear teeth
- Worn gear shaft

Crankcase Disassembly

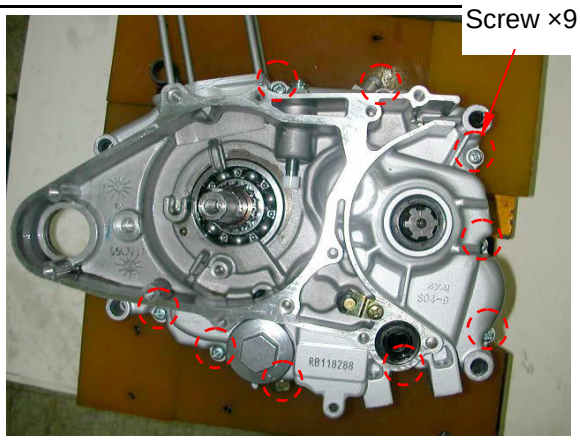
Remove the 6mm screw and clutch wire hold bolt from the right crankcase.



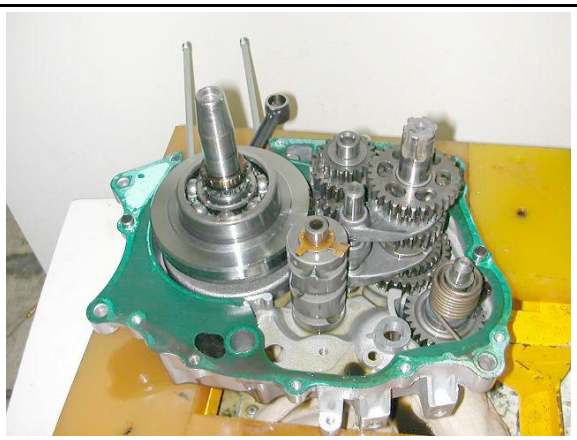
Remove the cam chain tensioner arm (bolt x 1).
Remove the cam chain.



Remove the 6mm screws from the left crankcase (screw x 9).

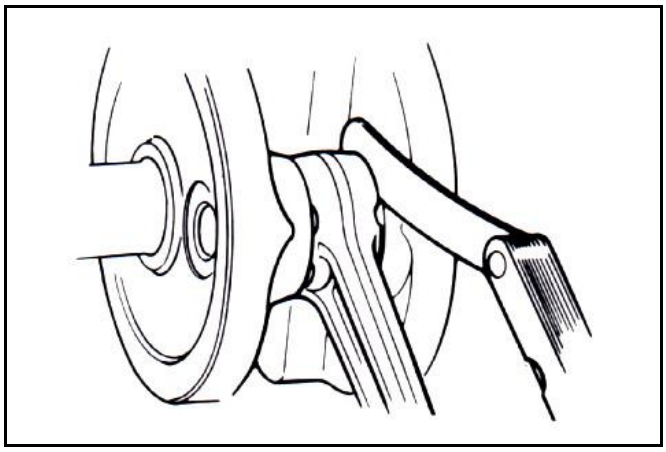


Remove the left crankcase from the right crankcase.
Shake the crankshaft gently and pull out the crankshaft.

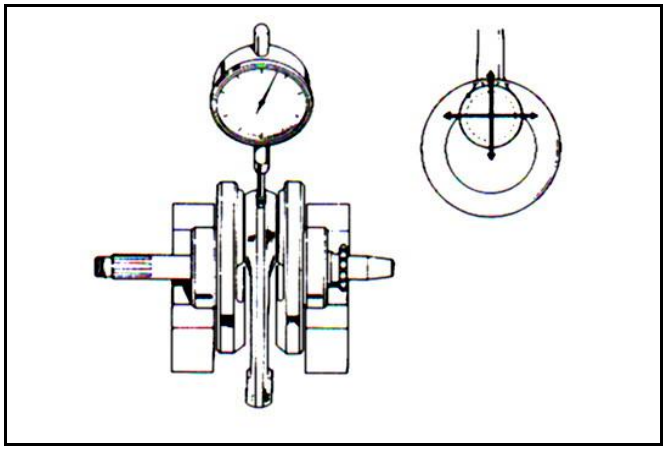


Crankshaft Inspection

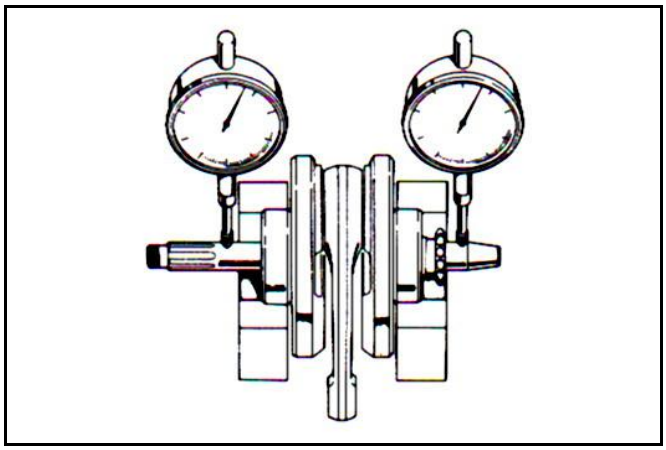
Use a feeler gauge to measure left and right clearance of connecting rod big end.
Service limit：0.6mm



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

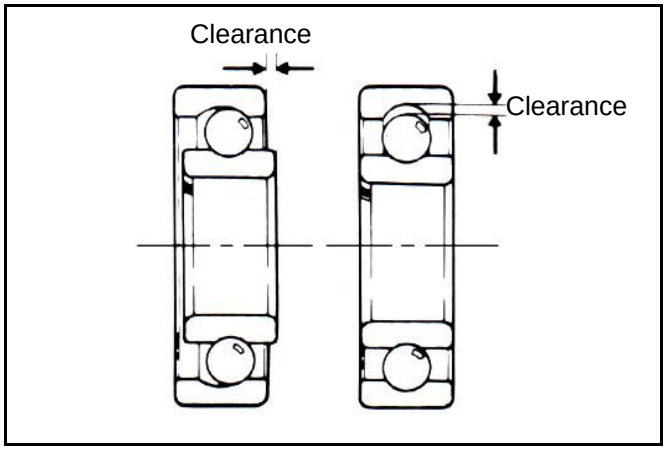


Place the crankshaft on a V-block.
Measure the crankshaft run-out.
Service limit：0.10 mm

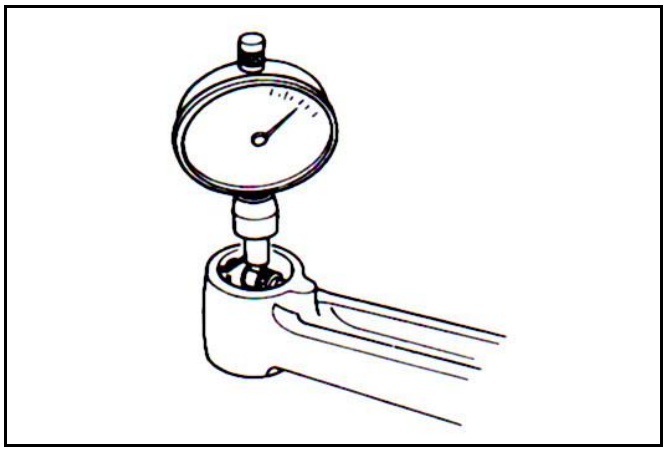


Crankshaft bearing inspection

Rotate the bearings on the left and right crankcase to check if the bearings rotate smoothly and silently.
Check if the outer ring of the bearing fixes on the crankcase firmly or not.
The bearing must be replaced if there is excessive noise or roughness.

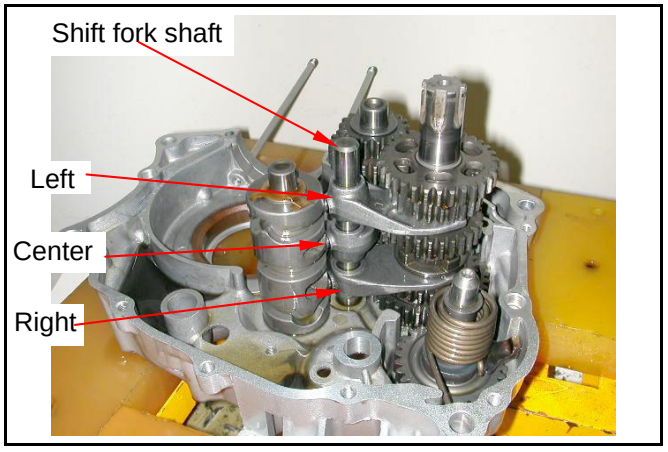


Measure the inner diameter of the crankshaft small end.
Service limit：15.08mm

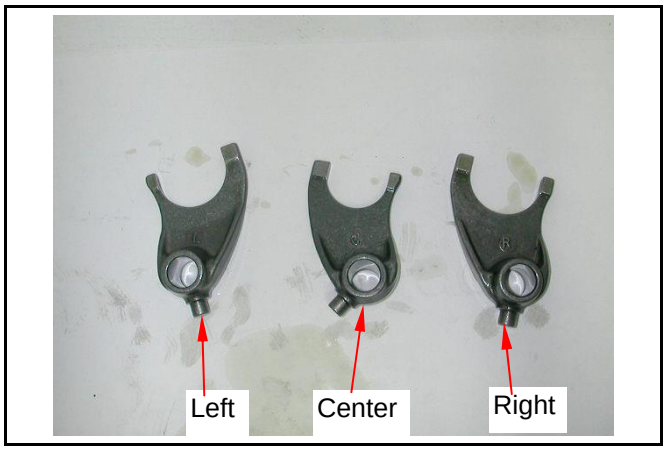


Transmission Disassembly

Remove the gear shift fork shaft.



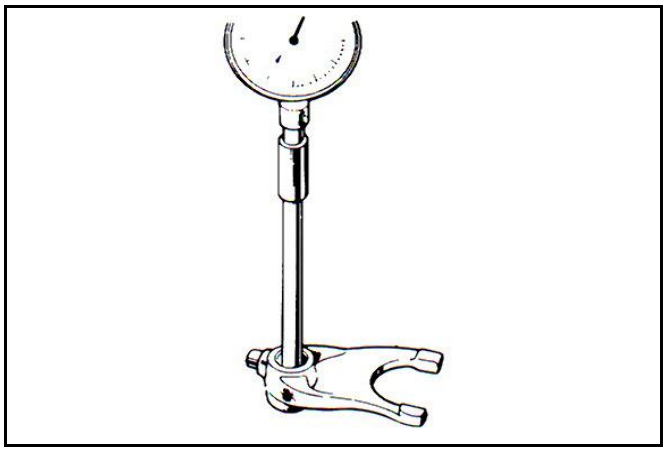
Remove the gear shift forks and shift drum.



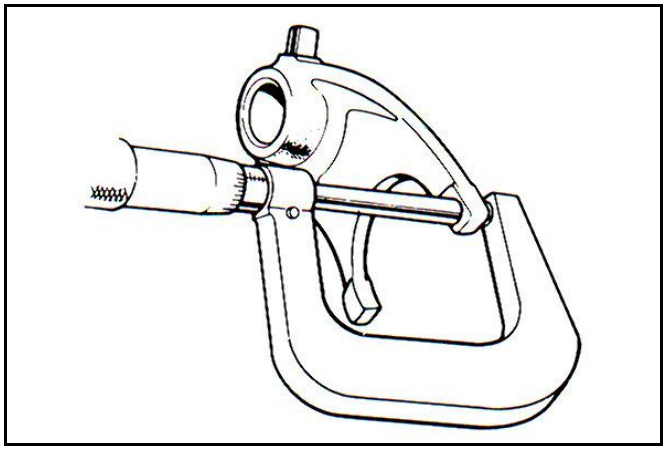
Remove the transmission mechanism.

Transmission Inspection

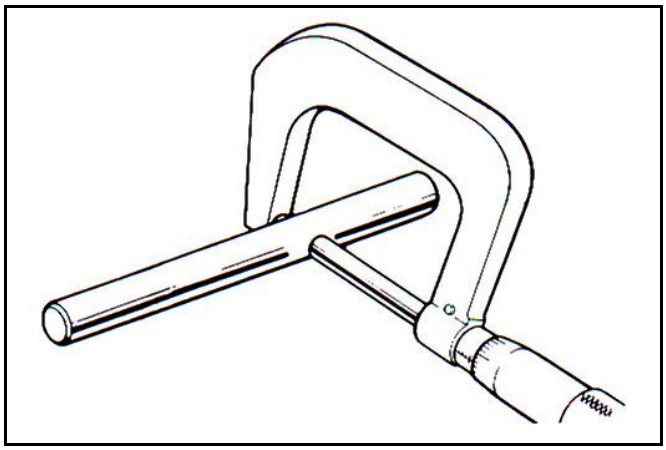
Check if the gear shift fork is worn, bent or damaged.
Measure the inner diameter of the gear shift fork.
Service limit：12.05mm



Measure the thickness of the gear shift fork claws.
Service limit：4.7mm



Measure the outer diameter of the gear shift fork shaft.
Service limit：11.96mm



Check the gear shift drum for wear or damage.

Disassemble the gears and washers on the main shaft and counter shaft.
Arrange the gears and washers in order.
Check the teeth and grooves of the gear for wear and damage.

4-speed

Assemble the gears and washers onto the main shaft and counter shaft by order after the inspection is finished without anything incorrect.

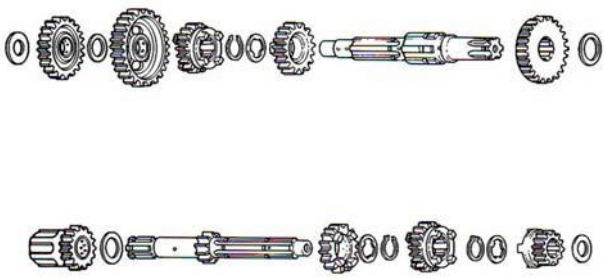
Caution

- Apply clean engine oil to the gears before assembly.
- Make sure the circlip is fully seated in the shaft grooves after installation.

5-speed

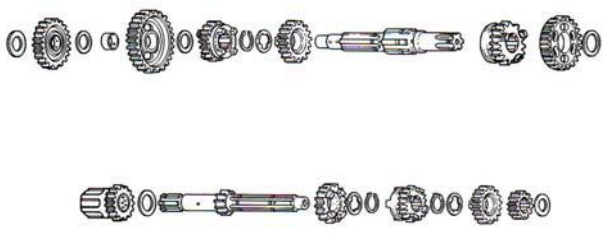
Four-speed gear sequence

4-speed



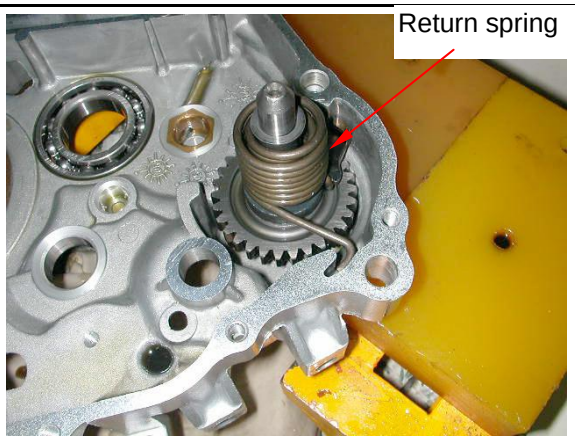
Five-speed gear sequence

5-speed

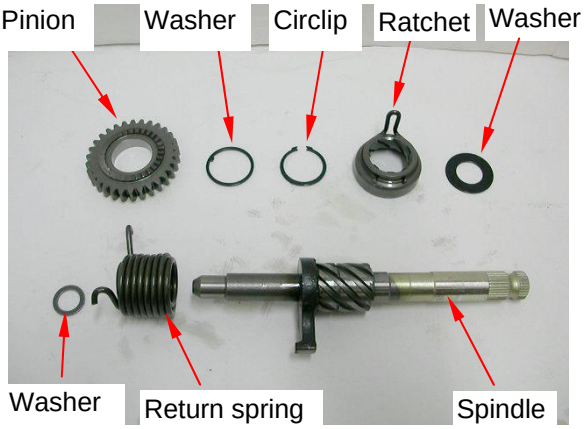


Kick Starter Disassembly

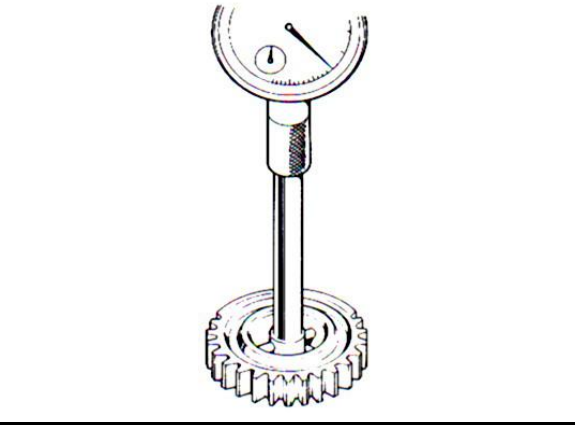
Remove the kick starter return spring.
Pull out the kick starter spindle and pinion from the right crankcase.



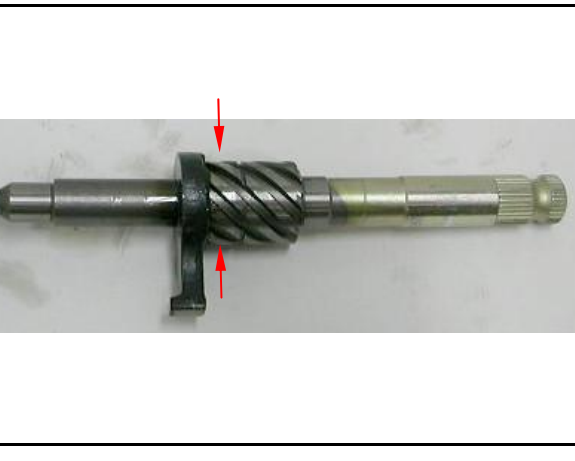
Remove the thrust washer and kick starter ratchet.
Remove the circlip and kick starter pinion.



Measure the inner diameter of kick starter pinion.
Service limit：24.96mm

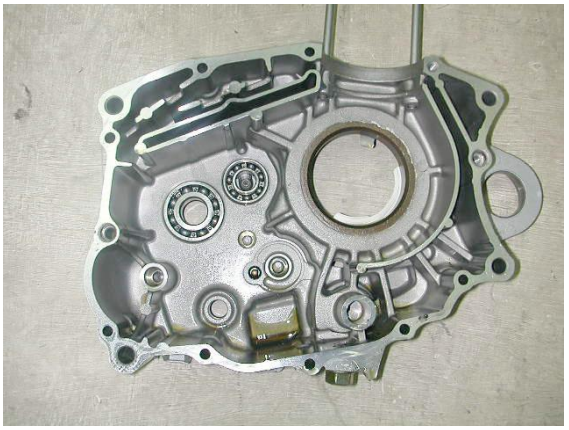


Measure the outer diameter of kick starter spindle.
Service limit：24.80mm



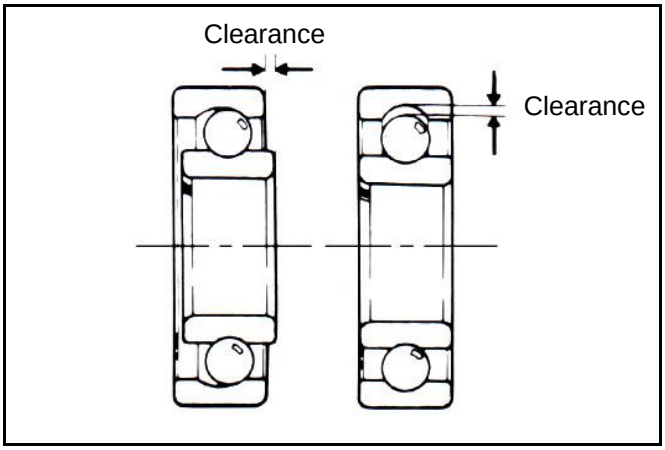
Crankcase Inspection

Check if the oil path on the crankcase is clogged or not.
Blow the oil path with compressed air if necessary.



Crankcase bearing / oil seal inspection

Rotate the bearings to check if the bearings rotate smoothly and silently.
Check if the outer ring of the bearing fixes on the crankcase firmly or not.
The bearing must be replaced if there is excessive noise or roughness.
Check the oil seal of the counter shaft for any damage; replace it with new one if necessary.

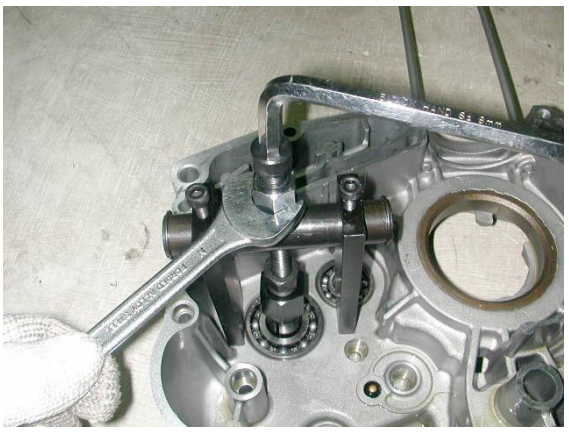


Crankcase bearing removal

Remove the damaged bearing by using the inner bearing puller.

Special tool：

Inner bearing puller SYM-6204020

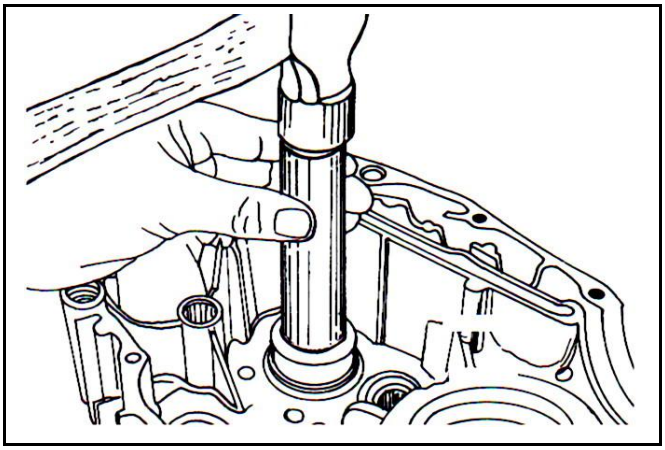


Crankcase bearing installation

Install the new bearings onto the crankcase by using bearing driver.

Special tools：

Bearing driver 6204	**SYM-9110400**
Bearing driver 6301	**SYM-9610000**
Bearing driver 6203/6004	**SYM-9620000**

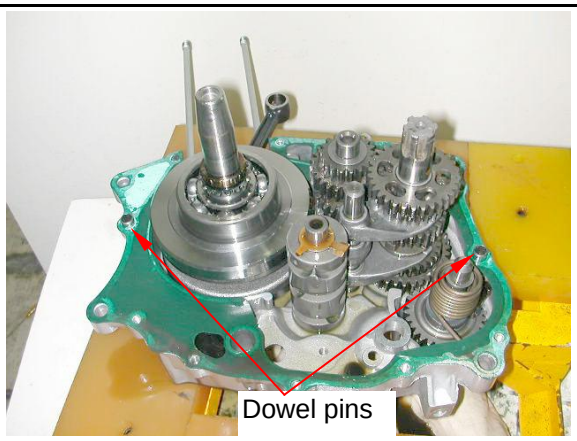


Crankcase Assembly

Remove the crankcase gasket and dowel pins.
Clean the gasket residues off the crankcase contact surface.

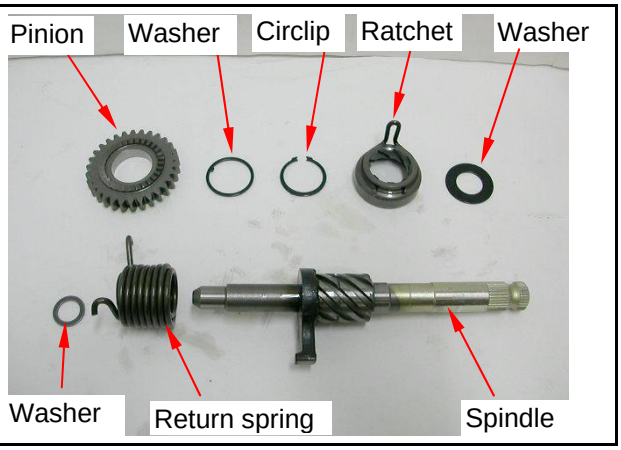
Caution

- Do not damage the contact surface of the crankcase.
- It is better to wet the gasket residue with solvent for easy scrapping.

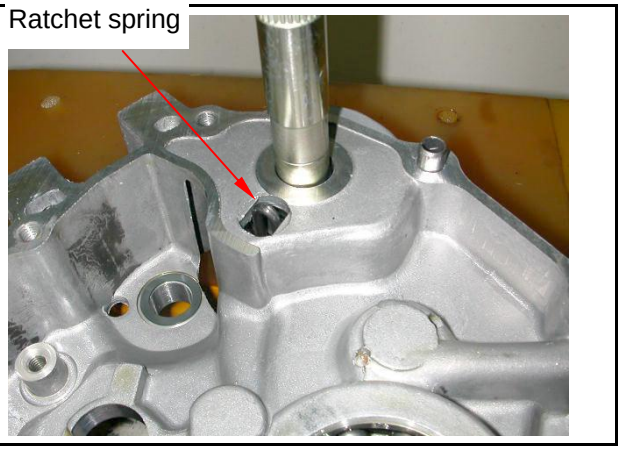


Kick starter assembly

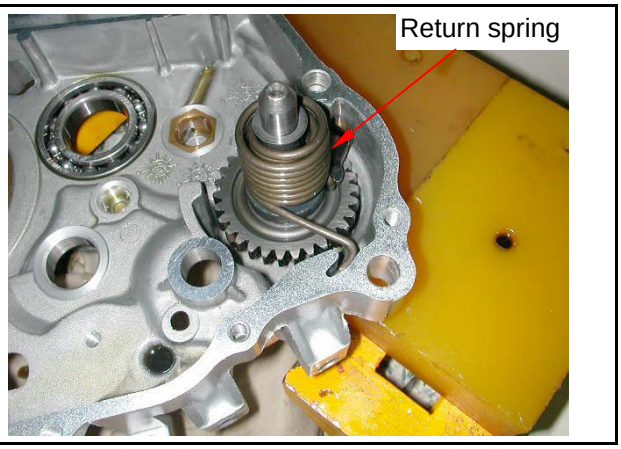
Assemble the kick starter pinion, thrust washer and circlip.
Assemble the kick starter ratchet and thrust washer.



Align the ratchet spring with the groove on the crankcase and install the kick starter spindle and pinion into the right crankcase.



Put the end of return spring into the groove on the right crankcase.



Install the main shaft and counter shaft to the right crankcase.

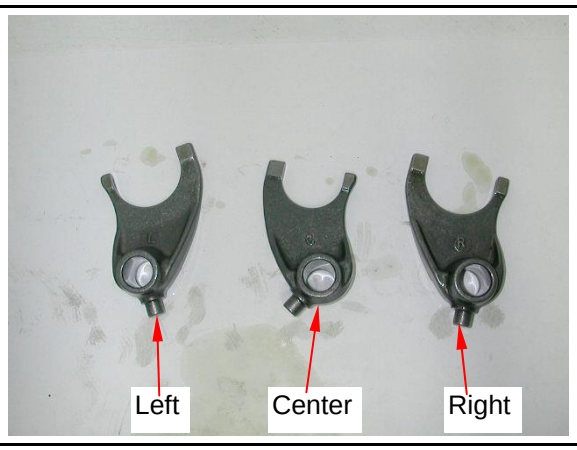
Caution

- Make sure the thrust washer in the position.

Install the gear shift drum.

Caution

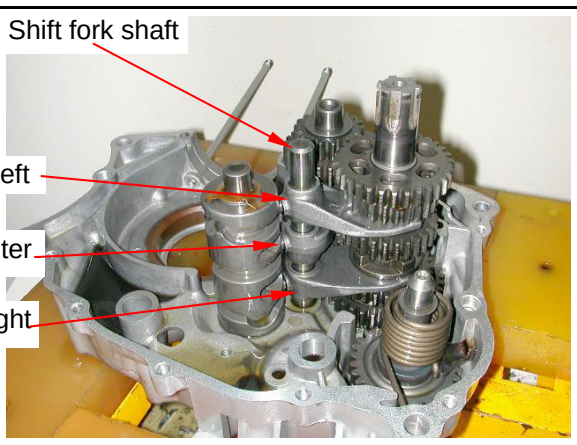
- The letters on the left and center shift fork should face upward; the letter on the right shift fork should face downward.



Install the gear shift forks into the shift drum guide groove.
Align the gear shift fork holes and plug in the gear shift fork shaft.

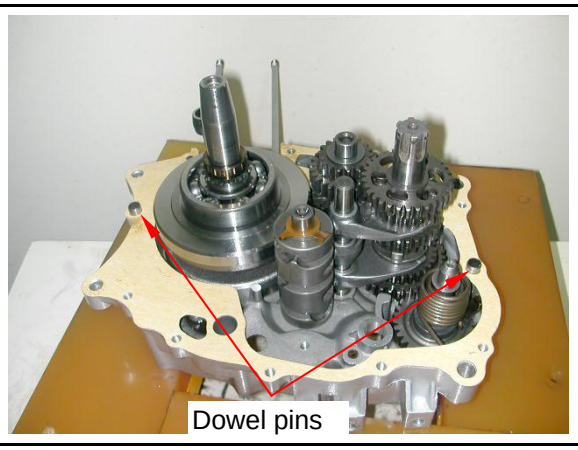
Caution

- Make sure all the parts move smoothly.
- Rotate the gear shift drum to the neutral gear.

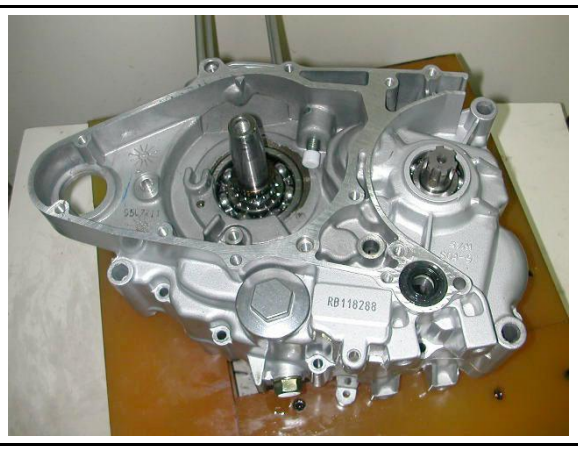


Install the crankshaft to the right crankcase.

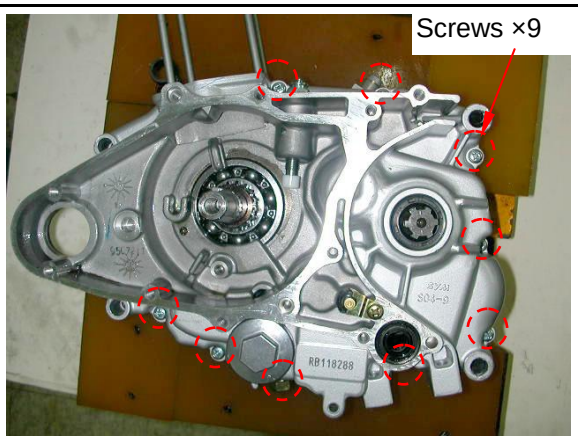
Install the new crankcase gasket and dowel pins.



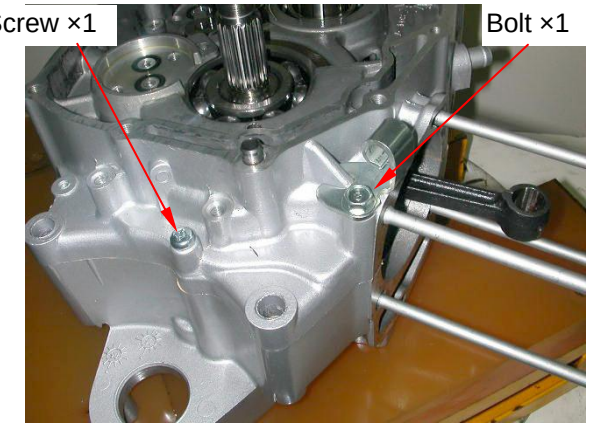
Install the left crankcase.



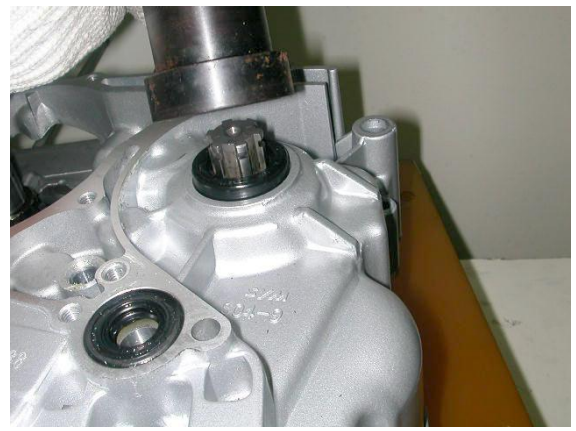
Tighten crankcase left side screws.
Torque value：0.8~1.2kgf-m



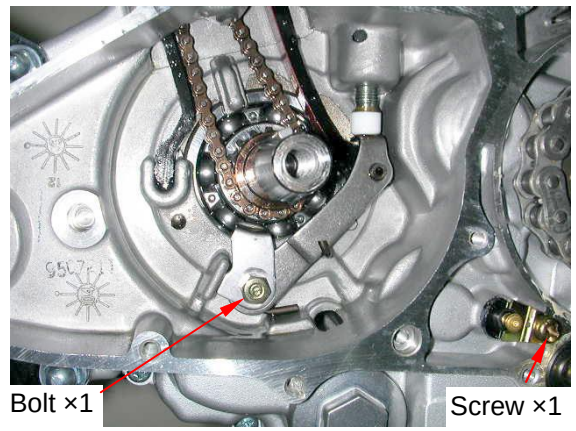
Tighten crankcase right side screws and clutch wire holder.
Torque value：0.8~1.2kgf-m



Coat grease to the new counter shaft oil seal and assemble the left crankcase.



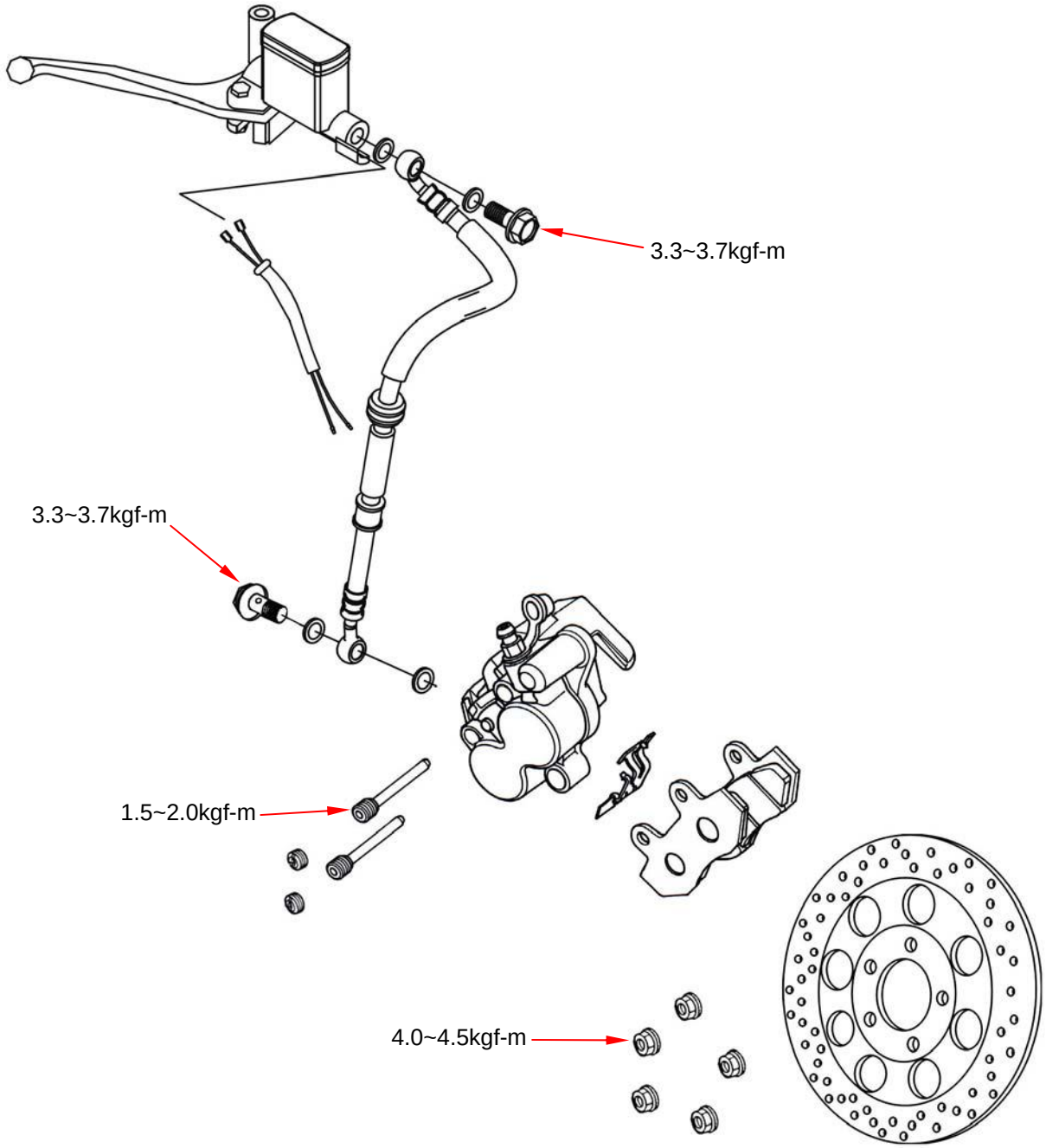
Install the cam chain.
Install the cam chain tensioner arm (boltx1).
Install the neutral switch.



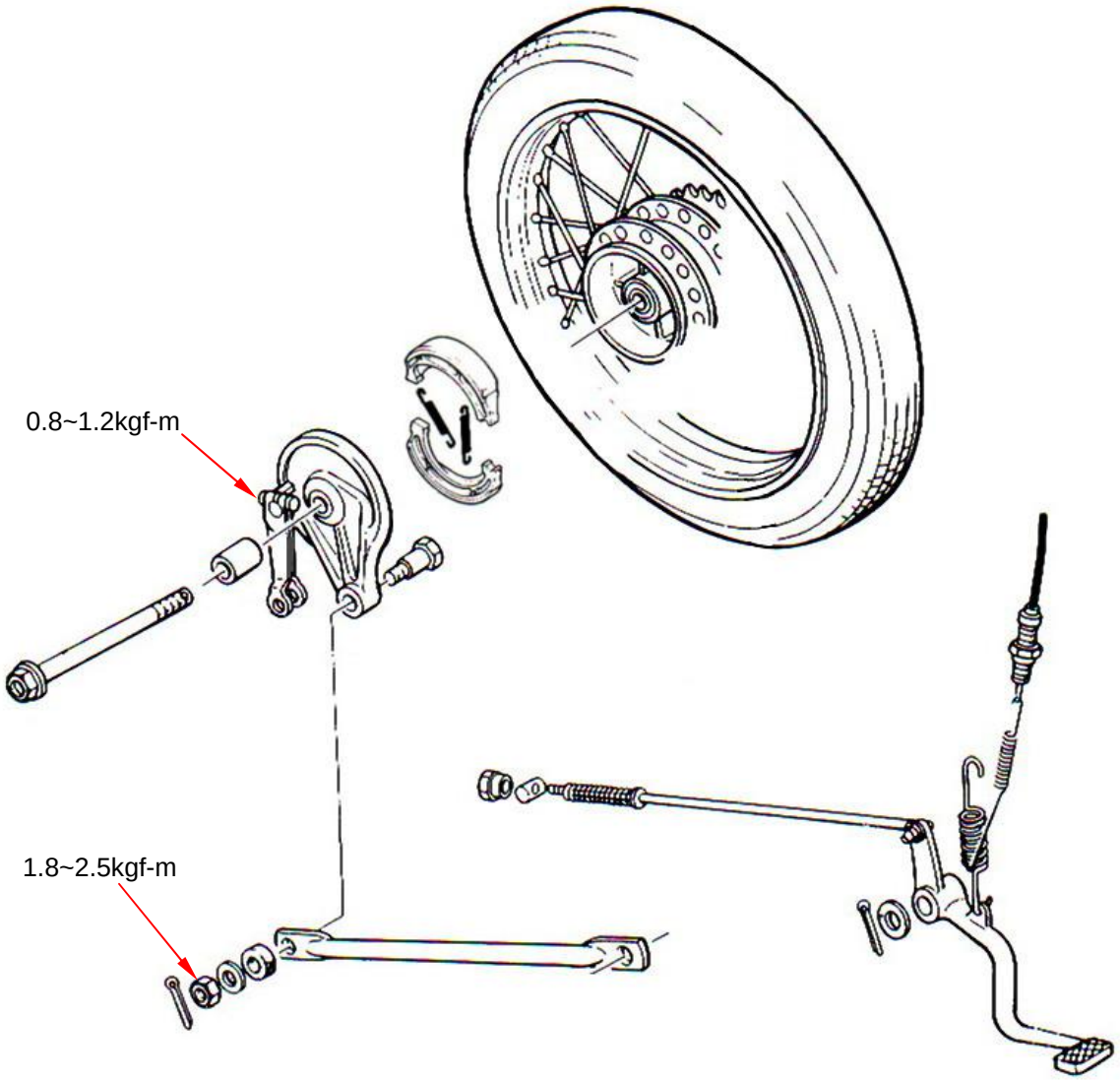
Note:

10

Mechanism Diagram - Disk Brake



Mechanism Diagram – Drum Brake



Precautions in Operation

⚠Caution

- Inhaling asbestos may cause disorders of respiration system or cancer, therefore, never use compressed air or dry brush to clean brake system. Use vacuum cleaner or other authorized tool instead.

- The brake caliper can be removed without removing the hydraulic system.
- After the hydraulic system is removed, or the brake system is felt to be too soft, bleed the hydraulic system.
- While refilling brake fluid, care should be taken not to let the foreign material entering into the brake system.
- Do not spill brake fluid on the painted surfaces, plastic or rubber parts to avoid damage.
- Check the operation of the brake system before riding.

Specification **Unit：mm**

Item	Standard	Service limit
Brake disk thickness	4.50	3.00
Brake disk eccentricity	0.1	0.30
Master cylinder inner diameter	12.700~12.743	12.755
Master cylinder piston outer diameter	12.100~12.043	11.945
Brake disk outer diameter	240.00	—
Front brake pad thickness	—	Mark on brake pad
Brake drum inner diameter	130.00	130.50
Rear brake shoe thickness	—	2mm / mark on brake shoe

Torque value

Rear brake arm bolt	0.8~1.2kgf-m
Brake drum locknut	2.8~3.2kgf-m
Brake lever locknut	0.8~1.2kgf-m
Brake hose bolt	3.3~3.7kgf-m
Brake caliper bolt	3.1~3.5kgf-m
Brake pad guide bolt	1.5~2.0kgf-m
Brake disk bolt	4.0~4.5kgf-m
Air bleed valve	0.8~1.0kgf-m
Rear brake torque link locknut	1.8~2.5kgf-m
Front wheel axle nut	5.0~7.0kgf-m
Rear wheel axle nut	10.0~12.0kgf-m

Special tool

Inner bearing puller	SYM-6204020

Troubleshooting

Disk Brake

Soft brake lever

1. Air inside the hydraulic system
2. Hydraulic system leakage
3. Worn master cylinder piston
4. Worn brake pad
5. Poor brake caliper
6. Worn brake disk
7. Low brake fluid
8. Blocked brake hose
9. Warped / bent brake disk
10. Bent brake lever

Hard brake lever operation

1. Blocked brake system
2. Poor brake caliper
3. Blocked brake hose
4. Seized / worn master cylinder piston
5. Bent brake lever

Uneven brake

1. Dirty brake pad / disk
2. Poor wheel alignment
3. Clogged brake hose
4. Deformed or warped brake disk
5. Restricted brake hose and fittings

Tight brake

1. Dirty brake pad / disk
2. Poor wheel alignment
3. Deformed or warped brake disk

Brake noise

1. Dirty brake pad / disk
2. Deformed brake disk
3. Poor brake caliper installation
4. Imbalanced brake disk / wheel

Drum Brake

Insufficient brake

1. Incorrect brake adjustment
2. Worn brake shoe
3. Worn wheel hub
4. Worn brake cam
5. Incorrect brake shoe installation
6. Jammed or interfered brake pedal
7. Contaminated brake shoe
8. Contaminated wheel hub
9. Worn brake shoe / cam contact face
10. Improper brake arm / cam contact face

Tight brake pedal

1. Worn or damaged brake arm return spring
2. Worn wheel hub
3. Contaminated brake shoe
4. Contaminated wheel hub
5. Jammed or interfered brake pedal
6. Worn brake cam
7. Incorrect brake shoe installation

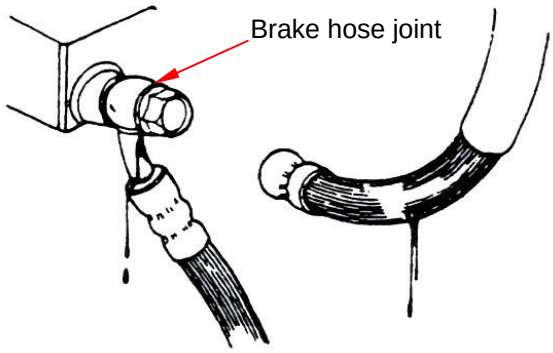
Brake noise

1. Worn brake shoe
2. Worn wheel hub
3. Contaminated brake shoe
4. Contaminated wheel hub

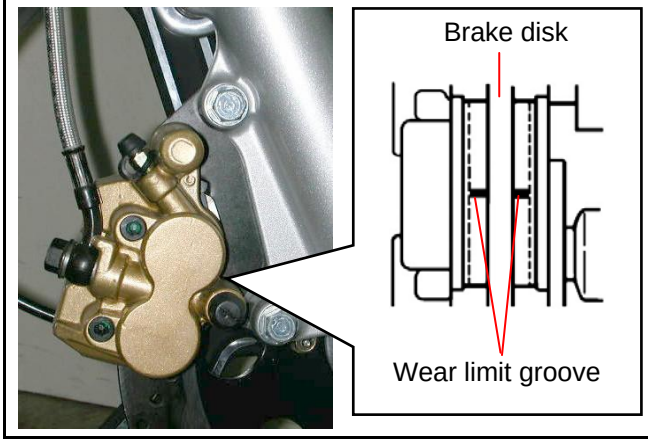
Disk Brake System Inspection

Inspection

Visually examine for leakage or damage.
Inspect the brake hose joint for looseness.
Turn the handle bar to right and left; press the cushion to see if there is any interference with the brake system.



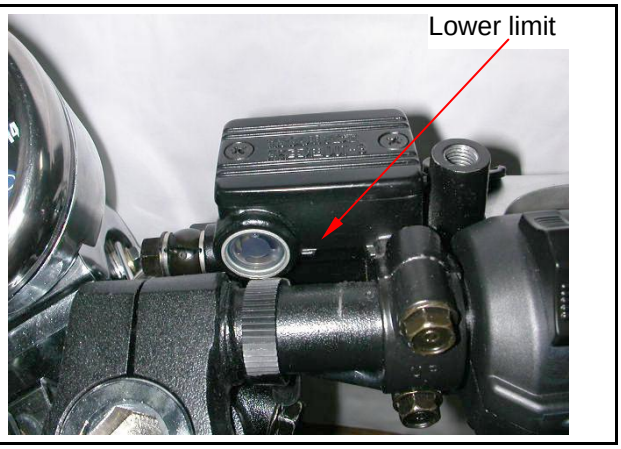
Check the brake pads for wear.
Replace the brake pads if either pad is worn to the bottom of wear limit groove.



Park the vehicle on the level ground.
Check the brake fluid level.
Recommended Brake Fluid: WELL RUN BRAKE OIL (DOT 3).

⚠Caution

- When the vehicle is inclined or just stopped, the brake fluid level could not be accurate.
- Do not mix different types of brake fluid which are not compatible with each other.
- Use the same brand brake fluid to ensure the brake efficiency.

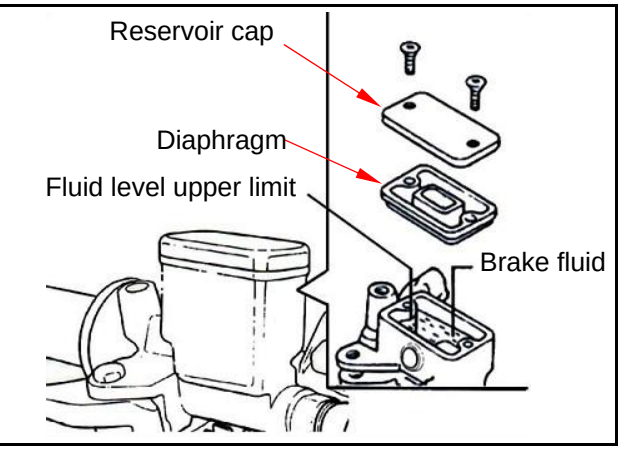


Adding brake fluid

Turn the handlebar to make the reservoir level before opening the reservoir cap.
Cover the painted, plastic or rubber surface with a rag before performing brake system maintenance.

⚠Caution

- Do not fill brake fluid over upper limit.



Remove the reservoir cap and diaphragm.
Fill the clean brake fluid.

Caution

- Contaminated brake disk or pad decreases braking performance.
- Foreign material will clog brake system and lead to decline or malfunction of braking capability.

Brake Fluid Replacement / Air Bleed

Connect a drain hose to air-bleed valve.
Open the air-bleed valve. Pump the brake lever until the old brake fluid is entirely drained out. Close the air-bleed valve and add specified brake fluid into the brake fluid reservoir.

Caution

- Reuse of old brake fluid will affect brake efficiency.

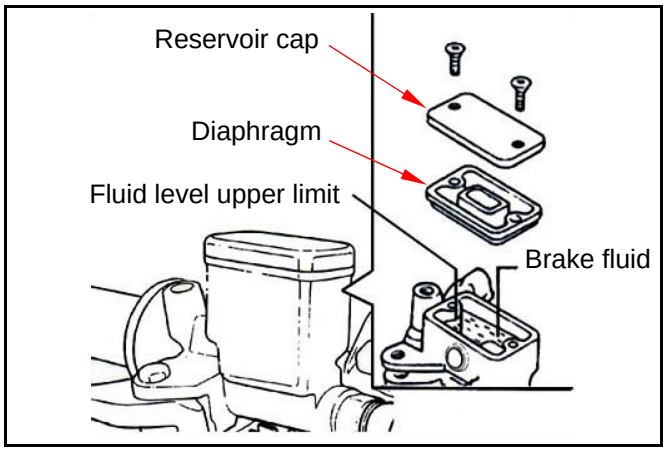
Connect a drain hose to the air-bleed valve, and put the other end into a container.
Open the air-bleed valve around 1/4 turns, and at the same time pump the brake lever until there is no air bubble in the drain hose and also feeling resistance on the brake lever.
Close the air-bleed valve when the brake system fluid filling procedure is finished.
Pump the brake lever to check whether air bubble is in brake system or not.
If brake is still soft, please bleed the system as described below:

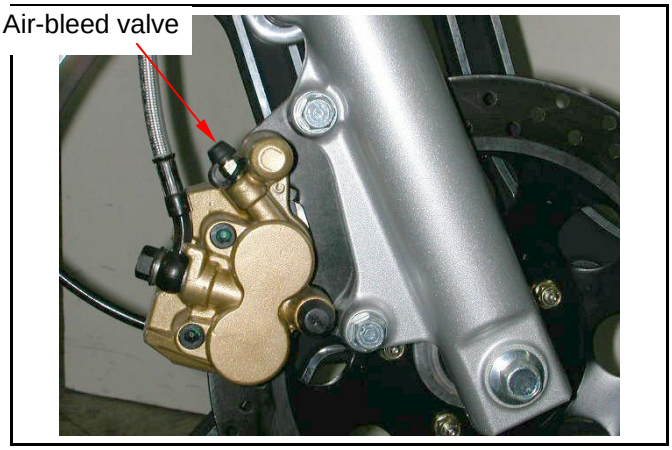
1. Tightly hold the brake lever and open the drain valve around 1/4 turns, and then close the valve.

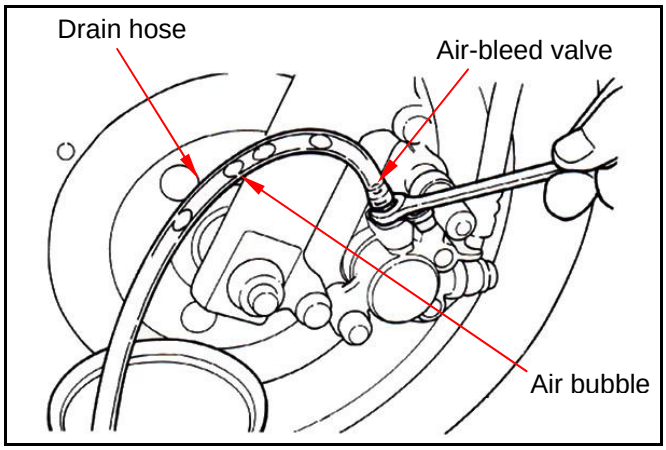
Caution

- Do not release the brake lever before the air-bleed valve is closed.

1. Release the brake lever slowly.
2. Repeat steps 1 and 2 until there is no air bubble at the end of the hose.
3. Confirm the brake fluid level. Add fluid if necessary.
4. Cover the reservoir cap.







Brake Caliper

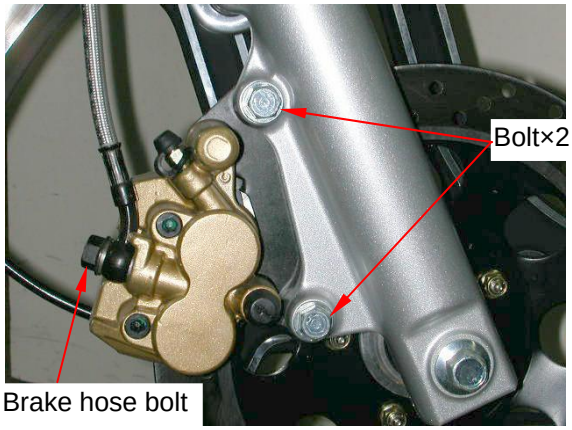
Removal

Place a container under the brake caliper, and loosen the brake hose bolt and remove the brake hose.

⚠Caution

- Do not spill brake fluid on painted surfaces.

Remove two caliper bolts and the caliper.



Confirm the brake pad wear condition. Replace with new brake pad if wear limit is reached.

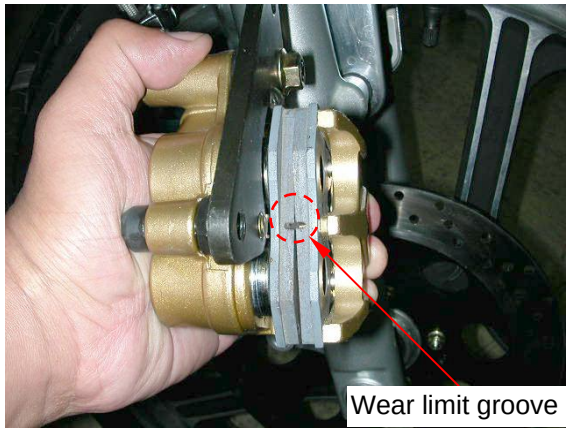
Installation

Install the caliper and tighten the bolts.

Torque value：3.1~3.5kgf-m

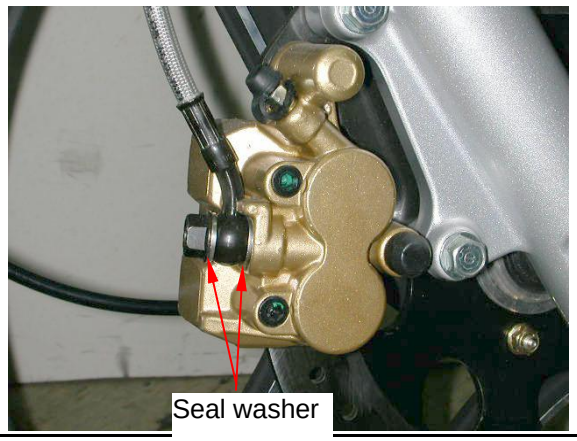
⚠Caution

- Use M8 x 32 mm flange bolt only.
- Long bolt will impair the operation of brake disk.



Use two seal washers and hose bolts to lock the hose and brake caliper in place.

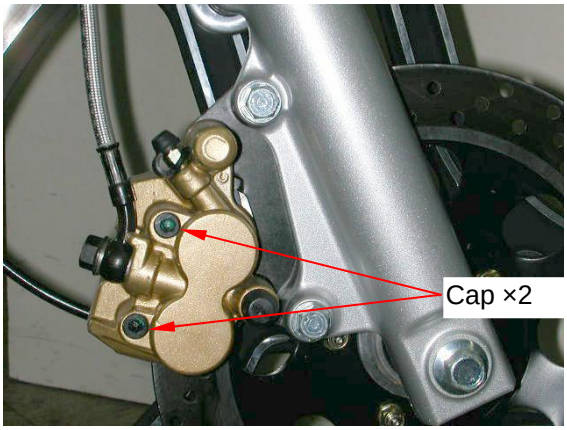
Torque value：3.3~3.7kgf-m



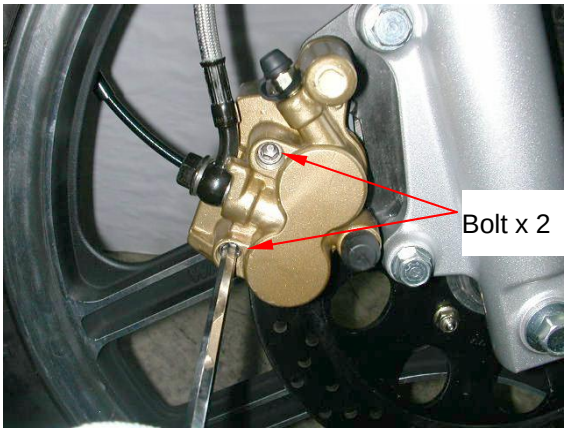
Fill the brake fluid to the reservoir and make necessary air bleeding.

Brake pad replacement

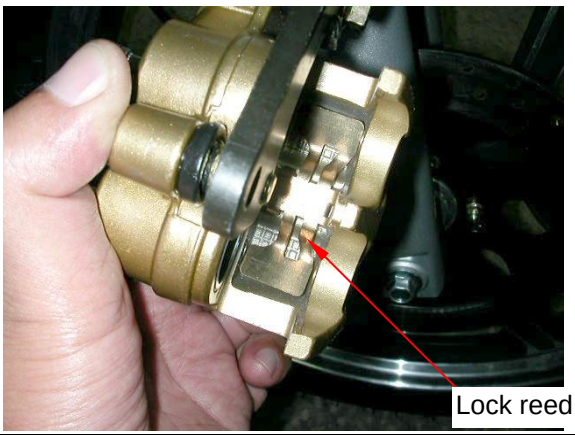
Remove the brake pad guide bolt cap.

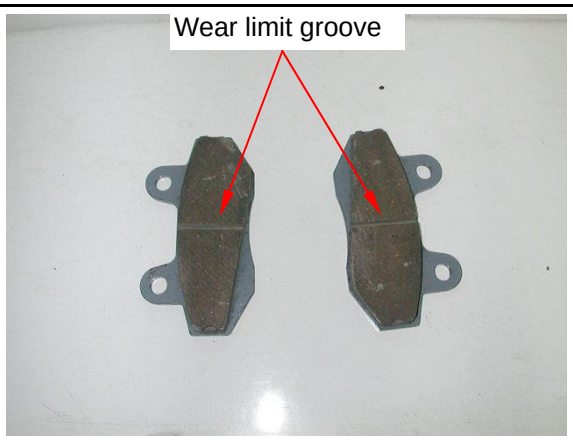


Loosen the brake pad guide bolts first.



Remove the front brake caliper.
Pull out the brake pad guide bolts.
Remove the brake pads and position reed.
Install the position reed.
Install the new brake pads and guide bolts.
Install the front brake caliper and tighten the lock bolts.
Tighten the brake pad guide bolts and bolt caps.
Torque value：1.5~2.0kgf-m

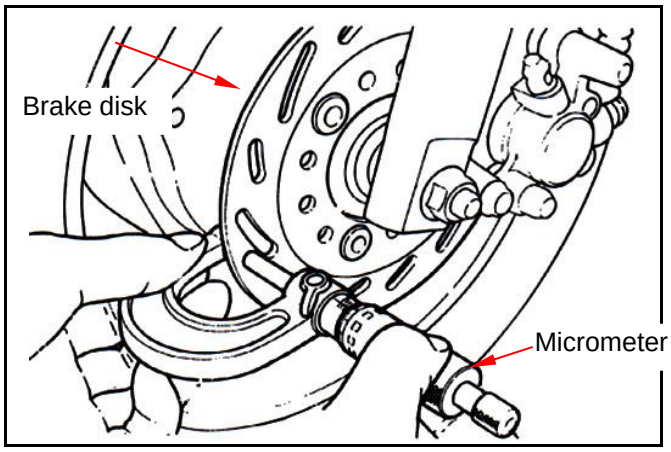




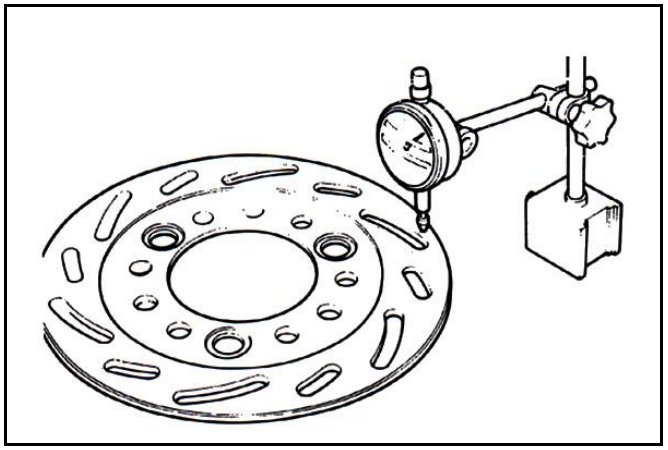
Brake Disk

Inspection

Visually check the brake disk for wear or damage.
Measure the thickness of the disk at several places. Replace the disk if it has exceeded the service limit.
Service limit：3.0 mm



Remove the brake disk from wheel.
Check the disk for deformation and bend.
Service limit：0.30 mm

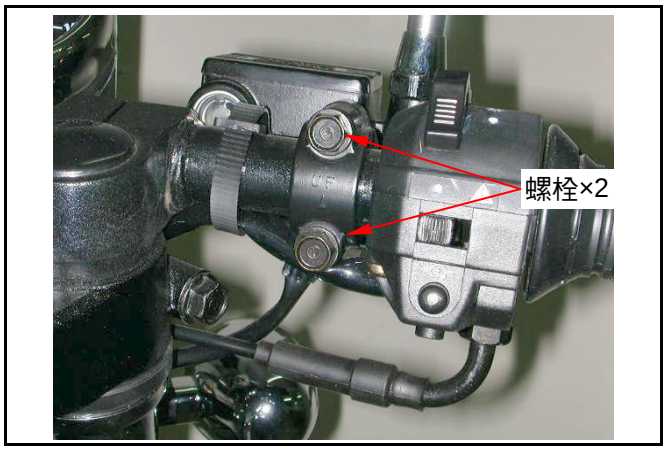


Caution

- The dirty brake pad or disk will reduce the brake performance.
- Brake pad includes the asbestos ingredient. Do not use compressed air to clean the brake system. The operator should put on gauze mask and glove, use vacuum cleaner to clean it.

Brake Master Cylinder

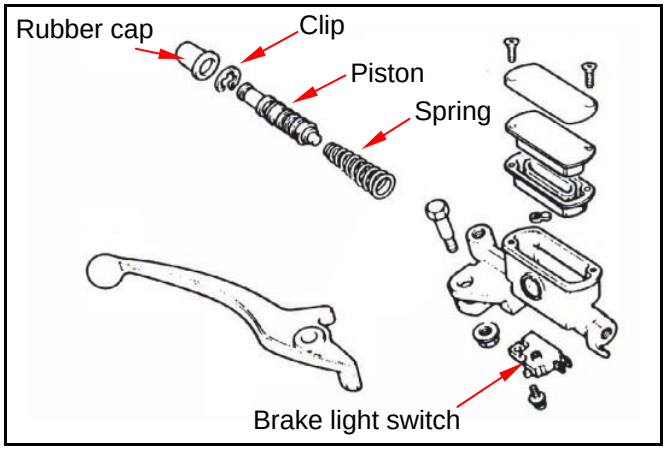
Removal



Caution

- Do not let foreign materials enter into the cylinder.
- The whole set of master cylinder, piston, spring, diaphragm and cir clip should be replaced as a set.

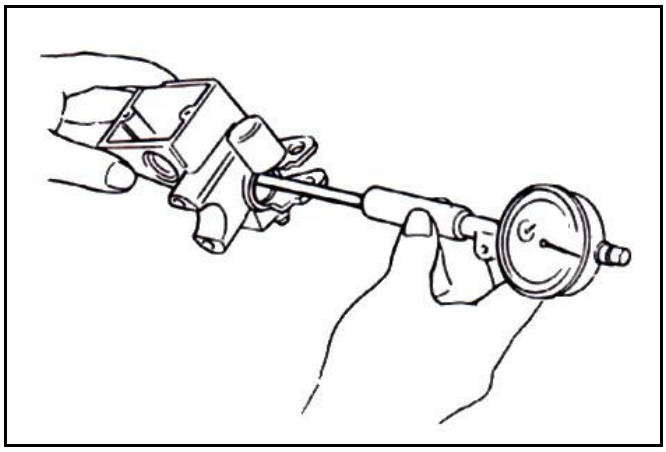
Remove the back mirror.
Disconnect the brake light coupler.
Drain the brake fluid.
Remove the brake lever and brake hose.
Remove the brake caliper (bolt x 2).
Remove the rubber cap.
Remove the clip.
Remove the piston and spring.
Clean the master cylinder with recommended brake fluid.



Inspection

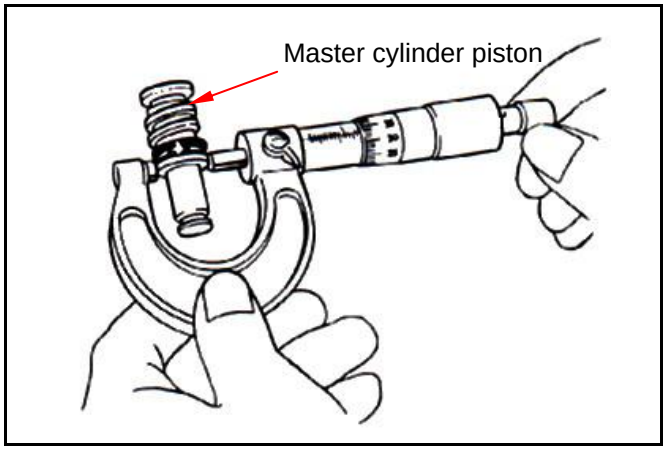
Check the master cylinder for damage or scratch. Replace it if necessary.
Measure the cylinder inner diameter at several points along both X and Y axis.
Replace the master cylinder if the measured values exceed service limit.

Service limit：12.755 mm



Measure the master cylinder piston outer diameter. Replace the piston if its measured value exceeds service limit.

Service limit：11.945 mm

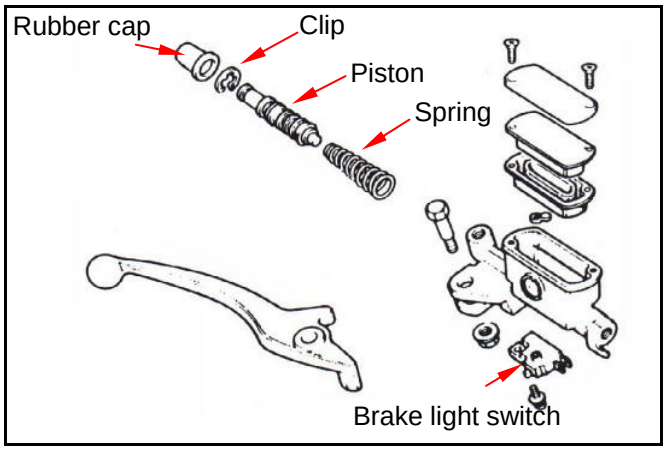


Assembly

⚠Caution

- Make sure there is no dust on all components before assembling.

Apply clean brake fluid to the piston and then install the piston.
Install the larger end of the spring onto the master cylinder.
Install the cir clip.



⚠Caution

- Make sure the clip is seated securely in the groove.

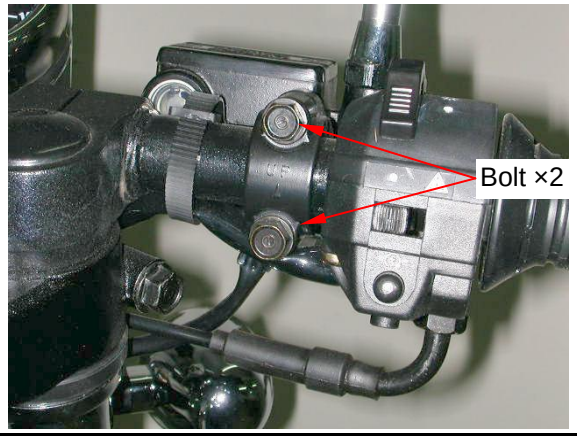
Install the rubber cap into the groove properly.

Installation

Install the brake caliper and tighten the lock bolts.

Torque value：0.8~1.2kgf-m

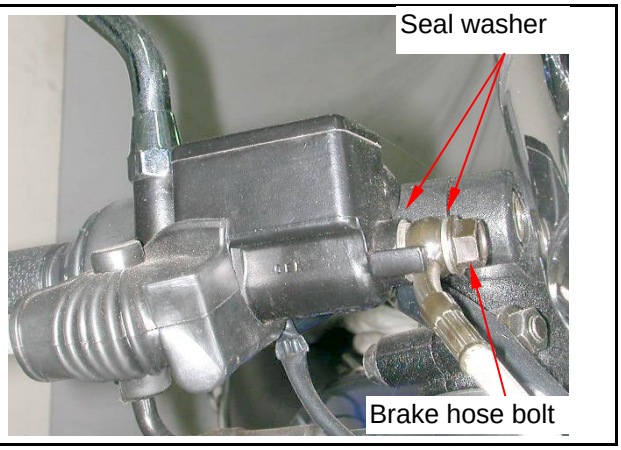
Assemble the brake lever and connect the brake light coupler.



Connect the brake hose with 2 new washers. Tighten the brake hose bolt to the specified torque value.

Torque value：3.3~3.7kgf-m

Make sure the hose is installed correctly.



⚠Caution

- Improper routing may damage hose.
- Twist brake hose may reduce brake performance.

Add specified brake fluid and bleed the system.

Brake Drum

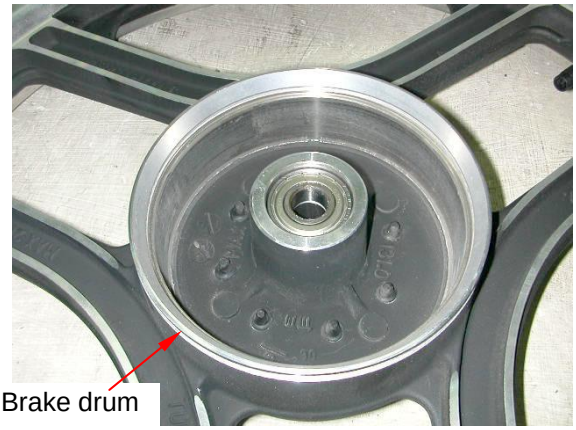
Removal

Use a vacuum cleaner and other suitable tools to clean the brake parts to minimize the hazard caused by the asbestos dust.

⚠Caution

- Inhaling asbestos dust may cause respiration system disorder or even cancer. Never use compressed air or dry brush to clean the brake system.
- Grease on brake shoe will reduce braking efficiency.

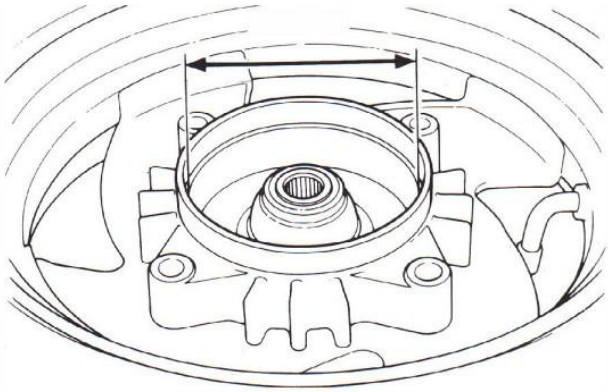
Remove the wheel rim and brake drum.



Inspection

Check the brake drum for wear or damage.
Replace the wheel hub if necessary.
Measure the brake drum inner diameter at several points and record the largest value.

Service limit： 130.5mm



⚠Caution

Remove the rust by using #120 sand papers.

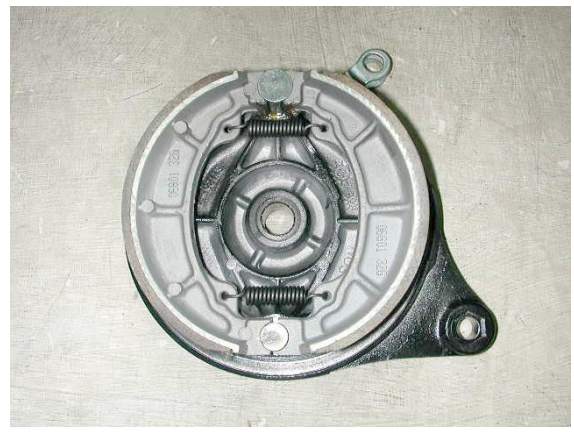
- An inside micrometer must be used when measuring the brake drum inner diameter.

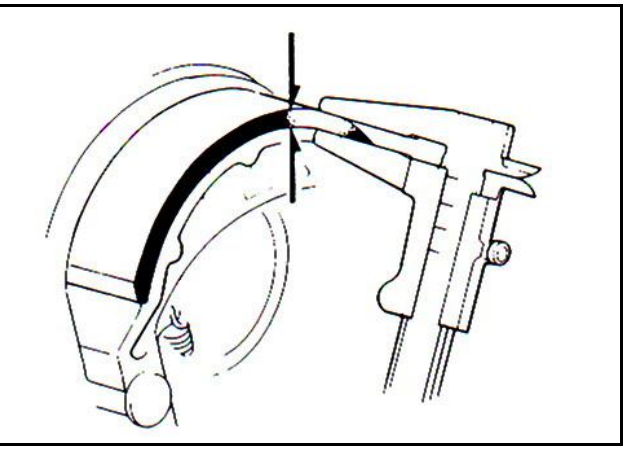
Brake Shoe

Inspection

Measure the brake shoe thickness at three points (both ends and center).
If the thickness is less than specified, or if it is contaminated by oil or grease, replace as a set.

Service limit： 2.0 mm



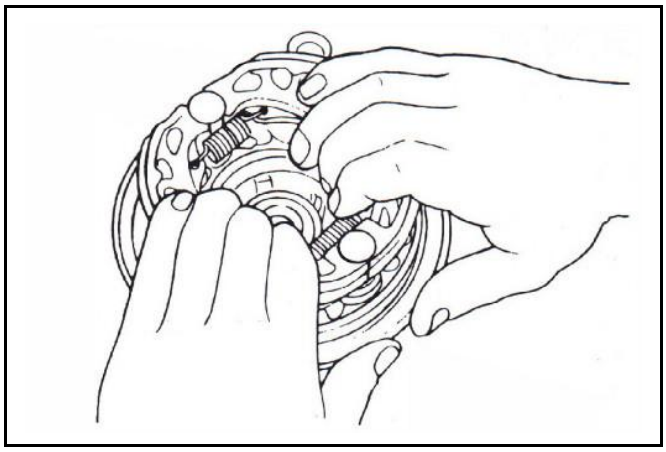


Removal

Caution

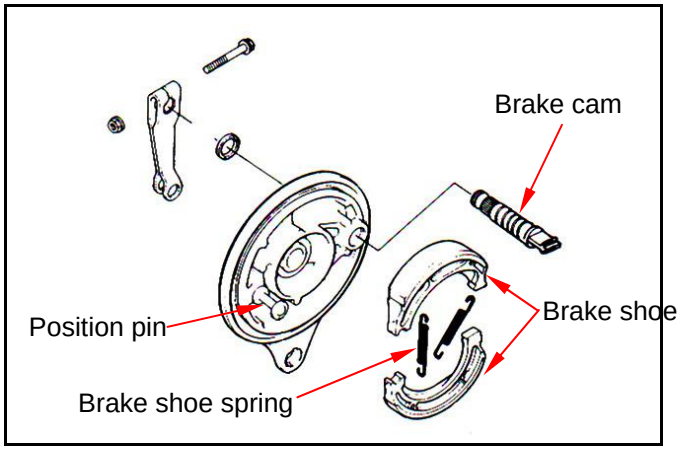
- Brake linings must be replaced as a set.

Remove the brake shoes from the brake panel by pulling out the brake shoes.



Installation

Apply a thin coat of grease to the brake cam and the position pin.
Hook the brake shoe spring onto the brake cam.
Pull out the brake shoes and install them onto the brake panel.
Wipe off the excessive grease from the brake cam installation.
Slightly grind the brake shoe surface with sand-paper to clean the surface.



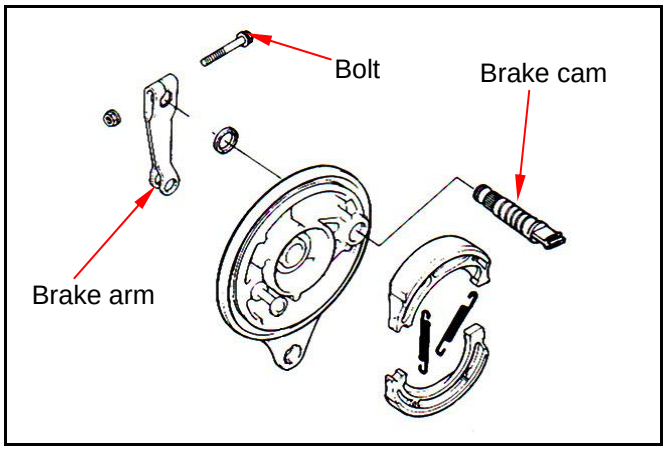
Caution

- Braking efficiency will be reduced if brake shoe is contaminated by oil or grease.

Brake Panel

Removal

Remove the brake arm bolt, brake arm, brake return spring and brake cam as well as the oil seal from the brake panel.



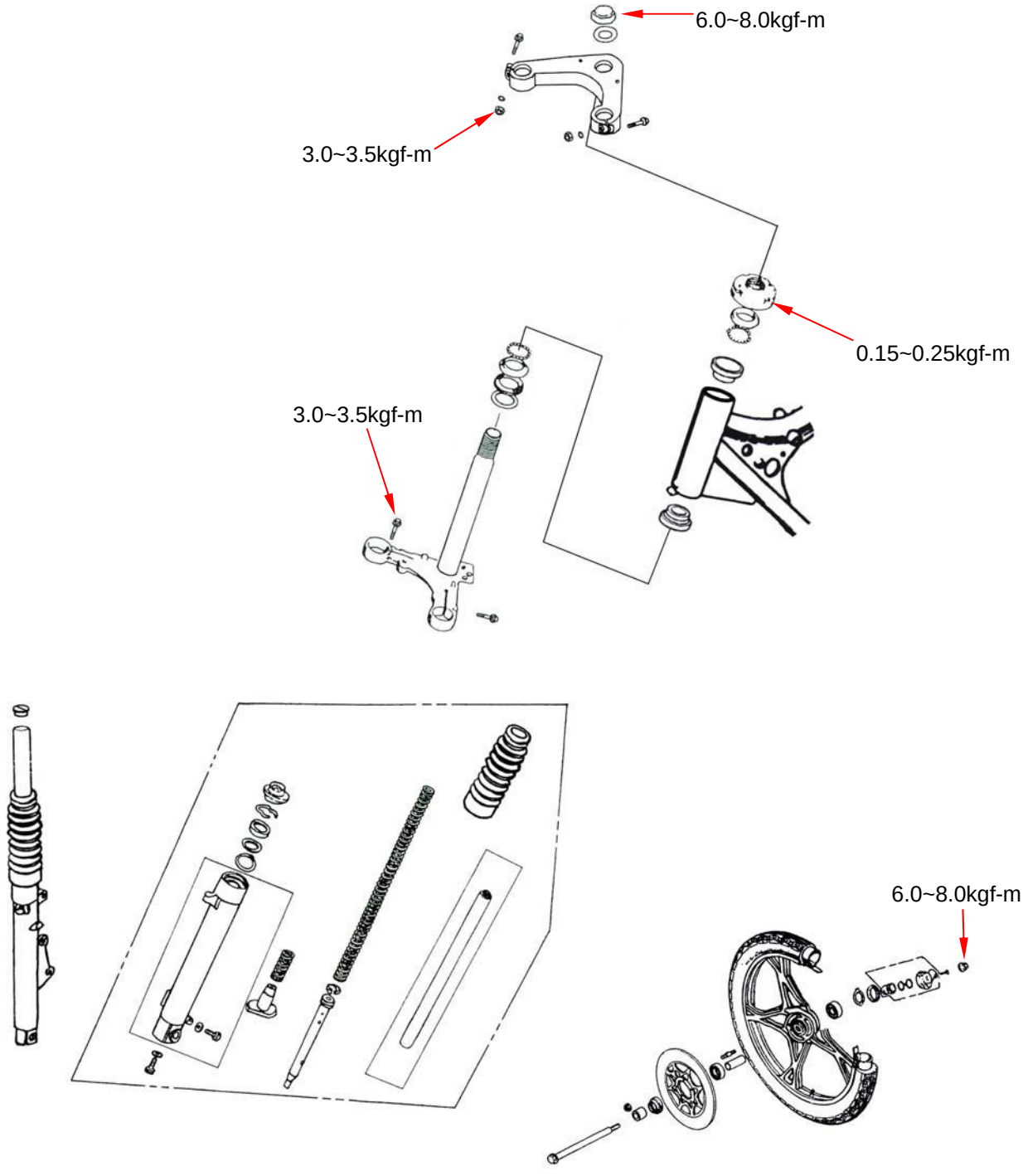
Installation

Apply a thin cost of grease between the oil seals on the brake cam.
Install the brake cam.
Align the mark on the brake arm with the inner gear of the brake cam.
Tighten the bolts and nuts to specified torque.

Torque value：0.8~1.2kgf-m

Note:

Mechanism Diagram



Precautions in Operation

General information

Please refer to the Maintenance Manual of tubeless tire in respect to the removal, repair and installation of the tire.

⚠ Caution

- Inhaling asbestos may cause disorders of respiration system or cancer, therefore, never use compressed air or dry brush to clean brake system. Use vacuum cleaner or other authorized tool instead.

Specification **Unit：mm**

Item		Standard	Service limit
Wheel axle runout		—	0.2
Wheel rim runout	Axial	—	2.0
	Radial	—	2.0

Torque value

Front wheel axle locknut	6.0~8.0kgf-m
Steering handlebar bolt	3.0~3.5kgf-m
Steering stem locknut	0.15~0.25kgf-m
Fork top bridge bolt	6.0~8.0kgf-m
Speedometer cable screw	0.15~0.3kgf-m
Front fork bolt	3.0~3.5kgf-m
Brake lever locknut	0.8~1.2kgf-m

Special tool

Steel ball race driver 32×35mm

Steel ball race driver 42×47mm

Inner bearing puller	SYM-6204020
Steering stem locknut socket wrench	SYM-5320000、SYM-5321100

Troubleshooting

Hard steering
- Steering stem nut too tight
- Worn or damaged steering ball bearing / seat
- Insufficient tire pressure

Steering handlebar tilted
- Incorrect fork adjustment
- Bent forks
- Bent wheel axle
- Damaged tire

Front wheel runout
- Bent wheel rim
- Worn tire
- Worn or damaged front wheel bearing

Soft suspension
- Worn fork spring
- Fork seal leakage

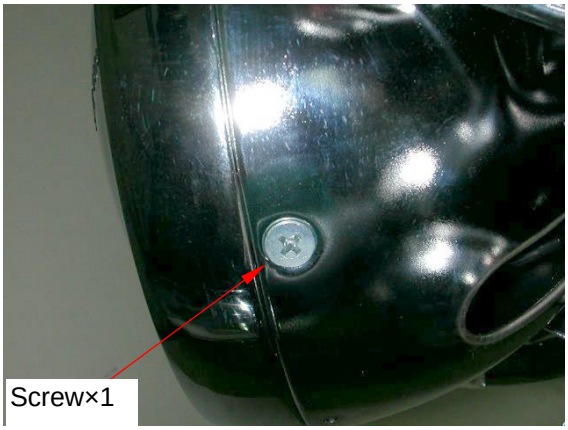
Hard suspension
- Bent fork pipes
- Excessive fork fluid

Front suspension noise
- Bent fork pipes
- Insufficient fork fluid
- Loose fork fasteners

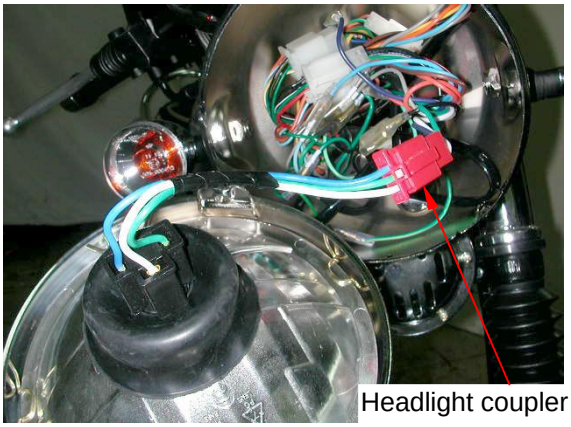
Headlight

Removal

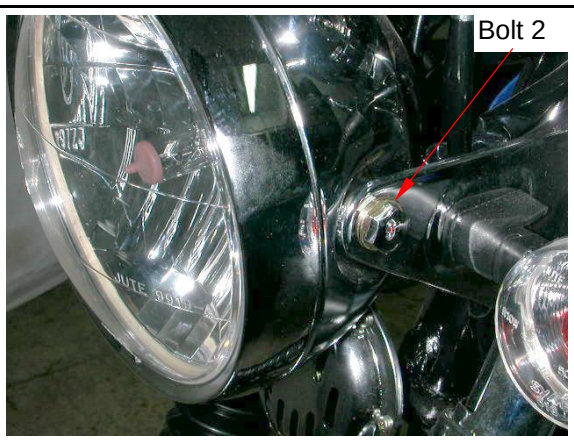
Remove the headlight lock screw.



Pull out the headlight assembly. Disconnect the headlight wire coupler and remove the headlight assembly.



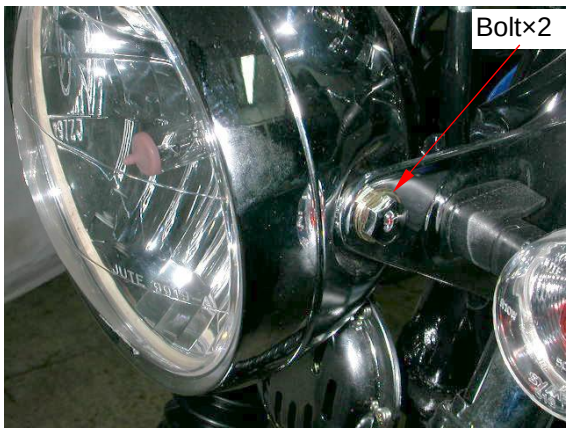
Remove the wire couplers.
Remove the headlight case bolt.
Remove the headlight case.



Installation

Align the index marks and install the headlight case.
Install the other parts in the reverse order of removal.

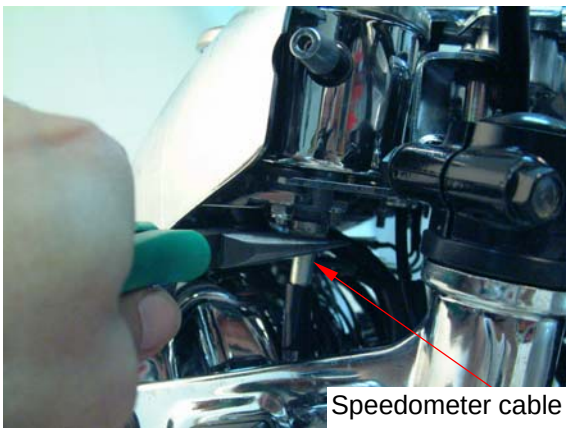
Headlight angle adjustment
Loosen the headlight side bolts and adjust the headlight angle by moving the headlight case up and down.
Tighten the side bolts after adjustment is finished.



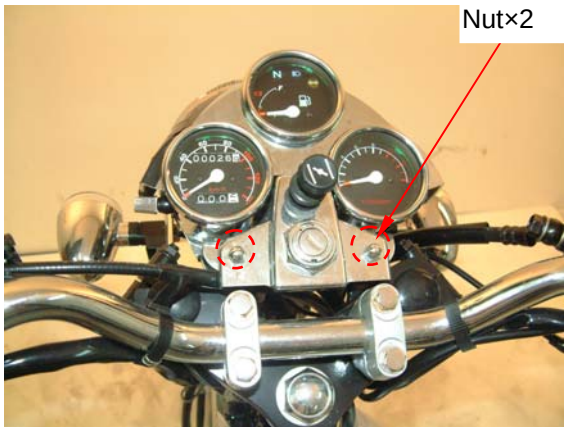
Meter

Wolf Classic 125

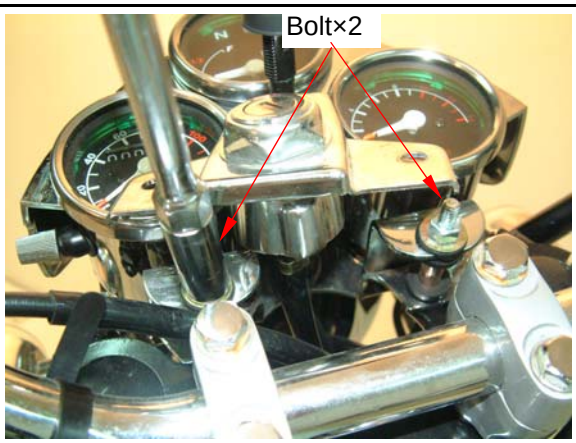
Removal
Remove the headlight.
Disconnect wire couplers.
Remove the speedometer cable.



Remove the main switch locknuts.
Remove the main switch.



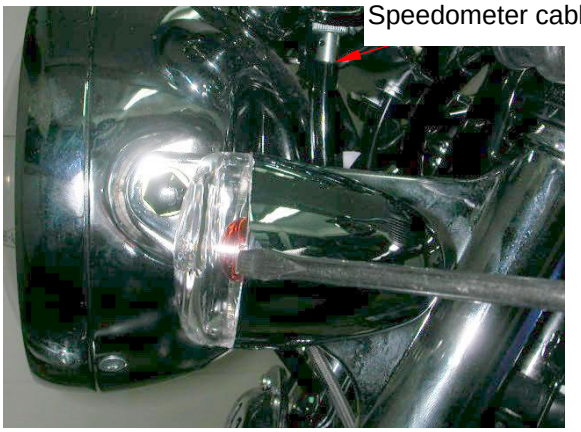
Remove the meter assembly bolt.
Remove the meter assembly.



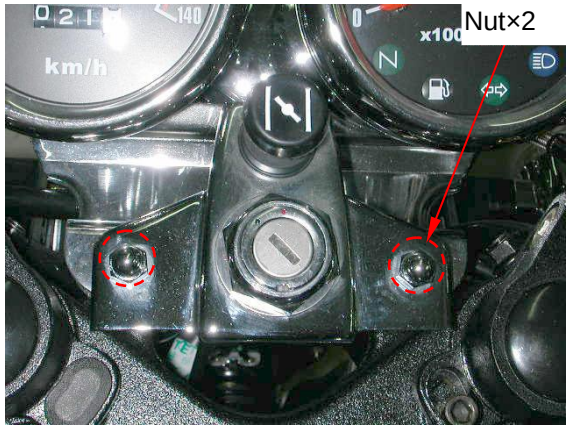
Wolf Classic 125 R

Removal

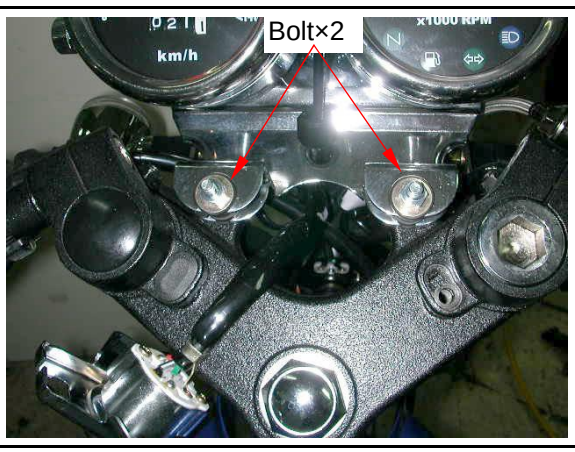
Remove the headlight.
Disconnect wire couplers.
Remove the speedometer cable.



Remove the main switch locknut.
Remove the main switch.



Remove the meter assembly bolt.
Remove the meter assembly.

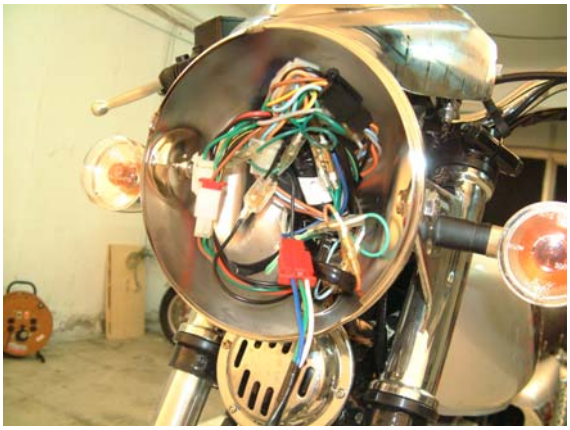


Steering Handlebar

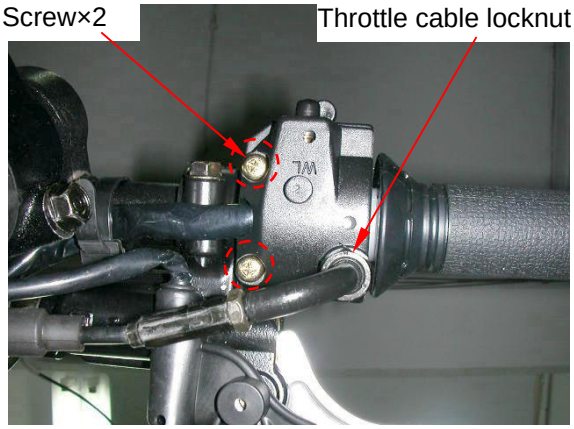
Wolf Classic 125

Removal

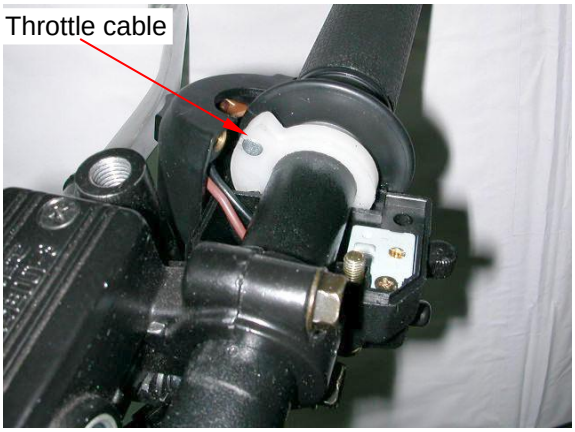
Remove the back mirror.
Remove the headlight.
Disconnect the left / right handlebar switch, clutch switch, brake light switch couplers.



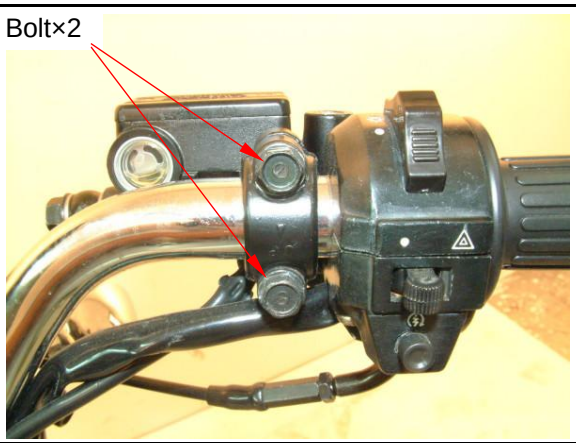
Loosen the throttle cable locknut.
Remove the right handlebar switch screws.



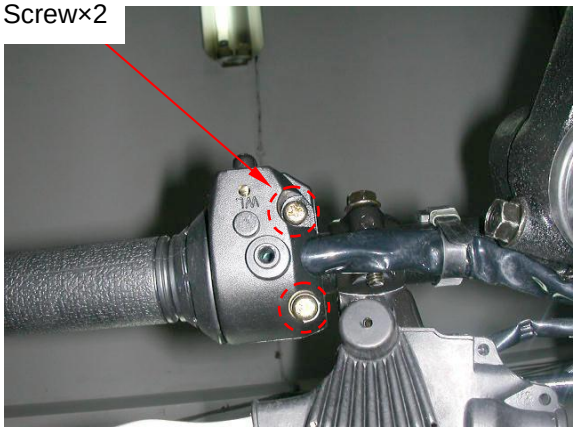
Remove the throttle cable.
Remove the throttle grip and right handlebar switch.



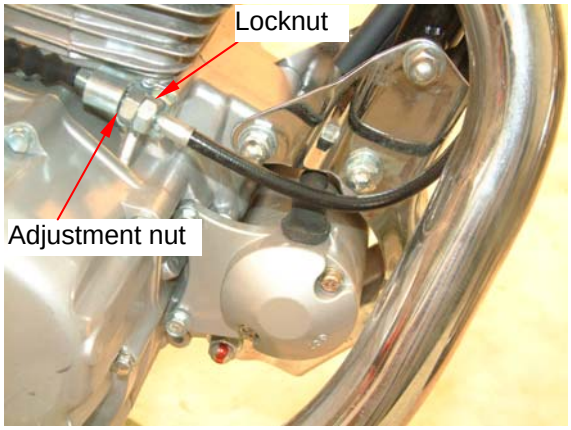
Remove the front brake master cylinder bolt.
Remove the master cylinder and holder.



Remove the left handlebar switch (screwx2).



Loosen the clutch cable locknut and adjustment nut.

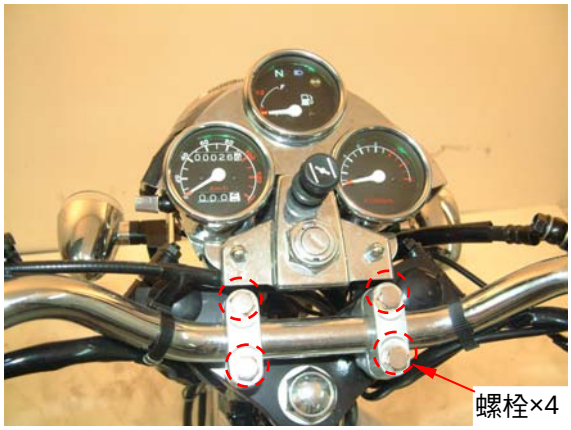


Loosen the clutch cable locknut and adjustment nut.
Remove the clutch lever pivot bolt.
Remove the clutch lever and clutch cable.
Loosen the clutch lever bracket (boltx1).

Remove the handlebar holder and bolt.
Remove the steering handlebar.

Installation
Install in the reverse order of removal.
Torque value：
Steering handlebar bolt　3.0~3.5kgf-m

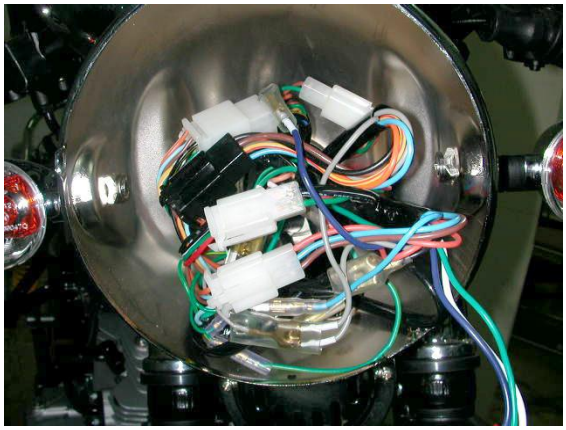
After the handlebar is installed, confirm and adjust：
- throttle grip operation and free play
- meter, electrical parts operation



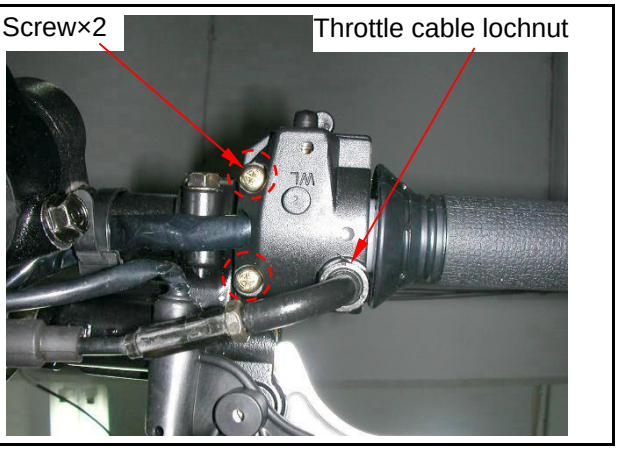
Wolf Classic125R

Removal

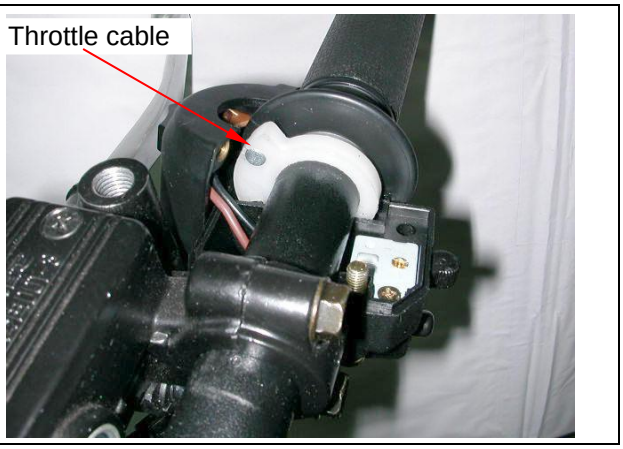
Remove the back mirror.
Remove the headlight.
Disconnect the left / right handlebar switch, clutch switch and brake light switch coupler.



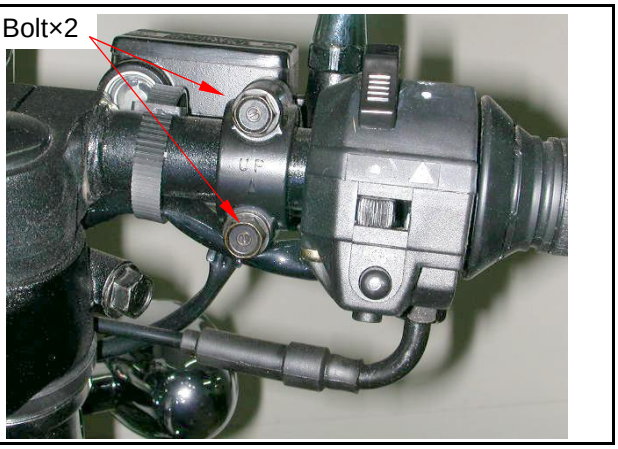
Loosen the throttle cable locknut.
Remove the right handlebar switch screws.



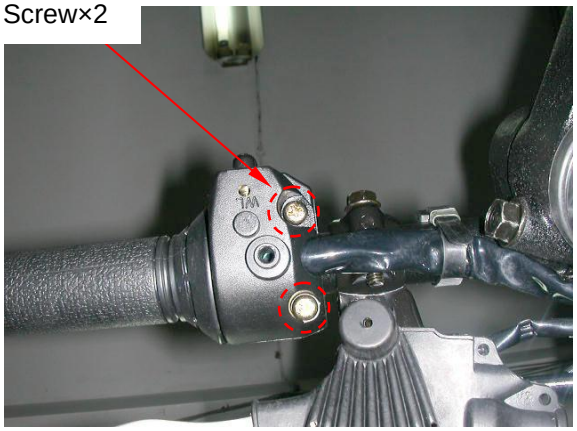
Remove the throttle cable.
Remove the throttle grip and right handlebar switch.



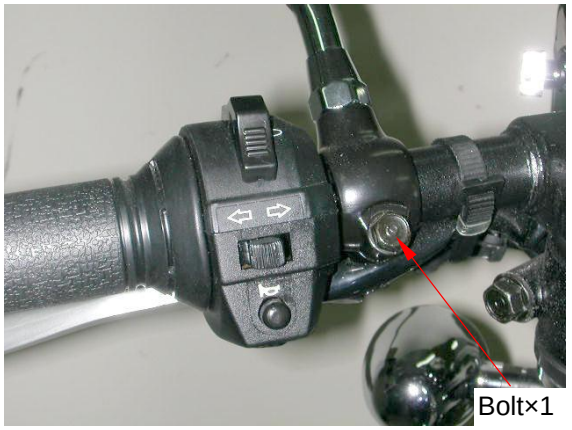
Remove the front brake master cylinder bolt.
Remove the master cylinder and holder.



Remove the left handlebar switch (screwx2).

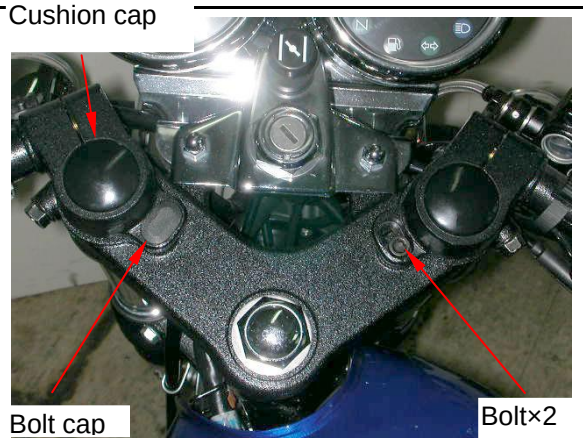


Loosen the clutch cable locknut and adjustment nut.
Remove the clutch lever pivot bolt.
Remove the clutch lever and clutch cable.
Loosen the clutch lever bracket (boltx1).



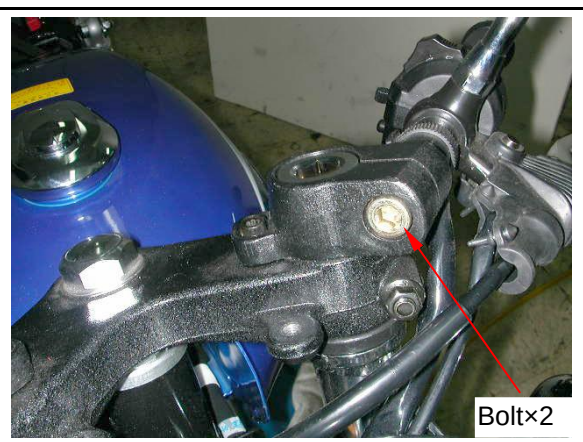
Remove the handlebar position bolt cap and cushion top cap.
Remove the handlebar position bolt.

Loosen the handlebar lock bolt.
Remove the left / right handlebar.



Installation
Install in the reserve order of removal.
Torque value：
Handlebar bolt　3.0~3.5kgf-m

After the handlebar is installed, confirm and adjust：
- throttle grip operation and free play
- meter, electrical parts operation



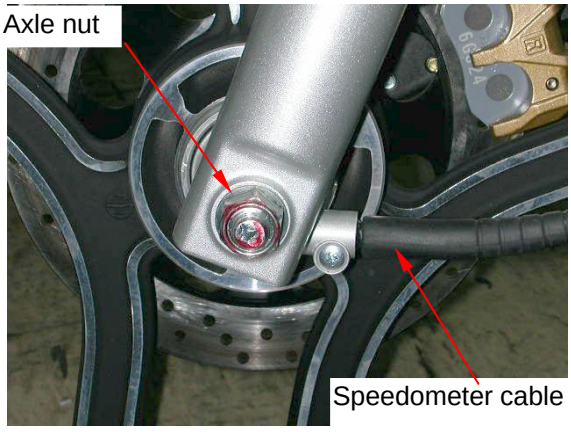
Front Wheel

Removal

Use a bracket to hold the bottom of engine and let the front wheel away from the ground.
Remove the speedometer cable.
Remove the front wheel axle locknut.
Pull out the front wheel axle.
Remove the front wheel, speedometer gear and side collar.

Caution

- Do not pull the front brake lever when the front wheel is removed to prevent the brake pads from being pushed out.

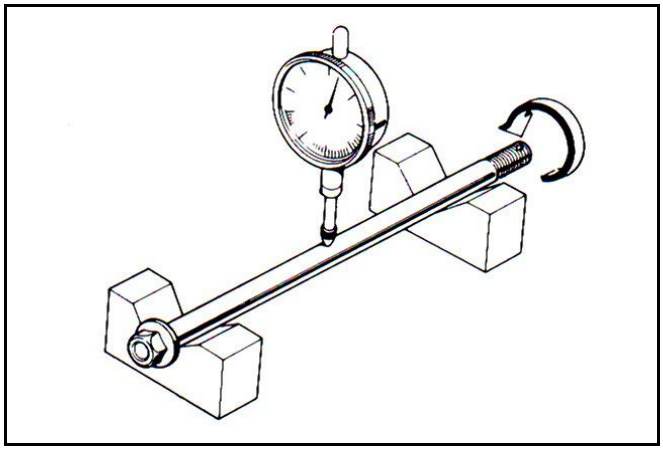


Inspection

Wheel axle

Put the axle on a V-block and measure the run out.

Service limit：0.2 mm

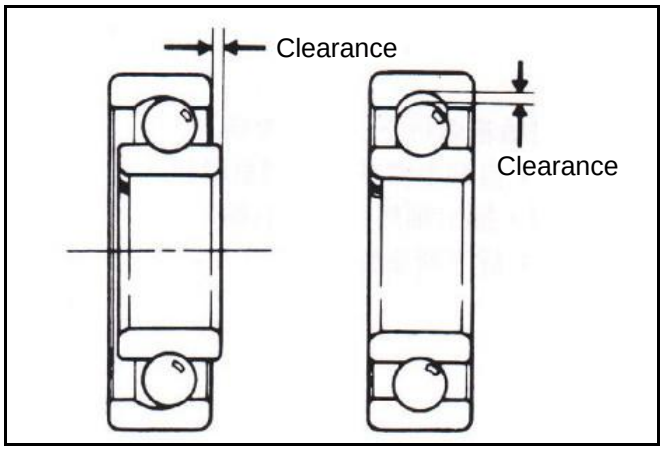


Bearing

Turn the inner ring of each bearing to check if it rotates smoothly and quietly.
Meanwhile, check if the outer ring fits the wheel hub closely.
If the bearing doesn't rotate smoothly or quietly, replace it with new one.

Caution

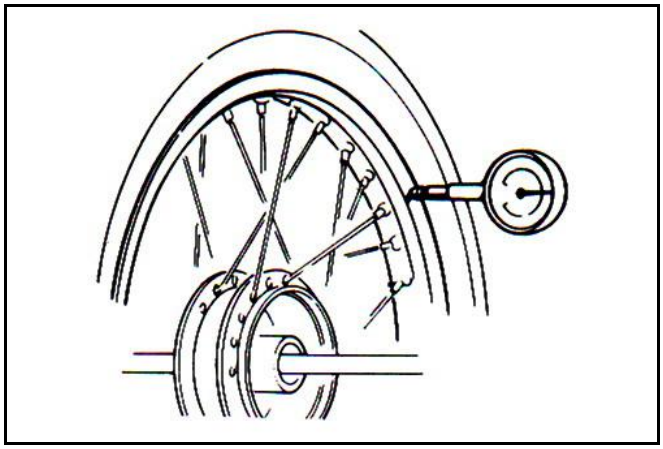
- The old bearing cannot be reused but be replaced with new one by pairs.



Wheel rim

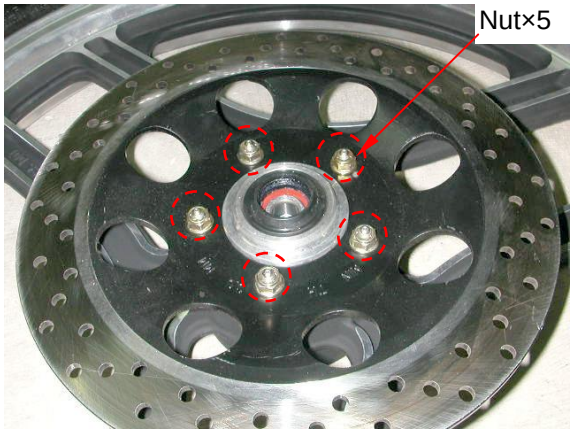
Place the rim in a rotating stand.
Spin the rim by hand and measure the runout by using a dial indicator.

Service limit： Radial 2.0mm
Axial 2.0mm



Disassembly

Remove the brake disk (locknut×5).



Pull out the left side bearing and oil seal by using the inner bearing puller.
Remove the distance collar.
Pull out the right side bearing and oil seal by using the inner bearing puller.

Special tool：

Inner bearing puller SYM-6204020

Assembly

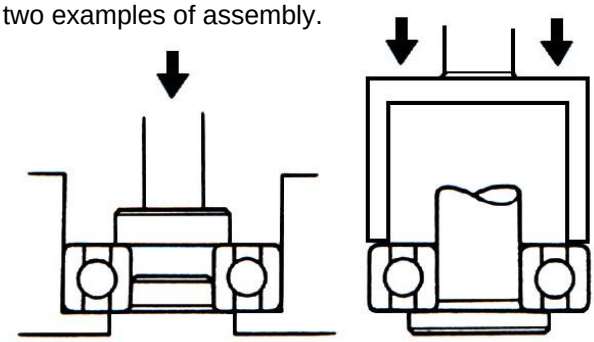
Install in the reverse order of removal.
Apply grease to the wheel hub / bearing contact surface.
Install the left side bearing.
Install the distance collar and the right side bearing.

Caution

- The bearing cannot lean to one side during installation.

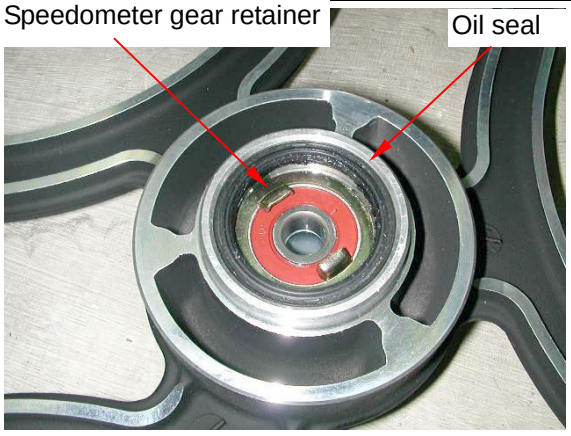
Tool：

Bearing driver

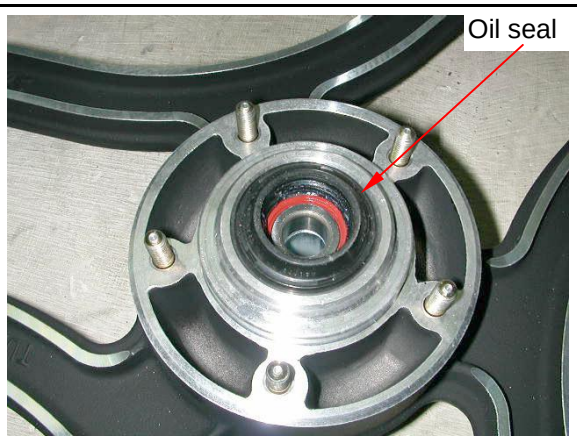


Installation

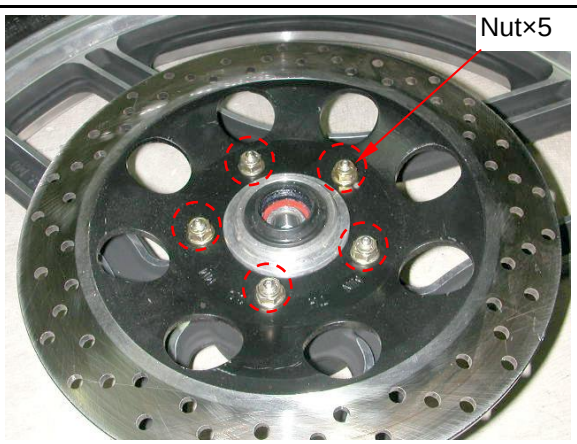
Install the speedometer gear retainer.
Apply grease to the inner and outer side of oil seal and install oil seal into the wheel hub.



Apply grease to the inner and outer side of oil seal and install oil seal into the wheel hub.



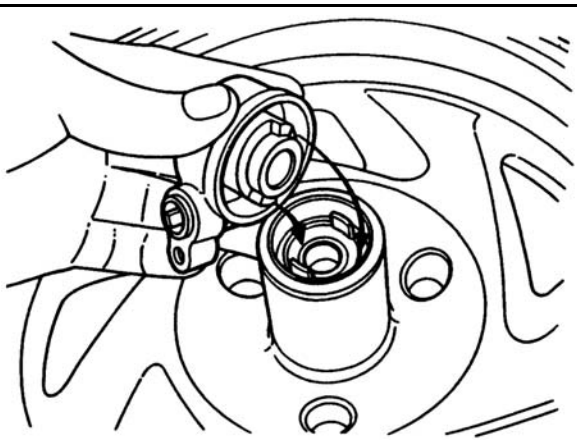
Install the brake disk (nut×5).
Torque value：1.4~1.6kgf-m



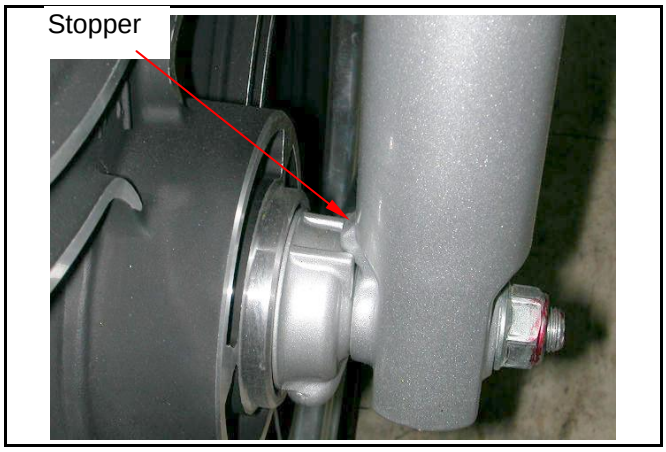
Align the raised part of speedometer gear with the groove of speedometer gear retainer.
Install the speedometer gear.

⚠ Caution

- Contaminated brake pad will decrease braking efficiency; therefore grease cannot be applied to brake pad and brake disk.



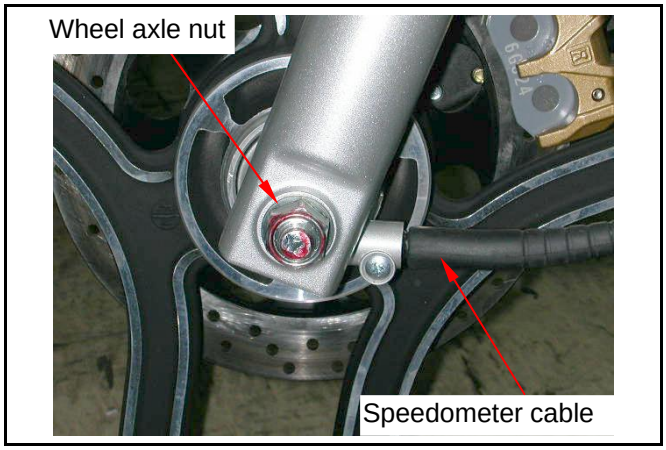
Place the front wheel between the front forks. Align the groove on the speedometer gear with the raised stopper on the left front fork.



Install the front wheel axle from the right fork. Install the wheel axle nut and tighten it to the specified torque value.

Torque value：6.0~8.0kgf-m

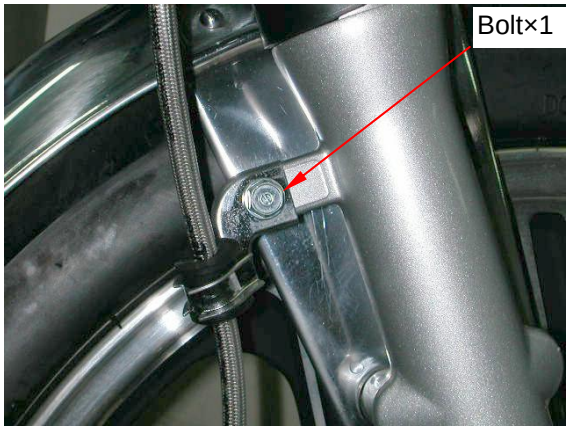
Assemble the speedometer cable to the speedometer gear.



Front Fork

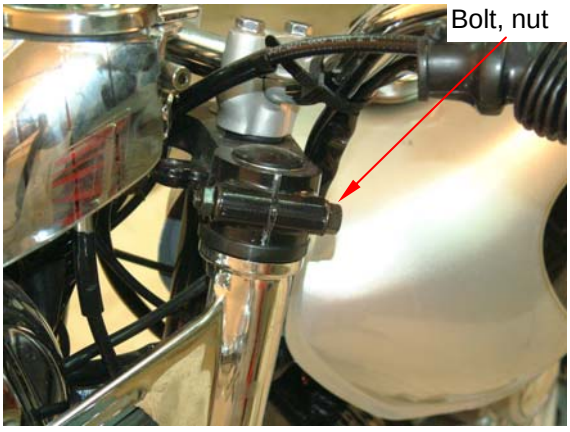
Removal

Remove the front wheel and front brake parts.
Remove the brake hose clamp from the right fork (boltx1).



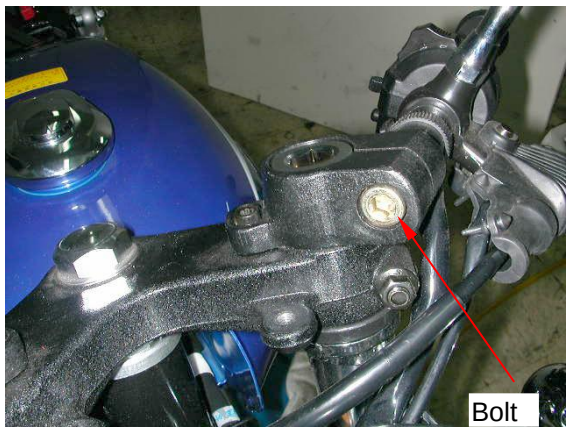
Wolf Classic 125

Loosen the fork upper bolt on the top bridge (nutx2, boltx2).

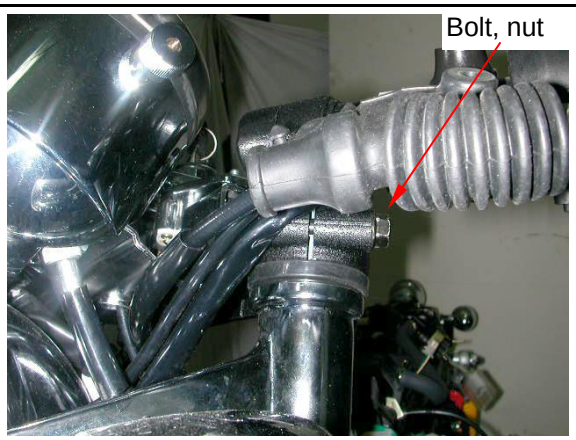


Wolf Classic125R

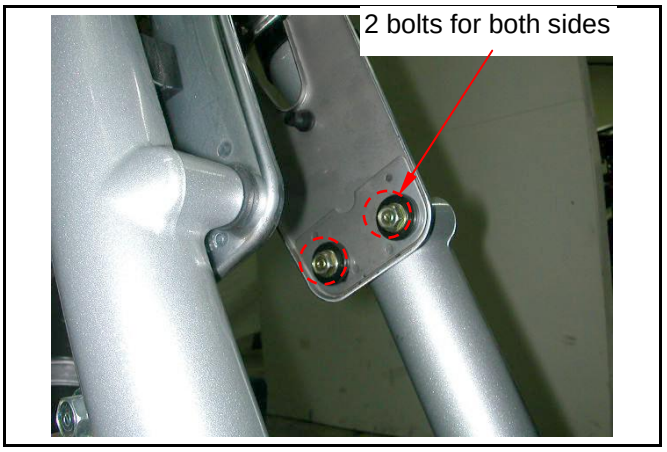
Loosen left / right steering handlebar bolts.



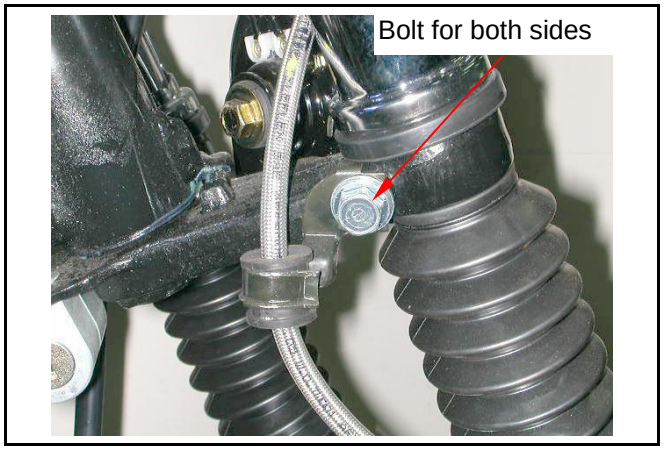
Loosen front fork bolt on the top bridge (nut×2, bolt×2).



Remove the front fender (boltx4).

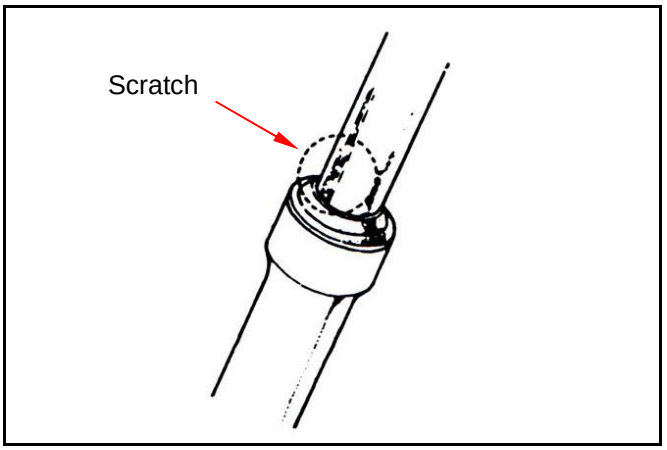


Remove the front fork bolt from the steering stem and remove the front fork.



Oil seal inspection / replacement

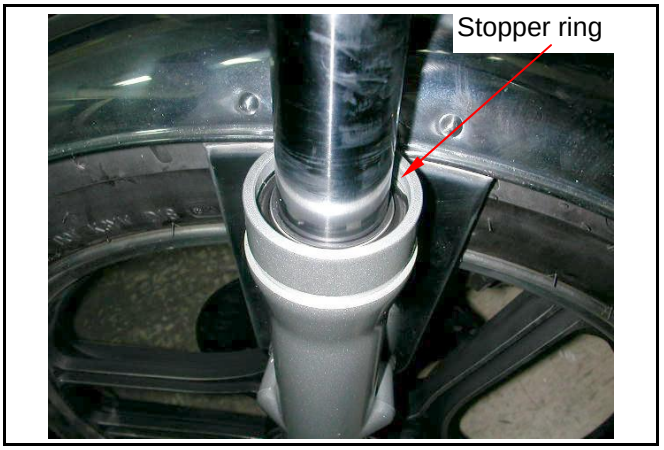
Push the fork pipe for several times to check if there is any oil leakage or excessive noise.
Check if there is any scratch on the fork pipe if oil leakage happens.
Replace the front fork if there is a scratch on the fork pipe.



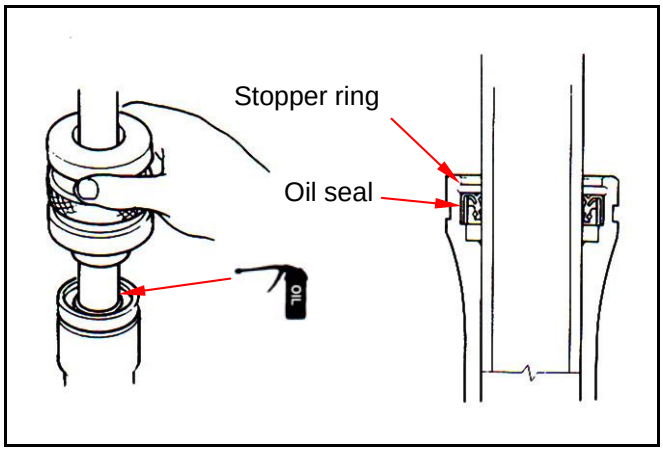
If there is oil leakage but without scratch on the fork pipe, replace the oil seal.
Pour out the fork fluid.
Remove the oil seal stopper ring and then remove the old oil seal.

⚠ Caution

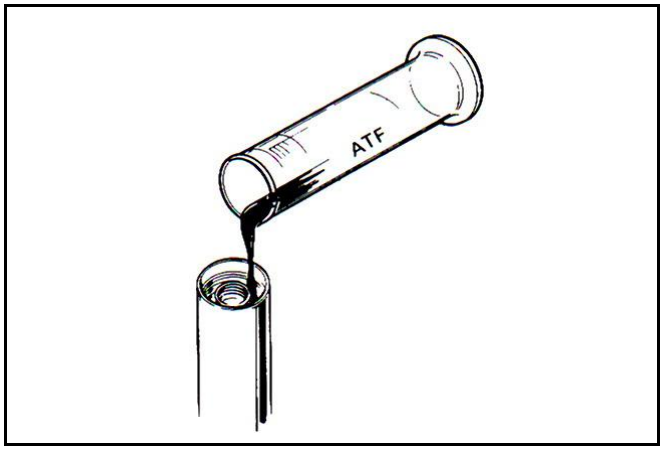
- Do not damage the fork pipe when removing the oil seal.



Coat the inner side of the new oil seal with cushion oil and then put in the fork pipe.
Install the oil seal to the right position by using an oil seal driver.
Clip the stopper ring.



Adjust the fork fluid capacity if the front fork is too hard or too soft.
Cushion oil：BRAMAX CUSHION OIL
Capacity：160~180c.c.



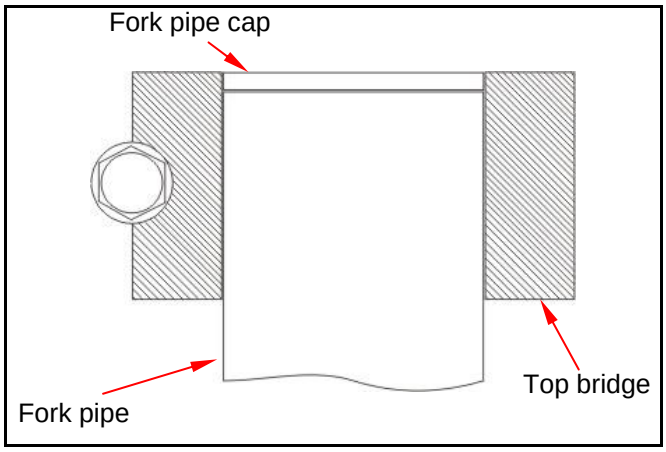
Installation

⚠ Caution

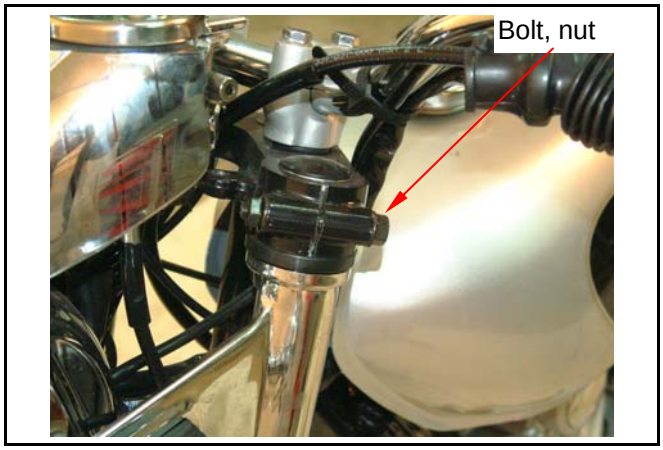
- Rotate the fork pipe during installation will make it easier to install the fork pipe.

Wolf Classic 125

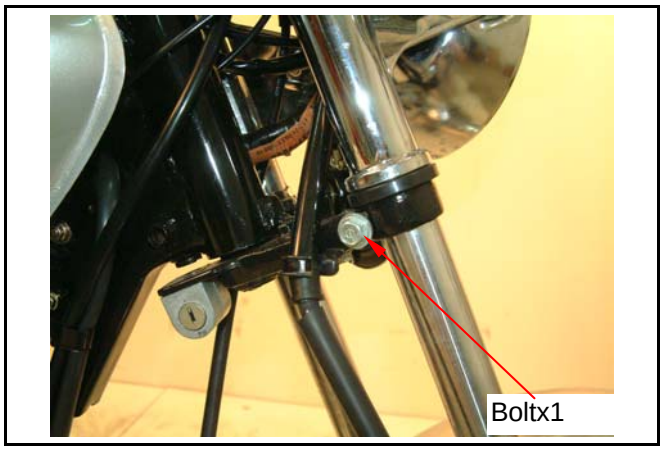
Install the fork pipe from the bottom of the front fork. Align the fork pipe cap with the top bridge.



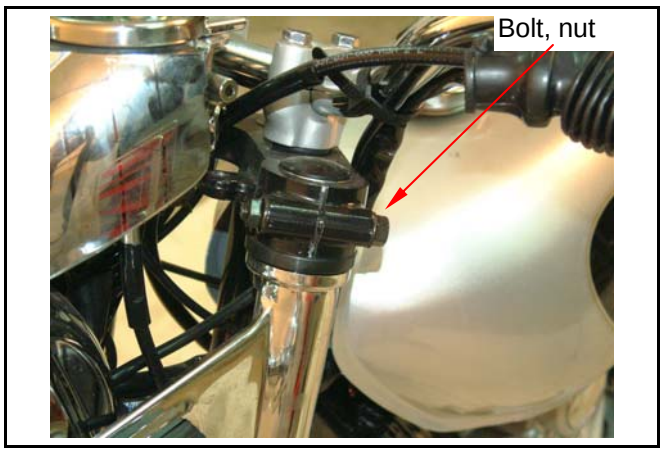
Hold the fork pipe by hand and tighten the front fork upper bolt and nut.



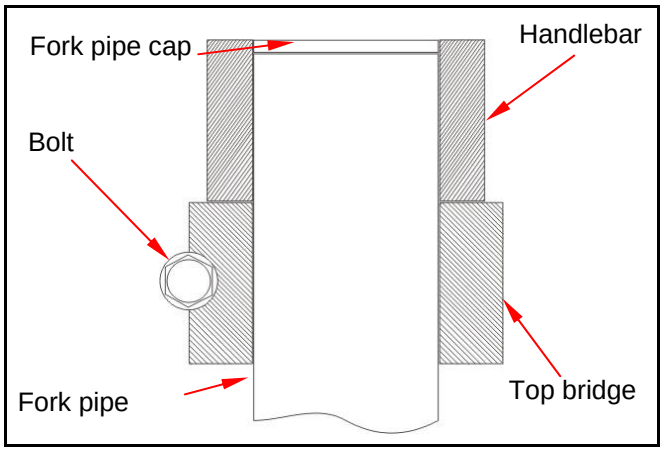
Tighten the fork bolt on the steering stem.
Torque value：3.0~3.5kgf-m



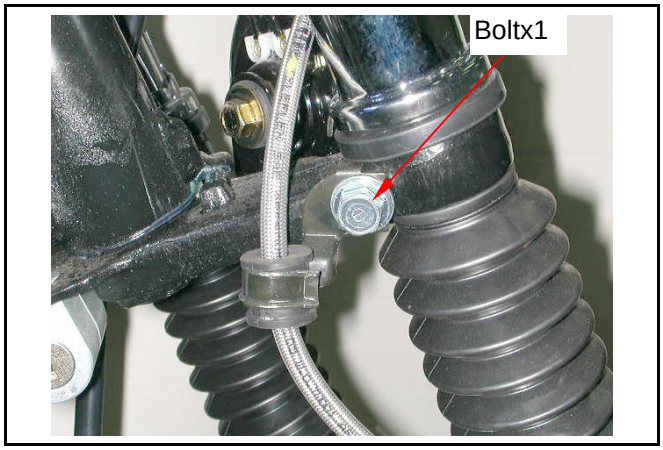
Tighten the front fork upper bolt and nut and confirm the specified torque value.
Torque value：3.0~3.5kgf-m



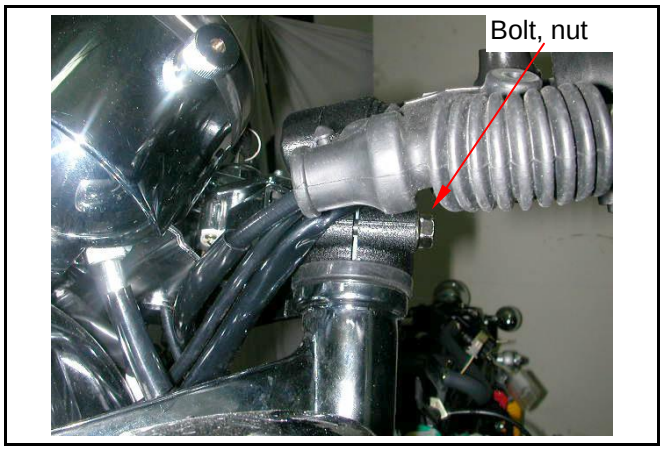
Wolf Classic 125 R
Install the fork pipe from the bottom of the front fork. Align the fork pipe cap with the steering handlebar.
Hold the fork pipe by hand and tighten the front fork upper bolt and nut.



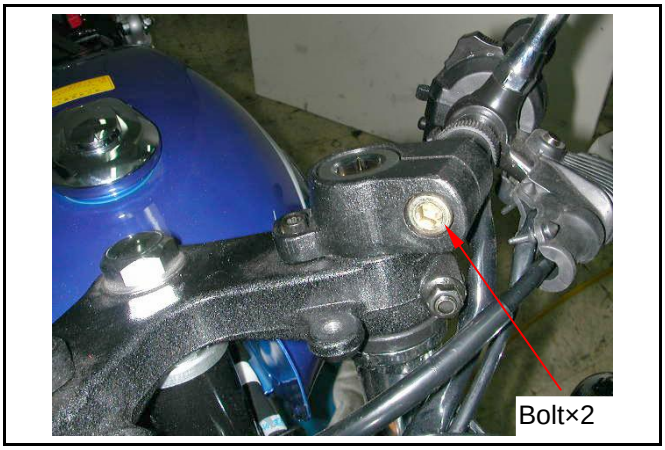
Tighten the fork bolt on the steering stem.
Torque value：3.0~3.5kgf-m



Tighten the front fork upper bolt and nut and confirm the specified torque value.
Torque value：3.0~3.5kgf-m



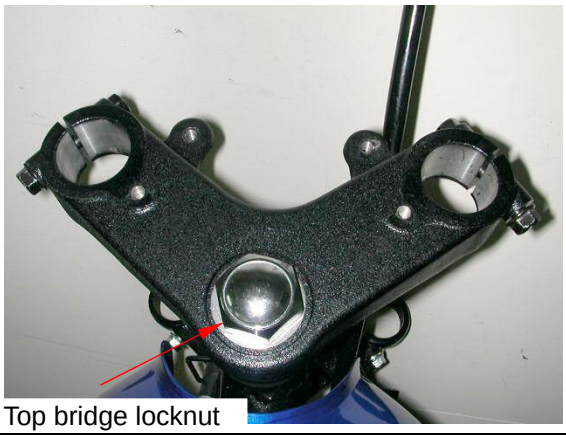
Tighten the left / right handlebar.
Torque value：3.0~3.5kgf-m



Steering Stem

Removal

Remove the meter, headlight, steering handlebar, front wheel, front brake and front fork.
Remove the top bridge.


Top bridge locknut

Remove the steering stem locknut and steering upper cone race.
Special tool：
Stem locknut socket wrench SYM-5320000
Remove the steering stem.

⚠ Caution

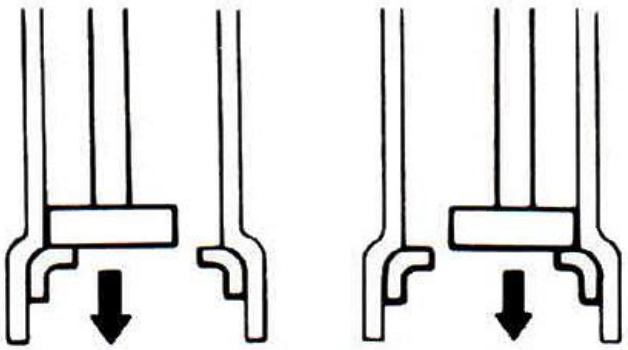
- Keep the steering steel balls in a container to avoid missing them.


Steering stem thread

Remove the steering upper / bottom ball race by driver and rubber hammer.
Remove the steering bottom cone race from the steering stem.

⚠ Caution

- Do not do any damage to the frame and steering stem.



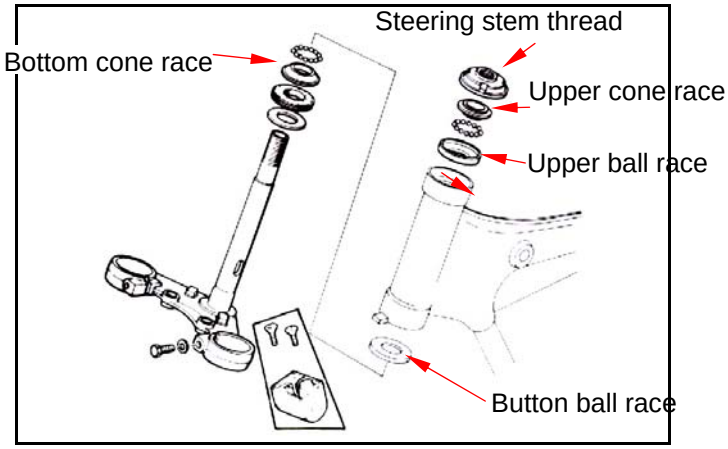
Installation

Install a new steering bottom cone race onto the steering stem and lubricate with grease.
Install the steering upper / bottom ball race to the right position.

⚠ Caution

- Do not let the ball race lean on one side during installation.

Coat the upper / bottom ball race with grease and install the steering balls.

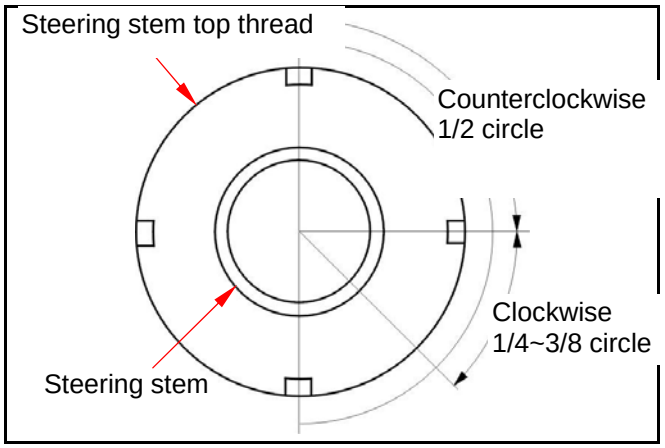


Install the steering stem into the frame.
Lubricate the steering upper cone race.
Tighten the upper cone race and steering stem locknut to the steering stem till the steering balls touch the upper cone race closely.
Turn the upper cone race counterclockwise 1/2 circle and then tighten it with specific torque value (1/4~3/8 circle).

Special tool：

Upper cone race wrench SYM-5320000

Torque value：0.15~0.25kgf-m

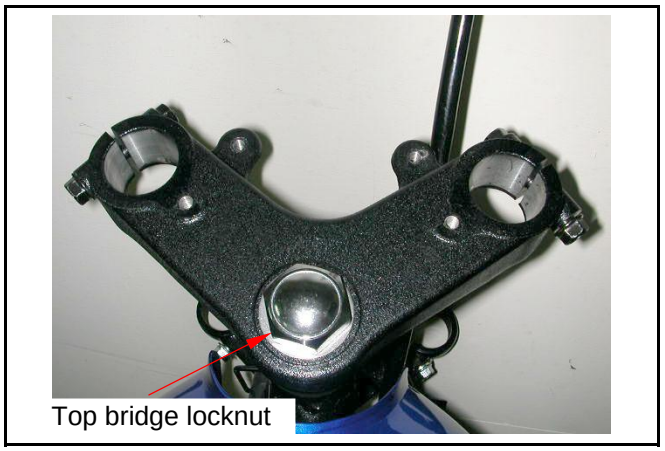


Caution

- Do not over tighten upper cone race or the steering ball race may be damaged.

Install the top bridge and tighten the nuts.

Torque value：6.0~8.0kgf-m



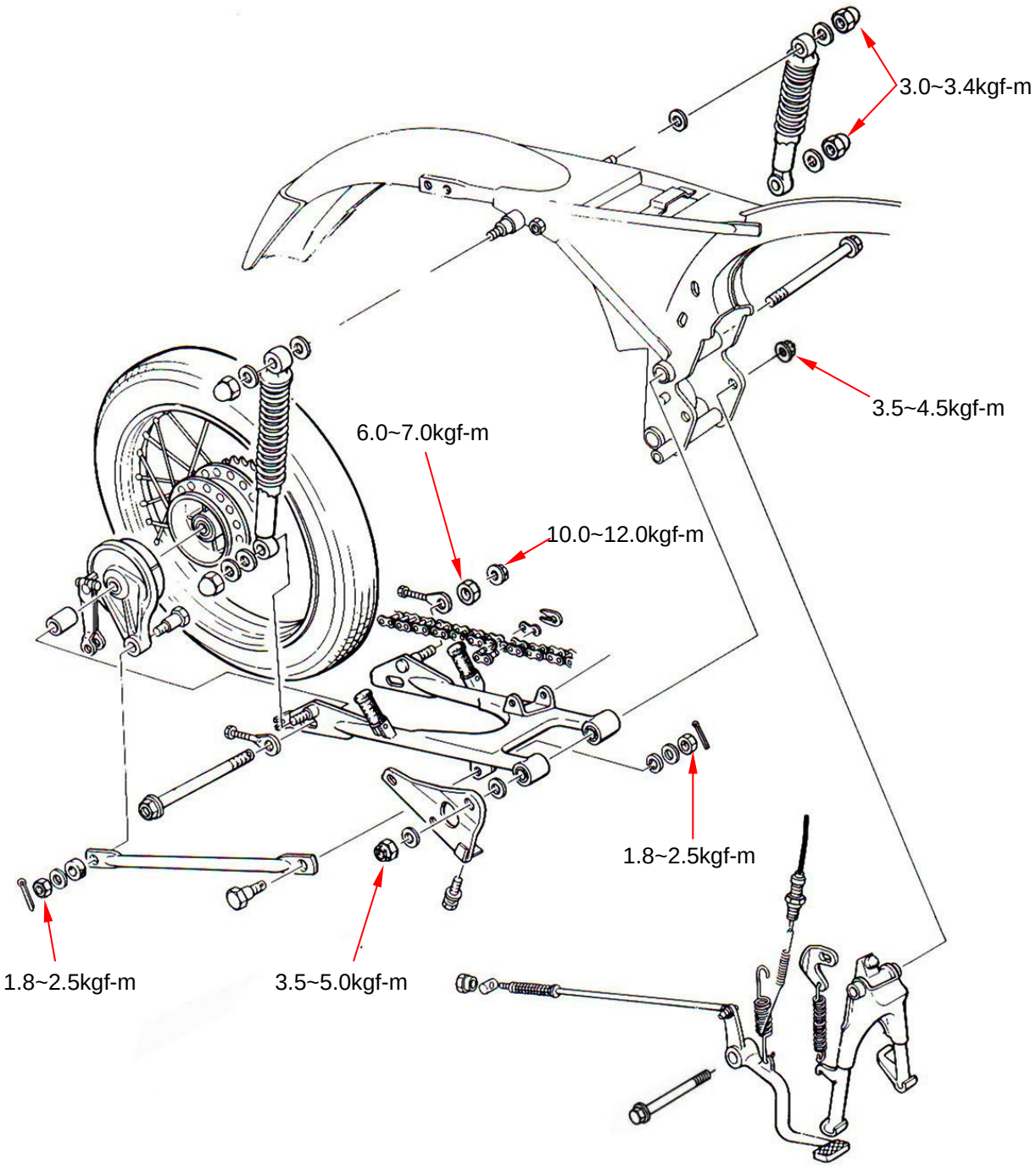
Caution

- After installation, check if the steering stem can rotate freely without vertical clearance.

Install other parts in the reverse order of removal.

Note:

Mechanism Diagram



Precautions in Operation

General information

Refer to the service manual of tire for the information of tire removal, repair and installation.

Specification **unit：mm**

Item		Standard	Service limit
Axle runout		—	0.2
Wheel rim runout	Radial	—	2.0
	Axial	—	2.0
Brake drum inner diameter		130.0	132.0
Drive chain slack		—	10~20

Torque value

Final driven sprocket bolt	2.7~3.0kgf-m
Rear wheel axle nut	10.0~12.0kgf-m
Swingarm pivot bolt nut	3.5~5.0kgf-m
Exhaust pipe locknut	1.0~1.4kgf-m
Rear cushion upper nut	3.0~3.4kgf-m
Rear cushion lower nut	3.0~3.4kgf-m
Rear brake arm nut	0.8~1.2kgf-m
Rear brake torque link nut	1.8~2.5kgf-m
Main stand nut	3.5~4.5kgf-m

Special tool

Inner bearing puller	SYM-6204020
Steering stem locknut socket wrench	SYM-5320000
Rubber bush puller / driver	SYM-1120310

Troubleshooting

Rear wheel wobbling

- Bent rim
- Faulty rear tire
- Incorrect wheel axle tightening

Too soft suspension

- Weak cushion spring
- Incorrect suspension adjustment

Too hard suspension

- Damaged rubber bush
- Bent

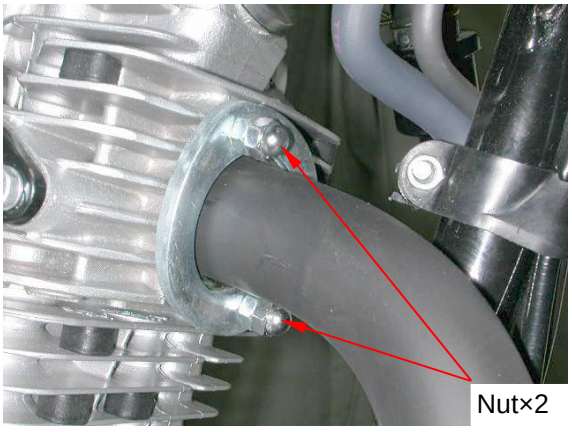
Rear suspension noise

- Incorrect cushion nut tightening
- Damaged rubber bush
- Cushion fluid leakage
- Bent rear cushion

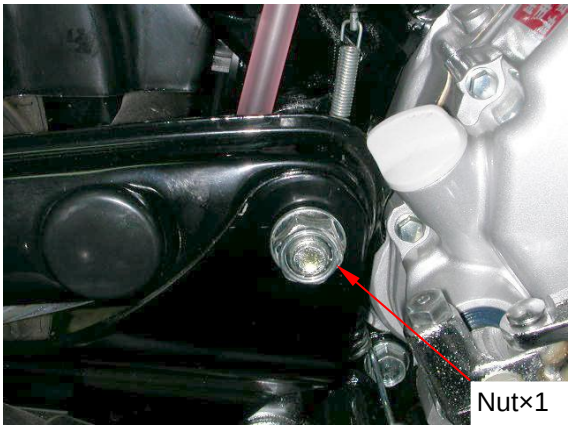
Rear Wheel

Removal

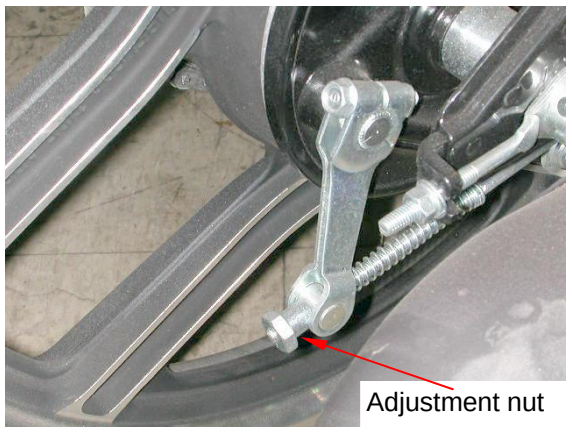
Remove the exhaust pipe locknuts.



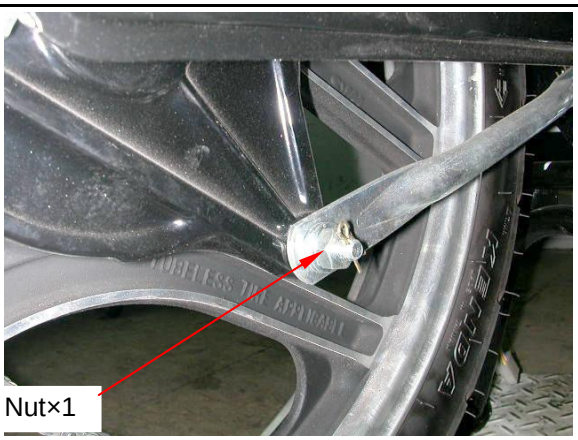
Remove the swingarm pivot bolt nut.
Remove the exhaust pipe.



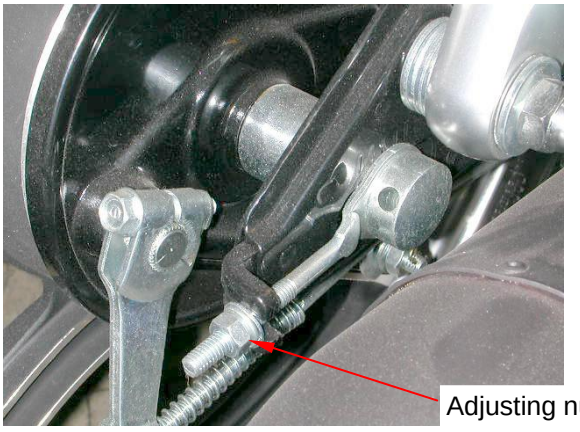
Remove the rear brake adjustment nut.
Remove the rear brake rod.



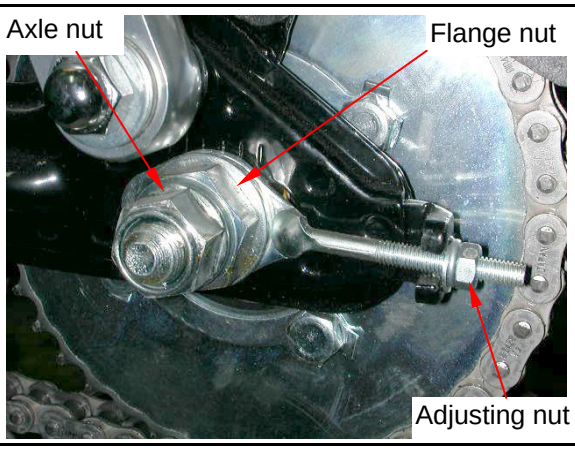
Remove the rear brake torque link.



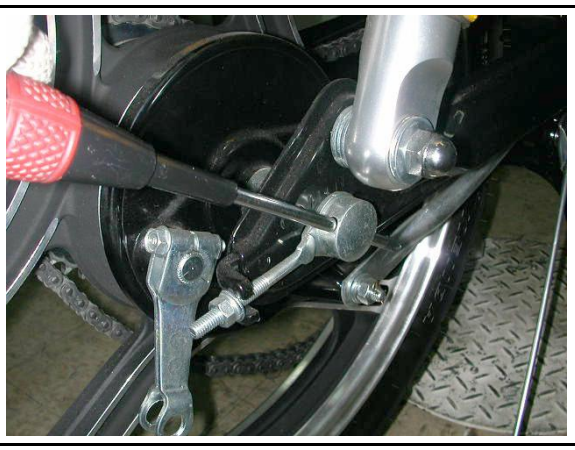
Loosen the drive chain adjusting nut.



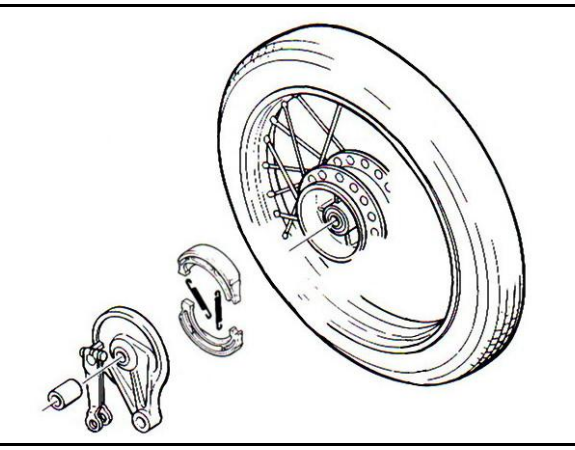
Loosen the driven flange nut.



Insert a screw driver into the rear wheel axle and fix the axle.
Remove the rear wheel axle nut.



Remove the rear wheel, side collar, drive chain adjuster and rear brake panel after the wheel axle is removed.

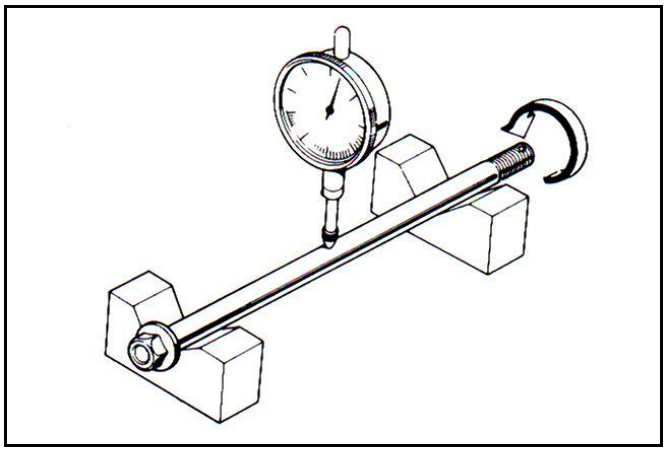


Inspection

Wheel axle

Put the axle on a V-block and measure the run out.

Service limit：0.2 mm

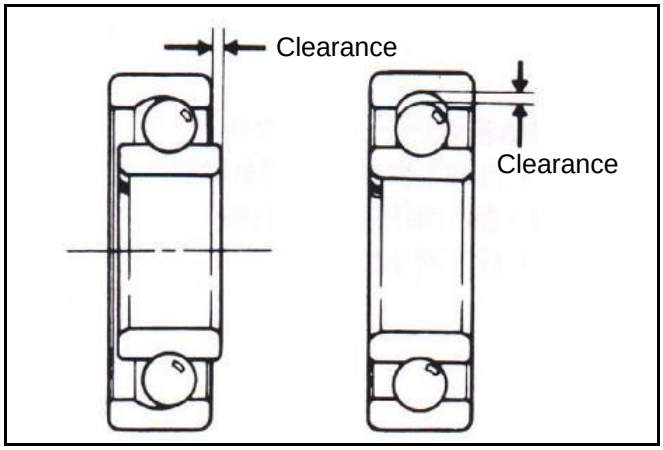


Bearing

Turn the inner ring of each bearing to check if it rotates smoothly and quietly.
Meanwhile, check if the outer ring fits the wheel hub closely.
If the bearing doesn't rotate smoothly or quietly, replace it with new one.

⚠ Caution

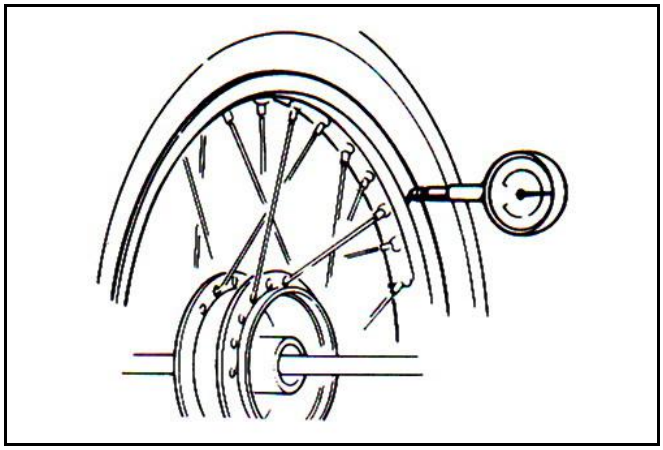
- The bearing should be replaced in pairs.



Wheel rim

Place the rim in a rotating stand.
Spin the rim by hand and measure the runout by using a dial indicator.

Service limit：Radial 2.0mm
Axial 2.0mm



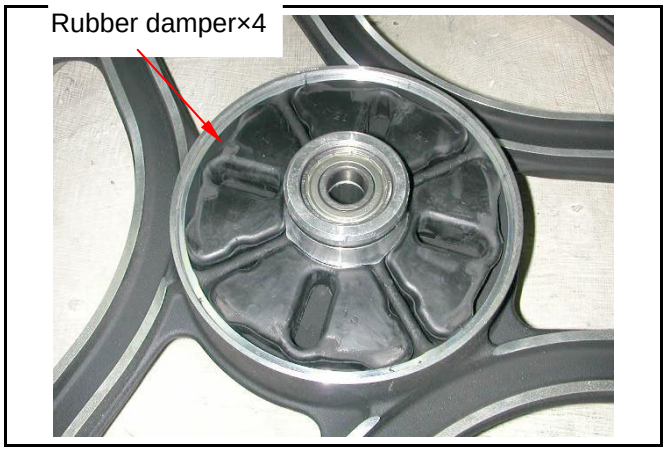
Brake drum

Inspect the brake drum inner diameter.

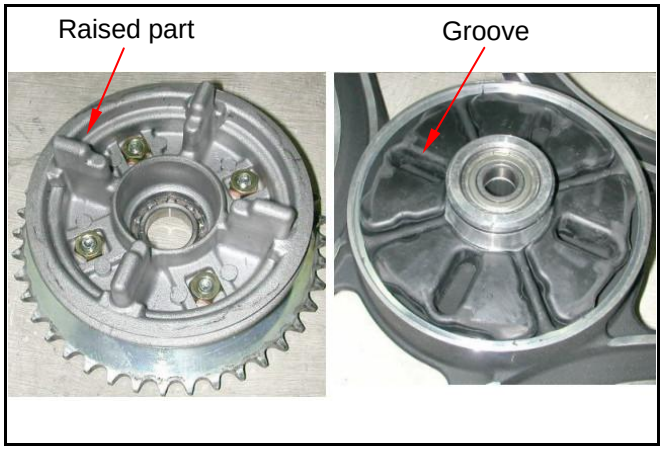
Service limit：132.0mm

Refer to chapter 10 for brake system inspection.

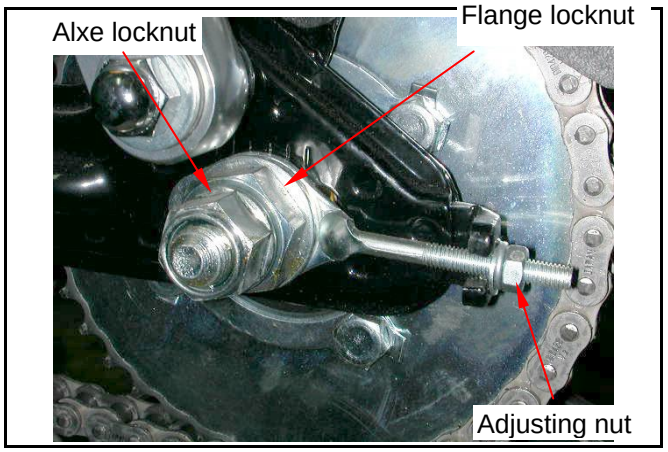
Driven flange rubber damper inspection
Inspect the rubber dampers on the driven flange for wear or damage.
Replace it if necessary.



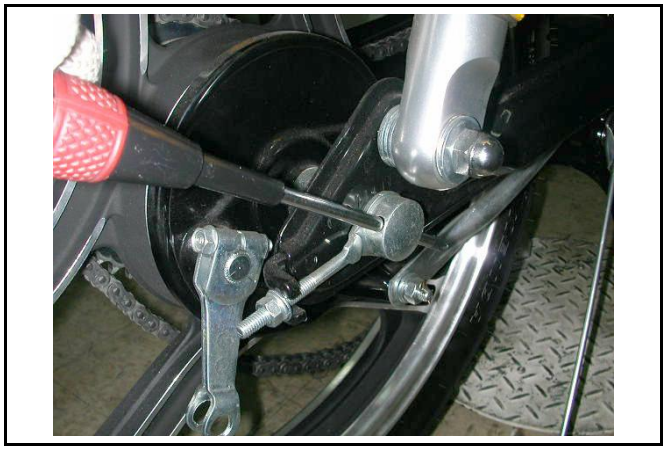
Rear wheel installation
Install the rear brake panel into the brake drum.
Align the groove on the rubber damper with the raised part on the driven flange.
Install the rear wheel.



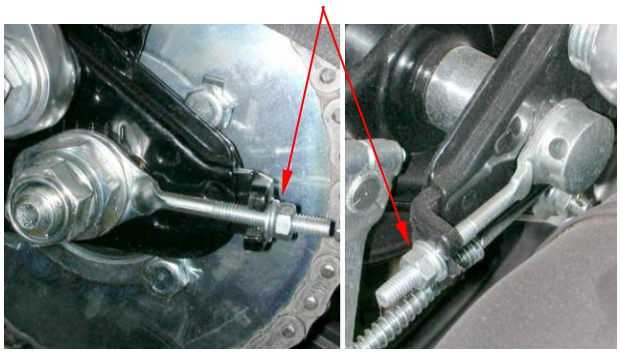
Install the side collar and insert the rear wheel axle.
Adjust the drive chain slack.
Tighten the rear flange locknut.
Torque value：6.0~7.0kgf-m



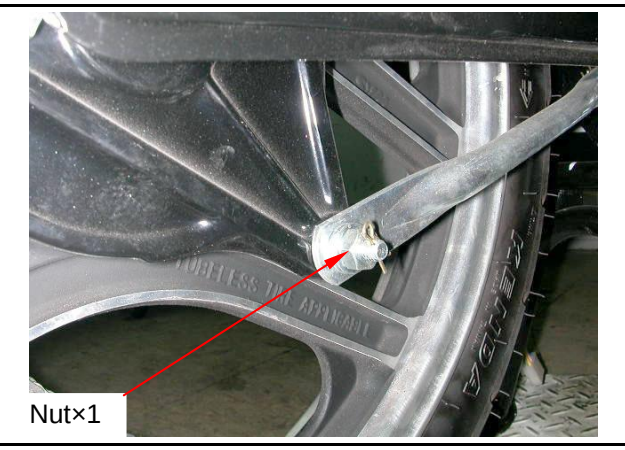
Insert a screw driver into the rear wheel axle and fix the axle.
Tighten the rear wheel axle locknut.
Torque value：10.0~12.0kgf-m



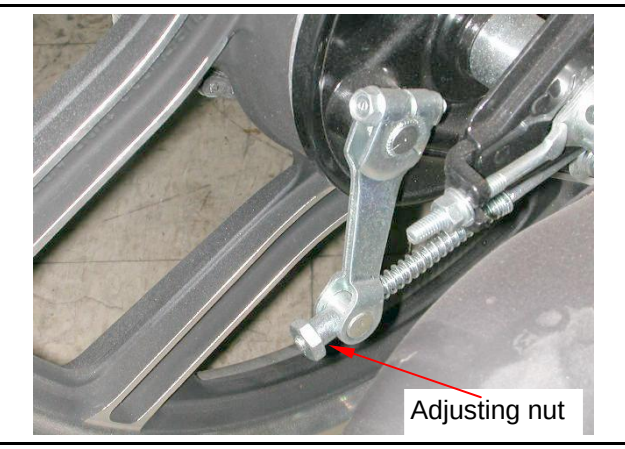
Tighten the drive chain adjusting nut slightly to prevent it from loosening.

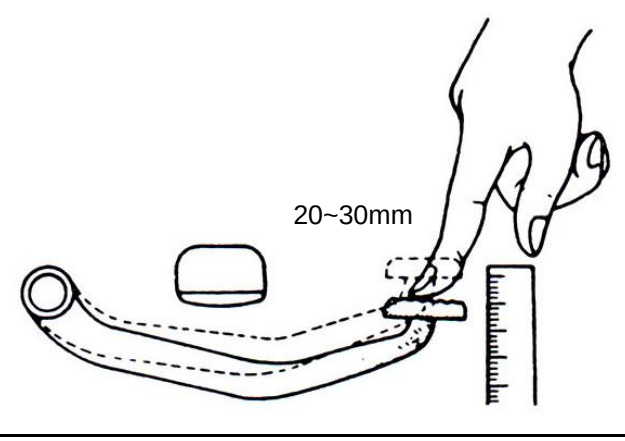


Install the rear brake torque link.
Torque value：1.8~2.5kgf-m



Install the rear brake rod and adjusting nut.
Adjust the rear brake pedal free play.
Rear brake pedal free play：20~30mm

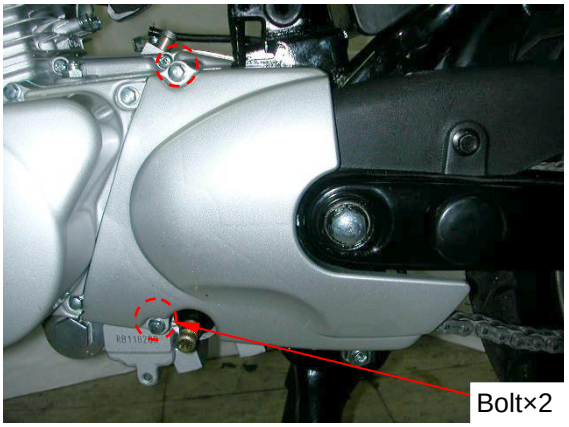




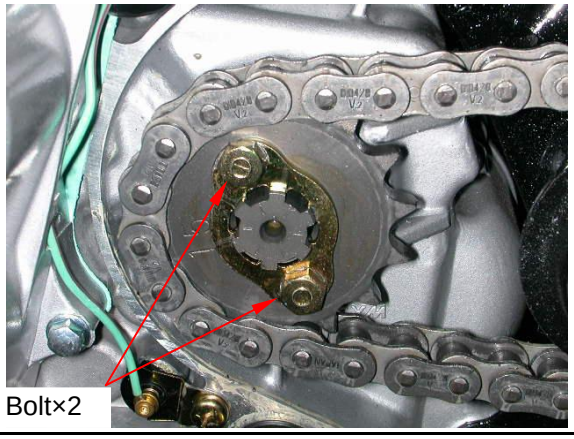
Drive Chain / Sprocket / Flange

Drive chain / sprocket removal

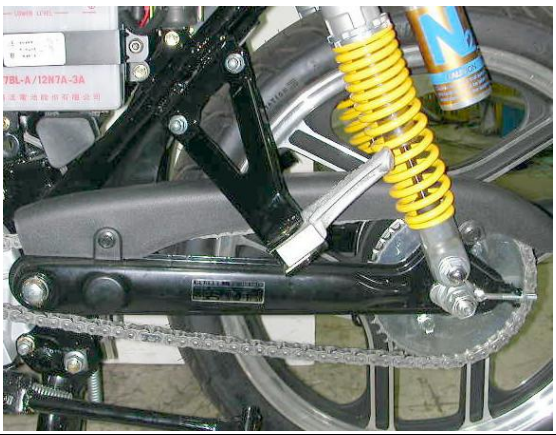
Remove the left crankcase rear cover (bolt×2).



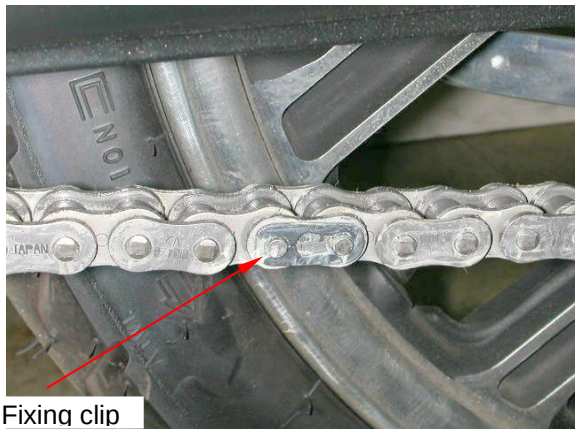
Remove the drive sprocket fixing plate.



Remove the drive chain cover.



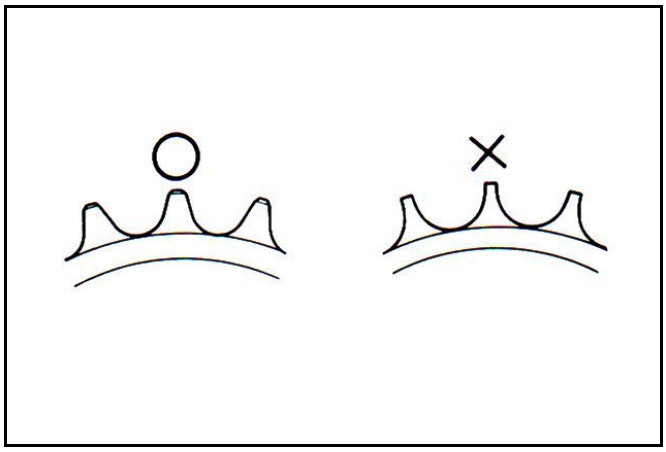
Remove the drive chain fixing clip.
Remove the drive chain.



Drive chain / sprocket inspection

Driven sprocket

Check the condition of driven sprocket teeth.
Replace the sprocket if the teeth are worn out.

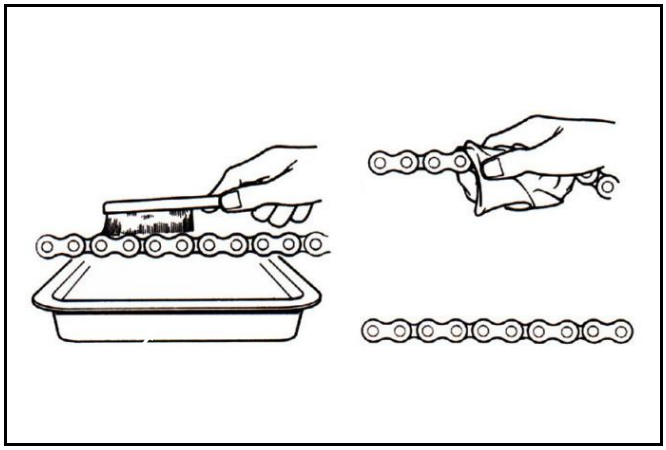


⚠ Caution

- Driven sprocket and drive chain condition should be checked at the same time.

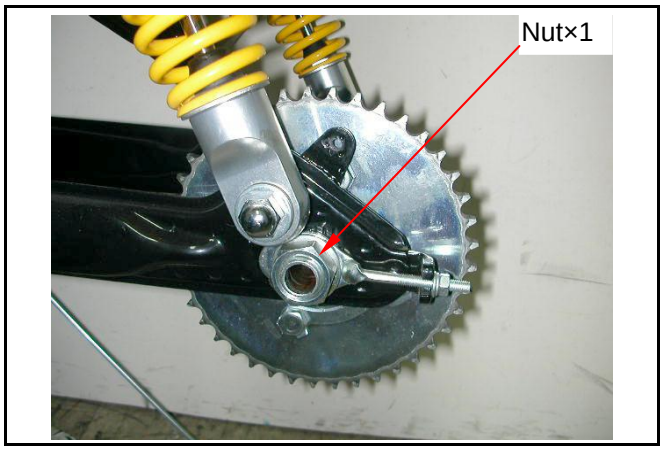
Drive chain

Clean and check the drive chain links condition. Replace the drive chain if it is worn out.

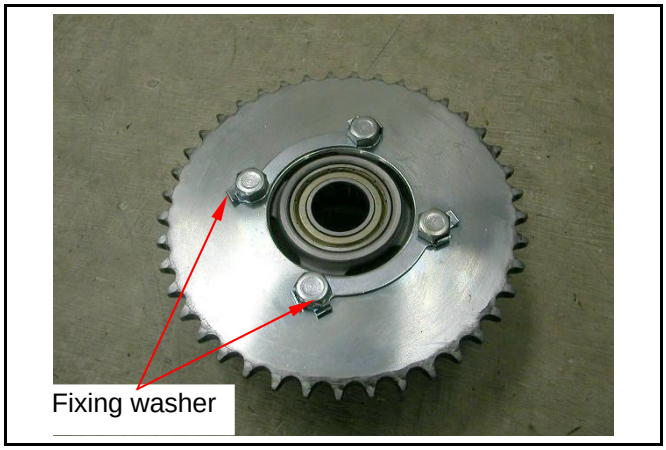


Driven sprocket / flange removal

Remove the rear wheel and drive chain.
Remove the rear flange locknut.
Remove the rear flange and sprocket.



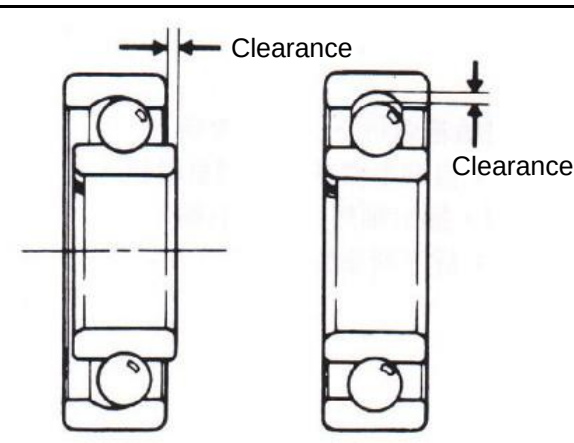
Flat the sprocket bolt fixing washer.



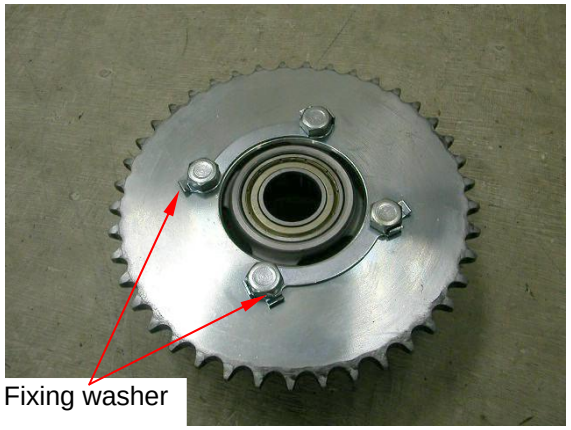
Remove the driven sprocket (boltx4, nutx4).

Driven flange inspection
Check the flange for wear or damage.

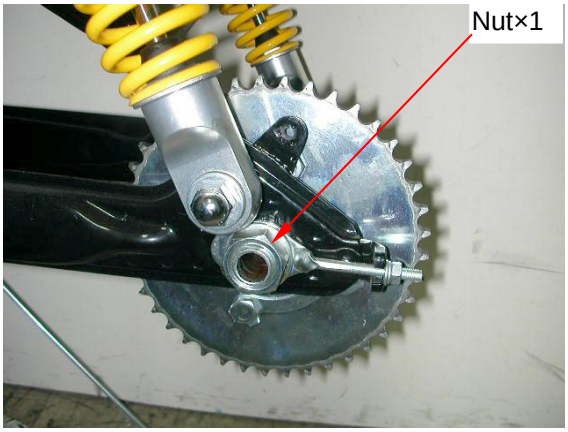
Bearing inspection
Turn the inner ring of each bearing to check if it rotates smoothly and quietly.
Meanwhile, check if the outer ring fits the wheel hub closely.
If the bearing doesn't rotate smoothly or quietly, replace it with new one.



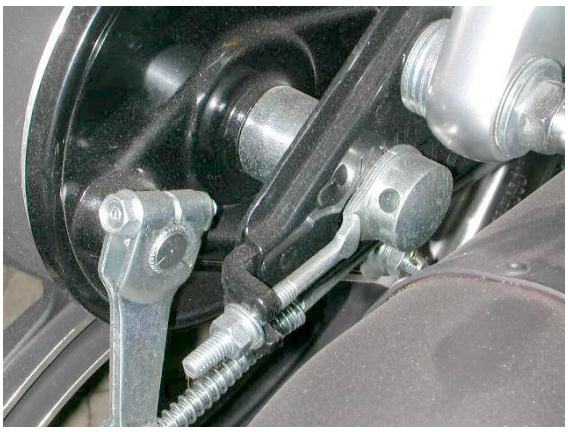
Driven flange / sprocket installation
Install the driven sprocket to the flange.
Tighten the bolts and bend the fixing washer.



Install the driven flange and sprocket to the swingarm.
Install the left drive chain adjuster.



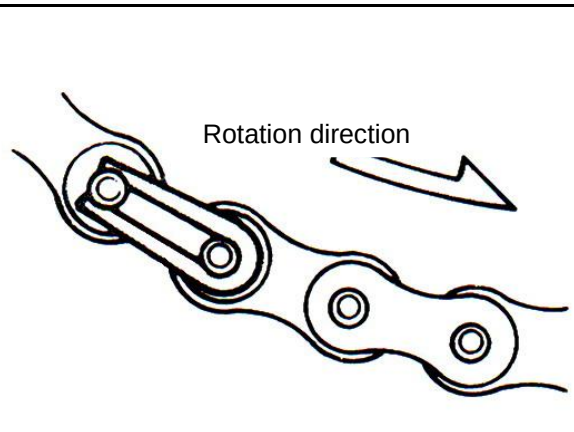
Install the rear wheel right drive chain adjuster.



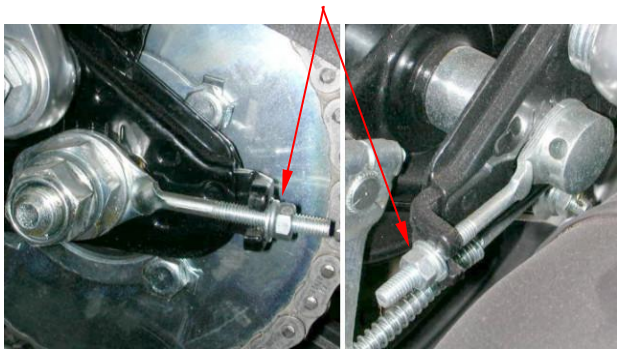
Install the drive chain.

⚠ Caution

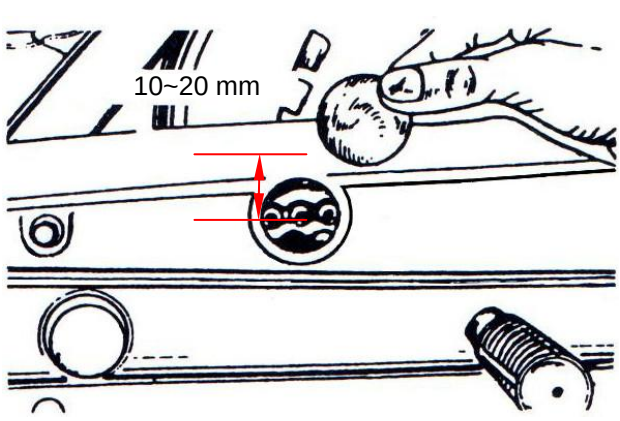
- The breach of the drive chain fixing clip should be opposite to the chain rotation direction.



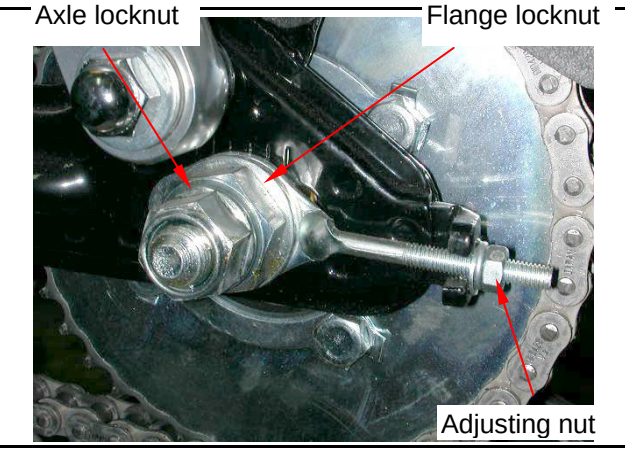
Drive chain adjustment
Rotate the left / right drive chain adjusting nut evenly to make the drive chain slack within normal range.



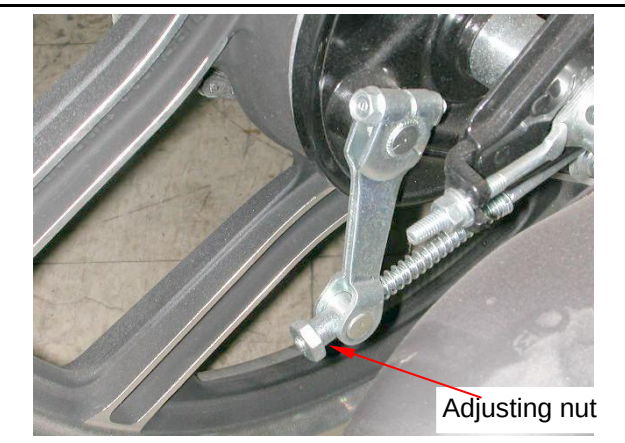
Rotate the adjusting nut clockwise to tighten the drive chain slack. Rotate the adjusting nut counterclockwise to loosen the drive chain slack.
Drive chain slack：10~20mm



Tighten the drive flange locknut first and then the rear wheel axle lock nut.
Torque value：4.0~5.0kgf-m
After locking the rear wheel axle locknut, tighten the drive chain adjuster nuts slightly to prevent the adjuster nuts from being loosened. Check the drive chain slack again to make sure that the rear wheel can rotate smoothly. Lubricate the drive chain.



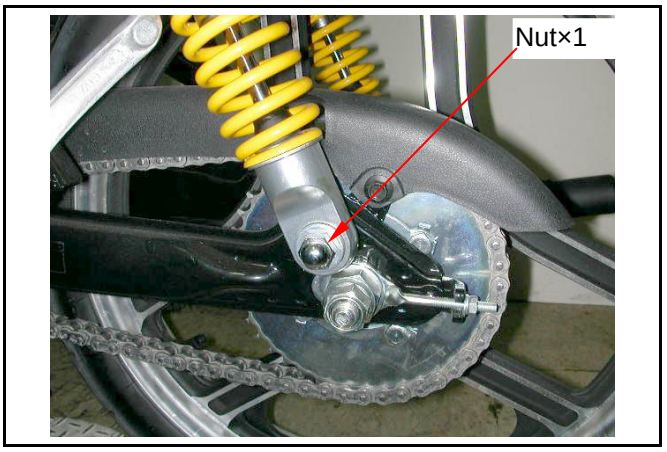
Install the rear brake torque link, tighten the locknut and insert the split pin.
Install the rear brake rod and adjust the rear brake pedal free play.



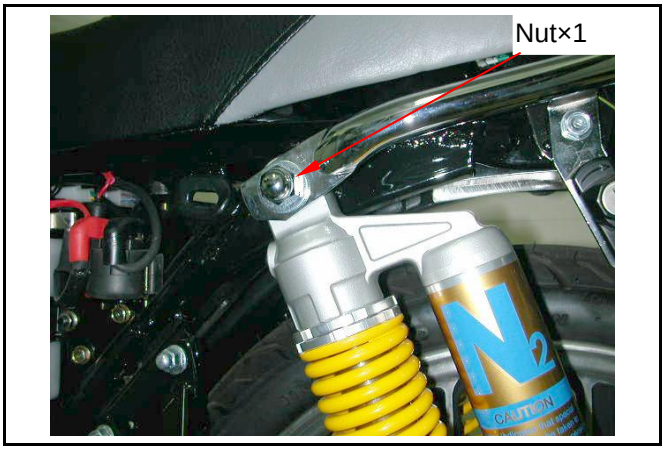
Rear Cushion

Removal

Remove the rear cushion lower locknut.



Rear the rear cushion upper locknut.
Remove the rear carrier.
Remove the rear cushion.



Installation

Install in the reverse order of removal.

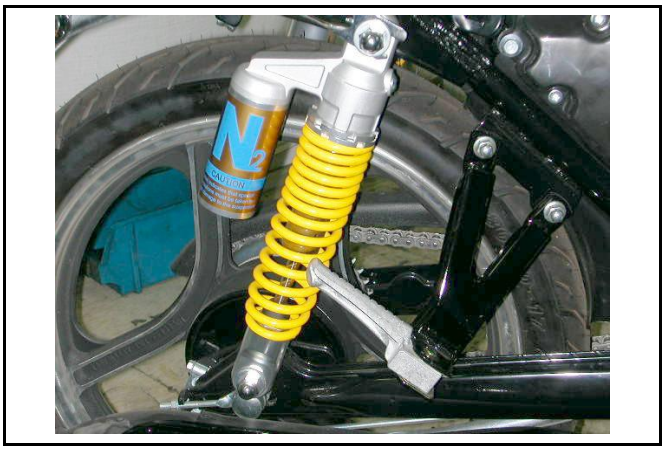
Torque value：

Cushion locknut 3.0~3.4kgf-m

Caution

- Rear cushion should be replaced as a complete set.
- Rubber bush and structure will be damaged during disassembly.

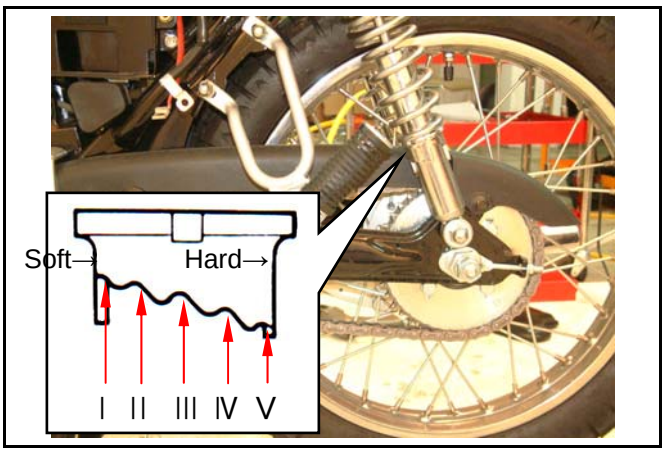
Press the rear cushion to check if the rear cushions move freely.



Check if both sides of rear cushion spring adjusters are adjusted to the same tightness.
common cushion：Ⅰ、Ⅱ、Ⅲ、Ⅳ、Ⅴ
nitrogen cushion：Adjusting screw thread

Special tool：

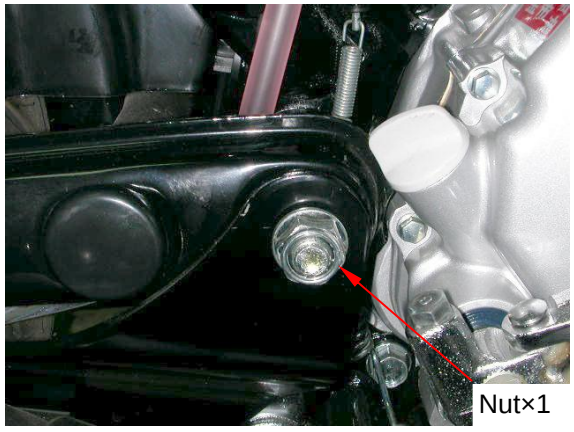
Steering stem locknut socket wrench
SYM-5320000



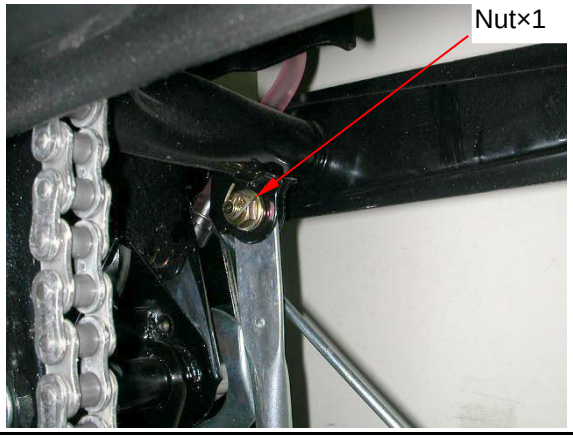
Swingarm

Removal

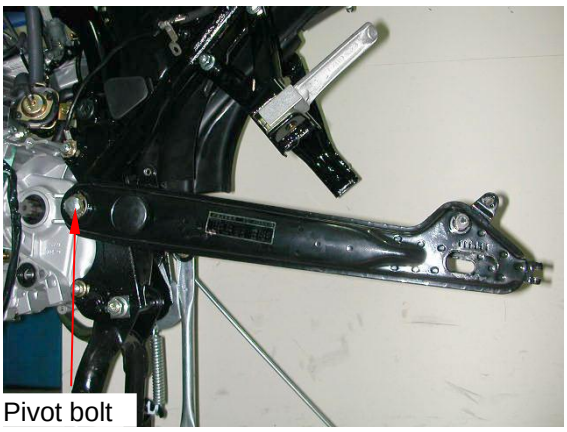
Remove the swingarm pivot bolt nut.
Remove the exhaust pipe, rear wheel, drive chain, drive sprocket, drive chain cover and rear cushion.



Remove the rear brake torque link.



Pull out the swingarm pivot bolt.
Remove the swingarm.

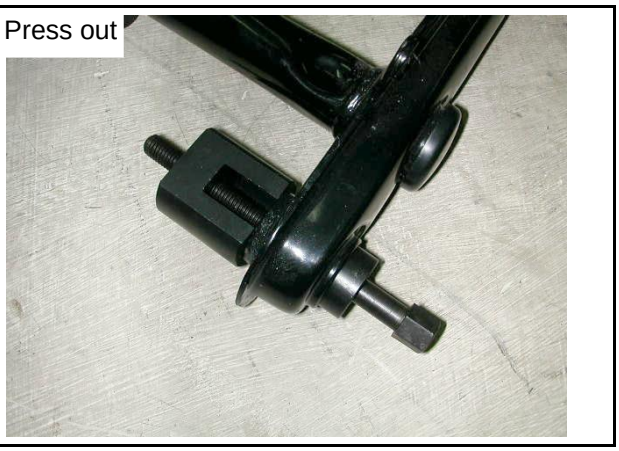


Inspection

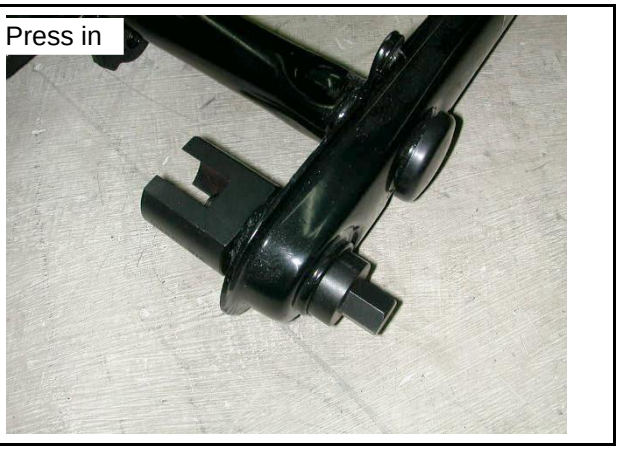
Check the swingarm for wear or damage.

Check the swingarm rubber bush for crack or wear.

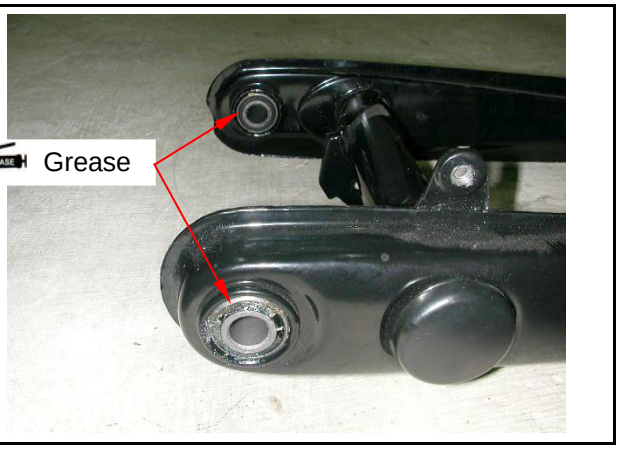
Swingarm rubber bush replacement
Press out the swingarm rubber bush.
Special tool：
Rubber bush puller / driver SYM-1120310



Press in the new swingarm rubber bush.
Special tool：
Rubber bush puller / driver SYM-1120310



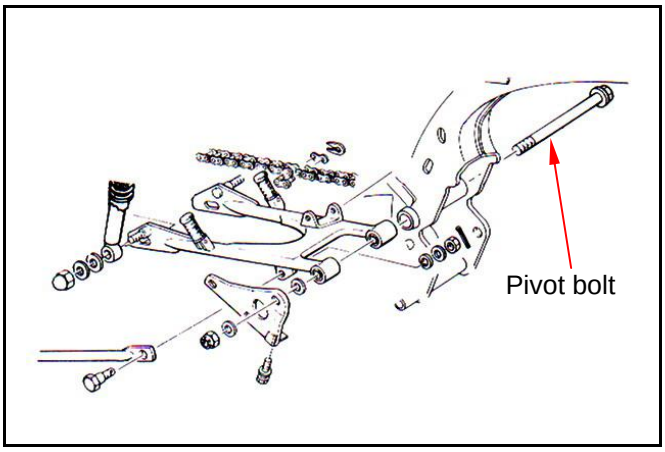
Apply grease to both sides of rubber bush after installation.



Installation
Install in the reverse order of removal.

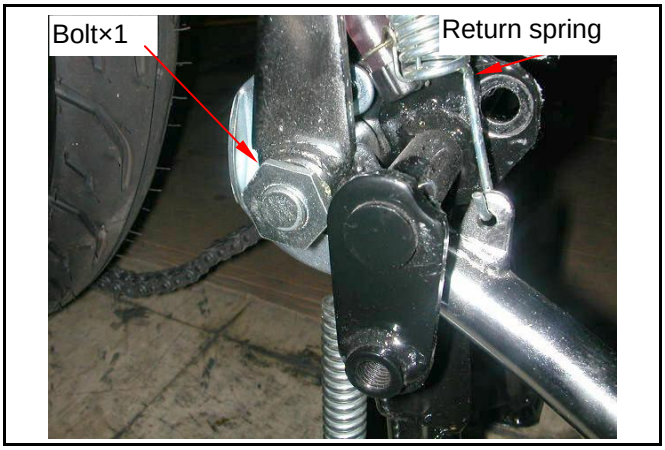
Torque value：

Swingarm pivot bolt	**3.5~5.0kgf-m**
Brake torque link locknut	**1.8~2.5kgf-m**



Rear Brake Pedal

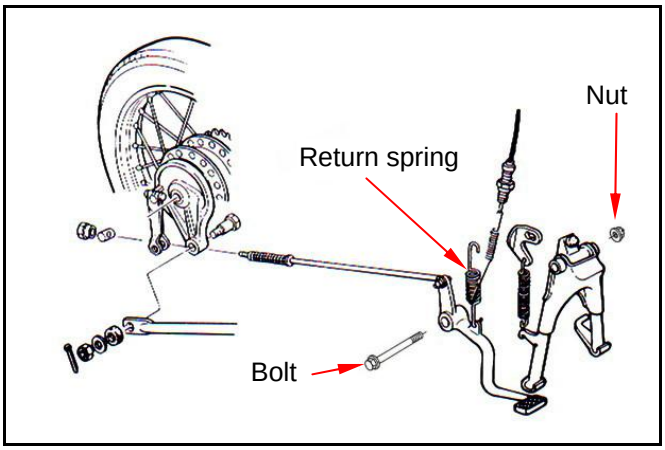
Removal
Remove the swingarm pivot bolt nut.
Remove the step bar and exhaust pipe.
Remove the rear brake adjustment nut and rear brake rod.
Remove the rear brake light switch spring.
Remove the rear brake pedal return spring.



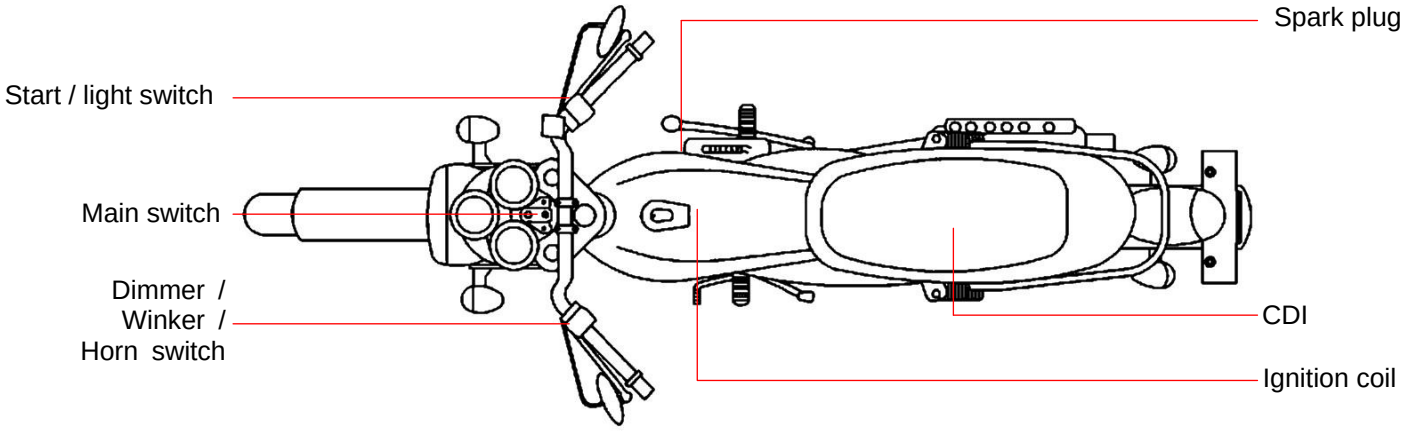
Remove the rear brake pedal and main stand locknuts.
Remove the rear brake pedal.

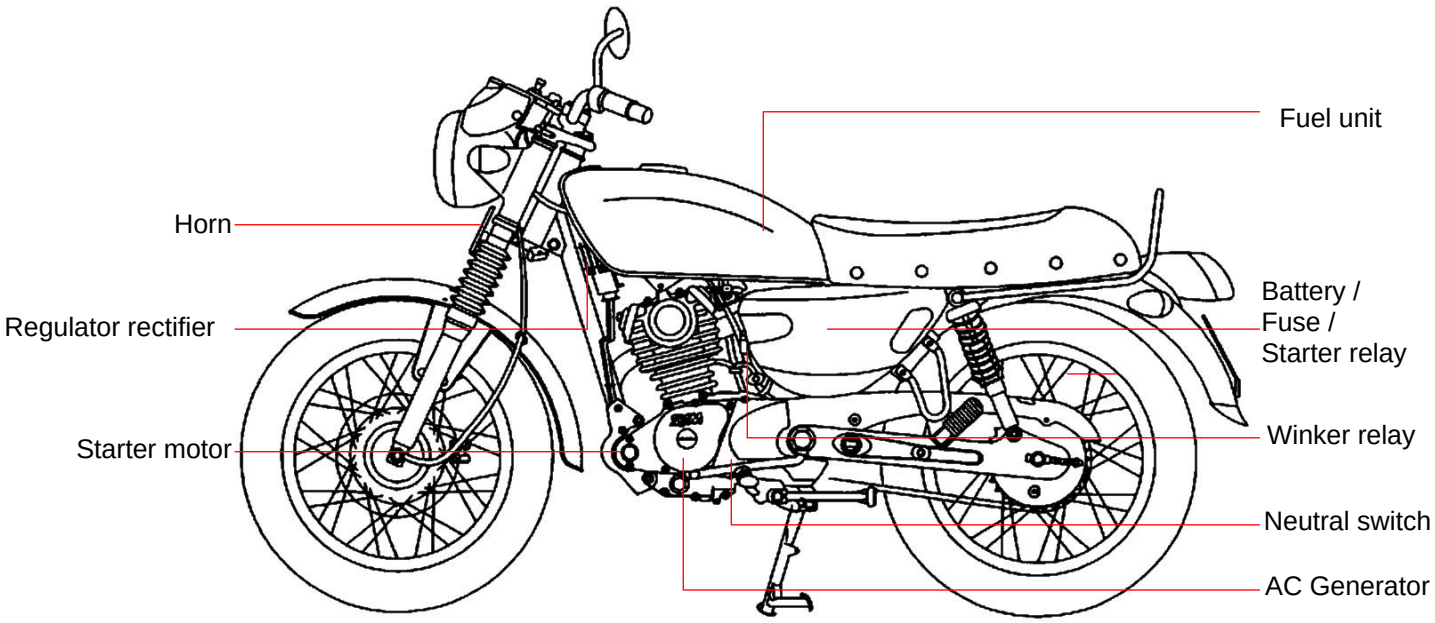
Installation
Install in the reverse order of removal.
Adjust the rear brake pedal free play after installation.

Brake pedal free play：20~30mm



Mechanism Diagram





Precautions in Operation

Charging system

- When removing the battery, the disconnection sequence of cable terminals shall be strictly observed. (First disconnect the negative cable terminal then the positive cable terminal.)
- The electrolyte level should be checked carefully. Add distilled water if electrolyte is not enough.
- Remove the battery from the frame before charging and remove the electrolyte plug from the battery.
- Do not proceed with quick charging except in emergency.
- The voltage meter is required when checking the charging voltage.
- The battery can be recharged. If the battery is not in use after being discharged, it will lead to damage, short life span or lower performance. The performance of the battery may decline after 1-2 years of normal usage. The voltage of the battery with lower capacity will recover after recharging.
- If the battery cells are shorted, the terminal voltage cannot be measured. When the regulator rectifier doesn't function properly, the charging voltage will be too excessive and the battery life span will be shortened.
- The battery will self discharge if the battery is not in use for a long period of time. Recharge the battery two months later when the vehicle is not in use.
- Add electrolyte to the new battery and ten minutes later check if the terminal voltage is over 12.5V or not. Recharge the battery if the terminal voltage is too low. Charging the new battery before using it may lengthen the battery life span.
- Follow the troubleshooting procedure to check the charging system.
- Always turn off the main switch before disconnecting any electrical components or the regulator rectifier will be damaged due to excessively high voltage.
- Follow the removal procedure to remove the AC Generator and pulse coil.

Ignition system

- Follow the troubleshooting procedure to check the ignition system.
- The ignition timing does not need to be adjusted since the C.D.I. is factory present. Check the C.D.I and AC Generator if the ignition timing is not correct. Check the ignition timing with ignition timing light after replacement.
- The drooping or impact of C.D.I. set may lead to malfunction. Pay attention during removal.
- Most of the malfunctions result from poor contact of terminal, coupler and switch. Check for any poor contact before proceeding with repair or maintenance.
- Improper spark plug will cause abnormal operation or severe damage of engine. Besides, pay attention to the spark plug tightening torque.

Starting system

- Follow the troubleshooting procedure to check the starting system.
- The removal of the starter motor can be preceded when the engine is still on the vehicle.
- Refer to chapter 5 to remove the starter clutch.

Technical Specification

Charging system

Item			Specification
Battery	Capacity / Type		12V7Ah / 12N7A
	Charging rate		0.7A / 5~10hr (standard) 3A / 1hr (quick)
	Specific gravity of electrolyte (20ºC)		1.260~1.280
	Fully charged	Voltage (20ºC)	13.0~13.2V
	Need to be charged		12.3V
AC Generator	Characteristic		14V / 7A
	Coil resistance (20ºC)		0.722Ω±20% (yellow - pink)
Leak current			1mA below
RPM to start charging			2100 rpm
Control voltage in charging			14.5±0.5V
Fuse			15A

Ignition system

Item		Specification
Spark plug	Type (recommended)	NGK D7EA
		NGK DR8EA
	Clearance	0.6~0.7 mm
Ignition coil resistance	Primary winding	0.6Ω±15%
	Secondary winding (without cap)	4.2 KΩ±15%
Ignition timing	〝F〞 mark	BTDC 10° / 1500rpm
	Advance (BTDC)	34° / 4000rpm
		34° / 8000rpm
Pulse coil resistance (20ºC)		105Ω±20% (blue / white – green / white)
Exciter coil resistance (20ºC)		420Ω±20%(black / red – ground)
Exciter coil voltage		95~400V
Pulse coil voltage		1.7 V

Starting system

Item		Specification
Starter motor	Model	DC
	Characteristic	0.35 KW

Troubleshooting

Charging system

No battery voltage
- Battery discharged
- The cable disconnected
- The fuse is blown
- Improper operation of the main switch

Low battery voltage
- The battery is not fully charged
- Poor contact
- Poor charging system
- Poor regulator rectifier

Intermittent power supply
- Loose charging system coupler
- Poor contact of the battery cable

Poor charging system
- Burned fuse
- Poor contact, open or short circuit
- Poor regulator rectifier
- Poor ACG

Ignition system

No spark
- Poor spark plug
- The cable is poorly connected, open or short-circuited
  ~between AC. Generator / C.D.I.
  ~between C.D.I. / ignition coil
  ~between C.D.I. / main switch
- Poor main switch
- Poor C.D.I.
- Poor AC. Generator

Engine does not crank smoothly
- Primary winding circuit
  ~Poor ignition coil
  ~Poor contact of cable
  ~Poor contact of main switch
- Secondary winding circuit
  ~Poor ignition coil
  ~Poor spark plug
  ~Poor ignition coil cable
  ~Current leakage from spark plug cap
- Incorrect ignition timing
  ~Poor AC. Generator
  ~Improper installation of pulse coil
  ~Poor C.D.I.

Starting system

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

Weak starter motor
- Poor charging system
- Insufficient battery voltage
- Poor contact of power cable
- The starter motor gear is stuck by foreign material

Starter motor works but engine does not crank
- Poor starter motor pinion
- The starter motor run in reverse direction
- Poor starter clutch

Poor battery

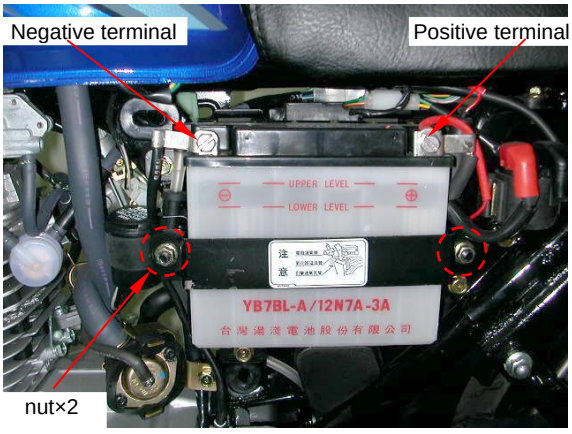
Charging System

Battery

Removal

Remove the left side cover.

Disconnect the negative terminal wire first and then the positive terminal.
Remove the battery fixing bracket (2 nuts).
Remove the battery.
Install in the reverse order of removal.



Caution

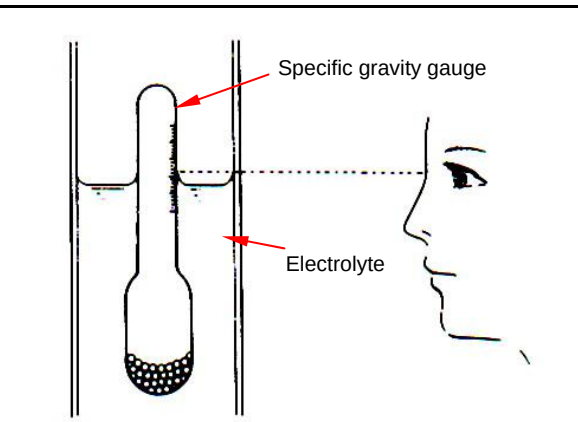
- To prevent short circuit, the positive terminal wire should be connected before the negative terminal being connected.

Specific gravity of electrolyte inspection

Measure the specific gravity of electrolyte with the specific gravity gauge.

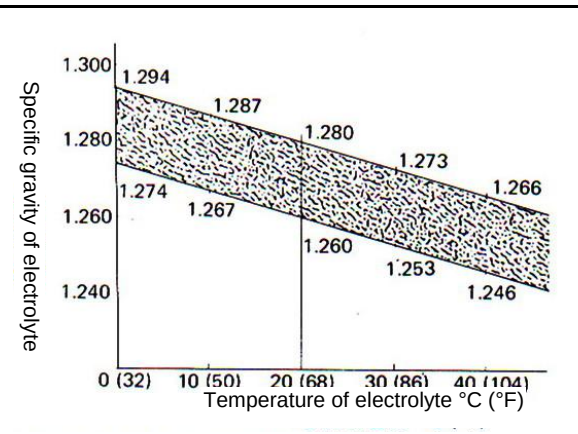
Specific gravity specification (20°C)：

1.260~1.280 Fully charged
1.220 以下 Insufficiently charged



Caution

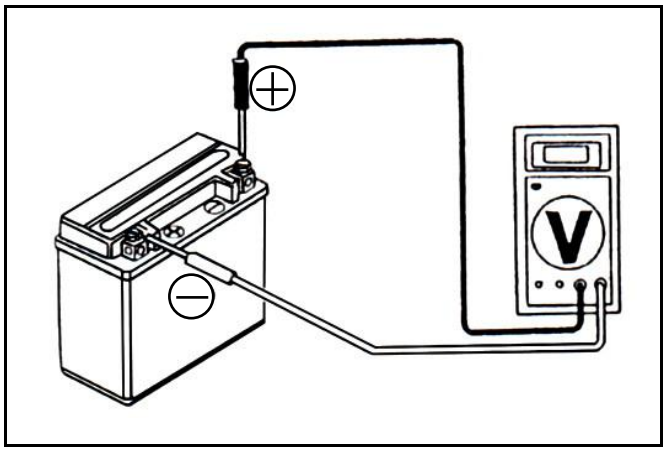
- Recharge the battery when the specific gravity of electrolyte is below 1.23.
- The specific gravity of electrolyte changes when the temperature changes, as shown on the right chart.
- Replace the battery with new one when the formation or deposit of lead sulfate happens.



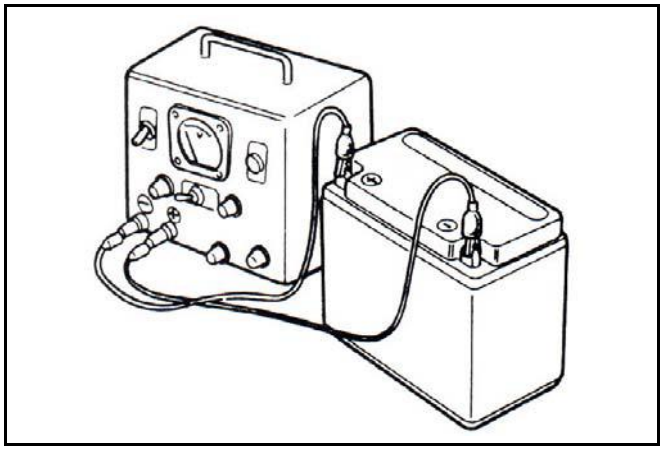
Warning

- The battery contains sulfuric acid. Avoid contact with skin, eyes or clothing.
  Antidote :
  1. external: flush with water
  2. internal: drink large amount of water or milk, and call for medical care
  3. Stay away from fire and keep good ventilation.

Battery voltage inspection
Use the digital voltmeter or multi meter to measure the battery voltage.
Voltage
Fully charged：13.0~13.2V (20°C)
Insufficiently charged：Below 12.3V (20°C)



Charging
Remove the battery cell caps.
Connect the charger positive (+) cable to the battery positive (+) terminal.
Connect the charger negative (-) cable to the battery negative (-) terminal.



⚠ Warning

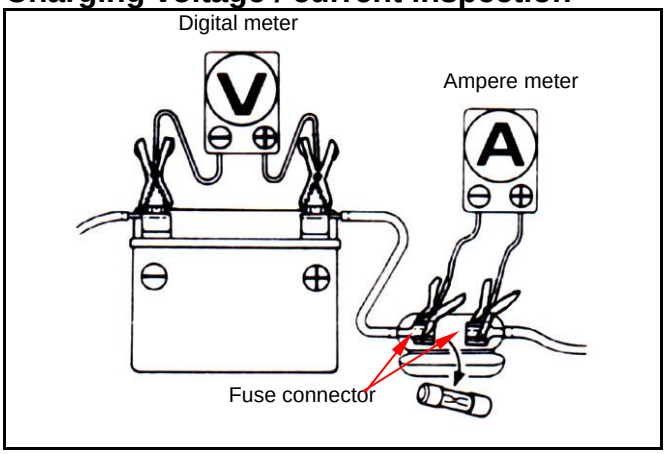
- Avoid any fire near the battery during charging.
- Before or after charging, always turn off the charging machine to avoid explosion caused by sparks.
- Follow the regulated charging current and time shown on the battery.

⚠ Caution

- Do not charge the battery quickly except for emergency situation.
- Confirm the charging current and time before charging the battery.
- Excessive charging current or time will damage the battery.
- After charging the battery, wait for 30 minutes and then measure the battery voltage.

After installing the battery, coat the terminal with grease to avoid oxidation.

Charging voltage / current inspection



Caution

- Make sure the battery being charged already before carry out inspection.
- While starting the engine, the starter motor draws large amount of current from the battery.
- Use a fully charged battery having a voltage larger than 13.0 V

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

Caution

- Use a ampere meter having an indication that the current flows from the positive or the negative direction. The measurement should be at zero if the ampere meter is one direction only.

Caution

- Do not use a short-circuit cable.
- While the starter motor is activated, the surge current the motor may damage the ammeter. Use the kick starter to start the engine.
- The main switch shall be turned to OFF position during the process of inspection. Never tamper with the ampere meter and the cable while there is current flowing through. It may damage the ampere meter.

Connect a tachometer.
Turn on the headlight to high beam and start the engine.
Accelerate the engine to the specified revolution per minute and measure the charging voltage.

Charging current :

(headlight off) >0.7A / 2500rpm
>1.2A / 6000rpm
(headlight on) >0.4A / 2500rpm
>1.0A / 6000rpm

Charging controlled voltage
14.5±0.5V / 2100rpm

Caution

- Check if the charging current / voltage is normal or not after replacing new battery.

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.

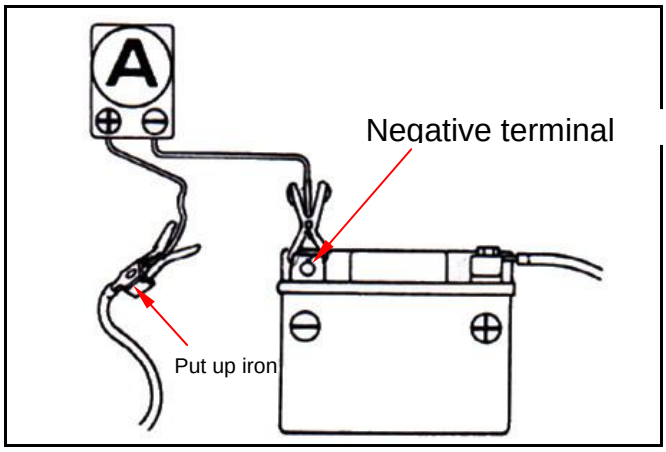
The following problems are not related to the charging system; correct it if any by following steps indicate in the checking list.

(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.

Current leakage inspection
Turn off the main switch.
Disconnect the negative terminal wire from the battery.
Connect ammeter between battery negative terminal and negative terminal wire (as shown at picture).



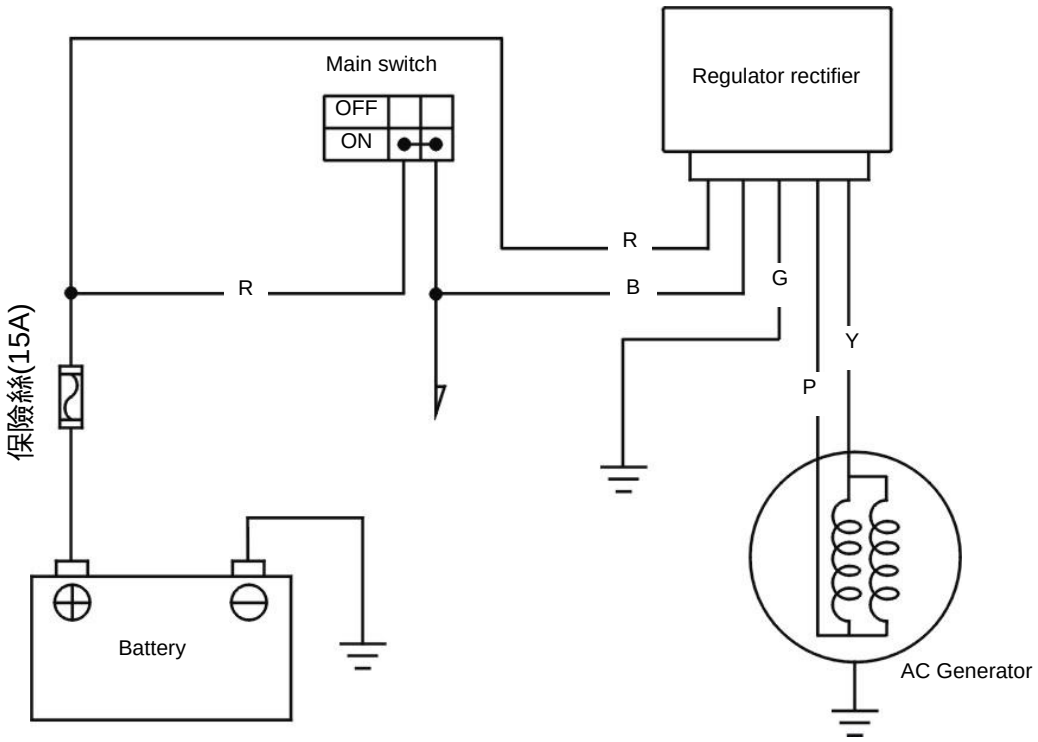
⚠ Caution

- In the current leakage test, set the current range at the largest 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 on the main switch when testing the current leakage.

If the current leakage is over the standard value, it shows that short circuit happens.
Current leakage：below 1mA

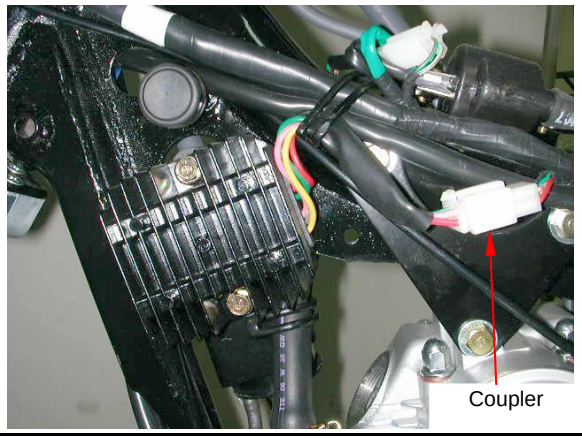
If the leaked current exceeds the specified value, it may indicate a short circuit.

Charging circuit



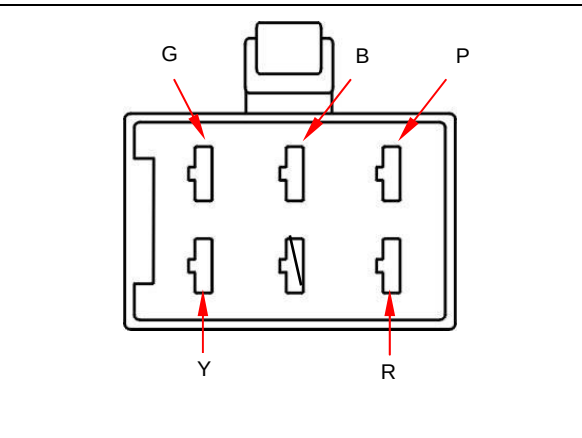
Regulator rectifier inspection

Remove the seat and fuel tank.
Disconnect the regulator rectifier 6 pin coupler and inspect the wire circuit.



Wire harness circuit inspection

Item (wire color)	Judgment
Battery (red) / frame grounding	Battery voltage
Earth (green) / frame grounding	Close circuit
Main switch (black) / frame grounding (Key ON)	Battery voltage
Charge coil (yellow) / (pink)	Close circuit with resistance



If the readings measured are not normal, check parts in the circuit.
If the parts are normal, then trouble is in the wiring.
If there is nothing wrong with parts and wiring, replace the regulator rectifier.

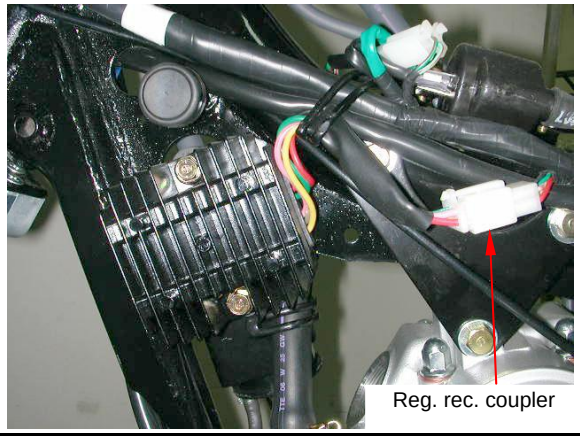
Regulator rectifier inspection

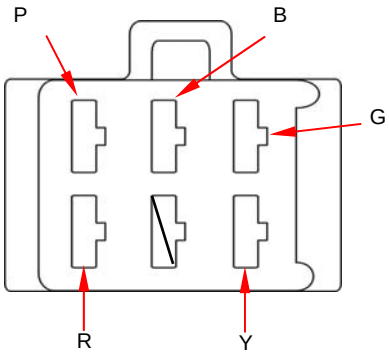
(+) / (-)	Black	Green	Yellow	Red	Pink
Black		29.3 KΩ	1.3 MΩ	2.1 MΩ	1.2 MΩ
Green	29.3KΩ		1.3 MΩ	2 MΩ	1.2 MΩ
Yellow	15.5MΩ	15.5 MΩ		1.2 MΩ	15.3 MΩ
Red	18.9 MΩ	18.9 MΩ	16.8 MΩ		18.4 MΩ
pink	10.5 MΩ	10 .5MΩ	10 MΩ	1.3 MΩ	

Replace the regulator rectifier if the resistance value is abnormal.

⚠ Caution

- Human body has resistor. Do not touch the multi meter probe metal or the measured value would be affected.



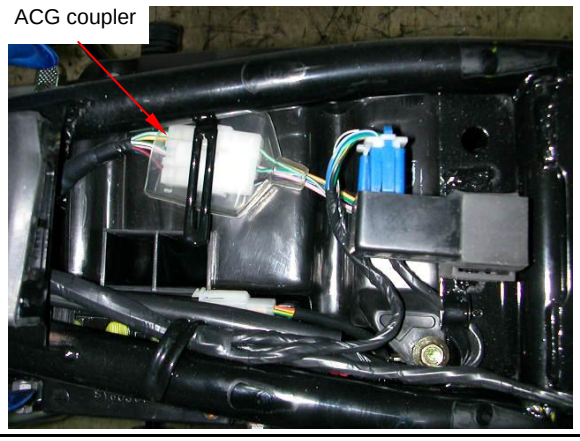


AC Generator coil inspection

⚠ Caution

- The inspection of AC Generator charge coil / lamp coil can be proceeded on the engine.

Measure the resistor value between AC. Generator wiring.
Disconnect AC Generator 6 pin coupler.



The following wire should be closed circuit.

Standard value :

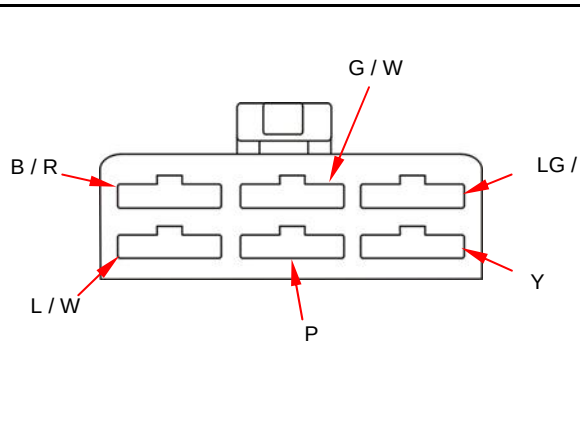
Yellow - pink **0.9Ω±10%**

Black / red - ground **420Ω±10%**

Green / white – blue / white 105Ω±10%

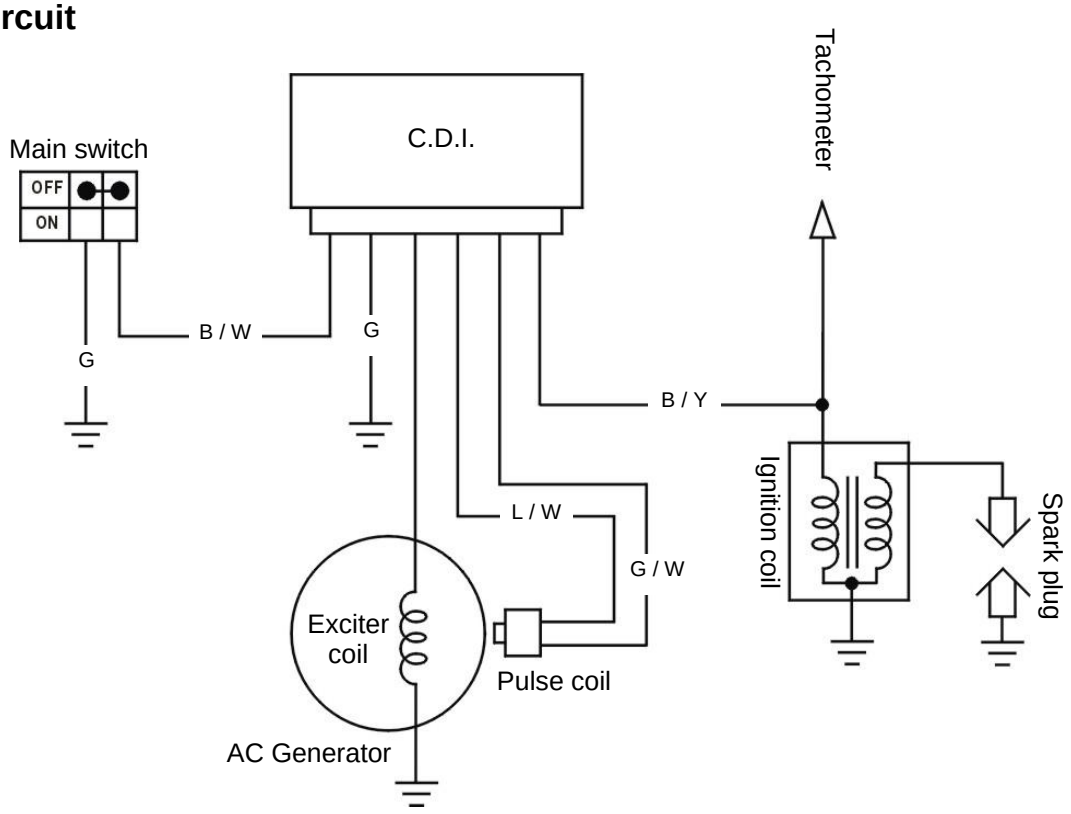
Light green / red (neutral switch)

Replace the AC. Generator coil if the measured value is over the standard value.



Ignition System

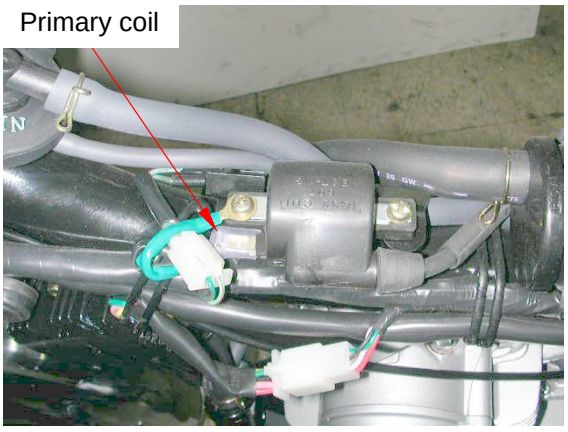
Ignition circuit



Ignition coil inspection

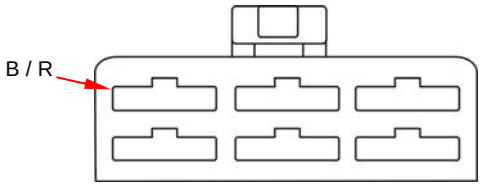
Remove the seat and fuel tank.
Measure the resistance between the terminals of the primary winding.
Standard value：0.6Ω±15% (20ºC)

Remove the cap from the spark plug and measure the resistance between terminals of secondary winding.
Standard value：
4.2KΩ±15% (without cap 20ºC)
8.7KΩ±15% (with cap 20ºC)



Exciter coil inspection

Disconnect the AC. Generator 6 pin coupler.
Measure the resistance between the terminal Black / Red and terminal Green.
Standard value：420Ω±10%

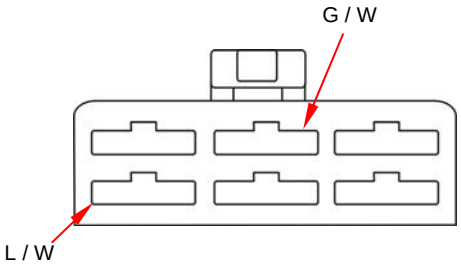


⚠ Caution

- Coil does not need to be removed from the engine before inspection.

Pulse coil inspection

Disconnect the AC. Generator 6 pin coupler.
Measure the resistance between the terminal blue / white and terminal green / white.
Standard value：105Ω±10%



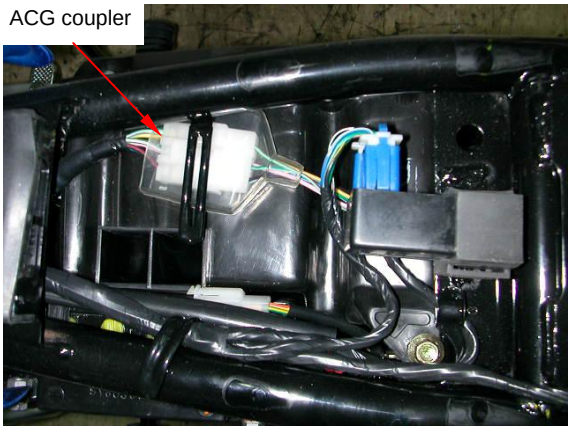
⚠ Caution

- Coil does not need to be removed from the engine before inspection.

C.D.I.

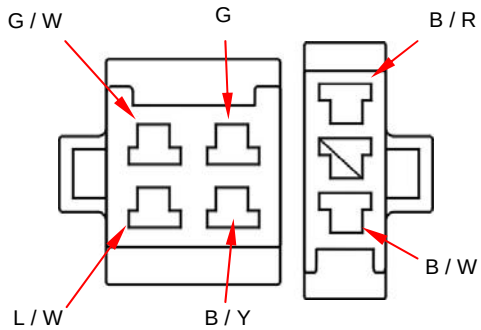
Removal

Remove the seat.
Remove the CDI.



Inspection

Disconnect C.D.I. coupler.
Check the following wire coupler.

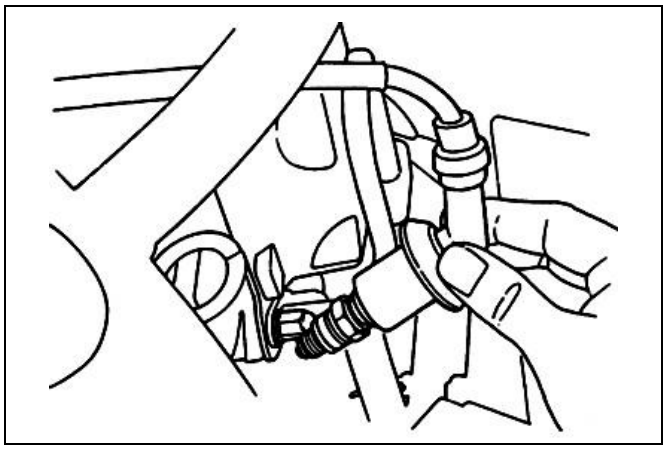


Item		Check point	Standard value (20°C)
Main switch		B / W – G	Closed circuit
Exciter coil		B / Y – G	420Ω±20%
Pulse coil		L / W – G / W	105Ω±20%
Ignition coil	Primary winding	B / Y – G	0.6Ω±15%
	Secondary winding	G – ignition coil (without cap)	4.2 KΩ±15%
		G – ignition coil (with cap)	8.7 KΩ±15%

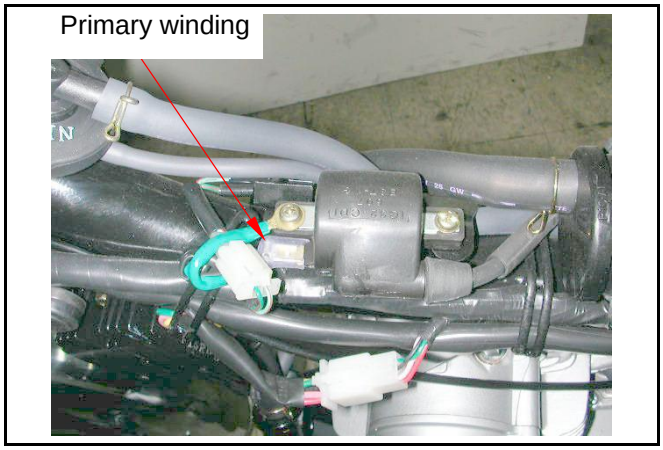
Spark plug inspection
Check the sparking condition.
If the sparking condition is not proper or the spark plug electrode is contaminated, replace it with new one.

Caution

- Be extremely careful to carry out the sparking condition inspection.



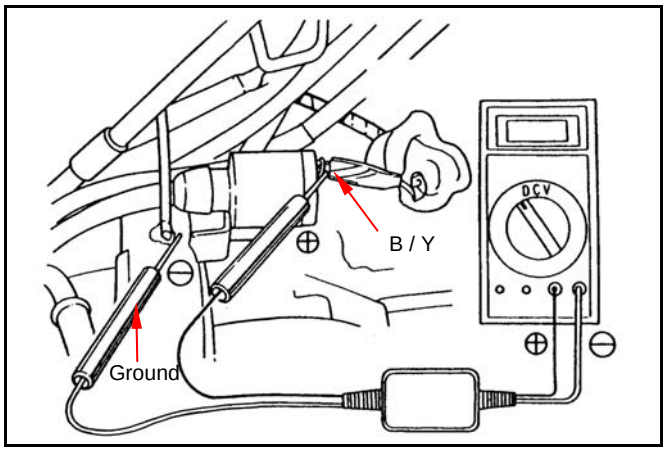
Ignition coil removal
Remove the seat and fuel tank.
Remove the spark plug cap.
Disconnect the ignition coil wire (black/yellow).
Remove the ignition coil (screw x 2).
Install in the reverse order of removal.



Use a multi meter with input resistor over 10MΩ 10CV.
Connect the terminals of primary winding, positive cable to Black / Yellow, negative cable to earth.
Minimum voltage：95~400V

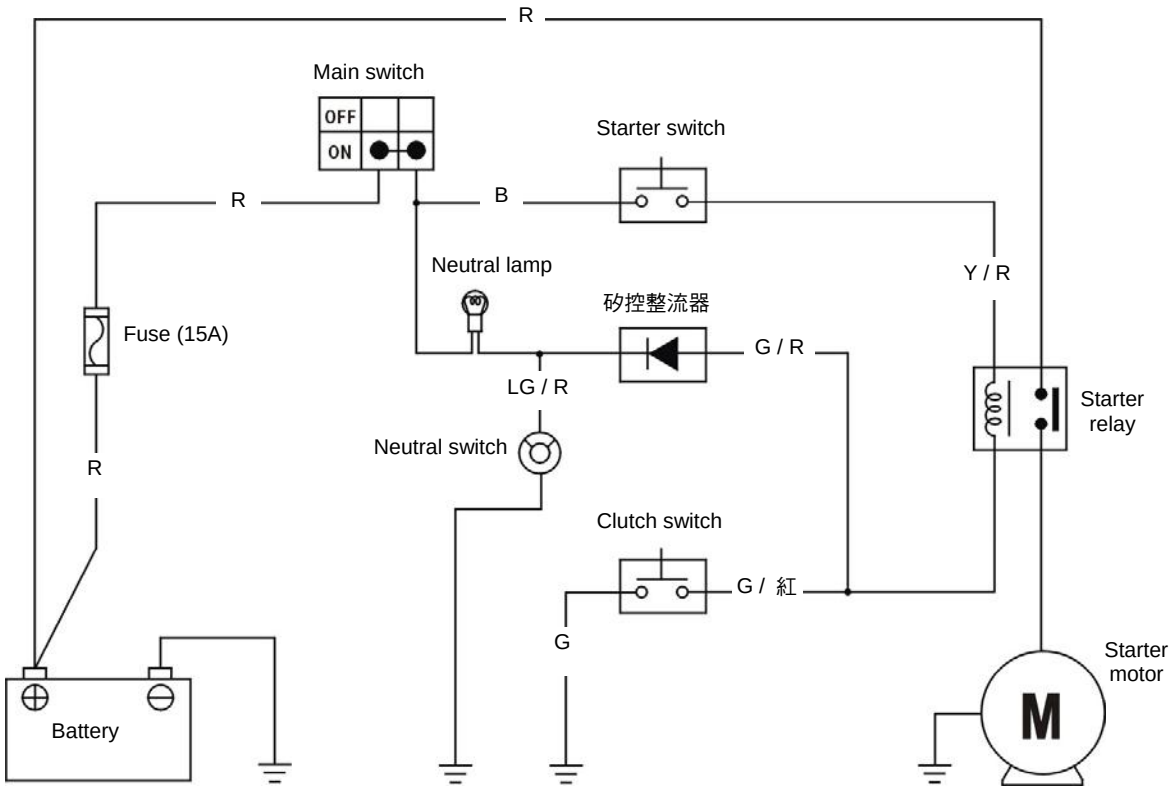
Caution

- Do not touch the probe metal during inspection, or electric shock may happen.



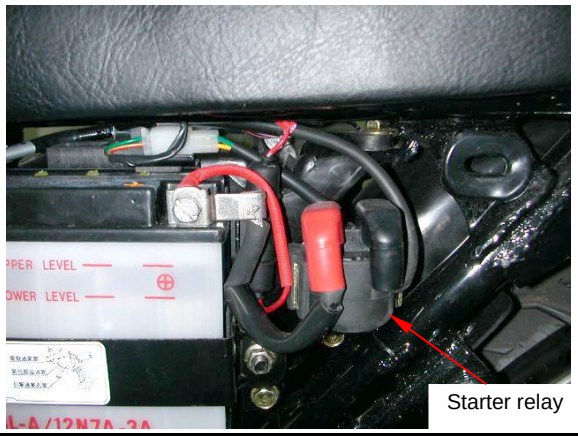
Starting System

Starting circuit

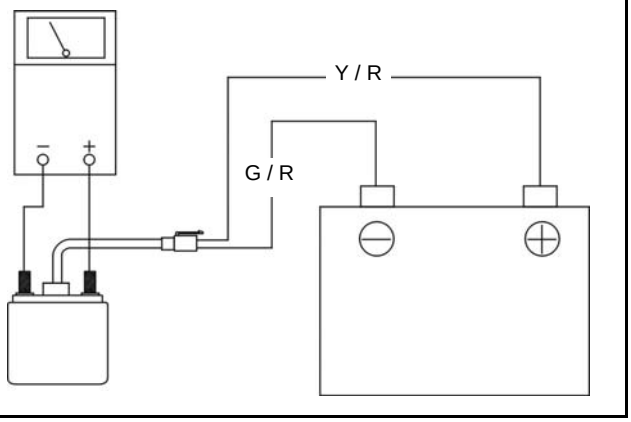


Starter relay inspection

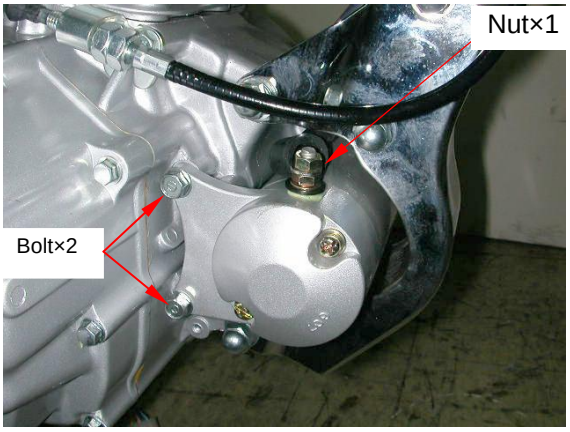
Turn the main switch.
Pull the brake lever and press the starter switch.
If a sound of “Looh Looh” is heard, it indicates the relay function normally.



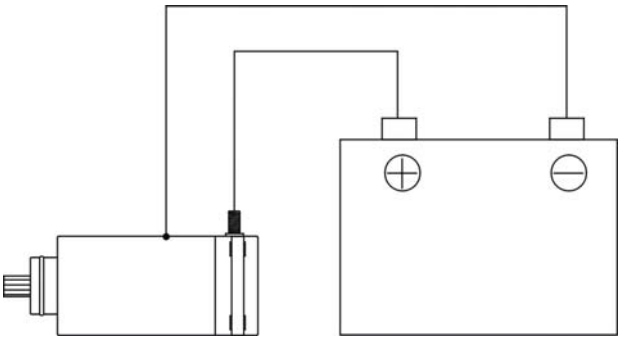
Remove the left side cover.
Disconnect the negative terminal wire.
Disconnect the starter relay coupler.
Connect an ohmmeter to the starter relay terminal.
Connect the yellow / red wire to the battery positive terminal and the green / yellow wire to the battery negative terminal.
Check the continuity of the starter relay terminal.
If there is no continuity, replace the relay.



Starter motor removal
Disconnect the starter motor wire coupler.
Remove the starter motor lock bolts.
Remove the starter motor.



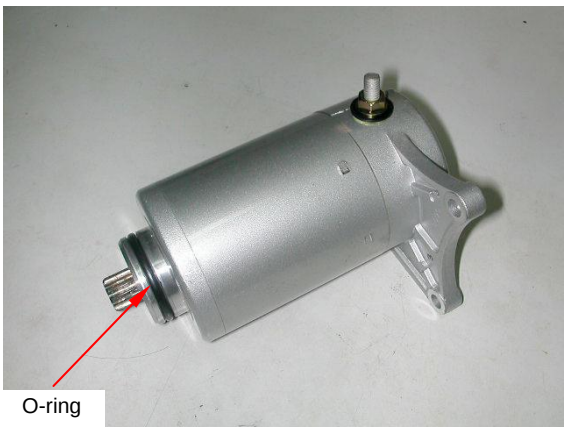
Starter motor inspection
Connect the battery positive terminal and starter motor power terminal.
Put up iron between the battery negative terminal and starter motor case.
Check the starter motor rotating condition.
Replace the starter motor if the rotating speed is too slow.



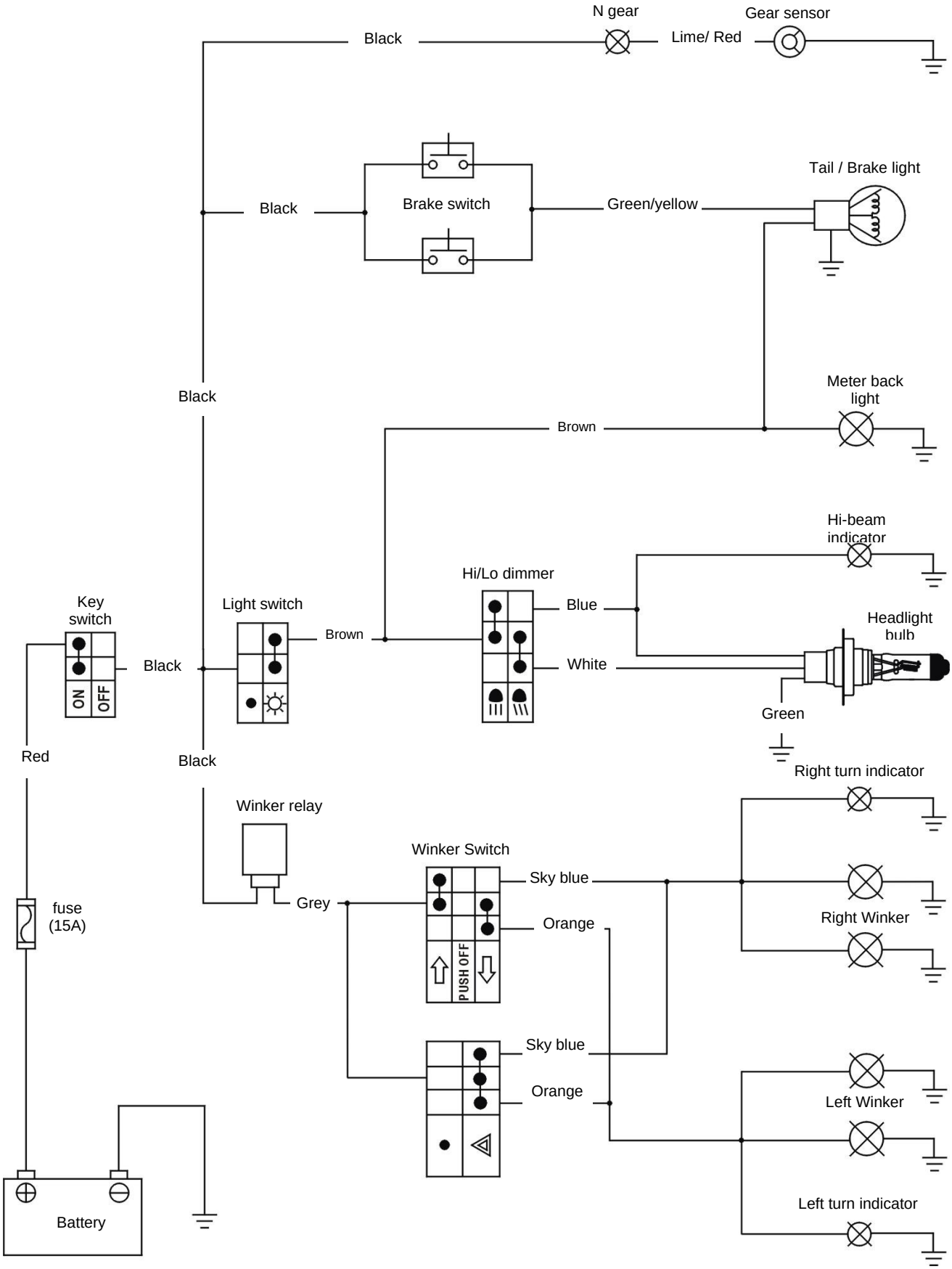
Starter motor installation
Install in the reverse order of removal.

⚠ Caution

- Make sure the O ring is ok and coat it with motor oil before installation.

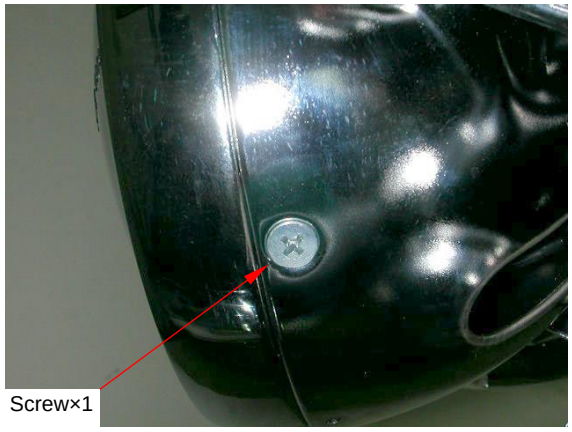


Light System

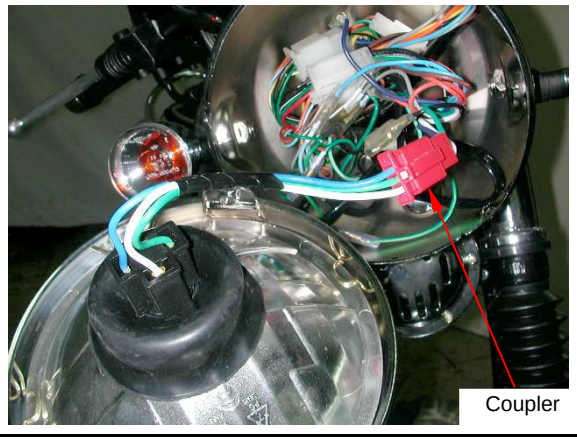


Headlight bulb replacement

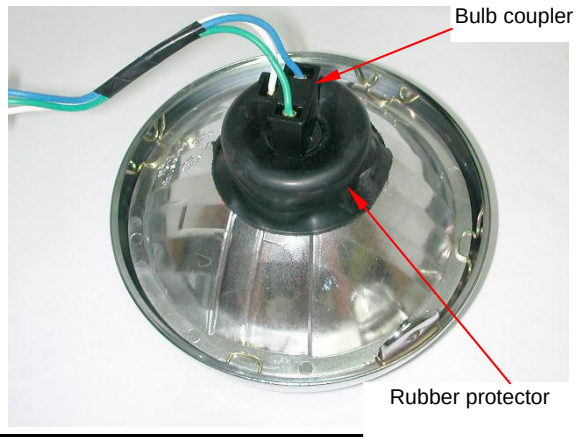
Remove the headlight assembly fixing screw.



Pull out the headlight assembly.
Disconnect the headlight coupler and remove the headlight assembly.

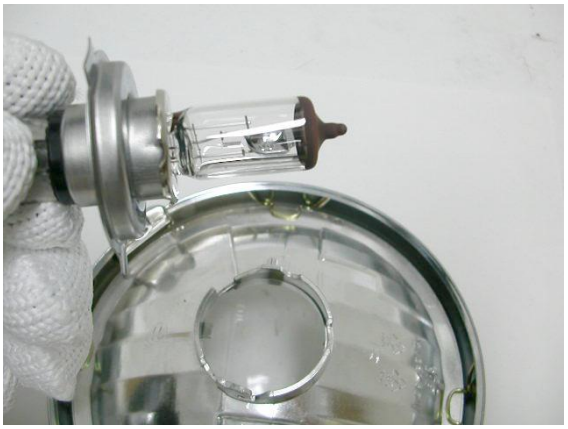


Disconnect headlight bulb coupler.
Remove the rubber protector.

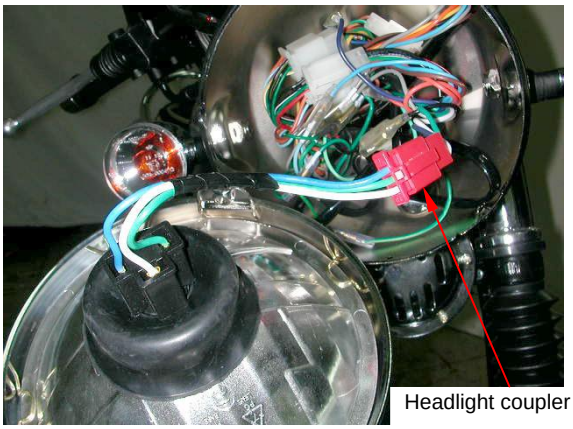


Remove the bulb.

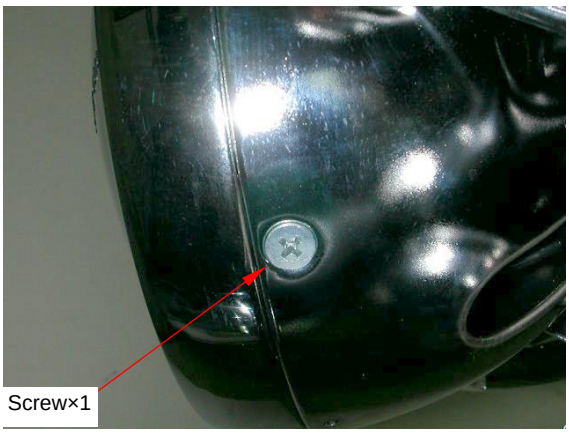
Replace the headlight bulb if necessary.
Specification :
Headlight bulb 12V 35W/35W



Headlight installation
Install in the reverse order of removal.
Connect the headlight coupler.



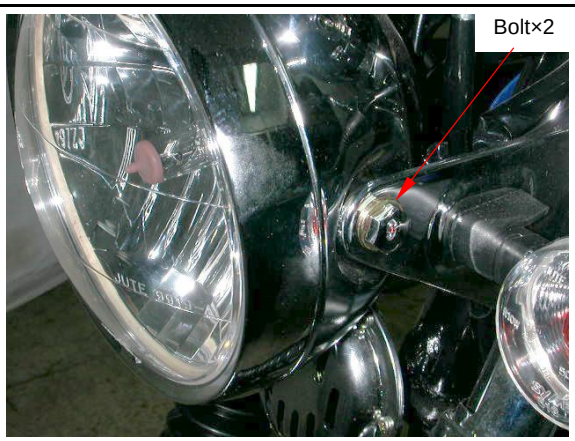
Alight the headlight set with the headlight lens.
Tighten the lock screw.
Make sure the headlight work properly.
Adjust the headlight beam.



Headlight beam adjustment
Loosen the headlight lock bolt and move the headlight up and down to adjust headlight beam.
Tighten the lock bolt after adjustment.

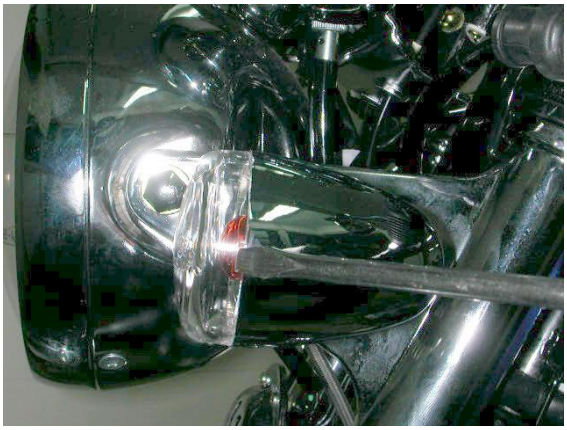
⚠ Caution

- Do not adjust the headlight beam except for necessity.
- Improper headlight beam adjustment dazzles the coming driver / rider or results in insufficient illumination.



Winker bulb replacement

Remove the winker lens.



Press the winker bulb slightly and rotate it clockwise.
Remove the winker bulb.

Replace the winker bulb if it is burned out.

Specification：

Winker bulb **12V 10W**

Installation

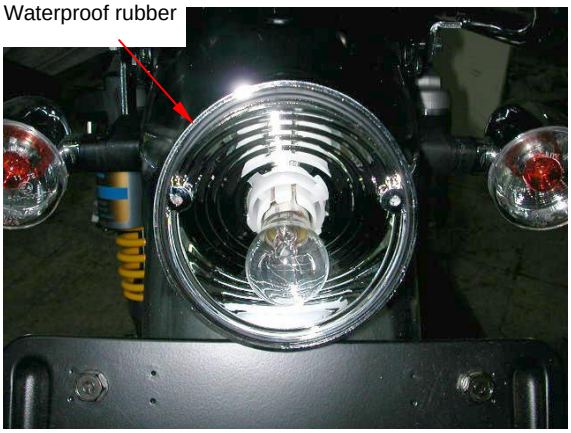
Install in the reverse order of removal.

Taillight / brake light
Bulb replacement
Remove the taillight lens screw.

Caution

- Make sure taillight lens and case properly sealed up during assembly.

Remove the lens.

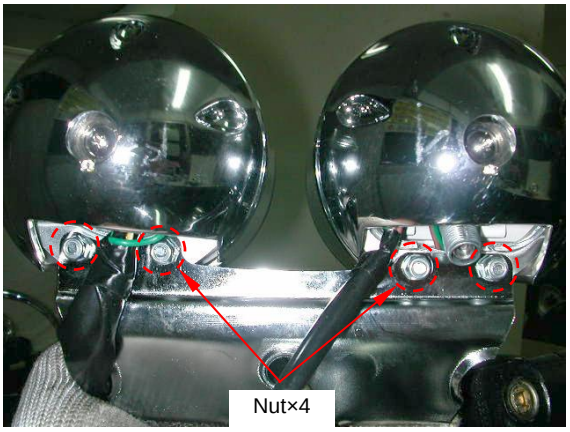


Press the bulb slightly and rotate it counterclockwise to remove it.
Specification :
Taillight / brake light 12V 5W/18W

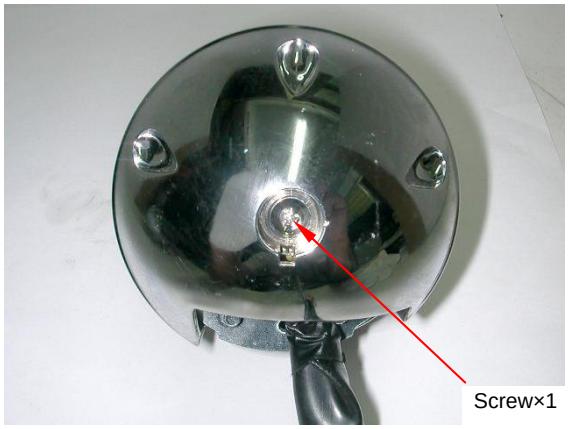
Installation
Install in the reverse order of removal.

Meter bulb replacement

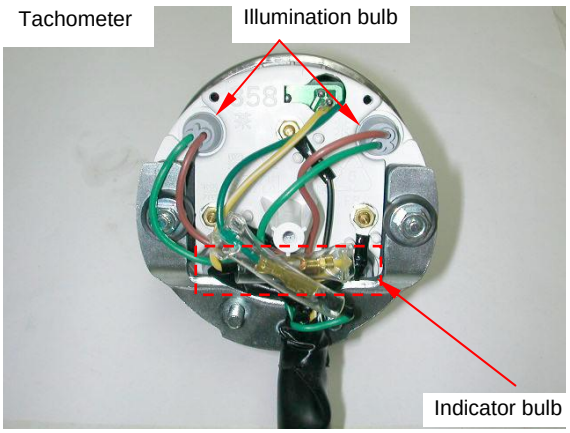
Remove the main switch and meter assembly.



Remove the meter cover.



Pull out the indicator bulb with bulb seat.
Replace the indicator bulb if it is burned out.

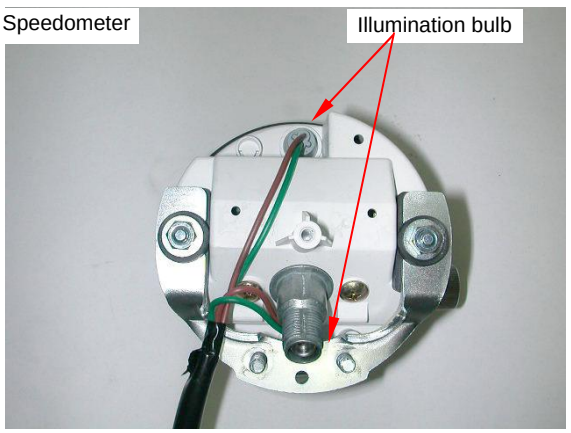


Specification :

Winker indicator bulb	**12V 1.7W**
High beam indicator bulb	**12V 1.7W**
Neutral indicator bulb	**12V 1.7W**
Meter illumination bulb	**12V 1.7W**
Fuel indicator bulb	**12V 1.7W**

Installation

Install in the reverse order of removal.

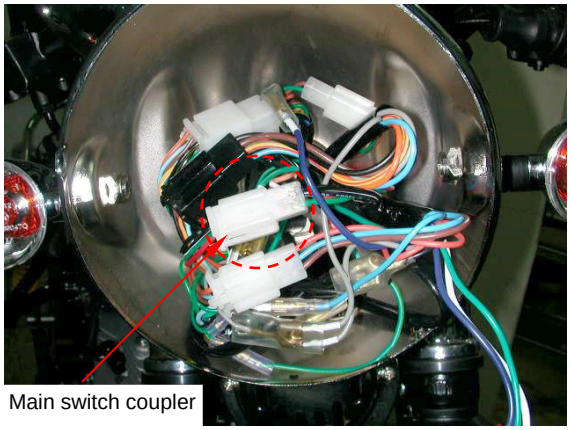


Switch / Horn

Main switch

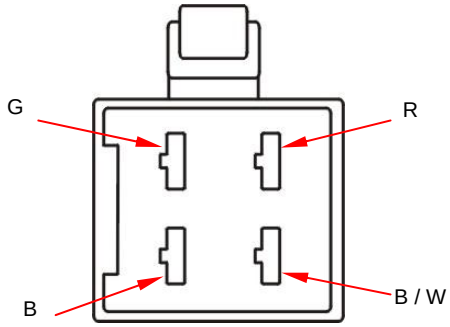
Inspection

Remove the headlight assembly.
Disconnect the main switch coupler.


Main switch coupler

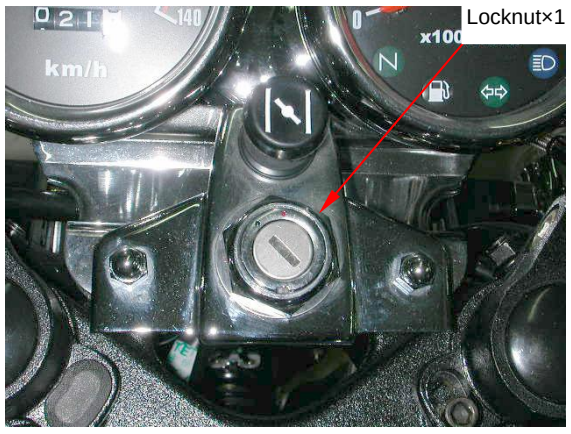
Check the following coupler circuit.

	BAT1	BAT2	IG	E
OFF			●	●
ON	●	●		
Color	Red	Black	B / W	Green



Replacement

Remove the headlight assembly.
Disconnect the main switch wire coupler.
Remove the main switch locknut.
Remove the main switch.



Installation

Install in the reverse order of removal.

Handlebar switch
Remove the headlight.
Remove the right handlebar switch coupler.

Check the following switch circuit.

Light switch

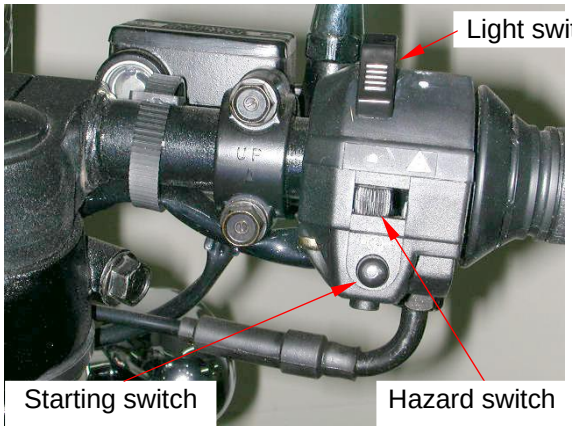
	BAT2	TL
●		
☼	●	●
Color	**Black**	**Brown**

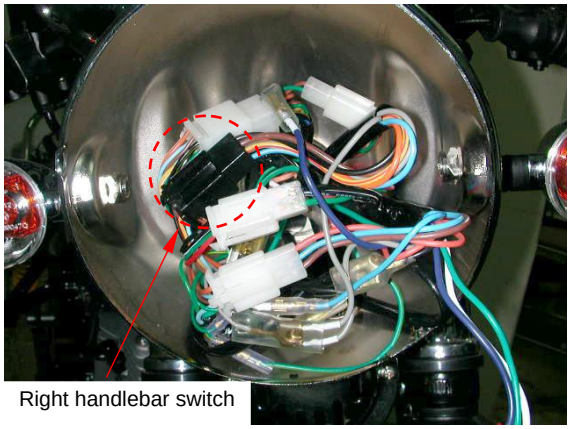
Hazard switch

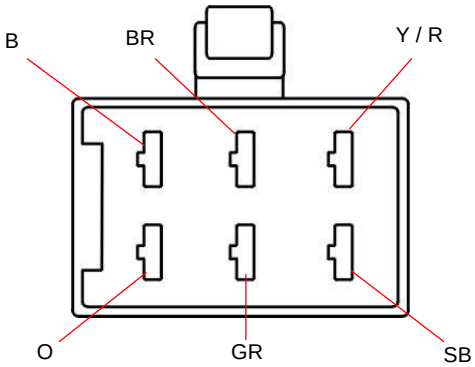
	W	L	R
●			
△	●	●	●
Color	**Gray**	**Orange**	**Sky blue**

Starting switch

	BAT2	ST
FREE		
⚡	●	●
Color	**Black**	**Yellow / red**





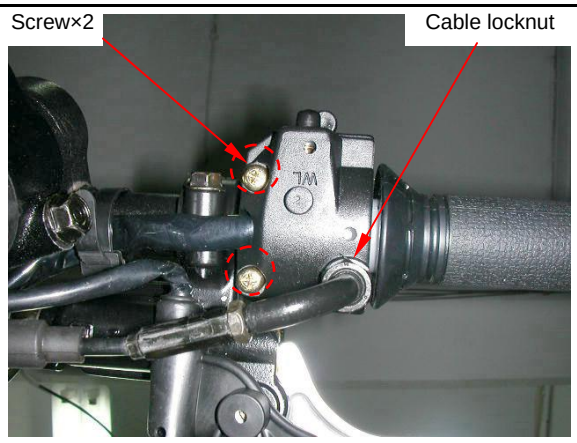


Removal

Loosen the throttle cable locknut and remove the right handlebar screws.
Remove the throttle cable.
Remove the throttle grip and right handlebar switch.

Installation

Install in the reverse order of removal.
Check if switch operation is normal after installation.



Left / right handlebar switch
Remove the headlight assembly.
Disconnect the left / right handlebar switch wire coupler.

Check the following coupler circuit.

High / low beam switch

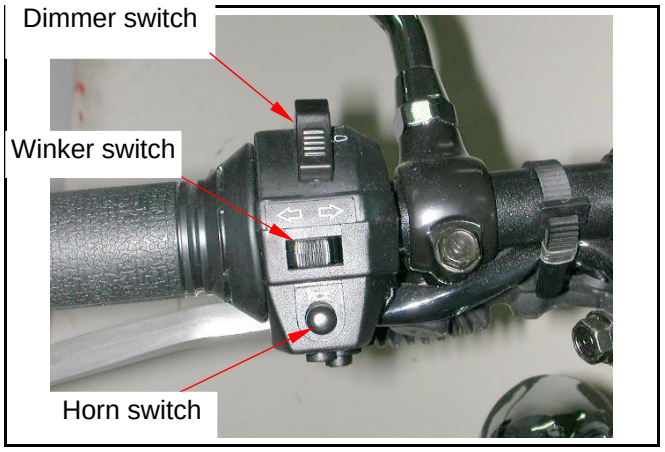
	TL	LO	HI
	●	●	
	●		●
Color	**Brown**	**White**	**Blue**

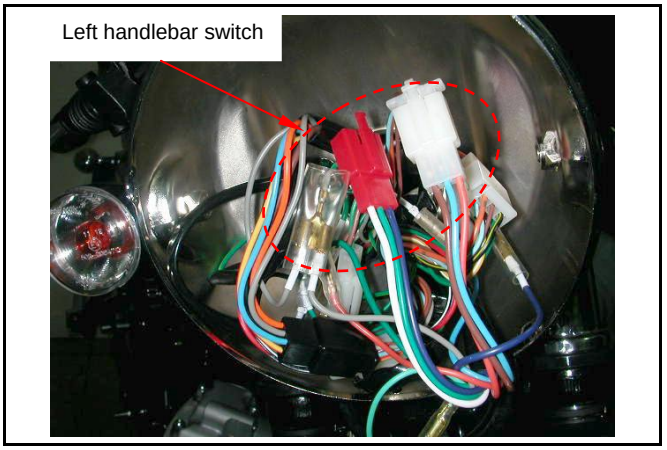
Winker switch

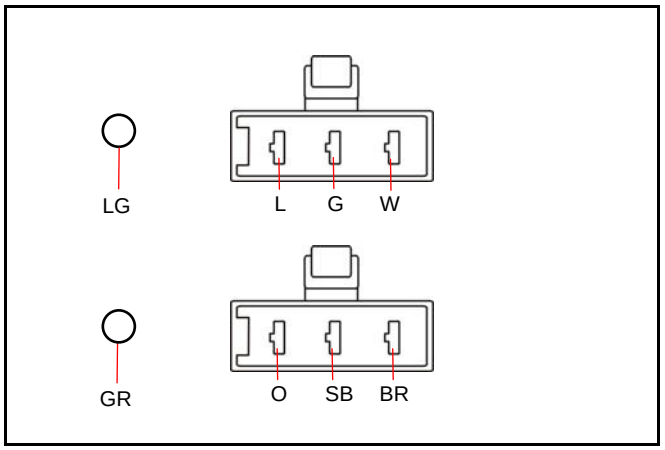
	L	W	R
⇨		●	●
⇦	●	●	
Color	**Orange**	**Gray**	**Sky blue**

Horn switch

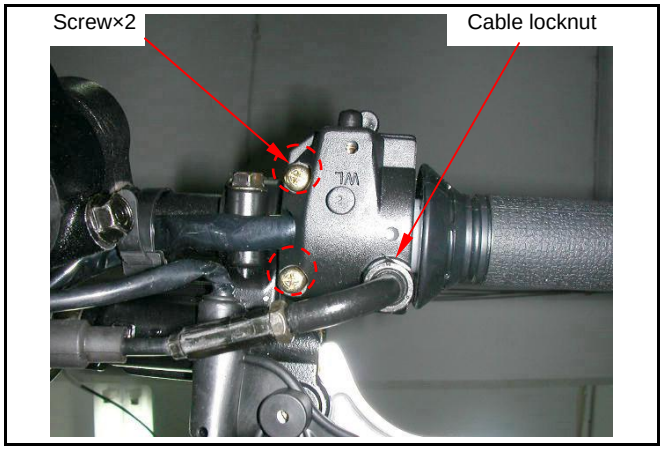
	HO	E
FREE		
	●	●
Color	**Light green**	**Green**





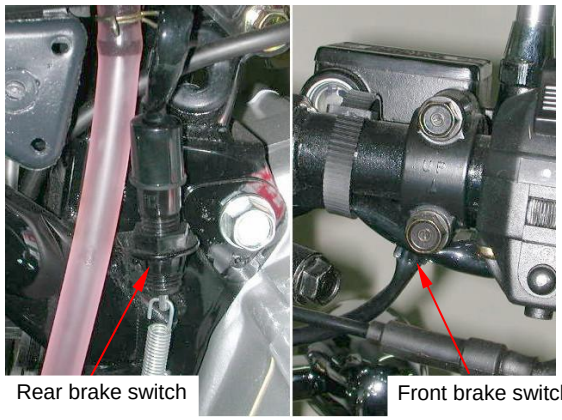


Removal
Remove the left handlebar switch (screw x 2).

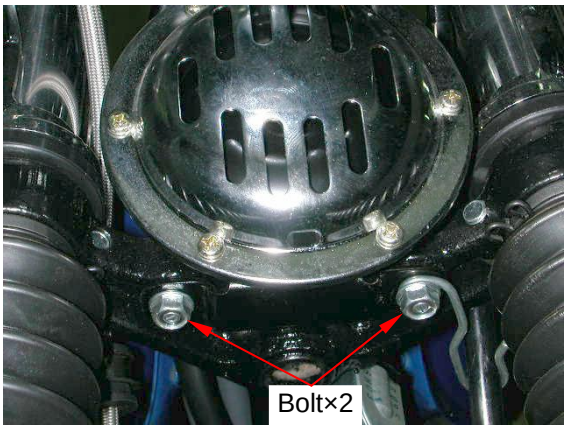


Installation
Install in the reverse order of removal.
Check if switch operation normal after installation.

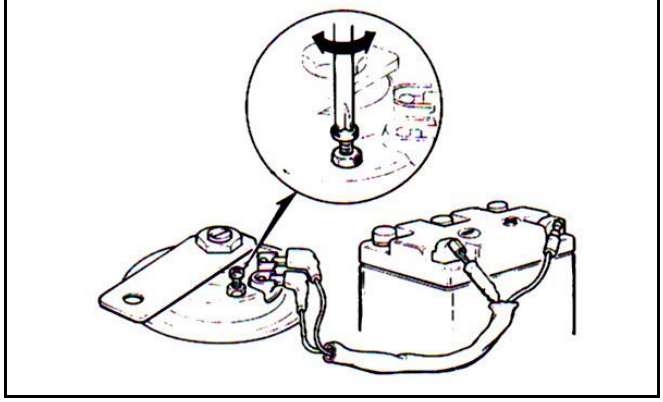
Brake switch
While grasp the brake lever firmly, the terminals of black and green/yellow of the brake should have continuity.
Replace the switch if damaged.



Horn
Disconnect the coupler and remove the horn (bolt x 2).



Remove the front cover and front under spoiler.
Apply 12 V power source to two terminals of the horn, the horn should make sound.
Replace the horn if necessary.
Adjust the quality of sound by turning the adjusting screw.

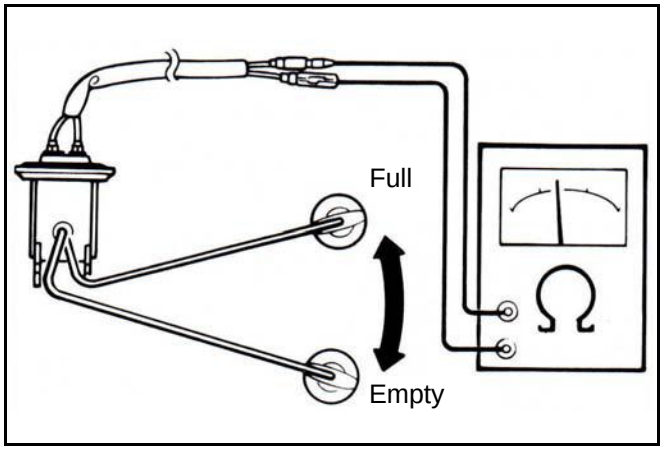


Fuel Unit / Fuel Level Warning Switch

Fuel level warning switch inspection
Remove the fuel level warning switch.
Measure the switch resistance.
Resistance：960Ω±10%
Replace the gasket if it is deformed or damaged.

Caution

- Make sure there is not too much fuel in the fuel tank before proceeding operation.



Fuel unit inspection
Remove the fuel unit.
Measure the fuel unit resistance.

Float position	Resistance
E (empty)	97.5~107.5 Ω
F (full)	4~10 Ω

Connect the fuel unit coupler to the wire harness.
Turn on the main switch.
Move the float arm to verify the proper position the fuel gauge needle indicates.

Float position	Indication
Up (full)	F (full)
Low (empty)	E (empty)

Caution

- Make sure the battery voltage is sufficient before proceeding inspection.

Replace the gasket if it is deformed or damaged.

Emission Control System Mechanism

Four-Stroke Engine Model

1. Catalyst converter (CATA.)
2. Evaporative Emission Control System (E.E.C.)
3. Air Injection System (A.I.)
4. Positive Crankcase Ventilation System (P.C.V.)

Function of Mechanism in the Emission Control System

General

The emission control strategy of this model was formulated basing on a four-stroke SOHC carburetor single cylinder engine. It adopts secondary air introducing device to purify the exhaust, in addition, it also adopts a charcoal canister to absorb the fuel vapor generated through evaporation in the fuel system.

※ **Engine refinements—**
Two Valves designed combustion chamber, together with optimum compression ratio, ignition timing, intake and exhaust timing, have all contributed to maximize the intake/exhaust efficiency and combustion efficiency.

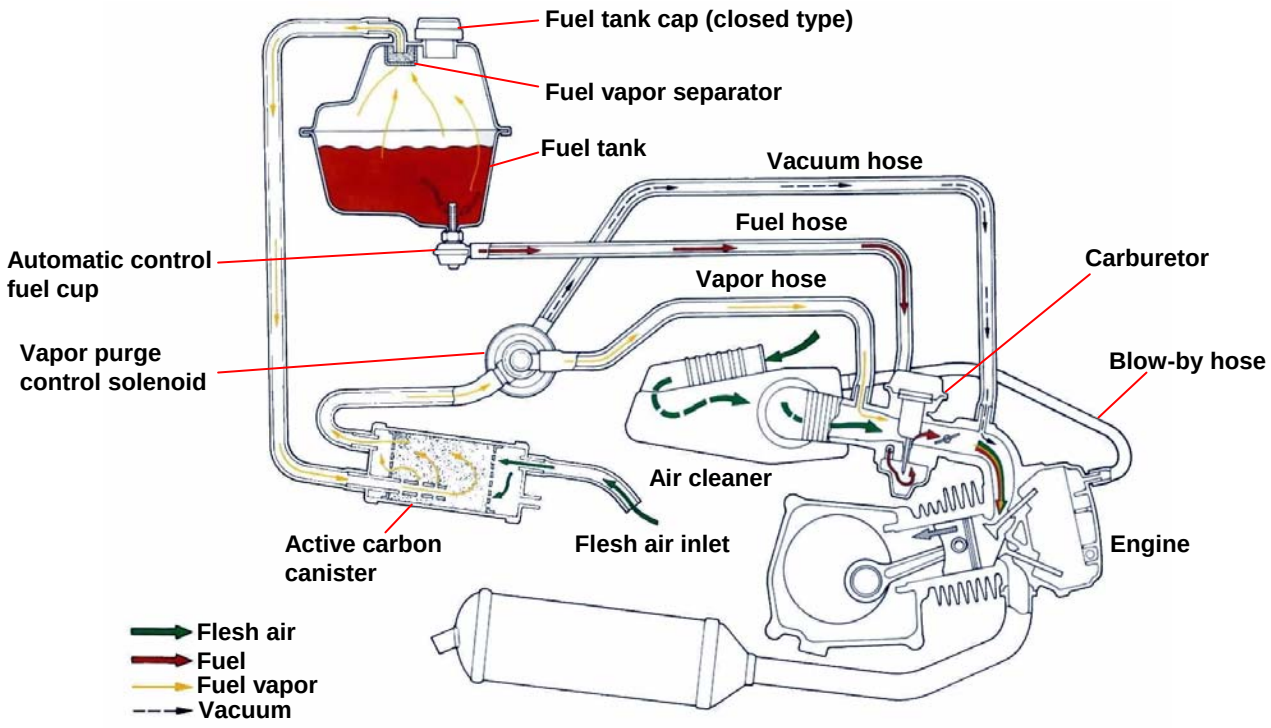
※ **Secondary air introducing system—**
It is used to introduce secondary air into exhaust manifold so that incomplete burned exhausts, CO & HC, may be burned again and to be harmless gases.

System	Device	Components	Purpose & function
Combustion chamber	Combustion chamber	2-valve combustion chamber	The semi-circular combustion chamber is designed to balancing the air stream to achieve the combustion stability.
Exhaust system	Post-treatment device	Catalytic converter	Installed a three-way catalytic converter in the middle of exhaust pipe to oxidize the CO, HC in the exhaust gas.
E.E.C. system	Evaporative emission control system	Charcoal canister Purge control valve	A canister is used to absorb vapor from fuel tank and to introduce it into carburetor at an opportune timing.
A.I. system	Secondary air-injection system	Air inject cut-valve Secondary air filter	To introduce flesh air into exhaust manifold controlled by an air cut-valve to burn the exhaust again.
P.C.V. system	Crankcase blow-by introducing device	Vapor separator	To introduce blow-by into combustion chamber via a vapor separator for burning then discharging.

Fuel Evaporative Emission Control System (E.E.C.)

1. Construction:

- Reduce HC to pollute air.
- To absorber fuel vapor and saving fuel consumption



2. Principle of operation

- Vapor generated in fuel tank and fuel system through evaporation is contained in the confined system to prevent it from escaping into the atmosphere, at the same time, the vapor will be introduced into a charcoal canister where the hydrocarbon in the vapor will be absorbed by active carbon.
- When engine is running, the negative pressure of intake opens the purge line, breaks HC off from active carbon and then sucks it into engine together with air from bottom of the canister.
- The canister can be used repeatedly without reducing its performance because of the system's purge function.

3. Trouble Diagnosis:

Fuel can not flow to carburetor

- No fuel in the fuel tank
- loosen vacuum hose of the fuel pump
- plugged hose in the system

4. Cautions:

- Do not exceed the reed valve of the fuel filler when filling out fuel.
- Do not have rush acceleration or running in high speed when applying the spare fuel.

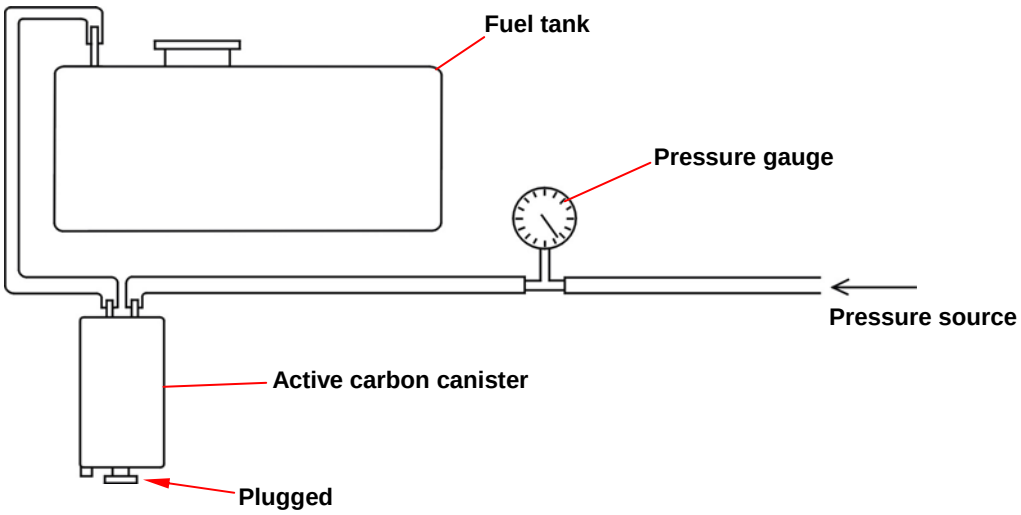
Evaporative Emission Control System (EEC)

1. Visual check:

1) Check the outside of canister for damage.
2) Check all hoses for breakage.

2. Leak test:

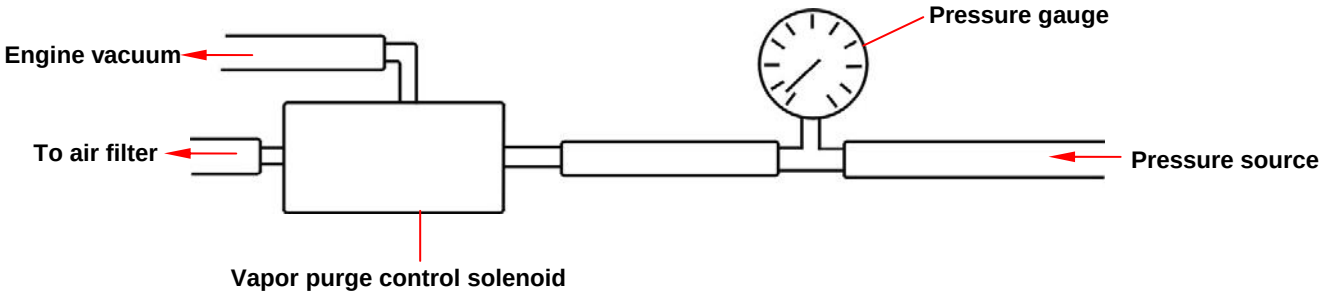
1) Disconnect the Vapor purge control solenoid hose, and connect a T-type hose connector to a pressure gauge and a pressure source as shown below:



2) Plug canister vent.
3) Apply 100mmAq into pressure source inlet then plug it. The pressure at the gauge should not drop to below 10mmAq within 10 seconds.

3. PCV Function Test

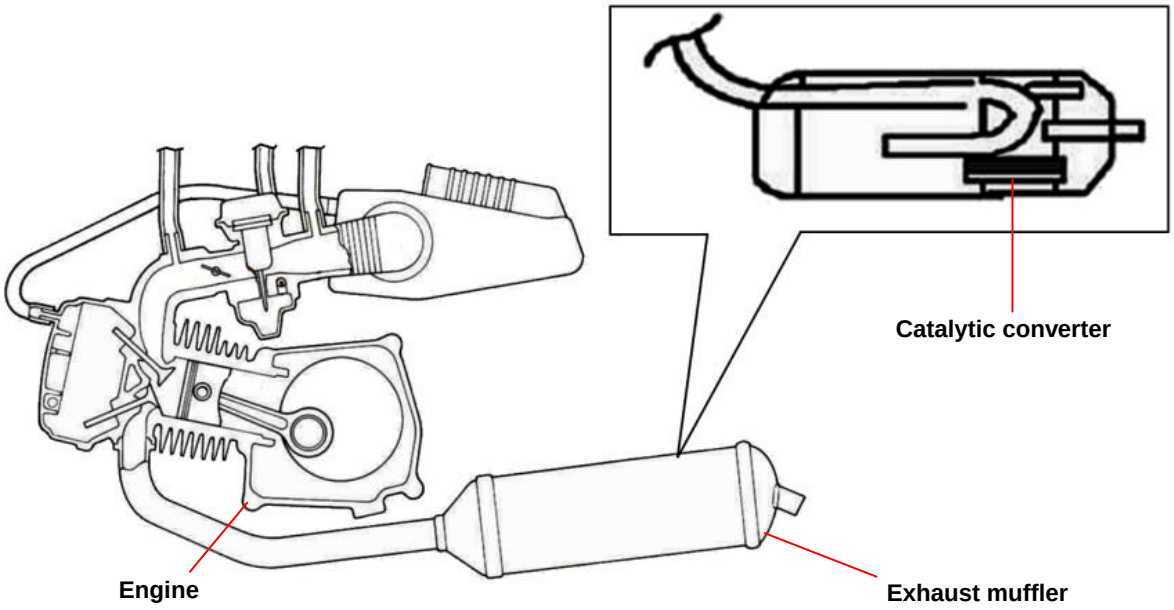
1) Disconnect the hose of connection to the active carbon canister, and then connect a T-type hose connector to pressure source as shown below:



2) Apply 100mmAq into pressure source inlet as engine stopped then plug it. The pressure at the gauge should not drop to below 10mmAq within 10 seconds.

Catalytic Converting System (CATA)

1. Construction:

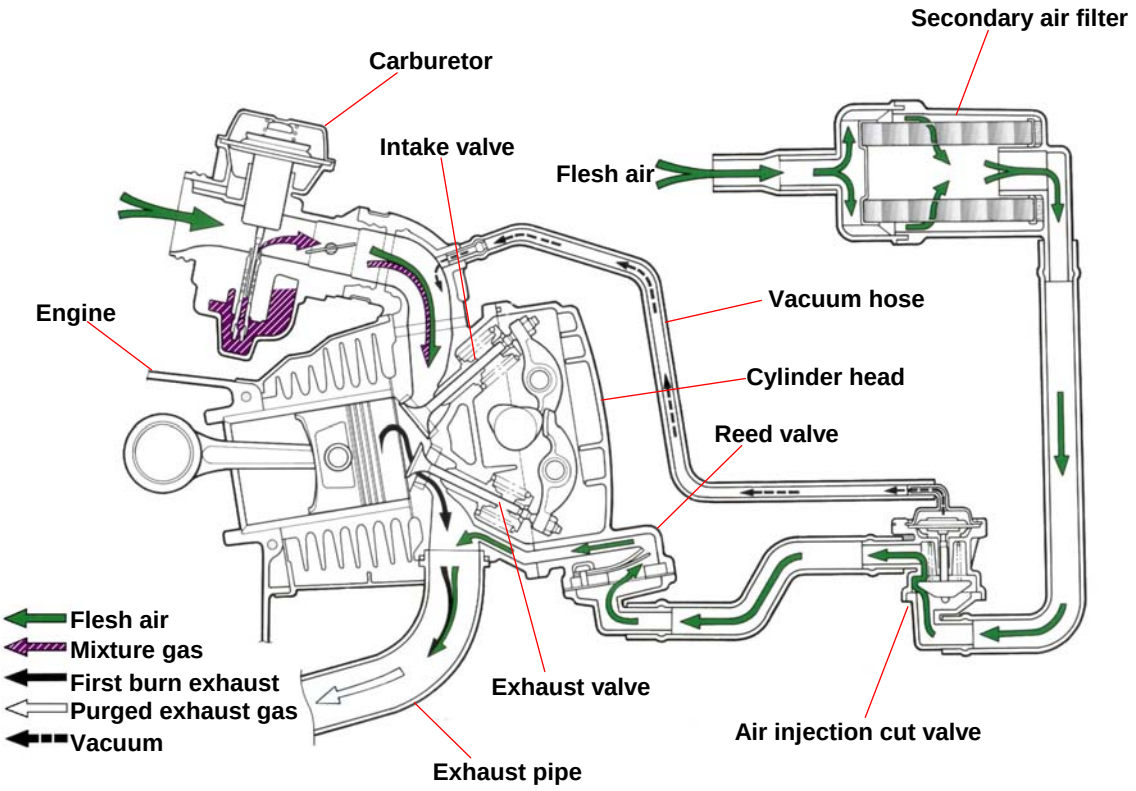


2. Description:

1) The function of the catalytic converter is to transfer unburned CO, HC, and NOx harmless CO_2, H_2O, N_2 gases.
2) Pt, Pd, Rh…etc. precious metals are used into the catalytic converter so use only unleaded gasoline to prevent from cause the catalytic converter to fail.

Secondary Air Introduction System

4. Construction



This system contained AICV (air Injection Cut Valve), R/V (Reed Valve) and other intake components.

2. Principle of operation:

- Secondary air is introduced into exhaust manifold so that CO and HC in the exhaust will be burned again under a state of rich oxygen and appropriate temperature and be turned into harmless CO_2, H_2O.
- The opening and closing of the exhaust valve can generate a positive or a negative pressure pulse inside a motorcycle's exhaust system. Exhaust gas is controlled by a reed valve. When pressure inside the exhaust manifold is negative, reed valve will be sucked open by the negative pressure and outside air will enter to mix with CO, HC, thus generating a secondary burn reaction and turning them into harmless gases. When pressure inside the exhaust manifold is positive, reed valve will close to prevent exhaust back up and enter into the secondary air cleaner.
- Air cut-off valve (AICV) will cut off the secondary air supply during engine fuel returning cycle to reduce after-burning noises.

3. Service Points/Trouble Diagnosis:

Diesel
a. Malfunction of air inject cut valve (AICV).
b. System hose leakage.
c. abnormal ignition timing.
d. lean mixture gas.
e. abnormal fuel supply.

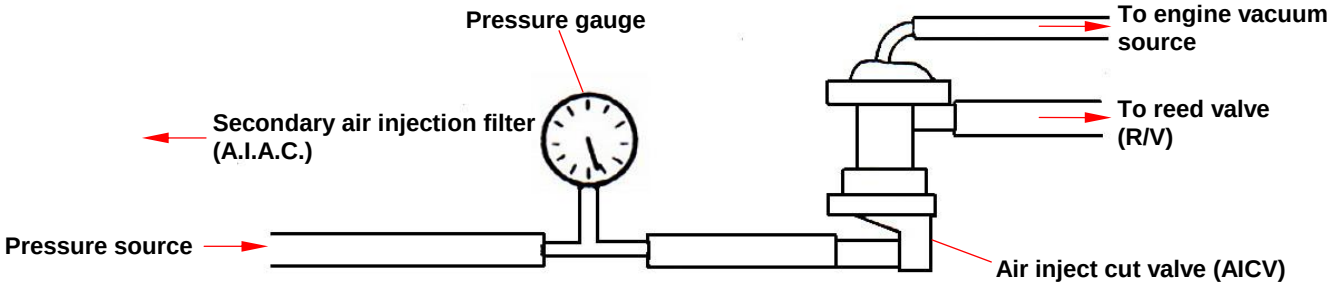
Rich Exhaust Gas:
a. plugged air-jet by dirty carburetor.
b. poor adjustment of air adjustment screw.
c. poor reed valve.
d. System hose leakage or plugged.

Noise:
a. System hose leakage.
b. Loosen secondary air injection filter.
c. Loosen secondary air injection filter hose.

4. AI System Service methods:

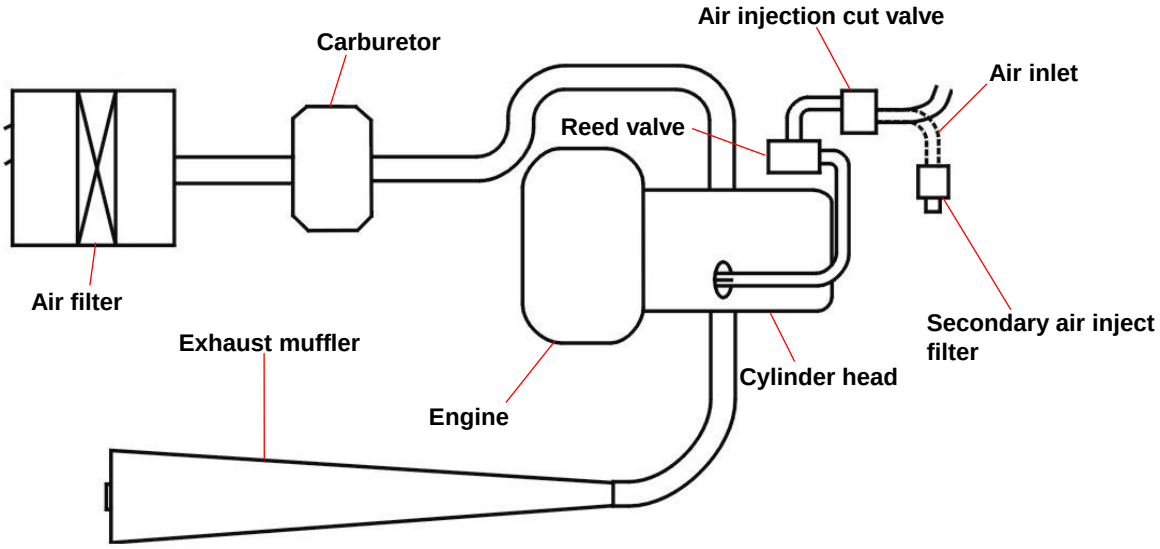
a. Visual check:
- Check reed valve, air cut-off valve, secondary air cleaner for outside damages.
- Check metal pipes and hoses for breakage and cracks.

b. Leak test:

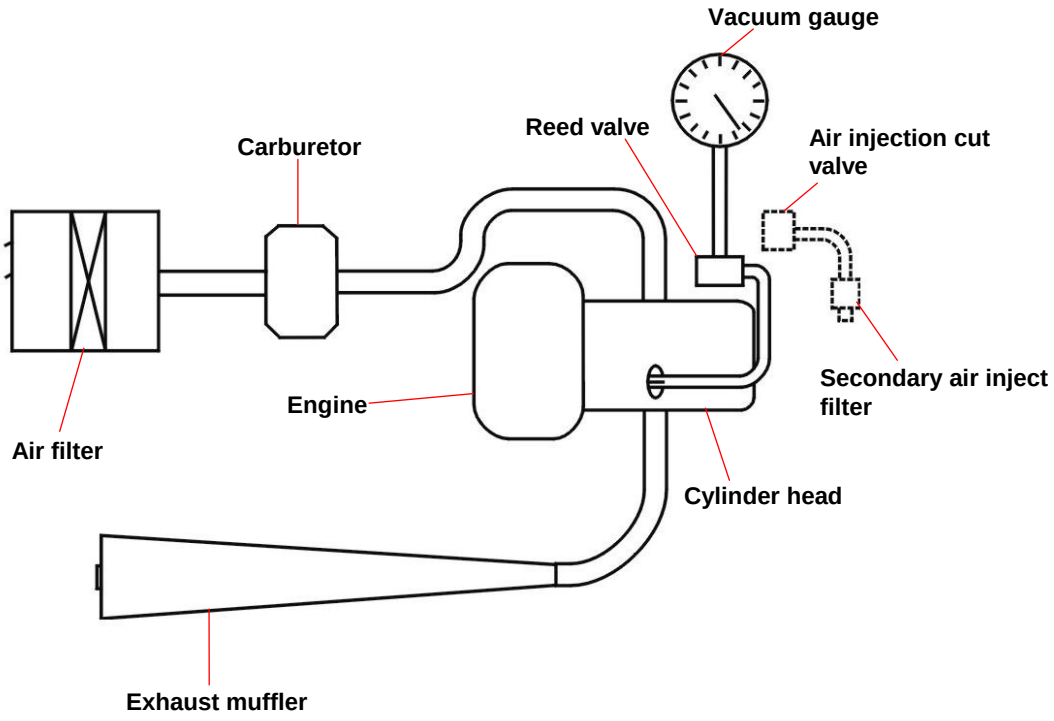


- Plug the hose leading to reed valve.
- Remove the hose of connection to air injection cut valve. Connect a T-type hose connector, pressure gauge and pressure source as shown above.
- With engine stopped, apply 1.0kg/cm2 pressure to inlet and then plug it. There should be no leakage.

1. **Warm-up test:**
   - Start engine.
   - Remove the air injection filter.
   - Check the air inlet if there is air-sucking sounds during idling (should hear Bo-Bo-Bo sound).



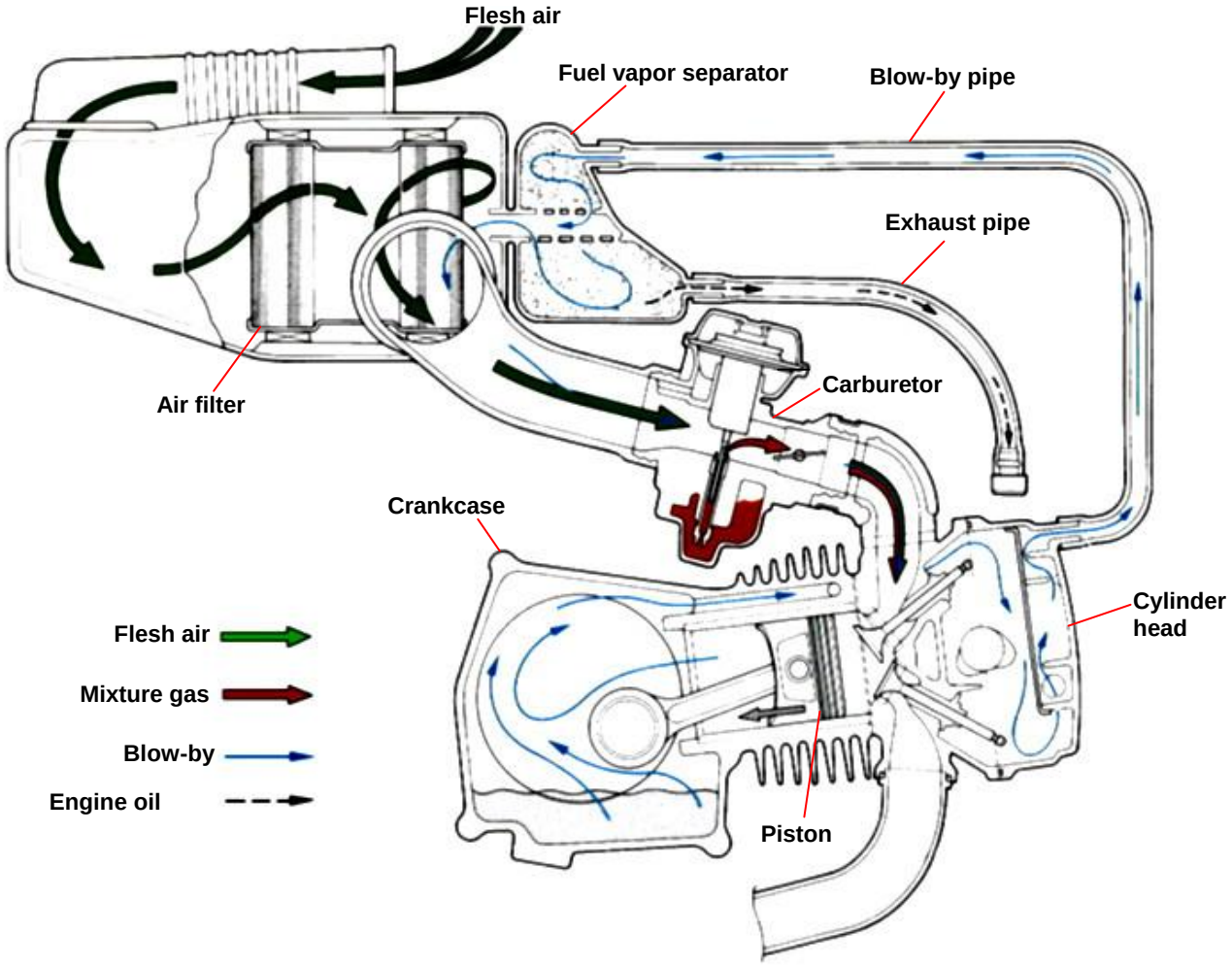
   - If no sound is heard, remove air cut-off valve, and connect a vacuum meter to air pipe to check for leakage.



   - If there is no vacuum, replace reed valve and test again.
   - If there is no vacuum, check the air pipe for leakage, plugged or loose.

Positive Crankcase Ventilation System (P.C.V.)

1. Construction



2. Principle of operation:

- Install a separated chamber on cylinder head, and suck the blow-by gas to the fuel vapor separator by engine vacuum.
- Drill a hole in the air cleaner and install a vapor separator, so that blow-by from crankcase will flow through a cylinder check valve and then separated by the separator.
- The separated vapor will be sucked into combustion chamber by engine negative pressure to be burned again instead of discharging into atmosphere. Drain liquidized fuel in the drain pipe periodically.

3. Service Methods

Visual check:

- Remove drain plug to drain the fuel when fuel level on the drain pipe reaches 80 % full.
- Check connecting hose for damage and looseness.

Inspection Items

Secondary air injection system

1. Visual inspect the reed valve, air injection cut valve, and secondary air filter as well as hoses for damage.
2. Leaking check.
3. Warm-up running check.

Fuel Evaporation Control System

1. Visual inspect the carbon canister and hoses for damage.
2. Leaking check.
3. Function test of the purge control solenoid.

Catalytic converter

1. Check if exhaust gas content is within standard.
2. Remove the exhaust pipe and shake it gently for noise.

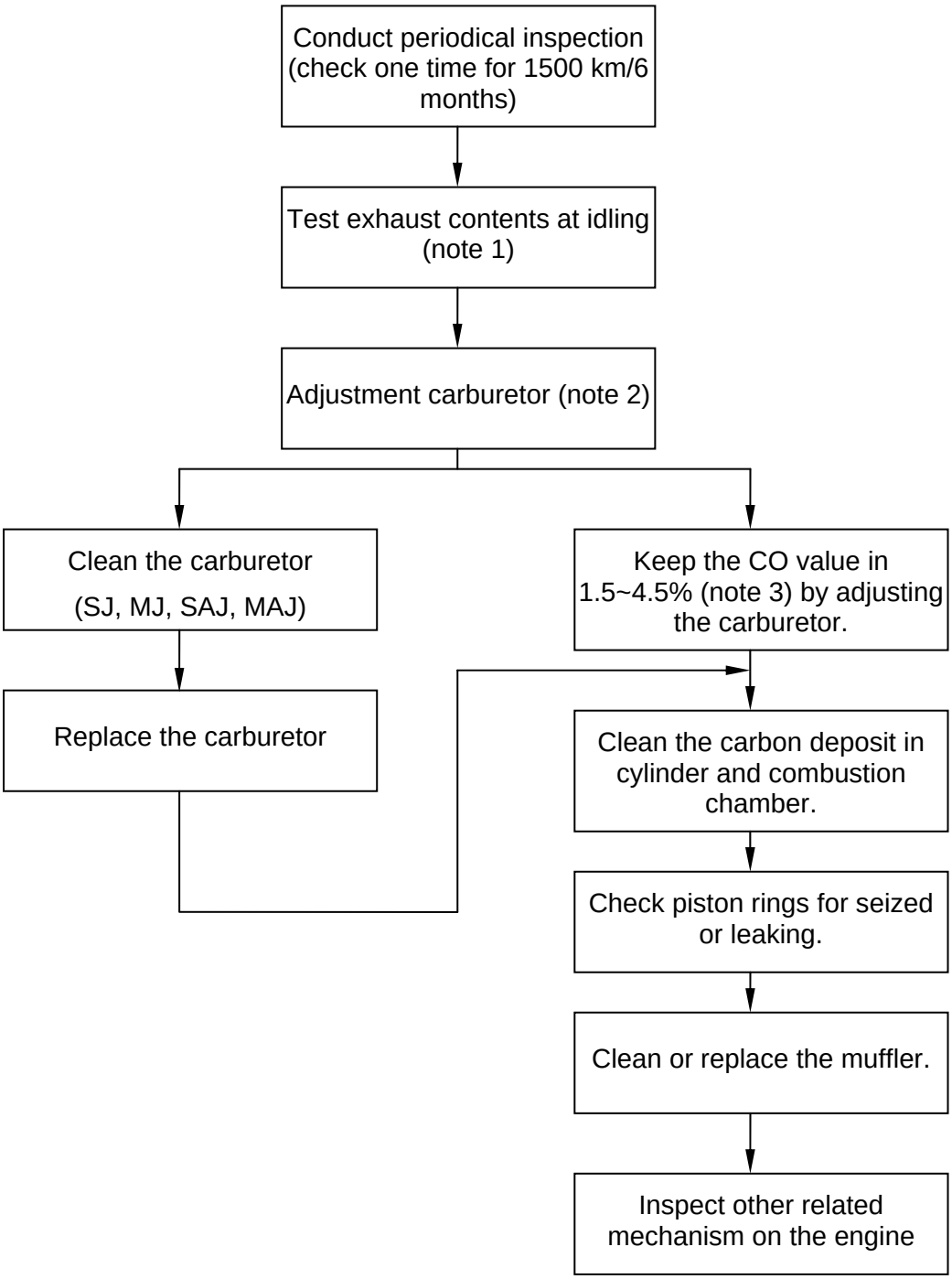
Fuel Supply System

1. Clean the air filter.
2. Check the air filter.
3. Clean the carburetor fuel jet, air jet and all circuit with air gun or specified solvent.
4. Check the float level of carburetor.
5. Adjust CO/HC values at idling. (engine rpm must be within specification)

Ignition system

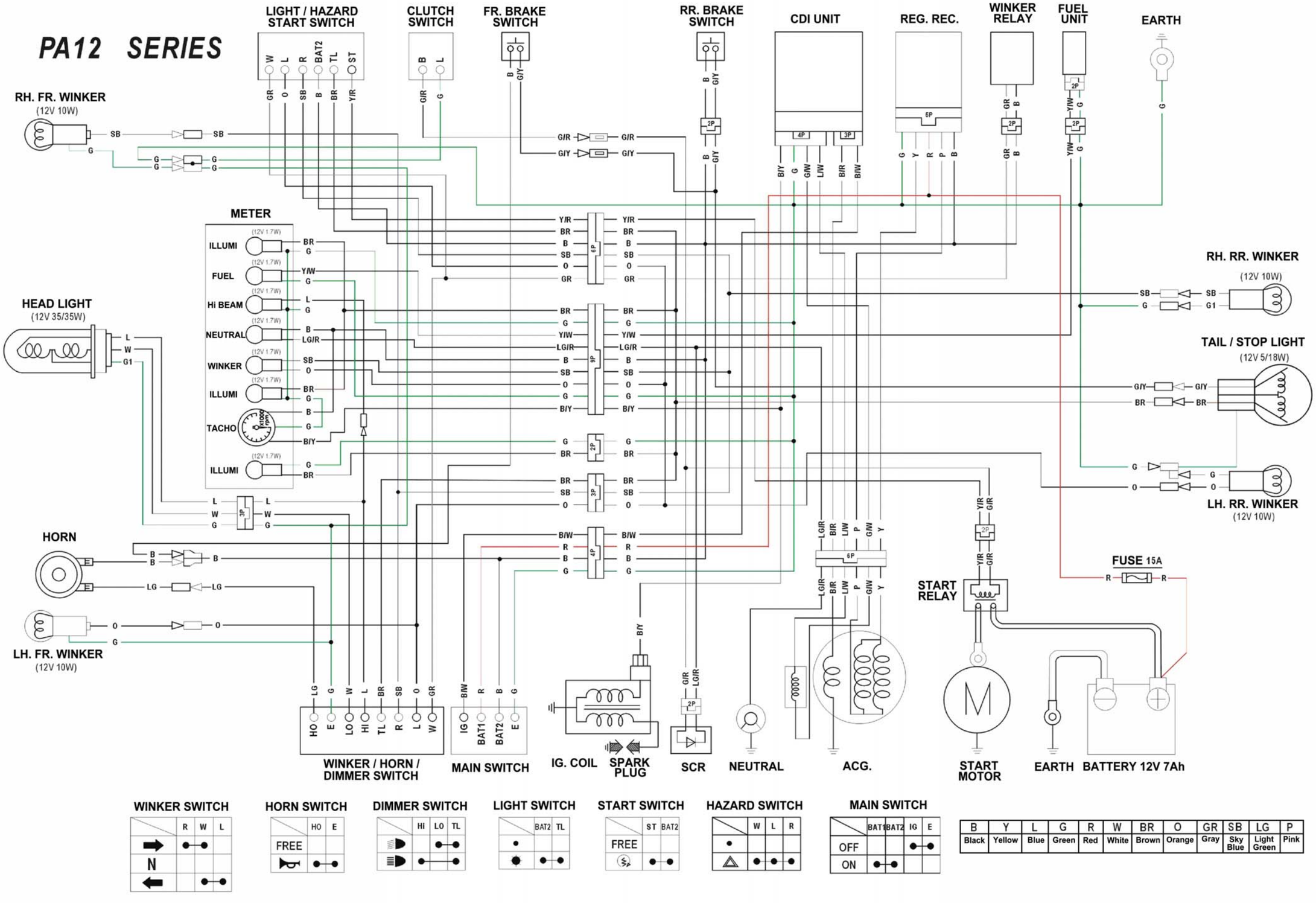
1. Spark plug check and replacement.
2. Ignition coil check and replacement.

Countermeasure for Emission Pollutants Not Within Standard as In Idle Speed (4-Stroke Engine)



Note 1: Test it according to the idling test procedure.
Note 2: Adjustment the idle adjustment screw. Set the engine rpm in specified speed, and test CO, HC at idling. And then adjust the air adjustment screw at the same time to let CO value to be 1.5~4.5%.
Note 3: If the values still can not be reached to specification after adjusted the carburetor, then clean or replace it with new one according to the procedures.

PA12 SERIES



WINKER SWITCH

	R	W	L
➡	●	●	
N			
⬅		●	●

HORN SWITCH

	HO	E
FREE		
📯	●	●

DIMMER SWITCH

	HI	LO	TL
🔆		●	●
🔆	●		●

LIGHT SWITCH

	BAT2	TL
•		
●	●	●

START SWITCH

	ST	BAT2
FREE		
Ⓢ	●	●

HAZARD SWITCH

	W	L	R
•			
△	●	●	●

MAIN SWITCH

	BAT1	BAT2	IG	E
OFF			●	
ON	●			

B	Y	L	G	R	W	BR	O	GR	SB	LG	P
Black	Yellow	Blue	Green	Red	White	Brown	Orange	Gray	Sky Blue	Light Green	Pink

15. Wiring Diagram

NOTE: