Symbols and Marks ····· 1-1	Torque Values(Frame)····· 1-11
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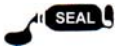
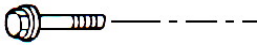
Symbols and Marks

Symbols and marks are used in this manual to indicate what and where the special service are needed, in case supplemental information in procedures is 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 goes 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 a 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 compressed air 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

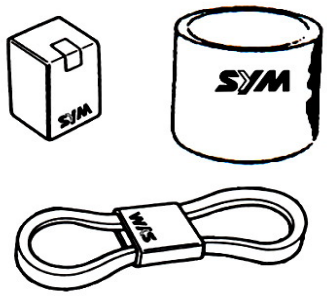
Brake fluid

⚠ Caution

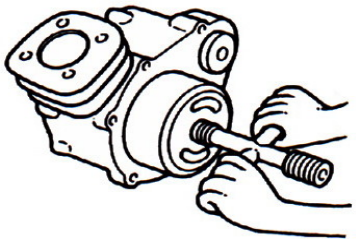
Spilling brake fluid on painted, plastic, or rubber parts may cause damage to the parts. Place a clean towel on the above-mentioned parts for protection when servicing the brake system. Keep the brake fluid beyond reach of children.

Service Precautions

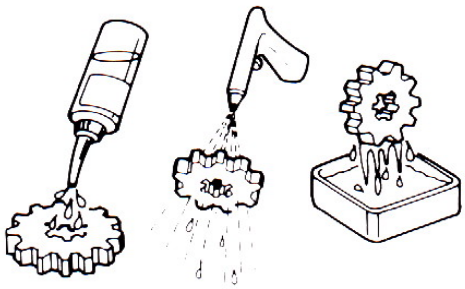
- Always use with SANYANG genuine parts and recommended oils. Using non-genuine parts for SANYANG vehicle may damage it.



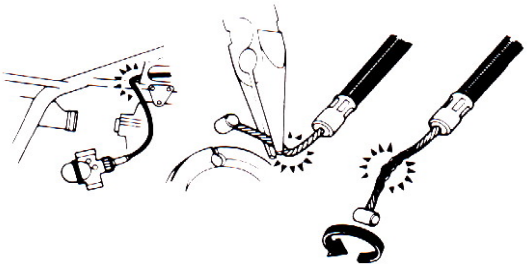
- Special tools are designed for removal and installation of components without damaging the part. Using wrong tools may result in damage.



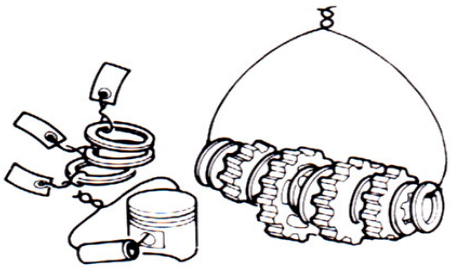
- When servicing this bike, use only metric tools, metric bolts, and nuts. Using wrong tools and fasteners may damage this vehicle.
- Clean the outside of the parts or the cover before removing it from the bike. Otherwise, dirt and deposit accumulated on the part's surface may fall into the engine, chassis, or brake system, and cause damage.
- Wash and clean parts with high ignition point solvent, and blow them dry with compressed air. Pay special attention to O-rings or oil seals because most cleaning agents have an adverse effect on them.



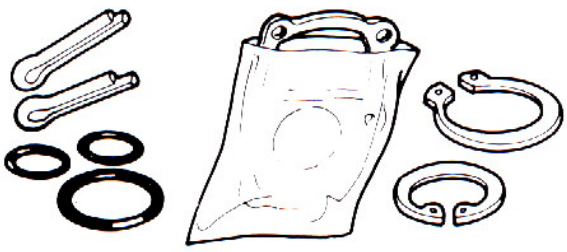
- Never bend or twist a control cable to prevent unsmooth control and premature worn out.



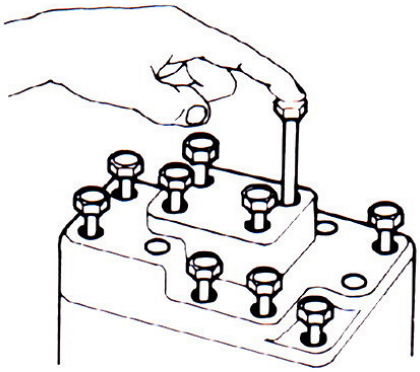
- Rubber parts may become deteriorated when old and easy to be damaged by solvent and oil. Check these parts before installation to make sure that they are in good condition, replace if necessary.
- When loosening a component, which has different sized fasteners, operate with a diagonal pattern and work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



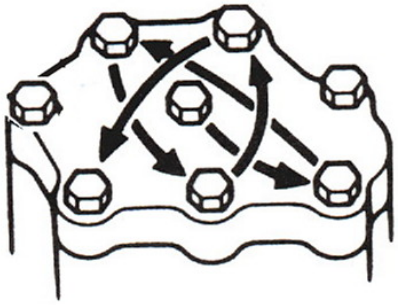
- Note the reassemble position of the important components before disassembling them to ensure they will be reassembled in correct dimensions (depth, distance or position).
- Components not to be reused should be replaced when disassembled including gaskets metal seal rings, O-rings, oil seals, snap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



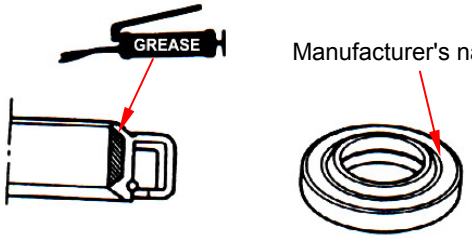
- The length of bolts and screws for assemblies, cover plates or boxes is different from one another; make sure they are correctly installed. In case of confusion, Insert the bolt into the hole to compare its length with other bolts, if its length outside the hole is the same with other bolts, it is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



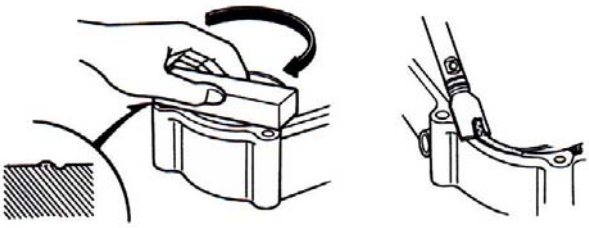
- Tighten assemblies with different dimension fasteners as follows: Tighten all the fasteners with fingers, then tighten the big ones with special tool first diagonally from inside toward outside, important components should be tightened 2 to 3 times with appropriate increments to avoid warp unless otherwise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



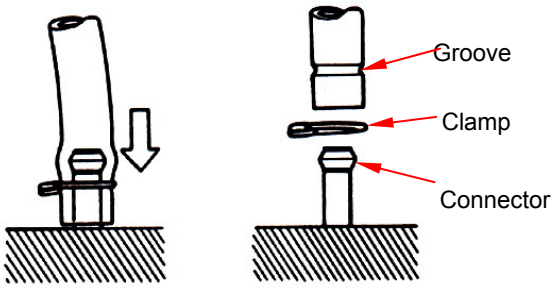
- When installing oil seal, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, and check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.



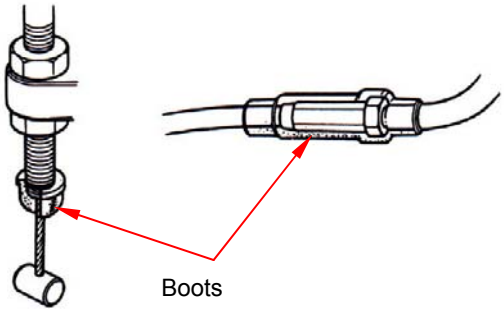
- Remove residues of the old gasket or sealant before reinstallation, grind with a grindstone if the contact surface has any damage.



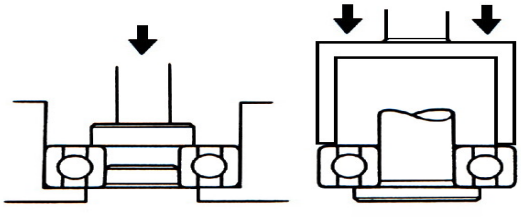
- The ends of rubber hoses (for fuel, vacuum, or coolant) should be pushed as far as they can go to their connections so that there is enough room below the enlarged ends for tightening the clamps.



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

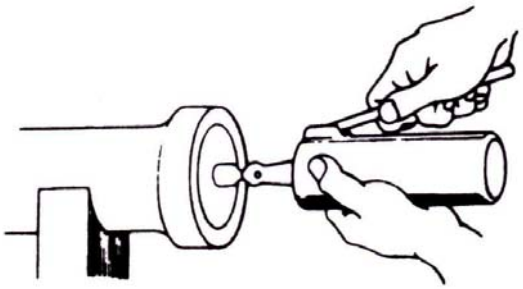


- The tool should be pressed against two (inner and outer) bearing races when removing a ball bearing. Damage may result if the tool is pressed against only one race (either inner race or outer race). In this case, the bearing should be replaced. To avoid damaging the bearing, use equal force on both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

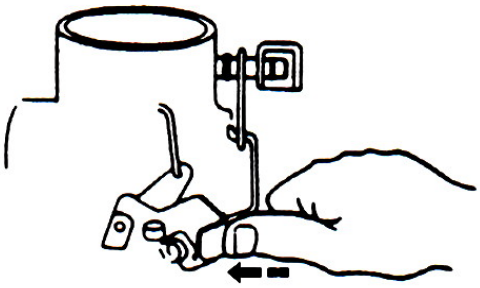


Both of these examples can result in bearing damage.

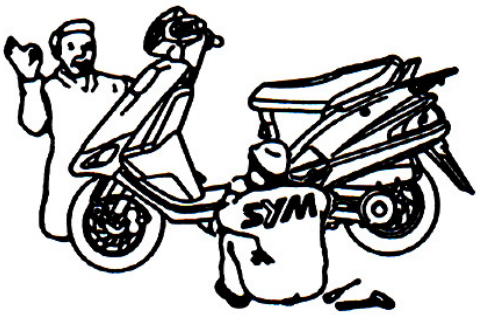
- Lubricate the rotation face with specified lubricant on the lubrication points before assembling.



- Check if positions and operation of installed parts are correct and proper.

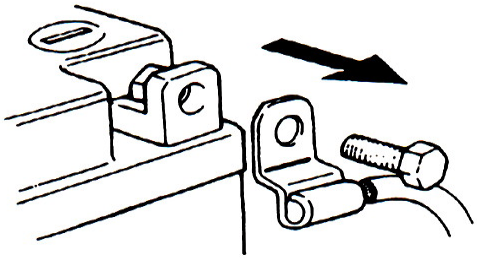


- Make sure service safety each other when conducting by two persons.

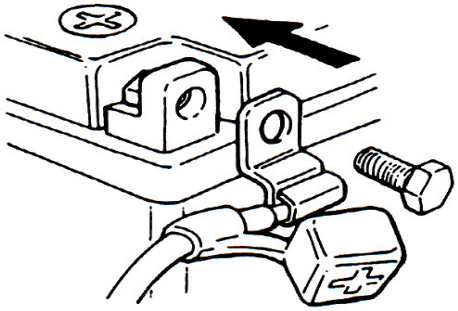


- Note that do not let parts fall down.

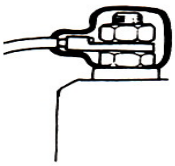
- Before battery removal operation, you have to remove the battery negative (-) cable first.
  Avoid using tools like open-end wrench, which may contact with body or create spark.



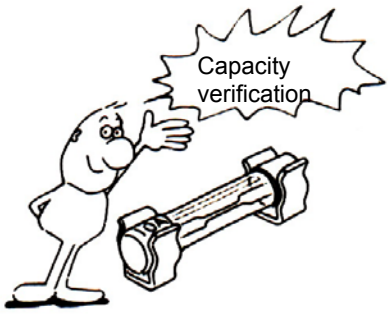
- After service completed, make sure all connection points is secured.
  Battery positive (+) cable should be connected firstly.
  And the two posts of battery have to be greased after connected the cables.



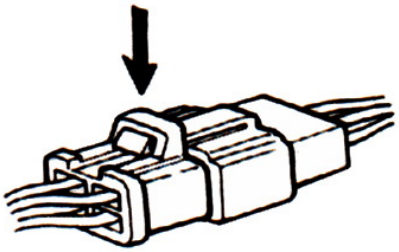
- Make sure that the battery post caps are located properly after the battery posts had been serviced.



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

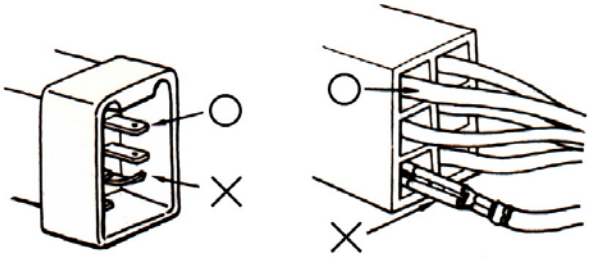


- When separating a connector, its locker has to be unlocked first. Then, conduct the service operation.

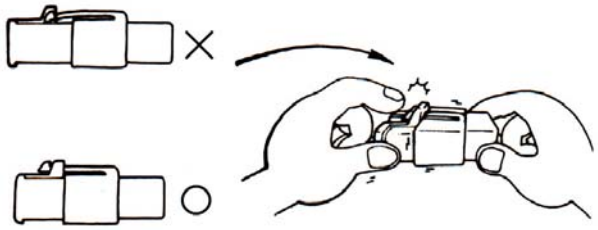


- Do not pull the wires as removing a connector or wires. Hold the connector body.

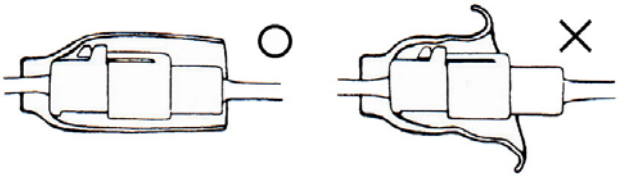
- Make sure if the connector pins are bent, extruded or loosened.



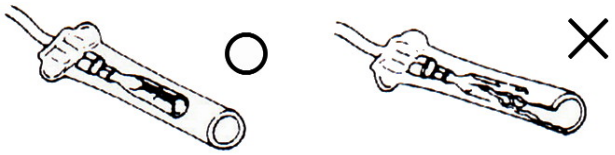
- Insert the connector completely.
- If there are two lockers on two connector sides, make sure the lockers are locked in properly.
- Check if any wire loose.



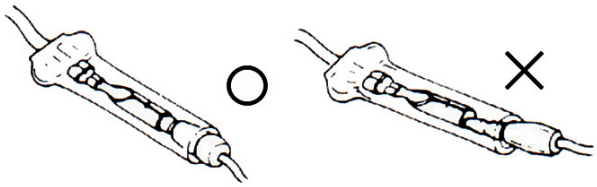
- Check if the connector is covered by the twin connector boot completely and secured properly.



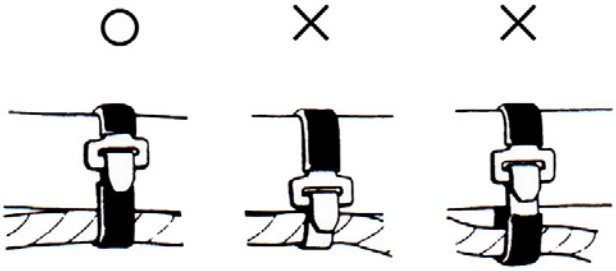
- Before connecting terminals, check if the boot is cracked or the terminal is loose.



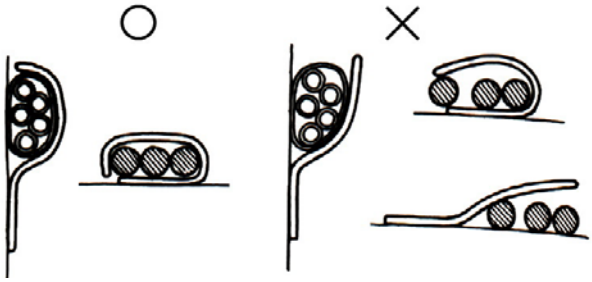
- Insert the terminal completely.
- Check if the boot covers the terminal.
- Do not let boot open facing up.



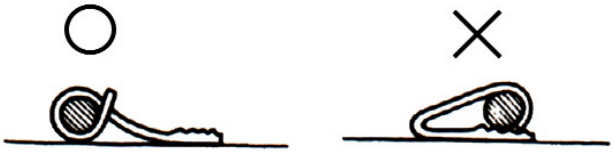
- Secure wires and wire harnesses to the frame with respective wire bands at the designated locations. Tighten the bands so that only the insulated surfaces contact the wires or wire harnesses



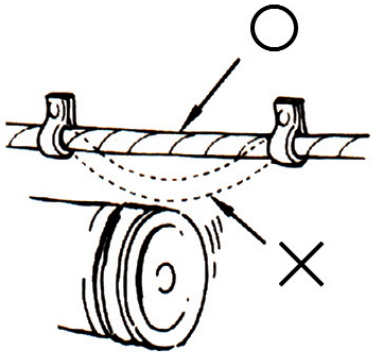
- Wire band and wire harness have to be clamped secured properly.



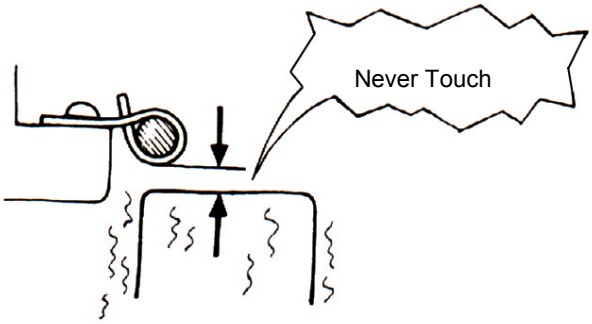
- Do not squeeze wires against the weld or its clamp.



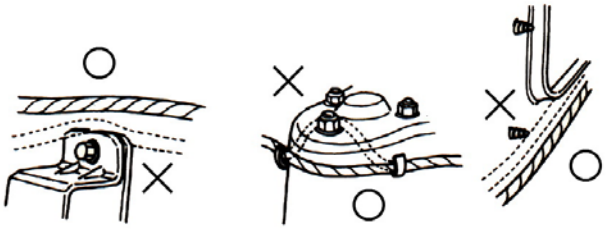
- Do not let the wire harness contact with rotating, moving or vibrating components when routing the harness.



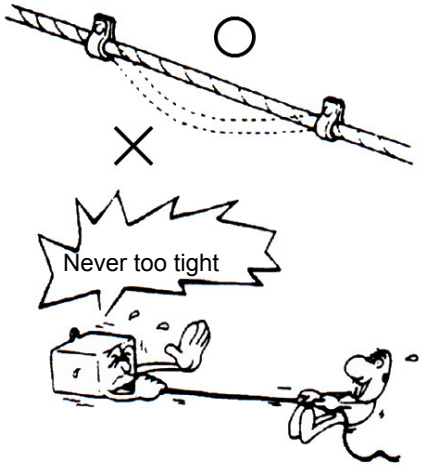
- Keep wire harnesses far away from the hot parts.



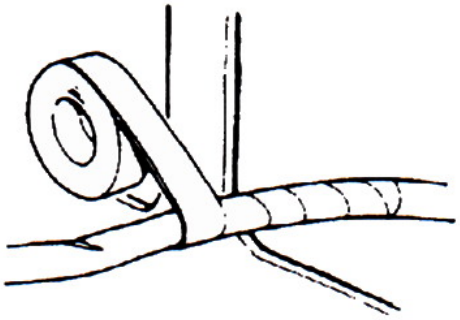
- Avoid wire harnesses from sharp edges or corners, and also avoid the jutted-out ends of bolts and screws.



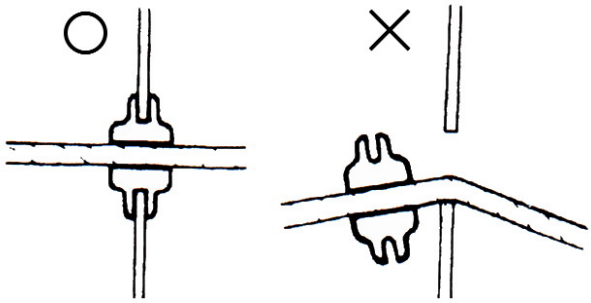
- Route harnesses so that they neither pull too tight nor have excessive slack.



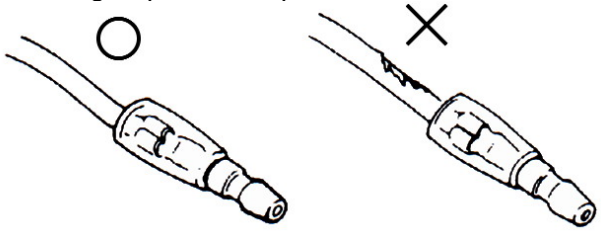
- Protect wires or wire harnesses with electrical tape or tube if they contact a sharp edge or corner. Thoroughly clean the surface where tape is to be applied.



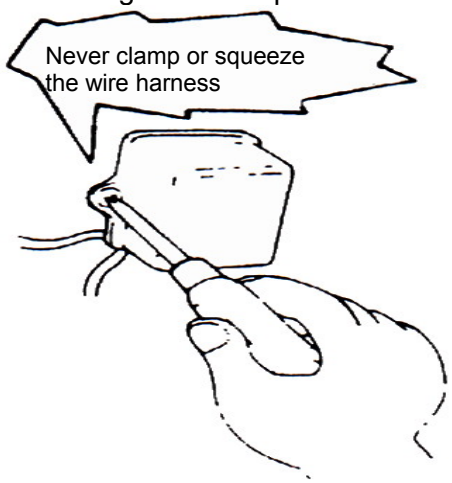
- Secure the rubber boot firmly as applying it on wire harness.



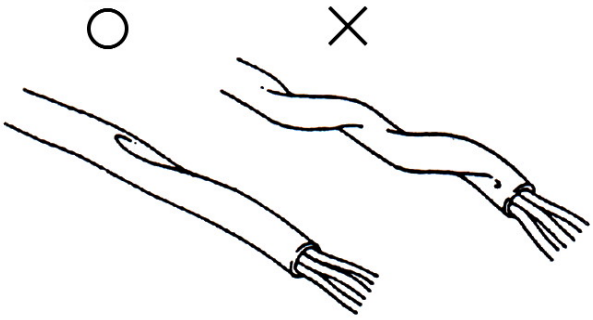
- Never use wires or harnesses which insulation has broken. Wrap electrical tape around the damaged parts or replace them.



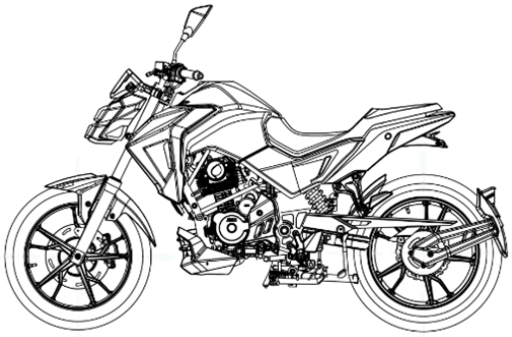
- Never clamp or squeeze the wire harness when installing other components.



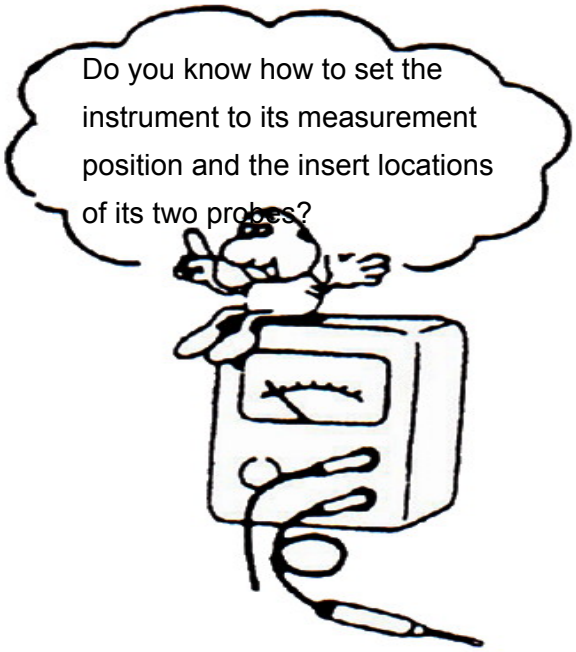
- Do not let the wire harness be twisted when installation.



- 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, the operator should read the operation manual of the instrument, and then conducts 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			SYM	Model		ME20BW-COC
Dimension	Overall Length		**2040 mm**	Suspension System	Front	**TELESCOPIC FORK**
	Overall Width		**750 mm**		Rear	**SINGLE**
	Overall Height		**1080 mm**	Tire Specifications	Front	**110/70-17**
	Wheel Base		**1400 mm**		Rear	**130/70-17**
Weight	Curb Weight	Front	**68 kg**	Brake System	Front	**DISK (ø 260 mm)**
		Rear	**74 kg**			
		Total	**142 kg**		Rear	**DISK (ø 222 mm)**
	Passengers/Weight		**Two / 150 kg**	Performance	Max. Speed	**> 125 km/hr**
	Total Weight	Front	**95 kg**		Climb Ability	**> 25deg**
		Rear	**198 kg**	Reduction	Primary Reduction	**Gear 3.182(70/22T)**
		Total	**293 kg**		Final Reduction	**Chain 3.20 (48/15T)**
Engine	Type/ Cooling System		Water-cooled 4-stroke gasoline engine		Clutch	**Wet Multi Disc Clutch**
	Installation and arrangement		**Vertical, below center, incline 15°**		Transmission	**6-speed gear change**
	Fuel Used		**Above 92 unleaded**	Speedometer		**0 ~ 199 km/hr**
	Fuel supply		**injection**	**Horn**		**87~112 dB**
	Cylinder	Bore	**Ø 63.5 mm**	Muffler		**Expansion & Pulse Type**
		Stroke	**57.8 mm**	Exhaust Pipe Position and Direction		**Right side and Backward**
		Number/Arrangement	**Single Cylinder**	Lubrication System		**forced circulation and splashing**
	Displacement		**183 cc**	Exhaust Concentration	Solid Particulate	**-**
	Compression Ratio		**11.1 : 1**		CO	**< 5.5 g/km**
	Max. HP		**13.5kw / 8500 rpm**		HC	**< 1.2 g/km**
	Max. Torque		**15.7Nm / 7500 rpm**	**Fuel Capacity**		11L
	Ignition		**Full transistor Ignition**	**Spark Plug**		CPR8EA-9
	Starting System		**Electrical starter**	Battery Capacity		12 V 6Ah

Torque Values (Engine)

Item	Q't	Thread Dia. (mm)	Torque Value(kgf-m)	Remarks
Cylinder stud bolt	4	10	1.0~1.4	
Cylinder head nut	4	10	3.6~4.0	
Cylinder head right bolt	2	6	1.0~1.4	
Cylinder head side cover bolt	3	6	1.0~1.4	
Cylinder head cover bolt	4	6	0.8~1.2	
Cylinder head stud bolt (inlet	2	6	1.0~1.4	
Cylinder head stud bolt (EX.	2	8	2.4~3.0	
Air inject pipe bolt	4	6	1.0~1.4	
Tappet adjustment screw nut	4	5	0.7~1.1	Lubricate with oil
Spark plug	1	10	1.0~1.2	
Camshaft gear fix bolt	2	6	1.0~1.4	
Camshaft setting plate bolt	1	6	0.8~1.2	
Cam chain tensioning bolt	2	6	1.0~1.4	
Throttle fix nut	2	6	0.8~1.2	
Engine oil draining bolt	1	12	3.5~4.5	
Engine oil strainer cap	1	30	1.3~1.7	
Flywheel nut	1	14	8.5~10.5	
R. crankcase cover bolt	12	6	0.8~1.2	
L. crankcase cover bolt	11	6	0.8~1.2	
L. crankcase rear cover bolt	2	6	0.8~1.2	
Oil pump screw	2	6	0.7~1.1	
Oil pump cover bolt	2	6	0.8~1.2	
Water pump impeller	1	7	1.0~1.4	
Water pump cover bolt	4	6	0.8~1.2	
Crankcase bolt	11	6	0.8~1.2	
Oil strainer cover bolt	2	6	0.8~1.2	
Balancing shaft drive gear bolt	4	6	0.8~1.2	
Primary drive gear nut	1	16	8.5~10.5	
Balancing shaft fix nut	1	14	8.5~10.5	
Clutch lifter plate bolt	6	6	1.0~1.4	
Clutch fix nut	1	16	8.5~10.5	
ACG fix bolt	3	6	0.8~1.4	
Drive gear bolt	2	6	0.8~1.2	

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

Torque Values (Frame)

Item	Q'ty	Thread Dia. (mm)	Torque Value (Kg-m)	Remarks
Mounting bolt for steering handle post	4	8	1.0~1.4	
Lock nut for steering stem	1	22	6.0~8.0	
Steering top cone race	1	22	0.15~0.25	
Front wheel axle nut	1	12	6.0~8.0	
Rear wheel axle nut	1	14	10.0~12.0	
Rear drive sprocket nut	4	8	2.7~3.0	
Front cushion mounting bolt	4	8	3.0~3.5	
Rear cushion upper connection bolt	1	10	3.5~4.5	
Rear cushion lower connection bolt	1	10	3.5~4.5	
Brake lever bolt	2	6	0.8~1.2	
Brake hose bolt	4	10	3.0~4.0	
Brake air-bleeding valve	2	6	0.8~1.0	
Front brake disc mounting bolt	3	6	3.7~4.3	
Rear brake disc mounting bolt	2	8	2.4~3.0	
Gear change bolt	1	6	0.8~1.2	
Brake clipper mounting bolt	2	6	1.5~2.0	
Engine suspension nut	2	8	2.4~3.0	upper part of engine & frame
Engine assembly nut	2	8	3.0~4.0	engine front part & engine hanger
Engine assembly nut	1	10	4.5~5.5	engine rear part & frame
Special Bolt	8	8	1.5~2.5	
Swing arm pivot nut	1	10	10.0~12.0	
Muffler mounting nut	2	8	1.0~1.2	
Muffler mounting bolt	2	8	3.2~3.8	

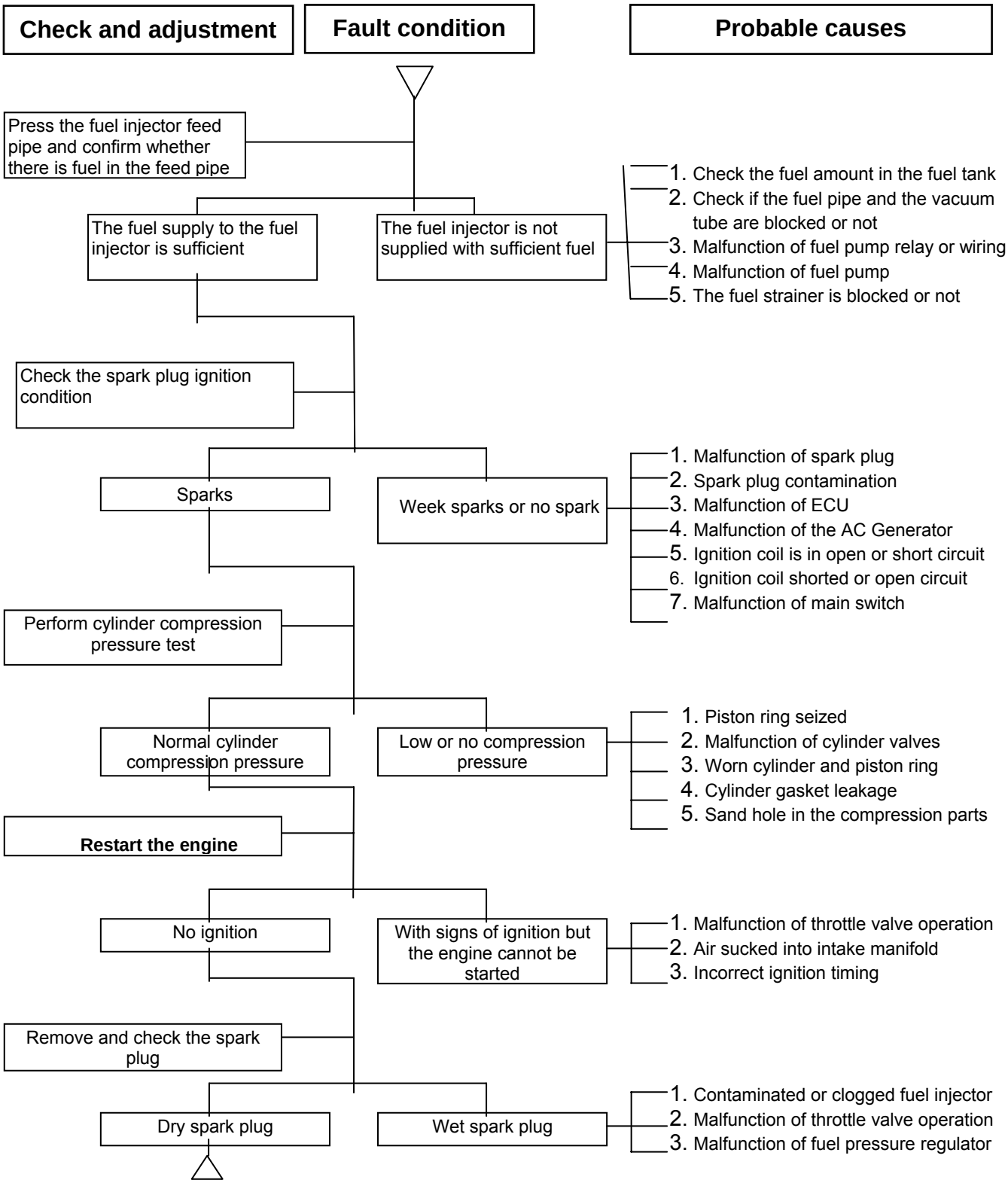
The torque values listed in above table are for more important tightening torque values. Please refer to standard values for those not listed in the table.

Torque Values

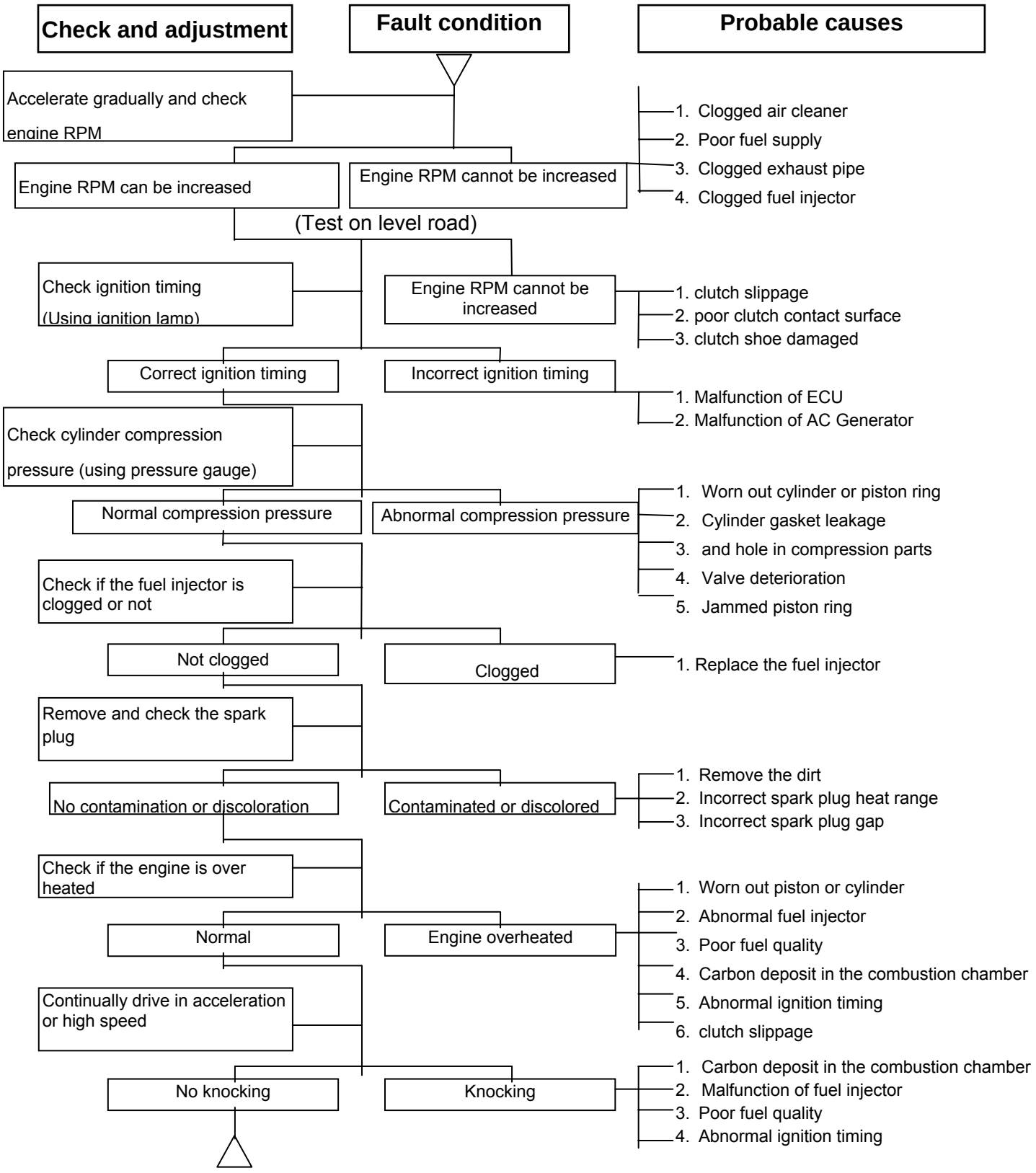
Type	Tighten Torque	Type	Tighten Torque
5mm bolt, nut	0.45~0.60kgf-m	4mm screw	0.10~0.15kgf-m
6mm bolt, nut	0.80~1.20kgf-m	5mm screw	0.35~0.50kgf-m
8mm bolt, nut	1.80~2.50kgf-m	6mm screw, SH nut	0.70~1.10kgf-m
10mm bolt, nut	3.00~4.00kgf-m	6mm flange bolt, nut	1.00~1.40kgf-m
12mm bolt, nut	5.00~6.00kgf-m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

Troubleshooting

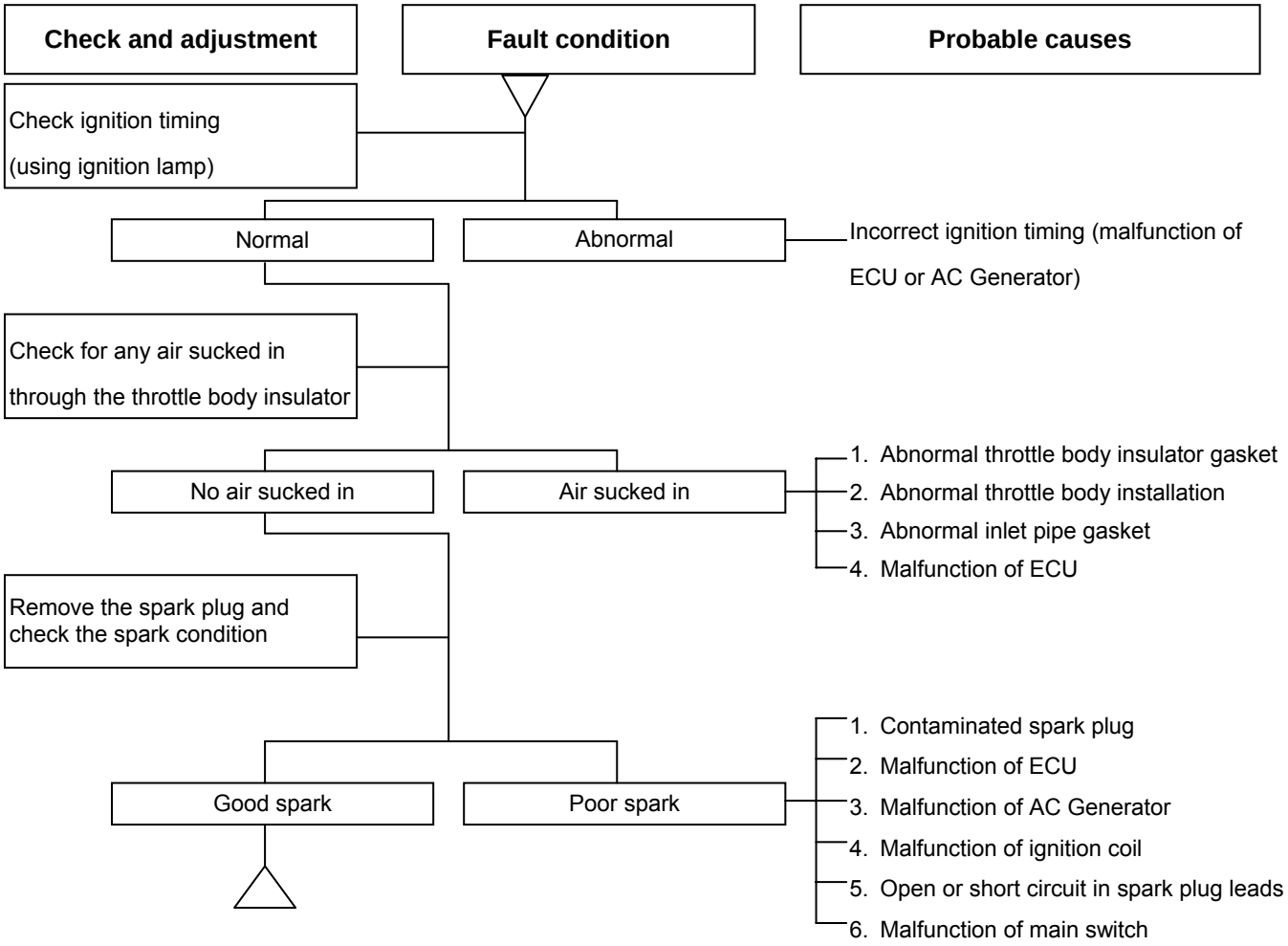
A. Engine cannot be started or difficult to be started



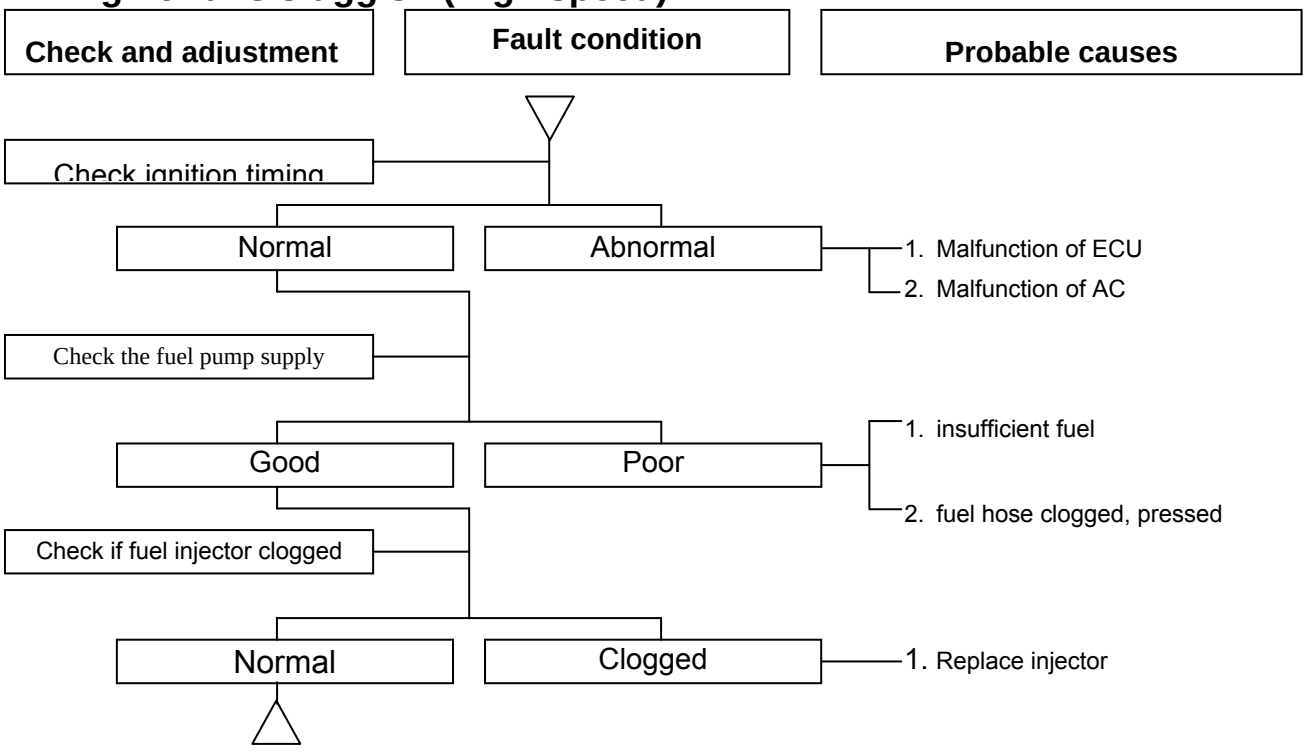
B. Engine runs sluggish (Speed does not go up, lack of power)



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

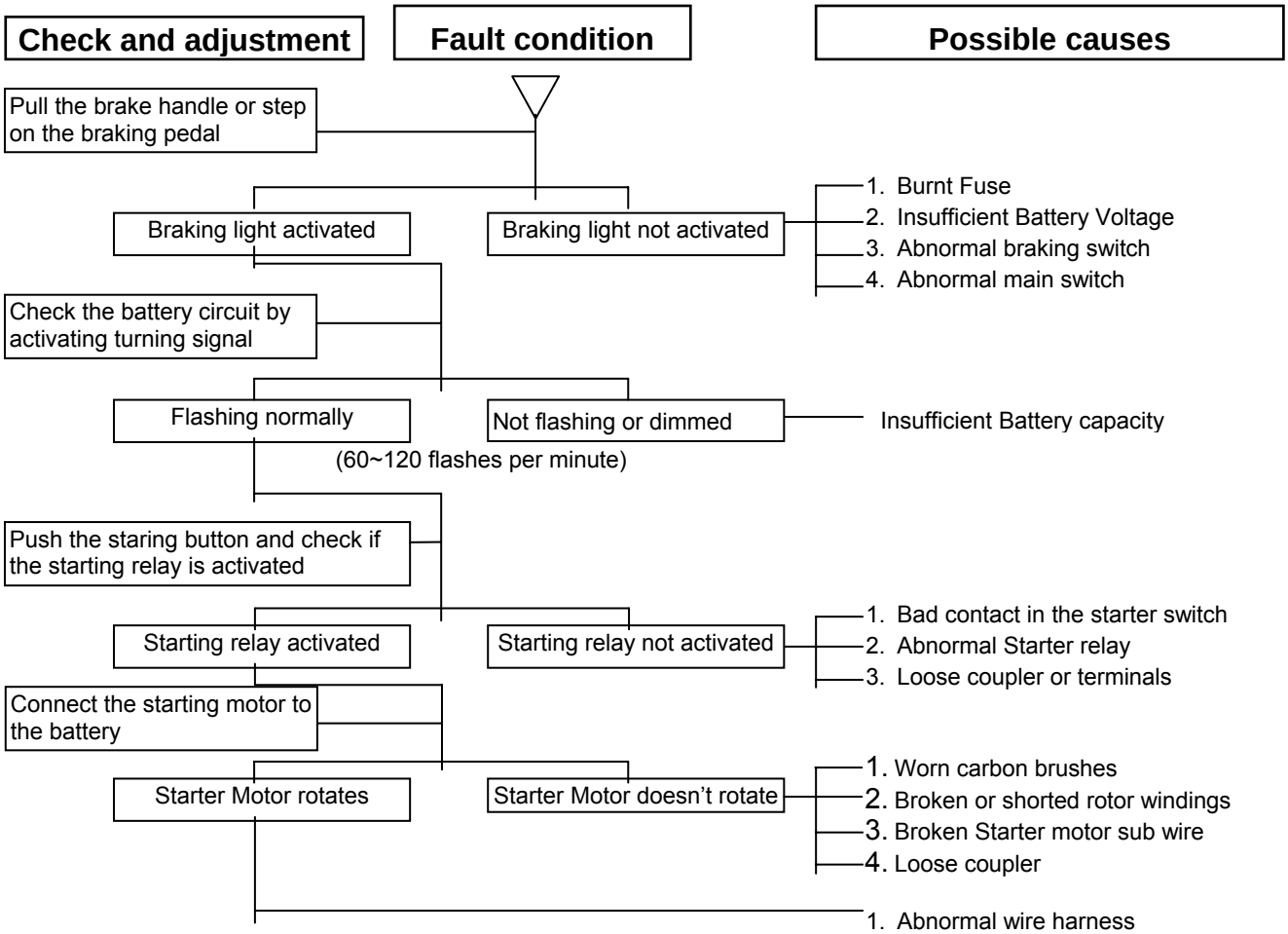


D. Engine runs sluggish (High speed)

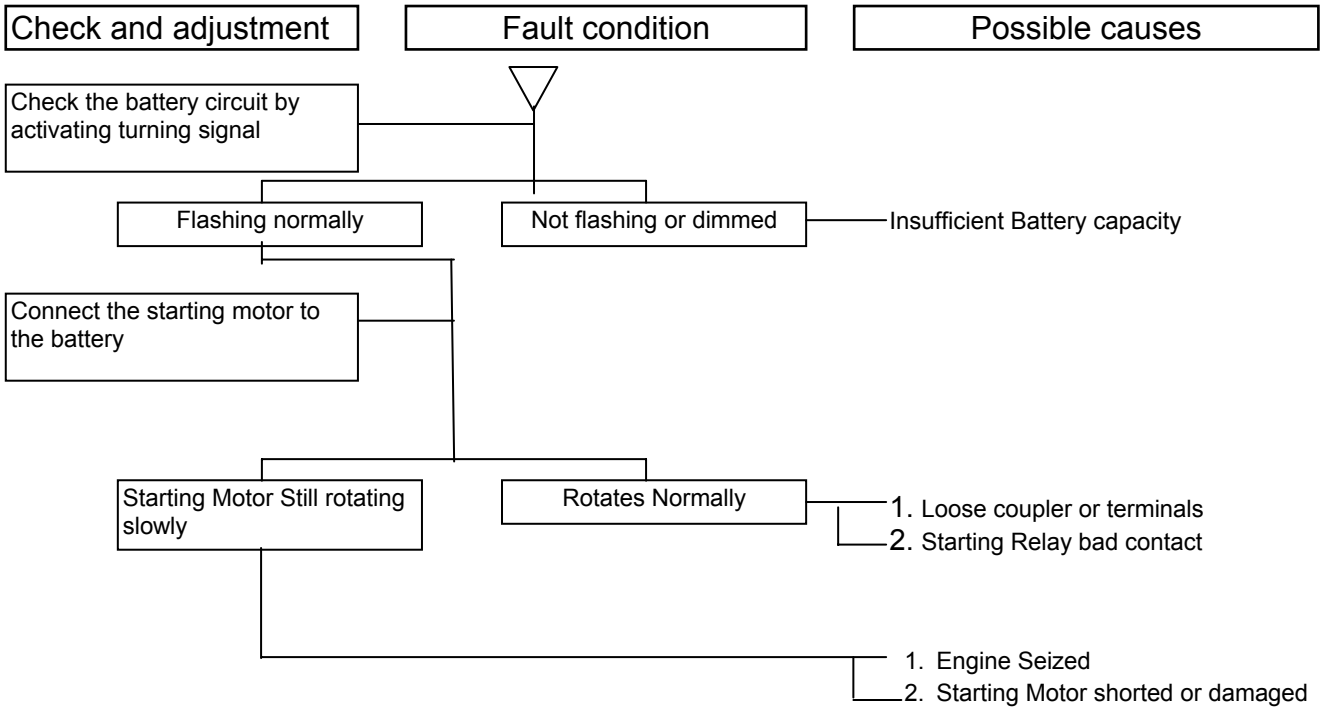


E. Starter Motor Malfunction

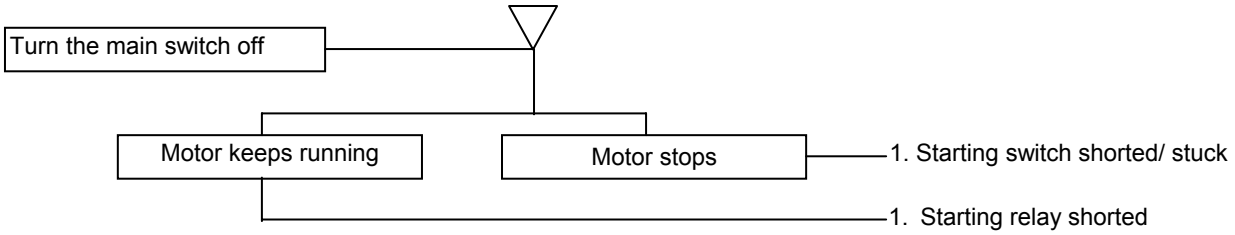
1. Starter Motor doesn't rotate



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



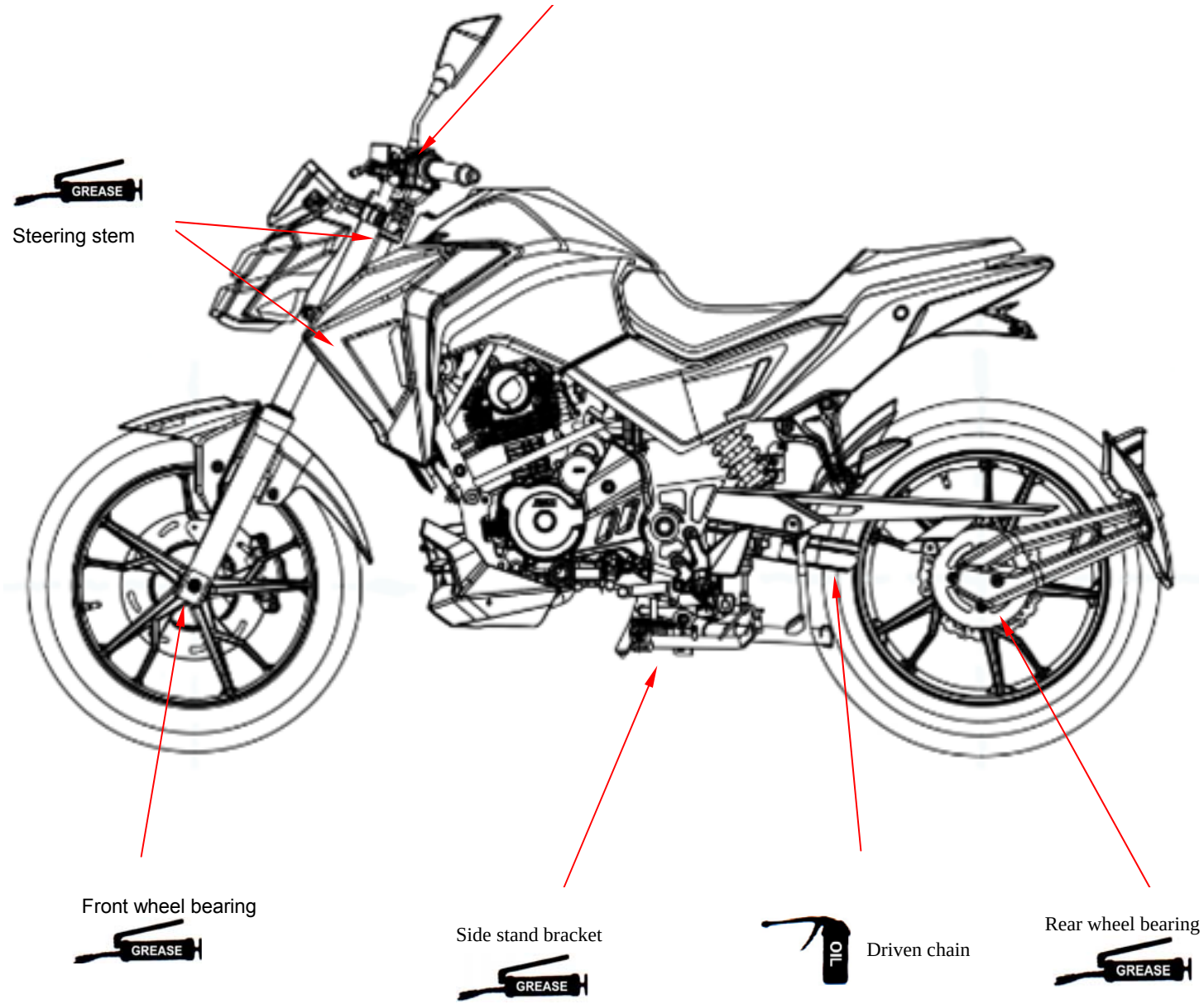
3. Starter motor won't stop rotating



F. Abnormal Engine Noise

Fault condition	Possible causes
Rocker arm noise	1. Excessive valve clearance 2. Worn rocker arm 3. Worn camshaft
Piston slapping	1. Worn piston and cylinder 2. Carbon deposit in the combustion chamber 3. Worn piston pin or connecting rod lower end
Cam chain noise	1. Worn camshaft bearings 2. Worn cam sprocket 3. Loose or worn cam chain
Clutch knocking	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



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Precautions in Operation

Specifications

Fuel tank capacity	Capacity	11000 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		CPR8EA-9
Spark plug gap		0.7~0.8 mm
Ignition timing		BTDC 13º / 1650 rpm
Idle speed		1550±150 rpm
Cylinder compression pressure		12-16 kgf/cm²
Valve clearance	In	0.10±0.02 mm
	Ex	0.15±0.02 mm
Tire size	Front	110/70-17
	Rear	130/70-17
Tire Pressure	Single ride	Front：2.0 kg/cm² / Rear：2.0 kg/cm²
	Tandem ride	Front：2.0 kg/cm² / Rear：2.25 kg/cm²
Battery	Type	YTX7A-BS (12 V 6Ah)

Periodical Maintenance Schedule

NO	Items	Initial 300KM	1 month / every1000 KM	3 months / every3000 KM	6 months / every6000 KM	1year / every12000KM
1	☆Air filter element	I		C	C	R
2	☆Gasoline filter	I			I	R
3	☆Engine oil filter	R			R	
4	☆Engine oil strainer	C			C	C
5	☆Engine oil replacement	R	Change every 1000km			
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	Change every 5000km			
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 spring	I			I	
25	Fuel lines	I		I		
26	Cam chain	I		I		
27	☆Valve clearance	I		A		
28	☆PCV	I		C		
29	☆Crankcase blow-by over-flow pipe	I	Drain every 2000km			
30	☆Evaporative control system			I		
31	☆Throttle body	A	I	A	C	
32	ECUimput voltage				I	
33	EFi sensor coupler	I		I		

Note: I-Inspection A-Adjust R-Replace C-Clean L-Lubricate

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.

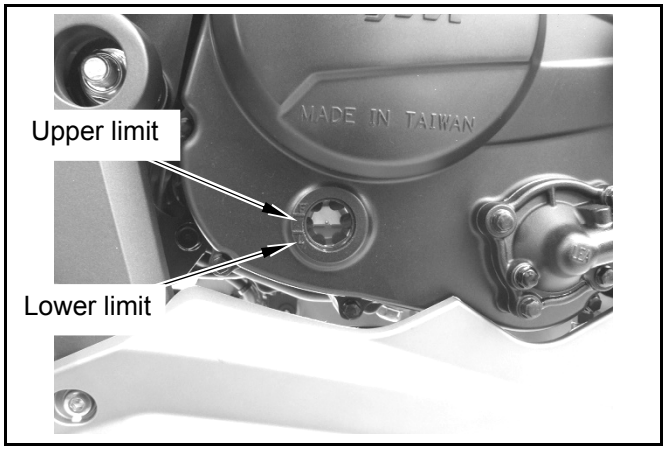
Lubrication System

Engine Oil quantity

⚠ Caution

- Turn off the engine; park the motorcycle on level surface with main stand.
- Run the engine for 3-5 minutes, check oil capacity after engine off for3-5

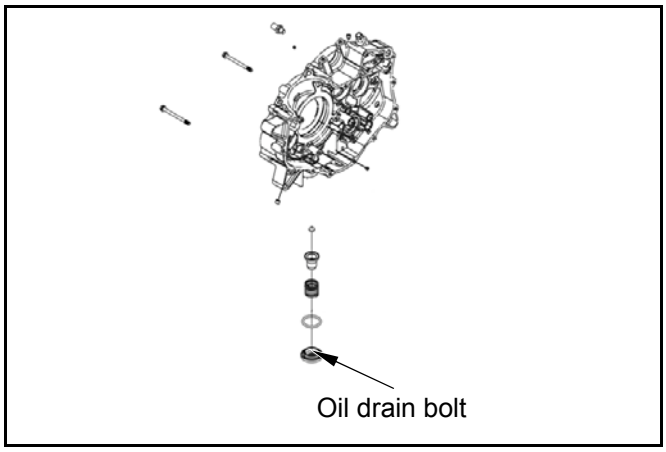
Check oil quantity from inspection window, if oil level is near lower limit, fill in the recommended oil to upper limit.



Exchange engine oil

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 draining oil; that will make engine oil easily and thoroughly drained.

Fill in the engine oil to the standard quantity.

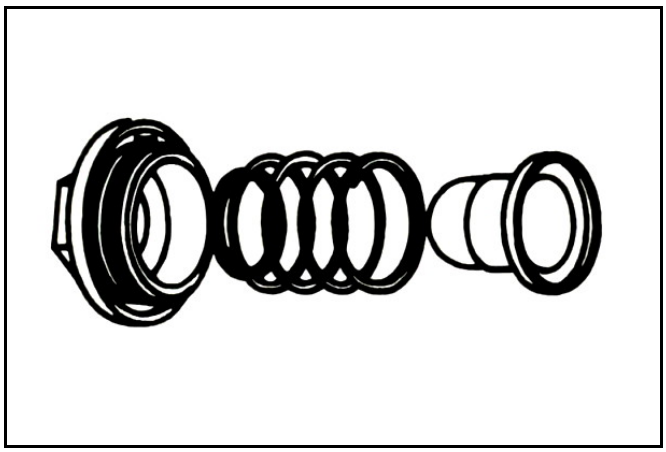
Oil viscosity :SAE10W -30

Engine oil exchange volume

Full disassembly：1200 c.c.

Regular exchange：1000 c.c.

Run the engine for several minutes, check for oil leakage.



Engine oil strainer cleaning

Drain engine oil completely，remove oil strainer cap, spring, and strainer from left side of crankcase.

Clean oil strainer with solvent or compressed air.

Check if O-ring is deformed or damaged, replace if necessary.

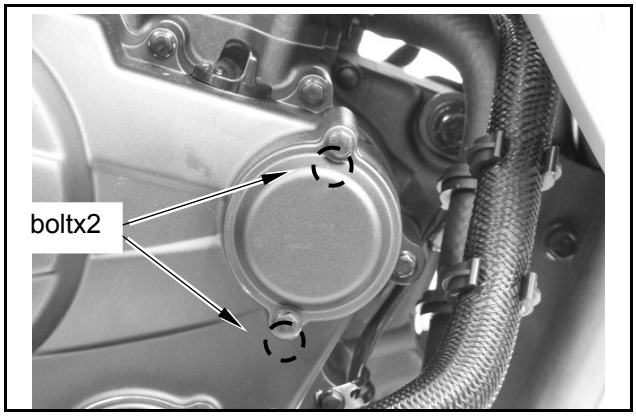
Install strainer, spring, and oil strainer cap.

Torque value：**1.3~1.7kgf-m**

Replace oil filter

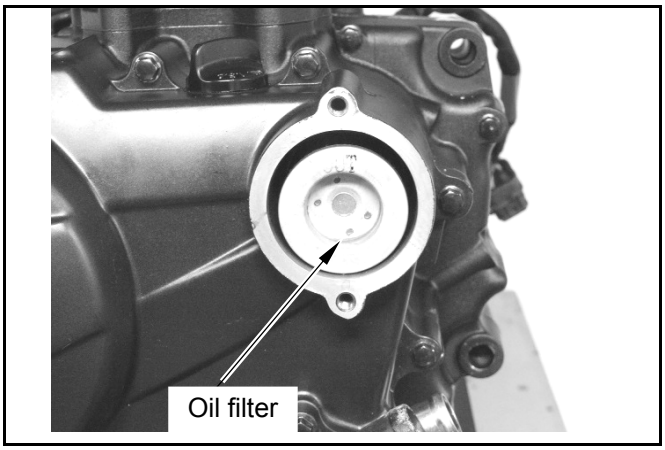
Remove bolts of oil filter chamber.

Remove the filter and replace it with a new one.



⚠ Caution

- Oil filter is paper type and cannot be cleaned or reused.



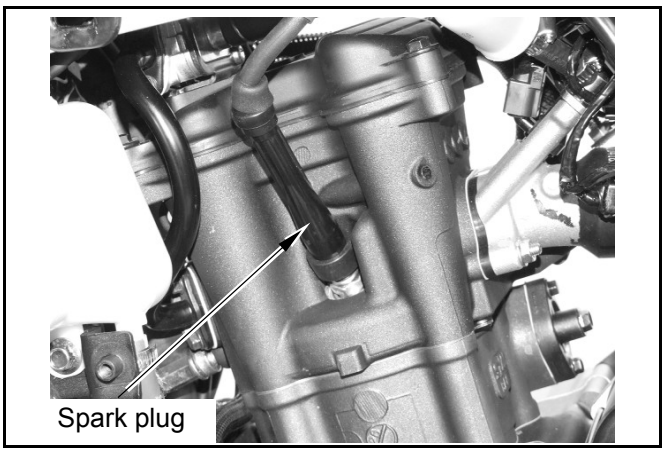
Cylinder compression test

Warm up engine and turn it off.

Remove left cylinder head cover

Remove spark plug cap and spark plug.

Install compression gauge into the spark plug hole, full open the throttle, and rotate the engine.



⚠ Caution

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

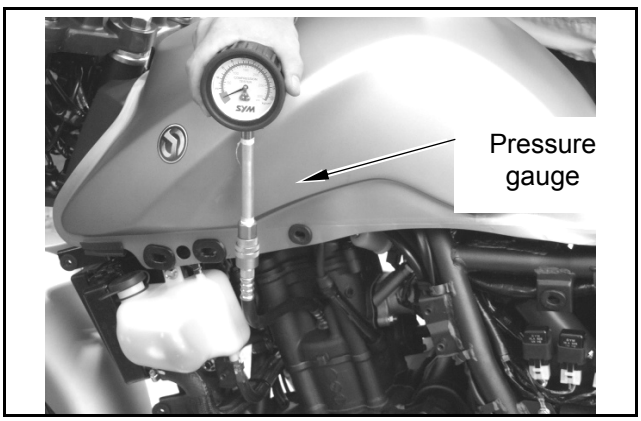
- Usually, the highest-pressure reading will appear in 4~7 seconds.

Compression pressure：12 -16 Kgf/cm²

Check the following items if the pressure is too low:

- Incorrect valve clearance.
- Valve leakage
- Cylinder head leakage. Piston, piston ring, cylinder damaged.

Over-high pressure means combustion chamber or piston top deposit carbon.



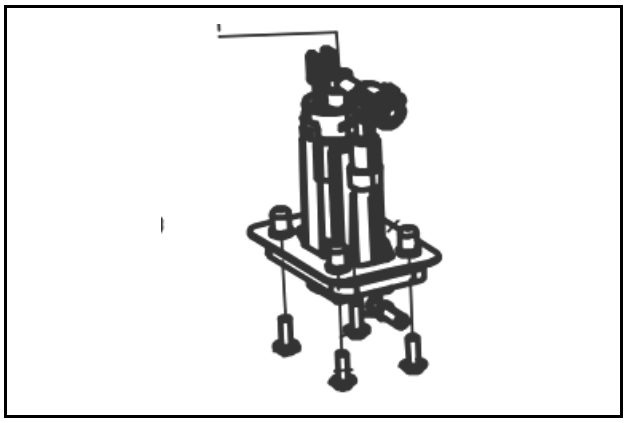
Fuel System

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.



Remove seat, fuel tank, and fuel pump.

Check if fuel filter is clogged or broken; replace it with a new one when necessary.

Check the fuel line for leakage.

Air filter

Air filter element

Remove the seat.

Remove the air filter cover (2 Screws)

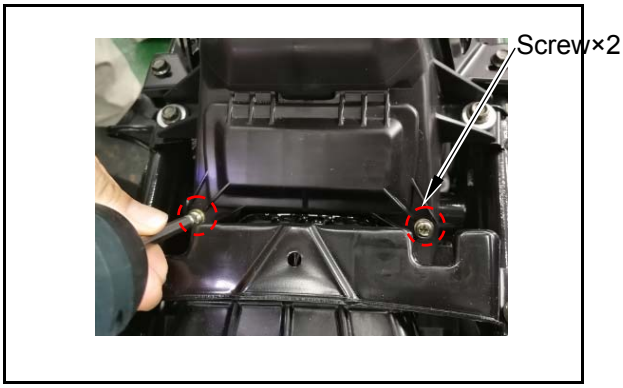
Remove the air filter element

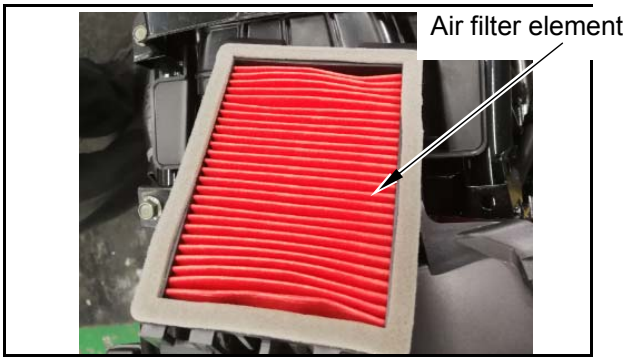
Check if the filter element is dirty or damaged.

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

⚠ Caution

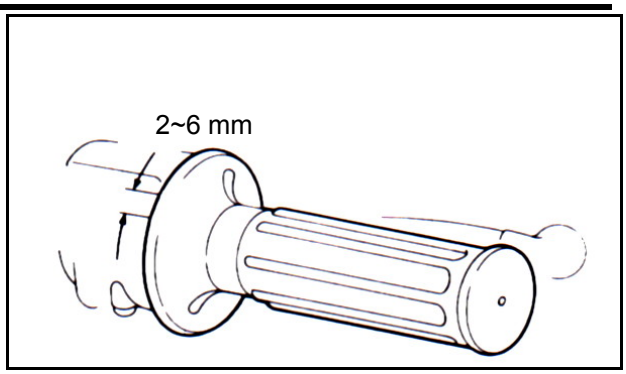
- The air filter element is paper type and cannot be soaked or washed, or engine performance will be affected.
- If the filter element is not installed correctly, dust will be sucked into cylinder, which will result in decreased power and shortened engine life.



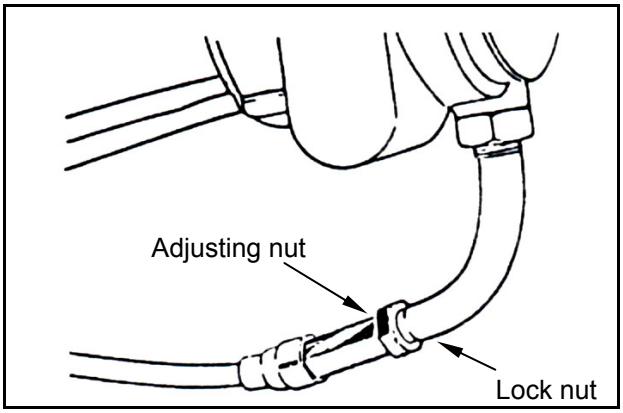


Throttle operation

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 does not go smoothly, lubricate the cable.
Measure the free play of the throttle grip, through the inner side flange of it.
Free play：2~6 mm



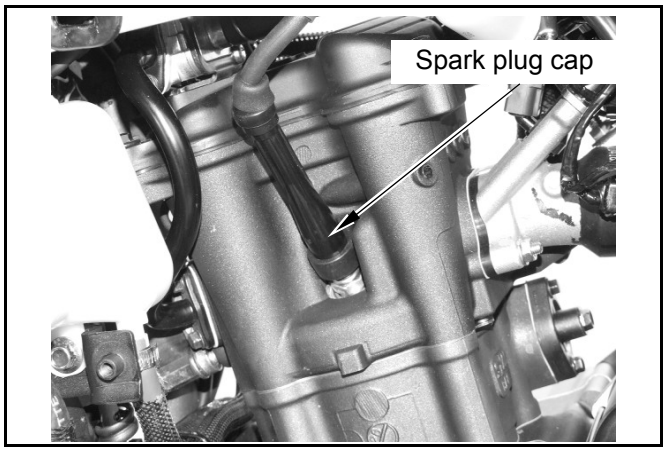
Adjustment can be done on both side of throttle cable.
Conduct secondary adjustment on upper side.
Loose fix nut and rotate it to adjust free play.



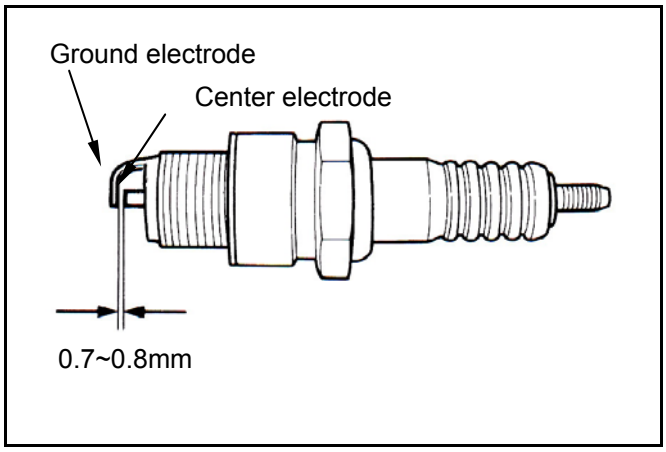
Spark plug

Recommended spark plug

Remove cylinder head left cover. (boltX3)
Remove spark plug cap.
Clean dirt around the spark-plug hole.
Remove spark plug.



Measure spark plug ignition gap.
Spark plug gap：0.7~0.8 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
Install the spark plug cap.

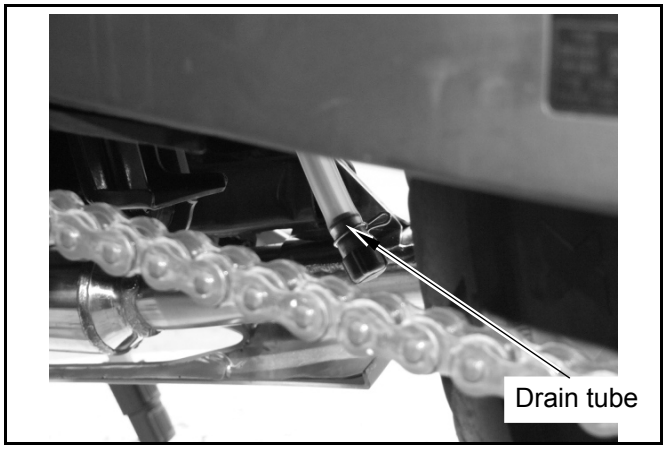


PCV System

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 tube.

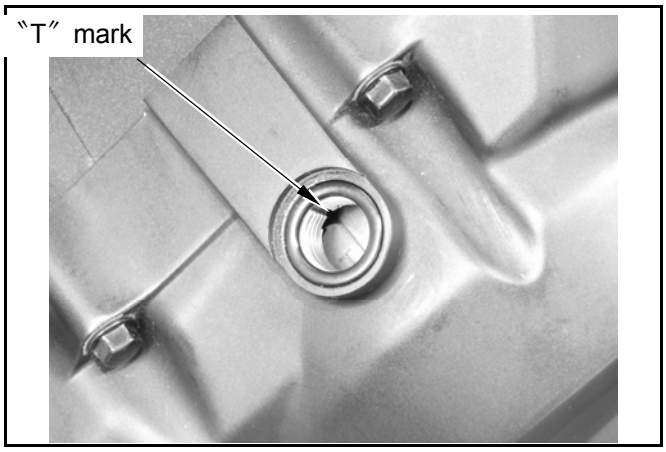


Valve clearance Adjustment

Caution

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

Remove fuel tank. Remove cylinder head.
Remove 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)

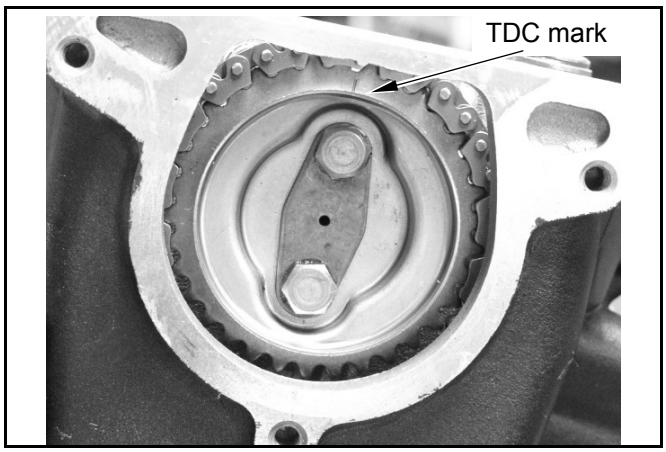


Valve clearance inspection & adjustment

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

Valve clearance： IN: 0.10±0.02 mm
EX: 0.15±0.02 mm

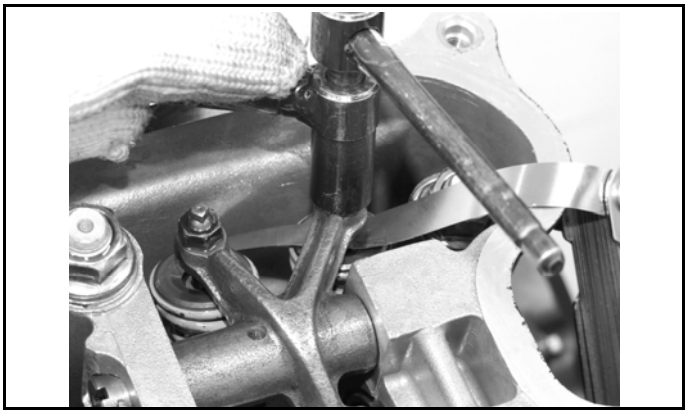
Adjust by loosening the lock nut first, and turning the adjusting screw.



Caution

- When adjusting valve clearance, make sure all clearance on standard volume; recheck after tightening lock nuts.

Install cylinder head, cylinder head side cover, timing inspection cap, and the AC.G cap



Caution

- Before installing cylinder head side cover, timing inspection cap, and the AC.G cap, check if the O-ring is damaged, and apply some oil on it.

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 have different wearing situations, 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 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.

Torque value：4.0~5.0kgf-m

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

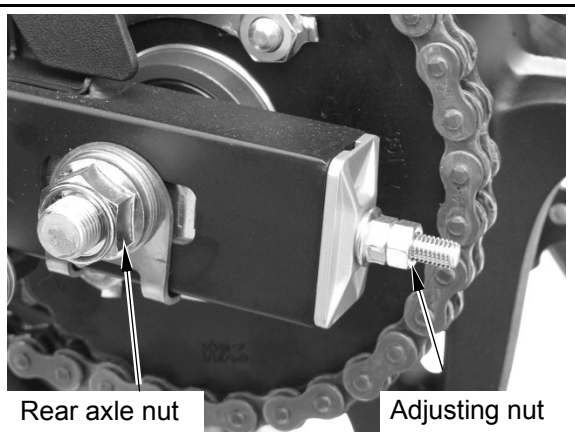
Recheck the chain slack, and make sure the rear wheel rotates smoothly.

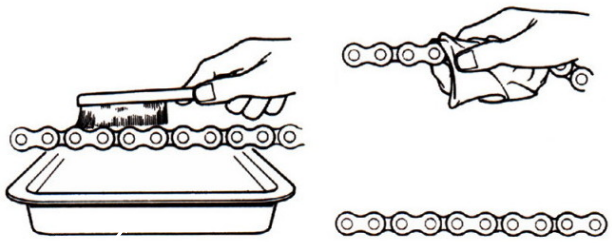
If the chain is too dirty, use high-flash point solvents to clean the chain. (Kerosene or Diesel.)

⚠ 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.

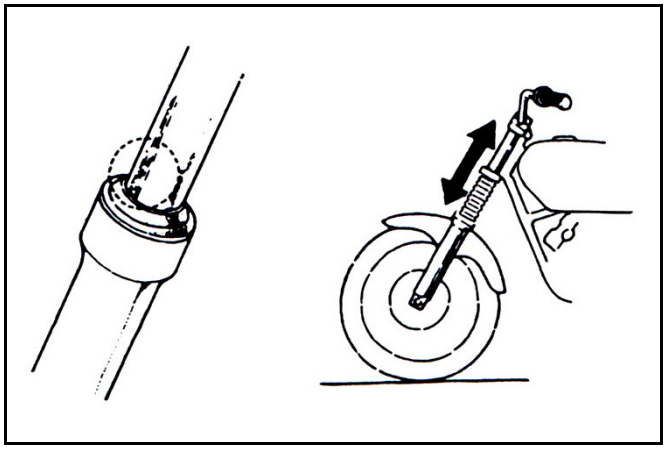
Turn handle from right to left and check if turning is smoothly.

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

Suspension system

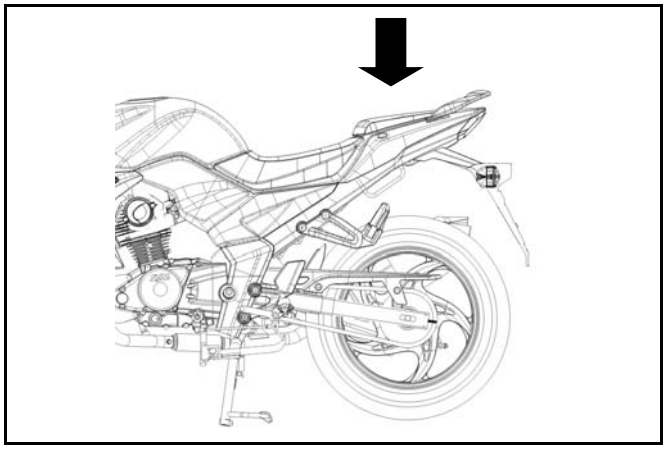
⚠ Caution

- Do not ride the motorcycle with poor cushion.
- Loosened, worn or damaged cushion will make poor stability and maneuverability.



Front cushion

Press down the front cushion several times to check its integrity.
Check if any oil leakage or damage.
Replace relative parts if damaged.
Tighten all nuts and bolts.



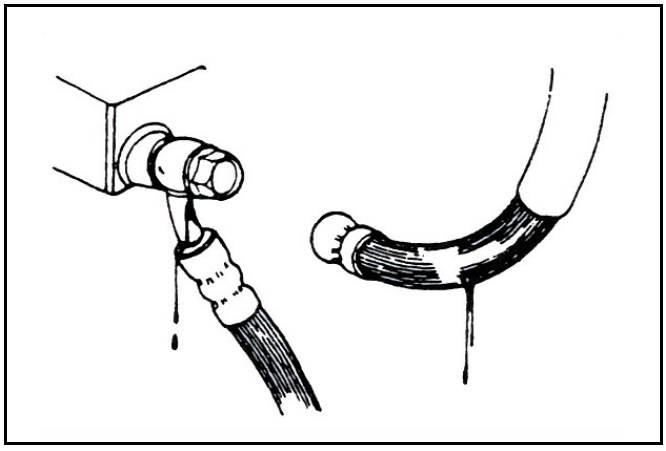
Rear cushion

Press down the rear cushion several times to check its integrity.
Check if any oil leakage or damage.
Replace relative parts if damaged.
Start the engine and gradually rise R.P.M. to rotate the rear wheel; check if any looseness, vibration; replace bushing if damaged.
Tighten all nuts and bolts.

Disk brake system

Brake System Hose

Check the brake hoses for corrosion or brake fluid leaking.

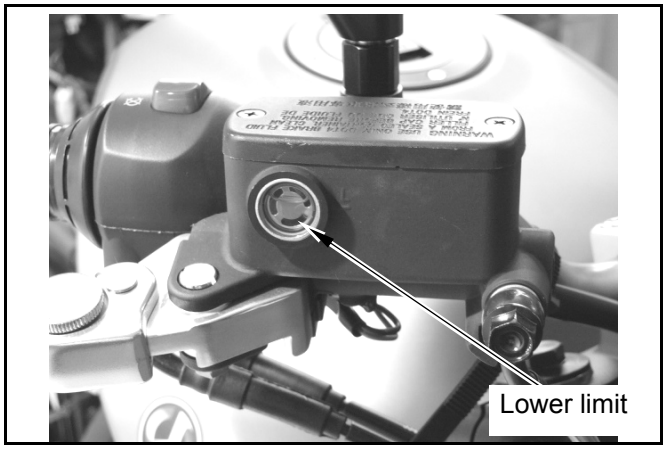


Brake Fluid

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

- To keep the reservoir in horizontal position, do not take off the brake fluid cap before keeping the steering handle steady.
- Do not operate the brake lever after the cap removed. Otherwise, the brake fluid will be sprayed out.
- Do not mix non-compatible brake fluid.



Air bleeding operation

Connect a transparent hose to air-bleeding 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 hose.

⚠ Caution

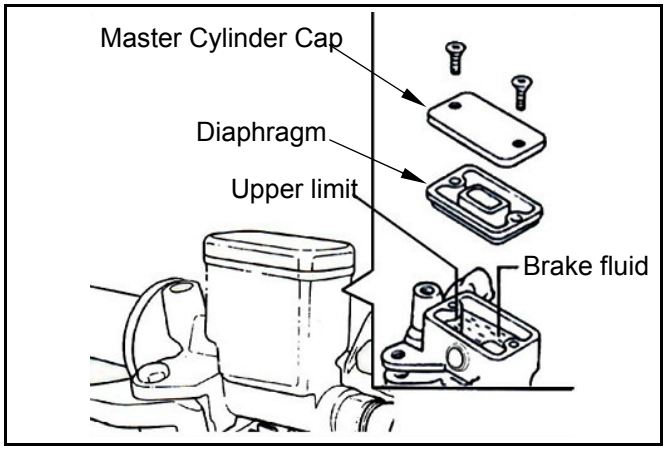
- Before closing the air bleed valve, do not release the brake lever.

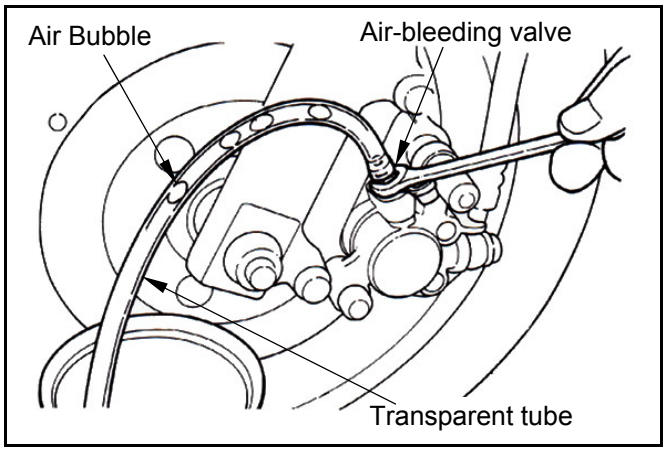
Add Brake Fluid

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

⚠ Caution

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





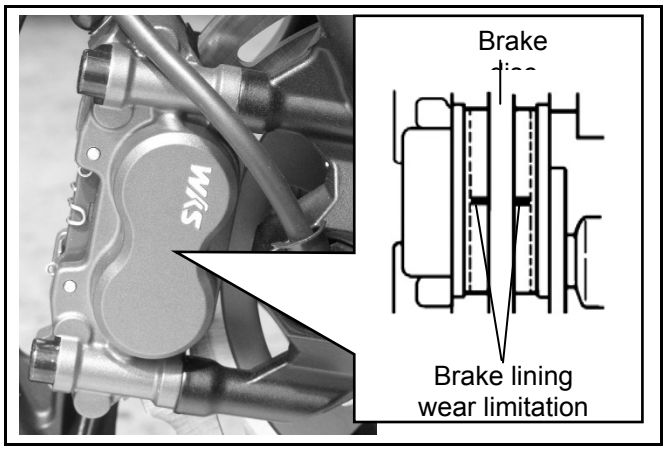
Brake Lining Wear

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.



Tire

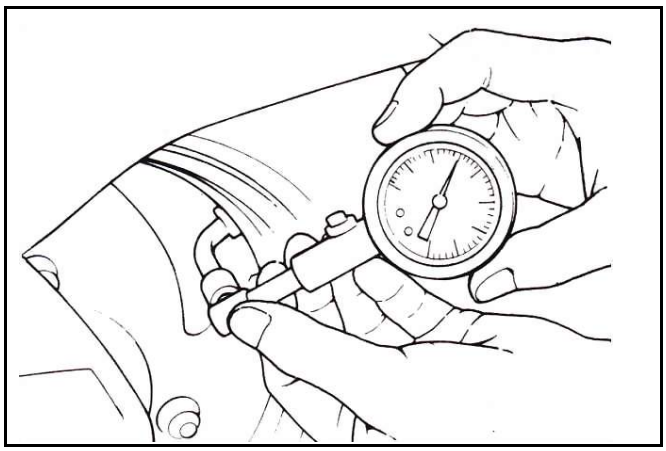
Check the pressure of the tire to see if it is in the specified pressure range.

⚠ Caution

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

Specified tire pressure range

Tire pressure		Front	Rear
Tire pressure when cold (Kg/cm²)	Single riding	2.0	2.0
	Dual riding	2.0	2.25



Specified tire:
Front：110/70-17
Rear：130/70-17

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

Check if tire surface and wall are damaged or worn, replace when necessary.

Check tire tread depth with eye or tire depth gauge.

Replace the tire if it is uneven worn or insufficient tread depth.

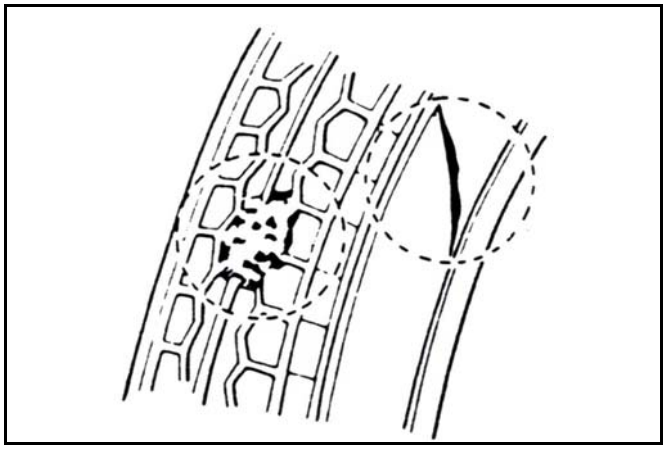
If the wearing of the tire thread reaches triangle TWI mark index, the tire have to be replaced.

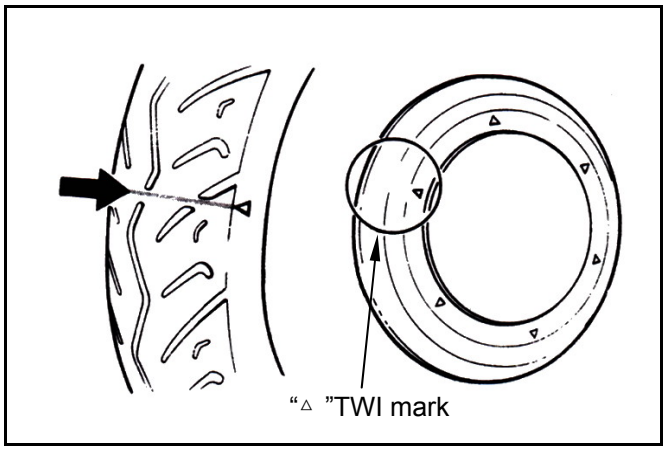
Measure tire thread depth from tire central surface, replace the tire, if the depth is not enough.

Minimum tread depth:

Front wheel: 1.5 mm

Rear wheel: 2.0 mm

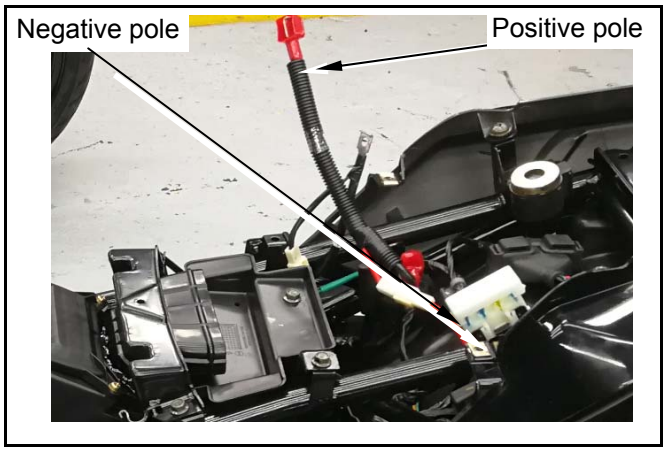




⚠ Caution

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

Battery



Battery removal

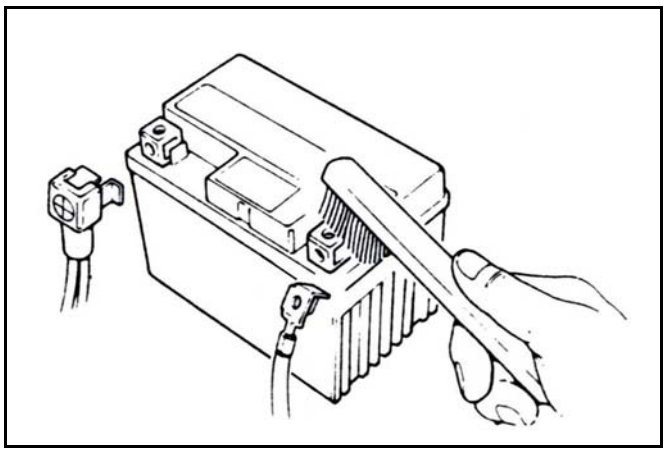
Remove the seat

Remove the 〝—〞 negative pole first, then remove the 〝+〞 positive pole.

Remove the battery holder and take out the battery.

⚠ Caution

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

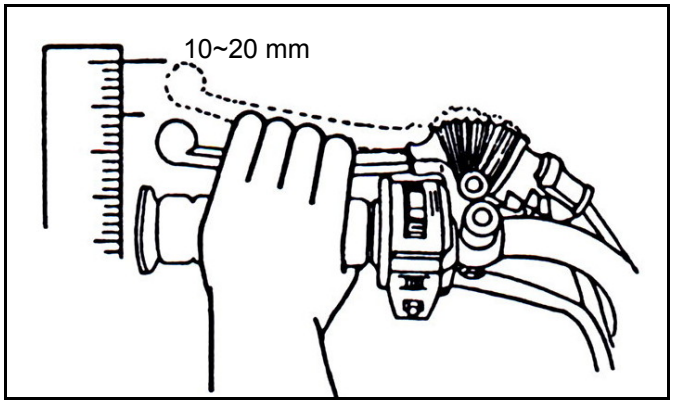


If there is some rust on battery posts, clean it with steel brush.

Install the battery in the reverse procedures of removal.

Battery model : YTX7A-BS

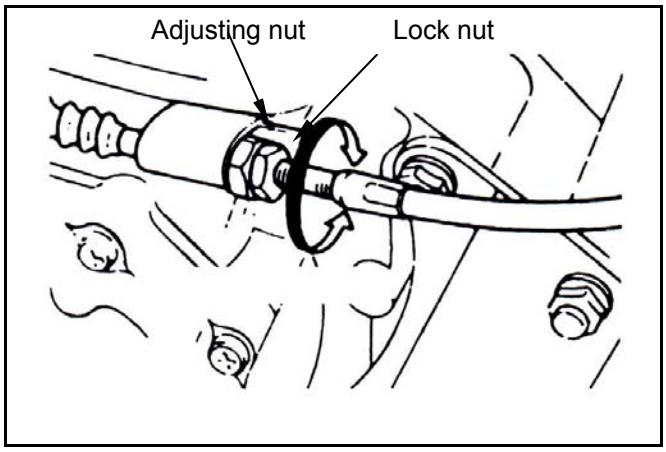
Clutch adjustment



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.

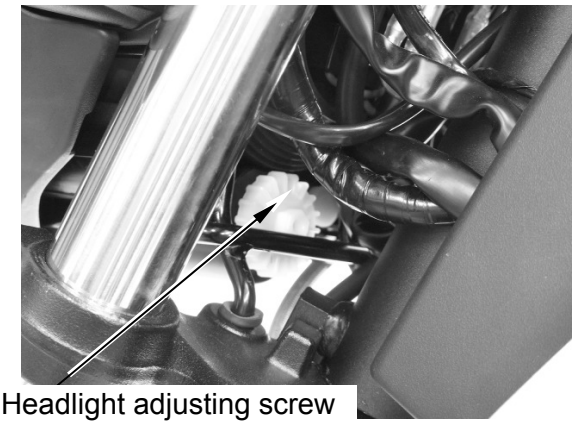
Lubricate the clutch cable.

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.

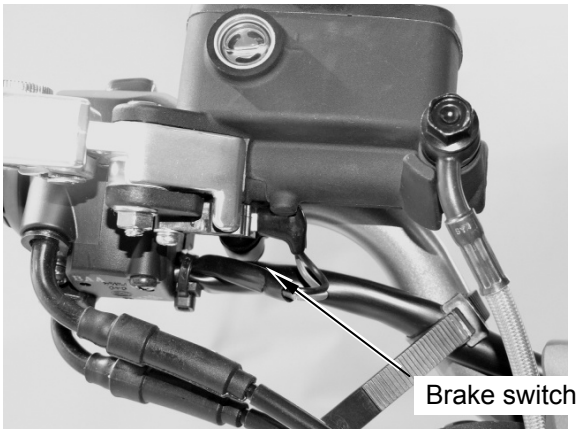

Headlight adjusting screw

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.


Brake switch

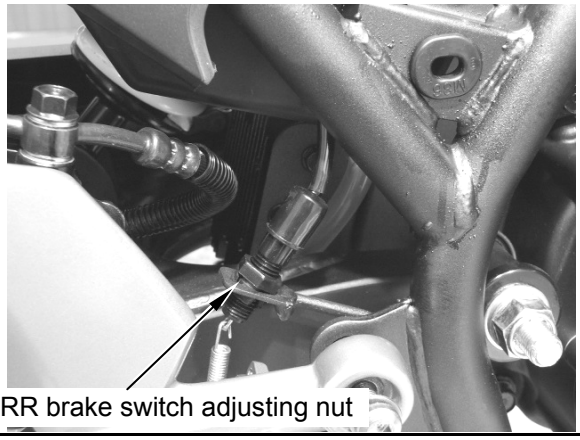
Adjustment of rear brake switch

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 will increase the free play.


RR brake switch adjusting nut

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 within standard torque.

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

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EFi System Components ····· 4-3
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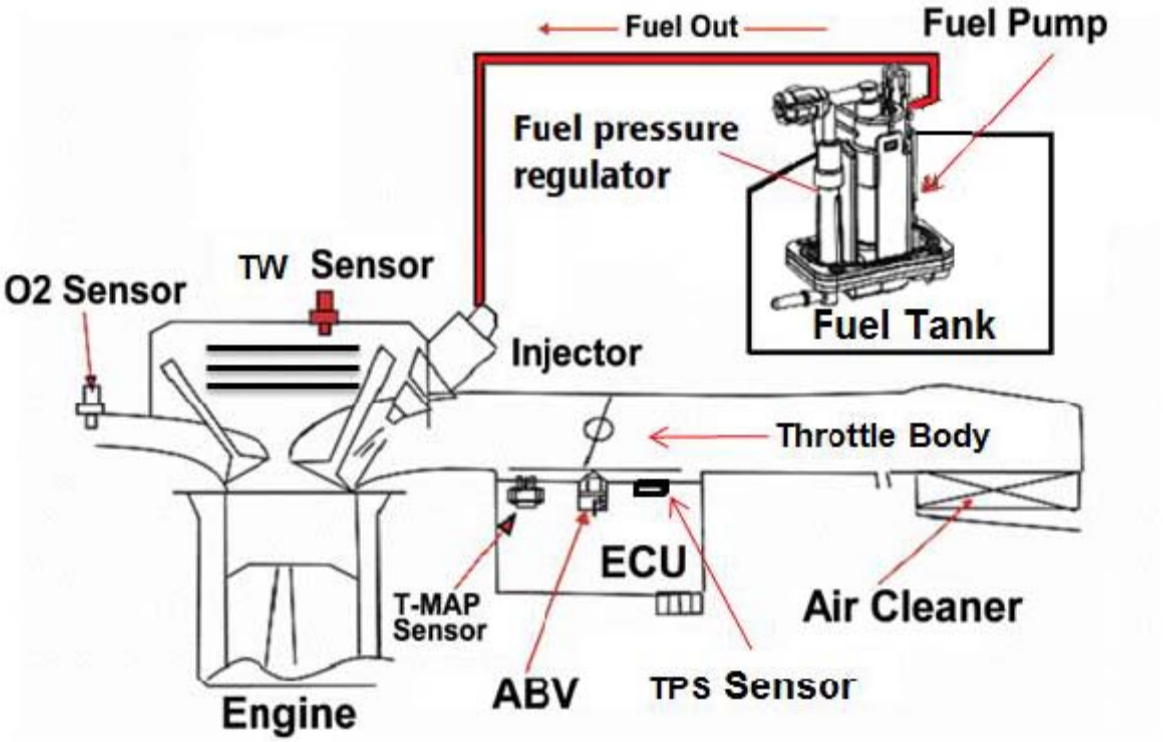
5

EFi System Diagram



EFi System Introduction

Based on 4-stroke SOHC engine, displacement 125/180 c.c. electronically controlled fuel injection. The O2 sensor enhances the efficiency of the catalytic converter, by dynamically controlling the Fuel/Air ratio.

Electronic Fuel Injection Device

Fuel supply devices: fuel tank, fuel pump, fuel filter, and fuel pressure regulator.
Fuel control devices: fuel injector, and ECU.
The fuel is pumped from electrical fuel pump in the fuel tank, to the injector on the inlet pipe. The fuel pressure regulator keeps the pressure around 2.5 Bar. The signals from ECU enable the injector to spray fuel into the combustion chamber once each two crankshaft-revolutions. The excessive fuel flows back to the fuel tank through the fuel pressure regulator. Fuel pump is placed inside the fuel tank to reduce the working noise, and the complicity of fuel pipes. Electrically controlled ignition and injection system effectively reduce fuel consumption rate and pollution.

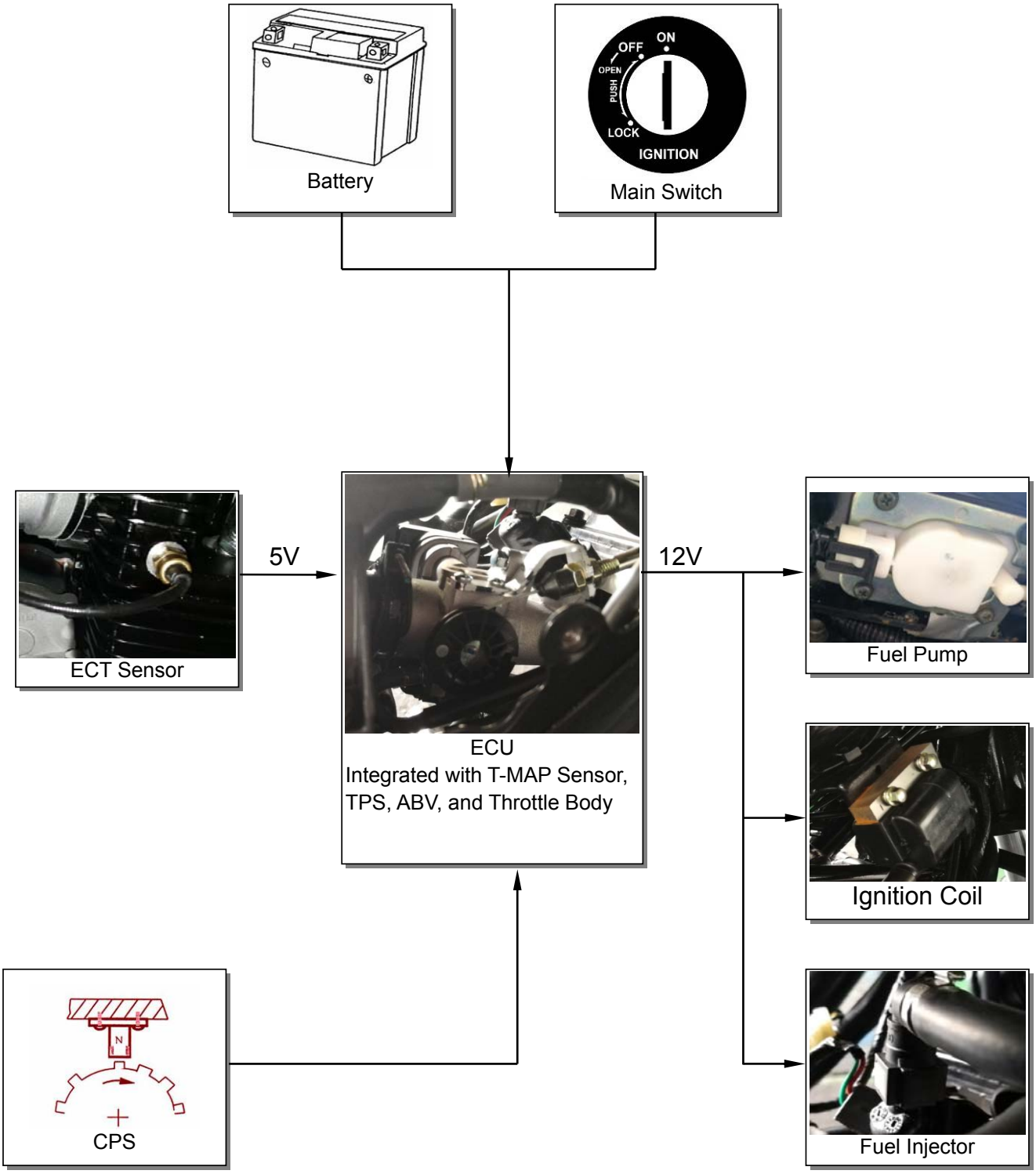
In traditional gasoline engine, carburetor supplies the fuel. The process is done by the engine vacuum, and the negative pressure in the carburetor mixes fuel with air. Under this condition, three major processes are done simultaneously in the carburetor: 1. air quantity measurement, the determination of fuel quantity, the mix of fuel and air.

Electronic fuel injection system separates the three major processes into three different devices: 1. T-MAP sensor measures the air quantity and temperature and sends the signal to ECU as a reference. 2. ECU determines the amount of fuel to be injected, according to the default A/F rate. 3. ECU enables the injector to spray appropriate fuel amount. The independence of these three functions will raise the accuracy of the whole process.

EFi engine uses computer-programmed fuel injection, the main features are:

1. The quantity of fuel injected is determined according to the condition of the engine. The engine RPM, and throttle position determines the fuel quantity and injection time-length.
2. The quantity of fuel injection, and the determination of injection time length, are all controlled by 16-bit microcomputer.
3. The fuel pressure regulator maintains a 2.5 Bar pressure difference between inlet pipe and fuel pipe, raising the accuracy of fuel injection.
4. By measuring the air pressure of inlet pipe, this system gives the vehicle better accommodation to the environment.
5. Air by-pass system supplies fuel and air to stabilize the idle running, and cold starting.

EFi System Components



EFi System Component Description

Integrated ECU Module

Engine Control Unit (ECU)

- Powered by DC 8~16V, and has 32 terminals connector on the unit.
- The hardware component consists of an 16-bit computer that is its control center. It contains the functional circuit interface of engine condition sensing and the driving actuator for the air by-pass valve, fuel injector, and fuel pump, as well as transistor ignition coil.
- Its major software is a monitor strategy operation program that includes with controlling strategy, microarray profile and self-diagnosis programs.

Air Bypass Valve (ABV)

- Its major component is the solenoid valve of high resistance driven by electric current.
- By means of signals from all sensors, ECU outputs a signal to control the opening angle of the valve so that can adjust air flowing to the inlet manifold through the air by-pass valve, and then correct the idle speed to have engine in normal operation.

T-MAP Sensor

- The major component of the T-MAP sensor is a variable transistor IC. Its reference voltage is DC 5V, and output voltage range is DC 0~5V.
- It is a sensor of combination by both sensing pressure and temperature, and can measure the absolute pressure and temperature in intake process. It also conducts the fuel injection quantity correction based on environmental temperature and position level.

Throttle Position Sensor (TPS)

- Its major component is a highly variable resistor. The input voltage range: 5V DC.
- Located on the side of throttle body. By means of the throttle valve rotation to cause voltage change in linear, it provides ECU with current throttle valve openness information. And also, the ECU determines the most properly fuel injection and ignition timing.

Idle Speed Control Valve (stepper motor) :

- If it’s mainly low-power DC motors, drives idle speed control valve (ISC) of the movement to adjust the idle air flow channel size, control of idle speed of the engine in the cold or hot.

Fuel Injector

- Powered by DC 8~16V, and has 2 terminals connector on the injector.
- Its major component is the solenoid valve of high resistance driven by electronic current.
- The two terminals are connected to power source and ground respective. It is controlled by ECU to determine the injection timing, and the injector pulse width. Working with 2-valve engine, the unique 2-hole designed injector can provide each intake valve with suitable fuel quantity to reduce HC emission.

Fuel Pump

- Powered by DC 8~16V, and has 2 terminals connector on the pump.
- The two terminals are connected to power source and ground respective. The ECU is to control and manage the operation of fuel pump through electrical power.
- Its major component is a driving fan pump that equipped with a low electrical consuming DC motor. Powered by 12V voltage and keep fuel pressure inside the fuel pump in 2.5 bars, which can offer 14 liters of fuel per hour.
- The fuel pump is located inside of the fuel tank, and installed a filter in front of its inlet so that can prevent from foreign materials sucking into the fuel pump to damage it and the fuel injector.

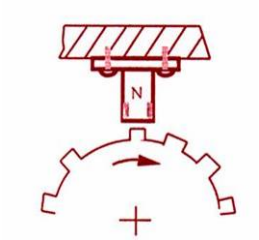
Ignition Coil

- Powered by DC 8~16V, and has 2 terminals connector on the coil.
- The two terminals are connected to power source and ground respective. Its major component is the high transferring rate transformer.
- Its ignition timing is controlled by computer program. From the signals of crankshaft position sensor, throttle position sensor, and engine temperature sensor as well as intake air temperature sensor, and correspondence with engine speed, then the ECU determines the ignition timing properly by means of controlling primary current in ON & OFF operation to create the secondary voltage of 25000~30000V. And then, the voltage triggers the spark plug ignition. Such kind of ignition system not only can enhance engine performance to maximum, but also increases fuel consumption efficiency and improves emission quality.

ECT Sensor

- Powered by 5V DC from ECU, and has 2 terminals connector on the sensor. One terminal is for voltage output and the other one for ground.
- Its major component is the thermo-resistance of negative temperature coefficient (temperature rises up while resistance falls down).
- Located on the cylinder head. Correspondence with engine coolant temperature change, it transferred to voltage signal and sent to ECU to calculate current temperature. Then, the ECU will correct fuel injection time and ignition timing according to engine warm up condition.

CPS

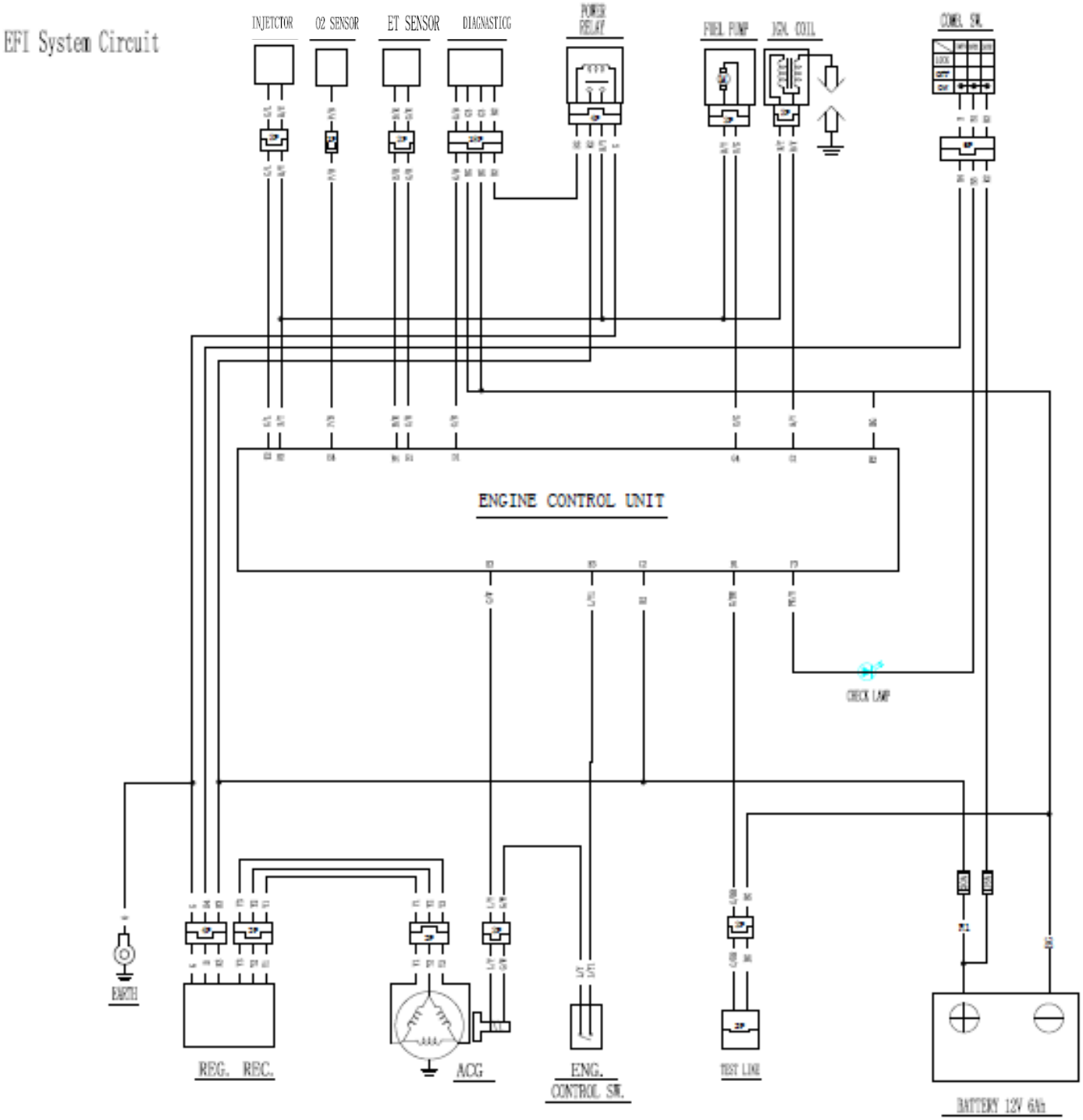


- It does not need power supply, and has 2-signal terminals connector on the sensor.
- Its major component is the magnetic pickup coil, and its output voltage range is ±0.8~100V.
- The air gap between the sensor and flywheel must have .07~0.9mm.
- By cutting the magnetic field, the magnetic sensor sends an inductive voltage that is created with the rotation gear (24-1 tooth) on the flywheel, and the pulse will be sent to the ECU. Then, the ECU calculates current engine speed and crank position based on the voltage so that controls fuel injection quantity and ignition timing properly.

O2 Sensor

- Powered by DC 8~16V, and has 1 terminals connector on the sensor. the one is for signal output.
- The O2 sensor feeds signal to ECU, and the ECU can control the air/fuel rate around 14.6. It's a close –loop control system.
- The catalytic converter reaches the best converting rate when this 14.6 A/F ratio is maintained.
- The heating coil resistance <200kohm (30—45kohm)

EFi System Circuit



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.
- Release the fuel pressure before removing the fuel pipe to prevent splashing the fuel.

⚠ Caution

- Do not bend or twist throttle cable. Damaged cable will make unstable drive ability.
- When disassembling the fuel system parts, pay attention to O-ring position, replace with new one as re-assembly.

Fuel pressure release procedure:
Disconnect the fuel pump relay, switch on and press the start switch for a few seconds to crank the engine.

Specification

Item	
Idle speed	1700±100 rpm
Throttle grip free play	2~6 mm
Fuel pressure	2.5 bar

Torque value

Engine temperature sensor：0.74~0.88 kgf-m

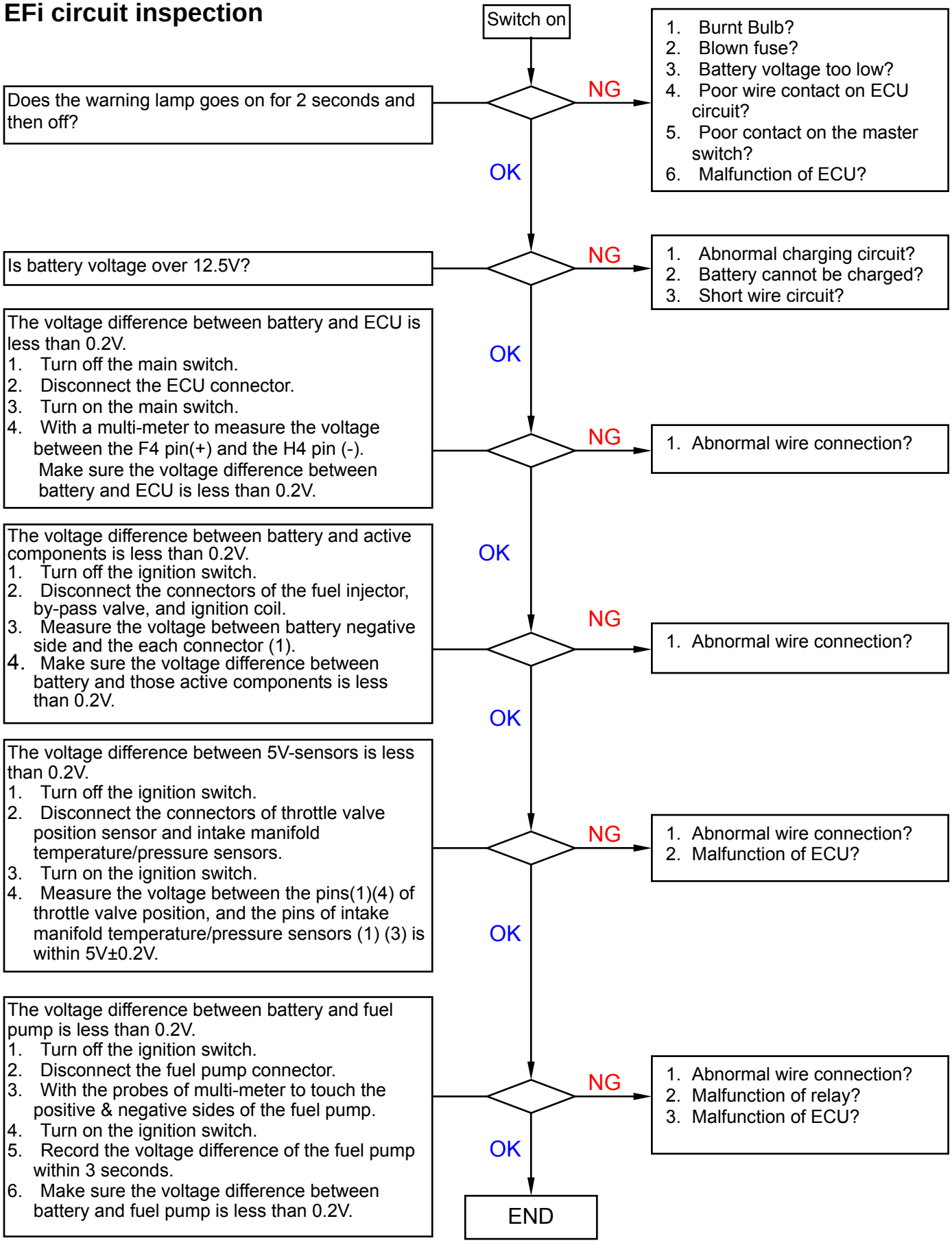
O2 sensor：3.6~4.6 kgf-m

Special tools

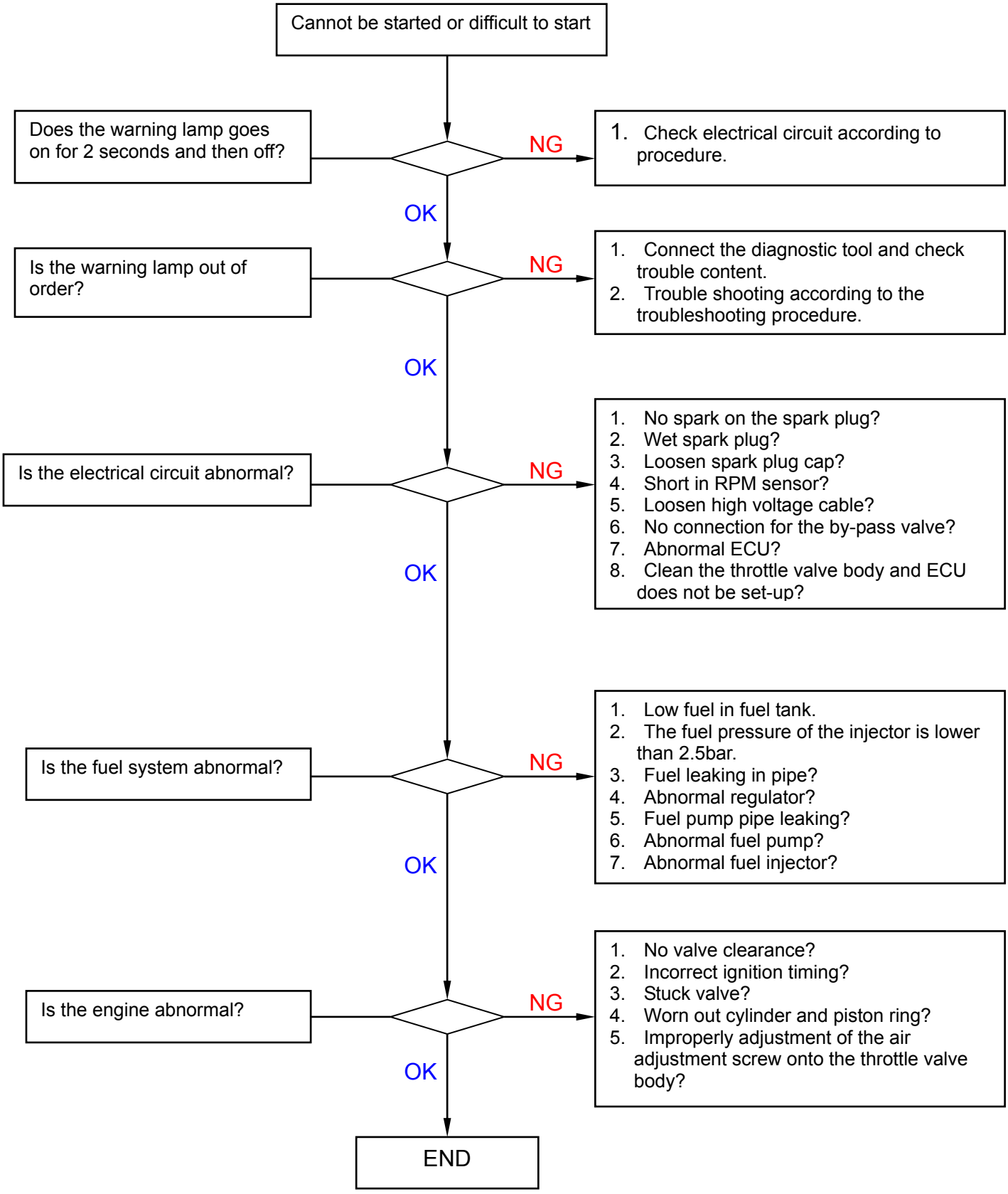
Injection system diagnostic tool

Troubleshooting

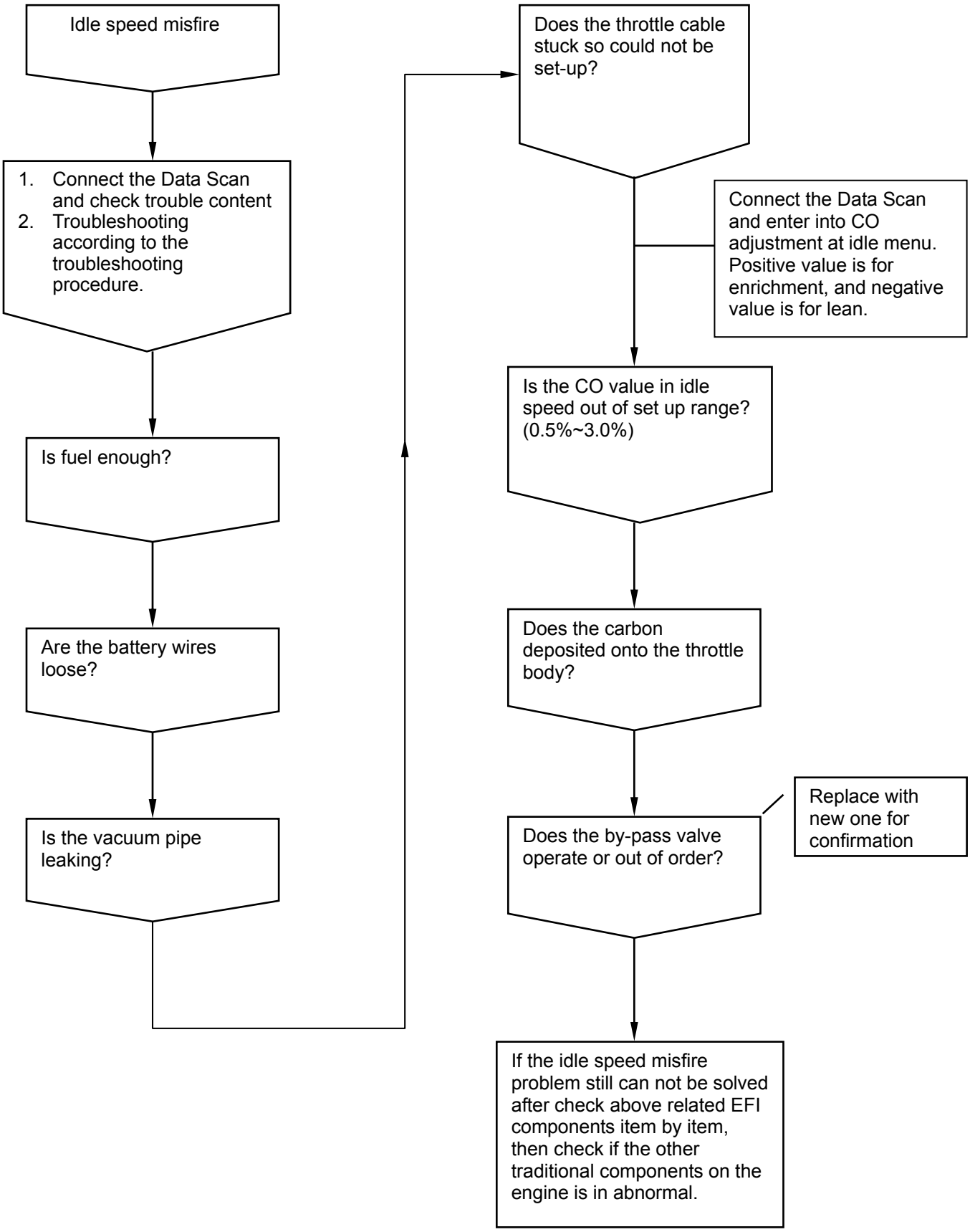
EFi circuit inspection



Engine cannot be started or difficult to start.

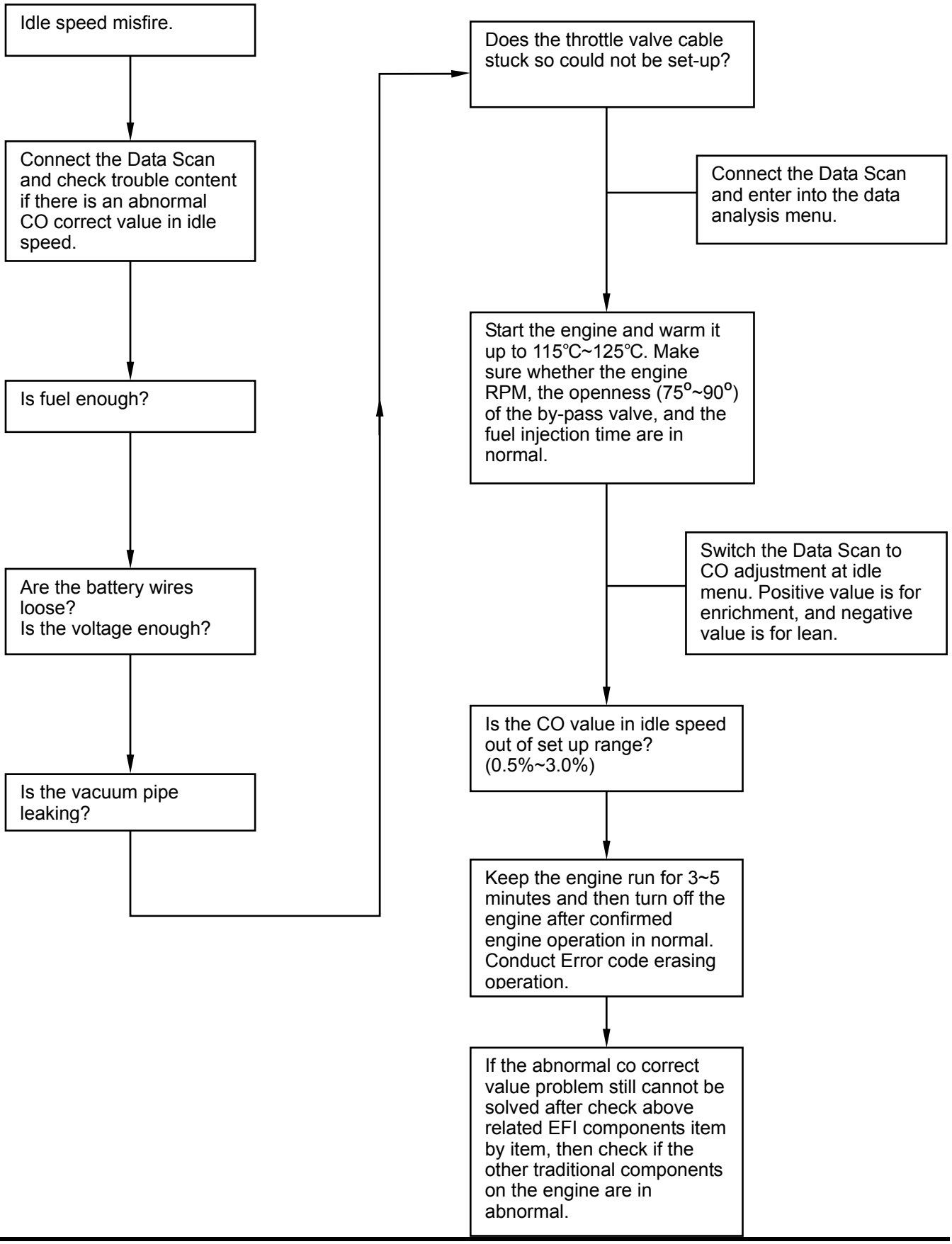


Diagnosis of Idle Speed Misfire



Abnormal CO value

If the system has O2 sensor, the CO value doesn't have to be adjusted. If the CO value still goes abnormal, please check O2 sensor first, to see if any malfunction occurred.



Throttle Body & By-pass Valve Clean Procedure

- It's suggested that clean the air by-pass valve before cleaning the throttle body.
- Recommended cleaning frequency: every 6000 km.

Clean procedure:

1. Air by-pass valve：

1. Switch off; disconnect the air tube between the air by-pass valve and connecting pipe.
2. Turn on the engine and keep the idle speed.
3. Spray a little carburetor cleaner into the air by-pass vale for 3~5 minutes. Do not shut down the engine during cleaning.
4. Connect the air tube.

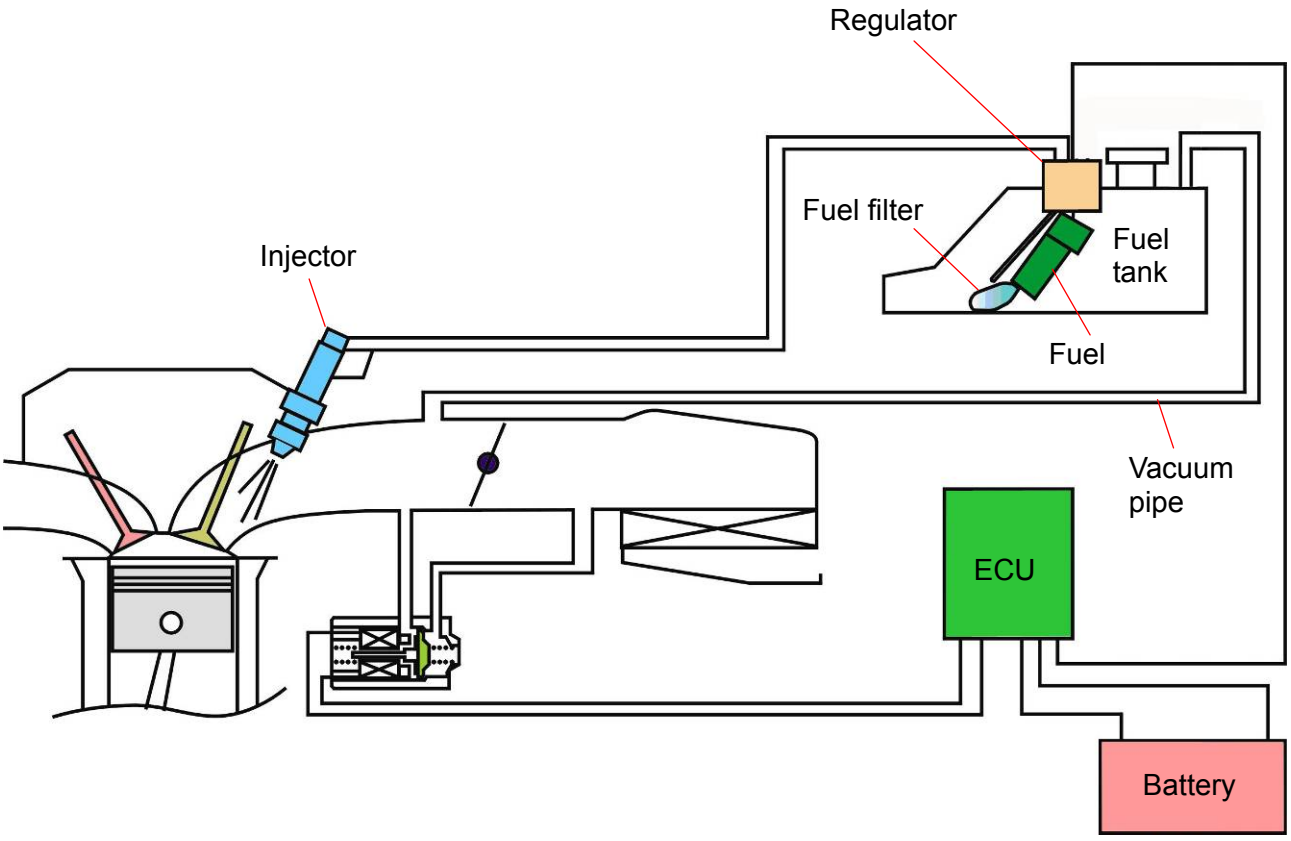
2. Throttle body:

1. Switch off; remove the throttle body.
2. Spray a little carburetor cleaner into the throttle body.
3. Wipe off the dirty oil with clean cloth or tissue.
4. Dry the throttle body with compressed air and install the throttle body. Connect the diagnostic tool and switch on.

Idle speed learning:

After performing air by-pass valve or throttle body cleaning, idle speed learning should be carried out to let ECU know the engine condition well.
When performing the idle speed learning, run the engine at idle speed over 10 minutes after the engine temperature reaches the working temperature (around 70℃~95℃), and then ECU will get the parameters from sensors.

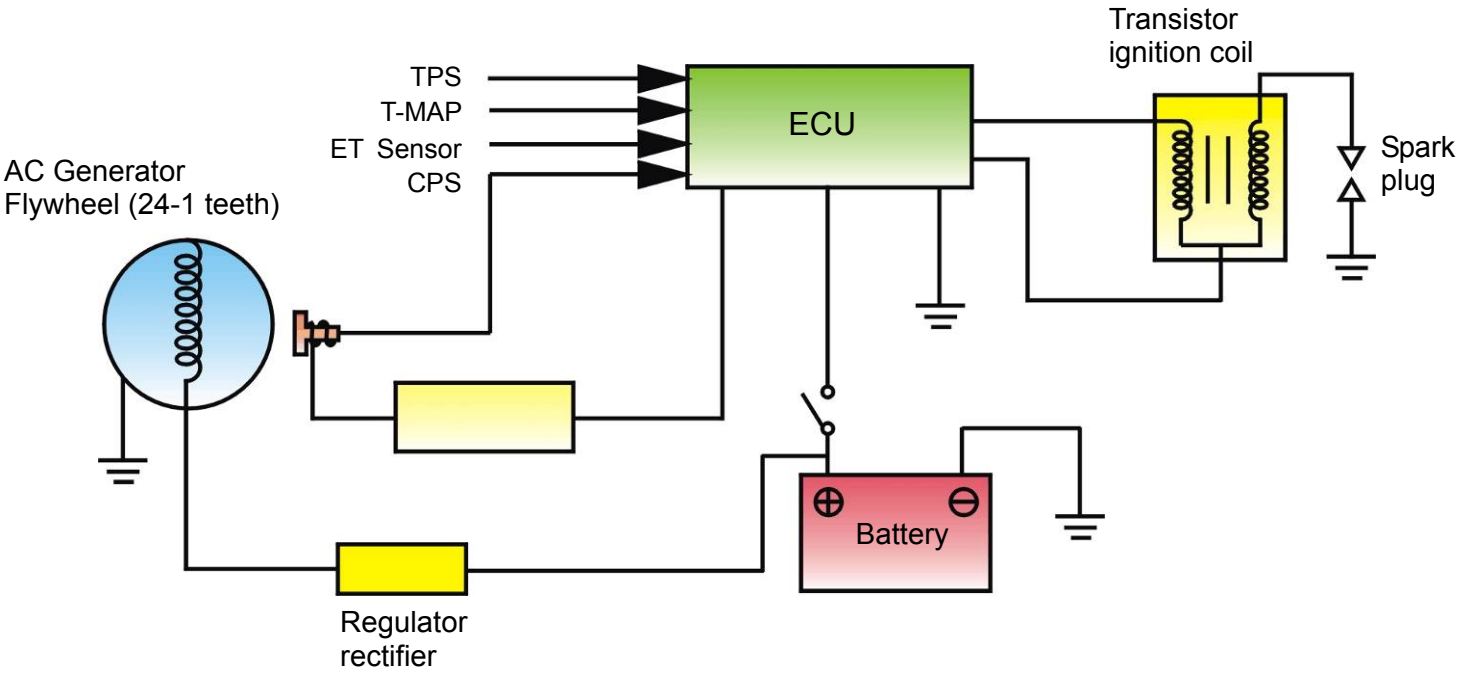
Fuel Lines



System description:

1. After key-on, all sensors' signals sent to the ECU first. The electrical fuel pump will be activated by ECU signal. If the engine did not start for 2~3 seconds, then the fuel pump will be turned off to save electricity. The pressure regulator maintains the fuel pressure around 2.5 Bar, and the fuel injector spray proper fuel quantity according to the conditions and environmental coefficient. When key-off or engine stopped, the fuel pumps stop operating.
2. The fuel filter is to filter alien materials so it has to be replaced regularly.
3. Do not let the starting motor keep running when the engine cannot start. It will cause battery voltage to decrease. If the voltage drops under 8V, the pump will not operate. The countermeasure will be starting the engine by connecting a new battery or with kick-starter.

Ignition System



Principle of operation

The engine is equipped with a computerized ignition control system that collects signals from CPS, TPS, ET Sensor, and T-MAP Sensor. Then, correspondence with engine RPM, this 8-bit microcomputer in the system controls ignition timing properly. The secondary coil creates 25000~30000V high voltage to ignite the spark plug by means of the transistor operation of the primary current entry from the ECU. This can maximize engine performance and also decrease fuel consumption.

Specification

1. **Ignition timing: BTDC 10°/ 1700RPM**

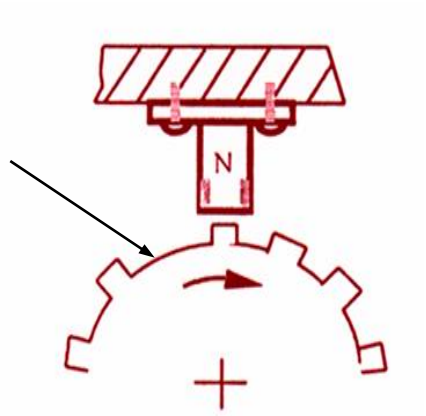
2. **Spark plug: CPR8EA-9**
3. **Gap: 0.8mm**

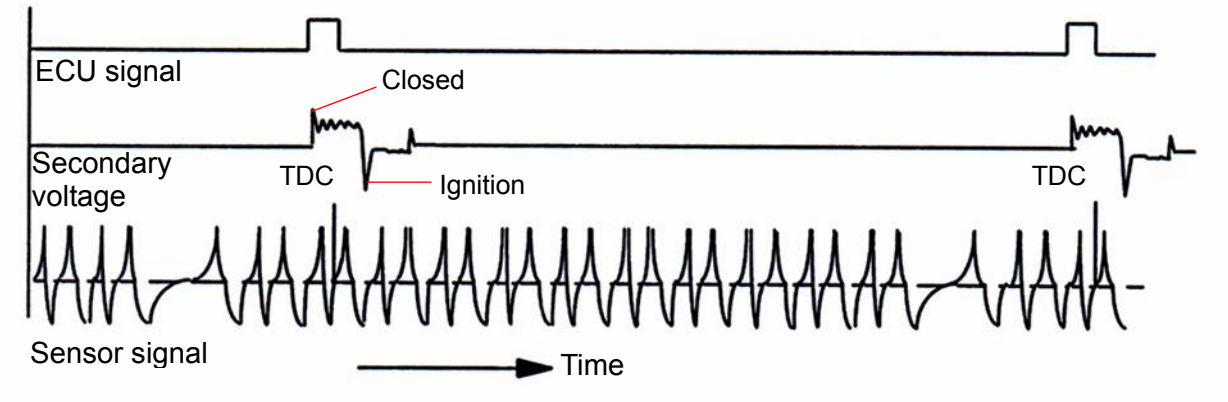
3. **CPS pulse generator coil: 80~160Ω / 20ºC (G/W-LY)**

4. **Ignition coil**
   Primary circuit：0.63±0.03Ω (23ºC)

5. **Battery:**
   Capacity: 12V 6Ah

Crankshaft Position Sensor

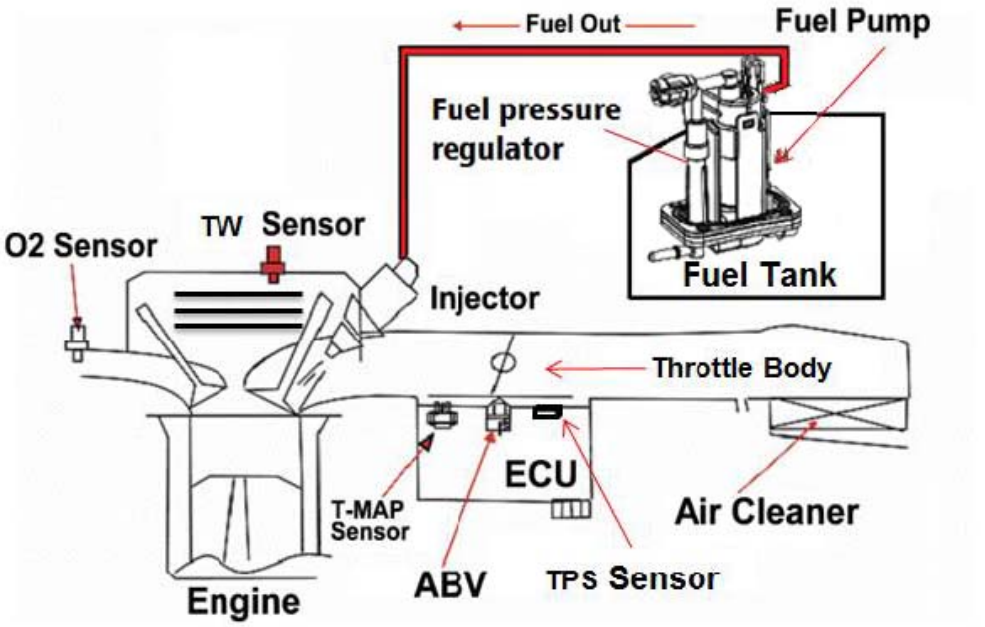




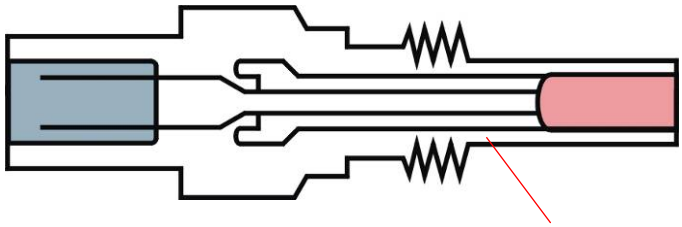
Description:
The magnetic field type sensor generates a voltage signal to calculate engine speed with ACG gear ring (24-1 tooth).

There is one tooth every 15 degree on the gear ring. But, one of the teeth is blank for the TDC calculating base.

Engine Temperature Sensor / T-Map Sensor



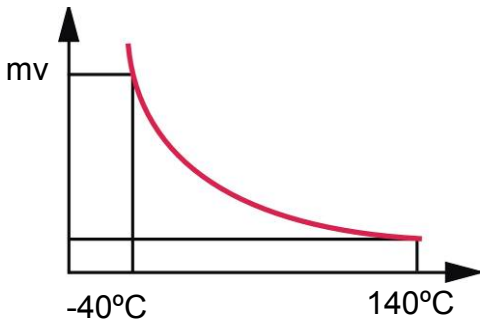
Engine temperature sensor:
According to the semiconductor's characteristic, the sensor detects the temperature of engine oil and metal parts and then sends a voltage signal to the ECU. On this base, the ECU can correct fuel injection and ignition timing.



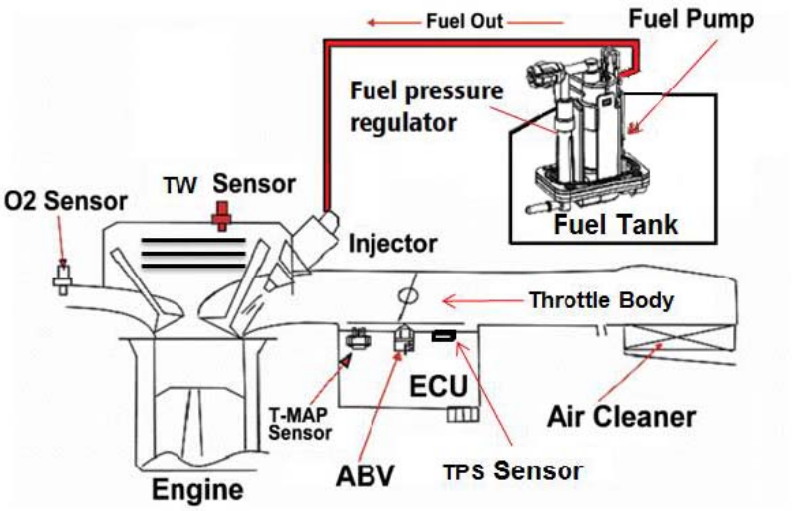
NTC- Negative Temperature Coefficient Resistor

T-MAP Sensor :

Sensor combined both pressure and NTC can detect the absolute pressure and temperature in the intake manifold, and then provides the ECU with signal for adjustment fuel injection quantity based on environmental temperature and air pressure difference from elevation level change.



Air By-pass Valve



Description:
ECU receives all sensors' signals to control the throttle valve openness with PWM, and adjust airflow through the by-pass valve of the intake manifold. It can adjust idle speed for a stably running engine.

1. When engine cold starting---the by-pass valve open for a while to increase airflow and to stabilize engine idle speed within initial starting
2. Warm-up---when engine oil is in low temperature condition, the by-pass valve adjusts airflow according to engine temperature (engine oil temperature), and raises idle speed.
3. Speed decreasing--- ECU controls the by-pass valve in correspondence with throttle operation, to provide inlet pipe with proper airflow quantity. Such operation will smooth the engine rpm reduction process, preventing the engine from stalling, excessive negative pressure, and also reduce HC emission.

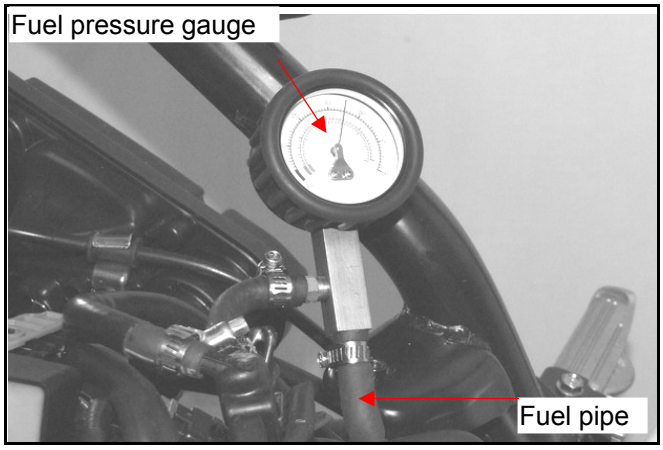
Fuel Injector

The injector provides intake valve a fuel jet. This can reduce the pollution of HC. The shortened version of fuel pump plate makes its size more compact, and sturdier against shocks. ECU signal controls the regulator to maintain 2.5 bars between the fuel pressure and the air pressure of inlet pipe. Through controlling the time length of injection under steady fuel pressure, the system can optimize the fuel injection quantity according to different engine workloads.

Fuel Pump

Electrical fuel pump is mounted inside the fuel tank. The power source is DC current provided and controlled by ECU; the pump can provide 14L/hour under the pressure of 2.5 bars.

Inspection：
Disconnect the fuel pipe from the fuel injector.
Connect the fuel pressure gauge to check the fuel pressure.



⚠ Caution

- Make sure the fuel pressure is normal (2.5 bar).
- Always release the fuel pressure before removing the fuel pipe to prevent the fuel from splashing.

Special tool：

Fuel pressure gauge SYM-HT07010
Replace the fuel pump with new one if malfunction is confirmed.

Fuel Tank

Removal

Disconnect the fuel pump and the fuel unit coupler.
Remove fuel pipe.
Remove the fuel cut valve pipe.
Remove the fuel tank

Installation

Install in the reverse order of removal.

⚠ Caution

- Make sure the fuel in the tank is not too much before removing the fuel tank.
- Replace the fuel tank if there is any damage or leakage.

EFi Troubleshooting and Solution

•Electronic fuel injection（EFi）system fault warning light

After the main switch is on, the EFI indicator will be light. If the vehicle existing problems, the EFI indicator will light up all the time after the electrical starter button is on. When the problem is eliminated, restart the electrical starter button, the EFI indicator will light out automatically.

Error Code Message and Solution Operation

DTC code	Service priority	Message	Solution operation
P0217	**1**	Engine temperature overheat	Stop the vehicle immediately, and solve it with priority. Check the lubricant system for malfunction. Check if the ignition or fuel supply system is in normal. Check if the engine is burnt. Make sure if the engine temperature sensor is in normal. Make sure if the connector is in normal.
P0335	**2**	Abnormal crankshaft position sensor	Check if the connection of the crank position sensor is open-circuit. Check if the gap between the sensor and gear tooth is within specification. Check if the crank rotation is run-out. Check if the sensor is in normal according to the new component replacement procedure.
P0120	**2**	Abnormal throttle position sensor learning value	Connect the diagnostic and reset the throttle valve position. Make sure if the idle speed position is within standard range. Make sure if the wire circuit of the throttle valve position sensor is loosen or short. Check if the openness of idle speed by-pass valve is within specification. (40~100%) Adjust the idle speed CO value to specified range. (0.5%~2.0%) If this problem symptom still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P0121	**2**	Abnormal throttle position sensor output voltage	Make sure if the wire circuit of the throttle valve position sensor is loosen or short. If this problem symptom still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P0124	**2**	Abnormal throttle position sensor turning speed	Make sure if the wire circuit of the throttle valve position sensor is loosen or short. If this problem still existing, check if the throttle position sensor (TPS) is in normal according to the new component replacement procedure.
P0560	**1**	Abnormal battery voltage	Make sure if the battery voltage is too low or high (below 10V or exceed 16V) Make sure if the ACG generator charging system circuit is short or abnormal. Check if the G4 terminal on the ECU to battery positive post is short. Make sure if the battery is in normal. Replace it with new if the battery is out or order.
P0110	**2**	Abnormal intake air temperature sensor	Make sure if the sensor’s wire is in open-circuit. Make sure if the sensor is normal according to the new component replacement procedure.

DTC code	Service priority	Message	Solution operation
P0505	**2**	Abnormal air bypass valve learning value	Check if the air bypass valve openness is in normal. Check if the intake manifold is leaking.
P0200	**2**	Abnormal fuel injector	Make sure if the fuel injector resistance is within specification. (12 Ω , 20℃) Check if the connector or wire is in open-circuit. (The G1 terminal of ECU) Make sure if the fuel injector power supplied is normal. (12~15V)
P0350	**2**	Abnormal ignition circuit	Make sure if the ignition coil resistor is within specification. (0.63 Ω , 23℃) Make sure if the connector or wire is in open-circuit. (The 12th terminal of ECU) Make sure if the ignition coil's power supplied is in normal. (12~15V)
P0230	**2**	Abnormal fuel pump relay	Make sure if the connector or wire is in open-circuit. Replace with new relay to make sure if this abnormal is disappeared.
P0219	**2**	Engine over-RPM	Engine speed exceed safety limit. Decrease the speed and then the DTC code disappeared. Check if the CVT belt is broken.
P0700	**2**	Too high RPM when starting engine	If the engine RPM exceeds 3000rpm as starting, in order to prevent run-away accident, the ECU will decrease engine speed or stop the engine. Rider should avoid to starting engine with WOT suddenly. Check if acceleration cable is stuck. Re-set the idle speed adjustment position.
P0115	**2**	Abnormal engine temperature sensor	Make sure if the sensor's resistor is within specification. (60℃, 703.8±40.9 Ω) Make sure if the sensor's wire is in open-circuit. (9th terminal of ECU)
P0650	**2**	Abnormal check lamp	Check if the check lamp is burnt. Check if the check lamp circuit is open. (C2 terminal of ECU)
P0136	**2**	Abnormal O2 sensor wiring	Check O2 sensor coupler. Check O2 sensor wiring (D2, D1 terminal of ECU).
P0141	**2**	Abnormal O2 sensor heater wiring	Check O2 sensor coupler. Check O2 sensor wiring (H1 terminal of ECU). Check O2 sensor white cable voltage (12V).
P0105	**2**	Abnormal MAP sensor	Clean the sensor. Replace the ECU.

DTC code	Service priority	Message	Solution operation
P0170	2	Fuel supply too thick or too thin	Check the fuel tank. Check and clean the air cleaner. Check the fuel injector, O2 sensor and fuel pump.
P1001	2	Abnormal reset coupler	Check the coupler wiring.

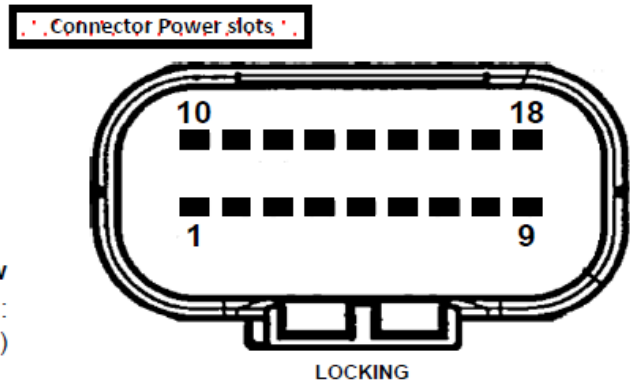
ECU coupler terminal layout :

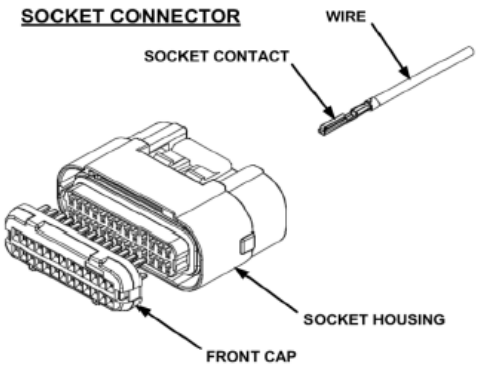
X10	X11	X12	X13	X14	X15	X16	X17	X18
Ignition coil	MIL	(H)EGO Sensor	Crank Pulse Sensor (+)	VBD	CHTS	Veh Speed	Neutral switch / Side stand switch	Fuel pump
PGND	Temperature gauge	SAI / CPV	Crank Pulse Sensor(-)	HEGO heat / Fan relay	Tilt switch	VBK	Diagnostic Tool / K-line	Injection
X1	X2	X3	X4	X5	X6	X7	X8	X9

Power supplies
Sensors Inputs
Logic Inputs
Differential Inputs
Power outputs
Configurable I/O

M4L pin insertion connector front view

JAE reference for development connectors :
MX23A18NF2 (reverse type)





EFi System Diagnosis Methods

When the motorcycle injection system in the wrong signal, causing abnormal functioning of the engine or can not start engine, warning light at the meter will be lighting, to inform drivers to carry out maintenance.

Overhaul, the diagnosis tool can be used for troubleshooting (refer to diagnosis tool use guide), or manually by the meter warning light inspection revealed that the fault codes (refer to checking signal fault codes discriminant method), the two methods for maintenance.

If the fault has been ruled out or repair after the inspection light will be extinguished, but ECU fault code will be recorded, so the need to get rid of fault codes. If a fault exists, this system has two kinds of methods to eliminate fault codes respectively in the diagnosis tool removal and manual removal.

Injection System for Use diagnosis - V70


Link cable

Software cartridge

Note:

- When problems arise, can be used for diagnosis tool of the fault is detected, and exclusion.
- In addition to testing, troubleshooting, another of the operation can be carried out data analysis-type monitor.

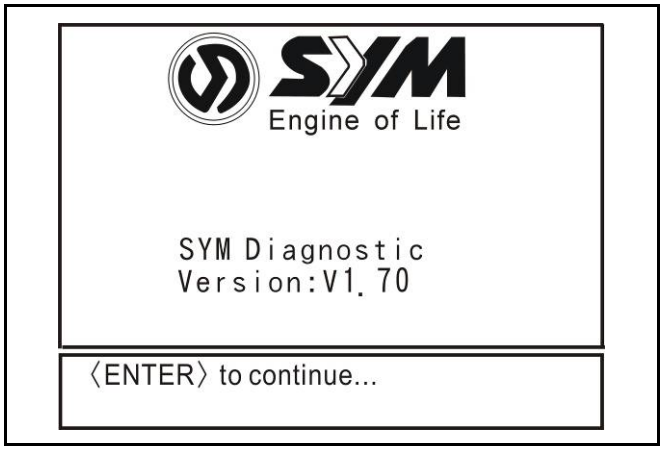
Method of Use:

1. Maintain engine flameout state, do not open main switch.
2. Opened the luggage box lighting light cover (screw x2), connected to the diagnostic connector for diagnosis tool.
3. Then open the main switch and the diagnosis tool power switch after diagnosis display screen appeared the words connection.
4. Press the "ENTER" button into the main screen (there are 6 major functions: ECU ID, DATA STREAM, FREEZED DATA, TROUBLE CODE, ERASE TB CODE and CO ADAPTION)
5. Use ▲, ▼ select button under the function, press the "ENTER" button access into various functions.
   Example: select "DATA STREAM," by the "ENTER" button, the screen showed that the existing fault codes; indicates no fault "system is OK."
6. Press "EXIT" buttom to leave of the various functions.
7. Must to close the main switch or power switch of the diagnosis tool after, and then can removal of diagnosis tool coupler.

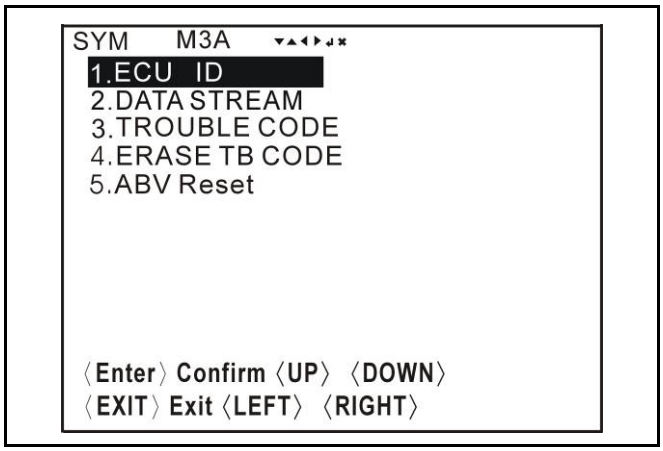
Diagnostic tool illustration

Connect the diagnostic tool wire connector and turn on the main switch.
Press <Enter> button to proceed.

Press <Enter> button to enter function-options page.

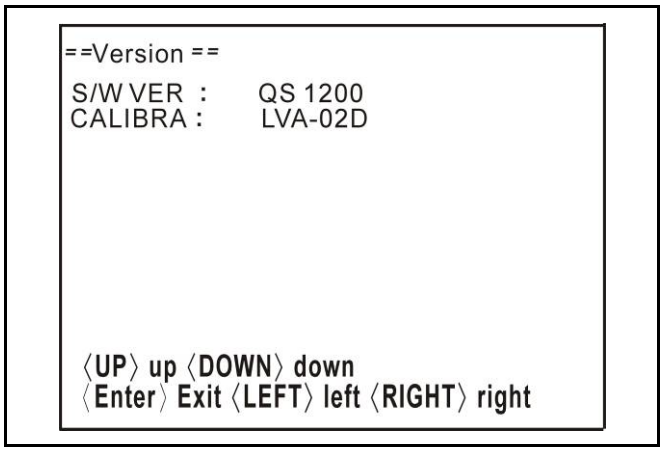


Press <Enter> button to enter ECU ID version page.



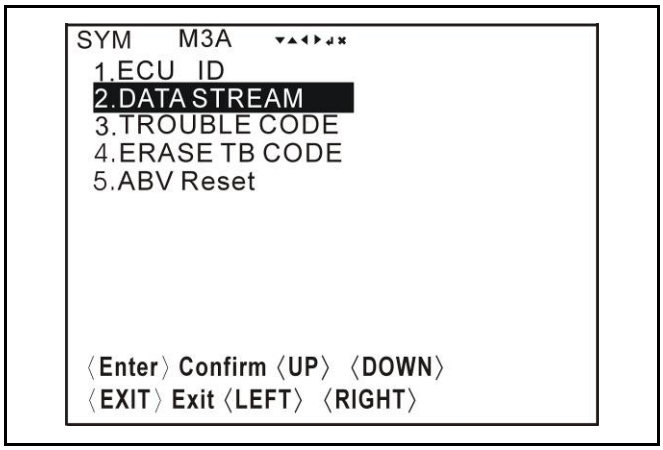
System Information

Press <Enter> button to get back to the function-options page.

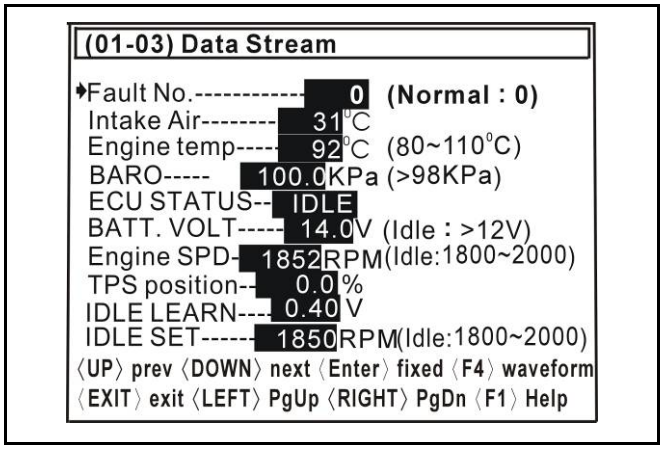


DATA STREAM

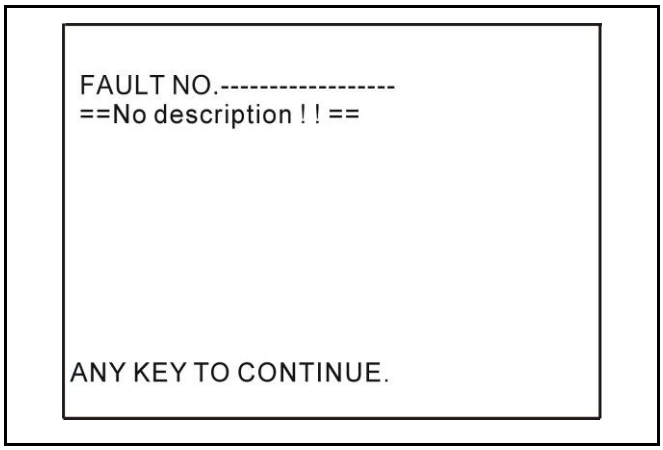
Press <Enter> button to enter Data Stream page.



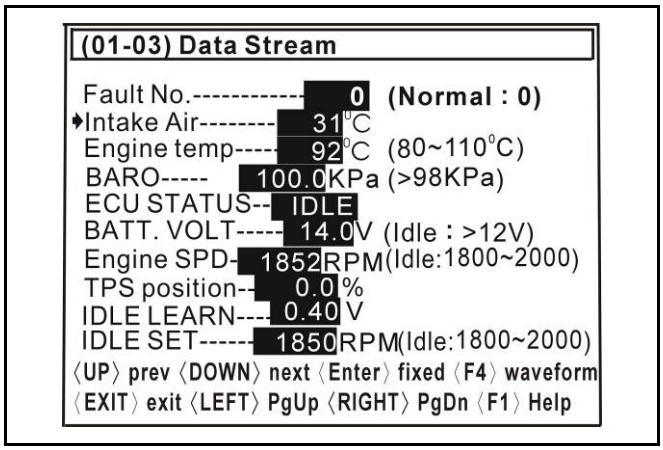
Press <UP> or <DOWN> button to choose Fault No. item.



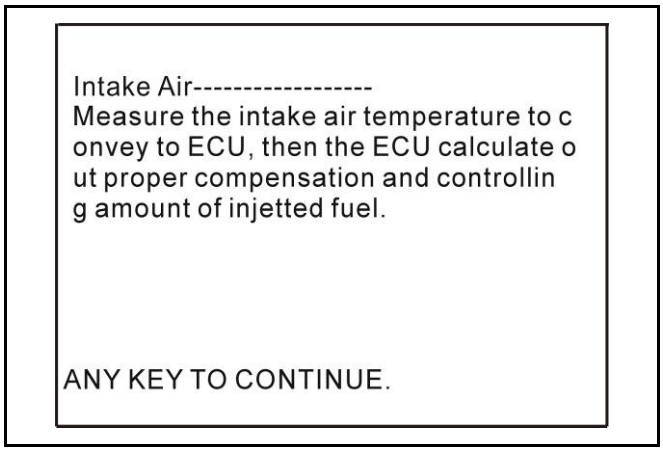
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



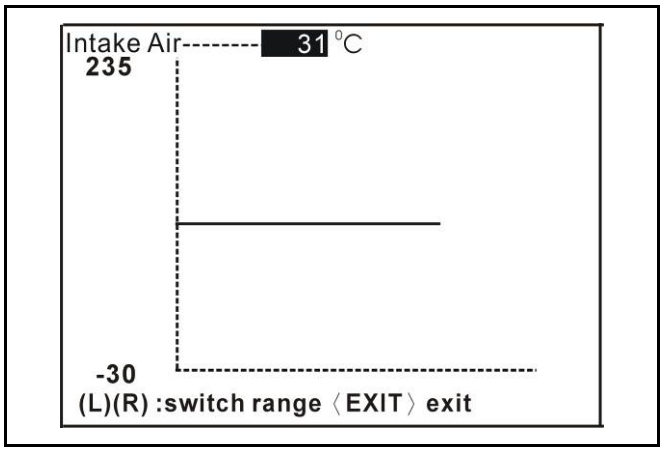
Press <UP> or <DOWN> button to choose Intake Air item.



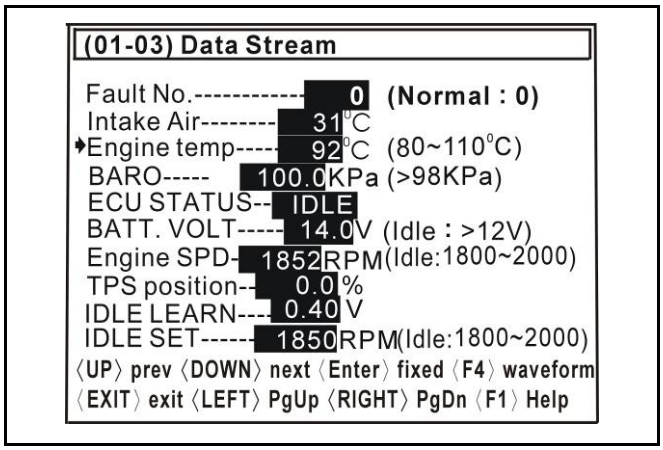
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



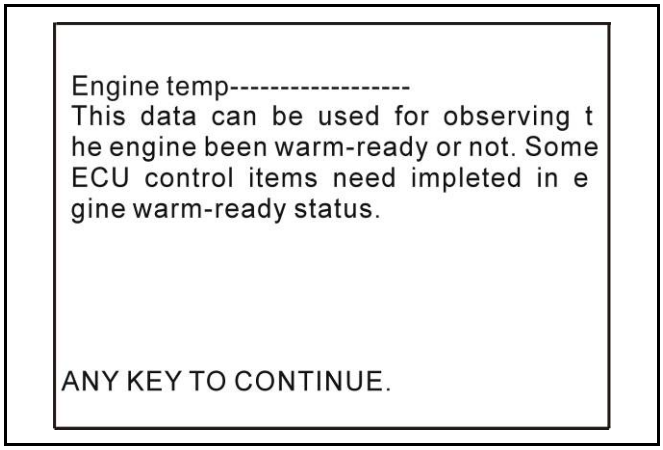
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



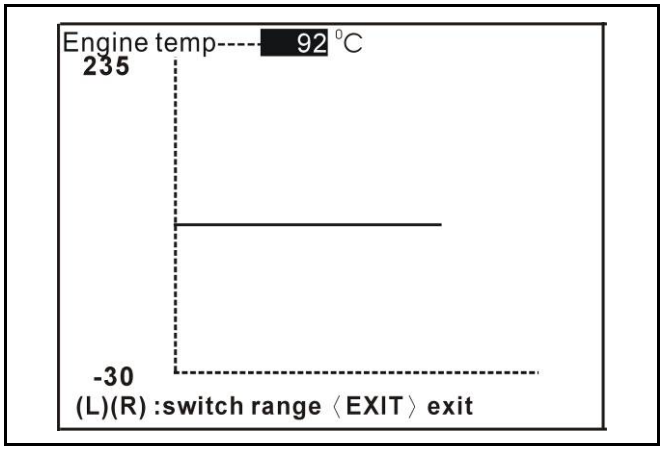
Press <UP> or <DOWN> button to choose Engine Temp item.



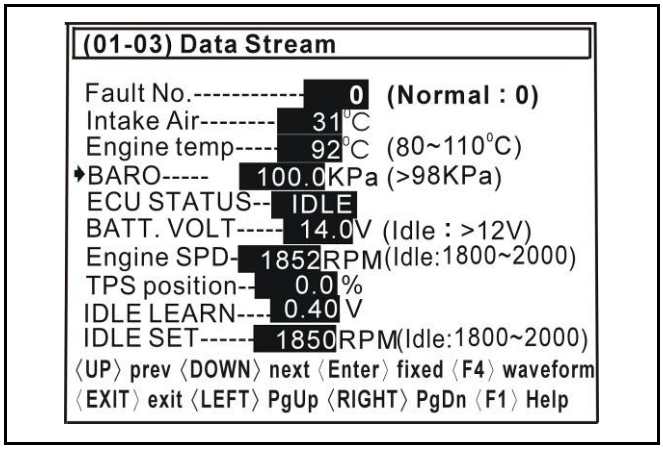
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



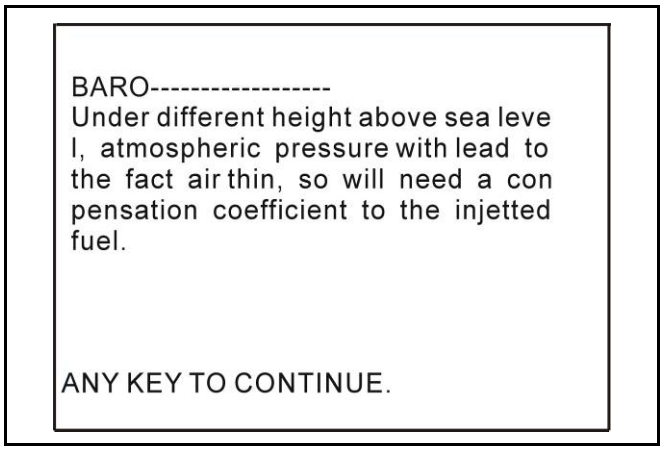
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



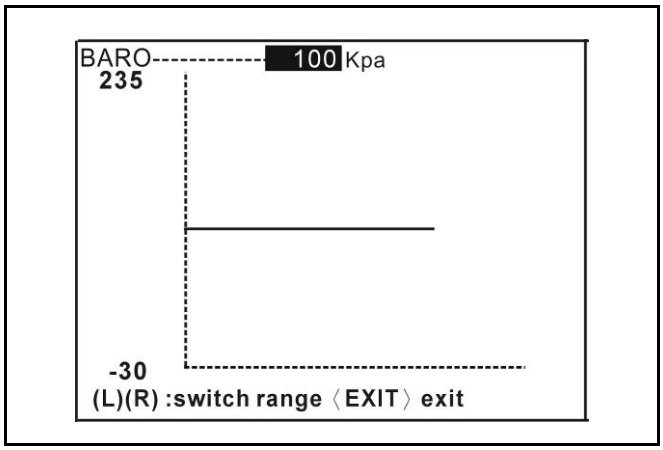
Press <UP> or <DOWN> button to choose BARO item.



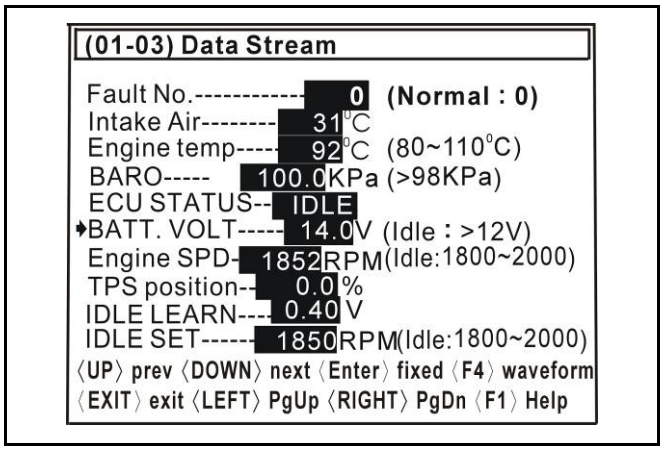
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



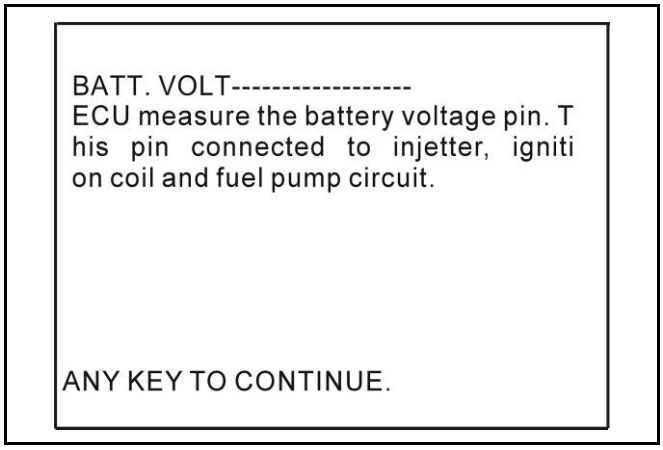
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



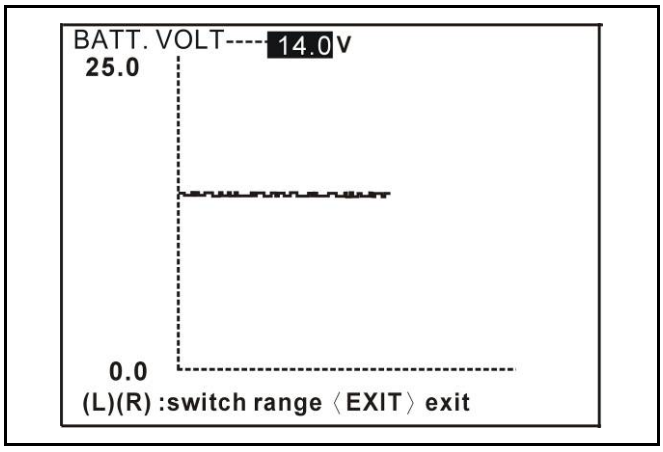
Press <UP> or <DOWN> button to choose BATT. VOLT item.



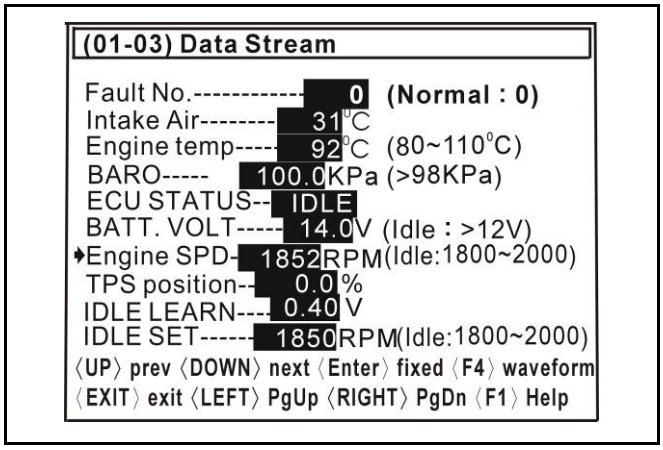
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



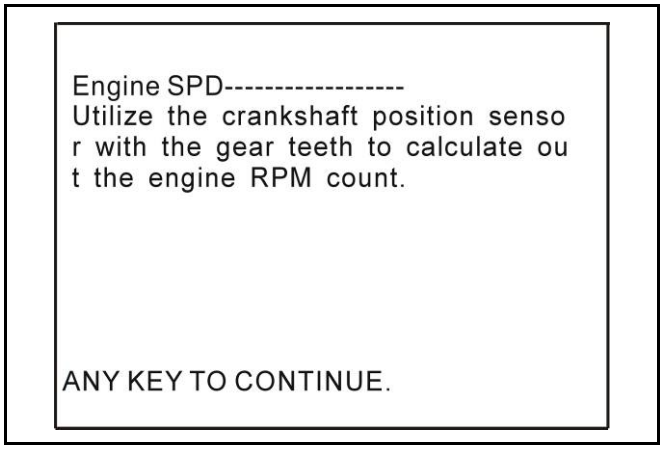
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



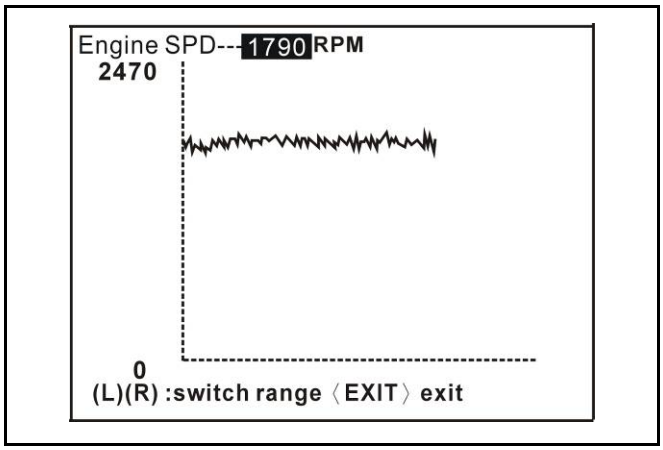
Press <UP> or <DOWN> button to choose Engine SPD item.



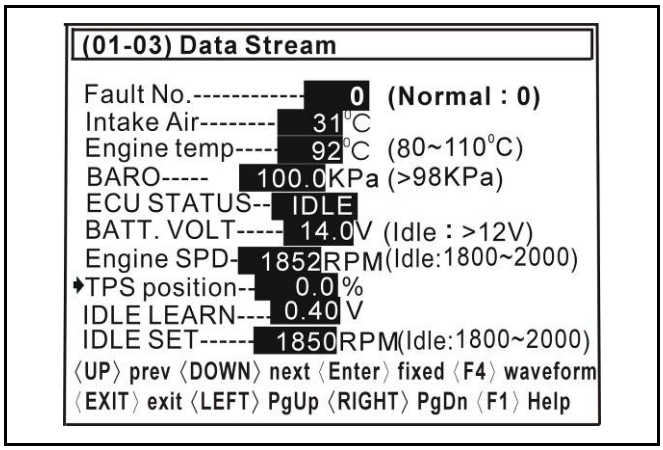
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



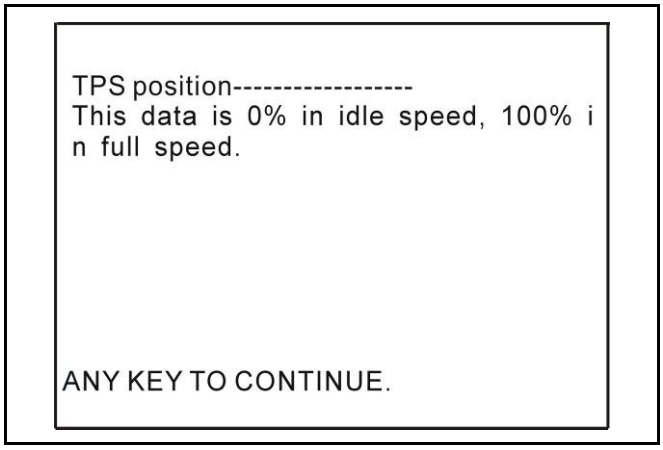
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



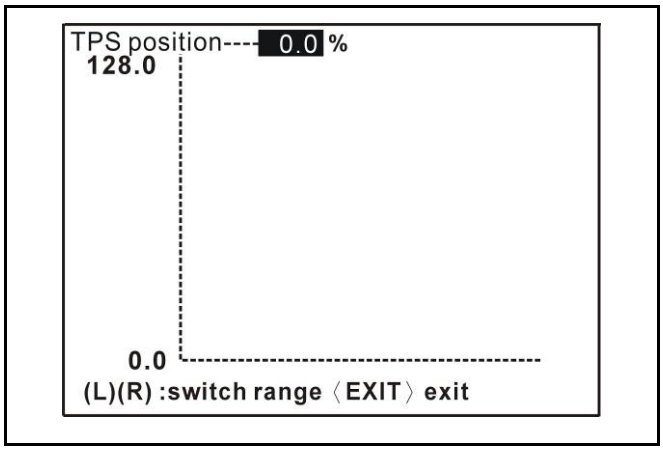
Press <UP> or <DOWN> button to choose TPS position item.



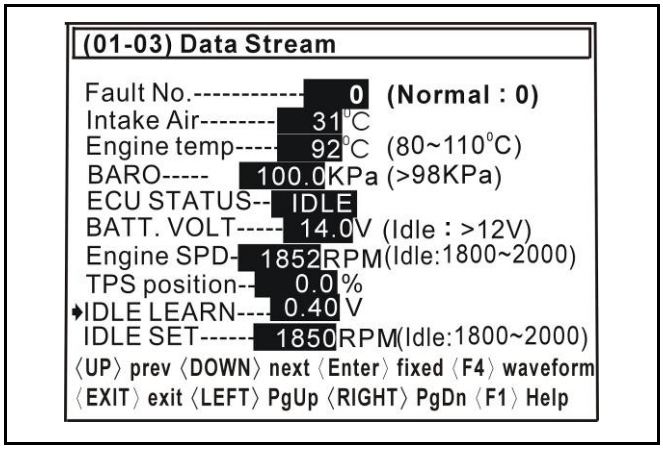
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



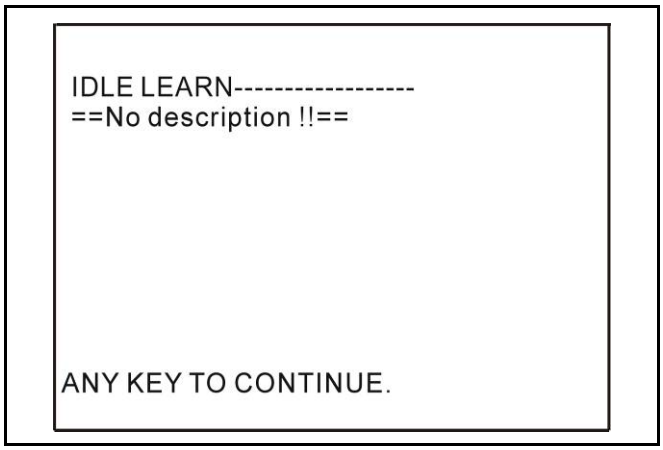
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



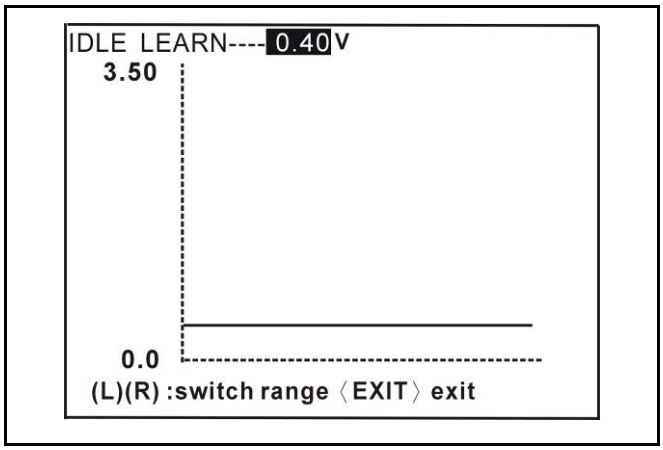
Press <UP> or <DOWN> button to choose IDLE LEARN item.



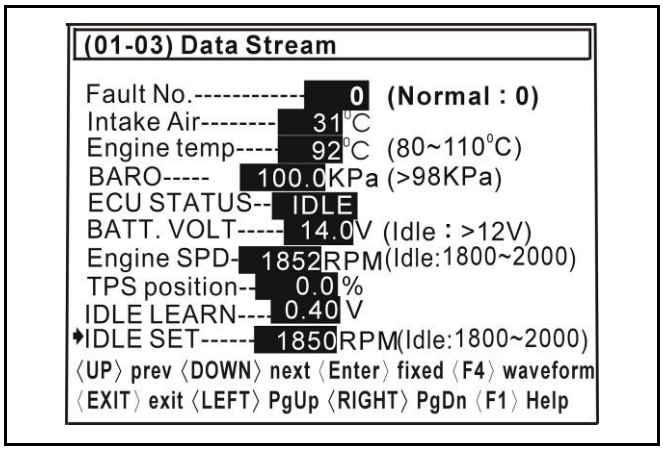
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



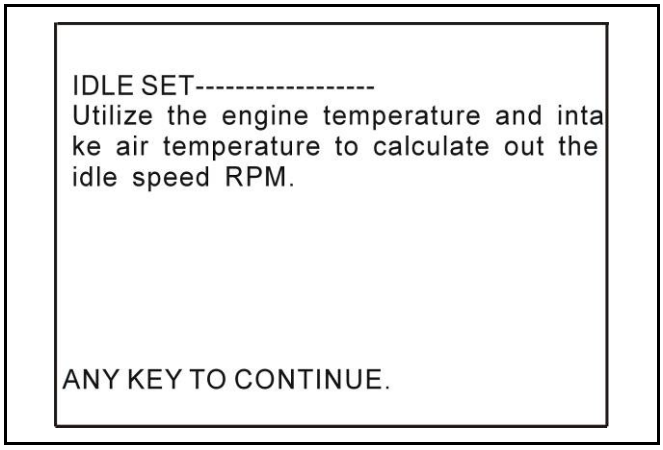
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



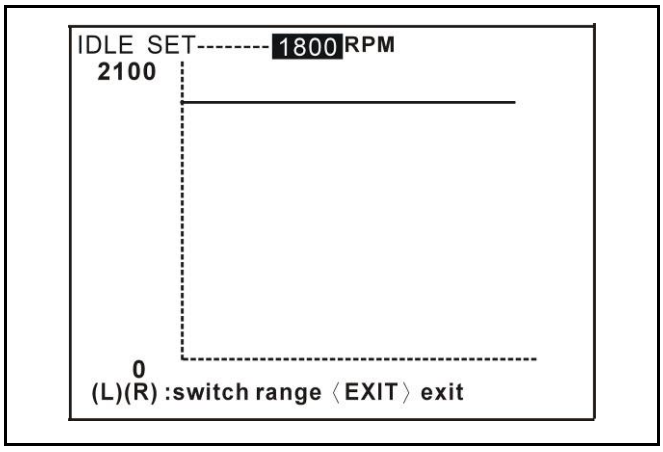
Press <UP> or <DOWN> button to choose IDLE SET item.



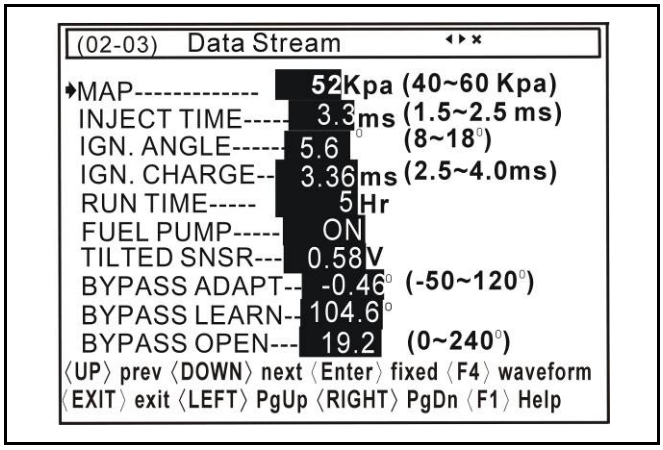
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



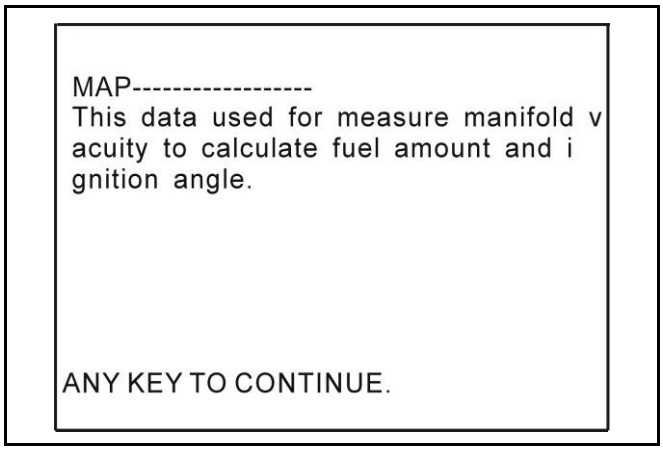
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



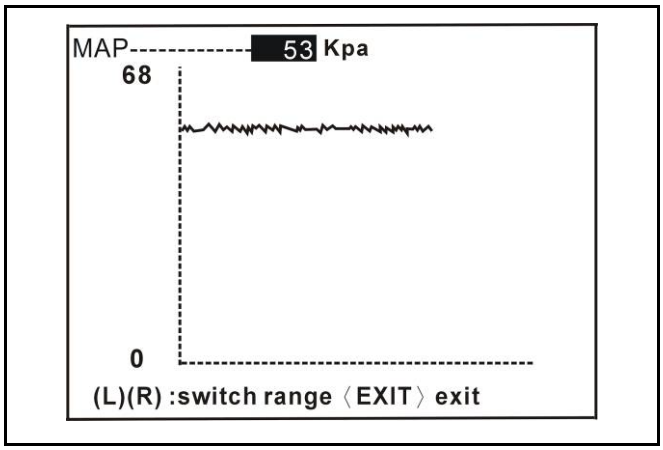
Press <RIGHT> button to get to next page to choose MAP item.



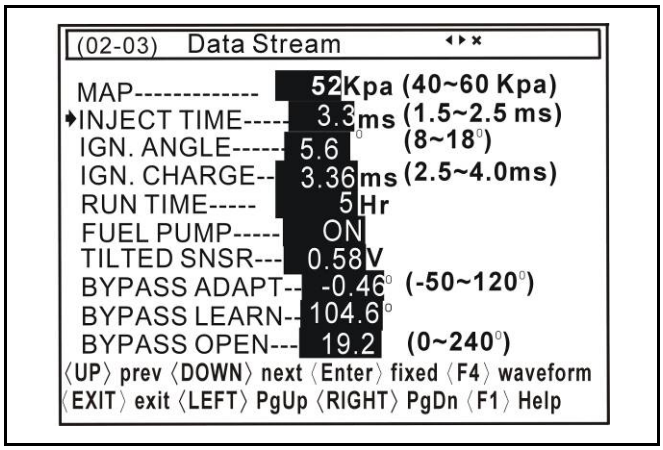
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



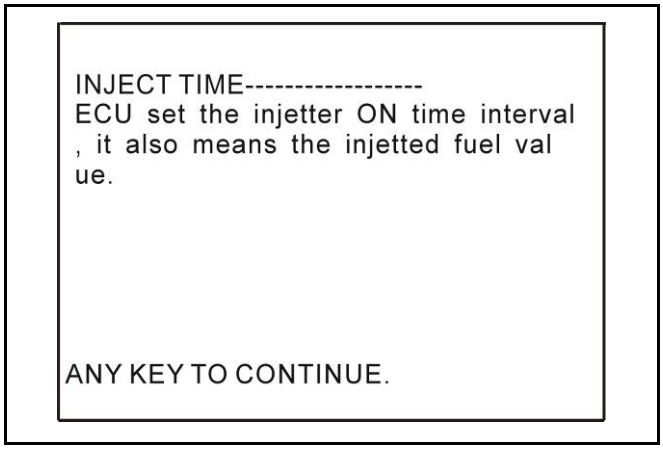
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



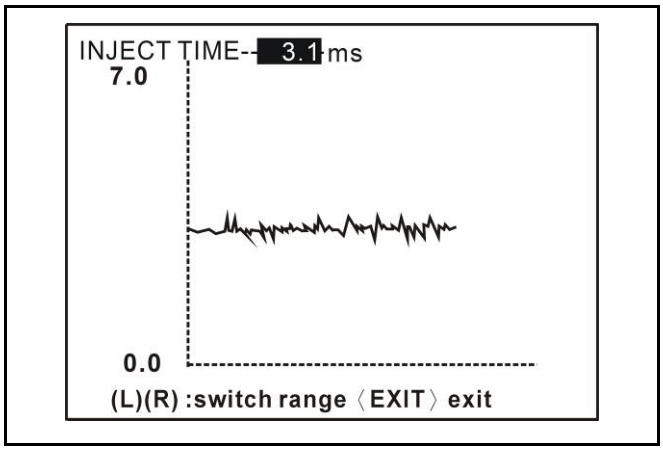
Press <UP> or <DOWN> button to choose INJECT TIME item.



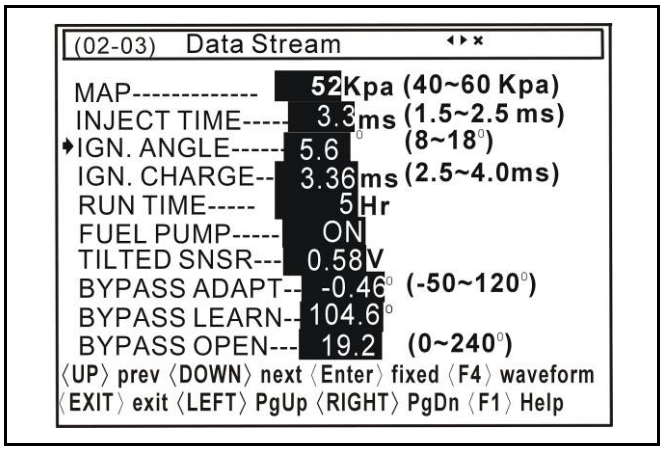
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



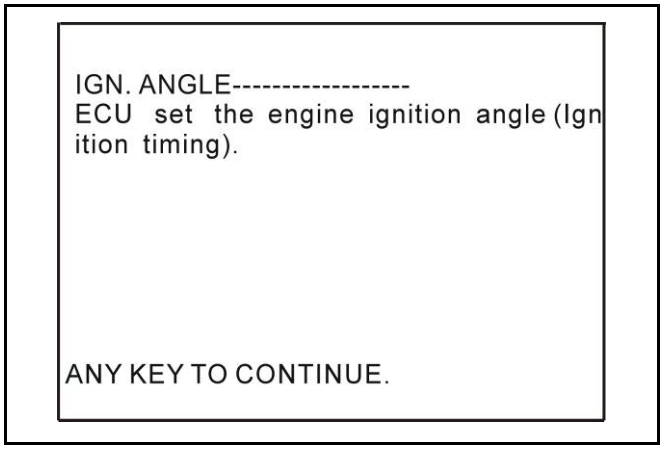
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



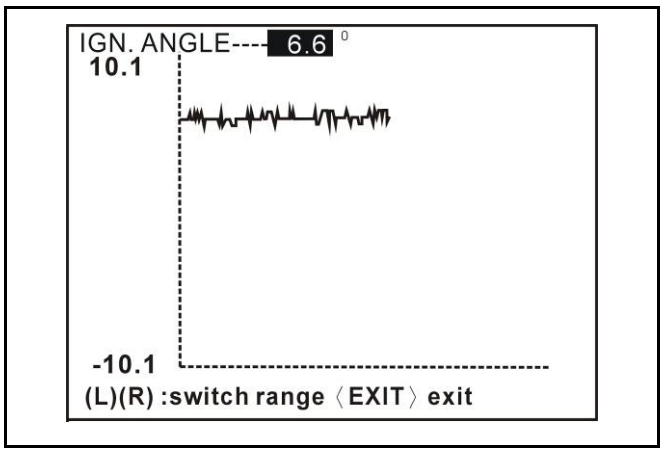
Press <UP> or <DOWN> button to choose IGN. ANGLE item.



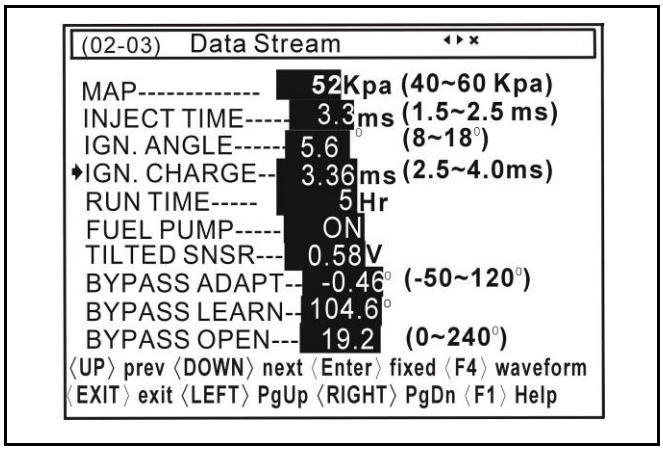
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



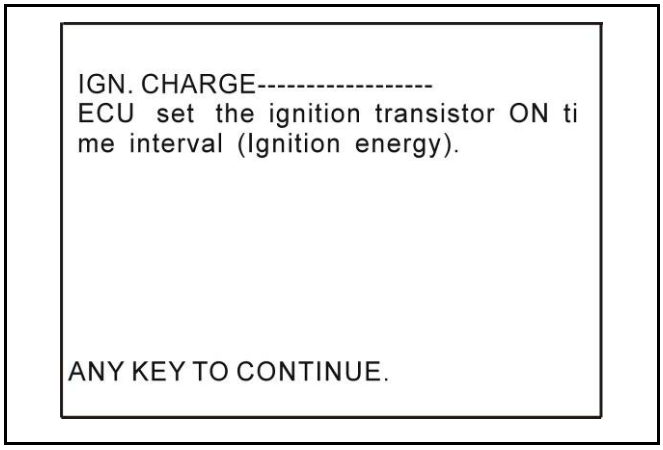
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



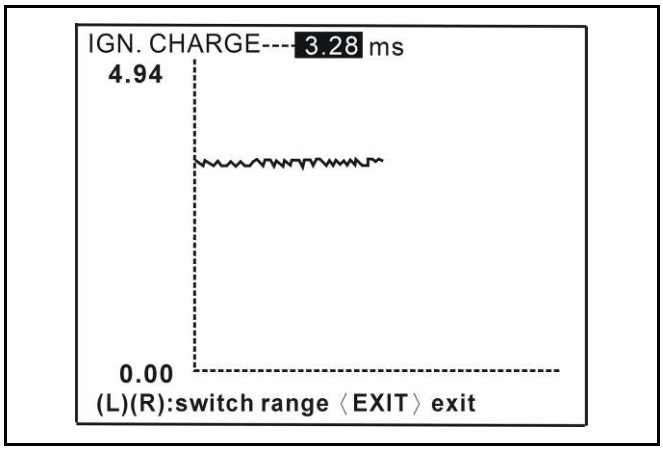
Press <UP> or <DOWN> button to choose IGN. CHARGE item.



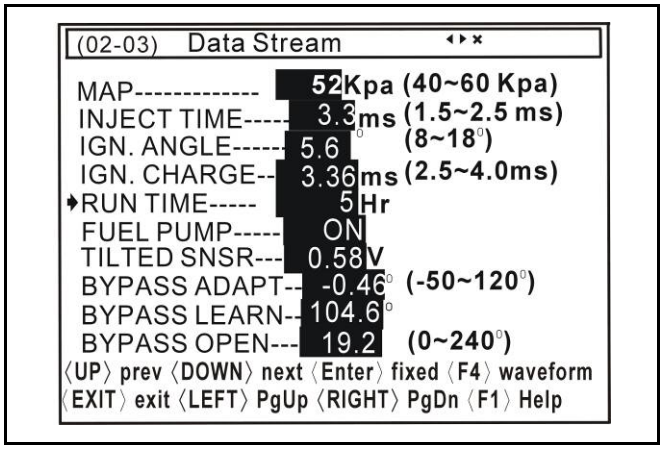
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



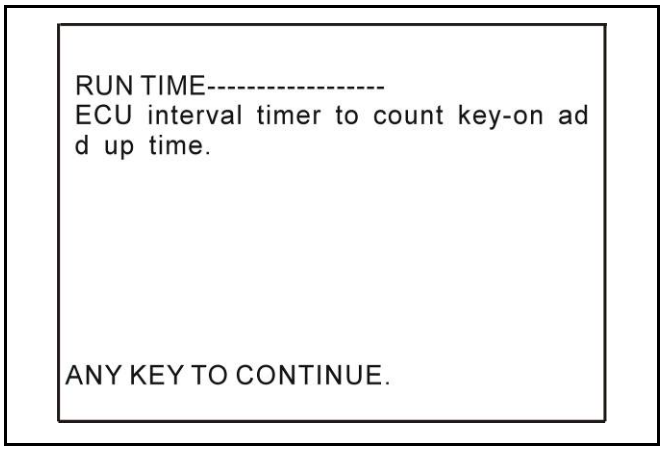
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



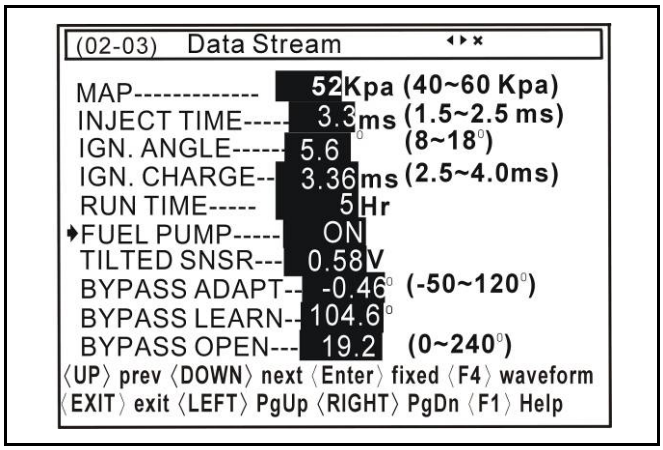
Press <UP> or <DOWN> button to choose RUN TIME item.



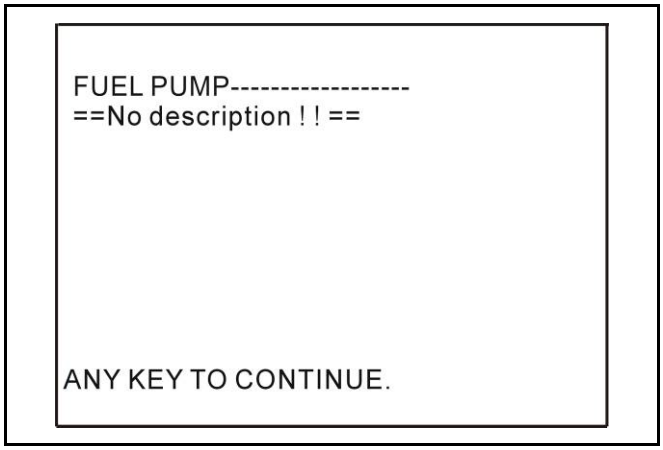
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



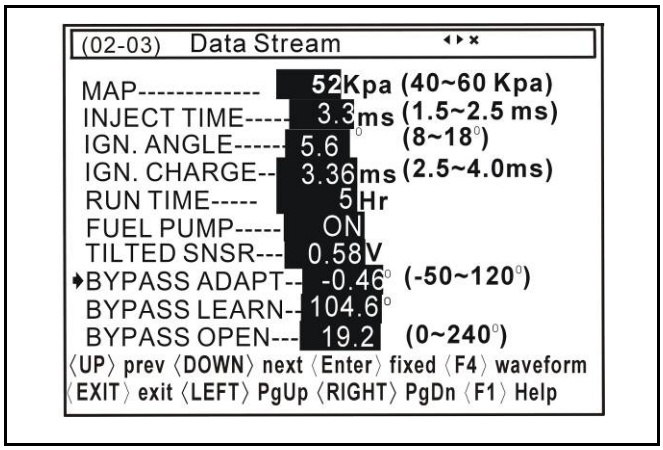
Press <UP> or <DOWN> button to choose FUEL PUMP item.



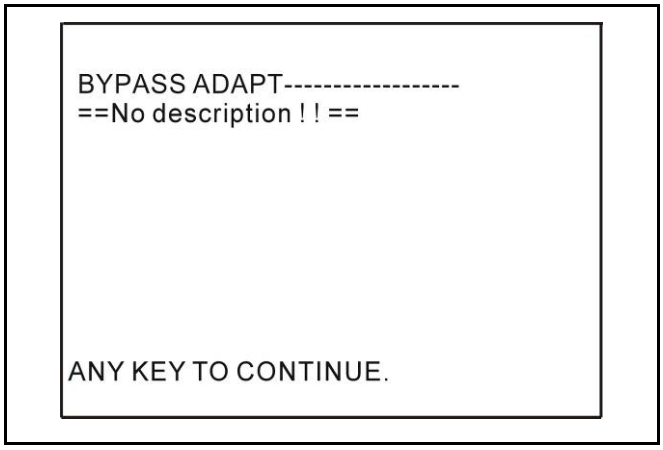
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



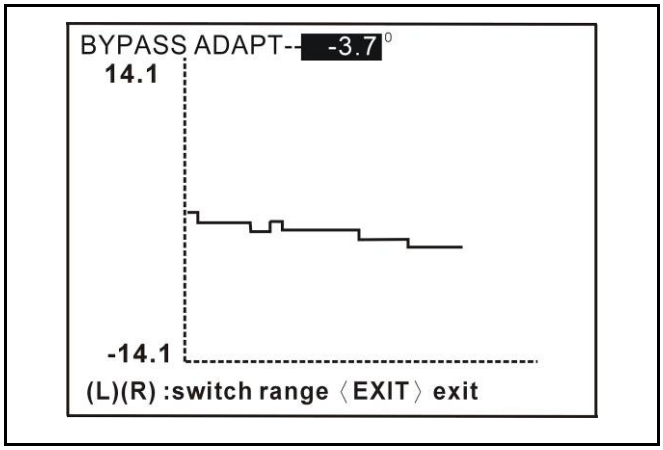
Press <UP> or <DOWN> button to choose BYPASS ADAPT item.



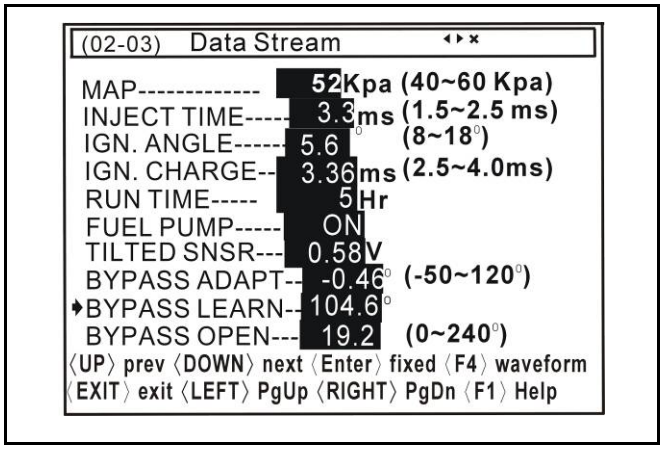
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



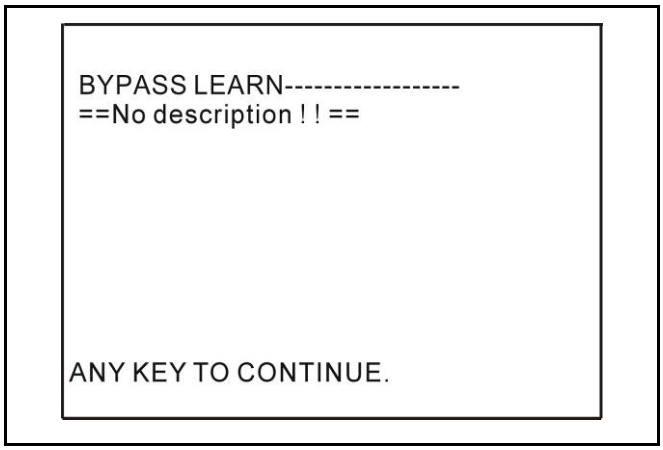
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



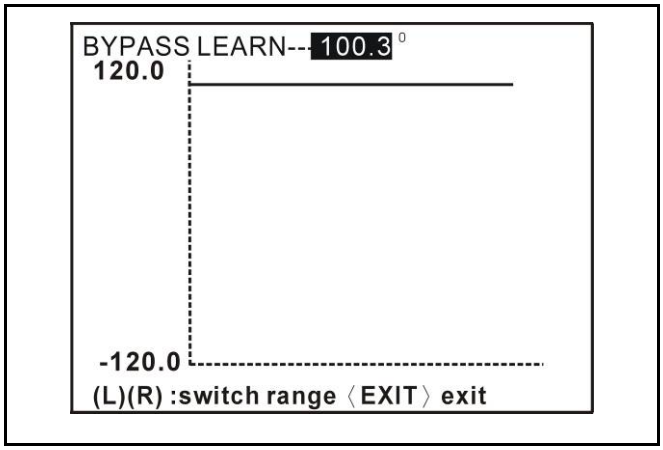
Press <UP> or <DOWN> button to choose BYPASS LEARN item.



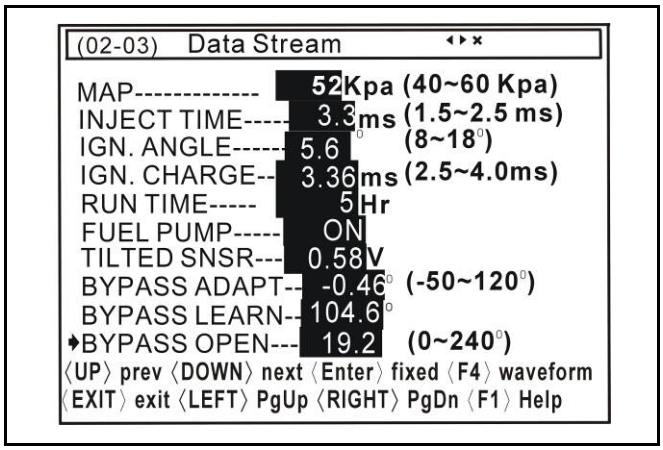
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



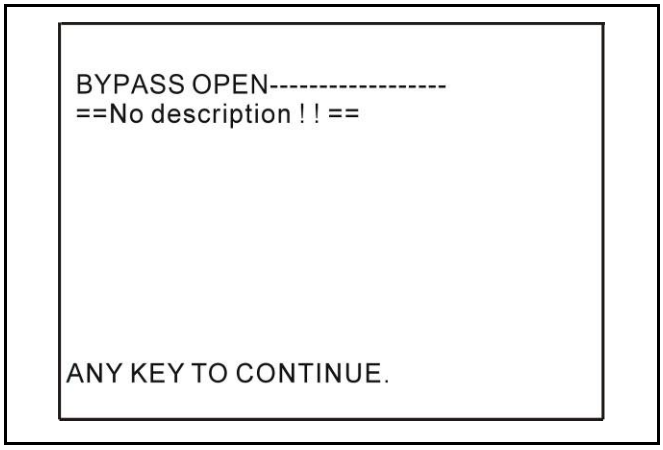
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



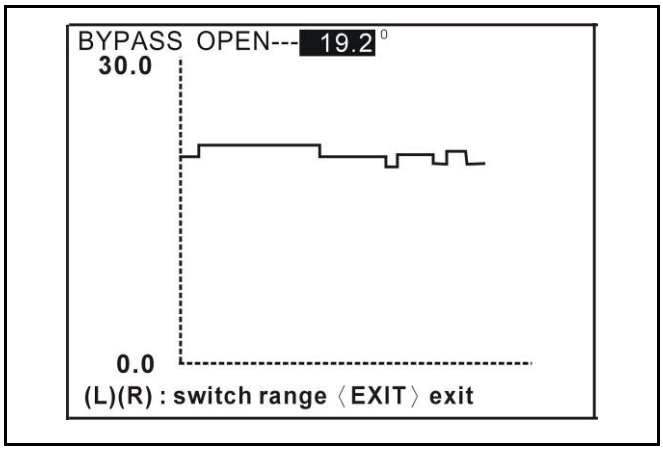
Press <UP> or <DOWN> button to choose BYPASS OPEN item.



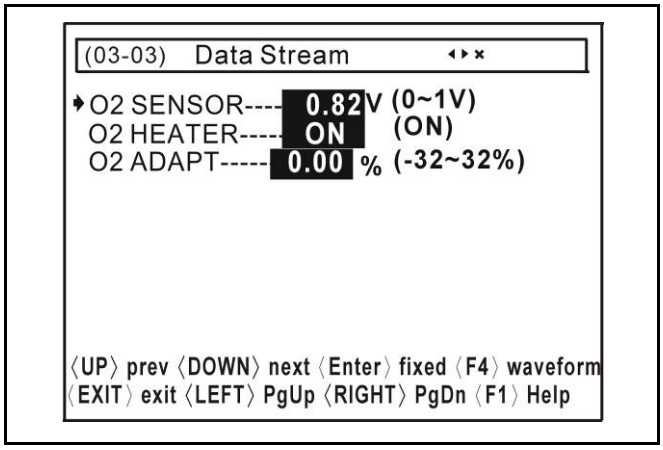
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



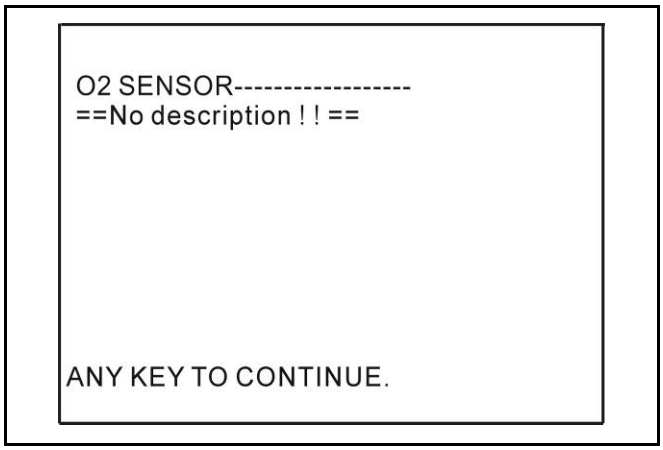
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



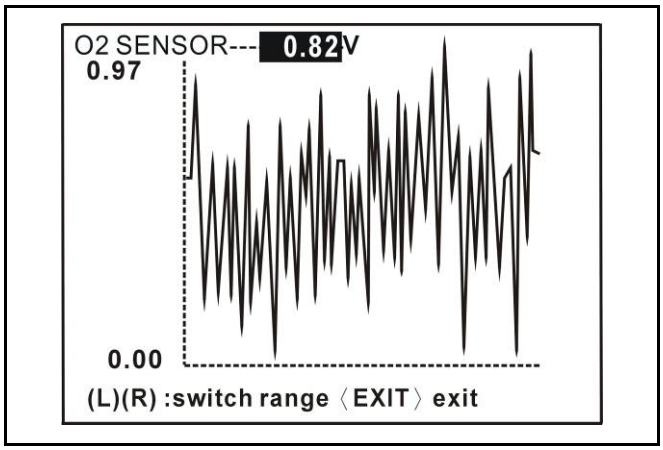
Press <RIGHT> button to get to next page to choose O2 SENSOR item.



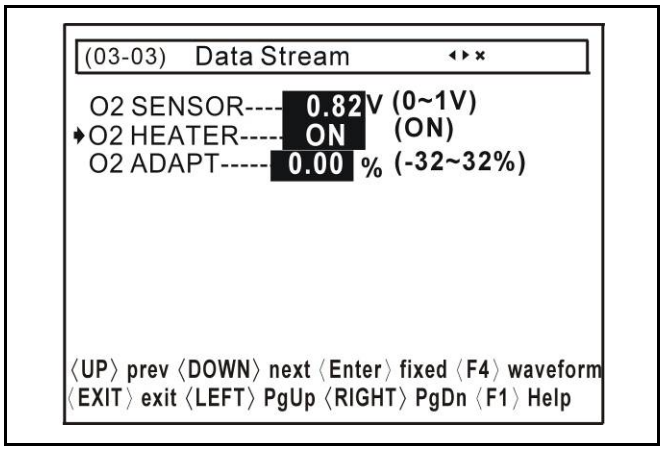
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



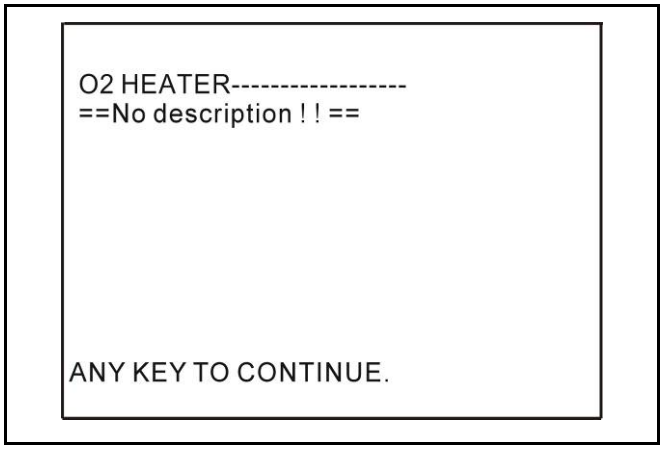
Press <F4> button to enter waveform page. Press <EXIT> button to get back to Data Stream page.



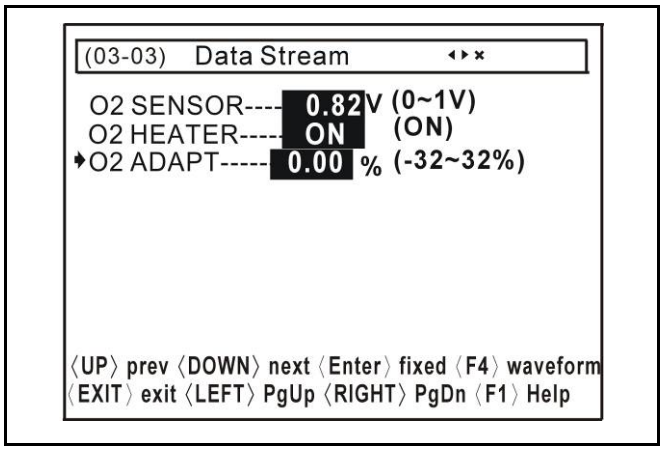
Press <UP> or <DOWN> button to choose O2 HEATER item.



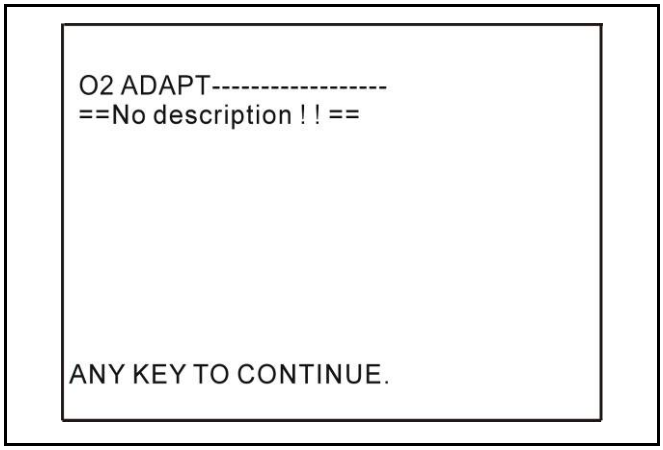
Press <F1> button to enter description page. Press any key to get back to Data Stream page.



Press <UP> or <DOWN> button to choose O2 ADAPT item.

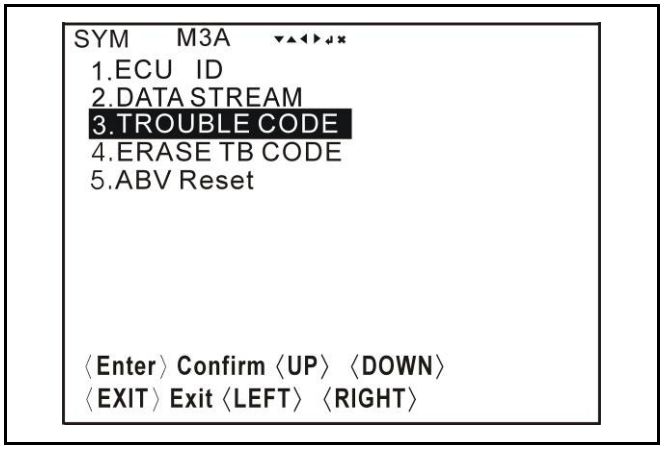


Press <F1> button to enter description page. Press any key to get back to Data Stream page.

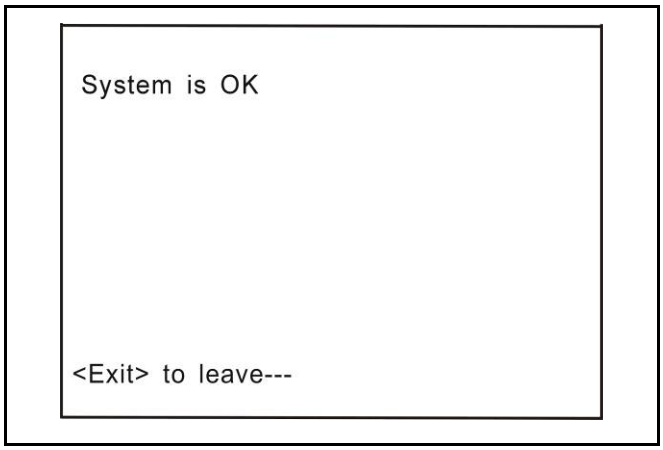


Read Trouble Code

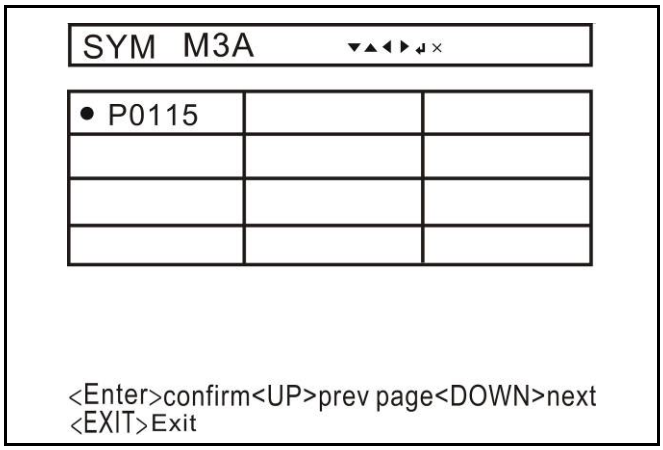
Press <UP> or <DOWN> button to choose Trouble Code item.
Press <Enter> button read trouble code.



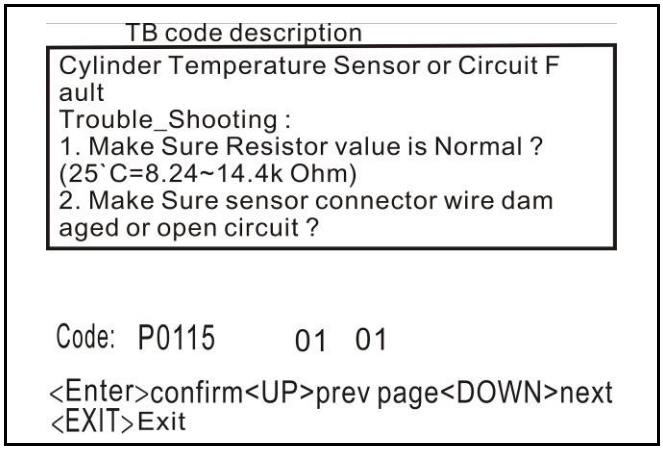
If there is no malfunction in the EFi system, “System is OK” will be shown.



If there is malfunction happen to the EFi system, Trouble Code will be shown.

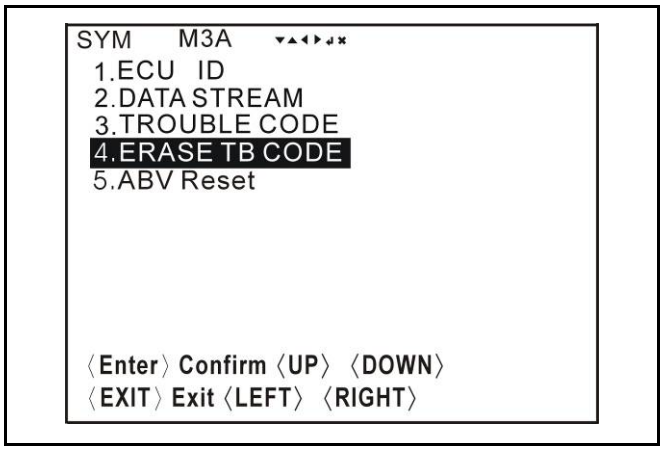


Press <Enter> button to enter Trouble Code and troubleshooting description page.

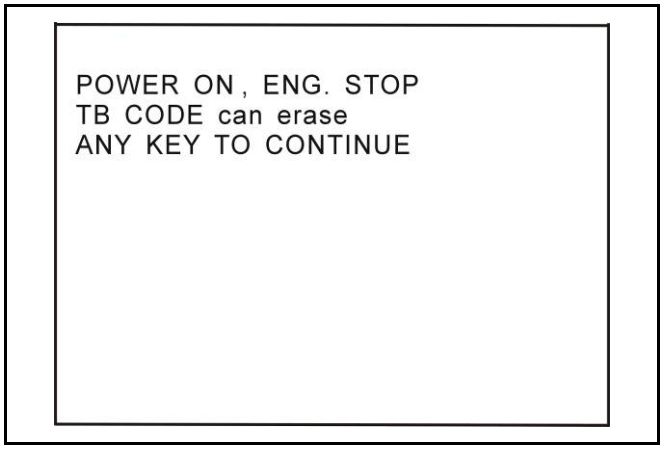


Erase Trouble Code

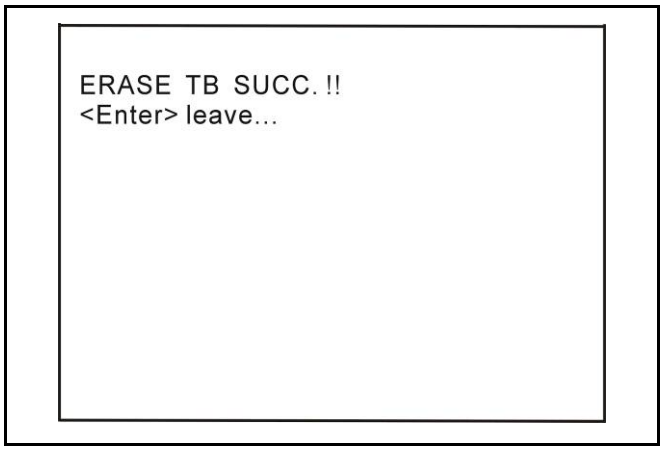
Press <UP> or <DOWN> button to choose Erase TB Code item.
Press <Enter> button erase Trouble Code.



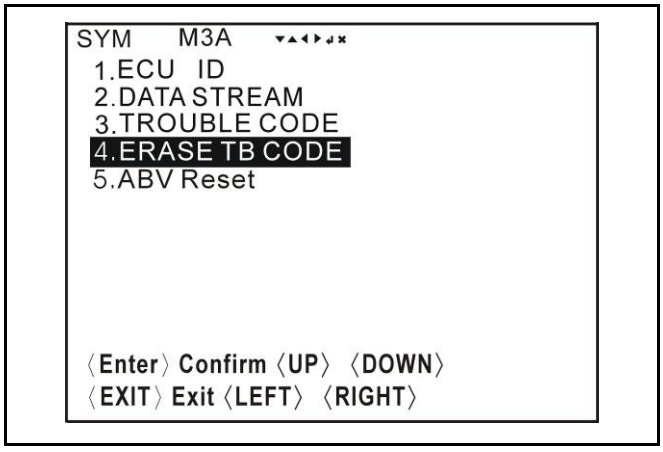
Key on but do not start the engine.
Press any key to erase Trouble Code.



Trouble Code is erased successfully.
Press <Enter> button to leave.

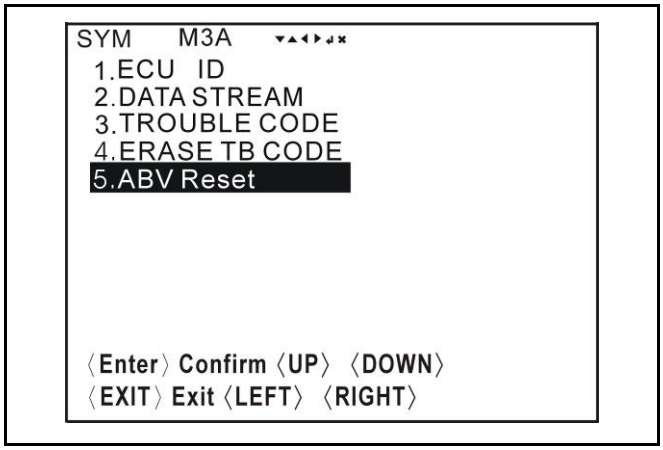


Get back to function-options page.

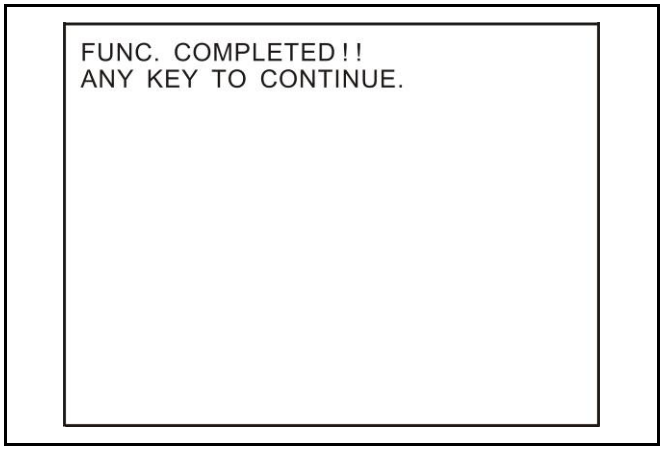


Reset ABV

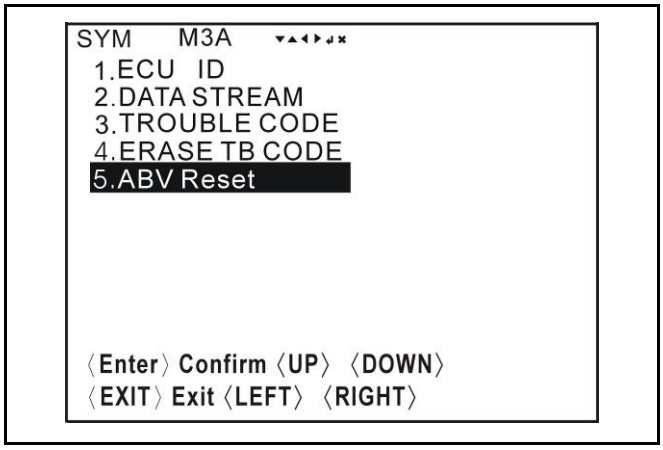
Press <UP> or <DOWN> button to choose ABV reset item.
Press <Enter> button to reset ABV.



ABV reset is completed.
Press any key to continue.



Get back to function-options page.



EFi Component Malfunction Check& Replacement Procedure

Item	Parts Name	Service schedule	Inspection Method	Adjustment & replacement procedure
1	Ignition coil	At least 20000km life-expectancy Check it every 3000km	Use diagnostic tool to check if the ignition coil has malfunction. Erase the DTC codes and replace with new coil and confirm again. If the DTC codes disappear, then the ignition coil is abnormal. Replace it with new one. If the DTC codes still exist, replace the ECU for confirm. If the DTC codes disappear, then the ECU is abnormal. Replace it with new one Before the ignition coil is verified for malfunction, check the coil resistance and connector wire for short-circuit.	If the ignition coil has to be changed, erase the DTC codes with the diagnostic tool. Turn off ignition switch, and replace the coil with new one. Turn on ignition switch and make sure the DTC codes disappear.
2	Air by-pass valve	At least 20000km life-expectancy Check it every 3000km	Check if the by-pass valve DTC code appears on the diagnostic. Erase the DTC codes and replace with new one & confirm again. If the DTC codes disappear, then the by-pass valve is abnormal. Replace it with new one. If the DTC codes still exist, check if the wire connector and by-pass valve resistance are normal. If the DTC codes still exist, replace the ECU for confirmation. If the DTC codes disappear, then the ECU is abnormal. Replace it with new one.	If the by-pass valve has to be changed, erase the DTC codes with the diagnostic tool first. Turn off the ignition switch, and then replace the valve with new one. Turn on ignition switch and make sure the DTC codes disappear. Check idle speed CO value and adjust if necessary.
3	fuel pump and fuel regulating valve	At least 20000km life-expectancy Check it every 6000km	Connect a pressure gauge between the regulator and fuel injector. Make sure fuel pressure is within 2.5bar. The pressure should reach 2.5 bars within 3 seconds after turning on ignition switch. If the fuel pressure is out of the range, check if the fuel pipe is leaking. And check if the fuel pump voltage is over 12V? Replace the fuel-regulating valve and confirm again.	The oil seal has to be replaced along with replacement of the fuel-regulating valve. Oil seal has to be installed into the outer cover before assembling.
4	Engine temperature sensor	At least 20000km life-expectancy Check it every 3000km.	Is there any DTC code on the Data Scan diagnostic? Engine temperature has to reach to environmental temperature after engine stopped for a while. Erase the DTC codes and replace with new one and confirm again. If the DTC codes disappear, then the sensor is abnormal. Replace it with new one. If the DTC codes still exist, check if wire connector and sensor's resistance are in normal range	If the sensor has to be changed, erase the DTC codes with the diagnostic tool. Turn off ignition switch, and remove connector. Remove the sensor with tools. Engine temp. Sensor tighten torque is 0.74~0.88kg-m. Connect the coupler, and the diagnostic tool. Then, turn on ignition switch. Check if the DTC codes disappear. The value of stopped engine temperature should approximate the environmental temperature.

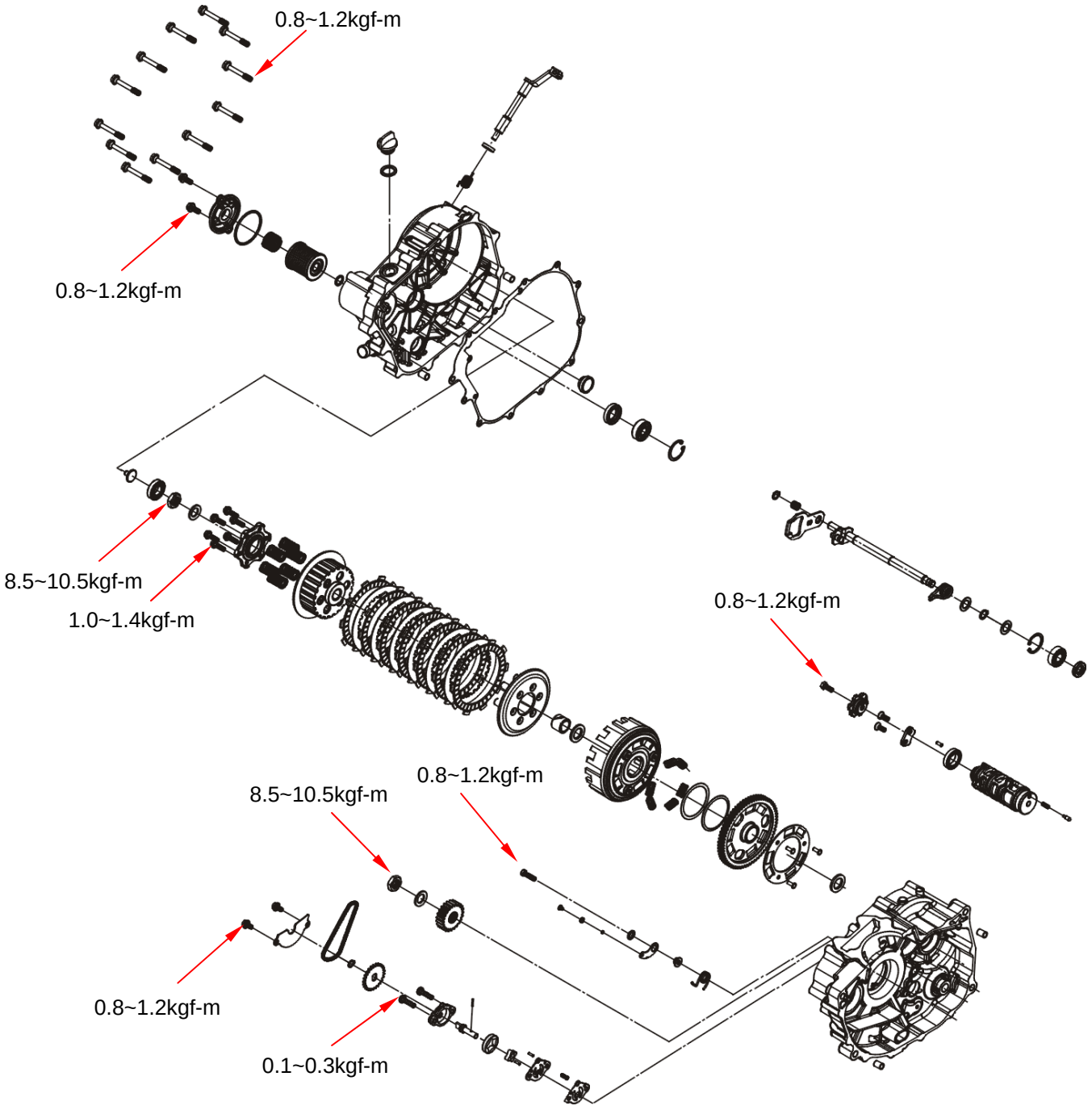
Item	Parts Name	Service schedule	Inspection Method	Adjustment & replacement procedure
5	Intake temperature/pressure sensor	At least 20000km life-expectancy Check every 3000km	Connect the diagnostic tool for inspection. The engine intake temperature and pressure should approximate environmental temperature and atmosphere pressure. (Execute this task after engine is stopped for a while) If the DTC codes of intake temperature or pressure shown on the diagnostic tool, replace the pressure sensor with new one. Check if the DTC codes are disappearing. If not, check the connector wires for short-circuit. Replace the connector if necessary. If the DTC codes still exist, replace the ECU. But if the DTC codes disappear, install the original pressure sensor and check it again. If the original sensor doesn't trigger the DTC error code, replace the ECU with new one.	Replacement procedure for T-MAP (intake temperature/pressure sensor) Turn off the ignition switch. Disconnect the connector of intake temperature/pressure sensor. Replace the sensor with new one. Connect the connector with diagnostic tool. Turn on the ignition switch, and check if the intake temperature/ pressure readings close to environmental temperature and atmosphere pressure. Erase the DTC codes, and make sure the problem is solved.
6	Throttle body	At least 20000km life-expectancy Check every 3000km	Please refer to idle speed adjustment section for the idle speed CO adjustment. Connect the diagnostic tool and check if the throttle position DTC code appears. If the code appears, replace the throttle body to make sure the code can be erased. If the code disappears, replace the throttle body. If the code still exists, replace the ECU with new one.	The throttle body replacement procedure: Install a new throttle body Make sure there is no leaking. Connect the diagnostic tool and read the carbon-accumulated time. Reset the time with the diagnostic tool. Reset the throttle position data with the diagnostic tool. Throttle valve WOT set up. Turn off ignition switch, and WOT the throttle valve and hold. Turn on the ignition switch and hold WOT position for 2 seconds. Then release the throttle valve. Please refer to the idle speed adjustment section for the idle speed CO if necessary.
7	Fuel injector	At least 20000km life-expectancy Check every 3000km	Check if the fuel injector DTC code appears. If the code appears, replace a new fuel injector for confirmation. If the code can be erased, then, replace the fuel injector. If the code still is there after changing a new injector, check if connector wire is short. If the code still exists, replace the ECU with new one. If the code can be erased after changing the ECU, this ECU has to be replaced.	Confirmation or replacement procedure for the fuel injector: Erase the DTC code with the Data Scan. Turn off ignition switch and disconnect the fuel injector coupler. Connect to a new fuel injector. Connect the diagnostic tool, and turn on the ignition switch. Make sure the DTC code had been cleared. Please refer to idle speed adjustment section for idle speed CO value confirmation. (Firstly, make sure if the fuel injector DTC code had been clear, and then install a new fuel injector.)

Item	Parts Name	Service schedule	Inspection Method	Adjustment & replacement procedure
8	ECU	At least 20000km life-expectancy Check every 3000km	Connect the diagnostic tool. Record the ECU service time.	ECU replacement procedure: Connect the Diagnostic tool onto the original ECU. Record the ECU service time. Turn off the ignition switch. Replace the ECU with new one. Re-set the ECU service time. Clean the carbon deposition around the throttle body. Please refer to idle speed adjustment section for idle speed CO value confirmation.
9	Idle speed CO Adjustment	Check for new motorcycle and every 3000km.	Warm up the motorcycle by running it in 50km/hr for 5 minutes. Connect the diagnostic tool. Record the idle speed CO value, and engine rpm In O2 sensor closed-loop system, the CO value should be kept in normal range. If the CO value goes wild, please check the O2 sensor, engine, injector, and the fuel system for malfunction.	Warm up the motorcycle by running it in 50km/hr for 5 minutes. Connect the Diagnostic tool. Record the idle speed CO value, rpm. Use the Data Scan to adjust the idle speed CO value to be 0.5%~2.0%. Record the idle speed CO value, rpm and CO variant value. (The engine temperature has to be in 115℃~140℃, and intake temperature to be in 25℃~40℃ as adjusting.) Perform ECU learning

NOTE:

Mechanism Diagram 4-1	Clutch Disassembly..... 4-5
Precautions in Operation..... 4-2	Clutch Inspection..... 4-6
Troubleshooting 4-3	Clutch Installation..... 4-7
Engine Oil..... 4-4	Oil Pump 4-9
Engine Oil Strainer Cleaning 4-4	Gear Shift Linkage Mechanism..... 4-11

Mechanism diagram



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 :

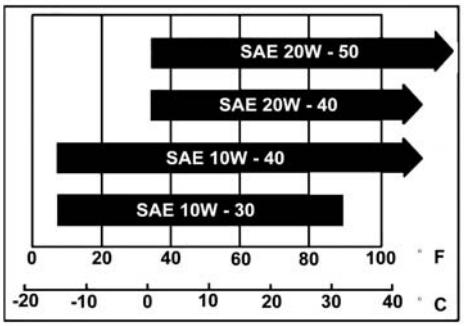
Full disassembly：1200 c.c.

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	0.15	0.20
	Clearance between outer rotor and the pump body	0.15~0.20	0.25
	Rotor to pump cover clearance	0.04~0.09	0.12
Clutch	Lever free play	10~20	-
	Spring free length	44.65~44.80	41.70
	Friction disk thickness	3.00	2.50
	Clutch plate warp	-	0.20

Torque value

Oil pump cover bolts: 0.8~1.2kgf-m
Oil pump screw: 0.7~1.1kgf-m
Primary drive gear nut 8.5~10.5kgf-m
R. Crank case bolts: 0.8~1.2kgf-m
Clutch fix nut 8.5~10.5kgf-m
Clutch lifter plate bolt 1.0~1.4kgf-m

Special tools

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
- Engine oil is not exchanged periodically.
- 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
- insufficiently lubricated clutch cable
- Damaged clutch cable
- Clutch lifter mechanism damaged

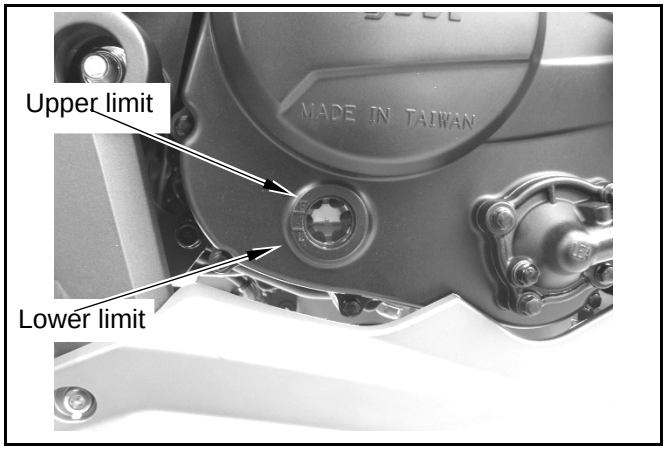
Hard to shift gear
- Excessive clutch free play settings
- Twisted or bent shifting forks

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 the engine; park the motorcycle on level surface with main stand. Check oil level 3-5minutes later.
Check oil quantity from window, if oil level is near lower limit, fill in the recommended oil to upper limit.



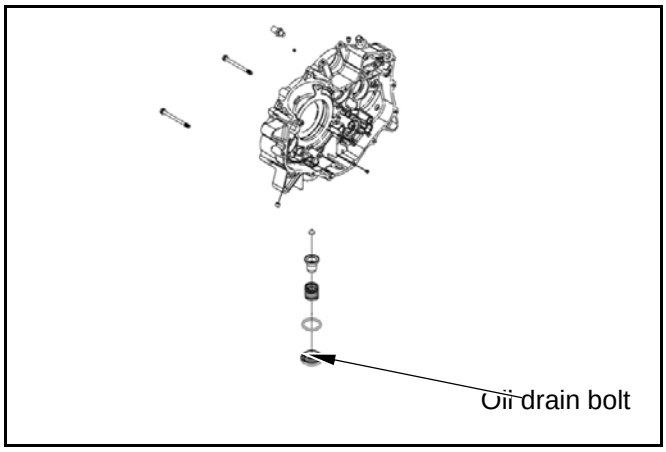
Exchange engine oil

⚠ 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.
Check if the washer damaged, replace when necessary.
Fill in new engine oil after installing oil drain bolt.

Torque value：3.5~4.5kgf-m

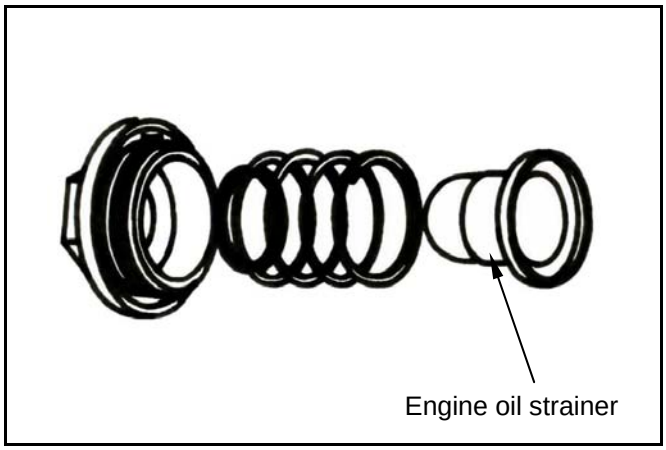


Engine oil strainer cleaning

Remove engine oil strainer cap.
Remove engine oil strainer and spring.
Clean oil strainer with compressed air.
Check if O-ring can be re-used. If it's damaged, please replace with a new one
Install engine oil strainer and spring.
Install engine oil strainer cap.

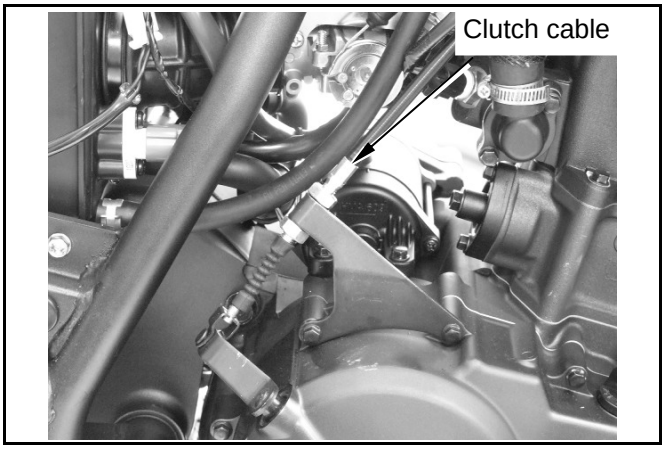
Torque value：1.3~1.7kgf-m

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

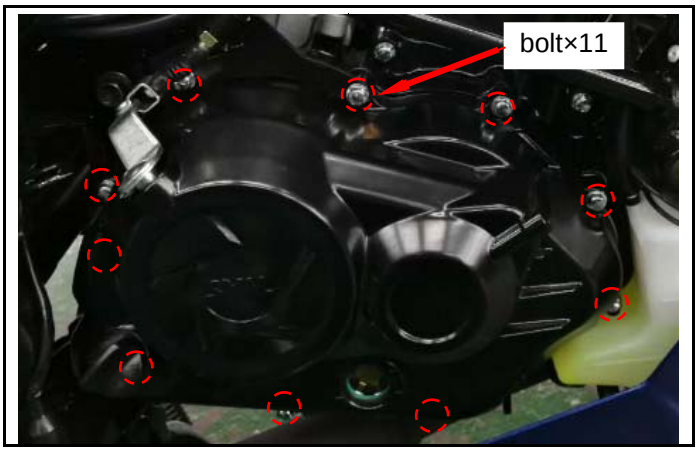


Clutch disassembly

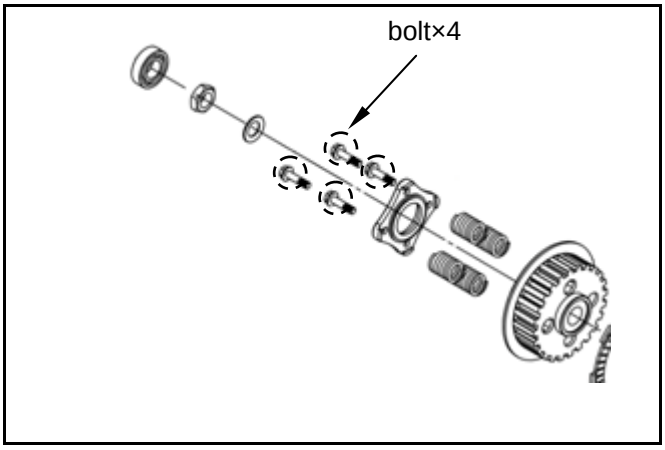
Drain all engine oil.
Remove clutch cable.



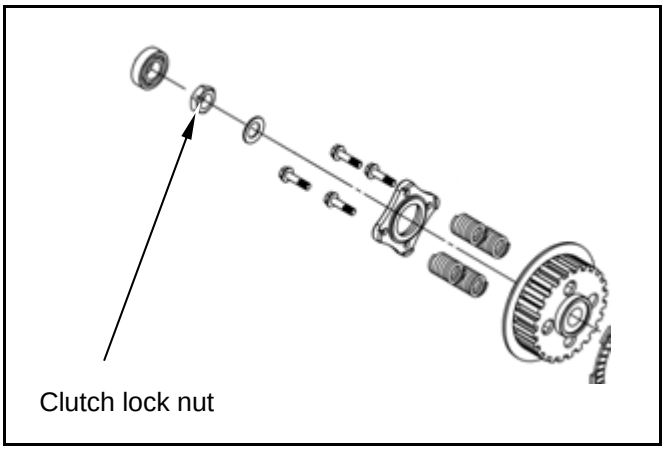
Remove right crankcase cover(bolt×11)。



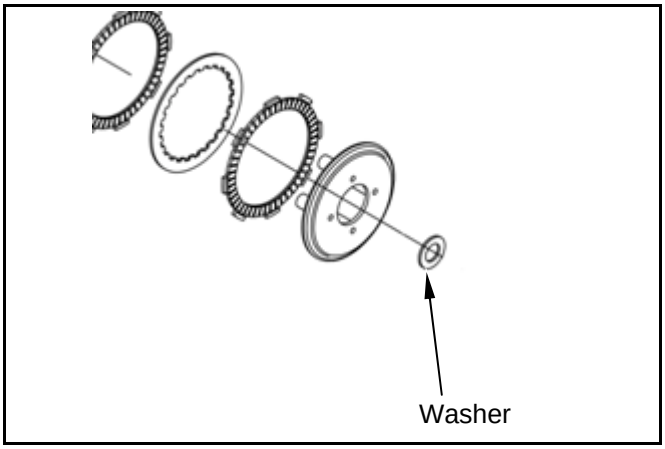
Remove clutch lifter(boltX4)。
Remove clutch spring.



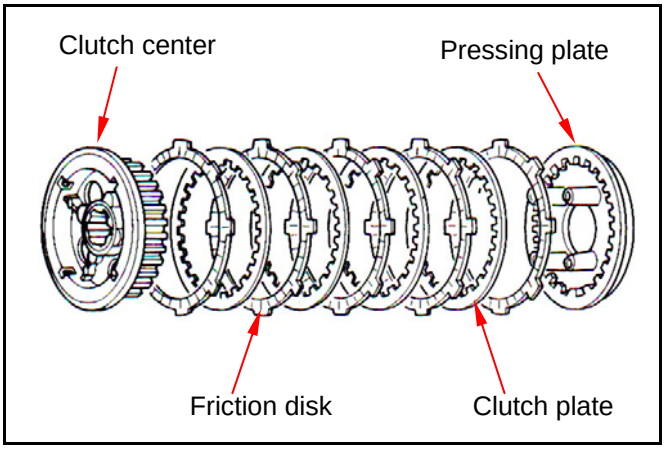
Remove clutch lock nut.
Remove clutch center, friction disks, clutch plates, and pressing plate.



Remove washer, clutch outer, and center guide.



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

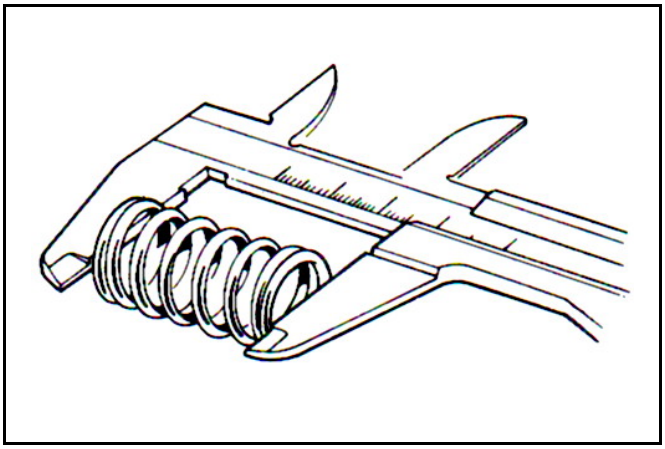


Clutch inspection

Clutch spring inspection

Measure the free length of the 6 clutch springs.

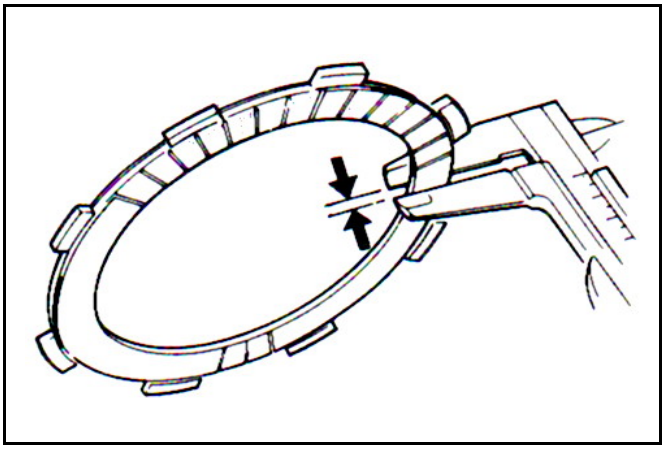
Service limit：41.70**mm**



Clutch friction disk inspection

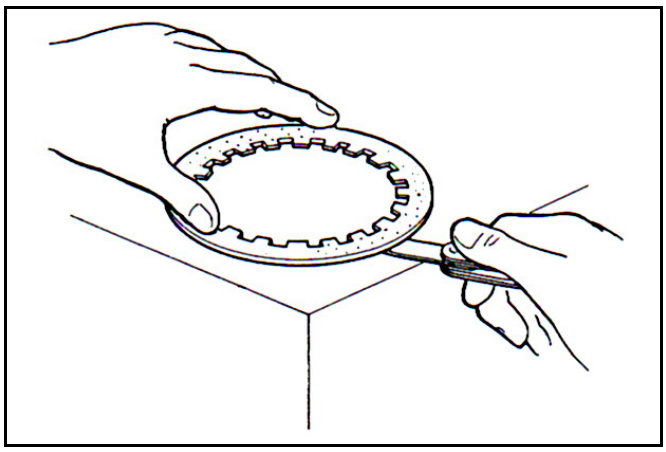
Measure the thickness of each clutch friction disk. If it's under service limit or damaged, please replace it with a new one.

Service limit：2.50**mm**

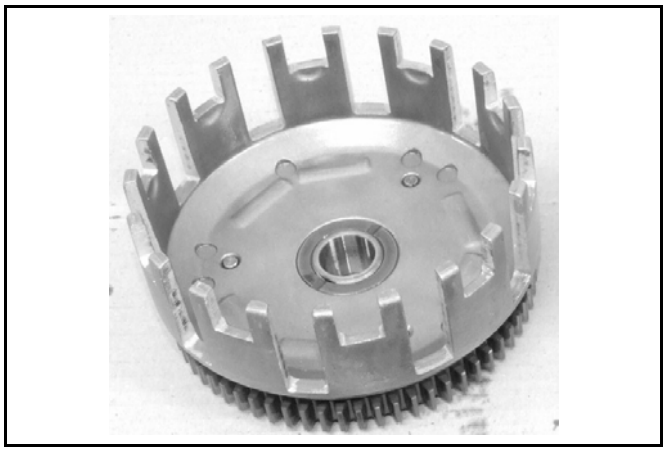


Clutch plate inspection
Use a feeler gauge to measure the warp of each clutch plate.

Service limit：0.2mm

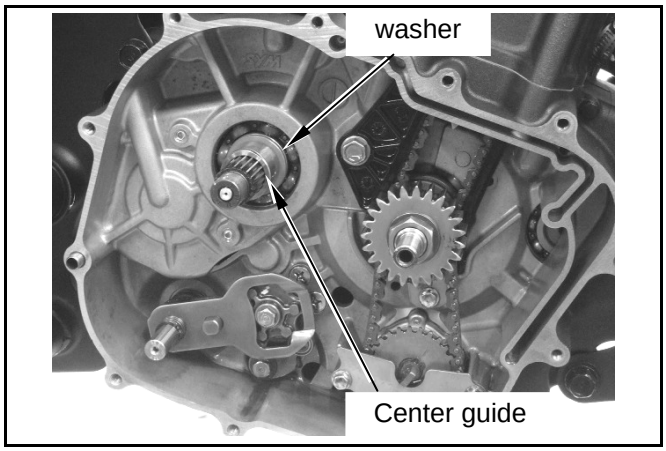


Clutch outer inspection
Check if the clutch outer is cracked or damaged.

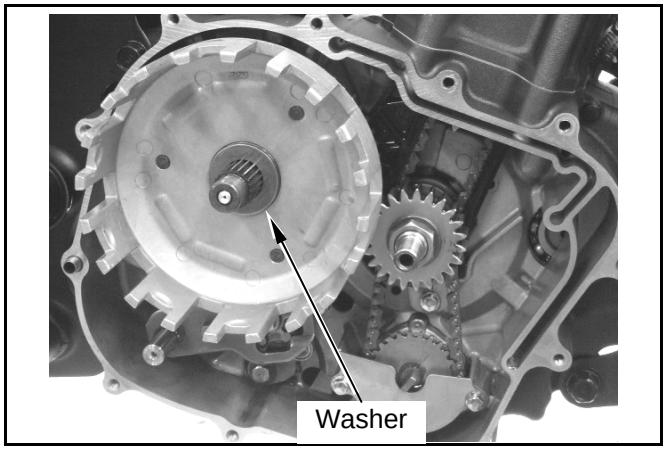


Clutch installation

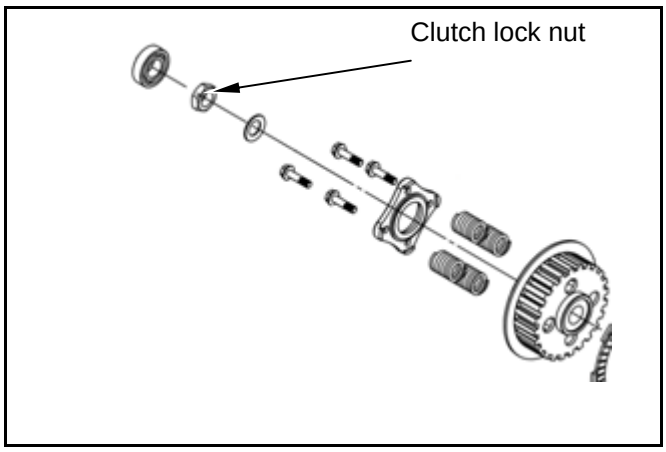
Install clutch washer, center guide.



Install clutch outer and washer.



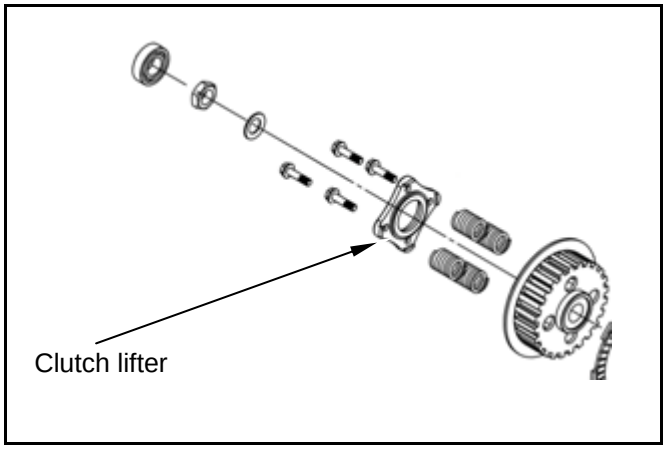
Install clutch center, clutch plate, friction disk, and pressing plate.
Tighten clutch lock nut.



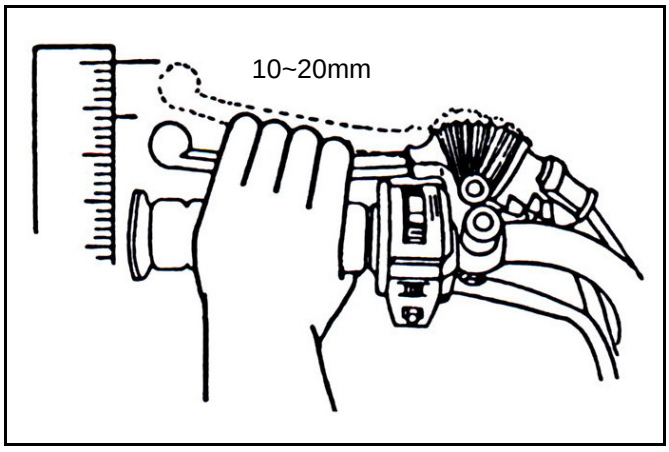
Install clutch spring, clutch lifter; tighten 4 bolts.

Install right crankcase cover. (bolt×11)。

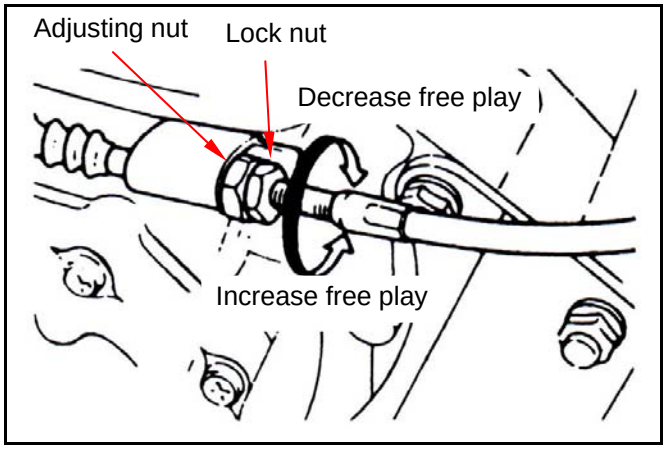
Install clutch cable.
Fill in specified engine oil.



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



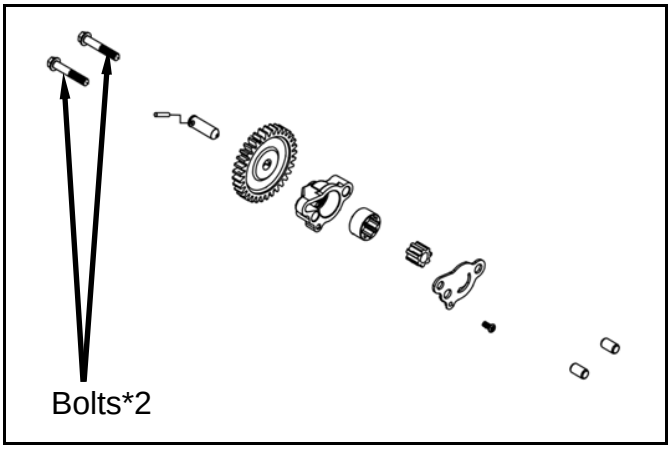
After achieving the correct free play, tighten the adjusting nut and the lock nut.



Oil pump

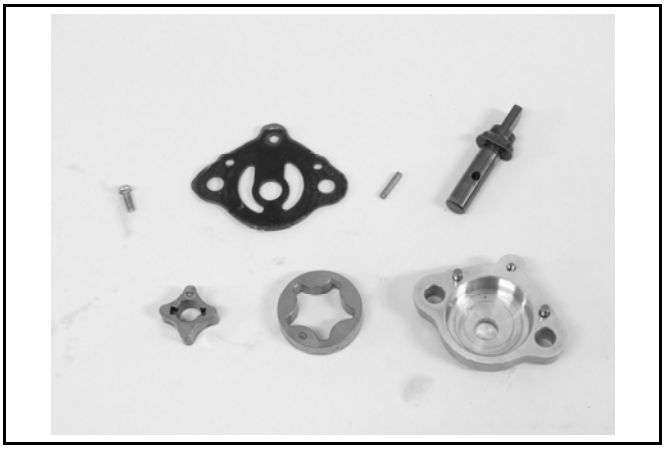
Oil pump disassembly

Remove bolts * 2
Remove oil pump cover. (screw×1)
Disassemble oil pump.

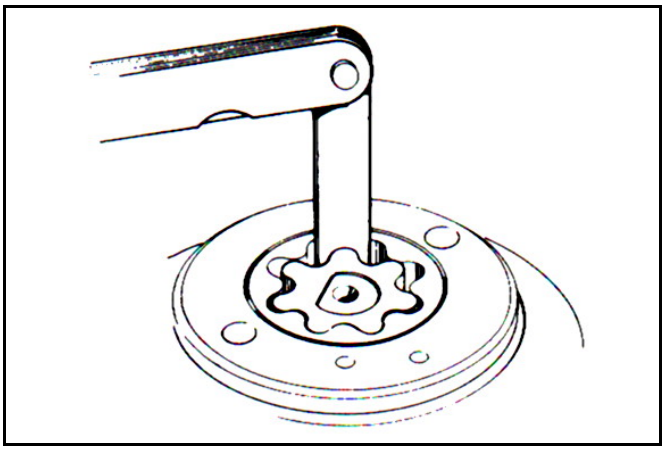


Oil pump inspection

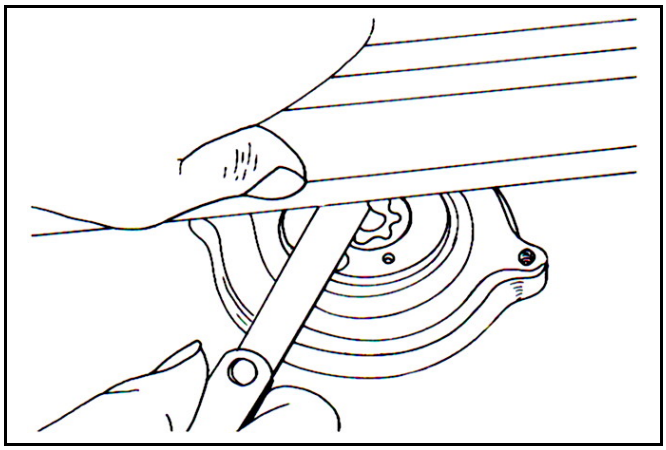
Check the clearance between oil pump body and outer rotor.
Service limit: under 0.25 mm



Check clearance between inner and outer rotors.
Service limit: under 0.20mm



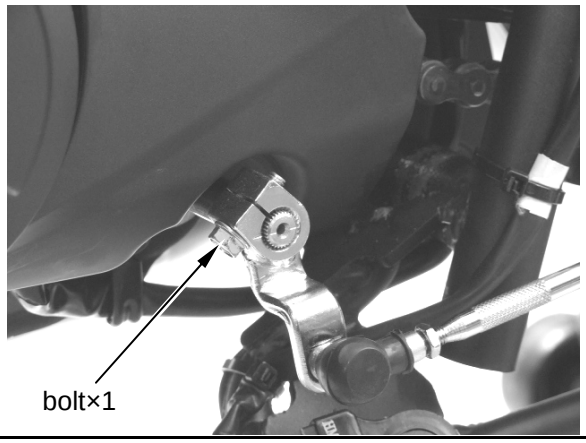
Check the unevenness between rotor face and pump body.
Service limit: under 0.12 mm



Gear shift linkage mechanism

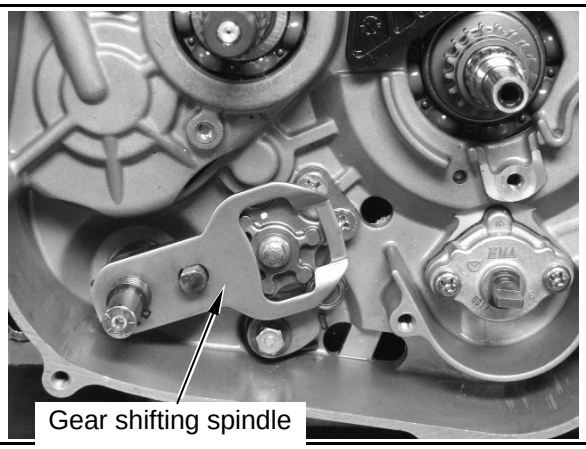
Gear shift linkage disassembly

Remove shifting lever. (bolt×1)

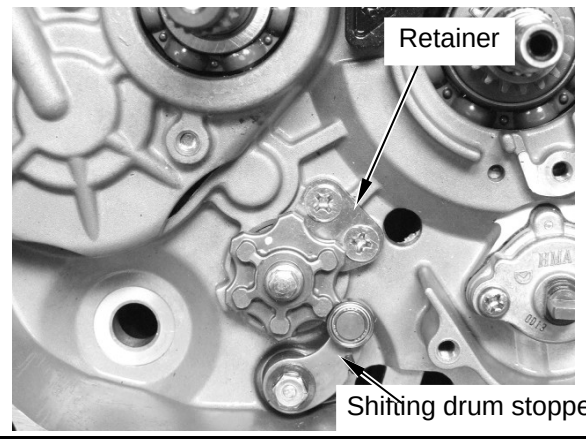


Remove cultch cable.
Remove right crankcase cover.
Remove cultch assembly.

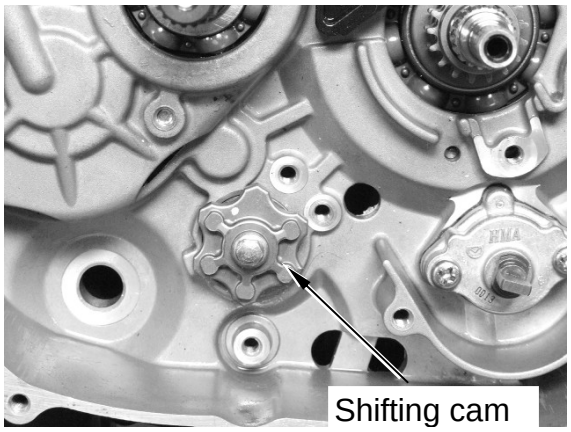
Take out the gear shifting spindle.



Remove the shifting drum stopper arm and the return spring. (bolt×1)
Remove shifting drum retainer. (boltx2)



Remove shifting cam. (bolt×1)
Remove alignment pin.



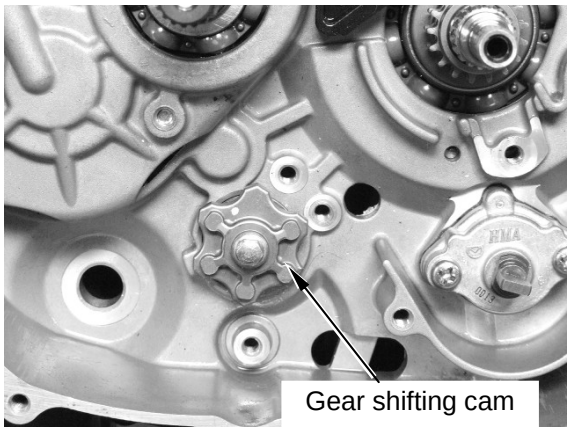
Inspection
Check if shifting spindle and the fork assembly damaged or worn.

Check if shifting drum stopper arm and the return spring damaged or worn.

Check if gear shifting cam damaged or worn.

Gear shift linkage mechanism installation
Install alignment pin.
Install the gear shifting cam by matching the alignment pin.

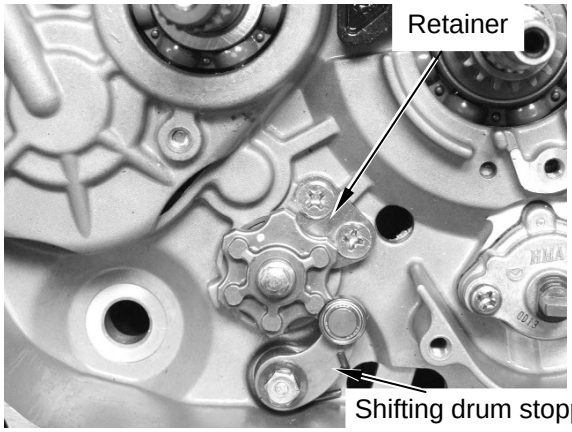
Tighten gear shifting cam lock bolt. (bolt×1)。
Torque value：0.8~1.2kgf-m



Install shifting drum stopper and the return spring. (bolt X 1)
Install shifting drum retainer. (boltx2)
Torque value：0.8~1.2kgf-m

⚠ Caution

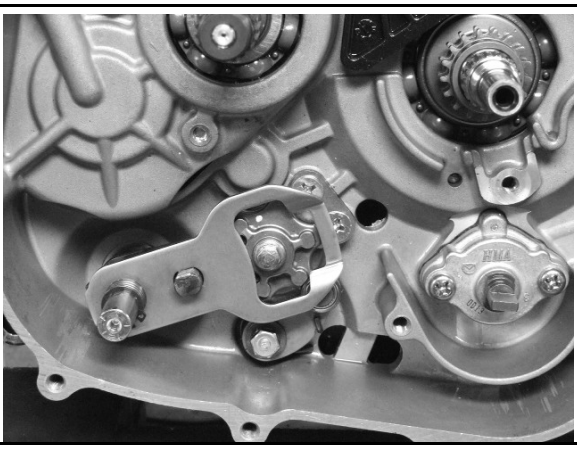
- Check if the stopper is working smoothly after assembly.



Install the gear shifting spindle and the fork assembly. Then install the shifting pedal (bolt X1)

⚠ Caution

- The return spring on the shifting spindle should contact the salient on the crankcase.

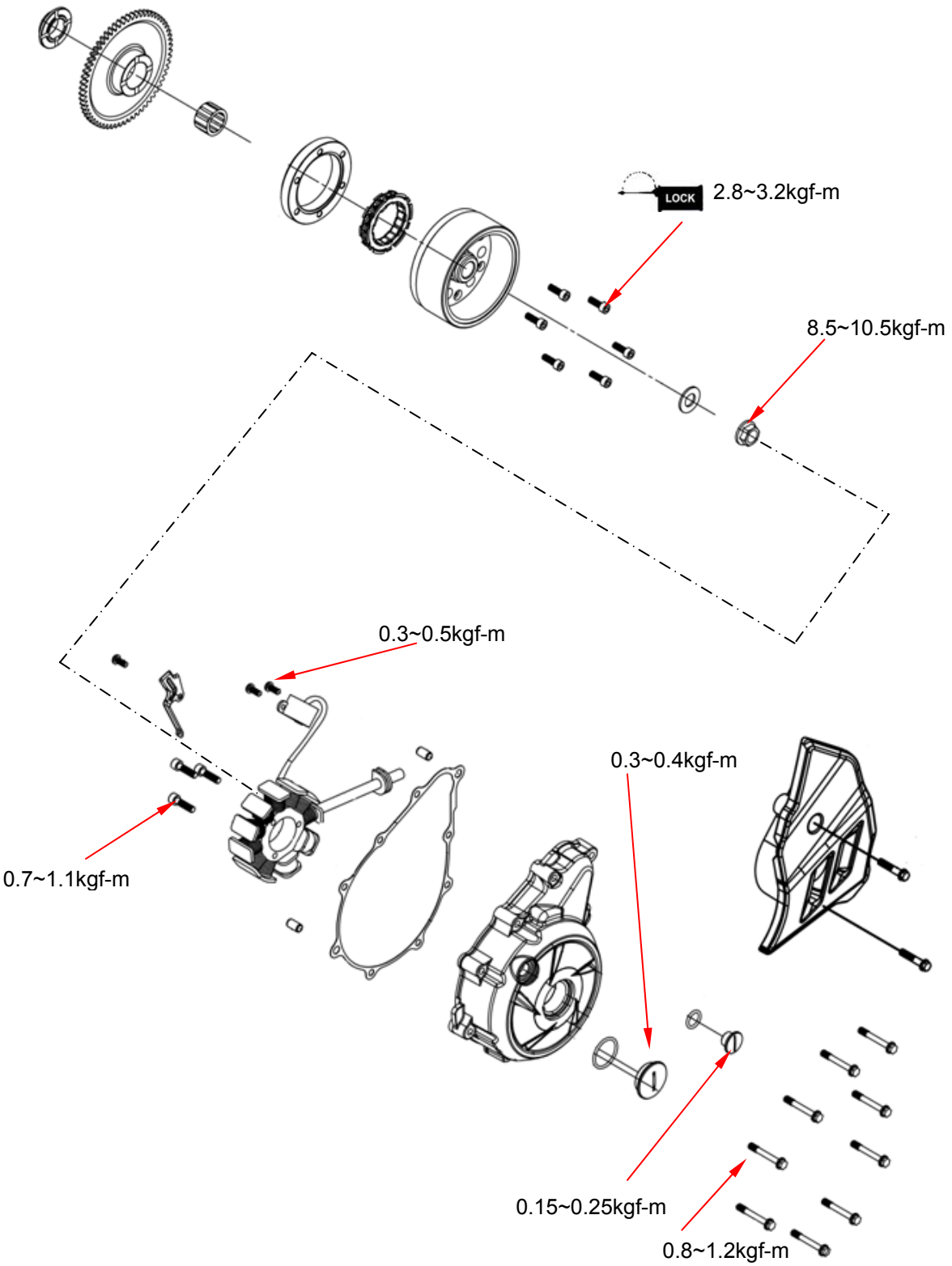


Install cultch assembly.
Install alignment pin and another new right crankcase gasket, then the right crankcase cover.
Connect clutch cable, and adjust the clutch free play.
Fill in specified engine oil.

NOTE:

Mechanism Diagram ····· 5-1	ACG Stator Disassambly ·····5-3
Precautions in Operation····· 5-2	ACG Flywheel/ Starter Clutch····5-5

Mechanism diagram



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 14th.

Specifications **measurement : mm**

Item	Standard	Service limit
Start Driven Gear exterior diameter	42.192~42.208	42.100
Starting Clutch interior diameter	25.026~25.045	25.050

Torque value

Flywheel nut 8.5~10.5kgf-m
Left crankcase cover bolt 0.8~1.2kgf-m
Starting clutch inner-hexagon bolt 2.8~3.2kgf-m with screw adhesive

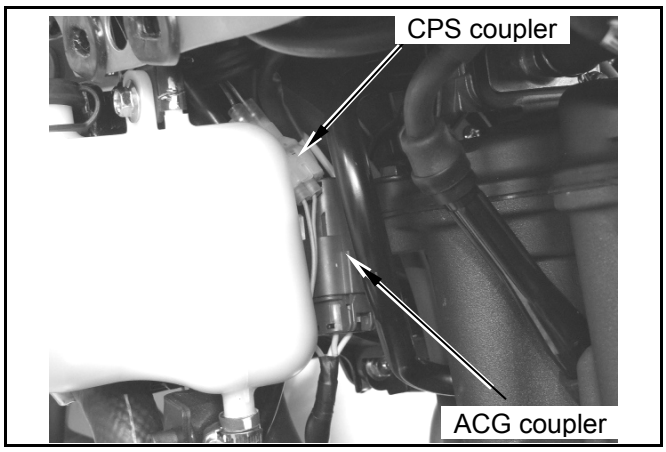
Special tool

Flywheel puller SYM-3111000-HMA

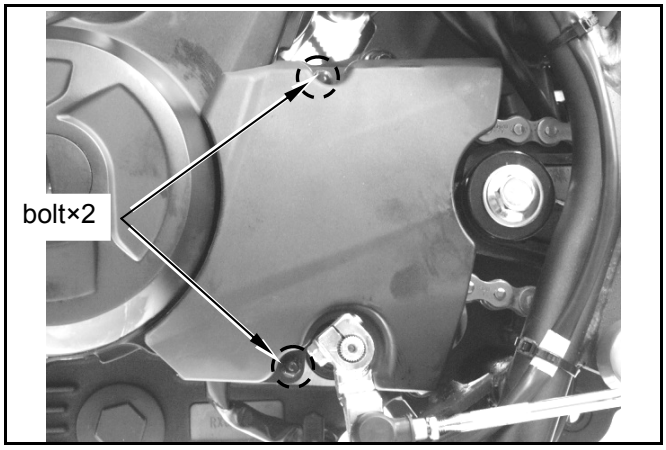
ACG stator disassembly

ACG stator disassembly

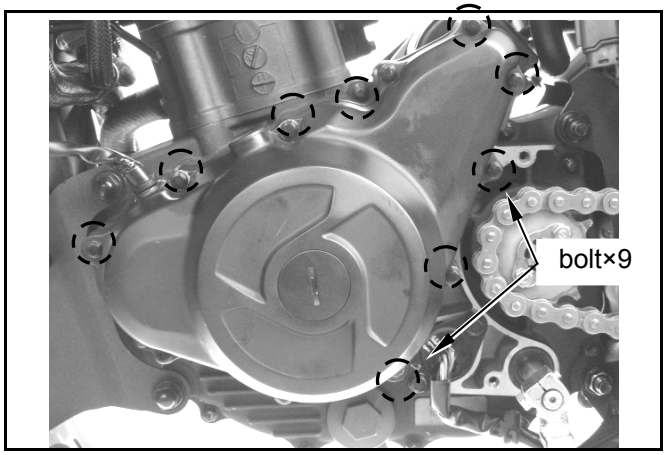
Remove ACG coupler and CPS coupler.



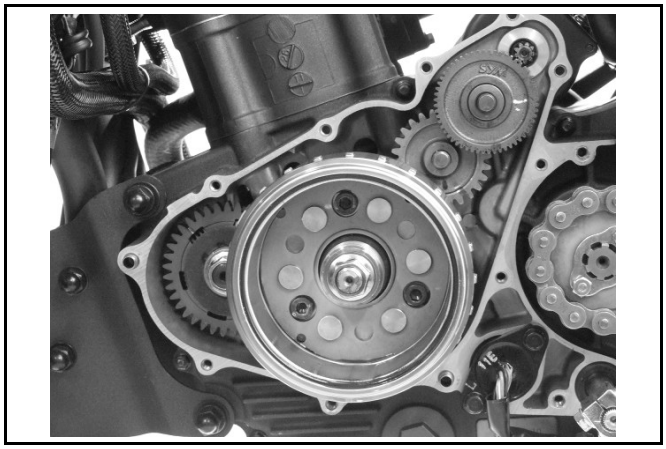
Remove left crankcase chain cover. (bolt×2)



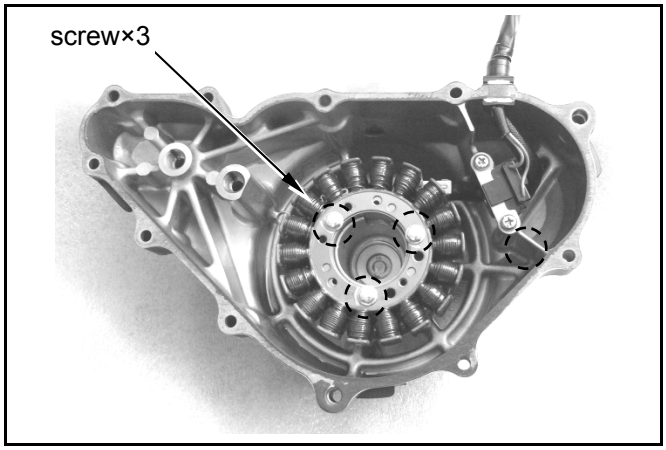
Remove left crankcase cover. (bolt×9)。



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



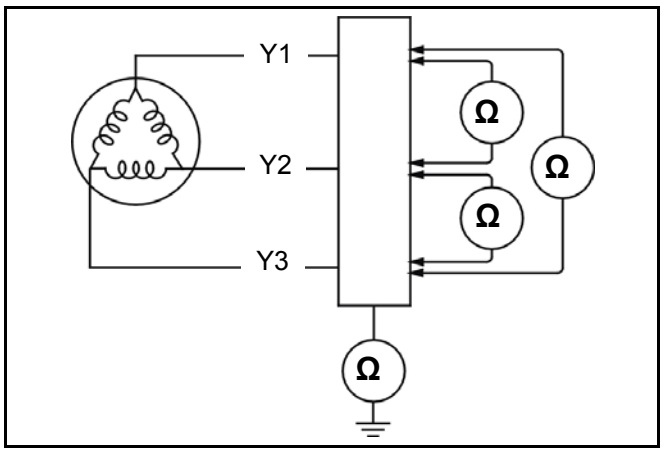
Remove ACG stator holding screw. (screwX3)



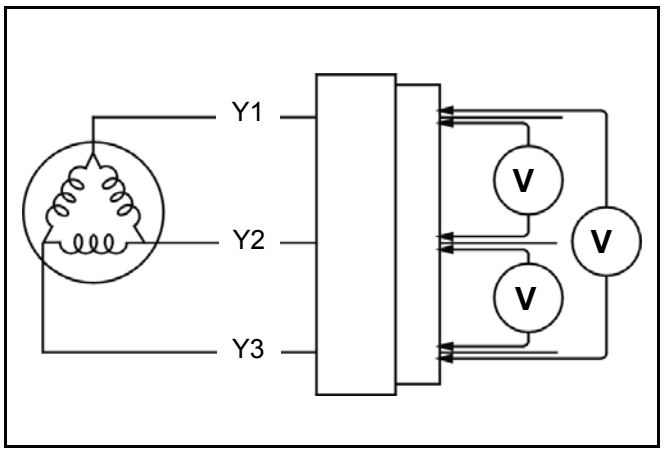
ACG stator inspection

Remove ACG coupler and check its resistance and grounding condition with ohmmeter. Replace ACG if any abnormal situation found.

	V	Ω
Y1	70~80	0.42Ω±20%
Y2	70~80	0.42Ω±20%
Y3	70~80	0.42Ω±20%



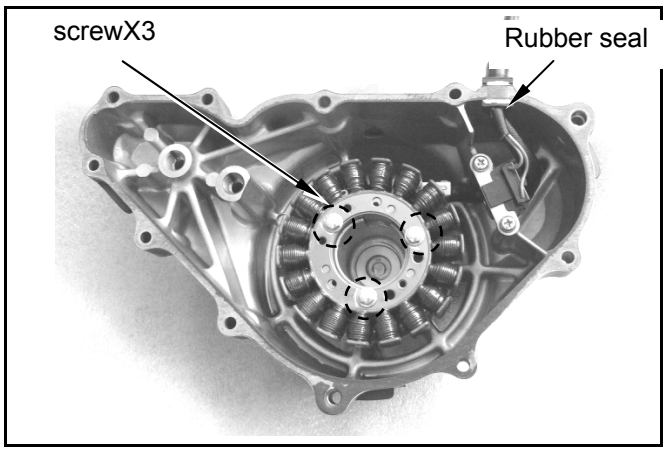
Without removing coupler, voltage generated can be measured by voltage meter while the engine is running.



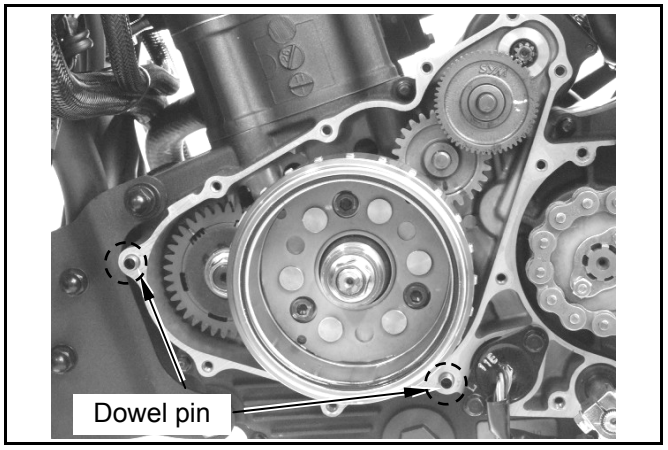
ACG stator assembly

Install ACG stator. (screw×3)。

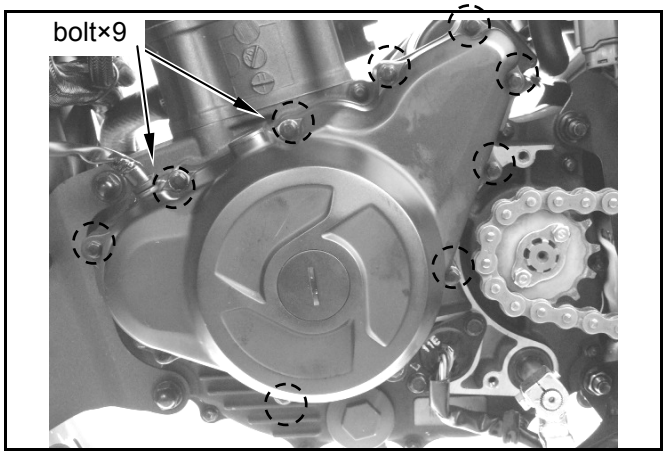
Assemble the stator wire correctly onto the L-crankcase cover with the rubber seal.



Install dowel pin and new L crankcase cover gasket.



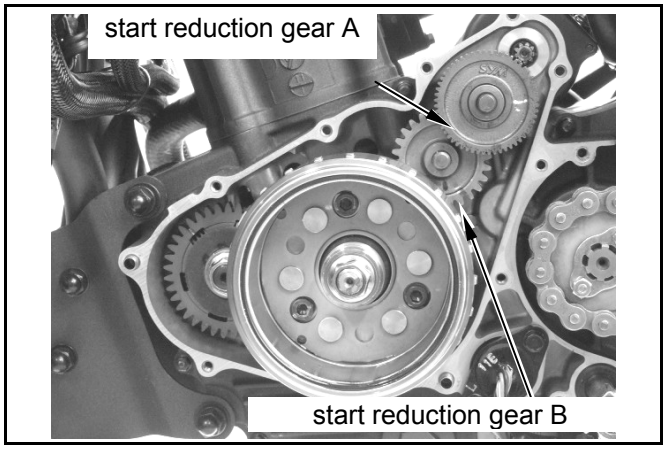
Install left crankcase cover. (bolt×9)。



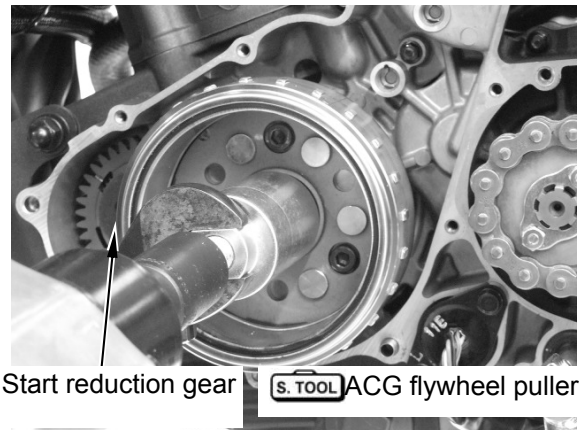
ACG flywheel / starter clutch

ACG flywheel / starter clutch disassembly

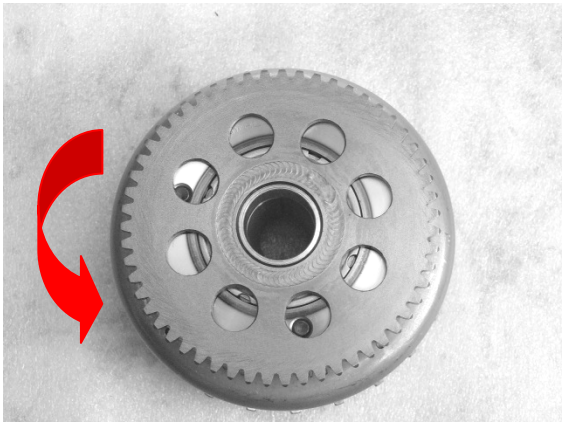
Remove start reduction gear A / B and shaft.



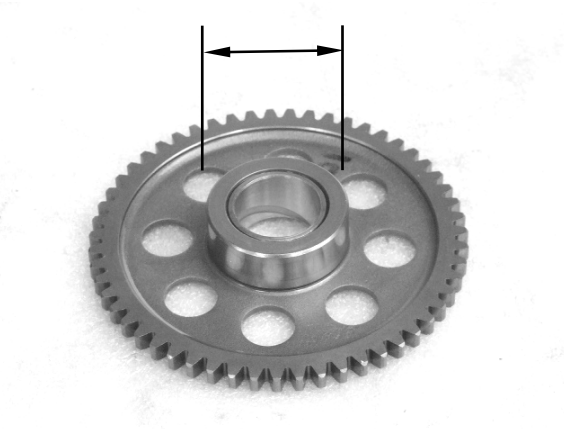
Remove flywheel, starting clutch, and start driven gear with flywheel puller and shaft protector.
Special tool:
ACG flywheel puller
Shaft protector



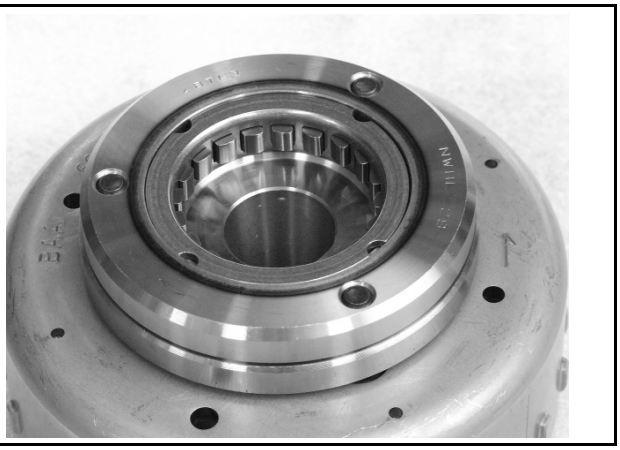
Starting clutch inspection
Assemble the start driven gear onto the starting clutch.
Hold the starting clutch and turn the start driven gear.
Start driven gear should only be able to turn counterclockwise.



Check if the start driven gear damaged or worn.
Measure the exterior diameter of the start driven gear.
Service limit:
Interior diameter: over 25.050 mm
Exterior diameter：over 42.100 mm



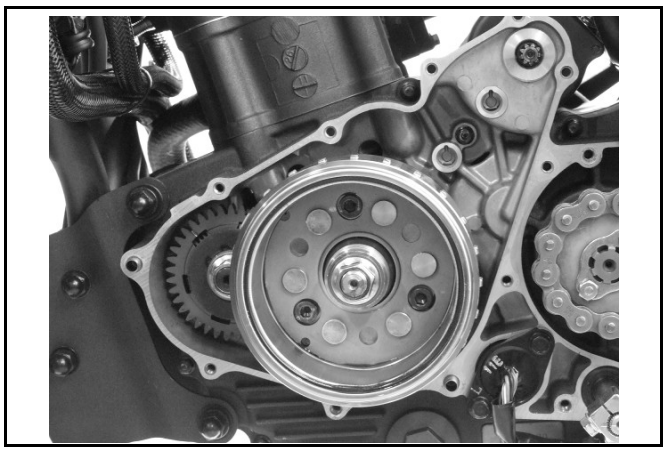
Check if the roller of starting clutch damaged or worn.



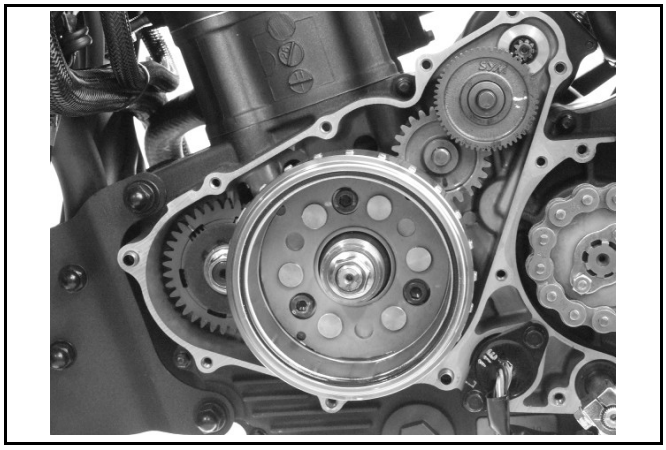
ACG flywheel / starting clutch assembly
Install ACG flywheel, starting clutch, and starting gear.

Tighten ACG flywheel. (bolt×1)。

Torque value: 8.5~10.5kgf-m



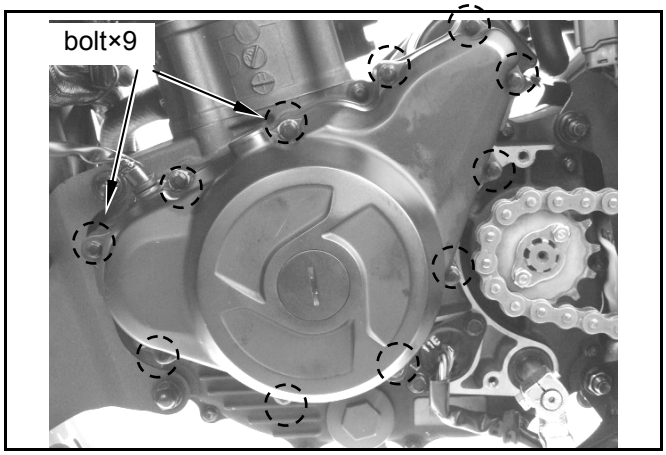
Install start reduction gear A / B and shafts..



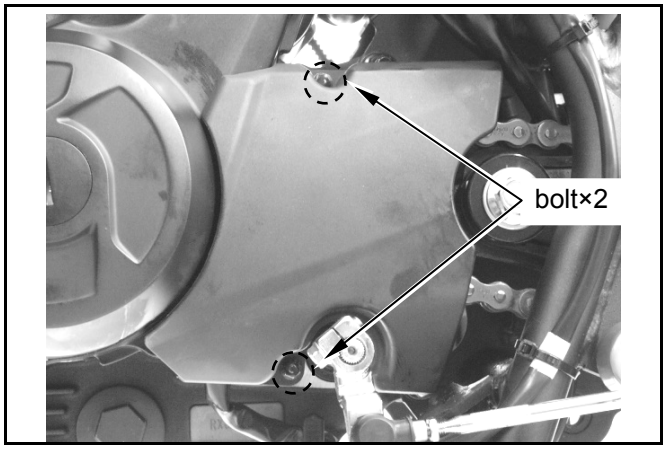
Install dowel pin and new gasket.

Install left crankcase cover. (bolt×9)。

Torque value：0.8~1.2kgf-m



Install left crankcase chain cover. (bolt×2)



NOTE:

Precautions in Operation·····6-1
Engine Removal·····6-2
Engine Installation·····6-7

Precautions in operation

General information

- During the 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 installed on the frame:
  1. AC generator
  2. Starting cultch
  3. Clutch
  4. Transmission mechanism
- You must remove the engine for repairing the following parts:
  1. Piston
  2. Cylinder
  3. Cylinder head
  4. crank shaft / balancing shaft
  5. Transmission mechanism

Specification

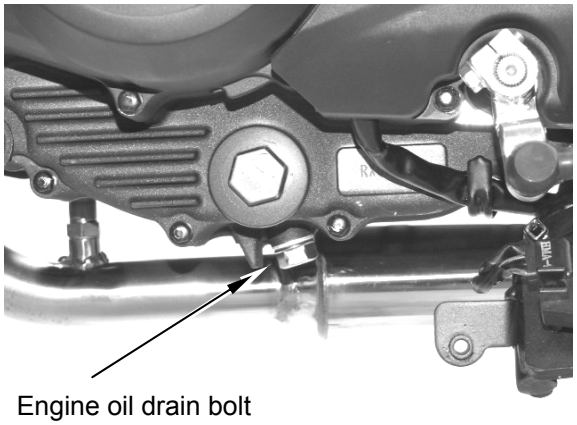
Model		Specification
Engine oil capacity	Regular exchange	1000 c.c.
	Fully disassembly	1200 c.c.

Torque value

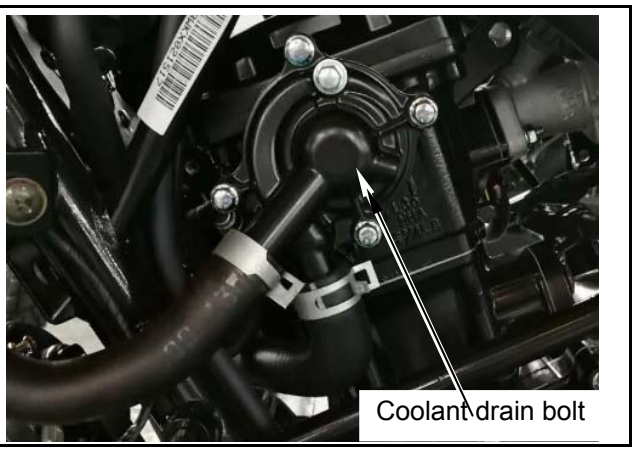
Engine suspension nut (the upper part of engine and frame) 2.4~3.0kgf-m
Engine assembly nut (the front part of engine and engine hanger) 3.0~4.0kgf-m
Engine assembly nut (the back part of the engine and frame) 4.5~5.5kgf-m
L crankcase chain cover bolt 0.8~1.2kgf-m
Driven sprocket bolt 0.8~1.2kgf-m

Engine removal

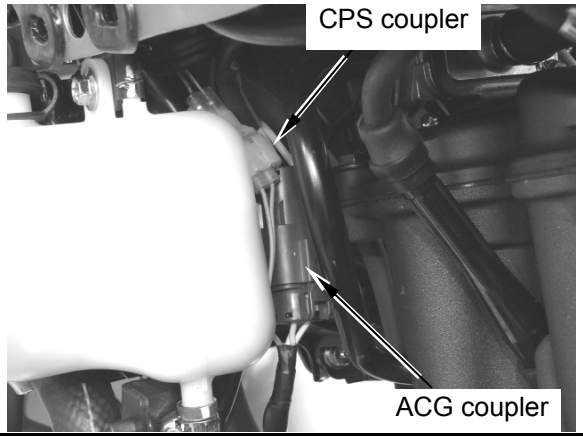
Drain all engine oil.



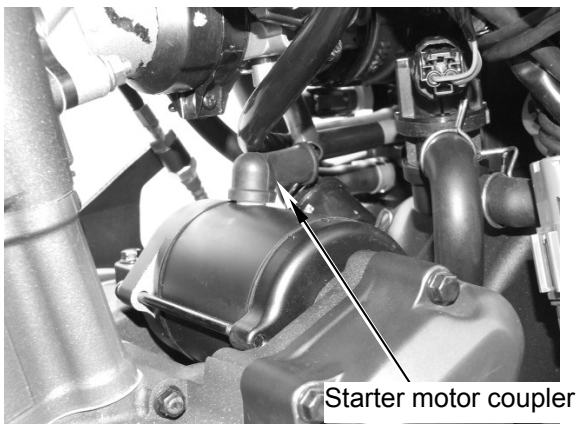
Drain all coolant.



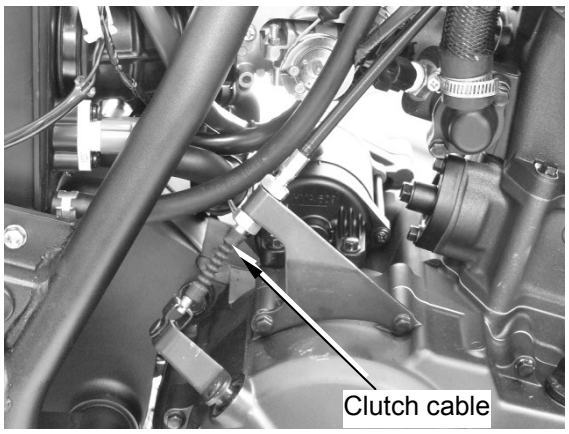
Disconnect CPS and ACG couplers.



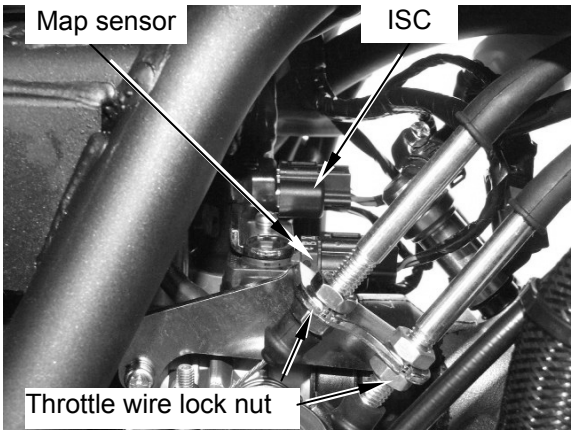
Disconnect starter motor coupler.



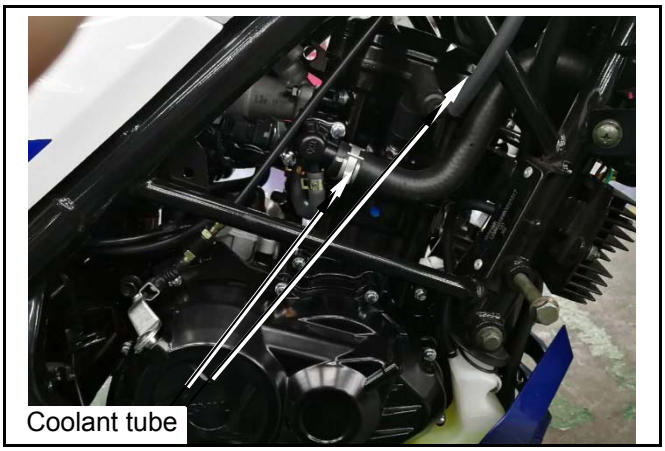
Loosen clutch cable lock nut and adjusting nut, remove clutch cable.



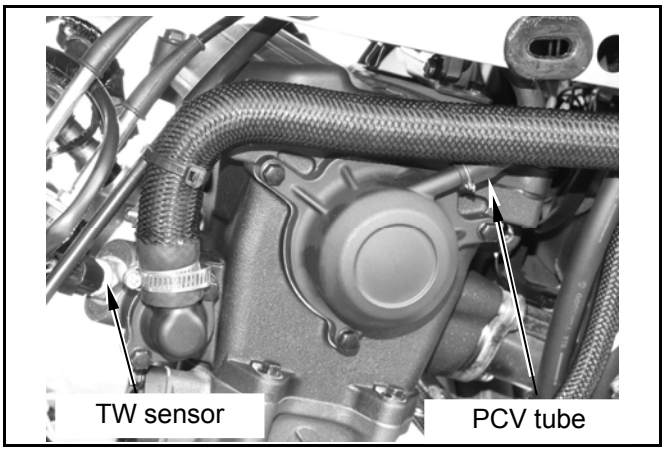
Loosen throttle wire lock nut, remove throttle cable.
Disconnect MAP sensor and ISC couplers.



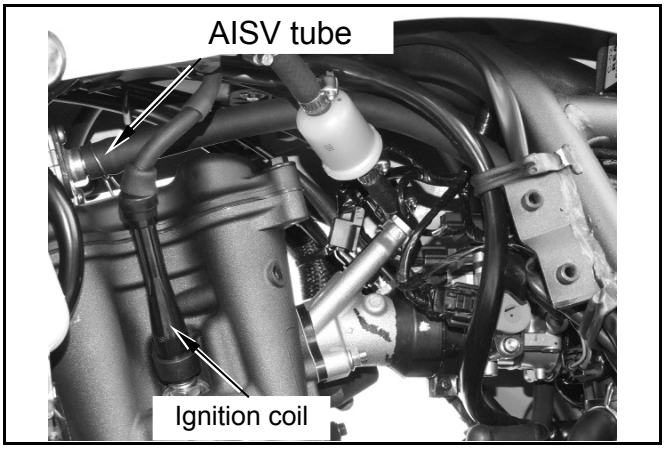
Loosen coolant hose band, remove coolant hose.



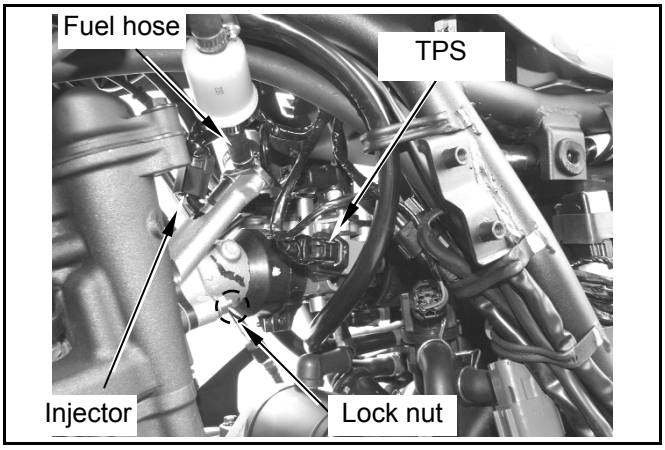
Remove PCV tube.
Disconnect TW sensor coupler.



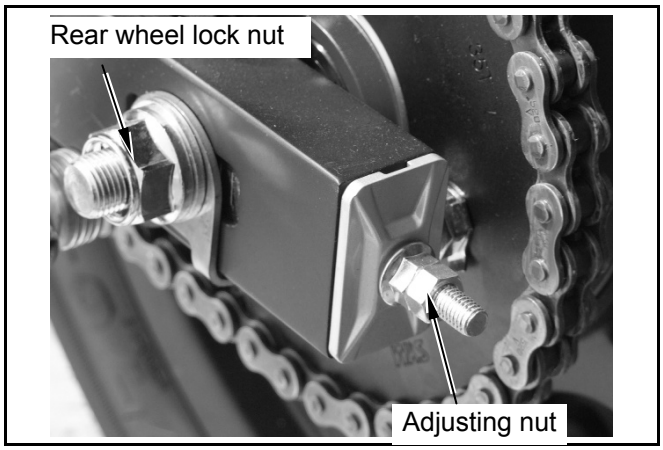
Disconnect ignition coil coupler and AISV tube.



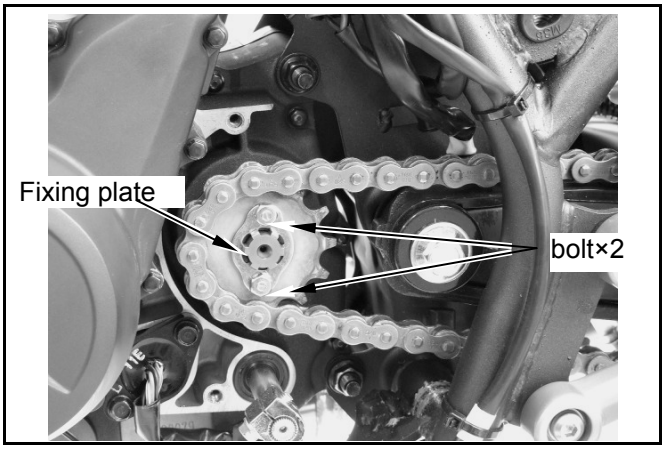
Disconnect fuel hose.
Disconnect injector and TPS couplers.
Remove injector. (lock nutX2)



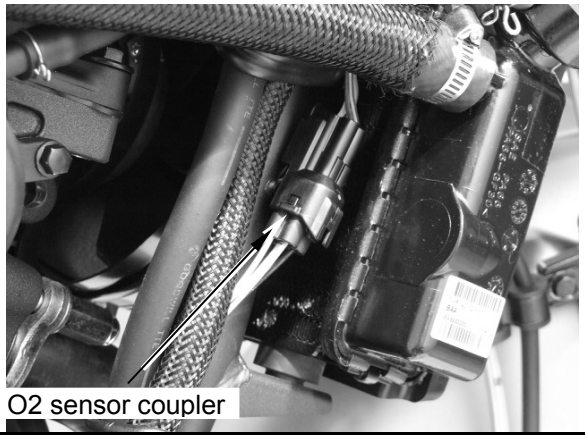
Loosen rear wheel axle lock nut.
Loosen drive chain adjusting nut and push the rear wheel forward.



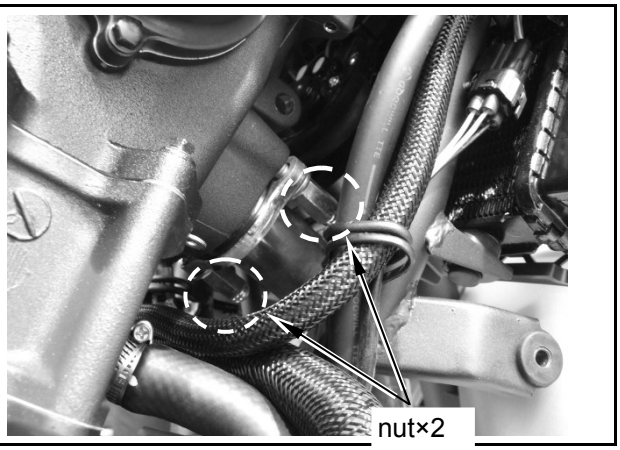
Remove left crankcase chain cover.
Remove the drive sprocket bolts (bolt×2), sprocket fixing plate, drive sprocket, and chain.



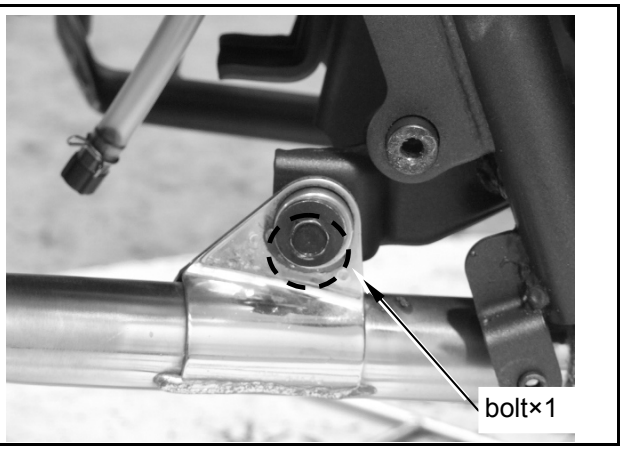
Disconnect O2 sensor coupler.



Remove exhaust pipe front lock nut. (nut×2)。

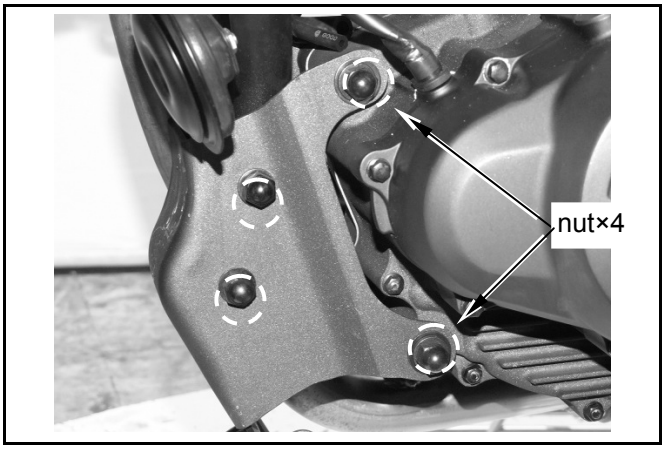


Remove the exhaust pipe center bolt.

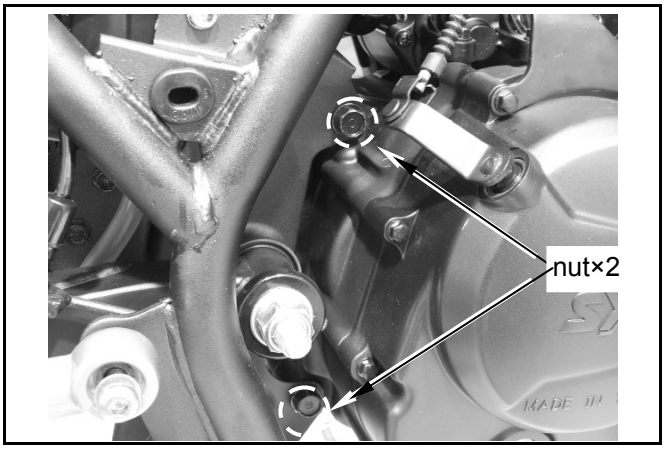


Remove the exhaust pipe rear bolt.
Remove the exhaust pipe.

Settle the engine on a rack.
Remove engine front hanger. (nut×4, bolt×4)



Remove engine rear holding bolts. (nut×2, bolt×2)。
Remove the engine.

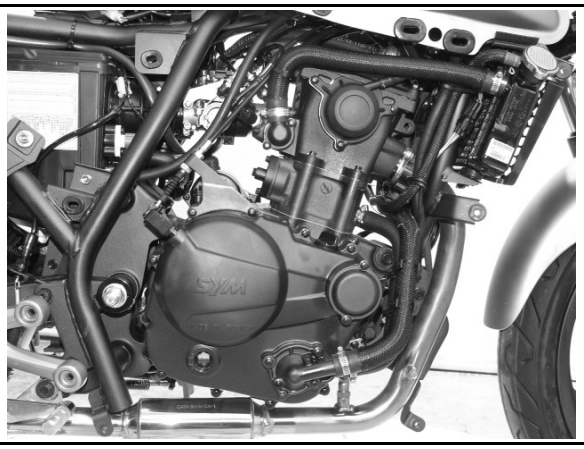


Engine installation

Install the engine in the reverse order of removal.

Caution

- When assembling, always pay attention to possible injuries.
- Wires, cables, tubes, and hoses cannot be bent or pressed.
- Please align the wires and cables in accordance with the setting diagram.



Torque value:

Engine suspension nut (the upper part of engine and frame)	**2.4~3.0kgf-m**
Engine assembly nut (the front part of engine and engine hanger)	**3.0~4.0kgf-m**
Engine assembly nut (the back part of the engine and frame)	**4.5~5.5kgf-m**
L crankcase chain cover bolt	**0.8~1.2kgf-m**
Driven sprocket bolt	**0.8~1.2kgf-m**

After installation, fill in specified engine oil and coolant, adjust clutch lever free play, drive chain free slack, and idle speed.

NOTE:

Mechanism Diagram ····· 7-1
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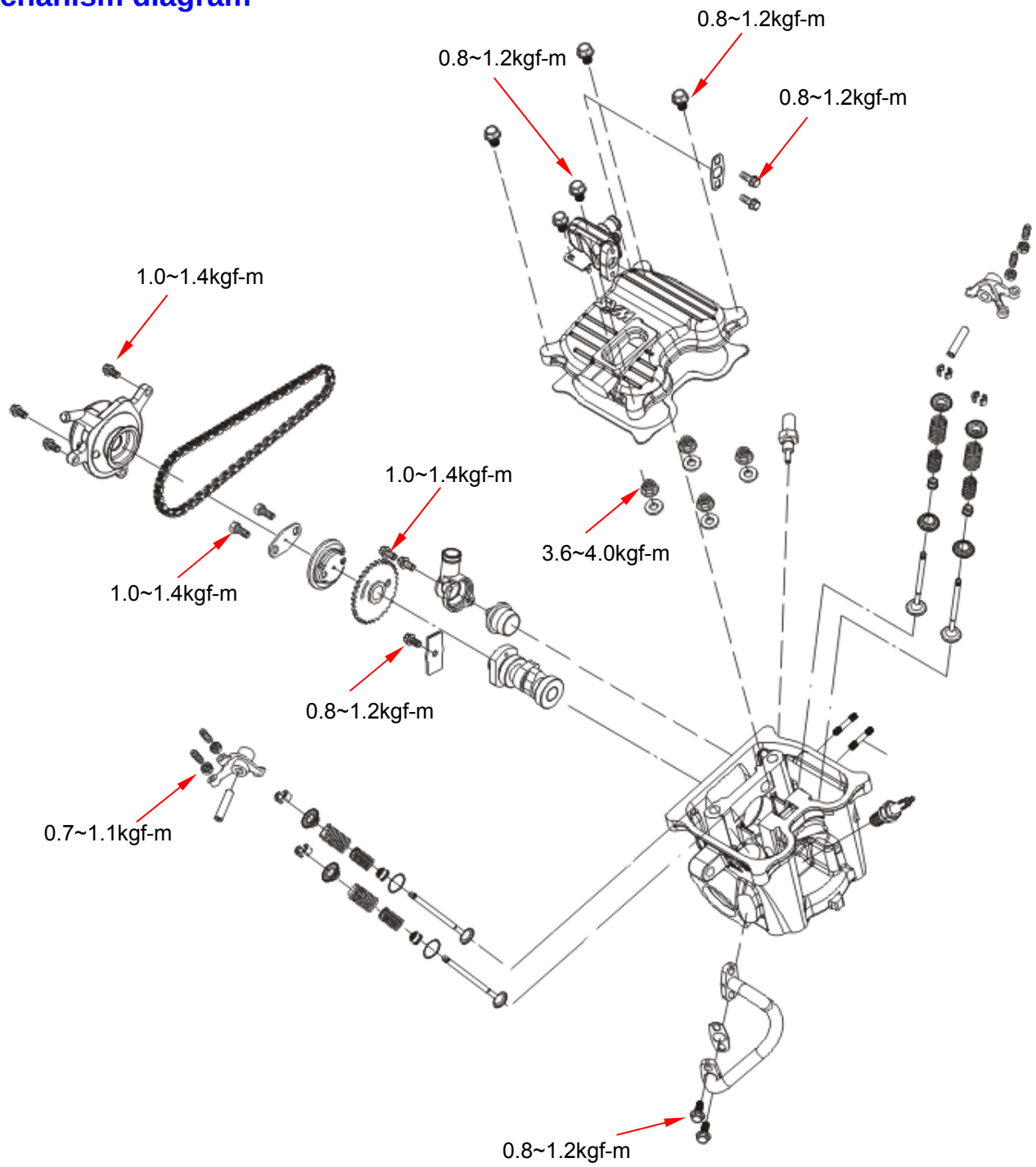
Troubleshooting····· 7-3
Cylinder Head Removal····· 7-4
Cylinder Head Disassembly····· 7-6
Cylinder Head Inspection ····· 7-8
Valve Guide Replacement····· 7-10
Valve Seat Inspection & Refacing ····· 7-11
Cylinder Head Assembly ····· 7-13
Cylinder Head Installation····· 7-14
Valve Clearance Adjustment···· 7-16

Mechanism diagram



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: mm**

Item			Standard	Service Limit
Valve Clearance (when engine is cold)		In	0.10 ± 0.02	—
		Ex	0.15± 0.02	
Compression Pressure			12 ± 2 kg/cm²	—
Camshaft	Cam Lift	In	34.880	34.860
		Ex	34.740	34.725
Rocker Arm	Inner Diameter		11.982~12.000	12.080
	Outer Diameter		11.966~11.984	11.936
Valve	Valve stem outer diameter	In	4.975~4.990	4.900
		Ex	4.950~4.975	4.900
	Valve guide		5.000~5.012	5.030
	Clearance between Valve stem and guide	In	0.010~0.037	0.080
		Ex	0.025~0.062	0.100
	Valve spring free length	Inner spring	38.700	35.200
		Outer spring	40.400	36.900
	Valve seat width		1.600	—
Warpage/clearance between cylinder head and cylinder			—	0.050

Torque value

Cylinder head bolt 0.8~1.2kgf-m
Cylinder head right bolt 1.0~1.4kgf-m
Cylinder head side cover bolt 1.0~1.4kgf-m
Cylinder head nut 3.6~4.0kgf-m
Cam chain sprocket bolt 1.0~1.4kgf-m
Rocker arm shaft setting plate bolt 0.8~1.2kgf-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
Valve Guide driver 5.0mm
Rocker arm shaft/ Camshaft Disassemble tool SYM-1445100
Valve Spring Compressor SYM-1471100
Valve Spring Assemble/Disassemble Tool SYM-1471110/20
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 by performing cylinder compression test or judging the abnormal noise.

Poor idling

The compression pressure is too low.

Low compression pressure

1. Valve

- Improper valve clearance adjustment
- Burnt or bent valve
- Improper valve timing
- Valve spring damaged
- Valve carbon deposit
- Valve seat warpage
- Improper spark plug installation

2. Cylinder head

- Cylinder head gasket leaking or damaged
- Tilted or cracked cylinder

3. Piston

- Piston rings worn

High compression pressure

Too much carbon deposit on combustion chamber or piston head

Abnormal noise

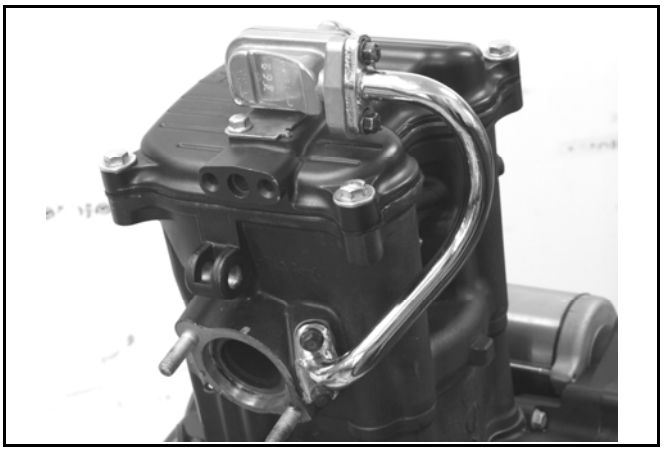
- Improper valve clearance adjustment
- Burnt valve or damaged valve spring
- Camshaft worn out or damaged
- Chain worn out or loosened
- Auto-tensioner worn out or damaged
- Camshaft sprocket worn not or damaged
- Rocker arm or rocker arm shaft worn out

Smoke from exhaust pipe

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

Cylinder head removal

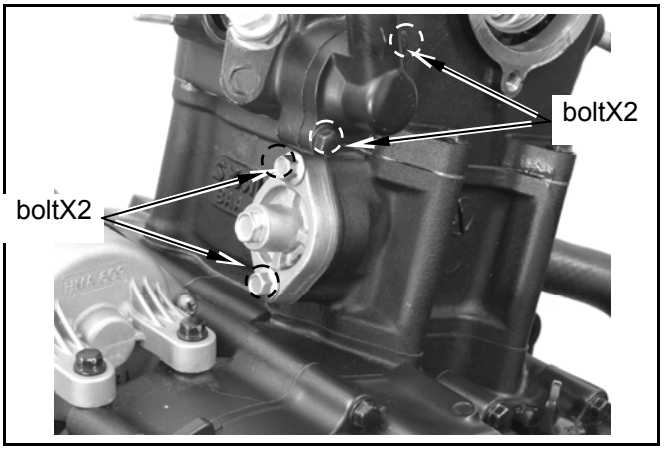
Remove engine. (Refer to chapter 6)



Remove auto-tensioner adjusting bolt.

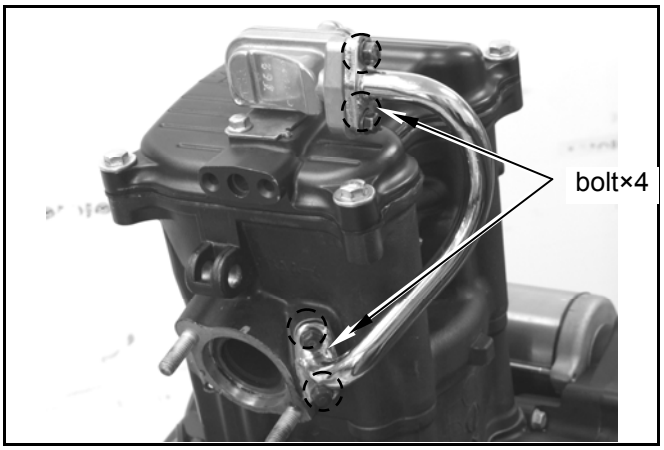
Remove auto-tensioner. (bolt×2)。

Remove thermostat. (bolt×2)。

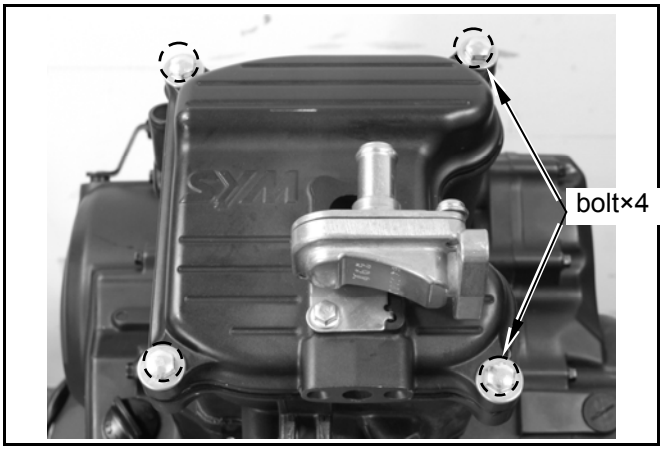


Remove AI pipe. (bolt×4)。

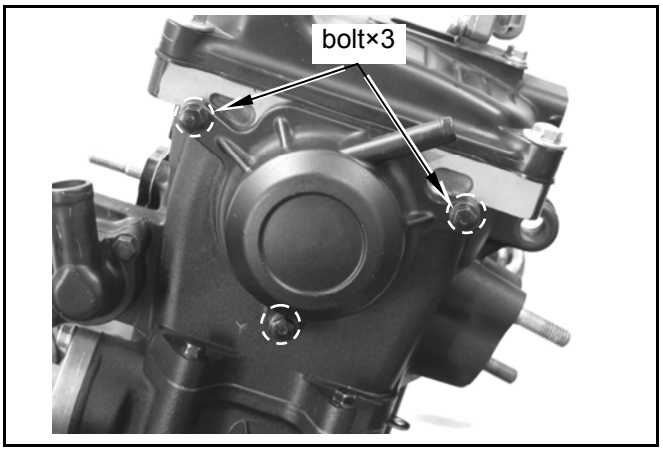
Remove spark plug.



Remove cylinder head cover. (bolt×4)。



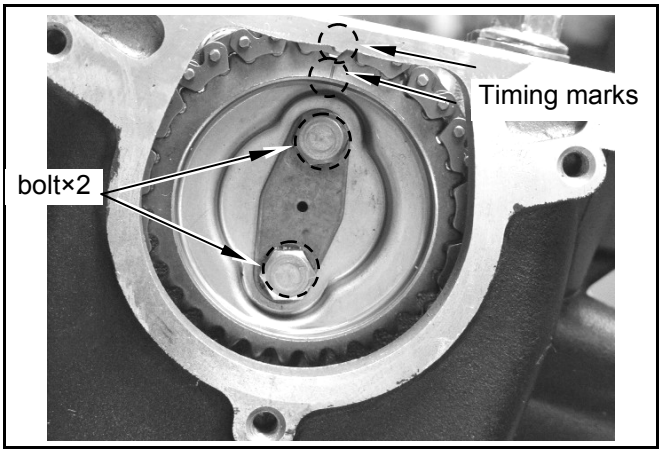
Remove cylinder head side cover. (bolt×3)。



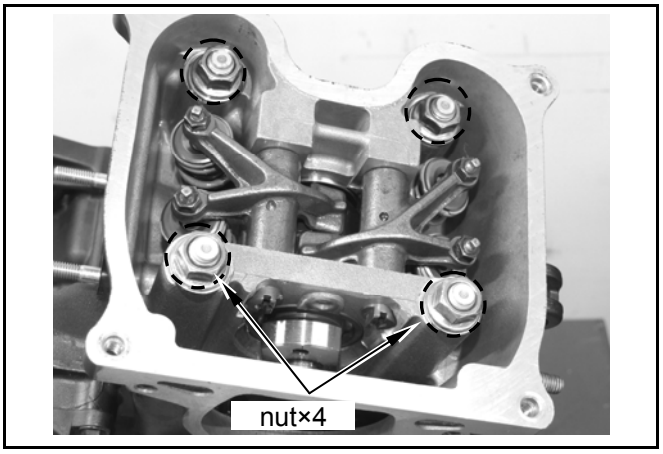
Remove timing-inspecting hole cap.
Remove ACG cap, turn ACG flywheel counterclockwise, align “T” mark with the mark on L crankcase; align the timing marks on cam gear and cylinder head.

Remove cam gear lock nut. (bolt×2)。

Remove cam gear.



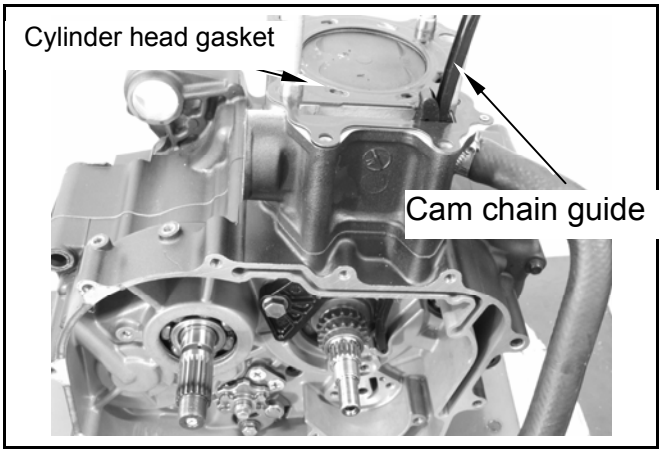
Remove bolts on right side of cylinder head first (bolt×2) , then the cylinder head nuts. (nut×4)
Remove cylinder head.



Remove cylinder head gasket and dowel pins.
Remove cam chain guide.
Clean up the matching surfaces between cylinder and cylinder head.

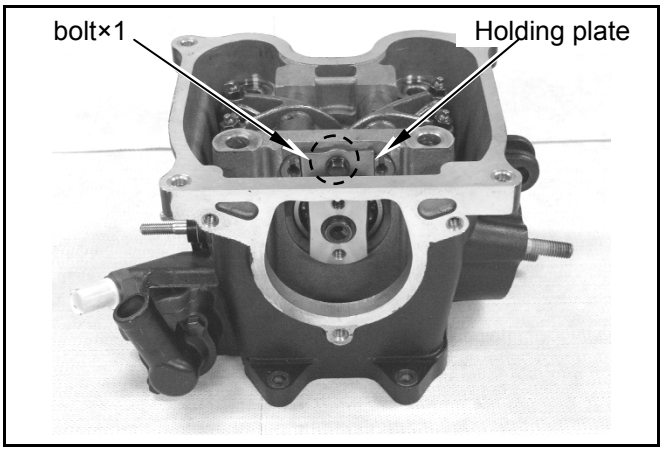
⚠ Caution

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

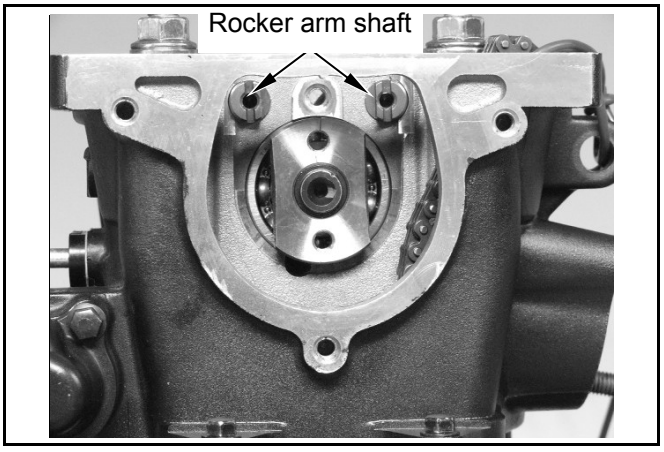


Cylinder head disassembly

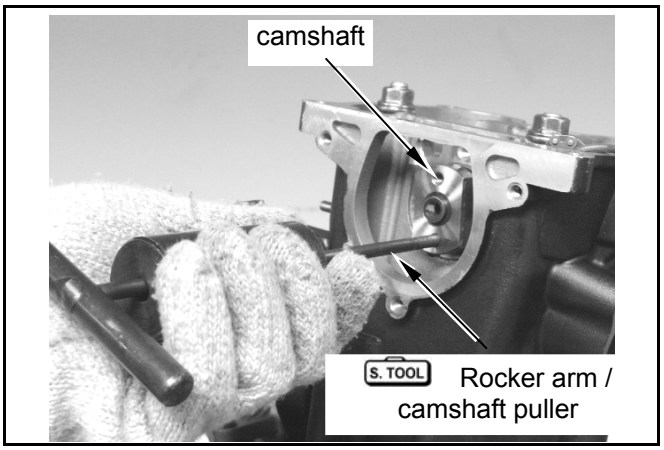
Remove rocker arm shaft holding plate.
(bolt×1)



Use **Rocker arm / camshaft puller** to pull out the rocker arm shafts.
Special tool:
Rocker arm / camshaft puller SYM-1445100



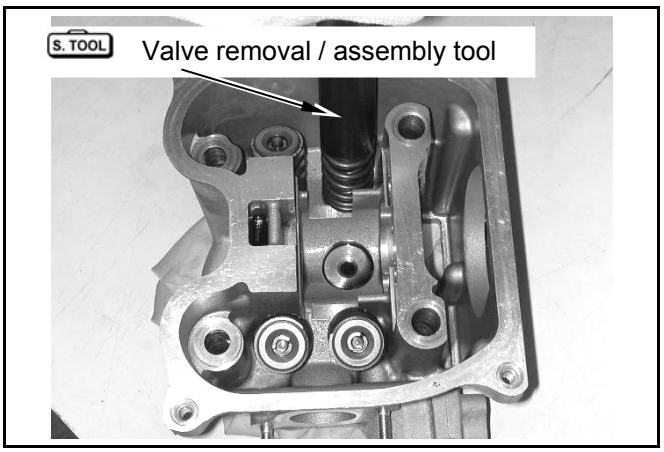
Use **Rocker arm / camshaft puller** to pull out the camshaft.
Special tool:
Rocker arm / camshaft puller SYM-1445100



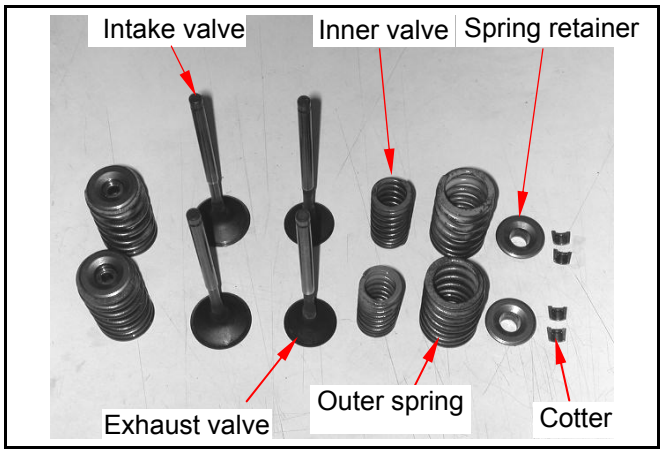
Use Valve removal / assembly tool to compress the spring, remove the valve cotter.
Special tool:
Valve removal / assembly tool SYM-1471110-SY125

⚠ Caution

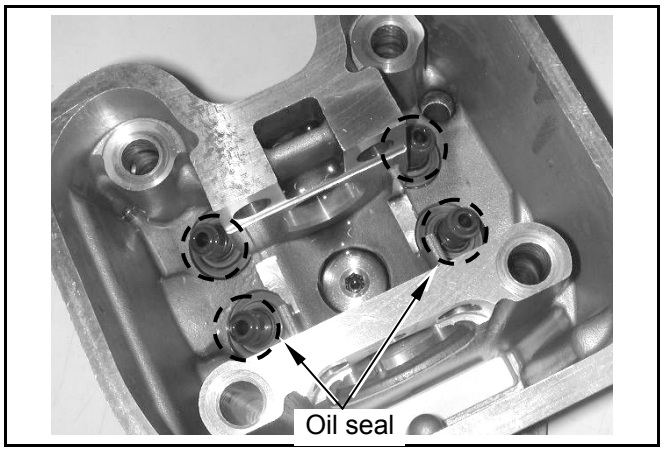
- Do not over compress the valve spring.
- When removing springs, place cloth in combustion chamber to hold the valves avoiding bending the valve.



Remove cotters, springs, and the spring retainers.



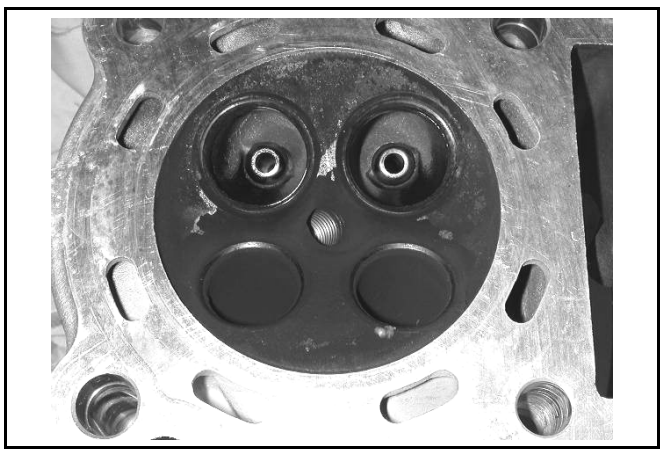
Remove valve guide oil seals.



Clean up carbon deposit in combustion chamber.
Clean up cylinder head matching surface.

⚠ Caution

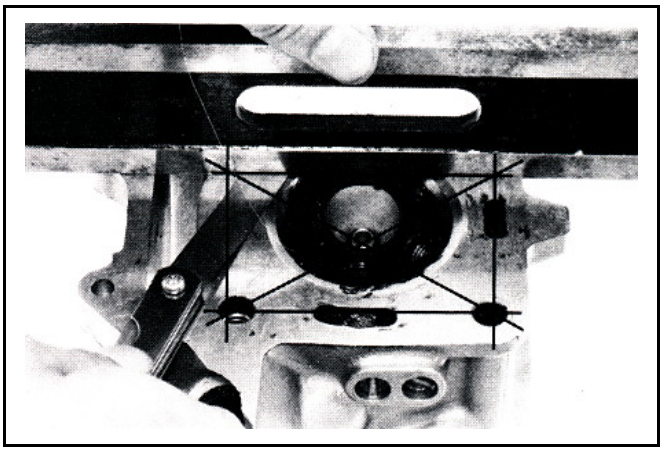
- Do not damage cylinder head matching surface.



Cylinder head inspection

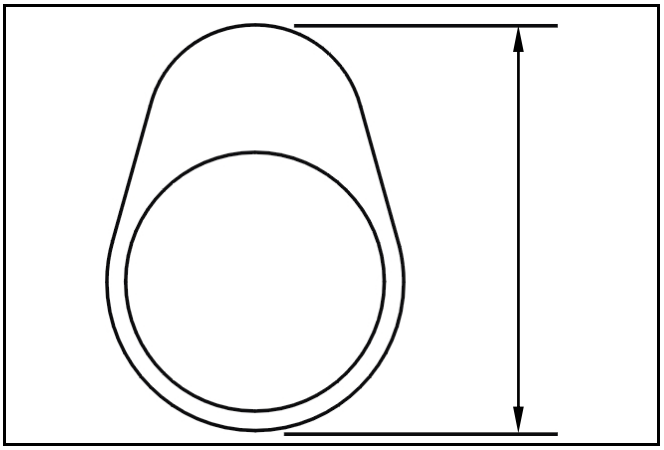
Cylinder head surface / hole

Check if spark plug hole and valve hole cracked or damaged.
Measure the cylinder head surface for warpage.
Service limit: 0.05mm



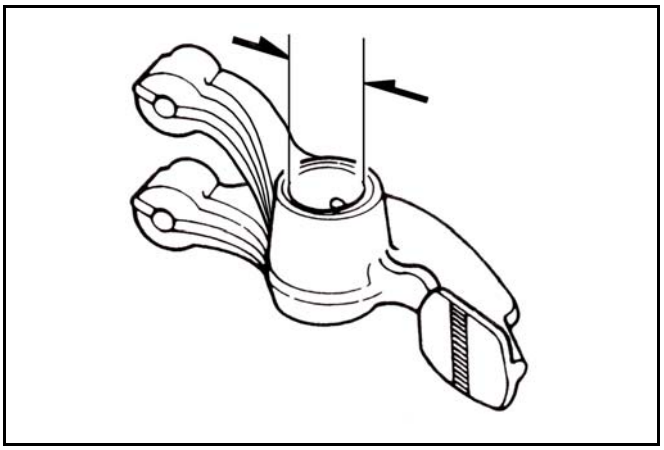
Camshaft

Measure the camshaft.
Service limit:
Intake: 34.860mm
Exhaust: 34.725mm
Check if the camshaft bearing loosened or worn, replace the camshaft assembly if necessary.



Rocker arm

Measure rocker arm inner diameter.
Service limit: 12.080 mm
Check if the oil hole clogged and the surface worn.

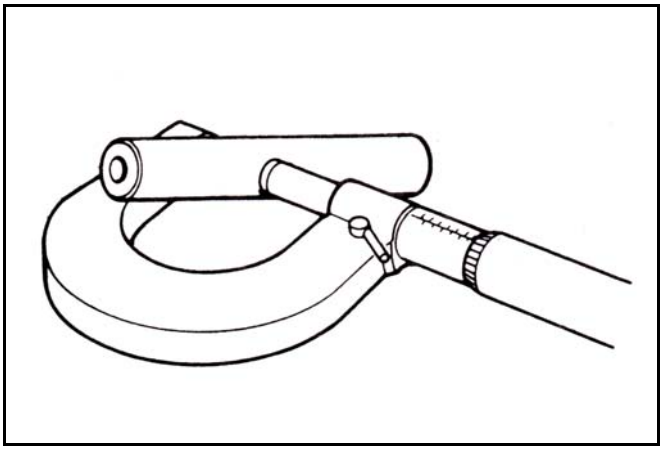


Rocker arm shaft

Measure the active outer diameter of the cam rocker arm shaft and cam rocker arm.

Service limit: 11.936 mm

Calculate the clearance between rocker arm shaft and rocker arm.
Service limit: 0.10 mm



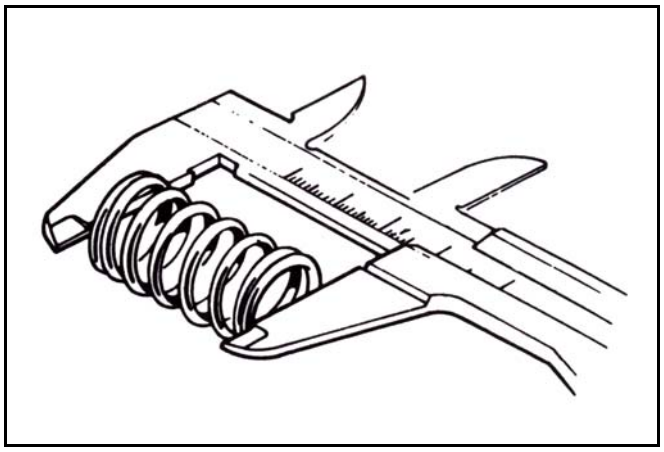
Valve spring

Measure the free length of intake and exhaust valve springs.

Service limit:

Inner valve spring: 35.20mm

Outer valve spring: 36.90mm

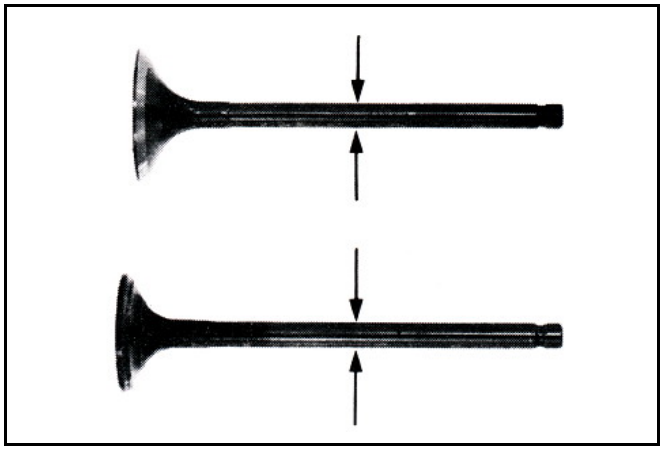


Valve stem

Check if valve stem bent, burnt, or worn.

Check the operation condition of valve stem in valve guide, and measure the valve stem outer diameter.

Service limit: 4.90 mm



Valve guide

⚠ Caution

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

Special tool: valve guide reamer 5.0mm

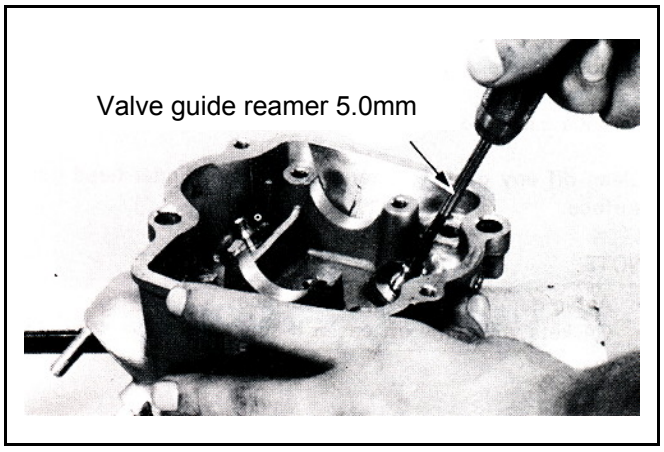
Measure and record each valve guide inner diameter.

Service limit: 5.03 mm

The clearance value is valve guide inner diameter deducts valve stem outer diameter.

Service limit:

Intake valve	**0.080 mm**
Exhaust valve	**0.100 mm**

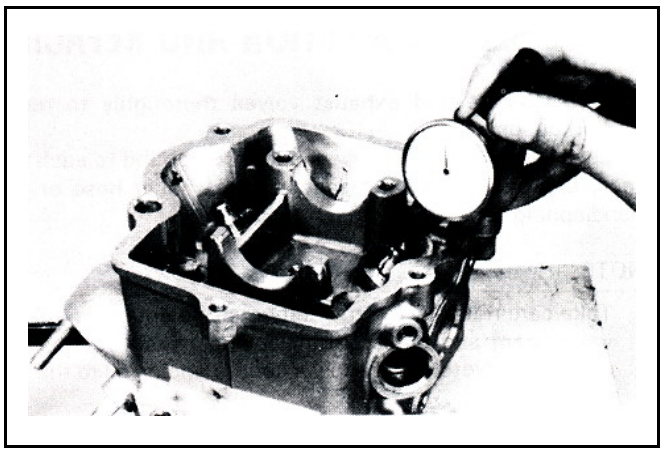


⚠ Caution

- If clearance is over service limit, check if only replacing a 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.



⚠ Caution

- Fix the valve seat when replacing valve guides.

Valve guide replacement

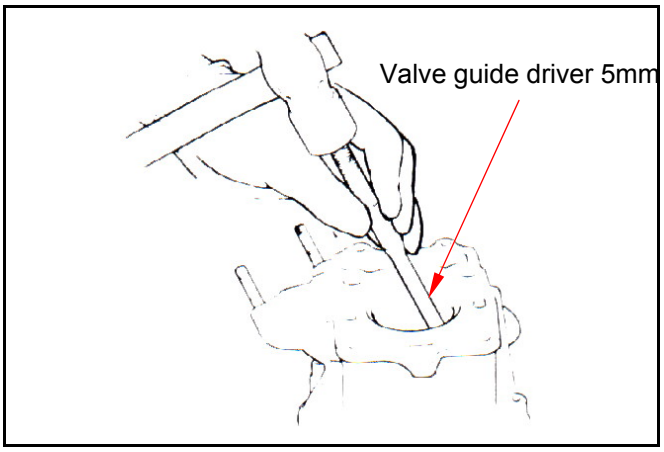
Heat cylinder head with heating plate or toaster till the temperature reaches 100~150 ℃.

⚠ Caution

- Do not use flame to heat cylinder head directly. Otherwise, cylinder head will be deformed.
- Wear heat insulation gloves 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 5mm



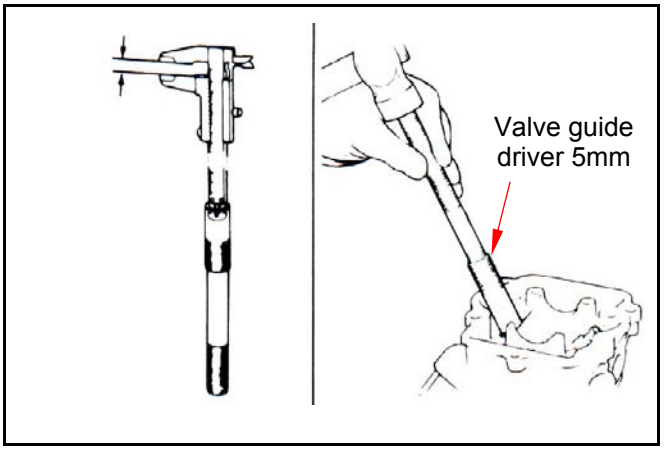
⚠ Caution

- Check if new valve guide deformed after installation.
- When installing new valve guide, keep cylinder head on 100~150℃.

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

Install new valve guide from rocker arm side.

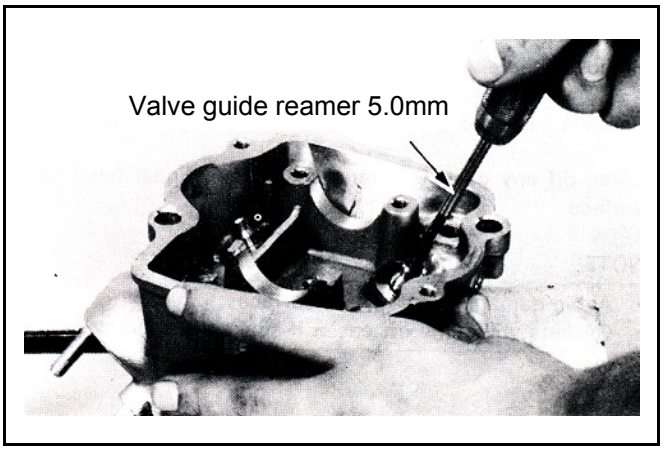
Tool: valve guide driver 5mm



After cylinder head cooling down to room temperature, fix the new valve guide with reamer.

⚠ Caution

- Use cutting oil when fixing valve guide with a reamer.
- When inserting or rotating the reamer, turn it in same direction.



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

Special tool: valve guide reamer 5mm

Valve seat inspection and refacing

Clean up all carbon deposits around intake and exhaust valves.

Apply emery slightly onto valve contact surface. Grind valve seat with grinding tool.

⚠ Caution

- Prevent emery from getting into valve stem and guide.
- After grinding, clean up emery, and apply red lead slightly onto the surface.

Remove valves and check if the contact surface even or not.

⚠ Caution

- The valve cannot be ground and reused. If the valve is burned, worn, or contact surface is uneven, replace it.
- If the valve contacts the valve seat unevenly after grinding, replace it.

Valve seat inspection

If the valve seat is too wide, too narrow, or worn, re-grind it.

Valve seat width

Service limit: 1.6 mm

Check the contact condition of the valve seat.

Valve seat grinding

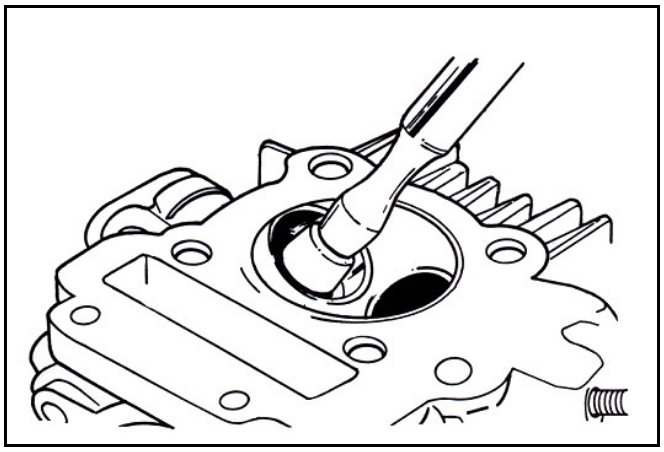
Grind the worn surface with specified valve seat cutter.

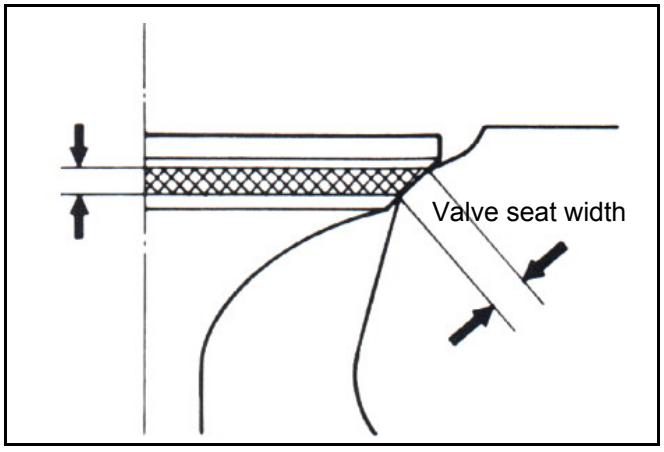
Use the 45 degree valve seat cutter to remove any roughness on the valve seat.

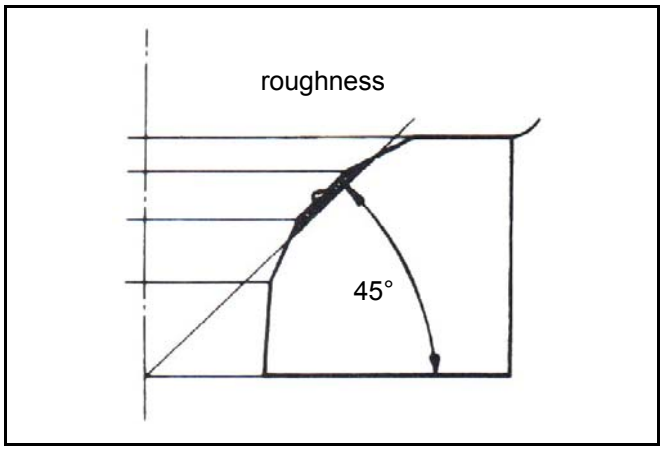
⚠ Caution

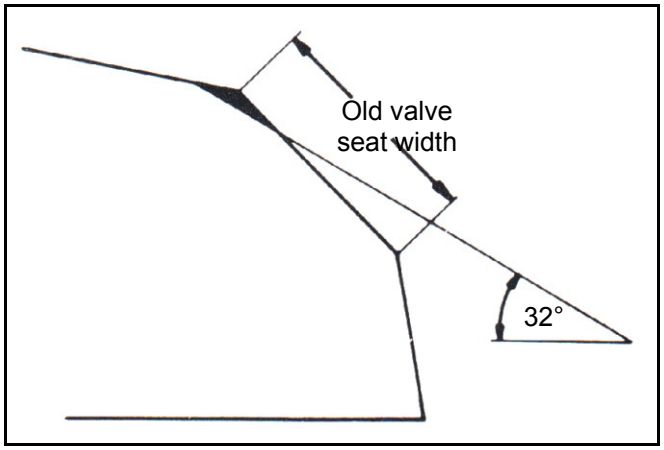
- Use the 45 degree valve seat cutter to grind the seat after changing the valve guide.

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

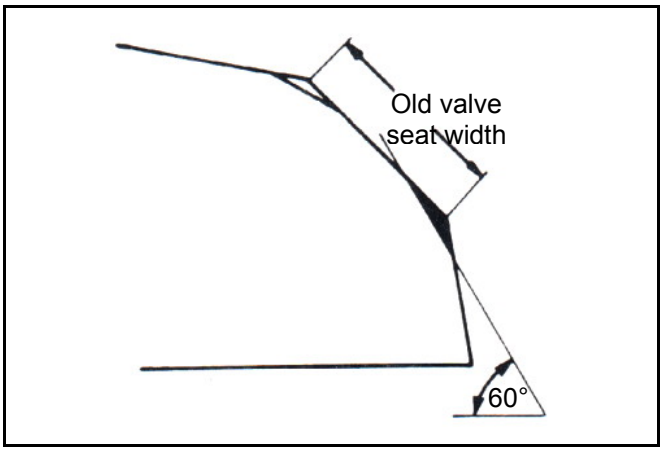








Use the 60 degree cutter to remove the bottom 1/4 part of the seat and check the new valve seat.

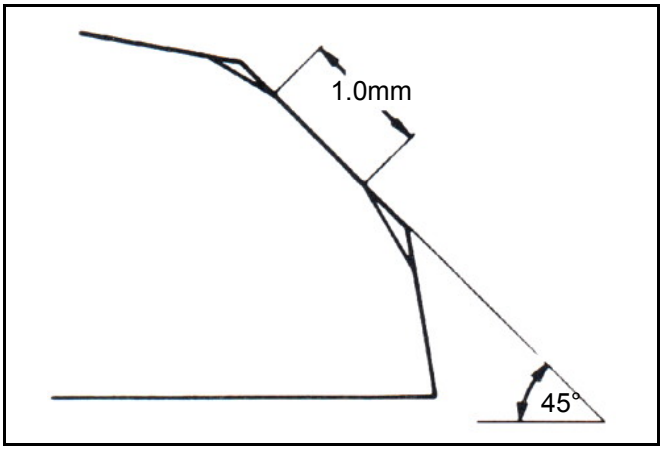


Use the 45 degree cutter to cut the seat to the proper width.

Caution

- Confirm that all roughness is removed.

Re-grind if necessary.

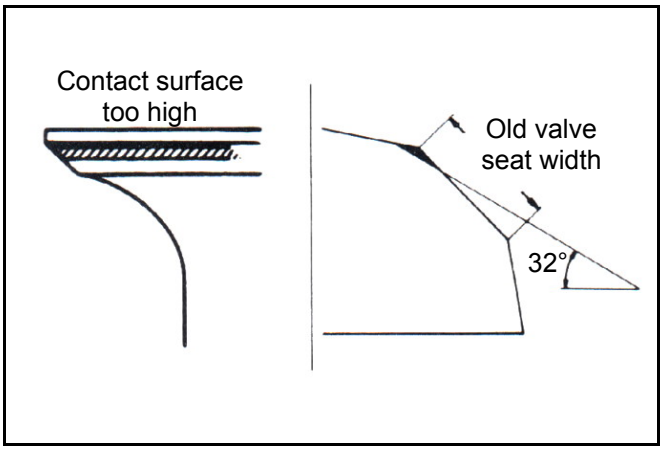


Coat the valve seat surface with Prussian blue or red lead.
Install the valve through valve guide until the valve contacting with valve seat, slightly press down the valve but do not rotate it so that a seal track will be created on contact surface.

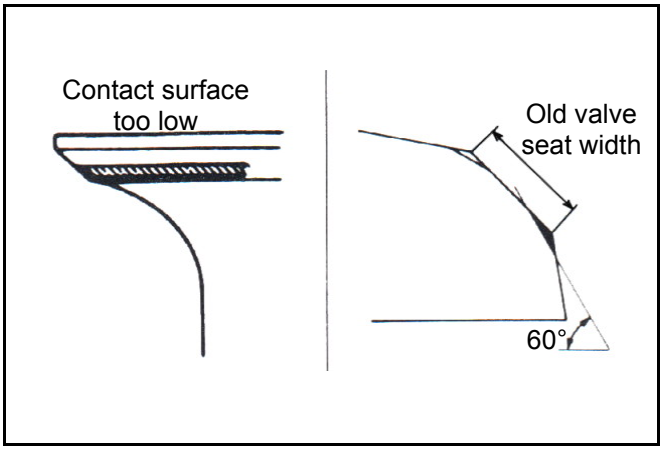
Caution

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

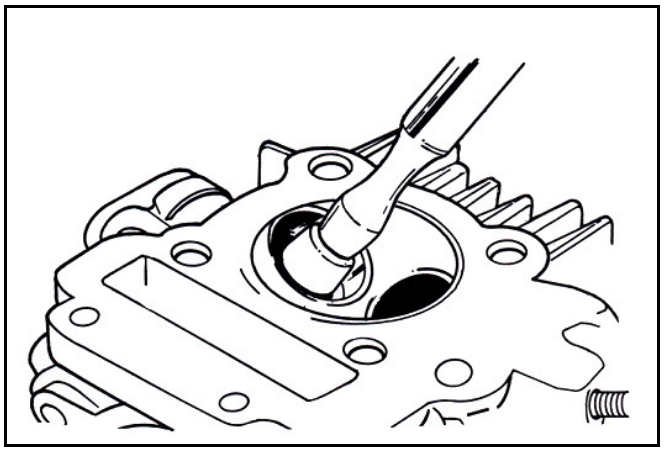
If the contact surface on the valve is too high, cut the valve seat with the 32 degree cutter. Then cut the valve seat to the proper width with the 45 degree cutter.



If the contact surface 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 grinding, apply emery slightly onto valve contact surface. Grind valve seat with grinding tool.
Clean up emery covered on the cylinder head and valve.

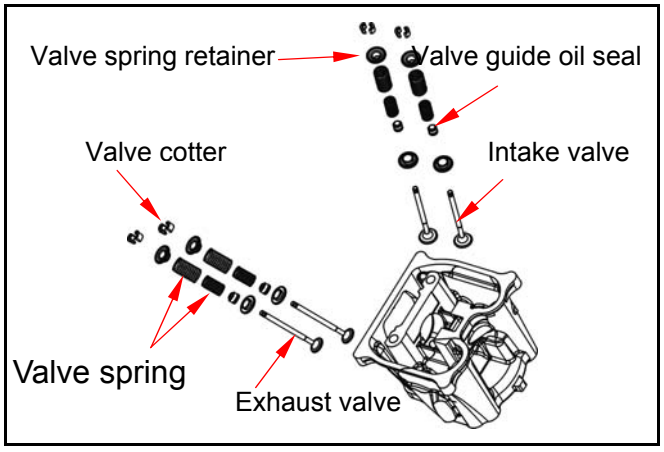


Cylinder head assembly

Lubricate valve stem with engine oil, then insert it to valve guide.
Install new valve stem oil seal.
Install valve spring and valve spring retainer.

⚠ Caution

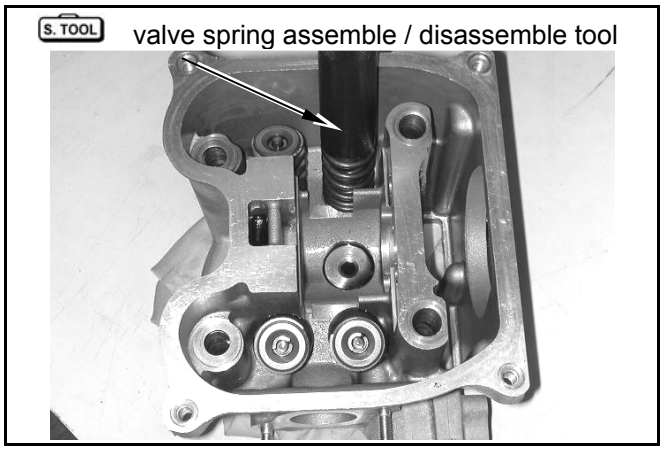
- The dense end of valve spring should face down to combustion chamber.



Install valve by valve spring assemble / disassemble tool.
Special Tool:
Valve Spring Assemble/Disassemble Tool
SYM-1471110

⚠ Caution

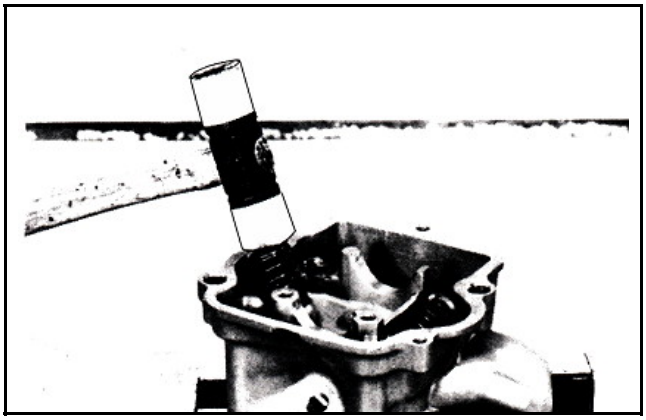
- When installing springs, place cloth in combustion chamber to hold the valves avoiding bending the valve.



Slightly tap the valve stem with a plastic hammer to secure the valve cotter.

⚠ Caution

- Hold cylinder head on a working table to avoid damaging the valve.



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

Cylinder head installation

Clean up foreign materials on the matching surfaces of cylinder and cylinder head.
Install cam chain guide.
Install new dowel pins and gasket on the cylinder.

⚠ Caution

- Do not damage matching surfaces.
- Prevent foreign material from falling into the crankcase.

Install cylinder head.
Tighten the 4 cylinder head nuts, then the 2 bolts on right side of cylinder head.

Torque value:
Cylinder head nut 3.6~4.0kgf-m
Bolt on right side of cylinder head 1.0~1.4kgf-m

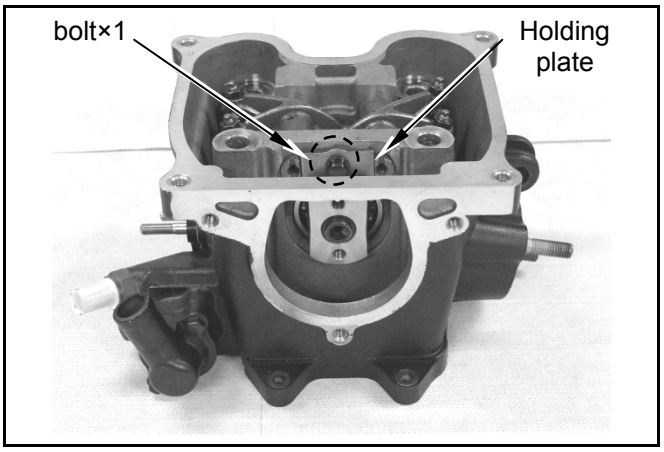
⚠ Caution

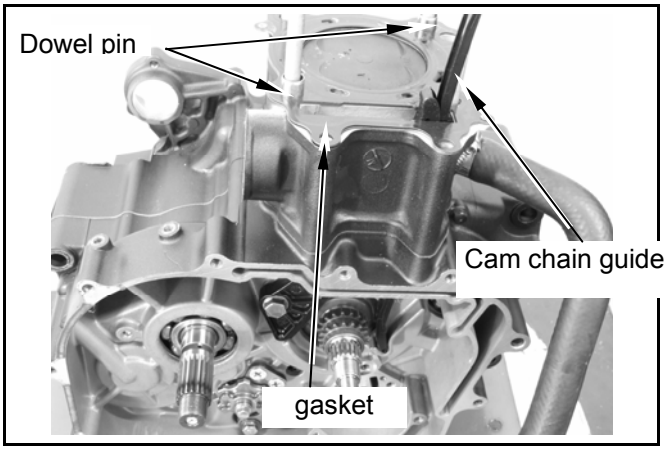
- Lubricate with engine oil and tighten the cylinder head nuts in diagonally opposite sequence.
- Do not exceed the specified torque value to prevent damaged cylinder head, abnormal noise, leakage or poor engine performance.

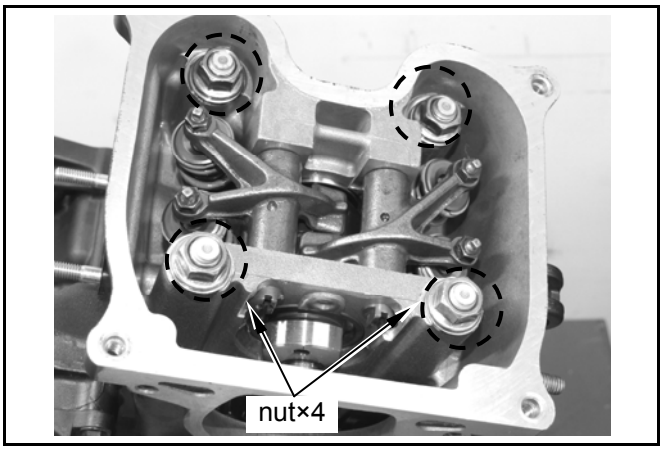
Rotate the crankshaft counterclockwise and align the “T” mark on the flywheel with the index mark on the left crankcase cover. (The piston is on the top dead center.)
Install the cam chain sprocket and sprocket, align the timing mark with the index mark on the cylinder head.
Tighten sprocket bolt. (bolt×2)
Torque value: 1.0~1.4kgf-m
Install spark plug.
Torque value:1.0~1.2kgf-m

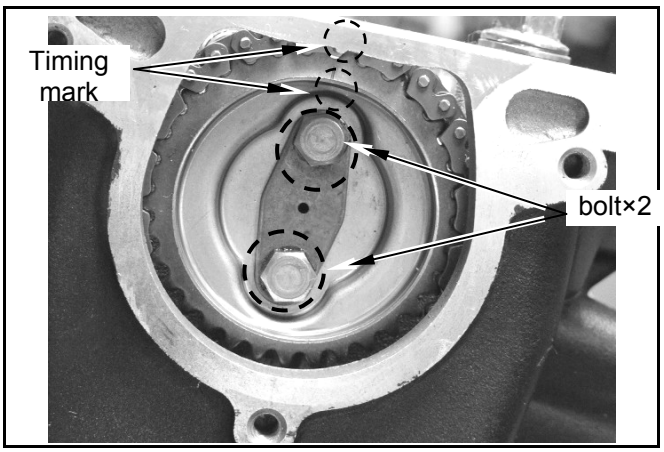
⚠ Caution

- Make sure aligning the timing mark.

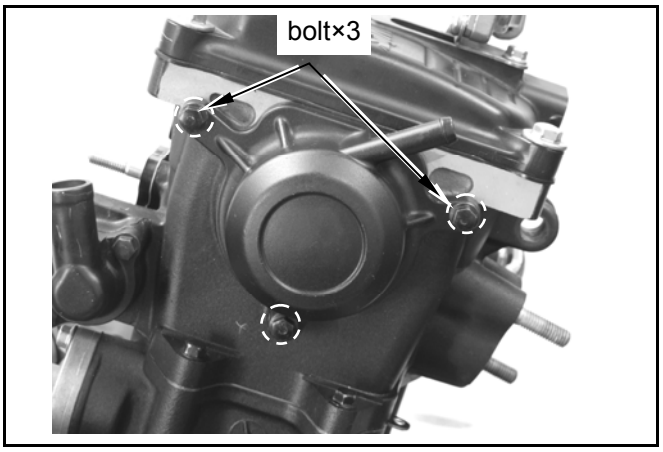






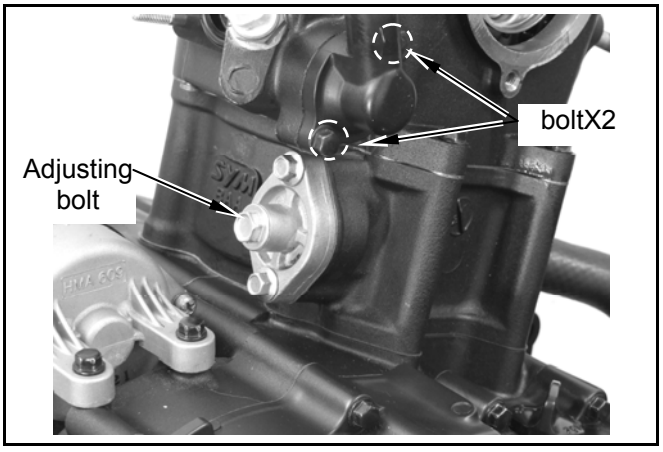


Install cylinder head side cover. (bolt×3)。

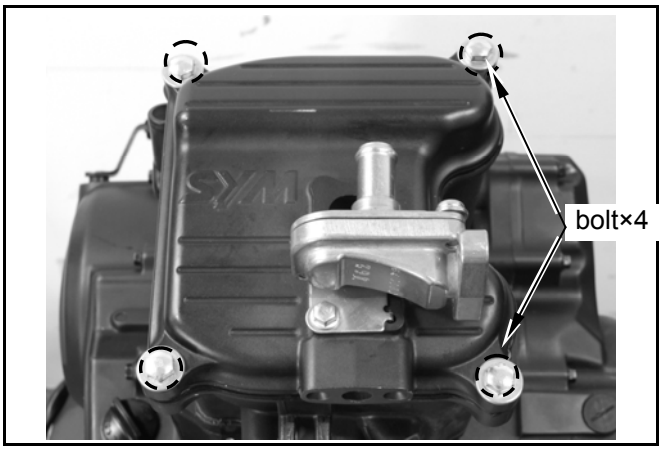


Install thermostat. (bolt×2)。

Loosen cam chain auto-tensioner adjusting bolt, remove the spring.
Install auto-tensioner (bolt×2), then install the spring and adjusting bolt.

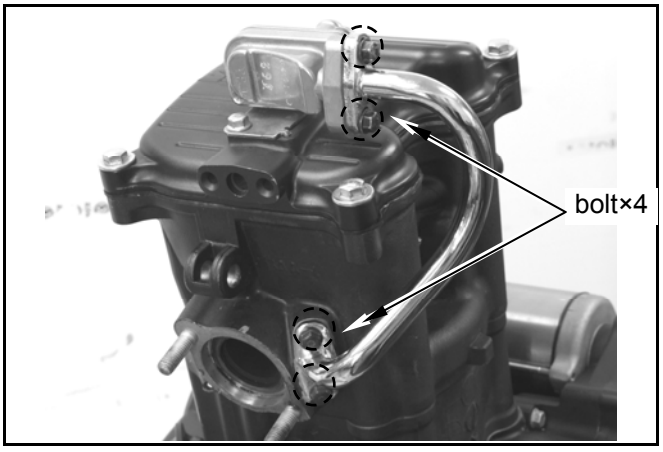


Install cylinder head cover. (bolt×4)



Install AI pipe (bolt×4)
Install spark plug.
Torque value: 1.0~1.2kgf-m

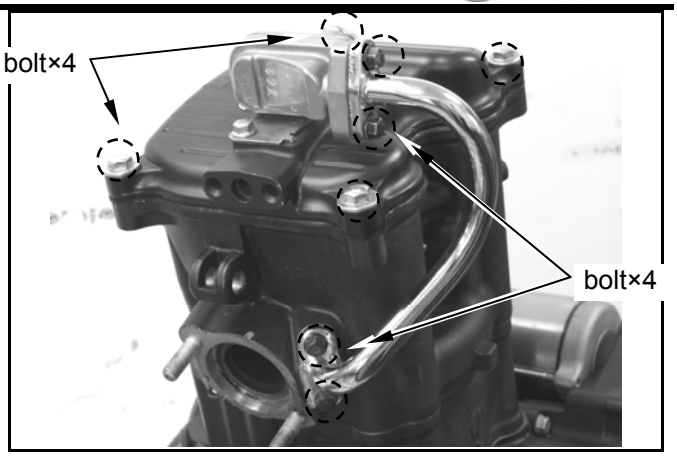
Install the engine onto the frame. (refer to 6th chapter)



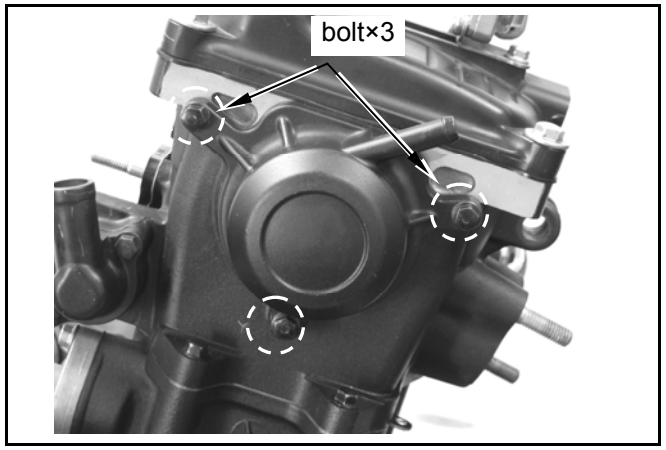
Valve clearance adjustment

Remove AI pipe. (bolt×4)。

Remove cylinder head cover. (bolt×4)。



Remove cylinder head side cover. (bolt×3)。

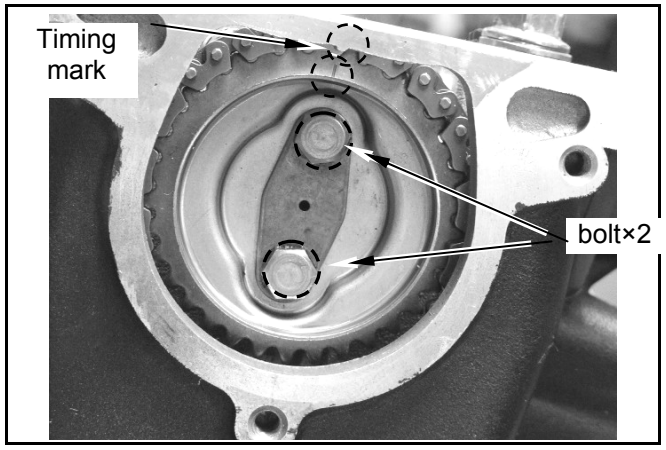


Remove timing-inspecting hole cap.
Remove ACG cap, rotate the crankshaft counterclockwise and align the “T” mark on the flywheel with the index mark on the left crankcase cover. Align the cam sprocket timing mark with the index mark on the cylinder head.

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.

Valve clearance: In 0.10±0.02 mm

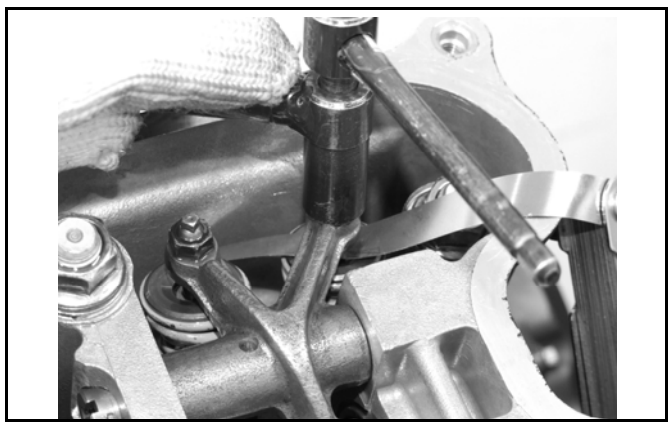
Ex 0.15±0.02 mm



Install cylinder head side cover. (bolt×3)
Start the engine, make sure engine oil pumped up to cylinder head, then shut off the engine immediately.
Install cylinder head cover. (bolt×4)
Install AI pipe. (bolt×4)

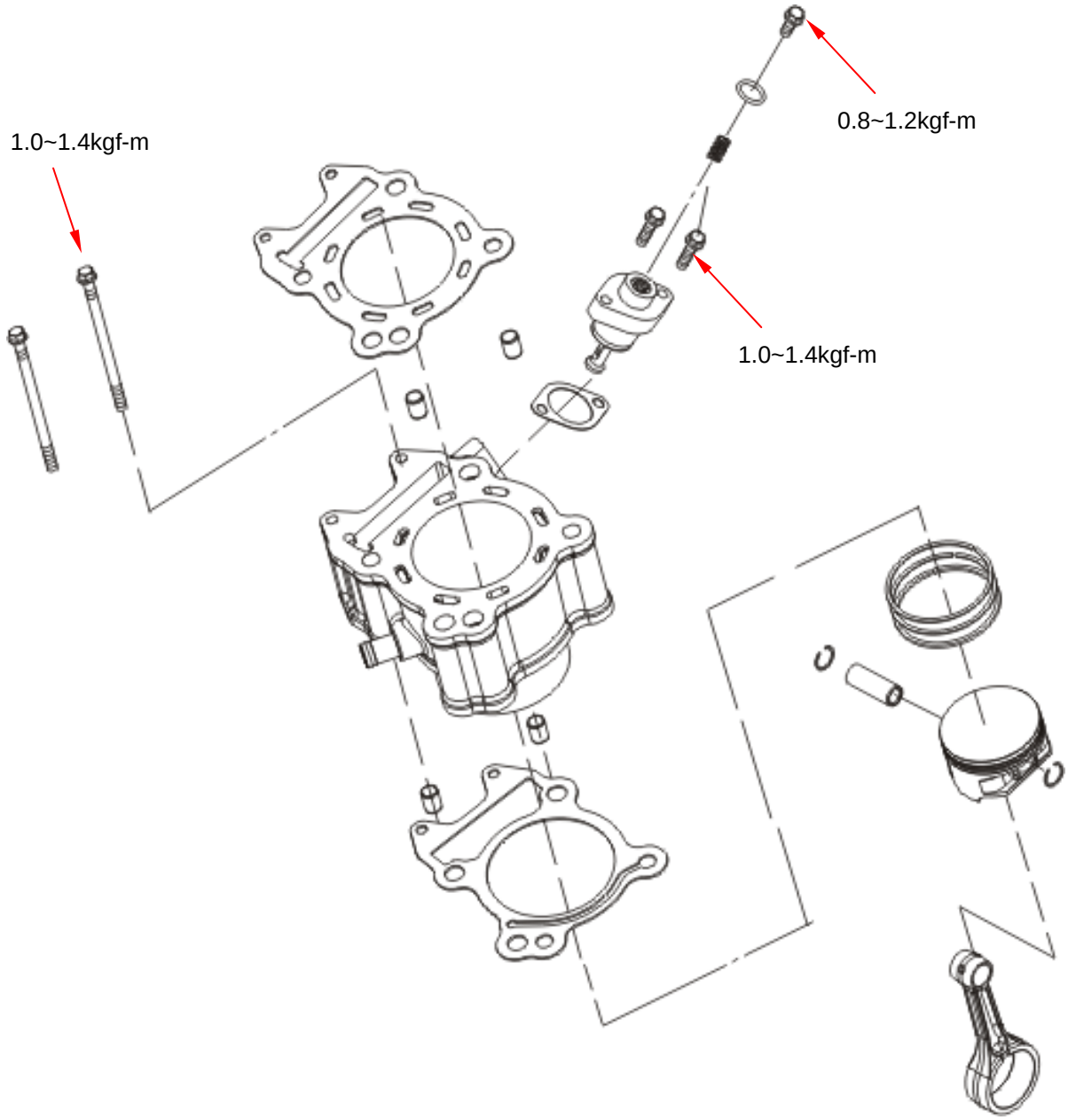
⚠ Caution

- Cylinder head parts will be seriously damaged, if engine oil does not lubricate properly.
- Check the lubrication condition while idling, do not rise R.P.M.



Mechanism Diagram ····· 8-1	Piston Removal / Inspection ···· 8-5
Precautions in Operation····· 8-2	Piston Rings Installation ····· 8-8
Troubleshooting····· 8-2	Piston Installation ····· 8-9
Cylinder Removal / Inspection·· 8-3	Cylinder Installation····· 8-10

Mechanism diagram



Precautions in operation

General information

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

Specification

Measurement: mm

Item			Standard	Service limit
Cylinder	Inside Diameter		70.995~71.015	71.100
	Warpage		-	0.050
	Taper		-	0.050
	Out of round		-	0.050
Piston / Piston Ring	Piston Ring / Groove Clearance	Top Ring	0.015~0.050	0.130
		Second Ring	0.015~0.050	0.120
	Piston Ring End Gap	Top Ring	0.150~0.300	0.500
		Second Ring	0.300~0.450	0.650
		Oil Ring	0.200~0.700	-
	Piston Ring Thickness	Top Ring	1.475~1.490	1.460
		Second Ring	1.475~1.490	1.460
	Piston Outside Diameter		70.430~70.480	70.380
	Piston/ Cylinder Clearance		0.010~0.040	0.100
	Piston Pin Hole Inside Diameter		17.002~17.008	17.020
Piston Pin Outside Diameter			16.994~17.000	16.960
Piston/ Piston Pin Clearance			0.002~0.014	0.020
Connecting Rod Small End Inside			17.016~17.034	17.064

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, piston, or piston rings

Improper piston rings installation

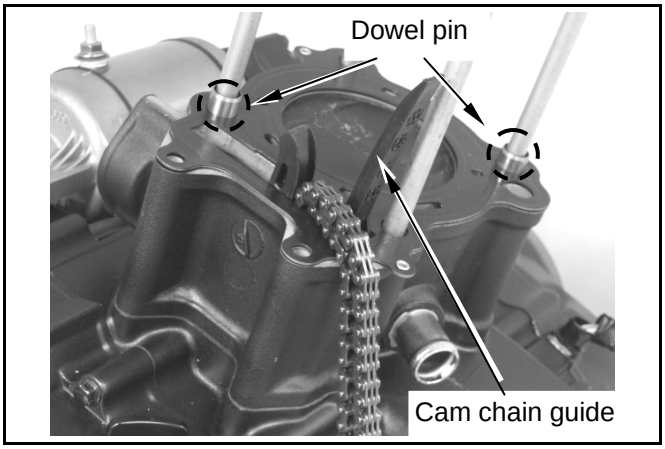
Worn cylinder or piston rings

Overheating

Excessive carbon built-up on the top of the piston

Cylinder removal / inspection

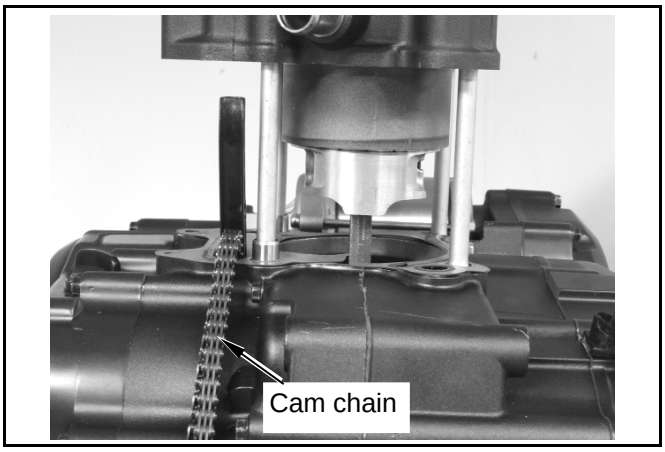
Remove the cylinder head. (refer to chapter 7)
Remove cylinder head gasket and dowel pins.
Remove cam chain guide.



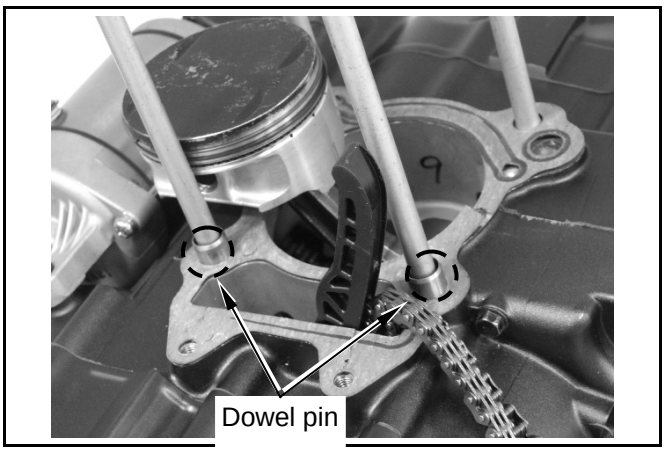
Remove cylinder.

Caution

- Prevent cam chain from falling into crankcase when removing cylinder.



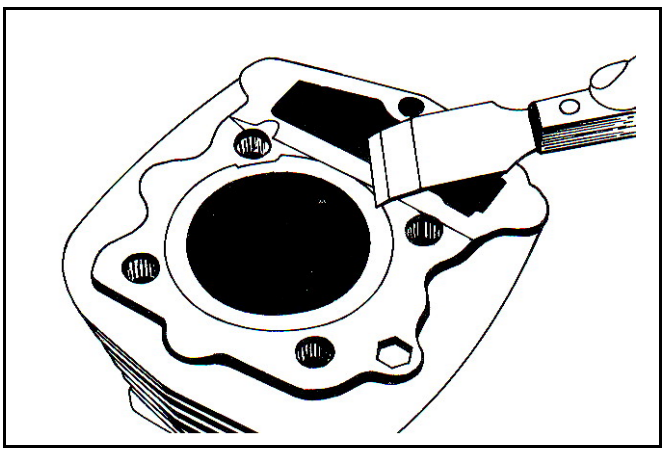
Remove cylinder gasket and dowel pins.



Clean all the gasket material from the contact surface.

Caution

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



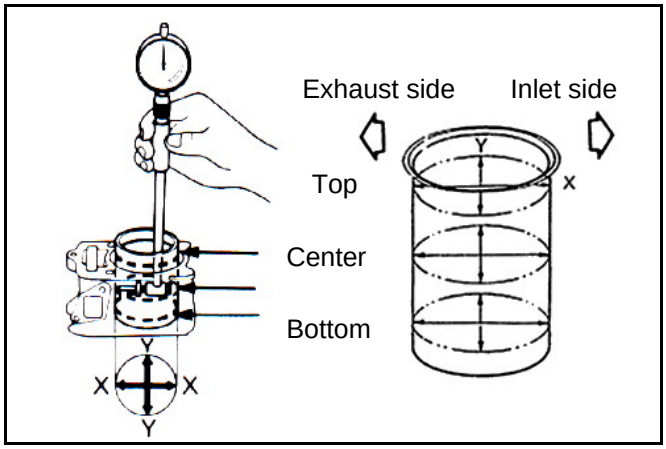
Cylinder inspection

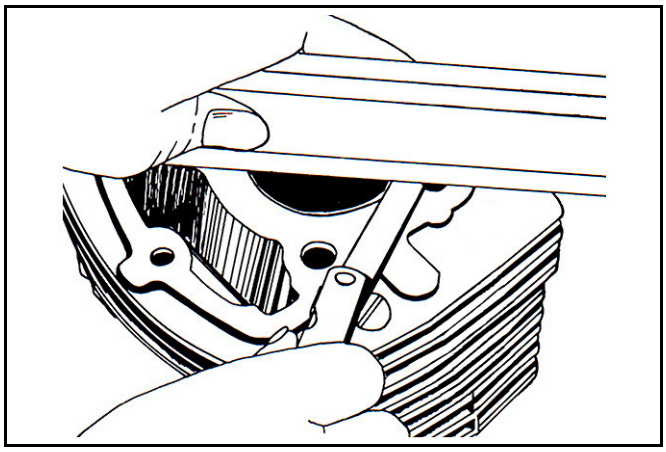
Check if the inner diameter of cylinder is worn out or damaged.
Measure the cylinder inner diameter in X and Y axis at three levels.
Service limit: 71.10 mm
Calculate the taper and out of round at three levels in X and Y axis. Take the maximum value to determine.
Service limit:

Out of round : correct or replace if over 0.05 mm

Taper : correct or replace if over 0.05 mm

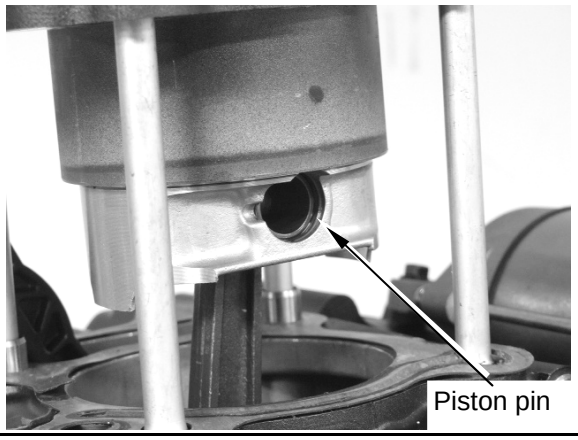
Measure the cylinder upper surface for warpage.
Service limit: correct or replace if over 0.05mm



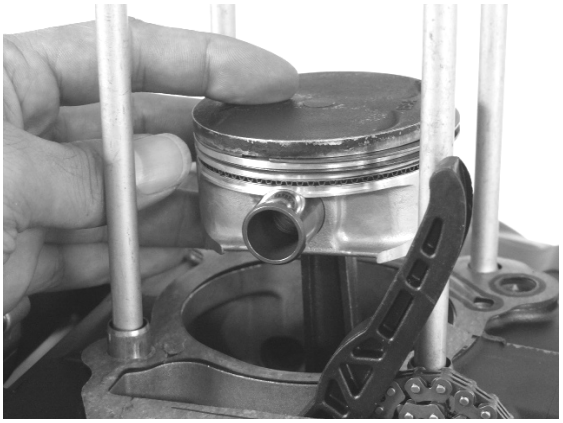


Piston removal / inspection

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



Remove the piston pin circlip and remove the piston pin and piston.



Remove piston rings.

⚠ Caution

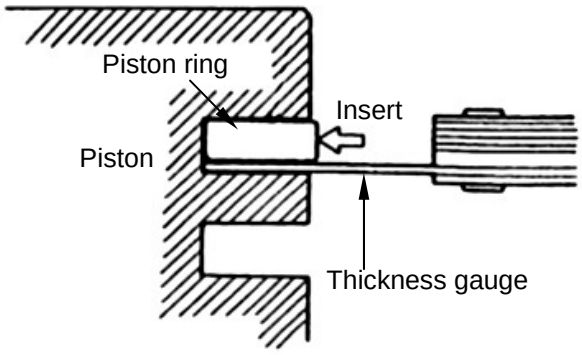
- Piston rings are easy to break, please be careful during operation

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

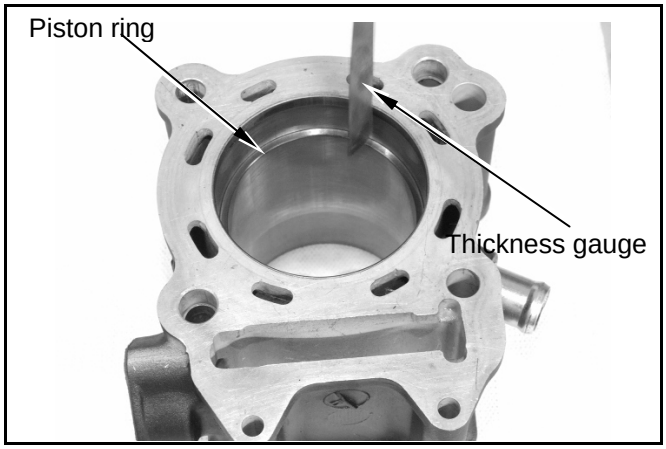
Measure the clearance between piston rings and ring grooves

Service limit :

Top groove: replace if over 0.13 mm
Second groove: replace if over 0.12 mm



Install piston rings respectively into cylinder 20 mm below cylinder top.
Measure the piston ring end gap.



⚠ Caution

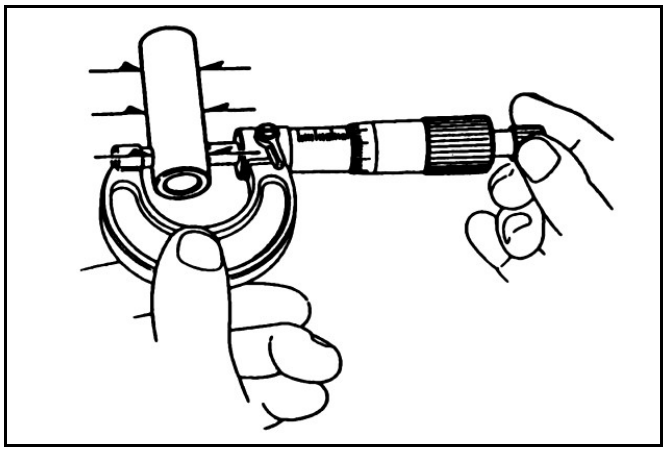
- Use the piston head to push the piston rings squarely into the cylinder.

Service limit：

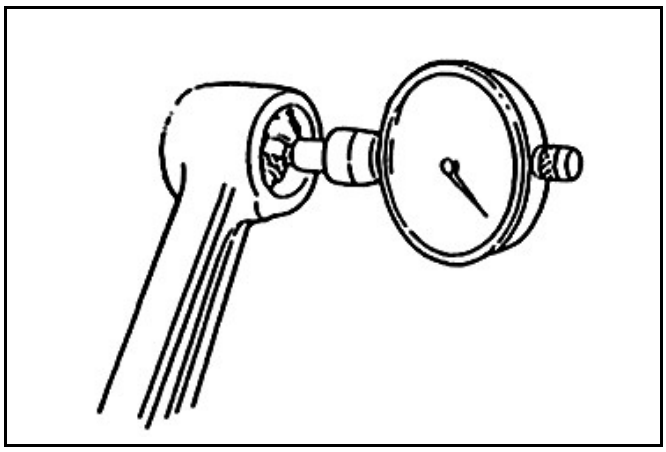
Top ring：replace if over 0.5 mm

Second ring：replace if over 0.65 mm

Measure the piston pin outer diameter.
Service limit: 16.96mm

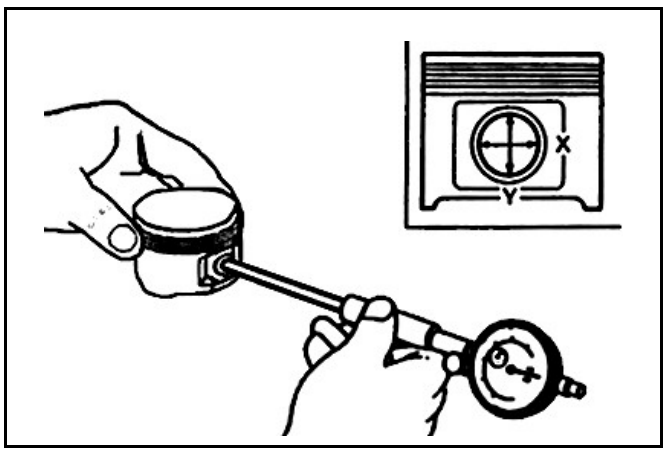


Measure the conrod small end inner diameter.
Service limit: 17.064mm



Measure the inner diameter of piston pin hole.
Service limit: 17.020mm

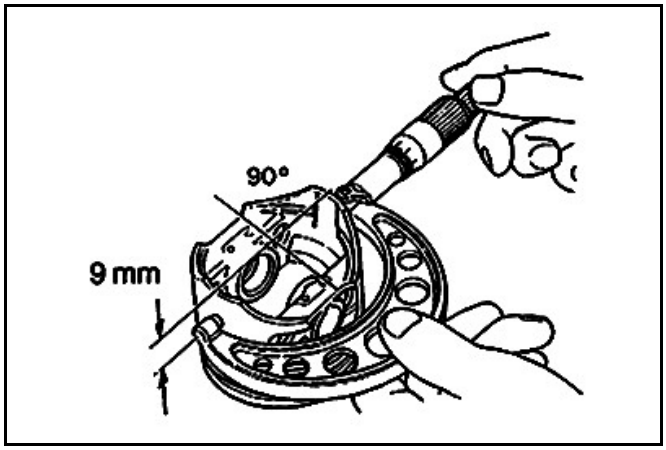
Calculate the clearance between the piston pin and its hole.
Service limit: 0.02mm



Measure the outer diameter of piston pin.

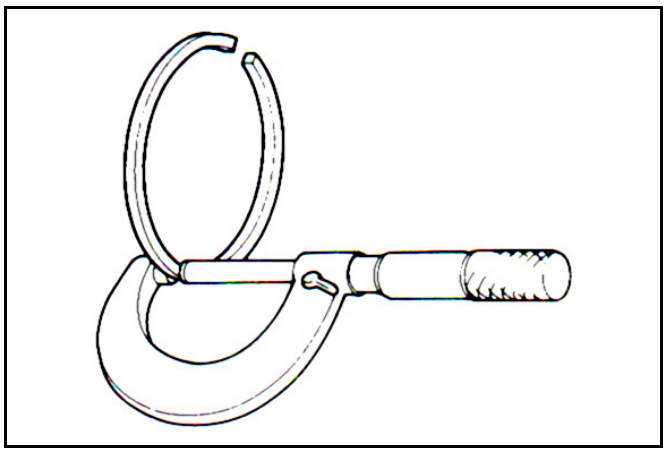
⚠ Caution

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



Service limit: 70.38 mm
Compare the measured value with service limit to calculate the clearance between the piston and cylinder.

Measure piston ring thickness.
Service limit: 1.46mm

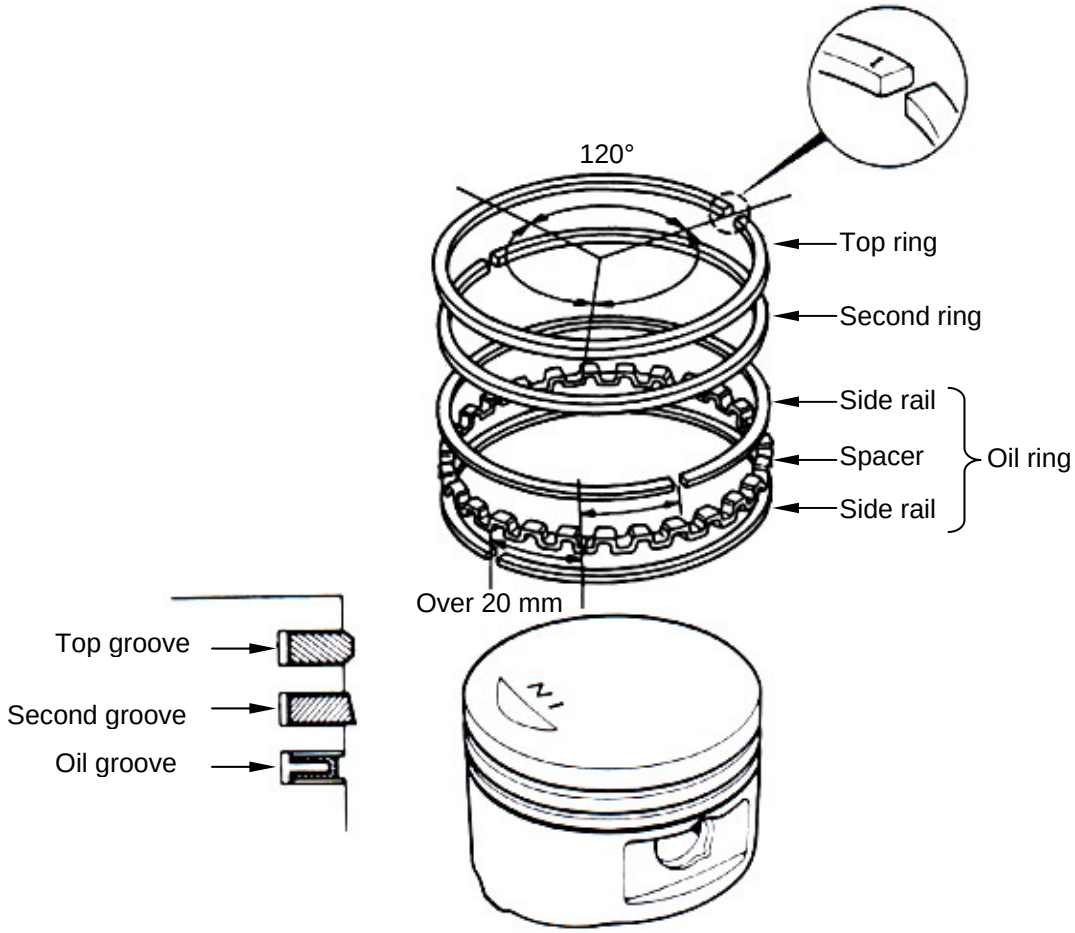


Piston rings installation

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

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.

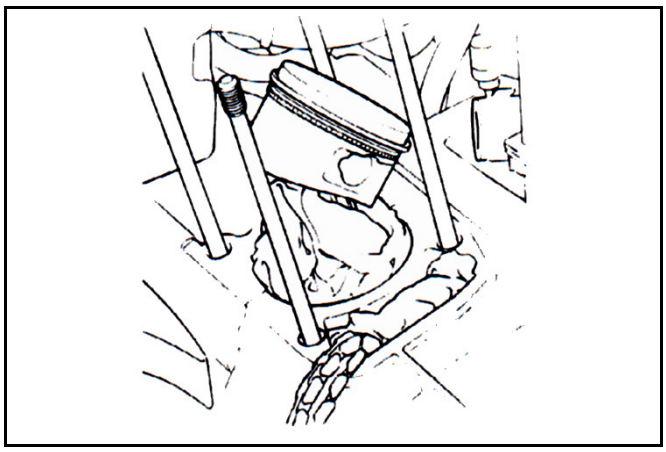


Piston installation

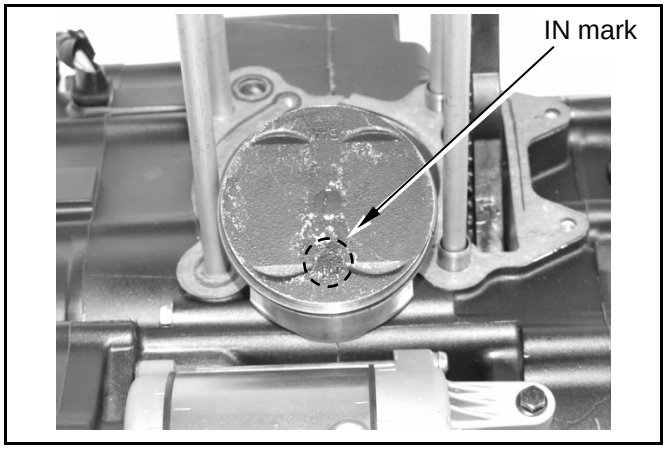
Place a piece of clean rag under the piston. Clean all the gasket material from the contact surface.

Caution

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



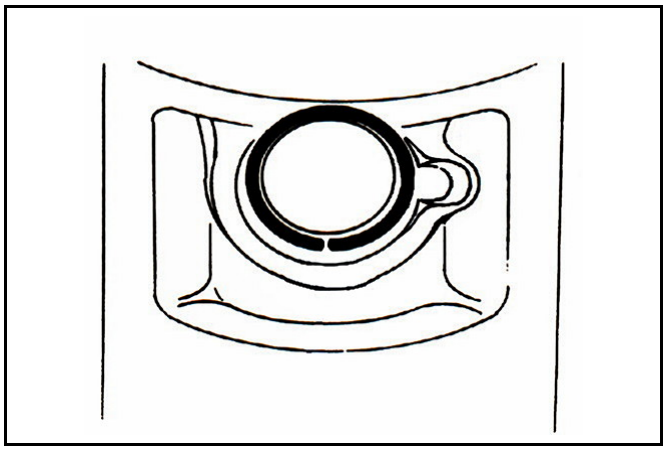
Install piston and piston pin and make the IN mark facing the inlet side.



Install the new piston pin circlip.

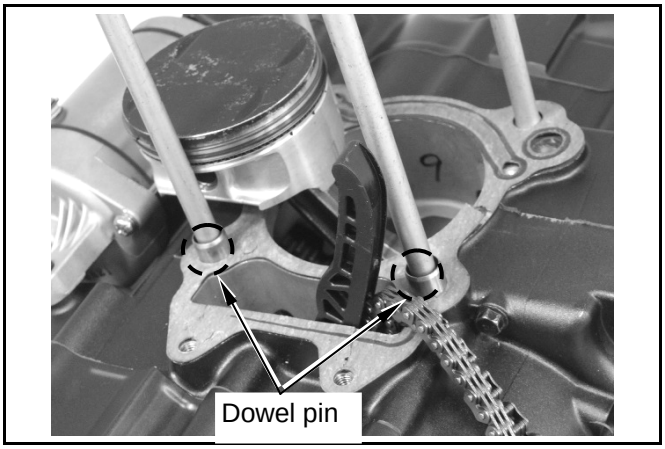
Caution

- Do not make the piston pin circlip 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 circlip from falling into the crankcase.

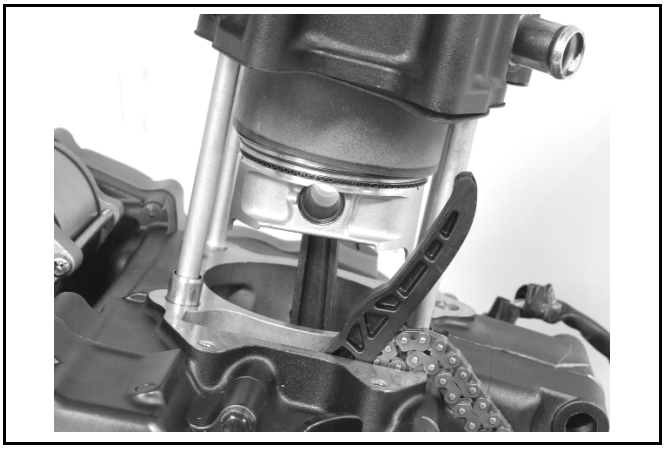


Cylinder installation

Install dowel pins and new cylinder gasket.



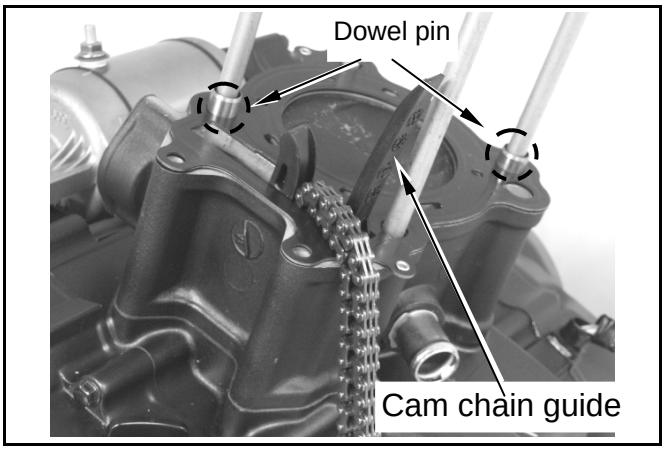
Apply clean engine oil to the cylinder bore, piston and piston rings.
Install the cylinder carefully. Press the piston rings respectively when installing.



⚠ Caution

- Do not force the piston into the cylinder 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)



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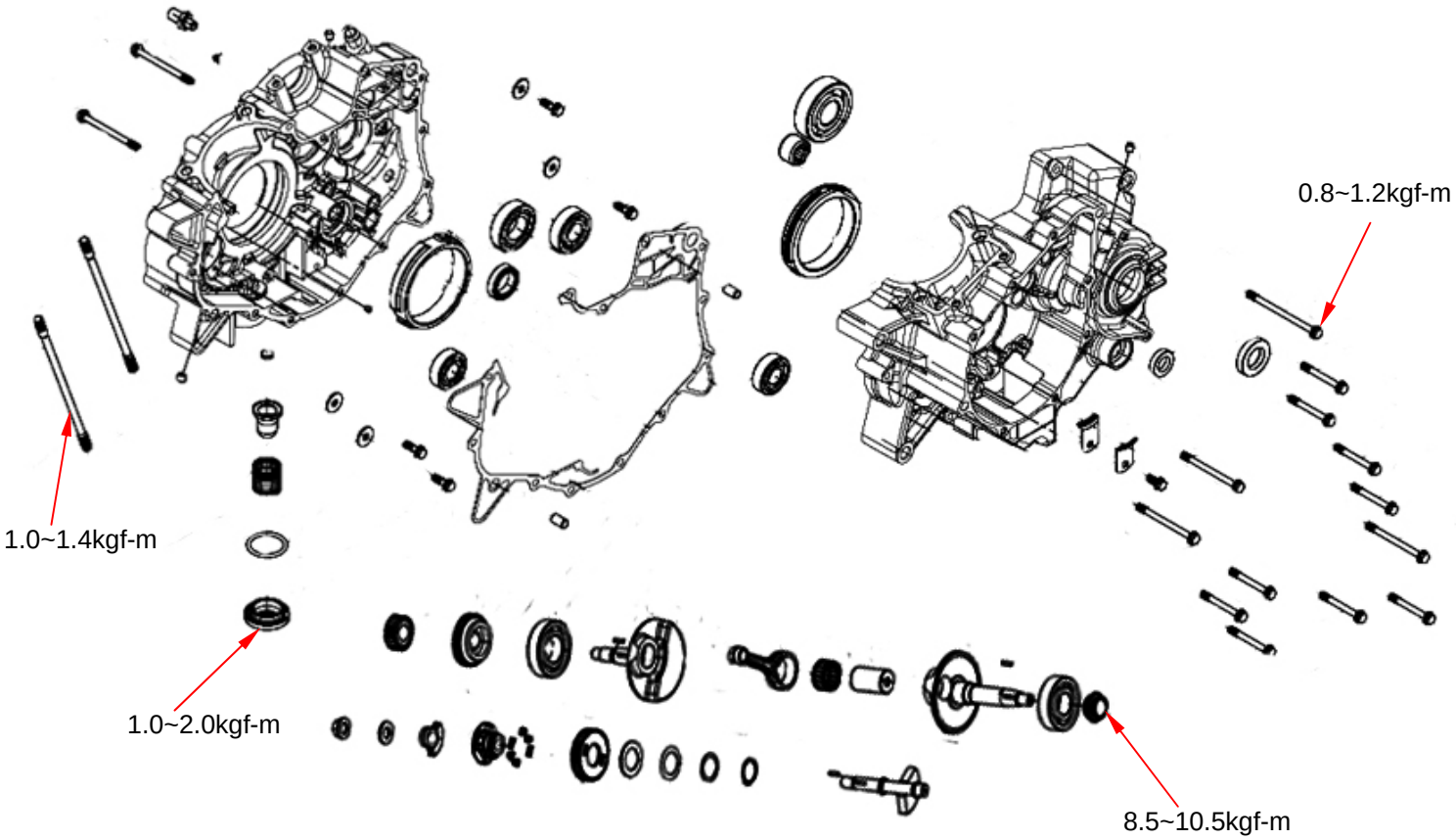
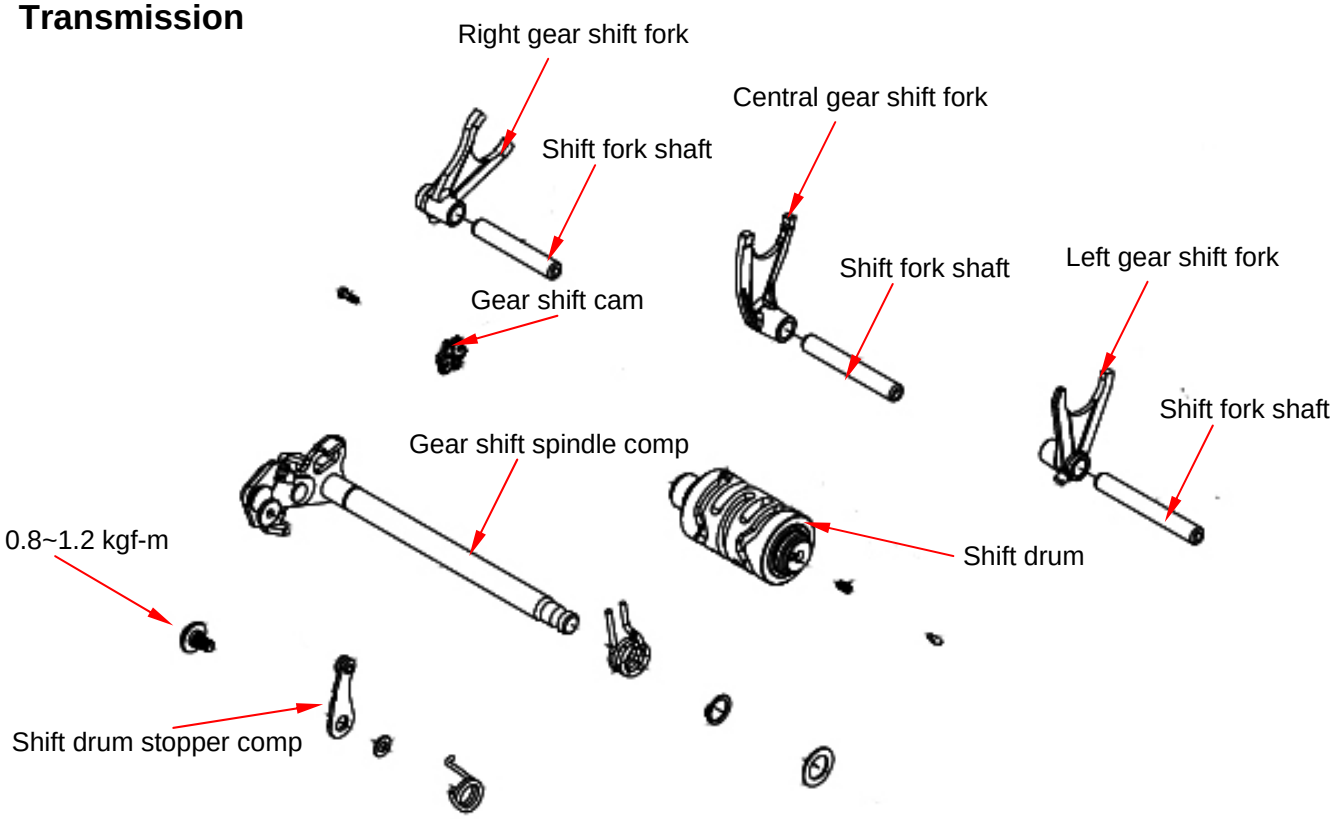
Crankshaft Inspection ·····9-7	

Mechanism diagram

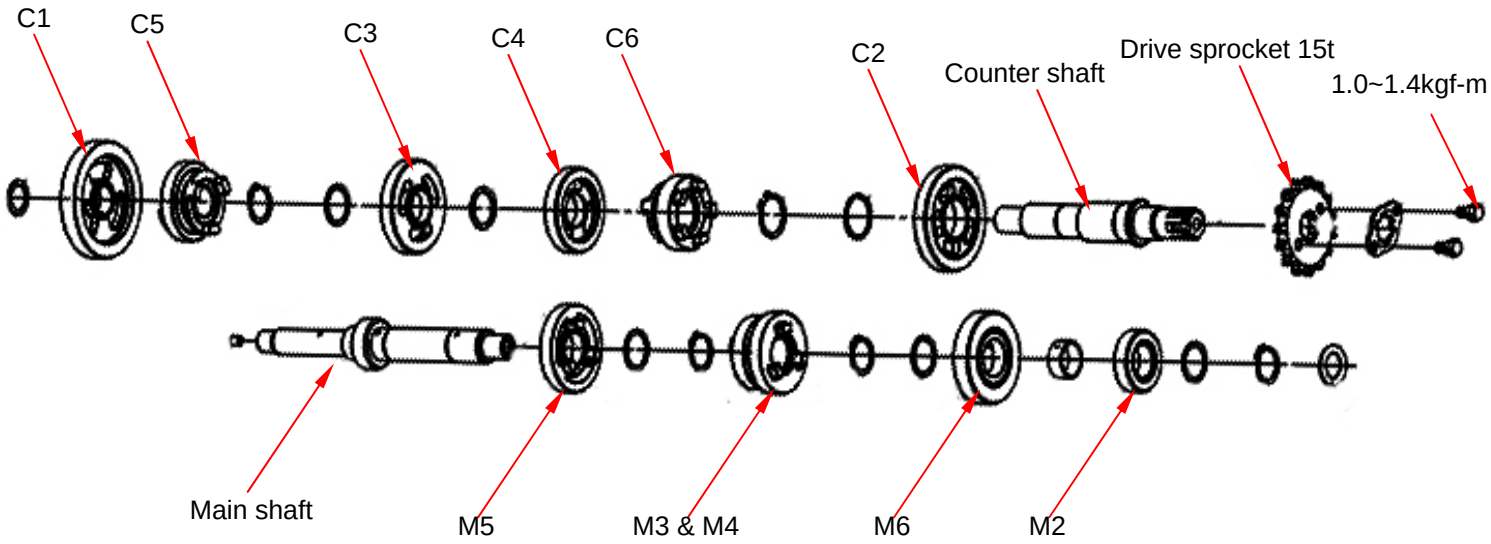
Crankcase / crankshaft



Transmission



Six-speed gear



Precautions in operation

General information

- This chapter concerns disassembly of the crankcase, transmission system, and balancing shaft 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 or the crankshaft bearing needs to be replaced.

Specification **measurement：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	17.016~17.034	17.064
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

Torque value

Crankcase bolt	0.8~1.2kgf-m
Cylinder / cylinder head bolt	1.0~1.4kgf-m
Engine oil drain bolt	3.5~4.5kgf-m
Oil strainer cover	1.0~2.0kgf-m
Gear switch bolt	0.7~1.1kgf-m

Special tools

Inner bearing puller	SYM-6204025
Bearing driver 6204	SYM-6204024
Bearing driver 6301	SYM-6204024
Bearing driver 6203/6004	SYM-6204024

Troubleshooting

Excessive engine noise
- Worn conrod big end
- Worn crankshaft bearing
- Worn piston pin or piston pin hole

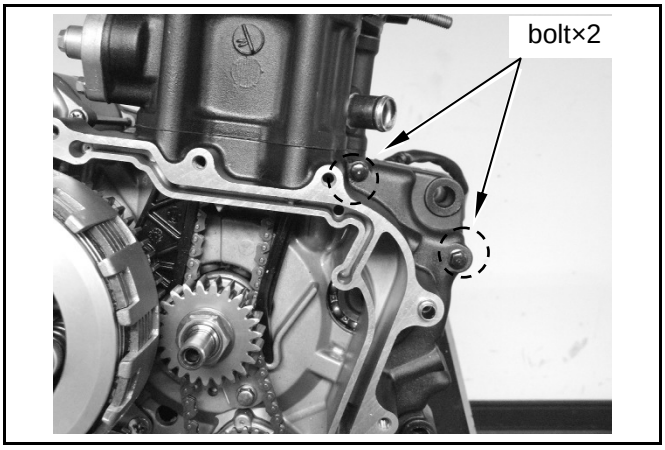
Hard to shift gear
- Bent shift fork
- Bent shift fork shaft

Gear jumps out
- Worn gear teeth
- Bent or damaged shift fork
- Bent shift fork shaft

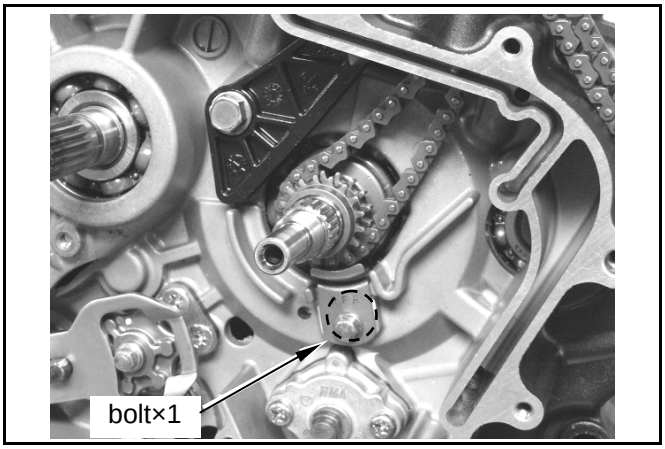
Excessive gear noise
- Worn gear teeth
- Worn gear shaft

Crankcase disassembly

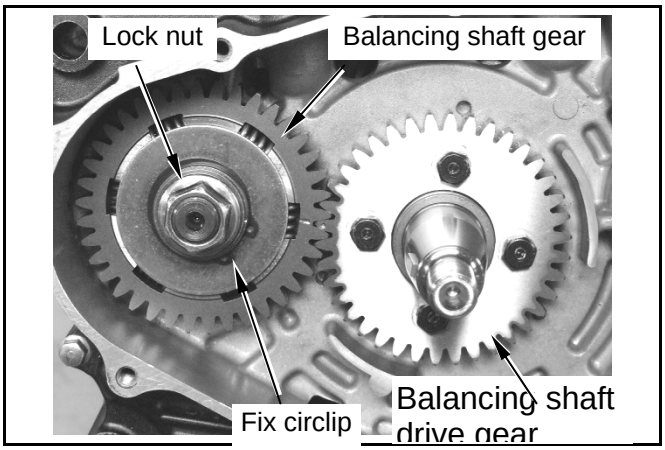
Remove the 6mm bolt from right crankcase. (boltX2)



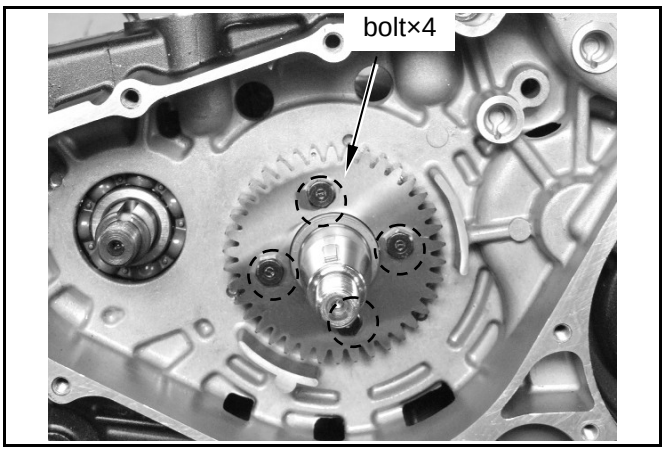
Remove the cam chain tensioner arm from right crankcase. (bolt×1)
Remove cam chain.



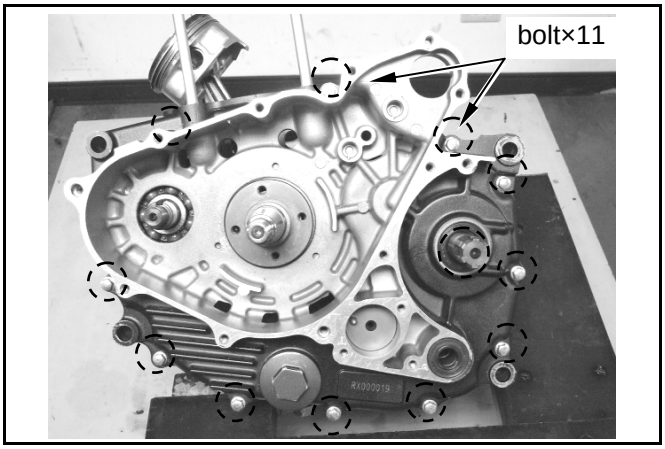
Remove balancing shaft lock nut and fix circlip from left crankcase.
Remove balancing shaft gear.



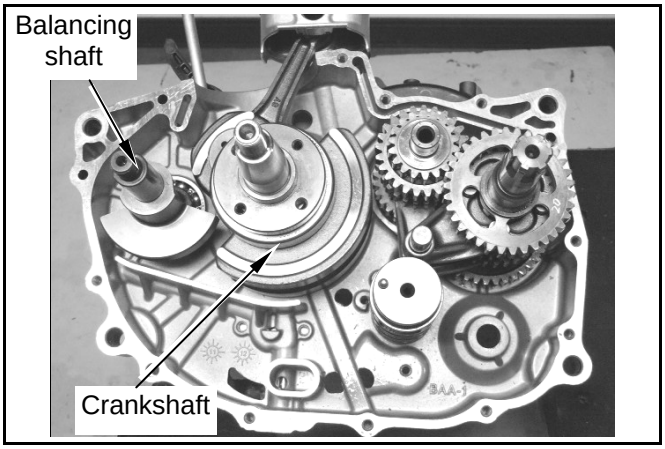
Remove balancing shaft drive gear bolt. (boltX4)
Remove balancing shaft drive gear.



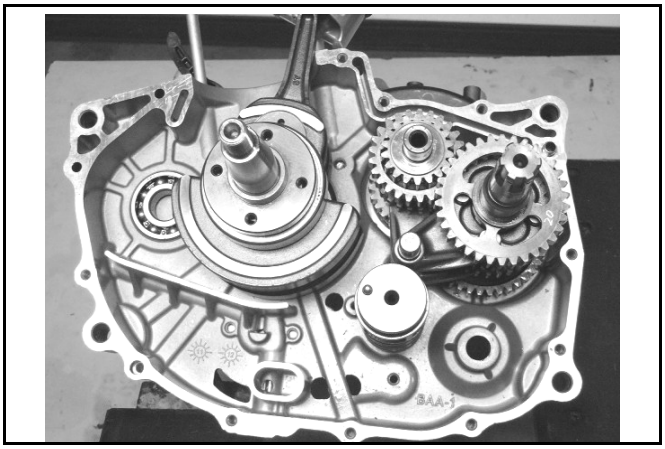
Remove the 6mm bolt from left crankcase. (boltX11)



Remove the left crankcase from the right crankcase.
Remove balancing shaft.

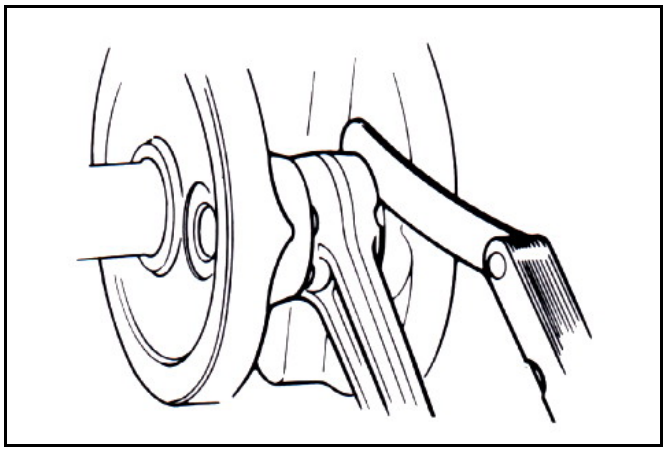


Shake the crankshaft gently and pull out the crankshaft.

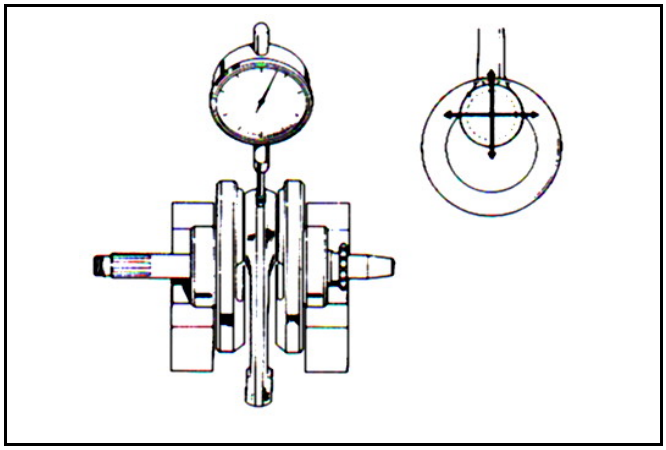


Crankshaft inspection

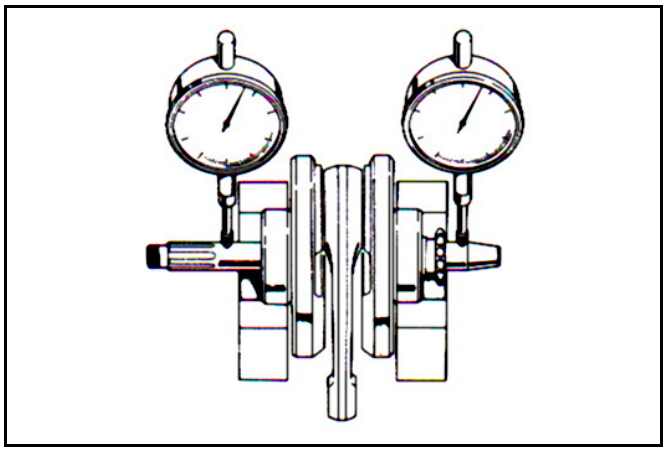
Use a feeler gauge to measure left and right clearance of conrod big end.
Service limit: replace if over 0.6mm



Place the crankshaft on a V-block, measure the clearance of the big end at the vertical direction.
Service limit: 0.05 mm

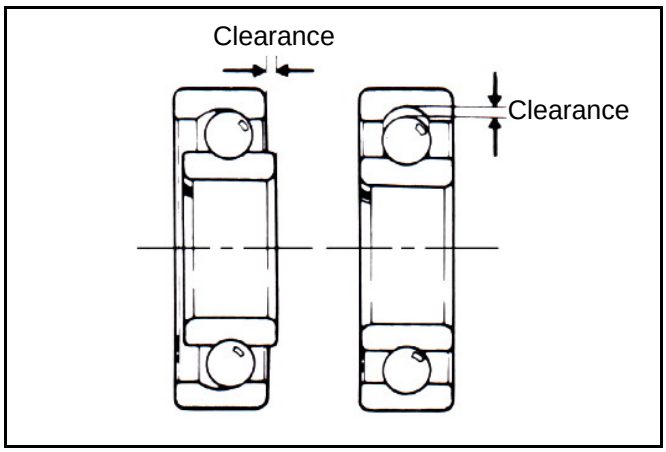


Place the crankshaft on a V-block, measure the crankshaft run-out.
Service limit: 0.10 mm



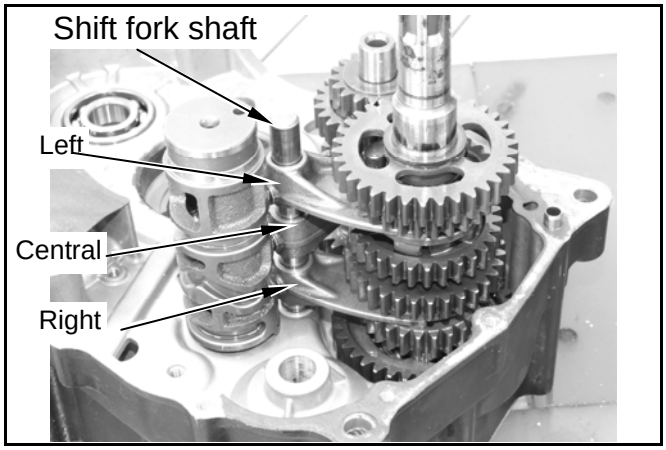
Crankshaft bearing inspection

Rotate the bearings to check if the bearings rotate smoothly and silently.
Check if the inner ring of the bearing fixes firmly on the crankshaft.
Replace the bearing if there is excessive noise or roughness.

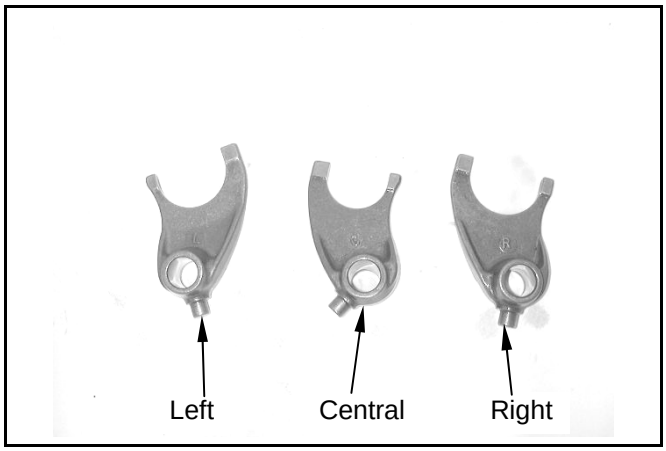


Transmission disassembly

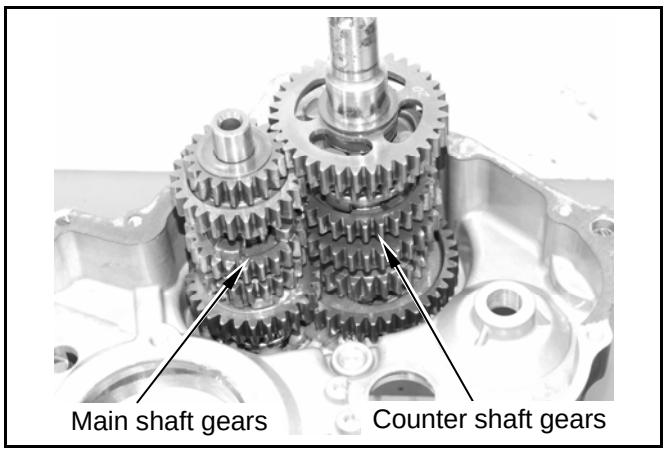
Remove the gear shift fork shaft.



Remove shift drum, then remove left, central, and right shift fork.

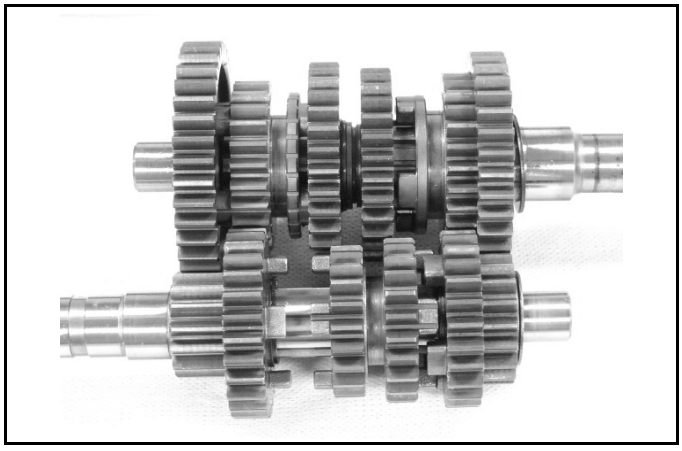


Remove the transmission mechanism.



Disassemble the gears and washers on the main shaft and counter shaft, and arrange them in order.
Check if the teeth and grooves of each gear worn and damaged.

Assemble the gears and washers onto the main shaft and counter shaft in order after the inspection.

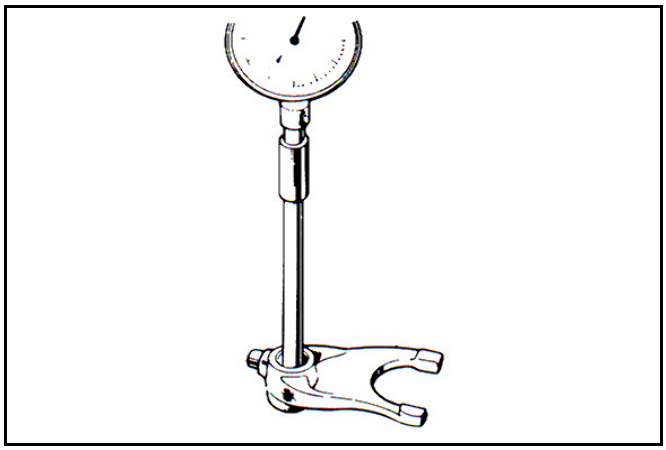


Caution

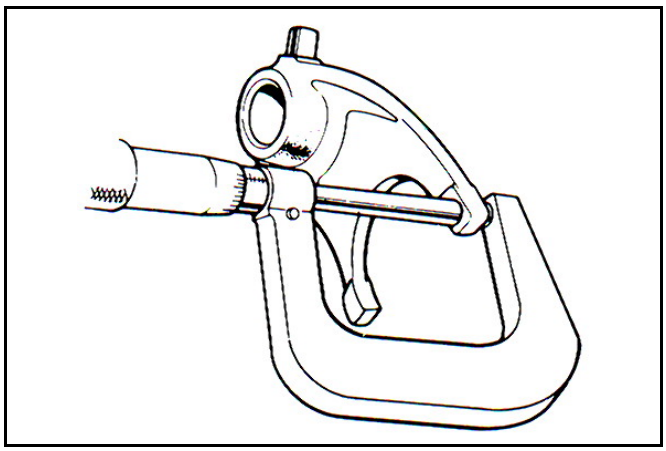
- Apply clean engine oil to the gears before assembly.
- Make sure circlips are securely seated in the shaft grooves.

Transmission inspection

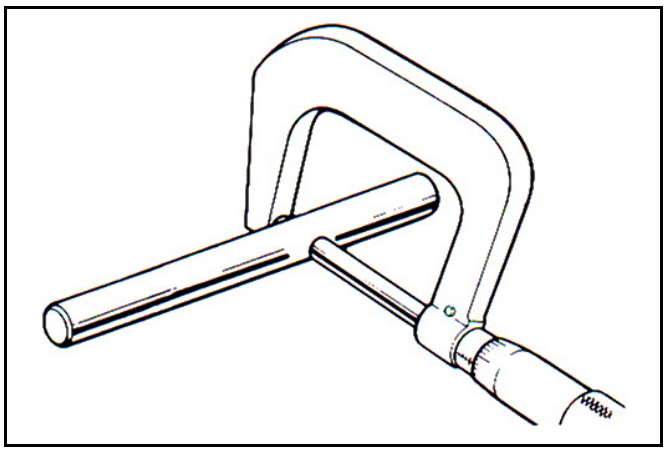
Check if the gear shift fork worn, bent or damaged.
Measure the inner diameter of the gear shift fork.
Service limit: 12.05mm



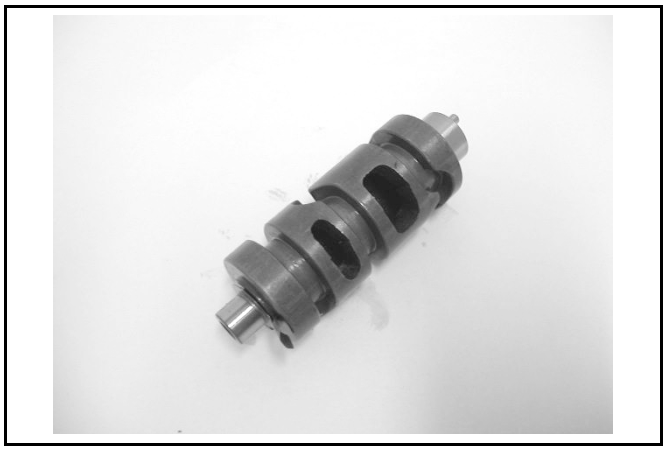
Measure the thickness of the gear shift fork claws.
Service limit: 4.7mm



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

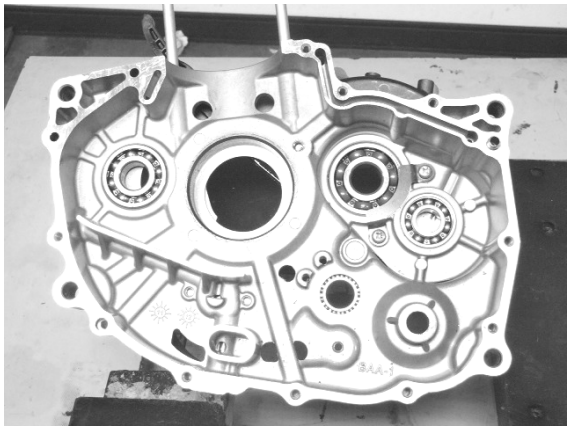


Check if the gear shift drum worn or damaged.



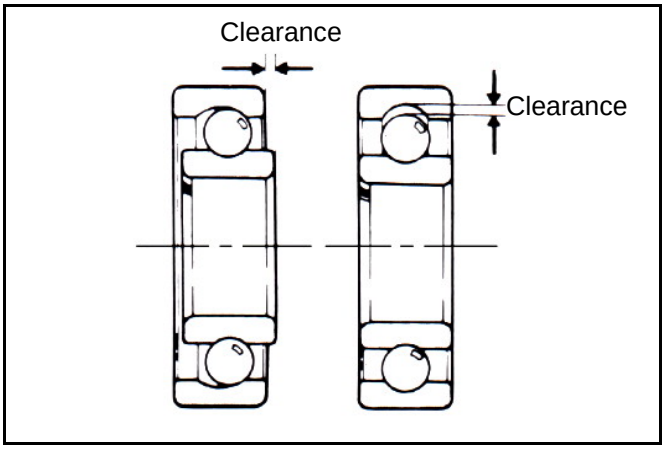
Crankcase inspection

Check if the oil path on the crankcase clogged, blow the oil path with compressed air if necessary.



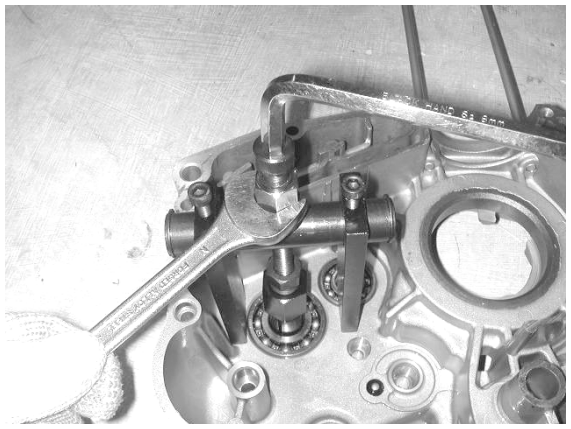
Crankcase bearing / oil seal inspection

Rotate the bearings to check if the bearings rotate smoothly and silently.
Check if the outer ring of the bearing fixes firmly on the crankcase.
Replace the bearing if there is excessive noise, roughness, or looseness.
Check if counter shaft oil seal damaged, replace if necessary.



Crankcase bearing removal

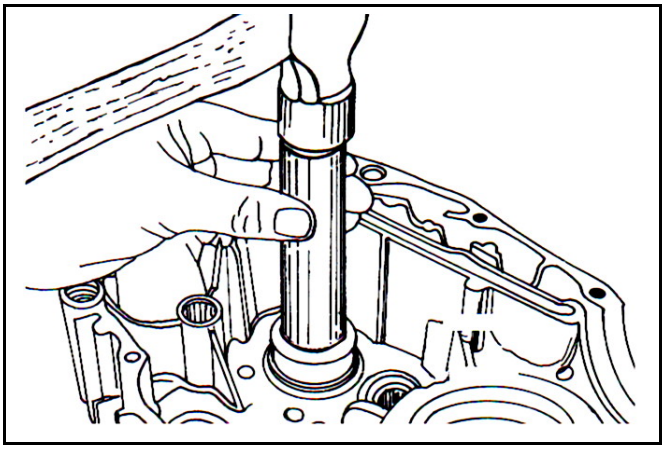
Remove the damaged bearing by using the inner bearing puller.
Special tool:
Inner bearing puller SYM-6204025



Crankcase bearing installation

Install new bearings onto the crankcase by using bearing driver.
Special tools:

Bearing driver 6204	**SYM-6204024**
Bearing driver 6304	**SYM-6204024**
Bearing driver 6203/6305	**SYM-6204024**

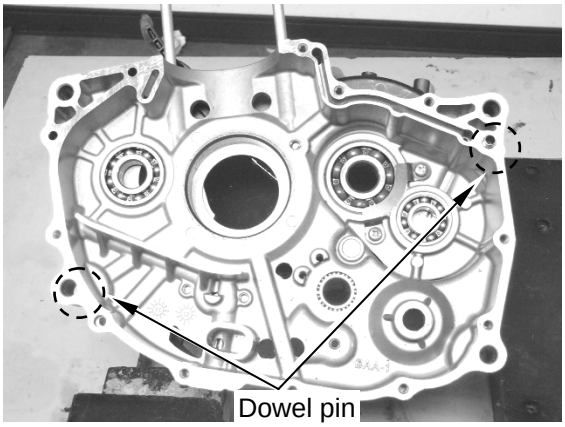


Crankcase assembly

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

Caution

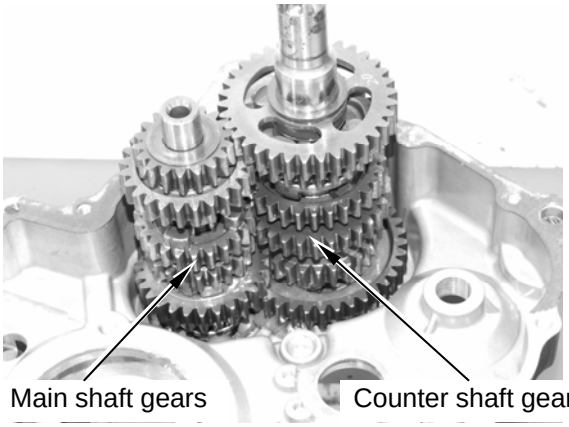
- Do not damage the contact surface of the crankcase.
- Use solvent to wet the gasket material in order to remove it more easily.



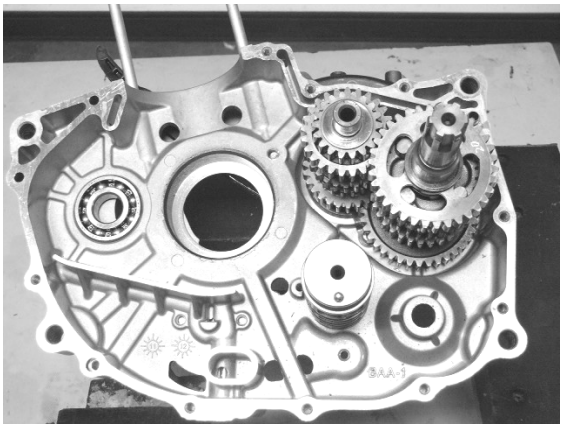
Install main shaft and counter shaft to the right crankcase.

Caution

- Make sure the right washer in the position.

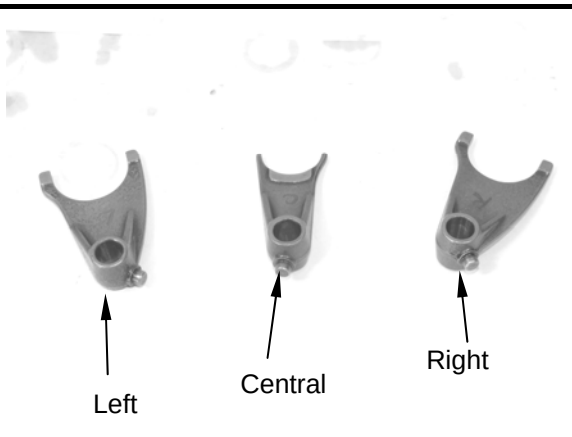


Install the gear shift drum.



Caution

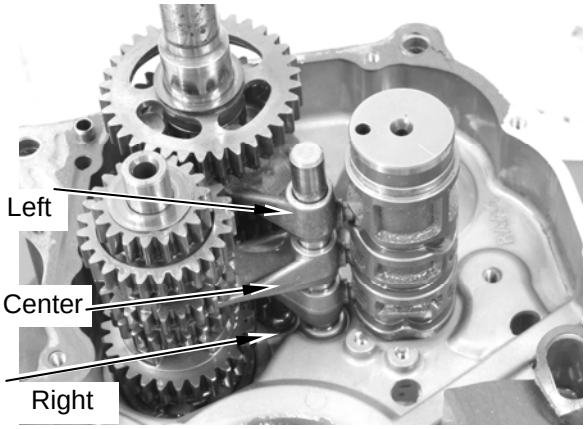
- When installing shift forks, make sure the letters facing upward.



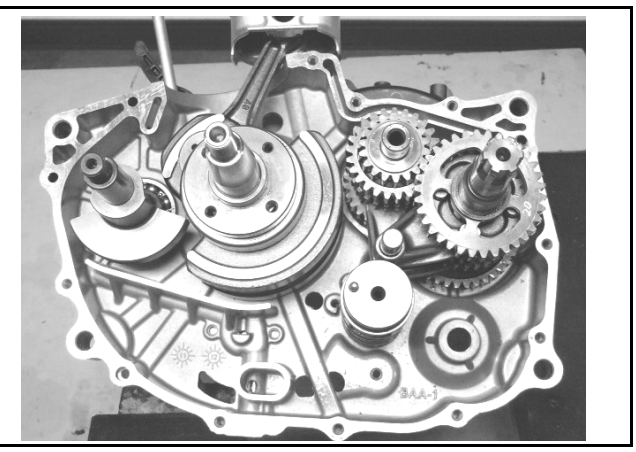
Install shift forks (left, right) on counter shaft, and install the shift fork pin into shifting drum groove.
Install shift fork (center) on main shaft, and install the shift fork pin into shifting drum groove. Align the holes of shift forks, then insert gear fork guide shaft.

Caution

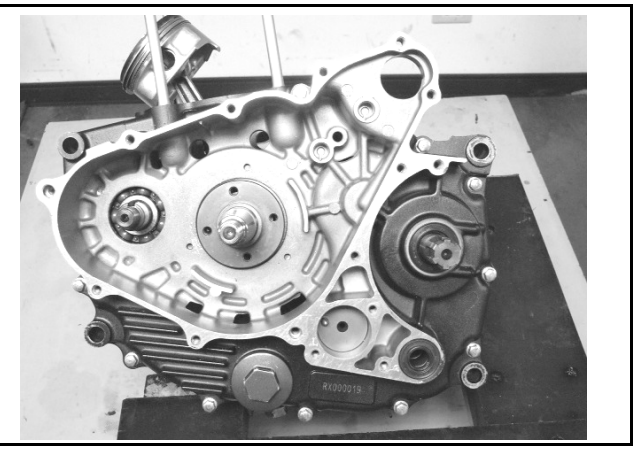
- Make sure all parts move smoothly; rotate the gear shift drum to neutral gear. (rotate the main shaft, and the counter shaft will not rotate simultaneously)



Install crankshaft and balancing shaft to the right crankcase.
Install the new crankcase gasket and dowel pins.

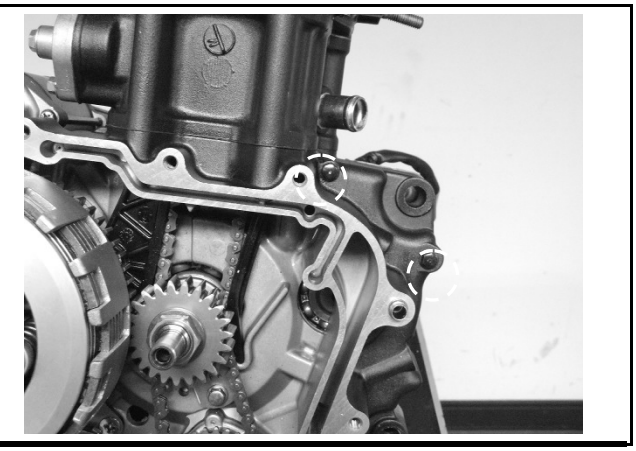


Install left crankcase.

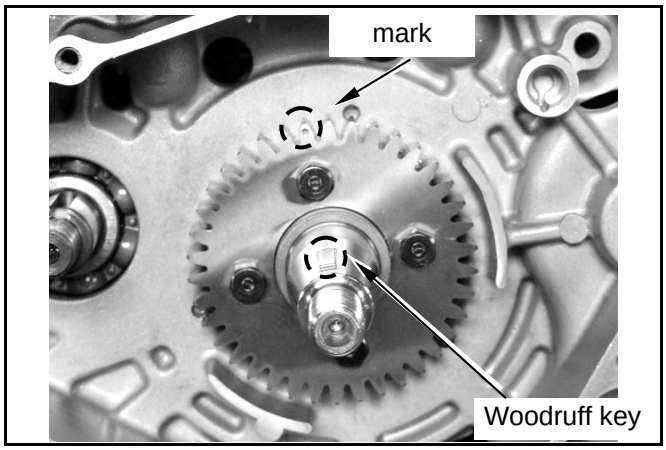


Tighten crankcase left side screws.

Torque value: 0.8~1.2kgf-m
Coat grease to the new counter shaft oil seal and install it to crankcase.
Tighten crankcase right side bolts.
Torque value: 0.8~1.2kgf-m



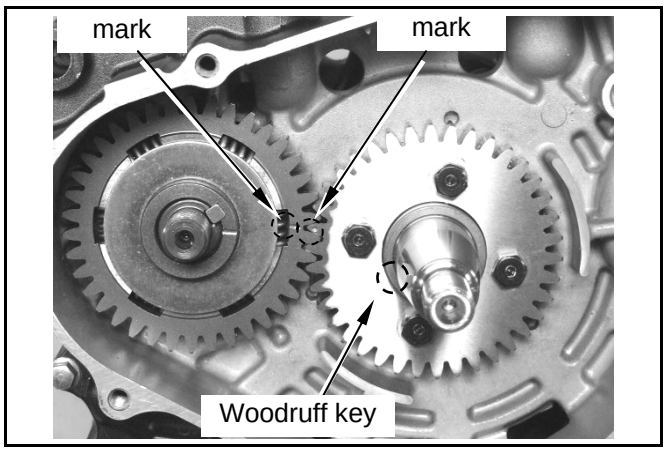
Install balancing shaft drive gear, and align woodruff key and the mark on the gear.
Tighten balancing shaft drive gear bolts.
Torque value: 0.8~1.2kgf-m



Caution

- Make sure aligning woodruff key and the mark on the gear; incorrect installation will result in knocking of crankshaft and balancing shaft and cause serious damage.

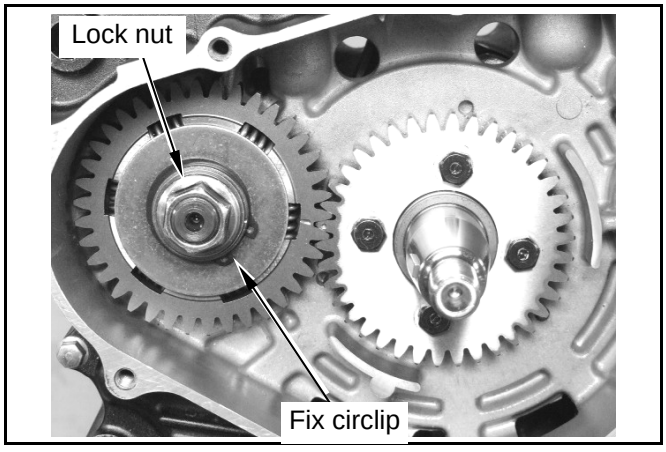
Install balancing shaft gear, align marks on balancing shaft gear and balancing shaft drive gear.
Torque value:0.8~1.2kgf-m



Caution

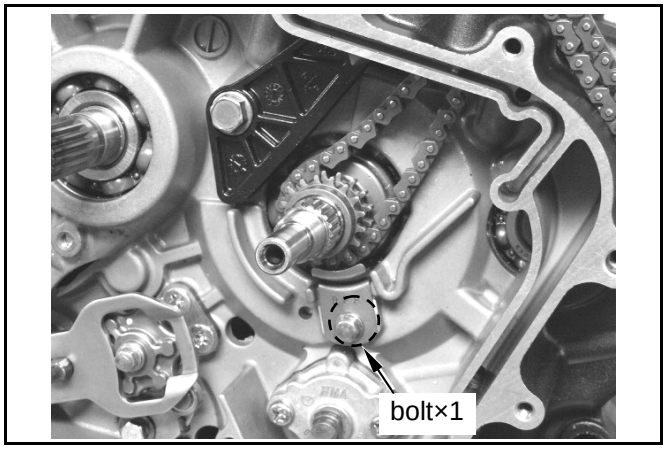
- Make sure aligning marks on balancing shaft gear and balancing shaft drive gear; incorrect installation will result in knocking of crankshaft and balancing shaft and cause serious damage.

Install the fix circlip on the balancing shaft gear.
Tighten balancing shaft lock nut.
Torque value: 8.5~10.5kgf-m



Install cam chain.

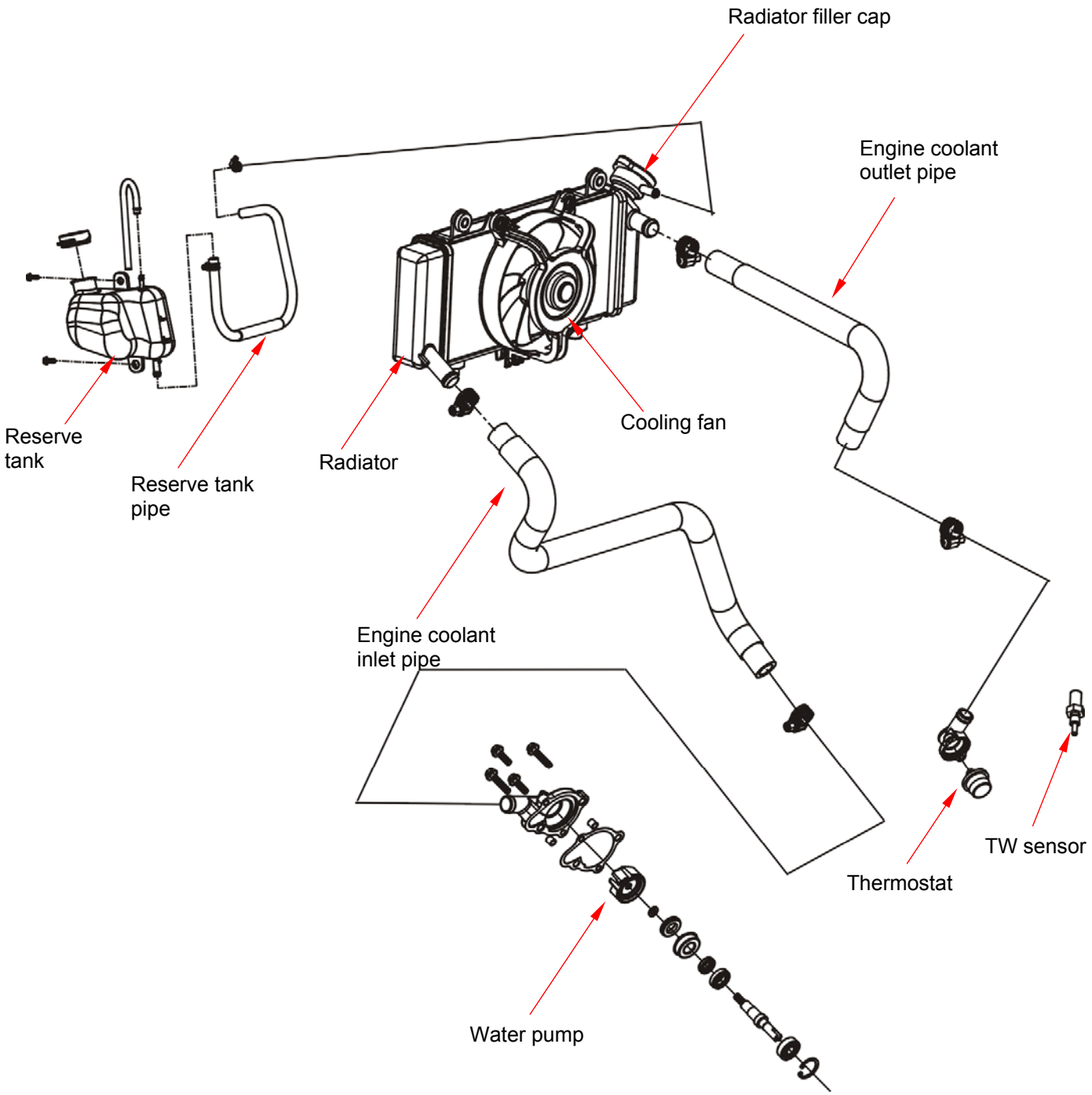
Install the cam chain tensioner arm. (bolt×1)。



NOTE:

Mechanism Diagram ·····10-1	Coolant Change····· 10-5
Precautions in Operation·····10-2	Radiator ····· 10-6
Troubleshooting·····10-2	Water Pump ····· 10-8
Diagnosis of Cooling System·10-3	Thermostat ····· 10-12

Mechanism diagram



Precautions in operation

General information

⚠ Caution

- While the engine is running, never attempt to open the radiator filler cap, the pressurized hot coolant may shoot out and cause serious scalding injury. No maintenance work is allowed to perform unless the engine is completely cooled down.

- Refill the radiator with distilled water or specified additives.
- Add coolant to the reservoir.
- The cooling system can be serviced on the motorcycle.
- Never spill the coolant to the painted surface.
- Test the cooling system for any leakage after the repair.
- Please refer to Ch3 for inspection of TW sensor.

Specification

Item	Specification
Pressure to open filler cap	0.75~1.05 Kgf/cm²
Capacity of coolant: Engine + radiator Reservoir	1200c.c. 400c.c.
Thermostat	Begins to activate at: 82~95ºC Stroke : 0.05~3.00mm
Boiling point	Not-pressure :107.7ºC Pressurized: 125.6ºC

Torque Value

Water pump rotor 1.0~1.4kgf-m

Special tools

Water pump bearing driver (6901) SYM-9100100
Water pump oil seal driver (Inner) SYM-9120500-H9A
Water pump mechanical seal driver SYM-1721700-H9A
Inner bearing puller SYM-6204020

Troubleshooting

Engine temperature too high

- TW sensor malfunction.
- Thermostat seized.
- Insufficient coolant.
- Water hoses clogged.
- Water pump malfunction.
- Fan motor malfunction.
- The filler cap of the radiator malfunction.

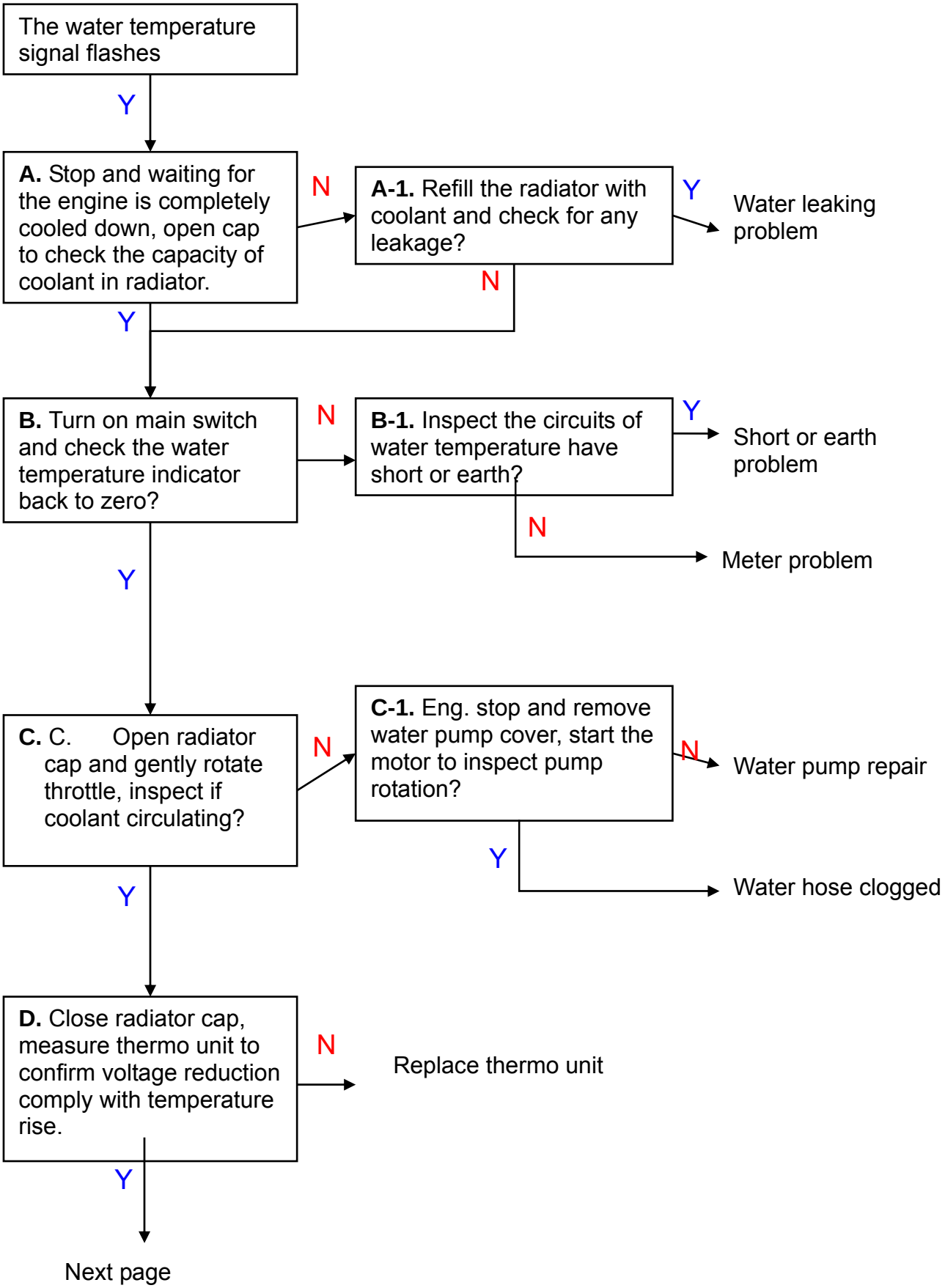
Engine temperature too low

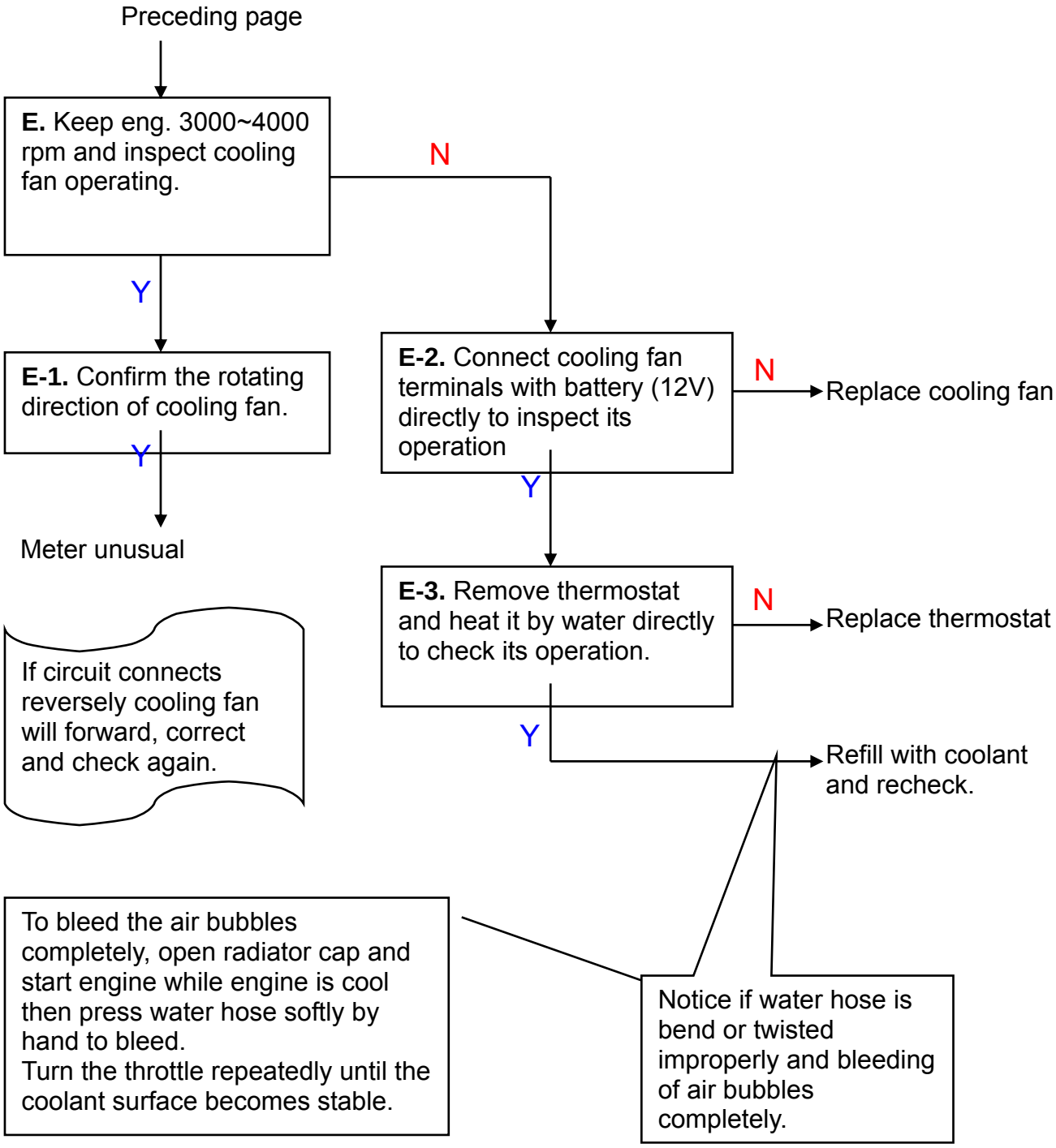
- TW sensor malfunction.
- Thermostat seized.

Coolant leakage

- water pump mechanical seal malfunction
- Thermostat O ring deterioration.
- Water hose deteriorated or damaged

Diagnosis of cooling system



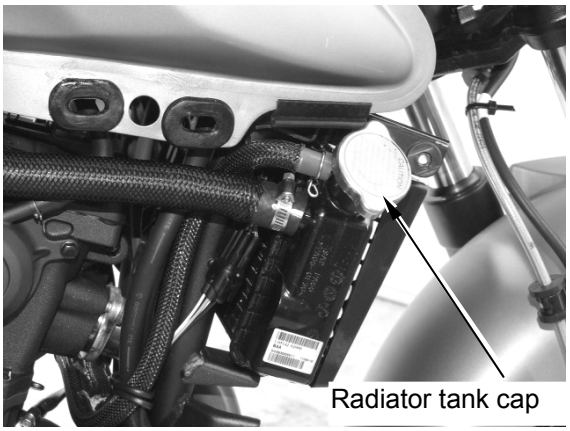

Preceding page
E. Keep eng. 3000~4000 rpm and inspect cooling fan operating.
N
Y
E-1. Confirm the rotating direction of cooling fan.
Y
Meter unusual
If circuit connects reversely cooling fan will forward, correct and check again.
E-2. Connect cooling fan terminals with battery (12V) directly to inspect its operation
N
Replace cooling fan
Y
E-3. Remove thermostat and heat it by water directly to check its operation.
N
Replace thermostat
Y
Refill with coolant and recheck.
To bleed the air bubbles completely, open radiator cap and start engine while engine is cool then press water hose softly by hand to bleed.
Turn the throttle repeatedly until the coolant surface becomes stable.
Notice if water hose is bend or twisted improperly and bleeding of air bubbles completely.

Coolant change

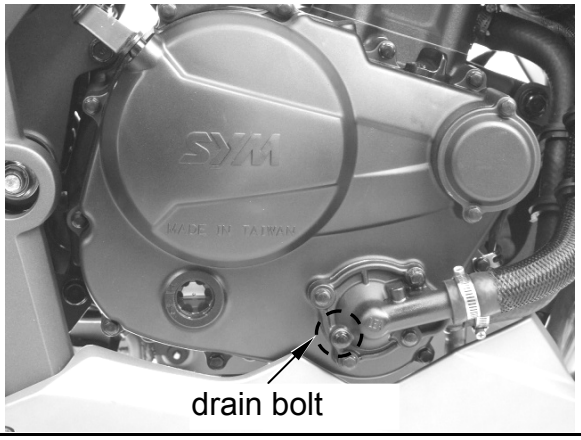
Warning

- Never attempt to carry out service work on the cooling system unless the engine is completely cooled down, otherwise, you may get scalded.

Remove right-front body cover. (screwX2)
Remove radiator tank cap.



Remove under spoiler. (boltX4)
Place a water pan under the water pump; loosen the drain bolt to drain out the coolant.
Reinstall the drain bolt.



Refill system with coolant and bleed the air bubbles.

- Remove radiator tank cap.
- Start the engine and confirm no bubbles from the radiator and the coolant level is stable.
- Shut down engine, refill coolant if necessary.

Caution

- To avoid the water tank rusting, please do not use an unknown trademark refrigerant.

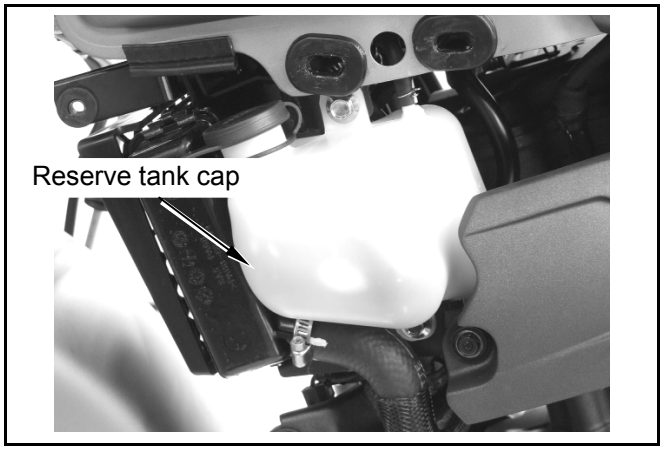
Coolant recommended: SYM Bramax radiator agent.
Concentration: 50%

Reserve tank check

- Remove left-front body cover.
- Check reserve tank coolant level, refill coolant to standard level. (between upper and lower)
- Install reserve tank cap.

Caution

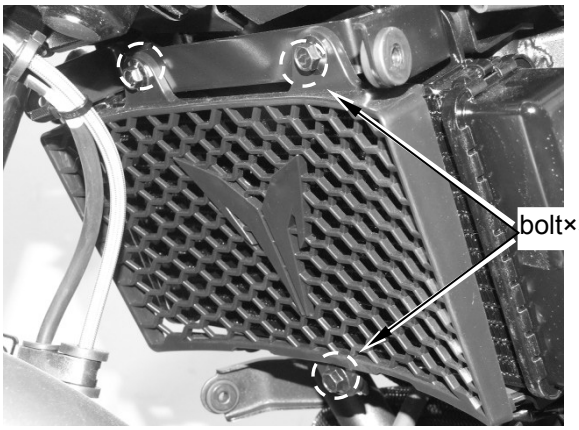
- Do not fill too much coolant, or the collant will backflow after the water temperature rises.



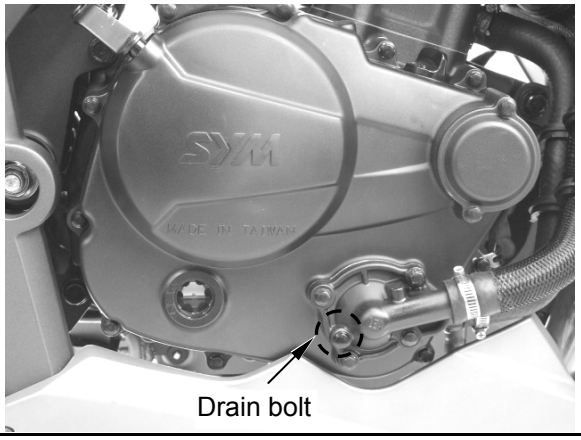
Radiator

Removal / Check

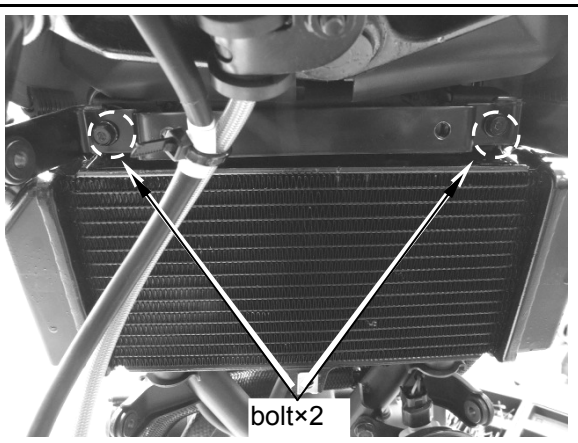
Remove radiator air duct. (boltX3)
Check for any leakage from weld seam.
Blow radiator with compressed air. If the radiator is blocked by dirt, use low pressure water jet to clean it.
Care shall be taken when straightening the sink fan.



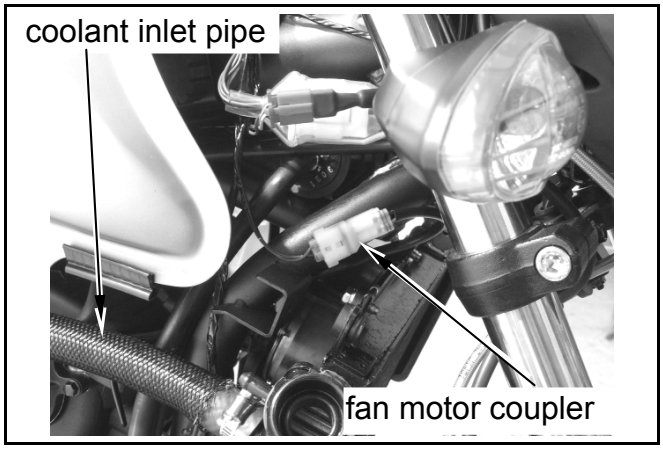
Place a water pan under the water pump; loosen the drain bolt to drain out the coolant.
Install drain bolt.



Remove radiator bolt. (bolt×2)

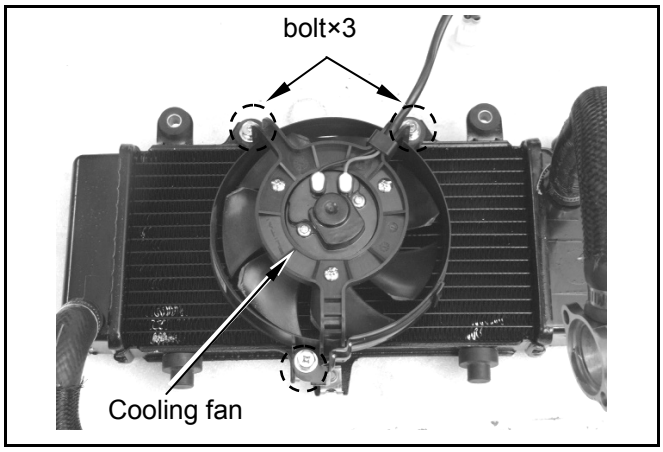


Disconnect the fan motor coupler.
Remove engine coolant inlet pipe, reserve tank inlet pipe and radiator inlet pipe.
Remove the radiator and the cooling fan.



Disassembly

Remove the cooling fan mounting bolt and the fan. (bolt×3)
Remove thermo switch.

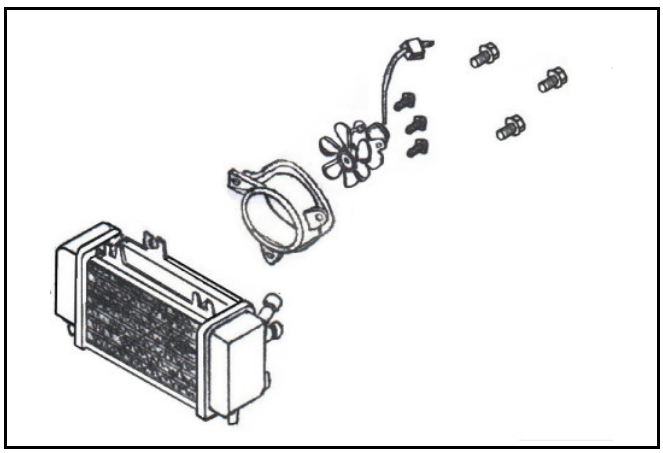


Assembly

Install cooling fan onto the radiator. (bolt×3)
Install thermo switch.

Installation

Install the removed parts in the reverse order of removal.
Upon completion, check for any leakage.

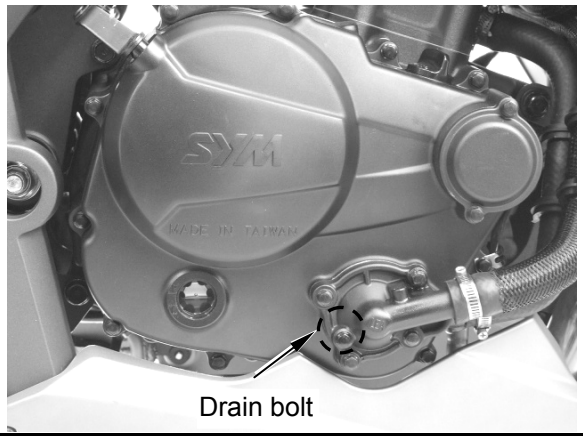


Water pump

Water pump seal / cooling system leakage inspection

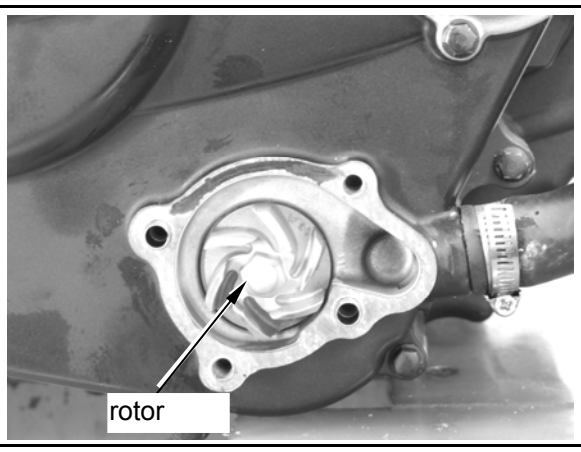
- Remove drain bolt to drain some coolant to check if there is greasiness in it.
- Remove engine oil gauge rule to check if the oil is emulsified.

If the two phenomena appear, oil seals of water pump, cooling system, cylinder head, or cylinder gasket could be damaged. Please remove right crankcase to check (replace) water pump oil seals, then inspect cylinder head and cooling system.



Water pump removal

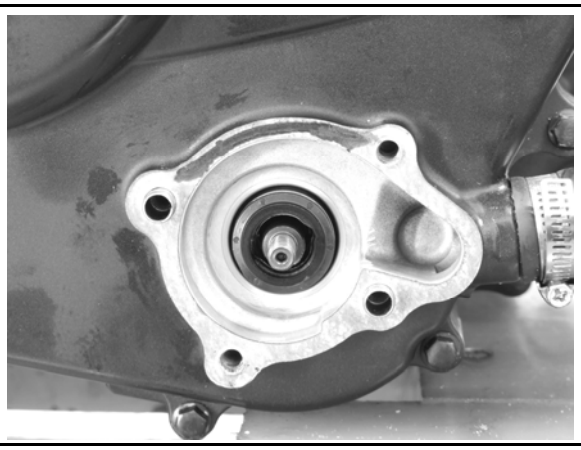
Remove drain bolt and drain out coolant.
Remove the water hose.
Remove four water pump bolts and cover.
Remove gasket and dowel pin.
Remove 12 right crankcase bolts and the crankcase.
Remove gasket and dowel pin.



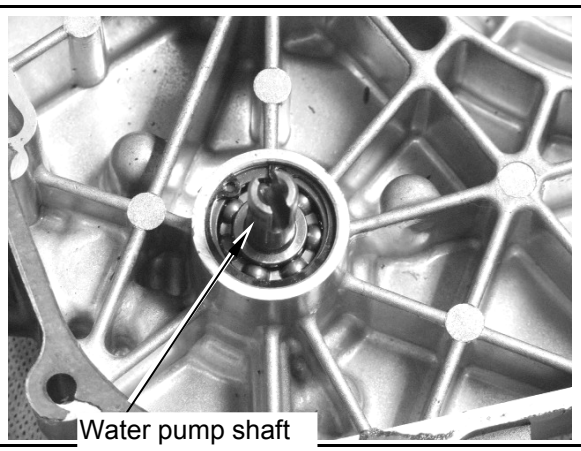
Hold water pump drive shaft and remove water pump rotor clockwise.

⚠ Caution

- The rotor is provided with left turn thread.



Remove circlip from right crankcase.
Remove water pump shaft and inner bearing.
Remove the outside bearing by inner bearing puller.
Rotate the inner ring of bearing, the bearing shall move smoothly and quietly.
If the bearing does not rotate smoothly or produces a noise, replace it with new one.



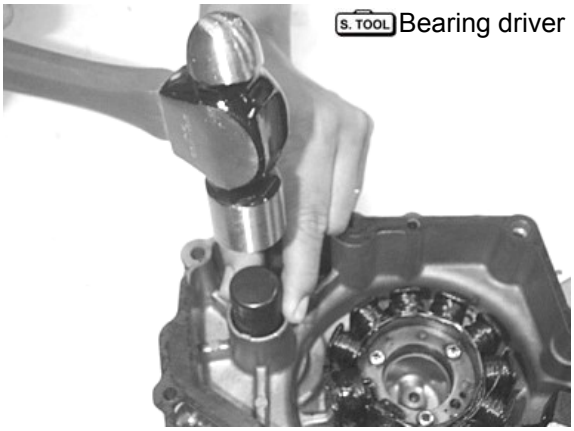
Check if mechanical seal and inside seal damaged or worn.

⚠ Caution

- The mechanical seal and inside seal must be replaced as a unit.

Replacement of Mechanical Seal

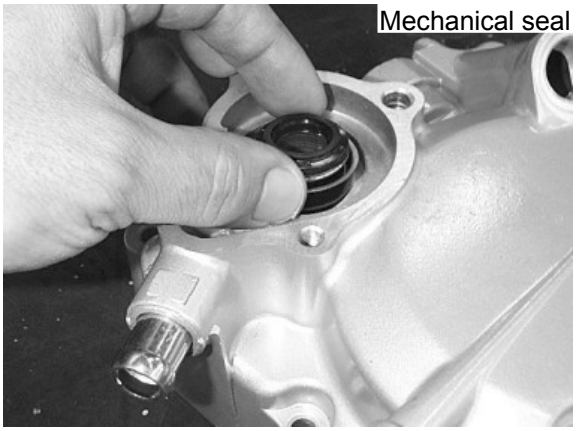
Remove the inside bearing from inner side of right crankcase by inner bearing puller.
Drive the seal by bearing driver.
Special tool
Bearing driver(6901) SYM-9100100



⚠ Caution

- Replace with a new mechanical seal after removing it.

Apply sealant to the mating surfaces of the right crankcase before installing the new mechanical seal.



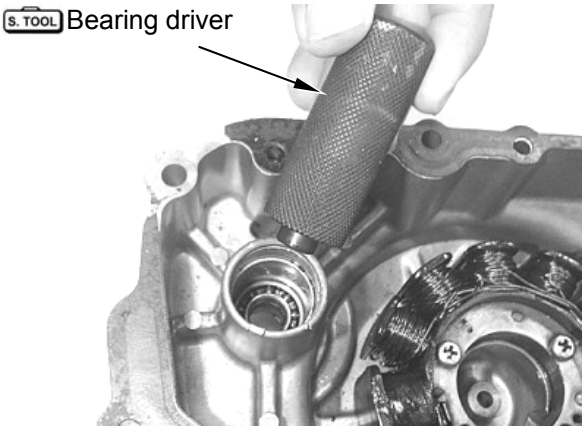
Install the new mechanical seal onto the right crankcase.
Special tool
Water pump mechanical seal driver SYM-1721700-H9A

Install the new inner seal (12×20×5) onto the right crankcase.
Special tool
Water pump oil seal driver (inner)
SYM-9120500-H9A

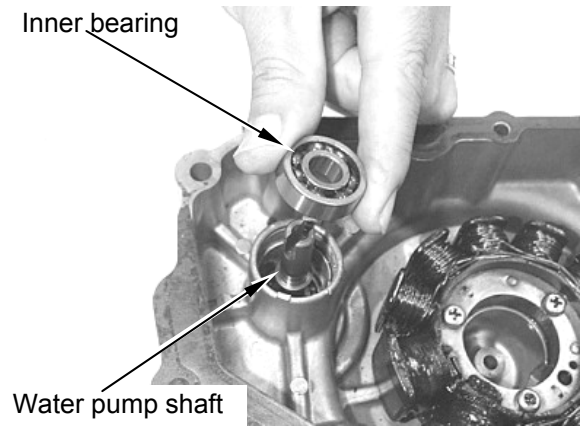
Install a new outside bearing to the right crankcase cover.
Special tool
Bearing driver (6901)SYM-9100100

⚠ Caution

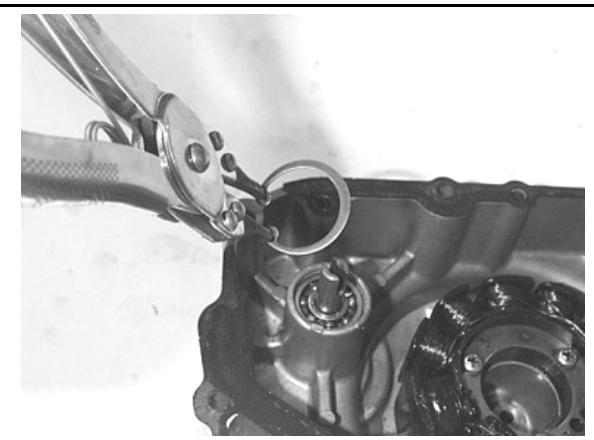
- Do not reuse old bearing. It must be replaced with a new one once it has been removed.



Mount the water pump shaft and the inner bearing to the right crankcase cover.



Install the inner bearing circlip.



Rotor installation

Install the seal washer onto the water pump shaft.

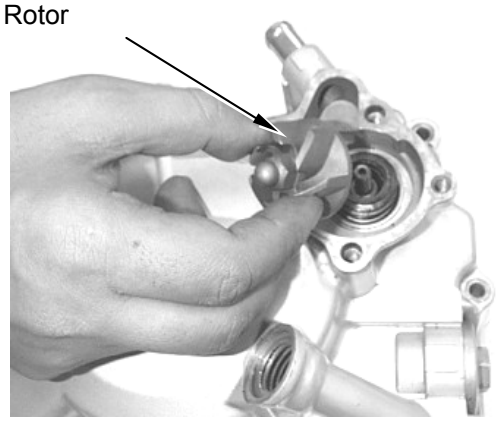
⚠ Caution

- Washer must be replaced together with the mechanical seal.

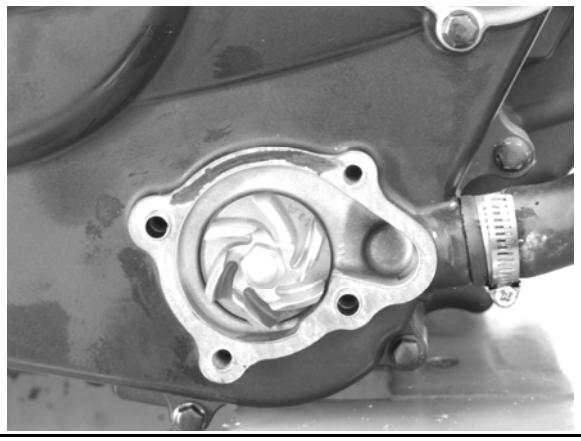
Install the rotor onto the water pump shaft.
Torque Value:1.0~1.4kgf-m

⚠ Caution

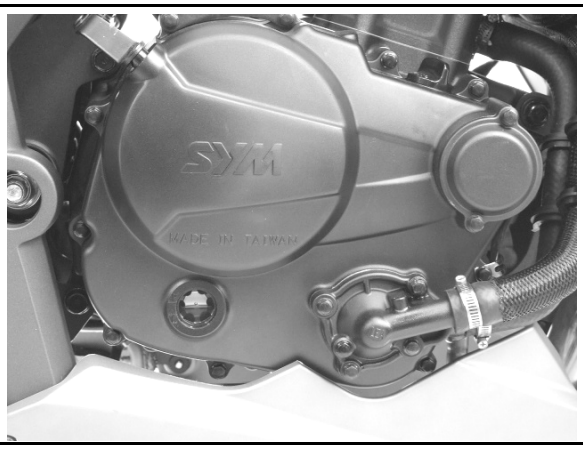
- The rotor is left thread.



Install the dowel pin and right cover gasket. Rotate the rotor to align it with water pump drive shaft. Install right crankcase. (bolt×10)



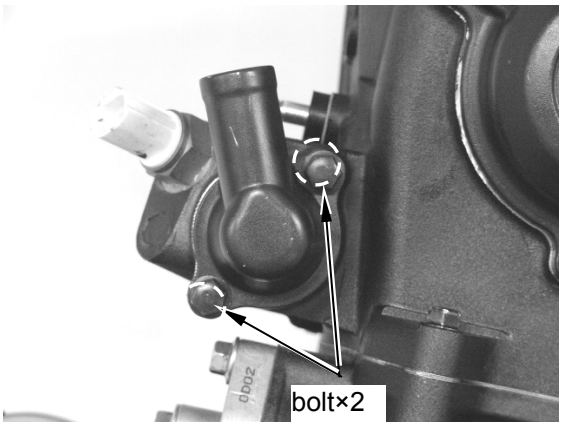
Install the dowel pin and new gasket.
Install the water pump cover. (bolt×4)



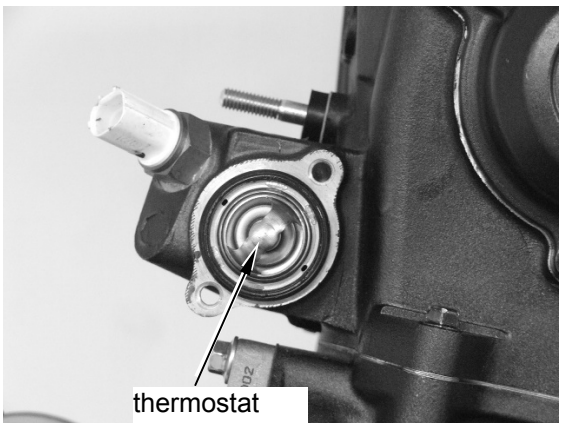
Thermostat

Removal

Remove thermostat cover. (boltX2)



Remove thermostat



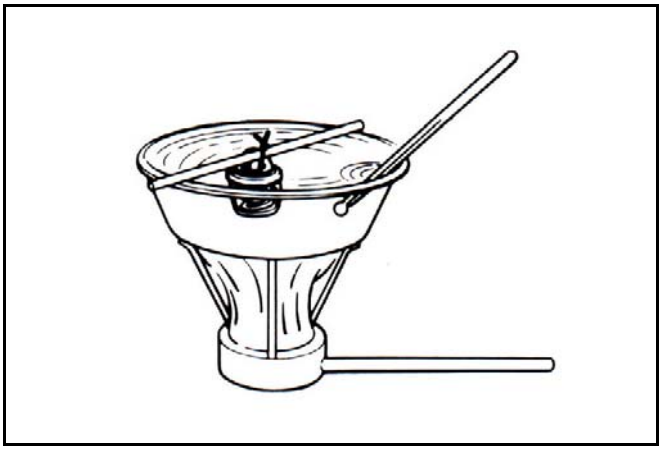
Inspection

Check if thermostat damaged.

Place the thermostat into heated water to check its operation.

⚠ Caution

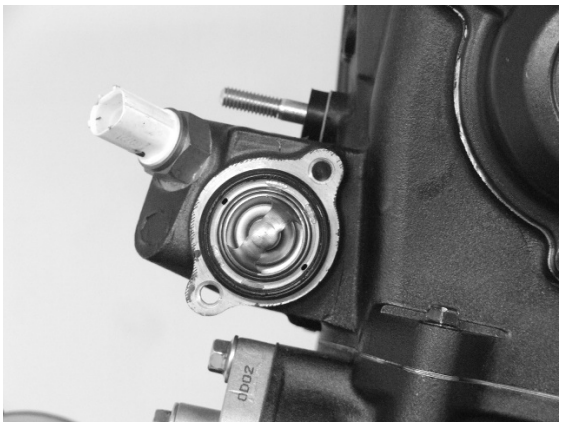
- If the thermostat or thermometer contact with the container, the value displayed will be incorrect. If the valve of the thermostat remains open at room temperature or the valve operation is not corresponding to the temperature change, then it must be replaced.



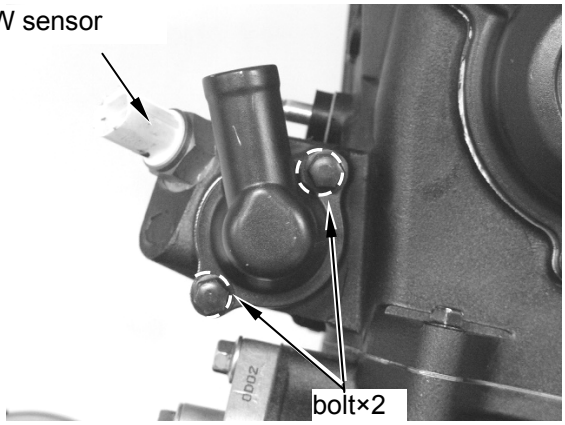
Technical Data

Valve begins to open	82~95ºC
Valve stroke	0.05~3.00mm

Installation
Install the thermostat.



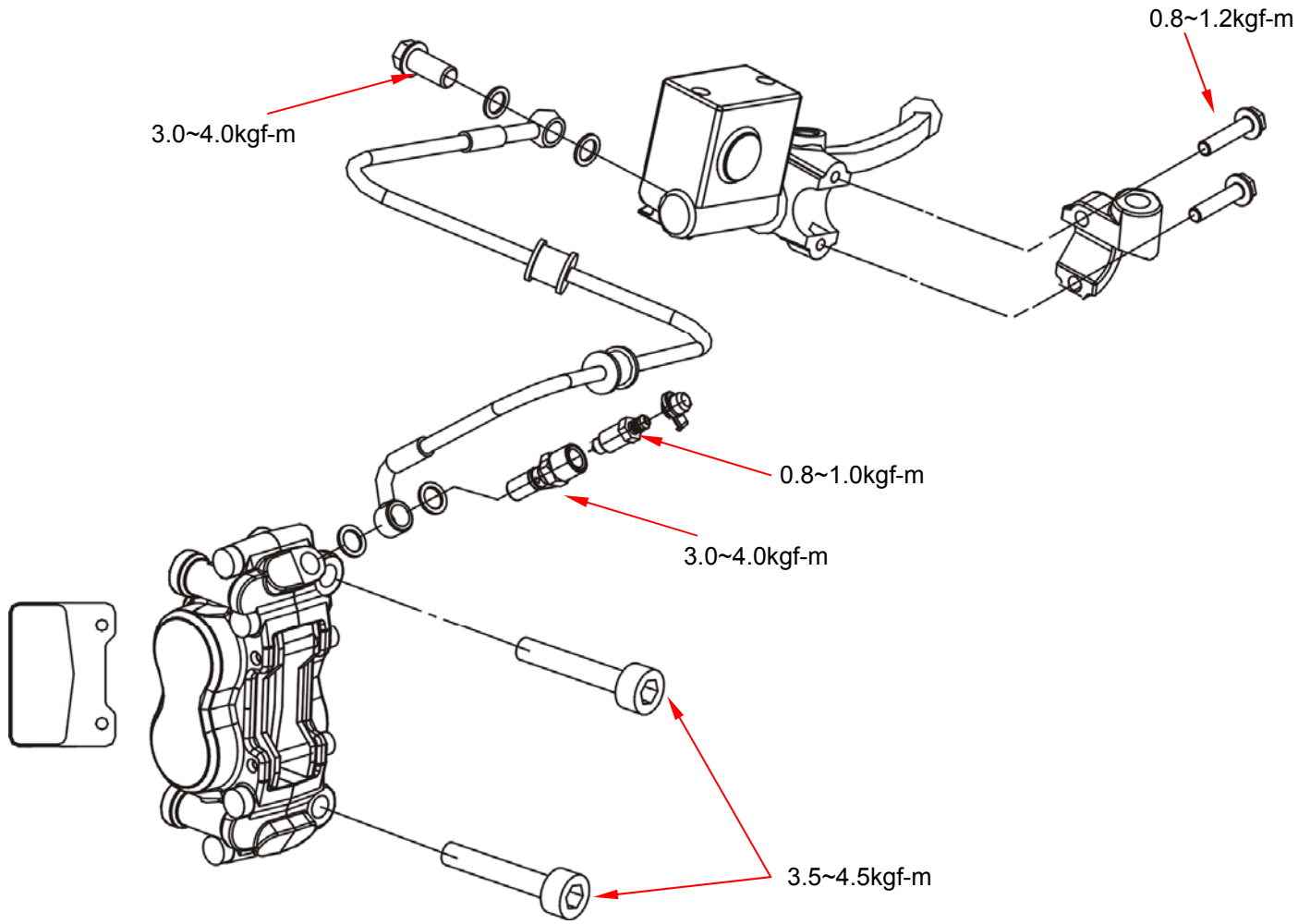
Install the thermostat cover. (bolt×2)
Install hose, refill coolant and bleed out air bubble.



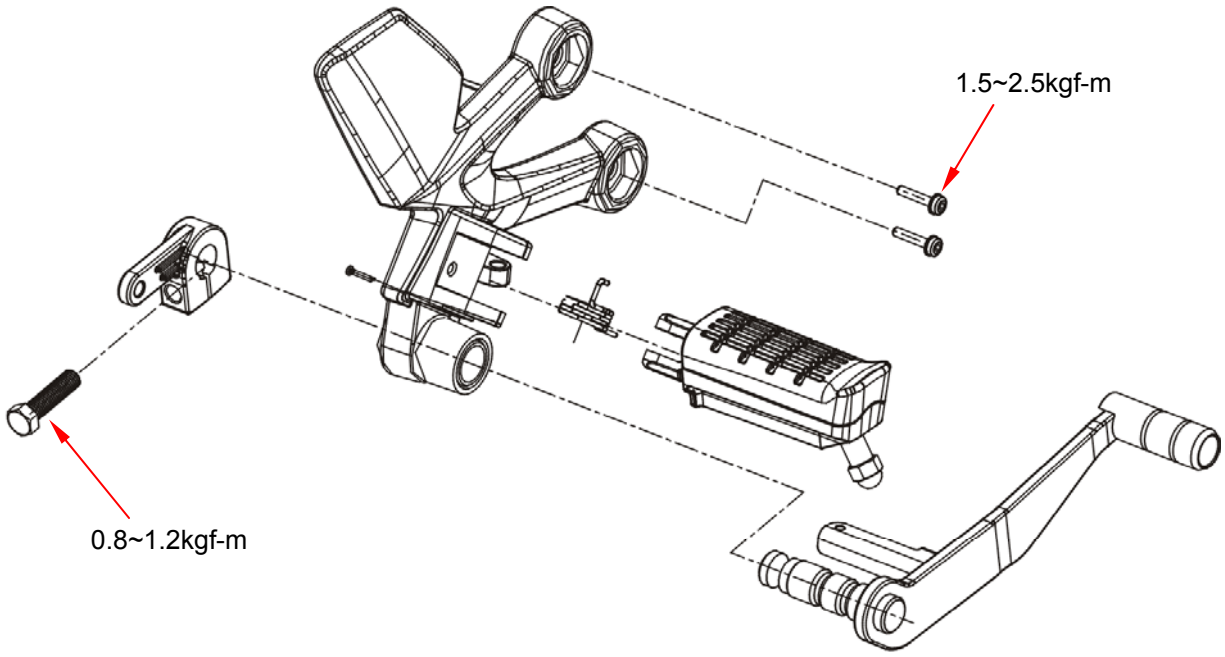
NOTE:

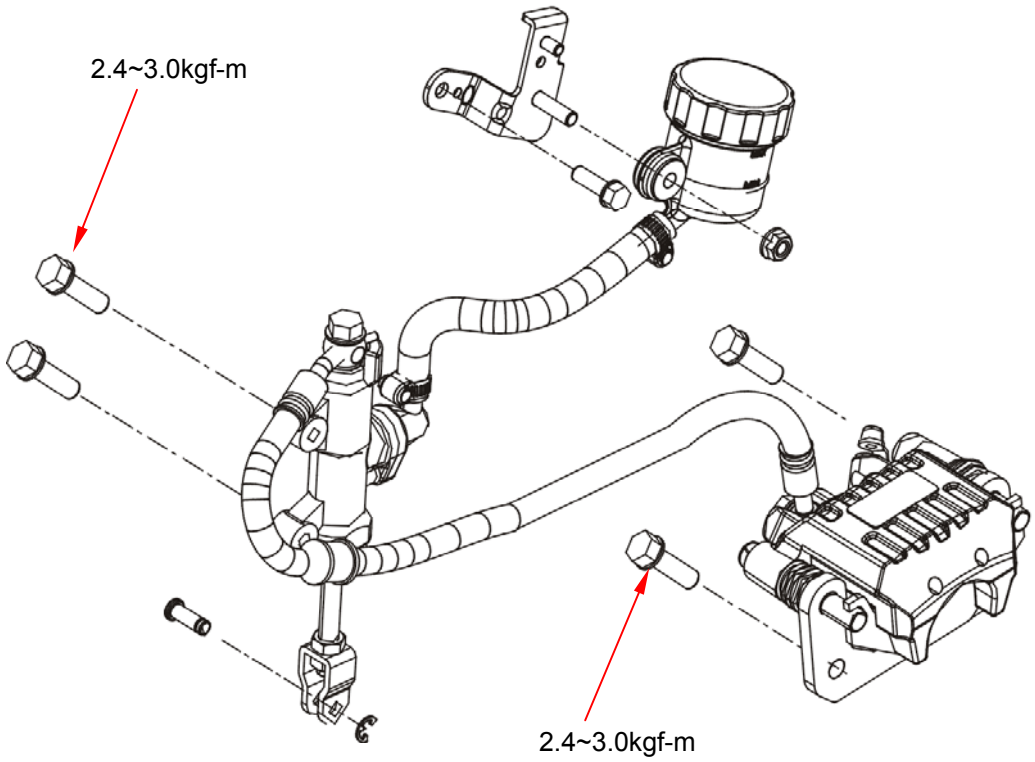
Mechanism Diagram - Front Disk Brake ····· 11-1	Brake Fluid Replacement / Air Bleed ····· 11-6
Mechanism Diagram - Rear Disk Brake ····· 11-2	Front Brake Caliper ····· 11-7
Precautions in Operation ····· 11-3	Rear Brake Caliper ····· 11-8
Troubleshooting ····· 11-4	Brake Disk ····· 11-9
Disk Brake System Inspection ···· 11-5	Brake Master Cylinder ····· 11-10

Mechanism diagram – front disk brake



Mechanism diagram – rear disk 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 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 **measurement : mm**

Item	Standard	Service limit
Front brake disk thickness	5.00	4.50
Rear brake disk thickness	4.00	3.00
Front brake disk outer diameter	288.00	—
Rear brake disk outer diameter	222.00	—
Brake disk eccentricity	0.1	0.30
Bake pad thickness	–	Mark on brake pad

Torque value

Brake hose bolt	3.0~4.0kgf-m
Front brake caliper bolt	3.5~4.5kgf-m
Brake disk bolt	3.7~4.3kgf-m
Air bleed valve	0.8~1.0kgf-m
Front wheel axle nut	6.0~8.0kgf-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. Poor brake caliper
5. Worn brake pad
6. Low brake fluid
7. Blocked brake hose
8. Warped / bent brake disk
9. 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. Blocked brake hose
4. Warped / bent brake disk
5. Blocked brake hose / joint

Tight brake

1. Dirty brake pad / disk
2. unbalanced brake disk / wheel
3. Warped / bent brake disk

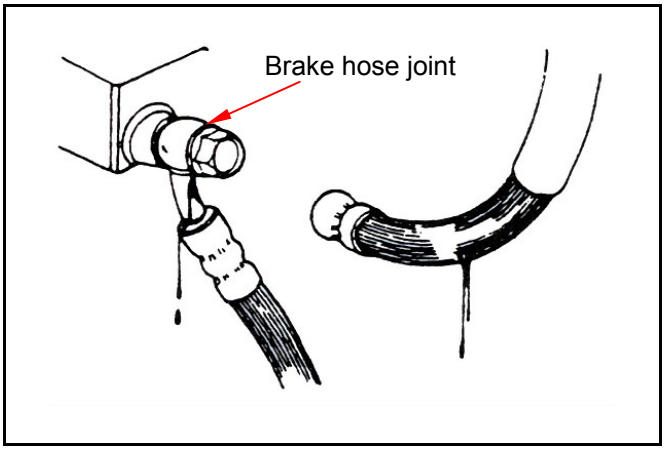
Brake noise

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

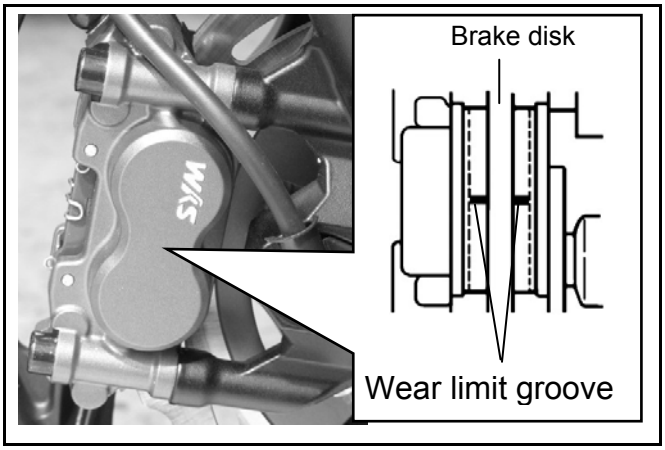
Disk brake system inspection

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.



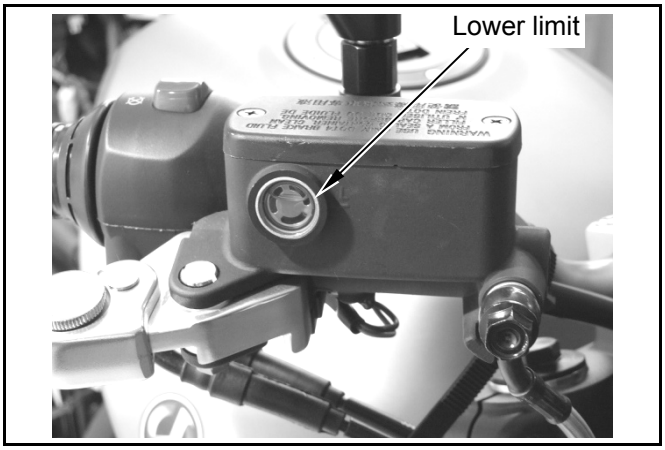
Check if the brake pads worn. Replace the brake pads if either pad is worn to the bottom of wear limit groove.



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.

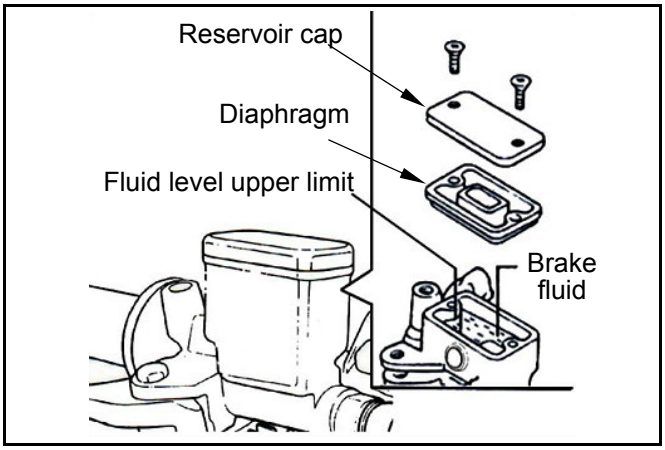


Adding brake fluid

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.
Clean the dirty brake disk.

⚠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.

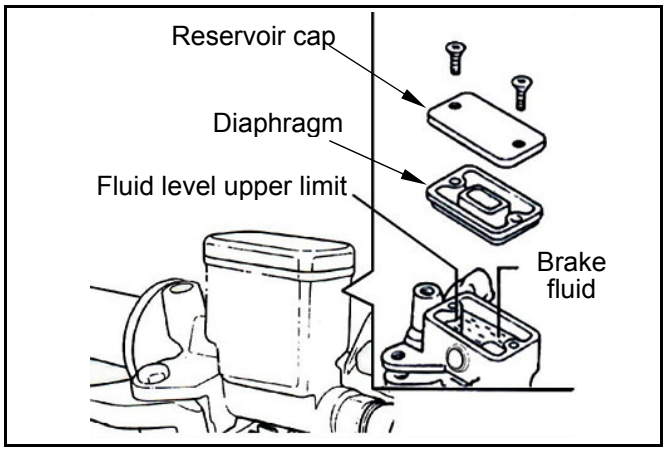
Connect a drain hose to the air-bleed valve, and put the other end into a container.
Open the air-bleed valve around 1/4 turns, and at the same time pump the brake lever until there is no air bubble in the drain hose and also feeling resistance on the brake lever.
Close the air-bleed valve when the brake 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:

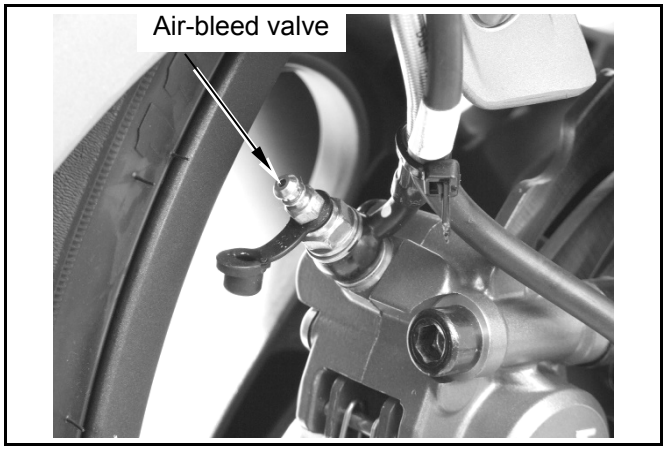
1. Tightly hold the brake lever and open the drain valve around 1/4 turns, and then close the valve.

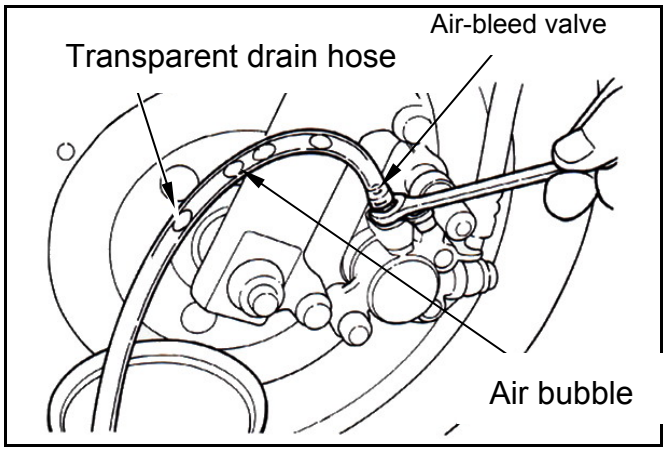
⚠Caution

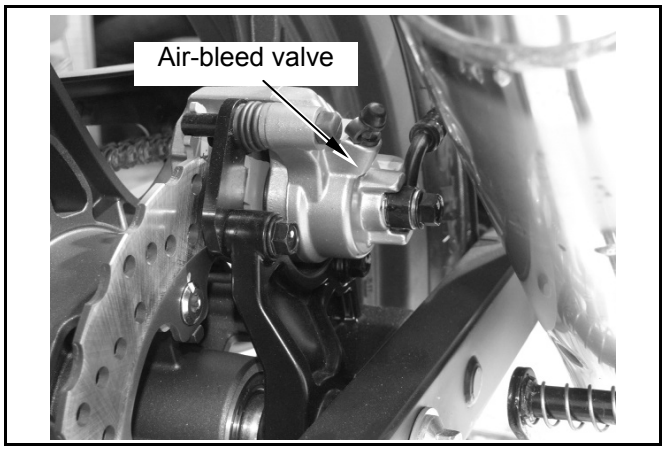
- Do not release the brake lever before the air-bleed valve is closed.
- When bleeding air, frequently check fluid level to avoid air entering the brake system.

2. Release the brake lever slowly.
3. Repeat step 1 and 2 until there is no air bubble at the end of the hose. Tighten air-bleed valve.
4. Confirm the brake fluid level, add fluid if necessary.
5. Cover the reservoir cap.









Front brake caliper

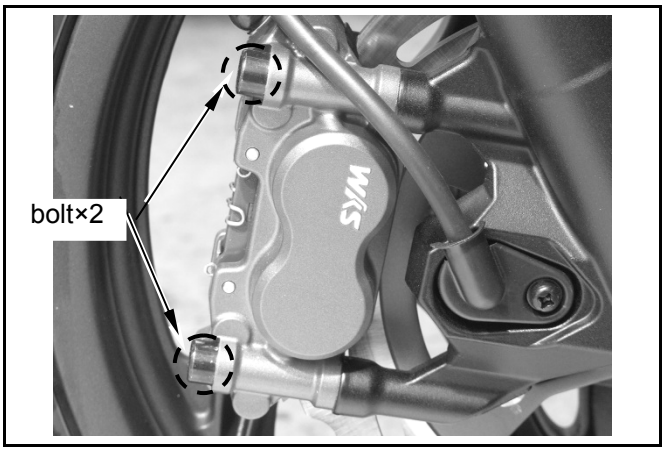
Removal

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

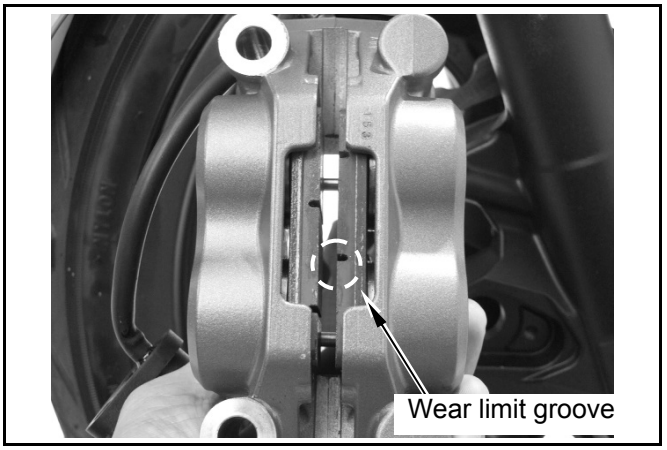
⚠Caution

- Do not spill brake fluid on painted surfaces.

Remove caliper bolts, (bolt×2) remove the caliper.



Check the brake pad wear condition, replace with new brake pad if wear limit is reached.



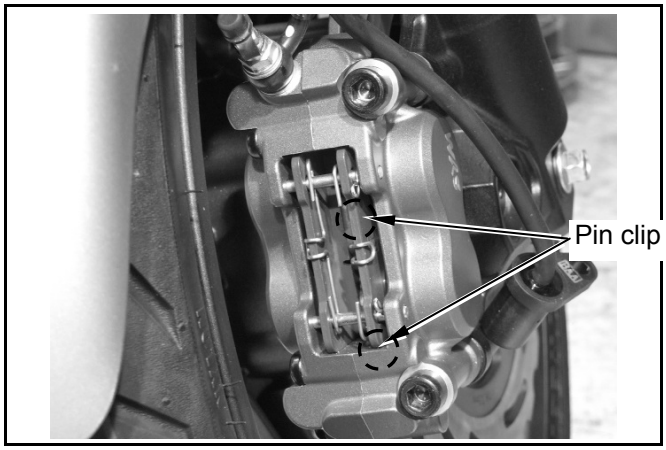
Installation

Install the caliper and tighten the bolts.

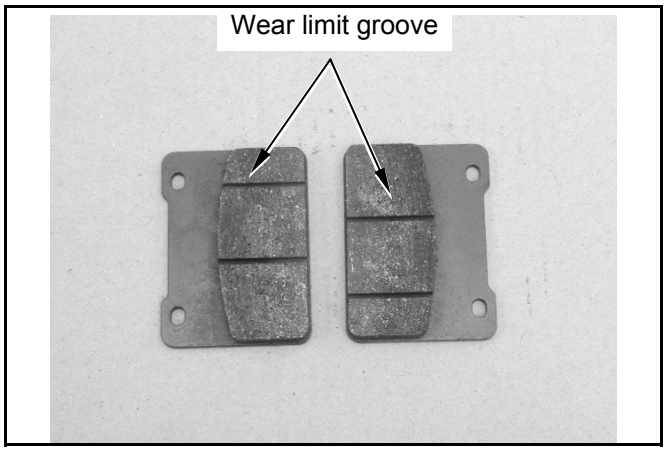
Torque value：3.5~4.5kgf-m

Brake pad replacement

Remove pin clips.
Remove pad pins and spring.



Remove brake pads.
Install new brake pads, pad pins, and spring.
Install pin clip.



Rear brake caliper

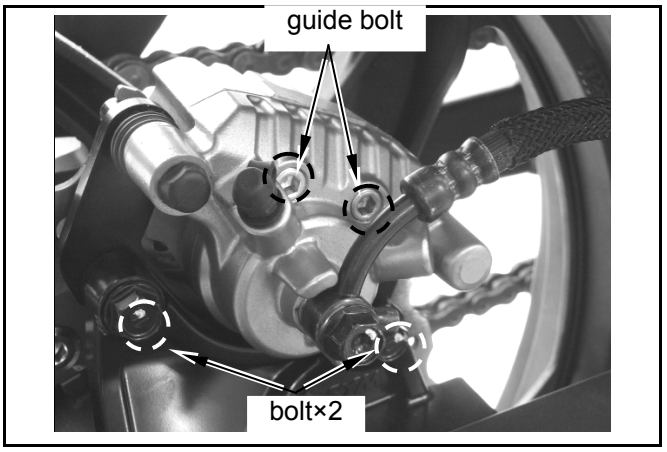
Removal

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

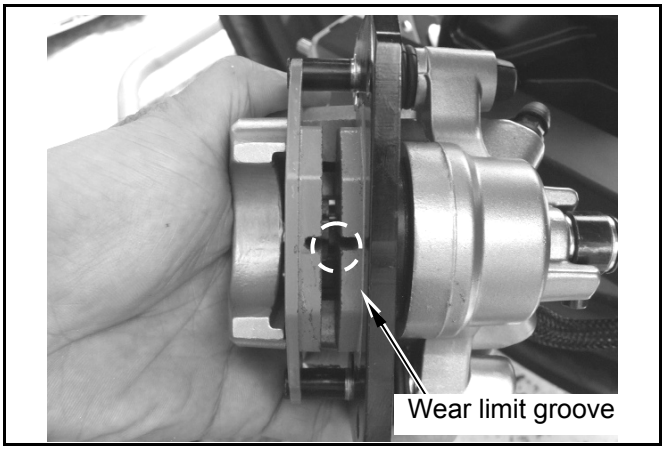
⚠Caution

- Do not spill brake fluid on painted surfaces.

Remove caliper bolts, (bolt×2) remove the caliper.



Check the brake pad wear condition, replace with new brake pad if wear limit is reached.

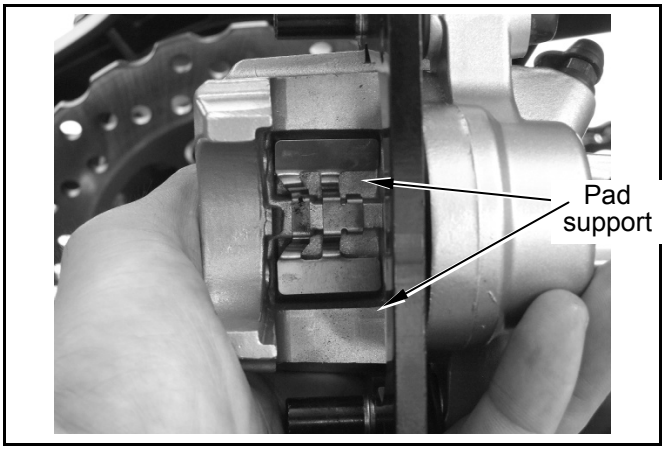


Installation

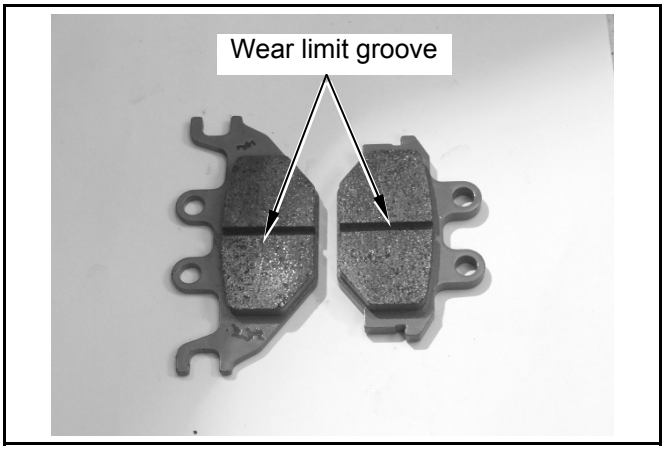
Install the caliper and tighten the bolts.
Torque value: 3.1~3.5kgf-m

Brake pad replacement

Remove guide bolts.
Remove brake pads.
Remove pad support.



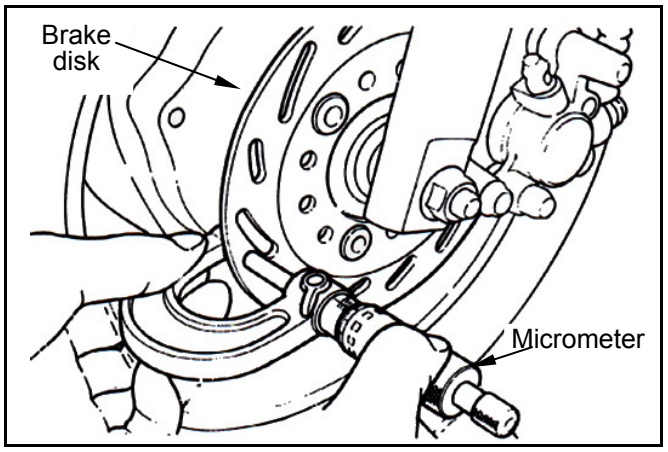
Install pad support.
Install new brake pads.
Install guide bolts.
Install brake caliper, tighten caliper bolts.
Torque value: 1.5~2.0kgf-m



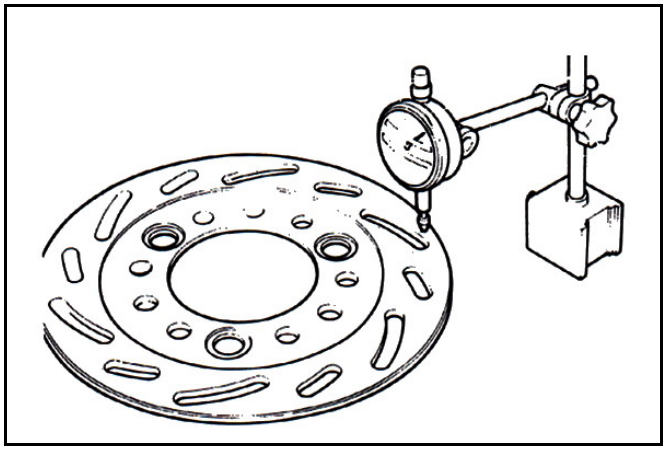
Brake disk

Inspection

Visually check if the brake disk worn or damaged.
Measure the thickness of the disk at several places. Replace the disk if it has exceeded the service limit.



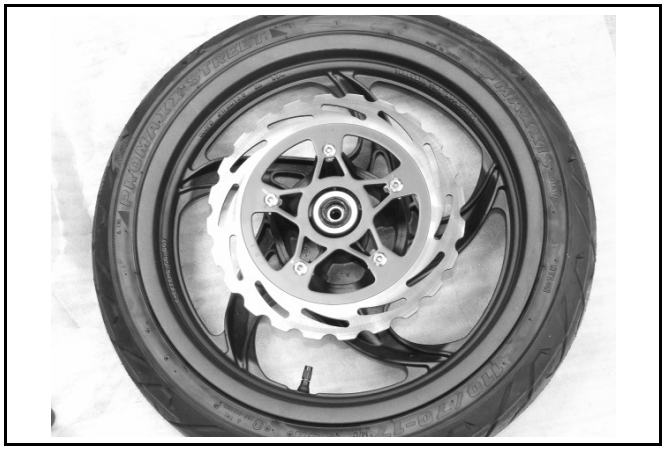
Remove the brake disk from wheel.
Check if the disk for deformed or bent.



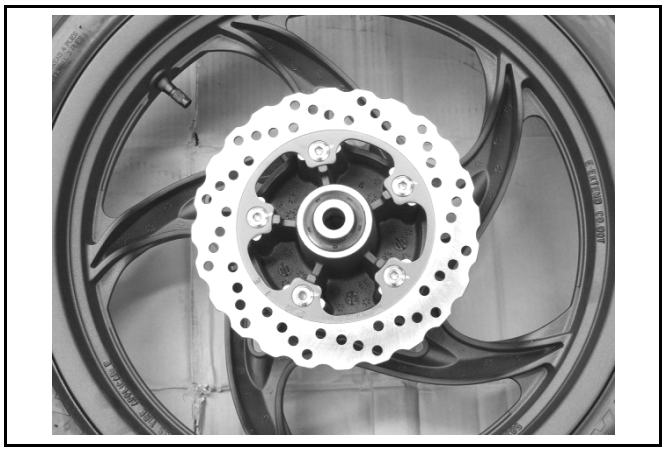
⚠Caution

- 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.

Front brake disk service limit: 4.5 mm



Rear brake disk service limit: 3.0 mm



Brake master cylinder

Removal

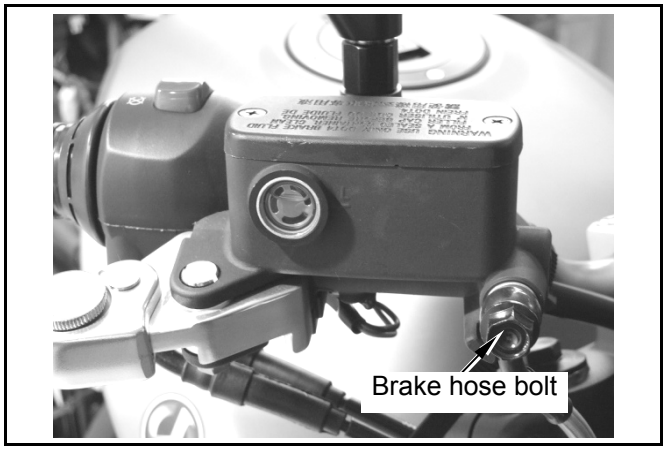
⚠Caution

- Do not let foreign materials entering the cylinder.

Remove back mirror.
Disconnect brake light coupler.
Drain brake fluid.
Remove the brake lever from brake master cylinder.
Remove brake hose.

Remove brake master cylinder from handlebar. (bolt×2)。

Clean the master cylinder with recommended brake fluid.



Installation

Install brake master cylinder on handle bar, tighten bolts. (bolt×2)。

Torque value: 0.8~1.2kgf-m

Install brake lever, connect brake light coupler.

Apply 2 new seal washers, install brake hose. Tighten the brake hose bolt to the specified torque value.

Torque value: 3.0~4.0kgf-m

Make sure the hose is installed correctly.

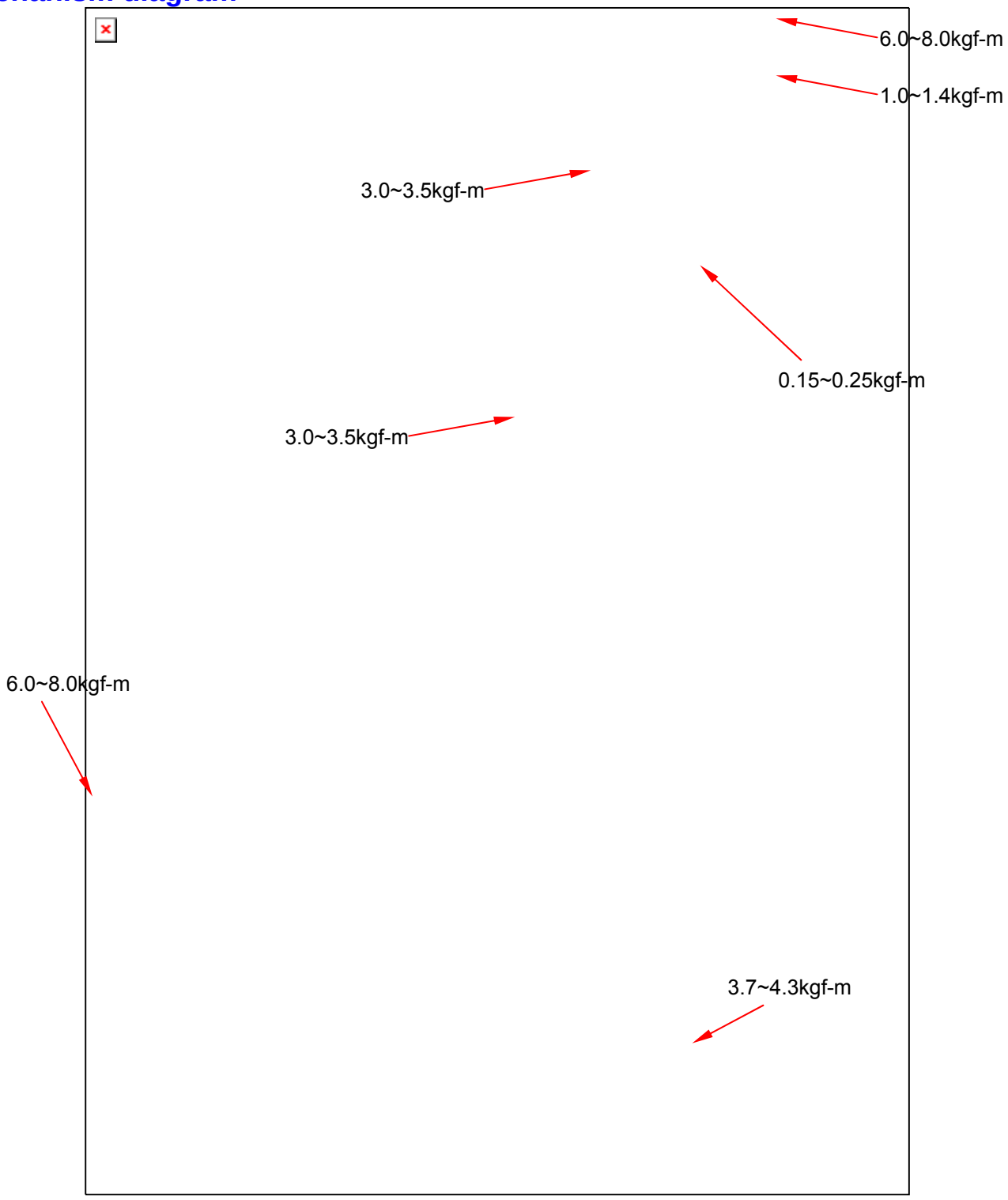
⚠Caution

- Improper routing may damage the hose and wire.
- Twisted brake hose and wire may reduce brake performance.

Add specified brake fluid and bleed the system.

Mechanism Diagram ····· 12-1	Front Wheel ····· 12-6
Precautions in Operation····· 12-2	Front Fork ····· 12-9
Troubleshooting····· 12-3	Steering Stem ····· 12-12
Steering Handlebar····· 12-4	

Mechanism diagram



Precautions in operation

General information

- While removing the front wheel, hold the engine bottom with a hanger to lift the front wheel.
- During maintaining, do not stain brake pads with any oil or grease.
- 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 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.

⚠ 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 **measurement : 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	Front brake hose bolt	3.0~4.0kgf-m
Steering handlebar bolt	1.0~1.4kgf-m	Air bleed valve	0.8~1.0kgf-m
Steering head thread comp	0.15~0.25kgf-m	Brake disk fix bolt	3.7~4.3kgf-m
Steering stem locknut	6.0~8.0kgf-m	Front brake caliper bolt	3.5~4.5kgf-m
Front fork bolt	3.0~3.5kgf-m		

Special tool

Cone race puller

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-5320010

Troubleshooting

Steering mechanism / front fork

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
- wheel axle locknut loosened
- Worn tire
- Worn or damaged front wheel bearing

Soft suspension
- Worn fork spring
- Fork seal leakage

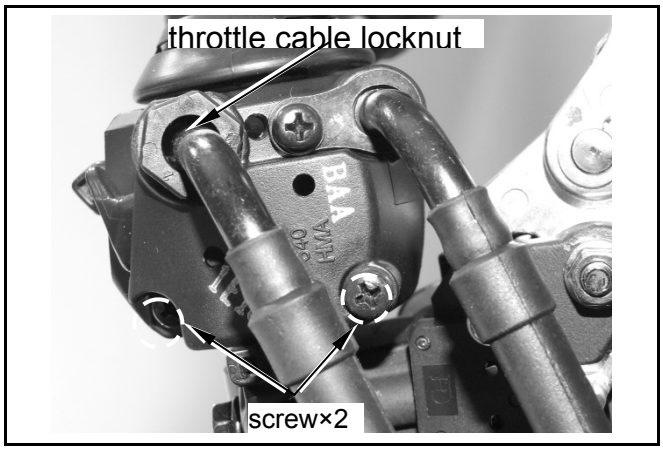
Hard suspension
- Bent fork pipes
- Excessive fork fluid

Front suspension noise
- Bent fork pipes
- Insufficient fork fluid
- Loosened suspension

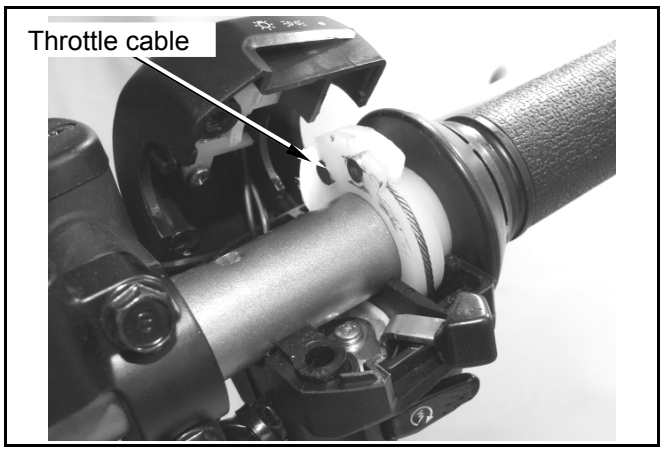
Steering handlebar

Removal

Loosen the throttle cable locknut. Remove the right handle switch screws. (screw×2)。

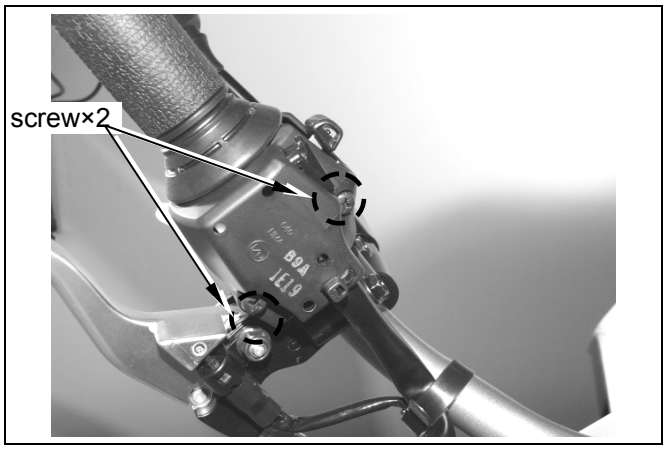


Remove the throttle cable. Remove the throttle grip and right handle switch.

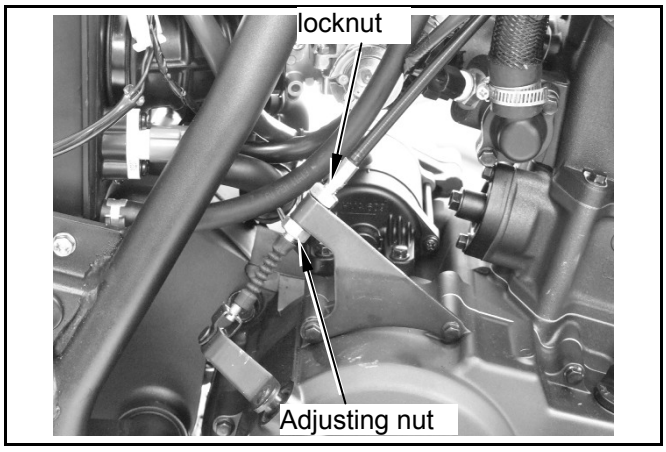


Remove the front brake master cylinder. (bolt x2)

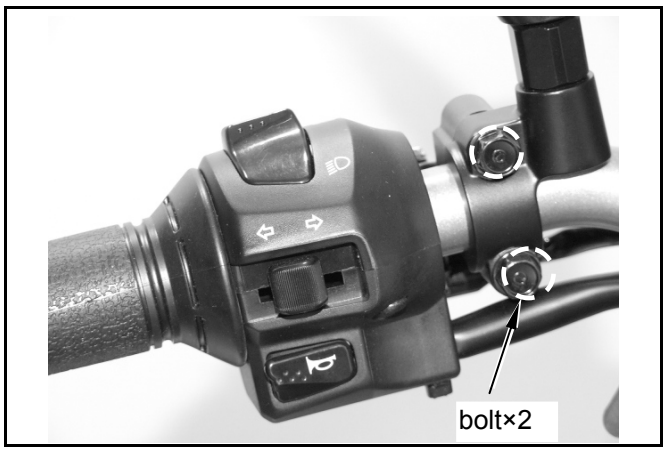
Remove the left handle switch. (screw x2)



Loosen the clutch cable locknut and adjusting nut.



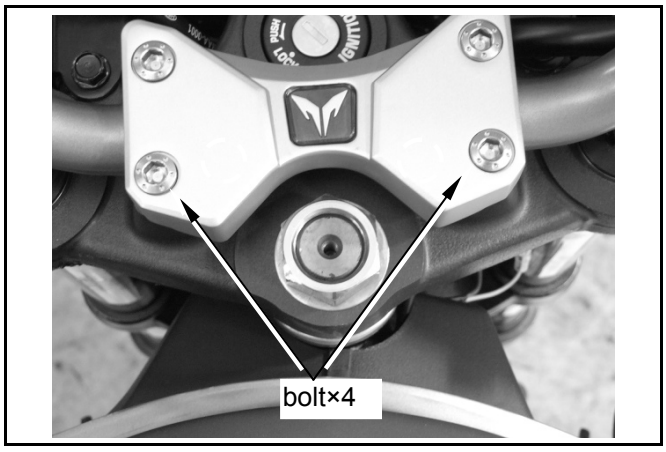
Remove the clutch lever pivot bolt. Remove the clutch lever and clutch cable.
Remove the clutch lever socket. (bolt×2)
Remove the handlebar bolts and holders. (bolt x4) Remove the handlebar.



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

Lubricate switches, throttle grip, and throttle cable when installing.
Align the salient on the switch and the intaglio on the handlebar holder.
After the handlebar is installed, confirm and adjust :

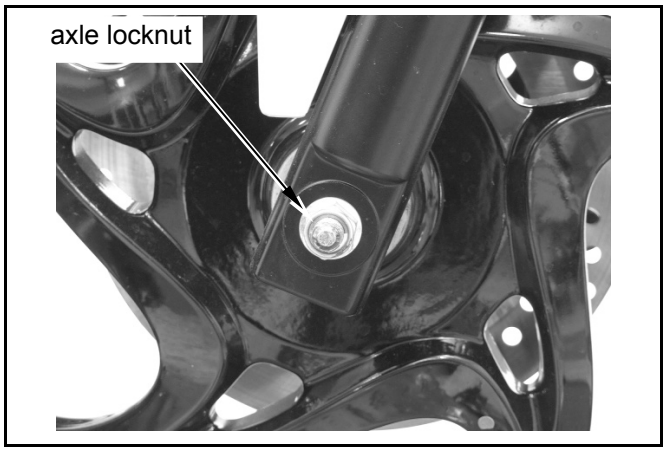
- throttle grip operation and free play
- meter, electrical parts operation



Front wheel

Removal

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



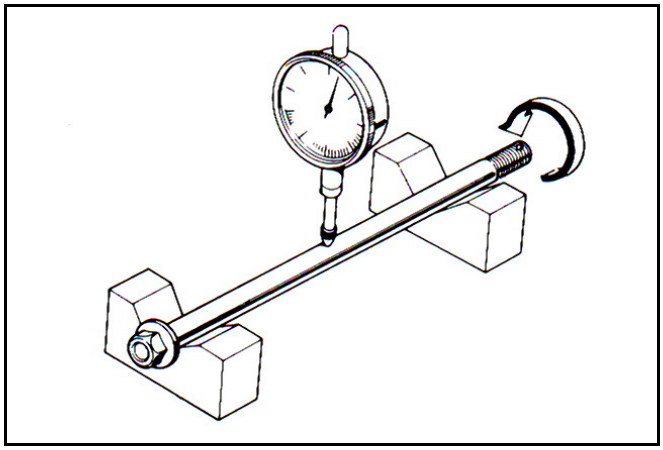
⚠ Caution

- 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

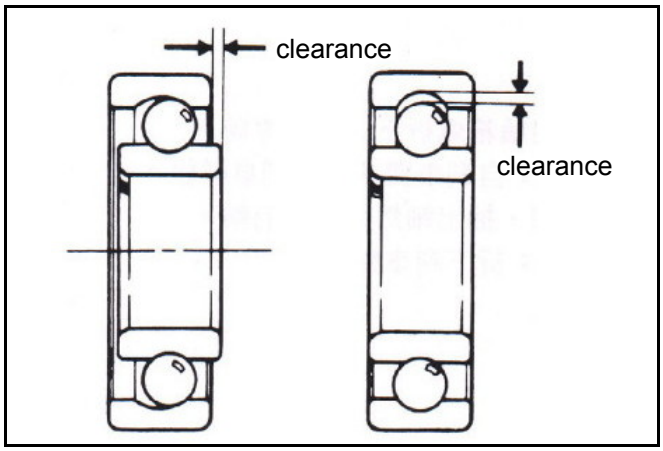


Bearing

Rotate the bearings to check if the bearings rotate smoothly and silently.
Check if the outer ring of the bearing fixes firmly on the wheel hub.
Replace the bearing if there is excessive noise, roughness, or looseness.

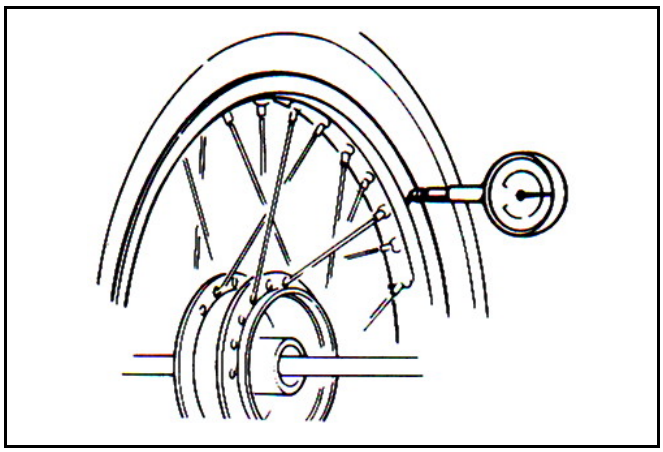
⚠ **Caution**

- The bearings should be replaced in pair.



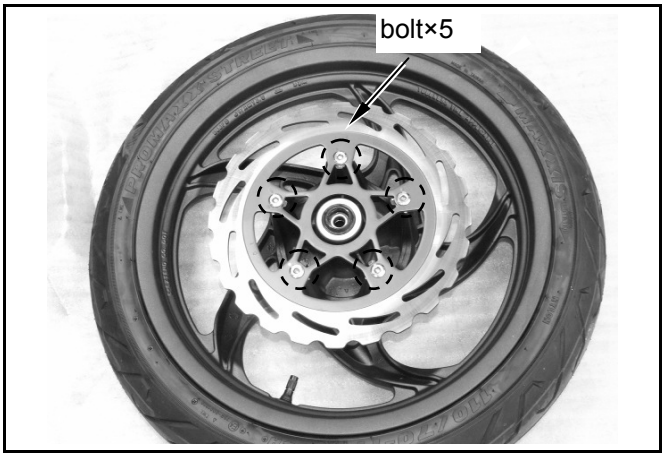
Wheel rim

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

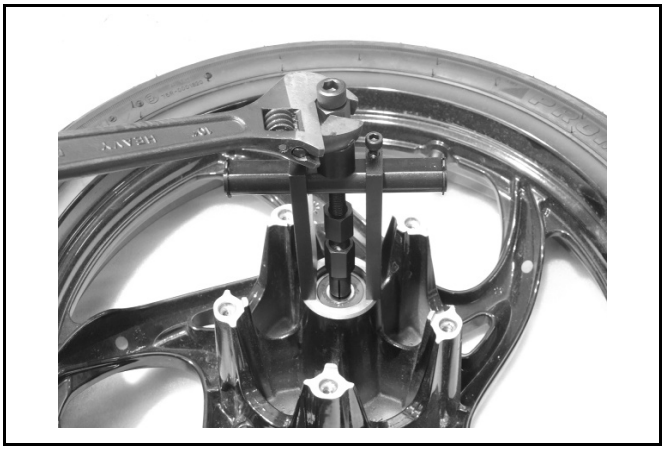


Disassembly

Remove the brake disk. (bolt×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

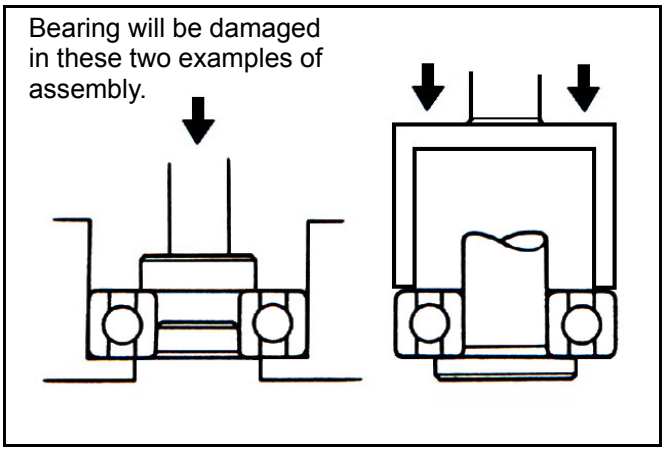


Assembly

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

- Do not use a used bearing; replace the bearings in pair when removed from wheel hub.
- The bearing cannot lean to one side during installation.

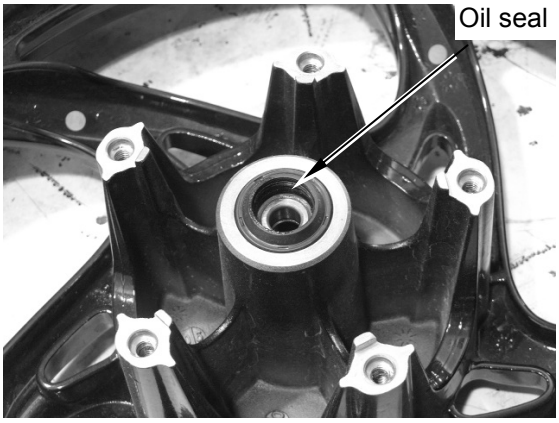


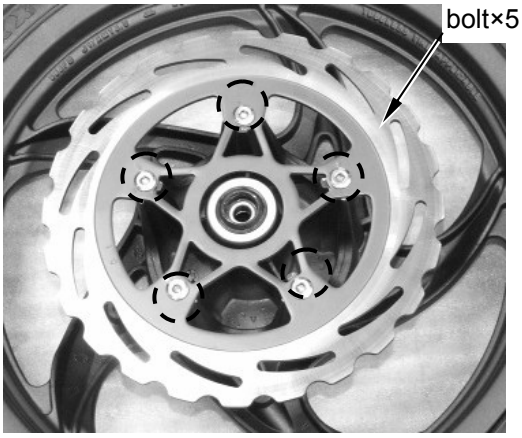
Tool：

Bearing driver

Installation

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





Install brake disk. (bolt×5)。

Torque value: 1.4~1.6kgf-m

Install side collar.

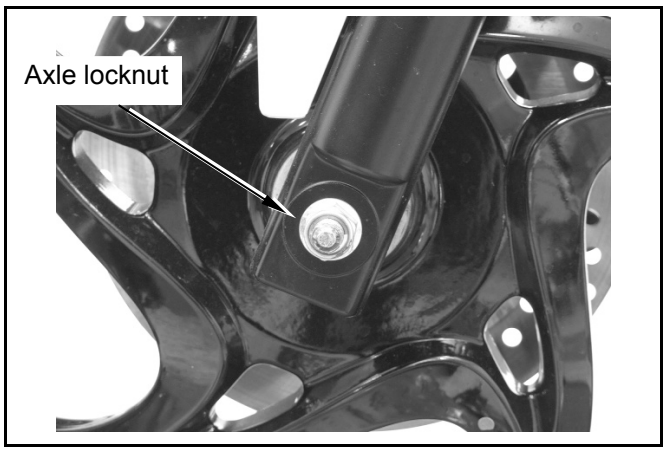
⚠ Caution

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

Install the front wheel axle from the right cushion.

Install the axle locknut and tighten the locknut to the specified torque.

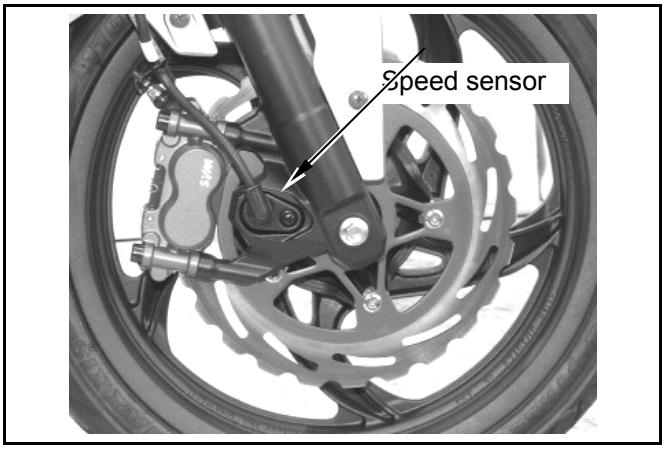
Torque value: 6.0~8.0kgf-m



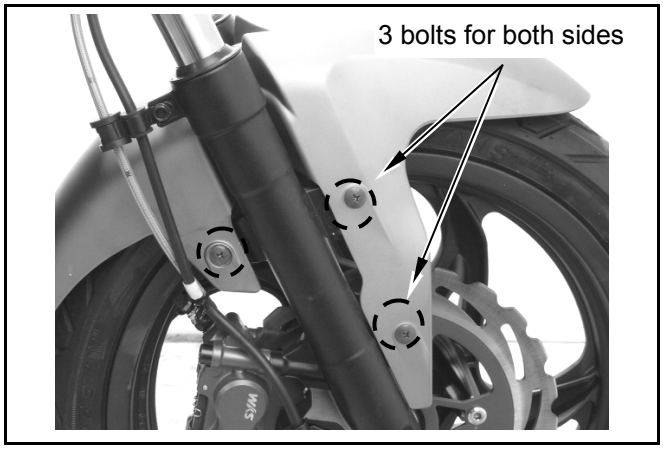
Front fork

Disassembly

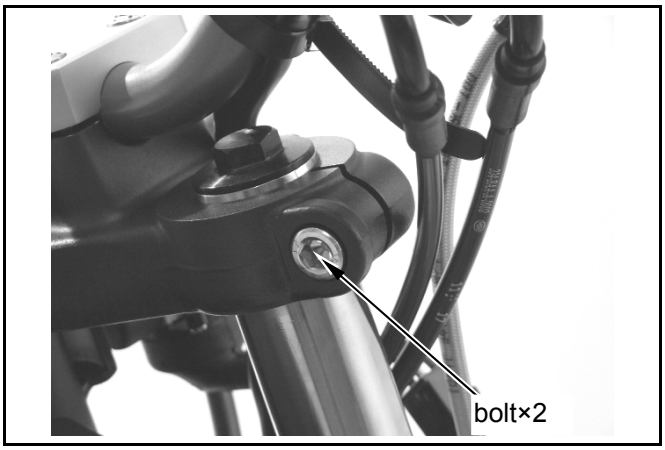
Remove the front wheel, speed sensor and front brake caliper.



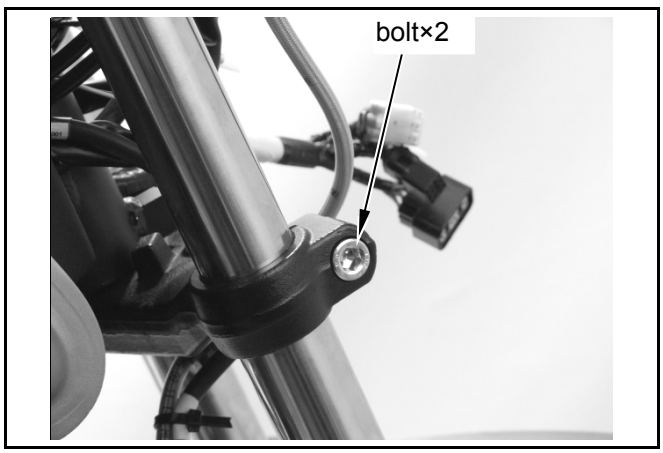
Remove the front fender. (bolt×6)。



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

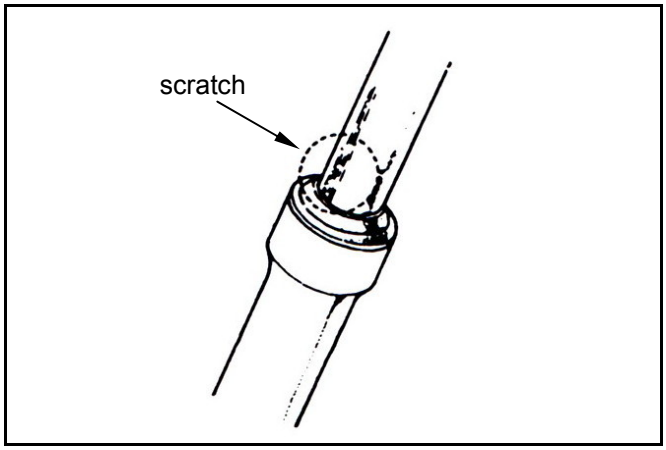


Loosen the front fork bolt on the steering stem. (bolt×2) Remove the front fork.



Front fork inspection / oil seal replacement

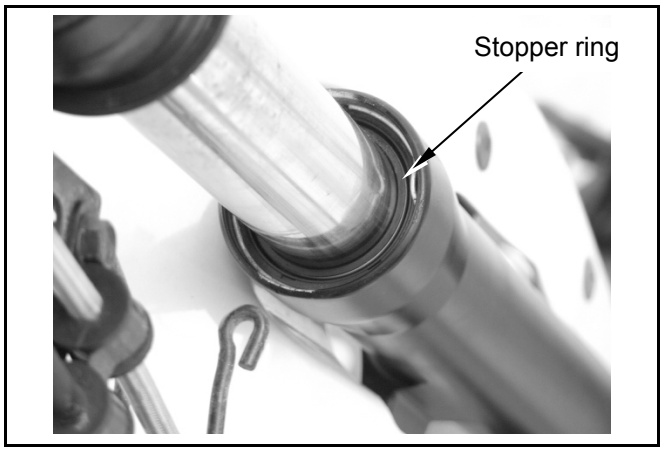
Push the fork pipe for several times to check if there is any oil leakage or excessive noise.
Check if there is any scratch on the fork pipe if oil leakage happens.
Replace the front fork if there is a scratch on the fork pipe.



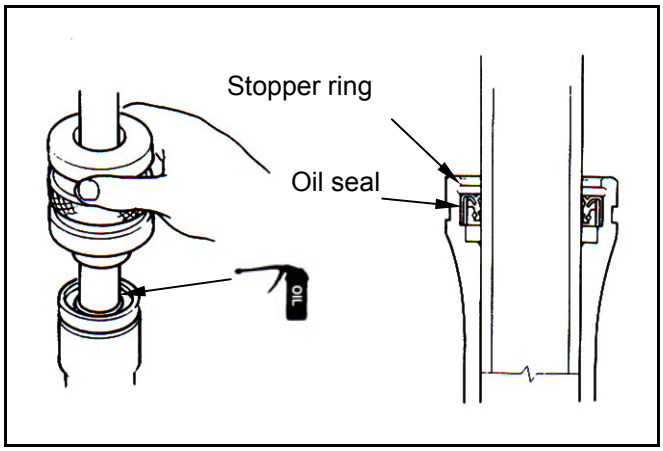
If there is oil leakage but without scratch on the fork pipe, replace the oil seal.
Pour out the fork fluid.
Remove the oil seal stopper ring and then remove the old oil seal.

⚠ Caution

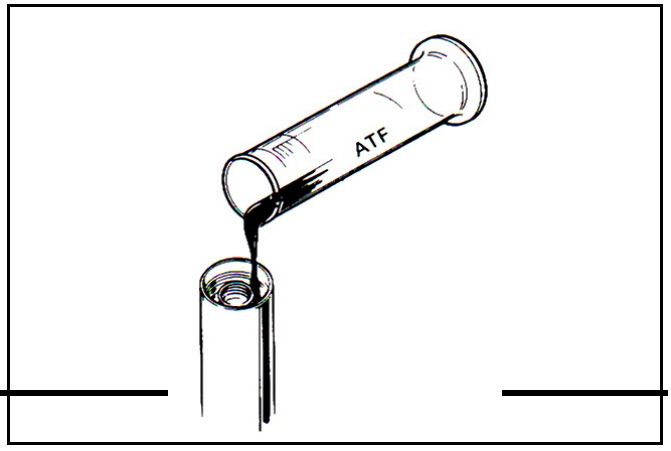
- Do not damage the fork pipe when removing the oil seal.



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.

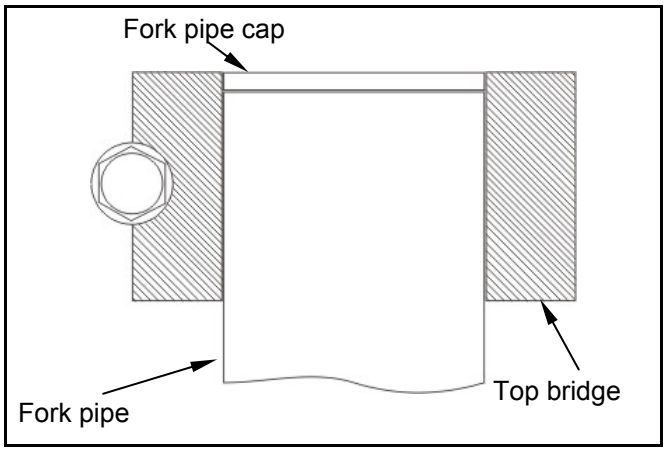


Installation

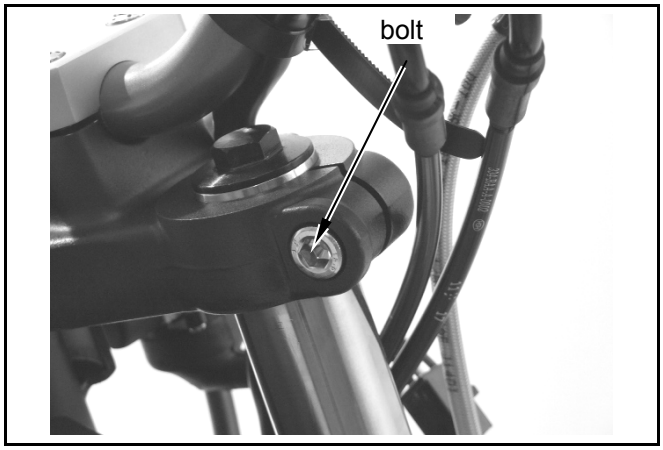
⚠ Caution

- The installing will be easier by rotating the fork pipe.

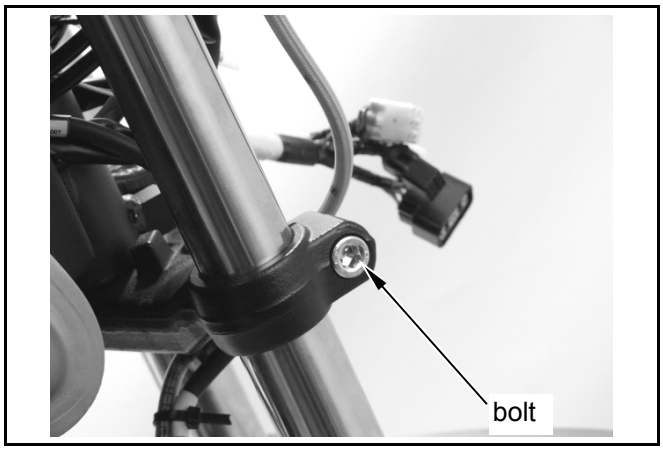
Install the fork pipe from the bottom of the front fork. Align the fork pipe cap with the top bridge.



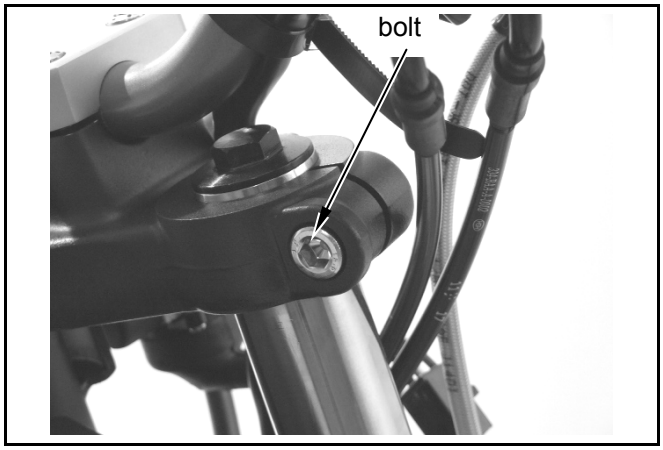
Hold the fork pipe by hand and tighten the front fork upper bolt. (bolt×2)。



Tighten the fork bolt on the steering stem. (bolt×2)
Torque value: 3.0~3.5kgf-m



Tighten the front fork upper bolt. (bolt×2)
Torque value: 3.0~3.5kgf-m

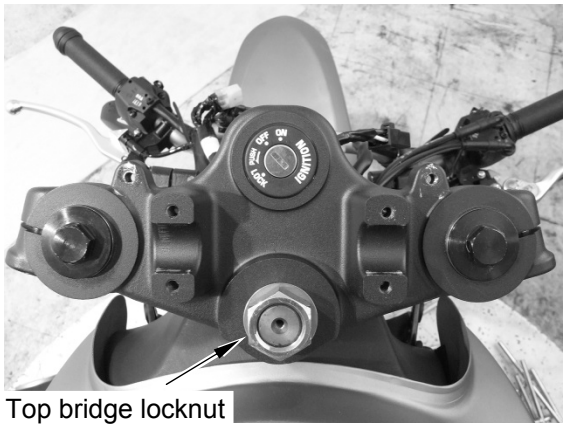


Steering stem

Removal

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

Remove top bridge locknut. (nut×1)



Remove the steering stem locknut and steering upper cone race by using stem locknut socket wrench.

Special tool:

Stem locknut socket wrench SYM-5320000

Remove the steering stem.

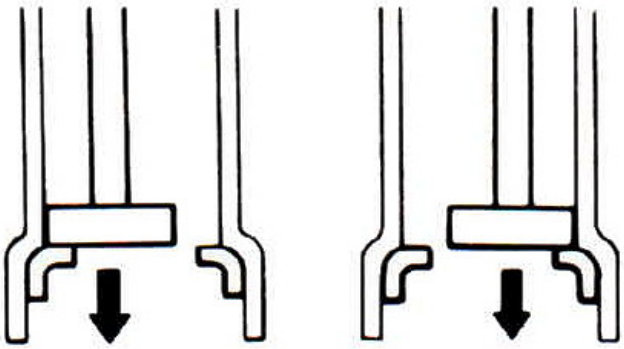
Caution

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

Remove the steering upper ball race by rubber hammer.

Remove the steering bottom ball race by driver.

Remove the steering bottom cone race from the steering stem.



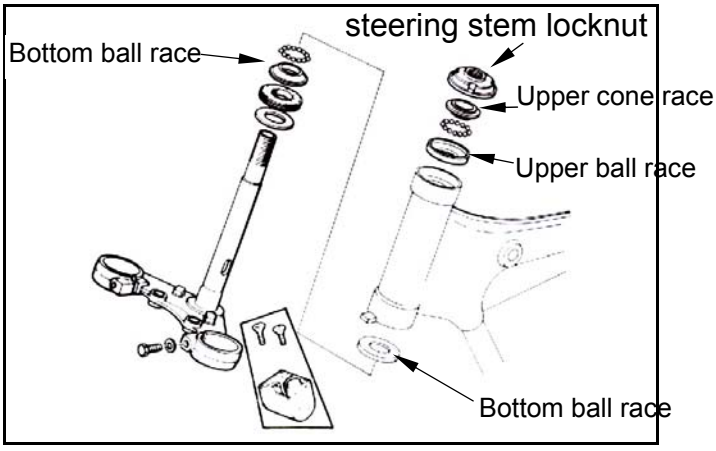
Caution

- Do not damage 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.



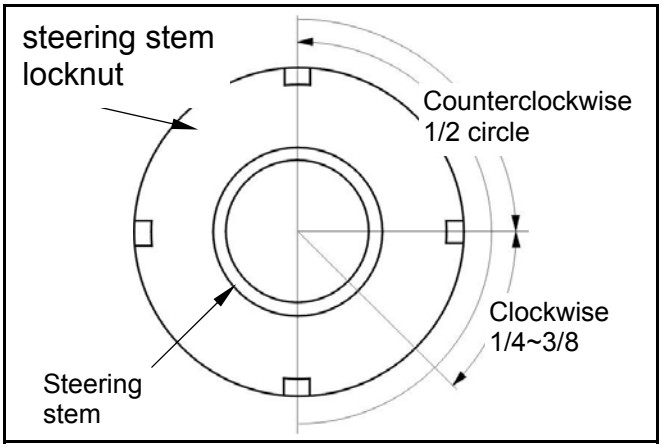
Caution

- 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)

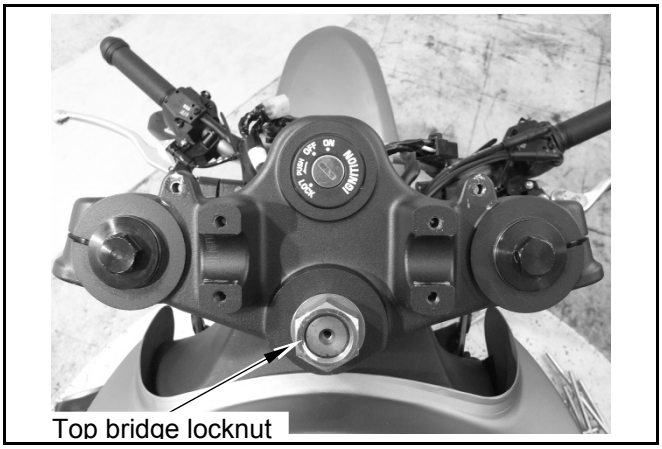
Special tool:
Stem locknut socket wrench SYM-5320000
Top bridge locknut socket SYM-5320010
Torque value: 0.15~0.25kgf-m



⚠ Caution

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

Install the top bridge and tighten the nut.
Torque value: 6.0~8.0kgf-m



⚠ Caution

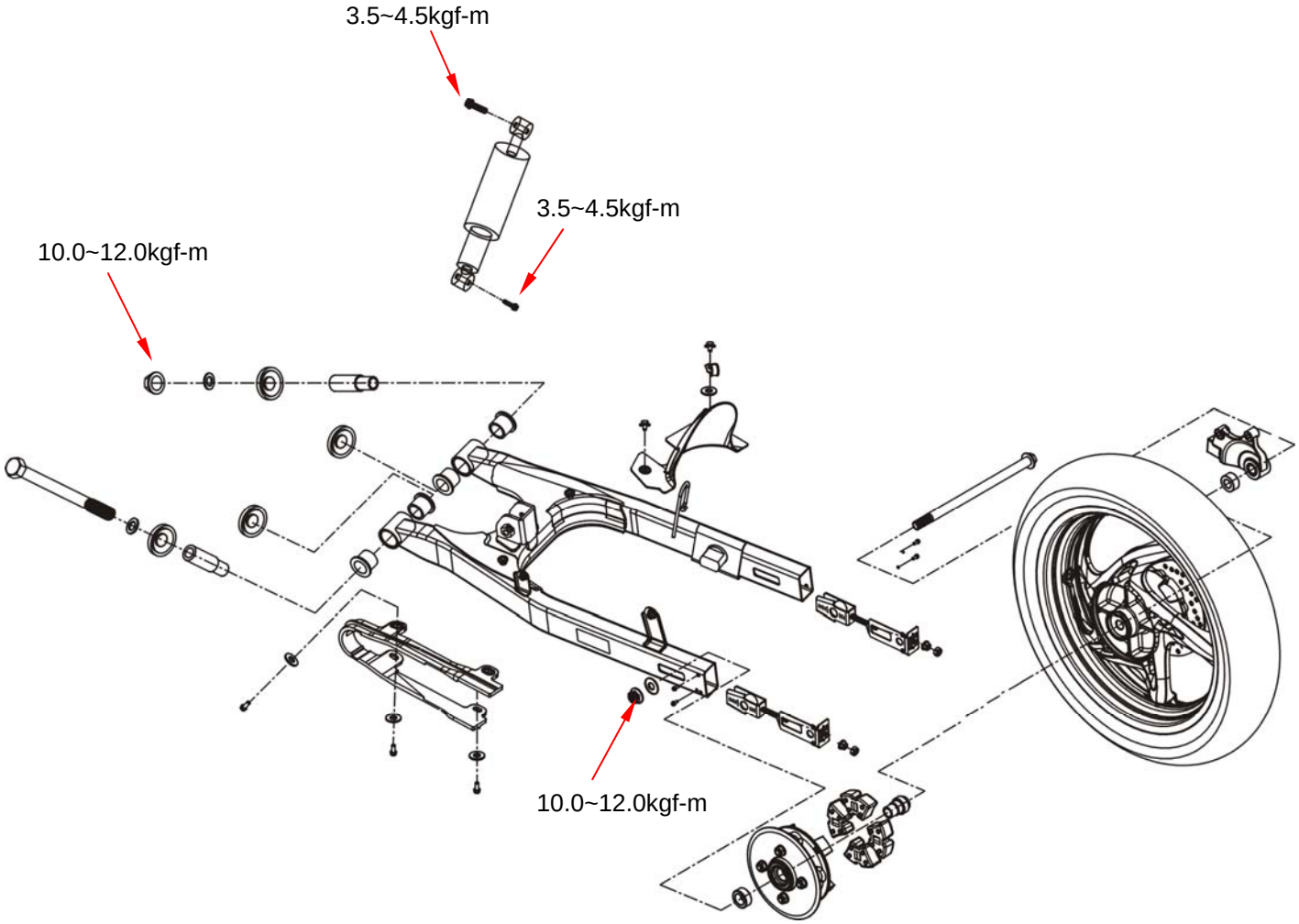
- After installation, check if the steering stem rotate freely without vertical clearance.

Install other parts in the reverse order of removal.

NOTE:

Mechanism Diagram ····· 13-1	Drive Chain / Sprocket / Flange · 13-6
Precautions in Operation····· 13-2	Rear Cushion ····· 13-9
Troubleshooting····· 13-2	Swingarm ····· 13-10
Rear Wheel ····· 13-3	

Mechanism diagram



Precautions in operation

General information

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

Specification **measurement: mm**

Item		Standard	Service limit
Axle runout		–	0.2
Wheel rim runout	Radial	–	2.0
	Axial	–	2.0
Drive chain slack		–	10~20

Torque value

Rear drive sprocket bolt	2.7~3.0kgf-m
Rear wheel axle nut	10.0~12.0kgf-m
Rear cushion upper bolt	3.5~4.5kgf-m
Rear cushion lower bolt	3.5~4.5kgf-m

Special tool

Inner bearing puller	SYM-6204020
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
- Faulty rear cushion

Too hard suspension

- Damaged rubber bush
- Bent rear cushion

Rear suspension noise

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

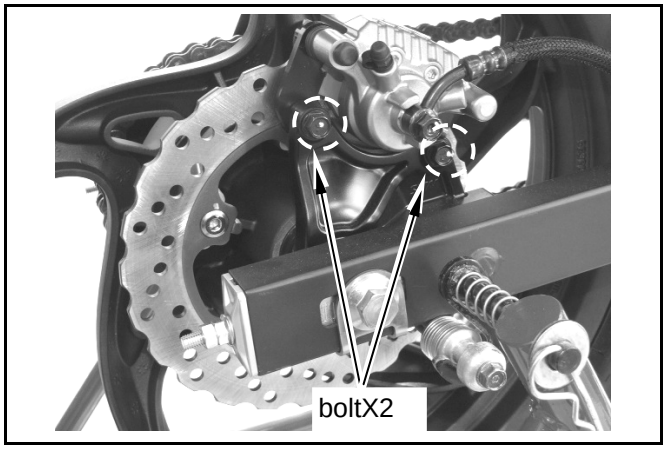
Poor brake efficiency

- Poor brake adjustment
- contaminated brake pad
- Worn brake pad

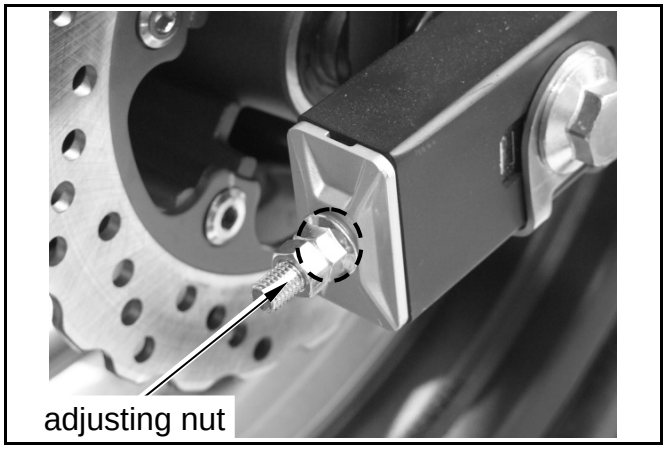
Rear wheel

Removal

Remove the rear brake caliper. (boltX2)

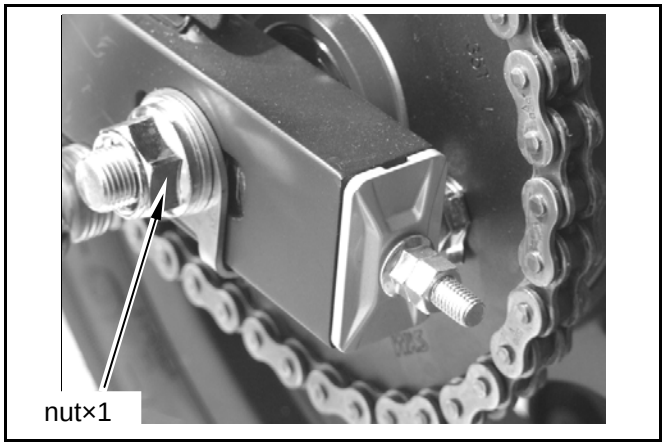


Loosen the drive chain adjusting nuts on both sides.



Remove the rear axle locknut.

After removing rear axle, remove the rear wheel, right / left side collar, chain adjuster, and brake disk.

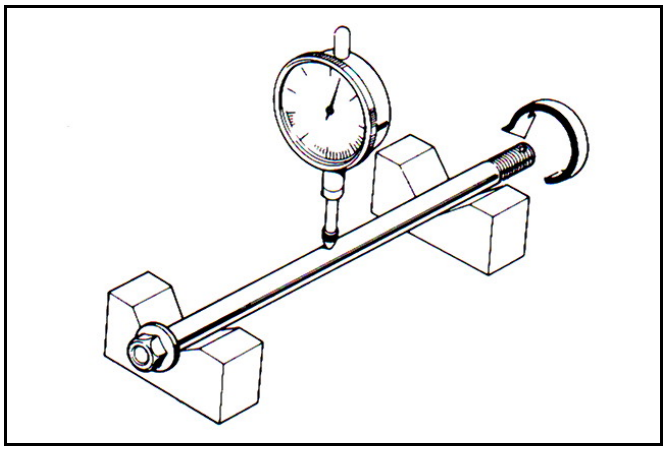


Inspection

Wheel axle

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

Service limit: 0.2 mm

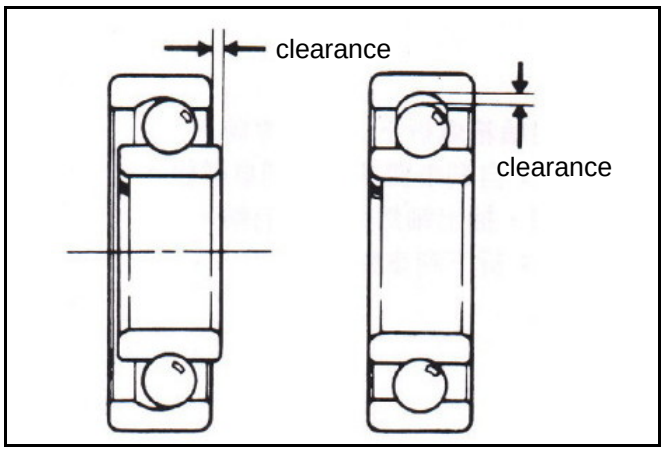


Bearing

Rotate the bearings to check if the bearings rotate smoothly and silently.

Check if the outer ring of the bearing fixes firmly on the wheel hub.

Replace the bearing if there is excessive noise, roughness, or looseness.



Caution

- The bearings should be replaced in pair.

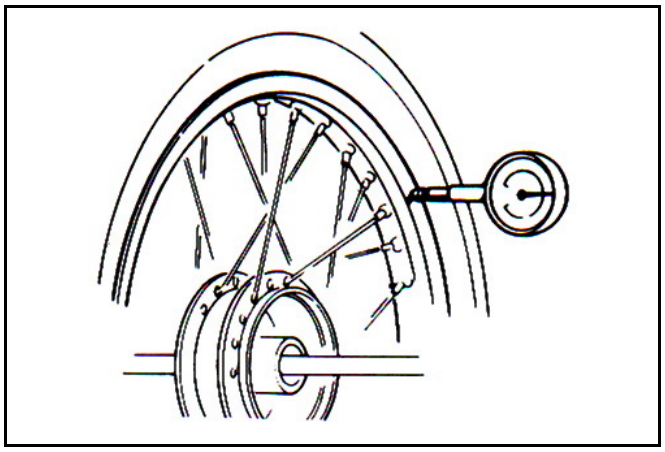
Wheel rim

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

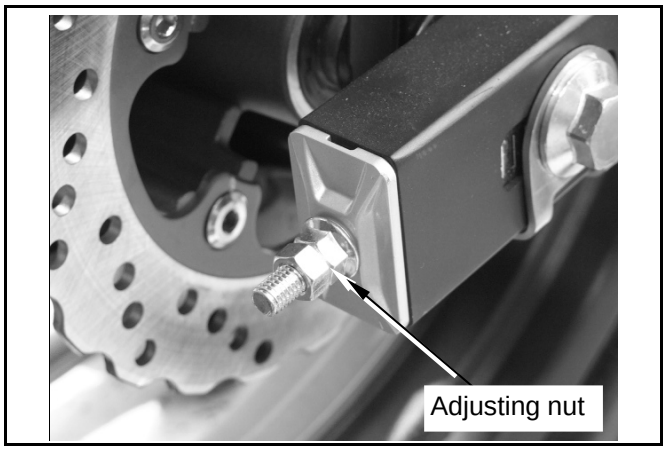


Rear wheel installation

Install in the reverse order of removal.

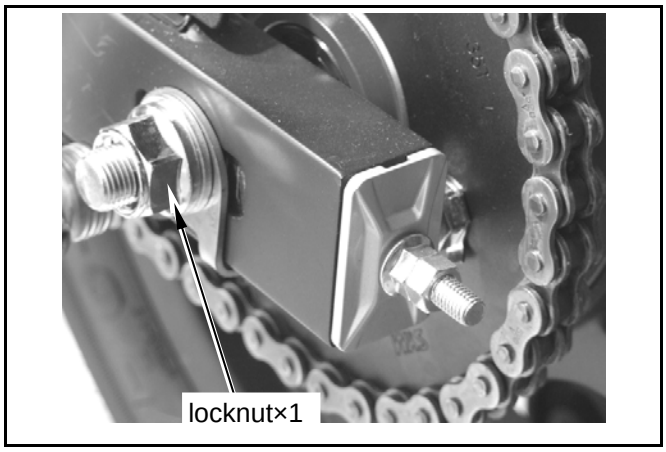
Adjust drive chain slack. (refer to ch 2)

Tighten rear wheel washer nut.

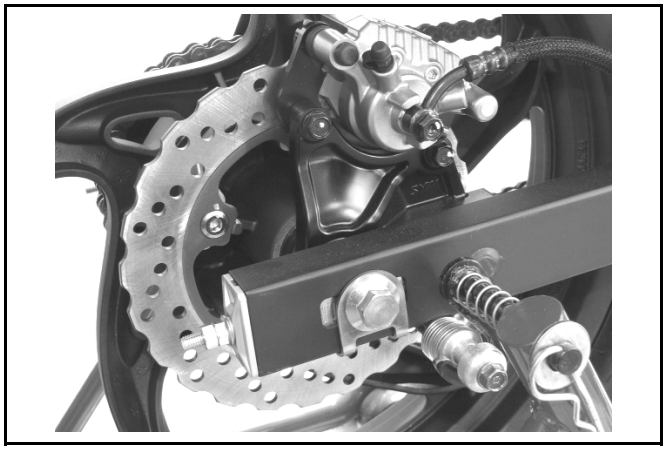


Tighten axle locknut. (nut×1、PIN×1)

Torque value: 10.0~12.0kgf-m



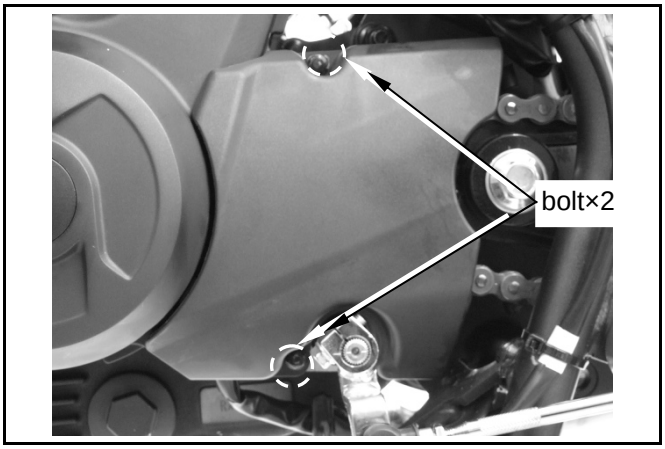
Install the caliper.



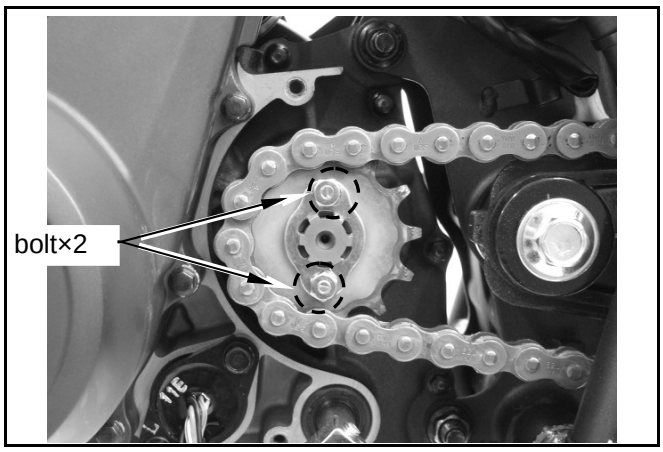
Drive chain / sprocket / flange

Drive chain / sprocket removal

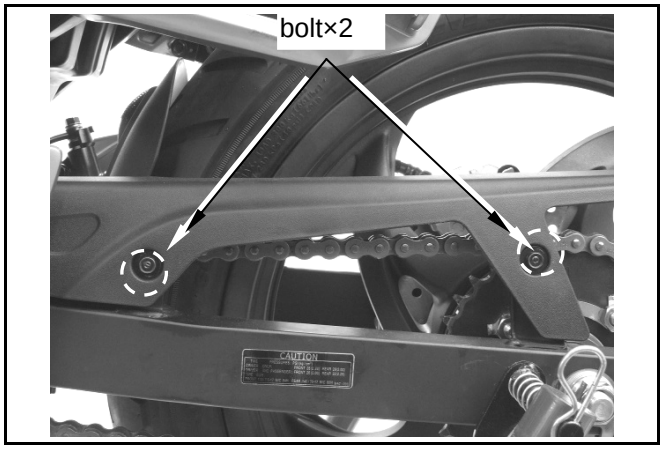
Remove the left crankcase rear cover. (bolt×2)



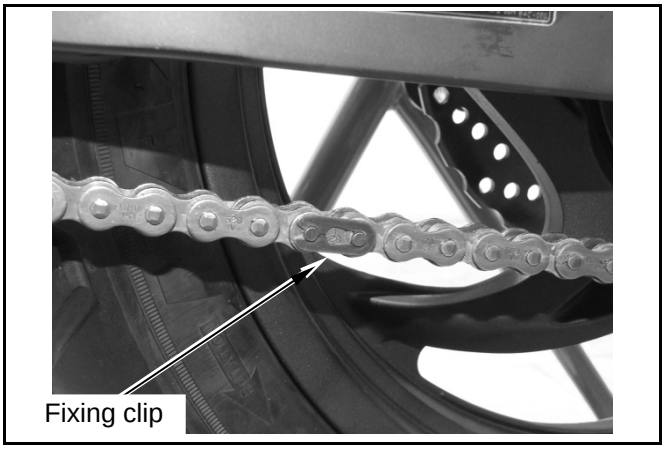
Remove the drive sprocket bolts (bolt×2), sprocket fixing plate, and drive sprocket.



Remove the drive chain cover. (boltX2)。



Remove the drive chain fixing clip and drive chain.



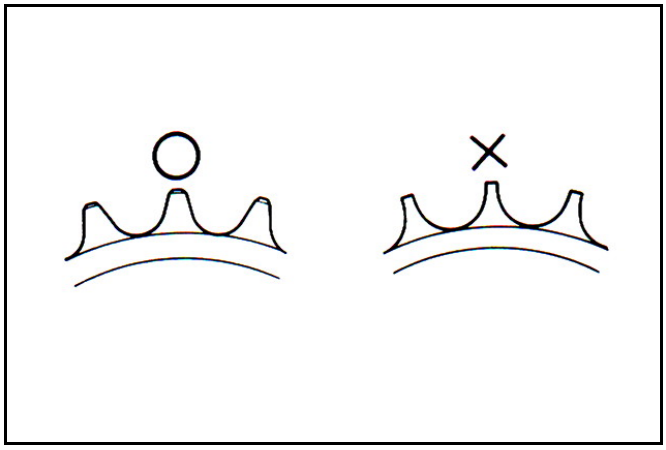
Drive chain / sprocket inspection

Sprocket

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

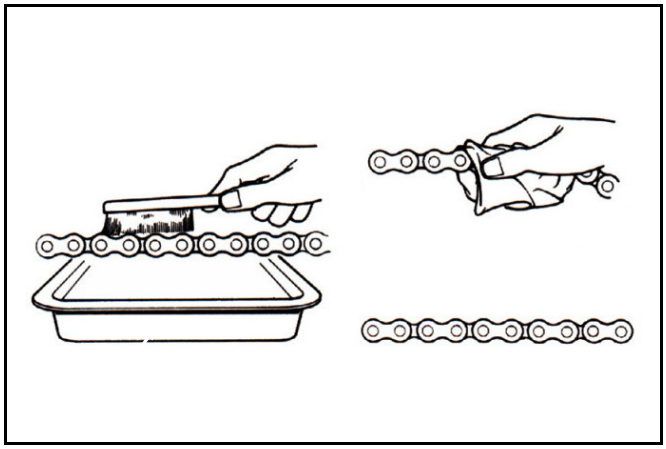
Caution

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



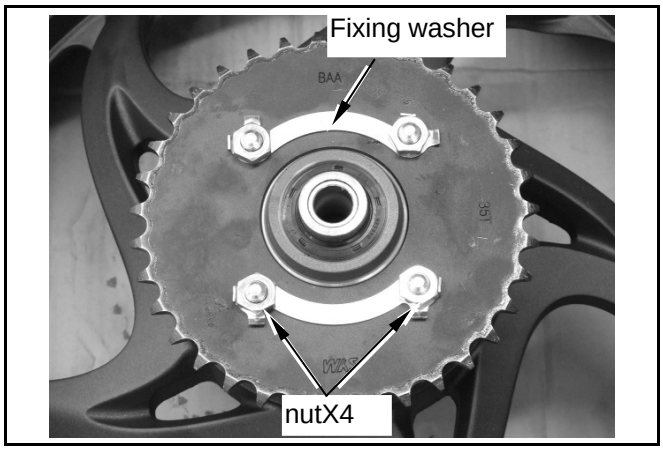
Drive chain

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

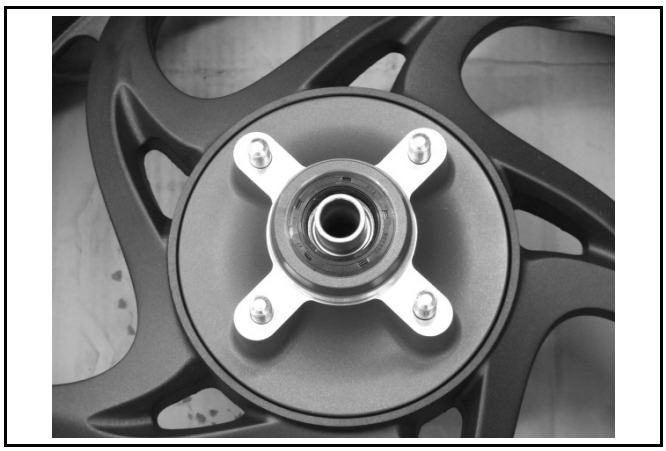


Sprocket / flange removal

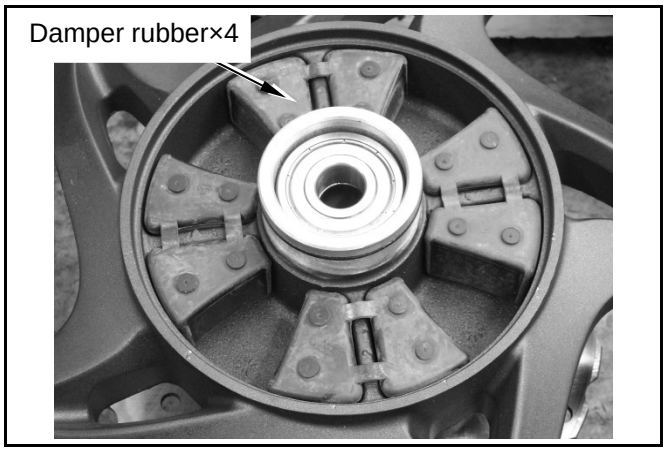
Remove rear wheel / drive chain.
Flat the sprocket bolt fixing washer.
Remove sprocket nuts and fixing washer.
Remove the sprocket.



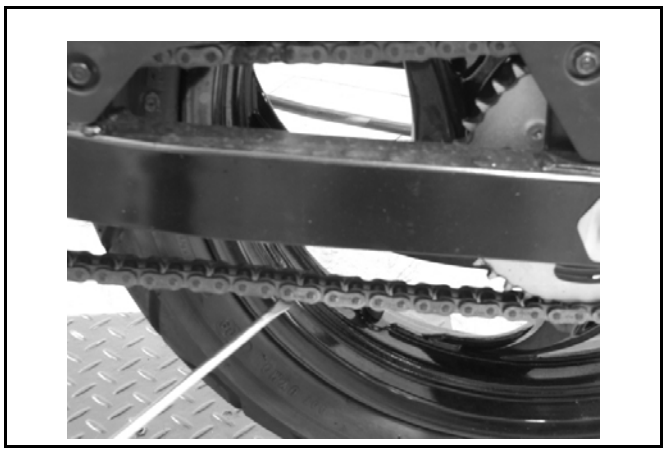
Remove the flange.



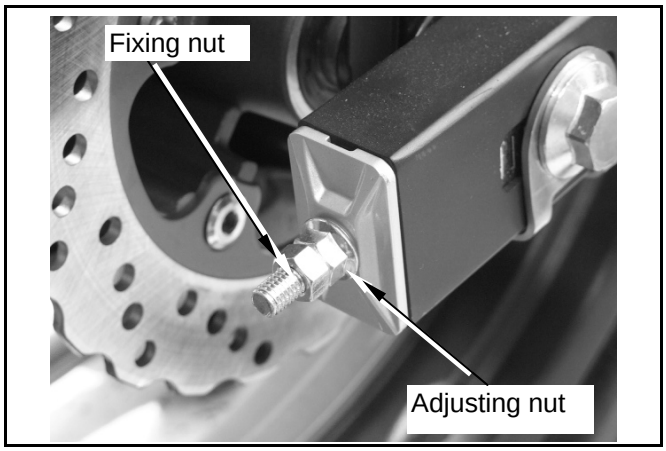
Damper rubber inspection
Check if the damper rubbers worn or damaged, replace if necessary.



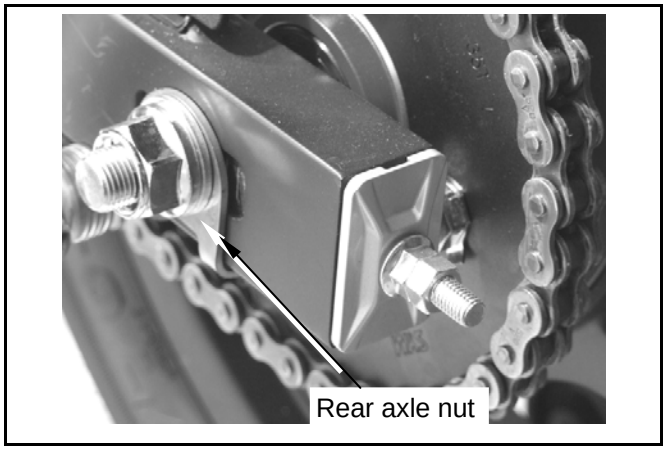
Drive chain adjustment
Turn the left and the right side adjusting nut evenly to make the chain slack within the standard range.



Turn the nuts clockwise to tighten the chain, or counterclockwise to loosen the chain.
Chain slack: 10~20mm



Tighten axle nut.
Torque value: 10.0~12.0kgf-m
After tightening the rear axle nut, please check the adjusting nuts to prevent them from loosening.
Recheck the chain slack, and make sure the rear wheel rotates smoothly.
Lubricate the chain with chain lubricant.

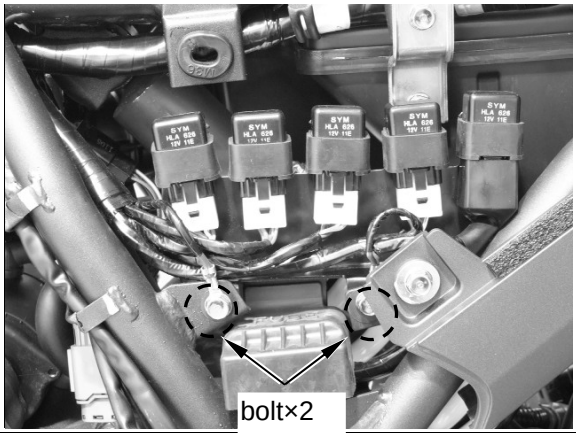


Rear cushion

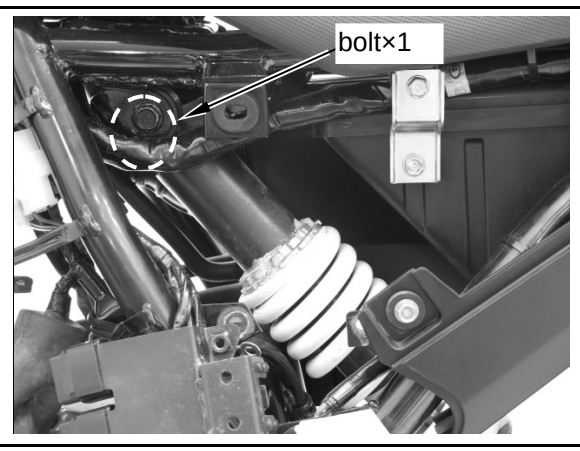
Removal

Remove the left body cover.

Remove the fuse / relay bracket. (bolt x2)

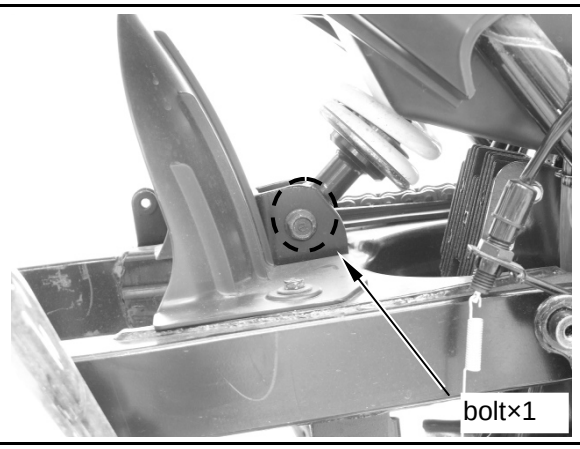


Remove the rear cushion upper bolt. (bolt×1)。



Remove the rear cushion lower bolt.

Remove the rear cushion.



Installation

Install in the reverse order of removal.

Torque value: cushion locknut 3.5~4.5kgf-m

Caution

- The rear cushion should be replaced as a complete set. Do not disassemble it, or the structure and rubber bush will be damaged.

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

Special tool:

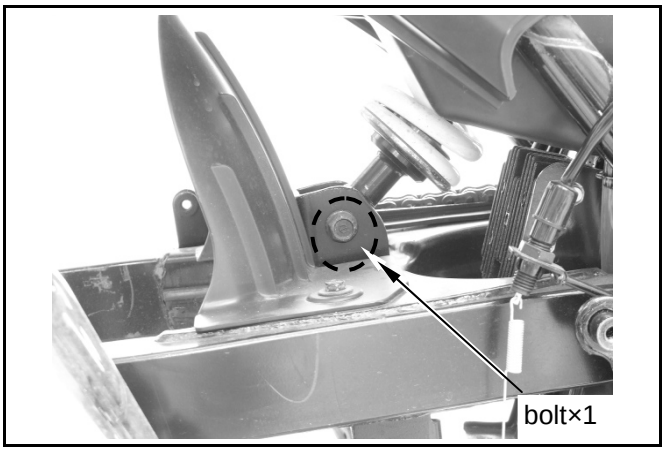
Steering stem locknut socket wrench

SYM-5320000

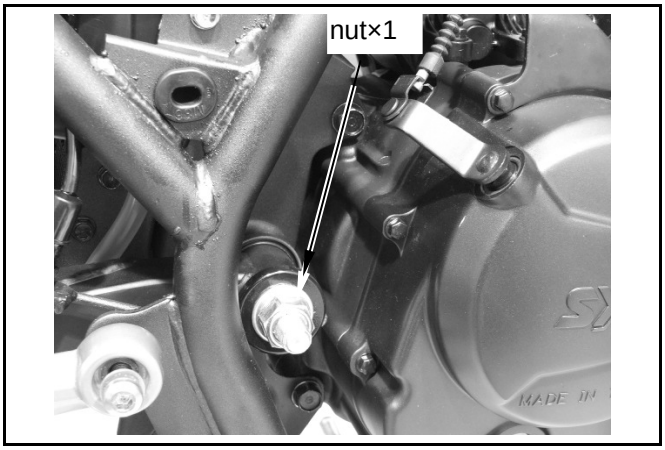
Swingarm

Removal

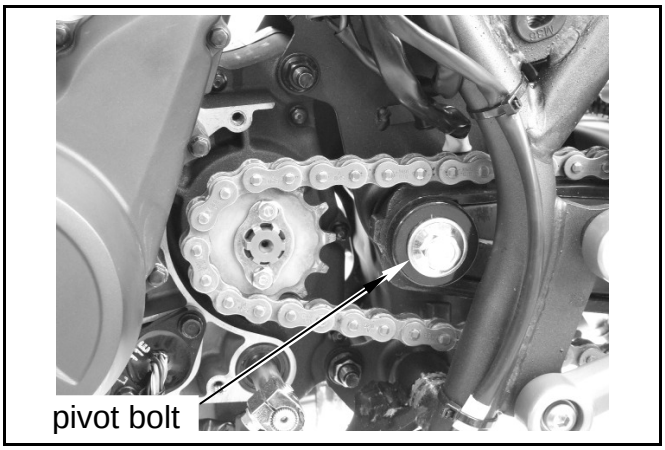
Remove rear wheel, drive chain, sprocket, and rear cushion lower bolt.



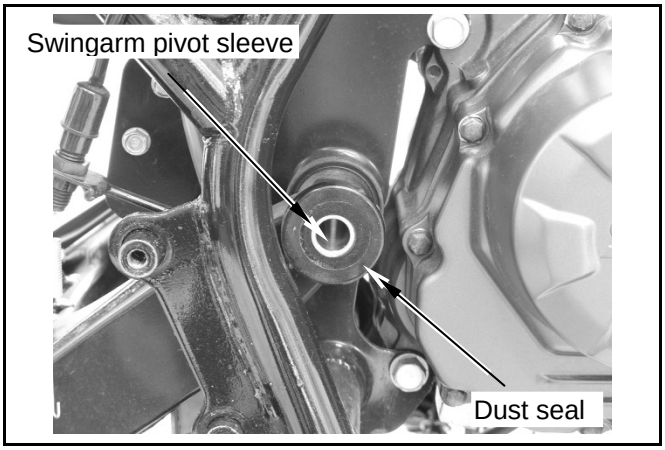
Remove the swingarm pivot locknut. (nut×1)。



Pull out the swingarm pivot bolt.



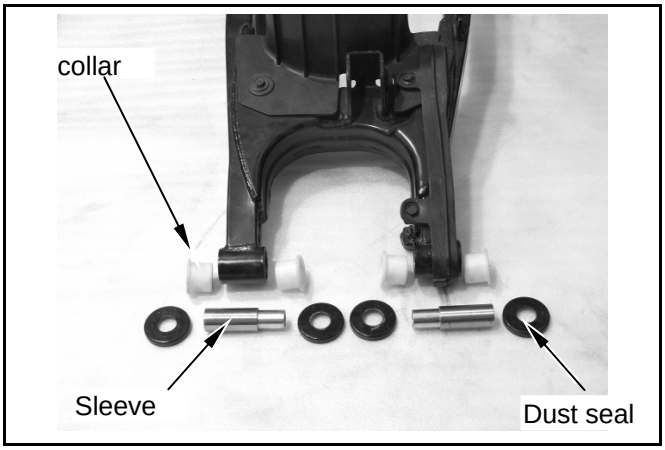
Remove the swingarm pivot sleeve and dust seal.
Remove the swingarm.



Inspection

Check if the swingarm worn or damaged.

Check if swingarm collars, sleeves and dust seals cracked or worn.



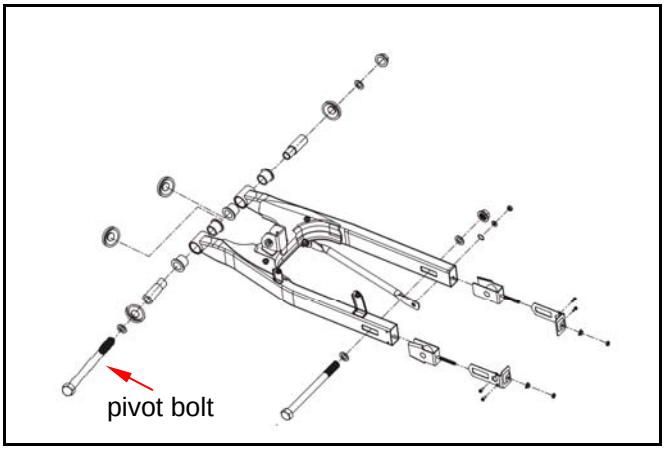
Installation

Install in the reverse order of removal.

Torque value: swingarm pivot locknut 10.0~12.0kgf-m

Caution

- The rear cushion should be replaced as a complete set. Do not disassemble it, or the structure and rubber bush will be damaged.



NOTE:

Precautions in operation

Charging system

- When removing battery, first disconnect the negative cable terminal, then the positive cable terminal.
- The maintenance free battery requires no inspection of electrolyte level and refilling of distilled water.
- When charging, the battery has to be removed from the vehicle, but do not remove the sealing cap.
- Do not apply rapid recharge, unless it is an urgent situation.
- Use a digital voltmeter to check the charging voltage.
- The battery can repeatedly discharge and be recharged. After discharging, if the battery is not in use for a long time, deterioration, lowered efficiency, or shortened service life may occur to the battery. The battery efficiency will be lowered after 1~2 years in usual case. After recharging, the voltage of battery can be restored; If it connects to an additional load, the voltage will plunge then rise,
- Normal overcharging conditions can be observed from battery appearance. If battery inner circuit shorted, voltage cannot be measured at the battery terminals. If voltage regulator does not operate, the voltage will be too high and that may reduce battery's life.
- When not in use for a long time, the battery will self-discharge and the capacity decrease. Please recharge the battery around 2 months.
- After filling electrolyte, a new battery will generate a voltage of 12.5V or more after 10 minutes. If the voltage is still low, keep charging the battery. After fully charging a new battery, the service life of it will be prolonged.
- Please check electrical device according to the procedure of diagnosis chart.
- Do not disconnect and connect the connector of electrical devices when current is passing these devices because this will generate high voltage and the electrical components in the voltage-current regulator will be damaged. The ignition switch must be turned OFF before performing any work.
- Please do not replace with a traditional type battery as replacement.
- Please refer to the removal instruction when removing ACG and CPS.

Ignition System

- Please follow the procedure of trouble diagnosis chart to check ignition system.
- As E.C.U. transistor ignition assembly does not require an ignition timing check. In case ignition timing is incorrect, check E.C.U. and AC generator. Verify with an ignition timing light after replacement if necessary.
- E.C.U. failure reasons are most resulted from E.C.U. looseness or impact. Take special care when removing.
- Most of ignition system problems were resulted from poor connecting connector. Please check the connectors first when servicing.
- Make sure that the heat range of spark plug is suitable. Improper spark plug is the main cause of poor engine operation or combustion.
- Inspection procedures in this manual are based on Max. voltage. This manual also contains methods of how to check ignition coil resistance and component operation.
- Please follow the continuity chart to check ignition switch.

Starting system

- Please follow the inspection procedures of troubleshooting to check ignition system.
- Starting motor can be removed directly from engine.
- Please refer to chapter 5 for starting clutch removal procedures.

14. Electrical system

Techinical specification

Charging system

Item			Specification
Battery	Capacity / Model		12V 6Ah YTX7A-BS
	Charging rate		Standard:1.2A / 5~10hr Rapid:5A / 1hr
	Fully charged	voltage(20ºC)	13.0~13.2V
	Need to be charged		12.6V
ACG	Output		14.5~28A
	Charging circuit resistance (20ºC)		0.42Ω±20% (Y/Y)
Leaking current			Under 10mA
Start charging R.P.M.			Under 2100 rpm
Voltage controlled by regulator			14.5±0.5 V
Fuse	Others		15A
	Battery		20A
	Main switch		15A
	Injection system		15A

Ignition system

Item		Specification
Spark plug	Model	CPR8EA-9
	Gap	0.7~0.8 mm
Ignition coil resistance	Primary	2.8Ω±15%
	Secondary	Without plug cap: 9.0KΩ±20% With plug cap :14.0KΩ±20%
CPS resistance		120Ω±20%

Starting system

Item		Specification
Starting motor	Model	DC type
	Output	0.6 KW

Blub

Item		Specification		
Blub	Front Position Lamp	LED	12V	1.5W
	Headlight (low)	LED	12V	14W
	Headlight (high)	LED	12V	25W
	Stoplight	LED	13.5V	5.5W
	Taillight	LED	13.5V	2.5W
	License plate light	LED	12V	0.257W
	Turn Signal Light	LED	13.5V	1.8W

Troubleshooting

Charging system

No power supply

- Disconnected battery cable
- Battery over discharging
- The fuse is blown
- Improper operation of the main switch

Low voltage

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

Intermittent power supply

- Loosened charging system connector
- Poor battery cable connection
- Poor connection or short-circuit of the charging system
- Poor connection or short-circuit of the power generation system

Faulty charging system

- The fuse is blown
- Connector poor contact, short, or open
- Poor regulator rectifier
- Poor ACG

Ignition system

No spark

- Poor spark plug
- The cable is poorly connected, open or short-circuited
  - Between ACG and ECU
  - Between ignition coil and ECU
  - Between main switch and ECU
- Poor main switch and relay
- Faulty ECU
- Faulty ACG

Engine does not crank smoothly

- Primary coil circuit
  - Poor ignition coil
  - Cables, wire, ,connector poor contact
  - Main switch poor contact
- Ignition circuit
  - Poor ignition coil
  - Poor spark plug
  - Faulty ignition coil wire
  - Current leakage in the spark plug cap
- Incorrect ignition timing
  - Faulty ACG
  - Improper installation of CPS
  - Faulty ECU

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 or rear brake switches do not operate correctly
- Starter relay is out of work
- The ignition coil is poorly connected, open or short-circuited
- The starter motor is out of work

Weak starter motor

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

Starter motor is working, but engine does not crank

- Poor starter motor pinion
- Poor starter clutch
- The starter motor run in reverse direction
- Poor battery

Charging system

Battery removal

Remove the rear seat.

⚠

- Electrolyte (diluted sulfuric acid) is very toxic. Once it spread on clothes, skin, or eyes, it will cause burn. In case of being spread, flush with great quantity of water immediately, and then send to hospital.
- Once clothes are spread by electrolyte, it will contact with skin. Immediately take off the clothes and flush with great quantity of water.

Disconnect the negative terminal wire first and then the positive terminal.

Remove the battery.

Battery installation

Install in the reverse order of removal.

⚠

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

Current leakage inspection

Key off and disconnect the ground cable (negative) from the battery.

Connect the ammeter (+) probe to the ground cable and the ammeter (-) probe to the negative terminal of the battery.

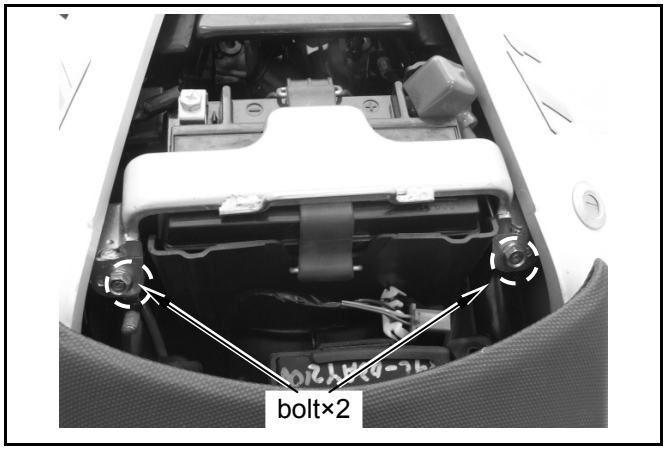
⚠ **Caution**

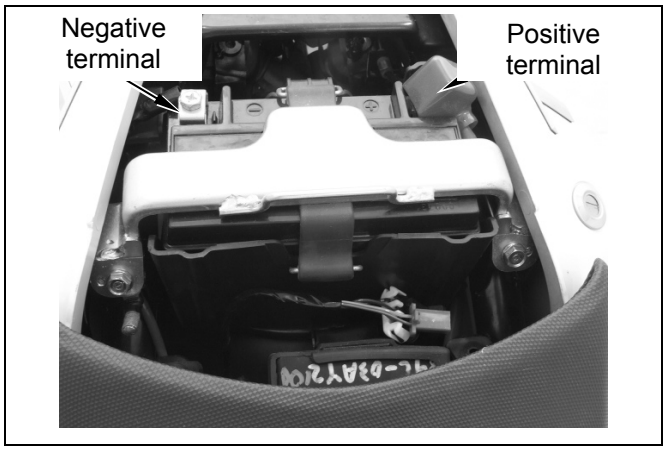
- When measuring the current, set the ammeter to a higher range and then set the range down to the appropriate level. Current flow higher than the selected range may blow out the fuse in the ammeter.
- While measuring the current, do not key on or a sudden surge of current may blow out the fuse in the ammeter.

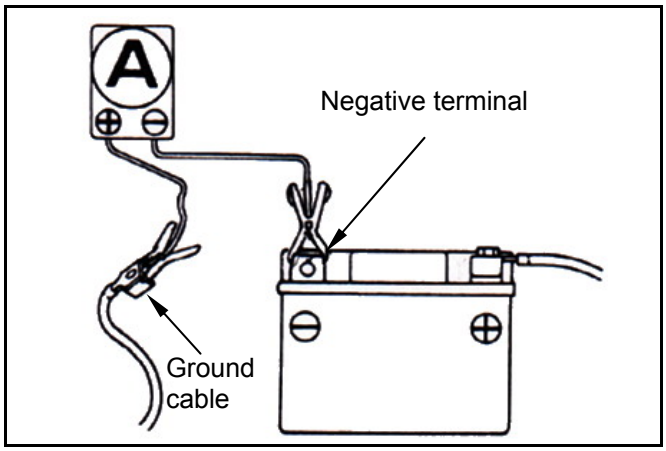
If the current leakage exceeds the specified value, a shorted circuit may occur.

Current leakage：below 10mA

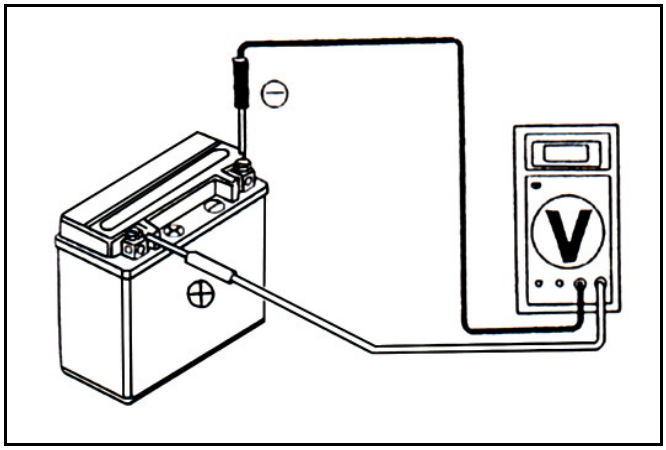
Locate the shorted circuit by disconnecting the connections one by one and measuring the current.



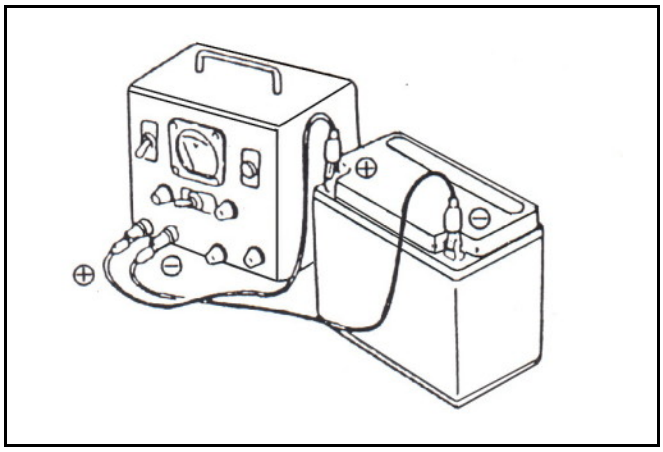




Voltage inspection
Measure the battery voltage by using a digital multimeter.
Voltage
Fully charged: 14.0~15.0V (20°C)
Insufficiently charged: 12.3V (20°C)



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

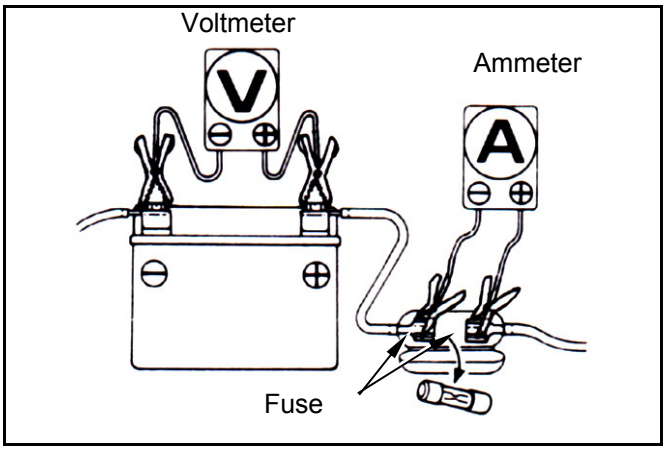
- Avoid any fire near the battery during charging.
- Control the charging from ON/OFF on the charger, do not disconnect the cables.
- Before or after charging, always turn off the charging machine to avoid explosion caused by sparks.
- Follow the regulated charging current and time shown on the battery.

⚠ 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.

Inspection on Charging Voltage / Current



Caution

- Before conducting the inspection, be sure that the battery is fully charged with a voltage larger than 13.0 V. If undercharged, the current changes dramatically.
- While starting the engine, the starter motor draws large amount of current from the battery.

After the engine is warmed up, replace original battery with a fully charged battery.

Connect a digital voltmeter to the battery terminals.

Connect an ammeter between both ends of the main fuse.

Caution

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

Caution

- Do not use a short-circuit cable.
- It is possible to measure the current by connecting an ammeter between the battery positive terminal and the cable position terminal, however, while the starter motor is activated, the surge current the motor draws from the battery 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 ammeter and the cable while there is current flowing through. It may damage the ammeter.

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: 0.6A / 2100rpm (headlight off)
1.2A / 6000rpm

Control Charging Voltage: 14.5±0.5V/2100rpm

Caution

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

The following problems are related to the charging system; follow the instructions provided in the checking list to correct it if any 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 much higher than the standard values.

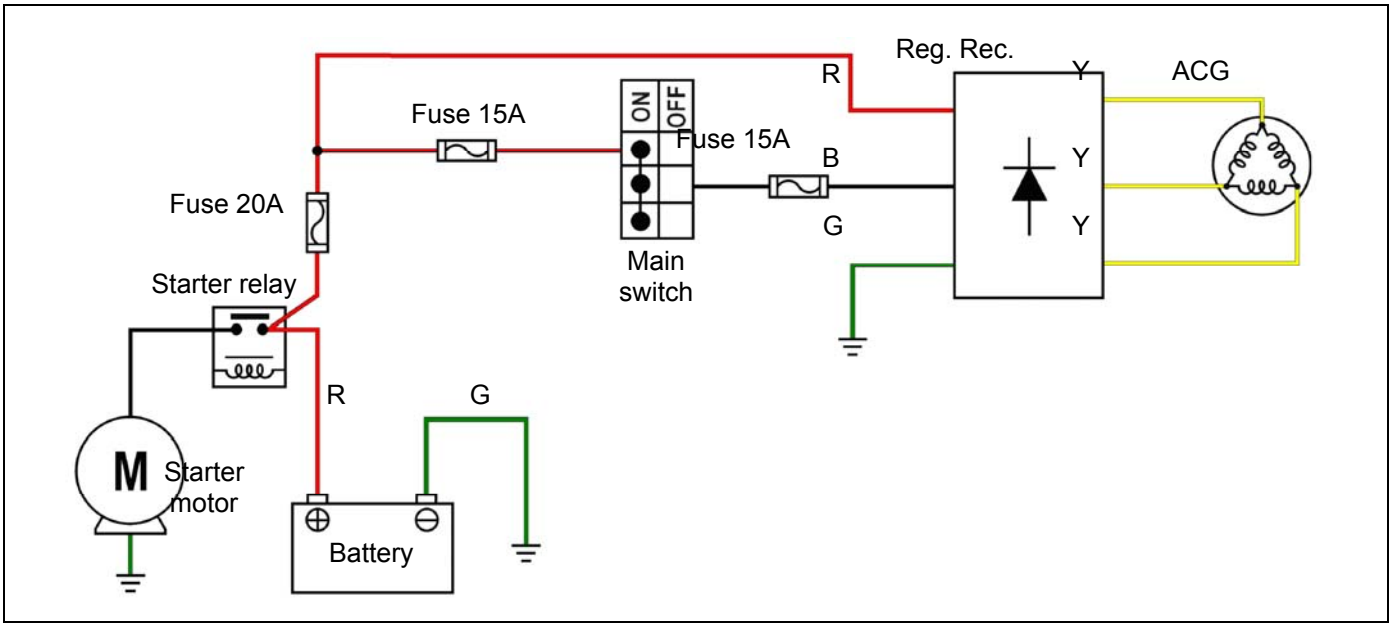
The following problems are not related to the charging system; correct it if any by following steps indicate in the checking list.

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 does 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.

Charging circuit

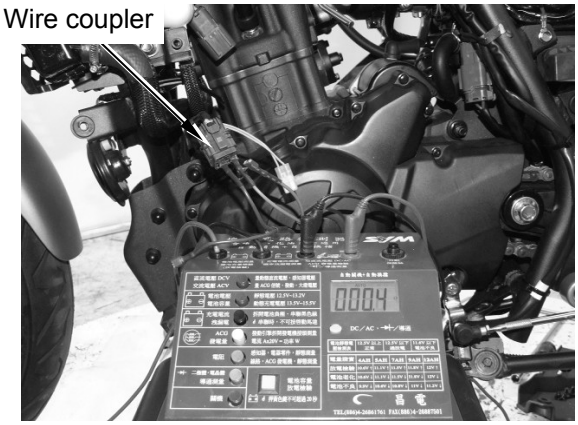


Regulator/ rectifier inspection (KΩ)

+ / -	Y1	Y2	Y3	R	B	G
Y1		∞	∞	∞	∞	∞
Y2	∞		∞	∞	∞	∞
Y3	∞	∞		∞	∞	∞
R	∞	∞	∞		∞	∞
B	5~30	5~30	5~30	∞		1~10
G	2~20	2~20	2~20	∞	1~10	

AC Generator

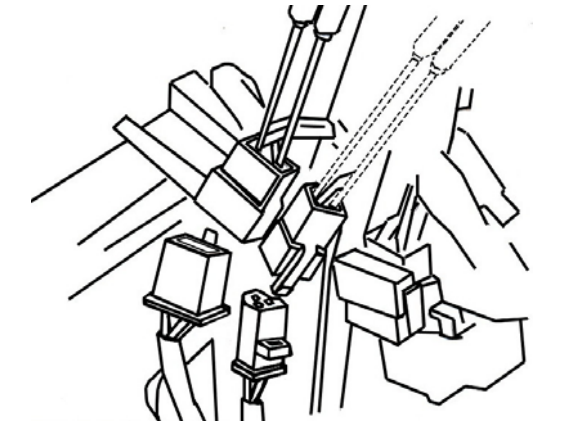
Remove wire strap right-up side cover.
Disconnect the ACG coupler 3P coupler.



Disconnect the regulator rectifier 6 pin coupler and inspect the wire circuit.

Item	Wire color	Judgment
Main switch	R– B	Battery voltage (ON)
Battery	R– G	Battery voltage
Charge coil	Y– Y	0.42Ω±20%

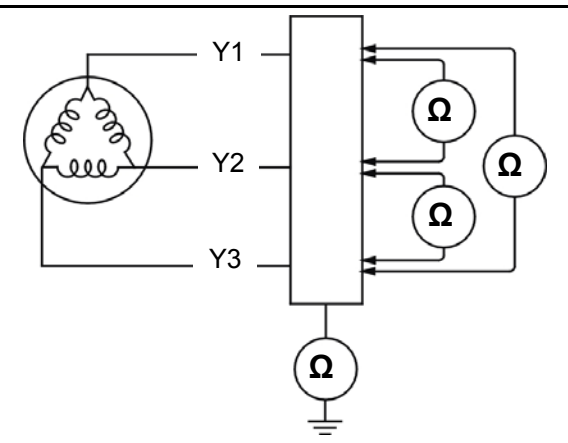
If the readings measured are not normal, check parts in the circuit.
If the parts are normal, then trouble is in the wiring.
If there is nothing wrong with parts and wiring, replace the regulator rectifier.



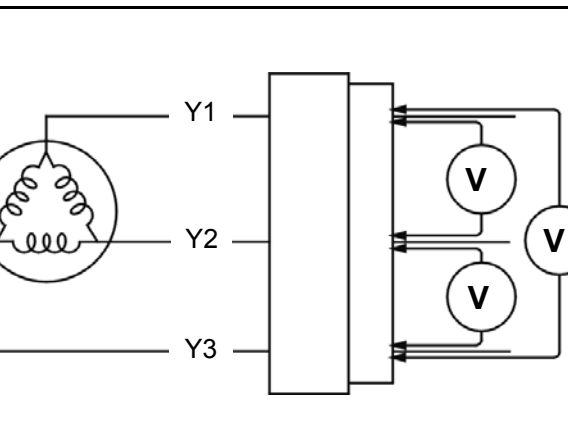
ACG coil inspection

Disconnect 3 pin couplers of the generator coil.
Connect an ohmmeter to the each terminal end.
Check the continuity of the each terminal end, and engine ground with short circuit?
If there is no continuity or short circuit, replace the AC. Generator.

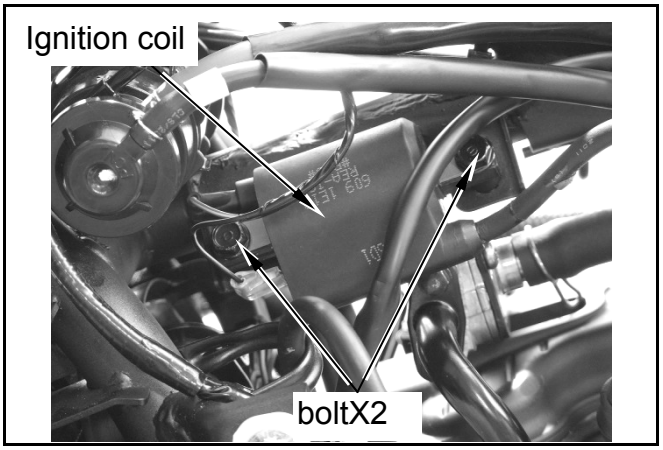
	V	Ω
Y1	70~80	0.42Ω±20%
Y2	70~80	0.42Ω±20%
Y3	70~80	0.42Ω±20%



Without disconnecting the coupler, voltage generated can also be checked by voltmeter while the engine is running.



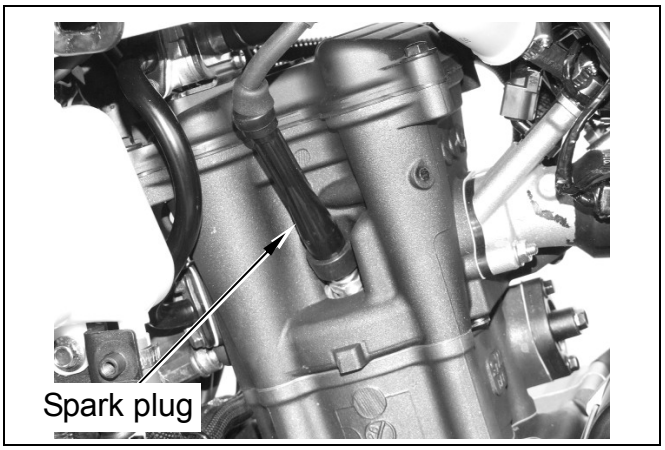
Ignition coil
Removal
Remove side cover and seat.
Remove spark plug cap.
Remove ignition coil wire.
Remove bolts and ignition coil.
Install in the reverse order of removal.



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

⚠

- Make sure each wire connection is correct, and test as required. Even the wire connection is correct; sometimes the test may not be carried out successfully.



Connect the high voltage shunt with a multi-meter or input a resistor in the 10M 10CV of voltage meter.

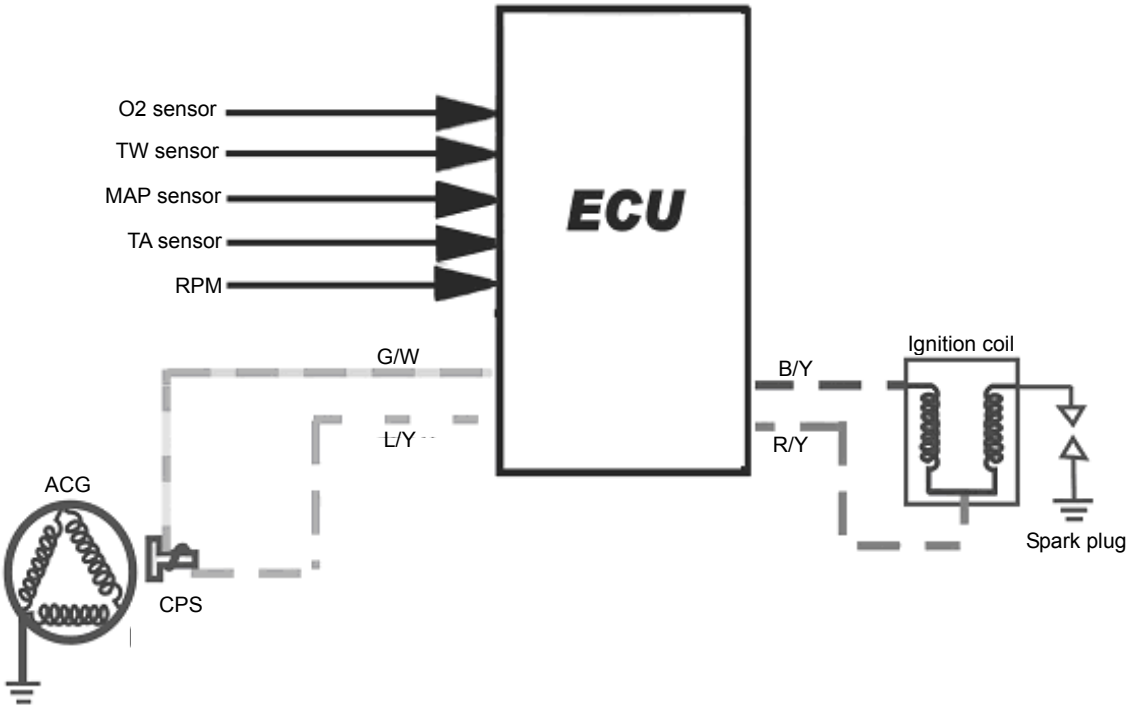
Measure voltage and resistance.
Voltage: battery voltage

⚠

注意

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

Ignition circuit



Ignition coil inspection

Remove ignition coil connector.
Measure the resistance of ignition coil.
Standard value:
Primary: 2.8Ω±15%
Secondary: Without plug cap: 9.0KΩ±20%
With plug cap: 14.0KΩ±20%

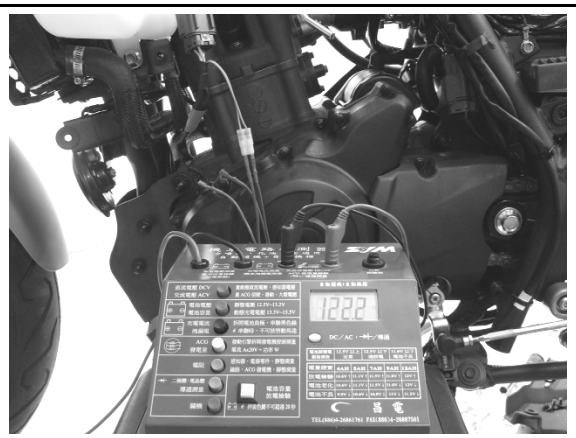
CP Sensor inspection

Remove wire strap.
Disconnect CP Sensor 2P coupler, measure the resistance between the terminals of green/white and blue/yellow.
Standard value: 120Ω±20%

⚠ Caution

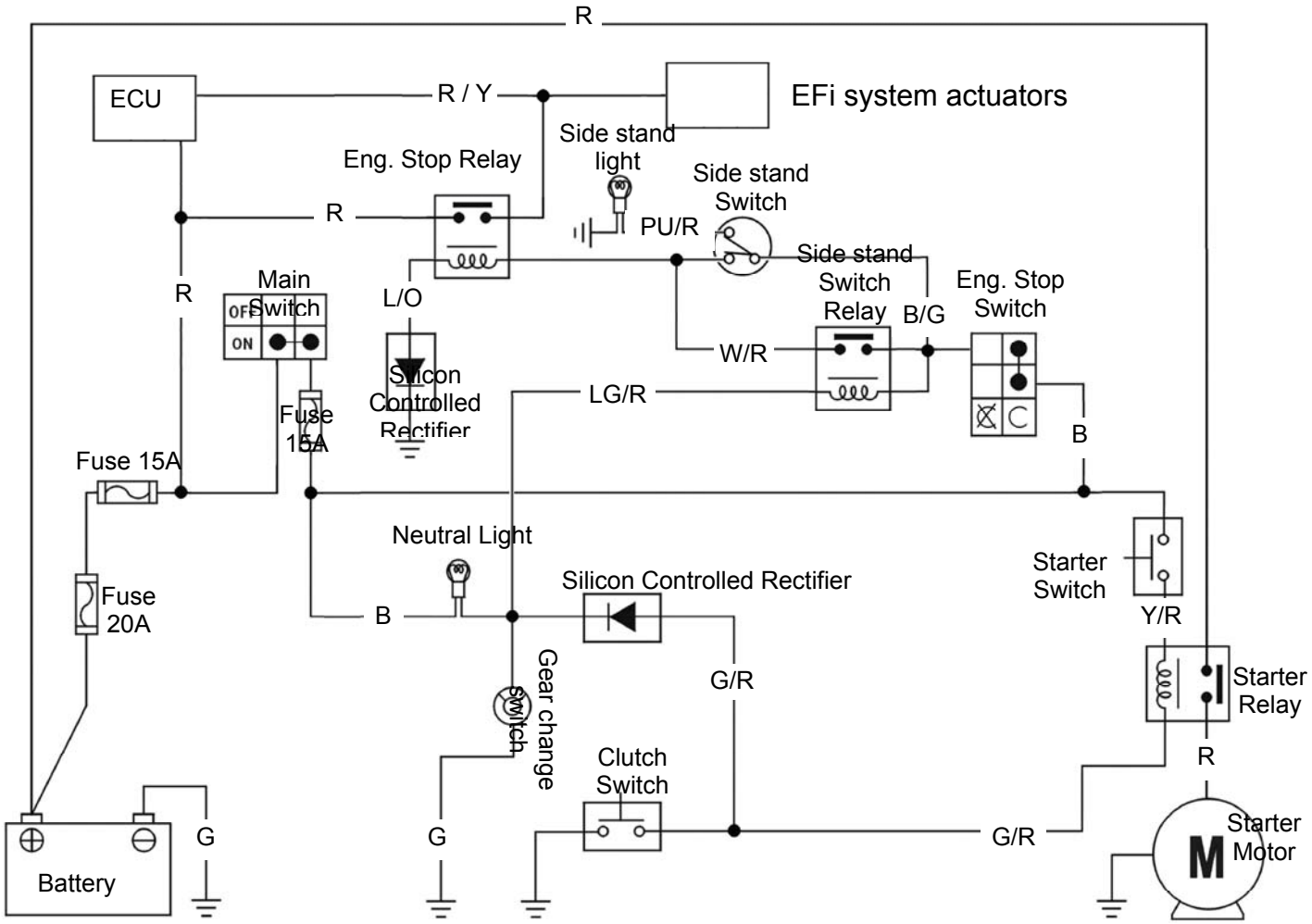
- No need to remove circuit from the engine to carry out this test.

Please refer to ch. 5 if the circuit needs to be replaced.



Starting system

Starting circuit diagram



Starter relay inspection

Key on and pull the brake lever and press the starter switch.

If a sound of “Looh Looh” is heard, it indicates the relay function normally.

Disconnect the negative terminal wire.

Disconnect the starter relay coupler.

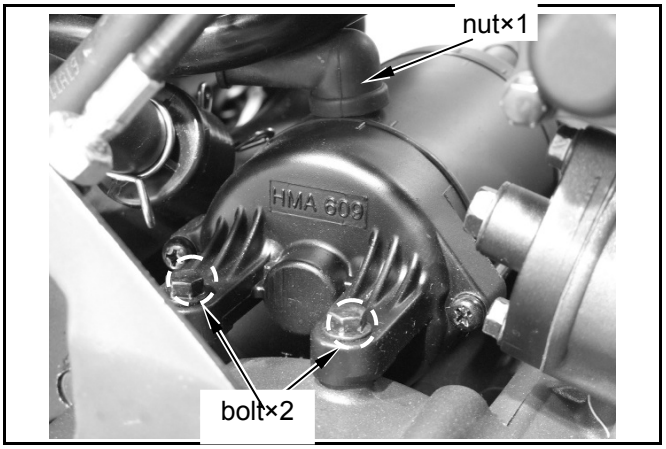
Connect an ohmmeter to the starter relay terminal.

Connect the green / yellow wire to the battery positive terminal and the yellow / red wire to the battery negative terminal.

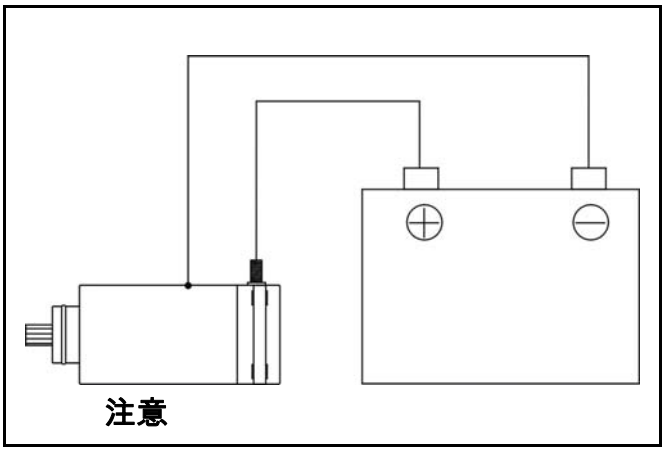
Check the continuity of the starter relay terminal.

If there is no continuity, replace the relay.

Starter motor removal
Remove the starter motor wire. (nut×1)
Remove the starter motor. (bolt×2)



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.



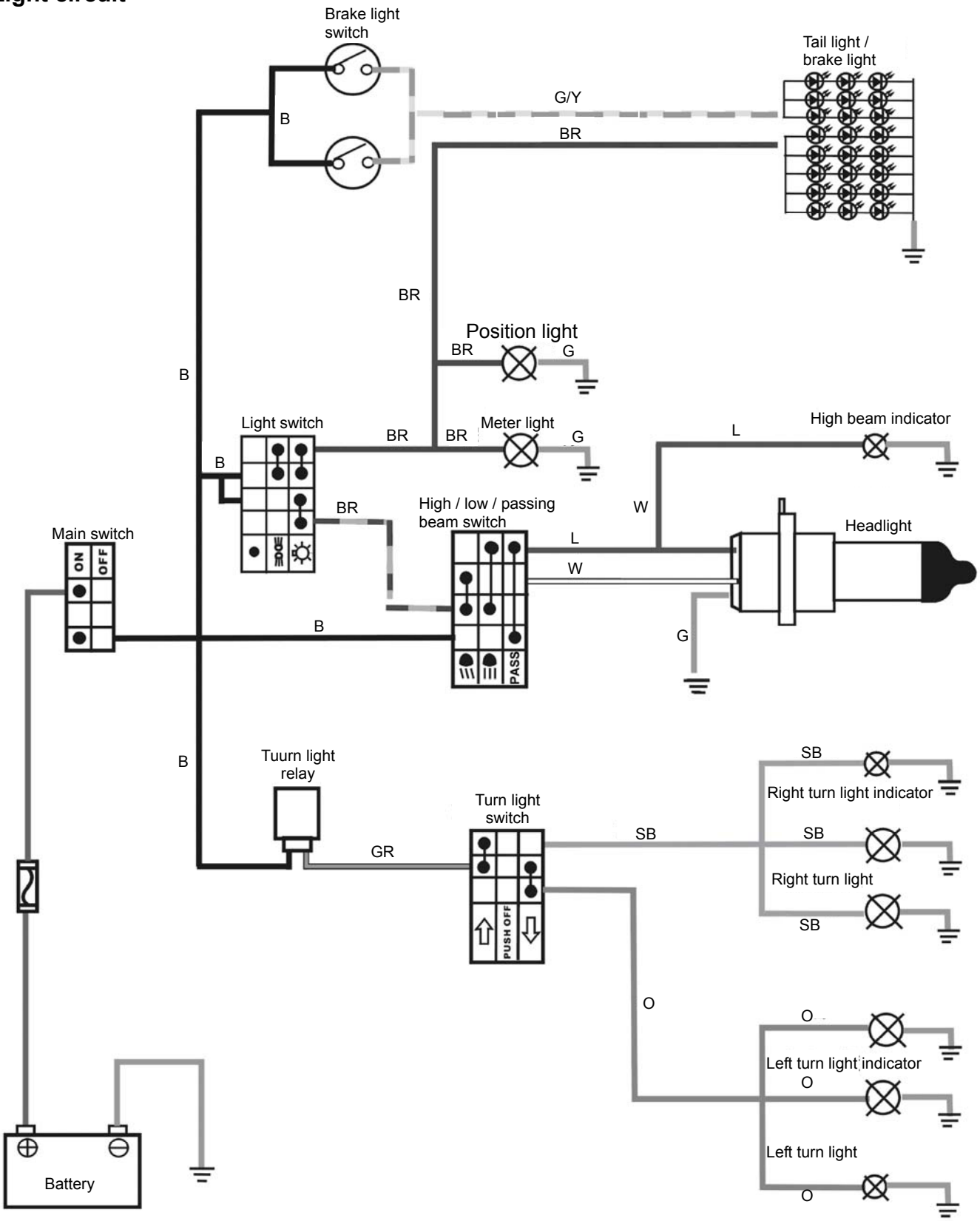
Starter motor installation
Install in the reverse order of removal.

⚠

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

Light system

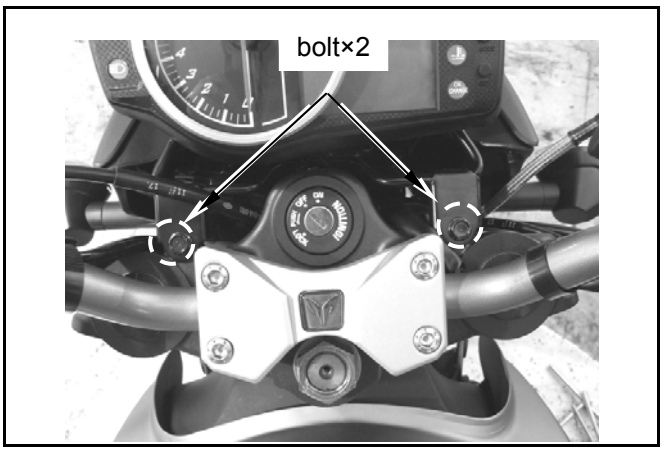
Light circuit



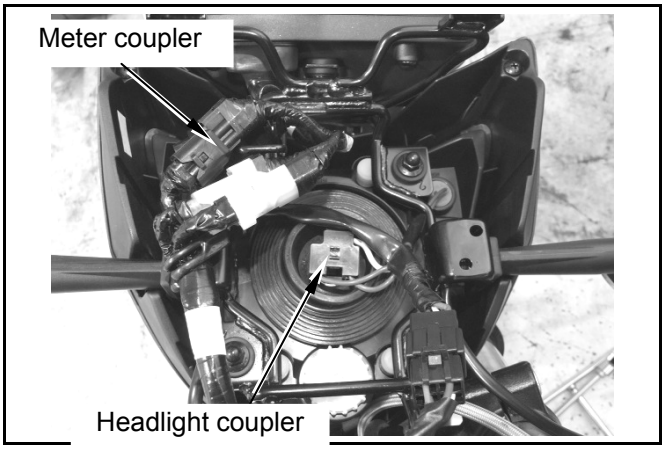
Meter

Removal

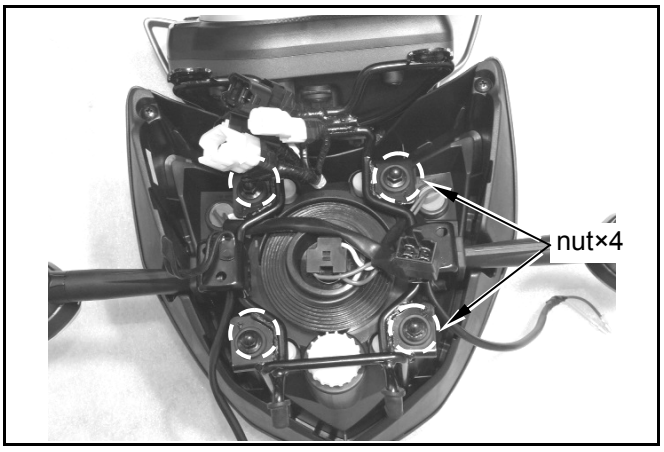
Remove the headlight / meter (bolt x2).



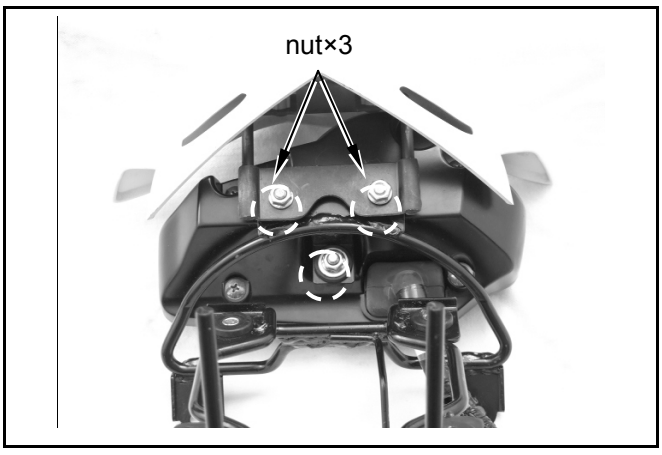
Disconnect the headlight / meter coupler.



Remove the headlight locknuts. (nut×4)



Remove the meter locknuts. (nut×3)
Remove the meter.



Installation

Install in the reverse order of removal.

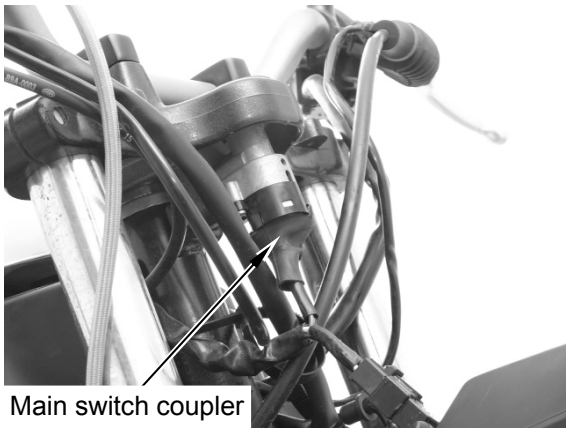
Switch / horn

Main switch

Inspection

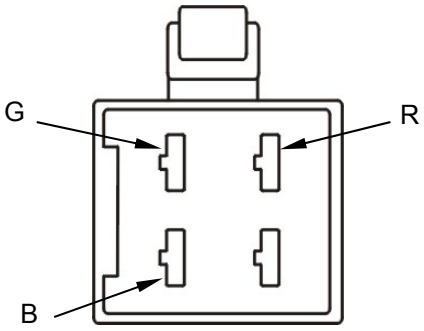
Remove the headlight. (bolt×2)

Disconnect the main switch coupler.



Check the continuity between two points as indicted below

pin / position	BAT1	BAT2	**IG**
LOCK			
OFF			
ON	●	●	
color	B	R	G

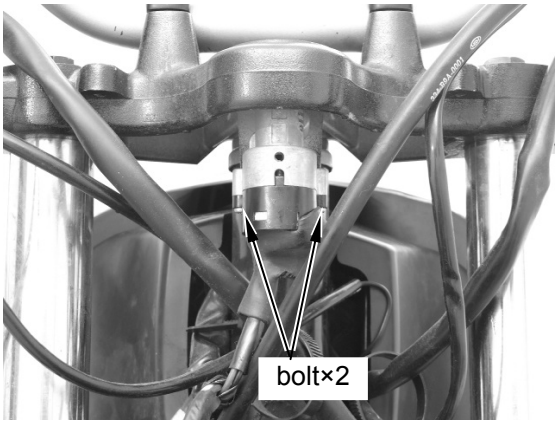


Replacement

Remove the headlight assembly (bolt ×2).

Disconnect the main switch coupler.

Remove the main switch. (bolt x 2)



Installation

Install in the reverse order of removal.

Right handle switch
Remove the right handlebar switch coupler.

Check the following switch circuit.

Headlight switch

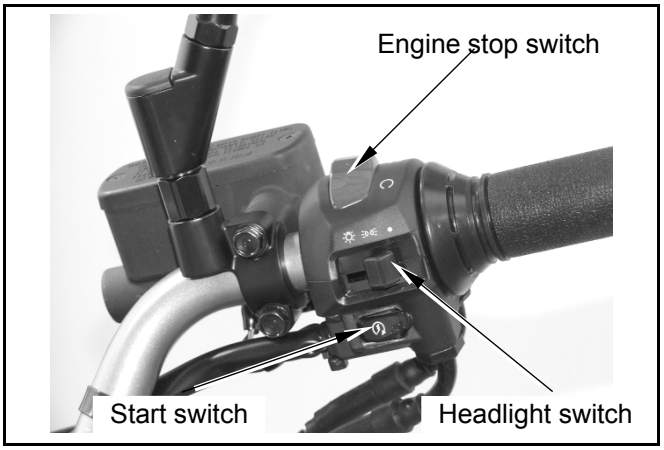
pin / position	BAT	TL	HL
•			
≡D⊂	●	●	
☼	●	●	●
color	B	BR	L/W

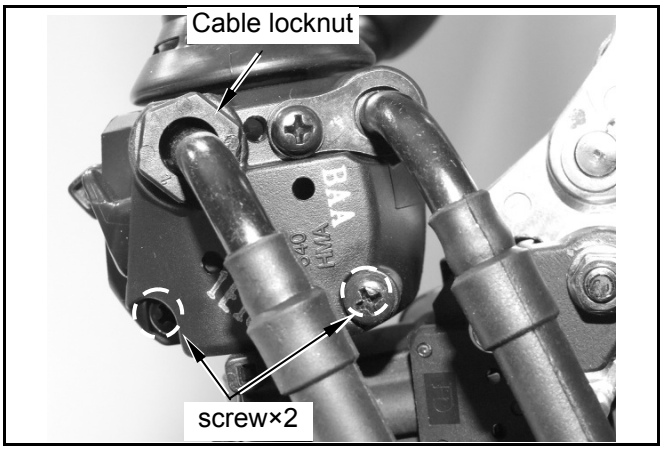
Start switch

pin / position	BAT	ST
FREE		
⚡	●	●
color	B	Y/R

Engine stop switch

pin / position	ST	BAT
⊗		
∩	●	●
color	B/G	B



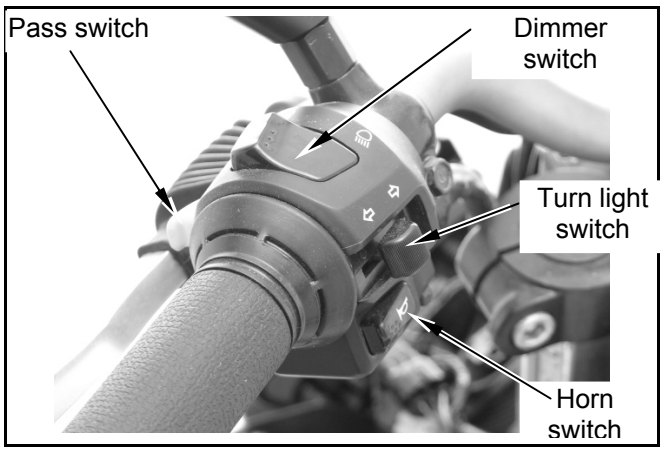


Removal
Loosen the throttle cable locknut and remove the right handle switch screws. (screw×2)
Remove the throttle cable.
Remove the throttle grip and right handle switch.

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

Left handle switch
Disconnect the left handle switch wire coupler.

Check the following coupler circuit.

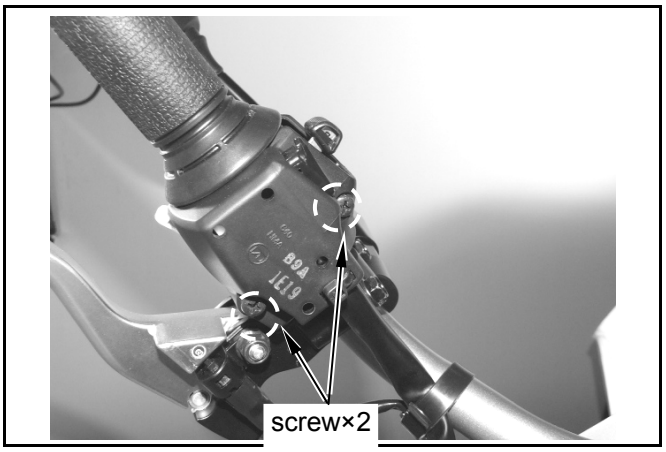


Dimmer switch

pin / position	HI	LO	HL	BAT
		●	●	
	●		●	
PASS	●			●
color	L	W	L/W	B

Turn light switch

pin / position	L	W	R
		●	●
	●	●	
color	O	GR	SB



Horn switch

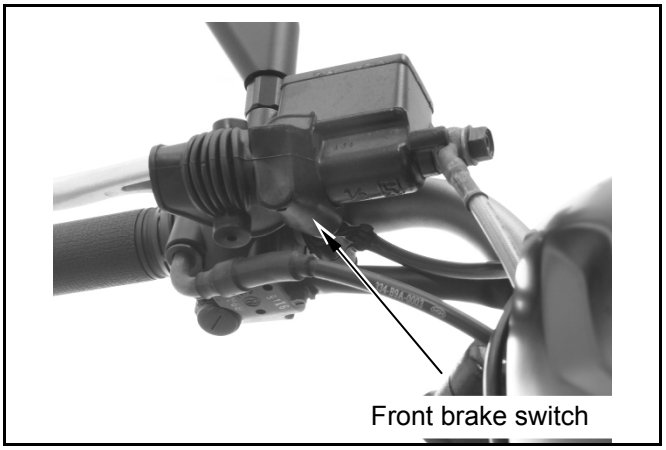
pin / position	HO	BAT
FREE		
	●	●
color	LG	B

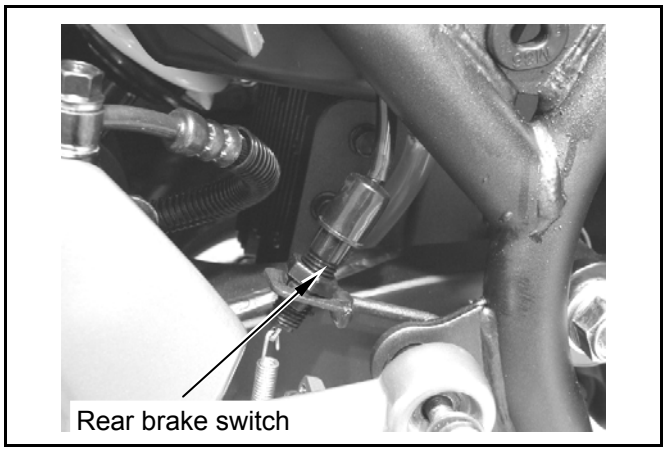
Removal
Remove the left handle switch screws, (screw×2) remove the left handle switch.

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

Brake light switch

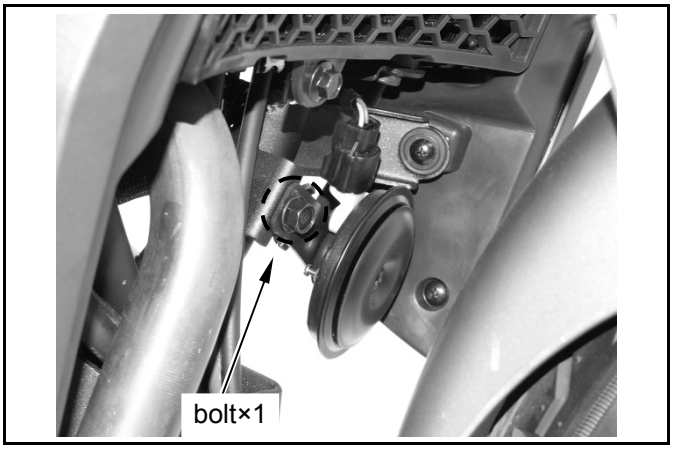
While pulling the brake lever or stepping the rear brake pedal, the terminals of black and green/yellow of the brake should have continuity.
Replace the switch if damaged.



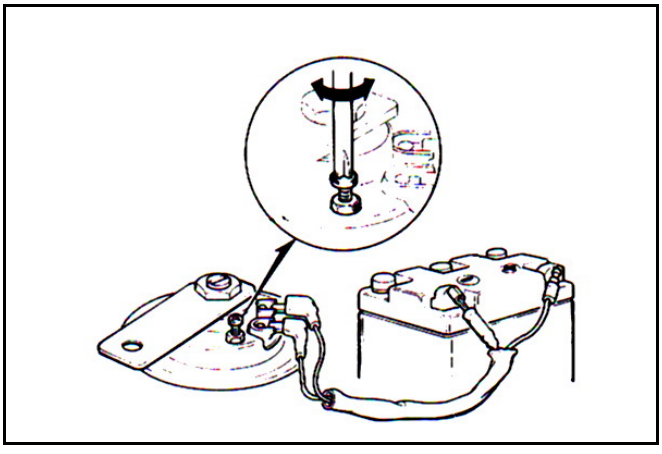


Horn

Disconnect the horn coupler and remove the horn. (bolt x 1)



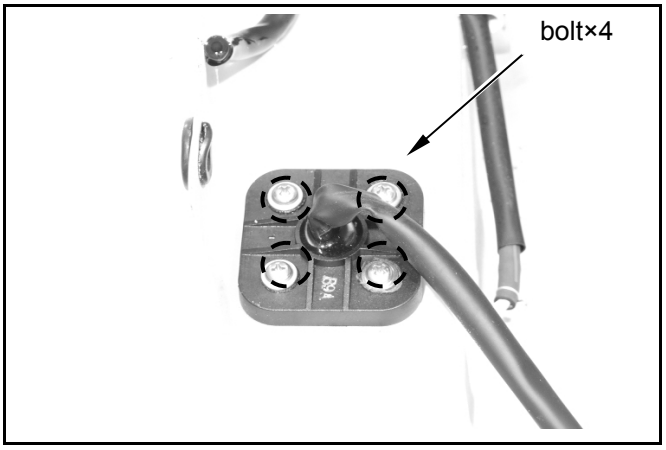
Apply 12 V power source to two terminals of the horn, the horn should sound.
Replace the horn if necessary.



Fuel unit

Remove the fuel tank. (Please refer to ch.3)

Disconnect the fuel unit wire coupler.
Remove the fuel unit. (bolt×4)

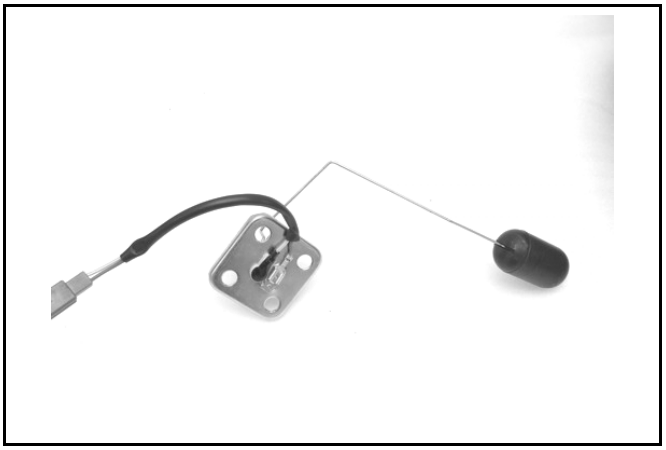


⚠

- Do not bend or damage the float arm.

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.

Arm position	Needle position
Up (full)	F (full)
Down (empty)	E (empty)

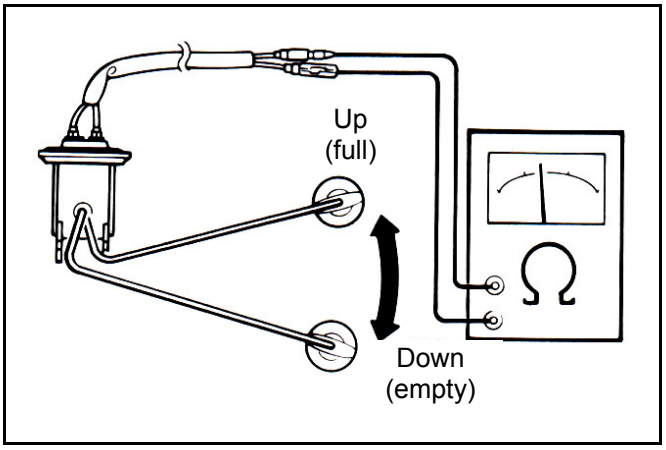


⚠

- While conducting the test, turn on the turn light to make sure that the battery is in serviceable condition.

When the float arm shifts to the F position or the E position, the resistance measured shall be as follows:

Arm position	Resistance
Up (full)	100±5Ω
Down (empty)	600±15Ω



ME20BW-COC(NHA) ELEC.DISTRIBUTION

R. HANDLE SW.
LIGHT/START
ENG. STOP SW.
FR. STOP SW.
RR. STOP SW.
SP. SENSOR
HORN
COMB. SW.
O.B.D
ENGINE CONTROL UNIT
POWER RELAY
IGN. COIL
FUEL UNIT
O2 SENSOR
FAN RELAY
FAN MOTOR
FUEL PUMP
ET SENSOR
INJETCTOR

ELEC. METER ASSY

1- L/R
2- L/B
3- W/L
4- R/W
5- BR/Y
6- Y/B
N- LG/R
EFI- PU/R
ILLUMI BR

HIGH BEAM L
TURN RIGHT SB
TURN LEFT O
IGNITION B
FUEL SENSOR Y/W
SPEED +5V W/G

BATTERY+ R
RPM B/Y
GROUND BG
TEMPERATURE B/L
SEEED SENSOR IN SB/W
SEEED SENSOR OUT P
OIL CHECK

LH. RR. WINKER
(LED*3)
RH. RR. WINKER
(LED*3)
TAIL/STOP LIGHT
(LED*6)
LICENSE LIGHT
(LED*3)

RH. FR. WINKER
(LED*3)
LH. FR. WINKER
(LED*3)

HEAD LIGHT
(HI:LED*1 LO:LED*4)
FR. POSITION LIGHT
(R:LED*6 L:LED*6)

WINKER SW./DIMMER SW./HORN SW
L. HANDEL SW.

WINKER RELAY
USB UNIT
REG. REC.
ACG
CHANGE SW.
SILCON RECT.
CLUTCH SW.
FUSE BOX ASS'Y
MAG. SW.
START MOTOR
BATTERY