

Foreword

This service manual provides maintenance guidelines for KYMCO AHG5 fuel injection engine.

Chapter 1 contains all the operational precautions that you should read carefully before you start.

Chapter 3 gives inspection and fine-tuning tips and maintenance of individual functions beginning with regular inspection.

The remaining chapters outline assembly/ disassembly and inspection steps for the engine, and electrical system.

Each chapter begins with an overall explanation of the exploded diagram, system diagram, maintenance troubleshooting, and diagnosis description.

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By the Technology Training Section
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1. Engine /Frame Serial Number

Frame Serial Number



Engine Serial Number

1. Quick Reference



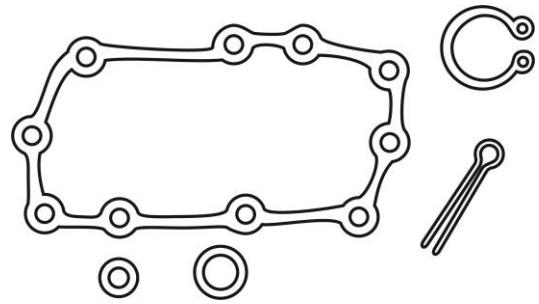
2. Specifications

Model Code		SK64DA		
Model Name		DT X360		
Overall Length (mm)		2165		
Overall Width (mm)		780		
Overall High (mm)		1285		
Wheel Base (mm)		1545		
Engine Type		Four Stroke OHC		
Displacement (cc)		320.6		
Fuel Recommended		None lead 92#		
Curb Weight (kg)	Front Wheel	85		
	Rear Wheel	106		
	Total	191		
Max. weight capacity (kg)	Front Wheel	77		
	Rear Wheel	106		
	Total	183		
Tires	Front Wheel	120/80-14 58S		
	Rear Wheel	150/70-13 64S		
Ground clearance (mm)		140		
Performance	Braking distance (m)		7.9m/ 40km/h	
	Min. turning radius (m)		R/L 2500	
Engine	Starting system		Starting motor	
	Type		Gasoline, 4-stroke	
	Cylinder arrangement		Single Cylinder	
	Combustion chamber type		Semi-sphere	
	Valve arrangement		OHC	
	Bore x stroke (mm)		∅75.3*72.0	
	Compression ratio		10.7 : 1	
	Compression pressure (kgf/cm ²)		12.0	
	Max. Horsepower (kW/rpm)		21.0/7500	
	Max. Torque (N·m/rpm)		29.3/5750	
	Valve timing	Intake	Open	10° ATDC
			Close	37° ABDC
		Exhaust	Open	10° BBDC
			Close	40° ATDC
	Valve clearance (cold) (mm)		Intake	0.12
			Exhaust	0.12
	Idle speed (rpm)		1700±100	
	Lubricate System	Lubrication type		Forced pressure & Wet sump
		Oil Pump Type		Inner/outer rotor type

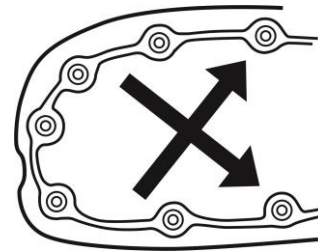
	Oil Filter Type		Full-flow filtration	
	Engine Oil	Disassembly	1.5L	
		Exchange	1.3L	
	Gear Oil	Disassembly	0.23L	
Exchange		0.20L		
Cooling Type			Liquid Cooling	
Fi System	Air cleaner type & No		Paper element, wet	
	Fuel capacity		12.5L	
	Throttle Body	Type	M4C	
		Venturi dia (mm)	∅34.5	
Throttle Valve		Butterfly type		
Electrical Equipment	Ignition System	Type	Inductive Ignition Coil	
		Ignition Timing	ECU Controls	
	Spark plug	Spec	NGK-CR7E	
		Gap (mm)	0.7 ~ 0.8	
	Battery Capacity		12V 11.8Ah (20HR)	
Power Drive System	Clutch	Type	Dry Multi-clutch	
	Transmission Gear	Type	CVT	
		Operation	Automatic centrifugal type	
	Reduction Gear	Type		2-staged Reduction
Reduction Ratio		1 st	2.65 ~ 0.78	
		2 nd	7.222	
Moving Device	Wheel Type		Tubeless	
	Rim Material		Aluminum	
	Tire Pressure (kgf/cm ²) (2 People)	Front Wheel	2.0	
		Rear Wheel	2.25	
	Turning Angle	Left	40°	
Right		40°		
Brake System Type		Front	Single Disk (260)	
		Rear	Single Disk (240)	
Damping	Suspension Type		Front	TELESCOPE
			Rear	SWING ARM
車架型式			UNDER BONE	

3. Operation precautions

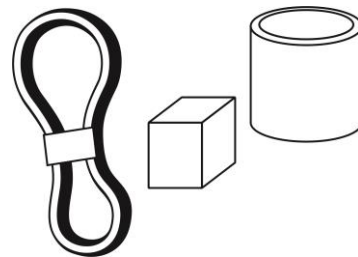
If any gaskets, O-rings circlips and cotter pins are removed, they need to be replaced with new ones.



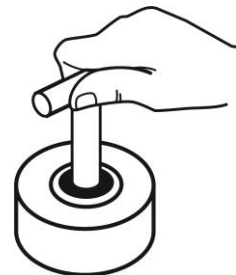
Tighten the screws and nuts from the one with bigger outer diameter diagonally to the specified torque.



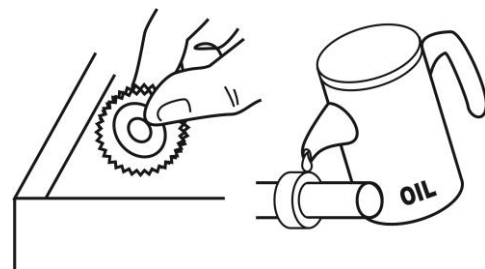
We recommend that you use genuine lubricants and parts.



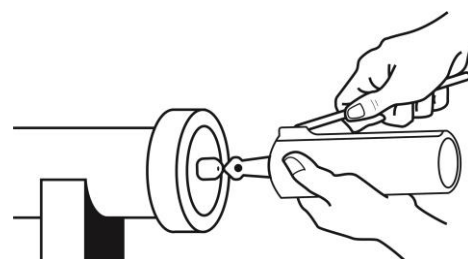
Please use dedicated or common tools when working on any assembly and disassembly of the parts during service operation.



After dismantling, the parts to be inspected should be cleaned. During assembly, apply oil to the frictional surface between parts for lubrication.



Apply recommended lubricant on the specified positions.



4. Torque

4.1. General Torque Value

Item	Torque (kgf· m)	Item	Torque (kgf· m)
5mm Bolt/ Nut	0.45~0.6	4mm Tapping screw (Cut)	0.05~0.15
6mm Bolt/ Nut	0.8~1.2	4mm Tapping screw (Point)	0.2~0.4
8mm Bolt/ Nut	1.8~2.5	5mm screw (Cut)	0.1~0.3
10mm Bolt/ Nut	3.0~4.0	5mm Tapping screw (Point)	0.35~0.5
12mm Bolt/ Nut	5.0~6.0	6mm screw /SH bolt	0.7~1.1
14mm Bolt/ Nut	6.0~8.0	6mm Flange bolt/ Nut	1.0~1.4
		8mm Flange bolt/ Nut	2.4~3.0
		10mm Flange bolt/ Nut	3.5~4.5


4.2. Engine

NO	ITEM	THREAD SIZE AND TYPE	TORQUE		PR VALUES N·m	REMARKS	THREAD DWG. NO.	IND. DWG
			N·m	kgf·m				
1	BOLT, A STUD 10x180	M10x1.25	9.8~13.7	1.0~1.4	11.8	APPLY OIL	90032-LEA7-E000	—
2	NUT, STUD BOLT	M10.X1.25	33.3~37.2	3.4~3.8	35.3	APPLY OIL	94050-10060	—
3	BOLT, SET PLATE	M6X1.0	9.8~13.7	1.0~1.4	11.8		90001-GAE1-9210	—
4	THERMOSTAT	M6X1.0	9.8~13.7	1.0~1.4	11.8		96001-06028-08 96001-06022-08	—
5	BOLT, SEALING	M12x1.0	9.8~19.6	1.0~2.0	14.7		12205-KHE8-3010 12205-LEA7-E000	—
6	L COVER	M6x1.0	9.8~13.7	1.0~1.4	11.8		96001-06030-08	—
7	COVER, L COVER	M6x1.0	9.8~13.7	1.0~1.4	11.8		96001-06020	—
8	CYLINDER HEAD	STUD M6x1.0	6.9~10.8	0.7~1.1	8.9	INLET PIPE AREA	92900-06040-0B	—
		STUD M8x1.25	6.9~10.8	0.7~1.1	8.9	EX PIPE AREA	90033-GY6-9000	—
9	BOLT, CAM SPROCKET	M6x1.0	6.9~10.8	1.0~1.4	8.9		90001-GFY6-9010	○
10	TAPPET ADJ NUT	M5x0.5	6.9~10.8	0.7~1.1	8.9	APPLY OIL	90206-001-0010	—
11	CAM CHAIN TENSIONER PIVOT	SPECIAL BOLT M8x1.25	7.8~11.8	0.8~1.2	9.8		14531-KHE7-9000	○
12	TENSIONER LIFTER	M6x1.0	9.8~13.7	1.0~1.4	11.8		90001-GBHB-6610	—
13	TENSIONER LIFTER	M6x1.0	3.4~4.9	0.35~0.5	4.2		90005-KAWI-9010	—
14	OIL PUMP	SCR PAN M3x0.5	1.0~2.9	0.1~0.3	2.0		93500-03010-1A	○
15	MISSION CASE	M8x1.25	17.7~21.6	1.8~2.2	19.7		95701-08035-08 95701-08040-08	—
16	L CASE CHECK /DRAIN BOLT	M8x1.25	7.8~11.8	0.8~1.2	9.8		95701-08012-08	—
17	L CASE DRAIN BOLT	M12x1.5	19.6~29.4	2.0~3.0	24.5		9052A-LEB1-9000	—
18	DRIVE FACE	M14x1.25	88.2~98	9.0~10.0	93.1	APPLY OIL	90201-KR8-7520-MI	—
19	CLUTCH OUTER	N.F. M12x1.25	49~58.9	5.0~6.0	54		90201-KHE7-9000	—
20	DRIVE PLATE COMP	M28x1.0	49~58.9	5.0~6.0	54		90202-187-0010	○
21	ONEWAY CLUTCH	BOLT SOCKET M8x1.25	17.7~21.6	1.8~2.2	19.7	APPLY THREAD LOCK	96600-08015-10	—
22	ACG FLYWHEEL	N.F. M14x1.25	53.9~63.7	5.5~6.5	58.8		90201-KR8-7520-MI	—
23	SPARK PLUG	M10x1.0	9.8~13.7	1.0~1.4	11.8		98059-57916-00	—
24	WATER PUMP IMPELLER	M7x1.0	9.8~13.7	1.0~1.4	11.8	L.H SCREW	19215-LEA7-E000	—
25	ACG STATOR	M5x0.8	7.8~9.8	0.8~1.0	8.8		92101-05032-0H	—
26	OTHERS	SH BOLT	7.8~11.8	0.8~1.2	9.8		—————	—
27	SW ASSY, OIL PRESSURE	PT 1/8	20.3~29.3	2.1~3.0	24.8	APPLY SEAL	35500-KED9-9000	○

4.3. Frame


NO	ITEM	THREAD SIZE AND TYPE	TORQUE		PR VALUES N·m	REMARKS	THREAD DWG. NO.	IND. DWG
			N·m	kgf·m				
1	BOLT, A STUD 10x180	M10x1.25	9.8~13.7	1.0~1.4	11.8	APPLY OIL	90032-LEA7-E000	—
2	NUT, STUD BOLT	M10.X1.25	33.3~37.2	3.4~3.8	35.3	APPLY OIL	94050-10060	—
3	BOLT, SET PLATE	M6x1.0	9.8~13.7	1.0~1.4	11.8	/	90001-GAE1-9210	—
4	THERMOSTART	M6x1.0	9.8~13.7	1.0~1.4	11.8	/	96001-06028-08 96001-06022-08	—
5	BOLT, SEALING	M12x1.0	9.8~19.6	1.0~2.0	14.7	/	12205-KHE8-3010 12205-LEA7-E000	—
6	L COVER	M6x1.0	9.8~13.7	1.0~1.4	11.8	/	96001-06030-08	—
7	COVER, L COVER	M6x1.0	9.8~13.7	1.0~1.4	11.8	/	96001-06020	—
8	CYLINDER HEAD	STUD M6x1.0	6.9~10.8	0.7~1.1	8.9	INLET PIPE AREA	92900-06040-0B	—
		STUD M8x1.25	6.9~10.8	0.7~1.1	8.9	EX PIPE AREA	90033-GY6-9000	—
9	BOLT, CAM SPROCKET	M6x1.0	6.9~10.8	1.0~1.4	8.9	/	90001-GFY6-9010	○
10	TAPPET ADJ NUT	M5x0.5	6.9~10.8	0.7~1.1	8.9	APPLY OIL	90206-001-0010	—
11	CAM CHAIN TENSIONER PIVOT	SPECIAL BOLT M8x1.25	7.8~11.8	0.8~1.2	9.8	/	14531-KHE7-9000	○
12	TENSIONER LIFTER	M6x1.0	9.8~13.7	1.0~1.4	11.8	/	90001-GBHB-6610	—
13	TENSIONER LIFTER	M6x1.0	3.4~4.9	0.35~0.5	4.2	/	90005-KAWI-9010	—
14	OIL PUMP	SCR. PAN M3x0.5	1.0~2.9	0.1~0.3	2.0	/	93500-03010-1A	○
15	MISSION CASE	M8x1.25	17.7~21.6	1.8~2.2	19.7	/	95701-08035-08 95701-08040-08	—
16	L CASE CHECK /DRAIN BOLT	M8x1.25	7.8~11.8	0.8~1.2	9.8	/	95701-08012-08	—
17	L CASE DRAIN BOLT	M12x1.5	19.6~29.4	2.0~3.0	24.5	/	9052A-LEB1-9000	—
18	DRIVE FACE	M14x1.25	88.2~98	9.0~10.0	93.1	APPLY OIL	90201-KR8-7520-MI	—
19	CLUTCH OUTER	N.F. M12x1.25	49~58.9	5.0~6.0	54	/	90201-KHE7-9000	—
20	DRIVE PLATE COMP	M28x1.0	49~58.9	5.0~6.0	54	/	90202-187-0010	○
21	ONEWAY CLUTCH	BOLT SOCKET M8x1.25	17.7~21.6	1.8~2.2	19.7	APPLY THREAD LOCK	96600-08015-10	—
22	ACG FLYWHEEL	N.F. M14x1.25	53.9~63.7	5.5~6.5	58.8	/	90201-KR8-7520-MI	—
23	SPARK PLUG	M10x1.0	9.8~13.7	1.0~1.4	11.8	/	98059-57916-00	—
24	WATER PUMP IMPELLER	M7x1.0	9.8~13.7	1.0~1.4	11.8	L.H SCREW	19215-LEA7-E000	—
25	ACG STATOR	M5x0.8	7.8~9.8	0.8~1.0	8.8	/	92101-05032-0H	—
26	OTHERS	SH BOLT	7.8~11.8	0.8~1.2	9.8	/	—————	—
27	SW ASSY, OIL PRESSURE	PT 1/8	20.3~29.3	2.1~3.0	24.8	APPLY SEAL	35500-KED9-9000	○


5. Special Tool

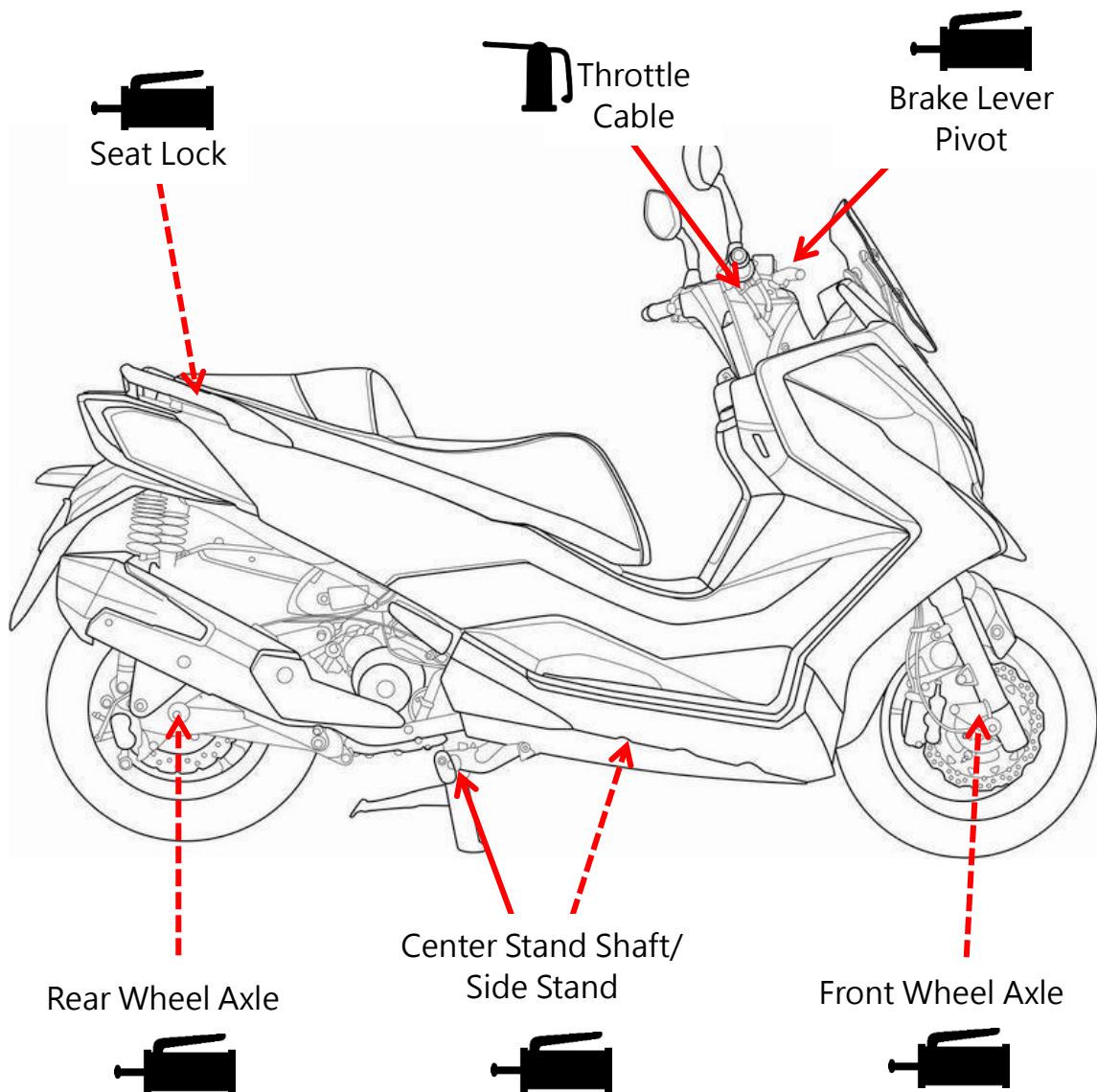
Tool Name	Tool No.	Performance	Photo
Flywheel Puller	A120E00003	A.C. generator flywheel removal	
Tappet Adjuster	A120E00012	Tappet adjustment	
Oil Seal & Bearing Installer	A120E00014	Oil seal & bearing installing	
Flywheel Holder	A120E00021	A.C. generator flywheel holding	
#41 Nut & Fitting	A120E00028	Clutch disassembly & assembly	
Thread Protector	A120E00029	Protecting the crankshaft's thread	
Valve Cotter Installer	A120E00051	Valve cotter installation	
Clutch Spring Compressor	A120E00053	Clutch disassembly & assembly	
Shaft Collar Puller	A120E00088	Bearing crankcase removal	
Shaft Collar Driver	A120E00091	Bearing crankcase removal	
Shaft Collar Installer	A120E00092	Bearing crankcase installation	
Bearing Puller	A120E00093	Bearing removal	
Lock Nut Socket Wrench	A120F00002	Steering stem removal or installation	
Electric Repair Kit	A120F00032	Fuel injection system diagnosis	

6. LUBRICATION POINTS-FRAME

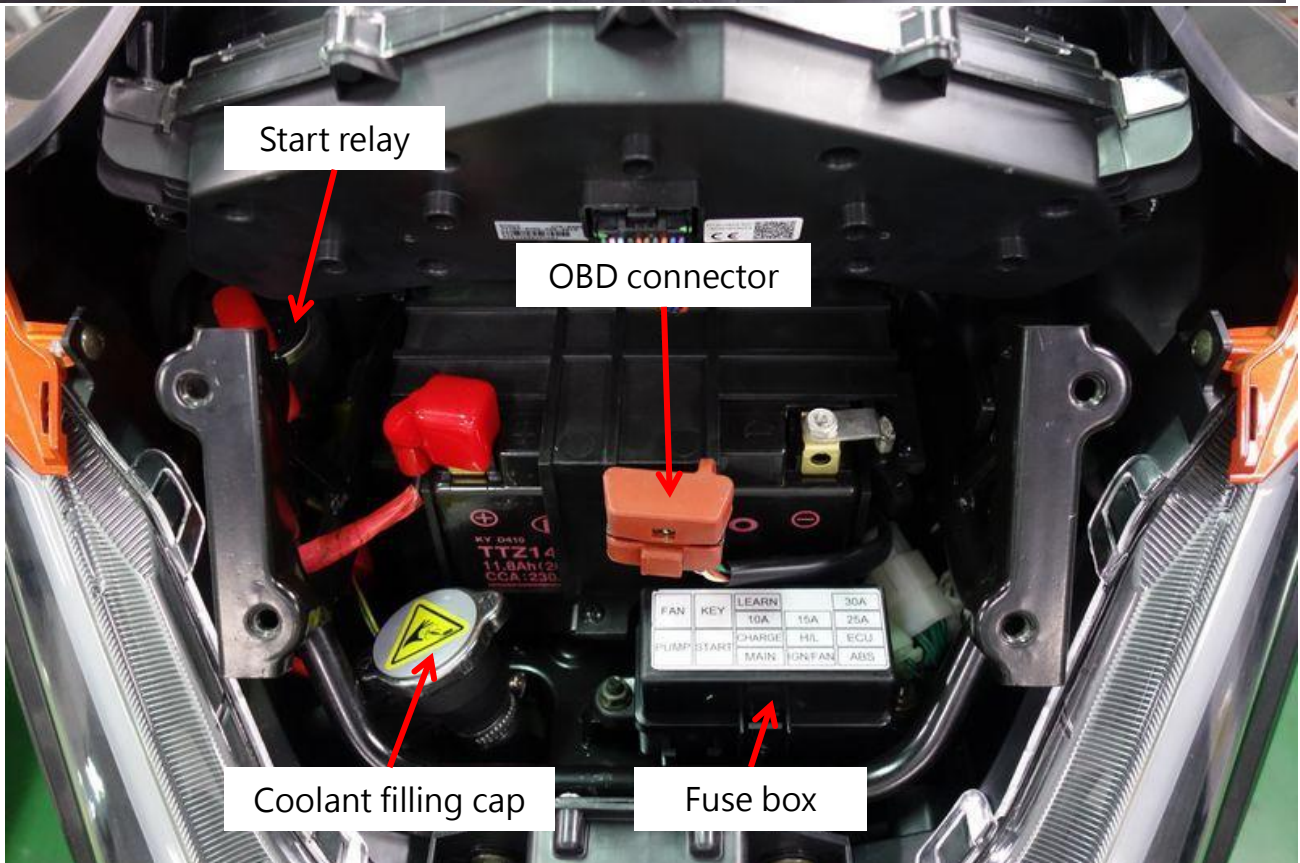
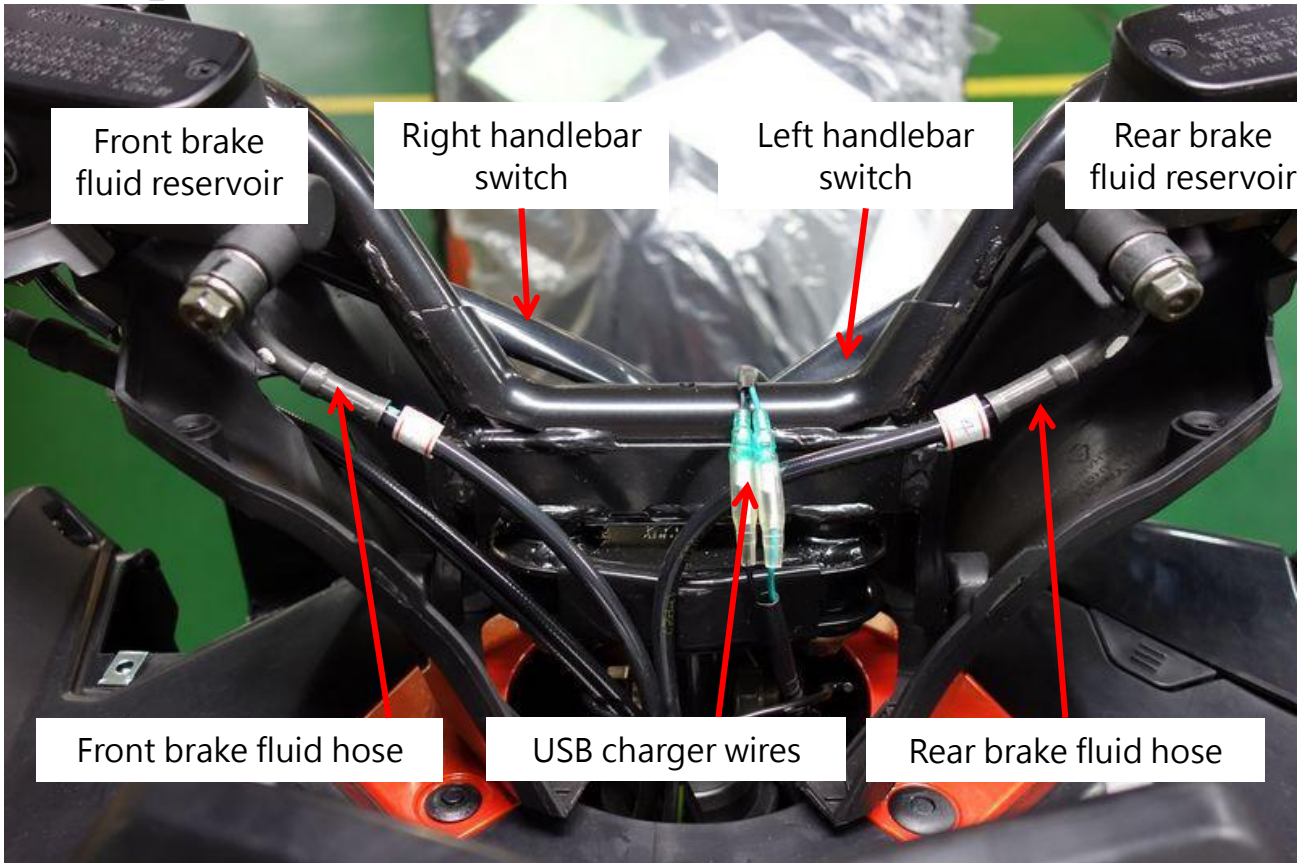
The following is the lubrication points for the frame. Use grease for parts not listed. Apply engine oil or grease to cables and movable parts not specified. It will avoid abnormal noise and damage the durability of the motorcycle.

 : Grease

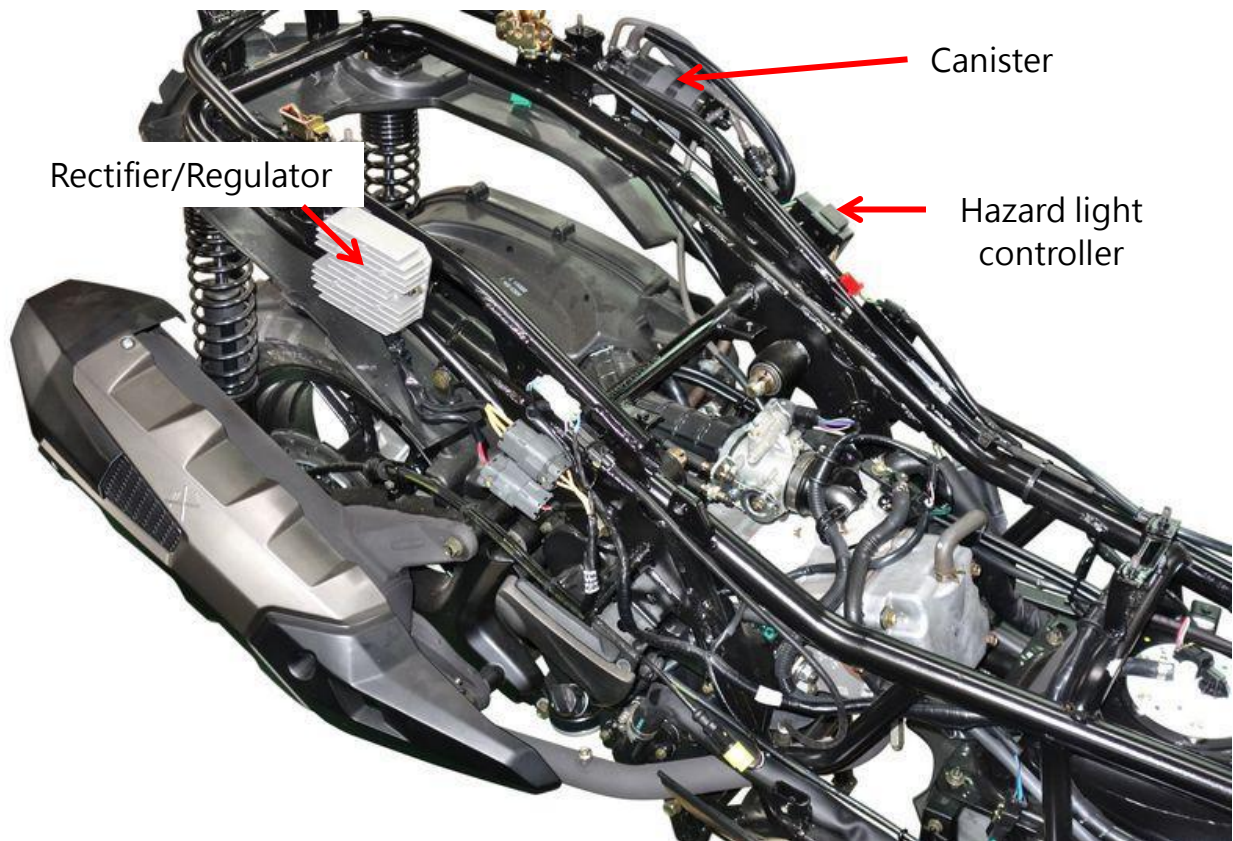
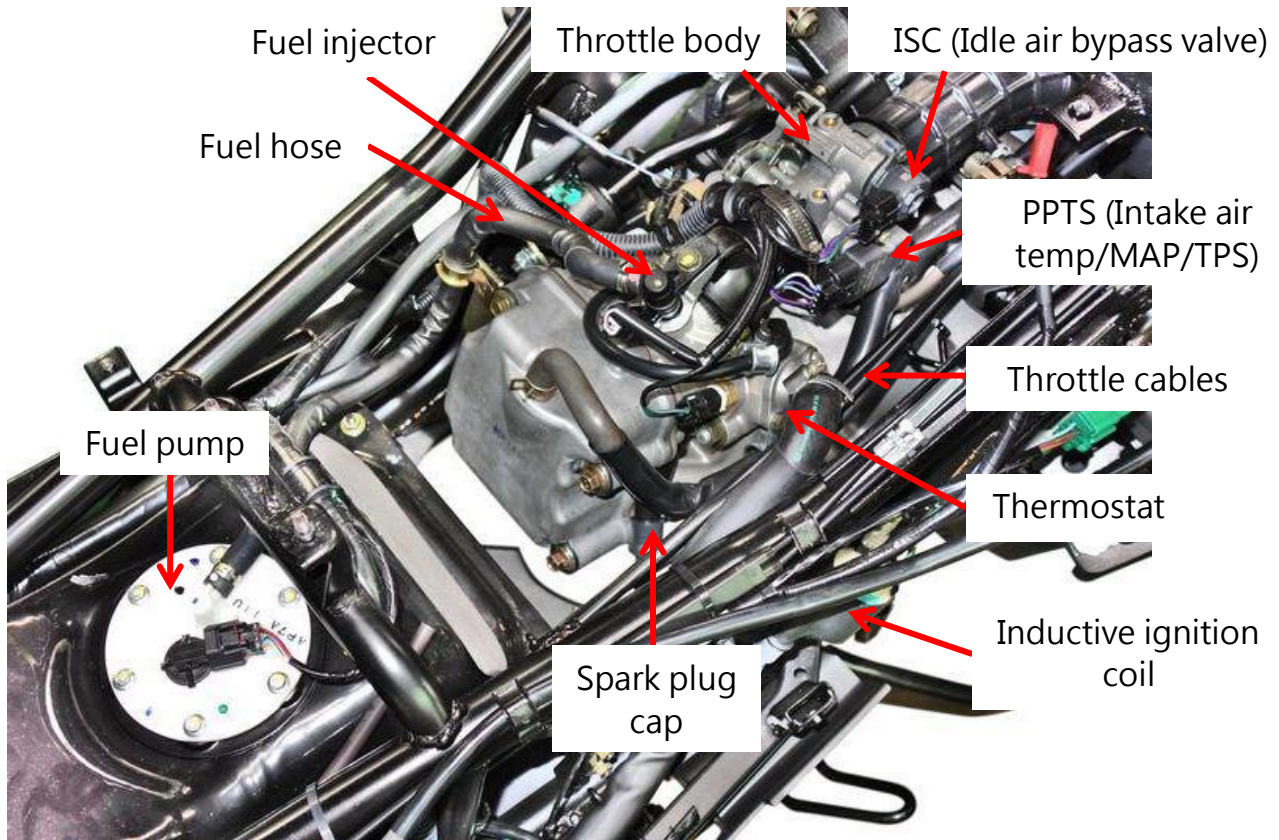
 : Engine Oil



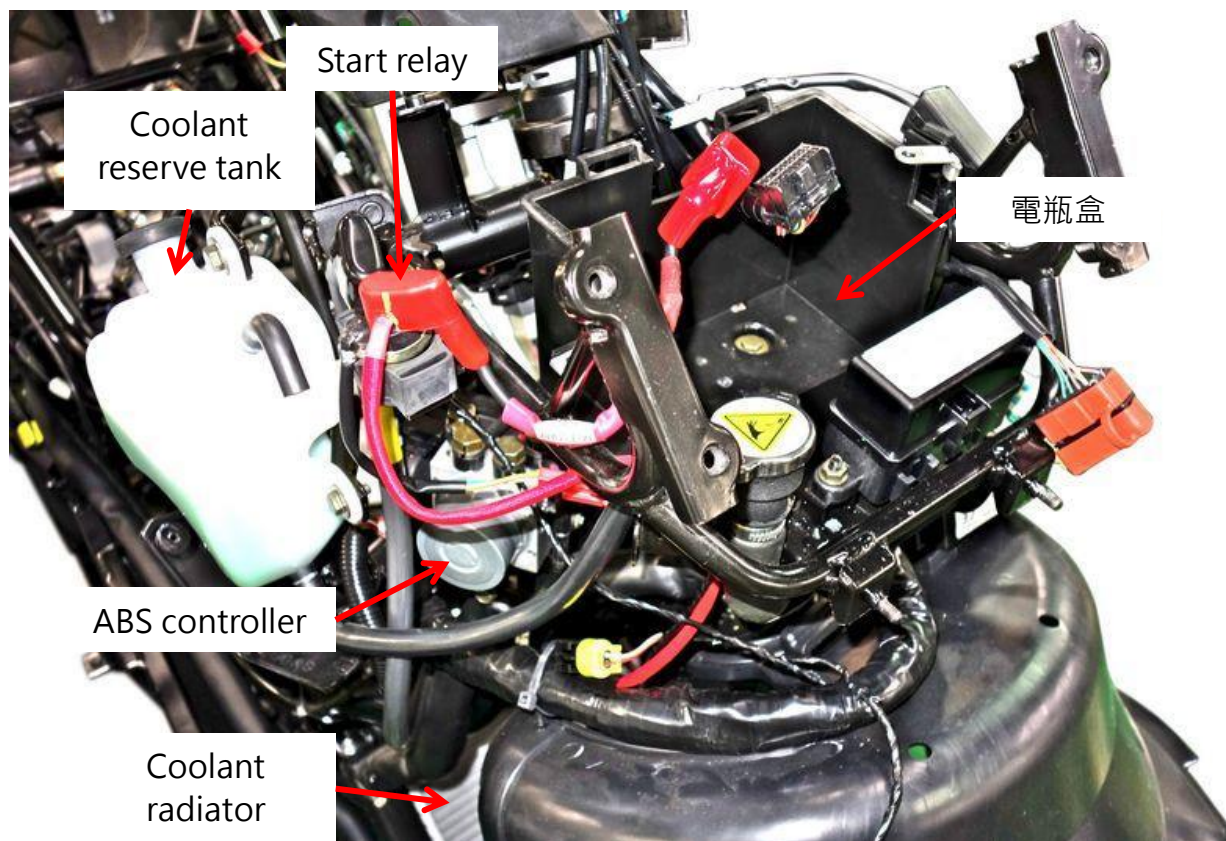
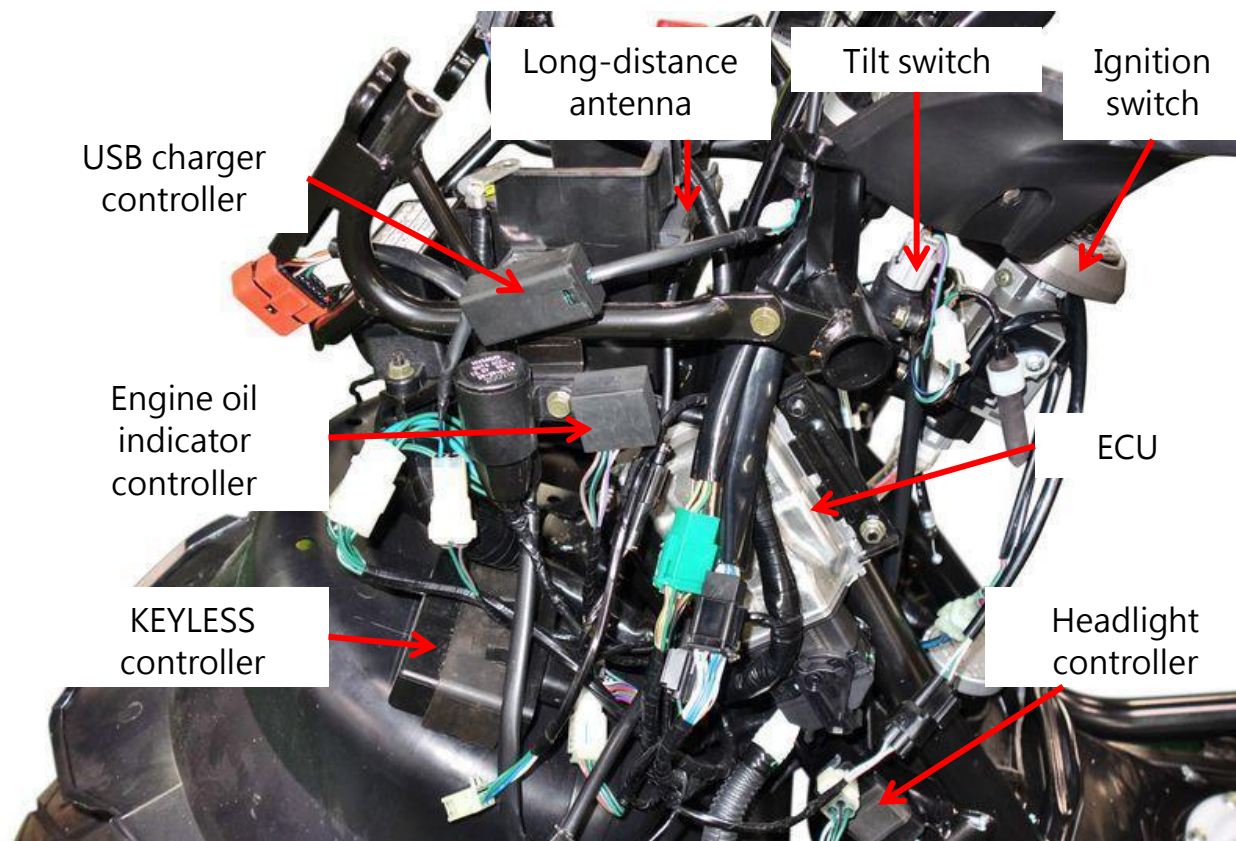
7. Components Location



1. Quick Reference



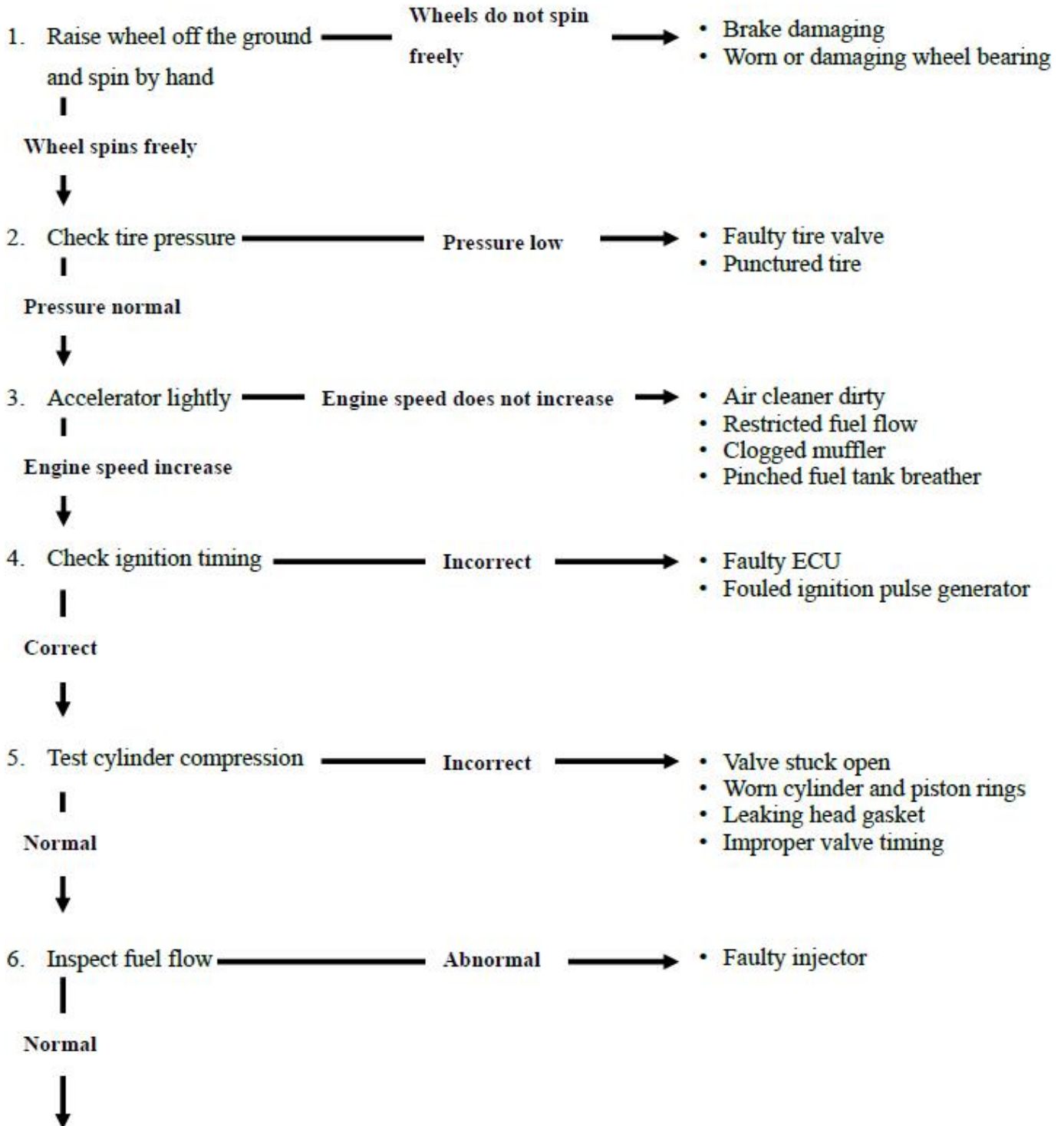
1. Quick Reference



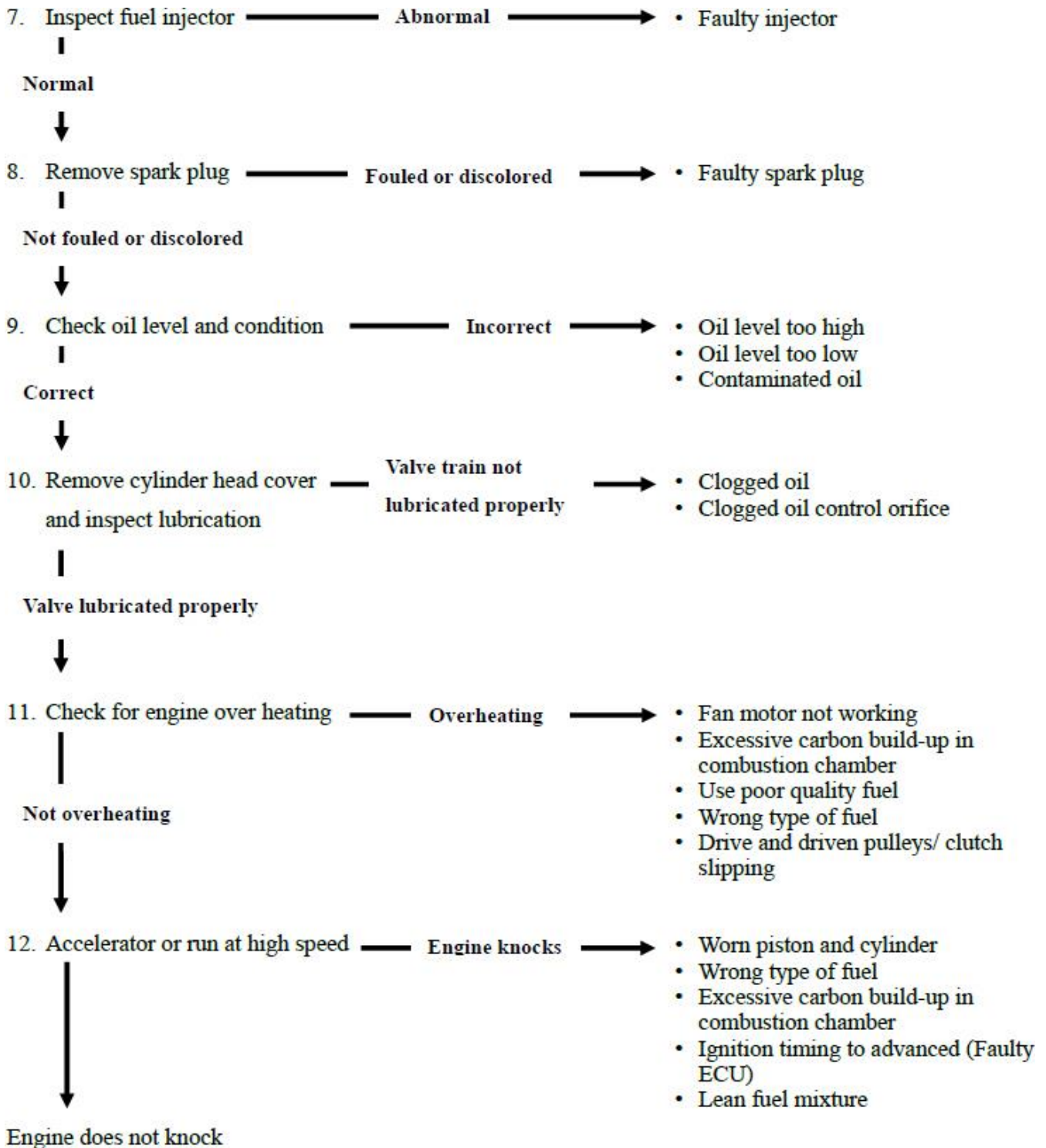
8. General Troubleshooting

8.1. Engine lacks power

Possible Causes

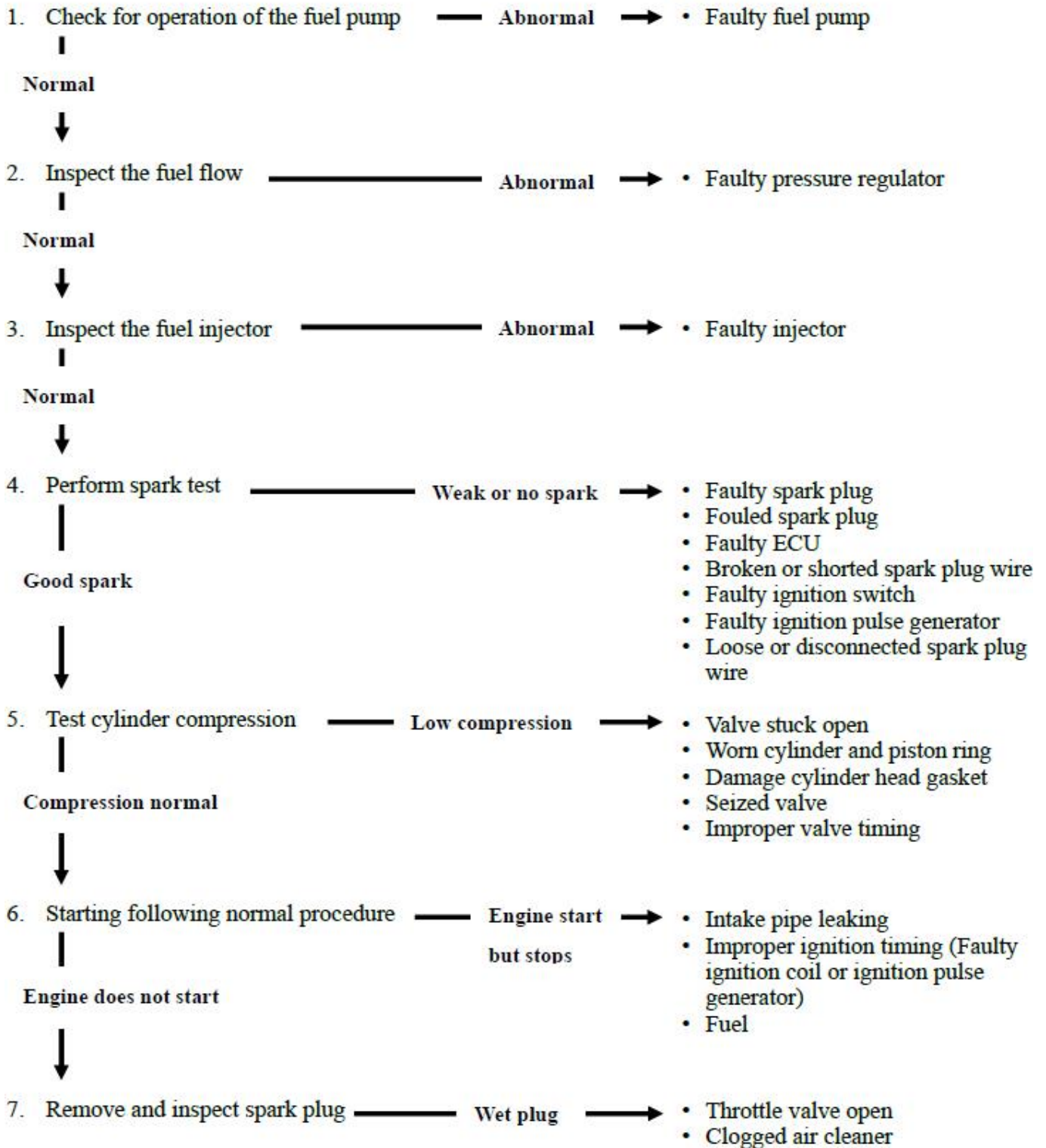


1. Quick Reference




8.2. Engine will not start or is hard to start


Possible Causes




8.3. Poor handling

Possible Causes

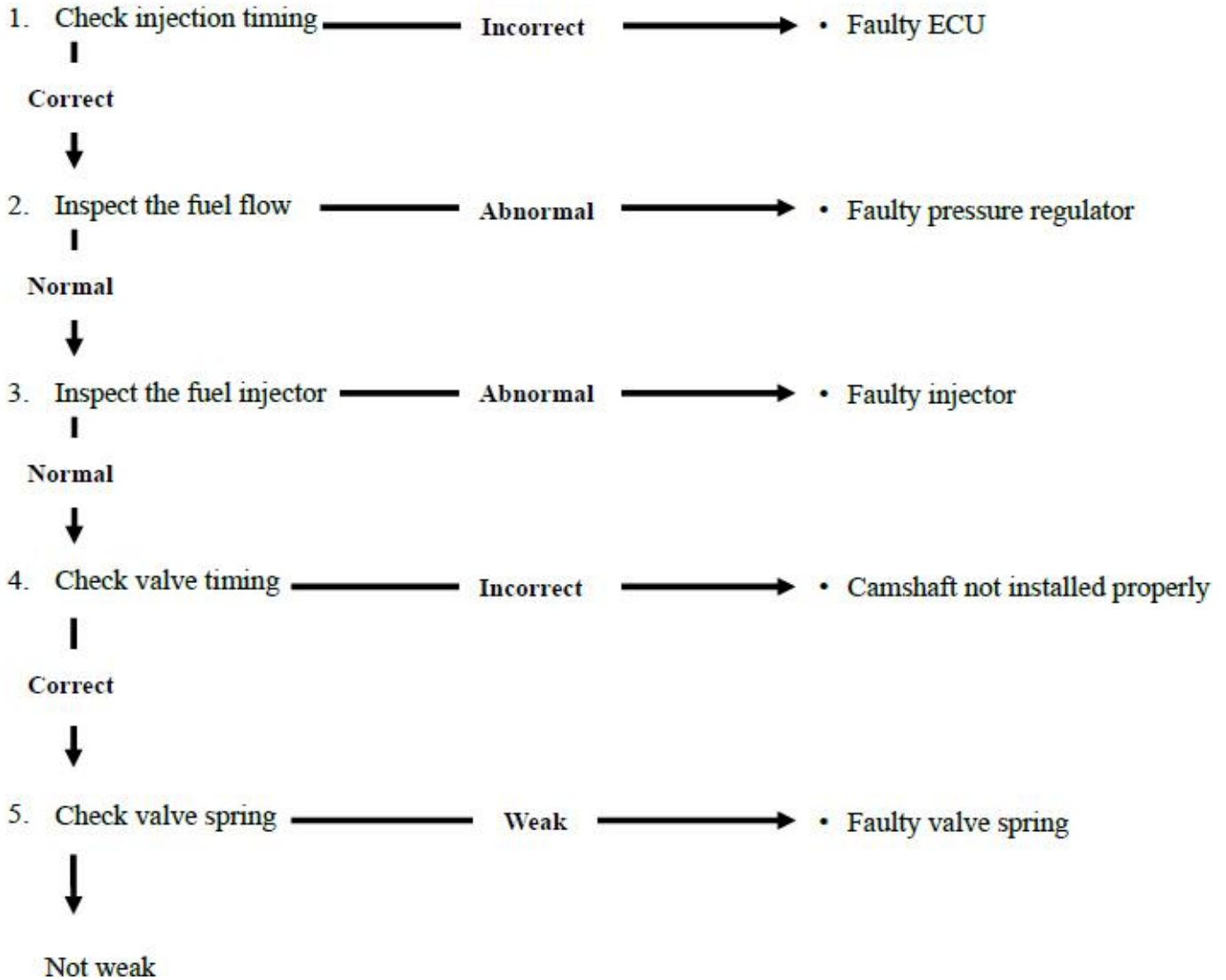
1. If steering is heavy 
 - Steering stem adjusting nut too tight
 - Damaged steering head bearings

2. If either wheel is wobbling 
 - Excessive wheel bearing play
 - Bent rim
 - Improper installed wheel hub
 - Swing arm pivot bearing excessively worn
 - Bent frame

3. If the motorcycle pulled to one side 
 - Faulty shock absorber
 - Front and rear wheel not aligned
 - Bent fork
 - Bent swing arm
 - Bent axle

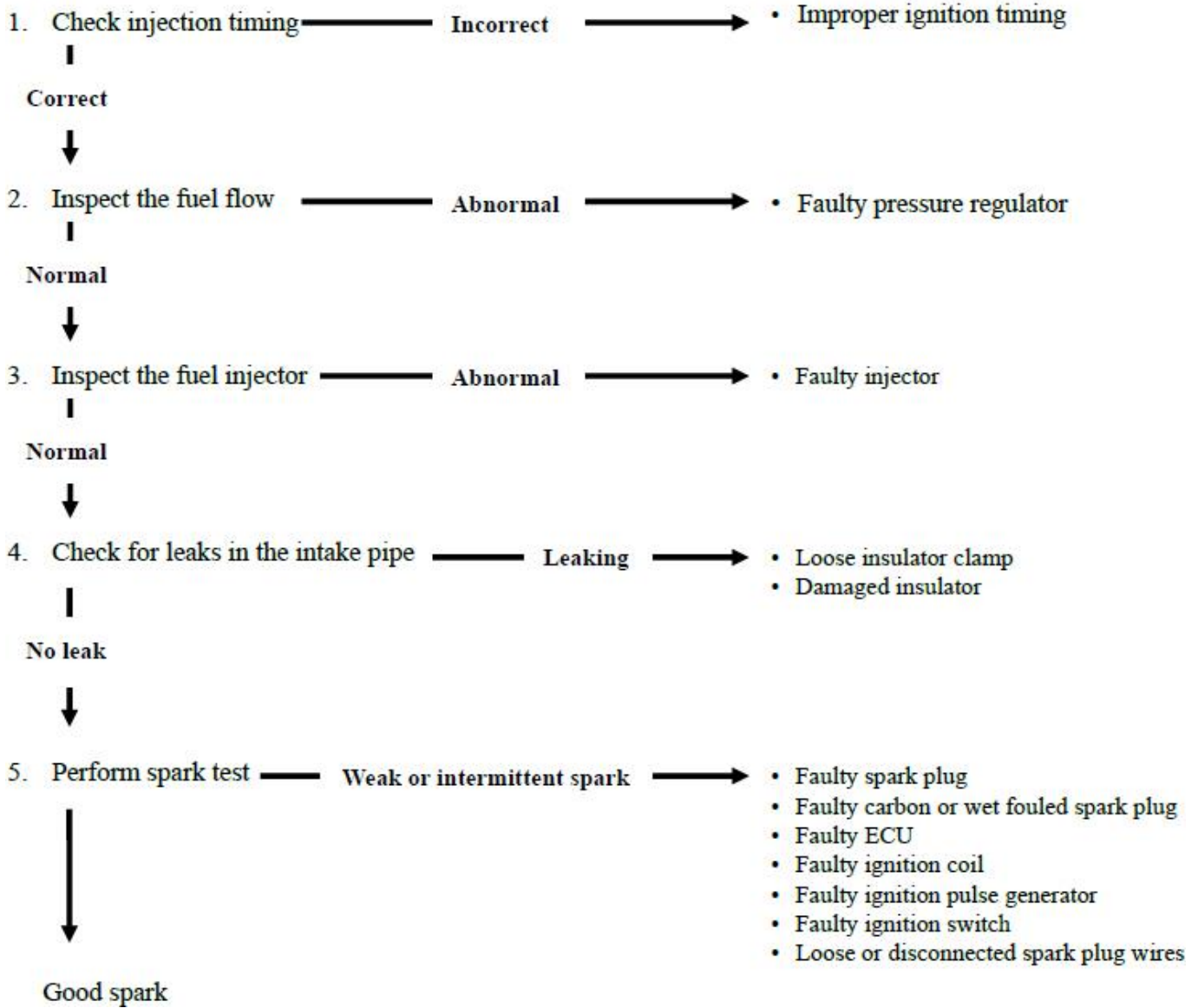
8.4. Poor performance at high speed

Possible Causes

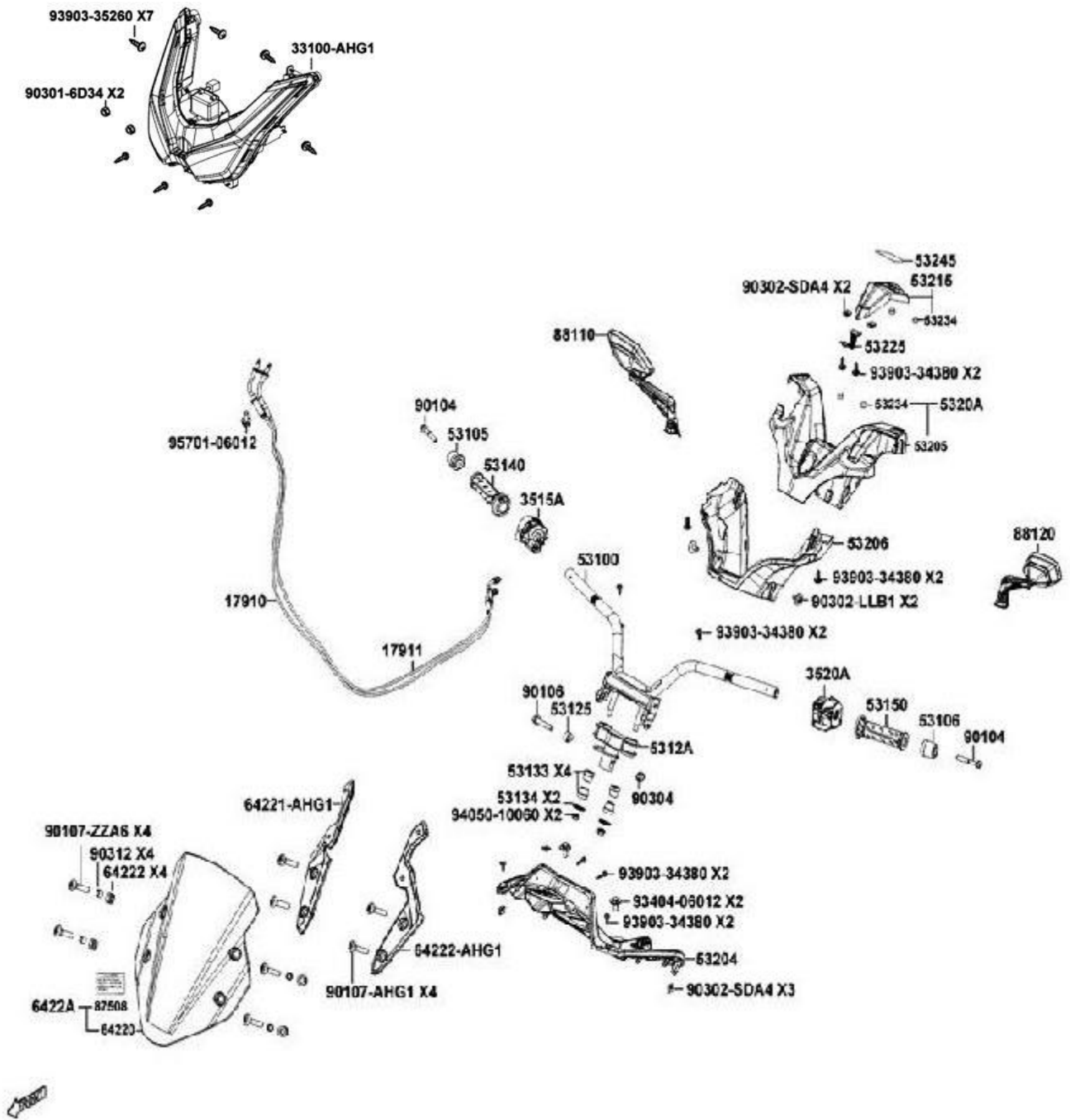


8.5. Poor performance at low and idle speed

Possible Causes



2. External components, Exhaust pipe



2

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1. Service Information

1.1. General Instructions

- When removing frame covers, use care not to pull them by force because the cover joint claws may be damaged.
- Make sure to route cables and harnesses according to the Cable & Harness Routing.

1.2. Torque value

Item	Torque (kgf·m)	Remarks
Exhaust pipe fixing bolts (tighten on the rear fork)	3.5~4.5	
Exhaust pipe front end nuts	1.8~2.2	
Other bolts on the exhaust pipe	1.8~2.2	
O2 sensor	2.5	

1.3. Troubleshooting

Excessive exhaust noise

- Broken exhaust system
- Exhaust gas leaks

Poor performance

- Deformed exhaust system
- Clogged muffler
- Exhaust gas leaks

2. External Components Removal

2.1. Wind screen

Remove the bolts and Allen bolts.

Remove the wind screen and brackets.

Install in the reverse order of work.



2.2. Front cover

Remove the plastic screws.



Remove the screws.

Remove the front cover.

Install in the reverse order of work.

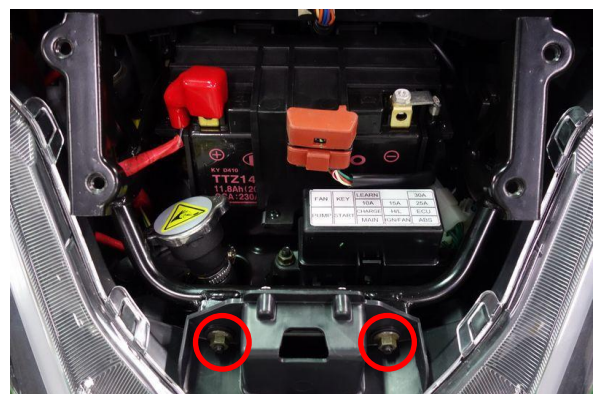


2.3. Headlight assy

Remove the wind screen.

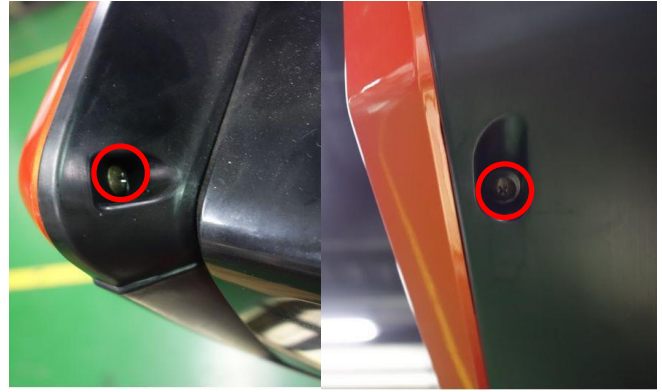
Remove the front cover.

Remove the nuts.



2. External components, Exhaust pipe

Remove the screws on each side of cover.



Remove the leg shields mat and floor mats on each side of cover.

Remove the screws.

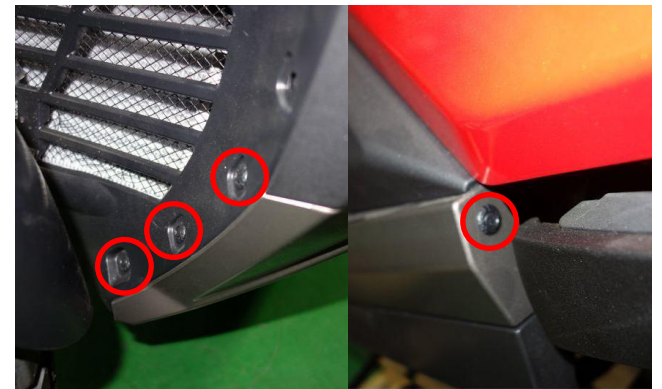


Side covers

Remove the plastic screws on each side of the under cowl.

Remove the plastic screw on rear part of the side cover. Repeat the process on the other side cover.

Remove the side covers.



Remove the screws on each side.

Remove the headlight assy.

Install in the reverse order of work.



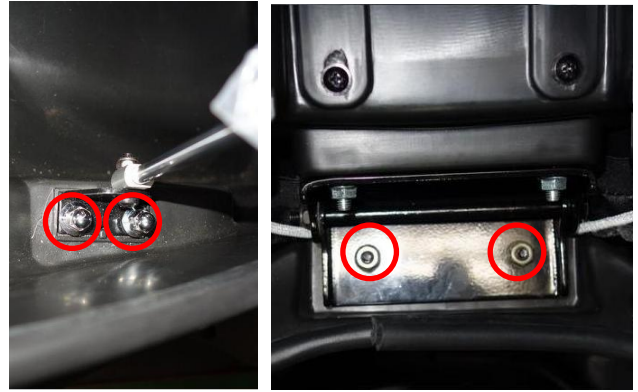
2.4. Seat

Open the seat.

Remove the nuts.

Remove the seat.

Install in the reverse order of work.



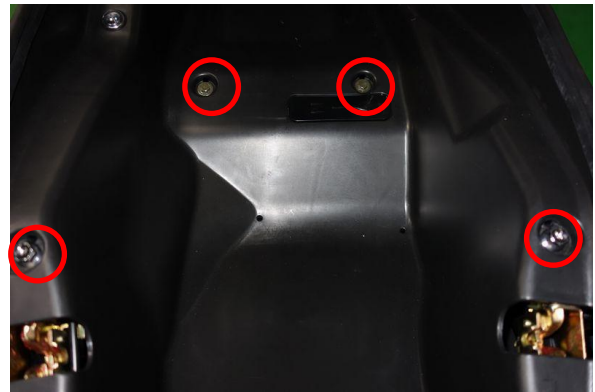
2.5. Luggage box

Remove the bolts and nuts.

Disconnect the luggage box light connector.

Remove the luggage box.

Install in the reverse order of work.

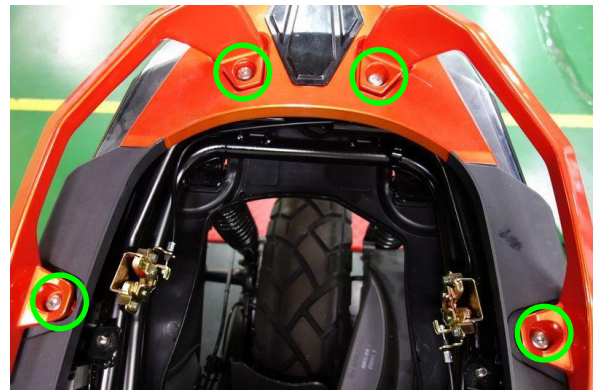


2.6. Rear carriers

Remove the Allen bolts on the each rear carrier.

Remove the rear carriers.

Install in the reverse order of work.



2.7. Center cover

Remove the plastic screws.

Pull the center cover back and up to remove it.

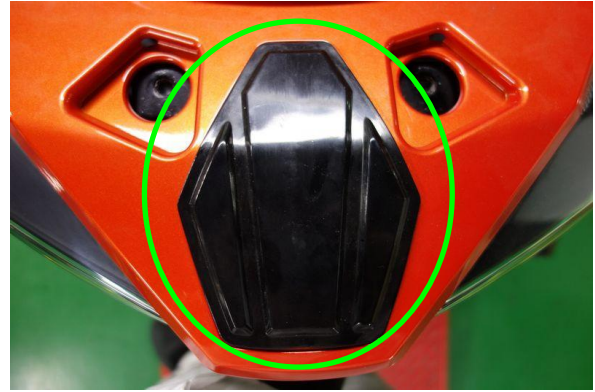
Install in the reverse order of work.

※ Do not damage the joint claws when removal.

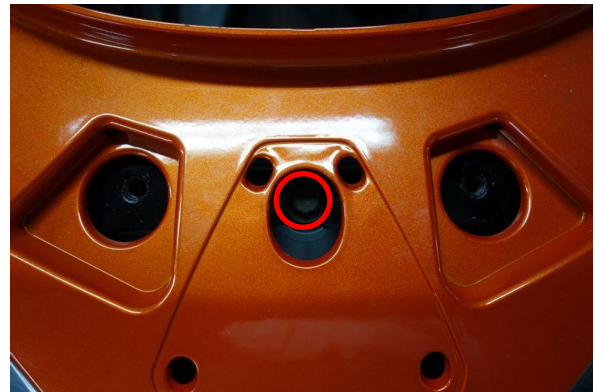


2.8. Tail light assy

Remove the center rubber cover.



Remove the bolt.

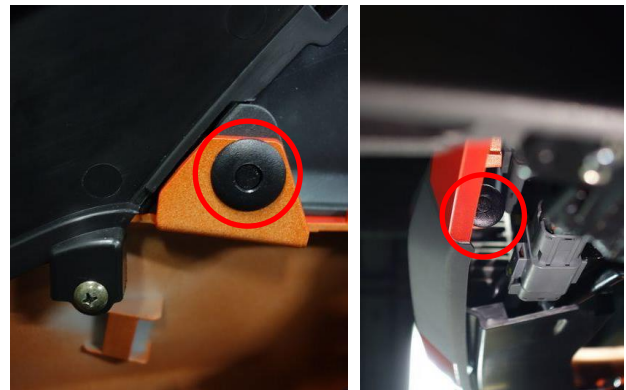


Remove the plastic screws on the upper and down side of each side cover.

Disconnect all connectors of tail light assy.

Remove the tail light assy.

Install in the reverse order of work.

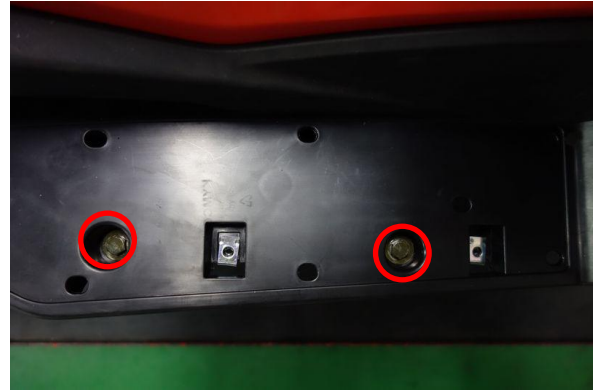


2.9. Floor panel assy

Remove the upper and lower bolts on the each side.



Remove the bolts on each side of floor panels.



Remove the plastic screw on each side of the leg shield.

Remove the floor panel assy.

Install in the reverse order of work.



2.10. Meter cover

Remove the wind screen.

Remove the front cover.

Remove the headlight assy.

Remove the plastic screws.



Remove the screw on each side of the meter cover.



2. External components, Exhaust pipe



Loosen the screw of ignition switch cover.
Turn the cover counterclockwise.
Pull out the cover but do not over pull it.
Disconnect the connector.

Remove the ignition switch cover.

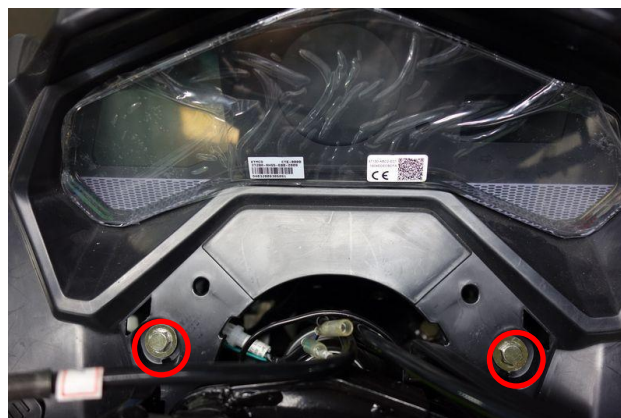


Use a proper tool to pry out the lid.
Remove the key cover.

Lid Key cover



Remove the bolts.



Remove the plastic screw on each side of the meter cover.
Disconnect the connector of the meter.
Remove the meter cover.

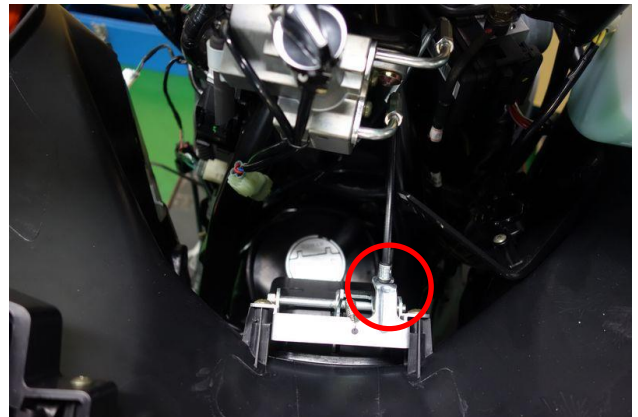


2.11. Leg shield

Remove the bolt on each side of the cover.



Remove the cable of the fuel filling cap cover.
Remove the leg shield.



Install in the reverse of work.

2.12. Handlebar covers

Remove the bolts on each side of lower handlebar cover.



Disconnect the USB connector.
Remove the upper handlebar cover.

Remove the throttle cables.
Remove the screws on the lower handlebar cover.
Remove the lower handlebar cover.



Install in the reverse order of work.

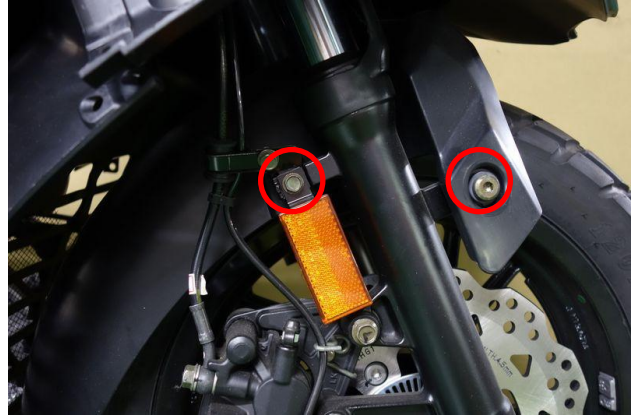
※ Do not damage the joint claws during removal.

2.13. Front fender

Remove the Allen bolt and the bolt on each side of the front fender.

Remove the front fender.

Install in the reverse order of work.



2.14. Rear fenders

Remove the bolts on the lower rear fender.

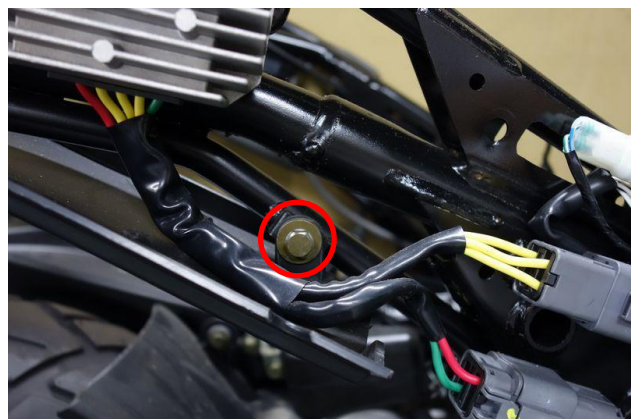
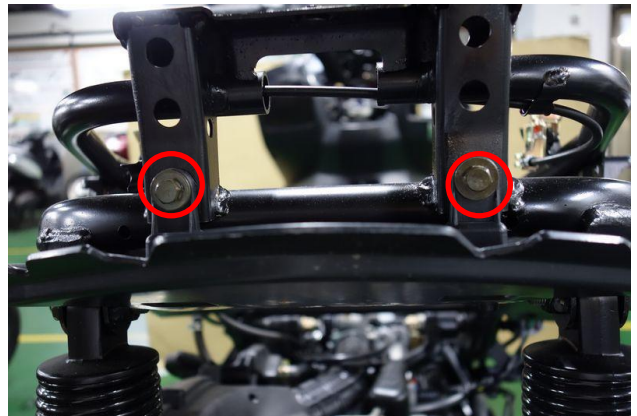
Remove the lower rear fender.

Remove the bolts on the upper rear fender.

Remove the bolt on each side of the upper rear fender.

Remove the upper rear fender.

Install in the reverse order of work.

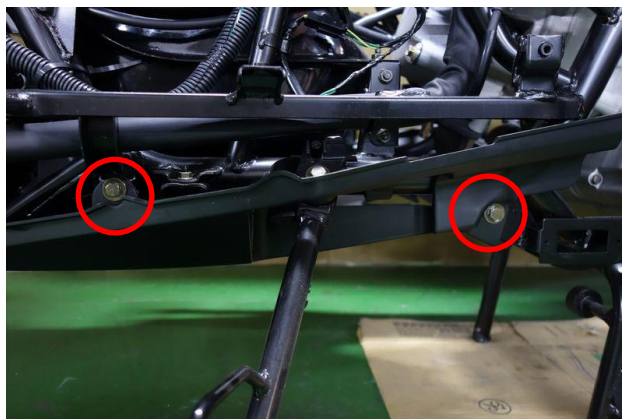


2.15. Undercover

Remove the bolts on each side of the undercover.

Remove the undercover.

Install in the reverse order of work.

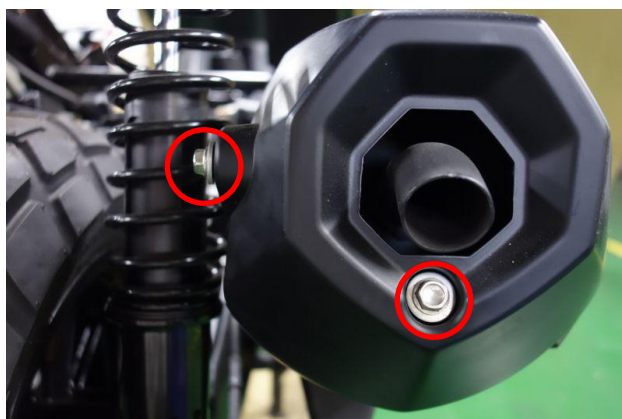


2.16. Muffler cover

Remove the bolts.

Remove the muffler cover.

Install in the reverse order of work.



3. Exhaust assembly

3.1. Muffler

Remove the Allen bolt.

Remove the bolts.

Remove the muffler

Install in the reverse order of work.



3.2. Exhaust pipe

Remove the muffler.

Disconnect the O2 sensor connector.

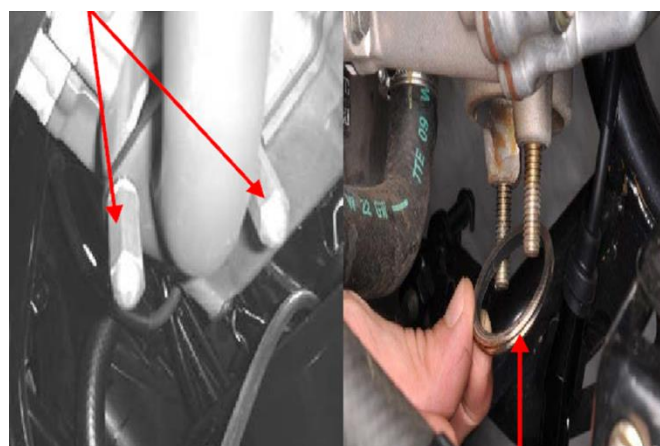
Remove the nuts on the front end of the exhaust pipe.

Remove the gasket.

Install in the reverse order of work.

※ **Replace a new gasket after remove the exhaust pipe.**

Nuts



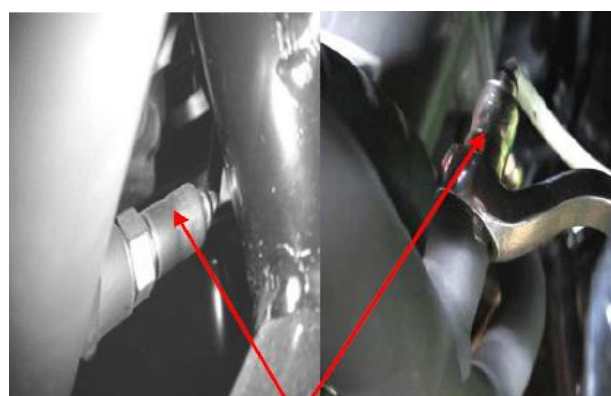
Gasket

Torque value

Item	Torque value
Front end nuts	1.8~2.2kgf·m
Bolts	3.5~4.5kgf·m
Allen bolt	1.8~2.2 kgf·m
O2 sensor	2.5kgf·m

※ **Do not damage the O2 sensor and twist the cable.**

※ **Tighten the O2 sensor to the specific value to prevent water infiltration.**



O2 sensor

Periodic Maintenance

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1. Service Information

1.1. Warning

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

1.2. Specifications

Throttle Grip Free Play	2~6 mm	
Spark Plug	NGK: CPR7E	
Spark Plug Gap	0.7~0.8 mm	
Valve Clearance	IN: 0.1 mm	EX: 0.1 mm
Idle Speed	1700±100 rpm	
Cylinder Compression	12±2 kgf/cm	
Engine Oil Capacity	At disassembly : 1.5 L	
	At change : 1.3 L	
Gear Oil Capacity	At disassembly : 0.23 L	
	At change : 0.20 L	
Coolant Capacity	Total: 1719 cc	Radiator: 766 cc
		Reservoir: 590 cc
		Hose: 363 cc
Ignition Timing	ECU control	

Tire

	1 Rider (60 kg)	2 Riders (120 kg)
Front	2.0 kgf/cm ²	2.0kgf/cm ²
Rear	2.25 kgf/cm ²	2.25 kgf/cm ²

Tire specification

Front	120/80-14 58S
Rear	150/70-13 64S

Torque values

Front axle	2.0 kgf-m
Rear axle nut	12 kgf-m

2. Maintenance Schedule

Perform the pre-ride inspection at each scheduled maintenance period.

This interval should be judged by odometer reading or months, whichever comes first.

I: INSPECT AND CLEAN, ADJUST, LUBRICATE OR REPLACE IF NECESSARY

C: CLEAN

R: REPLACE

A: ADJUST

L: LUBRICATE

The following maintenance schedule specifies all maintenance required to keep your scooter in peak operating condition. Maintenance work should be performed in accordance with standards and specifications of KYMCO by properly trained and equipped technicians. Your KYMCO dealer meets all of these requirements.

* Should be serviced by your KYMCO dealer, unless the owner has the proper tools and service data and is mechanically qualified.

* * In the interest of safety, we recommend these items be serviced only by your KYMCO dealer.

KYMCO recommends that your KYMCO dealer should road test your scooter after each periodic maintenance is carried out.

NOTES:

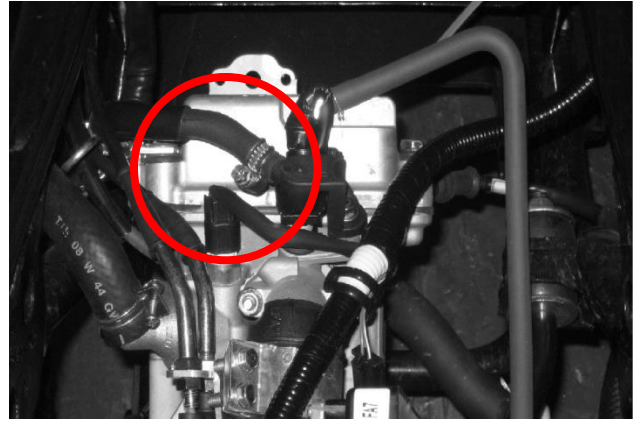
1. For higher odometer readings, repeat by the service interval illustrated here.
2. Service more frequently for long-term riding in unusually wet or dusty areas.
3. Service more frequently for long-term riding in rain or with full throttle.
4. Inspect every 5000 km (3000 mi) after replacement and replace every 10000 km (6000 mi).
5. Replace every 5000km (3000mi) or every 6 months. Replacement requires mechanical skill.
6. Replace every 2 years. Replacement requires mechanical skill.

3. PERIODIC MAINTENANCE

Frequency		Which Ever Comes First	Odometer Reading (Note1)							
			Throttle Operation							
Item	Note	→	X1000 km	1	5	10	15	20	25	30
		↓	X1000 mi	0.6	3	6	9	12	15	18
		Month	1	6	12	18	24	30	36	
*	Air Cleaner	Note2			R	R	R	R	R	R
	Spark Plug	Note4			I	R	I	R	I	R
*	Throttle Operation				I	I	I	I	I	I
*	Valve Clearance				I	A	I	A	I	A
*	Fuel Line					I		I		I
	Crankcase Breather	Note3		C	C	C	C	C	C	C
*	Engine Oil			R	R	R	R	R	R	R
*	Engine Oil Screen				C	R	C	R	C	R
*	Engine Oil Filter			R	R	R	R	R	R	R
*	Engine Idle Speed					I		I		I
*	Transmission Oil	Note5		R	R	R	R	R	R	R
*	Drive Belt				I	I	I	R	I	I
**	Radiator coolant				I	R	I	R	I	R
**	Clutch Shoe Wear					I		I		I
	Brake Fluid	Note6			I	R	I	R	I	R
	Brake Pad Wear				I	I	I	I	I	I
	Brake System				I	I	I	I	I	I
*	Brake Light Switch				I	I	I	I	I	I
**	Steering Bearings				I	I	I	I	I	I
*	Headlight Aim				I	I	I	I	I	I
*	Nuts, Bolts, Fasteners				I	I	I	I	I	I
**	Wheels/ Tires				I	I	I	I	I	I
**	Injector				D	C	D	C	D	C
**	Coolant Level Check				I	R	I	R	I	R

3. Fuel Line

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

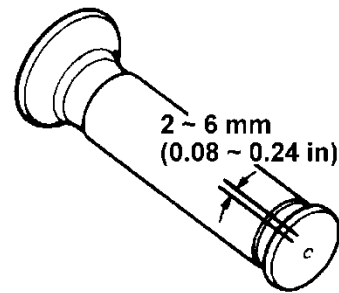


4. Throttle Operation

Check the throttle grip for smooth movement.

Measure the throttle grip free play.

Free Play: 2~6 mm



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

When the free play has been moved into specification hold the adjuster in place and tighten the locknut securely. Adjust the closing cable as needed for a proper throttle action.

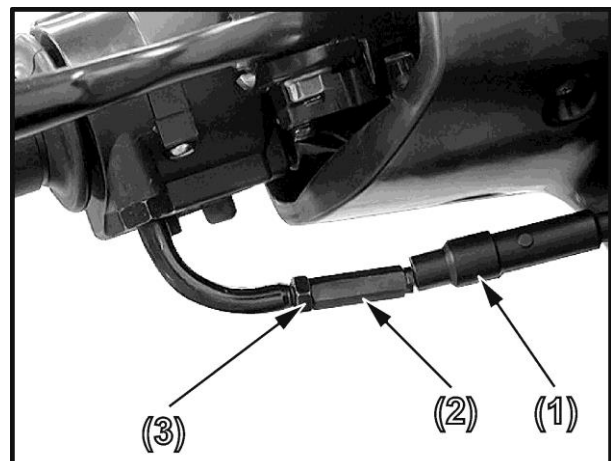


Adjust nut

Lock nut

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

Slide the rubber cover (1) out and adjust by loosening the lock nut (3) and turning the adjusting nut (2).

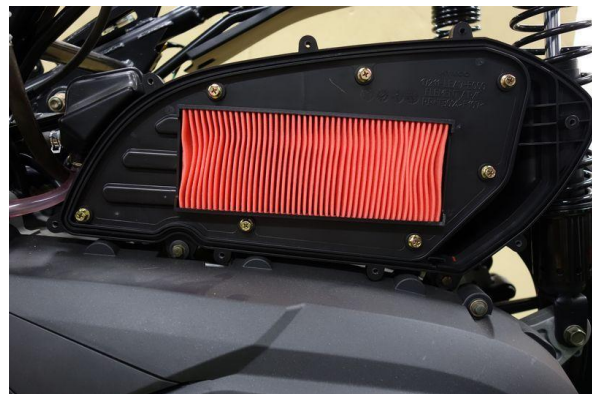


5. Air Cleaner

1. Remove the screws from the air cleaner cover, and then remove air cleaner cover.
2. Remove screws from the air cleaner element, then remove and discard this air cleaner element.
3. The new air cleaner element installation is in the reverse order of removal.

Use the KYMCO genuine air cleaner element or an equivalent air cleaner element specified for your model. Using the wrong KYMCO air cleaner element or a non-KYMCO air cleaner element which is not of equivalent quality may cause premature engine wear or performance problems.

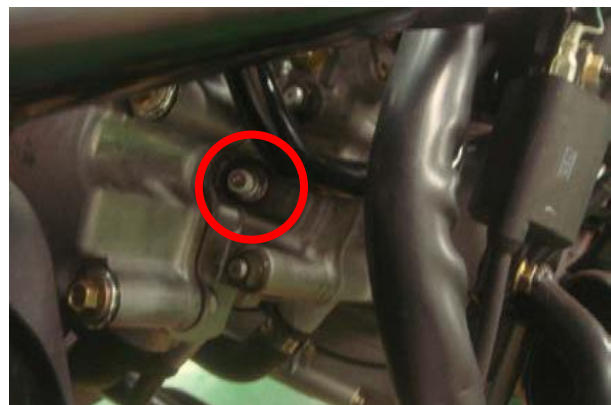
※ **The air cleaner should be serviced at regular intervals. Service more frequently when riding in unusually wet or dusty areas.**



6. Spark Plug

Remove the spark plug cap and spark plug
Check the spark plug for wear and fouling deposits.

Clean any fouling deposits with a spark plug cleaner or a wire brush.



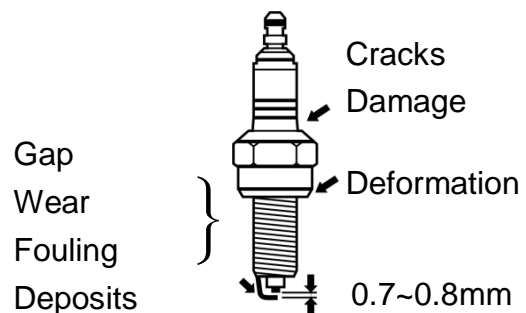
Specified Spark Plug: CPR7E (NGK)

Measure the spark plug gap.

Spark Plug Gap: 0.7~0.8 mm

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

Torque: 0.8~1.2 kgf-m (8~12 N-m)



7. Valve Clearance

7.1. Inspection

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

Remove the four bolts, and then remove cylinder head cover.

Cylinder head cover



Bolts

Remove the timing inspection cap from the right side of the engine with a large flat blade screwdriver. Inspect the O-ring on the cap and replace it as needed.

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



Turn crankshaft clockwise until the "T" mark aligns with the index notch in the timing inspection hole.

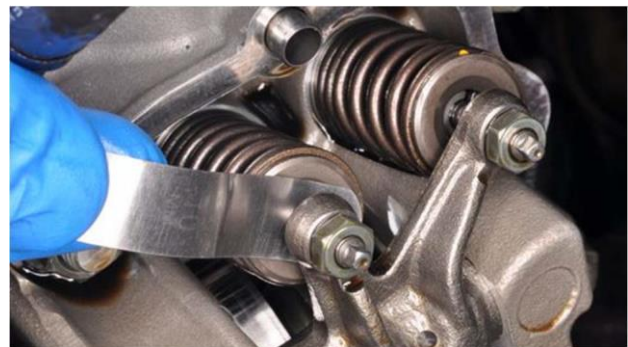
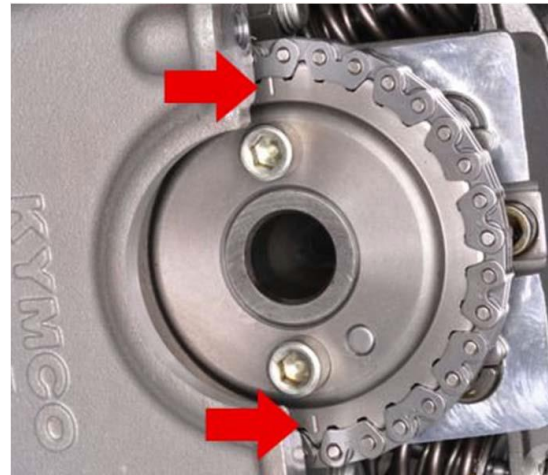


For correct engine timing the marks on the camshaft sprocket must be even with the cylinder head mating surface at the same time the "T" mark is lined up with the with the index notch in the timing inspection hole. Also the camshaft sprocket mounting boss should be visible above the cylinder head surface.

If this is not the case, rotate the crankshaft 360° clockwise until the "T" mark is once again aligned with the notch on the case cover.

Measure the valve clearance with a thickness feeler gauge. Insert the feeler gauge between the tappet adjusting screw and the valve stem. The clearance is correct when there is a light drag on the feeler gauge. The clearance is the same for the exhaust and intake valves. If the clearance is out of spec move on to the adjustment section.

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



7.2. Adjustment

Place a 9 mm box end wrench over the locknut, and loosen the locknut. If the valve clearance is tight back out the valve tappet adjusting screw with the tappet adjustment tool. If the clearance is too loose turn in the adjusting screw until there is a light drag on the feeler gauge. Hold the adjusting screw locknut in place with the wrench to make sure it doesn't interfere with the adjustment. Lubricate the tappet adjusting screw threads with fresh engine oil. Hold the adjuster in place and tighten the locknut. Always recheck the clearance after tightening the locknut. Also, recheck after turning the engine over and back to TDC on the compression stroke.

Install the removed parts in the reverse order of removal.

Make sure the O-rings on the crankshaft and timing plugs are in good condition.

Replace them as needed. Install the timing inspection and crankshaft caps to the right side of the engine. Tighten the caps securely but not overly with a large flat blade screwdriver.



Torque: 0.7~1.1 kgf-m

Special tool:

Valve adjuster A120E00012

8. Cylinder Compression

Warm up the engine before compression test.

Remove the center cover and spark plug cap. Remove the spark plug.

Insert a compression gauge.

Open the throttle valve fully and push the starter button to test the compression.

Compression: 12±2 kgf/cm²

If the compression is low, check for the following:

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

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

9. Engine Oil

9.1. Engine oil

recommendation

Use a premium quality 4-stroke motor oil to ensure longer service life of your scooter. Use only oils which are rated, SJ under the API service classification. The recommended viscosity is SAE 5W-50. If SAE 5W-50 motor oil is not available, select an alternative according to the right chart.

Engine oil capacity:

At disassembly:

1.2 L (0.968 Imp qt, 1.166 US qt)

At change:

1.0L

9.2. Engine oil level check

Check the engine oil level each day before riding the scooter.

The level must be maintained between the upper and lower level marks on the oil filler cap/dipstick.

1. Start the engine and let it idle for a few minutes.
2. Stop the engine and put the scooter on its center stand on level ground.
3. After a few minutes, remove the oil filler cap/dipstick, wipe it clean, and reinsert the oil filler cap/dipstick without screwing it in. Remove the oil filler cap/dipstick. The oil level should be between the upper and lower marks on the oil filler cap/dipstick.
4. If required, add the specified oil up to the upper level mark. Do not overfill.
5. Reinstall the oil filler cap/dipstick. Check for oil leaks.

※ Let the engine and exhaust system cool before working in those areas.



9.3. Engine oil replacement

Engine oil quality is the chief factor affecting engine service life. Change the engine oil as specified in the maintenance schedule.

When running in very dusty conditions, oil changes should be performed more frequently than specified in the maintenance schedule.

Please dispose of used engine oil in a manner that is compatible with the environment. We suggest you take it in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash or pour it on the ground or down a drain.

1. Remove the oil filler cap/dipstick (1) from the right crankcase cover.
2. Place a container under the left crankcase.
3. Remove the oil drain plug (2) to drain the oil.
4. Reinstall the drain plug and tighten the drain plug to specification.

Oil drain plug torque: 2.5 kgf-m

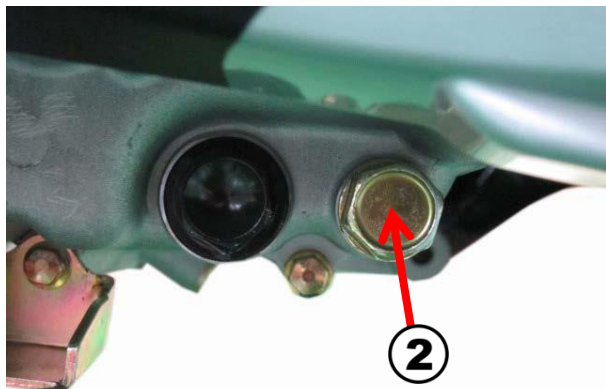
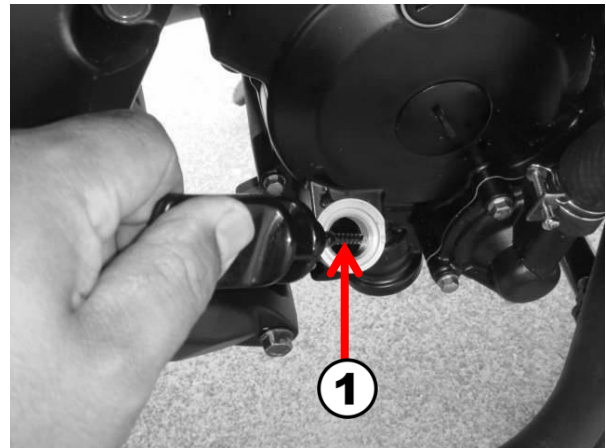
5. Fill the crankcase with the recommended grade oil and install the oil fill cap.

Oil capacity (after draining): 1.0 liter

6. Start the engine and let it idle for 2–3 minutes.
7. Stop the engine and check that the oil level is at the upper level mark on the oil filler cap/dipstick with the scooter upright on firm, level ground. Make sure there are no oil leaks.

Used engine oil may cause skin cancer if repeatedly left in contact with the skin for prolonged periods. Although this is unlikely unless you handle used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil.

Change the engine oil with the engine at normal operating temperature and the scooter on its center stand to assure complete and rapid draining.



※ Let the engine and exhaust system cool before working in those areas.

9.4. Oil strainer screen clean

Change the engine oil with the engine at normal operating temperature and the scooter on its center stand to assure complete and rapid draining.

※ **Let the engine and exhaust system cool before working in those areas.**

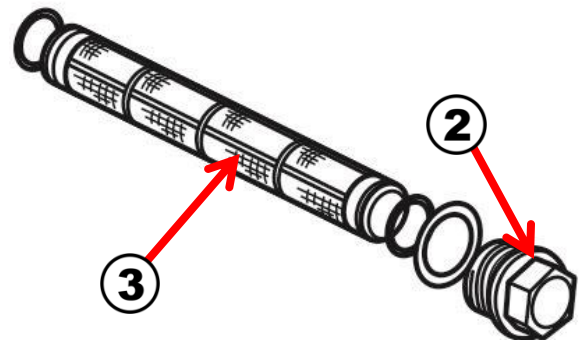
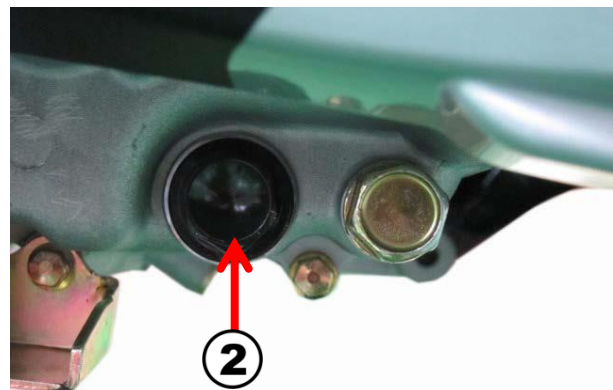
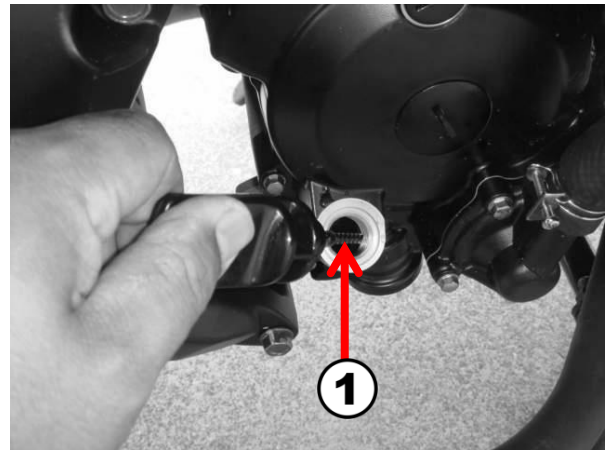
1. Remove the oil filler cap/dipstick (1) from the right crankcase cover.
2. Place a drain pan under the crankcase and remove the oil strainer screen cap (2).
3. The oil strainer screen (3) will come out when the drain plug is removed.
4. Let the engine oil drain out.
5. Clean the oil strainer screen.
6. Check that the oil strainer screen, sealing rubber and drain plug O-ring are in good condition.
7. Apply light coat engine oil on the O-rings.
8. Install the oil strainer screen, washer and oil strainer screen cap.

Oil strainer screen cap torque: 1.5 kgf-m

9. Fill the crankcase with the recommended grade oil and install the oil filler cap.

Oil capacity (after draining): 1.0 liter

10. Start the engine and let it idle for 2–3 minutes.
11. Stop the engine and check that the oil level is at the upper level mark on the oil filler cap/dipstick with the scooter upright on firm, level ground. Make sure there are no oil leaks.

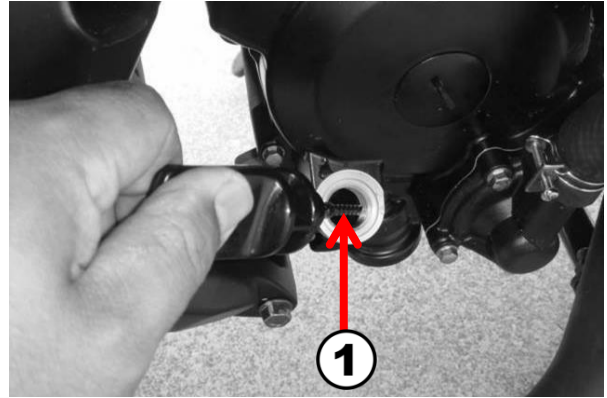


9.5. Oil filter replacement

Change the engine oil with the engine at normal operating temperature and the scooter on its center stand to assure complete and rapid draining.

※ **Let the engine and exhaust system cool before working in those areas.**

1. Remove the oil filler cap/dipstick (1) from the right crankcase cover.
2. Place a drain pan under the crankcase. Remove the oil filter cap and O-ring.



3. The spring will come out when the filter cap is removed. Let the engine oil drain out.
4. Remove and discard the oil filter.

※ **Do not remain the rubber seal on the oil filter in the oil filter housing.**



Check that the O-ring is in good condition.

5. Install the new oil filter.

Cap bolt torque: 1.2 kgf-m

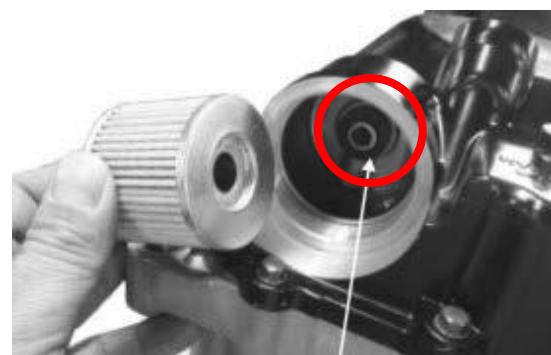
6. Install the spring, O-ring and cap.

Cap bolt torque: 1.2 kgf-m

7. Fill the crankcase with the recommended grade oil and install the oil filler cap.

Oil capacity (after draining): 1.0 liter

8. Start the engine and let it idle for 2—3 minutes.
9. Stop the engine and check that the oil level is at the upper level mark on the oil filler cap/dipstick with the scooter upright on firm, level ground. Make sure there are no oil leaks.

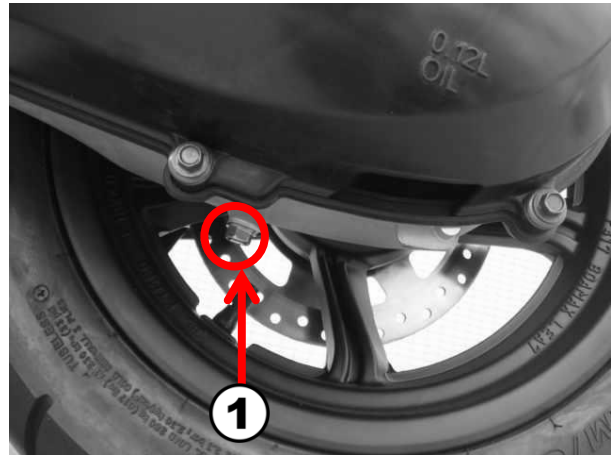


※ **Make sure the rubber seal on the oil filter facing the left crankcase.**

10. Transmission Oil

10.1. Oil change

1. Place the scooter in its center stand.
2. Place a drain pan under the drain bolt (1).
3. Remove the transmission oil drain bolt.



4. Remove the transmission oil filler bolt (2), slowly turn the rear wheel and drain the oil.

After draining the oil completely, install the oil drain bolt with a new sealing washer and tighten it.

Torque: 1.0kgf-m

5. Fill the transmission case with recommended oil.

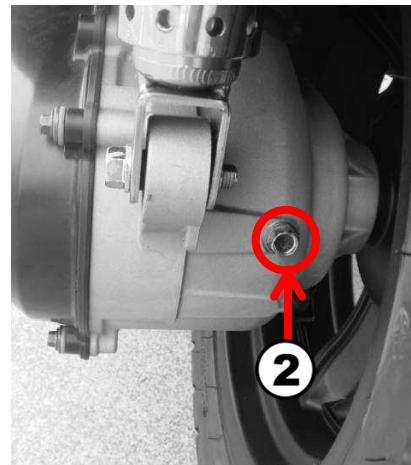
Recommended transmission oil:

SAE 90

Oil capacity (at draining): 0.2 liter

6. Install the transmission oil filler bolt with a new sealing washer and tighten it.

Torque: 1.0kgf-m



11. Idle Speed

※ It is not necessary to adjust idle speed for DOWNTOWN125i. The throttle body is factory pre-set, do not loosen or tighten the painted bolts and screws of throttle body. Loosening or tightening them can cause throttle and idle and valve synchronization failure.

Idle Speed: 1750±100 rpm

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

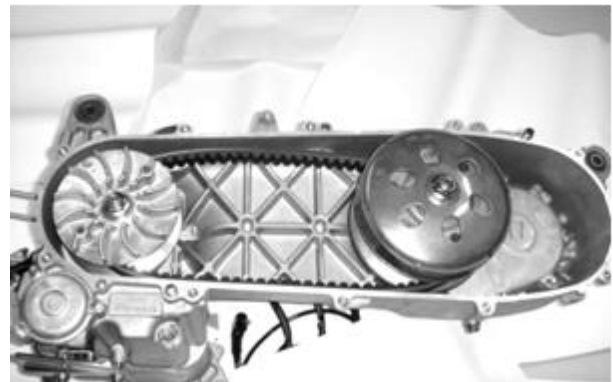
When the engine misses or run erratic, adjust the pilot screw.

12. Drive Belt

Remove the left crankcase cover.

Inspect the drive belt for cracks or excessive wear.

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



13. Clutch Shoe Wear

Start the engine and check the clutch operation by increasing the engine speed gradually.

If the scooter tends to creep, or the engine stalls, check the clutch shoes for wear and replace if necessary



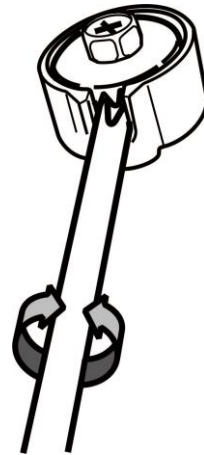
14. Headlight Aim

Remove the front cover

Place the scooter on a level surface

Adjust the headlight beam adjuster.

A clockwise rotation moves the beam up and counterclockwise rotation moves the beam down.



15. Coolant

15.1. Inspection

Check the coolant level through the inspection window at the right side of main switch with the scooter in an upright position on a level ground.

If the coolant level is below the LOWER level mark, remove the reserve tank cap to add coolant mixture until it reaches the F level mark.

Always add coolant to the reserve tank. Do not attempt to add coolant by removing the radiator cap.

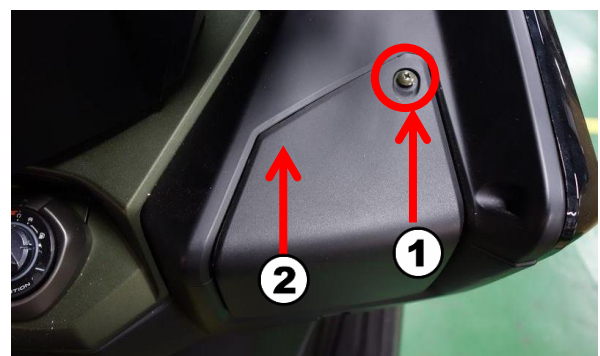
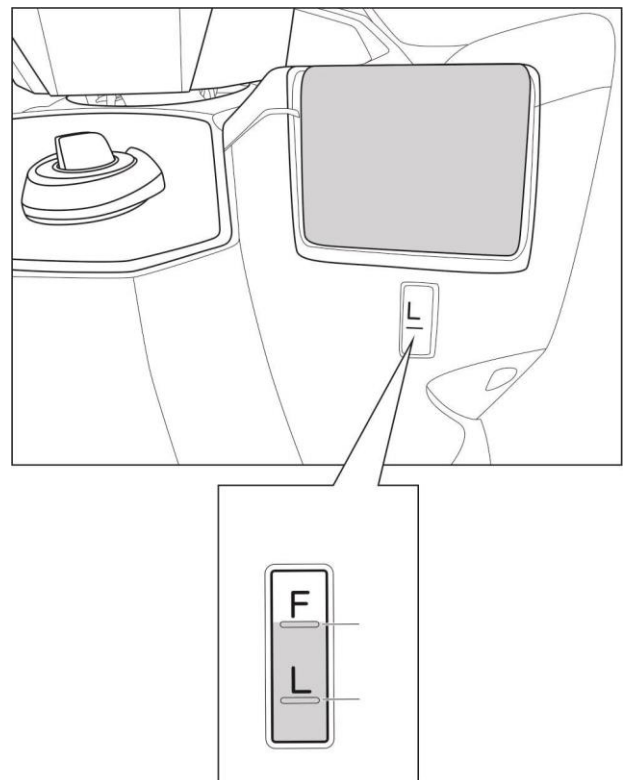
If the reserve tank is empty, or if coolant loss is excessive, check for leaks and see your KYMCO dealer for repair.

15.2. Add coolant

Remove the screw (1).

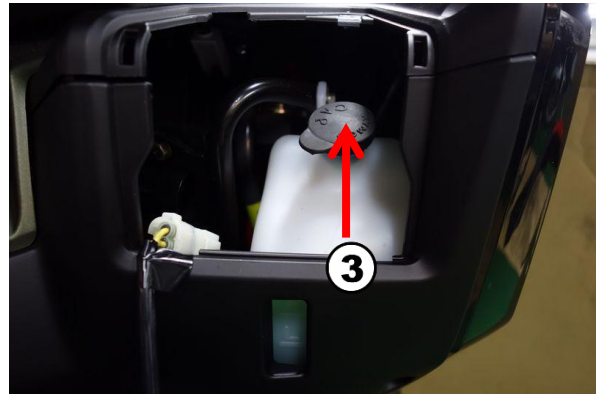
Press the cover at (2) part to release the joint claw.

Remove the cover.



Remove the reserve tank cap to add coolant mixture until it reaches the F level mark.

- ※ **Removing the cap while the engine is hot that can cause the coolant to spray out, seriously scalding you. Always let the engine and radiator cool down before removing the cap.**
- ※ **Using poor quality coolant may shorten the service life of radiator. Please be careful.**
- ※ **Use only low mineral drinking water or distilled water for mixing cooling liquid.**



15.3. Coolant recommendation

The owner must properly maintain the coolant to prevent freezing, overheating, and corrosion, use only high quality ethylene glycol antifreeze containing corrosion protection inhibitors specifically recommended for use in aluminum engines. (See antifreeze container label.)

Use only low-mineral drinking water or distilled water as a part of the antifreeze solution. Water that is high in mineral content or salt may be harmful to the aluminum engine.

Using coolant with silicate inhibitors may cause premature wear of water pump seals or blockage of radiator passages.

Using tap water may cause engine damage. The factory provides a 50:50 solution of antifreeze and distilled water in this scooter. This coolant solution is recommended for most operating temperatures and provides good corrosion protection.

A higher concentration of antifreeze decreases the cooling system performance and is recommended only when additional protection against freezing is needed. A concentration of less than 40:60 (40% antifreeze) will not provide proper corrosion protection. During freezing temperatures, check the cooling system frequently and add higher concentrations of antifreeze (up to a maximum of 60% antifreeze) if required.

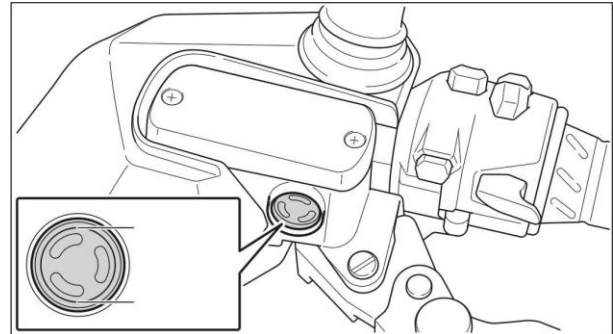
16. Brake

16.1. Brake fluid

Brake fluid level

With the scooter in an upright position, check the front and rear fluid level. It should be above the lower level mark. If the level is at or below the lower level mark "L", check the brake pads for wear.

Worn pads should be replaced. If the pads are not worn, have your brake system inspected for leaks.



The recommended brake fluid is **DOT 4** brake fluid from a sealed container, or an equivalent.

Other checks:

Make sure there are no fluid leaks. Check for deterioration or cracks in the hoses and fittings.

※ **Warning: Brake fluid is very caustic and can damage paint, chrome and plastic. Wipe up any spills immediately.**

16.2. Brake pad wear

Brake pad wear depends upon the severity of usage, the type of riding, and road conditions. (Generally, the pads will wear faster on wet and dirty roads.) Inspect the pads at each regular maintenance interval.

Front brake

Check the cutout in each pad.

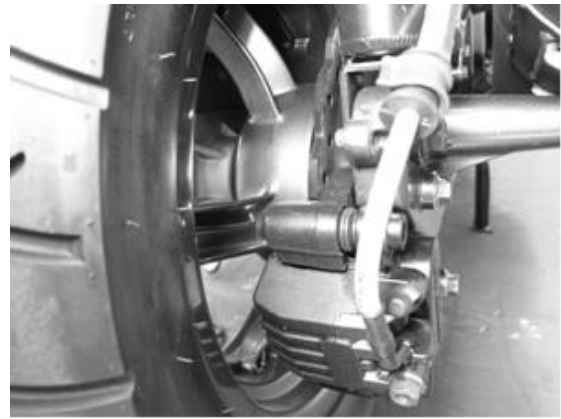
If either pad is worn to the cutout, replace both pads as a set. See your KYMCO dealer for this service.



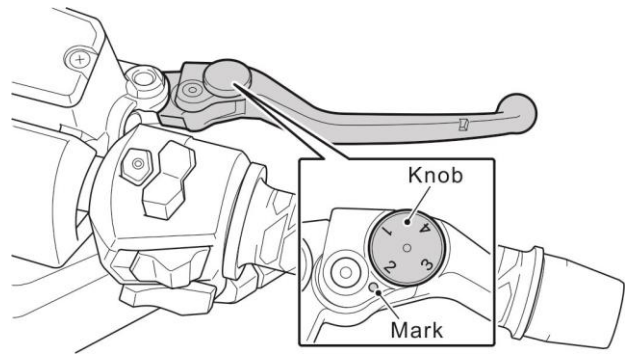
Rear brake

Check the cutout in each pad.

If either pad is worn to the cutout, replace both pads as a set. See your KYMCO dealer for this service.

**16.3. Brake levers**

1. Adjust brake lever clearance using adjustment knob (totally 4 adjustment positions).
2. Push the brake lever forward and then turn the adjuster knob to align the number with the round punch mark on the lever
3. After adjustment, release the Brake Lever and check if the lever position is suitable for driver



※ The distance from the grip to the released lever is at its closest at number 1 and the furthest away at number 4.

17. Nuts/Bolts/Fasteners

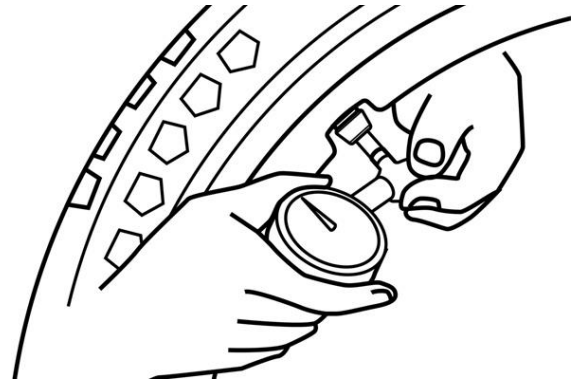
Check all important chassis nuts and bolts for looseness.

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

18. Wheels/Tires

18.1. Tire pressure

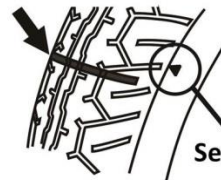
Insufficient air pressure in the tires not only hastens tire wear but also seriously affects the stability of the scooter. Under inflated tires make smooth cornering difficult and overinflated tires decrease the amount of tire in contact with the ground which can lead to skids and loss of control. Be sure that the tire pressure is within the specified limits at all times. Tire pressure should only be adjusted when the tires are cold.



Cold inflation tire pressure

	1 Rider (60 kg)	2 Riders (120 kg)
Front	2.0 kgf/cm ²	2.25 kgf/cm ²
Rear	2.0 kgf/cm ²	2.25 kgf/cm ²

Service limit indication

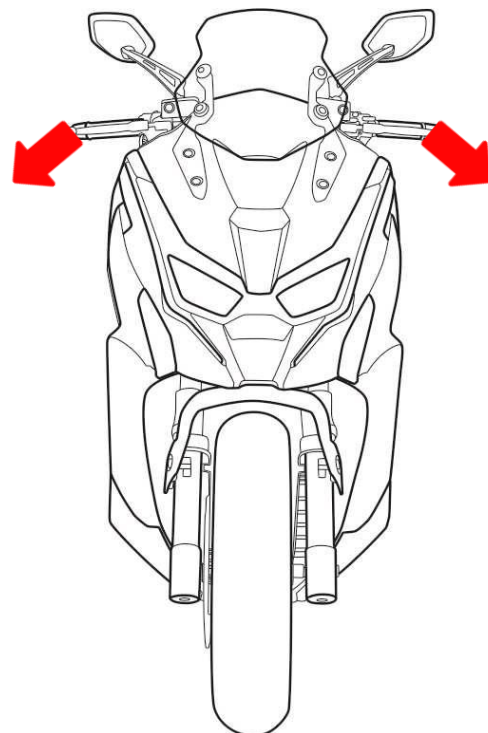


Service limit indication

19. Steering Handlebar

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

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



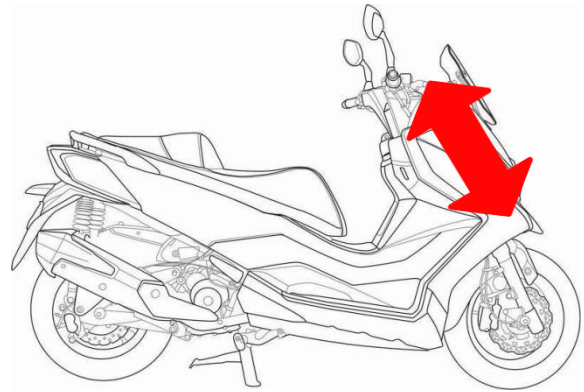
20. Suspension

Check the action of the front/rear shock absorbers by compressing them several times.

Check the entire shock absorber assembly for oil leaks, looseness or damage.

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

Replace the engine hanger bushings if there is any looseness.



20.1. Rear suspension adjustment

Each shock absorber has 5 adjustment positions for different load or riding conditions.

Use a fitting wrench to turn the adjuster's boss.

Position 1 is for light loads and smooth road conditions.

Position 3 to 5 increase spring preload for a more stiff rear suspension and can be used under heavy loading.



NOTE: Always adjust the shock absorber pre-load position in sequence (1-2-3-4-5 or 5-4-3-2-1). Attempting to adjust directly from 1 to 5 or 5 to 1 may damage the shock absorber.

Standard spring preload position: 3

21. Side Stand

Perform the following maintenance in accordance with the maintenance schedule.

21.1. Functional check:

Check the spring for damage or loss of tension and the side stand assembly for freedom of movement.

Check the side stand ignition cut-off system:

1. Place the scooter on its center stand.
2. Put the side stand up and start the engine.
3. Lower the side stand. The engine should stop as you put the side stand down.

If the side stand system does not operate as described, see your KYMCO dealer for service.



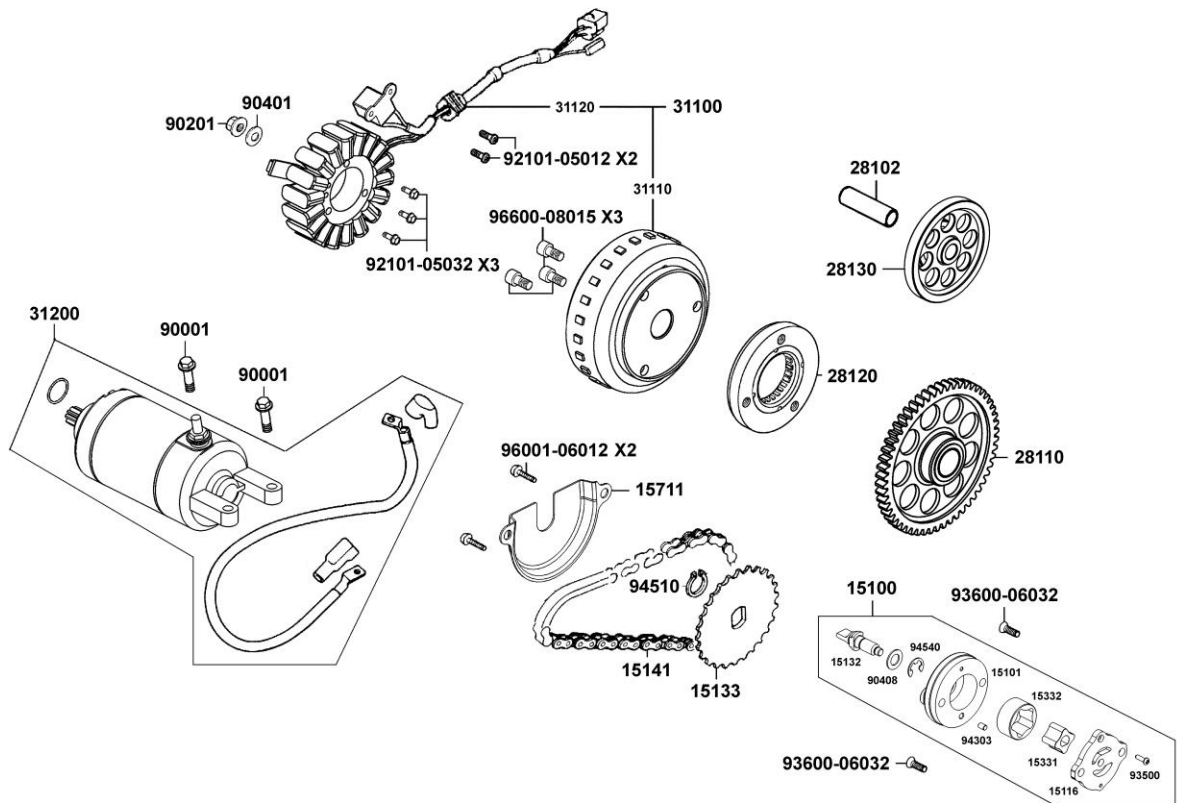
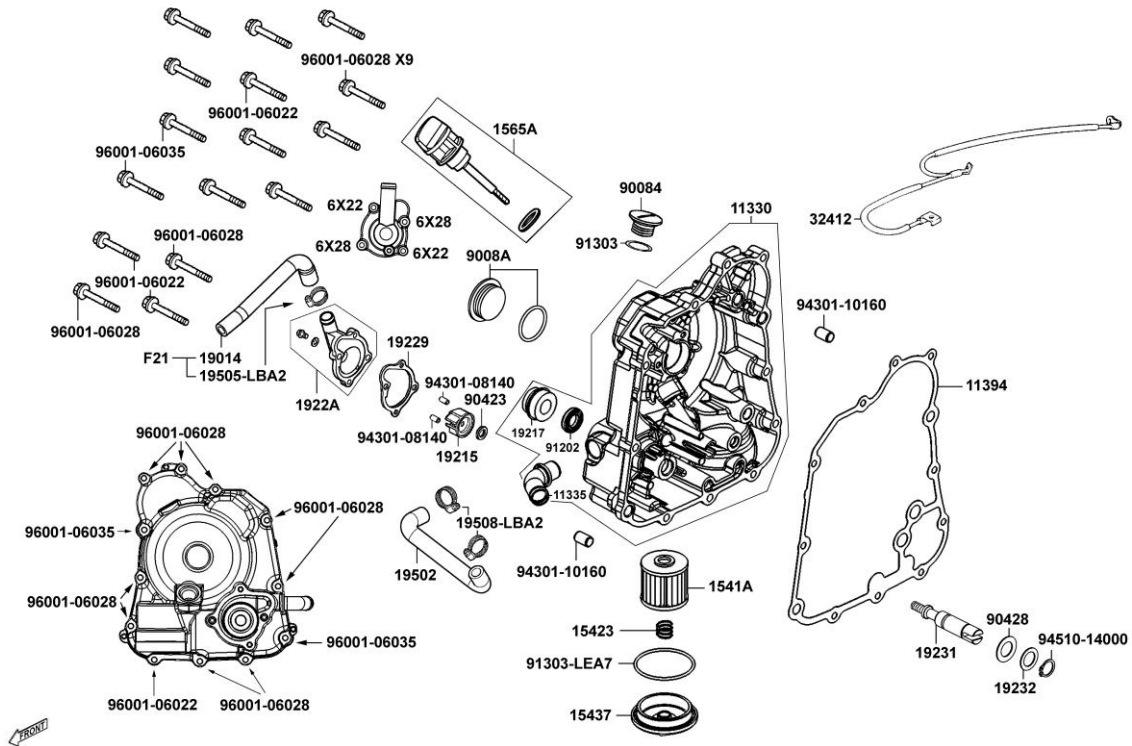
Side Stand Up



Side Stand Down

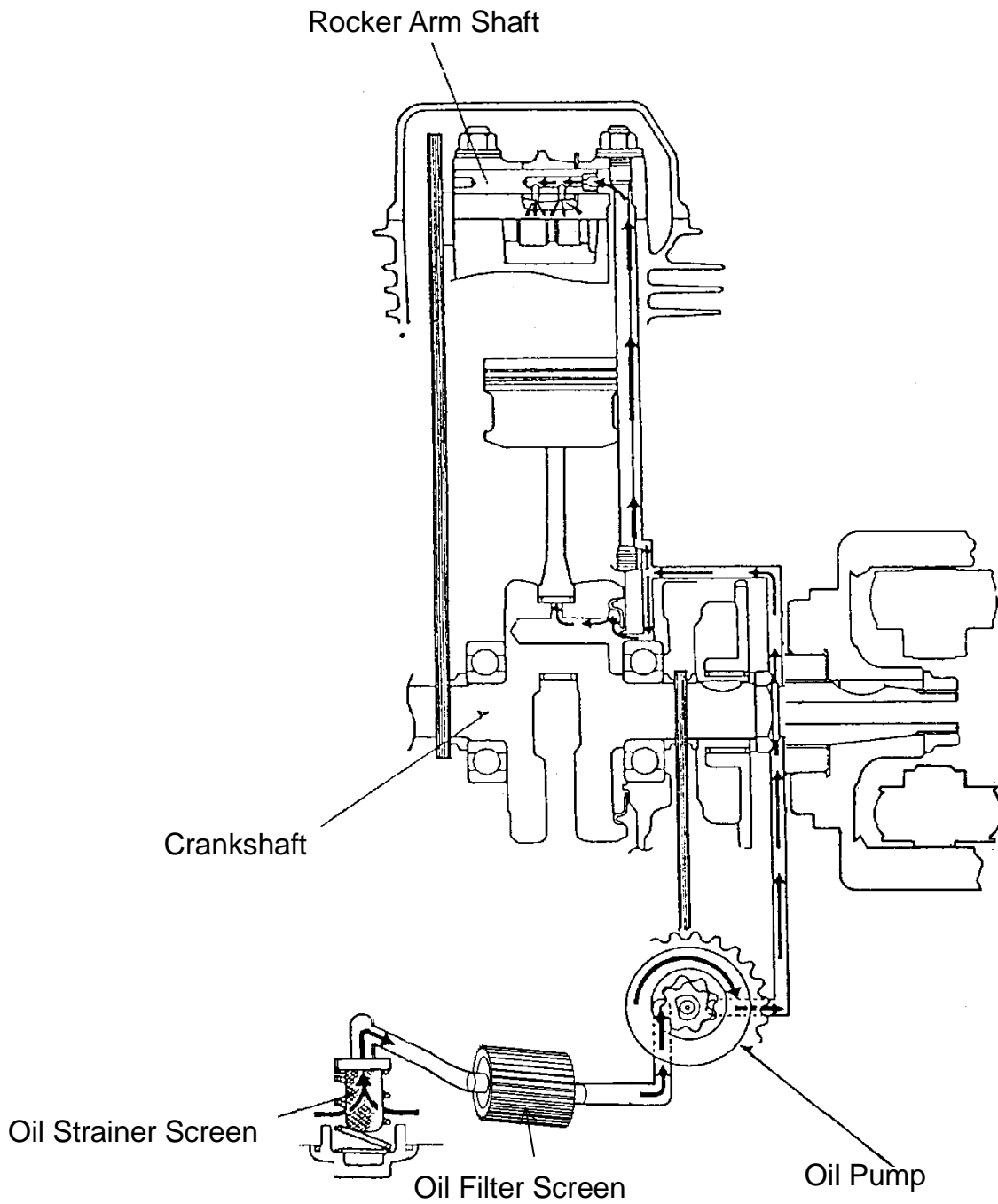
04. Lubrication System

Lubrication System



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1. Lubrication Diagram



2. SERVICE INFORMATION

2.1. GENERAL INSTRUCTIONS

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

2.2. SPECIFICATIONS

ENGINE OIL

Engine Oil Capacity	At disassembly	1.5 liter	
	At change	1.3 liter	
Recommended Oil		SAE 5W50	API: SJ

2.3. TROUBLESHOOTING

Oil level too low

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

Poor lubrication pressure

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

Oil contamination

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

3. Engine oil

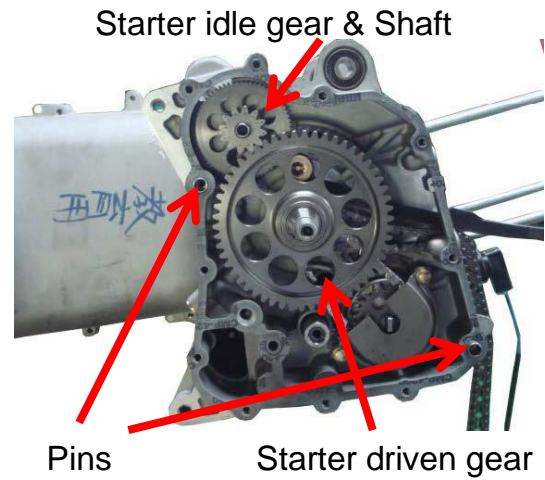
See the chapter 3 for more information.

4. Oil Pump

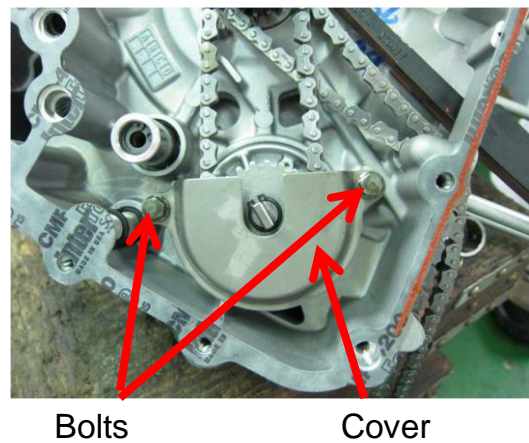
4.1. Removal

Drain the engine oil.

Remove the alternator cover, fly wheel, starter idle gear, shaft, pins and starter driven gear.

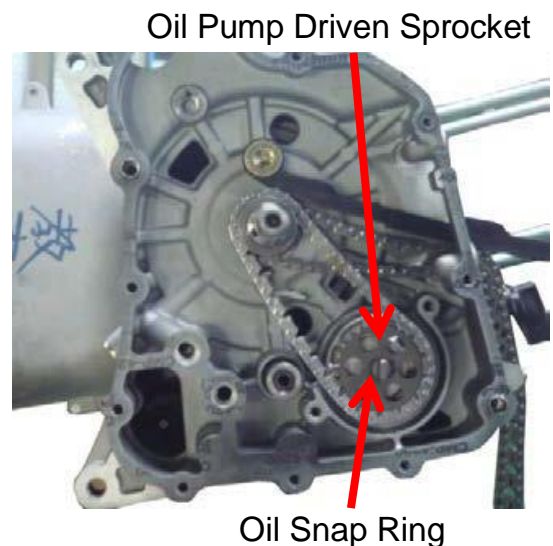


Remove the bolt and then oil pump cover.



Pry the snap ring off and remove the oil pump driven sprocket, then remove the oil pump drive chain.

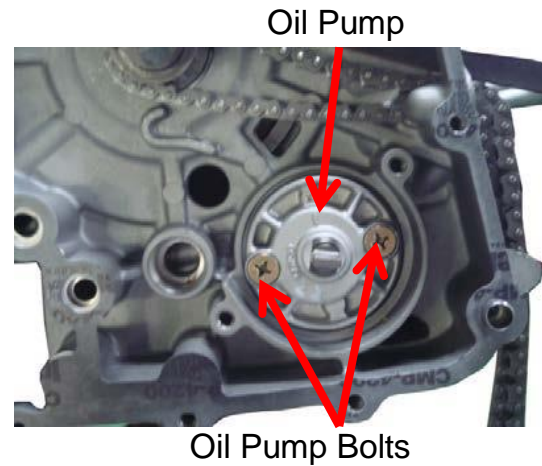
Inspect the oil pump drive chain and sprocket for signs of wear and damage. Replace the parts as needed.



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

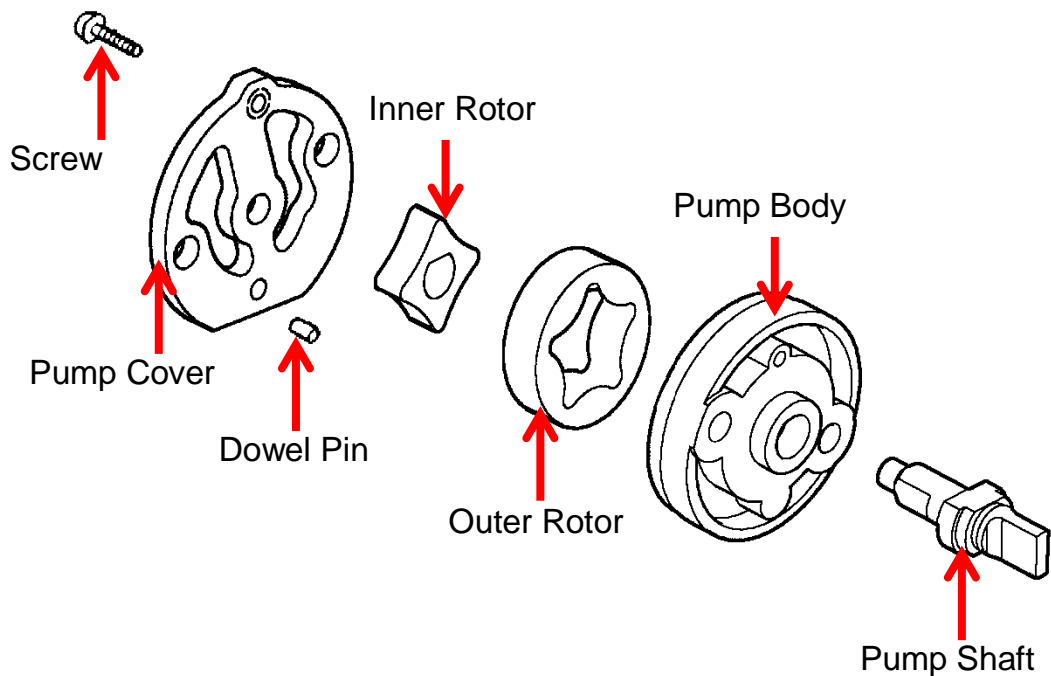
※ When removing and installing the oil pump, use care not to allow dust or dirt to enter the engine.

Turn the oil pump shaft by hand and make sure it turns smoothly. If the oil pump shaft will not rotate smoothly the oil pump should be replaced with a new unit.



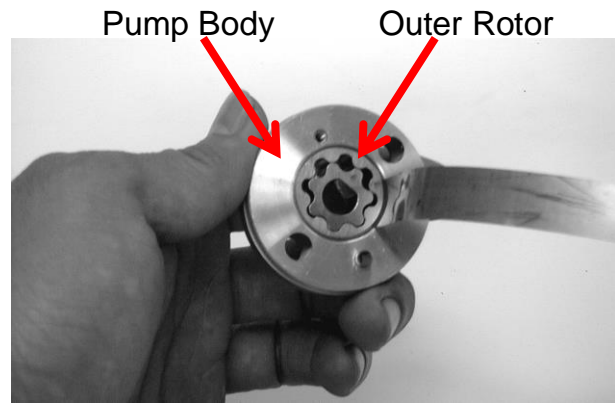
4.2. Disassembly

Remove the screw and disassemble the oil pump as shown.

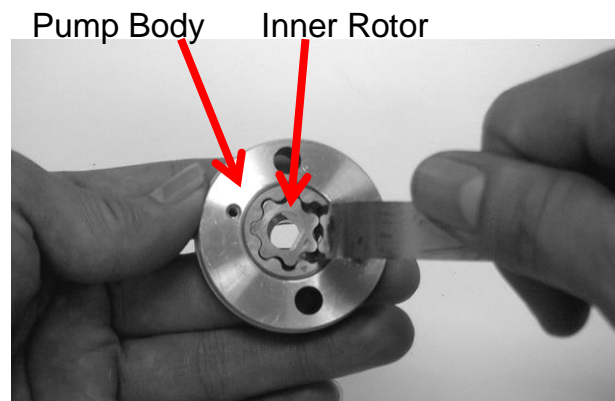


4.3. Inspection

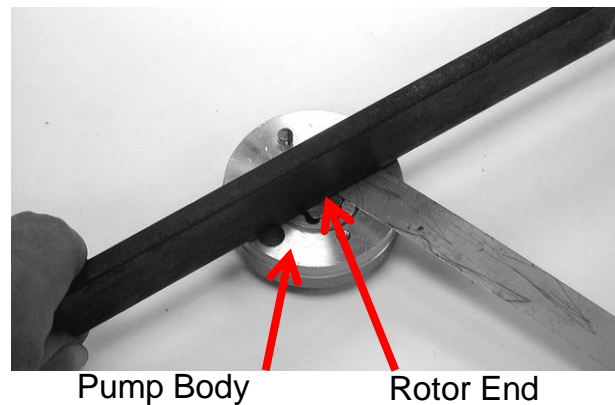
Measure the pump body-to-outer rotor clearance.



Measure the inner rotor-to-outer rotor clearance.



Measure the rotor end-to-pump body clearance.



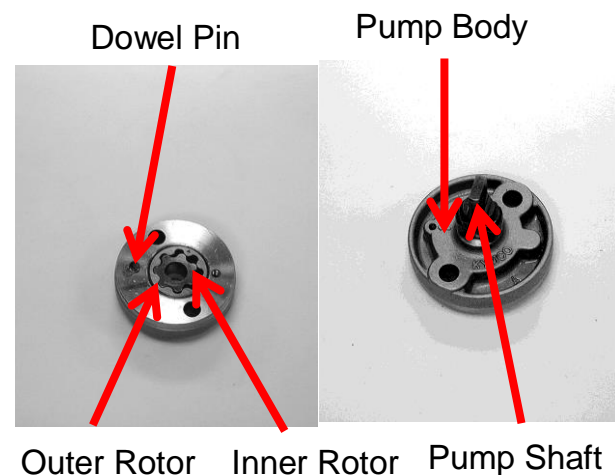
4.4. Assembly

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

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

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

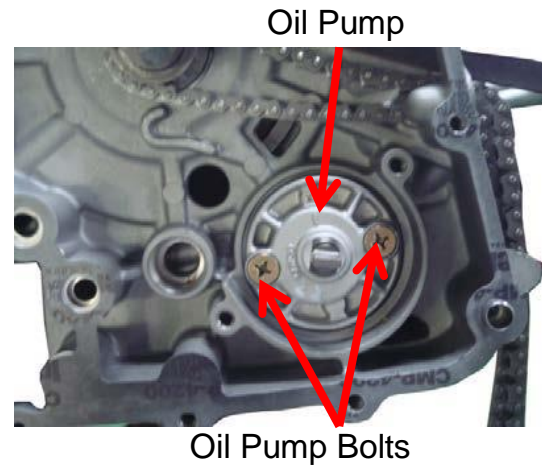
The mark is upside.



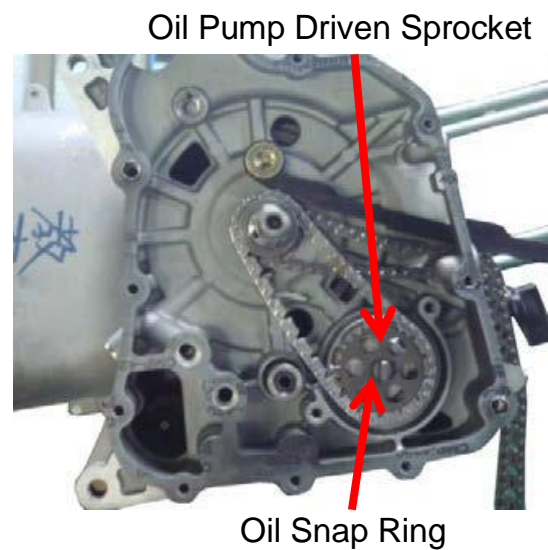
4.5. Installation

Install the oil pump and oil pump and tighten the two bolts.

※ **Make sure the pump shaft rotates freely and arrow mark which is on the oil pump is upside.**

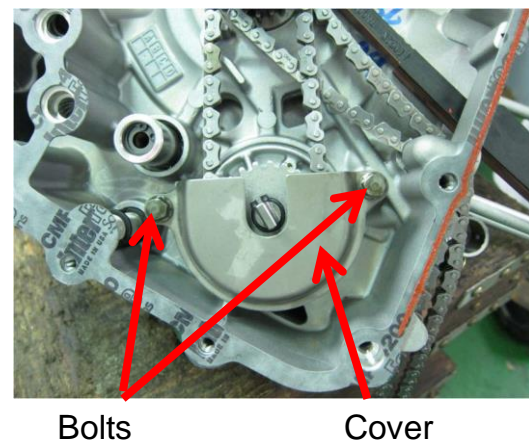


Install the pump drive chain and driven sprocket, then set the snap ring securely on the pump shaft.



Install the oil separator cover properly.

※ **Fit the tab of the pump cover into the slit in the pump.**



05. Engine Removal

Engine

1. ENGINE REMOVAL/INSTALLATION	4
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1.2. Installation.....	6

SERVICE INFORMATION**GENERAL INSTRUCTIONS**

- A floor jack or other adjustable support is required to support and maneuver the engine. Be careful not to damage the scooter body, cables and wires during engine removal.
- Use shop towels to protect the scooter body during engine removal.
- Drain the coolant before removing the engine.
- After the engine is installed, fill the cooling system with coolant and be sure to bleed air from the water jacket. Start the engine to check for coolant leaks.
- Before removing the engine, the rear brake caliper must be removed first. Be careful not to bend or twist the brake fluid tube.
- Place the scooter on the center stand.
- Remove the following external components:
 - Seat
 - Center Cover
 - Front Cover
 - Front Lower Cover
 - Foot Skirt
 - Rear Carrier
 - Body Cover
 - Under Cover
- Disconnect the cables from the battery terminals. See the Battery topic for more information.
- Remove the spark plug cap. See the Spark Plug topic for more information.
- Drain the coolant. See the Coolant topic for more information.
- Drain the engine oil. See the Engine Oil topic for more information.
- Remove the airbox. See the Airbox topic for more information.
- Remove the rear brake caliper. See the Rear Brake Caliper topic for more information.
- Remove the throttle body. See the Throttle Body Removal and Installation topic for more information.
- Remove the exhaust system. See the Exhaust System topic for more information.

SPECIFICATIONS

ENGINE OIL CAPACITY	at disassembly	1.5 L
	at change	1.3 L
COOLANT CAPACITY	Radiator capacity	0.766 L
	Reserve tank capacity	0.59 L
	Hot coolant hose	0.169 L
	Cold coolant hose	0.194 L
	Total capacity	1.719 L
TORQUE VALUES	Engine hanger bolts (Engine side)	5.0 kgf-m
	Engine hanger bolts (Frame side)	6.5 kgf-m
	Engine rear suspension mounting bolts	3.5 kgf-m
	Rear axle nut	12.0 kgf-m
	Rear shock absorber bolts	4.0 kgf-m
	Rear brake caliper mounting bolts	3.2 kgf-m

1. ENGINE REMOVAL/INSTALLATION

1.1. Removal

Remove the air cleaner.

Remove a bolt from fuel hose holder.

Disconnect the following connectors:

- Idle air bypass valve
- TPS
- WTS
- MAP
- Intake air pressure sensor
- O2 sensor
- Rectifier/ Regulator
- Fuel injector
- Thermostat

Remove the throttle cable.

Disconnect the fuel hose from fuel injector.

Remove the rubber cap on the starter motor lead.

Remove the starter motor lead nut. Free the cable lead from the starter motor. Thread the nut back on to keep track of it.

Disconnect the ground wire.

Loosen the water pump hose clamp with a #2 Phillips screwdriver. Slide up the clamp and free the coolant hose from the water pump. Allow any remaining coolant to drain into a suitable container.

Squeeze the air bleed hose clamp with needle nose pliers and slide back the clamp. Free the air bleed hose from the thermostat.

WTS connector



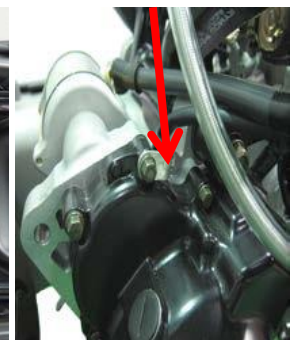
Fuel hose holder



Fuel injector



Ground wire



Air bleed hose



Coolant hose

Loosen the rear axle nut.

Support the scooter securely on its main stand.

Remove the bolts, and then remove the rear brake caliper.



Rear brake caliper bolts

Disconnect the alternator cord including the crank position sensor cord.



Remove the spark plug cap.



Remove the bolts.

Remove the shock absorbers.



Remove the engine mount nut.
Pull out the engine mount bolt.

Remove the engine from the frame.

※ **At removing the engine, be careful not to catch your hand or finger between the engine hanger and crankcase.**



1.2. Installation

Tighten the engine mounting bolts.

Torque: 5 kgf-m (Engine side)
6.5 kgf-m (Frame side)

Tighten the rear suspension bolts.

Torque: 3.5kgf-m

Tighten the right and left rear shock absorber lower mount bolts.

Torque: 4.0kgf-m

Tighten the rear axle nut.

Torque: 12.0kgf-m

Install the rear brake caliper and tighten the mount bolts.

Torque: 3.2 kgf-m

Installation is in the reverse order of removal.

※ **Install the cables and wires with the wire routine pics.**

After installation, inspect and adjust the following:

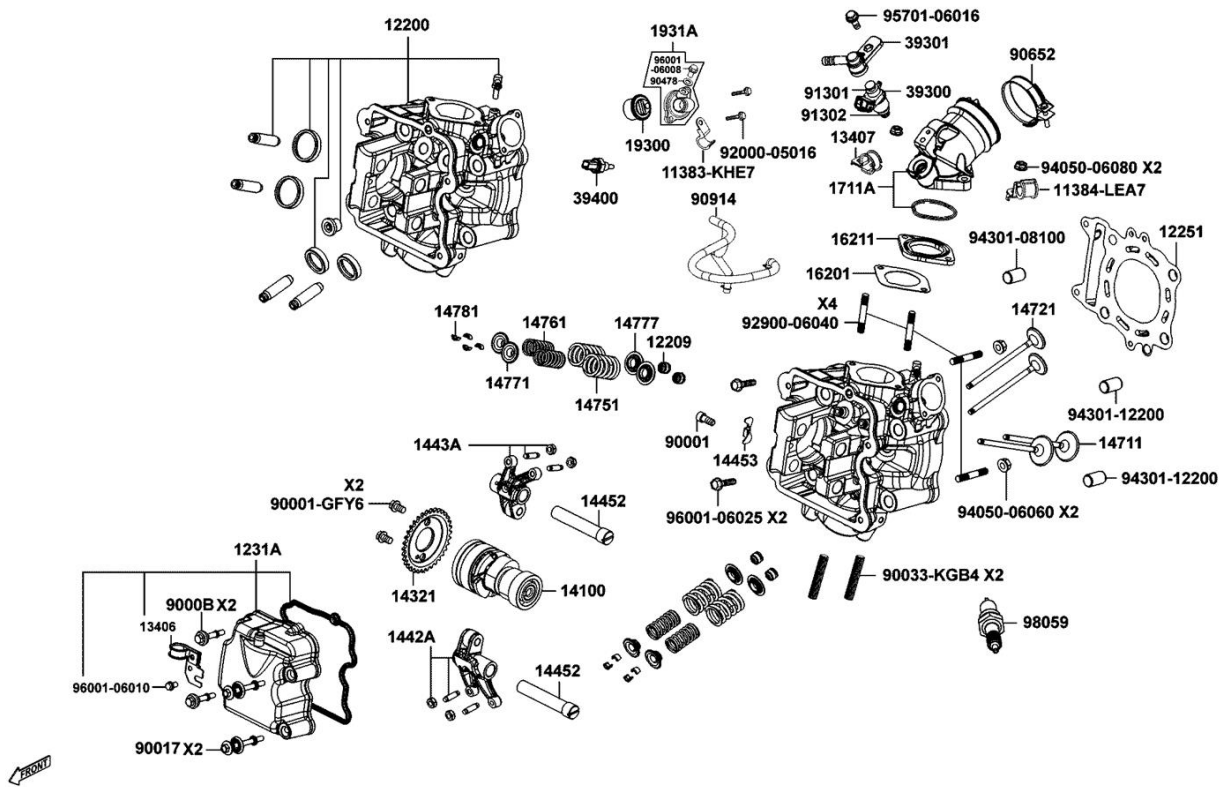
- Throttle grip free play
- Fill the cooling system with coolant and start the engine to bleed air from the system.

06. Cylinder Head & Valve

Cylinder Head/ Valve

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1. SCHEMATIC DRAWING



2. SERVICE INFORMATION

2.1. GENERAL INSTRUCTIONS

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

2.2. SPECIFICATIONS

Unit: mm

Item		Standard	Service Limit
Valve clearance (cold)	IN	0.1	—
	EX	0.1	—
Cylinder head compression pressure		12±2 kgf-cm ²	—
Camshaft cam height	IN	34.2987	33.89
	EX	34.1721	33.77
Valve rocker arm I.D.	IN	10.0~10.015	10.10
	EX	10.0~10.015	10.10
Valve rocker arm shaft O.D.	IN	9.972~9.987	9.91
	EX	9.972~9.987	9.91
Valve seat width	IN	1.2	2.0
	EX	1.2	2.0
Valve stem O.D.	IN	4.975~4.990	4.90
	EX	4.955~4.970	4.90
Valve guide I.D.	IN	5.00~5.012	5.30
	EX	5.00~5.012	5.30
Valve stem-to-guide clearance	IN	0.010~0.037	0.08
	EX	0.030~0.057	0.10

2.3. TORQUE VALUES

Item	Value	Remark
Cylinder head cover bolt	0.8~1.2 kgf-m	
Tensioner mounting bolt	1.0~1.4 kgf-m	
Tensioner sealing bolt	0.4 kgf-m	
Cylinder head nut	3.2~3.6 kgf-m	Apply engine oil to threads
Cylinder head bolt	0.7~1.1 kgf-m	
Valve clearance fixing nut	0.7~1.1 kgf-m	

2.4. SPECIAL TOOLS

Valve spring compressor: A120E00051

Valve adjuster: A120E00012

2.5. TROUBLESHOOTING

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

Poor performance at idle speed

Compression too low

White smoke from exhaust muffler

Worn valve stem or valve guide

Damaged valve stem oil seal

Compression too low

Incorrect valve clearance adjustment

Burned or bent valves

Incorrect valve timing

Broken valve spring

Poor valve and seat contact

Leaking cylinder head gasket

Warped or cracked cylinder head

Poorly installed spark plug

Abnormal noise

Incorrect valve clearance adjustment

Sticking valve or broken valve spring

Damaged or worn camshaft

Worn cam chain tensioner

Worn camshaft and rocker arm

Compression too high

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

White smoke from exhaust muffler

Worn valve stem or valve guide

Damaged valve stem oil seal

Excessive smoke from exhaust muffler

Worn or damaged piston rings

Worn or damaged cylinder and piston

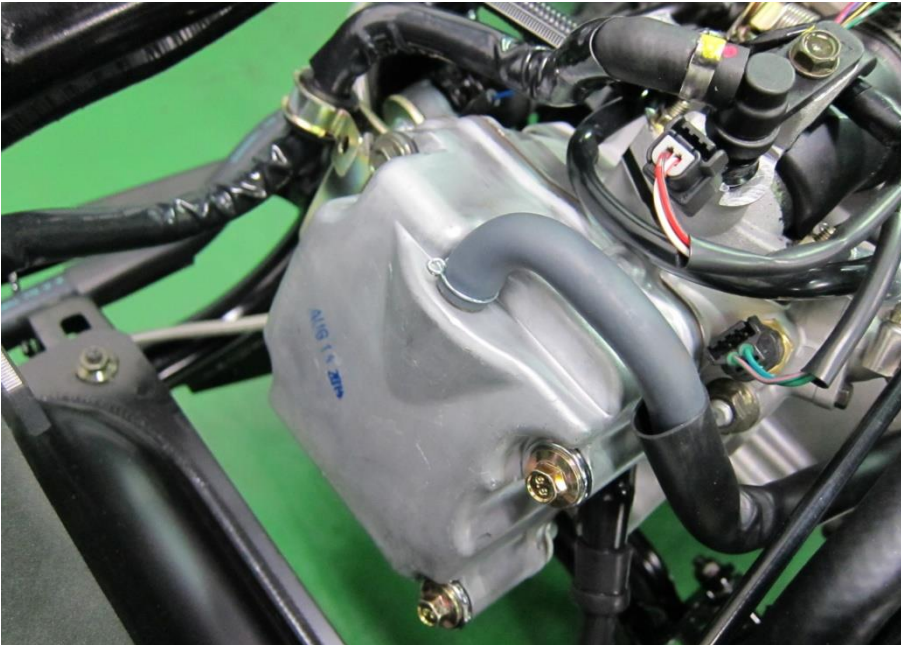
3. Cylinder Head Cover

SAFETY FIRST: Protective gloves and eyewear are recommended at this point.

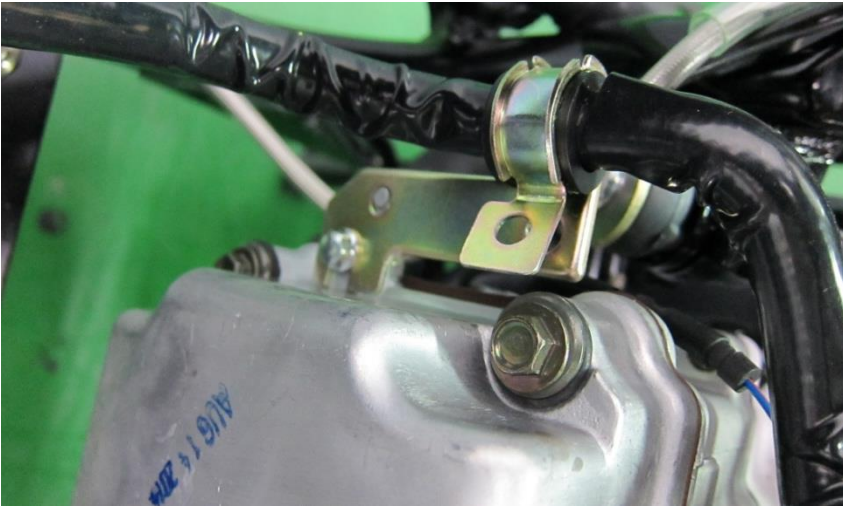
3.1. Removal

Remove the seat. See the Seat topic for more information.

Remove the luggage box. See the Luggage Box topic for more information.



Squeeze the breather hose clamp with needle nose pliers and slide it back. Remove the breather hose from the cylinder head cover.



Loosen the fuel hose stay bolt with an 8 mm socket. Free the fuel hose stay from the cylinder head cover.



Loosen the four cylinder head cover bolts with a 10 mm socket. Remove the cylinder head cover bolts with washers and grommets. Note the gold colored and longer bolts are on the left side.



Remove the cylinder head cover and gasket. Discard the gasket and replace it with a new item on installation.



Remove the dowel pin.

4. Camshaft

SAFETY FIRST: Protective gloves and eyewear are recommended at this point.

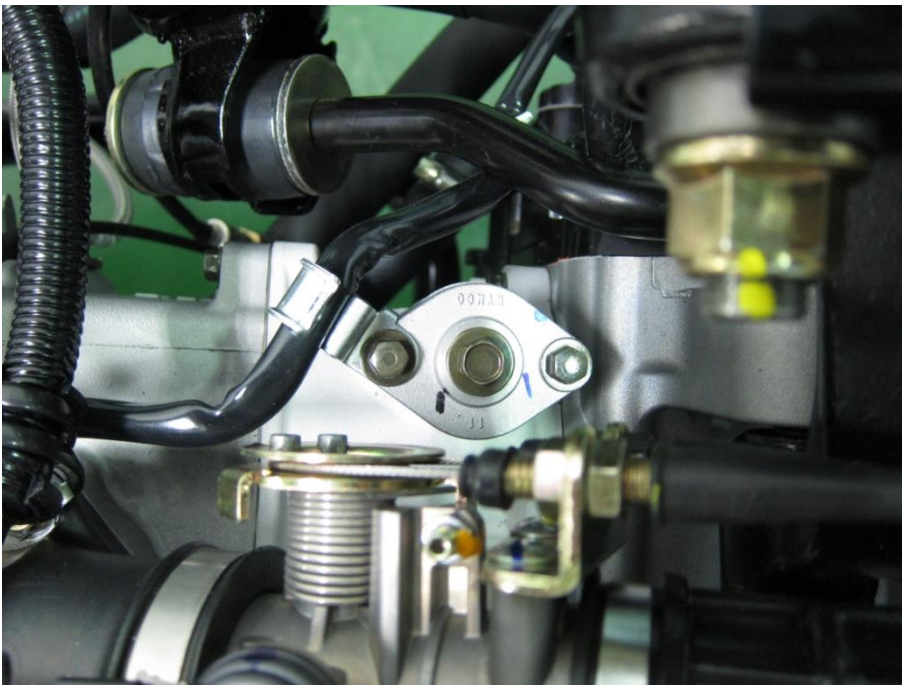
4.1. Removal

Remove the seat. See the Seat topic for more information.

Remove the luggage box. See the Luggage Box topic for more information.

Remove the spark plug. See the Spark Plug topic for more information.

Remove the cylinder head cover. See the Cylinder Head Cover topic for more information.



The cam chain tensioner is located on the back of the cylinder.



Remove the cam chain tensioner cap bolt with a 10 mm socket.



Loosen the cam chain tensioner mounting bolts evenly with an 8 mm socket.



Lift the cam chain tensioner out of the cylinder. Remove the cam chain tensioner gasket.



Use a 5 mm Allen wrench to remove the camshaft sprocket bolts.



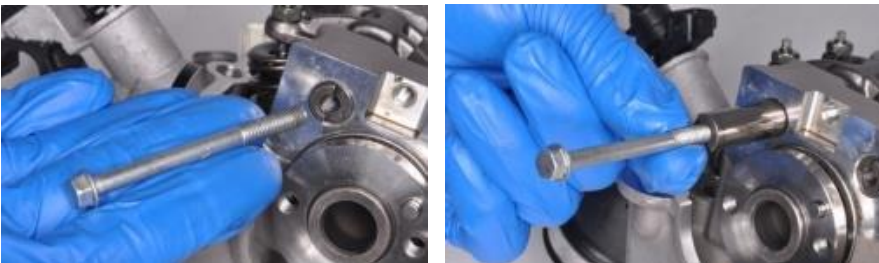
Remove the camshaft sprocket as shown. Support the chain so it does not fall into the cylinder head.



Use a 5 mm Allen wrench to remove the set plate bolt.



Remove the set plate as shown.



Thread a bolt into the rocker arm shafts and pull the shafts out.

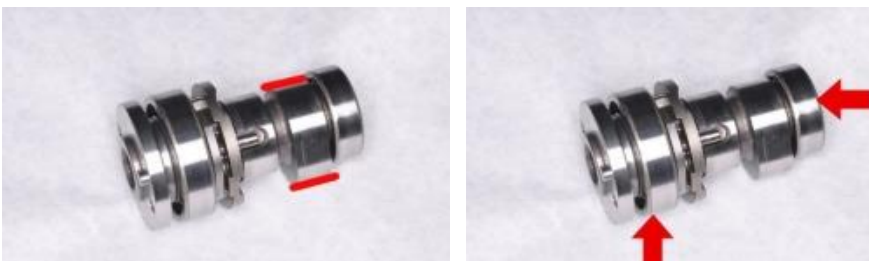


Lift out the rocker arms as the shafts are removed.



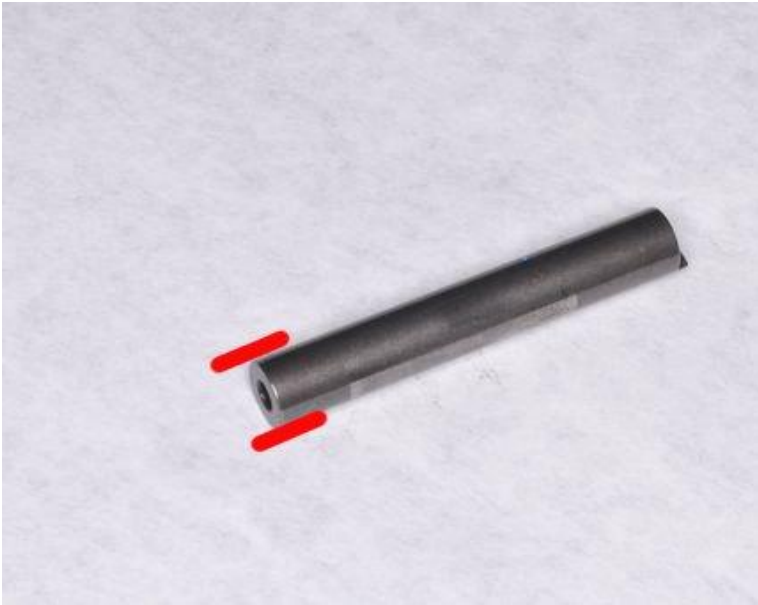
Remove the camshaft from the cylinder head.

4.2. Inspection



Inspect the camshaft cam heights for the intake and exhaust lobes. Inspect the camshaft bearings for excessive play or roughness. Replace the entire camshaft assembly if the bearings are rough or have excessive play.

Item		Standard (mm)
Camshaft cam height	IN	34.2987
	EX	34.1721



Inspect the rocker arm shaft outer diameter for the intake and exhaust valves.

Item		Standard (mm)
Valve rocker arm shaft O.D.	IN	9.972 - 9.987
	EX	9.972 - 9.987



Inspect the rocker arm inner diameter for the intake and exhaust valves.

Item		Standard (mm)
Valve rocker arm I.D.	IN	10.00 - 10.015
	EX	10.00 - 10.015



Inspect the camshaft bearing journals for scoring or scratches.

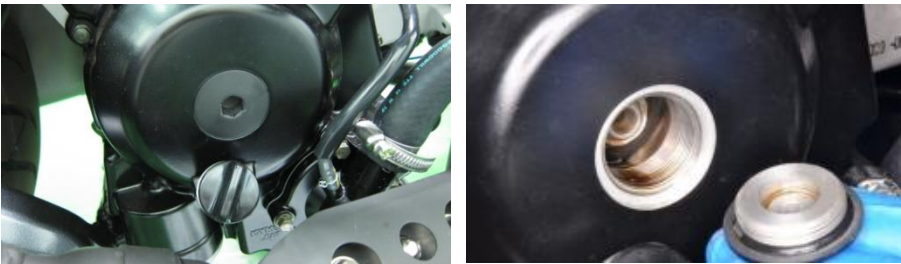


Inspect the camshaft sprocket for worn teeth or other signs of wear or damage.

4.3. Camshaft Installation

Clear out the cylinder head oil passages with compressed air. Make sure all cylinder head oil passages are free of clogs.

NOTE: Always wear safety glasses when using compressed air and never point it directly at yourself or anyone else.



Remove the crankshaft cap on the right side of the engine with a large flat blade screwdriver. Inspect the O-ring on the cap and replace it as needed.



Remove the timing inspection cap from the right side of the engine with a large flat blade screwdriver. Inspect the O-ring on the cap and replace it as needed.



The crankshaft must be rotate (clockwise) until the piston is at top dead center (TDC) on the compression stroke.



Position the piston at top dead center as above. The "T" mark should be aligned with the index notch in the timing inspection hole. Support the cam chain if the crank must be turned to position the piston correctly.

Lubricate the camshaft lobes and bearings with fresh engine oil.



Insert the camshaft into the camshaft holders with the lobes facing down.



Lubricate the inside diameter of the rocker arms and the roller with fresh engine oil. Position the rocker arms to accept the rocker arm shafts.



Wipe the rocker arm shafts clean. Insert the rocker arm shafts through the camshaft holders and rocker arms. Install the rocker arm shafts so that the end sits as shown.



Install the camshaft set plate so it fits into the groove on the camshaft and between the projections on the rocker arm shafts.

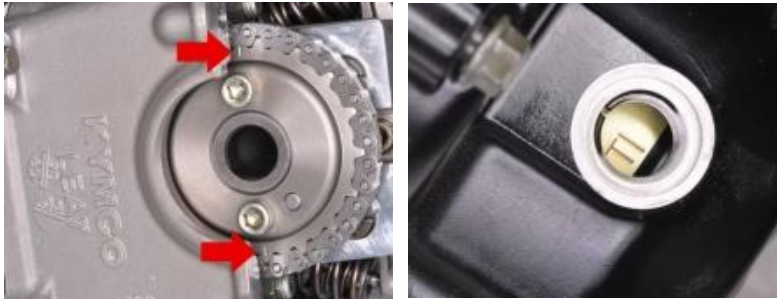


Apply a small amount of blue Loctite (non-permanent) to the threads of the set plate bolt. Thread in the bolt and tighten it to specification with a 5 mm Allen socket.

Item	Qty	Thread size (mm)	Torque	
			kgf-m	lb-ft
Camshaft set plate bolt	1		1.2	2.0



Install the camshaft sprocket onto the camshaft so the camshaft sprocket boss fits into the appropriate hole on the camshaft sprocket. Make sure the camshaft sprocket boss is facing up so it is visible above the edge of the cylinder head as shown. Align the horizontal marks on the camshaft sprocket with the top edge of the cylinder head as shown. Fit the camchain over the camshaft sprocket.



For correct engine timing the marks on the camshaft sprocket must be even with the cylinder head mating surface at the same time the "T" mark is lined up with the with the index notch in the timing inspection hole. The camshaft lobes should be facing down and their should be slack in the rocker arms.



Apply a small amount of blue Loctite (non-permanent) to the threads of the camshaft sprocket bolts. Thread in the camshaft sprocket bolts and tighten to specification using a 5 mm Allen socket.

Item	Qty	Thread size (mm)	Torque	
			kgf-m	lb-ft
Cam sprocket bolt	2	6	1.0-1.4	7.23-10.13

Double check the engine timing.



Use a small flat blade screwdriver bring in the cam chain tensioner rod. Turn the screwdriver counter clockwise to retract the rod. The rod must be held in with the screwdriver until the cam chain tensioner mounting bolts have been installed.



Install the camchain tensioner with a new gasket. Insert the mounting bolts and tighten them evenly to specification with an 8 mm socket. Remove the screwdriver and release the camchain tensioner rod.

Item	Qty	Thread size (mm)	Torque	
			kgf-m	lb-ft
Cam chain tensioner bolt	2	6	1.0-1.4	7.23-10.13



Rotate the crankshaft 360° clockwise and check the engine timing one more time.



Make sure the cam chain tensioner cap bolt O-ring is in good condition. Install the O-ring and cam chain tensioner cap bolt. Tighten the bolt to securely with a 10 mm socket.

Check the valve clearance. See the Valve Clearance topic for more information.



Make sure the O-rings on the crankshaft and timing plugs are in good condition. Replace them as needed. Install the timing inspection and crankshaft caps to the right side of the engine. Tighten the caps securely but not overly with a large flat blade screwdriver.

Install the cylinder head cover. See the Cylinder Head Cover topic for more information.

Install the spark plug. See the Spark Plug topic for more information.

Install the luggage box. See the Luggage Box topic for more information.

Install the seat. See the Seat topic for more information.

5. Cylinder Head

SAFETY FIRST: Protective gloves and eyewear are recommended at this point.

5.1. Removal

Remove the spark plug. See the Spark Plug topic for more information.

Remove the seat. See the Seat topic for more information.

Remove the luggage box. See the Luggage Box topic for more information.

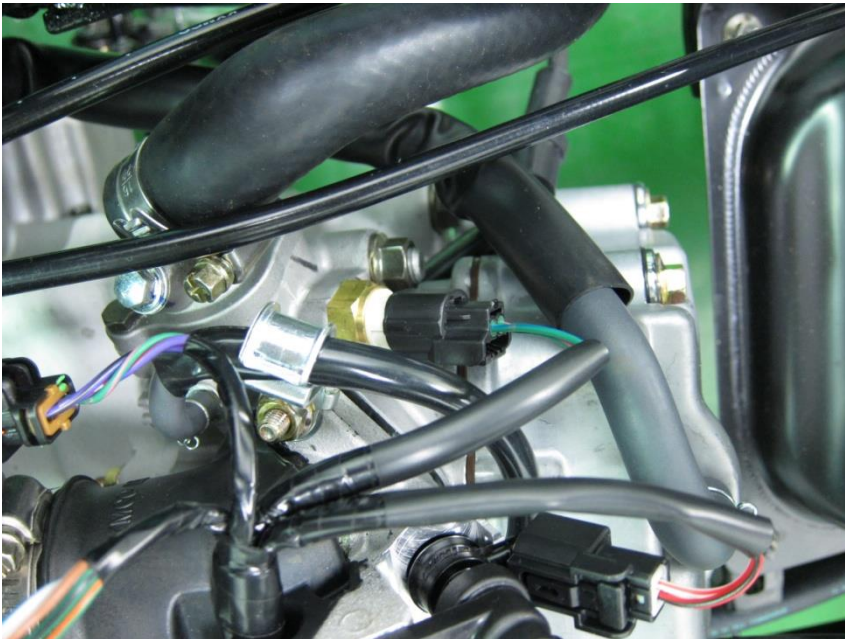
Drain the coolant. See the Coolant topic for more information.

Remove the cylinder head cover. See the Cylinder Head Cover topic for more information.

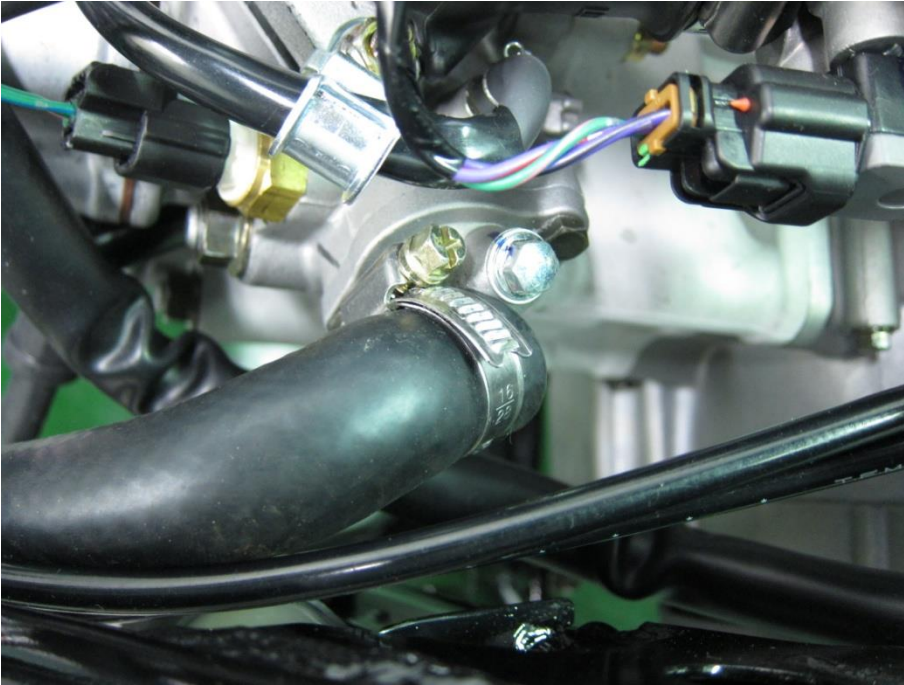
Remove the camshaft sprocket. See the Camshaft topic for more information.

Remove the throttle body. See the Throttle Body Removal and Installation topic for more information.

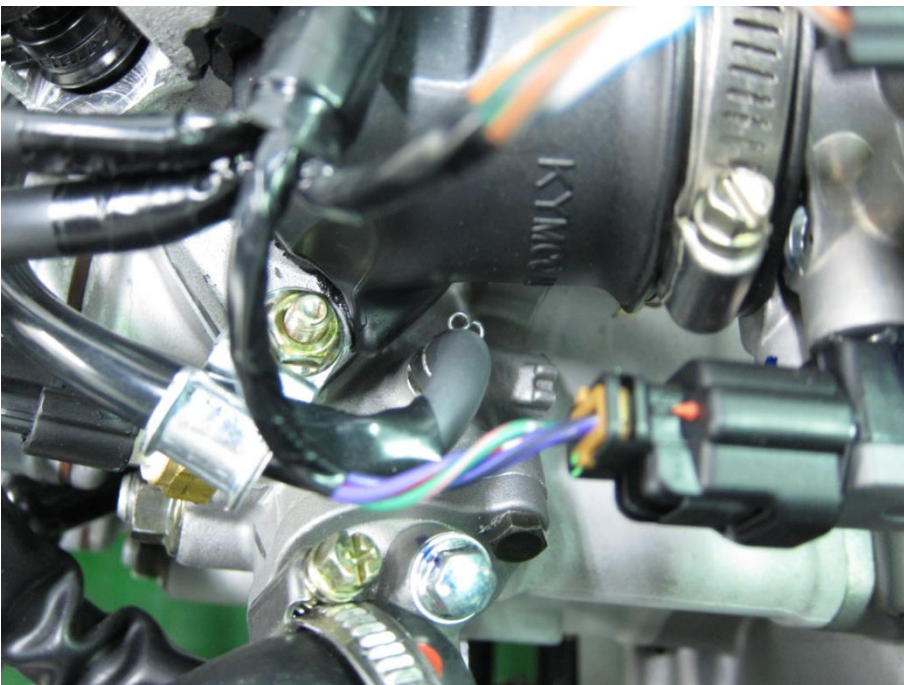
Remove the exhaust system. See the Exhaust System topic.



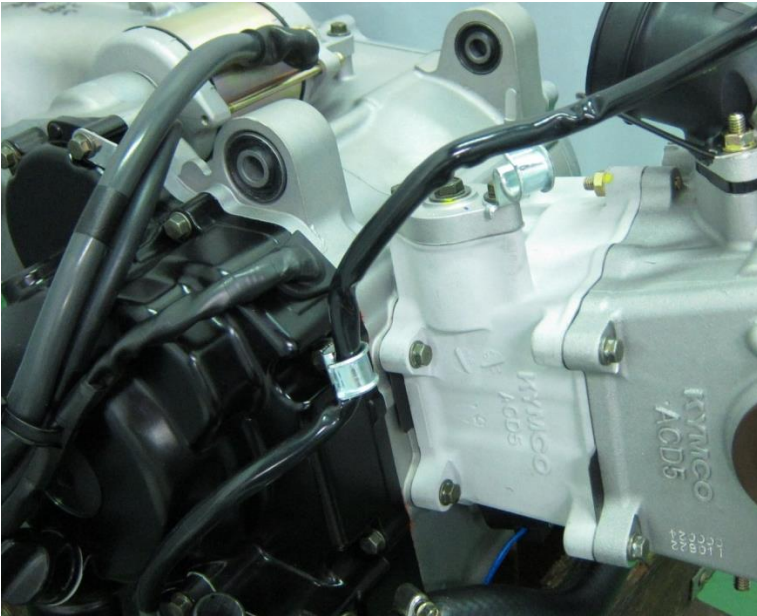
Unplug the water temperature sensor.



Loosen the thermostat hose clamp with a #2 Phillips screwdriver. Slide up the clamp and free the coolant hose from the thermostat. Allow any remaining coolant to drain into a suitable container.



Squeeze the air bleed hose clamp with needle nose pliers and slide back the clamp. Free the air bleed hose from the thermostat.



Remove the two right side cylinder head bolts with an 8 mm socket. Also, loosen the two cylinder bolts below with an 8 mm socket.



There are two cylinder head mounting nuts; one below the intake port and one below the exhaust port.



Loosen the upper nut with a 10 mm socket and the lower nut with a 10 mm wrench. Remove the two cylinder head mounting nuts.

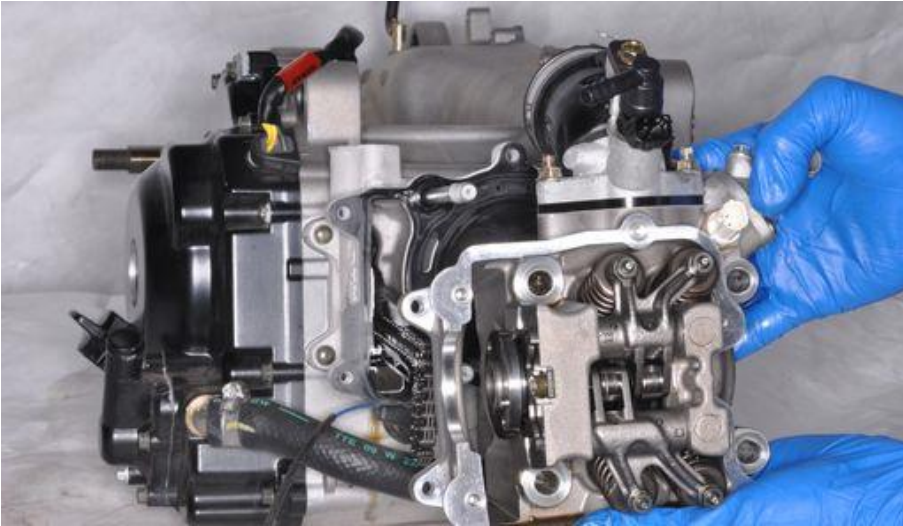


Remove the four camshaft holder nuts using a 14 mm socket. Loosen the camshaft holder nuts in a criss cross pattern over the course of 2-3 loosening sequences.

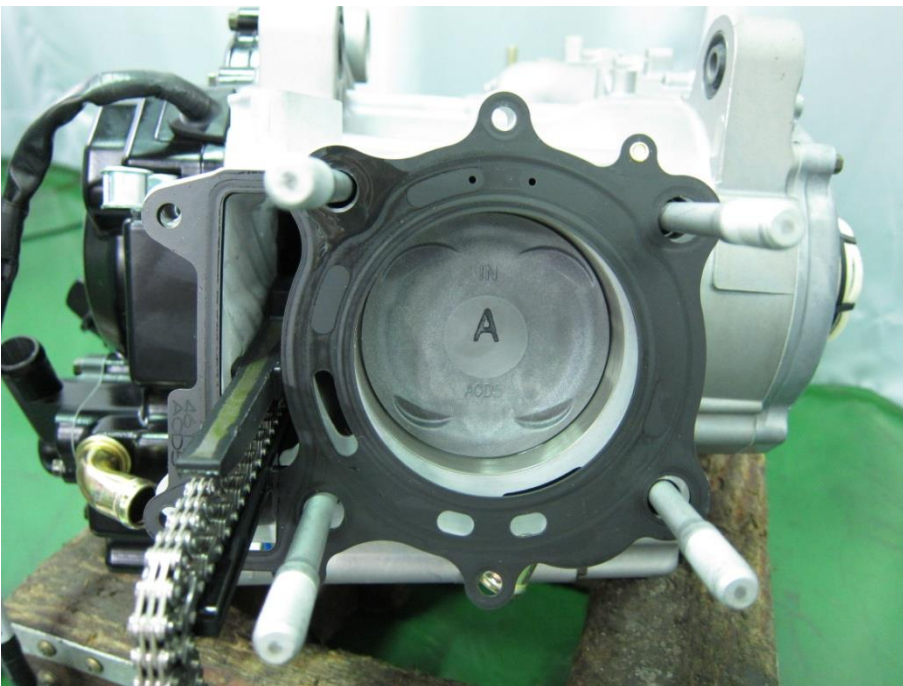
When installation:

Apply engine oil to the threads of the cylinder head nuts. Thread on the four cylinder head nuts and tighten to specification using a 14 mm socket. Tighten in criss cross pattern over the course of 2-3 rounds of tightening to reach specified torque.

Item	Qty	Thread size (mm)	Torque	
			kgf-m	lb-ft
Cylinder head stud nut	4	10	3.4-3.8	24.59-27.48



Lift the cylinder head off of the studs. Guide the cam chain through the opening in the cylinder head but do not allow the chain to fall into the crankcase.



Remove the cylinder head gasket.



Remove the two dowel pins from the left side cylinder head studs.



Remove the two intake mounting nuts with a 10 mm socket.



Remove the intake from the cylinder head.



Inspect the intake O-ring and replace it as needed.



Remove the intake plate and gasket from the cylinder head.



Use a 17 mm wrench to remove the water temperature sensor if needed.



Clean the combustion chamber with contact cleaner, a plastic knife, brush and/or rag. Take care to only remove carbon and not scrape the head.

To to remove the valves see the Valves topic.



Place a straight edge across the bottom of the cylinder head and check for warp with a feeler gauge. You will need to check clearance readings from several places on the bottom of the cylinder head surface for warp.

6. Valves

SAFETY FIRST: Protective gloves and eyewear are recommended at this point.

6.1. Removal

Remove the camshaft. See the Camshaft topic for more information.

Remove the cylinder head. See the Cylinder Head topic for more information.

IMPORTANT: Record the position of all parts so they can be returned to their proper place during reassembly.



Push down the valve springs with a valve spring compressor.

Special Tool- Valve Spring Compressor: E040



Remove the split keepers. There are two per valve.



Remove the spring retainer.



Remove the valve springs.



Push the valve stem down and remove the valve from the combustion chamber side of the cylinder head. Rotate the valve as it is removed.



Remove the valve seal from the valve guide. The valve seals should be replaced if they are removed or you are going to install new valves.



Remove the spring seat.

6.2. Inspection



Inspect the valve springs for fatigue and damage. Replace the valve springs as needed or if the valve is also to be replaced.





Inspect the valves for damage and burning. Measure the valve stem diameter in several places where the valve makes contact with the guide. If the measurement is below specification replace the valve.

Item		Standard (mm)
Valve stem O.D.	IN	4.990 - 4.975
	EX	4.970 - 4.955



Inspect the valve seat and the valve seat width. The valve seat should be centered on the valve face. If the seat is pitted, worn out, or fits poorly on the valve face the valve seat must be resurfaced.

Item		Standard (mm)
Valve seat width	IN	1.2
	EX	1.2



Measure the inside diameter of the valve guides. Replace the guides if the measurement is out of specification. Calculate the valve stem-to-guide clearance. Replace the guide and valve if the clearance is out of specification.

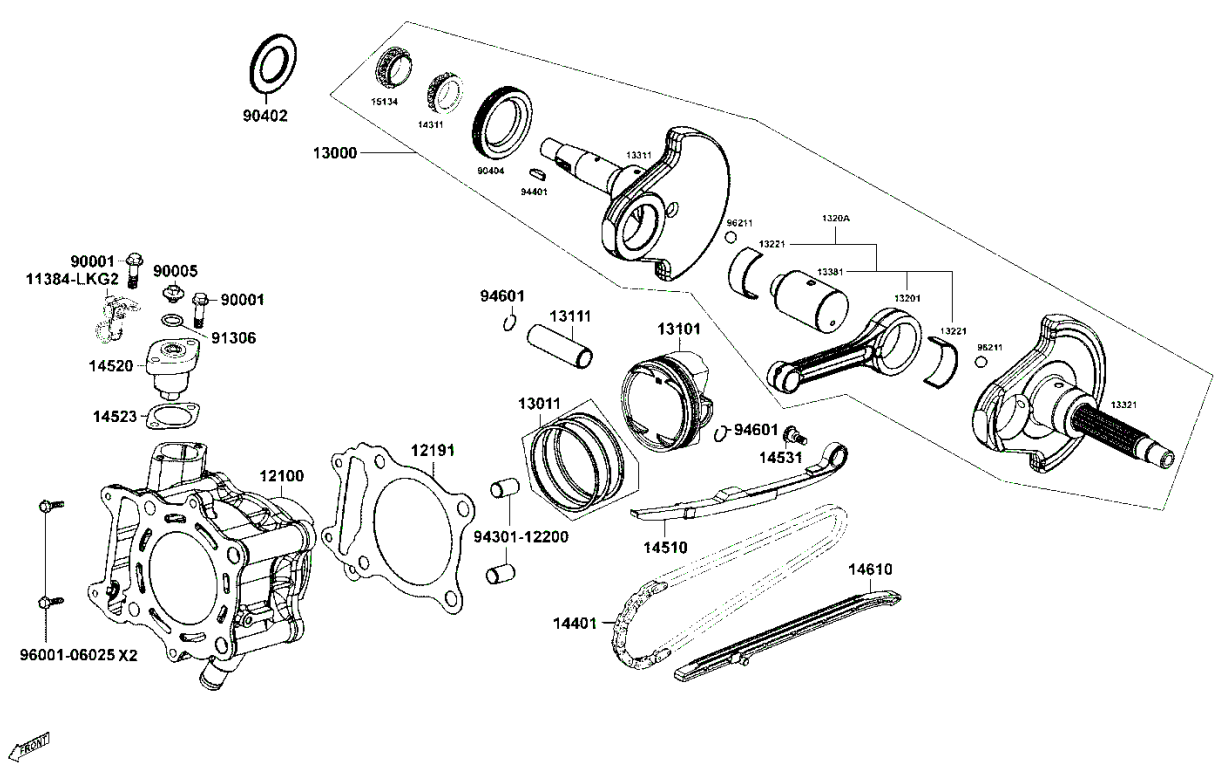
Item		Standard (mm)
Valve guide I.D.	IN	5.00 - 5.012
	EX	5.00 - 5.012
Valve stem-to-guide clearance	IN	0.010 - 0.037
	EX	0.030 - 0.057

07. Cylinder & Piston

Cylinder/ Piston

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1. SCHEMATIC DRAWING



2. SERVICE INFORMATION

2.1. GENERAL INSTRUCTIONS

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

2.2. SPECIFICATIONS

Unit: mm

Item		Standard	
Cylinder	Bore diameter	A: 75.30~75.31 B: 75.31~75.32	
	Warpage	---	
	Taper	---	
	Out of round	---	
Piston, piston ring	Ring side Clearance	Top	0.015~0.055
		Second	0.015~0.055
	Ring end gap	Top	0.10~0.25
		Second	0.10~0.25
		Oil side rail	0.2~0.7
	Piston outer diameter		A: 75.28~75.29 B: 75.29~75.30
	Piston O.D. measuring position		9 mm from bottom of skirt
	Piston-to-cylinder clearance		0.010~0.030
	Piston pin hole I.D.		18.002~18.008
	Piston pin O.D		17.994~18.000
Piston-to-piston pin clearance		0.002~0.014	
Connecting rod small end I.D. bore		18.016~18.034	

2.3. TROUBLESHOOTING

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

Compression too low or uneven compression

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

Compression too high

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

Excessive smoke from exhaust muffler

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

Abnormal noisy piston

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

3. Cylinder Block

3.1. Removal

Remove the engine from the frame. See the Engine Removal topic for more information.

Remove the cylinder head cover. See the Cylinder Head Cover topic for more information.

Remove the camshaft sprocket. See the Camshaft topic for more information.

Remove the cylinder head. See the Cylinder Head topic for more information.



Slide out the lower cam chain guide. Inspect the guide for excessive wear and damage. Replace the guide as needed.



Remove the two right side cylinder bolts with an 8 mm socket.



Loosen the cylinder coolant hose clamp with a #2 Phillips screwdriver. Free the coolant hose from the cylinder.



Slide the cylinder off of the studs and piston. Guide the cam chain through its opening and do not allow it to fall into the crankcase. Remove the cylinder.



Remove the base gasket.



Remove the two cylinder dowel pins from the left studs.

Place a clean shop towel under and around the base of the piston to prevent any parts or debris falling into the crankcase.



Remove the piston pin clips with a pick or needle nose pliers. Discard the piston pin clips.

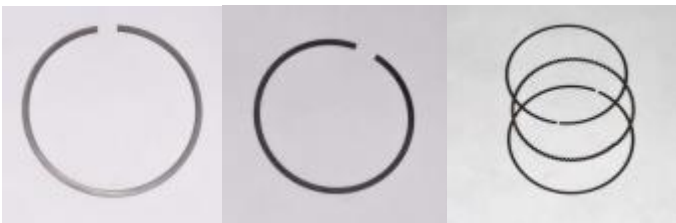
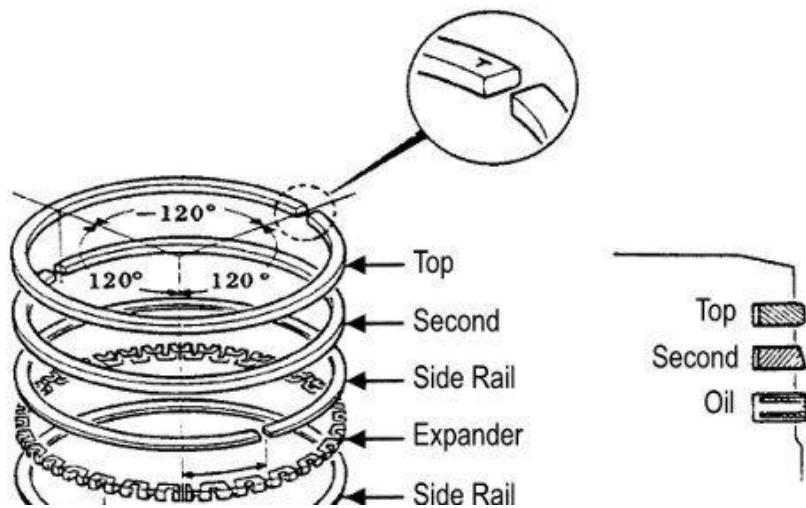


Remove the piston pin and the piston.

Clean off the cylinder mating surface, but take care to keep debris from falling into the crankcase.



Spread the piston rings and lift them off opposite the gap. Spread the rings the minimum amount during removal. The rings can be easily damaged.



The two upper rings are each a single piece of metal. The oil ring consists of an expander ring and two side rails.



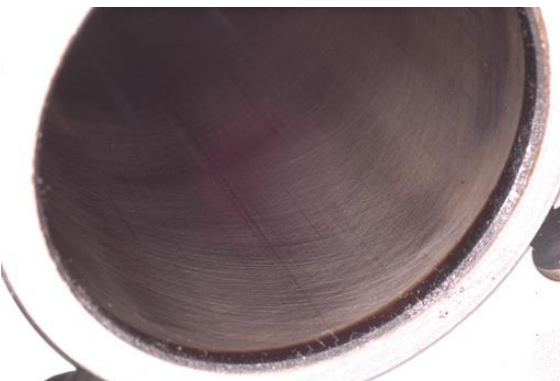
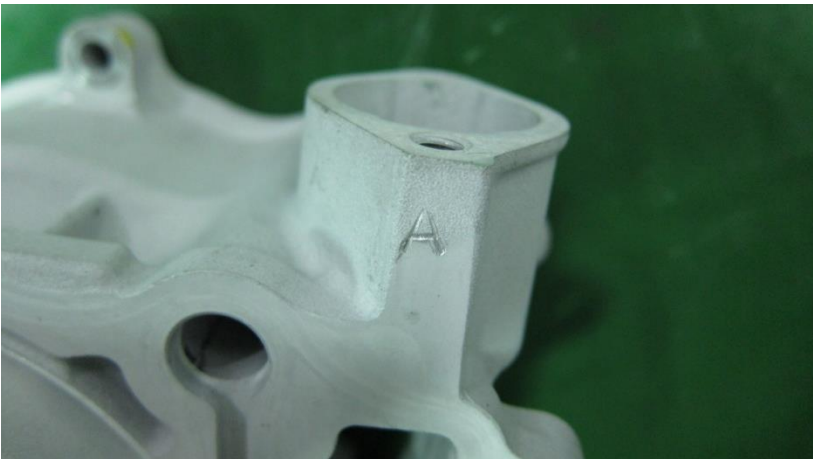
Clean the carbon build up off of the piston with a stiff bristled plastic brush or rag. Never use a wire brush to clean a piston.



Also clean out the ring grooves. You can use an old ring to scrape out any carbon build up in the grooves.

3.2. Inspection

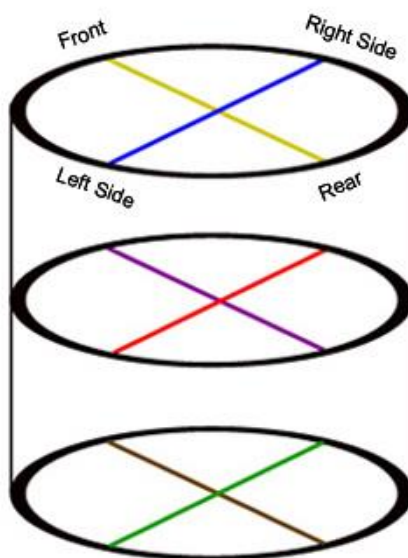
The cylinder and piston must be replaced as a set. There are two sets of cylinder and piston combinations. Make sure to have a No.A cylinder with an "A" piston or a No.B cylinder with a "B" piston.



Inspect the cylinder bore for damage and abnormal wear.



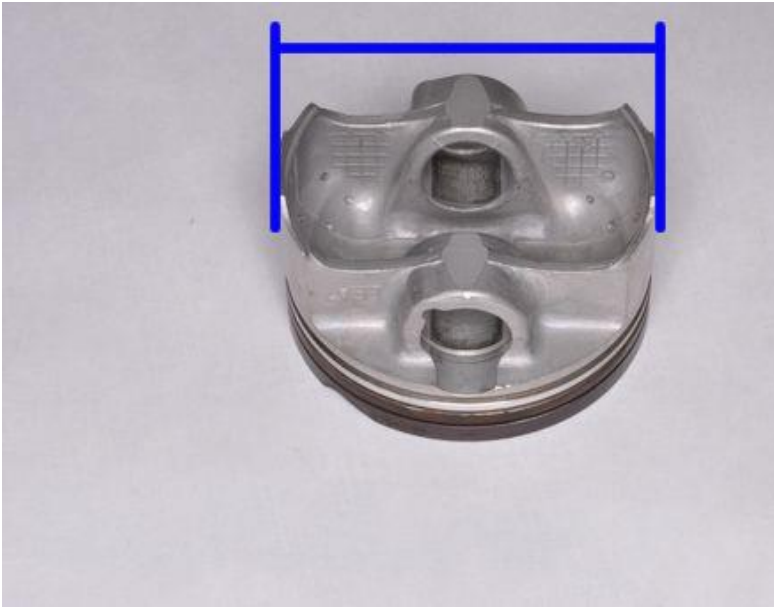
Measure the cylinder diameter as described below with a telescoping gauge.



Inspect the cylinder front to back and side to side at three different height levels with a dial bore gauge. Replace the cylinder and piston as a set if the cylinder is out of specification.

Calculate the cylinder taper. The taper is the maximum difference between either yellow and brown or blue and green.

Calculate the cylinder out of round. The out of round is greatest out of yellow, purple, or brown minus the smallest of blue, red, or green.



Measure the outside diameter of the piston at 9 mm up from the bottom of the skirt at a 90° angle to the piston pin. Measure the piston with vernier calipers or a micrometer. Check the piston for wear, damage, and extreme discoloration.

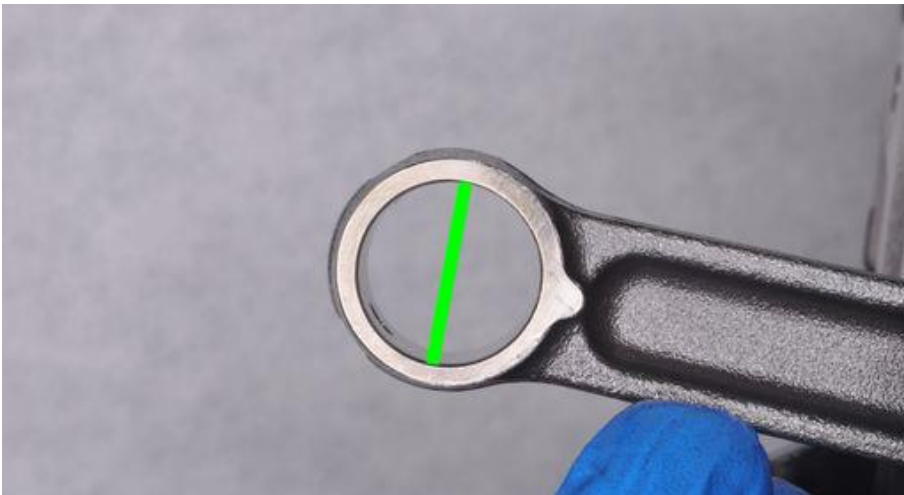
Subtract the diameter of the piston from the maximum front to rear diameter measurement of the cylinder to calculate the piston-to-cylinder clearance. Replace the piston and cylinder as needed to achieve a correct piston-to-cylinder clearance.

Item	Standard (mm)
Piston-to-cylinder clearance	0.010 - 0.030



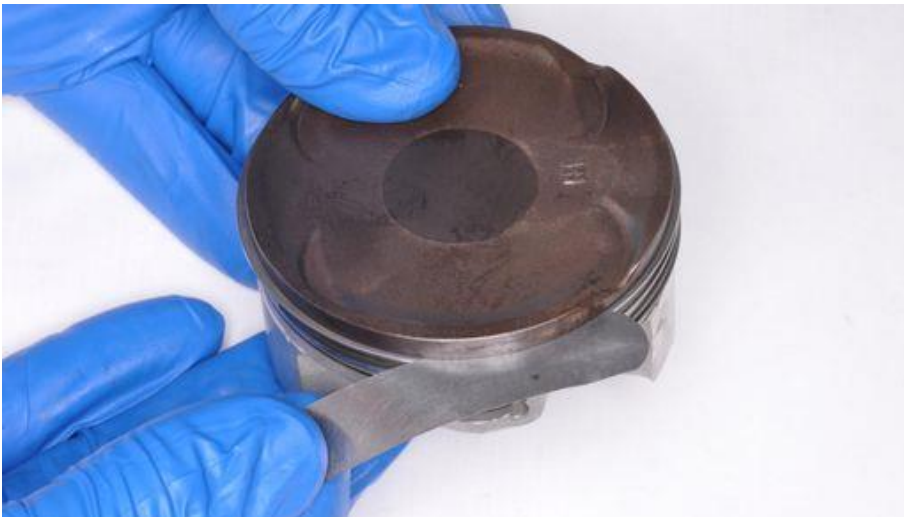
Measure the piston pin diameter with a micrometer. Measure the piston pin bore diameter with vernier calipers or a small bore gauge. Measure at three different points for each. Replace the parts if any of the specifications are not met.

Item	Standard (mm)
Piston pin hole I.D.	18.002~18.008
Piston pin O.D.	17.994~18.000
Piston-to-piston pin clearance	0.002~0.014



Measure the inside diameter of the small end of the connecting rod with vernier calipers.

Item	Standard (mm)
Connecting rod small end I.D. Bore	18.016~18.034



Measure the ring groove width and the ring-to-groove clearance with feeler gauges.

Item		Standard mm
Piston ring-to-groove clearance	1st	0.015 - 0.055
	2nd	0.015 - 0.055



Insert the top ring into the cylinder. Push the top ring in the cylinder about an inch. Use the piston to push in the ring to keep it square with the cylinder.



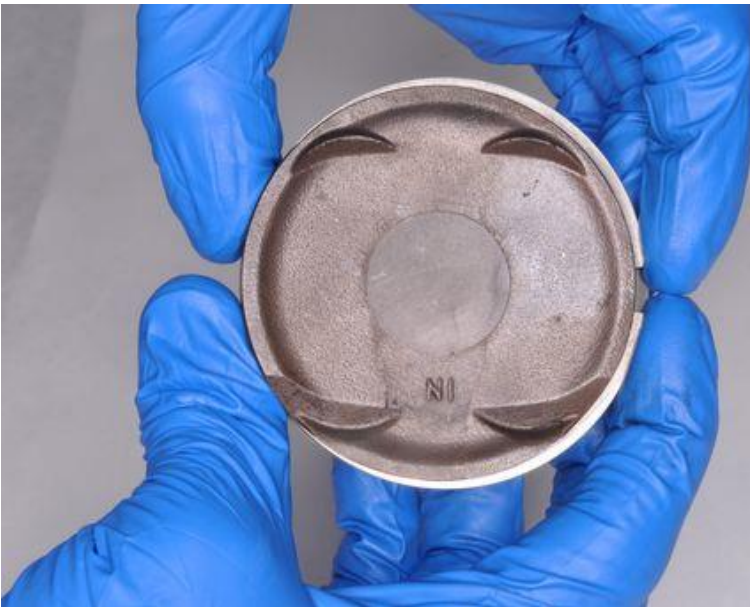
Measure the ring gap with a feeler gauge. Repeat this procedure with second ring and the oil side rails.

Item		Standard mm
Ring end gap	Top	0.10 - 0.25
	Second	0.10 - 0.25
	Oil side rail	0.2 - 0.7

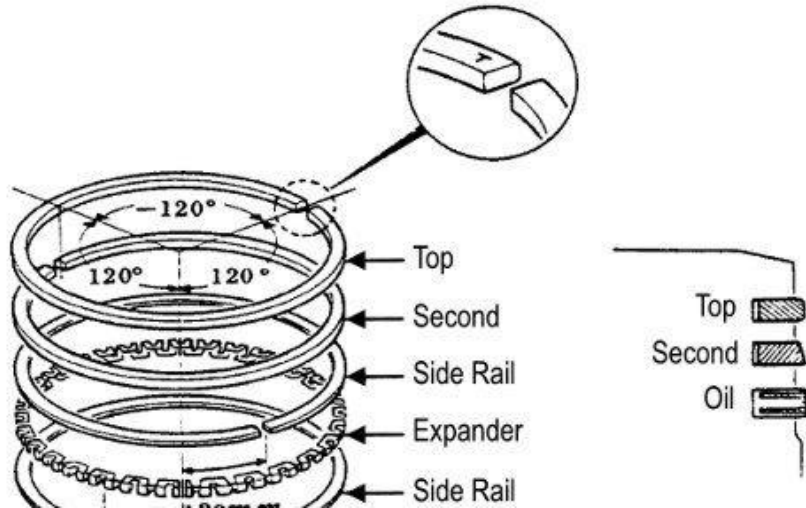


Check the oil jet for clogs.

3.3. Assembly



Clean the piston ring grooves and apply fresh engine oil to the piston rings. Spread the rings the minimum amount possible to install them. Do not try and force them on the piston.



Install the top and second rings with their markings facing up. Install the rings to the piston as shown above so that no ring end gaps line up with the piston pin or perpendicular to the piston pin. The rings should turn easily on the piston without sticking or roughness.

Install the oil expander ring so that the ends are not overlapping. Install the steel rails above and below the oil ring.

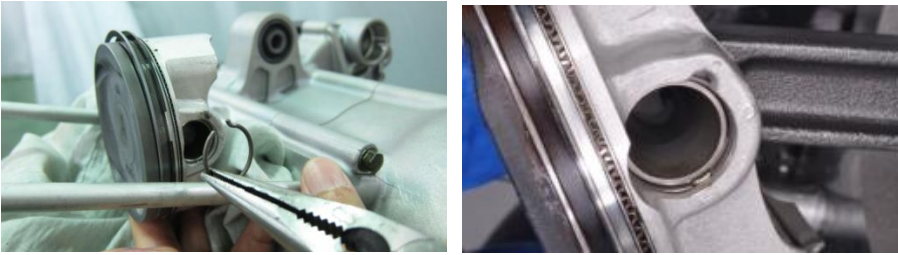
Lubricate the piston pin and the small end of the connecting rod with fresh engine oil.



The "IN" mark should face the intake side (rear) of the engine.



Place the piston over the connecting rod. Insert the piston pin into the piston and rod.



Install new piston pin clips securely into their grooves. Turn the gap in the clips away from the access gap.



Make sure the cylinder head mating surface is clean. Install the two dowel pins as shown.



Install the new base gasket onto the crankcase.



Coat the inside of the cylinder, piston rings, and piston in fresh engine oil. Lower the cylinder over the studs and guide the piston into the cylinder while you are compressing the rings with your fingers. Be careful to not damage the rings during this step. Bring the cam chain and guide through the opening.



Thread in the two cylinder bolts on the right side of the engine.



Fit the coolant hose to the cylinder. Tighten the cylinder coolant hose clamp to securely with a #2 Phillips screwdriver.



Insert the lower cam chain guide and make sure it is seated correctly.

Install the cylinder head. See the Cylinder Head topic.

Install the camshaft. See the Camshaft topic for more information.

Install the cylinder head cover. See the Cylinder Head Cover topic for more information.

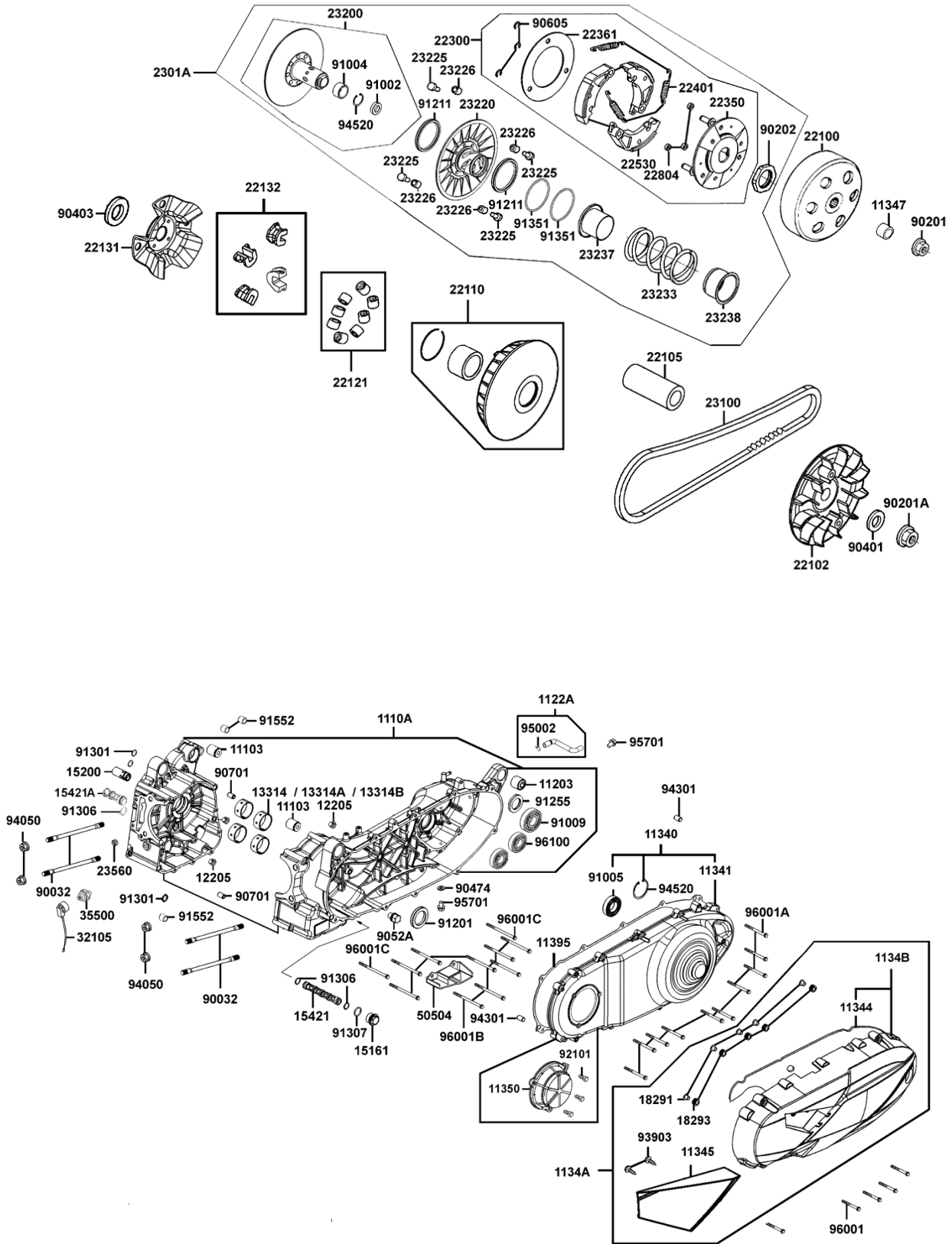
Install the engine into the frame. See the Engine Installation topic for more information.

08. Drive & Driven Pulleys

Drive & Driven Pulleys

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1. SCHEMATIC DRAWING



2. SERVICE INFORMATION

2.1. General Instructions

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

2.2. Specifications

Unit: mm

Item	Standard	Service limit
Clutch lining thickness	4.0	2.0
Clutch outer I.D.	152.1 ~ 152.2	152.2
Driven face spring free length	---	103.5
Weight roller O.D.	19.92~20.08	19.92

2.3. Torque Values

Left crankcase cover	1.2 kgf-m
Drive face nut	9.0~10.0 kgf-m
Drive pulley nut	5.0~6.0 kgf-m
Clutch outer nut	5.0~6.0 kgf-m
Clutch plate comp	5.0~6.0 kgf-m

2.4. Special Tools

Bearing installer	A120E00014
Universal holder	A120E00017
Clutch spring compressor	A120E00053

2.5. Troubleshooting

Engine starts but motorcycle won't move

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

Engine stalls or motorcycle creeps

- Broken clutch weight spring

Lack of power

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

3. Belt Case

SAFETY FIRST: Protective gloves and eyewear are recommended at this point.

3.1. Removal

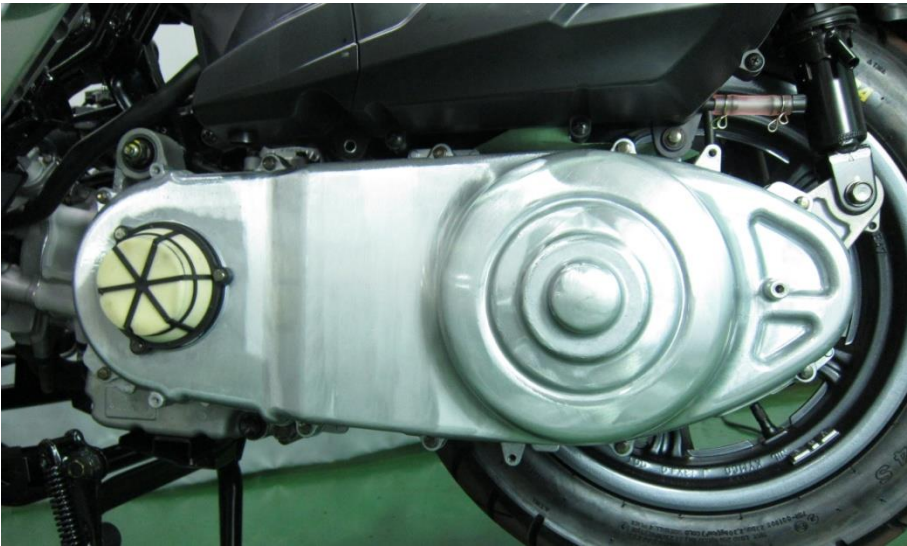
Remove the mounting bolts of belt case cover.



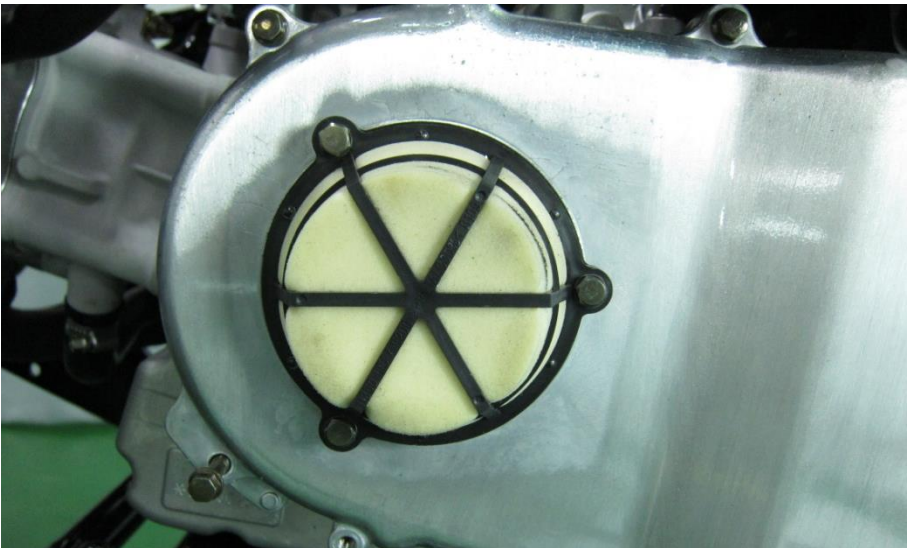
Remove the belt case cover.

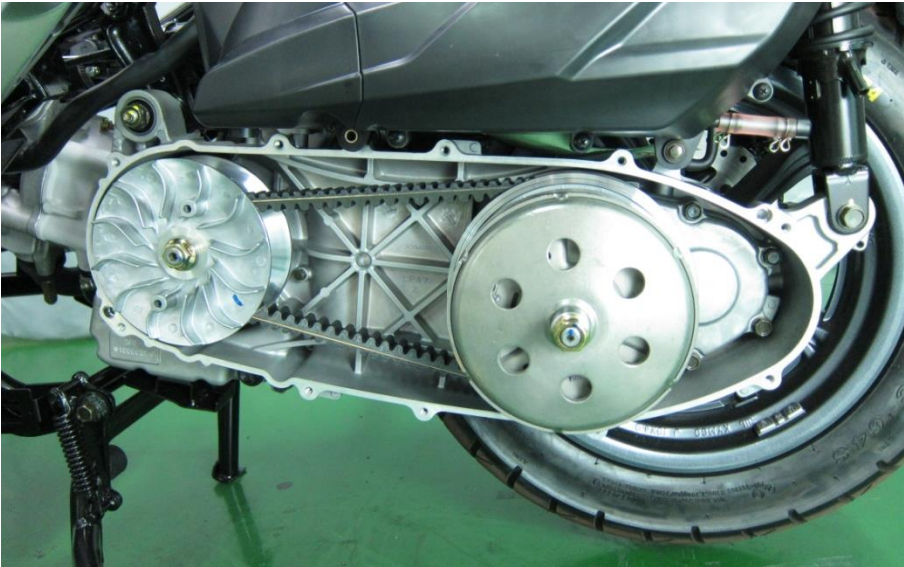


Remove the bolts of belt case and remove the belt case.



Remove the bolts of filter and remove the filter.



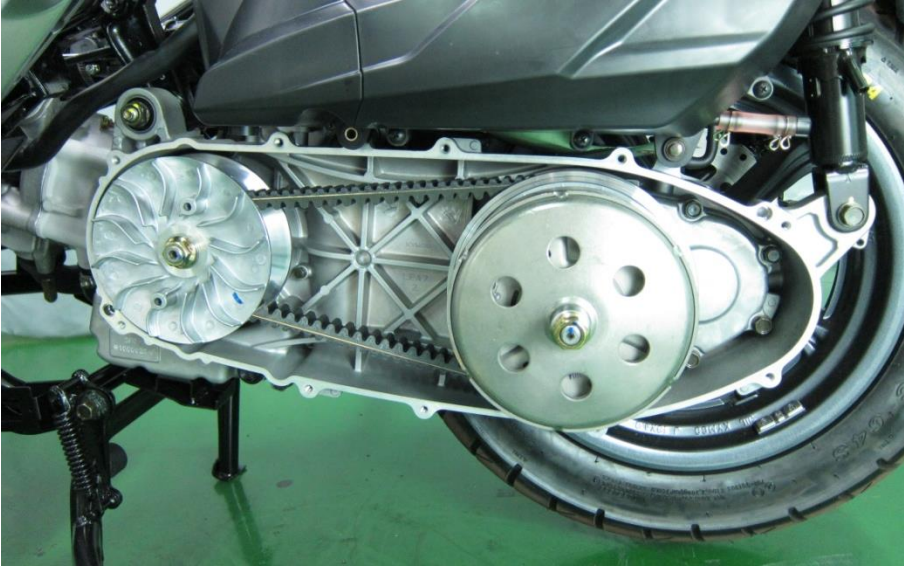


Remove the belt case cover and gasket.



Remove the two dowel pins.

3.2. Inspection



Inspect the drive belt for cracks or excessive wear.



Inspect the belt case bearing by turning it with a finger. Replace the bearing if it is rough or noisy.



Remove the bearing snap ring with snap ring pliers.



Remove the bearing with a suitable bearing puller.



Drive in a new bearing with a suitable bearing driver that has the same outside diameter as the bearing.



Install a new snap ring with snap ring pliers.

4. CVT Removal

SAFETY FIRST: Protective gloves and eyewear are recommended at this point.

Remove the belt case. See the Belt Case topic for more information.

4.1. Pulleys and Belt



Hold the drive pulley with a universal holder tool and loosen the nut with a 19 mm socket.



Remove the drive pulley nut and washer from the crankshaft.



Remove the left face of the drive pulley.



Loosen the driven pulley nut with a 19 mm socket.



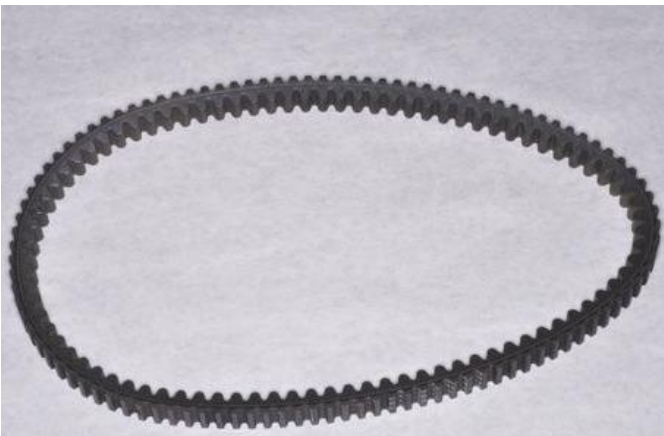
Remove the driven pulley nut and bushing.



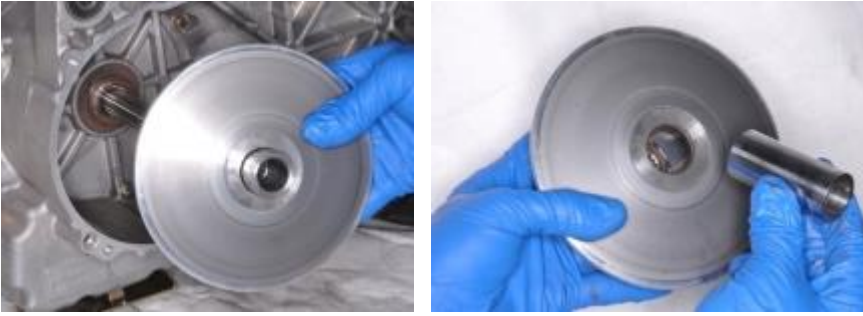
Slide the driven pulley off of the shaft.



Remove the belt from the driven pulley.



Inspect the drive belt for cracks or excessive wear.



Remove the right (movable) face of the drive pulley from the crankshaft. Slide the bushing out of the movable drive face.



Remove the washer from the crankshaft.

4.2. Drive Pulley Disassembly



Inspect the faces of the drive pulley. Clean away any grease from the faces.



Lift the ramp plate out of the back of the movable drive pulley face.



Remove the rubber damper pieces from the ramp.



There are eight weight rollers in the back of the movable face of the drive pulley.



Remove the rollers and check them for excessive or uneven wear. Measure the outside diameter of the rollers. Replace the weight rollers as needed.

Item	Standard (mm)	Service Limit (mm)
Weight roller O.D (Drive Pulley)	19.92 - 20.08	20.08



Inspect the movable drive face and bushing for wear and damage. Replace the parts as needed.

4.3. Clutch Disassembly

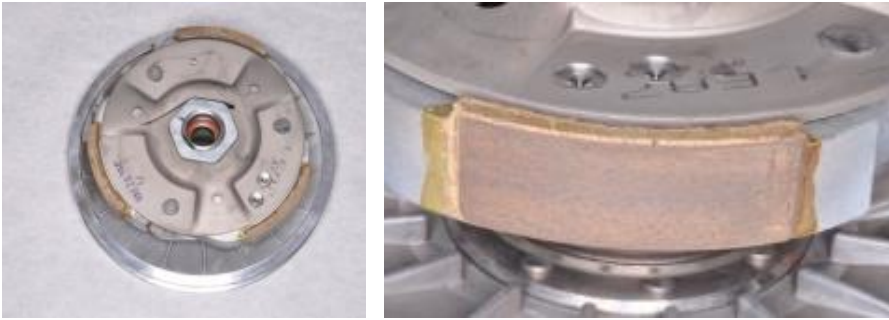


Lift the clutch outer off of the centrifugal clutch.



Inspect the inside of the clutch outer for excessive wear and damage. Measure the inside diameter of the clutch outer and replace the part as needed.

Item	Standard (mm)	Service Limit (mm)
Clutch outer I.D.	152.1 - 152.2	152.2



Inspect the clutch shoe lining thickness. Replace the shoes if the wear is below the service limit.

Item	Standard (mm)	Service Limit (mm)
Clutch lining thickness	4.0	2.0



To disassemble the clutch and driven pulley set the clutch fitting tool to onto the clutch.

ITEM	TOOL NO.	DESCRIPTION
#41 NUT AND FITTING TOOL	A120E00028	Clutch disassembly



Fit the clutch and fitting tool into the clutch spring compressor tool.



Use the clutch spring compressor tool to compress the spring in the driven pulley assembly.



Secure the spring compressor tool in a vise. Loosen the clutch drive plate nut with the special socket that comes with the fitting tool.



Remove the clutch drive plate nut.



Inspect the left side bearing by turning it with a finger. If the bearing is rough turning or noisy it should be replaced.

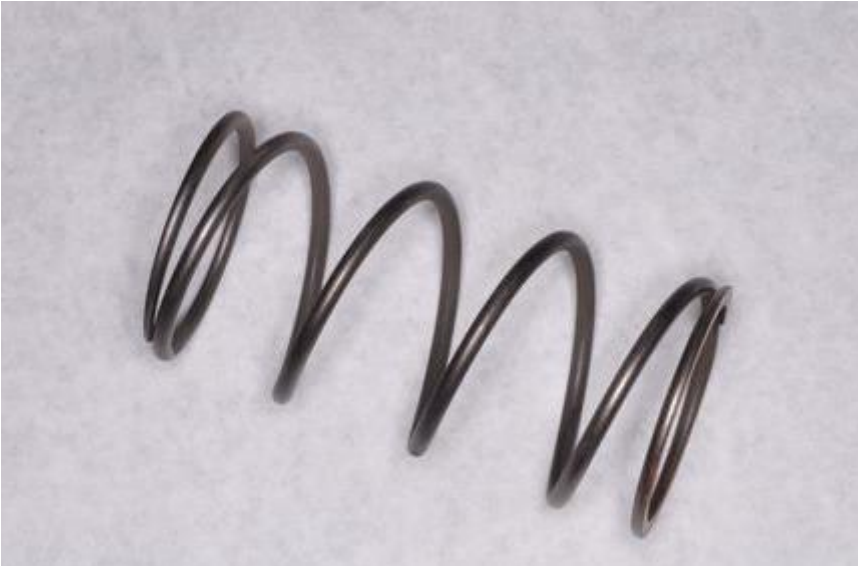


Remove the clutch spring compressor tool. Lift off the centrifugal clutch.





Remove the collars and spring.

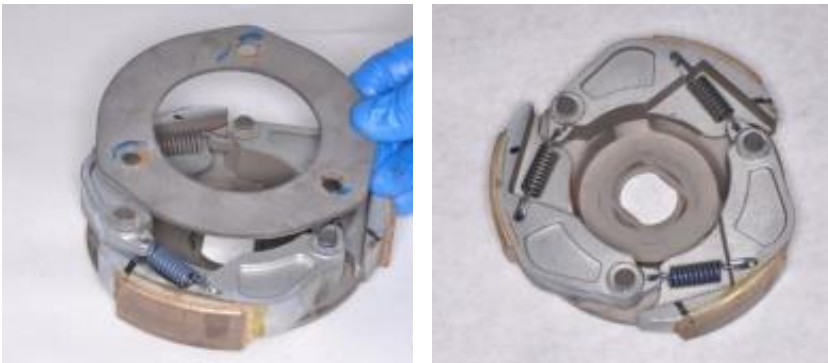


Measure the free length of the clutch spring. Replace the spring if the measurement fails to meet the service limit.





Remove the three circlips from the clutch pivot pins with a small flat blade screwdriver.



Lift off the plate.



Slide the clutch shoes off of the pivots on the drive plate.



Inspect the clutch shoe bumpers and replace them as needed.

4.4. Driven Pulley Disassembly

Remove the clutch as shown above.



Remove the four guide rollers with guide roller pins.



Separate the left and right faces of the driven pulley.



Inspect the faces of the driven pulley. Clean away any grease from the faces where the belt rides.





Remove the seals from the left face of the driven pulley.



Drive in the new seals with a suitable driver with the same outside diameter as the seal.



Remove the O-rings on the left face.

Clean the left face and roller pins with a high flash point solvent and compressed air.

NOTE: Always wear safety glasses when using compressed air and never point it directly at yourself or anyone else.

Bearing Replacement



Inspect the bearings in the right face of the driven pulley.



Remove the needle bearing with a suitable puller.



Remove the collar, snap ring, and bearing from the right face of the driven pulley.

Clean the right face with a high flash point solvent and compressed air.

NOTE: Always wear safety glasses when using compressed air and never point it directly at yourself or anyone else.



Drive in the new bearing so the sealed side face out towards the clutch. Install the snap ring into the groove. Install the collar and drive in the new needle bearing so that its markings face out. Drive in the bearings with a suitable driver with the same outside diameter as the bearing.



Lubricate the bearings in the right face of the driven pulley with grease.

5. CVT Installation

SAFETY FIRST: Protective gloves and eyewear are recommended at this point.

5.1. Driven Pulley



Lubricate the bearings in the right face of the driven pulley with grease.



Drive in the new seals with a suitable driver with the same outside diameter as the seal.



Install the O-rings to the left face of the driven pulley. Coat the O-rings seals, and inside of the left face where it rides on the right face with grease.



Fit the left face onto the right face. Wipe away any grease that gets on the faces where the belt will ride.



Lubricate the guide pins and rollers with grease. Place the rollers on the pins and insert the pins into driven pulley as shown.

5.2. Clutch



Apply a light coat of grease to the brake shoe pivot pins on the drive plate. Install the three rubber bumpers. Take care to keep the grease away from the clutch shoe linings.



Connect the clutch shoes with the springs as shown. Slide the clutch shoes onto the drive plate pivots.



Fit the plate onto the clutch shoe pivots.





Install the three clutch shoe pivot circlips.



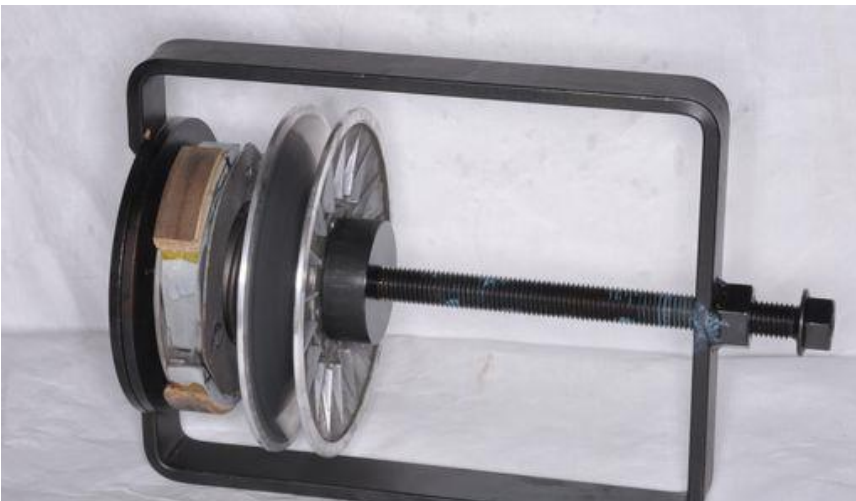
Install the seal collar and spring.



Install the spring collar into the spring and set the centrifugal clutch on top of the spring collar.



Set the clutch fitting tool to onto the clutch.



Use the clutch spring compressor tool to compress the spring in the driven pulley assembly.



Thread on the clutch drive plate nut.



Tighten the clutch drive plate nut to specification with the special socket that comes with the fitting tool.

Item	Qty	Torque	
		kgf-m	lb-ft
Clutch drive plate nut	1	5.0~6.0	36.17-43.40



Wipe away any excess grease. Do not allow grease to contact the clutch shoe linings or the driven faces where the belt will ride.



Place the clutch outer over the centrifugal clutch assembly.

5.3. Drive Pulley



Install the rollers into the back of the movable drive face of the driven pulley. Position the rollers so that their colored sides are clockwise.



Insert the four rubber damper pieces into the ramp.



Fit the ramp into the back of the movable drive face of the drive pulley. Make sure the rubber dampers fit onto the ridges as shown.

5.4. Pulleys and Belt



Slide the drive pulley washer onto the crankshaft.



Insert the bushing into movable drive face of the drive pulley. Slide the movable face of the drive pulley onto the crankshaft.

Make sure the drive face are clean and grease free where they will contact the belt.



Fit the Belt in between the faces of the driven pulley. Spread the faces by hand if needed in get the belt to fit.



Slide the driven pulley and clutch assembly onto the final drive shaft. Position the front end of the belt around the crankshaft.



Install the driven pulley bushing and nut.



Torque the driven pulley nut to specification with a 19 mm socket.

Item	Qty	Thread size (mm)	Torque	
			kgf-m	lb-ft
Clutch outer nut (driven pulley)	1	12	5.0-6.0	36.17-43.40



Slide the left face of the drive pulley onto the crankshaft.



Lubricate the threads of the drive pulley nut with engine oil. Install the drive pulley washer and nut.



Hold the drive pulley with a universal holder tool and torque the nut to specification with a 19 mm socket.

Item	Qty	Thread size (mm)	Torque	
			kgf-m	lb-ft
Drive face nut	1	14	9.0-10.0	65.10-72.33

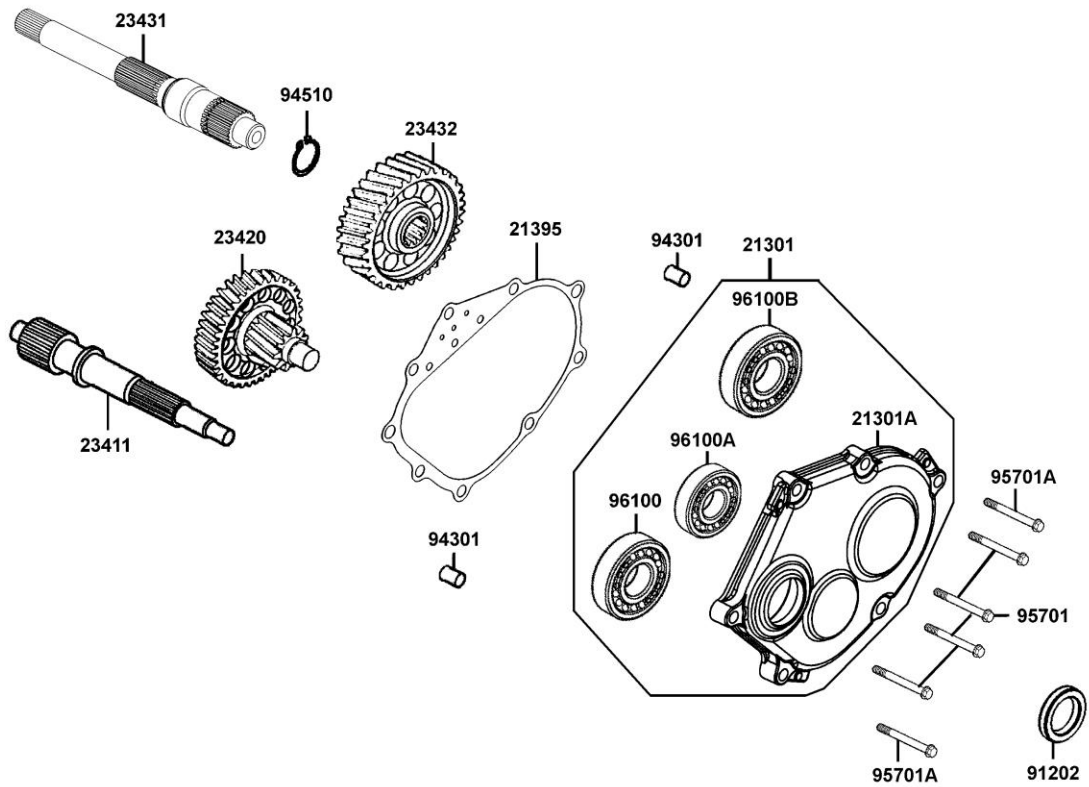
Install the belt case. See the Belt Case topic for more information.

09. Final Reduction

Final Reduction

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1. SCHEMATIC DRAWING



2. SERVICE INFORMATION

2.1. General Instructions

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

2.2. Specifications

Specified Oil	SAE 90#	
Oil Capacity	At disassembly	0.23 L
	At change	0.20 L

2.3. Torque Values

ITEM	TORQUE (kgf-m)
Transmission case cover bolt	1.8~2.2
L case gear oil check/ drain bolt	0.8~1.2

2.4. Special Tools

Oil seal and bearing installer	A120E00014
Bearing puller	A120E00037

2.5. Troubleshooting

Engine starts but motorcycle won't move

- Damaged transmission
- Seized or burnt transmission

Abnormal noise

- Worn, seized or chipped gears
- Worn bearing

Oil leaks

- Oil level too high
- Worn or damaged oil seal

3. Gear Oil

3.1. Draining

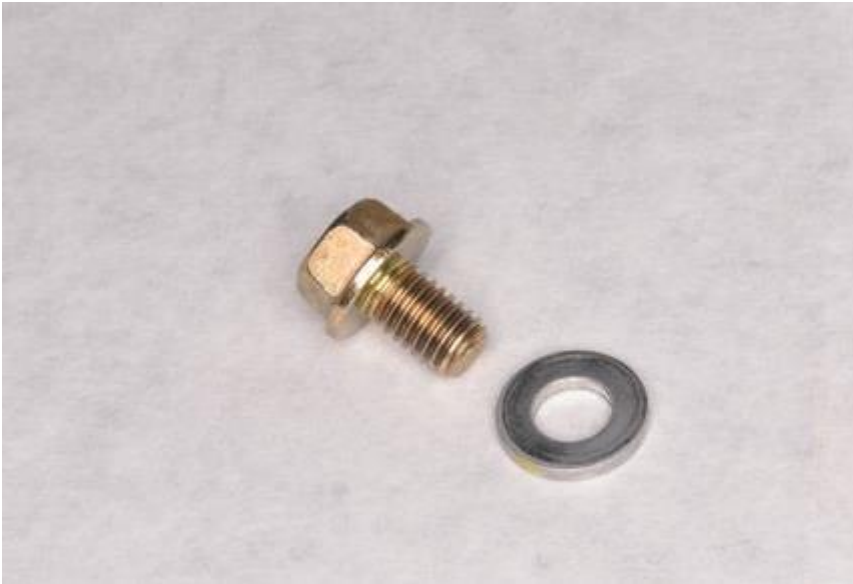
Place the vehicle on its center stand on level ground. Place a suitable oil drain pan under the transmission oil drain plug.



Remove the transmission oil level filler bolt with a 12 mm socket.



Place a suitable container under the drain plug to capture the final drive oil. Loosen the oil drain plug with a 12 mm socket. Remove the drain plug and slowly rotate the rear wheel to drain the transmission oil.



Inspect the drain plug and washer.



Install the oil drain plug and washer with a 12 mm socket. Tighten to specification.

Item	Qty	Thread size (mm)	Torque	
			kgf-m	lb-ft
Final drive oil drain bolt	1	8	0.8 - 1.2	5.79 - 8.68

3.2. Filling



Fill the final drive with the specified quantity of oil with a syringe.

Gear oil type:	SAE 90
Gear oil capacity:	
At disassembly	0.23 Liter
At change	0.20 Liter



Thread in the final drive oil level filler bolt.



Install the oil filler plug and torque it to specification with a 12 mm socket.

Item	Qty	Thread size (mm)	Torque	
			kgf-m	lb-ft
Final drive oil filler bolt	1	8	0.8 - 1.2	5.79 - 8.68

4. Final Reduction

SAFETY FIRST: Protective gloves and eyewear are recommended at this point.

4.1. Disassembly

Note: Do not remove the transmission case cover except for necessary part replacement. If the drive shaft is replaced, make sure to also replace the bearing and oil seal.

Remove the belt case. See the Belt Case topic for more information.

Remove the CVT belt and pulleys. See the CVT Removal topic for more information.

Drain the final drive oil. See the Final Drive Oil topic for more information.

Remove the rear wheel. See the Rear Wheel topic for more information.



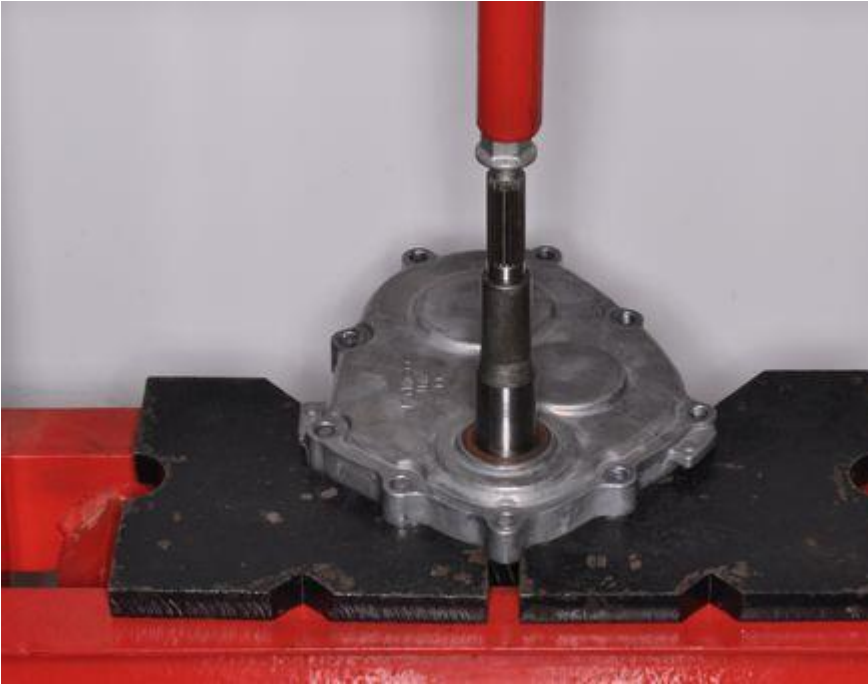
There are 9 transmission case cover bolts.



Remove the 9 transmission case cover bolts using a 12 mm socket.



Utilize the reinforced pry points and remove the case cover.



Use a press to remove the drive shaft. Thread a nut onto the drive shaft to protect the threads. If the drive shaft is to be replaced also replace the seal.



Remove the two dowel pins and the gasket.



Remove the final shaft gear.



Remove the countershaft.

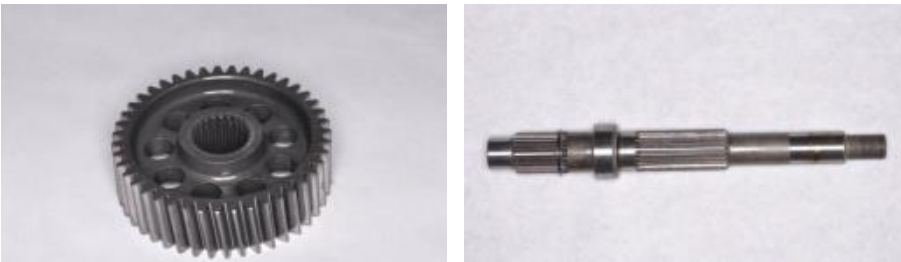


Remove the final shaft.

4.2. Inspection



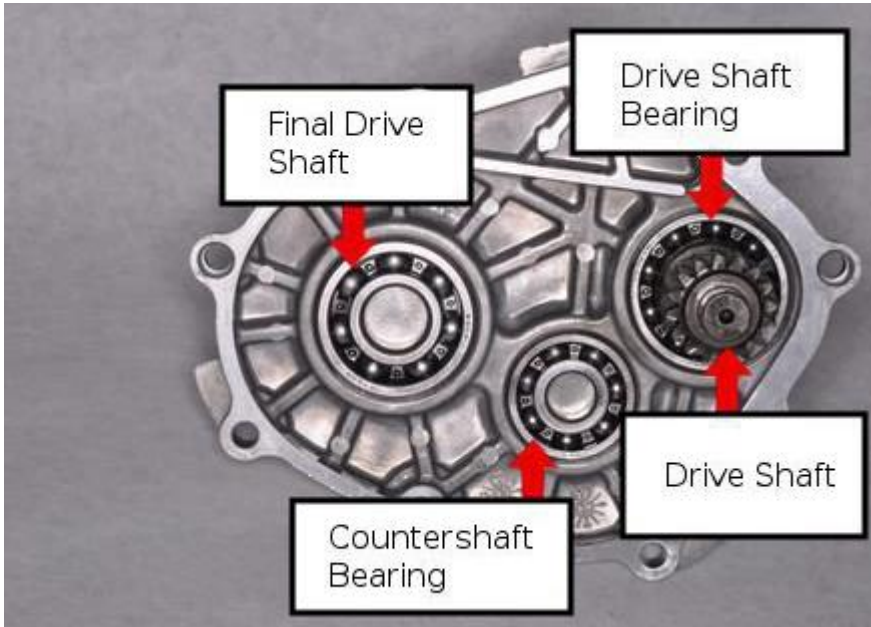
Inspect the countershaft gear for wear or damage.



Inspect the final gear and final shaft for wear, damage or seizure. If the final shaft snap ring is removed replace it with a new item.



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



Check the transmission case cover bearings for excessive play. Inspect the drive shaft, drive shaft bearing and oil seal for wear or damage.



Use a bearing puller to remove the crankcase or transmission case covers.



Use a seal pick to remove the oil seals.



Use a bearing driver to install any new bearings into the crankcase and transmission case cover. The driver should have the same outside diameter as the bearings. The bearings should go in square and have their markings facing out. Drive in a new seals in the same manner if needed.

4.3. Installation

Lubricate the final drive bearings with fresh final drive oil. Coat the lips of the seals in fresh final drive oil.



Press the drive shaft back into the transmission case cover as shown.



Insert the final shaft through the oil seal and bearing.



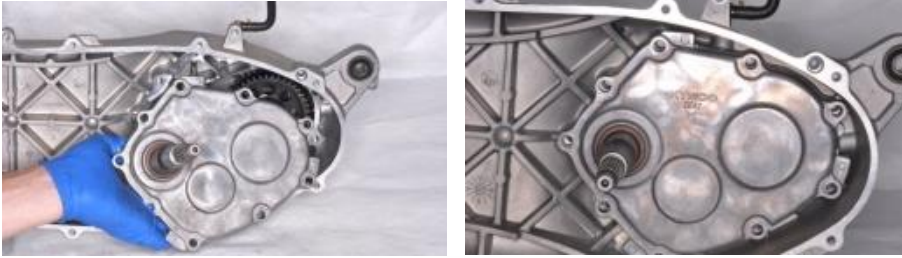
Install the countershaft into its bearing as shown.



Install the final gear onto the final shaft as shown.



Install the dowel pins. Install a new gasket onto the transmission case.



Install the transmission case cover onto the transmission. Fit the drive into its bearing in the case and make sure it gear engages correctly with the countershaft gear.

Turn the drive shaft and make sure the final shaft turns.



Insert the 9 transmission case cover bolts. Tighten the bolts to specification using a 12 mm socket.

Item	Qty	Thread size (mm)	Torque	
			kgf-m	lb-ft
Transmission case bolts	9	8	1.8~2.5	13.02~18.08

Install the rear wheel. See the Rear Wheel topic for more information.
 Fill the final drive oil. See the Final Drive Oil topic for more information.
 Install the CVT belt and pulleys. See the CVT Installation topic for more information.

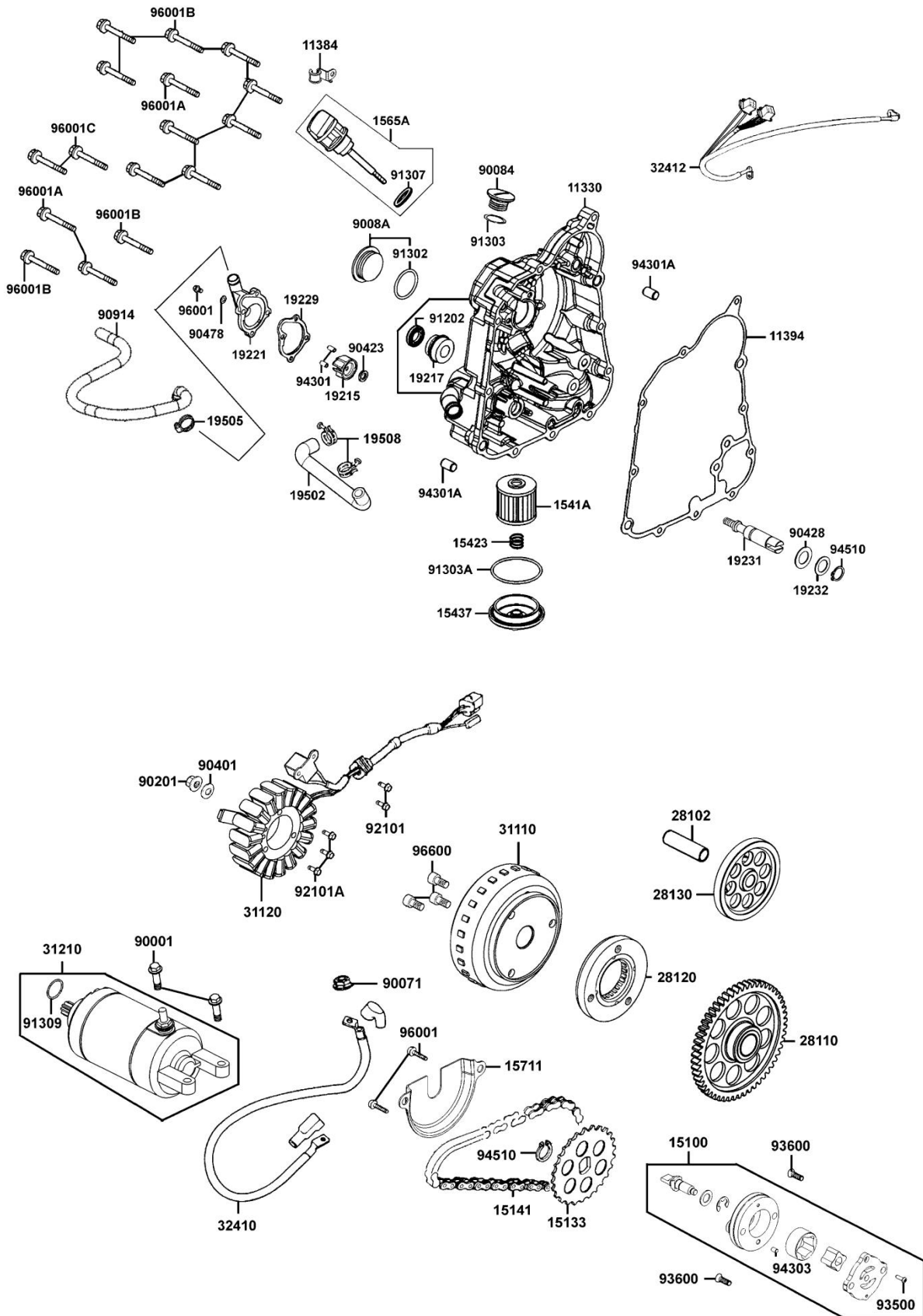
Install the belt case. See the Belt Case topic for more information.

10. Alternator & Starter clutch

A.C. Generator & Starter Clutch

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	Generator Cover	20

1. SCHEMATIC DRAWING



2. SERVICE INFORMATION

2.1. General Instructions

- All servicing operations and inspections in this section can be made with the engine installed.
- Drain the coolant before removing the right crankcase cover.
- Be careful not to drain the coolant when the engine temperature is high. (Perform this operation when the engine is cold.)
- Drain the coolant into a clean container.
- Drain the engine oil into a clean container before removing the right crankcase cover.
- When the right crankcase cover is installed, fill with the recommended engine oil and coolant. Then, bleed air from the water jacket.
- Refer to chapter 17 for A.C. generator inspection.

2.2. Specifications

Engine Oil		SAE 5W/50#
		API-SJ Above
Oil Capacity At Change		1.3 L
Coolant		Distilled Water + Coolant Concentrate
Coolant Capacity	Coolant radiator	766 cc
	Reserve tank	590 cc
	Hoses	363 cc
	Total	1917 cc

2.3. Special Tools

Flywheel Puller	A120E00099
Flywheel Holder	A120E00021

2.4. Torque Values

ITEM	TORQUE (kgf-m)	REMARK
Flywheel Nut	5.5~6.5	
One-way Clutch Bolts	1.8~2.2	Apply thread locker

2.5. Troubleshooting

Starter motor rotates but engine does not start

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

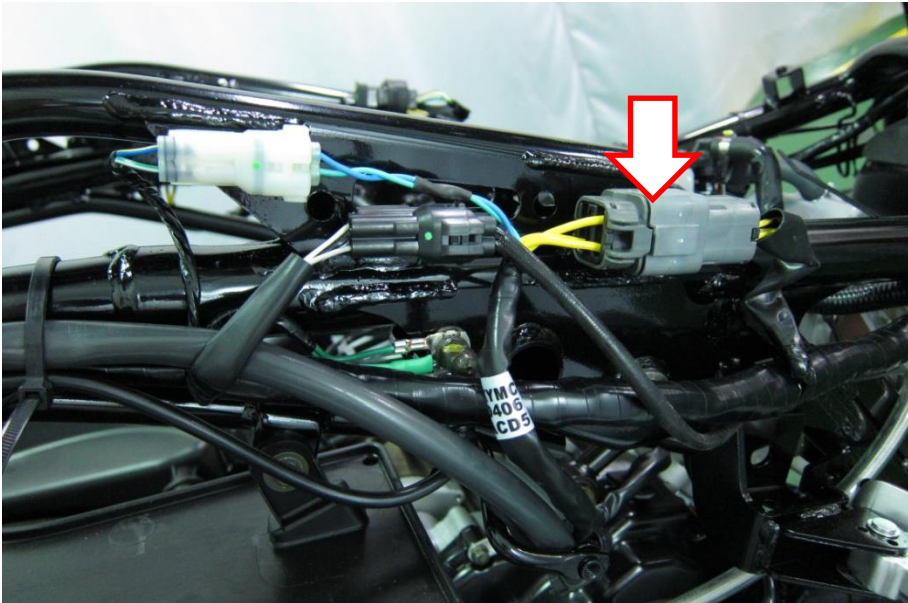
3. A.C. GENERATOR AND STARTER CLUTCH

SAFETY FIRST: Protective gloves and eyewear are recommended at this point.

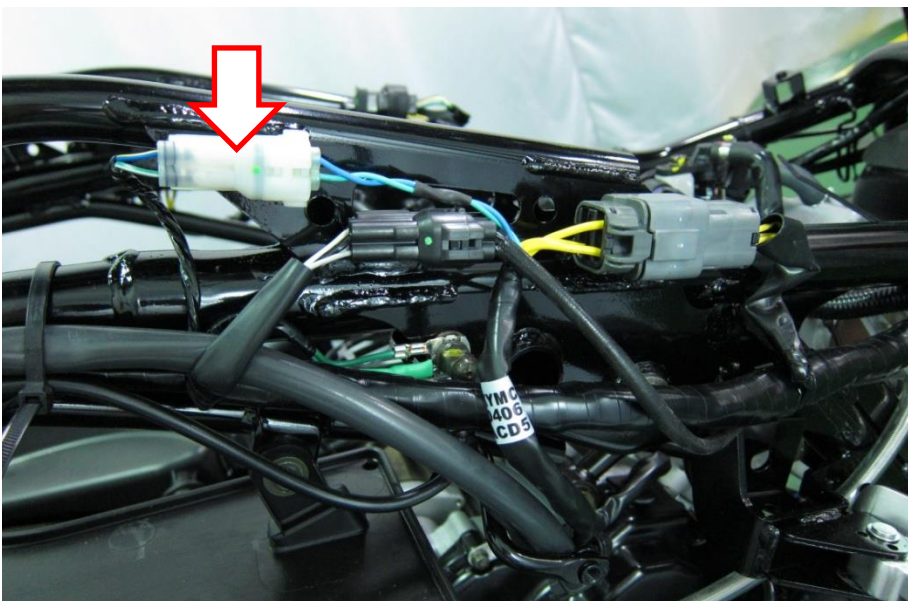
3.1. Removal

Drain engine oil and remove the oil filter. See the Engine Oil topic for more information.

Drain the coolant. See the Coolant topic for more information.



Disconnect the generator 3-pin connector.



Disconnect the crank position sensor wire coupler.



Loosen the water pump hose clamp with a #2 Phillips screwdriver. Slide up the clamp and free the coolant hose from the water pump. Allow any remaining coolant to drain into a suitable container.



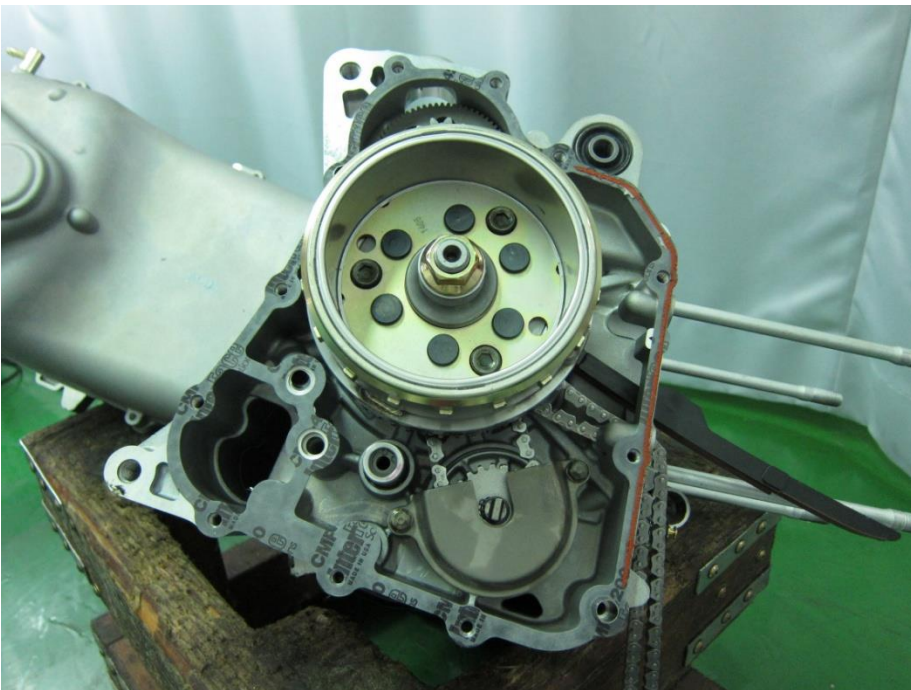
Loosen the right crankcase coolant hose clamp with a #2 Phillips screwdriver. Slide up the clamp and free the coolant hose from the right crankcase cover. Allow any remaining coolant to drain into a suitable container.





Remove the 12 generator cover bolts with an 8 mm socket.

Utilize the pry points and remove the generator cover.



Remove the generator cover gasket.



Remove the two dowel pins.



Remove the two oil filter chamber O-rings. Inspect the O-rings and replace them as needed.

Stator and Pulsar Coil/Crank Position Sensor

To inspect the stator see the Charging System topic.

For crank position sensor inspection see the Ignition System topic.



Free the rubber wire grommet from the right crankcase cover.



Remove the three stator mounting bolts and the two crank position sensor bolts with an 8 mm socket. Remove the stator and the crank position sensor together.

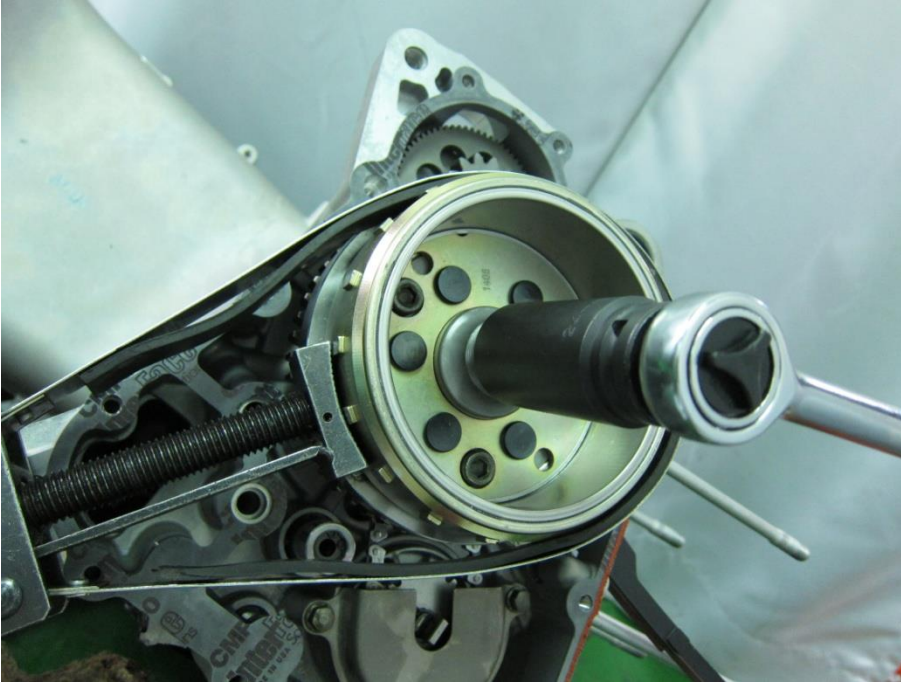
Flywheel

To remove the fly wheel two special tools are needed.

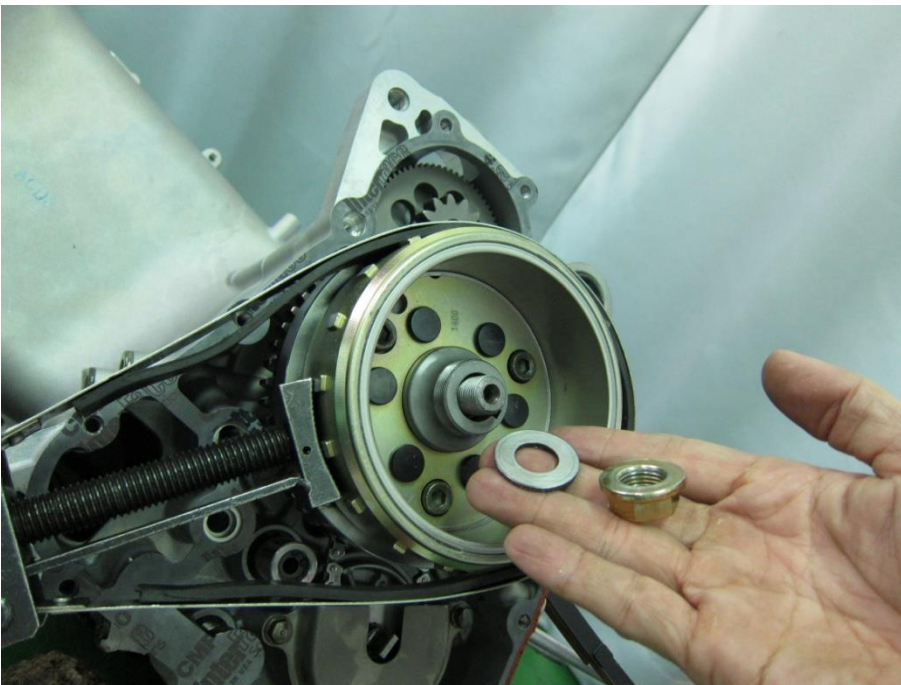
ITEM	TOOL NO.
UNIVERSAL HOLDER	E021



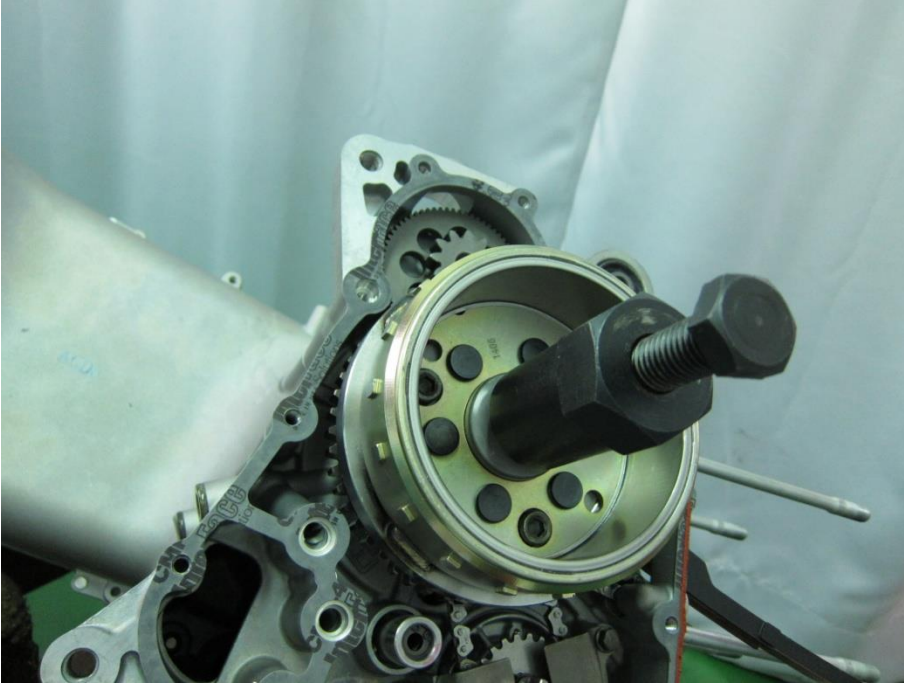
ITEM	TOOL NO.
FLYWHEEL PULLER	A120E00099



Hold the flywheel with the universal holder and loosen the nut with a 19 mm socket.



Remove the flywheel nut and washer.



Apply grease to the threads of the flywheel puller tool before using it. Thread the puller onto the flywheel. Hold the tool with a large wrench and turn in the bolt until the pressure separates the flywheel from the crankshaft.



Remove the flywheel from the crankshaft.



Slide the starter driven gear off of the crankshaft.

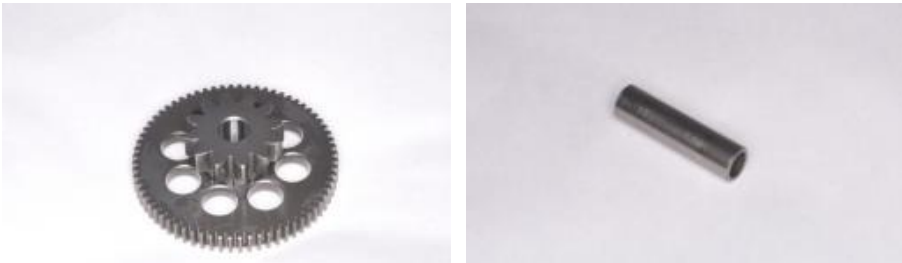


Remove the woodruff key from the crankshaft.

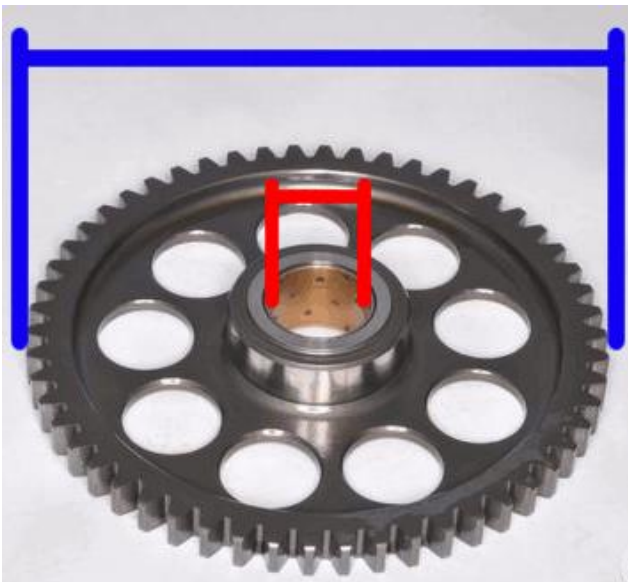
Starter Clutch



Remove the starter idle gear and shaft from the crankcase.



Inspect the starter idle gear and shaft for wear and damage. Replace the idle gear and shaft as needed.



Inspect the starter driven gear for wear and damage. Measure the inside and outside diameter of the starter driven gear and replace it as needed.

Item	Service Limit (mm)
Starter drive gear I.D.	22.15
Starter drive gear O.D.	41.50



Fit the boss of the starter driven gear into the starter clutch. The starter clutch should only allow the driven gear to turn in one direction. If the starter clutch allows turning both ways or will not let the driven gear rotate smoothly in one direction the starter clutch must be replaced.



Remove the three starter clutch mounting bolts with a 6 mm Allen socket.

3.2. Installation

Starter Clutch



Fit the starter clutch to the back of the flywheel. Apply blue Loctite to the threads of the three starter clutch mounting bolts. Insert the three starter clutch mounting bolts.



Tighten the starter clutch mounting bolts to specification with a 6 mm Allen socket.

Item	Qty	Thread size (mm)	Torque		Remark
			kgf-m	lb-ft	
Oneway clutch bolt	3	8	1.8-2.2	13.02-15.91	Apply thread locker



Lubricate the starter idle gear shaft with fresh engine oil. Install the starter idle gear and shaft into the crankcase.

Flywheel



Install the woodruff key into its slot on the end of the crankshaft.

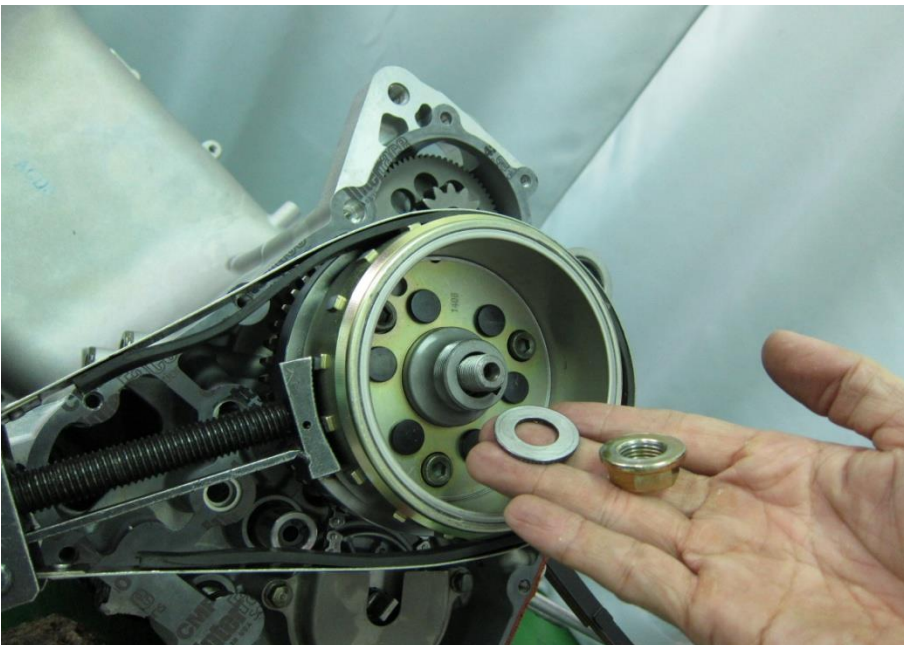


Lubricate the inside of the starter driven gear with fresh engine oil. Slide the starter driven gear onto the flywheel as shown.

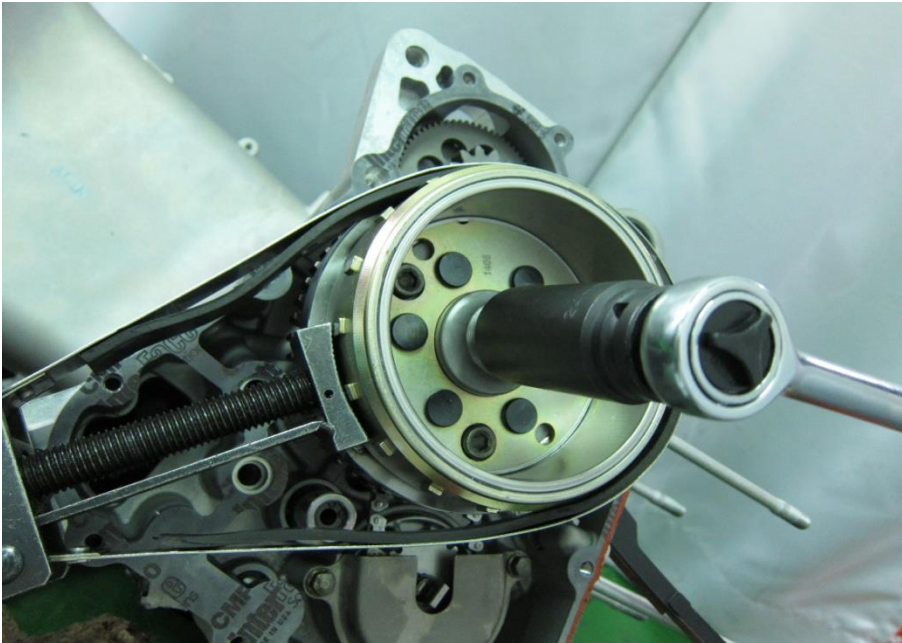
Clean off the tapered end of the crankshaft where the flywheel will ride and make sure the inside of the flywheel is oil free where it will contact the crankshaft.



Line up the groove in the flywheel with the key and fit the flywheel onto the crankshaft. Guide the starter driven gear into the starter clutch on the back of the flywheel.



Install the washer and flywheel nut.



Hold the flywheel with the universal holder and torque the flywheel nut to specification with a 19 mm socket.

Item	Qty	Thread size (mm)	Torque	
			kgf-m	lb-ft
ACG flywheel nut	1	14	5.5-6.5	39.78-47.01

ITEM	TOOL NO.
UNIVERSAL HOLDER	E021

Stator and Crank Position Sensor



Fit the stator and the crankshaft position sensor into the generator cover together as shown. Insert the two crank position sensor mounting bolts and the three stator mounting bolts. Tighten the bolts securely with an 8 mm socket.

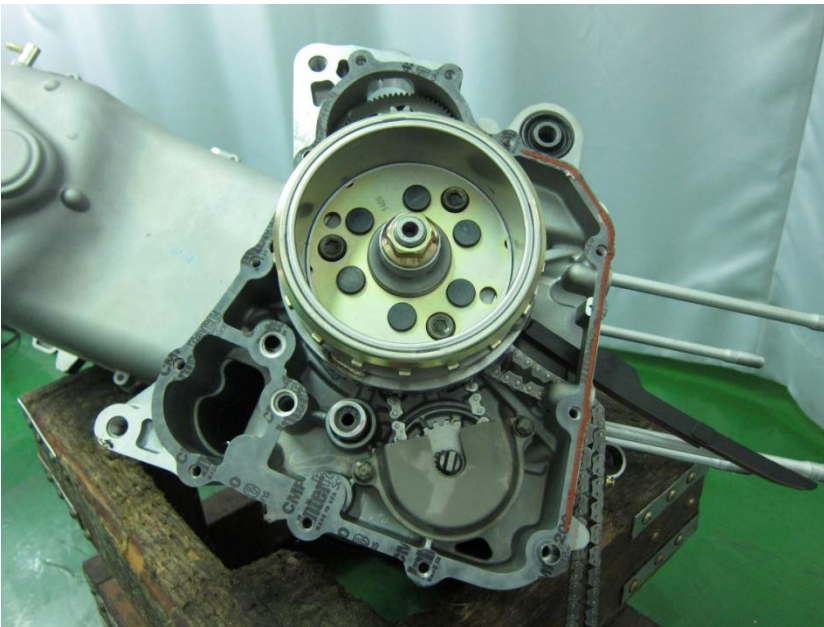


Coat the rubber grommet in silicone sealant where it contacts the generator cover. Fit the rubber wire grommet into its cutout in the crankcase cover.

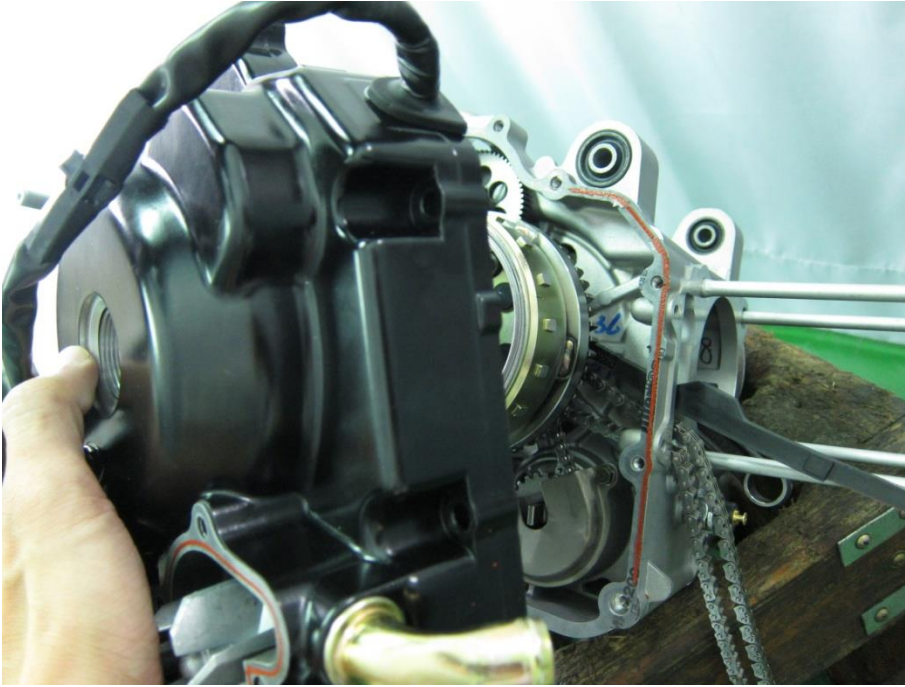
Generator Cover



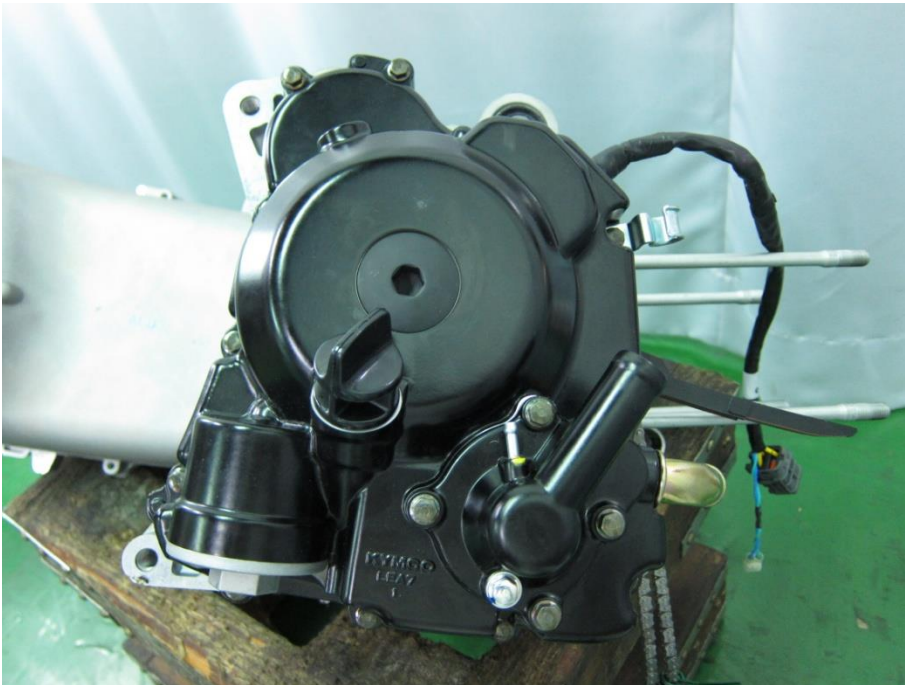
Make sure the generator cover mating surface is clean. Install the two dowel pins and a new generator cover gasket.



Make sure the oil filter chamber O-rings are in place and in good condition.



Fit the generator cover into place. Make sure the water pump shaft engages correctly with the oil pump shaft.



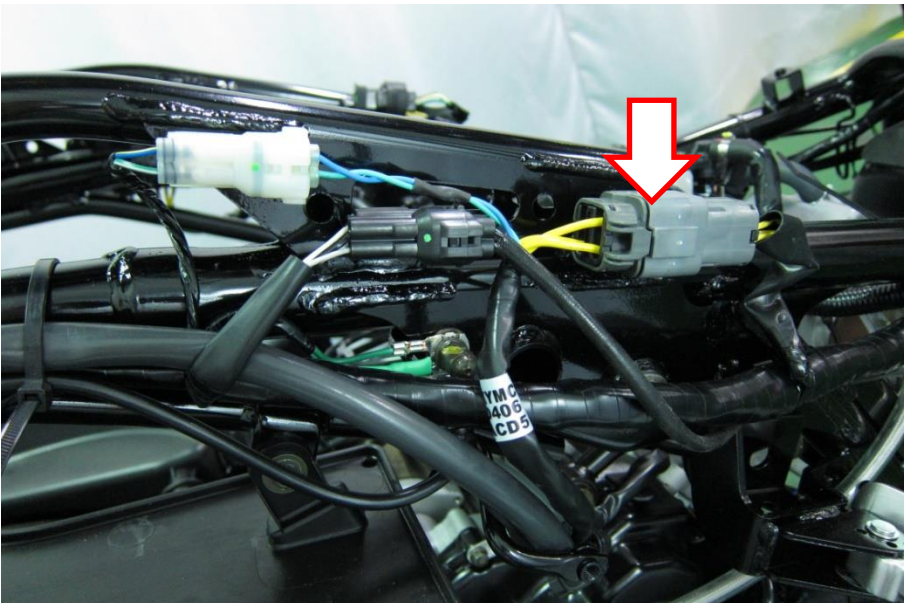
Insert the 12 generator cover bolts.
Tighten the bolts securely in a with an 8 mm socket.



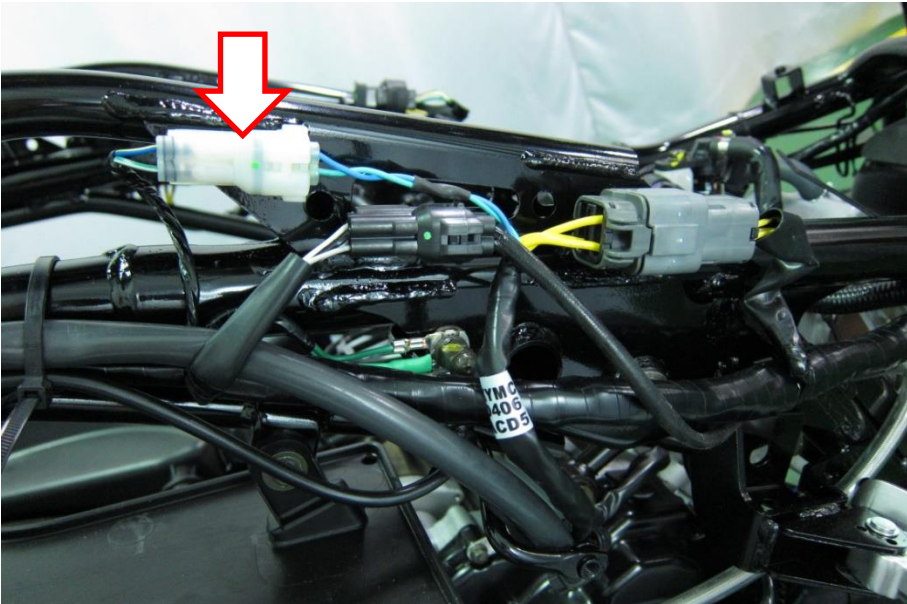
Fit the coolant hose to the right crankcase cover pipe. Secure the hose with the clamp and tighten the coolant hose clamp securely with a #2 Phillips screwdriver.



Connect the coolant hose to the water pump. Move the clamp into place and tighten it securely with a #2 Phillips screwdriver.



Plug in the regulator/rectifier 3-pin connector.



Plug in the crank position sensor wire coupler on the right side of the frame.

Fill the engine oil. See the Engine Oil topic for more information.

Install the exhaust system. See the Exhaust System topic for more information.

Fill the coolant and bleed the coolant. See the Coolant topic for more information.

11. Crankcase & Crankshaft

Crank Case

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2. SERVICE INFORMATION

2.1. General Instructions

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

2.2. Specifications

Unit: mm

	Item	Standard	Service Limit
Crankshaft	Connecting rod big end side clearance	0.15~0.35	0.6
	Connecting rod big end radial clearance	0~0.008	0.05
	Run out	---	0.1

2.3. Torque Values

Crankcase bolt	0.8~1.2 kgf-m
Cam chain tensioner pivot	0.8~1.2 kgf-m

2.4. Troubleshooting

Excessive engine noise

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

3. Crankcase

SAFETY FIRST: Protective gloves and eyewear are recommended at this point.

3.1. Splitting

Drain the engine oil and remove the strainer screen. See the Engine Oil topic for more information.

Remove the engine. See the Engine Removal topic for more information.

Remove the cylinder head cover. See the Cylinder Head Cover topic for more information.

Remove the camshaft sprocket. See the Camshaft topic for more information.

Remove the cylinder head. See the Cylinder Head topic for more information.

Remove the cylinder and piston. See the Cylinder and Piston topic for more information.

Remove the generator cover, flywheel, starter idle gear and starter driven gear. See the A.C. Generator and Starter clutch topic.

Remove the starter motor. See the Starter Motor topic for more information.

Remove the oil pump. See the Oil Pump topic for more information.

Remove the CVT pulleys and belt. See the CVT Removal topic for more information.

Remove the rear wheel. See the Rear Wheel topic for more information.



Remove the upper cam chain guide bolt with an 8 mm Allen.



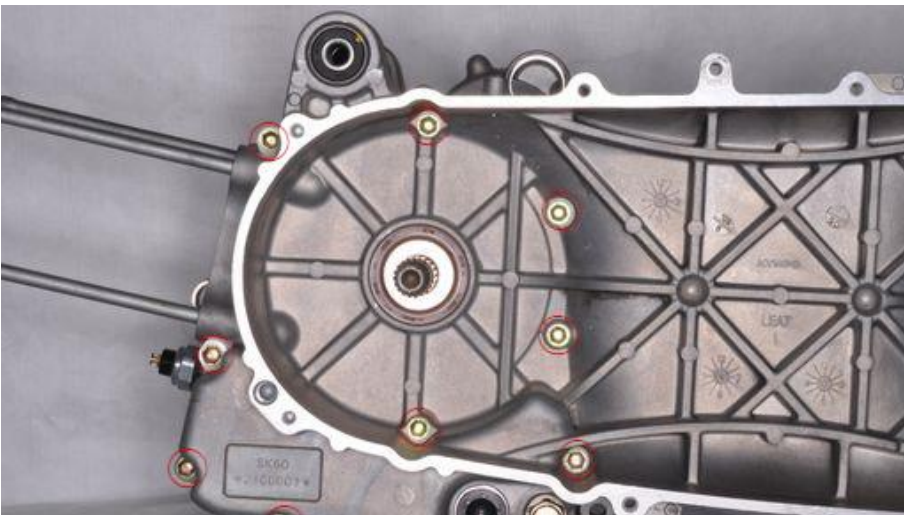
Remove the upper cam chain guide.



Inspect the cam chain guides for damage and excessive wear. Replace the guides as needed.



Remove the cam chain from the crankshaft and crankcase. Inspect the cam chain for wear and damage. Replace the cam chain as needed.



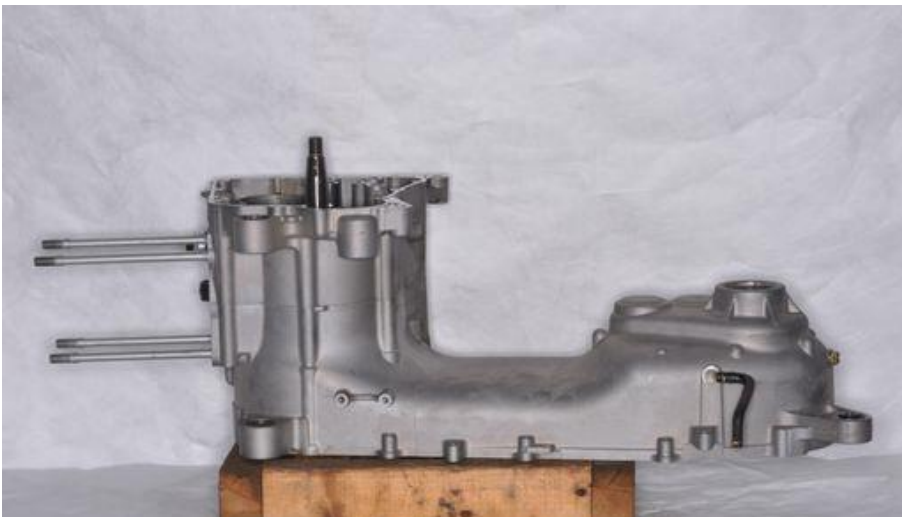
There are 11 crankcase bolts.



Loosen the 11 crankcase bolts in a crisscross pattern with an 8 mm socket. Remove the crankcase bolts from the left side of the engine.



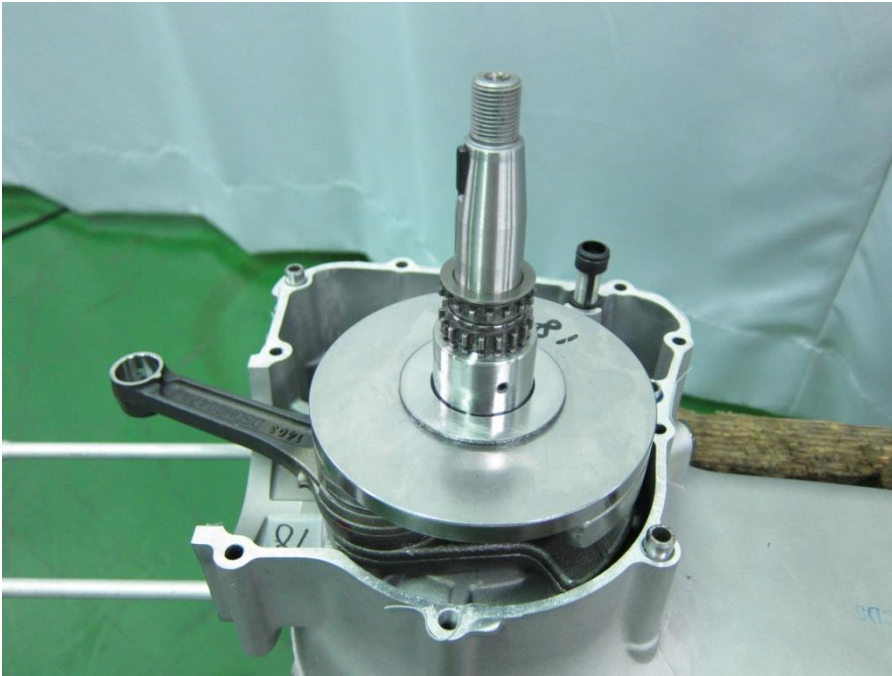
Remove the plate with the bottom two crankcase bolts.



Set the crankcases on the right side.



Separate the halves of the crankcase. If needed gently tap the reinforced areas of the right crankcase half with a rubber mallet. Lift the right crankcase off of the left.



Remove the dowel pins from the crankcase. Inspect the O-ring and replace it as needed. To remove the crankshaft see the Crankshaft topic.



Replace the left crankshaft seal if the crankcases are separated.



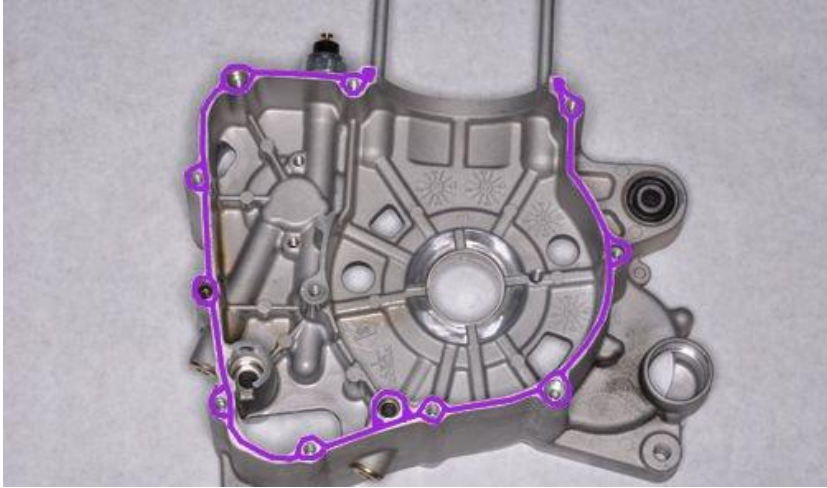
Remove the seal with a seal pick.



Drive the new seal into the left crankcase from the outside with a suitable driver. The driver should have the same outside diameter as the seal. Lubricate the new crankshaft seal lips with fresh engine oil.

3.2. Assembly

Thoroughly clean the crankcase mating surface.



Apply sealant uniformly to the crankcase mating surface as indicated. Do not allow sealant to enter oil passages or get in bearings.



Set the right case half down on top of the left. Install the engine mount spacer.

Note: Make sure the Right/Left crankcases with the same number.





Insert the 11 crankcase bolts. The plate goes on with the bottom two bolts.



Tighten the bolts securely and evenly in a crisscross pattern with an 8 mm socket.



Install the cam chain around the timing sprocket teeth on the crankshaft.



Fit the upper cam chain guide into place.



Insert the upper cam chain guide mounting bolt and tighten it to specification with an 8 mm Allen socket.

Item	Qty	Thread size (mm)	Torque	
			kgf-m	lb-ft
Cam chain tensioner pivot	1	8	0.8-1.2	5.79 - 8.68

Install the oil pump. See the Oil Pump topic for more information.

Install the starter idle gear, driven gear, flywheel, and the generator cover. See the A.C. Generator and Starter clutch topic.

Install the starter motor. See the Starter Motor topic for more information.

Install the CVT pulleys and belt. See the CVT Installation topic for more information.

Install the cylinder and piston. See the Cylinder and Piston topic for more information.

Install the cylinder head. See the Cylinder Head topic.

Install the camshaft. See the Camshaft topic for more information.

Install the cylinder head cover. See the Cylinder Head Cover topic for more information.

Install the rear wheel. See the Rear Wheel topic for more information.

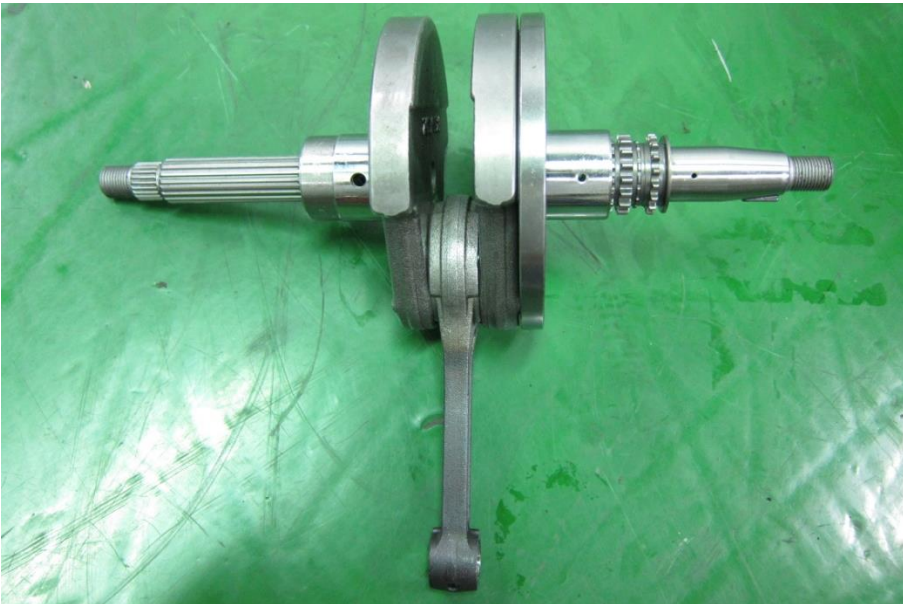
Install the engine into the frame. See the Engine Installation topic for more information.

4. Crankshaft

SAFETY FIRST: Protective gloves and eyewear are recommended at this point.

4.1. Removal

Split the crankcases. See the Crankcase topic for more information.



Lift the crankshaft out of the left crankcase half.

4.2. Crankshaft Inspection

Check the side clearance of the big end of the connecting rod with a feeler gauge.

Item		Standard (mm)	Service Limit (mm)
Crankshaft	Connecting rod big end side clearance	0.15 - 0.35	0.6

Grip the small end of the connecting rod and try and push the rod down towards the crank weights. If there is definite play between the connecting rod and crank the crankshaft should be replaced.

Measure the connecting rod big end side clearance.



Service Limit: 0.6 mm

Measure the connecting rod small end I.D.

Service Limit: 14.06 mm



Measure the crankshaft run-out.

Service Limit: 0.1 mm

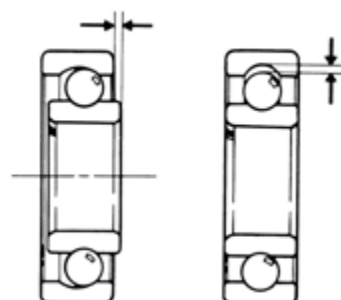


Measure the crankshaft bearing play.

Service Limits:

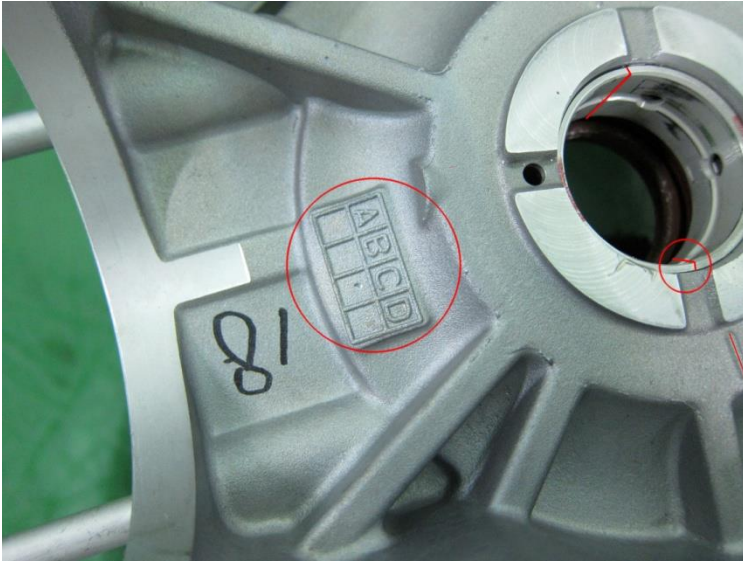
Axial: 0.2 mm

Radial: 0.05 mm



4.3. Crankshaft Bearings

Inspect the crankshaft bearings for signs of damage and wear. Replace the bearings if they show any kind of imperfection.



Note the bearing color code and crankcase code. The crank weights are also marked with a size code.



When the crankshaft and or crankcases must be replaced also replace both crank bearings according to the chart below.

-A,+A,A+ and A- all means A for both sides (CVT and stator sides)

-B,+B,B+ and B- all means B for both sides (CVT and stator sides)

And the gap between two bearings need to align the crankcase mark.

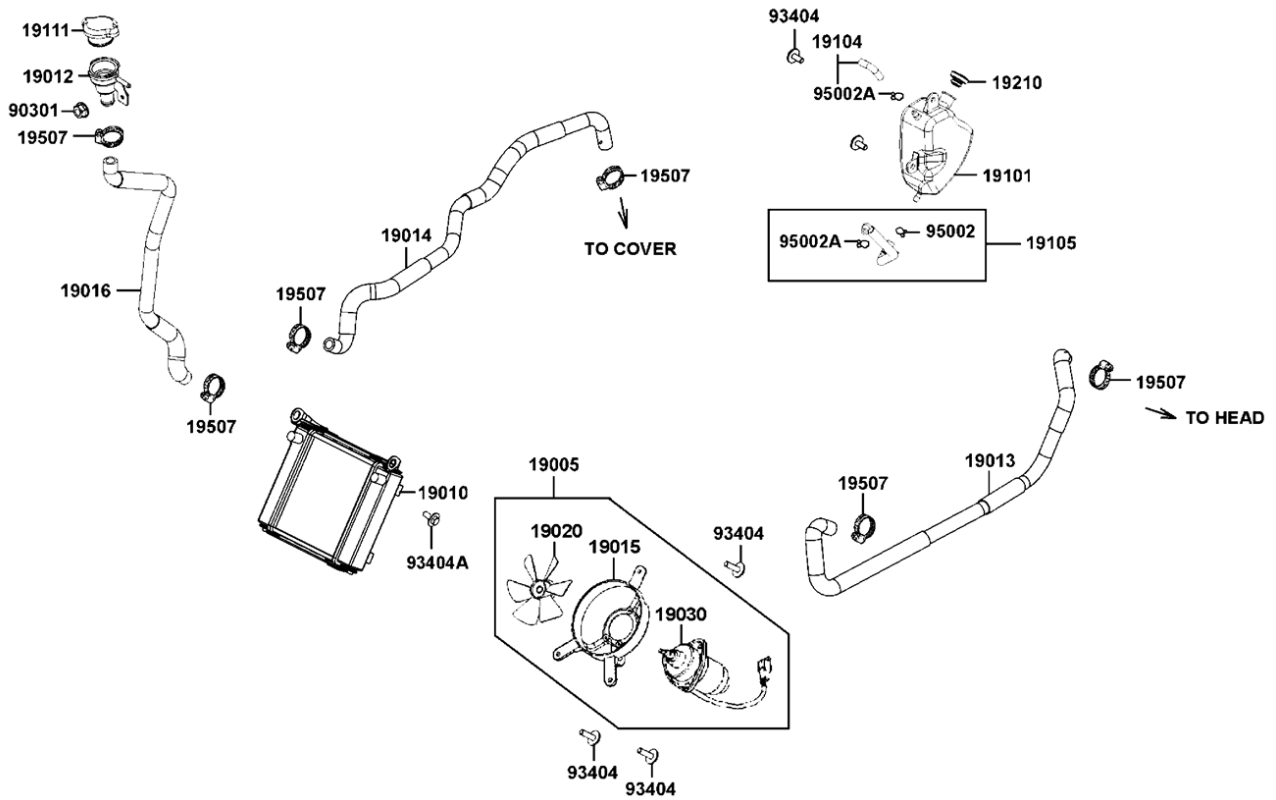
Bearing Color				
Crankshaft mark	Crankcase mark			
	A	B	C	D
A	black	green	green	red
B	green	green	red	---

12. Cooling System

Cooling System

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1. SCHEMATIC DRAWING



2. SERVICE INFORMATION

2.1. General Instructions

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

2.2. Special Tool

Mechanical seal driver

2.3. Torque Values

Water pump impeller	1.2 kgf-m	Left hand threads
Water pump cover bolt	1.0 kgf-m	

2.4. Troubleshooting

Engine temperature too high

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

Temperature gauge pointer does not register the correct coolant temperature

- Faulty temperature gauge or thermo sensor
- Faulty thermostat

Coolant leaks

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

2.5. Specifications

Radiator cap relief pressure		90±14.7 kPa (0.92±0.15 kgf/cm ² , 13.05±2.13 psi)
Thermostat temperature	Begins to open	82°C (180°F)
	Full-open	95°C (203°F)
	Valve lift	3.5~4.5 mm (0.14~0.18 in) minimum
Coolant Capacity	Coolant radiator	766 cc
	Reserve tank	590 cc
	Hoses	363 cc
	Total	1917 cc
Standard coolant concentration		1:1 mixture with soft water

2.6. Coolant Gravity

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

2.7. Coolant Mixture (With Anti-Rust And Anti-Freezing Effects)

Freezing Point	Mixing Rate
-9°C	20%
-15°C	30%
-25°C	40%
-37°C	50%
-44.5°C	55%

Cautions for Using Coolant:

Use coolant of specified mixing rate. (The mixing rate of 425cc KYMCO SIGMA coolant concentrate + 975cc distilled water is 30 %.)

Do not mix coolant concentrate of different brands.

Do not drink the coolant which is poisonous.

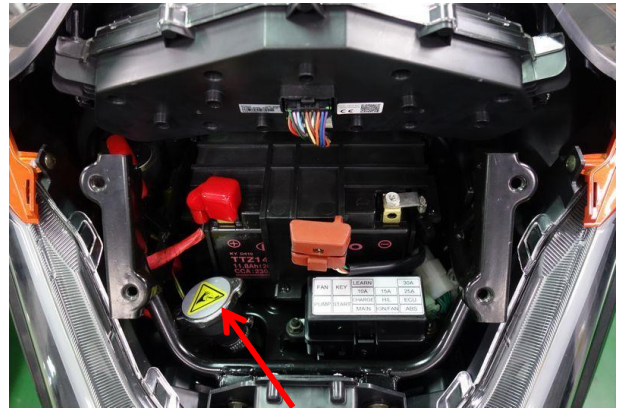
The freezing point of coolant mixture shall be 5°C lower than the freezing point of the riding area.

3. RADIATOR CAP INSPECTION

SAFETY FIRST: Protective gloves and eyewear are recommended at this point.

- ※ Removing the radiator cap while the engine is hot can cause the coolant to spray out, seriously scalding you.
- ※ Allow the engine sufficient time to cool before handling or working on the cooling system components.

Remove the radiator cap in two stages. Allow any built up pressure to vent and then open the cap all the way and remove it.

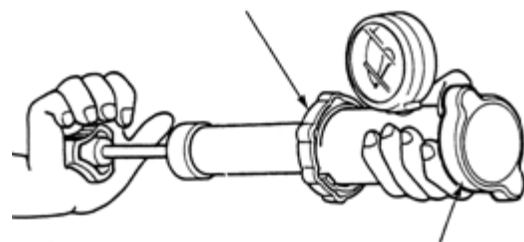


Radiator cap

After remove the radiator cap, wet the tester seal, and install the end of the pressure tester onto the filler neck. Pump the tester up until the gauge reads 0.84 kg/cm² or 12 psi. The cooling system should hold this pressure for at least 6 seconds.

Replace the radiator cap if it does not hold pressure, or if relief pressure is too high or too low.

It must hold the specified pressure for at least 6 seconds.



- ※ Before installing the cap in the tester, wet the sealing surface.
- ※ Excessive pressure can damage the cooling system components.
- ※ Do not exceed 105 kPa (1.05 kg/cm², 14.9 psi).

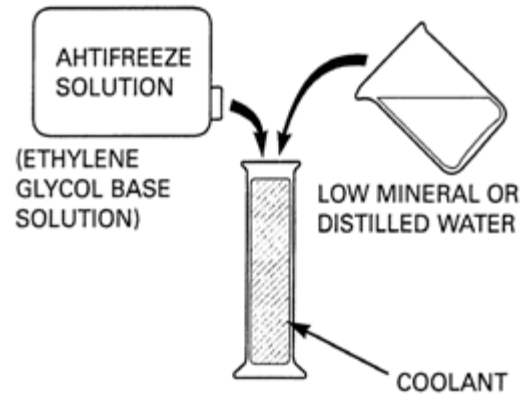
Radiator Cap Relief Pressure:
90 kPa (0.9 kg/cm², 12.8 psi)

4. COOLANT REPLACEMENT

4.1. Preparation

※ Antifreeze is highly toxic and can kill pets and animals if drank. Do not leave coolant where animals (including children!) can get to it.

- The effectiveness of coolant decreases with the accumulation of rust or if there is a change in the mixing proportion during usage. Therefore, for best performance change the coolant regularly as specified in the maintenance schedule.
- Mix only distilled, low mineral water with the antifreeze.



Recommended mixture:

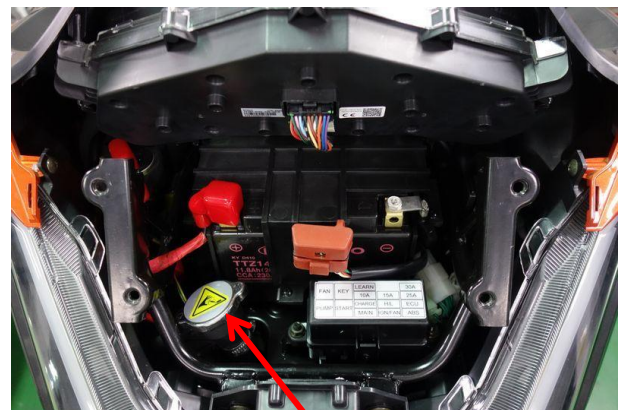
1:1 (Distilled water and antifreeze)

4.2. Replacement

Remove the front cover

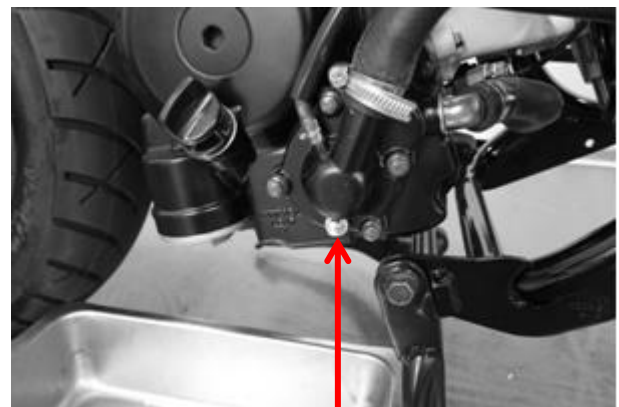
※ When filling the system or reserve tank with coolant (checking the coolant level), place the scooter in a vertical position on a flat, level surface.

Remove the radiator cap (1).



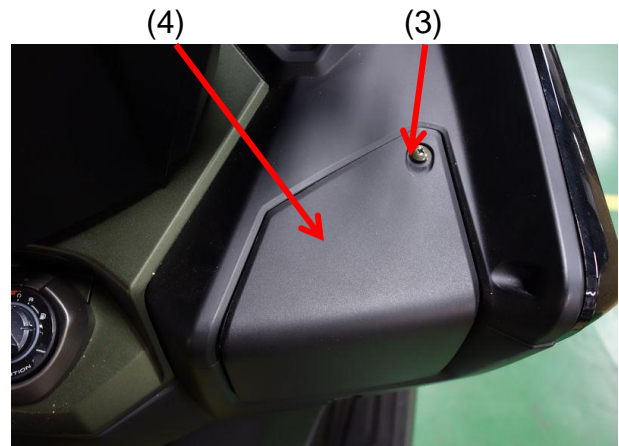
(1)

Remove the drain bolt and sealing washer and allow the coolant to drain into a suitable container.



(2)

Remove the screw (3) and reserve tank lid (4).



Open the coolant reserve tank lid. Siphon the coolant out of the reserve tank with an appropriate suction device. If a suction device is unavailable remove the reserve tank and pour it out.

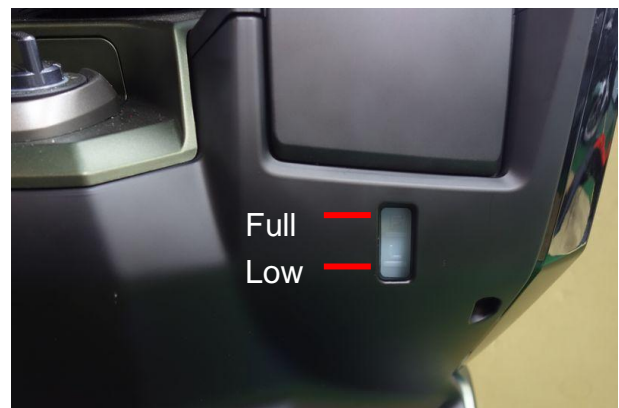


When the coolant has finished draining return the drain bolt to the water pump with a new sealing washer.

Fill the reserve tank to the upper level line.

Fill the system with the recommended coolant through the filler opening up to the filler neck.

Gently rock the vehicle side-to-side to release any air bubbles trapped in the cooling system.



4.3. Air Bleeding

Bleed air from the system as follow:

1. Start the engine and let it idle for 2–3 minutes.
2. Snap the throttle three to four times to bleed air from the system.
3. Stop the engine and add coolant to the proper level if necessary. Reinstall the radiator cap.
4. Check the level of coolant in the reserve tank and fill to the upper level if it is low.

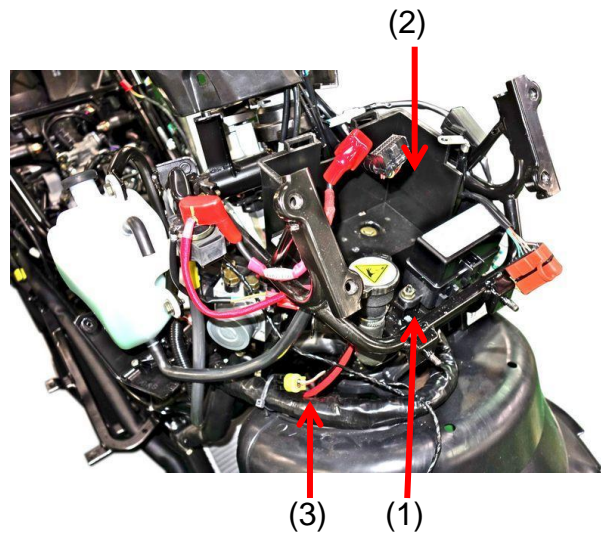
5. RADIATOR

5.1. Removal

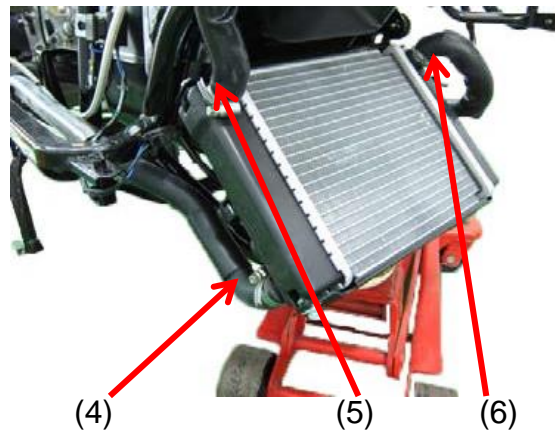
Drain the coolant.

Disconnect the siphon hose (1) and air bleed hose (2).

Remove the nut (3).

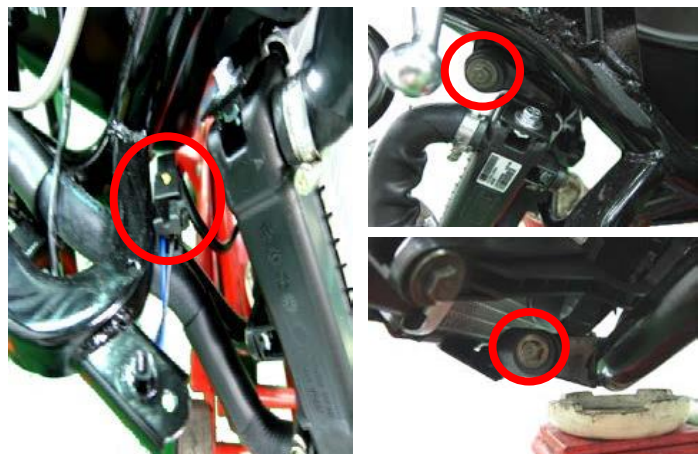


Loosen the hose bands, and then disconnect the output hose (4) (to the water pump), coolant filling hose (5) and input hose (6) (from the engine) from the radiator.



Disconnect the fan motor switch connector.

Remove the bolts and then remove the radiator from frame.



5.2. Inspection

Inspect the radiator fins for damage and clogging. To remove the fan, take out the three mounting bolts with a 10 mm socket.

Clean out the fins with low pressure compressed air and water.

Check the radiator for any bent or damaged fins. Use a small flat blade screwdriver to straighten them out, but be careful not to puncture the radiator.

※ Always wear safety glasses when using compressed air and never point it directly at yourself or anyone else.



Check the fan motor to operate using an available battery.



5.3. Installation

Installation is in the reverse order of removal.

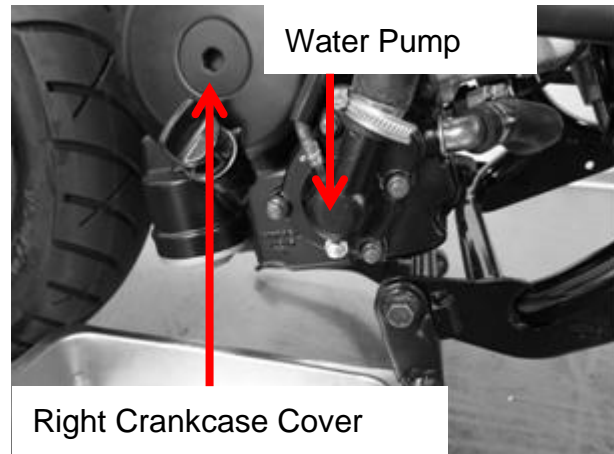
Refill the coolant.

6. WATER PUMP

6.1. Mechanical Seal (Water Seal) Inspection

Inspect the telltale hole for signs of mechanical seal coolant leakage.

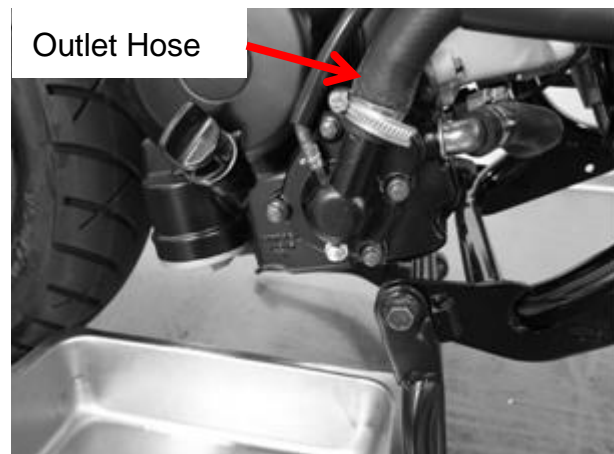
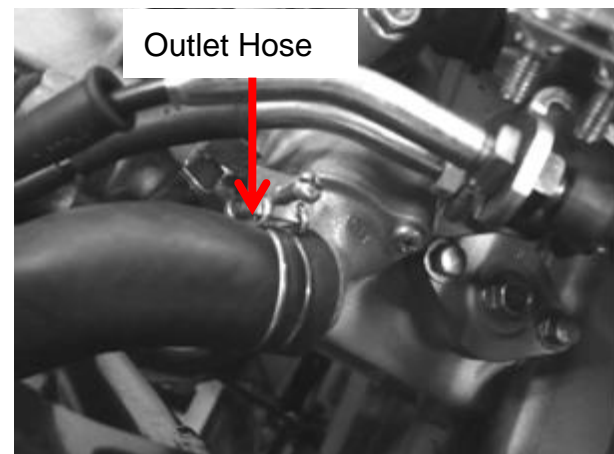
If the mechanical seal is leaking, remove the right crankcase cover and replace the mechanical seal.



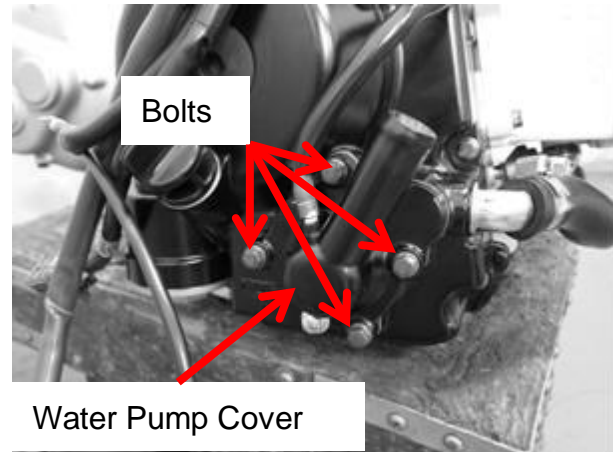
6.2. Water Pump/Impeller Removal

Drain the coolant.

Remove the coolant inlet hose and outlet hose.

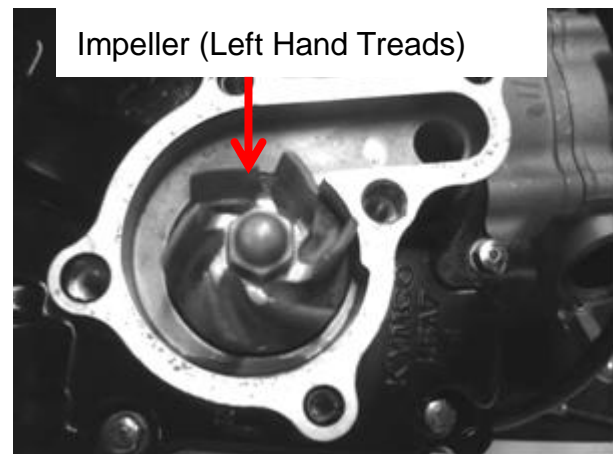


Remove the four bolts and the water pump cover, gasket and 2 dowel pins.



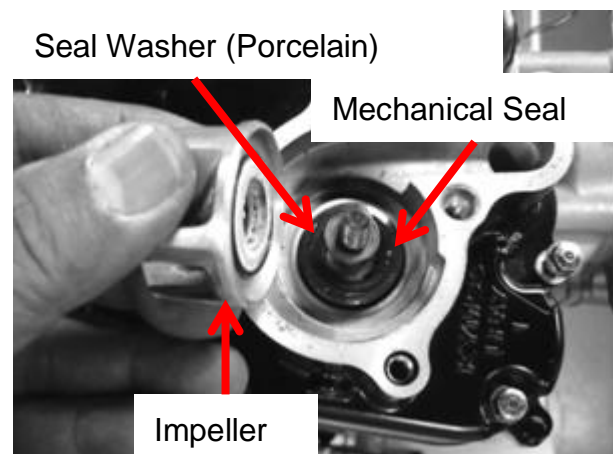
Remove the water pump impeller.

※ **The impeller has left hand threads.**



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

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



6.3. Water Pump Shaft Removal

Disconnect the water hose from the right crankcase cover.

Remove the 5 bolts attaching the water pump assembly.

Remove the water pump assembly, gasket and dowel pins.



Remove the water pump shaft clip and water pump shaft

Install the water pump shaft and shaft inner bearing into the water pump assembly.

Install the snap ring to secure the inner bearing properly.



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

Tighten the 5 bolts to secure the water pump assembly.

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



6.4. Water Pump/Impeller Installation

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

Install the impeller onto the water pump shaft.

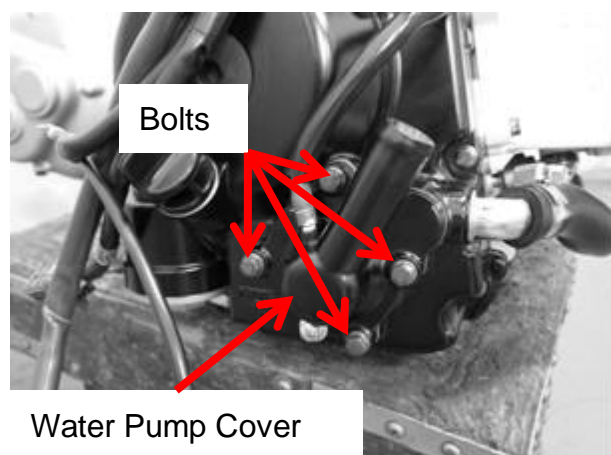
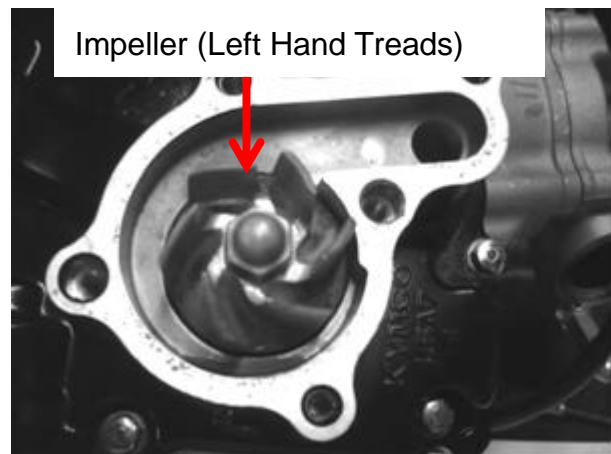
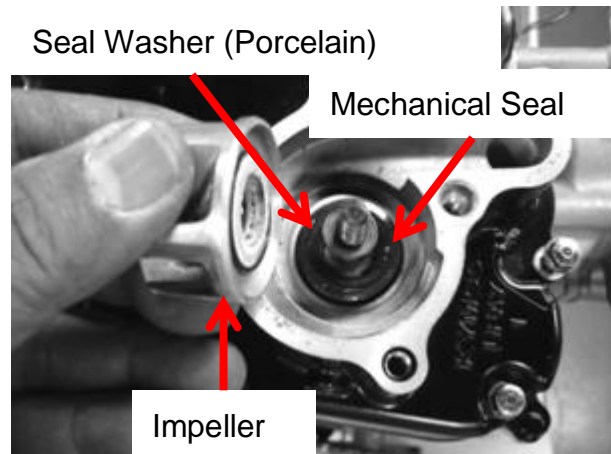
Torque: 1.2 kgf-m (12 N-m, 9 lbf-ft)

※ The impeller has left hand threads.

Install the two dowel pins and a new gasket.

Install the water pump cover and tighten the 4 bolts.

Torque: 1 kgf-m (10 N-m, 7 lbf-ft)



7. WATER TEMPERATURE SENSOR

7.1. Removal

Remove the luggage box.

Drain the coolant.

Disconnect the water temperature sensor connectors.

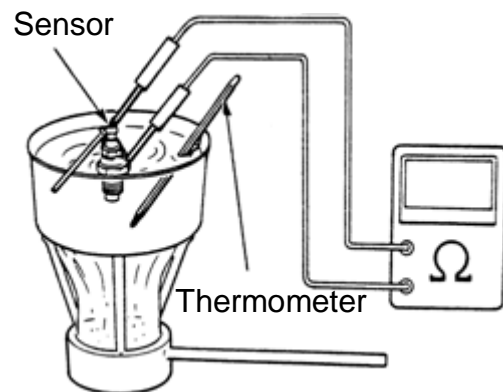
Remove the water temperature sensor from thermostat.



7.2. Inspection

Connect the water temperature sensor to the ohmmeter and dip it in oil contained in a pan which is placed on an electric heater.

Gradually raise oil temperature while reading the thermometer in the pan and the ohmmeter connected. If the resistance measured is out of specification, replace the temperature gauge with a new one.



Temperature	Standard resistance
50°C	123.9–478.9 Ω
100°C	26–29.3 Ω

※ Handle the water temperature sensor carefully as it is vulnerable to impact.

※ Do not allow the water temperature sensor and the thermometer to come in contact with the bottom of the pan.

7.3. Installation

With thread lock applied to the threaded part, tighten the water temperature sensor.

Torque: 0.8 kgf-m (8 N-m, 5.8 lbf-ft)

Connect the sensor connectors.

After the water temperature sensor has been installed, fill coolant and perform air bleeding

8. THERMOSTAT

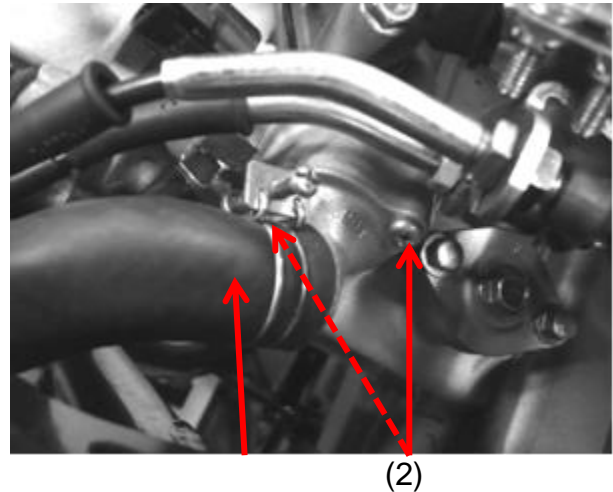
8.1. Removal

Drain the coolant.

Remove the luggage box.

Disconnect the water hose (1) from the thermostat housing.

Remove the mounting bolts (2) and the thermostat housing from the cylinder head.



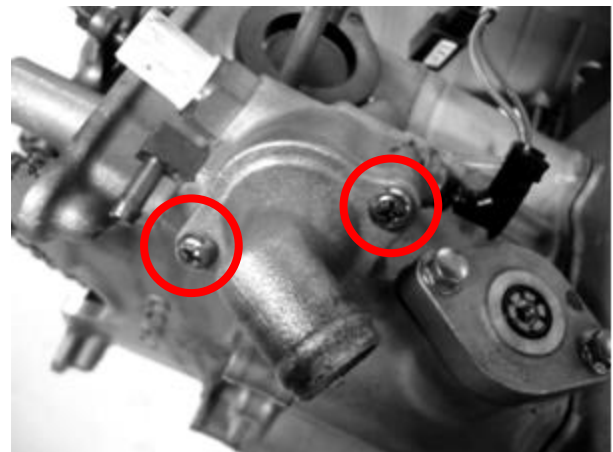
8.2. Installation

The installation sequence is the reverse of removal.

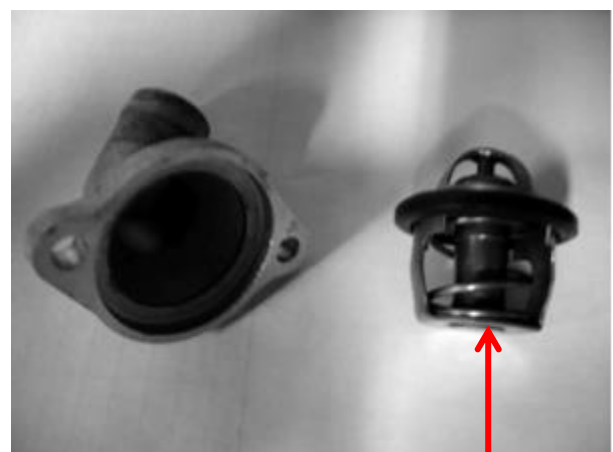
After the water thermostat has been installed, fill coolant and perform air bleeding.

8.3. Disassembly

Remove the two bolts and separate the thermostat housing halves.



Remove the thermostat from the thermostat housing.



Thermostat

8.4. Inspection

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

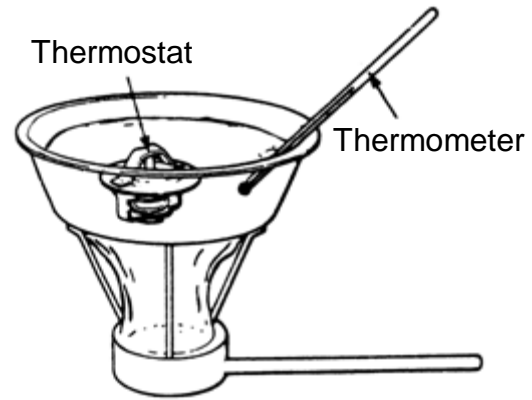
Technical Data

Begins to open	80 - 82°C (176 - 180°F)
Full-open	90°C (198°F)
Valve lift	3.5 mm (0.14 in) minimum

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

8.5. Assembly

Thermostat assembly is in the reverse order of disassembly.

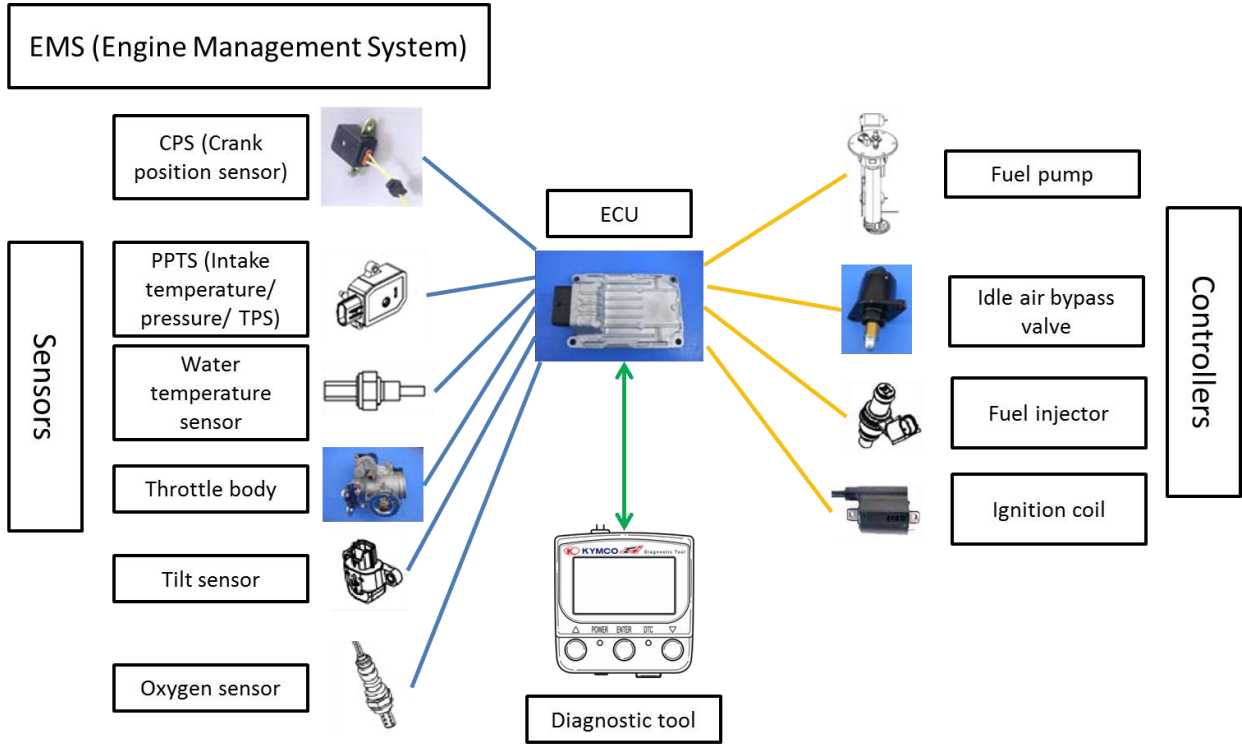


13. Fuel Injection System

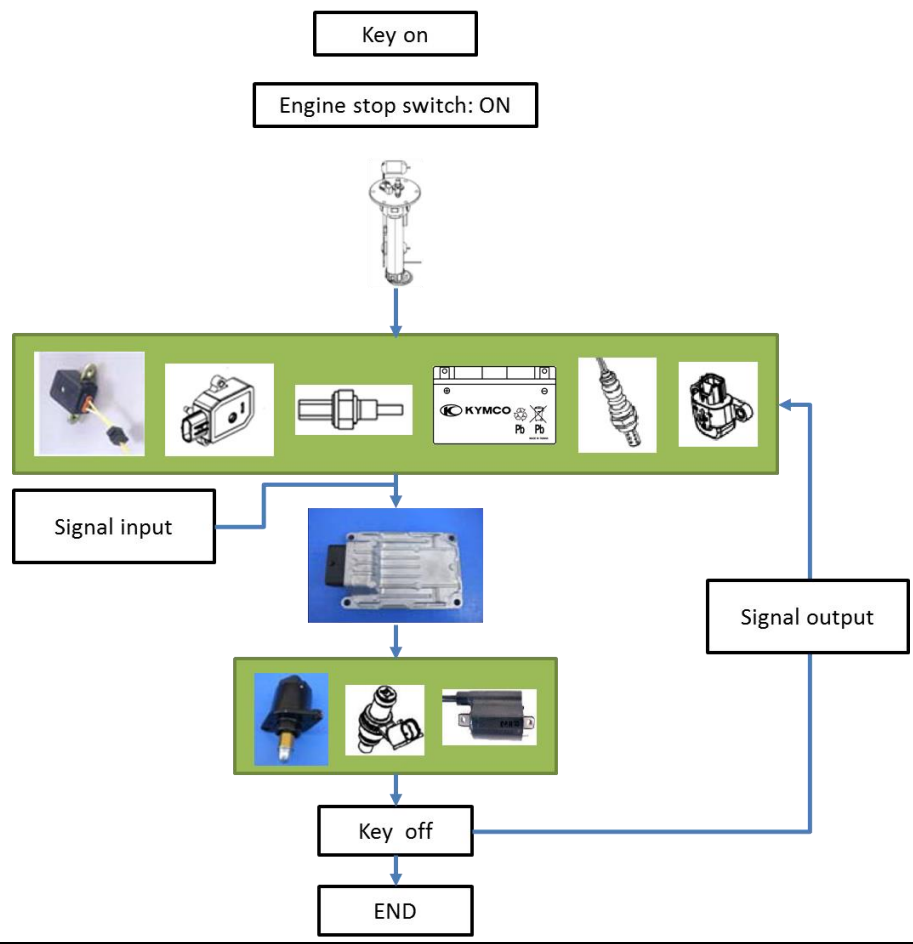
Fuel Injection System

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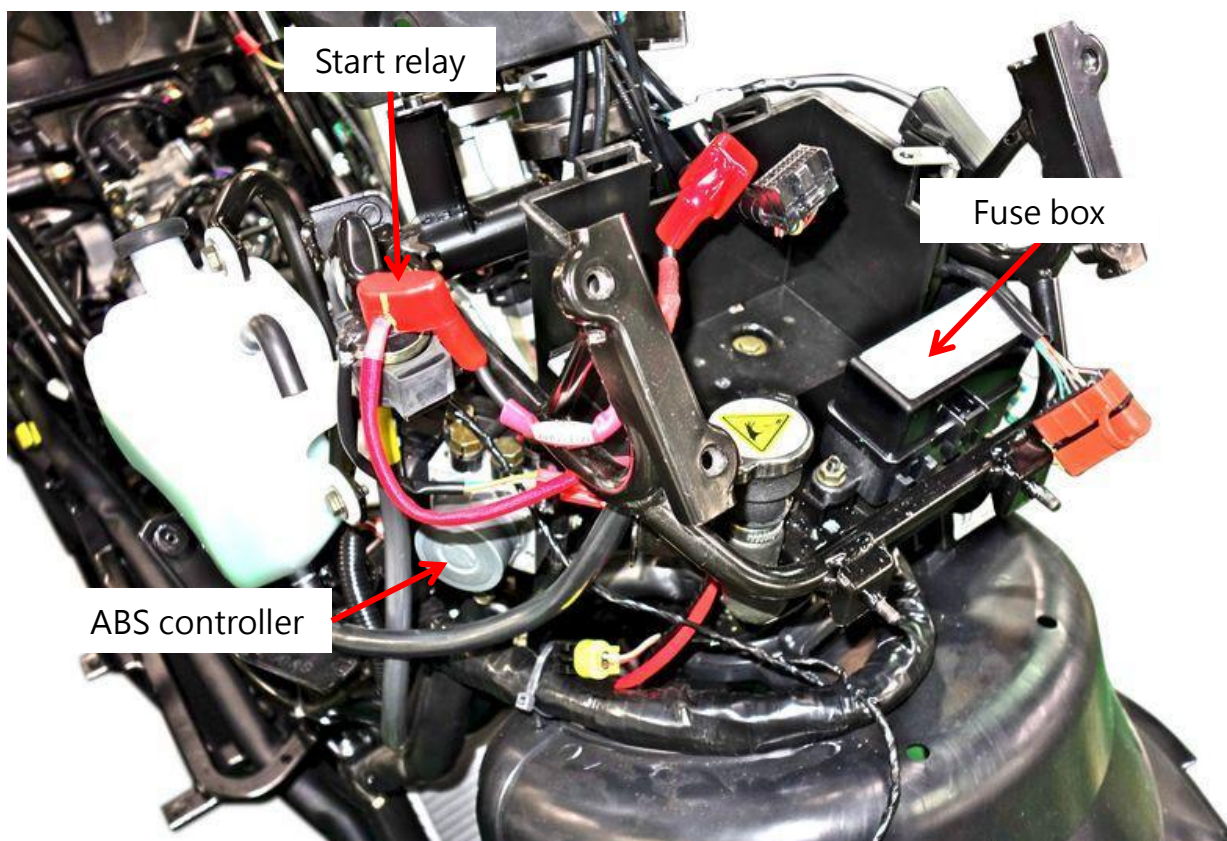
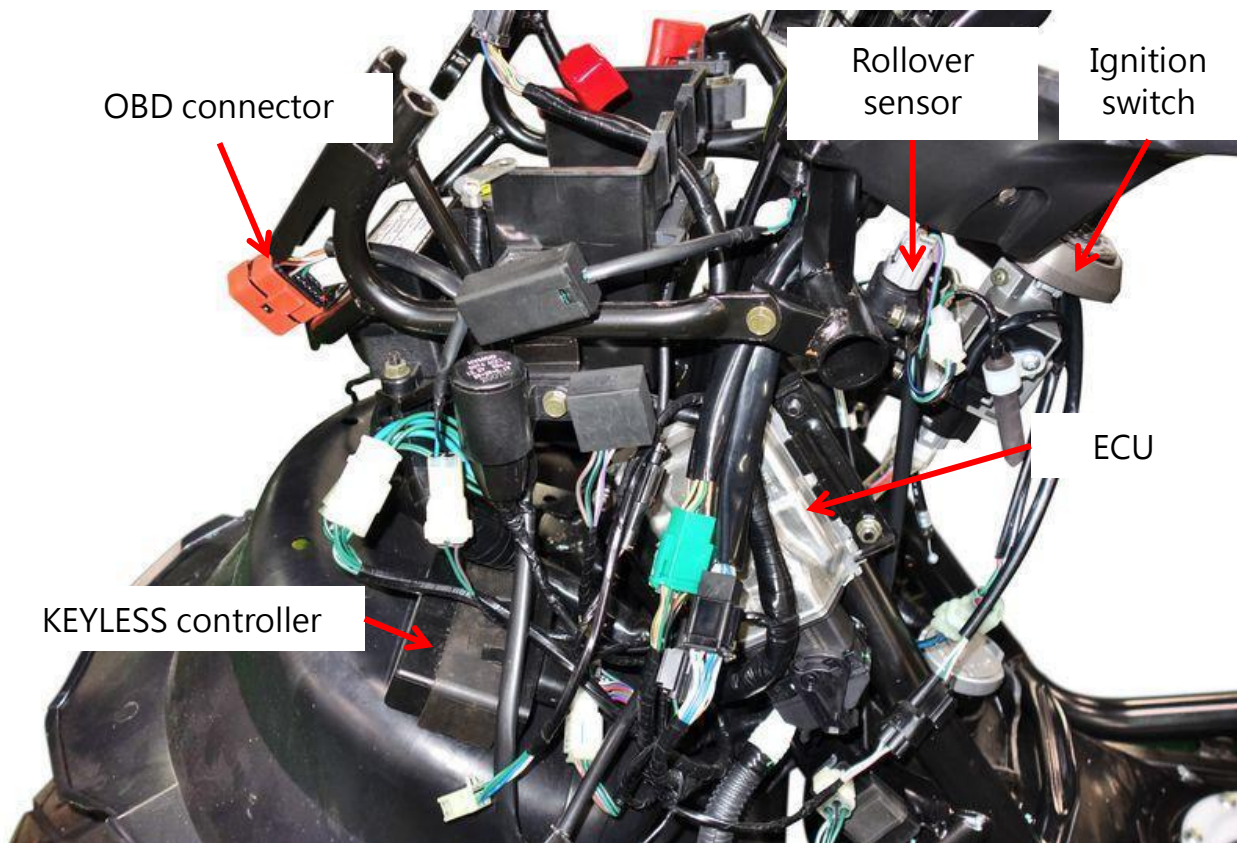
1. SYSTEM DIAGRAM

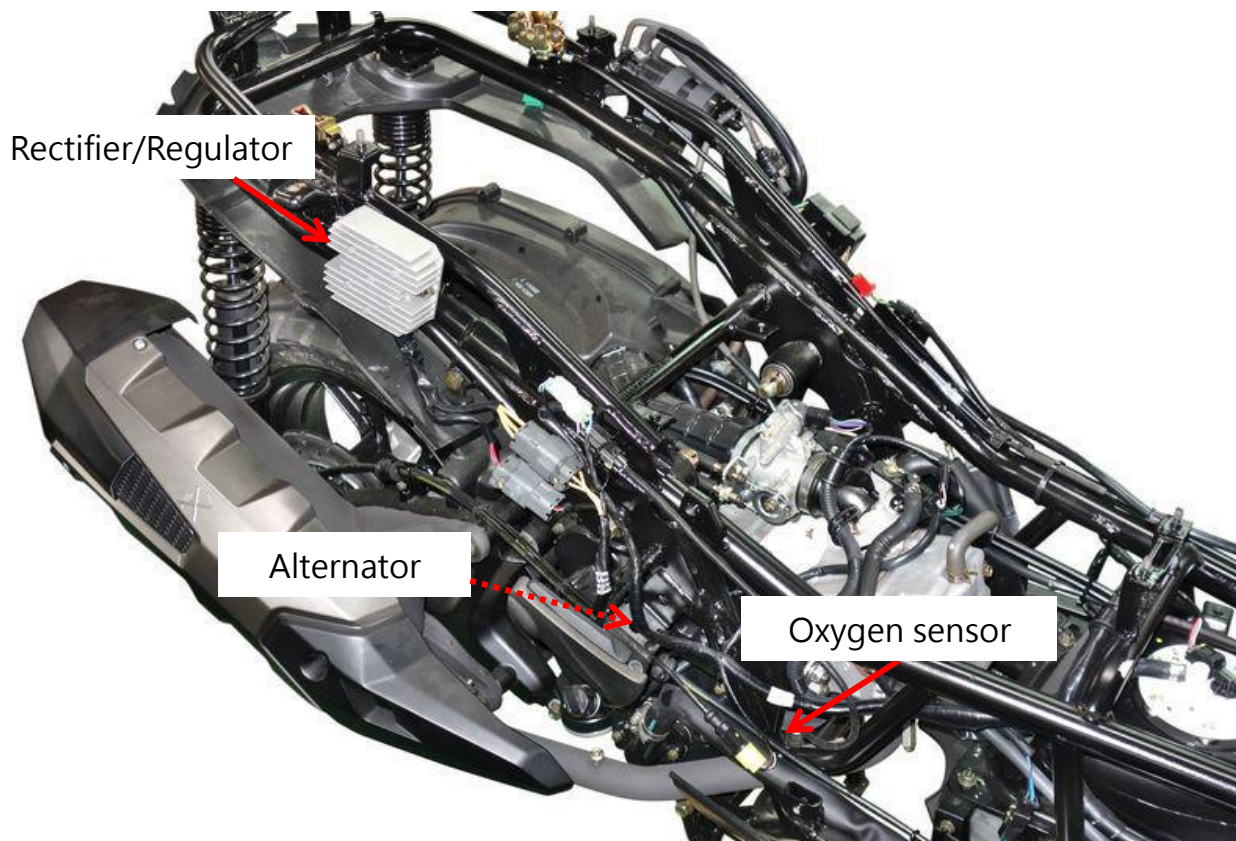
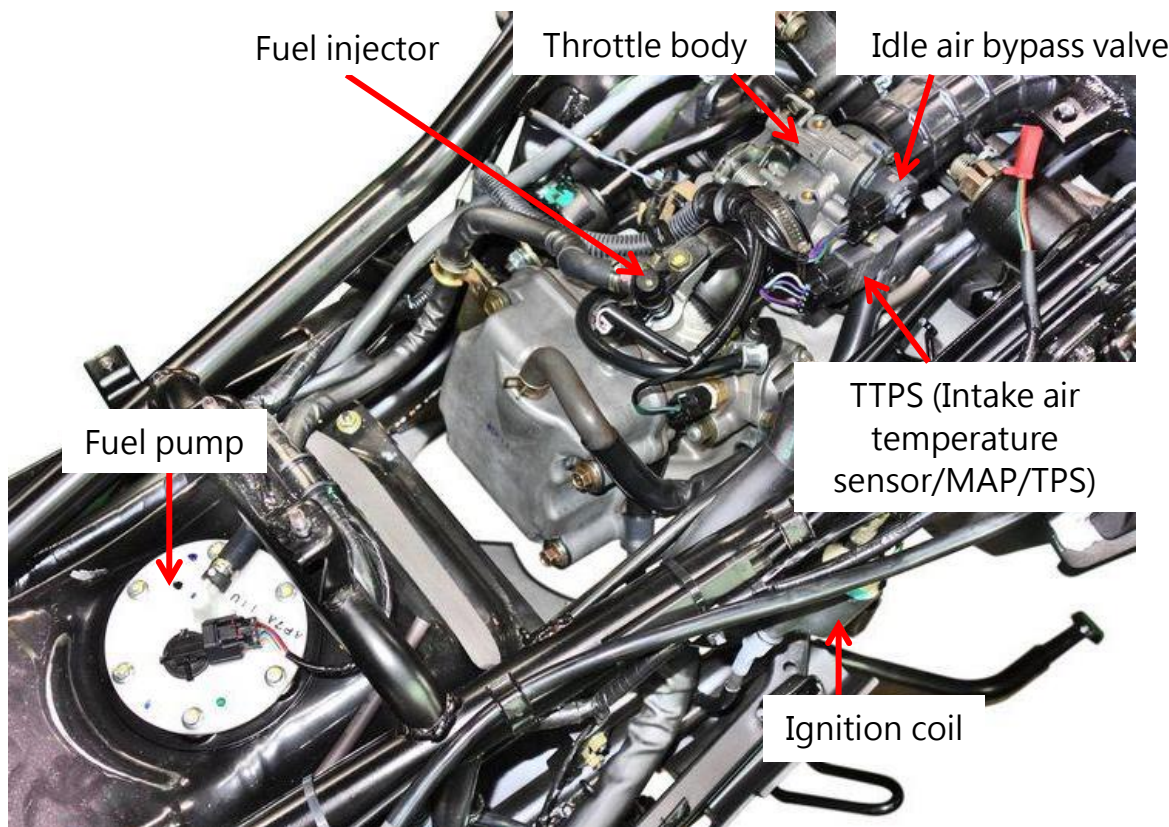


System layout



2. EMS COMPONENTS LOCATION





3. EMS COMPONENTS INTRODUCTION

3.1. ECU (Electronic Control Unit)

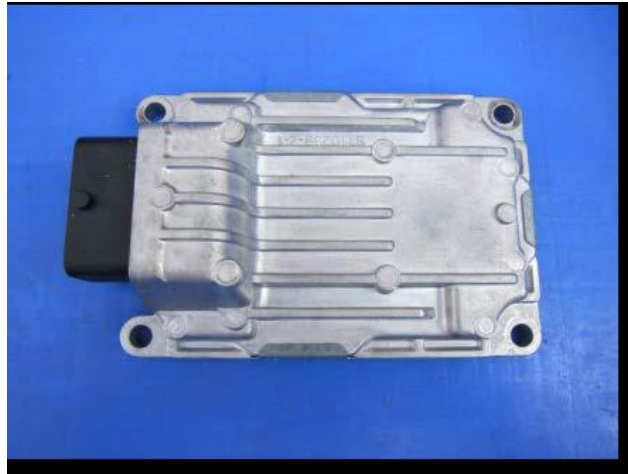
Input: DC 8~16V Battery voltage

There are 36 pins.

The ECU is a single-chip microprocessor.

The chip is recorded program of control module, Fuel Maps, self-diagnostic and etc.

The ECU also has the processing module of every sensors and the drive module of the fuel injector, fuel pump and the ignition coil.



3.2. Fuel Injector

2 Pins	
Power Input	ECU

Input: DC 8~16V Battery voltage

Standard Resistance: 9.97~11.03Ω

Fuel injector is a voltage driven electromagnetic needle valve. It located on the front part of engine and there is an O-ring on each connecting side.

The ECU controls fuel injection and open timing of fuel injector.



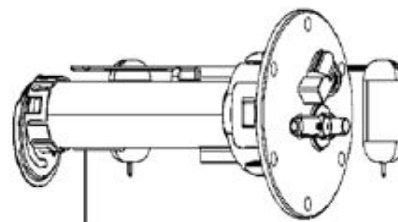
3.3. Fuel Pump

2 Pins	
Power Input	Grounded

Input: DC 8~16V Battery voltage

The ECU controls operation of the fuel pump by controlling the power supply. The fuel pump supplies 20L/hr fuel in 3kg/cm² pressure to fuel injector when power supply gives DC 12V. There is a filter combined with fuel level gauge under the fuel pump inlet to prevent impurities from entering the fuel pump.

It is a low-power DC motor turbine.



3.4. Idle Air Bypass Valve or ISC (Idle Speed Control)

4 Pins	
Power Input	Grounded
Heater	Signal Output

Input: DC 8~16V Battery voltage

The ISC is combined by two sets of independent coils. The operation is controlled by the ECU in small steps to open and restrict the valve through timing.



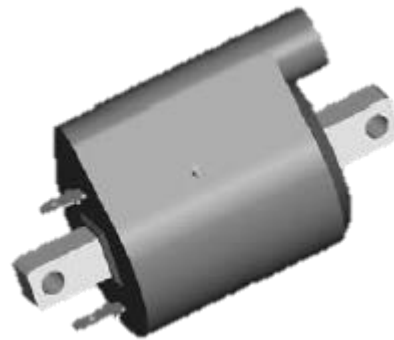
3.5. Inductive Ignition Coil

2 Pins	
Power Input	ECU

Input: DC 8~16V from battery voltage

The ECU controls the operation of the ignition coil through the ground terminal. After the primary circuit forms a magnetic field by power pass through, the power will be cut off by the ECU. The secondary coil will produce the high volt around 20kV for the spark plug to create the arc.

The power of arc can be controlled by the length of the primary coil power-on time. The timing of the primary coil power cut off is the ignition timing. Ignition coil is a high conversion ratio transformer.



3.6. ETS (Engine Temperature Sensor)

2 Pins	
Grounded	ECU

Input: DC 5V from ECU

The ECU provides power and detects resistance.

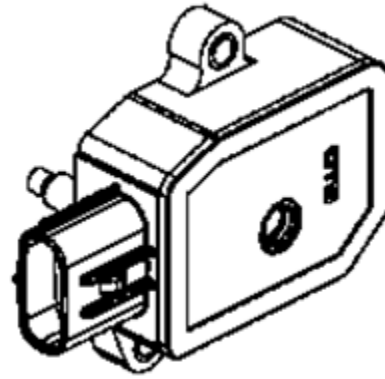


3.7.PPTS (MAP Sensor (Manifold Absolute Pressure)/ TPS (Throttle Position Sensor)/Inlet air temp sensor)

3 Pins		
Power Input	Grounded	Signal output

Input: DC 5V from ECU

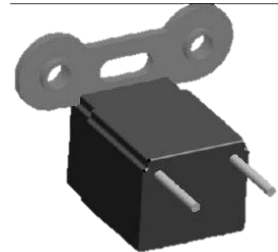
The PPTS is located at left side of throttle body. It is a precision variable resistor. The ECU controls fuel injecting and ignition based on the voltage signal of the PPTS data.



3.8.CPS, Crank Position Sensor

2 Pins	
Grounded	Pulse Signal Output

When the flywheel rotates, the inductive voltage changes. The changes are the data that the ECU determines and computes the engine speed and the crankshaft position. The output voltage over 1V shows that the engine speed is above 200rpm. The distance between CPS and flywheel tooth is less than 1.0 mm.



3.9. Oxygen Sensor

4 Pins	
Power Input	Grounded
Heater	Signal Output

Input: DC 8~16V from battery

Oxygen sensor is located at front part of the exhaust pipe to detect the A/F ratio and then send the data to ECU for controlling the fuel injecting.

The ECU will drive the heater in the O² sensor to make the sensor works because the sensor will not work and no output signal at the exhaust temperature lower than 350°C.

The resistance of a normal oxygen sensor is 6.7~9.5Ω.

Voltage output after engine warm

A/F<14.7 (Reach Mixture) : >0.7V

A/F>14.7 (Lean Mixture) : >0.18V

3.10. Rollover Sensor

3 Pins		
Power Input	Grounded	Signal output

Input: DC 5V from ECU

Once the vehicle tipped more than 65 degree, the rollover sensor will send the grounding signal to the ECU for it to determine the vehicle is tip over and then cut off the fuel and power supply to stop the engine.

The sensor is installed on the centerline of the vehicle frame.

To restart the vehicle, follow the following steps.

1. Lift the vehicle
2. Key off
3. Key on

There is a Hall magnetic component inside the rollover sensor.

Vehicle does not tip over: 0.4V~1.4V

Vehicle tip over: 3.7V~4.4V ◦



4. ENGINE COMPONENTS

4.1. Flywheel with Encoder Teeth

There are 22 teeth and 2 missing teeth.

There are 15 degrees between each tooth include the missing tooth, therefore, each tooth is just right on the 24 equal line.

When the flywheel is rotating, the magnetic field around the windings is cut by the teeth, which causes the CPS to send the inductive voltage signal that the ECU uses to determine and compute the engine speed and crankshaft position at the time.

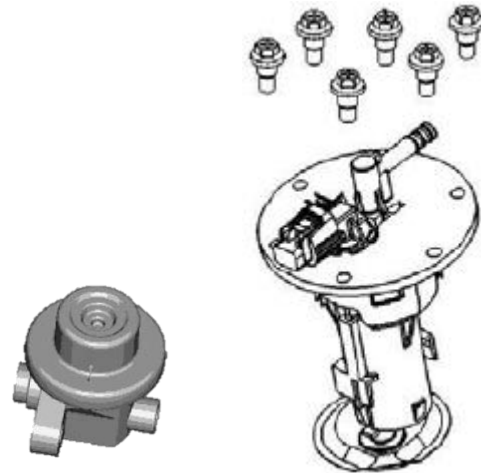


4.2. Fuel Pressure Regulator

This is a mechanical pressure regulator valve in the fuel pump. The main function of the fuel pressure regulator is that maintains absolute pressure of fuel hose.

The fuel pressure regulator changes positive pressure according to manifold pressure for maintaining the fuel supply pressure in 3 kg/cm².

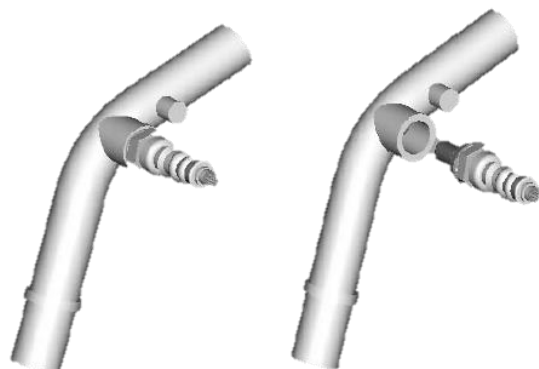
The excessive fuel will flow back to the fuel tank.



4.3. Exhaust Pipe A

The oxygen sensor on the exhaust pipe, there should full circumference weld a nut.

Apply a layer of anti-seize lubricant to the threads to prevent sintering at high temperatures.



Warning: Avoid hitting the oxygen sensor or pulling the wire of the oxygen sensor.

Torque: 2.7 kgf-m

5. SERVICE INFORMATION

5.1. Fi System Service Information

A. Service Information

1 CELP Indicator Instruction

The indicator will light up automatically after turn on the ignition switch. After the engine starts, the indicator will go off automatically in 10 seconds, which means the vehicle is working properly. If the engine does not be start, the indicator will not go off.

If the indicator is still lit after 10 seconds of engine start, the vehicle should have any malfunction. Please have KYMCO authorized dealers or workshop to check.

2 Inspection specifications: See the EMS specifications.

B. Cautions

1 Do not disconnect the battery when engine still runs. This will cause the ECU broken.

2 Do not attempt to connect the ground harness wire to positive terminal and the positive harness wire to the negative terminal on the battery. This will cause the ECU broken.

3 Do not disconnect the diagnostic tool when it is connecting to a power on vehicle. This will cause the diagnostic tool crash.

4 The diagnostic tool needs to reconnect again and reboot when the diagnostic tool crashes.

If the diagnostic tool does not recover still, turn the ignition switch off and then turn on. After the ignition turn on, connect the diagnostic tool again.

C. Periodic Maintenance

1 Maintenance Timing:

After Fi system vehicle has been ride for a while, follow the maintenance schedule to do the routine inspection. The operation conditions of the EMS must be thoroughly checked. Use the diagnostic tool for checking the vehicle conditions by follow the inspection procedure when maintenance.

2 Inspection Procedure:

2.1 To connect the diagnostic tool to the Fi system vehicle, the ignition switch should be turn on but do not start the engine, then connect the communication cable to the diagnostic connector in the vehicle. Use the diagnostic tool to read past error codes or start the engine to read the currently occurring error code.

2.2 If there are error codes, follow the “D. Troubleshooting” using the diagnostic tool for proper troubleshooting.

2.3 If there is no error code, follow the “Maintenance Schedule” for regular maintenance.

D. Troubleshooting

1 Troubleshooting Timing:

The CELP is flashing when turn on the ignition switch or during riding the vehicle, which indicates that the EMS of the vehicle has failed.

2 Inspection Procedure:

2.1 To connect the diagnostic tool to the Fi system vehicle, the ignition switch should be turn on but do not start the engine, then connect the communication cable to the diagnostic connector in the vehicle. Use the diagnostic tool to read past error codes

2.2 If there is no error code, follow the “Step 2.4”.

2.3 If there are error codes, follow the “D. Troubleshooting” using the diagnostic tool for proper troubleshooting.

2.4 If the vehicle still fails after the error code is solved, follow the troubleshooting table to check the symptoms of the fault and solve it.

2.5 After completing the troubleshooting, connect the diagnostic tool again to check for any error codes.

E. Inspection, Repair and Assembly:

Inspection Points of Circuit (Prepare wiring diagram):

Poor Connection, Short Circuit, Open Circuit, High Resistance in Circuit and Too much Voltage Drop (poor connection or oxidation terminals) ◦

- 1 Poor Connection: Check the connection between the harness wires and battery terminals, fuse installation, connection of each connector of Fi electronic components and sensors.
- 2 Short Circuit: The each pin in a connector of Fi electronic components or sensors should not be in short circuit. Set the multimeter at continuity mode to test.
- 3 Open Circuit: There should be continuity between each pin in a connector of Fi electronic components or sensors and power supply, ground wire, ECU PIN. Set the multimeter at Ω mode to test. If the result is above $40M\Omega$, this indicates an open circuit.
- 4 High Resistance in Circuit: The resistance should not be too high between each pin in a connector of Fi electronic components or sensors and power supply, ground wire, ECU PIN. Set the multimeter at Ω mode to test. The resistance value at both ends is subtracted from the internal resistance of the test leads. The resistance is still above 3Ω indicating a malfunction.
- 5 Too much Voltage Drop: Set the multimeter at V mode to measure the voltage from each power supply pin of Fi electronic components and sensors to ground wire, and then measure the battery voltage. If the voltage of the components to ground wire is 0.2 V DC lower than battery voltage, this is an abnormal voltage drop.

5.2. General Instructions

- Scooter services can be done with the engine installed in the frame.
- Be sure to relieve the fuel pressure before fuel pump or fuel hose removal.
- Bending or twisting the control cables will affect operation and could cause the cables to stick or bind, resulting in loss of vehicle control.
- Work in a fully ventilated area. Smoking or allowing flames or sparks in the work area or where gasoline is stored can cause a fire or explosion.
- Do not apply the Carburetor Cleaners to the inside of the throttle body, which is coated with molybdenum.
- Do not snap the throttle valve from fully open to fully close after the throttle cable has been removed; it may cause incorrect idle speed.
- Do not loosen or tighten the painted bolts and screws of the throttle body. Loosening or tightening them can cause throttle and idle valve synchronization failure.
- Seal the cylinder head intake ports with tape or a clean towel to prevent dirt and debris from entering the intake ports after the throttle body has been removed.
- Do not damage the throttle body. It may cause incorrect throttle and idle valve synchronization.
- Do not take the fuel pump on the ground downward.
- Always replace the packing when the fuel pump is removed.
- The electronic fuel injection system is equipped with the self-diagnostic system. If the Check Engine Lamp “CELP” illuminate while riding, follow the self-diagnostic procedures to solve the problem.
- A faulty AFI problem is often related to poorly connected or corroded connectors. Check those connections before proceeding.
- When disassembling the fuel injection parts, note the location of the O-rings. Replace them with new ones upon reassembly.
- Do not disconnect the battery negative (-) or positive (+) cable while engine is running, it may cause ECU damage.
- Do not disconnect or connect the ECU connector during the ignition switch “ON” ; it may cause the ECU damage.

5.3. TROUBLESHOOTING

No	Complaint	Symptom	Probable Cause
1	Engine will not start, or is hard to start.	Starter motor does not run	Ignition switch malfunction
			Starter motor malfunction
			Battery low
			Starter relay malfunction
			Start button bad connection
			Open circuit, short circuit
			Start button malfunction
			Engine stop switch malfunction
			Fuse burnt
		Starter motor runs but the engine does not crank	Starter clutch malfunction
			Valve seized
			Rocker arm seized
		Engine does not run	Piston seized
			Big end or small end of the rod seized
			Crankshaft seized
			Drive gear or bearing seized
			Camshaft seized
			Balance shaft bearing seized
		No fuel pass through	Insufficient fuel
			Fuel tank breathe hole clogged
			Fuel filter clogged
			Fuel pump malfunction
			Fuel hose clogged
		Engine overflow	Clean the spark plug
			Starting technical error (the engine cannot be started when the throttle is fully open during overflow, which will make the EMS supply more fuel)
		No spark/ weak spark	Ignition switch turn off
			Engine stop switch is at off
Gear not at neutral gear			
Battery low			
Spark plug contaminated or broken			
Spark plug cap or high tension lead broken			
Spark plug cap short circuit or poor connection			
Faulty spark plug			
ECU broken			
Open circuit/ Protection switch/ Side stand switch			

No	Complaint	Symptom	Probable Cause
			malfunction
			Ignition coil malfunction
			A.C. Generator signal cord malfunction
			Ignition switch or engine stop switch short circuit
			Short circuit or open circuit in the harness wire
			Ground wire poor connection
			Fuse burnt
		Air-fuel ratio too lean or too rich	Air cleaner clogged/ no sealed/ no installed
		Compression low	Spark plug loose
			Cylinder head is not tightened
			Cylinder head gasket worn
			Cylinder head distortion
			Cylinder or piston worn
			Piston rings worn/ sized/ elastic fatigue
			Valve has no gap
			Valve spring broken/ fatigue
			Valve is bent/ worn/ carbon deposits on the seat
			Pressure release cam rod is not placed properly
		2	Poor performance at low speed
Spark plug contaminated/ broken			
Spark plug cap or high tension lead broken			
Spark plug cap short circuit/ poor connection			
Faulty spark plug			
ECU broken			
Ignition coil malfunction			
Ground wire poor connection			
Air-fuel ratio too lean or too rich	Air cleaner clogged/ no sealed/ no installed		
	Fuel tank breath hole clogged		
	Throttle body loose		
	Fuel pump malfunction		
Compress pressure low	Spark plug loose		
	Cylinder head is not tightened		
	Cylinder head gasket worn		
	Cylinder head distortion		
	Cylinder or piston worn		
	Gap between piston ring and groove too large		
	Valve has no gap		
Valve spring broken/ fatigue			

No	Complaint	Symptom	Probable Cause
		Others	ECU broken
			Engine oil viscosity too high/ add too much
			Transmission system malfunction
			Gear oil viscosity too high/ add too much
			Brake delay or interference
			Engine overheat or too cool
			Slipping clutch
3	Engine lacks power at high speed/ poor operation	Faulty ignition timing	Spark plug contaminated/ broken
			Spark plug cap or high tension lead broken
			Spark plug cap short circuit/ poor connection
			Faulty spark plug
			ECU broken
			Ignition coil malfunction
			A.C. Generator signal cord malfunction
		Air-fuel ratio too lean or too rich	Air cleaner clogged/ no sealed/ no installed
			Throttle body loose
			Fuel pump malfunction
			Fuel contains water or foreign matters
			Fuel tank breathe hole clogged
			Fuel hose clogged
			Insufficient fuel
		Compress pressure low	Spark plug loose
			Cylinder head is not tightened
			Cylinder head gasket worn
			Cylinder head distortion
			Cylinder or piston worn
			Gap between piston ring and groove too large
			Valve spring broken/ fatigue
			Valve is bent/ worn/ carbon deposits on the seat
		Knock	Carbon deposits stuck in the combustion chamber
			Fuel quality bad or faulty fuel
			Faulty spark plug
		Others	Throttle-down
			Brake delay or interference
Slippery clutch			
Gear oil viscosity too high/ add too much			
Transmission system malfunction			
Gear oil viscosity too high/ add too much			
Engine overheat			

No	Complaint	Symptom	Probable Cause
			Exhaust pipe clogged
4	Excessive smoke	White smoke	Cylinder worn
			Valve oil seal worn
			Piston oil ring worn
			Valve guides or valve stem seals worn
			Too much engine oil
		Black smoke	Air cleaner clogged
		Brown smoke	Air cleaner clogged/ no sealed/ no installed

6. OBD P-CODE LIST

Failure Codes	P-Codes	Fault Description
A1	P0030	O2 sensor heater malfunction
A2	P0031	O2 sensor heater Voltage Low
A3	P0032	O2 sensor heater Voltage High
A4	P0105	MAP sensor malfunction
A5	P0107	MAP sensor Voltage Low
A6	P0108	MAP sensor Voltage High
A7	P0110	Intake air temperature sensor malfunction or Voltage High
A8	P0111	Intake air temperature circuit malfunction
A9	P0112	Intake air temperature sensor Voltage Low
D6	P0113	Intake air temperature sensor Voltage High
AA	P0114	Intake air temperature intermittent failure
AB	P0115	Engine Temperature Sensor malfunction or Voltage High
AC	P0117	Engine Temperature Sensor Voltage Low
AD	P0118	Engine Temperature Sensor Voltage High
AE	P0119	Engine Temperature intermittent failure
AF	P0120	Throttle Position Sensor malfunction or Voltage Low
B0	P0121	Throttle position sensor adaptation is out of range
B1	P0122	Throttle Position Sensor Voltage Low
B2	P0123	Throttle Position Sensor Voltage High
B3	P0124	Difference between the two last TPS acquisitions is out of range
B4	P0130	O2 sensor signal malfunction
B5	P0131	O2 sensor signal Voltage Low
B6	P0132	O2 sensor signal Voltage High
B7	P0200	Injection malfunction
B8	P0217	Engine over temperature condition
B9	P0219	CVT overspeed detected
BA	P0230	Fuel pump malfunction
BB	P0231	Fuel pump Voltage Low
BC	P0232	Fuel pump Voltage High
BD	P0260	Injection valve malfunction
BE	P0261	Injection valve Voltage Low
BF	P0262	Injection valve Voltage High
C0	P0335	Crankshaft sensor malfunction
C1	P0350	Ignition malfunction or Voltage Low
C2	P0351	Ignition Voltage High
C3	P0480	Fan Relay/Circuit malfunction
C4	P0505	ISAV idle speed actuator valve malfunction

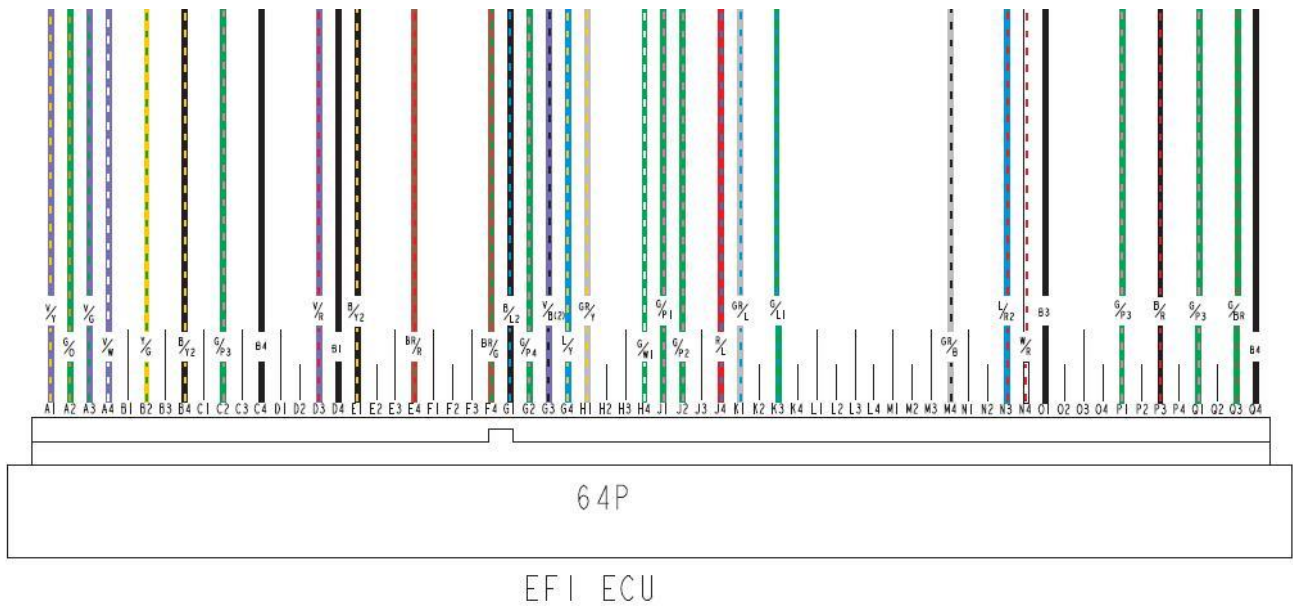
Failure Codes	P-Codes	Fault Description
C5	P0508	ISAV idle speed actuator valve Voltage Low
C6	P0509	ISAV idle speed actuator valve Voltage High
C7	P0562	Battery voltage VBK too Low
C8	P0563	Battery voltage VBK too High
C9	P0650	MIL Voltage High
CA	P0700	Engine overspeed detected
CB	P1110	Roll sensor Voltage High
CC	P1111	Roll sensor malfunction or Voltage Low
CD	P1410	AISV system break down
CE	P1630	Roll sensor circuit malfunction
CF	P2187	Oxygen sensor control too High
D0	P2188	Oxygen sensor control too Low
D1	B0099	Roll sensor Voltage High
D2	P263B	MIL Voltage High
D3	P263A	MIL Voltage Low
D4	P2300	Ignition malfunction or Voltage Low
D5	P2301	Ignition malfunction or Voltage High
D7	P0171	System over lean or over rich (Too Lean)
D8	P0172	System over lean or over rich (Too Rich)
D9	P0501	Vehicle Speed Sensor malfunction
Keihin OBD		
DA	P0201	Injection valve malfunction
DB	P0412	Secondary air injection system malfunction
DC	P0603	ECU memory error
DD	P1205	MAP sensor malfunction
DE	P0500	Vehicle Speed Sensor malfunction
DF	P0511	ISC stepper motor malfunction
E0	P1505	ISC system malfunction
E1	P1521	VACS Valve circuit malfunction
For AK550		
F0	C0064	Roll sensor malfunction
F1	P0484	Fan Relay/Circuit Voltage High
F2	P0485	Fan Relay/Circuit Voltage Low
F3	P0560	Battery voltage VBK malfunction
F4	P0561	Battery voltage VBK malfunction
Second cylinder		
BE	P0264	Injection valve Voltage Low
BF	P0265	Injection valve Voltage High

Failure Codes	P-Codes	Fault Description
D4	P2303	Ignition malfunction or Voltage Low
D5	P2304	Ignition malfunction or Voltage High
F5	P0642	Sensor Power Voltage Low
F6	P0643	Sensor Power Voltage High
F7	P0615	Starter Relay malfunction
F8	P0616	Starter Relay Voltage Low
F9	P0617	Starter Relay Voltage High

7. CHECKING COMPONENT

NO	Item	Pic	Inspection		Standard	Remark
			Diagnostic tool	Multimeter		
1	ECU		V	X	On board testing (with the diagnostic tool)	
2	Fuel injector		V	V	9.945~11.03Ω	10.5±0.53 Ω
3	Fuel pump		V	V	Resistance of the fuel pump: 1.9Ω	
4	ISC (Idle air bypass valve)		V	X	On board testing (with the diagnostic tool)	
5	Inductive ignition coil		V	V	Primary: 3.57~4.83Ω Secondary: 10.42~14.49Ω	
6	WTS		V	V	-20°C: 18.8KΩ 40°C: 1.136KΩ 100°C: 0.1553KΩ	20~30°C: 2.5~2.7KΩ
7	CPS		V	V	Resistance: 100~130Ω	115±15 Ω
8	Oxygen sensor		V	V	Heater: 6.7~9.5Ω	
9	Tilt sensor		V	V	Stand upright voltage: 0.4~1.4V Tilt voltage: 3.7~4.4V	

8. ECU WIRING



B-A1	STEPPER A_N (D)	B-D1		B-G1	TILT SIGNAL	B-K1	TIA	B-N1		B-O1	PGND 1
B-A2	STEPPER A_P (A)	B-D2	VSENS2(TPS)	B-G2	MODE SW	B-K2		B-N2		B-O2	
B-A3	STEPPER B_N (B)	B-D3	VSENS1(MAP,TILT)	B-G3	TPS SIGNAL	B-K3	THERMO	B-N3	MIL	B-O3	IGNITION COIL
B-A4	STEPPER B_P (C)	B-D4	VBR	B-G4	CPS (+)	B-K4		B-N4	INJ-1	B-O4	VBR
B-B1		B-E1	MANIFOLD AIR PRESSURE	B-H1	O2 SIGNAL	B-L1		B-O1	KILL SW	PIN PI FUNCTION	
B-B2	SIDE STAND SW	B-E2	SGND1(TPS)	B-H2		B-L2		B-O2			
B-B3	BRAKE SW1	B-E3		B-H3		B-L3		B-O3			
B-B4	MAIN RELAY	B-E4	CAN-HIGH(+)	B-H4	CPS (-)	B-L4		B-O4			
B-C1		B-F1		B-J1	SGND4(TILT)	B-M1		B-P1	PGND 2		
B-C2	SGND2(MAP)	B-F2		B-J2	SGND3(THERMO,TIA,O2)	B-M2		B-P2			
B-C3	START SW	B-F3		B-J3		B-M3		B-P3	FUEL PUMP RELAY		
B-C4	VBR	B-F4	CAN-LOW(-)	B-J4	FAN RELAY	B-M4	O2 HEAT	B-P4	STARTER RELAY		
PIN	PI FUNCTION	PIN	PI FUNCTION	PIN	PI FUNCTION	PIN	PI FUNCTION	PIN	PI FUNCTION		

9. DIAGNOSTIC STANDARD SPECIFICATIONS

KYMCO Diagnostic Report – AHG5

SF: _____ Customer: _____ Eng. No: _____

Date of Production: _____ Date of Repair: _____ Mileage: _____

Reason of repair: <input type="checkbox"/> Maintenance <input type="checkbox"/> Breakdown				
Item		Data	Reference	Remark
ECU Version	ECU No			AHG5 M4C
	Hardware Ver.			
	Software Ver.		KYCA2200	
	Calibration Ver.		E5AHG5EUAA	
	Model Name		DT X360	
DTC	Active			The current fault after starting the engine.
	Occurred			The occurred fault after starting the engine.
	History			Faults that have occurred in the past but have not been cleared.
(Cool Engine) Engine Stop	Engine Temp.(°C)		Eviron.temp±2 °C	
	Atm. Press.(kPa)		101.3±3 kPa	The ambient pressure drop about 12 kPa every time when the altitude ascends every 1000m.
	Throttle Position(°)		Above 0.0° / Above 85°	Close/full throttle
	TPS Volt(V)		0.71 ±0.03V/ Above 3.5V	Close/full throttle
	Battery Volt(V)		>12 V	
	Idle learn		---	Variable with temperature of the cylinder head
	Air bypass learn (%)		---	
	Tilt switch output (V)		Stand upright : 0.4~1.44V Fall down: 3.7~4.4V	
	ECU running time		---	

(Hot Engine) Before Repair	Engine Speed IDLE(rpm)		1700 ±100 rpm	
	Engine Temp. (°C)		87~96 °C	Coolant fan motor operating temperature
	Air Temp (°C)		---	
	MAP (kPa)		30~40 kPa	
	Fuel Injection duration (ms)		1.8~2.8 ms	
	Ign. Angle (°)		4~14 BTDC	
	Ignition Charge Time		2.9~3.6 ms	3.0~3.1 ms for 14V battery; 3.6~3.8 ms for 12V battery
	O ² Sensor Volt(V)		0~1.2V	
	O ² correction (%)		±10%	
	ISC step		Below 45%	Factory standard value
			Below 46%	<ol style="list-style-type: none"> When the angle exceeds 46%, clean the throttle body when exchange the engine oil. When the angle exceeds 500, clean the throttle body for optimal performance.
	ISC learning		+20~15%	After the coolant fan runs 5 times
	IDLE CO(%) before catalyst		0.3~1.3 %/ Below 500ppm	when warm-up temperature is 90~95°C
	IDLE CO(%) after catalyst		Below 0.3%/ Below 200ppm	
	TCS operating Ign. angle		Below 0 BTDC	TCS function turns on and is operating/ Throttle open angle exceeds 800 for more than 2 seconds.

(Hot Engine) After Repair	Engine Speed IDLE(rpm)		1700 ±100 rpm	
	Engine Temp. (°C)		87~96 °C	Coolant fan motor operating temperature
	Air Temp (°C)		---	
	MAP (kPa)		30~40 kPa	
	Fuel Injection duration (ms)		1.8~2.8 ms	
	Ign. Angle (°)		4~14 BTDC	
	Ignition Charge Time		2.9~3.6 ms	3.0~3.1 ms for 14V battery; 3.6~3.8 ms for 12V battery
	O ² Sensor Volt(V)		0~1.2V	
	O ² correction (%)		±10%	
	ISC step		Below 45%	Factory standard value
			Below 46%	3. When the angle exceeds 46%, clean the throttle body when exchange the engine oil. 4. When the angle exceeds 500, clean the throttle body for optimal performance.
	ISC learning		+20~15%	After the coolant fan runs 5 times
	IDLE CO(%) before catalyst		0.3~1.3 %/ Below 500ppm	when warm-up temperature is 90~95°C
	IDLE CO(%) after catalyst		Below 0.3%/ Below 200ppm	
TCS operating Ign. angle		Below 0 BTDC	TCS function turns on and is operating/ Throttle open angle exceeds 800 for more than 2 seconds.	

Repair description:

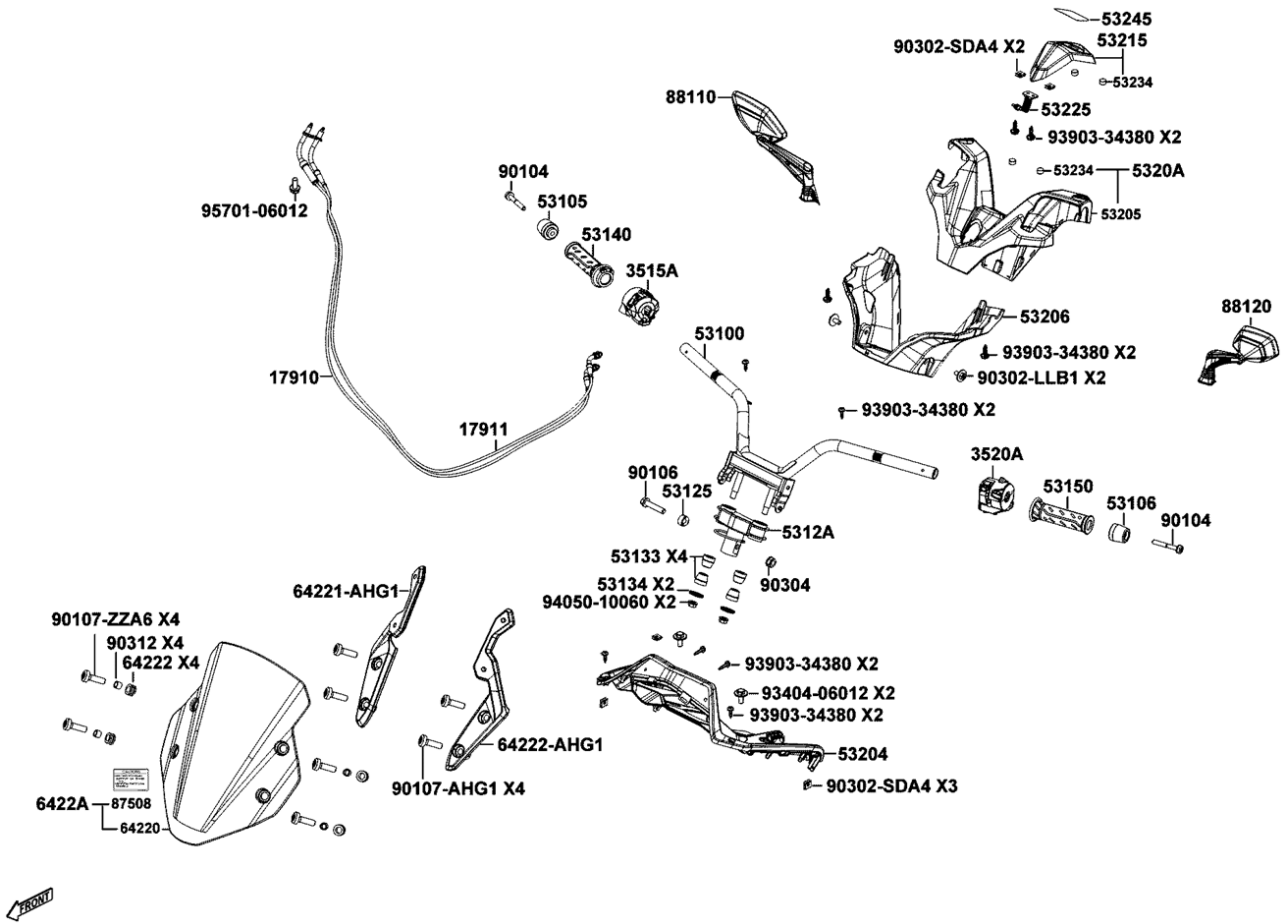
Repair Process:

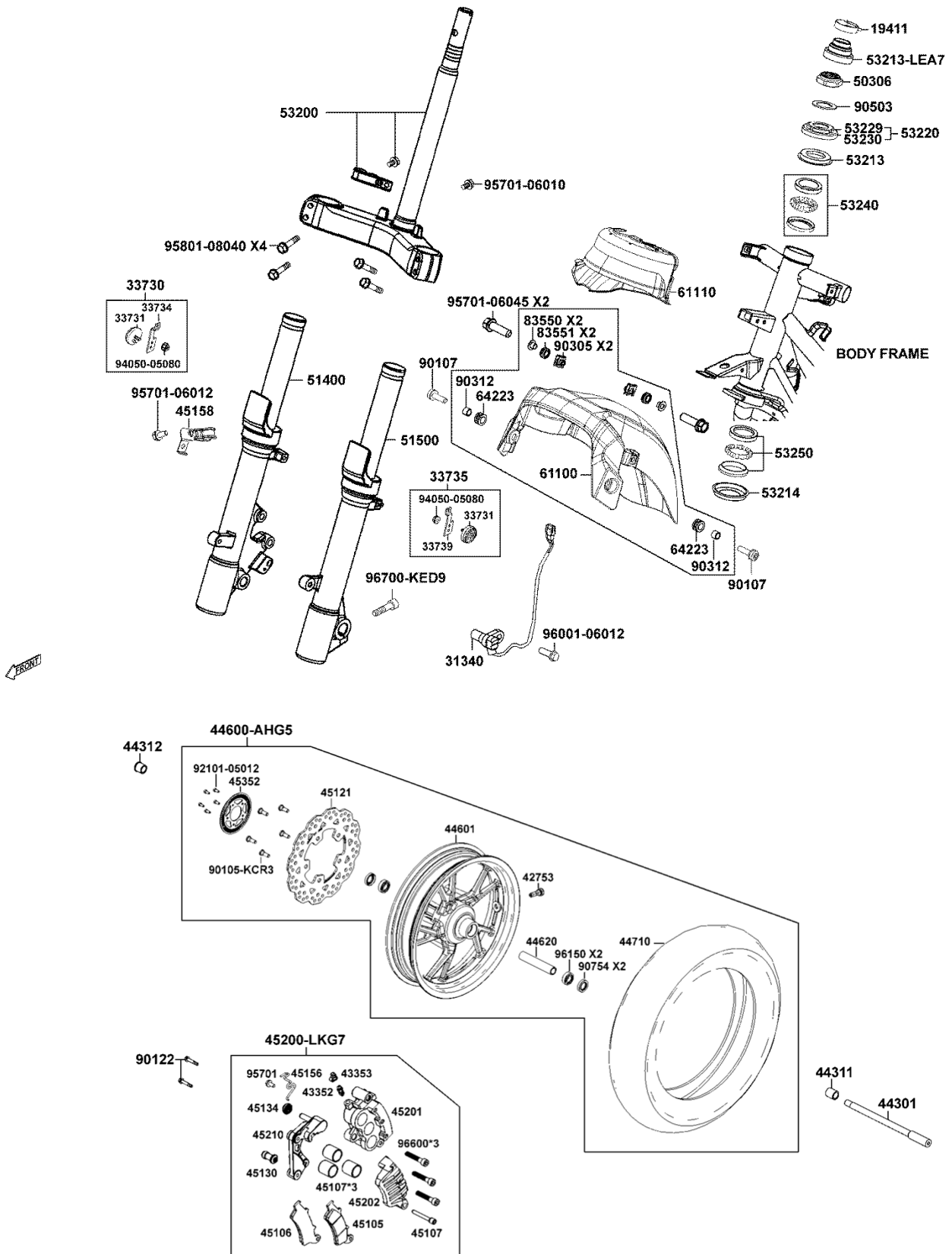
14. Front Assembly

Front Assembly

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1. SCHEMATIC DRAWING





2. SERVICE INFORMATION

2.1. GENERAL INSTRUCTIONS

- Remove the motorcycle frame covers before removing the front wheel, steering handlebar, front shock absorber and front fork. Jack the motorcycle front wheel off the ground and be careful to prevent the motorcycle from falling down.
- During servicing, keep oil or grease off the brake pads and brake disk.

2.2. SPECIFICATIONS

Unit: mm (in)

Item		Standard	Service Limit
Axle Shaft Runout		---	0.2
Front Wheel Rim Runout	Radial	---	2.0
	Axial	---	2.0
Brake Disk Thickness		4.0	3.0
Brake Disk Runout		---	0.3
Brake Master Cylinder I.D.		12.7~12.74	
Brake Master Cylinder Piston O.D.		12.65~12.68	
Brake Caliper Piston O.D.		25.33~25.36	
Brake Caliper Cylinder I.D.		25.4~25.45	

2.3. TORQUE VALUES

Handlebar Lock Nut	45 N•m (4.5 kgf•m)	
Steering Stem Lock Nut	70 N•m (7.0kgf•m)	
Steering Stem Pinch Bolt	27 N•m (2.7 kgf•m)	
Front Axle	20 N•m (2.0 kgf•m)	
Master cylinder reservoir cover screw	1.6N•m (0.16 kgf•m)	
Master cylinder holder bolt	12 N•m (1.2 kgf•m)	
Brake lever pivot bolt	2 N•m (0.2 kgf•m)	
Brake lever pivot nut	10 N•m (1 kgf•m)	
Brake light switch screw	1 N•m (0.1 kgf•m)	
Brake caliper mounting bolt	35 N•m (3.5 kgf•m)	ALOC bolt: replace with a new one.
Brake caliper bleed screw	5.5N•m (0.55 kgf•m)	
Brake hose oil bolt	35 N•m (3.5 kgf•m)	

2.4. SPECIAL TOOLS

Lock nut wrench	A120F00002
Oil seal and bearing installer	A120E00014
Bearing piller	A120E00037
Lock nut wrench	A120F00023
Bearing race remover	A120F00009
Bearing race installer	A120F00019

2.5. TROUBLESHOOTING

Hard steering (heavy)

- Excessively tightened steering stem top cone race
- Broken steering balls
- Insufficient tire pressure

Steers to one side or does not track straight

- Uneven front shock absorbers
- Bent front fork
- Bent front axle or uneven tire

Poor brake performance

- Worn brake pads
- Contaminated brake pad surface
- Deformed brake disk
- Air in brake system
- Deteriorated brake fluid
- Worn brake master cylinder piston oil seal
- Clogged brake fluid line
- Unevenly worn brake caliper

Front wheel wobbling

- Bent rim
- Loose front axle
- Bent spoke plate
- Faulty tire
- Improperly tightened axle nut

Soft front shock absorber

- Weak shock springs
- Insufficient damper oil

Front shock absorber noise

- Slider bending
- Loose fork fasteners
- Lack of lubrication

3. Front Wheel

3.1. Removal

Lift the front end of the vehicle with a suitable stand or jack so that the front wheel comes off of the ground.

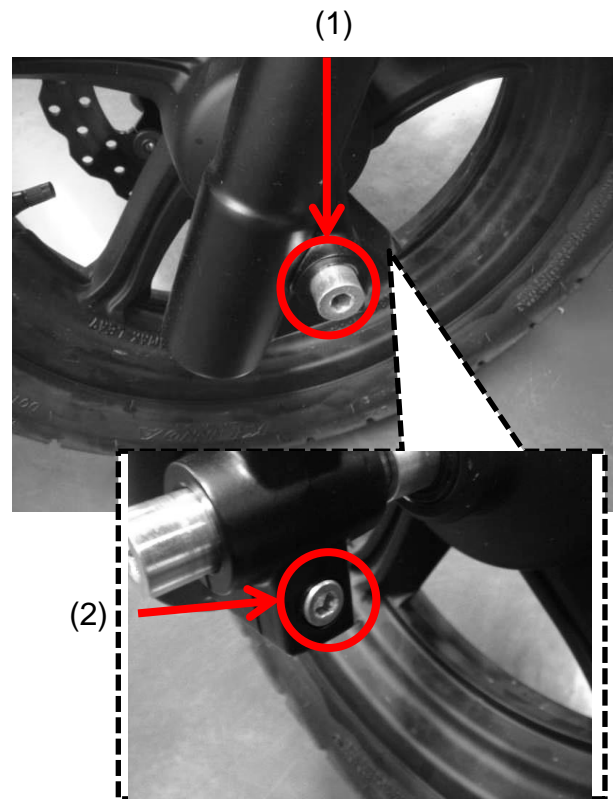
Loosen the front axle pinch bolt (2) with a 6 mm Allen.

Remove the front axle (1) with an 8 mm Allen socket.

Support the front wheel and slide the front axle out from the left side.

Guide the front wheel out from the fork legs and the brake disc out from between the pads. Do not squeeze the brake lever while the disc is not present between the pads.

Install in the reverse order of work.



3.2. Inspection

Remove the collars from each side of the wheel. Inspect the bearing seals and the O-rings seals on the collars. Replace the seals if they are in poor condition.

Turn the inner race of each bearing with your finger to see if they turn smoothly and quietly. Also check if the outer race fits tightly in the hub. Replace the bearings if the races do not turn smoothly, quietly, or if they fit loosely in the hub.



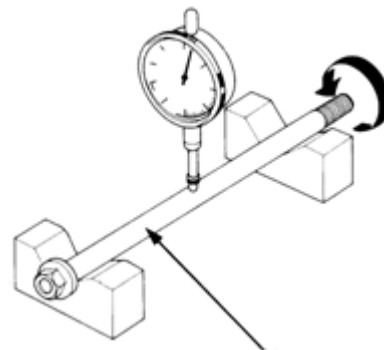
Axle Runout

Set the axle in V blocks and measure the runout using a dial gauge.

Check the front axle runout. The axle runout specification is half of the total indicator reading.

The actual runout is 1/2 of the total indicator reading.

Service Limit: 0.2 mm (0.008 in)



Wheel Rim

Place the wheel on a truing stand and use a dial indicator to check if the rim is out of true. The specifications for the front and rear wheels are the same. Check for lateral wobble. The service limit is 2.0 mm (0.08 in) or less.

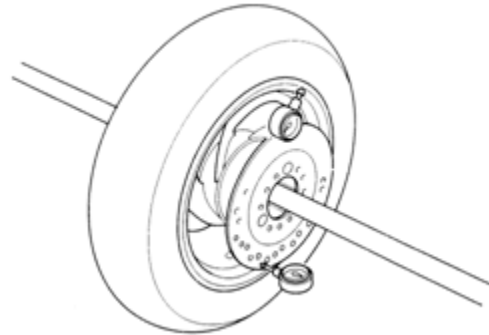
Check for radial hop. The service limit is 2.0 mm (0.08 in) or less.

Service Limit:

Axial: 2.0 mm

Radial: 2.0 mm

Apply grease to the collar, and then install the collar onto the wheel.



3.3. Disassembly

Replace bearings as a set, and do not reuse old bearings.

Place the new bearings in the freezer about an hour before you plan to install them.

Do not let the wheel rest on its brake disc.

Remove the side collar and dust seal.

The seal should be replaced with a new item.

Turn the inner race of each bearing with your finger to see if they turn smoothly and quietly. Also check if the outer race fits tightly in the hub.

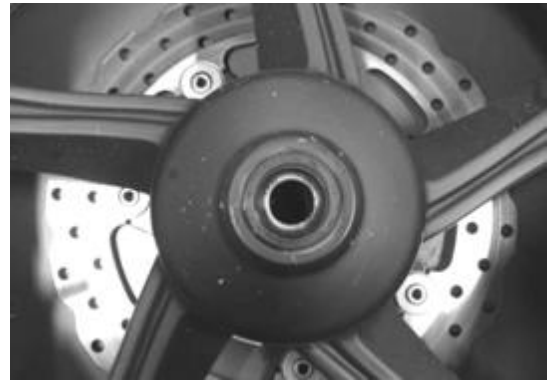
Replace the bearings if the races do not turn smoothly, quietly, or if they fit loosely in the hub.



Remove the front wheel bearing by using the special tool.

Special tool:

Bearing puller: A120E00037



Remove the distance collar from wheel.



3.4. Assembly

Heat the bearing area of the wheel with a heat gun, take the bearing out of the freezer and install it. You can use a bearing installer tool or a socket with the same outside diameter as the bearing. Make sure the bearing is fully seated and the marked side is facing out.

Special tool:

Bearing installer A120E00014

Insert the distance collar into the hub.

Drive in the other bearing. The bearing should fit against the distance collar.

Do not continue to force the bearing in or the distance collar will begin to push the right bearing back out.

Apply grease to the lips of the dust seals. Drive in new dust seals.



4. Front Brake Fluid

4.1. Check

Brake fluid: Fluid leakage → Replace.

Brake hose: Cracks/wear/damage → Replace.

Apply the brake lever several times.

Brake hose clamp: Loosen → Tighten

4.2. Fluid Replacement/Air Bleeding

Once the hydraulic system has been opened, or if the brake feels spongy, the system must be bled. When using a commercially available brake bleeder, follow the manufacturer's operating instructions.

- ※ A contaminated brake disc or pad reduces stopping power. Discard contaminated pads and clean a contaminated disc with a high quality brake degreasing agent.
- ※ Do not allow foreign material to enter the system when filling the reservoir.
- ※ Avoid spilling brake fluid on painted, plastic or rubber parts. Place a rag over these parts whenever the system is serviced.

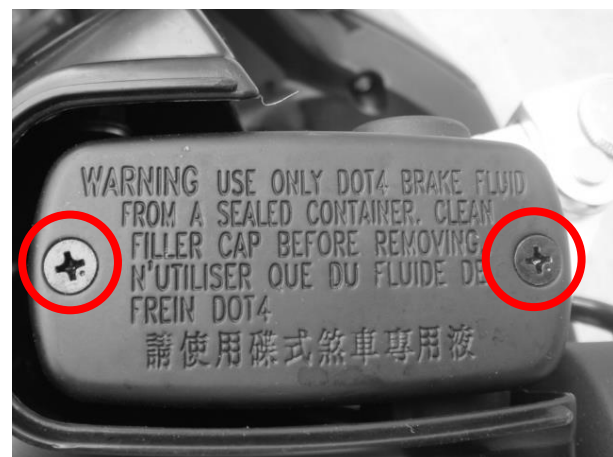
4.3. Brake Fluid Draining

Make sure that the master cylinder parallel to the ground, before removing the reservoir cover.

Remove the two screws.

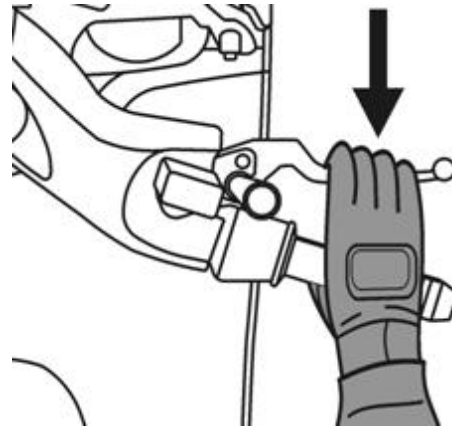
Remove the reservoir cover, diaphragm plate and diaphragm.

Connect a bleed hose to the bleed valve



Loosen the bleed valve and pump the brake lever.

Stop operating the brake when no more fluid flows out of the bleed valve.



4.4. Brake Fluid Filling/Air Bleeding

※ **Do not mix different types of fluid since they are not compatible.**

Fill the master cylinder with DOT 4 brake fluid to the upper level.

Connect a commercially available brake bleeder to the front caliper bleed valve.

Check the fluid level often while bleeding the brake to prevent air from being pumped into the system.

When using a brake bleeding tool, follow the manufacturer's operating instructions.

※ **If air enters the bleeder from around the bleed valve threads, seal the threads with teflon tape.**

Pump the brake bleeder and loosen the front caliper bleed valve. Add fluid when the fluid level in the master cylinder is low to prevent drawing air into the system.

Repeat the above procedures until no air bubbles appear in the plastic hose.

Close the front caliper bleed valve and operate the front brake lever.

If it still spongy, bleed the system again.

If the brake bleeder is not available, perform the following procedure.

Pump up the system pressure with the brake lever until there are not air bubbles in the fluid flowing out of the reservoir small hole and lever resistance is felt.

1. Pump the brake lever several times, then squeeze the brake lever all the way and loosen the bleed valve 1/4 turn. Wait several seconds and close the bleed valve

※ **If air enters the bleeder from around the bleed valve threads, seal the threads with teflon tape.**

2. Release the brake lever slowly until the bleed valve has been closed. Add fluid when the fluid level in the master cylinder is low to prevent drawing air into the system.

3. Repeat the steps 1 - 2 until there are no air bubbles in the bleed hose.

After bleeding air completely, tighten the bleed valve to the specified torque.

Torque: 6 N•m (0.6 kgf•m, 4.3 lbf•ft)

Fill the reservoir to the casting ledge with DOT 4 brake fluid to the upper level.

Install the diaphragm, set plate and reservoir cover and tighten the screws to the specified torque.

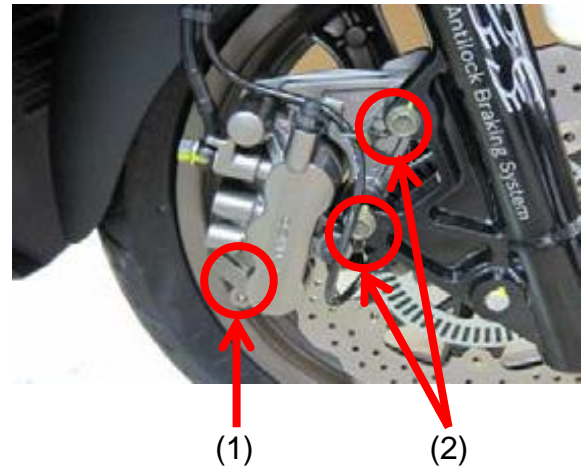
Torque: 2 N•m (0.2 kgf•m, 1.1 lbf•ft)

5. Front Brake Pad

5.1. Brake Pad Replacement

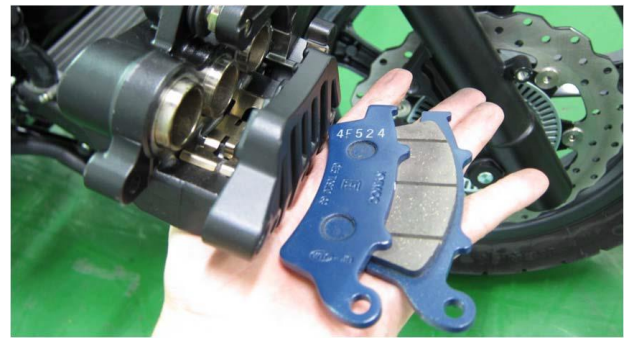
Remove the pad pins (1).

Remove the two caliper mounting bolts (2), and then remove the caliper.



Remove the brake pads. Replace the pads if the brake wear exceeds the wear indicator lines or if the wear is uneven. Insert new brake pads as needed.

※ Always replace the brake pads in pairs to ensure even disc pressure.



Apply a light coat of waterproof grease to the brake pad pin. Push the pads against the pad spring and insert the brake pad pin. It may be necessary to spread the pads and force the pistons back into the caliper in order to allow room for the brake disc to fit between the new pads.



Install the front caliper onto the fork leg and then install and tighten the new two caliper mounting bolts to the specified torque.

Torque: 35 N-m (3.5 kgf-m)

Tighten 1 pad pins to the specified torque.

Torque: 18 N-m (1.8 kgf-m, 13 lbf-ft)

6. Brake Disc

6.1. Inspection

Visually inspect the brake disc for damage or cracks.

Measure the brake disc thickness.

Service limits: 4 mm

Replace the brake disc if the smallest measurement is less than the service limit.



Measure the brake disc warpage.

Service limits: 0.3 mm

6.2. Removal

Remove the front wheel.

Remove the five brake disc mounting bolts with an Allen wrench.

Remove the front brake disc and front wheel speed sensor rotor.

Install in the reverse order of work.



7. Handlebar

7.1. Removal

Remove the lower handlebar cover and front cover.

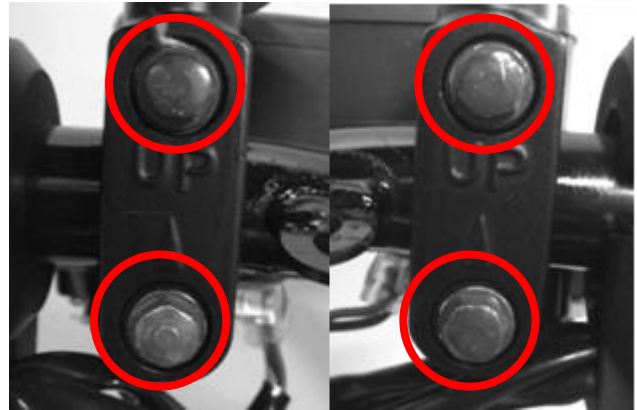
Remove the 4 bolts and disconnect the brake light switch wire, then remove the front and rear brake master cylinder.

Remove the inner cover

Route the cables and lines from the handlebar cable guide.

Remove the handlebar lock nut and take out the bolt.

Remove the handlebar and collar.



7.2. Installation

Install the handlebar onto the steering stem and install the handlebar collar, lock nut and bolt.

Tighten the bolt to the specified torque.

Torque: 4.5 kgf-m (45 N-m, 32 lbf-ft)

Install the front and rear master cylinders and connect the brake light switch wires

※ **Adjust the throttle grip free play to the specified range of 2~6 mm (0.08 ~0.24 in).**

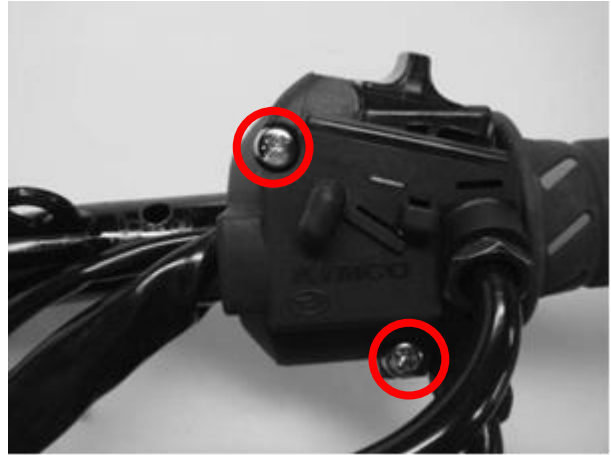


7.3. Disassembly

Switches

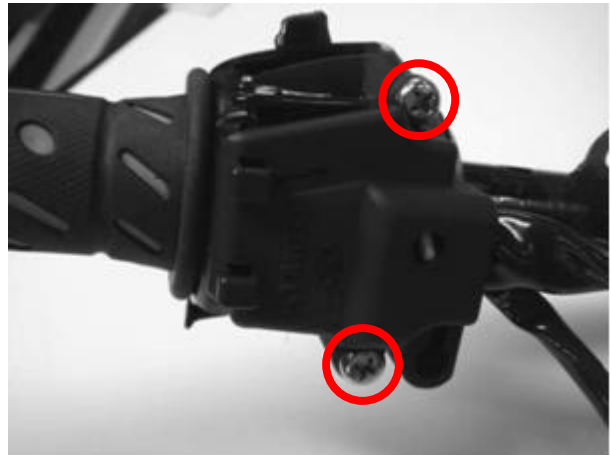
Remove the two screws from right handlebar switch.

Disconnect the throttle cables and free the right switch housing from the handlebar.



Remove the two screws and then remove the left handlebar switch.

Disconnect the switch. Separate the left switch housing from the handlebar.



Bar ends

Remove the bar ends with a 6 mm Allen.

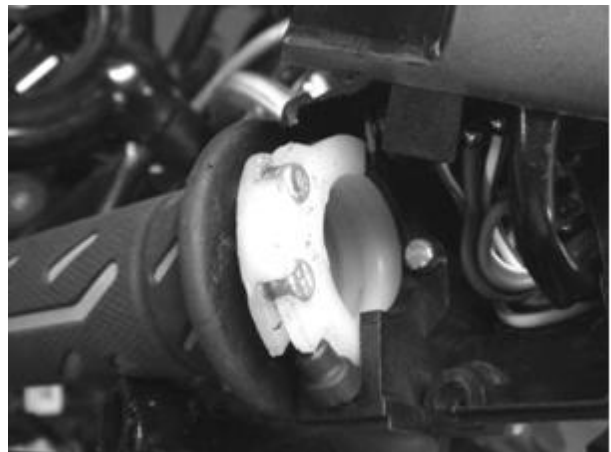


Grips

Remove the right handlebar switch.

Disconnect the throttle cable from the throttle grip.

Remove the throttle grip.



If you plan to replace the grips you can slice them lengthwise with a razor blade and peel them off. To remove the grips without cutting them use a screwdriver to open a gap between the grip and the handlebar. Spray in contact cleaner to break up the grip cement. Use compressed air to expand the grip so it can be easily slid off the end of the handlebar. Note the relationship between the angle of the grip and the throttle tube so that the new grip can be installed with the correct angle.



Before installing the grips to either the throttle tube or the handlebar, wipe down the area with a brake or parts cleaner that will dry without leaving a residue.

When you are sure the area is dry apply grip cement to the bar or tube. Install the left grip at an angle of your preference. Install the throttle grip onto the tube with the same angle as the original grip.

※ Always wear safety glasses when using compressed air and never point it directly at yourself or anyone else.

7.4. Assembly

Install the left handlebar switch.

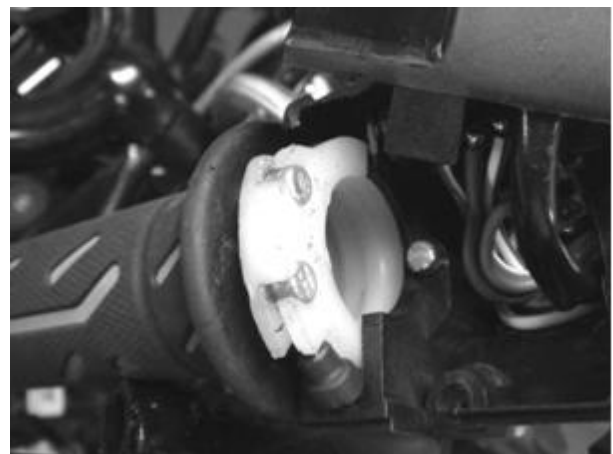
※ Align the pin on the left handlebar switch with the hole on the handlebar.

Install and tighten the two screws securely.

Install the right handlebar switch.

※ Align the pin on the right handlebar switch with the hole on the handlebar.

Lubricate the throttle grip front end with grease and then connect the throttle cable to the throttle grip.



Install and tighten the two screws.

8. Front Shock Absorber

8.1. Removal

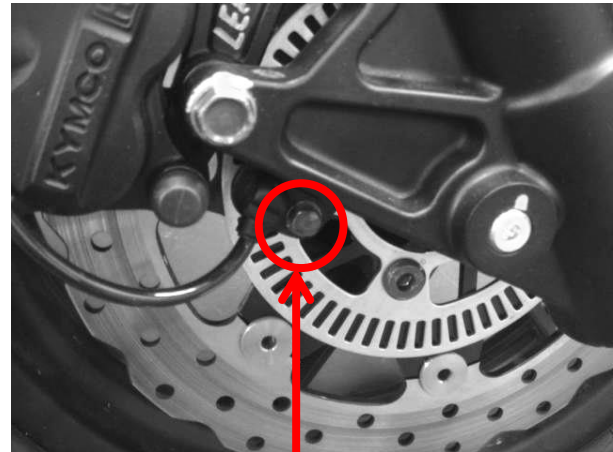
Remove the front cover and front fender.

Remove the front brake caliper.

Remove the front wheel.

Remove the speed wheel sensor bolt (1).

Remove the speed sensor wire and front brake hose guide mounting bolt with an 8 mm socket. Free the guide from the fork clamp.



(1)

Loosen the fork clamp pinch bolts with a 12 mm socket. The top bolts must be removed.

Slide the forks legs down and out of the fork clamp using a twisting motion.

Installation is in the reverse order of removal.

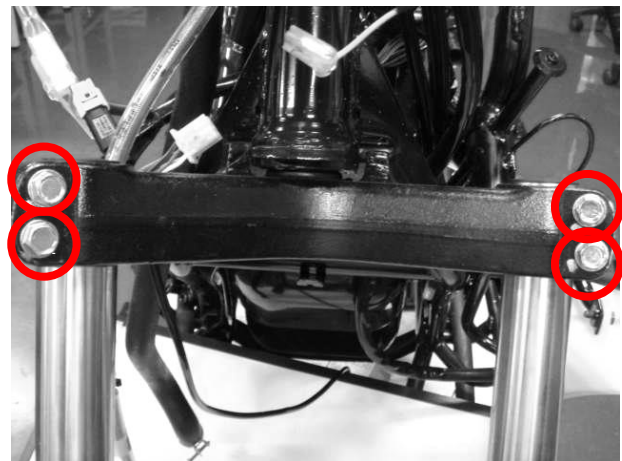
※ **Tighten the shock absorber mounting bolt to the specified torque.**

Torque: 3.2 kgf-m (32 N-m, 23 lbf-ft)

8.2. Inspection

Inspect the following items and replace if necessary.

- Front shock absorber tube bending, damage or wear
- Weak front shock absorber spring
- Damper and damper rod bending
- Oil seal damage or wear



9. Steering Stem

9.1. Removal

Support the vehicle with a suitable stand or jack so that the front wheel is off the ground. Grip the bottom of the fork legs and turn the front end side-to-side. If the movement is rough the bearings should be greased or replaced. If the movement is too tight or loose the steering stem adjusting nut may need to be adjusted.

Always replace the races at the same time as the bearings.

Remove the handlebar covers.

Remove the front cover.

Remove the handlebar.

Remove the front fender.

Remove the front wheel.

Remove the front fork.

Hold the steering stem top cone race and remove the steering stem lock nut by using the special tool.

Special tool:

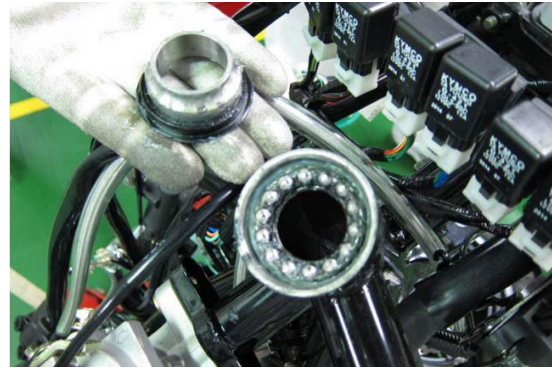
Lock nut wrench **A120F00002**

Remove the top cone race and washer remove the steering stem.

※ **Be careful not to lose the steel balls (26 on top race and 19 on bottom race).**

Lock nut wrench: **A120F00023**





Inspect the ball races, cone races and steel balls for wear or damage. Replace if necessary.

Remove the top balls.



Remove the bottom balls.



Use the special tools or a drift and hammer to drive out the bearing races in the steering head.

Have the drift set against the lip of the race, and work around the race evenly to drive it out. Repeat the process with the remaining bearing race.

Use a chisel to remove the bottom bearing inner race and dust seal.



Bottom Cone Race

※ Be careful not to damage the steering stem.



9.2. Installation

Install the new bottom cone race onto the steering stem.

Install the new upper and bottom ball races into the frame.

Apply grease to the top and bottom ball races and install new steel balls on the top ball race and new steel balls on the bottom ball race.

Install the steering stem.

Apply grease to the top cone race and install it.

Tighten the top cone race and then turn the steering stem right and left several times to make steel balls contact each other closely.

※ **Check that the steering stem rotates freely without vertical play.**

Special tool:

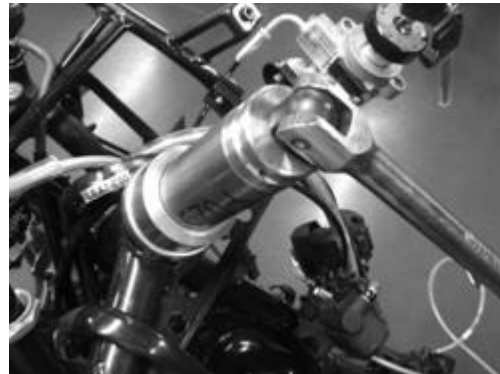
Lock nut wrench: A120F00023

Install the steering stem lock nut and tighten it to the specified torque by using the special tool while holding the top cone race.

Torque: 7 kgf-m (70 N-m)

Special tool:

Lock nut wrench A120F00002

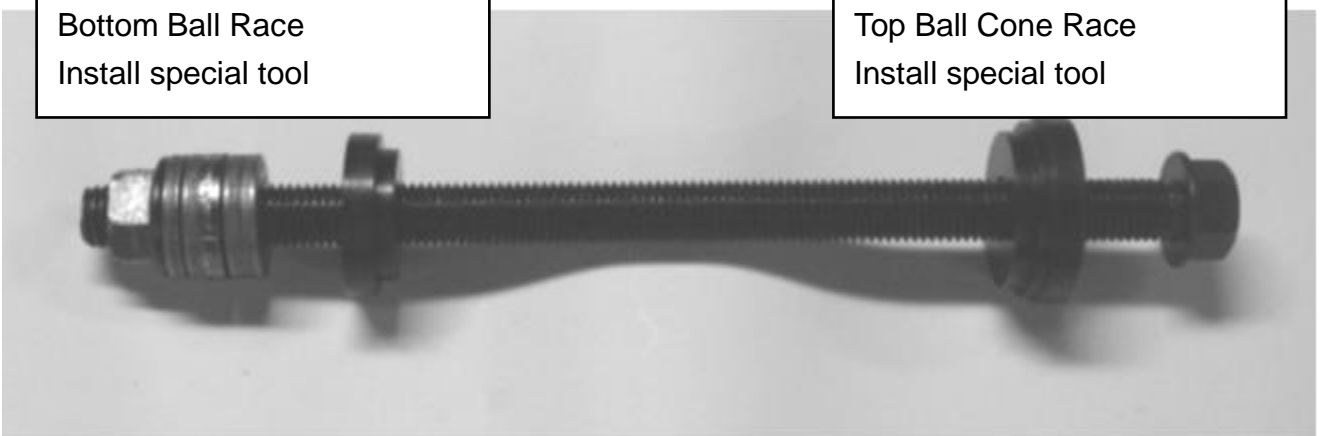


Bottom Ball Race
Remove Special Tool



A120 F00009

Bottom Ball Race
Install special tool



Top Ball Cone Race
Install special tool

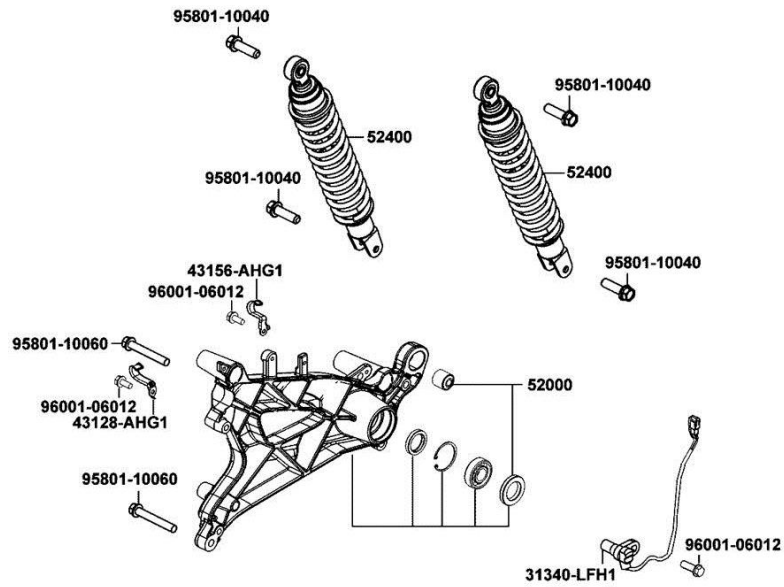
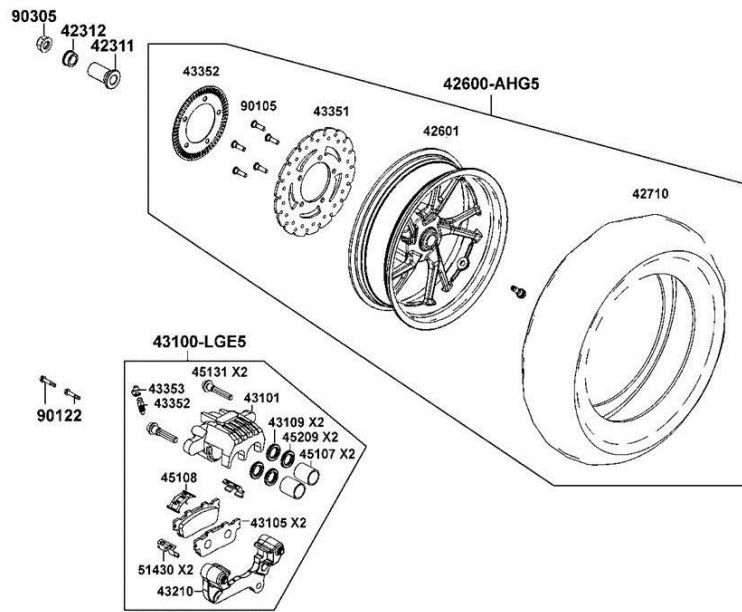
A120 F00019

15. Rear Assembly

Rear Assembly

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1. SCHEMATIC DRAWING



2. SERVICE INFORMATION

2.1. GENERAL INSTRUCTIONS

- When performing the services stated in this section, the engine and exhaust muffler must be cold to avoid scalding.
- During servicing, keep oil or grease off the brake pads and brake disk.

2.2. SPECIFICATIONS

Item	Standard (mm)	Service Limit (mm)
Rear wheel rim runout	---	2.0
Rear brake disk thickness	5.0	4.0
Rear brake disk runout	---	0.3
Rear brake master cylinder I.D.	27.00	
Rear brake master cylinder piston O.D.	26.95	

2.3. TORQUE VALUES

Item	Value	
	N-m	kgf•m
Exhaust muffler lock bolt	50 N-m	5 kgf•m
Exhaust muffler pipe nut	20 N-m	2 kgf•m
Rear axle nut	120 N-m	12 kgf•m
Rear shock absorber lower mount bolt	40N-m	4 kgf•m
Rear shock absorber upper mount bolt	40N-m	4 kgf•m
Rear brake caliper holder bolt	35 N-m	3.5 kgf•m

2.4. TROUBLESHOOTING

Rear wheel wobbling

- Bent rim
- Faulty tire
- Axle not tightened properly
- Engine not tightened properly
- Tire pressure too low
- Unbalanced wheel

Soft suspension

- Weak shock absorber spring
- Damper oil leaks

Hard suspension

- Incorrectly mounted suspension components
- Incorrect damper adjustment
- Bent swing arm pivot
- Bent damper rod
- Damaged swing arm pivot bearing(s)
- Faulty suspension linkage
- Damaged linkage pivot bearings

Rear wheel noise

- Worn rear wheel axle bearings
- Worn rear fork bearings
- Deformed rear fork

Poor brake performance

- Air in brake system
- Deteriorated brake fluid
- Contaminated brake pad surface
- Worn brake pads
- Clogged brake fluid line
- Deformed brake disk
- Unequal worn brake caliper

3. Rear Brake

3.1. Rear Brake Caliper Removal

Drain the rear brake fluid.

Place a suitable container under the banjo bolt to catch any remaining brake fluid.

Remove the banjo bolt that holds the brake hose.

Discard the two sealing washers.

Replace the brake hose banjo bolt sealing washers with new items on assembly.

Remove the exhaust muffler.

Remove the rear brake fluid tube bolt and disconnect the brake fluid tube.

Remove two bolts attaching the rear brake caliper.

Remove the rear brake caliper.

※ **When removing the brake fluid tube, use shop towels to cover plastic parts and coated surfaces to avoid damage.**

3.2. Inspection

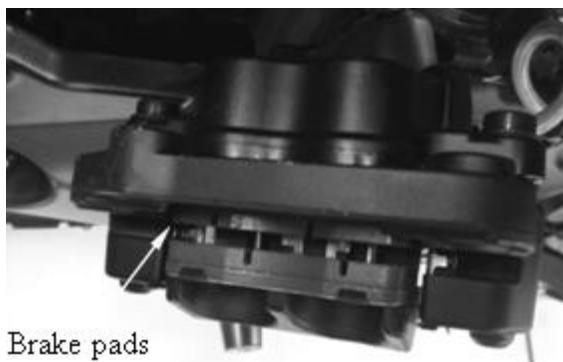
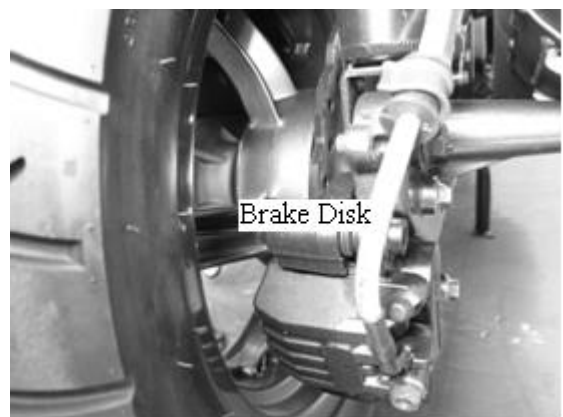
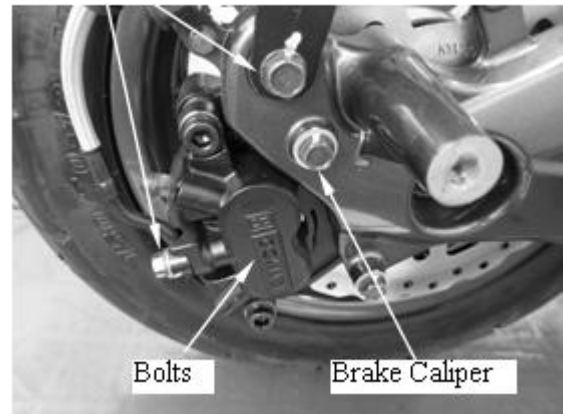
Inspect the brake pads and brake disk.

Measure the brake disk thickness.

Visually check the brake pad thickness



Fluid Tube Bolt



3.3. Disassembly

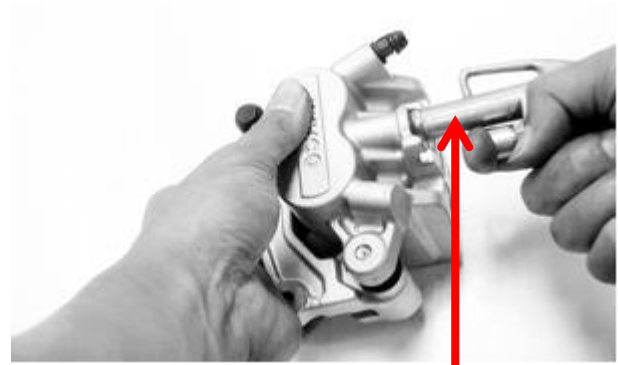
Remove two brake pads dowel pins and three bolts from the brake caliper.

Remove the brake pads.

Remove the piston from the brake caliper.

If necessary, use compressed air to squeeze out the piston through the brake fluid inlet opening and place a towel under the caliper to avoid contamination caused by the removed piston.

Check the piston cylinder for scratches or wear and replace if necessary.



Compressed Air

Push the piston oil seal outward to remove it.

Clean the oil seal groove with brake fluid.

※ **Be careful not to damage the piston surface.**



Check the piston for scratches or wear.

Measure the piston O.D. with a micrometer gauge.



Check the caliper cylinder for scratches or wear and measure the cylinder bore.



3.4. Assembly

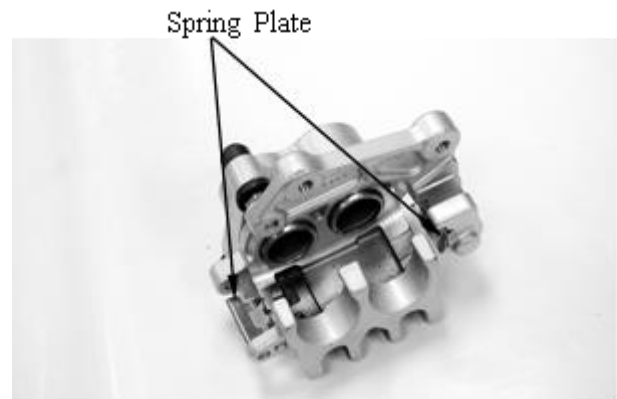
Clean all removed parts.

Apply silicon grease to the piston and oil seal. Lubricate the brake caliper cylinder inside wall with brake fluid.

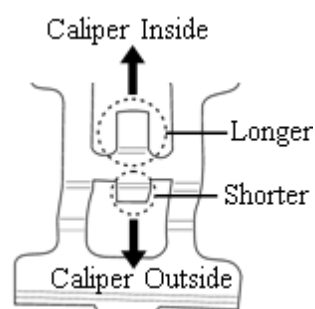
Install the brake caliper piston with grooved side facing out.

※ **Install the piston with its outer end protruding 3 ~ 5mm beyond the brake caliper.**

Install the two spring plates onto the groove of the caliper.



※ **Make sure the spring plate next to the brake pad dowel pin orientation.**



Install two brake pads and brake pad dowel pin.



3.5. Installation

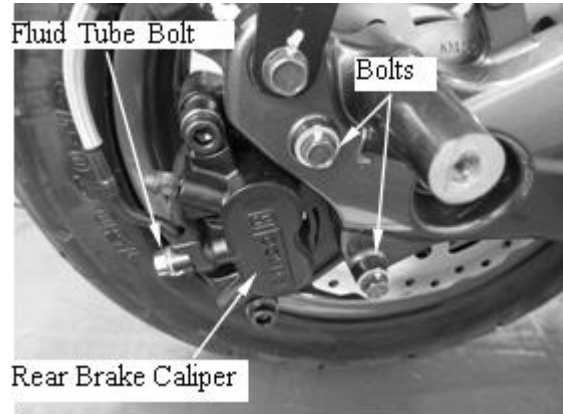
Install the brake caliper to the rear fork and tighten the two bolts.

Torque: 27 N-m

Connect the brake fluid tube to the brake caliper and install fluid tube bolt, copper washers and tighten the fluid tube bolt.

Fill the brake reservoir with the specified brake fluid and bleed air from the brake system.

※ **When installing the brake fluid tube, be sure to install the two copper sealing washers.**



4. Rear Fork

4.1. Removal

- Place the vehicle on its center stand.
- Remove the exhaust muffler.
- Remove the rear brake caliper.
- Remove the speed sensor.
- Remove the speed sensor wire and the rear brake fluid hose holder.
- Remove the lower mounting bolt of the right side rear shock absorber.
- Remove the rear axle nut and collar.
- Remove the rear fork mounting bolts.
- Remove the rear fork.

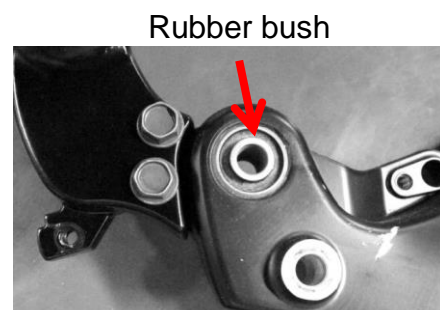
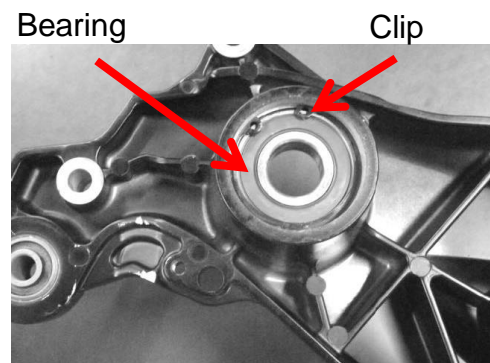
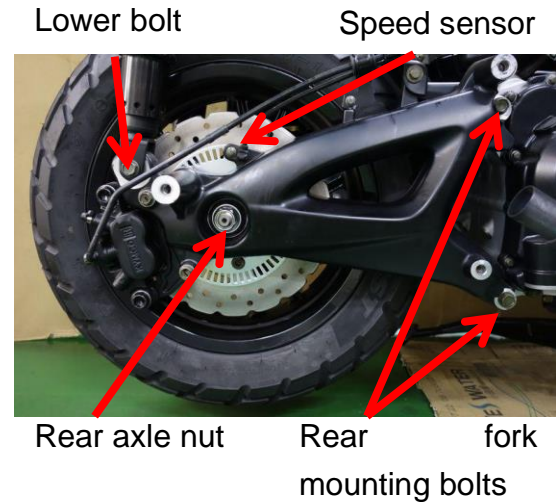
※ **Wrap the rear caliper with a proper cloth to protect the rear fork and covers from being scratched.**

Install in the reverse order of work.

4.2. Inspection

- Remove the clip.
- Turn the inner race of each bearing with your finger to see if they turn smoothly and quietly. Also check if the outer race fits tightly in the hub.
- Replace the bearings if the races do not turn smoothly, quietly, or if they fit loosely in the hub.
- Inspect the dust seal for damage or worn.
- Replace it if necessary.
- Apply grease on the dust seal before install.

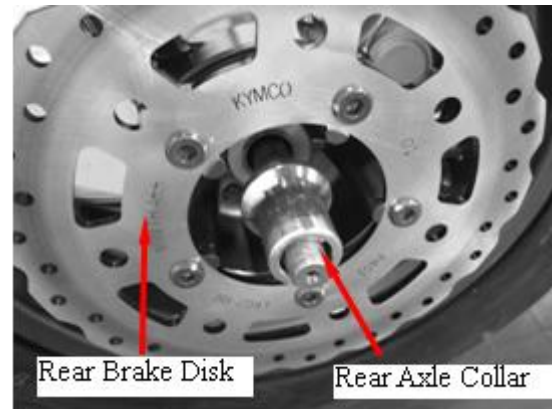
- Inspect the rubber bush for damage or worn.
- Replace it if necessary.



5. Rear Wheel

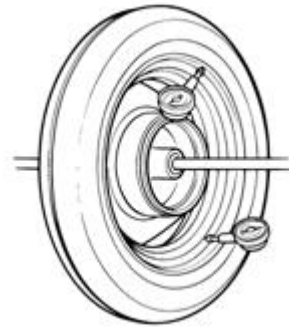
5.1. Removal

- Remove the exhaust muffler.
- Remove the rear brake caliper.
- Remove the rear fork.
- Remove the rear axle collar.
- Remove the rear wheel.



5.2. Inspection

- Measure the rear wheel rim runout.



5.3. Installation

- Apply a proper amount of grease on the rear axle before installation.
- Install in the reverse order of work.

Torque:

Rear shock absorber lower mount bolt:
35~45N-m

Rear axle nut: 120 N-m



6. Rear Shock Absorber

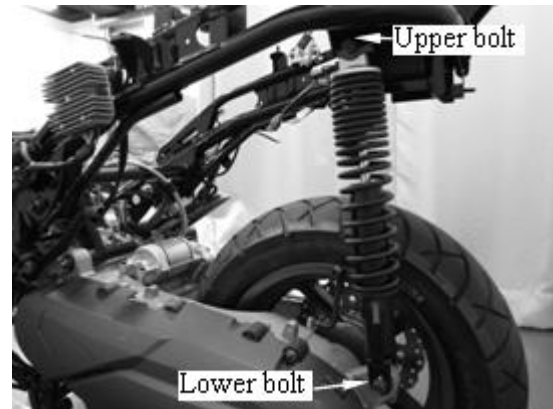
6.1. Removal

Remove the met-in box and carrier.

Remove the body cover, center cover and rear fender together.

Remove the right/left rear shock absorber upper and lower mount bolts.

Remove the right and left rear shock absorbers.



6.2. Installation

Install the rear shock absorbers in the reverse order of removal.

Torque:

Upper Mount Bolt: 40 N-m

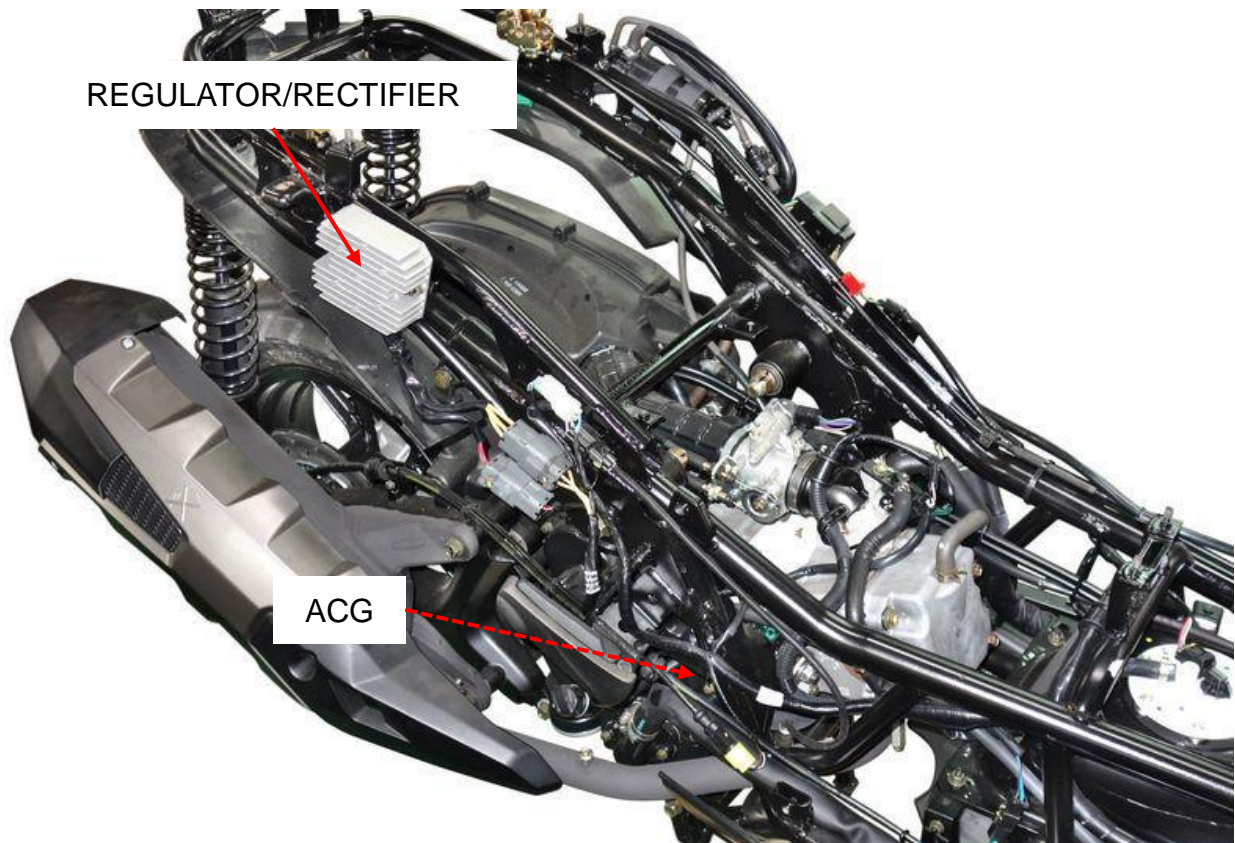
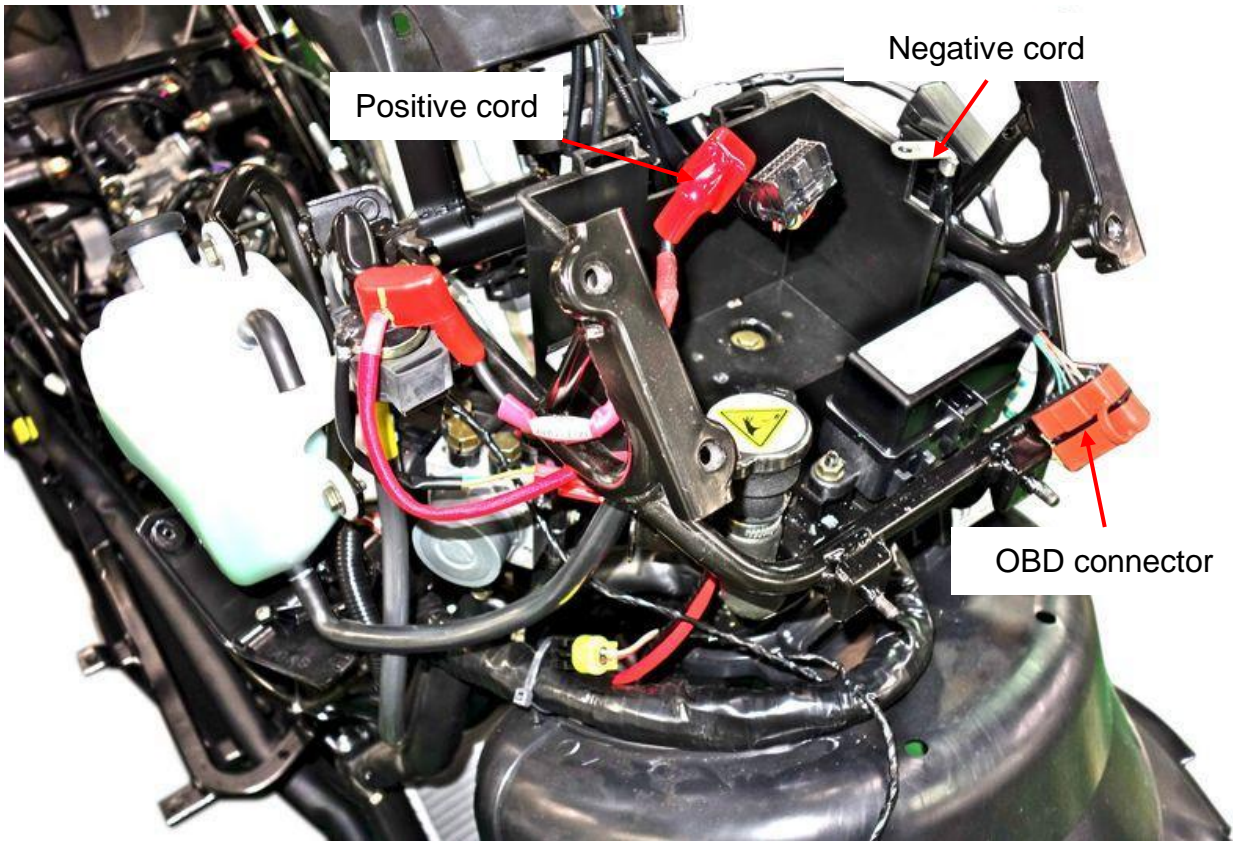
Lower Mount Bolt: 40 N-m

16. Battery & Charging System

Battery/Charging System

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1. CHARGING SYSTEM LAYOUT



2. SERVICE INFORMATION

2.1. GENERAL INSTRUCTIONS

- The battery can be charged and discharged repeatedly. If a discharged battery is not used for a long time, its service life will be shortened. Generally, the capacity of a battery will decrease after it is used for 2~3 years. A capacity-decreased battery will resume its voltage after it is recharged but its voltage decreases suddenly and then increases when a load is added.
 - When a battery is overcharged, some symptoms can be found. If there is a short circuit inside the battery, no voltage is produced on the battery terminals. If the rectifier won't operate, the voltage will become too high and shorten the battery service life.
 - If a battery is not used for a long time, it will discharge by itself and should be recharged every 3 months.
 - A new battery filled with electrolyte will generate voltage within a certain time and it should be recharged when the capacity is insufficient. Recharging a new battery will prolong its service life.
 - Inspect the charging system according to the sequence specified in the Troubleshooting.
 - Do not disconnect and soon reconnect the power of any electrical equipment because the electronic parts in the regulator/rectifier will be damaged. Turn off the ignition switch before operation.
 - It is not necessary to check the MF battery electrolyte or fill with distilled water.
 - Check the load of the whole charging system.
 - Do not quick charge the battery. Quick charging should only be done in an emergency.
 - Remove the battery from the motorcycle for charging.
 - When replacing the battery, do not use a traditional battery.
 - When charging, check the voltage with an electric tester.
- ※ **The battery electrolyte (sulfuric acid) is poisonous and may seriously damage the skin and eyes. Avoid contact with skin, eyes, or clothing. In case of contact, flush with water and get prompt medical attention**

2.2. SPECIFICATIONS

Item		Standard	
Battery	Capacity	12V 11.8Ah	
	Voltage (20°C)	Fully charged	13.0~13.2V
		Undercharged	12.3V
	Charging current	Normal	1.0X5~10H
Quick		10AX0.5H	
Alternator	Capacity	240W/5000rpm	
	Charging coil resistance (20°C)	Yellow-Yellow	
	RPM of charging start	Under 1300rpm (14V)	
	Charging performance	18A/ 5000rpm	
Regulator/ Rectifier	Regulated voltage	14..5±0.5V	

2.3. TROUBLESHOOTING

No power

- Dead battery
- Disconnected battery cable
- Fuse burned out
- Faulty ignition switch

Low power

- Weak battery
- Loose battery connection
- Charging system failure
- Faulty regulator/rectifier

Intermittent power

- Loose battery cable connection
- Loose charging system connection
- Loose connection or short circuit in ignition system

Charging system failure

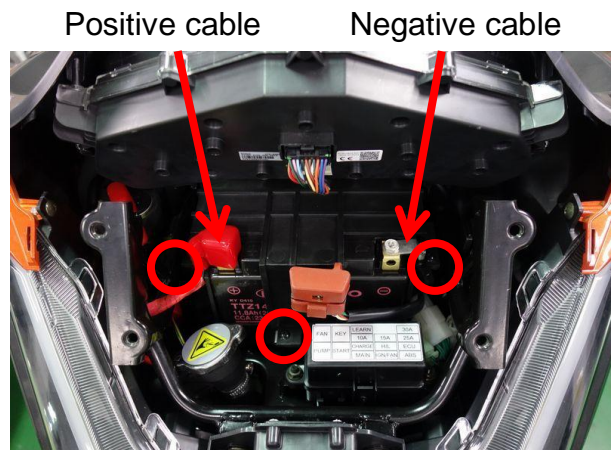
- Loose, broken or shorted wire or connector
- Faulty regulator/rectifier
- Faulty A.C. generator

3. Battery

3.1. Removal

The battery is in the front part of the vehicle.

1. Remove the wind screen and front cover.
2. Remove the screws.
3. Remove the battery cover.
4. Disconnect the negative cable from the battery first, and then disconnect the positive cable.
5. Remove the battery from the battery box.



3.2. Installation

Install in the reverse order of the removal.

※ When install the battery, first connect the positive cable and then negative cable to avoid short circuit.

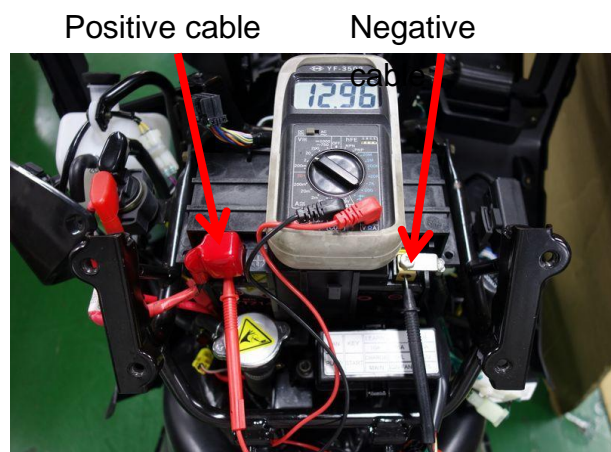
3.3. Voltage Inspection

Measure the battery voltage using a commercially available digital multimeter.

Voltage :

Fully charged: 13—13.2 V

Under charged: below 12.3 V

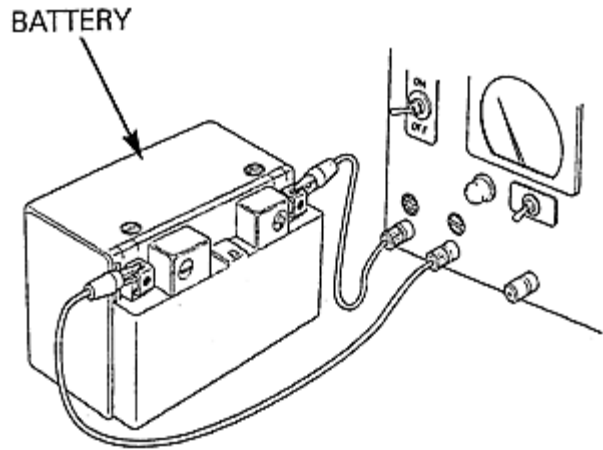


3.4. Battery Charging

Remove the battery

Connect the charger positive (+) cable to the battery positive (+) terminal.

Connect the charger negative (-) cable to the battery negative (-) terminal.



- ※ **Clean the battery terminals and position the battery as far as away from the charger as the leads will permit.**
- ※ **Always keep flammable material or spark from battery.**
- ※ **Turn off the charger after charging**
- ※ **Charging the battery under 45°C.**
- ※ **Quick charging should only be done in an emergency; slow charging is preferred.**
- ※ **For battery charging, do not exceed the charging current and time specified on the battery. Using excessive current or extending the charging time may damage the battery.**
- ※ **Measure the battery voltage after charging 30 minutes.**

Charging current time:

Standard: 1.2A/ 5~10 hours

Quick: 12 A/ 1 hours

4. Charging System Inspection

4.1. Charging Voltage

※ Perform this inspection after the battery is fully charged.

Start the engine and warm it up to the operating temperature; stop the engine.

Connect the multimeter between the positive and negative terminals of the battery.

To prevent short, make absolutely certain which are the positive and negative terminals or cable.

With the headlight on and turned to the high beam position, restart the engine.

Measure the voltage on the multimeter when the engine runs at 5000 min (rpm).

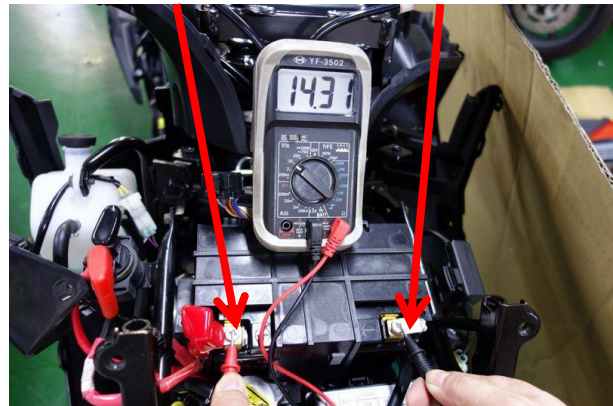
Standard:

14~15V/ Under 0.5A (Under 5000rpm)

Inspect the rectifier/regulator if the voltage is not in the standard.

※ Do not disconnect the battery or any cable in the charging system without first switching off the ignition switch. Failure to follow this precaution can damage the tester or electrical components.

Positive terminal Negative terminal



5. Regulator/Rectifier

5.1. Inspection

Disconnect the regulator/rectifier connectors.

Check the connectors for loose contacts or corroded terminals.

Battery line

Measure the voltage between the Red/White wire terminal and ground.

There should be battery voltage at all times.



Ground line

Check the continuity between the Green wire terminal and ground.

There should be continuity at all times and the value should be very small.

※ The inspection value should be minus the resistance value between the probes.

Check the continuity between the each yellow wire and ground wire.

There should not be continuity all times.

If there is continuity, the coil is short.

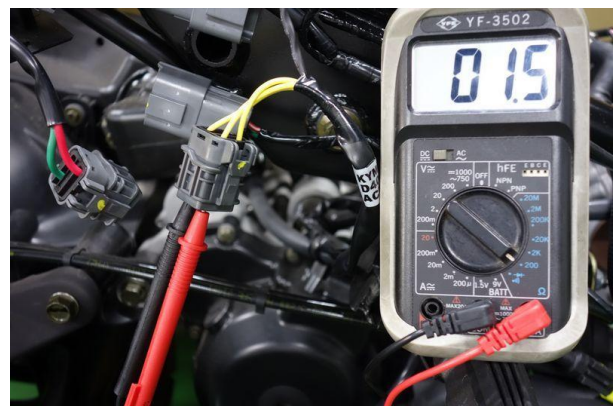
Charging coil line

Measure the resistance between each Yellow wire terminals.

Standard: 0.4 – 0.6 Ω (20°C/68°F)

Disconnect the regulator/rectifier connector. Check for continuity between each Yellow wire terminal regulator/rectifier side and ground.

There should be no continuity.



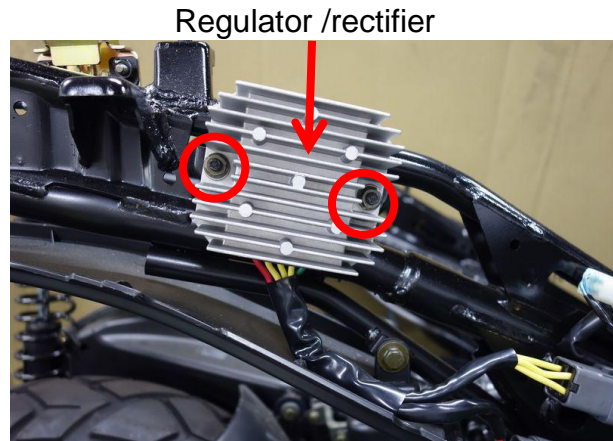
5.2. Removal/Installation

Remove the side body cover

Disconnect the regulator/rectifier connectors.

Remove the two bolts, regulator/rectifier.

Installation is in the reverse order of removal.

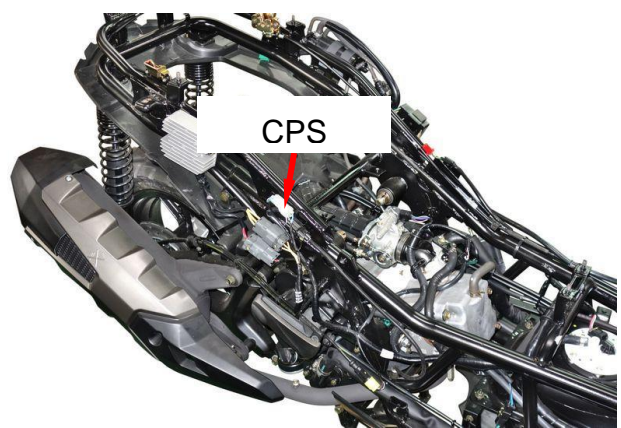
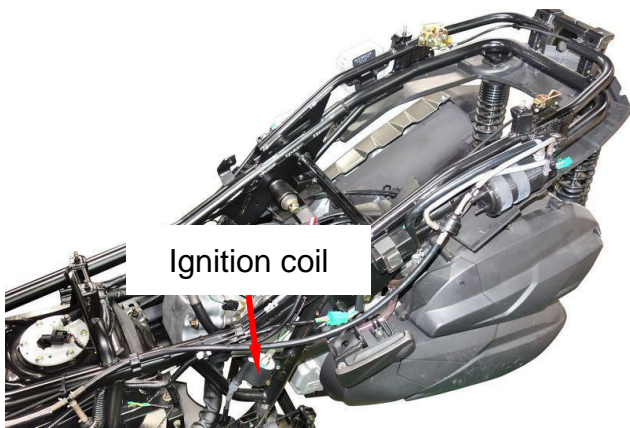
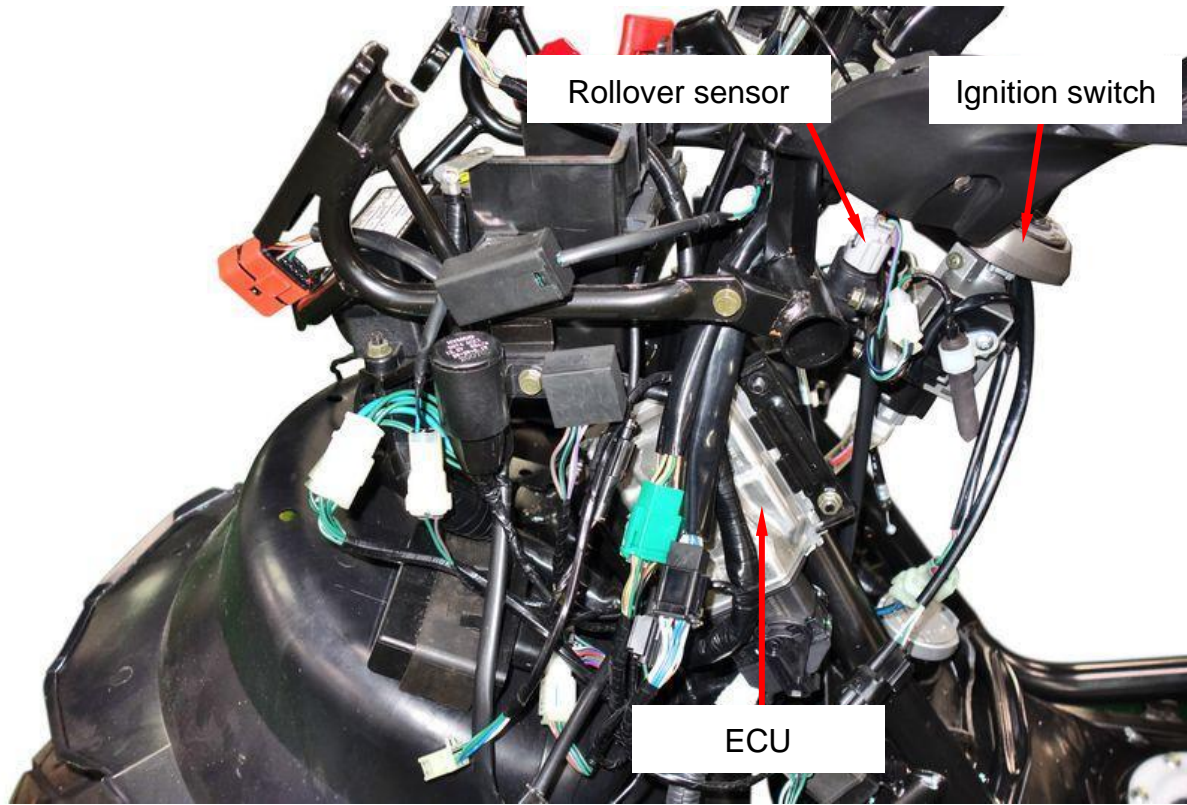


17. Ignition System

Ignition System

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1. Ignition System Layout



2. Service Information

2.1. General instructions

- Some electrical components may be damaged if terminals or connectors are connected or disconnected while the ignition switch is “ON” and current is present.
- When servicing the ignition system, always follow the steps in the troubleshooting.
- The ignition timing is set at the factory and is not adjustable. Perform the following checks. Before performing any tests make sure the electrical connections are not loose or corroded.
- The ignition control module or ECU may be damaged if dropped. Also, if the connector is disconnected when current is flowing, the excessive voltage may damage the ignition control module or ECU. Always turn off the ignition switch before servicing.
- A faulty ignition system is often related to poor connections. Check those connections before proceeding.
- Make sure the battery is adequately charged. Using the starter motor with a weak battery results in a slower engine cranking speed as well as no spark at the spark plug.
- Use a spark plug of the correct heat range. Using spark plug with an incorrect heat range can damage the engine.

2.2. Specifications

Item		Standard
Spark plug	Type	NGK CR7E
	Gap	0.7~0.8 mm
Ignition coil	Primary coil resistance	2.8 K Ω \pm 15%
	Secondary coil resistance (without)	9 K Ω \pm 20%
Throttle position sensor resistance		3500~6500 Ω
Fuel pump resistance		1.9 Ω
Fuel injector resistance		10.5 \pm 0.53 Ω
Water temperature sensor resistance		2.076K Ω \pm 10%
Oxygen sensor resistance(After warm up the vehicle)		120 \pm 24 Ω
Crank position sensor resistance		115 \pm 15 Ω
Rollover sensor resistance	Normal	0.4~1.4V
	Fall down	4~4.4V

2.3. Troubleshooting

LOW PEAK VOLTAGE

- Cranking speed is too low (battery is undercharged).
- Poorly connected connectors or an open circuit in the ignition system.
- Faulty ignition-coil.
- Faulty ignition control module.

NO PEAK VOLTAGE

- Short circuit in engine stop switch or ignition switch wire.
- Faulty engine stop switch or ignition switch.
- Loose or poorly connected ignition control module connectors.
- Open circuit or poor connection in ground wire of the ignition control module.
- Faulty ignition pulse generator.
- Faulty ignition control module.

PEAK VOLTAGE IS NORMAL, BUT NO SPARK JUMPS AT THE PLUG

- Faulty spark plug or leaking ignition coil secondary current.
- Faulty ignition coil.
- Spark plug leakage.
- Spark plug gap too small
- Spark plug worn out

SPARK PLUG NO SPARK

- Blown out fuse
- Faulty ignition switch
- Engine stop switch is at "STOP" position
- Faulty ignition coil
- Broken wire or short circuit
- Faulty installation of CPS
- Faulty ECU
- Faulty ECU relay
- Faulty rollover sensor
- Faulty side stand switch

3. Spark Plug

3.1. Inspection

Check the spark plug to see if it is the correct type and gapped properly. If the spark plug is black and fouled, replace it. See the Spark Plug topic for more information.

If the spark plug center electrode or side electrode are corroded or damaged, or if the insulator is cracked, replace the plug.

Measure the gap with a wire-type thickness gauge.

If the gap is incorrect, replace the spark plug.



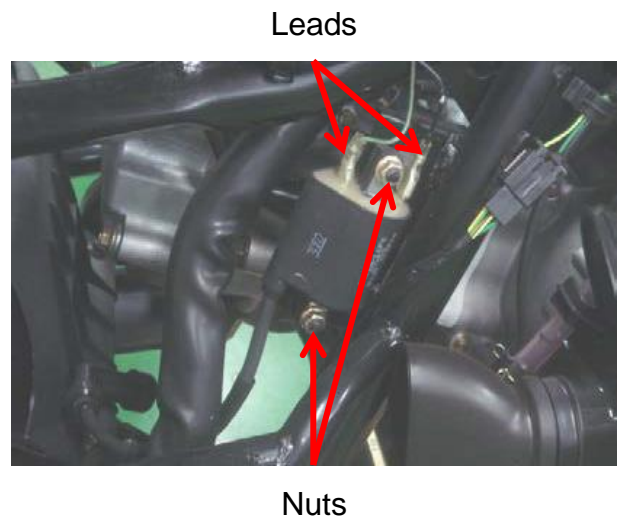
4. Ignition Coil

4.1. Removal

Remove the two ignition coil leads.

Remove the two ignition coil mounting bolts with an 8 mm socket.

Remove the ignition coil.



4.2. Inspection

Set the multimeter to read ohms of resistance (Ω).

Touch the positive and negative meter probes to the ignition coil terminals as shown. Measure the resistance

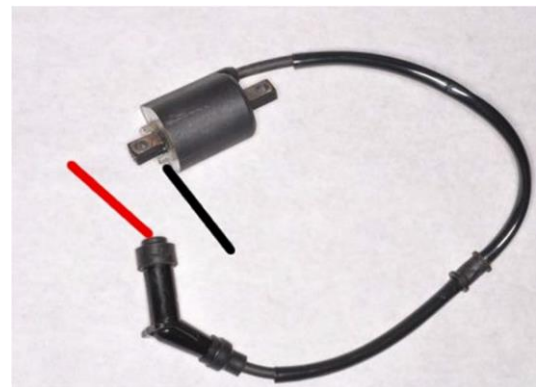
Primary resistance	2.38~3.22 Ω
---------------------------	--------------------

Check the secondary resistance between the ignition coil terminal and the spark plug cap.

Secondary resistance (with spark plug cap)	12.5~15.8 Ω
---	--------------------

Check the secondary resistance between the ignition coil terminal and the spark plug wire without the cap.

Secondary resistance (without spark plug cap)	7.2~10.8 Ω
--	-------------------



5. Crank Position Sensor

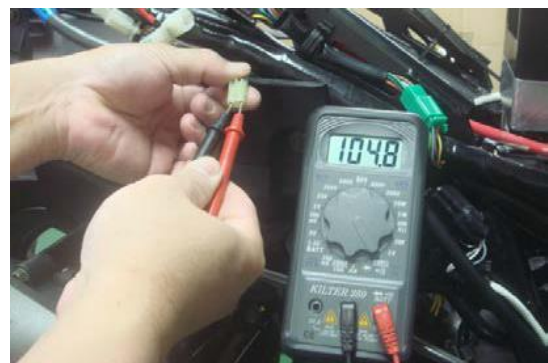
5.1. Inspection

※ This test is performed with the stator installed in the engine.

Disconnect the connector of the crank position sensor.

Measure the resistance between the B/W and the L/Y wires.

Terminal	Value
B/W-L/Y	120 \pm 24 Ω



6. Rollover Sensor

6.1. Inspection

Support the scooter level surface.

Put the side stand up and engine stop switch on "RUN". Turn the ignition switch to "OFF".

- ※ Do not disconnect the sensor connector during inspection.
- ※ The capacity of battery must be fully charged.

Up position resistance

Terminal	Value
V/R(+)-G/P(-)	5V (ECU voltage)
B/L(+)-G/P(-)	0.4~1.4V

Fall down resistance

Incline the tilt switch 65 ± 10 degrees to the left or right at the ignition switch "ON".

Measure the voltage as below.

Terminal	Value
V/R(+)-G/P(-)	5V (ECU voltage)
B/L(+)-G/P(-)	4~4.4V

- ※ To repeat this test, first turn the ignition switch to "OFF", then turn the ignition switch to "ON".

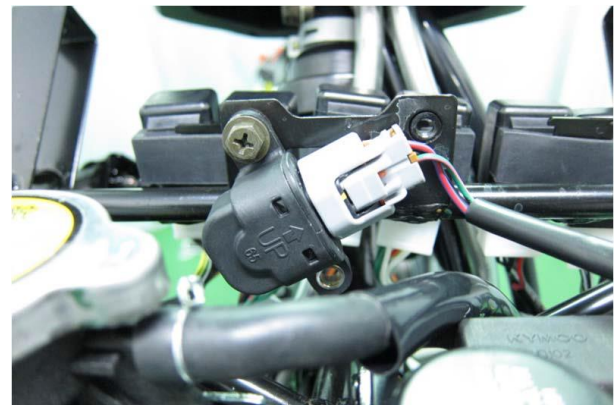
6.2. Removal

Disconnect the connector.

Remove the bolts to remove the sensor.

Install in the reverse order of work.

- ※ Install the sensor with its "up" mark facing up.



7. ECU

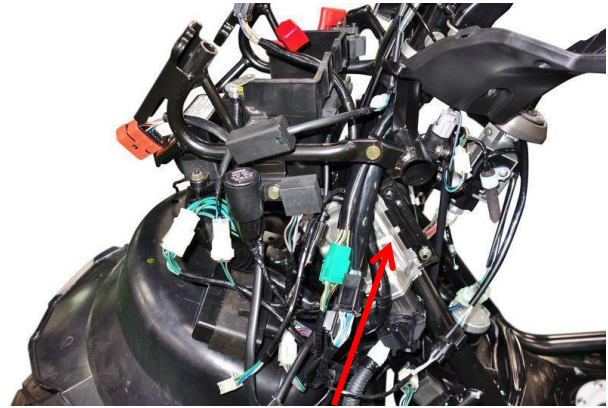
7.1. Removal/installation

The ECU is located at the front part of the vehicle.

Disconnect the harness cable.

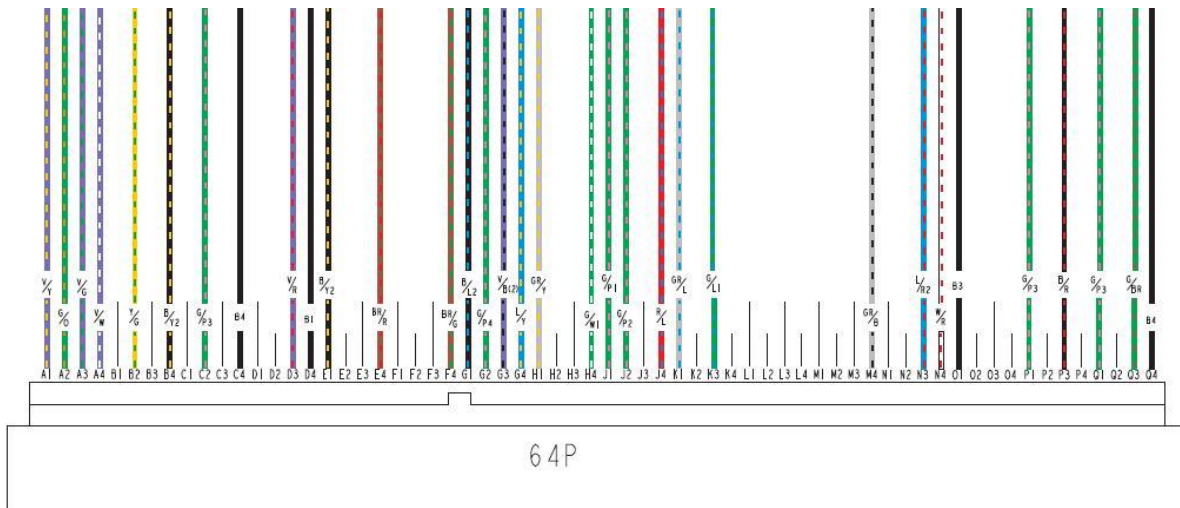
Remove the mounting nuts.

Remove the ECU.



ECU

※ The ignition control module or ECU may be damaged if dropped, soak in water, or the connector is disconnected when the key is "ON". The excessive voltage may damage the ignition control module or ECU. Always turn off the ignition switch before servicing.



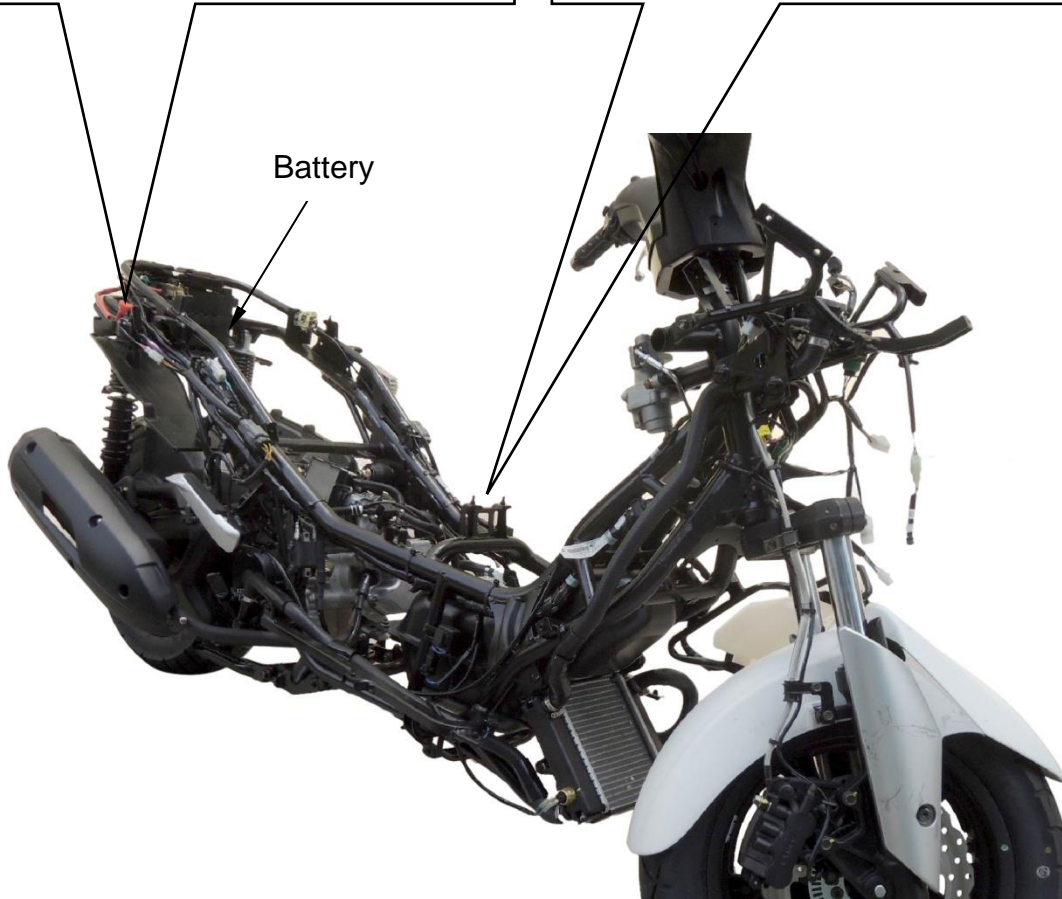
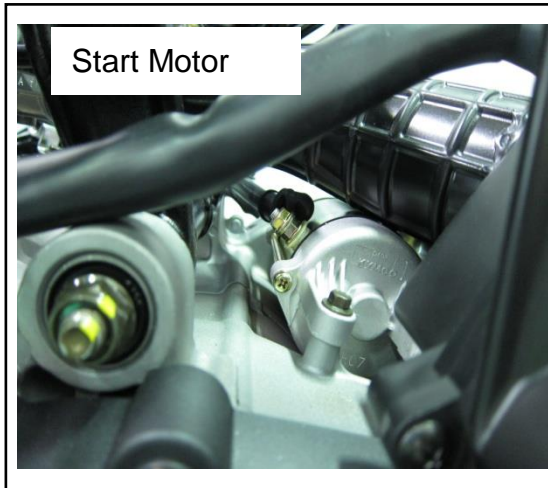
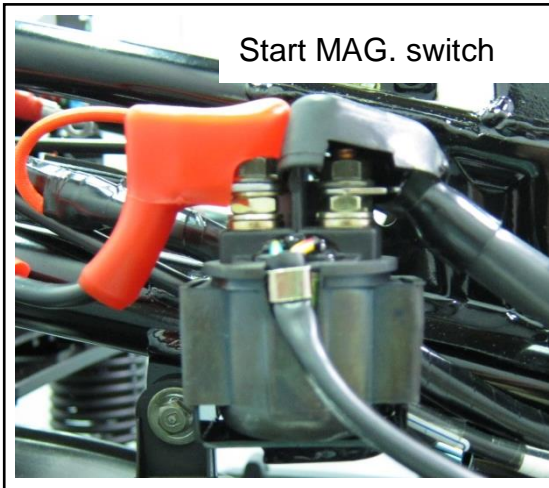
B-A1	STEPPER A_N (D)	B-D1		B-G1	TILT SIGNAL	B-K1	TJA	B-N1		B-O1	PGND 1
B-A2	STEPPER A_P (A)	B-D2	VSENS2(TPS)	B-G2	MODE SW	B-K2		B-N2		B-O2	
B-A3	STEPPER B_N (B)	B-D3	VSENS1(MAP, TILT)	B-G3	TPS SIGNAL	B-K3	THERMO	B-N3	WIL	B-O3	IGNITION COIL
B-A4	STEPPER B_P (C)	B-D4	VBR	B-G4	CPS (+)	B-K4		B-N4	INJ-1	B-O4	VBR
B-B1		B-E1	MANIFOLD AIR PRESSURE	B-H1	O2 SIGNAL	B-L1		B-O1	KILL SW	PIN	PI FUNCTION
B-B2	SIDE STAND SW	B-E2	SGND1(TPS)	B-H2		B-L2		B-O2			
B-B3	BRAKE SW1	B-E3		B-H3		B-L3		B-O3			
B-B4	MAIN RELAY	B-E4	CAN-HIGH(+)	B-H4	CPS (-)	B-L4		B-O4			
B-C1		B-F1		B-J1	SGND4(TILT)	B-M1		B-P1	PGND 2		
B-C2	SGND2(MAP)	B-F2		B-J2	SGND3(THERMO, TJA, O2)	B-M2		B-P2			
B-C3	START SW	B-F3		B-J3		B-M3		B-P3	FUEL PUMP RELAY		
B-C4	VBR	B-F4	CAN-LOW(-)	B-J4	FAN RELAY	B-M4	O2 HEAT	B-P4	STARTER RELAY		
PIN	PI FUNCTION	PIN	PI FUNCTION	PIN	PI FUNCTION	PIN	PI FUNCTION	PIN	PI FUNCTION		

18. Starting System

Starting System

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1. Starting System Layout



2. Service Information

2.1. General Instructions

- The removal of starter motor can be accomplished with the engine installed.
- For the starter clutch removal, refer to the chapter 10.
- After the starter clutch is installed, be sure to add the engine oil and coolant and then bleed air from the cooling system.

2.2. Torque Values

Item	Unit	
	kgf-m	N-m
Starter motor mounting bolt	0.7~1.1	7~11
ACG flywheel mounting bolt	5.5~6.5	55~65

2.3. Troubleshooting

Starter motor won't turn

- Fuse burned out
- Weak battery
- Faulty ignition switch
- Faulty starter clutch
- Faulty front or rear stop switch
- Faulty starter relay
- Poorly connected, broken or shorted wire
- Faulty starter motor

Lack of power

- Weak battery
- Loose wire or connection
- Foreign matter stuck in starter motor or gear

Starter motor rotates but engine does not start

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

3. Start Motor

3.1. Inspection

Connect the start motor cable directly to the battery positive terminal.

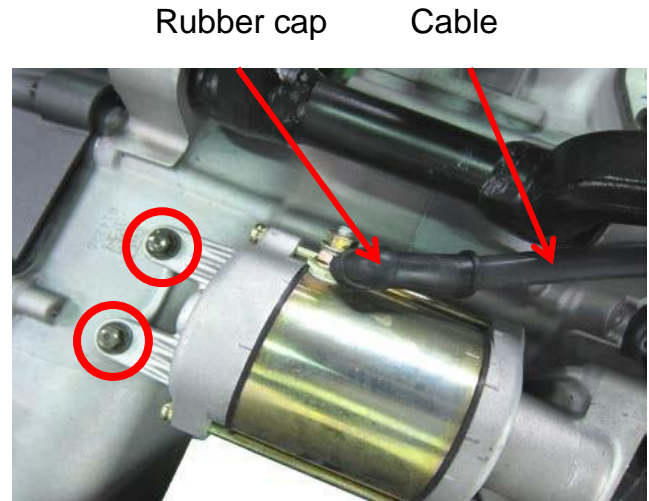
If the start motor does not turn, the starter motor is faulty.

3.2. Removal

Turn the ignition switch turned to “OFF”

Release the rubber cap and remove the terminal screw to disconnect the cable from the start motor.

Remove the two mounting bolts then remove the start motor.



3.3. Installation

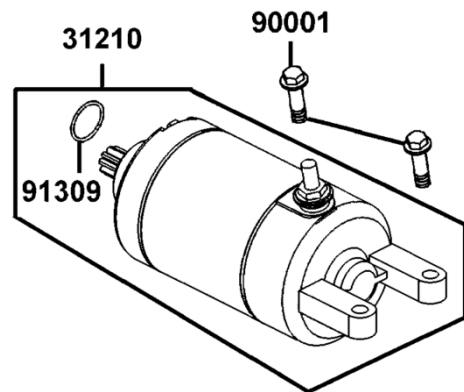
Coat a new O-ring (91309) with engine oil and install it into the start motor groove.

Install the starter motor into the crankcase.

Install the two mounting bolts securely.

TORQUE: 0.7~1.1 kgf-m

Connect the cable to motor terminal with the terminal screw and tighten it securely.



4. Starter Relay

4.1. Removal

Disconnect the starter relay wire connector.
Release the rubber caps and remove the nuts, then disconnect the start motor cable, battery positive cable and harness wire.
Remove the starter relay.



4.2. Installation

Install the starter relay.
Connect the connector and cables.
Tighten the nuts to the specified torque.

TORQUE: 3.0 kgf-m

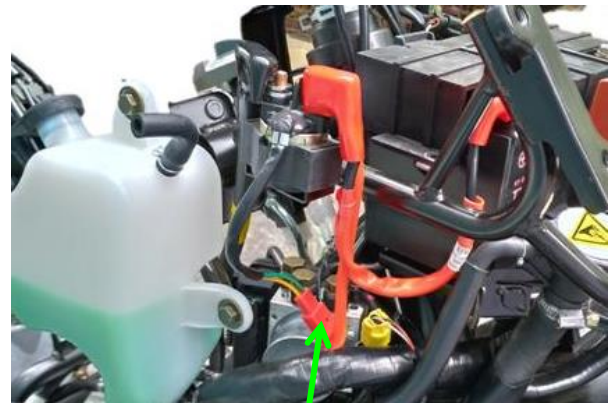
※ If the nuts are not tightened with the specified torque, the starter relay may be damaged and fail starting.

4.3. Inspection

Continuity Test

Disconnect the starter relay wire connector.

Check for continuity between the yellow/red wire and green/yellow wire. There should be continuity when the starter button is depressed. If there is no continuity, check the starter button for continuity and inspect the wire.



Connector

Operation Test (On Board)

Turn on the ignition switch.
Squeeze the brake lever and press the start button at the same time.
The engine should be started and the starter relay will emit a click sound.

No click sound:

- Check the starter relay voltage
- Check the grounding circuit
- Check the starter relay operation

Starter Relay Voltage

Turn on the ignition switch.

Use a multimeter to measure the voltage.

One probe touch the Y/R wire the other touch the ground.

The measurement result will be close to the battery voltage

Grounding Circuit

Disconnect the connector.

Check the continuity between the green wire and the frame.

There should be continuity always.

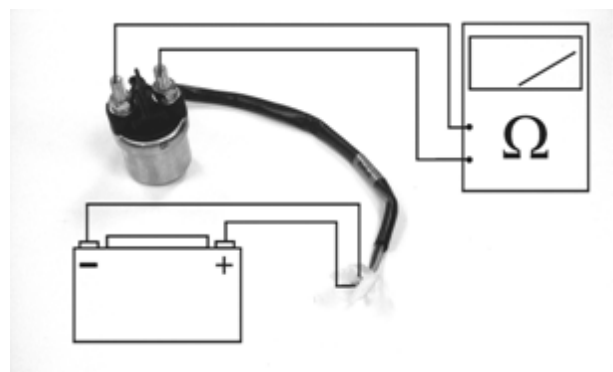
Operation Test (Removed)

Connect the electric meter to the starter relay terminals that connect to the battery positive cable and the starter motor cable.

Connect a fully charged battery across the starter relay yellow/red and green/yellow wire terminals.

Check for continuity between the starter relay large terminals.

The relay is normal if there is continuity and it emits click sound.



※ Do not apply the battery voltage jump for more than five seconds or the relay may be damaged.

19. Electrical System

Electrical System

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1. SERVICE INFORMATION

1.1. GENERAL INSTRUCTIONS

- Note the following when replacing the halogen headlight bulb
 - Wear clean gloves while replacing the bulb. Do not put finger prints on the headlight bulb, as they may create hot spots on the bulb and cause it to fail.
 - If you touch the bulb with your bare hands, clean it with a cloth moistened with alcohol to prevent its early failure.
 - Be sure to install the dust cover after replacing the bulb.
- Check the battery condition before performing any inspection that requires proper battery voltage.
- A continuity test can be made with the switches installed on the scooter.
- Route the wires and cables properly after servicing each component.

1.2. Specification

Head light	LED
Turn signal light	LED
Plate light	12V 5W
Tail/Brake light	LED
Luggage box light	LED
Meter indicator	LED
Fuses	15A, 10A, 30A, 25A

1.3. Troubleshooting

Lights do not come up, or horn does not sound after turn on the ignition switch

2. Front Lights assy

2.1. Headlight

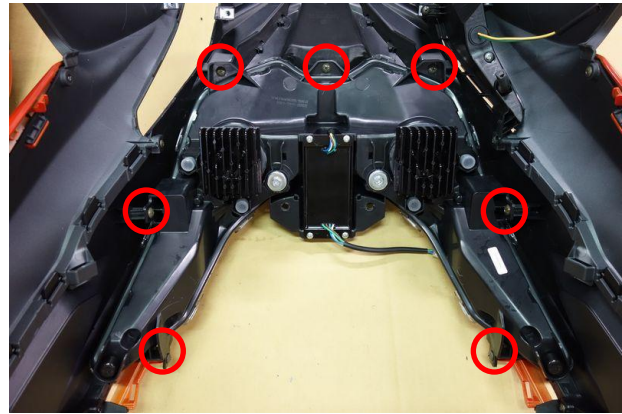
※ Place a cloth under the headlight assy after removal to prevent scratches.

Remove the headlight assy.

Remove screws.

Remove the headlight.

Install in the reverse order of work.



2.2. Front turn signal lights

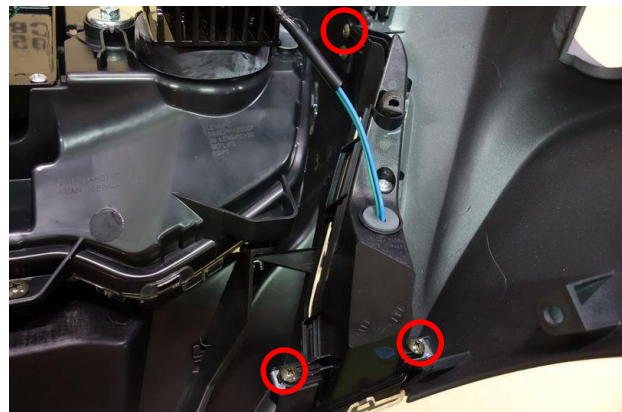
Remove the headlight assy.

Remove the screws.

Remove the front turn signal lights.

Repeat the process on the other side.

Install in the reverse order of work.



3. Rear Lights assy

3.1. Tail light assy

Remove the rear light assy.

Remove screws on the each side of cover.

Remove the side covers.



Remove the rear center cover.

Remove the screws.



Remove the tail light assy.

Installation is in the reverse order of removal.

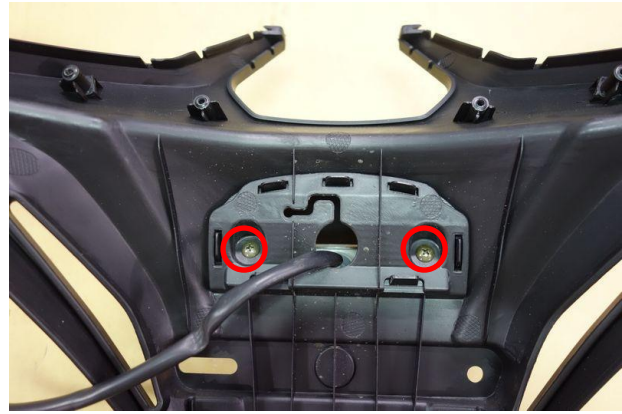


3.2. License Plate Light

Remove the rear light assy.

Remove the screws.

Remove the license plate light.



Remove the screws.

Push and turn the bulb counterclockwise to remove it, and then replace with a new one.

Specification: 12V 5W

Installation is in the reverse order of removal.

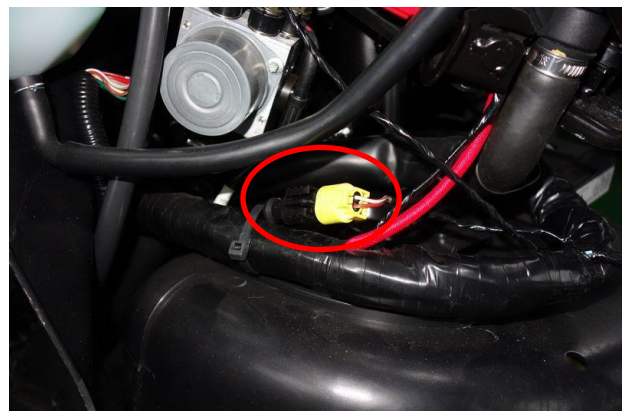


4. Speed Sensors

4.1. Front Speed Sensor

Remove the front cover.

Disconnect the speed sensor connector.



Remove the bolt.

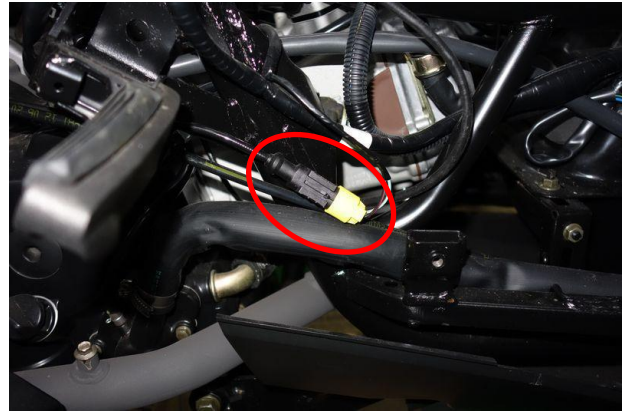
Remove the speed sensor.

Install in the reverse order of removal.



Rear Speed Sensor

Remove the right side cover,
Disconnect the speed sensor connector.



Remove the bolt.
Remove the rear speed sensor.

Install in the reverse order of removal.

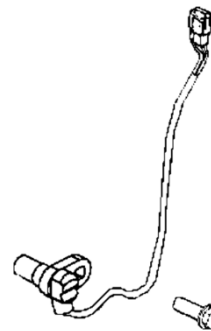


4.2. Inspection

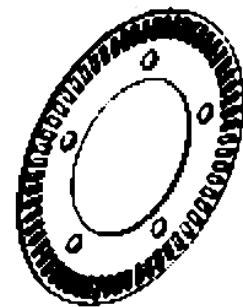
After remove the speed sensor, rotate the wheel to check the speed sensor ring.
If the speed sensor ring is deformed or damaged, it should be replaced.

Check the gap between the speed sensor and the ring.

Standard: 0.4~1.2mm



Speed sensor



Speed sensor ring

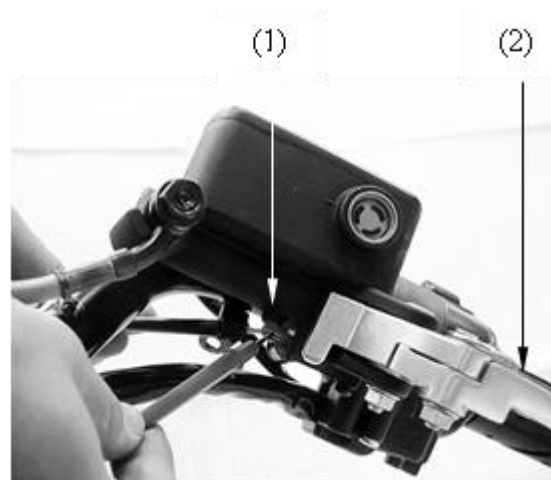
5. Switches

5.1. Brake Light Switch

Remove the upper handlebar cover.

Disconnect front or rear light switch connectors and check for continuity between the switch terminals (1).

There should be continuity with the front or rear brake lever squeezed, and there should be no continuity when the front or rear brake lever (2) is released.



5.2. Ignition Switch

INSPECTION

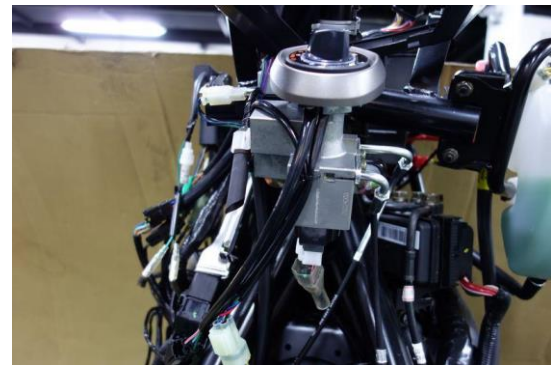
Remove the front cover.

Remove the leg shield.

Continuity should exist between the color code wires as follows:

CIRCUIT

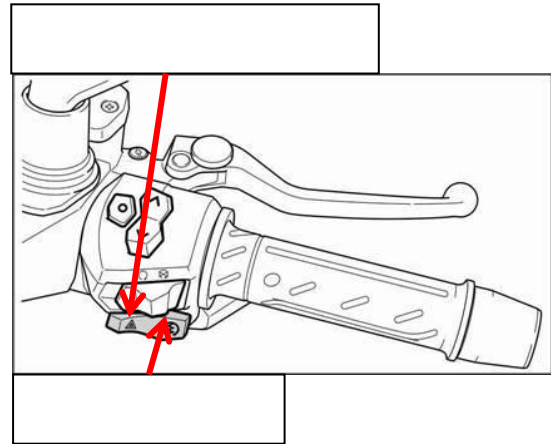
		BAT1	BAT2	BAT3	KEY INSTALL AND REMOVE
OPEN	CAP OPEN	○	○		NO AUTO REVERSE
OFF	20°	○	○		NO
ON		○	○	○	NO
OPEN	PUSH SEAT OPEN	○	○	○	NO AUTO REVERSE
OFF	45°				NO
OPEN	SEAT OPEN				NO AUTO REVERSE
LOCK	PUSH				NO
OPEN	SEAT OPEN				NO AUTO REVERSE



5.3. Right handlebar switch

Disconnect the right handlebar switch connector and check for continuity at switch side connector terminals.

Continuity should exist between the color code wires as follows:



STARTER SW

	E	ST
FREE		
PUSH	○ — ○	
COLOR	G	Y/R

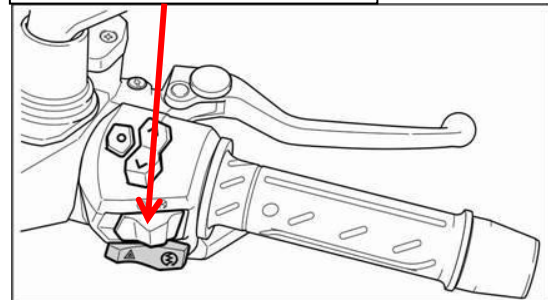
HAZARD SW

	HZ	BAT3
OFF		
ON	○ — ○	
COLOR	B/LI	Y/B

Engine Stop SW

	IG	BAT3
OFF		
RUN	○ — ○	
COLOR	B/W	B/G

Engine stop switch



5.4. Left Handlebar Switch

Disconnect the left handlebar switch connector and check for continuity at switch side connector terminals.

Continuity should exist between the color code wires as follows:

WINKER SW

	WR	R	L
R	○	○	
N			
L	○		○
COLOR	GR	SB	O

HORN SW

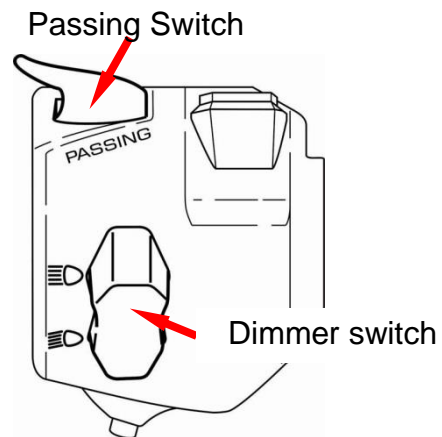
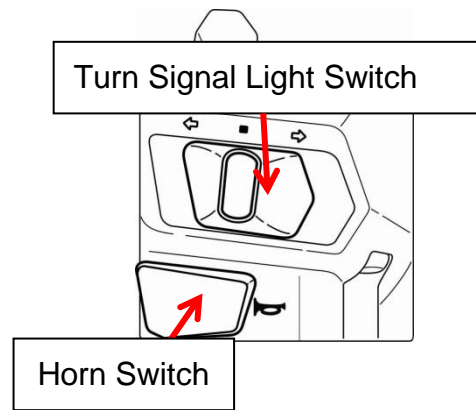
	BAT4	HO
FREE		
PUSH	○	○
COLOR	BR/L	LG

DIMMER SW

	HL	HI	LO
LO	○		○
(N)	○	○	○
HI	○	○	
COLOR	L/W2	L	W

PASSING SW

	BAT4	HI
FREE		
PUSH	○	○
COLOR	BR/L	L



6. Luggage Box Light Sensor

6.1.INSPECTION

Remove the luggage box.

Disconnect the luggage box light sensor connector and check the luggage box light sensor for continuity between the sensor terminals.

There should be no continuity with the luggage box light sensor being covered up, and there should be continuity with the luggage box light sensor being not covered up.

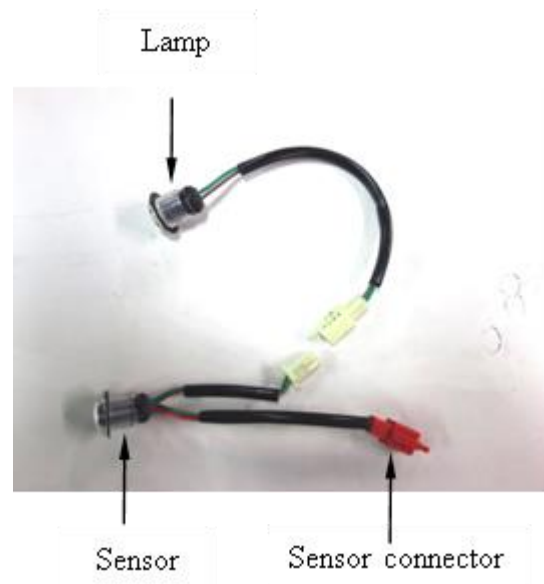
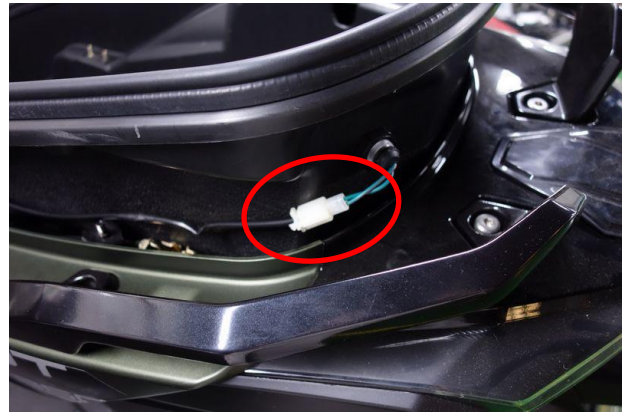
To inspect the lamp and sensor of luggage box:

Sensor:

- * Voltage supply range: 8~16V.
- * It will light off 2 minutes later while opening the rider seat.
- * It will light off 3 seconds later while masking the sensor below 4cm height.

Lamp:

- * Disconnect the light coupler.
- * Connect 8~16V power supply to the terminal leads of lamp, then check whether the illumination works or not.



7. Oil pressure sensor

7.1. Inspection

Check the engine oil level is at the standard before inspection.

The engine oil pressure will maintain in a certain pressure after start the engine.

To inspect the oil pressure sensor, the ignition switch should be turned on.

The engine oil pressure indicator should light up automatically after turn on the ignition switch.

If the indicator does not come up, perform the following inspection process.

1. Remove the protective cap to disconnect the wire.
2. Connect the wire to ground directly to check if the indicator comes up automatically.
3. If the indicator does not light up still, check any of following situation: blown fuse, poor connection of , short circuit.

The engine oil pressure indicator should go off automatically after run the engine.

If the indicator does not go off, perform the following inspection process.

1. Inspect for oil leakage or seized situation.
2. If none of the above situations occur, the engine oil pressure sensor should be replaced.



7.2. Removal

Remove the protective cap and disconnect the wire.



Remove the engine oil pressure sensor.



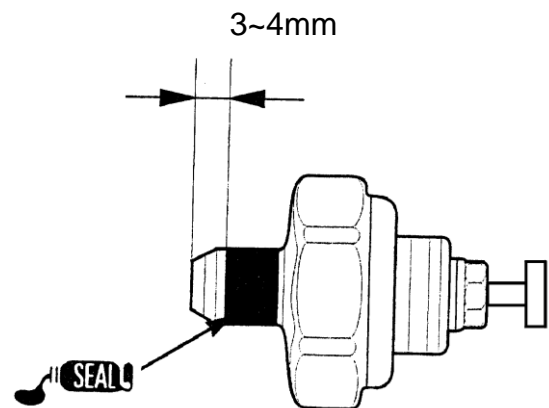
7.3. Installation

Apply suitable sealant as shown and do not seize the sensor.

Tighten the oil pressure sensor to specified torque.

TORQUE: 2.1~3.0kgf-m

Install the protective cap and connect the wire.



8. Fuel Pump

8.1. Removal

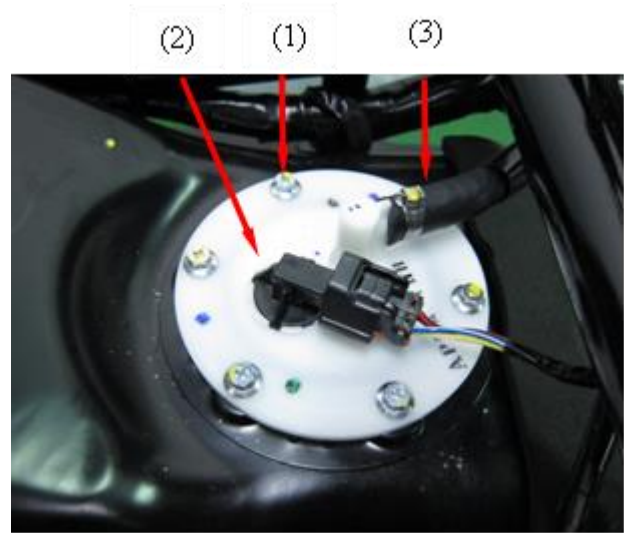
Remove the seat.

Remove the center cover

Remove the fuel pump connector

Be sure to relieve the fuel pressure before removing fuel pump or fuel hose.

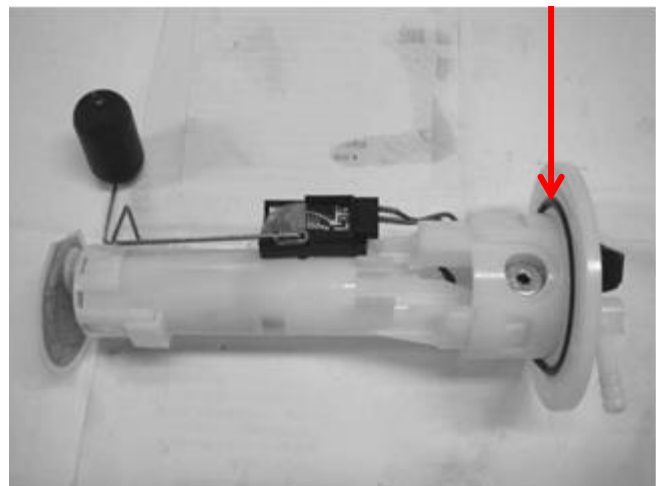
Remove the 6 nuts (1) and fuel unit connectors(2) then remove the fuel hose.(3)



Remove the fuel pump.



Check the fuel pump O-ring. If it was damage, replace new one



8.2. Inspection

Connect the fuel unit wire connectors and turn the ignition switch "ON".

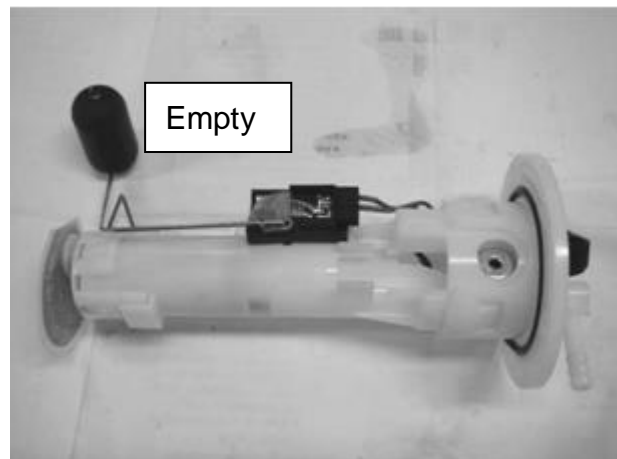
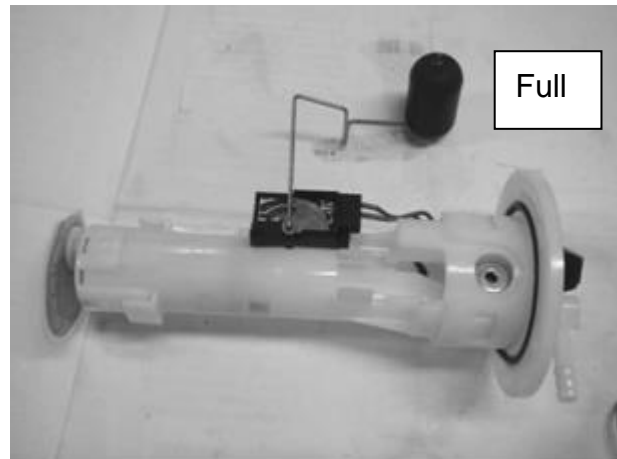
- ※ **Before performing the following test, operate the turn signals to determine that the battery circuit is normal.**
- ※ **Use a good condition and fully charged battery to perform the inspection.**

Check the fuel meter for correct indication by moving the fuel unit float up and down.

Float Position	Display
Upper	Much (Full)
Lower	Less (Empty)

Wire Terminals	Display
Free	From Much to Less
Apply	From Less to Much

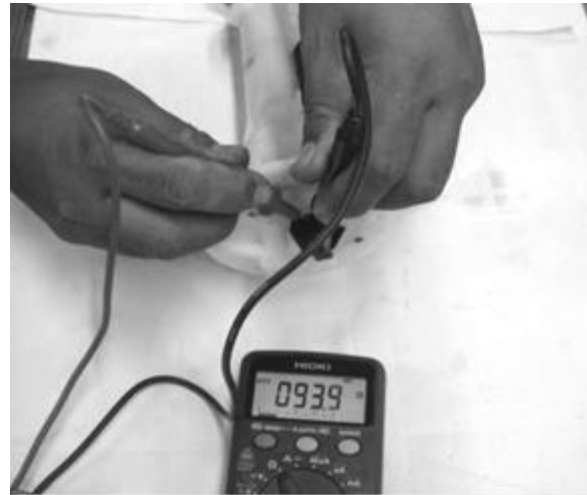
The fuel meter is normal if it operates as above indicated. If not, check for poorly connected terminals or shorted wires.



Measure the resistance between the Yellow/White and Blue/White terminals of the fuel unit connector.

Standard (at 20°C/68°F):

Float at full position	About 1100 Ω
Float at empty position	About 100 Ω



8.3. Installation

Installation is in the reverse order of removal.

- Check the fuel hose routing is correct.
- Check the fuel pump and the fuel gauge operate normally after installation.

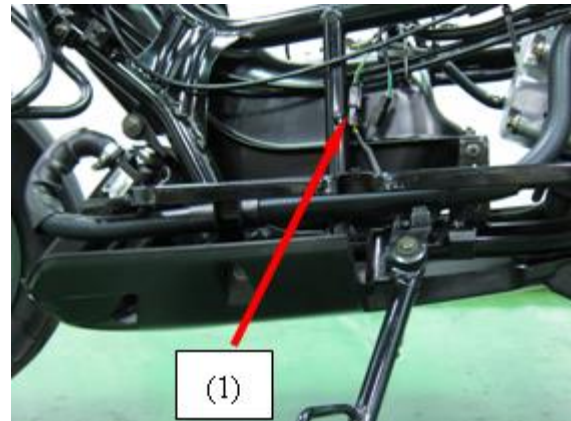
9. Side Stand Switch

9.1. Inspection

Disconnect the side stand switch connector (1).

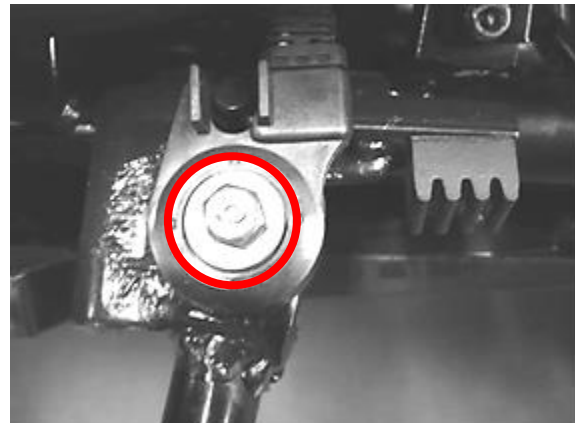
There should be continuity between the Yellow/Green and Green with the side stand retracted.

There should be continuity between the Yellow/Black and Green with the side stand applied.



9.2. Removal

Disconnect the side stand switch connector.
Remove the bolt and side stand switch from the side stand.



9.3. Installation

Installs the side stand switch aligning the groove on the switch with the pin on the side stand stay.

Install and tighten the side stand switch bolt securely.

Connect the side stand switch connector.

10. Horn

10.1. Inspection

Remove the front cover.

Disconnect the horn connectors (1) from the horn.

Connect a 12 V battery to the horn terminals.

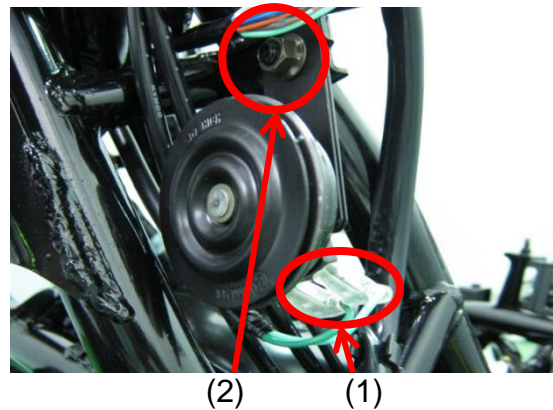
The horn is normal if it sounds when the 12 V battery is connected across the horn terminals.

10.2. Removal/Installation

Disconnect the horn connectors from the horn.

Remove the bolt (2) and horn.

Installation is in the reverse order of removal.



11. Rollover sensor

11.1. Inspection

Place the vehicle on a level ground and on its center stand.

Remove the front cover.

Turn on the ignition switch.

Use probes of a multimeter to test the voltage of the rollover sensor.

Terminals		Standard
(+): V/R	(-): G/P	5V (ECU voltage)
(+): B/L	(-): G/P	0.4~1.4V

If the vehicle tipping angle exceeds 65°, the engine will stop.

11.2. Removal/Installation

Disconnect the connector.

Remove the nut.

Remove the rollover sensor.

Remove the nuts.

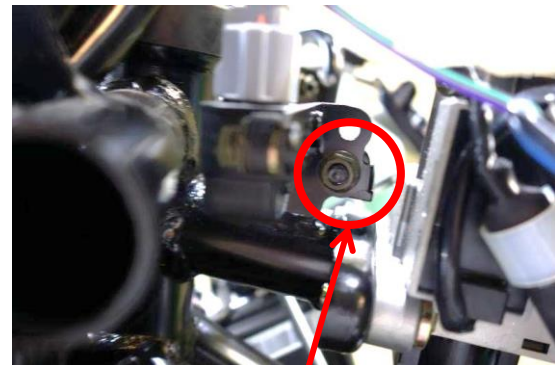
Remove the bracket.

Install in the reverse order of removal.

※ The arrow mark which above the UP mark should point to upward.



Rollover sensor



Nut

Nuts



Arrow & UP mark

20. ABS & TCS

Anti-Lock Brake System (ABS)

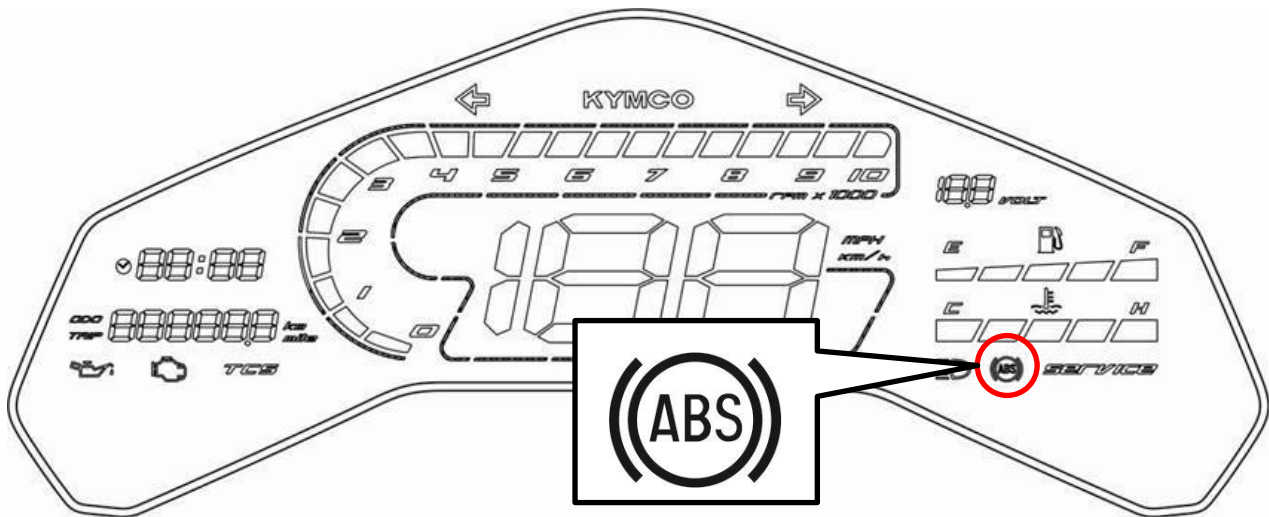
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1. ABS

1.1. Indicator Light

The ABS indicator light in the meter position. This light will come on when the ignition switch is turned on and goes off shortly after the vehicle starts moving at speed 6km/hr. min. It stays off.

If something is wrong with the ABS, the indicator comes on and remains it. When the indicator light is on the ABS doesn't function but if the ABS fails, the conventional brake system will still work normally.



1.2. Introduction

ABS is designed to help prevent the wheels from locking up when the brakes are applied hard while running straight. The ABS automatically regulates brake force.

Intermittently gaining gripping force and braking force helps prevent wheel lock-up and allows stable steering control while stopping.

Brake control function is identical to that of conventional vehicle. The brake lever is used for the front brake and rear brake.

Although the ABS provides stability while stopping by preventing wheel lock-up, remember the following characteristics:

- ABS cannot compensate for adverse road conditions, misjudgment or improper application of brakes. You must take the same care as with vehicle not equipped with ABS.
- ABS isn't designed to shorten the braking distance. On loose, uneven or downhill surfaces, the stopping distance of a vehicle with ABS may be longer than that of an equivalent vehicle without ABS. Use special caution in such areas.

- ABS will help prevent wheel lock-up when braking in straight line but it cannot control wheel slip, which may be caused by braking during cornering. When turning a corner, it is better to limit braking to the light application of both brakes or not to brake at all. Reduce your speed before you get into the corner.
- The computer could inter-grade in the ABS compare vehicle speed with wheel speed. Since non-recommended tires can affect wheel speed, they may confuse, which can extend distance.

※ **Use of non-recommended tires may cause malfunctioning of ABS and lead to extended braking distance. The rider could have an accident as a result. Always use standard for this recommended vehicle.**

NOTICE:

- When the ABS is functioning, you may feel a pulsing in the brake lever. This is normal. You need not suspend applying brakes.
- ABS does not function at speeds of approx. 10 km/h or below.
- ABS does not function if battery is discharged or battery power supply malfunctions. (Light will come on)

1.3. Troubleshooting Outline

The ABS indicator light lights up to alert the rider when an abnormality is detected by the system. The service codes are stored in the ABS unit memory. The codes will not be erased unless manually cleared. After the fault has been corrected erase the service codes.

Even when the ABS is operating normally, the ABS indicator light may light up under the conditions listed below. Turn the ignition switch OFF to stop the indicator light. If the scooter runs without erasing the service codes, the light may light up again.

- After continuous riding on a rough road.
- When the ABS has been subjected to strong electrical interference.
- When tire pressure is abnormal. Adjust tire pressure.
- When a tire different in size from the standard size is being used. Replace with standard size.
- When the wheel is deformed. Replace the wheel.

Much of the ABS troubleshooting work consists of confirming continuity of the wiring. The ABS parts are assembled and adjusted by the manufacturer, so there is no need to disassemble or repair them. Replace the ABS hydraulic unit if needed.

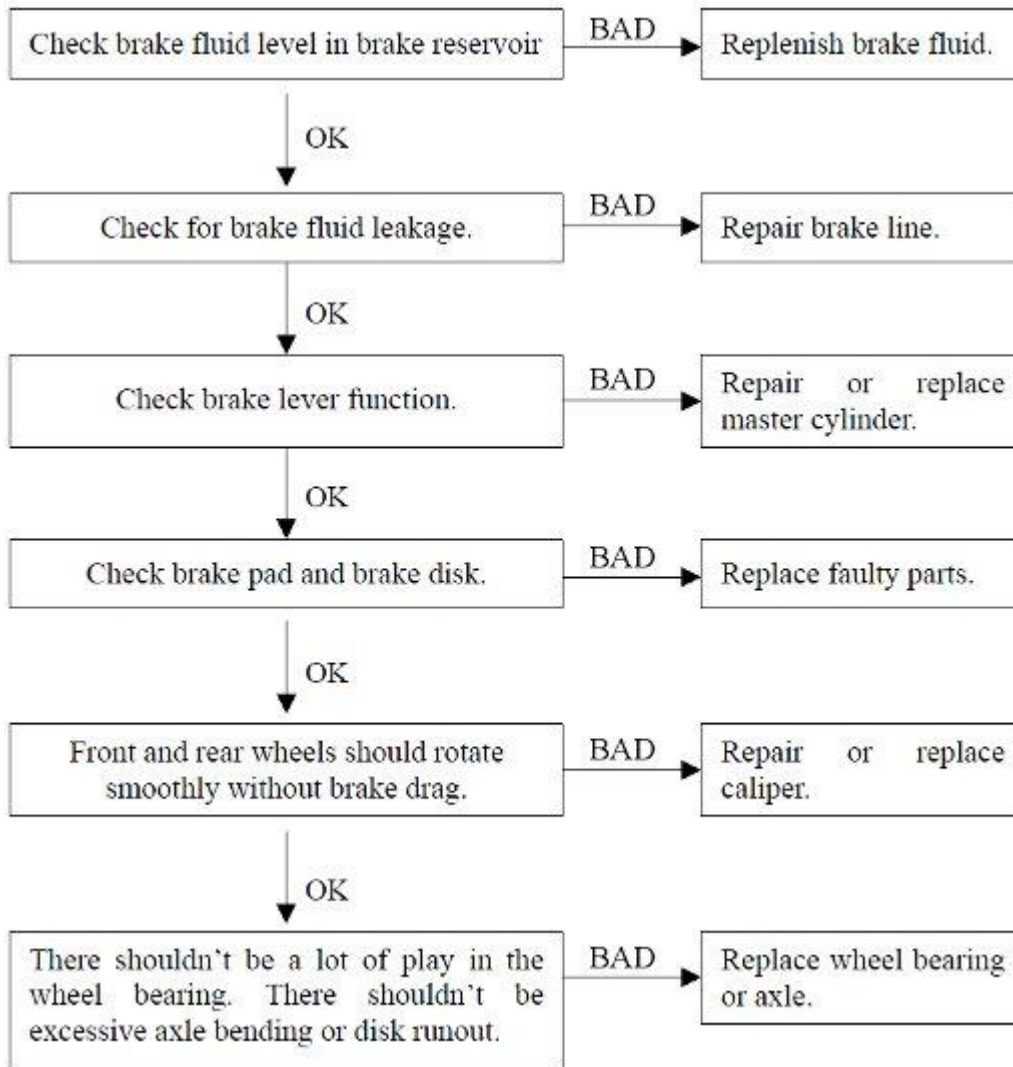
The basic troubleshooting procedures are listed below.

- Carry out pre-diagnosis inspections as a preliminary inspection.
- Check wiring and connections from the ABS hydraulic unit connector to the suspected ABS part, using the diagnosis tool.

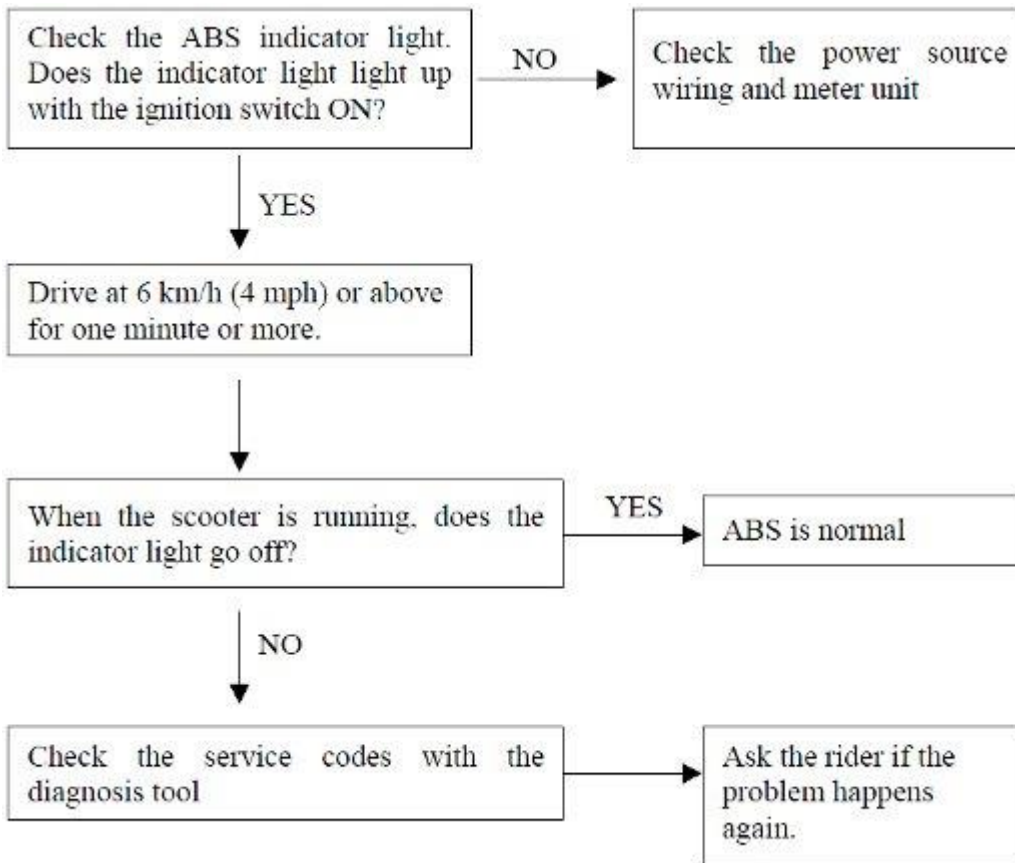
Special tool - Diagnosis tester: 3620A-LEB2-E00

- Visually inspect the wiring for signs of burning or fraying. If any wiring is poor, replace the damaged wiring.
- Pull each connector apart and inspect it for corrosion, dirt and damage. If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it.
- Check the wiring for continuity.

Pre-diagnosis Inspection Chart 1



Pre-diagnosis Inspection Chart 2



1.4. Removal

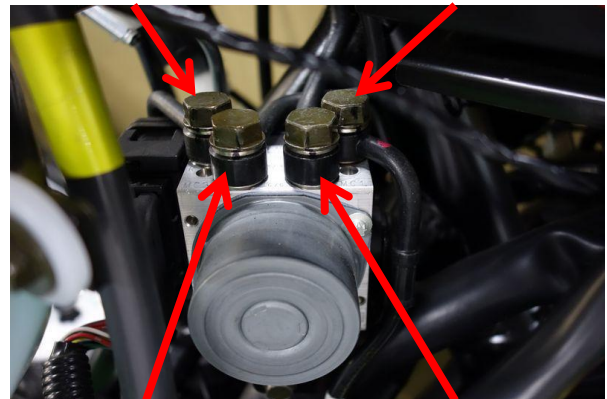
※ When replacing a new Hydraulic Unit, don't need to drain the brake fluid.

Place a cloth under the ABS module.
Remove the input and output bolts.

Disconnect the cable.
Be careful do not damage the joint claw.

Remove the bolts.
Remove the ABS module.

Rear brake fluid output Front brake fluid output



Rear brake fluid input Front brake fluid input

Bolts Joint claw



1.5. Installation

Install in the reverse order of removal.

TORQUE: 3~4 kgf-m

※ Install the brake fluid hoses in the correct positions.
※ Wipe off any remaining brake fluid.

Rear brake fluid output Front brake fluid output



Rear brake fluid input Front brake fluid input

2. Diagnostic Tool

2.1. PC version

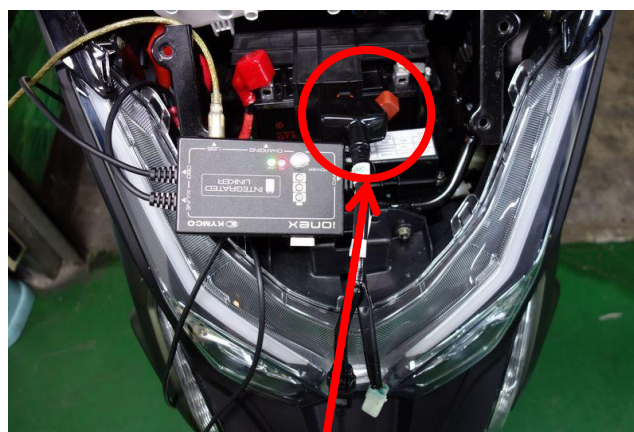
Open the diagnostic tool software.



Remove the front cover.

Connect the integrated linker to the OBD connector.

Turn on the ignition switch.



OBD connector

Chose the ABS brake system.



Check the ECU version which should be ACD5.

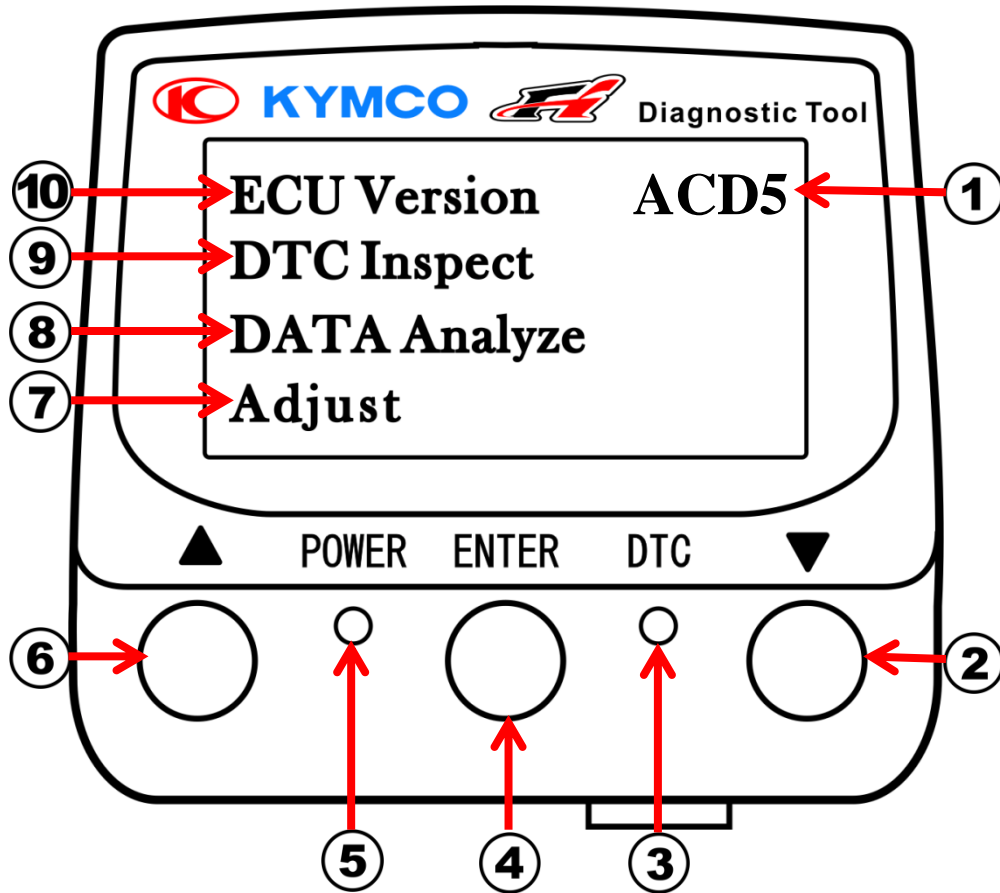


If any of components which are related to brake fluid is replaced, the air bleed procedure must be done.

3. Diagnostic Tool Operation

3.1. Operation Instructions

Part No. 3620A-LEB2-E00



KEY FUNCTION

- | | |
|---------------------------------|---------------------------------------|
| ① Model No. | ⑥ UP Button |
| ② Down Button | ⑦ Adjust (TPI and ABV reset function) |
| ③ DTC indicator (Failure codes) | ⑧ DATA Analyze |
| ④ Enter or Exit | ⑨ DTC Inspect |
| ⑤ Power indicator | ⑩ ECU Version |

Note: For EURO models

Use the Sub cord, OBD diagnostics connector (part number:36205-LFA7-E00) to connect between vehicle and diagnostic tool.

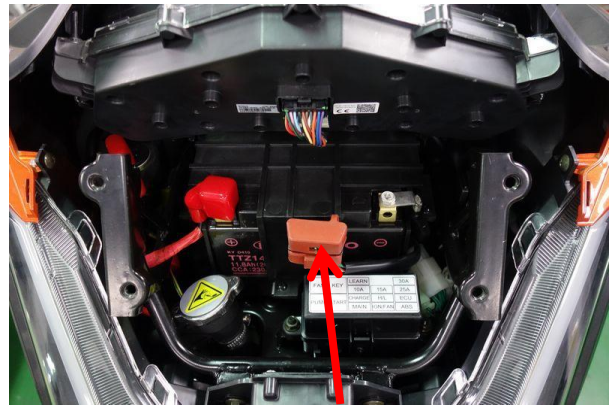


←To: Vehicle

To Diagnostic tool →

3.2. Connection

1. Connect the sub cord to the OBD connector and then connect the KYMCO Fi diagnostic tool. (KYMCO Fi Diagnostic tool Power comes from vehicle's Battery)



OBD Connector

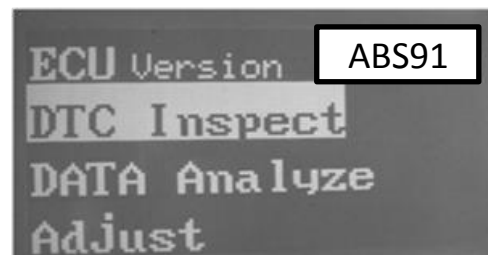
2. Put the side stand upward and ENG. stop switch is at "RUN" position.
3. Choose Fi ECU Version and press the enter button.
4. Press the down button 2 times to open the First diagnostic page.



5. Choose the ABS

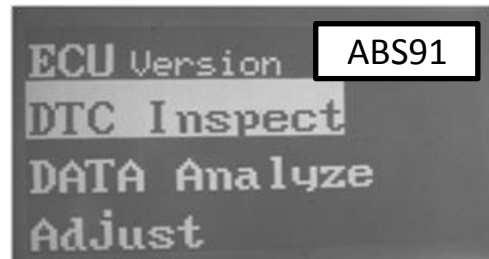


6. Open the previous page and press the enter button again to back to the Main page.

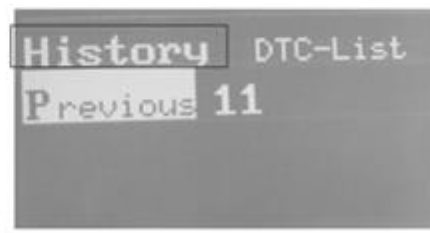
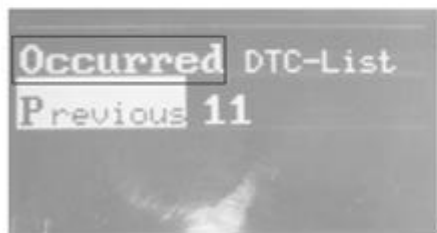
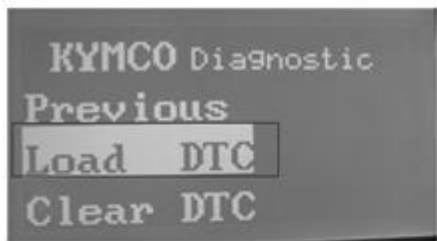


3.3.DTC Inspect

1. Choose DTC Inspect



2. Load DTC (Active 、Occurred 、History)



3.4.DTC Displayed

1. Rear wheel speed sensor disconnect

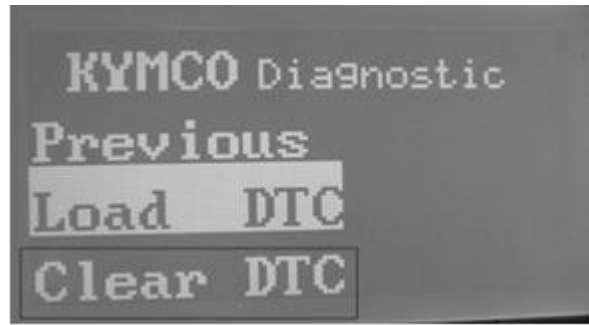


2. Front wheel speed sensor disconnect

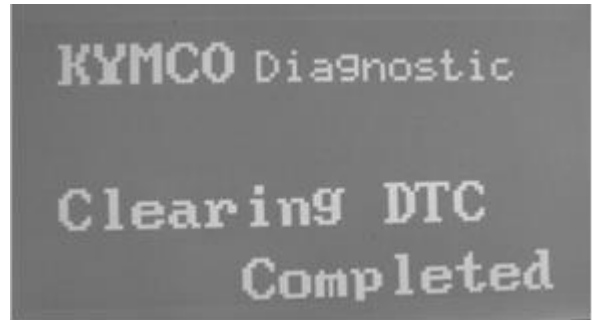


3.5. DTC Cleared

1. Choose “Clear DTC” and then push “Enter” button.

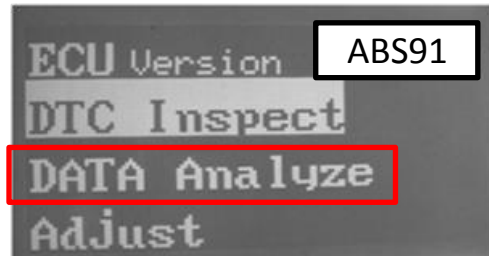


2. Clearing DTC completed until the DTC red lamp is off.



3.6. Data Analyze

1. Choose “DATA Analyze” and then push “Enter” button



2. Front wheel speed & Rear wheel speed & Battery volt

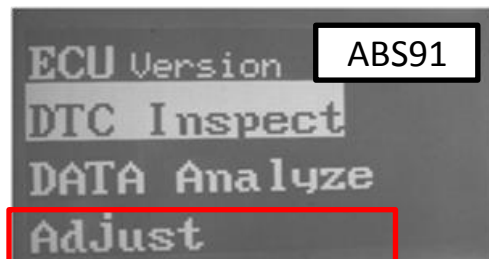
Battery volt: Standard 9.6~16.7 V

※ You can turn the front or rear wheel to check if the wheel speed is figured.



3.7. Air Bleeding

1. Choose the Adjust
2. Choose the front or rear brake to perform air bleeding.



4. DTC List

4.1. Bosch ABS91 DTC List

Code NO	DTC Code	Description
01	5013	Rear Inlet Valve malfunction (EV)
02	5014	Rear Outlet Valve malfunction (AV)
03	5017	Front Inlet Valve malfunction (EV)
04	5018	Front Outlet Valve malfunction (AV)
05	5019	Valve Relay malfunction (Failsafe relay)
06	5025	Deviation between Wheel speeds (WSS_GENERIC)
07	5035	Pump Motor Malfunction
08	5042	Front wheel speed sensor malfunction-Plausibility
09	5043	Front wheel speed sensor Disconnection/gnd Short/Battery Voltage Short
10	5044	Rear wheel speed sensor malfunction - Plausibility
11	5045	Rear wheel speed sensor Disconnection/gnd Short/Battery Voltage Short
12	5052	Power Supply Malfunction (Under Voltage)
13	5053	Power Supply Malfunction (Over Voltage)
14	5055	ECU malfunction

4.2. TCS DTC List

Code NO	DTC Code	Description
15	C1083	Front Wheel cylinder Pressure sensor hard ware failure
16	C1084	Front Wheel cylinder Pressure sensor offset/test pulse failure
17	C1085	Front Wheel Brake circuit Pressure Sensor plausibility failure
18	C1089	Pressure sensor power supply (external) failure
19	U2921	CAN Controller generic failure
20	U2922	CAN Bus Off Failure
21	U2924	CAN Engine Frame failure
22	U2926	CAN Engine Signal failure
23	U2929	CAN Meter timeout/ DLC failure

5. Introduction to KYMCO TCS System

If rider gives too much throttle or rides on a slippery surface like an ice-covered road or a wet road and etc., it may cause the rear wheel slipping. The traction control system helps the vehicle maintain traction when above situation happens. If sensors detect that the rear wheel is starting to slip (uncontrolled spinning), the TCS assists by regulating engine speed until traction is restored. You may notice changes in engine response or exhaust sound.

■NOTE: Turn off the TCS is recommended before start the engine in a cold weather , if open the throttle to make the engine start or warm up easily is necessary . After that, turn on the TCS.

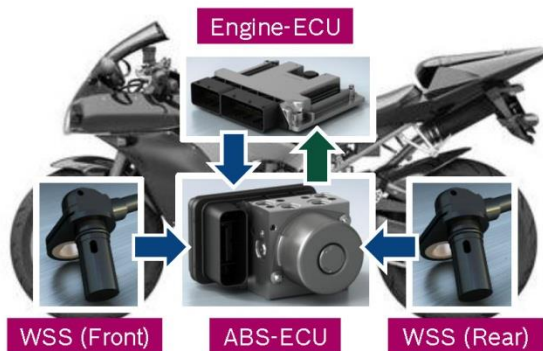
MTC: Motorcycle Traction Control Overview

ELM_160245e v01

Features

- Best acceleration with keeping stability by proper wheel longitudinal slip control at rear
- Mitigation for uncontrollable large wheely by engine torque down
- On/Off and mode switching by CAN interface (Optional, e.g. MTC-Off, race, rain, off-road, etc...)

System architecture



Input signals

- Wheel speeds at front & rear
- Engine speed
- Accelerator throttle position
- Rider's request engine torque
- Actual engine torque
- Gear position (Optional)
- Clutch switch signal (Optional)

Output signals

- MTC request engine torque
- MTC activation info.
- MTC Warning lamp

2

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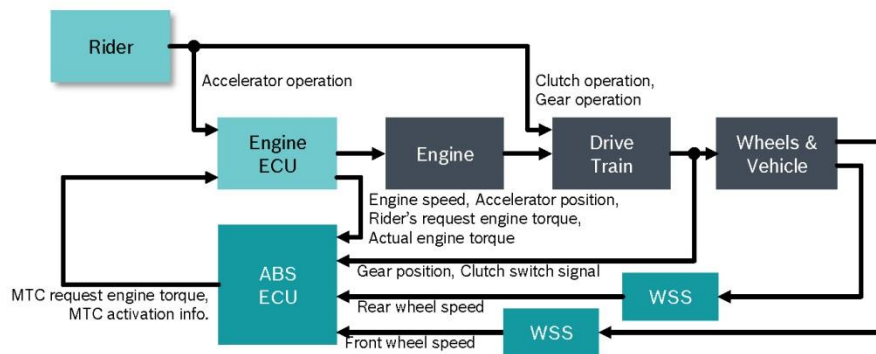

BOSCH

MTC: Motorcycle Traction Control Overview

ELM_160245e v01

Basic operating principle

- ❑ ABS-ECU refers wheel speed signals from each Wheel Speed Sensor (WSS) at front & rear, to monitor longitudinal slip and acceleration at rear wheel, and vehicle acceleration
- ❑ If large longitudinal slip at rear wheel is observed, ABS-ECU calculates proper torque to settle the slip, and send it to Engine-ECU via CAN
- ❑ If too much acceleration and/or rapid engine torque increase are observed, ABS-ECU calculates proper torque to reduce risk of vehicle instability / wheely, and sent it to Engine-ECU via CAN



MTC: Motorcycle Traction Control Topics

What requirements to be prepared for Bosch?

- Specification of CAN matrix (perhaps to be developed with Bosch based on Bosch-standard spec.)
- Performance evaluation maneuvers & criteria (perhaps to be developed in joint tests)
- Adopting/Omitting optional features e.g. MTC-OFF and Mode switching

What to be inquired/required by Bosch from ABS point of view?

- Availability of optional input for MTC e.g. gear position and clutch switch signal

What to be inquired/required by Bosch from Engine-ECU point of view?

- Torque-based CAN interface between Engine-ECU and ABS-ECU
- Accuracy & dynamic response of actual engine torque signal

CAUTION

If the TCS is turned off before start the engine, rider can turn on the TCS during idling or riding.

If the TCS is on during riding, the TCS cannot be turned off while the engine still running. To turn off the TCS after engine is on, please follow the steps below.

1. Stop the vehicle
2. Turn off the ignition switch
3. Turn on the ignition switch but do not start the engine
4. Turn off the TCS

WARNING

- The TCS is not a substitute for riding appropriately for the conditions. The TCS cannot prevent loss of traction or front wheel-slip while rider is entering turn in excessive speed or accelerating hard at a sharp lean angle or braking too hard. As with any vehicle approach surfaces that maybe slippery with caution and avoid especially slippery surfaces.
- Use only the specified tires. Using different size tires will result the TCS cannot operate accurately that may cause hazardous situation.

CAUTION

- The TCS will turn on automatically when ignition switch restarts.
- Turn the TCS off to free the rear wheel if the vehicle gets stuck in mud, sand, or other soft road surfaces.
- When the vehicle is on the center stand and the TCS is on, do not attempt to wide open the throttle for an extended period of time to avoid the spark plug wetting or cause the indicator light remains on due to the malfunction detected.
- The TCS will lose function and the indicator will light up when the battery malfunction or died.

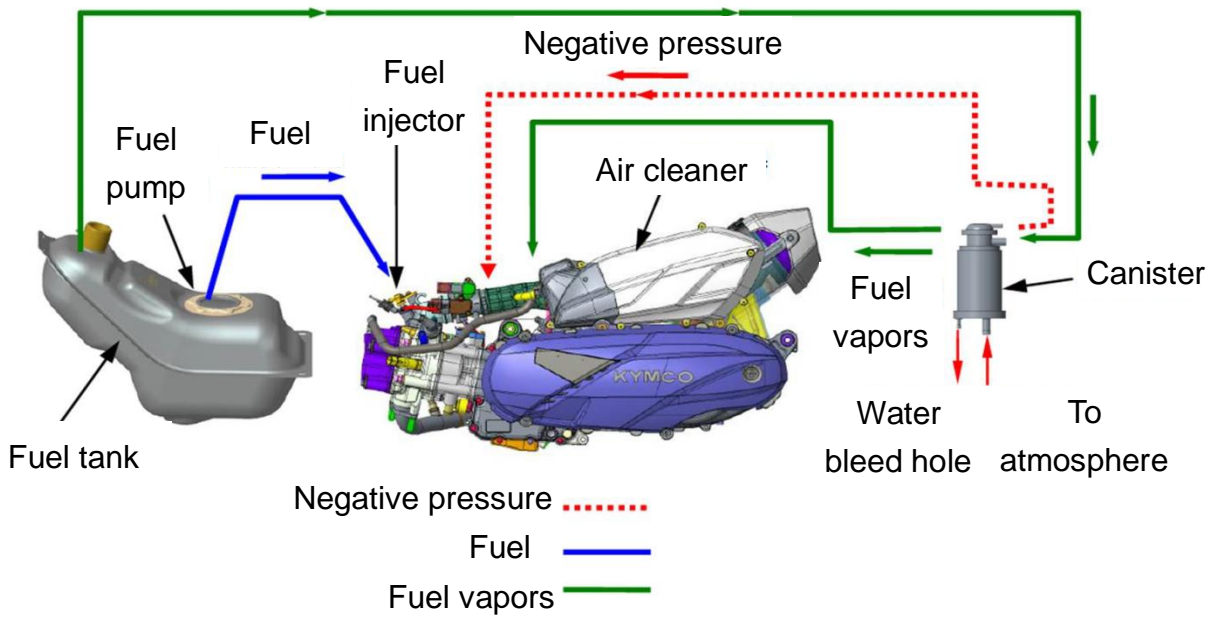
21. EEC System

EEC System

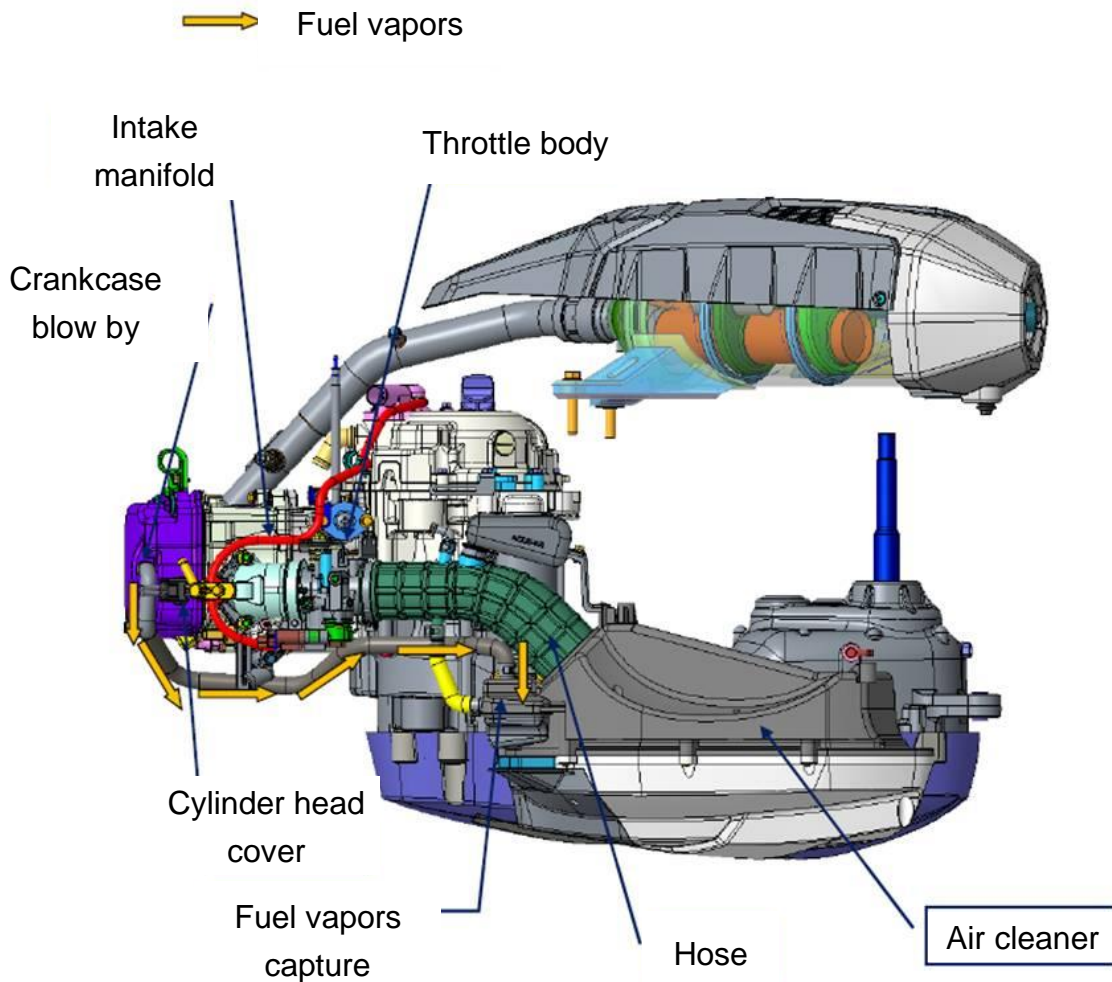
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1. Diagram

1.1. Evaporates Emission Control System Diagram



1.2. Pollution Emission System Diagram



2. E.E.C System Introduction

WARNING:

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

2.1. Evaporative Emission Control System

The evaporative emission control system is used to prevent gasoline vapors from escaping into the atmosphere from the fuel tank and fuel system.

2.2. Crankcase Emission Control System

The scooter is equipped with a closed crankcase system. Blow-by gas is recycled into the combustion chamber via the intake system. This arrangement is to prevent blow-by gas from spreading to the atmosphere.

2.3. Exhaust Emission Control System

The exhaust emission from the scooter is controlled by combustion management, fuel delivery, ignition setting and exhaust system. The exhaust system also includes the catalytic converter in the muffler.

2.4. Noise Exhaust Emission Control System

The engine, intake and exhaust systems of the scooter are designed to comply with federal or local noise regulations. Do not modify the intake or exhaust system, this behavior will offend against the noise regulations.

Note: Do not adapt any original factory design and setting, which will deteriorate the sound or emission level.

3. Function

Item	Function	Description
Evaporative Emission Control Valve	It is used to prevent gasoline vapors from escaping into the atmosphere from the fuel tank and fuel system.	Storage the gasoline vapors to canister, conduct the gasoline vapors to engine by vacuum when starting the engine.
Canister	Storage the gasoline vapors from fuel tank and fuel system.	The gasoline vapors storage by canister, to meet the regulation, the HC emission can not exceeds 2 grams.
P.C.V	Recycle the fuel gas from the crankcase blow by.	Recycle the fuel gas from the crankcase blow by to the engine.
Oxygen Sensor	To control the air/fuel mixture in best condition.	Sending the mixture condition info to ECU by voltage signal, ECU controls the fuel injection to meet the emission regulation.
Catalyst	To reduce the emission of HC, CO and NOx produced from the exhaust gas.	Using the catalyst converts the HC and CO to CO ₂ and H ₂ O also reduce the NOx pollution.
ECU	To control the injector, ignition and bypass air of fuel injection system to reach the best driving condition.	ECU (Electric Control Unit), receiving sensor which equipped on engine to precisely control fuel injection and ignition to reduce the exhaust emission pollution.

3.1. Trouble Shooting

Low engine power, instable engine idle speed

- Clog in canister or tubes.
- Emission control valve malfunction.
- E.E.C. system tubes loosen or crack.
- ECU malfunction.

Engine idle speed and acceleration in bad condition

- Clog in canister or tubes.
- Emission control valve malfunction.

4. Maintenance Schedule

Perform the pre-ride inspection at each scheduled maintenance period. This interval should be judged by odometer reading or months, whichever comes first.

4.1. Maintenance schedule legend

Perform the pre-ride inspection at each scheduled maintenance period.

This interval should be judged by odometer reading or months, whichever comes first.

I: INSPECT AND CLEAN, ADJUST, LUBRICATE OR REPLACE IF NECESSARY

C: CLEAN

R: REPLACE

A: ADJUST

L: LUBRICATE

The following maintenance schedule specifies all maintenance required to keep your scooter in peak operating condition. Maintenance work should be performed in accordance with standards and specifications of KYMCO by properly trained and equipped technicians. Your KYMCO dealer meets all of these requirements.

* Should be serviced by your KYMCO dealer, unless the owner has the proper tools and service data and is mechanically qualified.

* * In the interest of safety, we recommend these items be serviced only by your KYMCO dealer.

KYMCO recommends that your KYMCO dealer should road test your scooter after each periodic maintenance is carried out.

NOTES:

1. For higher odometer readings, repeat by the service interval illustrated here.
2. Service more frequently for long-term riding in unusually wet or dusty areas.
3. Service more frequently for long-term riding in rain or with full throttle.
4. Inspect every 5000 km (3000 mi) after replacement and replace every 10000 km (6000 mi).
5. Replace every 5000km (3000mi) or every 6 months. Replacement requires mechanical skill.
6. Replace every 2 years. Replacement requires mechanical skill.

Frequency		Which Ever Comes First	Odometer Reading (Note1)							
			Throttle Operation							
Item	Note	→	X1000 km	1	5	10	15	20	25	30
		↓	X1000 mi	0.6	3	6	9	12	15	18
		Month	1	6	12	18	24	30	36	
*	Air Cleaner	Note2			R	R	R	R	R	R
	Spark Plug	Note4			I	R	I	R	I	R
*	Throttle Operation				I	I	I	I	I	I
*	Valve Clearance				I	A	I	A	I	A
*	Fuel Line					I		I		I
	Crankcase Breather	Note3		C	C	C	C	C	C	C
*	Engine Oil			R	R	R	R	R	R	R
*	Engine Oil Screen				C	R	C	R	C	R
*	Engine Oil Filter			R	R	R	R	R	R	R
*	Engine Idle Speed					I		I		I
*	Transmission Oil	Note5		R	R	R	R	R	R	R
*	Drive Belt				I	I	I	R	I	I
**	Radiator coolant				I	R	I	R	I	R
**	Clutch Shoe Wear					I		I		I
	Brake Fluid	Note6			I	R	I	R	I	R
	Brake Pad Wear				I	I	I	I	I	I
	Brake System				I	I	I	I	I	I
*	Brake Light Switch				I	I	I	I	I	I
**	Steering Bearings				I	I	I	I	I	I
*	Headlight Aim				I	I	I	I	I	I
*	Nuts, Bolts, Fasteners				I	I	I	I	I	I
**	Wheels/ Tires				I	I	I	I	I	I
**	Injector				D	C	D	C	D	C
**	Coolant Level Check				I	R	I	R	I	R

5. Maintenance Information

Note of maintenance:

- Flame or spark should keep away when performing maintenance.
- Install the tubes in correct position.
- If the tubes broken should be replaced with a new one.
- The tubes should be installed tightly.
- The leakage hole should be installed downward.

Tool

Vacuum pump

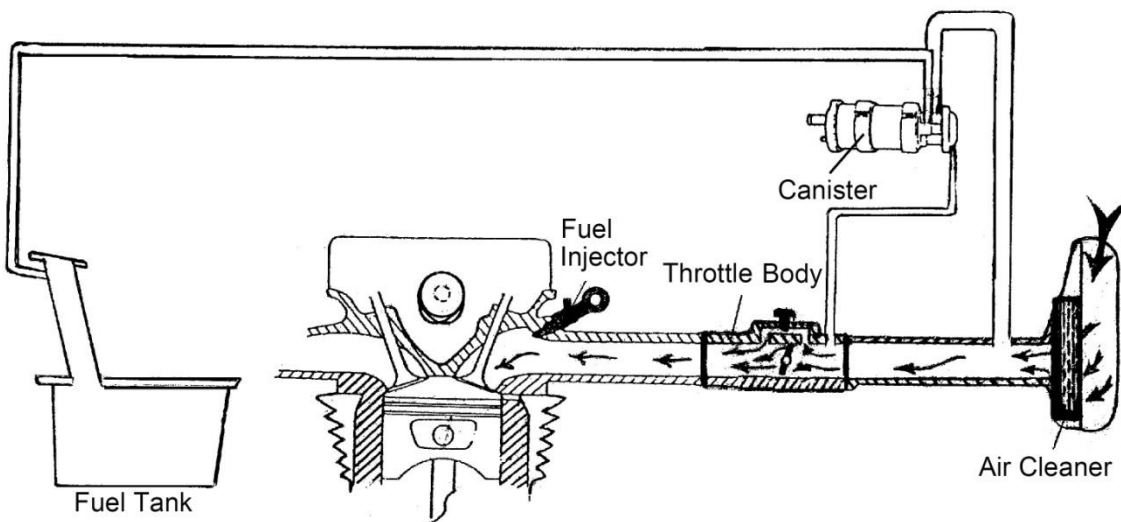
Pressure pump

Maintenance standard

Emission Vacuum Standard	45m/mHg
Capacity Of Canister	90cc
Install Angle	incline 60°

Evaporative Emission Control System

The location of tube connection diagram.



Leakage checking

1. Connection between canister and fuel tank.
2. Tubes of canister.

6. Canister

6.1. Removal

1. Remove the windshield, front cover and head light assembly.
2. Remove the canister tube set and canister.



Canister

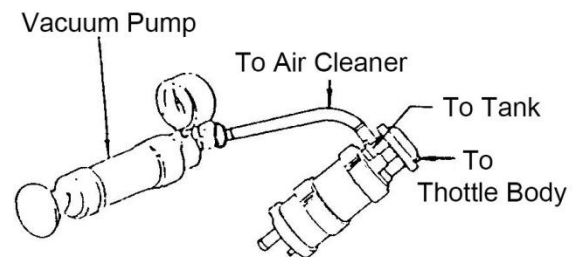
6.2. Inspection

Canister Evaporative Control Valve

Connect a vacuum pump to the tube of canister. (Follow the illustration below.)

Applying 250m/mHg pressure to the canister evaporative control valve.

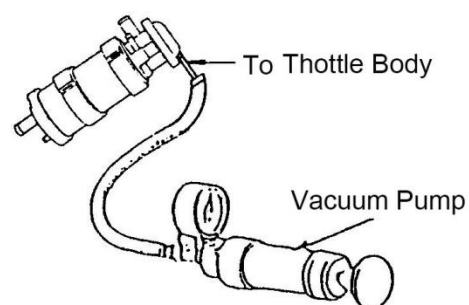
If the pressure will be kept without change obviously in one minute, that means the valve are with good condition, otherwise the valve malfunction, a new canister should be replaced.



Connect a vacuum pump to the tube of canister. (Follow the illustration below.)

Applying 45m/mHg vacuum pressure to the canister evaporative control valve.

If the pressure will be kept without change obviously in one minute, that means the valve are with good condition, otherwise represents the valve with malfunction. A new canister should be replaced.



Flow Rate of the Canister Vacuum Valve

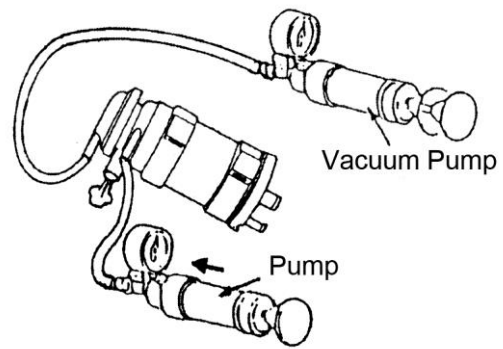
1. Using a vacuum pump connecting to the vacuum tube of canister and apply 45m/mHg of negative pressure.
2. Apply pressure to the emission control valve of canister, if the flow rate above 9.4 liters per minute that means the valve is in good condition, otherwise the canister should be replaced.

※ Always using the pump by manual, do not apply high pressure for testing to prevent the valve from malfunction.

6.3. Installation of canister

1. Installation is the reverse order to the dismantling.
2. Connect the tubes and circlips firmly.

※ The tube should not be wrenched or crashed and never refit the canister.

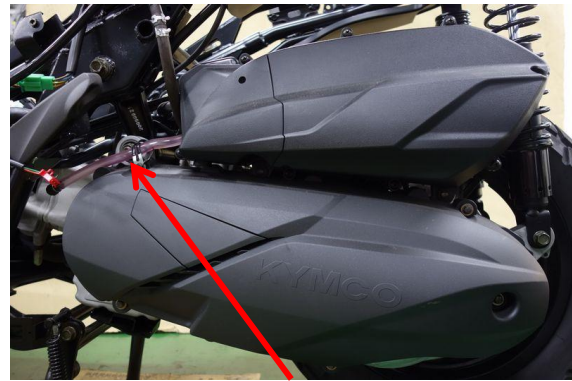


Canister

7. P.C.V.

7.1. Inspection

Check the



Canister



Air filter cover

7.2. Air filter

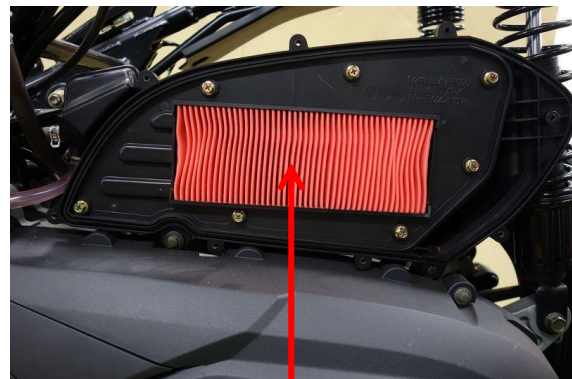
Replace the air filter according to the Maintenance Schedule, and more often in exceptionally rainy or dusty areas.

Remove the screws from the air cleaner cover, then remove air cleaner cover.

Remove screws from the air cleaner element, then remove and discard this air cleaner element.

The new air cleaner element installation is in the reverse order of removal.

Use the KYMCO genuine air cleaner element or an equivalent air cleaner element specified for your model. Using the wrong KYMCO air cleaner element or a non-KYMCO air cleaner element which is not of equivalent quality may cause premature engine wear or performance problems.



Ail filter element

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

7.3. Inspection of emission system

Inspect the air cleaner.

Inspect the spark plug.

Inspect the ignition system.

Plug in the diagnostic tool the check the information.

Warm up the engine reach above 80°C.

This model equipped the catalyst in the muffler to reduce the pollution emission.

Inspect Catalyst Converter

Inspect catalyst converter efficiency at idle speed.

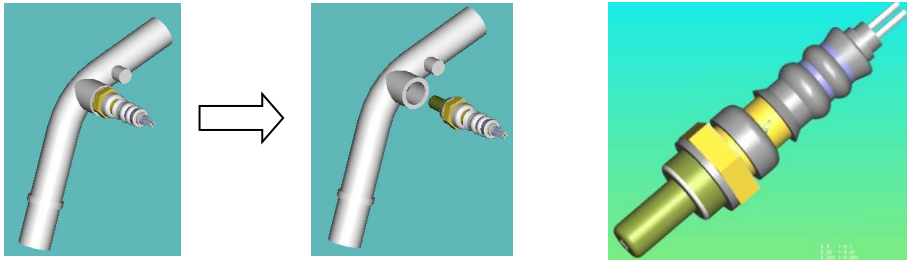
Warm up the engine 8~10 minutes, connect to emission machine.

To check the CO value before catalyst and after.

Normally, measuring after catalyst converting, the CO figure will be lower than the CO figure before catalyst converting.

If the number is abnormal, the catalyst converter could be deteriorated, the exhaust pipe should be replaced to prevent from the further pollution.

8. Oxygen Sensor



It uses DC-8-16V Battery Power with 4 pins: one power pin, one heater pin, one signal output pin and one earthing pin. The sensor is installed to the front pipe of exhaust pipe to detect the oxygen concentration of exhaust gas for determining if ECU shall instruct to increase or reduce fuel supply for meeting waste gas emission standard of environment legislation. When the temperature of exhaust is less than 350°C, the sensing portion cannot be activated and there is no signal output, and ECU will turn on the heater inside sensor to accelerate the temperature rise of sensor and cause the Oxygen Sensor to work normally. In normal hours, the impedance of heater is 7.7 +/- 1.2 ohm and can be told with multimeter. Output of sensor after the engine is warmed up is

A/F <14.7 (mixing ratio too thick) >0.7V

A/F > 14.7 (Mixing ratio too thin) <0.18V

Inspection and adjustment of emission

1. Start the engine and warm up for several minutes engine temperature 80~90°C, connect the diagnostic tool to check the information.
2. Idle speed should be in standard.
3. The emission machine should be connected to the front of the exhaust pipe measure hole. (Before Catalyst Converter)
4. Standard : CO:0.3~1.5 %
5. If the figure is out of range, check with the injection relative components.(For example, injector, fuel pump...etc.)
6. If the problems insist, please check the emission related system and check if there is any leakage from the cylinder head inlet/outlet valve.