TNT300 Service Manual

Preface

This maintenance manual which is prepared by the Benelli Company is intended for the use by Benelli dealers and professional maintenance personnel. Not all the service information related to motorcycles is included in this manual, so it is used only for repairing and maintaining Benelli motorcycles, to learn the principles, maintenance procedures and maintenance technologies of these motorcycles. We hope that the person who uses this manual for repairing and maintaining a Benelli motorcycle has a basic knowledge of motorcycle machinery and the necessary procedures for repair and maintenance of motorcycles. The assembly may be conducted improperly when repairing motorcycles and dangers may be caused after assembly without this knowledge.

This manual is only for reference during repair and maintenance of the TNT300 motorcycle.

The Benelli Company will continue to redesign and improve this type of motorcycle. Modifications or major changes in product specifications will be announced to all Benelli authorized dealers, and compiled in the later version of this maintenance manual.

Note:

Designs and specifications are subject to change without prior notice.

Important Information in This Maintenance Manual

The following important items are included in this manual:

Warning: If this symbol is present, failure to follow the instructions may cause severe injuries and even death to motorcyclists, people nearby or the one who is repairing the motorcycle.

Important: "Important" means specific preventive measures to avoid damaging the motorcycle.

Note: "Note" means important information which can make procedures much simpler and easier to complete.

User Guide

This manual is a practical reference guide which is easy to operate and use by technicians. Instructions for: assembly, removal, disassembly, repair and check of all of the components are in sequence, one step at a time.

1. Each chapter is divided into several sections, the headline included on the top of each page explains what section of the vehicle is being repaired.

2. In order to better identify parts and make different processes clearer, breakdown drawings are offered at the start of each section involving all parts in the disassembly.

3. Operating sequences are listed on breakdown drawings, and the sequences are numbered one by one. Each number refers to each step during the disassembly.

4. Parts that need to be lubricated when changed are symbolized. Please refer to the “Symbol” section.

5. Breakdown drawings are equipped with a table with ID numbers, including operating sequence, part name, precaution for work, etc.

6. Describe any other required information (such as special tools and technical data) in sequence.

Exhaust Emission Control Information

In order to protect our environment, Benelli Company has introduced provisions that conform to environmental protection regulations of China, Europe and the United States. This motorcycle is equipped with (1) crankcase blow-by gas filtering system, (2) exhaust emission control system and (3) fuel evaporation recovery system.

1. Crankcase blow-by gas filtering system

This system can prevent gas in the crankcase from being discharged into the environment. The gas in the crankcase is pumped into air inlets on both sides of the engine by an oil separator. When the engine is running, the gas is pumped into the combustion chamber, and then combusts with air and fuel pumped out of the fuel injection system.

2. Exhaust emission control system

This system can reduce the number of pollutants from exhaust gas from this type of motorcycle into the environment. Fuel injection system, ignition system and exhaust system of this type of motorcycle have been carefully designed and assembled to have fuel efficient engines and low quantity of pollutants discharged.

A catalytic converter system is included on this type of motorcycle.

3. Fuel evaporation recovery system

Fuel vapor in the fuel injection system will not be discharged into the environment, rather is pumped into the running engine to be combusted. If the engine is not started, the vapor will be stored in a charcoal canister. If it is liquid fuel, it will be pumped into separators, and then back into the fuel tank.

Warning

1. Before final buyers purchase or receive any motorcycle or motorcycle engine, no one shall disassemble or destroy any parts mounted on the motorcycle or motorcycle engine based on the provisions of this manual; any manufacturer or dealer shall not deliberately disassemble or destroy any parts after any motorcycle or motorcycle engine is sold or delivered to the final buyer.

2. After any motorcycle or motorcycle engine is sold or delivered to the final buyer, anyone who is engaged in repairing, maintaining, selling, leasing or trading motorcycles or motorcycle engines, or managing motorcycle teams shall not disassemble or destroy any parts mounted on the motorcycles or motorcycle engines based on the provisions of this manual…"

Remarks

"Disassembling or destroying any parts" is generally defined as follows:

1. Temporarily disassembling any parts or the situation in which the parts cannot temporarily run for the repairing purpose does not belong to "refit".

2. The following situations belong to "refit":

a) Improperly adjust motorcycle parts to make its exhaust gas discharged exceed emission standards.

b) Use of replacement parts or accessories that impact the performance or durability of the motorcycle.

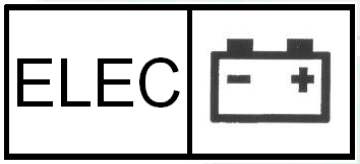
c) Add parts or accessories to make motorcycles exceed emission standards.

d) Permanently disassemble, separate or destroy any parts on exhaust emission control systems.

It is suggested that all dealers should abide by the above mentioned provisions for conformity with local laws.

Symbols

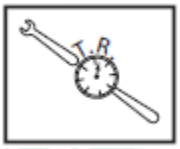
Specific Symbols

	**General Information**
	**Specifications**
	**Check and Regular Adjustment**
	**Chassis**
	**Engine**
	**Cooling System**
	**Fuel System**
	**Electrical System**
	**Fault and Troubleshooting**

Symbol Interpretation

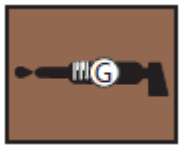
Wear Limit

Special Tool



Tightening Torque

Lubricating Point



Lubricating Grease

Sealant

Use a New Part

Thread Sealant

Content

Contents

Chapter I General Information

General safety

Carbon monoxide

If an engine must be started, the workplace should be well-ventilated. Engines should not be allowed to run in enclosed spaces.

Notes

A poisonous gas-carbon monoxide included in exhaust gas can make you lose consciousness and may cause death.

Engines are required to run in open spaces. Scavenging systems should be used when running in enclosed spaces.

Gasoline

Gasoline must be used in well-ventilated places. Smoking is strictly prohibited in workplaces or places where gasoline is stored.

Battery

Since the battery may emit explosive gas, it must be kept away from sparks, open flames and smoking areas. Keep the area well-ventilated while it is charging.
The battery contains sulfuric acid (electrolyte). Since it may cause burns once exposed to skin or eyes, you must wear a protective suit and a mask.
——Flush skin immediately with running water once electrolyte is splashed on it.
——Flush eyes immediately with running water for more than 15 min and seek a doctor for examination once electrolyte is splashed on them.
Electrolyte is poisonous, if ingested: Drink a large amount of water, milk, milk of magnesium oxide (a kind of laxative antacid) or vegetable oil immediately and ask a doctor for examination once electrolyte is accidentally drank by mistake. Therefore, please keep electrolyte out of the reach of children.

Engine oil

Repeated skin exposure to engine oil and then to the air may cause cancer to form in the human body. Although you may not be exposed to engine oil in daily life, you should clean yourself with water and soap immediately once it happens. Therefore, please keep engine oil out of the reach of children.

Used oil contains carcinogenic, mutagenic and teratogenic substances along with waste acid and heavy metals which are extremely harmful to human health. Aromatic compounds and other organic compounds among them are quite harmful to the body. These substances not only stay in the lungs but also get into the blood and the whole body to disturb our hematopoietic system, nervous system and other systems, which result in anemia, thrombocytopenia and other blood diseases, dizziness, nausea, anorexia and weakness and even cancer for instances of long exposure. Lead, cadmium and other heavy metals which are difficult to be discharged out of body and may accumulate in the human body have severe impacts on the nervous system resulting in oral ulcer, gingival and other diseases and symptoms. Since iron is an active metal, it will cause chronic inflammation in respiratory tracts and lungs further resulting in pulmonary fibrosis, emphysema and other diseases.

Thermal energy section

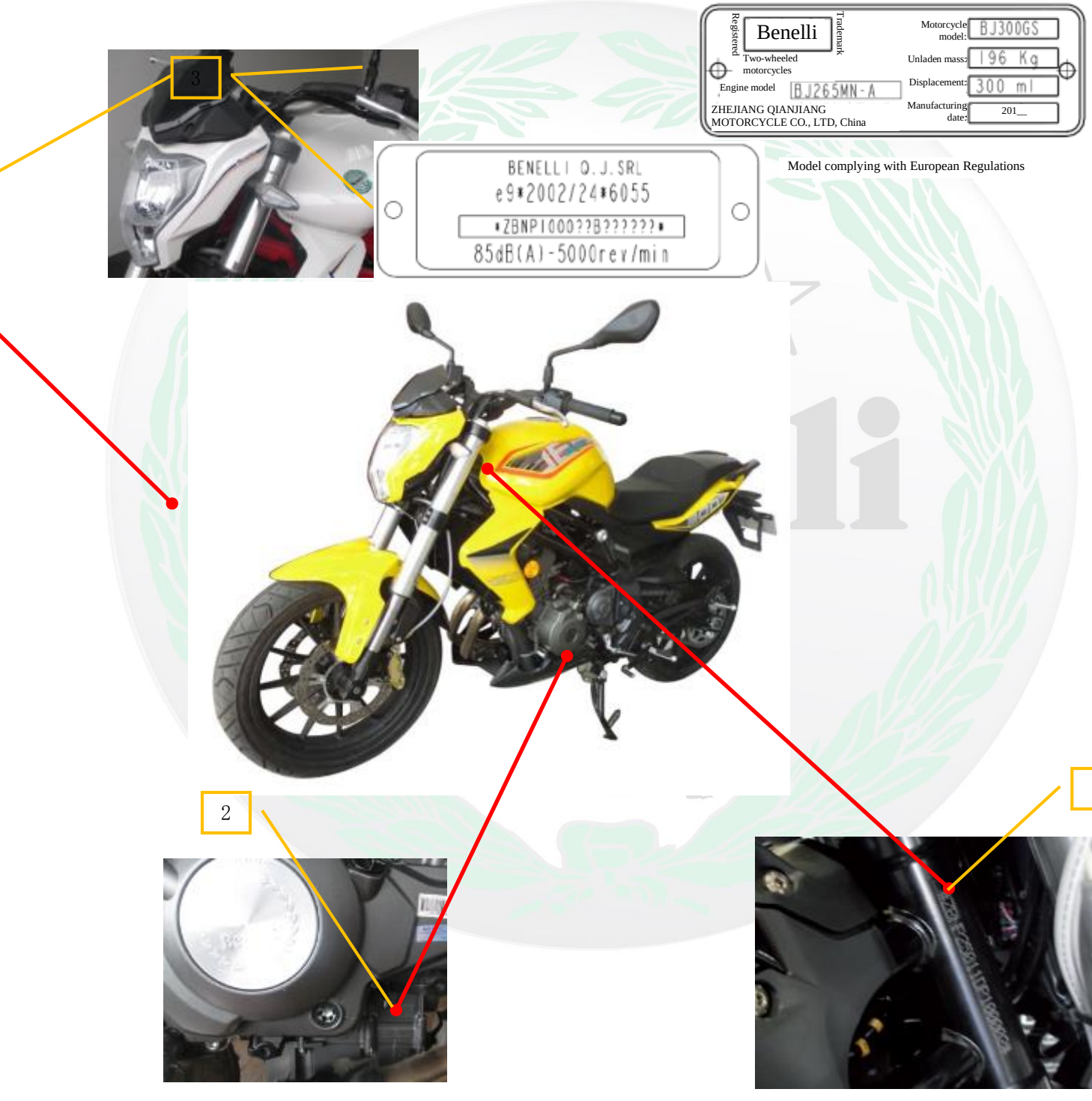
After start-up, the engine and the exhaust system sections will generate heat, they will begin to cool once the engine is shut-down but will remain hot for some time. These sections should be handled with heat insulating gloves or after the engine or exhaust system has cooled down.

Identification

Motorcycle identification

Identification data are as follows:

1. Serial number of frame (at the right side of steering tube on the frame)
2. Serial number of engine (at the lower right side of the engine)
3. Motorcycle nameplate (at the left side of steering tube on the frame)



Important parts

(1) Left rearview mirror
(2) Clutch lever
(3) Left handlebar switch
(4) Ignition switch
(5) Instrument cluster
(6) Right handlebar switch
(7) Right rearview mirror
(8) Front brake lever
(9) Throttle control grip
(10) Fuel tank
(11) Engine oil filler
(12) Rear brake lever
(13) Front footrest
(14) Rear footrest
(15) Rear brake caliper
(16) Front brake caliper
(17) Side stand
(18) Shifter lever
(19) Seat lock

Features

Instruments and Lights

When the ignition key is rotated to the “ON” position, the instruments and lights will turn on.

After preliminary inspection, information will correspond to the overall condition of the motorcycle at that time.

The following indicator lights are included on the dashboard:

Status indicator lights

1A: Turn Signal indicator light (green)

This flickering indicator light means that the turn signal light is on.

1B: Neutral indicator light (green)

When this indicator light is on, it means that the motorcycle’s transmission is in neutral.

1C: High beam indicator light (blue)

When this indicator light is on, it means that the high beam light is on.

1D: Oil pressure warning light (red)

When the engine is not started after the power is turned on, the engine oil indicator light is always on; if the oil pressure is normal after the engine is started, the engine oil indicator light will turn off; if the engine oil indicator light is not off, the oil pressure may be abnormal, which means that the engine should be shut down and the unit brought in for inspection;

If there is fuel or water in the engine oil, the indicator light will be on, which means that the engine should be shut down and the unit brought in for inspection.

FI: “FI” means fault code diagnosis of EFI system (orange)

When the key is turned to the “ON” position the EFI indicator light will be on, the fuel pump will run for 3 seconds, and the motorcycle will start. If the indicator light turns off after the motorcycle is started, the motorcycle is running normally without faults; if the indicator light is on, it means that there are some faults in the fuel injection system, which means that you should shut down the engine. For inspection please contact an authorized Benelli dealership which will use a special motorcycle fault diagnosis tester to check your motorcycle.

Function button (2)

Function button (3)

Button Function Table						
	Function	Power supply	Current interface display	Left button	Right button	Display interface after switching
	Function switching	ON	TOTAL	<3sec		TRIP A
	Function switching	ON	TRIP A	<3sec		TRIP b
	Function switching	ON	TRIP A	>3sec		TRIP A ##
	Function switching	ON	TRIP b	>3sec		TRIP b ##
	Function switching	ON	TOTAL → TRIP A → TRIP b → TOTAL			
	Function switching	ON	km km/h		<3sec	
	Function switching	ON	miles mph		<3sec	
	Clock setting	ON	TOTAL	>3sec		Hour bit flickering
		ON	TOTAL		<3sec	Hour bit+1 (0-23)
		ON	TOTAL TOTAL	<3sec		Switch to ten-of-minute flickering
		ON	TOTAL		<3sec	Tens of minutes+1 (0-5)
		ON	TOTAL TOTAL	<3sec		Switch to unit-of-minute flickering
		ON	TOTAL		<3sec	Units of minutes+1 (0-9)
		ON	TOTAL	<3sec		Exit clock menu
Note	In the adjusting state of clock, automatically exit the menu with no button being pressed in 5sec.					

Tachometer (4):

It indicates the rotations per minute of the engine at that time.

Coolant temperature measurement (5):

It indicates the coolant temperature in F° (Fahrenheit) or ℃° (Centigrade).

Odometer / Trip Meter (6)

You can choose the functions of relative mileage (TRIP) or total mileage (TOTAL) on the odometer, and choose the units of mph (miles) or km (kilometers) according to your needs.

Relative mileage (TRIP): It is an odometer that can be reset for recording the driving mileage in a certain period. Pressing and holding function button (2) can reset the trip meter in the state of relative mileage (TRIP).

Total mileage (TOTAL): It is used for recording the total driving mileage.

An odometer is used for recording the miles of total driving distance.

Speedometer (7):

A speedometer indicates the driving speed. Short press the function buttons (2) and (3) simultaneously to choose whether the unit is mph (miles/hour) or km/h (kilometers/hour) according to your needs.

Digital clock (8):

The time is shown in hours and minutes. Press and hold function button (3) if the clock requires adjustment.

Fuel Gauge (9):

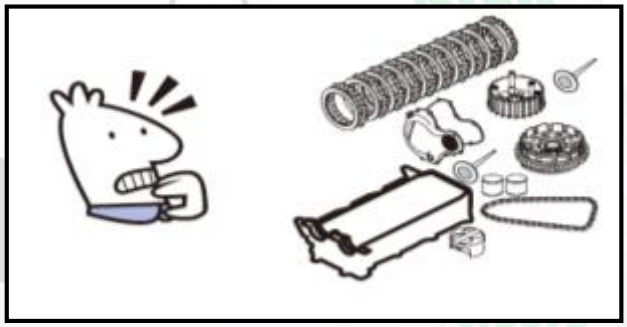
It indicates how much fuel is stored in the fuel tank. It will indicate a total of 7 fuel levels when full; when the fuel level is 1 or less than 1, the fuel level indicator will flash letting you know you need to refuel as soon as possible.

Important information

Preparation for disassembly and disassembling operations

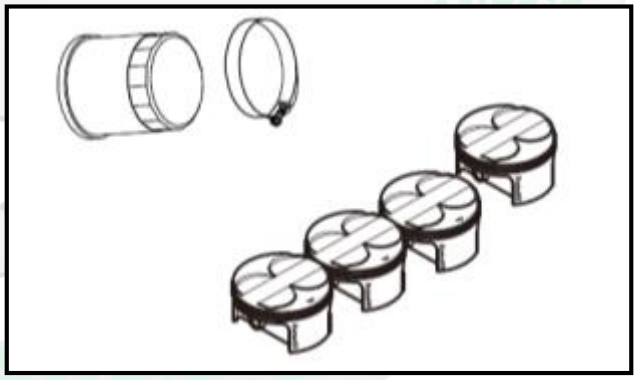
Please get rid of dirt, mud, dust or foreign matter before any disassembly or disassembling operation begins.
Only use appropriate cleaning tools and products. See the section “Special Equipment”.
When the motorcycle is disassembled, we suggest putting like parts together. These parts include gears, cylinder, piston and other items. Their surfaces may “wear-in” during normal operation. Matched pieces (i.e. brake pads) must be used or changed in pairs. During disassembling operations, clean all parts, and keep removed parts organized according to the various sections to avoid lost parts or mix-ups, which will make it easier to assemble the parts and make sure all the parts are accurately assembled.

All parts should be kept away from a heat source.

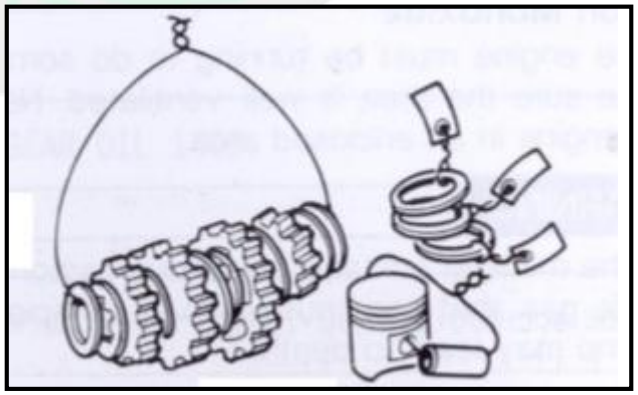


Replacement of parts

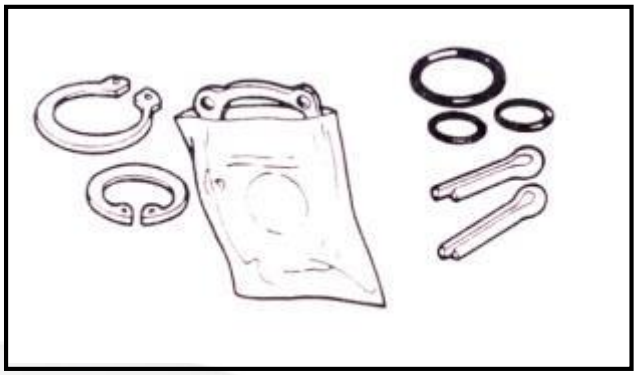
Use only original Benelli replacement of parts. Also only use oil and grease recommended by Benelli to lubricate parts.



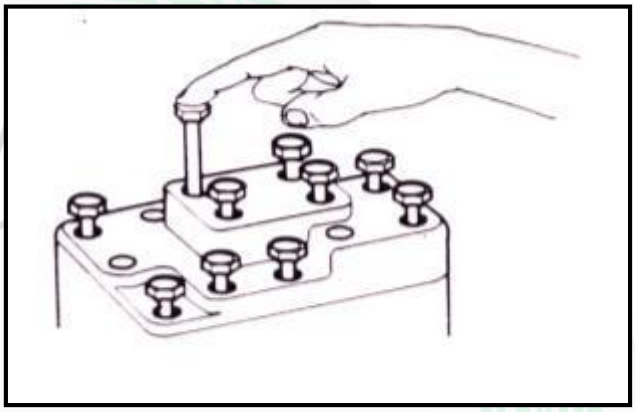
Parts with multiple assemblies should be loosened from outside to inside and small assembling units should be loosened first.
Gearbox and other complicated assemblies should be stored in the proper assembly sequence for future assembly.



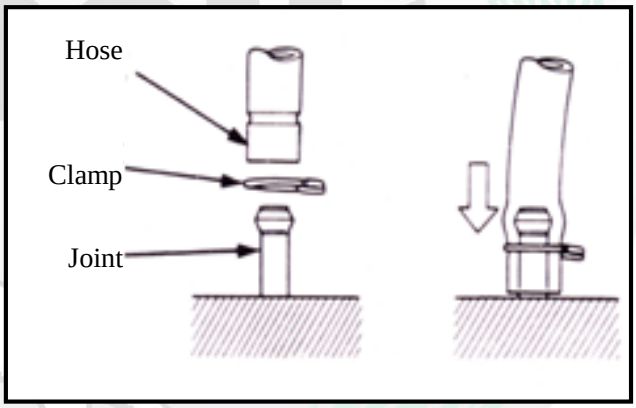
Pay special attention to important assembly positions before disassembly. Prepare for the parts which are no longer used before disassembly, and change the parts after disassembly.



Different assemblies and components have different bolts or screws which must be mounted in accurate positions. If they are mixed-up, put the bolts into the holes to check whether they will fit.

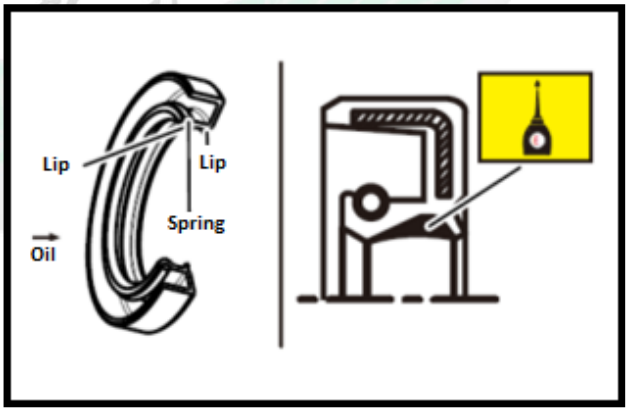


The end of rubber hoses (fuel hoses, vacuum hoses or coolant hoses) should be inserted to the bottom of the joint so that the hose clamps have enough space to clamp the joint. Rubber or plastic dirt-proof boots should be assembled in their original design positions.

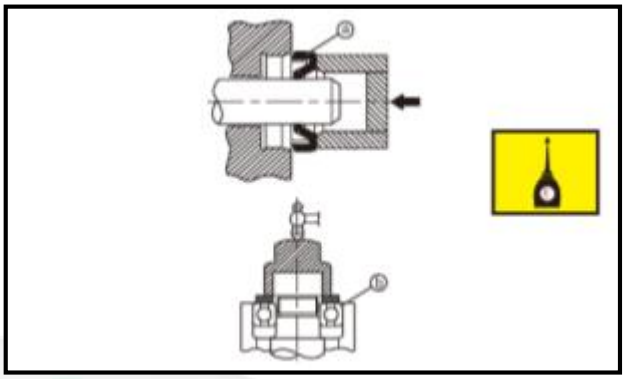


Gaskets, O-rings, Seals and Bearings

Change all the gaskets, oil seals and O-rings when engines are repaired.
Clean the surface of gaskets, oil seal lips and O-rings.

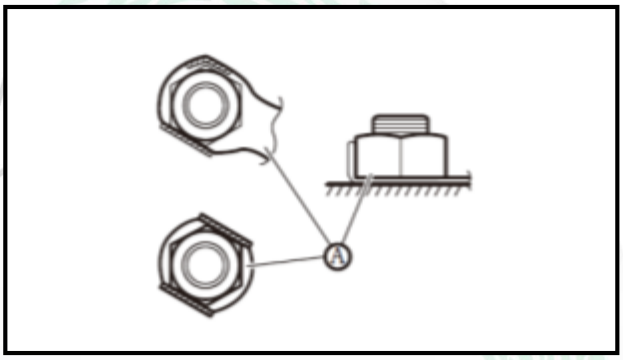


Assemble bearings and oil seals so that trademarks or manufacturer numbers are outwards and visible. When installing oil seals appropriately lubricate the sealing lips of all new oil seals.
Appropriately lubricate bearings during assembly.
a. Oil seal
b. Bearing



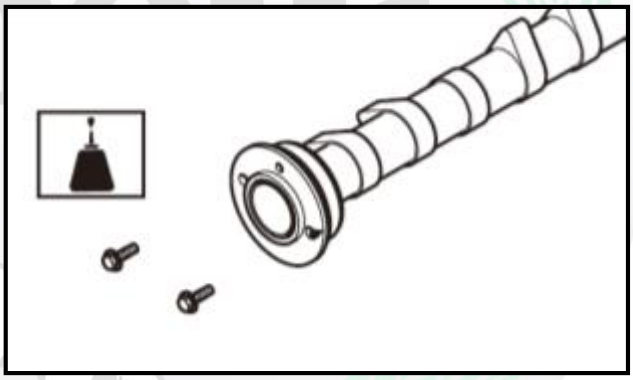
Important Note
Never use compressed air to dry bearings, it may damage their surfaces.

Lock washer/locking plate, bolt and thread sealant

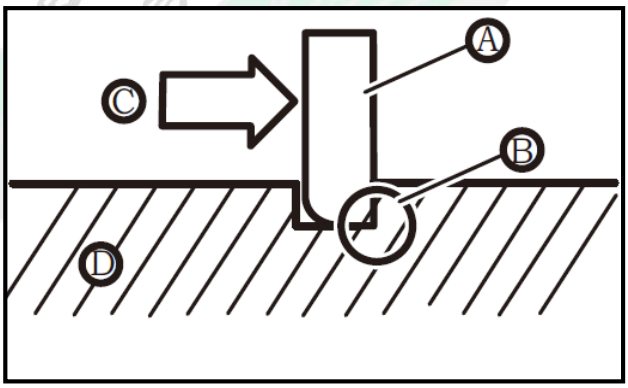


Replace all lock washers or locking plates “A” after lock washers, locking plates, bolts or nuts are disassembled.
After bolts or nuts are locked to specified torques, lock washers or locking plates are opposite to the planes of the bolts or nuts; use the locking marks and lock washers in case of curved tail end of locking plates.

Degrease both sides of bolts or nuts with solvent before the use of thread locking agents.



Circlip

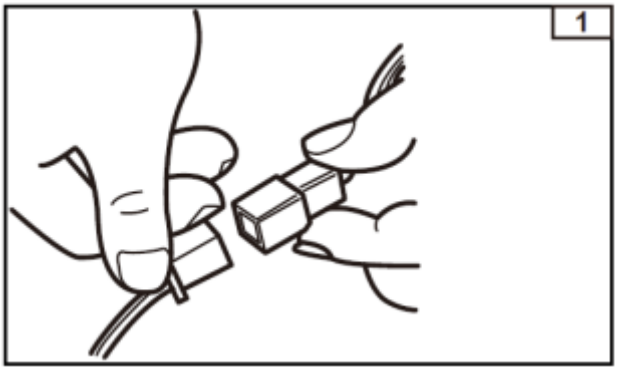


Carefully check all the circlips, and change all the damaged or deformed circlip rings before reassembly. All used circlips for the piston pin should be also changed.
The sharp edge “B” of the circlip should be on the opposite of thrust “C” felt by this circlip when the circlip “A” is assembled. And “D” is an axle.

Cable-to-cable connector check

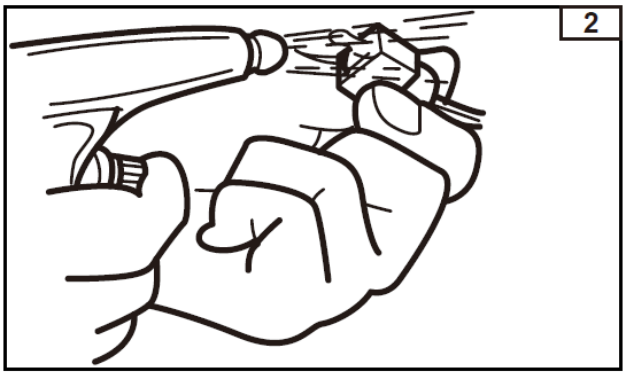
Ensure that there is no dirt, rust, water, loose terminals and/or other items on connectors.

1. Disconnect
   Wire
   Connector
   Joint

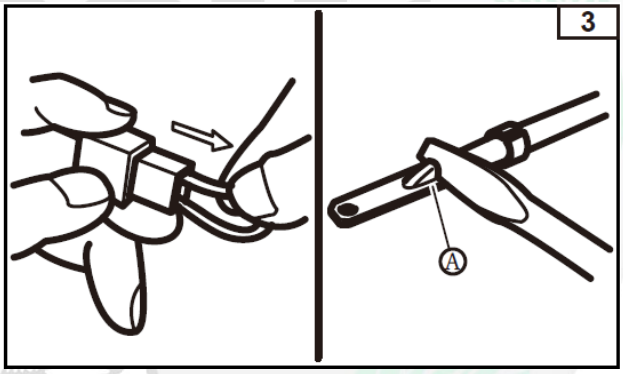


2. Check
   Wire
   Connector
   Joint

Use compressed air to dry water if any is present.
Connect and disconnect parts several times if there is rust present.

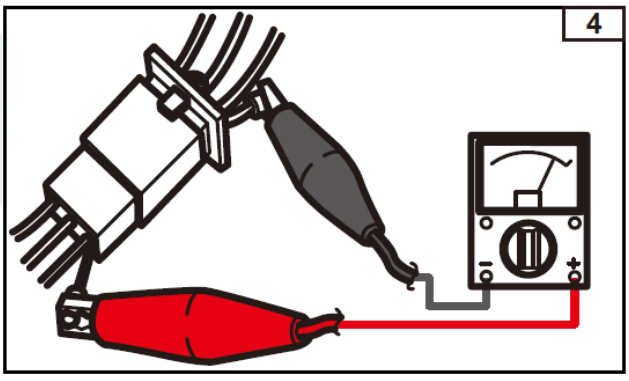


3. Check
   All the connecting terminals
   Properly reconnect any terminal if it is loose.



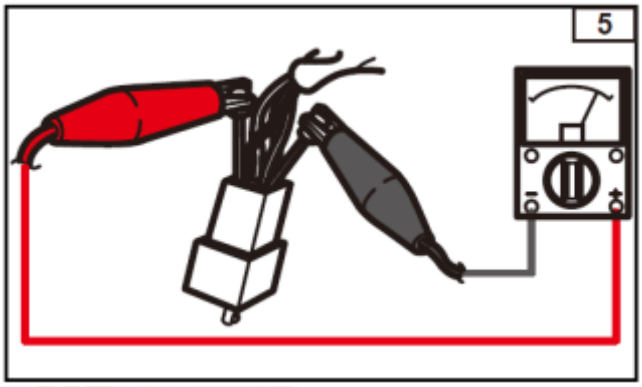
Notes
Please bend foot “A” on terminals if it becomes flat.

4. Check
   Wire
   Connector
   Joint



Notes
Ensure that all the joints are firmly assembled.

5. Check
Continuity (using a multimeter)



Notes

Clean terminals if there is no item that needs to be checked.

Wire sleeves should be checked according to steps 1-3.

Please use [contact rehabilitating agents] which are sold at most parts stores for quick correction.

Loose cables are a hidden electrical safety hazard.

Check the cable after the connector is clipped to ensure electrical safety;

Cable clips are not allowed to bend towards welding spots;

Bind cables at specified positions;

Cables should be routed away from the end of the frame or sharp corners;

Cables should be routed away from the end of bolts or screws;

Cables should be kept away from heat sources or from positions in which they may be cut during movement;

Cables run along the frame or near the handlebars should be prevented from being too tight or too loose, and should not interfere with their adjacent parts in any turning position;

Cables should be smooth without any twists or knots;

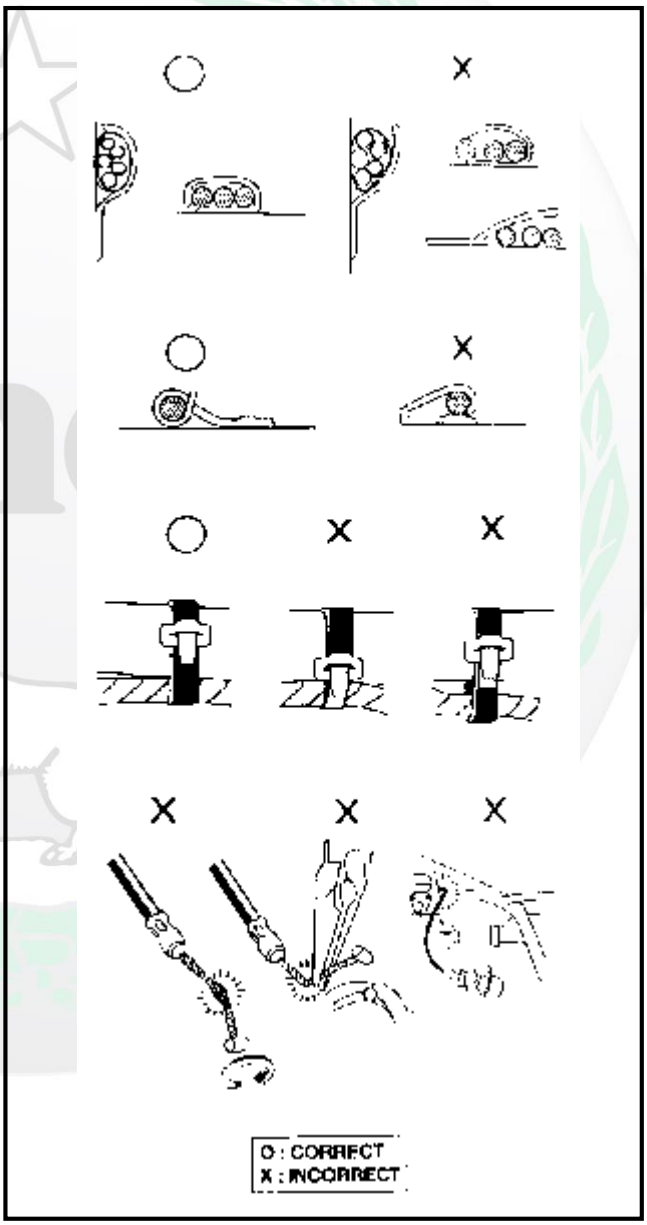
Confirm whether connector jackets are damaged, and/or connectors are excessively stretched before the connectors are reconnected.

Please protect cables with tape or hoses if they are at sharp corners or in turning positions;

Bind up exposed cables with tape after cables are repaired;

Control cables should not be bent or twisted.

Damaged control cables will result in poor control.

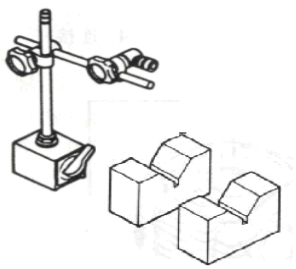


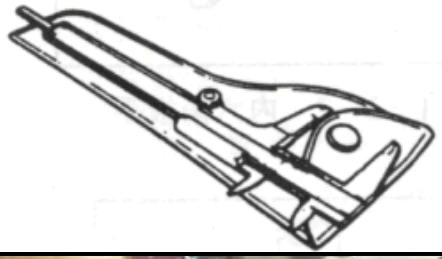
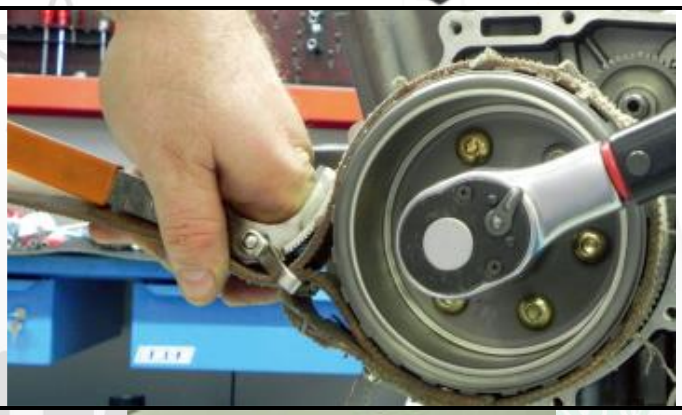
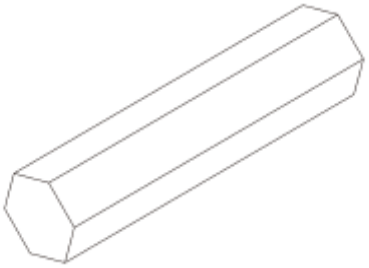
Special tools

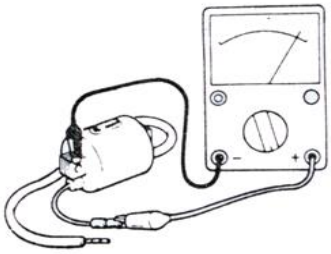
The following special tools are the ones necessary to conduct complete and correct adjustment and assembly. The use of correct special tools can avoid damage caused by improper tools or non-professional techniques. Required special tools may be different in different countries. Please refer to the following data when tools are ordered in case of any error.

Special tools for engine		
Quantity	Name	Image
KST02BS01004	The valve stem oil seal tool is used for inserting valve oil seals.	
KST02BS01003	The clutch holder tool is used for preventing clutch drums from turning and for loosening nuts.	
KST02BS01001	The sprocket locking tool is used for holding sprockets to mount or disassemble output sprocket nuts.	
1	The piston pin remover is used for taking out piston pins.	
KST02BS01002	The camshaft sprocket adjustment tool is used for adjusting the tension of the cam chain.	
1	The valve stem oil seal remover is used for taking oil seals out of cylinder heads.	
1	The breather pipe installation tool is used for mounting breather pipes on cylinder head covers and cylinder heads.	

KST03BL01024	The ring clamp tool is used for assembling piston rings on pistons and inserting them into the cylinders.	
1	The gearshift lever drum assembling tool is used for assembling gearshift lever drums.	
KST03BL01012	The flywheel extractor is used for removing flywheels from crankshafts.	
1	The engine adjusting tool is used for setting TDC positions.	
KST03BL01031	The oil filter tool is used for tightening or disassembling oil filters n engines.	
1	The cam chain tensioner locking tool is used for locking tensioners when chain tensioners are assembled.	
1	The bearing shell compression tool is used for mounting bearing shells. Lock either end of the bearing shell into the trough, put the tool on it, and press the tool by hand to make the bearing shell stick into the trough.	

1	The tool for disassembling / fastening clutch component clamp nuts is used for disassembling / fastening clutch component clamp nuts.	
1	The valve spring disassembling tool is used for disassembling springs from valves.	
1	The valve removal adapter is used for removing valves.	
1	This gauge is used for measuring the internal dimension of holes.	
1	This gauge is used for measuring the external dimensions of parts.	
1	Feeler gauges are used for measuring clearances.	
1	Magnetic stands and V-blocks are used for aiding in measuring dimensions.	

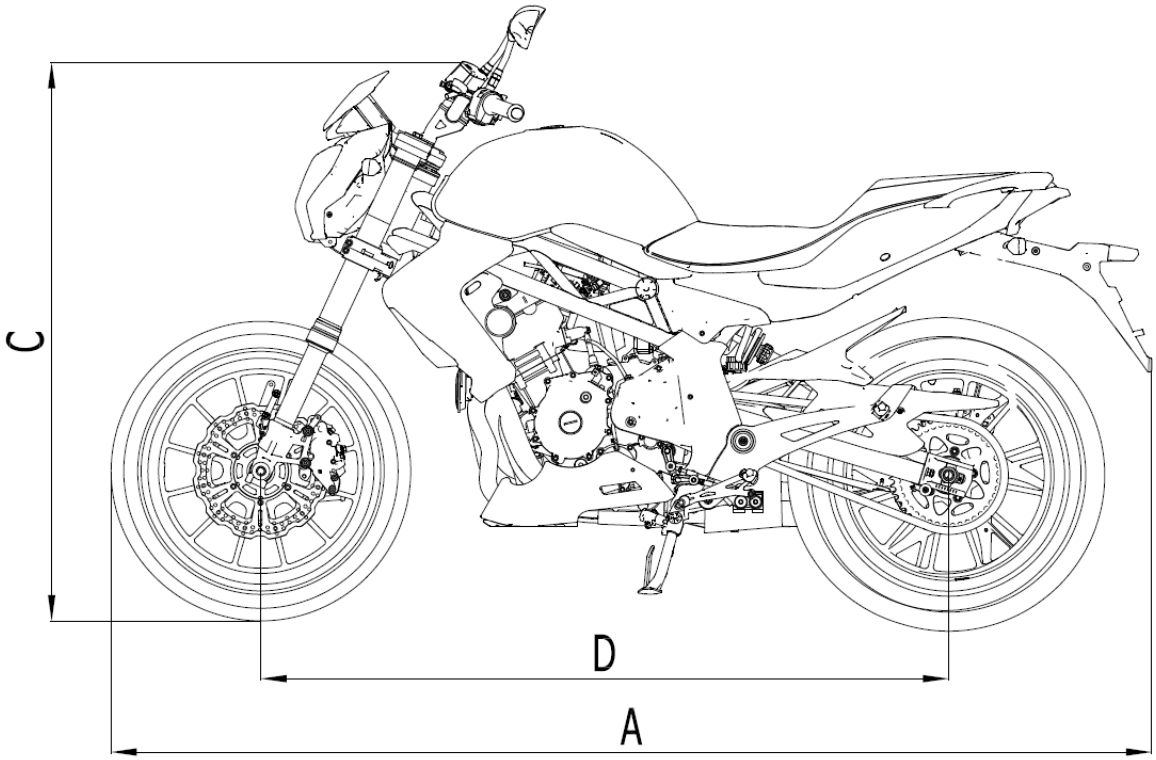
1	Dial gauges are used for measuring dimensions.	
1	Vernier calipers are used for measuring dimensions.	
KST03BL01030	The flywheel holder tool is used for disassembling the flywheel on crankshafts.	
KST02BS01006	The socket for the lock nut at the steering head is used for removal and fastening steering heads.	
1	Steering stem top nut allen tool for removing or adjusting the steering stem bearings or replacing the upper triple clamp.	
1	Oetiker clamp pliers are used for locking oetiker clamps.	

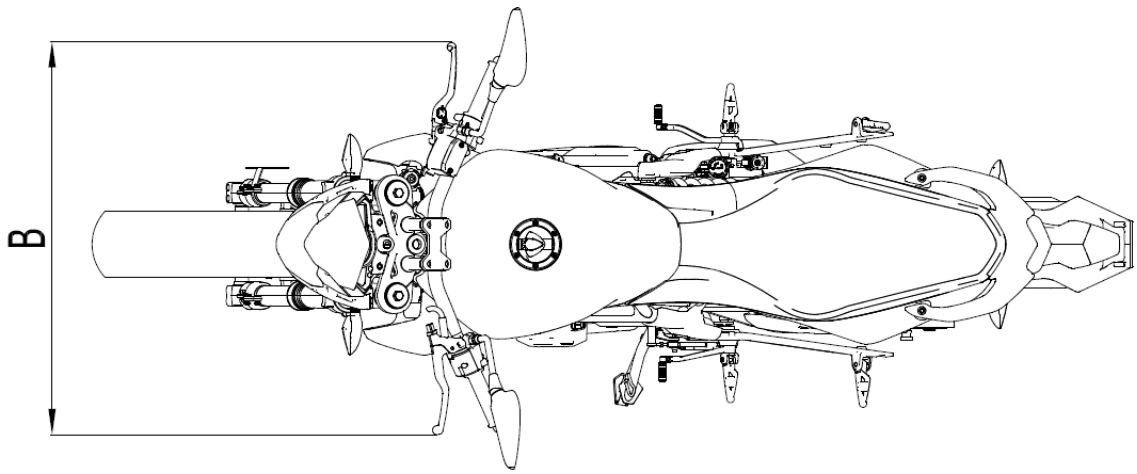
1	Multimeters are used for measuring the voltage, current and resistance of electrical parts.	

Chapter II Specification

Basic specifications

Dimension	Standard
Total length (A)	83.66 inches
Total width (B)	31.5 inches
Total height (C)	44.5 inches
Wheelbase (D)	55.31 inches
Weight	Standard
Curb weight (with oil and fuel)	432 lbs.
Empty motorcycle (with no oil and empty fuel tank)	404 lbs.
Maximum allowable load capacity (with cyclists and load)	353 lbs.



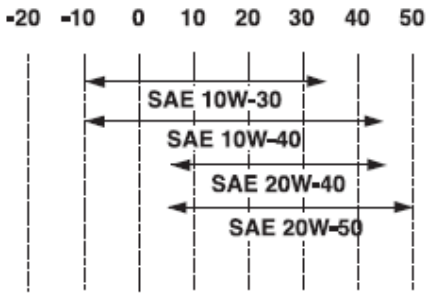


Technical Data of the Engine

Engine Specifications

Engine	Standard
Engine	Four-stroke, inline twin-cylinder, water cooled, four-valves per cylinder, and double overhead camshaft (DOHC)
Total displacement	299.82CC
Quantity of cylinders	2
Inside diameter × stroke	65.0×45.2
Compression ratio	12: 1
Low free speed	……
High free speed	……
Distribution	Double overhead camshaft, chain-controlled, and four-valves per cylinder
Maximum net power	37.6 HP @ 12000rpm
Maximum net torque	20.21 ft. lbs. @ 9000rpm
Fuel consumption limit	≤1.37gal./62 miles
Start-up mode	Electrical starting

Fuel	
Recommended fuel oil	Lead-free 91 and above

Engine Oil	
Lubricating mode	Force and splash lubrication
Total quantity	3.0L
Total quantity without replaced engine oil filter	2.8L
Total quantity with replaced engine oil filter	3.0L
 Recommended engine oil	Type: API SH, SJ or SL, JASO MA Viscosity: SAE 10W-40

Air Filter	
Type of air filter	Sponge
Intake resistance	1.2±0.12KPa

Technical Data of the Engine

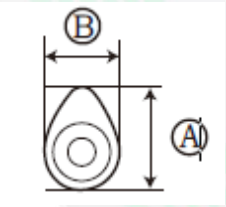
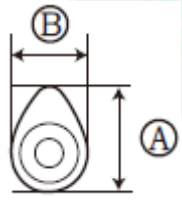
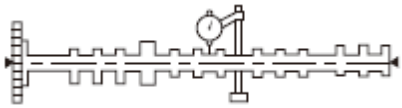
Engine Specifications	

Oil pump	
Type of oil pump	Rotor pump
Radial clearance of internal and external rotor	0.03-0.13mm

Ignition device	
Ignition mode	TLI

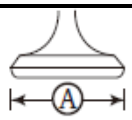
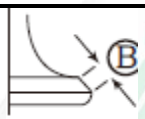
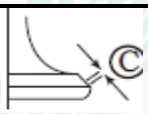
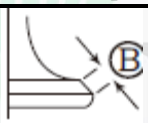
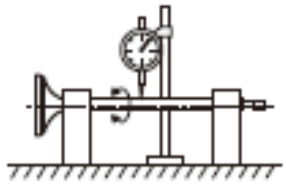
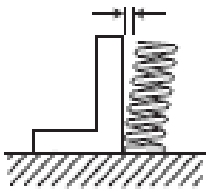
Spark plug	
Type of spark plug	NGK CR8EIA-9
Spark plug clearance	0.6-0.7mm

Cylinder head	
Maximum curvature of cylinder gasket	0.03 mm

Camshaft	
Control system	Chain transmission
Diameter of camshaft support	Ø23 (0，+0.021) mm
Clearance between support and camshaft follower	0.03-0.064 mm
Camshaft lobe dimension, intake side 	Measurement A= 32.495 mm Measurement B= 25 mm
Camshaft lobe dimension, exhaust side 	Measurement A= 32.495 mm Measurement B= 25 mm
Maximum bounce of camshaft 	0.03 mm

Technical Data of the Engine

Engine Specifications

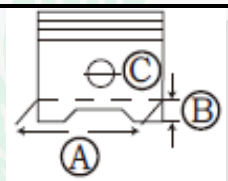
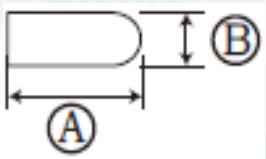
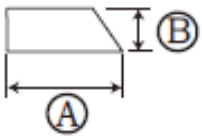
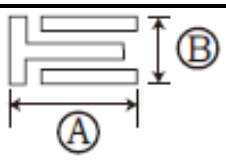
Valve, valve seat and valve guide		
Intake valve clearance (cold)		0.13-0.19 mm
Exhaust valve clearance (cold)		0.19-0.25 mm
Valve dimension		
 Valve head diameter	Intake	Ø 25 mm
	Exhaust	Ø 22 mm
 Valve face width	Intake	1.9-2.1 mm
	Exhaust	1.75 ~ 1.95 mm
 Valve seat amplitude	Intake	1 ~ 1.1 mm
	Exhaust	1 ~ 1.1 mm
 Valve seat width	Intake	1.9 ~ 2.1 mm
	Exhaust	1.75 ~ 1.95 mm
Valve stem diameter	Intake	3.965 ~ 3.98 mm
	Exhaust	3.965 ~ 3.98 mm
Clearance between valve stem and valve guide	Intake	0.04 ~ 0.065 mm
	Exhaust	0.05 ~ 0.075 mm
 Bounce of valve stem		0.05 mm
Valve spring	Intake	37.2 mm
	Exhaust	40.5 mm
Effective pressure of intake/exhaust	Intake	895MPa～1024MPa
	Exhaust	Lower end 751≥1000MPa, stem end 895-1042MPa
	Intake	0.5mm
	Exhaust	0.5mm

Technical Details of the Engine

Engine Specifications

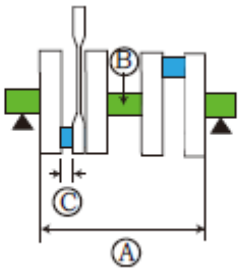
Timing chain	
Link number/type	92RH2015
Automatic tensioning	Self-adjusting type

Cylinder	
Cylinder layout	Vertical inline
Stroke ratio	65.0: 45.2
Compression ratio	12: 1
Stroke	45.2 mm
Largest oval	/O/ 0.008 mm
	/O/ 0.006 mm

Piston		
Clearance between piston and cylinder		0.035~0045mm
	Piston diameter “A”	65（-0.03，-0.025）/65（-0.025，-0.02）
	Piston height “B”	11 mm
	Piston pin boss diameter “C”	16（0.002，0.008）mm
External diameter of piston pin		16（-0.008，0）mm
Clearance between top piston ring and ring trough		0.05-0.09 mm
	Type of piston ring	Drum type
	Dimension A*B	2.3 × 0.8 mm
Clearance between the second piston ring and ring trough		0.04-0.08 mm
	Type of piston ring	Ladder type
	Dimension A*B	2.3 × 0.8 mm
Clearance between oil scraping ring and ring trough		0.04-0.14mm
	Dimension A*B	2.25 × 1.5 mm

Technical Details of the Engine

Engine Specifications

Piston Stem	
Color code of bearing	A=red, B=blue, C=yellow
Stem weight code	K1=black, K2=green, K3=white, K4=brown, K5=orange
Crankshaft	
	
Width A	131mm
Maximum centrifugal force	22.6 ± 0.01 mm
Side clearance C at the large end C of connecting stem	0.1-0.25 mm
Color code of main bearing	A=red, B=blue, C=yellow

Clutch	
Clutch mode	Oil-bath clutch with multiple plates
Clutch release mode	Cable and spring
Clutch control action	Cable action
Action	Use left lever.
Position of clutch disengaging lever	Align slotting positions with scribed lines on right covers.
Free clearance of clutch disengaging lever	Not Adjustable
Clutch cable clearance (at the end of clutch lever)	2 ~ 3 mm
Thickness of friction plate	3.0± 0.1mm
Quantity of friction plate	7
Thickness of steel plate	2.0± 0.1mm
Effective length of spring	36.7（0~0.2）mm
Quantity of spring	4

Throttle body	
Diameter	34mm
Switch mode of throttle	Rotating type

Technical details of engine

Engine Specifications

Transmission device		
Type of transmission device		6-speed, constant mesh
Final ratio		2.645
The second decelerating system		3.071
Transmission ratio	Level 1	2.846
	Level 2	1.947
	Level 3	1.556
	Level 4	1.333
	Level 5	1.190
	Level 6	1
Maximum speed		87 mph

Gear control mechanism	
Type of gear control mechanism	Sequence driven selector and pre-selector
Maximum deformation of gear-shift guide rod	Straightness 0.02mm Roundness 0.005mm

Coolant	
Recommended type	Antifreezing agent
Color	Green
Mixed ratio	50% distilled water, 50% coolant
Freezing point	–35°C (–31°F)
Total quantity	2 L

Fuel Pump	
Type of fuel oil pump	Electric type
Model (manufacturer)	Delphi
Output pressure	37 psi

Technical Data of the Motorcycle

Motorcycle Specifications

Motorcycle	
Frame type	Steel Trellis
Rake	25°
Castor	86mm

Front wheel	
Wheel type	6-spoke aluminum alloy
Wheel disc (dimension)	17×MT3.50
Wheel disc (material)	Aluminum alloy
Wheel disc (diameter)	17 inches

Rear wheel	
Wheel type	6-spoke aluminum alloy
Wheel disc (dimension)	17×MT4.50
Wheel disc (material)	Aluminum alloy
Wheel disc (diameter)	17 inches

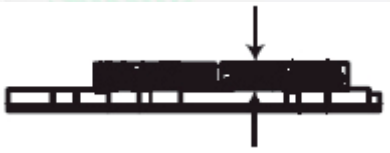
Front Tire	
Tire type	110/70-17 M/C
Model (trademark)	Cordial
Tire pressure	34 ± 2 psi

Rear Tire	
Tire type	140/70-17 M/C
Model (trademark)	Cordial
Tire pressure	36 ± 2 psi

Technical Data of the Motorcycle

Motorcycle Specifications

Front hydraulic brake		Limit
Brake type	Floating disc double-brake	
Action	Right hand lever	
Recommended liquid	DOT 4	
Brake disc		
 Diameter×thickness	Φ260×4	
Maximum thickness	4mm	3 mm
Maximum deformation		0.1mm
Thickness of worn brake pad		1mm
Diameter of pump cylinder	16mm (0.62 in)	
Diameter of piston cylinder	34 (1.33in)	

Rear hydraulic brake		
Brake type	Single disc brake	
Action	Right foot lever	
Recommended liquid	DOT 4	
Brake disc		
 Diameter×thickness	Φ260×5	
Maximum thickness	5mm	4 mm
Maximum deformation		0.1mm
Thickness of worn brake pad		1mm
Diameter of pump cylinder	12.9mm	
Diameter of piston cylinder	32 mm	

Technical Data of the Motorcycle

Motorcycle Specifications		

Front suspension		
Suspension type		Extension sleeve type
Maximum stroke		135mm
Spring	Free length	310 mm
	Gasket length	80 mm
	Elasticity	8.9 N/mm
	Spring stroke	0 ~ 135 mm
Damping oil		
Recommended oil		SAE 7.5 32#
Each amount of each damping oil		400ml
Horizon (pipes are fully compressed without fork spring from the top of lateral pipes)		130 mm

Steering	
Type of steering bearing	Ball bearing
Left steering angle	30°
Right steering angle	30°

Rear suspension		
Suspension type		Rocker arm type with adjustable gas shock
Maximum stroke		42 mm
Spring	Free length	170±1，5 mm
	Gasket length	No gasket
	Elasticity	180 N/mm
	Spring stroke	42±1 mm
Standard pressure of preloading gas/air of spring		1.5Mpa
Adjustment location of spring preloading	Minimum location	0
	Standard	9 mm
	Maximum location	20 mm
Adjustment location of rebound damping	Minimum location	500N
	Standard	1900N
	Maximum location	5000N V=0.1m/s

Drive chain	
Model (trademark)	525HO
Chain pitch quantity	108

Electrical Data

Electrical Specifications

System voltage	
System voltage	12V
Ignition coil	
Model (trademark)	Delphi
Resistance of primary coil	0.6Ω
Resistance of secondary coil	10kΩ
Choke of primary coil	2.5 mH (1 kHz 0.3V)
Choke of secondary coil	23.5 mH (1kHz)
Maximum endurable current	7.6 A

Charging system	
System type	Magnetic AC (between white and white: 0.1～0.2Ω)
Model (trademark)	5-101211-502-1 (DENSO)
Rated output	13.5 V 48 A at 5000 rpm
Voltage regulator (in AC generator)	Three-phase full wave
Voltage setting	14.5 + 0.3 V (5000 rpm 10 A 77°F)

Starting relay	
Model (trademark)	……
Amperage	100 A
Coil resistance	4.4Ω at 68°F

Starting motor	
Model (trademark)	……
Brush length of starting motor	12.5mm/5.5mm (limit of usage)
Bushing of starting idler shaft	8.3mm (limit of usage)
Outside diameter of starting idler shaft	7.94mm (limit of usage)

Battery	
Model (trademark)	YTX9-BS
Voltage of battery capacity	12V/8Ah
Relative density of electrolyte	1.280±0.01

Electrical Data

Electrical Specifications

Horn	
Horn type	Low pitch
Model (trademark)	DL122 K.X.D
Maximum amperage	3A
Performance	105 ~ 118 db (A)

Headlight		
Headlight type		Halogen
Light bulb (watt×quantity)	Headlight	H7(12V 55W)
	Front position indicator light	W5W
	Rear position indicator light/brake light	LED
	Steering light	LED
	License plate light	W5W
	Neutral indicator light	LED
	High beam indicator light	LED
	Oil level warning light	LED
	Steering indicator light	LED
	Engine fault indicator light	LED

Flasher	
Model (trademark)	Lihua 355 E10
Flasher type	Digital controlled flasher
Flicker frequency of steering light	Normal: 80±10 times/min; variable frequency: 160±10 times/min
Power	10W×4

Engine oil pressure sensor	
Model (trademark)	Delphi
Alarm	55KPa

Throttle body position sensor	
Model (trademark)	Delphi
Resistance	3k~12kΩ

Throttle body barometric sensor	
Model (trademark)	Smart

Electrical Data

Electrical Specifications

Fuse (amperage×quantity)	
Fuse ECU (control unit)	15A (blue)
Headlight fuse	15A (blue)
Hot wire fuse	10A (red)
Radiator-fan fuse	15A (blue)
Backup fuse	15A (blue)+ 10A (red)
Oil pump fuse	15A (blue)
Charging fuse	40A (orange)

Fuel pump	
Model	Delphi
Working voltage	12V～14V
Maximum amperage	1.8A
Output oil pressure	250kPa

Fuel level sensor	
E end (resistance value)	100Ω
F end (resistance value)	10Ω

Air temperature sensor	
Model (trademark)	HAIHUA
Structure	Resistance type

Cylinder head temperature sensor	
Model (trademark)	HAIHUA
Structure	Resistance type

Crankshaft position sensor	
Model (trademark)	CHONGQING LIJIAN

Outlet water temperature switch	
Working temperature	208°F

Velocity sensor	
Model (trademark)	CHONGQING SANMU
Type	Induction type

Electrical Data

Electrical specifications

Oxygen sensor	
Model (trademark)	Delphi
Resistance	9.6±1.5Ω (measured at 70°F)

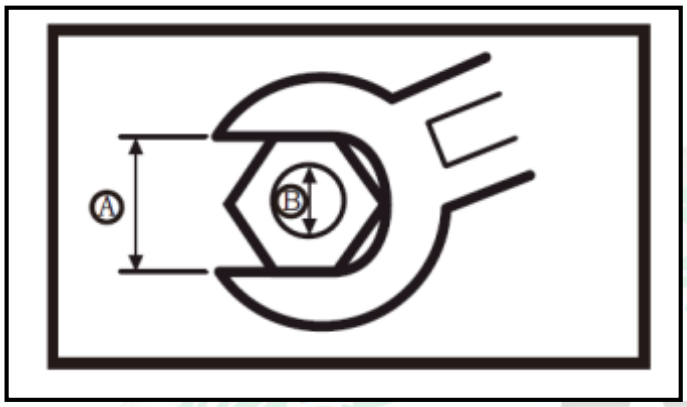
Fuel injector	
Model (trademark)	Delphi

Relay unit	
Model (trademark)	Panasonic

Stepping motor	
Model (trademark)	Smart

Technical Data of Nut Torque

Basic Torque Specifications



Locking torques of parts or specific components are offered in each chapter of this manual.
In order to avoid the risk of deforming the components across several fasteners, cross torque parts in proper order until required torques are achieved.
Locking torques are specified, the threads of the part must be clean and dry, unless otherwise specified.
Parts must be fastened at room temperature.

Nut	Basic fastening torque	
	N.m	Kgf.m
4mm	2.3	0.23
5mm	4.5	0.45
6mm	10	1.01
8mm	25	2.54
10mm	45	4.58
12mm	80	8.15
14mm	130	13.25
16mm	200	20.39
18mm	240	24.47

Technical Data of Bolt and Screw Torque

Basic Locking Specifications

Fastening torque of bolt and screw and relevant parameters

Bolt/screw	Basic fastening torque					
	Level 8.8		Level 10.9		Level 12.9	
	N.m	ft·lb	N.m	ft·lb	N.m	ft·lb
M4×0.7	3	2.2	4.2	3.1	5.2	3.8
M5×0.8	6	4.43	7.5	5.5	9	6.6
M6×1	10	7.38	13	9.6	16	11.8
M8×1.25	22	16.23	30	22	40	29.5
M8×1(*)	25	18.44	36	26.5	45	33.2
M10×1.5	45	33.2	65	48	80	59
M10×1.25(*)	50	37	70	51.6	85	62.7
M12×1.75	80	59	110	81.1	135	99.6
M12×1.5(*)	85	62.7	120	88.5	145	107
M12×1.25(*)	90	66.38	130	96	150	110.6
M14×2	130	96	185	136	220	162.3
M14×1.5(*)	150	110.63	205	151	245	180.7
M16×2	200	147.5	280	207	335	247
M16×1.5(*)	225	166	310	228.6	360	265.5
M18×2.5	265	195.5	370	272.9	450	331.9
M18×1.5(*)	320	236	450	332	550	405.6
M20×2.5	390	287.6	550	405.7	650	479.5
M20×1.5(*)	440	325	630	465	750	553
M22×2.5	540	398	750	553	900	664
M22×1.5(*)	600	443	850	627	1000	737.5
M24×3	670	494	950	701	1130	833.5
M24×2(*)	750	553	1050	774.4	1250	922
*: refers to fine thread.						

Technical Data of Bolt and Screw Torque

Locking Torque

Engine

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Cooling system				
Coolant drain bole	10	1.0	89 in·lb	
Cylinder fitting fixing bolt	9.8	1.0	87 in·lb	
Radiator fixing bolt	9.8	1.0	87 in·lb	
Radiator (water pipe) hose fastening screws	2.0	0.20	18 in·lb	
Expansion kettle fixing bolt	6.9	0.70	61 in·lb	
Bolt on the housing cover of thermostat	5.9	0.60	52 in·lb	
Thermostat shell fixing bolt	9.8	1.0	87 in·lb	
Water pump cover bolt	9.8	1.0	87 in·lb	
Water pump impeller fastening bolt	9.8	1.0	87 in·lb	
Cylinder head and cylinder head cover of engine				
Camshaft sprocket fixing bolt	20	20	14.75	L
Camshaft cover bolt	12	1.2	106 in·lb	S
Camshaft timing chain fairleader bolt	12	1.2	106 in·lb	
Camshaft timing chain tensioner fixing bolt	12	1.2	106in·lb	
Cylinder cover bolt (M10)	55	5.5	40.56	MO、S
Cylinder cover bolt (M6)	12	1.2	106 in·lb	S
Cylinder head cover bolt	12	1.2	106 in·lb	S
Spark plug	13	1.3	115 in·lb	
Throttle body assembly fixing bolt	12	1.2	106 in·lb	S
Clutch				
Right cover bolt	12	1.2	106 in·lb	Tighten them manually
Hexagon head bolt	12	1.2	106 in·lb	
Engine oil filler plug screw	—	—		
Clutch spring bolt	10	1.0	89 in·lb	
Sprocket mounting bolt	8	0.8	71 in·lb	
Balance shaft driving gear lock nut	60	6.1	44	L
Clutch lock nut	95	9.7	70	
Clutch driving sprocket screw	8	0.8	71 in·lb	
Engine lubrication system				
Oil pan drain magnetic bolt	20	2.0	15	
Oil pan bolt	10	1.0	89 in·lb	
Engine oil pump mounting bolt	10	1.0	89 in·lb	
Engine oil pump cover bolt	10	1.0	89 in·lb	
Sprocket mounting bolt	8	0.8	71 in·lb	
Engine oil pressure switch bolt	24.5	2.5	18 ft·lb	L
Engine oil filter bolt	17	1.7	13 ft·lb	

Technical Data of Bolt and Screw Torque

Locking Torque

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Crankshaft/transmission mechanism				
Balance shaft driven gear lock nut	100	10.2	73.7	L
Connecting rod big end nut	See the text.			
Crankshaft flywheel nut	105	10.7	77.4	L
Balance shaft driving gear lock nut	60	6	44	L
Follower bolt (M6, L = 14 mm)	10	1	89 in·lb	L
Oil passage plug (M16, L = 15 mm)	24.5	2.5	18.1	L
Follower screw (M6, L = 16 mm)	7	0.71	62 in·lb	L
Support bolt (M6, L = 20 mm)	10	1	89 in·lb	L
Crankcase bolt (M8, L = 85 mm)	24.5	2.5	18.1	MO、S
Crankcase bolt (M6, L = 40 mm)	10	1	89 in·lb	S
Crankcase bolt (M10, L = 60mm)	45	4.6	33.3	MO、S
Crankcase bolt (M8, L = 75 mm)	24.5	2.5	18.1	S
Crankcase bolt (M8, L = 115 mm)	24.5	2.5	18.1	S
Crankcase bolt (M10, L = 100mm)	45	4.6	33.3	MO、S
Crankcase bolt (M8, L = 45 mm)	24.5	2.5	18.1	S
Flywheel lock nut	100	10.2	73.7	
Overrunning clutch bolt	20	2.04	15	L
Positioning roller rocker arm bolt	12	1.22	106.49 in·lb	L
Shift positioning star wheel fixing bolt	12	1.22	106.49 in·lb	
Left cover bolt	12	1.22	106.49 in·lb	

Locking torques of main fasteners that need thread locking agent, silicone sealant and/or other adhesives are listed in the above table. The letters in the “Remark” column are defined as follows:

AL: Alternatively tighten fastening bolts twice according to higher locking torques.

G: Coat lubricating grease.

L: Coat thread fastening adhesive.

M: Coat lubricating grease containing molybdenum disulfide.

MO: Coat oil solvent containing molybdenum disulfide.

(Mixture of engine oil and lubricating grease containing molybdenum disulfide prepared at the weight ratio of 10:1)

R: Replace parts.

S: Follow the specified tightening sequences.

Si: Coat silicone grease.

SS: Coat silicone sealants.

Chapter III Check and Regular adjustment

Regular Maintenance and Lubrication Intervals

The specified mileage/time interval in the scheduled maintenance form is just a general guide for normal use. It is necessary to reduce the time interval due to weather, topography, geographical position and personal usage conditions. If users have the necessary skills, some operations can be completed by themselves; if it is explicitly mentioned in this manual, they also can be completed by the end user.

In brief, these operations should be completed at an authorized Benelli dealership. The list of authorized repair shops is available on our website at: www.usa.benelli.com.

Generally, motorcycles are kept upright by a rear support, engines are shut down, and switches are turned to the “OFF” position when maintenance is conducted for the motorcycle:

Preferably, motorcycles should be on a level surface, and the front and rear tires should be on the ground. When checking fluid levels the motorcycle must be vertical to the ground without the rear stand support.

Notes:

Annual checks should be conducted unless motorcycles have been maintained according to the set time intervals.

At 24,000 mi, for example, start to repeat maintenance services at 8,000 mi.

For ◙ marked time intervals, we suggest contacting your authorized Benelli dealer because some special equipment, professional information and/or experience/professional skills may be needed.

The following list shows all of the maintenance operations.

Notes:

Air Filter

Air filter elements should be replaced more often if the motorcycle is used in a particularly humid or dusty environments.

Hydraulic Brake Maintenance

Regularly check brake fluid levels and complete brake fluid flushes as needed or per interval.

Replace brake master cylinders and the oil seals in brake calipers every two years; and replace the brake fluids.

Replace brake hoses every four years; or replace them before if they are found broken or damaged.

Symbol interpretation	
I	Check, adjustment, cleaning, lubrication or replacement as required
R	Replacement
T	Tightening
◙	Dealer ONLY

Regular Maintenance and Lubrication Interval Schedule

Frequency

		Item	Content	0 mi	600 mi	4,000 mi	8,000 mi	12,000 mi	16,000 mi	Annual inspection
1		Engine Oil	Check / add / replace	I	R	R	R	R	R	R
				Check engine oil level before using the motorcycle						
2		Engine Oil Filter	Replace		R	R	R	R	R	R
				or when replacing oil engine						
3	◉	Fuel Filter	Check / replace			I	I	R	I	
4	◉	Air Filter	Check / replace			I	R	I	R	
				Repair and maintenance must be conducted after 4000 mi; the interval may be shortened appropriately under special conditions						
5	◉	Coolant	Check / add / replace	I	I	I	I	R	I	I
			Replace	Every two years, or 12,000 miles						
6	◉	Cooling System	Check the cooling liquid level, and ensure there is no liquid leakage	I	I	I	I	I	I	I
7	◉	Spark Plug	Check / replace			I	R	I	R	I
				Check the situation, wash and restore spark plug clearance						
8	◉	Drive Chain	Check chain tension, ensure that the rear wheel has been correctly aligned, clean and lubricate		I	I	I	I	I	I
				After a new motorcycle has run for 600 mi, adjust the chain tension, use the correct chain lube after every cleaning; later, adjust the chain tension once every 1,000 mi or under special use conditions, the adjustment cycle can be shortened according to the actual tension						
9	◉	Rear Sprocket	Check / lubricate		I	I	I	I	I	I
				Replace it when replacing chain						
10	◉	Front Sprocket	Check / replace		I	I	I	I	I	I
				Replace it when replacing chain						
11	◉	Fuel Hoses	Fault / leakage check			I	I	I	R	
				Replace every 16,000 miles; or under any circumstances, replace it every three years						
12	◉	Brake Fluid	Check / add	I	I	I	I	I	I	I
			Replace	Replace every 12,000 miles, or under any circumstances, replace it every two years						
13	◉	Front / Rear Brakes	Check operation and liquid level, and ensure there is no liquid leakage	I	I	I	I	R	I	I
14	◉	Brake Pads	Check / replace		I	I	I	I	I	
				If the wear reaches the limit, please replace						
15	◉	Drive Chain Protector	Check / replace		I	I	I	I	I	
				If the wear reaches the limit, please replace						
16	◉	Throttle Grip	Check operation; if possible, adjust throttle cable clearance, lubricate throttle grip enclosure and throttle cable	I	I	I	I	I	I	I

Continued

Frequency

		Item	Contents	0 mi	600 mi	4,000 mi	8,000 mi	12,000 mi	16,000 mi	Annual inspection
17	◉	Clutch	Check/adjust	I	I	I	I	I	I	I
18	◉	Valve Clearance	Check operation/ adjust the clearance						I	
				Every 16,000 miles, check the clearance						
19	◉	Timing Chain	Check / replace						R	
				Every 16,000 miles						
20	◉	Timing Chain Guides	Check / replace						R	
				When replacing the timing chain						
21	◉	Cam Chain Tensioner	Check / replace						R	
				When replacing the timing chain						
22	◉	Steering Stem Bearings	Check / replace				T		T	
				Every 12,000 miles, lubricate with lithium base grease						
23	◉	Front / Rear Wheel Bearings	Check / replace				I			
				Every 15,000 miles						
24	◉	Swing Arm Bearings	Check / replace			I	I	I	R	
				Every 16,000 miles						
25	◉	Rocker Arms	Check operation and ensure that there is not too much clearance			I	I	I	I	
26	◉	Front Suspension	Check operation and ensure that there is no leakage		I	I	I	I	I	I
27	◉	Front Suspension Oil	Replace					R		
				Every 16,000 miles						
28	◉	Rear Suspension	Check / adjust and ensure that there is no leakage			I	I	I	I	
				Before use of the motorcycle						
29	◉	Wheel	Ensure that there is no eccentricity or damage				I	I	I	
				Before use of the motorcycle						
30	◉	Tire	Check the tire tread depth and whether the tire has been damaged, and replace it when necessary; check the tire pressure, and fill the tire with air when necessary		I	I	I	I	I	I
				If the wear reaches the limit, please replace						
31	◉	Turn Signal Stay	Check operation	I	I	I	I	I	I	I
32	◉	Turn Signal Switch	Check operation	I	I	I	I	I	I	I
33	◉	Instrument Light Signal and Switch	Check operation	I	I	I	I	I	I	I

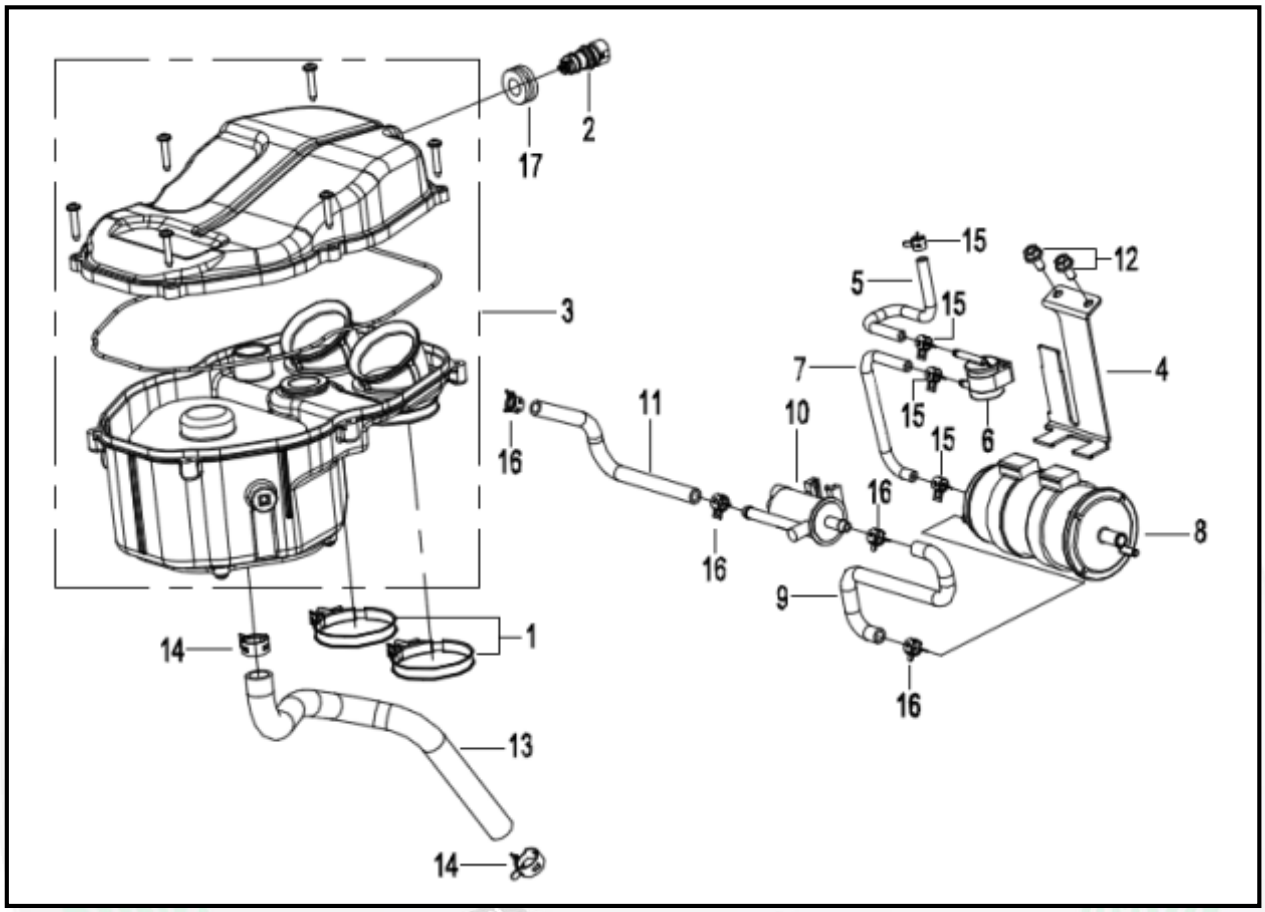
Continued

Frequency

		Item	Contents	0 mi	600 mi	4,000 mi	8,000 mi	12,000 mi	16,000 mi	Annual inspection
34	◉	Headlight	Check operation	I	I	I	I	I	I	
			Adjust							
35	◉	Horn	Check operation	I	I	I	I	I	I	I
36	◉	Instruments	Check operation	I	I	I	I	I	I	I
37	◉	Battery	Check operation	I	I	I	I	I	I	I
38	◉	Electrical System	Check operation	I	I	I	I	I	I	I
39	◉	Ignition System	Check operation	I	I	I	I	I	I	I
40	◉	Fan	Check operation	I	I	I	I	I	I	I
41	◉	Fuel Filter Element	Check / replace	I	I	I	I	I	I	I
				Every 12,000 miles						
42	◉	Nuts, Bolts, Fasteners and Hose Clamps	Ensure that all nuts, bolts and screws have been accurately fastened		T	T	T	T	T	T
43	◉	Catalytic Converter	Check / replace		I	I	I	I	R	
			Fault	Without maintenance requirements, do not replace it unless there is a fault						
44	◉	Charcoal Canister	Check / replace		I	I	I	I	R	
			Fault	Without maintenance requirements, do not replace it unless there is a fault						
45	◉	Brake / Clutch Hoses	Fault/leakage check	I	I	I	I	I	I	I
				Replace every four years						

Air Filter

Disassembly / Installation of Air Filter



No.	Name and specifications	Quantity	No.	Name and specifications	Quantity
1	Clamp components	2	10	Charcoal canister solenoid valve	1
2	Intake air temperature sensor	1	11	Solenoid valve and throttle valve connecting hose	1
3	Air Box Assembly	1	12	Screw M6×12-8.8-ZG	2
4	Charcoal canister mounting plate	1	13	Gas recovery hose	1
5	Fuel tank and check valve connecting hose	1	14	Plate clamp	2
6	Check valve components	1	15	Plate clamp	4
7	Check valve and charcoal canister connecting hose	1	16	Plate clamp	4
8	Charcoal canister combination	1	17	Rubber bushing II	2
9	Charcoal canister and solenoid valve connecting hose	1			

Air Filter

Disassembly / Installation of Air Filter

Replacement of Air Filter

Remove the fuel tank guard, see (the chapter of motorcycle covering parts/fuel tank guards).
Open the seat cushion lock, and remove the seat cushion.

Remove the fuel tank fixing bolts (1), and take off the fuel tank.

Remove the air filter cover.
Remove the air filter element.

Check:

Whether the filter element is polluted or damaged.
Please replace the filter element if damaged.

Cleaning:

- Thoroughly and gently clean the filter element with air filter cleaner.
  - Do not use gasoline as to not cause fires.
  - Do not distort or wring the filter element as to avoid damaging the foam material.
- Then, coat the filter element in air filter oil, and squeeze out the extra oil to make it moist without dripping oil.

Air Filter

Disassembly / Installation of Air Filter

Time Based Replacement

The air filter element should be cleaned/replaced often if the motorcycle is used in a particularly humid or dusty environment.

*Notes
When disassembling the air filter element, do not start the engine; otherwise, unfiltered air will enter the engine resulting in sharp wear on parts or possible damage to the engine. **Additionally, operation without the air filter element may impact the engine and the engine may function improperly, and overheat.**

Assembly should be conducted in reverse order of disassembly.

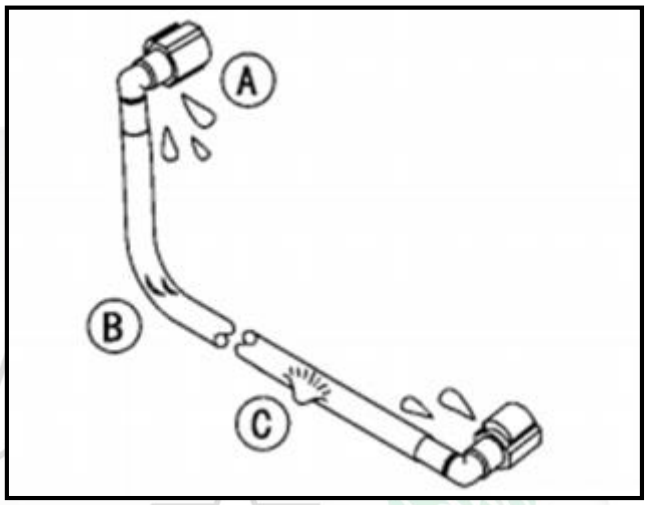
Fuel Hose

Fuel Hose Inspection

Check:

Fuel hoses (fuel leakage, hose cracks and hose routing)

Notes:
If the motorcycle is improperly handled, high pressure from the fuel hose will cause fuel leakage [A] or fuel hose cracks.



Disassembly:

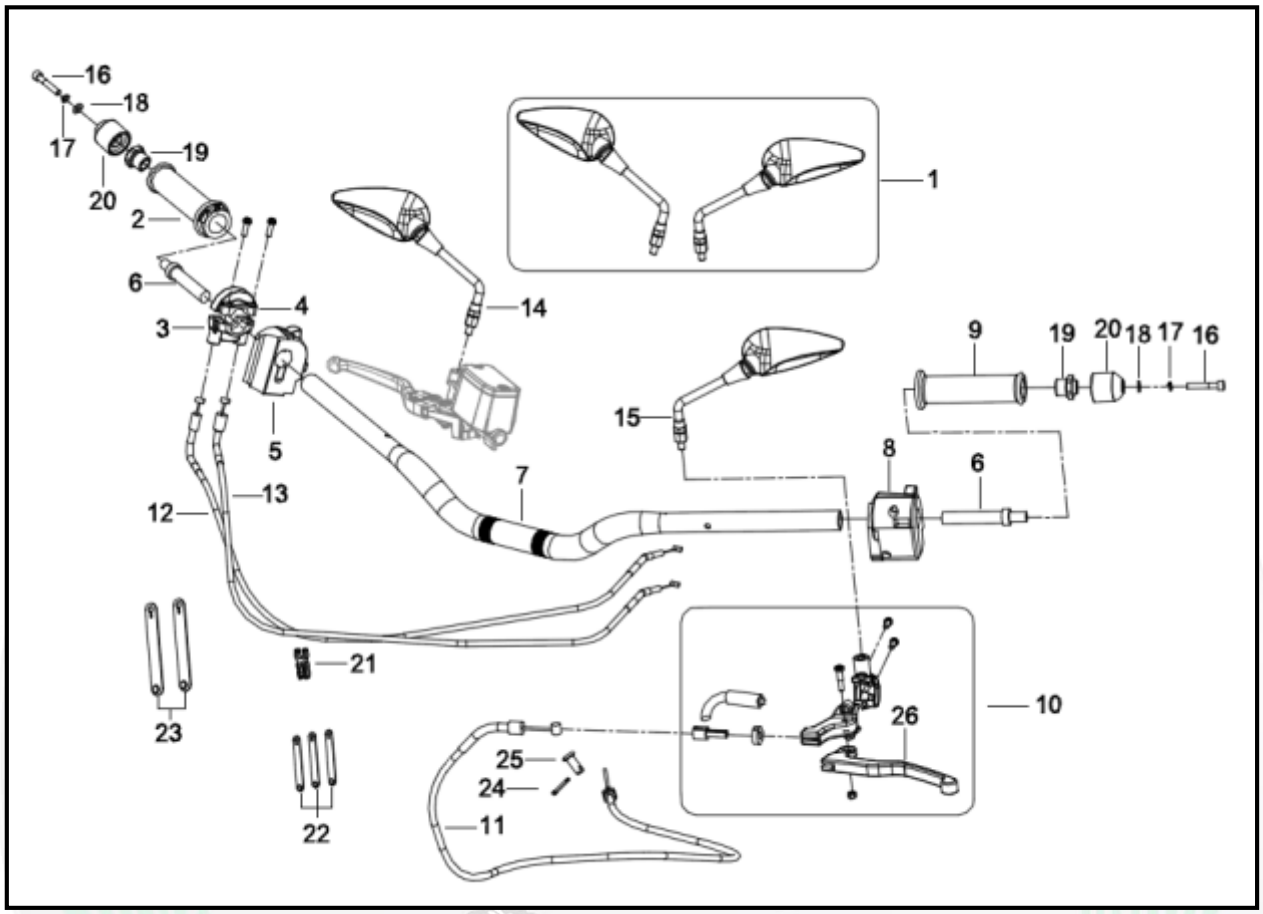
Remove the fuel tank (see Section “Air filter” of Chapter III “Check and Regular adjustment”).

Check: fuel hoses

If any wear, cracks [B] or expansion [C] is found, the fuel hose must be replaced.

Control

Control Cable



No.	Name and specifications	Quantity	No.	Name and specifications	Quantity
1	Rearview Mirror Set	1	14	Right Rearview Mirror	1
2	Throttle Grip	1	15	Left Rearview Mirror	1
3	Throttle Housing Top	1	16	Socket Head Bolt M6×35	2
4	Throttle Housing Bottom	1	17	Lock Washer 6	2
5	Right Combination Switch	1	18	Gasket 6	2
6	Handlebar Vibration Damper Insert	2	19	Handlebar End Insert	2
7	Handlebar	1	20	Handlebar End	2
8	Left Combination Switch	1	21	Cable Clamp	1
9	Left Grip	1	22	Soft Cable Clamp	3
10	Clutch Perch Assy.	1	23	Handlebar Soft Cable Clamp	2
11	Clutch Cable	1	24	Cotter Pin 2×18	1
12	Throttle Cable I	1	25	Hinge Pin 6×14	1
13	Throttle Cable II	1	26	Clutch Lever	1

Throttle Cable

Throttle Cable Adjustment

Check:

Throttle Cable Free play (A)

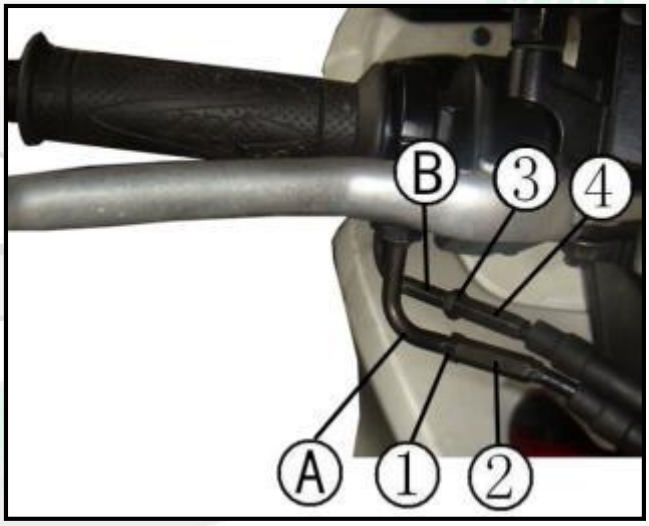
Ensure that the throttle control grip works properly, and can reach the maximum open position and automatically closed position in all of the handlebar positions. Make adjustments if needed, as shown in Fig. A.

*Notes
The engine idle speed should be properly adjusted before the throttle cables are adjusted.

Check the free play of the throttle which is 3-5mm.
Make some adjustments if it does not conform to the specified values.

Adjustment:

The motorcycle is equipped with dual throttle cables (push and pull). Throttle Cable A is the pull cable, and throttle cable B is the push cable. Please adjust the free play of the throttle grip according to the following steps:



(1) Remove the dirt-proof boot of the throttle cable.
(2) Loosen the lock nut ③.
(3) Completely screw in and adjust the nut ④.
(4) Loosen the lock nut ①.
(5) Rotate the adjusting nut ② to bring the free play of the throttle grip to 5mm ～10mm.
(6) Tighten the lock nut ①.
(7) Adjusting nut ④; and check whether the throttle grip turns easily.
(8) Tighten the lock nut ③.

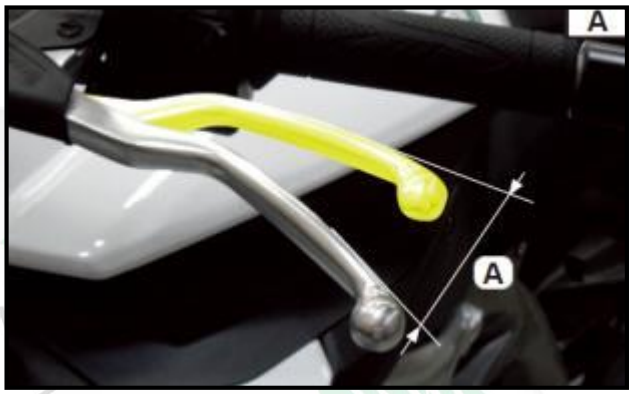
After the free play is adjusted, the handlebar should be turned to the left and right to make sure that there is no change in the engines idle speed.

Clutch Cable

Adjustment of Clutch Cable Clearance

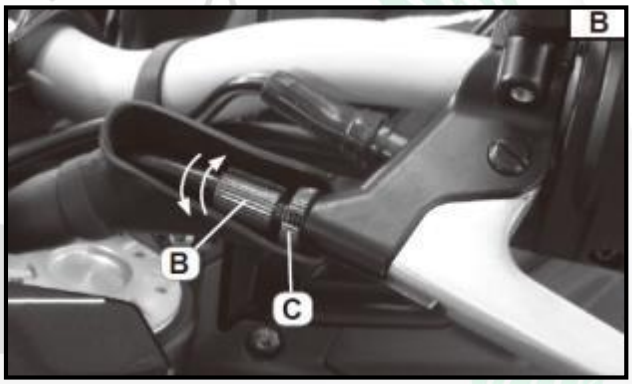
Check:

Free play of the clutch lever (A)
Make an adjustment if needed:
Measure the free play of the clutch lever at the end of the clutch handle.
Free play: 10 - 20mm



Adjustment:

1. Loosen the locking ring nut (C).
2. Rotate and adjust the clutch cable adjuster nut (B) clockwise or anticlockwise to set the clutch cable clearance as specified, as shown in Fig. B.
Increase clearance in clockwise direction.
Reduce clearance in anticlockwise direction.

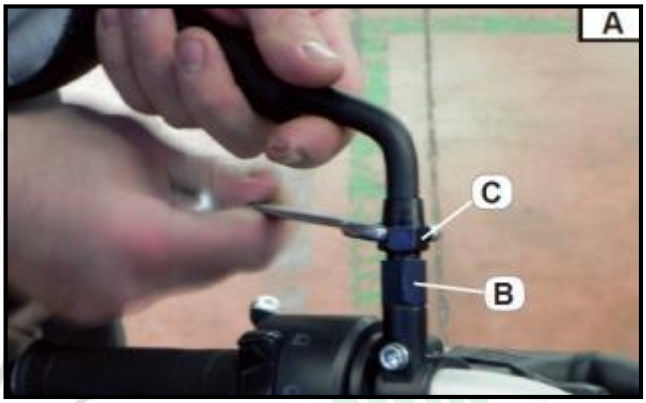


Notes
Use the adjusting nut at (E) RH side of engine if the clutch cable does not reach the specified clearance at the lever, as shown in Fig. C.

Rearview Mirror

Adjustment of Rearview Mirrors

The following steps are applicable to the adjustment of both rearview mirrors.



Adjustment

Fasten the rearview mirror on the handlebar, check the nut (B) and tighten it to the perch, as shown in Fig. A.

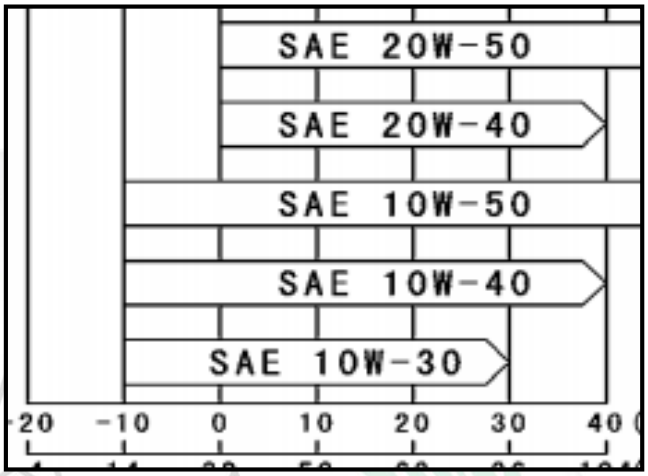
1. Unscrew the locking nut (C).
2. Rotate the rearview mirror rod to the proper position, and adjust the mirror position.
3. Fasten the nut (C).

Notes
Adjust the right rearview mirror in the same way.

Engine Oil

Engine Oil Level Inspection

Recommended Engine Oil



Model: API SE, SF or SG
API SH, SJ or SL, JASO MA, MA1 or MA2
Viscosity: SAE 10W-40
Capacity: 2.8 L (during oil change)
3.0 L (during disassembly)

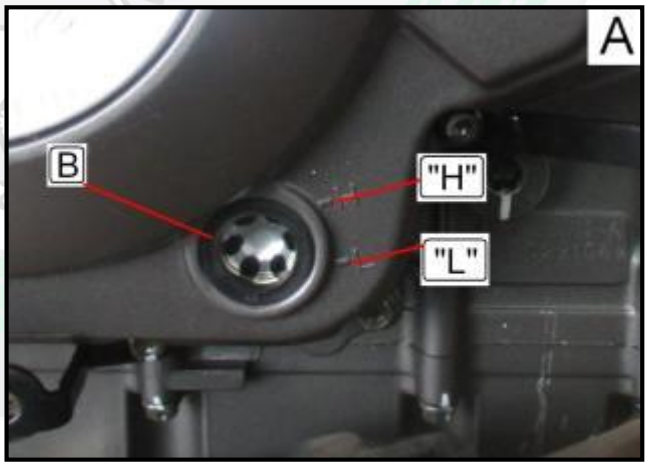
Notes
○ **DO NOT add any chemical additives into the engine oil! The engine oil that meets the above requirement is carefully prepared, and can adequately lubricate the engine and clutch.** ○ **Make corresponding changes according to the atmospheric conditions of specific areas, although it is recommended to use engine oil with a viscosity of 10W-40 in most cases.**

Parking: Park the motorcycle on flat ground.

Notes
When parking, the motorcycle should be in a vertical position on flat ground.

Start:

View the oil window (B) after the motorcycle is in the vertical position, the engine is running at idling speed for 2-3min, and then stopped for 2-3min, as shown in Fig. A.

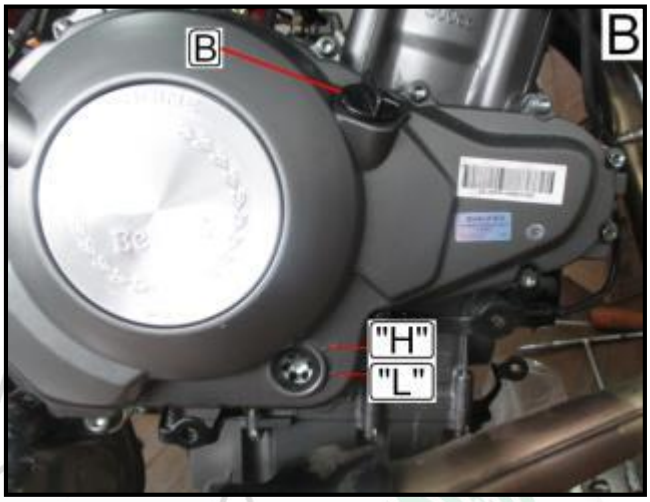


Warning
Please do not start the engine if the oil level is less than the lowest value (L).

Engine Oil

Engine Oil Level Inspection

Check



Engine Oil Level
Add the recommended engine oil until the oil level is between the lowest value (L) and the highest value (H) if it is less than the lowest value (L).

Adding Engine Oil:

1. Shut down the engine, and unscrew the oil filler cover (B).
2. Pour enough of the proper engine oil into the engine and place it between “H” and “L”, as shown in Fig. B.
3. Reinstall the Oil Filler Cap back into its original position.

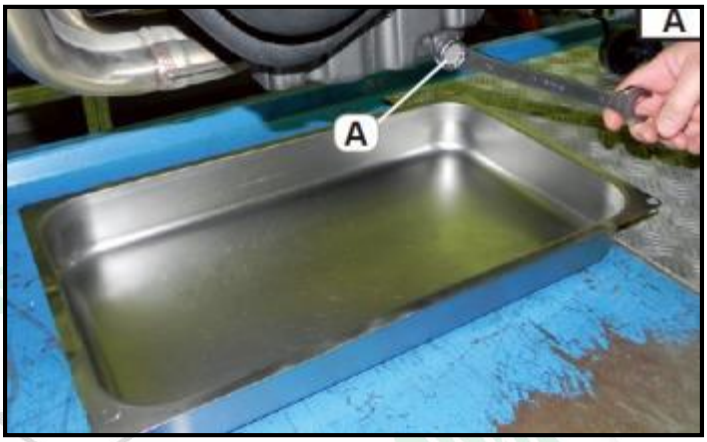
Note:
When checking the engine oil level, restart the engine to preheat it for several minutes, and then shut it down. Wait for 2-3 minutes to have enough time for the engine oil to flow down.

Important:

- Since engine oil also lubricates the clutch, engine oil of the wrong type or containing additives may cause clutch slipping. Therefore, we recommend you only use engine oil without any chemical additives or other types of engine oil not listed in the list of engine technical specifications.
- People or pets that swallow engine oil will be poisoned. In case of ingestion, send the poisoned people or pets to the hospital; do not force them to vomit to prevent the oil from being inhaled. Short exposure to engine oil may cause skin irritation.
- Store engine oil out of the reach of children and pets.
- Please wear long-sleeved clothing and waterproof gloves every time you handle engine oil.
- Please flush skin that is exposed to engine oil with soap or water.
- Please recycle all used engine oil.

Engine Oil

Replacement of Engine Oil



Start: engine, and preheat it for several minutes before shutdown.

Place: an appropriate container under the drain bolt (A) to collect the engine oil, as shown in Fig. A.

Remove: the oil drain bolt (A) (with the copper gasket).

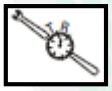
Drain: engine oil from the crankcase.

Note:

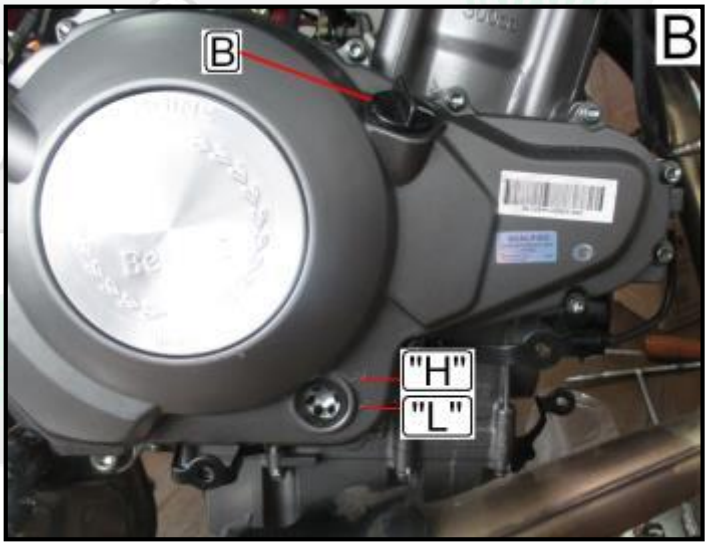
Replace: sealing the gasket for the drain bolt.

Assemble

New sealing gasket
Magnetic drain bolt
Fasten the magnetic bolt according to the following torque:



Torque: **16 ft·lb**



Fill: the specified amount of recommended engine oil into the crankcase filling port.

Install: oil filler cover (B), as shown in Fig. B.

Start: Engine.

Preheat the engine for several minutes before shutdown.

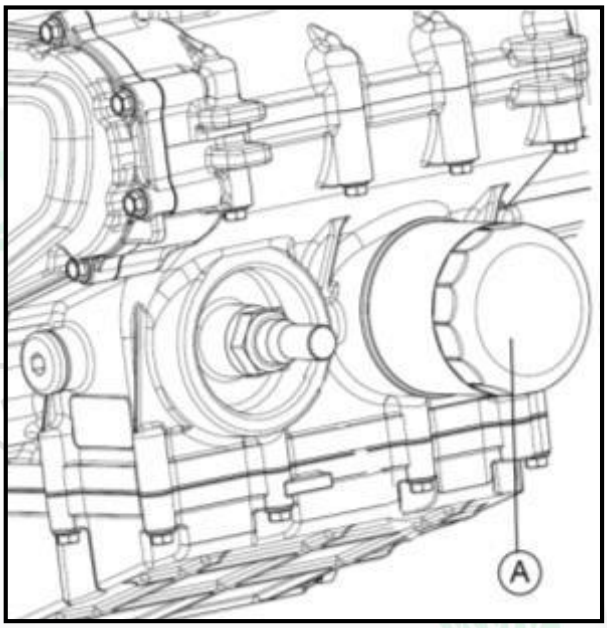
Note:

Ensure that the oil level is between the symbols “H” and “L” on the oil window, as shown in Fig. B.
Add engine oil if needed.

Engine Oil Filter

Replacement of the Engine Oil Filter

Replacement of engine oil filter



● Drain the engine oil (see “Replacement of engine oil”).

● Remove the engine oil filter [A] with the oil filter wrench.

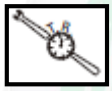
Special tool- engine oil filter wrench

● Replace the engine oil filter with a new one.

● Tighten the engine oil filter with the engine oil filter wrench.

Tightening torque:

Locking torque of engine oil filter:



Torque: **17 N·m (1.7 kgf·m, 13 ft·lb)**

Note:

○ *Please do not tighten the engine oil filter manually, because it cannot reach the specified locking torque.*

● Pour in engine oil of the specified type according to the specified amount (see “Replacement of engine oil”).

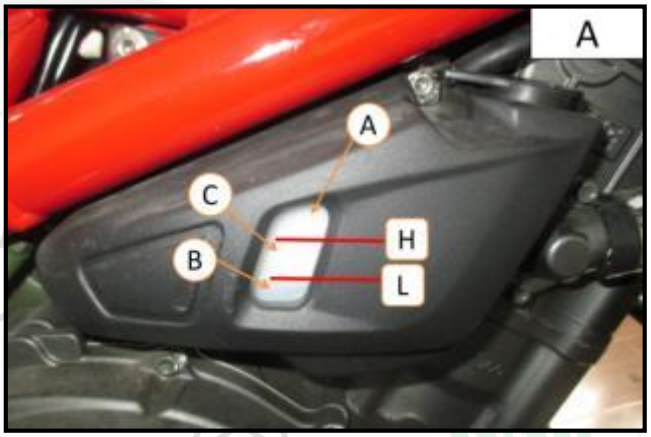
Coolant

Coolant Level Check

Parking: Park the motorcycle on flat ground.

Note:

When parking, the motorcycle should be in a vertical position on flat ground.



Remarks

○ Check the liquid level when the engine has cooled (at room temperature or ambient temperature).

● Place the motorcycle vertically (do not use the side stand), and check the coolant liquid level in the coolant reservoir [A], as shown in Fig. A.

★ Unscrew the cover of the coolant reservoir, and add coolant until the liquid level reaches the liquid level "H" [C] if the coolant liquid level is less than the liquid level "L" [B].

"L": Lowest level

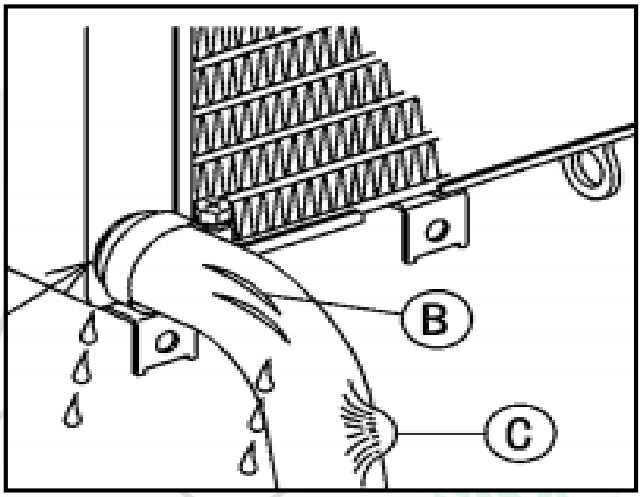
"H": Highest level

Notes
When adding coolant, add the specified mixture of coolant and distilled water. Adding water separately will dilute the coolant and reduce its anticorrosive property. The diluted coolant may corrode aluminum engine parts. In the case of an emergency you can add distilled water separately, but it is recommended that you change the fluid to the proper ratio again within a few days. If you notice that you must frequently add coolant or the coolant reservoir is completely dry, a leak may exist in the cooling system. Check for cooling system leaks, since the coolant may corrode painted surfaces. Immediately rinse with water if the frame, engine, wheels or other painted parts are spattered with coolant.

Radiator Hoses

Radiator Hose Inspection

Check: radiator hoses (coolant leakage, radiator hose damage and installation of radiator hoses)



Warning:

If the radiator hoses are improperly repaired, high pressure water from those hoses will cause coolant leakage [A] or water hose cracking.

Check:

Check whether the radiator hoses are corroded. Squeeze the radiator hoses, if they feel hard, fragile, and/or overtly soft or swelling it is time to replace the radiator hoses.

Note:

If any wear, cracks [B] or expansion [C] is found, the radiator hose must be replaced.

Check:

Check whether the radiator hoses are firmly seated, and the hose clamp is properly tightened.

Tightening torque of the radiator (water) hose clamps: 2.0 N·m (0.20 kgf·m, 18 in·lb).

Spark plug

Removal/Replacement of the Spark Plugs

The following steps are applicable to all the spark plugs.

Warning:

The engine must be cool during inspection and replacement of the spark plugs.

Disassembly:

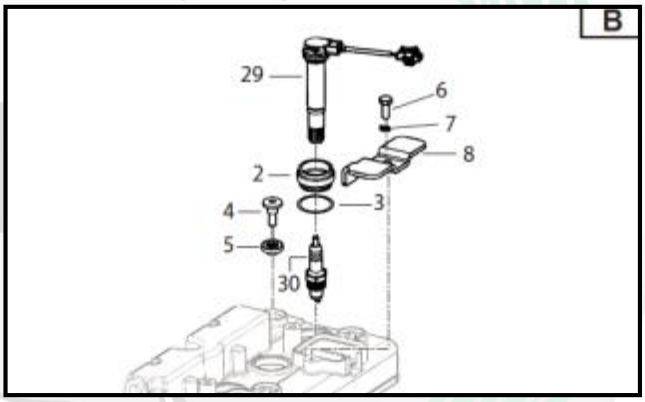
Follow the instructions in the earlier chapters of this manual “Air filter” and “Disassembly / Assembly of Air Box” prior to the below steps.

Important:

Before removal of the spark plugs, remove any dust from the cylinder cover with a stream of compressed air to prevent dust from falling into the cylinder.

Disassemble:

Bolt (6) and Washer (7)
Support (8)
Rubber grommet (2)
O-ring (3)



Disconnection:

Disconnect the connector (X) from the coil (29), as shown in Fig. A.

Remove: the coils (29)

Remove: the spark plugs (30) below, as shown in Fig. B.

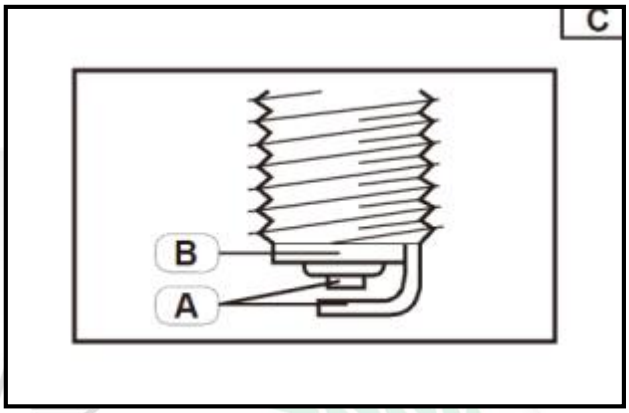
Note:

During removal of the spark plugs, make every attempt to keep impurities from entering the engine through the spark plug holes.

Spark Plug

Spark Plug Inspection

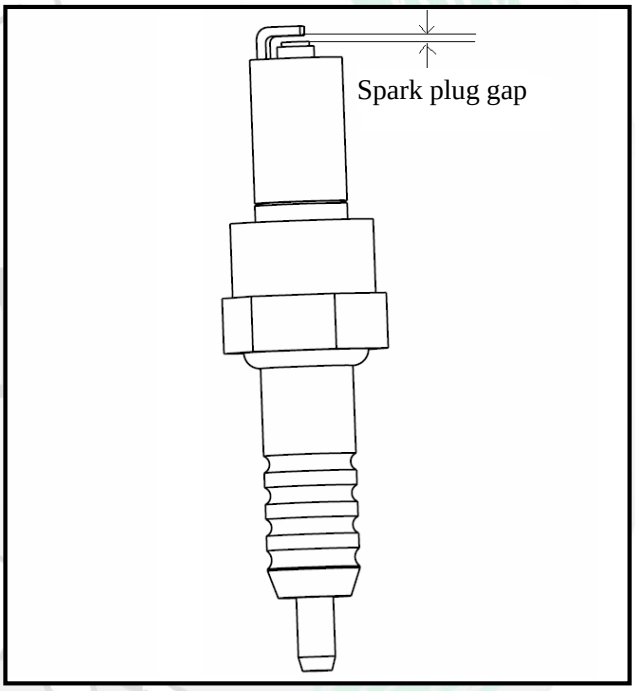
The following steps are applicable to all spark plugs.
Check the model of the spark plug.



Check:

1. Replace the spark plugs if there is any damage / wear on the electrode (A), as shown in Fig. C.
2. Insulated part (B), as shown in Fig. C.

If the color is abnormal, replace the spark plug.
The normal color is medium-light brown.



Check:

Check the spark plug gap.
Clearance: 0.6 - 0.7mm

Spark Plug

Spark Plug Inspection

The following table contains typical damages to the spark plugs due to different causes and their solutions.

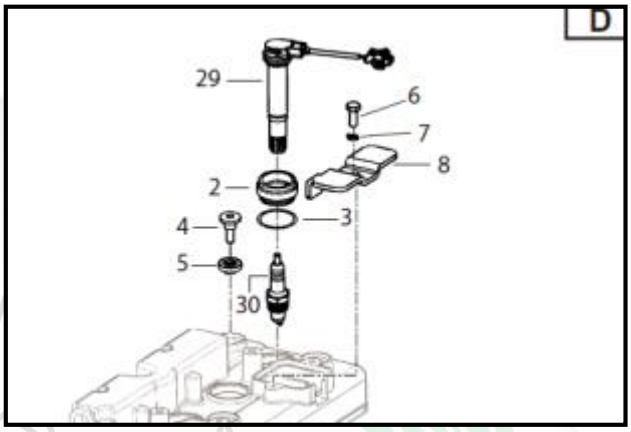
	Polluted spark plug		Overheated spark plug
Cause	Solution	Cause	Solution
Over-rich fuel mixture Vaporization setting error	Adjust fuel / vaporization systems.	Ignition advance	Adjust ignition timing.
		Inadequate air / fuel mixing	Adjust air / fuel ratio.
Electrical failure Poor coil connection	Check coil connection and relevant impedance	Lack of coolant / or lubricating oil	Add coolant and / or lubricating oil.
Special cycling Long-term low speed	The speed of motorcycle needs to be 80km/h.	Too low torque of spark plug	Fasten it to the proper torque.
Too cold of a spark plug	Use a hotter spark plug as specified.	Use of a too hot spark plug	Use colder spark plug as specified.

Spark Plug

Installation of the Spark Plugs

The following steps are applicable to all spark plugs.

Warning: Lubricate the spark plug threads with a copper-based grease.



Note: Before installation of the spark plugs, clean the parts and the side contacting with the gasket.

Installation:

Install the spark plugs into the cylinder head. At first, put the spark plug in the spark plug socket by hand and tighten it, and then fasten it with the spark plug wrench to the proper torque.

Torque: 9 ft·lb

Note:

The spark plugs should not be over torqued, the threads are staggered to prevent the threads on the cylinder head from being damaged.
During installation of the spark plugs, do not allow any impurities to enter the engine through the spark plug holes.

Assemble:

Coil (29)
Rubber grommet (2) and O-ring gasket, as shown in Fig. D.

Connect:

Coil connector

Assemble:

Bolt (6) and Washer (7)
Support (8)
Tighten Bolt (6) to the proper torque.

Torque: 6 ft·lb

Valve Clearance

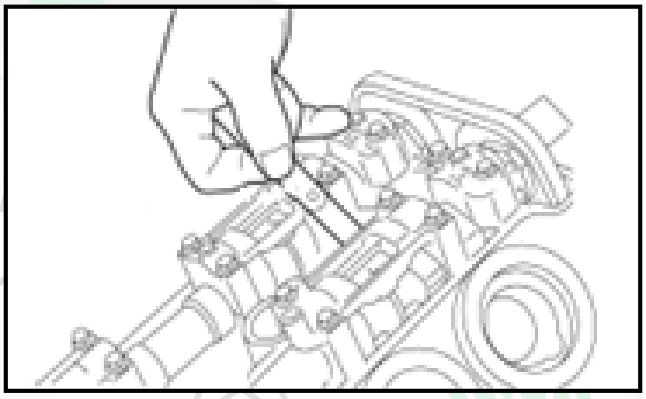
Valve Clearance Inspection

Note:

● Valve clearance can only be checked and adjusted when the engine has cooled down (indoor temperature).

Disassembly:

Remove the cylinder head cover from the engine (see “engine/cylinder head cover” section of Chapter V)



Check:

● Measure the valve clearance between the cam and the valve tappet with a thickness gauge.

Valve clearance

Standard:

Exhaust valve: 0.19 ~ 0.25 mm (0.0075 ~ 0.0099 in.)

Intake valve: 0.13 ~ 0.19 mm (0.0051~ 0.0075 in.)

Note:

● Insert the thickness gauge on the valve tappet horizontally.

Suitable: [A]

Unsuitable: [B]

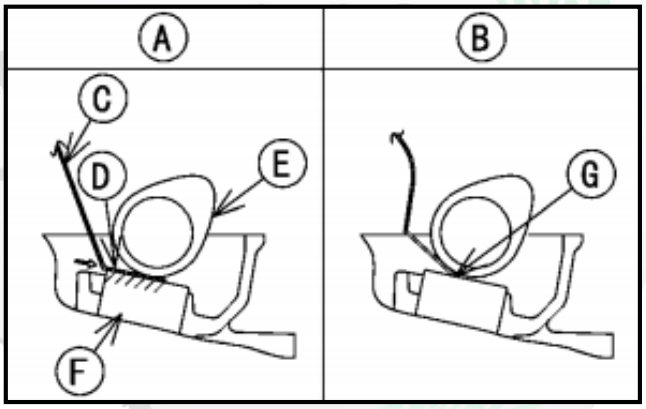
Feeler gauge: [C]

Insert horizontally: [D]

Cam: [E]

Valve tappet: [F]

Clipping the front end of feeler gauge on the valve tappet is incorrect: [G]



★ If the valve clearance is not within the specified range, record the valve clearance first, and then adjust the clearance.

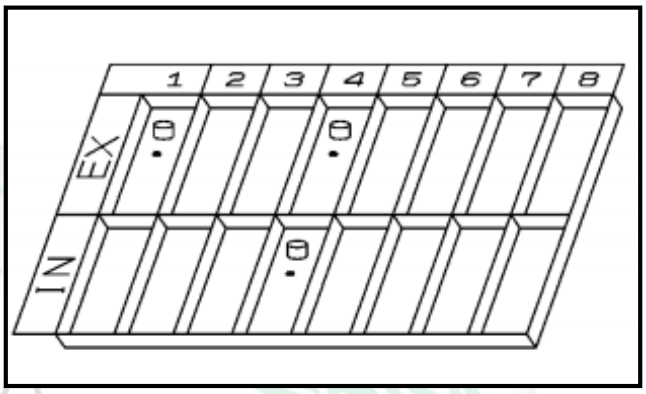
Assembly:

Assembly should be conducted in the reverse sequence of disassembly (see “engine/cylinder head cover” section of Chapter V)

Valve Clearance

Valve Clearance Adjustment

Adjustment of Valve Clearance



● In order to change the valve clearance, remove the camshaft chain tensioner, camshaft and valve tappet. Replace the currently used valve shim with a valve shim of different thickness.

Note:

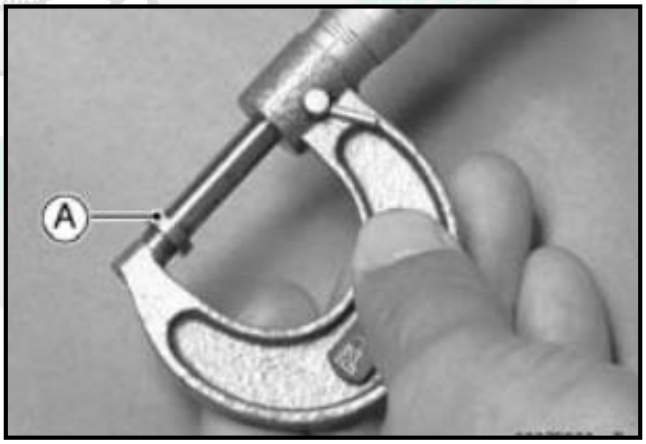
● Be sure to install the valve tappet and valve shim into their original positions, mark their locations before removing them to help facilitate this.

● In addition to the standard valve shims in the valve clearance adjustment table, the following valve shims can also be used.

Adjustment of valve shims:

Thickness	Thickness
1.325mm	1.825mm
1.375mm	1.875mm
1.425mm	1.925mm
1.475mm	1.975mm
1.525mm	2.025mm
1.575mm	2.075mm
1.625mm	2.125mm
1.675mm	2.175mm
1.725mm	2.225mm
1.775mm	2.275mm

Check:



● Remove dust or grease from the valve shims.

● Measure the thickness of the removed valve shim [A].

Valve Clearance

Adjustment of Valve Clearance

Valve Clearance Adjustment Table for Exhaust Valves

Examples of measured values (mm) of valve clearance	Examples of the current valve shims																				
Thickness (mm)	1.3	1.35	1.4	1.45	15	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3
0.00～0.02	—	—	—	—	—	1.3	1.35	1.4	1.45	15	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05
0.03～0.06	—	—	—	—	1.3	1.35	1.4	1.45	15	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1
0.07～0.10	—	—	—	1.3	1.35	1.4	1.45	15	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	2.15
0.11～0.14	—	—	1.3	1.35	1.4	1.45	15	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	2.15	2.2
0.15～0.18	—	1.3	1.35	1.4	1.45	15	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	2.15	2.2	2.25
0.19～0.25	valve clearance/adjustment is unnecessary																				
0.26～0.30	1.35	1.4	1.45	1.5	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	2.15	2.2	2.25	2.3	
0.31～0.35	1.4	1.45	1.5	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	2.15	2.2	2.25	2.3		
0.36～0.40	1.45	1.5	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	2.15	2.2	2.25	2.3			
0.41～0.45	1.5	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	2.15	2.2	2.25	2.3				
0.46～0.50	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	2.15	2.2	2.25	2.3					
0.51～0.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	2.15	2.2	2.25	2.3						
0.56～0.60	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	2.15	2.2	2.25	2.3							
0.61～0.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	2.15	2.2	2.25	2.3								
0.66～0.70	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	2.15	2.2	2.25	2.3									
0.71～0.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	2.15	2.2	2.25	2.3										
0.76～0.80	1.85	1.9	1.95	2.0	2.05	2.1	2.15	2.2	2.25	2.3											
0.81～0.85	1.9	1.95	2.0	2.05	2.1	2.15	2.2	2.25	2.3												
0.86～0.90	1.95	2.0	2.05	2.1	2.15	2.2	2.25	2.3													
0.91～0.95	2.0	2.05	2.1	2.15	2.2	2.25	2.3														
0.96～1.00	2.05	2.1	2.15	2.2	2.25	2.3															
1.01～1.05	2.1	2.15	2.2	2.25	2.3																
1.06～1.10	2.15	2.2	2.25	2.3																	
1.11～1.15	2.2	2.25	2.3																		
1.16～1.20	2.25	2.3																			
1.21～1.25	2.3																				

Thickness (mm) of valve shims to be installed

1. Measure the valve clearance (engine has cooled down).
2. Check the size of the current valve shims.
3. The valve clearance in the vertical column corresponds to size of the current valve shim in the horizontal column.
4. The values in the crossing blank spaces of vertical and horizontal columns are the specified values of the shim size. When the size of the valve shim is equal to the value in the blank space, the size of the valve clearance is suitable.

   Example: Thickness of the current valve shim is **1.60 mm**.

   The measured valve clearance is **0.33 mm**.

   Replace the **1.60 mm** valve shim with **1.70 mm** valve shim.
5. Re-measure the valve clearance, and re-adjust it if necessary.

Valve Clearance

Adjustment of Valve Clearance

Valve Clearance Adjustment Table for Intake Valves

Examples of measured values (mm) of valve clearance	Examples of the current valve shims																					
Thickness (mm)	1.3	1.35	1.4	1.45	15	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3
0.00～0.04	—	—	—	1.3	1.35	1.4	1.45	15	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	
0.05～0.08	—	—	1.3	1.35	1.4	1.45	15	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	
0.09～0.12	—	1.3	1.35	1.4	1.45	15	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	
0.13～0.19	valve clearance/adjustment is unnecessary																					
0.20～0.24	1.35	1.4	1.45	15	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3		
0.25～0.29	1.4	1.45	15	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3			
0.301～0.34	1.45	15	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3				
0.35～0.39	15	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3					
0.40～0.44	1.55	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3						
0.45～0.49	1.6	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3							
0.50～0.54	1.65	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3								
0.55～0.59	1.7	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3									
0.60～0.64	1.75	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3										
0.65～0.69	1.8	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3											
0.70～0.74	1.85	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3												
0.75～0.79	1.9	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3													
0.80～0.84	1.95	2.0	2.05	2.1	215	2.2	2.25	2.3														
0.85～0.89	2.0	2.05	2.1	215	2.2	2.25	2.3															
0.90～0.94	2.05	2.1	215	2.2	2.25	2.3																
0.95～0.99	2.1	215	2.2	2.25	2.3																	
1.00～1.04	215	2.2	2.25	2.3																		
1.05～1.09	2.2	2.25	2.3																			
1.10～1.14	2.25	2.3																				
1.15～1.19	2.3																					

Thickness (mm) of valve shims to be installed

1. Measure the valve clearance (engine has cooled down).
2. Check the size of the current valve shims.
3. The valve clearance in the vertical column corresponds to size of the current valve shim in the horizontal column.
4. The values in the crossing blank spaces of vertical and horizontal columns are the specified values of the shim size. When the size of the valve shim is equal to the value in the blank space, the size of the valve clearance is suitable

Example: Thickness of the current valve shim is **1.85 mm**.

The measured valve clearance is **0.36 mm**.

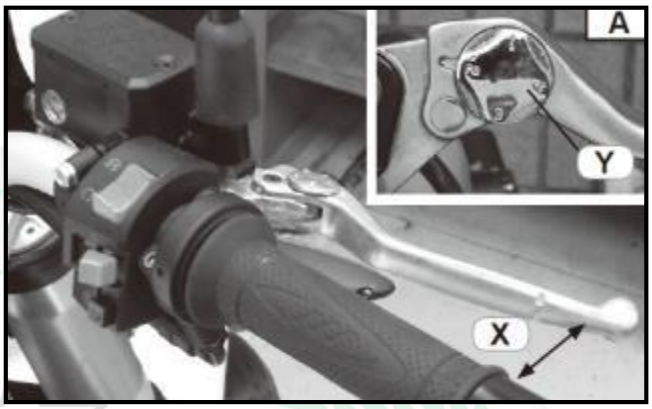
Replace the **1.85 mm** valve shim with **2.05 mm** valve shim.

5. Re-measure the valve clearance, and re-adjust it if necessary.

Brake Adjustment

Adjustment of Front Hydraulic Brake

Adjustment



Position of the brake handle is shown in Fig. A ("X" is the distance between the throttle and the brake handle)

Note:

Push the brake handle forward, to offset the spring tension, at the same time, rotate the ring nut "Y", and adjust its position clockwise or counterclockwise until the brake handle is in a suitable position.

Position of the ring nut	Distance
Position 1	Away from the handle
Position 4	Close to the handle

Warning:

If the brake lever feels soft when you pull it in, there may be air in the brake system. Before using the motorcycle, it is necessary that you discharge any air in the brake circuit. Air in the brake circuit will reduce braking performance, and may even allow the vehicle to become unstable, and cause accidents. So, check the system and, if necessary, remove any air in the brake circuit.

Important:

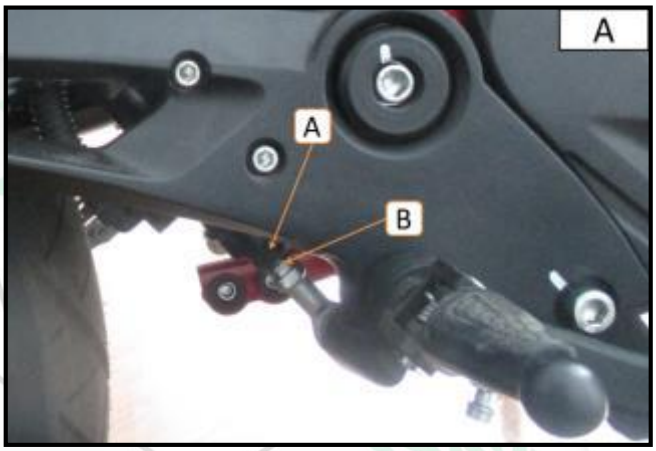
After adjusting the position of the brake lever, make sure that there is no braking drag.

Brake Adjustment

Adjustment of Rear Hydraulic Brake

Adjustment:

Adjust the position of the brake pedal with locknut and the master cylinder pin, as shown in Fig. A
Loosen the locknut B
Unscrew the master cylinder pin A



Position of the master cylinder pin	Position of the brake pedal
Clockwise	The pedal goes up
Counter-clockwise	The pedal goes down

Warning:

If the brake lever feels soft when you pull it in, there may be air in the brake system. Before using the motorcycle, it is necessary that you discharge any air in the brake circuit. Air in the brake circuit will reduce braking performance, and may even allow the vehicle to become unstable, and cause accidents. So, check the system and, if necessary, remove any air in the brake circuit.

Important:

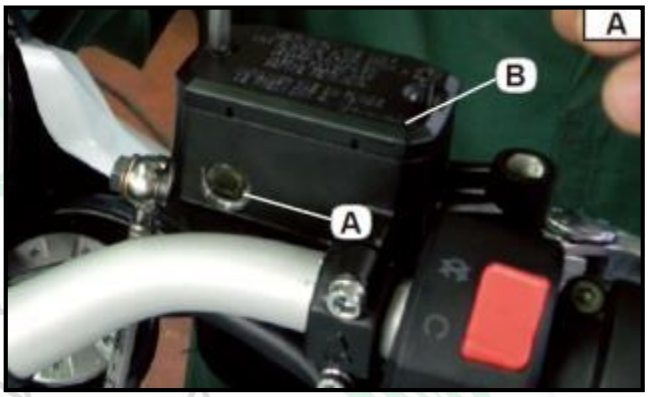
After adjusting the position of the brake pedal, make sure that there is no braking drag.

Brake Fluid Inspection

Inspection/Replacement of the Front Brake Fluid

Parking: Park the vehicle on flat ground.

NOTE: Stand the motorcycle up with a rear stand and make sure it is vertical.



Check: the brake fluid level

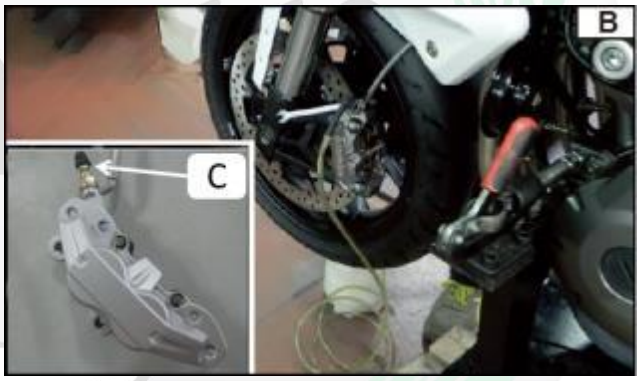
If the brake fluid is below the minimum mark on the observation window (A) in Figure A, add the recommended brake fluid until it reaches the correct fluid level.

Liquid adding procedure:

When the motorcycle is on flat ground, unscrew the master cylinder cover (B) from the brake master cylinder, as shown in Fig. A

Check:

Check the brake fluid cylinder diaphragm on the cover. If there is any damage/wear, replace the brake fluid cylinder diaphragm



Important:

Brake fluid may damage painted surfaces or plastic parts. Thus, wrap the pump with absorbent paper or a rag, and clean up any spilled brake fluid immediately. Add fluid, until the fluid level is above the observation window of the pump, as shown in Fig. C

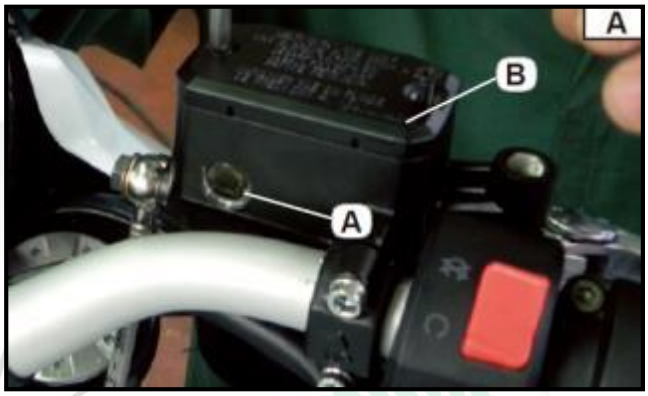
Warning

Use only the specified brake fluid. Other brake fluids may cause deterioration of the rubber gaskets, leakage, and improper operation of the braking system.
Use the same brake fluid in the system when adding brake fluid. Different brake fluid mixtures may cause adverse chemical reactions, which can lead to degradation of the braking system.
Be careful not to let water flow into the fluid bottle when adding brake fluid. Water will significantly reduce the boiling point of the brake fluid and will produce vapor bubbles when it is heated, which will cause degradation of the braking system.

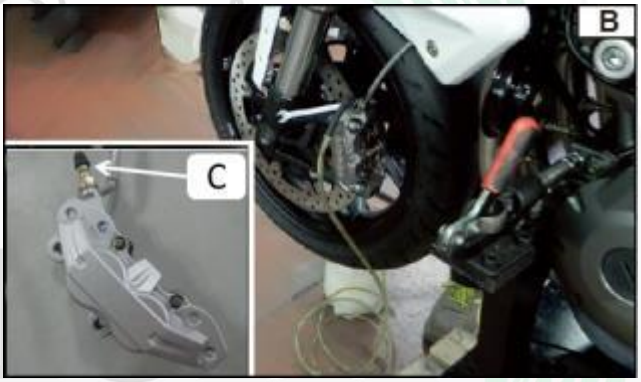
Brake Fluid Inspection

Inspection/Replacement of the Front Brake Fluid

Replacement of brake fluid:



1. Place the master cylinder horizontally, and remove the brake fluid cylinder cover.
2. Attach a tube to the end of the fluid drain screw, and place a drip pan at the front end of the tube, as shown in Fig. B
3. Pump and hold the lever then loosen the fluid drain screw, once the fluid escapes tighten the screw.
4. Repeat step 3 several times until the discharge tube no longer discharges dirty brake fluid.
5. Tighten the oil drain screw.
6. Fill with brake fluid until it is above the lower limit.
7. Operate the brake handle slowly, until bubbles no longer come out of holes in the brake cylinder and the brake lever feels solid.
8. After adjustment is completed, conduct assembly in the reverse sequence of disassembly.



Note:

Add brake fluid at the same time. The brake fluid should not fall below the lower limit.

Tighten the drain screw to the following torque:

Torque 4.5 ft·lb

Sequence for Removing Air from the Brake System

1. Remove the brake fluid cylinder cover.
2. Remove the brake fluid cylinder diaphragm.
3. Attach a tube to the end of the fluid drain screw, and place a drip pan at the other end of the tube.
4. After pumping the brakes several times, hold the brake lever tight, loosen the fluid drain screw about a 1/2 a turn, and then tighten it rapidly.
5. Repeat the above action until all the bubbles have been completely discharged out of the fluid drain screw.
6. Install the brake fluid cylinder diaphragm
7. Install the brake fluid cylinder cover

Note:

Do not let go of the brake lever before re-tightening the fluid drain screw.

Note:

Add brake fluid at the same time. The brake fluid should not fall below the lower limit.

Brake Fluid Inspection

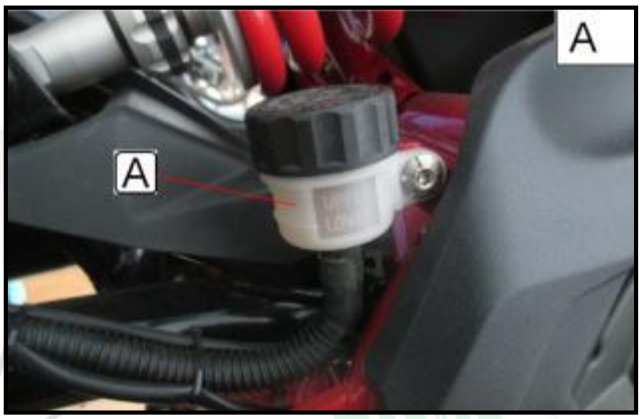
Inspection/Replacement of the Rear Brake Fluid

Parking: Park the vehicle on flat ground

NOTE: Stand the motorcycle upright with a rear stand and make sure it is vertical.

Check: the brake fluid level

If the brake fluid is below the minimum mark on the reservoir (A) in Figure A, add the recommended brake fluid until it reaches the upper fluid level mark.



Important:

Brake fluid may damage painted surfaces or plastic parts. Thus, wrap the reservoir with absorbent paper or a rag, and clean up any spilled brake fluid immediately.

Adding fluid:

When parked on flat ground, unscrew the fluid reservoir cap (B) from the fluid reservoir, as shown in Fig. B

Check:

Check the reservoir diaphragm at (C). If there is any damage/wear, replace the reservoir diaphragm, as shown in Fig. C

Brake Fluid Inspection

Inspection/Replacement of the Rear Brake Fluid

Add liquid, until it is above lower limit.

Warning

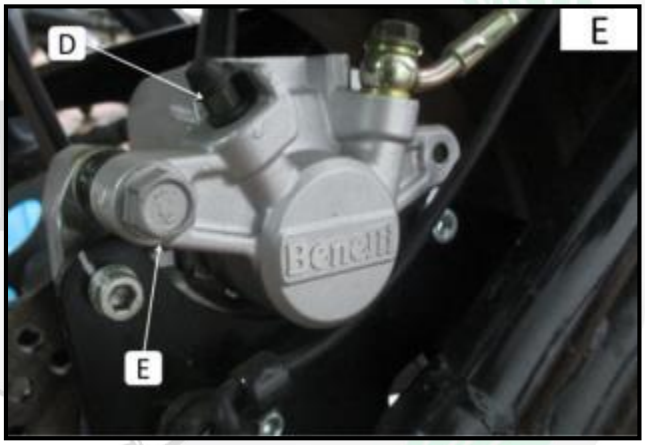
Use only the specified brake fluid. Other brake fluids may cause deterioration of the rubber gaskets, leakage, and improper operation of the braking system.

Use the same brake fluid in the system when adding brake fluid. Different brake fluid mixtures may cause adverse chemical reactions, which can lead to degradation of the braking system.

Be careful not to let water flow into the fluid bottle when adding brake fluid. Water will significantly reduce the boiling point of the brake fluid and will produce vapor bubbles when it is heated, which will cause degradation of the braking system.

Sequence for Removing Air from the Brake System

1. Remove the fluid reservoir cap.
2. Remove the fluid reservoir diaphragm.
3. Attach a tube to the end of the oil drain screw (D), and place a drip pan at the other end of the tube.
4. Remove bolt (E) from the rear brake caliper to lift the brake cylinder
5. After braking several times, press and hold the brake pedal down, loosen the fluid drain screw about 1/2 a turn, and then tighten it rapidly.
6. Repeat the above action until all the bubbles have been completely discharged out of the fluid drain screw.
7. Install the brake reservoir diaphragm.
8. Install the brake reservoir cap.



Note:

Do not let go of the brake pedal before re-tightening the fluid drain screw.

Note:

Add brake fluid at the same time. The brake fluid should not fall below the lower limit.

Tighten the drain screw to the following torque:

Torque 4.5 ft·lb

Upon completion of the fluid flushing procedure, lower the caliper, and reinstall fastening bolt (D) to the following torque:

Torque 22 ft·lb

Check of Brake Fluid

Check of Rear Brake Fluid Level/Add Brake Fluid

Replacement of brake fluid:

1. Place the oil cup horizontally, and remove the oil cup cap.
2. Mount a tube on the front end of the oil drain screw, and prepare a drip pan at the front end of the tube.
3. Loosen the oil drain screw.
4. Repeat braking several times until the oil discharge screw no longer discharges brake fluid.
5. Tighten the oil drain screw.
6. Add brake fluid until it is above the lower limit.
7. Press on the brake pedal, and fill the tube with brake fluid.
8. Operate the brake pedal slowly, until bubbles no longer come out of holes in the brake cylinder and the brake pedal feels solid.
9. Release air.
10. After adjustment is completed, conduct assembly in the reverse sequence of disassembly.

Note:

Add brake fluid at the same time. The brake fluid should not fall below the lower limit.
Tighten the drain screw to the following torque:

Torque 4.5 ft·lb

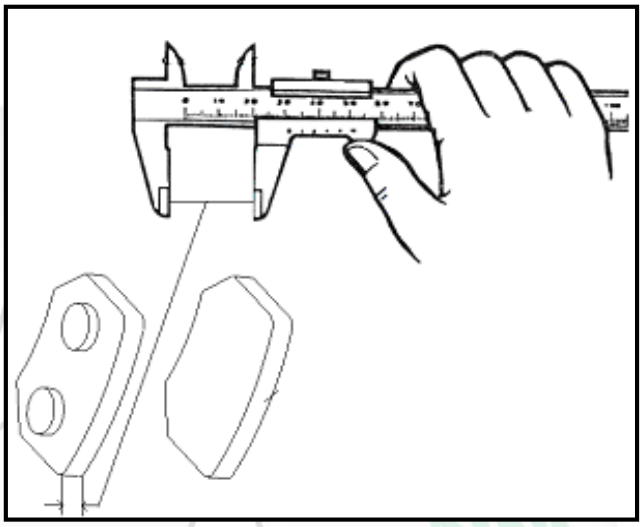
Brake Pad Inspection

Front and Rear Brake Pad Inspection

The following procedures are applicable to all brake pads.

Check:

Front brake pads/rear brake pads
Wear limit of front and rear brake pads
If the wear limit has been reached, replace the brake pads in pairs.



Brake Pad	Standard	Wear limit
Front Brake Pad	7.8mm	3.8mm
Rear Brake Pad	7.0mm	3.7mm

Note:

For replacement of brake pads, see “Front brake pad / rear brake pad” “Front and rear brake / rear brake pads” in the “Motorcycle” chapter.

Brake Hose Inspection

Brake Hose Inspection

The following procedures are applicable to all brake hoses and all brake hose clamps.

Check:

Front / Rear brake hoses.

If there are any signs of cracks / wear or damage, please replace them.

Check:

Clamp (A) of the front brake hose, shown in Fig. A. If the front brake hose is loosened, tighten the clamp bolt.

Check

Clamp (A) of the rear brake hose, shown in Fig. B. If the rear brake hose is loose, tighten it using the cable clamp.

Drive Chain Adjustment

Drive Chain Adjustment

Note: When the engine is running, do not check or adjust the drive chain.

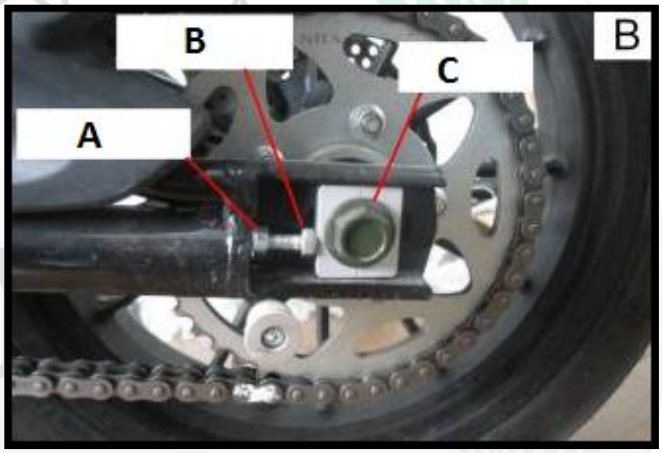
Note: When checking the drive chain, conduct the adjustment at the point which looks loosest.

Warning: If the drive chain is too tight, damage may occur to the engine or other key parts; if the drive chain is too loose, it may fall off and damage the engine or cause an accident. We recommend keeping the chain slack within the specified range.

Parking: Park the motorcycle on flat ground.

Warning: Support the motorcycle using a rear stand, to avoid tipping and to lift the rear wheel.
Rotate the rear wheel several times to find the position where the drive chain is loosest.

Check: If the drive chain slack is not within the specified value, adjust it. Fig. A



Drive Chain Slack	10 - 20mm

Adjustment: Tension of Drive Chain. Fig. B

1. Loosen the rear wheel axle (C).
2. Loosen the lock nuts (A) on each side using an open-ended wrench.
3. Screw into or out the adjusting bolt (B), until the specified slack has been reached.
4. Tighten the lock nut (A).
5. Fasten the rear wheel axle (C).

Tighten the rear wheel axle according to the following torque.

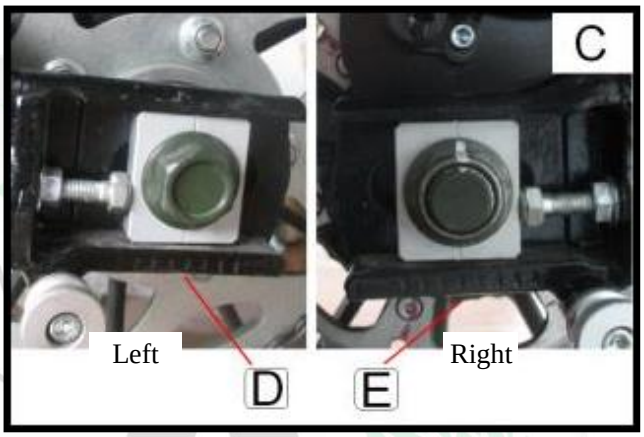
Torque 89 ft·lb

Screw in (B)	Slack increases
Screw out (B)	Slack decreases

Drive Chain Adjustment

Important:

If the drive chain slack is too little, damage may be caused to the engine and other main components and the chain may break. To prevent this phenomena, the chain slack must be kept within the specified range.



Note:

Make sure the scale of right chain adjusting block is at the eighth slot (E) of the swing arm (count backwards), and the scale of left chain adjusting block is at the eighth slot (D) of the swing arm (count backwards). Fig. C
Always ensure that the rear wheel is aligned using the scale on each side of the swing arm.

Lubrication of the Drive Chain

Important:

The drive chain consists of many interacting chain rollers. The chain needs proper maintenance to prevent rapid deterioration.
Therefore, we suggest maintaining the drive chain weekly, especially when using it in the places with a lot of dust. This motorcycle is equipped with a drive chain that has rubber O-rings which are installed between chain plate and roller. The drive chain should not be cleaned using a steam nozzle or pressure washer, corrosive solvent, or a brush with stiff bristles, to avoid damaging the rubber O-rings.
We suggest using only specifically designed chain cleaners and O-ring chain lubricants designed for on road motorcycles.

Note:

Chain lubricants will stick to the chain better if it is lubed after the chain has become warm from use. The best time to lube the chain is after the bike is shut down when parked for the day/night when the engine is still warm.

Steering Stem Bearing Adjustment

Steering Stem Bearing Adjustment

Parking: Park the motorcycle on flat ground

Note:

Support the motorcycle using a rear stand; lift the front wheel off of the ground using a jack under the header pipe.

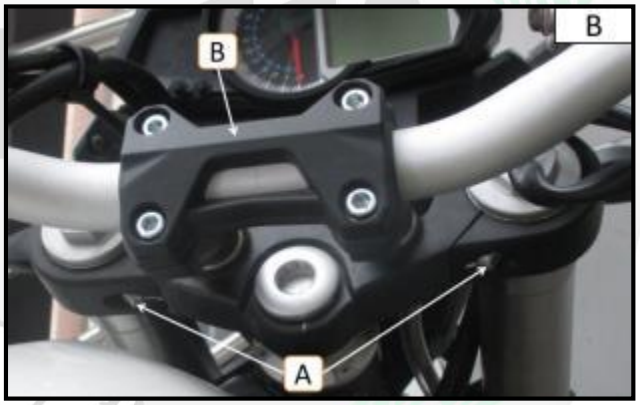
Check: Steering Stem Bearing Adjustment

Hold the end of the handlebar, gently swing the front forks left and right, adjust the bearings if there is any sticking/binding point or if there is any excessive front to rear play. Fig. A

Disassembly: Handlebars (see special section)

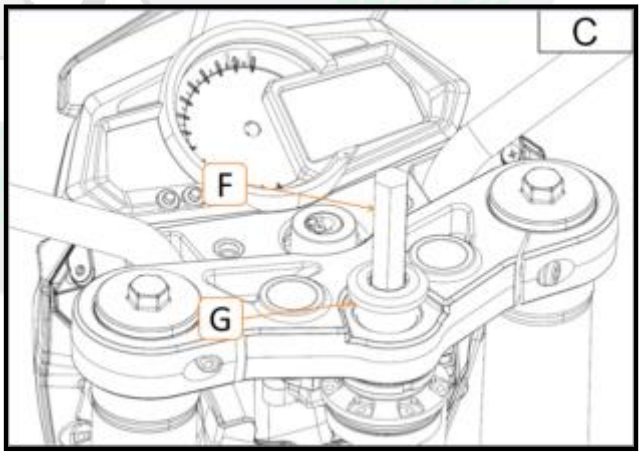
Disassembly: Upper handlebar holder (B), Fig. B

Loosening: Loosen the bolt (A) for the upper triple clamp, Fig. B



Disassembly:

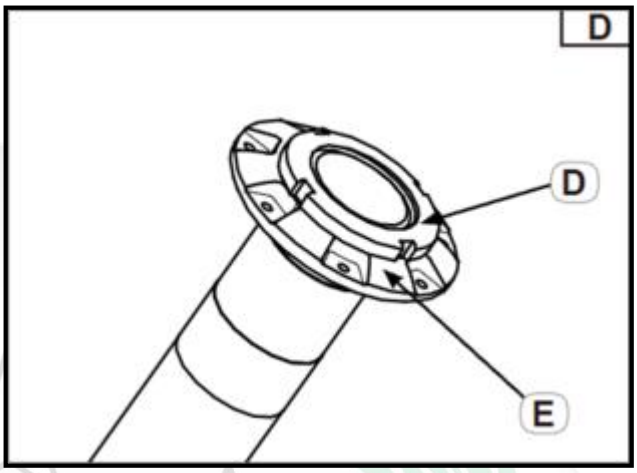
Remove the fastening bolt (G) using special tool (F), Fig. C



Steering Stem Bearing Adjustment

Steering Stem Bearing Adjustment

Adjustment:



Faucet handle

1. Remove the lock nut (D) from the steering stem, and loosen the retainer nut (E). Fig. D

Tighten the retainer nut (E) using the special tool.

Tighten the retainer nut (E) to the following value:

 **Torque 22～26 ft·lb**

2. Rotate the handlebars to the left and the right 2-3 times, and ensure that there is no binding and the bearing race is not loose;
3. Loosen the retainer nut by 1/4 turn and then tighten it, and tighten the retainer nut (E) using the special tool.

Tighten the retainer nut (E) to reach the following value,

 **Torque 15～18 ft·lb**

4. Tighten lock nut (D) using the special tool,

Tighten lock nut (D) to reach the following torque

 **Torque 44 ft·lb**

Warning:

Do not tighten locking nut (D) excessively

Check:

Ensure that the steering stem is not loose, rotate the front fork to the left and the right to ensure that there is no binding point. If there is any binding point, disassemble the upper and lower triple clamps, and check the upper and lower steering bearings.

Steering Stem Bearing Adjustment

Steering Stem Bearing Adjustment

Assembly:

Conduct assembly in inverse order of disassembly.

Recheck: Steering play/feel

Hold the end of the handlebar, rotate it to the left and the right, and repeat the operations to adjust the steering stem bearings if there is any sticking / binding points.

Front Fork Inspection

Front Fork Inspection

Parking: Park the motorcycle at flat ground.

Note: Support the motorcycle correctly, to avoid it tipping over.

Check

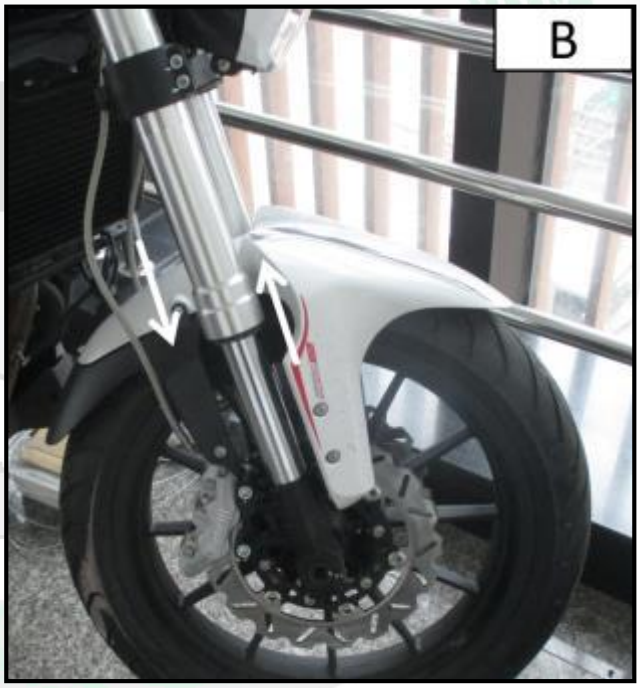
Outer cylinder of shock absorber (A), Fig. A
Inner cylinder of shock absorber (B), Fig. A
If there is any damage, please replace
If there is any leakage, please replace the oil seals

Keep: The motorcycle vertical

Apply: Front brake

Check:

Front fork operation
Push down firmly on the handlebars a few times to ensure that the front fork travels without binding. Fig. B



Note:

If it doesn’t move smoothly, please repair it

Rear Shock Absorber

Rear Shock Absorber Adjustment

Note: Support the motorcycle correctly, to avoid tipping.

Adjustment: Adjust the spring preload, Fig. A

The rear shock absorber is equipped with an adjustment ring nut (A) and a locking ring nut (D) for spring preload adjustment.

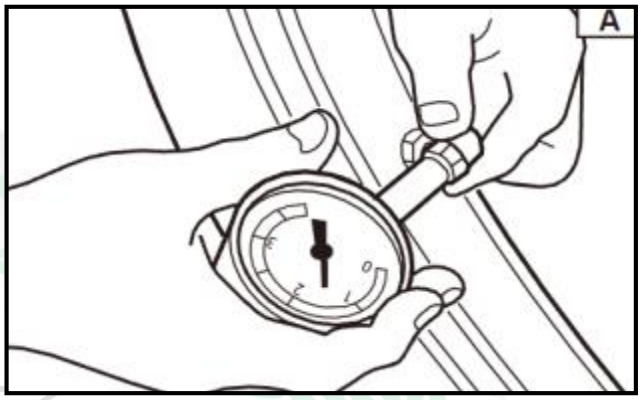
1. Loosen the above-mentioned locking ring nut (D) using a spanner wrench.
2. Loosen the above-mentioned adjusting ring nut (A) using a spanner wrench, to adjust the rear shock absorber to appropriate hardness.
   - Rotate the adjusting ring nut (A) in the direction of (B) to increase the spring preload, to make the rear shock absorber stiffer.
   - Rotate the adjusting ring nut (A) in the direction of (C) to reduce the spring preload, to make the rear shock absorber softer.
3. Upon completion of the adjustment, tighten the locking ring nut (D) using a spanner wrench

Front and Rear Tire Inspection

Inspection

The following procedures are applicable to the front and rear tires.

Check



Adjust the tire pressure if it is not within the specified value, Fig. A.

Warning:

When checking and adjusting tire pressures, the tires must be at room temperature.

Tire pressures and suspension should be adjusted according to the total weight (including luggage, rider, passenger and accessories), and assumed riding speed should also be considered.

Tires may be damaged when overloaded during operation, causing the risk of accidents and injuries.

Overload should be avoided.

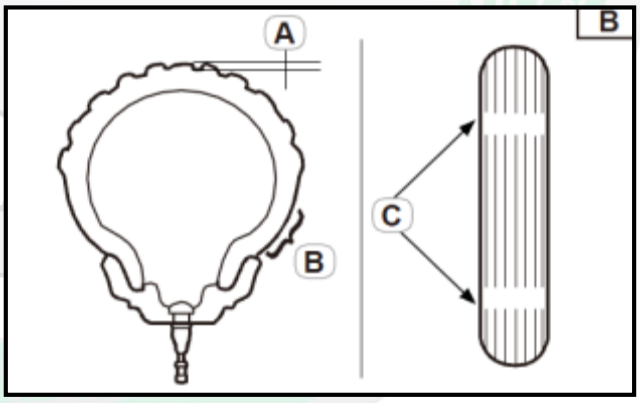
Cold Tire pressure	Front	Rear
Load below 198 lbs. *	34 psi	36 psi
220 lbs. to the maximum load*	35 psi	38 psi
Load includes luggage, rider, passenger and accessories.		

Specifications of front tire	110/70-17 M/C
Specifications of rear tire	140/70-17 M/C

Warning:

Tires become very dangerous when their tread is worn out.

If the tread reaches the tread wear indicator (TWI), replace the tire immediately.



Check: Tire surface, Fig. B

Tire damage / wear → Replace

Minimum depth of tread pattern: 1mm

A. Depth of tread pattern

B. Sidewall

C. Tread Wear Indicator (TWI)

Warning:

When a tire is new, its grip level is not as good as that when slightly worn. Therefore, it is recommended that you do not exceed 60 mph until the tires have been used for at least 60 miles to ensure the tires are properly scrubbed in.

Battery Charging and Inspection

Battery

Warning:

The battery will produce an explosive gas composed of hydrogen. The battery contains electrolyte composed of sulfuric acid which is poisonous and a highly corrosive substance. Therefore, the following precautions should be followed:

- When handling batteries or working near them, please wear goggles and protective gloves.
- Batteries must be charged in an adequate place with good ventilation.
- The battery must be kept away from fire, sparks or open flames (e.g., welding equipment, lit cigarettes, etc.).
- When charging or handling batteries, do not smoke.
- Batteries and electrolyte should be placed out of the reach of children.
- Do not get electrolyte on yourself or your clothing because it may cause severe burns or cause permanent eye damage.

First Aid Treatment if Accidentally Exposed:

Detoxification methods (external contact):

Skin: Wash with soap and water

Eyes: Flush with plenty of water for 15 minutes and seek immediate medical attention.

Detoxification methods (internal):

Drink plenty of water or milk, and then milk containing magnesium oxide, an egg or vegetable oil, and seek immediate medical attention.

Important:

The battery is sealed. Do not remove the sealing cover under any circumstances, because this will damage the balance between the batteries cells and effect battery performance.

The charging time, amperage and voltage of this battery is different from that of traditional batteries. If the battery is overcharged, the electrolyte level will be relatively lowered. Therefore, please be very careful when charging the battery.

Note: Check the battery condition by measuring the voltage at the battery terminals.

Disassembly:

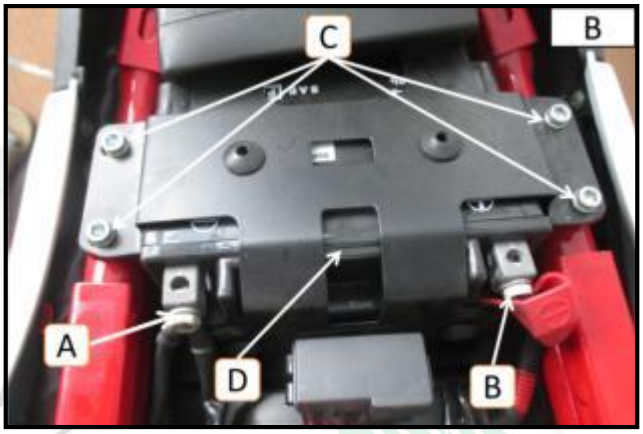
Remove the seat cushion using the key, Fig. A

Battery Charging and Inspection

Battery

Removal: Disconnect the terminal ends from the battery, Fig. B

Important: First disconnect the negative cable from the battery (A), and then disconnect the positive cable (B). Fig. B



Removal:

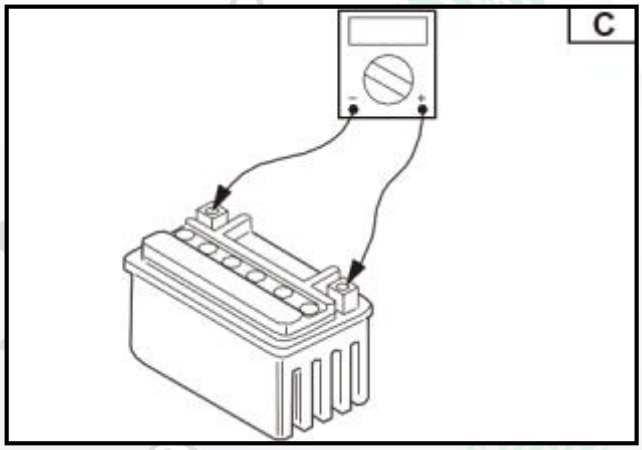
Battery

Remove the four bolts (C) which are used to attach the battery hold down bracket, and then remove the battery (D)

Check: Battery voltage

Connect a multimeter to the terminals of the battery, Fig. C

As shown on the chart in Figure D, check battery charging



Note: Measure battery voltage by connecting a multimeter to the positive and negative battery terminals. If the open-circuit voltage is equal to or exceeds 12.8V, charging is not required.

Example:

Open-circuit voltage = 12.0V

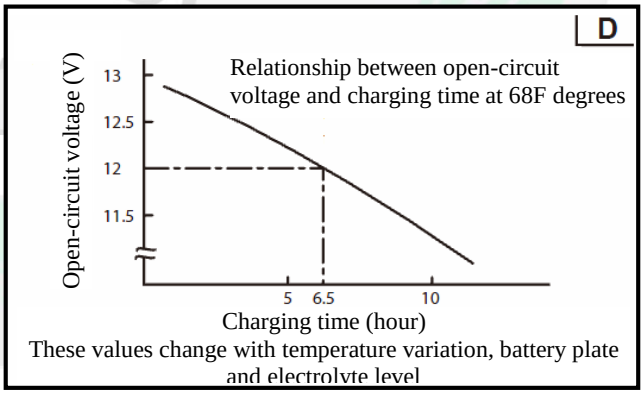
Charging time = 6.5 hours

Battery charge amount = 20 -30%

Charging

Battery (see the picture describing suitable charging methods)

Important: DO NOT quick charge the battery.



Warning:

Do not remove the cover which is used to seal the battery.

Do not use quick chargers, they will send high amperage current to the battery at a high rate of speed; this may cause overheating and damage to the battery.

If the charging current of the battery cannot be adjusted, be careful not to overcharge it.

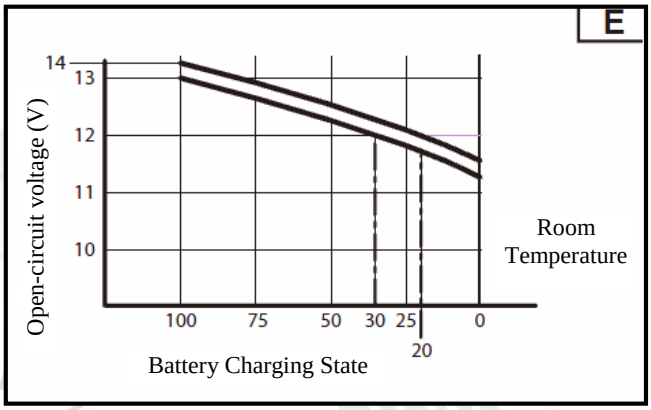
Batteries should be removed from the motorcycle when charging. (If the battery has to be charged in the motorcycle, disconnect the negative cable from the battery terminal)

To reduce the possibility of generating sparks, connect the battery charger to power only after connecting the charger leads to the battery.

Battery Charging and Inspection

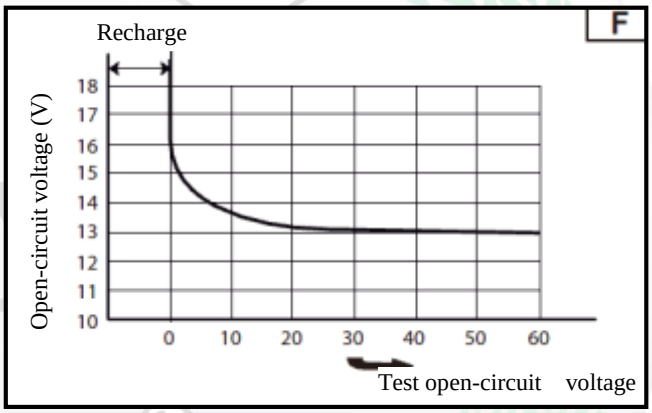
Battery

Make sure the charger is unplugged from the power source before connecting it to the battery terminals. Ensure that the battery charger clamps are completely connected to the battery terminals, and there are no shorts. Corroded terminal ends will generate heat in the contact area, and sparks can be generated. In this case clean the terminal ends before charging.



If battery is overheated during charging, immediately disconnect the charger and let the battery fully cool before continuing to charge. Overheated batteries can explode!

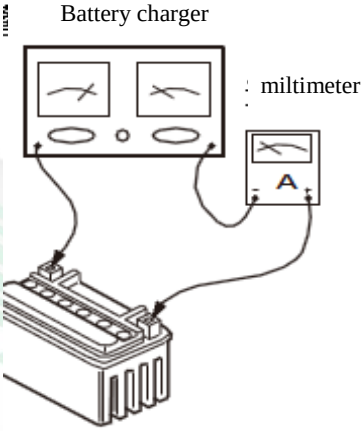
As shown in Fig. F, the voltage table after charging the open-circuit voltage of battery for 30 minutes and completing charging, or before measuring open-circuit voltage.



Battery Charging and Inspection

Battery

Charging method: use a charger with variable current (voltage)

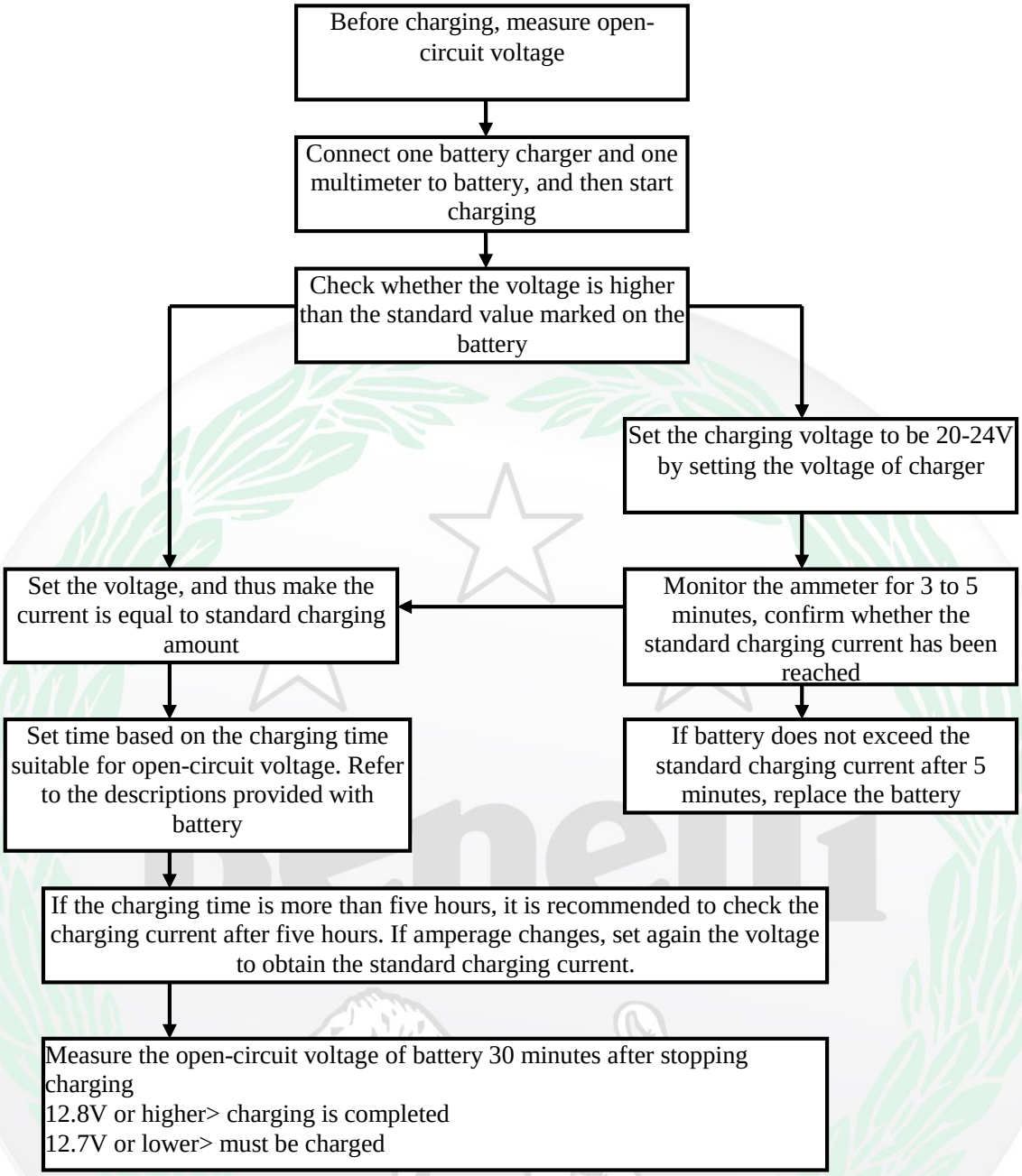


Note:

Measure the open-circuit voltage of the battery 30 minutes after completing charging.

Set the charging voltage to 16-17V (low setting may cause insufficient charging, while high setting may cause overload of the battery)

Connect one battery charger and one multimeter to battery, and then start charging


Before charging, measure open-circuit voltage
Connect one battery charger and one multimeter to battery, and then start charging
Check whether the voltage is higher than the standard value marked on the battery
Set the charging voltage to be 20-24V by setting the voltage of charger
Monitor the ammeter for 3 to 5 minutes, confirm whether the standard charging current has been reached
If battery does not exceed the standard charging current after 5 minutes, replace the battery
Set the voltage, and thus make the current is equal to standard charging amount
Set time based on the charging time suitable for open-circuit voltage. Refer to the descriptions provided with battery
If the charging time is more than five hours, it is recommended to check the charging current after five hours. If amperage changes, set again the voltage to obtain the standard charging current.
Measure the open-circuit voltage of battery 30 minutes after stopping charging
12.8V or higher> charging is completed
12.7V or lower> must be charged

Battery Charging and Inspection

Battery

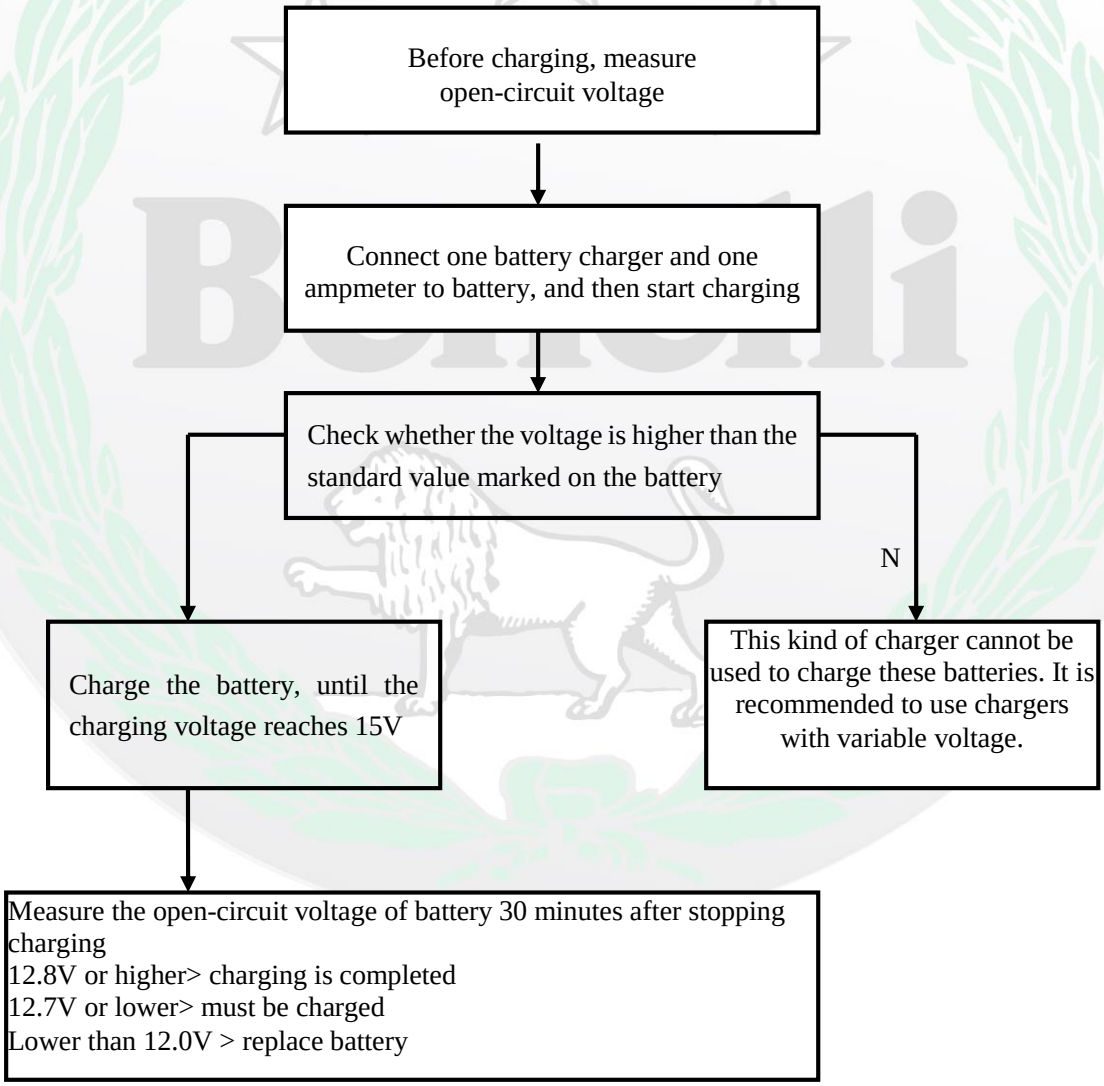
Charging method: Use a charger with variable current (voltage)

Note:

Measure the voltage of the battery 30 minutes after completing charging
Set the maximum charging time to be 20 hours

Note:

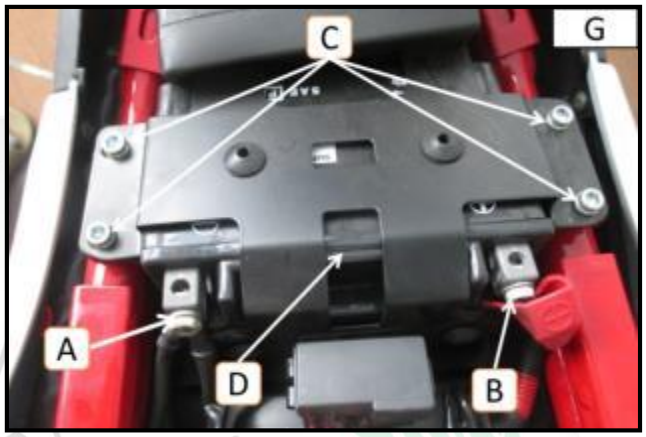
To ensure the maximum performance and durability of the battery, we recommend using an electronic charger which can provide stable charging voltage and current, and thus achieve the desired charging technology of the battery.



Battery Charging and Inspection

Battery

Installation:



Battery
Tighten the 4 bolts (C), after installing the battery hold down bracket.

Connection: Connect the cables to the battery terminals.

Important: First connect the positive cable (B) of the battery (D), and then the negative cable (A), Fig. G

Check: Battery terminals

If there is any dirt, remove the dirt using a metal brush then check for loose terminal bolts.

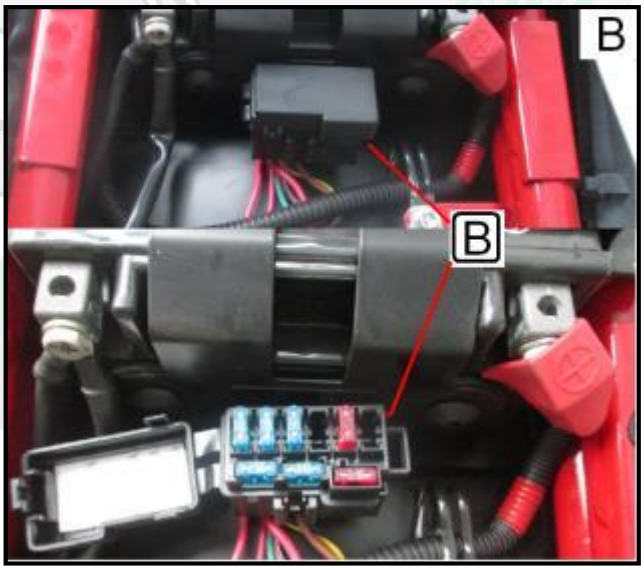
Fuse Inspection

Fuses

The following procedures are applicable to all fuses.

Important: To prevent short circuits, the ignition is always set to the OFF position before checking fuses.
Open the seat cushion using the key, Fig. A

Remove the fuse box cover (B), Fig. B



Check: Fuse

Connect a multimeter to the fuse and check whether it is in good condition.

Note: Set the multimeter to the ohm function.

If the reading on the multimeter is "∞", replace the fuse.

Replacement: Burned-out fuse

Rotate the ignition switch to OFF

Install a new fuse, and ensure it is of the correct amperage.
Turn ON the ignition switch, ensure the circuit is functional. If the fuse immediately burns out, check for shorts.

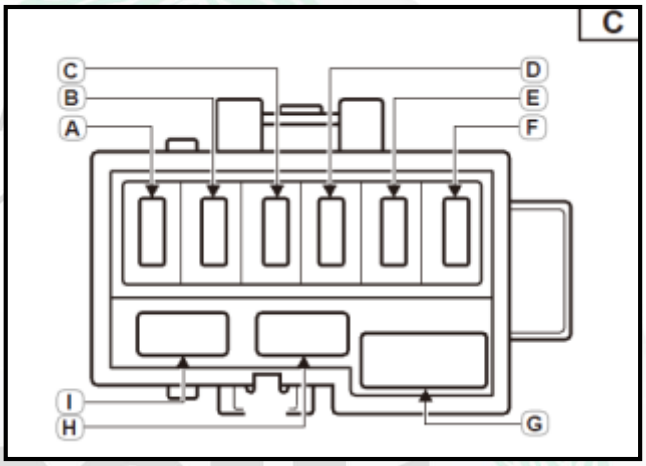
Fuse Location

Fuses

Warning:

Do not use fuses whose amperage is not specified. Makeshift fuses or ones with incorrect amperage may cause irreversible damage to the electrical system, affect the normal operation of the lights and ignition, and can even result in fire.

Fuse Position / Type



Reference drawing C

A. Fuel pump: 15A (blue)
B. Fan: 15A (blue)
C. ECU: 15A (blue)
D. Empty
E. Power lock: 10A (red)
F. Empty
G. Spare fuse 10A (red)
H. Spare fuse 15A (blue)
I. Spare fuse 15A (blue)

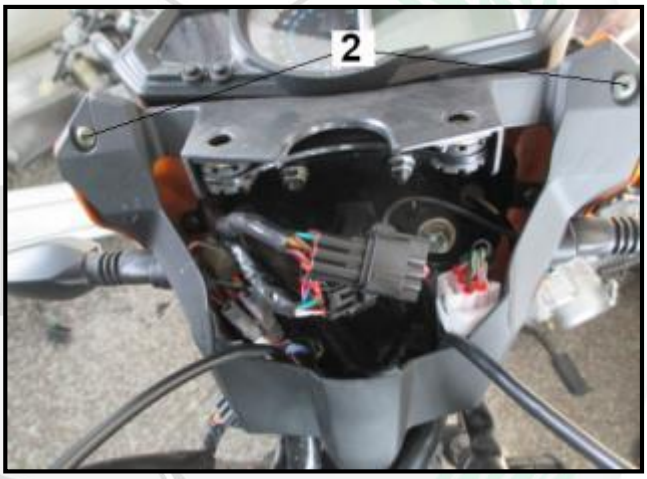
Replacement of the Headlight Bulb

Replacement of the Headlight Bulb

The following procedures are applicable to the headlight.

Disassembly:

Remove the headlight support fastening bolts (1).

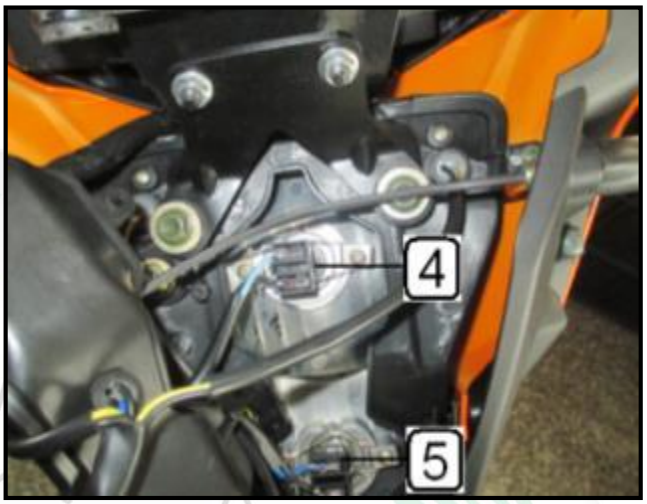


Tilt the combination headlight and fairing.
Remove the self-tapping screws (2).
Remove the rear decorative plate of the headlight fairing.

Remove the self-tapping screws (3).
Remove the headlight dust cover.

Replacement of the Headlight Bulb

Replacement of the Headlight Bulb



Unplug the socket connector from the headlight bulb (4), remove the socket seat, release the clamp spring and remove the bulb.

In the following figure: (4) is the low-beam bulb and (5) is the high-beam bulb. Removal for both the high and low beam bulbs is the same as above.

Align the position of the bulb base to fit the socket, and install the new light bulb.
Bulb type: H7 (12V / 55W) (High and Low Beam)

*** Note**

DO NOT change the headlight bulbs when the headlight is still hot from use, wait until it has cooled down.

Assembly:

Install the headlight in reverse order to disassembly.

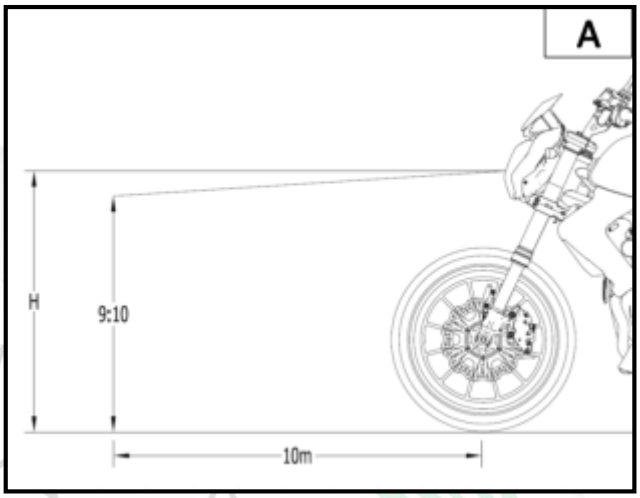
Note:

Avoid directly touching the glass part of bulb and do not make it oily; otherwise, the transparency, service life and luminous flux of the bulb will be affected.
If it is stained with oil or you have touched the glass, completely wipe it with a cloth with alcohol or other solvents.

Adjustment of the Headlight

Adjustment of the Headlight

To adjust the headlight beam follow the steps below:
Park the motorcycle about 10m (30 feet) away from a vertical wall, and park it on a perfectly flat surface. Fig. A
Sit on the motorcycle in your normal riding position.
Check where the highest point of the headlight beam falls on the wall, make it 1/10 lower than the horizontal axis of headlight.
If the beam does not fall within this range, make adjustments to keep it in the correct position.



Adjustment:

Use the adjusting screw (A) on the back of the headlight to adjust the beam of the headlight, Fig. B

Adjustment screw in the upper left corner:
Rotate the screw counterclockwise to lower the beam.
Rotate the screw clockwise to raise the beam.

Adjustment screw in the lower left corner:
Rotate the screw counterclockwise to move the beam towards the left.
Rotate the screw clockwise to move the beam towards the right.

Front Signal Light Bulb

Replacement of the Front Signal Light Bulb

Replacement of front signal lights

The front turn signal lights and headlight are attached to the same body. As shown in the figure, there is one front signal bulb ① on the left and right respectively.

(1) Conduct operations according to the prompts in the section "**Replacement of the headlight bulb**".

(2) Remove the damaged signal, and replace it with a new one as these lights are LED the entire unit must be replaced.

Assembly:

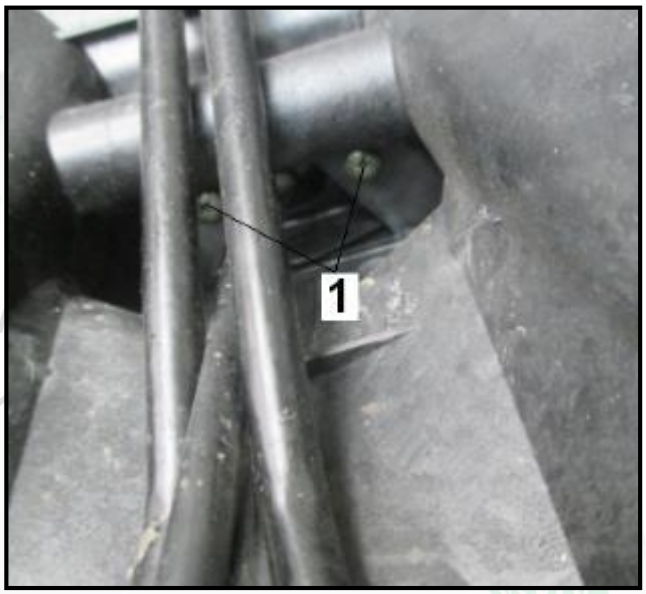
Install the light in inverse order of disassembly.

Rear License Plate Light

Replacement of the Rear License Plate Light

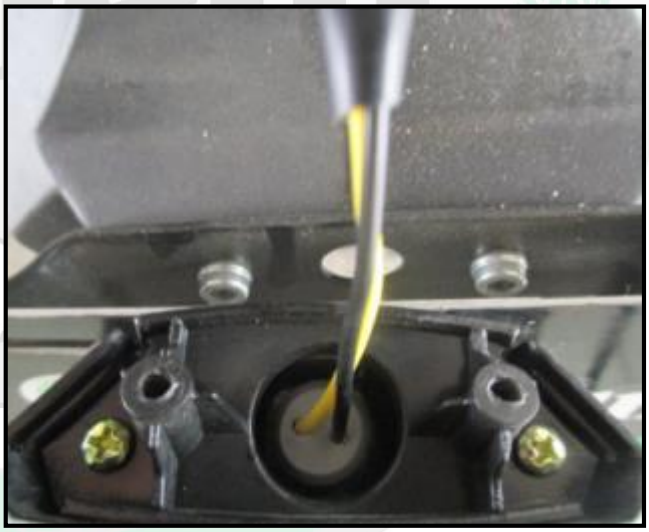
Replacement of the Rear License Plate Light

1. Remove the mounting screws for the rear license plate light (1), and then remove the rear license plate light.



2. Remove the damaged bulb, and replace it with a new bulb with the same specifications and model.

Bulb specifications: W5W （12V/5W）



Rear License Plate Light

Replacement of the Rear License Plate Light

(1) After replacing bulb, install the light in inverse order of disassembly.

Section IV Motorcycle

Front Wheel and Front Brake Rotors

Removal of the Front Wheel

Parking: Park the motorcycle on flat ground

Note:

Support the motorcycle using a rear stand; lift the front wheel off of the ground using a jack under the header pipe.

Disassembly: Disassemble the fastening bolts

(A) from the two brake calipers, Fig. A

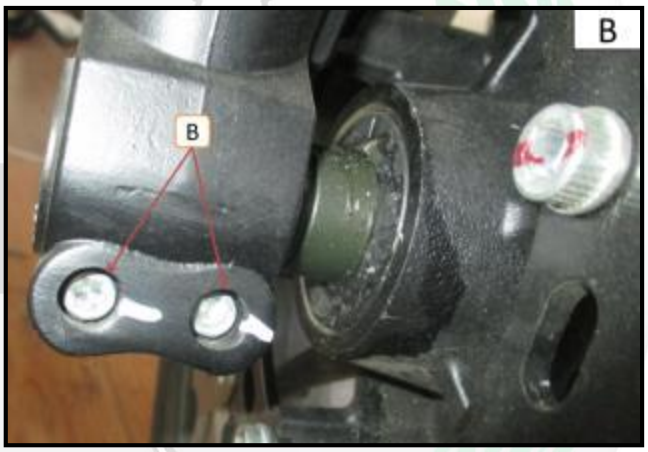
Separation: Right front caliper

Note

Repeat the above operations for the left front caliper.

Note

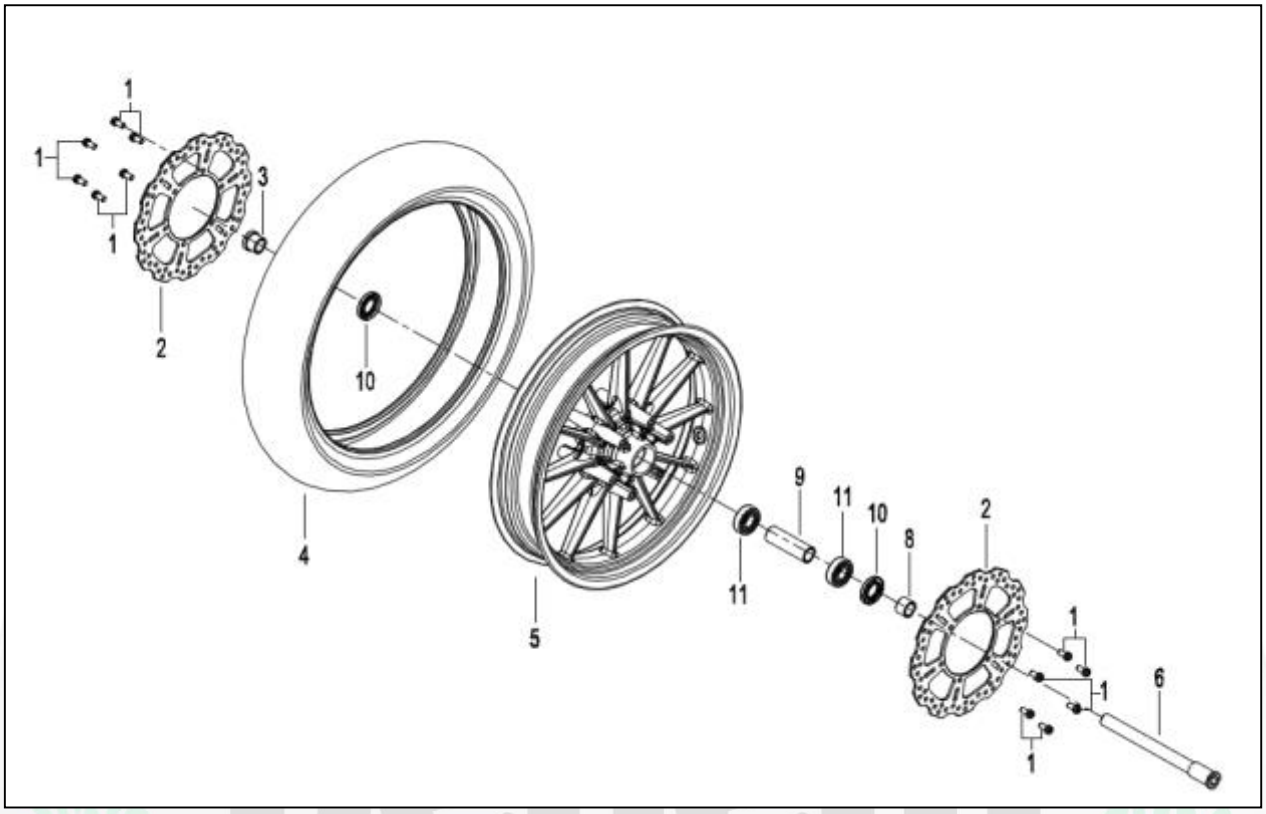
After removing the calipers, do not pull the front brake lever.
Loosen: pinch bolts (B), Fig. B



Disassembly:
Front wheel axle, Fig. C
Front wheel

Front Wheel and Front Brake Rotor

Disassembly and Assembly of the Front Wheel

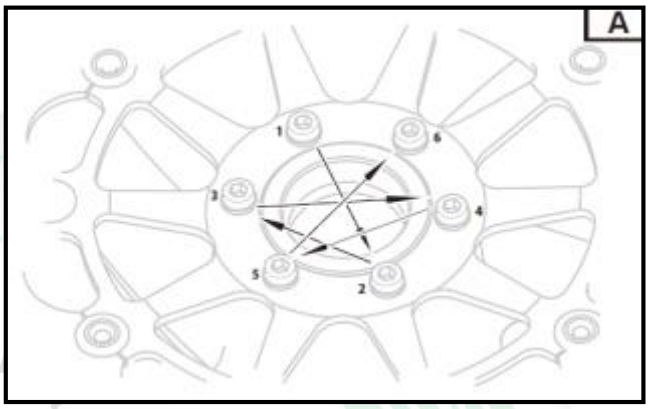


No.	Name	Quantity
1	Bolt M8×16	12
2	Front brake rotor ϕ260×4	2
3	Left wheel spacer	1
4	Tire 120/70-17	1
5	Front wheel rim	1
6	Front wheel axle	1
7	Valve Stem (not pictured)	1
8	Right front wheel spacer	1
9	Bearing spacer sleeve	1
10	Dust seal	2
11	Bearing 6204-2RS	2

Front Wheel and Front Brake Rotor

Disassembly and Assembly of the Front Wheel

Disassembly:



After removing the front wheel from the front forks, remove the 6 bolts (1) used for attaching the two brake rotors (2), Fig. A
If both rotors need to be replaced, please conduct the operations as follows:

Note

Heat may be necessary to more easily remove the rotor bolts as they are installed with locktite. Use a torch to heat each bolt taking care not to use too much heat that could cause damage to the painted wheel.

Assembly:

Insert the front brake rotor (2) into the edge of wheel rim (5).
After adding one drop of thread locker to the end of the threads, insert the 6 fastening bolts (1)

Note

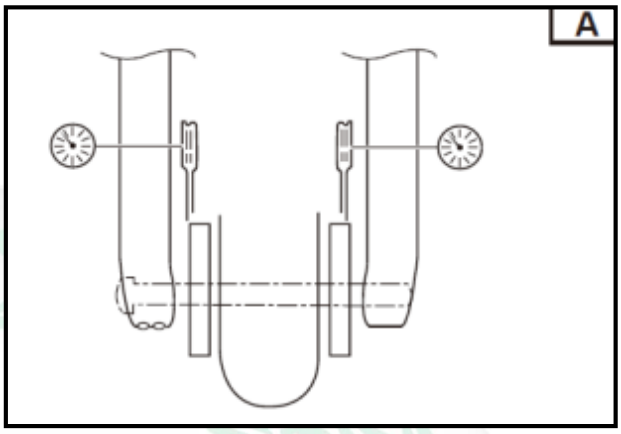
Repeat the above steps for the right front brake rotor.
The following procedure is applicable to both of the brake rotors.
Tighten the bolts for the rotor in a crisscross pattern as shown in Fig. A
Fasten the 6 bolts to the following torque:

Torque 16 ft·lb

Front Wheel and Front Brake Rotor

Front Brake Rotor Wear Inspection

The following procedures are applicable to both brake rotors.



Check: Brake Rotor

If there is any damage / wear, please replace

Brake Rotors	Deformation limit
Front brake rotor	0.1mm
Rear brake rotor	0.15mm

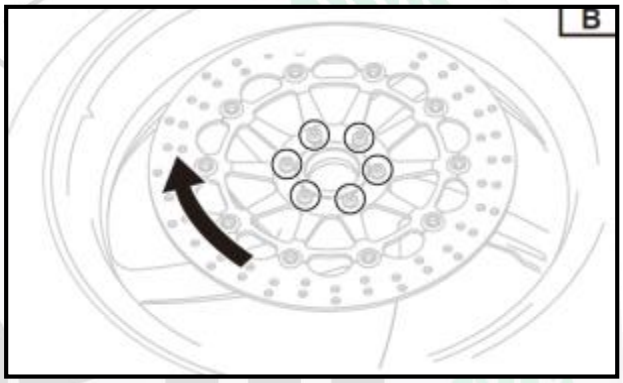
Park the motorcycle on flat ground, lift the wheel using a front stand or use a rear stand and a jack under the header.

Before measuring the runout of the front brake rotors, ensure that the front wheel will spin freely.

Remove the front brake calipers.

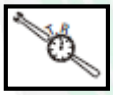
Place the gauge at the surface of brake rotor at a right angle.

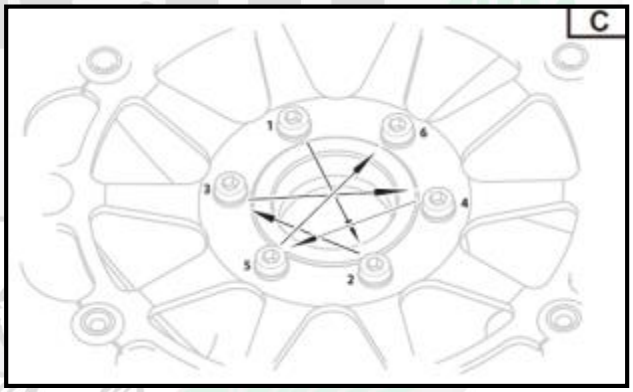
Measure the runout 1.5mm (0.05in) below the edge of the brake rotor. Fig. A



Note

Tighten the bolts for the brake rotor one by one in a crisscross pattern, Fig. C





Tightening torque

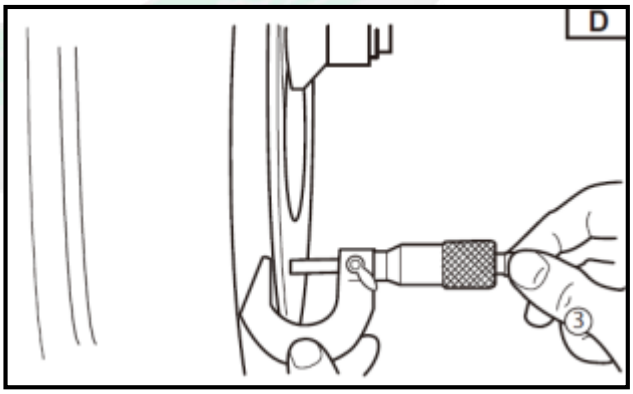
Brake Rotors	Tightening torque
Front brake rotor	16 ft·lb
Rear brake rotor	7 ft·lb

Measurement:

Brake rotor thickness

Measure the brake rotor thickness at several different points, Fig. D

If it exceeds the specifications, please replace.



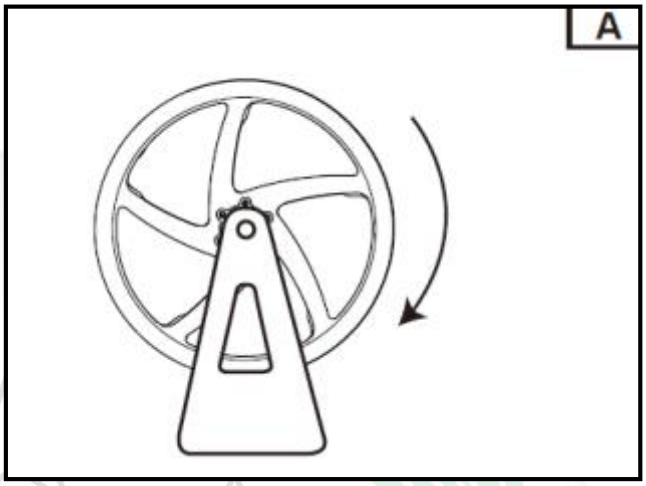
Brake Rotors	Standard	Lower wear limit
Front brake rotor	4.0mm	3.0mm
Rear brake rotor	5.0mm	4.0mm

Front Wheel and Front Brake Rotor

Check / Replacement of the Front Wheel Bearings

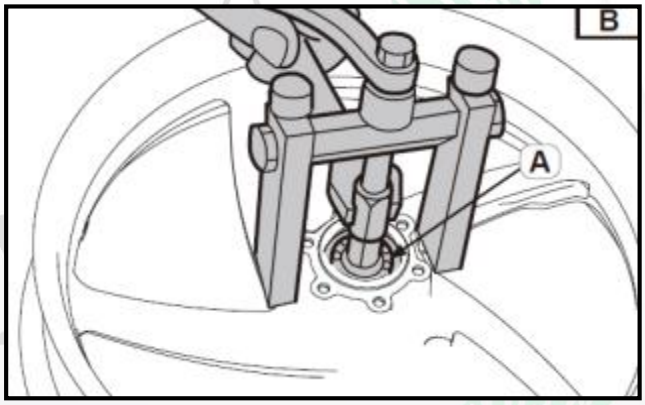
Check:

Front wheel bearings
If the front wheel rotates irregularly or is binding, please replace wheel bearings.



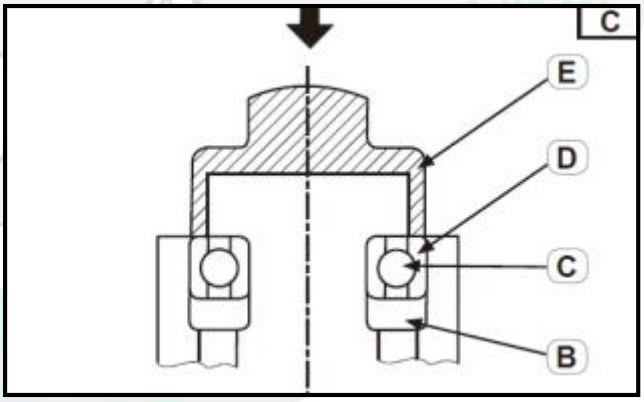
Replacement:

Front wheel bearings
Remove the front wheel bearings (A) using a conventional bearing remover. Fig. B
Install the new wheel bearings in inverse order of disassembly.



Important

When installing the bearings, do not touch the inner seat (B) or the ball bearing (C) of the wheel. Only contact the outer seat (D) of the bearing, Fig. C



Note

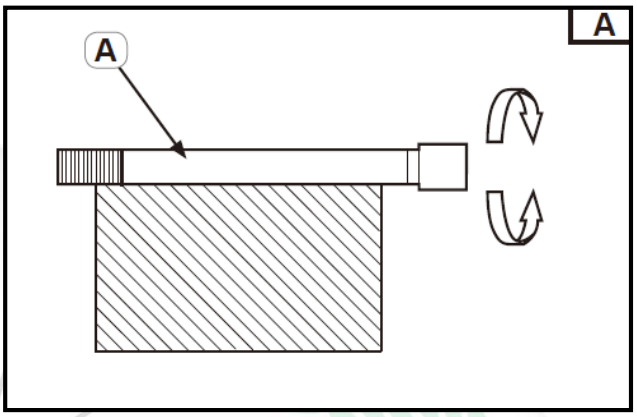
The tool used should be suitable for the diameter of the outside (D) of the wheel bearing, Fig. C

Front Wheel and Front Brake Rotor

Inspection / Replacement of the Front Wheel Axle

Check:

Front wheel axle
Roll the front wheel axle (A) on a flat surface, Fig. A
If there is any run out, please replace.

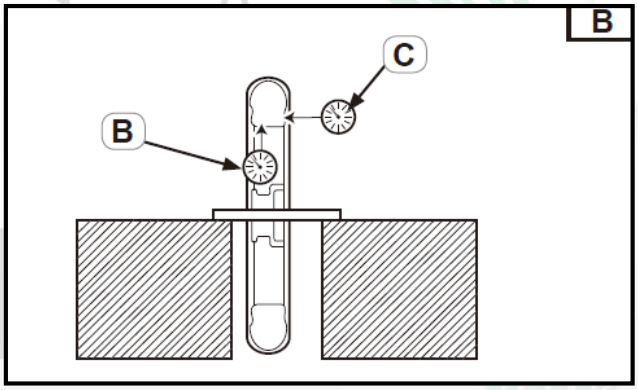


Warning

If the front wheel axle is bent, do not try to straighten it using force or a press.

Check:

Front wheel
Please refer to "Chapter III front and rear tires inspection"
Front wheel rim
If there is any run-out, please replace



Measurement:

Radial run-out of the wheel (B). Fig. B
Axial run-out of the wheel (C). Fig. B
If it exceeds the specified limit, please replace

Run-out	Limit
Longitudinal	0.05mm
Lateral	0.05mm

Front Wheel and Front Brake Rotors

Static Balance Adjustment of the Front Wheel

Note:

- After replacing the tire, wheel rim or both, perform a static balance of the front wheel.
- When adjusting the static balance of the front wheel, the brake rotors should be installed.

Remove:

Any old balancing weights

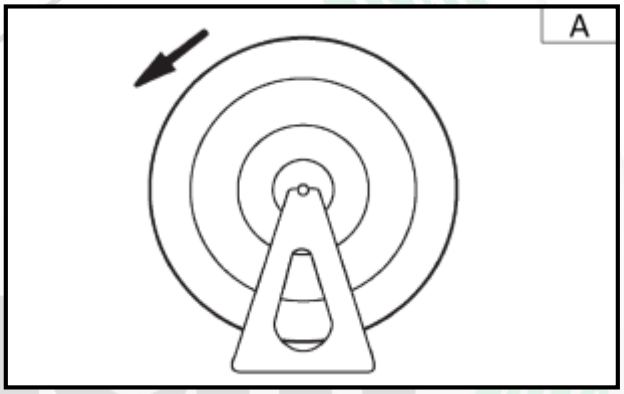
Inspect:

- Gravity point of the front wheel

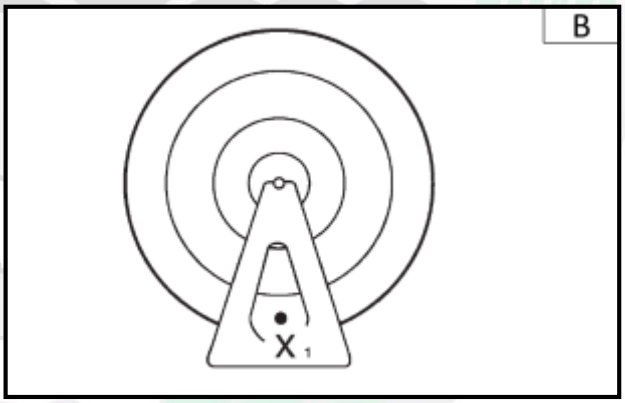
Note:

Place the front wheel in a proper balancing stand

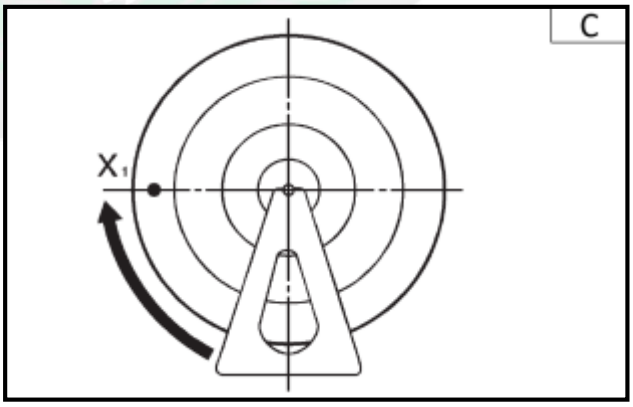
1. Rotate front wheel; Fig. A



2. When the front wheel stops rotating, make an "X_1" mark at the bottom of front wheel; Fig. B



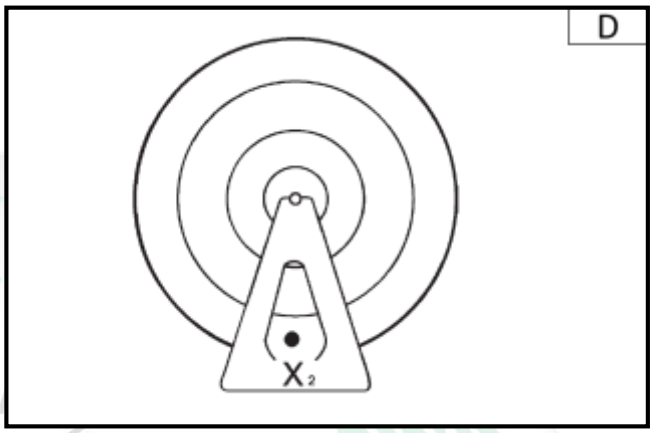
3. Rotate the front wheel by 90° to make "X_1" mark stop at the position shown in the figure; Fig. C
4. Release the front wheel;



Front Wheel and Front Brake Rotors

Static Balance Adjustment of the Front Wheel

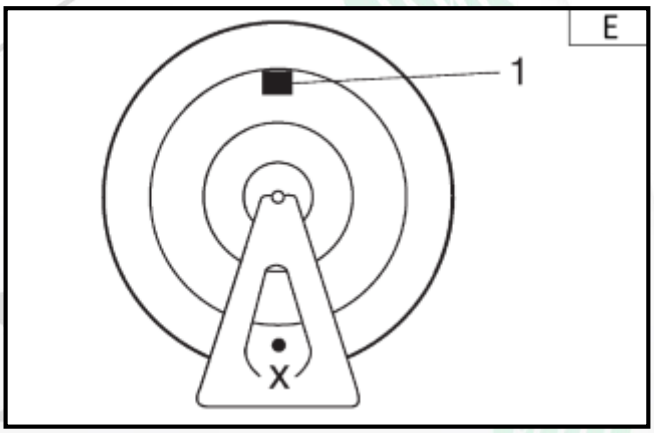
5. When the front wheel stops rotating, make an "X_2" mark at the bottom of the front wheel; Fig. D
6. Repeat the above steps 3 to 5 times, until all marks stop at the same position;
7. The position where all the marks stop is the gravity point of the front wheel "X".



Adjustment:

- Static balance of the front wheel

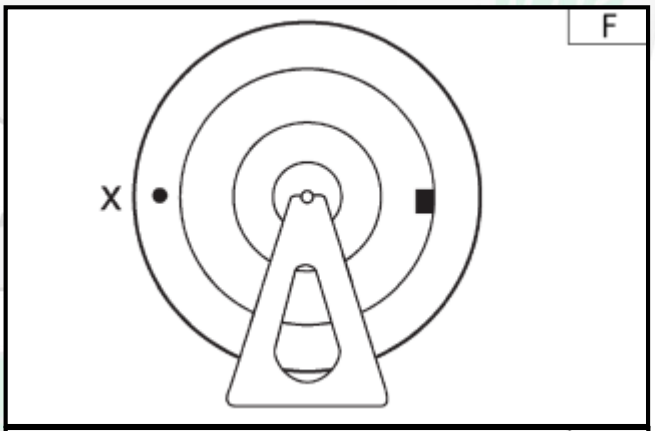
1. Install a "balance weight" (1) at the lower opposite side of the balance point "X" on the wheel rim, Fig. E



Note:

Start with the lightest balancing weight.

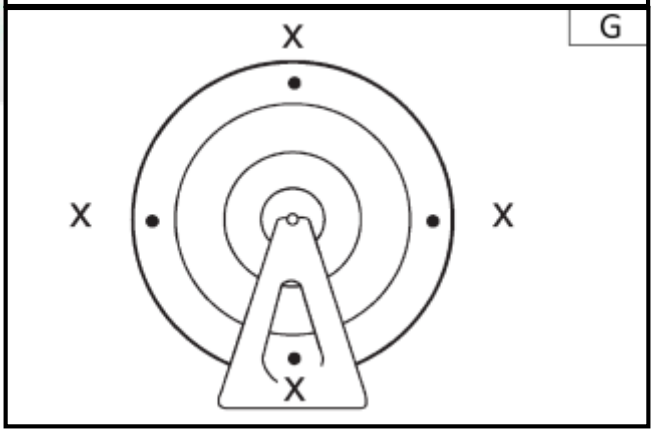
2. Rotate the front wheel by 90° to move the gravity point to the position shown in the figure. Fig. F
3. If the gravity point does not stop at this position, please use a heavier balancing weight;
4. Repeat steps 2 and 3, until the front wheel is balanced.



Check

- Static balance of front wheel

Rotate the front wheel, and ensure that it will stop at each position shown in the figure. Fig. G
If the front wheel remains still at each position, please re-balance it.



Front Wheel and Front Brake Rotors

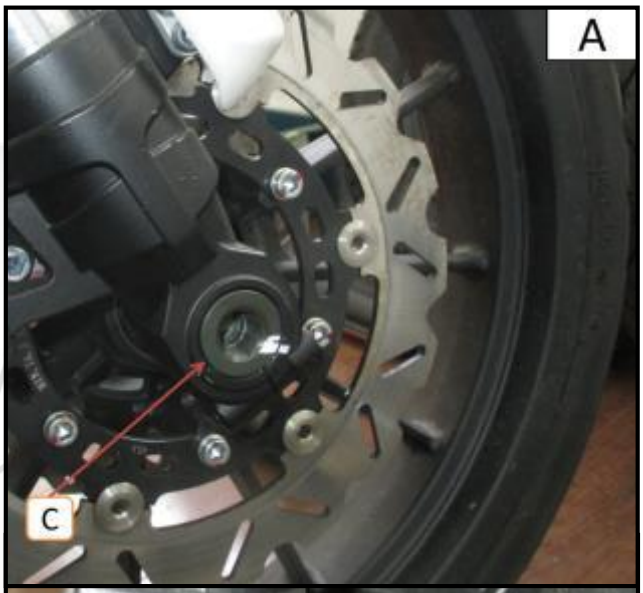
Front Wheel Assembly

Assembly:

Insert the entire front wheel between the two front shock absorbers.
First apply grease to the front wheel axle (C) and then insert it.
Fasten the front wheel axle using the special tools.

The tools used for tightening the front wheel axle are shown in the list of special tools.

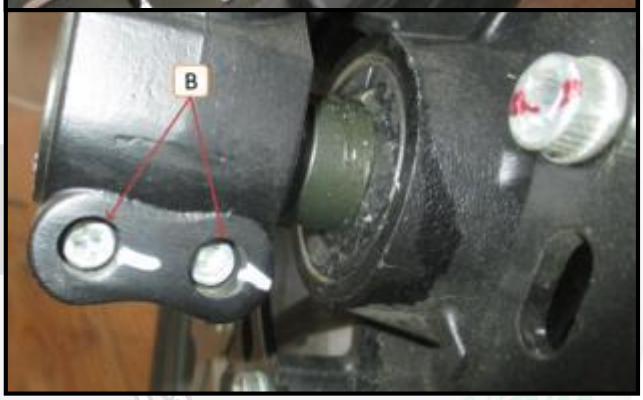
Torque 74 ft·lb



Assembly:

Insert the two bolts (B) and tighten them by hand.
Press the handlebars downward two to three times to align the front wheel axle in the forks, Fig. B
Fasten the two bolts (B) using the following torque:

Torque 6 ft·lb



Assembly:

Right brake caliper, insert fastening bolts (A). Fig. C
Use the following torque to fasten the two bolts (A):

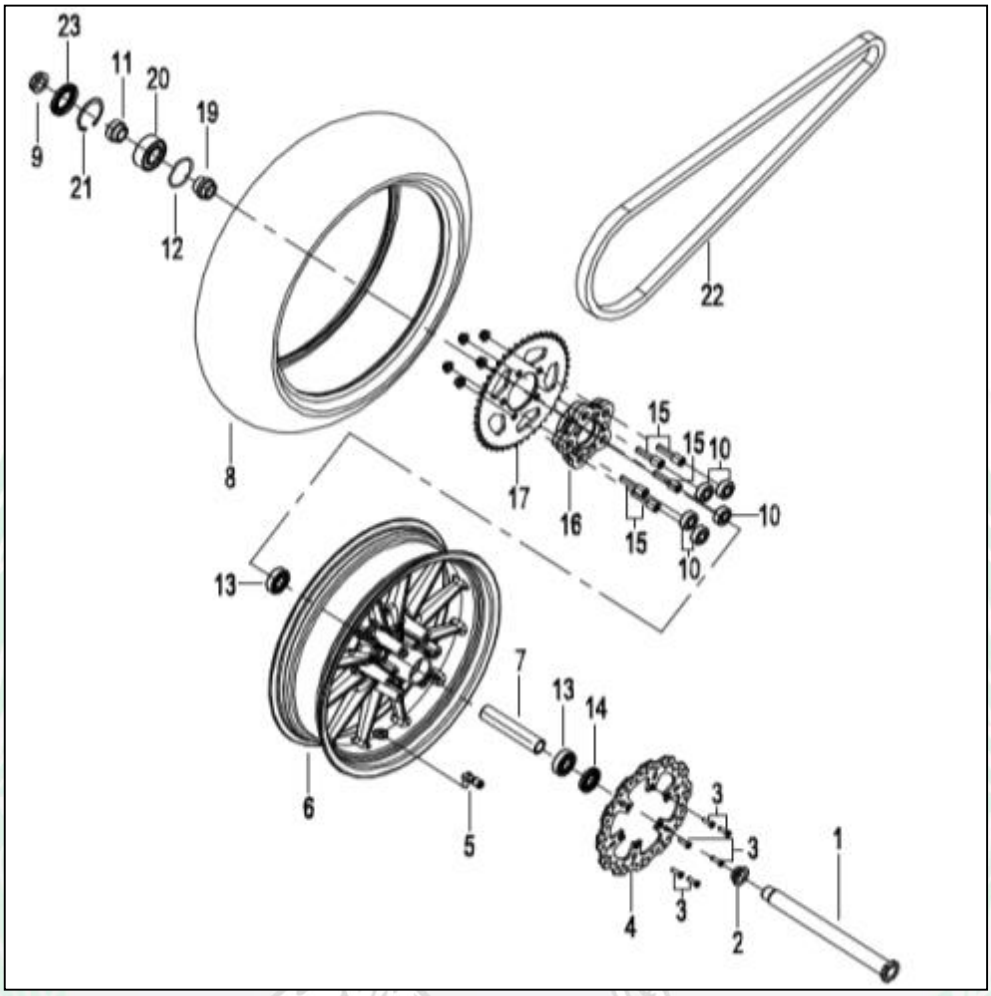
Torque 33 ft·lb

Note

For the left brake caliper, please repeat the above steps. Put the calipers between the brake rotors, and ensure that there is enough of a gap between the brake pads.
Check whether the routing of the brake hose is correct.

Rear Wheel and Rear Brake Rotor

Disassembly of the Rear Wheel

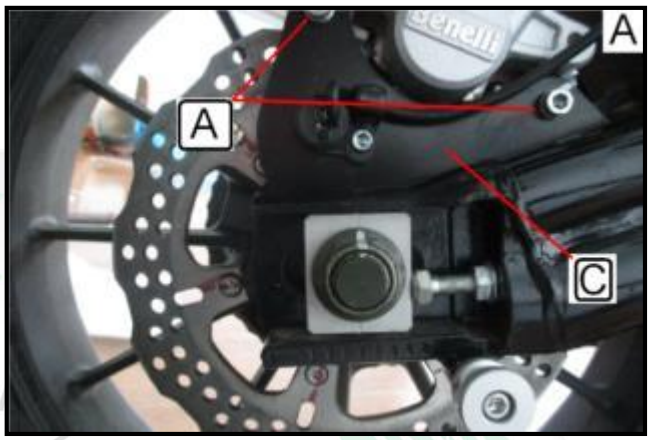


No.	Name and specifications	Quantity	No.	Name and specifications	Quantity
1	Rear wheel axle	1	13	Bearing 6204-2RS	2
2	Right rear wheel spacer	1	14	Dust seal	1
3	Bolt M6×20-10.9-ZG	6	15	Bolt M10×1.25×41	5
4	Rear brake rotor	1	16	Sprocket carrier hub	1
5	Valve Stem	1	17	Rear sprocket	1
6	Rear wheel rim	1	18	Locking nut M10×1.25	5
7	Bearing spacer sleeve	1	19	Sprocket carrier spacer	1
8	Tire 160/60-17	1	20	Bearing 30×62×23.8	1
9	Locking nut M20×1.5	1	21	C-Clamp Φ62	1
10	Rear wheel dampers	5	22	Chain 108 Link	1
11	Left rear wheel spacer	1	23	Dust seal	1
12	O-ring φ53×φ3.55	1			

Rear Wheel and Rear Brake Rotor

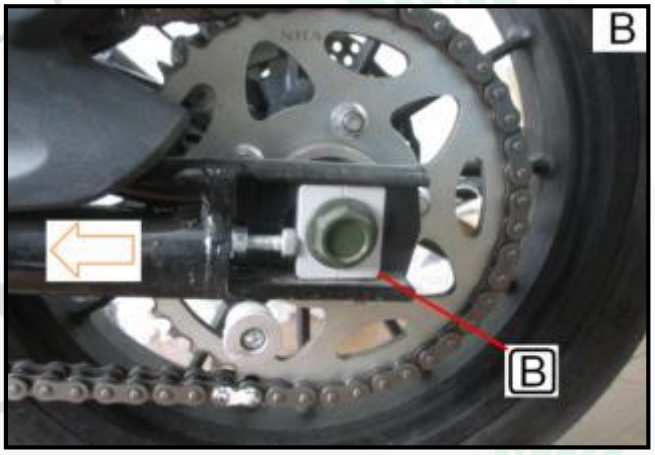
Disassembly of the Rear Wheel

Parking: Park the motorcycle on flat ground. Support the motorcycle using a rear stand, to lift the rear wheel easily.
Disassembly: Remove the mounting bolts (A) from the brake caliper, Fig. A



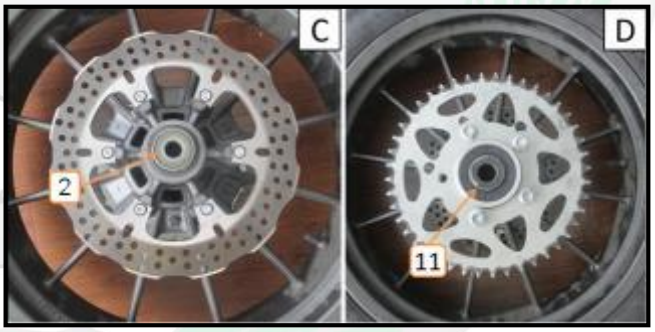
Separation: Brake caliper.

Disassembly: Rear axle nut (9) and rear wheel axle (1)
Note
During this process, note that the following parts may be separated:
Mounting bracket for the brake caliper, Fig. A.
Chain adjusting blocks (B), Fig. B.
Right wheel spacer, Fig. C
Left wheel spacer, Fig. D



Disassembly:

Right wheel spacer (2) (Fig. C), Left wheel spacer (11) (Fig. D).

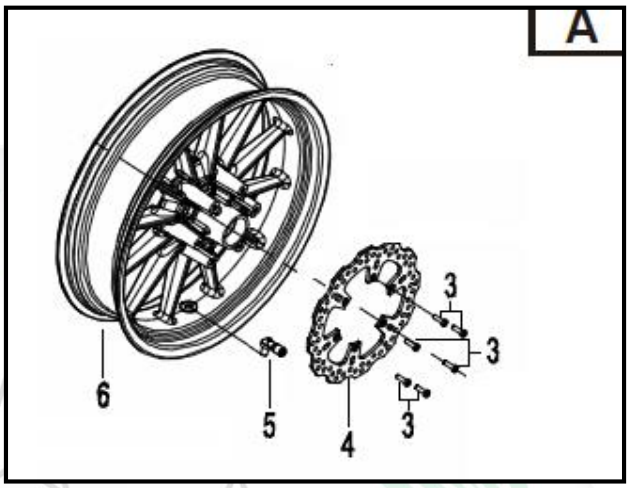


Rear Wheel and the Rear Brake Rotor

Disassembly of the Rear Brake Rotor and Rear Sprocket

Disassembly of the brake rotor

After removing the rear wheel, remove the brake rotor.
Loosen the 6 fastening bolts (3), and remove the brake disc (4), Fig. A

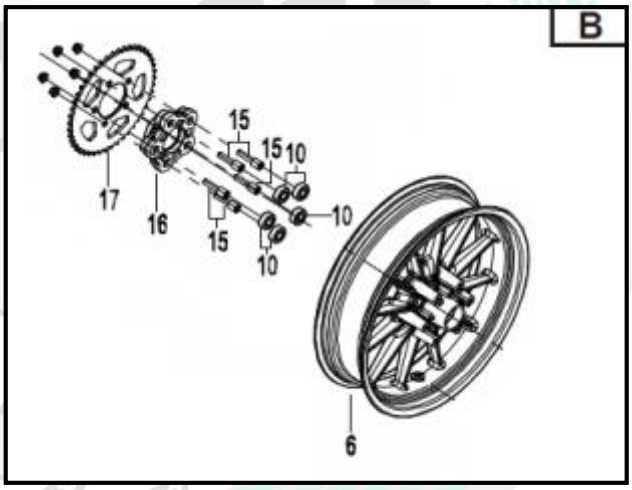


Note

Heat may be necessary to more easily remove the rotor bolts as they are installed with locktite. Use a torch to heat each bolt taking care not to use too much heat that could cause damage to the painted wheel.

Disassembly of the sprocket carrier:

After removing the rear wheel, disassemble the sprocket carrier (17), Fig. B. Remove the 5 fastening nuts, and separate the sprocket from the sprocket carrier (16).
Separate the sprocket carrier (16) from the bolts (15) and rear wheel cushion dampers (10).



Check:

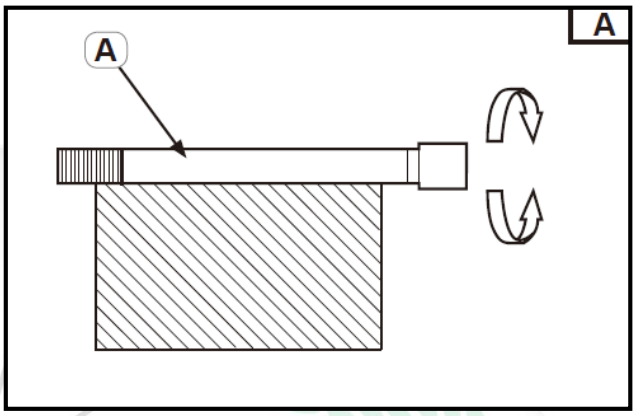
Sprocket Carrier
If there is any cracks / damage, please replace

Rear Wheel and the Rear Brake Rotor

Rear Wheel and Rear Axle Inspection

Check:

Rear wheel axle
Roll the rear wheel axle (A) on a flat surface, Fig. A
If there is any run-out, please replace.

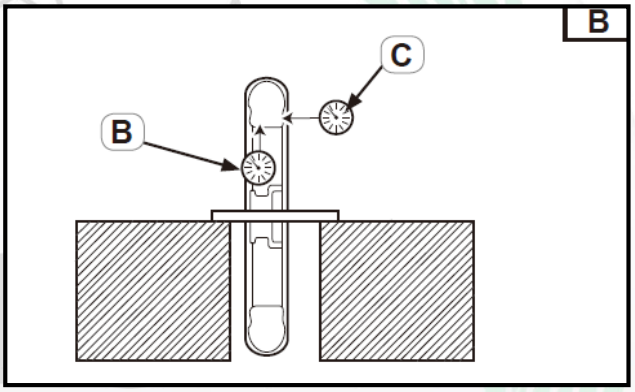


Warning

If the rear wheel axle is bent, do not try to straighten it using force or a press.

Check:

Rear wheel
Please refer to “Chapter III Front and Rear Tire Inspection”
Rear wheel
If there is any run-out, please replace



Measurement:

Radial run-out of wheel (B). Fig. B
Axial run-out of wheel (C). Fig. B
If it exceeds the specified limit, please replace

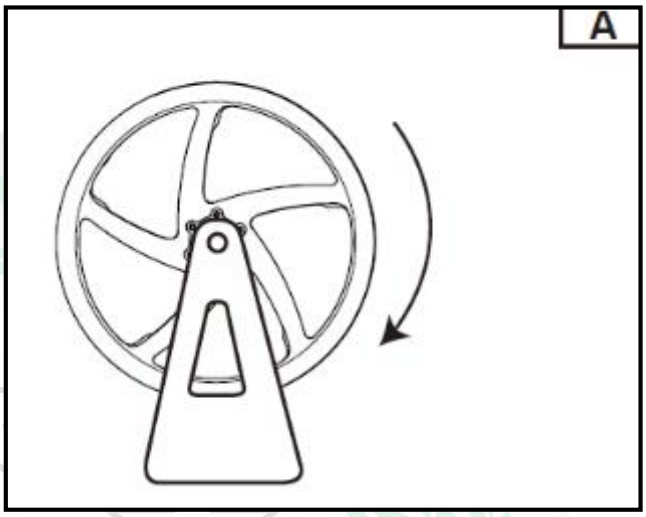
Run-out	Limit
Longitudinal	0.05mm
Lateral	0.05mm

Rear Wheel and the Rear Brake Rotor

Check / Replacement of the Rear Wheel Bearings

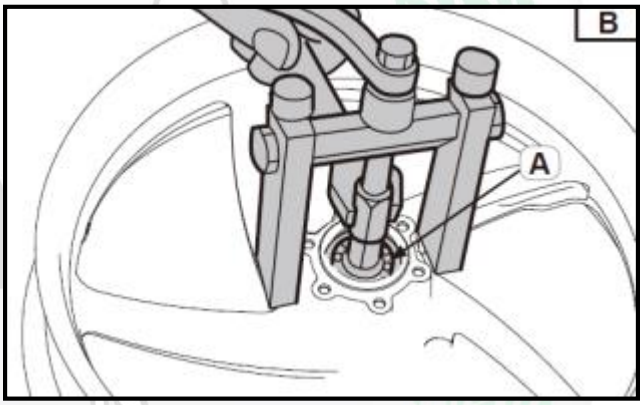
Check:

Wheel bearings
If the rear wheel rotates irregularly or is binding, please replace the wheel bearings.



Replacement:

Wheel bearings
Remove the bearing from the wheel (A) using a generic bearing remover. Fig. B
Install new wheel bearings in inverse order of disassembly.

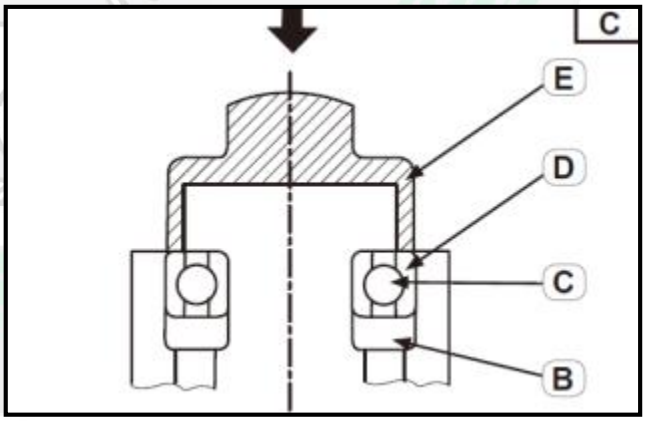


Important

When pressing bearings, do not touch the inner ring (B) or the ball bearing (C) of bearing. Only contact the outer seat (D) of the bearing, Fig. C

Note

The tool used should be suitable for the diameter of the outside (D) of the wheel bearing, Fig. C



Rear Wheel and the Rear Brake Rotor

Static Balance Adjustment of the Rear Wheel

Note:

- After replacing tire, wheel rim or both, check the static balance of the rear wheel.
- When adjusting the static balance of the rear wheel, the brake rotor should be installed properly.

Adjustment

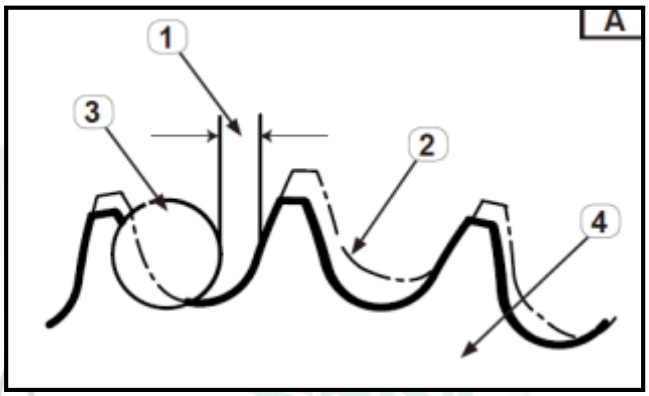
Please refer to “Static balance adjustment of the front wheel”

Rear Wheel and the Rear Brake Rotor

Inspection and Replacement of the Rear Sprocket

Check: Rear Sprocket

If more than 1/4 of each tooth has been worn, replace the rear sprocket.
If the tooth is bent, replace the rear sprocket.

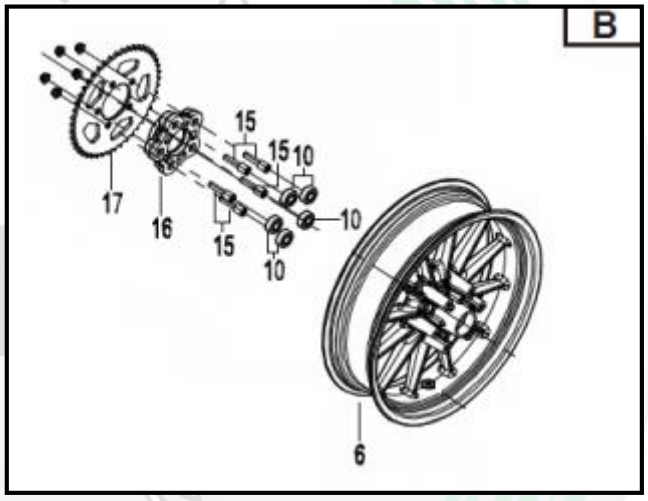


Replacement of Rear Sprocket:

After disassembling the rear wheel, remove the rear sprocket, as described in the section above.

Replacement:

Wipe off any dust or dirt from the surface of the sprocket carrier (16) with a clean cloth, especially the surface in contact with the sprocket.



Insert the 5 fastening bolts (15), and tighten the self-locking nuts to the following torque.

Torque 33 ft·lb

Note

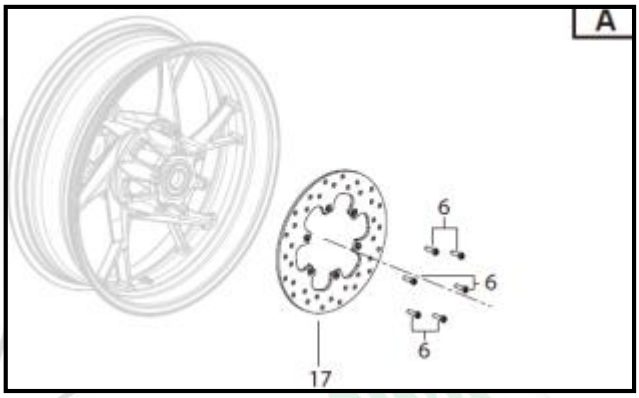
Fasten the self-locking nuts in a crisscrossed sequence.

Rear Wheel and the Rear Brake Rotor

Installation of the Rear Brake Rotor

Brake rotor:

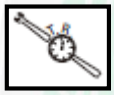
After removing the rear wheel, remove the brake rotor as described in the above section.
Wipe any dust off of the surface of the wheel hub with a clean cloth, especially the surface in contact with the brake rotor.



Assembly:

Brake rotor (17) and 6 bolts (6), Fig. A
Use thread locker at the end of the threads.

Tighten the fastening bolts to the following torque:



Torque 7 ft·lb

Note

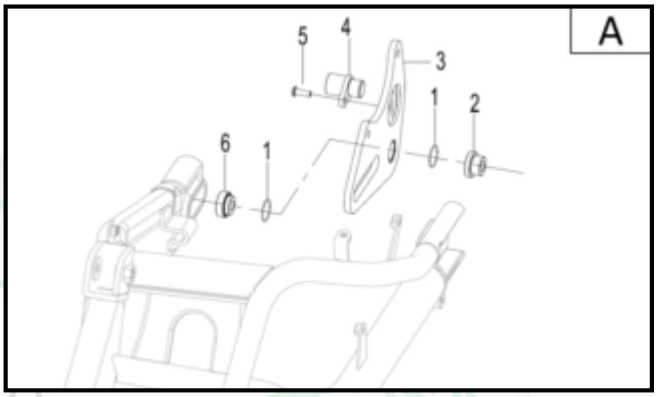
Fasten the bolts in a crisscrossed pattern.

Rear Wheel and the Rear Brake Rotor

Rear Wheel Assembly

Assembly:

Preassemble the support, connecting plate (3), and install the speed sensor (4) and bolts (5).



Insert the left wheel spacer (11) into the left side of the wheel, and insert the right wheel spacer (2) into the right side of the wheel, Fig. B

Insert the chain adjuster block onto the axle, and insert the axle on the brake rotor side first, Fig. C

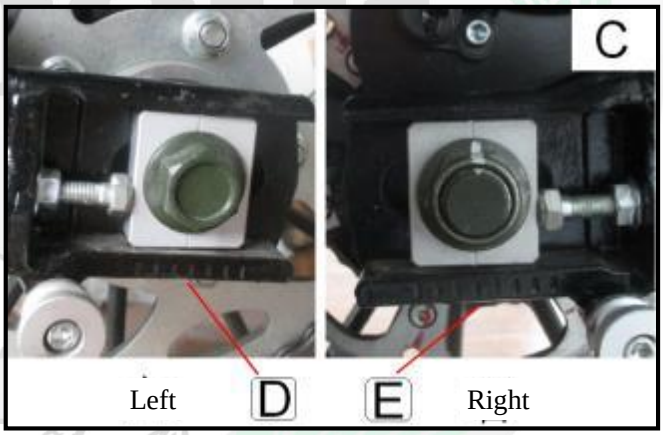
Assembly: Rear wheel

Lubricate and assemble:

Rear wheel axle (14)

Fasten nut (1) to the following torque, Fig. D

Torque 103 ft·lb



Assembly: Brake caliper, and respectively fasten the bolts to the following torque:

Torque 18 ft·lb

Note

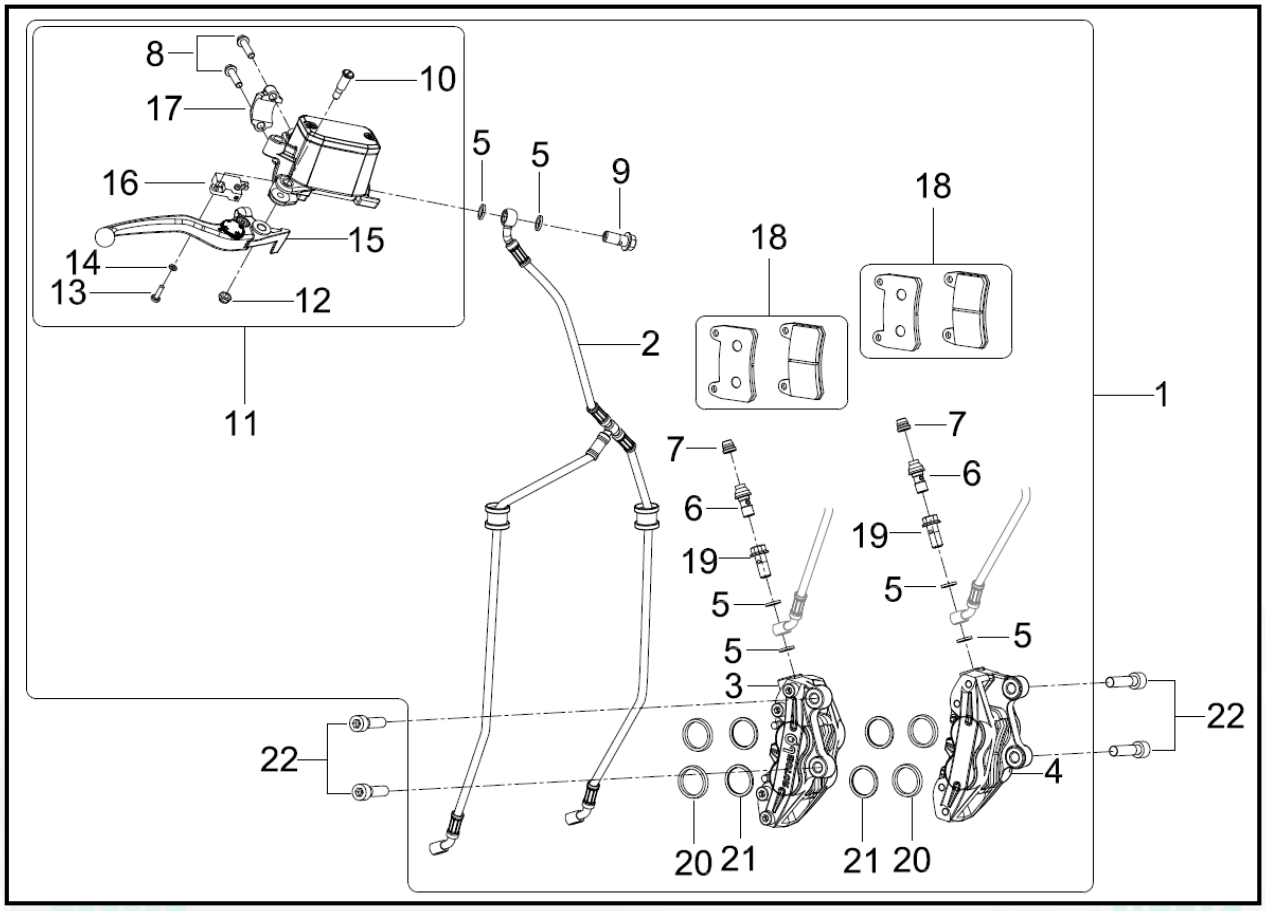
Install the caliper on the brake rotor, ensure that there is enough space between two brake pads.

Important

Ensure that the routing of the brake hose is correct.

Front and Rear Brakes

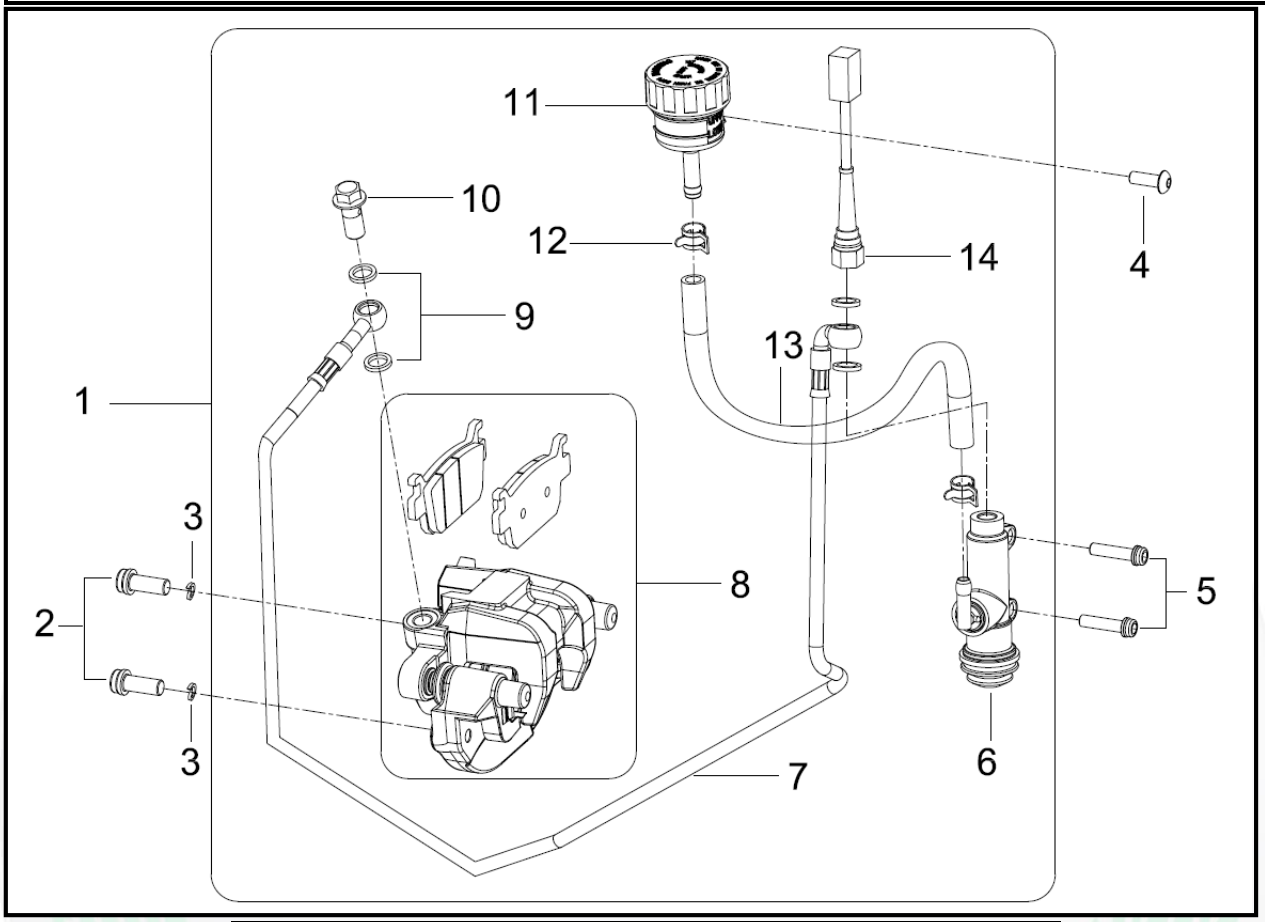
Front Brake



No.	Name	Quantity	No.	Name	Quantity
1	Complete Front Brake Assy.	1	12	Nut M6	1
2	Front brake hose	1	13	Screw M4×12	1
3	Front right brake caliper	1	14	Washer 4	1
4	Front left brake caliper	1	15	Front brake lever	1
5	Gasket, Banjo Bolt	6	16	Brake light switch, front	1
6	Valve, Bleeder	2	17	Clamp, master cylinder	1
7	Dust cover, bleeder valve	2	18	Pads, Front brake (set)	4
8	Bolt M6×23	2	19	Banjo bolt	2
9	Banjo bolt	1	20	Seal, brake piston A	4
10	Bolt, clutch lever pivot	1	21	Seal, brake piston B	4
11	Front Brake Master Cylinder Assy.	1	22	Socket head bolt M10×1.25×40	4

Front and Rear Brakes

Rear Brake



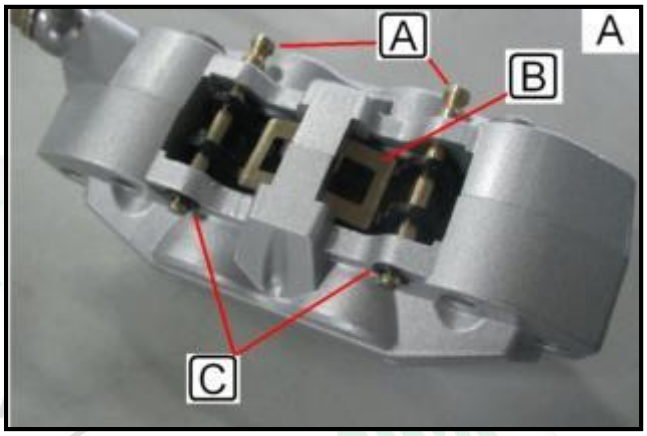
No.	Name	Quantity
1	Rear brake assy.	1
2	Bolt M8×1.25×25	2
3	Spring gasket φ8	2
4	Bolt M6×20	1
5	Bolt M6×30	2
6	Rear brake master cylinder	1
7	Rear brake line	1
8	Rear brake caliper complete	1
9	Sealing washer	4
10	Banjo bolt	1
11	Reservoir, master cylinder	1
12	Clamp, hose	1
13	Reservoir hose	1
14	Rear brake light switch	1

Front and Rear Brakes / Front Brake Pads

Disassembly and Assembly of the Front Brake Pads

Disassembly

Remove the circlips (C) with circlip pliers and then remove the locating pins (A) used to retain the brake pads, Fig. A



Note

When removing the brake pins (A), press down the retainer spring (B), Fig. A

Remove the worn brake pads, Fig. B

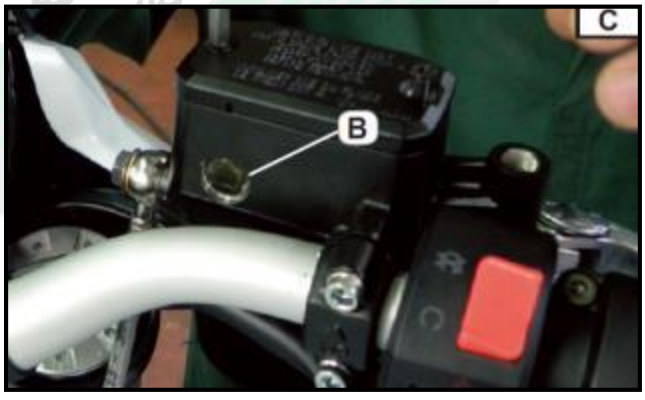
Measurement:

Wear limit of the brake pads
If they are below the minimum specifications, please replace the brake pads in pairs.

Brake Pads	Standard	Lower wear limit
Front brake Pads	7.8mm	3.8mm

Assembly: Continue to assemble in reverse order of disassembly.

Check: Brake fluid level (B), Fig. C



If it is lower than the minimum notch, add a sufficient amount of the recommended brake fluid, until it reaches the correct fluid level.

Check:

Operation of brake handle
If the brake lever is soft or feels light, bleed any air from the brake circuit.

Front and Rear Brakes / Rear Brake Pads

Disassembly and Assembly of the Rear Brake Pads

Disassembly

Disassemble the two fastening bolts (A) from the brake caliper, Fig. A.
Disassemble bolt (B) from the brake caliper, and rotate the brake caliper (E) towards the front of the motorcycle.

Remove: brake pads (D), Fig. B

Measurement: Wear limit of the brake pads.

If they are below the minimum specifications, please replace the brake pads in pairs.

Brake Pads	Standard	Lower wear limit
Rear brake Pads	7.0mm	3.7mm

Assembly:

Continue to assemble in reverse order of disassembly.
Fasten bolt (B) to the following torque:

Torque 18 ft·lb

Check:

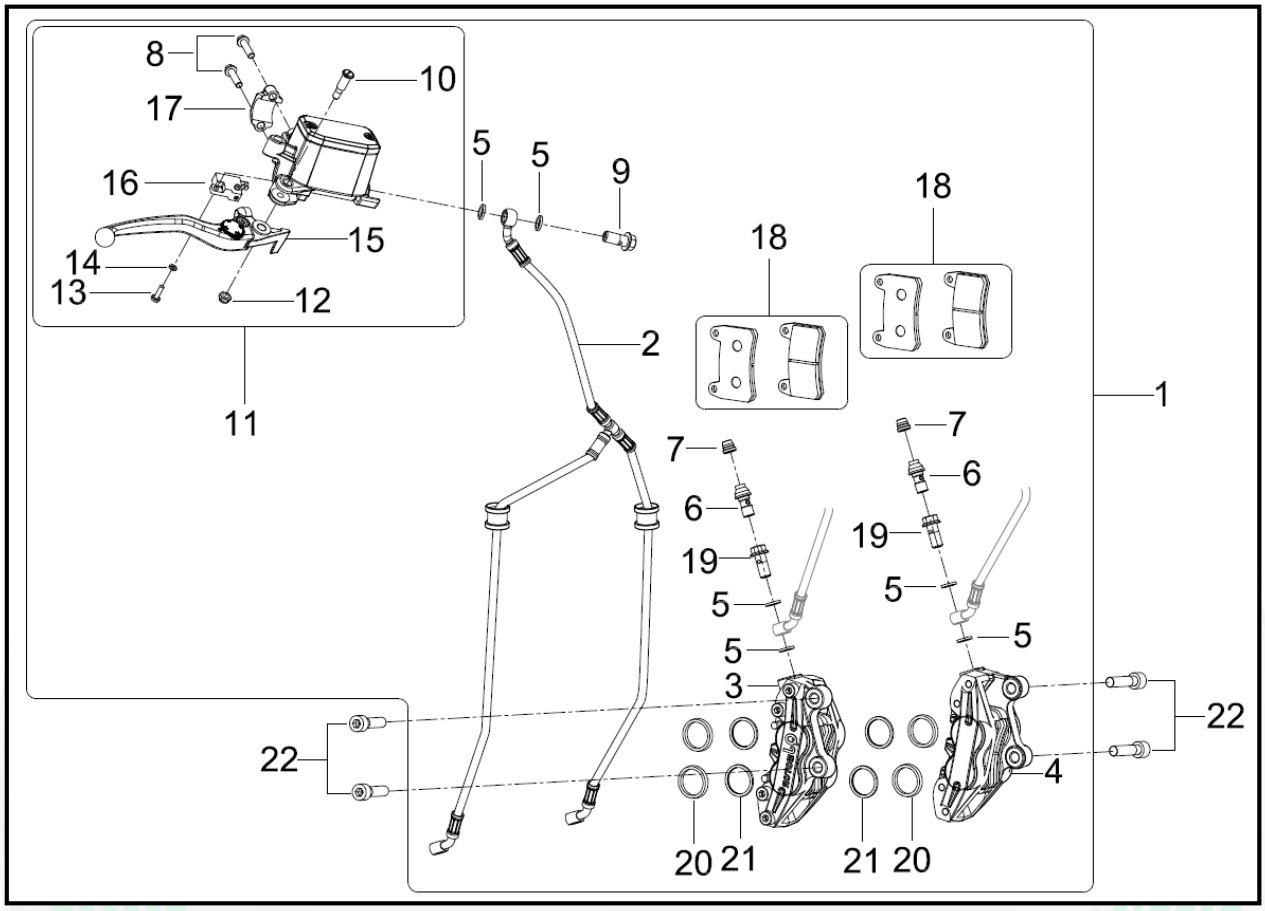
Brake fluid level (B), Fig. C
If it is lower than the minimum notch, add a sufficient amount of the recommended brake fluid, until it reaches the correct fluid level.

Check:

Operation of the brake pedal
If the brake pedal is soft or feels light, bleed any air from the brake circuit.

Front and Rear Brakes / Front Brake

Front Brake



No.	Name	Quantity	No.	Name	Quantity
1	Complete Front Brake Assy.	1	12	Nut M6	1
2	Front brake hose	1	13	Screw M4×12	1
3	Front right brake caliper	1	14	Washer 4	1
4	Front left brake caliper	1	15	Front brake lever	1
5	Gasket, Banjo Bolt	6	16	Brake light switch, front	1
6	Valve, Bleeder	2	17	Clamp, master cylinder	1
7	Dust cover, bleeder valve	2	18	Pads, Front brake (set)	4
8	Bolt M6×23	2	19	Banjo bolt	2
9	Banjo bolt	1	20	Seal, brake piston A	4
10	Bolt, clutch lever pivot	1	21	Seal, brake piston B	4
11	Front Brake Master Cylinder Assy.	1	22	Socket head bolt M10×1.25×40	4

Front and Rear Brakes / Front Brake

Assembly of the Front Brake Master Cylinder

Assembly:

Follow the steps below:

Warning

Before assembly, wash all of the internal parts of the brake, and lubricate using clean or new brake fluid.
Do not apply any solvent on the internal parts of brake cylinder.
Assemble the brake light switch by tightening the screw (13) and washer (14) to the pump. The torque is as follows:

Torque 13 in. lbs.

Insert the connector (X) for the front brake switch (16), Fig. A
Install the banjo bolt (9) and related gaskets (5) to the front brake hose and connect it to the pump.
Fasten the banjo bolt to the following torque:

Torque 19 ft·lb

Warning

Make sure the routing of the brake hose is correct.
Tighten nut (12) and fastening bolt (10) to the following torque, and install the front brake lever (15):

Torque 5 ft·lb

Install the master cylinder clamp (17) to the cylinder, and tighten the two fastening bolts (8) to the following torque, first torque the upper one and then lower one;

Note

Upon completion of these operations, add a little brake fluid. See Chapter 3, "checks and pre-maintenance", "front brake fluid check / add a little

Torque 6 ft·lb

Note

Assemble the master cylinder clamp, make sure it's "UP" logo is facing up (A), Fig. B

Note

Upon completion of these operations, add a sufficient amount of brake fluid. See Chapter III "Checks and early maintenance", "Check / adding of front brake fluid".

Front and Rear Brakes / Front Brake

Assembly of the Front Brake Calipers

Disassembly: The following procedures are applicable to both of the brake calipers.

Note

Before disassembling the brake calipers, drain the brake fluid in the brake circuit. Before disassembling brake cylinder, drain the brake fluid in the brake circuit.

Separation:

Banjo bolt (19) and sealing washer (5), Fig. A
Remove the front brake hose.

Note

Place the end of the brake hose into a container, and then slowly pull it out to drain all the brake fluid.
Disassemble the two calipers, and remove the fastening bolts (A) at the front forks, Fig. B

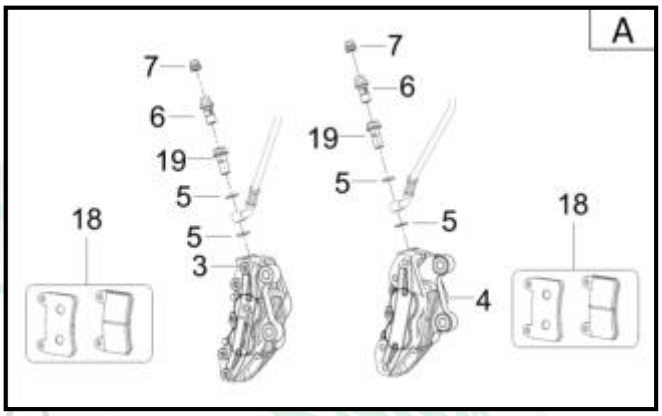
Separation:

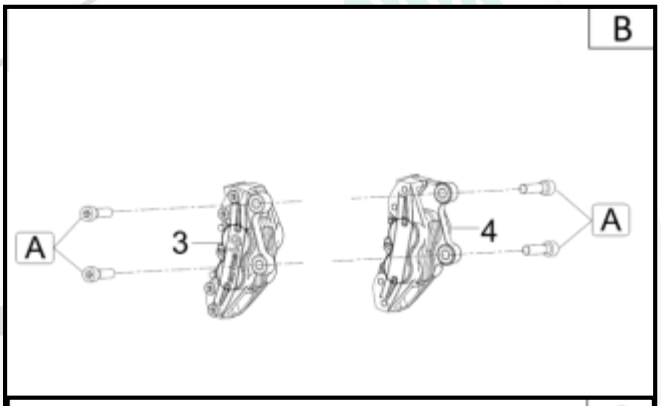
Brake caliper piston (B), Fig. C
Piston gasket (E) on brake caliper (first the smallest oil seal - washer, followed by the sealing ring – large gasket)

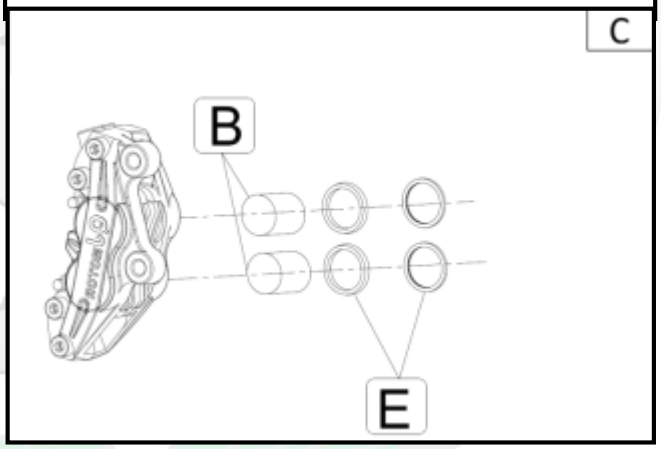
Place the pistons of the brake caliper against a large piece of wood, Fig. D
Blow compressed air into brake caliper banjo fitting to remove the pistons from the brake caliper, Fig. D

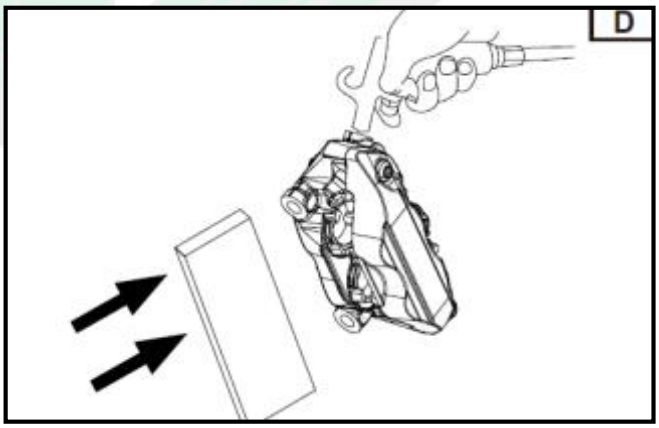
Warning

Remove the sealing rings from the pistons and the brake caliper.
Repeat the same steps to remove the pistons from the right side of the brake caliper, Fig. D





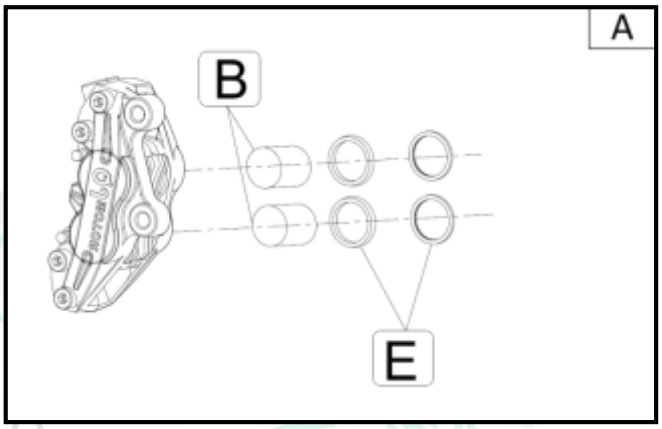




Front and Rear Brakes / Front Brake

Assembly of the Front Brake Calipers

Disassembly: The following steps are applicable to both brake calipers.



Warning

Before assembly, wash all of the internal parts of the brake, and lubricate using new brake fluid.

Do not apply any solvent to the internal parts of the brake, because solvent may cause the piston gaskets to swell or deform.

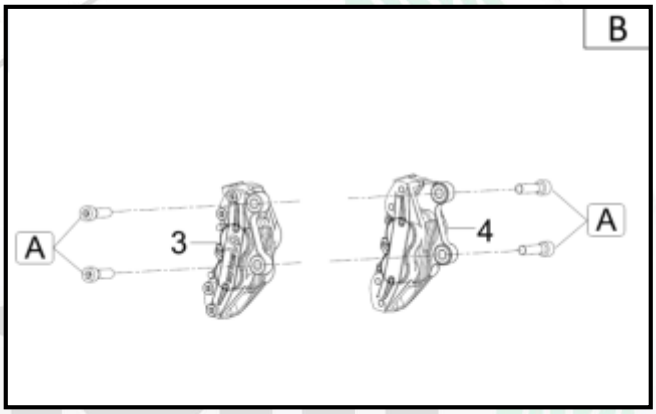
Replace the piston gaskets when disassembling the brake caliper every time.

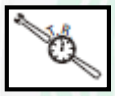
Assembly:

Install the piston gasket (E) into the brake caliper, Fig. A (first the smallest oil seal - washer, followed by the sealing ring – large gasket)

Brake caliper piston (B), Fig. A

Assembly: Tighten the fastening bolts (A) to front fork to attach the two calipers, Fig. B, according to the following torque:



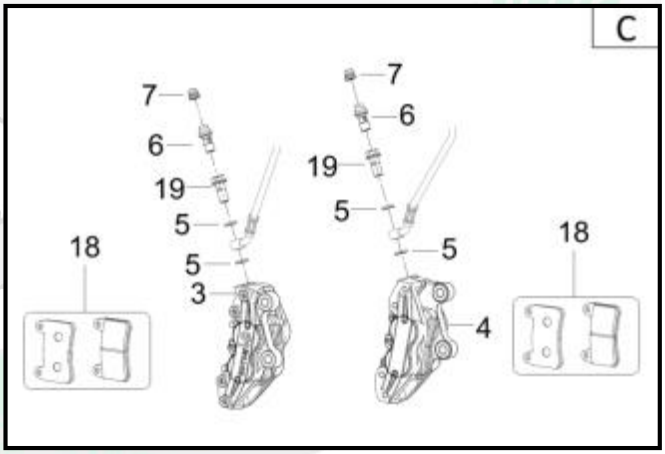


Torque 33 ft·lb

Front brake hose, Fig. C

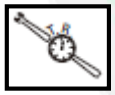
Sealing washer (5)

Banjo bolt (19)



Note

Tighten the banjo bolts, fasten them with a torque wrench twice, and tighten it to the following torque



Torque 19 ft·lb

Warning

To ensure the safety of the motorcycle, make sure the path of the brake hose is correct.

Fill: the brake fluid container

Warning

Use only the specified brake fluid. Rubber sealing rings may be damaged when using other types of brake fluid, resulting in leakage and reducing brake performance.

Only use brake fluid with the same brand when filling brake fluid. Mixing brake fluids of different brands should not be done, because this may cause a dangerous chemical reaction, and reduce braking performance.

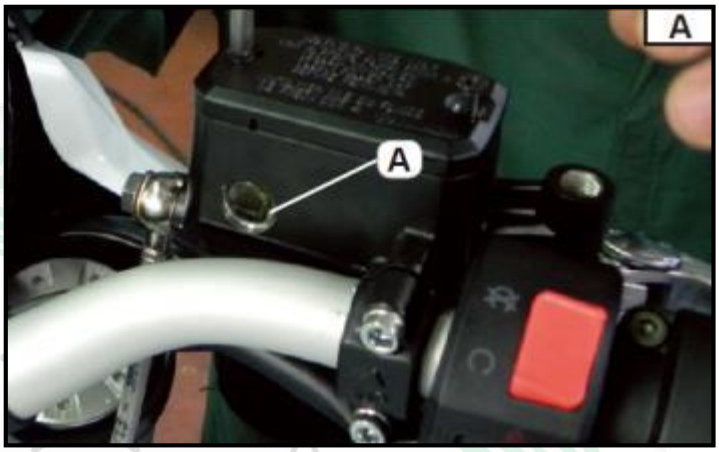
When adding brake fluid, be careful not to let any water into the container. Water will significantly reduce the boiling point of the fluid and lead to the formation of steam bubbles.

Front and Rear Brakes / Front Brake

Assembly of the Front Brake Cylinder

Important

Brake fluid may damage painted surfaces and plastic parts. Clean up any spilled brake fluid.



Emptying:

Brake circuit

Check:

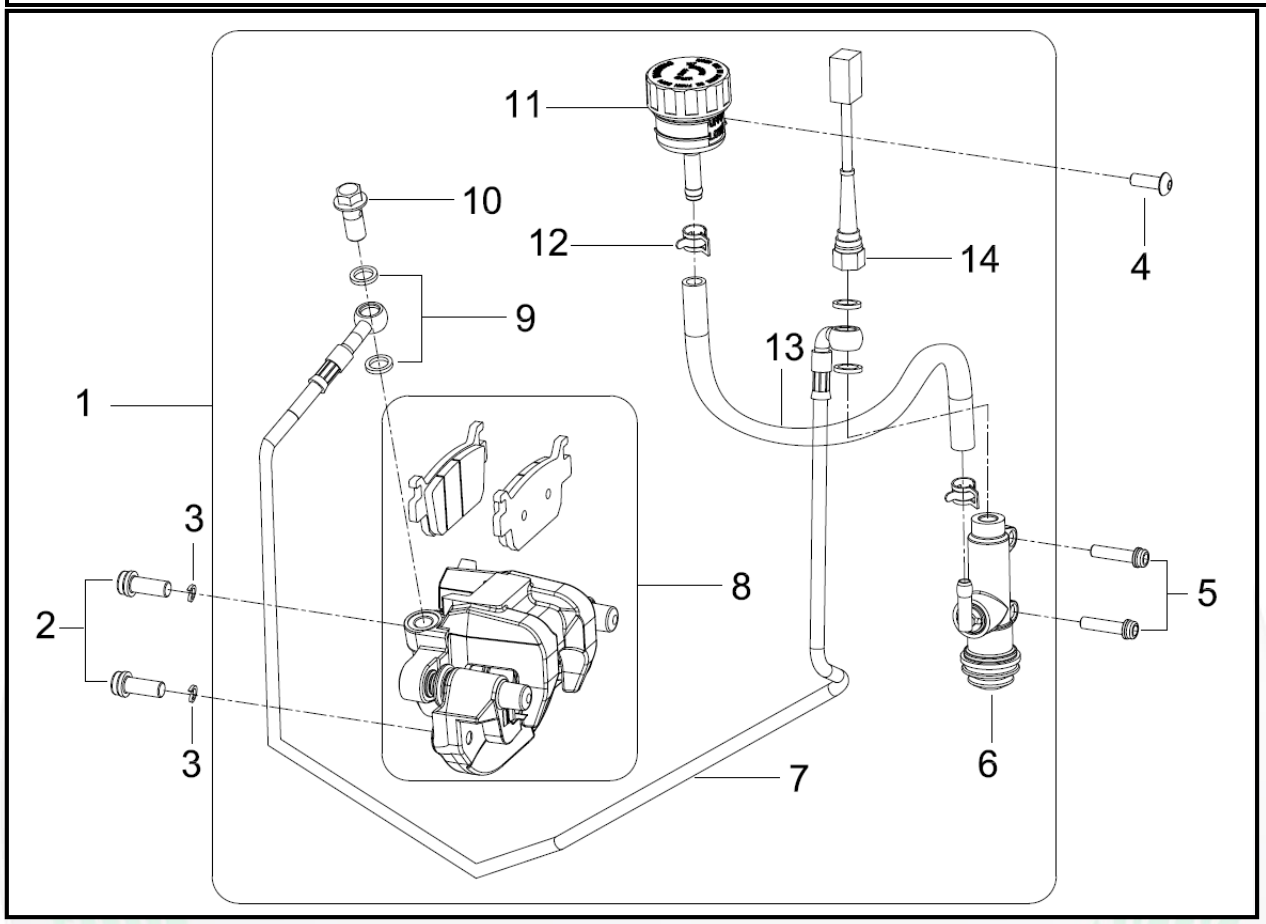
Check the brake fluid level, A, Fig. A
If it is lower than the minimum notch, add a sufficient amount of recommended brake fluid.

Check:

Operation of the brake lever
If the brake pedal is soft or feels light, bleed any air from the brake circuit.

Front and Rear Brakes / Rear Brake

Assembly of the Rear Brake Master Cylinder



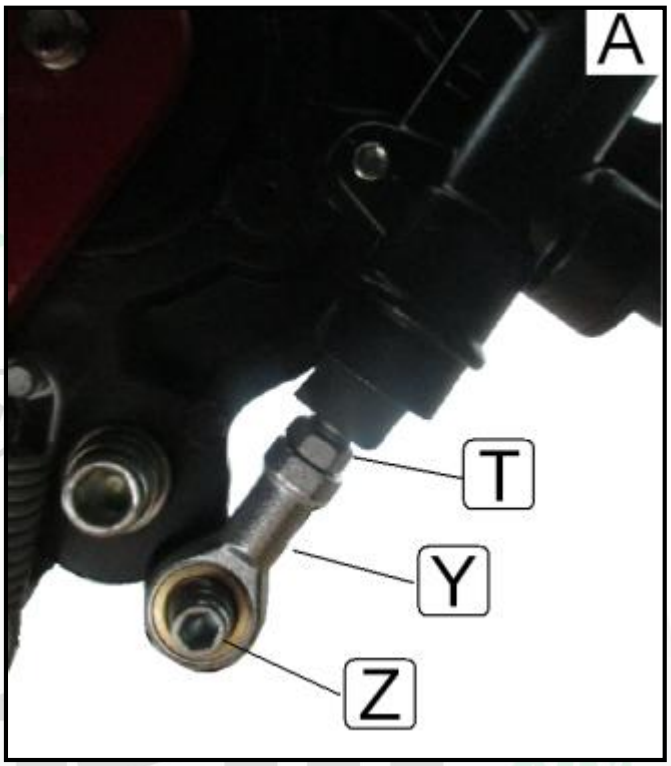
No.	Name	Quantity
1	Rear brake assembly complete	1
2	Bolt M8×1.25×25	2
3	Spring gasket φ8	2
4	Bolt M6×20	1
5	Bolt M6×30	2
6	Rear brake master cylinder	1
7	Rear brake line	1
8	Rear brake caliper complete	1
9	Sealing washer	4
10	Banjo bolt	1
11	Reservoir, master cylinder	1
12	Clamp, hose	1
13	Reservoir hose	1
14	Rear brake light switch	1

Front and Rear Brakes / Rear Brake

Assembly of the Rear Brake Master Cylinder

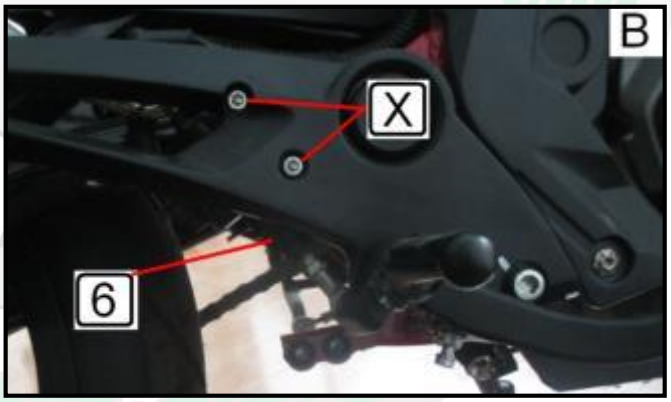
Assembly: Assemble in the following order:

Install the heim joint (Y) on the brake control rod (T), fasten connector (Y) to the brake pedal (Z), Fig. A



Tighten the fastening bolts (X) to the brake master cylinder (6), Fig. B, to the following torque:

Torque 7 ft·lb



Connect the rear brake caliper and related gaskets to the rear brake line and master cylinder. Tighten the rear brake caliper to the following torque:

Torque 19 ft·lb

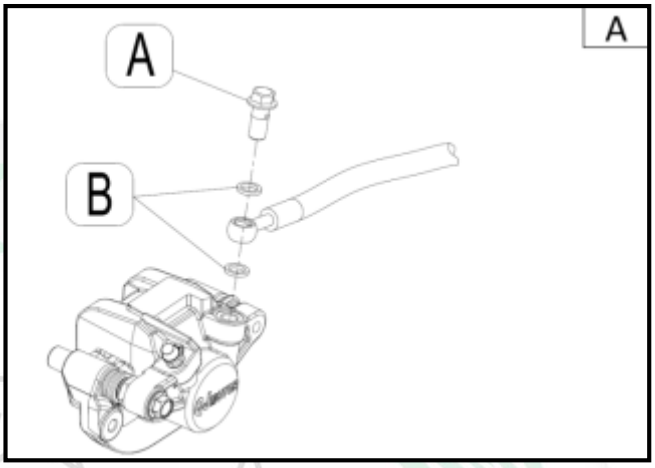
Warning

To ensure the safety of the motorcycle, make sure the path of the brake hose is correct.

Front and Rear Brakes / Rear Brake

Rear Brake Caliper

Disassembly:



Note:

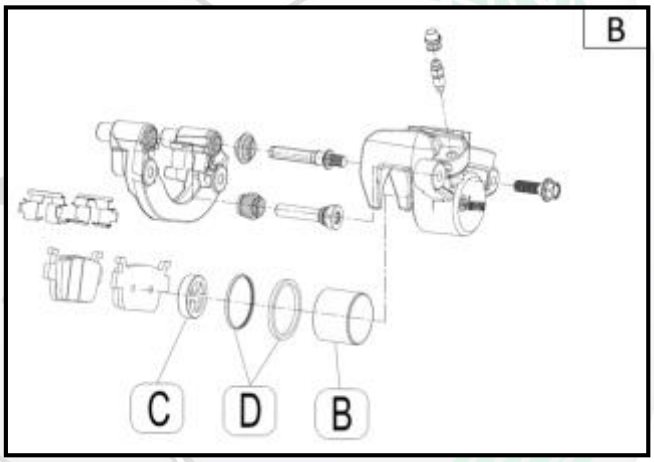
Before disassembling the brake caliper, drain the brake fluid from the brake circuit.

Separation:

Banjo bolt (A) and gasket (B), Fig. A
Remove the rear brake hose.

Note:

Disassemble the brake caliper, and remove the fastening bolt at the supporting plate of the brake caliper.



Separation:

Brake cylinder piston (B), Fig. B
Spacer (C)
Piston seal on the brake caliper (first the smallest oil seal - washer, followed by the sealing ring – large gasket)

Support the piston and brake caliper using a piece of wood, Fig. D
Blow compressed air into brake hose connector to extrude the piston at the right of the brake caliper, Fig. C

Warning

Do not try to open the piston of brake cylinder
Disassemble the seal ring of piston from brake cylinder. D

Front and Rear Brakes / Rear Brake

Rear Brake Caliper Inspection

Check:

Brake caliper piston
If there is any rust / patterns / signs of wear, replace the brake caliper piston.
Brake caliper
If there are any patterns / sign of wear, replace the entire brake caliper.
Main brake caliper body
If there are any cracks / damage, replace the entire brake caliper body.
Brake fluid conveying pipe (main brake cylinder body)
If there is a blockage, clean with a blast of compressed air.
Dust seals
If there are any cracks / signs of wear, replace the dust seals.

Important:

Replace piston gaskets when disassembling the brake caliper.

Check:

Connectors at the rear brake caliper support and rear swing arm.
If there is any rust / signs of wear, please replace.

Front and Rear Brakes / Rear Brake

Assembly of the Rear Brake Caliper

Assembly:

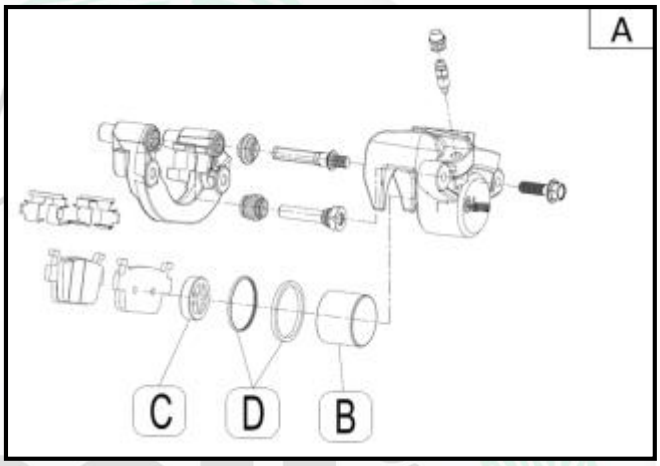
Warning

Before assembly, wash all internal parts of the brake, and lubricate them using new brake fluid.

Do not apply any solvents to the internal parts of brake, because solvent may cause the piston gaskets to swell or deform.

Replace piston gaskets when disassembling the brake caliper each time.

Assembly:

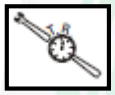


Install the piston gasket (D) into the brake caliper, Fig. A (first the smallest oil seal - washer, followed by the sealing ring – large gasket)

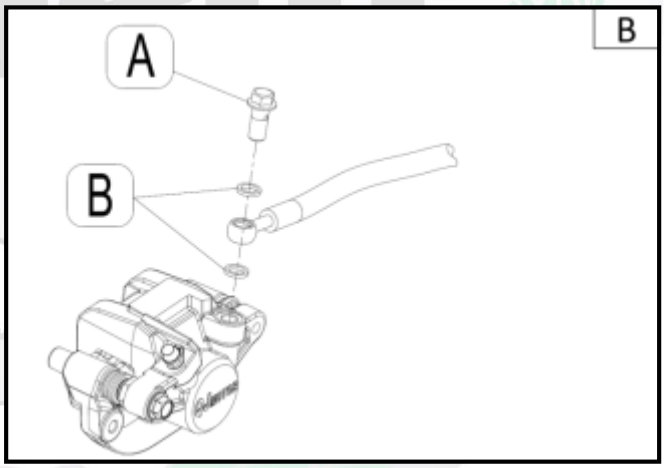
Insulator (C), Fig. A

Brake caliper piston B, Fig. A

Assembly: Tighten the fastening bolts to the caliper mounting plate according to the following torque:



Torque 16 ft·lb



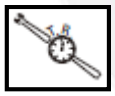
Rear brake hose, Fig. B

Sealing washer (B), Fig. B

Banjo bolt (A), Fig. B

Note

Tighten the banjo bolt, and set the torque twice after a few minutes according to the following torque:



Torque 19 ft·lb

Warning

To ensure the safety of motorcycle, the path brake hose must be correct.

Filling: Fluid reservoir of the brake pump

Warning

Use only the specified brake fluid. Rubber seal ring may be damaged when using other types of brake fluid, resulting in leakage and reducing brake performance.

Use the brake fluid with the same brand when filling brake fluid. The mixture of brake fluid with different brands should not be used, because this may cause a dangerous chemical reaction, and reduce brake performance.

When adding brake fluid, be careful not to let any water into the container. Water will significantly reduce the boiling point of the fluid and lead to the formation of steam bubbles.

Front and Rear Brakes / Rear Brake

Assembly of the Rear Brake Cylinder

Important

Brake fluid may damage painted surfaces and plastic parts. Clean up spilled brake fluid.

Filling:

Brake circuit

Check:

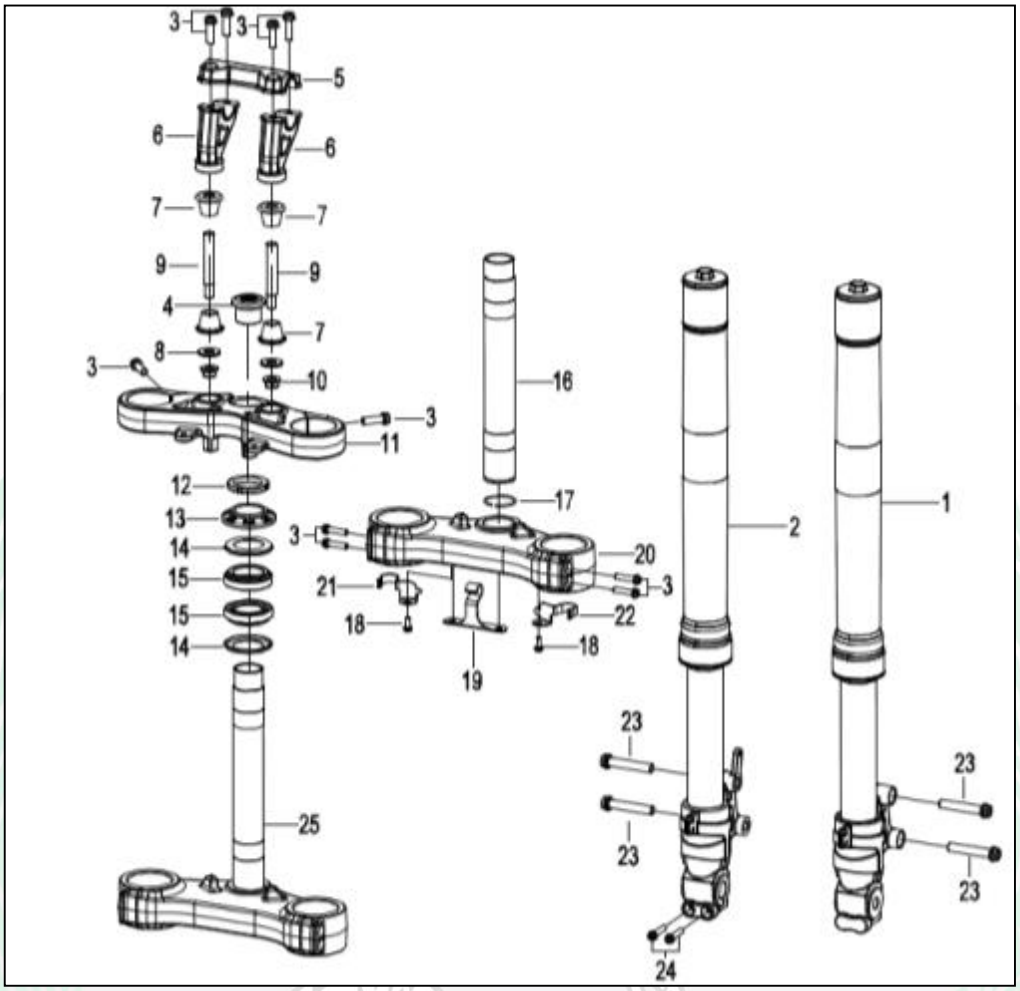
Check the brake fluid level, A, Fig. A
If it is lower than the minimum notch, add a sufficient amount of the recommended brake fluid.

Check:

Operation of the brake pedal
If the brake pedal is soft or light, remove air from the brake circuit.

Front Suspension

Disassembly of the Front Shock Absorbers



No.	Name and specifications	Quantity	No.	Name and specifications	Quantity	No.	Name and specifications	Quantity
1	Right shock absorber complete	1	11	Upper triple clamp	1	21	Left hydraulic brake Hose clamp	1
2	Left shock absorber complete	1	12	Nut, steering stem	1	22	Right hydraulic brake hoses clamp	1
3	Bolt M8×1.25×25	10	13	Nut, special	1	23	Bolt M10×1.25×40	4
4	Upper Triple Clamp Mounting Bolt	1	14	Dust seal	2	24	Bolt M6×30	2
5	Upper handlebar holder clamp	1	15	Steering stem bearing	2	25	Lower triple clamp complete	1
6	Lower handlebar clamps	2	16	Steering stem	1			
7	Damper, Rubber	4	17	C-Clamp	1			
8	Washer	2	18	Bolt M6×14	2			
9	double-end stud	2	19	Hydraulic brake hose clamp	1			
10	Self-locking nut M10×1.25	2	20	Lower triple clamp	1			

Front Suspension / Front Fork

Disassembly of the Front Forks

The following procedures are applicable to both front fork assemblies.

Parking: Park the motorcycle on flat ground.

Note

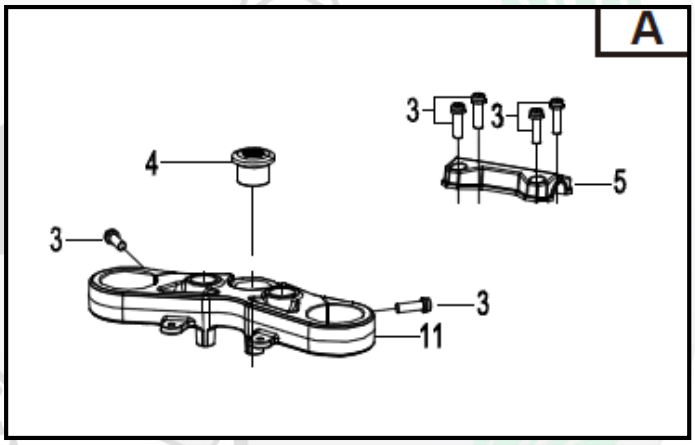
Support the motorcycle using a rear stand, lift the front wheel of the motorcycle using a jack placed under the header pipes.

Disassembly

Front brake calipers (see the steps in the section “front and rear brake”)
Front wheel (see the steps in the section “front wheel and front brake rotor”)
Front fender (see the steps in the section “covering parts/front fender”)

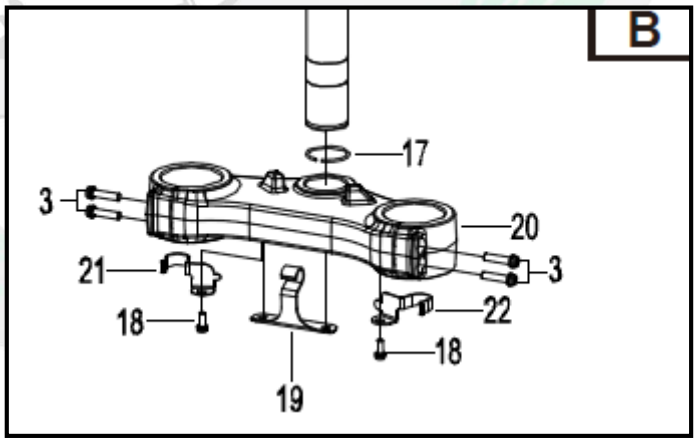
Disassembly

Remove the fastening bolts (3) from the upper triple clamp (11), Fig. A
Remove the fastening bolts (3) from the lower triple clamp (20), Fig. B



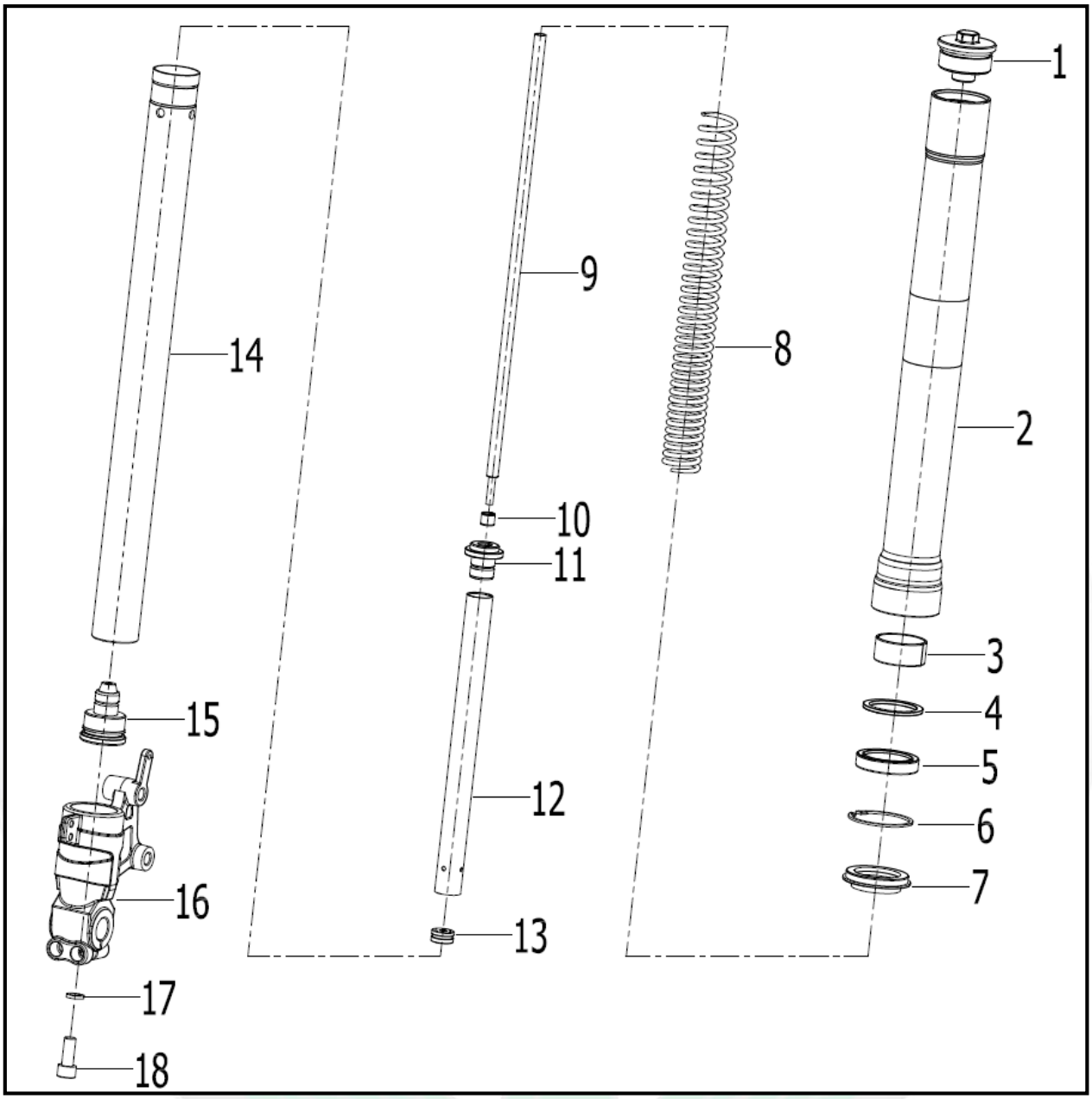
Important

Before releasing the fastening bolts on the lower triple clamp, first remove the support from the upper front shock absorber.



Front Suspension / Front Shock Absorber

Disassembly of the Front Forks



Note: The following steps are applicable to both of the front shock absorbers.

Disassembly

Remove the front fork cap bolt (1), Fig. A

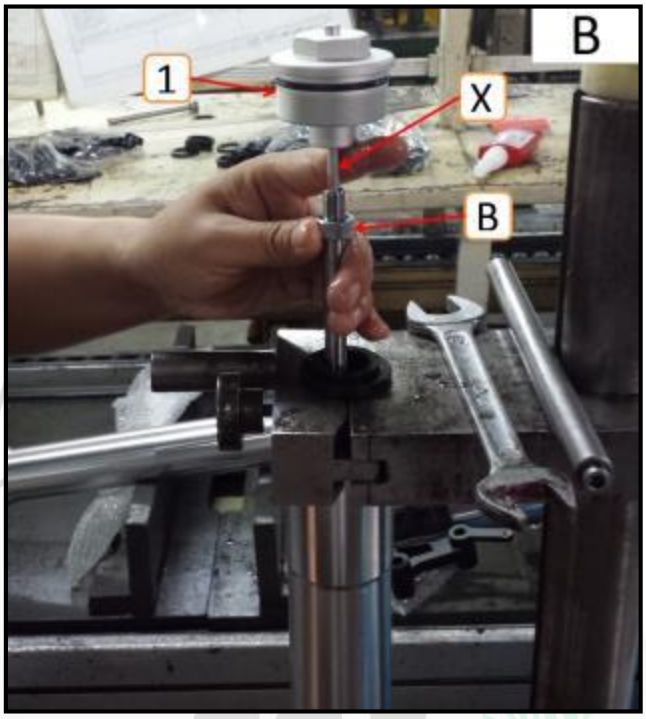
Important: Front shock absorbing spring is compressed.

Front Suspension / Front Shock Absorber

Disassembly of the Front Forks

Pushdown:

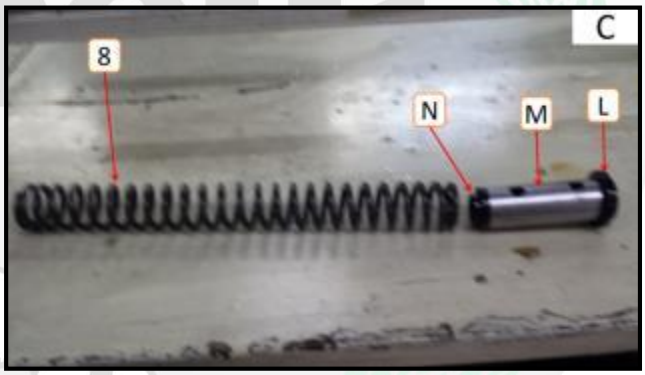
After compressing the spring using the special tool, remove the front fork cap bolt (1) and nut (B) using a wrench, Fig. B



Note:

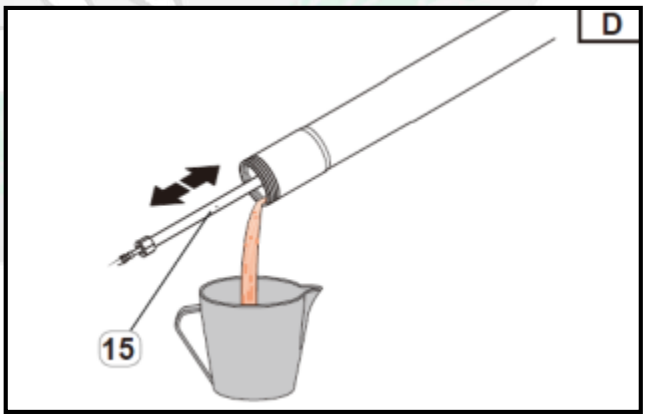
This is right shock absorber, the left shock absorber bolt is not equipped with an adjustment lever (X), otherwise the disassembly method is the same.

Slide the spring off of the sleeve, Fig. C:
Buffer block and adjusting sleeve seat (L)
Adjusting sleeve (M)
Spring seat (N)
Shock absorbing spring (8)



Releasing:

Release the rod from the clamp
Pour the fork oil into a container for disposal, Fig. D



Note

To help to drain the fork oil in the shock absorber, push the dampening rod (15) in and out at a slow speed, Fig. D

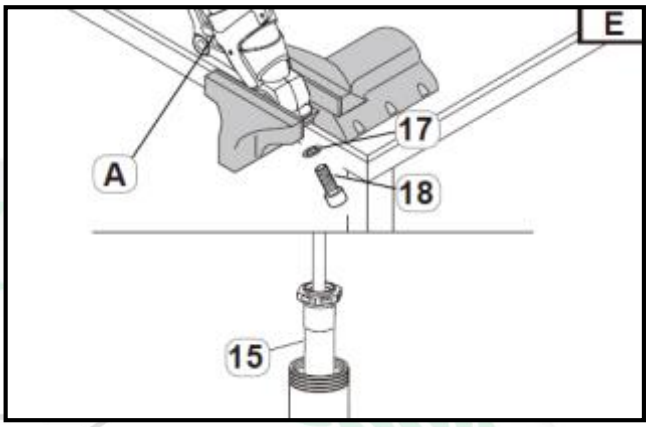
Important

This operation can only be conducted after draining the oil from the shock absorber.

Front Suspension / Front Shock Absorber

Disassembly of the Front Forks

Lock the lower portion of the fork in a vice (A), Fig. E.

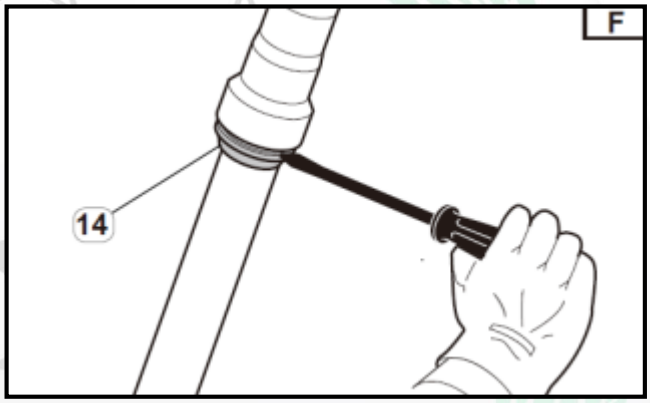


Disassembly

Bolt (18), gasket (17), and damping cylinder (15)

Important

This operation can only be conducted after draining the oil from the shock absorber.

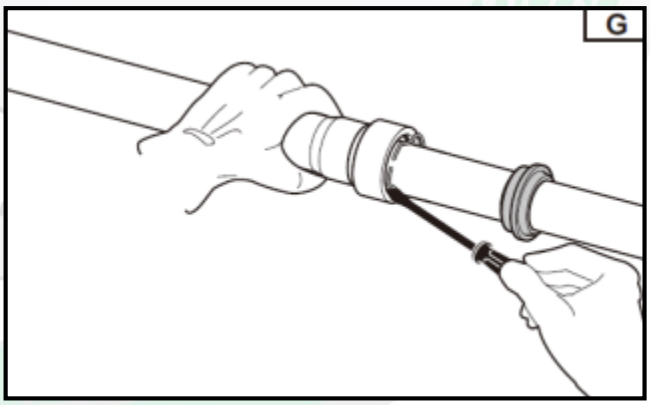


Disassembly

Disassemble the dust seal (14) from the outer fork leg using a small flathead screwdriver. Fig. F

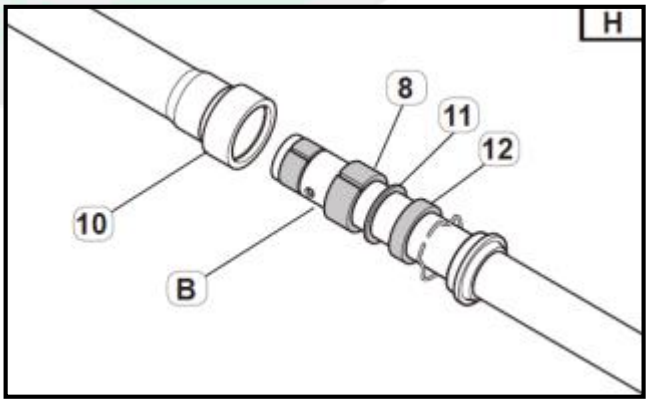
Disassembly

Remove the locking ring using the same screwdriver, Fig. G



Slide out:

Slide the inner pipe (B) out from inside the shock absorber outer cylinder (10) of the front fork Fig. H.



Note

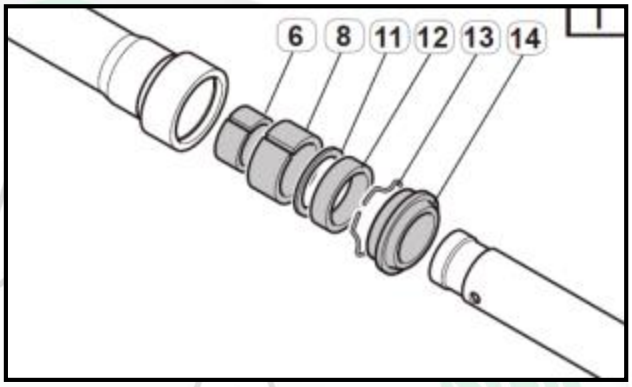
To separate these two parts, pull them with a small amount of force.
Oil seal (12)
Positioning ring (11)
Lower fork bushing (8)

Front Suspension / Front Shock Absorber

Disassembly of the Front Forks

Manual disassembly

Upper fork bushing (6), Fig. I



Note

If it is difficult to remove, use a flathead screwdriver in the open slot of the shock absorber bushing to spread it apart to make it easier to remove.
Lower guide sleeve (8)
Positioning ring (11)
Oil seal (12)
Locking ring (13)
Dust seal (14)

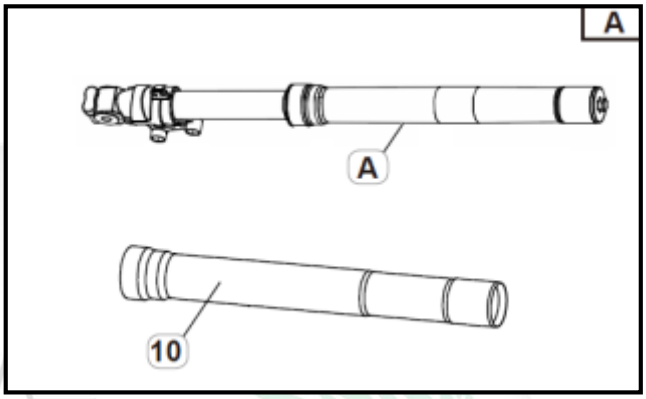
Note

If the oil seal and dust seal have been removed, they cannot be reused.

Front Suspension / Front Shock Absorber

Front Fork Inspection

The following steps are applicable to both of the front shock absorbers.

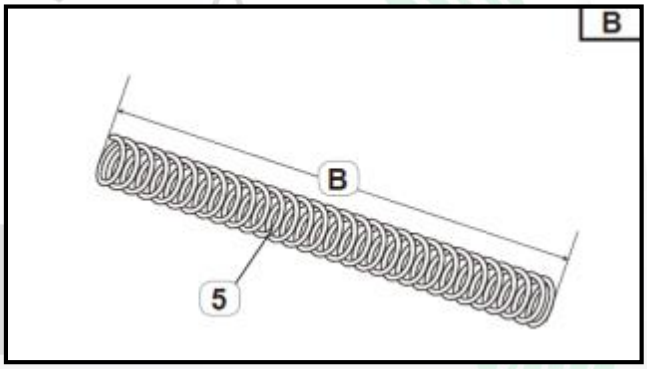


Check:

Shock absorber (A), Fig. A
Outer tube of the shock absorber (10)
If there is any deformation / damage / wear, please replace.

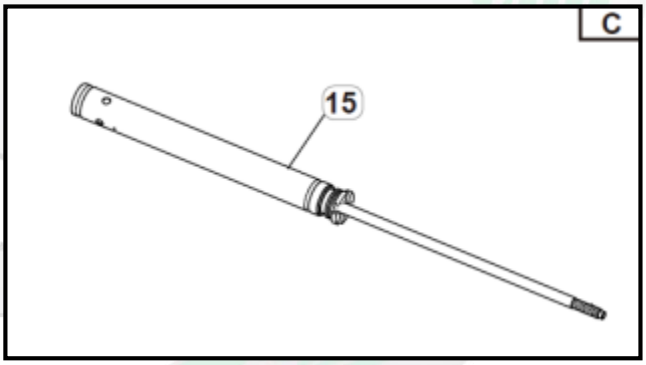
Warning

If the internal pipe of the shock absorber is bent, do not try to straighten it, because this may cause the internal pipe of the shock absorber become brittle and result in failure of the part.



Measurement: Full length (B) of the spring (5) (uncompressed state).
If it exceeds the specifications, please replace

Item	Standard	Lower deformation limit
Front shock absorbing spring	310mm	300mm



Check:

Damping cylinder (15), Fig. C
If there is any damage or wear, please replace.
If there is any blockages, blow out the entire oil passage with compressed air.

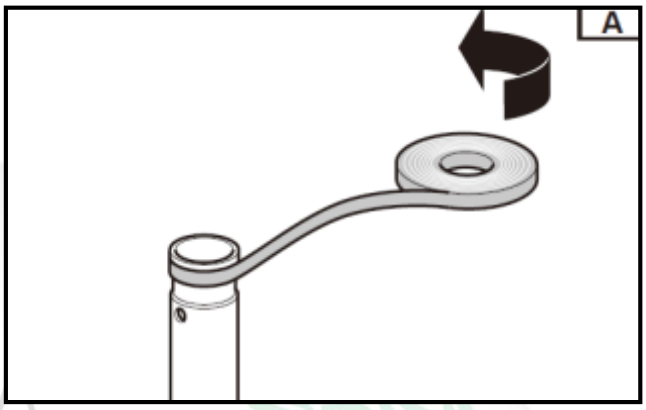
Important

When disassembling or reinstalling front shock absorber, do not let foreign bodies enter the shock absorber.

Front Suspension / Front Shock Absorber

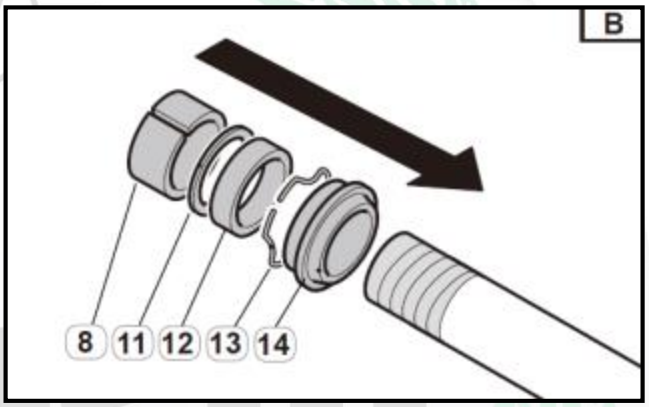
Assembly of the Front Shock Absorber

The following steps are applicable to both of the front shock absorbers.



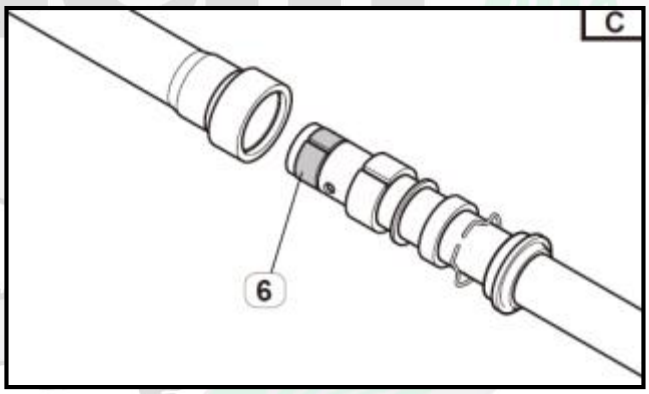
Important

After disassembly, the oil seal and the dust seal cannot be reused.
Before reinstallation, check the inner fork tube and the bushings; if there is any dents, chips, or scratches replace it.
Cover the end of the inner fork tube with tape, Fig. A
This will cover the sharp edge to keep it from cutting the seal or dust seal.
Slightly lubricate lower oil seal and dust seal with grease or fork oil.
Insert the dust seal, Fig. B
Dust seal (14)
Locking ring (13)
Oil seal (12)
Positioning ring washer (11)
Lower fork bushing (8)

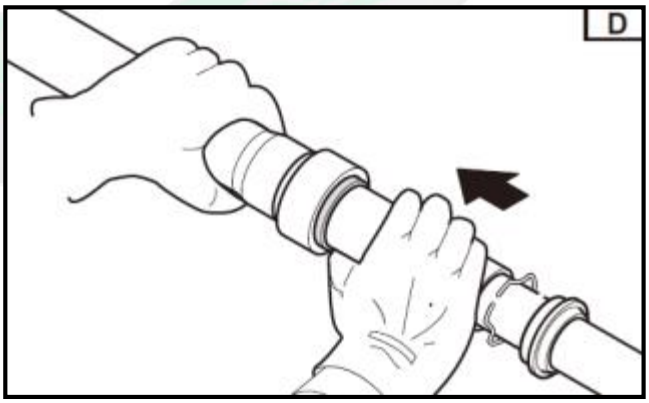


Important

Pay attention to the orientation of the oil seal (12).



Remove the tape from the end of internal fork tube, and remove any remaining tape residue.
Insert the following parts by hand: upper guide bushing (6), Fig. C
Insert the internal fork tube into the outer fork tube slowly, as to not damage the bushings.



Inserting simultaneously

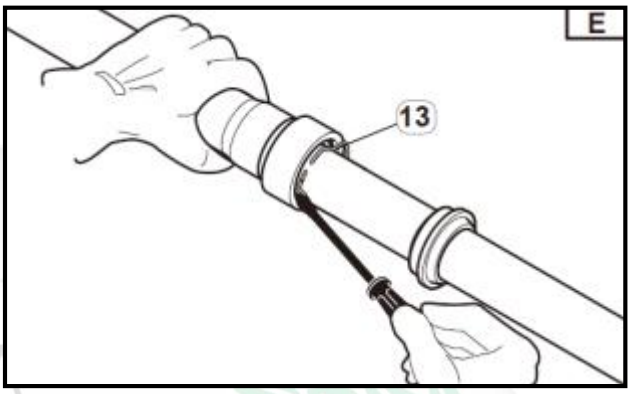
Lower the guide bushing, until the sleeve contacts the front fork, Fig. D
Positioning ring
Oil seal
And then install them in the base of the outer fork tube.

Front Suspension / Front Shock Absorber

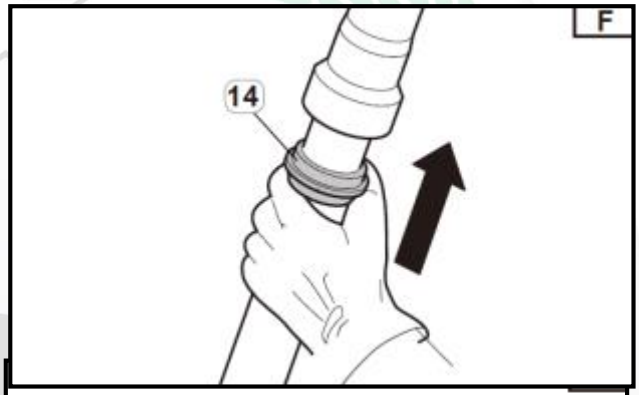
Assembly of the Front Shock Absorber

Assembly:

Install the locking ring (13) on the top of the oil seal with a small flathead screwdriver, ensure that it is properly inserted to the internal groove, and pay attention to not damage the internal fork tube, Fig. E.

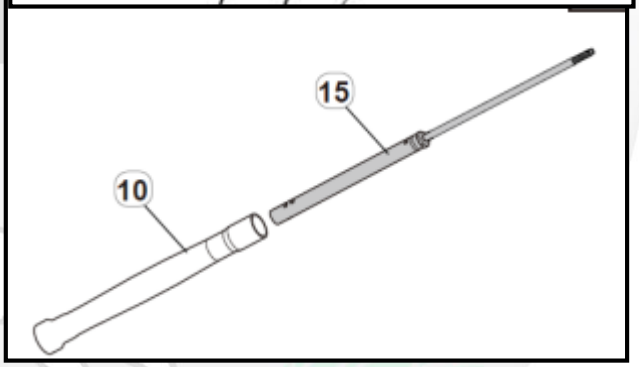


And then put the following parts into the base:
Install the dust seal (14) by hand, Fig. F



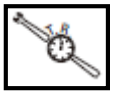
Inserting:

Insert the assembled damping rod (15) into the outer fork tube (10), Fig. G.

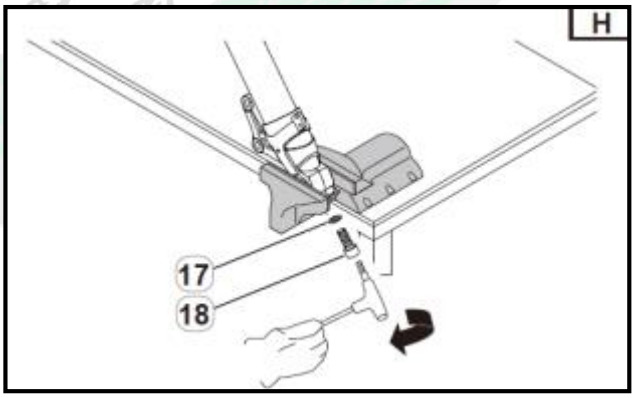


Assembly:

Clamp the bottom on the inner fork tube in a bench vise to install the bolt. Fig. H
Fasten the inner and outer fork tubes with a gasket (17) and socket head bolt (18), and fasten it to the following torque using an Allen wrench.



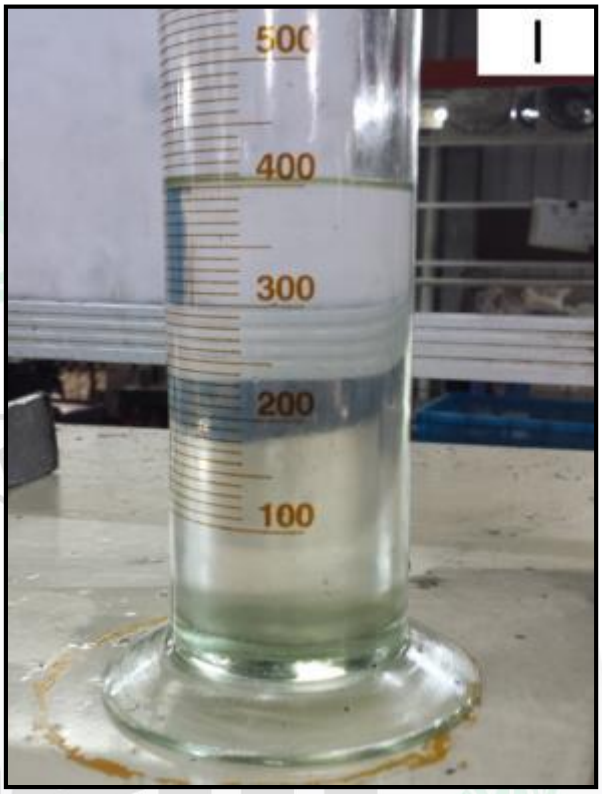
Torque 16 ft·lb



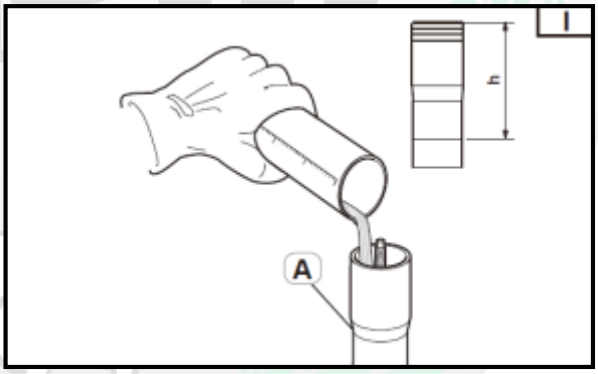
Front Suspension / Front Shock Absorber

Assembly of the Front Shock Absorber

Add 400mL of 7.5 weight fork oil with a graduated cylinder, Fig. I.



Lift the entire outer fork tube then use the graduated cylinder container, prepare the correct amount of fork oil and pour it into the outer fork tube, pour about 2/3 of oil into the fork cylinder (A), and then move the rod up and down to remove any air. Fig. I. Continue to pour, until the required volume is reached.



Assembly:

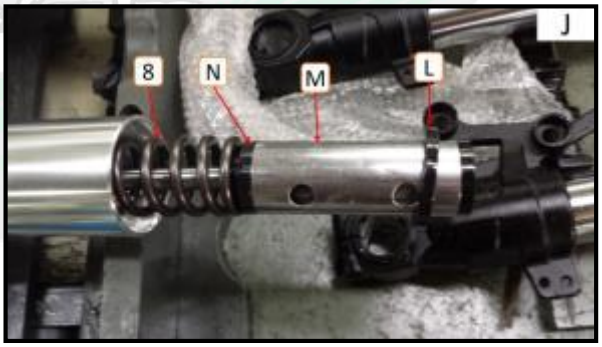
Install the following components on the dampening rod, Fig. J

Shock absorbing spring (8)

Spring seat (N)

Adjusting sleeve (M)

Buffer block and adjusting sleeve seat (L)



Front Suspension / Front Shock Absorber

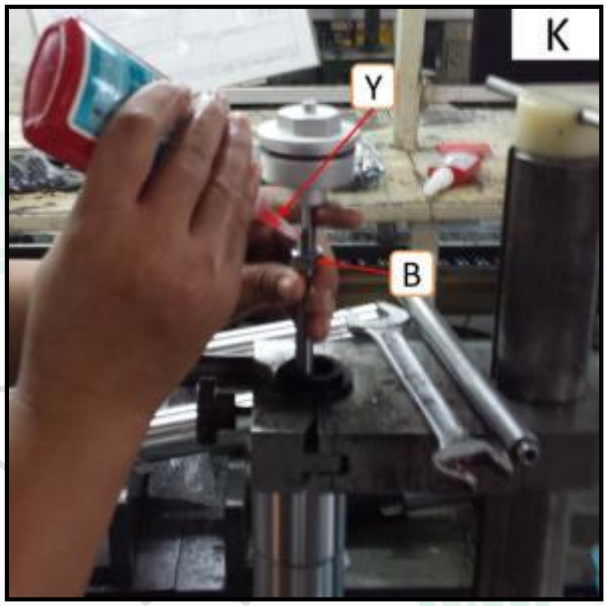
Assembly of the Front Shock Absorber

Assembly:

Compress the spring with the special tool, apply a proper amount of thread sealant (1261# glue), and lock it with a wrench, Fig. K

Fasten it to the following torque:

Torque 12–14 ft·lb



Assembly:

Fasten the upper bolt (1) using a socket, and torque it, Fig. M

Fasten it to the following torque:

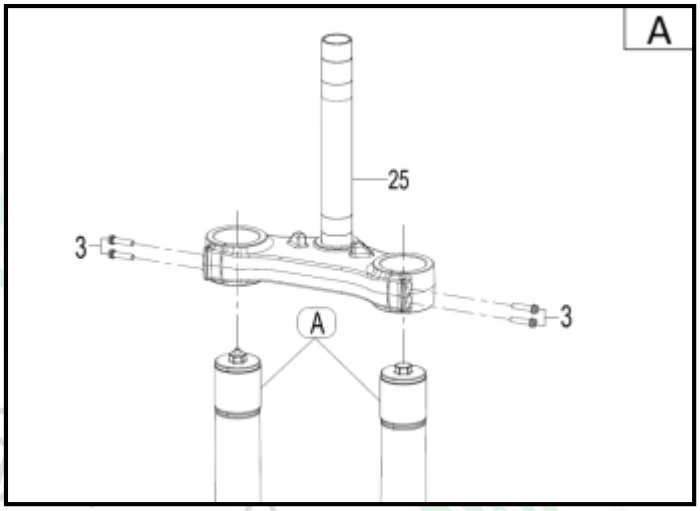
Torque 13-15 ft·lb

Front Suspension / Front Shock Absorber

Assembly of the Front Shock Absorber

Assembly: Outer cylinder of

the shock absorber (A), Fig. A
Fastening loosely.
Fasten the mounting bolts (3) to the lower triple clamp, Fig. A.



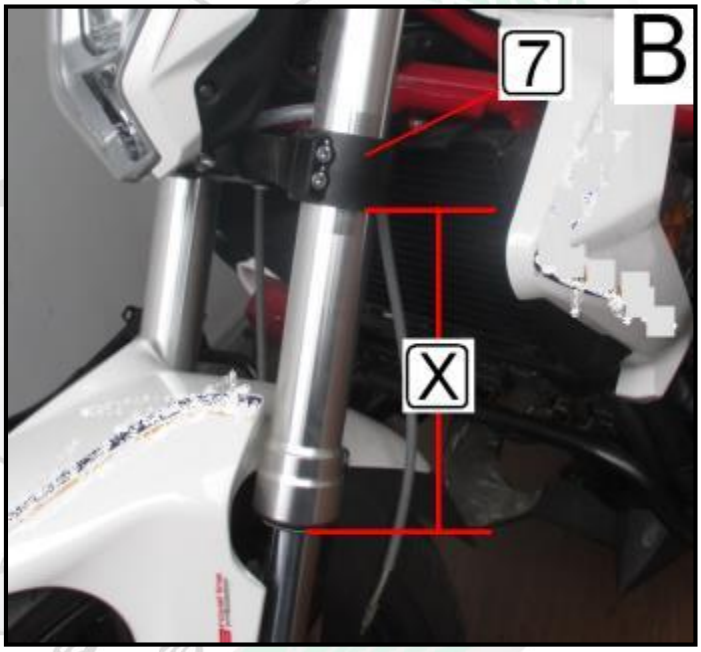
Note

Check assembly position (X), as shown in Fig. B

Assembly position (X)
204.5mm

Fastening: Fasten the mounting bolts (3) to the lower triple clamp (7); the torque is as follows:

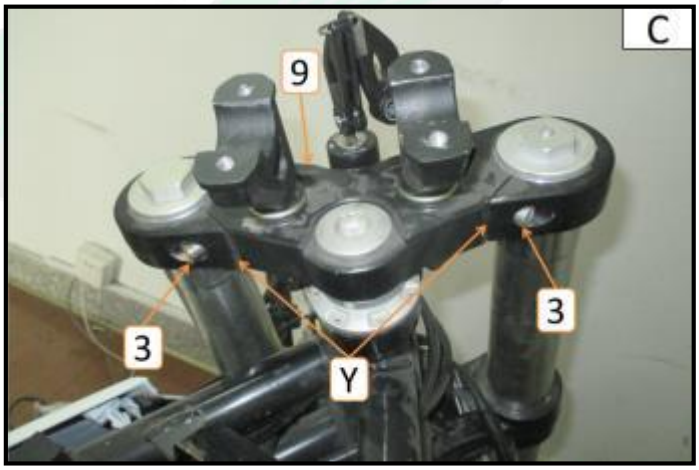
Torque 16 ft·lb



Note

The assembly is divided into three steps
Assemble the upper triple clamp, insert a straight blade screwdriver at the opening (Y), to simplify insertion of the front forks, Fig. C
Fasten: Install mounting bolts (3) to the upper triple clamp (9), and torque them as follows:

Torque 16 ft·lb

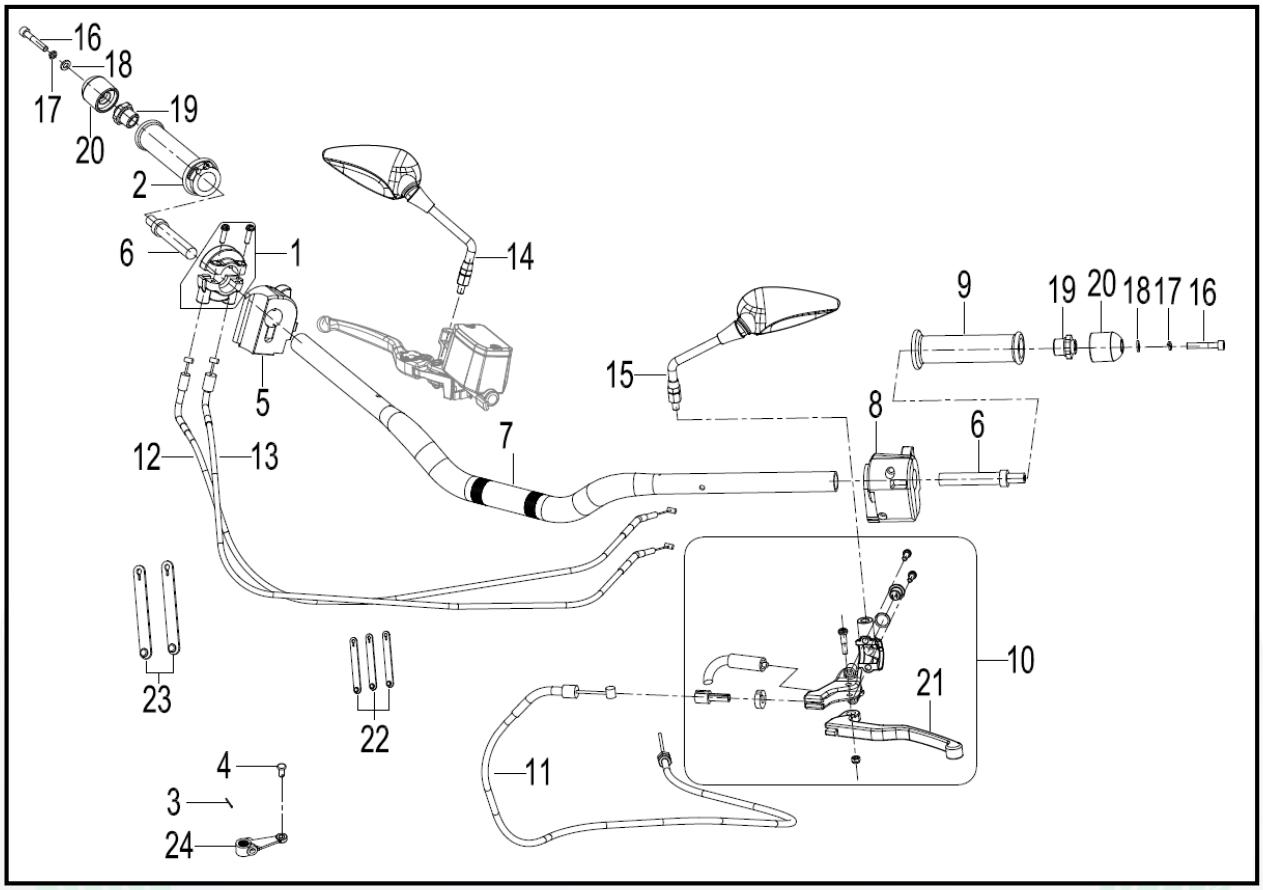


Important

Ensure that the routing of the brake hose is correct.

Control

Handlebar Disassembly



No.	Name and specifications	Quantity	No.	Name and specifications	Quantity
1	Throttle cable housing	1	13	Throttle cable II	1
2	Throttle grip	1	14	Right rearview mirror	1
3	2×18 cotter pin	1	15	Left rearview mirror	1
4	6×14 hinge pin	1	16	M6×35 bolt	2
5	Right combination switch	1	17	Lock washer 6	2
6	Handlebar end insert	2	18	Washer 6	2
7	Handlebar	1	19	Insert, handlebar end mounting	2
8	Left combination switch	1	20	Handlebar end weight	2
9	Left grip	1	21	Clutch lever	1
10	Clutch perch assembly	1	22	Soft wire clamp	3
11	Clutch cable	1	23	Soft wire clamp	2
12	Throttle cable I	1	24	Clutch actuator	1

Control

Handlebar Disassembly

Park the motorcycle on flat ground.

Important

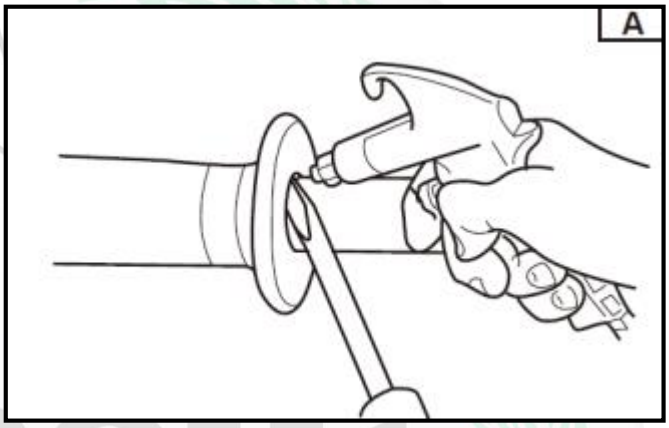
Support the motorcycle with a rear stand, so that it will not topple.

Remove the bolt (16), washer (18) and spring washer (17)

Remove the handlebar end weight (20)

Remove the handlebar end mounting insert (19) and the handlebar end insert (6)

Removal: Remove the left grip (9) from the handlebar by blowing compressed air between the handlebar and the handlebar grip. Fig. A



Note

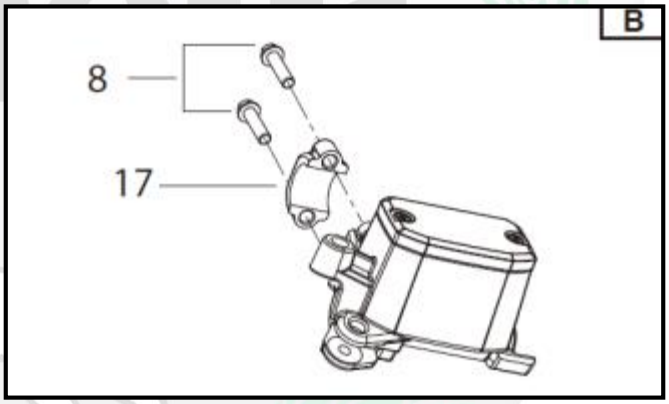
Blow compressed air directly between the left side of the handlebar and the grip, so the grip can be slipped off gently.

Remove the left combination switch.

Remove the clutch cable component.

Remove the rearview mirror and the adjusting nut

Remove the clutch perch by unscrewing the two fastening bolts from the clutch perch bracket, and then disassemble the clutch handle assembly.



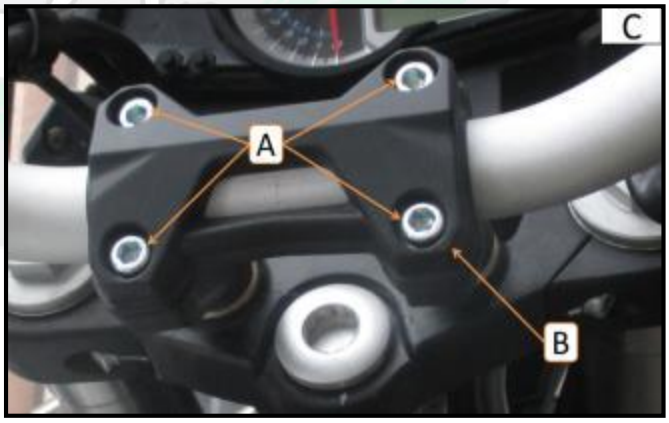
Repeat the same procedures for the right-hand grip, until the throttle grip is removed. In this case, the bolts on the throttle cable housing must be removed, so that the throttle grip can be removed.

Remove throttle cable I and throttle cable II.

Remove the right combination switch.

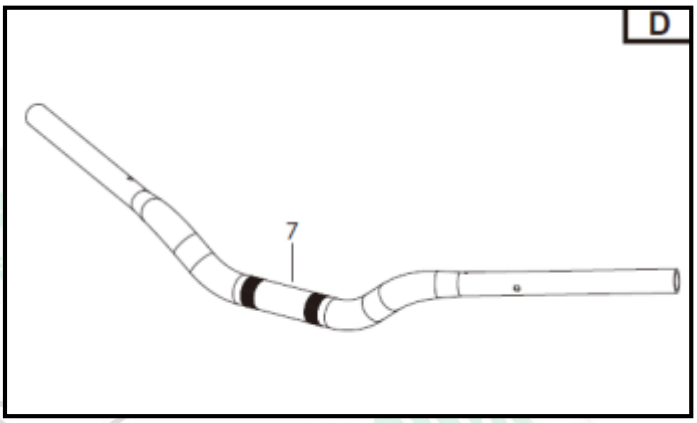
Unscrew the two fastening bolts (8), remove the mounting bracket from the master cylinder (17), and then remove the front brake master cylinder. Fig. B.

Loosen the four mounting bolts (A) from the handlebar holder bracket on the handlebars (B), and remove the handlebars. Fig. C.



Control

Handlebar Inspection



Check:

Handlebar (7). Fig. D.
If there are bends / breakage / damage, please replace it.

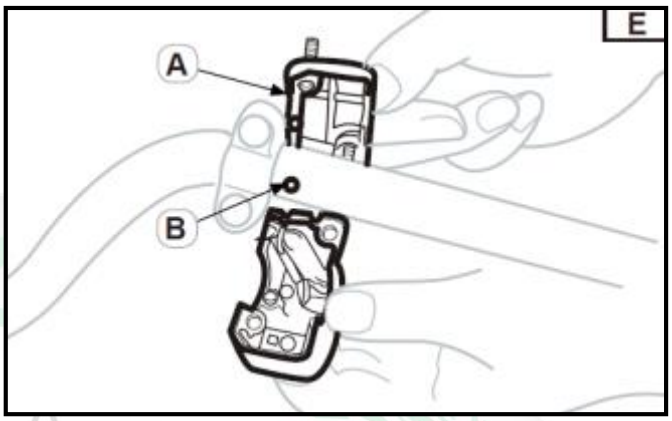
Warning

If the handlebar is bent, do not try to bend it straight, because the handlebar will become weak and this increases the risk or breakage.

Control

Control Assembly

Prepare for assembly, conduct it in reverse order of disassembly, but pay attention to the following information:

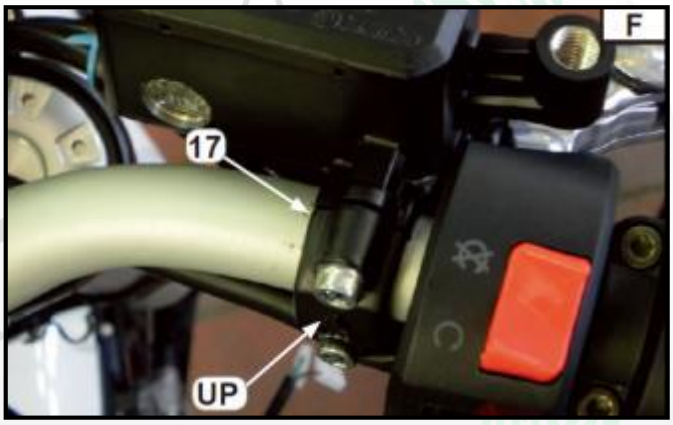


Assembly:

Install the right combination switch (5) and the left combination switch (8) onto the handlebar. Align the hole in the handlebar (B) with the projected part (A) of the switch. Both sides have a hole and tab. Fig. E.

Tighten the two bolts for the mounting bracket of the master cylinder (17), as shown in Fig. B, according to the following torque.

Torque 6 ft·lb



Note

Place the "UP" upwards when assembling the mounting bracket to the master cylinder Fig. F.

There should be a clearance of 2mm between the right handlebar switch and the master cylinder.

Assembly:

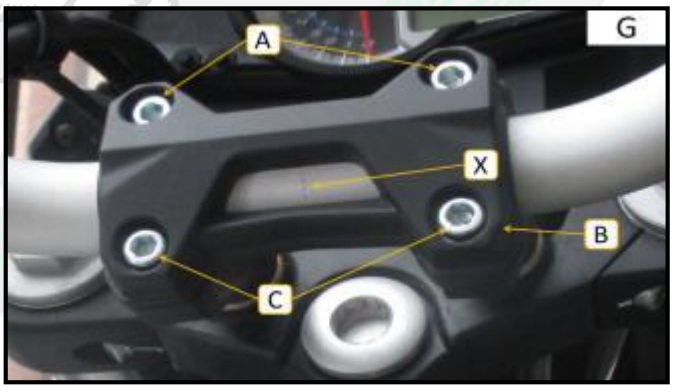
While holding the left grip, apply a thin layer of rubber adhesive to the end of the handlebar.

Slide the left grip onto the handlebar. The end of the left grip and the handlebar should line up.

Remove all traces of the rubber adhesive with a clean cloth.

Important

Do not touch the left grip until the rubber adhesive is completely dry.



Assemble:

Handle

When installing the handlebars, put the handlebar in the correct position, as shown in Fig. G, on the fourth reference mark (X).

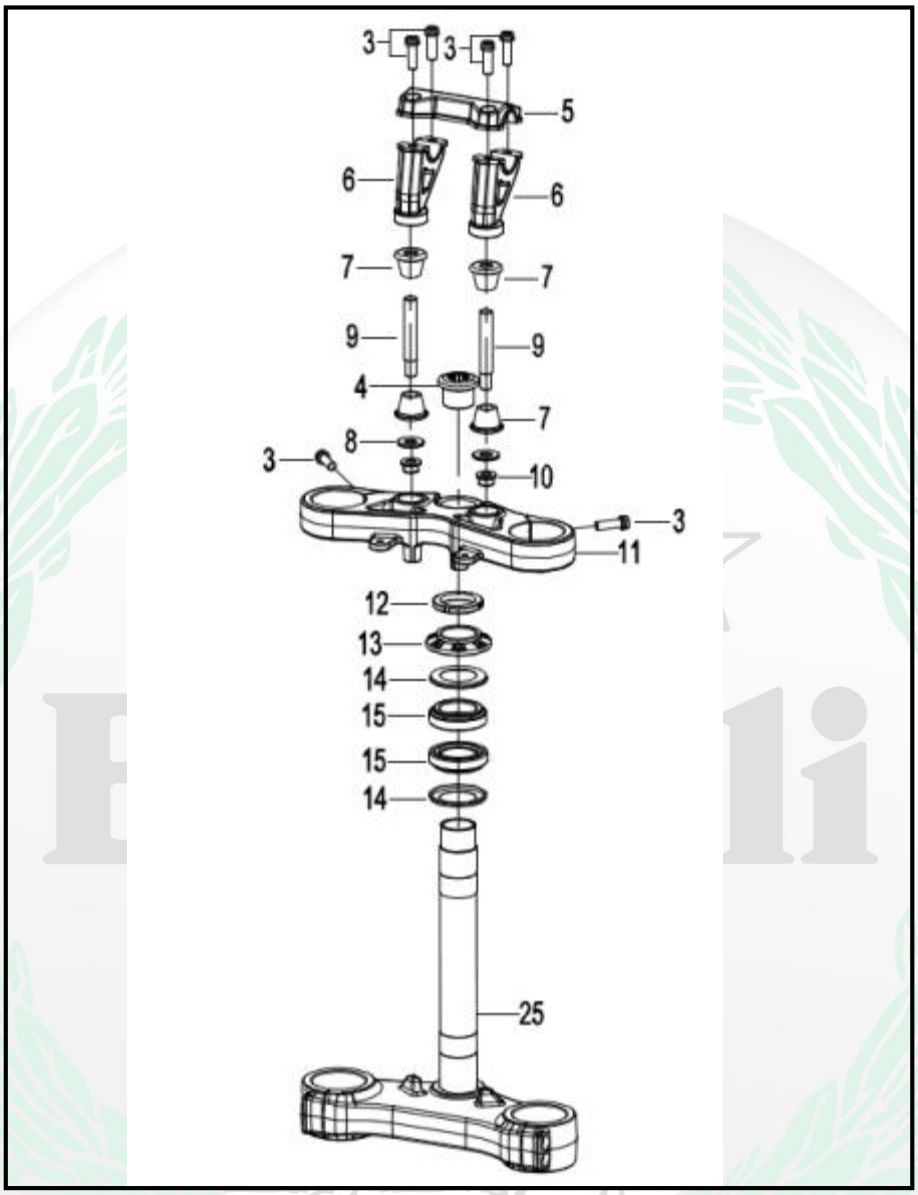
Tighten the two bolts (C) near the fuel tank at the back first, and then tighten two bolts (A) near the instrument in the front

Tighten the bolts to the following torque:

Torque 16 ft·lb

Control / Handlebar

Disassembly of Triple and Handlebar Clamps



No.	Name and specifications	Quantity	No.	Name and specifications	Quantity
3	M8×1.25×25 bolt	4	10	M10×1.25 self-locking nut	2
4	Upper Triple Clamp Mounting Bolt	1	11	Upper triple clamp	1
5	Upper handlebar clamp	1	12	Nut, steering stem	1
6	Lower handlebar clamps	2	13	Nut, special	1
7	Damper, rubber	4	14	Dust seal	2
8	Washer	2	15	Steering stem bearing	2
9	double-end stud	2	25	Lower triple clamp complete	1

Control / Handlebar

Disassembly of the Upper + Lower Triple Clamps

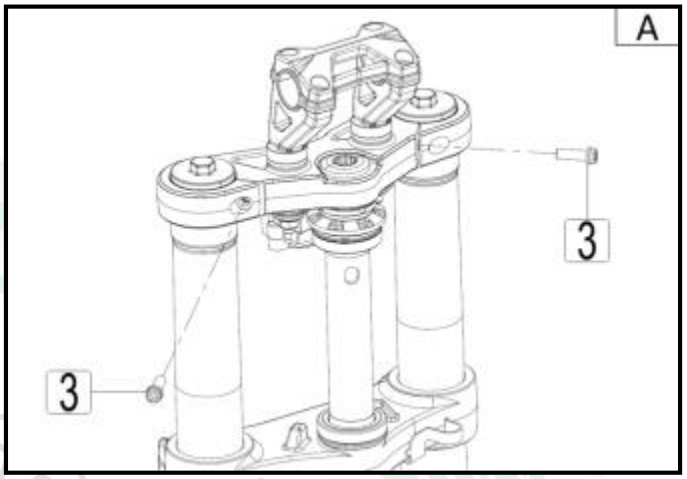
Park the motorcycle on flat ground.

Important

Support the motorcycle with a rear stand and a jack under the header pipe, so that it will not topple over without the front fork.

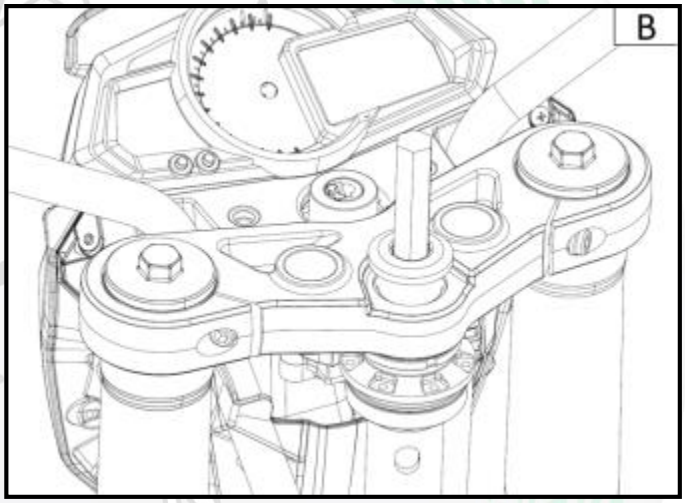
Disassemble:

Bolts on the upper triple clamp (3). Fig. A



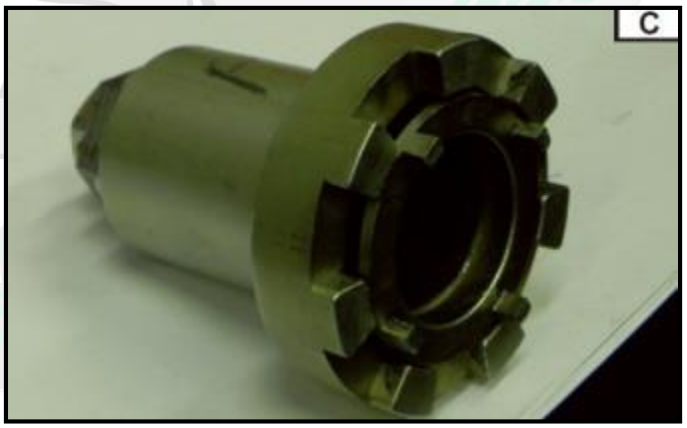
Disassembly:

Disassemble the retaining nut on the upper triple clamp with the special tool. Fig. B.



Loosen:

The special nut on the upper triple clamp.
Gland nut
Special tool used for the locknuts of the steering stem Fig. C.

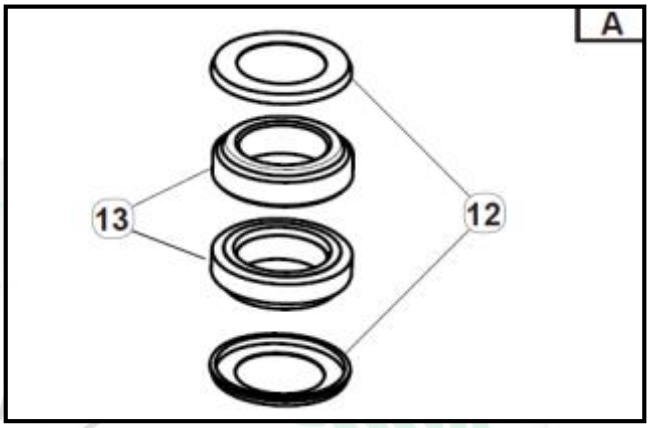


Control / Handlebar

Disassembly of the Upper + Lower Triple Clamps

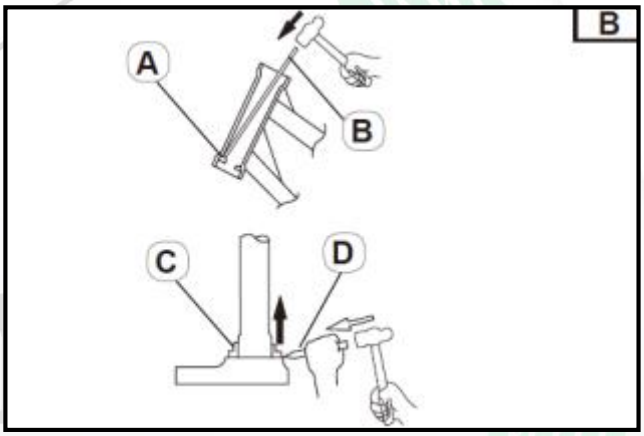
Check:

Steering stem bearings (13). Fig. A.
Dust seal (12). 图 A
If there is any damage, replace them.



Replace

Bearing
Bearing Race
Remove the bearing outer ring (A) from the headstock tube of the motorcycle frame with a punch and a hammer (B). Fig. B
Remove the bearing inner ring (C) from the lower triple clamp with a chisel (D) and a hammer. Fig. B
Install a new rubber seal and a new bearing.



Important

If the bearing outer ring is not installed properly, the headstock tube will be damaged.

Note

The ball bearing and the bearing race should be replaced together.
Each time the steering bearing is disassembled, a new rubber dust seal should be installed.

Check:

Upper steering bearing
Lower steering bearing (and the bushing)
If there is any bend/crack/damage, replace them.

Control / Handlebar

Disassembly of the Upper + Lower Triple Clamps

Lubricate:

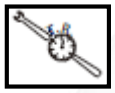
Ball bearing, Fig. A

Bearing outer race, Fig. A

Bearing inner race, Fig. A

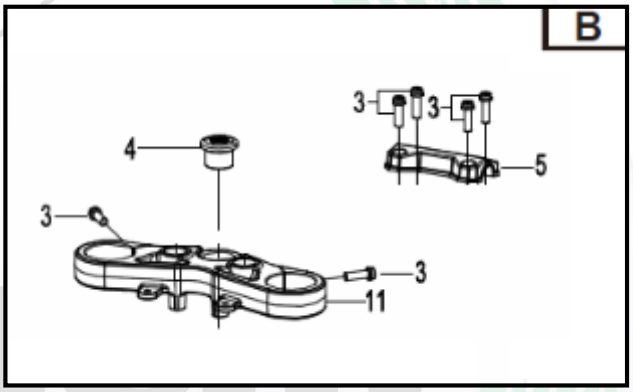
Note: Use lithium based grease on the steering bearings to prevent rust.

Assembly: assemble the nuts on the upper triple clamp with the special tools according to the following torque:



Torque 12 ft·lb

Tighten the locknuts for the steering stem.



Important

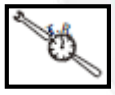
Do not over-tighten the steering stem nut.

Tighten the steering stem nut with the special tool to the following torque:

Torque 44 ft·lb

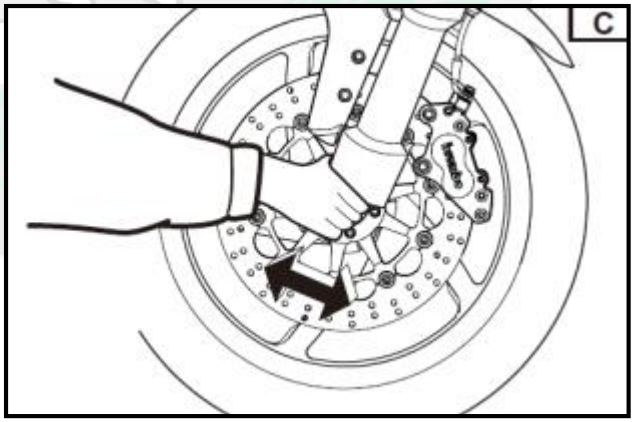
Assembly: assemble the front forks according to the above description.

Assembly: tighten the fastening nut on the upper triple clamp (4) with the special tool to the following torque:



Torque 44 ft·lb

Steering head wench



Fasten the bolts on the upper triple clamp (3), as shown in Fig. B, according to the following torque:

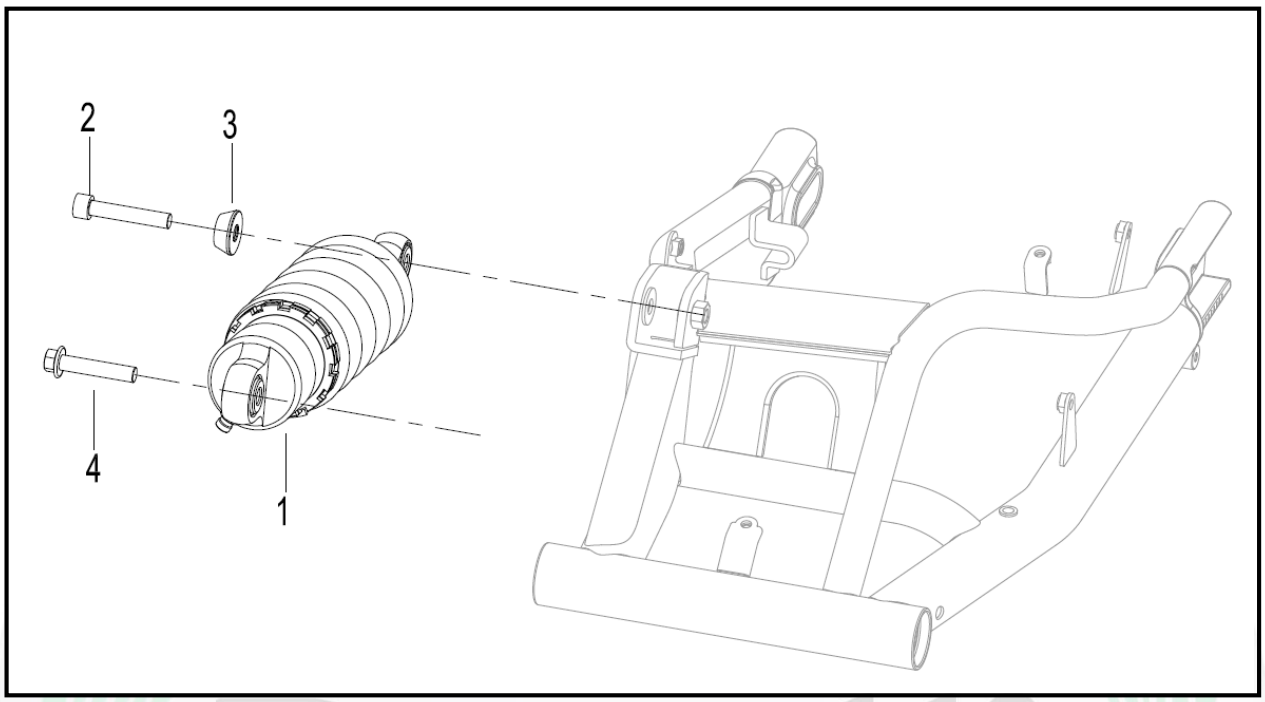
Torque 16 ft·lb

Check: Steering play, Fig. C

Grab the end of the fork and move it front to rear, and rotate the front fork gently from left to right. If it is binding / loose, readjust the steering stem bearing torque.

Rear Shock Absorber

Disassembly of the Rear Shock Absorber



No.	Name and specifications	Quantity
1	Rear shock absorber	1
2	Bolt, lower shock mounting	1
3	Decorative Washer, lower bolt	1
4	Bolts, upper shock mounting	1

Rear Shock Absorber

Disassembly of the Rear Shock Absorber

Park the motorcycle on flat ground.

Important

Support the motorcycle with a front stand and a jack under the header pipe, so that it will not topple over without the rear shock absorber installed.

Disassemble:

Bolt (16)
Bolt (18), Fig. A

Rear Shock Absorber

Rear Shock Absorber Inspection

Check:

Rear shock absorber rod 9, Fig. B

If there is any damage/bends, replace the rear shock absorber component.

Rear shock absorber cylinder 8, Fig. B

If there is any gas/oil leakage, replace the rear shock absorber component.

Rear shock absorber spring 7, Fig. B

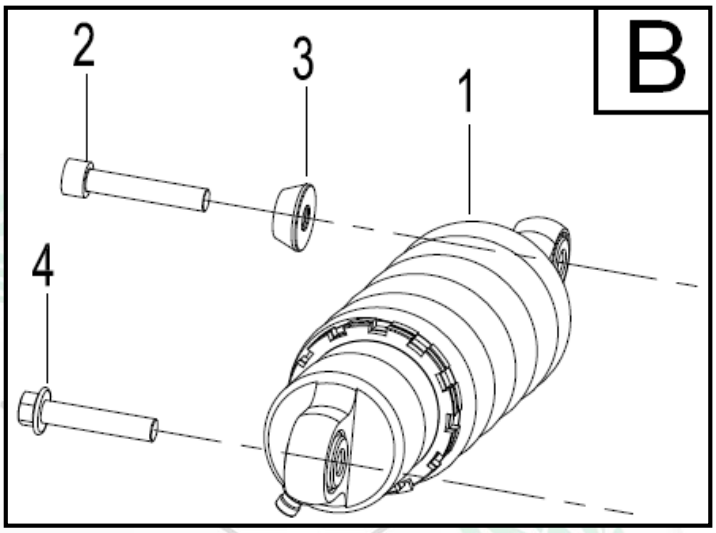
If there is any damage/wear, replace the rear shock absorber component.

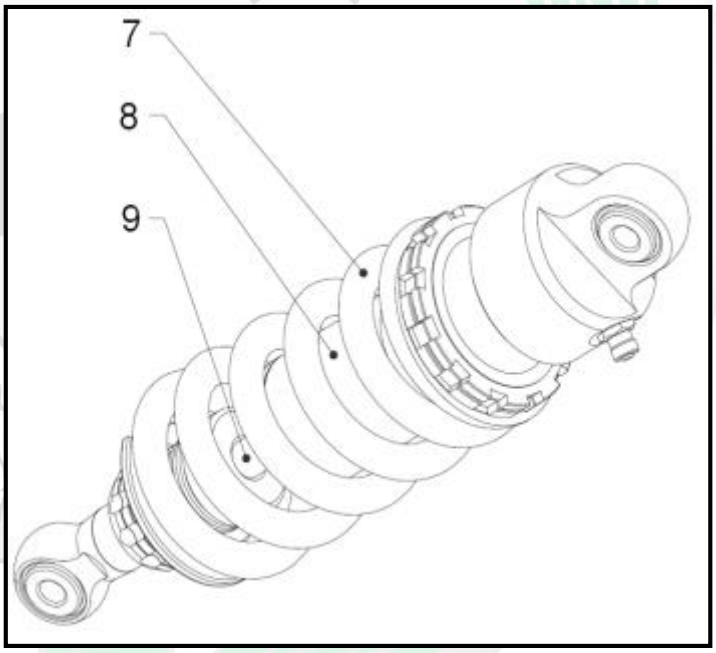
Rear shock absorber scraper seal

If there is any damage or wear, replace it.

Bolt (4) and Bolt (2), Fig. B

If there is any bend/damage/wear, replace them.



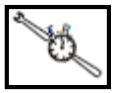


Rear Shock Absorber

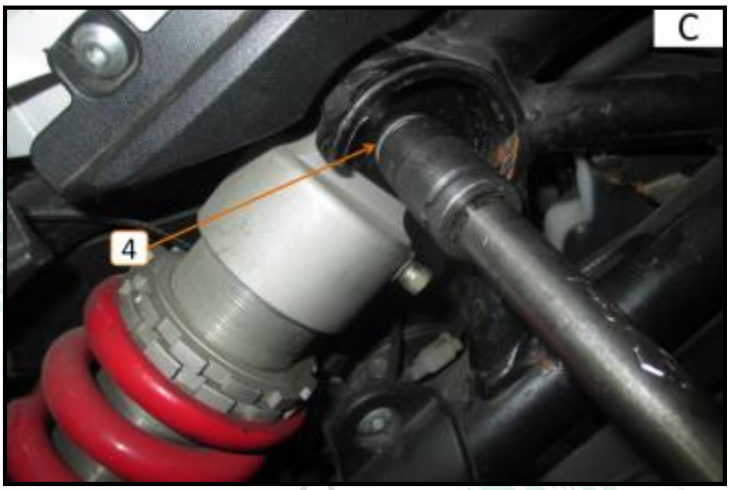
Assembly of the Rear Shock Absorber

Assembly:

Assemble the bolt (4), as shown in Fig C, and tighten it to the following torque:

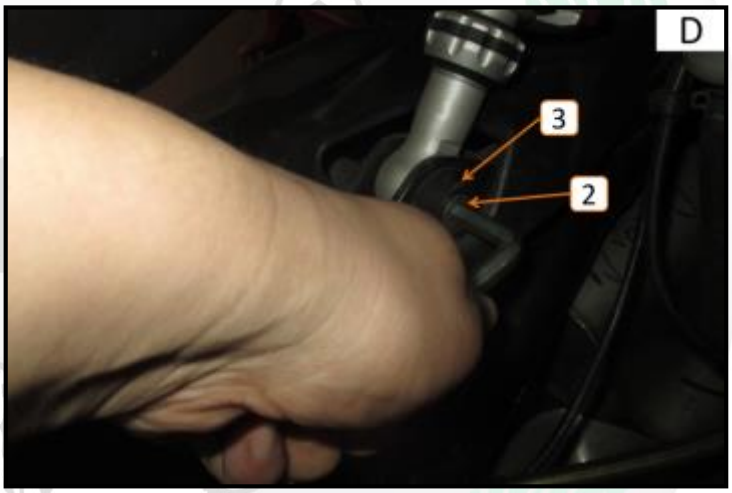


Torque 44 ft·lb



Assemble the bolt (2) and the decorative washer (3) according to the following torque:

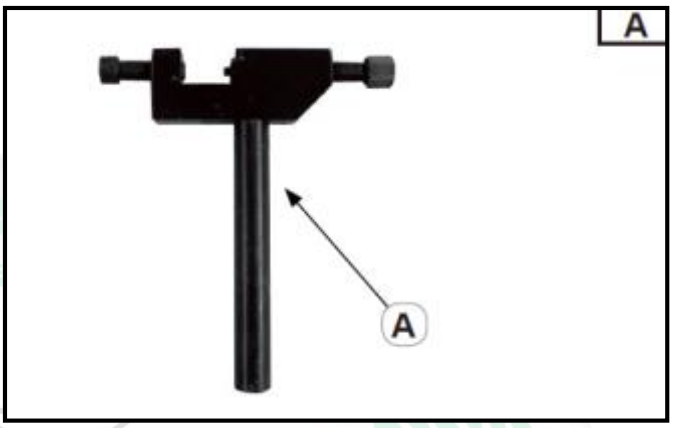
Torque 44 ft·lb



Drive Chain and Swing Arm

Disassembly of the Drive Chain

Park the motorcycle on flat ground.



Important

Support the motorcycle with a rear stand, so that it will not topple and the rear wheel is lifted.

Remove:

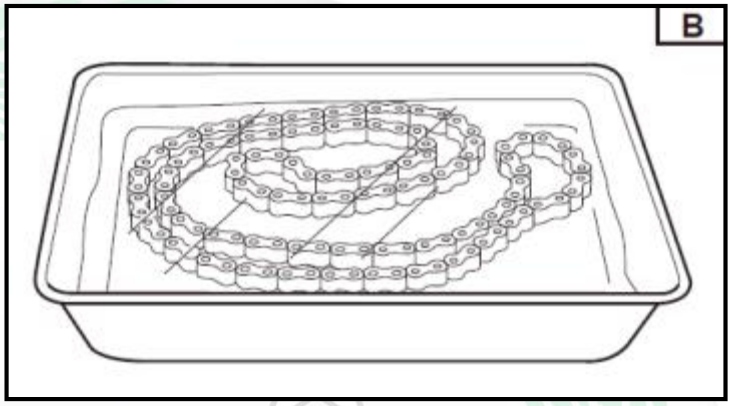
Drive chain
(Use a suitable tool for the drive chain (A), as shown in Fig. A, or use a special tool for the drive chain specified by the manufacturer)

Drive Chain and Rear Swing Arm

Drive Chain Inspection

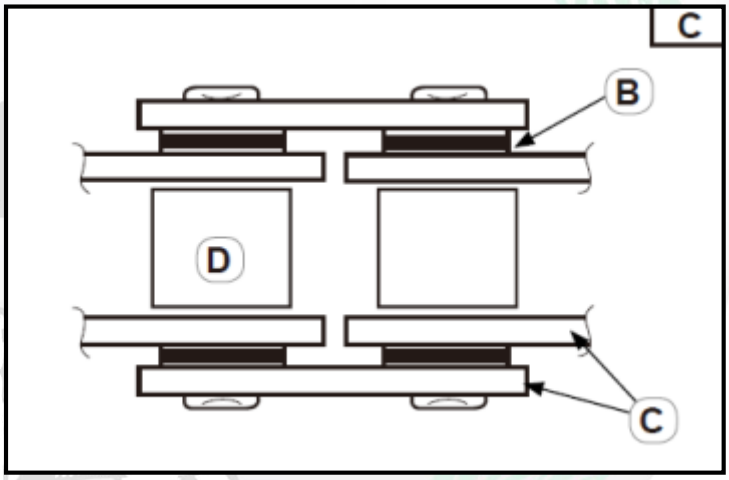
Check: drive chain, Fig. C

O-ring (B)
Drive chain roller (D)
Side plate of the drive chain (C)
Replace a damaged/worn drive chain
If there are any cracks, replace the drive chain. If the chain is stretched, replace it.



Clean: drive chain, Fig. B

Use a clean cloth to clean the drive chain.
Soak the drive chain in engine oil or chain cleaner to remove all the dirt.
Remove the drive chain from the oil/chain cleaner and dry it thoroughly.



Important

This motorcycle is equipped with an O-ring drive chain. There are rubber O-rings (B) between every two chain plates.
Do not use high pressure water or air to clean the chain. Do not use steam, gasoline, corrosive solvents (such as petroleum ether) or an excessively hard brush.
Using a pressure washer will force dirt into the crevices of the drive chain, and corrosive solvents can cause deterioration of the O-rings.
O-rings will be damaged by an excessively hard brush.

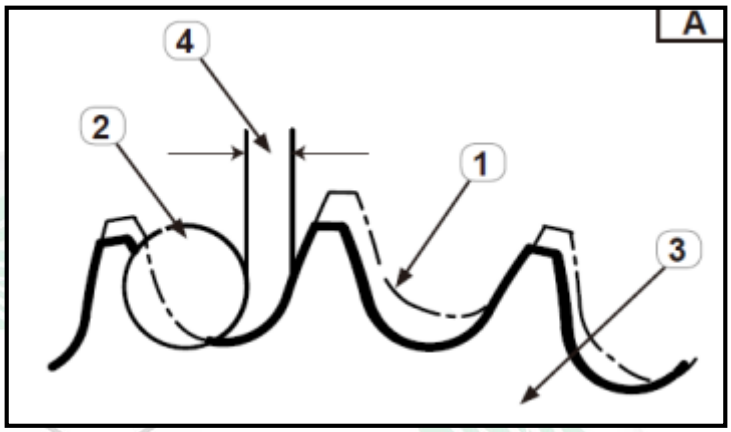
Lubricate: drive chain

It is recommended that only motorcycle drive chain lubricants are used to lubricate the drive chain.

Drive Chain

Drive Chain Inspection

Check: drive sprocket / drive chain sprocket. Fig. A



If the wear of each tooth is greater than 1/4 (4), replace the drive chain and the sprockets together.

If any teeth are bent, replace the drive chain and sprockets together.

Note

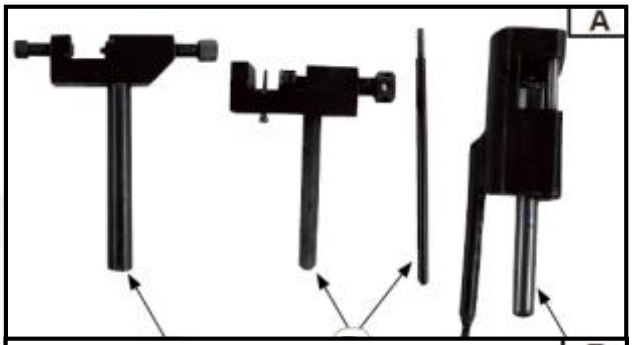
When installing a new chain, new sprockets should also be installed. Installing a new drive chain on used sprockets will rapidly wear out the chain.

Drive Chain

Replacement of the Drive Chain

Loosen: the drive chain

Use the special tool according to the manufacturer's specification as well as the type required for use of that chain. There are three tools to disassemble the rivet chain link (A), assemble the side plate (B), and flare the pins on the side plate (C) in Fig. A

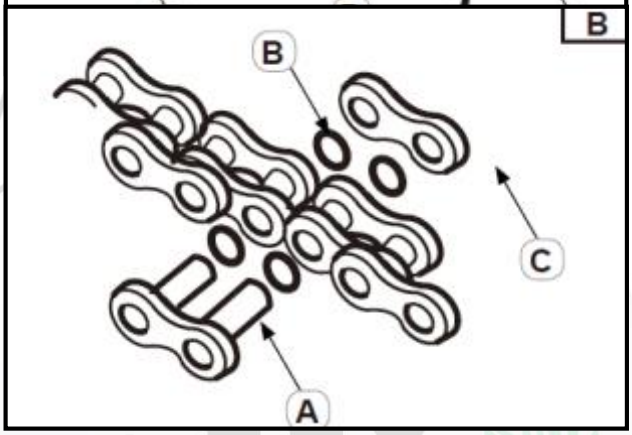


Warning

Never use old chains, main chain plates, main chain side plates, or rubber O-rings.

Insert:

Rivet chain link (A), Fig. B
Rubber O-ring (B), Figure B
Chain side plate (C), Fig. B

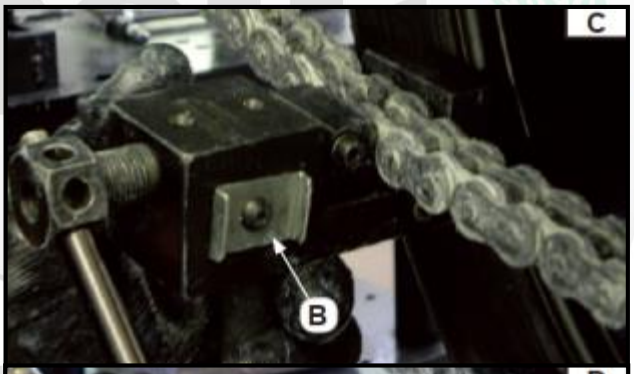


Important

Insert the rivet chain link thru the drive chain, then assemble the side plate, and place the ID logo outwards.

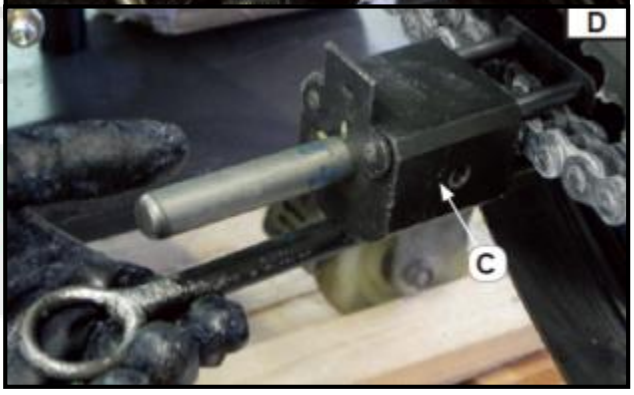
Fastening:

Press the rivet chain link against the chain side plate with a tool for assembling the chain side plate (B).



Clutch:

Press the pin on the chain side plate (C) with the special tool. Fig. D



Check:

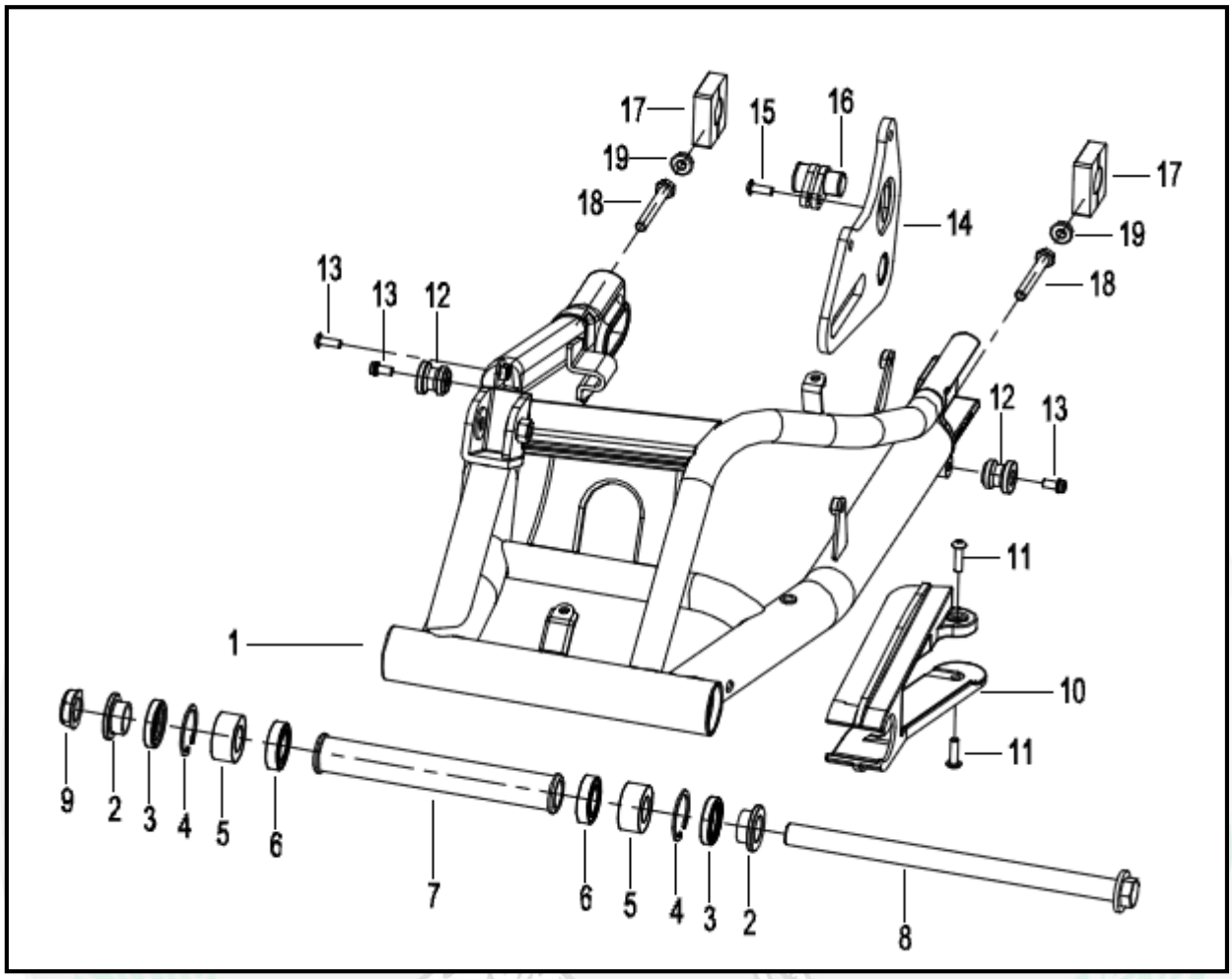
Make sure the chain side plate is properly seated before riveting the rivet chain link.
If there are any gaps, replace the rivet chain link, O-rings and side plate.

Important

Never use a used drive chain.

Drive Chain and Swing Arm

Assembly of the Swing Arm



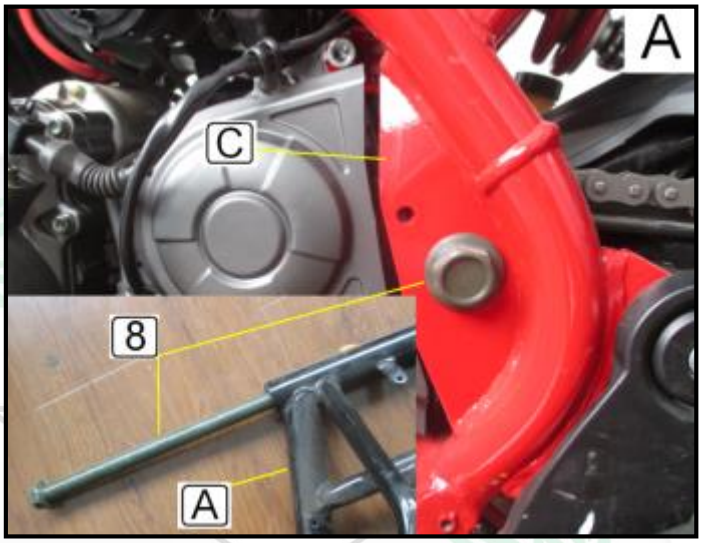
No.	Name and specifications	Quantity	No.	Name and specifications	No.
1	Rear swing arm complete	1	11	Screw M6×19.2	2
2	Rear swing arm bushing	2	12	Swing arm Spool	2
3	Oil seal, swing arm pivot25×37×7	2	13	Bolt M6×30	2
4	Circlip φ37	2	14	Rear Brake Caliper Carrier	1
5	Needle Bearing NA4904	2	15	Screw M6×14	1
6	Roller Bearing 61904-2RS	2	16	Speedometer Sensor	1
7	Swing arm bearing spacer sleeve	1	17	Chain adjusting block	2
8	Rear swing arm Axle	1	18	M8 Chain Adjusting Bolt	2
9	Self-Locking Nut M20×1.5	1	19	Nut M8	2
10	Chain Slider	1			

Swing Arm

Installation of the Swing Arm

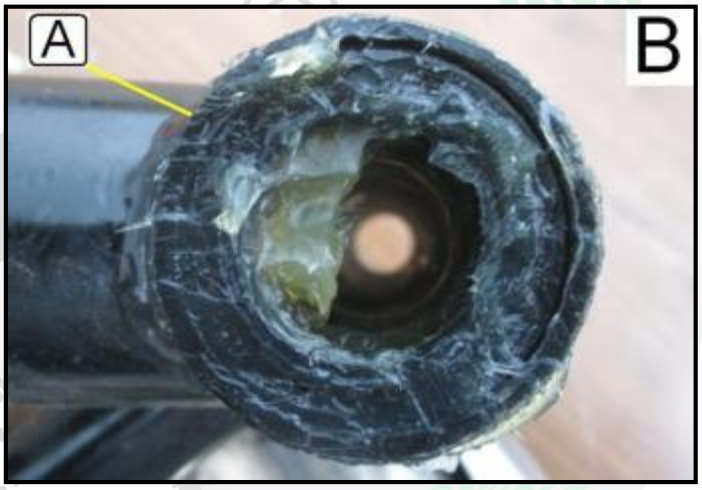
Assemble:

Swing arm component (A)
Swing arm shaft (8)
Arrange the swing arm components (A) in a row on both sides of the swing arm shaft (8). Insert the swing arm shaft (5) from the left side of the motorcycle frame (C) to the right side. Fig. A



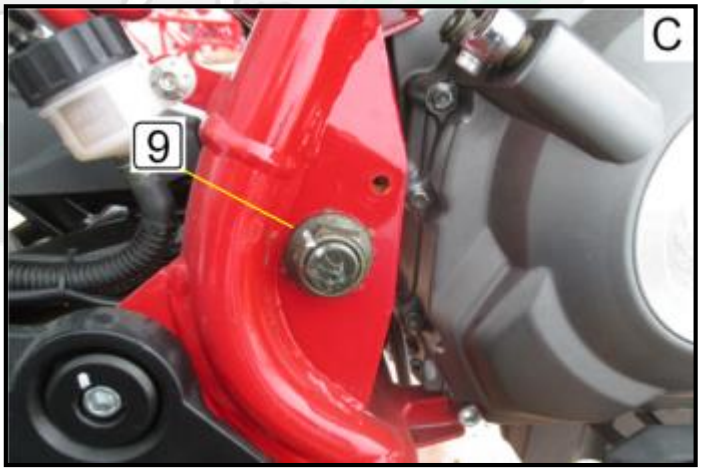
Note

Use lithium base grease during assembly. Apply it on the inner bores at both ends of the rear swing arm component (A). Fig. B



Screw the nut (9) onto the swing arm shaft (8) which is fastened to the motorcycle frame, as shown in Fig. C, to the following torque:

Torque 148 ft·lb

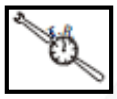


Rear Swing Arm

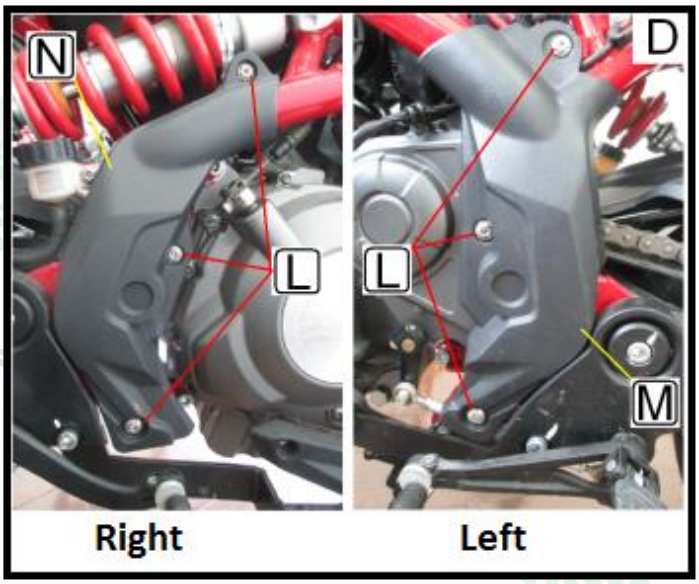
Assembly of the Swing Arm

Assembly:

Install the right decorating plate (N) on the motorcycle frame, and fix it with screws (L); Install the left decorating plate (M) on the motorcycle frame, and fix it with screws (L); as shown in Fig. D, according to the following torque:



Torque 7 ft·lb

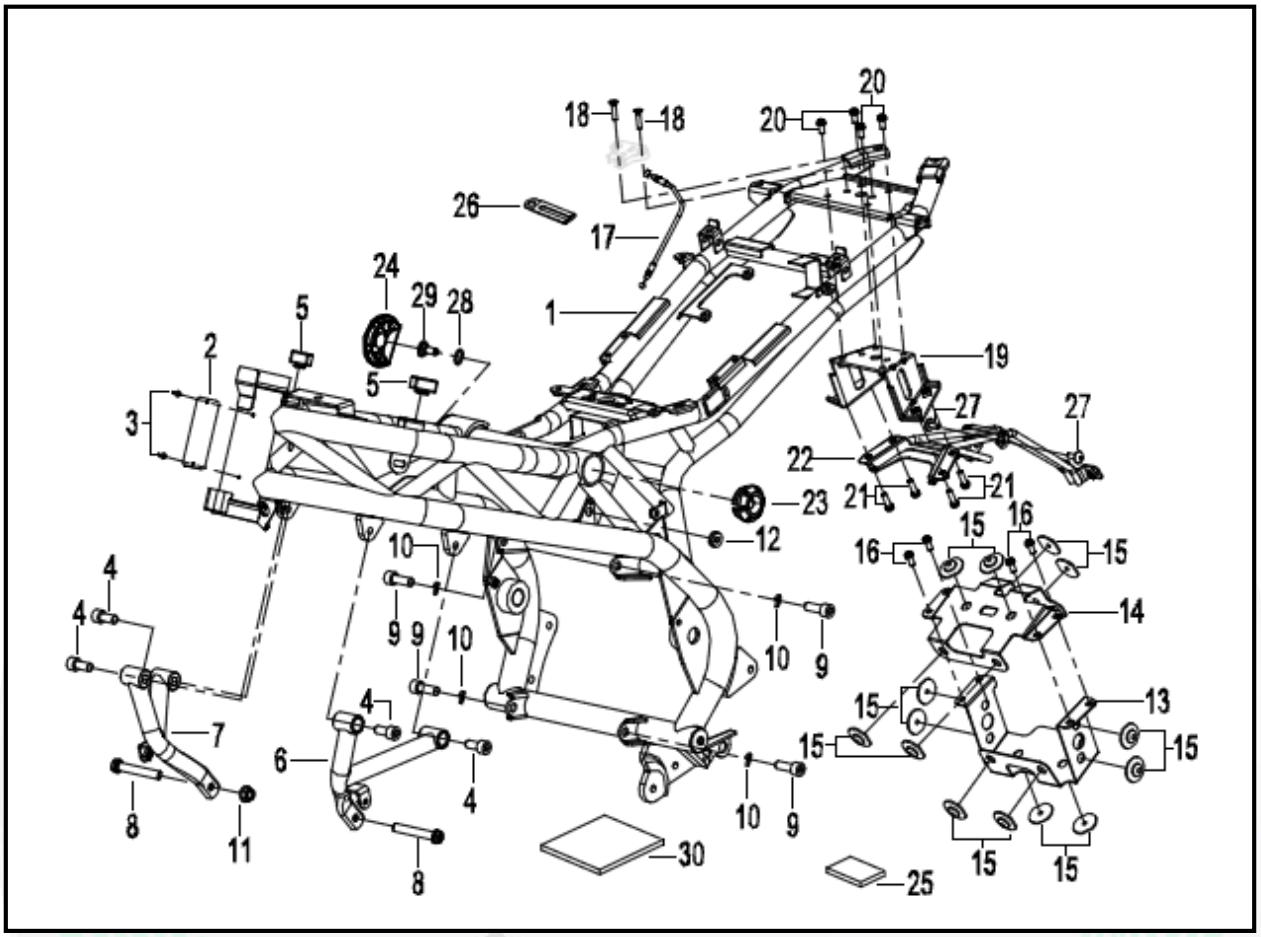


Assemble:

Rear shock absorber (see “rear shock absorber section”)
Rear wheel (see “rear wheel section”)

Frame

Frame Assembly



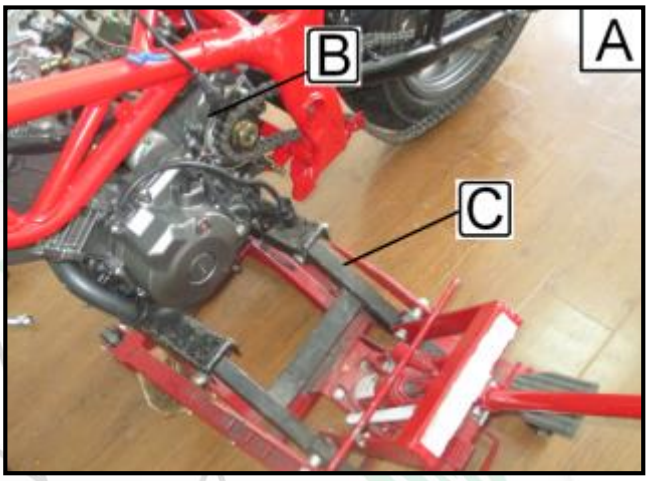
No.	Name and specifications	Quantity	No.	Name and specifications	Quantity
1	Main Frame	1	16	Screw M6×12-8.8-ZG	4
2	Frame Plate	1	17	Cable, Seat Lock	1
3	Rivet, Frame Plate 3×6	2	18	Bolt M6×30	2
4	Bolt, Socket Head M10×22	4	19	Bracket, Plate Carrier	1
5	Damper, Fuel Tank	2	20	Bolt M6×1×16	4
6	Frame, Engine Mounting Left	1	21	Bolt M6×1×20	4
7	Frame, Engine Mounting Right	1	22	Bracket, License Plate	1
8	Bolt, Socket Head M10×1.25×45	2	23	Left decorative cover (electroplated silver C9)	1
9	Bolt, Socket Head M10×30	4	24	Right decorative cover (electroplated silver C9)	1
10	Elastic washer 10	4	25	Cushion, Battery Box	1
11	Nut, Self-locking M10×1.25	1	26	Cable Clip II	1
12	Rubber Washer B	1	27	Screw M6×12	2
13	Battery Tray, Lower	1	28	Washer, Nylon	1
14	Battery Tray, Upper	1	29	Bolt M6×15.2	1
15	Rubber Damper	12	30	Cushion, Battery Box 65×25×4	1

Frame / Engine Assembly

Engine Assembly

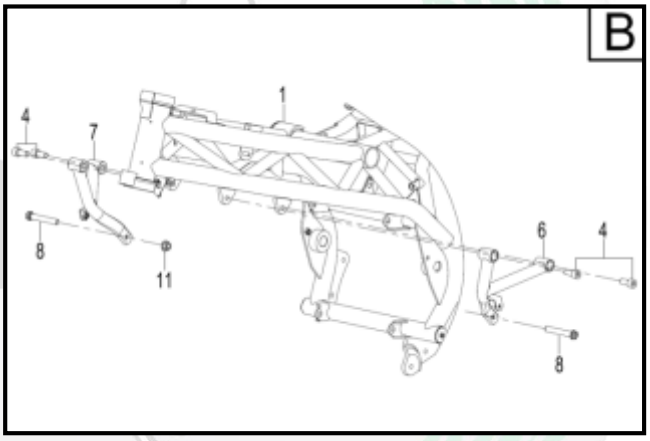
Important

Place the engine (B) on a liftable support (C) so that the engine or frame will not fall over by accident and injure the operators when assembling the motorcycle, as shown in Fig. A.



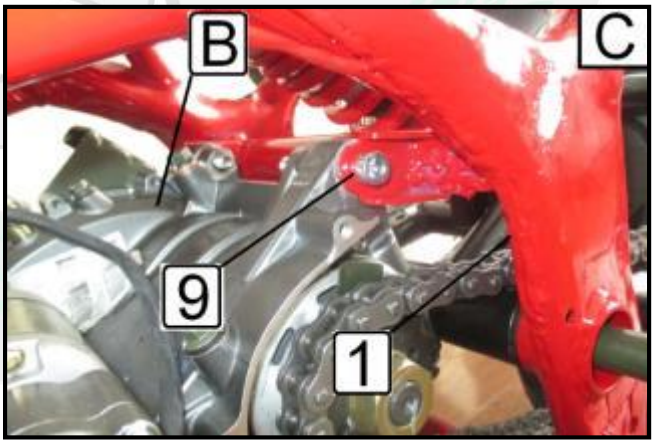
Assembly:

Install the welded engine mounting brackets on the left side (6) and right side (7) of the frame (1), and slightly screw in the socket head cap bolts (4) onto both sides of the frame (1), as shown in Fig. B.



Assembly:

Lift the engine (B), and screw in the four socket head cap bolts (9) fastened into the back of the engine and frame (1).
Screw in the rear upper left socket head cap bolts (9) into the engine (B), as shown in Fig. C.

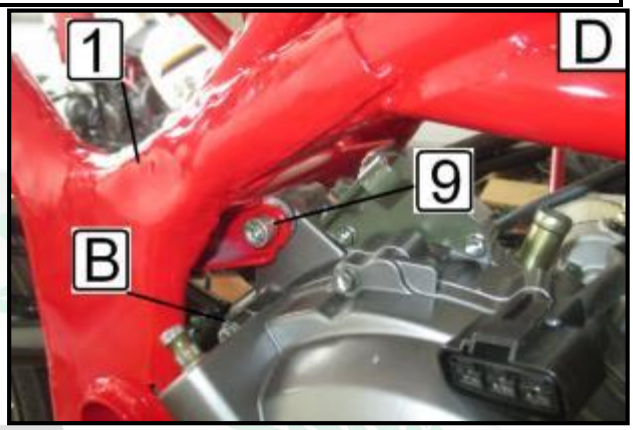


Frame / Engine Assembly

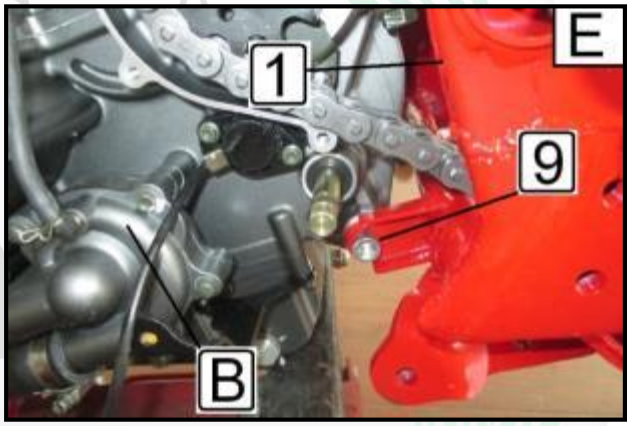
Engine Assembly

Assembly:

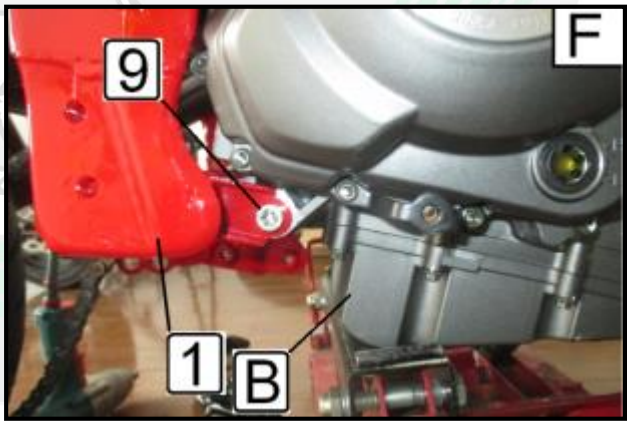
Screw in the rear upper right socket head cap bolts (9) into the engine (B), as shown in Fig. D.



Screw in the rear lower left socket head cap bolts (9) into the engine (B), as shown in Fig. E.



Screw in the rear lower right socket head cap bolts (9) into the engine (B), as shown in Fig. F.

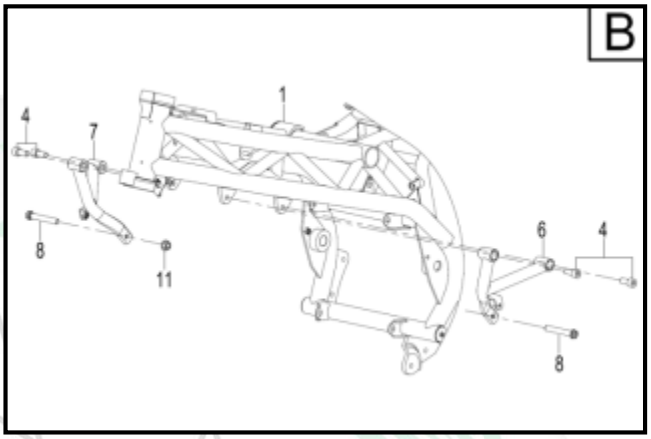


Frame / Engine Assembly

Engine Assembly

Assembly:

Screw in the socket head cap bolts (8) to loosely attach the welded assembly of the left engine mounting support (6) and the engine (B), as shown in Fig. B.
Screw in the socket head cap bolts (8) to loosely attach the welded assembly of right engine mounting support (7) and the engine (B), as shown in Fig. B.



Tightening:

Fasten the engine mounting bolts in order, and mark them after fastening.

1. Four rear socket head bolts (9) of the frame / engine, as shown in Fig. C, D, E and F.
2. The welded assembly for the front-left frame / left engine mounting support (6) and socket head cap bolts (4), as shown in Fig. B.
3. The welded assembly for the front-right frame / right engine mounting support (6) and socket head cap bolts (4), as shown in Fig. B.
4. One socket head cap bolt for the front-left engine (8), as shown in Fig. B.
5. One socket head cap bolt for the front-right engine (8), as shown in Fig. B.

Use thread locker at the end of each threaded bolt.

Tighten the fastening bolts to the following torque:

Torque 33 ft·lb

Frame / Engine Assembly

Engine Disassembly

Disassembly:

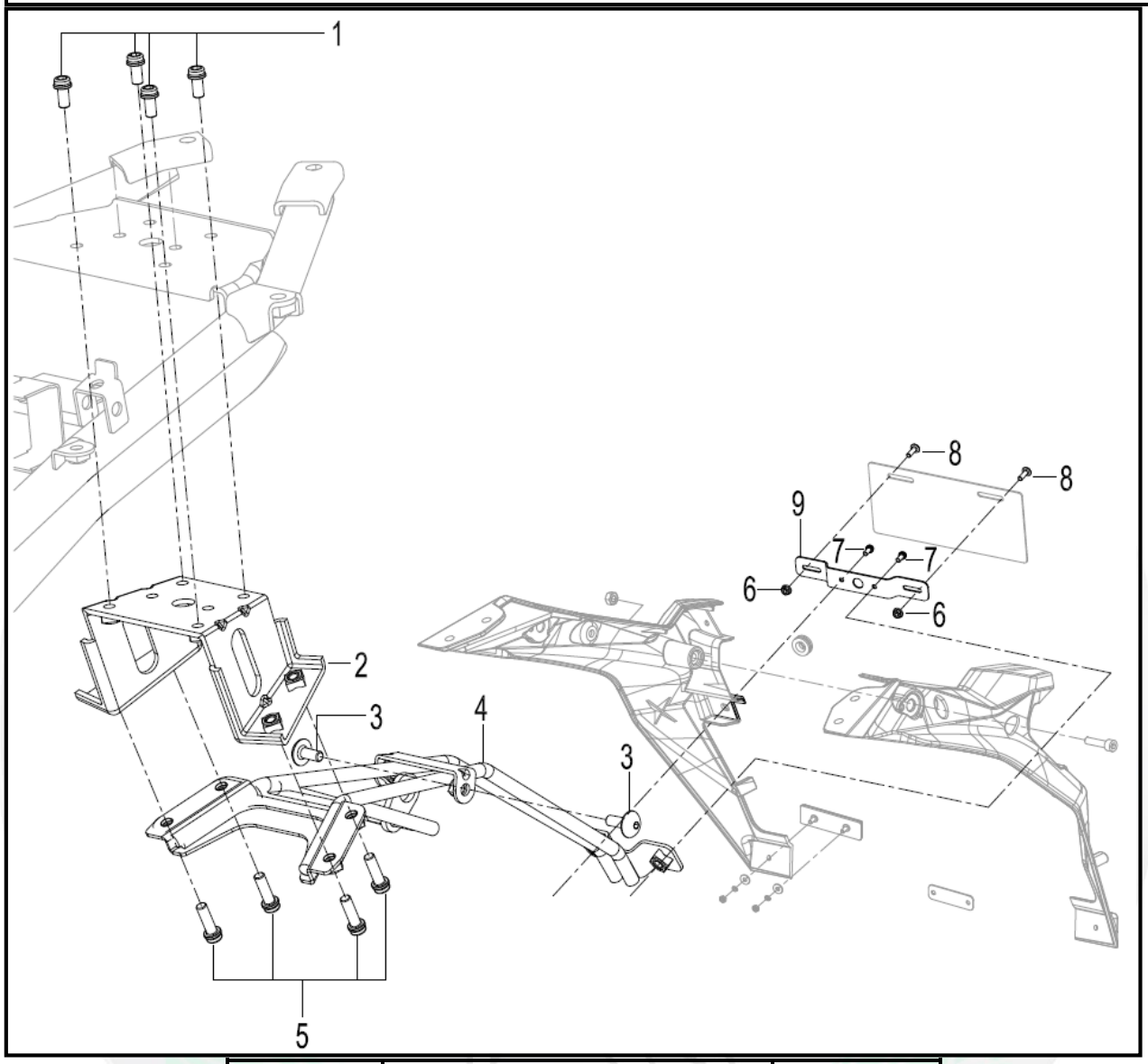
Conduct disassembly in reverse order of assembly.

Note:

Disassemble fastening screws from the front to back.

Frame / Rear License Plate Support

Assembly of the Rear License Plate Support



No.	Name and specifications	Quantity
1	Bolt M6×1×16	4
2	Bracket, Plate Carrier	1
3	Screw M6×12	2
4	Bracket, License Plate	1
5	Bolt M6×1×20	4
6	Nut M6	2
7	Bolt M6×1×16	2
8	Bolt M6×16	2
9	License plate holder	1

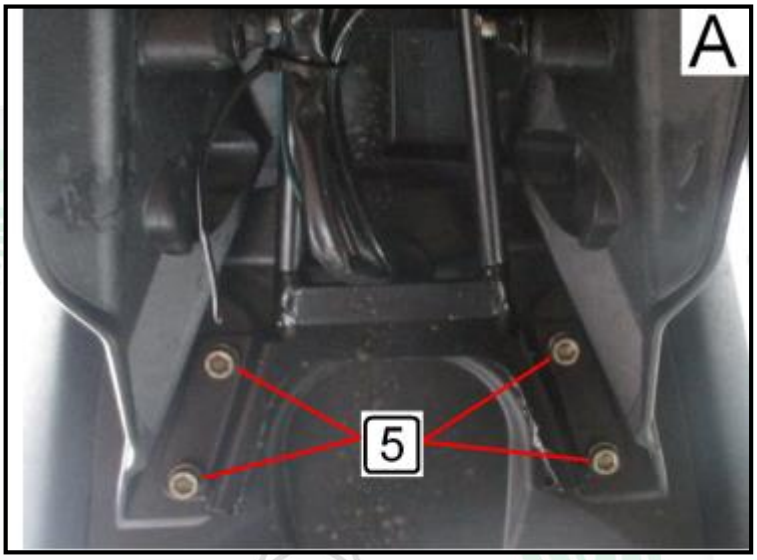
Frame / Rear License Plate Support

Assembly of the Rear License Plate Support

Assembly:

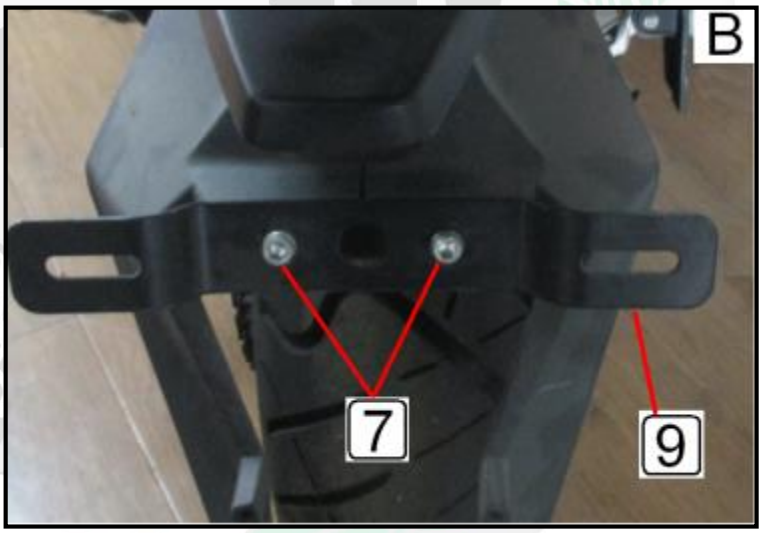
Assemble the rear fender, and screw the four socket head cap bolts (5) to the frame, as shown in Fig. A.
Tighten the fastening bolts to the following torque:

Torque 7 ft·lb



Screw the two socket head cap bolts (7) into the license plate support (9), and assemble it to the welded assembly of the rear fender support (4), as shown in Fig. B.
Tighten the fastening bolts to the following torque:

Torque 7 ft·lb



Connect:

Rear turn signal lights and the license plate light wires.

Frame / Rear License Plate Support

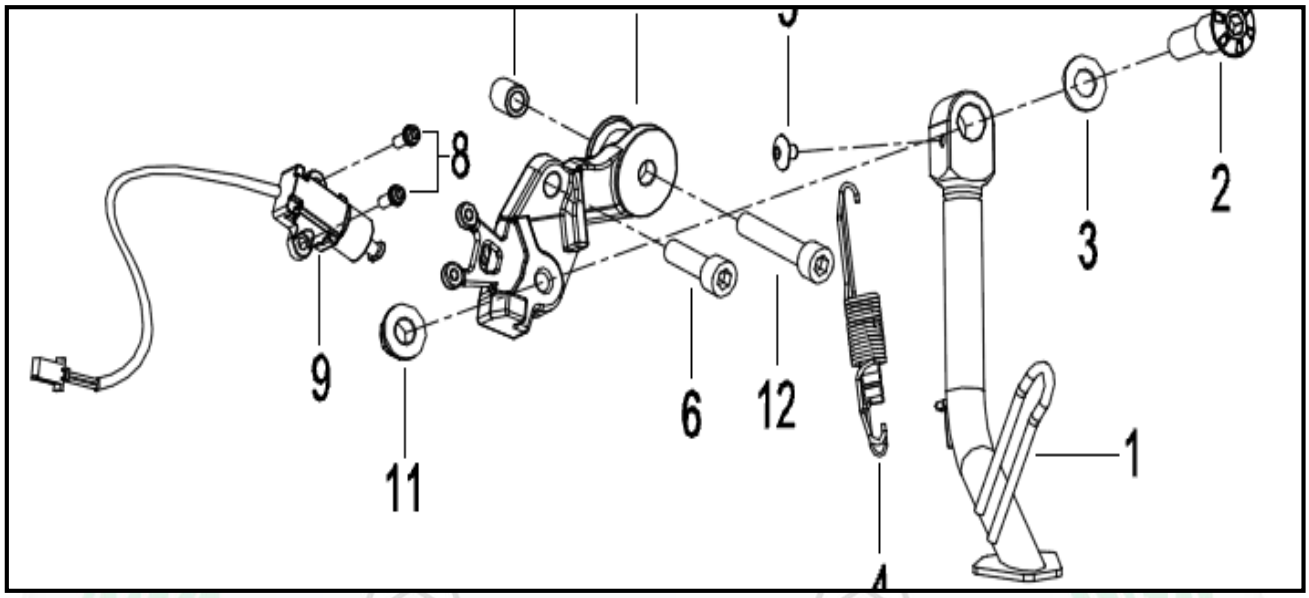
Disassembly of the Rear License Plate Support

Disassembly:

Conduct disassembly in reverse order of assembly.

Frame / Side Stand

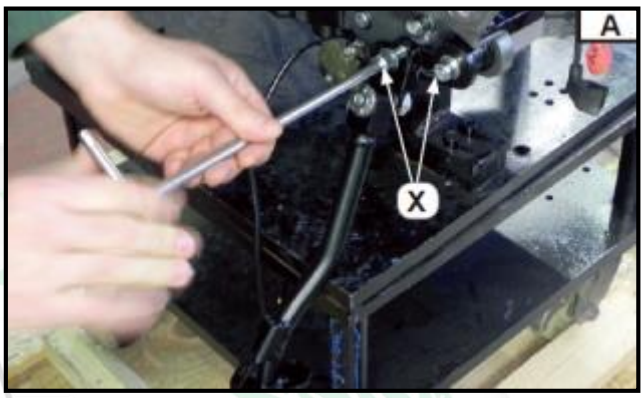
Assembly of the Side Stand



No.	Name and specifications	Quantity
1	Side Stand	1
2	Bolt, Side Stand Pivot	1
3	Washer, Side Stand Bolt	1
4	Spring, Side Stand	1
5	Bolt M6×8	1
6	Bolt, Socket Head M10×30	1
7	Bushing	1
8	Bolt M5×0.8×14	2
9	Switch, Side Stand Lockout	1
10	Bracket, Side Stand Mounting	1
11	Thin nut M12×1.25	1
12	Socket Head Cap Bolt M10×50	1

Frame / Side Stand

Assembly of the Side Stand



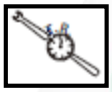
Assemble:

Install the side stand mounting bracket (5) on the frame using the two fastening bolts (X), as shown in Fig. A.

Note:

Use thread locker at the end of the threads.

Fasten the two bolts to the following torque:



Torque 33 ft·lb

Assemble: inner screw (5) and outer screw (8).

Connect the side stand lockout switch connector for the side stand to the wire harness.

Frame / Side Stand

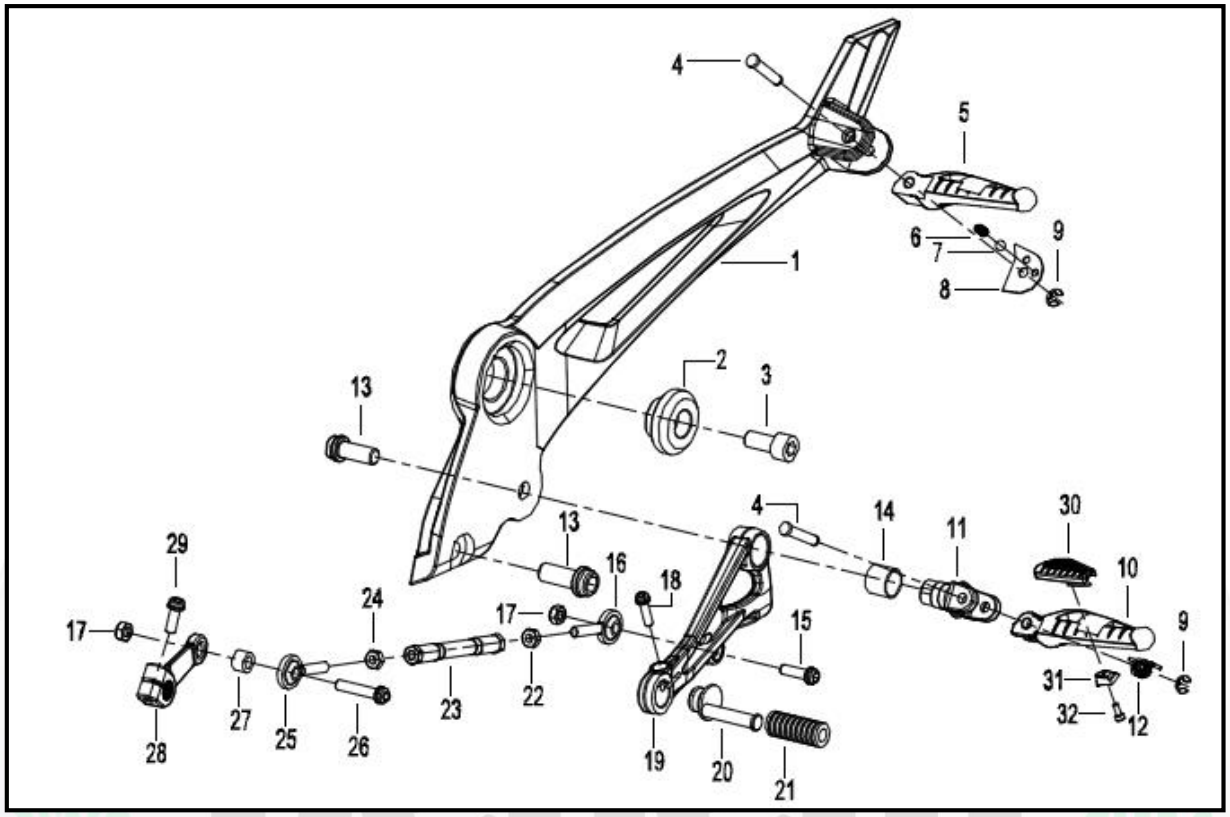
Disassembly of the Side Stand

Disassembly:

Conduct disassembly in reverse order of assembly.

Frame / Left Foot Pedal

Assembly of the Left Foot Pedal



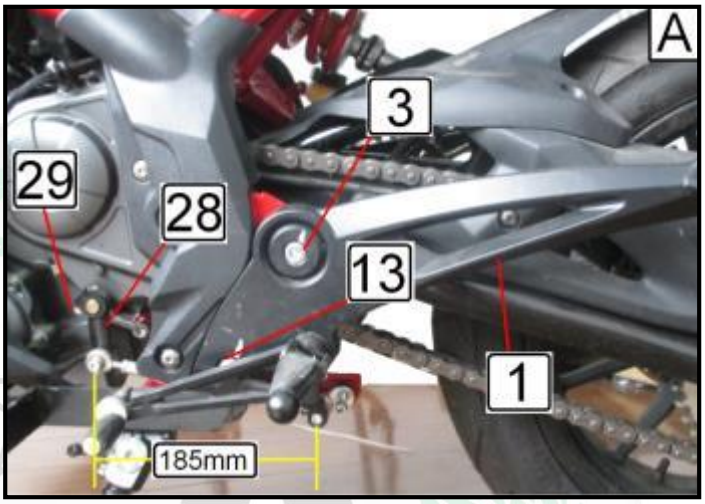
No.	Name and specifications	Quantity	No.	Name and specifications	Quantity
1	Front-left foot pedal support	1	17	Nut M6	2
2	Bushing, Foot Pedal Support	1	18	Bolt M5×0.8×18	1
3	Socket Head Cap Bolt M10×22	1	19	Lever, Shifter	1
4	Pin, Foot Pedal Pivot	2	20	Lever End, Adjustable Tip	1
5	Left, Rear Foot Pedal	1	21	Damper, Shifter End	1
6	Spring, Pedal Ball Stopper	1	22	Nut M6-8-ZG	1
7	Foot Pedal Ball Stopper	1	23	Shaft, Gear Change Lever	1
8	Stopper Plate, Foot Pedal	1	24	Nut, LH Thread M6	1
9	E-Clip φ5	2	25	Heim Joint M6 LH Thread	1
10	Left Foot Pedal, Driver	1	26	Screw M6×25-8.8-ZG	1
11	Mount, LH Driver Footpeg	1	27	Sleeve	1
12	Return Spring, Driver Foot Pedal	1	28	Knuckle, Shifter	1
13	Bolt M10×25	2	29	Bolt M6×1×20	1
14	Bushing, Brass	1	30	Damper, Rubber Left Foot Pedal	2
15	Bolt M6×30	1	31	Damper, Rubber Lower L Foot Pedal	2
16	Heim Joint M6	1	32	Bolt M4×10	2

Frame / Left Foot Pedal

Assembly of the Left Foot Pedal

Assemble:

Front-left foot pedal support (1), as shown in Fig. A.



Note

Use thread locker at the end of the threads.

Fasten two bolts (3) and bolts (13) to the following torque:

Torque 33 ft·lb

Note

Please replace the left foot pedal rubber damper if damaged.

Assembly:

Install the shifter knuckle for the shift lever (28) on the shift shaft spline, and lubricate it using a lithium-based grease. Tighten the fastening bolt (29) on the shifter knuckle for the shift lever.

Adjustment:

The distance between the connecting rod shaft (23) and connectors (16) and (25) is 185mm, as shown in Fig. A.

Note

If necessary, adjust this item according to the needs of the rider.

Frame / Left Foot Pedal

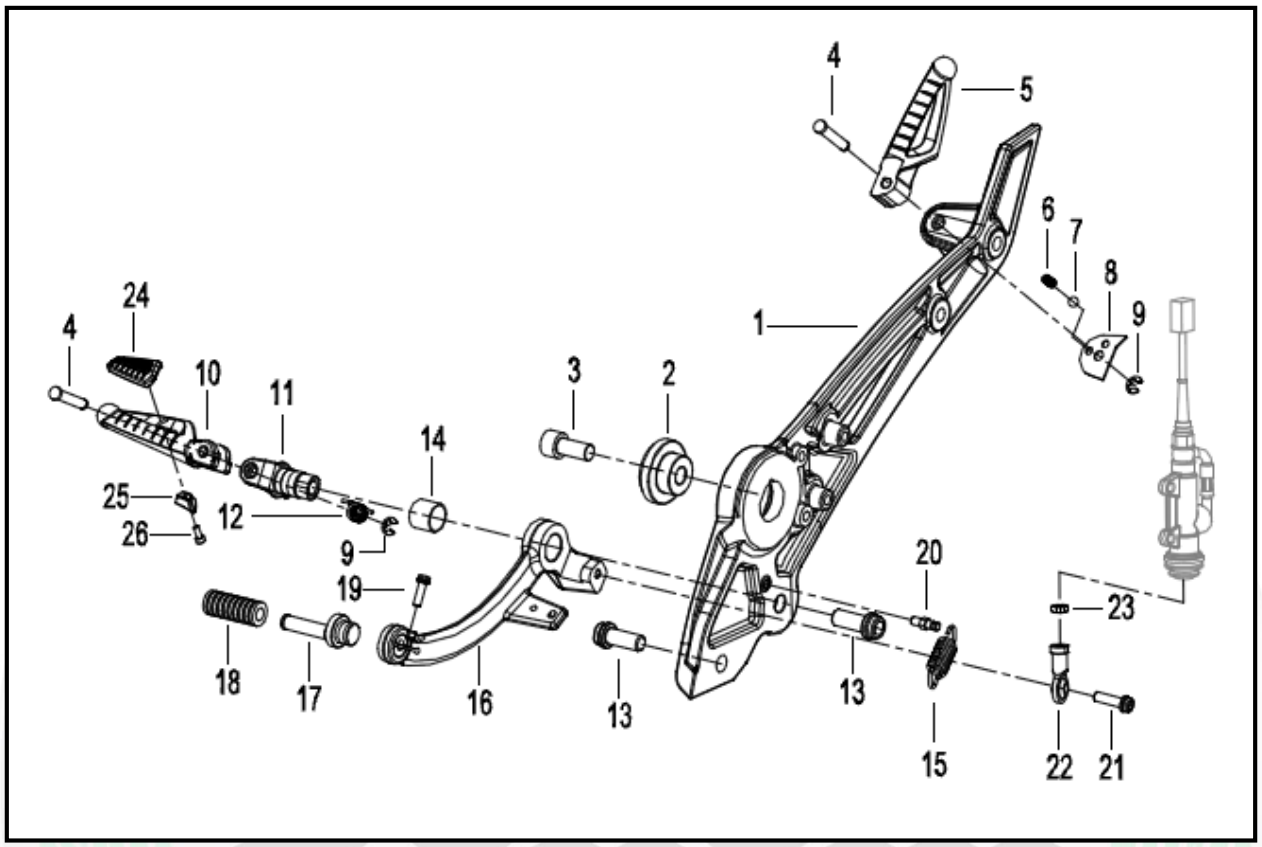
Disassembly of the Front-Left Foot Pedal

Disassembly:

Conduct disassembly in reverse order of assembly.

Frame / Right Foot Pedal

Assembly of the Front-Right Foot Pedal



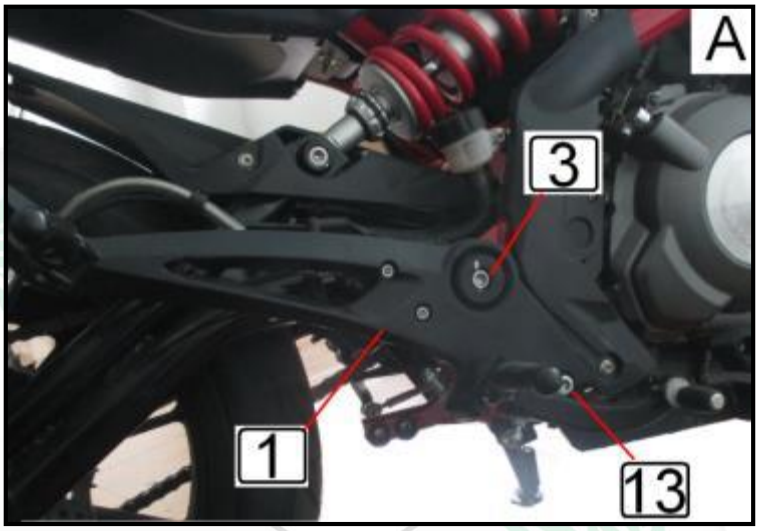
No.	Name and specifications	Quantity	No.	Name and specifications	Quantity
1	Front-Right Foot Pedal Support	1	14	Bushing, Brass	1
2	Bushing, Foot Pedal Support	1	15	Spring, Brake Lever Return	1
3	Socket head Bolt M10×22	1	16	Lever, Rear Brake	1
4	Pin, Foot Pedal Pivot	2	17	Lever End, Brake Pedal Adjustable	1
5	Right, Rear Foot Pedal	1	18	Rubber Damper, Brake Lever	1
6	Spring, Pedal Ball Stopper	1	19	Bolt M5×0.8×18	1
7	Foot Pedal Ball Stopper	1	20	Spring Pin, Upper	1
8	Stopper Plate, Foot Pedal	1	21	Bolt M6×1×16	1
9	E-Clip φ5	2	22	Heim Joint M6	1
10	Right Foot Pedal, Driver	1	23	Nut M6-8-ZG	2
11	Mount, RH Driver Foot Lever	1	24	Damper, Right Foot Peg	2
12	Return Spring, Driver Foot Pedal	1	25	Damper, Lower Right Footpeg	2
13	Bolt M10×25	2	26	Bolt M4×10	2

Frame / Right Foot Pedal

Assembly of the Front-Right Foot Pedal

Assemble:

Front-right foot pedal support (1), as shown in Fig. A.



Note

Use thread locker at the end of the threads.

Fasten the two bolts (3) and bolts (13) to the following torque:

Torque 33 ft·lb

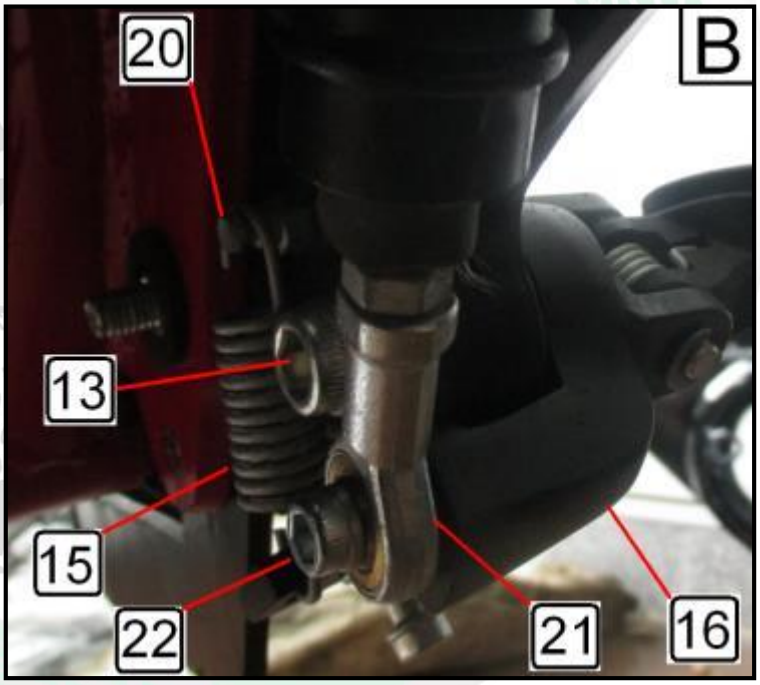
Note

If worn, replace the right pedal foot rubber damper (24).

Assembly:

Assemble the brake pedal lever (22) to the foot pedal stay, insert the bushing first (14) and then the screw (13) after greasing it, as shown in Fig. B, and fasten it to the following torque:

Torque 33 ft·lb



Assembly:

Fix the brake pedal lever (16) to the heim joint (21) using the fastening bolt (22), as shown in Fig. B, and fasten it to the following torque:

Torque 7 ft·lb

Assembly:

Assemble the upper spring pin (20) to the front-right foot pedal support (1), as shown in Fig. B.
Attach the return spring for the brake pedal (15) to the upper spring pin (20) of brake pedal lever (16).

Frame / Right Foot Pedal

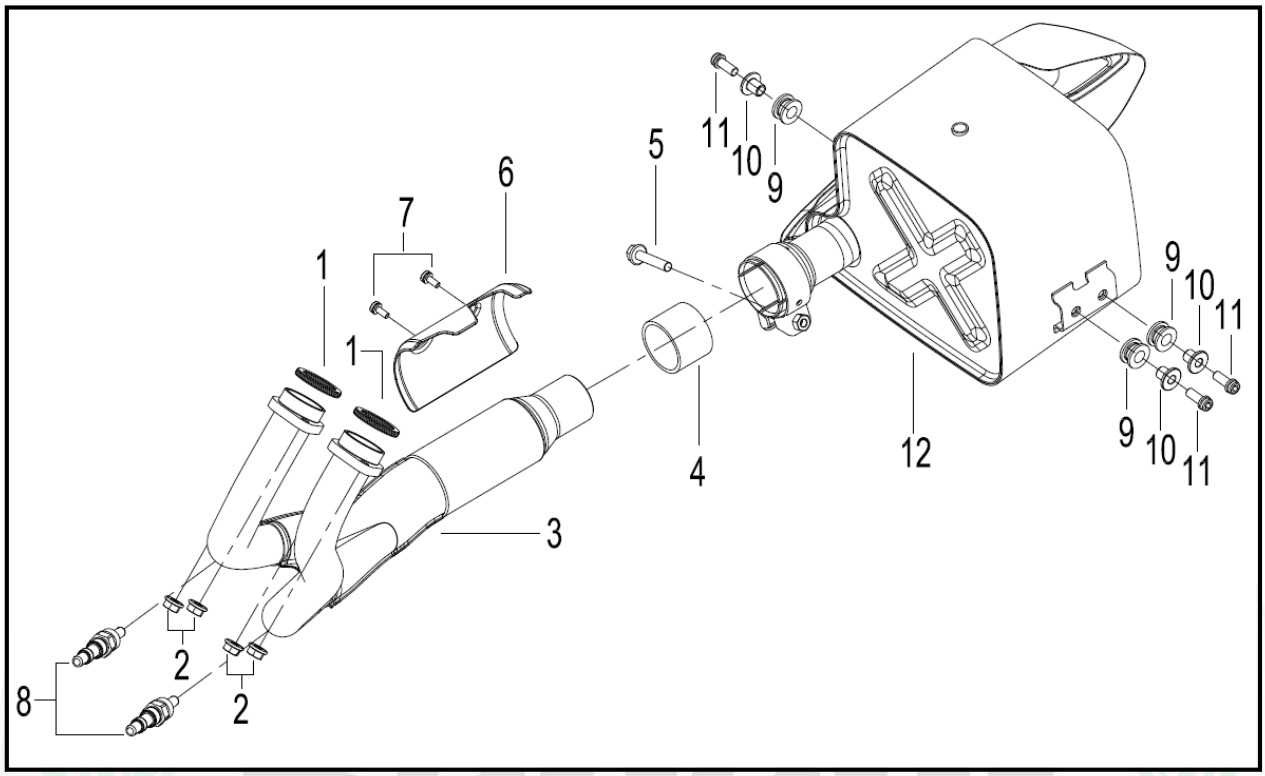
Assembly of the Front-Right Foot Pedal

Disassembly:

Conduct disassembly in reverse order of assembly.

Muffler

Muffler Assembly



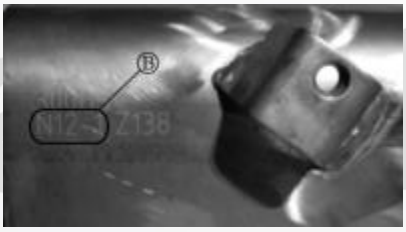
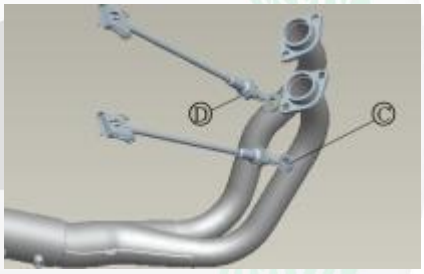
No.	Name and specifications	Quantity
1	Gasket, Header Pipe	2
2	Nut M8	4
3	Header, Exhaust	1
4	Gasket, Packing	1
5	Bolt	1
6	Cover, Thermal Protective	1
7	Screw M6×12	2
8	Oxygen Sensor	2
9	Damper, Rubber	3
10	Collar	3
11	Bolt M8×1.25×25	3
12	Muffler Assembly	1

Muffler

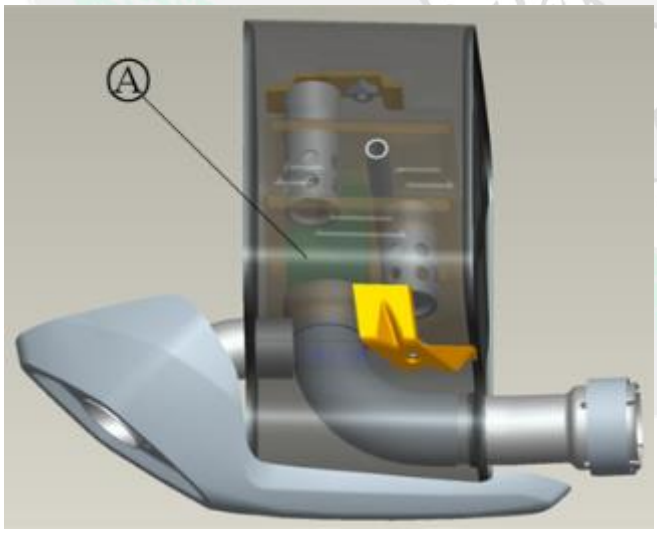
Muffler

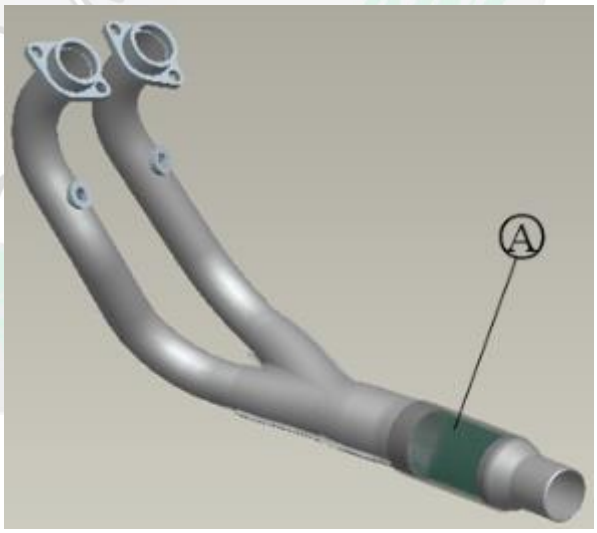
Exhaust system

Manifold	Muffler body
Catalytic Converter Sign: N12-1	**Catalytic Converter** Sign: N12-1 CCC noise emission and control information
Catalytic Converter Sign: C5390	**Catalytic Converter** Sign: C5390 European III noise emission and control information

Manifold mark position [A]	Mark position on Muffler Body	Manifold Placement [C] of Oxygen Sensor [D]
		

The position of the Catalytic Converter [A]





Muffler

Muffler Disassembly

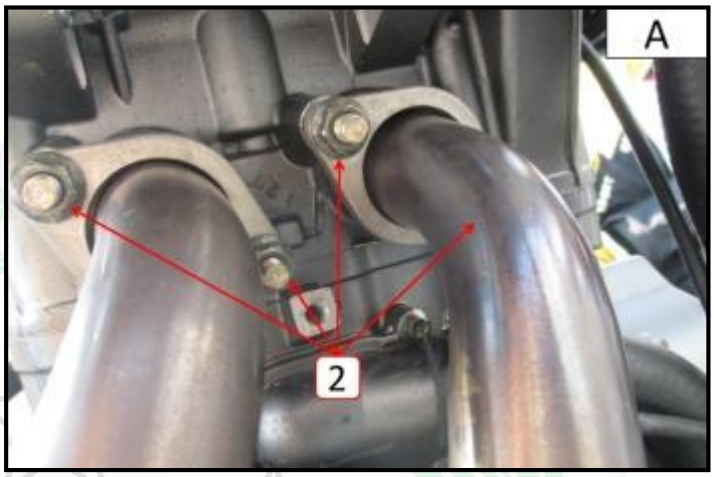
Parking: Park the motorcycle on flat ground.

Note:

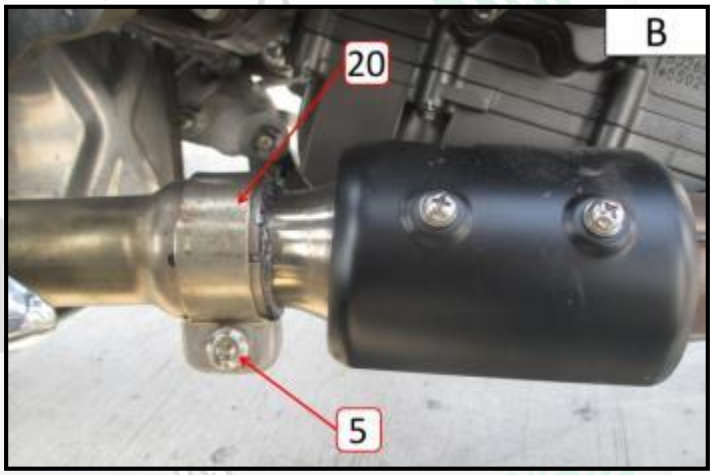
Support the motorcycle with a rear stand to prevent it from tipping over.

Disassembly:

Remove the nuts fastening the flange of exhaust pipe to the engine, as shown in Fig. A.



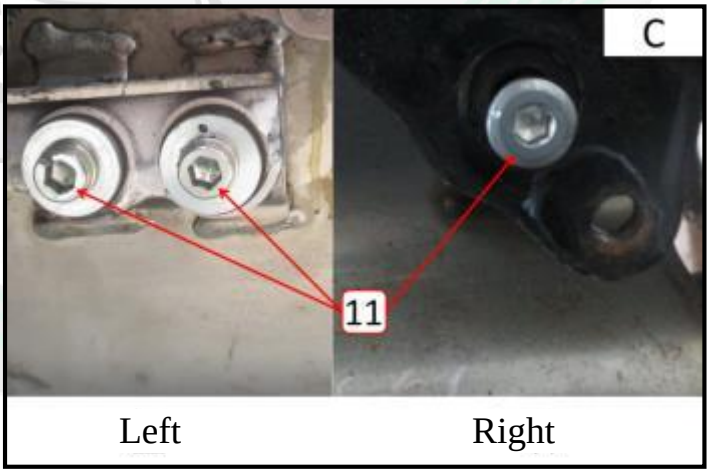
Unscrew the socket head cap screw (5) on the muffler clamp (20), as shown in Fig. B.



Remove the socket head cap bolts (11) fastening the muffler body, as shown in Fig. C.

Note:

Remove the right foot pedal stay followed by disassembling the socket head cap bolt (11) on the right (see Chapter IV “Frame / right foot pedal” of “Motorcycle”).



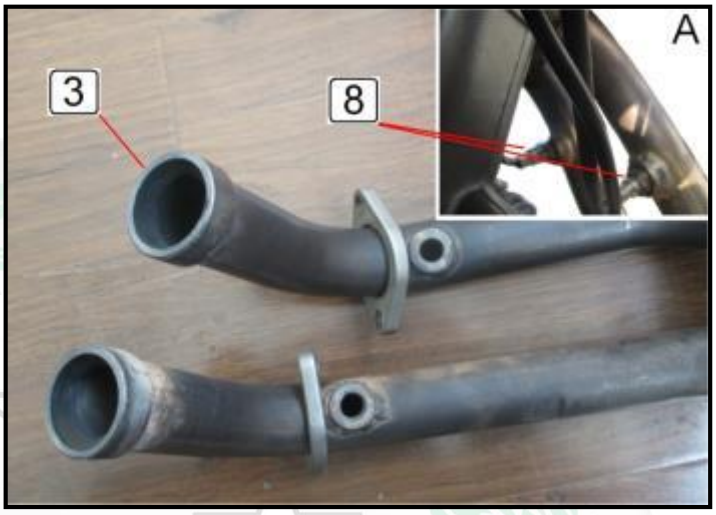
Muffler

Muffler Assembly

Assembly:

Install the oxygen sensors (8) on the exhaust pipe (3), as shown in Fig. A, and fasten it to the following torque.

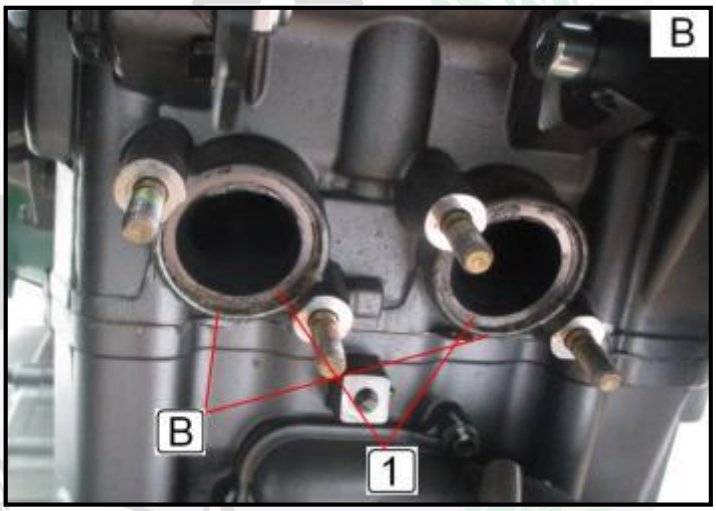
Torque 30-44 ft·lb



Apply lubricating grease to the two exhaust outlets (B) of the engine, and install the exhaust pipe gasket (1), as shown in Fig. B.

Note

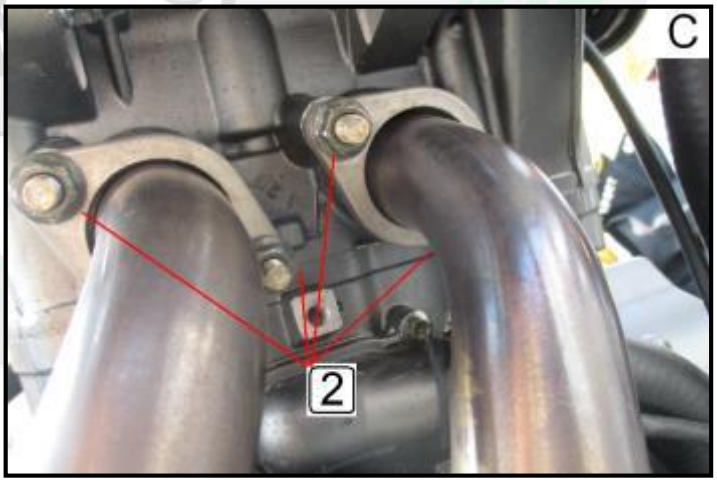
Apply lubricating grease to the exhaust pipe gasket to keep it stuck to the engine exhaust outlet, as shown in Fig. B.



Slightly tighten the nuts (2) onto the exhaust studs, as shown in Fig. C.

Note

Conduct this operation for all of the stud nuts.

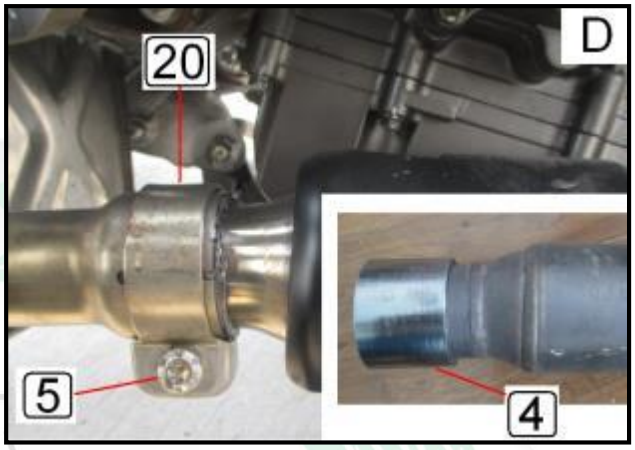


Muffler

Muffler Assembly

Assembly:

Install the packing gasket (4) on the exhaust pipe, as shown in Fig. D.

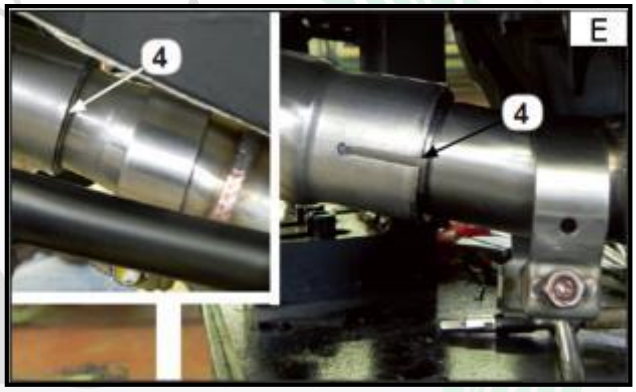


Note

Slightly screw the bolt (5) into the muffler clamp (20), as shown in Fig. D.

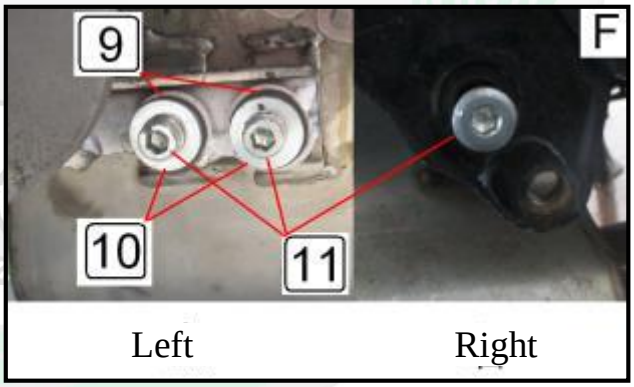
Assembly:

Insert the exhaust manifold into the muffler barrel and align the manifold with the bottom surface of packing gasket (4) and wiggle the inlet pipe surface into the muffler barrel, as shown in Fig. E.



Attach the muffler. Install the rubber dampers (9), and collars (10) and then bolt (11) it to the frame, and fasten it to the following torque:

Torque 16 ft·lb



Fastening:

Fasten the nuts (2) on the muffler studs, as shown in Fig. C, to the following torque:

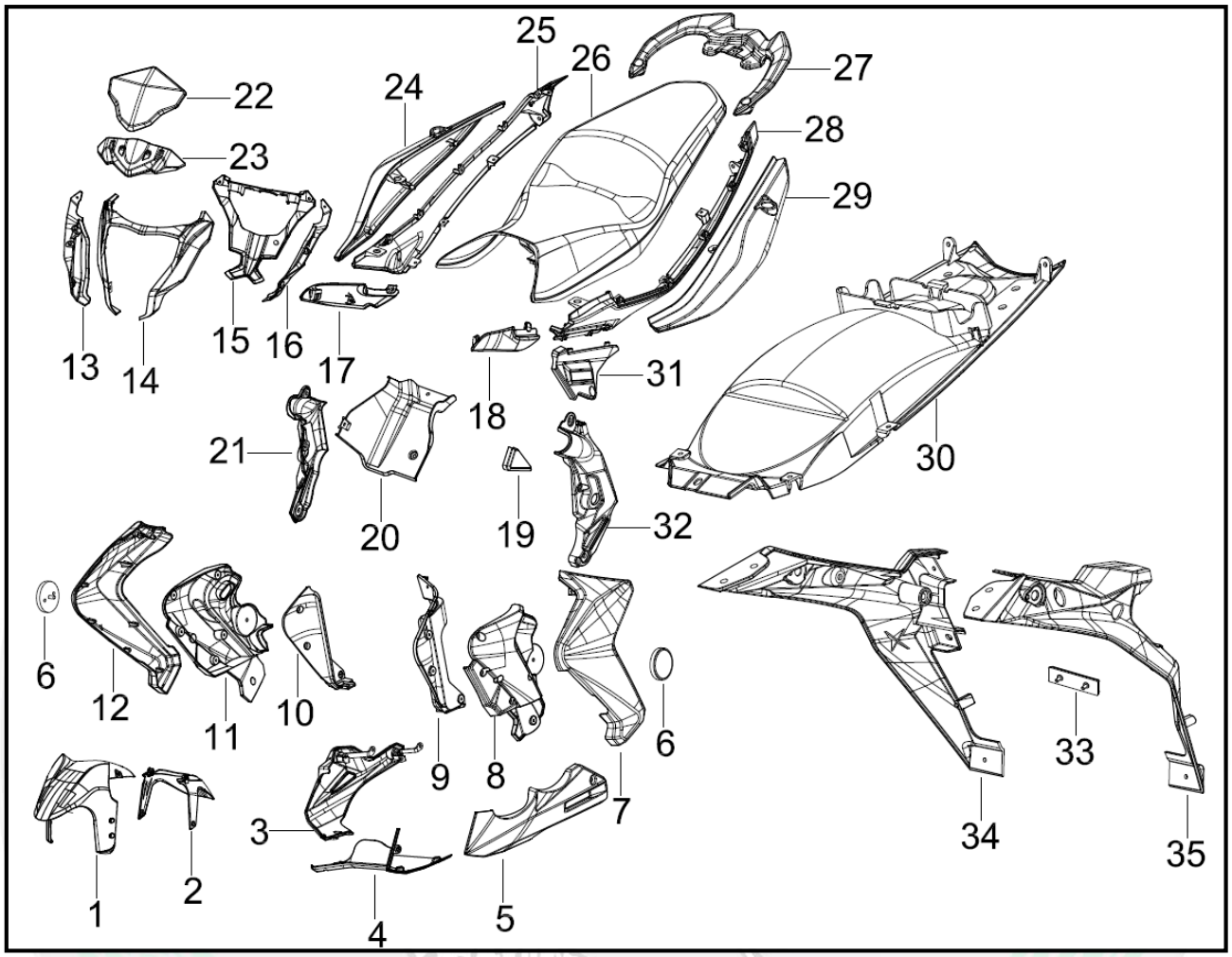
Torque 18 ft·lb

Fasten the socket head cap bolt (5) for the muffler clamp (20), as shown in Fig. D, to the following torque.

Torque 16 ft·lb

Fairing

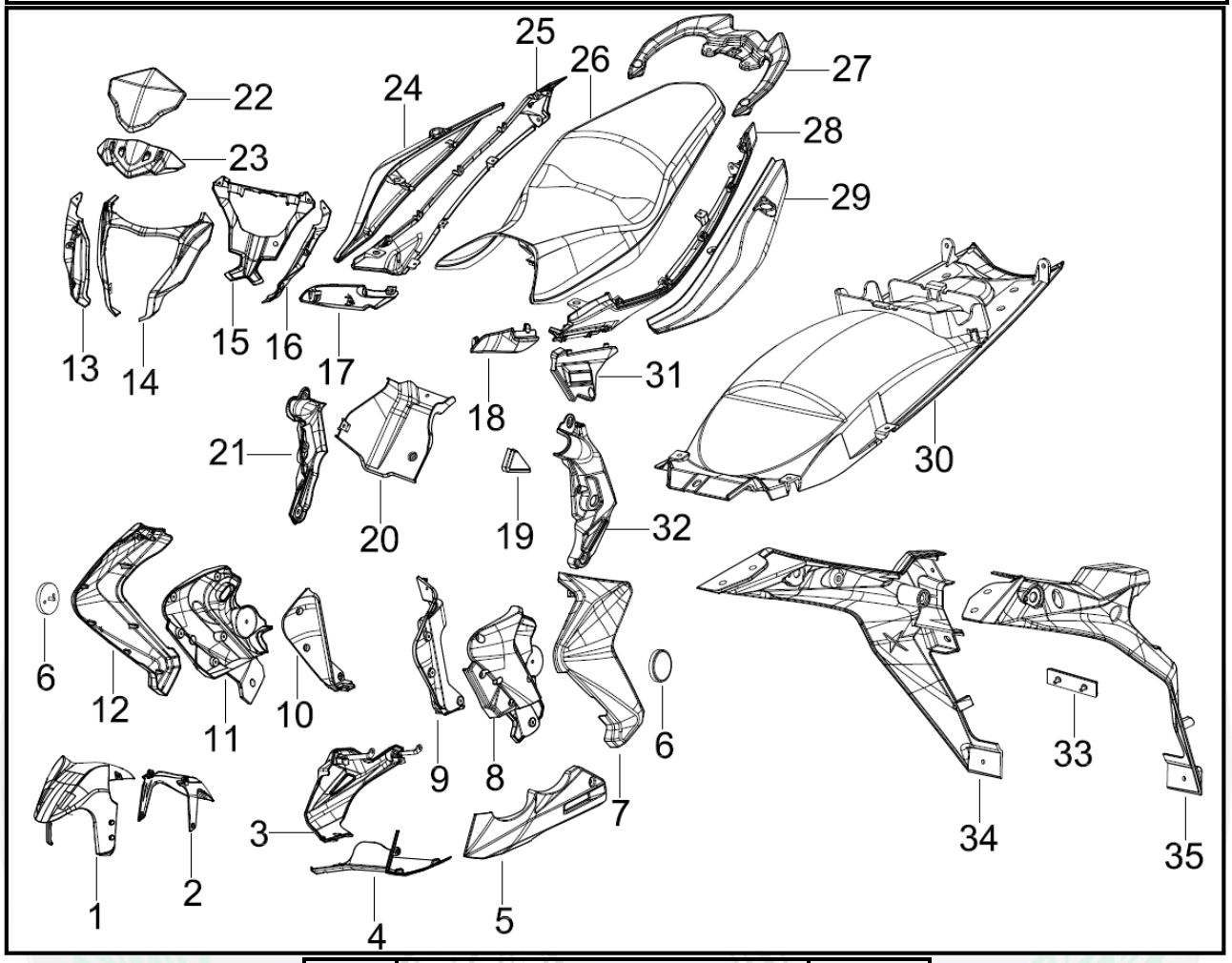
Fairing Assembly



No.	Name and specifications	Quantity	No.	Name and specifications	Quantity
1	Front Fender	1	15	Rear Headlight Fairing	1
2	Rear, Front Fender	1	16	Rear Left Headlight Fairing	1
3	Right Lower Cowling	1	17	Right Decorative Plate, Fuel Tank	1
4	Center Lower Cowling	1	18	Left Decorative Plate, Fuel Tank	1
5	Left Lower Cowling	1	19	Left Frame Deco Cap	1
6	Side Reflector	2	20	Battery box cover	1
7	Left Fuel Tank Cowling	1	21	Right Frame Decorative Cover	1
8	Inner Left Fuel Tank Cowling	1	22	Sun Visor, Speedometer	1
9	Decorative Inner Left Fuel Tank Cowling	1	23	Lower Instrument Cover	1
10	Decorative Inner Right Fuel Tank Cowling	1	24	Rear-Right Tail Cowling	1
11	Inner Right Fuel Tank Cowling	1	25	Rear-Right Lower Tail Cowling	1
12	Right Fuel Tank Cowling	1	26	Seat Assembly	1
13	Rear Right Headlight Fairing	1	27	Passenger Grab Rail	1
14	Headlight Fairing	1	28	Rear-Left Lower Tail Cowling	1

Fairing

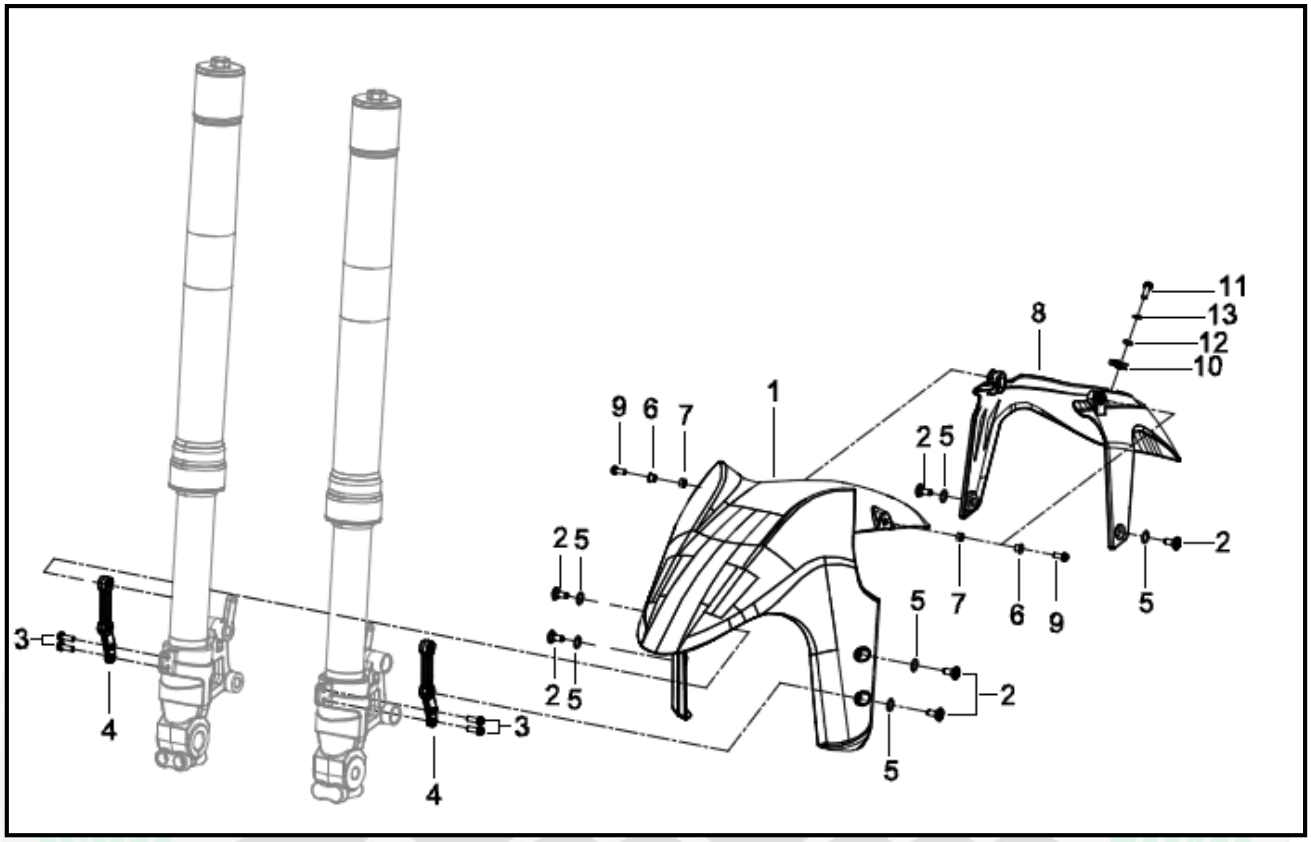
Fairing Assembly



No.	Name and specifications	Quantity
29	Rear-Left Tail Cowling	1
30	Rear Fender Liner	1
31	Left upper frame cover	1
32	Left Frame Decorative Cover	1
33	Rear Reflector	1
34	Right Rear Fender Half	1
35	Left Rear Fender Half	1

Front Fender / Mounting Brackets

Assembly of the Front Fender



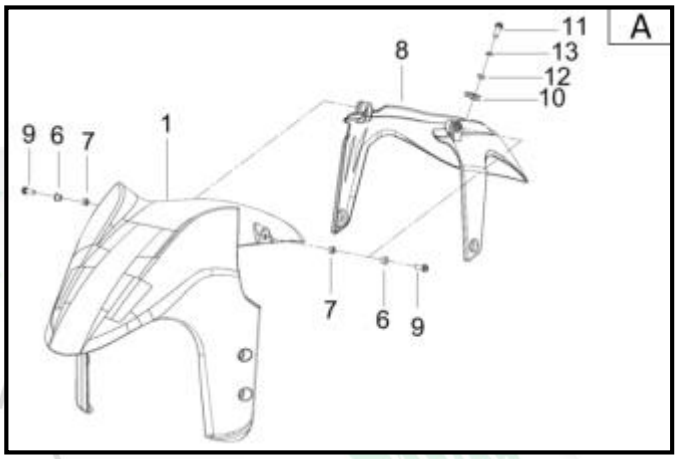
No.	Name and specifications	Quantity
1	Front fender	1
2	Screw M6×15.2	6
3	Screw M6×14	4
4	Mounting Bracket, Front Fender	2
5	Washer, Nylon	6
6	T-type Bushing 5×7×6×10×0.8	2
7	Nut M5	2
8	Rear, Front Fender	1
9	Bolt M5×0.8×14	2
10	Clamping Nut	1
11	Screw 5×12	1
12	Washer φ5	1
13	Spring Washer φ5	1

Front Fender / Mounting Brackets

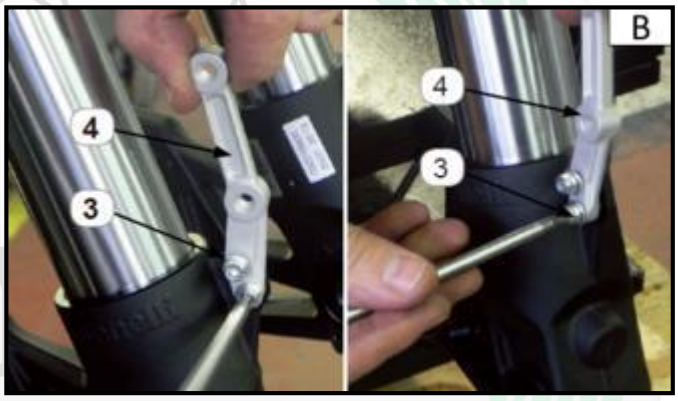
Assembly of the Front Fender

Assembly:

Assemble the front fender (1) and the rear front fender (8) together, as shown in Fig. A.

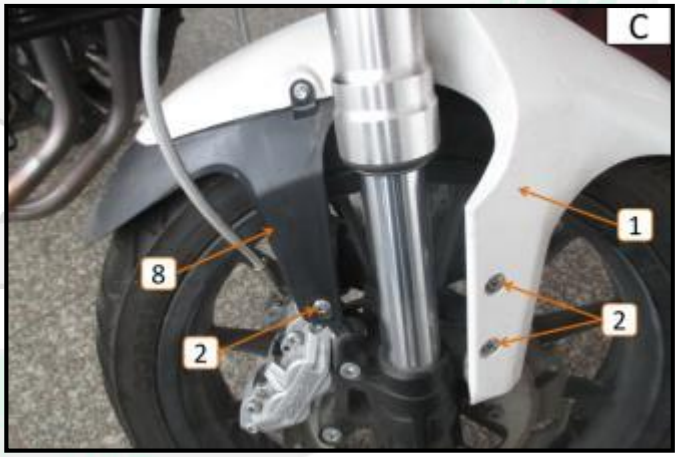


Install the mounting brackets for the front fender (4) and their bolts (3) at the bottom of both front forks, as shown in Fig. A.



Assembly:

Assemble the front fender (1), rear front fender (8) and their fastening bolts (2) on both sides, as shown in Fig. C.



Front Fender / Mounting Brackets

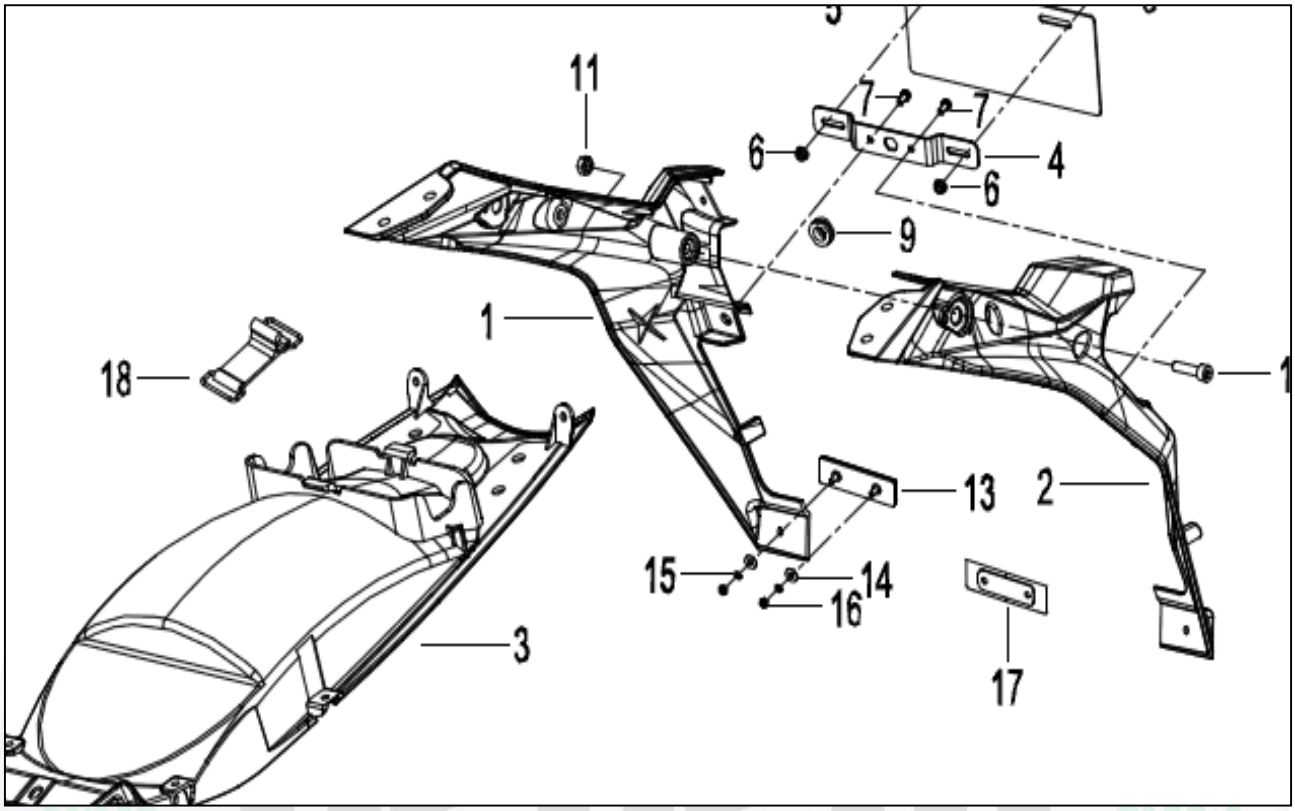
Disassembly of the Front Fender

Disassembly:

Conduct disassembly in reverse order of assembly.

Rear Fender / License Plate Mount

Assembly of the Rear Fender



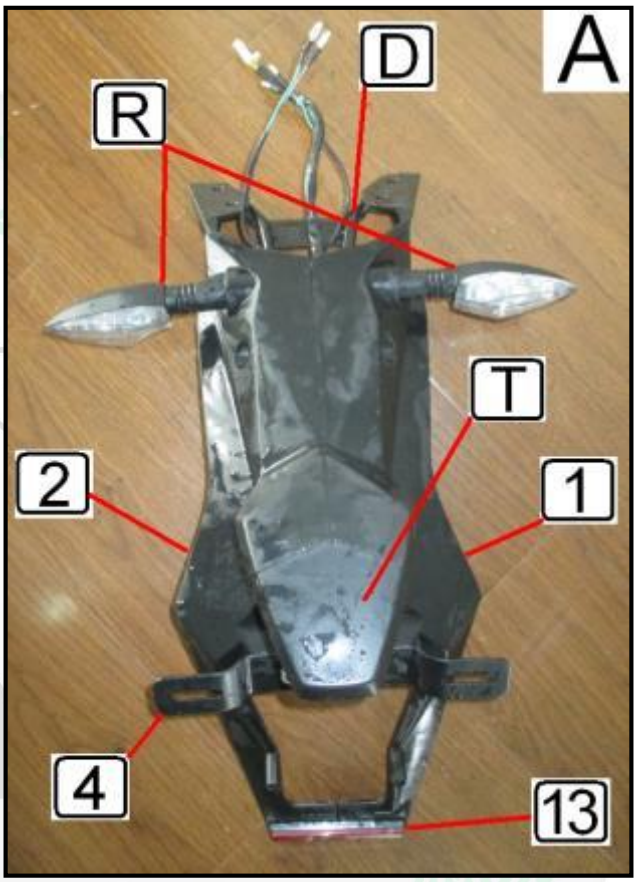
No.	Name and specifications	Quantity
1	Right Rear Fender Half	1
2	Left Rear Fender Half	1
3	Rear Fender Liner	1
4	License Plate Bracket	1
6	Nut M6	2
7	Bolt M6×1×16	2
8	Bolt M6×16	2
9	Rubber Damper	1
10	Decorative Bolt M6×25	1
11	Nut M6	1
12	Ring Nut M6	1
13	Rear Reflector	1
14	Gasket φ5	2
15	Lock Washerφ5	2
16	Nut M5	2
17	Mounting Plate, Rear Reflector	1
18	Tool Kit Strap	1

Rear Fender

Assembly of the Rear Fender

Assembly:

Assemble the right piece of the rear fender (1), left piece of the rear fender (2) and the welded assembly of the rear fender support (D) together, as shown in Fig. A.
Install the license plate holder (4), rear reflector (3), rear left and right turn signals (R) and license plate light (T) on the rear fender assembly, as shown in Fig. A.



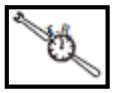
Install the front of the rear fender (3) on the motorcycle, as shown in Fig. B.

Rear Fender

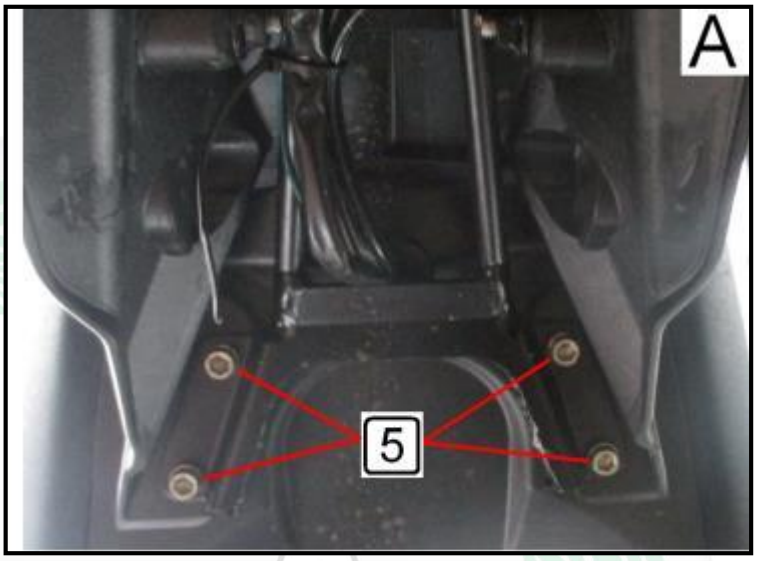
Assembly of the Rear Fender

Assembly:

Install the four screws (5) into the assembled rear fender, and attach it to the frame, as shown in Fig. A.
Fasten four bolts to the following torque:



Torque 7 ft·lb



Rear Fender

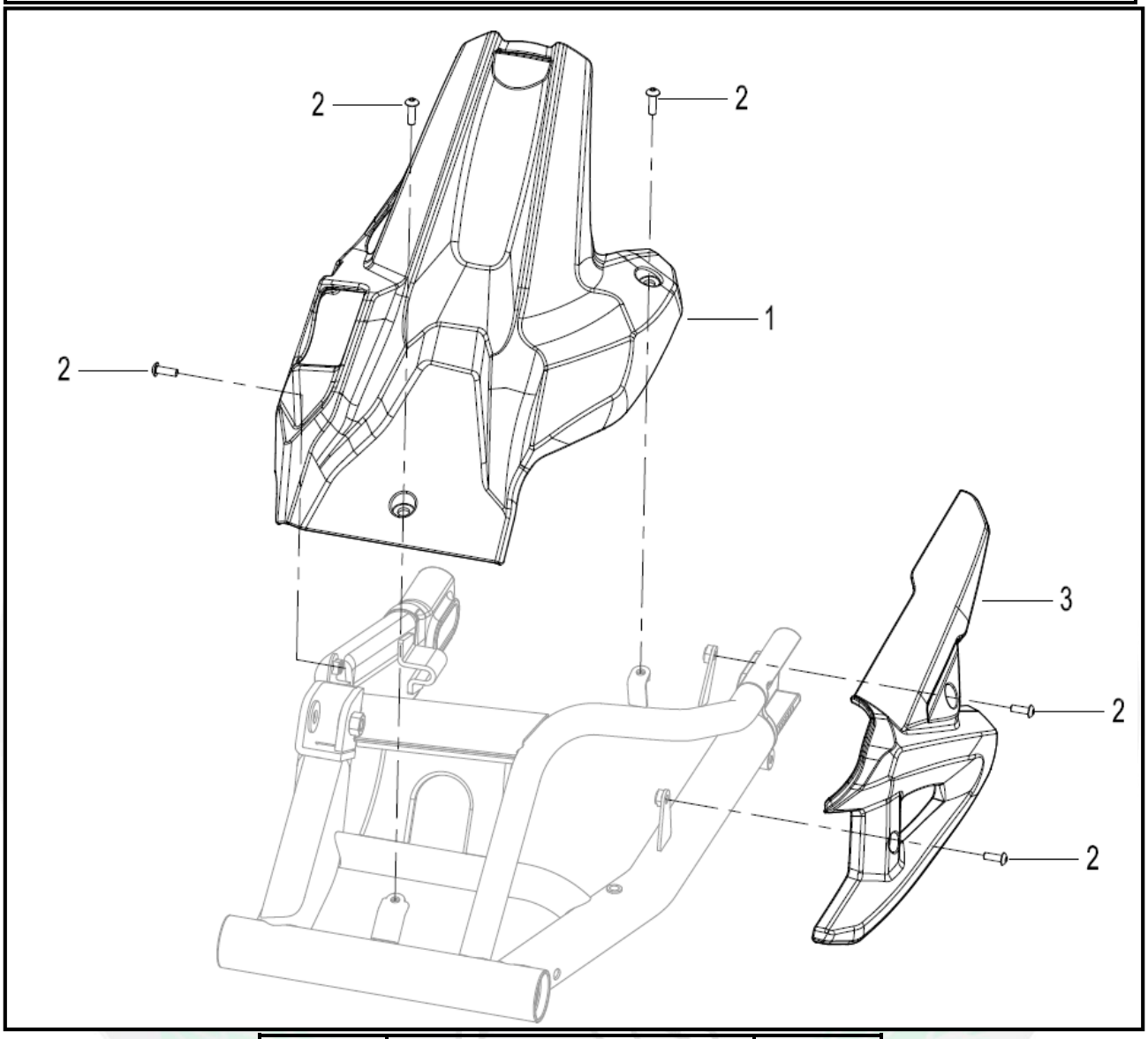
Disassembly of the Rear Fender

Disassembly:

Conduct disassembly in reverse order of assembly.

Rear Lower Fender and Chain Cover

Assembly of the Rear Lower Fender and Chain Cover



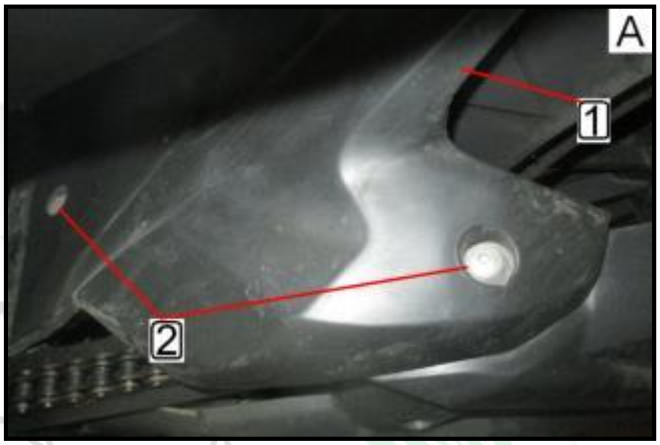
No.	Name and specifications	Quantity
1	Rear Lower Fender	1
2	Screw M6×15.2	5
3	Chain Cover	1

Rear Lower Fender and Chain Cover

Assembly of the Rear Lower Fender and Chain Cover

Assembly:

Attach the rear lower fender (1) onto the swing arm, and install the fastening screws (2), as shown in Fig. A and B.



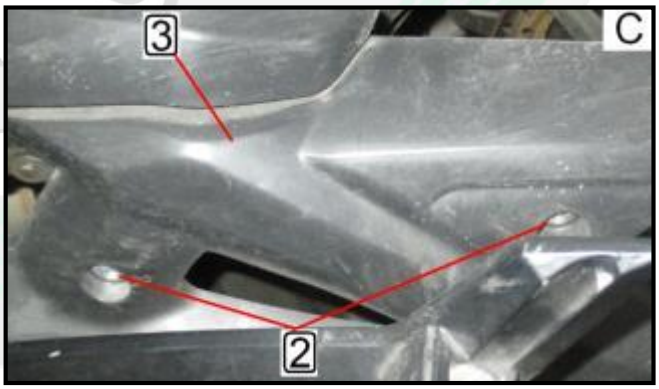
Note:

Fasten the three screws to the following torque:

Torque 7 ft·lb

Assemble:

Attach the chain cover (3) to the swing arm, and install the fastening screws (2), as shown in Fig. C.



Note:

Fasten the two screws to the following torque:

Torque 7 ft·lb

Lower Rear Fender and Chain Cover

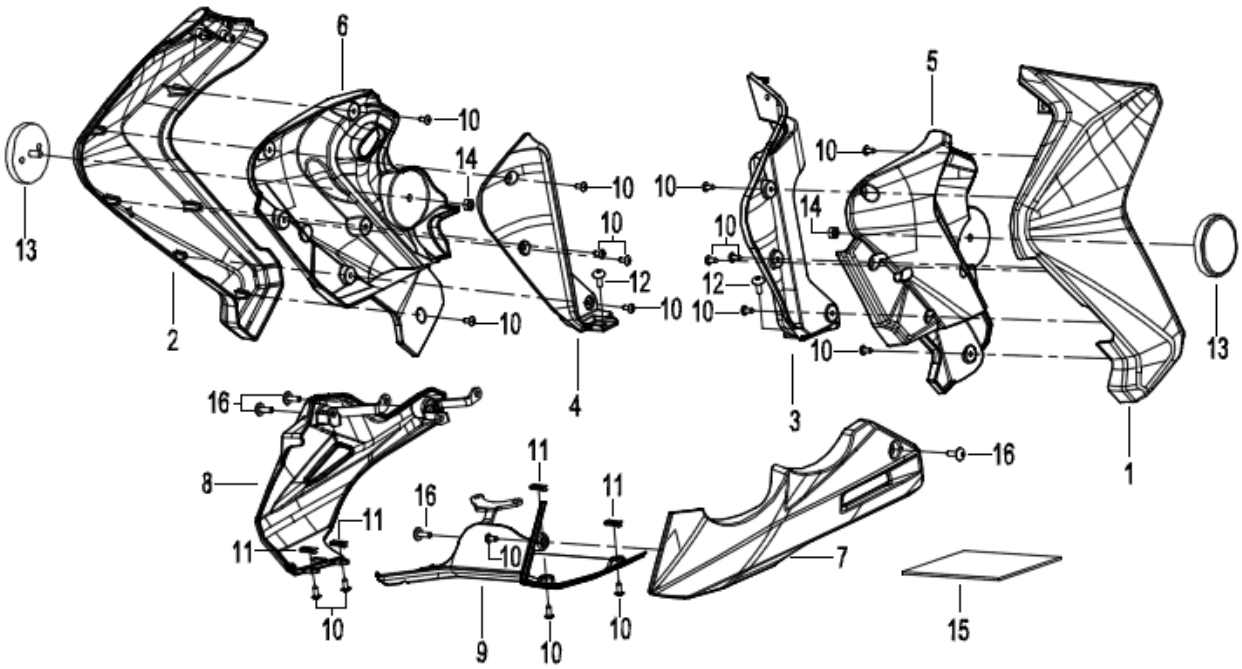
Assembly of the Rear Lower Fender and Chain Cover

Disassembly:

Conduct disassembly in reverse order of assembly.

Fuel Tank Cowling and Lower Fairing

Assembly of the Fuel Tank Cowling and the Lower Fairing



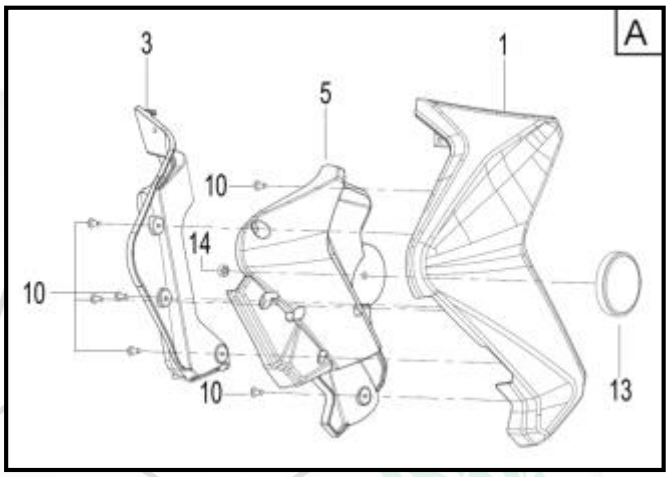
No.	Name and specifications	Quantity
1	Left Fuel Tank Cowling	1
2	Right Fuel Tank Cowling	1
3	Decorative Inner Left Fuel Tank Cowling	1
4	Decorative Inner Right Fuel Tank Cowling	1
5	Inner Left Fuel Tank Cowling	1
6	Inner Right Fuel Tank Cowling	1
7	Left Lower Fairing	1
8	Right Lower Fairing	1
9	Center Lower Fairing	1
10	Self-tapping screw ST4.2×13	17
11	Nut, Insert ST4.2	4
12	Screw M6×14	2
13	Side Reflector Assembly	2
14	Nut M5	2
15	Heat Absorbing Mat	1
16	Screw M6×15.2	6

Fuel Tank Cowling and the Lower Fairing

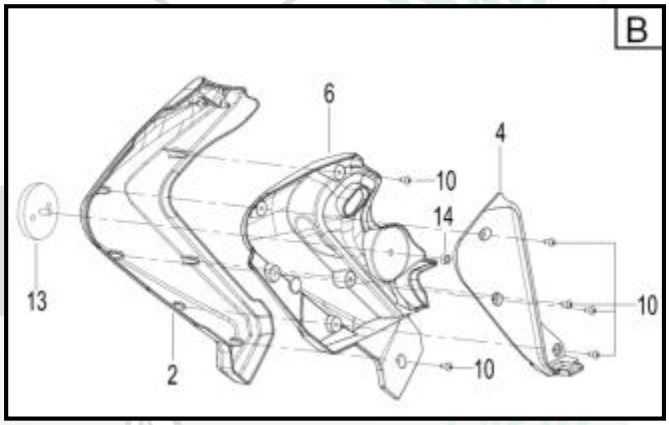
Assembly of the Fuel Tank Cowling

Assembly:

Assemble the left fuel tank cowling (1), decorative inner of the left fuel tank cowling (3), inner left fuel tank cowling (5) and the side reflector assembly (13) together using self-tapping screws (10), as shown in Fig. A.

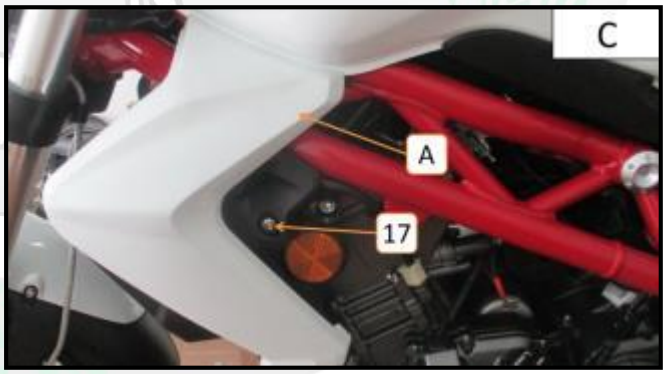


Assemble the right fuel tank cowling (2), decorative inner of the right fuel tank cowling (4), inner right fuel tank cowling (6) and the side reflector assembly (13) together using self-tapping screws (10), as shown in Fig. B.



Install the assembled left fuel tank cowling assembly (A) on the motorcycle, as shown in Fig. C.
Fasten the screw (17) to the following torque:

Torque 7 ft·lb



Install the assembled right fuel tank cowling assembly (B) on the motorcycle, as shown in Fig. D.
Fasten the screw (17) to the following torque:

Torque 7 ft·lb

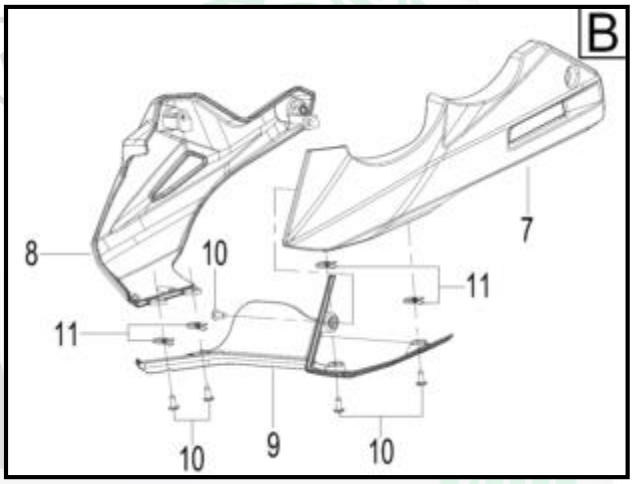
Fuel Tank Cowling and the Lower Fairing

Assembly of the Lower Fairing

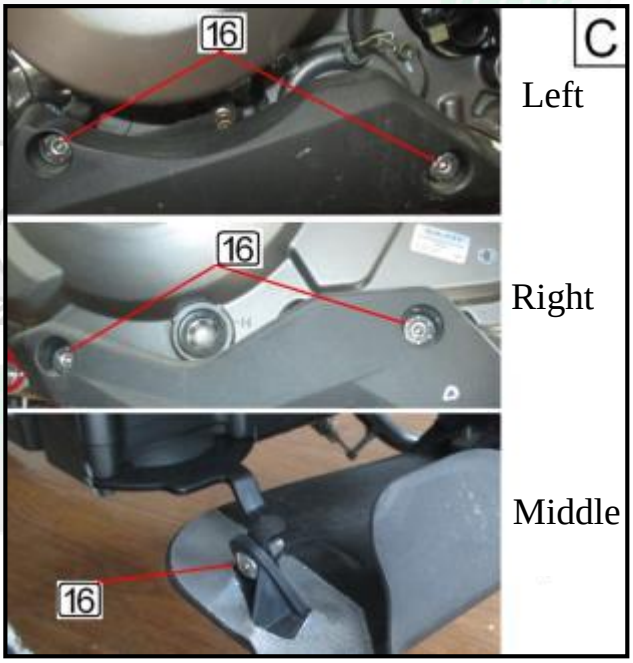
Assembly:

Attach the heat resistant mat (15) to the lower fairing center section (9), as shown in Fig. A.

Attach the left lower fairing (7), right lower fairing cover (8) and the center fairing (9) together using the self-tapping screws (10), as shown in Fig. B.



Install the assembled lower cowling cover assembly on the motorcycle using the screws (16), as shown in Fig. C.



Note:

Fasten the screws to the following torque:

Torque 7 ft·lb

Fuel Tank Cowling and Lower Fairing

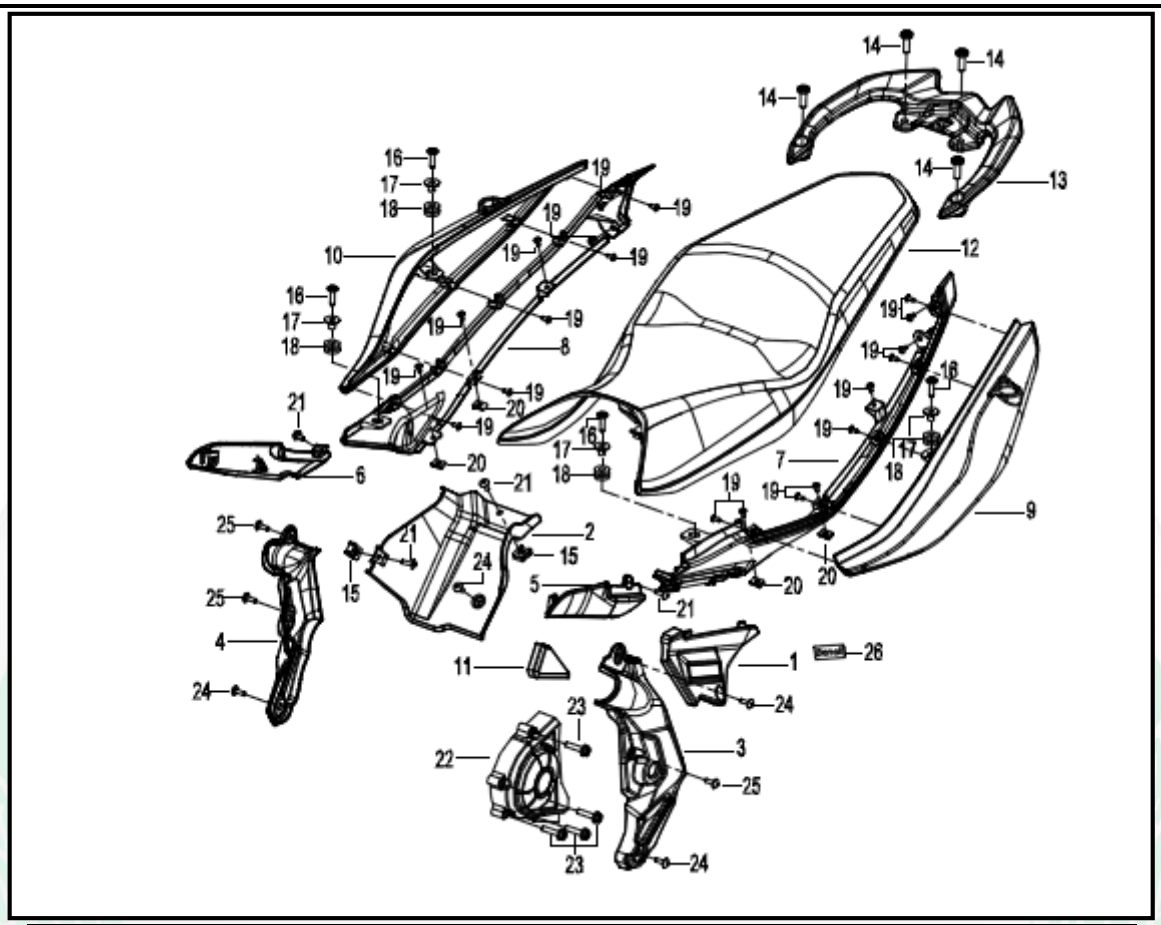
Disassembly of the Fuel Tank Cowling and Lower Fairing

Disassembly:

Conduct disassembly in reverse order of assembly.

Tail Section

Tail Section Assembly



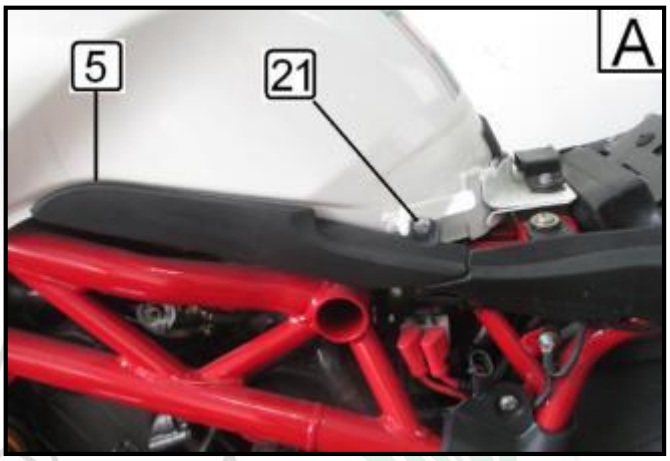
No.	Name and specifications	Quantity	No.	Name and specifications	Quantity
1	Left upper frame Cover	1	14	Bolt, Rear Carrier	4
2	Battery box cover	1	15	Nut, Insert M6	1
3	Left Frame Decorative Cover	1	16	Stainless Screw M6×25	4
4	Right Frame Decorative Cover	1	17	Collar	4
5	Left Decorative Cover, Fuel Tank	1	18	Grommet, Rubber	4
6	Right Decorative Cover, Fuel Tank	1	19	Self-tapping screw ST4.2×13	20
7	Rear Lower Left Tail Cowling	1	20	Nut, Clip ST4.2	4
8	Rear Lower Right Tail Cowling	1	21	Screw M6×14	4
9	Rear-Left Tail Cowling	1	22	Cover, Front Sprocket	1
10	Rear-Right Tail Cowling	1	23	Bolt M6×30	4
11	Left Decorative Cap, Frame	1	24	Screw M6×20	4
12	Seat Assembly	1	25	Screw M6×15.2	3
13	Passenger Grab Rail (matte black BG)	1	26	Sticker, Benelli	1

Tail Section

Tail Section Assembly

Assembly:

Install the left decorative fuel tank cover (5) on the fuel tank using the screw (21), as shown in Fig. A.

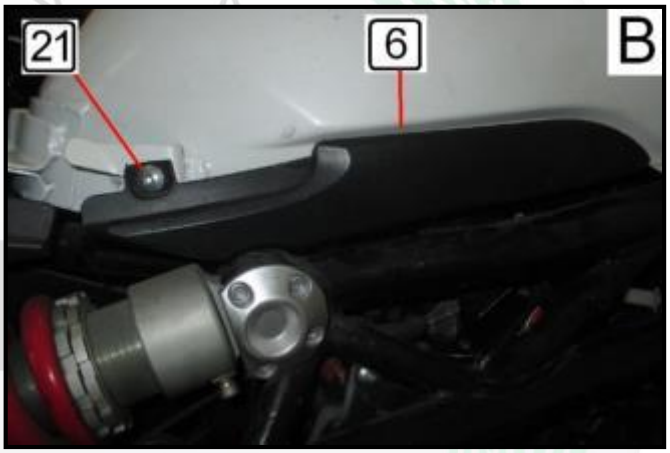


Note:

Fasten the screw to the following torque:

Torque 7 ft·lb

Install the right decorative fuel tank cover (6) on the fuel tank using the screw (21), as shown in Fig. B.

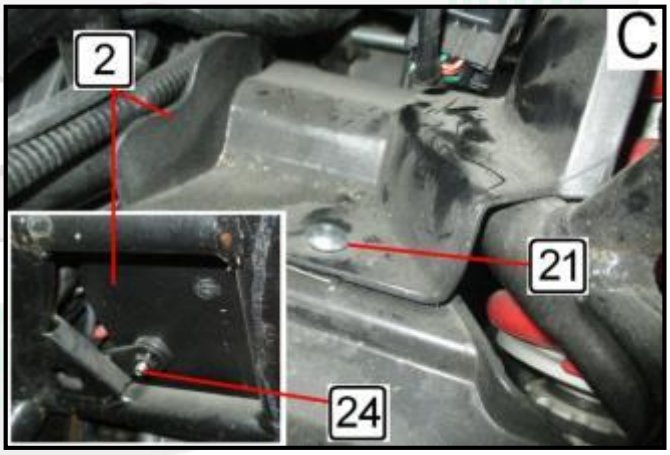


Note:

Fasten the screw to the following torque:

Torque 7 ft·lb

Install the right inner cover (2) on the frame using the screws (21) and (24), as shown in Fig. C.



Note:

Fasten the screws to the following torque:

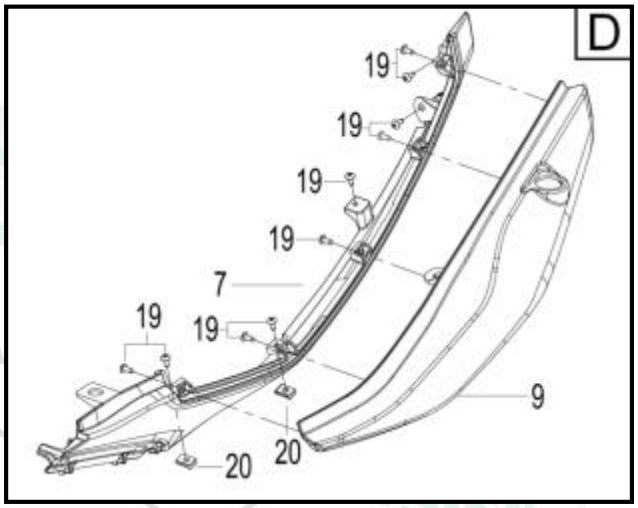
Torque 7 ft·lb

Tail Section

Tail Section Assembly

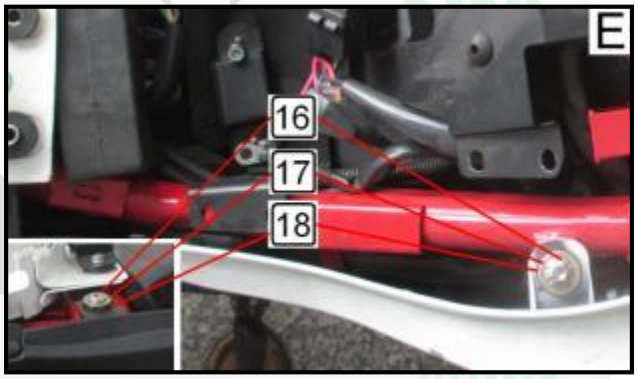
Assembly:

Assemble the rear lower left tail cowling (7) with the rear-left tail cowling (9) using the self-tapping screws (19), as shown in Fig. D.

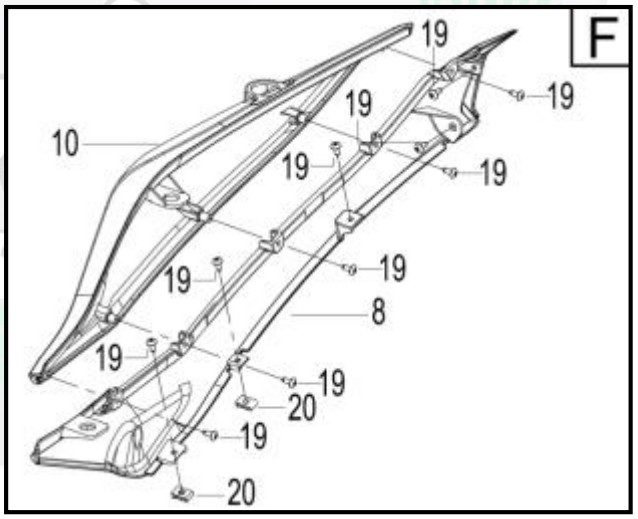


Install the assembled rear lower left tail cowling and rear-left tail cowling on the frame using the screws (16), collars (17) and rubber washers (18), as shown in Fig. E. Fasten the screws to the following torque:

Torque 7 ft·lb



Assemble the rear lower right tail cowling (8) and the rear-right tail cowling (10) using the self-tapping screws (19), as shown in Fig. F.

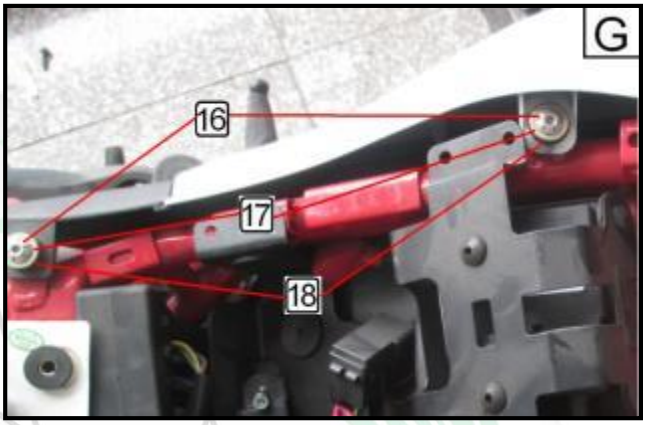


Tail Section

Tail Section Assembly

Assembly:

Install the assembled rear lower left tail cowling and rear-left tail cowling on the frame using the screws (16), collars (17) and rubber washers (18), as shown in Fig. G.



Note:

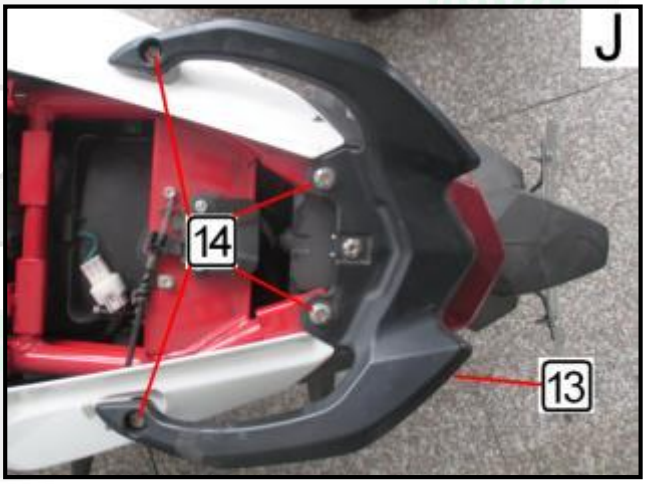
Fasten the screws to the following torque:

Torque 7 ft·lb

Install the left midframe cover (1) on the frame using the screw (24), as shown in Fig. H.
Fasten the screw to the following torque:

Torque 7 ft·lb

Install the rear passenger grab rail (13) on the frame using the screws (14), as shown in Fig. J.
Fasten the screws to the following torque:



Torque 16 ft·lb

Tail Section

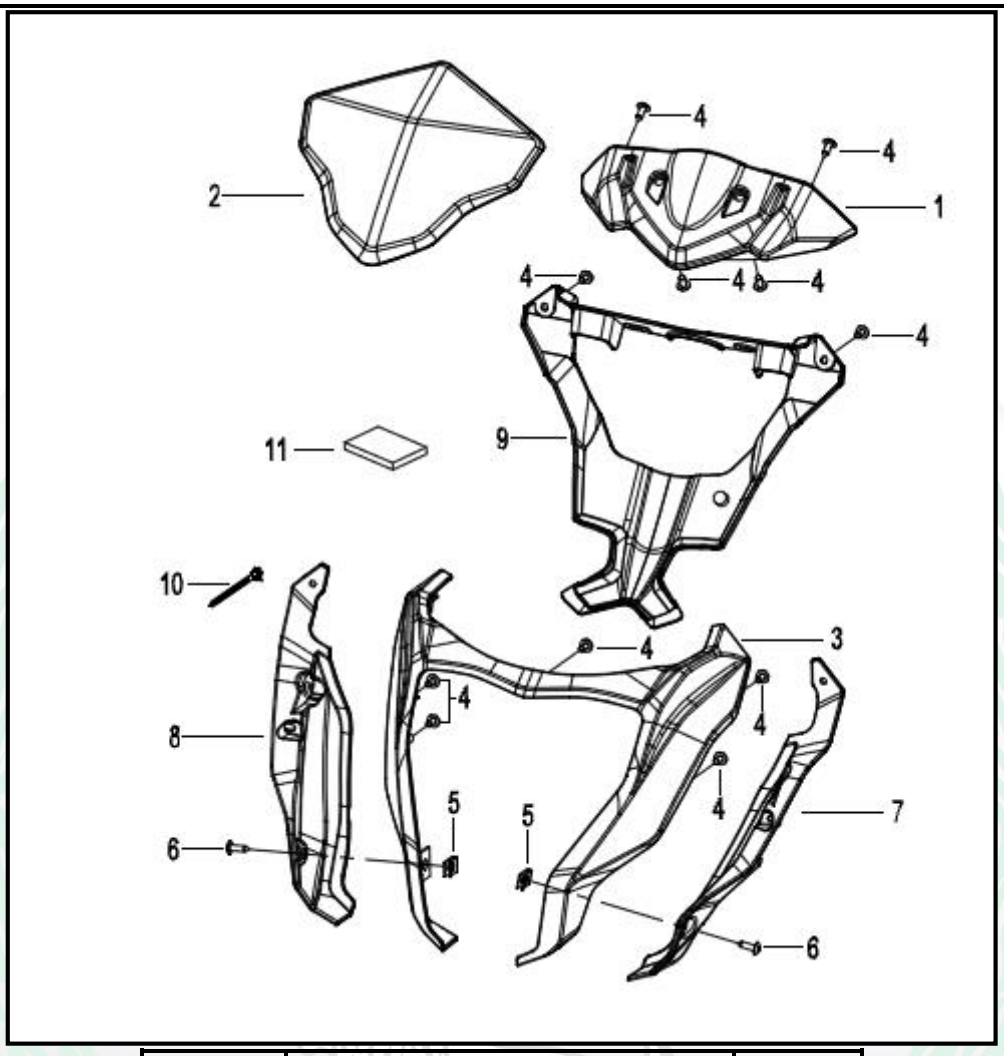
Tail Section Disassembly

Disassembly:

Conduct disassembly in reverse order of assembly.

Headlight Cowling

Headlight Cowling Assembly



No.	Name and specifications	Quantity
1	Lower Instrument Cover	1
2	Speedometer Visor	1
3	Headlight Cowling	1
4	Self-tapping Screw ST4.2×13	11
5	Clip, Nut ST4.2	2
6	Self-tapping Screw ST4.2×16	2
7	Rear Left Headlight Cowling	1
8	Rear Right Headlight Cowling	1
9	Rear Headlight Cowling	1
10	Wire Tie 150MM	1
11	Cushion	1

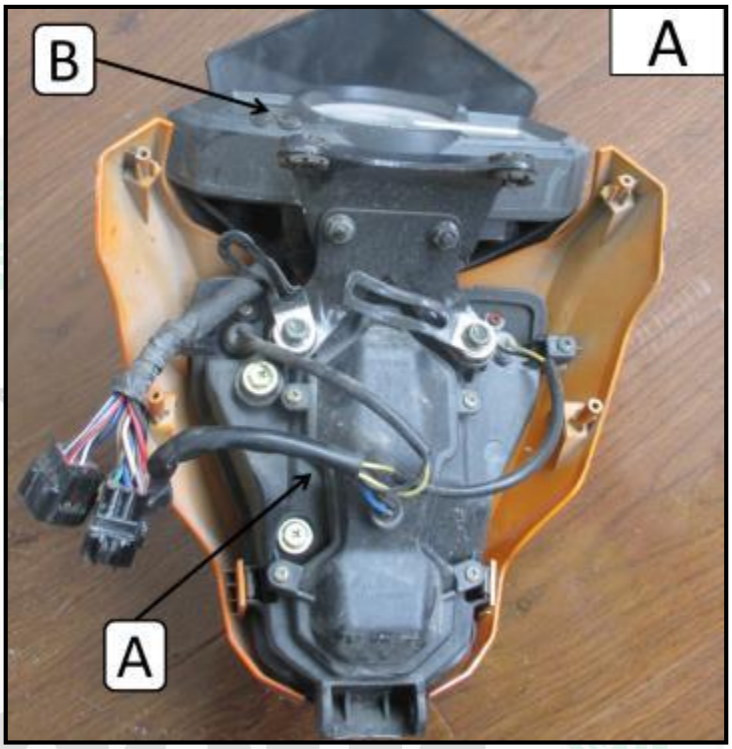
Headlight Cowling

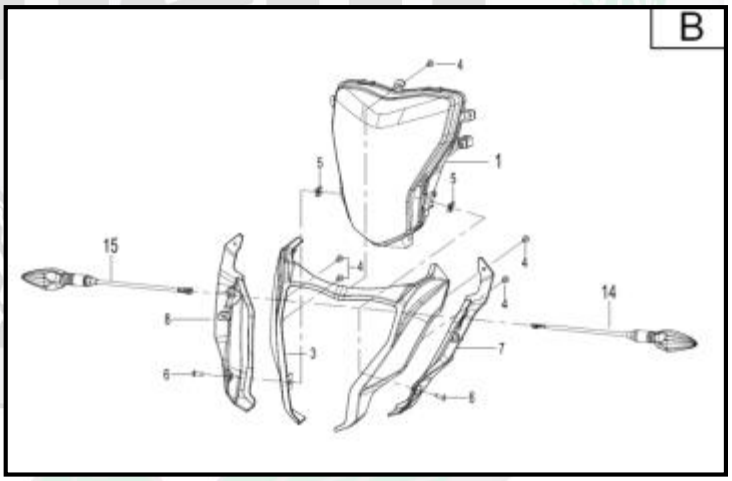
Cowling Assembly

Preassembly: as shown in Fig. A

and B.

Install the rear right headlight cowling (8) and the rear left headlight cowling (7) onto the headlight cowling assembly (3).
Install the speedometer visor (2) on the lower instrument cluster (1).
Assemble the headlight (A), instrument cluster (B) and the preassembled parts together.





Assembly:

Please see the chapter “Replacement of headlight bulb”.

Headlight Cowling

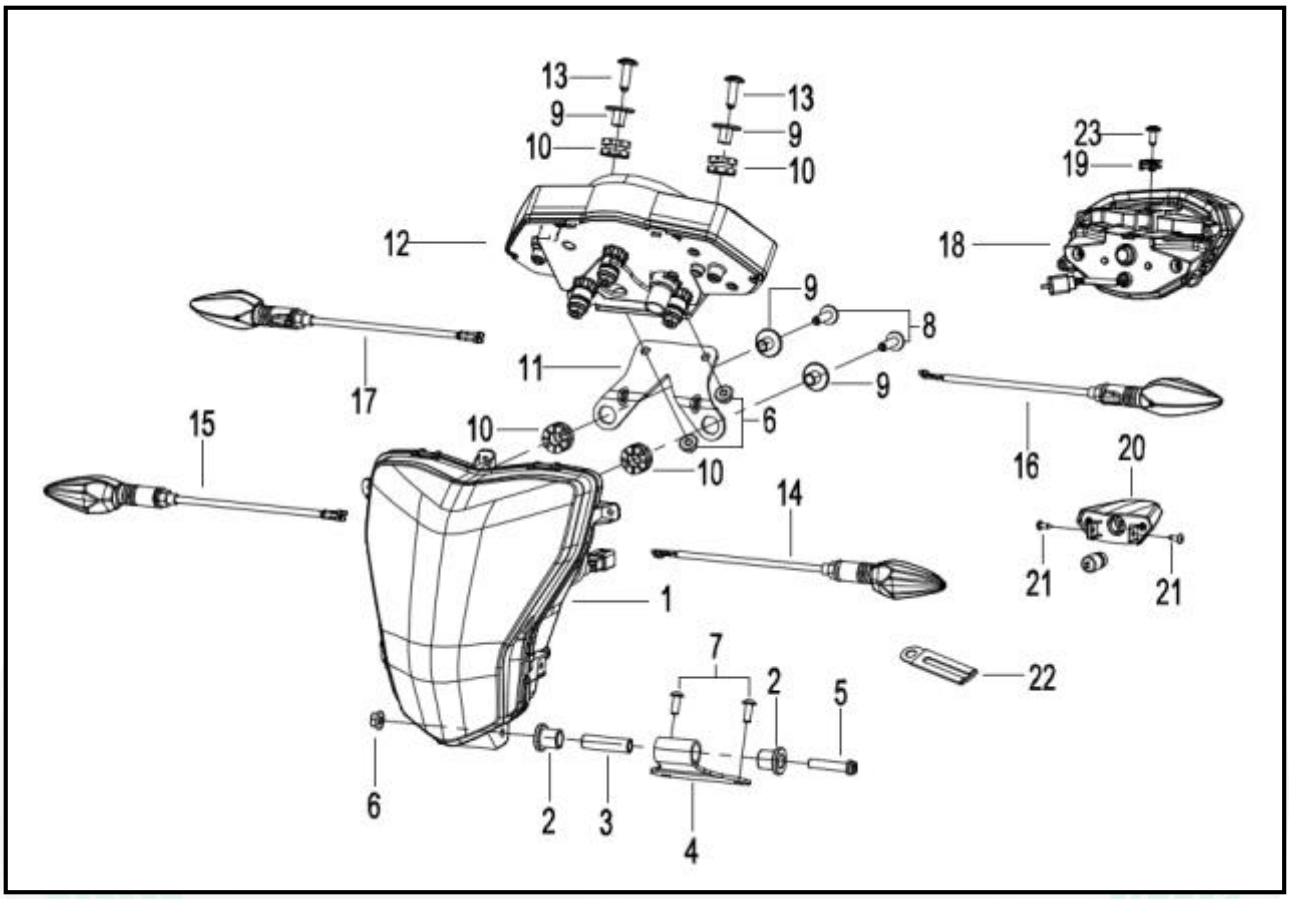
Cowling Assembly

Disassembly:

Conduct disassembly in reverse order of assembly.

Lights

Light Bulb Replacement



No.	Name and specifications	Quantity	No.	Name and specifications	Quantity
1	Headlight	1	13	Stainless steel screw M6×30	2
2	Damper, Headlight Mount	2	14	Turn Signal, Front Left	1
3	Spacer, Headlight Mount	1	15	Turn Signal, Front Right	1
4	Mounting Bracket, Lower Headlight	1	16	Turn Signal, Rear Left	1
5	Bolt, Hex Head	1	17	Turn Signal, Rear Right	1
6	Nut M6	3	18	Taillight	1
7	Bolt M6×1×16	2	19	Nut, Clip M6	1
8	Bolt, Stainless Steel M6×25	2	20	License Plate Light	1
9	Collar	4	21	Self-tapping screw ST4.2×13	2
10	Damper, Rubber	4	22	Wire Clamp	2
11	Mounting Bracket, Upper Headlight	1	23	Screw M6×20	1
12	Instrument Cluster	1			

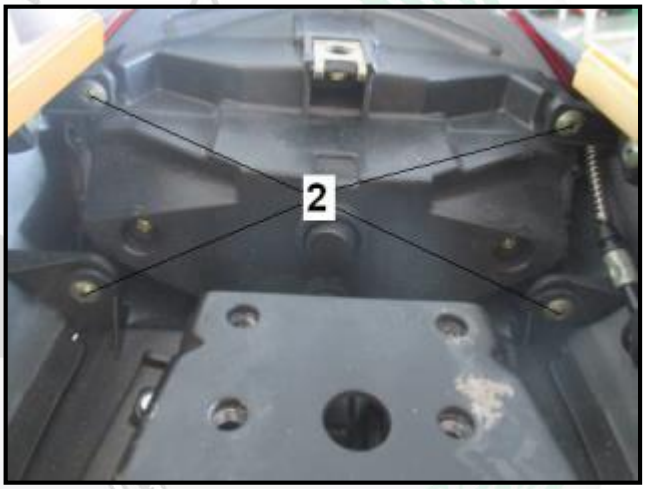
Lights

Light Bulb Replacement

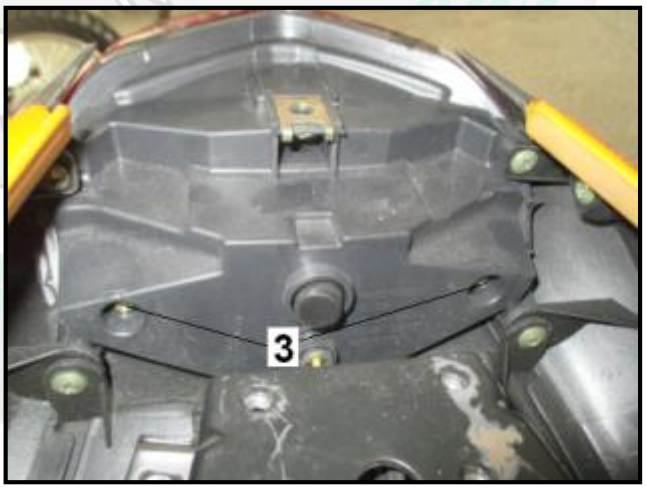
Replacement of Rear Taillight

The rear taillight is LED; replace the entire light when required.

(1) Remove the seat cushion.
(2) Remove the fixing screws for the rear passenger grab handle (1) and set the grab handle aside.



(1) Remove the fixing screws (2).



(2) Remove the fixing nuts (3).
(3) Disconnect the wiring connector cable for the rear taillight, remove the damaged light and replace it with a new rear taillight.

Assembly:

Install the light in reverse order of disassembly.

Front Turn Signals

Replacement of the Front Turn Signals

Replacement of the Front Turn Signals

The turn signal lights are LED; replace the entire light when required.

1. Operate according to the prompts in the section "**Light bulb replacement**"
2. Remove the fixing screw ① of the left or right turn signal light.
3. Disconnect the wiring connector for the front turn signal, remove the damaged light and replace it with a new turn signal light.

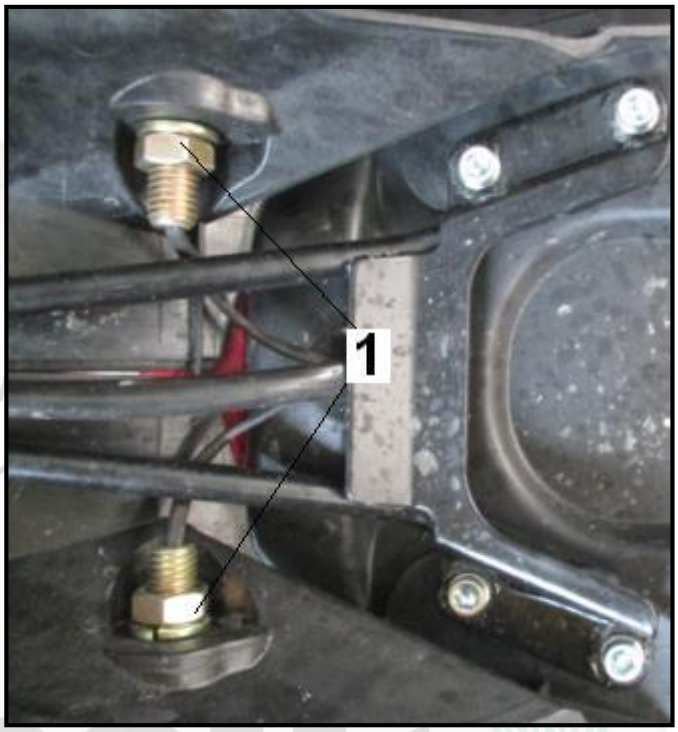
Assembly:

Install the light in reverse order of disassembly.

Rear Turn Signals

Replacement of the Rear Turn Signals

Replacement of rear turn signals

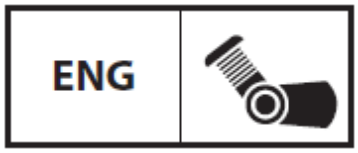


The turn signal lights are LED; replace the entire light when required.

1. Remove the fixing nut (1) of the left or right turn signal from the back of the rear license plate.
2. Disconnect the wiring connector for the rear turn signals, remove the damaged light and replace it with a new rear turn signal.

Assembly:

Install the light in reverse order of disassembly.

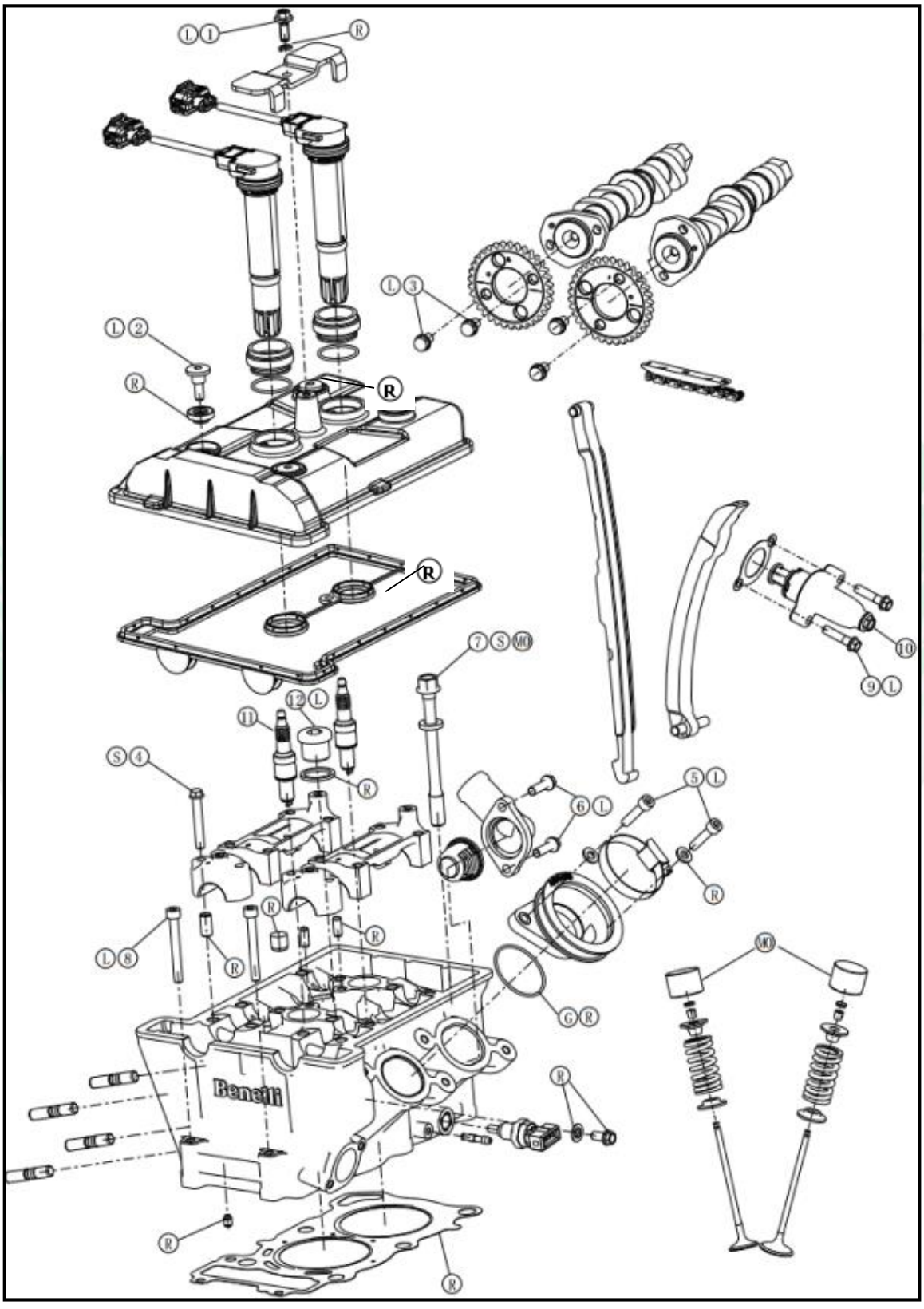


Chapter V Engine

Cylinder Head and Cylinder Head Cover

Cylinder Head and Cylinder Head Cover

Exploded view



Cylinder Head and Cylinder Head Cover

Cylinder Head and Cylinder Head Cover

Exploded view

No.	Fastener	Torque			Remark
		N·m	kgf·m	ft·lb	
1	Ignition Coil Retainer Bolt	12	1.2	106 in·lb	L
2	Valve Cover Bolt	12	1.2	106 in·lb	L
3	Camshaft Sprocket Fixing Bolt	20	2.0	14.75	L
4	Camshaft Holder Bolt	12	1.2	106 in·lb	S
5	Intake Manifold Bolt	12	1.2	106 in·lb	L
6	Thermostat Cover Bolt	12	1.2	106 in·lb	L
7	Cylinder Head Bolt (M10)	55	5.5	40.56	S、MO
8	Cylinder Head Mounting Bolt (M6)	12	1.2	106 in·lb	L
9	Tensioner Fixing Bolt	12	1.2	106 in·lb	L
10	Tensioner Sealing Bolt	12	1.2	106 in·lb	
11	Spark plug	13	1.3	115 in·lb	
12	Water Jacket Plug	20	2.0	14.75	

G: Apply lubricating grease.

L: Apply thread locker agent.

M: Apply lubricating grease containing molybdenum disulfide

MO: Apply oil solution containing molybdenum disulfide.

(Ratio of engine oil and lubricating grease containing molybdenum disulfide in weight: 10: 1)

R: Replace parts

S: Comply with the specified tightening order.

SS: Apply silicone sealant

Cylinder Head and Cylinder Head Cover

Cylinder Head and the Cylinder Head Cover

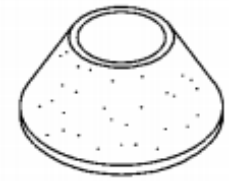
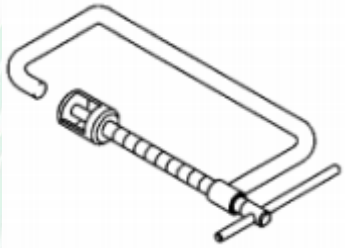
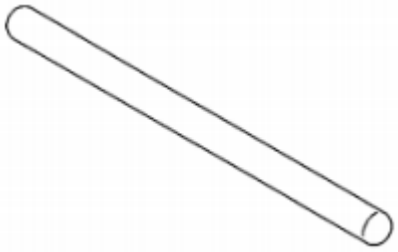
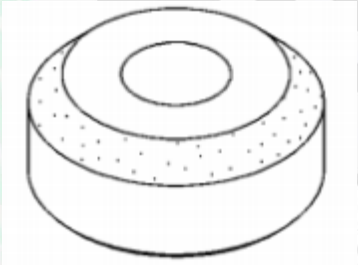
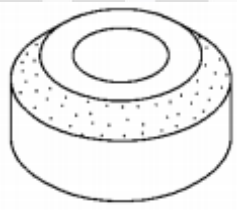
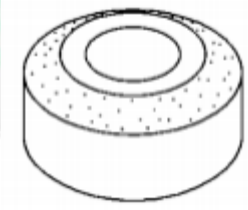
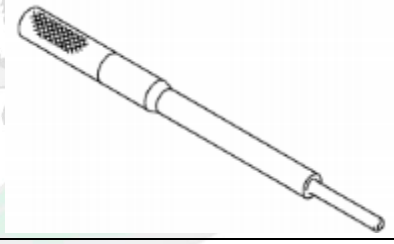
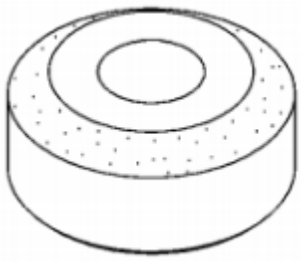
Technical parameters

Item	Standard	Operating limit
Camshaft		
Cam height:		
Exhaust valve	32.455 ~ 32.535 mm (1.2778 ~ 1.2809 in.)	32.36 mm (1.274 in.)
Intake valve	32.455 ~32.535 mm (1.2778 ~ 1.2809 in.)	32.36 mm (1.274 in.)
Camshaft oil passage, camshaft cover clearance	0.03~ 0.064mm (0.0012 ~ 0.0025 in.)	0.15mm (0.0059 in.)
Camshaft oil passage diameter	22.957 ~ 22.97mm (0.9038 ~ 0.9043 in.)	22.91 mm (0.902 in.)
Camshaft bearing bore diameter	23.000 ~ 23.021 mm (0.9055 ~ 0.9063 in.)	23.08 mm (0.909 in.)
Camshaft radial eccentricity	≤TIR 0.01 mm (0.0004 in.)	TIR 0.05mm (0.002 in.)
Cylinder		
Cylinder	(Application) When the rotating speed is 300 r/min: 1 030 ~ 1 570 kPa (10.5 ~ 16.0 kgf/cm²,149 ~ 228 psi)	——
Cylinder cover bending	——	0.05 mm (0.002 in.)
Valve		
Valve clearance:		
Exhaust valve	0.19 ~ 0.25 mm (0.0074 ~ 0.0098 in.)	——
Intake valve	0.13 ~ 0.19 mm (0.0051 ~ 0.0075 in.)	——
Valve head thickness:		
Exhaust valve	0.6 mm (0.024 in.)	0.4 mm (0.016 in.)
Intake valve	0.6 mm (0.024 in.)	0.4 mm (0.016 in.)
Valve stem bending	≤TIR 0.01 mm (0.0004 in.)	TIR 0.05mm (0.002 in.)
Valve stem diameter:		
Exhaust valve	3.965~ 3.98 mm (0.1561 ~ 0.1567 in.)	3.95mm (0.155 in.)
Intake valve	3.965-3.98 mm (0.1561 ~ 0.1567 in.)	3.95mm (0.155 in.)
Valve guide bore diameter:		
Exhaust valve	4.03 ~ 4.04 mm (0.1587 ~ 0.1590in.)	4.047 mm (0.16in.)
Intake valve	4.02 ~ 4.03 mm (0.1583 ~ 0.1587 in.)	4.037 mm (0.200 in.)
Valve clearance/valve guide clearance (the pendulum test):		
Exhaust valve	0.13~ 0.21 mm (0.0051 ~ 0.0083 in.)	0.40 mm (0.016 in.)
Intake valve	0.12 ~ 0.2 mm (0.0047 ~ 0.0079 in.)	0.34 mm (0.013 in.)
Valve seat cutting angle	30°、45°、60°	——
Valve seat surface:		
Width:		
Exhaust valve	1.1 ~ 1.3 mm (0.043 ~ 0.051 in.)	——
Intake valve	1.1 ~ 1.3 mm (0.043 ~ 0.051 in.)	——
Outside diameter:		
Exhaust valve	23.1 ~23.12mm (0.9094 ~ 0.9102in.)	——
Intake valve	26.1 ~26.12mm (1.0283 ~ 1.0291 in.)	——
Free length of valve spring:		
Exhaust valve	40.5mm (1.594 in.)	38.8 mm (1.528in.)
Intake valve	37.2mm (1.518 in.)	35.6 mm (1.402 in.)

Cylinder Head and Cylinder Head Cover

Cylinder Head and the Cylinder Head Cover

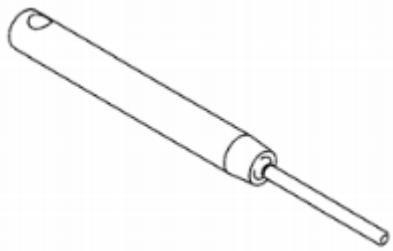
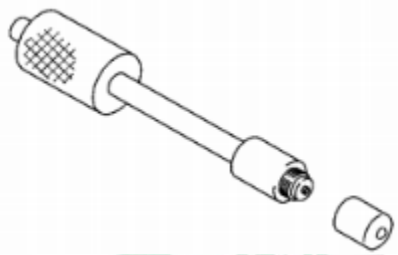
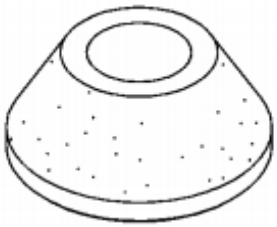
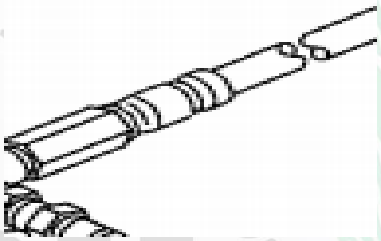
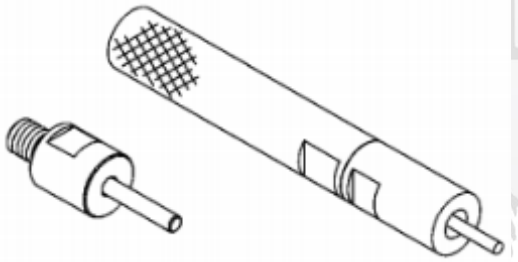
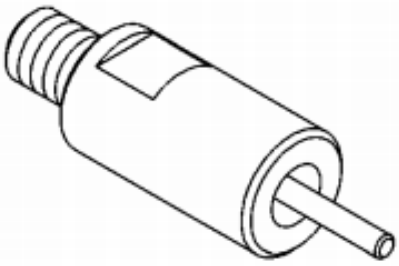
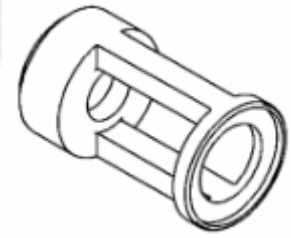
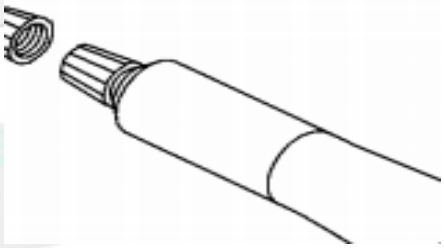
Special tools and Sealants

20 kgf/cm² pressure gauge	**60°-φ 30 valve-seat milling cutter**
	
Valve spring compressor	**Valve-seat milling cutter fixator rod**
	
45°-φ35 valve-seat milling cutter	**45°-φ30 valve-seat milling cutter**
	
30°-φ30 valve-seat milling cutter	**φ4 valve guide arbor**
	
30°-φ35 valve-seat milling cutter	**φ4 valve guide reamer**
	

Cylinder Head and Cylinder Head Cover

Cylinder Head and the Cylinder Head Cover

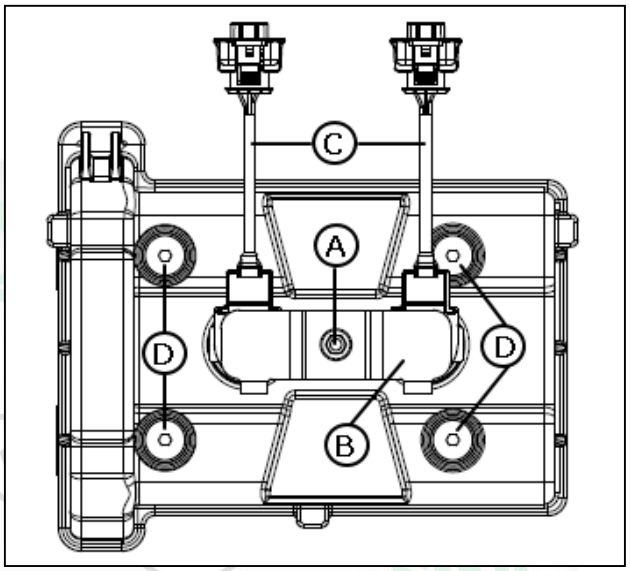
Special tools and sealants

φ4 valve-seat milling cutter fixator	**M10 × 1.0 pressure gauge adaptor**
	
60°-φ35 valve-seat milling cutter	L-shaped hose
	
Valve guide knock-in device	**Valve guide knock-in device accessory E**
	
φ24 valve spring **compressor** adaptor	**Adhesive (silicone sealant)**
	

Cylinder Head Cover

Cylinder Head Cover

Disassembly of the cylinder head cover



● Loosen the bolt and lock washer [A]

● Remove the ignition coil retaining plate [B]

●Remove the ignition coils [C], ignition coil cover, O-ring and so on.

● Loosen the valve cover bolts [D]

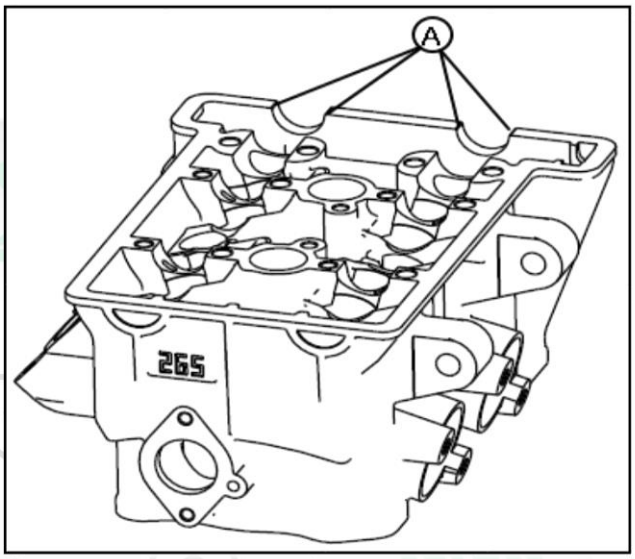
● Remove the valve cover sealing washers, cylinder head cover and cylinder head cover gasket assembly.

Cylinder Head Cover

Cylinder Head Cover

Assembly of the cylinder head cover

- Apply silicone sealant [A] on the semicircle sharp corner of the cylinder head cover as shown in the figure,



Sealant-silicone sealant

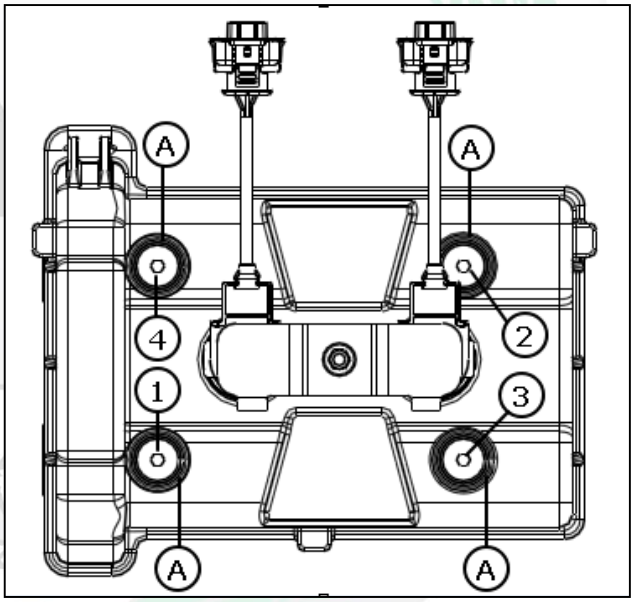
- Cylinder head cover gasket assembly, seal ring subassembly, O-ring and spring washer

It is necessary to replace them with new parts every time they are removed.

- Assembly:

Assemble the removed parts of the cylinder head cover in the reverse order of disassembly.

- Put the metal surface of the sealing washer subassembly [A] upwards
- Install the cover bolts in the order in the picture and tighten them twice.

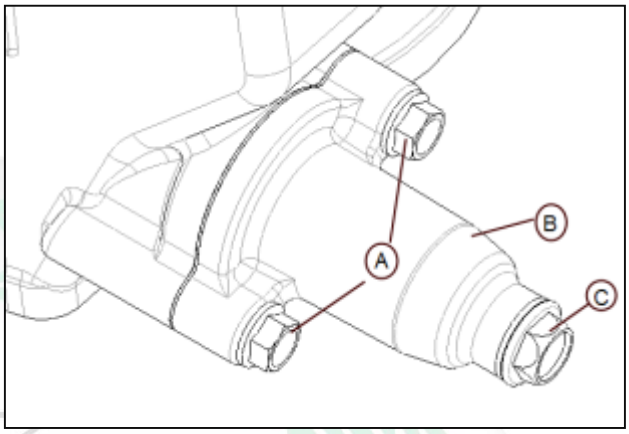


Locking torque of the cover bolts and the ignition coil retaining plate bolts:
12 N·m (1.2 kgf·m, 106 in·lb)

Camshaft Timing Chain Tensioner

Camshaft Timing Chain Tensioner

Disassembly of the camshaft transmission chain tensioner.



Note
Do not start the engine after the tensioner is removed, otherwise the timing of the camshaft chain will be affected, and the valves will be damaged.

● Remove the sealing bolt [C]

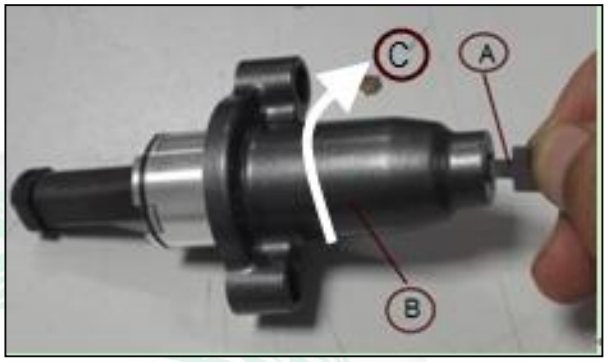
● Remove the fixing bolts [A], and remove the camshaft timing chain tensioner [B].

Camshaft Timing Chain Tensioner

Camshaft Timing Chain Tensioner

Assembly of the camshaft transmission chain tensioner.

●Insert the T-shaped tool [A] in the cross recess at the back of the tensioner [B], and rotate it in the direction [C]



● Screw the extending part of the tensioner [A] to the minimum and then insert the T-shaped tool [B] in the cross recess at the back of the tensioner and fix it.

● Tighten the fixing bolts [A] of the **tensioner**.

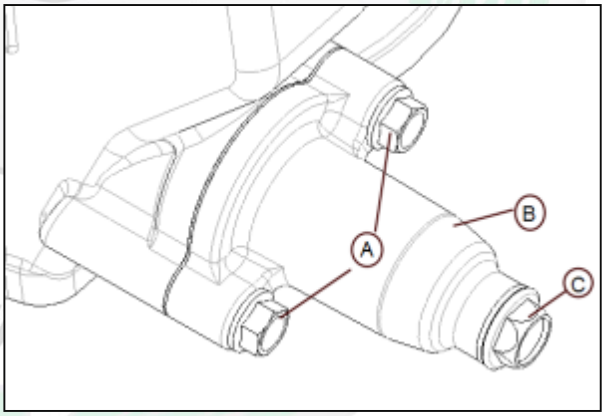
● Remove the T- shaped tool

● Tighten the sealing bolt [C].

Locking torque of the camshaft timing chain tensioner fixing bolts: 10N·m (1.0 kgf·m, 87 in·lb)

Locking torque of the camshaft timing chain tensioner sealing bolt: 10N·m (1.0 kgf·m, 87 in·lb)

● Rotate the crankshaft twice clockwise, and the tensioner will open. Then check the camshaft timing again.



Camshaft and Camshaft Timing Chain

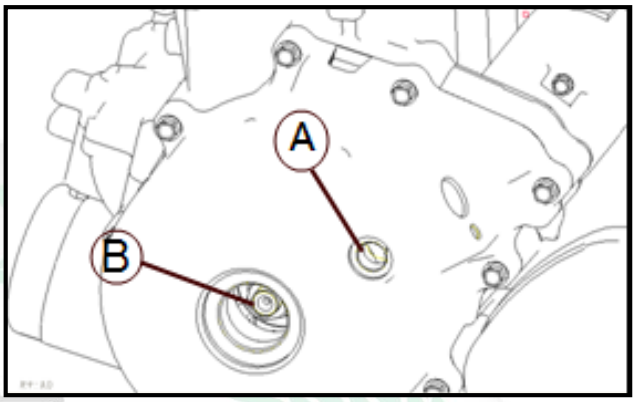
Camshaft and Camshaft Timing Chain

Removal of the camshafts:

● Remove:

Cylinder head cover (see "disassembly of the cylinder head cover"),

●Rotate the crankshaft [B] and put the crankshaft at the top dead center position. Align the timing observation hole slot [A] with the scribed line on the flywheel.



●Remove:

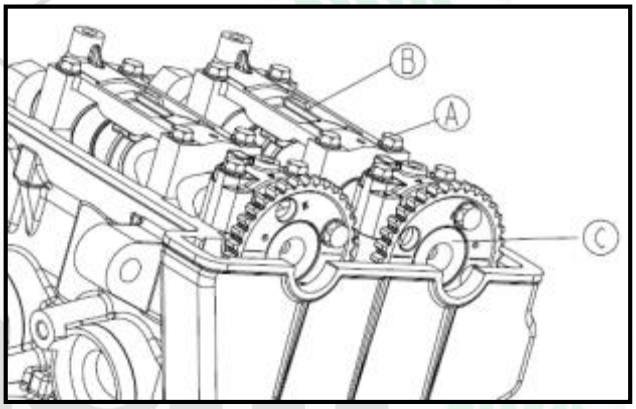
Camshaft timing chain tensioner (see "disassembly of the camshaft transmission chain tensioner"),

Camshaft retainer bolt [A],

Camshaft retainer [B],

Camshaft [C]

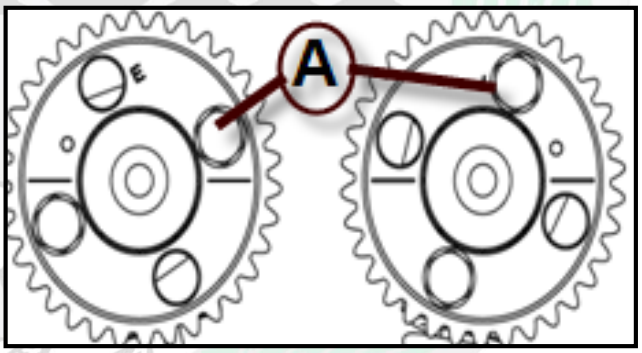
● To prevent parts from falling into the crankcase, plug the camshaft chain valley with a clean cloth.



● Remove:

Camshaft sprocket fixing bolts [A]

Camshaft sprocket



Note
The crankshaft can be rotated after the camshafts are removed. The transmission chain must be tightened during the rotation of the crankshaft, so as to prevent the lower (crankshaft) sprocket of the transmission chain from kinking and damaging the camshaft chain and sprockets.

Camshaft and Camshaft Timing Chain

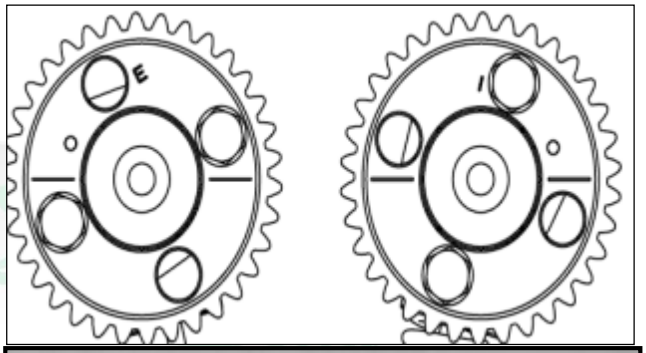
Camshaft and Camshaft Timing Chain

Assembly of the camshafts:

● Disassemble the camshaft sprocket, as shown in the picture.

● Apply thread locking agent on the threads of the fixing bolts, and then tighten the bolt.

Locking torque of camshaft sprocket fixing bolt: 20N·m (2.0 kgf·m, 11 ft·lb)

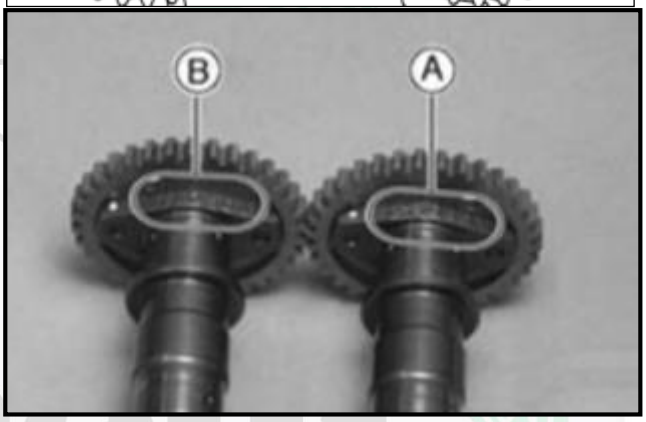


● Apply molybdenum disulfide oil solution on all cam parts and journals.

● If it is necessary to use new camshafts, apply a thin layer of molybdenum disulfide lubricating grease on the surfaces of the cams.

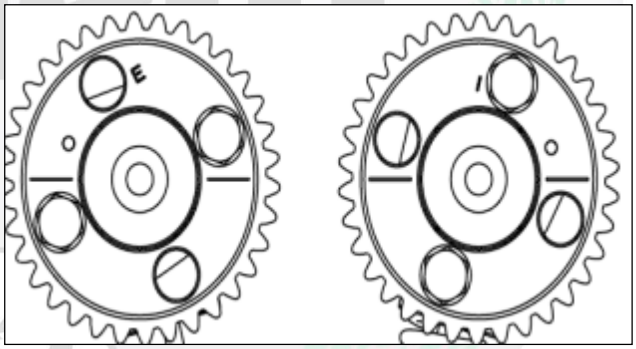
Remark

○ There is an E sign [A] on the exhaust camshaft sprocket, and there is an I sign [B] on the intake camshaft sprocket. Do not confuse the exhaust camshaft and the intake camshaft!



Remark

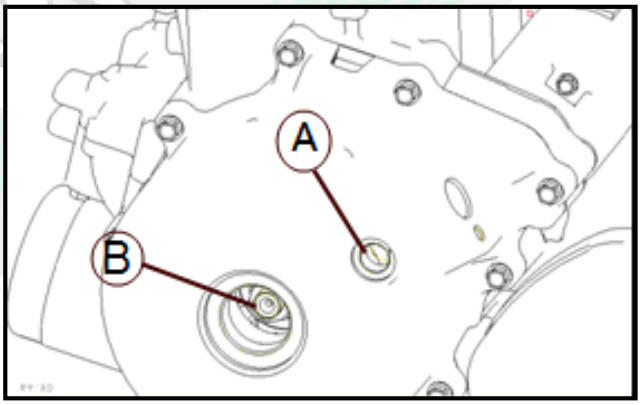
○The E and I signs should be put upwards during the adjustment of the timing.



● Rotate the crankshaft to the top dead center position.

● Tighten the tight side (exhaust side) of the chain when installing the chain.

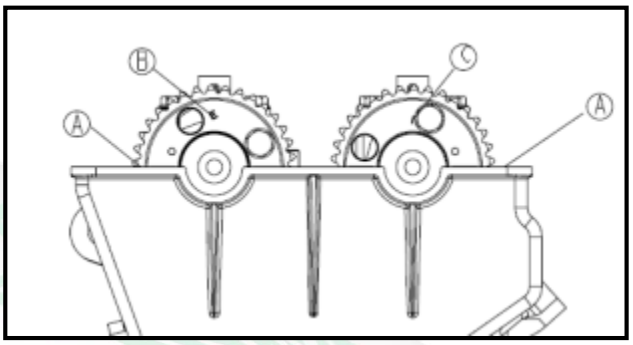
● Align the timing observation hole slot [A] with the scribed line on the flywheel.



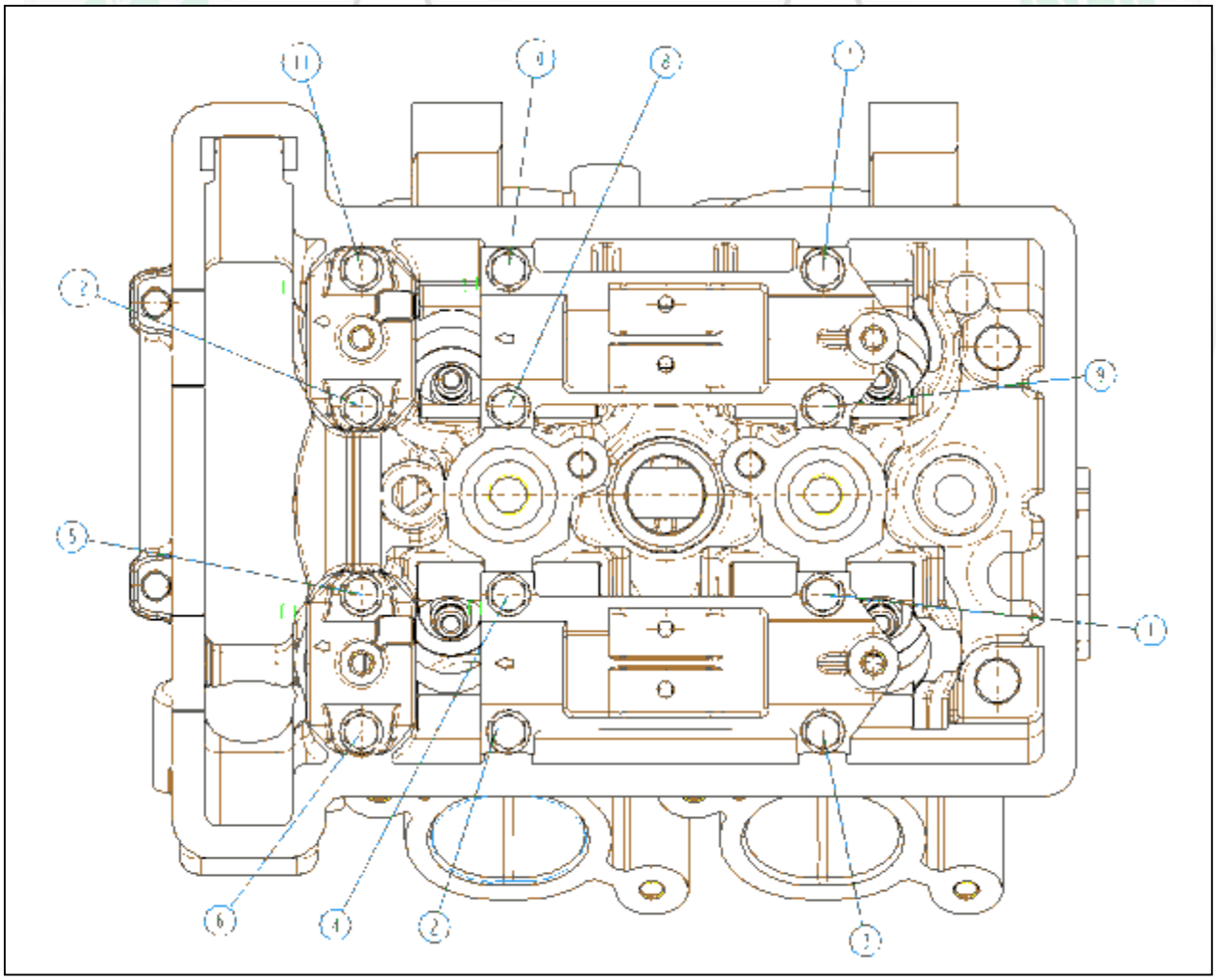
Camshaft and Camshaft Timing Chain

Camshaft and Camshaft Timing Chain

● Align the timing marks with the upper surface [A] of the cylinder head.
E sign [B]
I sign [C]

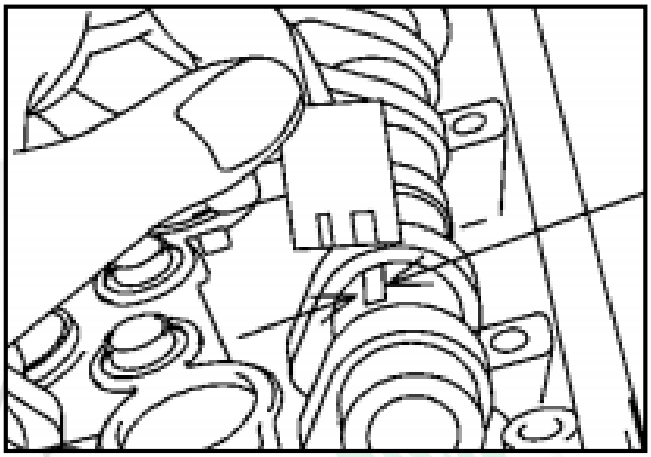


● Install the camshaft retainer
● Tighten the camshaft retainer but first, put the camshafts in the proper position, and then tighten all of the bolts according to the order shown in the figure.
Locking torque of No.1 to 12 camshaft cover bolt: 12 N•m (1.2 kgf•m, 106 in•lb)
● Assemble the camshaft timing chain tensioner (see “Assembly of the camshaft transmission chain tensioner”).



Camshaft and Camshaft Timing Chain

Camshaft and Camshaft Timing Chain



Camshaft inspection:

Wear of the camshaft and camshaft retainer block

● Remove:

Camshaft retainer block (see "Disassembly of the camshaft")

● Cut a plastic clearance gauge into strips according to the width of the journal. Put a strip of plastic clearance gauge in each oil passage, and align it with the camshaft which is installed in the correct position.

●Measure the clearance between each camshaft oil passage and camshaft lock block with the plastic clearance gauge [A].

● Tighten the camshaft retainer bolts and the chain guide bolt (see "Assembly of the camshaft").

Remark

○*Do not rotate the camshaft when* plastic clearance gauge *is between the oil passage and the camshaft lock block!*

Clearance between the camshaft oil passage and the camshaft retainer block
Standard: 0.03 to 0.064 mm (0.0012 to 0.0025 in.)
Operating limit: 0.15 mm (0.0059in.)

★ If clearance between any camshaft journal and camshaft retainer exceeds the operating limit, measure the diameter of each camshaft oil passage with a micrometer.

Diameter of camshaft oil passage
Standard: 22.957 to 22.97mm (0.9038 to 0.9043 in.)
Operating limit: 22.91 mm (0.902 in.)

★ If the diameter of the camshaft oil passage is lower than the operating limit, replace the camshaft, and then re-measure the clearance.

★ If the measured clearance is still beyond the limit, replace the cylinder head.

Camshaft and Camshaft Timing Chain

Camshaft and Camshaft Timing Chain

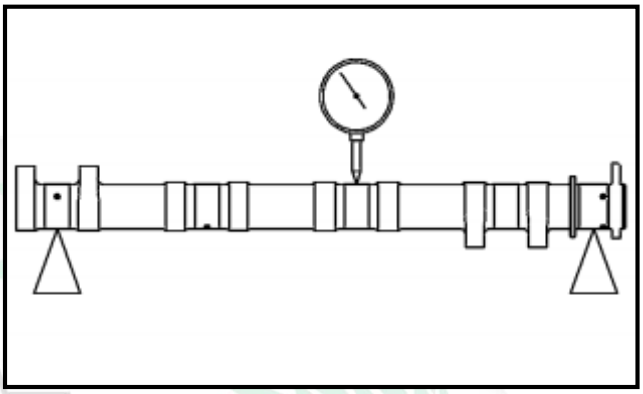
Camshaft radial eccentricity inspection:

● Remove the camshaft (see “Disassembly of the camshaft”).

● Place the camshaft in an alignment jig or a V-shaped block.

● Measure the radial eccentricity of the camshaft with a dial indicator at the position shown in the right figure.

★ If the radial eccentricity of the camshaft exceeds the operating limit, replace the camshaft.



Radial eccentricity of the camshaft

Standard: ≤TIR 0.01 mm (0.0004 in.)

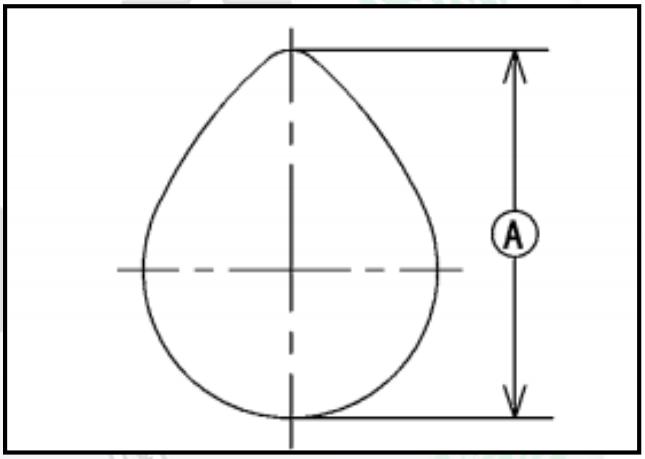
Operating limit: TIR 0.05 mm (0.002 in.)

Wear of the cam lobe:

● Remove the camshaft (see “Disassembly of the camshaft”).

● Measure the height of each cam lobe with a micrometer [A].

★ If wear of the cam lobe exceeds the operating limit, replace the camshaft.



Cam height

Standard:

Exhaust cam: 32.455 to 32.535 mm (1.2778 to 1.2809 in.)

Intake cam: 32.455 to 32.535 mm (1.2778 to 1.2809in.)

Operating limit:

Exhaust cam: 32.36 mm (1.274 in.)

Intake cam: 32.36mm (1.274 in.)

Camshaft and Camshaft Timing Chain

Camshaft and Camshaft Timing Chain

Removal of the camshaft timing chain:

● Remove:

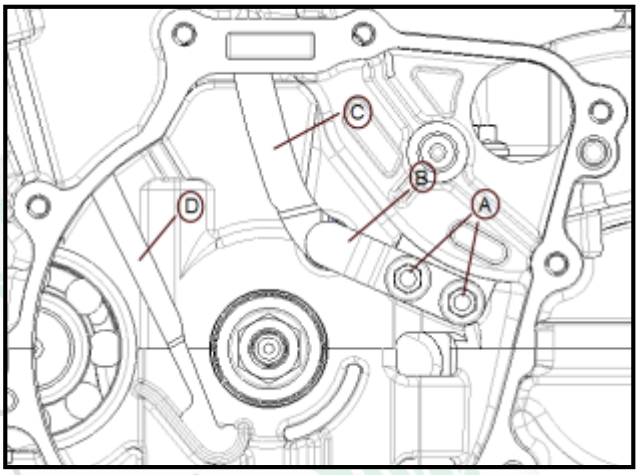
Camshaft (see “Disassembly of the camshaft”)

Front cam chain slider [D]

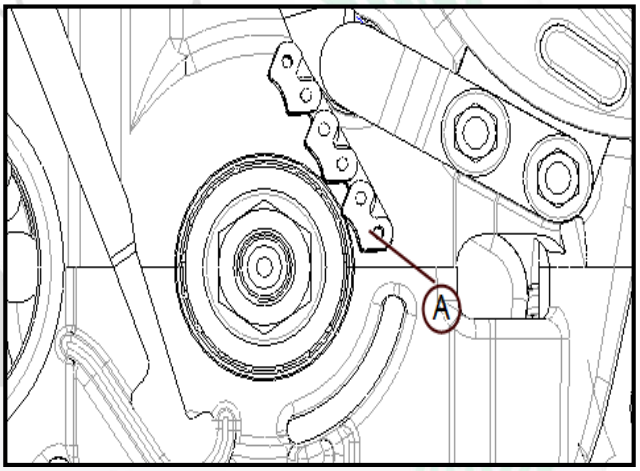
Rear cam chain slider follower bolts [A]

Rear cam chain slider pressure plate [B]

Rear cam chain slider [C]



● Pull the camshaft timing chain [A] out downwards.



Assembly of the camshaft timing chain

● Assemble the timing chain on the side of cylinder head camshaft first.

● Assemble the crankshaft with the engine at top dead center.

● Assemble the front cam chain slider.

● Assemble the rear chain slider.

● Tighten the rear cam chain slider follower bolts

Tightening torque of the rear cam chain slider follower bolts: 9.8N·m (1.0 kgf·m, 87 in·lb)

●Assemble the removed parts (see the corresponding section).

Cylinder Head

Cylinder Head

Measurement of cylinder compression:

Remark

● Use a fully charged battery!

● Warm up the engine completely.

● Turn off the engine.

● Remove:

The ignition coils

One spark plug (see "Chapter III Check and Regular Adjustment" and Chapter I "Replacement of the Spark Plug")

●Connect the pressure gauge [A] and adapter [B] firmly into the spark plug hole.

● Start the motor with the starting motor, and rotate the throttle to fully open until the reading on the pressure gauge does not increase. The maximum reading is the cylinder compression.

Special tool: Pressure gauge 20 kgf/cm: 57001-221

Pressure gauge adapter M10 × 1.0: 57001-1601

L-shaped hose [C]

Cylinder Compression

Application: when the rotating speed is 300r/min: 1030 to 1570 kPa (10.5 to 16.0 kgf/ cm^2, 149 to 228 psi)

● Measure the cylinder compression of the other cylinders according to above the steps.

● Install the spark plugs.

Spark plug locking torque: 13 N·m (1.3 kgf·m, 115 in·lb)

● If the pressure gauge readings are not within the above application scope, please refer to the following table.

Problem	Cause	Solution
Cylinder pressure is higher than pressure in the application scope	It may be due to damage to the valve stem seal and/or piston oil ring. There are carbon deposits on the piston and in the combustion chamber (this can be judged by the discharge of white exhaust gas).	Clean the carbon deposits, and replace the damaged parts if necessary.
	Thickness of the cylinder cover gasket is unsuitable.	Replace it with a gasket of standard thickness.
Cylinder pressure is lower than pressure in the application scope	There is leakage around the cylinder cover.	Replace the damaged gasket, and check the deformation of the cylinder cover.
	The valve seat is not working properly	Repair it if necessary.
	Valve clearance is incorrect	Adjust the valve clearance.
	Piston/cylinder clearance is incorrect	Replace the piston and/or cylinder.
	Cylinder score	Check the cylinder, and replace/repair the cylinder and/or piston if necessary.
	Piston ring and/or piston ring groove is not working properly	Replace the piston and/or piston ring.

Cylinder Head

Cylinder Head

Disassembly of the cylinder head:

● Remove:

The cylinder head cover (see “Disassembly of the cylinder head cover”),

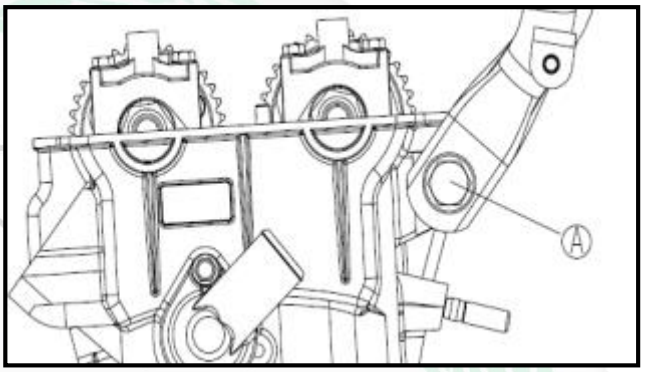
Camshaft (see “Disassembly of the camshaft”)

Cam chain sliders (see “Disassembly of the camshaft transmission chain”),

Auxiliary chain guide (see “Disassembly of the camshaft transmission chain”),

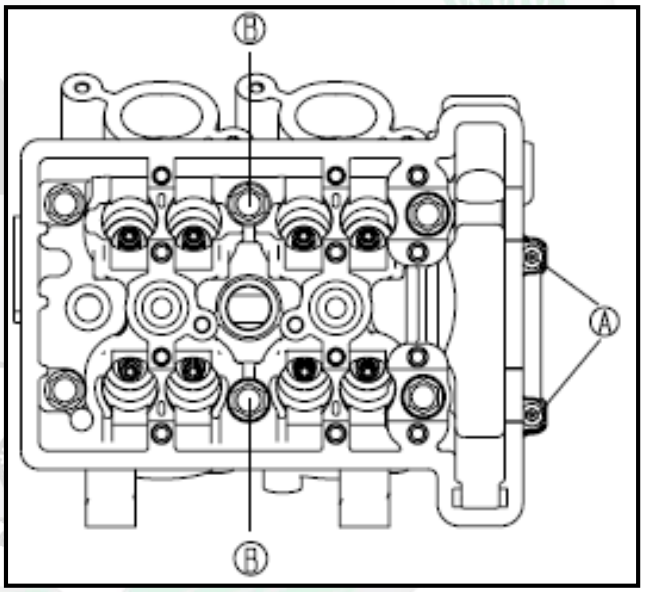
● Remove:

Front engine mounting bolt (M10) [A],



● Remove the M6 cylinder head bolts [A] and then remove the M10 cylinder head bolts [B].

● Remove the cylinder head.



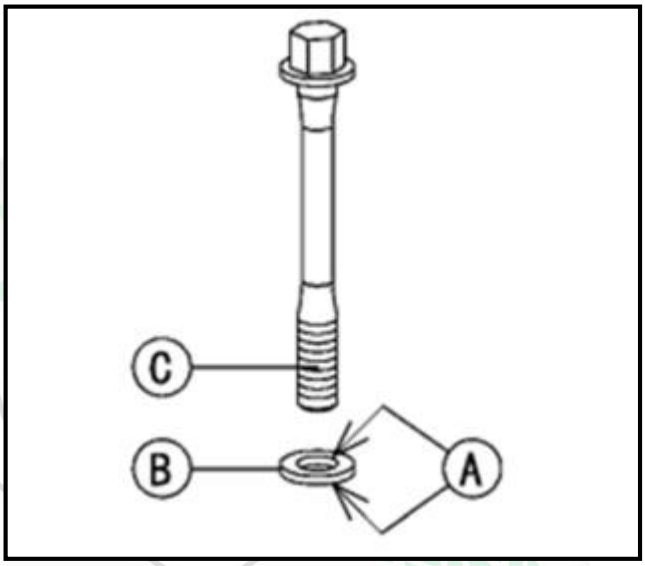
Cylinder Head

Cylinder Head

Assembly of the cylinder head:

Note

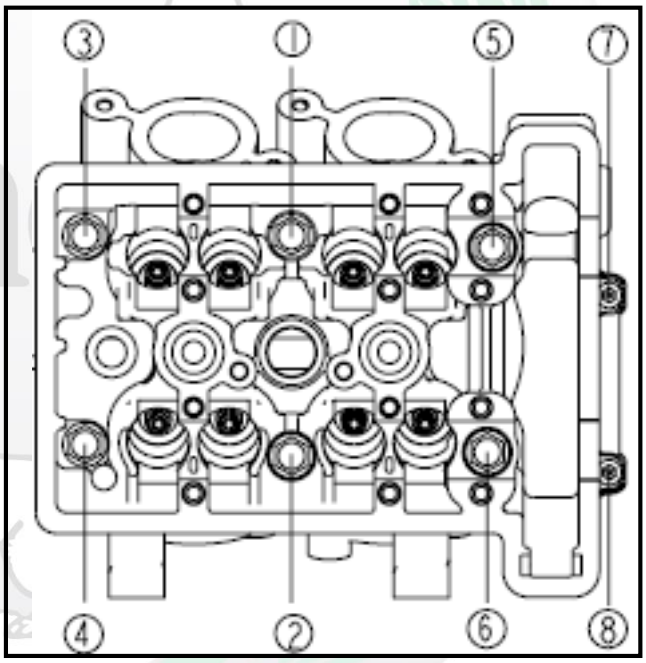
○ *The camshaft retainer and the cylinder head are machined together, therefore, if it is necessary to replace them together, please use the camshaft retainer shipped with the new cylinder head.*



● Assemble with a new cylinder head gasket and dowel pins.

● Replace with new cylinder head bolt washers [B].

● Apply molybdenum disulfide oil solution to both sides [A] of the cylinder head bolt washer [B] and the threads of the head bolts [C].



●Tighten the M10 cylinder head bolts in the order shown in the right figure [1～6].

Locking torque of cylinder head bolts (M10):

Preliminary lock: 22 ft·lb (3.0 kgf·m,)

Final lock: 40 ft·lb (5.5 kgf·m,)

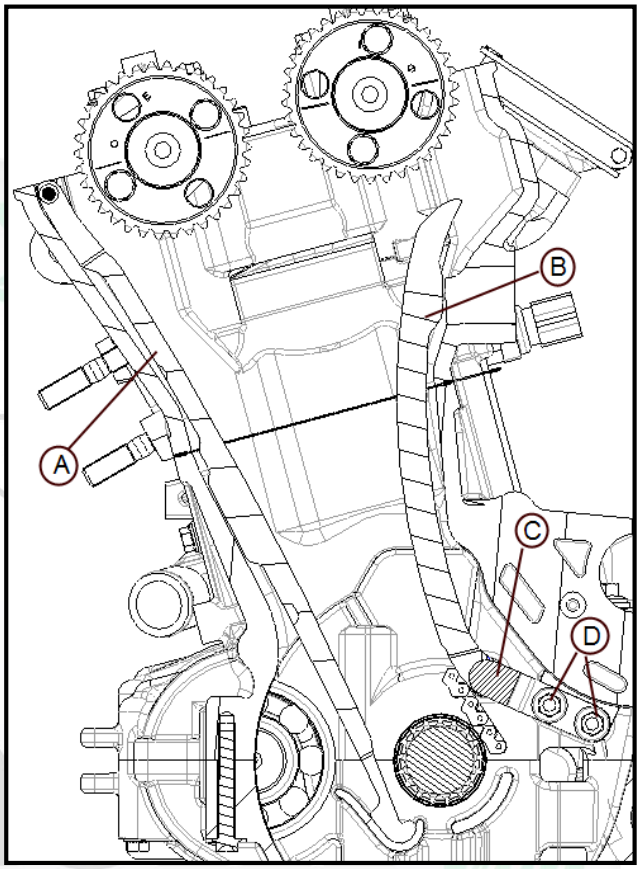
● Tighten the M6 cylinder head bolts [7 ~ 8].

Locking torque of cylinder cover bolts (M6): 9 ft·lb (1.2 kgf·m)

Cylinder Head

Cylinder Head

● Assemble:
Front cam chain slider [A],
Rear cam chain slider [B],
Rear cam chain slider pressure plate [C]
Pressure plate retaining bolts [D]
● Locking torque:
Tightening torque of the rear cam chain plate retaining bolts: 9.8N·m (1.0 kgf·m, 87 in·lb)
● Replace the following bolts with new bolts that have tightening agents already applied to them and tighten.
Engine bracket bolts (M8),
Front engine mounting bolts (M10),
Locking torque of engine bracket bolts (M8): 25 N·m (2.5 kgf·m, 18 ft·lb)
Locking torque of the front engine mounting bolts (M10): 59 N·m (6.0kgf·m, 44 ft·lb)
● Assemble the removed parts (see the corresponding section).



Cylinder Head

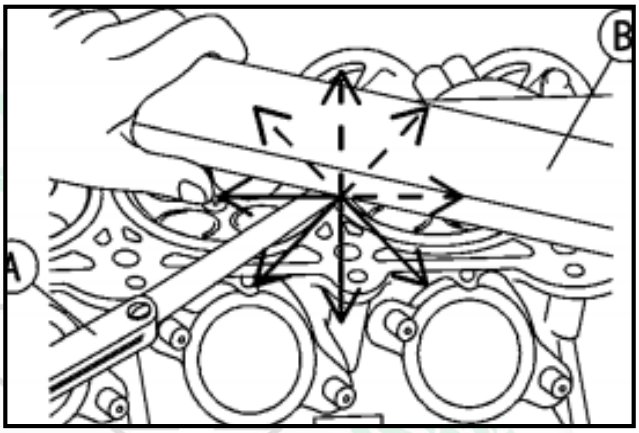
Cylinder Head

Check for deformation of the cylinder head:

● Clean the bottom of the cylinder head.

● Use a straight edge at several locations on the bottom surface of the cylinder head.

● Measure the distance between the cylinder head and the straight edge [B] with a clearance gauge [A].



Deformation of the cylinder cover

Standard: ---

Operating limit: 0.05 mm (0.002 in.)

★ If deformation of the cylinder head is beyond the operating limit, replace the cylinder head.

★ If deformation of the cylinder head does not exceed the operating limit, polish the lower surface of the cylinder head with sandpaper fixed on a flat surface (polish it with No.200 sandpaper first, then with No.400 sandpaper).

Valves

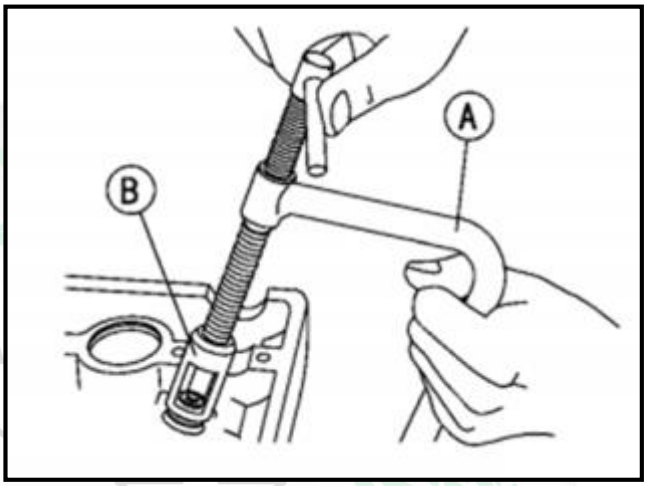
Valves

Check of the valve clearance:

● See “Chapter III Check and Regular adjustment” – “Check of the valve clearance.”

Adjustment of the valve clearance

● See “Chapter III Check and Regular adjustment” – “Adjustment of the valve clearance.”



Disassembly of the valves:

● Remove:

Cylinder head (see “Disassembly of the cylinder head”), Tappet Covers and Valve Shims

● Make marks on the tappet covers and valve shims, so that they can be assembled into their original positions later.

● Remove the valve with valve spring compressor assembly.

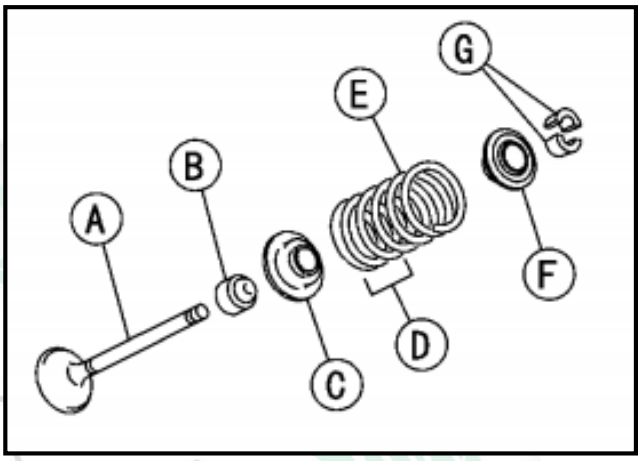
Valve spring compressor assembly [A]

Valve spring compressor adapter φ24 [B]

Valves

Valves

Assembly of the valves:



● It is necessary to use a new valve stem seal.

● Apply a thin layer of molybdenum disulfide grease on the valve stem first before assembling the valve.

● Put the end with narrower spacing of the spring downwards when assembling the valves.

The valve stem [A],
Oil seal [B],
Lower spring retainer [C],
Spring end with narrower spacing [D]
Valve spring [E]
Upper spring retainer [F]
Valve collets [G]

Valves

Valves

Disassembly of the valve guide

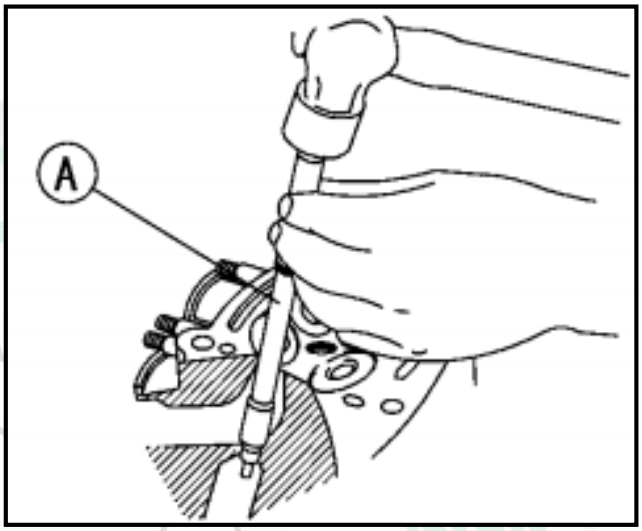
● Remove:

Valve (see “Disassembly of the valve”),

Oil seal,

Spring retainer

● Increase the temperature of the valve guide to 120~150°C (248~302°F), then tap the valve guide using the removal tool [A], and remove the guide from the top.



Note
Do not heat the cylinder head directly with fire, otherwise the cylinder head will be deformed. Soak the cylinder head in oil and heat the oil.

Special tool - the valve guide removal rod φ4

Valves

Valves

Assembly of the valve guides:

● Apply engine oil on the external surface of the valve guide before assembling it.

● Increase the temperature around the valve guide hole to 120 ~ 150°C (248~302°F).

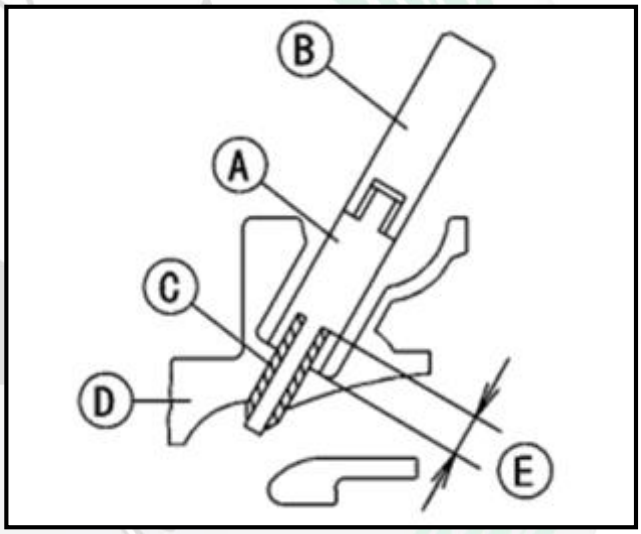
Note
Do not heat the cylinder head directly with fire, otherwise the cylinder head will warp. Heat the cylinder head in an oven to evenly heat the entire head.

● Assemble the parts of valve guide knock-in tooling (fixator and accessory E).

● Insert the rod of the knock-in tooling into the valve guide hole, and then hit the end of the knock-in tooling, until it reaches the bottom.

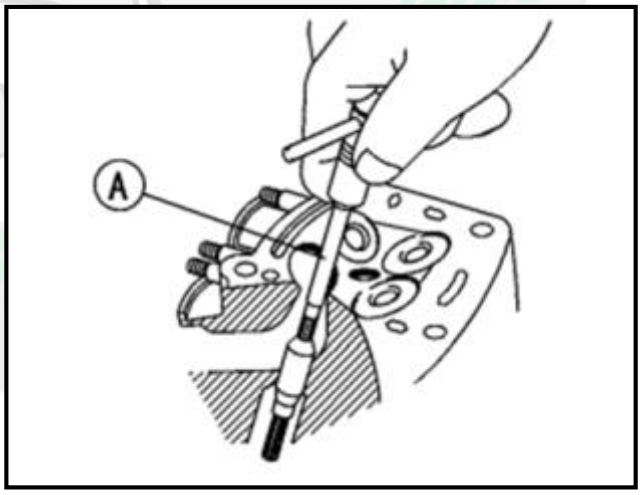
Valve guide screwdriver accessory E [A],
Valve guide screwdriver (fixator) [B],
Valve guide [C],
Cylinder head [D]
Valve guide installation height = 15.1 mm (0.59 in.) [E]

Special tool - valve guide screwdriver
Valve guide screwdriver accessory E



● Ream the valve guide with the valve guide reamer [A]. A used guide also needs to be reamed with the reamer.

Special tool - valve guide reamer φ4



Valves

Valves

Measurement of the clearance between the valve and guide (the pendulum test)

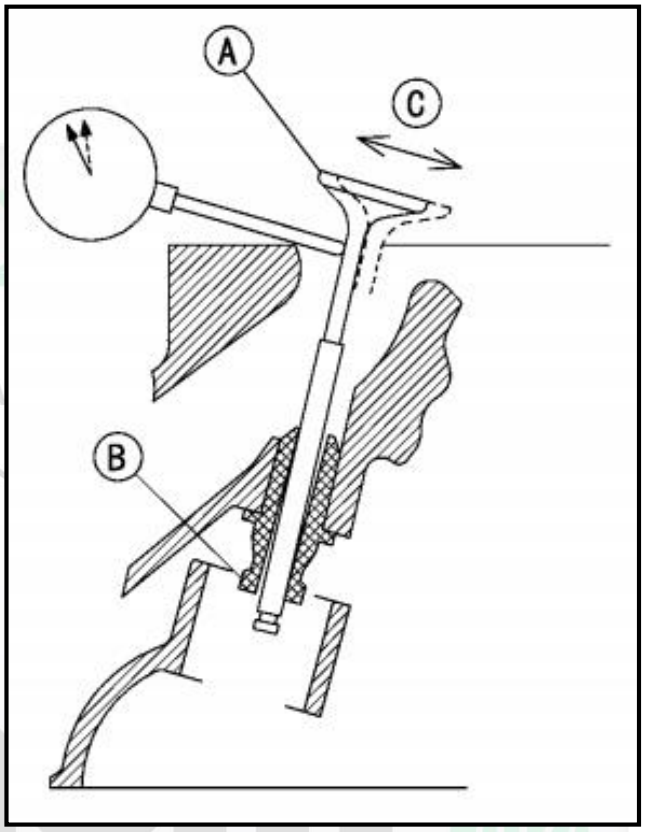
If there is no small-sized inside gauge available, clearance between the valve and the valve guide can be measured by the pendulum test as shown in the figure, thereby wear of the valve guide can be measured.

● Insert a new valve [A] into the valve guide [B], and attach the dial indicator perpendicular to the valve stem and keep it as close to the cylinder head surface as possible.

● Move the valve stem back and forth [C] to measure the clearance between the valve and the valve guide.

● Measure the clearance again in the above steps in the same direction and at the right angle.

★ If the reading exceeds the operating limit, replace the valve guide.



Remark

○ Since the measuring point and the valve guide is not in the same plane, so measured values of the pendulum test are not the actual clearance values between the valve guide and valve stem. Please refer to the following table during maintenance and replacement.

Clearance between the valve and guide (the pendulum test)
Standard:
Exhaust: 0.13 ~ 0.21 mm (0.0051 ~ 0.0083in.)
Intake: 0.12 ~ 0.2 mm (0.0047 ~ 0.0079 in.)
Operating limit:
Exhaust: 0.40 mm (0.016 in.)
Intake: 0.34 mm (0.013 in.)

Valves

Valves

Check of the valve seat:

● Remove the valve (see “Disassembly of the valve”).

● Check the valve seat surface [A] between the valve B] and valve seat [C].

● Measure the outside diameter [D] of the valve seat.

★ If the outer diameter of the valve seat is too large or too small, repair the valve seat (see “Repair of the valve seat”).

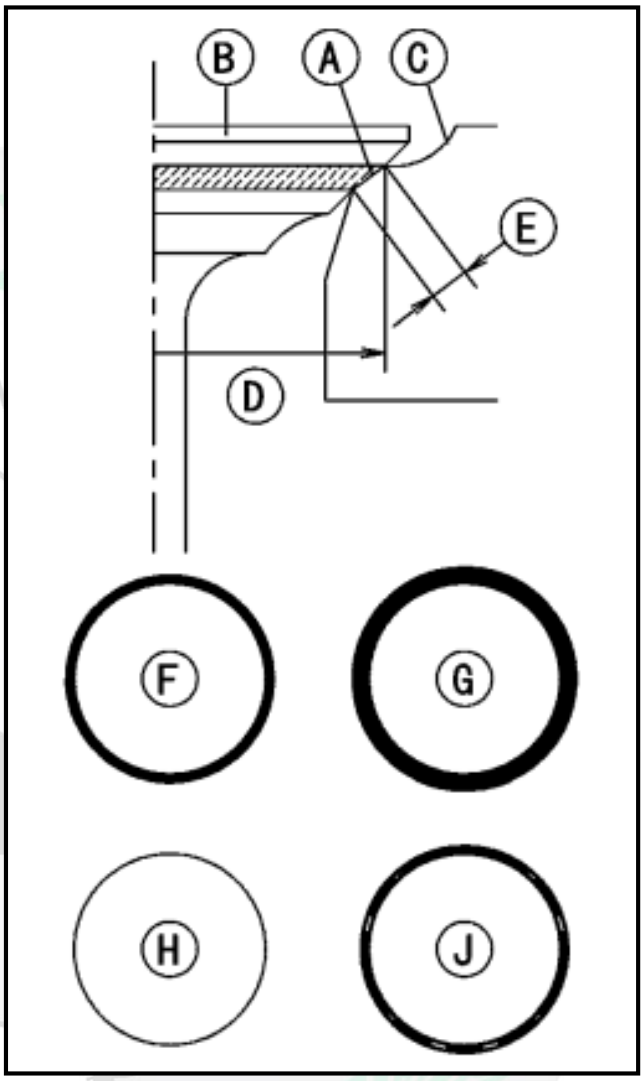
Outside diameter of the valve seat surface:
Standard:
Exhaust valve seat: 21.55 ~ 21.65 mm (0.849~ 0.853 in.)
Intake valve seat: 24.4~24.5 mm (0.961 ~ 0.965 in.)

● Measure the width [E] of the part without carbon deposits (the white part) on the valve seat with a vernier caliper.

Normal [F]

★ If the width is too large [G], too small [H] or uneven [J], repair the valve seat (see “Repair of the valve seat”).

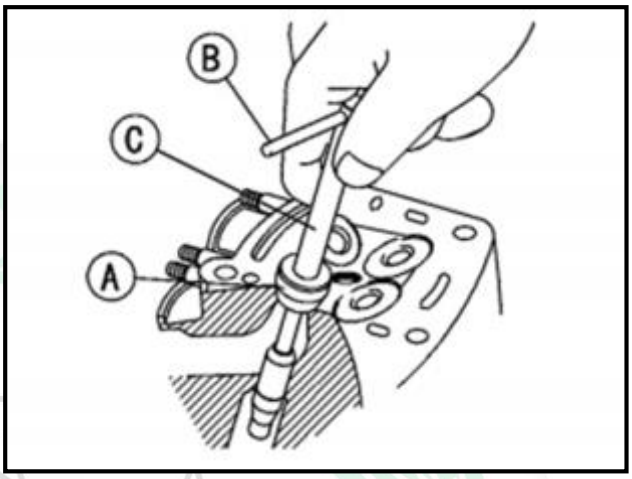
Width of the valve seat surface:
Standard:
Exhaust valve seat: 1.1 ~ 1.3 mm (0.043 ~ 0.051 in.)
Intake valve seat: 1.1 ~ 1.3 mm (0.043 ~ 0.051 in.)



Valve

Valve

Repair of the valve seat:



● Repair the valve seat with the valve seat milling cutter [A].

Special tool - **valve seat milling cutter fixator rod**
valve seat milling cutter fixator φ4

[Special valve seat milling cutter for exhaust valve seat]

Valve seat milling cutter 45 ° -φ30
Valve seat milling cutter 30 ° -φ30
Valve seat milling cutter 60 ° -φ30

[Special valve seat milling cutter for intake valve seat]

Valve seat milling cutter 45 ° -φ35
Valve seat milling cutter 30 ° -φ35
Valve seat milling cutter 60 ° -φ35

★ If you cannot find the instructions provided by the manufacturer, follow the following steps:

Note for the use of the valve seat milling cutter:

1. Since the valve seat milling cutter is designed for polishing of the valve seat to fix the valve seat, it can only be used to repair the valve seat and cannot be used for other purposes.
2. The valve seat milling cutter must be protected from drops or striking to prevent diamond particles from shedding.
3. Apply engine oil on the valve seat milling cutter before polishing of the valve seat surface, and clean the powder on the milling cutter with special cleaning oil.

Remark
○ *Do not use a wire brush to clean the metal powder on the milling cutter, otherwise the diamond particles will fall off.*

4. Put the valve seat milling cutter on the fixator, and operate the milling cutter with one hand. Do not use excessive force on the diamond section!

Remark
○ *Apply engine oil on the valve seat cutter before polishing, and clean the powder sticking to the milling cutter frequently with special cleaning oil during the use of the milling cutter.*

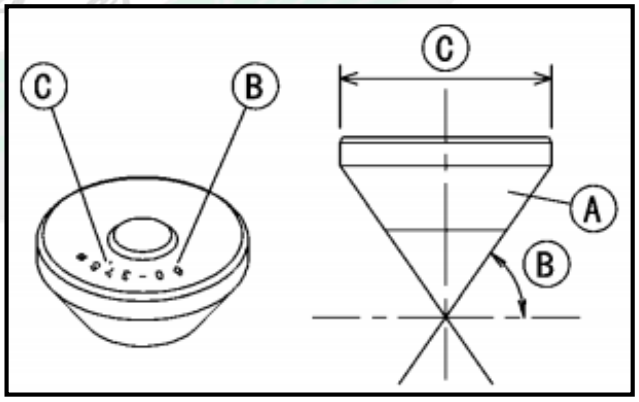
5. Clean the milling cutter with special cleaning oil after use, and then apply a thin layer of oil on it before storage

Signs printed on the milling cutter

Meanings of the signs printed on the back of the cutter are as follows:

60° ..... cutting tool angle [B]

37.5φ ..... outside diameter of the cutter [C]



Valves

Valves

Operating procedures:

● Thoroughly clean the valve seat.

● Coat the surface of valve seat with dye for mechanical processing (Dykem).

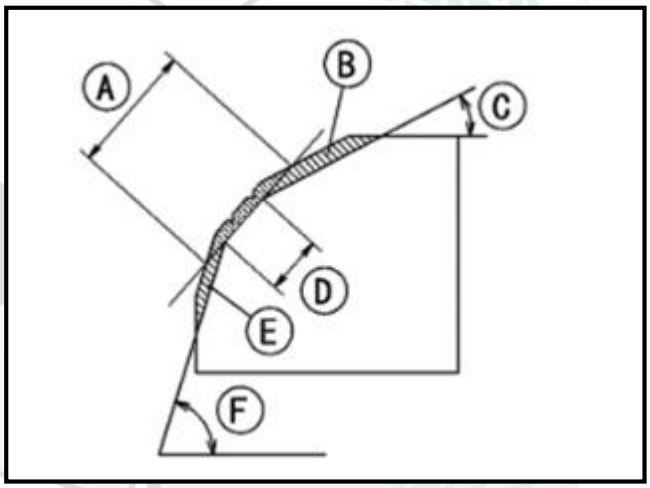
● Install a 45° milling cutter onto the fixator, and then slide it into the valve guide.

● Gently press down the handle, and then rotate it to left or right, polish the surface of the valve seat, until it becomes smooth.

Note
Do not polish the valve seat excessively, otherwise the valve may go into cylinder head, reducing the valve clearance. If the valve moves upward and goes into cylinder head too deep, the valve clearance cannot be adjusted, and the entire cylinder head assembly should be replaced.

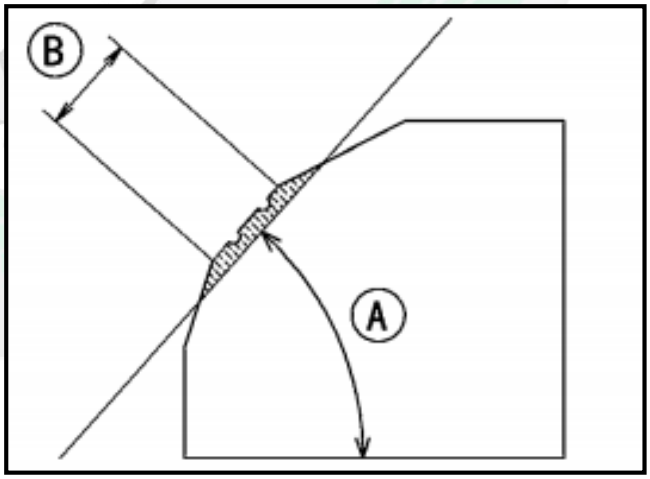
●Measure the outer diameter of valve seat surface with a vernier caliper.

★ If the outer diameter of valve seat surface is too small, continue to polish with a 45° milling cutter, until the diameter is within the specified range.



Widened width after polishing with 45 ° milling cutter [A]
Part polished with 30 ° milling cutter [B]
30 ° [C]
Correct width [D]
Part polished with 60 ° milling cutter [E]
60 ° [F]

● Measure the outer diameter of valve seat surface with a vernier caliper.



★ If the outer diameter of valve seat surface is too small, continue to polish with 45 ° milling cutter, until the diameter is within then specified range.

Original valve seat surface [B]

Remarks

○ *Clean the powder on the 45° polished surface.*

○ *After grinding with 45 ° milling cutter, coat a thin layer of special dye for mechanical processing (Dykem) to make the valve surface seat more obvious and facilitate 30° and 60° polishing.*

○ *When replacing valve guide, polish with 45 ° milling cutter, make the valve seat align at the center and ensure good contact.*

Valves

Valves

★ If the outer diameter of valve seat surface is too large, polish with a 30° milling cutter according to the following method.

★ If the outer diameter of valve seat surface is within the specified range, measure the width of valve seat according to the following method.

● Grind the valve seat at a 30° angle [B], until its outer diameter is reduced to the specified range.

● Install a 30° milling cutter at the fixator before polishing at a 30° angle, and then make it go into the valve guide.

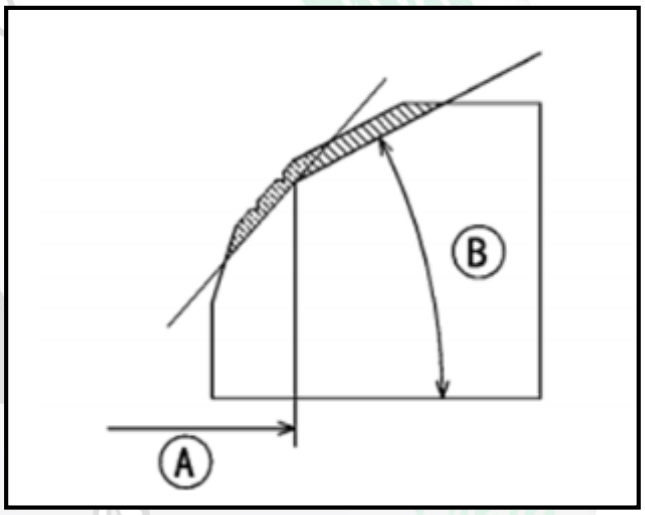
● Gently press down the fixator, turn it around once, and check the valve seat once per round.

Note
The polishing efficiency of a 30° milling cutter is very high, check the outer diameter of valve to avoid excessive polishing frequently.

● After polishing using a 30° milling cutter, go back to the above steps for measuring the outer diameter of valve seat.

● In order to measure the width of valve seat, measure the width of several different parts of valve seat with a vernier caliper.

★ If the width of valve seat is too small, repeat 45° polishing, until valve seat becomes a little wider, and then go back to the above steps for measuring the outer diameter of valve seat.



★ If the width of valve seat is too large, conduct 60°[A] polishing according to the following method.

★ If the width of valve seat is within the specified range, install the valve on valve seat according to the following methods.

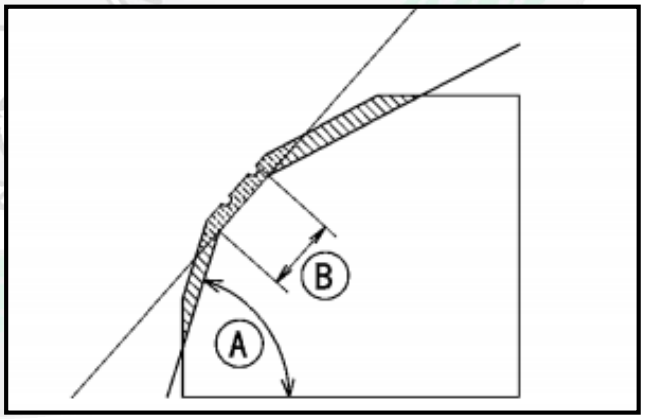
● Polish valve seat at a 60° angle, until the width of valve seat is within the specified range.

● Before polishing at a 60° angle, it is required to install 60° milling cutter on fixator, and then slide it into the valve guide.

● Gently press the fixator and rotate it at the same time.

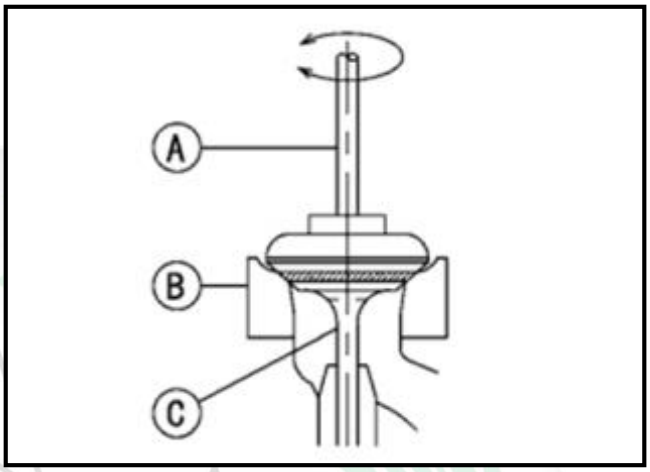
● After polishing at 60° angle, go back to the above steps for measuring the width of valve seat

Correct width [B]



Valves

Valve



● If the width and outer diameter of valve seat are within the specified range, install the valve into the valve seat.

● Place a small amount of grinding agent at several parts of around valve head.

● Rotate the valve, until the coarse grinding agent makes the contact surface between valve seat and valve smooth.

● Repeat the above grinding process using fine grinding agent.

Grinding tools [A]

Valve seat [B]

Valve [C]

● Make sure the valve is centered in the base of the valve seat.

★ If the base is not at the center of the valve, confirm whether the valve is the correct part. If it is correct, the problem is excessive polishing, and you need to replace it.

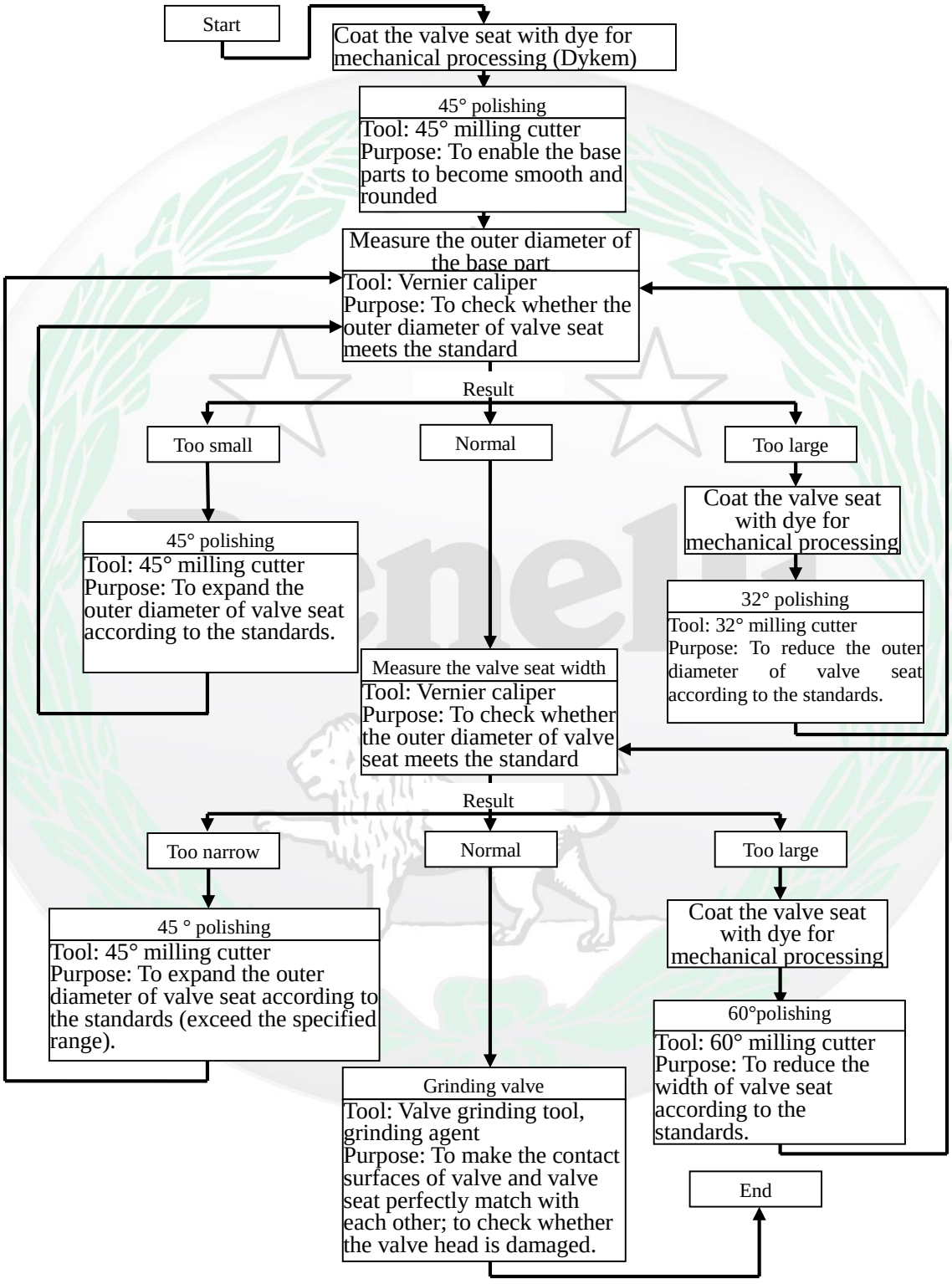
● Thoroughly clean all of the grinding agent before assembly.

● Adjust valve clearance before assembling engine (See “Chapter III Check and Regular Adjustment” –“Check valve clearance” for details).

Valves

Valves

Repair of valve seat



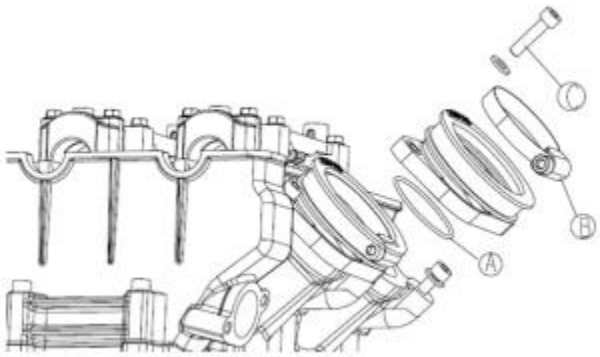
Intake Manifold

Intake Manifold

Installation of the intake manifold:

- Apply grease on the sealing O-ring [A].
- Remember to install the sealing O-ring.
- As shown in the figure, install the clamp [B].
- Tighten the mounting bolts.

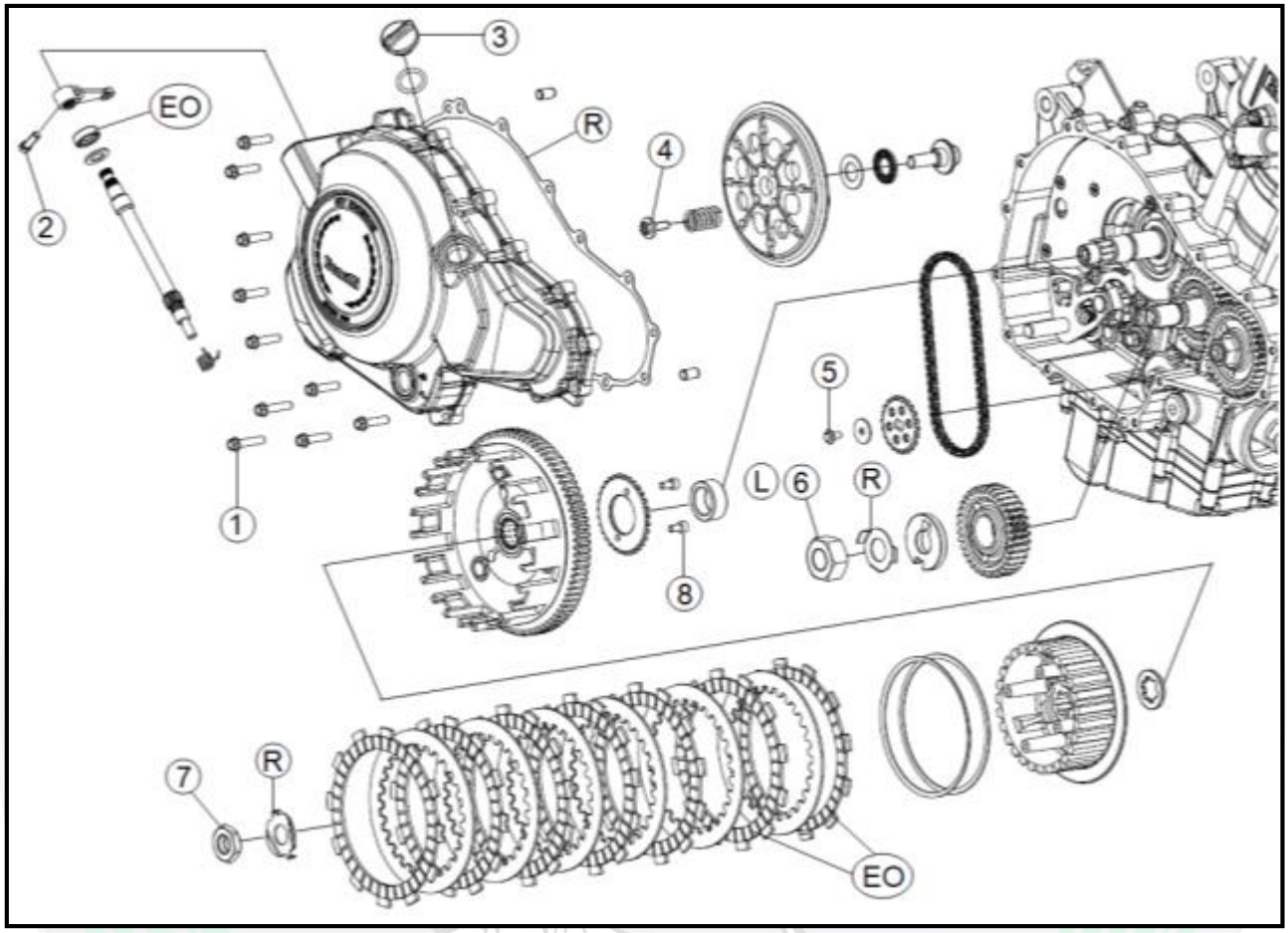
Locking torque of the intake manifold mounting bolts: 12 N·m (1.0kgf·m, 106 in·lb)



Clutch

Clutch

Breakdown Drawing



No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Right Cover Bolt	12	1.2	106 in·lb	
2	Hexagon bolt	12	1.2	106 in·lb	
3	Oil Filler Plug	—	—		Manual tightening
4	Clutch Spring Bolt	10	1.0	89 in·lb	
5	Oil Pump Drive Sprocket Bolt	8	0.8	71 in·lb	
6	Balancer Shaft Lock Nut	60	6.1	44 ft·lb	L
7	Clutch Hub Locking Nut	95	9.7	70 ft·lb	
8	Clutch Drive Sprocket Bolt	8	0.8	71 in·lb	

EO: Apply engine oil

L: Apply thread locking adhesives

R: Replace parts

Clutch

Clutch

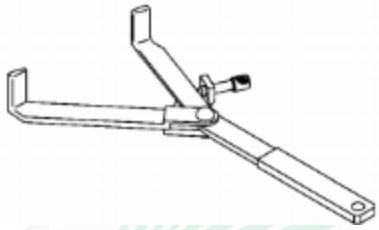
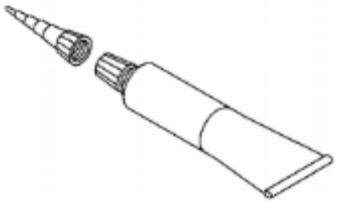
Technical parameters

Item	Standard	Use limit
Clutch operating lever		
Position of clutch operating lever	Align the slotting position at the marked line at right cover	——
Free clearance of clutch operating lever	Cannot be adjusted	——
Clutch		
Clutch pressure plate assembly	32.5 ~ 33.5 mm (1.28 ~ 1.32 in.)	——
Thickness of clutch friction plate:	2.9 ~ 3.1 mm (0.11 ~ 0.12 in.)	2.6 mm (0.1 in.)
Deformation of clutch plate	≤0.15 mm (0.0059 in.)	0.3 mm (0.012 in.)
Free length of clutch spring	36.7 mm (1.45 in.)	35.4 mm (1.4 in.)

Clutch

Clutch

Special tools and fastening adhesives

Clutch Basket Holder	Thread fastening adhesive
	

Right Engine Cover

Right Engine Cover

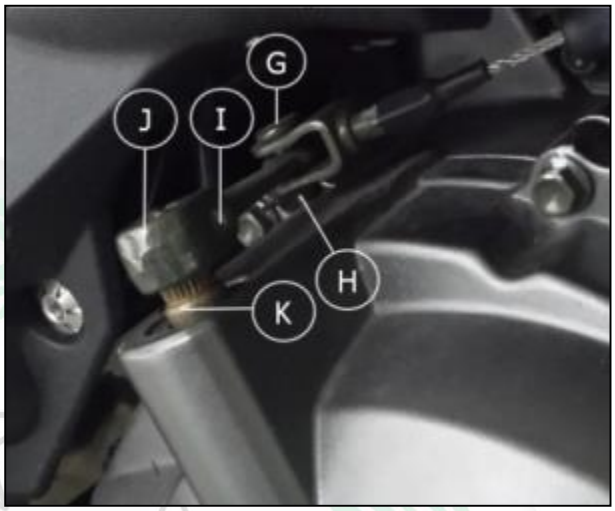
Disassemble the right engine cover:

● Drain the engine oil (see “Check and regular adjustment” – “Engine oil” for details

Disassemble:

The split pin used for retaining the hinge pin for the clutch cable [H].

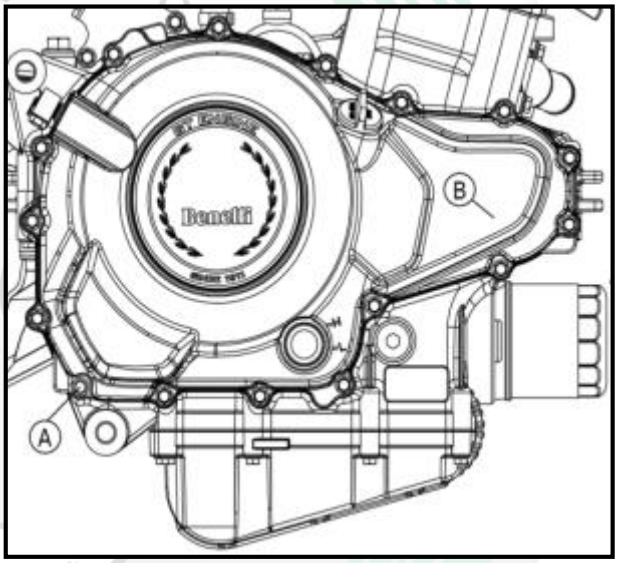
Hexagon bolt [I] used for fixing the releasing lever [J]



Disassemble:

16 right engine cover bolts [A]

Right cover gasket and dowel pins for the right engine cover [B].



Right Engine Cover

Right Engine Cover

Install the right cover:

● In reverse order of disassembly

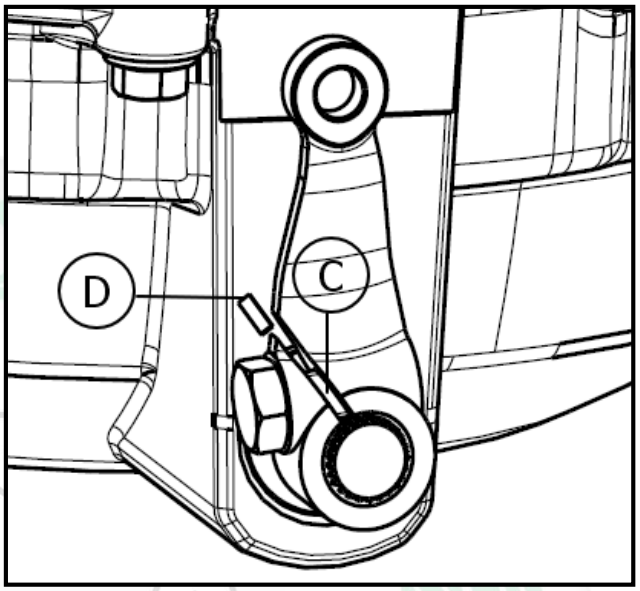
● Replace the right cover gasket

● Fasten the right cover bolts

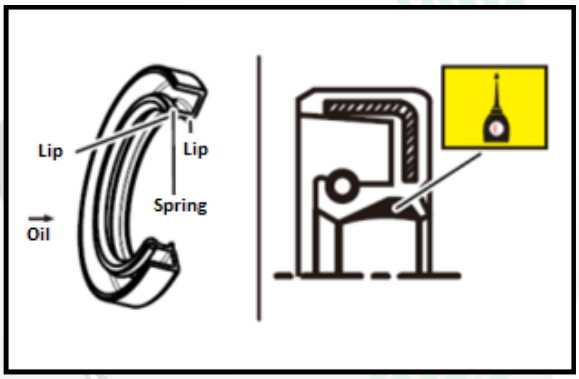
● Align the slot [C] on the clutch actuation lever with the mark [D] on the right cover.

Locking torque for the right cover bolts and hexagon bolt:

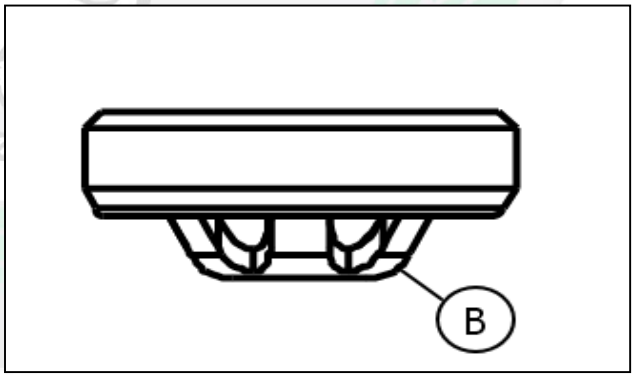
12 N·m (1.2kgf·m, 106 in·lb)



● If the oil seal, gasket and clutch operating lever [K] and operating lever spring need to be disassembled, lubricate the lip [E] of the oil seal with engine oil when installing the oil seal.



● If the oil sight window has been disassembled, make sure its projected portion [B] is facing inside. Grease if necessary, to facilitate installation.



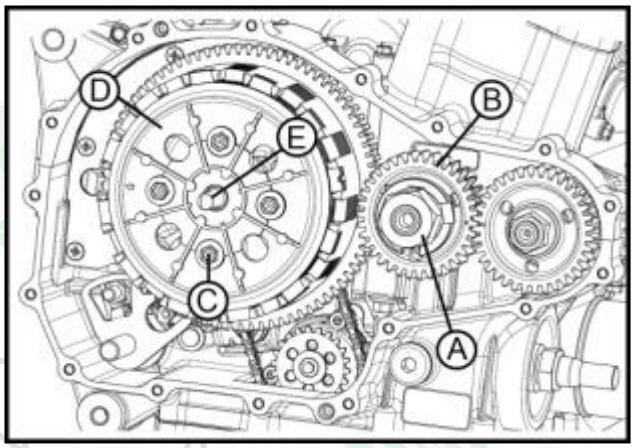
Clutch

Clutch

Disassembly of the clutch:

●Remove the engine oil (see “Check and regular adjustment” – “Engine oil” for details

Disassemble:



Right engine cover (see “Disassembly of right cover”)

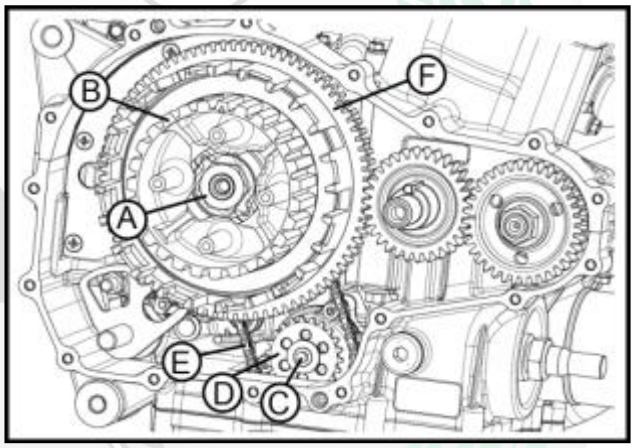
Balancing shaft driving gear lock nut [A], locking washer and gasket

Balance shaft driving gear [B]

Clutch spring bolts [C] and clutch springs

Clutch driven hub pressure plate [D]

Clutch Pin [E], flat needle roller bearings and thrust washers.



● Disassemble:

Clutch friction plates and clutch steel plates.

Disc spring and gasket.

Clutch lock nut [A],

● Hold the driven hub [B] with the special tool-clutch holder device, and remove the clutch lock nut [A] and lock washer.

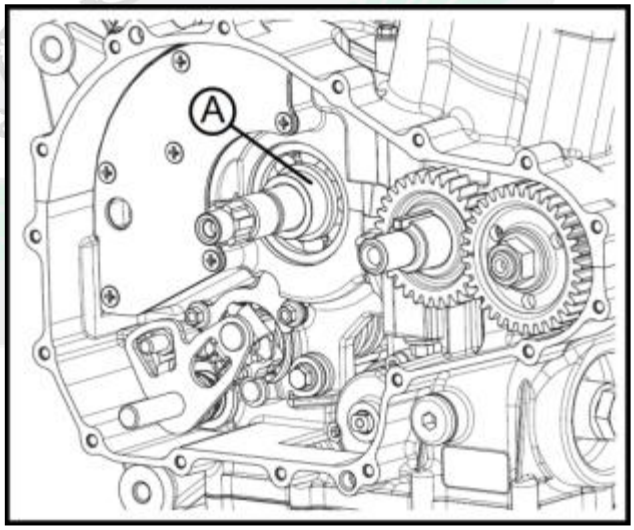
Special tool—clutch holder device

● Disassemble the clutch driven hub [B] and spline gasket.

● Disassemble:

Engine oil pump sprocket bolt [C], gasket and engine oil pump sprocket [D]

Engine oil pump chain [E] and clutch outer disc components [F]



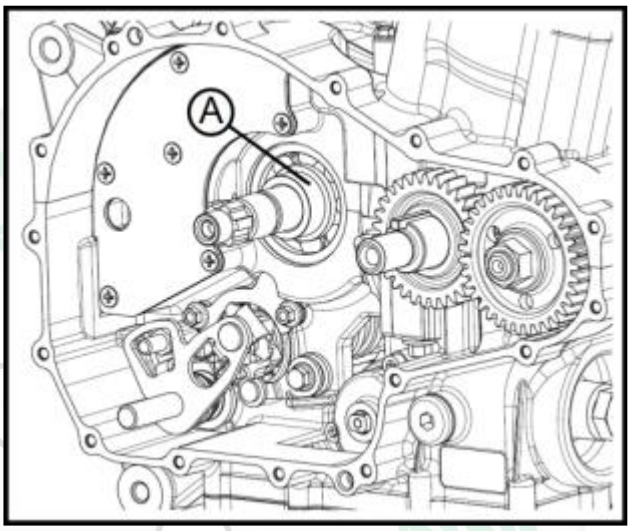
● Remove the clutch sleeve [A]

Clutch

Clutch

Installation of the clutch:

● Install the clutch sleeve [A]



● Install:

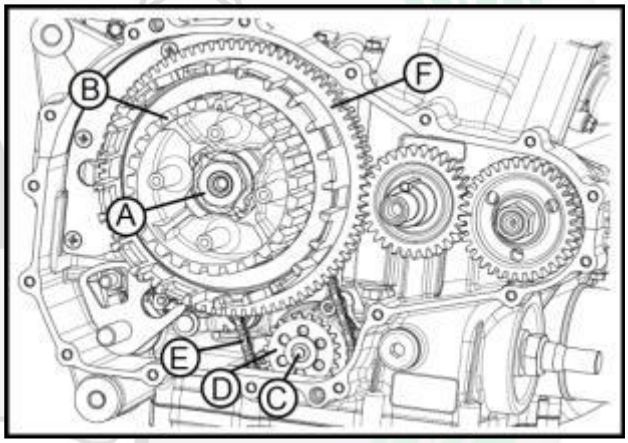
Installation

Clutch outer basket [F] and the engine oil pump chain [E]

Engine oil pump sprocket [D]

Engine oil pump sprocket mounting bolt [C] and gasket

Locking torque:



Locking torque of the engine oil pump sprocket mounting bolt [C]: 8 N·m (0.8 kgf·m, 71 in·lb)

Spline gasket and clutch driven hub [B]

● Install the clutch inner gasket nut [A] and install it with a new locking washer, attach the clutch driven hub using the clutch holder device, lock the clutch lock nut [A] using a torque wrench, and conduct mechanical locking using the lock washers.

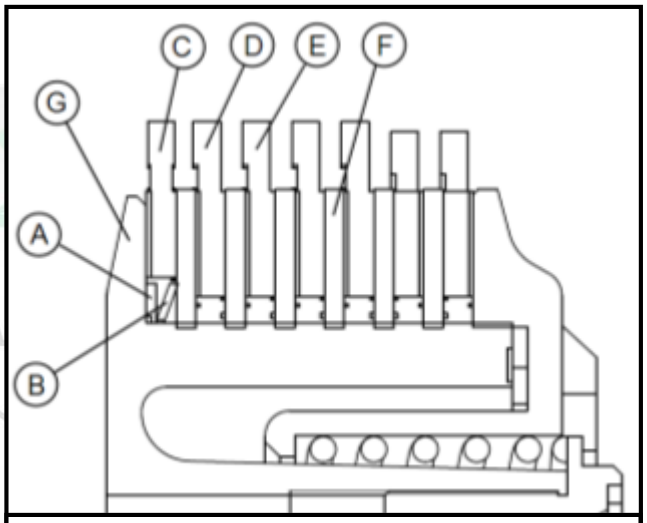
Special tool—clutch holder device

Locking torque of clutch lock nut [A]: 95 N·m (9.7 kgf·m, 70 ft·lb)

Clutch

Clutch

● As shown in the figure, install the washer [A], disk spring [B], clutch friction plates [C] [D] [E] and clutch steel plates [F].

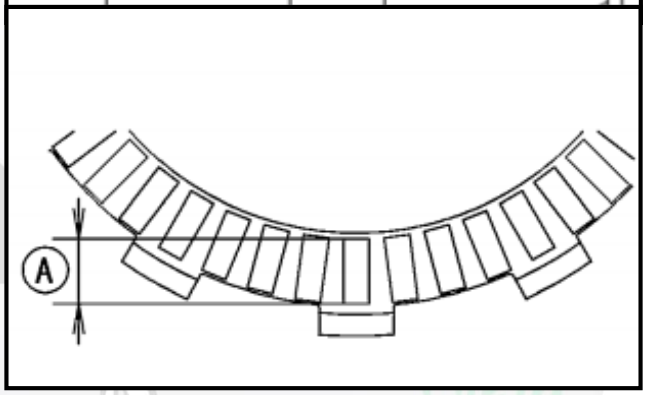


Remarks
● *The inner diameter of the first clutch friction plate is greater than that of other friction plates, because the role of gasket and disk spring is to reduce vibration noises.*

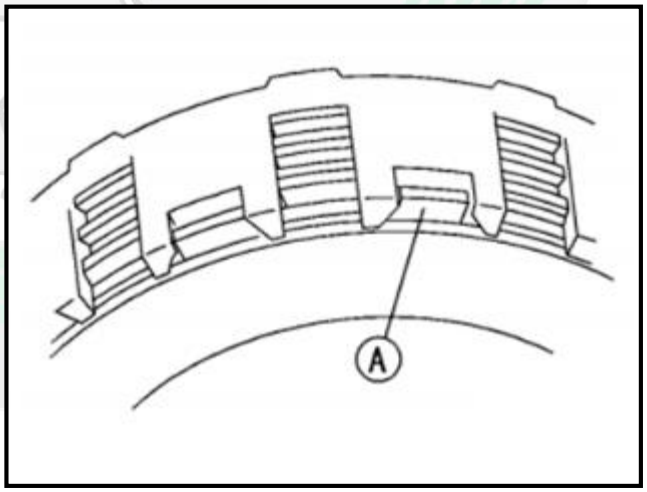
Clutch driven hub [G]

Note
To avoid seizure of the new clutch plates, apply engine oil to the surface of each plate when installing dry new clutch friction plates and steel clutch plates.

● The clutch friction plate with large area [A] should be placed at the outermost side.

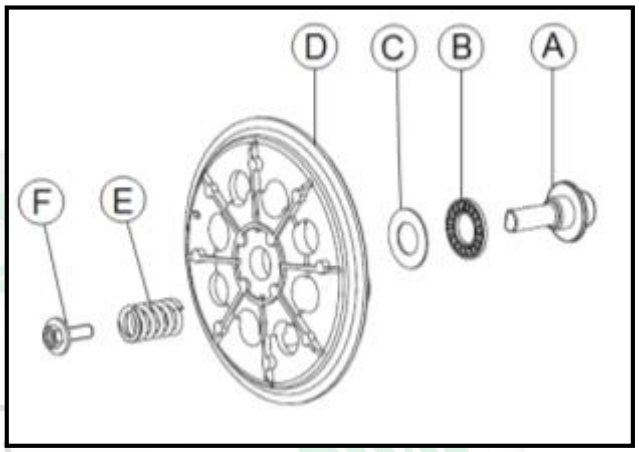


● As shown in the figure, install the bump [A] at the edge of the outermost clutch friction plate into the trough of clutch outer basket.



Clutch

Clutch



● Install:
Clutch pin [A], plane needle roller bearing [B] and thrust washer [C]
Clutch hub pressure plate [D]

● Install the clutch springs [E], evenly tighten the clutch spring bolts [F].
Locking torque:
Locking torque of clutch spring bolts [F]: 10 N·m (1.0 kgf·m, 89 in·lb)
●Install the balance shaft driving gear (see “Crankshaft / transmission gear”—“Install crankshaft” for details)
●Install the right engine cover (see “install right cover” for details)

Clutch

Clutch

Check of the entire group of clutch plates:

● Check the thickness of the clutch friction plates (see "Check whether the entire group of clutch friction plates has been worn or damaged" for details)

● As shown in the figure, measure the length of the entire group of clutch friction plates and steel clutch plates [A]

● Assemble:

Clutch driven hub [B]

Washer [C]

Disk spring [D]

Friction plates [E] [F] [G]

Clutch Steel plates [H]

Clutch pressure plate [J]

Clutch springs [K]

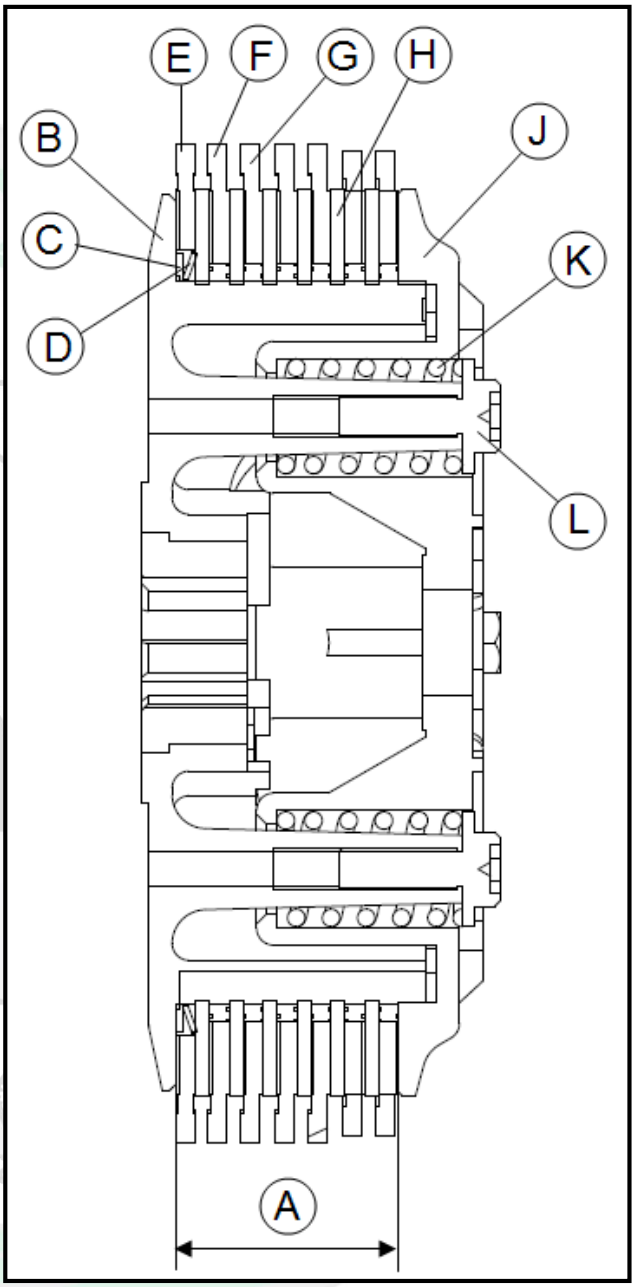
Clutch spring bolts [L]

Locking torque of clutch spring bolts[l]: 10 N·m (1.0 kgf·m, 89 in·lb)

Total thickness of entire group of clutch friction plates and clutch steel plates after installation:

Standard: 32.5 ~ 33.5 mm (1.28 ~ 1.32 in.)

★ If the length is not within the above range, please adjust (see "Adjustment of entire group of clutch friction plate and clutch plate" for details)



Adjustment of entire group of clutch friction plates and clutch steel plates

● Check the total thickness of the entire group of clutch friction plates and clutch steel plates after installation, and then replace the clutch friction plates, to adjust the length within the above range.

● Disassemble:

Clutch spring bolt

Clutch spring

Clutch pressure plate

● Replace clutch friction plate

Clutch friction plate thickness:

Standard: 2.9 ~ 3.1 mm (0.11 ~ 0.12 in.)

● Install the disassembled parts, and check the **total thickness of entire group of clutch friction plates and clutch steel plates after installation**

Locking torque of clutch spring bolt: 10 N·m (1.0 kgf·m, 89 in·lb)

Clutch

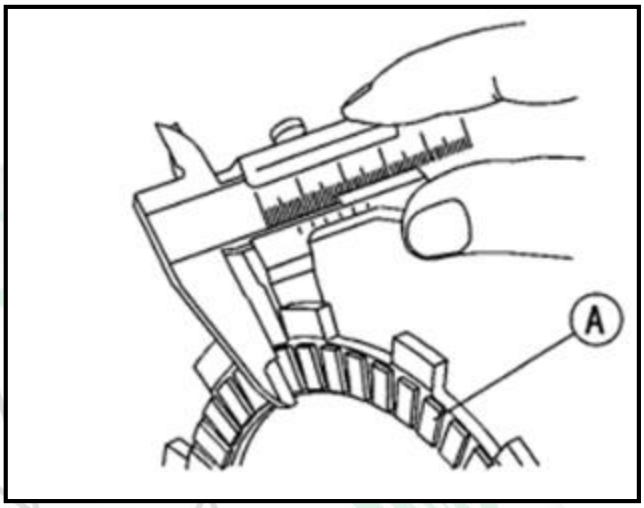
Clutch

Check whether the entire group of clutch friction plates has been worn or damaged:

● Visually check whether there is evidence of seizure, overheating (discoloration) or uneven wear on the clutch friction plates and clutch steel plates.

● Measure the thickness of each clutch friction plate [A] at different positions.

★ If any clutch friction plate has been broken or the wear exceeds the use limit, please replace with a new one.

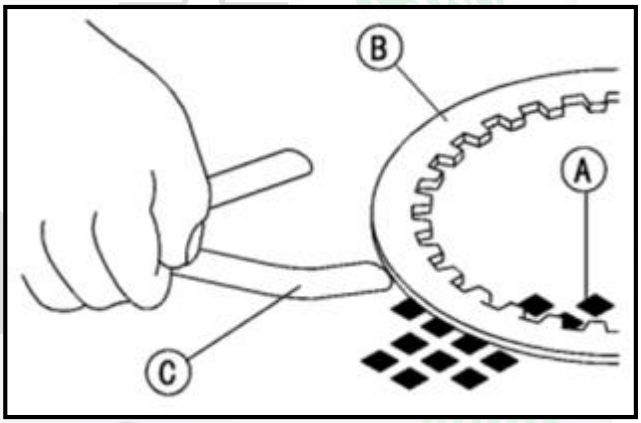


Thickness of clutch friction plates
Standard: 2.9 ~ 3.1mm (0.11 ~ 0.12 in.)
Use limit: 2.6 mm (0.1 in.)

Check for deformation in the entire group of clutch plates:

● Place each clutch plate at a flat surface, measure the clearance between flat plate and clutch plate with a feeler gauge. The measured clearance is the deformation of the clutch.

★ If the deformation of any clutch plate has exceeded the use limit, please replace with a new one.

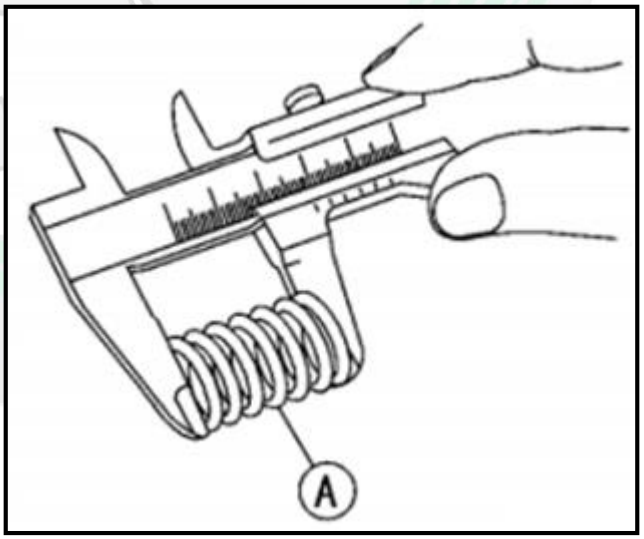


Deformation of clutch plate
Standard: ≤0.15 mm (0.0059 in.)
Use limit: 0.3 mm (0.012 in.)

Measure the free length of the clutch springs

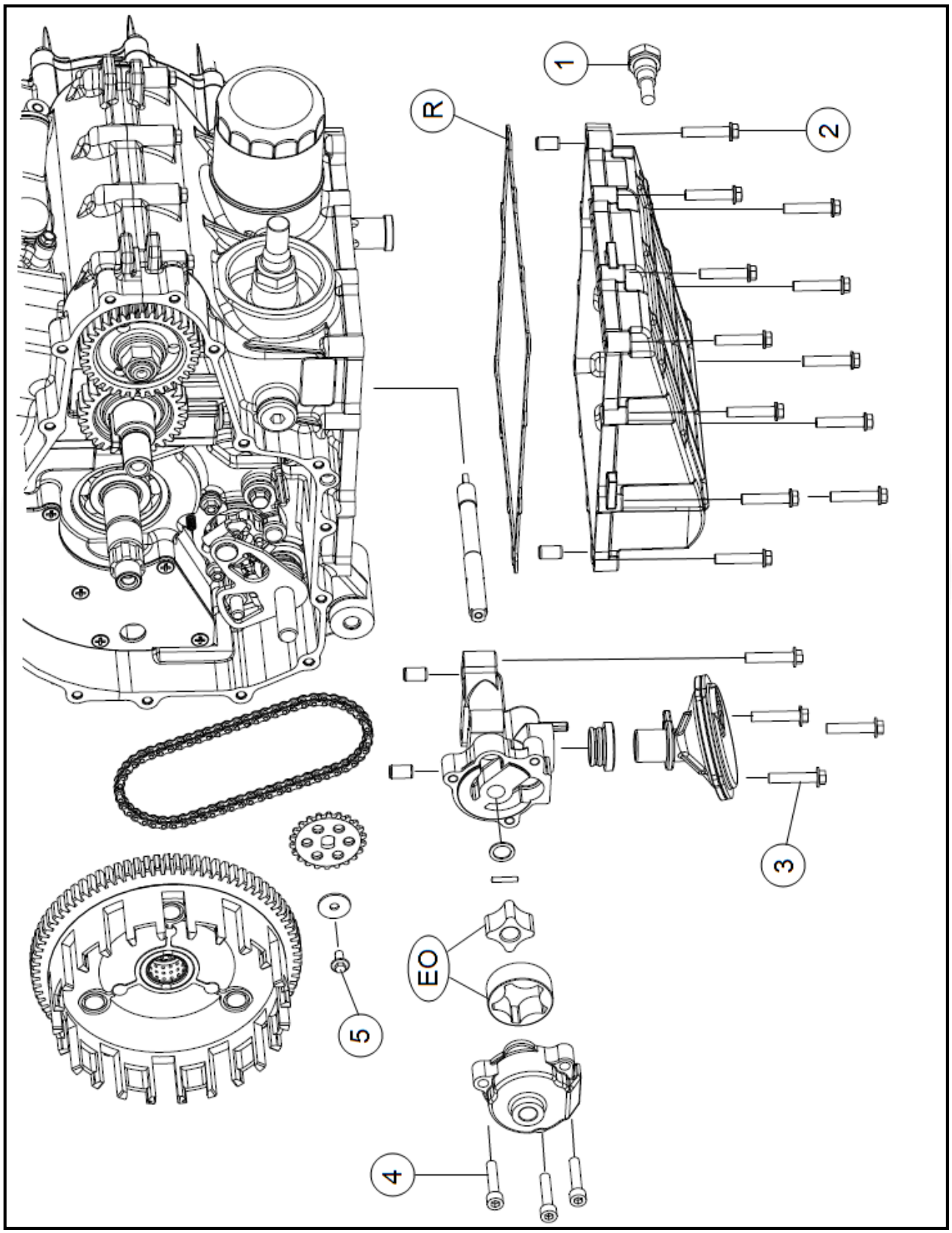
● Measure the free length of the clutch springs [A]

★ If the length of any clutch spring is below the use limit, please replace with a new one.



Free length of clutch springs
Standard: 36.7 mm (1.45 in.)
Use limit: 35.4 mm (1.4 in.)

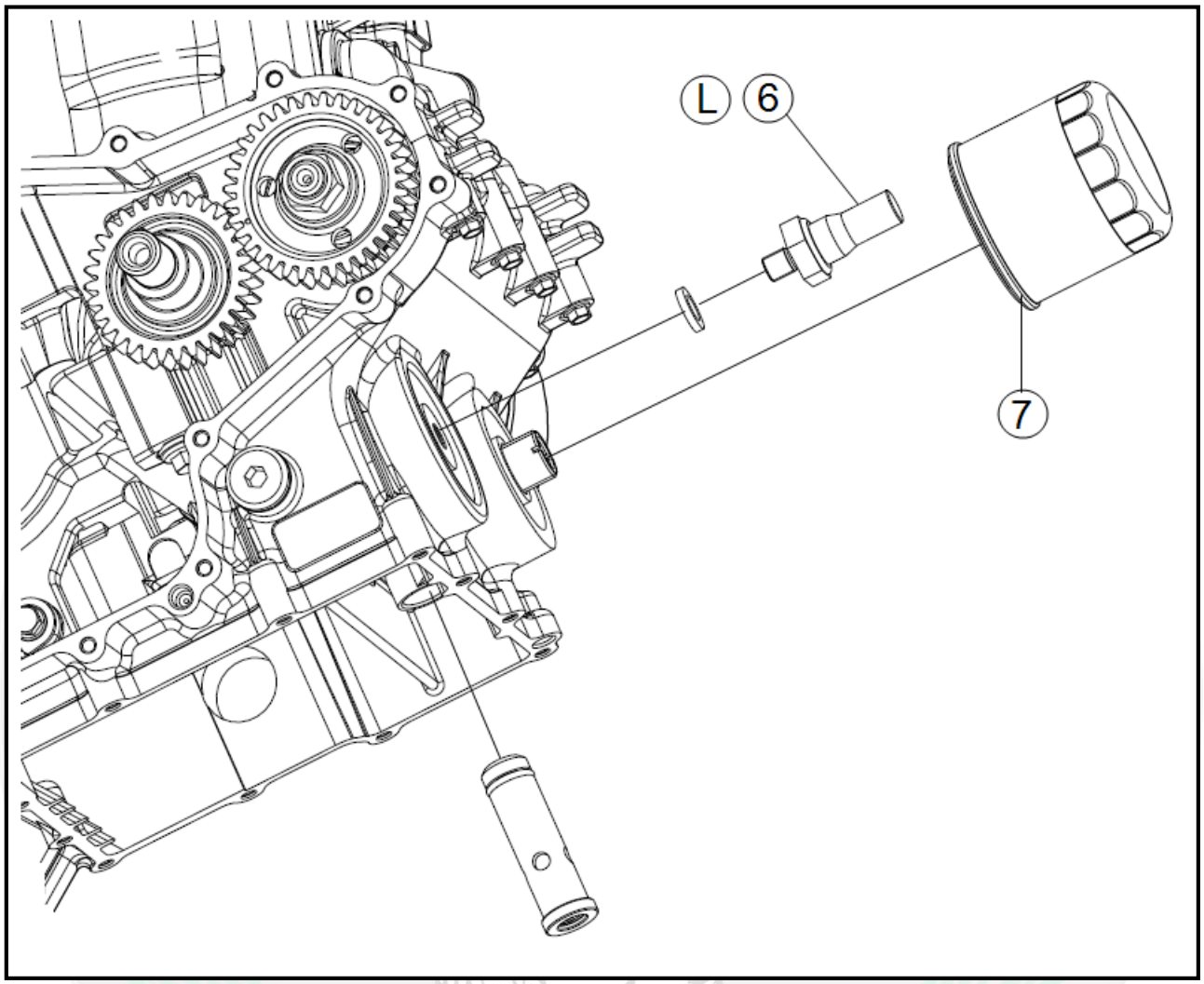
Breakdown Drawing



Engine Lubrication System

Engine Lubrication System

Breakdown Drawing



No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Oil pan drain magnetic bolt	20	2.0	15 ft·lb	
2	Oil pan mounting bolt	10	1.0	89 in·lb	
3	Engine oil pump mounting bolt	10	1.0	89 in·lb	
4	Engine oil pump cover bolt	10	1.0	89 in·lb	
5	Oil pump sprocket mounting bolt	8	0.8	71 in·lb	
6	Engine oil pressure switch bolt	24.5	2.5	18 ft·lb	L
7	Engine oil filter	17	1.7	13 ft·lb	

EO: Apply engine oil

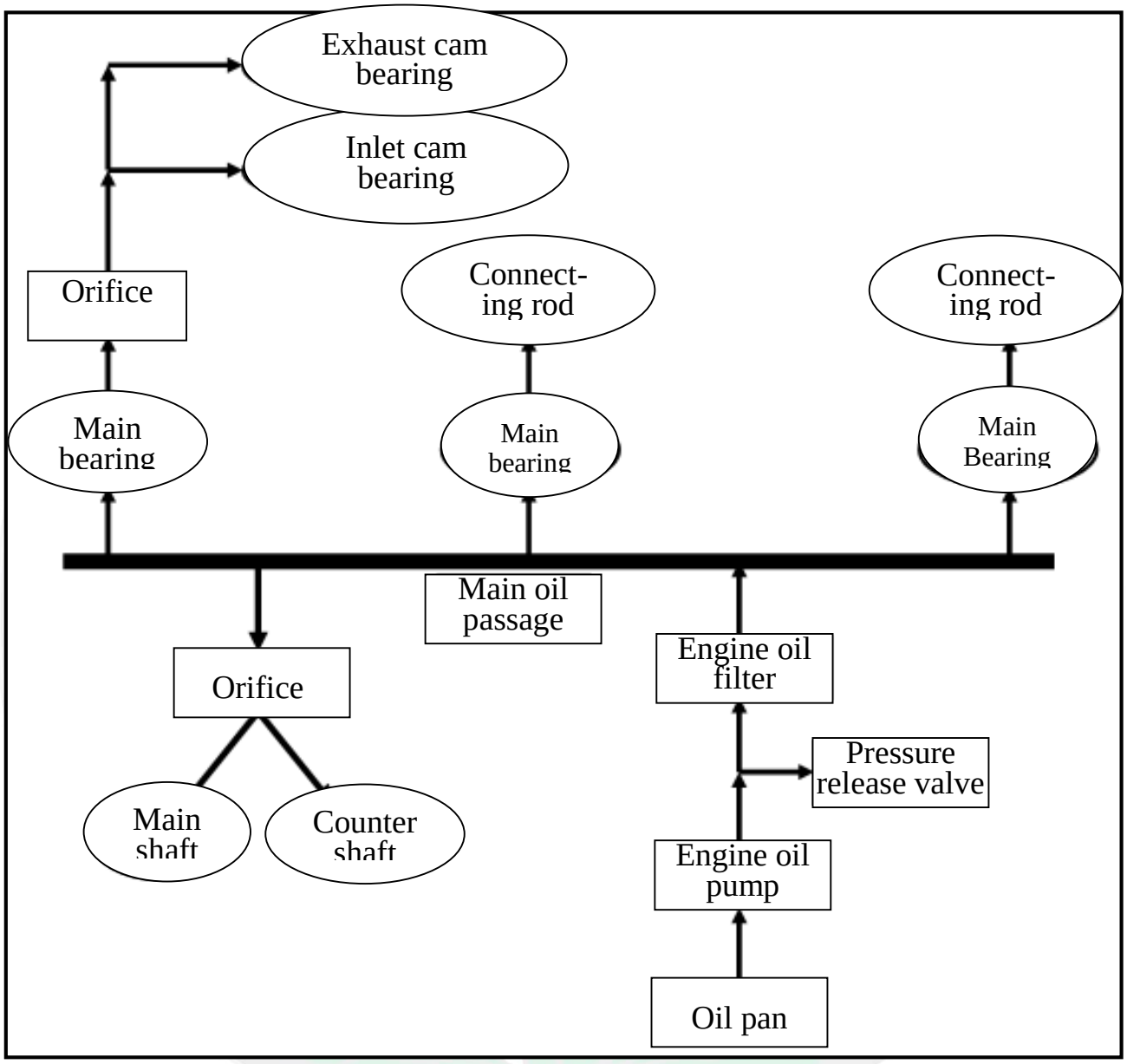
R: Replace parts

L: Apply thread fastening adhesives

Engine Lubrication System

Engine Lubrication System

Engine Oil Flow Diagram



Engine Lubrication System

Engine Lubrication System

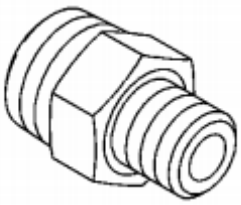
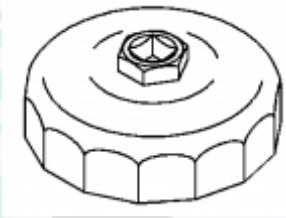
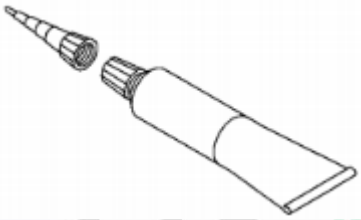
Technical Parameters

Item	Standard
Engine oil	
Type	API SE, SF or SG API SH, SJ or SL, JASO MA, MA1 or MA2
Viscosity	SAE 10W-40
Volume	2.8 L (When replacing oil) 3.0 L (When disassembling)
Oil level	Between upper and lower limits (2-3 minutes after idling or normal running)
Engine oil pump rotor	
Radial clearance between inner and outer rotor	0.05 ~ 0.13 mm （0.002 ~ 0.0051 in.）
Clearance between outer rotor and pump	0.11 ~ 0.17 mm （0.0043 ~ 0.0067 in.）

Engine Lubrication System

Engine Lubrication System

Special Tools and Fastening Adhesives

Engine oil pressure gauge 10 kgf/cm²	Adaptor of engine oil pressure gauge PT3/8
	
Engine Oil Filter Wrench	**Thread fastening adhesives**
	

Engine Oil and Engine Oil Filter

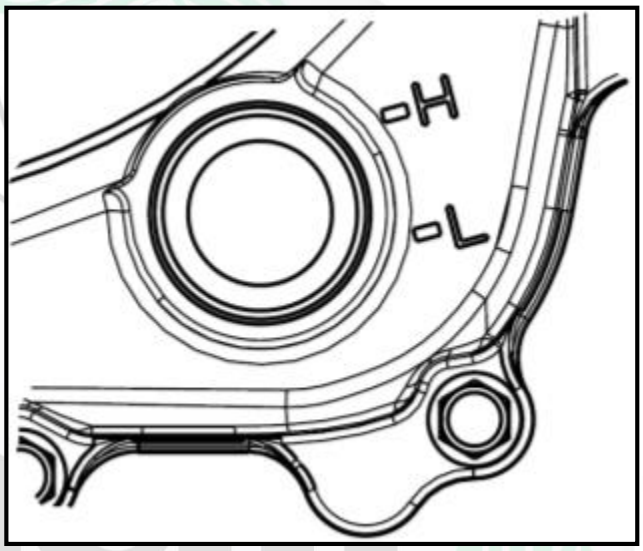
Engine Oil and Engine Oil Filter

⚠Warning

The insufficient amount, deterioration or contamination of the engine oil will accelerate the wear of the engine which may result in seizure of the engine or transmission group and cause a traffic accident and personal injury.

Check the oil level

● Check whether the level of the engine oil is between the high oil level line [H] and low oil level line [L] in the oil sight glass.



Remarks

○ *Park the motorcycle perpendicular to the ground.*
○ *If you have just used the motorcycle, wait a few minutes to let the engine oil return to the oil pan.*
○ *If you have replaced the engine oil, start the engine, let it run at idle speed for a few minutes, and this will fill the engine oil filter. Switch off the engine, wait a few minutes and let the oil settle.*

Note

If you start the engine and allow it to run at full speed before engine oil flows to each part, seizure may be caused to engine.
If the volume of the engine oil is very low, or engine oil pump or oil passage is blocked or abnormal, the engine oil pressure warning light will be on. If the operating speed is higher than the idle speed and the engine oil pressure warning light remains on, immediately shut down the engine and find the cause of the fault.

★ If the engine oil level is too high, please remove the excess engine oil with a syringe or other suitable tools.
★ If the engine oil level is too low, please add a proper amount of engine oil into the oil filler. Oil type and manufacturer used should be considered when adding oil to the engine.

Remarks

○ *If you are not sure about the type and manufacturer of the engine oil, you can fill it with any specified brand of engine oil to the highest level, but do not let the engine run when the engine oil level is low. However, you must replace the oil in the engine as soon as possible.*

Replacement of engine oil

● See “Chapter III Check and Regular Adjustment” – “Replacement of engine oil” for details

Replacement of engine oil filter

● See “Chapter III Check and Regular Adjustment” – “Replacement of engine oil filter” for details

Oil Pan

Oil Pan

Disassembly of the oil pan

● Drain the engine oil, remove the oil drain magnetic bolt [A] See “Chapter III Check and Regular Adjustment” – “Replacement of engine oil” for details

Muffler body (see “Top of engine” –“Disassembly / installation of muffler body” for details),

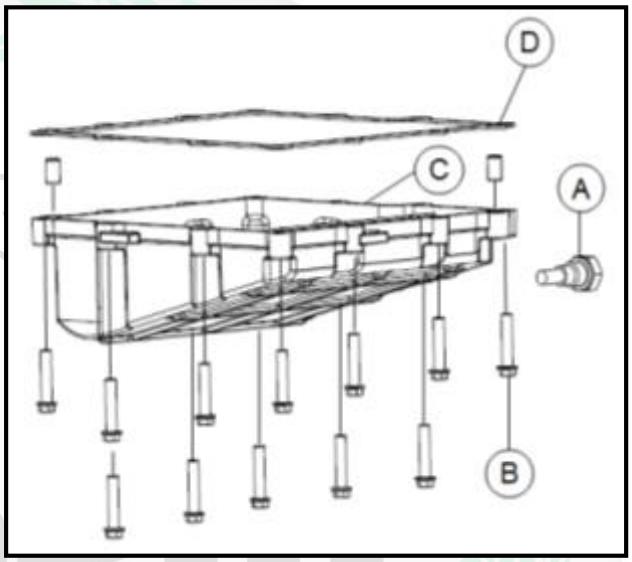
Exhaust pipe (see “Top of engine” –“Disassembly / installation of exhaust pipe” for details),

●Disassemble:

Oil pan bolts [B]

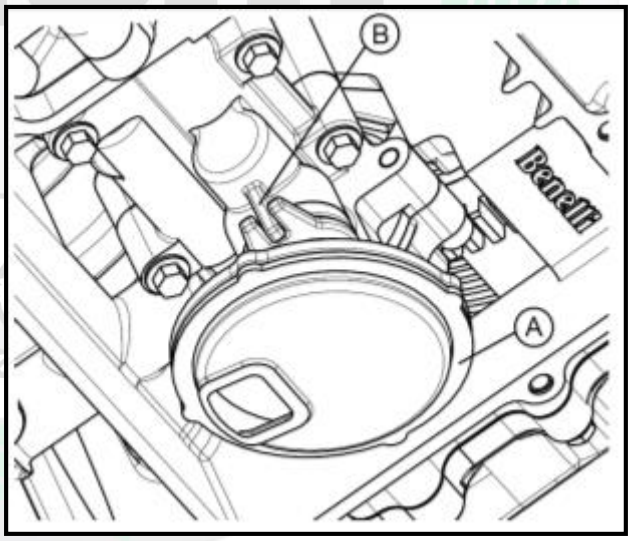
Oil pan [C]

Gasket [D]



●Disassemble:

Engine oil pickup screen [A] and seal cartridge



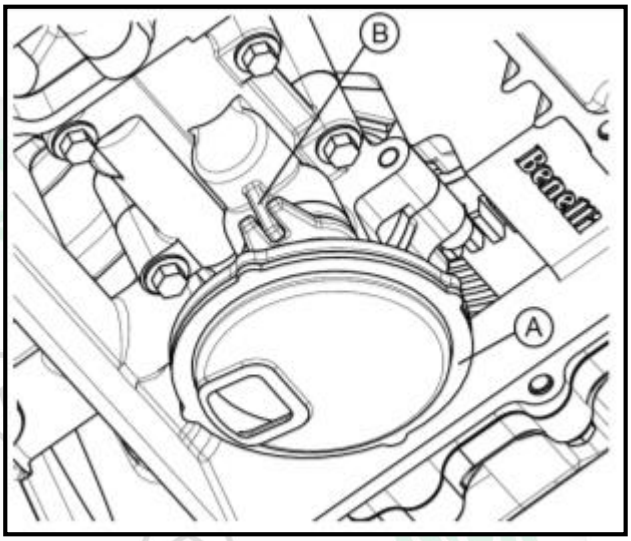
Oil Pan

Oil Pan

Installation of the oil pan

● Clean the engine oil pickup screen [A].

●Install the engine oil pickup screen and seal cartridge, and make the raised part [B] of engine oil pump align with the notch of engine oil pickup screen during installation.



● Install a new oil pan gasket [D]

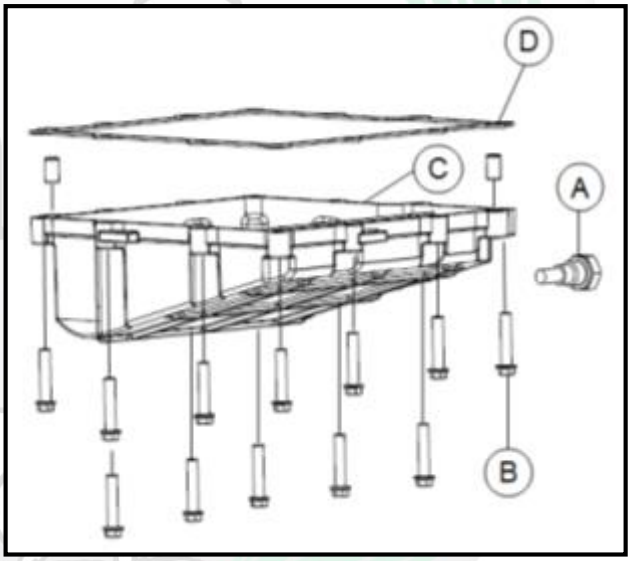
● Install the oil pan

Locking torque:

Locking torque of oil pan bolts [B]: 10 N·m (1.0 kgf·m, 89 in·lb)

Locking torque of the magnetic oil drain bolt [A]: 20 N·m (2.0 kgf·m, 15 ft·lb)

● Parts disassembled before installation.



Engine Oil Pump

Engine Oil Pump

Disassembly of the engine oil pump:

Drain the engine oil see “Chapter III Check and Regular Adjustment” – “Replacement of engine oil” for details

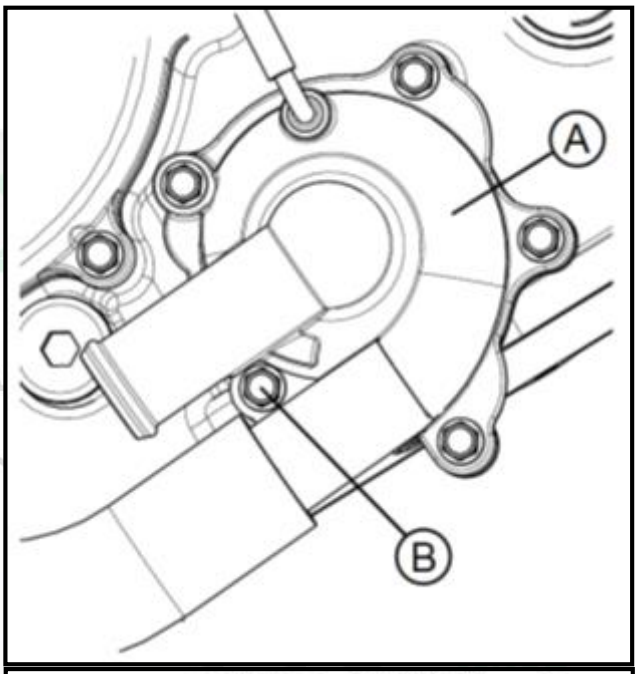
Disassemble the right cover (see “Clutch” – “Disassemble clutch” for details)

Disassemble the gear driving balance shaft at the crankshaft (see “Clutch” –“Disassemble clutch” for details)

Disassemble the clutch hub components (see “Clutch” – “Disassemble clutch” for detail)

Disassemble the oil pan and engine oil pickup screen (see “Disassembly of oil pan”)

Disassemble the water pump mounting bolt [B] and pump body [A]



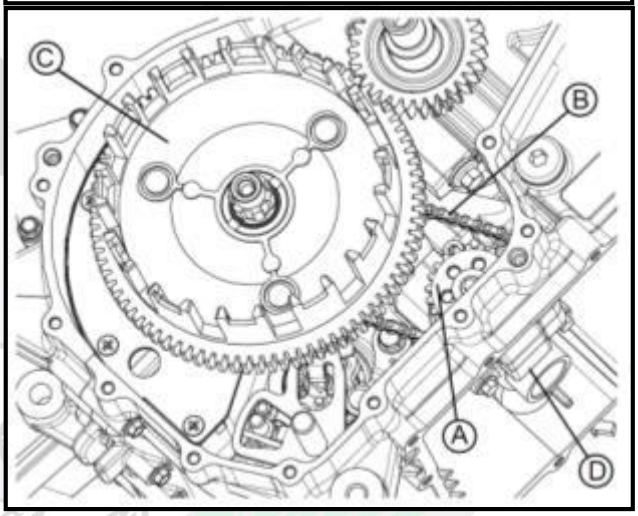
● Disassemble the oil pump sprocket mounting bolts and gaskets

● Disassemble the oil pump sprocket [A]

● Disassemble the oil pump chain [B] and clutch outer plate components [C]

● Disassemble the oil pump mounting bolts

● Disassemble the oil pump components [D] and positioning pins



● Disassemble the oil pump cover bolts

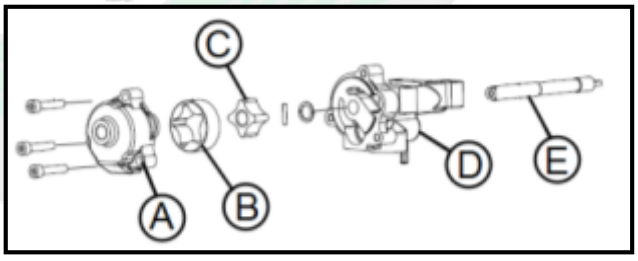
● Disassemble the oil pump cover [A]

● Disassemble the outer rotor [B] and inner rotor of oil pump [C]

● Disassemble the pin

● Disassemble the gasket

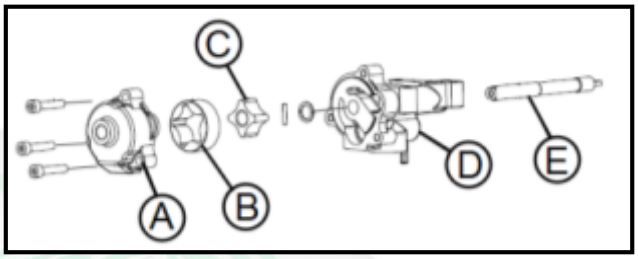
● Disassemble the oil pump shaft [E] and oil pump [D]



Engine Oil Pump

Engine Oil Pump

Installation of the engine oil pump:



●Clean the engine oil pump [D], engine oil pump cover [A], outer rotor [B], inner rotor [C] and the engine oil pump shaft [E] with engine oil.

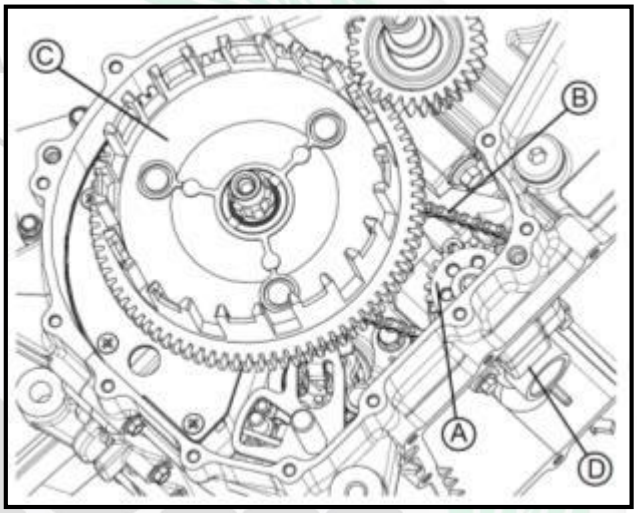
● Install the engine oil pump shaft [E] into the engine oil pump [D].

● Install the gaskets and pins

● Install the inner rotor [C], outer rotor [B] and oil pump cover [A]

Locking torque:

Locking torque of the engine oil pump cover bolts: 10 N·m (1.0 kgf·m, 89 in·lb)



● Install the engine oil pump positioning pins on the lower crankcase

● Install the oil pump components [D]

Locking torque:

Locking torque of the engine oil pump mounting bolt: 10 N·m (1.0 kgf·m, 89 in·lb)

● Install the clutch outer plate components [C] and engine oil pump chain [B]

● Install the engine oil pump sprocket [A] and gasket

Locking torque:

Locking torque of the engine oil pump sprocket mounting bolt: 8 N·m (0.8 kgf·m, 71 in·lb)

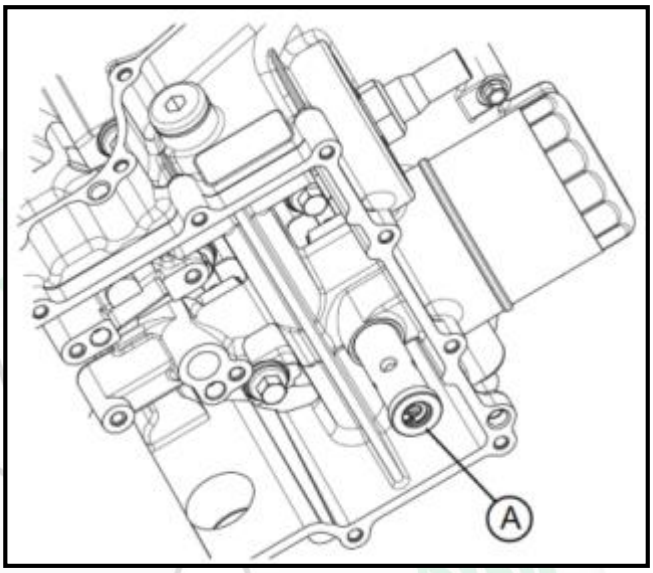
●Parts disassembled before installation

Engine Oil Pressure Relief Valve

Engine Oil Pressure Relief Valve

Disassembly of the engine oil pressure relief valve:

● Drain the engine oil (see Chapter III "Check and Regular adjustment"-"Replacement of engine oil").
Disassemble the right cover (see "Clutch"-"Clutch disassembly").
Disassemble the gear on the upper driving balance shaft of the crankshaft (see "Clutch"-"Clutch disassembly").
Disassemble the central components of the clutch see "Clutch"-"Clutch disassembly").
Disassemble the oil pan and engine oil strainer (see "Disassembly of oil pan").
● Disassemble the engine oil pressure relief valve [A].



Installation of engine oil pressure relief valve:

● Clean the engine oil pressure relief valve [A].
● Install the engine oil pressure relief valve [A].
● Install the disassembled parts.

Check of engine oil pressure relief valve:

● Check whether the relief valve [A] can slide smoothly, and return to the original position under the pressure of the spring [B] when it is pushed by sticks or other soft bars.

Remark

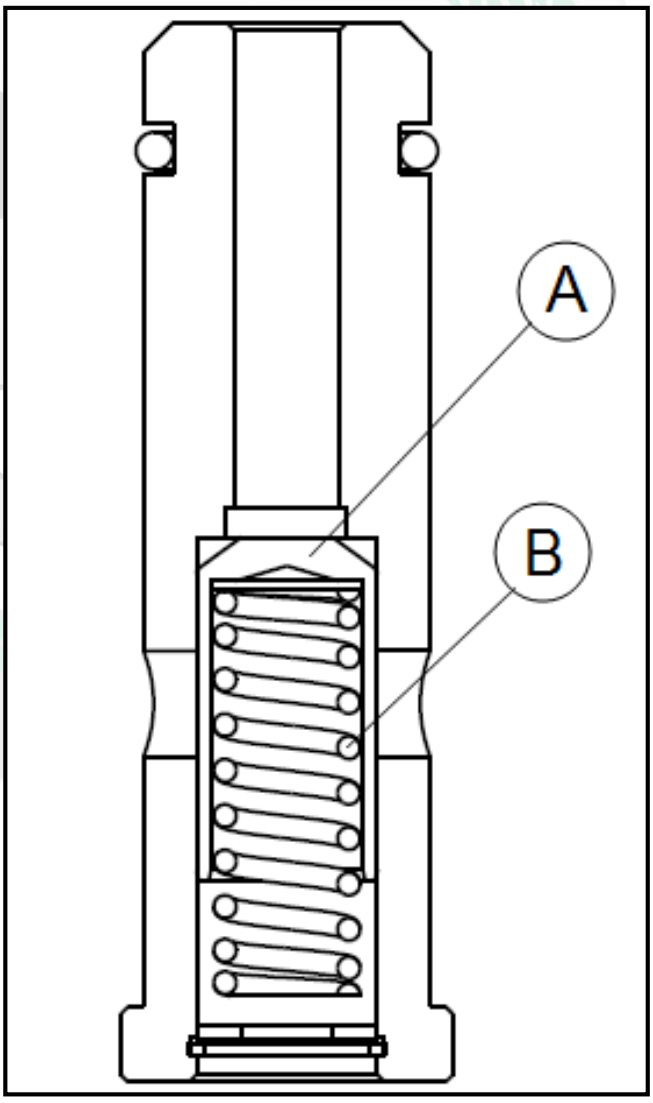
○ *Check the relief valve after installation, since the process of disassembling and assembling the relief valve will change its performance.*

★ Clean up the relief valve using a high flash solvent, and then blow out any foreign matter in the relief valve using compressed air if any impurities or foreign matter is found in the above checking process.

⚠Warning

Clean the engine oil pressure relief valve in a well-ventilated place, and prevent any spark or flame nearby operating areas. DO NOT clean the relief valve using gasoline or low flash solvents, since they are extremely flammable.

★ Replace the entire engine oil pressure relief valve if the above problem cannot be solved by cleaning the relief valve. DO NOT separately replace the individual parts, since the engine oil pressure relief valve is made with refined processing.



Measurement of Engine Oil Pressure

Measurement of Engine Oil Pressure

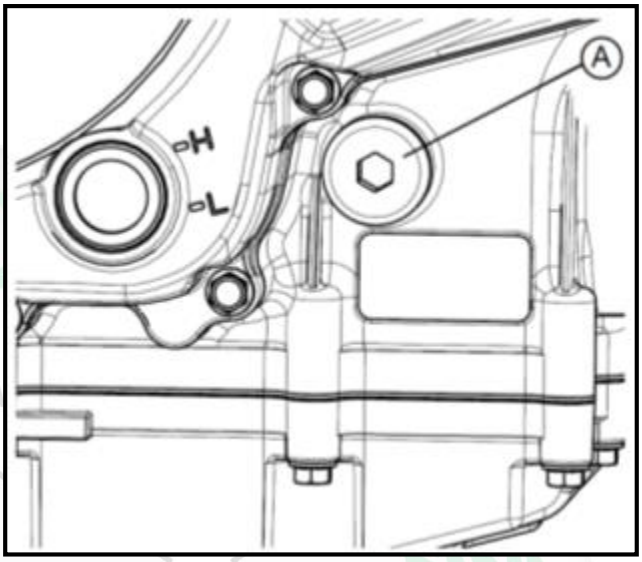
Measurement of engine oil pressure:

● Disassemble the oil passage plug [A].

● Connect the engine oil pressure gauge adaptor and engine oil pressure gauge to the crankcase.

Special tool-engine oil pressure gauge 10 kgf/cm²

Adaptor of engine oil pressure gauge PT3/8



● Start the engine for preheating.

● Run the engine at the specified speed, and take the readings on the engine oil pressure gauge.

★ Immediately check the wear patterns of oil pump, relief valve and / or crankcase bearings if the engine oil pressure is far lower than the standard.

★ Check whether the oil passage is blocked if the engine oil pressure is far higher than the standard.

Engine oil pressure

Standard: 50-60 psi [Engine speed=4,000 r/min, Engine oil temperature=185°F]

● Shut down the engine.

● Disassemble the engine oil pressure gauge and the engine oil pressure gauge adaptor.

⚠ Warning

Take care not to let skin be burnt by the engine oil flowing from the oil passage during disassembly of the engine oil pressure gauge adaptor!

● Install and lock the oil passage plug [A].

Locking torque of the oil passage plug: 15 ft·lb.

Engine Oil Pressure Switch

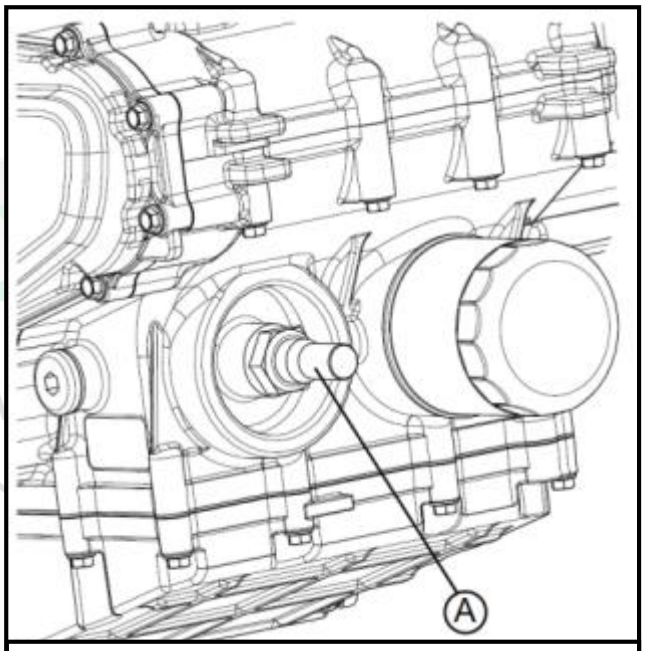
Engine Oil Pressure Switch

Disassembly of the engine oil pressure switch:

● Drain the engine oil (see Chapter III “Check and Regular adjustment”-“Replacement of engine oil”).

Disconnect the engine oil pressure switch wiring.

Remove the engine oil pressure switch [A] and gasket.

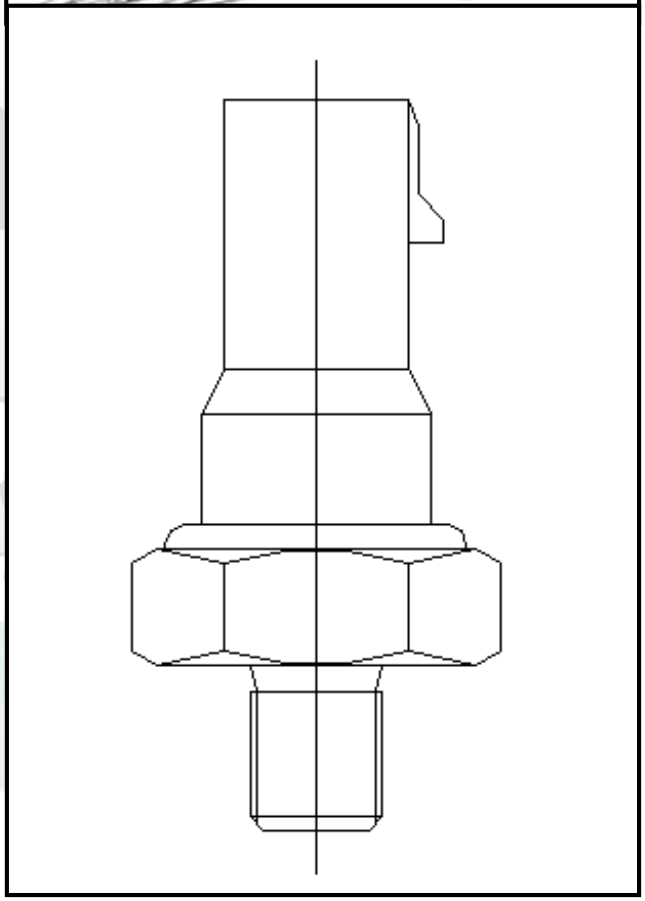


Engine oil pressure switch inspection:

Check whether the connector terminal has good contact with thread position. There is internal open-circuit in the terminal, if not, and it needs to be replaced.

Test whether there is impedance phenomenon on the sensor pin and engine crankcase when unplugging the sensor connector after starting the engine. There may be water or oil inside, or there is insufficient pressure in the engine, if any.

Initial pressure of alarming: 0.055±0.015MPa



Engine Oil Pressure Switch

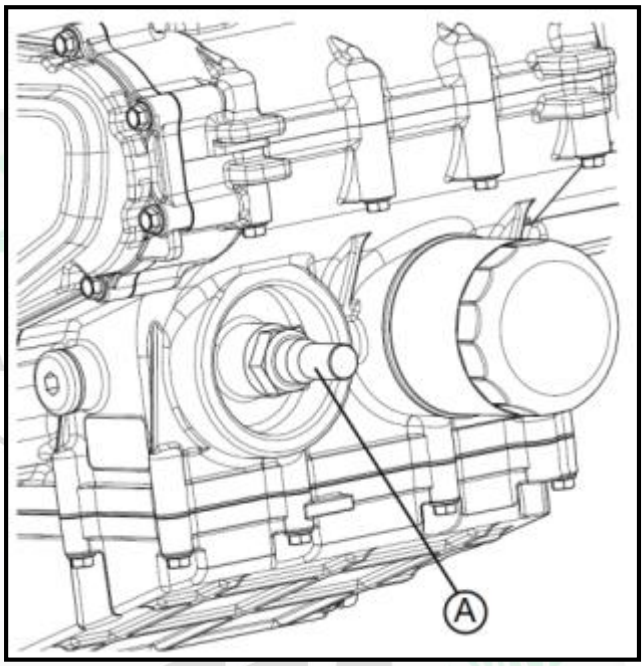
Engine Oil Pressure Switch

Installation of the engine oil pressure switch:

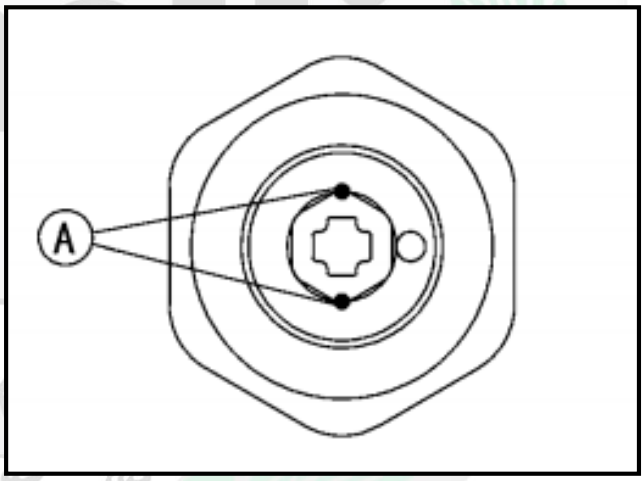
● Apply fastening adhesive to the threads of the engine oil pressure switch [A], and then install the engine oil pressure switch [A] and gasket.

Locking torque of engine pressure switch [A]: 24.5 N·m (2.5 kgf·m, 18 ft·lb)

● Install the engine oil pressure switch wiring.



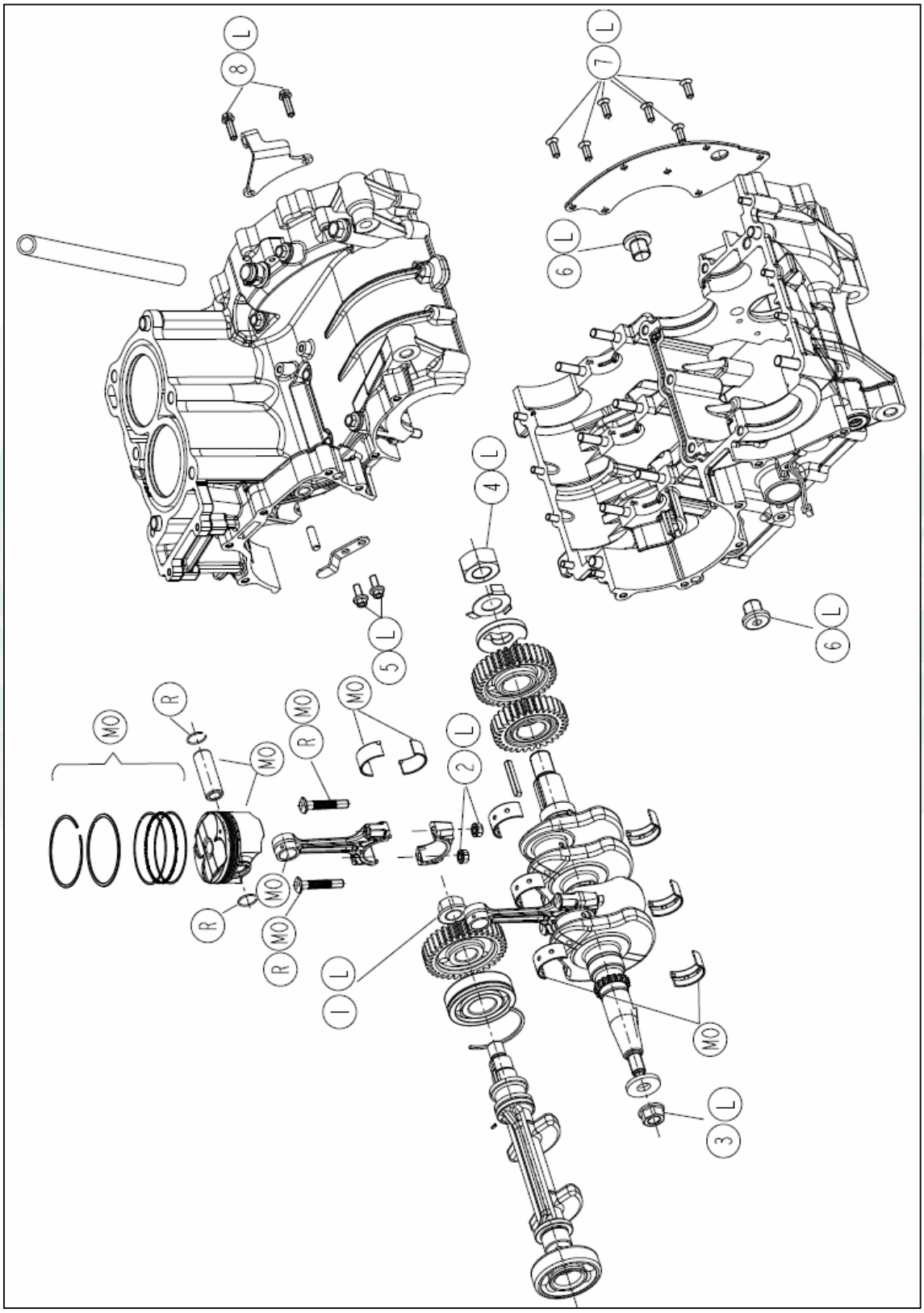
Remark
● *Add a little amount of lubricating grease to the terminal connector but take care not to block the two air vents [A] of switch membrane.*



Crankshaft / Transmission Gears

Crankshaft / Transmission Gears

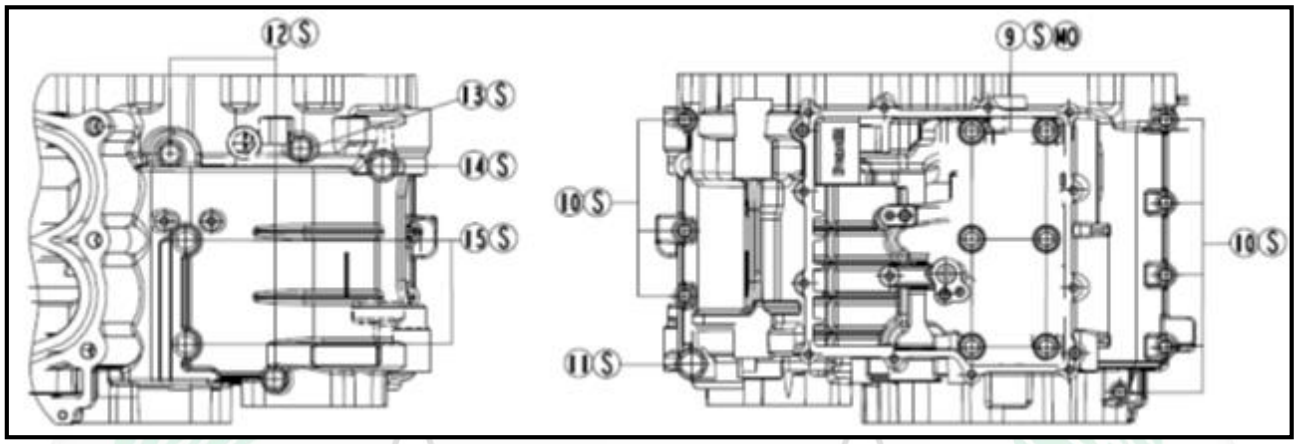
Breakdown Drawing



Crankshaft / Transmission Gears

Crankshaft / Transmission Gears

Breakdown Drawing



No.	Fastener	Torque			Remark
		N·m	kgf·m	ft·lb	
1	Balance shaft driven gear lock nut	100	10.2	73.7	L
2	Connecting rod big end nut	See the text			
3	Crankshaft flywheel nut	105	10.7	77.4	L
4	Balance shaft driving gear lock nut	60	6	44	L
5	Follower bolt (M6, L = 14 mm)	10	1	89 in·lb	L
6	Oil passage plug (M16, L = 15 mm)	24.5	2.5	18.1	L
7	Follower screw (M6, L = 16 mm)	7	0.71	62 in·lb	L
8	Support bolt (M6, L = 20 mm)	10	1	89 in·lb	L
9	Crankcase bolt (M8, L = 85 mm)	24.5	2.5	18.1	MO、S
10	Crankcase bolt (M6, L = 40 mm)	10	1	89 in·lb	S
11	Crankcase bolt (M10, L = 60mm)	45	4.6	33.3	MO、S
12	Crankcase bolt (M8, L = 75 mm)	24.5	2.5	18.1	S
13	Crankcase bolt (M8, L = 115 mm)	24.5	2.5	18.1	S
14	Crankcase bolt (M10, L = 100mm)	45	4.6	33.3	MO、S
15	Crankcase bolt (M8, L = 45 mm)	24.5	2.5	18.1	S

G: Apply lubricating grease.

L: Apply thread locking adhesive.

M: Apply molybdenum disulfide lubricating grease.

MO: Apply molybdenum disulfide oil solution.

(Weight ratio of engine oil and molybdenum disulfide lubricating grease: 10:1)

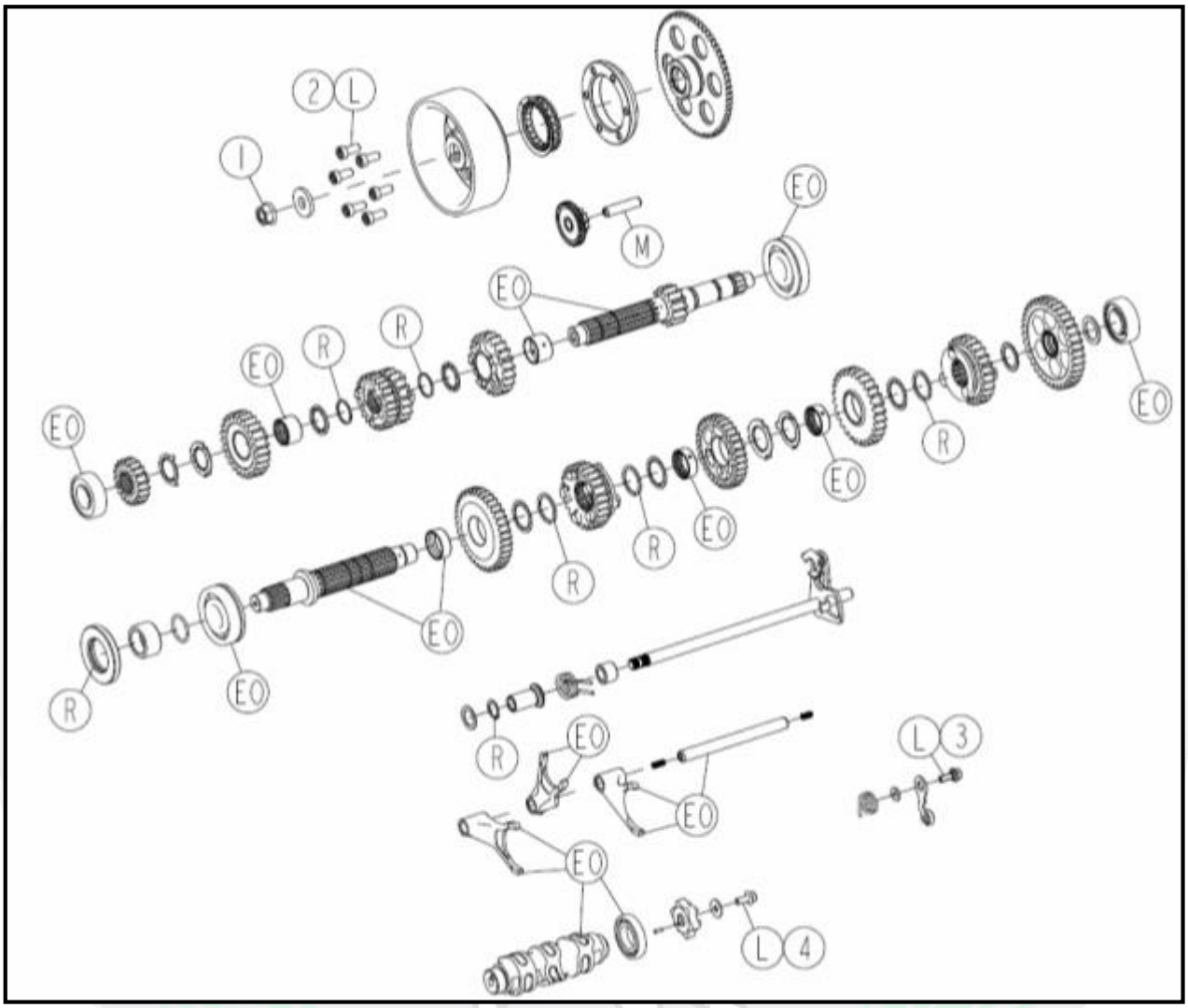
R: Replace parts.

S: Follow the specified tightening sequences.

Crankshaft / Transmission Gears

Crankshaft / Transmission Gears

Breakdown Drawing



No.	Fastener	Torque			Remark
		N·m	kgf·m	ft·lb	
1	Flywheel lock nut	100	10.2	73.7	
2	starter clutch bolt	20	2.04	14.74	L
3	Positioning roller rocker arm bolt	12	1.22	106 in·lb	L
4	Shift positioning star fixing bolt	12	1.22	106 in·lb	

EO: Apply engine oil.

G: Apply lubricating grease.

L: Apply thread locking adhesive.

M: Apply molybdenum disulfide lubricating grease.

R: Replace parts.

Crankshaft / Transmission Gears

Crankshaft / Transmission Gears

Technical parameters

Item	Standard	Operating limit
Crankcase, crankshaft and connecting rod		
Bend of connecting rod	——	TIR 0.2/100 mm (0.008/3.94 in.)
Distortion of connecting rod	——	TIR 0.2/100 mm (0.008/3.94 in.)
Clearance of connecting rod big end	0.1 ~ 0.25 mm (0.0039 ~ 0.0098 in.)	0.38 mm (0.015 in.)
Clearance of bearing bush of connecting rod big end / crankshaft	0.028 ~ 0.052 mm (0.0011 ~ 0.0020 in.)	0.07mm (0.0027 in.)
Diameter of crankshaft pin:	29.962 ~ 29.976 mm (1.1796 ~ 1.1801 in.)	29.91 mm (1.1775 in.)
Mark: A	29.969 ~ 29.976 mm (1.1799 ~ 1.1801 in.)	——
B ○	29.962 ~ 29.968 mm (1.1796 ~ 1.1798 in.)	——
Bore diameter of connecting rod big end:	33.000 ~ 33.016 mm (1.2992 ~ 1.2998 in.)	——
Mark A	33.000 ~ 33.008 mm (1.2992 ~ 1.299 5 in.)	——
B ○	33.009 ~ 33.016 mm (1.2995 ~ 1.2998 in.)	——
Thickness of bearing bush of connecting rod big end:		
Yellow	1.500 ~ 1.503 mm (0.05905 ~ 0.05917 in.)	——
Green	1.503 ~ 1.506 mm (0.05917 ~0.05929 in.)	——
Blue	1.506 ~ 1.509 mm (0.05929 ~ 0.05941 in.)	——
Extension of connecting rod bolt:	（适用范围）(Scope of application)	
New connecting rod	0.25 ~ 0.34 mm (0.0098 ~ 0.0134 in.)	——
Old connecting rod	0.25 ~ 0.34 mm (0.0098 ~ 0.0134 in.)	——
Side clearance of crankshaft	0.10 ~ 0.25mm (0.0039 ~ 0.0098 in.)	0.30 mm (0.0118 in.)
Radial oscillating quantity of crankshaft	≤TIR 0.02 mm (0.0008 in.)	TIR 0.06 mm (0.0024 in.)
Clearance of main crankshaft bearing bush / oil passage	0.022 ~ 0.045 mm (0.0009 ~ 0.0018in.)	0.06 mm (0.0024 in.)
Diameter of main crankshaft oil passage:	31.958 ~31.972 mm (1.2582 ~1.2587 in.)	31.94 mm (1.2575 in.)
Mark 1	31.965 ~ 31.972 mm (1.2585 ~ 1.2587 in.)	——
2	31.958 ~ 31.965 mm (1.2582~1.2585 in.)	——
Bore diameter of main crankshaft bearing bush:	35.000 ~ 35.021 mm (1.3779 ~ 1.3788 in.)	——

Crankshaft / Transmission Gears

Crankshaft / Transmission Gears

Technical Data

Item	Standard	Operating limit
Mark 01	35.000 ~35.007 mm (1.3779 ~1.3782 in.)	
02	35.007 ~ 35.014 mm (1.3782 ~ 1.3785 in.)	
03	35.014 ~ 35.021 mm (1.3785 ~ 1.3788 in.)	
Thickness of main crankshaft bearing bushing:		
Yellow	1.500~ 1.503 mm (0.0590 ~ 0.0592 in.)	
Green	1.503 ~ 1.506 mm (0.0592 ~ 0.0593 in.)	
Blue	1.506~ 1.509 mm (0.0593 ~ 0.0594 in.)	
Red	1.509 ~ 1.512 mm (0.0594 ~ 0.0595 in.)	
Piston		
Bore diameter of cylinder (on the crankcase)	65.010 ~ 65.020 mm (2.5594 ~ 2.5598 in.)	65.10 mm (2.5630 in.)
Piston diameter	64.97 ~64.98 mm (2.5579 ~ 2.5583 in.)	64.90 mm (2.5551 in.)
Piston / cylinder clearance	0.030~ 0.050 mm (0.0012 ~ 0.0020 in.)	
Clearance of piston ring groove:		
Top	0.05 ~ 0.09 mm (0.0020 ~ 0.0035in.)	0.17 mm （0.0067 in.）
Section II	0.04 ~ 0.08 mm (0.0016 ~ 0.0031 in.)	0.16 mm (0.0063 in.)
Width of piston ring groove:		
Top	0.83 ~ 0.85mm (0.0327 ~ 0.0335 in.)	0.90 mm (0.0354 in.)
Section II	0.83 ~ 0.85 mm (0.0327 ~ 0.0335 in.)	0.90 mm (0.0354 in.)
Thickness of piston ring:		
Top	0.76 ~ 0.78 mm (0.0299 ~ 0.0307 in.)	0.73 mm (0.0287 in.)
Section II	0.77 ~ 0.79 mm (0.0303 ~ 0.0307 in.)	0.74 mm (0.0291 in.)
End clearance of piston ring:		
Top	0.15 ~ 0.30 mm (0.0059 ~ 0.0118 in.)	0.4mm (0.0157 in.)
Section II	0.25 ~ 0.45 mm (0.0098 ~ 0.0177 in.)	0.65 mm (0.0256in.)
Composite oil ring	0.20 ~ 0.70 mm (0.0079 ~ 0.0276 in.)	1.0 mm (0.039 in.)

Crankshaft / Transmission Gears

Crankshaft / Transmission Gears

Technical data

Item	Standard	Operating limit
Transmission gear		
Thickness of fork	5.8 ~ 5.9 mm (0.2283 ~ 0.2323 in.)	5.65 mm (0.2224 in.)
Width of fork groove on gear	6 ~ 6.05 mm (0.2362 ~ 0.2382 in.)	6.15 mm (0.2421 in.)
Diameter of fork guide pin	7.93 ~ 8.0 mm (0.3122 ~ 0.315 in.)	7.83 mm (0.3083 in.)
Width of shift drum groove	8.05 ~ 8.15 mm (0.3169 ~ 0.3209 in.)	8.25 mm (0.3248 in.)

Selection of bearing bushing for the connecting rod big end

Bore diameter mark of connecting rod big end	Diameter mark of crankshaft pin	Bearing bush	
		Dimension and color	Part No.
A	A	Yellow	170116030000
A	B	Green	170116030000
B	A		
B	B	Blue	170116030000

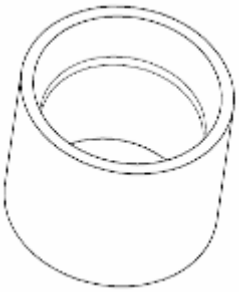
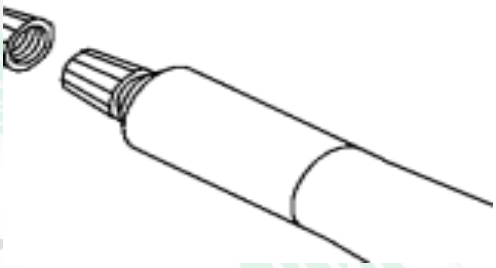
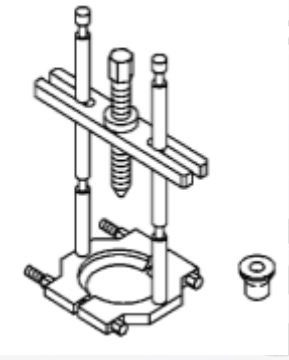
Selection of main crankshaft bearing shaft

Bore diameter mark of main crankshaft bearing bush	Diameter mark of main crankshaft oil passage	Bearing bush*	
		Dimension and color	Part No.
01	1	Yellow	150026030000
02	1	Green	150026030000
01	2		
03	1	Blue	150026030000
02	2		
03	2	Red	150026030000

Crankshaft / Transmission Gears

Crankshaft / Transmission Gears

Special Tools and Fastening Adhesives

Tooling of piston installation:	Adhesive:
	
Bearing puller:	
	

Crankcase

Crankcase

Crankcase disassembly:

● Remove the engine (see “Frame / engine installation”-“Engine disassembly”).

● Place the engine on a clean surface to ensure that the engine remains stable after disassembling parts.

● Disassemble:

Clutch (see “Clutch”-“Clutch disassembly”)

Starter motor (see “Electrical starting system”-“Starting motor”)

Engine oil pump (see “Engine lubricating system”-“Disassembly of oil pump”)

Alternator rotor (see “Electrical system”-“Disassembly of alternator rotor”)

Engine oil filter (see “Engine lubricating system”-“Disassembly of engine oil filter”)

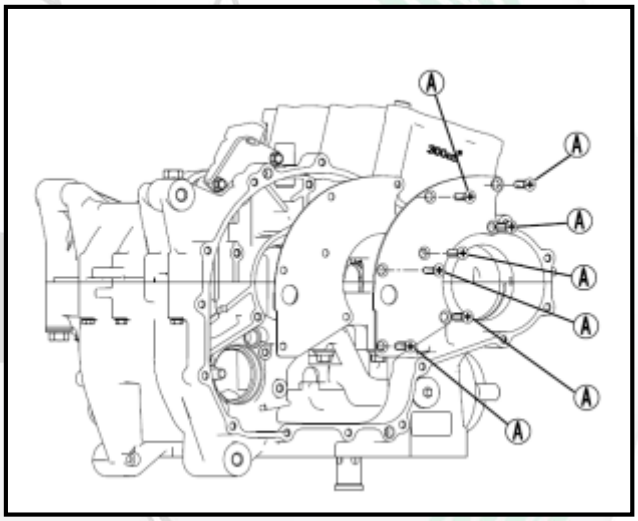
Oil pan (see “Engine lubricating system”-“Disassembly of oil pan”)

External gearshift (see “External gearshift”)

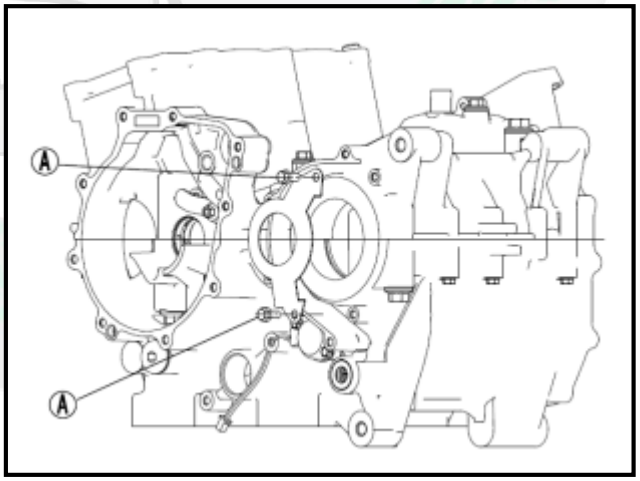
● Remove the screws from the oil-air separation labyrinth under the right cavity cover, and remove the cover plate and cover plate gasket;

● First, disassemble M6 screw and M6 bolt.

Disassemble M6 bolt [A].



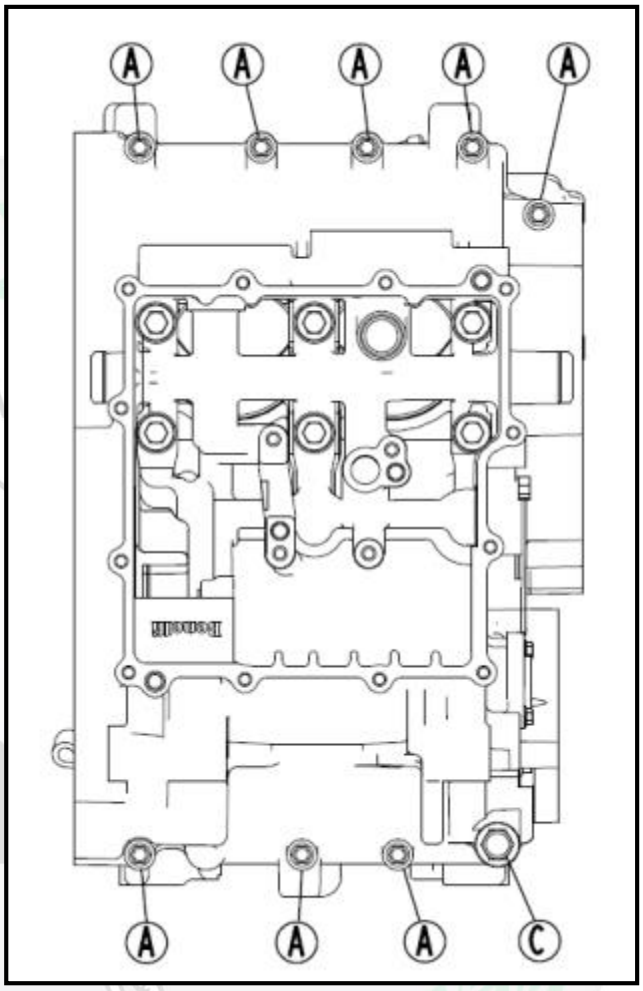
● Disassemble the bolt M6 on the side cover plate of the output sprocket, and remove the oil seal pressure plate; Disassemble M6 bolt [A].



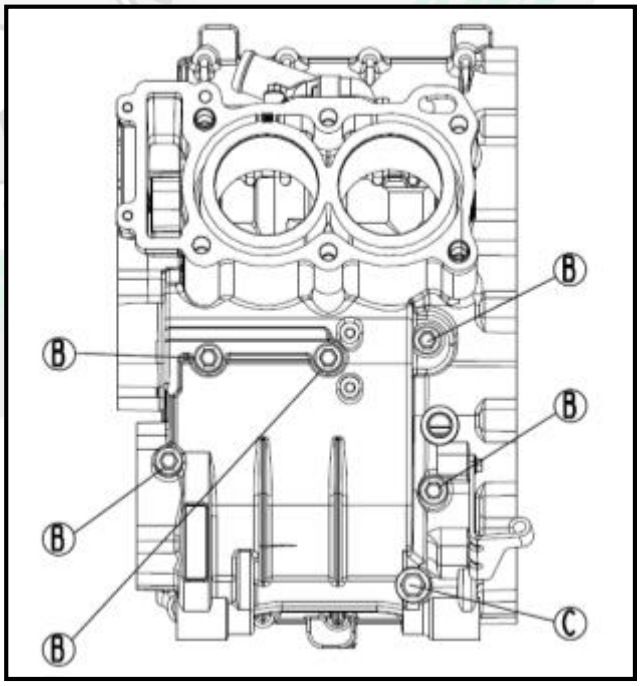
Crankcase

Crankcase

● Disassemble the lower crankcase bolts:
● First, disassemble M6 bolt [A].
● Then disassemble M10 bolt [C].



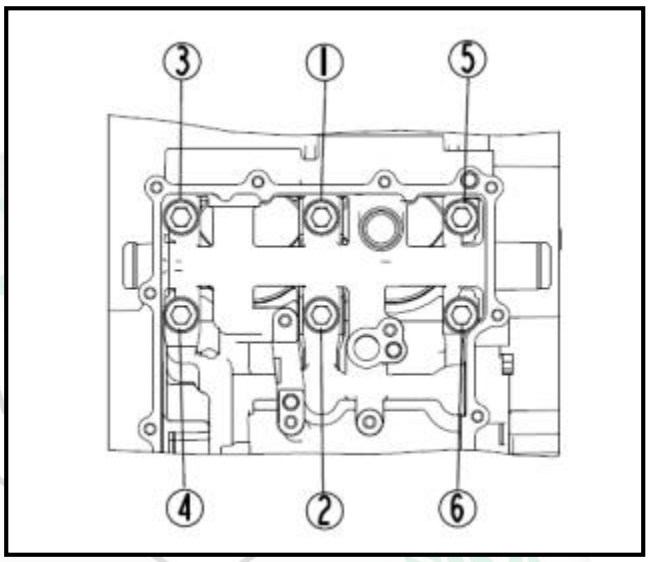
● Disassemble the upper crankcase bolts:
● First, disassemble M8 bolt [B].
● Then disassemble M10 bolt [C].



Crankcase

Crankcase

● Then disassemble the M8 bolts (sequence no.: 1-6).



● Gently knock the surfaces around the meshing plane of the crankcase using a plastic hammer, and separate the crankcase halves. Please avoid damaging the crankcase!

★ Disassemble the piston before disassembling the crankshaft (see "Piston disassembly").

● Disassemble the crankshaft connecting rod assembly and balance shaft assembly in the crankcase (see "Disassembly of crankshaft and balance shaft").

Crankcase

Crankcase

Crankcase installation:

Notes
The upper half and lower halves of the crankcase are machined together at the factory, so they must be replaced as a set.

● Clean the meeting planes of the crankcase using high flash solvents, and wipe it off.

● Blow out the oil passages in crankcase using compressed air.

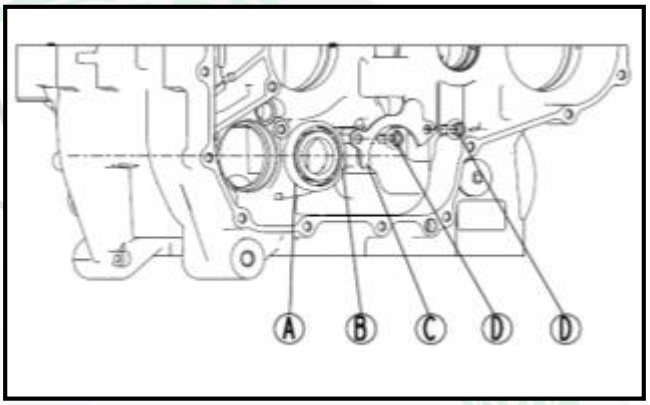
● Marked side [B] of the shift drum bearing [A] should be toward the outside during installation, as shown in the figure.

● Install the pressure plate of bearing [C] and bolt M6 [D].

● The sharp side of the pressure plate of the bearing should fall down, and its blunt side should be inward during installation.

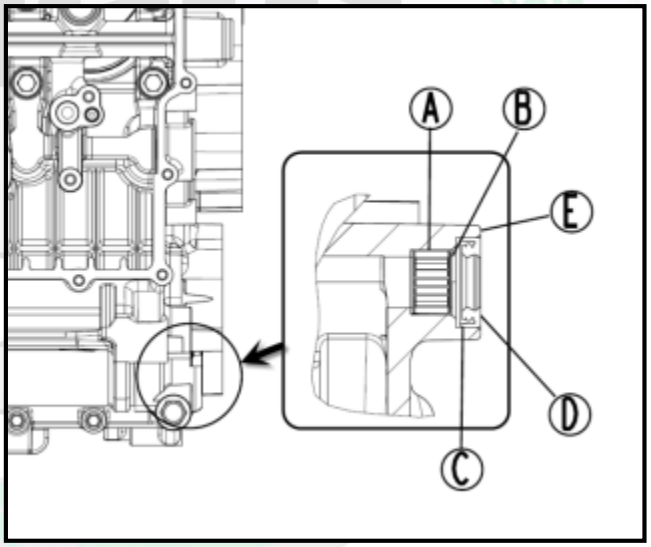
● Apply thread locking adhesive to the threads of the follower bolt on the fixed bearing, and then torque the bolt.

Locking torque of bolt on pressing plate of bearing: 10N·m (0.1 kgf·m, 7.4 ft·lb)



●The direction of marked side [B] of the new roller bearing [A] of the gear shaft during installation is shown in the figure.

● The surface [D] of new oil seal [C] should be level with the crankcase surface [E] during installation of new the oil seal [C].



● Install:

Piston connecting rod assembly of the crankshaft [A] (see “Installation of piston connecting rod assembly of crankshaft”)

Balance shaft assembly [B] (see “Installation of balance shaft assembly”)

Locating pin [C]

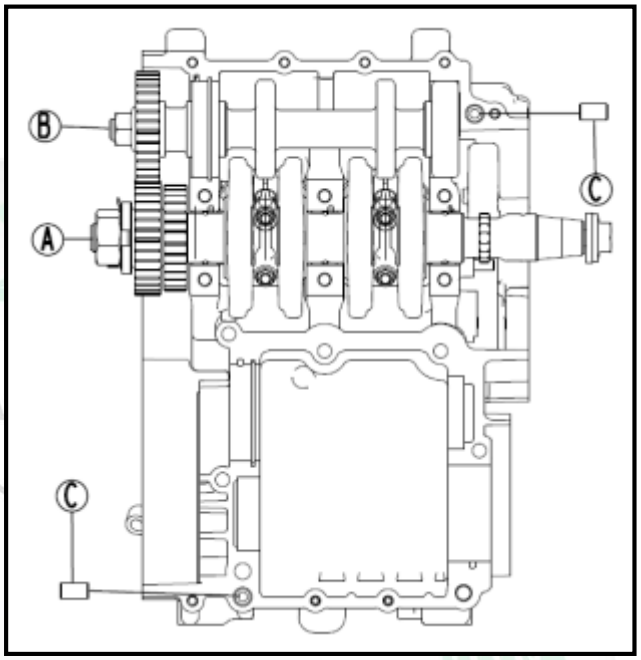
Crankcase

Crankcase

● Install the shift assembly of main shaft and counter shaft. (See “Installation of main shaft and counter shaft assembly”)

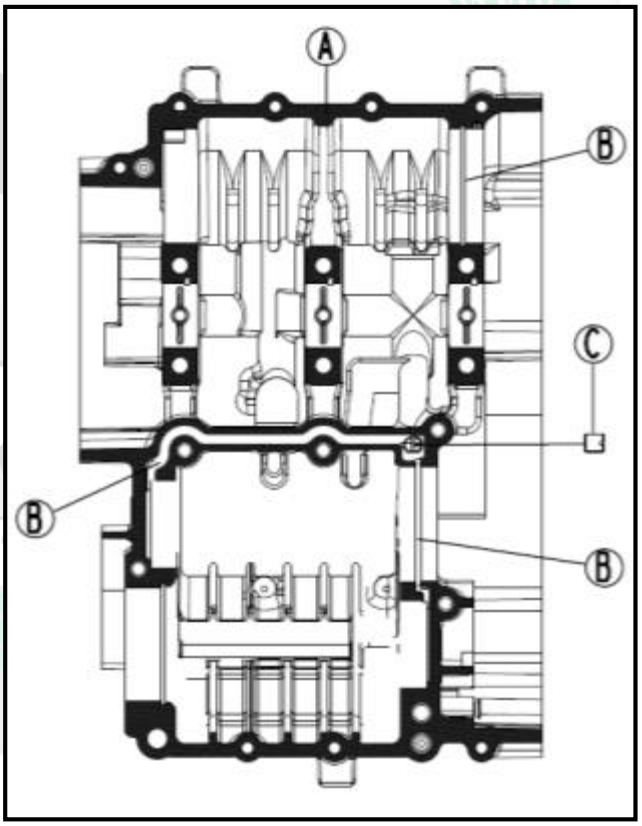
● Check the following items before connecting the lower crankcase and upper crankcase.

● Check whether the shift drum, main shaft and counter shaft are in the neutral position.



● Apply sealant [A] to the meshing plane of the lower crankcase half.

● Install the oil passage plug [C], and apply thread locking adhesive during installation.



Remarks
○ *Avoid blocking the orifice of the oil passage plug [C] when applying the crankcase sealant.*
○ *Apply the sealant to the closing surface on the lower half of crankcase within 20min.*

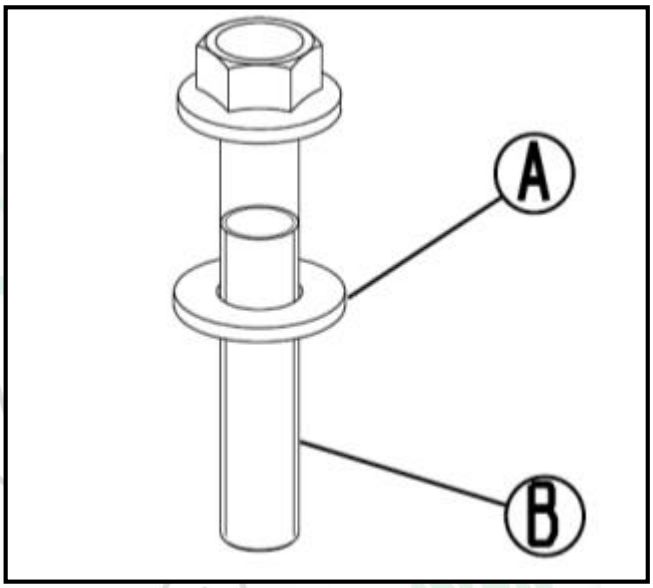
Notes
Do not apply sealant to the oil groove [B] nearby the main crankshaft bearing bushing and counter shaft bearing of balance shaft!

Crankcase

Crankcase

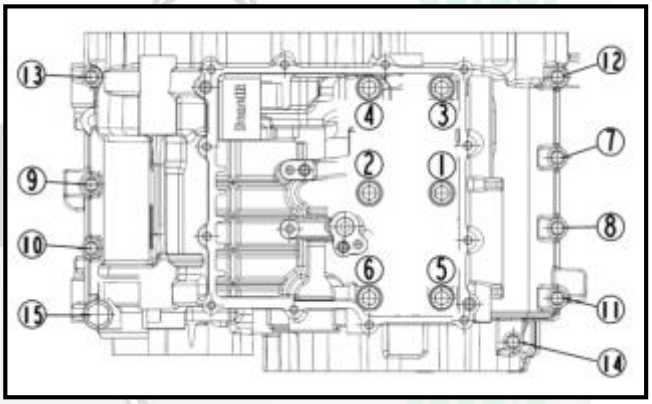
● Connect the lower crankcase to the upper crankcase.

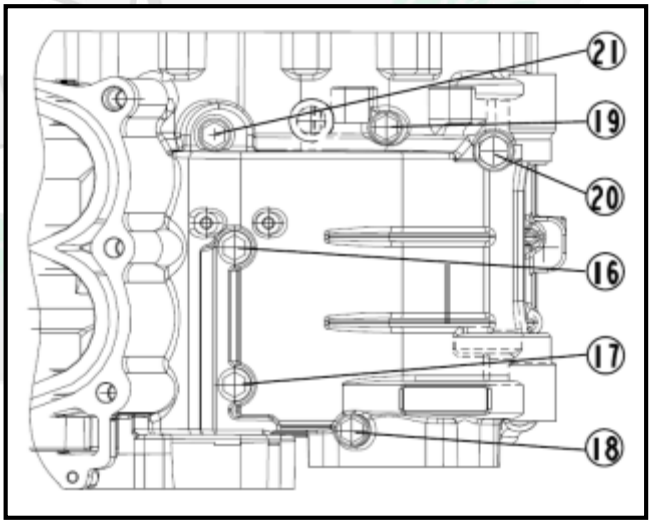
● Apply the molybdenum disulfide oil solution to the contact area [A] of the gasket, bolt and thread [B] of the M10 and M8 bolts.



● Tighten the crankcase bolts in the specified sequence (No.: 1-21). (See the image to the right)

○ M8 and M10 bolts are equipped with gaskets. Please replace the old gaskets with new ones.

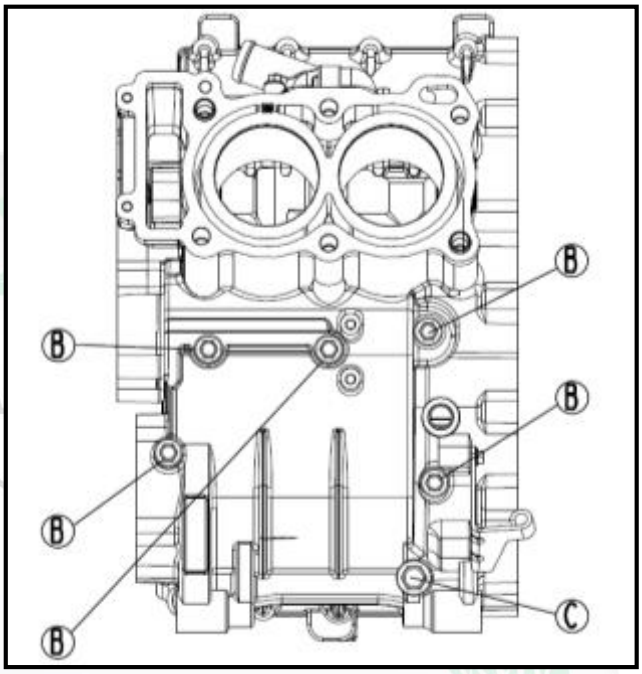


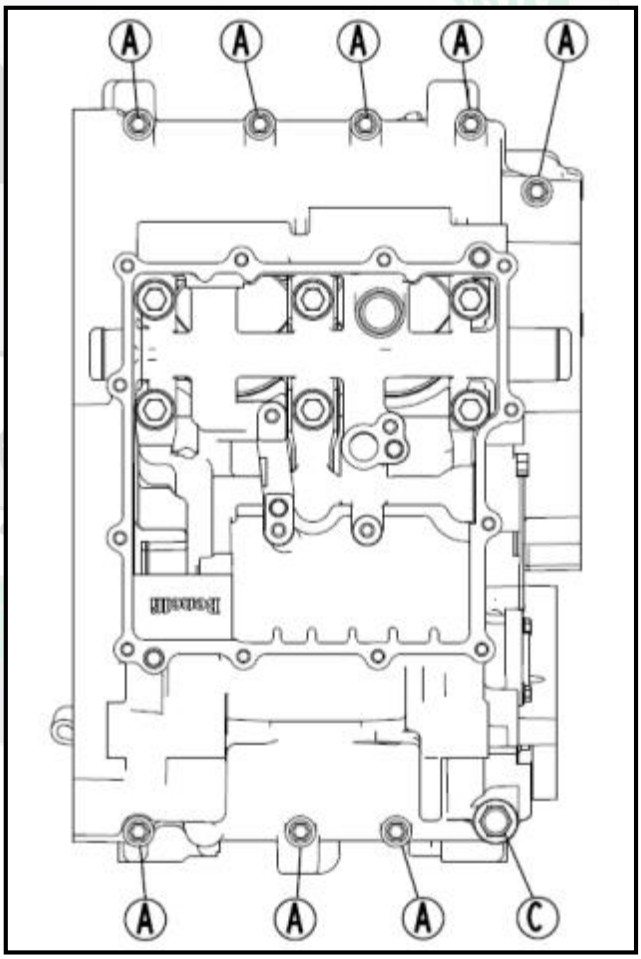


Crankcase

Crankcase

○ Lock:
M6 bolt [A]
M8 bolt [B] and gasket
M10 bolt [C] and gasket
Final locking torque:
Crankcase bolt (M6): 7.4 ft·lb (first tightening)
Crankcase bolt (M8): 18 ft·lb (second tightening: 7.4, 18)
Crankcase bolt (M10): 33 ft·lb
(third tightening: 7.4, 18, 33)





● Check the following items after locking all crankcase bolts.
● Check whether the crankshaft and transmission shaft can rotate smoothly.
● Check whether the gears can be smoothly shifted from first gear to neutral gear and vice versa when rotating the output shaft.
● Install the disassembled parts (see corresponding chapters).

Crankshaft and Connecting Rods

Crankshaft and Connecting Rods

Disassembly of the balancer shaft of crankshaft:

● Disassemble the crankcase (See detailed information at "Disassemble the crankcase")

● Disassemble the connecting rods (See detailed information at "Disassemble the connecting rods"

Hex nuts on crankshaft [E]

Driving gear of balance shaft [D]

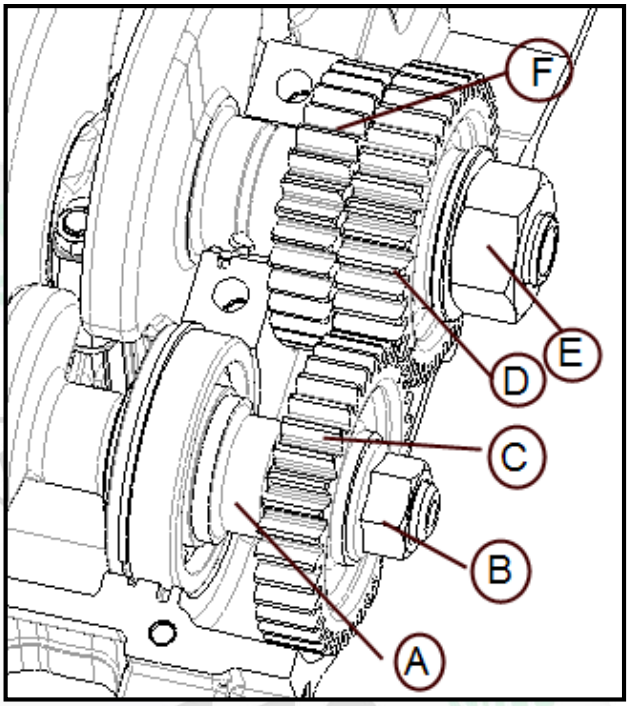
Driving gear [F]

Lock nut on balance shaft [B]

Balance shaft gear [C]

Axle sleeve [A]

● Disassemble the crankshaft and balance shaft from the crankcase.



Crankshaft and Connecting Rods

Crankshaft and Connecting Rods

Crankshaft assembly

Attention
To replace the crankshaft, crankshaft bushings or the upper crankcase/lower crankcase halves, select the appropriate bushing. Check the clearance with a plastic clearance gauge, and then assemble the engine this will aide selecting the appropriate bushing.

● Apply molybdenum disulfide oil solution on the principal axis bushing of the crankshaft.

● Install the connecting rod on the crankshaft (See details at "Connecting rod assembly").

● Assembly

Woodruff key

Driving gear [F]

Driving gear of the balance shaft [D]

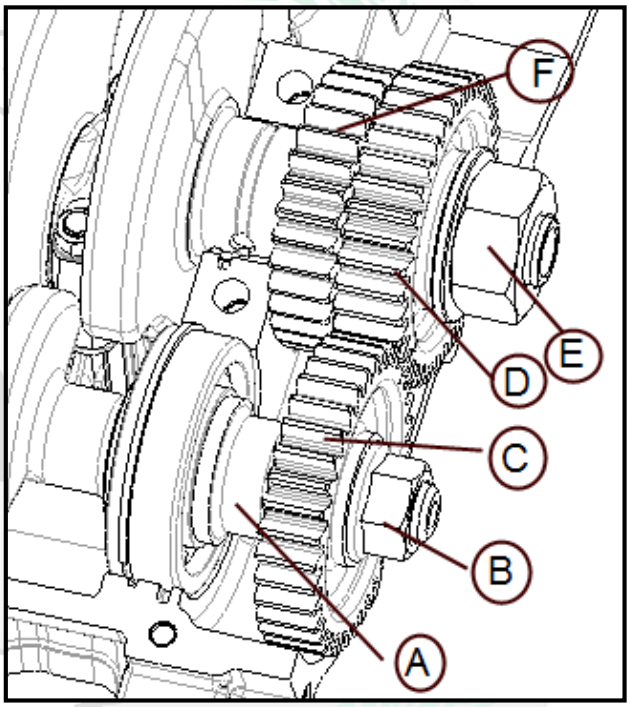
On the gasket

● Apply for tighten glue and lock the nuts [B]

Locking torque

Locking torque on the driving gear of balance shaft

60 N·m (6 kgf·m, 44 ft·lb)



Balance shaft assembly

● Rotate the crankshaft to top dead center (TDC)

● Assembly the balance shaft on the upper crankcase

● Assembly

Axle sleeve

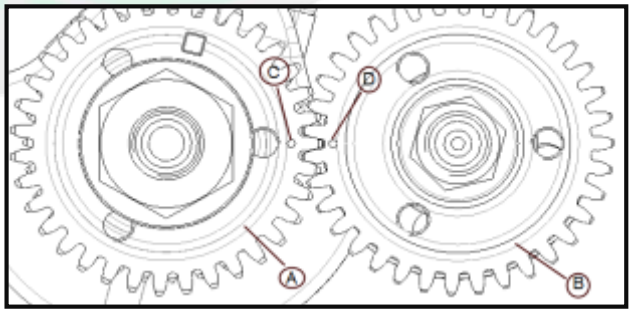
Woodruff key

Driven gear of the balance shaft. Align the mark [D] with the mark [C] on the driving gear of the balance shaft [A].

● Apply thread locking agent and lock the nuts

Locking torque

Locking torque of the driven gear of balance shaft 100 N·m (10.2kgf·m, 73.7ft·lb)



Crankshaft and Connecting Rods

Crankshaft and Connecting Rods

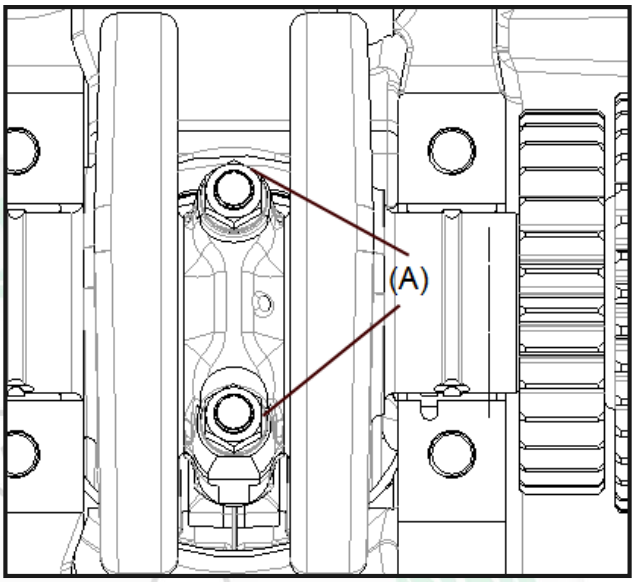
Connecting rod disassembly:

●Disassemble the crankcase (See detailed information at "Disassemble the crankcase")

● Disassemble:

Connecting rod nut [A]

Crankshaft



Note
● Make a mark on the connecting rod and connecting rod half ensure they do not get mixed up during reassembly.

● Disassemble the piston (See detailed information at "Disassemble the piston")

Attention
Discard the removed connecting rod bolts. To avoid damage to the crankshaft pin surface, it is necessary to ensure that the connecting rod bolts will not be knocked down to the crankshaft pin.

Crankshaft and Connecting Rods

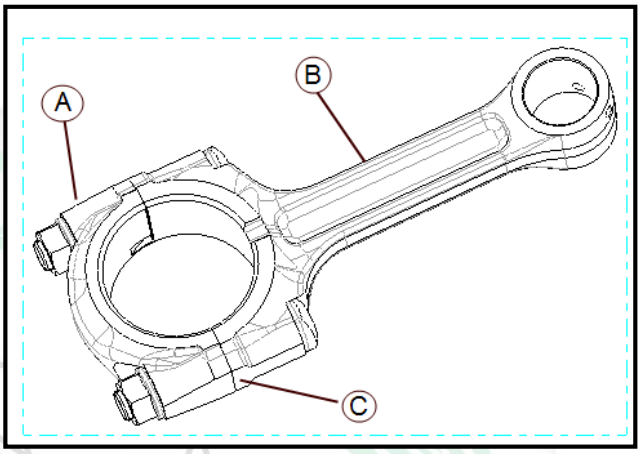
Crankshaft and Connecting Rods

Connecting rod assembly:

Connecting rod half [A]

Connecting rod [B]

Diameter symbol [C]: "A" or "B"

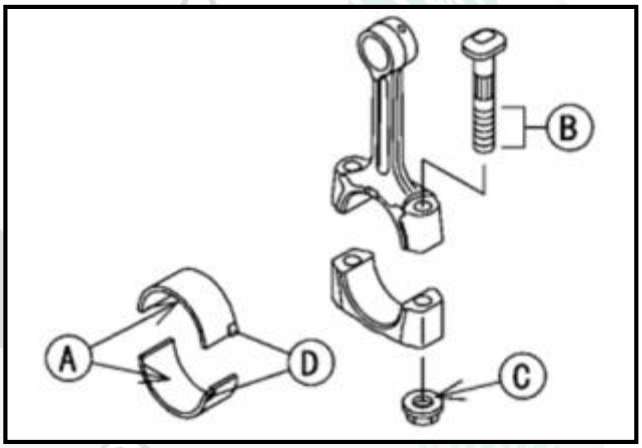


Attention
To replace the connecting rods, big end bearing, or crankcase, select the appropriate bushing. Check the clearance with a plastic clearance gauge, and then assemble the engine using the appropriate bushing.

● Apply molybdenum disulfide oil solution on the upper and lower inner surface of bushing [A].

● Apply molybdenum disulfide solution on the contact surface [B] of connecting rod nut and screw threads [B].

● Arrange the notches on the same side at installation of the bushing. Install the bushings into the notches of connecting rod and connecting rod half.



Attention
The bushing will be damaged if lubricating oil and grease are not applied correctly.

● Avoid damage to the bushing surface from the connecting rod edge [B] or connecting rod half [C] at the bushing assembly. The bushing assembly method is as shown below:

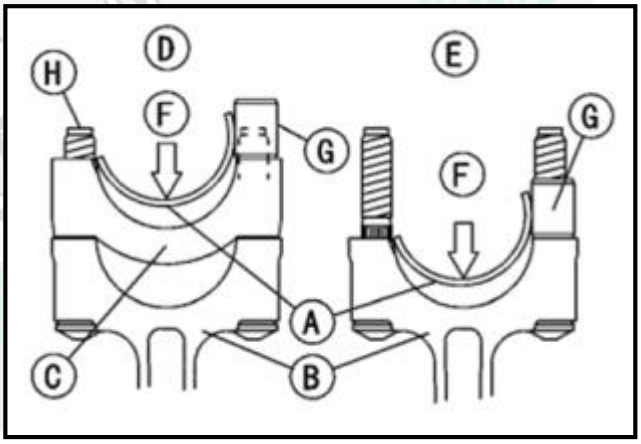
Connecting rod half assembly [D]

Connecting rod assembly [E]

Push [F]

Spare dowel pin [G]

Connecting rod bolt [H]



Crankshaft and Connecting Rods

Crankshaft and Connecting Rods

● Clean the surfaces of the bushings, as well as the bearing surfaces.

● Assemble the lower subsidiary cover of the lock to the connecting rod and align the diameter symbol.

● Assemble the crankcase (See detailed information at "Assemble the crankcase")

● Assemble each connecting rod to the original crankshaft pin.

● Lock the connecting rod big end by adopting "plastic zone fastening method"

● This approach can accurately achieve the required clamping force. Thus relatively finer and lighter bolts can be used to further reduce the weight of connecting rod.

● There are two plastic zone fastening methods in total. The first one is the bolt length measurement method and the other one is rotation angle method. You can choose either of the following methods. However, it is suggested to adopt bolt length measurement method since the big head nut can be fixed more reliably.

Attention
The connecting rod bolt is subject to elongating distortion thus secondary use is prohibited! Detailed information for the correct operating methods for screws, bolts and nuts is shown in the table below.

Attention
Do not over torque lock nuts! **The bolts should be placed on the contact surface correctly to avoid the bolt head colliding with the crankcase.**

Crankshaft and Connecting Rods

Crankshaft and Connecting Rods

Connecting rod inspection

(1) Bolt length measurement method

● Since all new connecting rods, bolts and nuts will be coated in antirust solution, the bolts, nuts and connecting rods must be completely cleaned with a solvent of high flash point to avoid torque reading errors.

⚠Warning

The bolts, nuts and connecting rods shall be cleaned in a place with excellent ventilation and to strictly avoid any sparks or flames around the operation area, including devices with indicator lights. Since gasoline or solvent of low flash points are extremely inflammable, it is recommended that you do not use them.

Attention

After cleaning, it is necessary to dry all of the bolts and nuts with compressed air immediately.
Bear in mind that the bolts and nuts should be rinsed thoroughly!

● Assemble a new bolt to the old connecting rod.

● As shown in Fig. [B], make dent marks on both bolt heads and bolt bottoms.

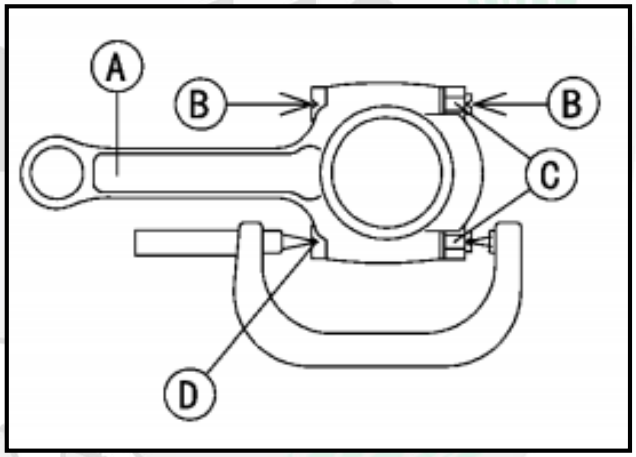
● Before torqueing the bolt, measure the length of the connecting rod bolt with a point micrometer and record the measurement so as to successfully calculate the elongated length after torqueing the bolt.

Connecting rod [A]

Make dent marks [B]

Nut [C]

Insert the micrometer pin into the dent mark [D].



● Apply molybdenum disulfide oil solution to the following places:

Screw threads on the nuts and bolts.

Contact surfaces of the nuts and connecting rods.

● Torque the nut until the bolt measurement reaches the value specified in the table below.

● Check the length of connecting rod bolt.

★ If the elongation amount exceeds application scope, it indicates over extension of the bolt. In the case of over extension of the bolt, the bolt will need to be replaced with a new one.

Bolt length after locking-bolt length after locking=bolt extension

Connecting rod assembly	Bolt	Nut	Application scope of connecting rod bolt elongation
New	Use bolts matching new connecting rod	Nut matching new connecting rod	0.25 ~ 0.34 mm (0.0098 ~ 0.0134 in.)
		New	
Old	Replace with new bolt	Old	0.25 ~ 0.34 mm (0.0098 ~ 0.0134 in.)
		New	

Crankshaft and Connecting Rods

(2) Rotating moment method

★ If there is no point micrometer available, the rotating moment method can be adopted to torque the nuts.

● The bolts, nuts and connecting rods shall be completely cleaned with a solvent of high flash point to avoid torque readings errors as the connecting rods, rod bolts, and nuts will be coated in an antirust agent.

⚠ Warning

The bolts, nuts and connecting rods shall be cleaned in a place with excellent ventilation and to strictly avoid any sparks or flames around the operation area, including devices with indicator lights. Since gasoline or solvent of low flash points are extremely inflammable, it is recommended that you do not use them.

Attention

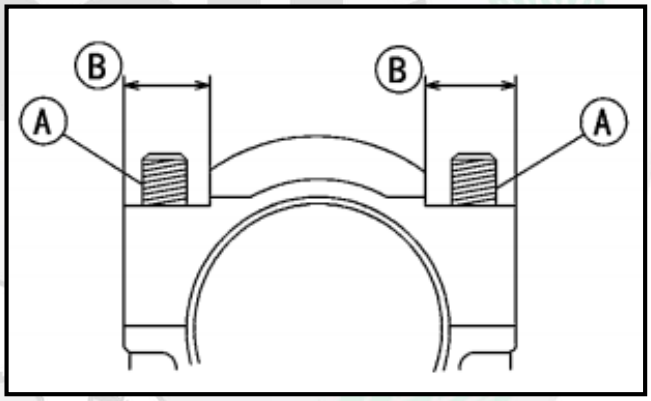
After cleaning, it is necessary to dry all of the bolts and nuts with compressed air immediately. Bear in mind that the bolts and nuts should be rinsed thoroughly!

● Assemble the new bolt to the old connecting rod.

● Apply molybdenum disulfide oil solution on the following sections:

Screw thread on nut and bolt [A]

Contact surface of nut and connecting rod [B]



● Tighten the nut applying the stipulated locking torque. See the table below:

Connecting rod assembly	Bolt	Nut	Moment N·m (kgf·m, ft·lb)
New	Use bolts matching new connecting rod	Nut matching new connecting rod	25 (2.5, 18.4) score 10 (1, 7.37), 20(2, 14.7) twice prefixation
		New	25 (2.5, 18.4) score 10 (1, 7.37), 20(2, 14.7) twice prefixation
Old	Replace with new bolt	Old	25 (2.5, 18.4) score 10 (1, 7.37), 20(2, 14.7) twice prefixation
		New	25 (2.5, 18.4) score 10 (1, 7.37), 20(2, 14.7) twice prefixation

Crankshaft/connecting rod cleaning

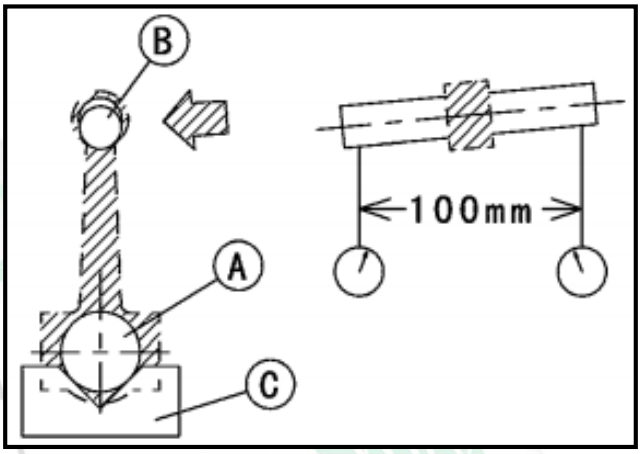
● After removing the connecting rod from crankshaft, clean the connecting rod with a solvent of high flash point.

● Discharge any foreign matter and residual oil in the crankshaft oil passages with compressed air.

Crankshaft and Connecting Rods

Crankshaft and Connecting Rods

Check the bend amount of the connecting rod:



● Disassemble the connecting rod big end bushing. Then assemble the lower subsidiary cover of the lock to the connecting rod.

● Select a mandrel with a diameter equal to that of connecting rod big end [A]. Then insert the mandrel from the connecting rod big end.

● Select a mandrel with a diameter equal to that of piston pin, and a length of at least 100mm (3.94 in.). Then insert the mandrel from the connecting rod small end.

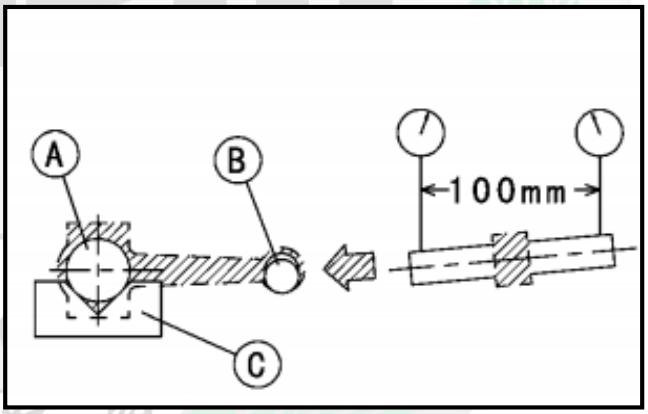
● Place the mandrel of connecting rod big end on the V block [C] on the slab.

● Fix the connecting rod vertically. Measure the difference value of mandrel height over 100mm (3.94 in.) on the slab with a height gauge to determine the bend amount of connecting rod.

★ If the bend amount of connecting rod exceeds the service limit, the connecting rod shall be replaced.

Bend amount of connecting rod
Service limit: TIR 0.2/100 mm (0.008/3.94 in.)

Check the warp amount of connecting rod:



● Fix the big head of mandrel [A] on V block [C]. Horizontally replace connecting rod. Measure the offset of mandrel in mandrel [B] 100 mm (3.94 in.) length parallel to slab to determine the warp amount of connecting rod.

★ If the warp amount of connecting rod exceeds the service limit, the connecting rod shall be replaced.

Warp amount of connecting rod
Service limit: TIR 0.2/100 mm (0.008/3.94 in.)

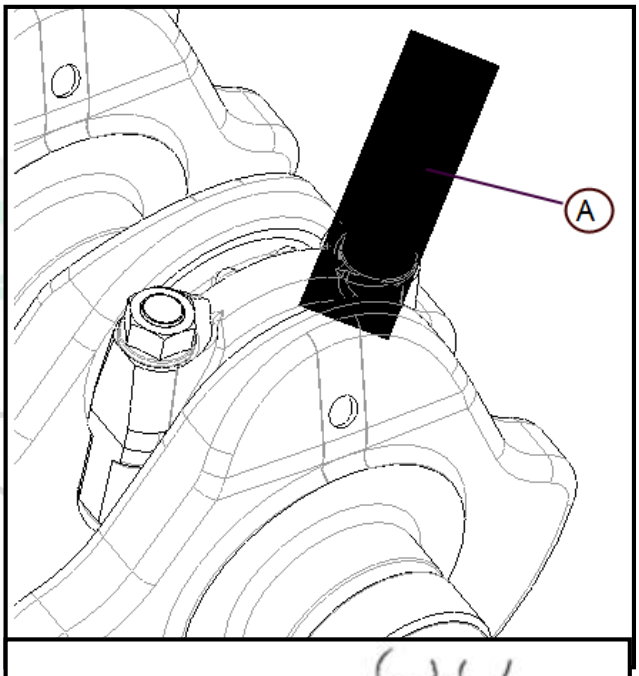
Crankshaft and Connecting Rods

Crankshaft and Connecting Rods

Check the side clearance of the connecting rod big end:

● Measure the side clearance of the connecting rod big end.

● Insert a feeler gauge [A] between the big end and balance weight of the crankshaft to measure the clearance between them.



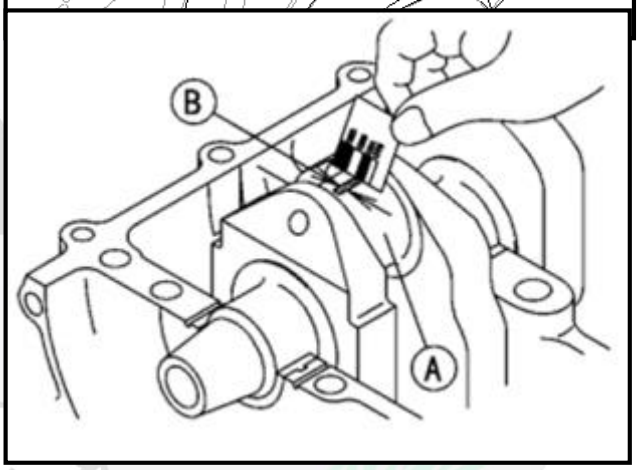
Side clearance of Connecting Rod Big End
Standard: 0.1~0.25 mm (0.0039~0.0098 in.)
Service limit: 0.38 mm (0.015 in.)

★ If the side clearance exceeds service limit, replace the connecting rod then re-check the side clearance. If the side clearance after replacing the connecting rod is too big, it is necessary to replace the crankshaft.

Check the abrasion of the connecting rod big end bearing bushing/crankshaft pin:

● Check the clearance between the bushing/crankshaft pin [A] with a plastigauge [B].

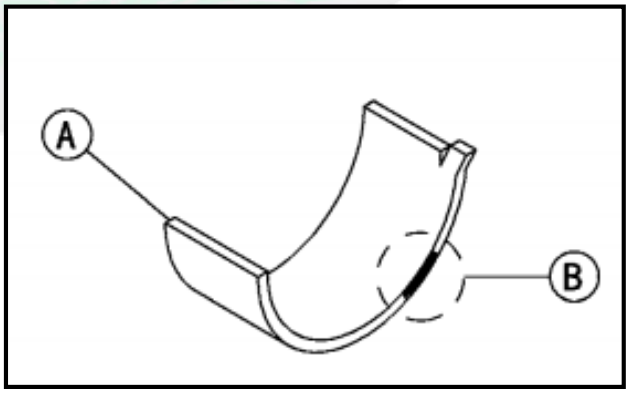
● Lock the nuts of the connecting rod big end with the stipulated torque (See detailed information of "connecting rod assembly")



Notes
● Do not rotate the connecting rod and crankshaft during the clearance measuring process!

Attention
Replace the connecting rod bolts after measuring the clearance.

Clearance of the connecting rod big end bushing/crankshaft pin
Standard: 0.028~0.052 mm (0.0011~0.0020 in.)
Service limit: 0.07mm (0.0027 in.)



★ If the measured clearance is within the standard, do not replace the bushing.

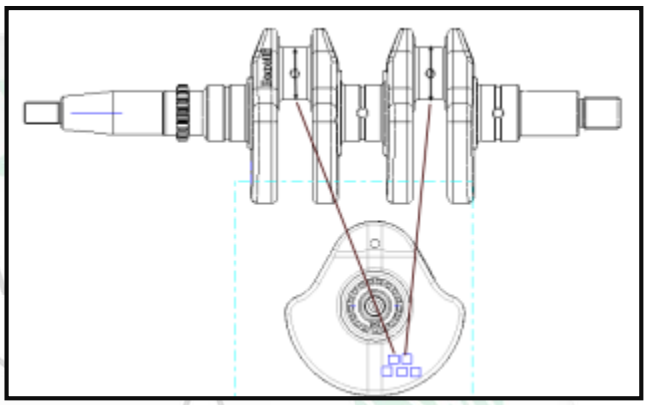
★ If the measured clearance is between 0.052 mm (0.0020 in.) and service limit (0.07 mm, 0.0027 in.), replace the current bushing [A] with one marked with blue paint [B]. Check the clearance between the bushing/crankshaft pin with a plastigauge. The measured clearance can slightly exceed the standard, but shall not be lower than the minimum value to prevent bushing galling.

★ If the clearance value exceeds the service limit, measure the diameter of crankshaft pin.

Crankshaft and Connecting Rods

Crankshaft and Connecting Rods

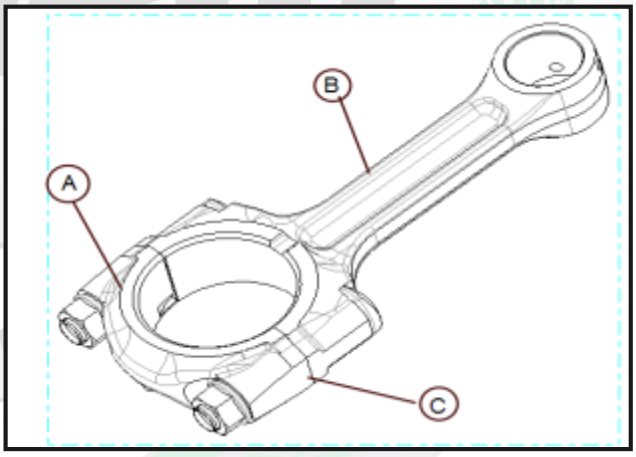
Diameter of crankshaft pin
Standard: 29.962~29.976 mm (1.1796~1.1801 in.)
Service limit: 29.91 mm (1.1775 in.)



★ If the measurement of any of the crankshaft pins exceeds the lower maintenance limit, replace it with a new crankshaft.
★ If the measured crankshaft pin diameter is equal to or higher than the lower maintenance limit, and the original diameter symbol on the crankshaft is inconsistent, replace it with a crankshaft of a different symbol.
Diameter symbol for crankshaft pin measurement:
A. 29.969 ～ 29.976 mm (1.1799 ～ 1.1801 in.)
B. 29.962 ～ 29.968 mm (1.1796 ～ 1.1798 in.)
△: Diameter symbol of crankshaft pin: "A" or "B"

● Measure the inner diameter of the connecting rod big end. Make corresponding marks on the connecting rod big end according to the measured inner diameter.
● Torque the connecting rod big end nuts to the stipulated locking torque (See detailed information of "connecting rod assemble")

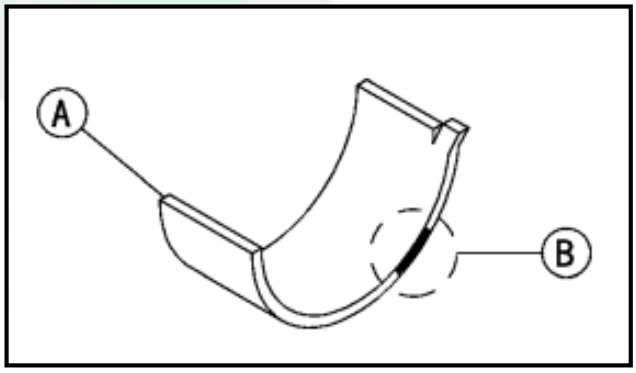
Notes
● The measured result and connecting rod big end shall be approximate to original symbols.



Inner diameter symbol of connecting rod big end:
A. 33.000 ～ 33.008 mm (1.2992 ～ 1.299 5 in.)
B. 33.009 ～ 33.016 mm (1.2995 ～ 1.2998 in.)
Connecting rod cap [A]
Connecting rod body [B]
Diameter symbol [C]: "A" or "B"

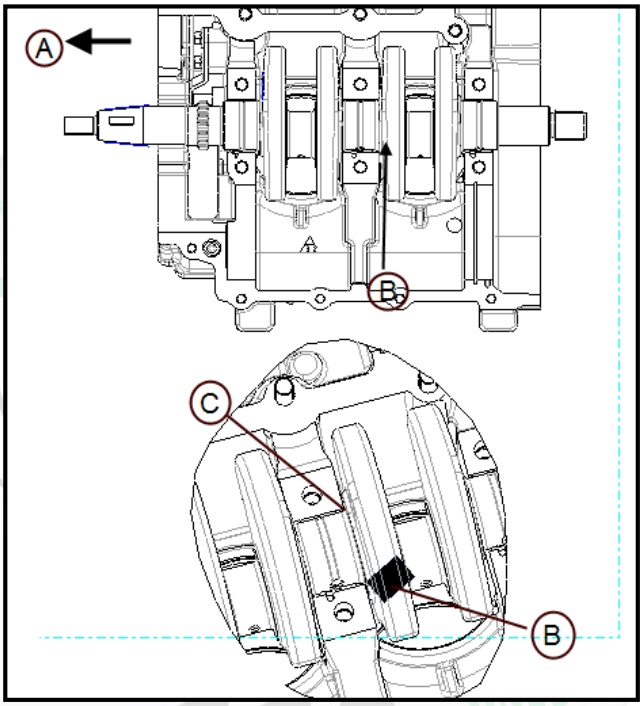
● Select the appropriate bushing according to the combination of the connecting rod and crankshaft color codes [A]. Size color [B].

Inner diameter symbol of connecting rod big end	Diameter symbol of crankshaft pin	Bearing bush	
		Size color	Part number
A	A	Yellow	170116030000
B	A	Green	170116030000
A	B		
B	B	Blue	170116030000



Crankshaft and Connecting Rods

● Assemble the new bushing to the connecting rod. Measure the clearance between bushing/crankshaft pin with a plastigauge.



Check the side clearance of the crankshaft:

● Move the crankshaft [A] toward the crankshaft transmission chain.

● Insert a feeler gauge [B] into the #2 main oil duct end and crankshaft end [C] of the crankcase to measure the clearance.

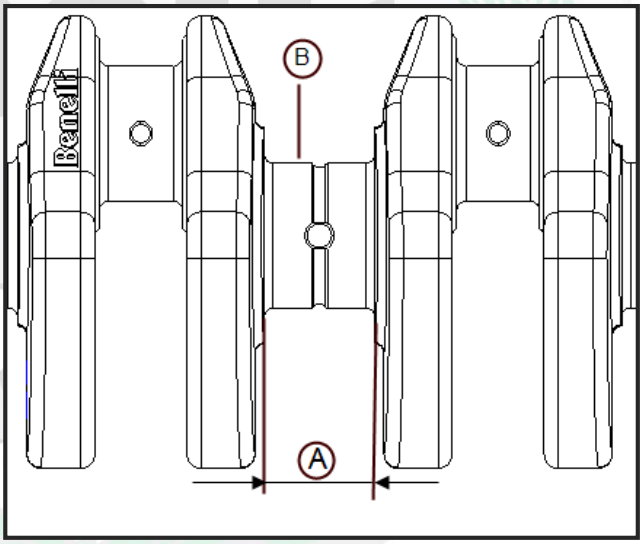
Side clearance of the crankshaft
Standard: 0.10~0.25 mm (0.0039~0.0098 in.)
Service limit: 0.30mm (0.0118 in.)

Notes
● The crankcase shall be replaced as a complete set.

● Check the width of the #2 main oil duct

● Check the width of the #2 main oil duct [A]

★ If the measured value exceeds the standard value, replace the crankshaft [B].

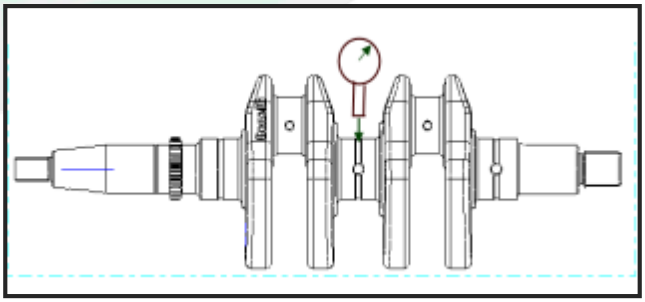


The width of the #2 main oil duct of crankshaft
Standard: 24.00~24.05 mm (0.9449~0.9468 in.)

Measure the radial oscillating measurement of the crankshaft.

● Set both ends of the crankshaft on a rotational jig. Measure the radial oscillation of the crankshaft.

★ If the measured value exceeds the standard value, replace the crankshaft.



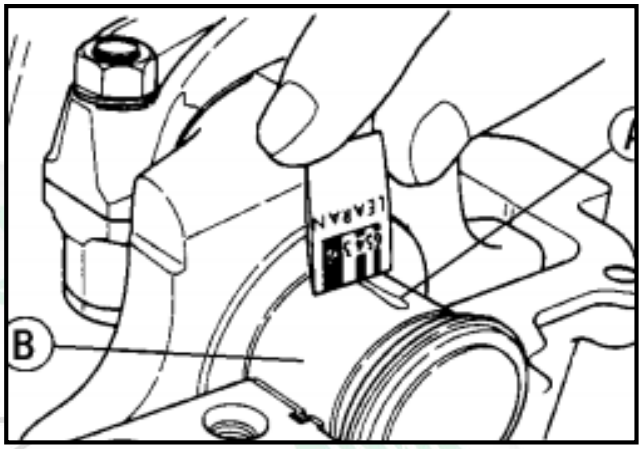
Radial oscillating quantity of crankshaft.
Standard: ≤TIR 0.02mm (0.0008in.)
Service limit: TIR 0.06 mm (0.0024 in.)

Crankshaft and Connecting Rods

Crankshaft and Connecting Rods

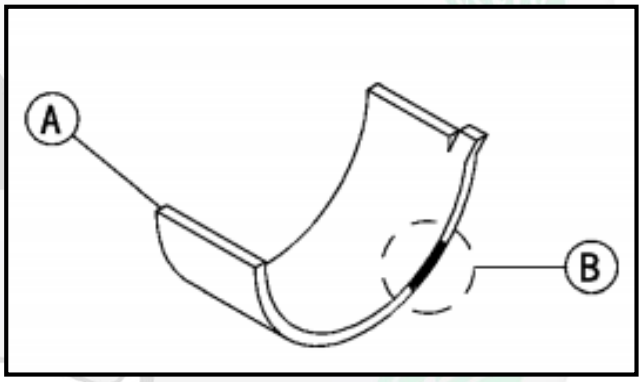
Check the wear of the main bushings of the crankshaft/oil duct:

● Check the clearance between the bushing/oil duct [B] with a plastigauge [A].



Notes
● Lock the crankcase bolt with the stipulated torque (See detailed information for "Crankcase assembly"). ● Do not rotate the crankshaft during the clearance measuring process! ● Oil duct clearance less than 0.025mm (0.00098 in.) cannot be measured with a plastigauge. Original parts enable the clearance satisfying the minimum standard.

Clearance of crankshaft principal axis bushing/oil duct
Standard: 0.022~0.045 mm (0.0009~0.0018in.)
Service limit: 0.06 mm (0.0024 in.)

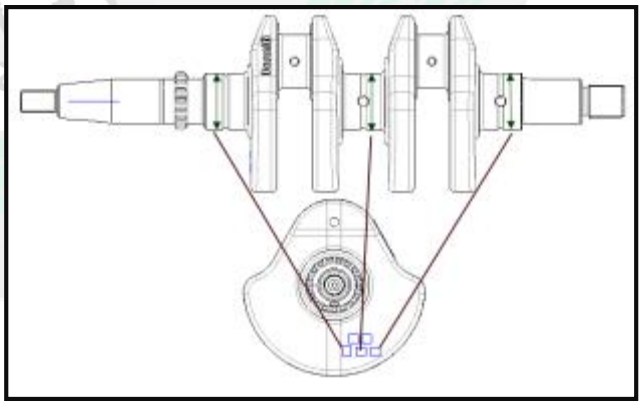


★ If the measured clearance is within the aforementioned standard, it is not required to replace the bushing.

★ If the measured clearance is between 0.046 mm (0.002 in.) and the service limit (0.06 mm, 0.0024 in.), replace the current bushing [A] with that with black paint [B]. Check the clearance between the bushing/crankshaft pin with a plastigauge. The measured clearance can slightly exceed the standard, but shall not be lower than the minimum value to prevent the bushing from galling.

★ If the clearance value exceeds the service limit, measure the diameter of the main oil duct of the crankshaft.

Diameter of the main oil duct of crankshaft
Standard: 31.958~31.972 mm (1.2582~1.2587 in.)
Service limit: 31.94 mm (1.2575 in.)



★ If the wear of any of the oil ducts exceeds the service limit, replace with a new crankshaft.

★ If the measured oil duct diameter is not lower than the service limit, and the original diameter symbol on the crankshaft is inconsistent, replace it with a crankshaft of a different symbol.

Diameter symbol of the main oil duct of crankshaft

1 31.965 ～ 31.972 mm (1.2585 ～ 1.2587 in.)

2 31.958 ～ 31.965 mm (1.2582 ～ 1.2585 in.)

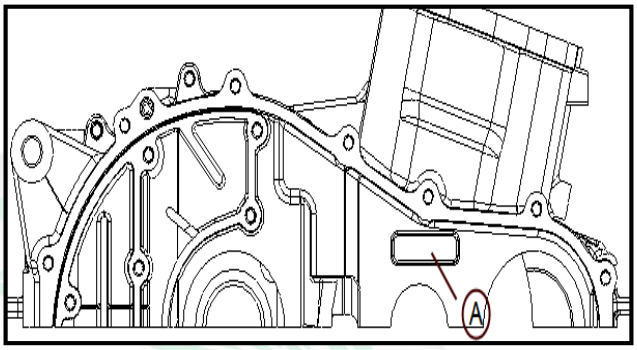
□: Diameter symbol of the main oil duct of the crankshaft: “1” or "2".

Crankshaft and Connecting Rods

● Measure the inner diameter of the principal axis bushing. Make corresponding marks on the crankcase according to the measured inner diameter.

A: Inner diameter symbol of the principal axis bushing of crankshaft: "01", "02" or "03".

● Torque the crankcase bolts with the stipulated locking torque (See detailed information for "Crankcase assembly").



Notes
● The measured results shall be approximate to the original symbols of the upper part of crankcase.

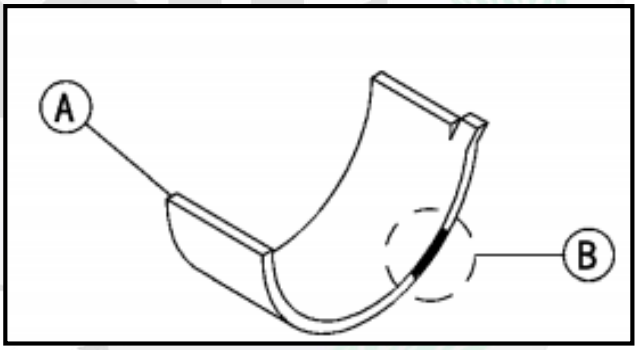
Inner diameter symbol of the principal axis bushing of crankshaft

01 35.000 ～ 35.007 mm (1.3779 ～ 1.3782 in.)

02 35.007 ～ 35.014 mm (1.3782 ～ 1.3785 in.)

03 35.014 ～ 35.021 mm (1.3785 ～ 1.3788 in.)

● Select the appropriate bushing according to the combination of connecting rod and crankshaft code [A]. Size color [B]



Inner diameter symbol of the principal axis bushing of crankshaft	Spindle oil duct diameter symbol of the crankshaft	Bushing *	
		Size color	Part number
01	1	Yellow	150026030000
02	1	Green	150026030000
01	2		
02	2	Blue	150026030000
03	1		
03	2	Red	150026030000

● Assemble the new bushing into the upper crankcase and lower crankcase. Measure the clearance between the bushing/oil duct with a plastigauge.

Pistons

Pistons

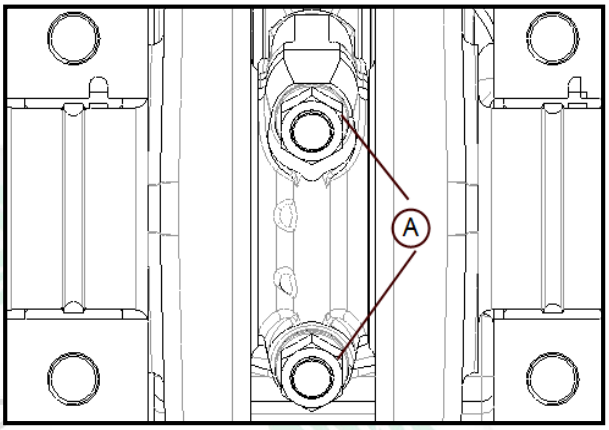
Disassemble the piston:

● Disassemble the crankcase (See detailed information at "Disassemble the crankcase")

● Disassemble:

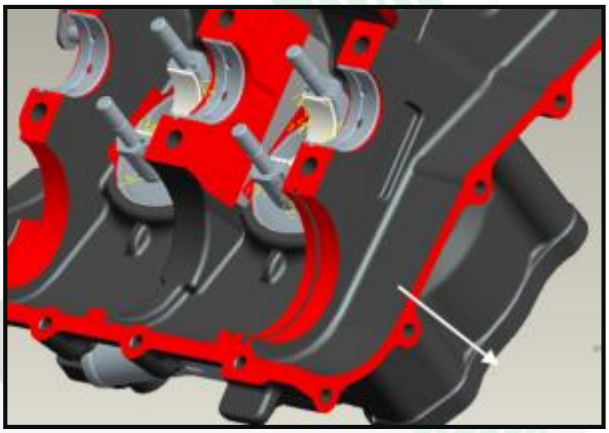
Connecting rod nuts [A]

Connecting rod half at the lower end of the connecting rod.



● Disassemble the crankshaft.

● Push the pistons out in the direction of the cylinder head.



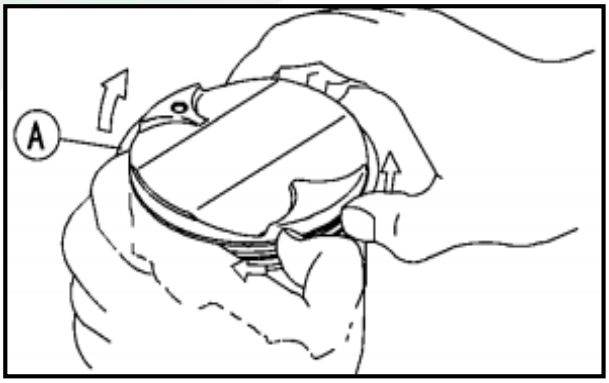
● Disassemble the piston pin clip [A].

● Disassemble the piston pin.

● Disassemble the piston.

● Use your thumbs to carefully remove the piston rings. Lift at the back of the piston ring [A] to remove the piston ring.

● Disassemble the compound oil ring with your thumbs according to the same method (including three components).

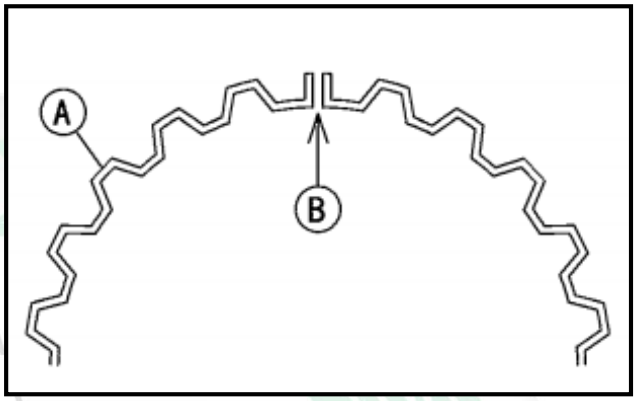


Pistons

Pistons

Piston assembly:

● Apply molybdenum disulfide oil solution on the bushing ring of compound oil ring. Assemble the bushing ring of compound oil ring on the piston ring bottom. Do not overlap the two sides of the bushing ring [B].

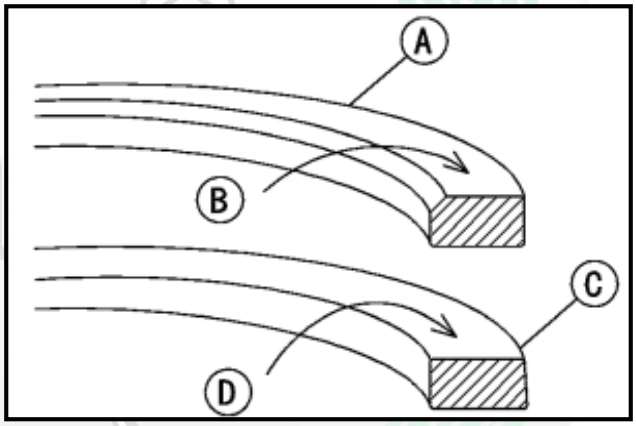


● Apply molybdenum disulfide oil solution on the scraper of the compound oil ring. Then assemble the compound oil ring and scraper ring. Assemble one on the upper side of the bushing ring, and the other on the lower side of the bushing ring.

● Open the scraper ring with your thumbs carefully. It should not be overstretched. Put the scraper ring on the piston.

● Loosen the scraper ring. Make it drop to the piston ring at the bottom.

Notes
● Scraper ring is not located at the "top" or "bottom".



● Do not confuse the top piston ring and the secondary piston ring!

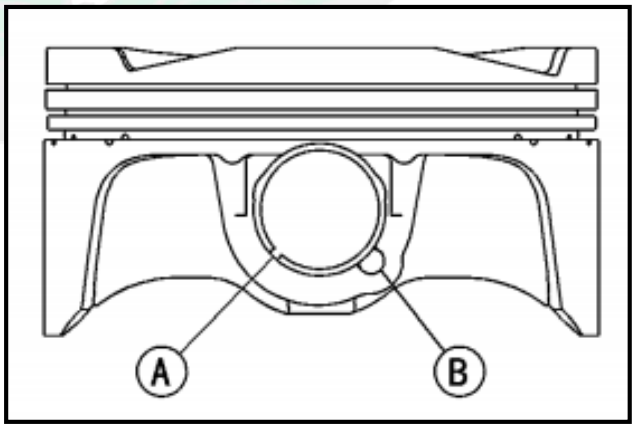
● While assembling the top piston ring, the symbol "DY" [B] should be upward.

● While assembling the secondary piston ring, the symbol "D" [D] should be upward.

● Apply molybdenum disulfide oil solution to the piston rings.

Notes
● When replacing the pistons, also replace the piston rings. Never use old rings with new pistons.

● Install a new piston pin clip into the piston. Line up the opening of the piston pin clip [A] with the hole on the piston side [B].



● Apply molybdenum disulfide oil solution on the piston pin and piston pin hole.

● Do not use force to assemble the piston pin clip.

Attention
Do not reuse the piston pin clip ring. The clip ring will be deformed, have weakened locking force, or can fall off and scratch the cylinder wall.

Pistons

Pistons

● The piston ring openings shall be assembled as shown in the right figure. The opening of the compound oil ring shall present an angle of 30～40° with the opening of piston ring.

Top piston ring [A]

The secondary piston ring [B]

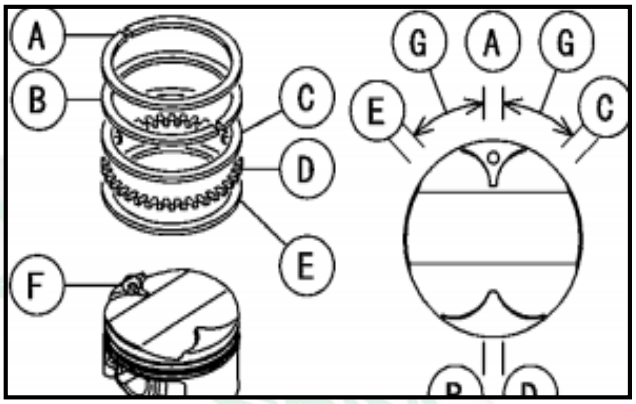
Upper scraper ring assembly [C]

Bushing ring of compound oil ring [D]

Lower scraper ring assembly [E]

Hole [F]

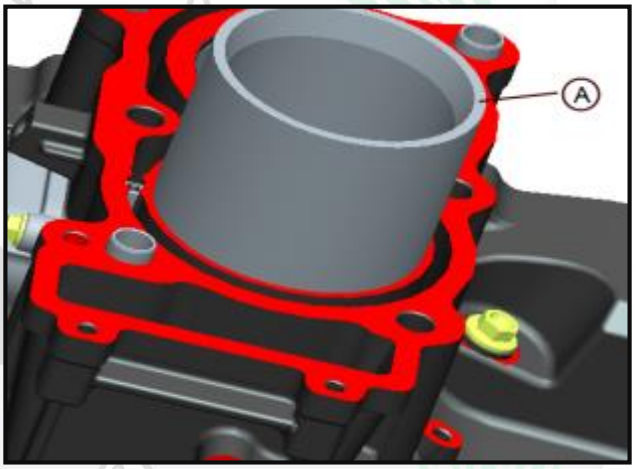
30～40°[G]



● The symbol shall be on the intake side during piston assembly.

● Install the piston with a piston ring installation tool [A] from the side of piston ring.

Special Tool - Piston ring compressor tool



● Assembly:

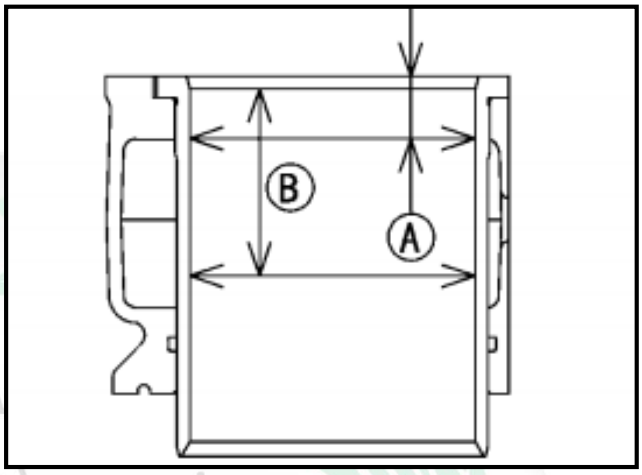
Crankcase (See detailed information at "Assemble the crankcase")

Connecting rod cover at the lower end of the connecting rod (See details at "Connecting rod assembly").

Pistons

Pistons

Check abrasion status of the cylinder bore (upper crankcase):



● Due to different abrasion status of the cylinder bore (upper crankcase), perform the measurement from one side to the other side, from the front to the back (four times in total) as shown in the two positions of the right diagram.

★ If any inner diameter measurement values of the cylinder bore exceeds the service limit, replace the crankcase!

10 mm (0.39 in.) [A]

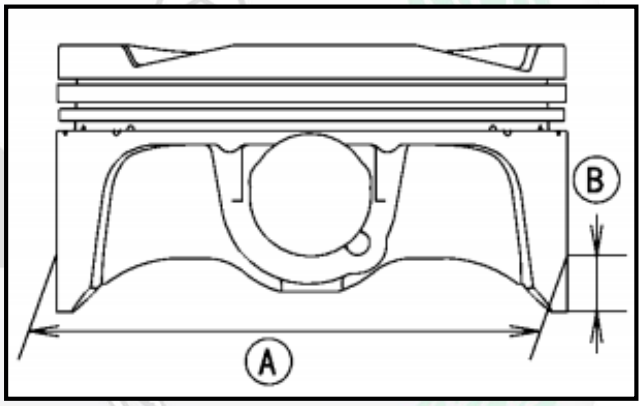
60 mm (2.36 in.) [B]

Inner diameter of cylinder bore (upper crankcase)

Standard: 65.010 ~ 65.020 mm (2.5594 ~ 2.5598 in.)

Service limit: 65.10 mm (2.5630 in.)

Check the piston abrasion:



● Measure the outer diameter of each piston [A] at a position 10mm (0.39 in.) [B] away from the piston bottom vertical to the piston pin.

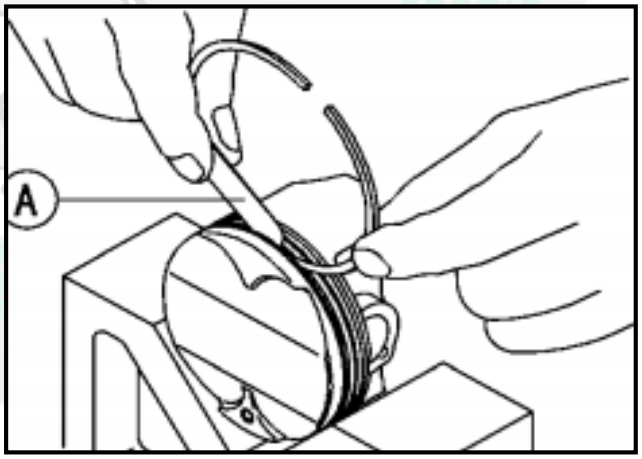
★ If the measured value is less than the lower limit, replace the piston!

Piston diameter

Standard: 64.97 ~ 64.98 mm (2.5579 ~ 2.5583 in.)

Service limit: 64.90 mm (2.5551 in.)

Check the abrasion of the piston rings and piston ring grooves:



● Check the base of the piston ring to determine whether the circular groove is subject to uneven wear.

★ The piston ring shall be totally parallel to the surface of its groove, otherwise pistons and piston rings shall be replaced.

● When the piston rings are in the circular groove, measure with a feeler gauge [A] several times to determine the clearance of the piston rings/piston ring grooves.

Clearance of piston ring/piston ring groove

Standard:

Top piston ring: 0.05 ~ 0.09mm (0.0020 ～ 0.0035in.)

The secondary piston ring: 0.77 ~ 0.79 mm (0.0303 ~ 0.0307 in.)

Service limit:

Top piston ring: 0.17mm (0.0067 in.)

The secondary piston ring: 0.16 mm (0.0063 in.)

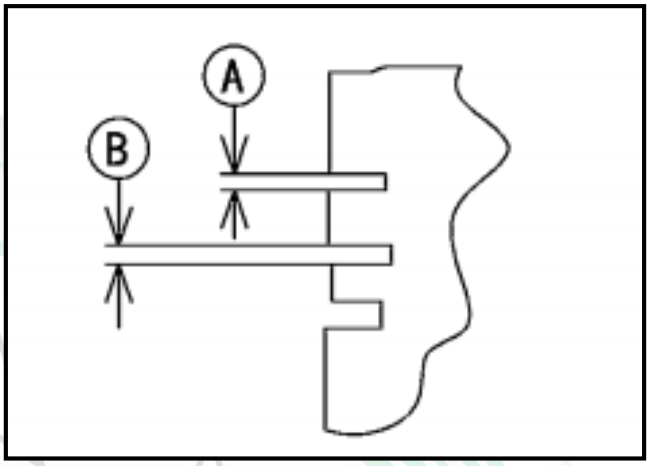
Pistons

Pistons

Check the width of piston circular groove:

● Measure the width of piston circular groove

● Measure the width of piston circular groove with a vernier caliper at different measuring points.



Width of piston circular groove

Standard:

Top piston ring [A]: 0.83 ~ 0.85mm (0.0327 ~ 0.0335 in.)

The secondary piston ring [B]: 0.83 ~ 0.85mm (0.0327 ~ 0.0335 in.)

Service limit:

Top piston ring [A]: 0.90mm (0.0354 in.)

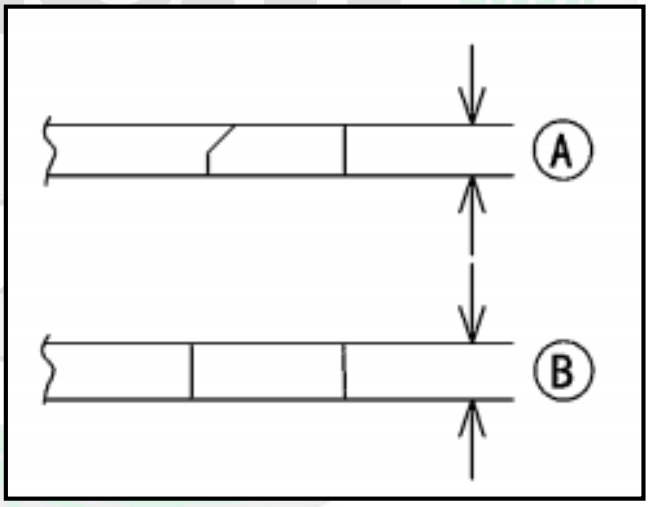
The secondary piston ring [B]: 0.90mm (0.0354 in.)

★ If the width of any of the piston circular grooves measured at any point is greater than the service limit, please replace the piston!

Check the thickness of the piston rings:

● Check the thickness of the piston rings

● Measure the width of the piston circular groove with a micrometer at different measuring points.



Thickness of piston ring

Standard:

Top piston ring [A]: 0.76 ~ 0.78 mm (0.0299 ~ 0.0307 in.)

The secondary piston ring [B]: 0.77 ~ 0.79 mm (0.0303 ~ 0.0307 in.)

Service limit:

Top piston ring [A]: 0.73mm (0.0287 in.)

The secondary piston ring [B]: 0.74mm (0.0291 in.)

★ If the width of any of the piston rings is lower than the service limit, please replace all the piston rings!

Notes
● If a new piston ring is used on an old piston, check if the piston circular groove is subject to uneven wear. The piston rings shall be totally parallel to the surface of circular groove, otherwise the pistons shall be replaced.

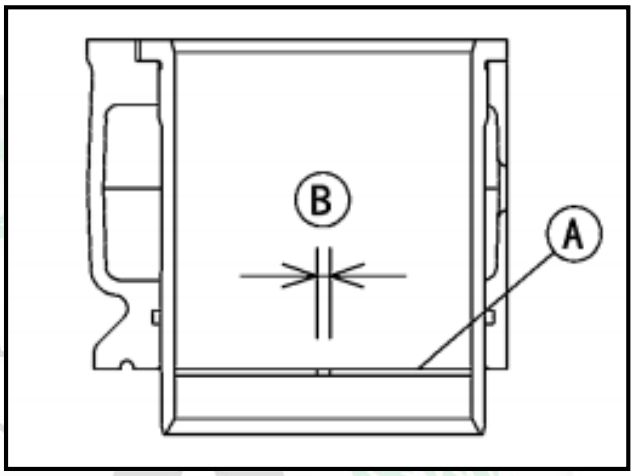
Pistons

Pistons

Check the open clearance of the piston rings:

● Put the piston rings [A] into the cylinder bore (upper crankcase). Move the piston ring into the cylinder bore bottom by utilizing a piston, due to the reduced wear at the cylinder bottom.

● Measure the open clearance of piston ring with a feeler gauge [B].



Open clearance of piston rings:
Standard:
Top piston ring: 0.15 ~ 0.30mm (0.0059 ~ 0.0118 in.)
Secondary piston ring: 0.25 ~ 0.45 mm (0.0098 ~ 0.0177 in.)
Oil ring: 0.20 ~ 0.70 mm (0.0079 ~ 0.0276 in.)
Service limit:
Top piston ring: 0.4mm (0.0157 in.)
Secondary piston ring: 0.65 mm (0.0256in.)
Oil ring: 1.0 mm (0.039 in.)

★ If the open clearance of the piston ring is higher than the service limit, please replace all the piston rings!

Electric Start System

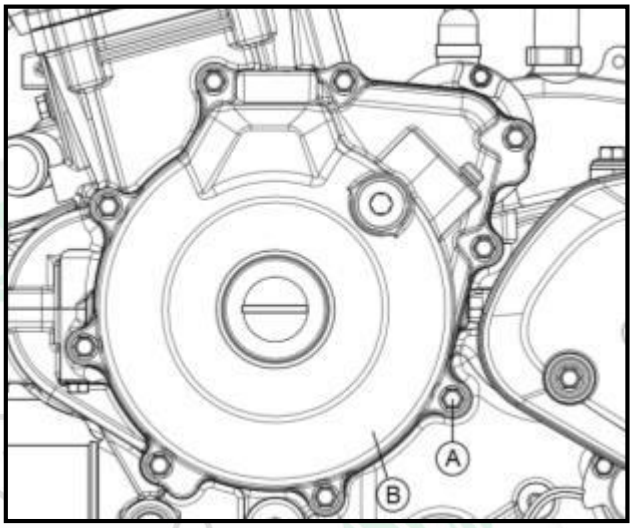
Electric Start

Disassemble the left cover:

● Disassemble the engine (See "Disassemble/assemble"-"Disassemble the engine")

● Remove the left engine cover bolts [A]

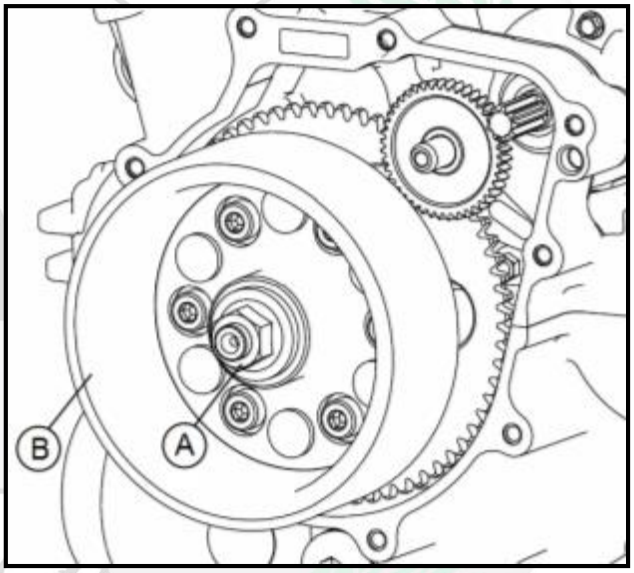
● Disassemble the left engine cover [B]



Disassemble the flywheel

● Remove the flywheel lock nut [A]

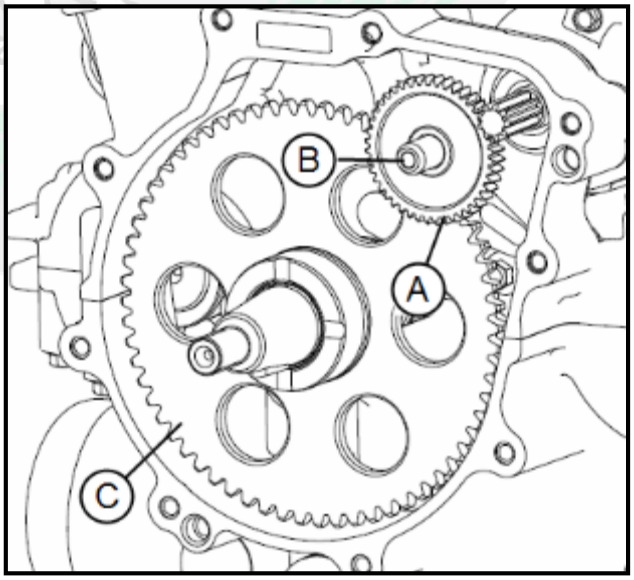
● Remove the flywheel [B]



Disassemble the electric starting idle gear and starter clutch gear:

● Remove the electric starting idle gear and starting idler shaft.

● Remove the starter clutch gear.



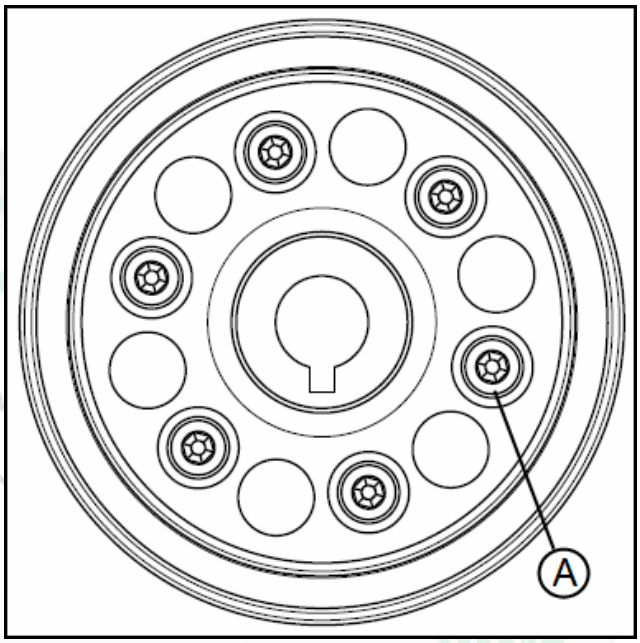
Electric Start System

Electric Start

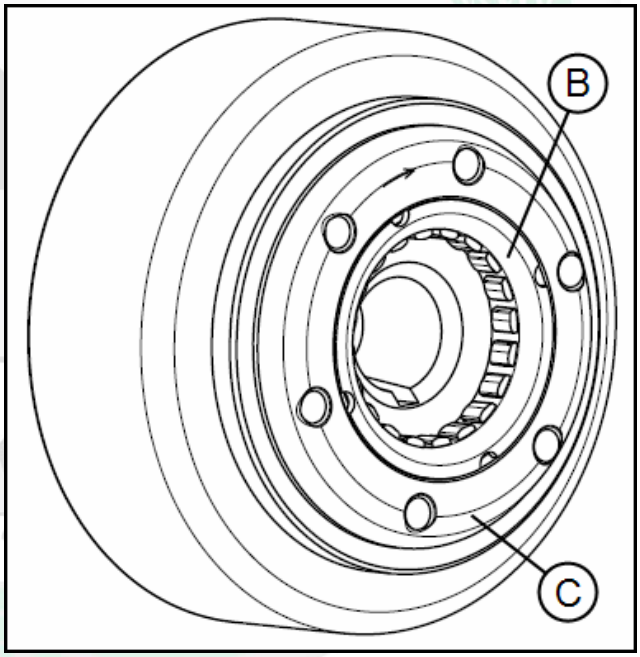
Disassemble the starting clutch:

● Disassemble the flywheel (See detailed information at "Disassemble the flywheel")

● Remove the bolts for the starter clutch [A]



● Remove the starting clutch [B] and the retainer ring for the starting clutch [C].



Electric Start System

Electric Start

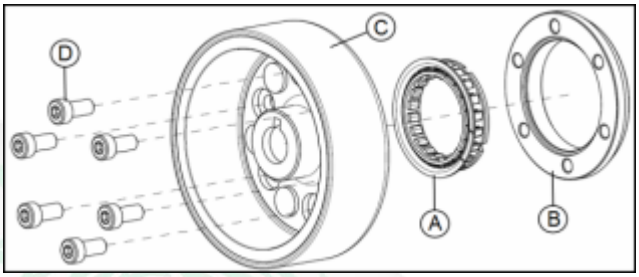
Installation of the starter clutch:

● Disassemble the starting clutch [A] and the retainer ring for the starting clutch [B] on the flywheel [C].

● Install the bolts for the starting clutch [D].

● Apply threaded locking adhesive on the bolt threads of the starting clutch bolts.

Locking torque of the starter clutch bolts [D]：20 N·m (2.04 kgf·m, 15 ft·lb)



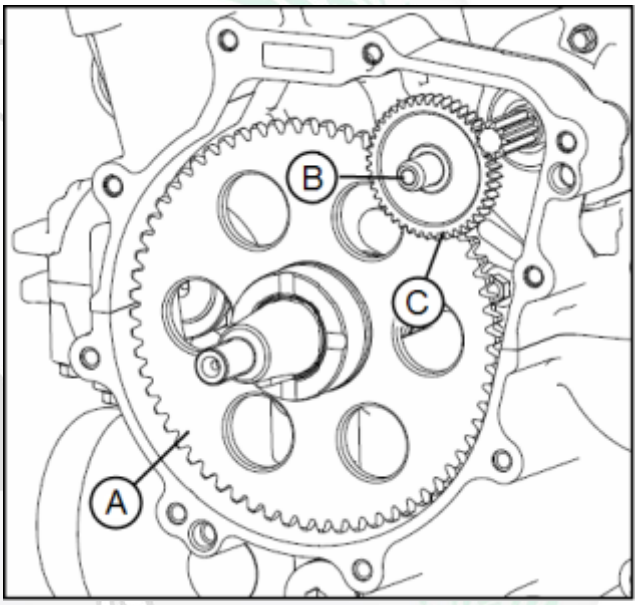
Assemble the starting clutch gear and electric starting idler gear:

● Assemble the starting clutch gear [A]

● Assemble the electric starter idler gear [C] and starter idler shaft pin [B].

● Apply molybdenum disulfide lubricating grease on the starter gear idler shaft.

● Assemble the electric starter idler gear [C].



Flywheel assembly

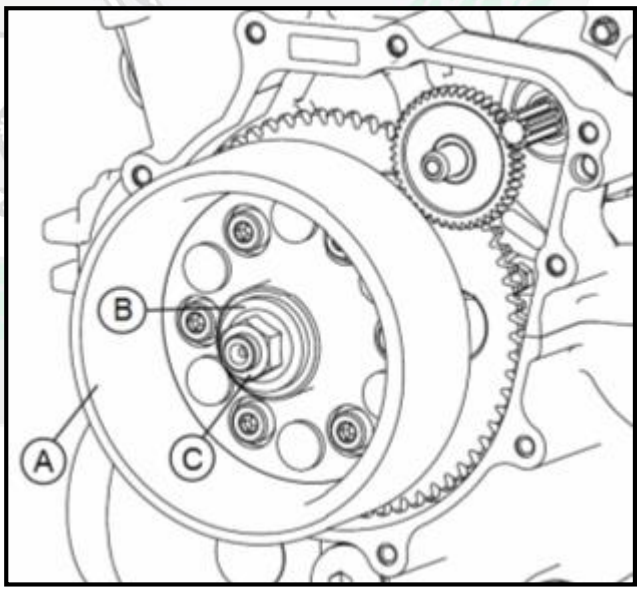
● Assemble the starter clutch (See detailed information at "Overrun clutch assembly")

● Flywheel assembly [A]

● Locking Washer assembly [B]

● Flywheel lock nut assembly [C]

Locking torque of the flywheel lock nut: 100 N·m (10.2 kgf·m, 74 ft·lb)



Electric Start System

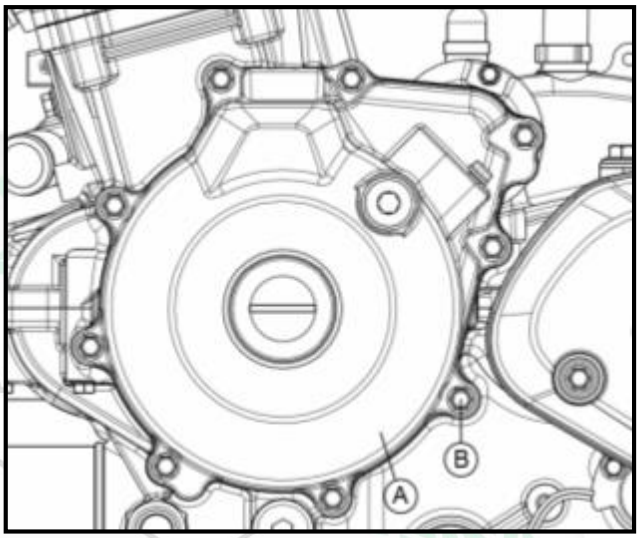
Electric Start

Left cover assembly:

● Left cover assembly.

● Left cover bolts assembly.

Locking torque of the left cover bolts：12N·m (1.22 kgf·m, 9 ft·lb)



Check the starting clutch:

● Disassemble:

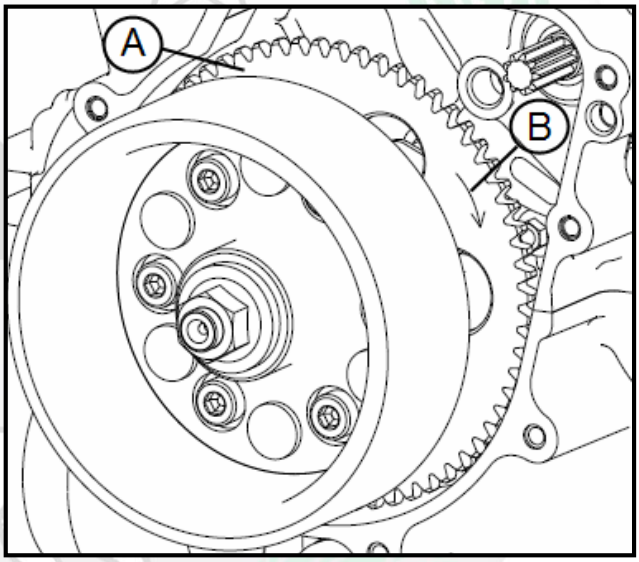
Left engine cover (See detailed information at "Left cover disassembly")

Electric starting idler and starting idler shaft (See detailed information at "Disassemble of starting big gear and electric starting idler").

● Rotate the starter clutch gear by hand [A].

From the left side of the engine, the starter clutch gear shall rotate smoothly rearward [B], but not forward.

★ If the starting clutch gear does not work as described above, or makes noise, disassemble the starter clutch and visually inspect every part. In the case of any worn or damaged parts, please replace them!



Gear Change Mechanism

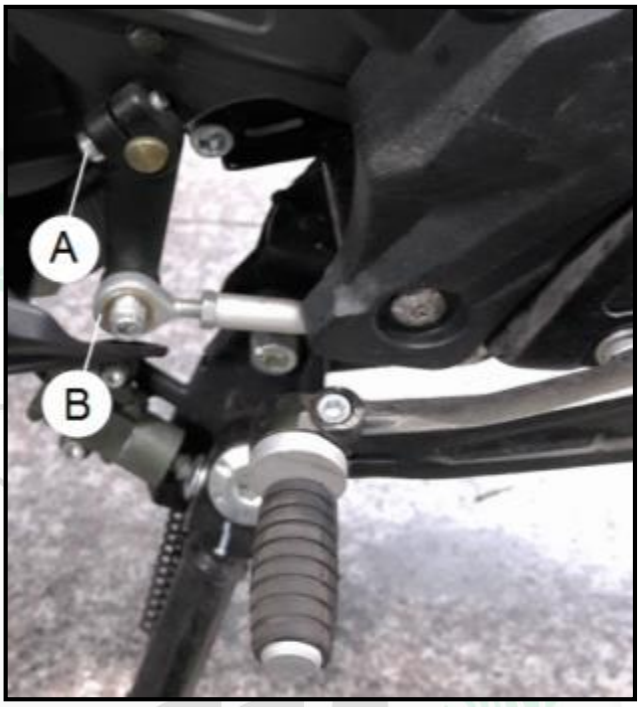
Gear Change Mechanism

Disassemble the gear change lever:

● Disassemble:

Knuckle, shifter rod [A].

Shifter Rod [B].



Gear shift pedal assembly:

● Gear shift pedal assembly

● Tighten up the shifter rod and shifter knuckle bolts.

Locking torque of the gear change lever bolts：6.9 N·m (0.70 kgf·m, 61 in·lb)

Gear Change Mechanism

Gear Change Mechanism

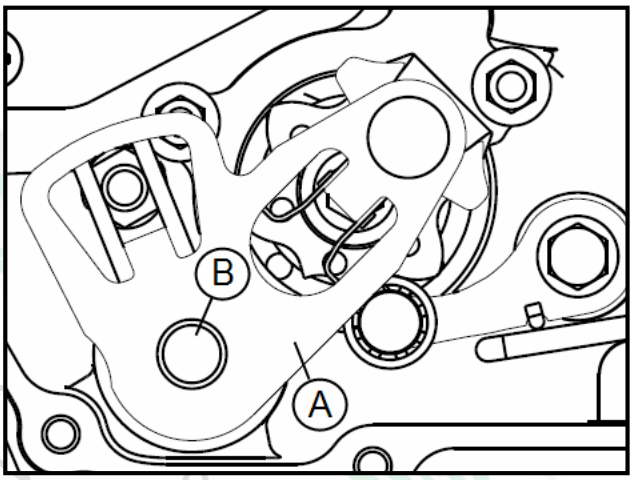
Disassemble the external gear shift mechanism:

● Disassemble:

Gear shift pedal

Clutch (See detailed information "clutch"-"Disassemble the clutch")

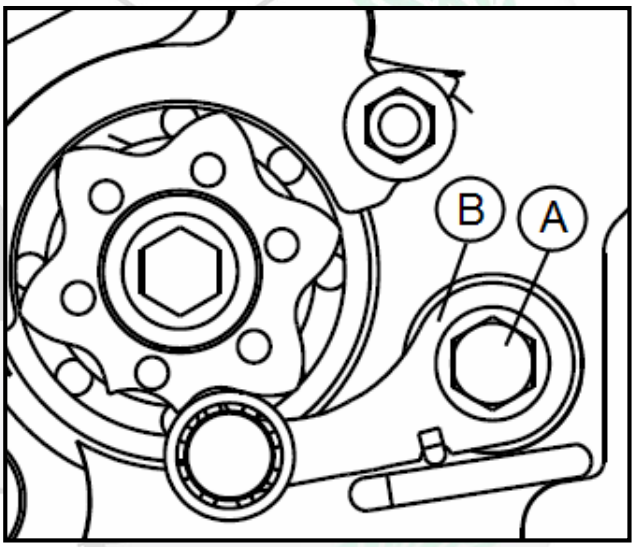
● Pull the gear shift shaft [A] and disassemble the variable block arm shaft [B].



● Disassemble:

Rocker arm bolt of positioning idler wheel [A].

Rocker arm, gasket and rocker arm spring of positioning idler wheel.



Gear Change Mechanism

Gear Change Mechanism

Assemble the external gear shift mechanism:

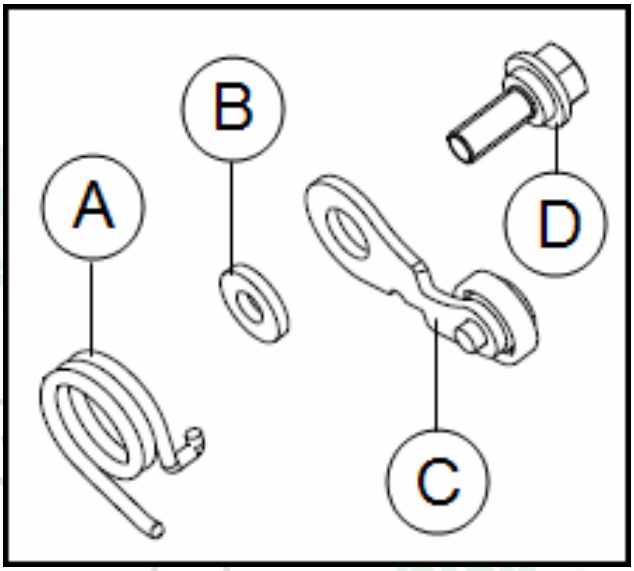
● Assemble the rocker arm spring as shown in the Fig. below [A]

Washer [B]

Rocker arm position idler wheel [C]

Rocker arm bolt for position idler wheel [D]

Locking torque of the rocker arm bolt for the position idler wheel: 12 N·m (1.22 kgf·m, 9 ft·lb)



Check the external gear shift mechanism:

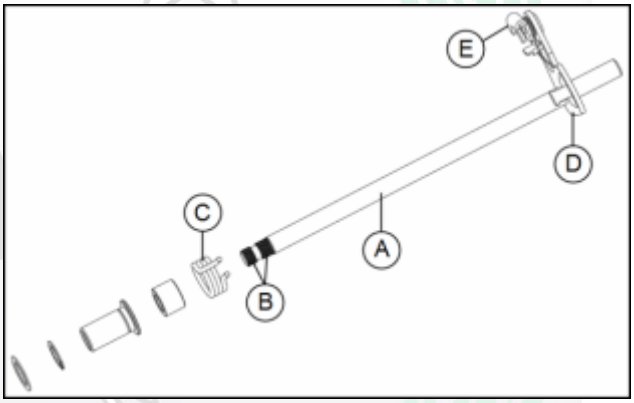
● Check whether the gear shifter shaft [A] is intact.

★ If the gear shifter shaft is bent, replace it with a new part.

★ If the spline [B] on the gear shifter shaft is damaged, please replace the gear shifter shaft.

★ If the spring [C] is damaged, please replace the spring.

★ If the gear shifter shaft fork [D] or push dog [E] is damaged, please replace the gear shifter shaft.



● Check whether the shifting shaft and the gear change fork [A] is loosening.

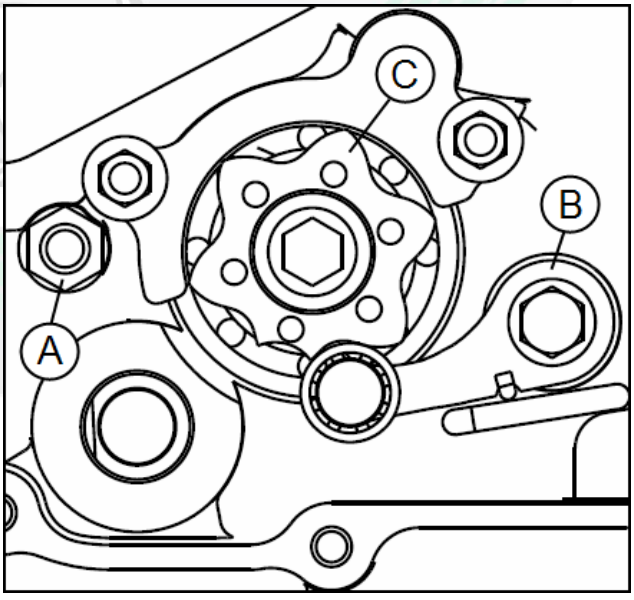
★ If the shifting shaft and gear fork is loosening, remove it, apply thread locking agent on the screw threads, and tighten the bolts to the following locking torque: **29 N·m (3.0 kgf·m, 21 ft·lb)**

● Check whether the rocker arm of positioning idler wheel [B] and spring is ruptured or twisted.

★ If the positioning idler wheel rocker arm or spring is damaged, please replace them with new parts.

● Perform a visual inspection on the gear shifting star wheel [C].

★ In case of severe wear or any damage to the shifting star wheel, please replace them with new parts.



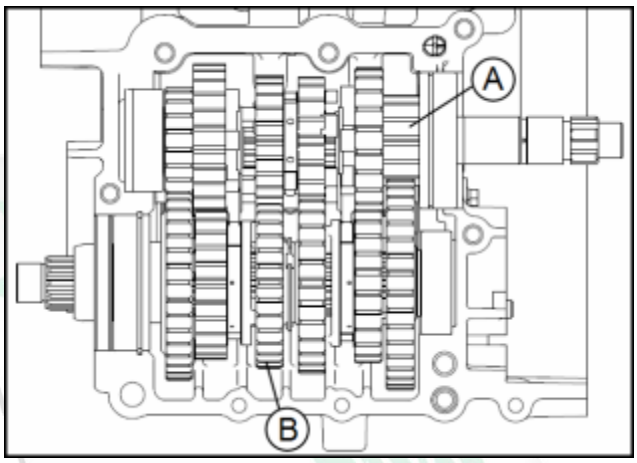
Transmission

Transmission

Disassemble the principal and auxiliary transmission shafts:

● Disassemble the crankcase (See detailed information at "Disassemble the crankcase")

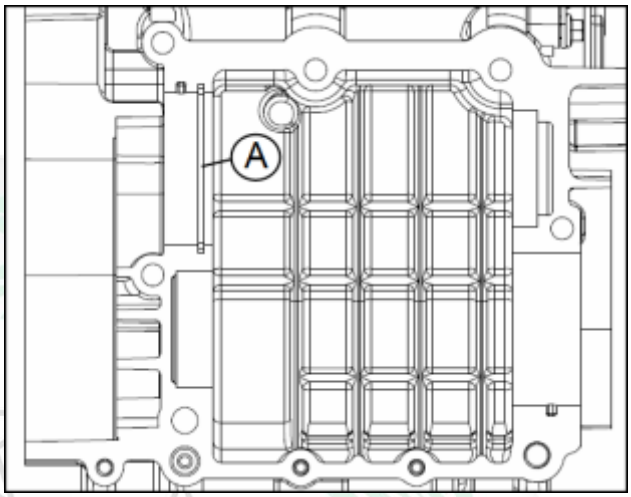
● Disassemble the principal [A] and auxiliary [B] transmission shafts.



Transmission

Transmission

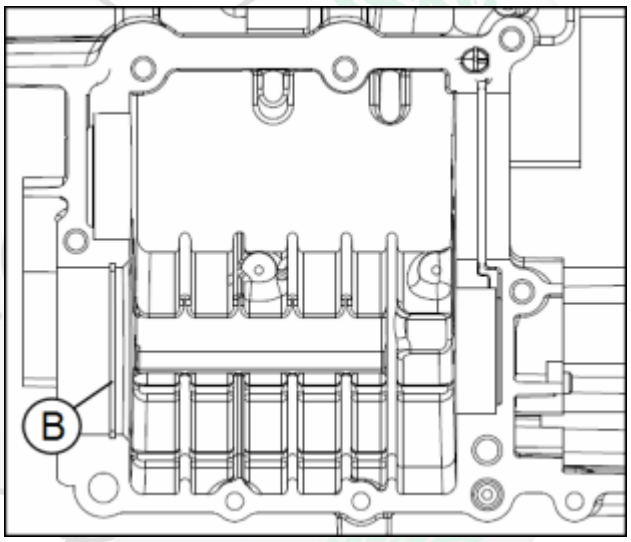
The principal [A] and auxiliary [B] transmission shaft assembly:



● Check whether the bearing retainer [A] on the crankcase is assembled in the correct position.

● Assemble the principal transmission shaft into the Crankcase.

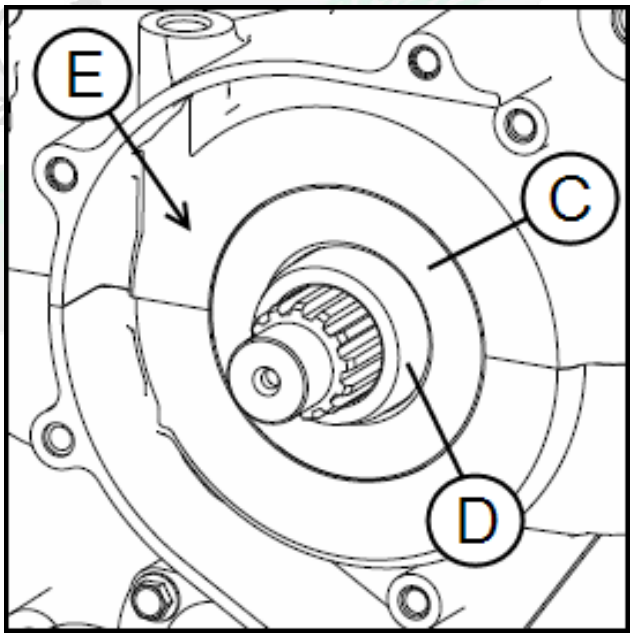
● The bearing check ring shall be aligned with the groove of the bearing outer ring.



● Check whether the bearing retainer [B] on the crankcase is assembled in the correct position.

● Assemble the auxiliary transmission shaft into the crankcase.

● The bearing check ring shall be aligned with the groove of the bearing outer ring.



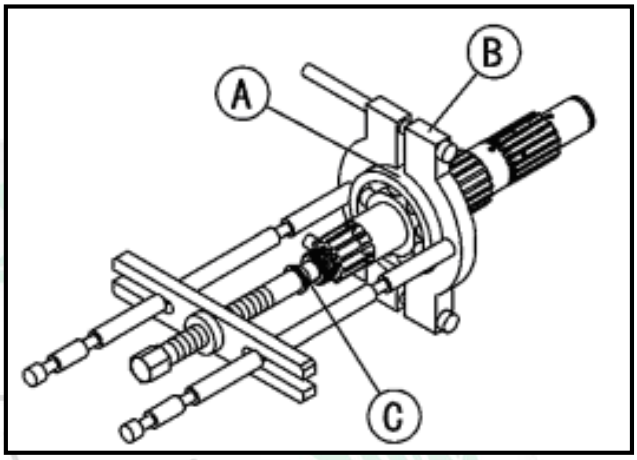
● Crankshaft assembly

● Press the oil seal [C] onto the axle sleeve [D]. Align the oil seal surface to the exterior plane [E] of the crankcase.

Transmission

Transmission

Disassemble the principal and auxiliary transmission shafts:



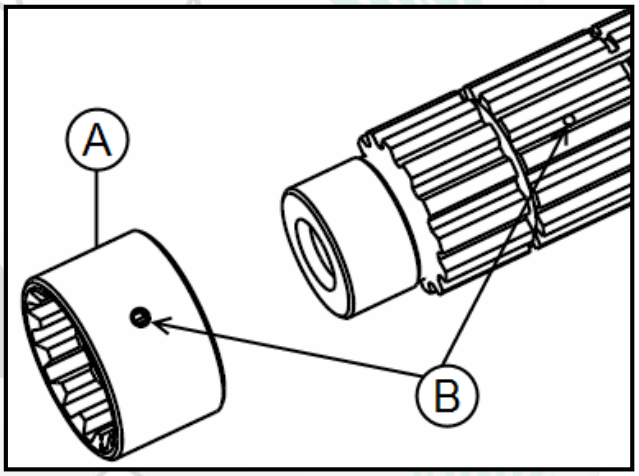
● Disassemble the principal and auxiliary trans shafts (See detailed information at "Disassemble the principal and auxiliary transmission shafts")

● Disassemble the check ring and gasket. Remove all of the gears.

● Remove the ball bearing from each shaft [A]
Special tool - bearing extractor [B]
Adaptor for bearing extractor [C]

● Discard bearing

The principal and auxiliary transmission shaft assembly:



● Apply engine oil on the surface of the bushing sleeve, ball bearing and shaft surface.

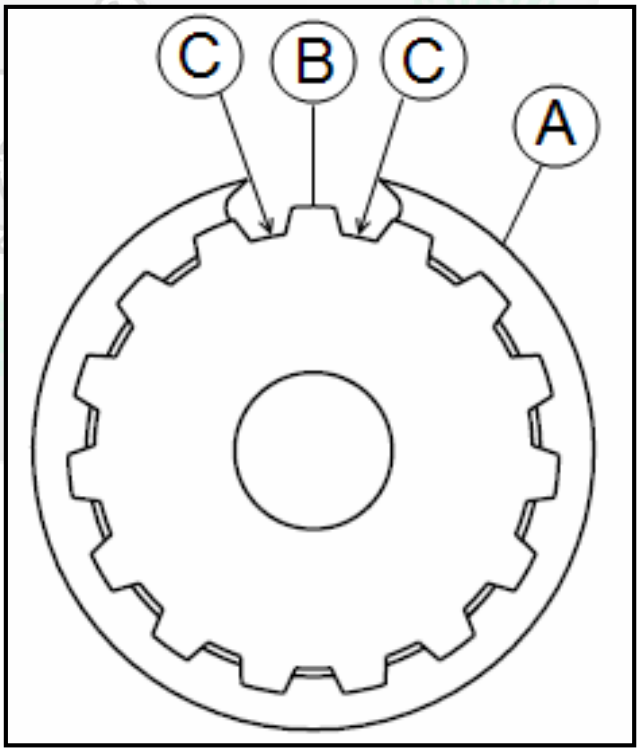
● Install the gear bushing [A] onto the shaft, be sure to align the holes on them both [B].

● All of the removed circlips shall be replaced with new.

● The opening [B] of the snap ring [A] shall be aligned with the spline groove [C].

● While assembling the snap ring, the face of the snap ring with the stamped rounded corners shall face the gasket.

● The principal transmission gears can be identified according to their diameter: The one with the Min. diameter is the grade I gear. The one with the Max. diameter is the grade VI gear. Make sure to assemble all the parts in the correct order. All the check rings and gaskets should be installed in the correct position.



● While assembling the grade III and IV gears onto the principal shaft, the oil holes on the gear shall be aligned to each other.

● While installing the bushing for sixth gear on the principal axis, the oil holes on the bushing shall be aligned.

● The auxiliary axis gear can be identified according to the diameter: The one with the Max. diameter is grade I gear. The one with the Min. diameter is grade VI gear. Make sure to assemble all the parts in the correct order. All the check rings and gaskets should be installed in the correct position.

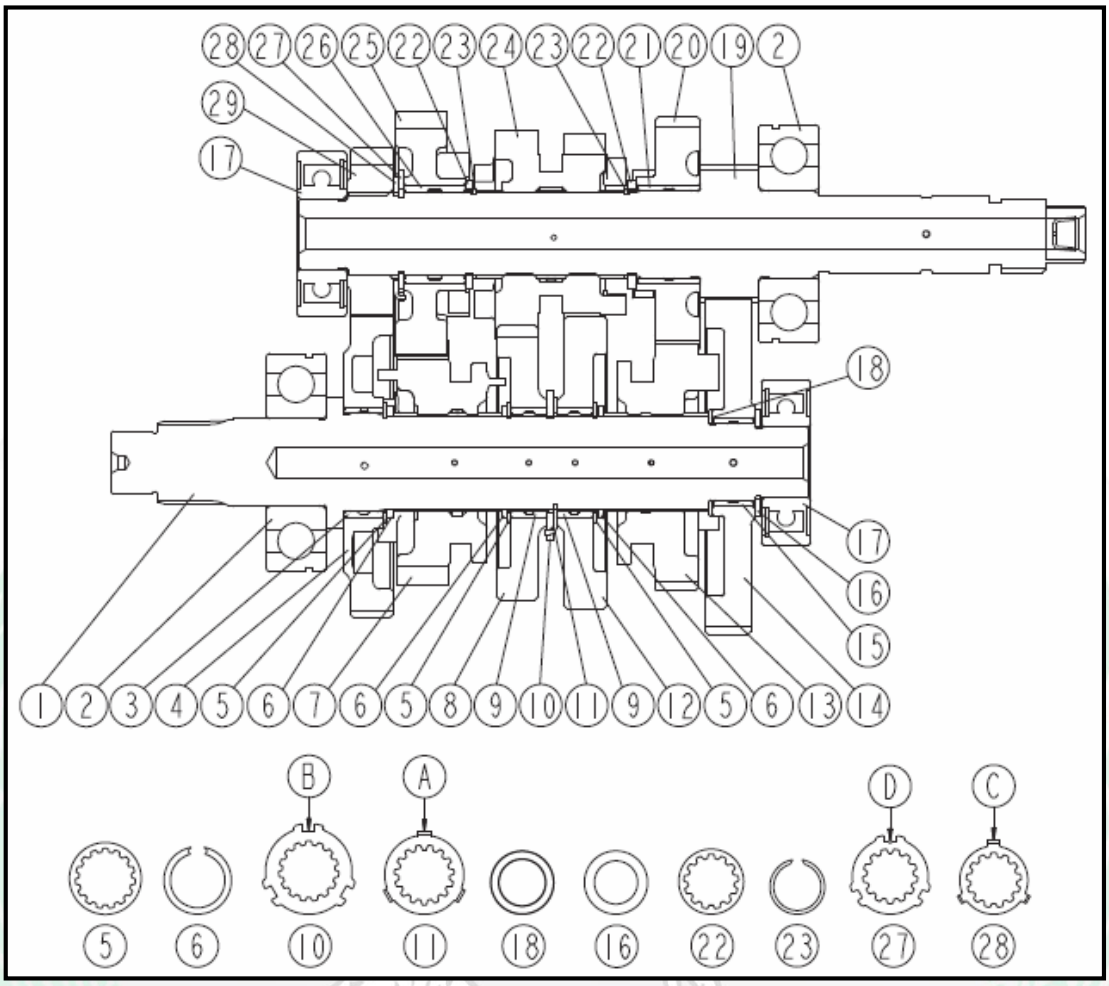
● While assembling the grade V and VI gears onto the auxiliary shaft, the oil holes on the gears shall be aligned to each other.

● While installing the bushing of the grade III/IV gears on the auxiliary shaft, the oil holes on the bushing shall be aligned.

● After assembling the principal and auxiliary shafts, check whether the gears can be smoothly rotated and slide without being subject to resistance.

Transmission

Transmission



1. Auxiliary Transmission Shaft	16. Washer
2. Bearing	17. Ball bearing
3. Sleeve, shaft	18. Washer
4. Gear, 2nd Output	19. Principal axis
5. Washer, inner spline	20. Gear, 5th Input
6. Snap ring	21. Sleeve
7. Gear, 6th Output	22. Washer, inner spline
8. Gear, 4th Output	23. Elastic ring 24
9. Sleeve, inner spline	24. Gear, 4th Input
10. Gasket of inner spline	25. Gear, 6th Input
11. Lock washer, inner spline	26. Sleeve, inner spline
12. Gear, 3rd Output	27. Washer, inner spline
13. Gear, 5th Output	28. Lock washer, inner spline
14. Gear, 1st Output	29. Gear, 2nd Input
15. Sleeve 22	

● The locking-foot [A] of the lock washer of the inner spline [11] shall be assembled into the notch [8] of the lock washer of the inner spline [10].

● The locking-foot [C] of the lock washer of the inner spline [28] shall be assembled into the notch [D] of the lock washer of the inner spline [27].

Transmission

Transmission

Disassemble the gear shift drum and shift fork:

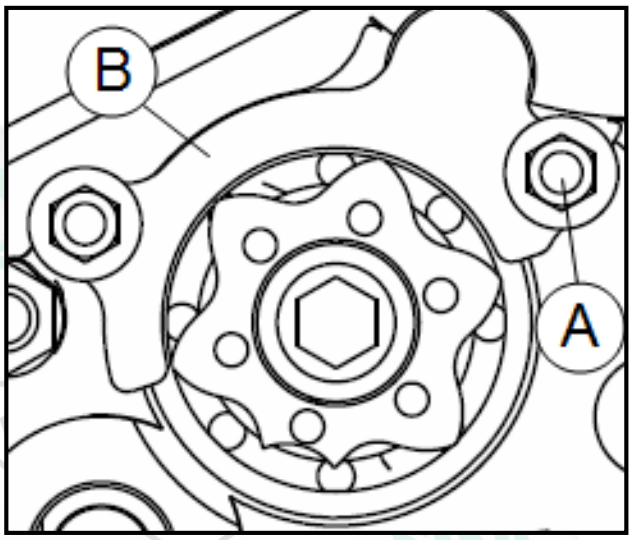
● Disassemble

Upper crankcase (See detailed information at "Disassemble the crankcase")

The principal and auxiliary transmission shafts (See detailed information at "Disassemble the primary and auxiliary transmission shafts")

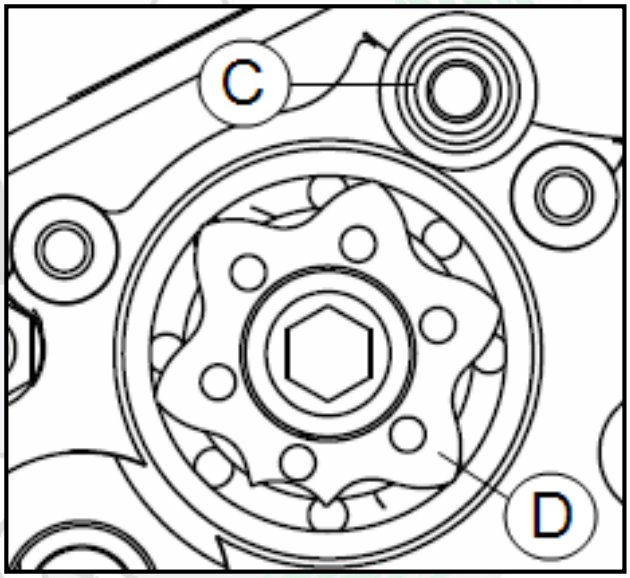
External gear shift mechanism (See detailed information at "External gear shift mechanism")

● Remove the bolt [A]. Remove the pressure plate [B].



● Pull out the shift fork shaft [C] and remove the shift fork

● Pull out shift drum [D]

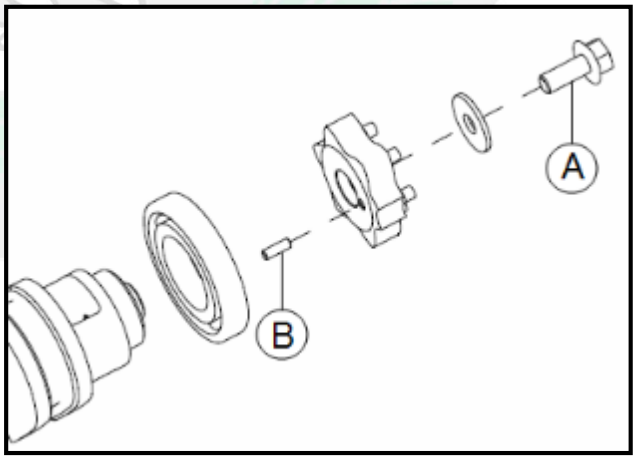


Disassemble the shift drum:

● Dismantle the shift drum (See detailed information at "Dismantle the shift drum and shift fork")

● Clamp the shift drum in a vice. Disassemble the fixing bolt for the shifting star wheel [A].

● Remove the washer, shifting star wheel, locating pin [B] and bearing.



Transmission

Shift drum assembly:

● DO NOT forget to install the locating pin on the shift drum.

● Apply thread locking adhesive on the threads of the shifting star wheel bolt, and then lock the bolt.

Locking torque of the shifting star wheel bolt: 12 N·m (1.22 kgf·m, 9 ft·lb)

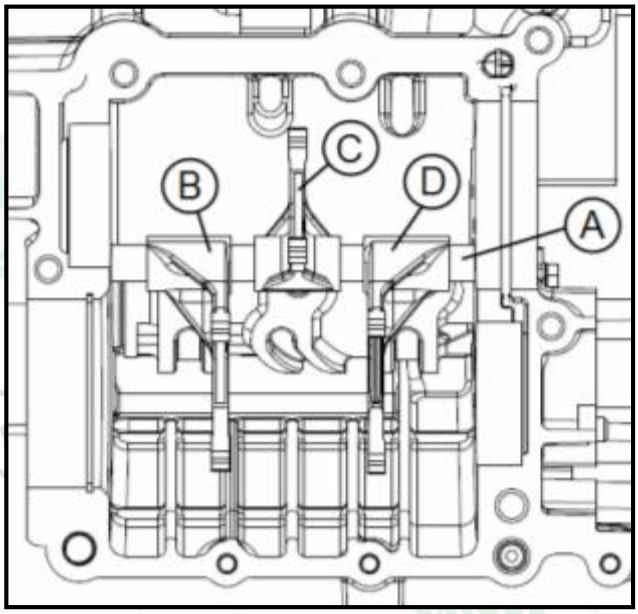
Gear shift drum and shift fork assembly:

● Apply engine oil on the shift drum, shift fork and shift fork shaft

● Shift drum assemble

● Shift fork shaft assemble [A]

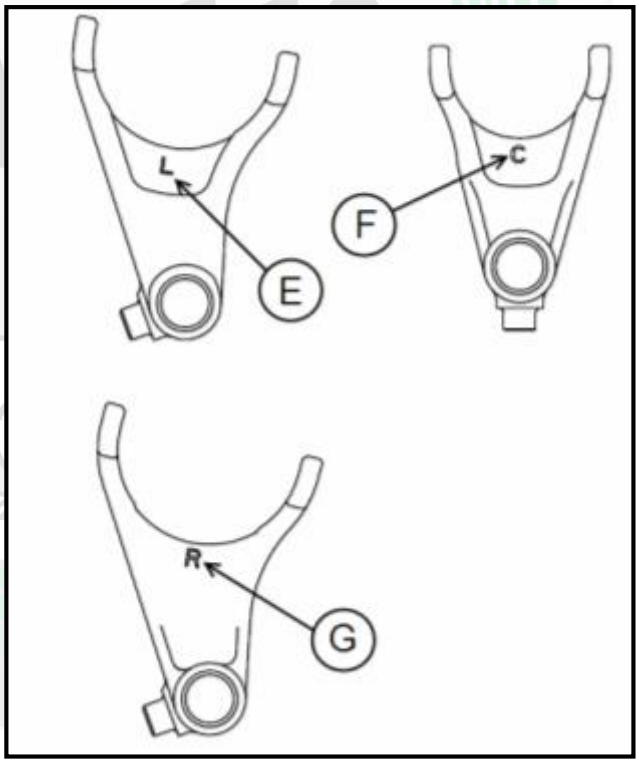
● Assemble of left shift fork [B], middle shift fork [C] and right shift fork [D].



● There is a symbol “L” [E] on the left shift fork [B], “C” [F] on the middle shift fork [C], and “R” [G] on the right shift fork [D].

● Assemble the middle shift fork on the principal transmission shaft. Install the left shift fork and the right shift fork on the auxiliary transmission shaft. Insert the guide pin into the center groove of the shift drum.

● All the symbols on the shift forks should point to the right side of the engine.

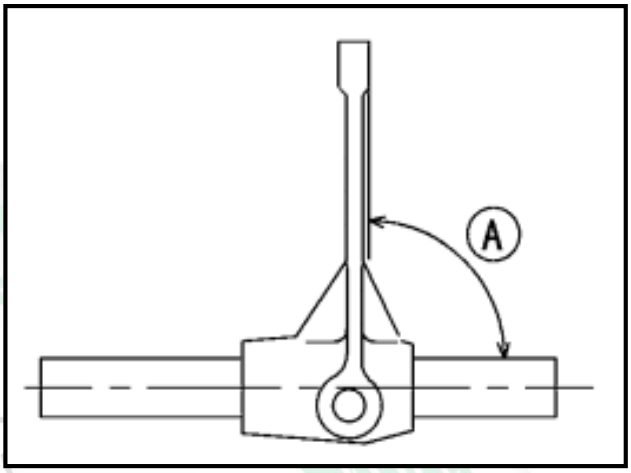


Transmission

Check whether the shift fork is bent.

● Visually inspect whether the shift fork is bent. If yes, it should be replaced! A bent shift fork will cause difficulty when shift gears or trip stop to 90° [A] at driving.

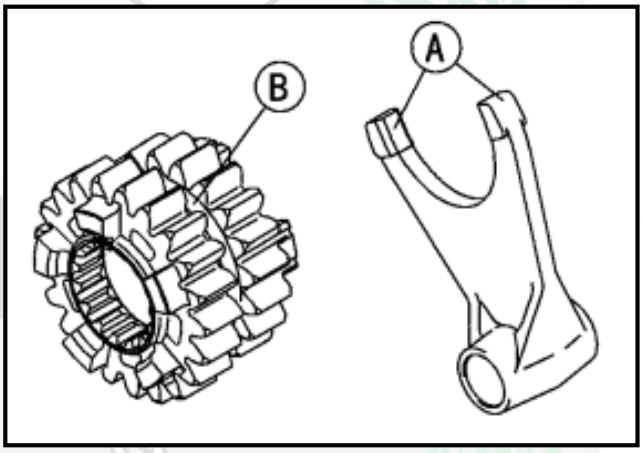
Check for signs of wear on the shift fork and fork groove on the interfacing gear.



● Measure the thickness of the shift fork and width of shift fork groove [B].

★ If the thickness of the shift fork is less than the service limit, the shift fork shall be replaced.

Thickness of shift fork:
Standard: 5.8 ~ 5.9 mm (0.2283 ~ 0.2323 in.)
Service limit: 5.65 mm (0.2224 in.)



★ If the width of the shift fork exceeds the service limit, the gear shall be replaced.

Width of shift fork groove:
Standard: 6 ~ 6.05 mm (0.2362 ~ 0.2382 in.)
Service limit: 6.15 mm (0.2421 in.)

Transmission

Transmission

Check the abrasion status of the shift fork guide pin and shift drum groove

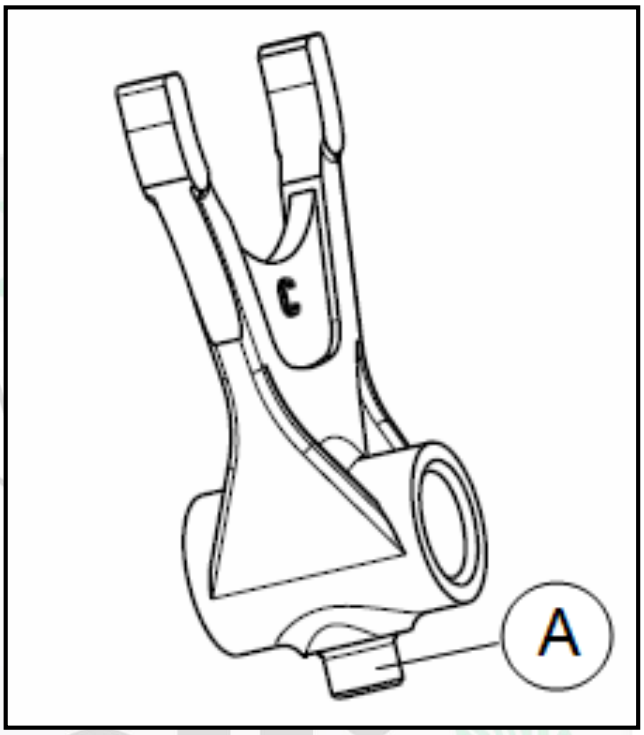
● Measure the diameter of shift fork guide pin [A] and the width of the shift drum groove [B].

★ If the diameter of guide pin on shift fork is less than the service limit, the shift fork shall be replaced.

Diameter of guide pin on shift fork

Standard: 7.93 ~ 8 mm (0.3122 ~ 0.315 in.)

Service limit: 7.83 mm (0.3083 in.)

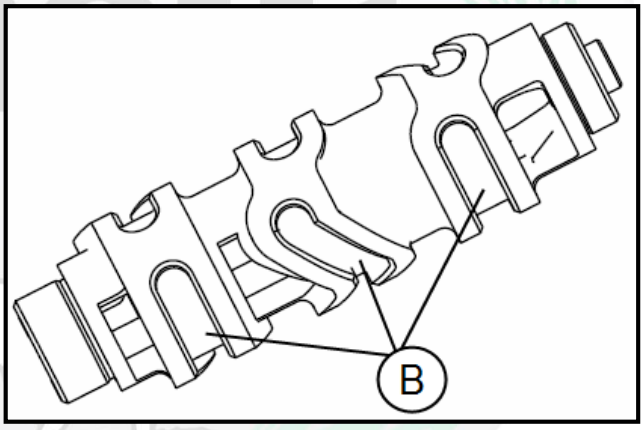


If the groove width on any part of the shift drum is greater than the service limit, the shift drum shall be replaced!

Groove width of shift drum

Standard: 8.05 ~ 8.15 mm (0.3169 ~ 0.3209 in.)

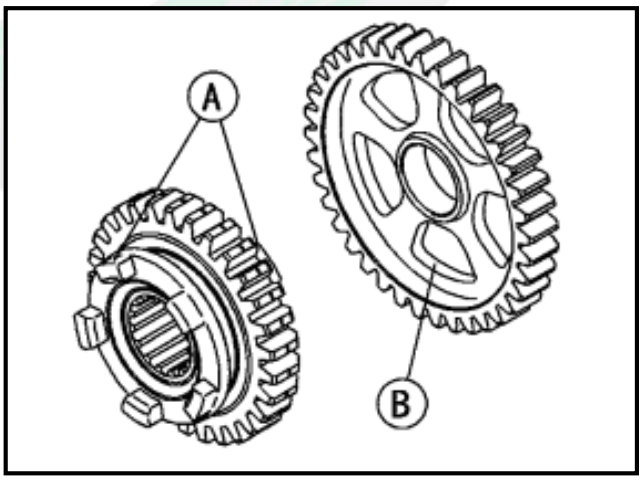
Service limit: 8.25 mm (0.3248 in.)



Check whether the gear ratchet and ratchet slot are subject to wear.

● Visually inspect whether the gear ratchet [A] and ratchet slot [B] are damaged or not.

★ In the case of excessive wear of the gear ratchet or ratchet slot, replace them with new parts!



Chapter VI Cooling system

Cooling System

Cooling System

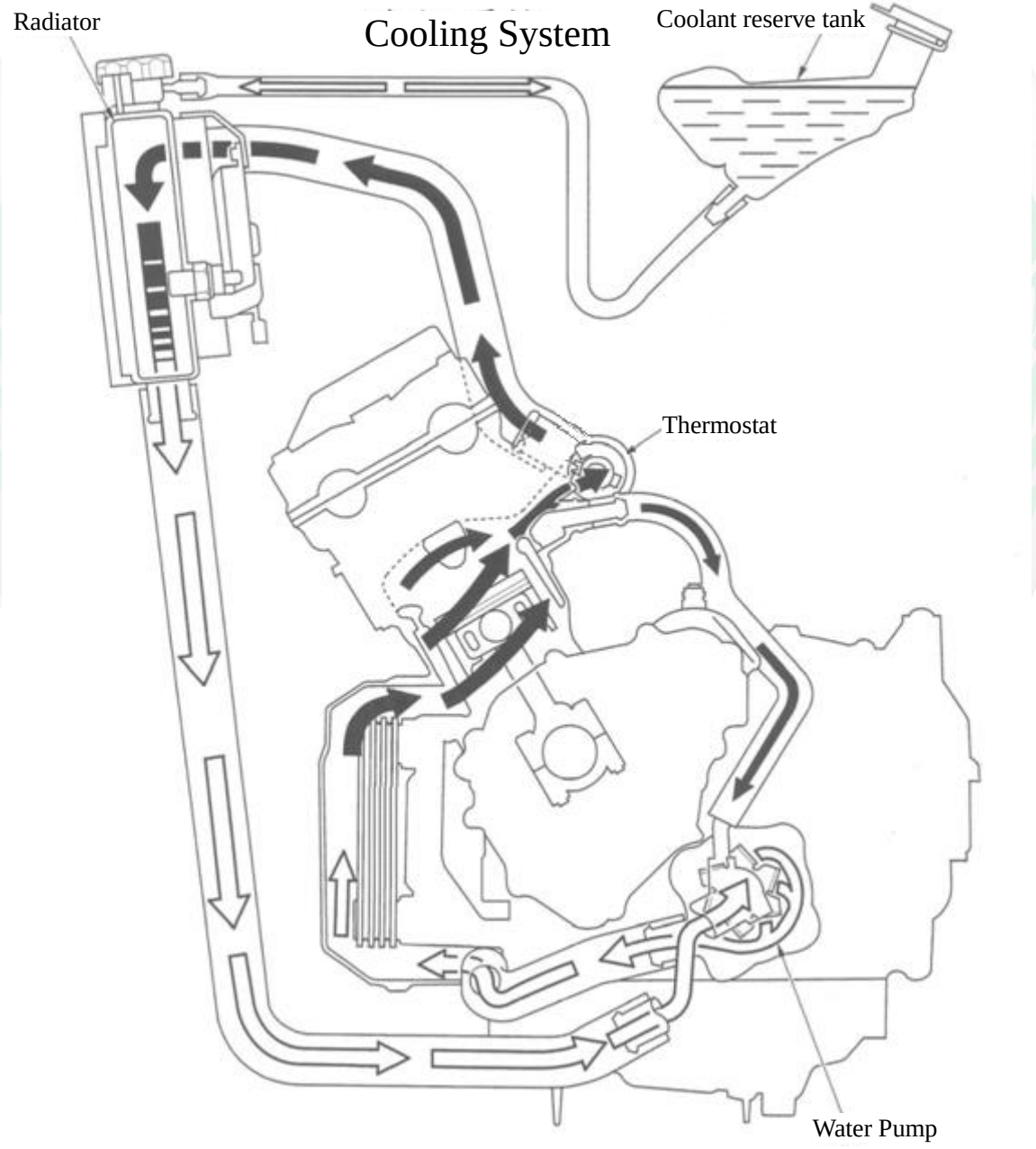
Functions of the cooling system:

Cooling method of the engine: Liquid Cooled

Liquid cooling adopts water as a heat absorption medium to cool down the high temperature parts and then transmit that heat into ambient air thus keeping the engine running under the most optimal temperature.

Specific cooling method:

Cooling water enters the water jacket from the crankcase through the crankcase waterway. Up through the cylinder head, the cooling water will eventually enter the radiator for cooling, relying on fins and a fan, it will transfer the heat to the ambient air.



Cooling System

Cooling System

Permanent type antifreeze can be used as cooling liquid to prevent the cooling system from rusting or corrosion. As long as the engine starts, the water pump starts running and cooling liquid starts circulating.

The cooling system adopts a paraffin based thermostat. It will open or close along with the temperature variation of the cooling liquid. In order to make the cooling fluid maintain the proper temperature, the thermostat will consistently change the valve opening. If the temperature of the cooling liquid is lower than 55°C (131°F), the thermostat will close so that the vent holes will restrict cooling fluid flowing thus the engine will warm up faster. If the temperature of the cooling liquid is higher than 58～62°C (136～144°F), the thermostat will open and the cooling liquid will flow.

If the temperature of the cooling liquid exceeds 95°C (203°F), the radiator fan switch will turn on to make the radiator fan run. If the air mass flow is insufficient (Such as: low speed driving of the motorcycle), the fan on the radiator will suck air through the radiator rectangular fins to accelerate the cooling action of the radiator. If the temperature of the cooling liquid is lower than 90°C (194°F), the fan switch for the radiator will shut off. The radiator fan will stop running.

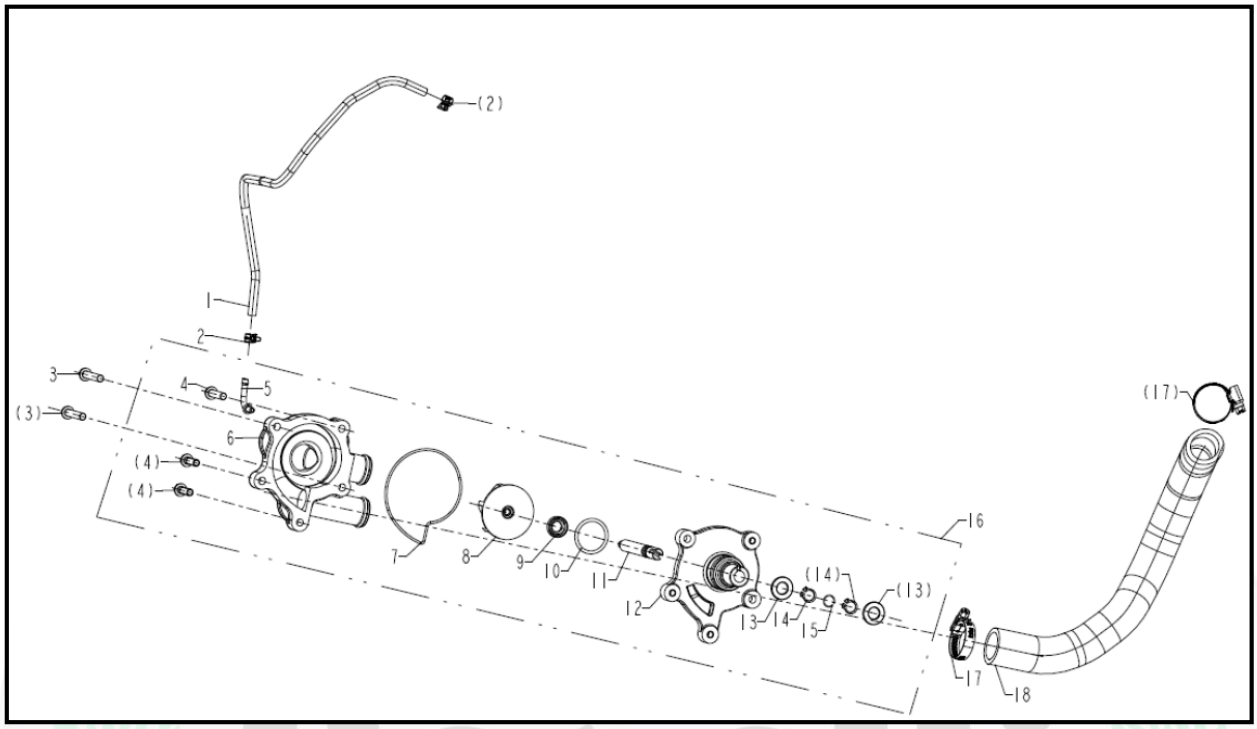
Using this method, controlling the temperature of the engine to a narrow range is made simple. The engine load will change and the engine will work efficiently.

The cooling system will pressurize through the radiator cap to avoid the cooling liquid boiling which will generate bubbles and could lead to engine overheating. Along with the rising temperatures of the engine, the radiator and cooling liquid in the cooling system will expand. Extra cooling fluid will flow through the radiator and hoses, and will flow into the coolant reserve tank and temporarily stay there until it is needed. On the contrary, with the temperature dropping in the engine, the cooling liquid in the radiator and hoses will shrink. The cooling liquid stored in the coolant reserve tank will flow back into the radiator.

There are two valves on the radiator. The first one is the pressure valve (radiator cap). The pressure valve during engine running will control the pressure in the cooling system. If the pressure exceeds 93～123kPa (0.95～1.25kgf/cm^2, 13～18psi), the pressure valve will open and release the pressure into the reserve tank. After releasing the pressure, the pressure valve will close and keep the pressure at 93～123kPa (0.95～1.25kgf/cm^2, 13～18psi). During the engine cooling process, another small valve on the radiator cap (negative pressure valve) will open. With cooling liquid temperature dropping, the cooling liquid will shrink and form a vacuum in the system. With the negative pressure opening, the cooling liquid will flow from the reserve coolant tank into the radiator.

Water Pump

Water Pump



Item Number	Description & specification	Qty.
1	Drain Hose, Weep Hole	1
2	Hose Clamp 6.5	2
3	Bolt M6*36	3
4	Bolt M6*22	2
5	Pipe, Weep Hole	1
6	Outer Cover, Water Pump	1
7	O-Ring, Water Pump Body	1
8	Impeller, Water Pump	1
9	Oil Seal, Water Pump Shaft	1
10	O-Ring 25.8*2.651	1
11	Water Pump Shaft	1
12	Water Pump Body	1
13	Gasket 10.5*19.8*2	2
14	Circlip	2
15	Circlip 10	1
16	Water Pump, Complete	1
17	Hose Clamp, Stainless Steel	2
18	Radiator Hose	1

Water Pump

Water Pump Disassembly

Note:

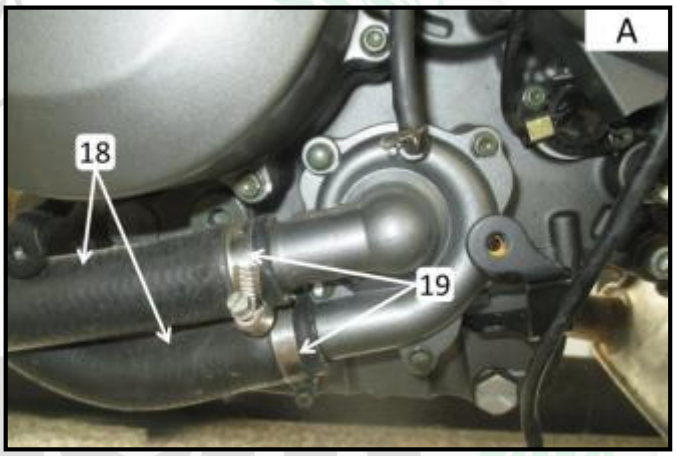
Before beginning water pump disassembly, please drain the engine oil (Oil discharging refer to Chapter III Engine oil)

Disassemble:

Disassemble the engine bottom cowling (See Chapter IV Assembly machine covering part/fuel tank guard plate, engine bottom cowling)

Disassemble:

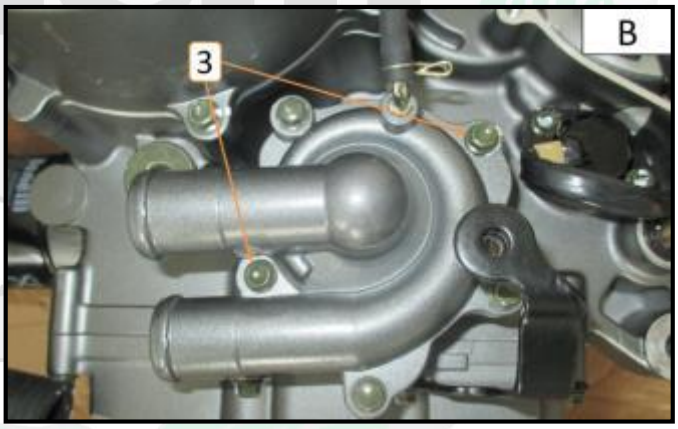
Disassemble the water hose clamps (19) and pull off the water hoses, Fig. A



Attention:

- Perform this operation when the engine has cooled.
- Discharge the coolant from the drain opening first.
- While pulling off the water hose, make sure not to splash coolant into yourself.

Loosen the bolt (3) and disassemble the water pump component, Fig. B.

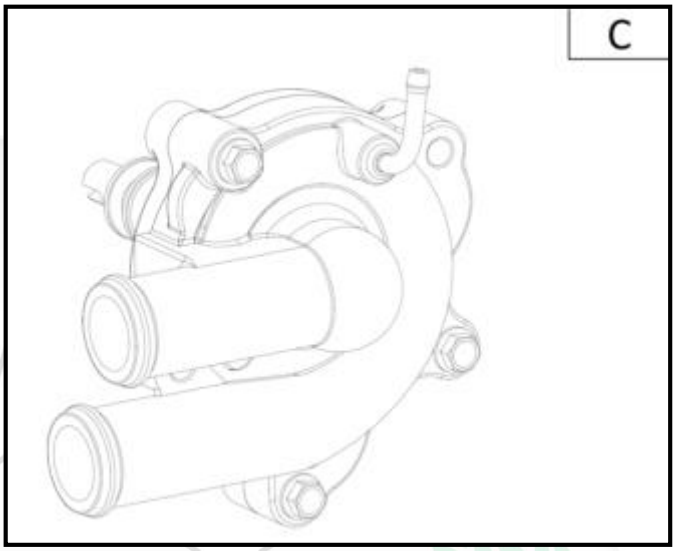


Water Pump

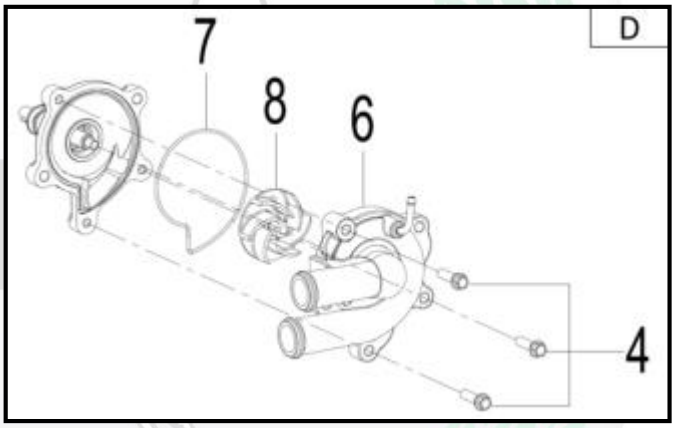
Water Pump Inspection

Disassemble

Water pump component, Fig. C



Loosen the bolt (4) and disassemble the water pump cover (6)



Remove the impeller (8)

Inspection

If the surface of the impeller has been corroded or the blades have been damaged. Replace the water pump assembly or impeller.

Attention:

Do not damage the gasket and body joint face during this operation.

Water Pump

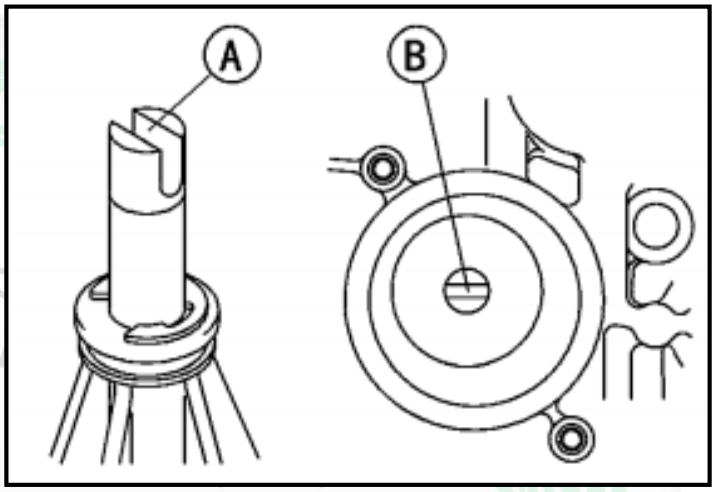
Water Pump Assembly

Assembly

Water pump assembly shall be in the reverse order of disassembly.

Note:

Rotate the water pump shaft to align the slot [A] on the shaft to the projecting portion of the driving gear of the oil pump [B].



Note:

Tighten screw pump cover to the following torque:

Torque: 7 ft·lb

Note:

Tighten screw pump cover to the following torque:

Torque: 7 ft·lb

Note:

Tighten water pipe clamp screw to the following torque:

Torque: 18 in·lb

Thermostat

Disassembly / Assembly of the Thermostat

Disassemble:

Disassemble the right fuel tank cowling component (See Chapter IV Assembly machine covering part / fuel tank cowling, engine bottom cowling)

Disassemble:

Disassemble the two screws tightening the cover of the thermostat (15). Disassemble the cover of the thermostat; Fig. A

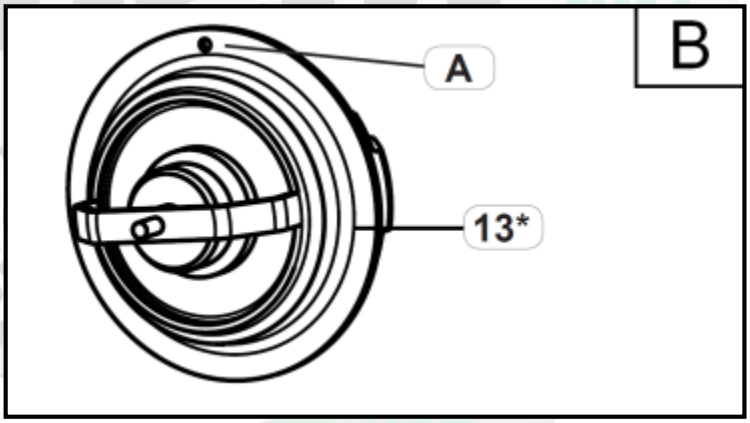
Remove the thermostat (13) from the engine, Fig. A.

Attention:

Follow these steps when the engine has completely cooled.

Inspection:

- By-pass port (A), Fig. B
  If it is blocked, replace it with a new one.
- Thermostat (13*), Fig. B
  If it does not open at 75°~ 90°C (167 ~ 194°F), replace it with a new one.

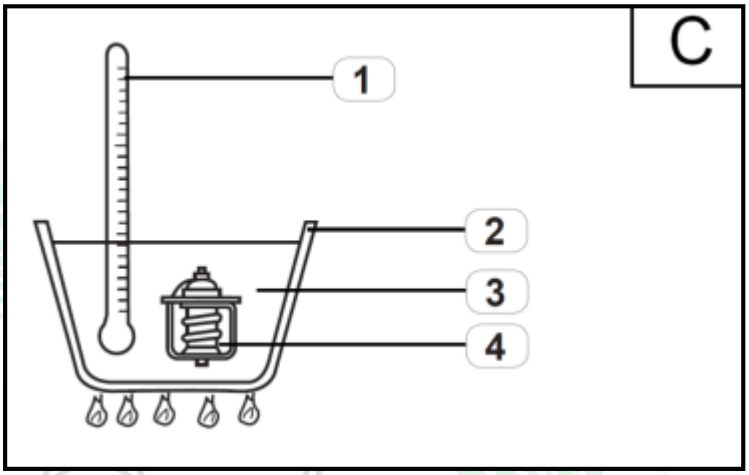


Thermostat

Disassembly / Assembly of the Thermostat

Inspection of the thermostat:

- Immerse the thermostat into a container filled with water.
- Add heated water slowly.
- Put a thermometer into the water.
- Monitor the temperature readings on the thermometer.
- After reaching 167°F of constant temperature the valve will open. After reaching 194°F of constant temperature the valve will open at least 7mm.



As shown in Fig. C

1.Thermometer

2.Container

3.Water

4.Thermostat

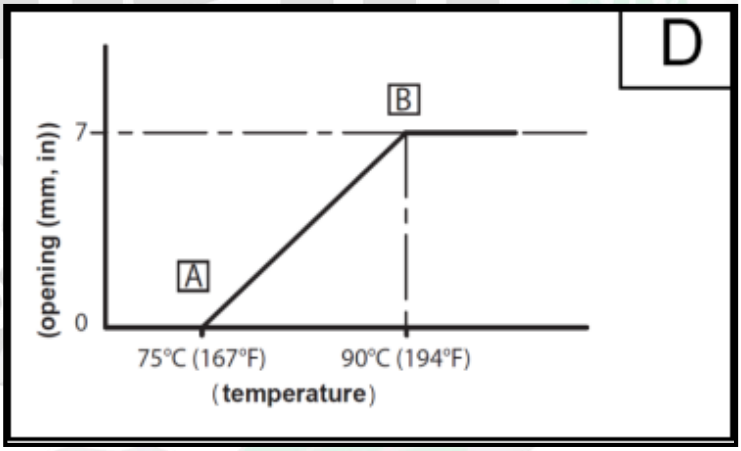
Note:

The thermostat and thermometer shall be suspend in the fluid hanging with a wire. They shall not contact the interior wall of the container.

On / Off status of the thermostat, Fig. D

[A] Totally off

[B] Totally on



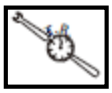
Attention:

A damaged thermostat will cause serious over heating or over cooling of the engine.

Assembly:

● The by-pass port of the thermostat shall be pointed upward at assembly as shown in Fig. A

● Fasten the two bolts (15*) to the following torque:



Torque: 9 ft·lb

Attention

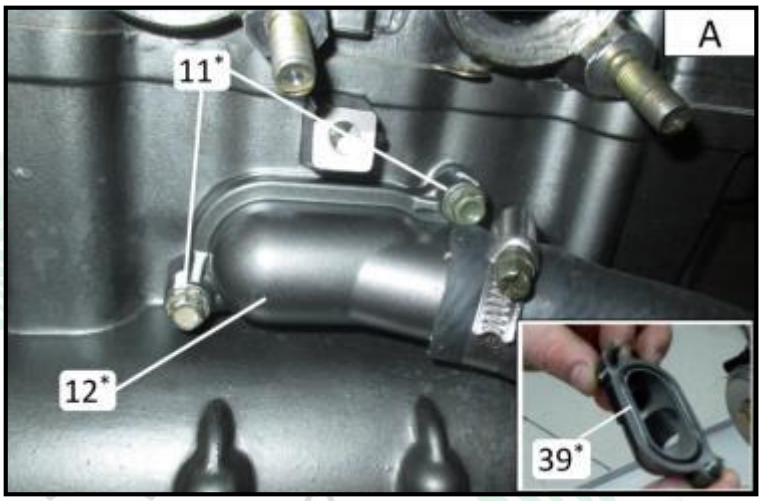
Coolant can be added only after completing all the steps mentioned above.

Water Pipe Connector

Disassembly / Assembly of the Water Pipe Connector

Disassemble:

Disassemble the two bolts (11*) and remove the water pipe connector (12*) Fig. A



Inspection:

- Water pipe connector (12*)
  If it is damaged, replace it with a new one.
- Sealing gasket (39*)
  Replace with a new O-ring any time this cover is removed.

Assemble:

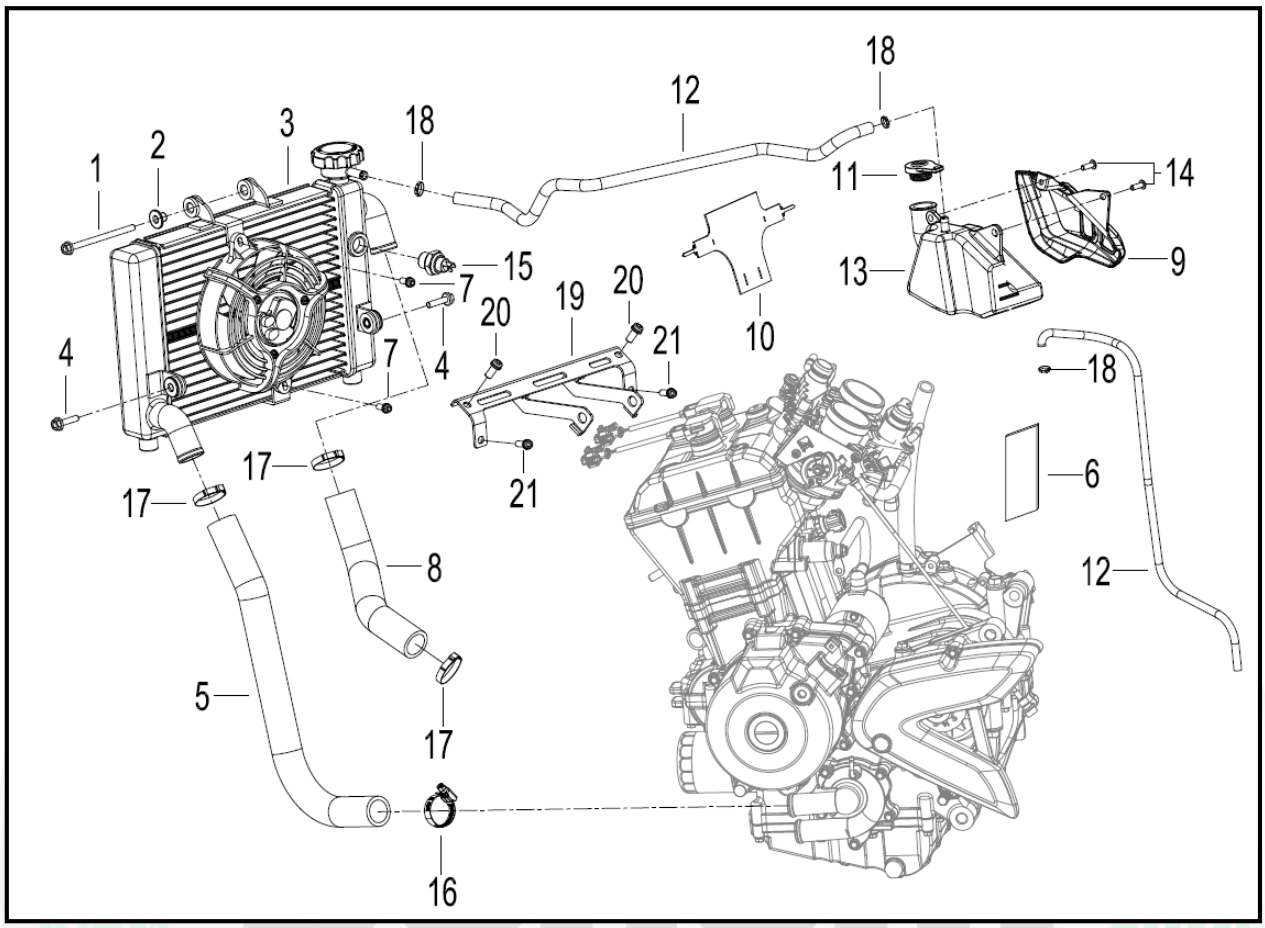
- Water pipe connector (12*) and sealing gasket (39*) assembly
- Fasten two bolts (11*) to the following torque:

Torque: 9 ft·lb

Attention

Coolant can be added only after completing all the steps mentioned above.

Radiator / Coolant Hoses



Item No.	Description & specification	Qty.	Item No.	Description & specification	Qty.
1	Bolt M6×95	1	12	Coolant Res. Overflow Hose	2
2	Collar	1	13	Coolant Reservoir	1
3	Radiator	1	14	Screw M6×20	2
4	Screw M6×25-8.8-ZG	2	15	Sensor, Coolant Temperature	1
5	Radiator Hose A	1	16	Hose Clamp, Stainless Steel	1
6	Anti-Heat Foil	2	17	Hose Clamp 033.1-706R	3
7	Bolt M6×12-8.8-ZG	2	18	Hose Clamp Φ10	3
8	Radiator Hose B	1	19	Lower Radiator Mounting Brkt.	1
9	Coolant Res. Decorative Cover	1	20	Bolt M6×1×16	2
10	Ventilation Rubber Mat	1	21	Bolt M6×14	2
11	Coolant Reservoir Cap	1			

Radiator

Radiator Disassembly

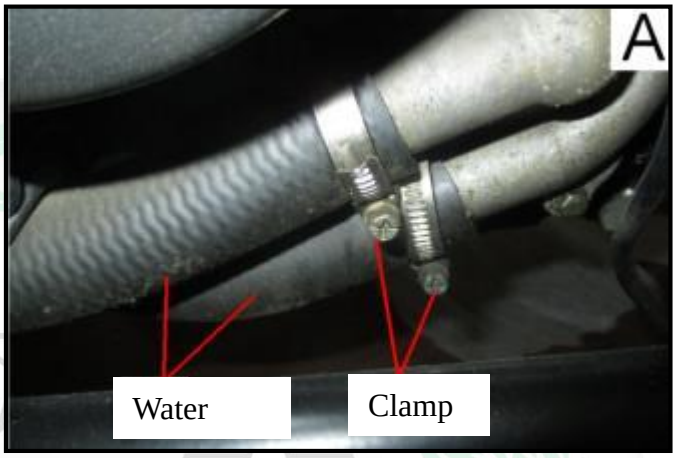
Attention

Follow these steps only when the engine has completely cooled.

Disassemble the radiator:

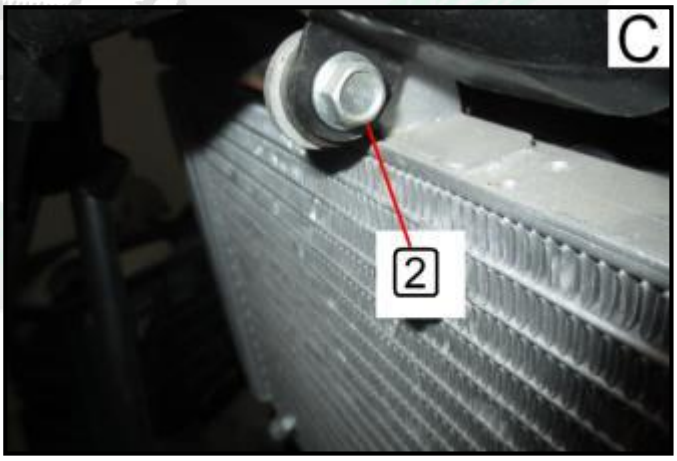
Disassemble the left and right fuel tank fairing components (See Chapter IV Assembly machine covering part/fuel tank fairing, and the lower cowling)

Disassemble the water hoses connecting to the radiator and the engine, as shown in Fig. A.



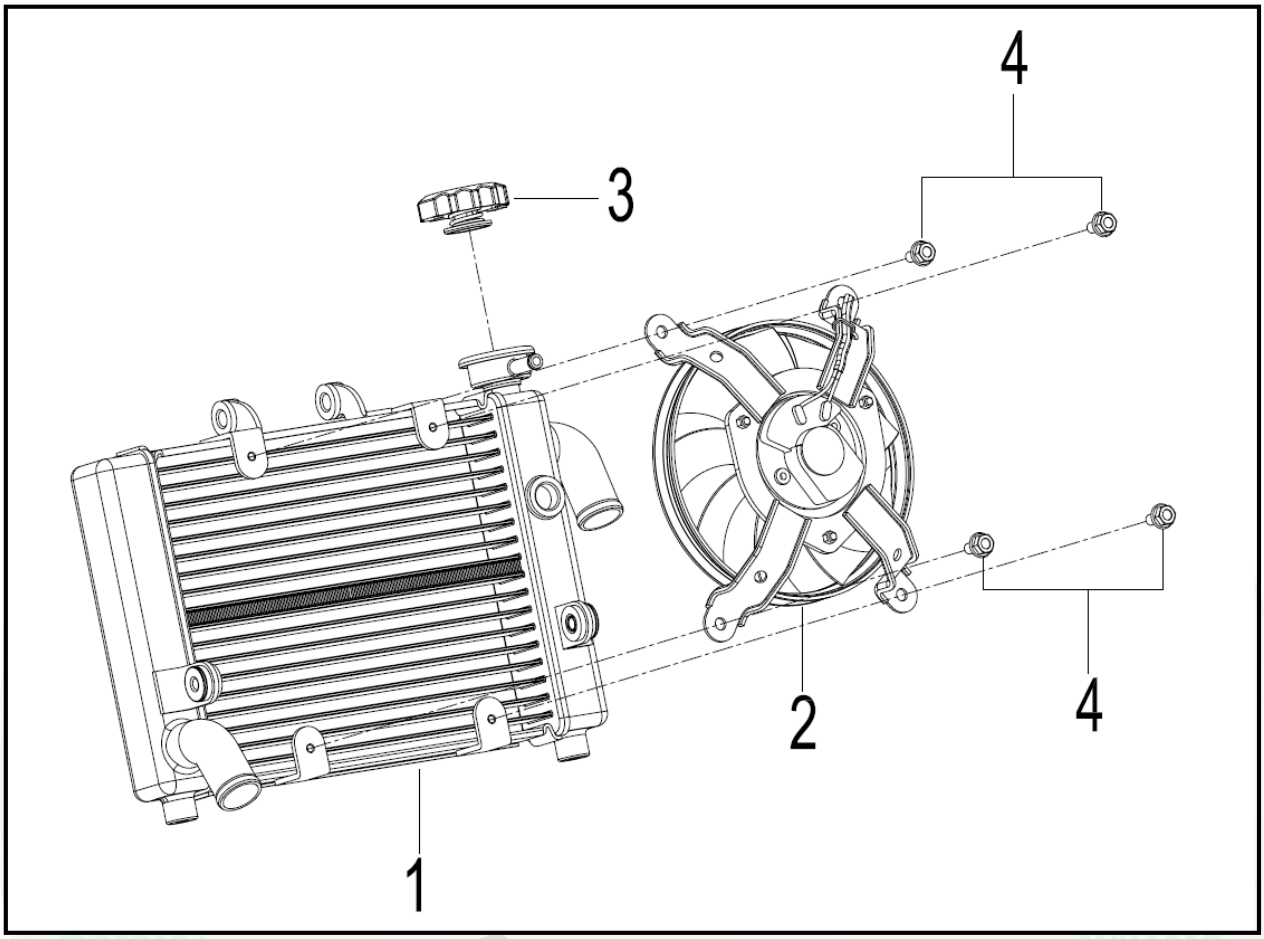
Disassemble the two fastening bolts (1) connecting the radiator and the lower radiator connecting bracket as shown in Fig. B.

Disassemble the fastening bolts connecting the radiator and the frame as shown in Fig. C.



Radiator

Radiator

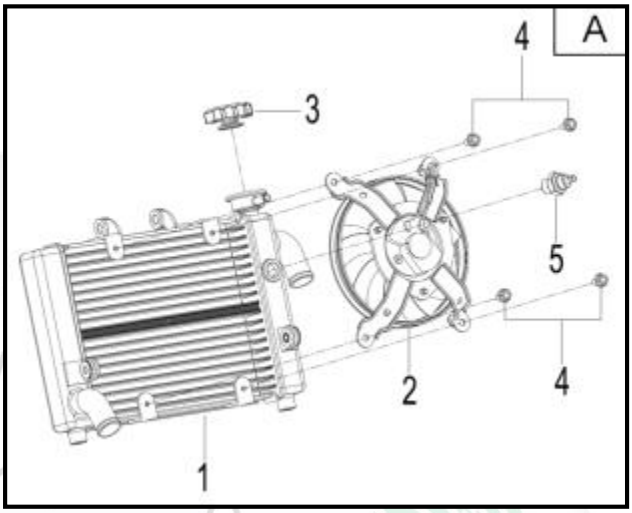


Item No.	Name	Qty.
1	Radiator	1
2	Fan Assembly	1
3	Radiator Cap	1
4	Bolt M6×16	4

Radiator

Radiator Disassembly

Dismantle the radiator



Dismantle: Fig. A

Radiator (1)
Fan assembly (2)
Radiator cap (3)
Water temperature switch (5)

Assembly:

Assembly shall be in reverse order of disassembly.

Note:

Tighten four bolts (4) to the following torque:

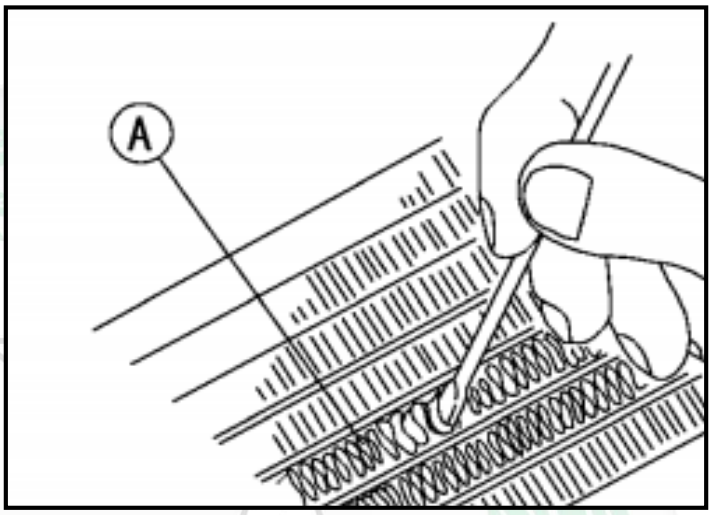
Torque: 7 ft·lb

Radiator

Radiator

Radiator

Check: rectangular fins of the radiator

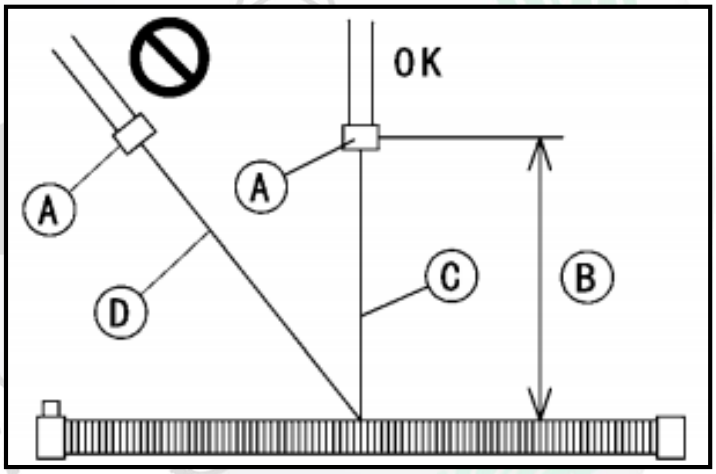


★ Please remove any objects blocking airflow if any are present!
★ In case of deformation of a rectangular fin [A], please straighten it carefully.
★ If the radiator has blockages or damaged fins covering 20% or more of the radiators' surface, remove and replace the radiator with a new one.

Attention

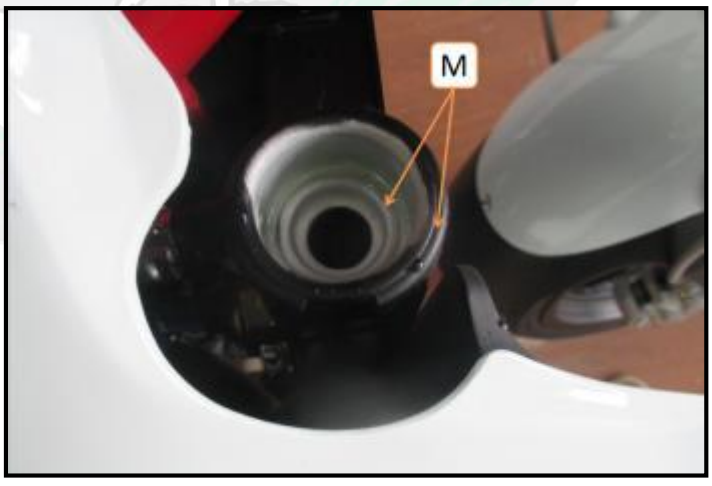
In order to avoid damage to the radiator, pay attention to the following when cleaning the radiator with a pressure steam cleaner:

- Keep the pressure steam gun [A] over 0.5m (1.6ft) [B] away from rectangular fins of the radiator.
- Hold the pressure steam gun, and keep it vertical [C] (do not tilt [D]) to the rectangular fin surface of radiator.
- Use the pressure steam gun following the direction of rectangular cooling fins of the radiator.



Check: Filling of the radiator:

- Check whether the filler neck of the radiator is damaged.
- Check the top and bottom seal surfaces [M] inside the filler neck. The top and bottom seal surfaces should be smooth and clean to ensure normal operation and sealing of the radiator.



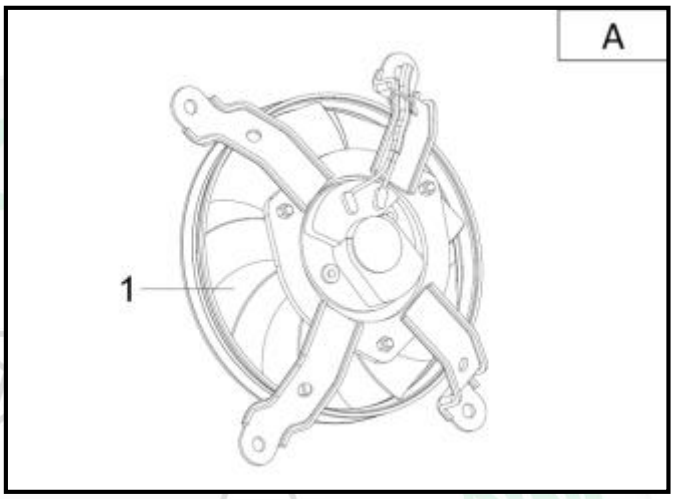
Radiator

Radiator

Fan

Check: Fan blades (1), as shown in Fig. A

In the case of fan blade damage, replace the fan component.



Confirm whether the copper parts of the fan inserter are loose or not. If not, connect the fan separately to the positive and negative electrode of a battery as shown in the figure to the right (The blue wire connects to the positive electrode, and the black wire connects to the negative electrode).

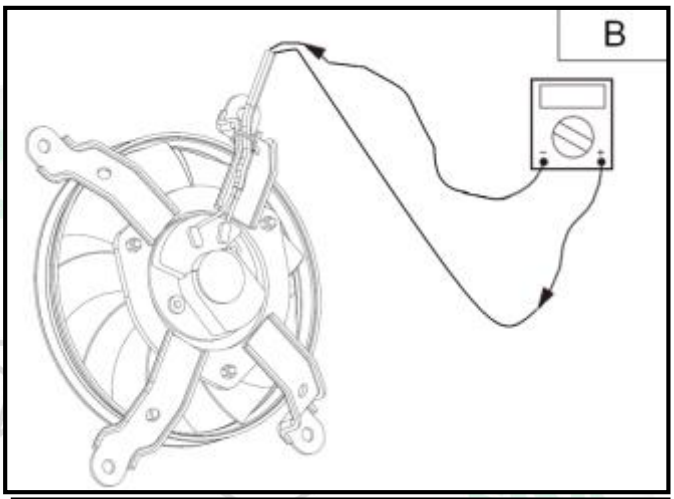
Radiator

Radiator

Check: Fan motor

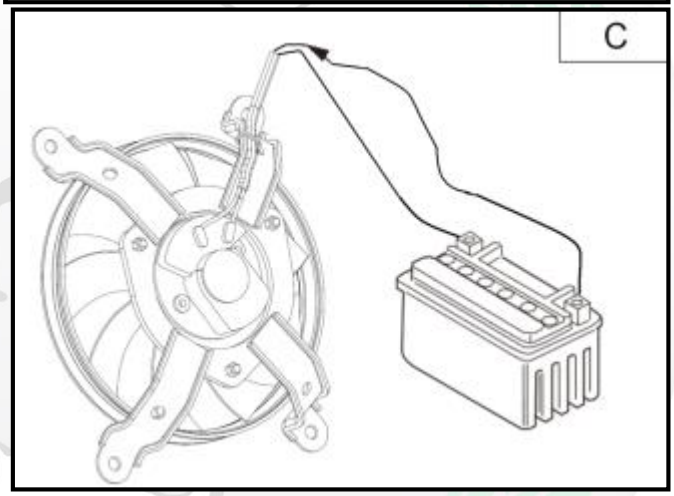
● Test the fan motor with a multimeter set to “Ω”, as shown in Fig. B

If it is shown as "∞", it means that the motor is damaged. Please replace the fan assembly.



- Connect the fan motor to a rechargeable battery as shown in Fig. C

Check whether the fan is operating and is blowing air in the direction of the installation bracket (rearward). If not, replace the fan; if the blowing direction is not correct, switch the wiring plug wire positions.

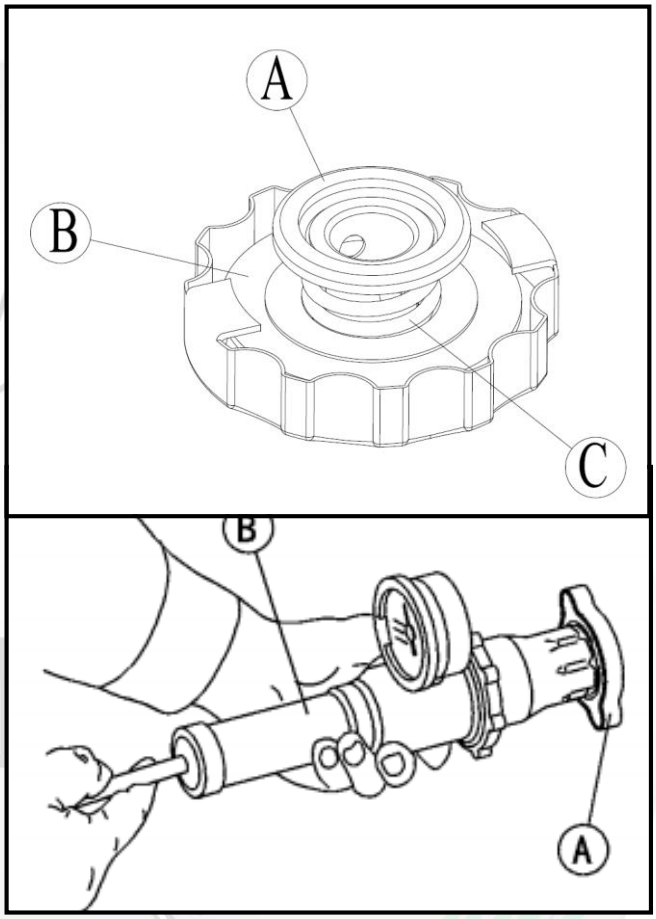


Radiator

Radiator

Radiator Cap

Disassemble:



Disassemble the right fuel tank fairing component (See Chapter IV Assembly machine covering part/fuel tank guard plate, engine bottom cover)

Check:

Check the base [A], top [B] valve seal and valve spring [C].

★ If any aforementioned part is damaged, replace it with a new radiator cap.

● Install the cap [A] into the cooling system pressure checking gauge [B].

Note:

Wet the sealing face of the radiator cap with water or cooling liquid to prevent pressure leakage.

Observe the pressure gauge. Pump up the pressure gage to increase the pressure until the decompression valve opens: Pressure gauge pointer flicks downward. Stop pumping and immediately measure the pressure value at air leakage. The decompression valve shall be turned on within the prescribed scope of the table below. In addition, pressure gauge pointer must stay for at least 6 seconds within the range.

Pressure release of radiator cap

Standard: 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18psi)

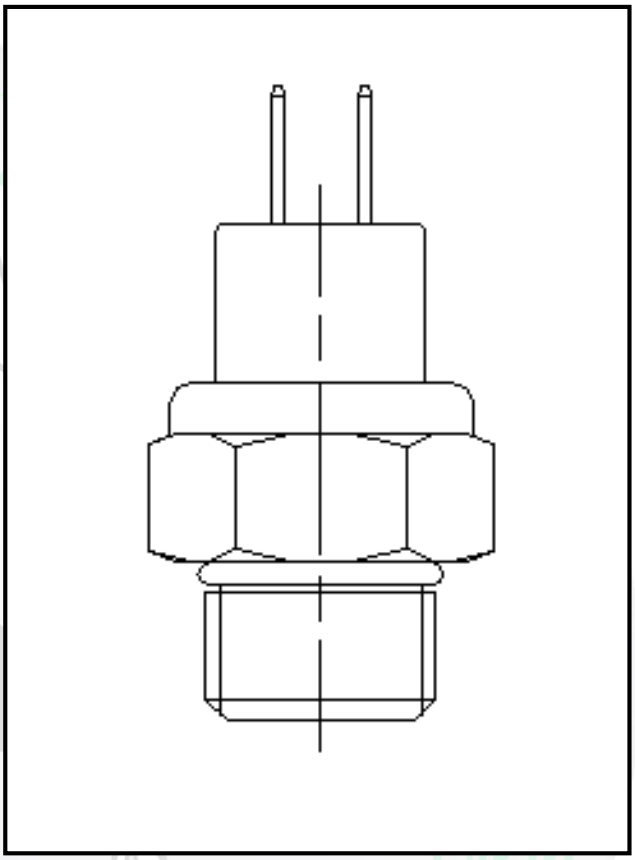
★ If the radiator cap prescribed cannot keep the stipulated pressure or keep excessive pressure, it is necessary to replace it with a new radiator cap.

Radiator

Radiator

Water Temperature Switch

Disassemble



Unplug the water temperature switch plug.
Disassemble the water temperature switch from the radiator with a wrench.

Conduction temperature: 208 ±4 °F
48°F≥connecting temperature—disconnecting temperature ≥37°F

Radiator

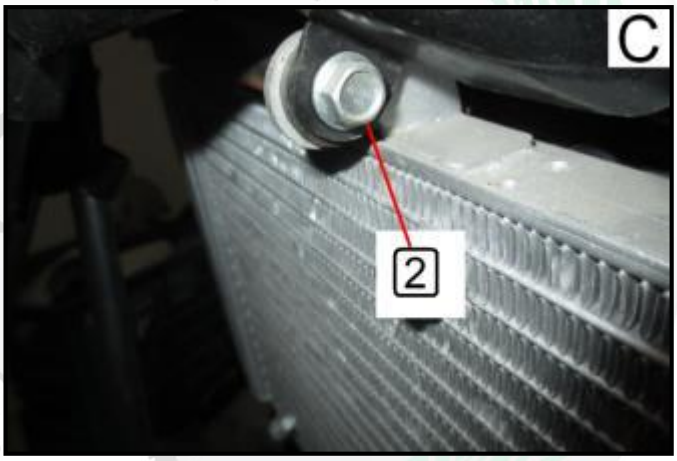
Radiator Assembly

Assembly shall be the reverse order of disassembly.

Note:

Fasten the radiator according to the following steps:

1. Fasten the bolts connecting the upper radiator end and the frame (2). Do not tighten the bolts yet. Fig. B



2. Fasten the bolts connecting the lower radiator end and lower radiator mounting bracket (1). Do not tighten the bolts yet. Fig. C

3. Fasten tightly
   - Fasten the bolts on the upper end of the radiator, and then the lower end;
   - Fasten them two or three times separately;
   - Tighten all the bolts to the following torque:

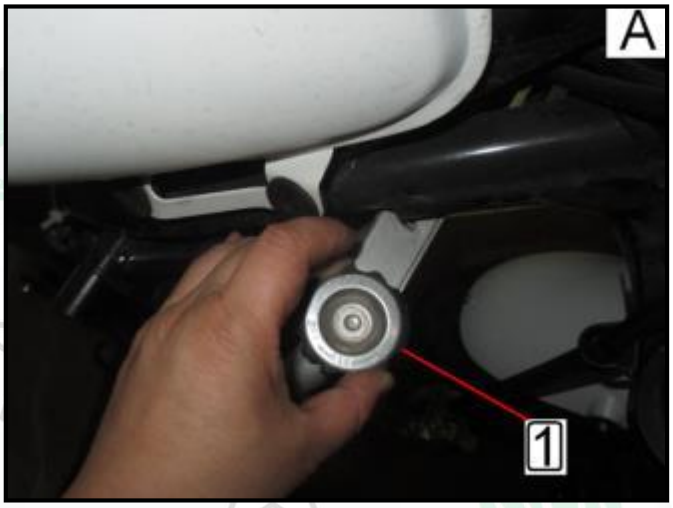
Torque: 7 ft·lb

Radiator

Filling the Radiator

Filling the Radiator

Open the radiator cap (1) and pour in coolant as shown in Fig. A.



Open the coolant reservoir (2) and pour in coolant liquid as shown in Fig. B.

Attention

While filling the coolant liquid, it is preferred to keep the coolant liquid level between the Max. and Min. scale on the coolant reservoir (3).

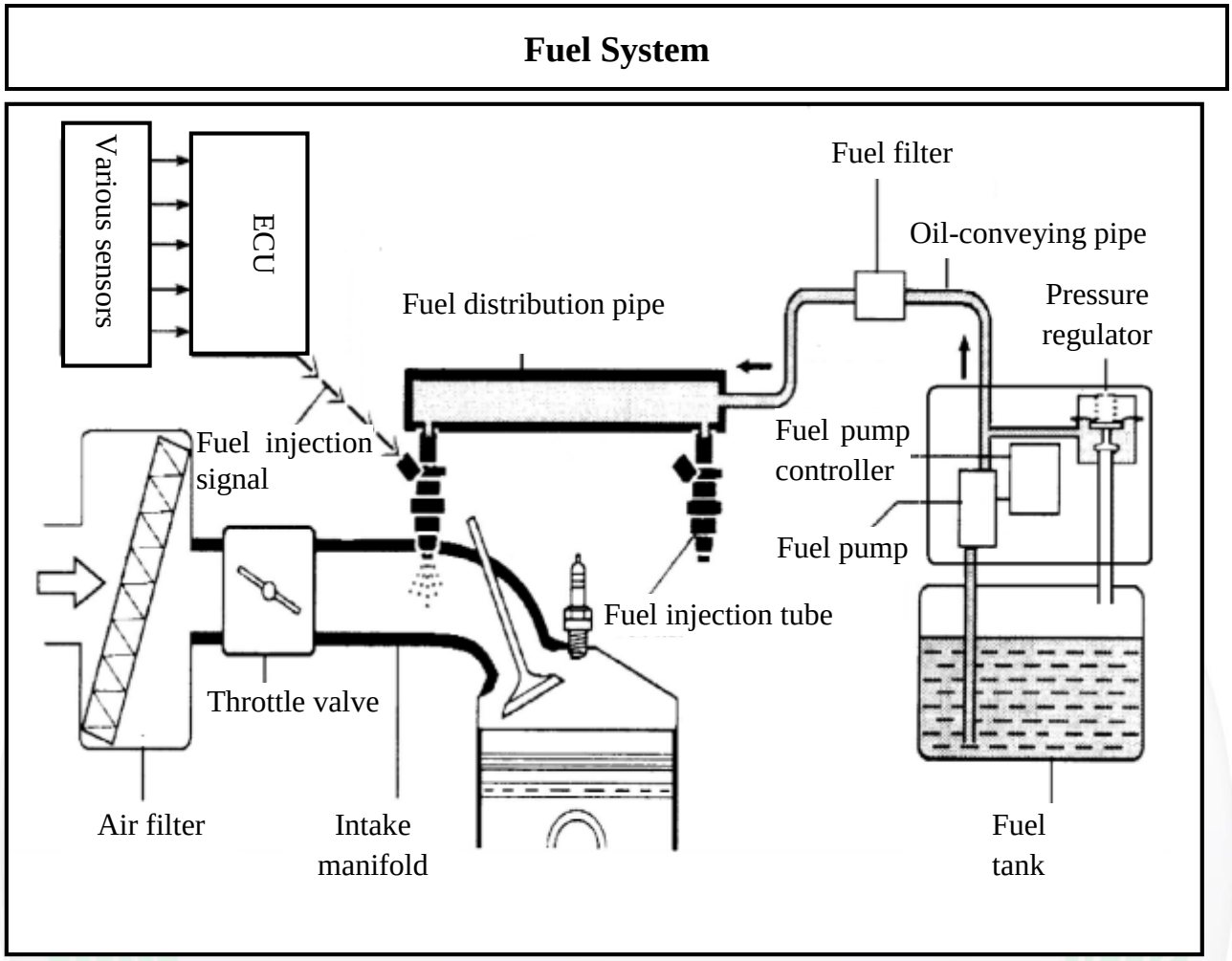
Discharge

Discharge the air in the cooling system according to the following steps:

1. Start the engine and remove the radiator cap. Slightly squeeze the exposed radiator hose pipe to discharge any bubbles in the radiator system until no bubbles can be observed in the coolant. If the liquid level at the radiator opening is low, you can add coolant liquid at any time.
2. Turn off the engine and wait for about 30 seconds. Add coolant liquid until the liquid level reaches the liquid filling port neck of the radiator.
3. Assemble the radiator cap and start the engine and allow it to run at idle speed or throttle up the engine slightly. The radiator fan can only be switched off after the radiator fan starts running.
4. After the engine cools down, check the coolant liquid level of the coolant reservoir. If the coolant liquid level is lower than the Min. liquid level stipulated, add coolant up to the Max. level as required.

Chapter VII Fuel system

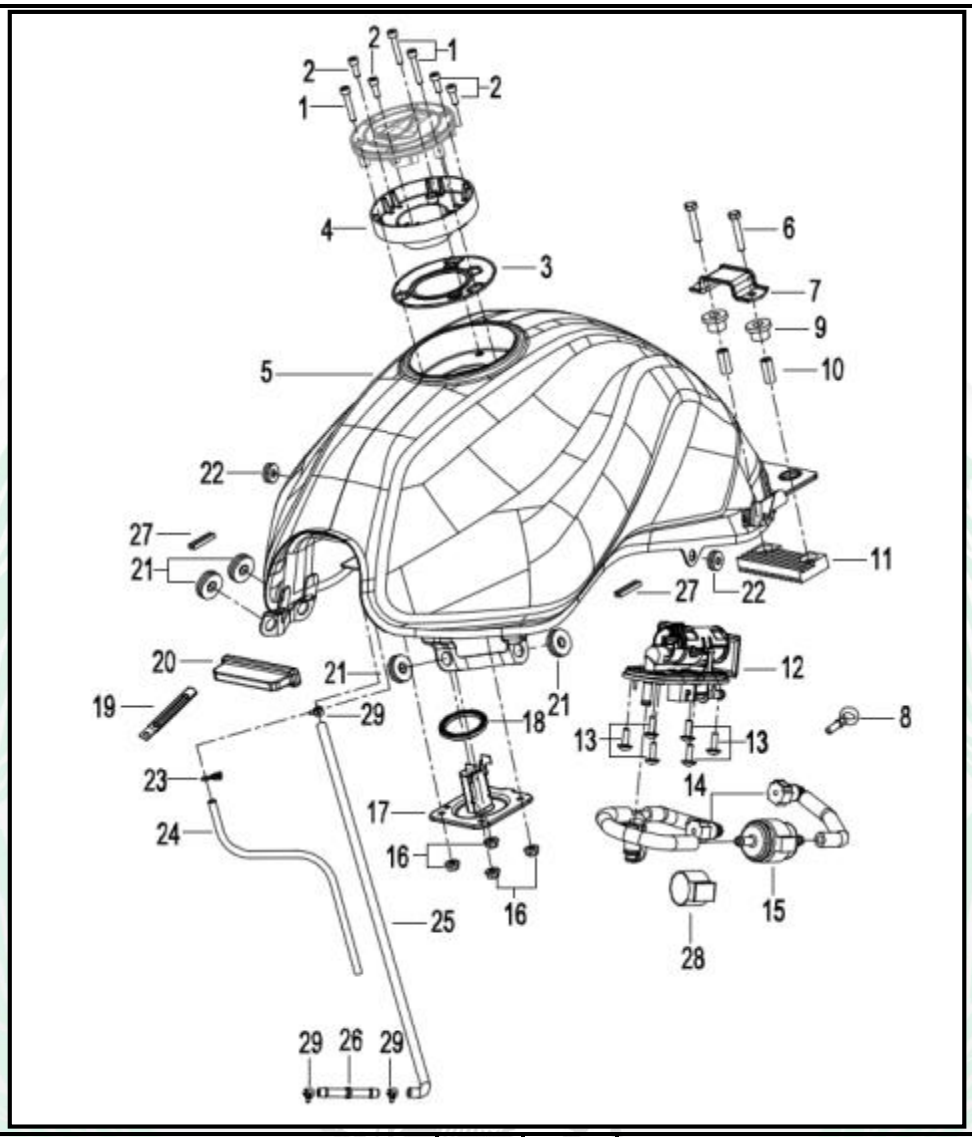
Fuel System



Schematic diagram of fuel system

Fuel Tank

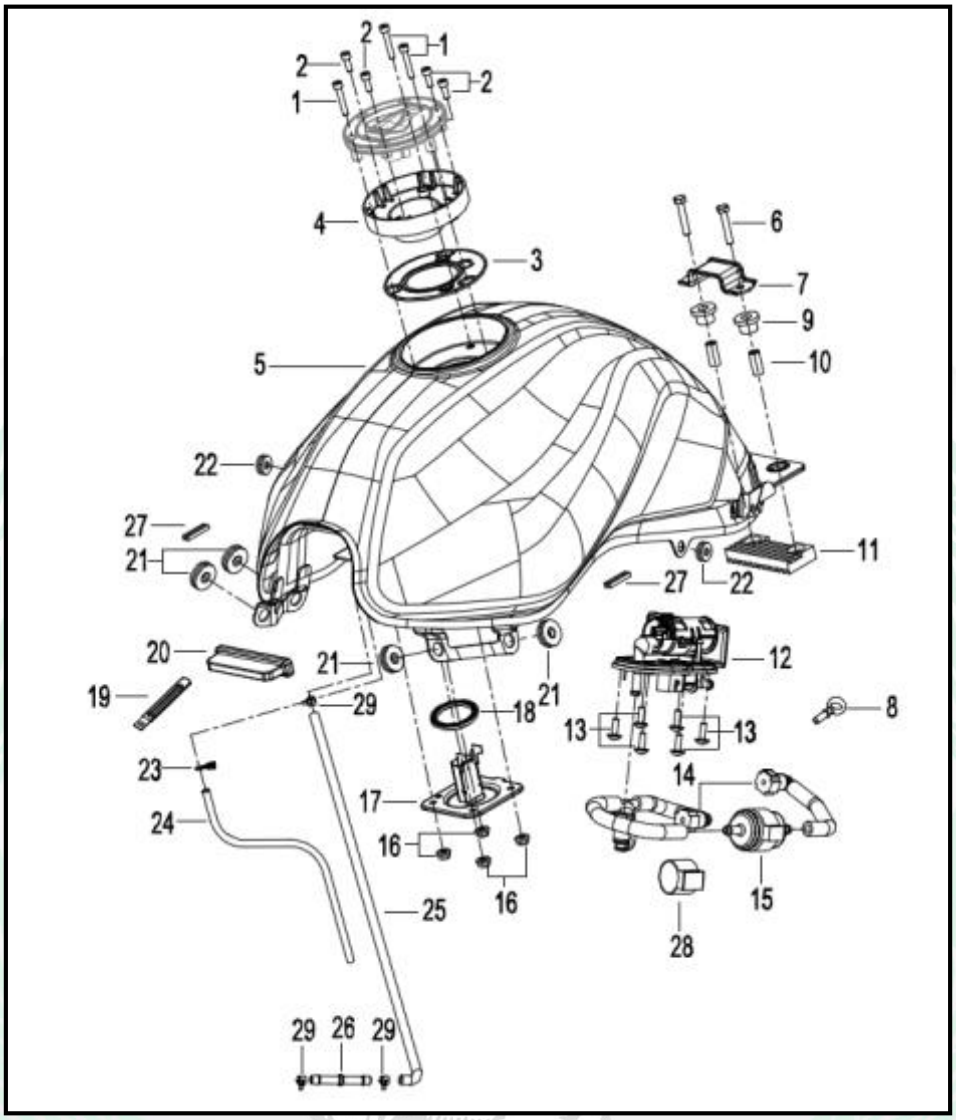
Fuel Tank Assembly



Item No.	Description & Specification	Qty.	Item No.	Description & Specification	Qty.
1	Bolt, Allen M5×30	3	9	Damper, Rubber	2
2	Bolt, Allen M5×14	4	10	Sleeve, Fuel Tank Mounting	2
3	Seal, Fuel Tank Cap	1	11	Base Damper, Fuel Tank Mount	1
4	Fuel Tank Cap Base Assy.	1	12	Fuel Pump Complete	1
5	Fuel Tank Complete	1	13	Screw M5×16	6
6	Bolt M6×35	2	14	Fuel Hoses	1
7	Mounting Bracket Assy., Seat Front	1	15	Fuel Filter	1
8	Fuel Pump Plug	1	16	Nut M6	4

Fuel Tank

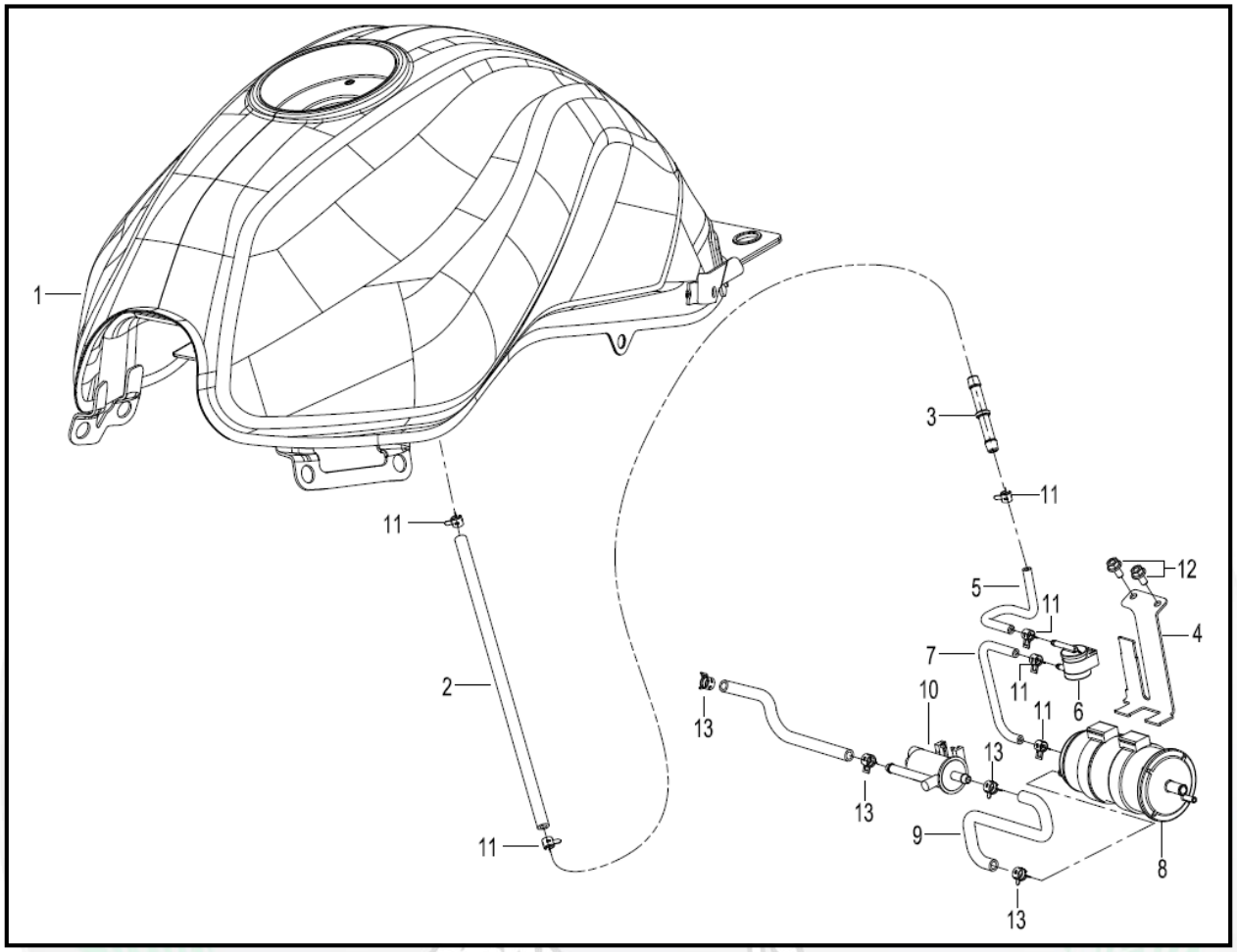
Fuel Tank Assembly



Item No.	Description & specification	Qty.	Item No.	Description & specification	Qty.
17	Fuel Lever Sensor	1	25	Hose, Check Valve	1
18	O-ring, Fuel Level Sensor	1	26	One-Way Check Valve	1
19	Wire Retainer Clip	1	27	Damper, Strip	2
20	Rubber Sleeve	1	28	Holder, Filter Jacket	1
21	Gromet, Plate C	4	29	Hose Clamp	4
22	Gromet, Plate B	2			
23	Hose Clamp Φ10.5	1			
24	Hose, Drain Φ7*2*880	1			

Fuel Evaporative Recovery System

Fuel Evaporative Recovery System



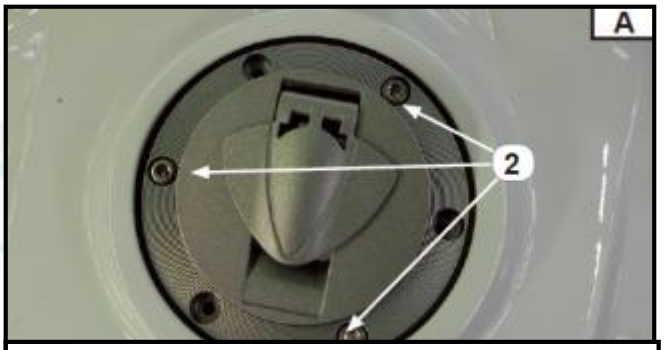
Serial number	Description & Specification	Qty.
1	Fuel Tank	1
2	Hose, Check Valve	1
3	One-Way Valve	1
4	Canister Mounting Bracket	1
5	Hose	1
6	Check Valve Component	1
7	Hose	1
8	Canister Assembly	1
9	Hose	1
10	Canister Solenoid Valve	1
11	Hose Clamp	6
12	Screw M6×12-8.8-ZG	2
13	Hose Clamp	4

Fuel Tank

Fuel Tank Assembly

Assemble:

Apply the sealing gasket for the fuel tank cover (3) on the fuel tank cover supporting component (4)
Assemble the fuel tank cap base component (4) onto the fuel tank (5).
Fasten the fuel tank cap base screws (1).
Use three relatively longer fastening screws (2) and tighten the tank opening lock as shown in Fig. A.



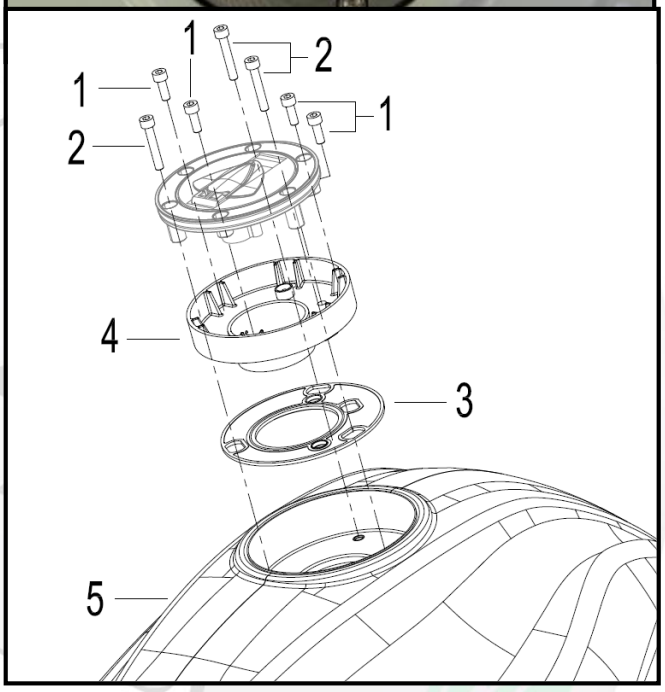
Note:

The shorter screws assembled outside the lock are only for visual effect.

Note:

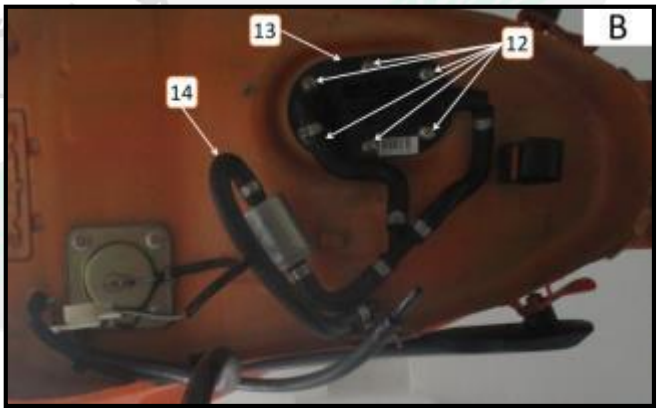
Tighten the bolts to the following torque:

Torque: 53 in·lb



Assemble:

Assemble the fuel pump component (13) to the fuel tank with the six bolts (12). Then attach the high-pressure fuel hose (14) correctly as shown in Fig. B



Note:

Tighten the bolts to the following torque:

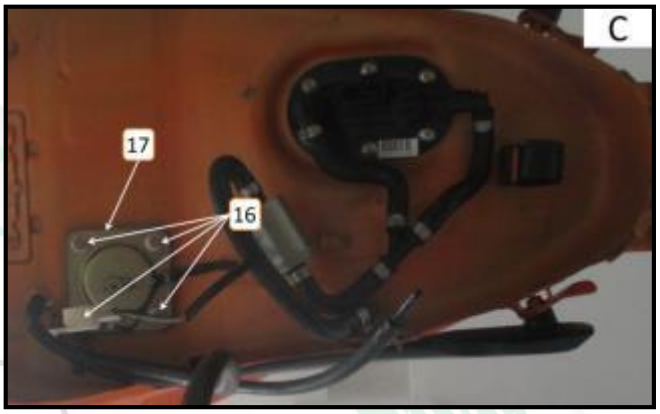
Torque: 26 - 35 in·lb

Fuel Tank

Fuel Tank Assembly

Assemble:

Assemble the fuel level sensor (17) to the fuel tank with four bolts (16).



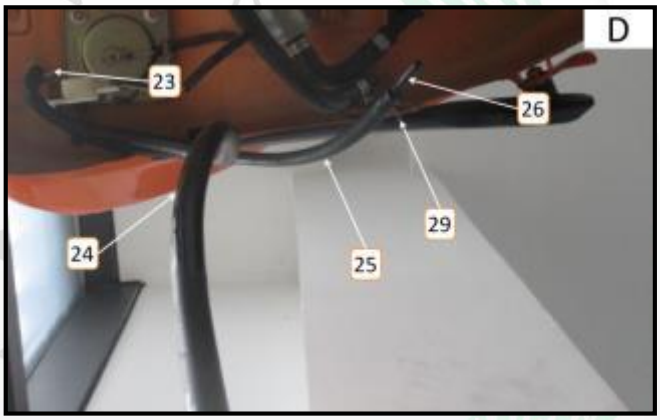
Note:

Tighten the bolts to the following torque:

Torque: 7 ft·lb

Assemble:

Install the overflow hose (24) on the fuel tank with the steel hose clamp Φ10.5 (23) as shown in Fig. D. Install the check valve and check valve connecting hose (25) onto the fuel tank with the hose clamp (29) as shown in Fig. D.



Assemble:

Attach the fuel tank to the frame with two bolts M6*35 as shown in Fig. E

Note:

Tighten bolts to the following torque:

Torque: 7 ft·lb

Fuel Tank

Fuel Tank Disassembly

Disassemble:

Disassembly shall be in reverse order of assembly.

Fuel Pump

Fuel Pump

Operating Principle of the Fuel Pump

Fuel pump assembly: Provides 36psi fuel pressure which satisfies the system requirements for the engine. Install on the bottom of the fuel tank through connecting hoses to provide fuel to the engine.

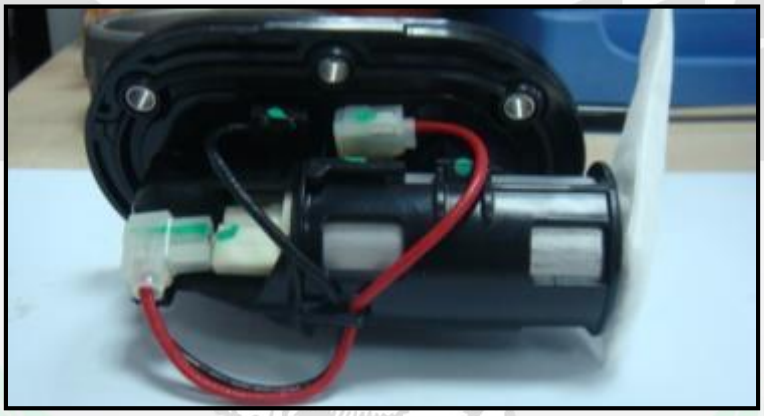
Fuel pump:

The electrical principle of the electric fuel pump is that when the fuel pump with a DC motor driven turbine structure running, the fuel existing in the circumferential grooves of the turbine rotor will make high-velocity motion along with the turbine rotor. Due to the function of centrifugal force caused by high speed, the fuel pressure at the fuel outlet will increase. In addition, the turbine will produce a certain amount of vacuum at the inlet of the fuel pump thus the fuel will be inhaled to turbine blade space. The inlet outlet pressure differential of the fuel can push fuel being transported from the outlet side to systematic fuel pipe continuously. The fuel delivery pressure generated by fuel pump is up to 36～58psi.

Pressure-regulating device: Mechanical diaphragm type. Performs fuel pressure regulation for the fuel pump unit to realize constant fuel pressure required by the system.

Fuel pump appearance

Interior Side:

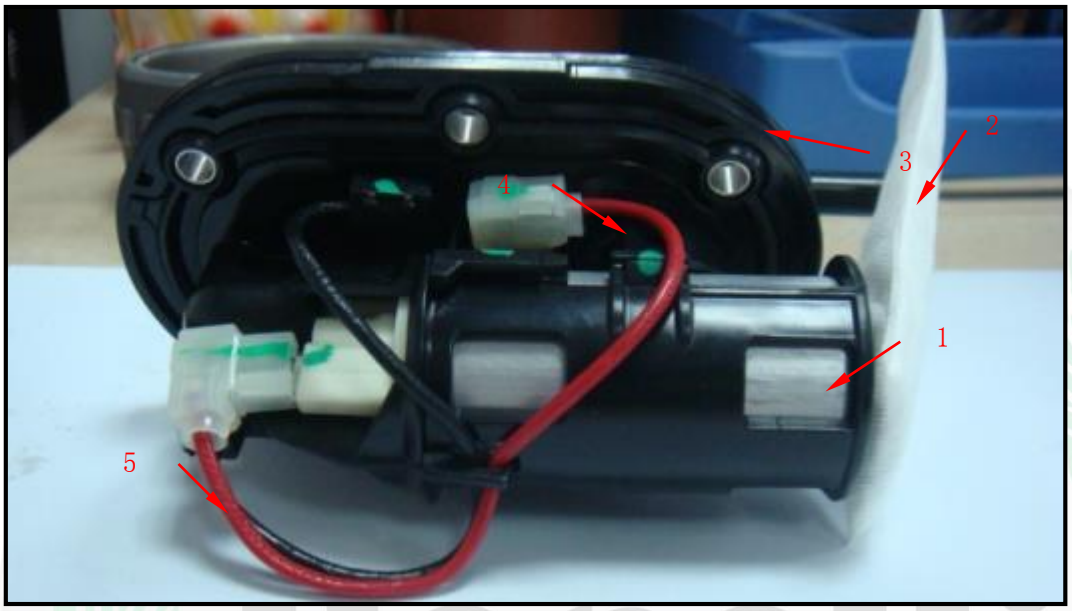


Exterior Side:

Fuel Pump

Fuel Pump

Fuel Pump Composition



1. Fuel Pump Assembly
2. Fuel Filter Screen
3. Fuel Pump Seal and Base Plate
4. Fuel Pressure Regulator
5. Fuel Pump Wire Harness

Tag and Identification Label of the Fuel Pump

Fuel pump assembly: Indicate in the form of label on the fuel pump assembly mounting cover.
Fuel pump: Engrave the marking on the pump body.
Fuel pressure regulator: Engrave the marking on the pump body.

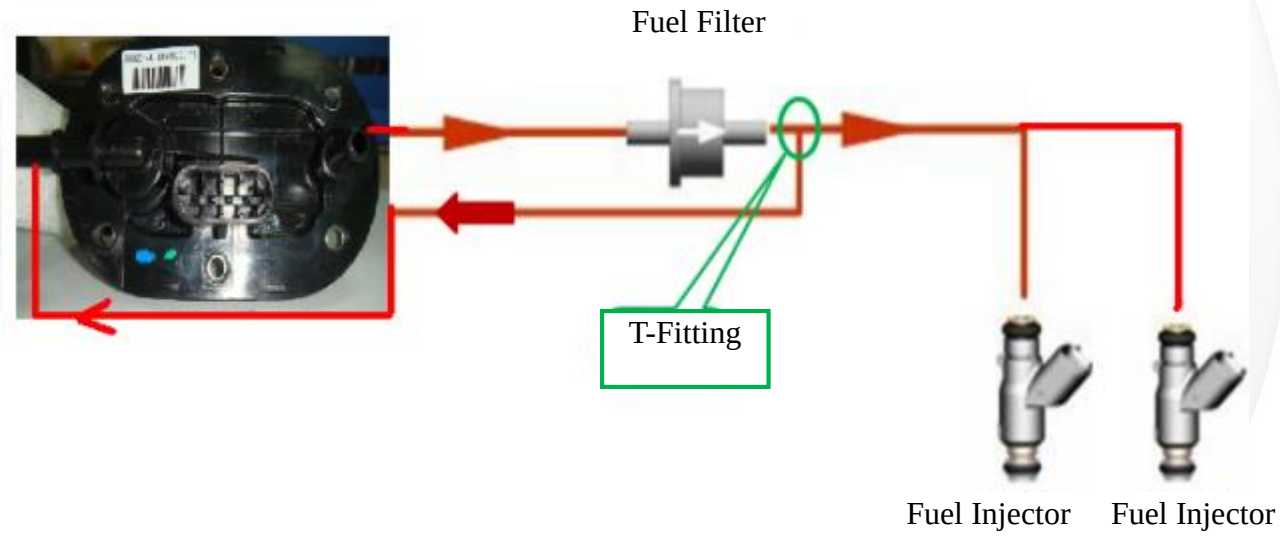
Fuel Pump

Fuel Pump

Working Environment of the Fuel Pump

- Fuel pump assembly shall be installed at the fuel tank bottom according to the installation requirements.
- Generally, the fuel pump assembly design is only for gasoline fuel, ethanol and gasoline ratios of no more than 22% ethanol.
- Please make sure that there is sufficient fuel when first running the fuel pump assembly. Don't run when there is no fuel as it can overheat and fail.
- For the fuel hose connection method, please refer to the following diagram:

Vehicle Fuel Line Diagram



Fuel Pump

Fuel Pump

Fuel Pump Maintenance Procedure

Safety protection:

In case of fuel system maintenance, watch out to ensure personal safety.

- Disconnect the negative terminal of the vehicle battery.
- Smoking is strictly prohibited. Set "No smoking" signs around the operating area.
- Ensure there is an extinguishing device nearby.
- Operating environment has excellent ventilation and shall be far away from sparks or open flames.
- Wear safety glasses.
- In order to release the fuel vapor in the fuel tank, open the fuel tank cover and then close it.
- When the engine shuts down and the pressure of the fuel system still remains very high, disassemble or loosen the fuel line, and the fuel will spray out. Operate according to "Fuel pressure release procedure" in the Chapter.
- There will be a small amount of fuel flowing out after disassembly make sure to avoid hazards. Block the fuel hose with a bolt or hose clamping device.
- After maintenance, ensure that fuel pipe and clamp are reasonably installed.
- After maintenance, perform a systematic fuel leakage test according to the "fuel leakage check procedure".
- After maintenance, connect the battery negative terminal. Make sure that there is sufficient fuel in the tank before fuel pump operation.

Fault diagnosis of the fuel pump assembly:

Proced-ure	Operation	Yes	No
1	After ignition key is switched on, the fuel pump will run for 3s. .	If the sound of the fuel pump running can be heard, skip to step IV directly.	If the sound of the fuel pump running cannot be heard, skip to step II directly.
2	Disconnect the fuel pump plug connector. Check whether the supply voltage of the fuel pump is within the range of 10-14V.	Perform step III	Check power supply circuit for the fuel pump.
3	Supply 12V DC current to the fuel pump. Make sure that there is sufficient fuel in the fuel tank to prevent the fuel pump running without fuel. Whether the fuel pump is operating.	1. Check the wiring from the fuel pump to the ECU. 2. Check the ECU.	1. Check the fuel pump wiring harness. 2. Check the fuel pump.
4	Check whether the fuel supply pressure at the front end of the jet nozzle is within the range of 32-39psi	Fuel pump assembly runs normally.	Perform step V.
5	Test whether the fuel pipe line pressure is lower than 32psi with a fuel pressure gauge.	1. Check whether the fuel hose joint is subject to leakage. 2. Check the fuel pump device. 3. Check the pressure regulator.	1. Blockage of the fuel filter 2. Pipeline kinks or twists. 3. Check the pressure regulator.

Fuel Pump

Fuel Pump

Dismount the fuel pump assembly:

- Release the fuel pressure in the fuel system referring to "Fuel pressure release process".
- Disconnect the negative terminal of the battery.
- Disconnect the connector clip for the fuel pump assembly wiring harness.
- Remove the residual fuel in the fuel tank. Save with an appropriate container to ensure safety and reduce pollution.
- Disassemble the connecting fuel hoses from the fuel pump assembly with a clamp.
- Disassemble the fuel tank from the motorcycle.
- Place the fuel tank upside down. Pay attention to avoid fuel tank scratching and collision.
- Disassemble the fuel pump assembly bolts.
- Take the fuel pump assembly out from inside the fuel tank.
- Pay attention not to scratch the fuel pump filter screen.

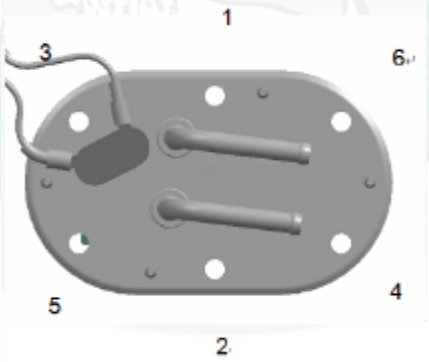
Fuel pump assembly:

- Replace the fuel pump seal for the pump assembly to the fuel tank (A used gasket may cause fuel leakage).
- Tuck the fuel pump filter screen into the tank and place the fuel pump assembly back into the fuel tank. Pay attention not to damage the fuel pump filter screen.

  Fuel pump assembly direction: The installation screw holes of fuel pump assembly are arranged in dissymmetric order. The pump can only be assembled in a specified direction. The pressure regulator shall face the backside of the fuel tank.

  Maintain the fuel tank installation surface is clean and flat.
- Install the retaining bolts on the fuel pump assembly base plate. Tighten the bolts uniformly according to the indicated sequence as shown in the Fig. below. Bolt assembly torque: 26.5 ~ 34.4 in·lb.

  The fuel pump assembly shall be fixed with special bolts. Tighten the bolts according to the stipulated sequence and torque at assembly. Over torque and/or the wrong tightening sequence will lead to gasket deformation and fuel leakage.
- Assemble the fuel tank on the motorcycle.
- Connect the fuel hoses and use the appropriate clamps to assemble.
- Connect the connector clip of the fuel pump wiring harness.
- Check for leakage before engine running according to "fuel oil leakage check procedure".



Bolt Installation Tightening Order

Fuel Pump

Fuel Pump

Fuel pressure release procedure:

Matters needing attention: DO NOT perform this procedure when the engine is warm or hot.

Confirm that the engine has cooled completely. Please conduct the following fuel pressure release operation:

- The motorcycle is in a "neutral gear" state.
- Disconnect the connector clip for the fuel pump assembly wiring harness and vehicle wiring harness.
- Start the engine until the engine automatically dies. Consecutively switch the ignition key “OFF” and “ON” again 2-3 times with a time interval of 3s between.
- After completing the aforementioned operations, connect the connector clip for the fuel pump assembly wiring harness.

Fuel leakage check procedure:

After completing the maintenance of any fuel system component, perform the fuel leakage check procedure:

- Fill with sufficient fuel in fuel tank
- Switch the ignition key “ON” for 3s and then turn “OFF” for 15s. Repeat the above operations 3-4 times, in order to establish fuel pressure in the fuel system.
- Check if there is any fuel leakage of components in the fuel system (fuel tank, connecting fuel hoses, fuel hose connectors etc.)

Fuel Pump

Fuel Pump

Operation Precaution:

Attention:	Causes
DON'TS: Throw and/or drop the fuel pump.	It will cause fuel pump internal damage.
DON'TS: Oil pump "dry running" (fuel pump inlet, free of fuel at the filter screen outlet). Make sure there is sufficient fuel in the fuel tank.	It will damage the internal parts of the fuel pump.
DON'TS: In case of damage to the filter screen.	Impurities will enter the fuel pump from the damaged filter screen and can damage the pump assembly.
DON'TS: Disassemble internal parts of the pump and pressure regulator. **DON'TS:** Replace the fuel pump harness and/or the pressure regulator (replacement excluded).	The damage caused by disassembly without permission is not covered by the warranty.
DON'TS: Lift the fuel pump assembly with the fuel pump assembly wiring harness. **DON'TS:** Lift and pull the fuel pump wiring harness in a vertical direction.	Wiring harness damage / fuel pump power supply disconnected.
DON'TS: Use a damaged fuel hose clamp.	Pressure leakage / fuel leakage.
DON'TS: Use a fuel pump assembly with seriously damaged or cut fuel pump filter screen.	Impurities will enter the fuel pump through the damaged filter screen into the pump body and cause damage.
DON'TS: Use the fuel pump to extract fuel from the fuel tank.	Oil pump is not designed for this purpose.
DON'TS: Use the mounting screws for the fuel pump assembly to fix other parts.	It will affect the installation of the fuel pump assembly.
DON'TS: Damage the fuel pump wiring harness and terminals at fuel pump assembly maintenance.	Leads to poor contact / fuel pump power supply disconnection.
DON'TS: Contact the fuel pump assembly while extracting fuel from the fuel tank with a manual pump.	Avoid fuel pump assembly damage.
DO'S: Make sure that the fuel hoses are not damaged during maintenance.	Avoids fuel oil leakage.
DO'S: Only use the "original" sealing gasket for the fuel pump assembly.	Counterfeit / aftermarket products may lead to fuel leakage.
DO'S: Use the specified hose clamps.	Ensure that there is no fuel leakage at the fuel hose connections.
DO'S: Fuel pump wiring harness shall be fixed on the motorcycle.	Reduce vibration.
DO'S: Use standard fuel.	Poor quality fuel will lead to premature failure of the fuel pump.
DO'S: Replace fuel filter within the required time.	An obstructed filter may cause reduction of fuel delivery.
DO'S: Use specified fuel filter in conformity with requirements.	The nonconforming filters will damage the jet nozzle, fuel pressure regulator and fuel pump.
DO'S: Ensure proper arrangement of the fuel hoses without interference with other parts.	Incorrect routing and interference will damage the fuel hoses.
DO'S: Make sure that there is sufficient fuel (to submerge the fuel pump filter screen) in the fuel tank.	Prevent the fuel pump running without fuel.
DO'S: Replace the two O-rings simultaneously during pressure regulator maintenance	Ensure correct pressure adjustment curve of pressure regulator.
DO'S: Carefully connect the electrical connector for the fuel pump assembly wiring harness.	Avoid damage to the connector terminal.
DO'S: Return any touched, damaged, and suspicious parts and describe the problems.	Detect the root causes rapidly.

Warning:

- For new motorcycles, since there is no gasoline in the fuel tank, after filling the fuel tank, there is a lot of air in the fuel lines. The engine needs to be cranked over many times to discharge the air in the fuel lines for normal operation. This is a normal phenomenon. This will only need to be done when the fuel system has been completely drained.
- Since gasoline plays a role to cool the fuel pump, the fuel pump shall not run with insufficient or even without fuel which may lead to fuel pump burnout.

Throttle Body

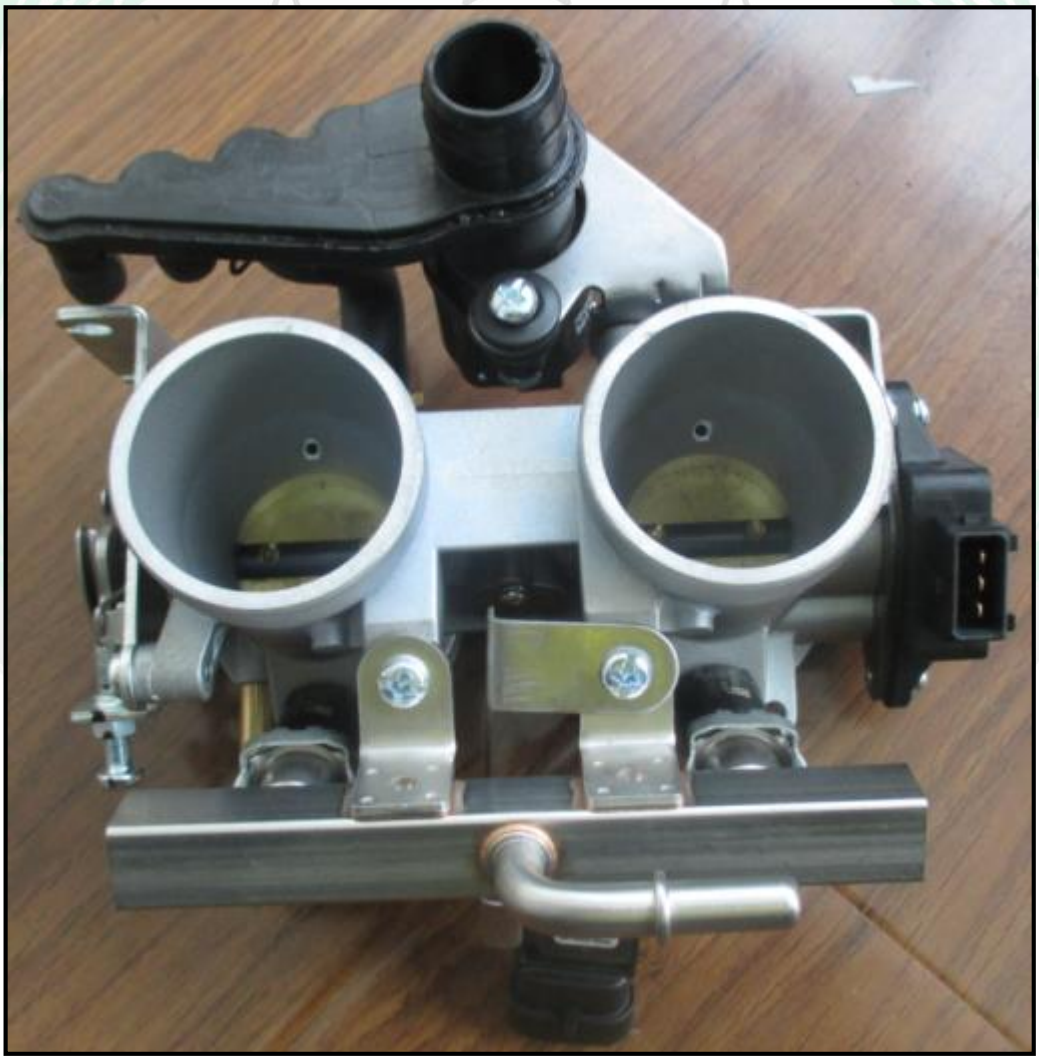
Throttle Body

Operating Principle of the Throttle Body:

Throttle body assembly is mainly composed of the following parts: main cast body, bearing, shaft and valve plates, return spring, throttle wire, position sensing system of the throttle valve and bypass air control system. All the subsystems will work together to meet the following functions:

- Inlet flow control
- Air idle flow control
- Position detection of the throttle valve - Provide throttle opening feedback signal for engine control system. Position sensor of throttle body provides throttle opening for ECU; stepper motor on the throttle body controls engine idle speed to maintain target idle speed as required by ECU.

Appearance of throttle body:



Throttle Body

Throttle Body

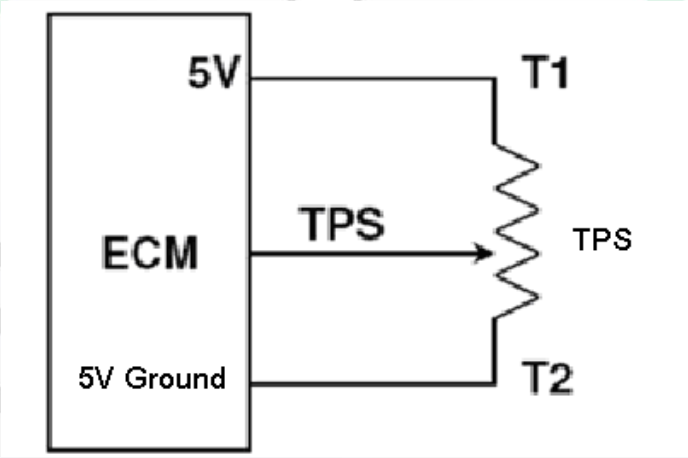
Technical Parameters

Throttle body:

- 34mm ID: Max. flow: ≥50g/s @ 2.7kPa vacuum degree
- Starting torque of throttle body:
  Idle state: 0.12±0.03Nm
  Fully open: 0.32±0.05Nm

Position sensor of throttle valve:

- Reference voltage: 5±0.1VDC
- Resistance between T1 and T2: 3k~12kΩ



Air idle control valve:

- Working voltage: 7.5~14.2 VDC
- Winding resistance: 53Ω±10%
- Wire winding coil: 33mH±20%

Working Environment of the Throttle Body

Normal operating temperature: -22 ~ 248°F

Disassembly of the Throttle Body

- Disconnect the negative terminal of the battery.
- Disconnect the connector assembly for the throttle valve positioning sensor, stepping motor, inlet temperature/pressure sensor (installed on the throttle body assembly).
- Dismantle the throttle cables.
- Dismantle the flexible hose connecting the air cleaner and air intake manifold.

Throttle Body

Throttle Body

Negative Pressure Balance of the Throttle Valve Regulation

Method to adjust the negative pressure balance: Connect the detection software; check the fuel injection pulse width of the two cylinders and control the ventilation through adjusting the by-pass port screws. After the adjustment, the fuel injection pulse width of the two cylinders will get close to each other. Generally, the fuel injection pulse width is at 2.0ms.

Throttle Valve Cleaning Method

Clean the throttle body with carburetor cleaner (3M products recommend). Spray the cleaner on interior walls of throttle body. Brush off any dust, carbon deposits etc. gently. Pay attention that the bypass air way shall not be blocked with dirt or debris.

Assembly of the Throttle Body

For throttle body assembly steps, pay attention to the following points:

- Adjust the throttle cables.
- Ensure that all the dismantled parts, such as the stepper motor, have been installed in the correct position.
- Connecting screws assembly

Installation Cautions for the Throttle Body

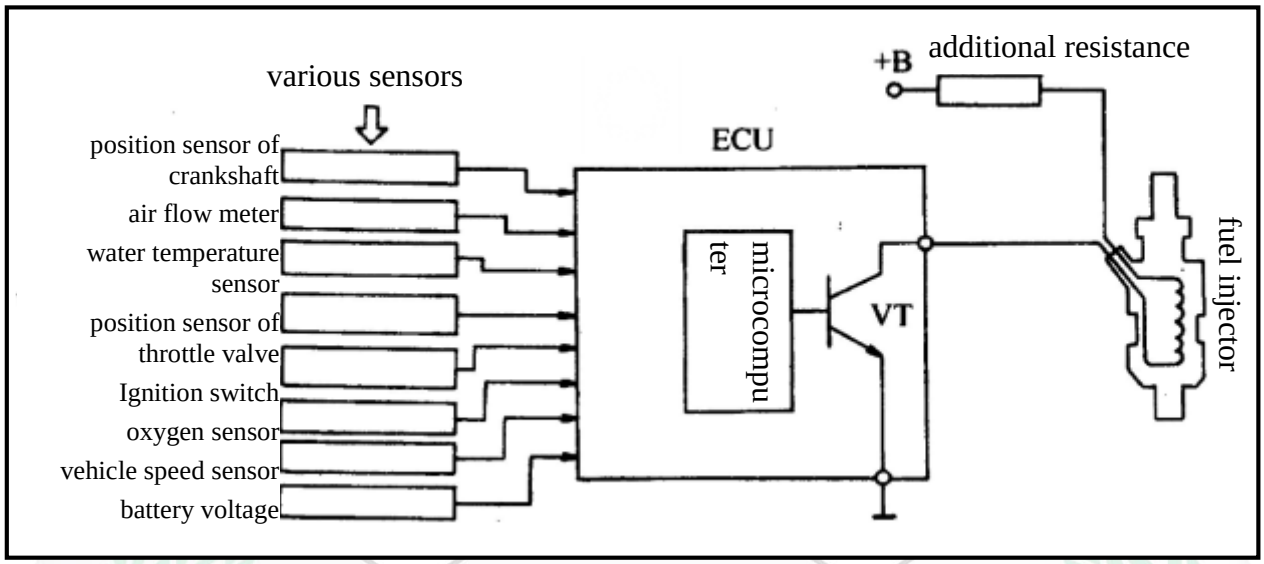
- Do not soak the position sensor for the throttle valve in liquid.
- Always use throttle cables to open up the valve.
- Do not use tools or other materials to open the throttle valves, which may cause valve deformation or scratch the interior walls of the throttle body. Such damage will cause the valve to be opened either very easily or very difficultly.

Operation Cautions for the Throttle Body

Attention:	Causes
DO'S: Install all the throttle body connectors carefully	Avoid damage to the wiring terminal.
DO'S: Avoid any liquids entering into the throttle body	Ensure normal operation.
DO'S: Take off and assemble only one throttle valve from the component tray at one time.	Avoid damage to key components.
DO'S: Send back any failing, damaged or suspect parts and components with quality issues. Attach tags to indicate the existing problems (only for warranty replaced components).	Quickly identify the cause of the problem.
DON'TS: Use any failing or extruded parts	May cause internal damages to the parts.
DON'TS: If it is stored or transported close to saline water without protection.	Corrosion may affect normal use.
DON'TS: In case of being exposed to the environment (for example humid environment) before assembly.	Corrosion may affect normal use.
DON'TS: Testing with non-system operating voltage	May lead to damage.
DON'TS: Using additional jigs	May lead to damage.
DON'TS: Remove the packaging to enable the parts to touch each other.	It may affect the minimum air leakage or cause any other damages.
DON'TS: Suddenly release the throttle from any position.	May lead to damage.
DON'TS: The bypass channel being blocked by dust or small particles	May affect idle speed stability.
DON'TS: Pick up, store, or hold parts by a means that may contact other components.	This behavior may cause damage.

Fuel Injectors

Fuel Injectors

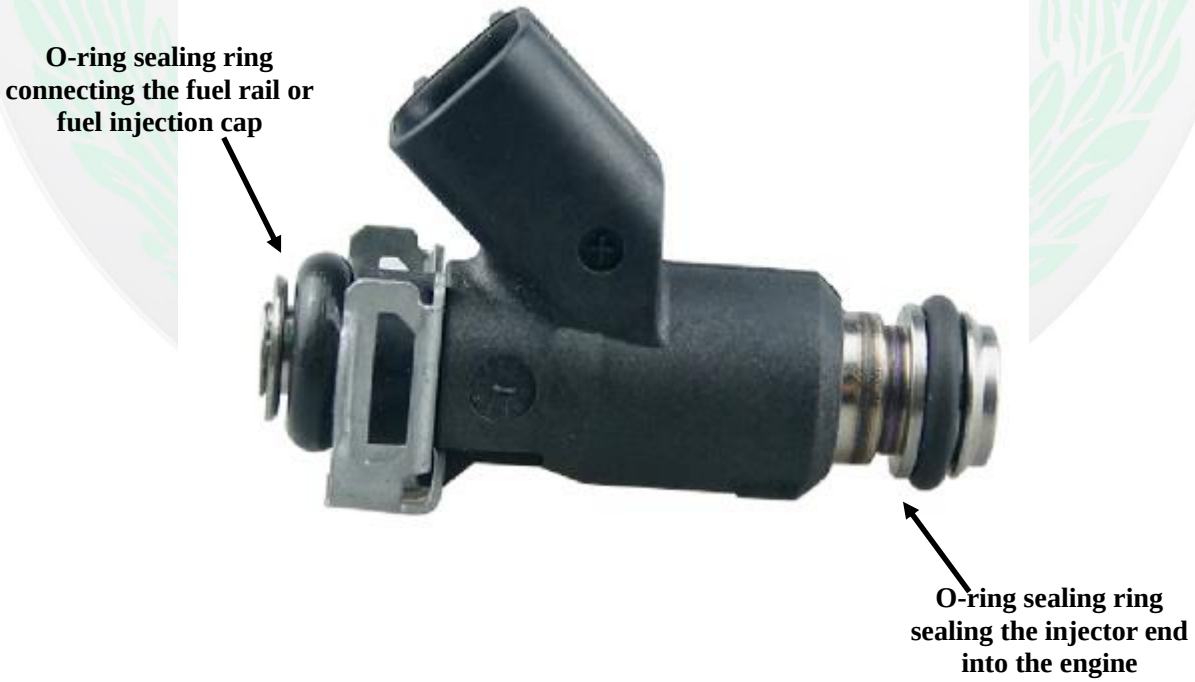


Operating principle of the fuel injectors

The fuel injector sends the appropriate volume of fuel and air into the cylinder for combustion.
Use the fuel injector with the same part number for replacement.

Appearance of fuel injector

The Fig. below is the appearance view of fuel injector.



Fuel Injectors

Fuel Injectors

Sealing O-ring for the Fuel Injectors

As shown in the Figure above, O-shaped sealing rings make sure that the fuel injector will not be subject to leakage within the range of -40 to 302°F (-40℃ to 150℃). In addition, it is resistant to all kinds of fuel additives (such as ethanol etc.). The following data is designed for current seal ring.

O-shaped sealing ring connecting fuel rail or spray cap.

- Size:
  - Inner diameter: 6.35 mm
  - Outer diameter: 14.85 mm
  - Section thickness: 4.25 mm
- Materials:
  - Viton ● GLT (blue): To be applied at low temperatures.
  - Viton ● A (black): Except to the applications be applied at low temperatures.

O-shaped sealing ring connecting inlet pipe end

- Size:
  - Inner diameter: 9.61 mm
  - Outer diameter: 14.49 mm
  - Section thickness: 2.44 mm
- Materials:
  - Viton A (Blue or brown)

Lubricant recommended

Lubricant shall be applied on the O-shaped ring to facilitate fuel injector assembly. The following is the list of verified lubricants. Testing demonstrates that the following lubricants have no impact on fuel injector performance:

List of lubricants recommended		
Name of the lubricants	**Manufacturer**	**Viscosity (cSt) @ 40 °C**
Spindura 10	Equilon	10
Spindura 22	Equilon	21
DTE-24	Mobil	32
DTE-25	Mobil	46
DTE-26	Mobil	68
Norpar 15	Exxon / Mobil	<1
Drawsol 60	DA Stewart	1-2
NocoLube AW 46	NOCO Energy	46
NocoLube AW 32	NOCO Energy	32
Advantage Spindle Oil	Advantage Lubrication Specialties	10

Fuel Injectors

Fuel Injectors

Overvoltage effects of the fuel injectors

Fuel injectors can run for one minute (operating with fuel) at maximum under the voltage of 26V with a pulse width of 100ms and 200ms one cycle operating conditions. It will not affect the flow rate, will not cause permanent damage on the electromagnetic coil, and will not weaken the electromagnetic performance.

Temperature range of the fuel injectors

Standard injector working temperature range is as follow. Within the scope of the qualified working temperature, fuel injector flow rate will not lose efficiency within the range of tolerance. In addition, the injector will not be subject to leaks, degradation and shortening of the life span in a proper working environment.

- Operating temperature range: -22~257°F (-30~125°C)
- Limit range of operation (it may be subject to functional degradation): -40~302°F (-40~150°C)
- Storage temperature: -76~140°F (-60 ~ 60°C)

Fuel pollutants of the fuel injectors

In spite of its self-cleaning function, the fuel injector is a serviceable part since it is designed to remove impurities with a small diameter accumulated between the fuel filter and the fuel injector. However, the impurities with a large diameter can cause fuel injector cementation, flow rate offset, leakage and other faults. Therefore, the fuel filter is very important and must be changed per the maintenance schedule.

Wiring harness layout of the fuel injectors

- Wiring harness layout of the fuel injectors shall be far away from a heat source. It shall be protected away from outside wear or damage.
- If it is not necessary, please do not plug the fuel injector connector.
- Fuel injector electrical connectors cannot be distinguished from positive and negative.

Fuel Injectors

Fuel Injectors

Operation Cautions for the Fuel Injectors

Attention:	Causes
DON'TS: Use an O-ring repeatedly. If a used O-ring must be used, please carefully check whether the O-ring is damaged before use.	Avoid leakage.
DON'TS: Immerse the jet nozzle end into lubricant.	May cause injection hole blocking.
DON'TS: Allow the engine to run with no fuel pressure.	Will damage internal mechanical components.
DON'TS: Allow water to enter the fuel system circuit during leakage inspection.	Will cause fuel injector damage.
DON'TS: Apply force to the head of the fuel injector during assembly.	While assembling the nylon air inlet pipe, it is allowable to apply force at a 45° angle.
DON'TS: Impact to the fuel injector while installing the fuel injector on the air inlet pipe.	Will cause damage to fuel injector and O-ring.
DON'TS: Applying pressure to the connector assembly.	Will cause an intermittent power supply.
DON'TS: Using a broken fuel injector.	May be damaged.
DON'TS: Store fuel injector, fuel rail, or engine with fuel in the system for long periods of time.	External environment could undermine electronic and mechanical components of the fuel system.
DON'TS: While lifting the assembly part, treat the fuel injector with caution.	It will damage the fuel injector.
DON'TS: The parts will contact each other during storage process.	It will damage the fuel injector.
DON'TS: The parts will contact each other during the transportation process.	It will cause damage to the fuel injector.
DON'TS: Tap the fuel injector to perform troubleshooting at occurrence of failure.	It will damage the fuel injector.
DON'TS: Substitute the original fuel injector with a new one with a part number other than those recommended.	It will seriously affect the performance of the fuel injector.
DO'S: Special attention should be paid that the O-ring shall not be damaged by the mounting base at fuel injector assembly	Protect the O-ring.
DO'S: Use a correct lubricant for installation. Assemble the part into the mounting holes after applying lubricant oil.	Protects O-ring and reduce pollution.
DO'S: Perform tests more frequently for fuel injector pasted by needle valve or failed to be seated. (Apply pulse less than 5s for fuel injector with a voltage within 9~15V)	Confirm the failure mode of fuel injector.
DO'S: Before fuel injector assembly, perform a fuel leakage test to check whether the needle valve of fuel injector has been seated properly.	During the transportation and delivery process, the needle valve of fuel injector may not return to the right position and may lead to fuel leakage.
DO'S: Avoid the fuel injector being polluted by the fluid.	It will lead to short circuit of electromagnetic coil.
DO'S: Disassemble the wiring harness carefully.	It may lead to terminal damage.
DO'S: Use the recommended lubricants at connector assembly.	It may produce corrosion on the terminal.
DO'S: It is not allowed to use failing, damaged components or those with material problems. Take a tag to illustrate the existing problem.	Make sure to detect the fault source quickly.

Fuel Injectors

Fuel Injectors

Installation Requirements for the Fuel Injectors

During the assembly and disassembly process, please strictly abide by the following methods to avoid damage to the fuel injector body and electronic components.

- Lubrication: Apply a small amount of lubricant at the lower side of O-ring. It is recommended to use ISO 10 light material oil or equivalent product. (See the chart on page 376)
- Under permissive conditions, the effects of applying lubricant on the fuel injector base are superior to being applied on the O-ring. Thus the contamination probability of the fuel injector can be reduced to the minimum level.
- The orifice panel shall not contact the lubricant, which will affect the fuel-injection amount. Do not dip the fuel injector into the lubricant.
- All the O-rings for the fuel injectors have been installed properly at delivery. In principle, reuse of the O-ring is not allowed. In case of repeated use, please carefully check whether the O-ring is damaged before use. Even tiny damage can cause leakage. Please take special care to fill the O-ring into the fixing seat.
- Pay attention not to destroy the connector at fuel injector assembly. After hearing the click sound, it means that the fuel injector connector has been installed into the correct position.
- Avoid unnecessary disassembling of the connectors.
- The wiring harness shall not be clamped too tightly. Over tightening will lead to short circuit.
- Do not rotate the fuel injector at fuel injector connector assembly which will lead to injection target offset.

Fuel Injector Replacement Method

Disassembly and replacement method of the fuel injector:

Attention: Fuel injector and high surrounding object temperature.

- Shut down the engine.
- Disconnect the negative battery terminal to avoid accidental starting of the engine.
- Remove the electrical connector assembly for the fuel injector.
- Release the fuel pressure.
- Remove the fuel lines from the fuel injector.
- Remove the fuel injectors from the throttle body.
- Disconnect the fuel injector retaining clip. Remove the fuel injector from the housing carefully.
- Remove any impurities from fuel injector contact surface. Pay attention not to damage the contact surface.
- Apply lubricant to the O-rings on both ends of the fuel injector.
- Put the fuel injector head into the duct carefully. Confirm that the installation is consistent with the original one.
- Press until the injector seats and attach the retaining clip properly.
- Fuel injection hose assembly.
- Insert connector assembly for the fuel injector until it clicks.
- Turn the key to power the fuel pump. Do not start up the engine to check fuel injector leakage.
- Start the engine to perform running inspection.

Fuel Injector Selection

Use the fuel injector with the same part number for replacement.

Fuel Injectors

Fuel Injectors

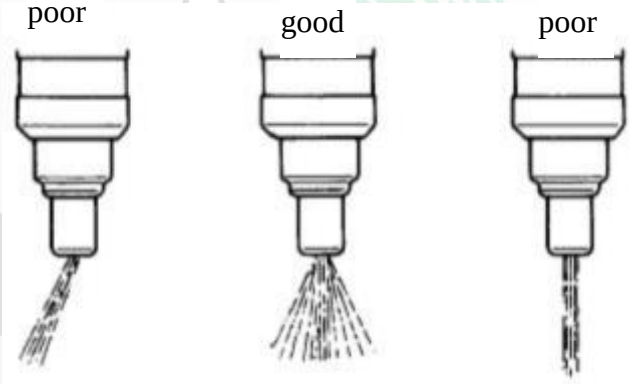
Blockage of the Fuel Injectors

Fuel impurity accumulation will cause improper atomization and shorten the injector's life. Engine heat makes the fuel produce precipitation at the fuel injector head. Precipitation gathers at the injection holes which will lead to flow deviation and improper atomization.

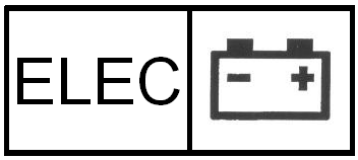
- Such blockages will lead to slow flow, increasing frictional force, impurity accumulation and other problems. It will ultimately affect the emissions and durability.
- Fuel and environmental factors may cause fuel crystallization or fuel injector corrosion which will cause flow deviation as well.
- Poor fuel oxidation stability will cause precipitation. Therefore, please use high-quality gasoline.
- Applying appropriate amount of fuel detergent can avoid precipitation.
- In case of a fuel injector blockage, clean the fuel injector according to the following cleaning method.

Warning:

- A filter is installed within the fuel injector. However, the fuel injector is not a serviceable part since it is designed to remove accumulation impurities between the fuel filter and fuel injector. Impurities can cause bonding, flow deviation and leakage fault. Thus the fuel filter is very important.
- Use the fuel injector with the same part number for replacement.



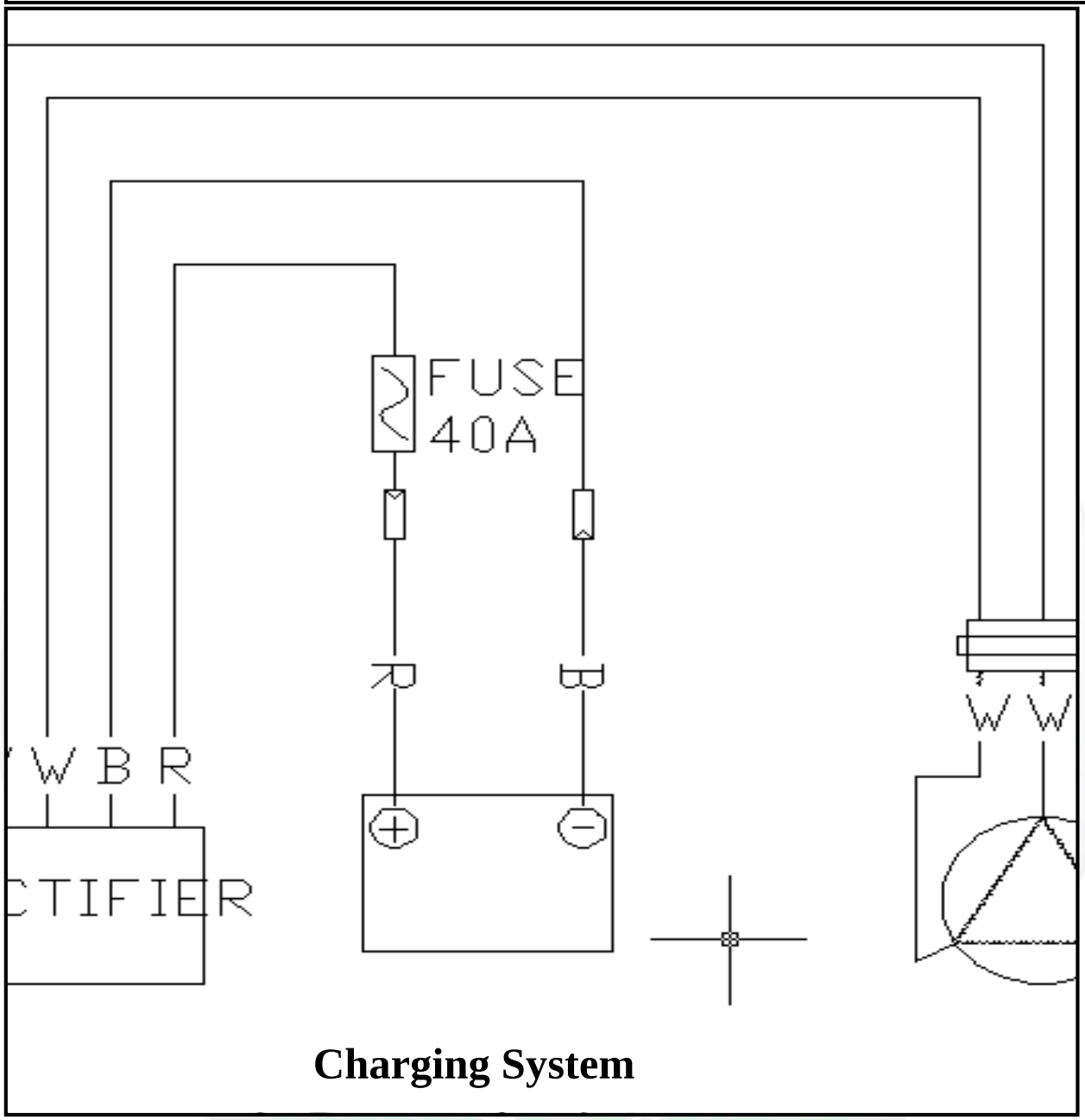
Fuel injector atomization state



Chapter VIII Electrical system

Charging System

Charging System



Charging System

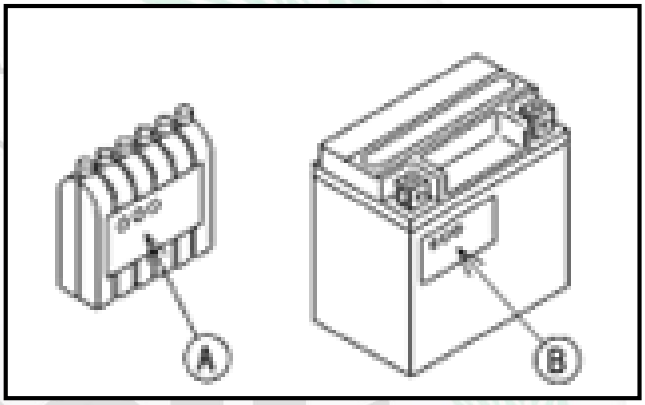
Rechargeable Battery

Rechargeable Battery

Battery disassembly:
Switch off the ignition switch.
Open the seat.
Disconnect the battery terminals.
Remove the battery installation clamp.
Remove the battery from the battery tray.

*Attention
Make sure to disconnect the (-) battery cable

Battery activation:
Electrolyte solution filling.
● Ensure that the model indicated on the electrolyte bottle [A] matches with the battery model [B]. These models must be the same.
Battery model of the TNT300: YTX9-L



Warning
Must use electrolyte solution with an indicating model of storage battery. Since the battery models are different, the volume and density of electrolyte solutions adopted will be different. This is to prevent excessive filling of the electrolyte thus to shorten the service life of the battery, and to reduce battery performance.

Warning
Before using, do not tear the aluminum seal [A] from the filling port [B]. Make sure to use dedicated storage containers to ensure correct volume of electrolyte filling.

● Put the battery on a flat surface.
● Check whether there are peeling, cracks, or holes.
● Disassemble the sealing strip

*Attention:
● The battery is vacuum sealed. In the case of air leakage from the sealing strip into the battery, the charging time for the first time could be longer.

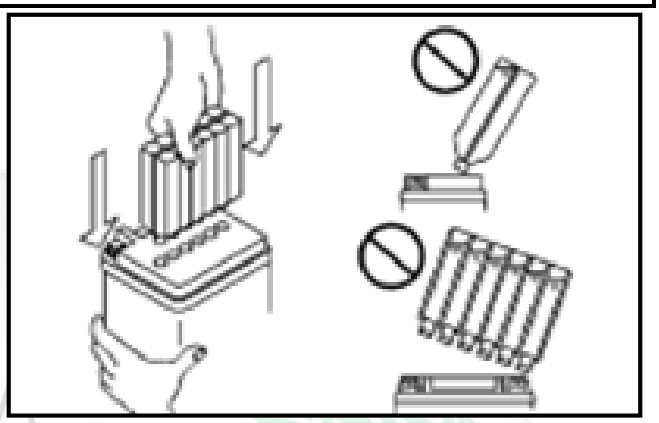
● Remove the electrolyte bottle from the plastic bag.
● Remove the strip lid [A] from the electrolyte container. Place the strip lid on slightly to seal the battery, but not completely (this keeps the electrolyte from splashing out during the charging process)

*Attention
Do not pierce nor open the seal layer of electrolyte bottle [B]. Do not try to open a single liquid cavity.

Rechargeable Battery

Rechargeable Battery

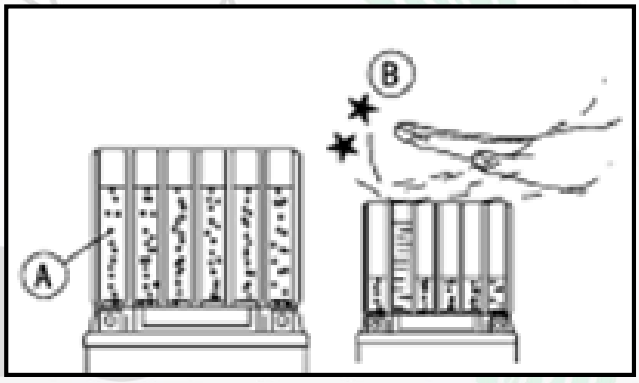
● To attach the electrolyte bottle, put the six seal grooves into the filling mouth. Keep the electrolyte bottle horizontal. Push down to pierce all six liquid chamber seals. As the electrolyte liquid fills the cavities, bubbles will be observed in the liquid cavity.



*Attention
● Don't tilt the electrolyte bottle.

● Check electrolyte flow:

★ If bubbles rising are not being observed in the liquid cavity [A], or if the electrolyte bottle is not fully filling the storage battery, slightly slap the top of the bottle several times [B].



● Allow the electrolyte bottle to fill for 20min. or longer. Before the container is completely empty, do not remove it from the battery. For normal operation of the battery, all of the electrolyte solution shall be removed from the container.

Warning
If the electrolyte solution in the electrolyte bottle is not fully filled into the battery, the service life of battery may be shortened. It needs at least 20 minutes to completely fill the electrolyte solution into the battery. Do not remove the electrolyte bottle before that.

● Slightly remove the electrolyte bottle from the battery.

● Let the battery sit for 60min. before charging, to allow the electrolyte solution to penetrate into the metal plates to achieve optimal performance.

*Attention
● Immediately charging batteries after filling will shorten the battery life. Let them sit for at least 60min. after filling.

Rechargeable Battery

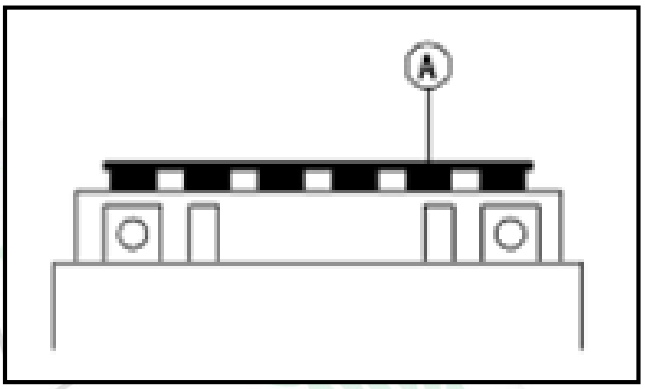
Rechargeable Battery

Initial charge:

● Slightly cover the open top [A] of the filling port. Do not completely press into the opening.

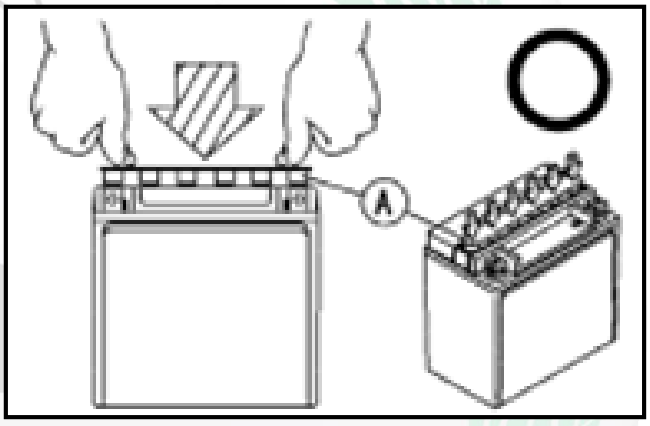
● The newly activated maintenance-free battery requires an initial charge.

Standard charging: 0.9A*5-10hrs



Attention
● Charging rate depends on the time and temperature of the battery, as well as the charger type. **● After the initial charge, let the battery sit for 30min. Use a voltmeter to check the voltage. If it failed to reach 12.6V, repeat the charging period.**

● After charging, press the strip cover [A] into battery with two hands (Do not thump or beat). After correct installation, make sure the strip cover is fully seated.



Warning
Once the strip cover has been installed on the battery, do not remove the cover, nor add water or electrolyte solution to the battery.

*Attention
● In order to ensure the longest battery life and highest customer satisfaction, it is recommended to perform a 15 second load test under three times the ampere hour rate. Recheck the voltage. If it is less than 12.6V, perform a charge cycle and load test again. If it is still lower than 12.6V, the battery is defective.

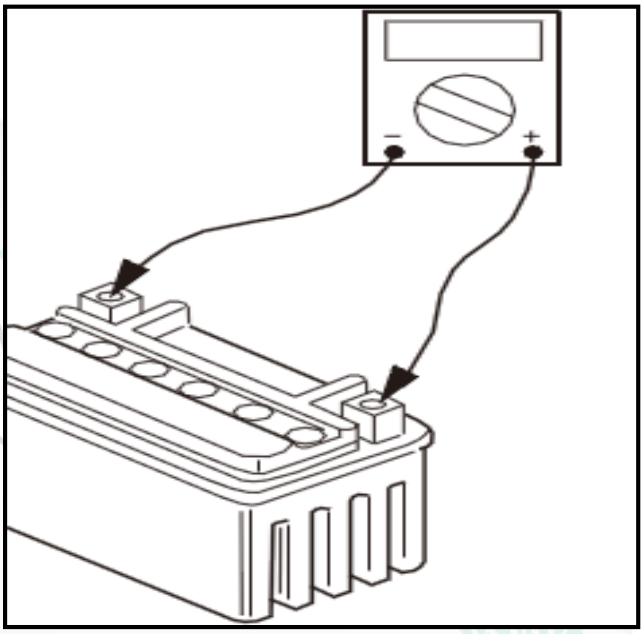
Rechargeable Battery

Rechargeable Battery

Inspection of charging state:

Battery can be checked with a voltmeter to measure the battery voltage.

- Battery disassemble
- Battery terminal voltage measurement



*Attention
Use a digital display voltmeter with high accuracy to measure the voltage.

If the reading is 13.6V or higher, it is not required to be recharged; however, if the reading is lower than the stipulated value, it is required to be recharged.
The following is the list stipulating terminal voltage and charging value:

Terminal voltage	Charging mode
Between 11.5 and 12.6V	0.9A x 5-10h
Lower than 11.5V	0.9A x 20h

Determine the battery status after recharging.
After charging, let the battery sit for 30min. Then determine the battery state according to the following table through measuring the terminal voltage:

Standard	Determination
12.6V or higher	Excellent
12.0~lower than 12.6V	Insufficient charging → Recharge
Lower than 12.0V	Unavailable→ Replacement

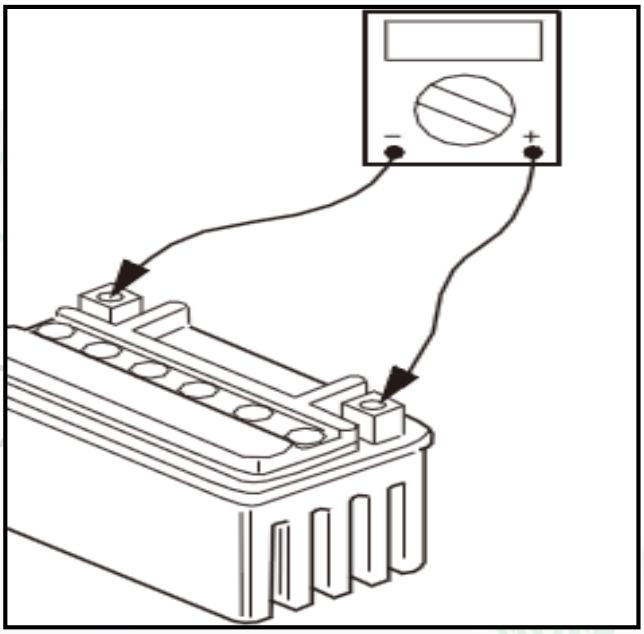
Use a voltmeter to check the battery charge state before installation.
Install the fully charged battery after the engine has cooled.
Connect a multimeter to the battery terminals.
Remove the main fuse. Connect the multimeter in a series along the terminals. (General multimeter limit to 10A)
Start the engine. Slowly rotate the throttle and measure the voltage and current.
Restriction voltage / rotational speed: 15V @ (5,000rpm) (DCV)
Limit voltage is out of the specified value range. Check the voltage regulator.
Lighting system will restrain voltage check.

Rechargeable Battery

Rechargeable Battery

Short circuit test:

Disconnect the negative (-) lead from the rechargeable battery. The voltmeter is to be connected to the position between the battery terminal and the ground wire. The switch should be turned to OFF. Check whether it has a short circuit.



*Attention
The positive pole of the multimeter is to be connected to the battery terminal.

In case of any anomalies, check whether there are any short circuits within the ignition switch and/or main wiring harness.

Inspection of charging state:

Use a multimeter to check if the battery is fully charged.

Install the fully charged battery only after the engine has cooled down.

Connect the voltmeter to the terminals of the battery.

Disassemble the main fuse and connect a multimeter in series along the terminals.

Start the engine. Slowly rotate the throttle and measure the voltage and current.

Restriction voltage / rotational speed: 14-15V (5,000rpm)

If the voltage is out of the specified value range, check the voltage regulator.

Lighting system will restrain voltage check.

Remove the seat cushion.

*Attention
Set the multimeter to alternating voltage.

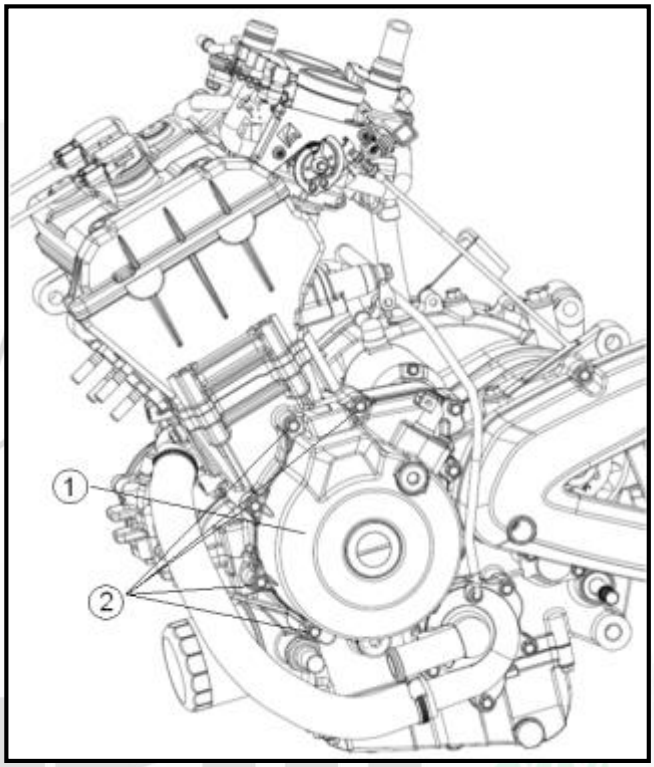
Restriction voltage: 13.1 (±) 0.5V/5,000rpm)

If the voltage is out of the specified value range, check the electric voltage current regulator.

Stator / Generator

Stator / Generator

*Attention
Check the charging coil of the stator / generator. It can only be testing when installed in the engine.



Left engine cover stator / generator disassembly

Disassemble:

Wiring connector for the stator / generator
Place a suitable container under the stator / generator cover to catch any leaking engine oil.
Loosen the left cover retaining bolts ①. Remove the left cover ② and stator assembly.
Pull the stator power cord from between the engine and the frame.

Disassemble the stator from the engine cover:
Stator cover (See disassemble section of stator / generator cover)
Wire holder bracket bolts ④ and bracket
Wire harness to cover seal ③ of the stator / generator
Stator coil bolts
Stator Assy. ①

Loosen the three retaining bolts for the stator ②
Remove the stator assemby.

Stator / Generator

Stator / Generator

Flywheel disassembly:

Magneto cover disassembly (See disassemble section of disassemble stator / generator cover)

Remove the fixing nut for flywheel with a high rpm impact gun and socket.

Remove the flywheel from the crankshaft with the flywheel puller.

Stator / Generator

Stator / Generator

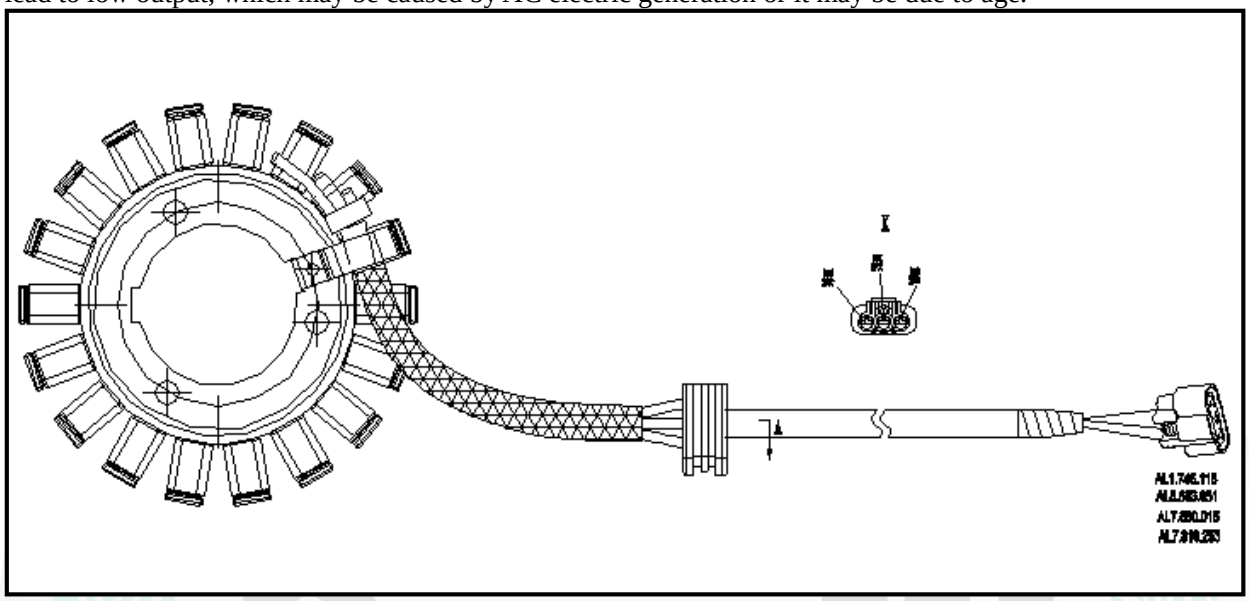
Remove the flywheel.

Stator Inspection

Stator Inspection

Stator / generator inspection:

There are three types of failures for the stator / generator: Short circuit, open circuit (wire burnout) or rotor demagnetization. Short circuit or open circuit will cause low output or even no output. Rotor demagnetization will lead to low output, which may be caused by AC electric generation or it may be due to age.



Turn "OFF" the ignition switch

Disassemble the stator / generator 3P connector.

Measure the resistance value among the three black terminals of the stator / generator with a multimeter.

Standard value: 0.05 ~ 0.5Ω (Room temperature 68°F)

★ If the resistance is greater than the aforementioned resistance, or any multimeter of any two power cord (infinite value), it is determined as stator line and shall be replaced. When it is far lower than the resistance, it refers to stator short-circuit. It shall be replaced.

● Measure the resistance between every single black power cord and chassis ground with a multimeter in the highest resistance range.

★ Use tester coil to check whether the engine is through. If yes, it refers to short-circuit of coil and engine. And it needs to check the charge coil.

★ If the resistance of the stator coil is normal, but the voltage check shows that the stator / generator has a failure, it means that rotor magnetism has been weakened. At this moment, the rotor has to be replaced.

Start up the engine

● Run the engine at the (rpm) according to Table 1

● Record the voltage readings (three measured values in total)

Table 1 Output voltage of the stator / generator

Range of tester	Wiring		Reading at 5,000 rpm
	Connect tester (+) to	Connect tester (-) to	
750 V AC	A black power cord	Another black power cord	55V or higher

★ If the output voltage indicated is within the range on the table, it means normal operation of the stator / generator.

★ If the output voltage indicated is much lower than the value within the range of the table, it means malfunction of the stator / generator.

Stator Inspection

Stator Inspection

Stator / generator assembly

Assembly shall be in reverse order of disassembly.

Note:

Apply thread locking agent on each screw.

Tighten all the bolts to the following torque:

 **Torque: 7 ft·lb**

*Attention

Clean the crankshaft and conical part of the flywheel.

Align the groove on the flywheel to the woodruff key.

Assemble the flywheel to the groove on the crankshaft correctly.

There are magnets on the inside of flywheel. Thus there should be no bolts on that surface.

Regulator / Rectifier

Regulator / Rectifier

Disassemble the rectifier:

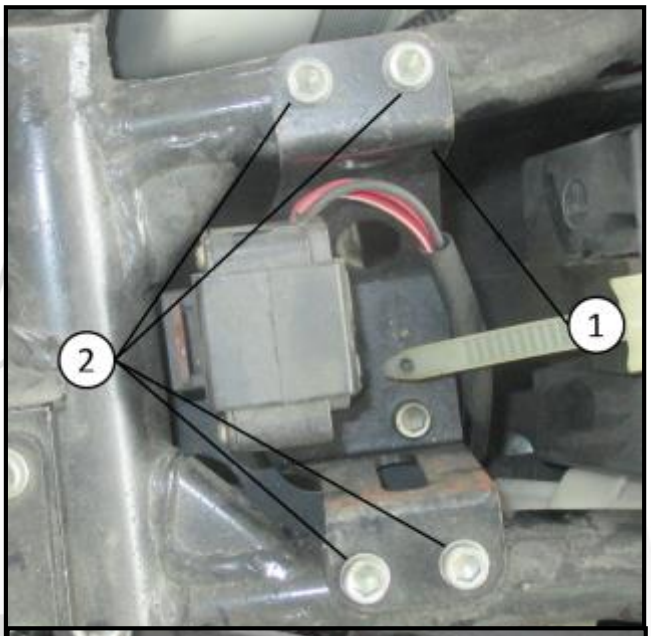
Remove the seat cushion component (See Chapter III Check and Regular Adjustment of "Air filter"

Remove the fuel tank (See Chapter III Check and Regular Adjustment of "Air filter"

Remove the left guard plate (See Chapter IV Assembly machine covering part/ guard plate)

Remove the bolts ②

Remove the relay bracket ①



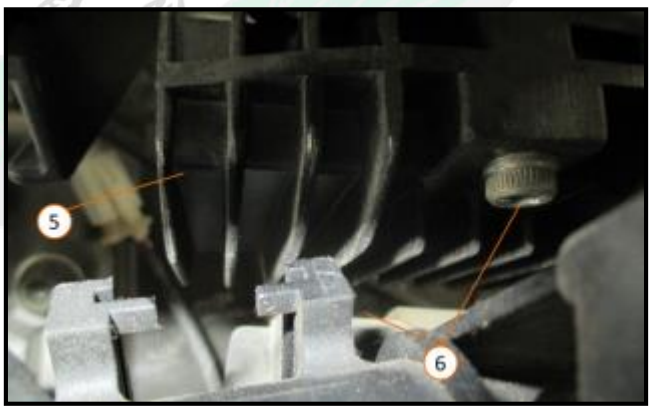
Remove the bolt ④

Remove the relay ③

Remove the bolt ⑥

Pull out the rectifier connector and disconnect it

Rectifier ⑤



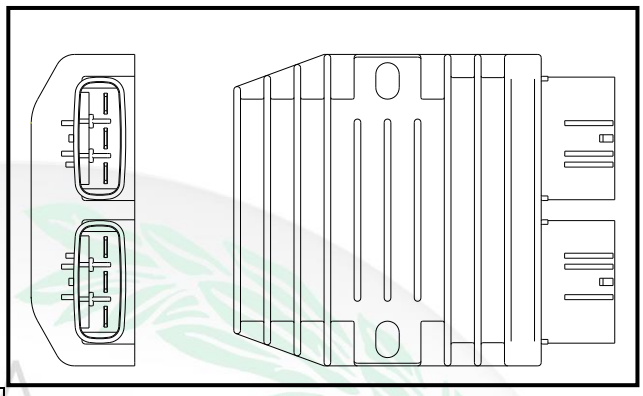
Regulator / Rectifier

Regulator / Rectifier

Loop inspection of the main wiring end terminal.

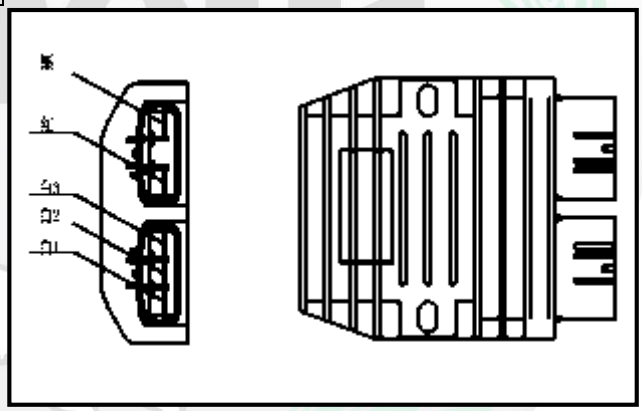
Dismantle the vehicle body work.

Disassemble the 3P connector of the regulator. The following method can be used to check the status of the main wiring end terminal.



Item (wiring color)	Determination
Between the battery (red) and vehicle GND Ground	Battery voltage existing
Between bond strap (black) and vehicle body GND Ground	Wiring existing
Between the charging coil (white) and vehicle body GND Ground	No resistance

Inspection of rectifier:



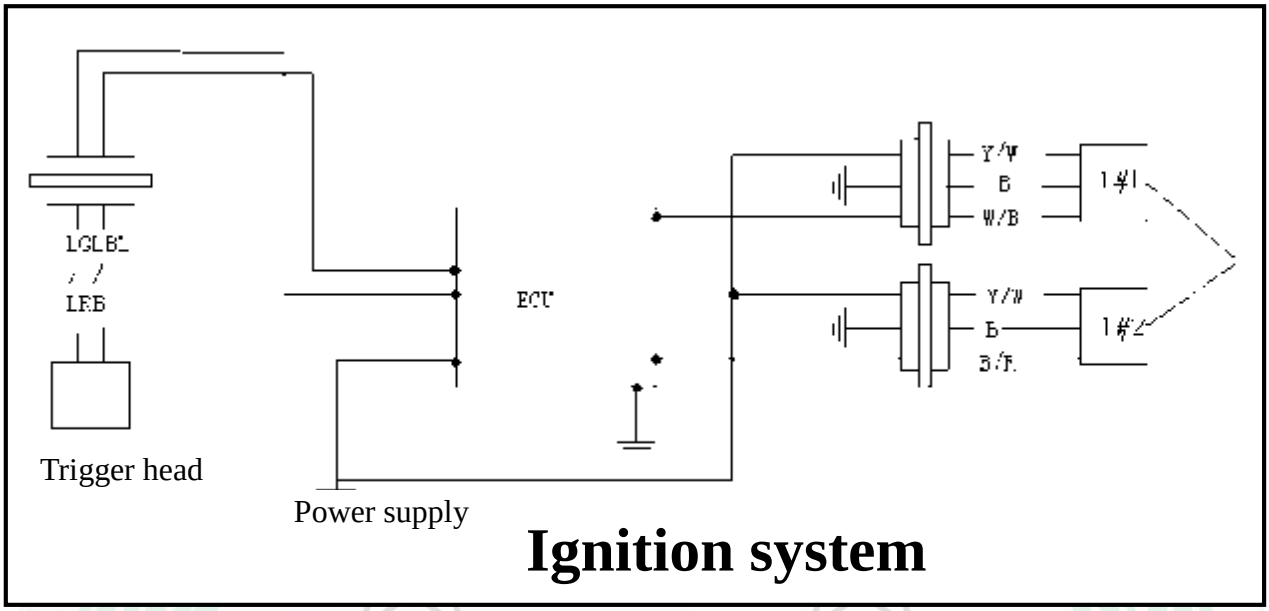
1. Multimeter selection: Diode grade;
2. The black probe is to connect the red line terminal of the voltage regulator. The red probe is to connect the white line terminal of voltage regulator (white 1, white 2 and white 3). The pointer shows a certain value (value range 0.1~0.5V) which indicate that the voltage regulator has to be replaced).
3、The red probe is to connect the red line terminal of voltage regulator port. The black probe is to connect the white line terminal of voltage regulator (white 1, white 2 and white 3). The pointer shows a certain value (value range 0.3~0.8V) which indicate that the voltage regulator has to be replaced).

***Attention**
●The metal part of the multimeter cannot be touched by fingers. ●Check with a multimeter. For different resistance values of the multimeter, the check shall not be correct.

In case of impedance value anomaly between terminals, the voltage regulator should be replaced.

Ignition System

Ignition System



Ignition system

Issues to be noted at operation

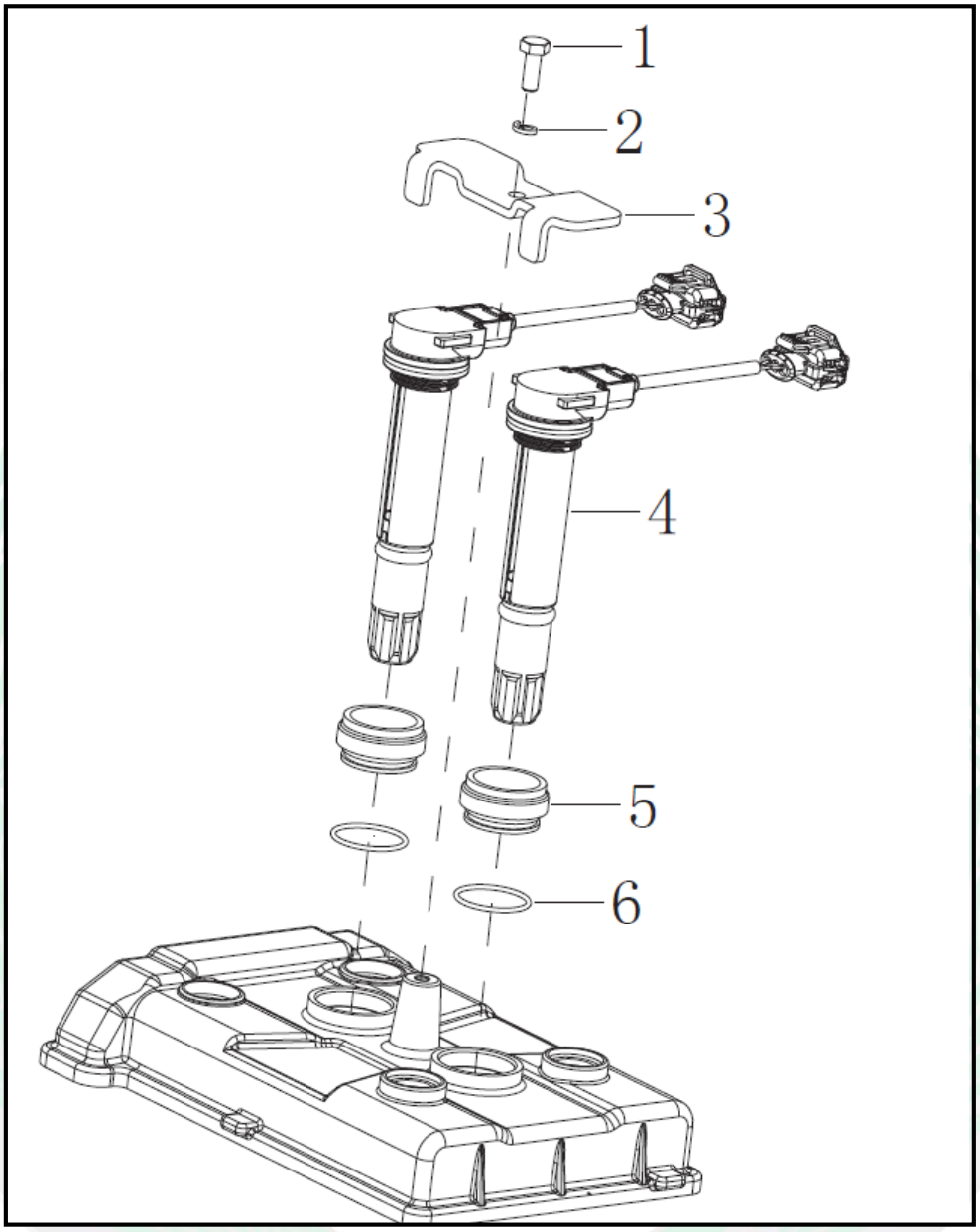
1. The ignition system shall be checked item by item as stipulated in the Troubleshooting Table.
2. Ignition system has an electronic automatic timing angle device. The ignition duration shall not be adjusted.
3. The most common ignition system failure is poor connector contact. Check whether the connector contact is in good condition or not.
4. Check whether the heat value of the spark plug is correct. Improper spark plug heat range or model is the primary cause which will lead to unsmooth engine operation or spark plug burnout.
5. The inspection of the ignition switch shall be implemented according to the Switch Conduction Part. (Attachment)
6. The disassembly of the stator / generator shall follow the disassembly demonstration.

⚠ Warning
The ignition system will generate extremely high voltage. When the engine is running, do not touch the spark plug or coil. Otherwise, you may be seriously shocked.

*Attention
When the ignition is on and the engine is running, do not disconnect the battery cables or any other electrical connections. This is to prevent damage to ECU. Do not install the battery in reverse. The negative terminal shall be grounded. This is to prevent damage to the ECU.

Ignition Coils

Ignition Coils



Serial number	Description & specification	Qty.
1	Bolt	1
2	Lock Washer	1
3	Ignition Coil Retainer Bracket	1
4	Ignition Coil	2
5	Ignition Coil Seal	2
6	O-ring	2

Ignition Coils

Ignition Coils

Disassemble the ignition coils:

Remove the seat cushion.

Disassemble the left and right fuel tank fairing.

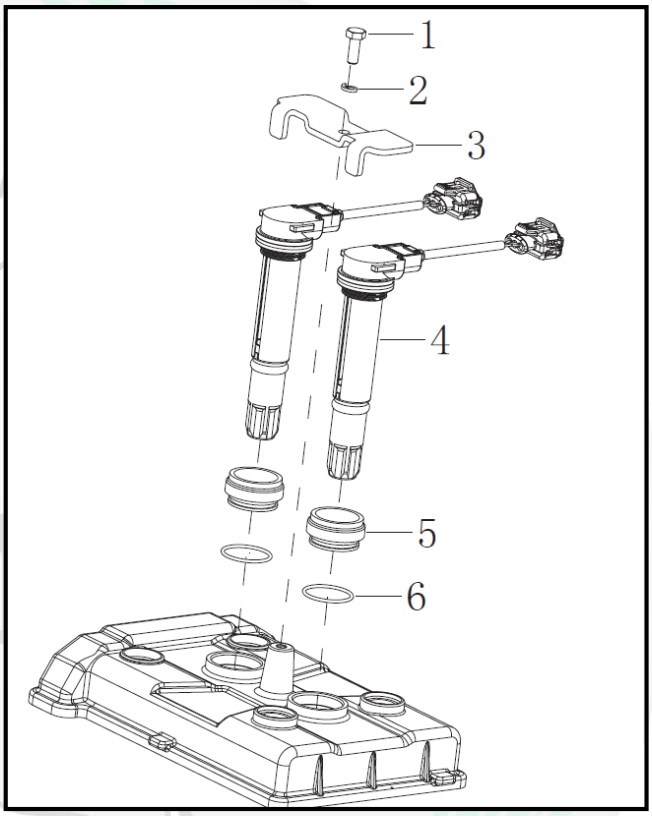
Remove the fuel tank assembly.

Remove the airbox.

Disassemble the bolt (1), spring washer (2) and ignition coil retaining bracket (3) from the engine.

Pull the ignition coils (4) from the engine.

Remove the O-rings (6), ignition coil seals (5) from the ignition coils (5).



Warning
Use caution when removing the coils, do not damage the coil connectors.

Ignition Coils

Ignition Coils

Operating principle of the ignition coils:

Ignition coils provide energy to the spark plugs which are installed in the combustion chamber. High-tension wires are used to connect the spark plugs and ignition coils. The ignition coil is a part that cannot be serviced.

Ignition coil appearance

Technical parameters

- Input voltage: 9~14 VDC
- Output voltage: 25~35kV
- Normal operating temperature: -22~230°F
- Storage temperature: -40~311°F

Check the coil one time

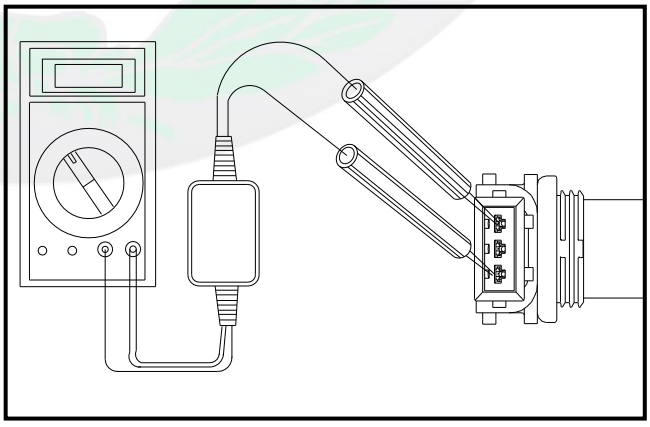
Coil terminal impedance measurement

Standard value: (0.6±0.1) Ω (68°F)

When the resistance value is within the standard value range the coil is good.

Resistance value "∞" indicates coil wire damage.

It is necessary to replace the ignition coil.



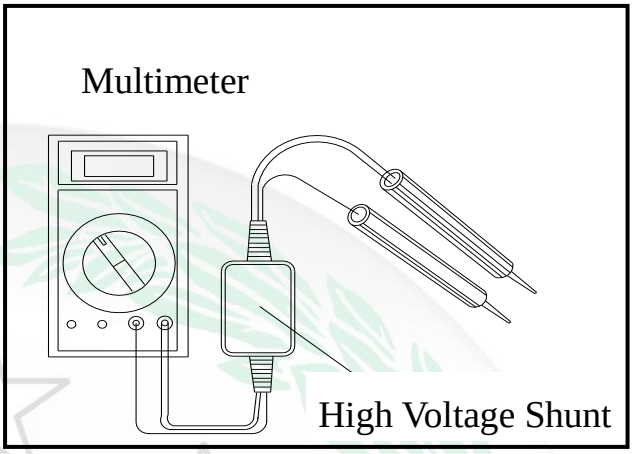
Secondary coil

Ignition Coils

Ignition Coils

Ignition system inspection:

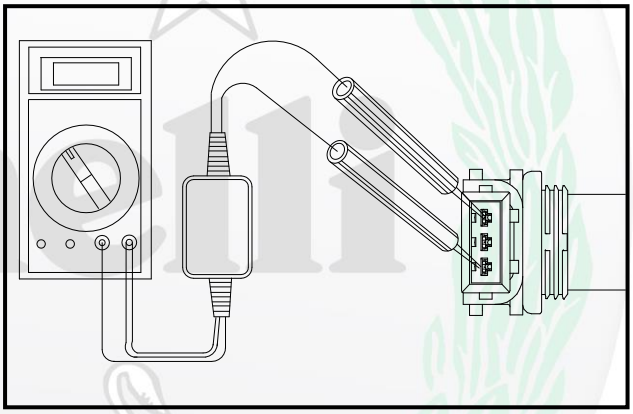
*Attention
● When the spark plug doesn't produce spark, check whether the wiring components are loose, a part is defective etc. Check whether the voltage value is normal. ● There are many brands of multimeters with different internal resistance, the tests values will be different as well.



Connect a high voltage shunt on the multimeter.
Or a multimeter with an input impedance over 10MΩ10CV.

Primary voltage of the ignition coil:

If the spark plug is removed, install another spark plug to make GND with the engine.



*Attention
Test the circuit wiring after correcting the wiring. The normal circumstance of cylinder pressure refers that the sparking plug is installed into the cylinder.

Connect the ignition coil wire. A coil terminal (black/red) is to be set on the frame.
Press the start to send power to the ignition coil to measure the Max. voltage.

Min. voltage: over 95V

*Attention
Pay special attention that the metal parts of the multimeter cannot be touched by fingers to avoid electric shock.

Ignition Coils

Ignition Coils

Operation precaution:

Operation precaution	Causes
DON'TS: Assemble low voltage connectors after the power is on.	The behavior could lead to accidental ignition of the secondary coil, and may cause personal injury.
DON'TS: Remove the secondary coil connectors with a screwdriver. The right tools shall be used.	It may damage the secondary coil connector, form additional circuit, produce an arc, cause fire or even bodily injury.
DON'TS: Use dropped or physical damaged parts not visually inspected.	Damaged parts can lead to premature failure of components.
DON'TS: Scrap the secondary high pressure head or put any material on the surface of high pressure head.	The behavior may damage the sealing surface and cause high voltage leakage.
DON'TS: Use tools to pound or impact ignition system components.	It will lead to physical hazard, and will cause a system fault or failure.
DON'TS: Spray paint or other mist spray into the connector.	Insulation spray may form high impedance or open circuit. Conductive sprays may form short circuit.
DON'TS: Mount the ignition system components with high-tension cable and ignition wire.	The adapting piece of ignition system shall not bear the part weight which may lead to poor circuit connection or reduce the performance.
DON'TS: Pierce or destroy the secondary high tension line.	It will form a loop outside the system and cause fire or even bodily injury caused by electric arc.
DON'TS: Use without a spark plug installed.	The ignition coils can store energy if the unit is started without the spark plugs/coils installed. This presents the possibility or electric shock which can injure.
DON'TS: Ignition wire shared with other components.	Wiring harness is the only system which can prevent interference between electrical components.
DON'TS: In addition to battery power, apply additional voltage into the ignition system.	It may lead to performance reduction or fault of ignition system electric components.
DON'TS: Use tools to connect the sparking plug to secondary high pressure head of ignition coil. Manual installation of high-tension cable is the optimal.	It may cause damage to high pressure head and connectors surface.
DO'S: Assemble secondary guide line connecting primary line	The generated secondary voltage may cause ignition components damage, test equipment damage and even personal injury.
DO'S: Be carefully while working around the ignition system.	The high voltage generated by secondary high voltage coil may cause bodily injury or damage to the test equipment.
DO'S: The appropriate operation and transportation modes are conducive to reducing the impact, and damages caused by moisture and contaminants.	The damaged parts can lead to premature failure of components.
DO'S: Avoid frequent connector plug electrical components.	Connecting and disconnecting parts frequently may lead to poor contact.
DO'S: Ensure that the low voltage socket is connected to right position and is locked	This can cause ignition failure due to intermittent connection of electric circuit.
DO'S: Use allowable junction box for test ignition system.	It may cause the damage of the connectors or parts.
DO'S: Ensure proper sealing at connection.	Liquid invasion end connection may lead to circuit short circuit. Under external environment, it may lead to serious corrosion.
DO'S: Use on the gasoline engine.	It is necessary to design another combustion system by using other fuel.
DO'S: Install insurance in power supply circuit.	Protect the system in case of short circuit.

Ignition Coils

Ignition Coils

Operation precaution:

Operation precaution	Causes
DO'S: In case of engine operation, take hot plate and guard plate as junction point.	High voltage and current may lead to failure or reducing the module performance.
DO'S: Bind the guard plate and vehicle as far as possible.	This will reduce the potential grounding and improve the module heating.
DO'S: The ground wire of ignition system should be as short as possible. If it is allowable, it can be common-grounded with the engine which will reduce unnecessary ground loop.	This will reduce unnecessary ground loop.
DO'S: The wiring harness of ignition system should be reasonably arranged to prevent additional heat effect and damage.	It helps to prevent virtual circuit, open circuit and short circuit.
DO'S: Ignition secondary high voltage wire shall not connect with primary ignition wires and other wiring harness connection.	The peak voltage generated by secondary high pressure wire may cause reducing or failure of adjacent component performance.
DO'S: Spark plug wire (secondary wire) and primary cable shall not connect to cutting edge. The fixed parts shall not be connected too tightly. It shall be far away from the moving components (belt, fan etc.) Keep a distance at least 125 mm away from 400F heat source. Take protection measures (dirt, oil, water etc.) for environment damages.	Spark plug wire will carry high voltage (30,000V). In case of insulating layer failure, notch or scoring may generate electric arc. This may lead to ignition system fire, fireless or premature failure.
DO'S: Not all the clamp devices are designed as reusable. Pay attention on specifications of the fastening devices. All wiring harness should get supporting within 6 inches away from the connector.	If the clamp device is designed as not reusable, it cannot get sufficient retention. The connector cannot support the weight of wiring harness in design.
DO'S: Replace the sparking plug according to the following steps: 1-Before removing sparking plug, keep far away from oil and inflammable materials. 2-Pull out the cavity cap connecting to sparking plug. Hold the sparking plug, rotate 90°. 3-Use appropriate socket wrench to loose each spark plug or alternately.	To remove the sparking plug, it is necessary to cool down the engine first. After combustion, the engine and sparking plug are under high temperature. Removal of sparking plug may lead to damage of sparking plug screw thread. Use safety goggles to protect eyes from being damaged by dust from compressed air at sparking plug holes.
DO'S: Clean the spark plug according to the following steps: 1-Remove the residual oil, water and sewage on the sparking plug surface. 2-If there is still oil contamination on sparking plug after combustion, nonflammable and nontoxic solvent can be used to clean the sparking plug. And then use compressed air to dry the sparking plug. 3-Take propane flame to dry wet sparking plug head. Flames are allowed to enter the center electrode of insulators. 4-If there are any carbon depositions on sparking plug screw thread, wire brush can be used to clean the sparking plug. Pay attention not to damage the electrode and the insulator.	-Cleaning sparking plug will reduce the voltage generated between electrodes arc. -Cleaning and clearance adjustment cannot recover the spark plug to total new state. Through cleaning, to substitute the used sparking plug for the new one is the most economic and effective method. -Do not use water or any liquid for cooling. -Cleaning the thread is conducive to sparking plug installation. In addition, sparking plug and cylinder cover shall be contact closely for heat dissipation.
DO'S: Adjust the spark plug gap according to the manufacturer's instructions to maintain the best fuel economy and good performance of the engine; the scale can be used to accurately measure the spark plug gap; the side electrode of sparking plug can be moved. However, the central electrode cannot be moved. Too wide gap may lead to fire (higher ignition voltage is required)	Too narrow gap may affect the stability of idling. The used spark plug cannot be measured and identified accurately.

Ignition Coils

Ignition Coils

Operation precaution:

Operation precaution:	Causes
DO'S: When replacing the spark plugs, use the ones with same heat range value, thread and size.	Overheating of the spark plugs may lead to ignition advance or piston ring damage. Over cooling of the spark plugs may cause pollution or emission problems.
DO'S: Spark plug installation shall abide by the following steps: 1. Make sure that the cylinder threads and spark plugs threads are clean. The spark plug threads shall be free of burrs. Use tools for tapping or threading if necessary. 2. Make sure that the spark plug gaskets are clean. No gasket is required for spark plugs with tapered thread. 3. Screw the spark plugs into the cylinder head by hand, then use a torque wrench to tighten them to the appropriate torque recommended by the spark plug manufacturer. The torque will differ depending on spark plug type and cylinder head materials.	If the spark plug threads are damaged, this will hinder optimal heat transfer to the cylinder head. Do not use tapered thread or surface discharge spark plugs. This will reduce the optimal torque of the spark plug, which may allow the spark plug to rotate away from the engine cylinder head which will decrease cylinder pressure or lead to a no start situation. If the spark plug is too tight, it will be difficult to remove or cause damage to the threads.

Ignition Coils

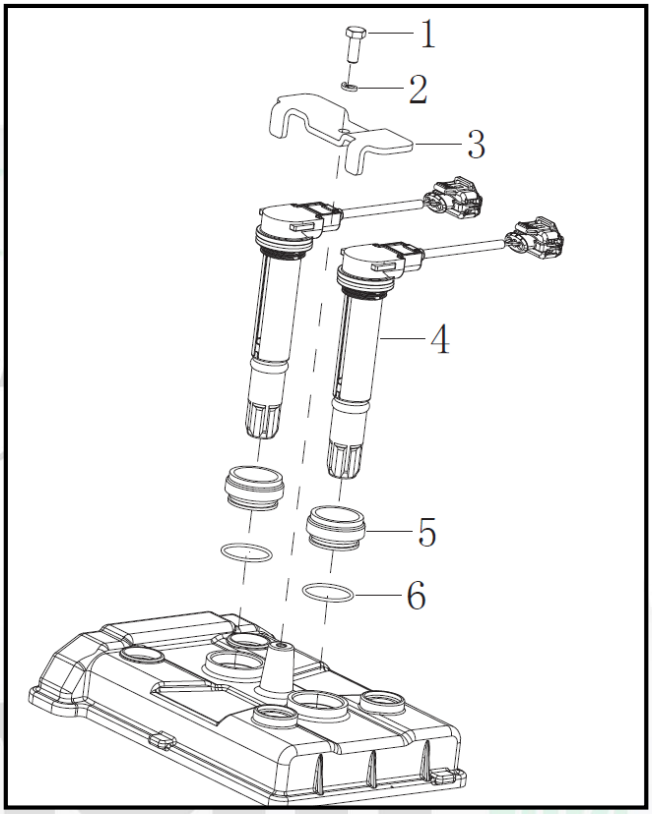
Ignition Coils

Ignition coil installation:

Install the O-ring (6) and ignition coil set (5) on ignition coil (4).

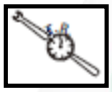
Install the ignition coil (4) into the engine.

Fix the ignition coil on the engine by utilizing the bolt (1), spring washer (2) and ignition coil positioning clamp (3).



Note:

Tighten the bolts to the following torque:



Torque: 7 ft·lb

*Attention
Primary coil is for black/red line joint installation.

Crankshaft Position Sensor

Crankshaft Position Sensor

Disassemble the crankshaft position sensor:

Bolt of crankshaft sensor [A]

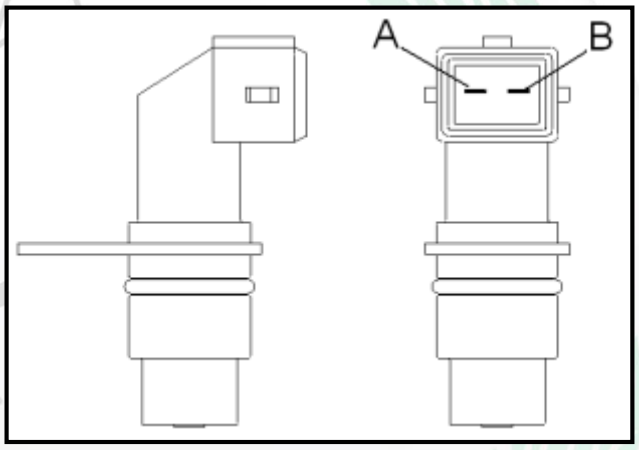
Crankshaft sensor [B]

*Attention
Do not drop the sensor on the ground, especially on hard ground. The sensor may be damaged if subjected to such collision.

Use a tester

***Attention**

Check whether the trigger will work on the engine.



Check the crankshaft position sensor:

Disassemble the electrical connector from the sensor.

Measure the resistance value at point A and B of the sensor.

Standard value: 550± 50 Ω (68°F)

If the measured resistance is higher than the stipulated value, the sensor shall be replaced.

If the measured resistance is lower than the stipulated value, the sensor shall be replaced.

ECU

ECU

ECU disassembly:

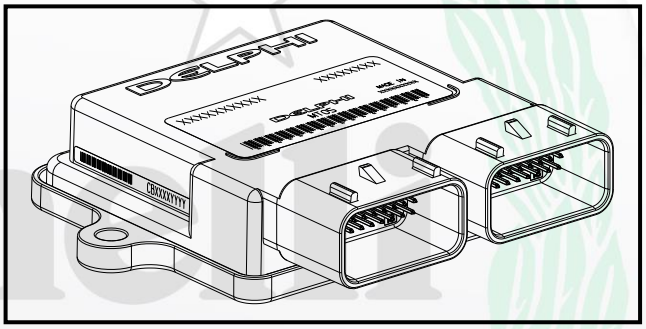
Remove the seat cushion.

Remove the bolts (2). Take the ECU (1) out from the frame, as shown in Fig. A.

Unplug both ECU connector cables.

Check ECU

Remove the ECU unit. Check the parts associated with the ignition system at wiring connectors. See details at: "Fuel Injection System / ECU section".



Spark Plugs / Lockout System Inspection

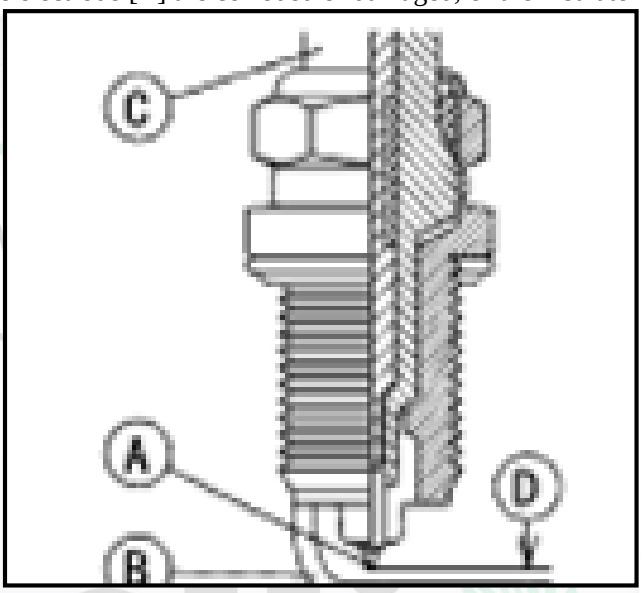
Spark Plugs / Lockout System Inspection

Sparking plug inspection:

- Spark plug disassembly (See the section spark plug disassembly)
- Visual inspection of the spark plug:
- If the central electrode of the spark plug [A] and/or side electrode [B] are corroded or damaged, or the insulator terminal [C] is damaged, replace the spark plug.
- If the spark plugs are contaminated or have carbon deposits, replace the spark plug.
- Use a spark plug feeler gauge to measure the gap [D].
- If the clearance is incorrect, replace the spark plug.

  Spark plug gap: 0.6-0.7mm (0.024 -0.028 in.)
- Use the standard spark plug or one of the same level/grade.

  Spark plug: CR8EIA-9



Ignition inspection:

- Start the engine according to the following conditions:

The first inspection:

Conditions:

Transmission → in 1st Gear

Clutch handle → Hold In

Kick stand → Up

- Turn on the ignition and press start button.
- If the starting system circuit is normal, the motor will not rotate.
- If the engine starts, check start button, handlebar kill switch, clutch switch and starter relay.
- If all unit status are normal, replace the ECU. Start the engine according to the following conditions:

The second inspection:

Conditions:

Gear → Neutral position

Clutch handle → Released

Kick stand → Lowered

- Turn on the ignition and press start button.
- Then start the engine. The precondition is that the circuit of start-up system should be normal.

★ If the engine failed to start, check the starter switch, side stand switch and starter relay.

★ If all unit status are normal, replace the ECU.

Spark Plugs / Lockout System Inspection

Spark Plugs / Lockout System Inspection

The third inspection:

● Perform the following operation. Check whether the engine can be safely shut off.

● Run the engine according to the following conditions:

Conditions:

Gear → in 1st Gear

Clutch handle → Released

Kick stand → Up

● Put the kick stand on the ground. The engine will shut down.

★ If the engine doesn't shut down, check the starter switch, clutch lockout switch, side stand kill switch, and the starter relay.

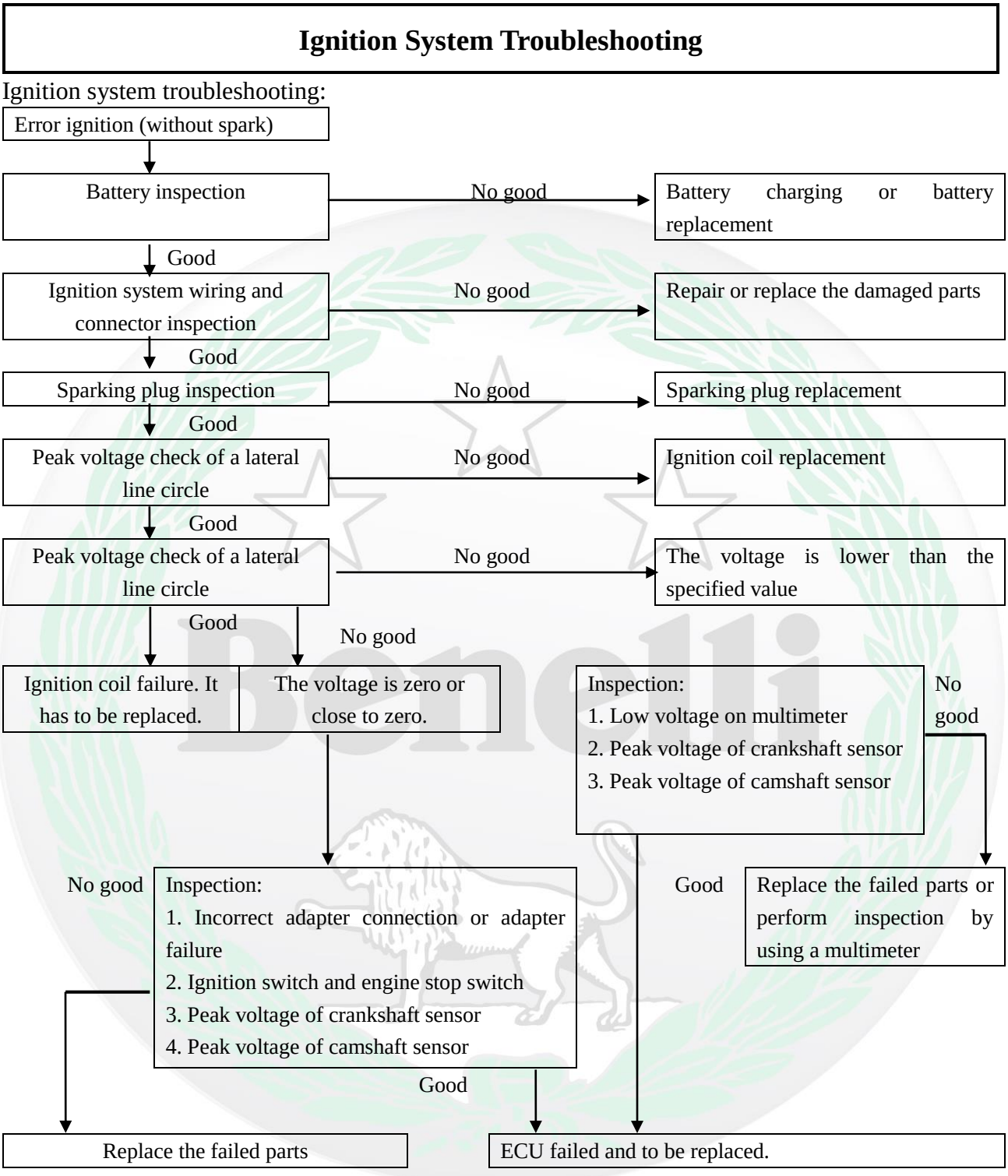
★ If all unit status are normal, replace ECU.

IC igniter inspection:

● Built-in igniter within ECU

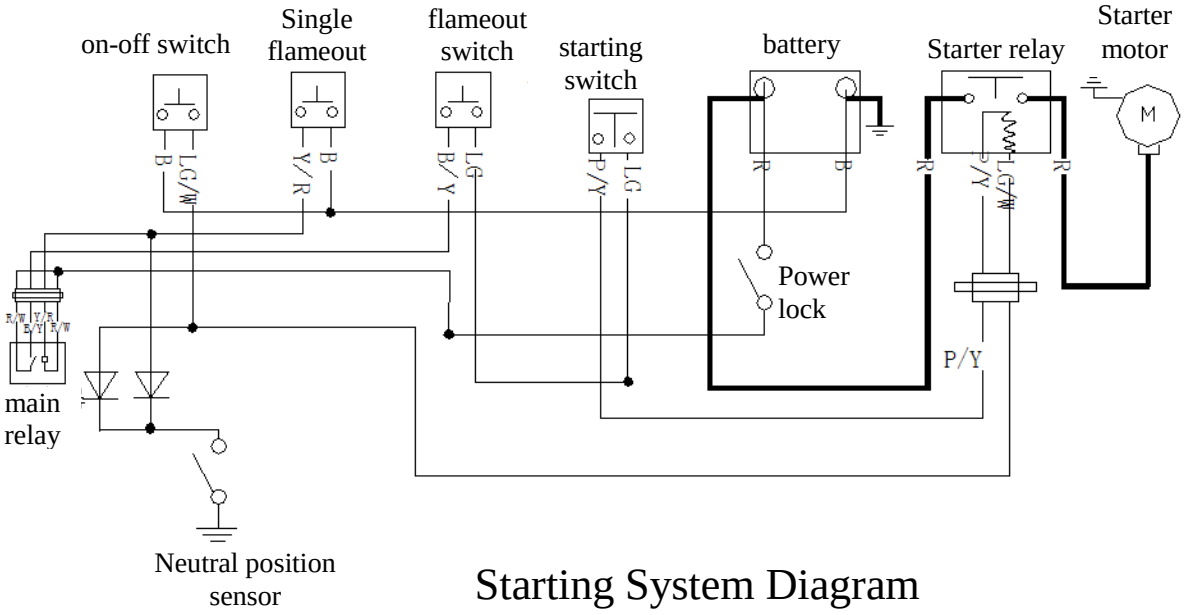
- Refer to the following items:
- Operation inspection related components of the electric start safety circuit (See operation inspection related components of electric start safety circuit)
- Troubleshooting of ignition system (See ignition system section)
- Voltage check of ECU (See detailed information at electronic fuel injection system (ECU)-ECU power check)

Ignition System Troubleshooting



Starting System

Starting System



Starting System Diagram

Starter Motor

Starter Motor

Disassemble starter motor:

*Attention
Before motor disassembly, it is necessary to turn the ignition switch to "OFF". Disconnect the battery terminal ends from the battery.

Attention:
Do not tap the motor shaft or fuselage. Otherwise, it will damage the motor body.

- Remove the coolant reservoir decorative cover.
- Remove the coolant reservoir.

- Remove the terminal nuts for the (+) and (-) leads.
- Remove the bolts for the starter motor.
- Remove the starter motor from the left side of engine.

Starting Inspection:

Start up the engine according to the following conditions

Conditions:

Gear → Neutral position

Clutch handle → Released

Kick stand → Lowered

a) Turn on the ignition switch and press the start button.

b) After exclusion of normal operation of the starting system normal circuit, the motor will not start up

c) Remove the starter motor and directly connect to positive and negative electrode of a battery. If it spins normally, the problem is elsewhere in the engine.

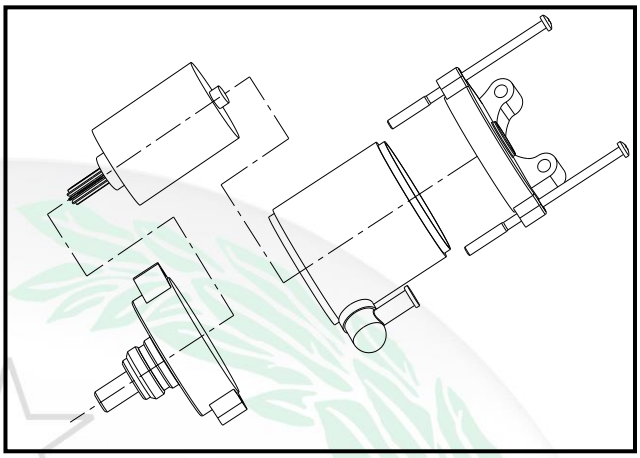
d) Matching problem: If it fails to start, it means that the starter motor is damaged.

Starter Motor

Starter Motor

Disassemble the starter motor:

Dismantle the shell screws, front cover, motor shell and other parts.



Carbon brush inspection:

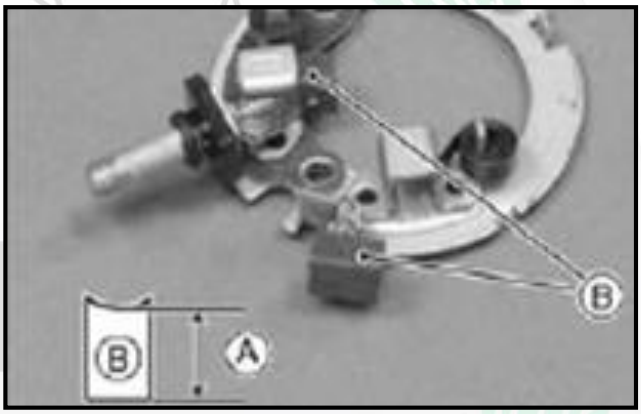
● Measure the length [A] of each carbon brush [B]

★ If a carbon brush has reached the service limit, the carbon brush plate assembly has to be replaced.

Length of the carbon brush

Standard: 10mm

Service limit: 5.0 mm

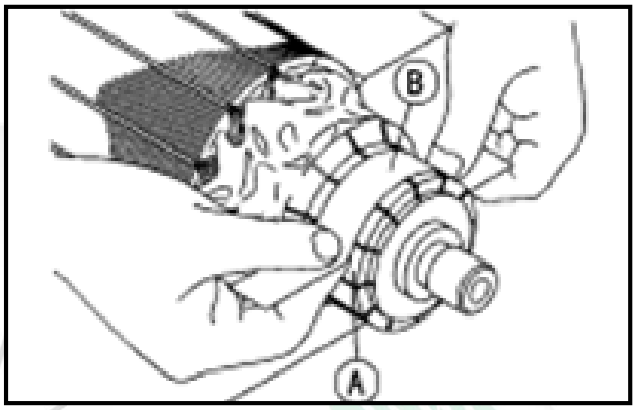


Starter Motor

Starter Motor

Cleaning and inspection of the commutator:

● Smooth the commutator surface [A] with fine grit sandpaper [B] if necessary. Clean the grooves first.



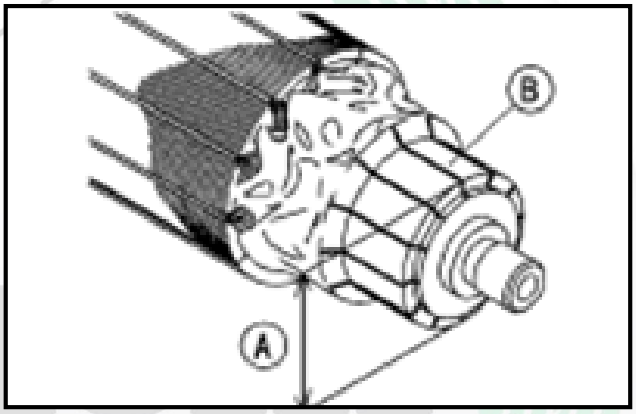
● Diameter [A] of commutator [B]

★ If the diameter of the commutator is smaller than the operational limit, replace with a new starter motor.

Diameter of commutator

Standard: 28 mm

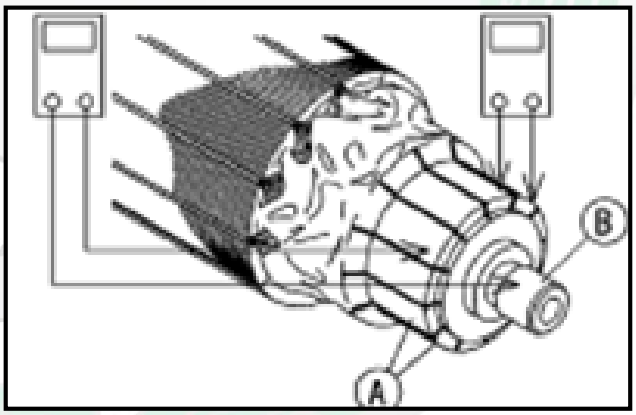
Service limit: 27 mm



★ If the resistance between the two commutators is high or without reading, the coil has an open circuit. The starter motor must be replaced.

● Use a multimeter to measure the distance between the commutator and axis [B]

★ If the reading is 0, it means a short circuit of the armature and the starter motor has to be replaced.



Starter Motor

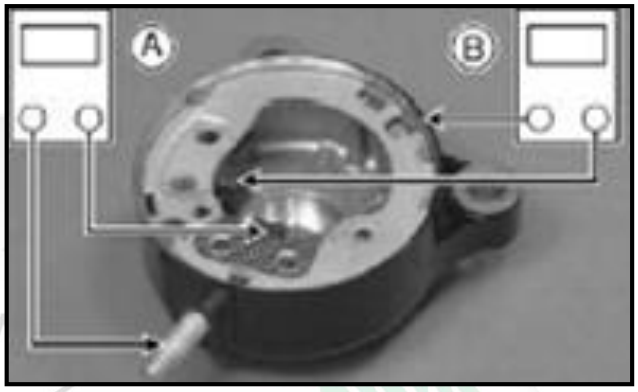
Starter Motor

Carbon brush inspection:

● Measure the resistance with a multimeter of x 1Ω as shown in the Fig. below:

Terminal bolt and positive carbon brush [A]

Right end cover and negative carbon brush [B]



★ If it is close to 0Ω. It means open circuit of the carbon brush. Carbon brush plate assembly has to be replaced.

Right end cover assembly inspection:

● Measure the resistance with a multimeter as shown in the Fig. below:

Terminal and right end cover [A]

★ In case of any reading, short circuit of right end cover. Right end cover assembly inspection.

Start motor assembly:

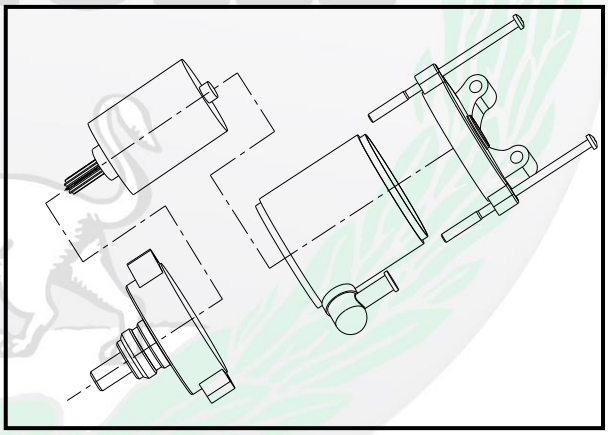
Oil seal in front cover. Apply lubricating grease.

Install the electric brush on electric brush bracket.

Apply lubricating grease at both sides of the electric brush shaft

Press the electric brush onto the bracket.

*Attention
● Pay special attention that the contact surface of the electric brush and armature shall be free of damage. ● Pay attention not to damage the oil seal lip during armature shaft installation.



Install the starter motor back cover:

The bolt hole and front cover at the motor cover shall be aligned for installation.

Tighten the shell bolts.

*Attention
During shell and front cover assembly, the armature can be easily pulled out by absorbing the front cover with a magnet. Gently bend with hands to assemble.

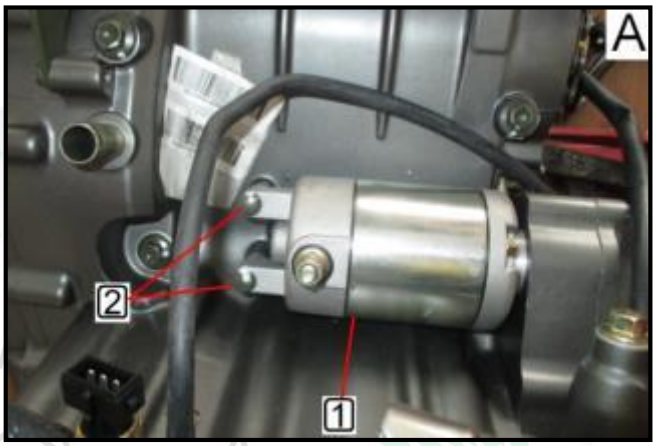
Starter Motor

Starter Motor

Starter motor assembly:

Install the starter motor. Make sure to install dirt-proof boot properly.

Attach the starter motor (1) onto the engine with the fixing bolts (2) as shown in Fig. A.



Note:

Tighten the two bolts to the following torque:

Torque: 7 ft·lb

Starter Relay

Starter Relay

Disassemble:

*Attention
Before motor disassembly, it is necessary to turn the master switch to the "OFF" position. Disconnect the battery terminal ends. Open the power supply to see whether the motor is running to make sure it is safe.

Disassemble the left tail cowling:

Remove the bolt ④.

Disassemble the relay ③.

Disassemble the (+) starter motor wire connector.

Disassemble the (-) starter motor wire connector.

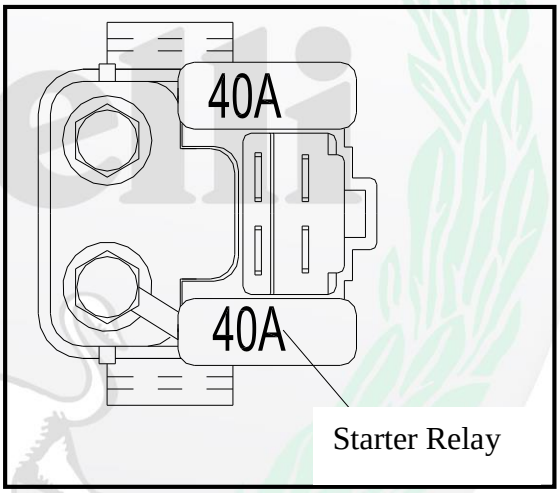
Starter relay inspection:

When the ignition switch is turned to the "ON" position, listen for a clicking" sound.

If the is sound observed, it is normal.

If there is no sound:

- Check the input voltage of the starter relay.
- Check the starter relay fuse.

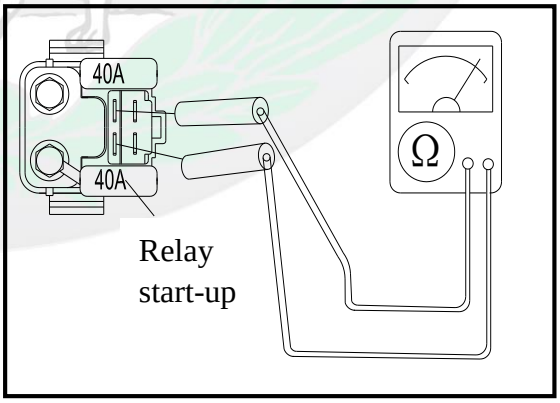


Voltage check of the starter relay:

Perform engine start up. Measure the voltage between the starter relay joint purple/yellow wire and chassis (GND) Ground.

When the ignition switch is turned to the "ON" position, turn on the kill switch. The transmission shall be in the neutral position. The battery voltage shall comply with regulations.

In case of no voltage at starter relay terminal, the kill switch can be cleaned. Check whether it is the neutral position. Perform wire inspection of the secondary wiring harness.



Starter Relay

Starter Relay

Starting relay inspection:

Disconnect the starter relay connector.

Conduction checking of the black wire of wire connector terminals and vehicle GND Ground.

Start up the button. The green/yellow wire and vehicle GND Ground shall be connected properly.

Continuity and guide line inspection at start button while without conduction

Function check of the starter relay:

● Connect the starter relay to a multimeter and a 12V battery, as shown in the Fig. to the right.

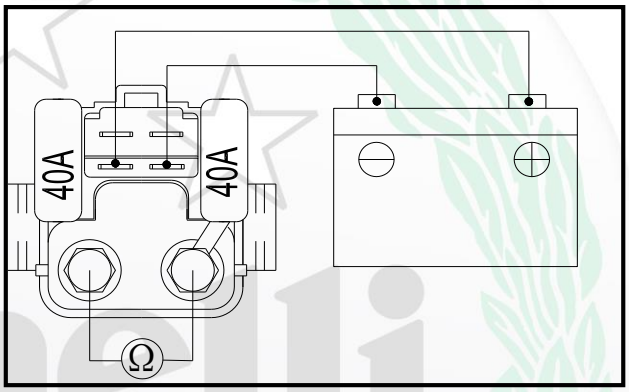
● If the relay fails to work according to regulation, the relay is damaged and needs to be replaced.

Test relay:

Tester range: x 1 Ω scope

Standard: At battery connection → 0 Ω

At battery disconnection → ∞ Ω



Starter Relay

Starter Relay

Assembly

Install the starter motor wire connectors. Install the battery wire connectors.
Tighten the bolt ④.
Relay assembly ③.

Note:

Tighten screws to the following torque:

Torque: 7 ft·lb

Instrument Cluster

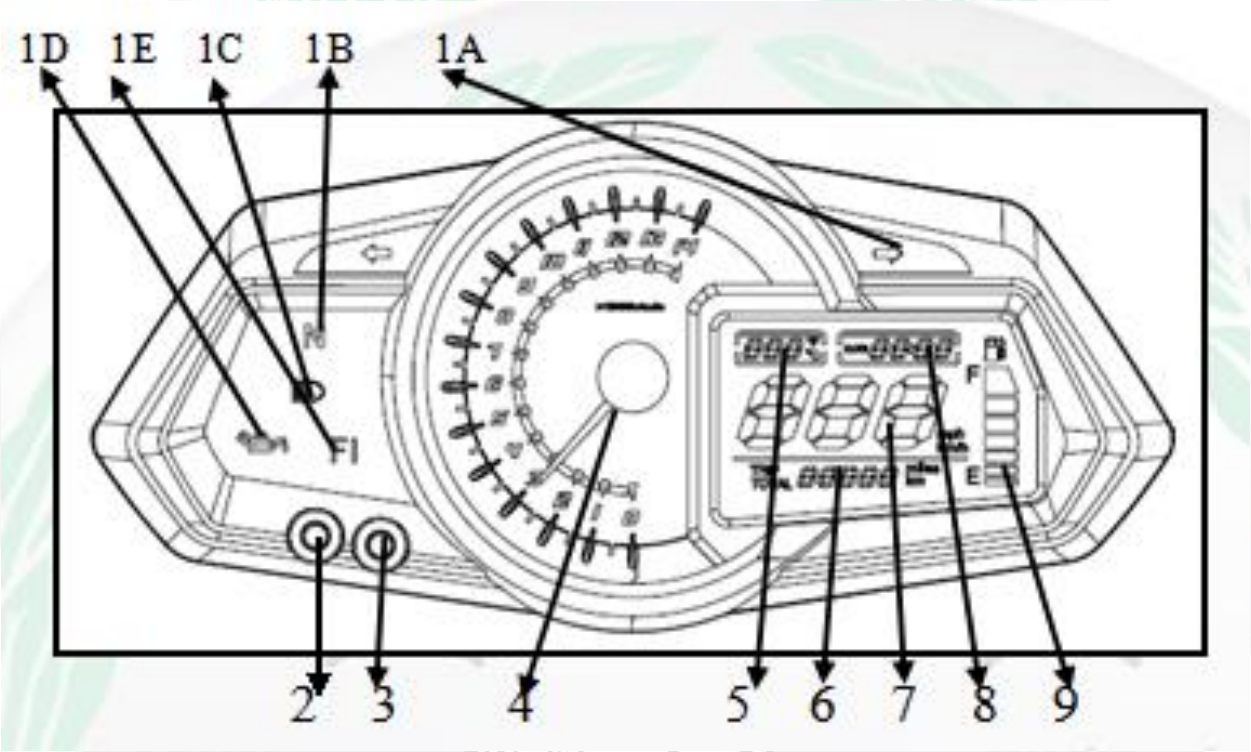
Instrument Cluster

Instrument disassembly

Dismantle the retaining bolts at headlight cowling with a hex socket.
Dismantle the instrument bracket mounting plate.
Separate the instrument bracket mounting plate from the instrument cluster.
Dismantle the air guide sleeve with a screwdriver at the front of the instrument.

Instrument and indicator lights

When the ignition key is turned to the "ON" position, the instrument and indicator lights will light up.
After initial inspection, information is displayed corresponding to the overall health status of the vehicle.
The gauge cluster has the following indicator lights:



Status indicator lamp

1A: Turn Signal indicator light (green)
When the indicator light flashes, it means that the turn signal light is on.
1B: Neutral position indicator light (green)
When the indicator light is on, it means that the transmission is in the neutral position.
1C: High beam lamp (blue)
When the indicator light is on, it means that the high beam headlight is on.
1D: Oil pressure warning light (red)
After the ignition is switched “ON”, and the engine has not been started, the engine oil light is normally on; after start up, if the engine oil pressure is normal, the engine oil indicator light will turn off, if the oil lamp does not turn off, shut down immediately and perform an inspection;
At engine oil pressure oil inlet, engine oil pressure water inlet, the indicator light will be constant on. It needs to stop running for inspection.
1E. FI: “FI” refers to fault code diagnosis of EFI system (orange)

Instrument Cluster

Instrument Cluster

After the key and the electronic injection indicator light are on, the fuel pump will cycle for 3 seconds. Start the motorcycle. After the motorcycle has started, the indicator light will turn off, which indicates that the vehicle is normal and without fault; otherwise, it means fault. At the same time, if the indicator light goes out and the vehicle runs normally. If the indicator light is on, turn off the engine for inspection. Contact a Benelli Authorized Motorcycle dealer to carry out the fault diagnosis.

Function button (2)

Button function table						
Item No.	Function	Power supply	Indication	Left button	Right button	Results
	Functions switching			<3s		TRIP
	Functions switching		TRIP	<3s		TOTAL
	Small mileage reset		TRIP	>3s		trip mileage reset
	Functions switching		km km/h		<3s	miles mph
	Functions switching		miles mph		<3s	km km/h
	Time setting		TOTAL	>3s		Hour place flashing
			TOTAL		<3s	Hour place +1（0-23）
			TOTAL	<3s		Shift to decade place
			TOTAL		<3s	decade place +1（0-5）
			TOTAL	<3s		Shift to unit place and flash
			TOTAL		<3s	Unit point +1（0-9）
			TOTAL	<3s		Exit clock menu
Note	Under clock adjustment state, if there is no pressing action in 5s, it will automatically exit the menu.					

Tachometer (4):

It indicates revolutions per minute of the engine.

Water temperature gauge (5):

It indicates water temperature in °F (Fahrenheit) or C° (degrees Celsius)

Odometer (6)

According to your needs, select relative odometer mileage (TRIP) or TOTAL mileage (TOTAL) function, and you can switch units as MPH (miles) or km. Short press the function button (2) to switch.

Relative odometer mileage (TRIP): It is an odometer that can be reset. Record the driving mileage within a certain distance range. Under relative odometer mileage (TRIP) status, long press (6) function button A to reset.

Total distance (TOTAL): Records the total mileage used.

Odometer records the total distance traveled.

Speedometer (7)

Speedometer refers to driving speed. According to your requirements, short press the function button at the same time.

Choose unit as mph (miles/h) or km/h.

Digital clock (8)

Displays hours and minutes. If the time has to be adjusted, serial number function button (2)

Fuel gauge (9):

Refers to the residual fuel in the fuel tank. When the tank is full of fuel it will indicate 7 bars of fuel level. When the fuel is insufficient, and the fuel level is one level or insufficient to one level, the fuel gage will flash consecutively.

Instrument Cluster

Instrument Cluster

Assembly:

Assembly shall be in reverse order of disassembly.

Ignition Switch

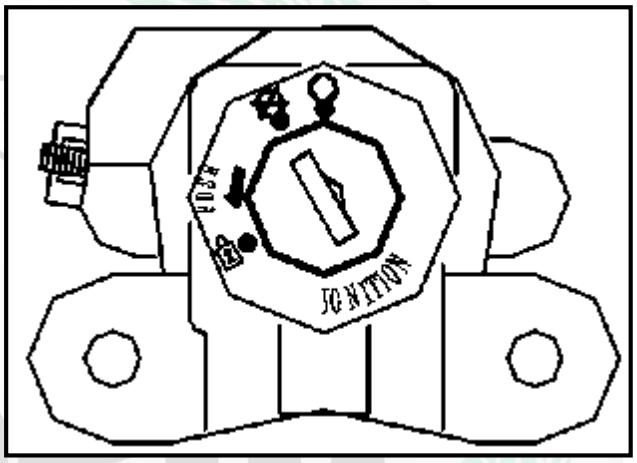
Ignition Switch

Ignition switch disassembly

Disassemble the air guide sleeve.
Disassemble the ignition switch wiring connector.

Check the ignition switch

Conduction checking on connector terminal:
If it doesn’t tally with the conduction table, please replace the ignition switch.



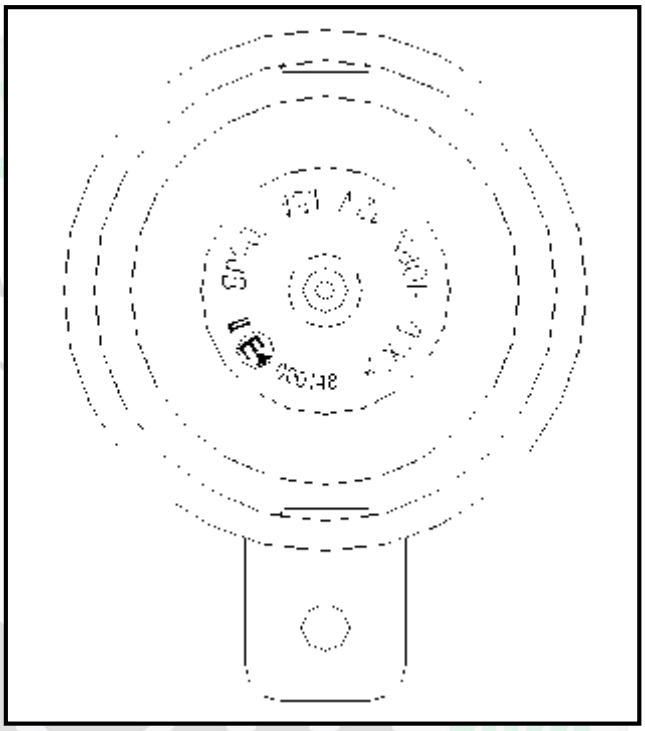
Schematic wiring diagram		
Wire color / Gear	R	R/W

Horn

Horn

Disassemble:

Disconnect the horn wiring.



Inspection

When the horn is connected to a battery, if there is an audible sound, it is operating normally.

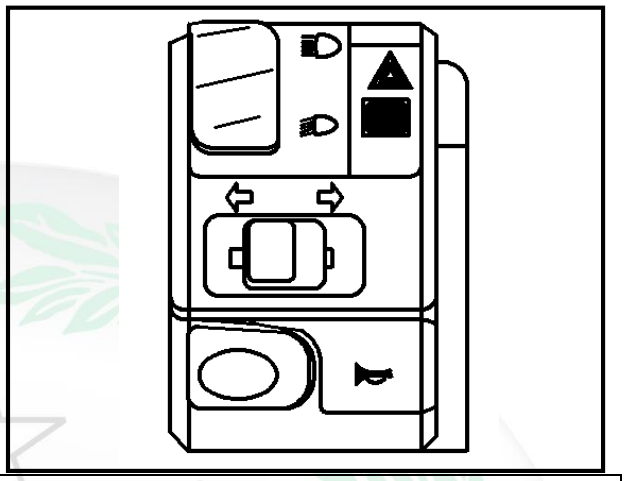
Resistance value: 3.2Ω

Handlebar Switches (Chinese market)

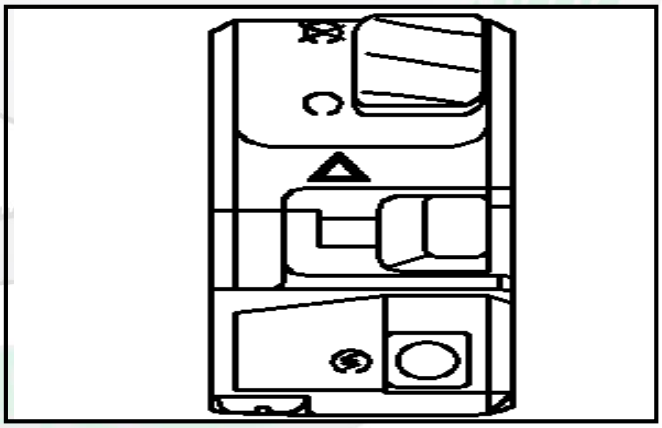
Handlebar Switches

The switches can be divided as:

1. Passing light switch
2. Turn signal indicator switch
3. Horn switch
4. Headlight High/Low switch
5. Engine kill switch
6. Starting switch



Wiring Diagram Schematic											
Passing light switch					Turn signal indicator switch				Horn switch		
	R/W	BL	R/Y	LBL		G/B	O	G/W		R/W	N
		○—○	○—○			○—○				○—○	
	○—○						○—○	○—○			
			○—○				○—○				



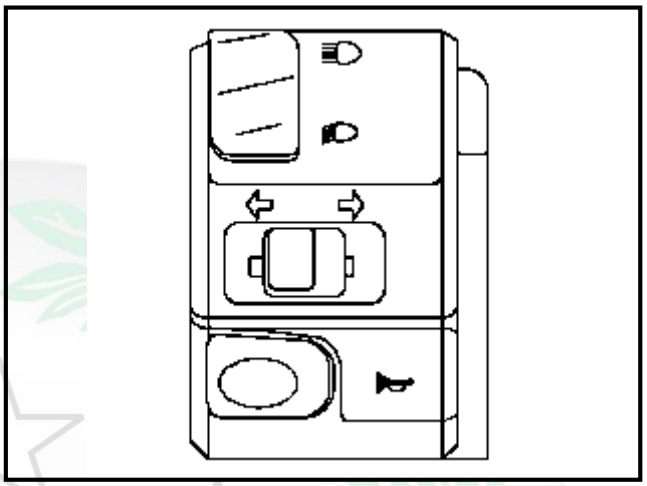
Wiring Diagram Schematic									
Headlight High /Low switch				Engine kill switch			Starting switch		
	R/W	Y	Y/R		R	N/Y		N/Y	G/Y
	○—○	○—○			○—○			○—○	

Handlebar Switches (US-STANDARD)

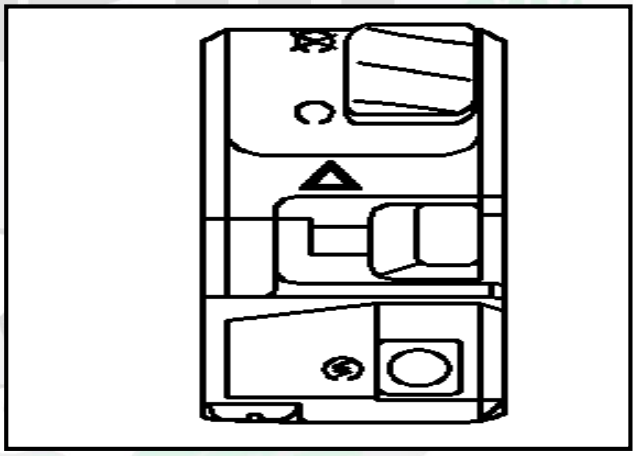
Handlebar Switches

The switches can be divided as:

1. Passing light switch
2. Turn signal indicator switch
3. Horn switch
4. Hazard light switch
5. Engine kill switch
6. Starting switch



Wiring Diagram Schematic											
Passing light switch					Turn signal indicator switch				Horn switch		
	R/W	BL	R/Y	LBL		G/B	O	G/W		R/W	N
		○—○				○—○				○—○	
	○—○										
			○—○				○—○				



Wiring Diagram Schematic									
Hazard light switch				Engine kill switch			Starting switch		
	R/Y	BL			R	N/Y		N/Y	G/Y
	○—○				○—○			○—○	

Speedometer Sensor

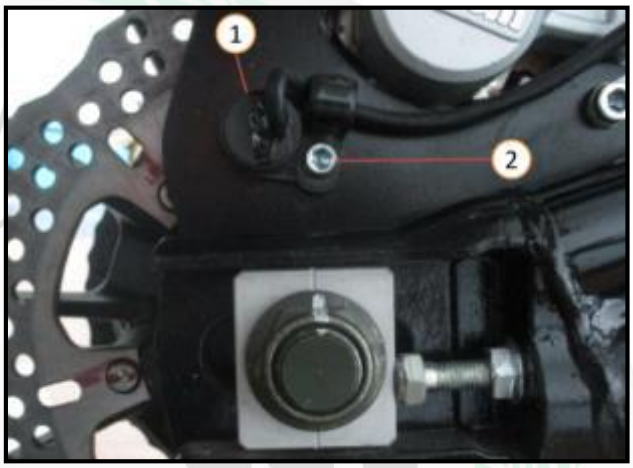
Speedometer Sensor

Disassemble the speedometer sensor

Warning
Do not drop the sensor to the ground, especially on hard ground. Impact vibrations can damage the sensor.

● Loosen the bolt ② Remove the speedometer sensor ①

● Disconnect the wiring connector for the speedometer sensor.



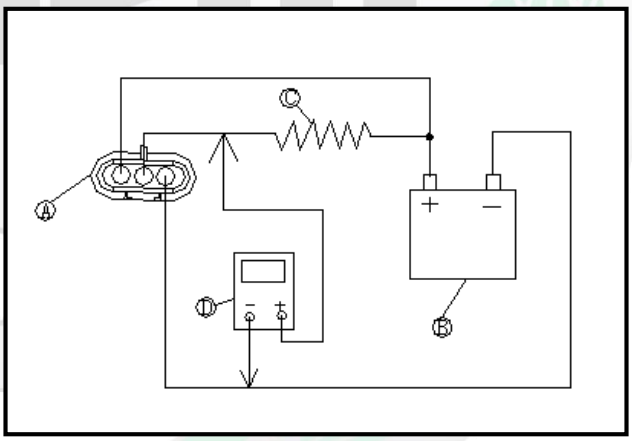
Check the speedometer sensor

● Disassemble the speedometer sensor (See the speedometer sensor disassembly section)

● Connect the speedometer sensor connector [A] and a battery [B], 10kΩ resistor [C] and a handheld multimeter [D] as shown in the Fig. to the right.

● Set the multimeter to DC 20V (digital multimeter)

● Slide the sensor surface transverse voltage of speedometer sensor from the battery voltage to 0 - 1V.



Speedometer sensor assembly

Assembly shall be in reverse order of disassembly.

Note:

Tighten the bolt to the following torque:

Torque: 7 ft·lb

Relays and Fuse-Block

Relays

Relays

Disassemble the relay

Relay are directly installed on the wiring harness.

Remove the upper cover at disassembly.

Pull out #2 and #5 relays.

Remove the fixing screws with a hex socket.

Take out the relay.

*Attention
Relay diode is available at the relay box. The diode of the relay box is not removable.

Warning
Do not drop the relay to the ground, especially on hard ground. Such vibrations may cause damage to the relay.

Circuit inspection for relay:

● The electrical conductivity of the following terminals through connecting a handheld multimeter and a 12V battery to the relay (See internal circuit of relay box).

★ If the readings of the multimeter are not conforming to the regulations, replace the relay box.

- **Circuit inspection for relay (Disconnect the battery)**

	Multimeter connection	Readings of multimeter (Ω)
Main relay	3-4	∞
	1-2	Not ∞*
Fan relay	7-8	∞
	5-6	Not ∞*
Fuel pump relay	11-12	∞
	9-10	Not ∞*
Main ECU relay	15-16	∞
	13-14	Not ∞*
Lighting relay	19-20	∞
	17-18	NOT ∞*

- *: Actual readings may differ according to different **handheld multimeters** used.

- **Circuit inspection for relay (Installed with battery)**

	Battery connection (+) (-)	Multimeter connection	Readings of multimeter (Ω)
Main relay	1-2	3-4	0
Blower relay	5-6	7-8	0
Fuel pump relay	9-10	11-12	0
Main ECU relay	13-14	15-16	0
Lighting relay	17-18	19-20	0

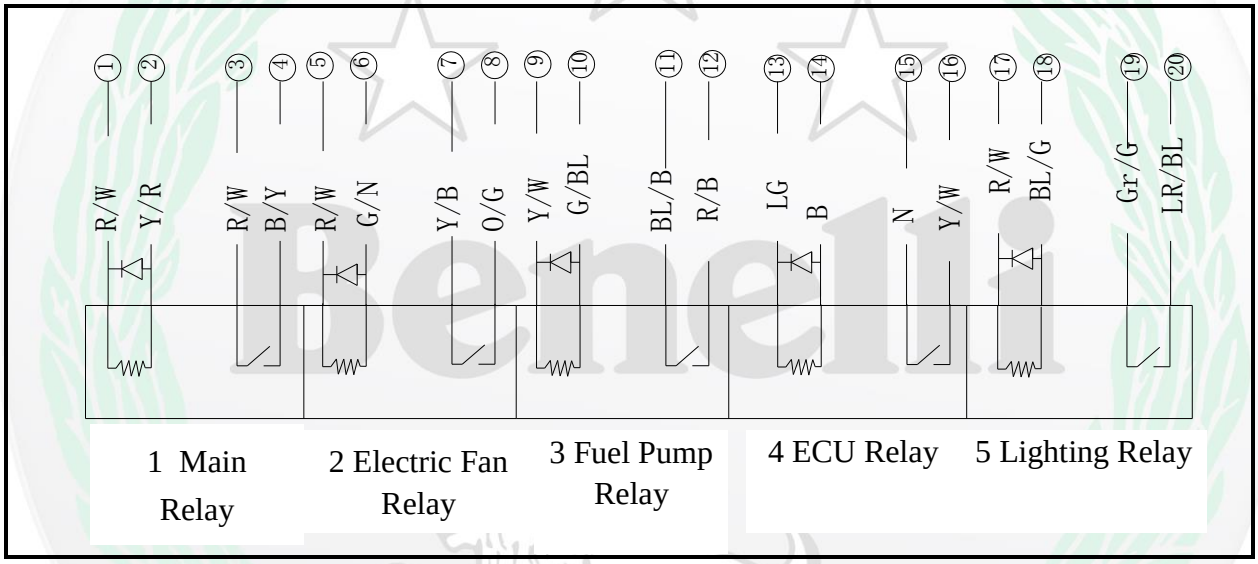
(+): Connect to positive wire

(-): Connect to negative wire

Relays and Fuse-Block

Relays

Relays (US-STANDARD)



Relays (only on Chinese market models)

Units manufactured for the Chinese market do not contain #5 relay.

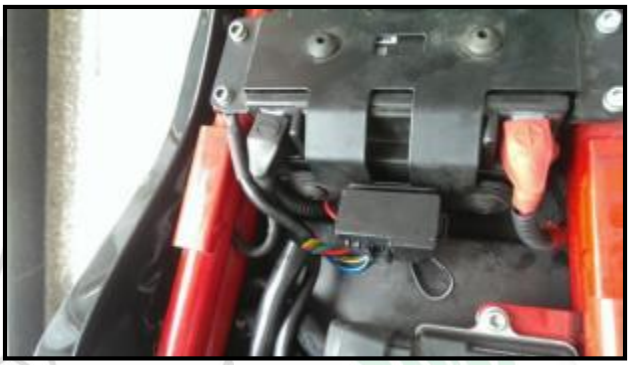
Relays and Fuse-Block

Fuse Block

Fuse Block

Fuse disassembly:

● Seat cushion disassembly (See Chapter Frame, Seat cushion disassembly)



● Open the snap joints and lift the cover

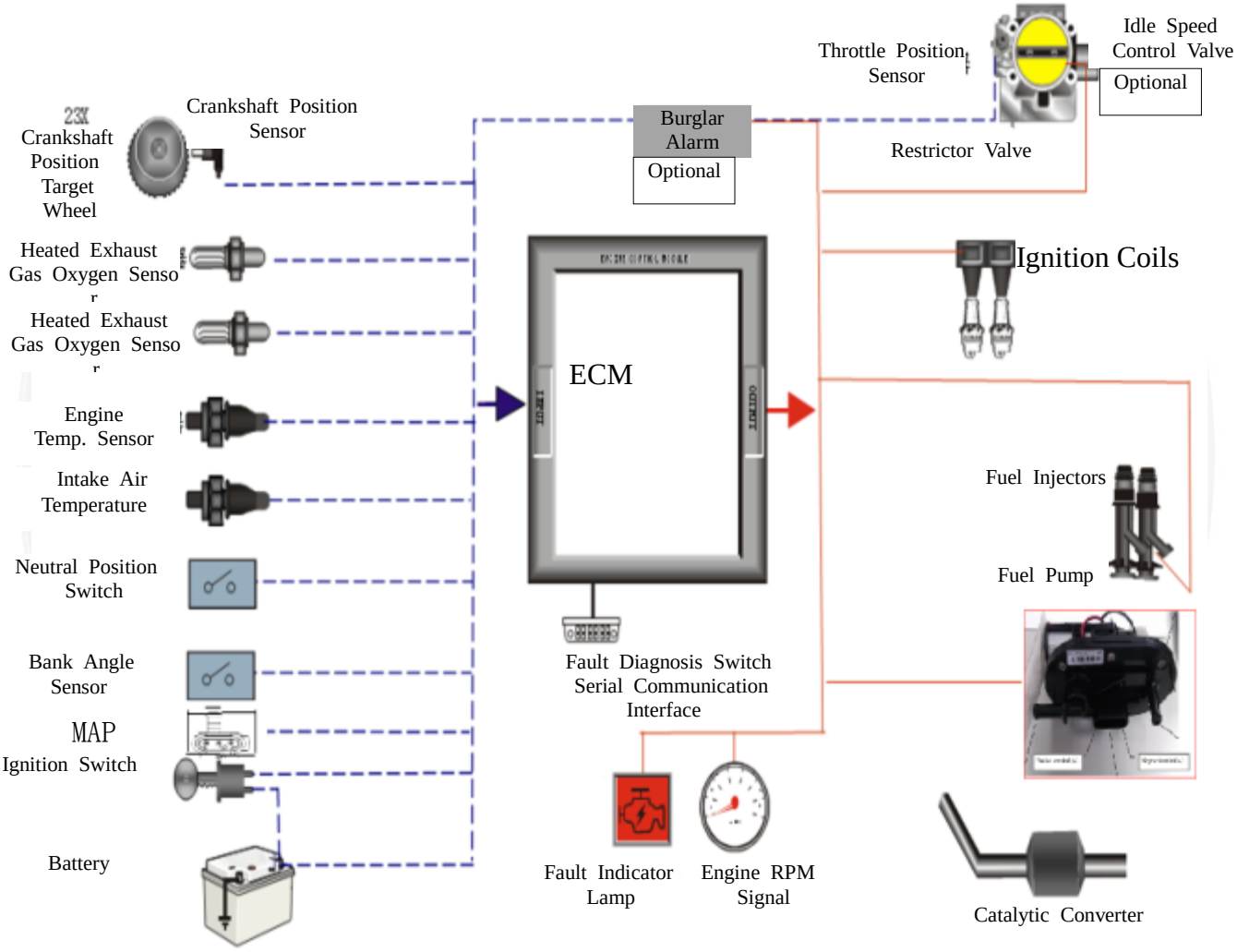
● Pull the fuses straight up from the fuse-base block with a pair of needle nose pliers.

Fuel Injection System

Fuel Injection System

Introduction:

The TNT300 uses a small sized engine fuel injection system manufactured by the Delphi Corporation. The system conducts closed-loop control through two oxygen sensors. Two independent fuel injectors and ignition control. A three-way catalytic converter is used to process engine combustion gas to transform into an innocuous gas and discharge it into the air. The system uses a closed-loop self-diagnostic system. It can effectively diagnose faults within the system and related mechanical parts thus to improve the comprehensive consistency of the whole machine.



Fuel Injection System / ECU

ECU

Engine control unit (MT05 ECU)

The engine controller detects the real-time engine running state through various kinds of sensors. Through reasonable calculation and a self-learning control output device, it optimizes the functionality of the vehicle under various working conditions, and ensures the vehicle meets the original vehicle emissions regulations and fuel economy as well. Additionally, in case of a system failure the ECU can perform self-diagnosis functions.

ECU appearance:

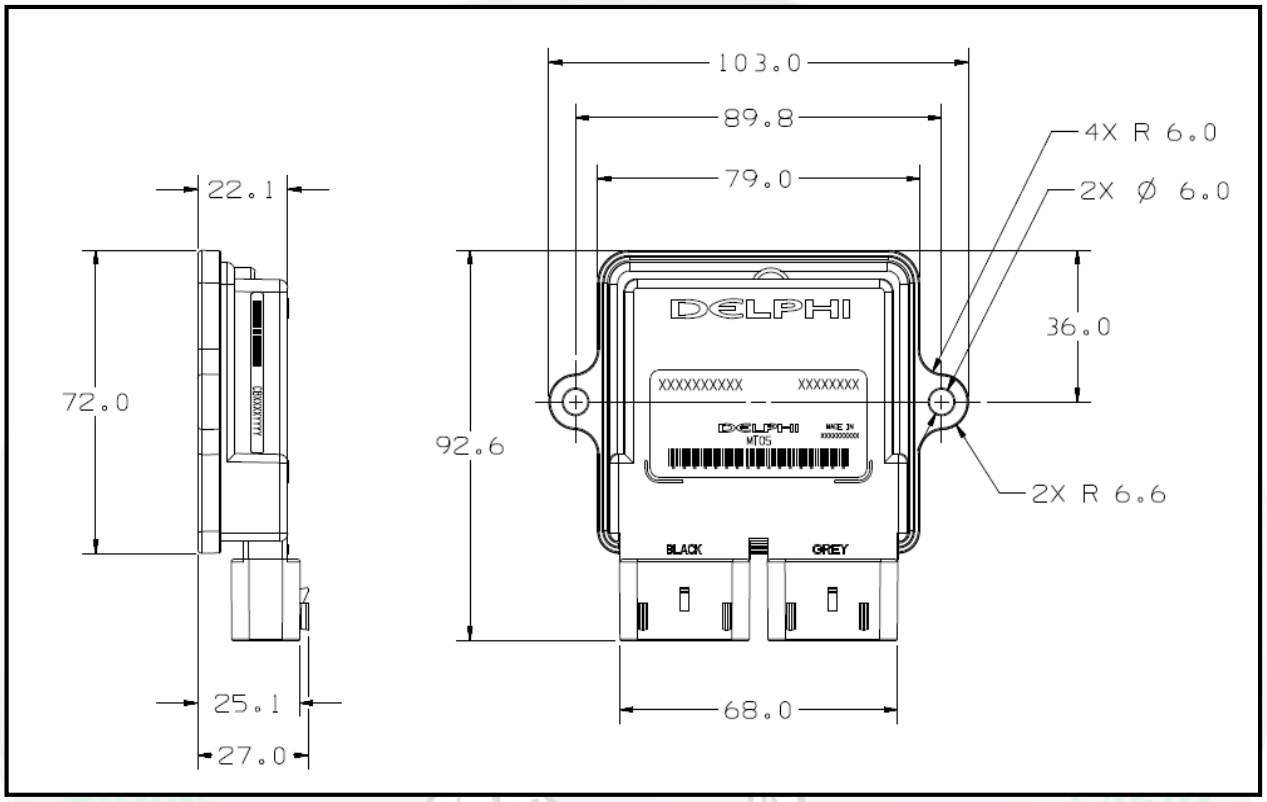
The upper part of MT05 ECU shell adopts a plastic body, while the bottom part adopts an aluminum alloy body. Fig. 2 is the front and reverse side of the MT05 controller.

Fuel Injection System / ECU

ECU

Overall dimensions:

The Max. overall dimension of the controller is 103*92.6*27.1mm. The size of the mounting holes, which are used for attaching the controller, have been included, however, it doesn't include the connectors and wiring harness for the controller. Please refer to the following outline dimension drawing.

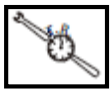


Assembly

Assemble ECU (1) on the frame with bolts (2) as shown in Fig. A

Note:

Tighten the two bolts to the following torque:



Torque 35 in·lb ±10%

Warning:

The mounting surface must be flat to prevent generating exterior stress on the controller which may lead to controller circuit board bending.

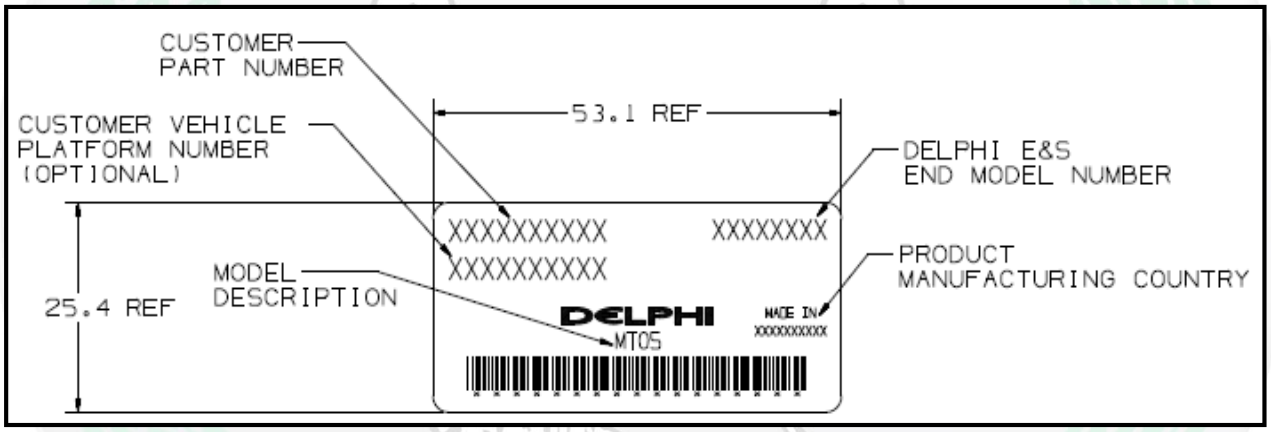
Fuel Injection System / ECU

ECU

Tag and identification label

Each controller has a product identification label for traceability. Label information shall cover the Delphi and customer part number, customer vehicle model, controller type description and production date. The label shall not be damaged or contaminated since it is an important basis for Delphi to confirm controller information. If the label is damaged or contaminated, Delphi will not provide after-sales services for the controller. Please refer to the diagram below.

- CUSTOMER PART NUMBER: Product identification number stipulated by the manufacturer;
- DELPHI E&S END MODEL NUMBER: Product serial number identification number of DELPHI;
- CUSTOMER VEHICLE PLATFORM NUMBER: Vehicle information number stipulated by the manufacturer;
- MODEL DESCRIPTION: Product model identification number of DELPHI;
- PRODUCT MANUFACTURING COUNTRY: Manufacturing site of ECM; identification labels should be in English.



Fuel Injection System / ECU

ECU

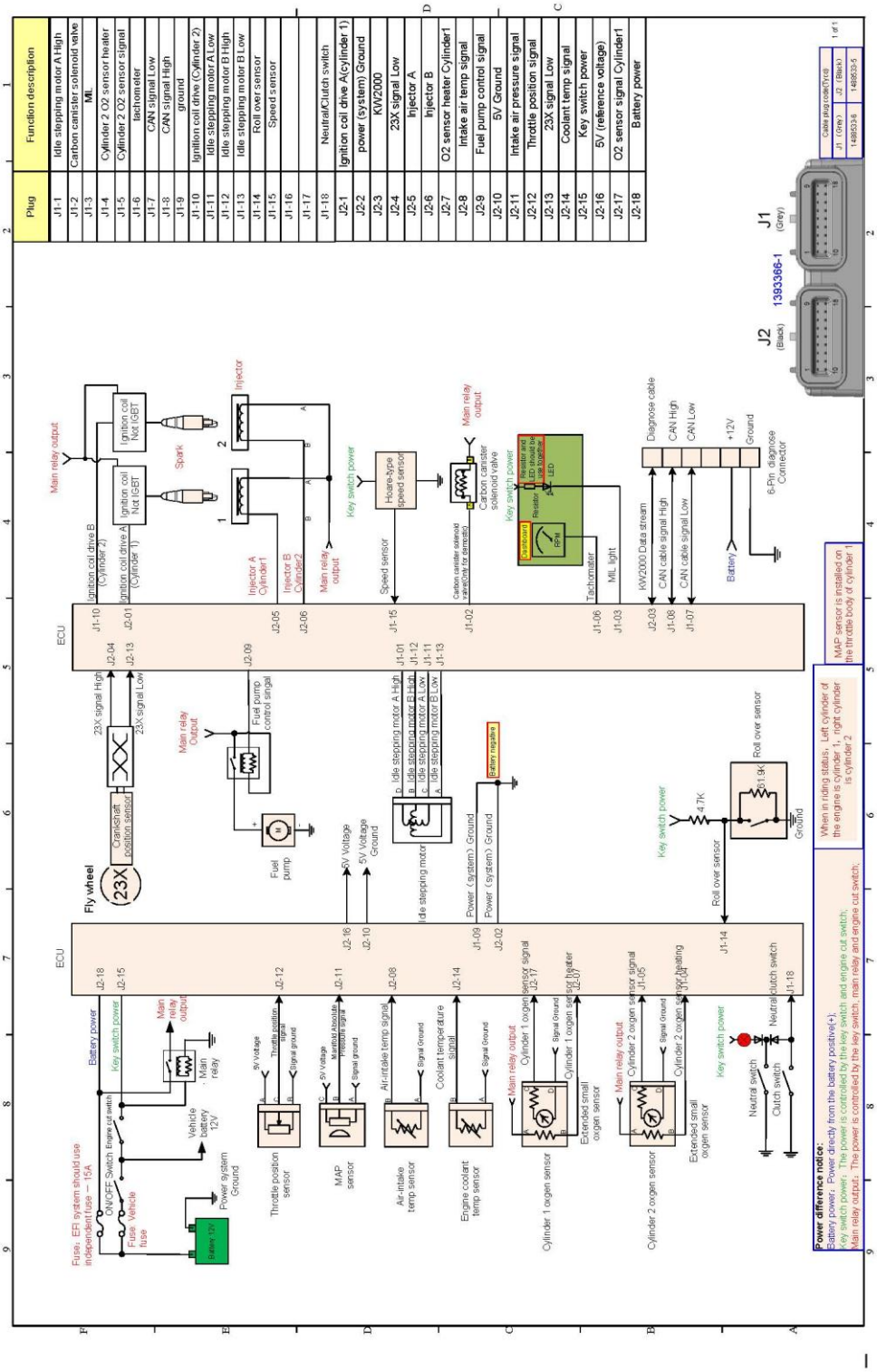
Definition of ECU pin:

J1-1	Idle speed stepper motor high A pin	J2-1	Driving pin of 1-cylinder ignition coil
J1-2	ECP pin	J2-2	System ground pin
J1-3	Fault indicating light pin	J2-3	K line communication pin
J1-4	Heating pin of 2-cylinder oxygen sensor	J2-4	High potential pin of crank signal
J1-5	Signal pin of 2-cylinder oxygen sensor	J2-5	Driving pin of 1-cylinder fuel injector
J1-6	Revolution meter	J2-6	Driving pin of 2-cylinder fuel injector
J1-7	Low CAN line signal	J2-7	Heating pin of 1-cylinder oxygen sensor
J1-8	High CAN line signal	J2-8	Signal pin of intake air temperature sensor
J1-9	System ground pin	J2-9	Pin of oil pump control signal
J1-10	Driving pin of 2-cylinder ignition coil	J2-10	5V Reference voltage ground pin of the system
J1-11	Idle speed stepper motor low A pin	J2-11	Signal pin of MAP
J1-12	Idle speed stepper motor high B pin	J2-12	Signal pin of position sensor of throttle body
J1-13	Idle speed stepper motor low B pin	J2-13	Low potential pin of crank signal
J1-14	Dumping switch (being effective at low position)	J2-14	Signal pin of water temperature sensor
J1-15	Pin of vehicle speed sensor	J2-15	Priming supply (12V positive voltage after key)
J1-16		J2-16	5V reference voltage
J1-17		J2-17	Signal pin of 1-cylinder oxygen sensor
J1-18	Pin of neutral clutch switch	J2-18	Rechargeable battery (rechargeable battery 12V positive power supply)
Viewing from rear side of the engine, the left one is cylinder #1 and the right one is cylinder #2.			
Note: J1 refers to the grey connector of ECU; J1 refers to the black connector of ECU; J1-1 refers to #1 pin on the grey connector of ECU.			

The Fig. below presented the definition of the pin of MT05 ECU interface as well as the wiring harness connecting diagram of the engine.

Fuel Injection System / ECU

ECU



Fuel Injection System / ECU

ECU

Attention:	Causes
DON'TS: Place the ECU close to an exhaust pipe or the engine.	High temperature may reduce the service life of the controller and even cause damage to the controller directly.
DON'TS: Place the ECU close to any liquids.	Controller may be damaged by liquids.
DON'TS: The controller surface is not to be covered by clay or any other pollutants.	Clay or other pollutants which may affect the heat dissipation performance of the controller.
DON'TS: Load additional voltage to the controller	It may cause controller performance failure or even controller damage.
DON'TS: Clean the controller with liquid with dissolution or corrosion action.	May damage the controller shell.
DO'S: Ensure that water or a large amount of moisture will not drip or attach on the connectors of the controller.	The connectors may be short circuited and further lead to controller damage.
DO'S: Clean the controller with wet cloth and wipe dry	Can prevent controller damage.

Power supply requirements:

- Power supply: If the battery voltage is greater than 6.3V, the power supply module can start the control chip of the controller which is automatically controlled by the controller.
- Scope of supply: The controller will work normally with a battery and ignition voltage of 9 to 16v.
- Shutdown: In case of the ignition voltage being lower than 6.2V, the controller will automatically shut down.
- Controller will enter shutdown procedure and store the important information in the memory of the controller.
- Restart: In the event of a restart, all the output will be set to a predefined state. Controller will be under real-time monitoring. In case any internal errors are being detected, it will automatically enter restart status. After a restart, the controller will execute according to the normal program.
- Overvoltage: Under the circumstance of working for one minute at a DC voltage not exceeding 26V, the controller will not be subject to permanent damage.
- Backward voltage: Under the circumstance of working for one minute at a DC backward voltage not exceeding 13V, the controller will not be subject to permanent damage.

Temperature requirements:

Operating temperature: The control can run normally between ambient temperatures from -4°F to 185°F.

Fuel Injection System / Water Temperature Sensor

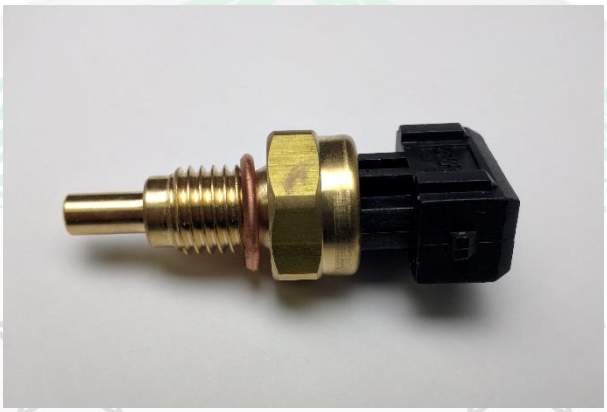
Water Temperature Sensor

Operating principle of the water temperature sensor:

The sensor is to be used on water cooled engines to measure the temperature of the engine coolant. It is assembled in the radiator. Within the sensor temperature range, the resistance will be varied along with different engine temperatures. It is characterized of negative temperature coefficient resister. It is a part that cannot be maintained.

Appearance of engine water temperature sensor:

The appearance of water temperature sensor is as shown below.



Installation requirements for the water temperature sensor:

- Dynamic torque requirements: It should be manual installed first to correctly mount the screw threads. Tighten it to stipulated torque manually with a wrench. The recommended assembly torsion is as below:

 **Torque 15~18 ft·lb**

● Static torque requirements: The torque used to disassemble the sensor from engine shall not exceed 200% of that used for assembly.

Working environment of the water temperature sensor:

● The sensor is mainly used only on water cooled engines.
● Normal operating temperature range: -40 ~ 275°F (consecutive running)
● Relative humidity of working environment: 0 ~ 100%
● Typical working pressure: Under the minimum installation torque, the sensor can realize engine coolant sealing under the condition that the actual pressure is up to 206.8kPa (30psi) and the temperature is 275°F.
● Limits of working environment: Can only operate for one hour at the Max. temperature of 302°F.

Electrical environment of the water temperature sensor:

● Typical working voltage: reference voltage: 5 ± 0.1VDC

Cleaning method of the water temperature sensor:

The sensor can be cleaned with isopropyl alcohol and then subject to air drying if necessary. Immerse with isopropyl alcohol for not more than 1 minute. Install necessary sealing connector to prevent cleaning solution from invading the interior of the sensor.

Fuel Injection System / Intake Air Temperature Sensor

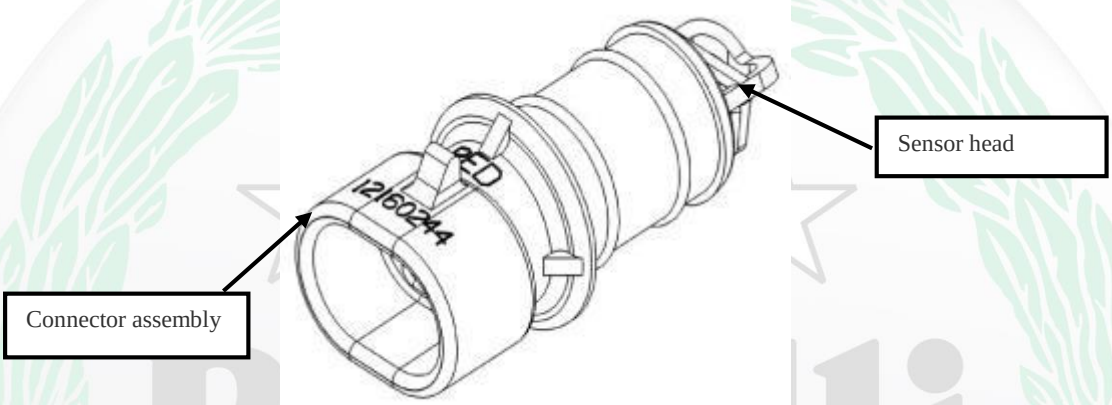
Intake Air Temperature Sensor

Operating principle of the intake air temperature sensor:

Within the sensor temperature range, the resistance will be varied along with different engine temperatures. It is characterized of negative temperature coefficient resister. It is a part that cannot be maintained.

Appearance of the intake air temperature sensor:

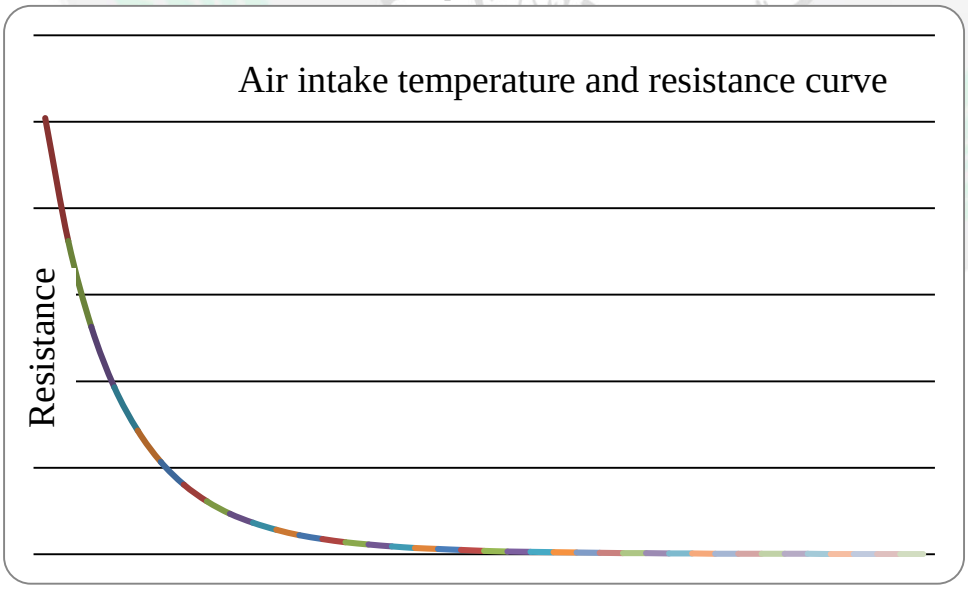
The appearance of intake air temperature sensor is as shown below.



I. Technical parameters:

- Working voltage: 5VDC
- Response time: <15s
- Operating temperature: -40 ~ 302°F
- Relative humidity: 0 to~100% RH.

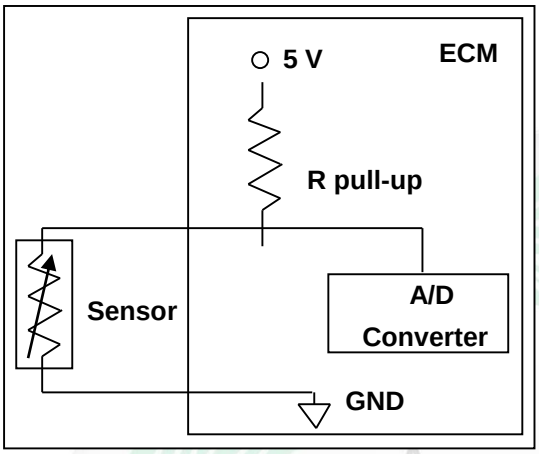
Resistance measurement value and temperature curve:



Fuel Injection System / Intake Air Temperature Sensor

Intake Air Temperature Sensor

Pin definition and functional diagram:



Measure the resistance between the two pins with a multimeter. The corresponding list of specific temperature and resistance are as shown below:

Measured temperature (°F)	Resistance value (Ω)
0	9,399
41	7,263
50	5,658
59	4,441
68	3,511
77	2,795
86	2,240

Intake air temperature sensor is located in the air box. It can be pulled out wearing gloves.

Cleaning:

The sensor can be cleaned with isopropyl alcohol and then subject to air drying if necessary. Immerse with isopropyl alcohol for not more than 1 minute. Install necessary sealing connector to prevent the cleaning solution from invading the interior of the sensor.

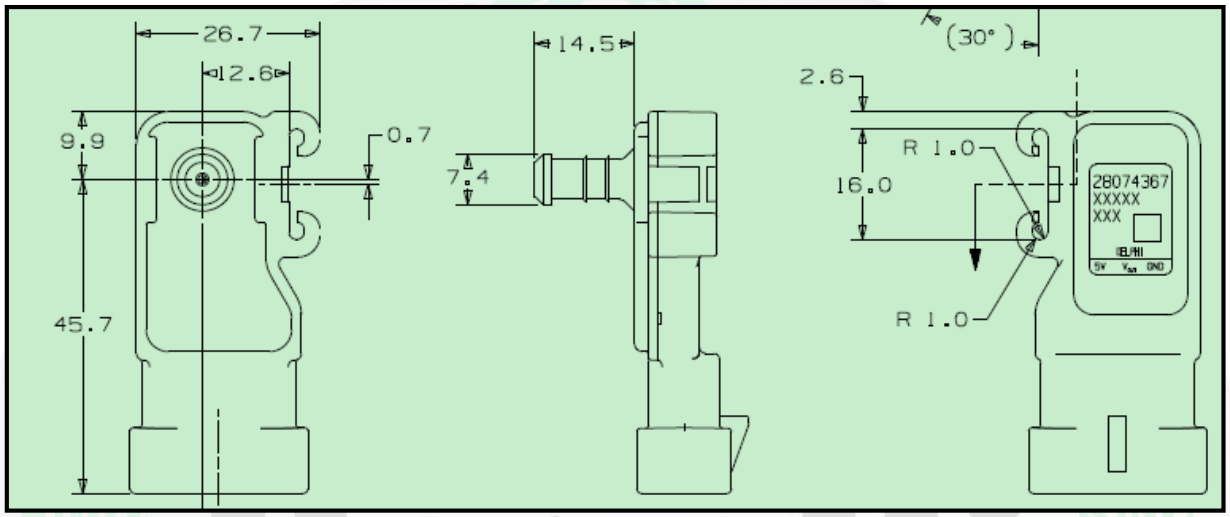
Fuel Injection System / Intake Manifold Pressure Sensor (MAP)

MAP Sensor

Operating principle of MAP

The sensor is used to measure the absolute pressure of the intake air. It reflects the size of inlet pressure which can be converted into air intake volume entering the combustion chamber of the engine. It is a part that cannot be maintained as well.

Appearance of the MAP Sensor:



Working environment:

- Working pressure range: 20 ~ 102kPa.
- Operating temperature range: -40 ~ 221°F.
- Relative humidity: 0 to~100% RH.
- Limit working environment: Will only work for two hours at the Max. temperature of 257°F.

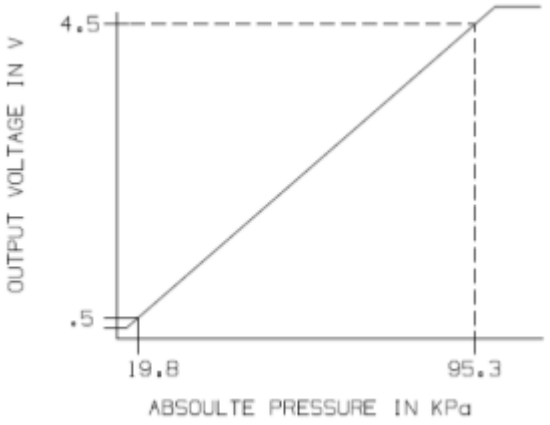
Storage environment:

Storage temperature: -58°F ~ 302°F.

Electrical environment:

Typical voltage: DC reference working voltage of sensor is 5 ± 0.1V.

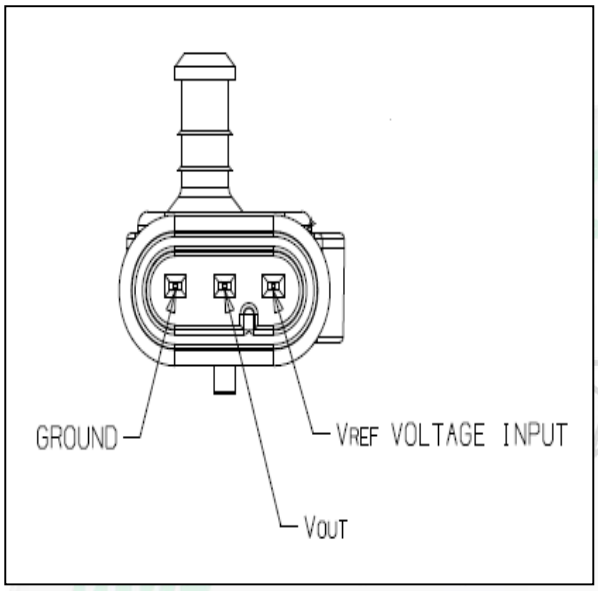
Characteristic curve:



Fuel Injection System / Intake Manifold Pressure Sensor (MAP)

MAP Sensor

Definition of pin positions:



Position

MAP is integrated on the throttle body valve.

Cleaning:

The sensor can be cleaned with isopropyl alcohol and then subject to air drying if necessary. Immerse with isopropyl alcohol for not more than 1 minute. Install necessary sealing connector to prevent the cleaning solution from invading the interior of the sensor.

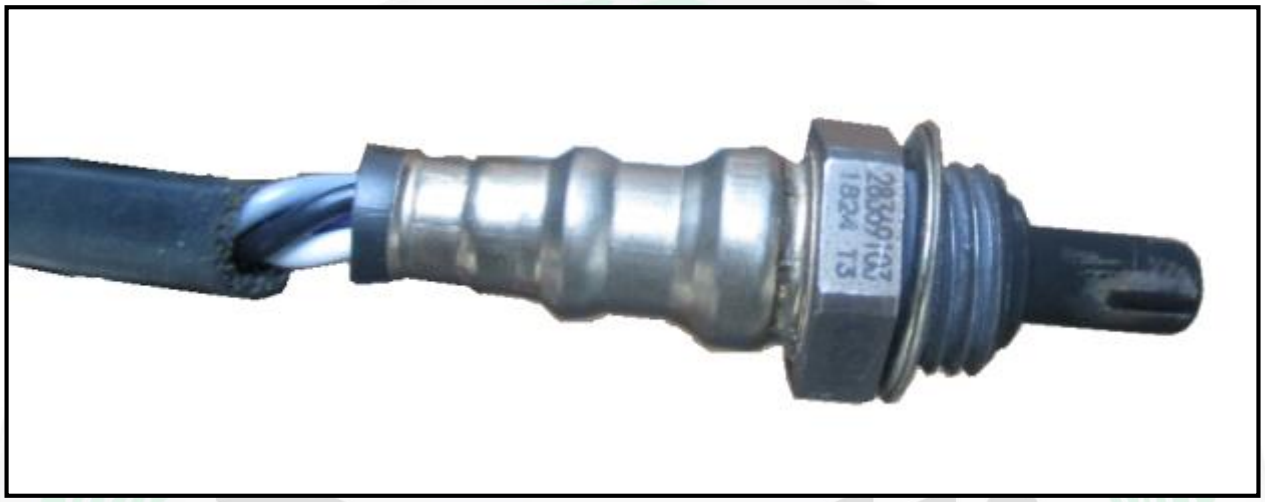
Fuel Injection System / Oxygen (O2) Sensor

Oxygen Sensor

Operating principle of the oxygen sensor:

The oxygen sensor is used to detect the oxygen content in exhaust gas discharged from the engine exhaust pipe, to control internal fuel closed-loop of the ECU, and to maintain engine combustion at the most reasonable air to fuel ratio (14.7).

Appearance of the oxygen sensor:



Technical parameters

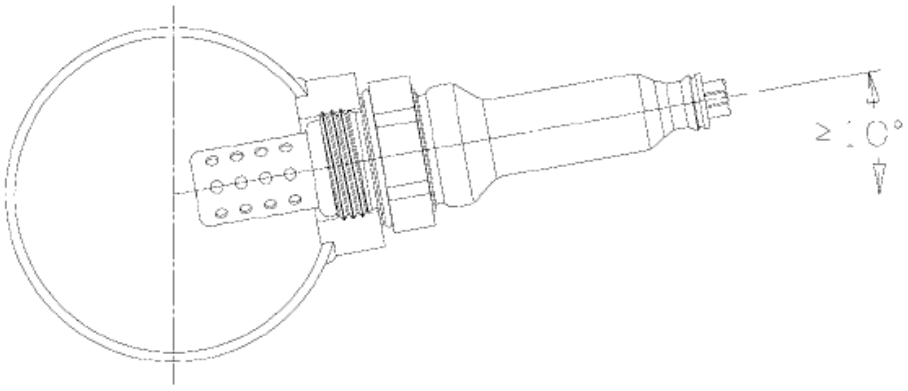
- Threshold value of air-fuel ratio: ＞750 mVDC
- Dilute threshold of air-fuel ratio: ＜120 mVDC
- Heating power of oxygen sensor: 7.0W

(The aforementioned parameters can be measured on engine pedestal. Working conditions: 842°F exhaust gas temperature, 70% duty ratio, 10Hz, 13.5V voltage).

- Heat resistance: 9.6±1.5Ω (measured at 70°F).
- Operating temperature range: 500-1562°F.

Installation requirements:

- Installation angle (included angle with the horizontal plane): ≥10



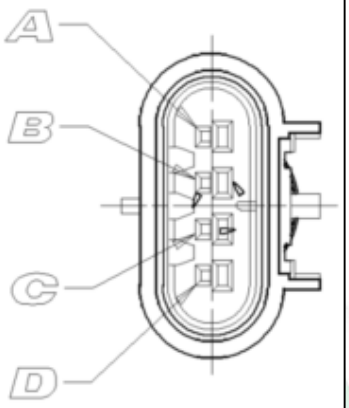
- **Tightening torque: 30-44 ft·lb**

Fuel Injection System / Oxygen (O2) Sensor

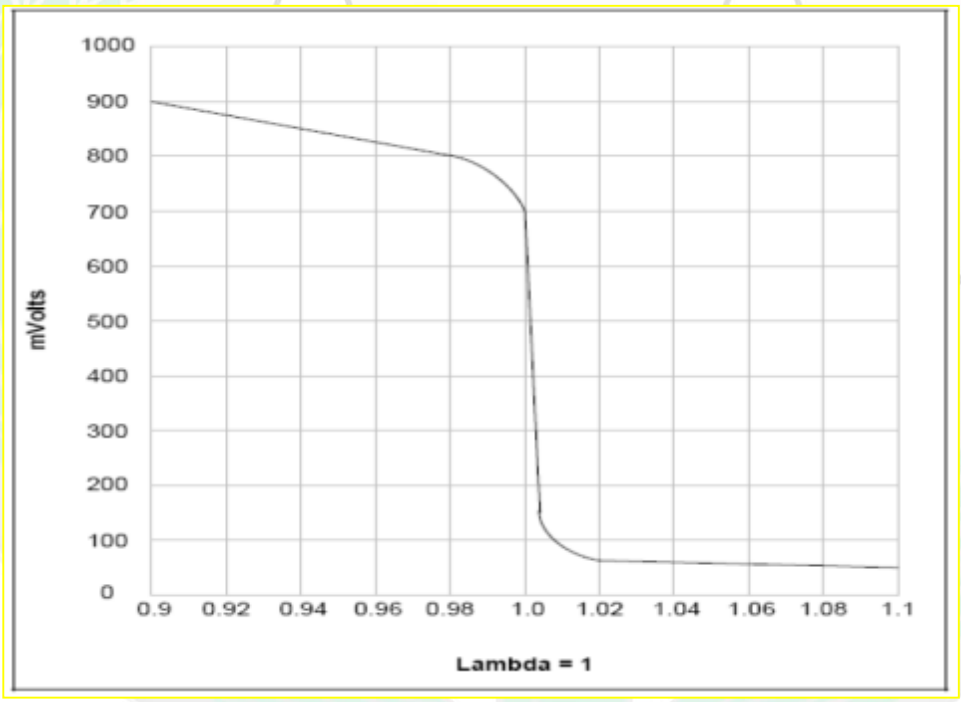
Oxygen Sensor

Definition of pin position:

CONNECTOR PIN	WIRE COLOR	PIN AND WIRE CONNECTION
A	PURPLE	HEATER +
B	WHITE	HEATER -
C	GRAY	SENSOR (OUTPUT)
D	BLACK	SENSOR (GROUND)



Characteristic curve:



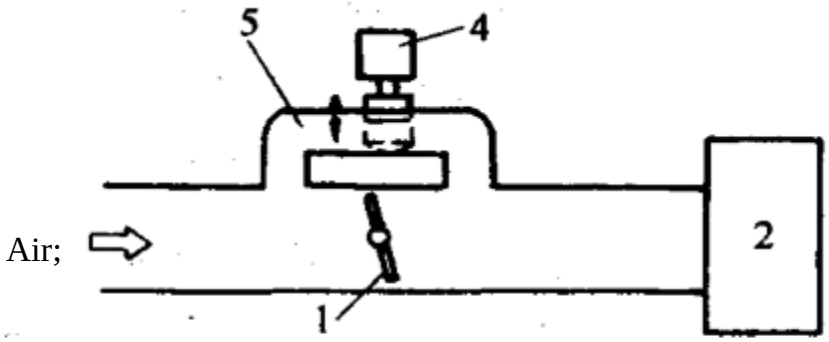
The oxygen sensors are located on the exhaust header. Please disconnect the oxygen sensor connector prior to removal. Dismantle the oxygen sensor with a 13mm open spanner. Do not tie off or twist the wiring harness at disassembly.

Fuel quality requirements:

- Pb≤0.005g/L
- P≤0.0002g/L
- S≤0.04% (weight proportion)
- MMT≤0.0085g/L
- Si≤4ppm

Fuel Injection System / Idle Speed Stepper Motor

Idle Speed Stepper Motor

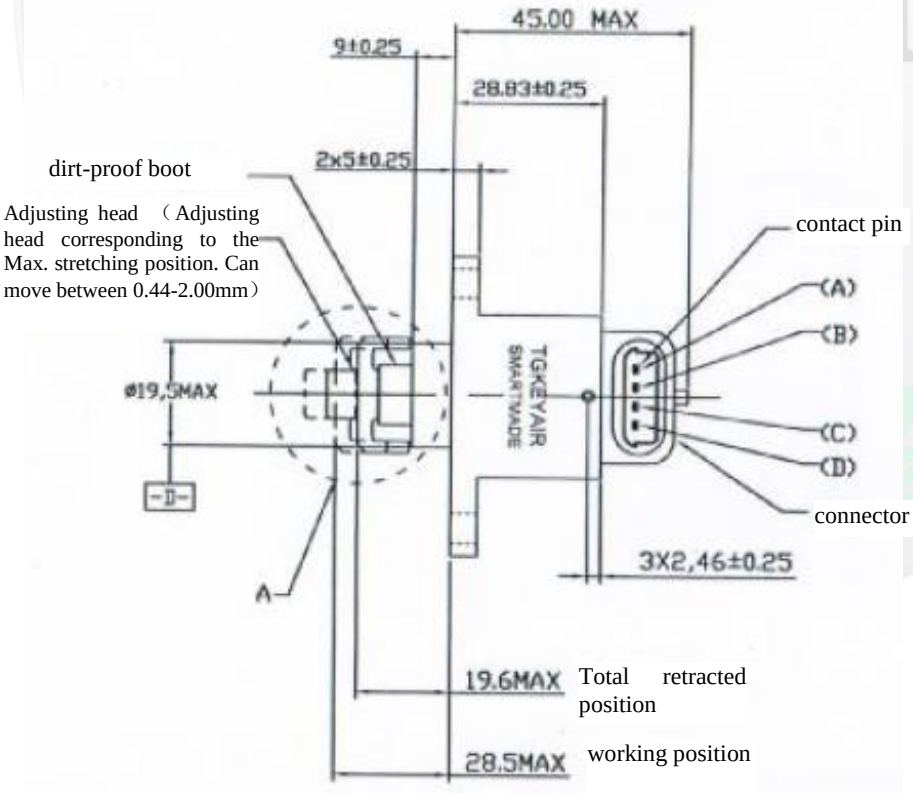


1. Air; 2. valve block; 3.intake manifold ;4.Idle speed stepper motor; 5. bypass port

Operating principle of the idle speed stepper motor:

Idle speed control valve is used to control the flow area of the bypass thus to regulate the air amount fed to the engine to realize engine idle speed control.

Definition of pin:



Fuel Injection System / Idle Speed Stepper Motor

Idle Speed Stepper Motor

Characteristic parameters:

Rated voltage:	12Vdc
Max./Min. working voltage	7.5Vdc/14Vdc
Each volume resistance (@27°C):	53Ω±5.3
Minimum resistance (@-40°C):	35Ω
Each coil inductance (@25°C):	33.5mH±6(1kHz)
Stepping distance (stride)	0.04167mm
Maximum stroke:	8.5mm (204 steps)
Operating temperature range:	-40°F to 257°F (302°F peak value)
Minimum storage temperature	-40°F
Weight	110g

The stepper motor is always integrated on the throttle body valve. For cleaning, disassembly the stepping motor first, and then clean up with clean dusting cloth.

Appearance of idle speed stepper motor:

Fuel Injection System / ECP

Canister Solenoid Valve

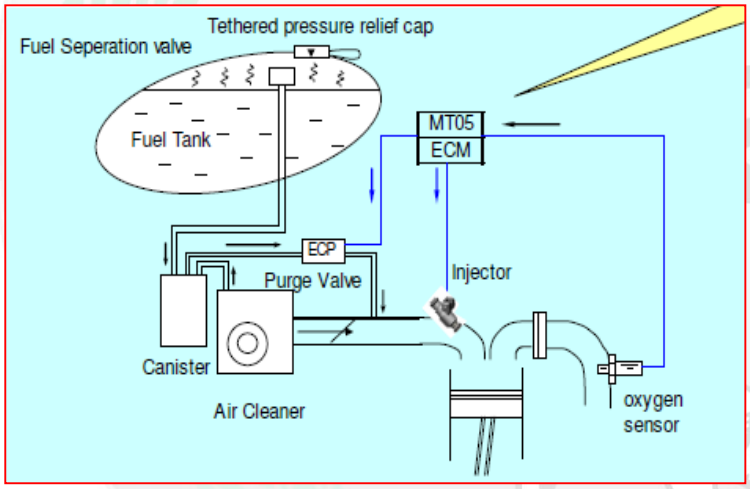
Operating principle description:

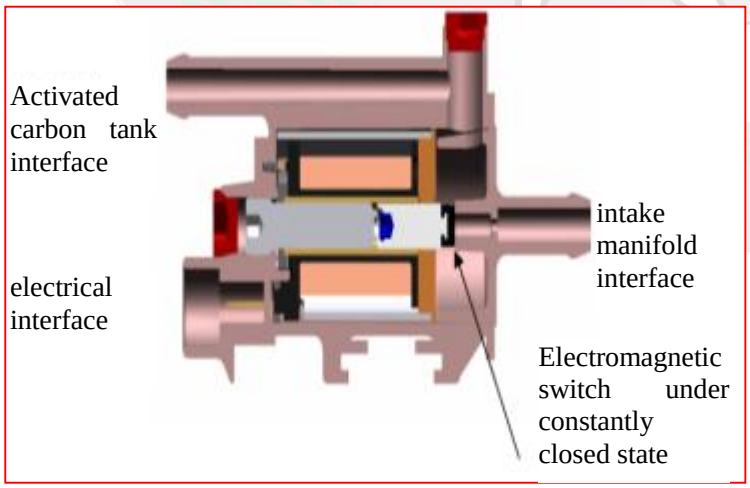
ECP controls the fuel vapor in the fuel tank to enter the engine air intake system to realize combustion in the engine. Thus the fuel evaporative emissions can be reduced.

Appearance

The appearance of ECP is as shown below:

ECP solenoid valve pin cannot be distinguished from positive and negative electrode. The connection method is as shown in the schematic diagram.





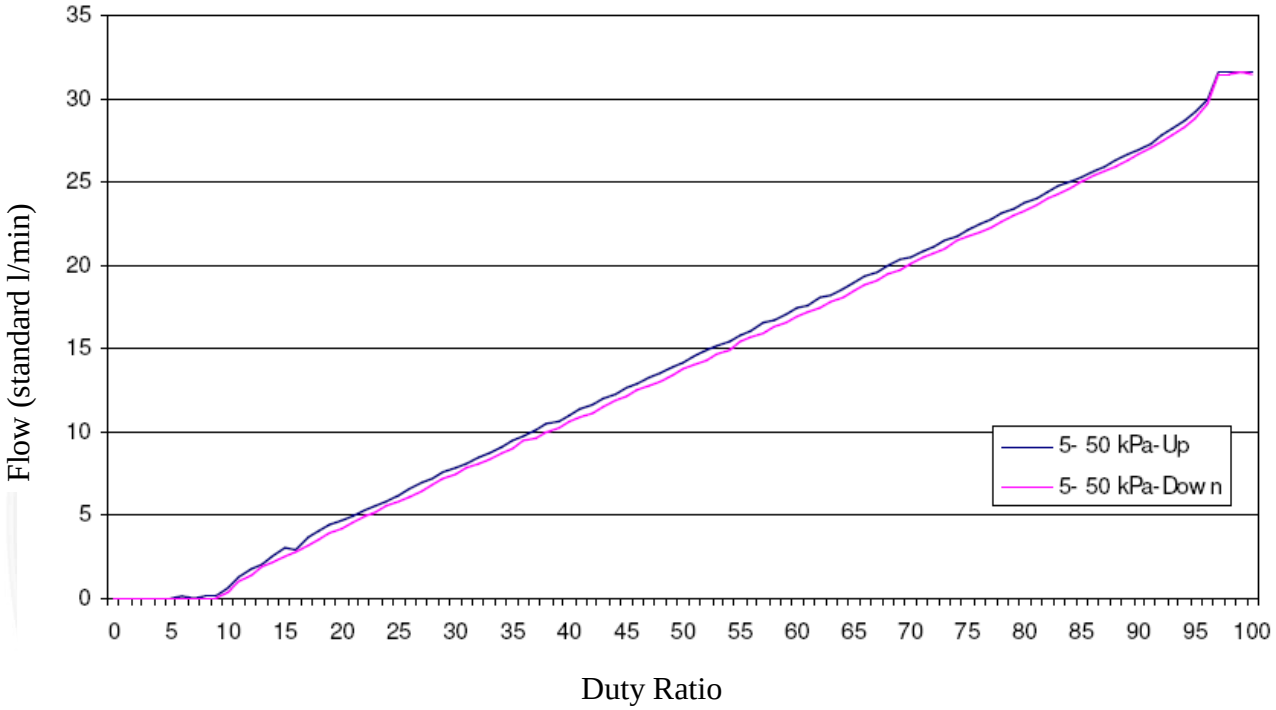
Fuel Injection System / ECP

Canister Solenoid Valve

I. Technical parameters

- Normal working voltage: 8 ~ 16V VDC
- Operating temperature: -40 ~ 248°F
- Working frequency: 16 Hz
- Maximum flow rate: 25-35L/min

Flow curve is as shown in the Fig. below:

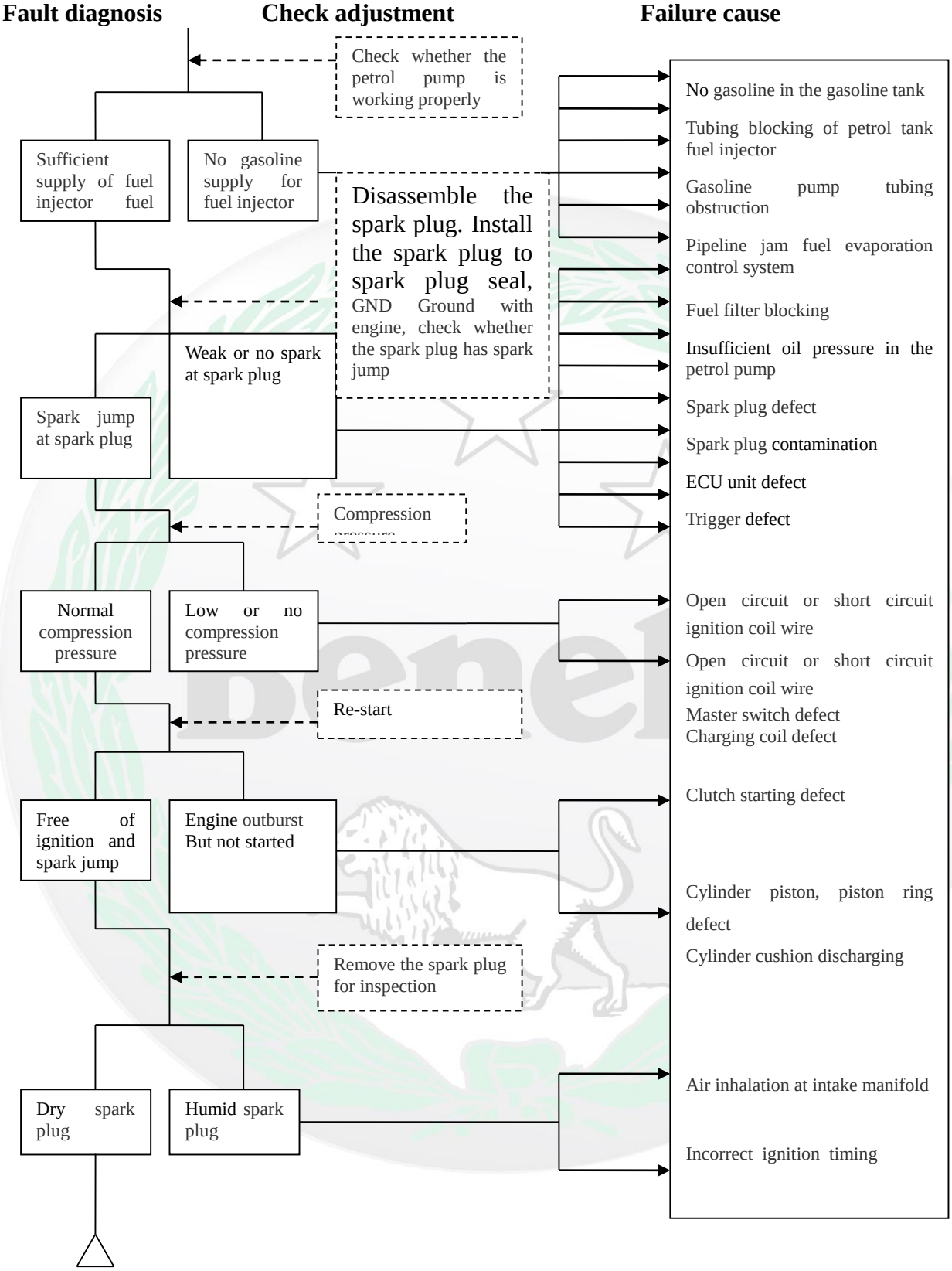


Installation requirements:

- ECP shall be horizontally installed on motorcycle.
- ECP shall be installed close to the position of the center of rotation axis of the crankshaft thus to reduce vibration.

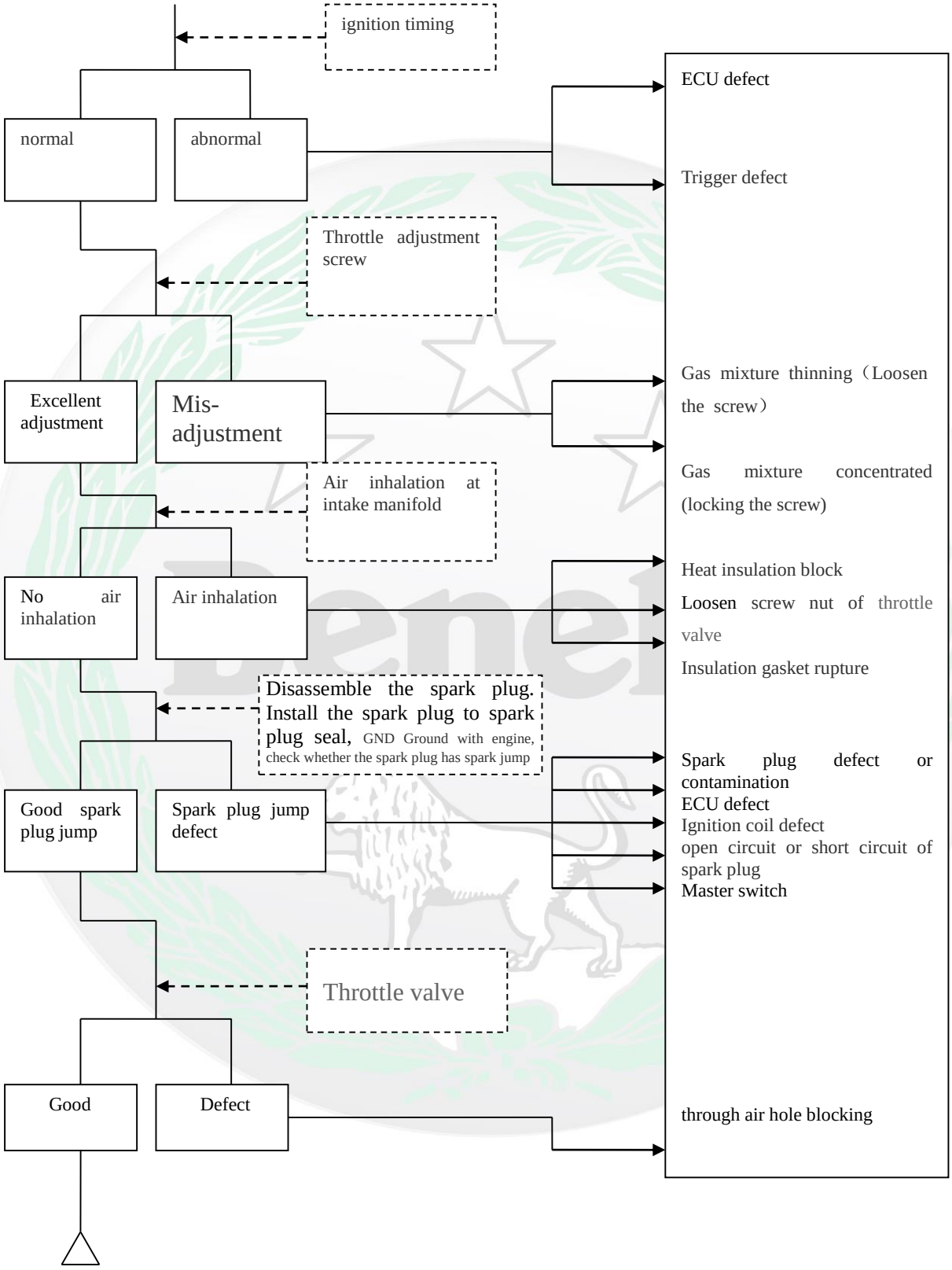
Chapter IX Faults and Troubleshooting

Difficulty in Starting or Starting Failure

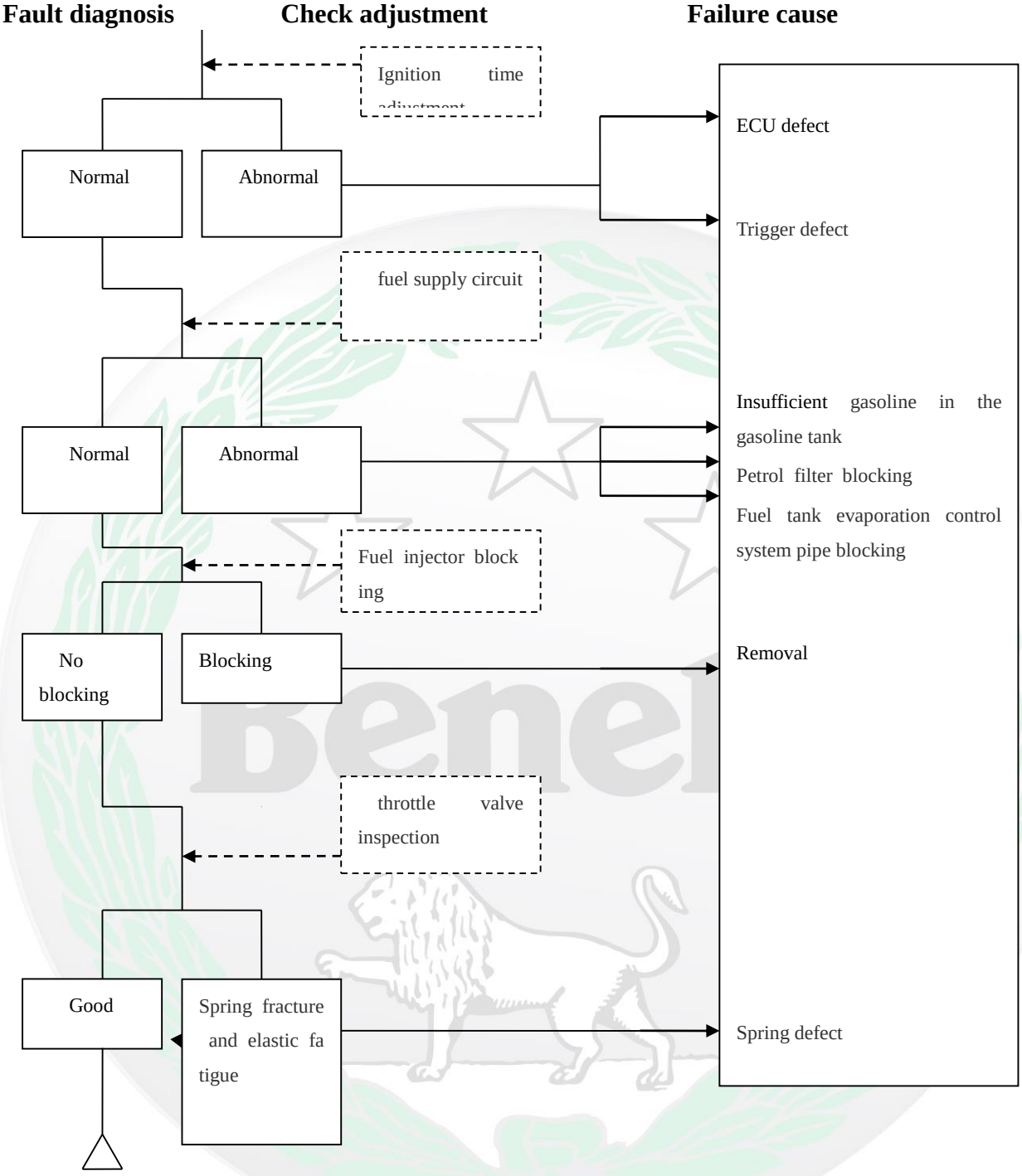


Poor Running (Especially at low speed)

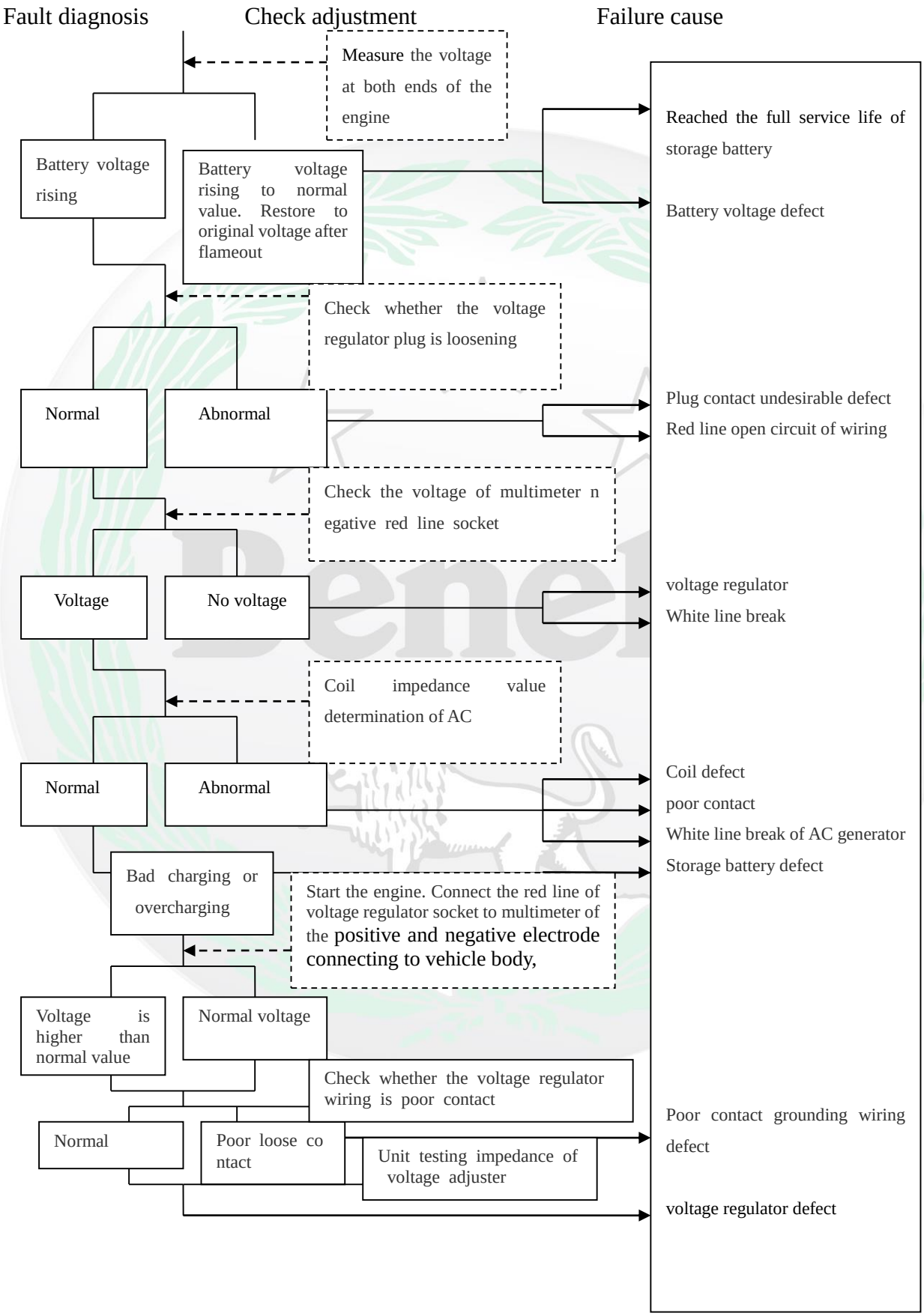
Fault diagnosis **Check adjustment** **Failure cause**



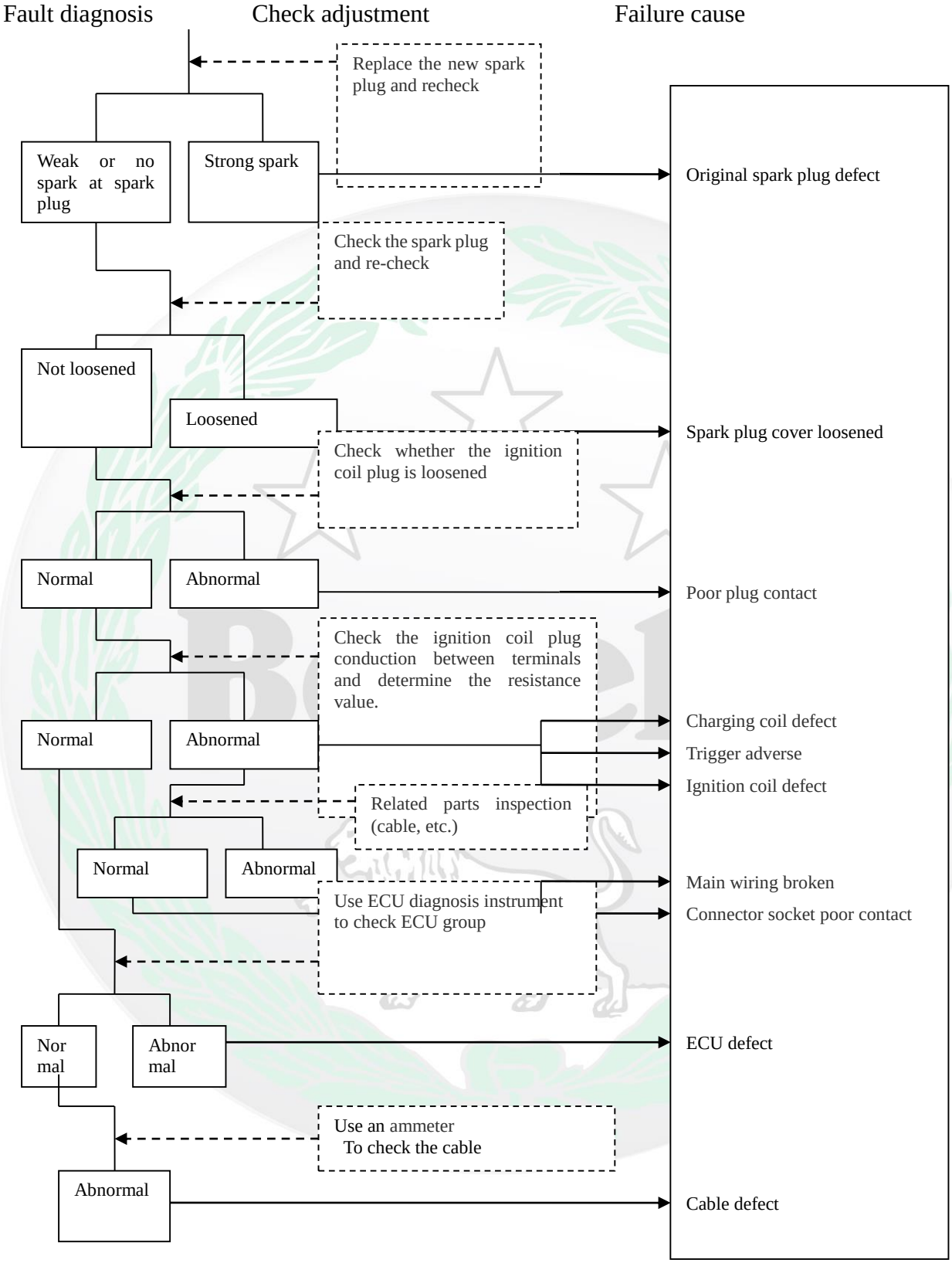
Poor Running (High speed)



Charging Defect (Over Discharging or Under Charging Battery Voltage)



Spark plug


Fault diagnosis
Check adjustment
Failure cause
Replace the new spark plug and recheck
Weak or no spark at spark plug
Strong spark
Original spark plug defect
Check the spark plug and re-check
Not loosened
Loosened
Spark plug cover loosened
Check whether the ignition coil plug is loosened
Normal
Abnormal
Poor plug contact
Check the ignition coil plug conduction between terminals and determine the resistance value.
Normal
Abnormal
Charging coil defect
Trigger adverse
Ignition coil defect
Related parts inspection (cable, etc.)
Normal
Abnormal
Main wiring broken
Use ECU diagnosis instrument to check ECU group
Connector socket poor contact
Nor mal
Abnor mal
ECU defect
Use an ammeter To check the cable
Abnormal
Cable defect

Diagnosis Breakdown of the Fuel Injection System

Fault Indicating Light of the Fuel Injection System

Fault indicating light (FI) is located on the instrument panel. Under normal circumstances, turn on the key and the fault indicating light will be on. It indicates that the fuel injection system is under power supply state and it is working normally. When the fault indicating light is off, it indicates that the fuel injection system has no power and it will not work. It is necessary to check the fuses and positive and negative electrode connection status of the battery. After starting up the engine, the fault indicating light will be off which means that it is free of faults; on the contrary, if the fault indicating light is still constantly on, it indicates that the fuel injection system is not normal, and requires troubleshooting due to the malfunction.

Diagnosis Breakdown of the Fuel Injection System

Malfunction Detection Methods

Directly use the fault indicating light flashing diagnosis (FI) on the instrument cluster

Under the circumstance of fault, operate through three on/off operations, namely key on---key off---key on---key off---key on. The fault indicating light will flash the corresponding failure flash code. Find the corresponding fault code through the fault code table.

For reading the fault through fault indicating light, flash codes rules are as shown below: For example, for the fault of MAP disconnection or signal side pin or short circuit to negative electrode of the battery, after three on/off operations of the key, the fault indicating light will quickly flash for 10 times representing 0. After an interval of 1.2s, it will quickly flash for one time presenting 1; after an interval of 1.2s, it will quickly flash 10 times representing 0; after an interval of 1.2s, it will quickly flash 7 times presenting 7, namely P0107. It can be seen that except for 0 being presented by flashing for 10 times, the numbers from 1 to 9 are represented by the actual times of flashing. For other fault codes, such as P0.01, 1 means fuel injector failure. After flashing P0107, pending for 3.2s, flash P0201 fault code. If there is no other fault, it will flash P0107, P0201. And then correlative malfunction can be detected from the fault codes.

While using PCHUD software, the software will report the fault code by means of decimal numeral system. The decimal numeral system and the former hexadecimal are one-to-one correspondence. Corresponding faults can be detected according to the corresponding relation. For example, in the software MULFCURR (current malfunction)=263, is corresponding to P0107 in the fault codes list, namely MAP failure.

Diagnosis Breakdown of the Fuel Injection System

Methods to Detect Faults

MT05 fault codes list:

System or Component	DTC Description	DTC Number	
		HEX(Diagnostic instrument display)	DEC(Software display)
Manifold Absolute Pressure Sensor (MAP)	MAP Circuit Low Voltage or Open	107	263
	MAP Circuit High Voltage	108	264
Intake Air Temperature Sensor (IAT)	IAT Circuit Low Voltage	112	274
	IAT Circuit High Voltage or Open	113	275
Coolant Temp. Sensor	Coolant Temperature Sensor Circuit Low Voltage	117	279
	Coolant Temperature Sensor Circuit High Voltage or Open	118	280
Throttle Position Sensor (TPS)	TPS Circuit Low Voltage or Open	122	290
	TPS Circuit High Voltage	123	291
Oxygen Sensor	O2S 1 Circuit Low Voltage	131	305
	O2S 1 Circuit High Voltage	132	306
Oxygen Sensor Heater	O2S Heater Circuit High Voltage	31	49
	O2S Heater Circuit Low Voltage	32	50
Fuel Injector A	Injector A Fault	201	513
Fuel Injector B	Injector B Fault	202	514
Fuel Pump Relay (FPR)	FPR Coil Circuit Low Voltage or Open	230	560
	FPR Coil Circuit High Voltage	232	562
Crankshaft Position Sensor (CKP)	CKP Sensor Noisy Signal	336	822
	CKP Sensor No Signal	337	823
Ignition Coil A	Cylinder A Ignition Coil fault	351	849
Ignition Coil B	Cylinder B Ignition Coil fault	352	850

Diagnosis breakdown of the Fuel Injection System

Methods to detect fault

Continued

System or Component	DTC Description	DTC Number	
		HEX(Diagnostic instrument display)	DEC(Software display)
Idle Control System	Idle Speed Control Error	505	1285
System Voltage	System Voltage Low	562	1378
	System Voltage High	563	1379
MIL	MIL Circuit Malfunction	650	1616
Tachometer	Tachometer Circuit Low Voltage	1693	5779
	Tachometer Circuit High Voltage	1694	5780
Oxygen Sensor 2	O2S 2 Circuit Low Voltage	137	311
	O2S 2 Circuit High Voltage	138	312
Oxygen Sensor Heater 2	O2S Heater 2 Circuit High Voltage	38	56
	O2S Heater 2 Circuit Low Voltage	37	55
Vehicle Speed Sensor	VSS No Signal	500	1280
Neutral Switch Diag.	Neutral Switch Error	850	2128
CCP	CCP short to high	445	1093
	CCP short to low/open	444	1092
Rollover Sensor Diagnostic	Rollover Sensor malfunction/Triggered	1500	5376
BLM_MaxAdapt	Several BLM value hit maximum	171	369
BLM_MinAdapt	Several BLM value hit minimum	172	370
PESystLean	PE mode burned AFR keeps lean	174	372

Diagnosis breakdown of the Fuel Injection System

Malfunction Detection Methods

Use of the diagnostic apparatus for fault diagnosing

Operation methods:

a) 6-wire diagnostic interface on motorcycle.
b) Connect the cable and diagnostic instrument interface.
c) Perform diagnosis after the ignition switch is turned to the on position.

Warning

- XCM－PT100X diagnostic apparatus is a highly sophisticated instrument which should be kept away from impact and vibrations;
- If during the first start, the instrument doesn't work normally nor show stably. Please disconnect the power cord and retry;
- Please make sure that connectors are always tight on the diagnosis interface;
- It is strictly prohibited to use electrical signal exceeding the limiting value;
- It is strictly prohibited for riders to use the instrument during driving process;
- Use and storage conditions:
  Ambient temperature: 32 ~ 122°F
  Relative humidity: lower than 90%

Diagnosis breakdown of the Fuel Injection System

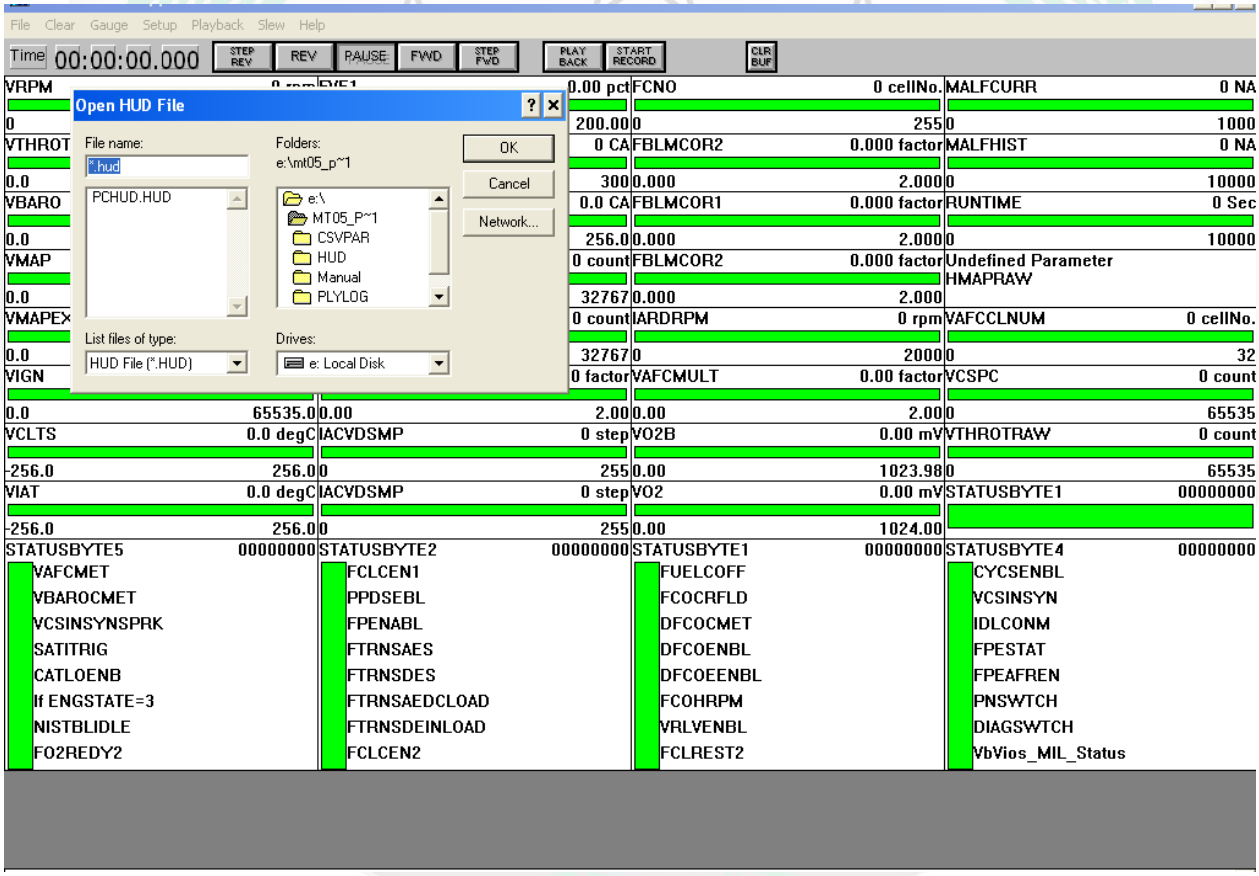
Malfunction Detection Methods

Check the faults with diagnostic software PCHUD

PCHUD software is used to detect and record the engine operating data. Before using the software, connect the laptop to the 6-pin diagnostic connector on the motorcycle through K wire. The diagnostic connector is located below the rear seat cushion. Please note that PCHUD system only supports 16 Bit software Windows operating system or very few 32 bit Windows operating system. It doesn't support 64 bit Win7, Win8 or iOS. Install K wire driver software on the laptop or notebook.

PCHUD software instruction:

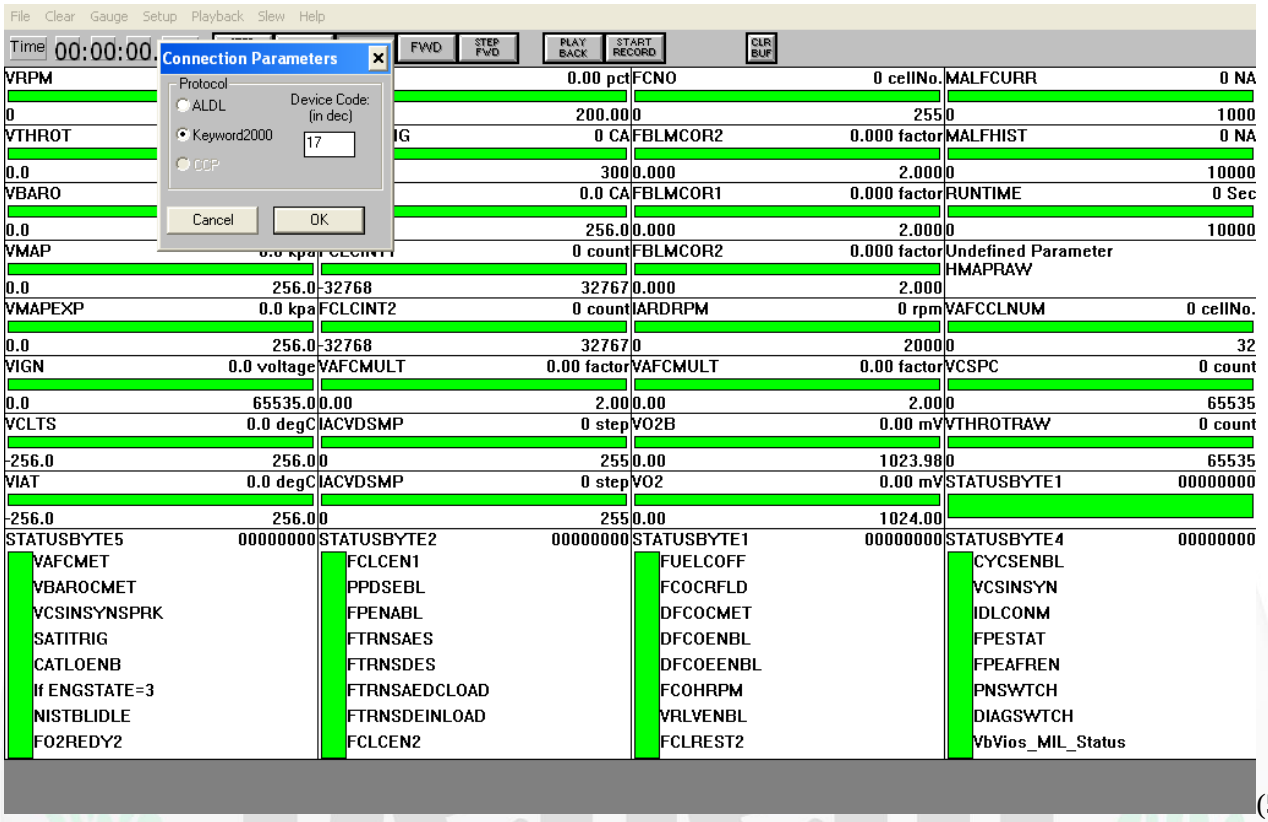
(1) Connect the laptop to the 6-pin diagnostic connector of the motorcycle through K wire and turn on the ignition.
(2) Double click "HUD.EXE" icon and start up PCHUD software.
(3) Select "File" on the software interface. Click "Open" to select “PCHUD.HAD”. Select OK to confirm.



(4) Select “Parameter File” under "Setup". Click MT05common.par. Select “Comm protocol” under "Setup". Select “Keyword2000” and then click OK. Select 17 for Device Code.

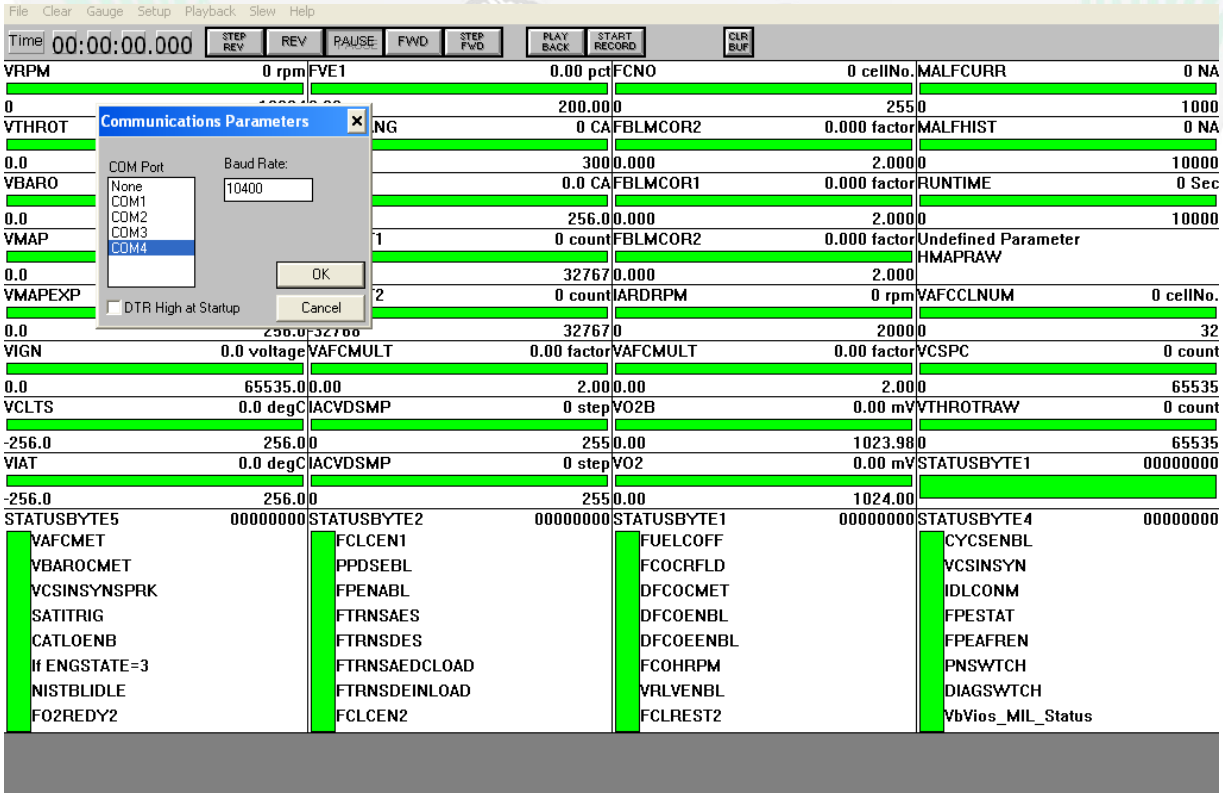
Diagnosis breakdown of the Fuel Injection System

Malfunction Detection Methods



(5)

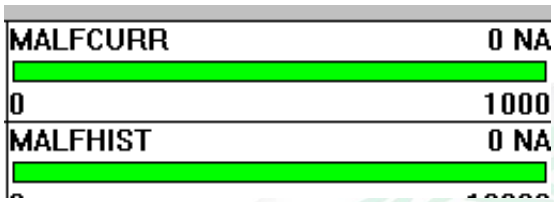
If the software interface can't display the real-time operational data check the following items. Check COM port to connection setup to find if there is any problems. Generally set COM Port: 4. Baud Rate: 10400. Do not select DTR High at startup.



Diagnosis breakdown of the Fuel Injection System

Malfunction Detection Methods

Perform normal communication. Display current fault code at MALFCURR. Display the historical fault codes at MALFHIST.



Check corresponding fault through fault codes list

Diagnosis breakdown of the Fuel Injection System

Malfunction Detection Methods

Parameters interpretation of PCHUD software:

Attention: Viewing from rear side of the engine, the left one is cylinder #1 and the right one is cylinder #2.

VRPM	engine speed
VTHROT	throttle position
VBARO	BARO
VMAP	manifold air pressure
VMAPEXP	expect manifold air pressure
VIGN	ignition key voltage
VCLTS	cylinder temperature or coolant temperature
VIAT	intake air temperature
STATUSBYTE5	STATUSBYTE5
VAFCMET	airflow correction met
VBAROCMET	Baro update met
VCSINSYNSPRK	sequential spark enable
SATITRIG	tip-in Spark Advance retard trigger
CATLOENB	catalyst light-off logic enable
IF ENGSTATE=3	engine work in run state
NISTBLIDLE	stable warm idle
FO2REDY2	O2 ready
FCNO	block learn memory cell
FBLMCOR1	cylinder 1 block learn memory
FCLCINT1	integral of close loop correction
FCLCMUL1	close loop correction
IARDRPM	desired idle rpm
IARPMERR	idle rpm error
FPWVC1	base pulse width of cylinder 1
VO2	Oxygen sensor signal
STATUSBYTE3	STATUSBYTE3
FO2STAT1	cylinder 1 oxygen sensor signal rich lean state
FCLREST1	cylinder 1 close loop correction reset
FOSHTREN	Oxygen sensor heater enable
FO2REDY1	cylinder 1 Oxygen sensor ready
IF IACV MODE=0	idle airflow control valve close loop correction enable
IAMTRLOST	IACV lost
IACMVIHB	IACV move disable
VIGNS	ignition state
FVE1	cylinder 1 Volumetric efficiency
VMAPRANG	MAP read angle
AFFNLAFR	target air fuel ratio

SAESTA	cylinder 1 Spark Advance
SAIDLDYN	idle dynamic Spark Advance
SPDWELL	dwell time
IAINTEGOFST	airflow integral of idle air control valve
IACVDSMP	desired position of idle air control valve
STATUSBYTE2	STATUSBYTE2
FCLCEN1	cylinder 1 close loop correction enable
PPDSEBL	prime pulse disable
FPENABL	fuel pump enable
FTRNSAES	acceleration enrich enter
FTRNSDES	deceleration enlean enter
FTRNSAEDCLOAD	acceleration enrich exit
FTRNSDEINLOAD	deceleration enlean exit
FCLCEN2	cylinder 2 close loop correction enable

Diagnosis breakdown of the Fuel Injection System

Malfunction Detection Methods

Diagnostic process:

1. Insert the key into the vehicle but do not start the motorcycle, please check:

Parameter	Check and Record	Min	Max	Description	Units
VIGN	□Norm □Abnormal	11.5	13	battery voltage	volt
VTHROT	□Norm □Abnormal	0	1	fully closed throttle position	percent
VTHROT	□Norm □Abnormal	98	100	fully open throttle position	percent
VTHROTRAW	□Norm □Abnormal	4000	9000	Absolutely throttle body voltage AD	None
VBARO	□Norm □Abnormal	98	103	atmospheric pressure	kpa
VIAT	□Norm □Abnormal	-15	40	intake air temperature	degC
VCLTS	□Norm □Abnormal	-15	40	cylinder temperature or coolant temperature	degC

2. Starting:

Parameter	Check and Record	Min	Max	Description	Units
Start	□Norm □Abnormal	-	-	-	-
TERRCNT	□Norm □Abnormal	0	0	Fly wheel tooth error counter	count
FUELCOFF	□Norm □Abnormal	0	0	fuel cut-off enable, the normal flag is white, if not blue	None
VRLVENBL	□Norm □Abnormal	0	0	Rollover sensor enable, normal is white, if not blue	None

Diagnosis breakdown of the Fuel Injection System

Malfunction Detection Methods

3. Idle: The parameters can be checked after 1 min for idle speed after vehicle starting. Then check the stability of EFI parameter after 3 minutes of long idle.

Parameter	Check and Record	Min	Max	Description	Units
VRPM	□Norm □Abnormal	1300	1700	engine speed	rpm
VTHROT	□Norm □Abnormal	0	1	fully closed throttle position	percent
MALFCURR	□Norm □Abnormal	0	0	current MALF code	None
VBARO	□Norm □Abnormal	98	103	atmospheric pressure	kpa
VMAP	□Norm □Abnormal	47	53	intake pressure measured value	kpa
VIGN	□Norm □Abnormal	12	16	battery voltage	volt
PNSWTCH	□Norm □Abnormal	0	0	Neutral and Clutch switch enable flag, blue is working	None
IACVDSMP	□Norm □Abnormal	10	60	stepping motor target value	step
vehicle speed	□Norm □Abnormal	0	0	vehicle speed	Km/h
FBLMCOR1	□Norm □Abnormal	0.75	1.15	cylinder 1 block learn memory	factor
FBLMCOR2	□Norm □Abnormal	0.75	1.15	cylinder 2 block learn memory	factor
FCLCINT1	□Norm □Abnormal	-15	15	cylinder 1 integral of lose loop correction	count
FCLCINT2	□Norm □Abnormal	-15	15	cylinder 2 integral of close loop correction	count
FPWVC1	□Norm □Abnormal	1.5	2.6	base pulse width of cylinder 1	ms
FPWVC2	□Norm □Abnormal	1.5	2.6	base pulse width of cylinder 2	ms
VO2	□Norm □Abnormal	45	850	cylinder 1 oxygen sensor voltage	mv
VO2B	□Norm □Abnormal	45	850	cylinder 2 oxygen sensor voltage	mv

Diagnosis breakdown of the Fuel Injection System

Malfunction Detection Methods

4. Run with stable speed

Parameter	Check and Record	Min	Max	Description	Units
MALFCURR	□Norm □Abnormal	0	0	current MALF code	None
VCLTS	□Norm □Abnormal	40	105	cylinder temperature or coolant temperature	degC
VIGN	□Norm □Abnormal	12	16	battery voltage	volt
vehicle speed	□Norm □Abnormal	0	220	vehicle speed	Km/h
FBLMCOR1	□Norm □Abnormal	0.75	1.15	cylinder 1 block learn memory	factor
FBLMCOR2	□Norm □Abnormal	0.75	1.15	cylinder 2 block learn memory	factor
FCLCINT1	□Norm □Abnormal	-15	15	cylinder 1 integral of lose loop correction	count
FCLCINT2	□Norm □Abnormal	-15	15	cylinder 2 integral of close loop correction	count
VO2	□Norm □Abnormal	45	850	cylinder 1 oxygen sensor voltage	mv
VO2B	□Norm □Abnormal	45	850	cylinder 2 oxygen sensor voltage	mv

5. Top speed with full throttle (PE mode, power enrich)
PE mode: 70% < VTHROT < 100%, in this situation，the value of oxygen sensor (VO2 VO2B) is around 800mv.

Parameter	Check and Record	Min	Max	Description	Units
VCLTS	□Norm □Abnormal	80	105	cylinder temperature or coolant temperature	degC
VIGN	□Norm □Abnormal	12	16	battery voltage	volt
VO2	□Norm □Abnormal	750	950	cylinder 1 oxygen sensor voltage	mv
VO2B	□Norm □Abnormal	750	950	cylinder 2 oxygen sensor voltage	mv

Common trouble shooting methods for the Fuel Injection System

Common Failures

Repair kit

a) Disassembly and assembly of electric control system components - Dismantlement tool of commonly used automobile mechanical parts.

b) Electronic control system circuit and system electrical signal - digital multimeter (with buzzer)

c) Fault diagnosis of electronic control system as well as engine working condition detection

- Electronic control system fault diagnosis instrument (recommended)
- Fault diagnosis software (PCHUD) and interface wiring (can be used when the condition is allowed)

d) Electronic control system fault codes (emergency application)

e) Fuel pressure gauge, measuring range 0 ~ 44psi

Common trouble shooting methods for the Fuel Injection System

Common Failures

Engine working data flow indicated on the diagnostic apparatus

Analyze and determine engine failure according to the engine working data flow displayed by the diagnostic apparatus.

Step I

a) Engine wiring harness and vacuum pipeline - May affect system control air flow and fuel supply.
b) Whether oxygen sensor assembly is in place - Could affect the measurement of the system of the air-fuel ratio.
c) Engine failure indicator light - Affect warning of the system of the fault.
d) Battery voltage - Determine whether battery power is sufficient.
e) Determine whether the displayed values of coolant temperature sensor, intake air temperature sensor, inlet manifold absolute pressure sensor and oxygen sensors are normal according to their specifications.
f) Working range of position sensor of throttle valve - Cannot be fully opened or closed. It may affect the engine power performance and partial system function.

Step II

Check whether the ECU power supply is closed off - Turn off the diagnostic instruments and system communication after turning off the key.

Step III

a) Coolant temperature and coolant temperature cycle - indicate whether the thermostat is working correctly.
b) Battery voltage (14V) - Display whether the electric generator is working correctly.
   Excessive high: Possible voltage regulator fault.
   Excessive low: Possible improper electric generator wiring or electric generator fault.
c) Manifold absolute pressure - It can indicate intake air leakage and/or valve clearance adjustment needed.
   Too little valve clearance: It can affect the dynamic property of the engine due to exhaust valve, high temperature rising to greatly shorten the service life of the oxygen sensors and three-way catalytic converter;
   Too much valve clearance: It will cause too low of intake manifold pressure, affect the judgment on diagnosing of the working state of engine and cause poor idling.
   In addition, if the exhaust system is blocked, such as: foreign body existing in the exhaust passage, too high of fuel consumption and blocking of ternary catalysts, as well as three-way catalytic converter internally broken; the value will be too high.
d) Cycle index of oxygen sensor - Cycle number is too low which indicates oxygen sensor failure.

Simple troubleshooting methods

When fixing the fuel injection system, please complete the following steps in order. If the failure can be fixed in the next step, suspend the subsequent steps. Use the diagnostic tool. Perform inspection acceptance and clear the fault codes according to "Engine working data flow displayed by the diagnostic apparatus".

When using the diagnostic apparatus, the battery voltage shall not be lower than 8.5V.

Daily use and maintenance:

- Use #91 octane premium unleaded gasoline.
- ECU has a moistureproof boot on the connector. However, pressure washer guns cannot be used to wash the shell.
- Gasoline filter shall be replaced once per every 12,000 mi.
- Under the condition of normal use, clean the throttle valve once per every 6,000 mi. or one year.

Common trouble shooting methods for the Fuel Injection System

Common Failures

Fault phenomenon— Engine cannot be started:

a) Turn the ignition switch to the "ON" position to check whether the fault indicating light is on.

If not:	◆ Check the fuses and grounding wires ◆ Check whether the ECU plug is connected firmly or not ◆ Check whether the light and wire line is normal by using executing agency of diagnostic apparatus ◆ Check and repair the light bulb and wiring
If the light is on:	◆ Connect the diagnostic apparatus to system diagnosis interface

b) Check whether the diagnostic apparatus connects to system connection communication

If not:	◆ Check the fuses and grounding wires ◆ Check whether the ECU plug is connected firmly or not ◆ Check whether the diagnostic apparatus works normally on the normal vehicle.
If yes:	◆ Exclude the failures indicated by the diagnostic apparatus

c) Check the ignition system fault - Check whether the spark plugs can perform normal ignition

If not:	◆ Check whether the high-tension cable and spark plugs are firmly installed or damaged. ◆ Determine by using another ignition coil assembly ◆ Determine by using ECU
If yes:	◆ Check whether the high-tension cable is correctly connected to the ignition coil and spark plug.

d) Check fuel supply system failure

Check whether the fuel pump is working - When the ignition switch is turned to the “ON” position, the sound of the fuel pump working can be heard around the fuel tank.

Not working:	◆ Check whether the fuel pump relay is working correctly. ◆ Check whether the position sensor of the crankshaft is connected properly. ◆ Determine by using ECU ◆ Check fuel pump wiring	
If it works:	1) Whether the fuel supply pressure is greater than 220Kpa	
	2) Insufficient pressure:	◆ Check whether the fuel tank has sufficient fuel. ◆ Check whether the fuel filter should be replaced (Note: Special gasoline filter for electronic injection shall be replaced once per every 12,000mi.). ◆ Check whether the fuel feed hose and fuel return pipe are damaged
	3) Normal pressure:	◆ Check whether the nozzle control circuit is normal. ◆ Check whether the nozzle should be cleaned or not

a) Determine whether the cylinder is submerged

If yes:	◆ Fully open the accelerator. Connect the starter motor. The engineer shall show work signs of the engine after a few seconds.

b) Check whether the clearance of the position sensor for the crankshaft is too big.

Common trouble shooting methods for the Fuel Injection System

Common Failures

Fault phenomenon— Engine cannot be started, accompanying with tempering

a) Check whether the ignition coil is loose
b) Check whether the timing ring is loose

Fault phenomenon—Unstable idle speed

Idle speed control system:	Check whether the idle adjustment bolt is over screwed or under screwed. Generally two rings.
Fuel supply system:	If there is fuel leakage in the fuel pipeline.

Fault phenomenon-Idle speed too high or too low (obvious idling and nonconforming to target idle speed)

Idle speed is too high:	◆ When the water temperature is lower than 68°, the system will improve the idling speed to accelerate machine heating up process. In addition, check according to the following steps. ◆ Check whether the idle by-pass is over screwed ◆ Valve clearance, especially whether the exhaust valve clearance is too large.
Idle speed is too high:	◆ Check the fuel tank oil, fuel filter, oil pressure and nozzle ◆ Check whether the idle by-pass is under screwed ◆ Check whether the valve clearance is too small.

Fault phenomenon - Unsteady idle speed accompanying with slowing down:

a) Check the valve clearance.
b) Check whether the idle by-pass port and throttle body is too dirty.

Fault phenomenon - Insufficient acceleration:

a) Whether the parameters of idle speed and high idle speed are normal;
b) Check the fuel tank fuel and fuel filter;
c) Check whether the exhaust system is blocked, for example: whether the three-way catalytic converter is blocked due to engine oil burnout or breakage;
d) Check oil pressure and nozzle.
e) Check whether the fault indicating light is bright, and whether it is due to normal ignition of air cylinder.

Fault phenomenon - Slight fire phenomenon:

Check whether the spark plug gap is in accordance with the specification 0.6~0.7mm

Fault phenomenon-Fault indicating light is on. The fault code is nonconforming to the fault:

It may be because of a loose system ground wire. Re-connect the grounding wire. Disconnect the battery power line. Connect and re-start the engine three minutes later.

Fault phenomenon - The fuel consumption is too high:

a) Check whether the oxygen sensor for the two cylinders are installed properly. If it is loose, the oxygen sensor will wrongly increase the fuel/air ratio which will lead to extremely high fuel consumption.
b) After confirming the engine mechanical components and oxygen sensors are normal, run the engine to observe the readings of oxygen sensors. Under normal water temperature, if the reading is always greater than 500mV, check whether the fuel spray nozzle is subject to fuel leakage.

Common trouble shooting methods for the Fuel Injection System

Common Failures

Attention:

- Most of the electronic injection parts are unrepairable. After confirming the part is damaged, perform replacement processing.
- When starting the engine, do not operate any mechanism on the engine (including accelerator. Do not twist the throttle).
- If the engine fault indicating light is lit up in the process of engine operation, make sure to find out the cause and perform diagnostic troubleshooting as soon as possible.
- Do not use leaded petrol. Lead will damage to the oxygen sensors and three-way catalytic converter.
- In case of abnormal fuel consumption, settle the problem as soon as possible, some material in the engine oil will damage the oxygen sensor and 3-D catalytic converter.
- The valve clearance should not be too little. If the exhaust temperature is too high, it will shorten the service life of three-way catalytic converter.
- When the air temperature is lower than 50°F, and the whole vehicle and engine is running at a low speed. The exhaust pipe may have carbon deposits and black oxide coating which is a normal phenomenon. After running for a period of time at high speed, take appropriate means to keep the engine coolant temperature within specified temperature range.

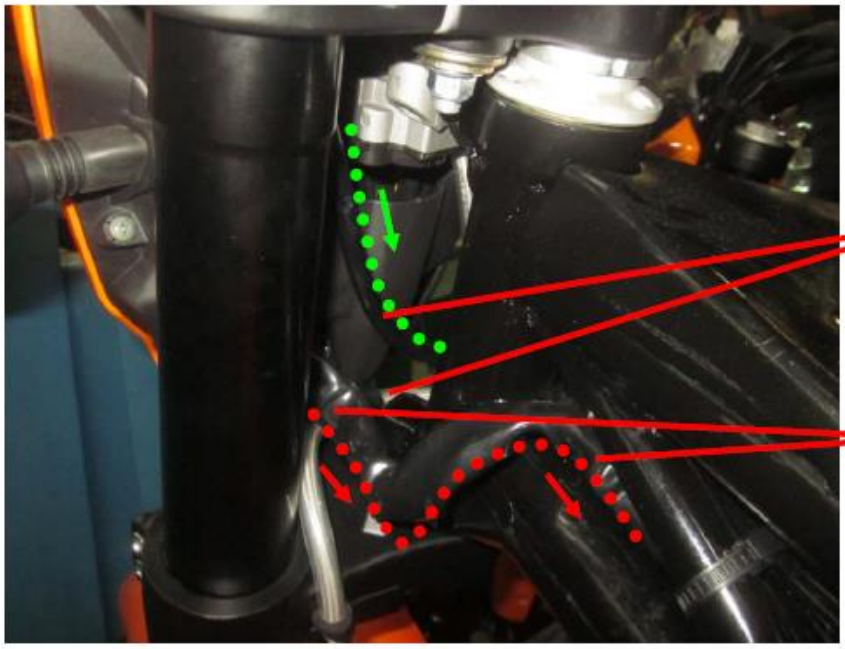
Chapter X Appendices

Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations



Clutch cable and front hydraulic brake hose goes through the steering head and rear side of front cap lamp installation plate. Pay attention not to cross between the two.

The main harness cable goes through the hydraulic brake hose. Enters from the rear side of the steering head, and access from the left side triangular notch.

One cable clamp installed at the throttle cables. Clamp the two cables together. Pay attention that the clamp is installed with the opening facing away from you.

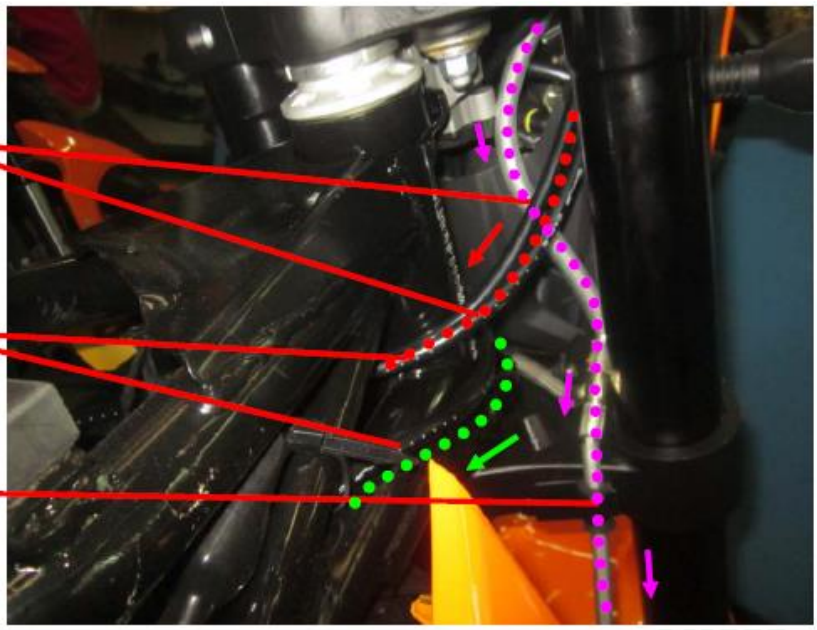
Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations

Throttle cables and the front hydraulic brake hose go through the rear side of the mount plate of the front hood downlight. The throttle cables go through the rear side of the front hydraulic brake hose. Pay attention that the throttle cables are on the clutch wire.

Throttle cable and the clutch cable access to the vehicle frame from the rear side of head wire and right side of frame.

The sleeve of front hydraulic brake hose is pressed into the corresponding clamp on the lower joint plate.



The left switch wires are clamped with a wire clamp. The connector part is placed to the front hood downlight.

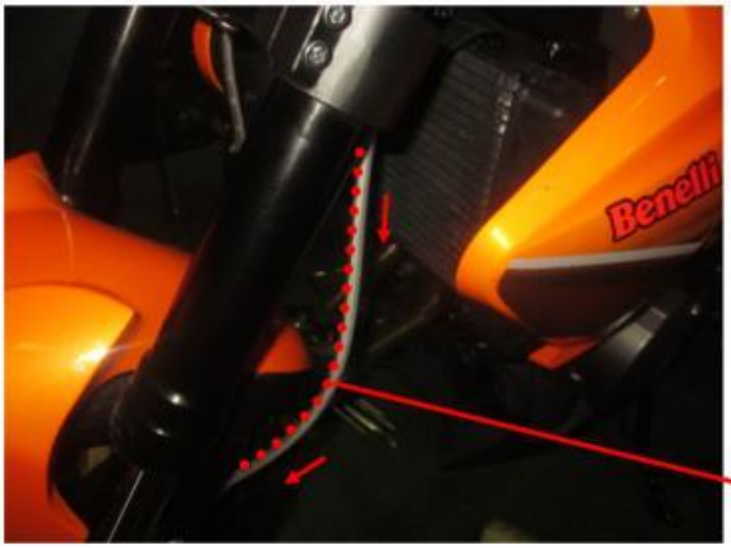
Wire / Hose Routing and Cable Tie Locations

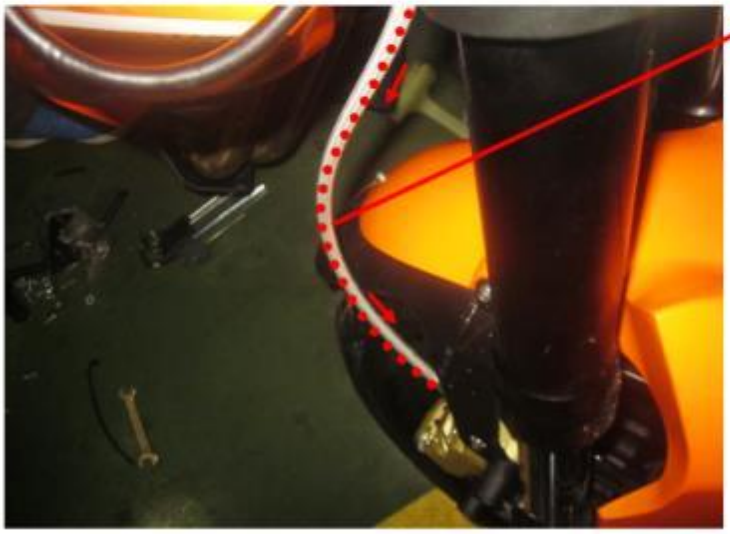
Wire / Hose Routing and Cable Tie Locations

The left switch wire unit, headlight wire and electric ignition switch line are clamped together with a cable clamp. The component part is placed to the headlight and cable. Pay attention that the electric door lock shall not be filled.

Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations

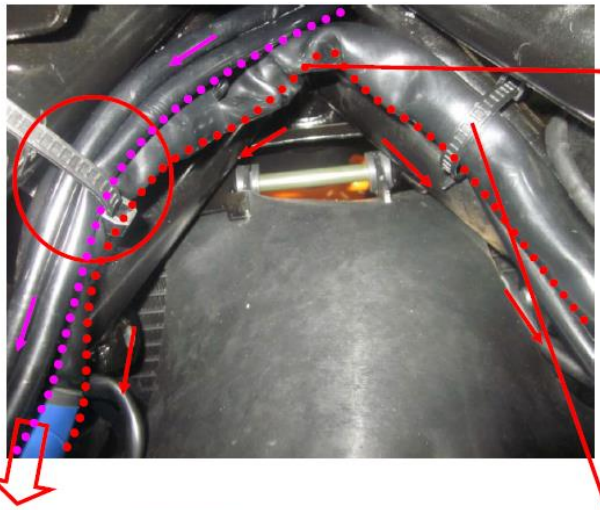




For lower part of the front hydraulic brake hose layout, pay attention that it does not make contact with the front fender to avoid abrasion of the front hydraulic brake hose.

Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations



The main harness wires goes through the lower side of the throttle cable. Pay attention that the crossing parts shall not block the air filter air inlet port.

Bind with a 200mm cable clamp, throttle cable into the vehicle frame: the main harness is clamped to the frame. The throttle cable goes through the external side.

Remove the cable clamp at this location.

The oxygen sensor wires, ignition coil wires and oil pressure sensor wires are pulled to the rear side of coolant reservoir. After connecting to the triangle hole, put the component cables into this place: bind the cables, components and sleeves with a 250mm cable clamp to the frame. The position is as shown to the left.

Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations

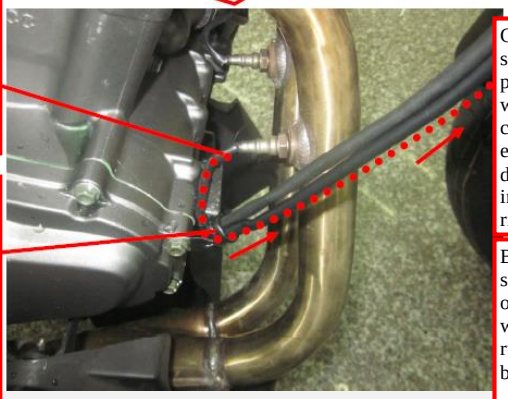
Bind the cable with a 200mm cable clamp to the frame. The position is as shown to the left and right.

Bind the cable and oil pressure sensor with a 200mm cable clamp to the frame.

Clamp the oxygen sensor wires and oil pressure sensor wire with a metal cable clamp at the position as shown in the figure.

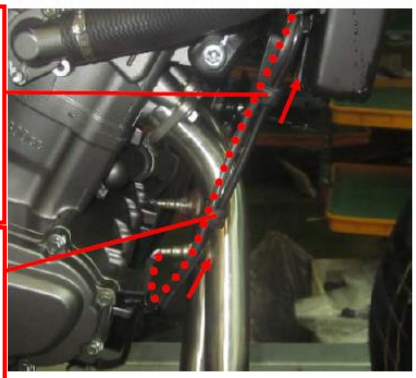
Pay attention that the oxygen sensor wires shall not be pulled too tightly.

A rubber cable clamp will bind the oxygen sensor wires and oil pressure sensor wires to the rear side of the coolant reservoir.



Clamp the oxygen sensor wires and oil pressure sensor wires with a metal cable clamp on the engine in the direction as shown in the figure to the right.

Bind the oxygen sensor wires and the oil pressure sensor wire tightly with a rubber binding band.



Wire / Hose Routing and Cable Tie Locations

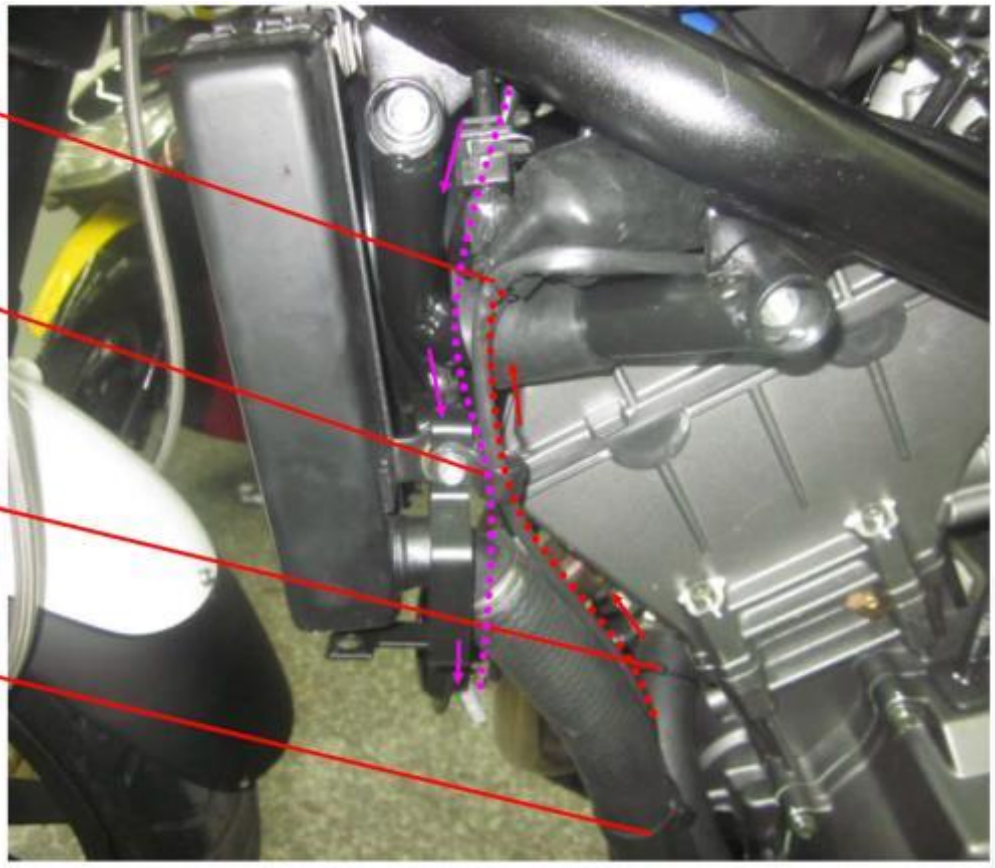
Wire / Hose Routing and Cable Tie Locations

Bind the oxygen sensor wires, component sleeve end and high voltage component cable together with fine cable band. Pay attention to place the component and sleeve into the triangle hole. The high voltage component cable is in rubber.

The oxygen sensor goes through from this location. After the horn wire going through this clamp (as shown by the colored line)

The oxygen sensor wires are to be clamped with a rubber band. Avoid contacting the oxygen sensor wires with the engine.

Bind the rubber band to the water pipe. Pay attention to avoid oxidation.



Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations

The right bond strap goes towards to right rear; the right ignition coil wire points to right rear; the two shall not contact the radiator fan.

Wiring of the right ignition coil wire etc. is at the rear side of the rubber barrier seal to avoid the cables being damaged by the radiator fan.

Wiring of left ignition coil wire etc. is at the rear side of the rubber to avoid the cables being damaged by the radiator fan.

The left bond strap goes towards to left rear; the right ignition coil wire points to left rear; the two shall not shall not contact the radiator fan.

Connect the throttle cable to the throttle body. Attention: Connect the upper front side throttle cable to the upper side first, then the rear throttle cable connects to this place.

Wire / Hose Routing and Cable Tie Locations

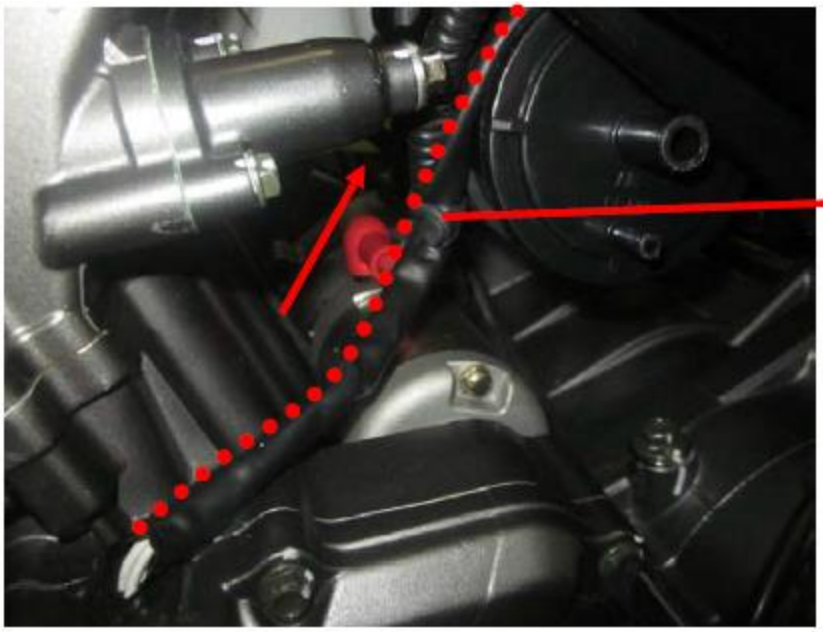
Wire / Hose Routing and Cable Tie Locations

The main harness is wired to backside of the frame along the upper left side. Pay attention to the rectifier.

Motor wire goes to inner side of the main cable. Attention: Not intertwine with other cable

Wire / Hose Routing and Cable Tie Locations

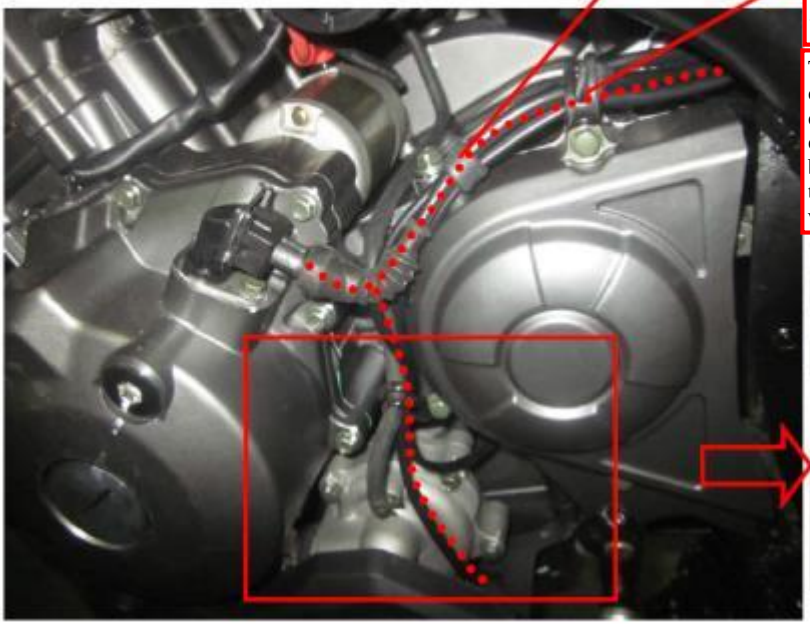
Wire / Hose Routing and Cable Tie Locations



The cables at this point are bonded together. Attention: Keep the wires in an orderly fashion.

The cables at this point are bonded together by a rubber band. Attention: Keep the wires in an orderly fashion.

Kick stand lock out switch and crankshaft position wire etc. are clamped with a metal wire clamp, the installation position of which is on the mounting bolt of the front sprocket cover towards the upper side of the vehicle.



The cables and wires are clamped with a metal wire clamp, the installation position of which is on the mounting bolt of the front sprocket cover towards the front side of the vehicle.

Kick stand lock out switch wire goes through the inner side at the position as shown in the figure.

Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations

The positive wire of the battery, frame bond strap, kick stand lock out switch wire and other components are bonded together tightly with 150mm cable clamp at the end.

The main cables are bonded together with 250mm cable clamp. Pay attention to the main cable shall be at rectifier and component upper side.

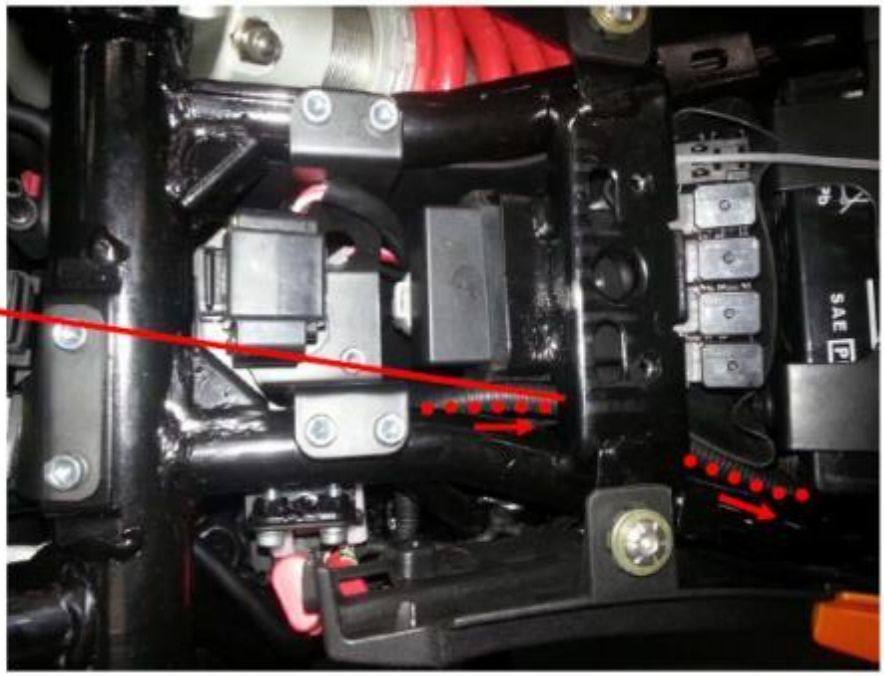
The installation position of the cable clamp is as shown in the figure. The position is above the main cable.

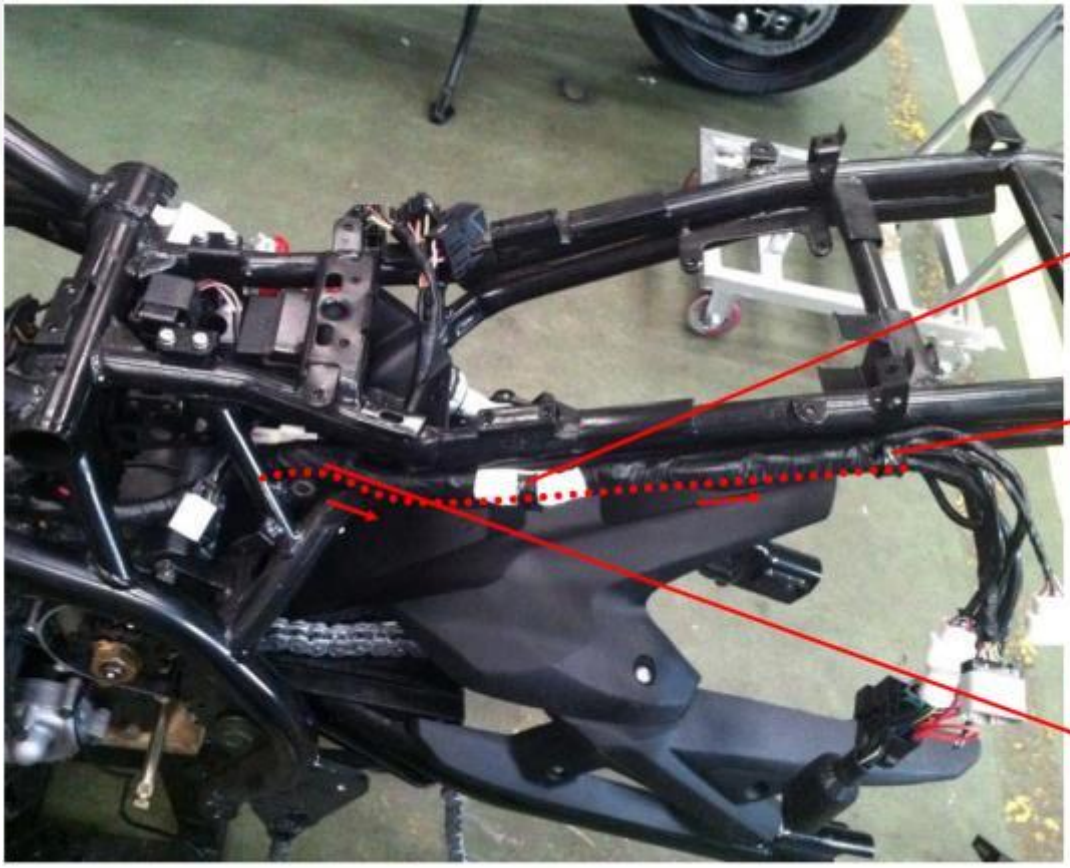
The positive terminal wire of the battery is at the inner side of the frame.

Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations

The positive terminal wire of the battery goes inside the frame, below the frame brace component.





The main wire harness is clamped with a wire clamp.

The main cable is tightly clamped with a wire clamp. The tail cable goes inside the frame passing the frame as shown in the figure.

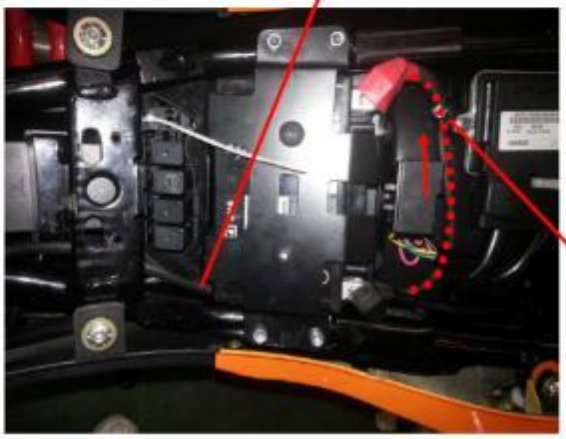
The main cable is tightly clamped with a wire clamp. The tail cable goes inside the frame passing the frame as shown in the figure.

Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations

The positive terminal wire of the battery goes inside the frame passing the frame below the welded components

The seat cushion wire is clamped by a metal clamp (do not use the tail cable at this position to clamp the wire). The wire clamp is as shown in the figure above.



The positive terminal wire of the battery is clamped by a metal wire clamp. The wire clamp is as shown in the figure to the left.

Attention: The coolant hose goes through the triangle hole in the frame.

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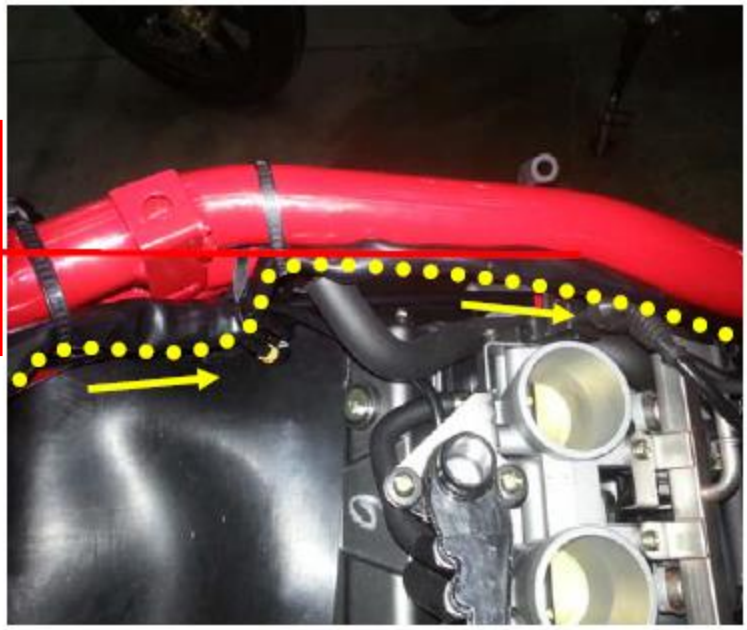
Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations

The cable at the right side of the vehicle goes backward along the right upper side of the frame.



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The cable clamp at this location is removed.

The clutch cable to go to upper side of the mounting bracket of the coolant reservoir.

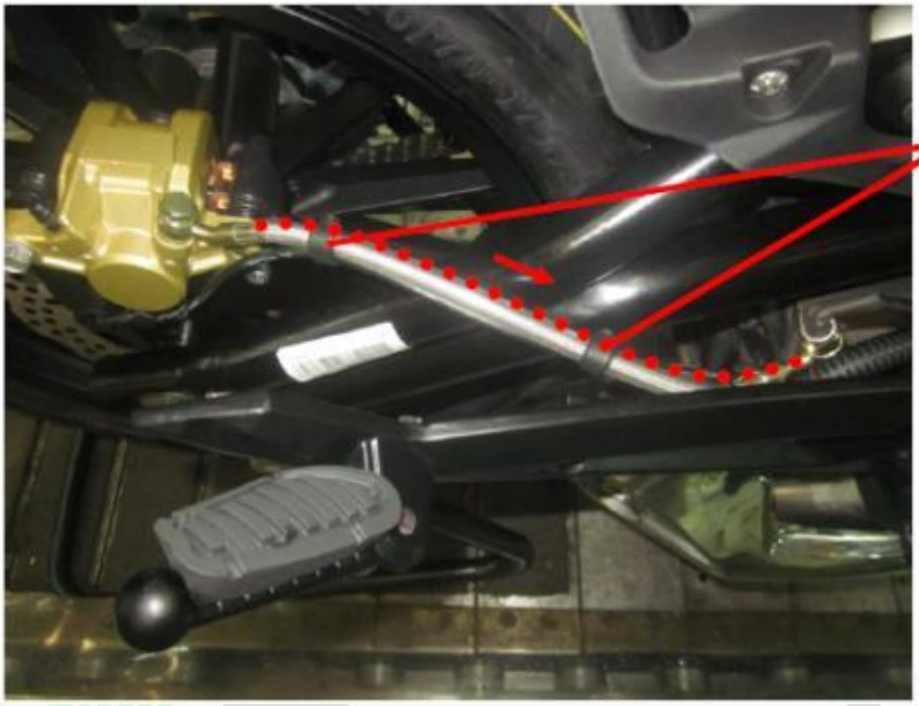
Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations

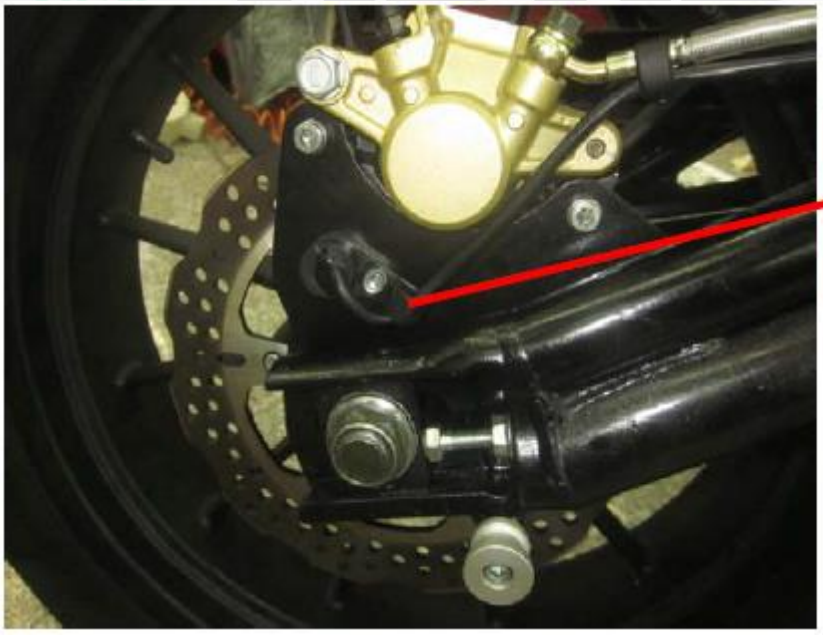
Bind the speedometer sensor wire and the brake light wire with a 200mm cable clamp.

Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations



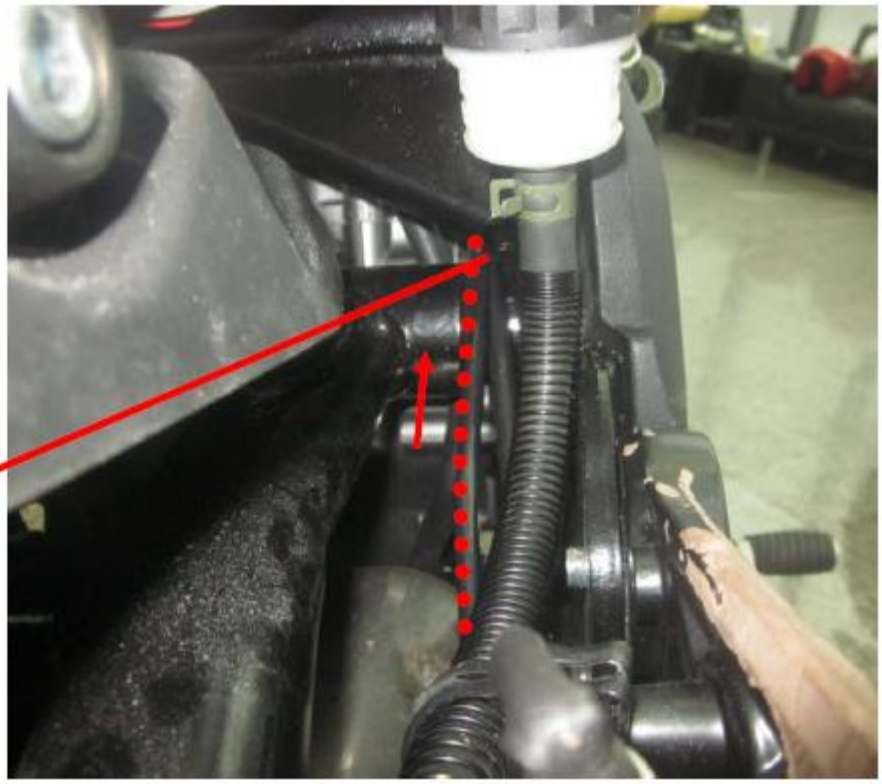
The rear hydraulic brake hose and the speedometer sensor wire are bonded together with a rubber binding band. The speedometer wire is run along the brake hose.



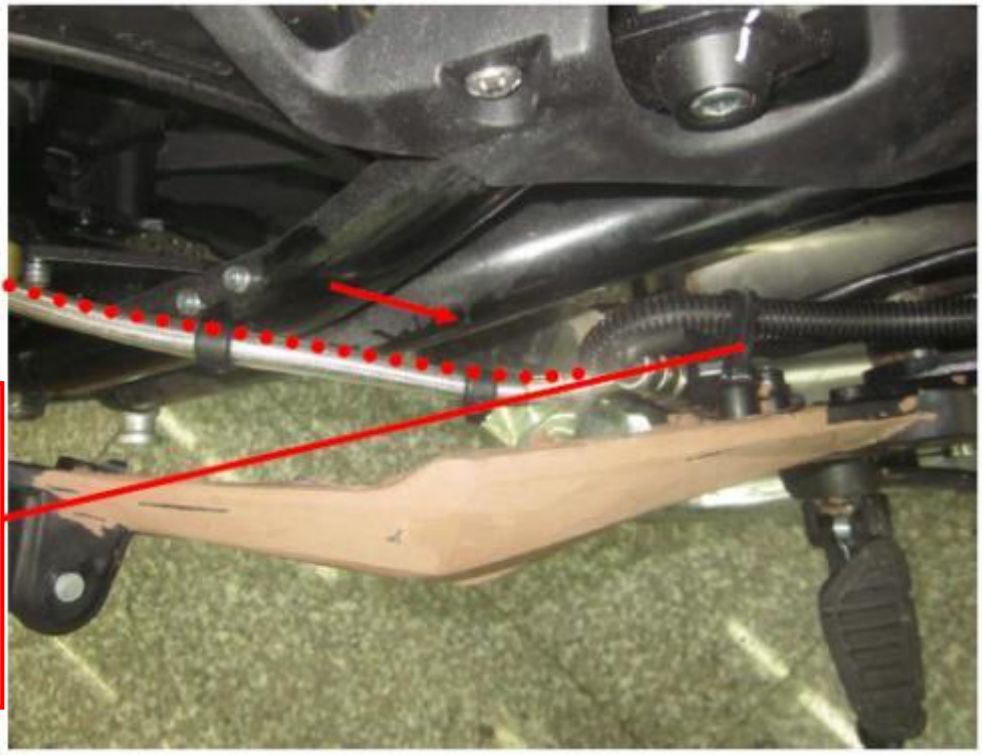
The speedometer sensor wire goes through the wire clamp. The wire clamp position is shown to the left.

Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations



Speedometer pickup wires and the brake light wires are run below the frame.



The rear brake reservoir, fluid hose, speedometer sensor and brake light wire are clamped together by a small clamp. Pay attention not to kink the fluid hose.

Wire / Hose Routing and Cable Tie Locations

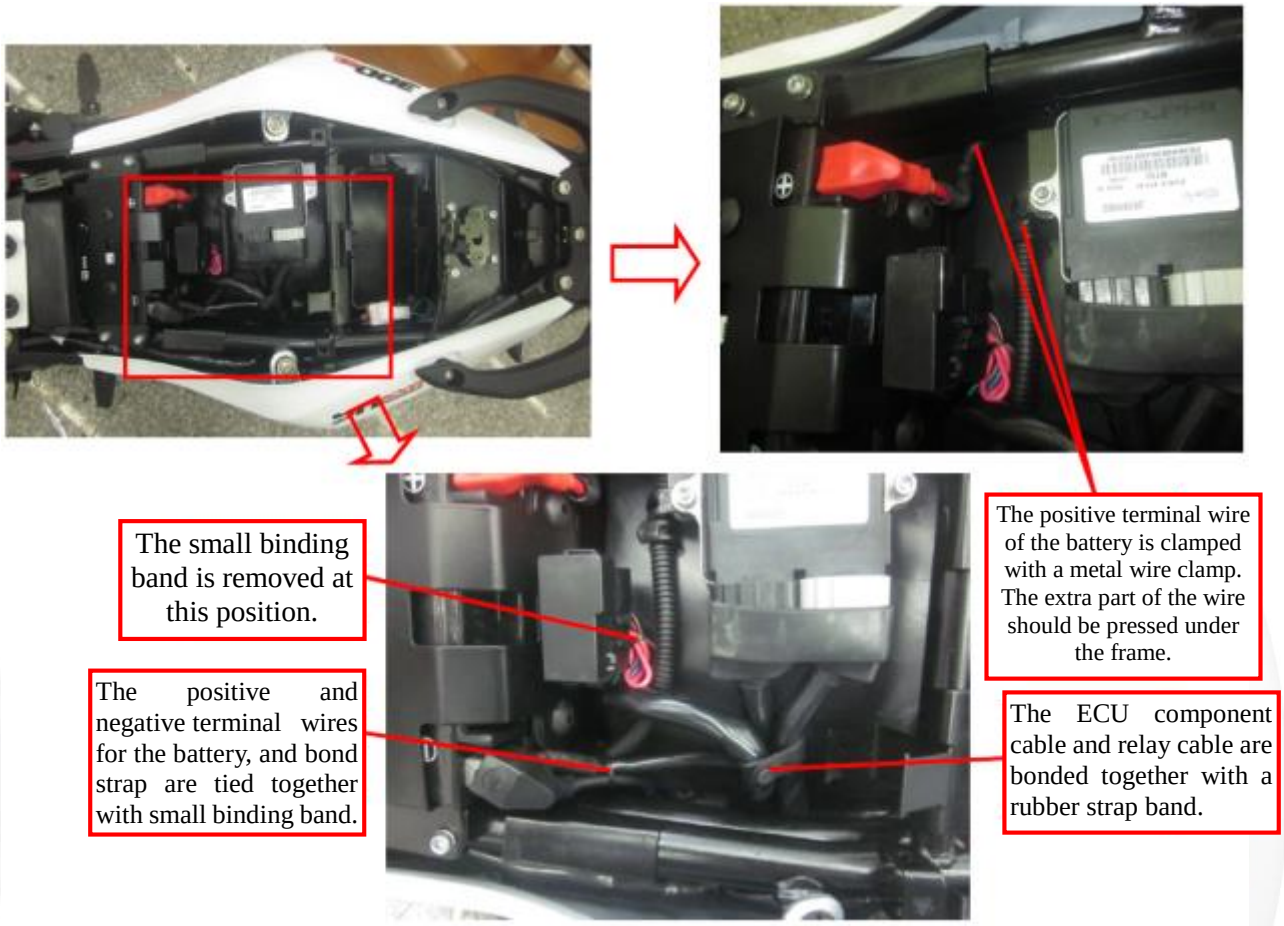
Wire / Hose Routing and Cable Tie Locations

The coolant reservoir overflow hose is arranged beside the engine and in front of the real wheel.

The fuel overflow drain hose is arranged beside the engine and in front of the real wheel.

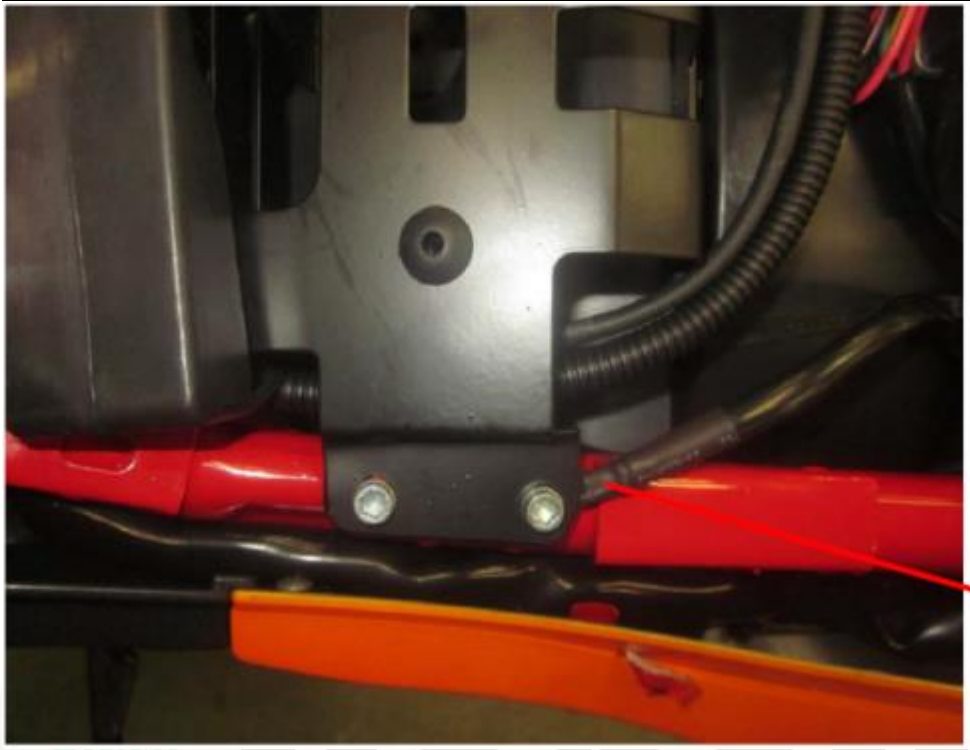
Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations

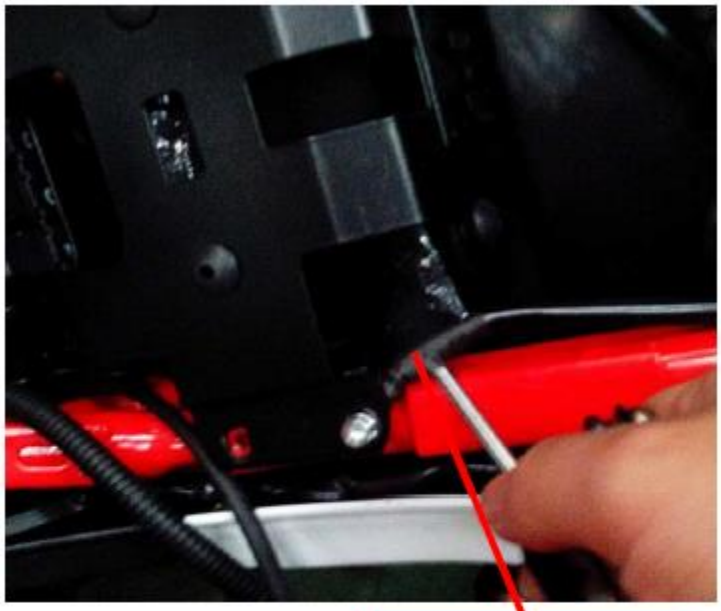


Wire / Hose Routing and Cable Tie Locations

Wire / Hose Routing and Cable Tie Locations

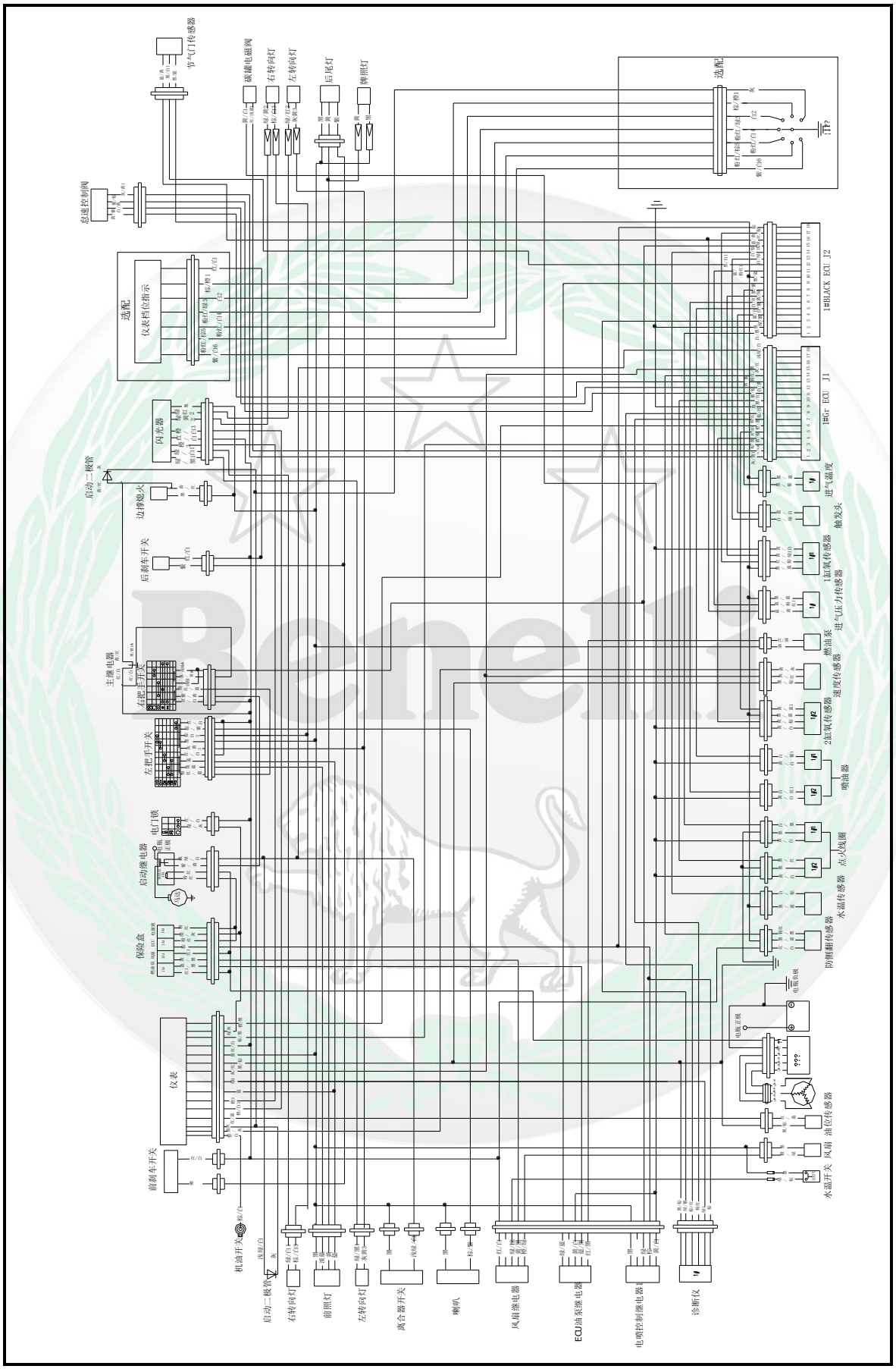


The negative battery terminal wire connects to the frame at the left side using the mounting bolt for the battery bracket. Pay attention that the terminal end is placed under the battery bracket. Do not touch the frame.



The terminal angle is as shown in the figure.

TNT300 Wiring Diagram (sale in Chinese market)



TNT300 Wiring Diagram (US-STANDARD)