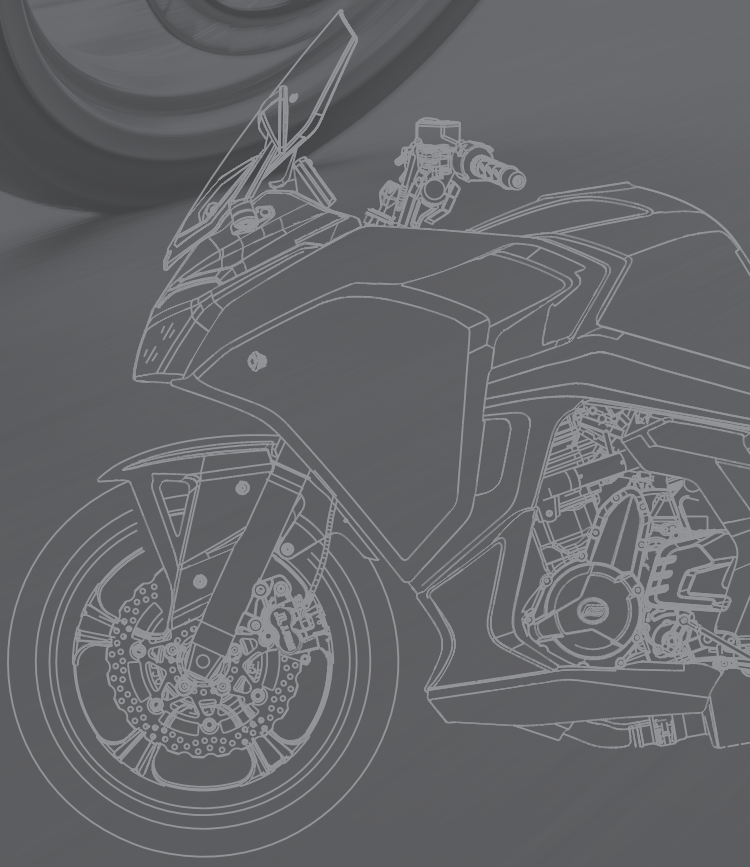
SERVICE MANUAL

400GT
650GT

CF400-5
CF650-8
CF400-5F
CF650-8F



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INTRODUCTION

This manual introduces CF400-5/CF650-8/CF400-5F/CF650-8F maintenance information, including disassembly procedure checking &adjustment methods, troubleshooting and technical specifications. There are some illustrations, drawing to guide your operation.

The first three chapters mainly introduce general operation information, special tool, vehicle structure, basic specification, inspection&maintenance methods etc,.

The rest chapters introduce vehicle part removal, installation, adjustment, service, fault diagnosis and etc,.

This manual has been improved by using many ways to make it accuracy. But we are no response for any difference and missing.

CFMOTO reserves right to make improvements and modifications to the products without prior notice. Overhaul and maintenance should be done according to actual condition of vehicle. And CFMOTO is not responsible for production improvements and modifications. This manual is only for reference. If any objections, please ask the nearest dealer to get the latest information.

The information in this manual are the latest depends on latest productions on coming out. The images in this manual may not stand for real model assy and parts.

The manual standard: **GB/T9969-2008** and **GB/T19678-2005**.

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CFMOTO CO.LTD
August, 2018

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Conversion table

A	Ampere	lb	Pound
ABDC	After bottom dead center	m	Meter
AC	Alternating current	min	Minute
ATDC	After top dead center	N	Newton
BBDC	Before bottom dead center	Pa	Pascal
BDC	Bottom dead center	PS	Metric horse power
BTDC	BTDC Before top dead center	Psi	Pound/Square Inch
°C	Centigrade	r	Revolutions
DC	Direct current	rpm	Revolutions per minute
F	Farad	TDC	Top dead center
°F	Fahrenheit	TIR	Total indicator reading
ft	Feet	V	Volt
g	Gram	W	Watt
h	Hour	Ω	Ohm
L	Litre	in	Inch
US gal	Gallon(US)	US qt	Quart(US)
oz	Ounce	HP	British horsepower
cm Hg	Centimeter of mercury	pint	Pint
cu in	Cubic inch	mL	Milliliter

Forward

This service manual is not only specially designed for professional machinist, but also it is used to instruct the vehicle's user how to do maintenance work. It is necessary to know mechanical knowledge, tools proper usage and have a well understanding of service procedure Conversion before you perfectly solve all service problems. If no, you should get the service support by professional machinist. Please read this service manual and understand it before operate for high efficiency work. And working in clean area. For vehicle mechanical performance and safety works. No tools replaced or use temporary tools since that we have been appointed the special service tools and equipment. All service and scheduled maintenance should be executed base on the instructions of service manual. Any consequences are responsible by the vehicle's owner resulted from any rule-breaking operations.

How to get Long Service Life:

●Follow scheduled maintenance and service operations base on service manual.
●Non-periodical maintenance in special situations.
●Use tools properly and use CFMOTO genuine parts.
●Special tools, dashboard and tester have been listed into this service manual for necessary genuine parts.
●Strictly operated bas on the correct service procedures.
●Keep fully service records and specify the date of new parts replacement.

How to use this manual:

In this manual, the production will be separated as several systems. All the systems are shows up in the contents. That will help you to lock the chapter. And each chapter has its own contents. For example, If you wanna see ignition coil information, use the contents to find our the electrical system and find the ignition coil in electrical system chapter.

Whenever you see the warning or warning symbol, you must keep attention and comply with the safety operation and maintenance method

⚠Danger: This symbol means it will cause serious injuries even death if you don't follow the procedure.

⚠Warning: This symbol means the special steps. It may cause the vehicle damage if you don't follow the procedure.

⚠Note: This symbol means the special steps for higher efficiency and easier working.

The other three symbol as following in order to distinguish the different levels of warning information in service manual.

●Procedure or operation should be acted.

○One step of procedure or how to operate after procedure finished. Probably it is the guidance before attention matters.

★ To take actions based on the front steps or test results from the front procedures. It shows detail illustration including torque, lubrication oil, and lubrication grease or tighten glue during assembling instruction.

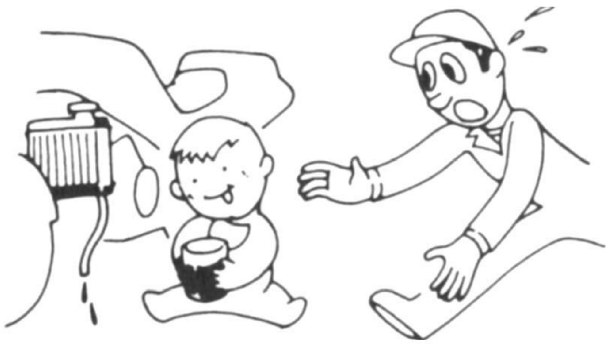
1.1 Operation Caution

⚠Note: Exhaust contains toxic ingredients. Never run the engine in enclosed or poorly-ventilated areas.

⚠Note: When the engine just stops, the temperature of engine, muffler is still high. Never touch them with bare hands to avoid getting burnt. Wear a uniform with long sleeves and gloves during operation.

⚠Note: The liquor (dilute sulfuric acid) in Battery is strongly corrosive. It may burn the skin and blind the eyes. If you contact the liquor, wash it with plenty of clean water immediately, and seek for medical treatment. Besides, wash it with plenty of clean water when it contacts the clothes to avoid skin burnt. The battery and battery liquor must be stored strictly out of the reach of children.

⚠Note: The coolant is poisonous, Never drink it. Neither let it contact the skin, eyes or clothes. If it contacts skin or clothes, rinse it immediately. If it contacts eyes, wash it with plenty of clean water immediately and seek for medical treatment. If accidental drinking of the coolant, attempt to spit it out/gargle it, and seek for medical treatment immediately. The coolant must be stored strictly out of the reach of children.



⚠Note: Must wear uniform (pilot uniform etc), cap, safety boots during operation. Wear safety articles such as dust-proof goggles, dust proof respirator and gloves when necessary.

⚠Note: The battery may produce combustible and explosive hydrogen when being charged. It may explode if there is a flame or electric spark. Charge it in the place with nice ventilation.

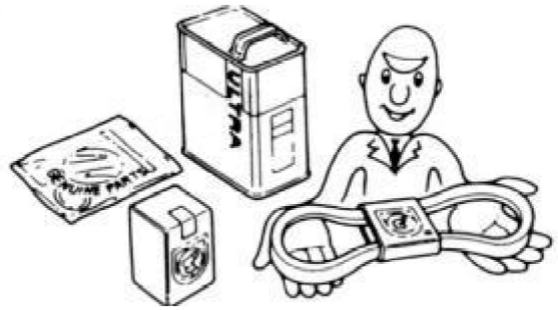
⚠Note: Never touch the rotating or movable pieces such as wheels, clutch, etc. Pay attention not to get pinched during operation.

⚠Note: No smoking or naked fire at the operation site, because the gasoline is combustible. Not only flames, but electric sparks shall be avoided. Besides, the vapored gasoline is explosive. Operate in the place with nice ventilation.

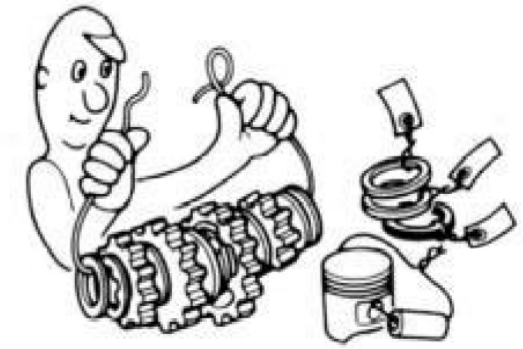
⚠Note: The operators shall remind each other from time to time for safety purpose during operation.

1.2 Disassembly&Assembly Attentions

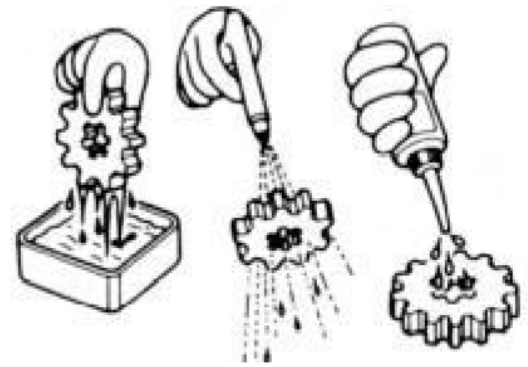
■ Use CFMOTO genuine or recommended parts, lubricants and grease.



■ Place and store the disassembled parts separately for correct assembly.



■ Clean and blow off the detergent after disassembling the parts. Apply lubricant on the surface of moving parts.

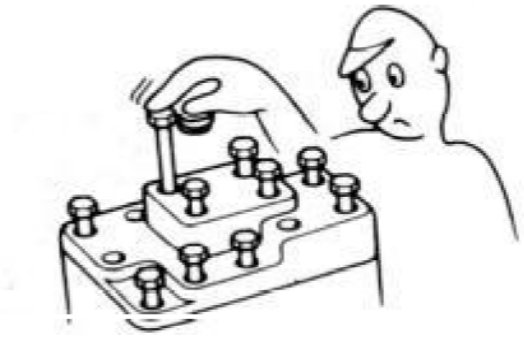


■ Clean the mud, dust before overhauling.

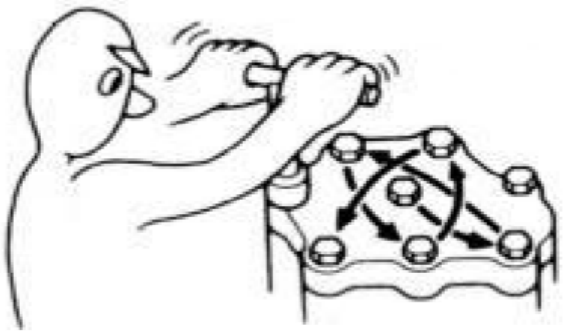
■ Replace the removed washers, o-rings, piston pin circlips, cotter pins with new ones.
■ Elastic circlips might get distorted after disassembly. Do not use the loosened circlips.

■ Measure the data during disassembly for correct assembly.

■ If not know the length of screws, install the screws one by one and tighten with same torque.



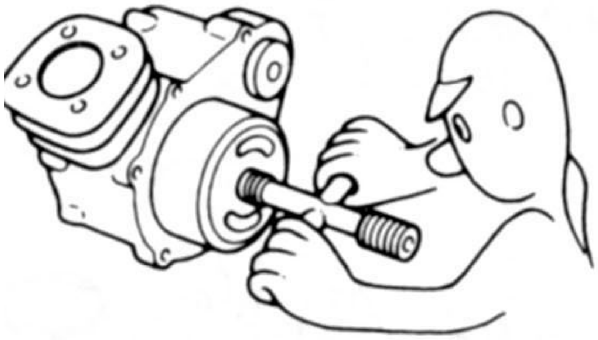
■ Pre-tighten bolts, nuts and screws, then tighten them according to the specified torque, from big to small and from inner side to outer side.



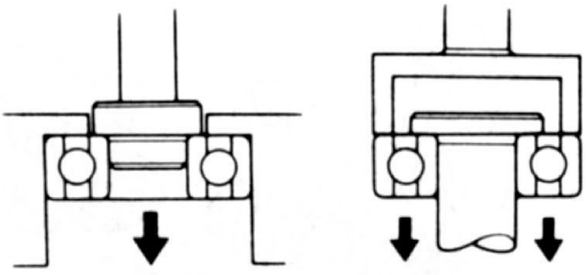
■ Check if the disassembled rubber parts are aged. Replace it if necessary. Keep the rubber parts away from the grease.

■ Apply or inject recommended lubricant to the specified parts.

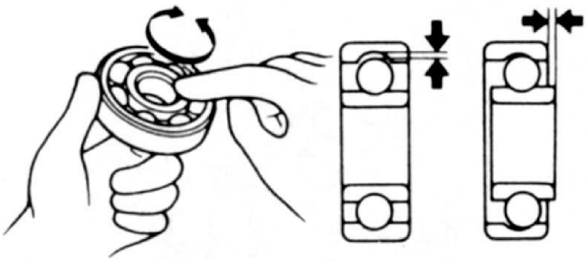
■ Use special tools when necessary.



■ If remove the ball bearing by pressing the balls, the removed bearings should not be used again.



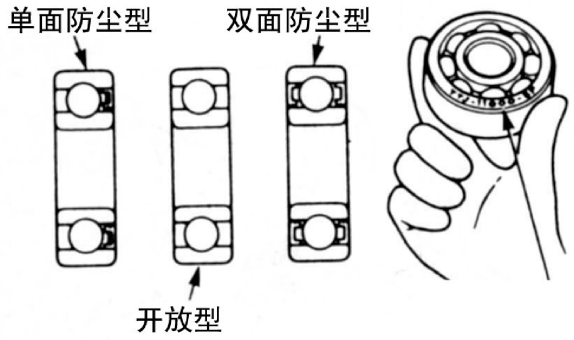
■ Turn the ball bearing with hands to make sure the bearing will turn smoothly.
Replace if the axial or radial play is too big.
If the surface is uneven, clean with oil and replace if the cleaning does not work.
When pressing the bearing into the machine or to the shaft, replace the bearing if it could not be pressed tightly.



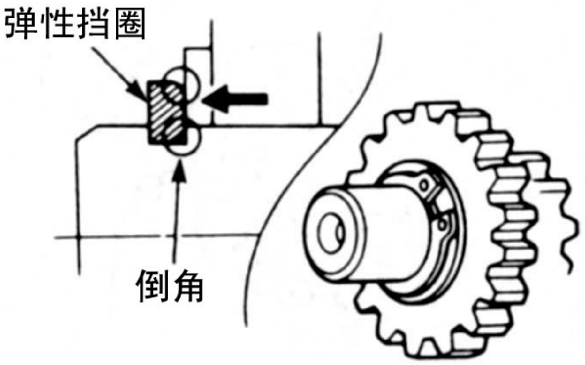
■ Keep the bearing block still when blowing the bearing after washing. Apply oil or lubricant before assembly.

■ After assembly, check if all the tightened pats are properly tightened and can move smoothly.

■ Install the one-side dust-proof bearing in the right direction. When assembling the open type or double-side dust-proof bearing, the side with manufacturer's mark should face outside.

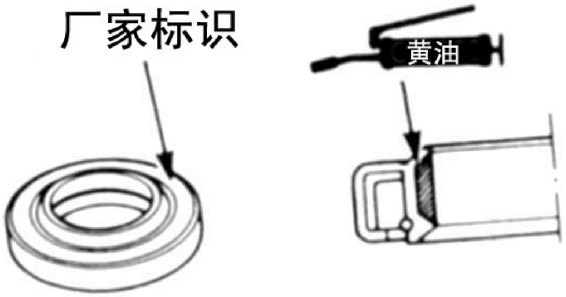


■ The circlip with chamfering side should be towards force direction. Loosened circlips can not be used. Turn the circlip after installation to make sure it is has been installed into the slot.

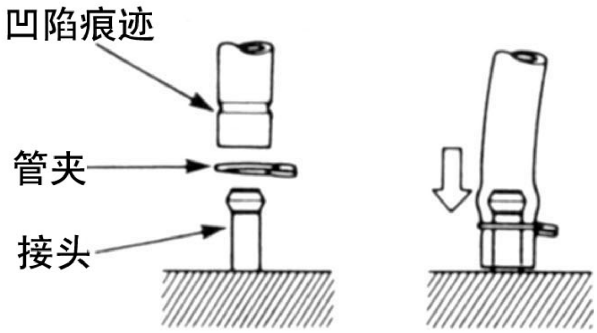


■ Brake fluid and coolant may damage coating, plastic and rubber parts. Flush these parts with water if splashed.

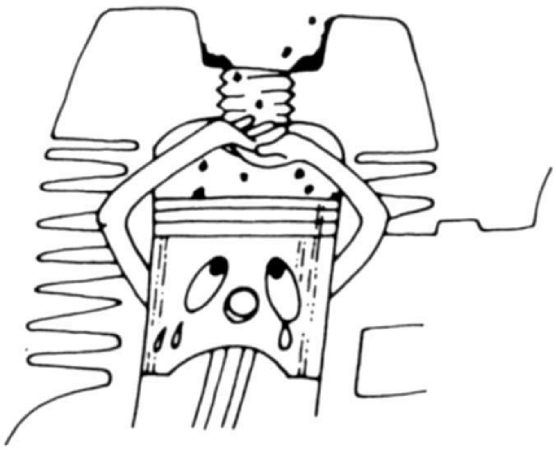
■ Install oil seal with the side of manufacturer's mark facing outside.
·Do not fold or scratch the oil seal lip.
·Apply grease to the oil seal lip before assembly.



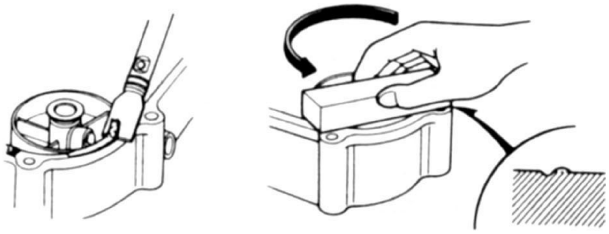
■ When installing pipes, insert the pipe till the end. Fit the pipe clip, into the rove. Replace the pipes or hoses that cannot be tightened.



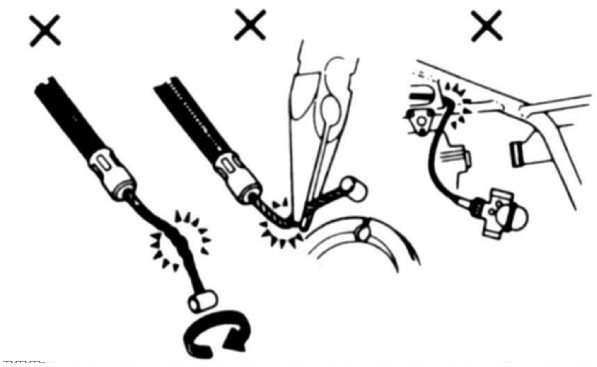
■ Do not mix mud or dust into engine or the hydraulic brake system.



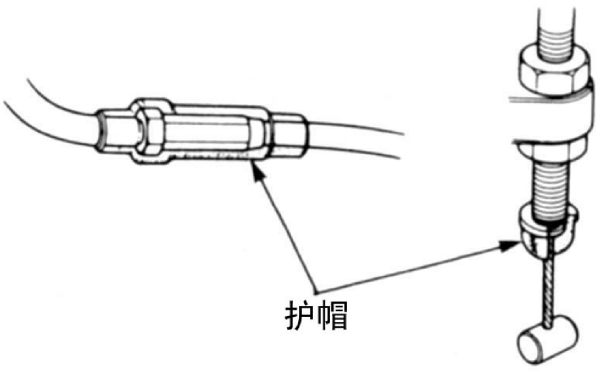
■ Clean the gaskets and washers of the engine cases before assembly. Remove the scratches on the contact surfaces by polishing evenly with an oil stone.



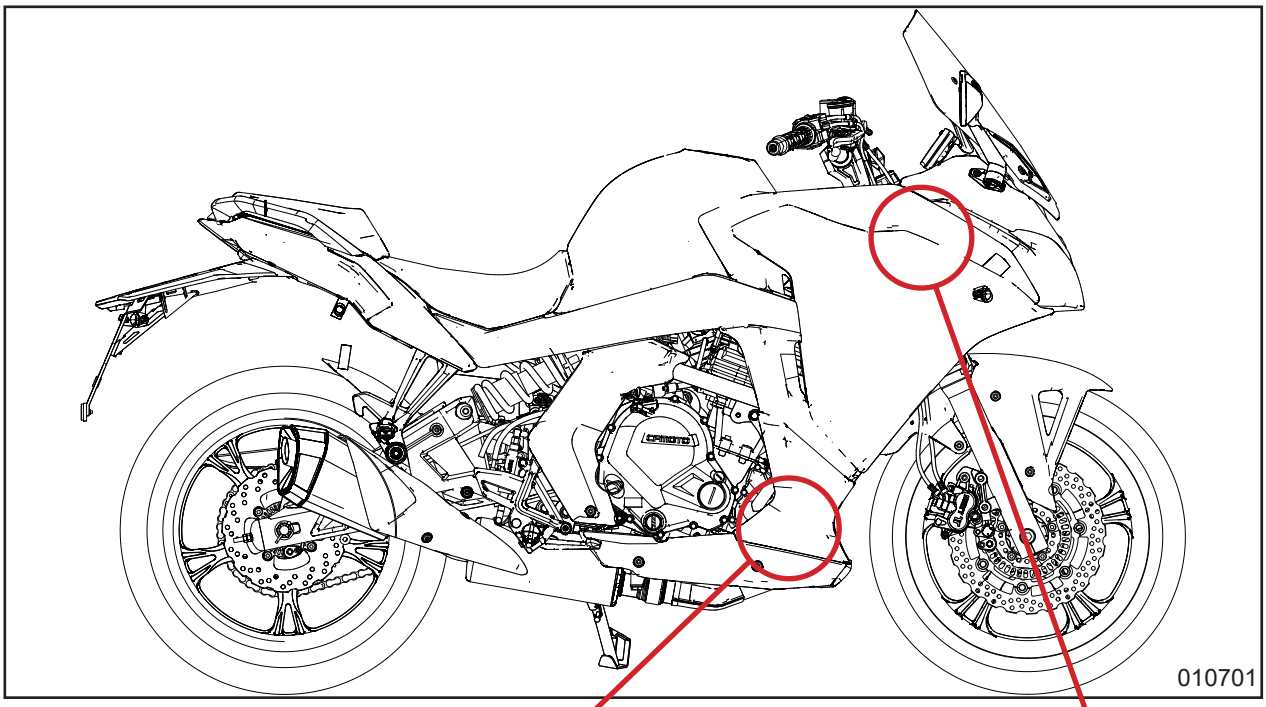
■ Do not twist or bend the cables too much. Distorted or damaged cables may cause poor operation.



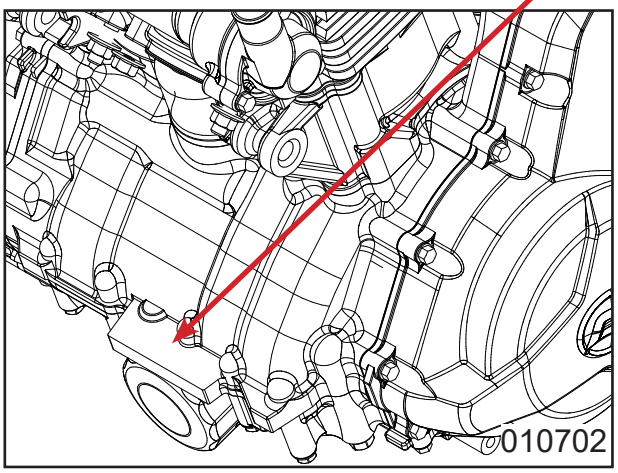
■ When assembling the parts like protection caps, insert the caps to the grooves.



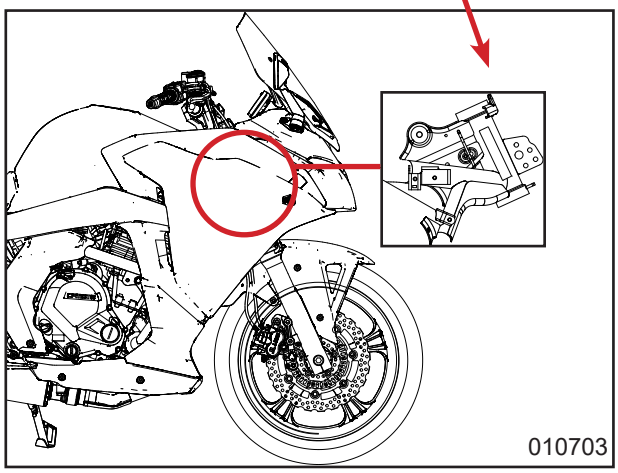
1.3 Location of VIN/EIN



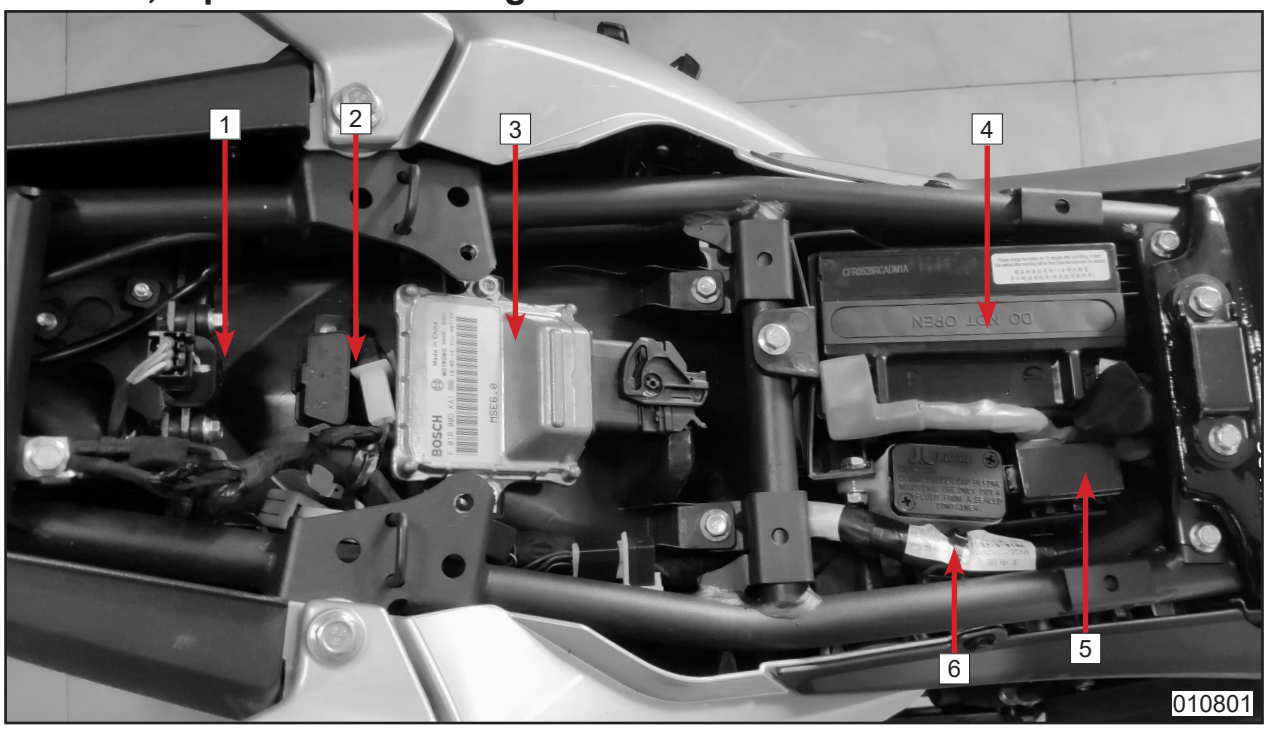
EIN



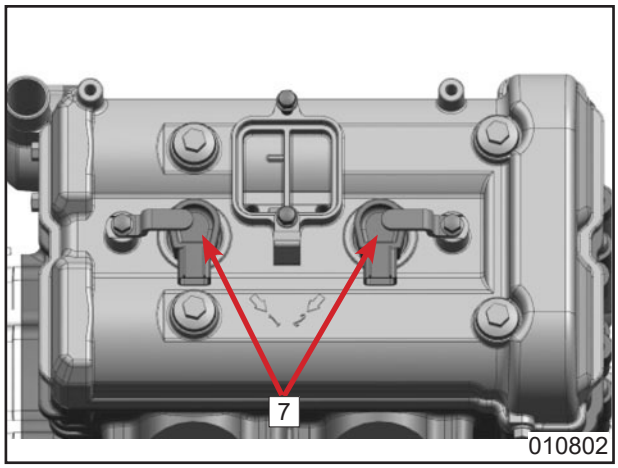
VIN

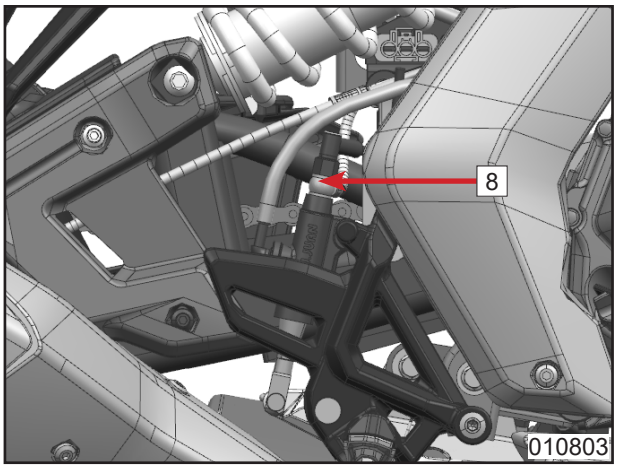


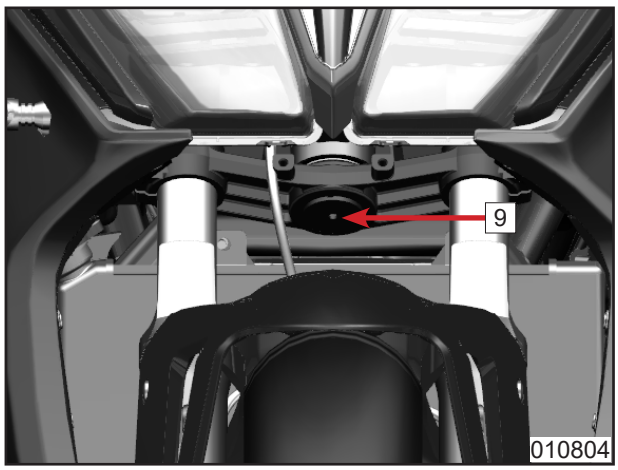
1.4 Wire, Pipe and Cable Diagram

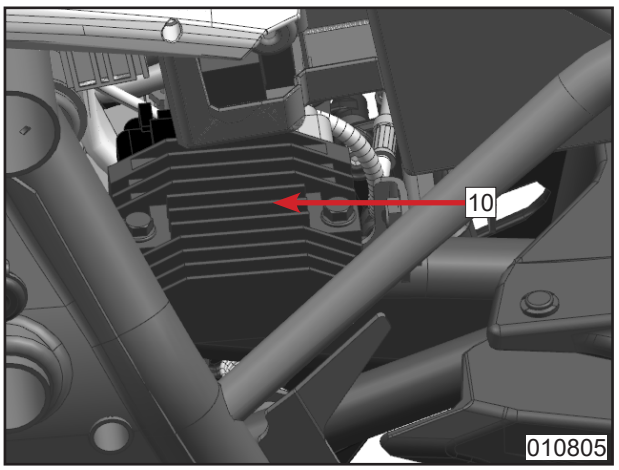


1	Roll-over sensor	3	ECU	5	Fuse box
2	Diagnosis connector	4	Battery	6	Main cable

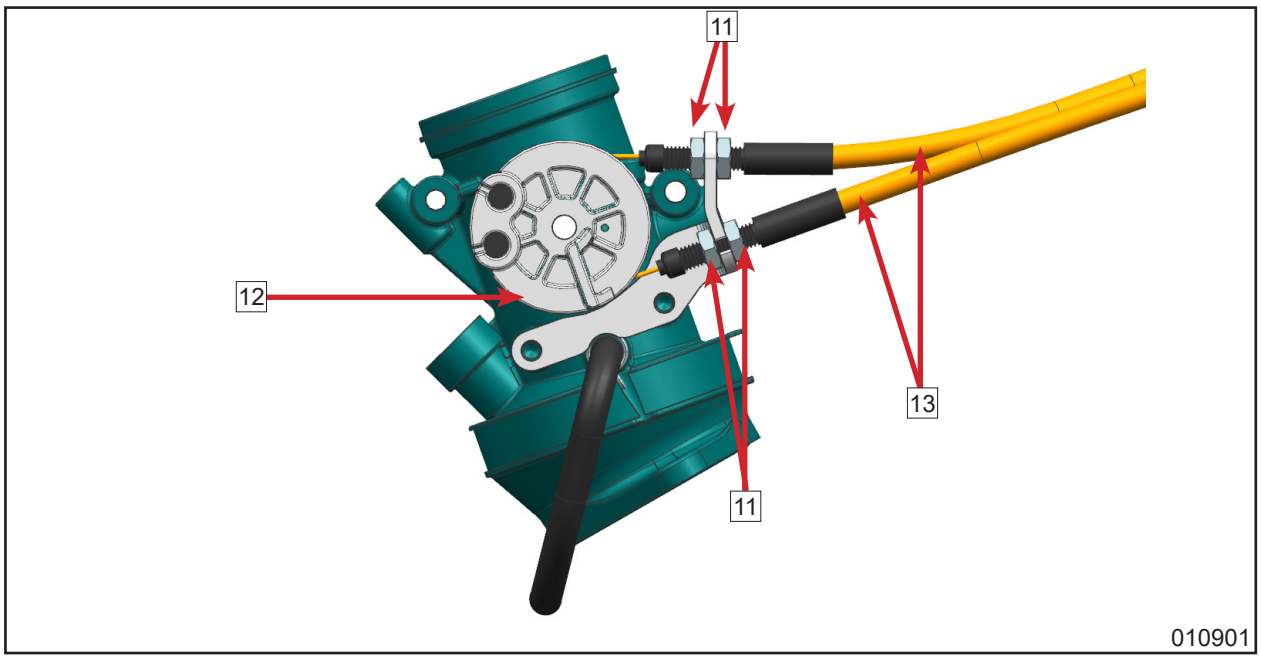




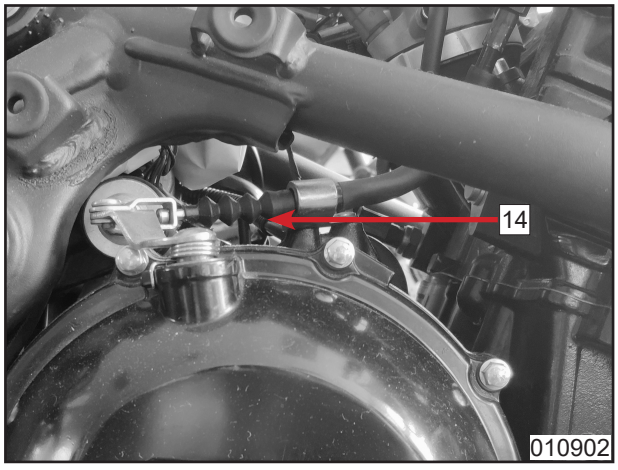


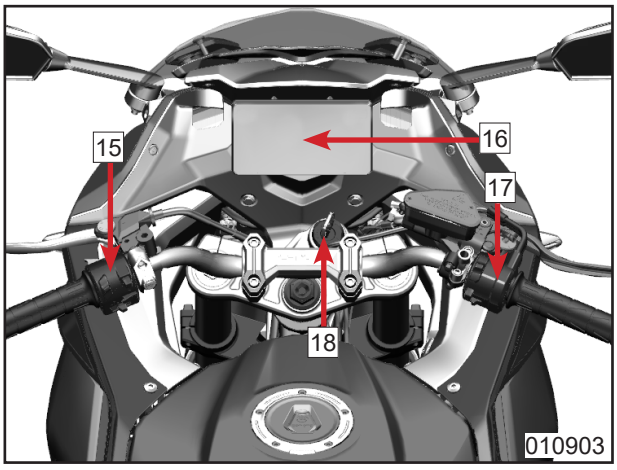


7	Ignition Coil	8	Rear brake pump	9	Horn	10	Regulator



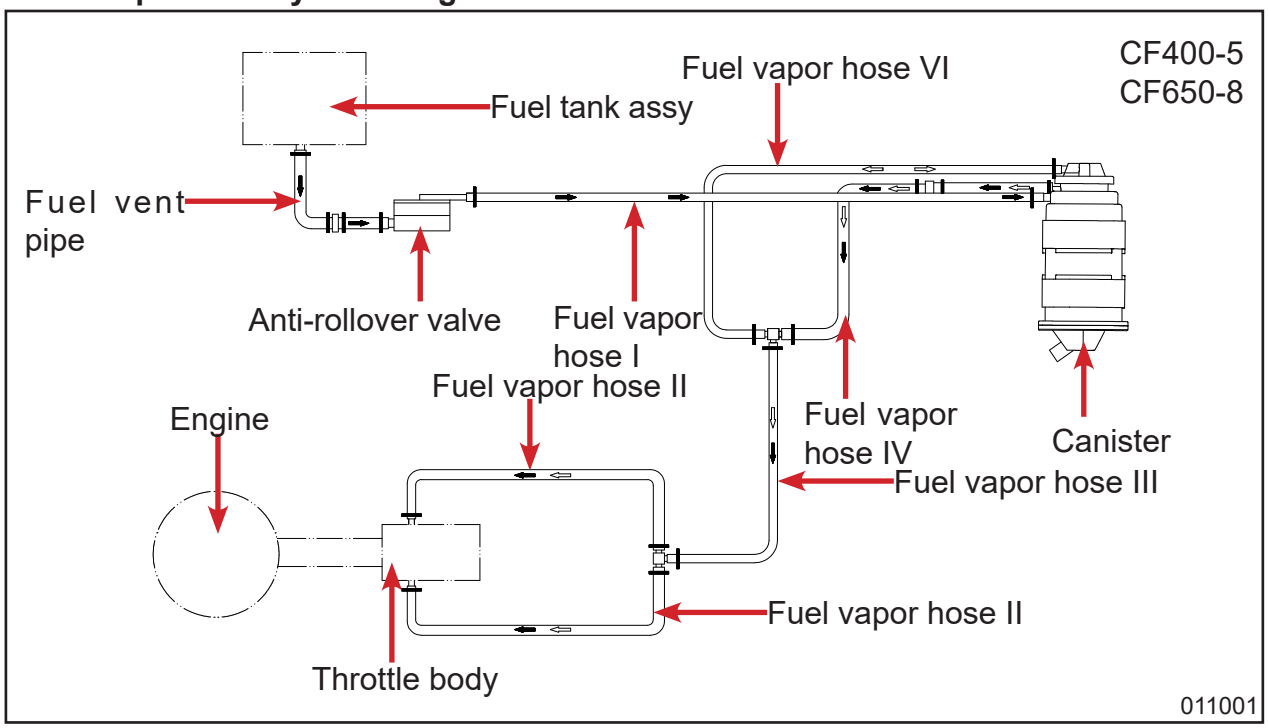
11	Adjusting nut, throttle cable	12	Throttle valve body	13	Throttle cable





14	Clutch cable	15	LH handlebar switches	16	Dashboard	17	RH handlebar switches	18	Lock

Fuel evaporation system diagram



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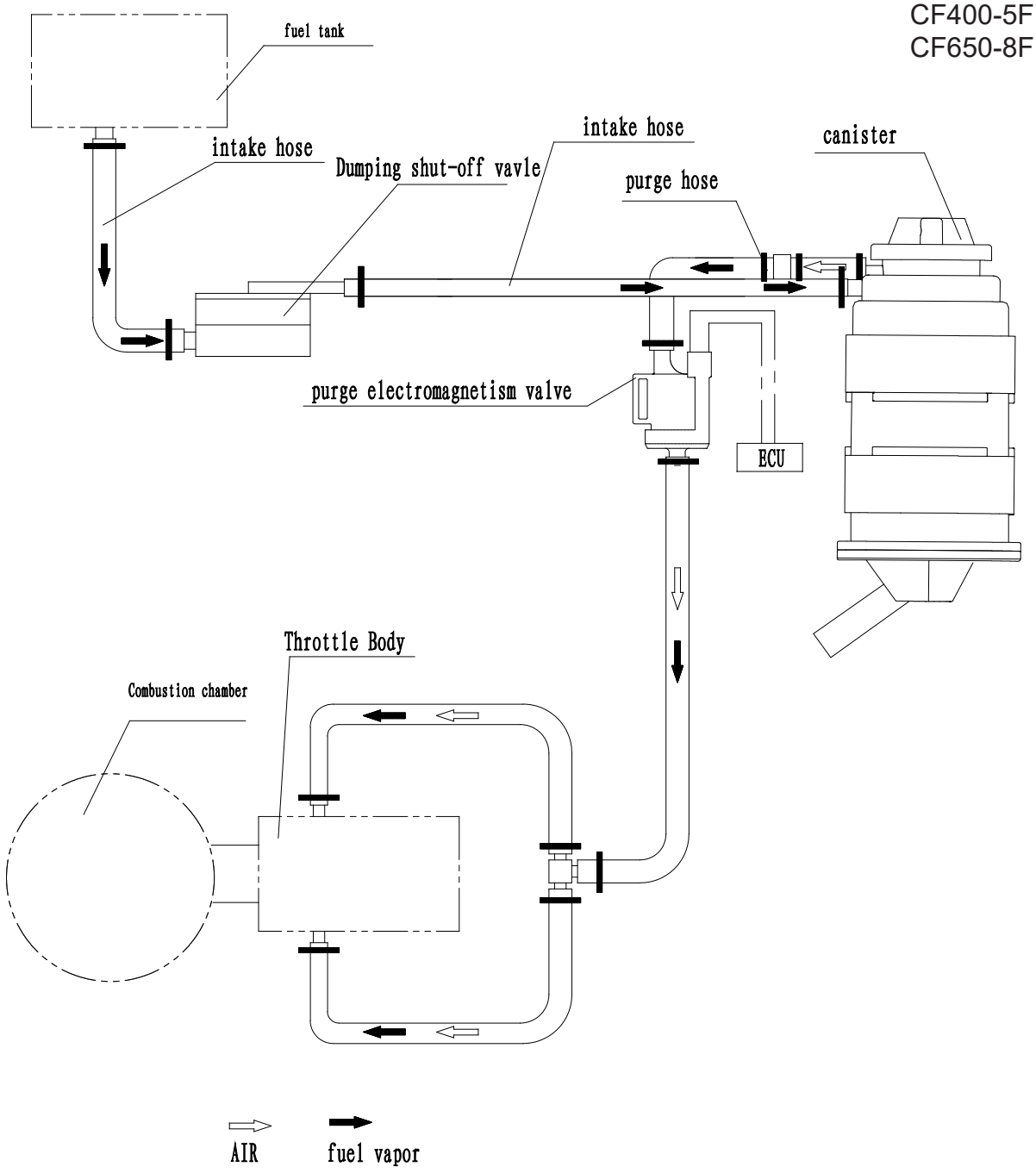

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⚠ Attention: To fixed the anti roll-over valve as horizontal position. Don't change the fuel evaporation system. Tube connection should be well connected after maintenance by disassembling without air leakage, blocking, squeezing, broken and damage etc. Fuel steam will be released into carbon tank by absorption tube from fuel tank. Absorbing fuel steam by active carbon when engine stop; Fuel steam of carbon tank will follow into combustor for burning when engine working in order to avoid environment pollution if fuel stem released into air directly. Meanwhile, Air pressure of fuel tank should be balanced by absorption tube. If inner pressure of fuel tank is lower than outside, it is available to replenish air pressure by air tube of carbon tank or absorption tube. So, All tube system should be smooth running without blocking and squeezing, otherwise fuel pump will be damaged, fuel tank will be deformed or broken.

Cautions:
► = Severe Use Item. Reduce interval by 50% on vehicles subjected to severe use.
■ = Have an authorized dealer perform repairs that involve this component or system.
♦ = Emissions related components. Have an authorized dealer perform repairs that involve this component or system.

2.1 Maintenance before Operation

Item		Maintenance before operation			
		Hour	Calendar	km	Remarks
Fuel system					
	Fuel hose	-	Daily	-	Inspect for aging
Electrical system					
	Switches	-	Daily	-	Inspect
	Lights and horns	-	Daily	-	

2.2 Break-in Maintenance Schedule

Item		Break-in Maintenance Interval (Service whichever interval comes first)			
		Hour	Calendar	km	Remarks
Engine					
■	Engine oil and oil filter	-	-	1000	Replace
	Idle	-	-	1000	Inspect
■	Coolant	-	-	1000	
	Throttle system	-	-	1000	
Electrical system					
■	Functions of electrical parts	-	-	1000	Inspect
	Battery	-	-	1000	
	Fuses or circuit breakers	-	-	1000	
Brake system					
	Brake discs	-	-	1000	Inspect
	Brake pads	-	-	1000	
	Brake fluid level	-	-	1000	
	Brake lever	-	-	1000	Inspect for free play
■	Brake hoses	-	-	1000	Inspect for damage and sealing
Wheels					
	Tire condition	-	-	1000	Inspect
	Tire pressure	-	-	1000	
Suspension system					
■	Rear shock absorber and front forks	-	-	1000	Inspect for leaking (maintain parts according to the requirement)
Cooling system					
	Coolant level	-	-	1000	Inspect
■	Coolant	-	-	1000	
■	Radiator fan function	-	-	1000	
	Coolant hoses	-	-	1000	
Steering system					
■	Steering bearings	-	-	1000	Inspect
Other parts					
■	Diagnosis connector	-	-	1000	Read with PDA
■	Mobile parts	-	-	1000	Lubricate; inspect for flexibility
■	Bolts and nuts	-	-	1000	Inspect for fastness
■	Cables and wires	-	-	1000	Inspect for damage, bending and routing

2.3 Periodic Maintenance Schedule

Item		Periodic Maintenance Interval (Service whichever interval comes first)			
		Hour	Calendar	km	Remarks
Engine					
	Engine oil and oil filter	-	-	5000	Replace
■	Clutch	-	-	10000	Inspect
	Idle	-	-	10000	
■	Coolant	-	-	10000	
		-	24	30000	Replace
	Throttle system	-	-	10000	Inspect
■	Throttle valve	-	-	5000	Clean
► ■	Air filter element	-	-	10000	Inspect
		-	24M	-	Replace
■	Spark plug	-	-	10000	
■	Valve clearance	-		40000	Inspect
Electrical system					
■	Functions of electrical parts	-	12M	10000	Inspect
	Battery	-	6M	5000	
	Fuses or circuit breakers	-	6M	5000	
■	Wires	-	12M	10000	Inspect for damage, bending and routing
Brake system					
	Front and rear brake system	-	12M	10000	Inspect
		-	24M	20000	
	Brake discs	-	12M	10000	
		-	24M	20000	
►	Brake pads	-	12M	10000	
		-	24M	20000	
	Brake fluid level	-	12M	10000	
		-	-	20000	
	Brake lever	-	24M	20000	Inspect for free play
		-	12M	10000	
■	Brake hoses	-	24M	20000	Inspect for damage and sealing
		-	12M	10000	
■	Brake fluid		24M	-	Replace
Wheels					
	Tire condition	-	12M	10000	Inspect
		-	24M	20000	
	Tire pressure	-	12M	10000	
		-	24M	20000	
■	Wheel bearings	-	-	10000	
		-	-	30000	

Item		Periodic Maintenance Interval (Service whichever interval comes first)			
		Hour	Calendar	km	Remarks
Suspension system					
■	Suspension system	-	-	5000	Inspect
		-	-	10000	
		-	-	15000	
■	Rear shock absorber and front forks	-	12M	10000	Inspect for leaking (maintain parts according to the requirement)
		-	24M	20000	
■	Swing arms	-	-	10000	Inspect
		-	-	30000	
Cooling system					
	Coolant level	-	12M	10000	Inspect
		-	24M	20000	
■	Coolant	-	12M	10000	
		-	24M	20000	
■	Radiator fan function	-	12M	10000	
		-	24M	20000	
■	Coolant hoses	-	12M	10000	
		-	48M	30000	
Frame system					
	Frame	-	-	30000	Inspect
Steering system					
■	Steering bearings	-	12M	10000	Inspect
		-	24M	20000	
Chain					
►	Chain, rear sprocket and engine sprocket	-	12M	10000	Inspect
		-	24M	20000	
Other parts					
■	Diagnosis connector	-	12M	10000	Read with PDA
		-	24M	20000	
■	Mobile parts	-	12M	10000	Lubricate; inspect for flexibility
		-	48M	30000	
■	Bolts and nuts	-	12M	10000	Inspect for fastness
		-	48M	30000	
■	Cables and wires	-	12M	5000	Inspect for damage, bending and routing
		-	24M	15000	
■	Pipes, ducts, hoses and sleeves	-	12M	10000	Inspect for cracks, sealing and routing
		-	48M	30000	

3.1 General Specifications

Item		Specifications	
Model		400GT	650GT
Length		2100mm	
Width		784mm	
Height		1300mm	
Wheel base		1415mm	
Displacement		400.4mL	659.3mL
Fuel grade		RQ-95 or above	
Gross weight		211kg	
Passengers		2 people (including driver)	
Load		361kg	
Tire	Front	120/70 ZR17	
	Rear	160/60 ZR17	
Min. ground clearance		150mm	
Turning circle diameter		5.6m	
Steering	Steering angle	Right	32°
		Left	32°
Brake system		Front	Hydraulic Disc
		Rear	Hydraulic Disc
Shock absorber	Suspension	Front wheel	Telescopic
		Rear wheel	Cantilever type
Frame			Steel tube

Item		Standard
Fuel supplier	Fuel capacity	19L
	Injector	Type: F01R00M126
	Fuel pump	Voltage: DC13.5V
		Pressure: 0.33MPa±0.01MPa
		Flow: ≥45L/h
		Current: ≤2.80A

3.2 Engine Specification

NO.	Item			Type/Specification	
				400GT	650GT
1	Type			Line Engine/duplex cylinder/four strokes/water-cooled	
2	Bore × Stroke			68.4mm×54.5mm	83mm×60mm
3	Displacement			400.4mL	649.3mL
4	Compression ratio			11.1:1	10.3:1
5	Low idling speed (Idling)			1450r/min±145r/min	
6	Starting			Electric	
7	Electrical system	Ignition type		ECU	
		Spark plug/Electrode gap		NGK CR7E/0.7mm~0.9mm	
		Magneto type		Out rotor, flywheel	
8	Combustion system	Combustion chamber		Triangular	
		Air filter type		Sponge filter	
		Gasoline		RQ-95 and above	
9	Valves system	Valves type		SOHC/chain drive	
10	Lubrication system	Lubrication type		Pressure and splash	
		Oil pump type		Rotor drive	
		Oil filter type		Paper type, replaceable	
		Engine oil type		SAE10W~40/SG	
11	Cooling system	Cooling type		Closed coolant circulation	
		Coolant type		-35°C anti-rust and anti-freeze fluid	
12	Drive train system	Clutch		Wet and multi-plate clutch	
		Transmission type		6-gear,constant mesh, step transmission	
		Reducer gear		6 gears	
		Gearshift methods/orders		Mechanical reciprocating 1-0-2-3-4-5-6-5-4-3-2-0-1	
		Primary ratio		2.147	2.095
		Final drive		3.857	3.067
		Secondary ratio	1st	2.500	2.353
			2nd	1.800	1.714
			3rd	1.333	1.333
			4th	1.111	1.111
			5th	0.966	0.966
			6th	0.852	0.852
13	Overall size			L(mm)×W(mm)×H(mm): 386mm×312.7mm×439mm	
14	Dry weight			31kg	
15	Output type			Chain	
16	Rotation of engine output			When moving forward, counter clockwise(left view).	

3.3 Maintenance Specifications

3.3.1 Front Wheel

Item			Standard	Service limit
Front wheel	Front wheel shaft bending		-	0.2mm
	Rim run-out	Longitudinal	0.8mm	2.0mm
		Horizontal	0.8mm	2.0mm
	Tire	Remaining groove	-	1.6mm
		Tire pressure	225kPa±22.5kPa (2.25kgf/cm2±0.225kgf/cm2)	-

3.3.2 Rear Wheel

Item			Standard	Service limit
Rear wheel	Rim run-out	Longitudinal	0.8mm	2.0mm
		Horizontal	0.8mm	2.0mm
	Tire	Remaining groove	-	1.6mm
		Tire pressure	225kPa±22.5kPa (2.25kgf/cm2±0.225kgf/cm2)	-

3.3.3 Brake System

Item		Standard	Service limit
Front brake	Front (hand brake) free travel	10mm~20mm	-
	Brake disc abrasion	4mm	3mm
Rear brake	Rear (foot brake) free travel	10mm~20mm	-
	Brake disc abrasion	4mm	3mm

3.3.4 Lighting, Dashboard and Switch

Item	Standard	
Fuse	Primary	30A
	Subsidiary	1×7.5A 1×10A 5×15A
Light, bulb	Headlight(Hi/Lo)	12V 14.4/13.3W
	Position light	LED
	Tail light	LED
	Turn light	LED
	License light	LED

3.4 Service Specification

3.4.1 Valve Train&Cylinder Head

Item	Standard			Service limit	Remark
	400GT(268MQ-A)		650GT(283MT)		
Valve clearance (cold engine)	IN	0.08mm~0.13mm		-	
	EX	0.22mm~0.28mm			
Clearance, valve guide bushing and valve stem	IN	0.02mm~0.08mm		-	
	EX	0.07mm~0.14mm		-	
I.D of valve guide bushing	IN & EX	4.5mm~4.512mm		-	
O.D of valve stem	IN	4.475mm~4.490mm		-	
	EX	4.455mm~4.470mm			
Free length, valve spring		39.5mm±0.68mm	41.6mm		
Valve spring force	When compressed to 35.9mm, elasticity is 95.5N~111.5N		When compressed to 38.4mm, elasticity is 103N~121N		
	When compressed to 29.1mm, elasticity is 364.4N~402.4N		When compressed to 30.5mm, elasticity is 422N~466N		
	When compressed to 28.1mm, elasticity is 417.6N~461.6N		When compressed to 29.8mm, elasticity is 455N~503N		
Camshaft lift	IN	35.743mm~35.857mm	36.543mm~36.657mm		
	EX	34.743mm~34.857mm	35.843mm~35.957mm	-	
Camshaft to hole clearance	0.028mm~1.020mm		0.028mm~0.071mm		
O.D of camshaft	223.950mm~23.972mm			-	
I.D of camshaft mating hole	24mm~24.052mm		24mm~24.021mm	-	
Camshaft run-out	0.02mm				
Cylinder head junction surface flatness	0.05mm				

3.4.2 Lubrication System

Item	Standard		Service limit	Remark
Outer rotor to inner rotor clearance	0.08mm~0.15mm		-	
Outer rotor to pump body clearance	0.15mm~0.193mm		-	
Oil pressure	3000r/min 10kPa~30kPa		-	
Oil type	SAE10W-40,API SJ		-	
	Change filter	2200mL	-	

3.4.3 Cylinder, Piston, Piston Ring and Connecting Rod

Item	Standard			Service limit	Remark
	400GT(268MQ-A)		650GT(283MT)		
Clearance between piston and cylinder	0.030mm~0.045mm		0.015mm~0.037mm		
Dia. of piston skirt	68.366mm~68.384mm		82.988mm~82.970mm	-	
I.D of cylinder	68.4mm~68.418mm		83mm~83.032mm	-	
Cylinder junction surface flatness	0.03mm			-	
Piston ring closed gap	1 Ring	0.15mm~0.30mm	0.25mm~0.40mm	-	
	2 Ring	0.20mm~0.40mm	0.40mm~0.55mm	-	
Clearance between piston ring and groove	1 Ring	0.02mm~0.06mm	0.03mm~0.07mm		
	2 Ring	0.02mm~0.06mm	0.02mm~0.06mm	-	
Thickness of piston ring	1 Ring	0.97mm~0.99mm	0.87mm~0.89mm	-	
	2 Ring	0.97mm~0.99mm	0.97mm~0.99mm	-	
Width of piston ring groove	1 Ring	1.01mm~1.03mm	0.92mm~0.94mm	-	
	2 Ring	1.01mm~1.03mm	1.01mm~1.03mm	-	
	Oil ring	1.5mm~1.52mm	1.510mm~1.525mm		
O.D of piston pin	17.996mm~18mm		18.996mm~19mm	-	
I.D of connecting rod small end	18.01mm~18.02mm		19.01mm~19.02mm	-	
Connecting rod big end side clearance	41mm~41.016mm		41mm~41.016mm	-	
Connecting rod big end thickness	22.85mm~22.9mm		22.85mm~22.9mm	-	
Crankshaft run-out	0.02mm		0.02mm	-	

3.4.4 Clutch and Transmission

Item	Standard	Service limit	Remark
Friction disc	2.95mm~3.05mm	2.8mm	
Quantity	7		
Steel plate A	1.92mm~2.02mm	-	
Quantity	1		
Steel plate B	2.42~2.52		
Quantity	5		
Driven disc deformation	0.15mm	0.30mm	
Free length of clutch spring	33.1mm~34.1mm	32.6mm	
Quantity	5		
Thickness of gearshift fork	5.9~6.0(268MQ-A) 4.8~5.0(283MT)		

3.4.5 Cooling System

Item	Standard/Specification		Service limit	Remark
	400GT(268MQ-A)	650GT(283MT)		
Start temp. of thermostat	80°C~84°C	70°C~74°C	-	
Lift range of thermostat valve	When 95°C, ≥8mm	When 85°C, ≥8mm	-	
Open pressure of radiator cap	108kPa		-	
The relationship between the resistance of water temp. sensor and temperature	Temperature (°C)	Resistance (kΩ)	-	
	-20	15.04		
	20	2.45		
	80	0.318		
	120	0.11		
Coolant type	-35°C anti-rust and anti-freeze fluid with high boiling point		-	

3.4.6 Air Inlet System

Item	Specification		Remark
	400GT(268MQ-A)	650GT(283MT)	
Throttle model	0MQ0-173000	0700-173000-60000	
Idle air control valve (canister control valve)	018B-172000		
Idle speed	1450r/min±145r/min		

3.4.7 Electrical System

Item		Specification	Remark
Spark plug	Model	NGK CR7E	
	Gap	0.7mm~0.9mm	
Spark		>8mm, 1MPa	
Ignition coil resistance	Primary	740MΩ~780MΩ	
	Secondary	10.1kΩ~11.1kΩ	
Magneto coil resistance	Trigger	100Ω~160Ω	
Magneto Voltage, unloading state (cold engine)		>50V(AC),5000r/min	
Max power		280W,6000 r/min	
Stabilized voltage		13.5V~15.0V,5000r/min	
Primary peak voltage, ignition coil		12V	
Peak voltage, trigger coil		>1.5V	
Starter relay coil resistance		3Ω~5Ω	
Starter auxiliary relay coil resistance		90Ω~100Ω	

3.5 Tighten Torque

3.5.1 Tighten Torque Table for Vehicle

Item	Torque N•m(kgf•m)	Item	Torque N•m(kgf•m)
M5 bolt, nut M6 bolt, nut M8 bolt, nut M10 bolt, nut M12 bolt, nut	5(0.5) 10(1.0) 22(2.2) 34(3.5) 54(5.5)	M5 screw M6 screw M6 SH flange bolt M6 flange bolt and nut M8 flange bolt and nut M10 flange bolt and nut	4(0.4) 9(0.9) 10(1.0) 12(1.2) 26(2.7) 39(4.0)

Please use standard torque if without torque value mentioned below table.

⚠Note: 1. Lubrication oil should be applied on screw thread and contact surface
2. Replace with new ones if self-locking bolts are removed.

Item	Qty.	Thread dia. (mm)	Torque N·m (kgf·m)	Remark
Engine				
Engine mounting bracket bolt	5	5	30(3.1)	
Engine mounting shaft nut	1	14	100(10.1)	
Front wheel, front suspension and steering system				
Steering column lock nut	1	26	100(10.1)	
Handlebar lock screw	4	8	20(2.1)	
Front wheel shaft	1	12	65(6.6)	
Upper lock bolt, shock absorber	2	8	20(2.1)	
Lower lock bolt, shock absorber	4	8	20(2.1)	
Rear wheel and rear suspension				
Rear wheel shaft nut	1	14	100(10.1)	
Upper lock bolt, shock absorber	1	10	40(4.1)	
Lower lock bolt, shock absorber	1	10	40(4.1)	
Brake system				
Mounting bolt, front brake disc	5	8	30(3.1)	
Mounting bolt, front brake caliper	2	10	40(4.1)	
Muffler				
Mounting nut, muffler front exhaust pipe	2	8	26(2.7)	
Mounting nut, muffler body	1	8	20(2.1)	

3.5.2 Tighten Torque Table for Engine

Item	Qty.	Thread dia. (mm)	Torque N·m	Remark
Bolt, crankcase	8	M7	20	
Bolt, crankcase	6	M8	27.5	
Bolt, crankcase	4	M8	35	Flange, with engine oil and MoS2 grease (ratio 10:1)
Bolt, crankcase	6	M9	44	With engine oil and MoS2 grease (ratio 10:1)
Mounting bolt, breather guard	2	M6	10	With thread locker
Mounting stud, cylinder	1	M10	Hand-tighten, height limit	Long thread with thread locker Short thread with engine oil and MoS2 grease (ratio 10:1)
Mounting screw, shaft sleeve press plate (CF188)	1	M6	Hand-tighten	With thread locker
Lock nut, cylinder	1	M10×1.25	Hand-tighten (49)	
Mounting bolt, oil pipe IV (152MI)	2	M6	10	With thread locker
Mounting bolt, breather	4	M6	8	With thread locker
Mounting bolt, lower crankcase cover (152MI)	6	M6	10	With thread locker
Mounting screw, oil shielding plate	2	M6	8	With thread locker
Mounting bolt, trigger	2	M5	6	With thread locker
Low engine oil warning switch	1	R1/8	Hand-tighten (15)	With silicone sealant
Oil relief valve	1	M12×1.25	15	With thread locker
Screw plug, lower crankcase oil rail	1	M6	Hand-tighten, surface	With thread locker
Plug, main oil rail	1	R23/8	20	With thread locker
Mounting bolt, oil filter	1	3/4″ (16 thread/in)	25	With thread locker
Dowel pin, gearshift shaft spring	1	M8	29	With thread locker
Mounting bolt, RH side cover (152MI)	12	M6	12	
Hole cap, timing inspection	1	M12×1.5	Hand-tighten	
Filler plug	1	3/4″	Hand-tighten	
Strainer cover (1P72MM)	1	M35×1.5	Hand-tighten (25)	With engine oil
Mounting bolt, LH side cover (152MI)	11	M6	12	
Mounting bolt, LH side cover (1P52MI)	1	M6	12	
Bolt, engine oil strainer press plate (152MI)	2	M6	10	With thread locker

Item	Qty.	Thread dia. (mm)	Torque N·m (kgf·m)	Remark
Bolt with lip, cylinder head cover (152MI)	1	M6	10	
Bolt, clutch cable bracket (152MI)	1	M6	10	With thread locker
Bolt, cylinder head	5	M10	New bolt 25→54 Old bolt 25→49	With engine oil and MoS2 grease (ratio 10:1)
Bolt, cylinder head	1	M10×1.25	New bolt 25→54 Old bolt 25→49	With engine oil and MoS2 grease (ratio 10:1)
Water temp. sensor (1P52MI-B)	1	M12×1.5	12	
Bolt, camshaft seat (CF188)	8	M6	12	
Bolt, camshaft press plate (CF188)	4	M6	12	
Plug 1/2, cylinder head	3	R21/2	Hand-tighten (40)	With silicone sealant
Bolt, cylinder	1	M8	27.5	With engine oil and MoS2 grease (ratio 10:1)
Inner hex screw, cylinder and cylinder head (1P52MI-B)	2	M6	Hand-tighten (12)	
Bolt, timing tensioner (172MM-B)	2	M6	12	
Bolt, timing sprocket	4	M6	15	With thread locker
Pin shaft	1	M8	20	With thread locker
Bolt, tensioner spring seat	1	M11×1	20	
Mounting bolt, magneto rotor	1	M12×1.25	155	With thread locker
Bolt, crankshaft RPM trigger disc	1	M8	40	With thread locker
Bolt, connecting rod	4	M9×1	40→0→29N•m +30°+70° Final torque: 65N•m~90N•m	With engine oil and MoS2 grease (ratio 10:1)
Bolt, connecting rod	4	M9×1		With engine oil and MoS2 grease on thread and junction surface (ratio 10:1)
Bolt, gearshift drum cam (152MI)	1	M6	12	With thread locker
Neutral gear sensor screw, gearshift cover screw	Each 1	M6	Hand-tighten (5)	With thread locker
Screw, gear case bearing guard 1	1	M6	Hand-tighten (10)	With thread locker
Nozzle, gear case	1	M5	Hand-tighten, limit	No glue

Item	Qty.	Thread dia. (mm)	Torque N·m	Remark
Screw, countershaft fork shaft guard 2	1	M6	10	With thread locker
Bolt, gear case	9	M7	20	With thread locker
Bolt, oil pipe I plate	1	M6	8	With thread locker
Screw, oil pump chain guide (152MI)	1	M6	10	With thread locker
Screw, oil pump chain guide	1	M6	10	With thread locker
Bolt, oil pump assy (152MI)	3	M6	12	With thread locker
Bolt, oil pump sprocket	1	M6 (Left-hand thread)	12	With thread locker
Second gear	1	M20×1.5	80	
Spark plug	2	M10×1	15	
Oil filter	1	M20×1.5	17	With engine oil
Bolt, cylinder head cover	4	M6	10	
Nut, counter pulse	1	M20×1.5	125	With thread locker
Nut, clutch	1	M20×1.5	132	With thread locker
Water pump impeller	1	M6	10	With thread locker
Bolt, isolator	3	M8	34	With thread locker
Bolt, magneto stator	3	M6	12	With thread locker
Bolt, position swing arm	1	M6	12	With thread locker
Neutral gear sensor	1	M10×1.25	15	
Drain bolt	1	M12×1.5	30	
Clutch press spring	5	M6	10	
Tighten bolt, oil pan	10	M6	12	
Speed sensor	1	M5	8	With thread locker
Drain bolt, water pump cover	1	M6	7	
Bolt, starter motor (152MI)	2	M6	12	With silicone sealant
Bolt, clutch cable bracket (152MI)	2	M6	10	With silicone sealant
Screw, gearshift drum press plate	2	M6	5	With thread locker
Other bolts		M5	4.5~6	
		M6	8~12	
		M8	18~25	

3.6 Consumption Materials&Assembling Materials

Consumption materials include lubricant oil (engine oil), lubricant grease (butter) and coolant. Assembling materials include flange sealants, thread locker.

3.6.1 Vehicle Consumption Materials

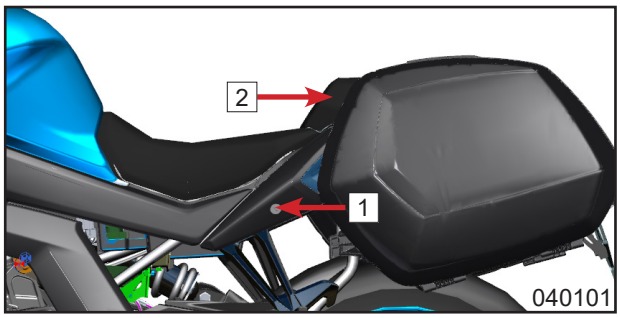
Application areas	Notes	Type
Vehicle's head pipe, bearing races Front wheel dust-proof seal lip Rear brake cam movable parts, cam Junction, dashboard soft shaft Shaft joint, throttle cable Throttle handlebar part Pivot, rear pedal(LH), Pivot, rear pedal(RH), Pivot, side stand Rear fork oil seal lip Counter gear/small gear surface and movable parts Main bracket shaft		Multi-purpose lithium base lubrication oil
Thread of rear wheel axle nut and joint Handle bar inner surface		Engine oil
Lower dust-proof seal lip of front shock absorber		Absorber oil 5#

3.6.2 Engine Consumption Materials&Assembling Materials

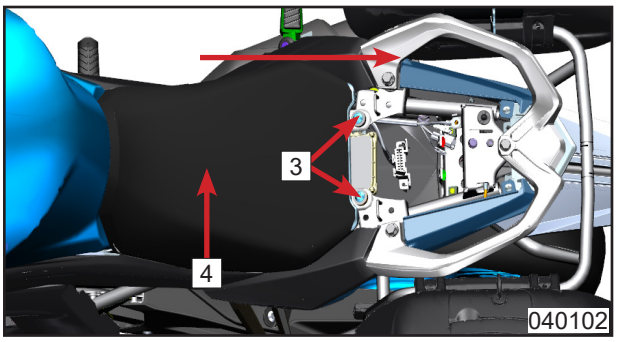
Item	Specification	Using parts	Remark
Lubricant oil	For 4-stroke motorcycle SAE15W-40, API SF or SG	Rotation and moving section in cylinder, crankcase and cylinder head. Details refer to lubricant chart.	Oil Capacity: 2200mL(oil and filter change)
Lubricant oil with molybdenum		Piston pin, valve stem, valve oil seal, camshaft	
Lubricant grease	#3 MoS_2 lithium grease	Oil seal, o-ring and rubber seal face, bearing with sealant	
Coolant	-35°C anti-rust and anti-freeze fluid with high boiling point	Cooling system, water seal installation	Capacity depends on radiator water pipes
Flange sealant		Crankcase faying face , crankcase and cylinder joint cylinder head and cylinder head cover joint	
Tread locker		Parts of thread	

4.1 Seat

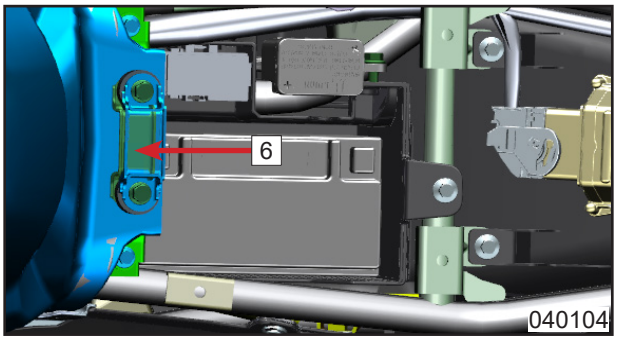
Removal
Insert the key into seat lock 1.
Turn the key clockwise.
Remove rear seat 2.



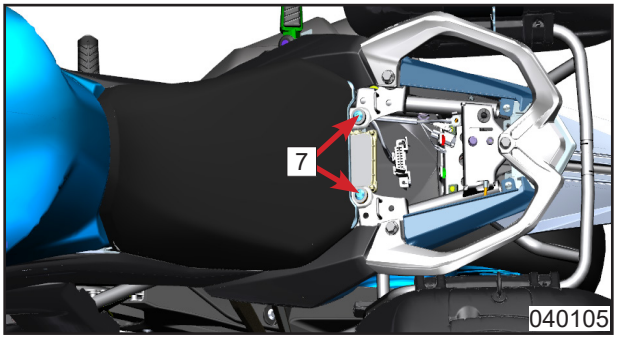
Remove two M6 bolts 3.
Remove front seat 4 from the rear side.



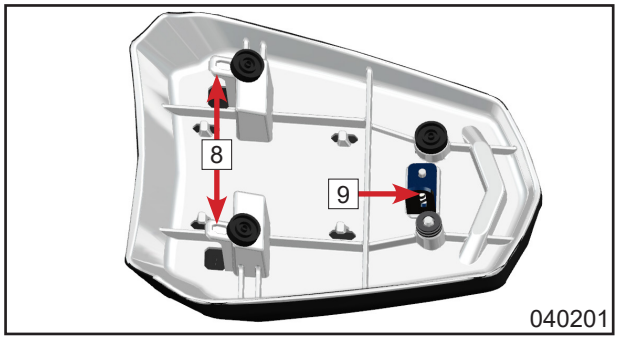
Installation
Insert the seat limit hook 5 into the clasp 6
.



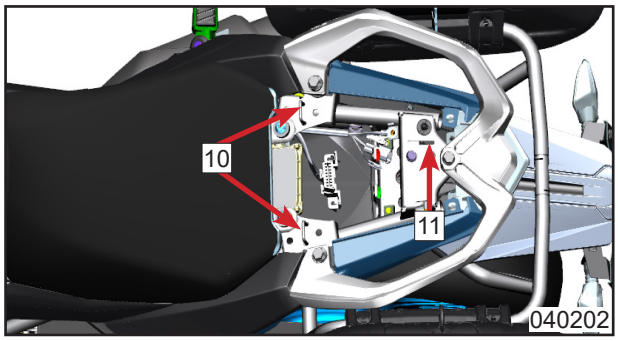
Install two M6 bolts 7.



Insert rear seat limit hook [8] into the clasp [10].



Insert the seat lock hook [9] into the lock seat [11].

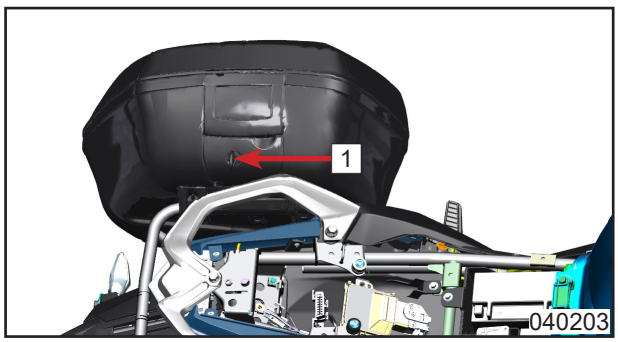


Installation
Reverse the removal procedures for installation.

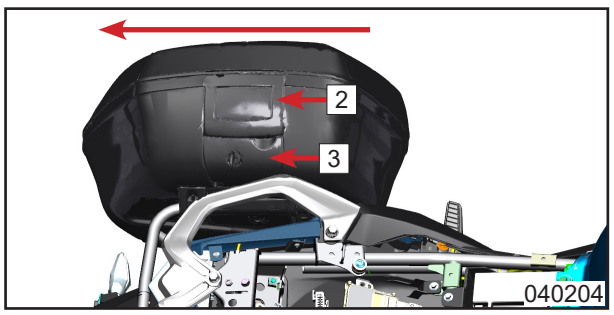
4.2 Side Box

When the vehicle is equipped with side boxes, please follow the procedures for removal.

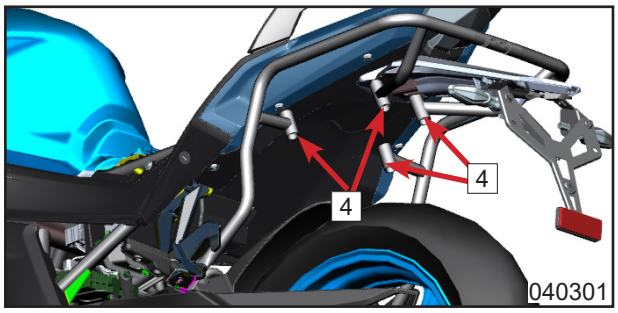
Removal
Insert the key into seat lock [1].
Turn the key clockwise.



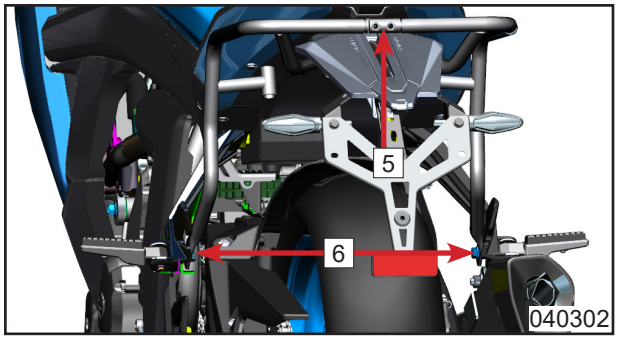
Turn up side box handle [2].
Turn up lock press cover [3].
Push the side box from behind.
RH side box removal refers to LH side box removal procedures.



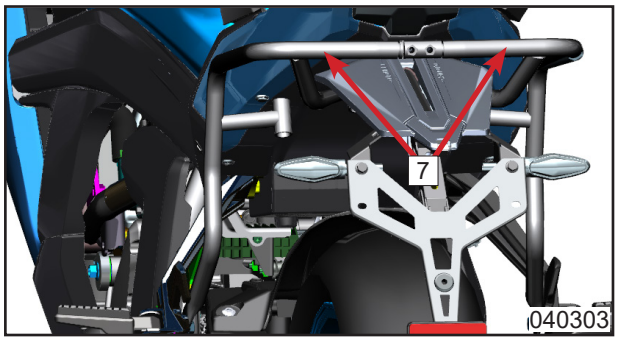
Remove four M8 inner hex bolts [4].



Remove two M8 inner hex bolts [5].
Remove two M8 bolts [6].



Remove side box brackets [7].



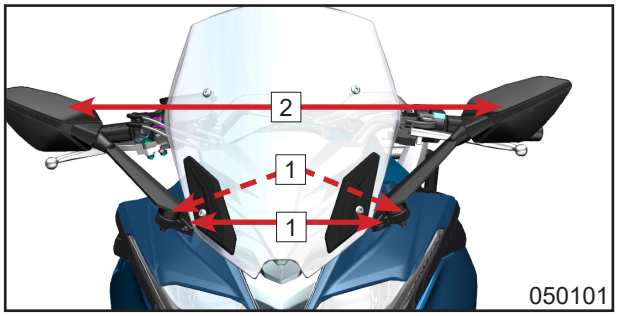
Installation
Reverse the removal procedures for installation.

Danger:
In some situations, the gasoline is highly flammable and explosive.
Do not overfill the fuel tank. When the fuel reaches the neck of the oil filler, it is the maximum capacity.
The engine must be stopped when refueling and must be refueled in a well-ventilated area or outdoors
No smoking, open fire or sparkle in the refueling area or gasoline storage area.
If gasoline spills onto the skin or clothing, wash immediately with soap and water or change the clothes.
Seek medical attention immediately if accidentally contact your eyes or swallow gasoline.

5.1 Headlight Assy

5.1.1 Rear View Mirror

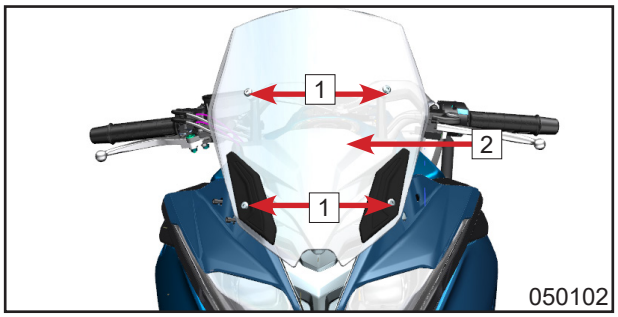
Removal
Remove four M6 inner hex bolts [1].
Remove rear view mirrors [2].



Installation
Reverse the removal procedures for installation.

5.1.2 Windshield

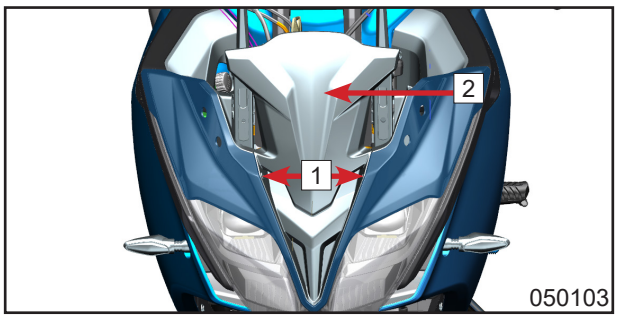
Removal
Remove four M6 inner hex bolts [1].
Remove windshield [2].



Installation
Reverse the removal procedures for installation.

5.1.3 Headlight Upper Plate

Removal
Remove two expansion screws [1].
Remove headlight upper plate [2].



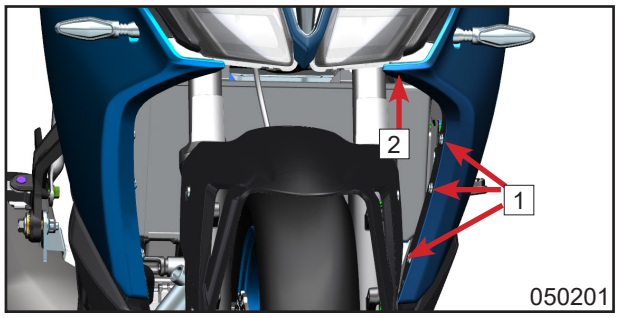
Installation
Reverse the removal procedures for installation.

5.1.4 Reservoir LH Outer Plate

Removal

Remove three expansion screws [1].

Remove screw [2].

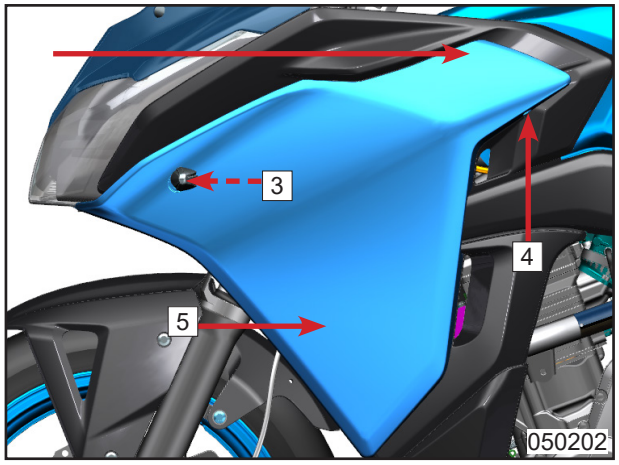


Remove screw [4].

Remove reservoir LH outer plate [5] in the direction of arrow.

Pull out turn light connectors [3].

Reservoir RH outer plate removal refers to LH outer plate removal.



Installation

Reverse the removal procedures for installation.

5.1.5 LH Panel and RH Panel

Removal

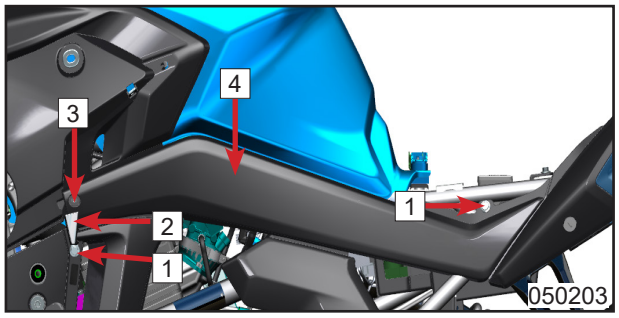
Remove two expansion screws [1].

Remove bolt [2].

Remove damp block [3].

Remove LH panel [4].

RH panel removal refers to LH panel removal.



Installation

Reverse the removal procedures for installation.

5.1.6 Engine Guard

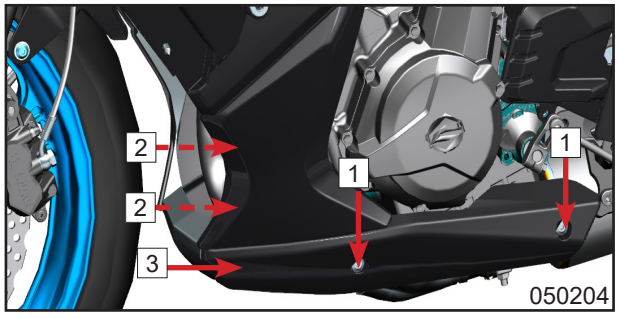
Removal

Remove two M6 inner hex bolts [1].

Remove two expansion screws [2].

Engine RH guard removal refers to LH guard removal.

Remove engine guard [3].



5.1.7 Reservoir LH Inner Plate

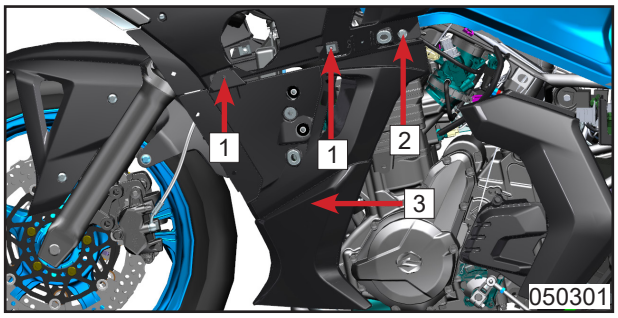
Removal

Remove two M6 bolts 1.

Remove expansion screw 2.

Remove reservoir LH inner plate 3.

Reservoir RH inner plate removal refers to LH inner plate removal.



Installation

Reverse the removal procedures for installation.

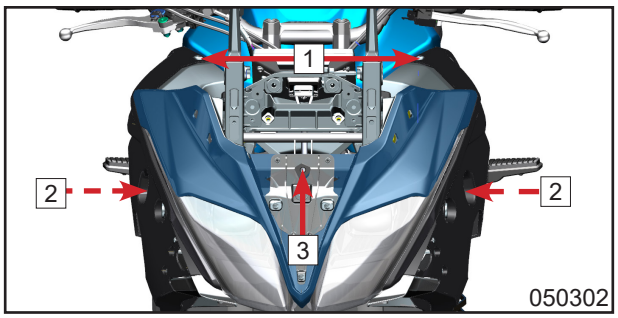
5.1.8 Headlight Assy

Removal

Remove two M6 inner hex bolts 1.

Remove two M6 bolts 2.

Remove bolt 3.

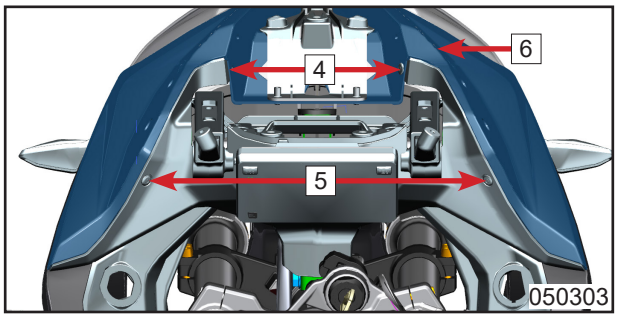


Remove two expansion screws 4.

Remove two expansion screws 5.

Remove headlight assy 6.

Disconnect connectors between headlight and main cable.



Installation

Reverse the removal procedures for installation.

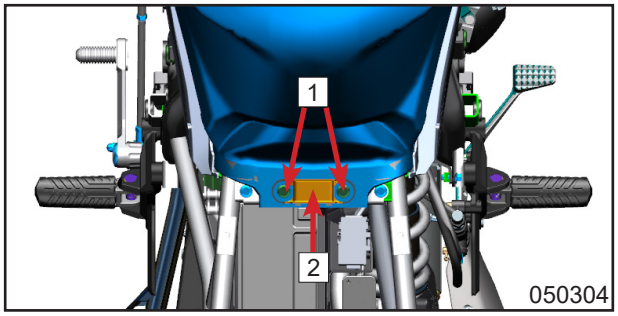
5.2 Fuel Tank

⚠ Note: Fuel tank inversion is forbidden. Otherwise, the fuel will leak from fuel tank cover.

Removal

Remove two M6 bolts 1.

Remove seat hook 2.



Lift the rear part of the fuel tank 3.

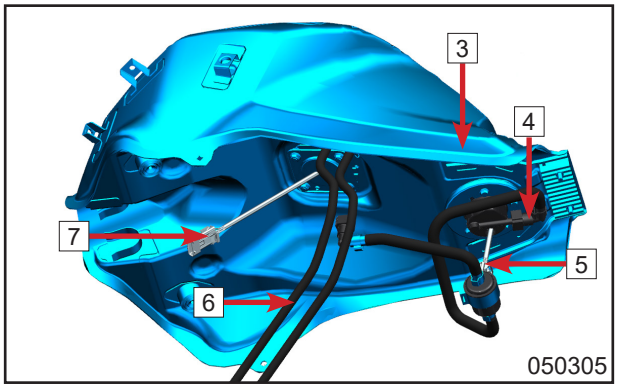
Pull out high-pressure hose quick joint 4.

Disconnect fuel pump connector 5.

Remove fuel level sensor 7.

Remove adsorption tube 6.

Remove fuel tank 3.



Inspection
If fuel tank and fuel hose has crack, age, leakage or other deflective factors, replace in time.

Installation
Reverse the removal procedures for installation.

⚠ Note: When installing fuel tank, all hoses, pipes and cables can not be extruded.

6.1 Maintenance Information

6.1.1 Operation Caution

⚠Warning:
·Headlight bulb has big power and will be very hot when it is turned on. Do not touch it after it is just turned off. Operation should be done when the bulb is cooled down
·The temperature of headlight is quite high when turned on. Replacing with bare hand or stained glove will cause oil stains on the glass face which may form hot spot and cause deformation of glass face and damage to bulb.
·Pay attention to the followings when replacing the bulb:
-Do not replace the bulb when it is turned on. Keep ignition switch in the OFF position, and replace after the bulb is cooled down.
-Replace the bulb with hands in clean gloves to avoid oil stains on the glass surface.
-Clean the glass with a clean rag dipped in alcohol or isoamyl acetate in case of any oil stains on the glass surface.
·If the Inspection has to be done check if the battery is normal.
·Inspection of switch continuity can be done without removing the switches from the vehicle.
·After the inspecting and overhauling of each part, cables and wires should be routed properly.

6.1.2 Inspection Standard

Item		Standard
Fuse	Main fuse	30A
	Auxiliary fuse	1×7.5A 1×10A 5×15A
Light&Bulb	Headlight (Hi/Lo)	12V-14.4/13.3W
	Position light	LED
	Tail light	LED
	Turn light	LED
	License light	LED

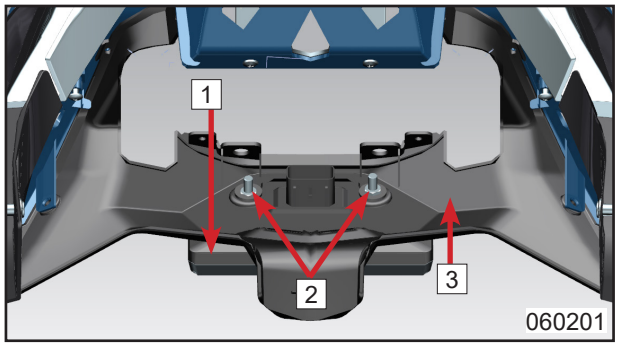
6.2 Trouble Shooting

Head light cannot turn on, Hi/Lo switch doesn't work:

Fuse is blown
Switch is damaged
Bulb is burnt
Battery bad connection or no electricity
Wire connector loosen

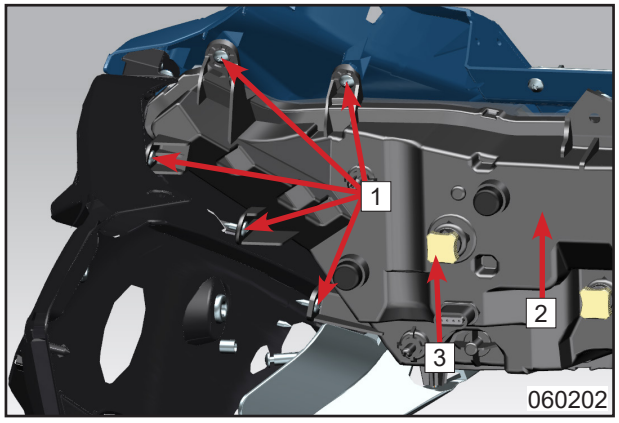
6.3 Dashboard

Removal
Remove body covering parts first according to the Chapter 5.
Disconnect dashboard connectors.
Remove dashboard lover cover [3].
Remove two M6 nuts [2].
Remove dashboard [1].
Installation
Reverse the removal procedures for installation.



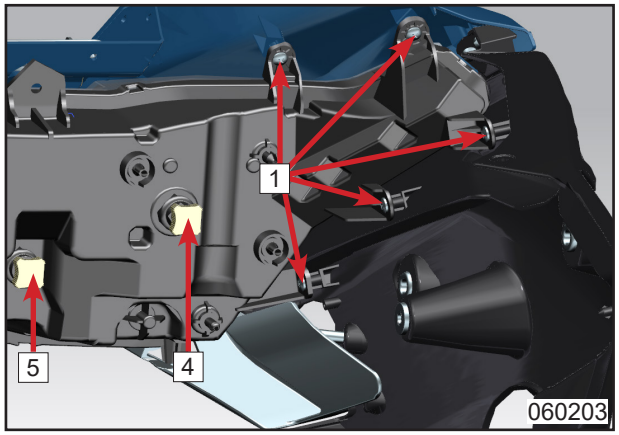
6.4 Headlight Body

Removal
Remove the headlight assy first according to the Chapter 5.
Remove ten cross screws [1] on both sides.
Remove headlight body [2].
Installation
Reverse the removal procedures for installation.



Adjust the light angle and height of low-beam and high-beam by LH low-beam adjusting button [3], RH low-beam adjusting button [4] and high-beam adjusting button [5].

⚠Note: When headlight damages, replace the whole set.



6.5 Turn Light

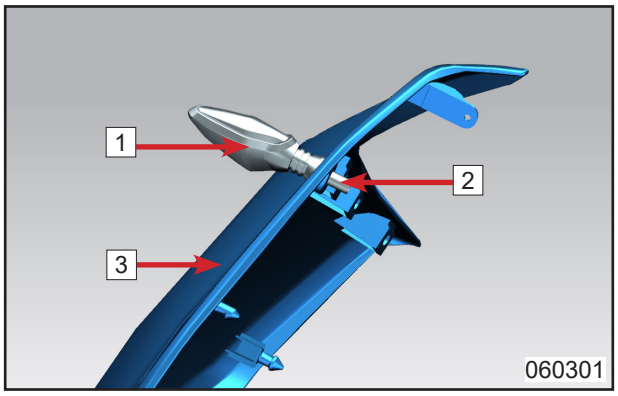
Removal

Remove reservoir outer plate 3. (See Chapter 5 Reservoir Outer Plate removal)

Remove M5 nut 2.

Remove turn light 1.

⚠Note: The turn light is consisted of LED lights. When the light damages, replace the whole set.



Installation

Reverse the removal procedures for installation.

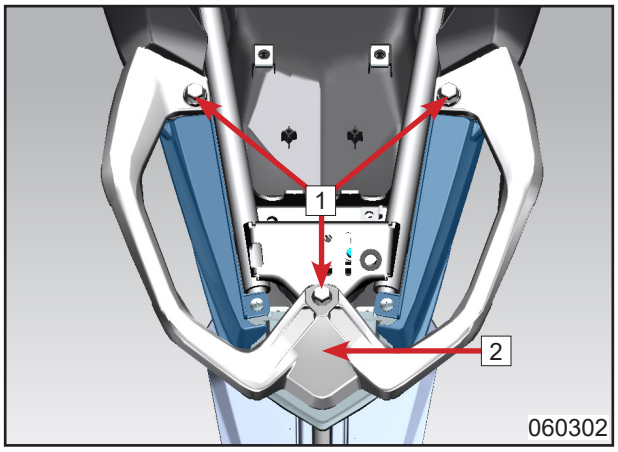
All turn lights follow the same procedures to remove and install.

6.6 Tail Light/Brake Light

Rear Armrest

Remove M8 bolts 1.

Remove rear armrest 2.



Tail Light/Brake Light

Removal

Remove cross screws 1.

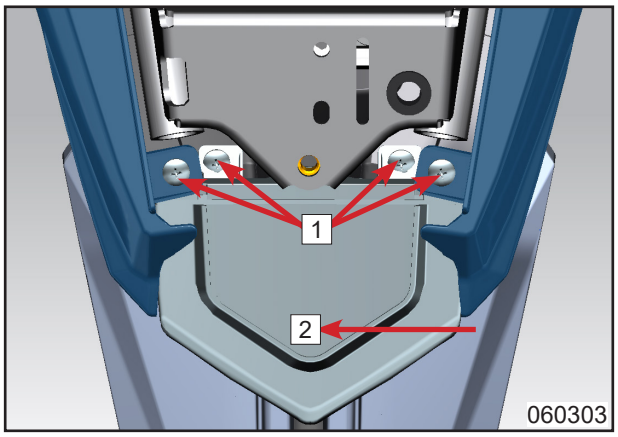
Disconnect connectors with the main cable.

Remove tail light 2 from behind.

Installation

Reverse the removal procedures for installation.

⚠Note: The tail light is consisted of LED lights. When the light damages, replace the whole set.

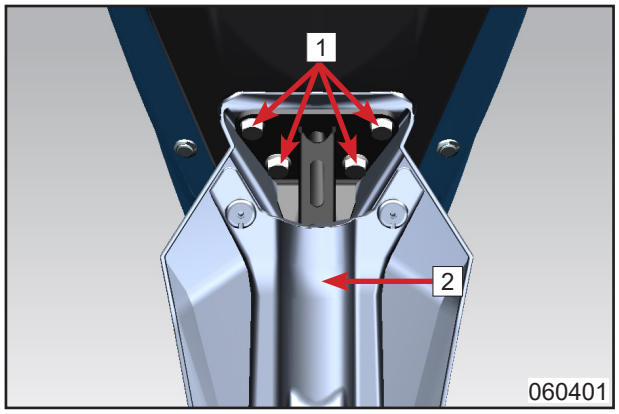


6.7 Rear License Light

Removal

Remove four M6 bolt [1].

Remove rear fender [2].

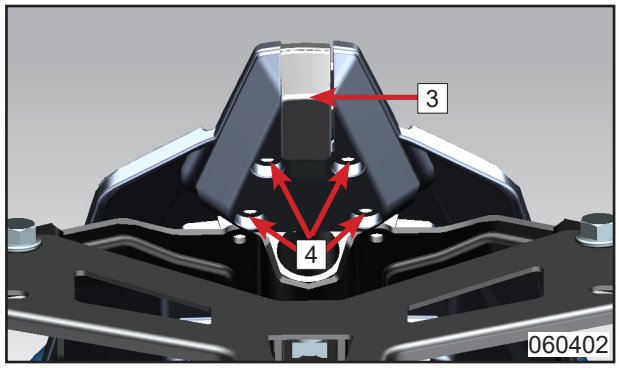


Remove four cross screws [4].

Disconnect connectors with the main cable.

Remove rear license light [3].

⚠ Note: The license light is consisted of LED lights. When the light damages, replace the whole set.

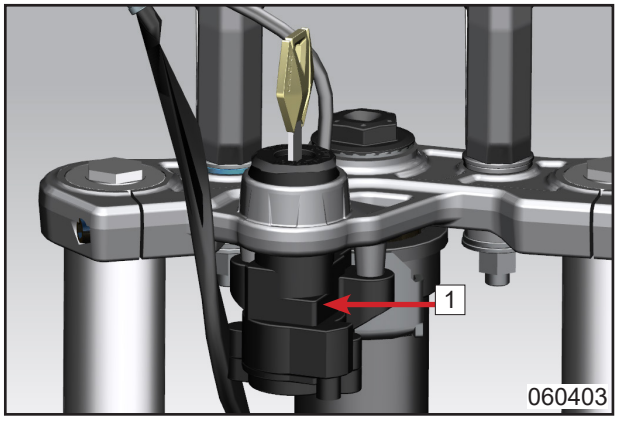


6.8 Ignition Switch

Inspection

Pull out the connectors between ignition switch [1] and main cable to check its performance.

Action/Color	G	B W	R	B
			●	●
	●	●		
	●	●		

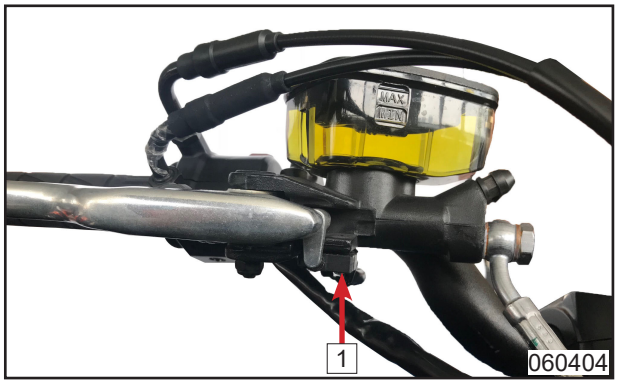


6.9 Front Brake Light Switch

Pull out the connectors between front brake light switch [1] and main cable to check its performance.

1) Grip front brake lever, the brake light is on.

2) Loosen front brake lever, the brake light is off.

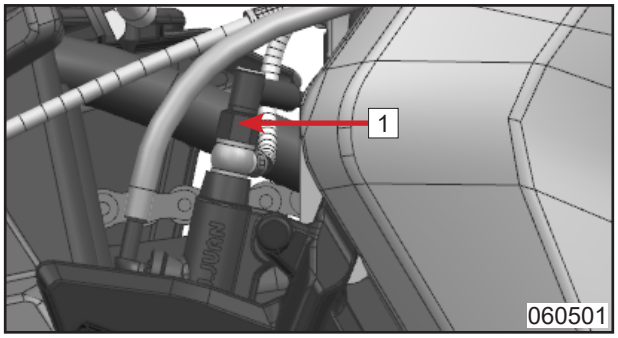


6.10 Rear Brake Switch

Pull out the connectors between rear brake light switch [1] and main cable. Inspect rear brake switch for its performance.

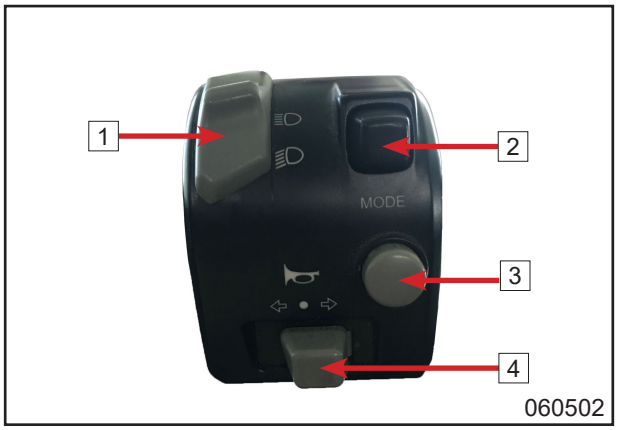
1) Press rear brake pedal, the rear brake light is on.

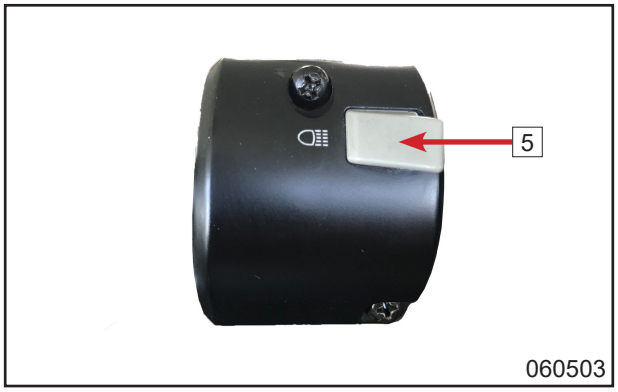
2) Loosen rear brake light is off.



6.11 LH Handlebar Switch

Pull out the connectors between LH handlebar switch [1] and main cable to check its performance.





Dimmer switch [1]

Color / Action	W L	Br W	B W	Br	G
≡D	●	●			
≡D	●	●	●	●	●

R

Mode Switch [2]

Color / Action	Lg/G	G	Br	G
MODE（ON）	●	●	●	●
MODE（OFF）			●	●

R

Horn switch [3]

Color / Action	B Br	Lg	Br	G
🔊	●	●	●	●

R

Turn switch [4]

Color / Action	O	Gr	Sb	Br	G
⇦	●	●		●	●
⇨		●	●	●	●

R

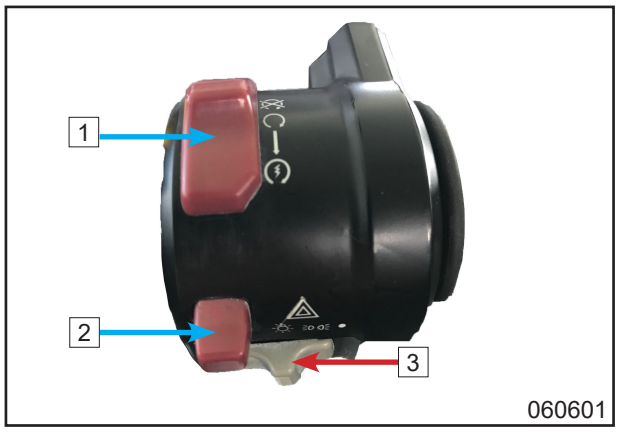
Override switch [5]

Color / Action	B Br	Br W	Br	G
≡D	●	●	●	●

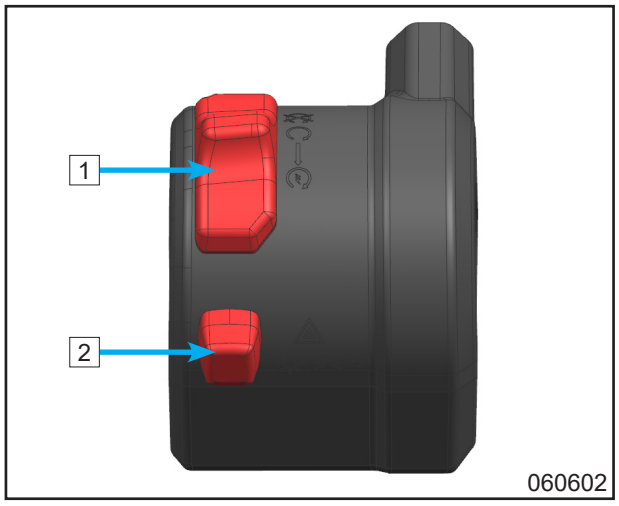
R

6.12 RH Handlebar Switch

Pull out the connectors between RH handlebar switch 1 and main cable to check its performance.



CN



EU

Stop switch slider 1				
Color / Action	Br B	B Br	Br	G
⊗			●	●
↺	●	●	●	●

R

Start switch slider 1				
Color / Action	Br B	Y R	Br	G
⚡	●	●	●	●

R

Warning switch 2					
Color / Action	O	Gr	Sb	Br	G
△ (ON)	●	●	●	●	●
△ (OFF)				●	●

R

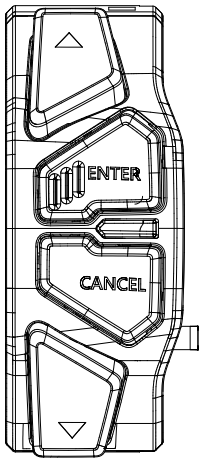
Illumination switch slider 3					
Color / Action	Br	W G	W L	Br	G
●				●	●
≡D○≡	●	●		●	●
☼	●	●	●	●	●

R

6.13 Instrument Switches(2022)

Instrument Switches						
Color / Function	G	B/W	L	GR	L/W	BR
▲	●	●				●
ENTER	●		●			●
CANCEL	●			●		●
▼	●				●	●

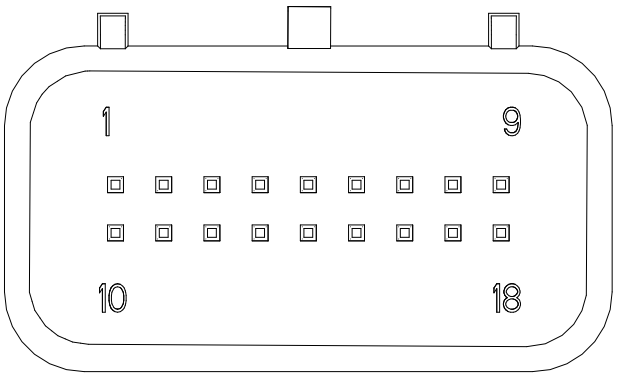
R



6.14 Instrument

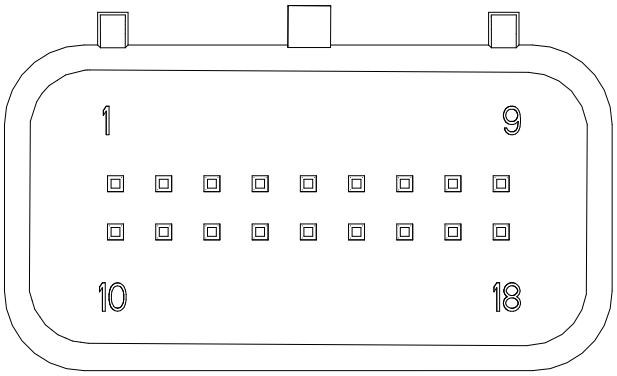
6.14.1 400-5 650-8

接线定义	
线脚	接口定义
1	模式开关
2	机油压力报警
3	转速信号
4	K-LINE
5	ON 档电
6	常电
7	接地 GND
8	输出空档信号给 ECU
9	ABS 指示灯
10	车速信号
11	档位信号
12	油量信号
13	电喷故障信号
14	
15	左转向灯
16	背景光电源 / 位置灯
17	远光灯
18	右转向灯



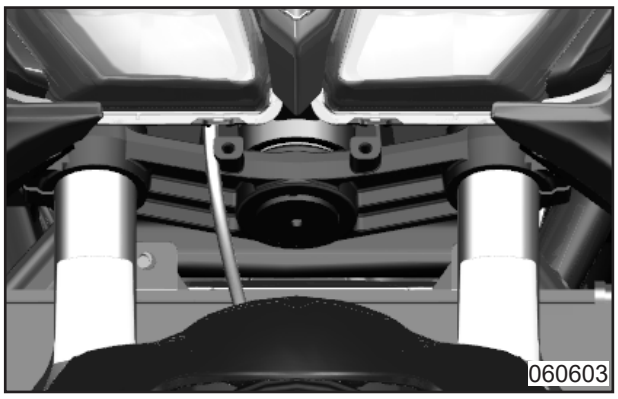
6.14.2 400-5F 650-8F (2022)

接线定义	
线脚	接口定义
1	电源正极
2	电门锁
3	电源负极
4	档位信号
5	手把开关：向上
6	手把开关：向下
7	手把开关：确认
8	手把开管：返回
9	左转向灯信号
10	右转向灯信号
11	位置灯信号
12	远光灯信号
13	油量信号
14	机油压力信号
15	ABS 信号
16	EFI 故障灯
17	CAN-H
18	CAN-L



6.15 Horn

Pull out horn connector. Connect with 12V battery to check If the horn works well and the sound is loud and clear. Otherwise, replace with a new horn.



6.16 Fuel Level Sensor

Removal

Remove four M6 mounting nuts [1].

Remove fuel lever sensor [2].

⚠Note: Remove fuel level sensor slowly, in case it deforms.

Inspection

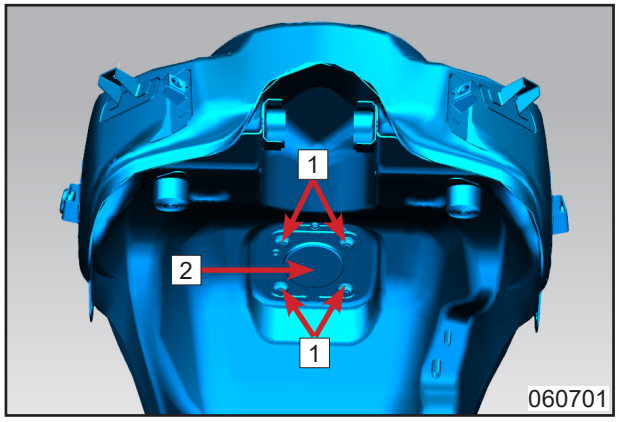
Inspect fuel level sensor seal ring [3] for deformation, damage or hardening. Replace if it does.

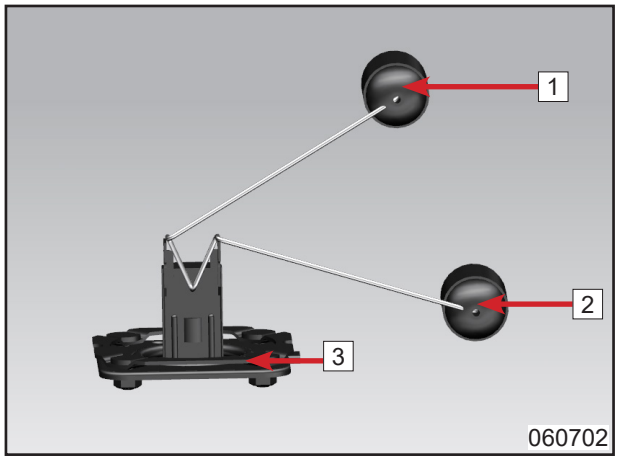
Check the electrical resistance of the oil level sensor at high and low poles.

Resistance:

High: 4~10 Ω

Low: 90~100 Ω



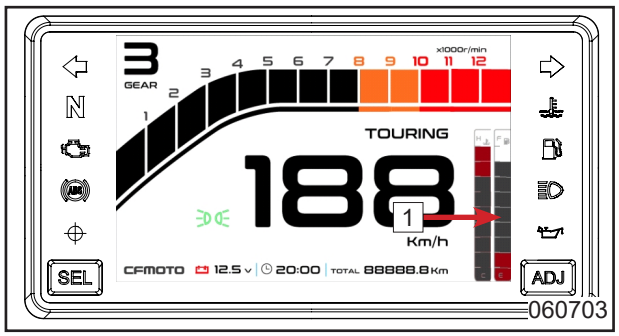


1	High	2	Low

Connect fuel level sensor and main cable. Turn on ignition switch, the floater of fuel level sensor swings up and down slowly. See the fuel gauge pointer on dashboard.

If the pointer can not reach F or E, it means the fuel gauge is not qualified, replace a new one.

If the pointer swings unsteadily, it means the fuel gauge is not qualified, replace a new one.



Installation

Reverse the removal procedures for installation.

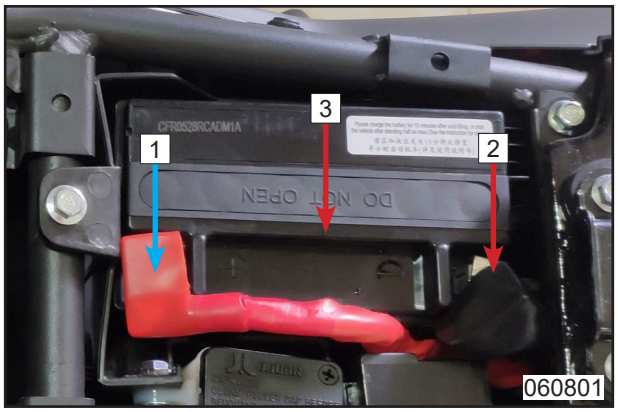
⚠Note: Check leakage after fuel level sensor installation.

6.17 Battery

⚠Warning:
1. Battery acid and gas will produce serious corrosion, avoid contacting with battery acid and gas.
2. Keep batteries out of reach of children.
3. When battery acid contacts skin, wash with plenty of water. If battery acid enters the eye, flush with water for at least 15 minutes and seek for medical help.

⚠Note:
1. Please wear protective clothing and goggles. Keep the battery away from sparks and open fire. Only charge the battery in a well-ventilated room.
2. Do not mis-connect the positive and negative pole of battery. Remove the negative wire first if disassembling battery, in case it damages electrical elements. The system of this vehicle uses negative earth mode.
3. Battery wires are not allowed to be removed while the engine is working.
4. Battery positive/negative wires and electrical control units have to be removed before welding on the vehicle.
5. It is forbidden to puncture the wire to test the input/output electrical signals.
6. Establish the awareness of environmental protection and effective disposal of waste generated during maintenance.

Removal
Remove seat.
Remove battery negative wire fixing bolt.
Remove negative wire [1] from the battery.
Remove battery positive wire fixing bolt.
Remove positive wire [2] from the battery.
Remove battery [3].



⚠Warning: Negative wire must be removed first. Otherwise, it will cause battery short circuit.

Installation
Reverse the removal procedures for installation.

⚠Note:
1. Even if the battery is not used, it also loses power every day.
2. Charging condition and charging mode are very important for the service life of the battery. Using high charging current will have a negative impact on the service life.
3. If the charging current, charging voltage and charging time are exceeded, the battery will be damaged.
4. If the battery becomes empty due to repeated start of the vehicle, it needs to be charged immediately.
5. When the battery is stored in the discharge condition for a long time, deep discharge and sulfuric acid salination will occur, which damages the battery.
6. The battery does not need to be maintained, which means the acid level does not need to be checked.

Charge

Shut down all the electrical devices and engine.
Remove battery.
Connect charger and battery.
After charging, remove the charger from the battery.

⚠Note: If the vehicle is not used, recharge the battery every three months.

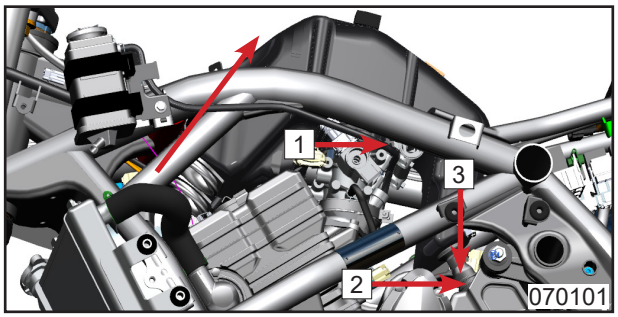
Charging Voltage Inspection
The battery has proper performance and is fully charged.
Start the vehicle and measure the voltage.
Measuring point is positive pole (+), the other measuring point connects ground (-).

Charging Voltage	
5000rpm	13.5V~15.0V

If less than specification:
Inspect the connectors between engine and regulator.
Inspect the connectors between regulator and cables.
Inspect engine electronic winding.
If more than specification:
Replace regulator.

7.1 Air Filter

⚠Note: Check air filter every 12,000km. Clean or replace it if necessary. The Air filter maintenance should be more frequent when in severe environment.



Removal

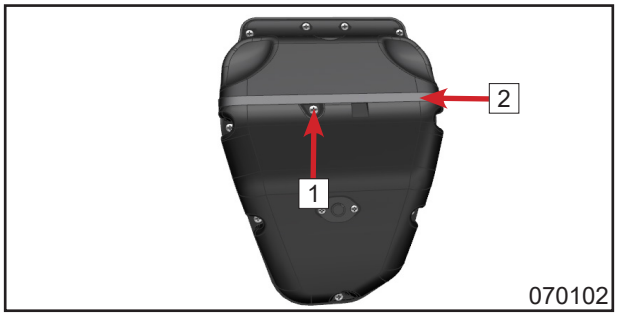
Loose two clasps [1].
Loose Clamp [2].
Remove breather hose [3].

Remove the air filter [5] in the direction of the arrow.

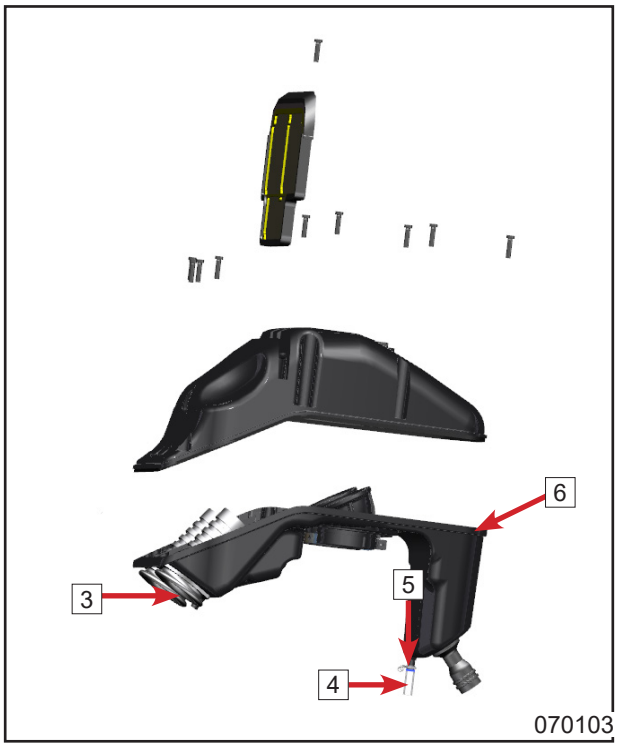
Inspection

If air filter has jams, less air input, lower power, increasing fuel consumption, inspect and clean air filter following the procedures below:

•Loose screw [1].
•Remove filter element assy [2] from air filter.
•If there is too much dirty in filter element [2], use high-pressure air to clean it.
•Inspect air filter element for damage. Replace if necessary.



⚠ Note: Keep filter element clean during operation. Engine quickens damaged if working without, or with dirty or broken filter. Frequently clean filter, if working in dirty situation.



•Check the air intake pipe [3]. If dust in it, clean it by detergent.
•Check oil storage hose [4] if engine oil remains. If it does, remove clamp [5] and oil storage hose [4] and clean up the engine oil in hose.
•Check if seal ring [6] of air filter breaks. If it does, replace a new one.

Installation

Reverse the removal procedures for installation.

⚠ Note: Ensure all parts be fixed and sealed reliably.

8.1 Service Tool

Tool: PDA

Function:
Read erase trouble code of EFI system, observe data flow and accessories test etc.

080201

Tool: Digital multimeter

Function:
Inspect the parameter of EFI system like voltage, current and resistant etc.


080202

Tool : Vacuum gauge

Function:
Inspect the pressure of air inlet hose.


080203

Tool: Ignition timing light

Function:
Inspect ignition timing of the engine.


080301

Tool: Cylinder compression gauge

Function:
Inspect the cylinder pressure of the engine


080302

Tool: Oil pressure gauge

Function :
Check the pressure of fuel system and judge the working condition of fuel pump and oil pressure regulating valve in fuel system.


080303

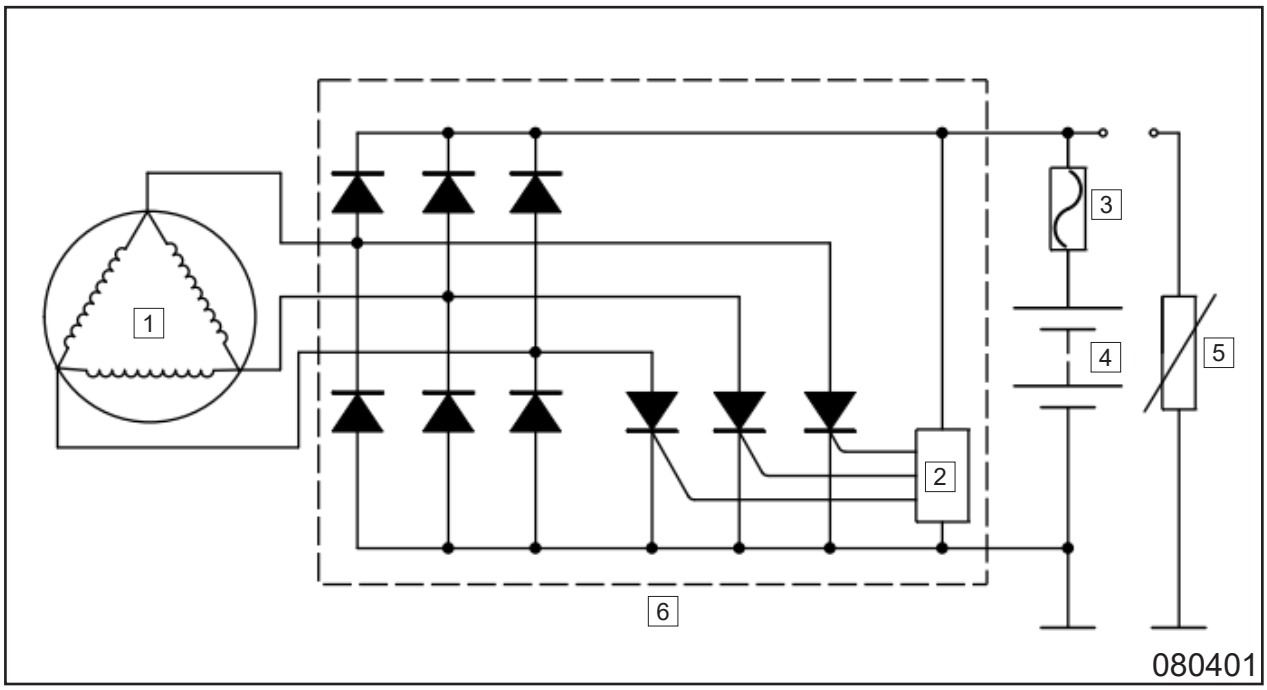
Tool: Fuel injector cleaning analyzer

Function:
Analyze the cleaning of fuel injector.

080304

8.2 Charging System

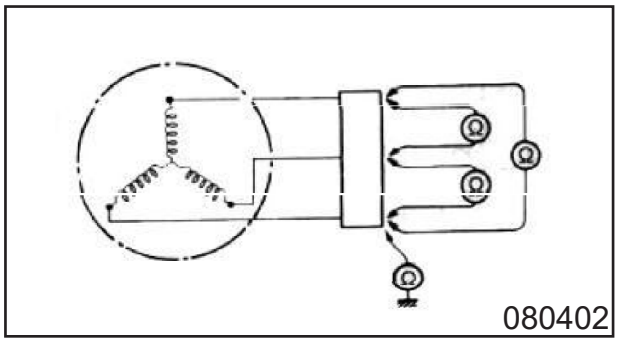
8.2.1 Charging Diagram



1	Magneto	3	Fuse	5	Load
2	Stable Voltage	4	Battery	6	Regulator

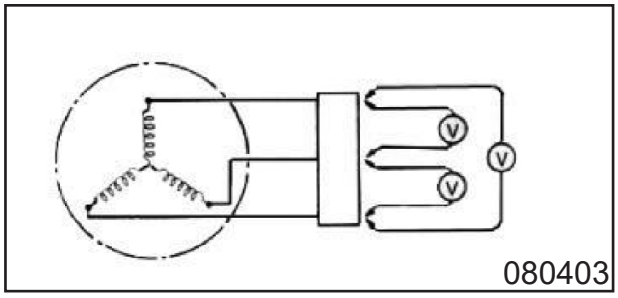
8.2.2 Magneto Coil Resistance

●Measure 3-phase magneto stator coil resistance.
●If the resistance is out of specification, replace with a new stator.
●Check for the insulation between stator coil and core.
Turn multimeter to 1×10Ω
MAG Coil Resistance:
0.5Ω~1.5Ω (Yellow-Yellow)
Resistance between Stator Coil and Core:
∞Ω (Yellow-Ground)

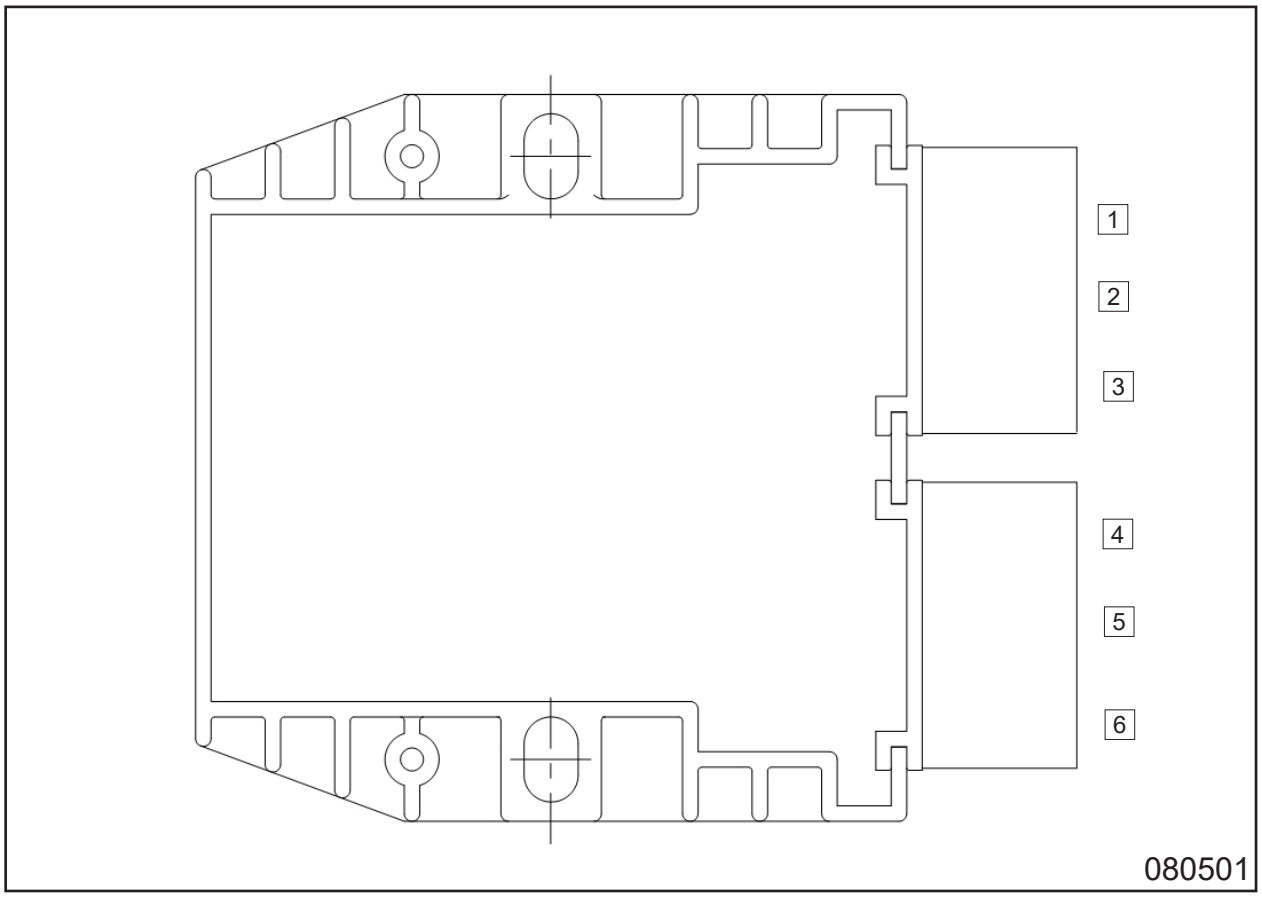


8.2.3 MAG Non-loaded Performance

●Start the engine and allow it run at 5000r/min. Use multimeter to measure the voltage between 3 output lines.
●If the reading is below specification, replace with a new magneto.
Turn Multimeter to **V(AC)**.
Voltage between Output Lines When MAG Non-loaded:
>50V(AC) at 5000r/min



8.2.4 Regulator

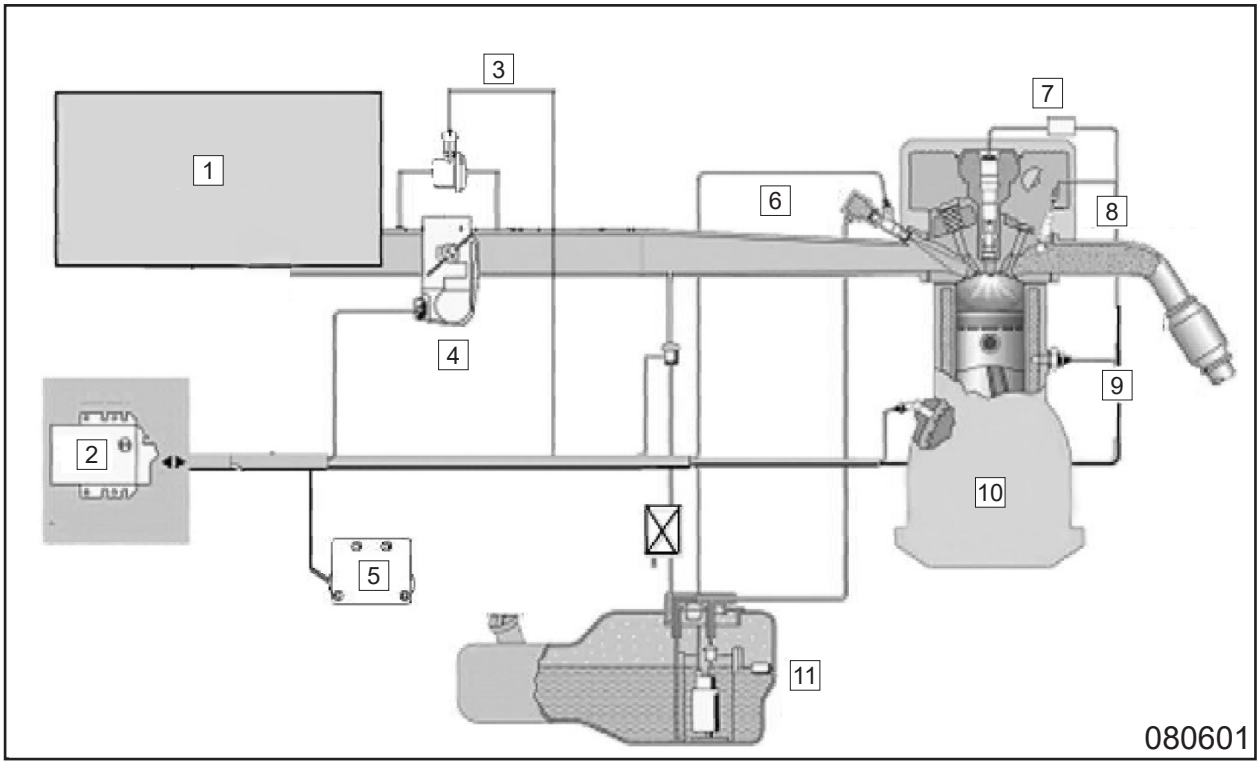


1	IN3	2	IN2	3	IN1	4	OUT	5	NC	6	GND

After engine running and at the state of battery full charged, of which the RPM is about 5000r/min, if the voltage between positive and negative terminal exceeds 15V or is lower 13.5V, replace with a new regulator.

8.3 EFI

8.3.1 EFI Structure



1	Air filter	5	Roll-over sensor	9	Water temp. sensor
2	ECU	6	Injector	10	Trigger
3	Stepping motor	7	Ignition coil	11	Fuel pump assy
4	Throttle body	8	Oxygen sensor		

8.3.1.1 Sensors

A sensor is a device that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument. Sensors in EFI system include:

Air pressure sensor (Air density and pressure information)
Air temp. sensor (Air density information)
TPS (Load, load range, speed information)
Trigger (crankshaft information)
Water temp. sensor (engine temp.)
Speedometer sensor (Output shaft RPM information)
Oxygen sensor (Air factor= λ >1 or <1)
Roll-over gear sensor (Output vehicle gradient information)

8.3.1.2 ECU

Electronic Control Unit, the brain of EFI system,which determines the amount of fuel injection, ignition timing and other parameters a engine needs to keep running by calculating and analyzing values provided by sensors.

8.3.1.3 Actuators

Actuators execute the EFI instruction. Main actuators include:

●**Fuel Pump** (Provide high-press fuel)
●**Fuel Injector** (Inject the fuel to make it spray better)
●**Ignition Coil** (Provide high ignition energy to spark plug)
●**Idle Air Control Valve** (Provide idle inlet air)

8.3.2 EFI System Maintenance Notice

●Always use genuine CFMOTO parts for maintenance. Otherwise it can not assure a normal performance to EFI system.

●During the maintenance procedure, never try to break down the EFI components.

●In the course of maintenance, EFI parts must be handled carefully.

●Ignition switch must be shut off before connecting or disconnecting connectors. Otherwise, it may cause the EFI parts damage.

●When removing fuel pump from fuel tank, do not energize the fuel pump. Otherwise, a spark can cause a fire.

●Fuel pump is not allowed to operate in a dry environment or under water. Otherwise, its life would be shortened. Besides, reverse connections between positive and negative terminal of fuel pump is not permitted.

●The fuel pressure in EFI fuel supply system is very high (about 330kPa), accordingly, all fuel lines are high pressure resisting. Even if the engine is not running, the fuel pressure is high. Therefore, do not disassemble the fuel line unless it's necessary.

When the fuel line needs to be repaired, release the fuel pressure as follow shows:

Remove fuel pump relay, start the engine and allow it to idle until the engine stalls automatically.

Fuel line removal and fuel filter replacement should be practiced by a professional person in a well-ventilated place.

●If possible, don't do the spark test. If spark test is done unavoidably, try to complete the test as soon as possible. Besides, don't open the throttle, otherwise, a large quantity of unburnt fuel would enter muffler, causing the catalytic converter damage.

●Idle speed is controlled by ECU, so it's unadjustable. The throttle limiter screw has been adjusted by manufacturer before sale. Therefore, it's not recommended to adjust it by the user.

●Don't reverse the battery cable connections. This may damage electrical components.

●Never remove the battery cables When the engine is running.

●Always remove cables and electrical control units which are connected with battery terminals.

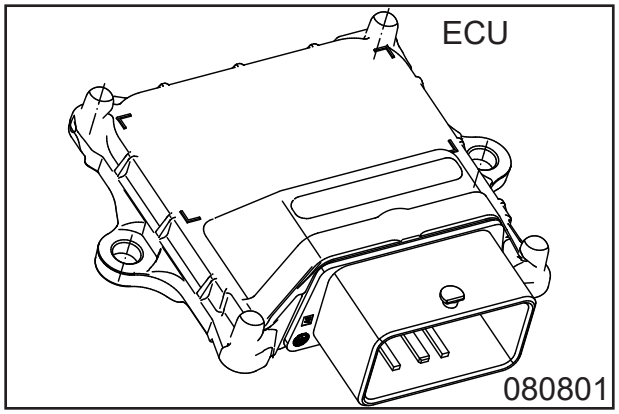
●Never test the component input and output electric signal by piercing the cable plastic jacket.

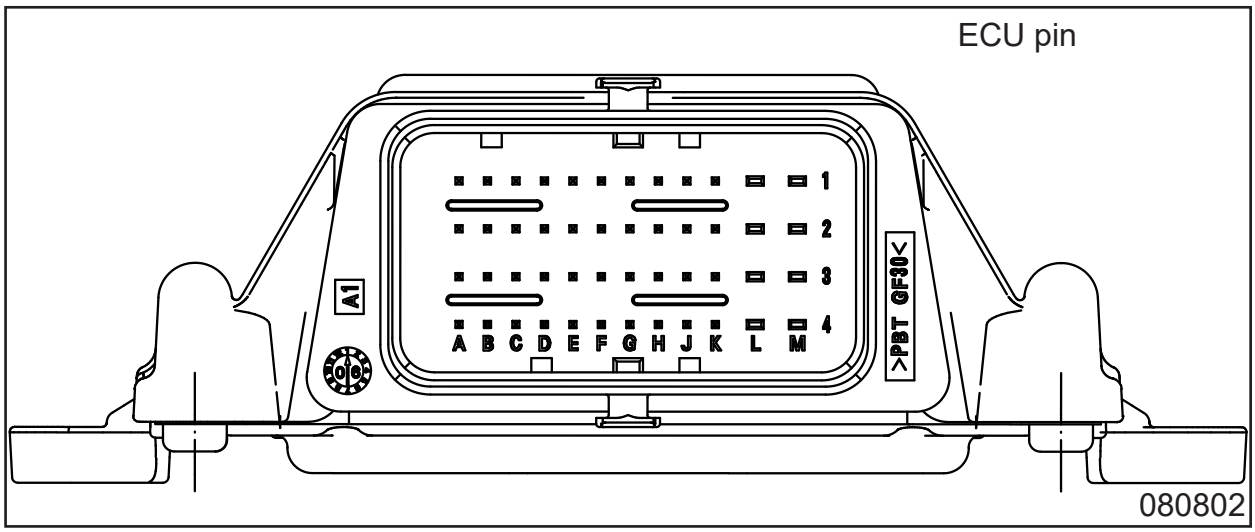
●Respect the environment and dispose of the waste left during maintenance.

8.3.3 Structure and Performance of EFI Parts

8.3.3.1 ECU

Electronic control unit , is the brain of EFI system. It analyzes and cope with the information provided by sensors, and send the conclusion in the form of instruction to actuator, then make the engine run in the optimal condition.





ECU pin function:

1(M1)	Oxygen sensor heated 2	17(B1)	Stepping motor phase D	33(F3)	Uninterrupted battery (UBD)
2(L1)	Oxygen sensor heated 1	18(A1)	Stepping motor phase C	34(E3)	K-line
3(M2)	Ignition 1	19(K2)	Oxygen sensor signal 1	35(D3)	Neutral switch
4(L2)	Unused	20(J2)	Oxygen sensor signal 2	36(C3)	Ignition diagnosis 1
5(M3)	Ignition to ground	21(H2)	Ignition diagnosis 2	37(B3)	Clutch switch
6(L3)	Unused	22(G2)	Unused	38(A3)	Roll-over switch
7(M4)	Ignition 2	23(F2)	Side stand switch	39(K4)	Touring/Sport mode switch
8(L4)	Interruptible battery UBR1	24(E2)	Unused	40(J4)	RPM output
9(K1)	Intake air pressure sensor 1 (DS)	25(D2)	Unused	41(H4)	Speed sensor
10(J1)	Sensor to ground 1	26(C2)	Starter relay	42(G4)	RPM sensor B
11(H1)	Intake air temp. sensor (TANS)	27(B2)	Stepping motor phase A	43(F4)	RPM sensor A
12(G1)	TPS (DKG)	28(A2)	Stepping motor phase B	44(E4)	Headlight relay
13(F1)	Engine temp. sensor (TMOT)	29(K3)	MIL	45(D4)	Fan relay
14(E1)	Main relay	30(J3)	5V output 1	46(C4)	Fuel pump relay
15(D1)	CANL	31(H2)	Unused	47(B4)	Fuel injector 2
16(C1)	CANH	32(G3)	Ignition switch KL15	48(A4)	Fuel injector 1

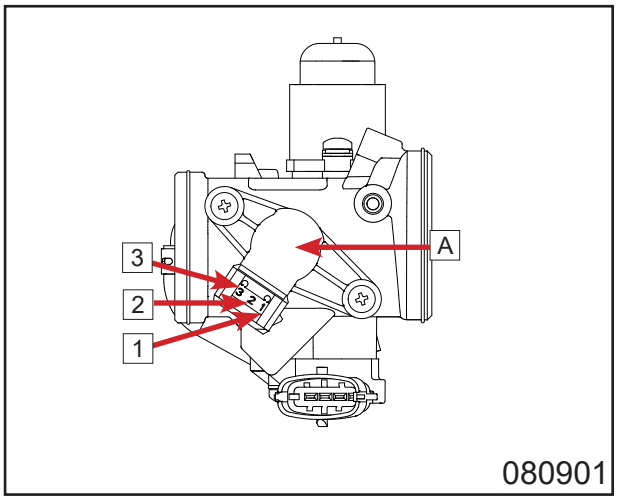
Limit Data:

Item		Value			Unit
		Min.	Standard	Max.	
Battery voltage	Normal	9	14±0.1	16	V
	Limit function	6.0~9.0		16.0~18.0	V
Limit and time of battery over voltage	26.0V	Keep part of function, can diagnose the trouble		5	min
Working temperature		-40		70	°C
Storage temperature		-40		70	°C

⚠Note: It is not allowed to load on housing or cover. Gently handle it. Do not drop it on the ground.

8.3.3.2 Throttle Body

Connect with air filter and the engine, control the on-off angle of throttle by throttle cable. Send out the angle signal through TPS to ECU.



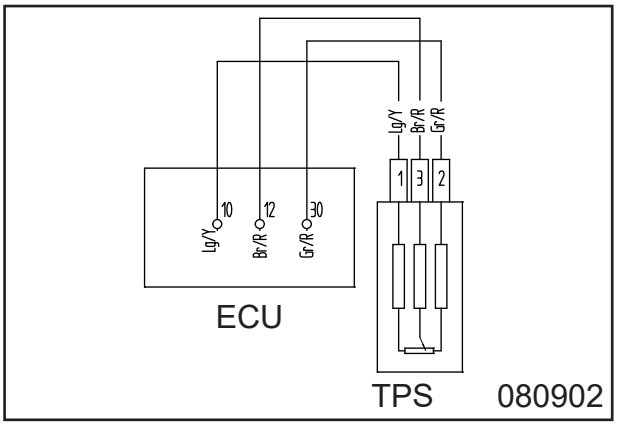
080901

Pin Function:

1 connects ECU pin 10 (ground).
2 connects ECU pin 30 (5V power).
3 connects ECU pin 12 (output voltage signal).

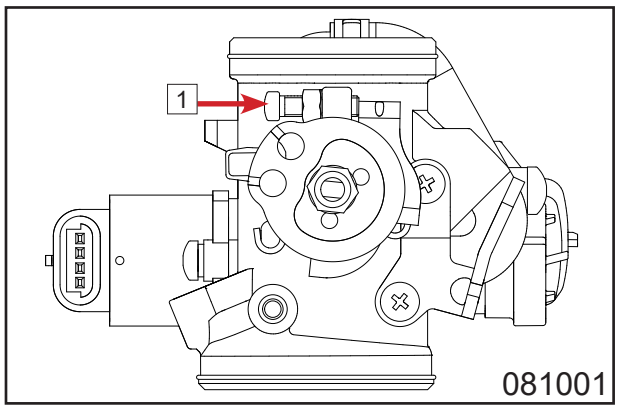
A TPS

ECU connection circuit:



080902

⚠Note: Engine idle is completely controlled by EFI system. Do not adjust idle limit screw [1] manually.
It is not allowed to load on housing or cover. Gently handle it. Do not drop it on the ground.

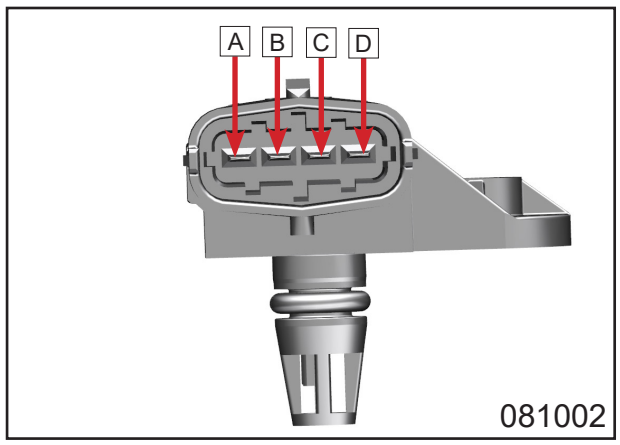


8.3.3.3 T-MAP

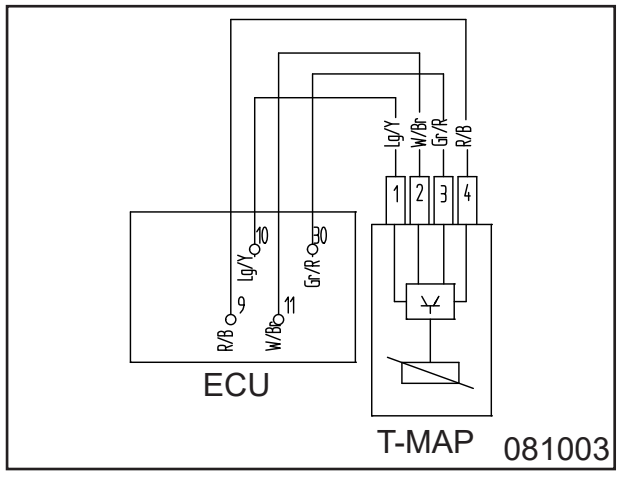
This sensor monitor inlet air pressure, which provides the engine load signal to ECU.

Pin Function:

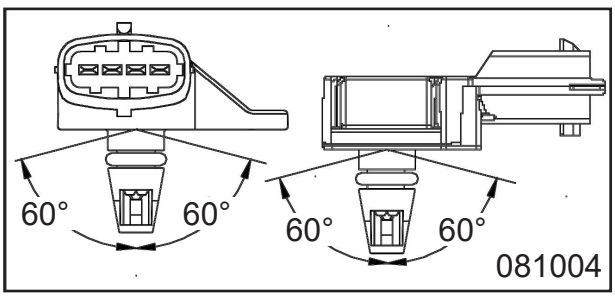
[A] connects ECU pin 9 (inlet air pressure signal).
[B] connects ECU pin 30 (5V voltage).
[C] connects ECU pin 11 (inlet air temp. signal).
[D] connects ECU pin 10 (sensor to ground 1).



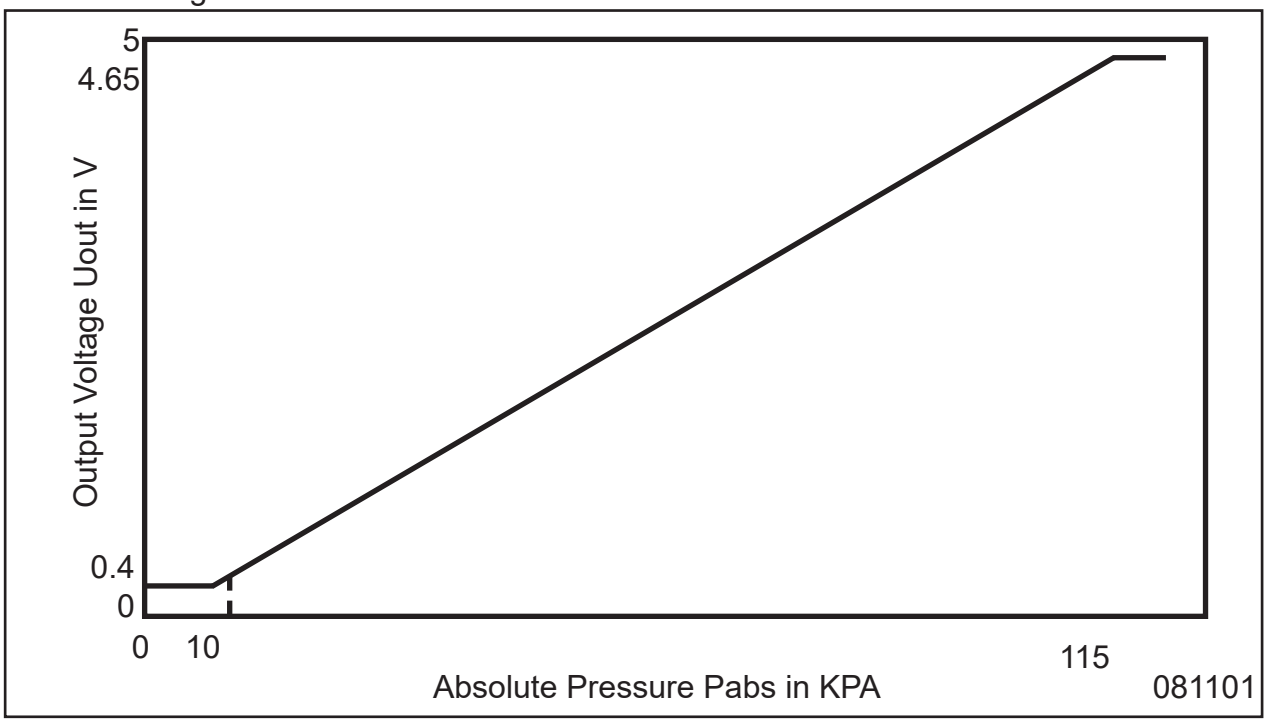
Sensor connection circuit:



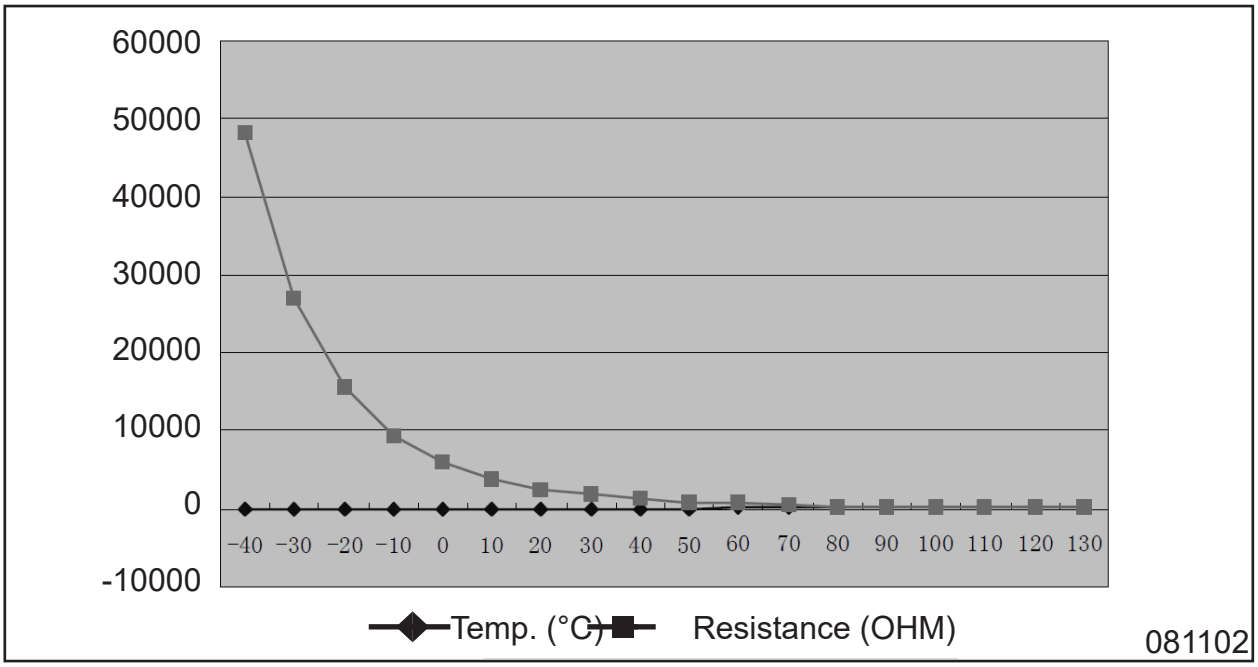
The right picture shows the allowable mounting range, which ensures that condensation does not form inside the sensor, as the condensation damages pressure sensitive elements within the sensor.



The relationship between output voltage and pressure.
Pressure range: 10~115kPa



The relationship between sensor temperature and resistance.



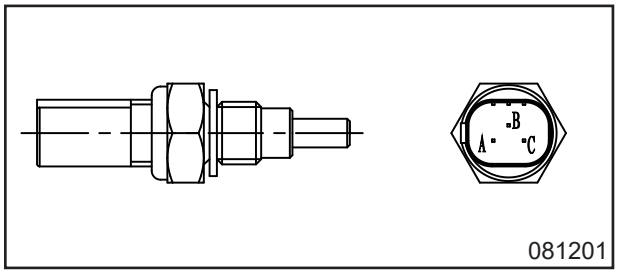
8.3.3.4 Water Temp. Sensor

This sensor is a NTC thermo resistance. The resistance becomes lower when the air temperature becomes higher, but it is not a liner relationship.

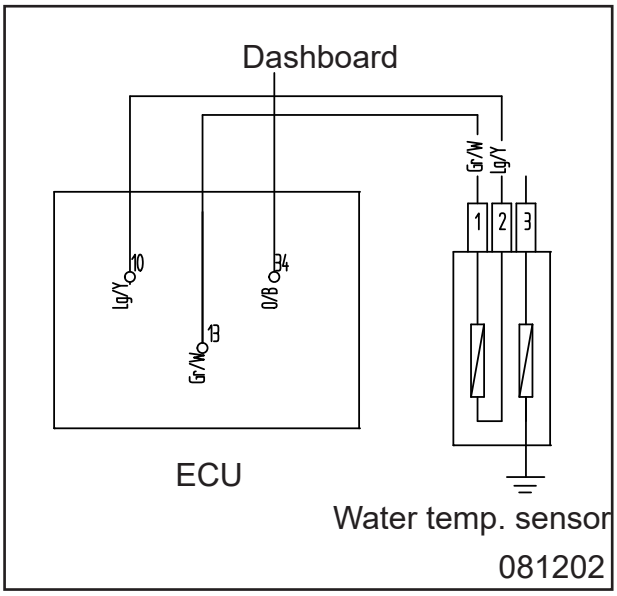
One group of parameters is sent to ECU to monitor engine temperature condition, One group is sent to dashboard to monitor coolant temperature condition.

A and C are one group which provides water temperature signal to the ECU.

Through ECU, B sends the water temperature signal to dashboard.



Sensor connection circuit:

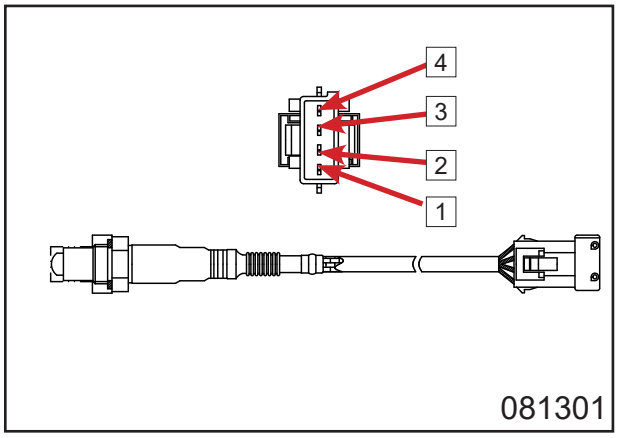


The right table shows the relationship between temperature and resistance. This signal is sent to ECU.

Temp. °C	Resistance between A and C (KΩ)
-20±0.1	13.71~16.94
25±0.1	1.825~2.155
80±0.1	0.303~0.326
110±0.1	0.1383~0.1451

8.3.3.5 Oxygen Sensor

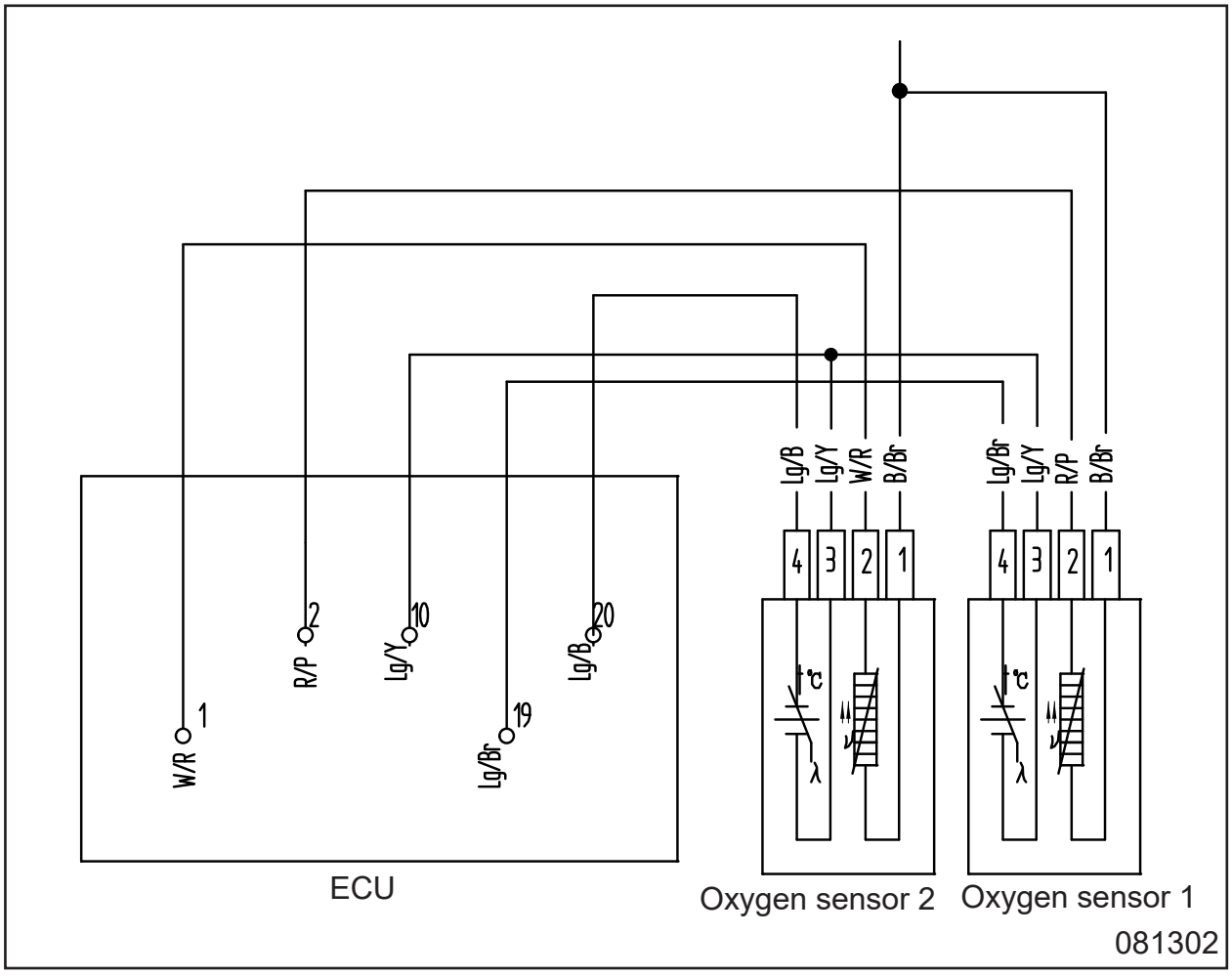
This sensor is used in closed-loop feedback controlled fuel injection to improve the air-to-fuel ratio accuracy and control the emission. It's located in the exhaust stream to measure the amount of oxygen in exhaust and send the signal to ECU, which can revise the fuel injector output, so as to reduce the amounts of unburnt fuel and make catalytic converter convert HC, CO and NO_X of Nitrogen efficiently.



Pin Function:

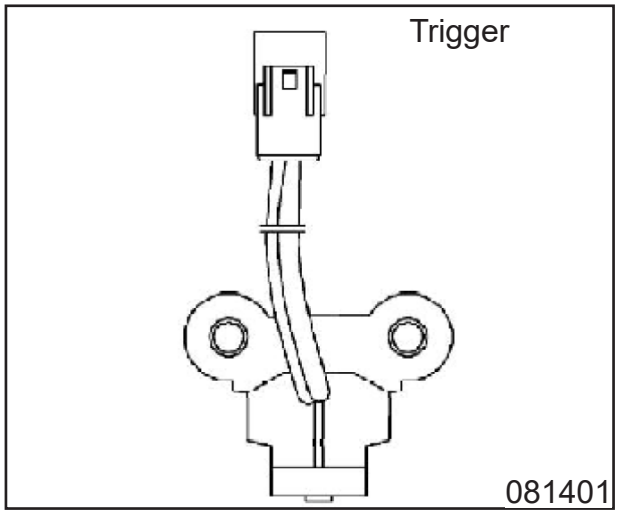
4 Output signal voltage +
3 Output signal voltage -
2 Heated ground -
1 Heated power +

Sensor connection circuit:

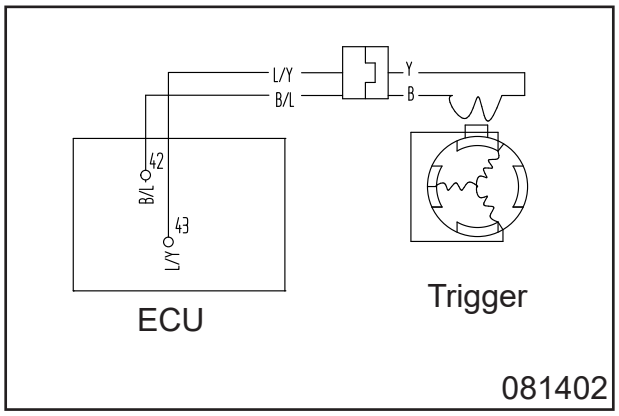


8.3.3.6 Trigger

The trigger transfers signal of engine speed to ECU and by which ECU to confirm engine speed ignition angle and injecting phase.



Trigger connection circuit:



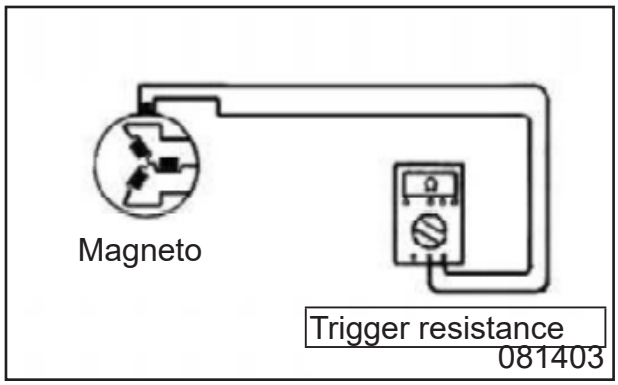
Measure trigger resistance

Set multimeter to 1×100Ω range.
Trigger coil resistance: 100Ω~160Ω(20°C)
Replace a new one when resistance is not within above value range.

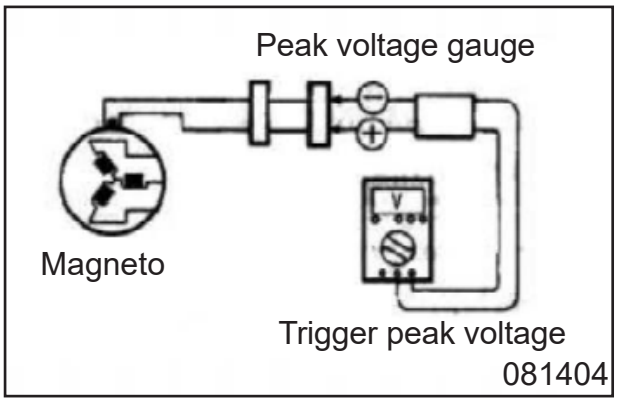
Measure trigger peak voltage

Connect multimeter and peak voltage adapter as shown as right picture
+Probe: Green (A) wire
-Probe: Blue (B) wire

⚠Note: Refer to owner manual when using peak value voltage adapter.

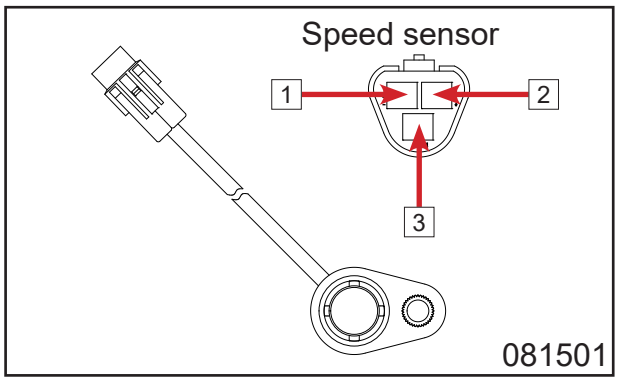


Set multimeter to ACV range.
Set engine to Neutral gear, turn on ignition switch.
Press starter button and keep engine running for seconds, then measure trigger coil peak value voltage.
Repeat a few times and record the highest value.
Trigger coil peak value voltage: ≥2V (300r/min)
Replace a new one when peak value voltage is not within above value range.



8.3.3.7 Speed Sensor

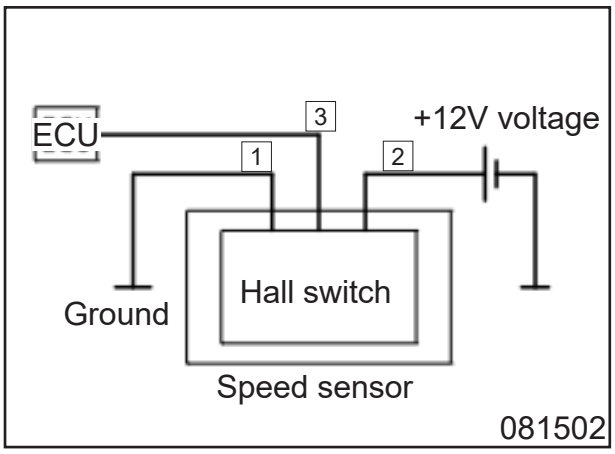
This sensor provides engine output shaft speed to ECU. Then ECU can calculate the speed according to this signal. It is a hall switch type device, which outputs square wave by the change of the magnetic field.



Pin Function:

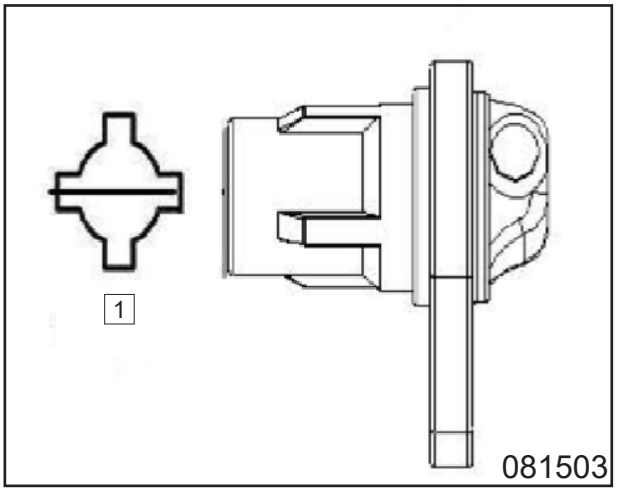
1 Connecting ground
2 Battery +DC 12V
3 Output voltage signal yellow (>80% of input voltage)

Sensor connection circuit:



Speed Sensor Inspection

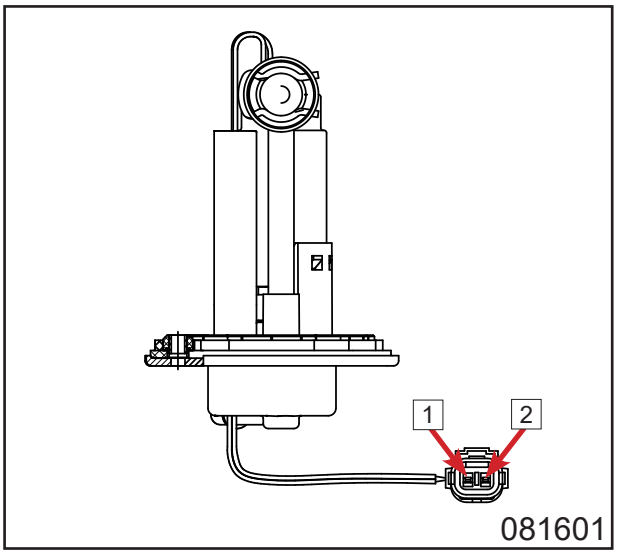
Ground pin 1 and pin 2 with +12V power.
Fix the gear 1 2.5mm away from the speed sensor as the picture shows.
Turn multimeter to DCV.
Slowly turn the gear and measure the voltage between pin 2 and pin 3 to determine that if the reading varies from 0V~12V
If the reading doesn't vary, it indicates the sensor is defective and needs to be replaced.



8.3.3.8 Fuel Pump

The right picture shows the fuel pump assy, fuel pump relay and ECU wiring diagram.

This fuel pump assy consists of fuel pump, plastic bracket, fuel strainer, fuel filter element and pressure-regulating valve. It delivers fuel from the tank to the engine at a certain oil pressure and flow rate.



Pin function:

1 Blue (Ground)

2 Red (+12V)

Performance parameter:

Pressure-regulating valve open pressure: 0.33MPa±0.01MPa

Flow rate: 45L/h

Do not run the fuel pump assy when there is no fuel inside the fuel tank, in case of fuel pump damage.

Handle the fuel pump gently. Do not drop it on hard surfaces.

The battery supplies power to the fuel pump through the relay. Only when starting or running the engine can the circuit be switched on.

Measure fuel pressure:

Connect oil pressure gauge and fuel pump oil port, lock with clamp to ensure there is no leak form the junction.

Connect the circuit as the picture shows.

Turn on ignition switch and stop switch.

The fuel pump will work for 5 seconds. When stop working, the oil pressure should reach the specified value. Otherwise, replace with a new fuel pump.

After stopping working, the pressure should maintain 0.2MPa for at least 5 minutes. Otherwise, replace fuel pump assy.

Fuel hose pressure release method:

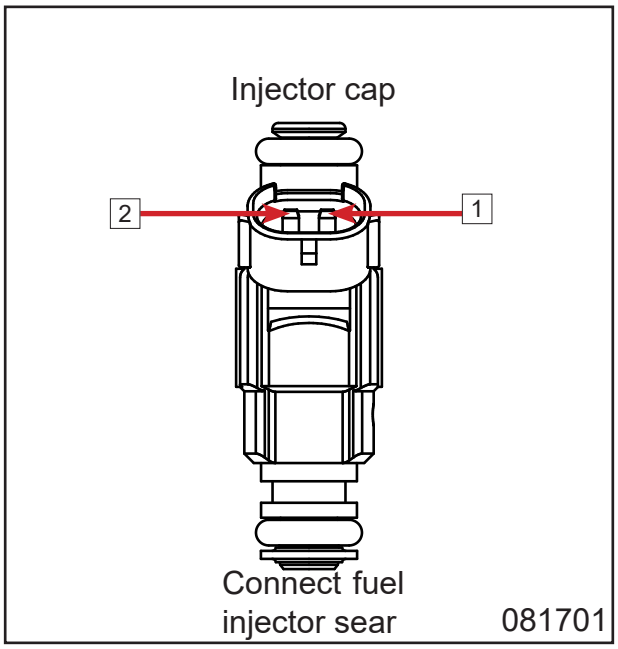
The fuel supply pressure in EFI system is high, all fuel hoses are high-pressure resistance. Even the engine does not work, the pressure in fuel passage is still high. So when in the maintenance process, be careful not to remove the fuel hose causally.

When servicing EFI system, release the pressure before removing the fuel hose. The release method is like:

Remove the fuel pump relay. Start the engine and make it idle until the engine stops automatically.

8.3.3.9 Fuel Injector

One end of fuel injector mounts into fuel injector seat, and the other end attaches to the injector cap, which connects with a fuel line. Fuel injector is controlled by ECU to inject fuel at stated time into the engine. This injector nozzle is a 4-hole style. Don't turn injector after the joint between injector and injector cap is installed.

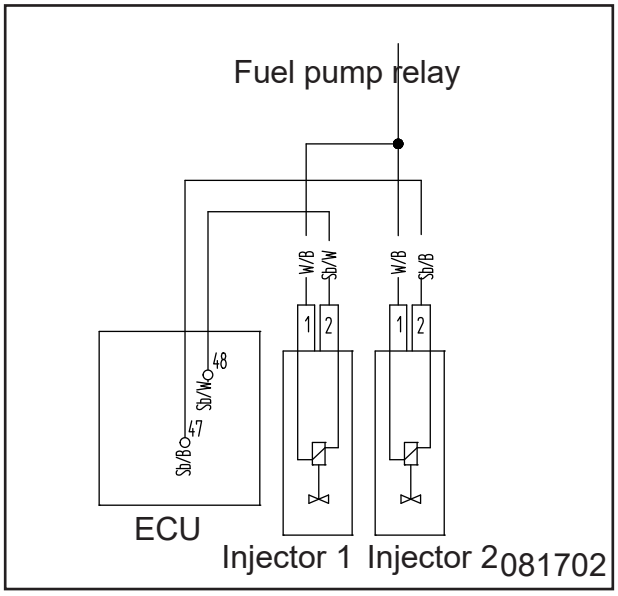


Pin function:

2 Fuel pump relay output
1 Injector 1 connects ECU pin 48.
1 Injector 2 connects ECU pin 47.

Fuel injector resistance: 12.5Ω±1Ω (20°C)

Injector connection circuit:



Fuel Injector Installation

Install fuel injector manually. Never knock fuel injector with a hammer.

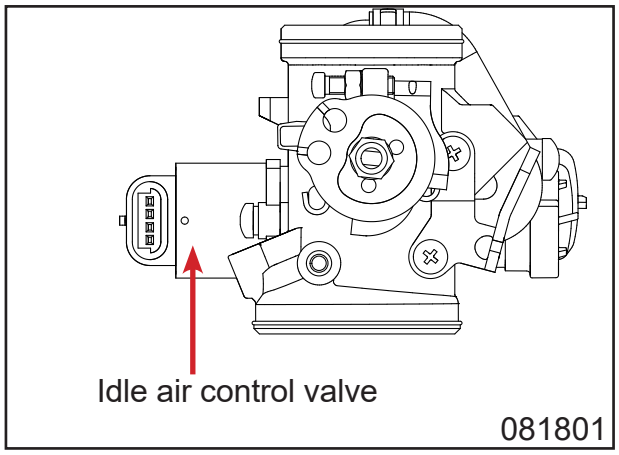
When removing and installing fuel injector, the O-rings on both ends must be replaced.

Perform pressure relief before fuel injector removal if necessary.

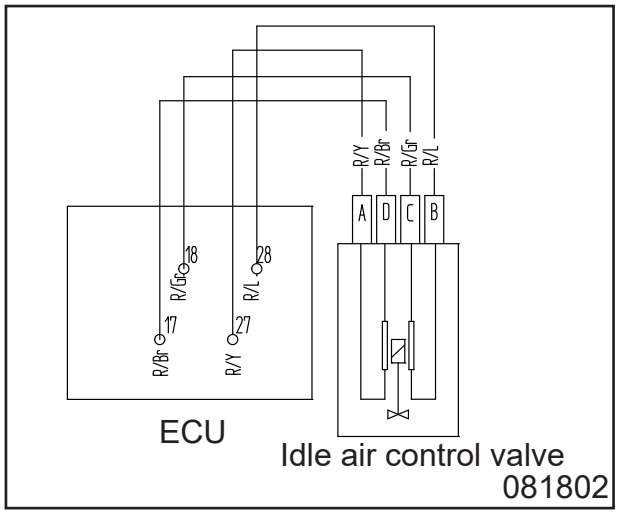
Test the fuel injector sealing after installation to ensure no leaks.

8.3.3.10 Idle Air Control valve

IACV is used to control the air flow of by-pass. ECU calculates the engine load and controls IACV through electrical pulse duration and frequency (commonly known as duty ratio). IACV allows different air flows passed through under different pressure. Therefore, it should be connected properly. Otherwise, idle speed may be incorrect. When there is no electrical pulse, IACV would be closed.



Idle air control valve circuit:

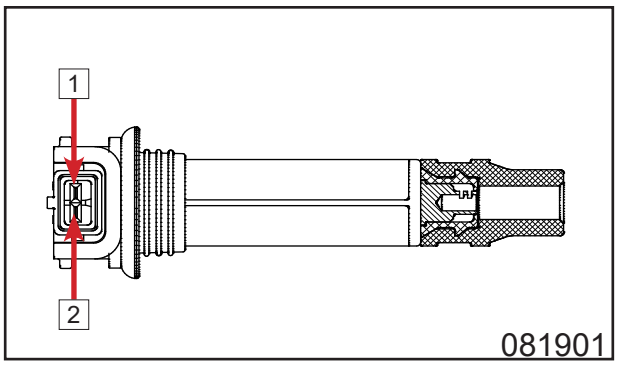


Idle air control valve parameters

Item	Value			Unit
	Min	Standard	Max	
Rated voltage		13.5		V
+20°C resistance		16		Ω
Rated current		0.85		A
Control pulse frequency			30	HZ
Standard control pulse width		≦ 8		ms
Air Flow(When pressure difference= 700mbar, duty ratio=100%)		5		m3/h

8.3.3.11 Ignition coil

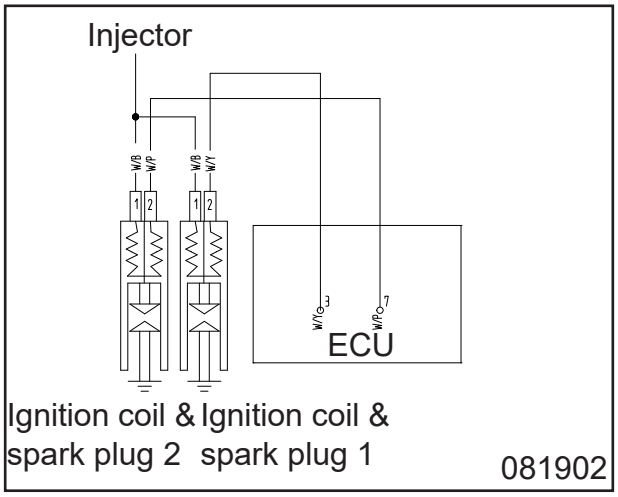
Ignition coil transforms the low voltage of primary coil to high voltage of secondary coil needed to spark the spark plug and ignite the mixture of air and fuel in cylinder.



Pin function:

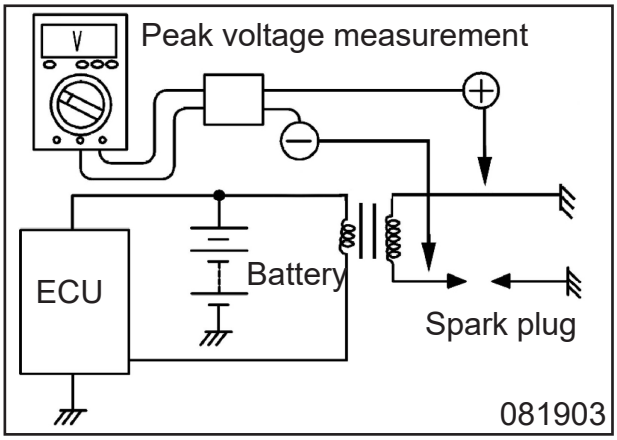
1 connects power.
2 connects signal.

Ignition coil connection circuit:



Secondary Ignition Voltage Test:

- Connect the engine according to EFI wiring diagram.
- Connect the peak voltage tester according to the right diagram.
- Start the engine.
- Secondary ignition voltage should be more than 15 kV.

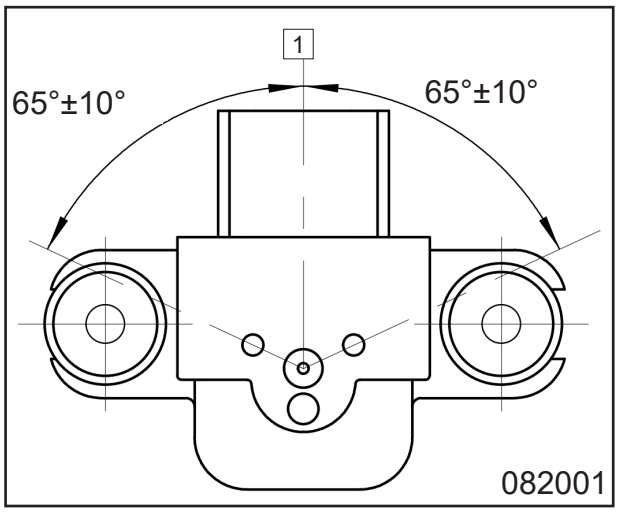


Ignition coil parameter chart table:

Item		Value			
		Min	Standard	Max	Unit
Stated Voltage			14		V
Operating Voltage		6		16.5	V
Resistance (20°C~25°C)	Primary	0.74	0.76	0.78	Ω
	Secondary	10.1	10.6	11.1	kΩ
Primary Current			7		A

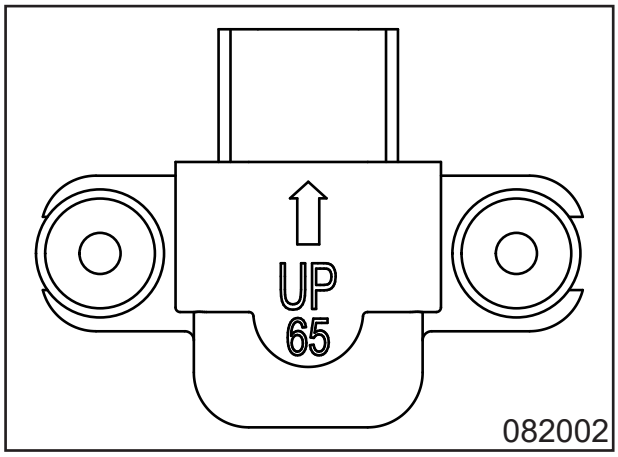
8.3.3.12 Roll-over Sensor

Roll-over sensor is used for preventing vehicle from tilting. When vehicle's tilt angle is larger than settled tilt angle, an "OUT" signal will be transferred to ECU. ECU will stop the engine.

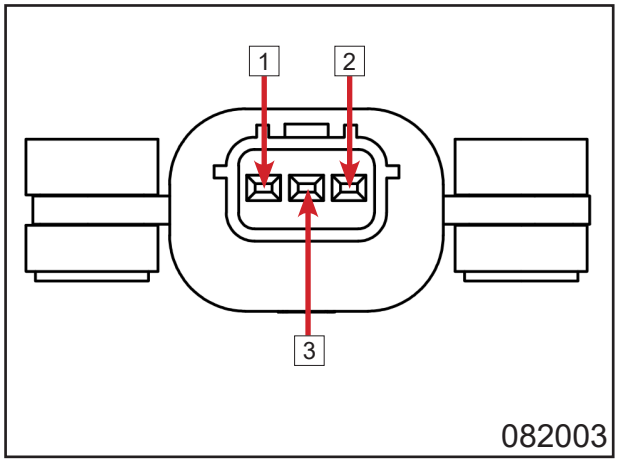


1	Tilt angle

The "UP" faces upward when installing as picture shows.



Connect the engine as EFI diagram shows:



1	VCC	2	GND	3	OUT

8.3.4 Self-diagnosis

ECU constantly monitor sensors, actuators and circuits, MIL and battery voltage, etc, even ECU itself and inspect the sensor output signal, actuator drive signal and internal signal (such as close loop control, coolant temperature, idle speed control and battery voltage control, etc.) for reliability. If any process or signal is suspect, ECU records the trouble code in the RAM memory.

Faulty information is recorded in the form of trouble code, and in the sequence of which trouble comes first.

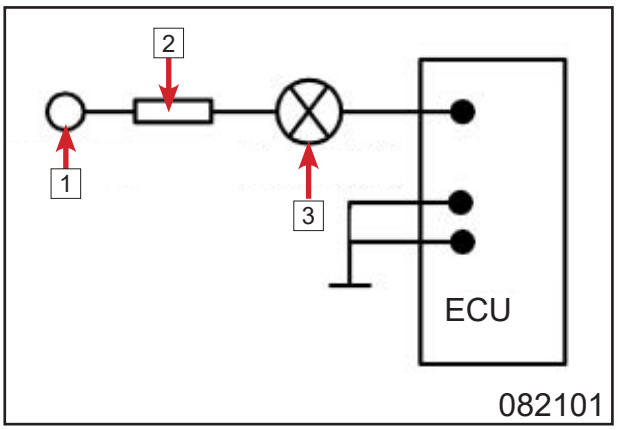
When servicing, using PDA and MIL, the defective parts can be promptly found to improve the service efficiency and quality.

EFI system is mainly diagnosed by MIL and PDA.

8.3.4.1 Malfunction Indicating Lamp (MIL)

It indicates different fault codes through the flashes in different frequency.

The right picture is the MIL connection circuit. The current in pin 29 to ECU should be less than 0.5 A.



1	+12V power	2	Resistant	3	LED

MIL Flash Principles:

a: In flash code mode, and no fault in memory

When the ignition switch is on, but the engine doesn’t start, MIL goes on.

MIL shows the yellow light when it is on.

After the engine starts, if OBD system doesn't detect the fault, MIL goes off.

If any part connected with OBD system and related to emission breaks down or the OBD system breaks down with itself, MIL activates and turns on to inform the drive about the fault with visible signal.

After service and troubleshooting, restart the vehicle.

The historical fault information can be detected, and can be cleaned with PDA.

8.3.4.2 PDA

PDA has 3 pins, power, ground wire and data cable K. These pins are connected with related ECU pins. The right photo refers to operation panel of PDA. When it comes to detailed keys function, refer to PDA manual.

1	UP Key	4	EXIT Key	7	Power switch
2	LH Key	5	OK Key		
3	RH Key	6	Down Key		

Pin function:

(1) connects ECU pin 34.
(2) connects ground.
(3) connects +12V battery.

Key function:

LH Key: Page up
UP Key: Scroll Up
RH Key: Page Down
Down Key: Scroll Down
OK Key: Entrance
EXIT Key: Exit

PDA Function:

(A) Version Information Display

PDA can display engine,ECU hardware and soft ware information.

(B) Fault Display

PDA monitors IAP sensor, IAT sensor,coolant temperature sensor, TPS, O2S, O2S heater circuit, air-to-fuel ratio revision, fuel injector, fuel pump relay, CPS, speed signal, idle speed, idle air control valve, system voltage, ECU, FI indicator and displays the fault code.

(C) Engine Data stream Display

PDA can display battery voltage, RPM, desired idle speed, vehicle speed, coolant temperature, coolant temperature sensor signal voltage, inlet air temperature, IAT sensor signal voltage, inlet air pressure, inlet air flow, IACV target position, TPS signal voltage, throttle body position, throttle body relative position, canister duty, charging time, FI pulse width, park advance angle, O2S voltage, engine relative load, canister load, IACV position, atmospheric pressure, altitude multiplier, engine operation time.

(D) EFI Status Display

Starter switch, main relay, fuel pump relay, idle speed, idle speed, full load status, deceleration activation, acceleration activation, FI close loop activation, lambda control activation, canister control valve activation, MIL status.

(E) Actuator Test Function

MIL, fuel pump, IACV, canister control valve, ignition, fuel injection.

8.3.4.3 Fault Code

No.	Fault code	Instruction(UAES)
1	P0030	First Cylinder Oxygen Sensor Heated Control Circuit Open (Bank 1 Sensor 1)
2	P0031	First Cylinder Oxygen Sensor Heated Control Circuit Low Voltage (Bank 1 Sensor 1)
3	P0032	First Cylinder Oxygen Sensor Heated Control Circuit High Voltage (Bank 1 Sensor 1)
4	P0050	Second Cylinder Oxygen Sensor Heated Control Circuit Open (Bank 1 Sensor 1)
5	P0051	Second Cylinder Oxygen Sensor Heated Control Circuit Low Voltage (Bank 1 Sensor 1)
6	P0052	Second Cylinder Oxygen Sensor Heated Control Circuit High Voltage (Bank 1 Sensor 1)
7	P0107	Intake Air Pressure Sensor Short to Ground
8	P0108	Intake Air Pressure Sensor Short to Power
9	P0112	Intake Air Temperature Sensor Low Voltage
10	P0113	Intake Air Temperature Sensor High Voltage
11	P0117	Water Temperature Sensor Circuit Low Voltage
12	P0118	Water Temperature Sensor Circuit High Voltage
13	P0122	Throttle Position Sensor Circuit Low Voltage
14	P0123	Throttle Position Sensor Circuit High Voltage
15	P0130	First Cylinder Oxygen Sensor Signal Abnormal (Bank 1 Sensor 1)
16	P0131	First Cylinder Oxygen Sensor Low Signal (Bank 1 Sensor 1)
17	P0132	First Cylinder Oxygen Sensor Signal Circuit Low Voltage (Bank 1 Sensor 1)
18	P0134	First Cylinder Oxygen Sensor Signal Circuit Error (Bank 1 Sensor 1)
19	P0150	Second Cylinder Oxygen Sensor Signal Abnormal (Bank 1 Sensor 1)
20	P0151	Second Cylinder Oxygen Sensor Low Signal (Bank 1 Sensor 1)
21	P0152	Second Cylinder Oxygen Sensor Signal Circuit High Voltage (Bank 1 Sensor 1)
22	P0154	Second Cylinder Oxygen Sensor Signal Circuit Error (Bank 1 Sensor 1)
23	P0201	First Cylinder Injector Control Circuit Open
24	P0261	First Cylinder Injector Control Circuit Short to Ground
25	P0262	First Cylinder Injector Control Circuit Short to Power
26	P0202	Second Cylinder Injector Control Circuit Open
27	P0264	Second Cylinder Injector Control Circuit Short to Ground
28	P0265	Second Cylinder Injector Control Circuit Short to Power
29	P0322	No Speed Sensor Signal (Open Circuit Or Short Circuit)
30	P0480	Fan Control Circuit Open
31	P0511	Idle Actuator Short Circuit
32	P0560	Battery Voltage Signal Abnormal
33	P0562	Battery Low Voltage
34	P0563	Battery High Voltage
35	P0627	Fuel Pump Relay Control Circuit Open
36	P0629	Fuel Pump Relay Control Circuit Short to Power
37	P0650	Mil Circuit Error
38	P0691	Fan Control Circuit Short to Ground
39	P0692	Fan Control Circuit Short to Power
40	P0501	Speed Signal Error
41	P1116	Engine High Temperature Over Range
42	P0602	Control Module Programming Error
43	P0116	Engine Water Temperature Sensor Circuit Error
44	P1098	Roll-Over Sensor Error

8.4 Fault Diagnosis and Treatment

8.4.1 Engine Body

Troubles	Possible Cause	Countermeasures
Cannot start or difficult to start	**Cylinder pressure too low**	
	1. Cylinder worn	Replace
	2. Piston ring worn	Replace
	3. Air leakage of cylinder gasket	Replace
	4. Valve stem worn or unsuitable valve seat	Repair or replace
	5. Spark plug loosen	Tighten
	6. Starting motor rotate too slowly	Check electrical parts
	7. Improper valve timing	Adjust
	8. Improper valve clearance	Adjust
	Spark plug cannot ignite or weak ignition	
	1. Improper spark plug clearance	Adjust or replace
	2. Spark plug dirty or wet	Clean & dry or replace
	3. Defect ignition coil	Replace
	4. Trigger short circuit or open circuit	Replace
	5. Magneto malfunction	Replace
	Insufficient fuel inside throttle body	
	1. Breather hole block	Clean or replace
	2. Injector blocked or failure	Clean or replace
	3. High Pressure oil pump failure	Inspect or replace
	4. Low pressure,oil pump	Inspect or replace
	5. Oil pump Filter net blocked	Clean or replace
No idle speed or unstable speed	1. Improper valve clearance	Adjust
	2. Unsuitable valve seat	Repair or replace
	3. Defective valve	Replace
	4. Rocker or rocker arm wear	Replace
	5. Dirty spark plug	Replace
	6. Incorrect valve clearance	Replace or adjust
	7. Ignition coil failure	Replace
	8. In & Ex a air hose blocked, idle valve	Adjust or replace
	9. Magneto failure	Replace

Troubles	Possible Cause	Countermeasures
High RPM unstable	1. Valve spring getting worn 2. Camshaft worn 3. Spark plug dirty 4. Spark plug gap too narrow 5. Valve timing incorrect 6. Ignition coil failure 7. Low pressure,oil pump 8. Air filter too dirty	Replace Replace Clean or replace Adjust or replace Adjust Replace Adjust or replace Clean or replace
Blue or black exhaust gas	1. Engine oil too much 2. Piston ring worn 3. Valve worn 4. Cylinder worn or scraped 5. Valve stem worn 6. Oil seal of valve stem damaged	Check oil level and drain Replace Replace Replace Replace Replace
Engine Power not enough	1. Valve clearance improper 2. Valve spring getting weak 3. Valve timing incorrect 4. Cylinder worn 5. Piston ring worn 6. Improper valve seat 7. Spark plug dirty 8. Improper spark plug gap 9. Injector blocked 10. Insufficient pressure,oil pump 11. Air filter too dirty 12. Rocker arm or camshaft worn 13. Air leakage of inlet pipe 14. Engine oil too much	Adjust Replace Adjust Replace Replace Replace or repair Clean or replace Clean or replace Clean or replace Adjust or replace Clean or replace Replace Tighten or replace Check oil level and change
Engine Overheating	1. Carbon deposit on piston head 2. Engine oil too less or too much 3. Oil pump failure 4. Fuel hose blocked 5. Air leakage of inlet pipe 6. Unsuitable engine oil 7. Cooling system failure(see7-5)	Clean Check and add or drain Replace Clean Tighten or replace Change oil

Troubles	Possible Cause	Countermeasures
Engine abnormal noise	**Valve abnormal noise**	
	1. Valve clearance too big	Adjust
	2. Valve spring worn or broken	Replace
	3. Swing arm or camshaft worn	Replace
	Piston abnormal noise	
	1. Piston worn	Replace
	2. Cylinder worn	Replace
	3. Carbon deposit inside combustion chamber	Clean
	4. Piston pin or pin hole worn	Replace
	5. Piston ring or groove worn	Replace
	Timing chain abnormal noise	
	1. Chain stretched out	Replace chain and sprocket
	2. Chain sprocket worn	Replace chain and sprocket
	3. Tensioner failure	Repair or replace
	Clutch abnormal noise	
	1. Clutch gear worn or damaged	Replace clutch gear
	2. Cushion rubber aging or damaged	Replace clutch gear
	Crankshaft abnormal noise	
	1. Bearing noise	Replace
	2. Crankshaft pin bearing down	Replace
	3. Clearance too big	Replace
	Transmission abnormal noise	
	1. Gear worn or damaged	Replace
	2. Main shaft or counter shaft worn	Replace
	3. Bearing worn	Replace
	4. Bushing worn	Replace
Clutch slippery	1. Clutch drive disc worn	Replace
	2. Clutch driven disc worn or damaged	Replace
	3. Clutch spring getting weak	Replace

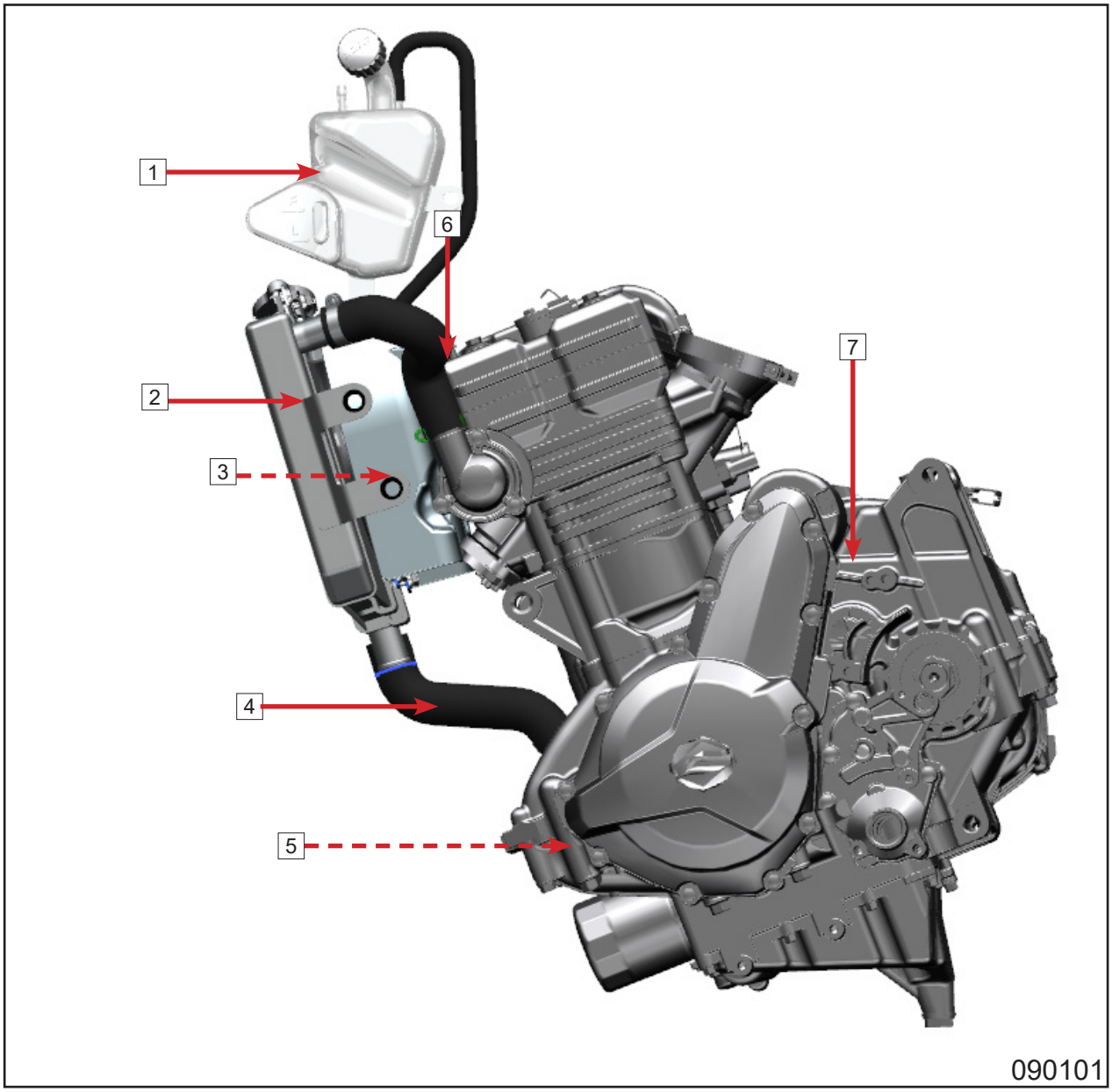
8.4.2 Fault Treatment

When parts have faults in EFI system, the ECU applies the following procedures to prevent the engine damage.

Fault code	Part	Unstable output voltage range or standard	Remark
P0112 or P0113	Inlet air temperature sensor	Inlet air temperature Ta=-40°C~+130°C	If inlet air temp. sensor breaks down and open circuit, the ECU setting temperature is -40°C. If inlet air temp. sensor breaks down and short circuit, the ECU setting temperature is 130°C.
P0117 or P0118	Water temperature sensor	Water temperature Tw=-40°C~+130°C	If water temp. sensor breaks down and open circuit, the ECU setting temperature is -40°C. If water temp. sensor breaks down and short circuit, the ECU setting temperature is 129°C.
P0130, P0131, P0132 or P0134	Oxygen sensor #1	Oxygen sensor activates and continuously sends signal (output voltage) to ECU.	If oxygen sensor isn't activated, ECU stops oxygen sensor feedback mode. If oxygen sensor outputs wrong voltage signal, ECU stops oxygen sensor feedback mode.
P0150, P0151, P0152 orP0154	Oxygen sensor #2	Oxygen sensor activates and continuously sends signal (output voltage) to ECU.	If oxygen sensor isn’t activated, ECU stops oxygen sensor feedback mode. If oxygen sensor outputs wrong voltage signal, ECU stops oxygen sensor feedback mode.

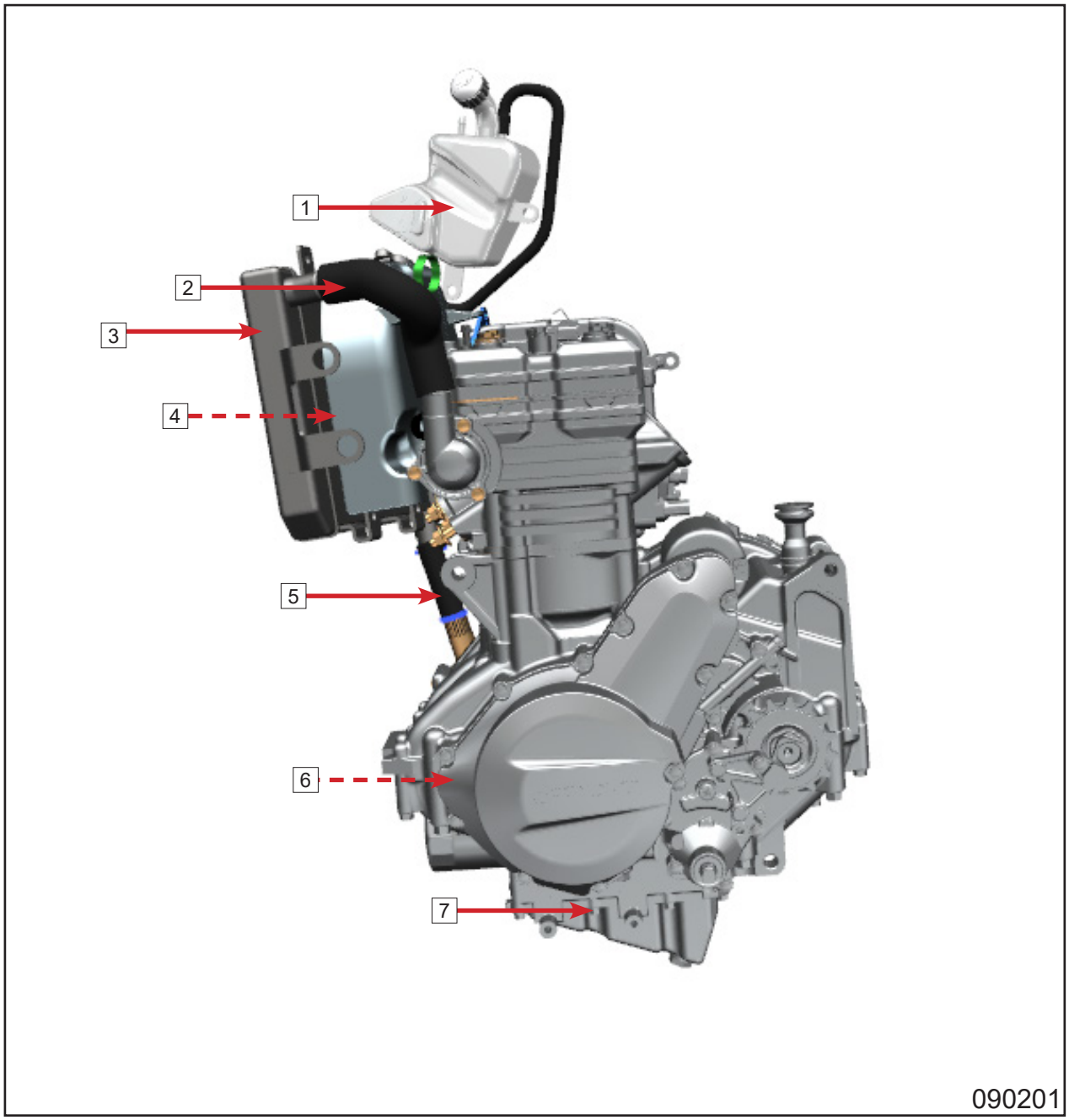
9.1 Cooling System Diagram

9.1.1 400-5 (268MQ-A Engine) Cooling System



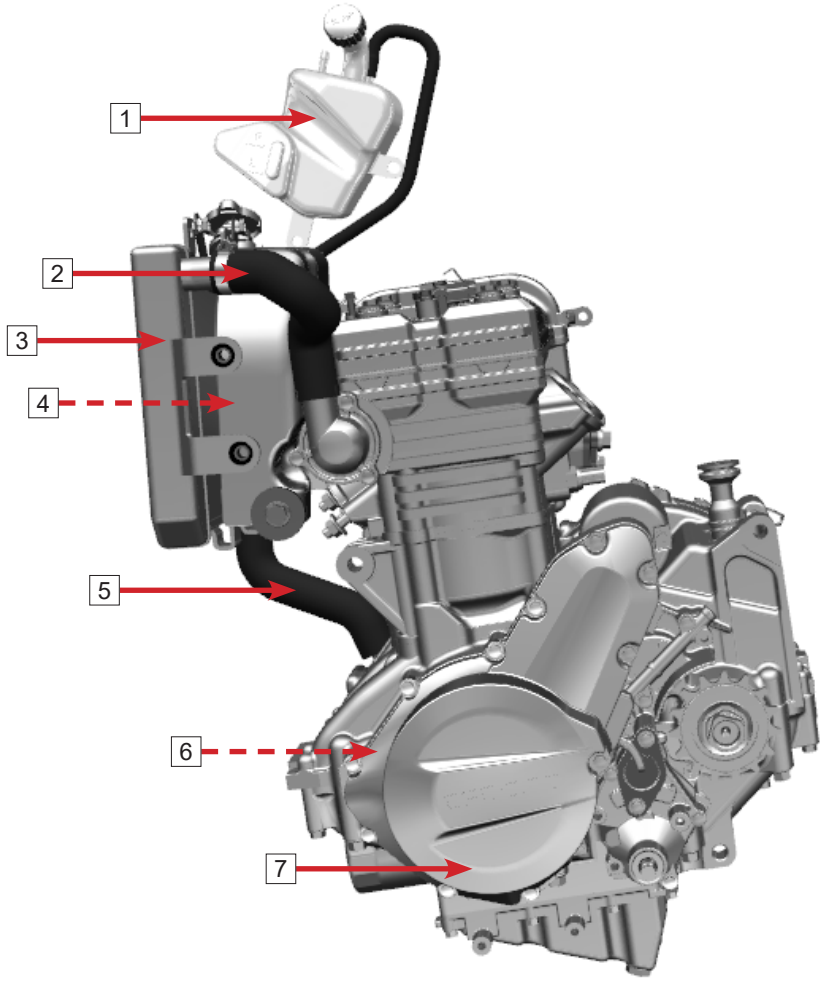
1	Reservoir	2	Radiator assy	3	Fan motor
4	Outlet pipe, radiator	5	Water pump assy	6	Inlet pipe, radiator
7	Engine assy				

9.1.2 CF650-8(283MT Engine) Cooling System (Status 1)



1	Reservoir	2	Inlet pipe, radiator	3	Radiator assy
4	Fan motor	5	Outlet pipe, radiator	6	Water pump assy
7	Engine assy				

9.1.3 CF650-8(283MT Engine) Cooling System (Status 2)



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1	Reservoir	2	Inlet pipe, radiator	3	Radiator assy
4	Fan motor	5	Outlet pipe, radiator	6	Water pump assy
7	Engine assy				

⚠Warning:
Never open the radiator cap when the engine is still hot. Otherwise, the vapor or hot coolant will cause injury.
Coolant is poisonous. Do not swallow or satin it on skin and eyes. If it happens, flush with water immediately. Search for medical help if necessary.
Keep the coolant out of the reach of children.

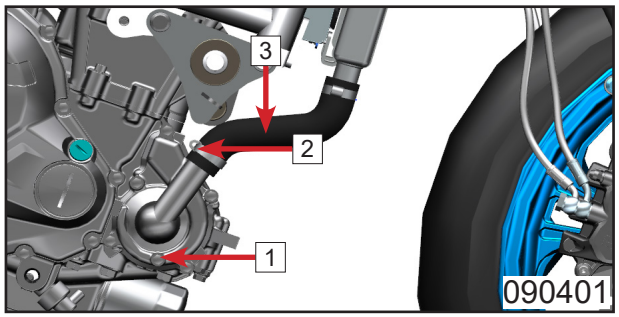
9.2 Cooling System Assy Removal

Removal

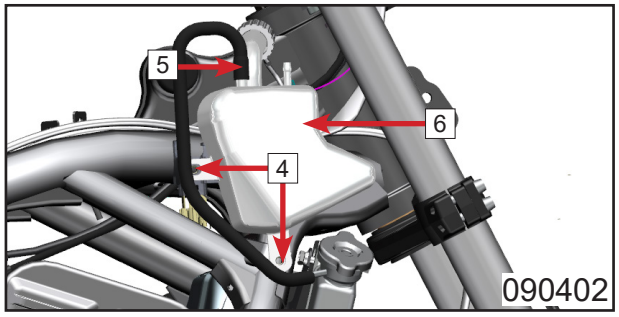
Place a pan under the outlet pipe joint.
Remove drain bolt [1].
Darin the coolant.

⚠Note: After the outlet pipe removal, there is still come coolant spilling.

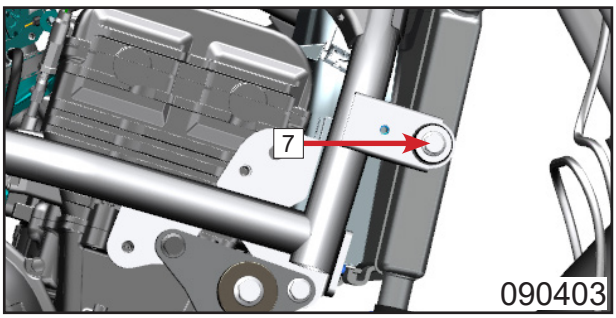
Loose clamp [2] after coolant drain.
Remove outlet pipe [3].



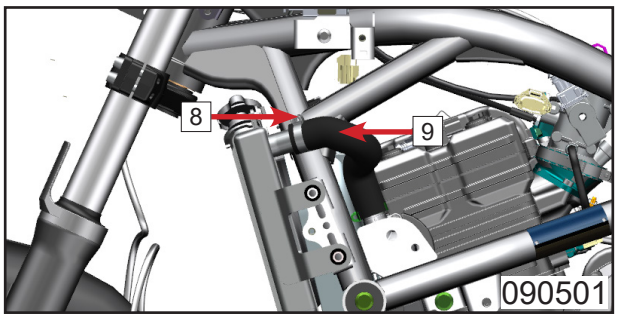
Remove M6 bolts [4].
Remove hose [5].
Remove reservoir [6].



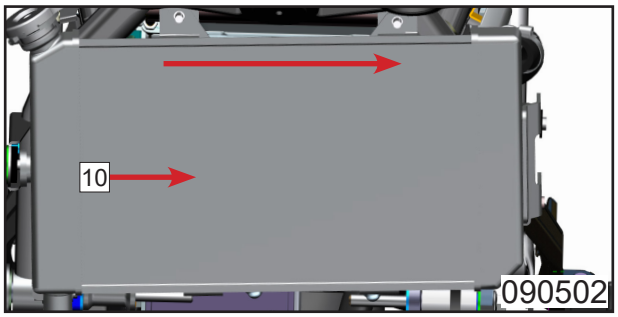
Remove M8 bolt [7].



Loose clamp 8.
Remove radiator outlet pipe 9.



Push the radiator 10 in the direction of the arrow.

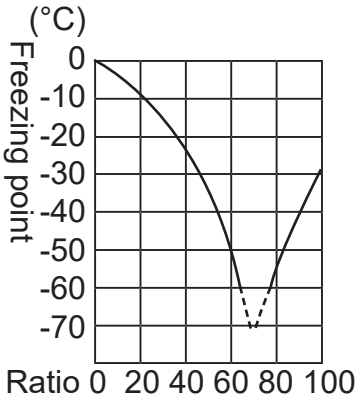


Installation
Reverse the removal procedures for installation.

9.3 Engine Coolant

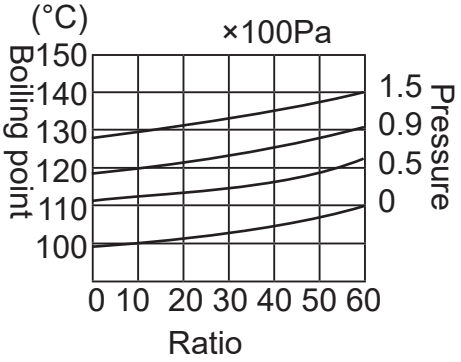
●Coolant in cooling system is a mixture of 51.5% distilled water,46% ethylene glycol antifreeze and 2.5% additive. This mixture ratio provides optimized corrosion resistance and fine heat production. The mixture has good anti-corrosion and endothermic function, and its solidification point is -30°C. If engine works under -30°C, choose coolant of 55% or 60%.

Mixing ratio	Freezing point
50%	30°C
55%	-40°C
60%	-55°C



⚠Warning:
Use high quality ethylene glycol base antifreeze mixed with distilled water. Never mix alcohol base anti-freeze or other different brands of antifreeze.
The ratio of mixture should not be more than 60% or less than 50%.
Do not use anti-leak additive.

⚠Warning:
Never open the radiator cap when the engine is still hot. Otherwise, the vapor or hot coolant will cause injury.
Coolant is poisonous. Do not swallow or satin it on skin and eyes. If it happens, flush with water immediately. Search for medical help if necessary.
Keep the coolant out of the reach of children.



9.4 Seal Inspection

Radiator Cap Inspection

Remove radiator cap.

Measure the open pressure of radiator cap with pressure gauge.

If the pressure is out of standard, replace a new part.

Radiator Cap Open Pressure

Standard:

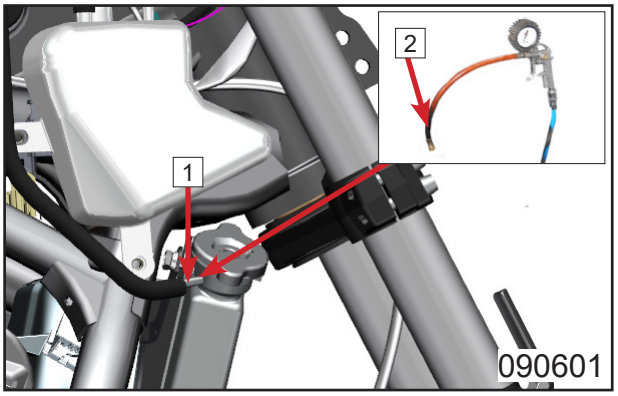
125 kPa~150 kPa

1.27 kgf/cm^2~1.53 kgf/cm^2

18.13 psi~21.76 psi

Seal Inspection

Connect the pressure gauge [2] with reservoir joint [1].



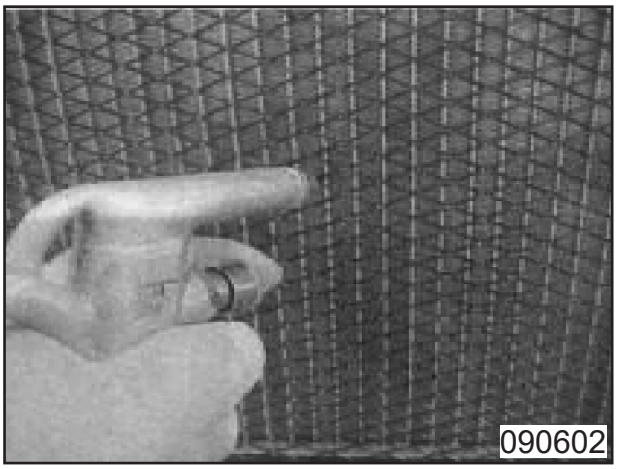
⚠Warning: Never open the radiator cap when the engine is still hot. Otherwise, the vapor or hot coolant will cause injury.

Inflate to 120 kPa, and last for 10s.

If the pressure decreases within 10s, there is leaking inside the system. Inspect the whole system and replace the broken parts.

⚠Note: When remove the gauge, cover radiator cap with cloth, in case the coolant spills out.

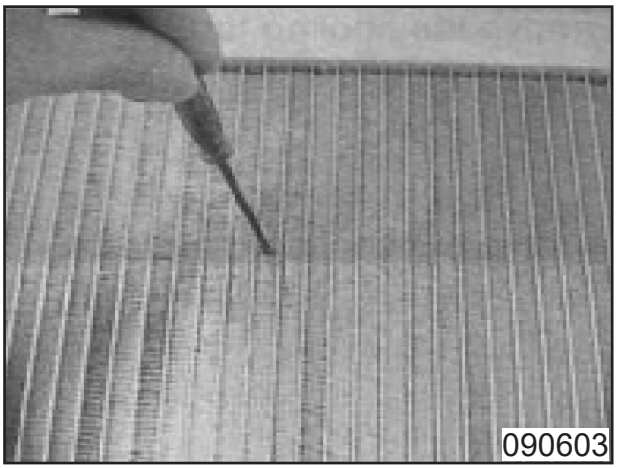
⚠Note: The testing pressure does not exceed the open pressure.



9.5 Radiator and Water Pipes Inspection and Clean

Radiator Inspection and Clean

Remove dirt and dust from the radiator with high-pressure air.



Repair radiator fins with a small screwdriver.

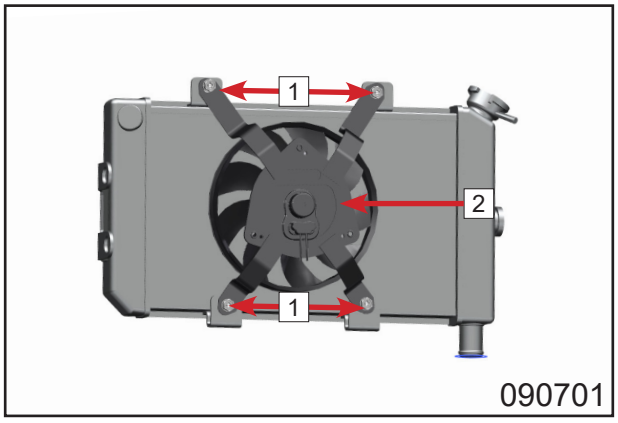
Radiator Water Pipes Inspection
Inspect radiator water pipes for leakage, damage. Replace if necessary.

Inspect radiator water pipe clamps. Replace if loose.

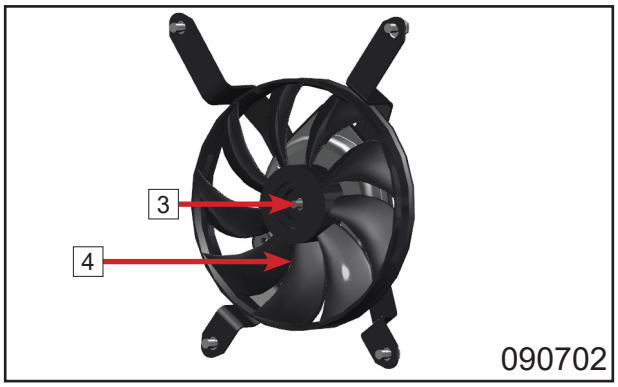
After radiator and water pipes inspection, inspect the coolant. Add coolant if necessary.

9.6 Fan Motor Inspection

Remove four M6 bolts 1.
Remove fan 2.

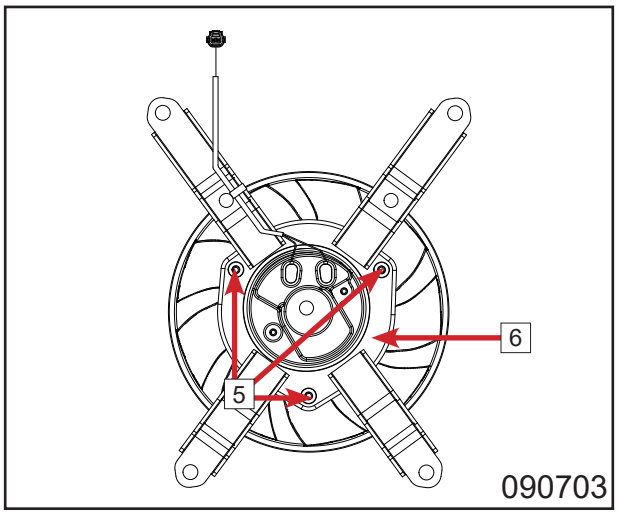


Rotate the impeller with hands to inspect its movement. Replace if the rotation isn't smooth or the impeller is broken.
Remove M6 nut 3.
Remove impeller 4.



Connect 12V battery, the motor works and the current is less than 5A. If the motor doesn't work or the current exceeds the standard, replace a new motor.
Remove impeller.
Remove three M6 bolts 5.
Remove motor 6.

Installation
Reverse the removal procedures for installation.

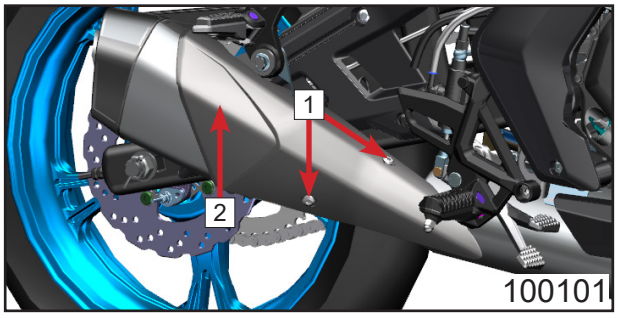


10.1 Muffler

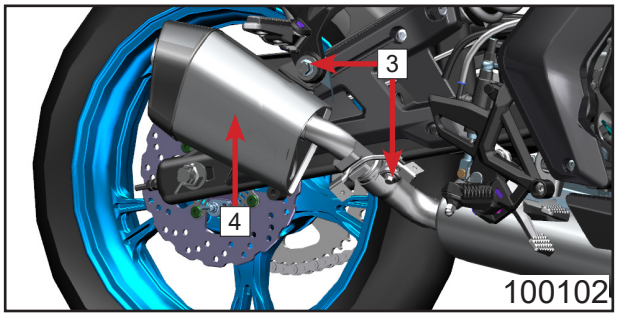
⚠Warning: Muffler is very hot when running the vehicle. Never touch high-temperature parts. Do operation when the system cools down.

Removal

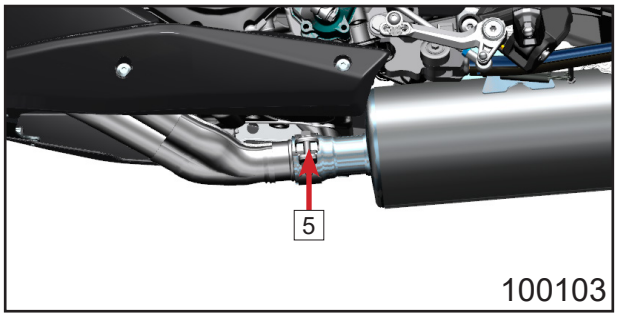
Remove two M6 inner bolts 1.
Remove tail muffler deco cover 2.



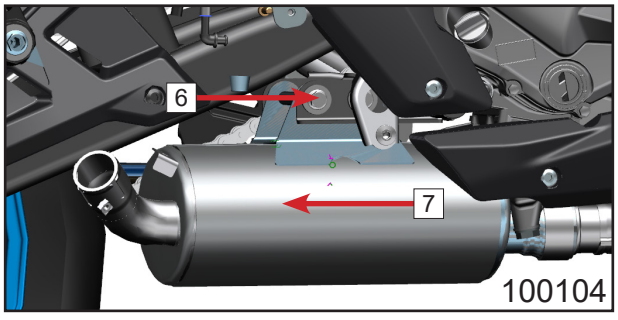
Remove two M6 bolts 3.
Remove tail muffler assy 4.



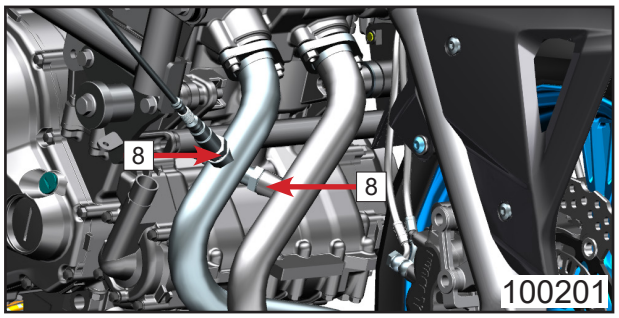
Remove M6 bolt 5.



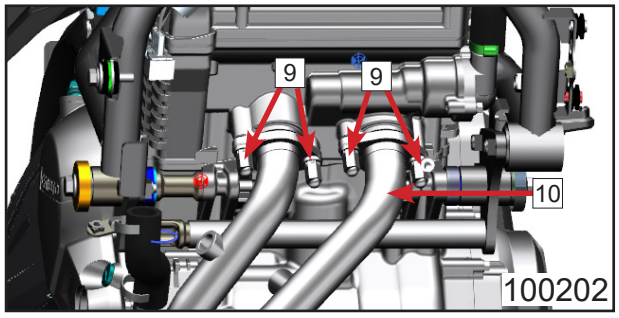
Remove M8 bolt 6.
Remove main muffler assy 7.



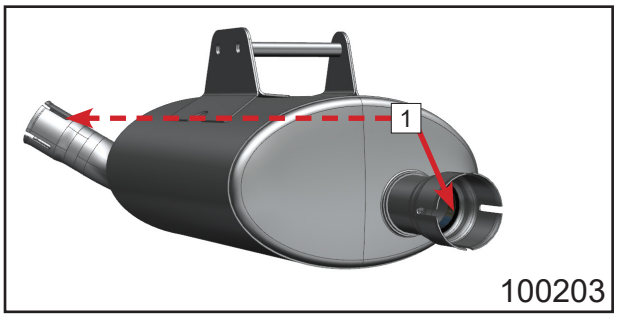
Remove two oxygen sensors [8] counter clockwise.



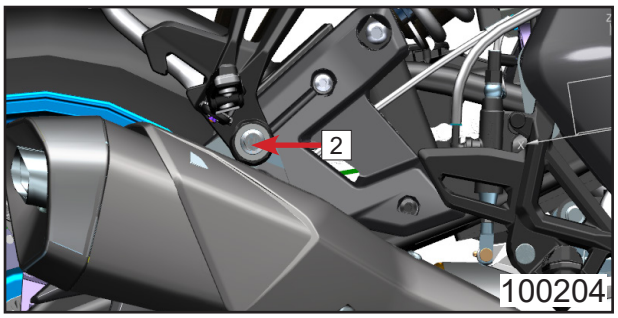
Remove four 4 nuts [9].
Remove exhaust pipe [10].



Inspection
Inspect the graphite seal ring [1] after removal. Replace if rusty or cracked.



Inspect the rubber sleeve of footrest bracket mounting bolt [2]. Replace if cracked.

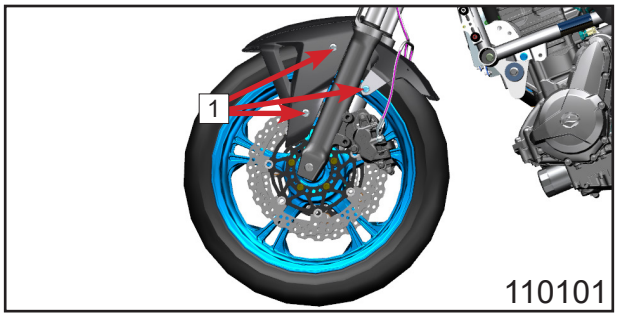


Installation
Reverse the removal procedures for installation.

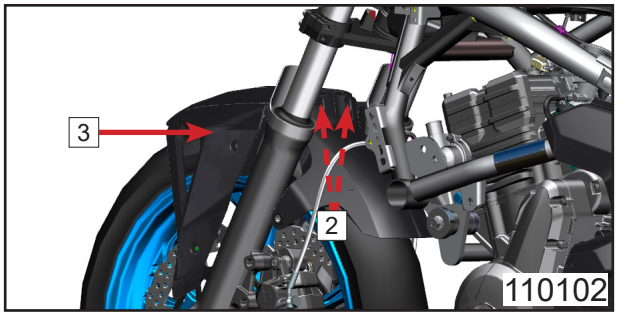
11.1 Front Wheel Assy Removal

Removal

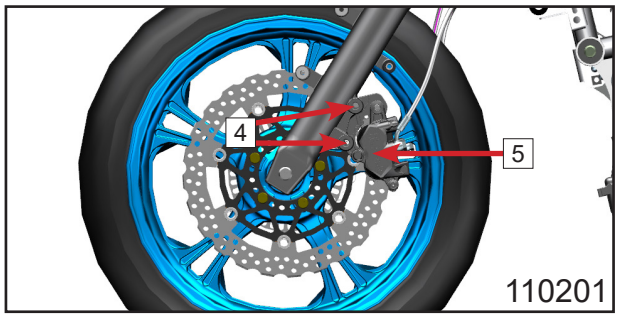
Remove three M6 inner hex bolts [1] on the left side.
Remove three M6 inner hex bolts [1] on the right side.



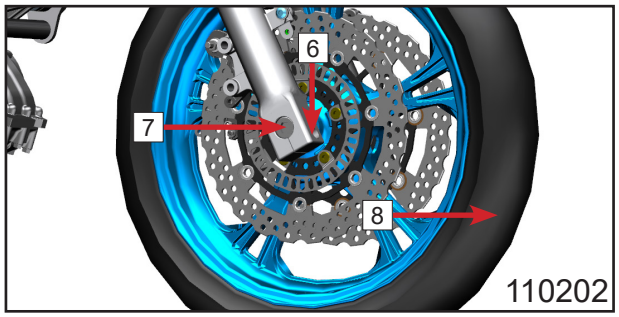
Remove two screws [2].
Remove front fender [3] in the front side of the vehicle.



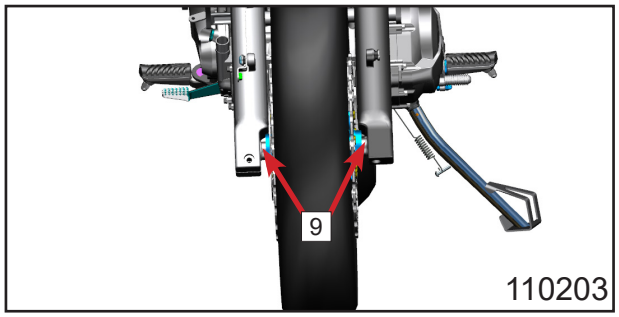
Place a jack under the engine. Load the rear part of the vehicle to lift the front part of the vehicle.
Remove speed sensor and wheel speed sensor.
Remove two M8 bolts [4] on the left side.
Remove two M8 bolts [4] on the right side.
Remove RH brake caliper [5].
LH brake caliper removal refers to RH brake caliper.



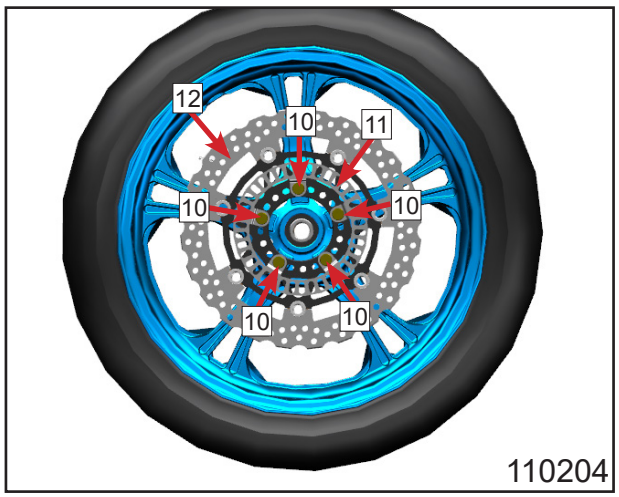
Loose M8 nut [6].
Remove M20 front wheel shaft [7].
Remove front wheel [8].



⚠Note: Do not miss the front wheel shaft sleeve [9].



Remove M6 bolts [10].
Remove sensor disc [11] and RH front brake disc [12].
LH front brake disc removal refers to RH brake disc.

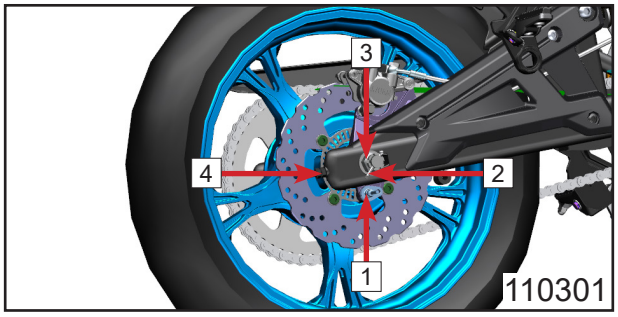


Installation
Reverse the removal procedures for installation.

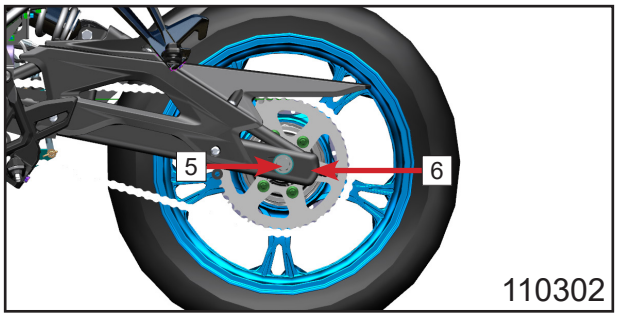
11.2 Rear Wheel Assy Removal

Removal

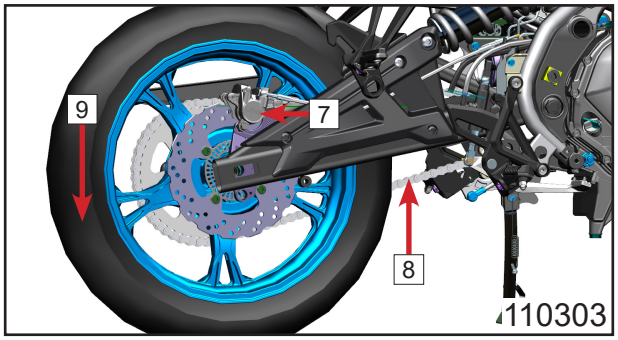
Lift the rear wheel with bracket.
Remove speed sensor [1].
Remove cotter pin [2].
Remove M18 nut [3].
Remove adjusting block [4].



Remove bolt [5].
Remove adjusting block [6].

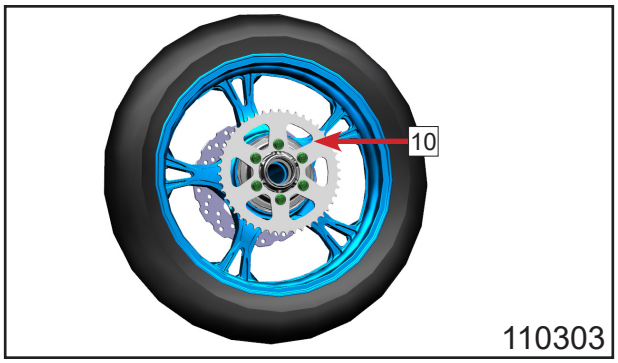


Remove rear brake caliper [7].
Push the rear wheel towards the front part of the vehicle.
Remove chain [8].
Remove rear wheel [9].

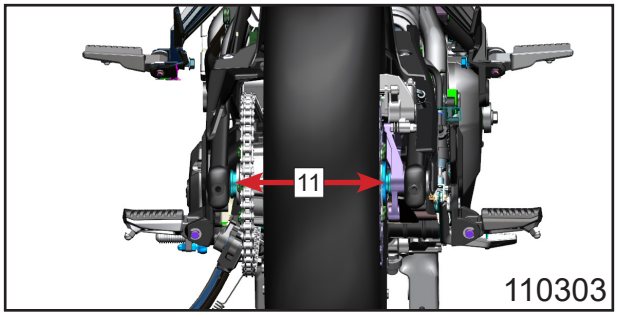


Remove sprocket seat [10].

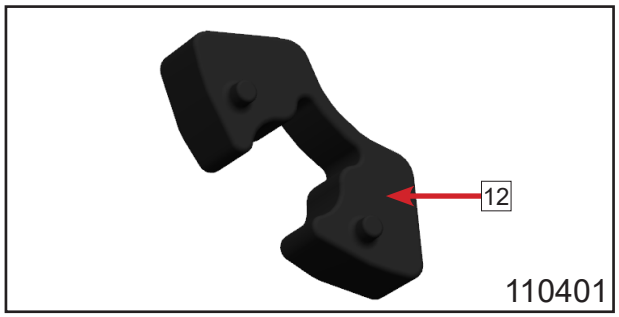
⚠Note: Lean the rear wheel rightward during removal, in case the sprocket seat falls down to cause injury.



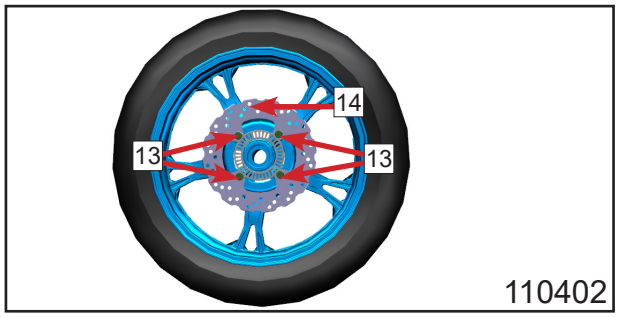
⚠Note: Do not miss two rear wheel shaft sleeves [11].



Remove rubber damper 12. Replace if aged, damaged or harden.



Remove four M6 bolts 13.
Remove brake disc 14.

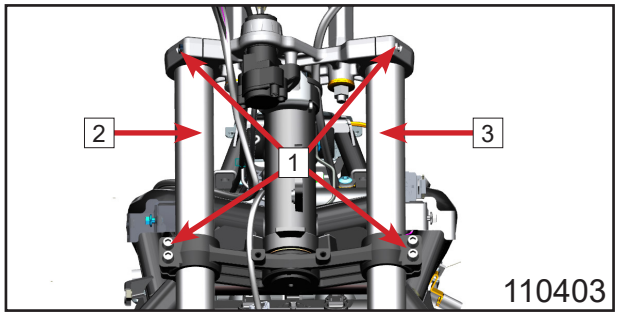


Installation
Reverse the removal procedures for installation.

11.3 Hydraulic Brake Assy Removal

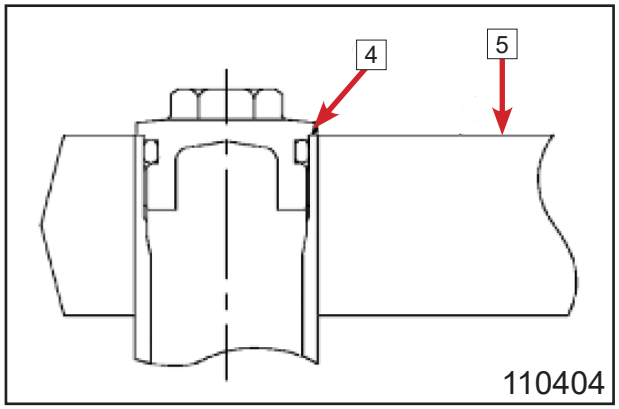
11.3.1 Front Shock Absorber Removal

Remove six M8 inner hex bolts 1.
Remove front RH shock absorber 2.
Remove front LH shock absorber 3.



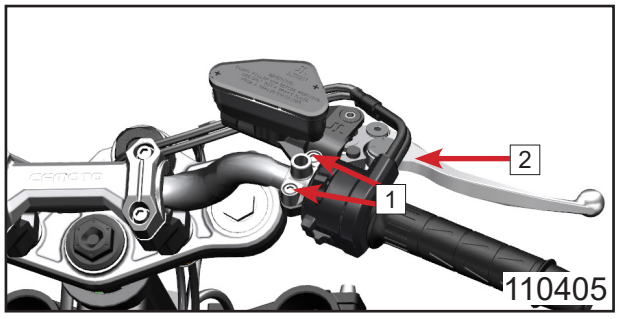
Installation
Reverse the removal procedures for installation.
Front shock absorber bolt tighten torque: 20 N•m

When installing front shock absorbers, the upper ends 4 of two shock absorber inner pipes should be parallel and exceed 1mm~2mm of the upper connecting plate upper surface 5.



11.3.2 Front Brake Removal

Remove M6 bolt 1.
Remove front brake lever 2.



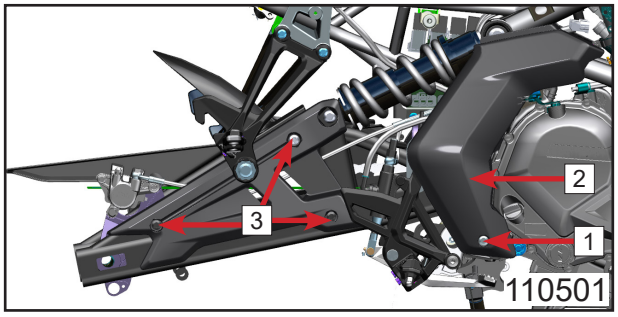
⚠Note: Never hang brake master cylinder with brake hose. Never lean brake master cylinder, in case the air gets into the system.

⚠Note: Never grasp the front brake lever after front brake assy removal.

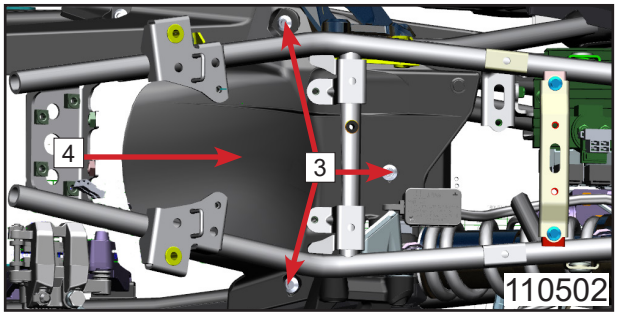
11.3.3 Rear Brake Removal

Removal

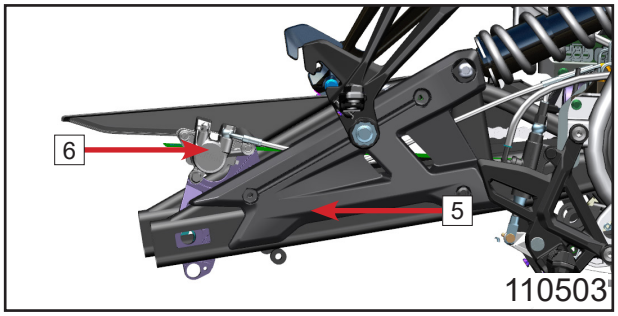
Remove M6 bolt 1.
Remove frame RH panel 2.
Frame LH panel removal refers to RH panel.



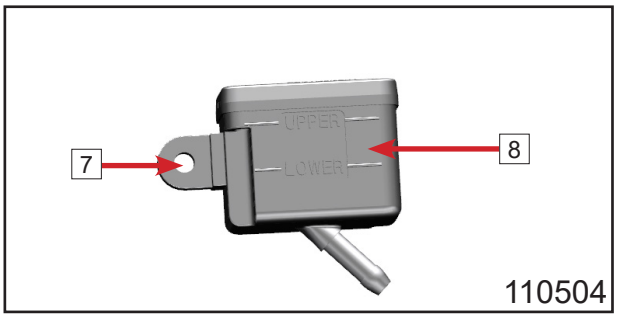
Remove six M6 inner hex bolts 3.
Remove rear fender 4.



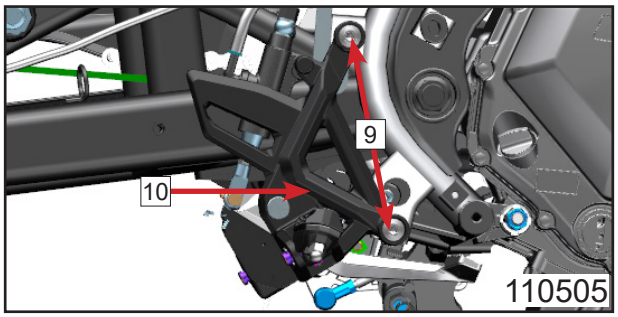
Remover rear deco plate 5.
Remove rear brake 6.



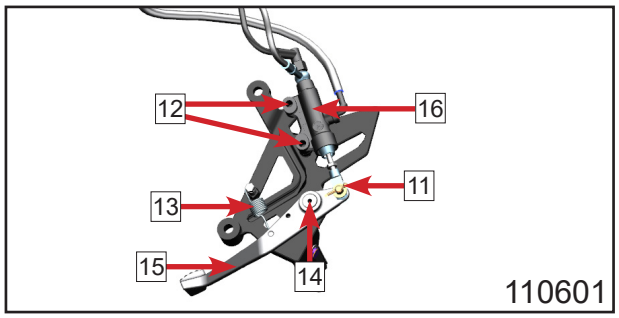
Remove M6 bolt 7.
Remove rear brake fluid reservoir 8.



Remove two M6 inner hex bolts 9.
Remove RH footrest bracket 10.



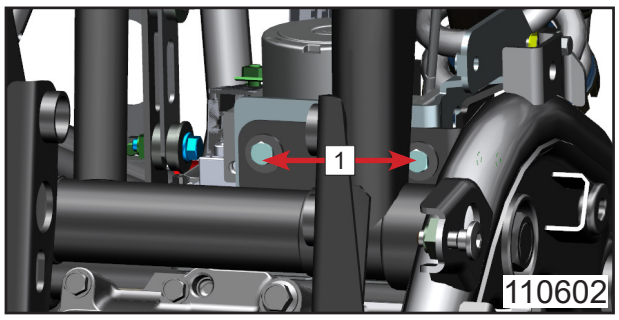
Remove cotter pun and washer 11.
Remove two M6 bolts 12.
Remove return spring 13.
Remove pin shaft assy 14.
Remove brake lever 15.
Remove rear brake master cylinder 16.



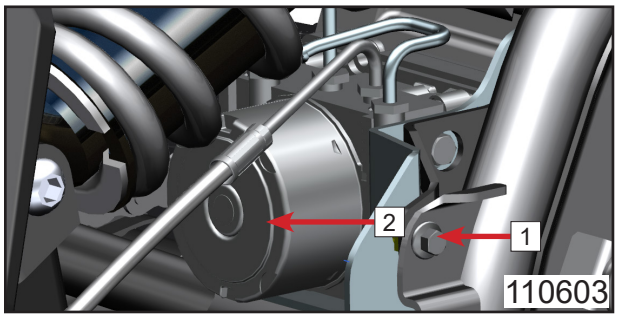
11.3.4 MAB Actuator Removal

Removal

Remove two M6 bolts 1.



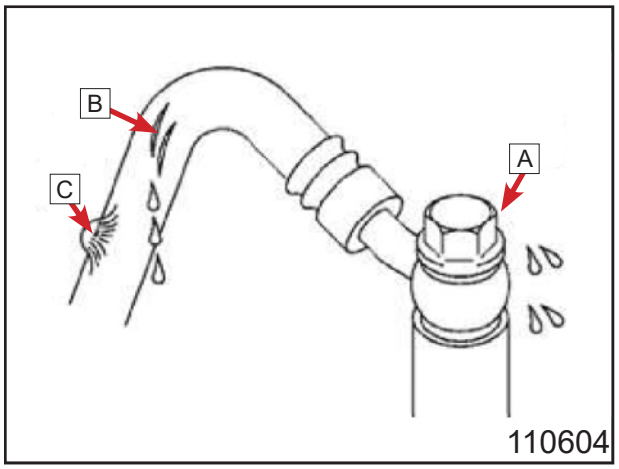
Remove M6 bolt 1.
Remove MAB actuator 2.
Remove whole ABS hydraulic brake assy.



11.4 Front Brake Assy Inspection

11.4.1 Brake Hose Inspection

Inspect brake hose, connectors and pipes for damage, cracks or leaking.
With improper maintenance, the high pressure inside the brake hose can cause fluid leaking A or hose burst.
Inspect brake hose for bending or twist. Replace with new hoses and pipes if crack B, bulge C or leaking detected.
Tighten all the brake hose connecting bolts and nuts.
Inspect brake hose route. Reset the hose route if not proper or correct.



11.4.2 Brake Performance Inspection

Inspect the front&rear brake performance on dry road.

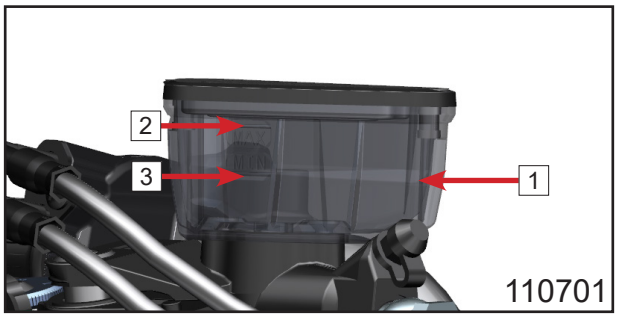
If the brake performance is not good, inspect the brake system for damage or other defects.

11.4.3 Front Brake Fluid Level Inspection

Straighten the vehicle to make the front brake fluid reservoir 1 parallel the ground.

Check if the brake fluid level is between the UPPER 2 and LOWER 3 line.

Add or reduce the brake fluid until the level is in between if not.



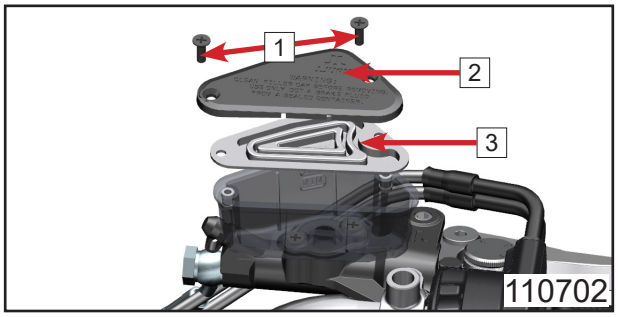
11.4.4 Brake Fluid Replacement

Straighten the vehicle to make the brake fluid reservoir parallel the ground.

Remove two crossing bolts 1.

Remove brake reservoir cap 2.

Remove brake reservoir gasket 3.

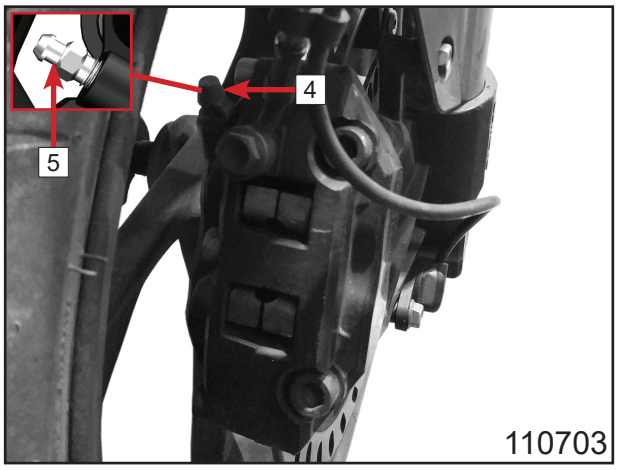


Remove rubber sleeve 4 of air-bleed bolt.

Connect a clean plastic hose with the air-bleed bolt 5.

Place the another end of the hose in a container.

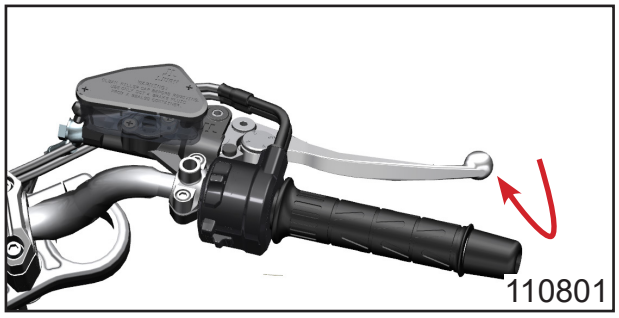
Add new brake fluid.



Repeatedly hold and loose brake lever until it feels hard.
Hold the brake lever tightly.
Loose air-bleed bolt a little bit.
Tighten the bolt right after the old brake fluid sprays out.
Repeat the above procedures until the new brake fluid sprays out.

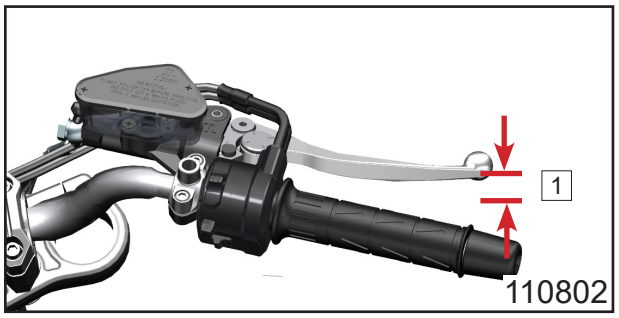
⚠Note: Keep the brake fluid level between upper and lower line. Do not spray brake fluid on plastic parts or painted surface.

Pull out plastic hose.
Install air-bleed bolt rubber sleeve.
Install brake fluid reservoir.



11.4.5 Front Brake Lever Free Play

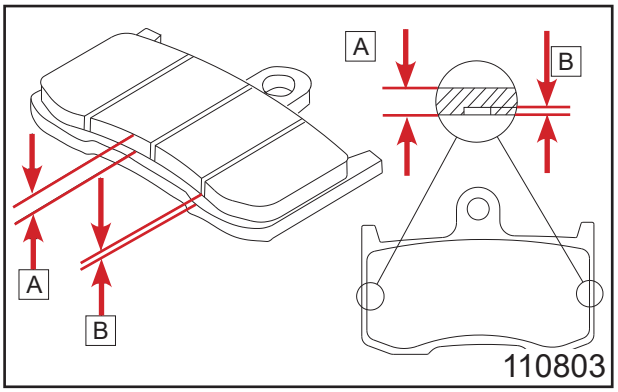
Front brake lever free play 1: 3mm~6mm



11.4.6 Front Brake Pad Inspection

Front Brake Pad Wear Inspection

Remove brake caliper.
Inspect brake pad thickness of every brake caliper.
Replace when the brake pad thickness A reaches service limit B 3mm.



Installation

Reverse the removal procedures for installation.

⚠Warning: Do not run the vehicle right after replacing new brake discs or pads. Do break-in on brake pads. Operate the brake lever several times until brake pad and brake caliper engage well.

11.5 Front/Rear Wheel, Brake Disc Inspection

11.5.1 Tire Pressure Inspection

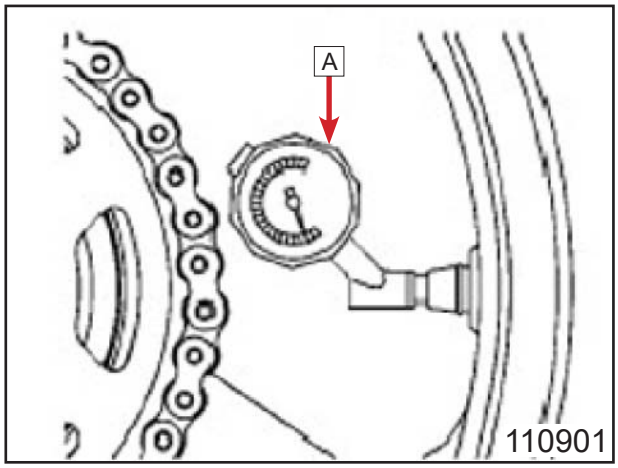
Remove tire inflation valve cap.

Measure the tire pressure with air gauge [A] when it is cool.

Install tire inflation valve cap.

Pressure	kPa	kgf/cm2	psi
Front	250±25	2.50	36.25
Rear	280±28	2.80	40.6

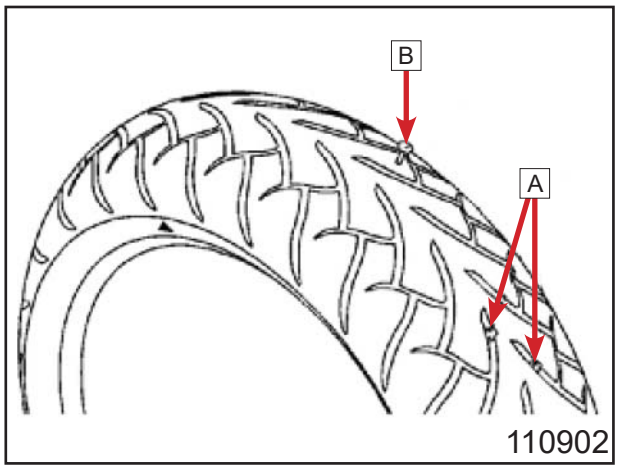
Adjust the tire pressure according to the standard if necessary.



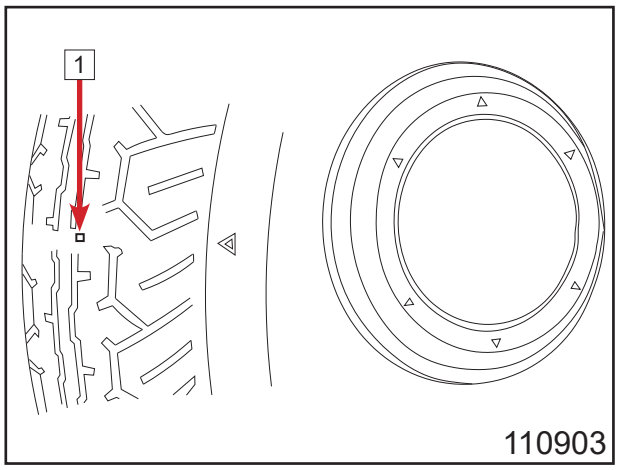
11.5.2 Tire Inspection

Clean the embedded stone [A] or other inclusions [B] on tires.

Inspect the tire for cracks or damages by watching it. Replace if necessary. If tire expands or has bulges on it, replace a new tire.



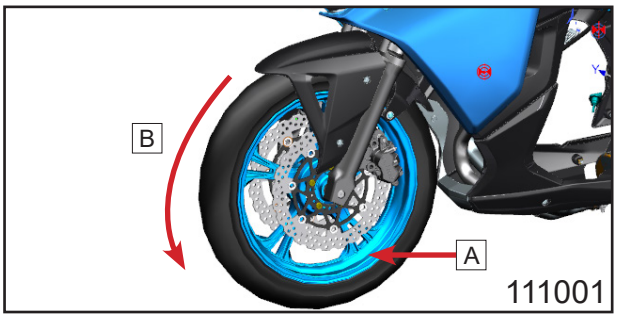
When the tire thread wears to the block [1] height, replace a new tire.



11.5.3 Wheel Bearing Inspection

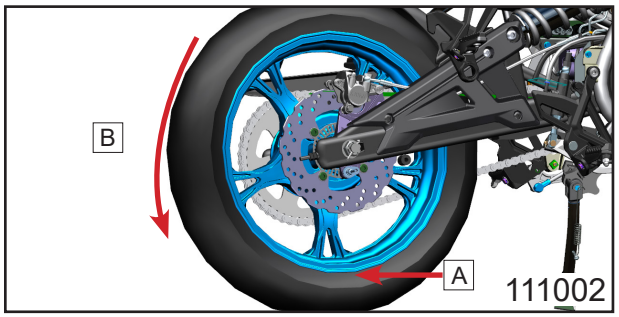
Front Wheel

Lift the front wheel with jack.
Inspect the front wheel bearing for damage buy pushing or pulling the wheel [A].
Rotate the front wheel [B] to inspect the for the smooth movement and noise.
Replace if the movement is stuck or noise occurs.



Rear Wheel

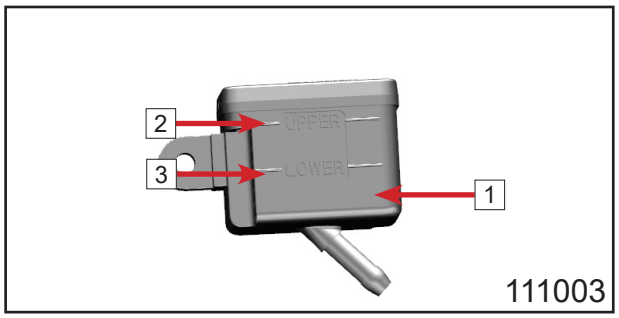
Lift the rear wheel with jack.
Inspect the rear wheel bearing for damage buy pushing or pulling the wheel [A].
Rotate the rear wheel [B] to inspect the for the smooth movement and noise.
Replace if the movement is stuck or noise occurs.



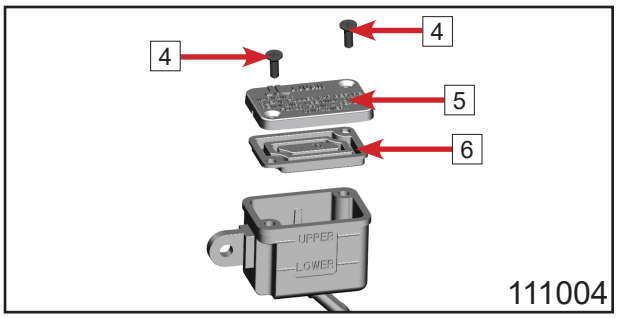
11.6 Rear Brake Assy Inspection

11.6.1 Rear Brake Fluid Inspection

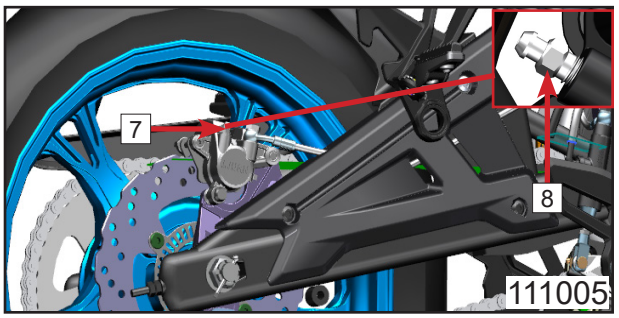
Straighten the vehicle to make the front brake fluid reservoir [1] parallel the ground.
Check if the brake fluid level is between the UPPER [2] and LOWER [3] line.
Add or reduce the brake fluid until the level is in between if not.



Remove two crossing bolts [4].
Remove brake reservoir cap [5].
Remove brake reservoir gasket [6].



Remove rubber sleeve [7] of air-bleed bolt.
Connect a clean plastic hose with the air-bleed bolt [8].
Place the another end of the hose in a container.



11.6.2 Brake Pedal Inspection

Brake pedal free play: 10mm

Inspect brake light performance (refer to Chapter 06).

Add new brake fluid.

Repeatedly step brake pedal until it feels hard.

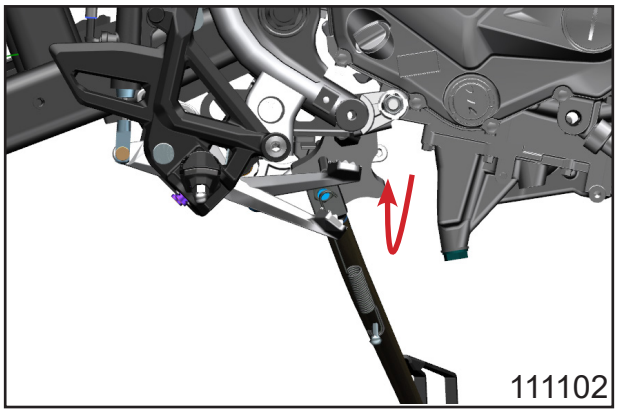
Step the brake pedal.

Loose air-bleed bolt a little bit.

Tighten the bolt right after the old brake fluid sprays out.

Repeat the above procedures until the new brake fluid sprays out.

⚠Note: Keep the brake fluid level between upper and lower line. Do not spray brake fluid on plastic parts or painted surface.



Pull out plastic hose.

Install air-bleed bolt rubber sleeve.

Install brake fluid reservoir.

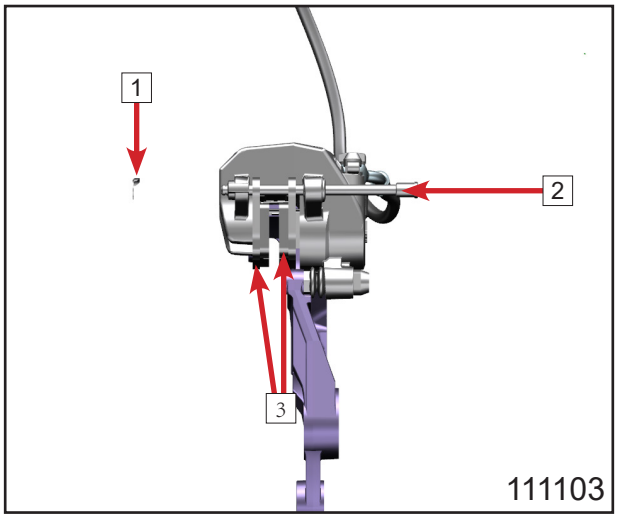
11.6.3 Rear Brake Pad Inspection

Removal

Remove guide rod clasp 1.

Remove guide rod 2.

Remove rear brake pads 3.



Rear Brake Pad Wear Inspection

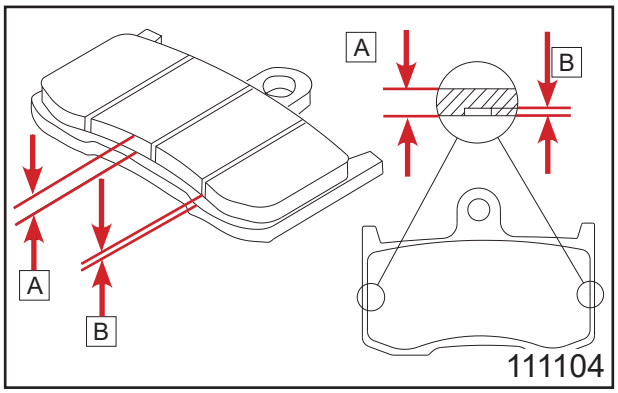
Inspect brake pad thickness of every brake caliper.

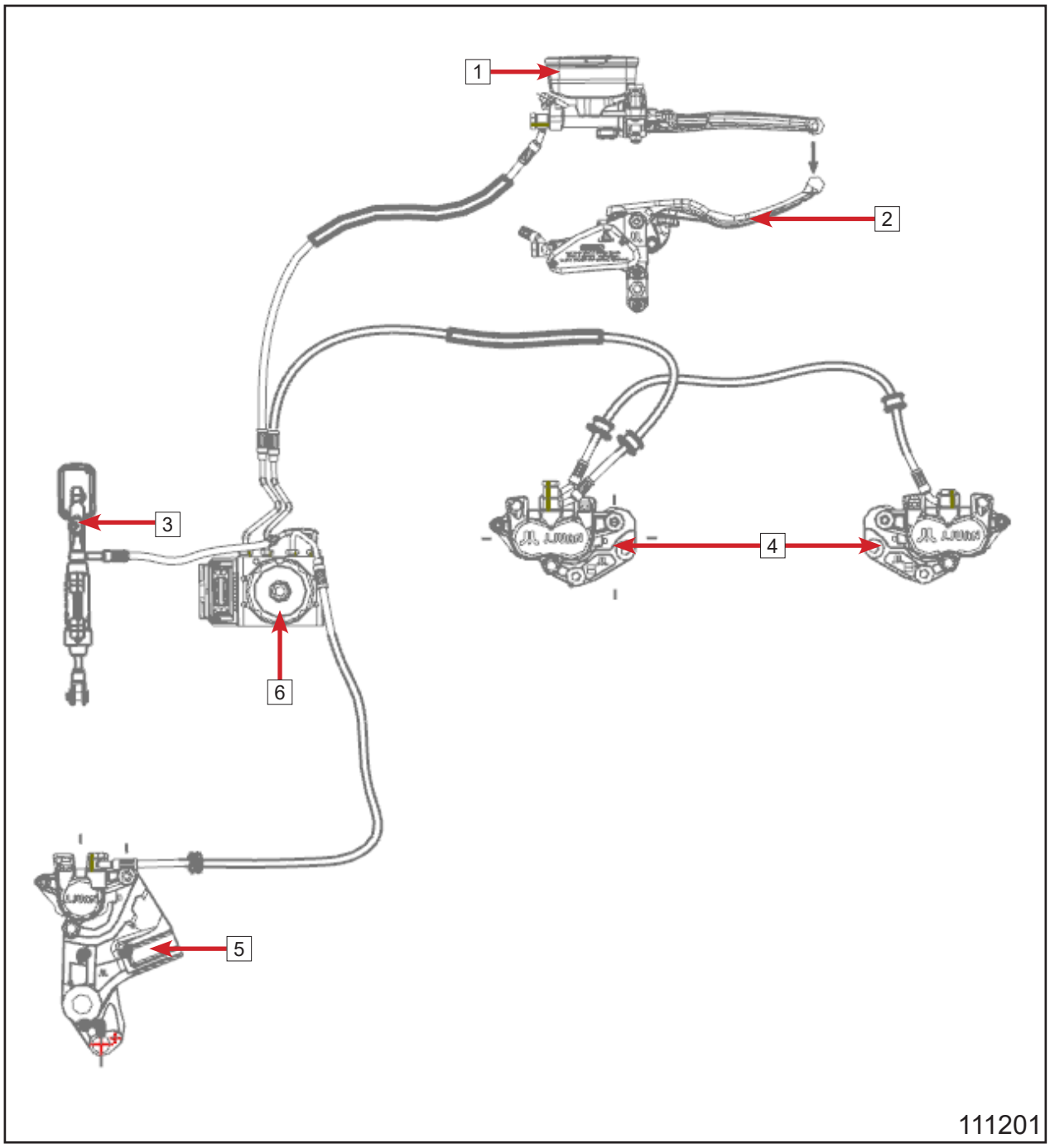
Replace when the brake pad thickness A reaches service limit B 3mm.

Installation

Reverse the removal procedures for installation.

⚠Warning: Do not run the vehicle right after replacing new brake discs or pads. Do break-in on brake pads. Operate the brake lever several times until brake pad and brake caliper engage well.



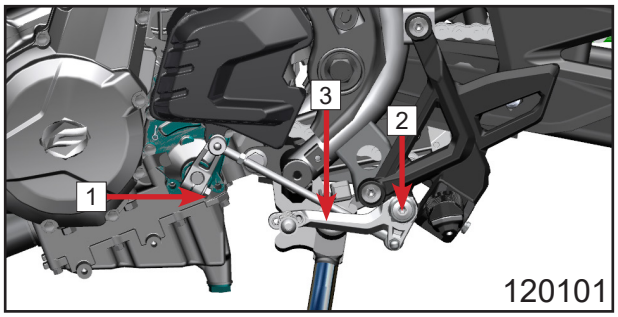


1	Front brake fluid reservoir	2	Brake lever	3	Master cylinder	4	Front brake caliper
5	Rear brake caliper	6	MAB actuator				

⚠Note: Before operation, the vehicle has to be fixed, in case it falls down to cause injury.

12.1 Gearshift Lever Assy

Loose M6 bolt [1].
Remove M6 inner hex bolt [2].
Remove gearshift lever assy [3].



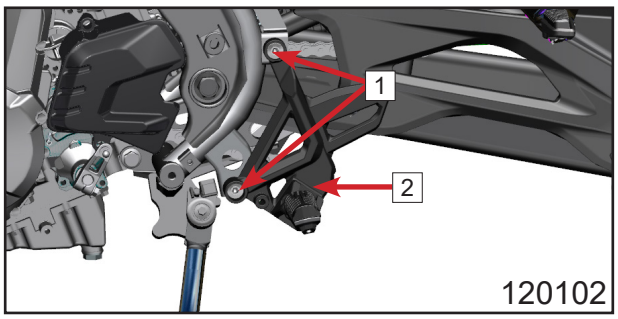
Installation

Reverse the removal procedures for installation.

12.2 LH Footrest Bracket

Removal

Remove two M6 inner hex bolts [1].
Remove LH footrest bracket [2].



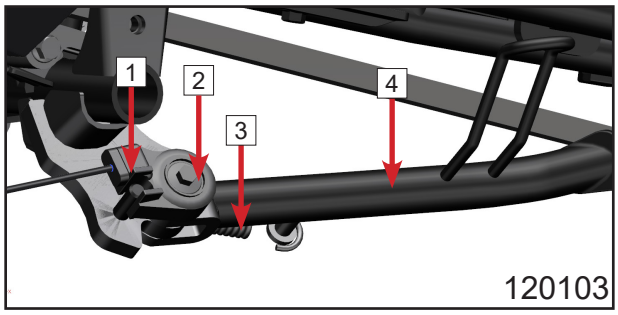
Installation

Reverse the removal procedures for installation.

12.3 Side Stand

Removal

Remove side stand switch connector [1].
Remove side M6 bolt [2].
Remove side spring [3].
Remove side stand [4].



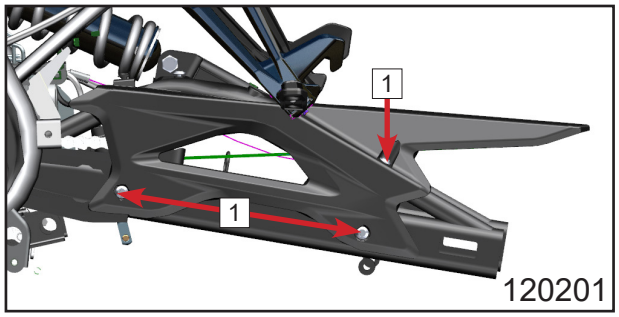
Installation

Reverse the removal procedures for installation.

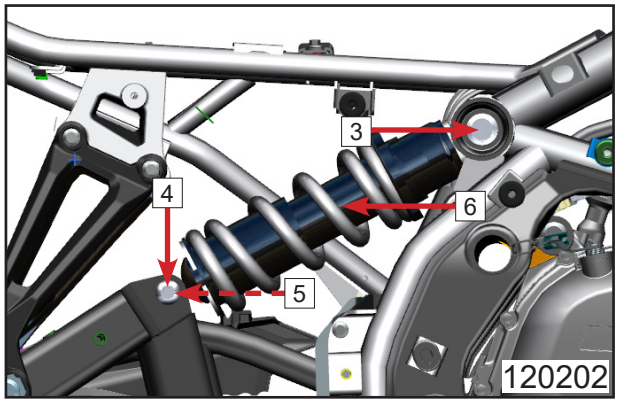
12.4 Rear Shock Absorber

Removal

Remove three M6 inner hex bolts [1].
Remove sprocket cover [2].
Remove chain guard.



Remove M15 bolt [3].
Remove M15 bolt [4].
Remove nut [5].
Remove shock absorber [6].

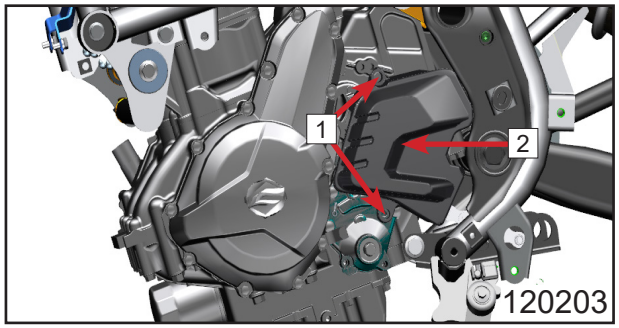


⚠Note: After rear shock absorber removed, the rear fork can be removed.

Installation

Reverse the removal procedures for installation.

Rear shock absorber nut tighten torque: 59N•m

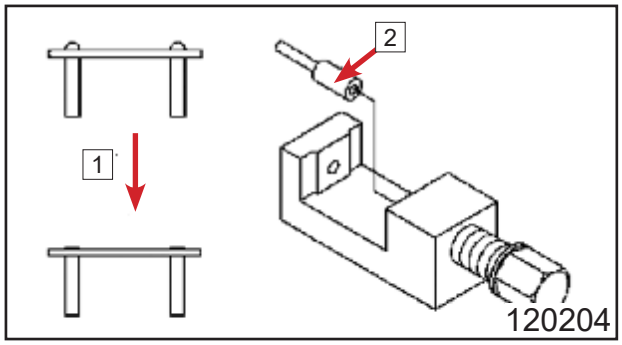


12.5 Chain

Removal

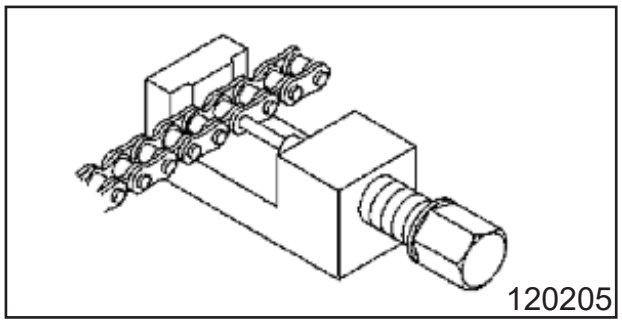
Remove two M6 bolts [1].
Remove small sprocket cover [2].
Loose chain.

Because the chain is installed through the swing arm, it can only be cut rather then removed. Prepare new chain pin, chain board and pin seat to reconnect the chain.

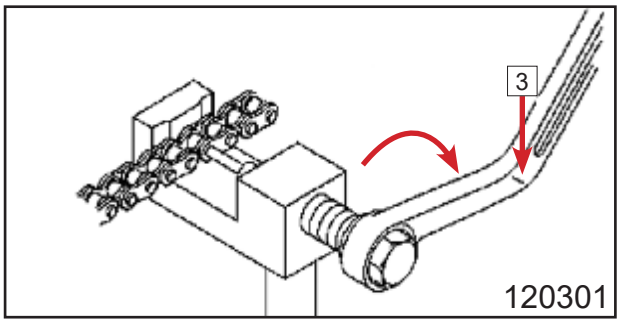


Press hard [1] to make two pin heads parallel.
Set the cutting and riveting pin [2] as picture shows.

Tighten the bolt to narrow the pin seat until it touches chain pin.
Make sure the centers of cutting and riveting pin and chain pin are aligned.



Rotate the pin seat with wrench [3] clockwise to remove the chain pin.



Drive Chain Installation

Install new chain knots on chain to replace the old ones.

Remove the chain boards of new drive chain.

Apply grease on chain pin [2] and seal rings [1].

Engage the chain and rear chain sprocket.

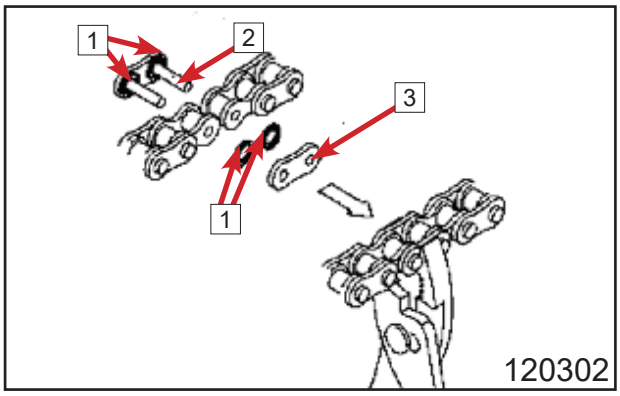
Insert chain pins into chain knots.

Install seal rings [1].

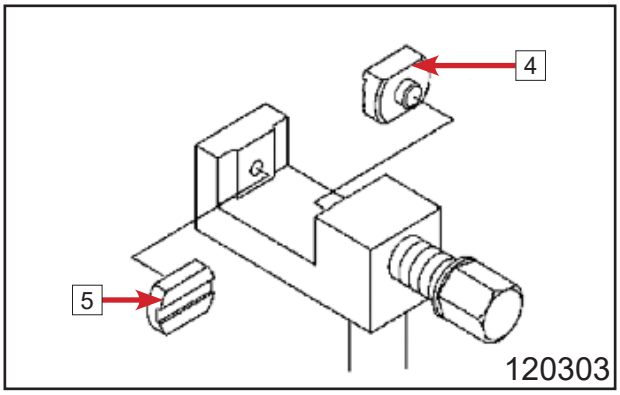
Install chain boards and make the mark [3] face outside.

Fix the chain board with hand or plier.

Make sure the seal ring is installed correctly in case of the chain grease leaking.

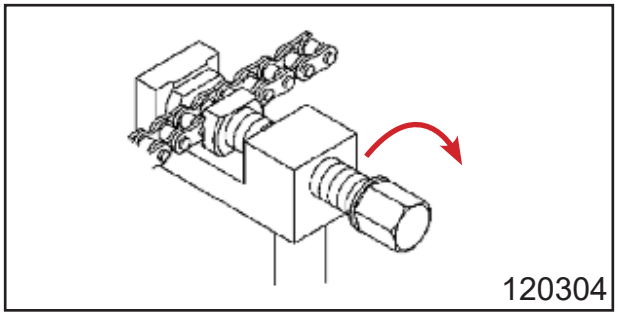


Set the holder [4] and [5].



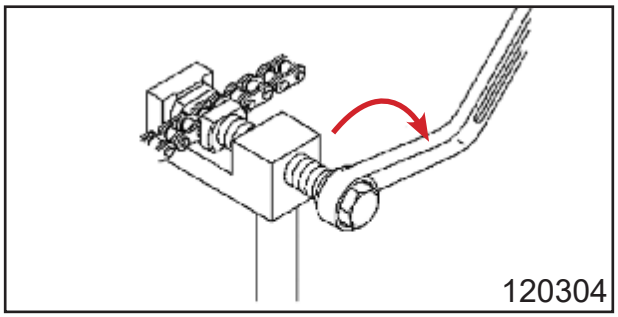
Align the holder and chain board.

Rotate the pin seat until it touches the chain board.

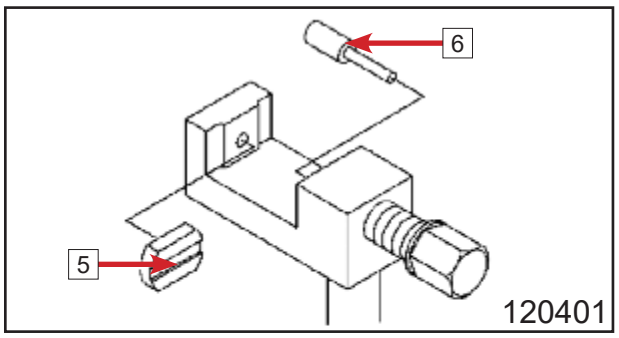


Rotate the pin seat with wrench clockwise until two pins get into the grooves of holder.

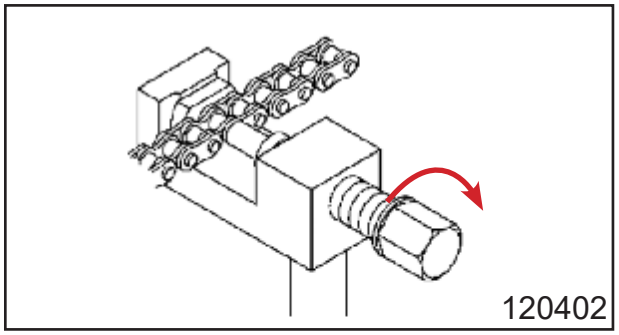
Remove holder [4].



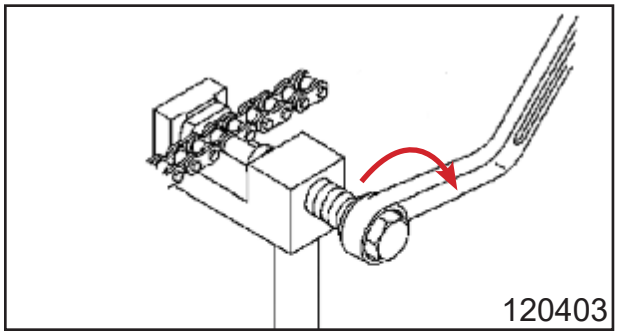
Set the holder [5] and cutting and riveting pin [6] as picture shows.



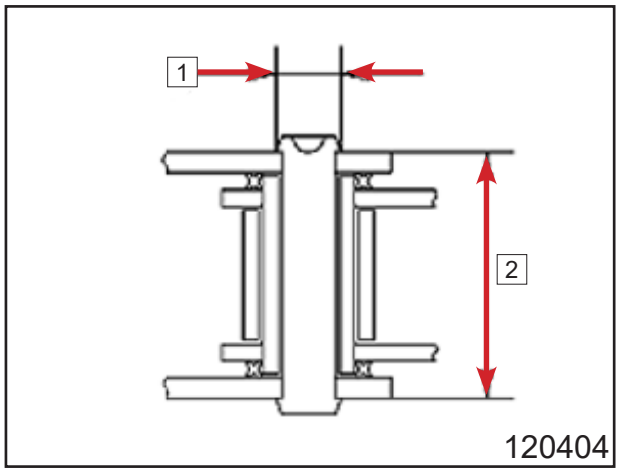
Rotate the pin seat until it touches chain pin.



Rotate the wrench clockwise until cutting and riveting pin head touches chain pin to rivet.
Other chain pins installation follows the same procedures.



Inspection
After installation, inspect riveting knots for cracks. Measure chain pin outer diameter [1] and chain board width [2].
Chain pin outer diameter
Standard: 5.45 mm~5.55 mm
Chain board width
Standard: 17.25 mm~17.45 mm
(0.679 in.~0.687 in.)
Cut and re-rivet the chain knots if out of standard.

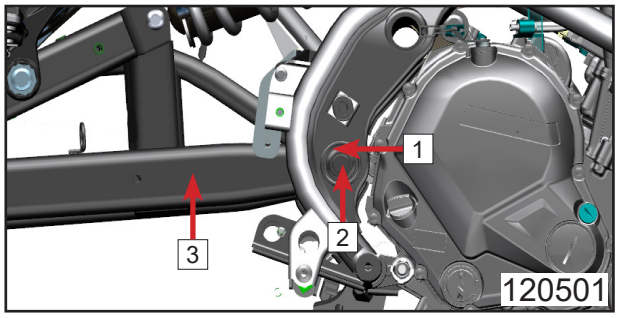


Chain Looseness Adjustment
Chain sag standard: 30mm~40mm

12.6 Rear Fork

Removal

Remove M20 nut 1.
Remove rear fork shaft 2.
Remove rear fork 3.



Installation

Reverse the removal procedures for installation.

Rear fork shaft nut tighten torque: 180 N•m

13.1 Engine Special Tool

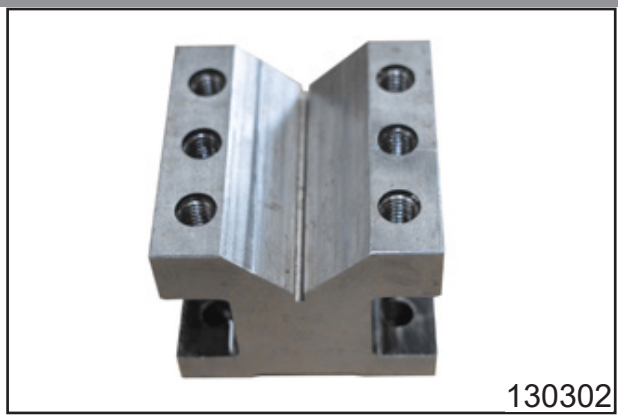
Magneto rotor removing tool (to remove magneto rotor)

0700-031000-922-00


130301

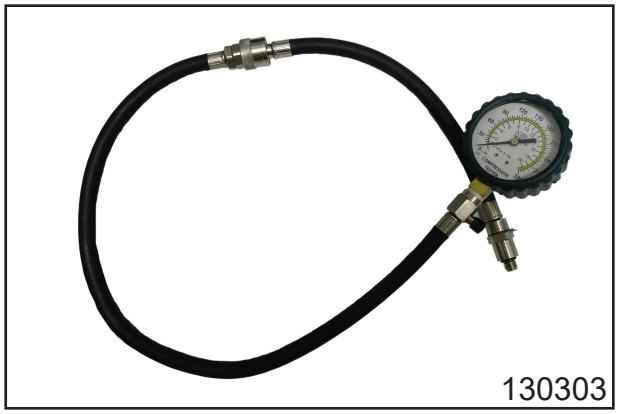
V-block

0800-060000-923-001


130302

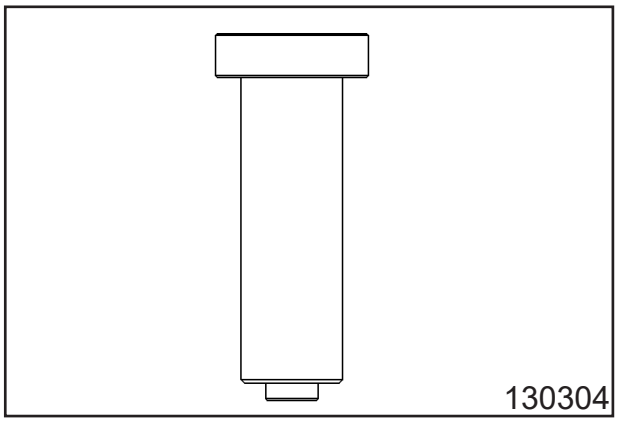
Cylinder pressure gauge and connecting seat

Cylinder pressure standard: 0-2 MPa


130303

Water seal ring installing tool (puncher pin)

0700-080000-923-002


130304

Piston pin circlip installing tool (to install piston pin circlip)

0800-040005-922-001


130401

Feeler gauge (to measure the valve clearance)


130402

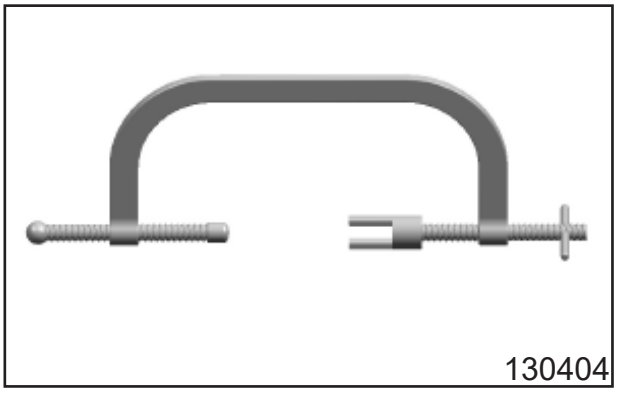
Spark plug sleeve

0700-170200-923-001


130403

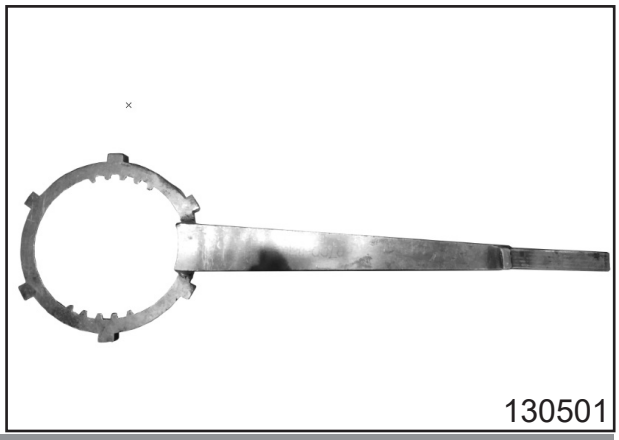
Valve spring compressing tool

CF188-022006-922-001


130404

Clutch stopping wrench (to remove/install clutch nuts, crankshaft RH nuts)

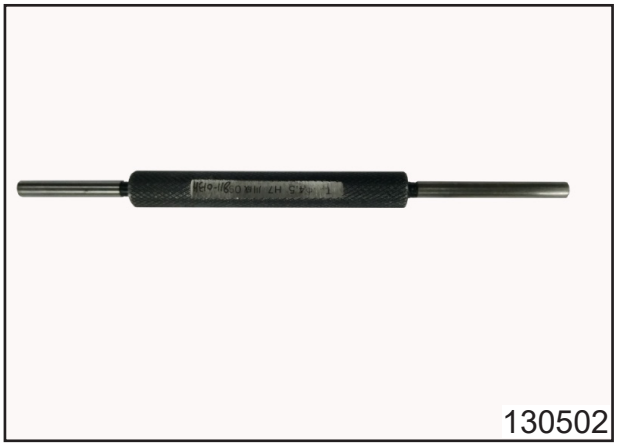
0700-051000-922-001



130501

Valve pipe guide shaft

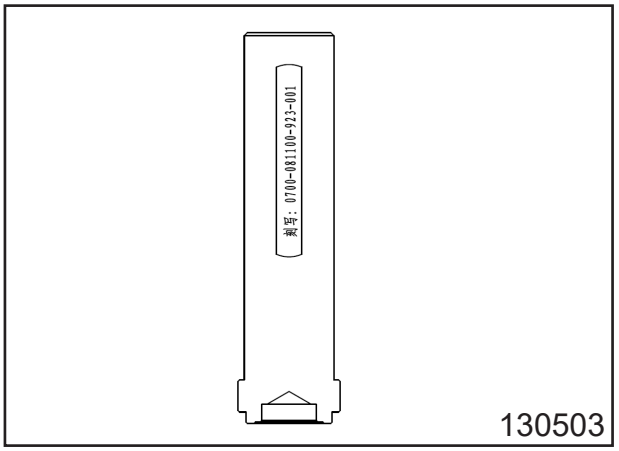
φ4.5



130502

Water pump oil seal puncher

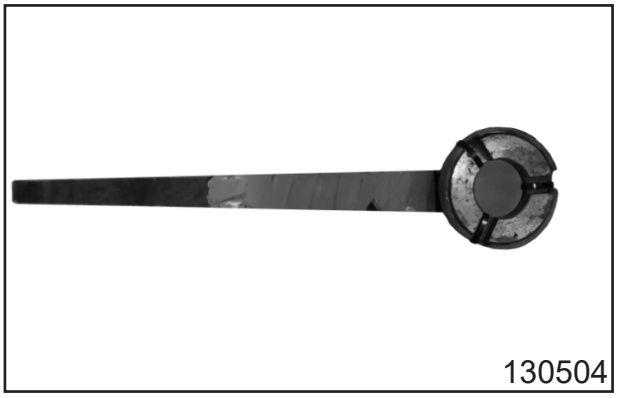
0700-081100-923-001



130503

Magneto rotor stopping wrench

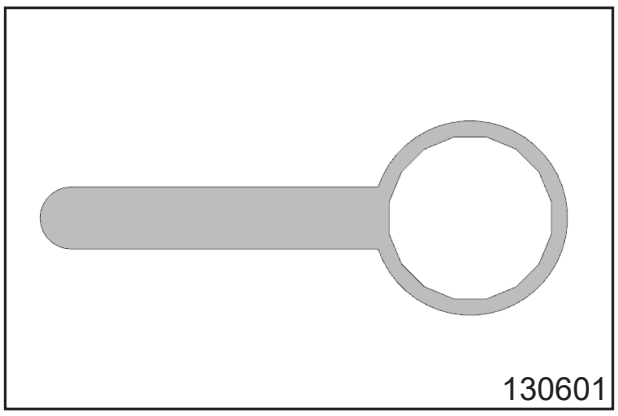
0700-031000-922-001



130504

Oil filter wrench

0700-070200-922-001



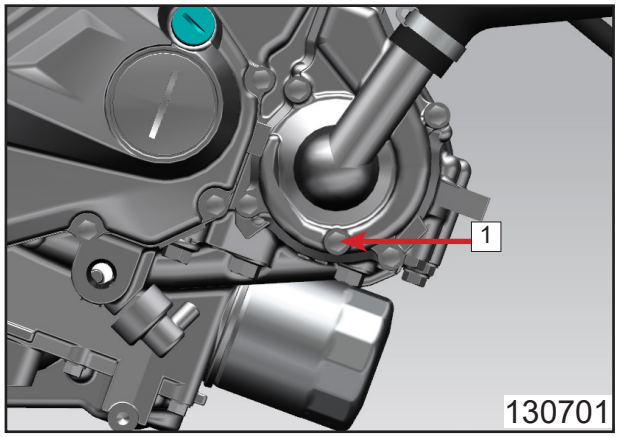
13.2 Engine Removal

Remove muffler.
Remove electrical connectors on engine.
Remove reservoir LH&RH outer protection plates.
Remove reservoir LH&RH inner protection plates.
Remove LH&RH panels.
Remove engine guards assy.
Remove frame LH&RH protection plates.

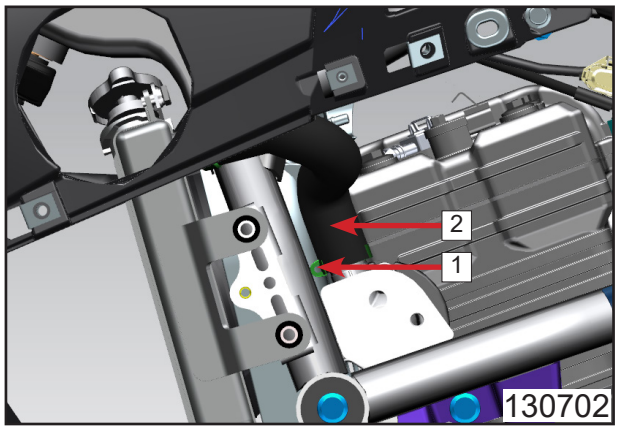
⚠Note: Remove the engine until it cools down or wear protection clothes to avoid burnt injury.

13.2.1 Engine Inlet&Outlet Water Pipe Removal

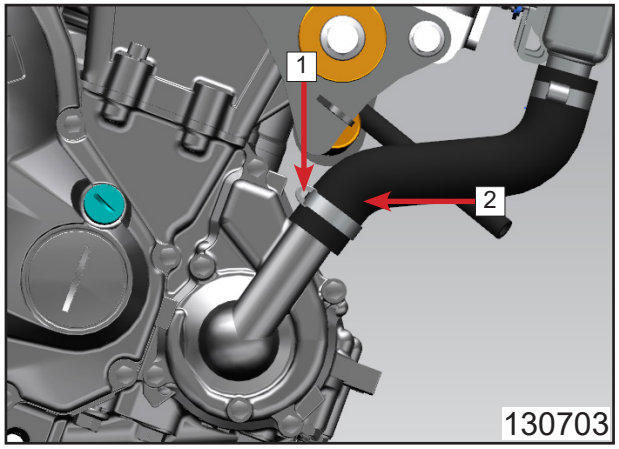
Open reservoir cap.
Straighten the vehicle. Place a pan under the engine to store the drained coolant.
Remove M6 bolt [1] and washer to drain the coolant.



Loose clamp [1].
Pull out inlet pipe [2] from the engine with caliper.

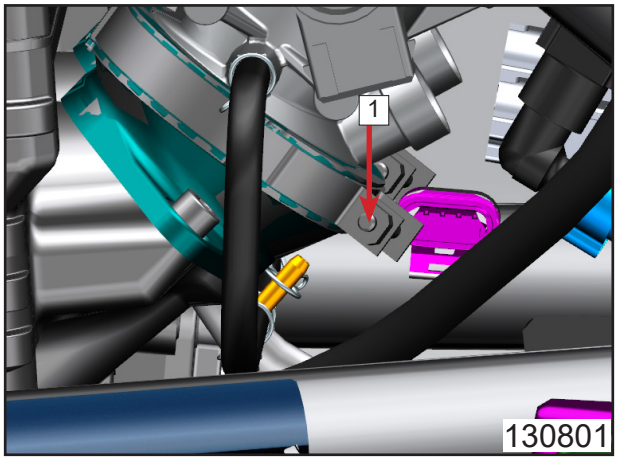


Loose clamp [1].
Pull out outlet pipe [2] from the engine with caliper.

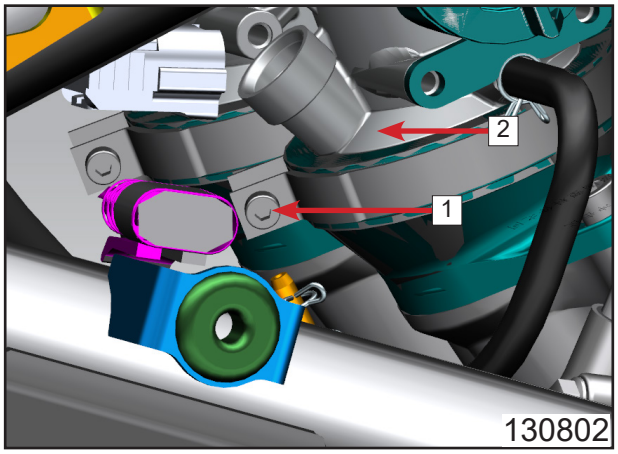


13.2.2 Air Filter Loose

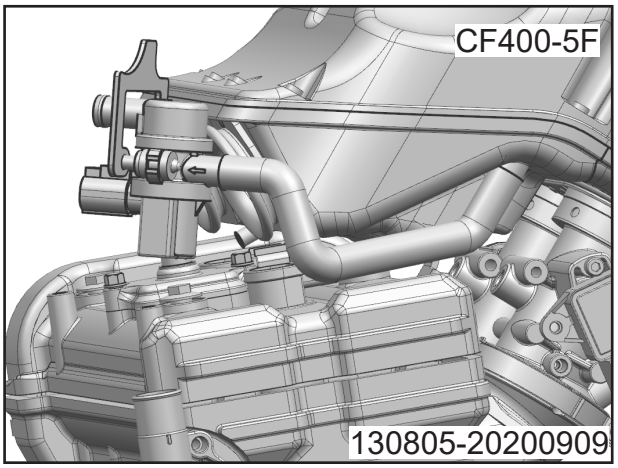
Loose clamp [1].



Loose clamp [1].
Shake throttle valve body [2] until it looses.
Remove air filter.

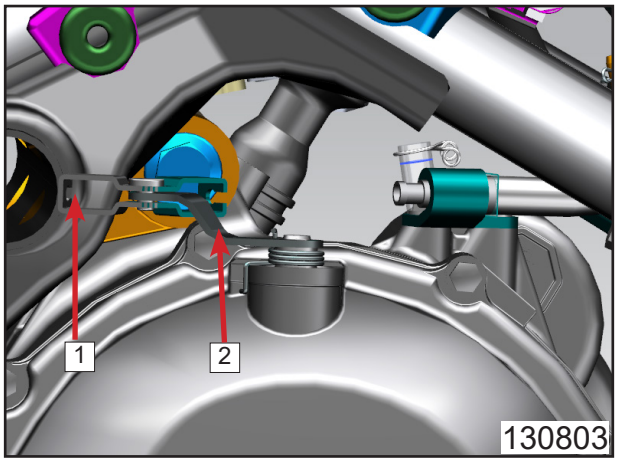


Remove AIS valve and air inlet and outlet pipes;
Remove air filter.



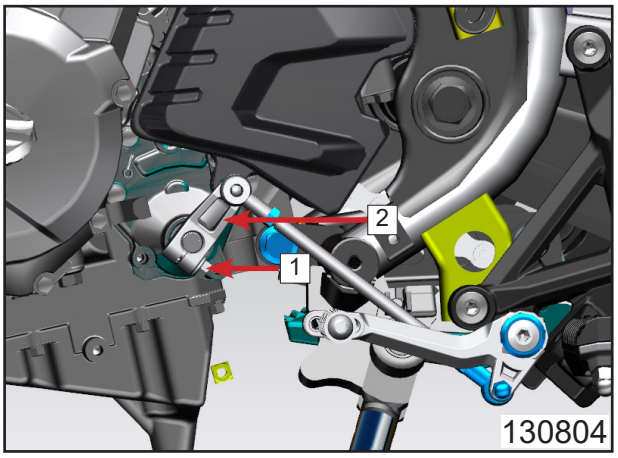
13.2.3 Clutch Cable Removal

Use tool to rotate clutch rod [2].
Remove clutch cable [1].



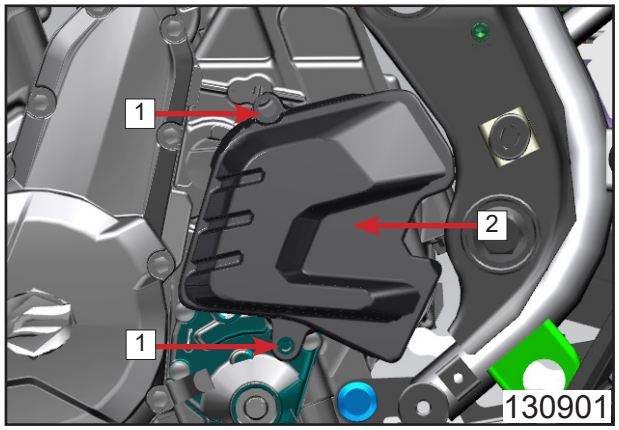
13.2.4 Gearshift Lever Assy Removal

Remove M6 bolt [1].
Remove gearshift lever assy [2].



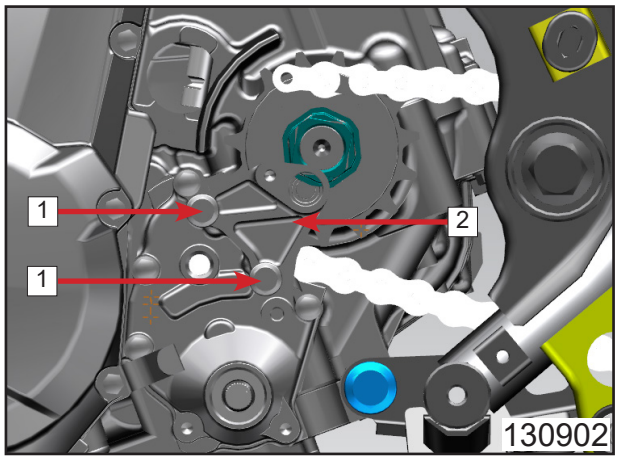
13.2.5 Sprocket Removal

Remove M6 bolt [1].
Remove engine LH rear cover [2].

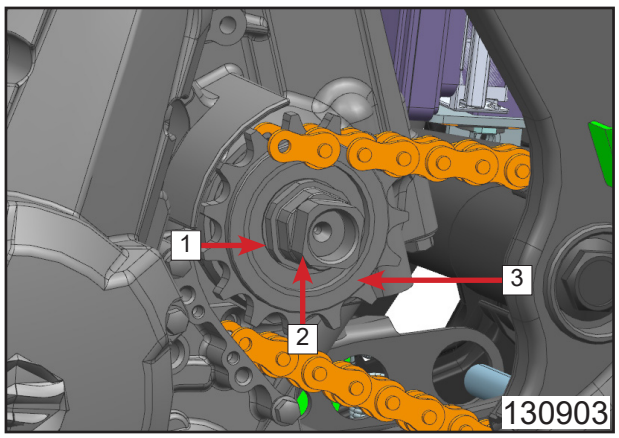


Remove M6 bolt [1].
Remove bracket [2].

⚠Note: Pay attention there are two dowel pins under the bracket [2]. After bracket [2] removal, remove dowel pins in case of getting lost.



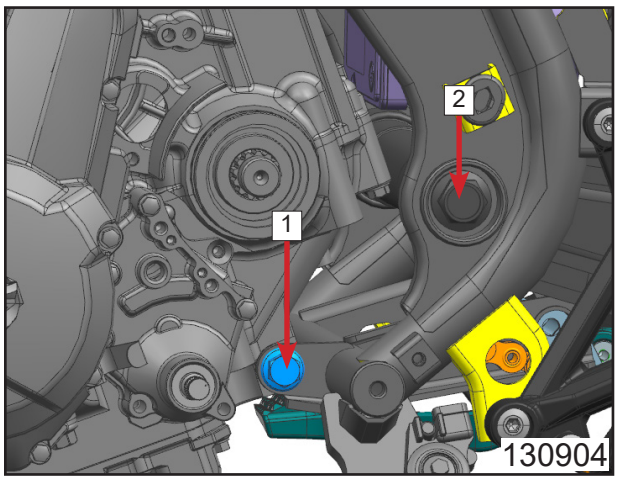
Knock and straighten the flanging of retainer [1].
Remove counter pulse M20 nut [2].
Remove retainer [1].
Remove output sprocket [3].



13.2.6 Engine Assy Removal

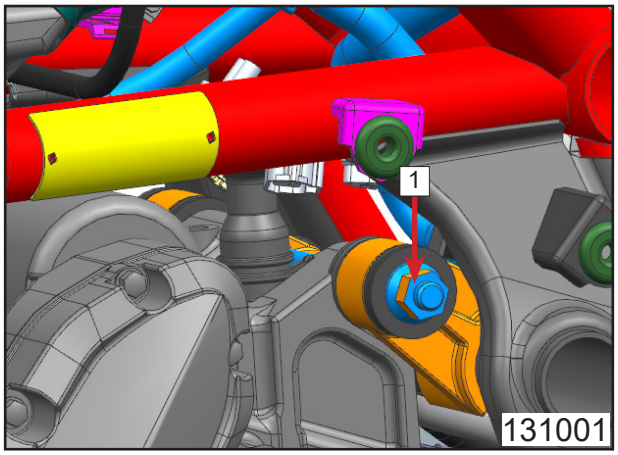
Place the jack with soft cushion under the engine to support it.
Remove M10 nut [1] and bolt.
Remove M20 nut [2] and bolt.

⚠Note: Fix the other side with wrench during removal.



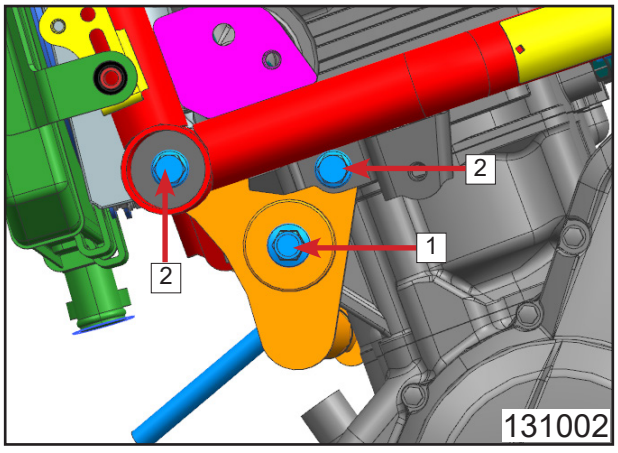
Remove M10 nut [1] and bolt.

⚠Note: Fix the other side with wrench during removal.

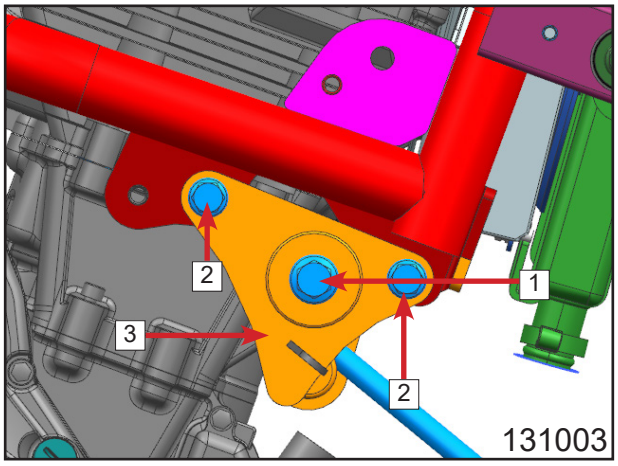


Remove M10 bolt [1] and nut.
Remove M8 bolts [2].

⚠Note: Fix the other side with wrench during removal.



Remove M10 bolt [1] and nut.
Remove M8 bolts [2].
Remove engine front mounting bracket assy [3].
Shake the engine and decline the jack slowly to remove the engine.

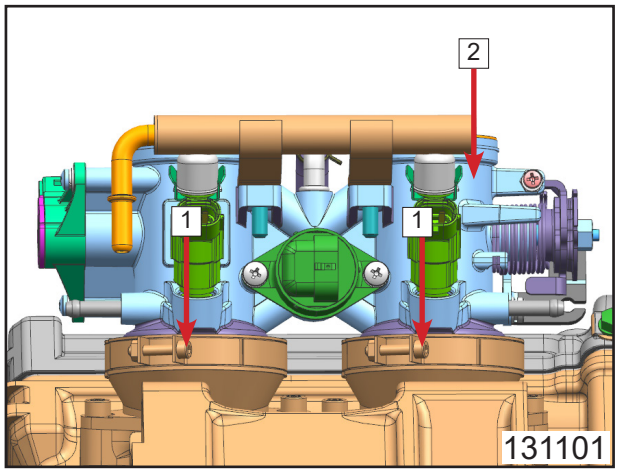


13.3 Engine Air Intake System

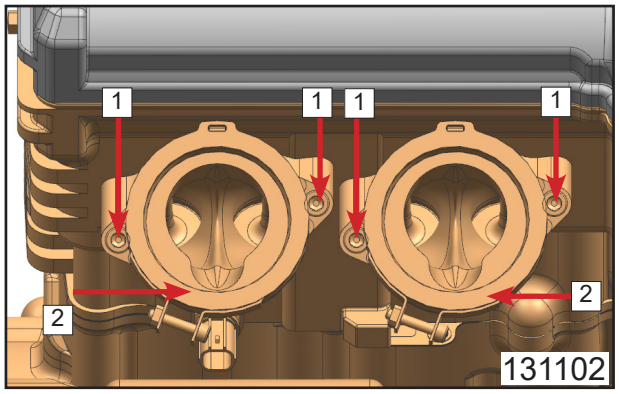
13.3.1 Throttle Valve Assy Disassembly

Air Filter Assy Removal (refer to Air Filter chapter)

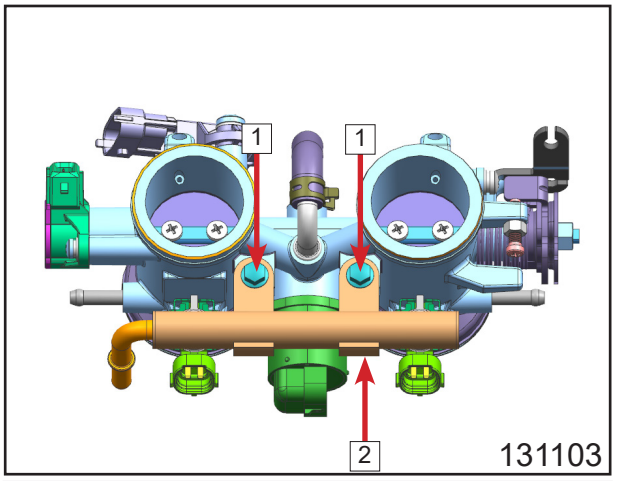
Loose clamps 1.
Remove throttle valve assy 2.



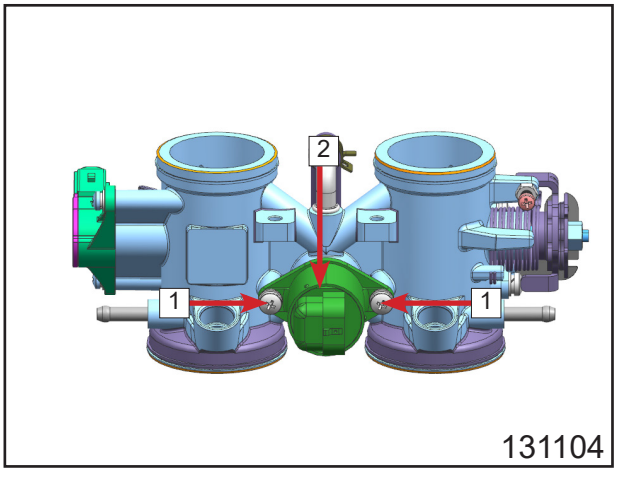
Remove M6 inner hex screws 1.
Remove air intake pipes 2.



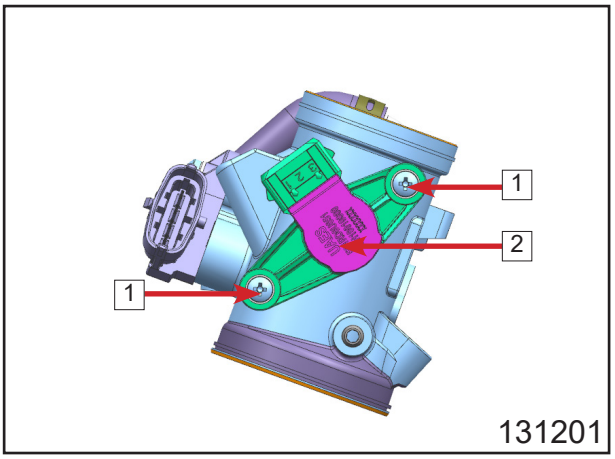
Remove M6 bolts 1.
Remove fuel rail assy 2.



Remove screws 1.
Remove idle stepping motor 2.

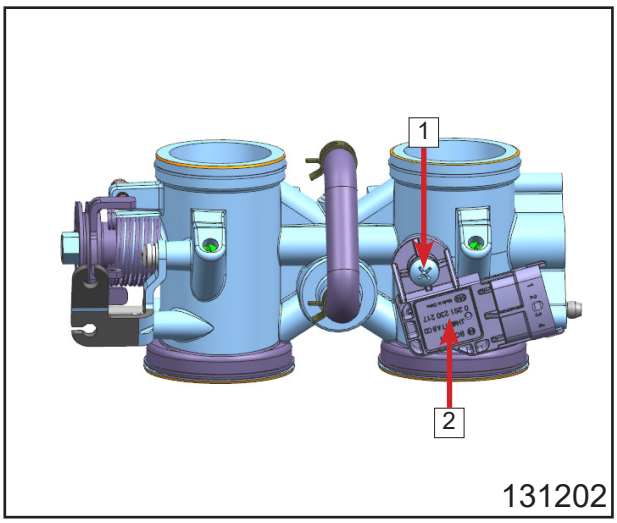


Remove screws [1].
Remove TPS [2].



131201

Remove screw [1].
Remove T-MAP [2].



131202

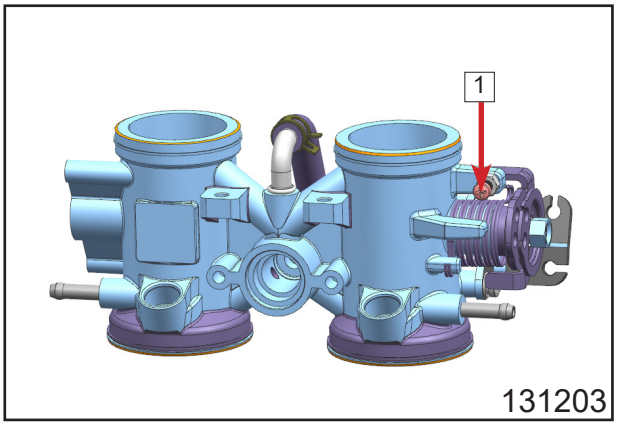
13.3.2 Throttle Valve Assy Inspection

13.3.2.1 Throttle Valve Body

Inspect throttle valve body for crack or damage. Replace if it does.

Inspect electrical parts (refer to the Inspection section of Electrical System chapter).

⚠Note: It is not allowed to remove the idle position screw [1].



131203

13.3.2.2 Fuel Rail Assy

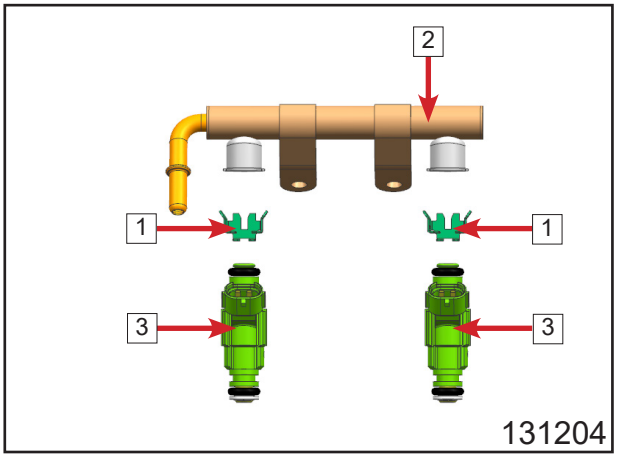
Disassembly

Push both sides of injector spring[1] with thumbs to remove the spring [1].
Remove fuel injector caps[2].

Details refer to Electrical System.

Assembly

Install injector [3] on injector caps [2]. Then install injector cap spring [1]. Make sure the edge of the injector cap [2] clip into the groove of the spring [1].



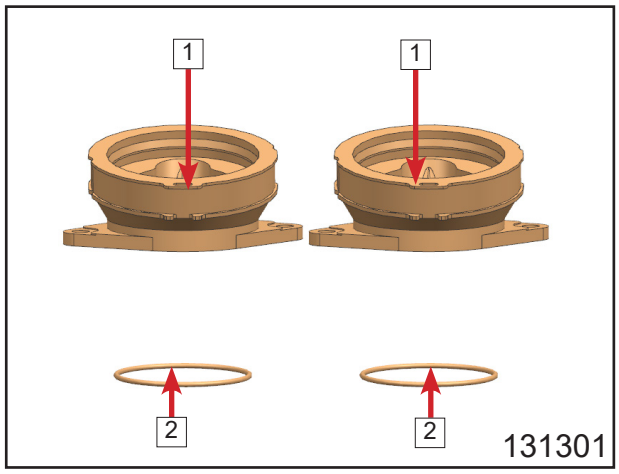
131204

Idle stepping motor, TPS and T-MAP inspection refer to Electrical System chapter.

13.3.2.3 Air Intake Pipe Inspection

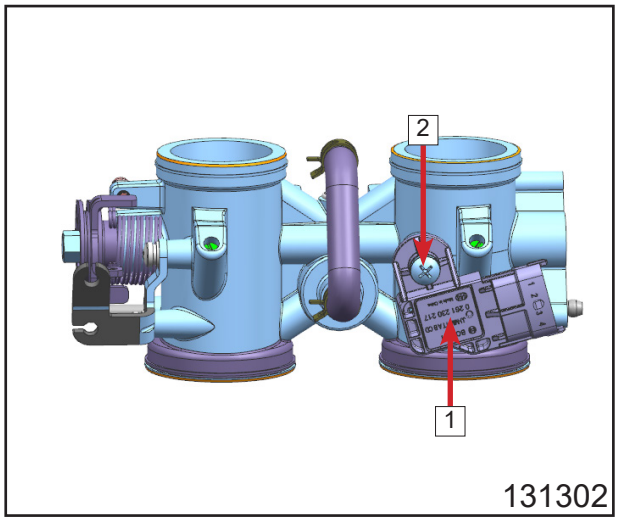
Inspect air intake pipes [1] for cracks or damage. Replace if they do.

Inspect rubber seal rings [2] for cracks, hardening or damage. Replace if they do.

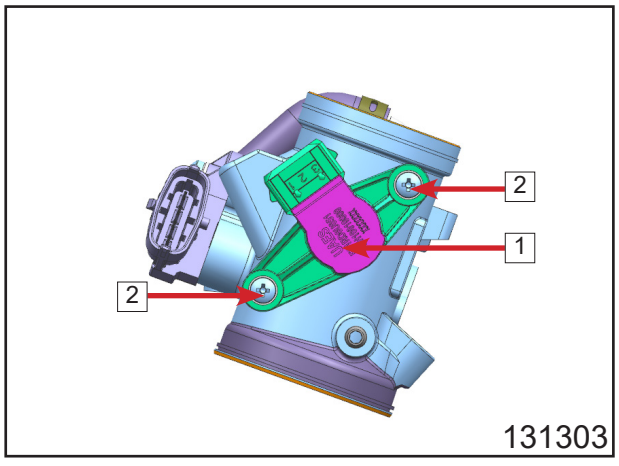


13.3.3 Throttle Valve Assy Assembly

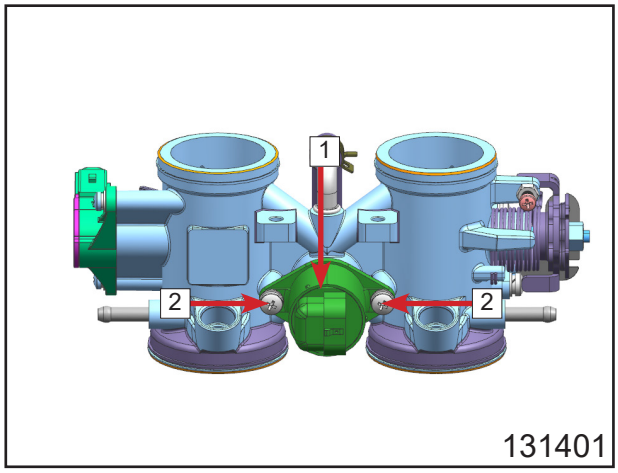
Install T-MAP [1].
Install screw [2].



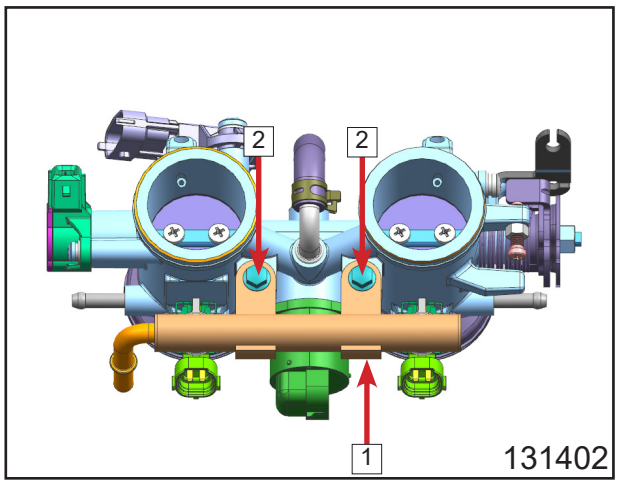
Install TPS [1].
Install screws [2].



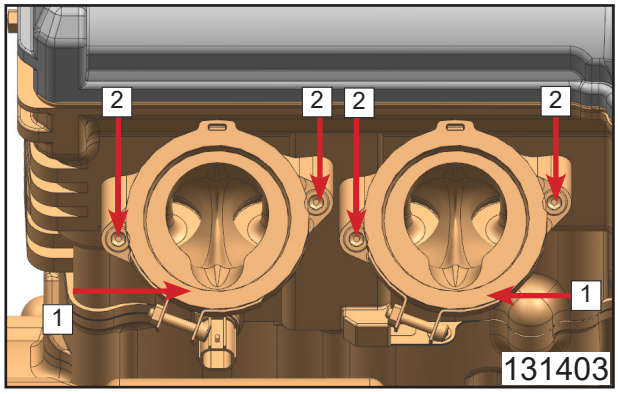
Install idle stepping motor [1].
Install screws [2].



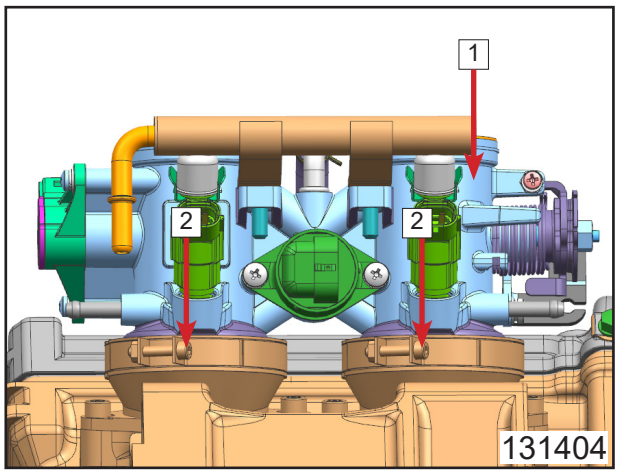
Install fuel rail assy [1].
Install M6 bolts [2].



Install air intake pipes assy [1].
Install M6 inner hex screws [2].



Install throttle valve assy [1].
Tighten clamps [2].



13.4 Engine Disassembly

Put the engine on operating bench and fix it.

⚠Warning: Fix the engine firmly on the bench, in case it falls down to cause injury or engine damage.

⚠Warning: Disassemble the engine when the engine is cool. Otherwise, wear protective clothes in case of getting burnt.

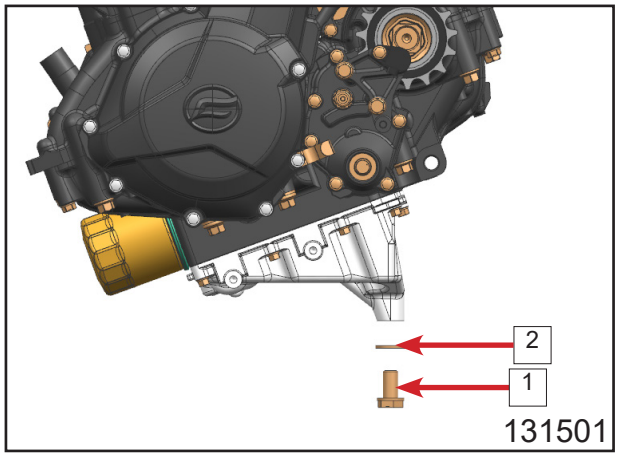
13.4.1 Engine Oil Drain

Place a pan under the engine to store the engine oil from the engine.

Remove M12×22 drain bolt [1].

Remove washer 12 [2].

Drain the engine oil.

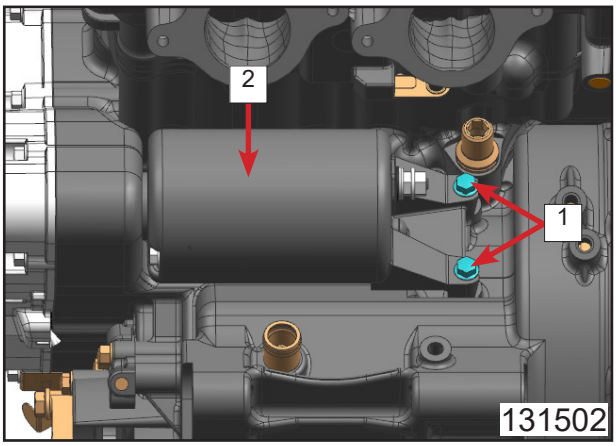


13.4.2 Starter Motor Removal

Remove M6 bolts [1].

Shake the starter motor [2] to remove it.

If it is too tight, knock the motor gently with hammer to loose. Do not knock it very hard.

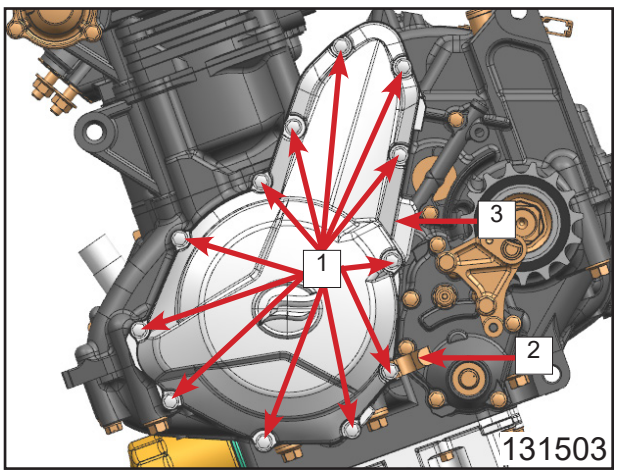


13.4.3 Magneto Rotor Removal

Remove M6 bolts [1].

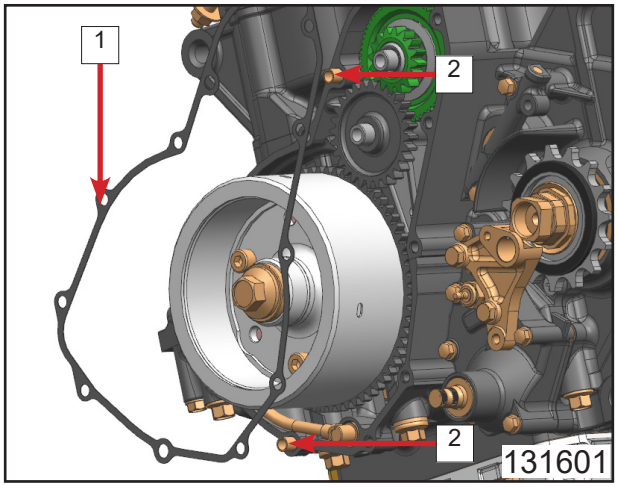
Remove cable clip [2].

Remove LH front cover [3].

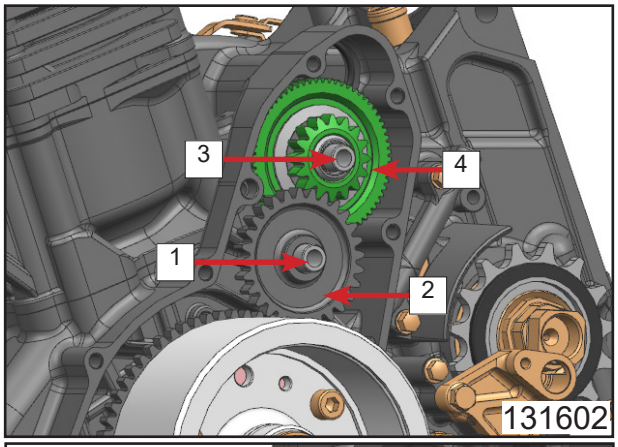


Remove seal gasket [1].
Remove dowel pins [2].

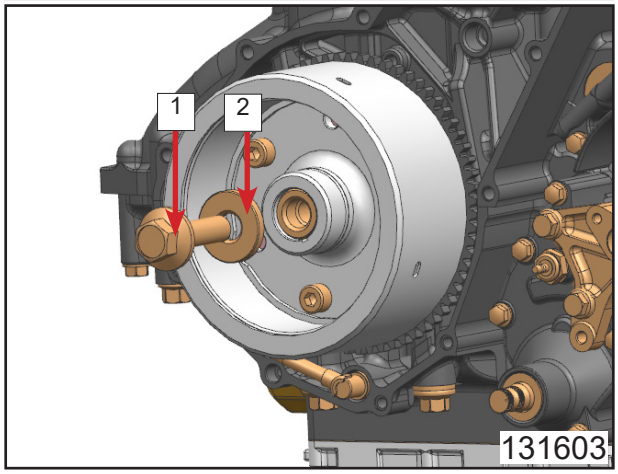
⚠Note: Pay attention there are dowel pins [2] in case of getting lost. Dowel pins [2] may be on the LH front cover when removing it.



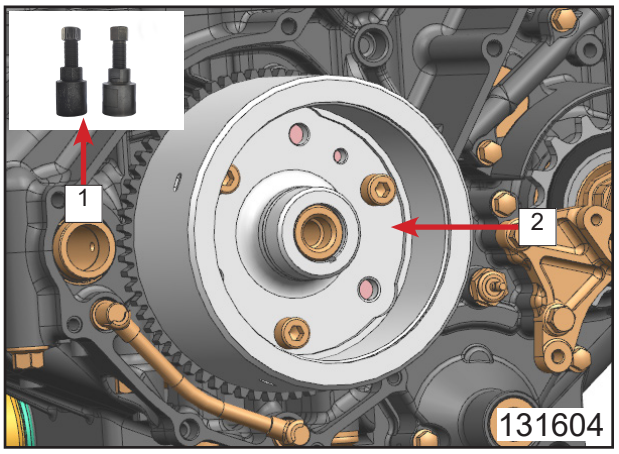
Remove middle gear shaft [1].
Remove starter middle gear [2].
Remove middle gear shaft [3].
Remove dual gear assy [4].



Remove M12 bolt [1].
Remove washer [2].

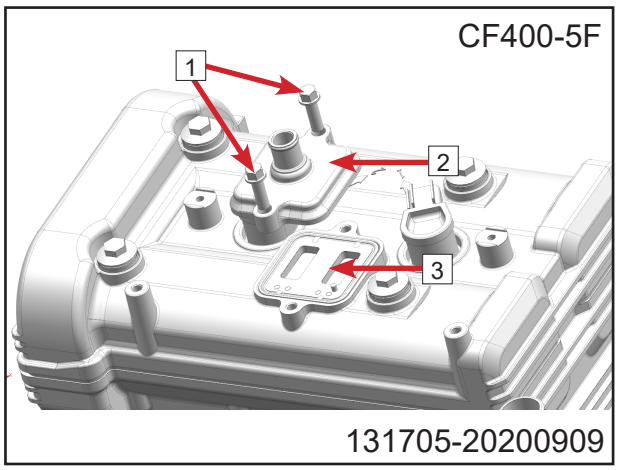


Use special tool: magneto rotator removing tool [1] to remove the magneto rotor [2].

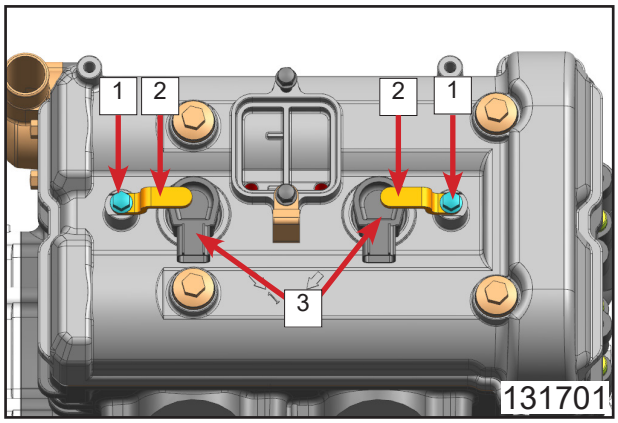


13.4.4 Ignition Coil and Spark Plug Removal

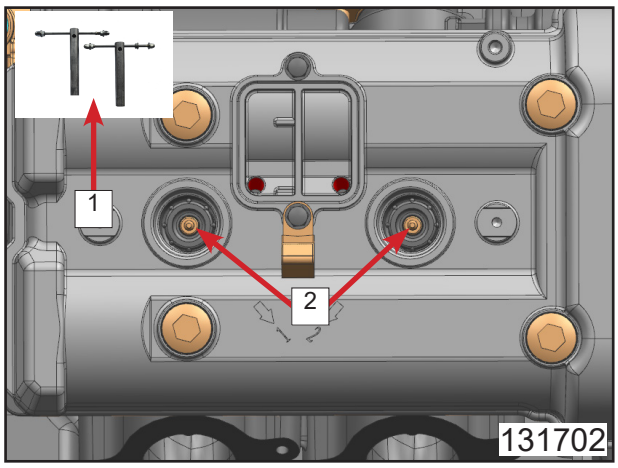
Remove bolts [1]
Remove spring valve cover [2];
Remove spring valve assy [3].



Remove M6 bolts [1].
Remove press plate [2].
Rotate the ignition coil [1] counter clockwise until it gets loose.
Pull out ignition coil [1].

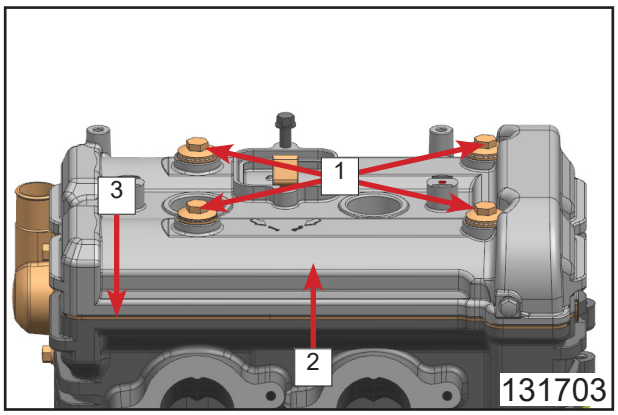


Use special tool: spark plug sleeve [1] to remove spark plug [2].



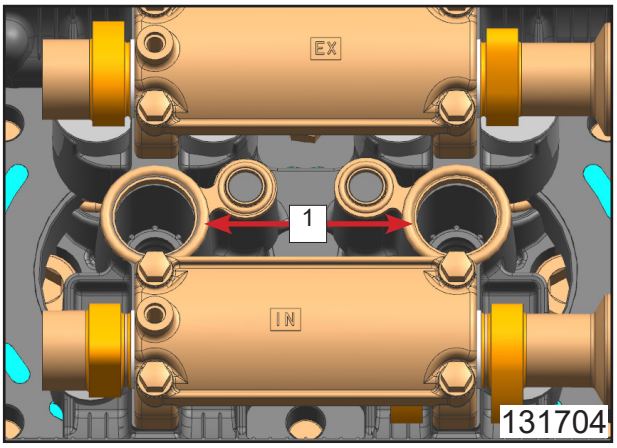
13.4.5 Cylinder Head Cover Removal

Remove cylinder head cover M6 bolts and seal rings [1].
Remove cylinder head cover [2].
Remove cylinder head cover seal gasket [3].

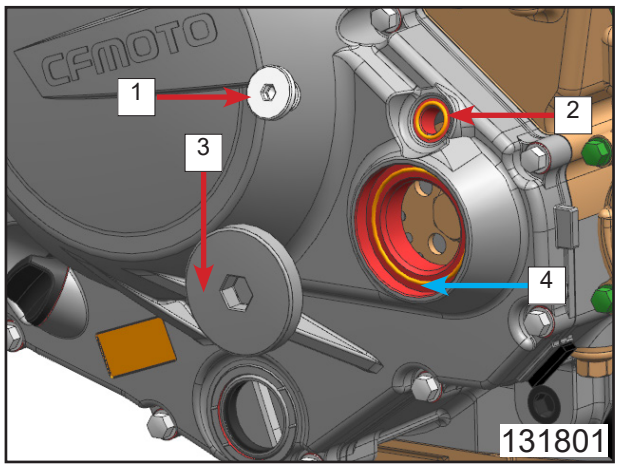


⚠Note: After cylinder head cover removal, the seal gasket may remain on the cover. If the gasket is not broken, it is not necessary to remove it.

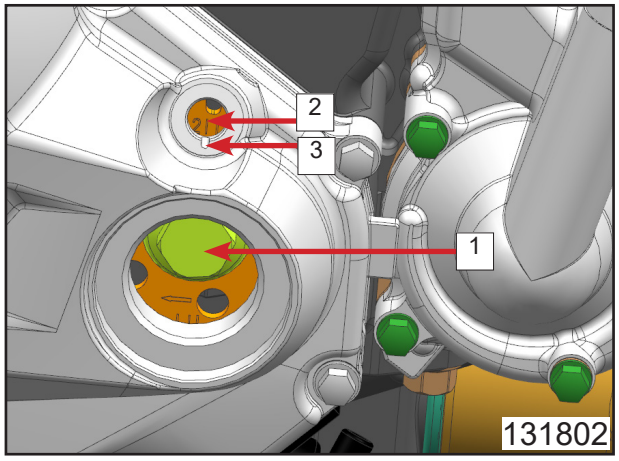
Remove spark plug hole seal ring [1].



Remove timing inspection hole cap [1].
Remove o-ring [2].
Remove oil filter cover [3].
Remove o-ring [4].

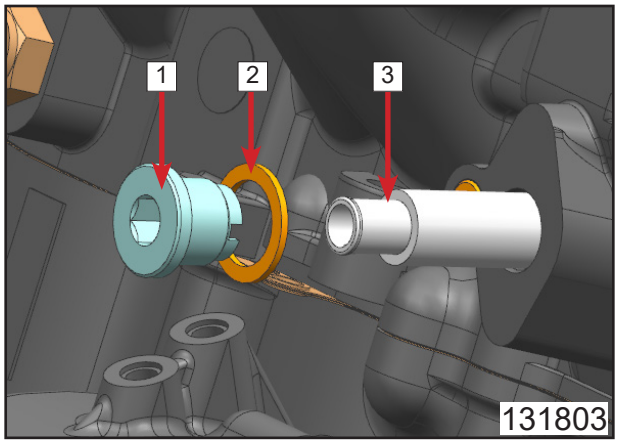


Find a proper sleeve to install on M8 bolt [1]. Rotate it clockwise until X/T mark [2] is aligned with the timing inspection mark [3] on RH side cover.



13.4.6 Tensioner Removal

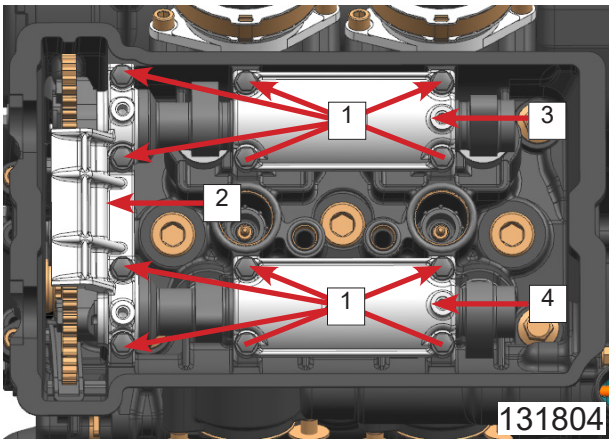
Remove M16X14 screw plug [1].
Remove washer [2].
Remove tensioner assy [3].



13.4.7 Camshaft Removal

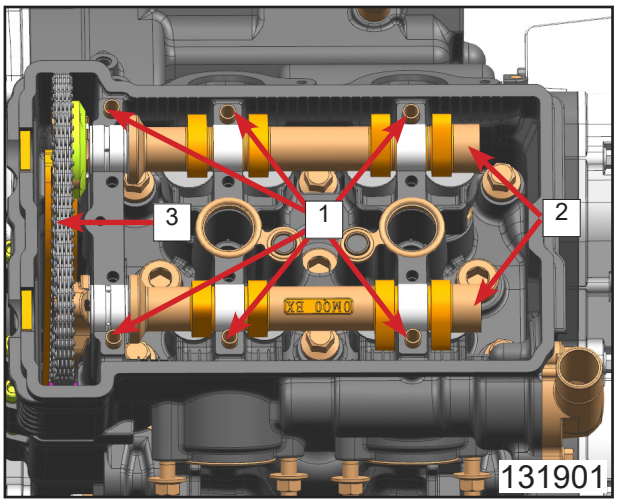
Remove M6 bolt [1].
Remove camshaft plate [2].
Remove air inlet camshaft seat [3].
Remove air exhaust camshaft seat [4].

⚠Note: Pay attention to dowel pins in case of getting lost when removing camshaft plate, air inlet&exhaust camshaft seat. Do not knock parts hard during removal, in case of damaging dowel pins and parts.



Remove dowel pins [1].
Remove camshaft assy [2].

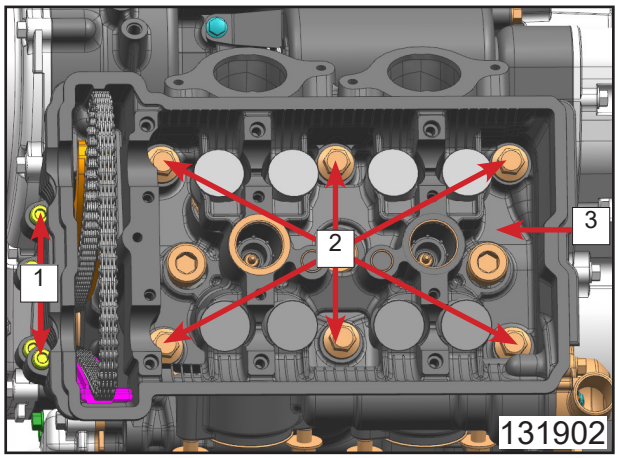
⚠Note: During camshaft assy [2] removal, hook timing chain [3] in case it falls down into the engine.



13.4.8 Cylinder Head Removal

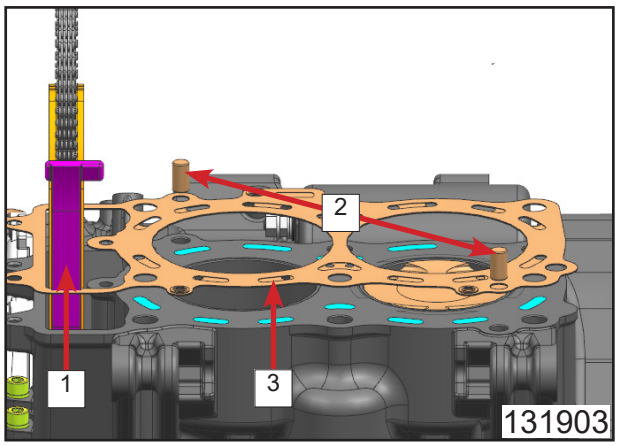
Remove M6 inner hex bolts [1] and washers.
Remove cylinder head M10 bolts [2] and washers.
Remove cylinder head [3].

⚠Note: Pay attention to the washers in case of getting lost or falling into the engine body when removing bolts. Cylinder head M10 bolts [2] can be removed with magnet.



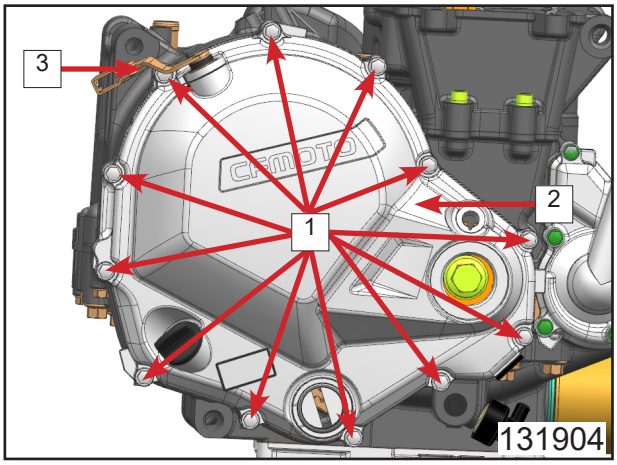
⚠Note: Cylinder head can be removed by shaking it. Pay attention to dowel pins in case of getting lost. Hook timing chain [3] in case it falls down into the engine.

Remove chain guide [1].
Remove dowel pins [2].
Remove cylinder head gasket [3].

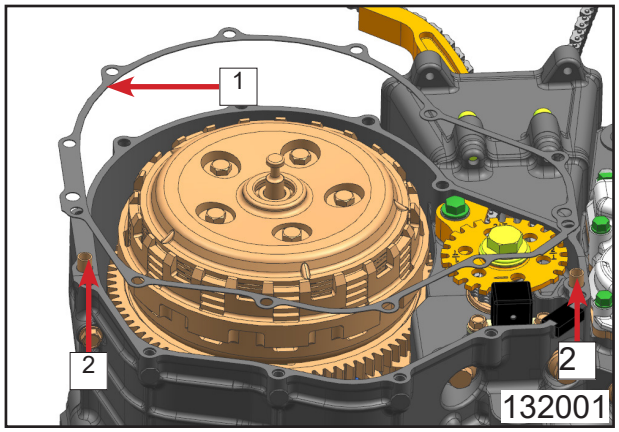


13.4.9 RH Side Cover Removal

Remove M6 bolts [1].
Remove RH side cover [2]. (Rotate the clutch rod [3] to the proper position to remove the RH side cover.)

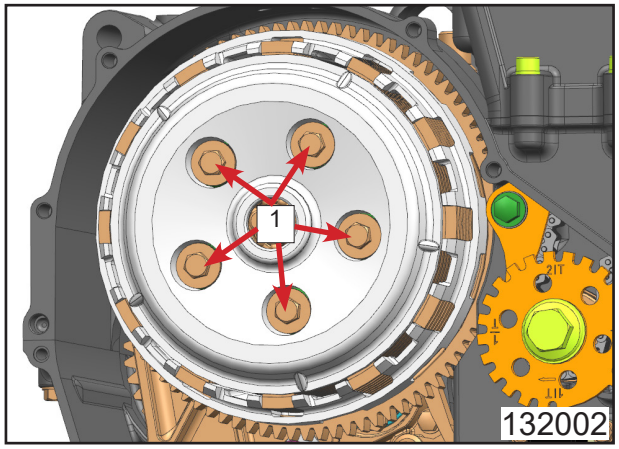


Remove seal gasket [1].
Remove dowel pins [2].

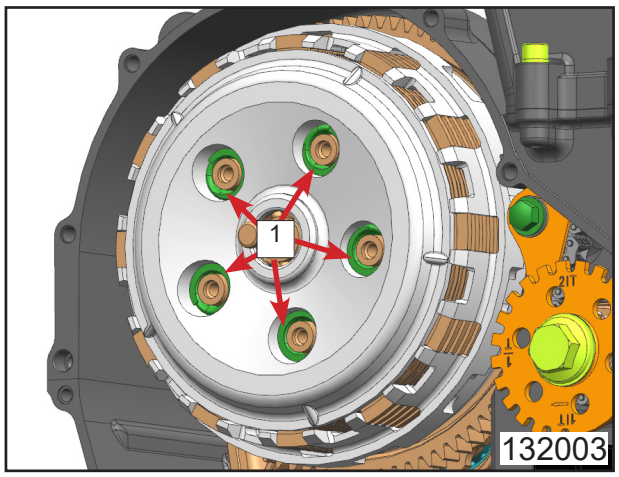


13.4.10 Clutch Removal

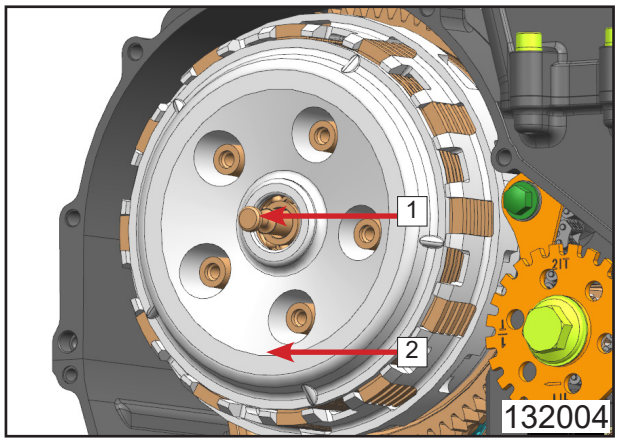
Remove M6 bolts assy [1].



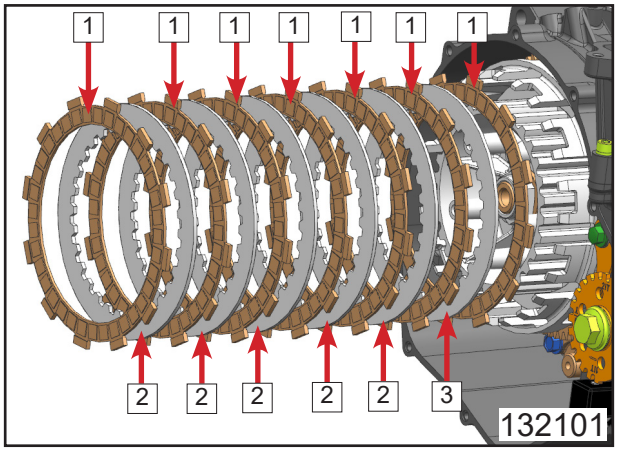
Remove clutch springs [1].



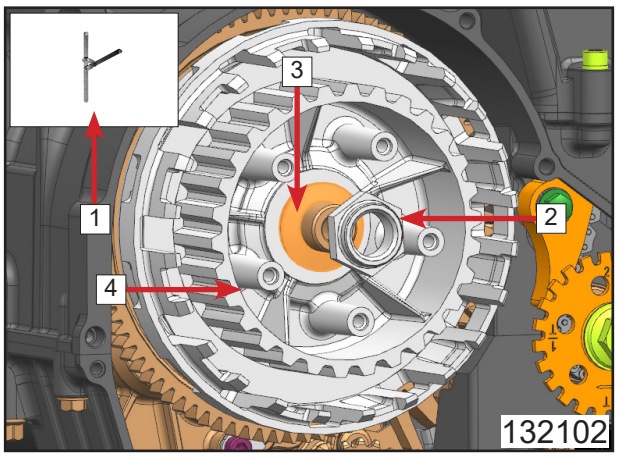
Pull the tie-rod [1] to remove clutch press plate [2] along with tie-rod [1].
Remove the tie-rod [1] from the press plate [2].



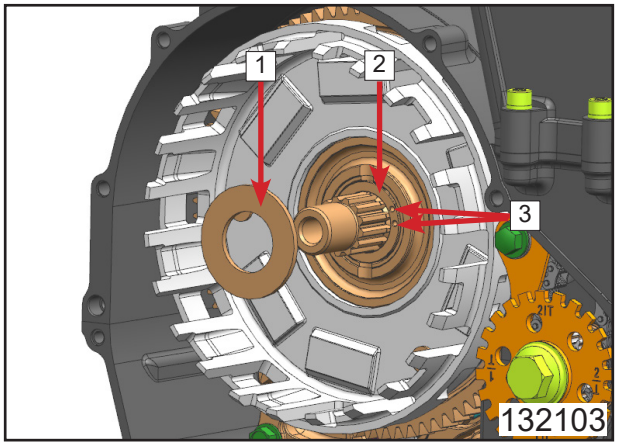
Remove frication disc assy [1].
Remove steel plate B [2].
Remove steel plate A [3].



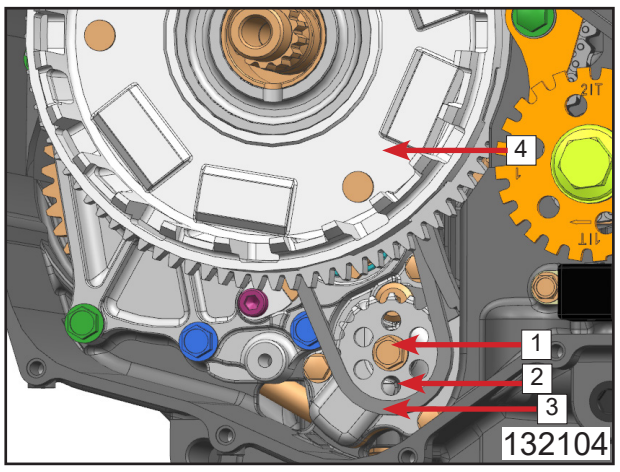
Use special tool: clutch stopping wrench [1] to fix the clutch hub and remove M20 nut [2].
Remove washer [3].
Remove central sleeve assy [4].



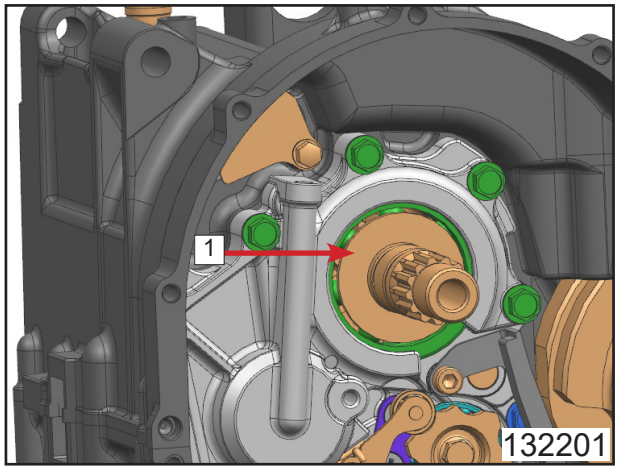
Remove washer [1].
Insert into the holes [3] with needle-nose pliers and pull out the clutch shaft sleeve [2].



Remove M6 bolt [1] and washer. (Left-hand thread)
Pull out oil pump sprocket [2] with needle-nose pilers. (Oil pump sprocket is still on the oil pump chain assy.)
Remove housing assy [4], oil pump chain [3] and oil pump sprocket together.

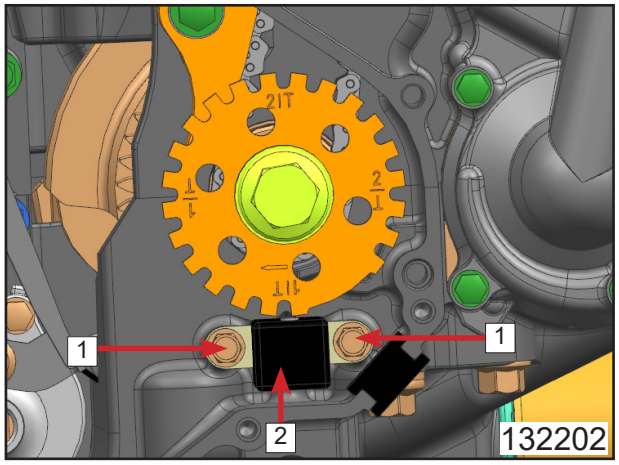


Remove washer 1.

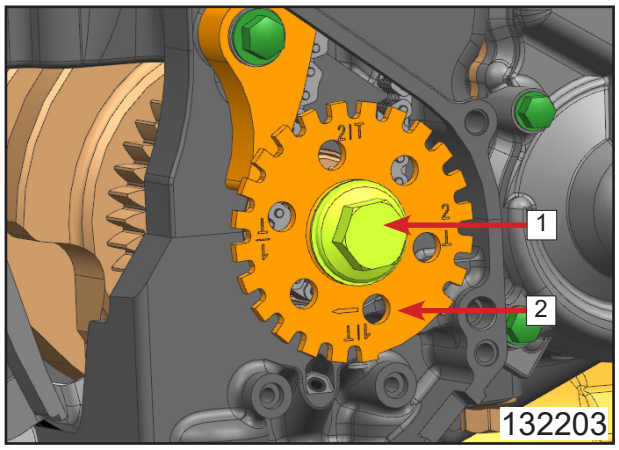


13.4.11 Crankshaft Pulsing Rotor Removal

Remove M5 bolt 1.
Remove trigger assy 2.

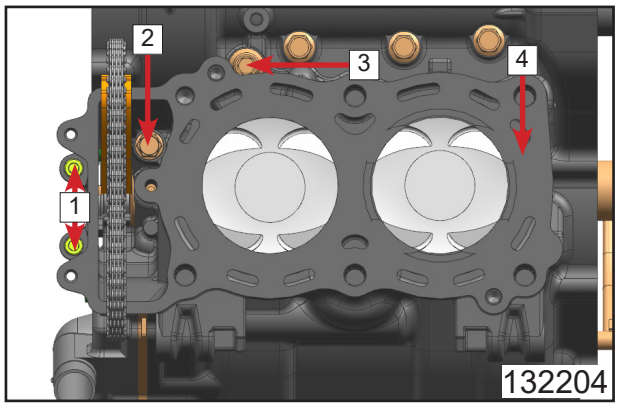


Remove M8 bolt 1 and washer.
Remove crankshaft pulsing rotor 2.



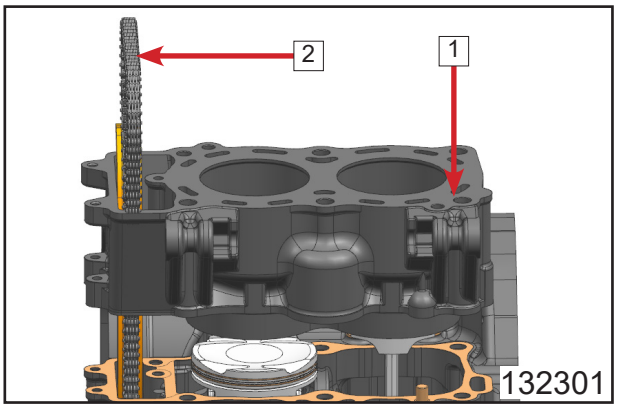
13.4.12 Cylinder Body Removal

Remove M6 inner hex bolts 1 and washers.
Remove M8 bolt 2.
Loose M10 nut 3. Loose the cylinder body 4 by slightly shaking it. Remove M10 nut 3 and washer.

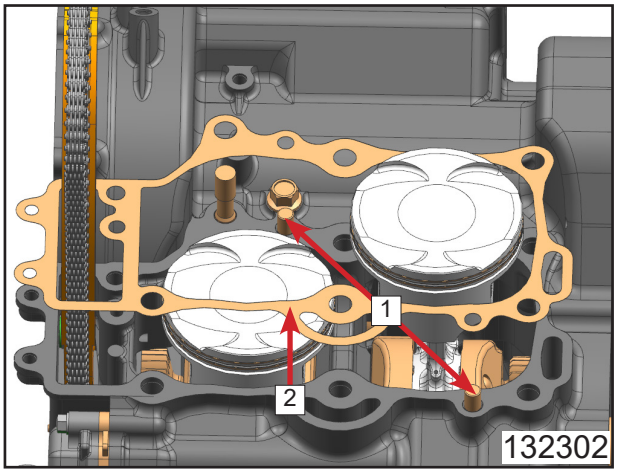


Lift and pull out cylinder body [1].

⚠Note: Hook timing chain [2] in case it falls down into the engine.



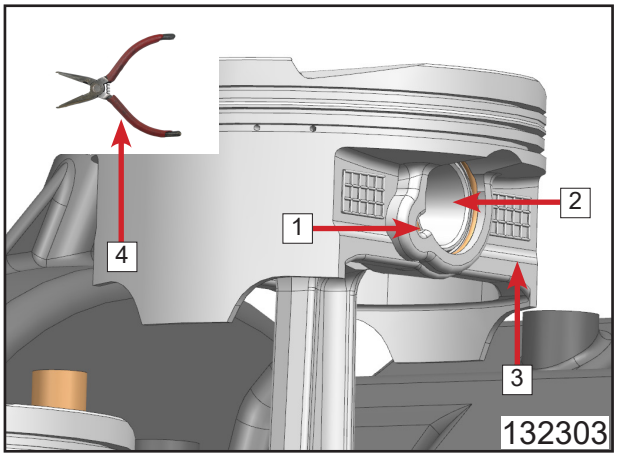
Remove dowel pins [1].
Remove cylinder body gasket [2].



13.4.13 Piston Removal

Rotate the crankshaft to the proper situation.
Use special tool: piston pin installing tool [4] to remove the circlip [1] from the gap.
Remove the piston pin [2].
Remove piston [3].

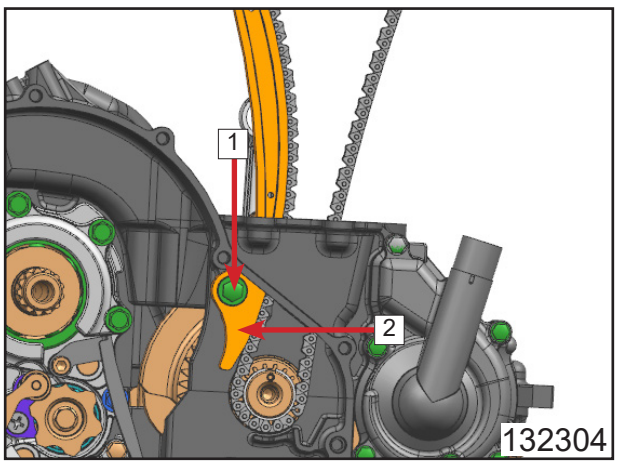
⚠Note: When removing piston pin, it is not necessary to remove the circlip on both sides. One is enough. The removed circlip can not be used again. Replace with a new one when installing.



Rotate the crankshaft to proper position to remove the other piston following the same procedures.

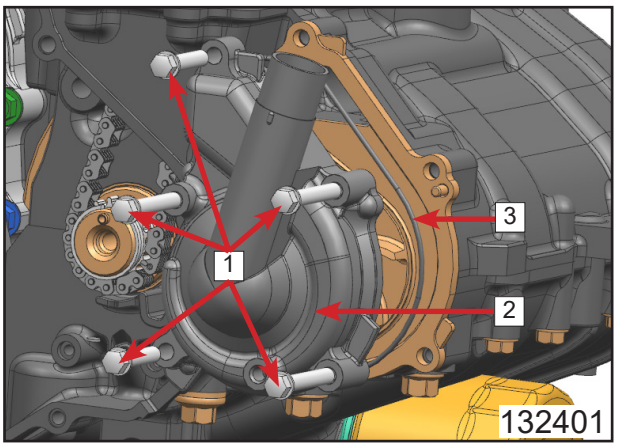
13.4.14 Tensioner Plate Removal

Remove pin shaft [1].
Remove tensioner plate [2].

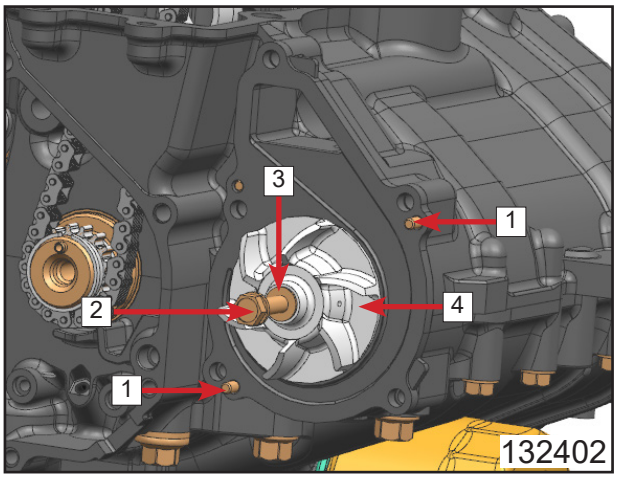


13.4.15 Water Pump Removal

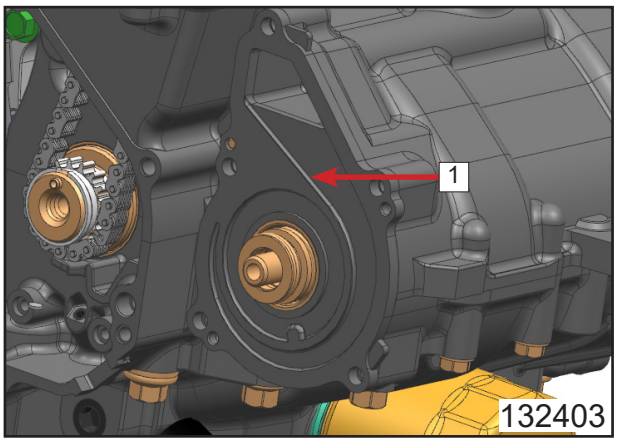
Remove M6 bolts [1].
Remove water pump cover [2]. The seal gasket [3] may remain on the cover. Remove it along with the water pump cover.



Remove dowel pins [1].
Remove M6 bolt [2].
Remove washer [3].
Remove water pump impeller [4].

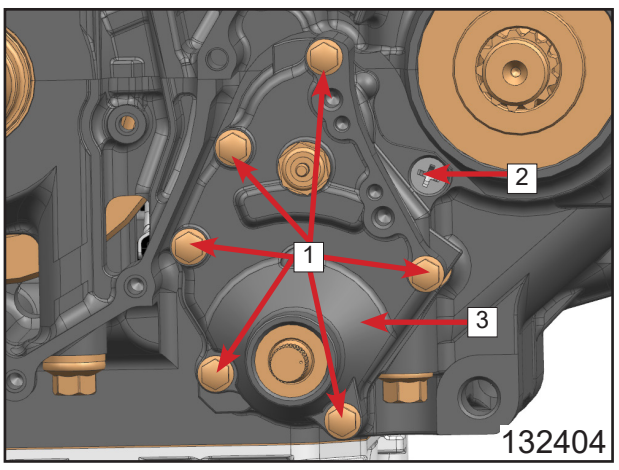


Remove water pump [1].

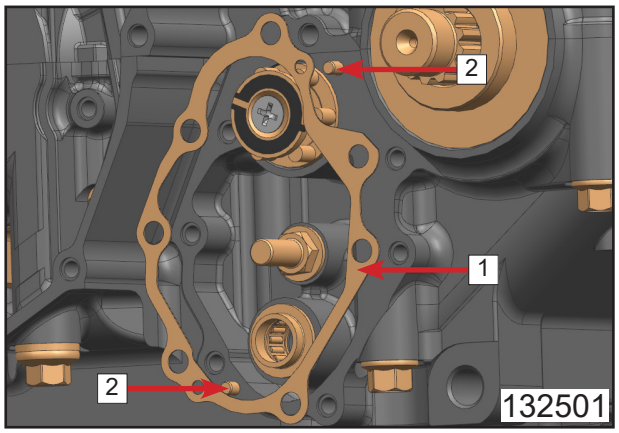


13.4.16 Gearshift Assy Removal

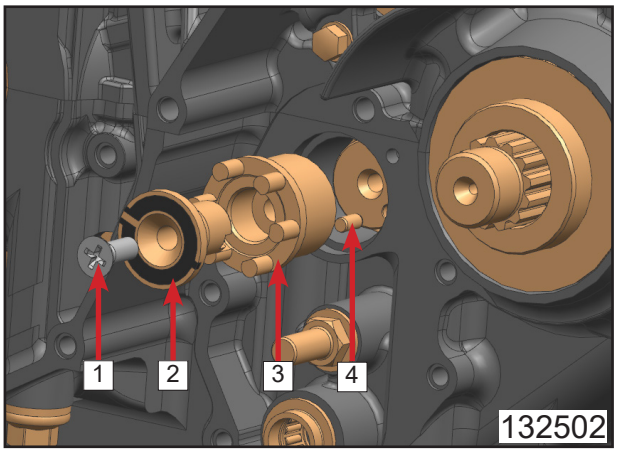
Remove M6 bolts [1].
Remove screw [2].
Remove gearshift cover [3].



Remove gearshift cover gasket [1].
Remove dowel pins [2].

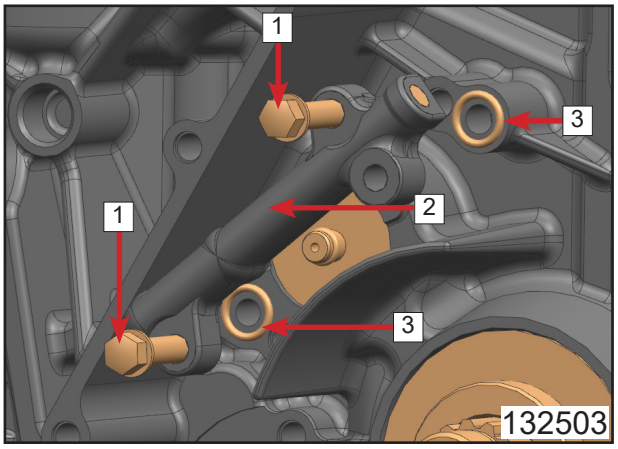


Remove screw [1].
Remove gear sensor [2].
Remove shift location drum [3].
Remove roller needle [4].



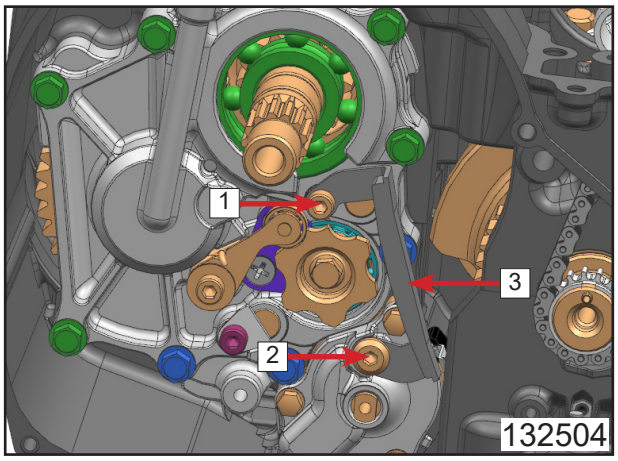
13.4.17 Oil Pipe IV Removal

Remove M6 bolts [1].
Remove oil pipe IV assy [2].
O-ring [3] remains on oil pipe IV assy [2].
Remove o-ring [3].

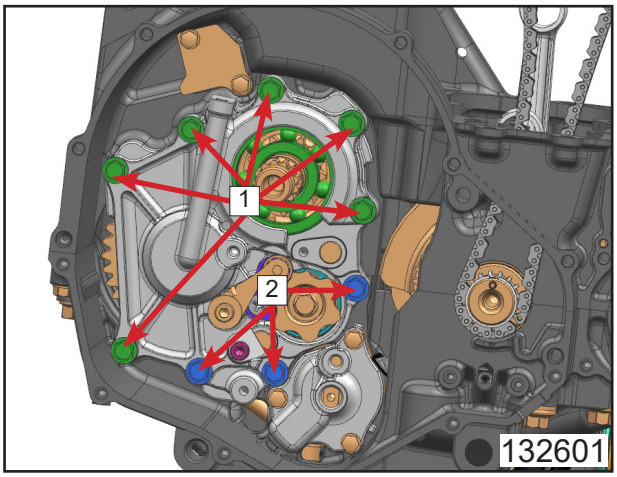


13.4.18 Transmission Assy Removal

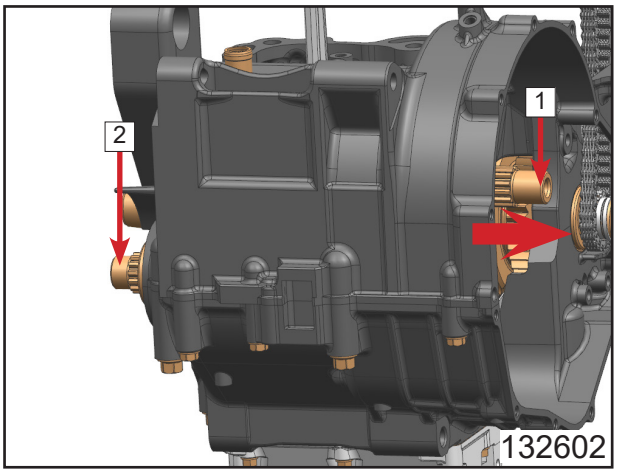
Remove M6 screw [1].
Remove M6 screw [2].
Remove oil pump chain guide [3].



Remove M7 bolts [1].
Remove M7 bolts [2].

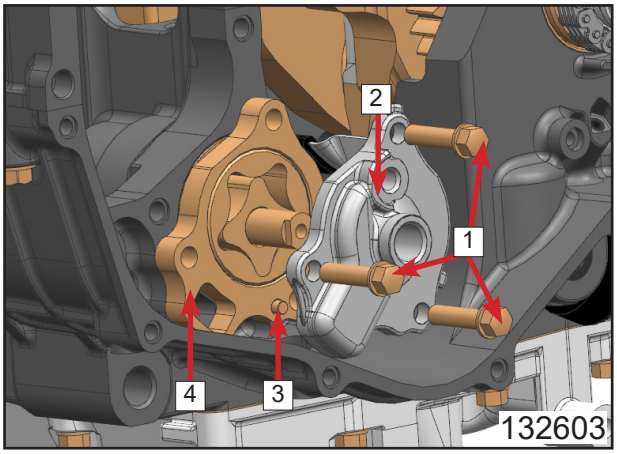


Pull the main shaft [1] in the arrow direction (by slightly shaking).
If shaking doesn't work, slightly knock the countershaft [2] with rubber hammer in the arrow direction, then pull out the whole transmission assy.

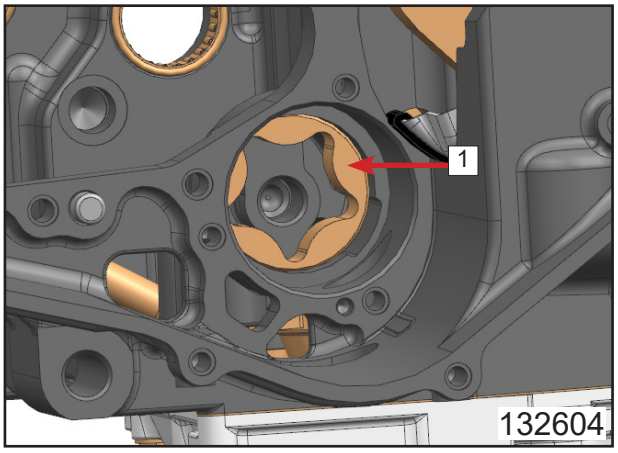


13.4.19 Oil Pump Assy Removal

Remove M6 bolts [1].
Remove oil pump cover [2].
Remove roller needle [3].
Remove oil pump assy [4] with needle-nose pliers.



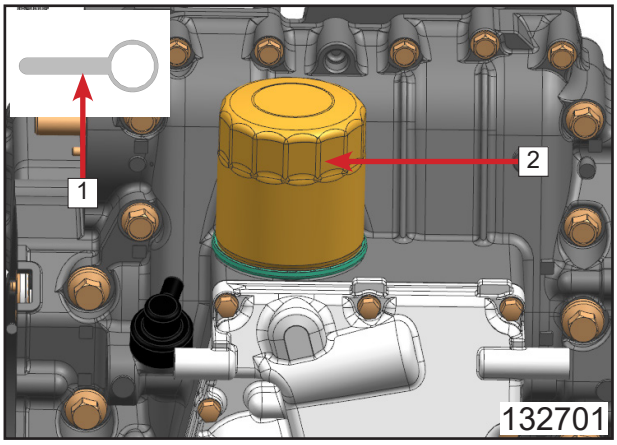
Remove oil pump outer rotor [1].



13.4.20 Oil Filter Removal

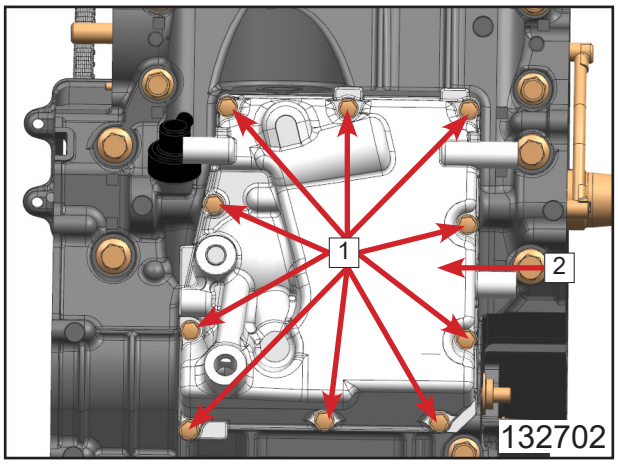
Use special tool: oil filter wrench [1] to remove the oil filter [2].

⚠Note: Cover a cloth or rubber cushion when removing the oil filter, in case the special tool damages the oil filter.

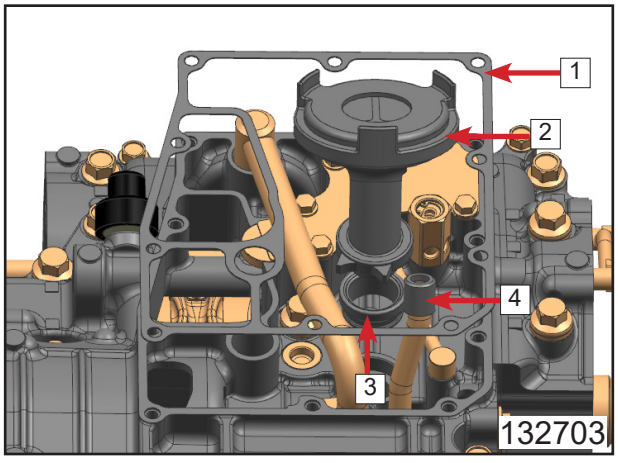


13.4.21 Oil Pan Assy Removal

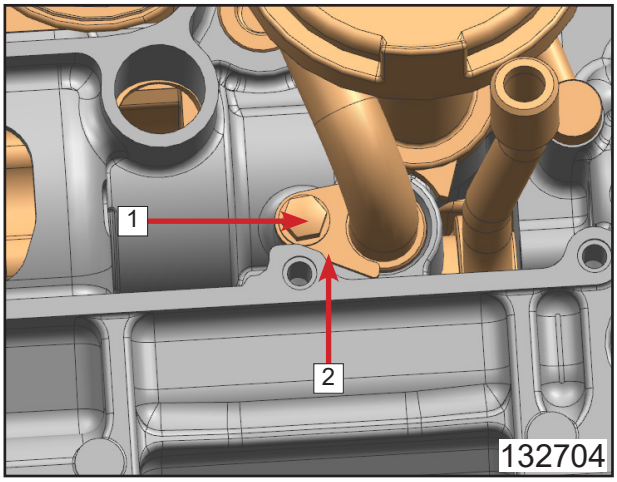
Remove M6 bolts [1].
Remove oil pan [2].



Remove seal gasket [1].
Remove oil suction pan assy [2].
Remove seal gasket [3].
Remove oil return pipe rubber sleeve [4].

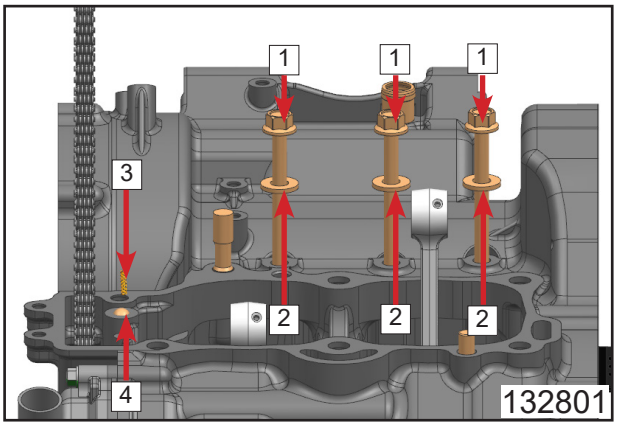


Remove M6 bolt [1].
Remove oil pipe I press plate [2].

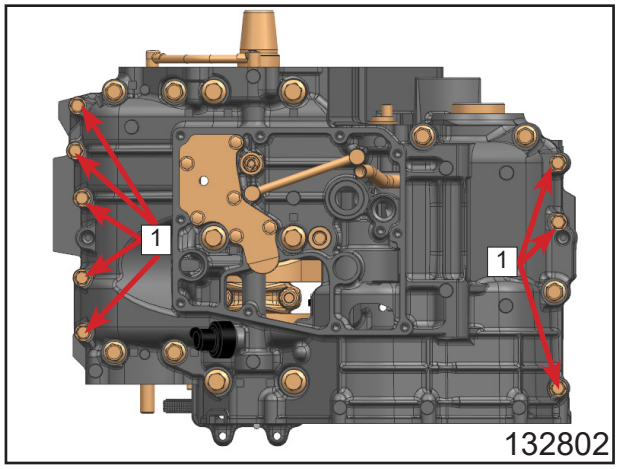


13.4.22 Engine Case Removal

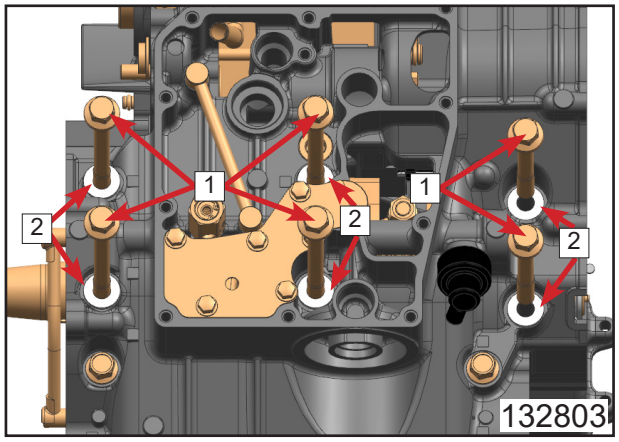
Remove M8 bolts [1].
Remove washers [2].
Remove spring [3].
Remove steel ball [4].



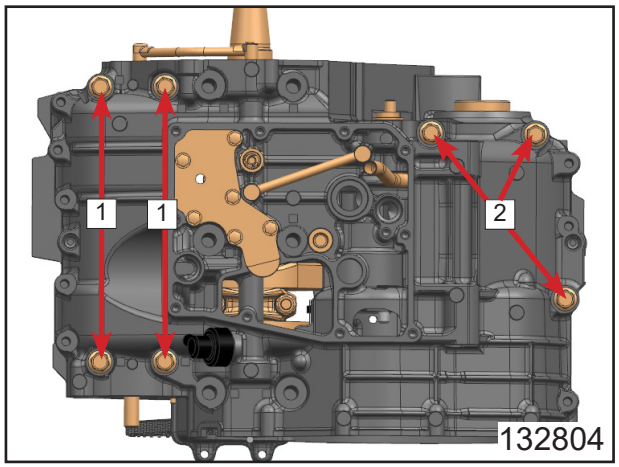
Remove M7 bolts [1].



Remove M9 bolts [1].
Remove washers [2].

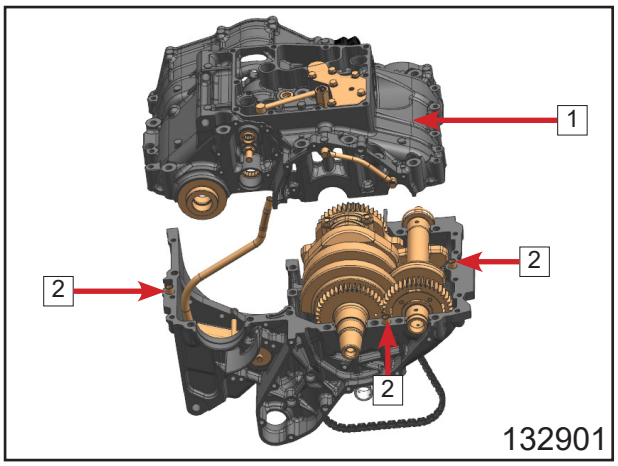


Remove M8 bolts [1].
Remove M8 bolts [2].



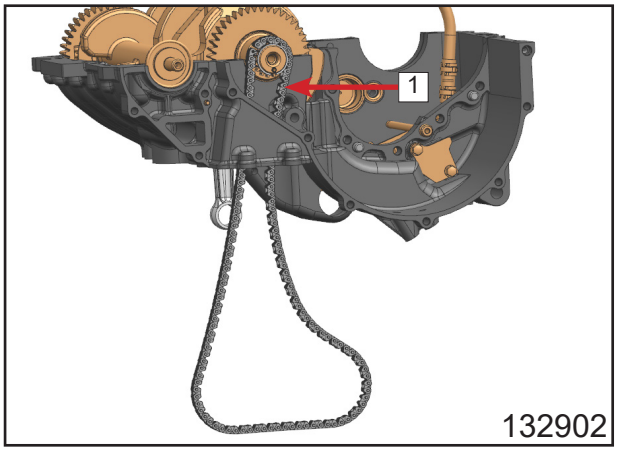
Remove engine case [1].
Remove dowel pins [2].

⚠Remove: Pay attention to dowel pins [2] during removal in case of getting lost.



13.4.23 Timing Chain Removal

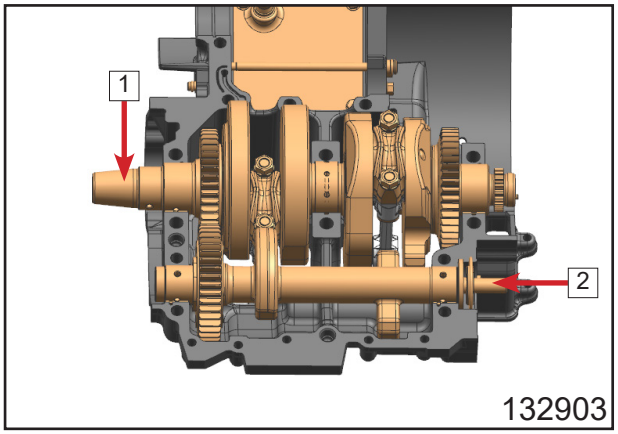
Remove timing chain [1].



13.4.24 Crankshaft and Balance Shaft Removal

Remove crankshaft [1] and balance shaft [2] together.

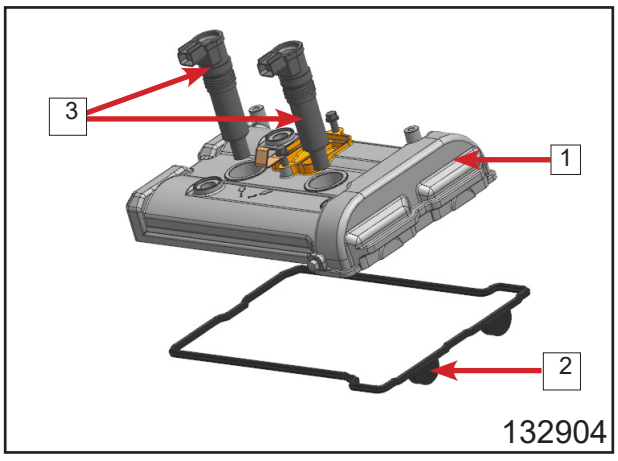
⚠Note: Pay attention during crankshaft and balance shaft removal in case of parts impact and damage.



13.5 Engine Parts Inspection

13.5.1 Cylinder Head Cover Inspection

Inspect cylinder head cover [1] for crack or damage. Replace or repair if any defect occurs.
Inspect seal gasket [2] for crack, hardening or damage. Replace if any defect occurs.
Inspect ignition coil [3] for damage. Replace if any defect occurs.

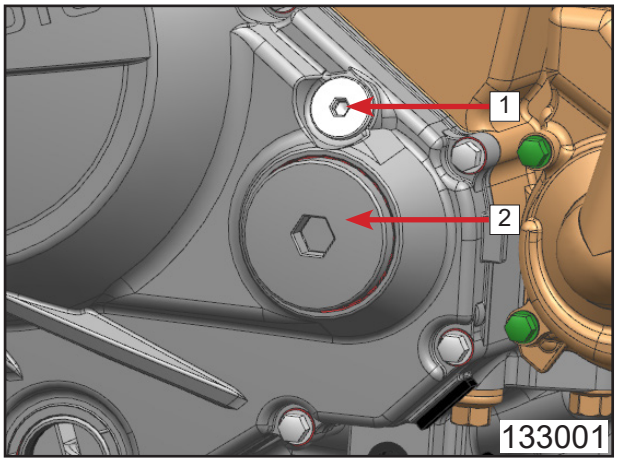


13.5.2 Cylinder Head Inspection

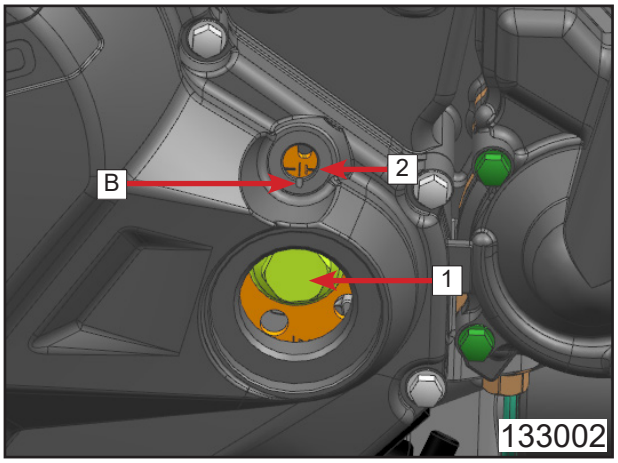
Valve Clearance Inspection and Adjustment

⚠Note: Inspect and adjust when engine is cool.

Adjust first cylinder timing.
Remove cylinder head cover. (Refer to Engine Disassembly section)
Remove timing inspection hold cap [1].
Remove oil strainer cover [2].

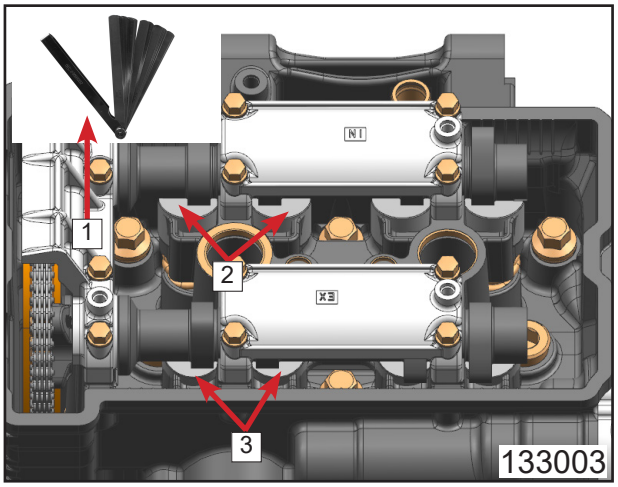


Rotate M8 bolt [1] with sleeve and watch its movement through timing inspection hole [2]. Stop rotating when mark "1/T" on pulsing rotor is aligned with mark [B]. This is the TDC of first cylinder.



Measurement

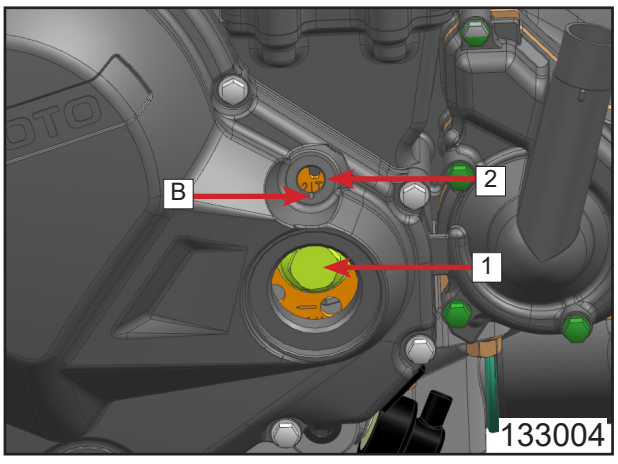
Use feeler gauge [1] to measure the clearance of air inlet valve [2] and air exhaust valve [3]. Record measurement result. Transfer it to tappet thickness according to data. If the valve is out of standard, remove tensioner, intake&exhaust camshafts and replace the tappets of proper thickness. Inspect again after installation.



Valve Clearance Standard
Exhaust: 0.22 mm~0.28 mm
Intake: 0.08 mm~0.13 mm

Installation procedures refer to Installation section.

Adjust second cylinder timing.
Rotate M8 bolt [1] with sleeve and watch its movement through timing inspection hole [2]. Stop rotating when mark "2/T" on pulsing rotor is aligned with mark [B]. This is the TDC of second cylinder.

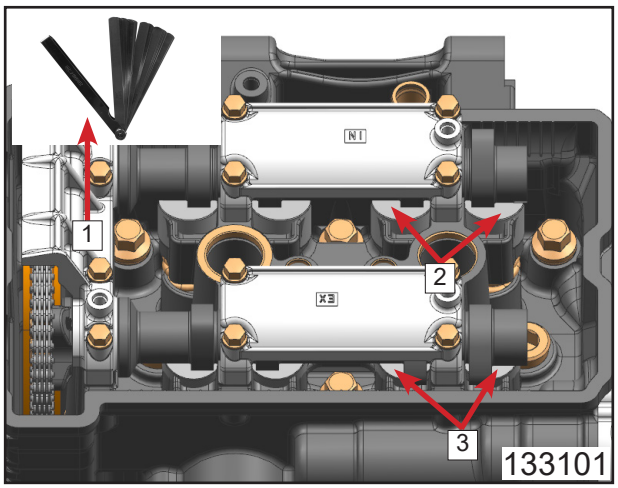


Measurement

Use feeler gauge [1] to measure the clearance of air inlet valve [2] and air exhaust valve [3]. Record measurement result. Transfer it to tappet thickness according to data. If the valve is out of standard, remove tensioner, intake&exhaust camshafts and replace the tappets of proper thickness. Inspect again after installation.

Valve clearance standard
Exhaust: 0.22 mm~0.28 mm
Intake: 0.08 mm~0.13 mm

Installation procedures refer to Installation section.

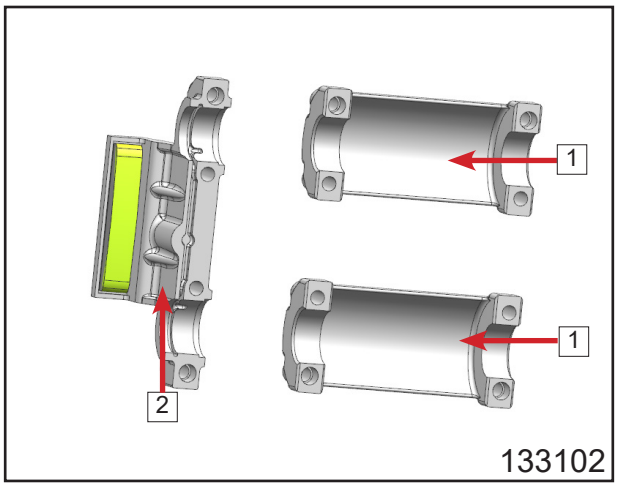


13.5.3 Camshaft Cover Inspection

Removal/installation procedures refer to engine disassembly/assembly sections.

Inspect camshaft covers [1] for wear, cracks or damage. Replace camshaft and cover together if any defect occurs.

Inspect camshaft holding strip [2] for wear, cracks or damage. Replace if any defect occurs.



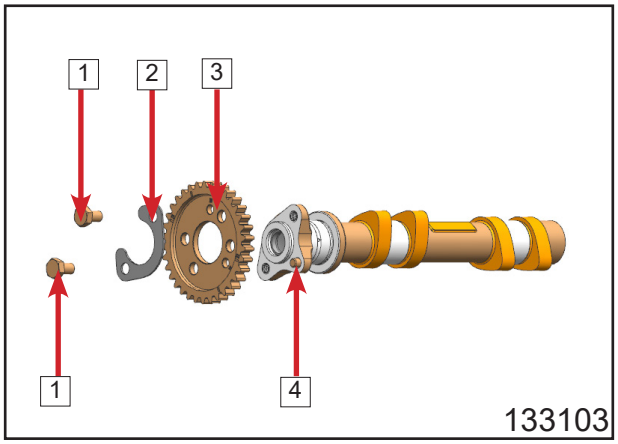
Camshaft cover hole diameter
Standard: 24.00 mm~24.021 mm
Service limit: 24.05 mm

⚠Note: Replace with new cylinder head assy if the camshaft cover hole diameter is beyond service limit.

13.5.4 Camshaft Assy Inspection

Camshaft Disassembly

Remove M6 bolts [1].
Remove retainer [2].
Remove timing sprocket [3].
Remove roller needle [4].

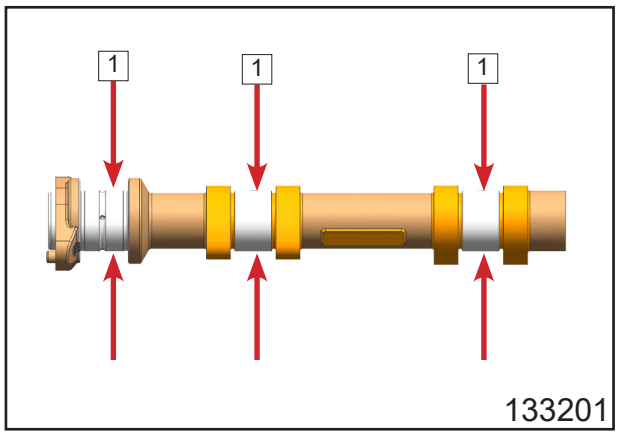


Camshaft Neck Diameter Measurement
Measure camshaft neck 1 diameter.

Camshaft neck diameter
Standard: 23.950 mm~23.972 mm
Service limit: 23.920 mm

⚠Note: Replace with new camshafts if the diameter is beyond service limit.

Clearance between camshaft neck and camshaft cover
Standard: 0.028 mm~0.071 mm
Service limit: 0.13mm



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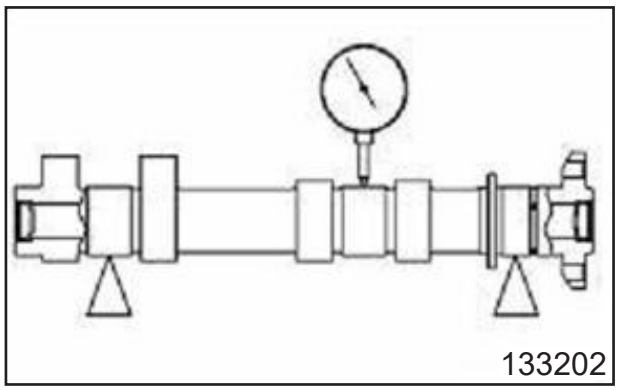
Camshaft Deformation

Remove camshafts (refer to Camshaft Removal section).
Replace with new camshafts if the difference is beyond service limit.

Place camshafts on camshaft fixing tool or V-block.

Measure camshaft deformation value with dial gauge as picture shows.

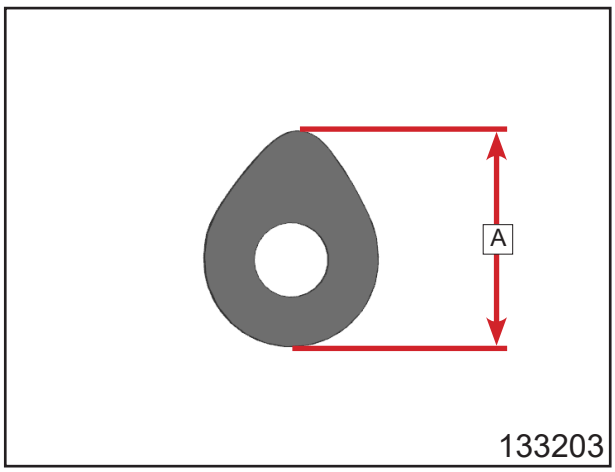

133202

Cam Wear

Remove camshafts (refer to Camshaft Removal section).
Measure each cam height [A] with dial gauge.
Replace if cam wear is beyond service limit.

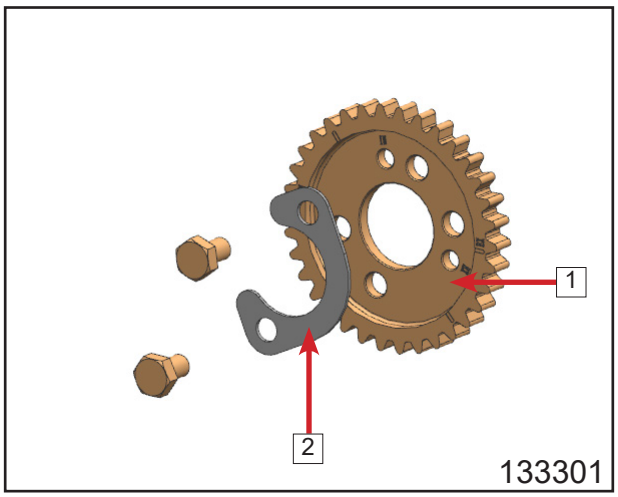
Cam height standard
Exhaust: 34.743 mm~34.857 mm
Intake: 35.743 mm~35.857 mm

Service limit
Exhaust: 34.64 mm
Intake: 35.64 mm



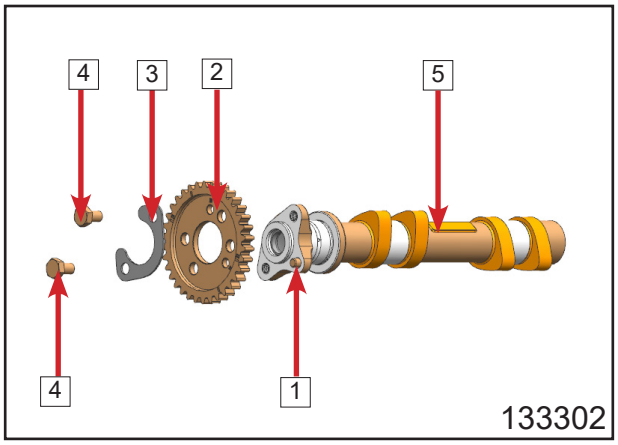
133203

Inspect timing sprocket [1] for teeth break, damage or wear. Replace if any defect occurs.
Inspect retainer [2] for damage. Replace if it does.



Camshaft Assy Assembly

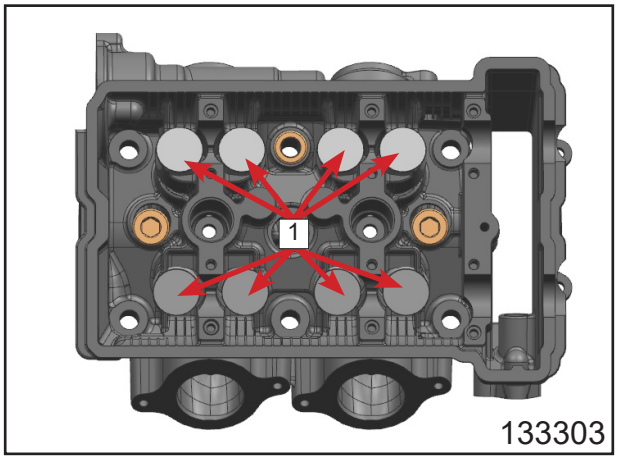
Put roller needle [1] on camshaft [5].
Install timing sprocket [2].
Install retainer [3].
Install M6 bolts [4].



13.5.5 Cylinder Head Assy Inspection

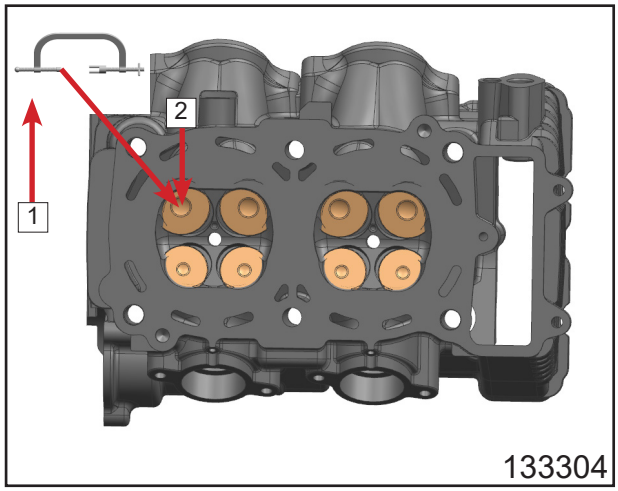
Cylinder Head Assy Disassembly
Remove tappets [1].

⚠Note: Record every tappet place so that it can be installed into the original position.

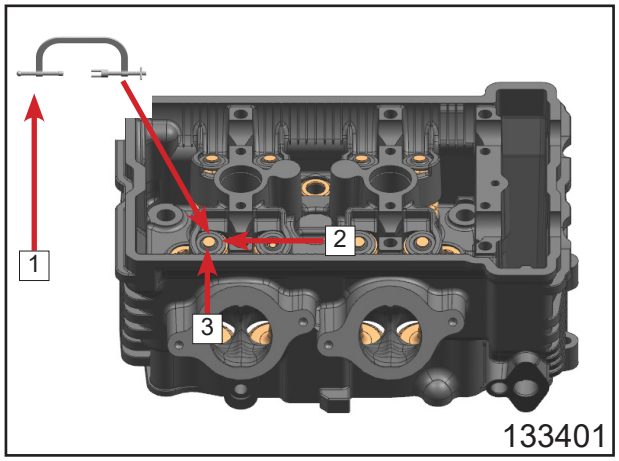


Put special tool: valve spring compressing tool [1] in the center [2] of valves as picture shows.

⚠Warning: Wear goggles all the way during valve spring removal. Be caution because the spring may pop out due to high pressure when removing it.



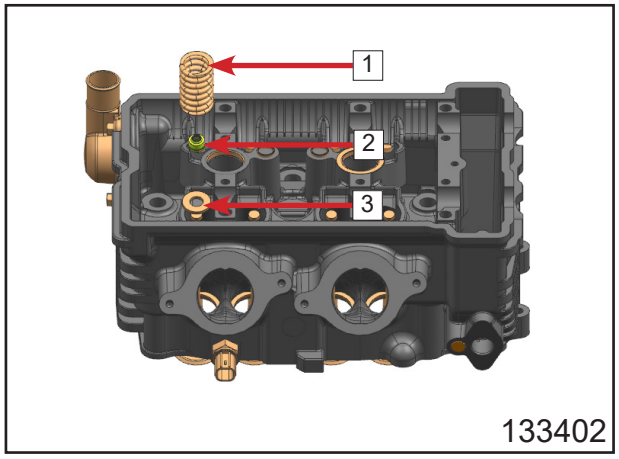
Install special tool: valve spring compressing tool [1] on valve spring upper seat [3] as picture shows. Tighten it to compress the spring.
Remove valve clip [2] with tweezers.
Loose valve spring compressing tool [1].
Remove valve spring upper seat [3].



133401

⚠Note: The removed valve and related parts should be marked and put together in case of getting mixed.

Remove spring [1].
Remove valve stem seal ring assy [2].
Remove valve spring lower seat [3].

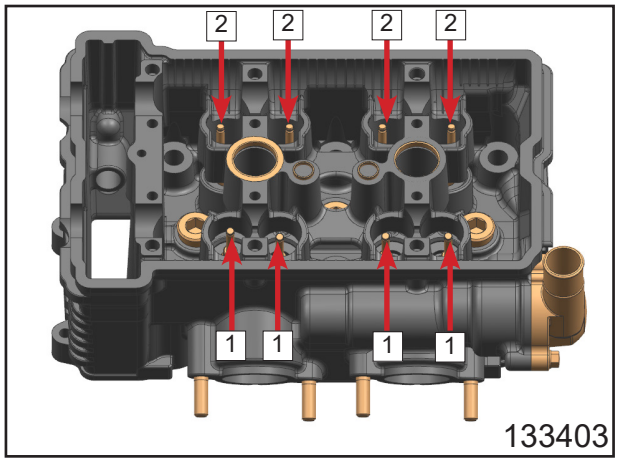


133402

⚠Note: Replace with new seal rings after every removal. The removed seal rings are sorted into waste.

⚠Note: The removed valve and related parts should be marked and put together in case of getting mixed.

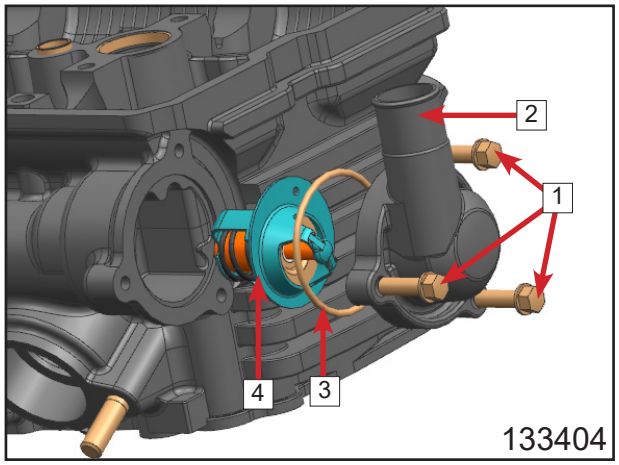
Compress exhaust valves [1]. Remove exhaust valves [1] from other side.
Compress intake valves [2]. Remove intake valves [2] from other side.



133403

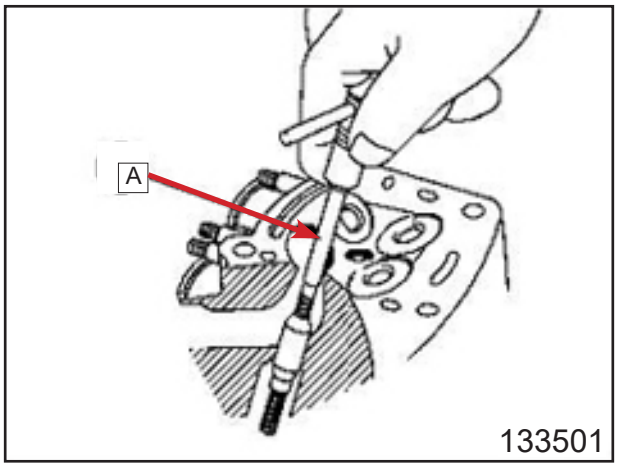
⚠Note: The removed valve and related parts should be marked and put together in case of getting mixed.

Remove M6 bolts [1].
Remove thermostat cover [2].
Remove o-seal ring [3].
Remove thermostat [4].



133404

13.5.6 Valve Guide Pipe Removal



Removal
Remove valve (refer to Valve Removal section).
Remove soil seal and spring seat.

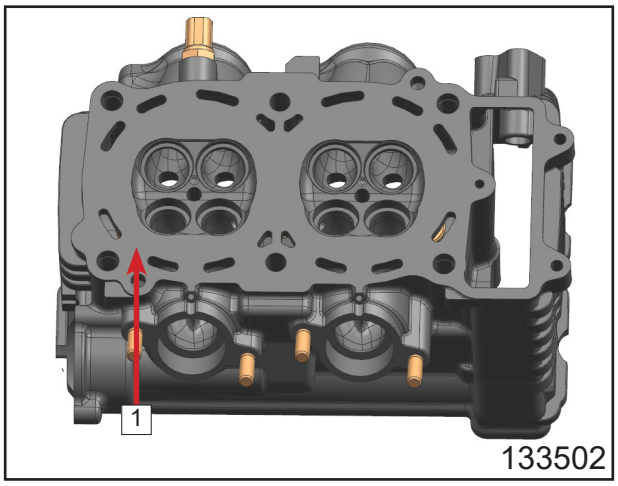
Heat valve guide pipe nearby area to 120°C~150°C, slightly knock the valve guide shaft head [A] to remove the valve guide pipe.

⚠Warning: Do not heat the cylinder head directly. Otherwise, it will cause deformation. Soak the cylinder into the oil and heat the oil, in order to heat the cylinder head indirectly.

Special tool: valve pipe guide shaft φ4.5

13.5.7 Cylinder Head Wear

Cylinder Head Inspection



Put a parallel rule under the different positions under cylinder head lower surface [1]. Measure the clearance between parallel rule and cylinder head with feeler gauge.

Cylinder head flatness service limit: 0.05 mm

Replace a new cylinder head if beyond service limit.

If the flatness is less than service limit, wipe cylinder head lower surface [1] for service with sandpaper that is fixed on a tablet (first use #200 sandpaper, then #400).

Valve Clean

Rotate the reamer clockwise until it can rotate freely in valve guide pipe. Never rotate counter clockwise, or the reamer may be dull.
Clean the valve guide pipe.
Tool: Valve guide pipe reamer φ4.5

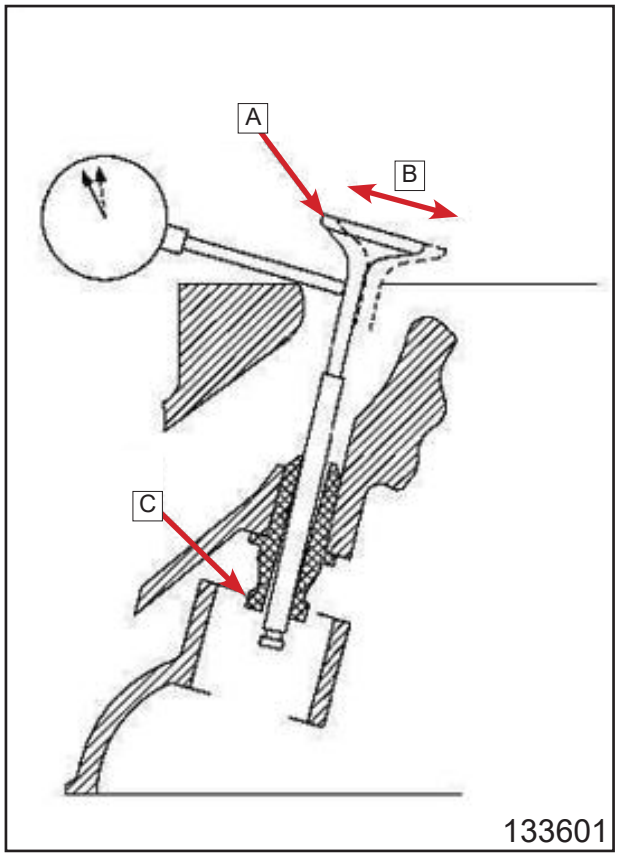
Valve/Valve Guide Pipe Clearance Measurement (Swing Method)

Insert a new valve [A] into guide pipe [B]. Place the dial gauge perpendicular to valve stem and close to cylinder head connecting surface as much as possible.
Swing the valve forward and backward [C] to measure the clearance between valve and valve guide pipe.
Repeat several times to measure. Replace valve guide pipes if beyond service limit.

⚠Note: The measurement valve is not the exact clearance, because the measuring point is on the valve stem.

Valve/valve guide pipe clearance standard
Exhaust: 0.07 mm~0.14 mm
Intake: 0.02 mm~0.08 mm

Service limit
Exhaust: 0.27 mm
Intake: 0.22 mm



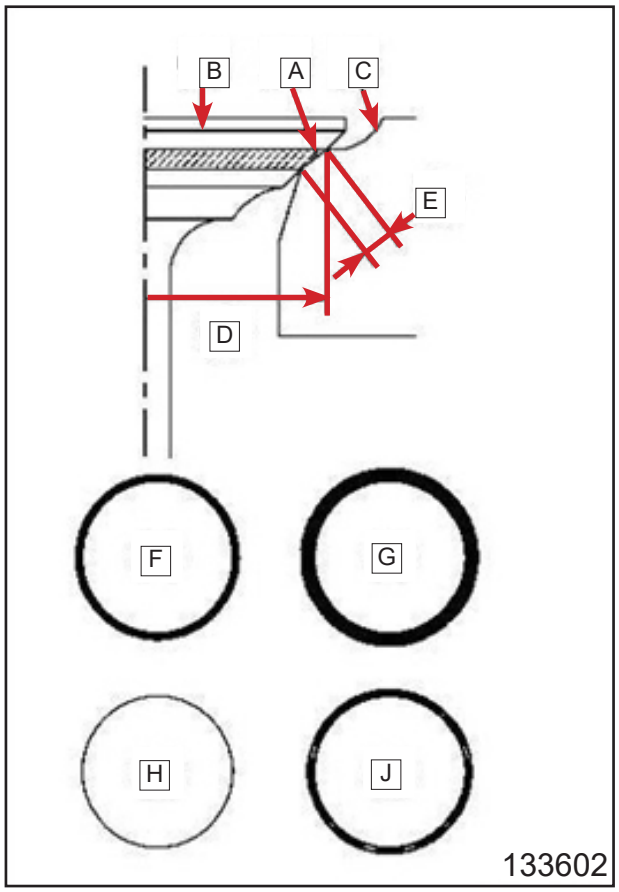
Valve Seat Ring Inspection

Remove valve (refer to Valve Removal section).
Inspect valve [B] and the seal surface [A] of valve seat ring [C].
Measure the outer diameter of valve seat ring [D].
Service valve seat ring if outer diameter is too large or small.

Valve seat ring outer diameter standard
Exhaust: 22.6 mm~22.7 mm
Intake: 26.7 mm~26.8 mm

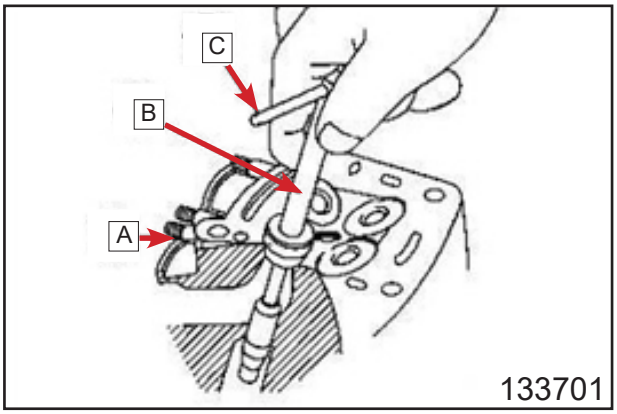
Measure the valve seat seal surface width [E] of no carbon deposition with slide caliper.
[F] is proper. If it is too wide [G], too narrow [H] or uneven [J], service valve seat ring.

Valve seat ring width standard
Exhaust: 0.5 mm~1.0 mm
Intake: 0.5 mm~1.0 mm



Valve Seat Ring Service

Tool: valve seat ring knife [A], Holding shaft [B] and lever [C]

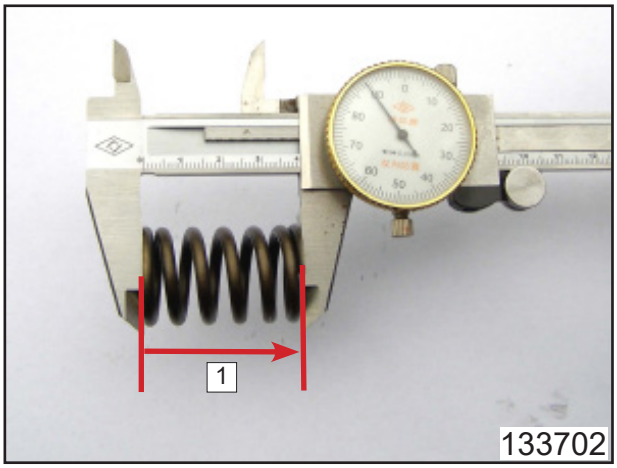


Valve Spring

Valve spring is used to strengthen the seal effect between valve and valve seat. Spring elasticity reduce will cause the engine output power reduce and valve noise.

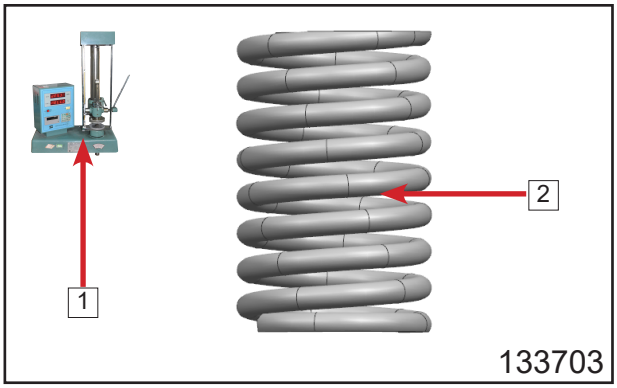
Measure spring free length. Replace if less than service limit.

Valve spring free length service limit (intake&exhaust): 39.5 mm±0.68 mm



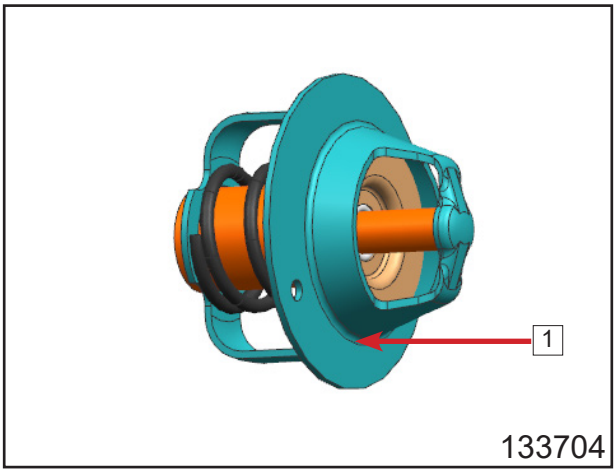
Use spring scales [1] to measure the spring [2] elastic force when compressed to specific length. Replace if beyond standard.

Intake&Exhaust closed: 95.5 N~111.5 N when compressed to 35.9 mm
Intake valve open: 364.4 N~402.4 N when compressed to 29.1 mm
Exhaust valve open: 417.6 N~461.6 N when compressed to 28.1mm



Measure spring lean value. Replace if beyond service limit.

Spring lean service limit: 2°



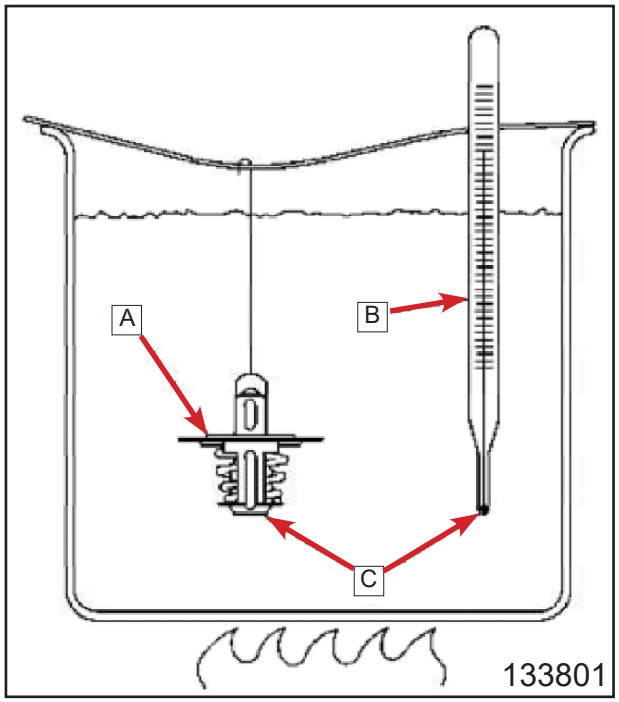
Thermostat Inspection

Remove thermostat [1] and inspect it at room temperature.
Replace with a new thermostat if the valve opens.

To inspect the valve open temperature, soak the thermostat [A] into the container full of water, and gradually heat the water. The thermostat has to be immersed into the water, but do not touch container wall or bottom. Place a standard temperature gauge [B] into the water at the same level [C] with the thermostat. The gauge can not touch the container neither.

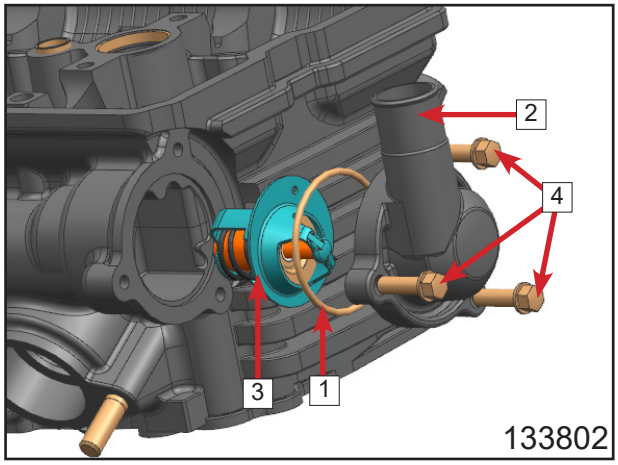
Replace if the value is beyond the standard.

Thermostat valve open temperature
Initial open: 80°C~84°C
Full open: 93°C~97°C

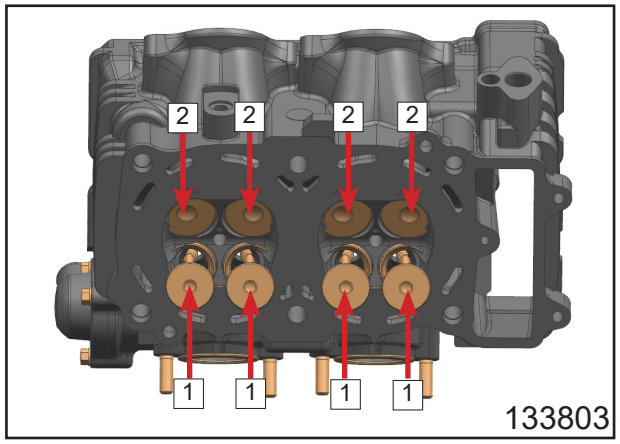


Cylinder Head Assy Assembly

Install o-seal ring [1] on thermostat cover [2].
Install thermostat [3].
Install M6 bolts [4].

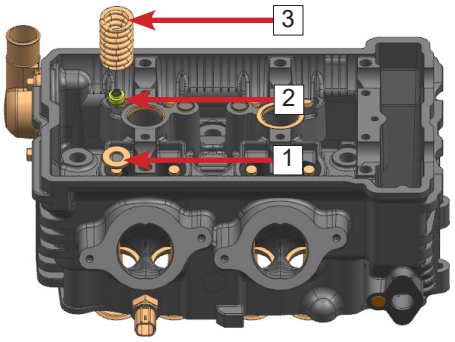


Install air exhaust valves [1] according to the records.
Install air intake valves [2] according to the records.



According to records, install valve spring lower seat [1].
Install valve stem seal ring assy [2].
Install valve spring [3].

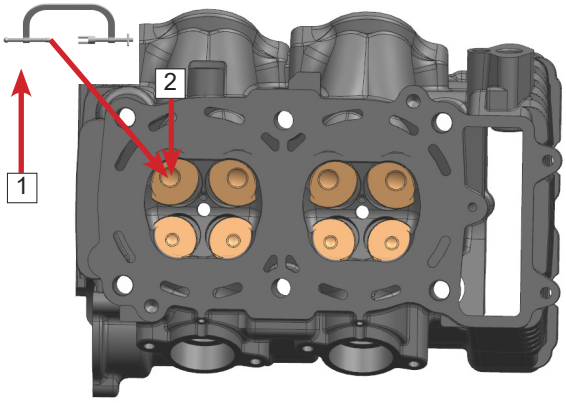
⚠Note: Replace with new seal rings after every removal. The removed seal rings are sorted into waste.



133901

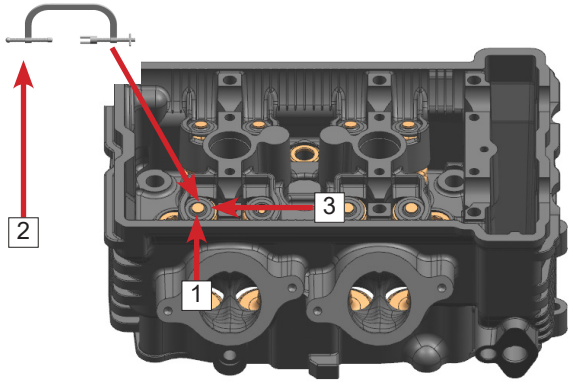
Put special tool: valve spring compressing tool [1] in the center [2] of valves as picture shows.

⚠Warning: Wear goggles all the way during valve spring removal. Be caution because the spring may pop out due to high pressure when removing it.



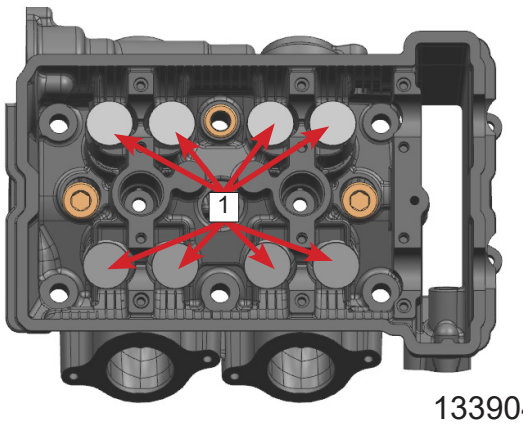
133902

According to records, install valve spring upper seat [1].
Install special tool: valve spring compressing tool [2] on valve spring upper seat [1] as picture shows. Tighten it to compress the spring.
Install valve clip [3] with tweezers.
Loose valve spring compressing tool [2] after the clip is installed.



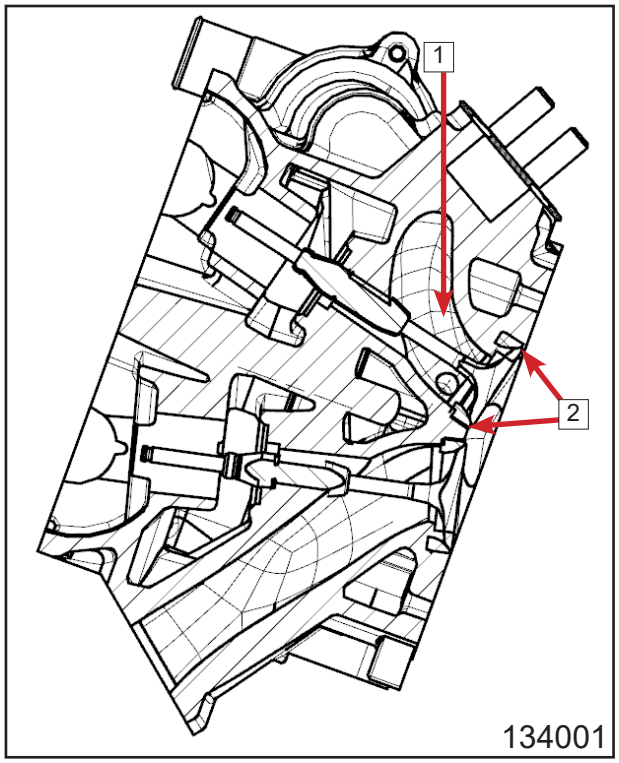
133904

Install tappets [1] into the original positions according to records.



133904

Cylinder head sealing inspection: Inject cleaning agent into air intake/exhaust passage [1]. Wait for a while to check whether there is leaking from valve seat [2] .

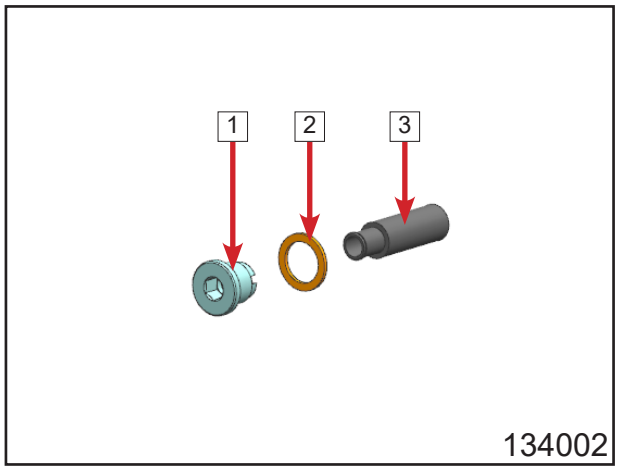


134001

13.5.8 Timing Tensioner Inspection

Removal procedures refer to Engine Disassembly section.

Inspect screw plug [1] and washer [2] for damage. Replace if any defect occurs.
Inspect tensioner [3] for damage or smooth movement. Replace if any defect occurs.
Press timing tensioner arm to inspect whether it can return smoothly. Replace if rough return or getting stuck.



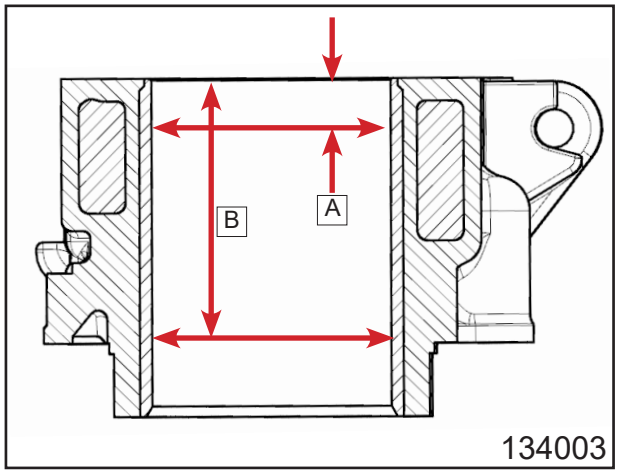
134002

Installation procedures refer to Engine Assembly chapter.

13.5.9 Cylinder Body Inspection

Cylinder body removal/installation procedures refer to Engine Disassembly/ Assembly sections.
Cylinder head has different wear degree in different directions. Measure at four points as picture show. Replace cylinder body if any measuring point is beyond service limit.

10 mm [A]
60 mm [B]



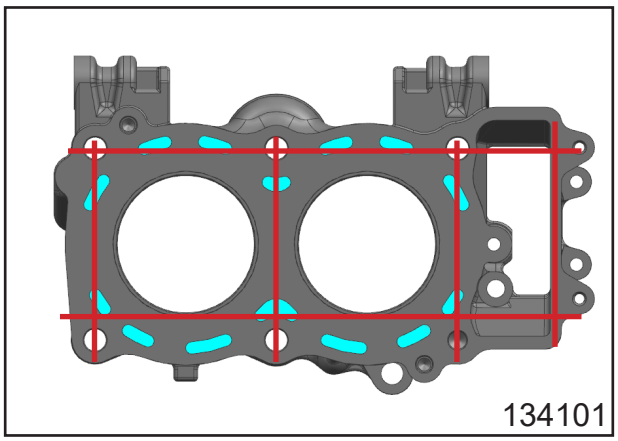
134003

Cylinder body inner diameter
Standard: 68.4 mm~68.418 mm
Service limit: 68.50 mm

Cylinder Body Deformation

Measure the flatness of cylinder sealing surface with straight edge knife and feeler gauge at different measuring points. Replace the cylinder body if any value is beyond the service limit.

Cylinder body flatness service limit: 0.03 mm



⚠Note: Replace with new piston rings when replacing cylinder body.

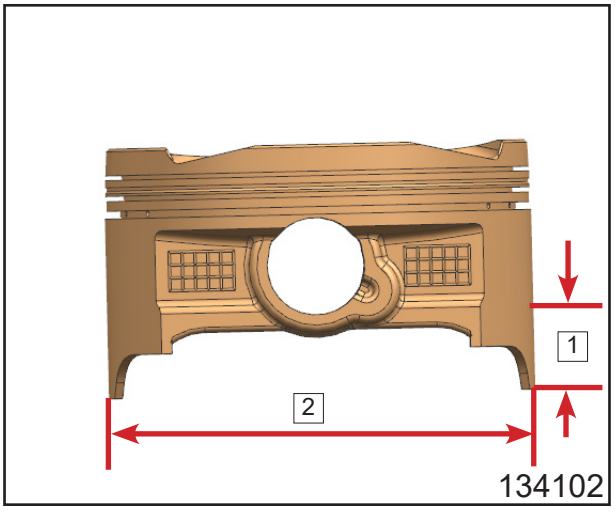
13.5.10 Piston Assy Inspection

Removal/Installation procedures refer to Engine Disassembly/Assembly sections.

Measure piston outer diameter [2] at different positions which are perpendicular to piston pin and 10 mm [1] from the bottom. Replace if the measuring value is less than service limit.

Piston diameter
Standard: 68.366 mm~68.384 mm
Service limit: 68.24 mm

According to the above measurement, figure out the fit clearance between piston and cylinder body. If the clearance is larger than 0.10 mm, replace cylinder body and/or piston.

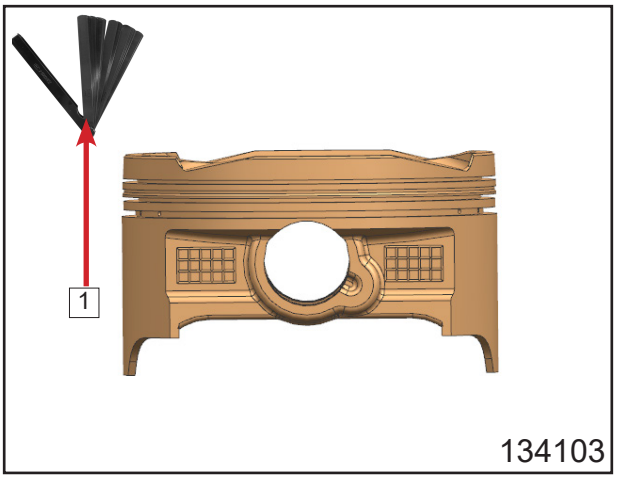


Piston Ring/Groove Clearance

Piston rings have to be parallel to piston ring groove. Replace piston and all piston rings if not parallel.

Use feeler gauge [1] to measure the clearance between piston ring and groove for several times.

Clearance between first ring and groove
Standard: 0.02 mm~0.06 mm
Service limit: 0.16 mm
Clearance between second ring and groove
Standard: 0.02 mm~0.06 mm
Service limit: 0.16 mm

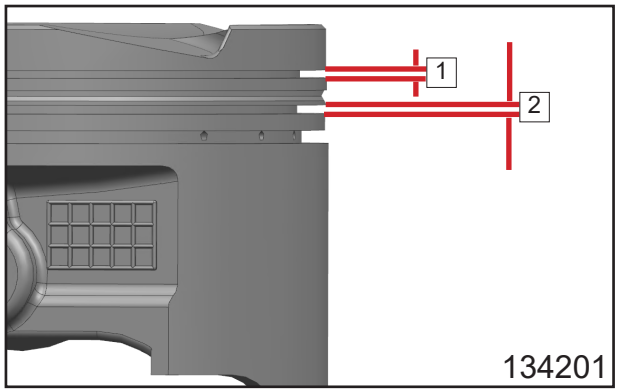


Piston Ring Groove Width

Measure piston ring groove width with slide caliper at different points.

First piston ring groove width 1
Standard: 1.01 mm~1.03 mm
Service limit: 1.11 mm

Second piston ring groove width 2
Standard: 1.01 mm~1.03 mm
Service limit: 1.11 mm



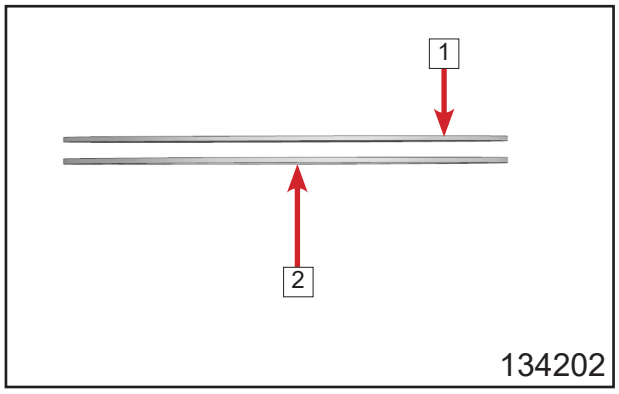
Replace piston if the width of any ring is beyond service limit.

Piston Ring Thickness

Measure piston ring thickness with dial gauge at different points.

First piston ring thickness 1
Standard: 0.97 mm~0.99 mm
Service limit: 0.90 mm

Second piston ring thickness 2
Standard: 0.97 mm~0.99 mm
Service limit: 0.90 mm



Replace piston if the thickness of any ring is beyond service limit.

⚠Note: If new rings are used on old piston, inspect the ring groove for wear condition. If the groove surface is not parallel, replace piston.

Piston Ring Cut Clearance

Put piston ring 1 into cylinder body and fix it to the end, at which cylinder has minimum wear.
Measure piston ring cut clearance 2 with feeler gauge.
Replace all rings if clearance of any ring is beyond service limit.

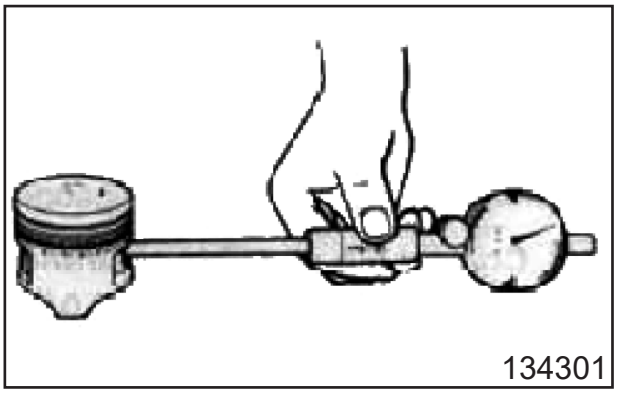
First piston ring cut clearance
Standard: 0.15 mm~0.30 mm
Service limit: 0.60 mm

Second piston ring cut clearance
Standard: 0.20 mm~0.40 mm
Service limit: 0.70 mm

Piston Pin and Pin Hole

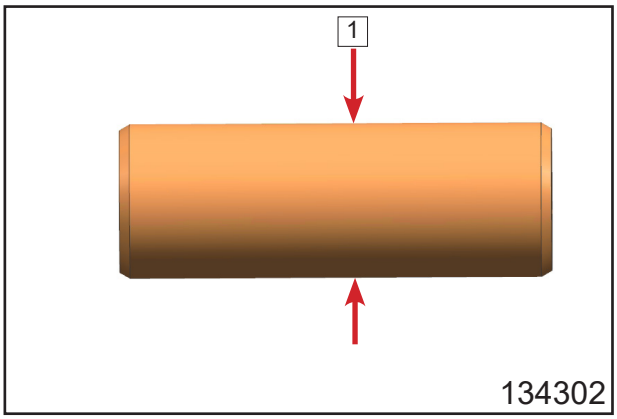
Measure piston pin hole inner diameter and outer diameter with dial gauge. Replace piston and piston pin together if beyond standard.

Piston pin hole inner diameter standard: 18.004 mm~18.01 mm


134301

Measure piston pin outer diameter 1 at three points.

Piston pin outer diameter standard: 17.996 mm~18 mm

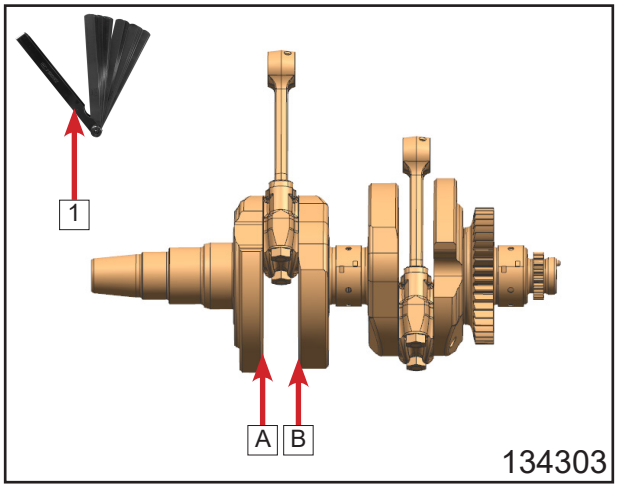


134302

13.5.11 Camshaft Connecting Rod Assy Inspection
(Status 1)
Connecting Rod Big Side Clearance
Measurement: Push the big end closely to the shaft neck surface A. Insert the feeler gauge 1 between surface B and rod to measure the clearance.
Connecting Rod Bid Side Clearance Standard:

Standard	0.15 mm~0.30 mm
Service limit	0.55 mm

⚠Note: Replace with a new connecting rod and measure the clearance if beyond service limit. If the clearance is still out of standard, replace crankshaft.



134303

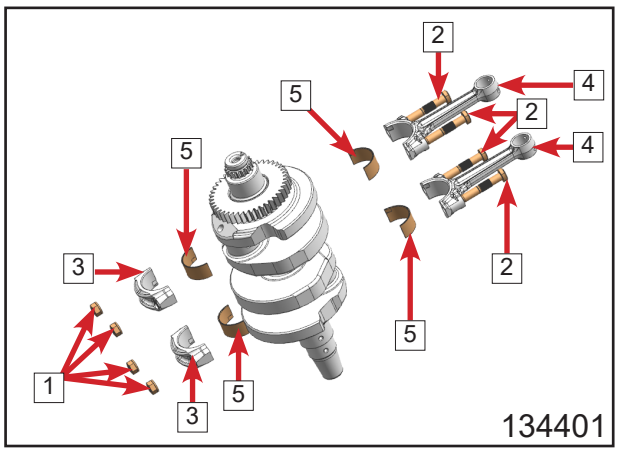
Disassembly

Remove connecting rod M9 nut 1.
Remove connecting rod bolts 2.
Remove connecting rod cap 3.
Remove connecting rod body 4.
Remove the plain bearing 5 from connecting rod cap 3 and body 4.

⚠Waring: Pay attention during connecting rod removal, in case it breaks the shaft neck.

⚠Note: Mark connecting rod cap and body after removal.

⚠Note: If not worn or damaged, plain bearings 3 are not necessary to remove.

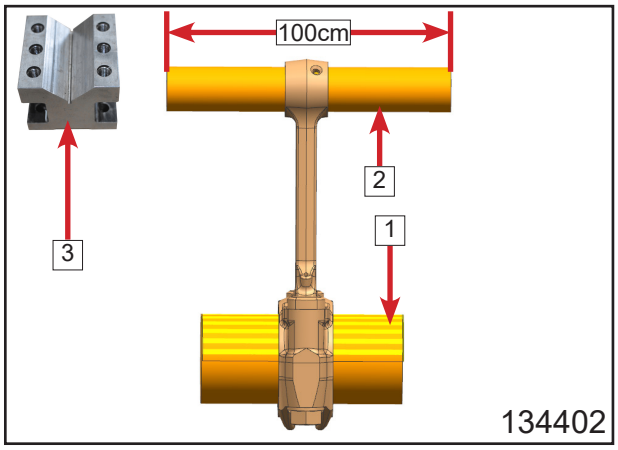


Connecting Rod Parallelism

Remove plain bearings and install connecting rod cap.
Insert mandrel 1 into big end hole.
Insert mandrel 2 (100 mm long) into small end hole.
Put connecting rod big end mandrel on V-block 3. Plumb it and measure mandrel 2 height on both sides, the height difference is the parallelism.

⚠Note: Replace if parallelism is beyond service limit.

Parallelism service limit: 0.2 mm

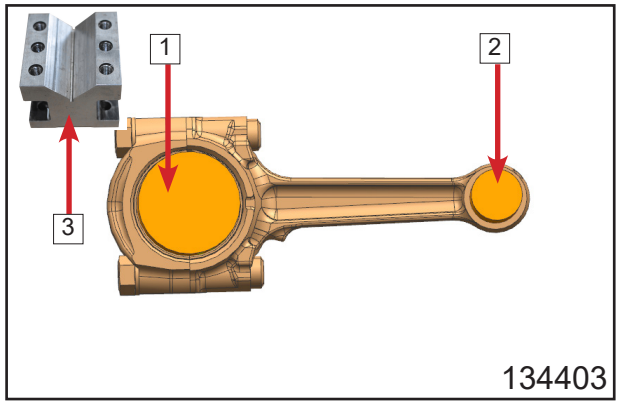


Connecting Rod Bend

Put connecting rod big end mandrel 1 on V-block 3.
Measure the mandrel 2 height difference, which is the bend value.

Bend service limit: 0.2 mm

⚠Note: Replace if bend value is beyond service limit.

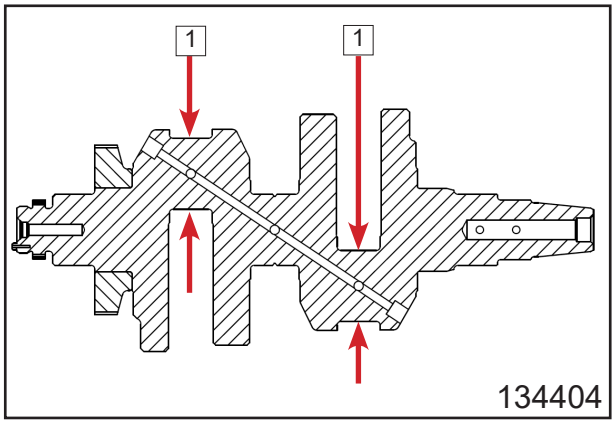


Crankshaft Rod Journal/Bearing Shell Wear

Measure crankshaft rod journal diameter 1 with micrometer.
Specification:

Standard	37.984 mm~38.00 mm
Service limit	37.97 mm

⚠Note: Replace if diameter is beyond service limit.

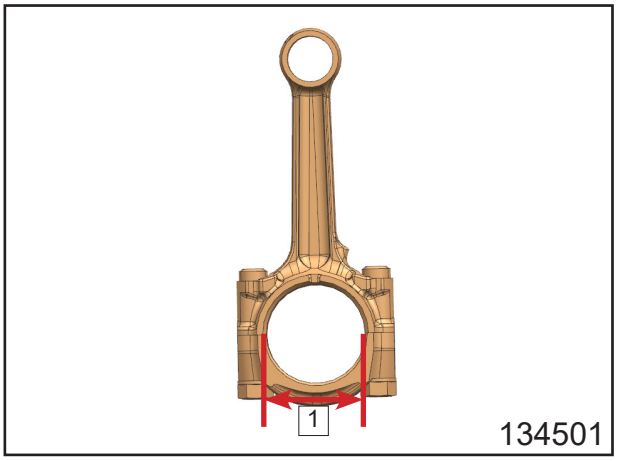


⚠Note: If measured diameter is not less than service limit but coincide the marks, re-mark signs.

Crankshaft rod journal diameter mark	
2	37.984 mm~37.992 mm
1	37.993 mm~38.000 mm

Measure connecting rod big end hole diameter [1]. It should coincide the mark. Otherwise, re-mark.

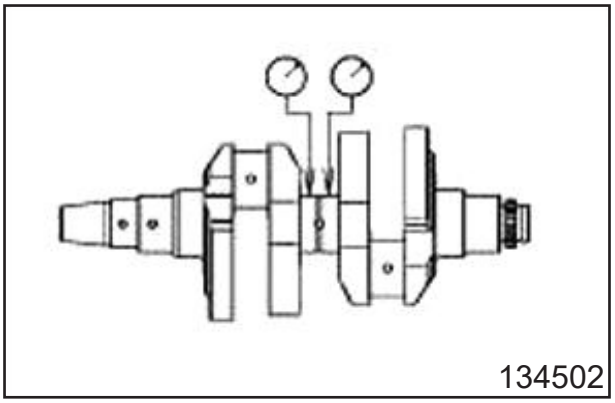
Connecting rod big end hole diameter mark	
1	41.00 mm~41.008 mm
2	41.009 mm~41.016 mm



Crankshaft Runout Inspection

Measure crankshaft runout value.

Crankshaft runout standard	
Standard	0.02mm
Service limit	0.05 mm



⚠Note: Replace with a new crankshaft if beyond service limit.

Crankshaft Main Journal

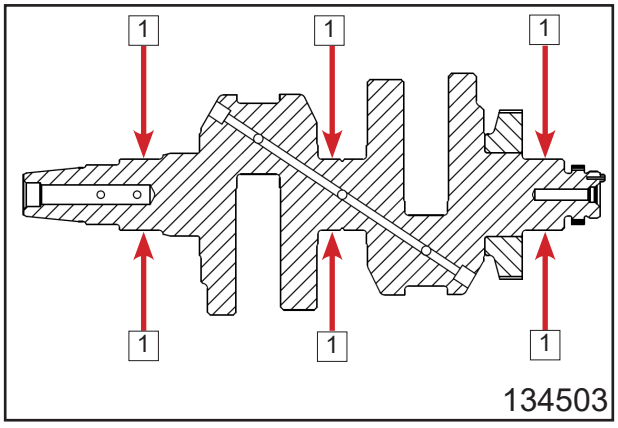
Measure crankshaft main journal [1] diameter with micrometer.

Crankshaft main journal diameter	
Standard	37.984 mm~38.00 mm
Service limit	37.97 mm

⚠Note: Replace with a new crankshaft if beyond service limit.

⚠Note: If measured diameter is not less than service limit but coincide the marks, re-mark signs.

Crankshaft main journal diameter mark	
2	37.984 mm~37.992 mm
1	37.993 mm~38.000 mm

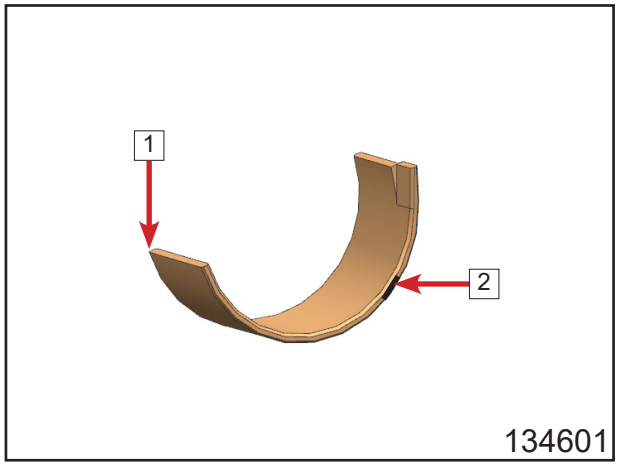


Measure crankcase main shaft hole diameter. It should coincide the mark. Otherwise, re-mark.

Crankcase main shaft hole diameter mark	
1	41.00 mm~41.008 mm
2	41.009 mm~41.016 mm

According to the crankshaft main journal mark and crankcase main shaft hole, choose main plain bearing [1]. Color mark [2].

Crankcase main shaft hole/main journal/ main plain bearing		
Crankcase main shaft hole mark	Crankshaft main journal diameter mark	Main plain bearing color
Yellow	1	Brown
Yellow	2	Black
Green	1	
Green	2	Blue



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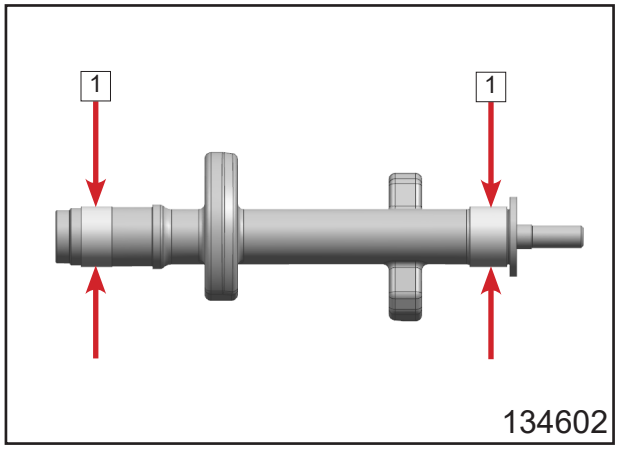
13.5.12 Balance Shaft/Plain Bearing Wear

Measure balance shaft journal [1] diameter with micrometer.

Balance shaft journal diameter	
Standard	27.987 mm~28.000 mm
Service limit	27.96 mm

⚠Note: Replace with a new balance shaft if beyond service limit.

⚠Note: If measured diameter is not less than service limit but coincide the marks, re-mark signs.



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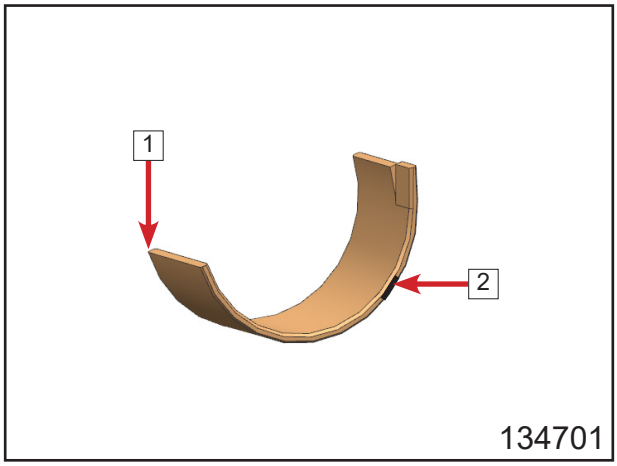
Balance shaft journal diameter mark	
1	27.987 mm~27.993 mm
2	27.994 mm~28.000 mm

Balance Shaft

Measure balance shaft hole diameter. It should coincide the mark. Otherwise, remark.

Balance shaft hole diameter mark	
1	31.000 mm~31.008 mm
2	31.009 mm~31.016 mm



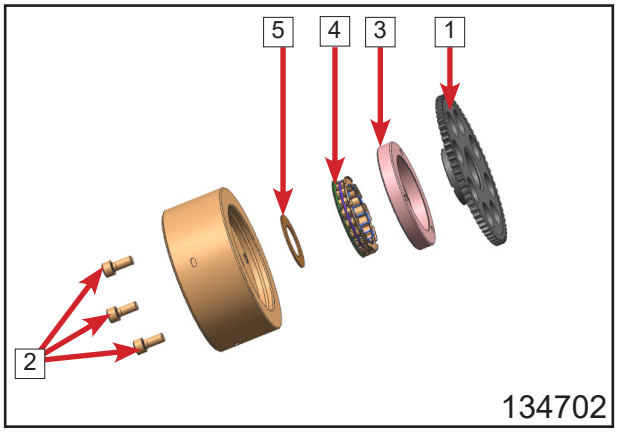
According to the balance shaft journal mark and balance shaft hole, choose main plain bearing [1]. Color mark [2].

Balance shaft hole/balance shaft journal/ balance shaft plain bearing		
Balance shaft hole mark	Balance shaft journal diameter mark	Balance shaft plain bearing color
Yellow	2	Brown
Yellow	1	Black
Green	2	
Green	1	Blue

13.5.13 Overriding Clutch Inspection

Disassembly

Remove starter big gear assy [1].
Remove M8 inner hex screws [2].
Remove one-way clutch seat [3].
Remove one-way clutch assy [4].
Remove washer [5].

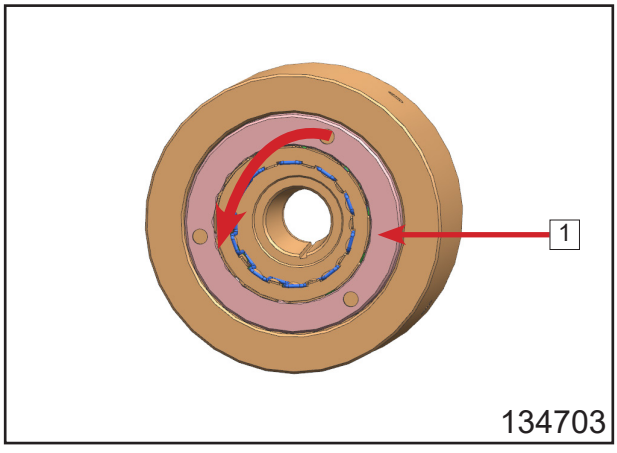


⚠Note: Never try to knock the AC generator rotor. Otherwise, magnet will lose its magnetism.

Inspection

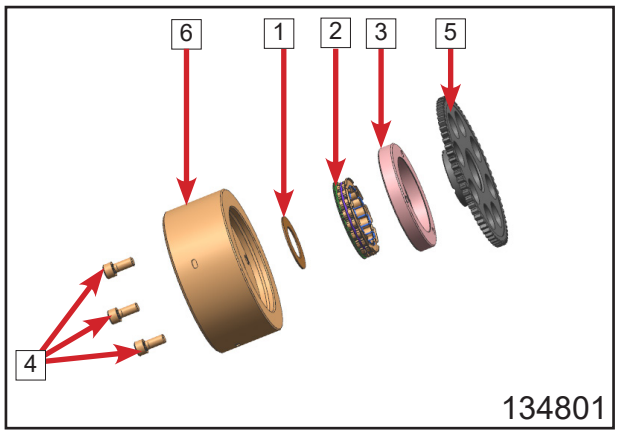
Turn overriding clutch assy gear [1] with hand. It should rotate counterclockwise freely, but not clockwise.

If overriding clutch assy can not work or makes noise, disassemble and inspect overriding clutch parts for damage. Replace if necessary.



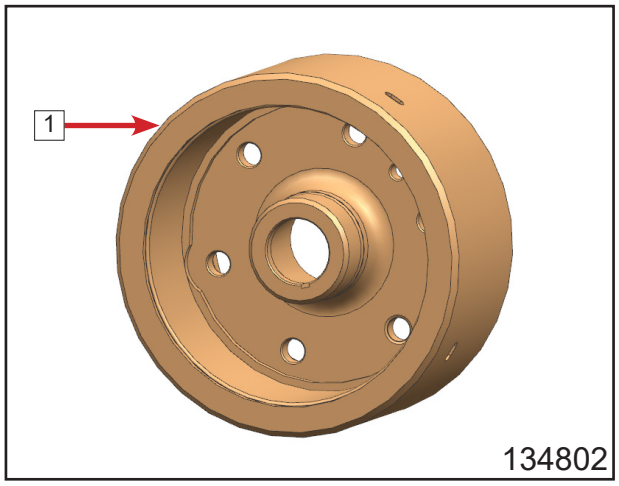
Assembly

Install one-way clutch assy [2] on seat [3].
Make sure the counter-clockwise direction.
Put the washer [1] under magneto rotor lower surface. Install one-way clutch assy [2] on rotor [6]. Install M8 inner hex screws [4] (with 243 thread locker).
Tighten torque: 34 N·m
Apply some grease on one-way clutch assy [2] inner side and install starter big gear [5].



13.5.14 Magneto Rotor Inspection

Inspect rotor [1] inside for scratch or other damage.
Inspect rotor [1] key groove for skewness or other damage.
Inspect rotor [1] outer ring teeth for lean or other damage.
Inspect woodruff key and key groove on crankshaft for wear or other damage.
Replace the parts above if severely damaged.



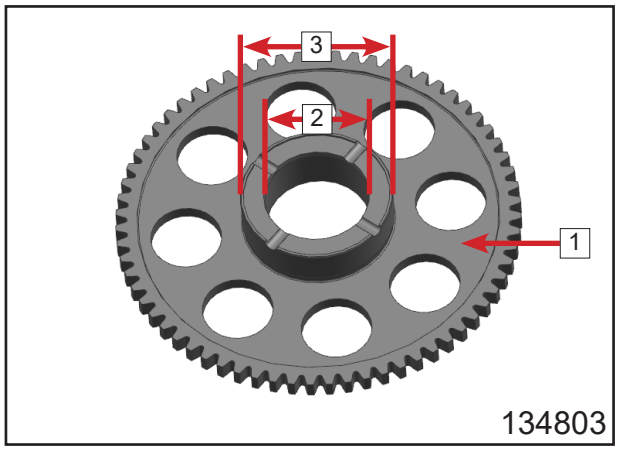
13.5.15 Starter Driven Gear, Dual Gear and Shaft Inspection

Inspection

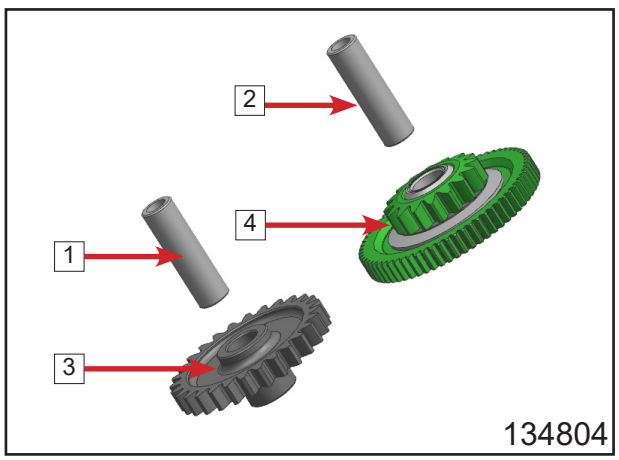
Inspect starter driven gear [1] for wear and damage.
-Measure starter driven gear [1] inner diameter and outer diameter.
Service limit:

Outer diameter [3]: 51.705 mm~51.718 mm
Inner diameter [2]: 32.025 mm~32.05 mm

Replace starter driven gear [1] if beyond service limit.



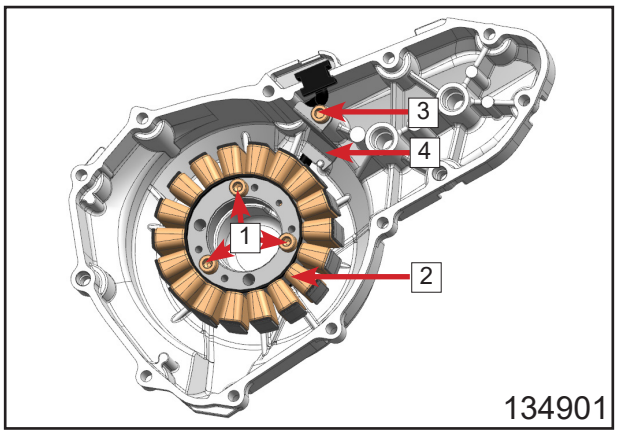
Inspect starter middle gear [3] and dual gear assy [4] for wear and damage. Replace if necessary.
Inspect middle gear shaft [1] and [2] for wear and damage. Replace if necessary.



13.5.16 Magneto Stater

Disassembly

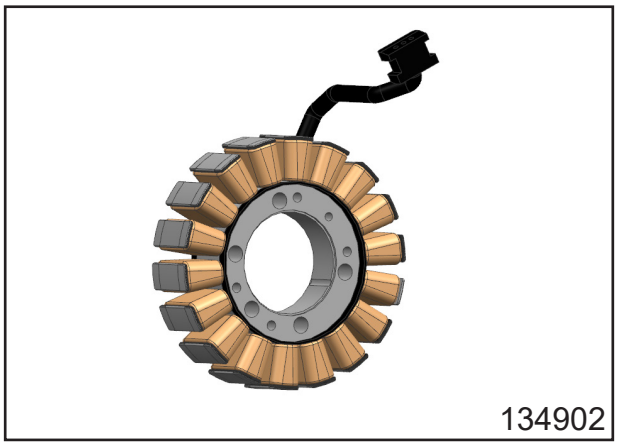
Remove M6 inner hex bolt [1].
Remove stater assy [2].
Remove M6 screws [3].
Remove wire-press plate [4].
Remove magneto stater [2].



Inspection

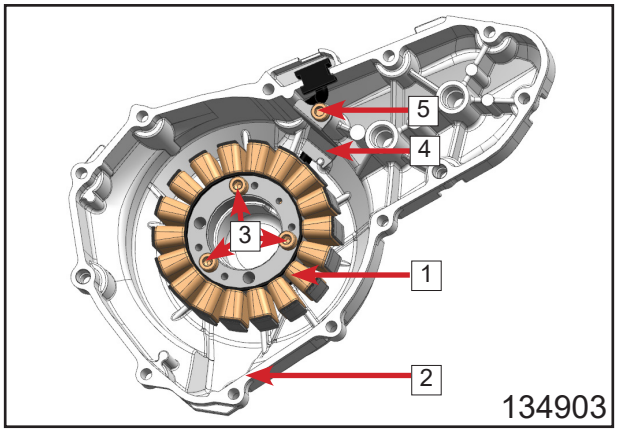
Inspect stater condition. Replace if broken.

Inspect coil for break, age or other damage. Replace if necessary.



Assembly

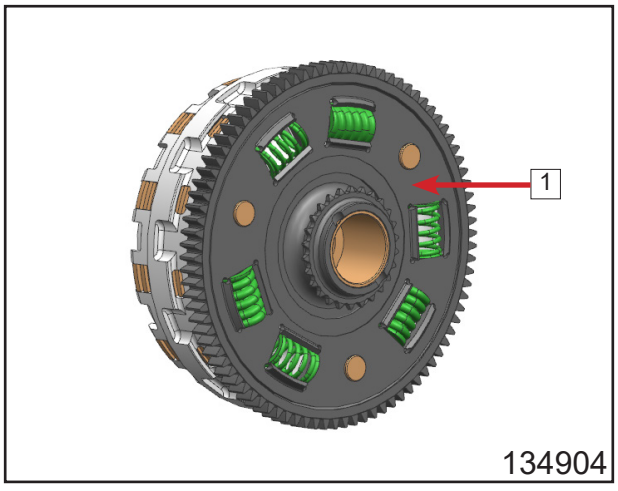
Install magneto stater [1] on engine LH side cover [2].
Install M6 inner hex bolt [3]. (With thread locker)
Install wire-press plate .
Install M6 screw [5]. (With thread locker)



13.5.17 Clutch Assy Inspection

Housing Assy

-If inner damping springs get worn, it will cause waggle between gear and clutch housing, which makes noise. Replace primary driven gear assy [1] if the waggle is severe.
-Replace two gears if worn or damaged.
-Replace two gears if the noise is too loud.



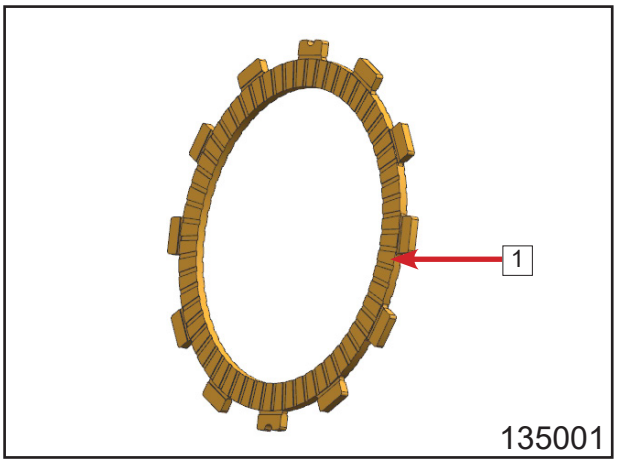
Friction Disc Assy

Inspect friction discs and steel plates for blocking, overheating (color changed) and other defects.

Measure friction disc [1] thickness at different positions.

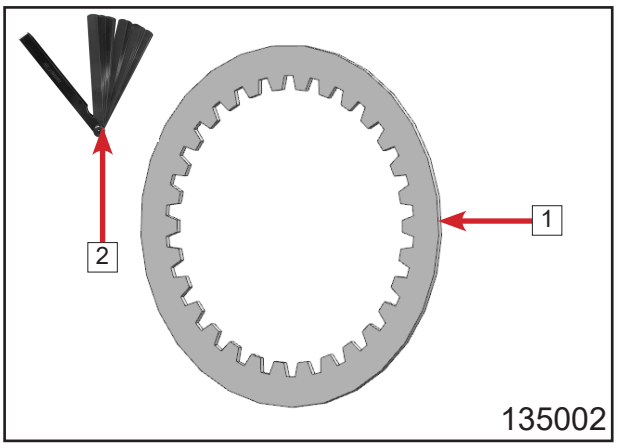
Replace if any disc gets broken or the thickness is beyond service limit.

Friction disc thickness	
Standard	2.95 mm~3.05 mm
Service limit	2.8 mm



Put every friction disc or steel plate on flatbed. Use feeler gauge [2] to measure the clearance [1] between flatbed and friction disc or steel plate. Such clearance is the friction disc or steel plate deformation value. Replace with new discs or plates if beyond service limit.

Friction disc and steel plate deformation	
Standard	0.15 mm or less
Service limit	0.3 mm

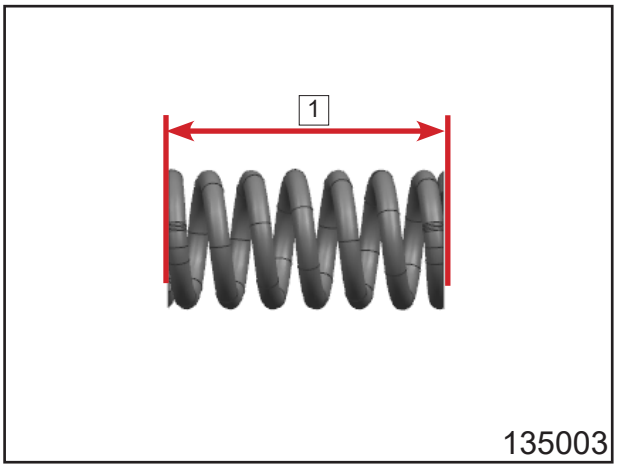


Clutch Press Spring

Measure clutch press spring [1] free length.

Replace if less than service limit.

Clutch press spring free length	
Standard	33.6 mm±0.5 mm
Service limit	32.6 mm



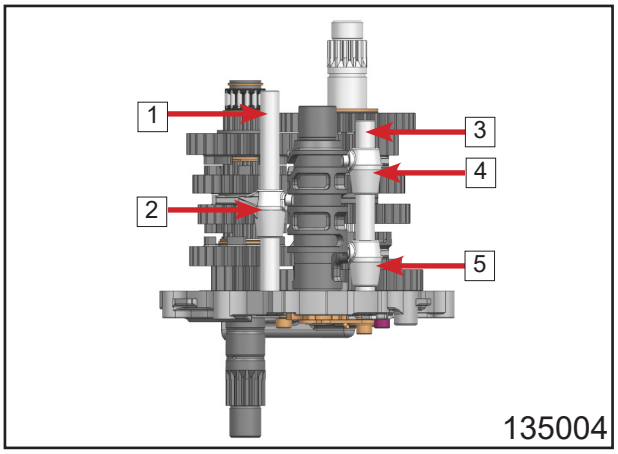
13.5.18 Transmission Case Inspection Disassembly

Remove main shaft fork shaft [1].

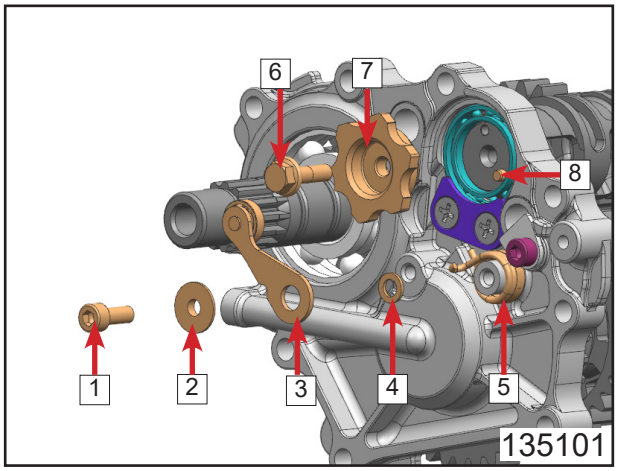
Remove main shift fork [2].

Remove countershaft fork shaft [3].

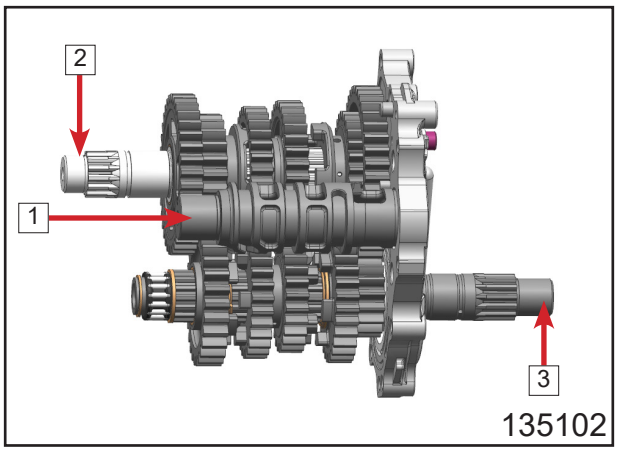
Remove countershaft shift fork [3] and [5].



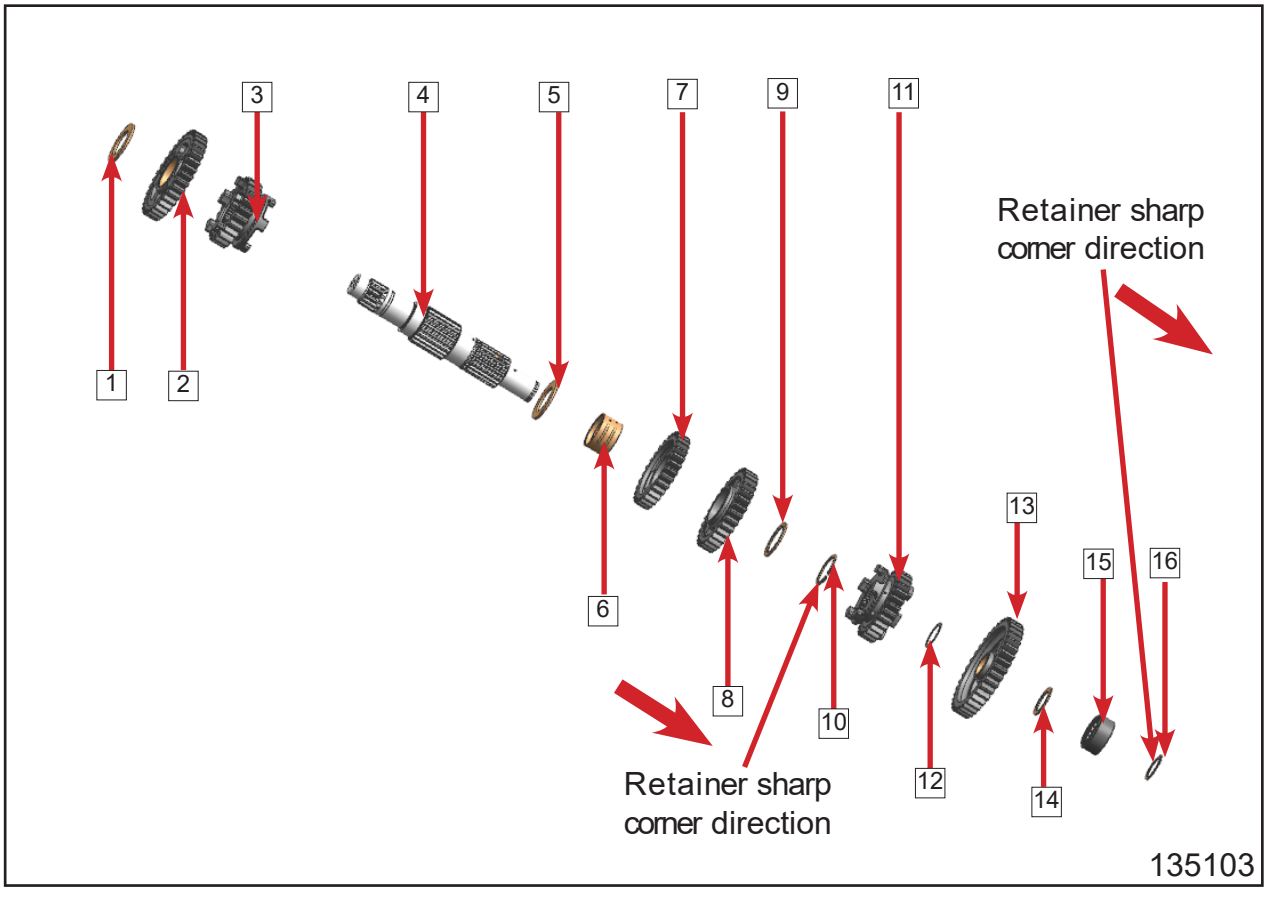
Remove M6 inner hex screw [1].
Remove gearshift swing arm bushing [2].
Remove gearshift swing arm assy [3].
Remove washer [4].
Remove gearshift swing arm spring [5].
Remove M6 bolt [6].
Remove gearshift cam [7].
Remove roller needle [8].



Remove shift drum hub [1].
Remove countershaft assy [2].
Remove main shaft assy [3].

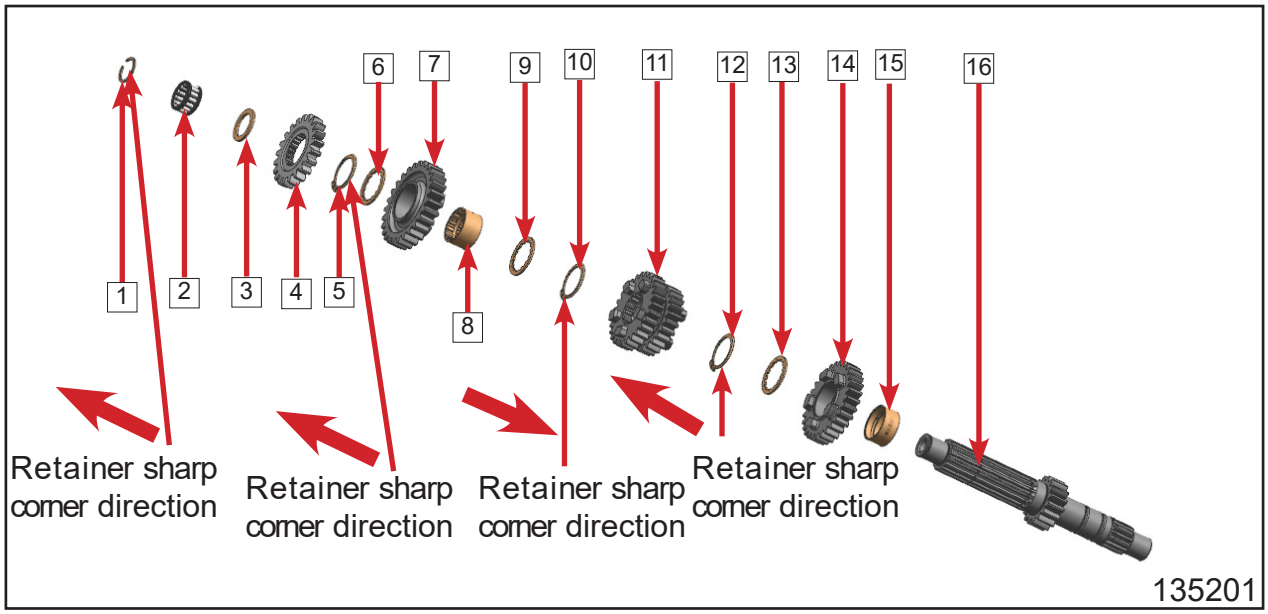


Countershaft Assy



1	25×39×2 washer	7	Driven gear (4th gear)	13	Driven gear (1st gear)
2	Driven gear (2nd gear)	8	Driven gear (3rd gear)	14	20.4×28×1.2 washer
3	Driven gear (6th gear)	9	Washer, spline	15	20×26×13.8 needle bearing
4	Countershaft	10	30 retainer	16	20 retainer
5	30 washer	11	Driven gear (5th gear)		
6	Bearing bushing	12	20.4×25×0.5 washer		

Main Shaft Assy



1	20 retainer	7	Drive gear (6th gear)	13	Washer, spline
2	Needle bearing	8	28×14.7 bearing bushing	14	Drive gear (5th gear)
3	20.5×30×1.5 washer	9	Washer, spline	15	28×14 bearing bushing
4	Drive gear (2nd gear)	10	28 retainer	16	Main shaft
5	28 retainer	11	Drive gear (3rd and 4th gear)		
6	Washer, spline	12	28 retainer		

⚠Note: The removed retainers are sorted into waste. Replace with new retainers during installation.

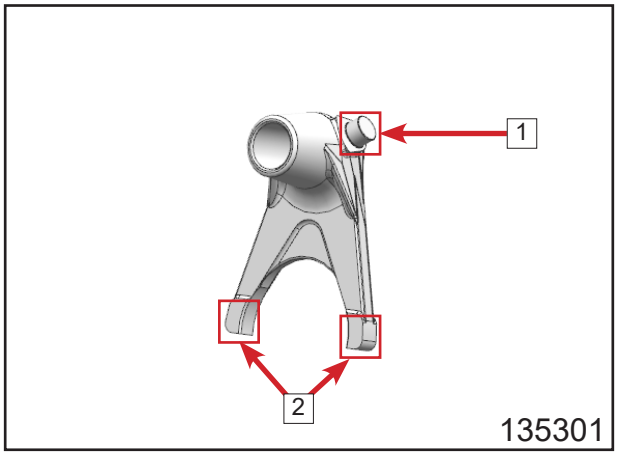
Gear Inspection

Inspect every gear to see whether it becomes blue, rusty or worn. Replace if it does.

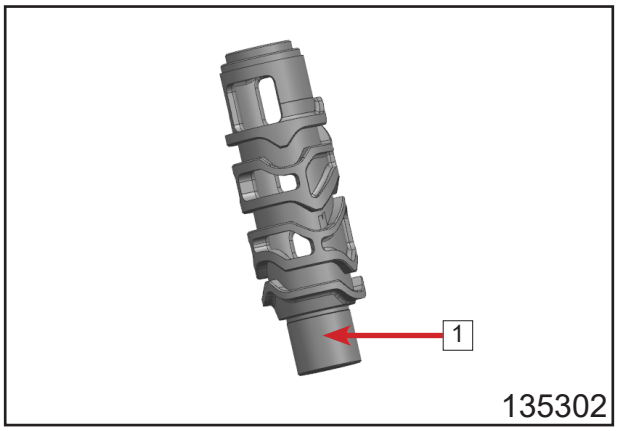
Inspect gear teeth if they become rounded, misplace or have cracks. Replace if they do.

⚠Note: Replace gears in pairs. Use new retainer during installation.

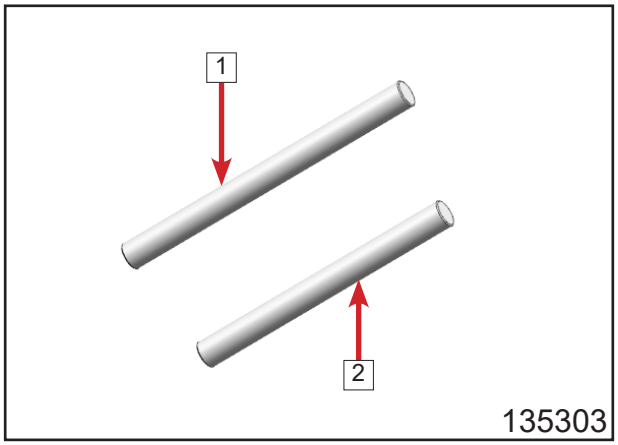
Shift Fork Inspection
Inspect shift fork bulge [1] and paw [2] for scratches, bend or damage. Replace if yes.



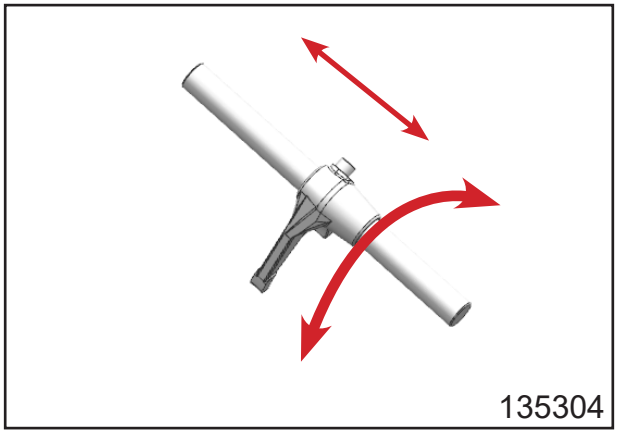
Shift Drum
Inspect shift drum groove and surface A for wear or damage. Replace if necessary.



Shift Fork Shaft Inspection
Inspect shift fork shaft [1] and [2] for deformation, scratches, wear or damage. Replace if necessary.

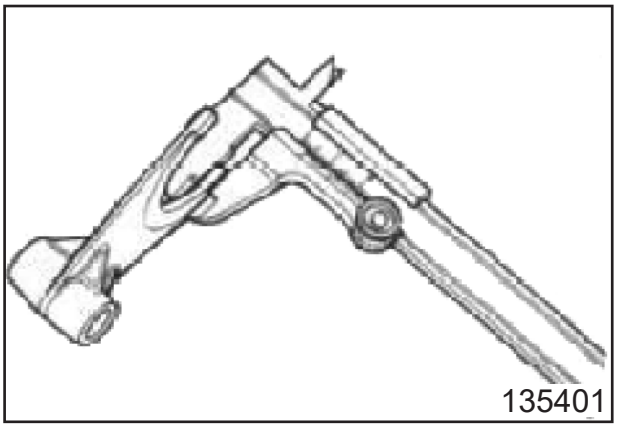


According to the picture, slide/rotate shift fork to check its action. Replace shift fork or fork shaft if the action isn't smooth.



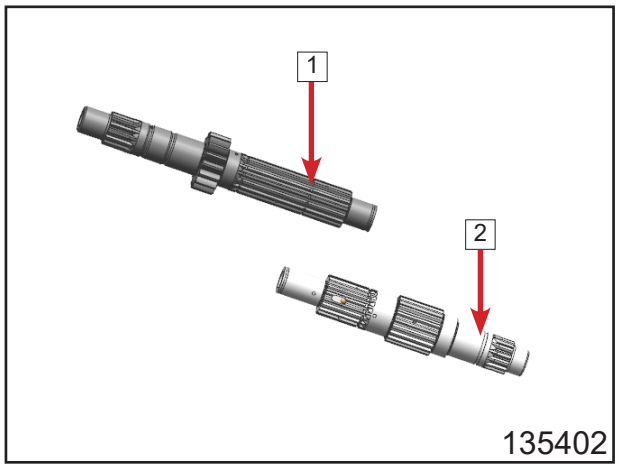
Measure shift fork joint thickness with vernier caliper.

Shift fork thickness: 5.9 mm~6.0 mm



Main Shaft and Countershaft

Inspect main shaft [1] and countershaft [2] for bending, wear or damage. Replace if they do.

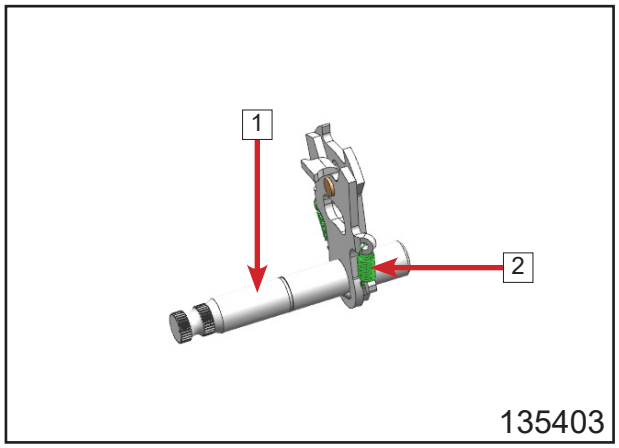


13.5.19 Gearshift Assy Inspection

Gearshift Rod Inspection

Inspect gearshift rod [1] for bending, wear or damage. Replace if it does.

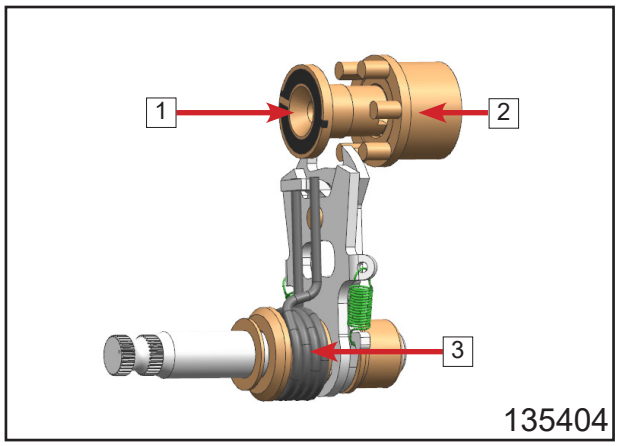
Inspect gearshift spring [2] for damage or severe deformation. Replace if it does.



Gear sensor [1] inspection refers to Electrical System chapter.

Inspect shift location drum [2] for damage or deformation. Replace if it does.

Inspect gearshift swing arm return spring [3] for damage or deformation. Replace if it does.

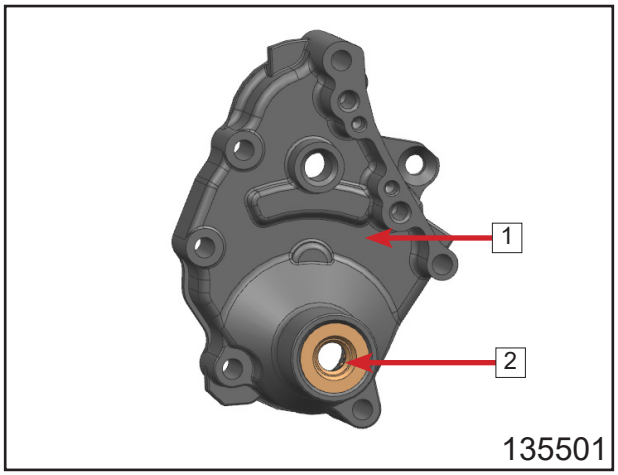


13.5.20 Gearshift Cover Inspection

Inspect gearshift cover [1] for cracks, damage or severe deformation. Replace if it does.

Rotate needle bearing [2] to inspect for block or damage. Replace if it does.

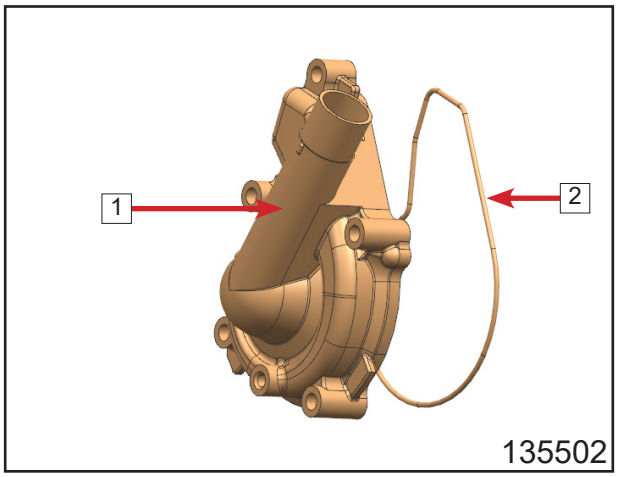
Inspect oil seal for damage. Replace if it does.



13.5.21 Water Pump Assy Inspection

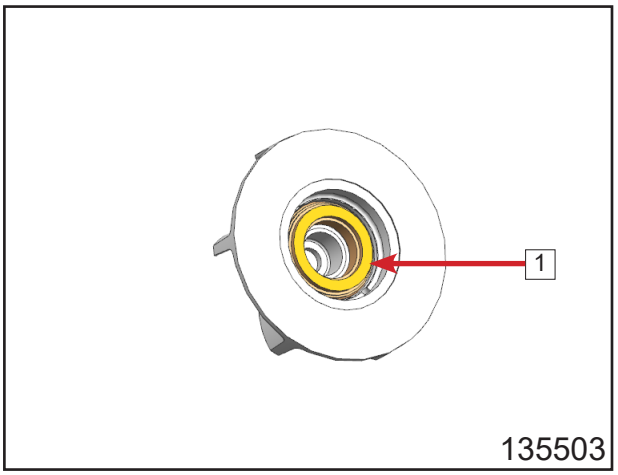
Inspect water pump cover [1] for cracks, damage or severe deformation. Replace if it does.

Inspect water pump cover seal ring [2] for cracks, aging or damage. Replace if necessary.



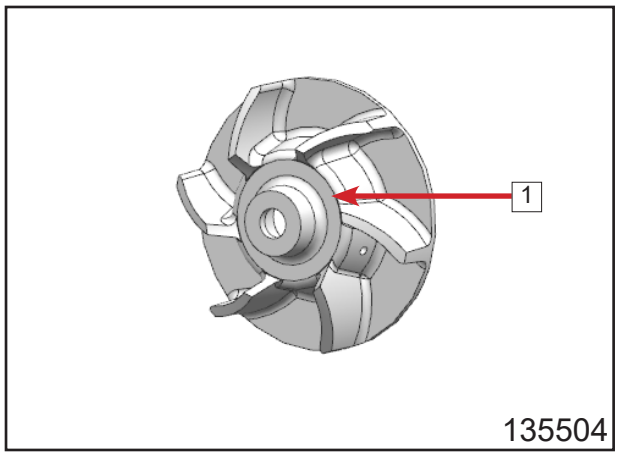
Water Pump Impeller Disassembly

Remove water seal moving ring [1].

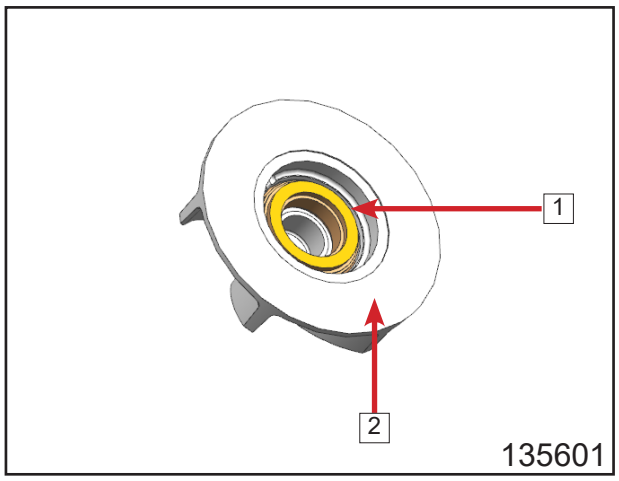


Inspection

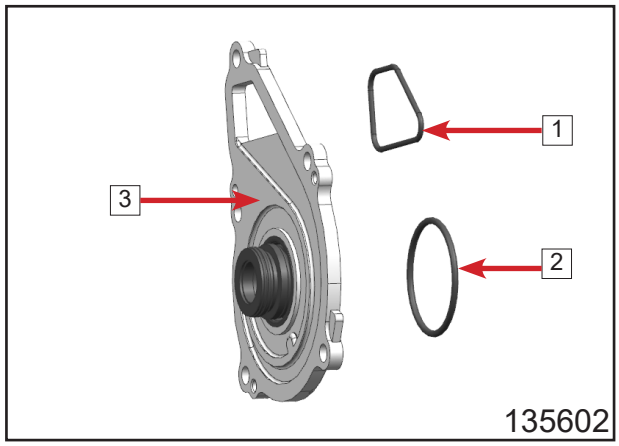
Inspect water pump impeller [1] for damage. Replace if it does.



Assembly
Dip some ethyl alcohol with clean cloth to clean water moving ring. Install the ring into the mounting hole on water impeller.



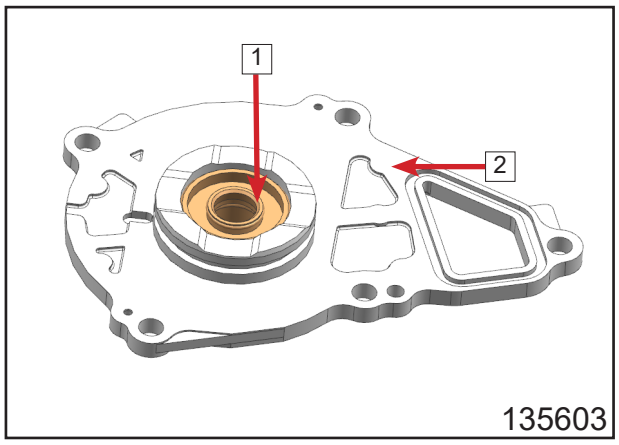
Water Pump Inspection
Inspect 34×2.5 o-seal ring [1] and water pump seal ring [2] for cracks, hardening or damage. Replace if necessary.
Inspect water pump [3] for cracks, damage or severe deformation. Replace if it does.



Water Seal Inspection
Watch the water seal to inspect. If any part breaks, replace the whole water pump assy. If the seal is good, it is not necessary to remove it.

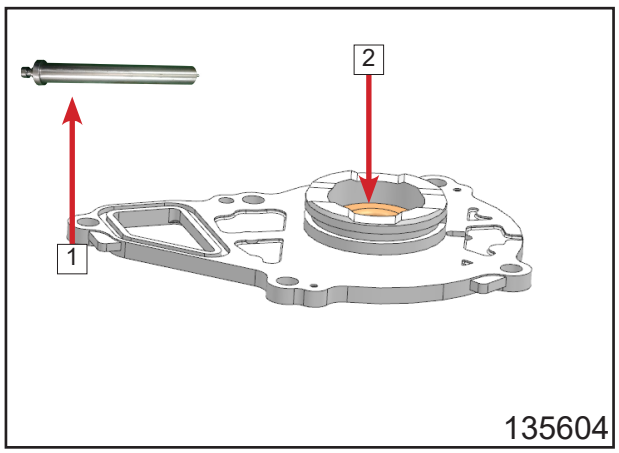
Removal
Remove oil seal [1] from water pump [2].

⚠Note: The removed oil seals are sorted into waste. Use new oil seals during installation.



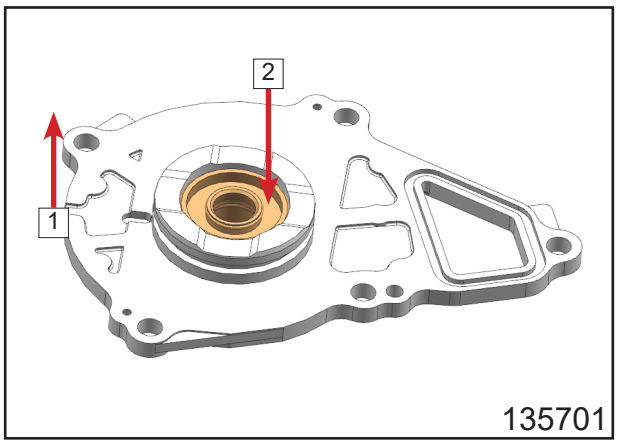
Use special tool: water seal puncher pin [1] to press out the static ring [2] from water pump.

⚠Note: The removed water seals are sorted into waste. Use new water seals during installation.



Assembly

Put the water pump on work bench as picture shows. Apply some surface sealing glue on 12×32×5.5 oil seal [2], put the seal on special tool: water pump oil seal puncher pin. Align the seal with water pump mounting hole. Knock puncher pin [1] with hammer to install the oil seal [2].



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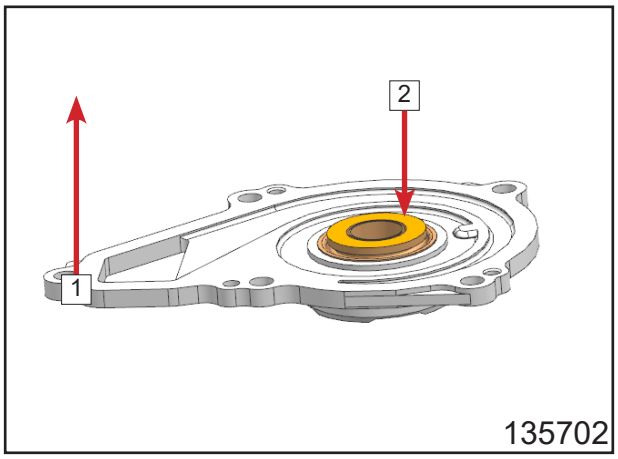
Apply 5699 sealing glue on water seal static ring assy [2]. Install it into the water pump mounting hole with special tool: water seal puncher pin [1].



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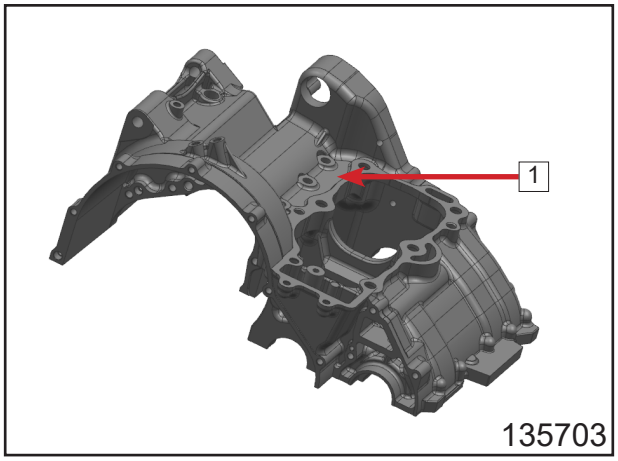
13.5.22 Crankcase Inspection

Inspect plain bearings on crankcase. Replace if severely worn.

Inspect upper crankcase [1] for cracks or damage. Replace in pairs if necessary.



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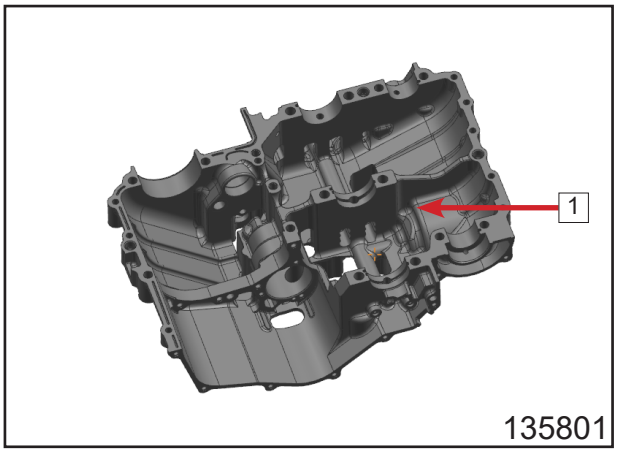
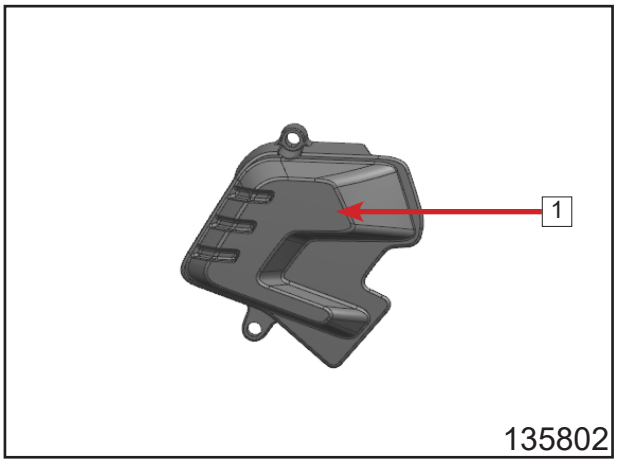
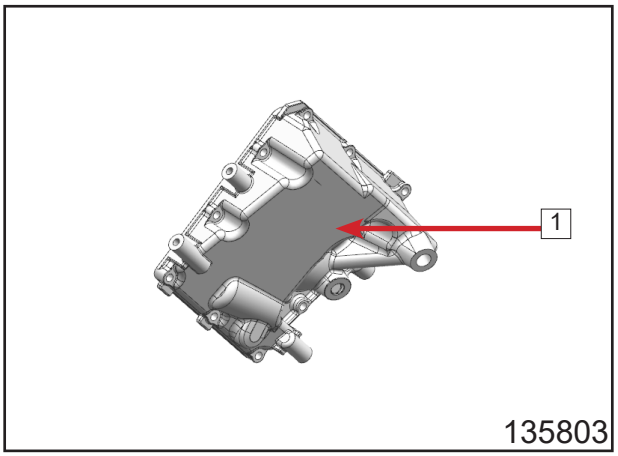
Inspect lower crankcase [1] for cracks or damage. Replace in pairs if necessary.



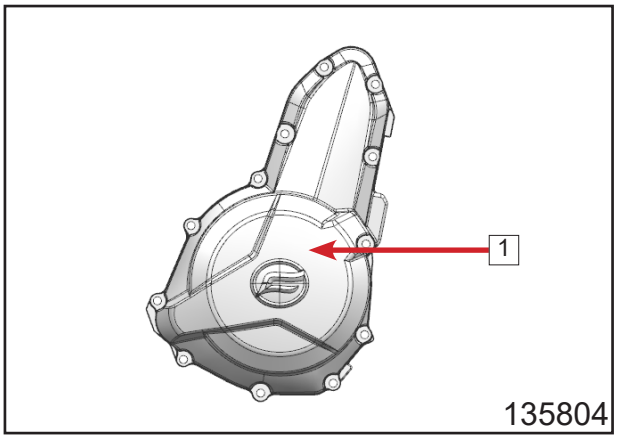
Inspect LH rear cover [1] for cracks or damage. Replace if necessary.



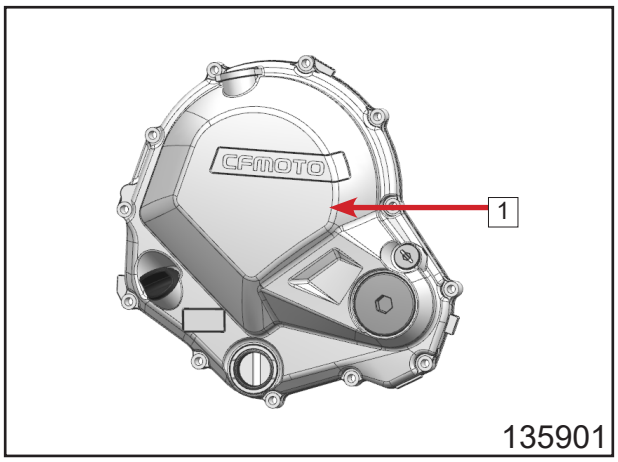
Inspect oil pan [1] for cracks or damage. Replace if necessary.



Inspect LH side cover [1] for cracks or damage. Replace in pairs if necessary.



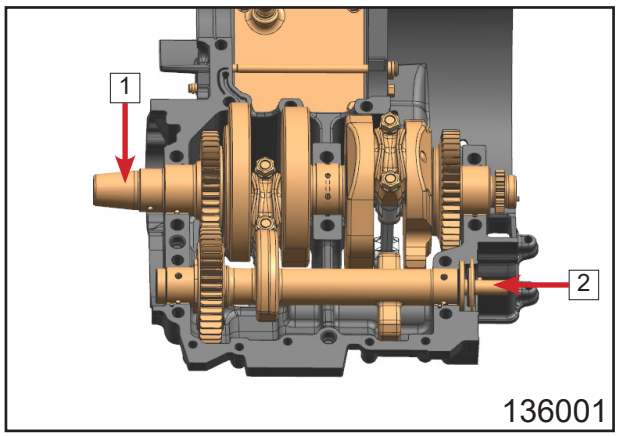
Inspect RH crankcase cover [1] for cracks or damage. Replace in pairs if necessary.



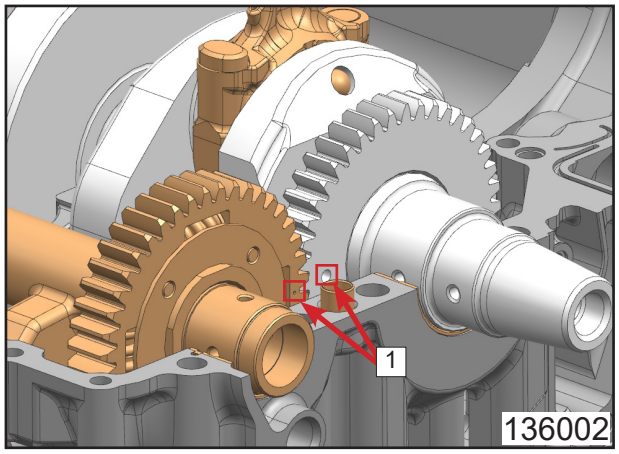
13.6 Engine Assembly

13.6.1 Crankshaft and Balance Shaft Installation

Apply MoS2 on crankshaft 1 and balance shaft 2 journal, then install them.

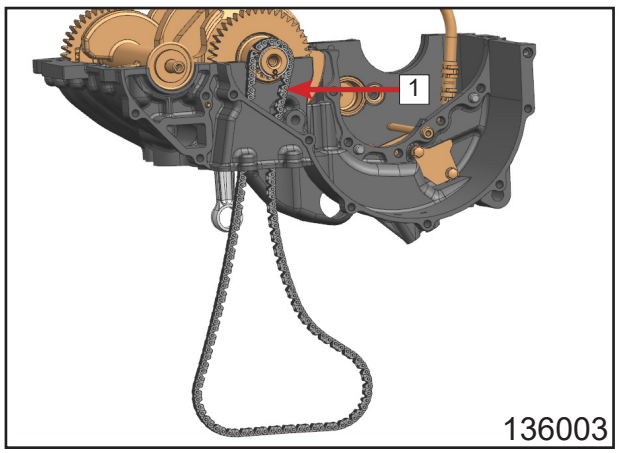


⚠Note: Align teeth marks 1 during installation.



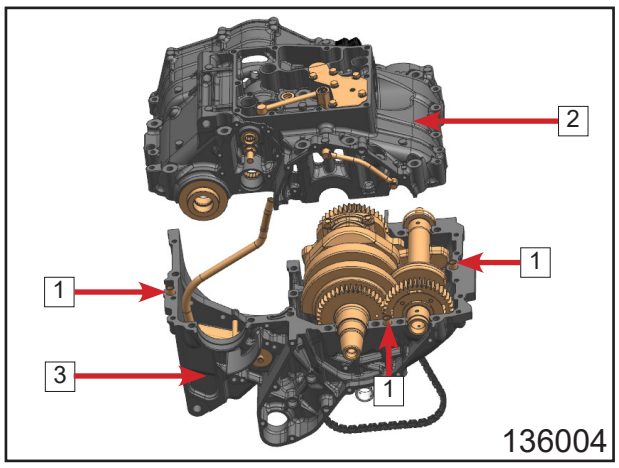
13.6.2 Timing Chain Installation

Install timing chain 1.



13.6.3 Crankcase Installation

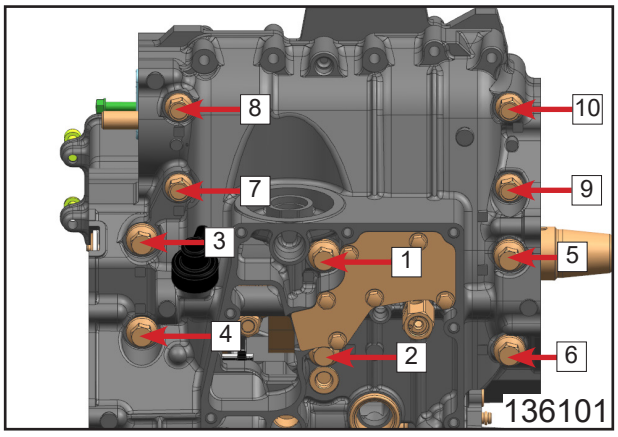
Install dowel pins 1.
Apply sealing glue on joint surface evenly and uninterruptedly.
Combine lower crankcase 2 with upper crankcase 3.



According to the number sequence, pre-tighten the bolts [1]~[10] with 20 N·m torque wrench. (Bolts [1]~[6] are M9, bolts [7]~[10] are M8.)
According to the number sequence, tighten the bolts [1]~[10] with 35 N·m torque wrench. (Bolts [1]~[6] are M9, bolts [7]~[10] are M8.)
According to the number sequence, tighten the bolts [1]~[6] with 44 N·m torque wrench. (Bolts [1]~[6] are M9, bolts [7]~[10] are M8.)

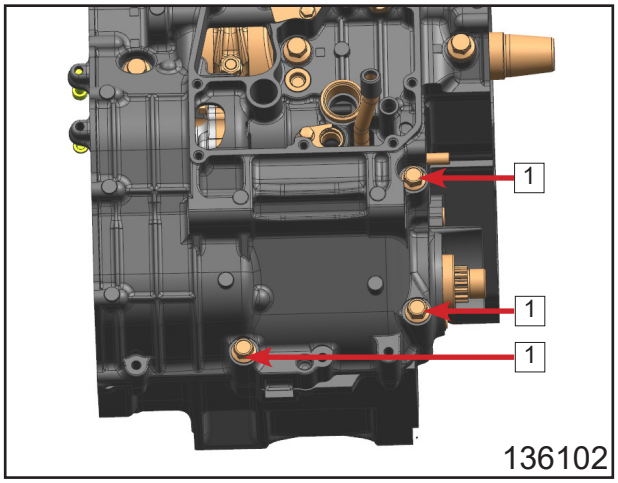
⚠Note: Insert the bolts into holes before installation. The exposed height should be the same. Adjust the bolt if not. Tighten the bolts in criss-cross way.

⚠Note: Apply engine oil on thread of bolts [1]~[10] and both sides of washers.



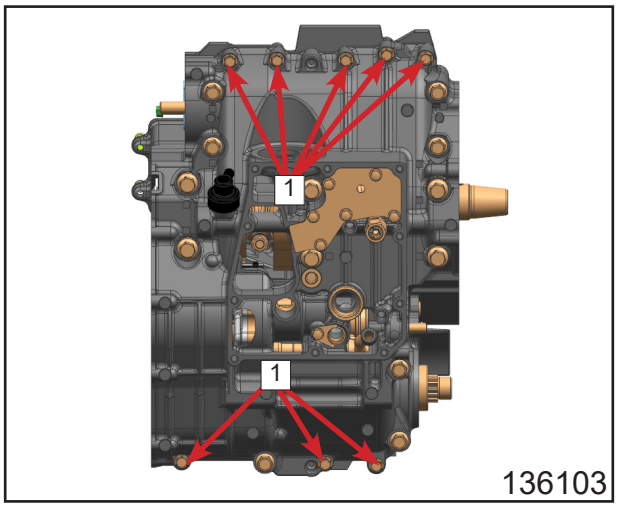
Install M8 bolts [1]. Tighten torque: 27.5 N·m.

⚠Note: Insert the bolts into holes before installation. The exposed height should be the same. Adjust the bolt if not. Tighten the bolts in criss-cross way.



Install M7 bolts [1]. Tighten torque: 20 N·m.

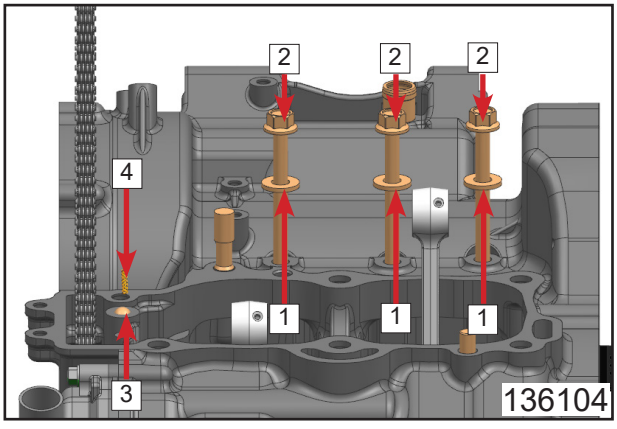
⚠Note: Insert the bolts into holes before installation. The exposed height should be the same. Adjust the bolt if not. Tighten the bolts in criss-cross way.



Put washers [1] on M8 bolts [2] and install the them on crankcase. Tighten torque: 27.5 N·m.

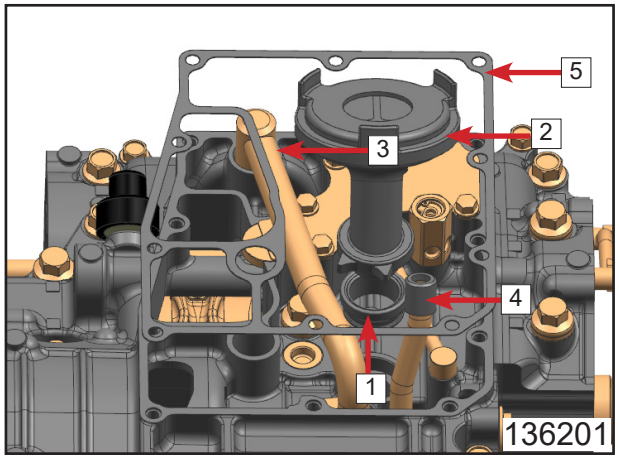
⚠Note: Apply engine oil on thread of bolts and both sides of washers.

⚠Note: When tightening bolts [2], tighten 2~3 times in criss-cross way, from inside to outside.

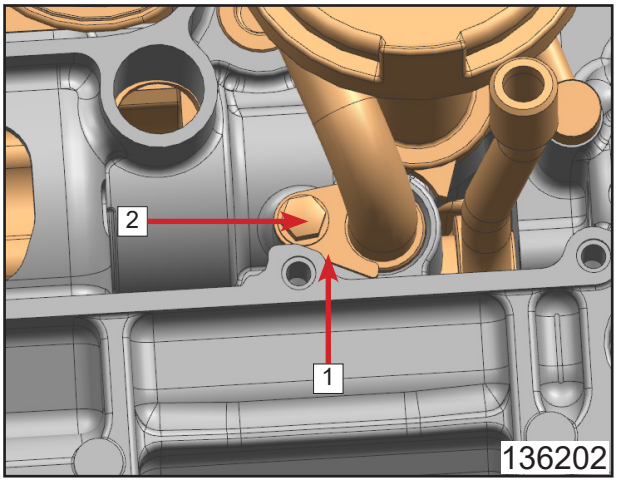


13.6.4 Oil Pan Assy Installation

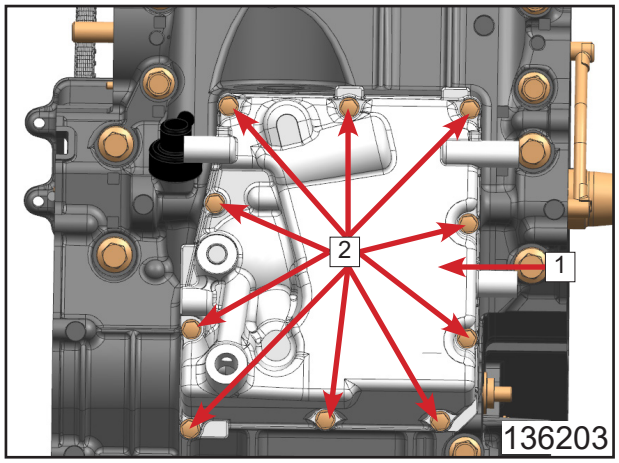
Install oil suction pan seal ring [1].
Install oil suction pan assy [2].
Put two 14x2.5 o-rings on oil pipe I [3].
Apply some engine oil to the mounting hose and install the pipe.
Install oil return hose damping rubber sleeve [4].
Install seal gasket [1].



Install oil pipe I press plate [1].
Install M6 bolt [2] with 243 thread locker.
Tighten torque: 8 N·m



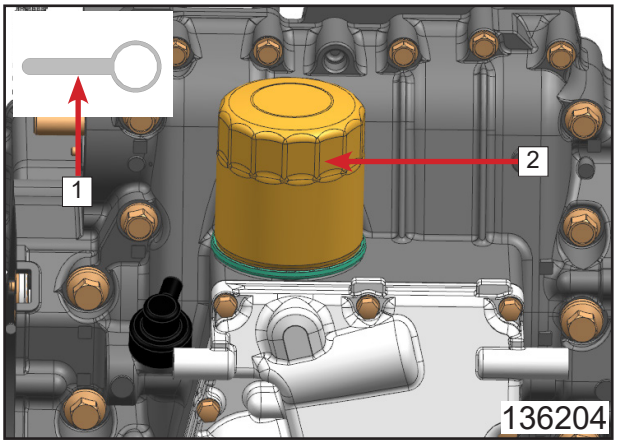
Adjust oil return hose to make it fix into the mounting groove. Then install oil pan assy [1].
Install M6×25 bolts [2].
Tighten torque: 11~13 N·m



13.6.5 Oil Filter Installation

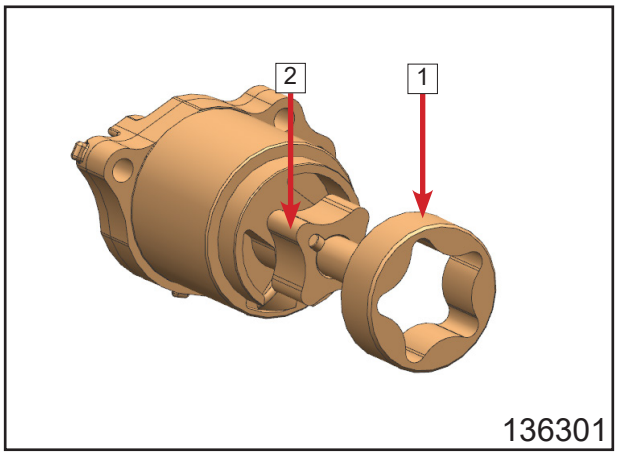
Use special tool: oil filter wrench [1] to install the oil filter [2]. Tighten torque: 16~18 N·m

⚠Note: Wrap oil filter with a cloth or rubber mat, in case the wrench breaks the filter.

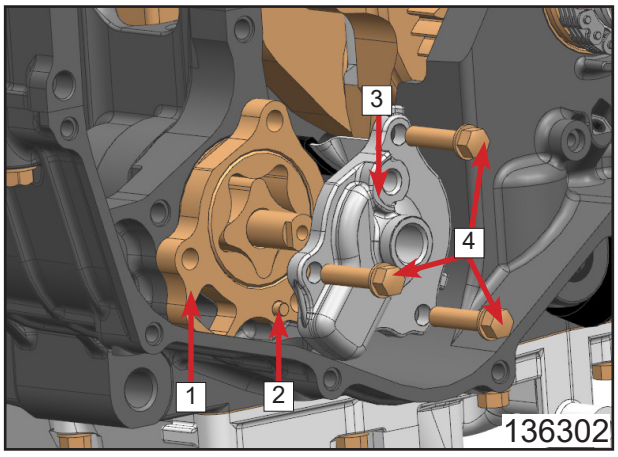


13.6.6 Oil Pump Installation

Install oil pump outer rotor [1] into the inner rotor [2].

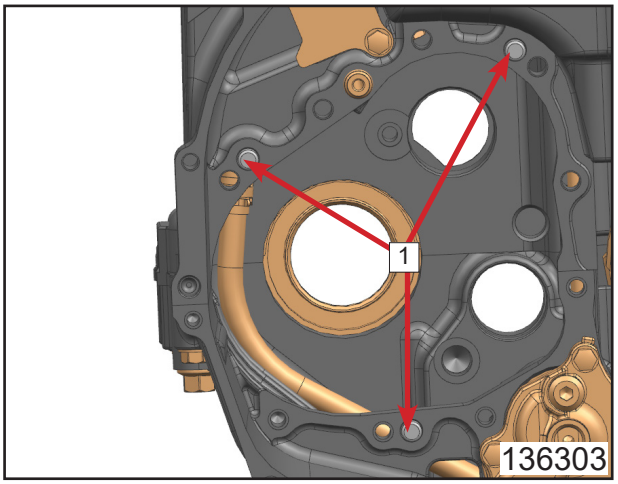


Install oil pump [1].
Install roller pin [2].
Install oil pump cover [3].
Install M6 bolts [4].

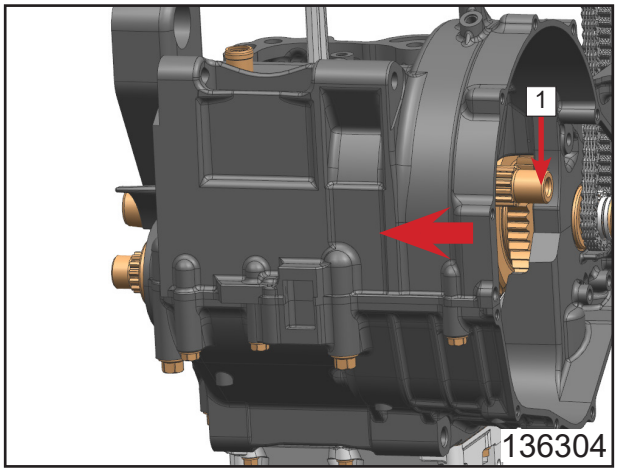


13.6.7 Transmission Case Installation

Install pins [1].

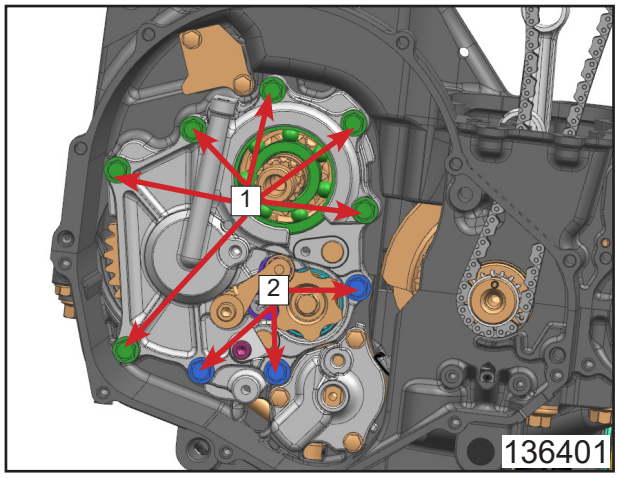


Install the gearshift cover sub assy [1] to the proper position in the direction of the arrow.

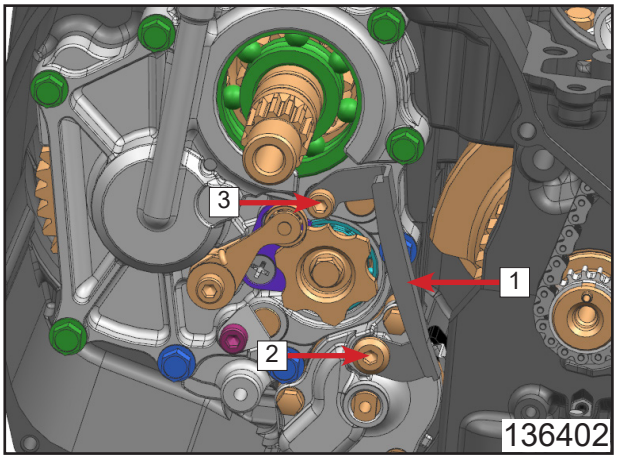


Install M7×30 bolts [1] with 243 thread locker.
Tighten torque: 19~21 N·m
Install M7×26 bolts [2] with 243 thread locker.
Tighten torque: 20 N·m

⚠Note: Tighten the bolts in criss-cross way.

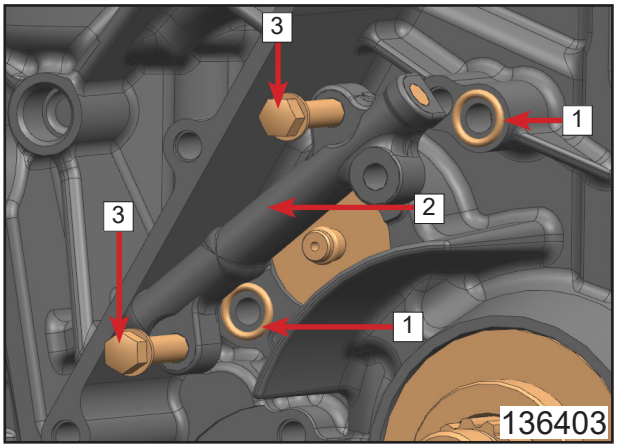


Install oil pump chain guide [1].
Install M6×12 screw [3] with 243 thread locker.
Tighten torque: 10 N·m
Install M6×9 screw [2] with 243 thread locker.
Tighten torque: 10 N·m



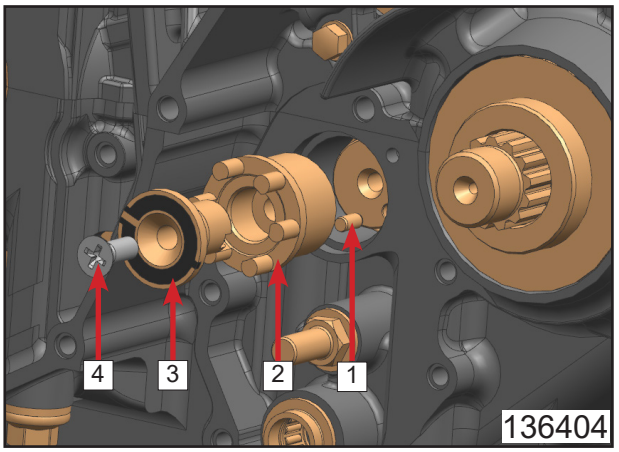
13.6.8 Oil Pipe IV Assy Installation

Apply engine oil on o-seal ring [1]. Install the ring on oil pipe IV assy [2].
Insert the oil pipe IV assy [2] into the hole on upper crankcase. After installing position confirmed, knock with rubber hammer to install the pipe.
Install M6 bolts[3]. (Along with a wire clip for each bolt)

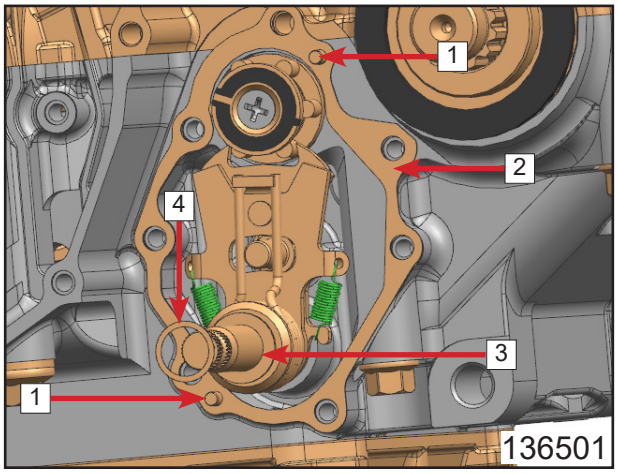


13.6.9 Gearshift Assy Installation

Install roller needle [1].
Install shift location drum [2].
Install gear sensor [3].
Install screw [4] with 243 thread locker.

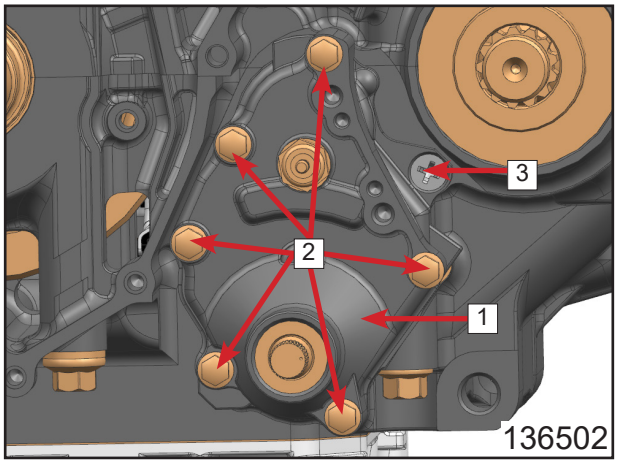


Install dowel pins [1].
Install seal gasket [2].
Install shift shaft sub assy [3].
Install washer [4].



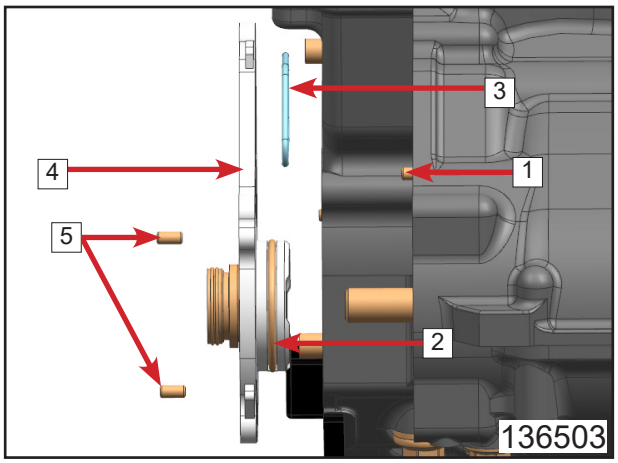
Install gearshift cover [1].
Install M6 bolts [2]. Tighten torque: 12 N·m
Install screw [3].

⚠Note: Insert the bolts into holes before installation. The exposed height should be the same. Adjust the bolt if not. Tighten the bolts in criss-cross way.



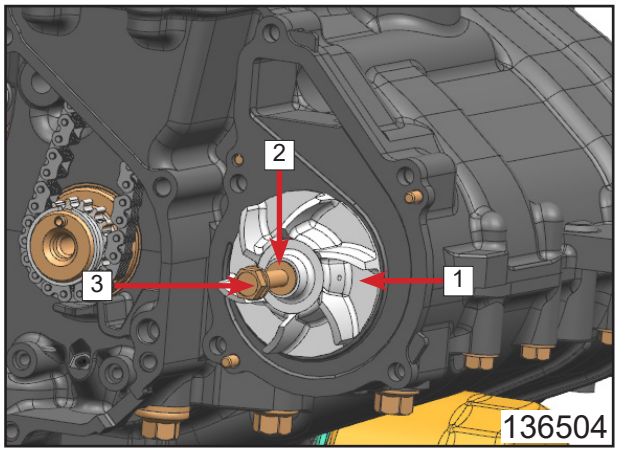
13.6.10 Water Pump Installation

Install roller needle [1].
Apply engine oil on o-ring [2].
Install seal ring [3] on water pump [4]. Do not drop the seal ring.
Install water pump [4].
Install roller needle [5].

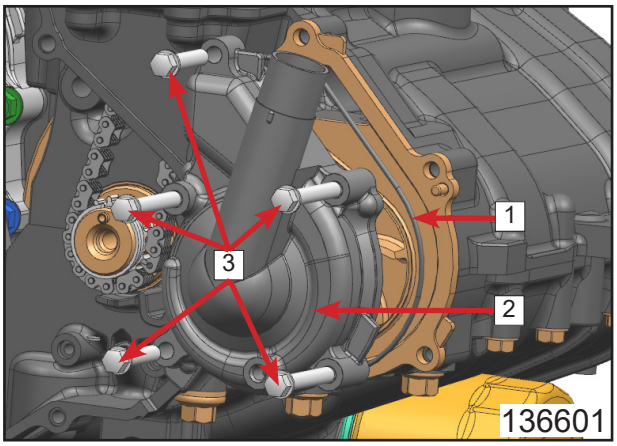


Install water pump impeller [1].
Put washer [2] on M6 bolt [3].
Install M6 bolt [3].

⚠Note: Measure the clearance between water pump and impeller during installation. The clearance should be 0.2~0.7.

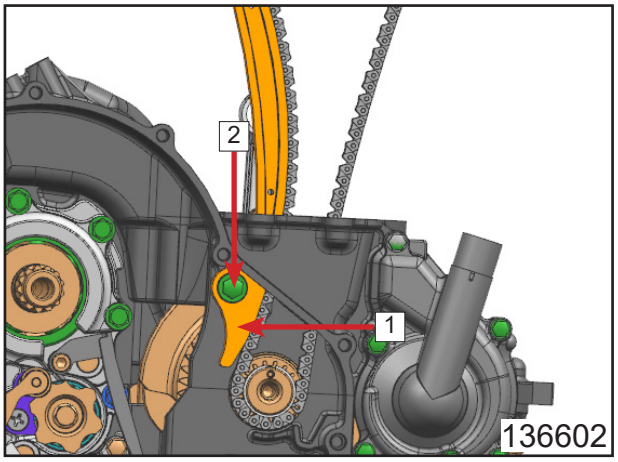


Put seal ring [1] on water pump cover [2].
Install water pump cover [2].
Install M6 bolts [3].



13.6.11 Tensioner Plate Installation

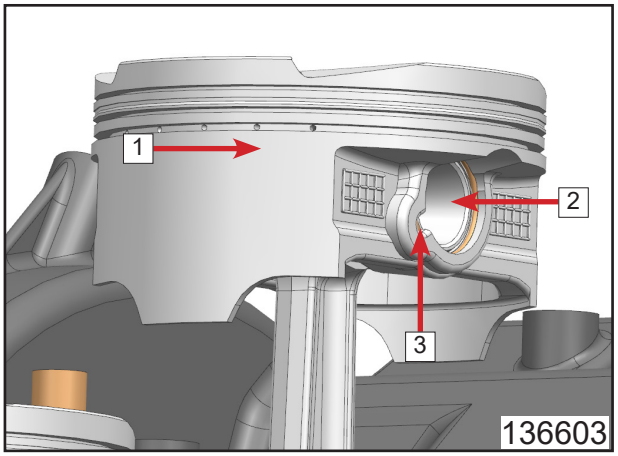
Install tensioner plate assy [1].
Install thread pin shaft [2] with 243 thread locker.
Tighten torque: 20 N·m



13.6.12 Piston Installation

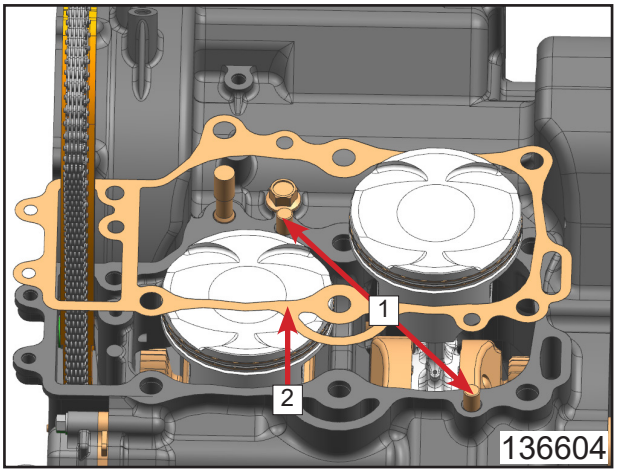
Install piston circlip on one side in advance.
Install piston [1].
Install piston pin [2].
Install piston circlip [3] on the other side. Adjust the circlip position to make the angle between circlip cut and piston cut approximately 30°.

⚠Note: Use new piston circlips after removal. Replace with new ones if deformed.



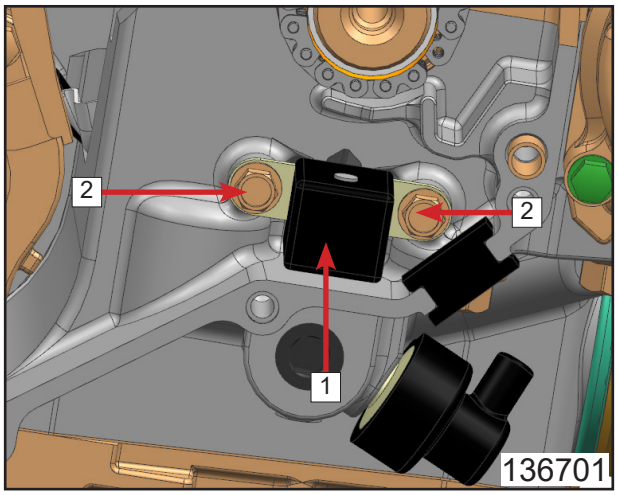
Turn crankshaft to adjust the proper position of the piston. Apply the same procedures to install the other piston.

Install dowel pins [1].
Install cylinder gasket [2].

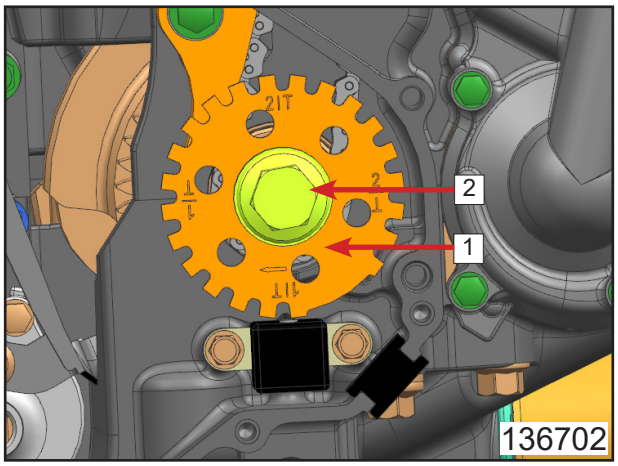


13.6.13 Crankshaft Pulsing Rotor Installation

Install trigger assy [1].
Install M5 bolts [2].



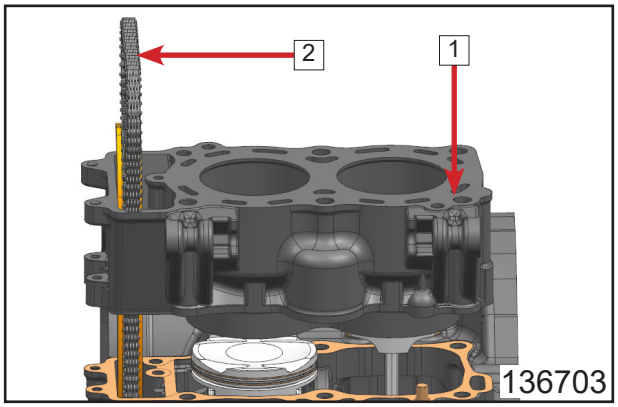
Install crankshaft pulsing rotor [1].
Install M8 bolt [2] with 243 thread locker.
Tighten torque: 40 N·m



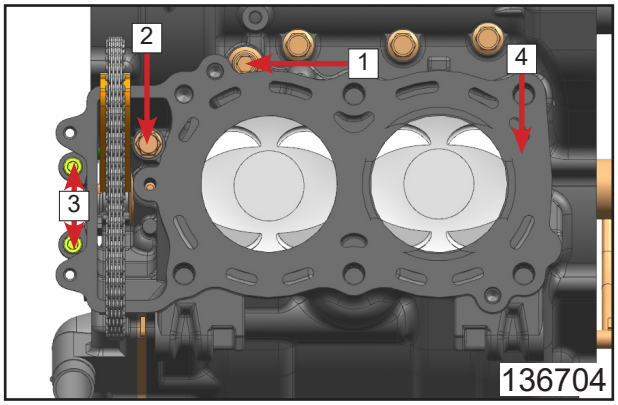
13.6.14 Cylinder Body Installation

Rotate the crankshaft until first cylinder and second cylinder are on the same level.
Apply engine oil inside the cylinder body.
Install cylinder body [1].

⚠Note: Hook the timing chain [2] in case it falls into the engine.



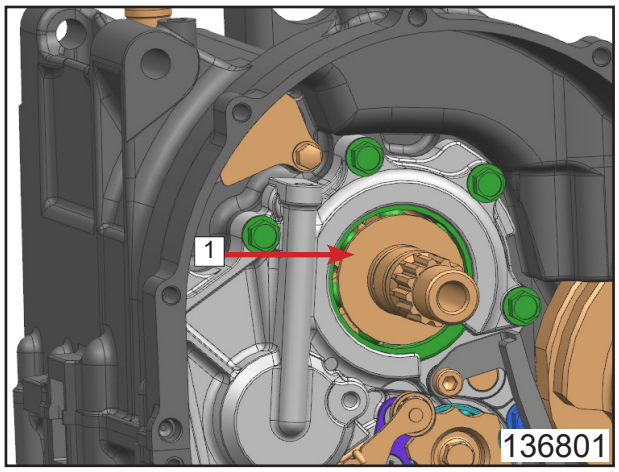
⚠Note: There three rings [2] [3] [4] on piston. Make sure the top ring [3] cut align with the mark "0" on piston. Make 180° angle between second ring [2] cut and the mark. Oil ring [4] upper and lower rail cuts align with the top ring and second ring respectively. Make 60° angle between spacer and rails. Compress the each ring into the groove before installing into the cylinder. Install the piston rings one by one.



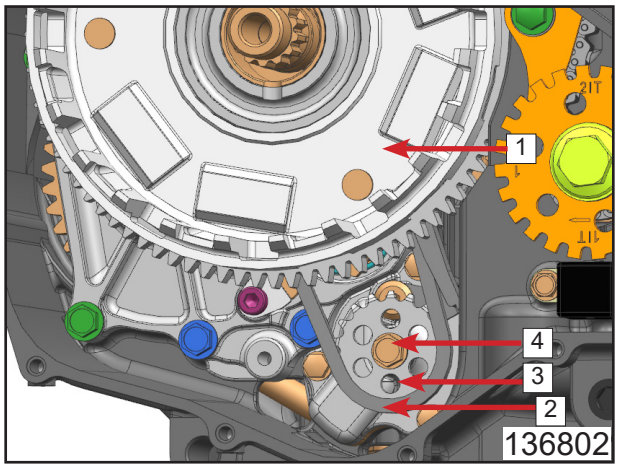
Install M10 nut [1].
Install M8 bolt [2] and washer.
Install M6 bolts [3] and washer.
Install cylinder gasket [4].

13.6.15 Clutch Assy Installation

Install washer [1].

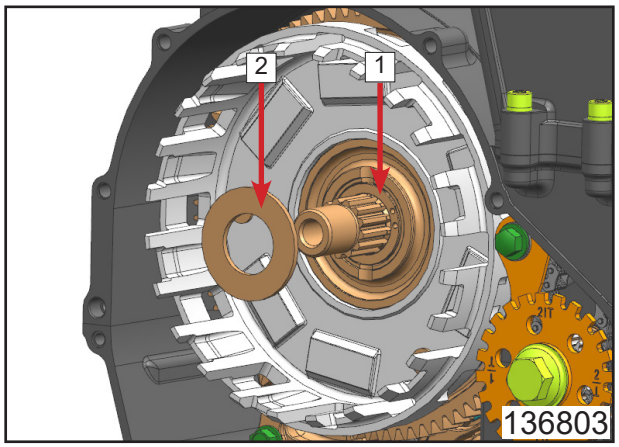


Put oil pump chain [2] on clutch housing sprocket [1], then put the oil pump sprocket [3] on chain [2].
Adjust oil pump shaft position, Install oil pump sprocket, chain and drive hub assy.
Apply 243 thread locker on M6×20 bolt [4] (left-hand thread). Install the bolt with 6.3×16.3×1.2 washer to fix the oil pump sprocket.
Tighten torque: 12 N·m



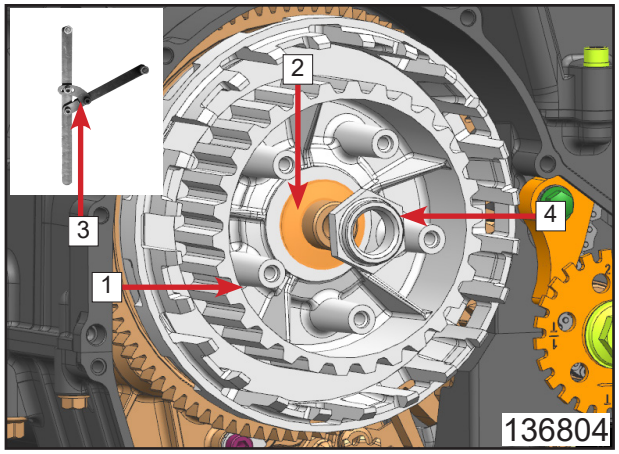
⚠Note: Align the sprocket and gear during installation.

Apply engine oil on clutch sleeve [1]. Insert it (the end with holes faces outside) between main shaft and clutch housing.
Install washer [2].



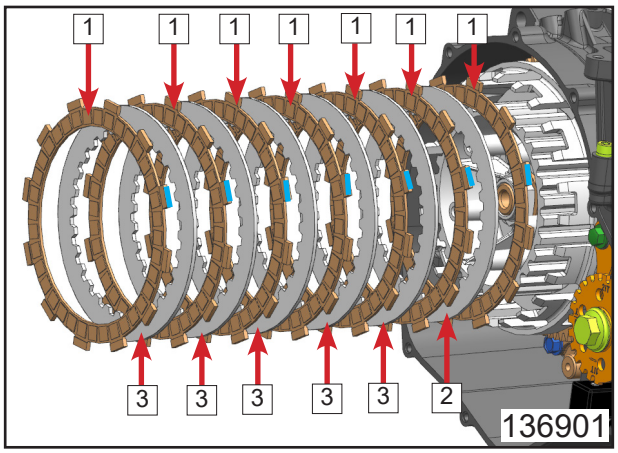
Install central sleeve [1].
Install washer [2].
Use special tool: clutch stopping wrench [3] to fix the clutch housing.
Install M20 nut [4] with 243 thread locker.
Tighten torque: 132 N·m

⚠Note: After tightening the nut, rotate the housing. The movement should be smooth, not blocked.

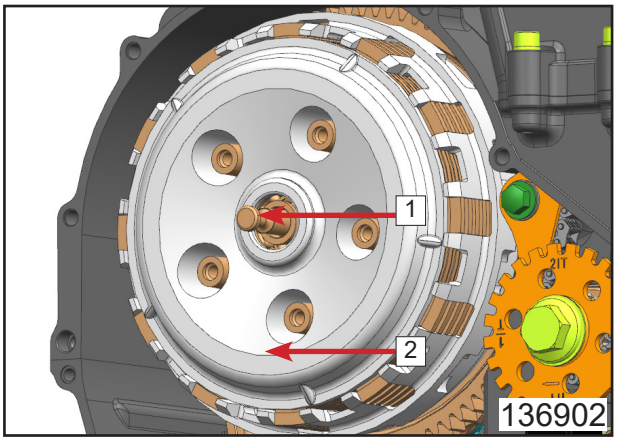


Install friction discs [1].
Install steel plates A [2].
Install steel plates B [3].

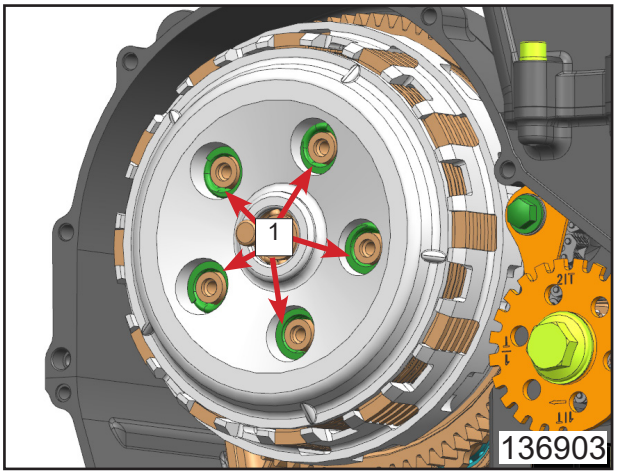
⚠Note: During installation, align first 6 friction discs opening cut. The outermost friction disc is dislocated.



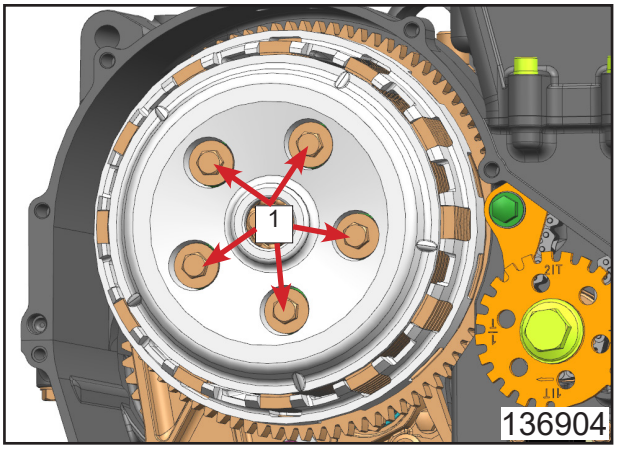
Install tie-rod [1].
Install operating pad [2].



Install springs [1].

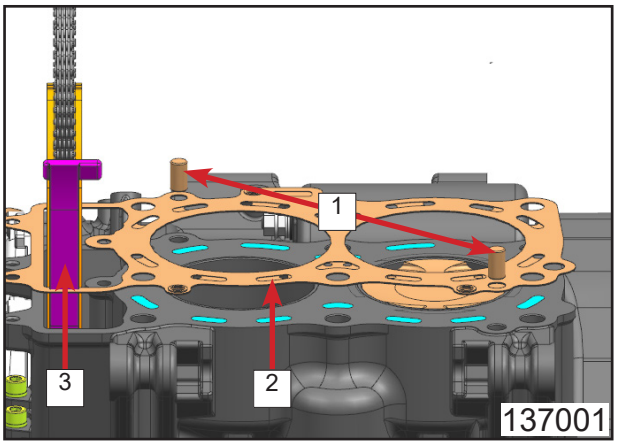


Install M6 bolts assy [1].



13.6.16 Cylinder Head Installation

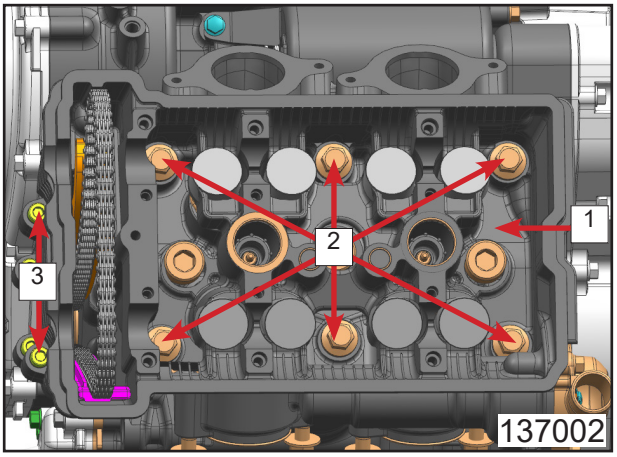
Install dowel pins [1].
Install cylinder head gasket [2].
Install chain guide [3].



Install cylinder head [1].
Install M10 bolts [2].
Tighten torque: 54 N·m (if the bolts are old ones, tighten torque: 49 N·m)
Install M6 inner hex bolts [3] and washers.

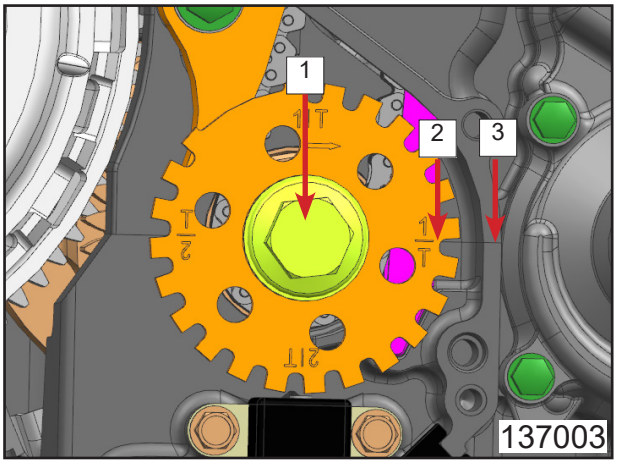
⚠Note: Apply engine oil on thread and washers before installation.

⚠Note: Hook the timing chain in case it falls into the engine.

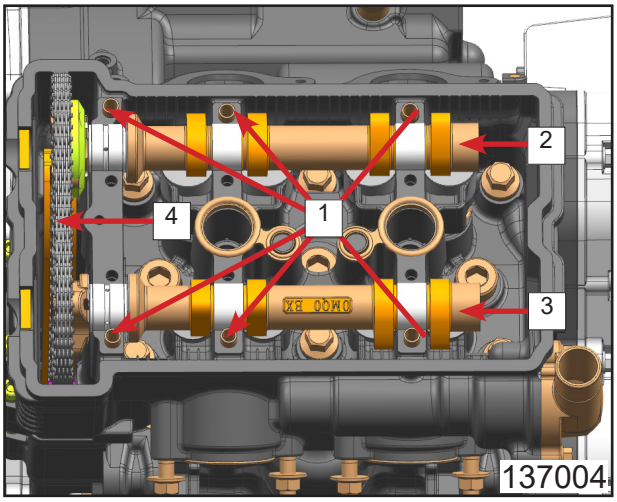


13.6.17 Camshaft Installation

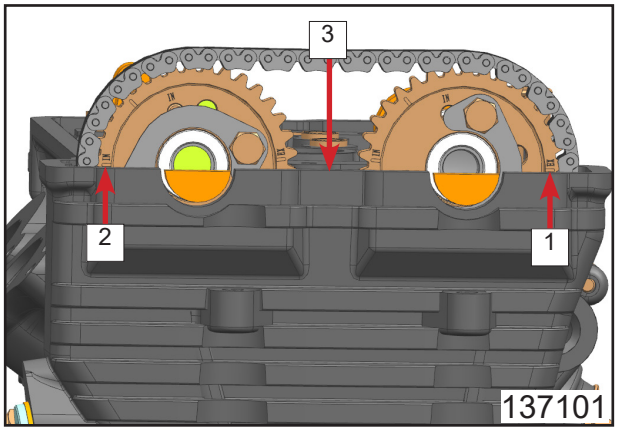
Install M8 bolt [1] with sleeve. Tighten until the mark [2] on pulsing rotor aligns the mark [3] on crankcase.



Install dowel pins [1].
Install intake camshaft assy [2]. (There is "IN" mark on the intake camshaft.)
Install exhaust camshaft assy [3]. (There is "EX" mark on the exhaust camshaft.)
Put the timing chain [4] on timing sprocket.

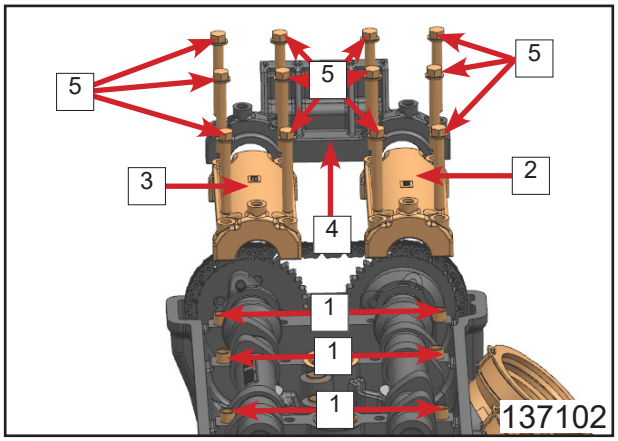


⚠Note: During intake camshaft installation, the "IN" mark line [2] on timing sprocket should be parallel with the cylinder edge [3]. During exhaust camshaft installation, the "EX" mark line [1] on timing sprocket should be parallel with the cylinder edge [3].



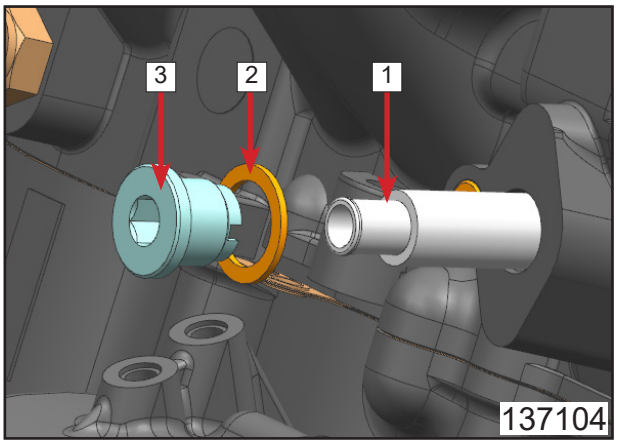
⚠Note: The timing chain can not move during installation, the pulsing rotor should be at the right position. After timing chain installation, check if all the marks are qualified or not. Reinstall if not qualified.

Install dowel pins [1].
Install intake camshaft seat [2].
Install exhaust camshaft seat [3].
Install camshaft position plate [4].
Install M6 bolts [5].



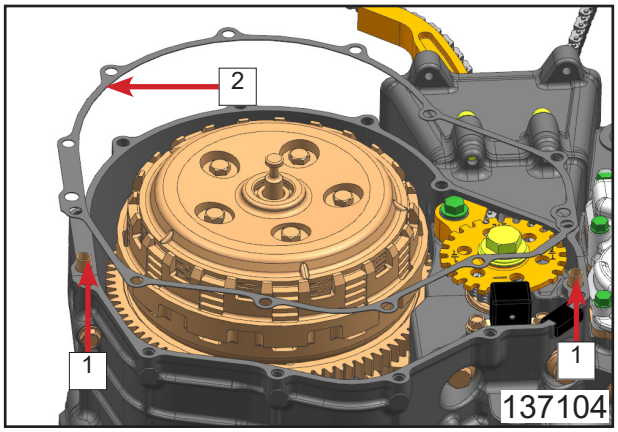
⚠Note: Tighten the bolts [5] for three times. The tighten torque is 5 N·m, 8 N·m and 12 N·m respectively. Tighten the bolts in criss-cross way.

⚠Note: The exhaust camshaft cover has "EX" mark on it while intake camshaft cover has "IN" mark.



13.6.18 Tensioner Installation

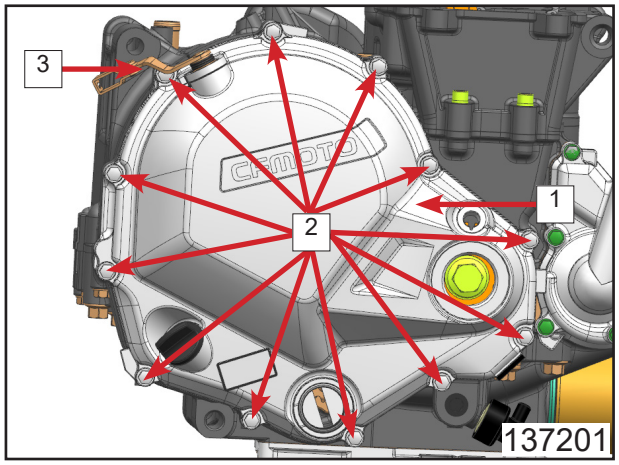
Install tensioner assy [1].
Install washer [2].
Install M16 inner hex screw plug [3].



13.6.19 RH Side Cover Installation

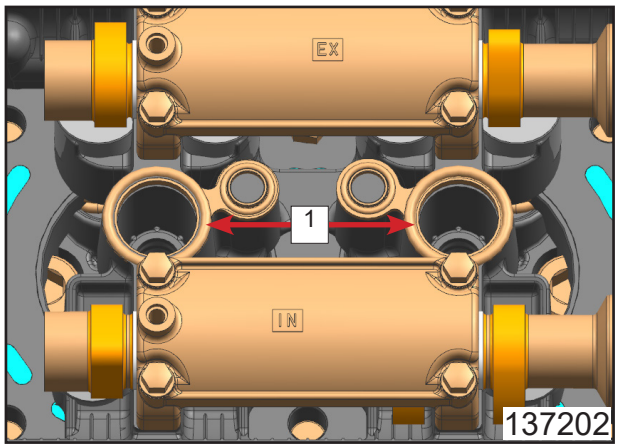
Install dowel pins [1].
Install seal gasket [2].

Install RH side cover [2].(During installation, rotate the clutch tie-rod [3] to proper position.)
Install M6 bolts [2].

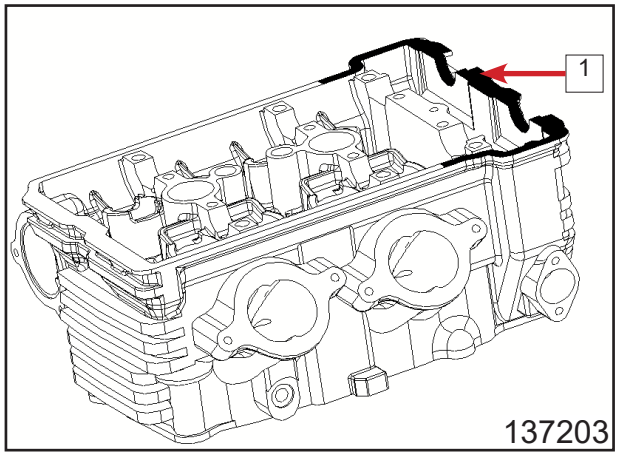


13.6.20 Cylinder Head Cover Installation

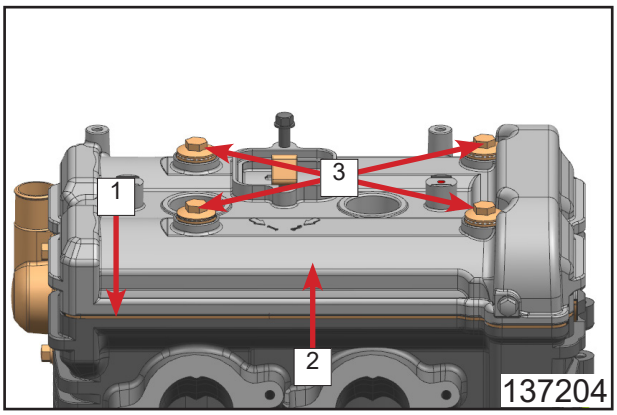
Install spark plug seal rings [1].



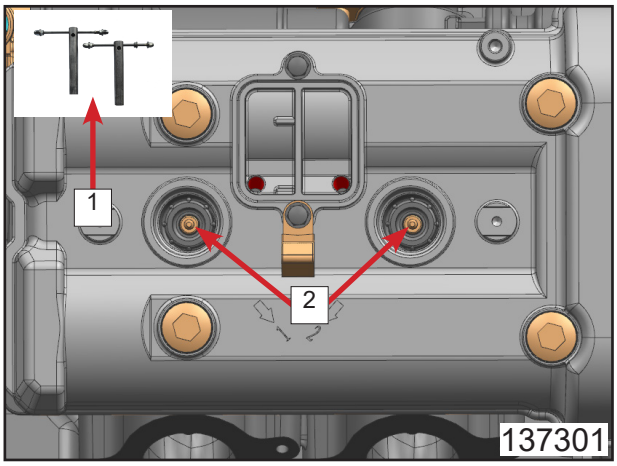
Apply 5699 surface sealing glue on cylinder head [1].



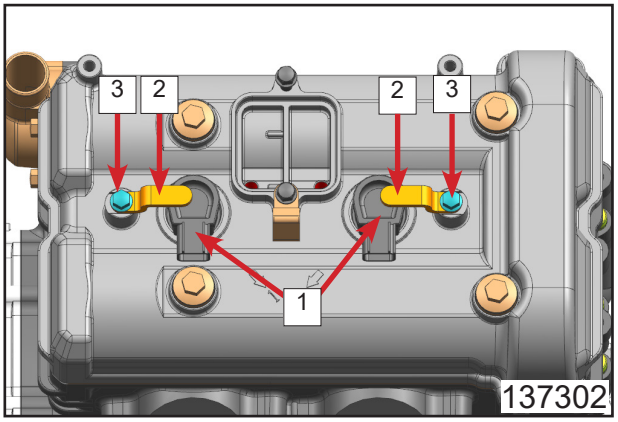
Put cylinder head seal ring [1] on cylinder head cover [2].
Install cylinder head cover [2].
Install M6 cylinder head cover bolts and washers [3].
Tighten torque: 11~13 N·m



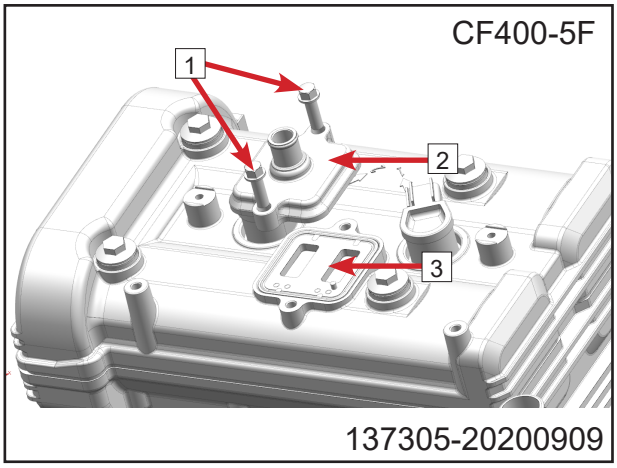
Use special tool: spark plug sleeve [1] to install spark plugs [2].
Tighten torque: 15 N·m



Install ignition coils [1].
Install press plates [2].
Install M6 bolts [3].



Install spring valve assy [3];
Install spring valve cover [2];
Install bolts [1].



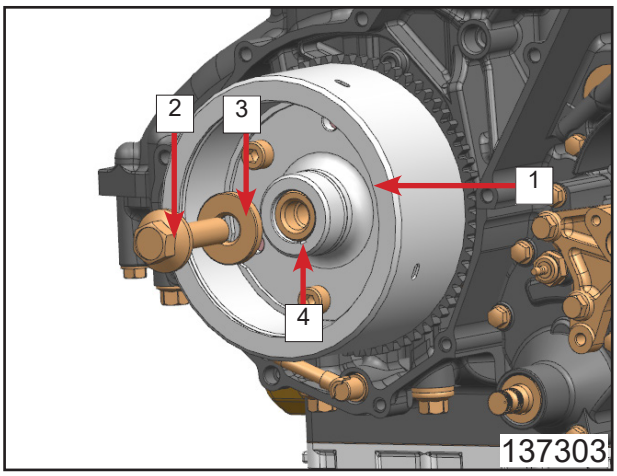
13.6.21 Magneto Rotor Installation

Apply engine oil on crankshaft and magneto rotor inner hole. Install magneto rotor [1].

Put washer [3] on M12 bolt [2]. Install M12 bolt [2] with 243 thread locker.

Tighten torque: 155 N·m

⚠Note: Before tightening the bolt, pull magneto with hand to make sure it doesn't move. Turn the starter big gear with hand, it can rotate in one direction.

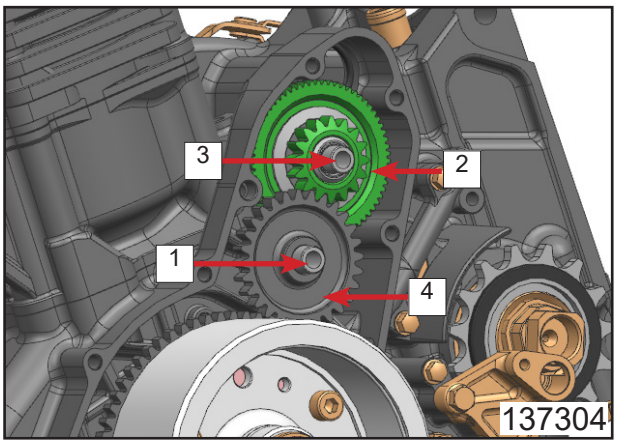


Install middle gear shaft [3].

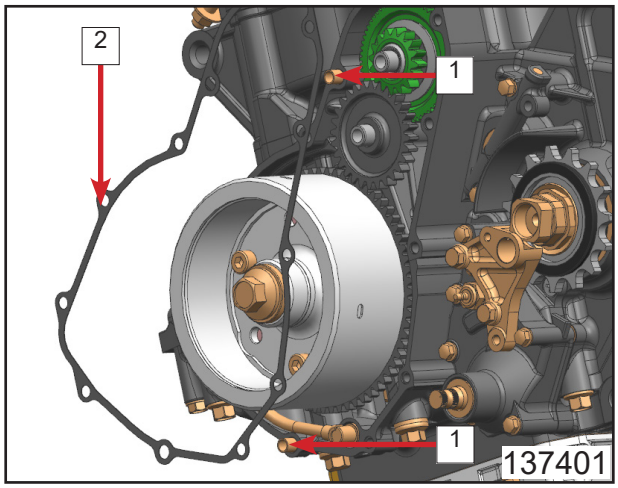
Install dual gear assy [2].

Install middle gear shaft [1].

Install starter middle gear [4].

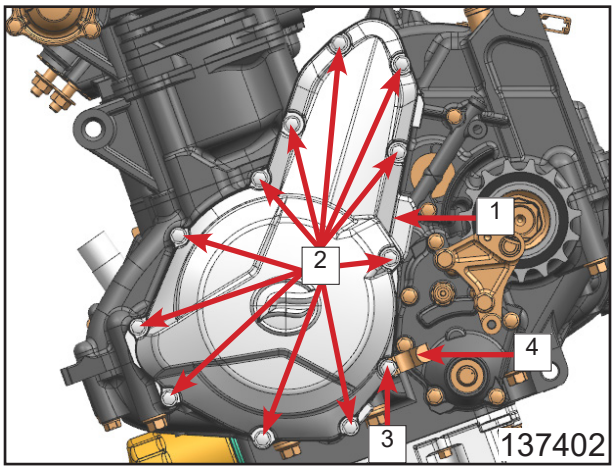


Install dowel pins [1].
Install seal gasket [2].



Install front LH cover [1].
Install M6 bolts [2] and M6 bolt [3]. Before installation, put wire clip [4] on M6 bolt, then install it.

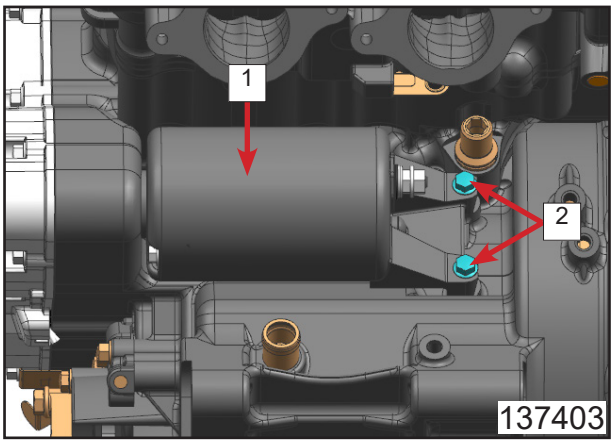
⚠Note: Insert the bolts into holes before installation. The exposed height should be the same. Adjust the bolt if not. Tighten the bolts in criss-cross way.



13.6.22 Starter Motor Installation

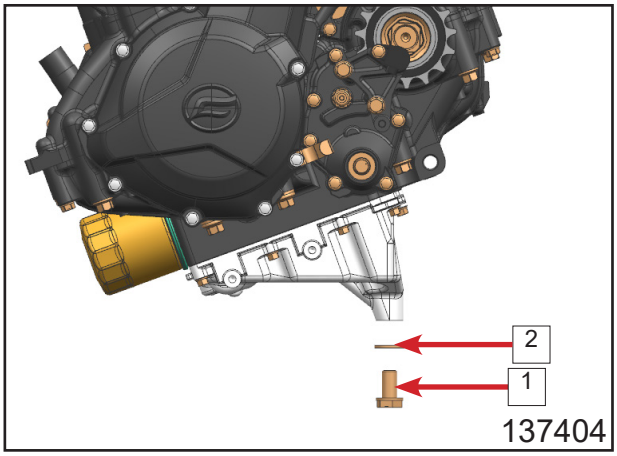
Install starter motor [1]. Use rubber hammer to knock the motor slightly for installation.
Install M6 bolts [2].

⚠Note: Apply engine oil on starter motor o-ring before installation. The o-ring can not be deformed.



13.6.23 Drain Bolt Installation

Install washer [1].
Install M12 magnetic drain bolt [2].
Tighten torque: 28~32 N·m



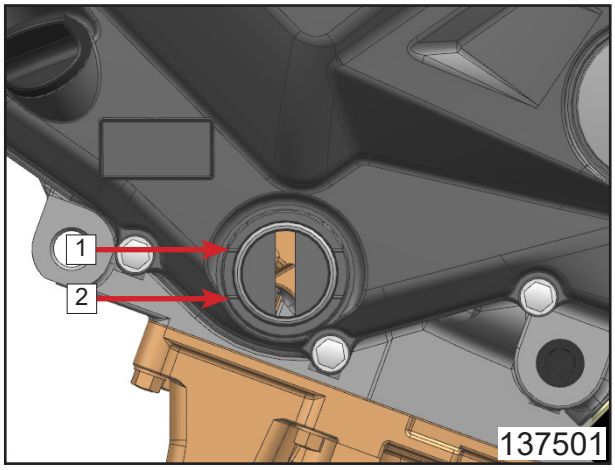
13.7 Lubrication System

13.7.1 Engine Oil Inspection

⚠Warning: Motorcycle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure, accident, and injury.

Oil Level Inspection

● Check that the engine oil level is between the upper 1 and lower 2 level in the viewer.



⚠Note:
Situate the motorcycle so that it is perpendicular to the ground.
If the motorcycle has just been used, wait several minutes for all the oil to drain down.
If the oil has just been changed, start the engine and run it for several minutes at idle speed. This fills the oil filter with oil. Stop the engine, then wait several minutes until the oil settles.

⚠Warning: Racing the engine before the oil reaches every part can cause engine seizure. If the engine oil gets extremely low or if the oil pump or oil passages clog up or otherwise do not function properly, the oil pressure warning light will light. If this light stays on when the engine is running above idle speed, stop the engine immediately and find the cause.

If the oil level is too high, remove the excess oil, using a syringe or some other suitable device.
If the oil level is too low, add the correct amount of oil through the oil filter opening. Use the same type and make of oil that is already in the engine.

⚠Note: If the engine oil type and make are unknown, use any brand of the specified oil to top off the level in preference to running the engine with the oil level low. Then at your earliest convenience, change the oil completely.

13.7.2 Engine Oil Change

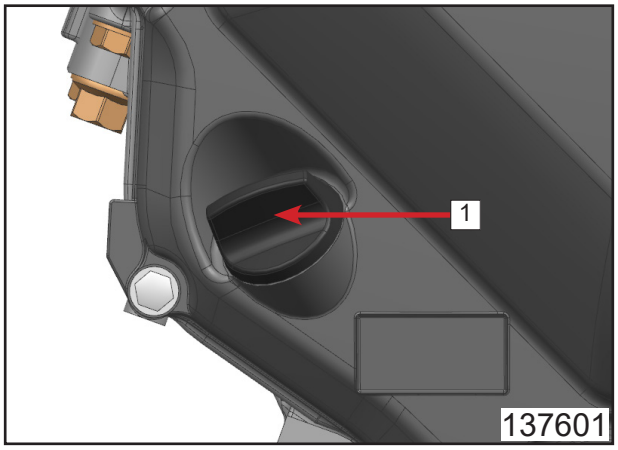
Make sure the engine is on the horizontal position before changing.
Change the engine oil and oil filter at the same time. Change when the engine is warm.

⚠Note: The engine temperature may be very hot when changing. Wait until the temperature is suitable.

⚠Note: Engine oil filter removal/installation and engine oil drain refer to Engine Disassembly/Assembly section.

⚠Note: The drain oil can reflect some conditions of the engine. Inspect whether there is some metal debris in the drain oil. The debris reflects the engine internal problems. Inspect the engine for trouble shooting.

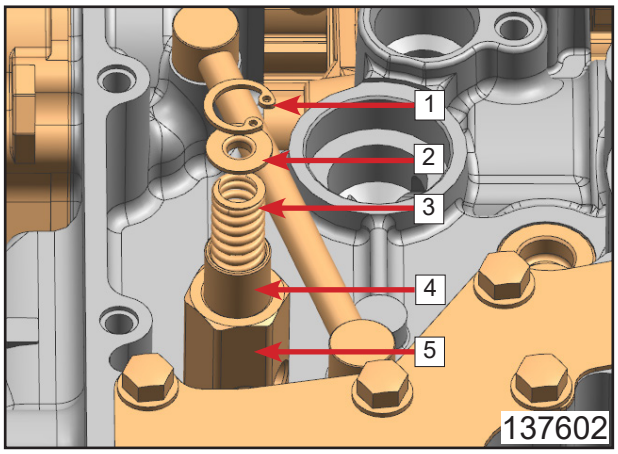
Remove filler screw plug [1]. Add engine oil.



13.7.3 Relief Valve

Disassembly

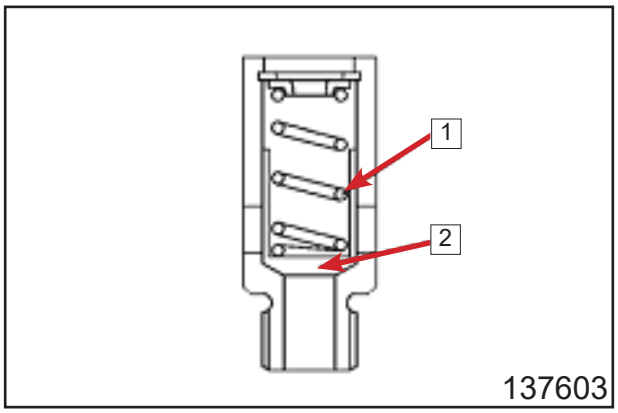
Remove circlip [1] with plier.
Remove relief valve spring seat [2].
Remove relief valve spring [3].
Remove relief valve element [4].
Remove relief valve [5].



Oil Relief Valve Inspection

Inspect to see if the valve [1] slides smoothly when pushing it in with a wooden or other soft rod, and see if it comes back to its seat by spring [2] pressure.

⚠Note: Inspect the valve in its assembled state. Disassembly and assembly may change the valve performance. Usually, the relief valve isn't disassembled.



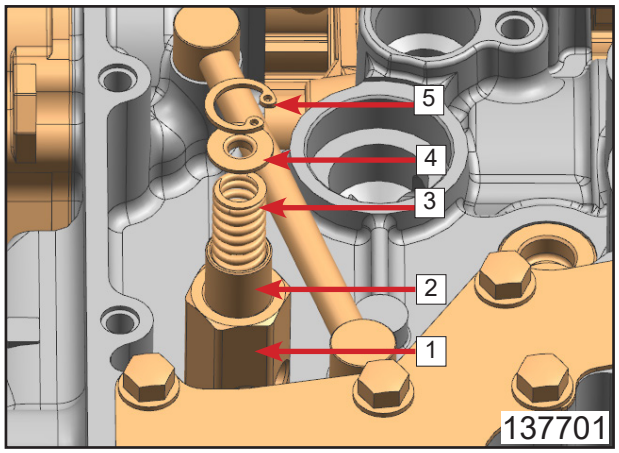
If any rough spots are found during above inspection, wash the valve clean with a high-flash point solvent and blow out any foreign particles that may be in the valve with compressed air.

⚠Warning: Clean the oil pressure relief valve in a well ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low flash point solvent.

⚠Note: If cleaning does no solve the problem, replace the oil pressure relief valve as an accessory. The oil pressure relief valve is precision made with no allowance for replacement of individual parts.

Assembly

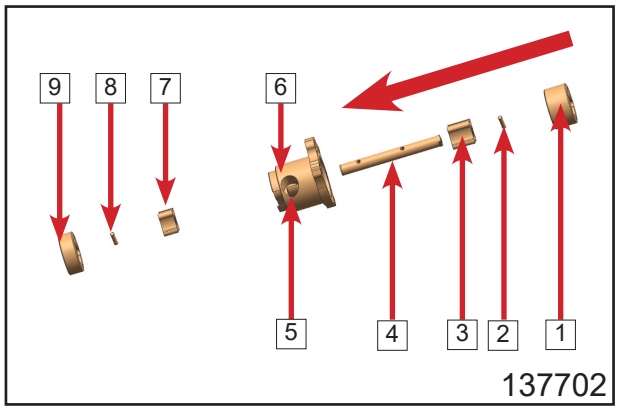
Install relief valve [1] with wrench.
Tighten torque: 15 N·m
Install relief valve element [2].
Install relief valve spring [3].
Remove relief valve spring seat [4].
Clamp circlip [5] with plier. Compress the valve spring seat to install the circlip [5].



13.7.4 Engine Oil Pump

Disassembly

Remove auxiliary oil pump outer rotor [1].
Remove auxiliary oil pump inner rotor [3].
Remove roller needle [2] through hole [5].
Remove main oil pump outer rotor [9].
Push oil pump shaft [4] towards arrow direction. Push the main oil pump inner rotor [7] towards arrow negative direction to remove roller needle [8].
Remove main oil pump inner rotor [7] from pump shaft [4].
Remove oil pump shaft [4] from the oil pump [6].



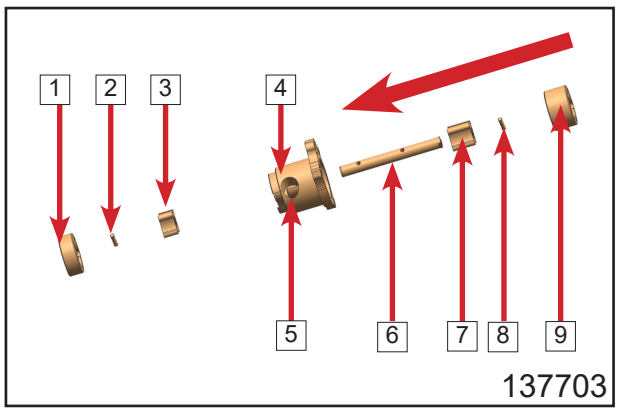
Inspection

Inspect oil pump each part for severe wear and damage. Replace with new oil pump assy.

Assembly

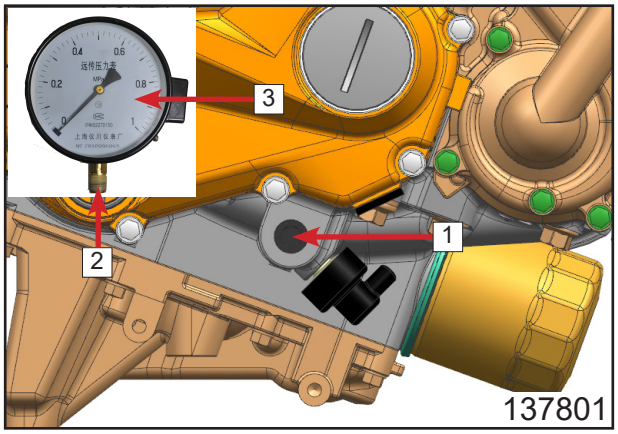
Install pump shaft [6] on oil pump [4].
Install main oil pump inner rotor [3].
Install roller needle [2].
Install main oil pump outer rotor [1].
Install roller needle [8] through hole [5].
Install auxiliary oil pump inner rotor [7].
Install auxiliary oil pump outer rotor [9].

⚠Note: The auxiliary oil pump rotors are wider than main oil pump ones.



13.7.5 Oil Pressure Measurement

Remove engine guard.
Remove main oil passage plug [1] and install the adapter [2] and dashboard [3] into the plug hole.



Tool: Oil pressure gauge 10kgf/cm2
Oil pressure gauge adapter PT3/8

Start and warm up the engine.
Run the engine at the specified speed, and read the oil pressure gauge

If the oil pressure is much lower than the standard, check the oil pump, relief valve, and/ or crankshaft bearing wear immediately.

If the reading is much higher than the standard, check the oil passages for clogging.

Oil Pressure
Standard: At 4000r/min(rpm), the temperature is 90°C (194°F) 216~294 kPa (2.2~3.0 kgf/cm2 ,31~43 psi)

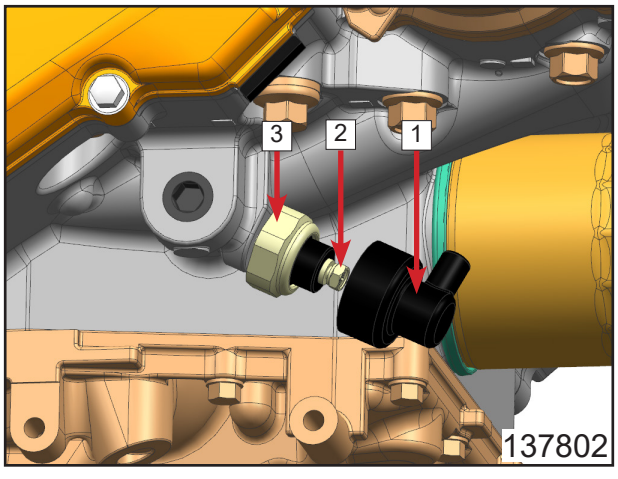
Stop engine.
Remove oil pressure gauge and adapter.

⚠Warning: Take care against burns form hot engine oil that will drain through the oil passage when the gauge adapter is removed.

Apply thread locker on main oil passage plug. Install and tighten the oil passage plug.
Tighten torque: 20 N·m

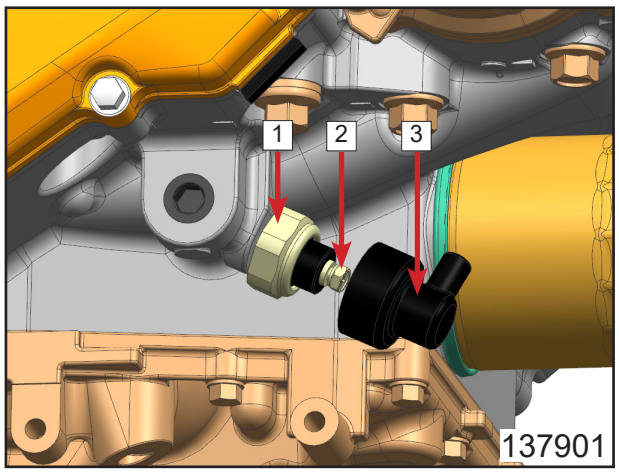
13.7.6 Oil Pressure Warning Switch Removal

Drain engine oil (refer to Engine Disassembly section).
Remove protection cover [1].
Remove screw [2].
Remove oil pressure warning switch [3].



Inspection
Refer to Electrical System chapter.

Assembly
Apply silicone sealant to the threads of the oil pressure switch [1] and tighten it.
Tighten torque: 15 N·m
Put the wire on screw [2] and then install the screw [2].
Install protection cover [3] on warning switch [1].

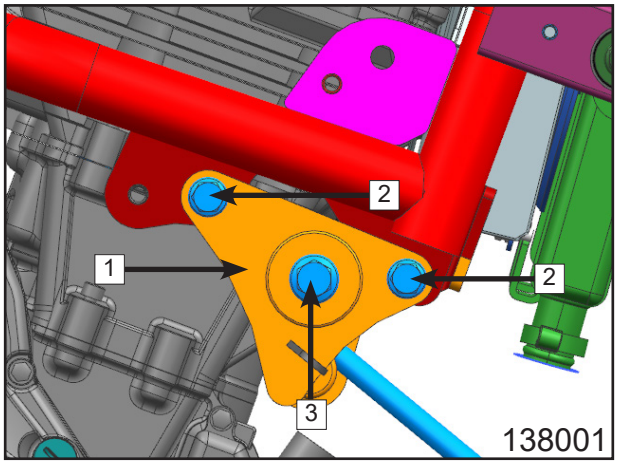


13.8 Engine Installation

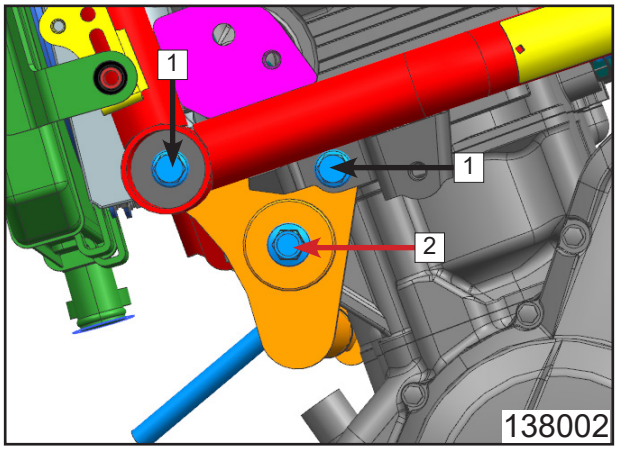
13.8.1 Engine Installation

Put the engine on jack and lift up the engine. Adjust it to the proper position.

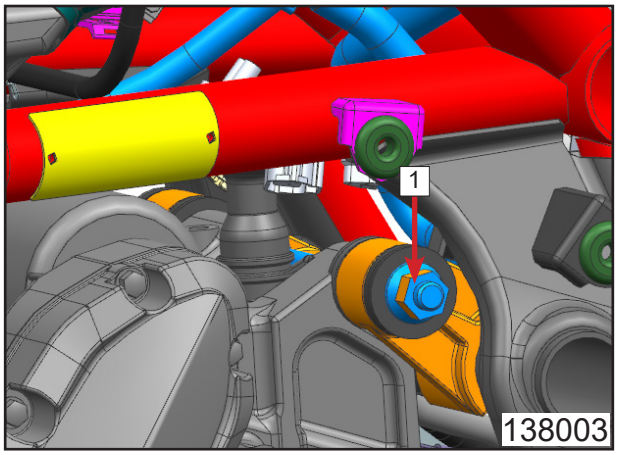
Install engine mounting bracket assy [1].
Install M8 bolts [2].
Put the M10 bolt [3] through the hole and install the nut. Fix the bolt with wrench and then tighten the nut.



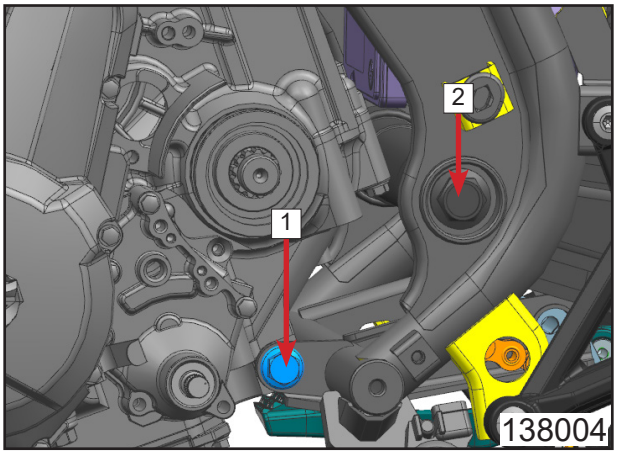
Install M8 bolts [1].
Put the M10 bolt [2] through the hole and install the nut. Fix the bolt with wrench and then tighten the nut.



Put the bolt [1] through the hole and install the M10 nut. Fix the bolt with wrench and tighten the nut.

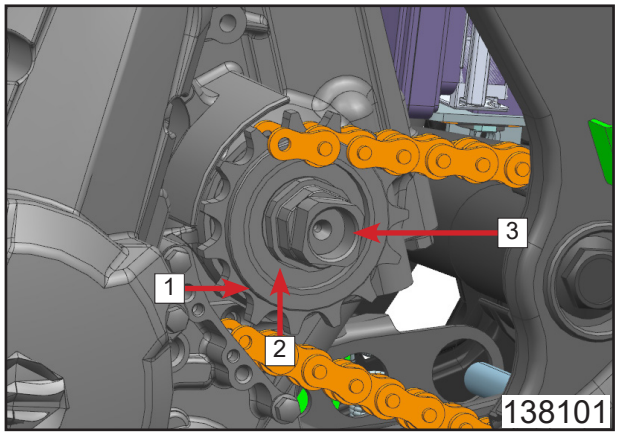


Put the M10 bolt [1] and M20 bolt [2] through the holes and install the nuts. Fix the bolts with wrench and tighten the nuts.



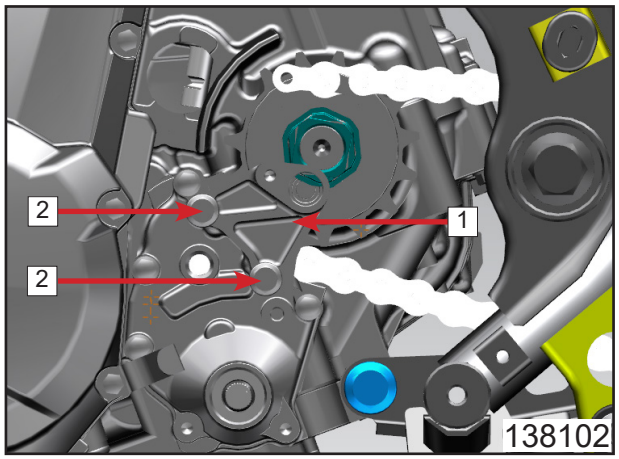
13.8.2 Output Sprocket Installation

Install output sprocket [1].
Install washer [2].
Install M20 pulsing nut [3] with 243 thread locker.
Tighten torque: 125 N·m

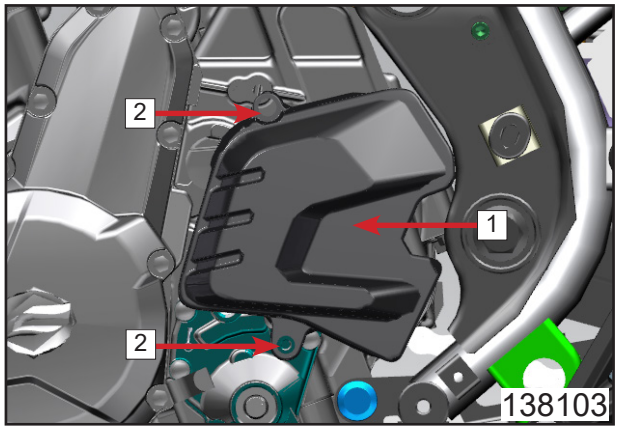


Install bracket [1].
Install M6 bolts [2].

⚠Note: There are two dowel pins [2] under the bracket. Do not lose them during installation.

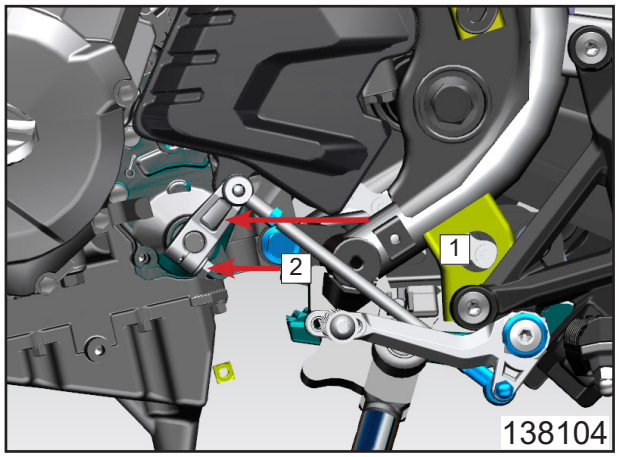


Install engine rear LH cover assy [1].
Install bolts [2].



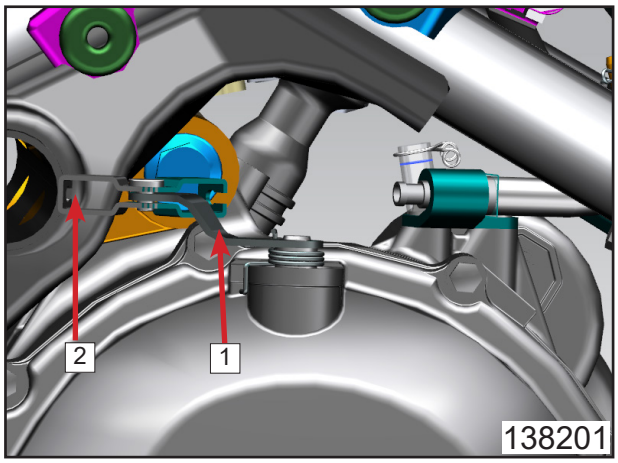
13.8.3 Gearshift Lever Assy Installation

Install gearshift lever assy [1].
Install M6 bolt [2].



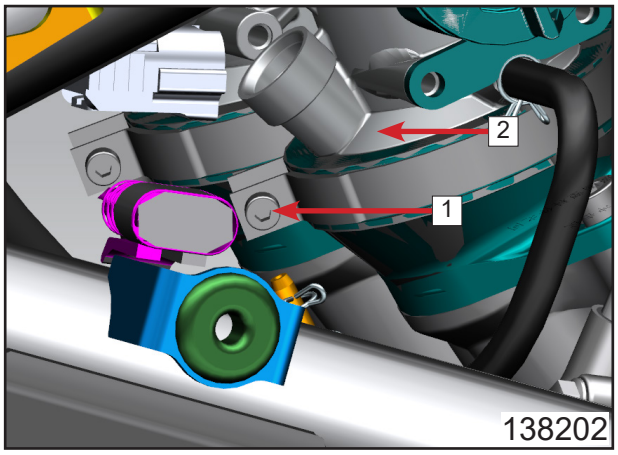
13.8.4 Clutch Cable Installation

Rotate the clutch tie-rod [1] and install the clutch cable [2].

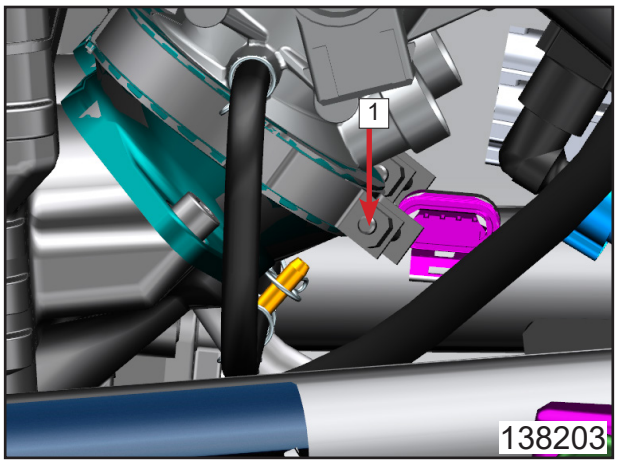


13.8.5 Air Filter Connection

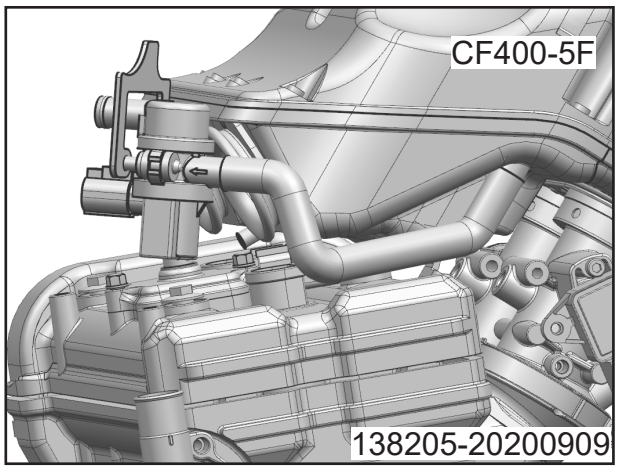
Install throttle valve body [2] properly.
Tighten clamp [1].



Tighten clamp [1].

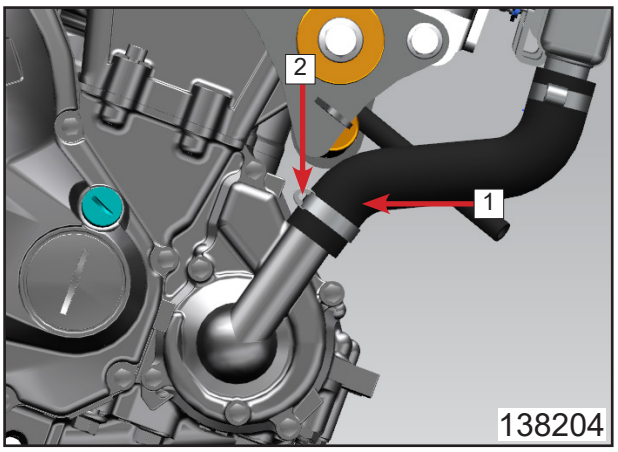


Install AIS valve and air inlet and outlet pipes.

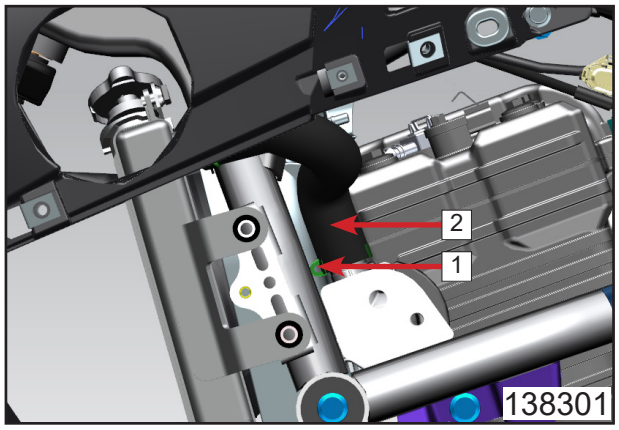


13.8.6 Inlet/Outlet Pipe Installation

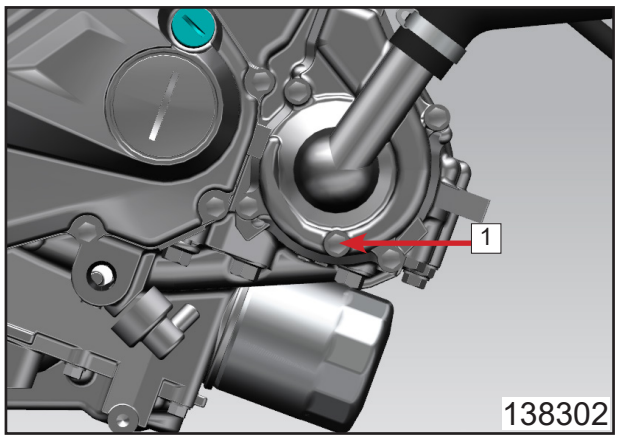
Install the outlet pipe [2] on engine.
Tighten clamp [1].



Install the inlet pipe [2] on engine.
Tighten clamp [1].

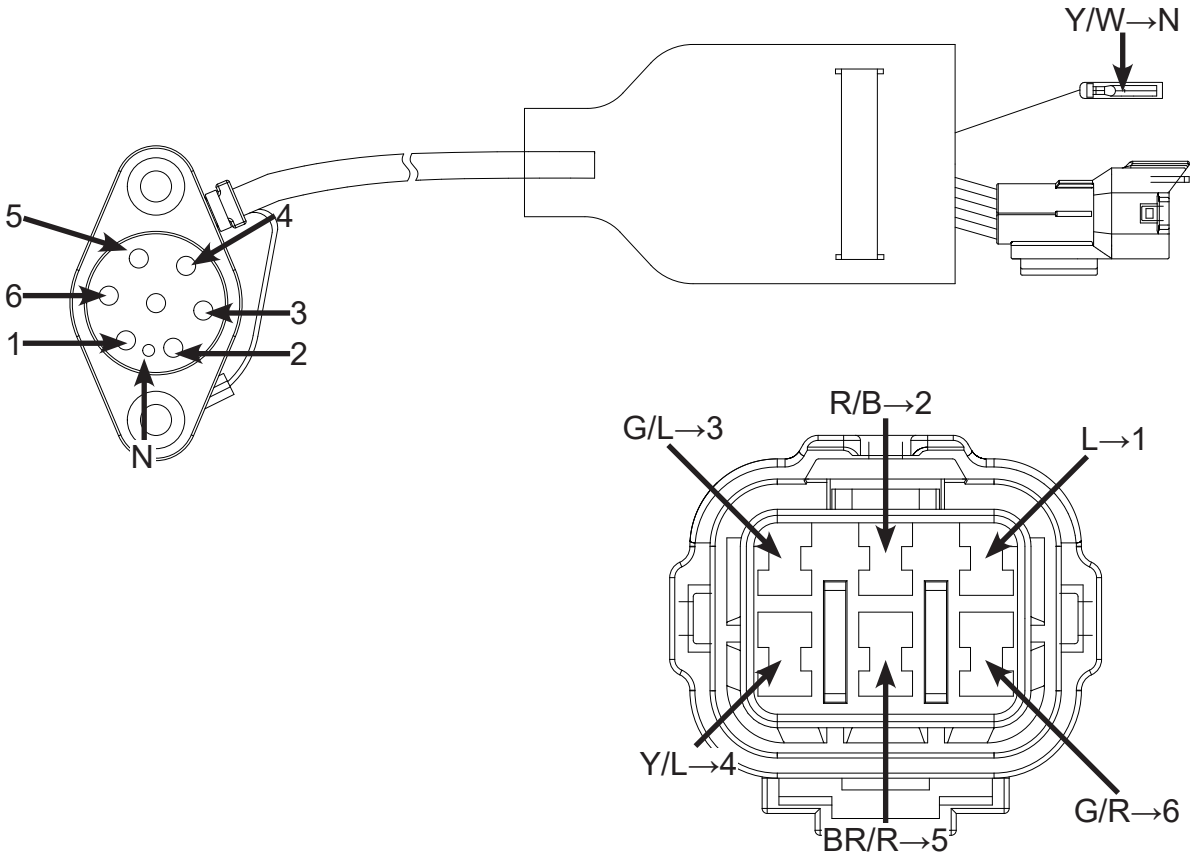


Install M6 drain bolt [1] and washer.



13.9 External gear display

Vehicles will be equipped with external gear display after moder year 2022.



14.1 14.1 Engine Special Tool

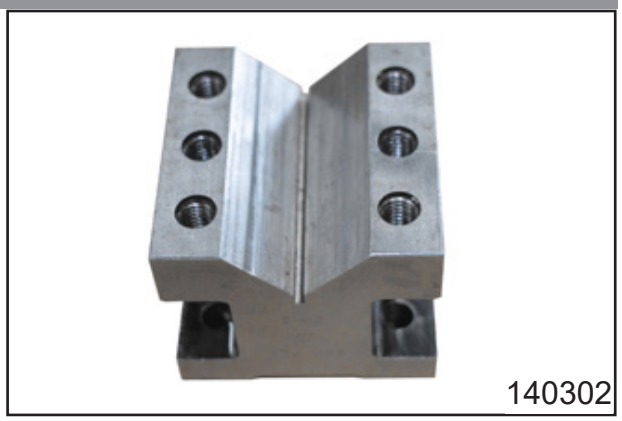
Magneto rotor removing tool (to remove magneto rotor)

0700-031000-922-00


140301

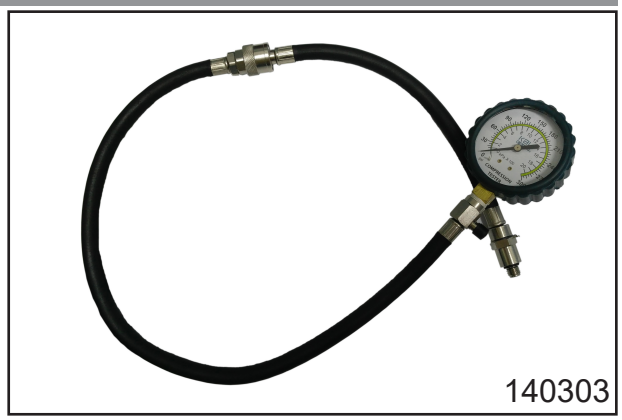
V-block

0800-060000-923-001


140302

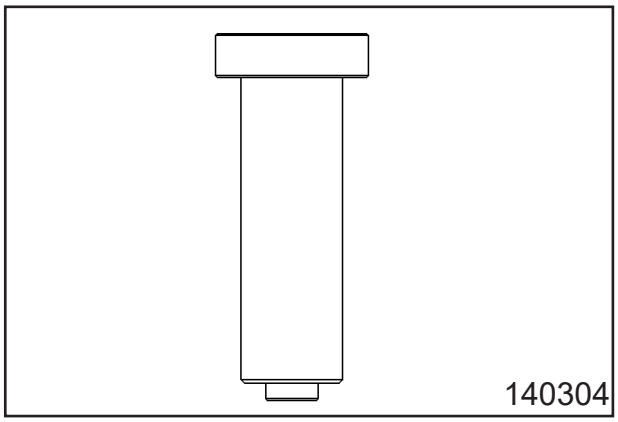
Cylinder pressure gauge and connecting seat

Cylinder pressure standard: 0-2MPa


140303

Water seal ring installing tool (puncher pin)

0700-080000-923-002


140304

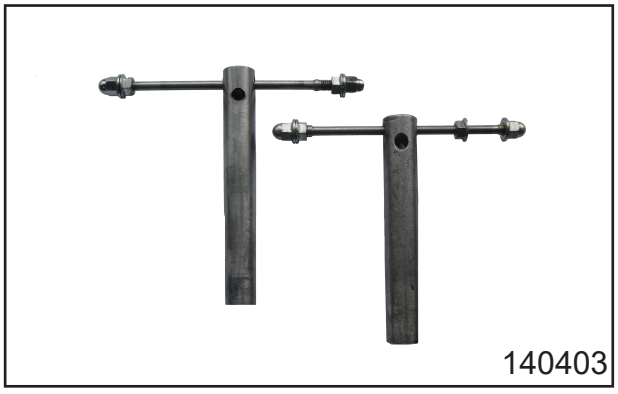
Piston pin circlip installing tool (to install piston pin circlip)

0800-040005-922-001

Feeler gauge (to measure the valve clearance)

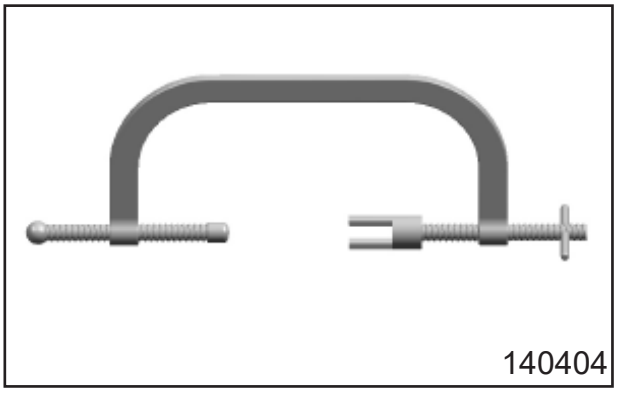
Spark plug sleeve

0700-170200-923-001



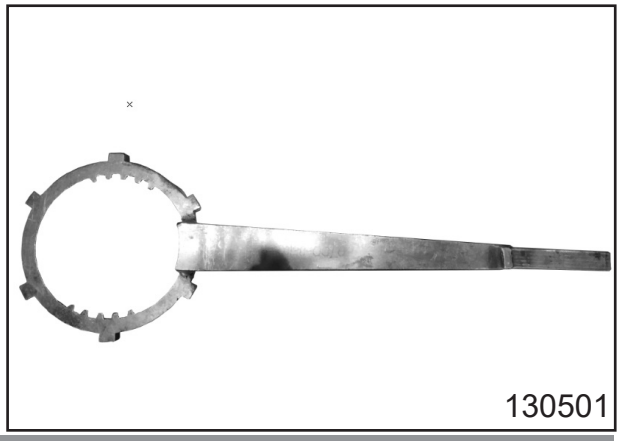
Valve spring compressing tool

CF188-022006-922-001



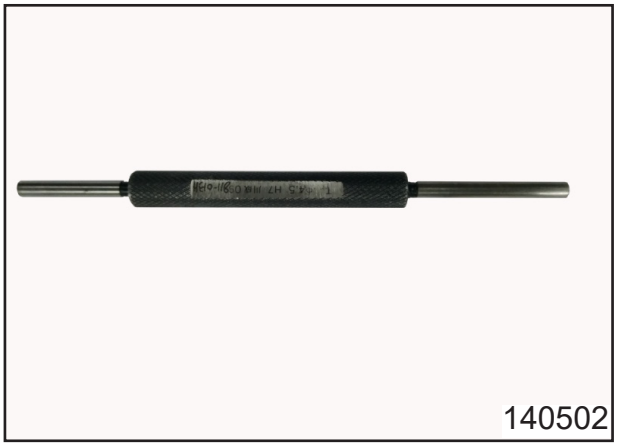
Clutch stopping wrench (to remove/install clutch nuts, crankshaft RH nuts)

0700-051000-922-001



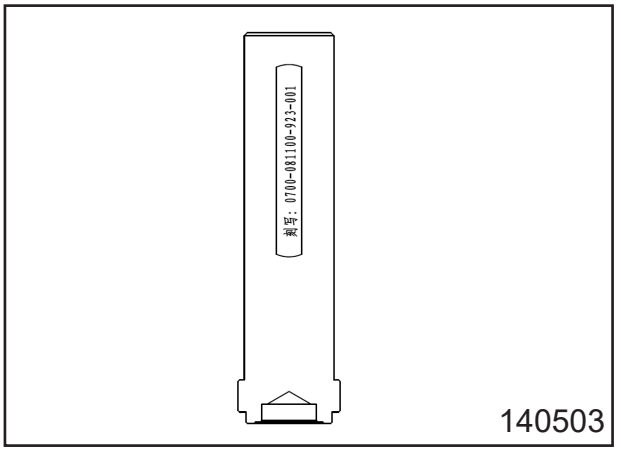
Valve pipe guide shaft

φ4.5



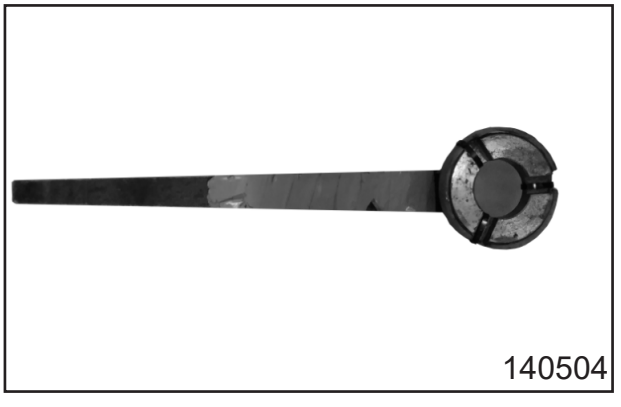
Water pump oil seal puncher

0700-081100-923-001



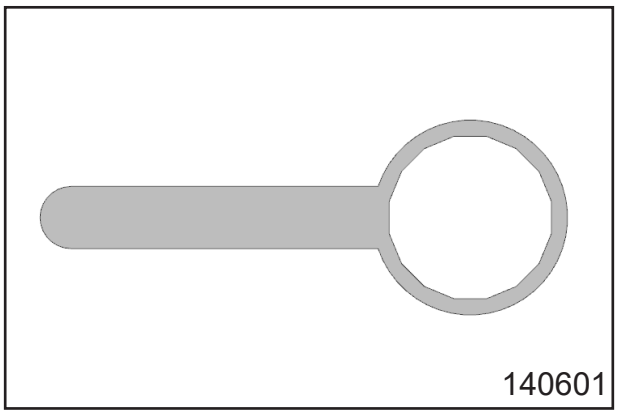
Magneto rotor stopping wrench

0700-031000-922-001



Oil filter wrench

0700-070200-922-001



140601

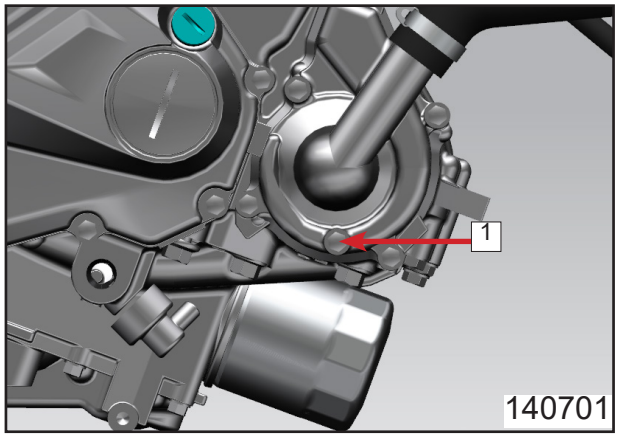
14.2 Engine Removal

Remove muffler.
Remove electrical connectors on engine.
Remove reservoir LH&RH outer protection plates.
Remove reservoir LH&RH inner protection plates.
Remove LH&RH panels.
Remove engine guards assy.
Remove frame LH&RH protection plates.

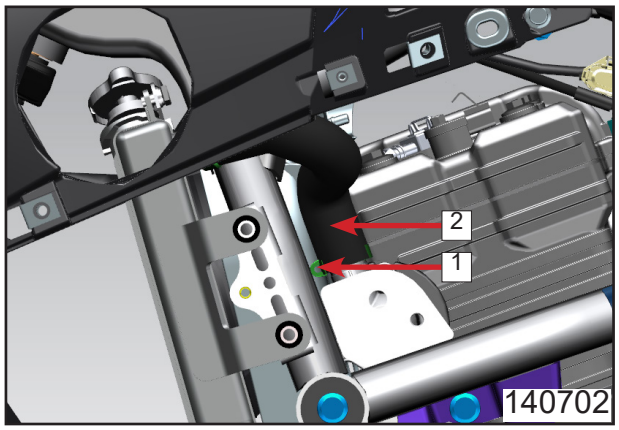
⚠Note: Remove the engine until it cools down or wear protection clothes to avoid burnt injury.

14.2.1 Engine Inlet&Outlet Water Pipe Removal

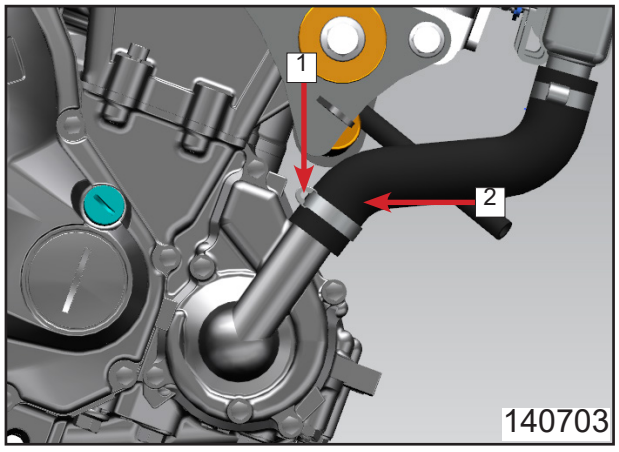
Open reservoir cap.
Straighten the vehicle. Place a pan under the engine to store the drained coolant.
Remove M6 bolt [1] and washer to drain the coolant.



Loose clamp [1].
Pull out inlet pipe [2] from the engine with caliper.

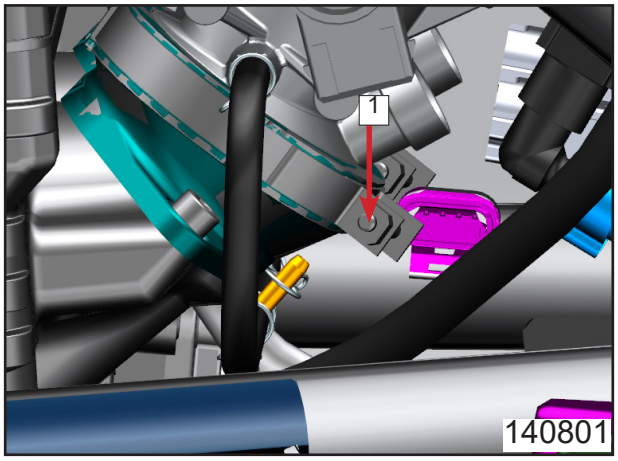


Loose clamp [1].
Pull out outlet pipe [2] from the engine with caliper.

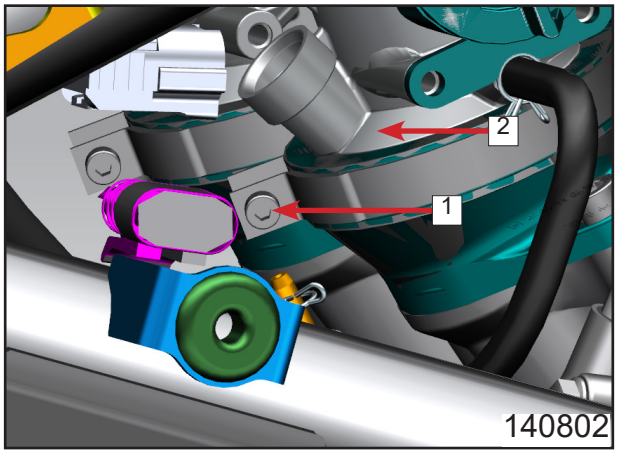


14.2.2 Air Filter Loose

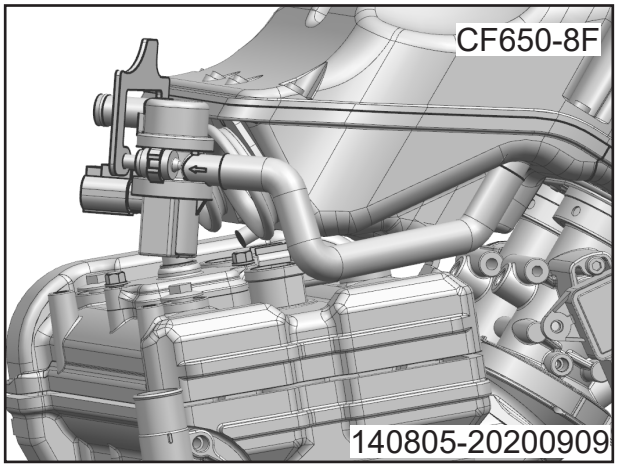
Loose clamp [1].



Loose clamp [1].
Shake throttle valve body [2] until it looses.
Remove air filter.

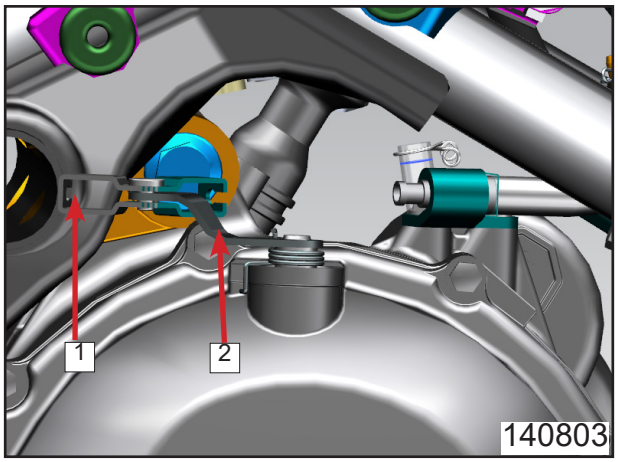


Remove AIS valve and air inlet and outlet pipes;
Remove air filter.



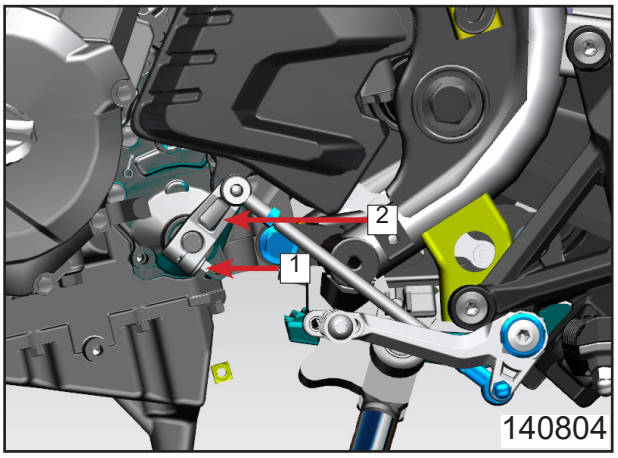
14.2.3 Clutch Cable Removal

Use tool to rotate clutch rod [2].
Remove clutch cable [1].



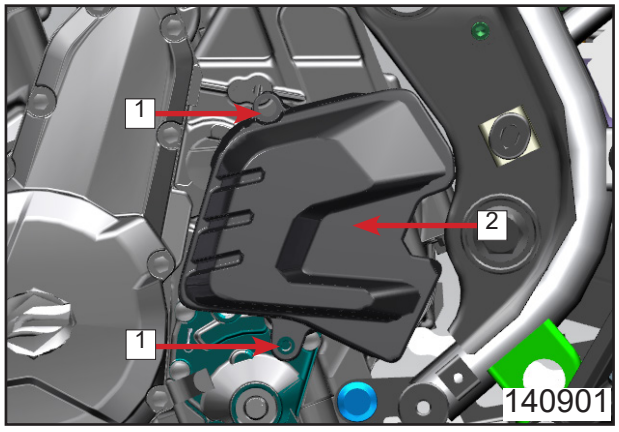
14.2.4 Gearshift Lever Assy Removal

Remove M6 bolt [1].
Remove gearshift lever assy [2].

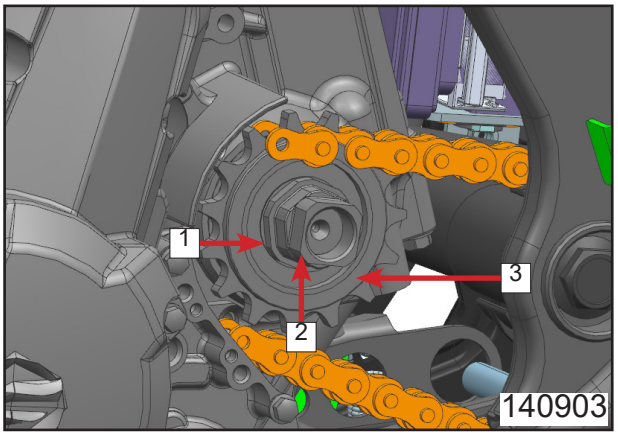


14.2.5 Sprocket Removal

Remove M6 bolt [1].
Remove engine LH rear cover [2].



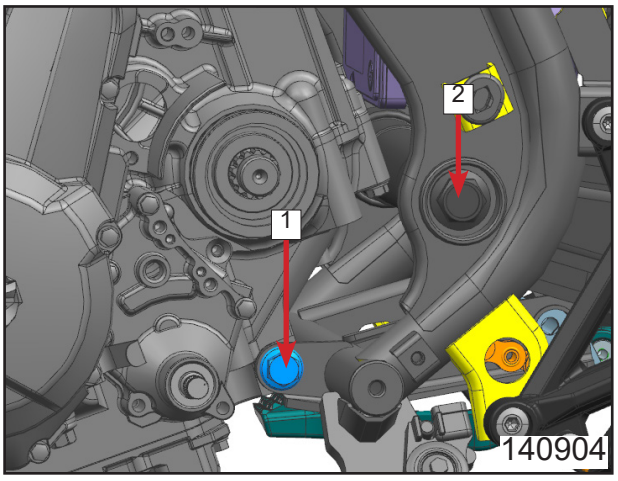
Knock and straighten the flanging of retainer [1].
Remove counter pulse M20 nut [2].
Remove retainer [1].
Remove output sprocket [3].



14.2.6 Engine Assy Removal

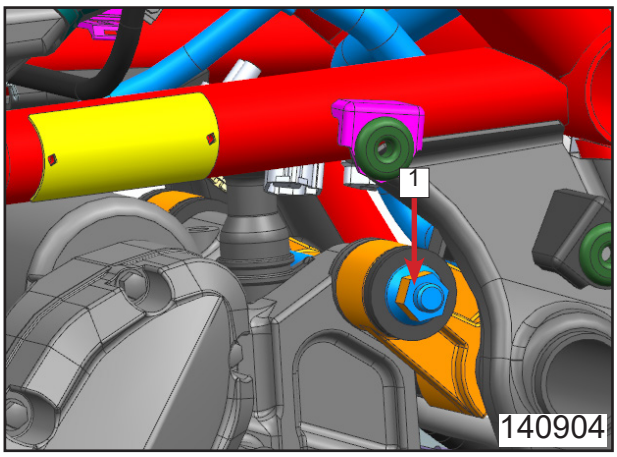
Place the jack with soft cushion under the engine to support it.
Remove M10 nut [1] and bolt.
Remove M20 nut [2] and bolt.

⚠Note: Fix the other side with wrench during removal.



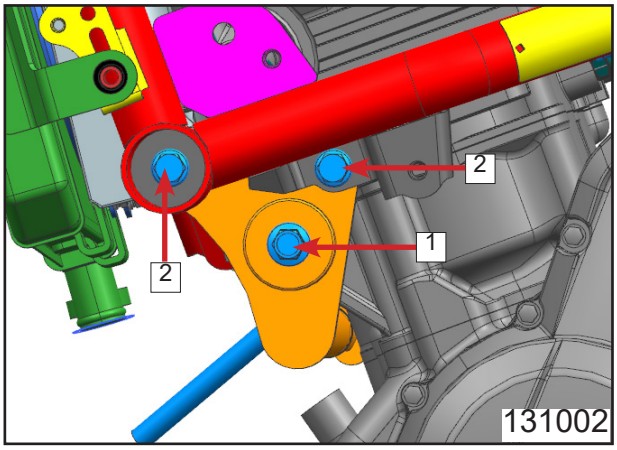
Remove M10 nut [1] and bolt.

⚠Note: Fix the other side with wrench during removal.



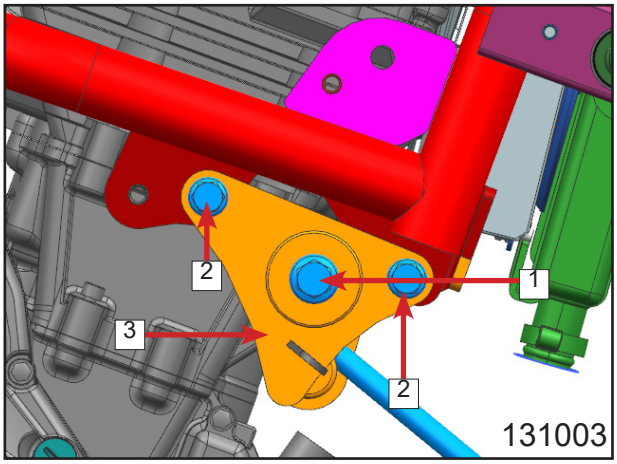
Remove M10 bolt [1] and nut.
Remove M8 bolts [2].

⚠Note: Fix the other side with wrench during removal.



Remove M10 bolt [1] and nut.
Remove M8 bolts [2].
Remove engine front mounting bracket assy [3].
Shake the engine and decline the jack slowly to remove the engine.

⚠Note: Fix the other side with wrench during removal.

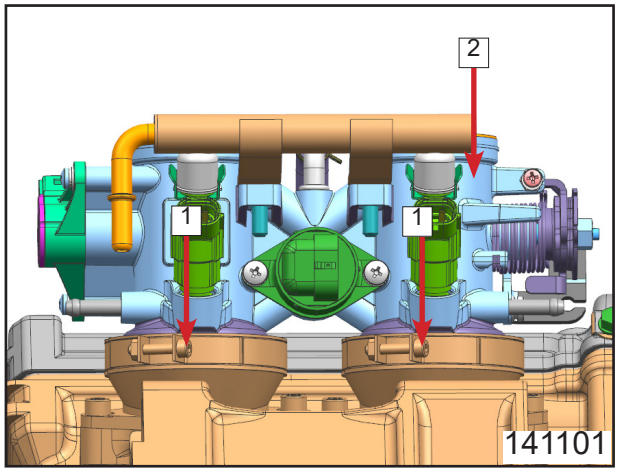


14.3 Engine Air Intake System

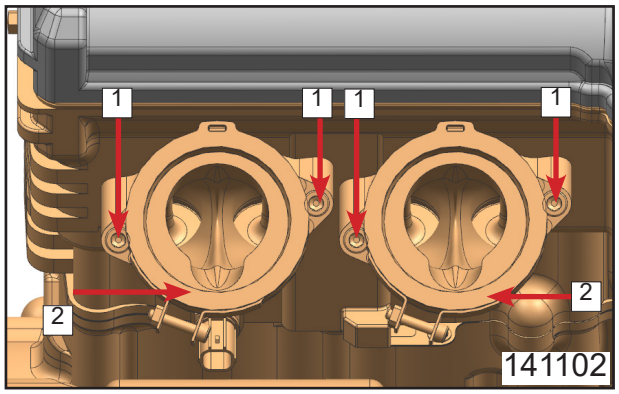
14.3.1 Throttle Valve Assy Disassembly

Air Filter Assy Removal (refer to Air Filter chapter)

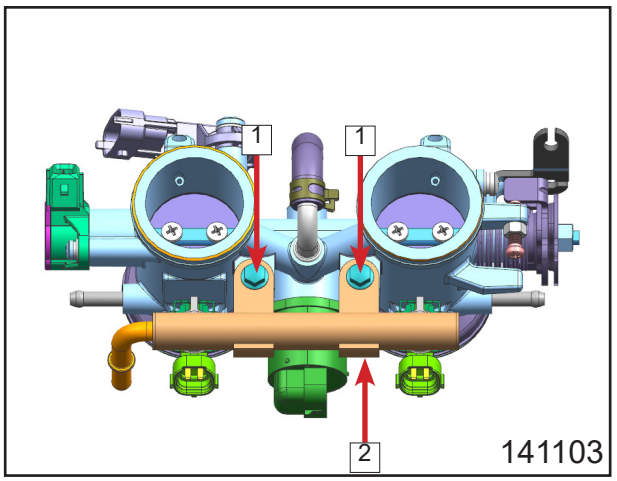
Loose clamps [1].
Remove throttle valve assy [2].



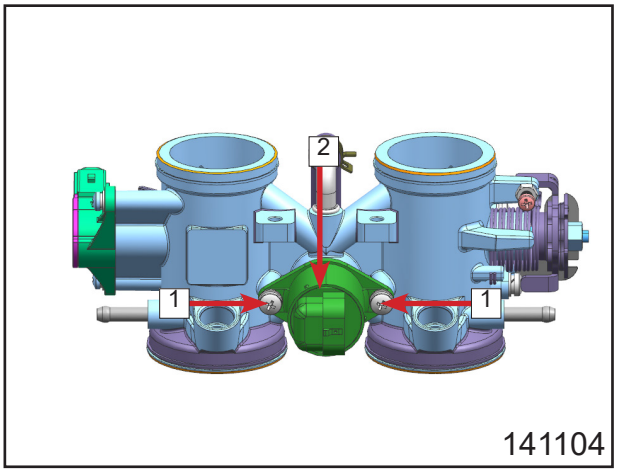
Remove M6 inner hex screws [1].
Remove air intake pipes [2].



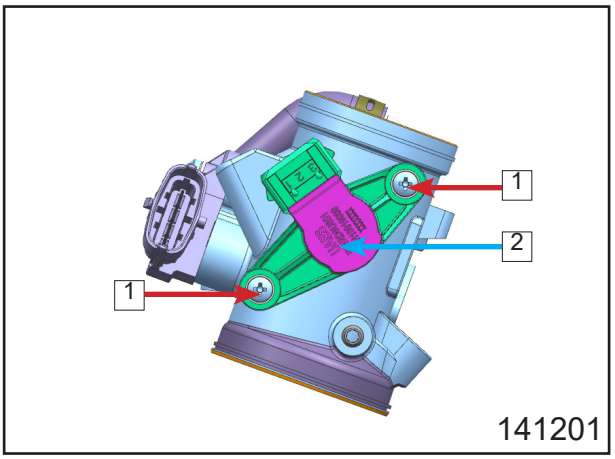
Remove M6 bolts [1].
Remove fuel rail assy [2].



Remove screws [1].
Remove idle stepping motor [2].

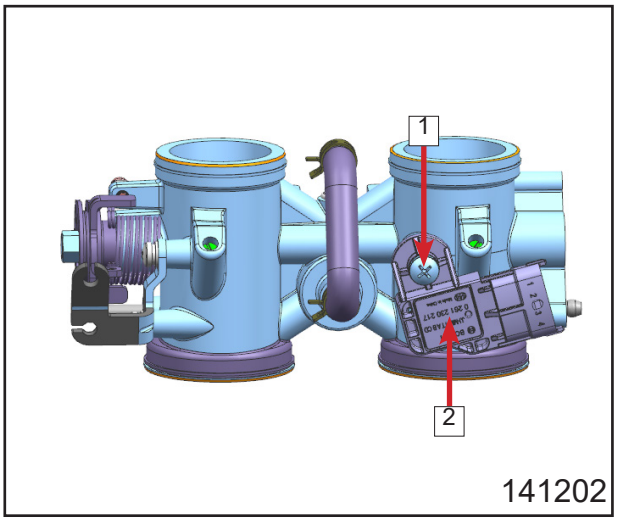


Remove screws [1].
Remove TPS [2].



141201

Remove screw [1].
Remove T-MAP [2].



141202

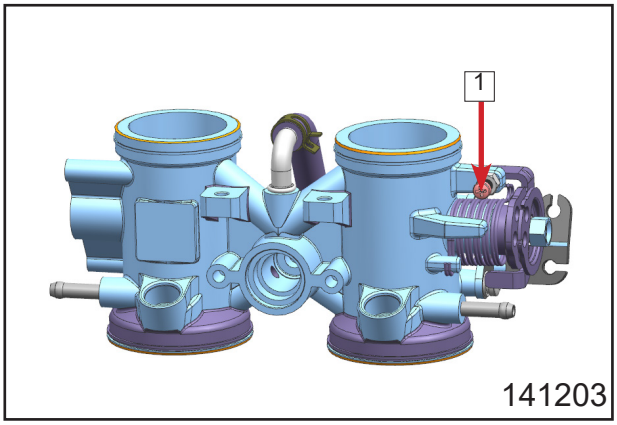
14.3.2 Throttle Valve Assy Inspection

14.3.2.1 Throttle Valve Body

Inspect throttle valve body for crack or damage. Replace if it does.

Inspect electrical parts (refer to the Inspection section of Electrical System chapter).

⚠Note: It is not allowed to remove the idle position screw [1].



141203

14.3.2.2 Fuel Rail Assy

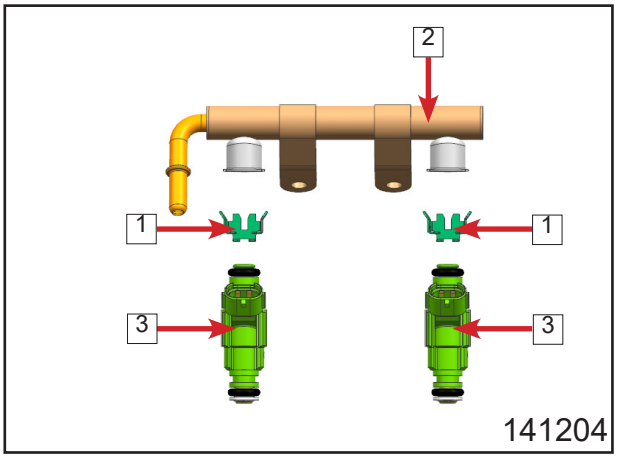
Disassembly

Push both sides of injector spring[1] with thumbs to remove the spring [1].
Remove fuel injector caps[2].

Details refer to Electrical System.

Assembly

Install injector [3] on injector caps [2]. Then install injector cap spring [1]. Make sure the edge of the injector cap [2] clip into the groove of the spring [1].



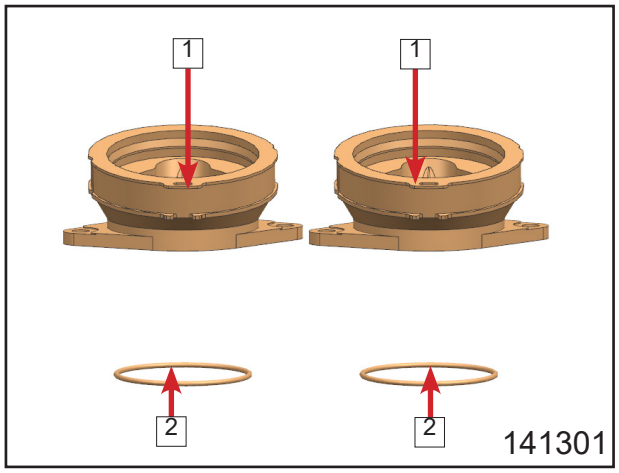
141204

Idle stepping motor, TPS and T-MAP inspection refer to Electrical System chapter.

14.3.2.3 Air Intake Pipe Inspection

Inspect air intake pipes [1] for cracks or damage. Replace if they do.

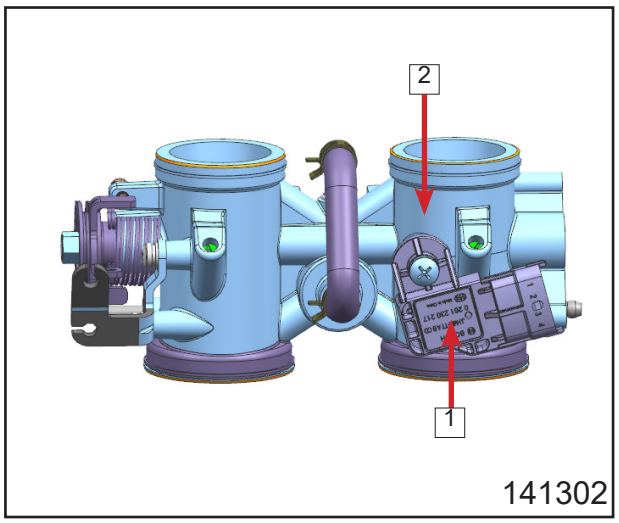
Inspect rubber seal rings [2] for cracks, hardening or damage. Replace if they do.



141301

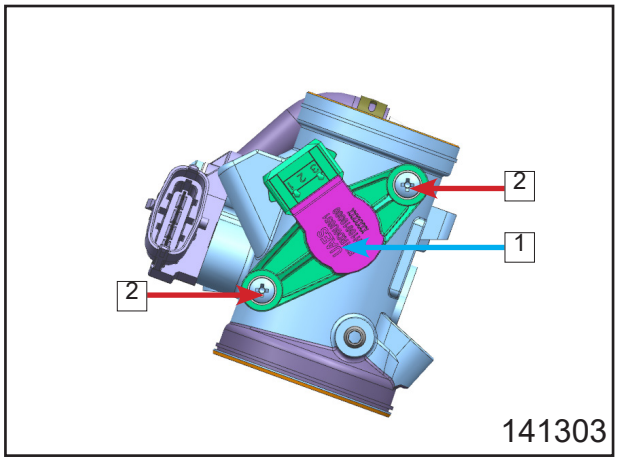
14.3.3 Throttle Valve Assy Assembly

Install T-MAP [1].
Install screw [2].



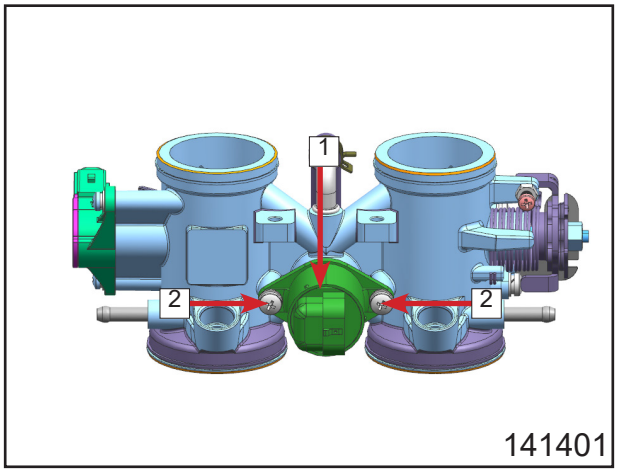
141302

Install TPS [1].
Install screws [2].

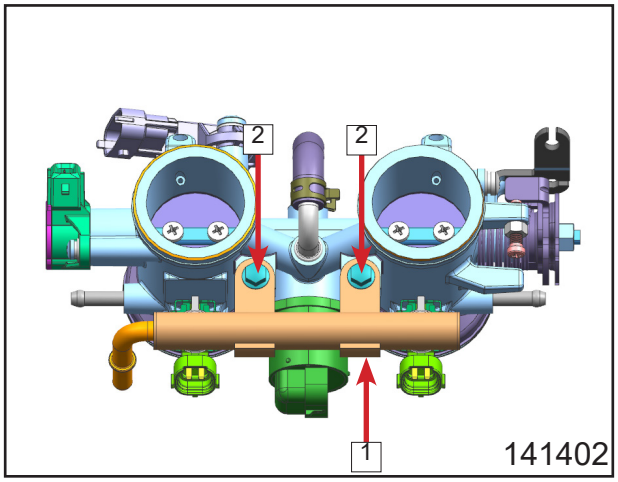


141303

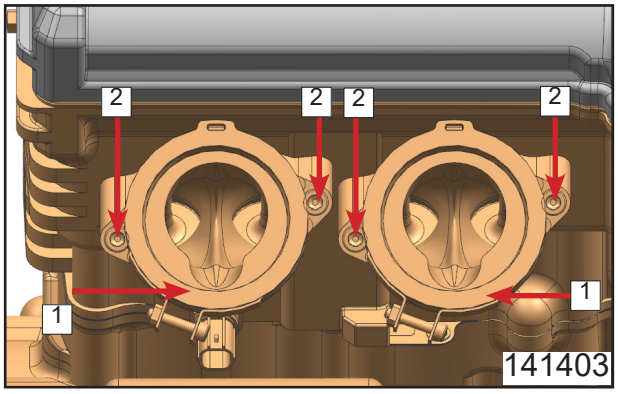
Install idle stepping motor [1].
Install screws [2].



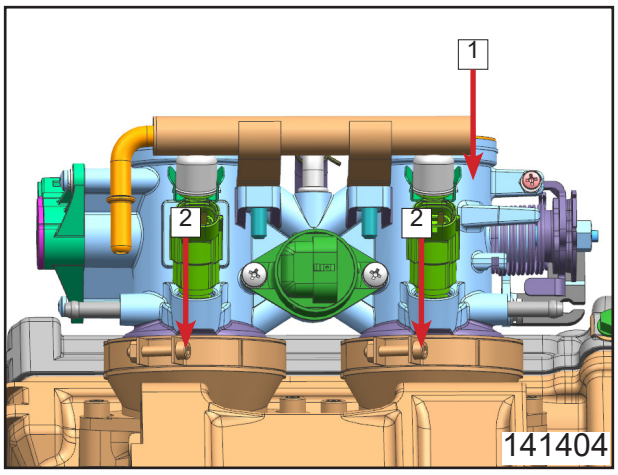
Install fuel rail assy [1].
Install M6 bolts [2].



Install air intake pipes assy [1].
Install M6 inner hex screws [2].



Install throttle valve assy [1].
Tighten clamps [2].



14.4 Engine Disassembly

Put the engine on operating bench and fix it.

⚠Warning: Fix the engine firmly on the bench, in case it falls down to cause injury or engine damage.

⚠Warning: Disassemble the engine when the engine is cool. Otherwise, wear protective clothes in case of getting burnt.

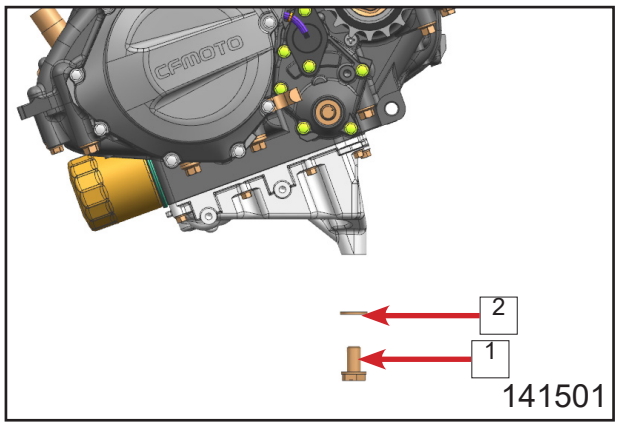
14.4.1 Engine Oil Drain

Place a pan under the engine to store the engine oil from the engine.

Remove M12×22 drain bolt [1].

Remove washer 12 [2].

Drain the engine oil.

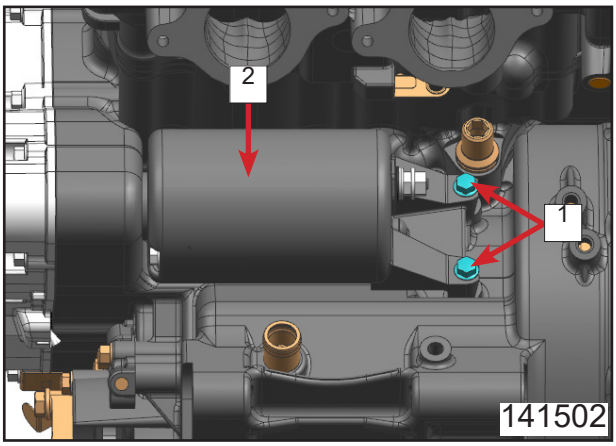


14.4.2 Starter Motor Removal

Remove M6 bolts [1].

Shake the starter motor [2] to remove it.

If it is too tight, knock the motor gently with hammer to loose. Do not knock it very hard.

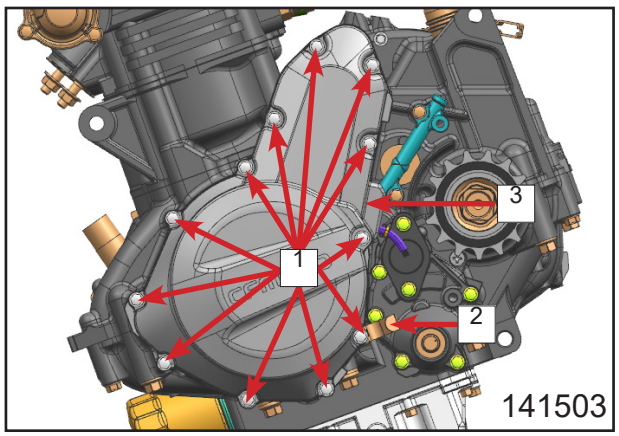


14.4.3 Magneto Rotor Removal

Remove M6 bolts [1].

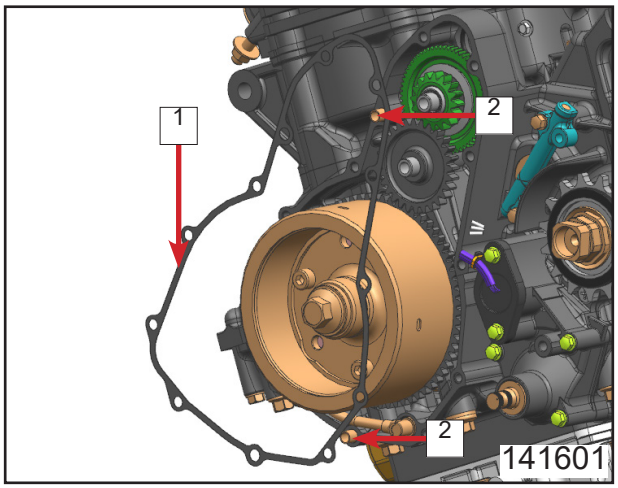
Remove cable clip [2].

Remove LH front cover [3].

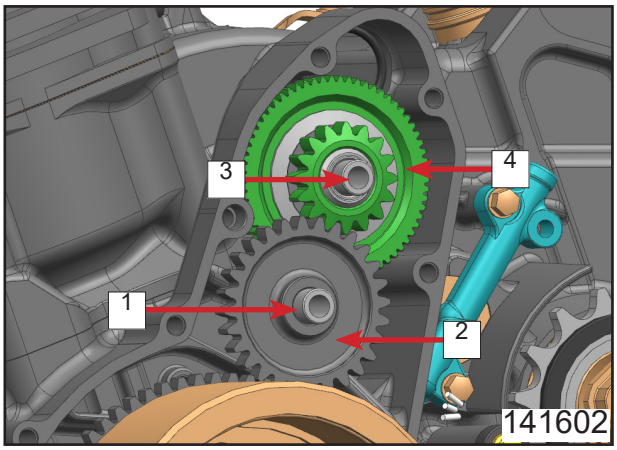


Remove seal gasket [1].
Remove dowel pins [2].

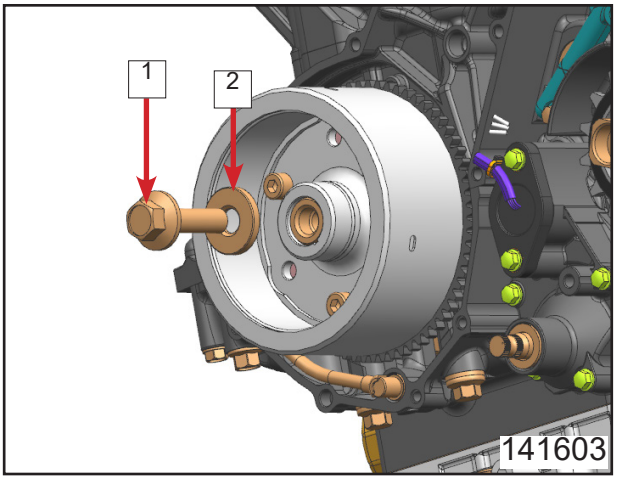
⚠Note: Pay attention there are dowel pins [2] in case of getting lost. Dowel pins [2] may be on the LH front cover when removing it.



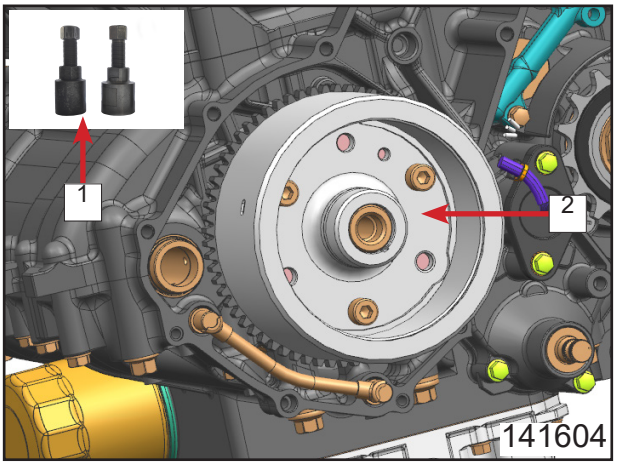
Remove middle gear shaft [1].
Remove starter middle gear [2].
Remove middle gear shaft [3].
Remove dual gear assy [4].



Remove M12 bolt [1].
Remove washer [2].

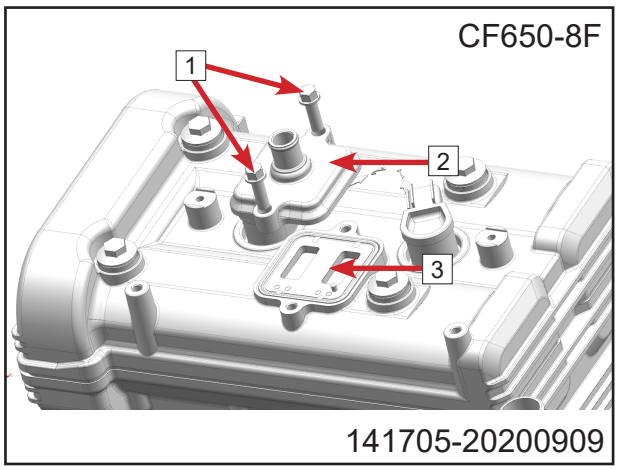


Use special tool: magneto rotator removing tool [1] to remove the magneto rotor [2].

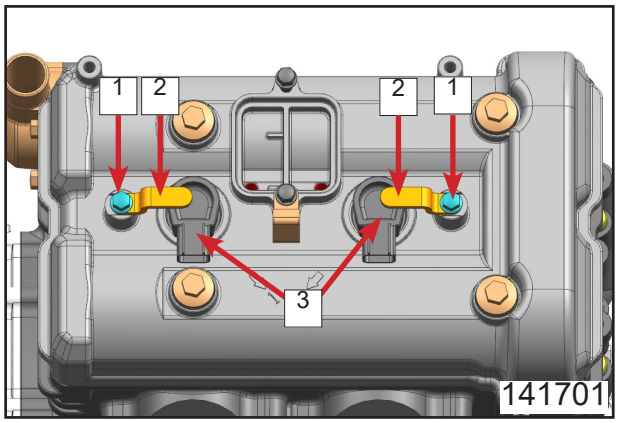


14.4.4 Ignition Coil and Spark Plug Removal

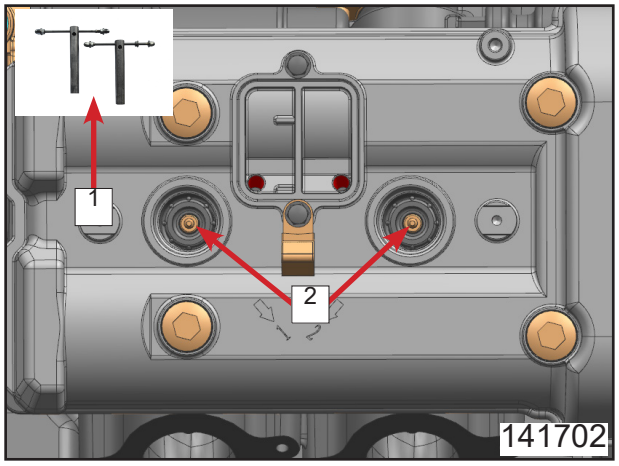
Remove bolts [1]
Remove spring valve cover [2];
Remove spring valve assy [3].



Remove M6 bolts [1].
Remove press plate [2].
Rotate the ignition coil [1] counter clockwise until it gets loose.
Pull out ignition coil [1].

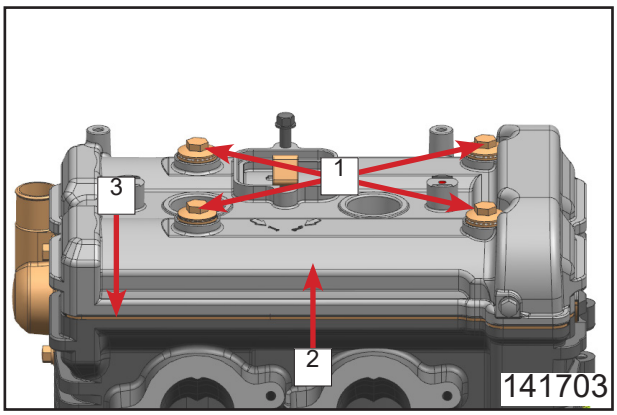


Use special tool: spark plug sleeve [1] to remove spark plug [2].



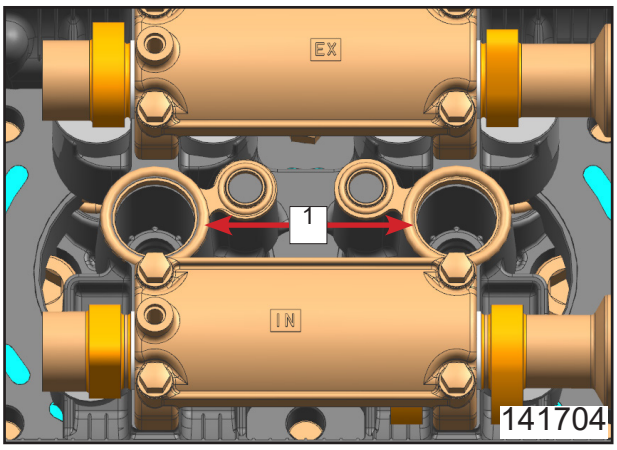
14.4.5 Cylinder Head Cover Removal

Remove cylinder head cover M6 bolts and seal rings [1].
Remove cylinder head cover [2].
Remove cylinder head cover seal gasket [3].

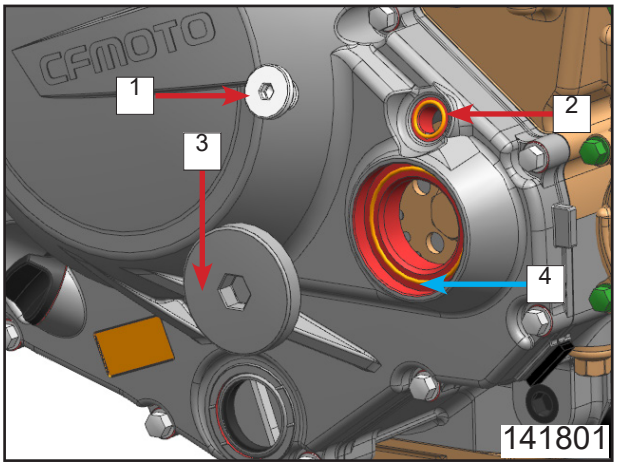


⚠Note: After cylinder head cover removal, the seal gasket may remain on the cover. If the gasket is not broken, it is not necessary to remove it.

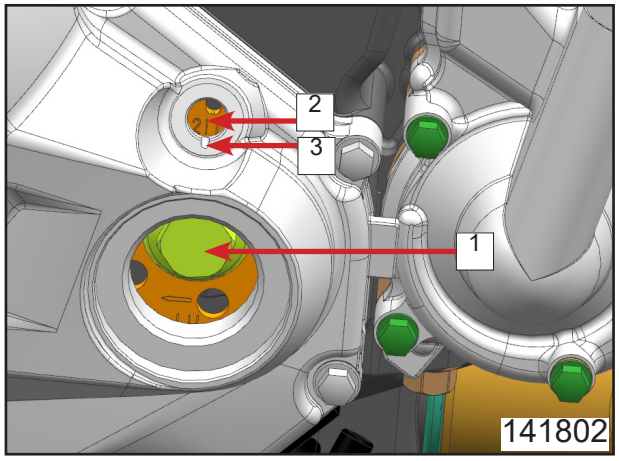
Remove spark plug hole seal ring [1].



Remove timing inspection hole cap [1].
Remove o-ring [2].
Remove oil filter cover [3].
Remove o-ring [4].

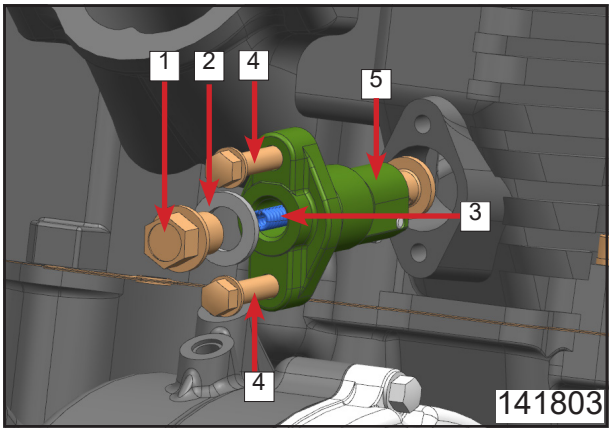


Find a proper sleeve to install on M8 bolt [1]. Rotate it clockwise until X/T mark [2] is aligned with the timing inspection mark [3] on RH side cover.



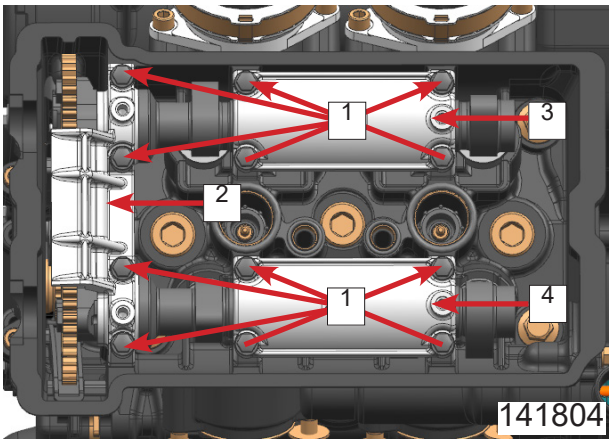
14.4.6 Tensioner Removal

Remove M11 spring seat bolt [1].
Remove washer [2].
Remove tensioner spring [3].
Remove M6X14 bolt [4].
Remove tensioner [5].



14.4.7 Camshaft Removal

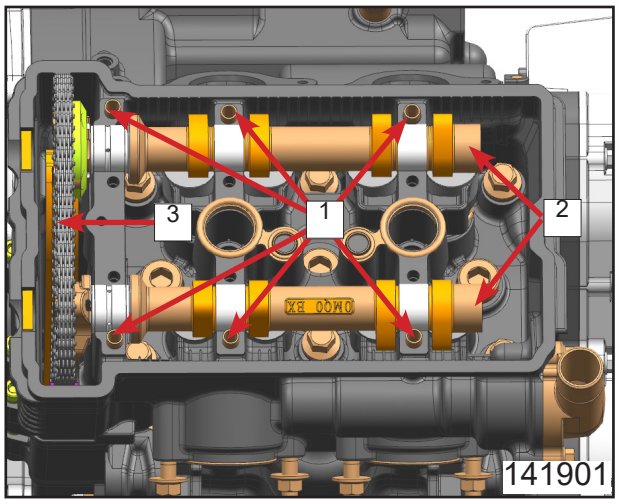
Remove M6 bolt [1].
Remove camshaft plate [2].
Remove air inlet camshaft seat [3].
Remove air exhaust camshaft seat [4].



⚠Note: Pay attention to dowel pins in case of getting lost when removing camshaft plate, air inlet&exhaust camshaft seat. Do not knock parts hard during removal, in case of damaging dowel pins and parts.

Remove dowel pins [1].
Remove camshaft assy [2].

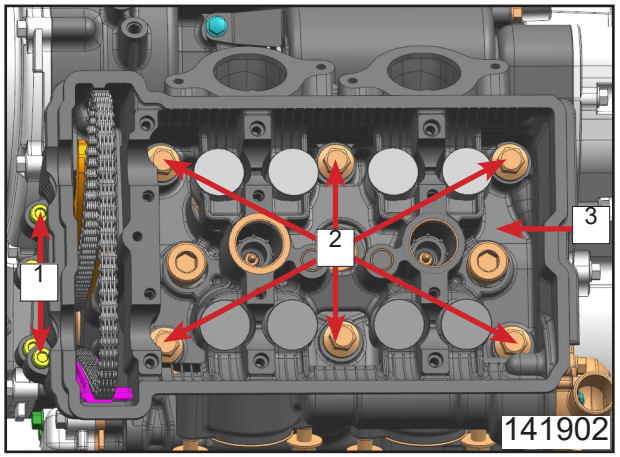
⚠Note: During camshaft assy [2] removal, hook timing chain [3] in case it falls down into the engine.



14.4.8 Cylinder Head Removal

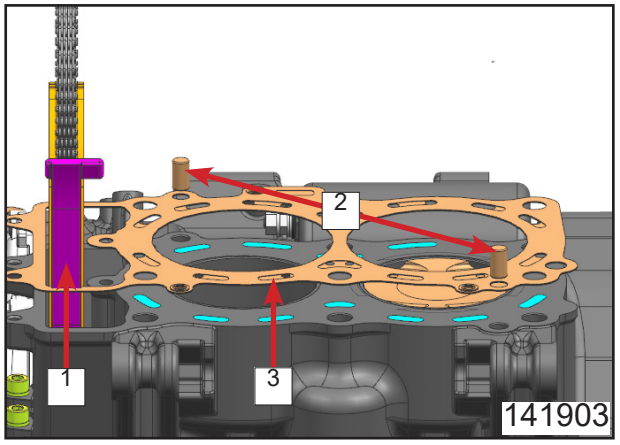
Remove M6 inner hex bolts [1] and washers.
Remove cylinder head M10 bolts [2] and washers.
Remove cylinder head [3].

⚠Note: Pay attention to the washers in case of getting lost or falling into the engine body when removing bolts. Cylinder head M10 bolts [2] can be removed with magnet.



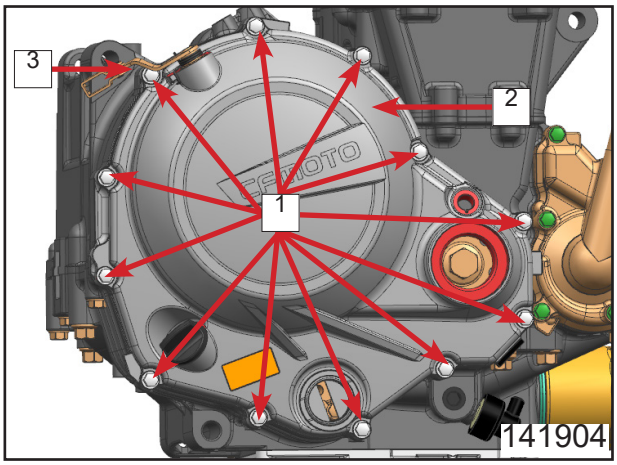
⚠Note: Cylinder head can be removed by shaking it. Pay attention to dowel pins in case of getting lost. Hook timing chain [3] in case it falls down into the engine.

Remove chain guide [1].
Remove dowel pins [2].
Remove cylinder head gasket [3].

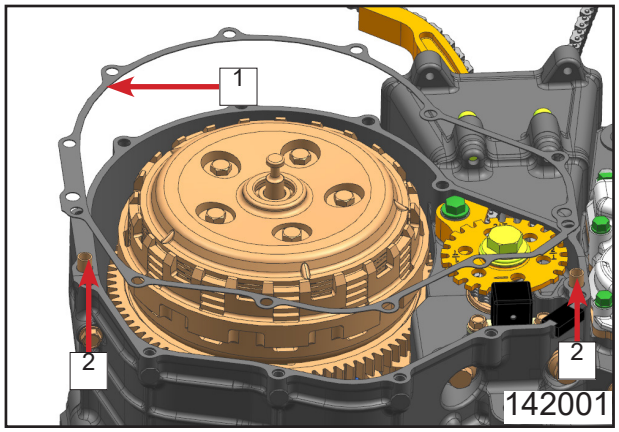


14.4.9 RH Side Cover Removal

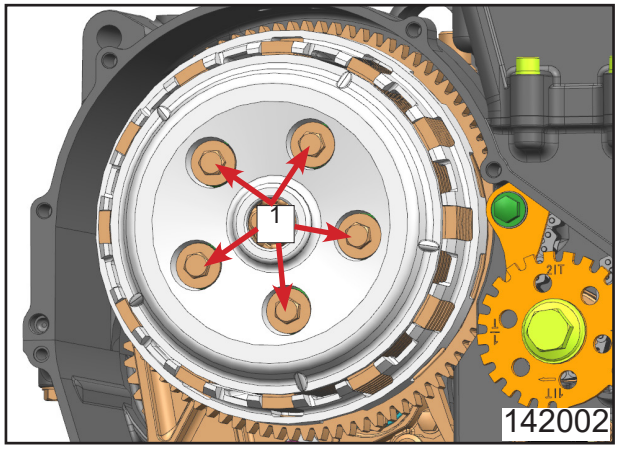
Remove M6 bolts [1].
Remove RH side cover [2]. (Rotate the clutch rod [3] to the proper position to remove the RH side cover.)



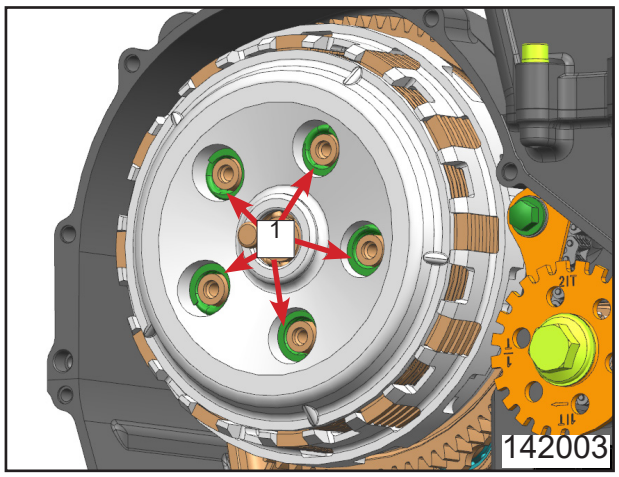
Remove seal gasket [1].
Remove dowel pins [2].



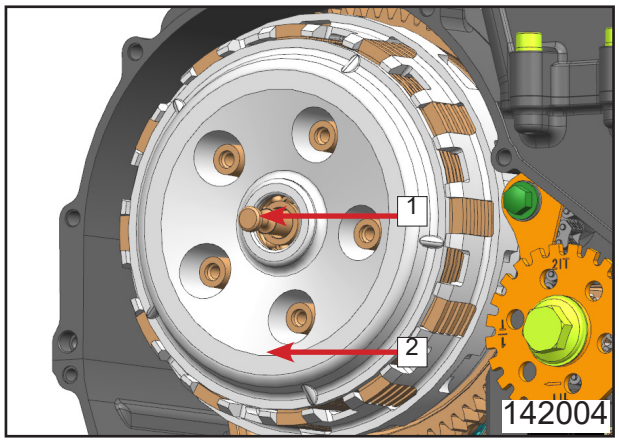
14.4.10 Clutch Removal
Remove M6 bolts assy [1].



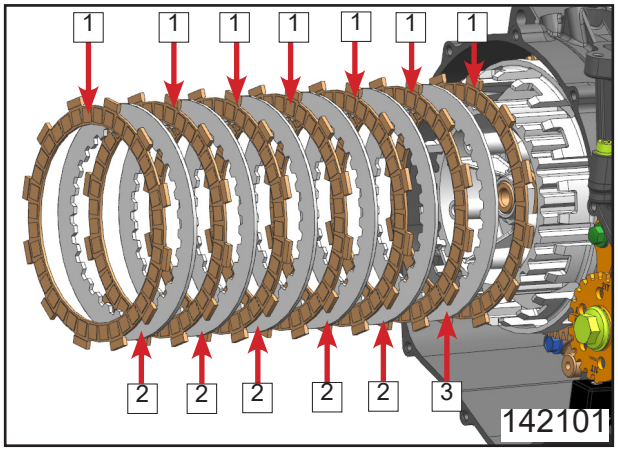
Remove clutch springs [1].



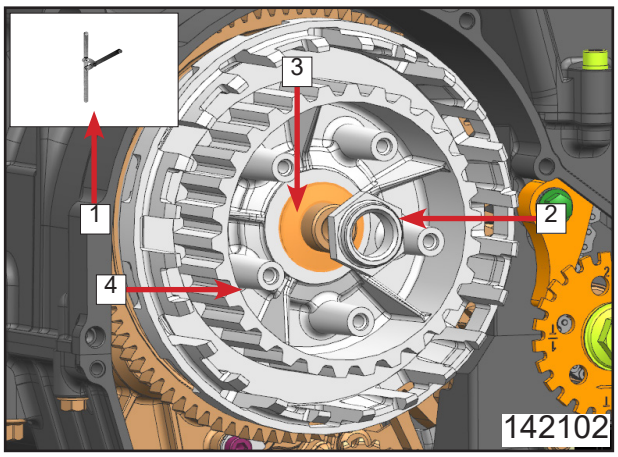
Pull the tie-rod [1] to remove clutch press plate [2] along with tie-rod [1].
Remove the tie-rod [1] from the press plate [2].



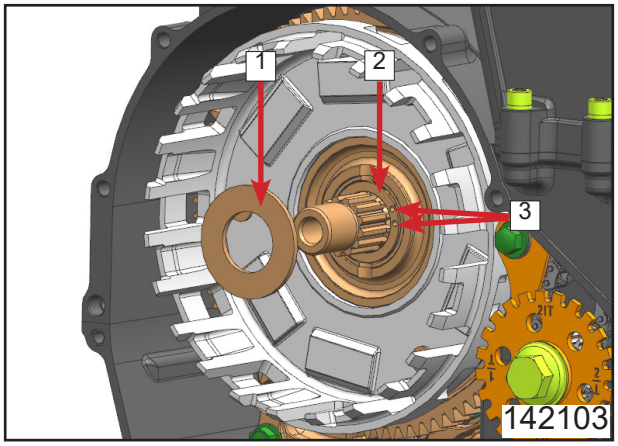
Remove frication disc assy [1].
Remove steel plate B [2].
Remove steel plate A [3].



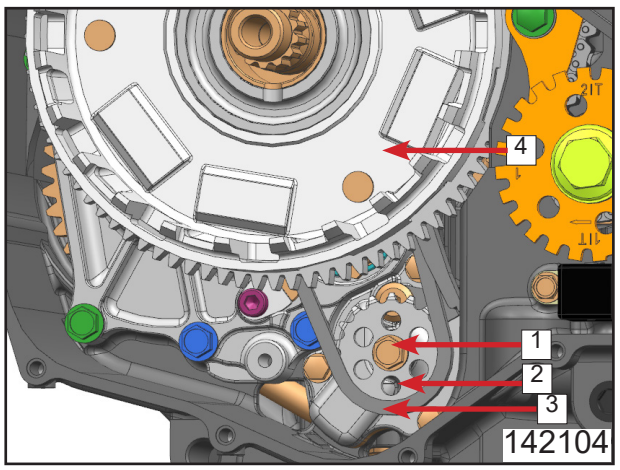
Use special tool: clutch stopping wrench [1] to fix the clutch hub and remove M20 nut [2].
Remove washer [3].
Remove central sleeve assy [4].



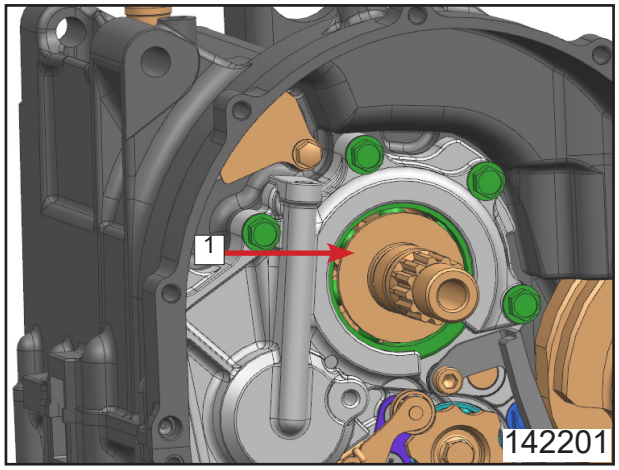
Remove washer [1].
Insert into the holes [3] with needle-nose pliers and pull out the clutch shaft sleeve [2].



Remove M6 bolt [1] and washer. (Left-hand thread)
Pull out oil pump sprocket [2] with needle-nose pilers. (Oil pump sprocket is still on the oil pump chain assy.)
Remove housing assy [4], oil pump chain [3] and oil pump sprocket together.

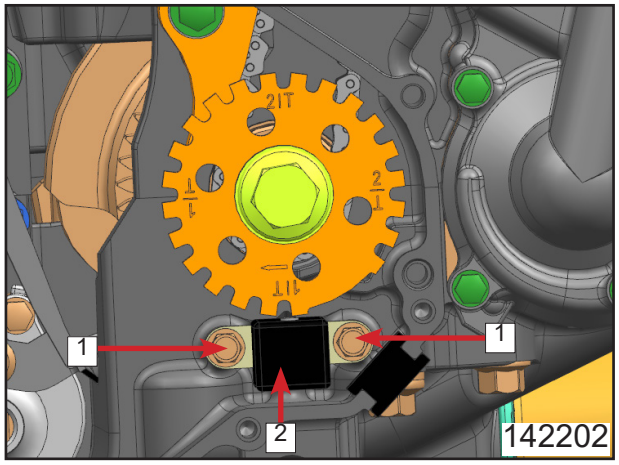


Remove washer [1].

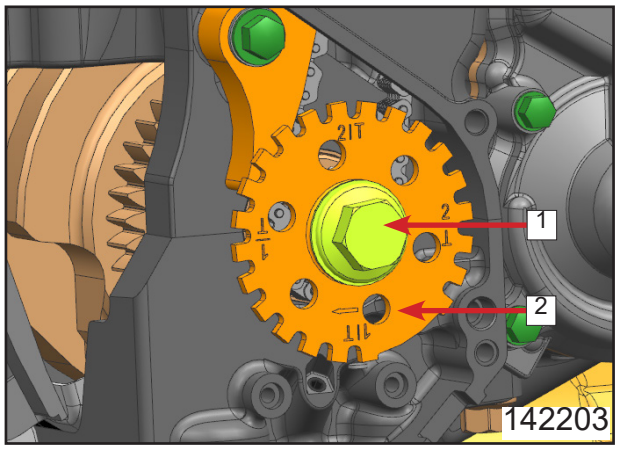


14.4.11 Crankshaft Pulsing Rotor Removal

Remove M5 bolt [1].
Remove trigger assy [2].

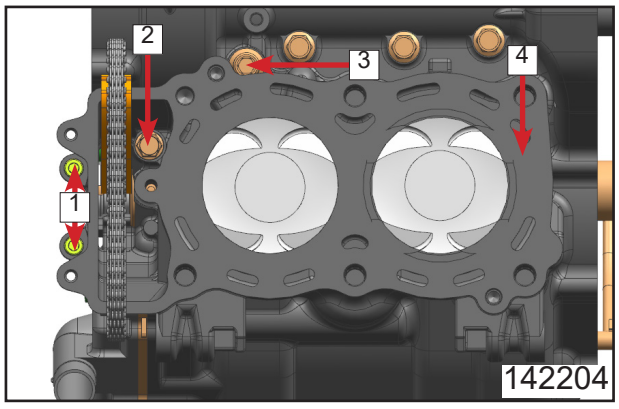


Remove M8 bolt [1] and washer.
Remove crankshaft pulsing rotor [2].



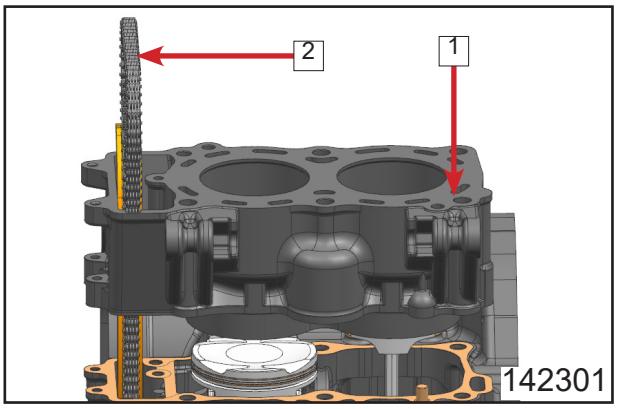
14.4.12 Cylinder Body Removal

Remove M6 inner hex bolts [1] and washers.
Remove M8 bolt [2].
Loose M10 nut [3]. Loose the cylinder body[4] by slightly shaking it. Remove M10 nut [3] and washer.

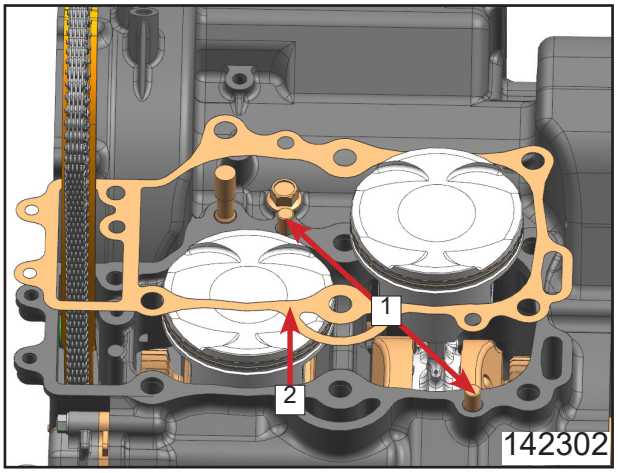


Lift and pull out cylinder body [1].

⚠Note: Hook timing chain [2] in case it falls down into the engine.



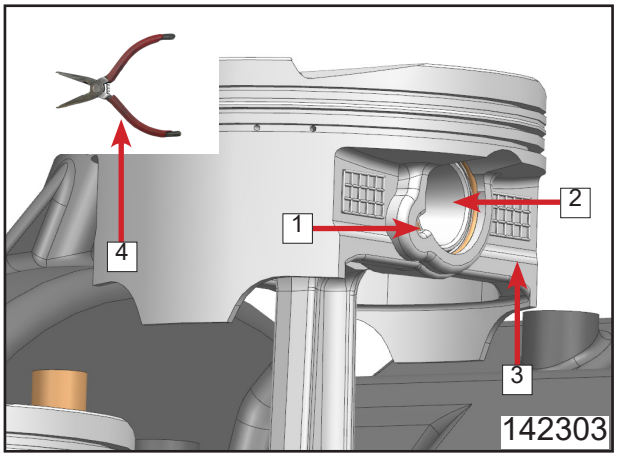
Remove dowel pins [1].
Remove cylinder body gasket [2].



14.4.13 Piston Removal

Rotate the crankshaft to the proper situation.
Use special tool: piston pin installing tool [4] to remove the circlip [1] from the gap.
Remove the piston pin [2].
Remove piston [3].

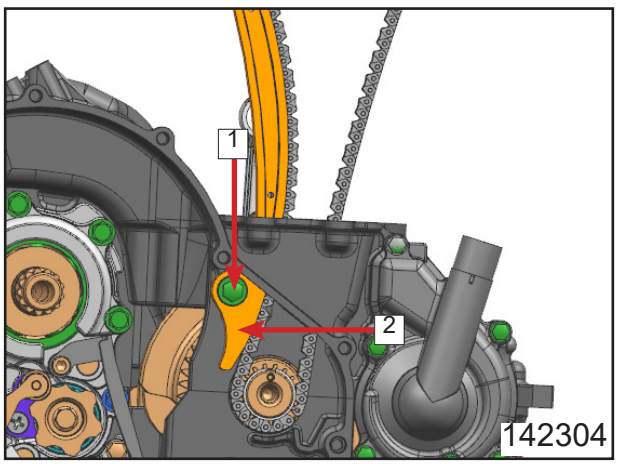
⚠Note: When removing piston pin, it is not necessary to remove the circlip on both sides. One is enough. The removed circlip can not be used again. Replace with a new one when installing.



Rotate the crankshaft to proper position to remove the other piston following the same procedures.

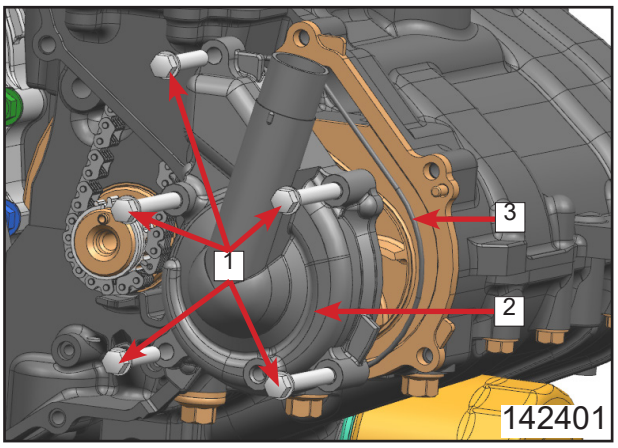
14.4.14 Tensioner Plate Removal

Remove pin shaft [1].
Remove tensioner plate [2].

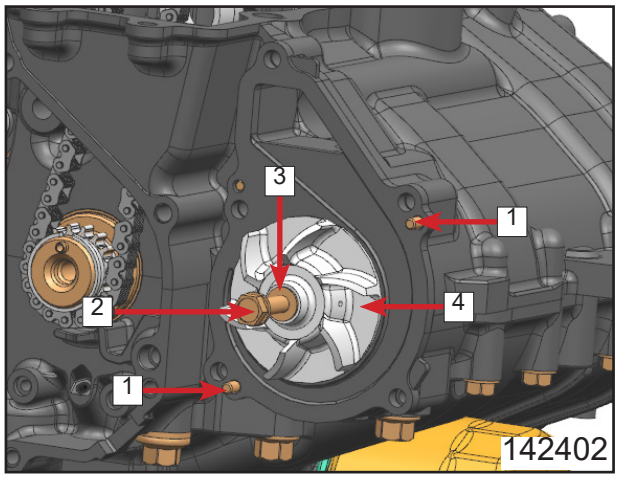


14.4.15 Water Pump Removal

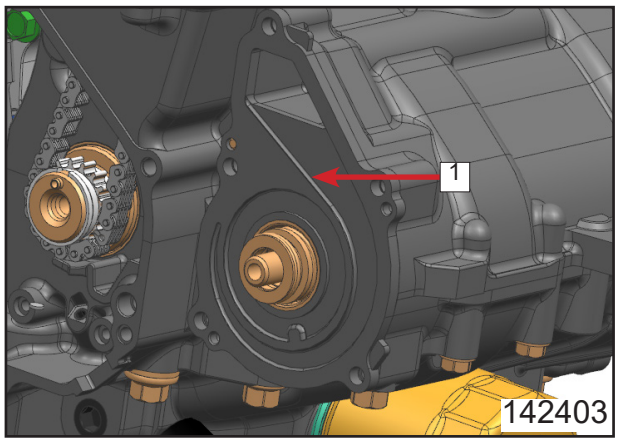
Remove M6 bolts [1].
Remove water pump cover [2]. The seal gasket [3] may remain on the cover. Remove it along with the water pump cover.



Remove dowel pins [1].
Remove M6 bolt [2].
Remove washer [3].
Remove water pump impeller [4].



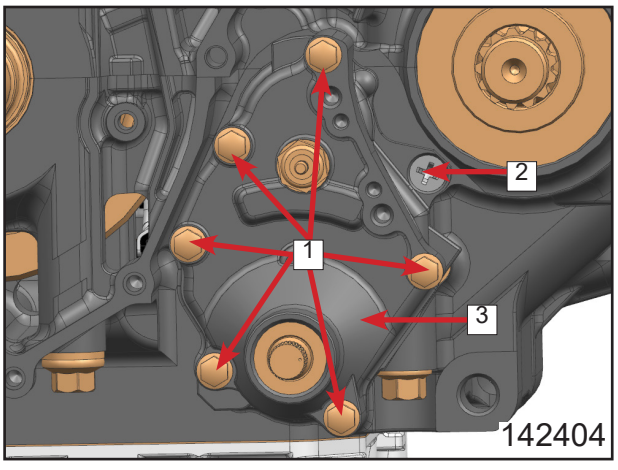
Remove water pump [1].



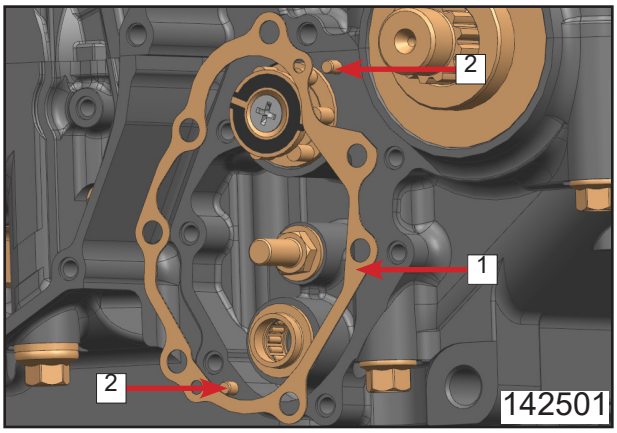
14.4.16 Gearshift Assy Removal

Status 1

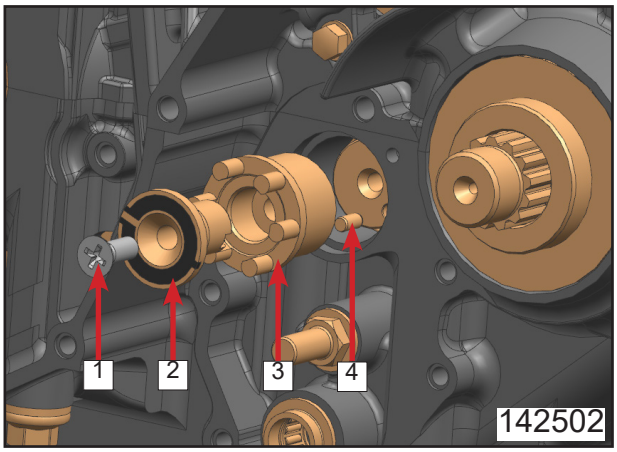
Remove M6 bolts [1].
Remove screw [2].
Remove gearshift cover [3].



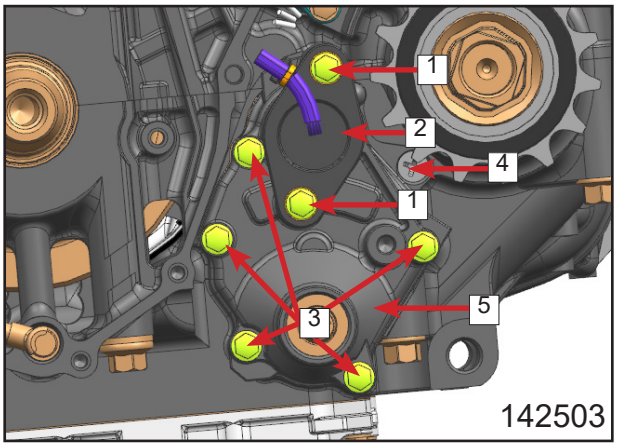
Remove gearshift cover gasket [1].
Remove dowel pins [2].



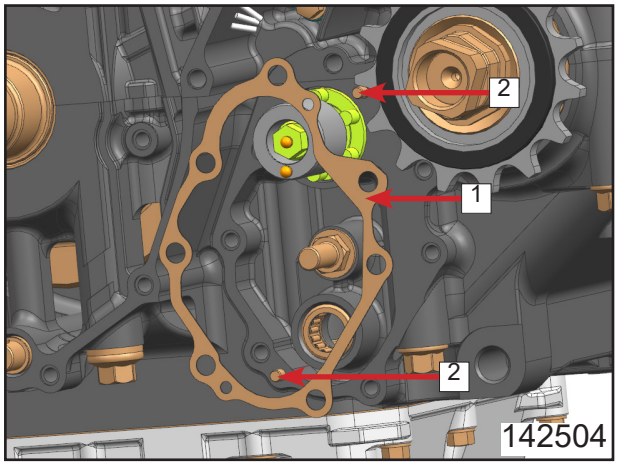
Remove screw [1].
Remove gear sensor [2].
Remove shift location drum [3].
Remove roller needle [4].



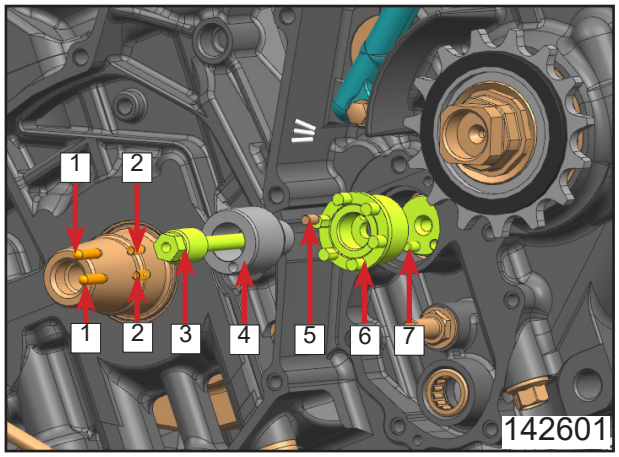
Status 2
Remove M6 bolts [1].
Remove gear position sensor [2].
Remove M6 bolts [3].
Remove screw [4].
Remove gearshift cover [5].



Remove gearshift cover gasket [1].
Remove dowel pins [2].

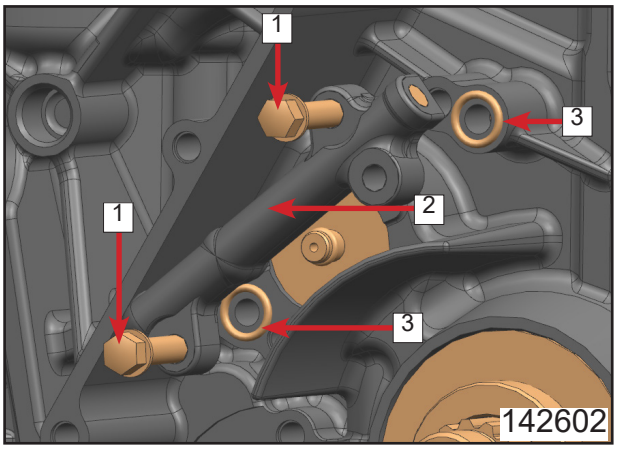


Remove ball contactors [1].
Remove contactor springs [2].
Remove contactor bolt [3].
Remove gear rotor [4].
Remove dowel pin [5].
Remove shift location drum [6].
Remove roller needle [7].



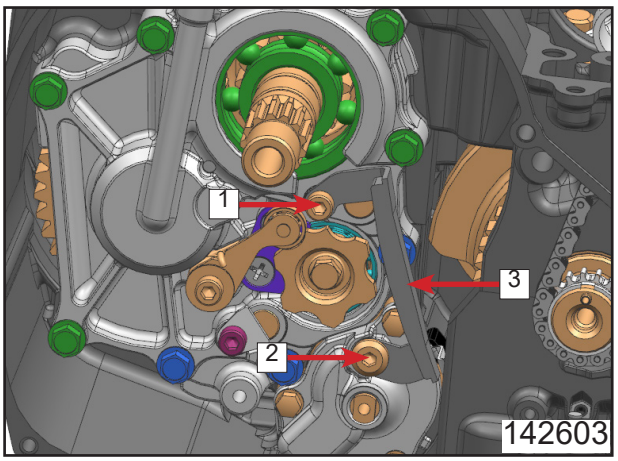
14.4.17 Oil Pipe IV Removal

Remove M6 bolts [1].
Remove oil pipe IV assy [2].
O-ring [3] remains on oil pipe IV assy [2].
Remove o-ring [3].

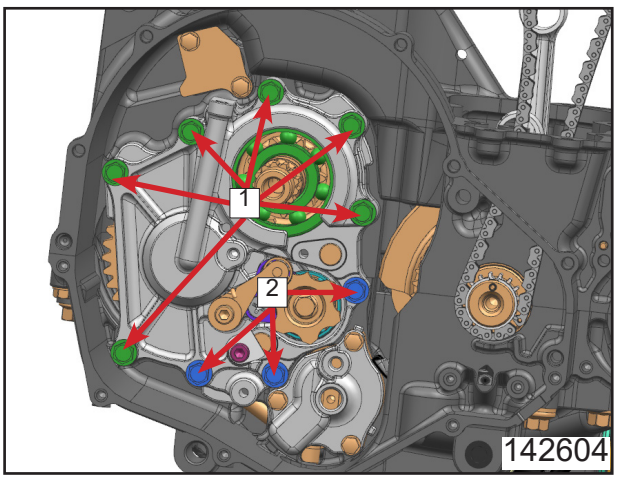


14.4.18 Transmission Assy Removal

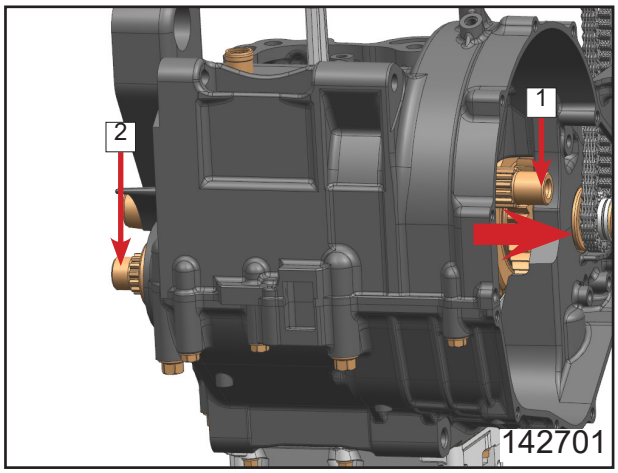
Remove M6 screw [1].
Remove M6 screw [2].
Remove oil pump chain guide [3].



Remove M7 bolts [1].
Remove M7 bolts [2].

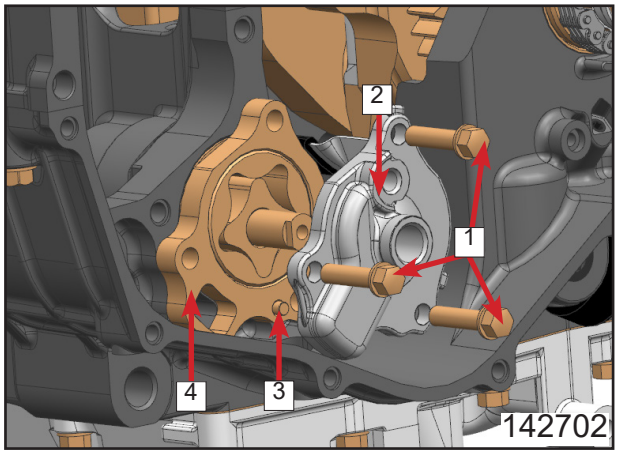


Pull the main shaft [1] in the arrow direction (by slightly shaking).
If shaking doesn't work, slightly knock the countershaft [2] with rubber hammer in the arrow direction, then pull out the whole transmission assy.

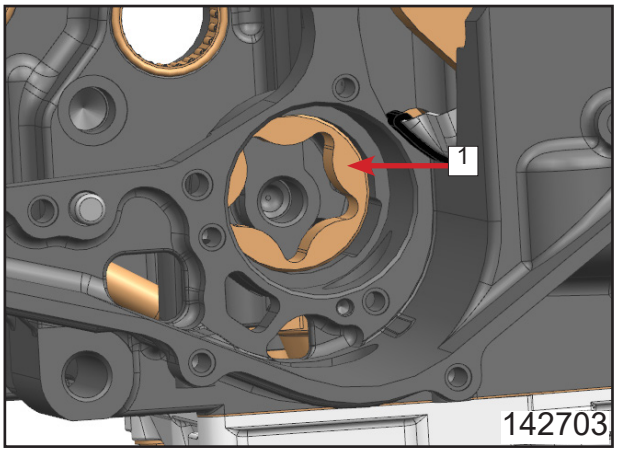


14.4.19 Oil Pump Assy Removal

Remove M6 bolts [1].
Remove oil pump cover [2].
Remove roller needle [3].
Remove oil pump assy [4] with needle-nose pliers.



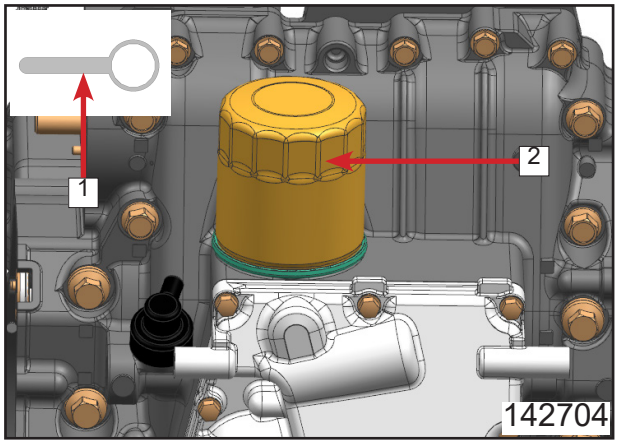
Remove oil pump outer rotor [1].



14.4.20 Oil Filter Removal

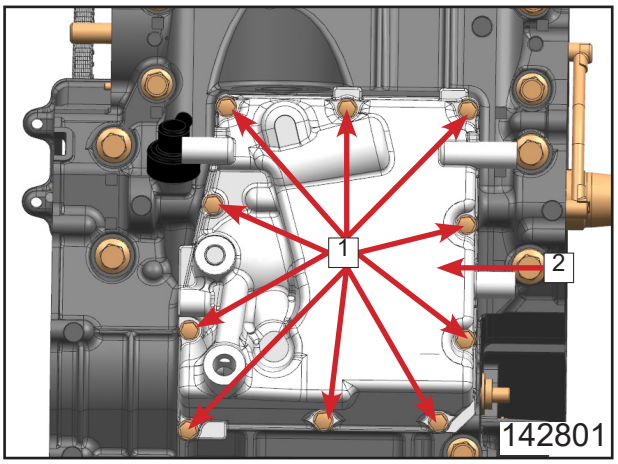
Use special tool: oil filter wrench [1] to remove the oil filter [2].

⚠Note: Cover a cloth or rubber cushion when removing the oil filter, in case the special tool damages the oil filter.

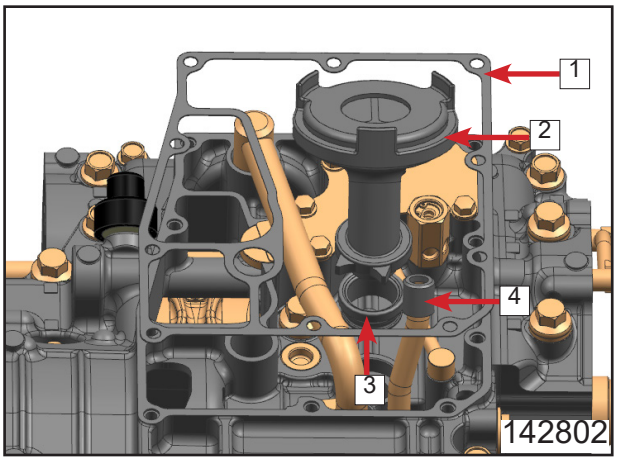


14.4.21 Oil Pan Assy Removal

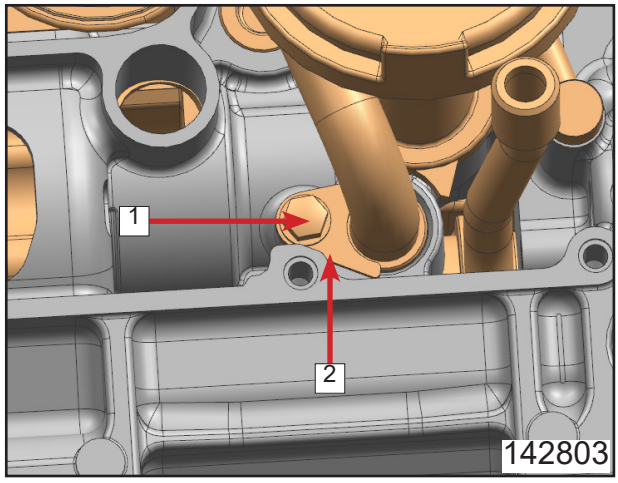
Remove M6 bolts [1].
Remove oil pan [2].



Remove seal gasket [1].
Remove oil suction pan assy [2].
Remove seal gasket [3].
Remove oil return pipe rubber sleeve [4].

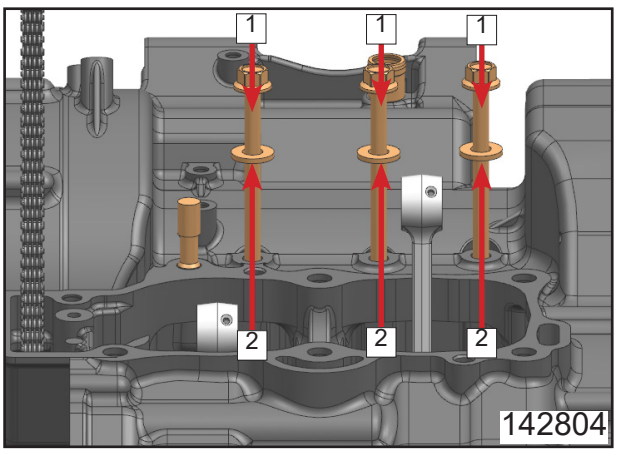


Remove M6 bolt [1].
Remove oil pipe I press plate [2].

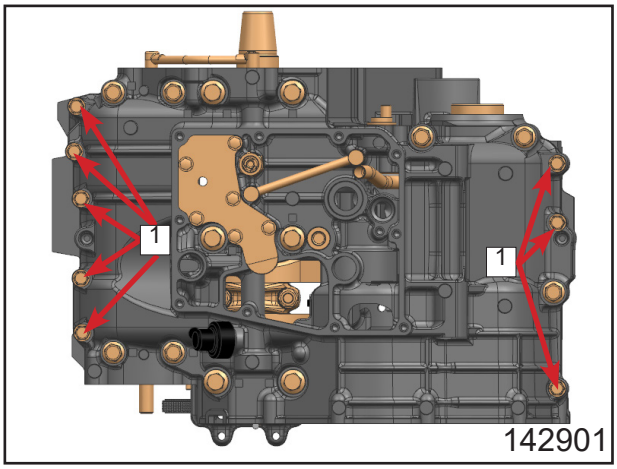


14.4.22 Engine Case Removal

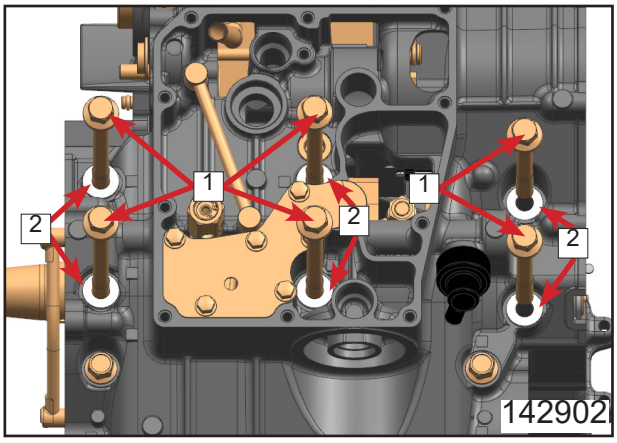
Remove M8 bolts [1].
Remove washers [2].



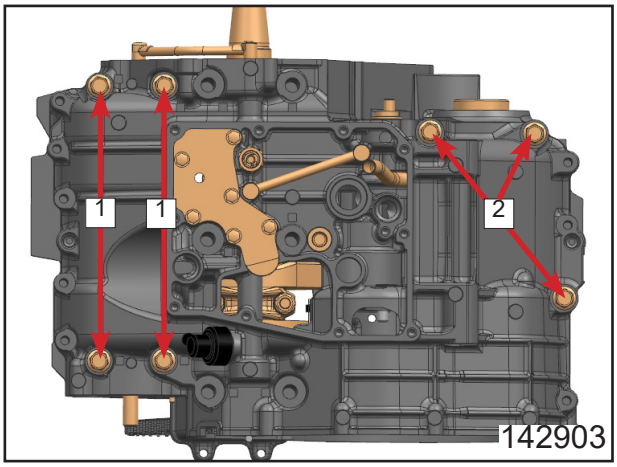
Remove M7 bolts [1].



Remove M9 bolts [1].
Remove washers [2].

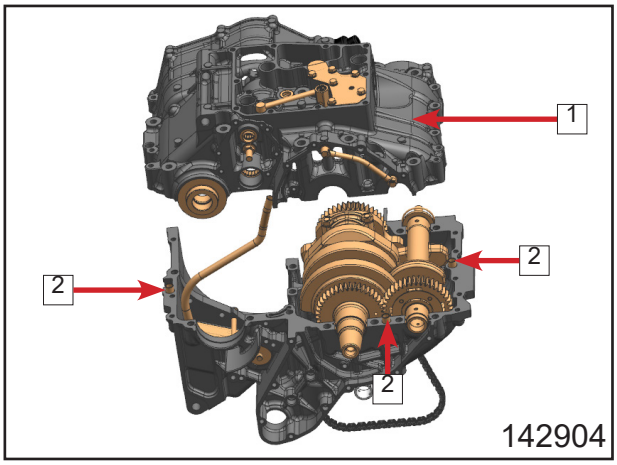


Remove M8 bolts [1].
Remove M8 bolts [2].



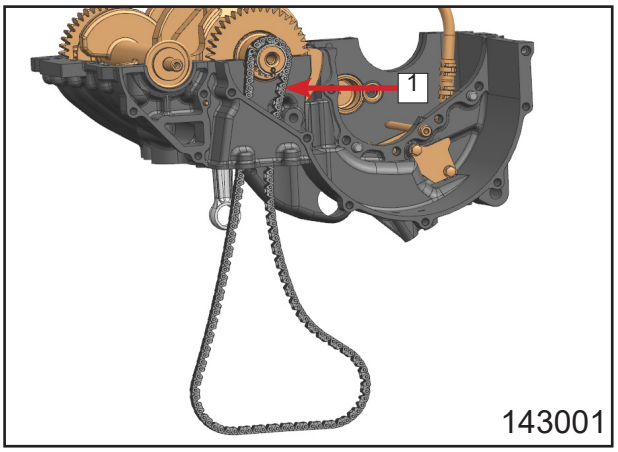
Remove engine case [1].
Remove dowel pins [2].

⚠Remove: Pay attention to dowel pins [2] during removal in case of getting lost.



14.4.23 Timing Chain Removal

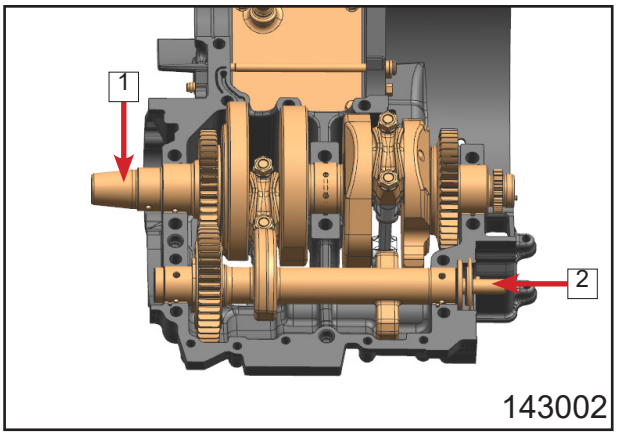
Remove timing chain [1].



14.4.24 Crankshaft and Balance Shaft Removal

Remove crankshaft [1] and balance shaft [2] together.

⚠Note: Pay attention during crankshaft and balance shaft removal in case of parts impact and damage.



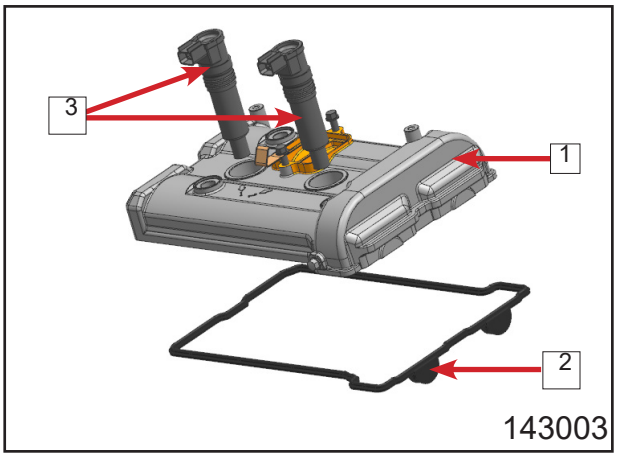
14.5 Engine Parts Inspection

14.5.1 Cylinder Head Cover Inspection

Inspect cylinder head cover [1] for crack or damage. Replace or repair if any defect occurs.

Inspect seal gasket [2] for crack, hardening or damage. Replace if any defect occurs.

Inspect ignition coil [3] for damage. Replace if any defect occurs.



14.5.2 Cylinder Head Inspection

Valve Clearance Inspection and Adjustment

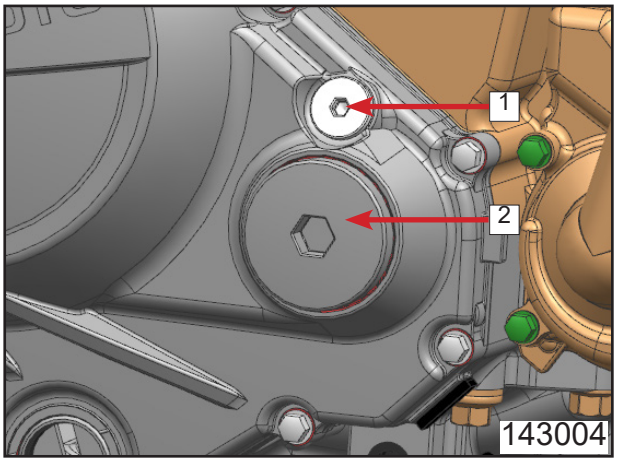
⚠Note: Inspect and adjust when engine is cool.

Adjust first cylinder timing.

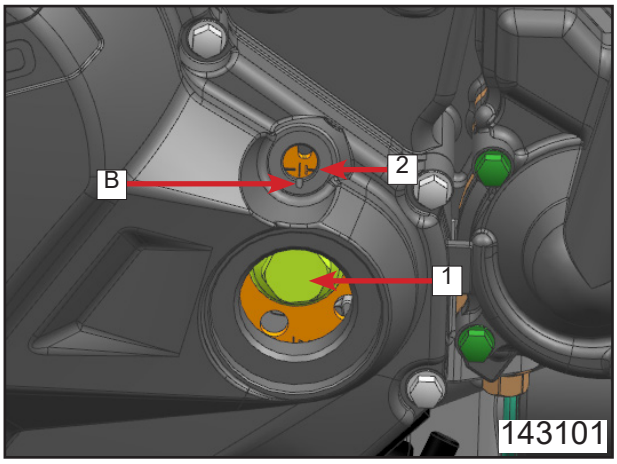
Remove cylinder head cover. (Refer to Engine Disassembly section)

Remove timing inspection hold cap [1].

Remove oil strainer cover [2].



Rotate M8 bolt [1] with sleeve and watch its movement through timing inspection hole [2]. Stop rotating when mark “1/T” on pulsing rotor is aligned with mark [B]. This is the TDC of first cylinder.

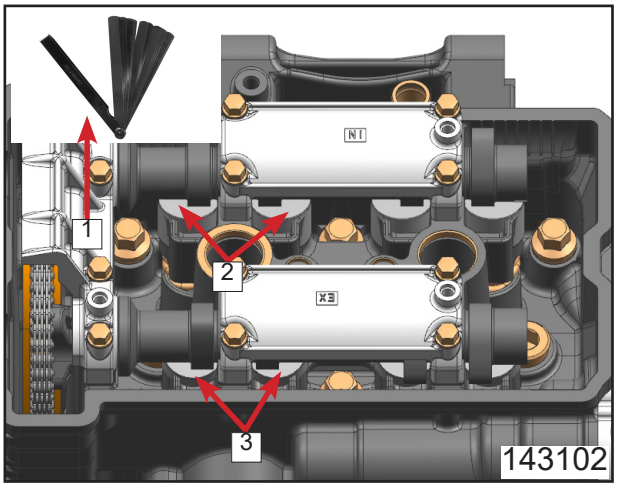


Measurement

Use feeler gauge [1] to measure the clearance of air inlet valve [2] and air exhaust valve [3]. Record measurement result. Transfer it to tappet thickness according to data. If the valve is out of standard, remove tensioner, intake&exhaust camshafts and replace the tappets of proper thickness. Inspect again after installation.

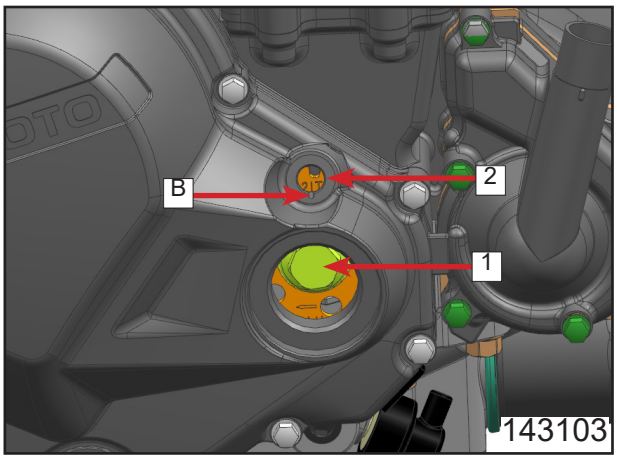
Valve Clearance Standard
Exhaust: 0.22 mm~0.28 mm
Intake: 0.08 mm~0.13 mm

Installation procedures refer to Installation section.



Adjust second cylinder timing.

Rotate M8 bolt [1] with sleeve and watch its movement through timing inspection hole [2]. Stop rotating when mark “2/T” on pulsing rotor is aligned with mark [B]. This is the TDC of second cylinder.

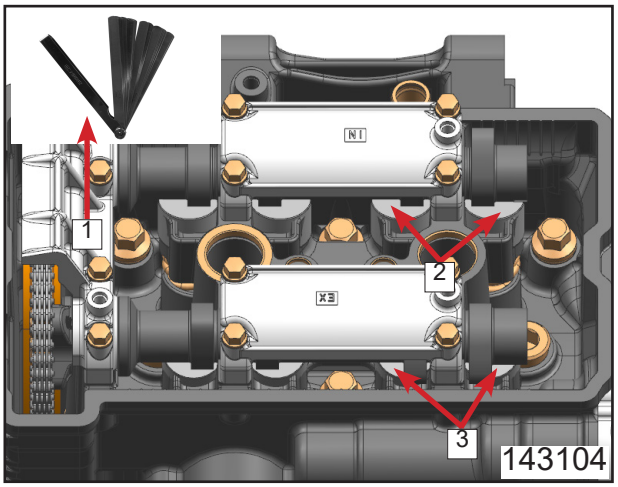


Measurement

Use feeler gauge [1] to measure the clearance of air inlet valve [2] and air exhaust valve [3]. Record measurement result. Transfer it to tappet thickness according to data. If the valve is out of standard, remove tensioner, intake&exhaust camshafts and replace the tappets of proper thickness. Inspect again after installation.

Valve clearance standard
Exhaust: 0.22 mm~0.28 mm
Intake: 0.08 mm~0.13 mm

Installation procedures refer to Installation section.



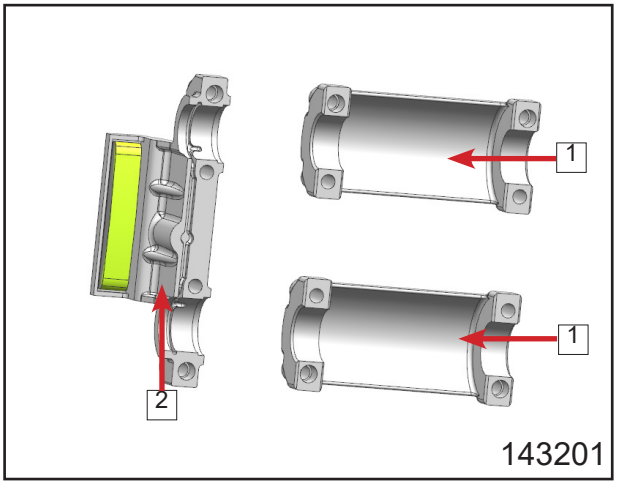
14.5.3 Camshaft Cover Inspection

Removal/installation procedures refer to engine disassembly/assembly sections.

Inspect camshaft covers [1] for wear, cracks or damage. Replace camshaft and cover together if any defect occurs.
Inspect camshaft holding strip [2] for wear, cracks or damage. Replace if any defect occurs.

Camshaft cover hole diameter
Standard: 24.00 mm~24.021 mm
Service limit: 24.05 mm

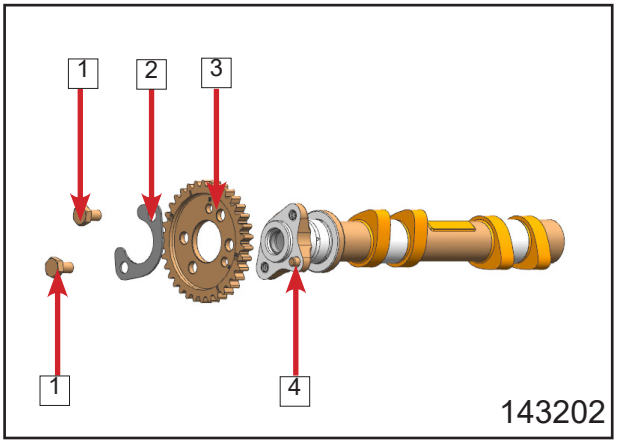
⚠Note: Replace with new cylinder head assy if the camshaft cover hole diameter is beyond service limit.



14.5.4 Camshaft Assy Inspection

Camshaft Disassembly

Remove M6 bolts [1].
Remove retainer [2].
Remove timing sprocket [3].
Remove roller needle [4].



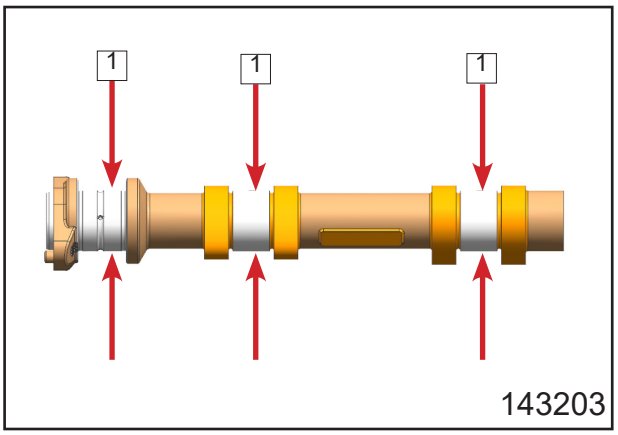
Camshaft Neck Diameter Measurement

Measure camshaft neck 1 diameter.

Camshaft neck diameter
Standard: 23.950 mm~23.972 mm
Service limit: 23.920 mm

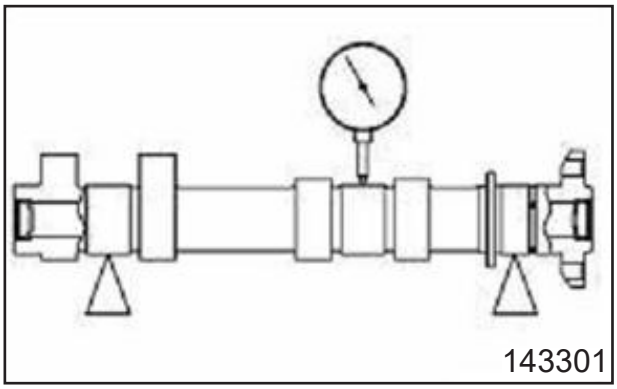
⚠Note: Replace with new camshafts if the diameter is beyond service limit.

Clearance between camshaft neck and camshaft cover
Standard: 0.028 mm~0.071 mm
Service limit: 0.13mm



Camshaft Deformation

Remove camshafts (refer to Camshaft Removal section).
Replace with new camshafts if the difference is beyond service limit.
Place camshafts on camshaft fixing tool or V-block.
Measure camshaft deformation value with dial gauge as picture shows.

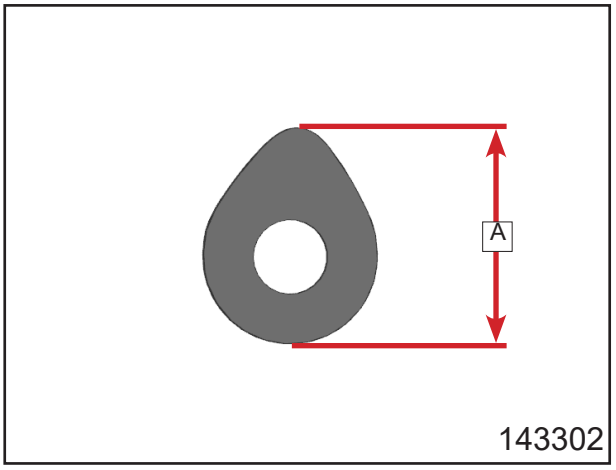

143301

Cam Wear

Remove camshafts (refer to Camshaft Removal section).
Measure each cam height [A] with dial gauge.
Replace if cam wear is beyond service limit.

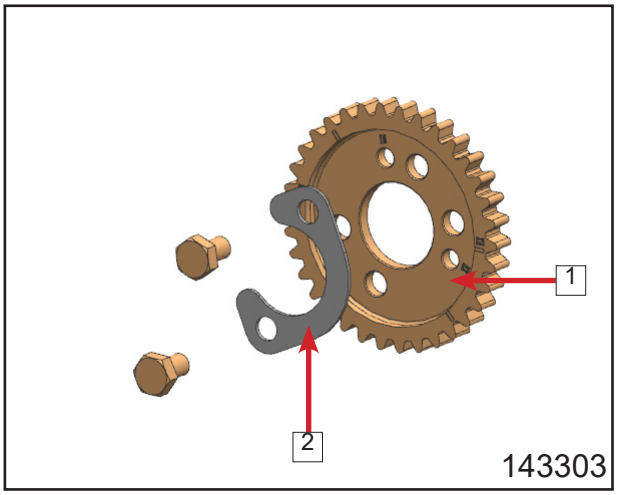
Cam height standard
Exhaust: 35.843 mm~35.957 mm
Intake: 36.543 mm~36.657 mm

Service limit
Exhaust: 35.74 mm
Intake: 36.44 mm



143302

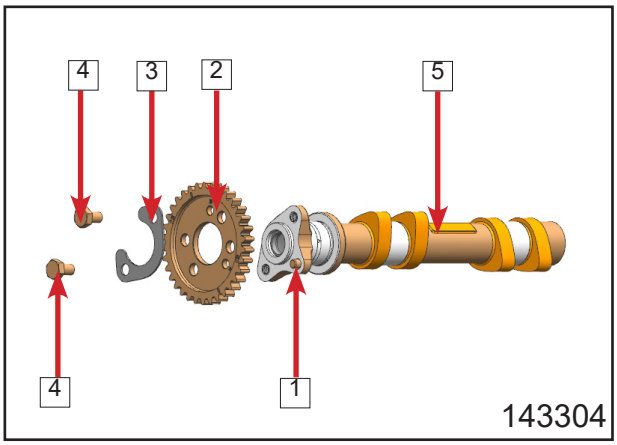
Inspect timing sprocket [1] for teeth break, damage or wear. Replace if any defect occurs.
Inspect retainer [2] for damage. Replace if it does.



143303

Camshaft Assy Assembly

Put roller needle [1] on camshaft [5].
Install timing sprocket [2].
Install retainer [3].
Install M6 bolts [4].



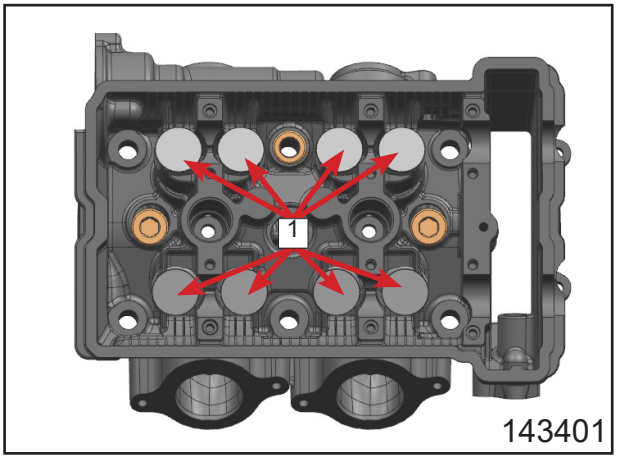
143304

14.5.5 Cylinder Head Assy Inspection

Cylinder Head Assy Disassembly

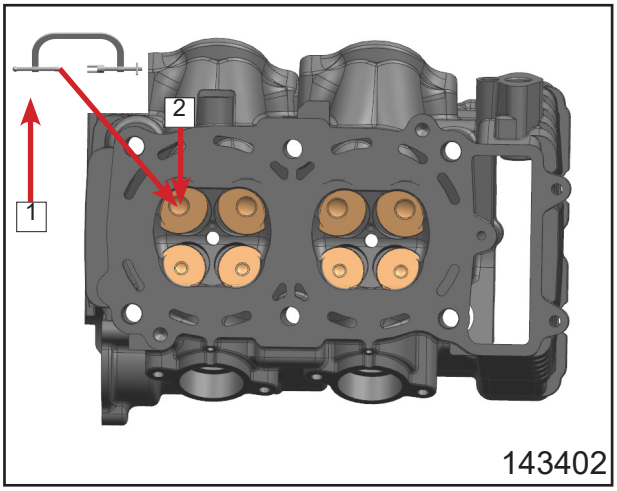
Remove tappets [1].

⚠Note: Record every tappet place so that it can be installed into the original position.



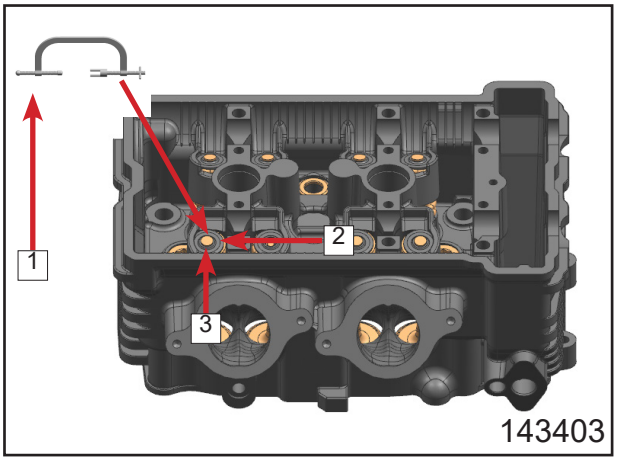
Put special tool: valve spring compressing tool [1] in the center [2] of valves as picture shows.

⚠Warning: Wear goggles all the way during valve spring removal. Be caution because the spring may pop out due to high pressure when removing it.



Install special tool: valve spring compressing tool [1] on valve spring upper seat [3] as picture shows. Tighten it to compress the spring.
Remove valve clip [2] with tweezers.
Loose valve spring compressing tool [1].
Remove valve spring upper seat [3].

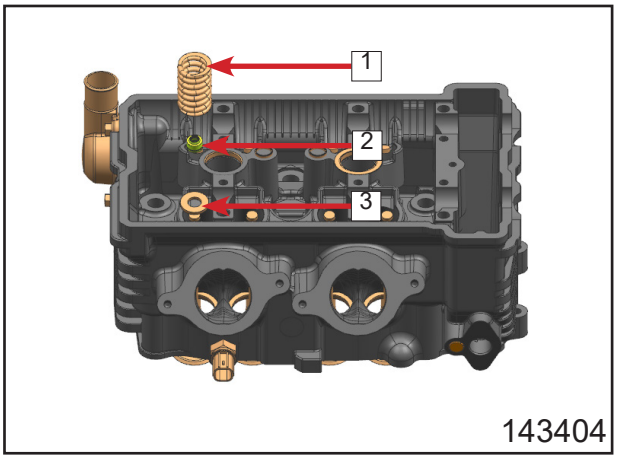
⚠Note: The removed valve and related parts should be marked and put together in case of getting mixed.



Remove spring [1].
Remove valve stem seal ring assy [2].
Remove valve spring lower seat [3].

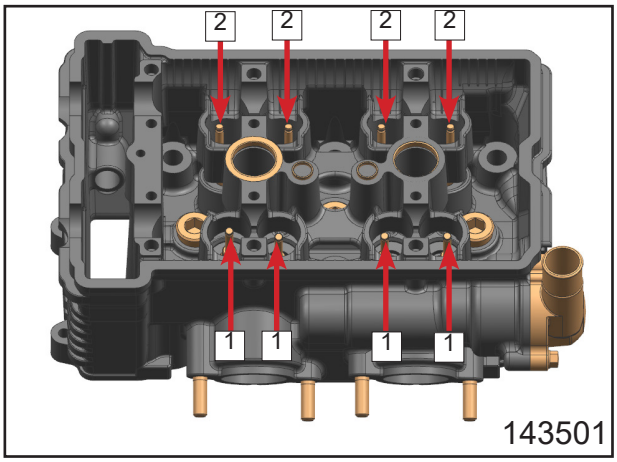
⚠Note: Replace with new seal rings after every removal. The removed seal rings are sorted into waste.

⚠Note: The removed valve and related parts should be marked and put together in case of getting mixed.

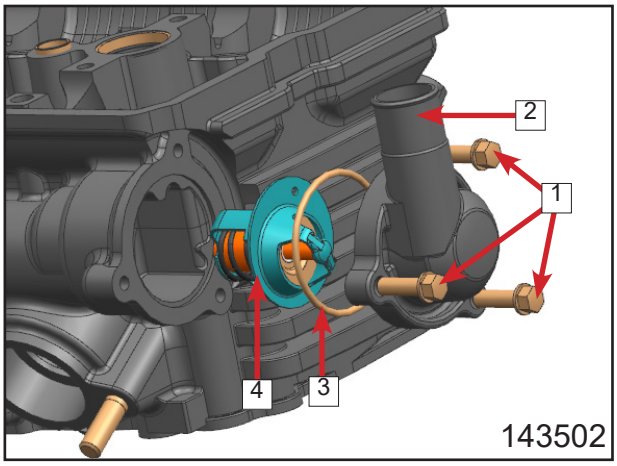


Compress exhaust valves [1]. Remove exhaust valves [1] from other side.
Compress intake valves [2]. Remove intake valves [2] from other side.

⚠Note: The removed valve and related parts should be marked and put together in case of getting mixed.



Remove M6 bolts [1].
Remove thermostat cover [2].
Remove o-seal ring [3].
Remove thermostat [4].



14.5.6 Valve Guide Pipe Removal

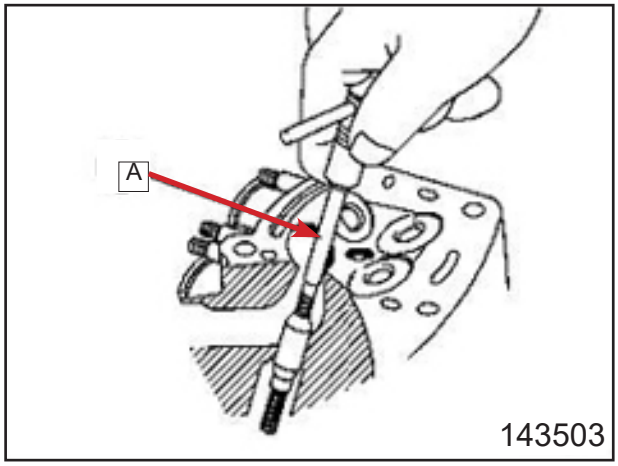
Removal

Remove valve (refer to Valve Removal section).
Remove soil seal and spring seat.

Heat valve guide pipe nearby area to 120°C~150°C, slightly knock the valve guide shaft head [A] to remove the valve guide pipe.

⚠Warning: Do not heat the cylinder head directly. Otherwise, it will cause deformation. Soak the cylinder into the oil and heat the oil, in order to heat the cylinder head indirectly.

Special tool: valve pipe guide shaft φ4.5



14.5.7 Cylinder Head Wear

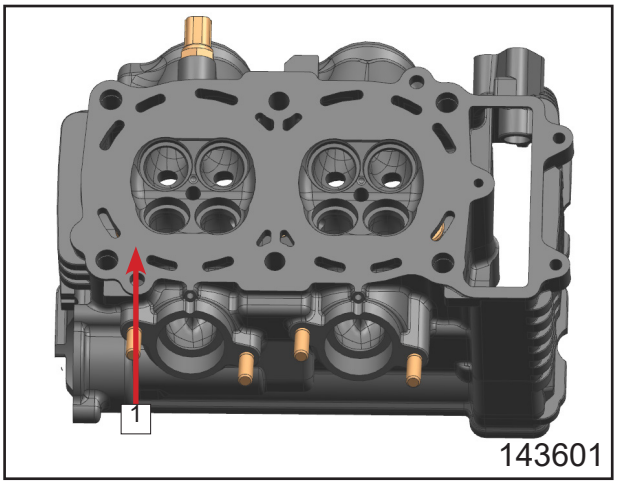
Cylinder Head Inspection

Put a parallel rule under the different positions under cylinder head lower surface [1]. Measure the clearance between parallel rule and cylinder head with feeler gauge.

Cylinder head flatness service limit: 0.05 mm

Replace a new cylinder head if beyond service limit.

If the flatness is less than service limit, wipe cylinder head lower surface [1] for service with sandpaper that is fixed on a tablet (first use #200 sandpaper, then #400).



Valve Clean

Rotate the reamer clockwise until it can rotate freely in valve guide pipe. Never rotate counter clockwise, or the reamer may be dull.

Clean the valve guide pipe.

Tool: Valve guide pipe reamer φ4.5

Valve/Valve Guide Pipe Clearance Measurement (Swing Method)

Insert a new valve [A] into guide pipe [B]. Place the dial gauge perpendicular to valve stem and close to cylinder head connecting surface as much as possible.

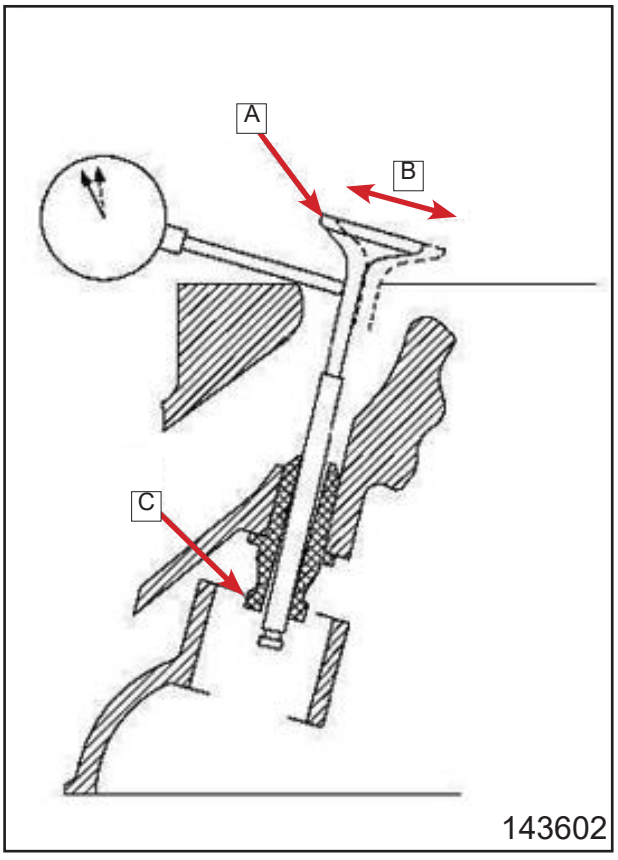
Swing the valve forward and backward [C] to measure the clearance between valve and valve guide pipe.

Repeat several times to measure. Replace valve guide pipes if beyond service limit.

⚠Note: The measurement valve is not the exact clearance, because the measuring point is on the valve stem.

Valve/valve guide pipe clearance standard
Exhaust: 0.07 mm~0.14 mm
Intake: 0.02 mm~0.08 mm

Service limit
Exhaust: 0.27 mm
Intake: 0.22 mm



Valve Seat Ring Inspection

Remove valve (refer to Valve Removal section).

Inspect valve [B] and the seal surface [A] of valve seat ring [C].

Measure the outer diameter of valve seat ring [D].

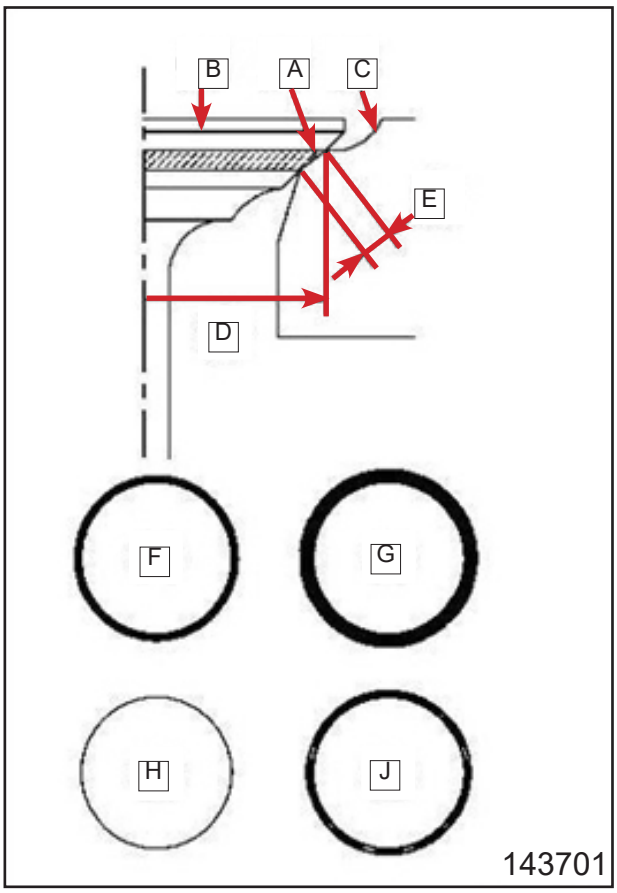
Service valve seat ring if outer diameter is too large or small.

Valve seat ring outer diameter standard
Exhaust: 26.6 mm~26.7 mm
Intake: 32.6 mm~32.7 mm

Measure the valve seat seal surface width [E] of no carbon deposition with slide caliper.

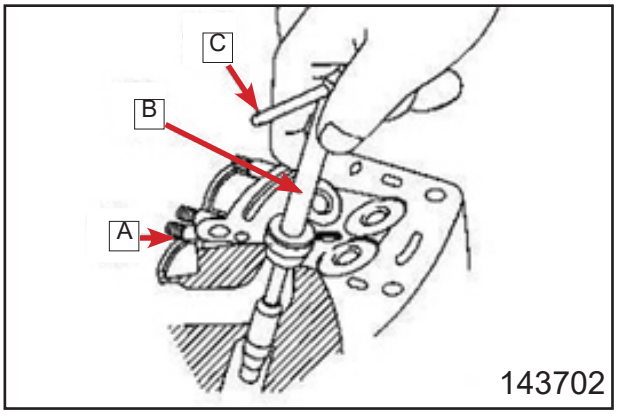
[F] is proper. If it is too wide [G], too narrow [H] or uneven [J], service valve seat ring.

Valve seat ring outer diameter standard
Exhaust: 0.9 mm~1.1 mm
Intake: 0.9 mm~1.1 mm



Valve Seat Ring Service

Tool: valve seat ring knife [A], Holding shaft [B] and lever [C]

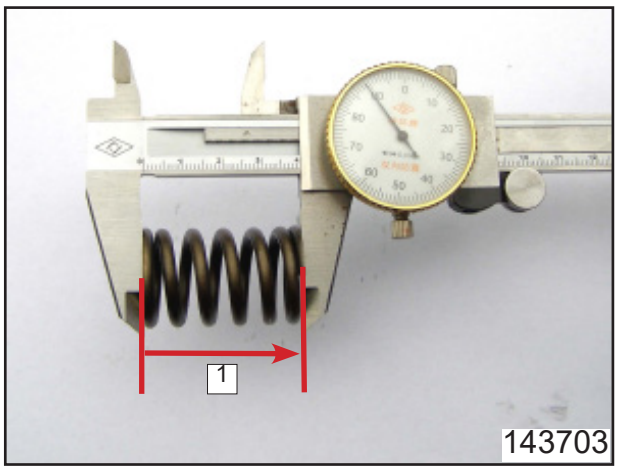


Valve Spring

Valve spring is used to strengthen the seal effect between valve and valve seat. Spring elasticity reduce will cause the engine output power reduce and valve noise.

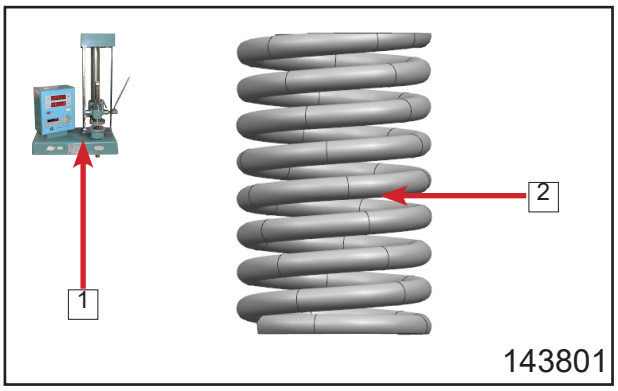
Measure spring free length. Replace if less than service limit.

Valve spring free length standard: 41.6 mm



Use spring scales [1] to measure the spring [2] elastic force when compressed to specific length. Replace if beyond standard.

When compressed to 38.4 mm, exhaust valve closed, the spring force is 103 N~121 N
When compressed to 30.5 mm, exhaust valve open, the spring force is 422 N~466 N
When compressed to 29.8 mm,exhaust valve open, the spring force is 455 N~503 N



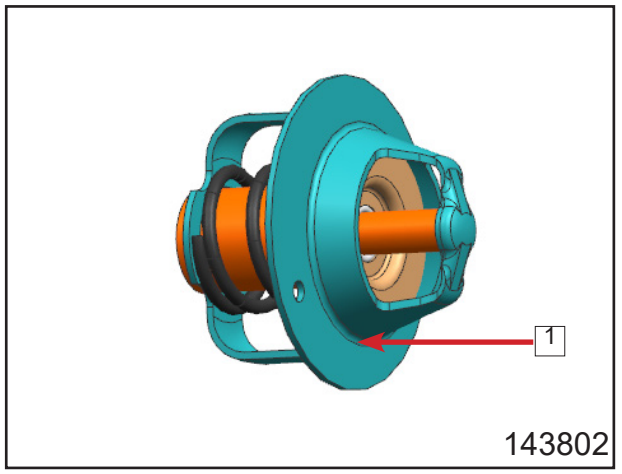
143801

Measure spring lean value. Replace if beyond service limit.

Spring lean service limit: 2°

Thermostat Inspection

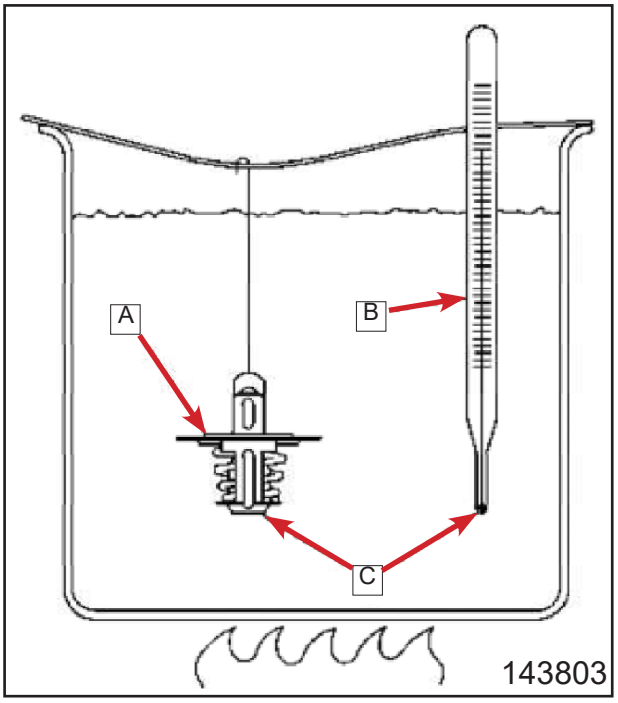
Remove thermostat [1] and inspect it at room temperature.
Replace with a new thermostat if the valve opens.



143802

To inspect the valve open temperature, soak the thermostat [A] into the container full of water, and gradually heat the water.
The thermostat has to be immersed into the water, but do not touch container wall or bottom. Place a standard temperature gauge [B] into the water at the same level [C] with the thermostat. The gauge can not touch the container neither.

Replace if the value is beyond the standard.

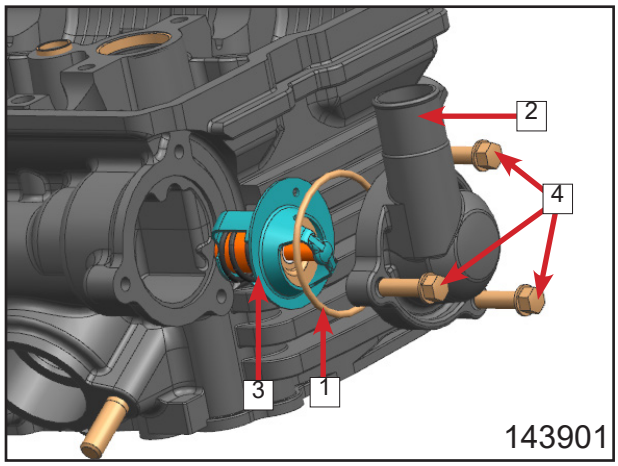


143803

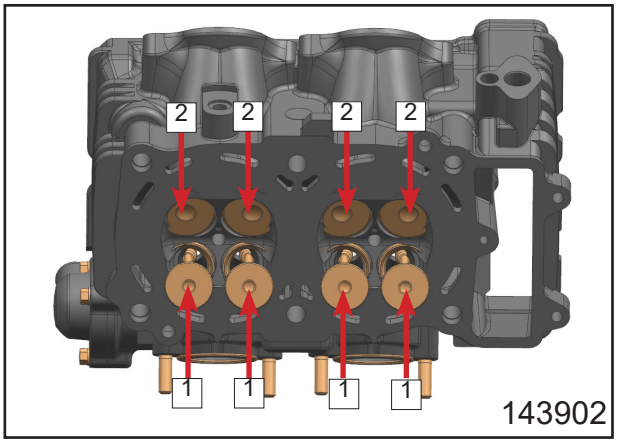
Thermostat valve open temperature
Initial open: 70°C~74°C
Full open: 83°C~87°C

Cylinder Head Assy Assembly

Install o-seal ring [1] on thermostat cover [2].
Install thermostat [3].
Install M6 bolts [4].

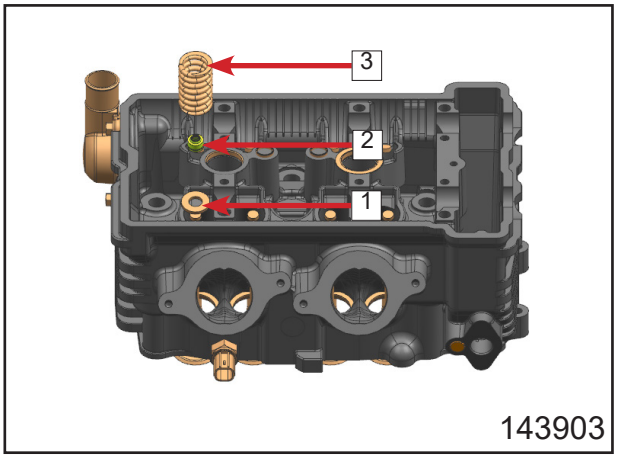


Install air exhaust valves [1] according to the records.
Install air intake valves [2] according to the records.



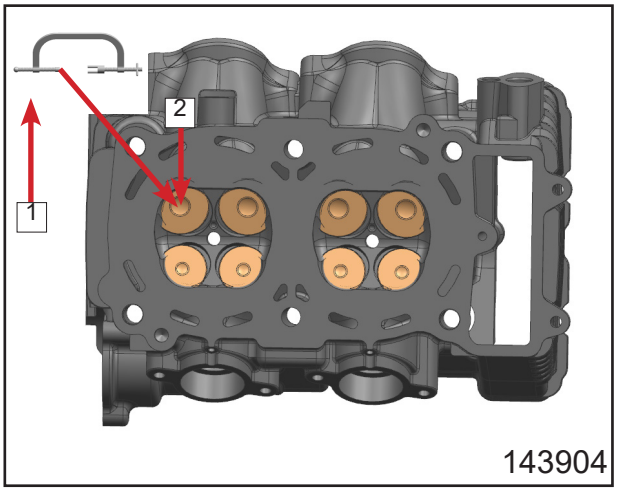
According to records, install valve spring lower seat [1].
Install valve stem seal ring assy [2].
Install valve spring [3].

⚠Note: Replace with new seal rings after every removal. The removed seal rings are sorted into waste.

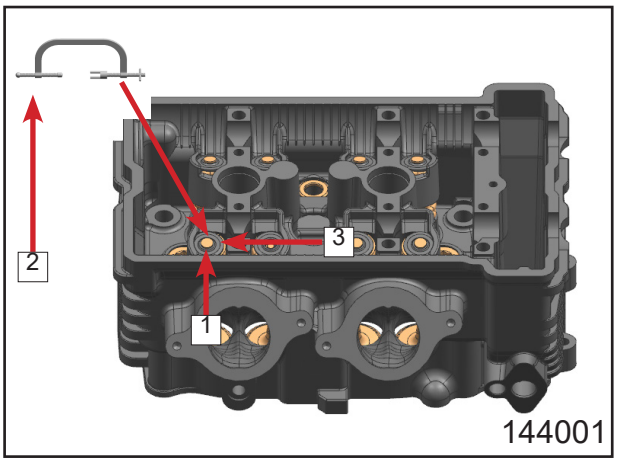


Put special tool: valve spring compressing tool [1] in the center [2] of valves as picture shows.

⚠Warning: Wear goggles all the way during valve spring removal. Be caution because the spring may pop out due to high pressure when removing it.

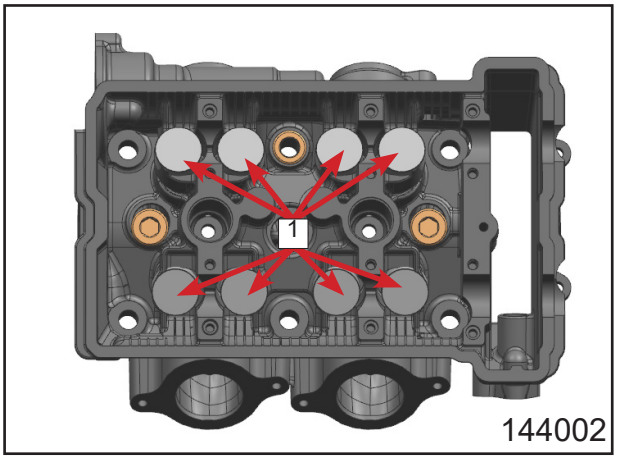


According to records, install valve spring upper seat [1].
Install special tool: valve spring compressing tool [2] on valve spring upper seat [1] as picture shows. Tighten it to compress the spring.
Install valve clip [3] with tweezers.
Loose valve spring compressing tool [2] after the clip is installed.



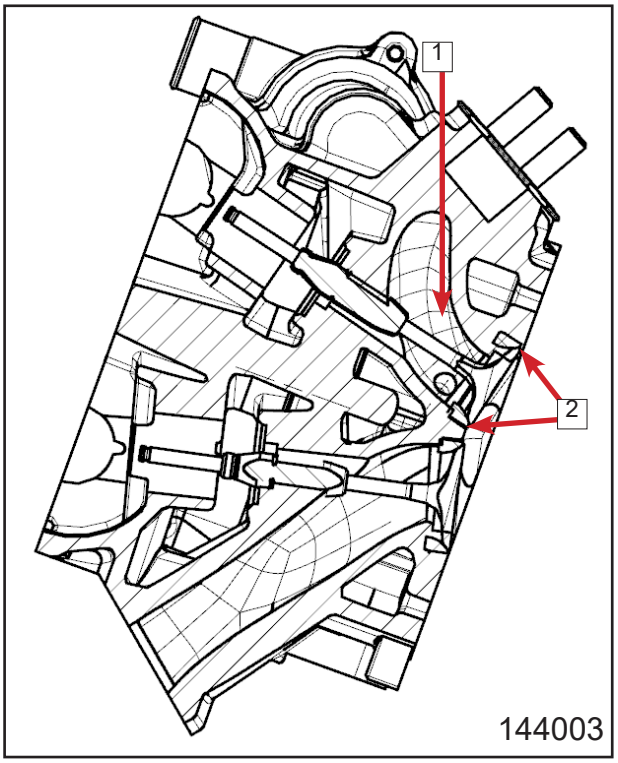
144001

Install tappets [1] into the original positions according to records.



144002

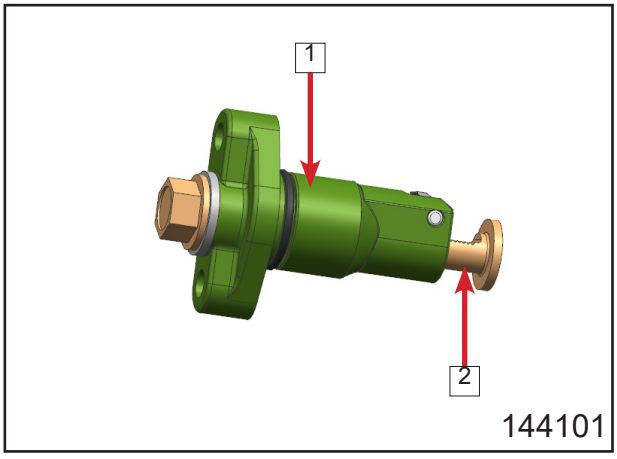
Cylinder head sealing inspection: Inject cleaning agent into air intake/exhaust passage [1]. Wait for a while to check whether there is leaking from valve seat [2] .



144003

14.5.8 Timing Tensioner Inspection

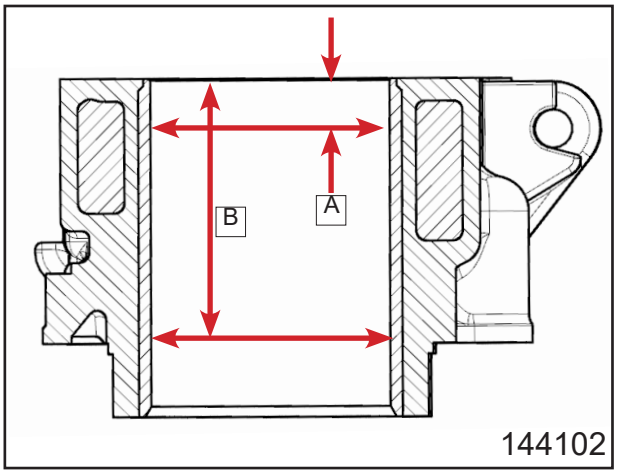
Removal procedures refer to Engine Disassembly section.
Inspect tensioner [1] for damage and smooth performance. Replace if defects below occur.
Method:
1. Compress the tensioner arm [2] to the end with hand.
2. Loose the arm, inspect whether the tensioner arm [2] can return gently and smoothly. Replace if the return is rough.
Inspect whether chain tensioner arm can return smoothly or have scratches or not. Replace if necessary.



144101

14.5.9 Cylinder Body Inspection

Cylinder body removal/installation procedures refer to Engine Disassembly/ Assembly sections.
Cylinder head has different wear degree in different directions. Measure at four points as picture show. Replace cylinder body if any measuring point is beyond service limit.
10 mm [A]
60 mm [B]



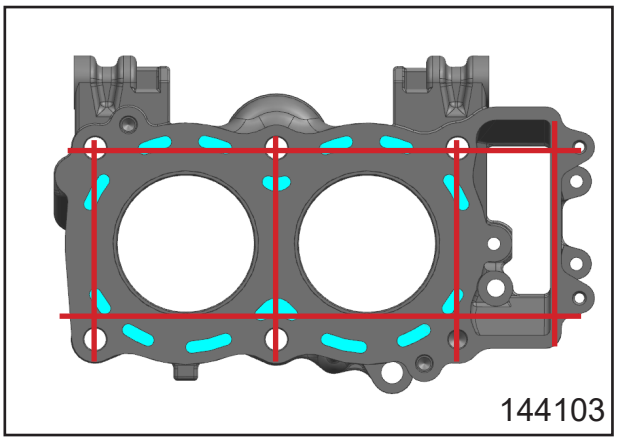
144102

Cylinder body inner diameter
Standard: 83.008 mm~83.026 mm
Service limit: 83.1 mm

Cylinder Body Deformation
Measure the flatness of cylinder sealing surface with straight edge knife and feeler gauge at different measuring points. Replace the cylinder body if any value is beyond the service limit.

Cylinder body flatness service limit: 0.03 mm

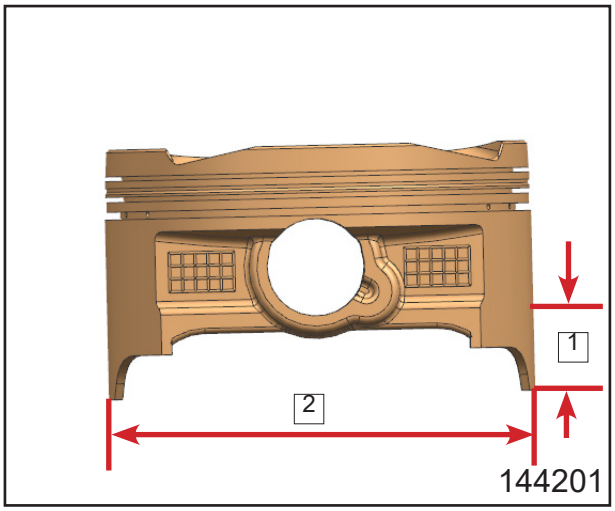
⚠Note: Replace with new piston rings when replacing cylinder body.


144103

14.5.10 Piston Assy Inspection

Removal/Installation procedures refer to Engine Disassembly/Assembly sections.
Measure piston outer diameter [2] at different positions which are perpendicular to piston pin and 10 mm [1] from the bottom. Replace if the measuring value is less than service limit.

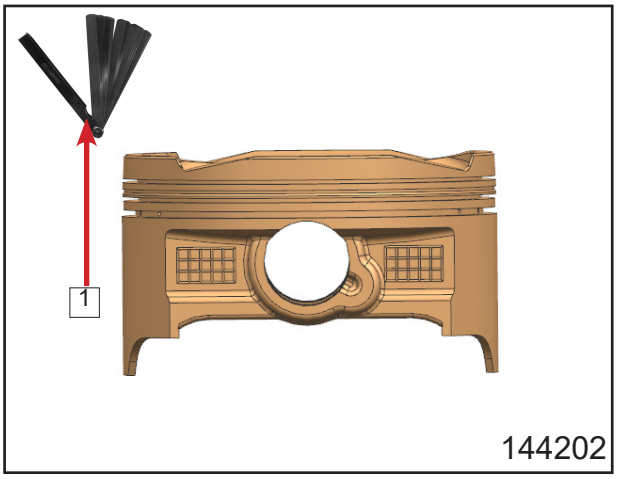
Piston diameter
Standard: 82.970 mm~82.988 mm
Service limit: 82.83 mm



According to the above measurement, figure out the fit clearance between piston and cylinder body. If the clearance is larger than 0.10 mm, replace cylinder body and/or piston.

Piston Ring/Groove Clearance
Piston rings have to be parallel to piston ring groove. Replace piston and all piston rings if not parallel.
Use feeler gauge [1] to measure the clearance between piston ring and groove for several times.

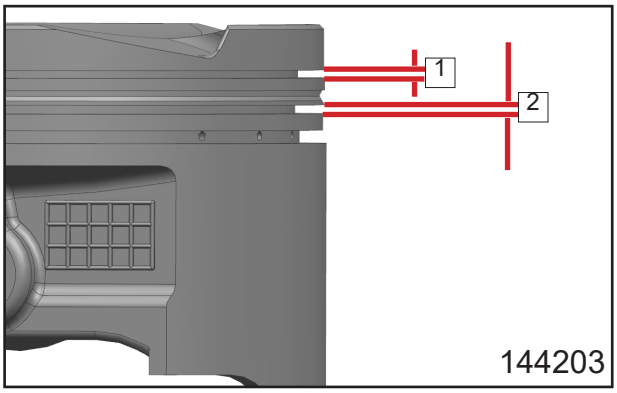
Clearance between first ring and groove
Standard: 0.03 mm~0.06 mm
Service limit: 0.16 mm
Clearance between second ring and groove
Standard: 0.02 mm~0.06 mm
Service limit: 0.16 mm



Piston Ring Groove Width
Measure piston ring groove width with slide caliper at different points.

First piston ring groove width [1]
Standard: 0.92 mm~0.94 mm
Service limit: 1.02 mm

Second piston ring groove width [2]
Standard: 1.01 mm~1.03 mm
Service limit: 1.11 mm



Replace piston if the width of any ring is beyond service limit.

Piston Ring Thickness

Measure piston ring thickness with dial gauge at different points.

First piston ring thickness [1]
Standard: 0.87 mm~089 mm
Service limit: 0.80 mm

Second piston ring thickness [2]
Standard: 0.97 mm~0.99 mm
Service limit: 0.90 mm

Replace piston if the thickness of any ring is beyond service limit.

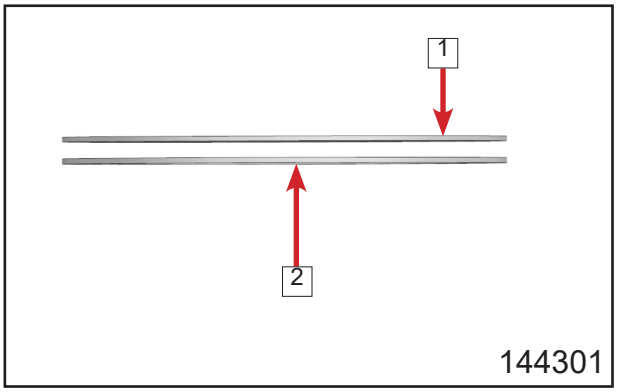
⚠Note: If new rings are used on old piston, inspect the ring groove for wear condition. If the groove surface is not parallel, replace piston.

Piston Ring Cut Clearance

Put piston ring [1] into cylinder body and fix it to the end, at which cylinder has minimum wear.

Measure piston ring cut clearance [2] with feeler gauge.

Replace all rings if clearance of any ring is beyond service limit.



144301

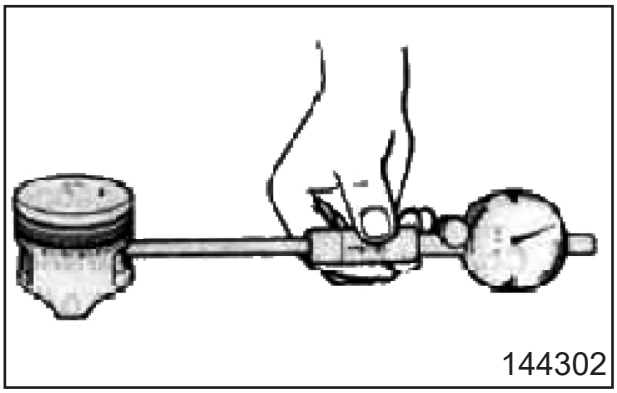
First piston ring cut clearance
Standard: 0.25 mm~0.40 mm
Service limit: 0.70 mm

Second piston ring cut clearance
Standard: 0.40 mm~0.55 mm
Service limit: 0.80 mm

Piston Pin and Pin Hole

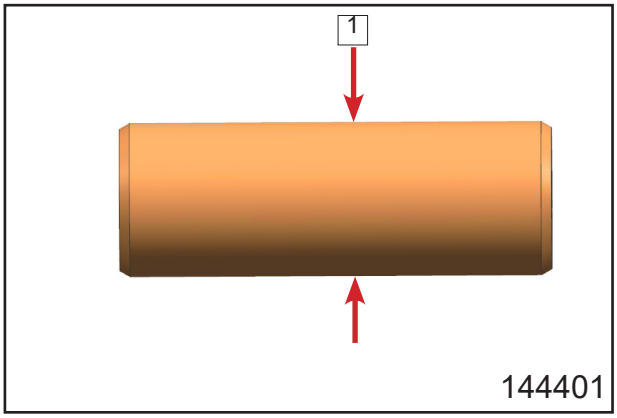
Measure piston pin hole inner diameter and outer diameter with dial gauge. Replace piston and piston pin together if beyond standard.

Piston pin hole inner diameter standard: 19.004 mm~19.010 mm


144302

Measure piston pin outer diameter [1] at three points.

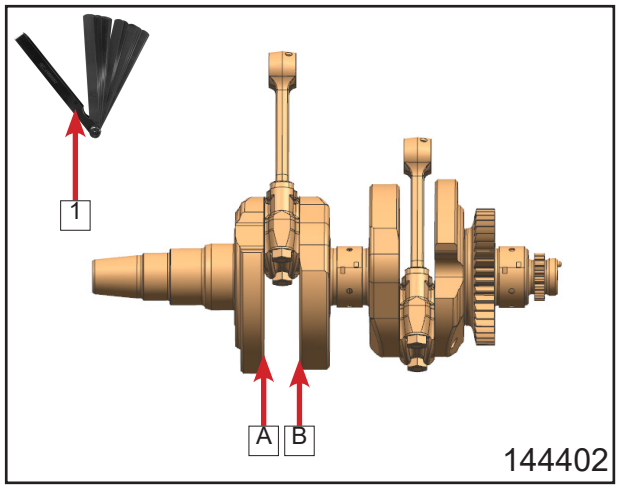
Piston pin outer diameter standard: 18.996 mm~19 mm



14.5.11 Camshaft Connecting Rod Assy Inspection
(Status 1)
Connecting Rod Big Side Clearance
Measurement: Push the big end closely to the shaft neck surface [A]. Insert the feeler gauge [1] between surface [B] and rod to measure the clearance.
Connecting Rod Bid Side Clearance Standard:

Standard	0.15 mm~0.30 mm
Service limit	0.50 mm

⚠Note: Replace with a new connecting rod and measure the clearance if beyond service limit. If the clearance is still out of standard, replace crankshaft.



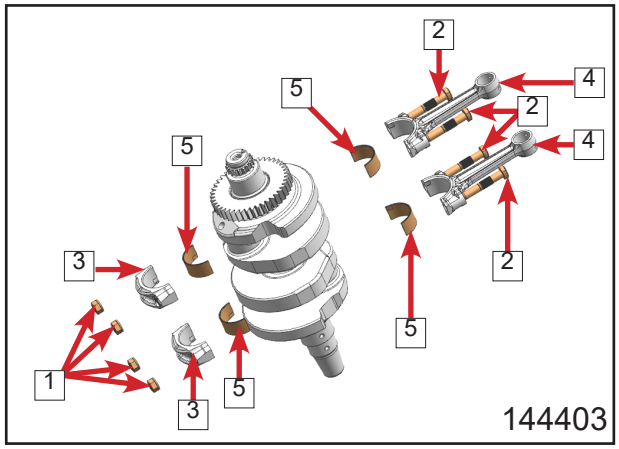
Disassembly
Remove connecting rod M9 nut [1].
Remove connecting rod bolts [2].
Remove connecting rod cap [3].
Remove connecting rod body [4].
Remove the plain bearing [5] from connecting rod cap [3] and body [4].

⚠Waring: Pay attention during connecting rod removal, in case it breaks the shaft neck.

⚠Note: Mark connecting rod cap and body after removal.

⚠Note: If not worn or damaged, plain bearings [3] are not necessary to remove.

⚠Note: Connecting rod bolt tighten method: 29 N·m+90°. Final torque: 65 N·m~90 N·m.

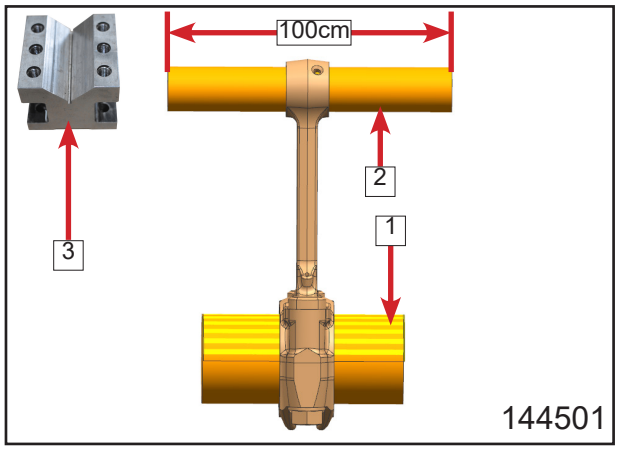


Connecting Rod Parallelism

Remove plain bearings and install connecting rod cap.
Insert mandrel [1] into big end hole.
Insert mandrel [2] (100 mm long) into small end hole.
Put connecting rod big end mandrel on V-block [3]. Plumb it and measure mandrel [2] height on both sides, the height difference is the parallelism.

⚠Note: Replace if parallelism is beyond service limit.

Parallelism service limit: 0.2 mm

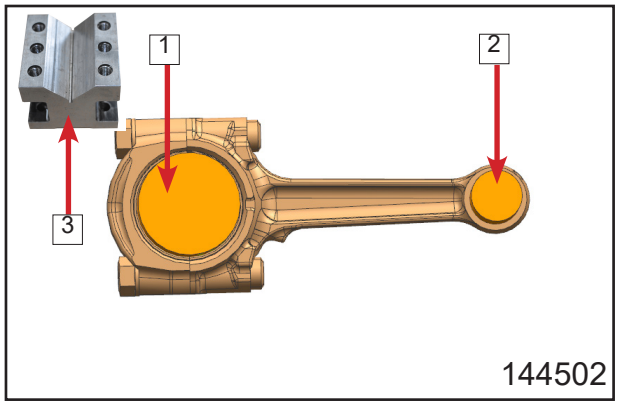


Connecting Rod Bend

Put connecting rod big end mandrel [1] on V-block [3].
Measure the mandrel [2] height difference, which is the bend value.

Bend service limit: 0.2 mm

⚠Note: Replace if bend value is beyond service limit.



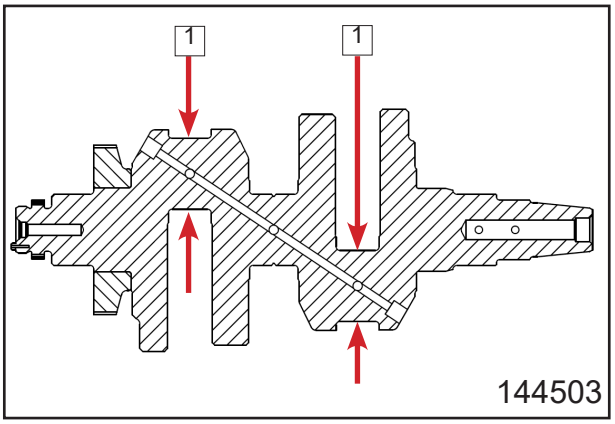
Crankshaft Rod Journal/Bearing Shell Wear

Measure crankshaft rod journal diameter [1] with micrometer.
Specification:

Standard	37.985 mm~38.00 mm
Service limit	37.97 mm

⚠Note: Replace if diameter is beyond service limit.

⚠Note: If measured diameter is not less than service limit but coincide the marks, re-mark signs.



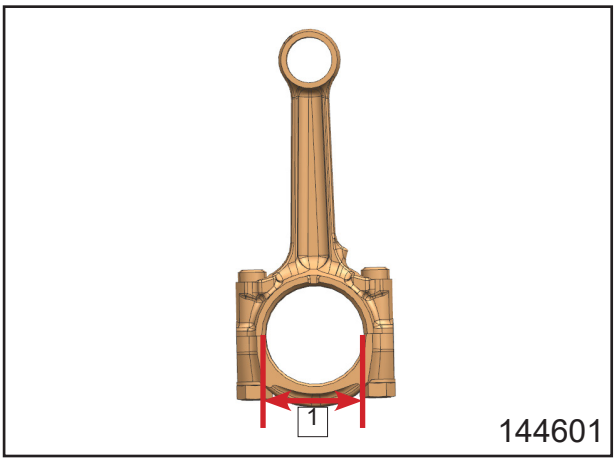
Connecting rod journal	
Journal size	Mark
ø37.985~ø37.990	3
ø37.991~ø37.995	2
ø37.996~ø38.000	1
Install on second crankshaft outer circle	

Measure connecting rod big end hole diameter [1]. It should coincide the mark. Otherwise, re-mark.

Connecting rod big end hole diameter mark	
1	41.00 mm~41.008 mm
2	41.009 mm~41.016 mm

After connecting rod plain bearing installation, measure connecting rod big end hole diameter and record the value. Clearance between connecting rod and crankshaft journal plain bearing:
0.032 mm~0.042 mm

⚠Note: The weight difference between two chosen connecting rods should be ≤2g.

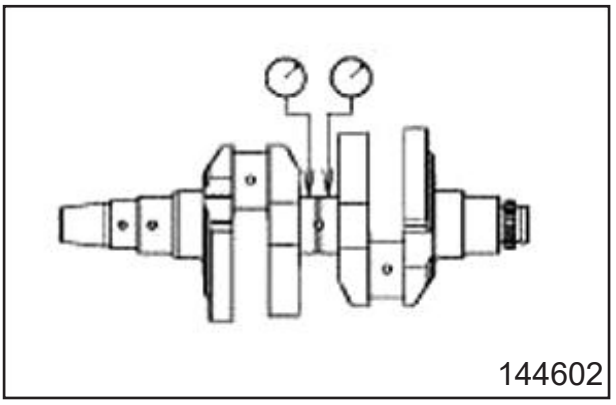


Crankshaft Runout Inspection

Measure crankshaft runout value.

Crankshaft runout standard	
Standard	0.02mm
Service limit	0.05 mm

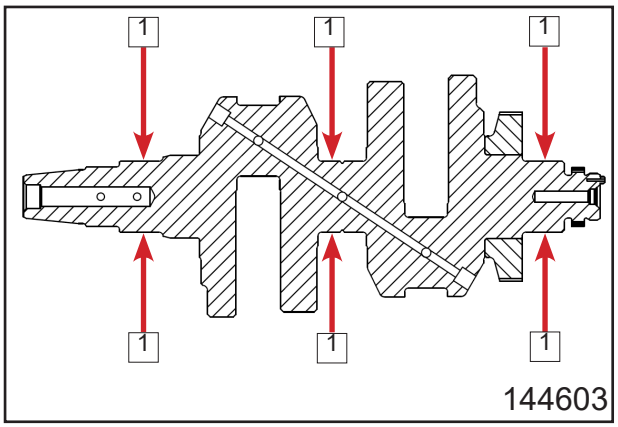
⚠Note: Replace with a new crankshaft if beyond service limit.



Crankshaft Main Journal

Measure crankshaft main journal [1] diameter with micrometer.

Crankshaft main journal diameter	
Standard	37.984 mm~38.00 mm
Service limit	37.97 mm



⚠Note: Replace with a new crankshaft if beyond service limit.

⚠Note: If measured diameter is not less than service limit but coincide the marks, re-mark signs.

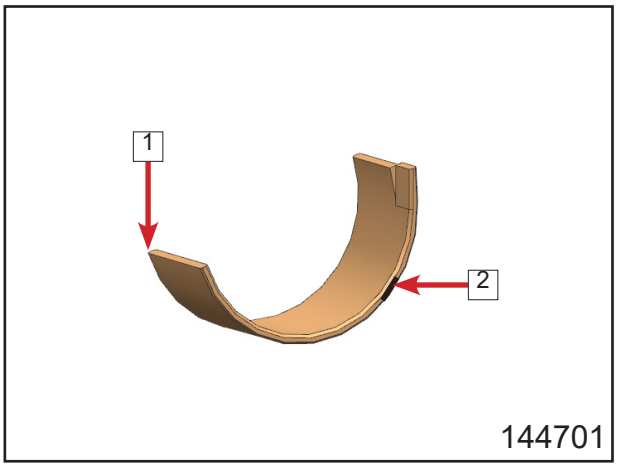
Crankshaft main journal diameter mark	
2	37.984 mm~37.992 mm
1	37.993 mm~38.000 mm

Assemble the upper and lower crankcase according to 14.3.6 Crankcase Assembly section (without installing other parts). Measure the crankcase hole diameter vertically. It should coincide the mark. Otherwise, re-mark.

Crankcase main shaft hole diameter mark	
Yellow	41.000 mm~41.008 mm
Green	41.008 mm~41.016 mm

According to the crankshaft main journal mark and crankcase main shaft hole, choose main plain bearing [1]. Color mark [2].

Crankcase main shaft hole/main journal/ main plain bearing		
Crankcase main shaft hole mark	Crankshaft main journal diameter mark	Main plain bearing color
Yellow	1	Brown
Yellow	2	Black
Green	1	
Green	2	Blue



144701

14.5.12 Balance Shaft/Plain Bearing Wear

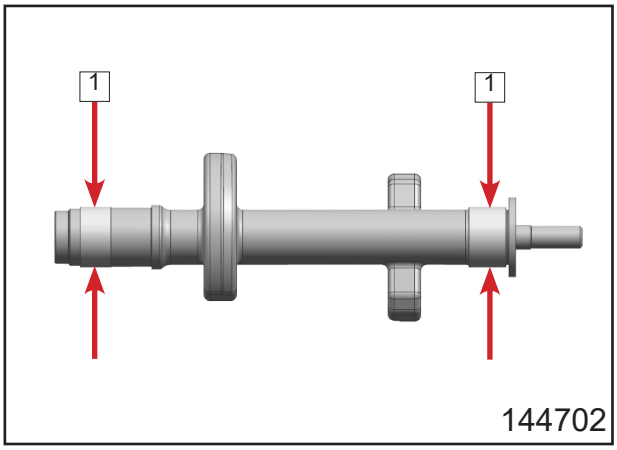
Measure balance shaft journal [1] diameter with micrometer.

Balance shaft journal diameter	
Standard	27.987 mm~28.000 mm
Service limit	27.96 mm

⚠Note: Replace with a new balance shaft if beyond service limit.

⚠Note: If measured diameter is not less than service limit but coincide the marks, re-mark signs.

Balance shaft journal diameter mark	
1	27.987 mm~27.993 mm
2	27.993 mm~28.000 mm



144702

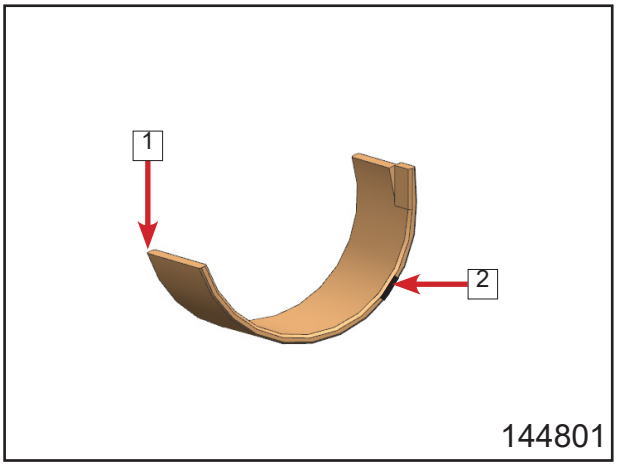
Balance Shaft

Measure balance shaft hole diameter. It should coincide the mark. Otherwise, re-mark.

Balance shaft hole diameter mark	
Yellow	31.000 mm~31.008 mm
Green	31.008 mm~31.016 mm

According to the balance shaft journal mark and balance shaft hole, choose main plain bearing [1]. Color mark [2].

Balance shaft hole/balance shaft journal/ balance shaft plain bearing		
Balance shaft hole mark	Balance shaft journal diameter mark	Balance shaft plain bearing color
Yellow	2	Brown
Yellow	1	Black
Green	2	
Green	1	Blue



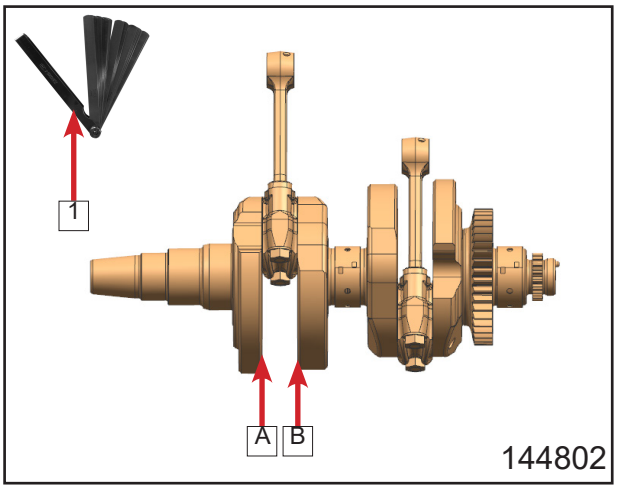
(Status 2)

Connecting Rod Big Side Clearance

Measurement: Push the big end closely to the shaft neck surface [A]. Insert the feeler gauge [1] between surface [B] and rod to measure the clearance.

Connecting Rod Bid Side Clearance Standard:

Standard	0.15 mm~0.30 mm
Service limit	0.55 mm



⚠Note: Replace with a new connecting rod and measure the clearance if beyond service limit. If the clearance is still out of standard, replace crankshaft.

Disassembly

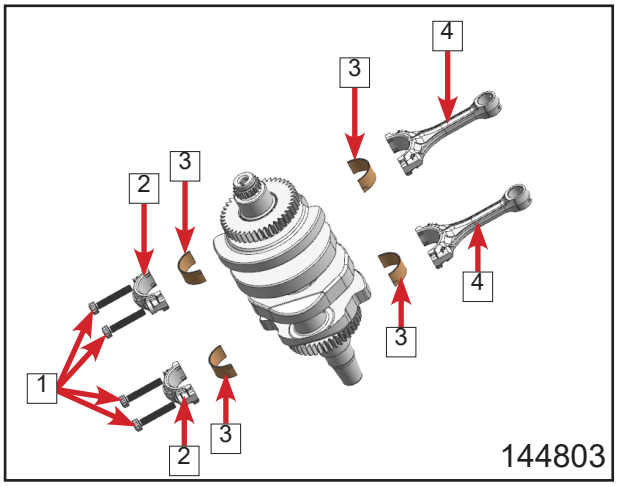
Remove connecting rod M9 nut [1].
Remove connecting rod bolts [2].
Remove connecting rod cap [3].
Remove connecting rod body [4].
Remove the plain bearing [5] from connecting rod cap [3] and body [4].

⚠Waring: Pay attention during connecting rod removal, in case it breaks the shaft neck.

⚠Note: Mark connecting rod cap and body after removal.

⚠Note: If not worn or damaged, plain bearings [3] are not necessary to remove.

⚠Note: Connecting rod bolt tighten method:20N·m+180°±5° for new bolt, 18N·m+180°±5° for old bolt. Connecting rod bolts can not be used more than three times.



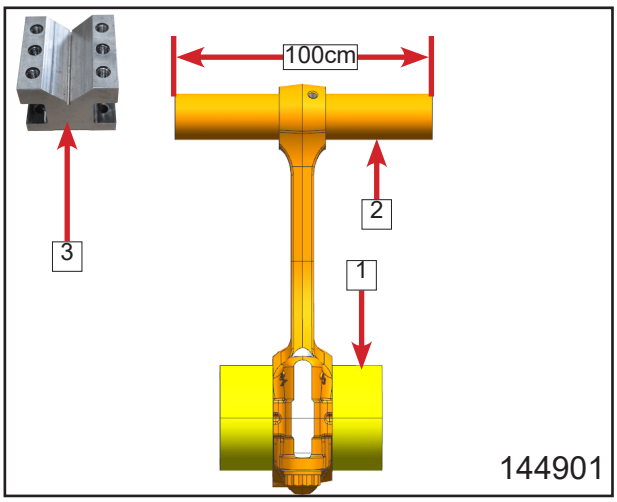
⚠Note: Loosen and tighten the connecting rod bolt, the diameter difference at 10° surface should be less than 0.01mm.

Connecting Rod Parallelism

Remove plain bearings and install connecting rod cap.
Insert mandrel [1] into big end hole.
Insert mandrel [2] (100 mm long) into small end hole.
Put connecting rod big end mandrel on V-block [3]. Plumb it and measure mandrel [2] height on both sides, the height difference is the parallelism.

⚠Note: Replace if parallelism is beyond service limit.

Parallelism service limit: 0.2 mm

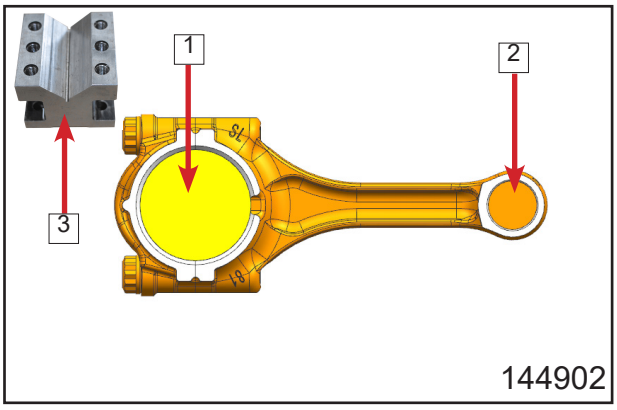


Connecting Rod Bend

Put connecting rod big end mandrel [1] on V-block [3].
Measure the mandrel [2] height difference, which is the bend value.

Bend service limit: 0.2 mm

⚠Note: Replace if bend value is beyond service limit.



Crankshaft Rod Journal/Bearing Shell Wear

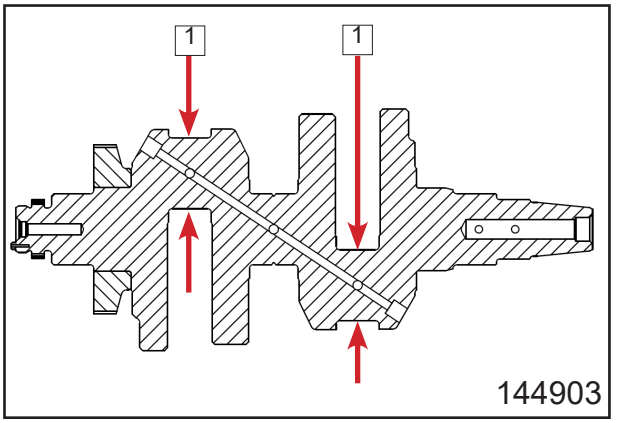
Measure crankshaft rod journal diameter [1] with micrometer.
Specification:

Standard	37.984 mm~38.00 mm
Service limit	37.97 mm

⚠Note: Replace if diameter is beyond service limit.

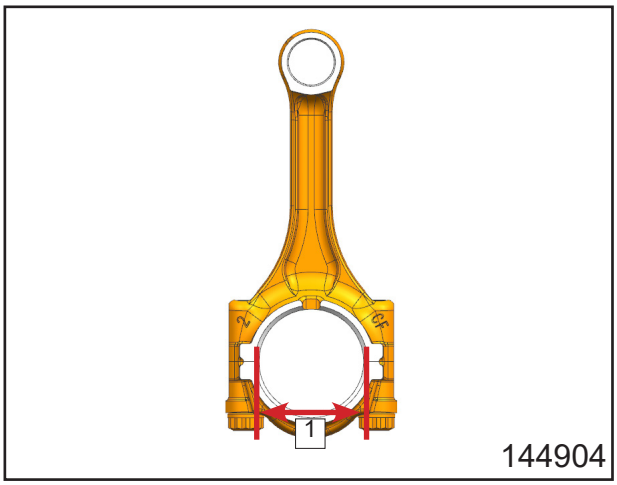
⚠Note: If measured diameter is not less than service limit but coincide the marks, re-mark signs.

Crankshaft rod journal diameter mark	
3	37.985 mm~37.990 mm
2	37.991 mm~37.995 mm
1	37.996 mm~38.000 mm



Measure connecting rod big end hole diameter [1]. It should coincide the mark. Otherwise, re-mark.

Connecting rod big end hole diameter mark	
1	41.000 mm~41.005 mm
2	41.005 mm~41.010 mm
3	41.010 mm~41.015 mm



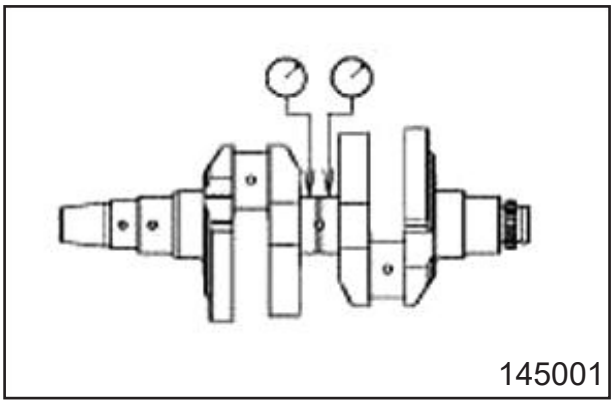
After connecting rod plain bearing installation, measure connecting rod big end hole diameter and record the value.
Clearance between connecting rod and crankshaft journal plain bearing:
0.032 mm~0.042 mm

⚠Note: The weight difference between two chosen connecting rods should be ≤2g.

Crankshaft Runout Inspection

Measure crankshaft runout value.

Crankshaft runout standard	
Standard	0.02mm
Service limit	0.05 mm

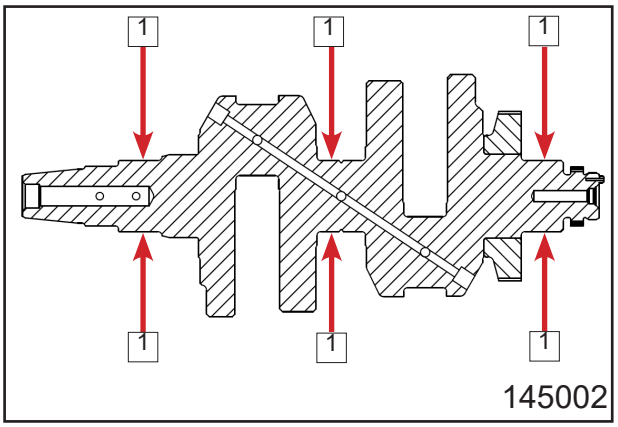

145001

⚠Note: Replace with a new crankshaft if beyond service limit.

Crankshaft Main Journal

Measure crankshaft main journal [1] diameter with micrometer.

Crankshaft main journal diameter	
Standard	37.984 mm~38.00 mm
Service limit	37.97 mm



145002

⚠Note: Replace with a new crankshaft if beyond service limit.

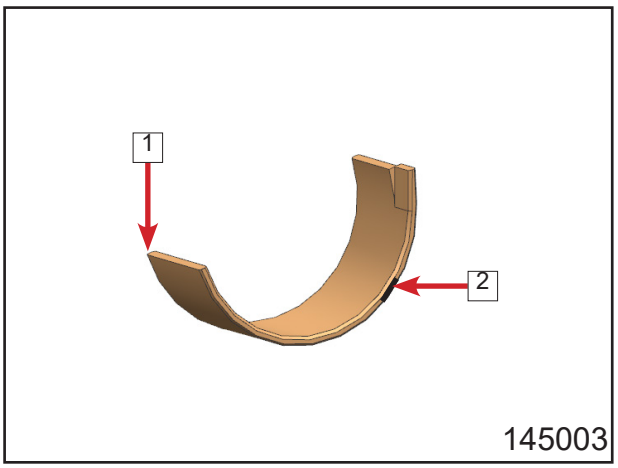
⚠Note: If measured diameter is not less than service limit but coincide the marks, re-mark signs.

Crankshaft main journal diameter mark	
2	37.984 mm~37.992 mm
1	37.993 mm~38.000 mm

Measure crankcase main shaft hole diameter. It should coincide the mark. Otherwise, re-mark.

Crankcase main shaft hole diameter mark	
1	41.00 mm~41.008 mm
2	41.009 mm~41.016 mm

According to the crankshaft main journal mark and crankcase main shaft hole, choose main plain bearing [1]. Color mark [2].



145003

Crankcase main shaft hole/main journal/ main plain bearing		
Crankcase main shaft hole mark	Crankshaft main journal diameter mark	Main plain bearing color
Yellow	1	Brown
Yellow	2	Black
Green	1	
Green	2	Blue

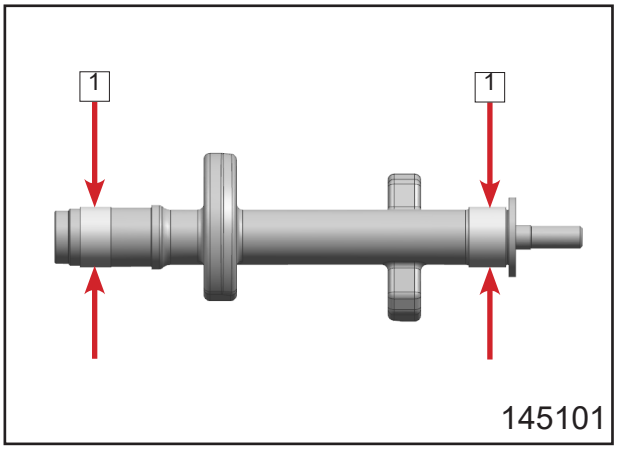
14.5.13 Balance Shaft/Plain Bearing Wear

Measure balance shaft journal [1] diameter with micrometer.

Balance shaft journal diameter	
Standard	27.987 mm~28.000 mm
Service limit	27.96 mm

⚠Note: Replace with a new balance shaft if beyond service limit.

⚠Note: If measured diameter is not less than service limit but coincide the marks, re-mark signs.



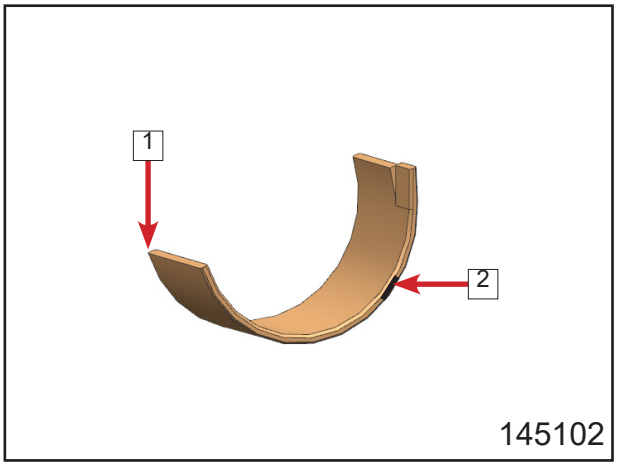
Balance shaft journal diameter mark	
1	27.987 mm~27.993 mm
2	27.994 mm~28.000 mm

Balance Shaft

Measure balance shaft hole diameter. It should coincide the mark. Otherwise, re-mark.

Balance shaft hole diameter mark	
1	31.000 mm~31.008 mm
2	31.009 mm~31.016 mm

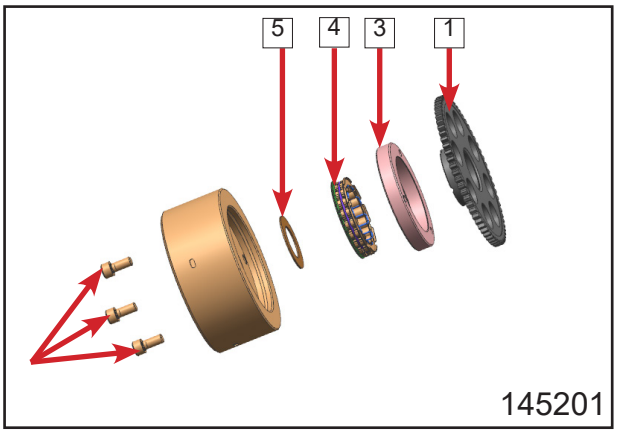
According to the balance shaft journal mark and balance shaft hole, choose main plain bearing [1]. Color mark [2].



Balance shaft hole/balance shaft journal/ balance shaft plain bearing		
Balance shaft hole mark	Balance shaft journal diameter mark	Balance shaft plain bearing color
Yellow	2	Brown
Yellow	1	Black
Green	2	
Green	1	Blue

14.5.14 Overriding Clutch Inspection
Disassembly
Remove starter big gear assy [1].
Remove M8 inner hex screws [2].
Remove one-way clutch seat [3].
Remove one-way clutch assy [4].
Remove washer [5].

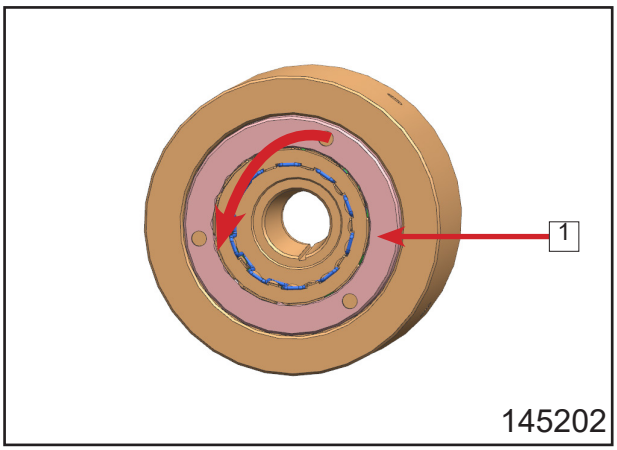
⚠Note: Never try to knock the AC generator rotor. Otherwise, magnet will lose its magnetism.



145201

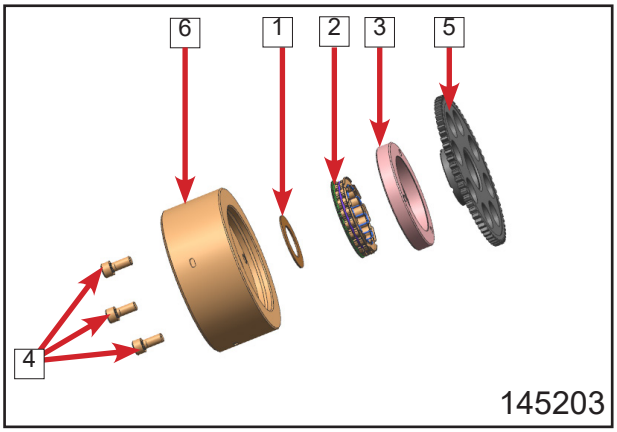
Inspection
Turn overriding clutch assy gear [1] with hand. It should rotate counterclockwise freely, but not clockwise.

If overriding clutch assy can not work or makes noise, disassemble and inspect overriding clutch parts for damage. Replace if necessary.



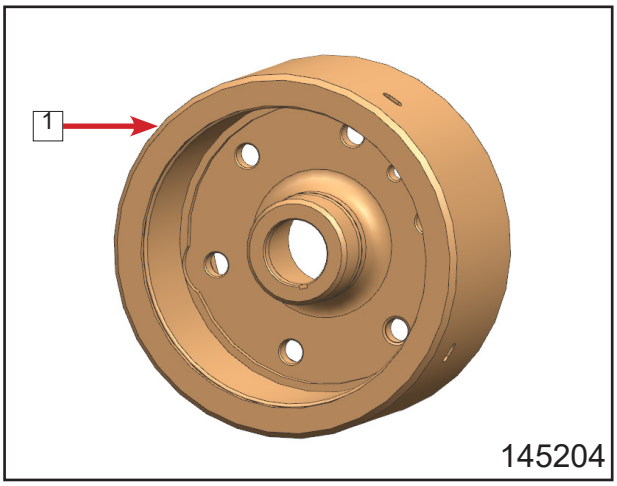
145202

Assembly
Install one-way clutch assy [2] on seat [3].
Make sure the counter-clockwise direction.
Put the washer [1] under magneto rotor lower surface. Install one-way clutch assy [2] on rotor [6]. Install M8 inner hex screws [4] (with 243 thread locker).
Tighten torque: 34 N·m
Apply some grease on one-way clutch assy [2] inner side and install starter big gear [5].



145203

14.5.15 Magneto Rotor Inspection
Inspect rotor [1] inside for scratch or other damage.
Inspect rotor [1] key groove for skewness or other damage.
Inspect rotor [1] outer ring teeth for lean or other damage.
Inspect woodruff key and key groove on crankshaft for wear or other damage.
Replace the parts above if severely damaged.



145204

14.5.16 Starter Driven Gear, Dual Gear and Shaft Inspection

Inspection

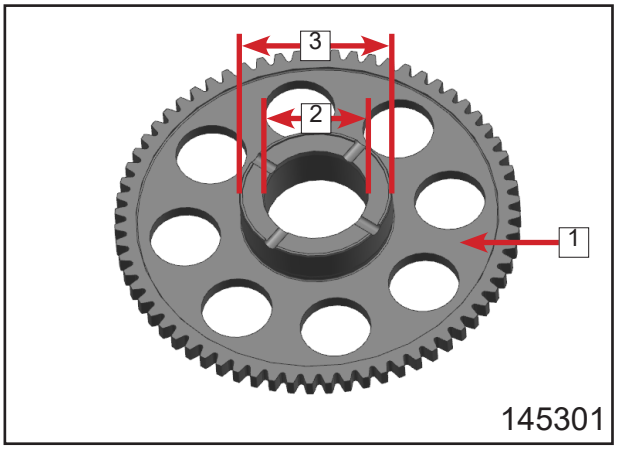
Inspect starter driven gear [1] for wear and damage.

-Measure starter driven gear [1] inner diameter and outer diameter.

Service limit:

Outer diameter [3]: 51.705 mm~51.718 mm
Inner diameter [2]: 32.025 mm~32.05 mm

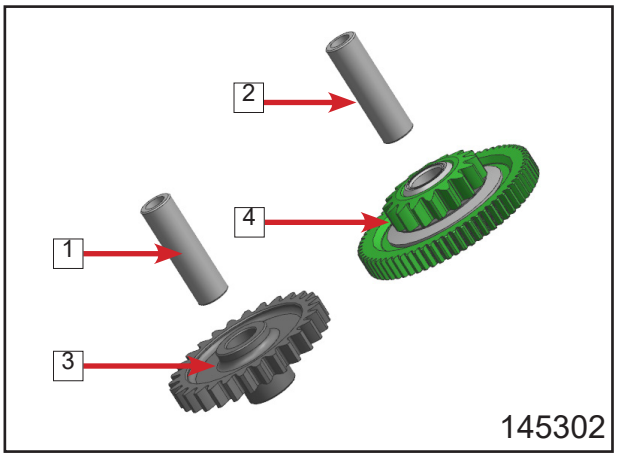
Replace starter driven gear [1] if beyond service limit.



145301

Inspect starter middle gear [3] and dual gear assy [4] for wear and damage. Replace if necessary.

Inspect middle gear shaft [1] and [2] for wear and damage. Replace if necessary.



145302

14.5.17 Magneto Stater

Disassembly

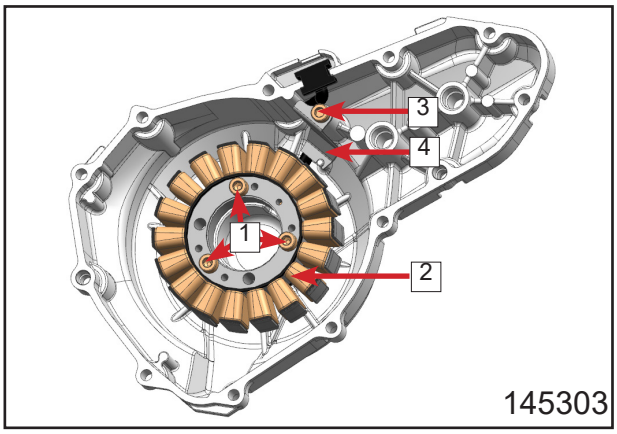
Remove M6 inner hex bolt [1].

Remove stater assy [2].

Remove M6 screws [3].

Remove wire-press plate [4].

Remove magneto stater [2].

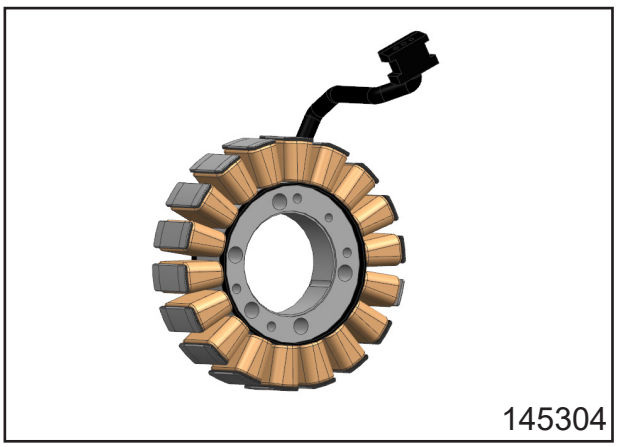


145303

Inspection

Inspect stater condition. Replace if broken.

Inspect coil for break, age or other damage. Replace if necessary.

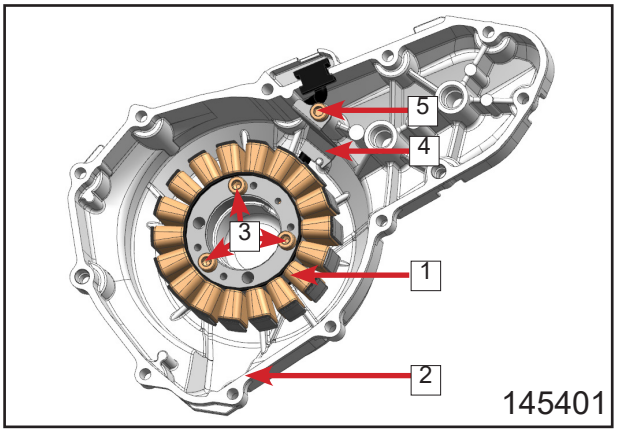

145304

Assembly

Install magneto stater [1] on engine LH side cover [2].

Install M6 inner hex bolt [3]. Install wire-press plate .

Install M6 screw [5].



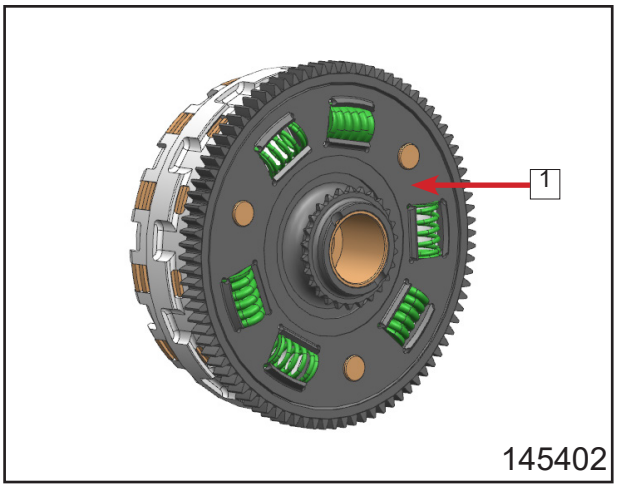
14.5.18 Clutch Assy Inspection

Housing Assy

-If inner damping springs get worn, it will cause waggle between gear and clutch housing, which makes noise. Replace primary driven gear assy [1] if the waggle is severe.

-Replace two gears if worn or damaged.

-Replace two gears if the noise is too loud.



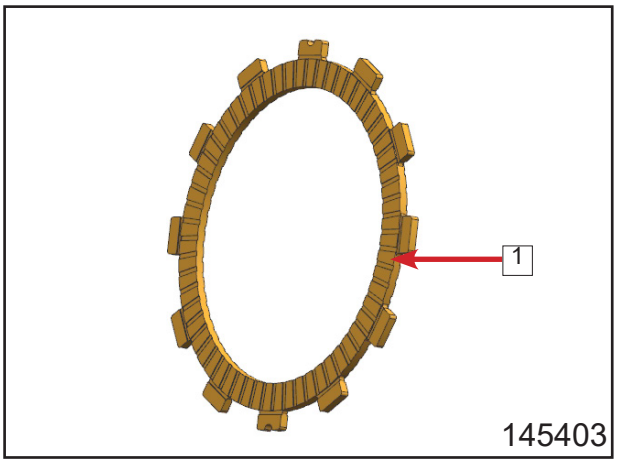
Friction Disc Assy

Inspect friction discs and steel plates for blocking, overheating (color changed) and other defects.

Measure friction disc [1] thickness at different positions.

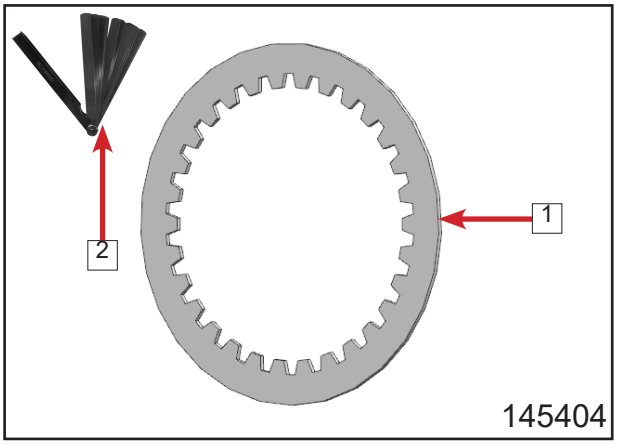
Replace if any disc gets broken or the thickness is beyond service limit.

Friction disc thickness	
Standard	2.95 mm~3.05 mm
Service limit	2.8 mm



Put every friction disc or steel plate on flatbed. Use feeler gauge [2] to measure the clearance [1] between flatbed and friction disc or steel plate. Such clearance is the friction disc or steel plate deformation value. Replace with new discs or plates if beyond service limit.

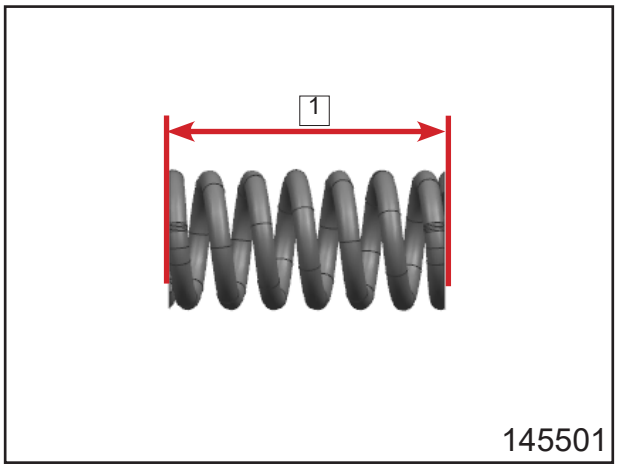
Friction disc and steel plate deformation	
Standard	0.15 mm or less
Service limit	0.3 mm



Clutch Press Spring

Measure clutch press spring [1] free length.
Replace if less than service limit.

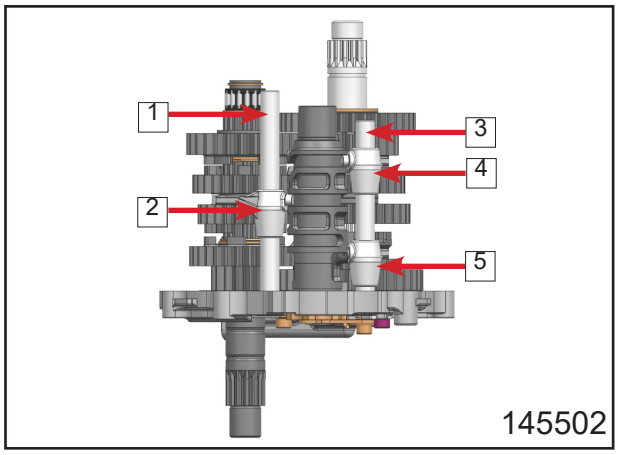
Clutch press spring free length	
Standard	33.6 mm±0.5 mm
Service limit	32.6 mm



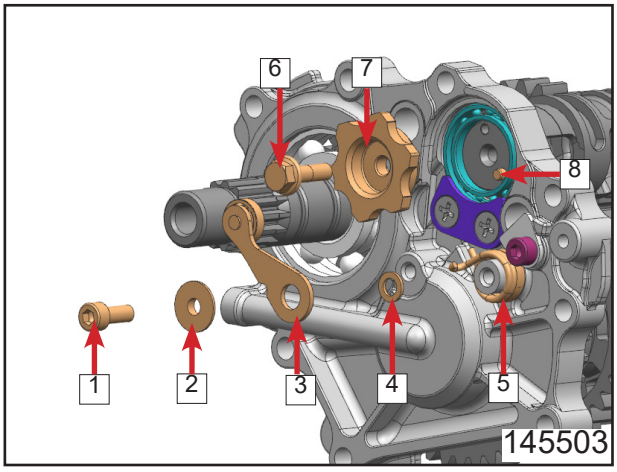
14.5.19 Transmission Case Inspection

Disassembly

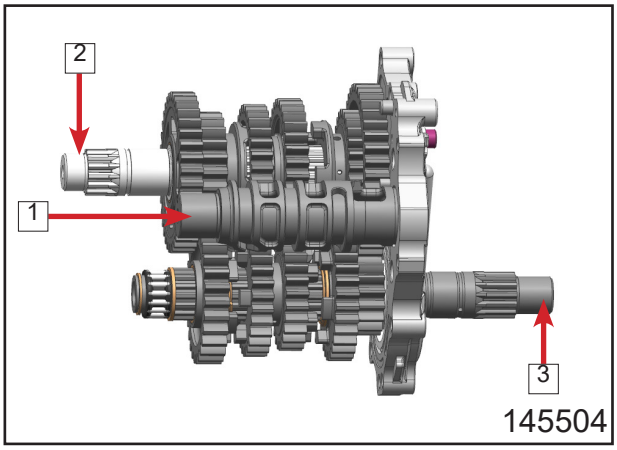
Remove main shaft fork shaft [1].
Remove main shift fork [2].
Remove countershaft fork shaft [3].
Remove countershaft shift fork [3] and [5].



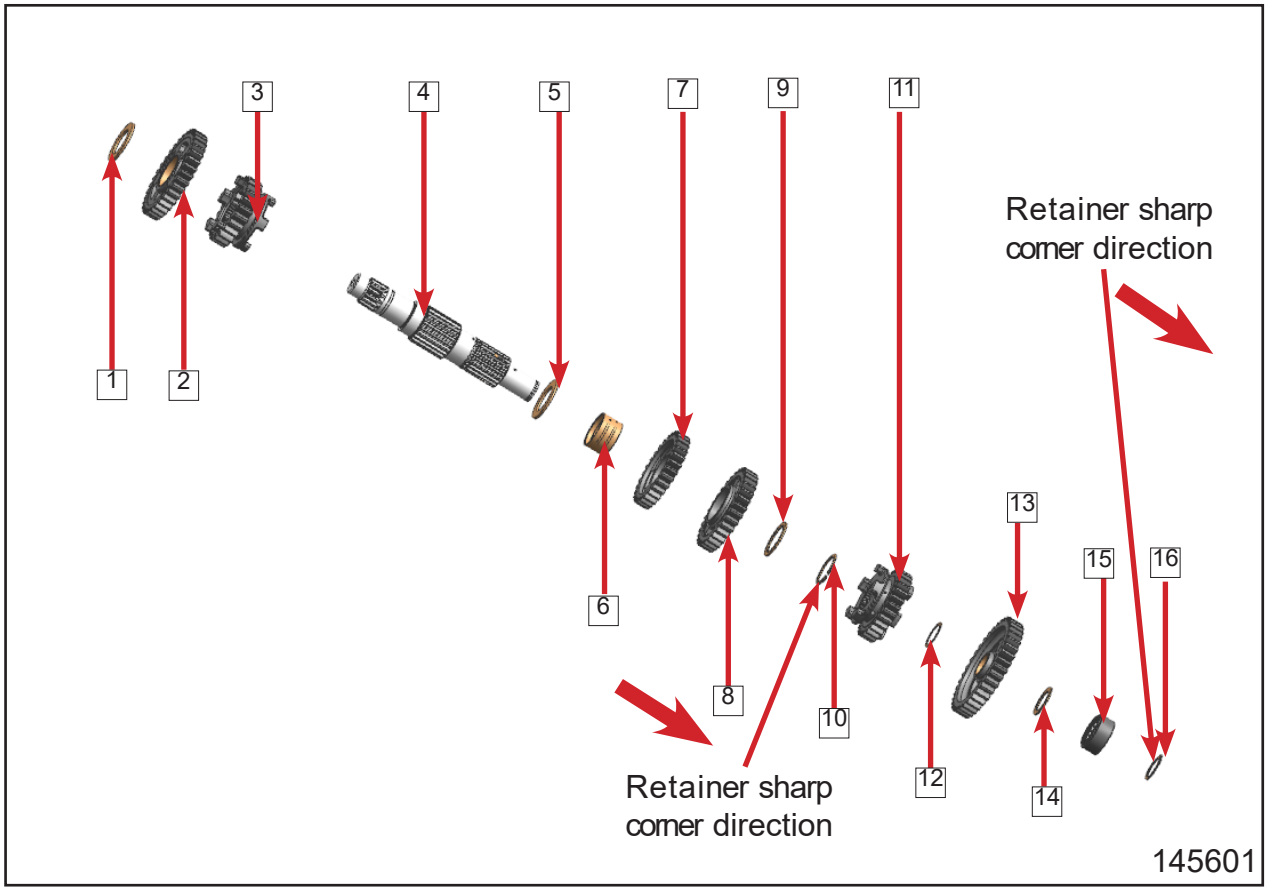
Remove M6 inner hex screw [1].
Remove gearshift swing arm bushing [2].
Remove gearshift swing arm assy [3].
Remove washer [4].
Remove gearshift swing arm spring [5].
Remove M6 bolt [6].
Remove gearshift cam [7].
Remove roller needle [8].



Remove shift drum hub [1].
Remove countershaft assy [2].
Remove main shaft assy [3].

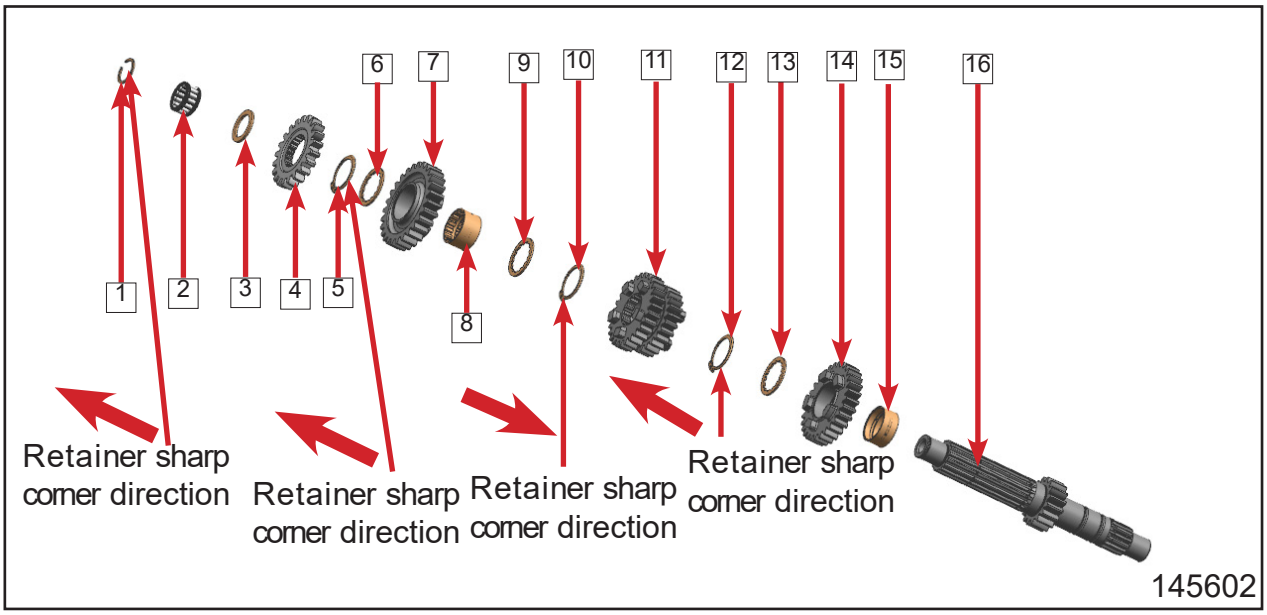


Countershaft Assy



1	25×39×2 washer	7	Driven gear (4th gear)	13	Driven gear (1st gear)
2	Driven gear (2nd gear)	8	Driven gear (3rd gear)	14	20.4×28×1.2 washer
3	Driven gear (6th gear)	9	Washer, spline	15	20×26×13.8 needle bearing
4	Countershaft	10	30 retainer	16	20 retainer
5	30 washer	11	Driven gear (5th gear)		
6	Bearing bushing	12	20.4×25×0.5 washer		

Main Shaft Assy



1	20 retainer	7	Drive gear (6th gear)	13	Washer, spline
2	Needle bearing	8	28×14.7 bearing bushing	14	Drive gear (5th gear)
3	20.5×30×1.5 washer	9	Washer, spline	15	28×14 bearing bushing
4	Drive gear (2nd gear)	10	28 retainer	16	Main shaft
5	28 retainer	11	Drive gear (3rd and 4th gear)		
6	Washer, spline	12	28 retainer		

⚠Note: The removed retainers are sorted into waste. Replace with new retainers during installation.

Gear Inspection

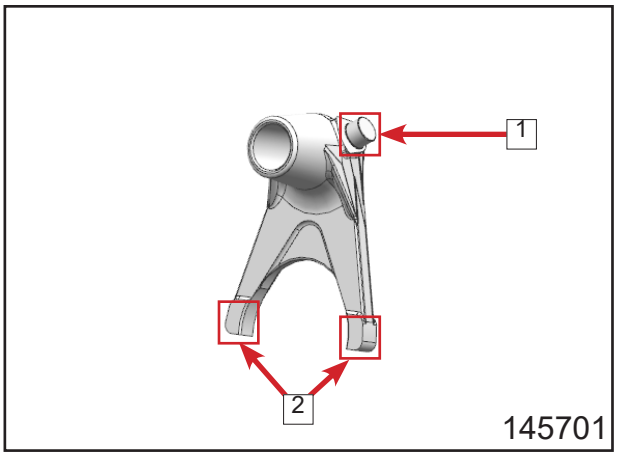
Inspect every gear to see whether it becomes blue, rusty or worn. Replace if it does.

Inspect gear teeth if they become rounded, misplace or have cracks. Replace if they do.

⚠Note: Replace gears in pairs. Use new retainer during installation.

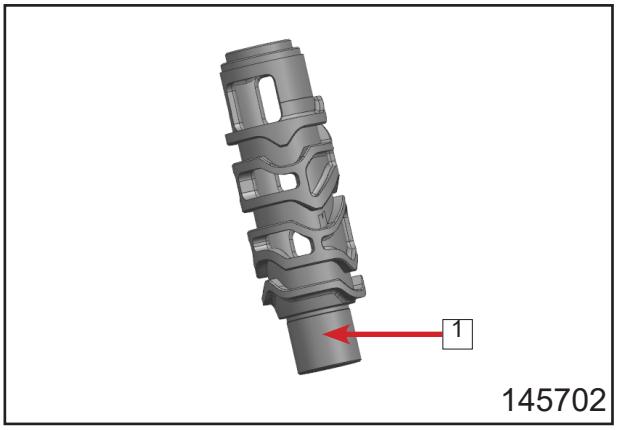
Shift Fork Inspection

Inspect shift fork bulge [1] and paw [2] for scratches, bend or damage. Replace if yes.



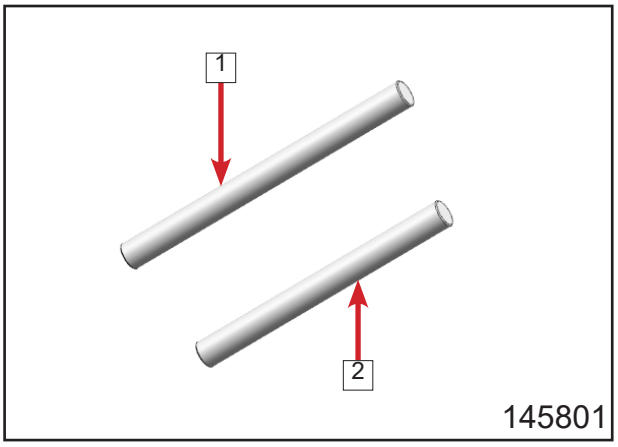
Shift Drum

Inspect shift drum groove and surface A for wear or damage. Replace if necessary.

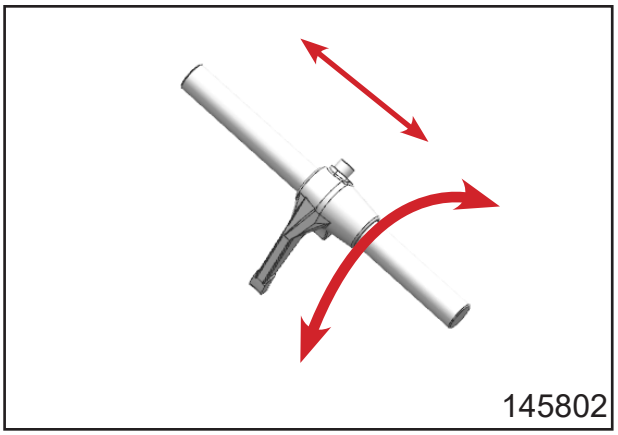


Shift Fork Shaft Inspection

Inspect shift fork shaft [1] and [2] for deformation, scratches, wear or damage. Replace if necessary.

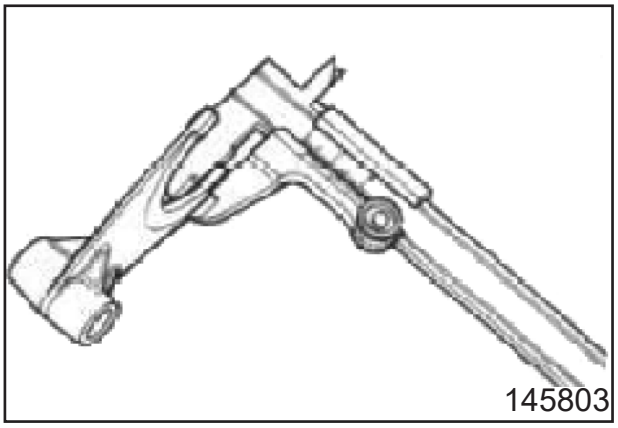


According to the picture, slide/rotate shift fork to check its action. Replace shift fork or fork shaft if the action isn't smooth.



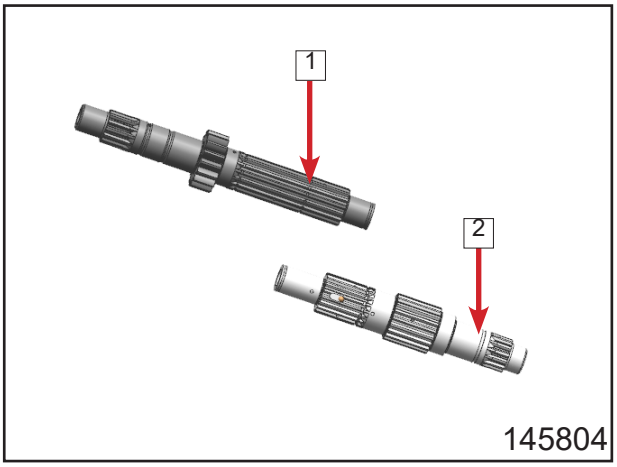
Measure shift fork joint thickness with vernier caliper.

Shift fork thickness: 4.8 mm~5.0 mm



Main Shaft and Countershaft

Inspect main shaft [1] and countershaft [2] for bending, wear or damage. Replace if they do.

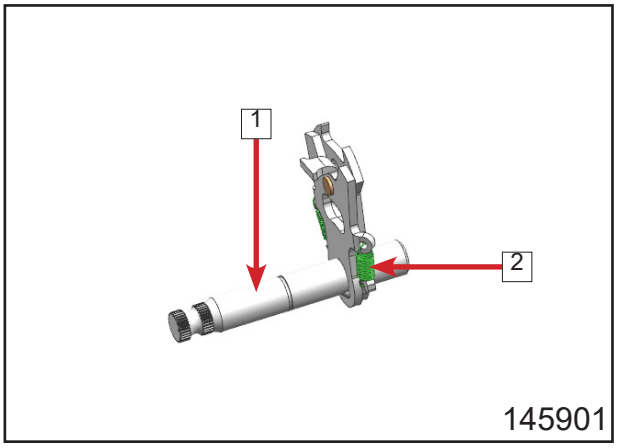


14.5.20 Gearshift Assy Inspection

Gearshift Rod Inspection

Inspect gearshift rod [1] for bending, wear or damage. Replace if it does.

Inspect gearshift spring [2] for damage or severe deformation. Replace if it does.

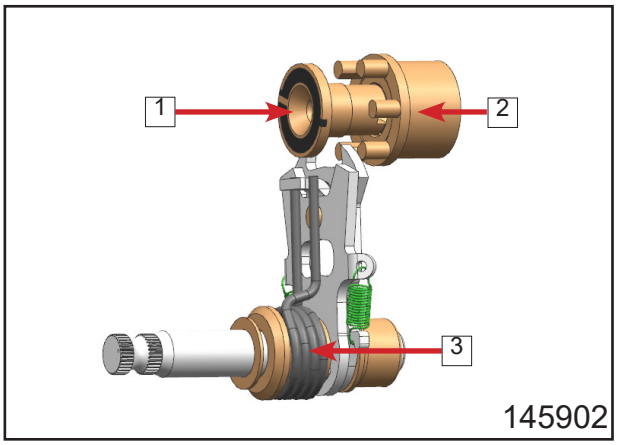


145901

Gear sensor [1] inspection refers to Electrical System chapter.

Inspect shift location drum [2] for damage or deformation. Replace if it does.

Inspect gearshift swing arm return spring [3] for damage or deformation. Replace if it does.



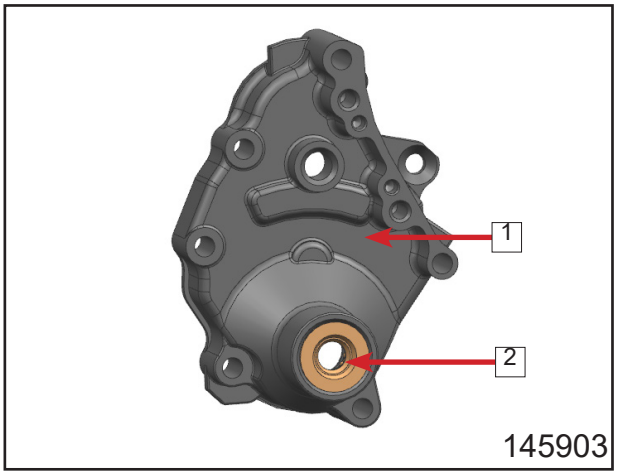
145902

14.5.21 Gearshift Cover Inspection

Inspect gearshift cover [1] for cracks, damage or severe deformation. Replace if it does.

Rotate needle bearing [2] to inspect for block or damage. Replace if it does.

Inspect oil seal for damage. Replace if it does.

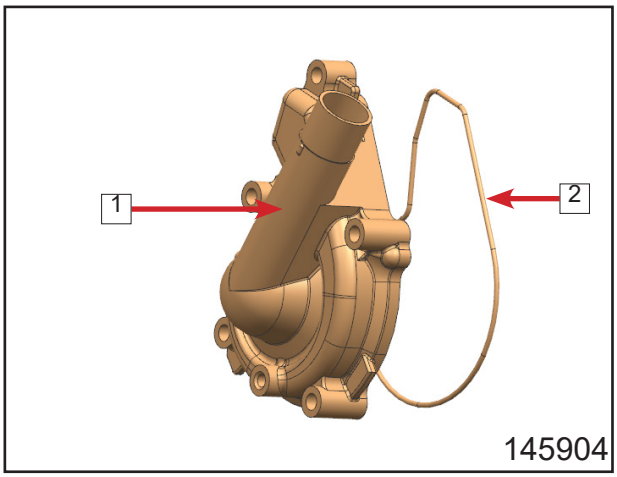


145903

14.5.22 Water Pump Assy Inspection

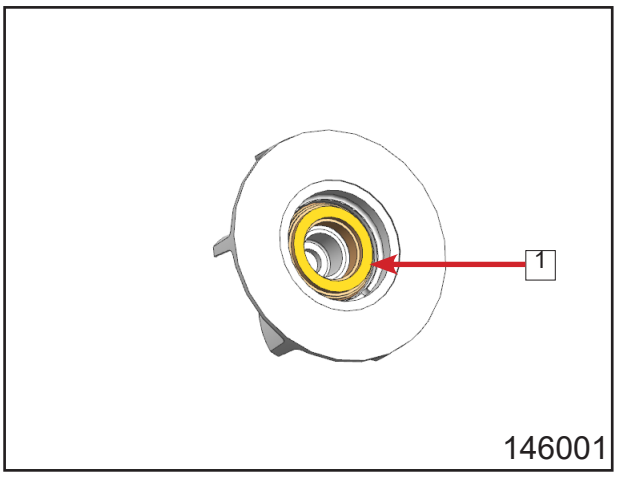
Inspect water pump cover [1] for cracks, damage or severe deformation. Replace if it does.

Inspect water pump cover seal ring [2] for cracks, aging or damage. Replace if necessary.

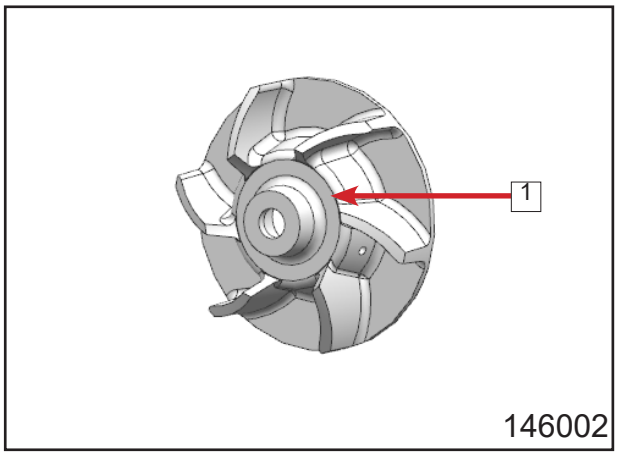


145904

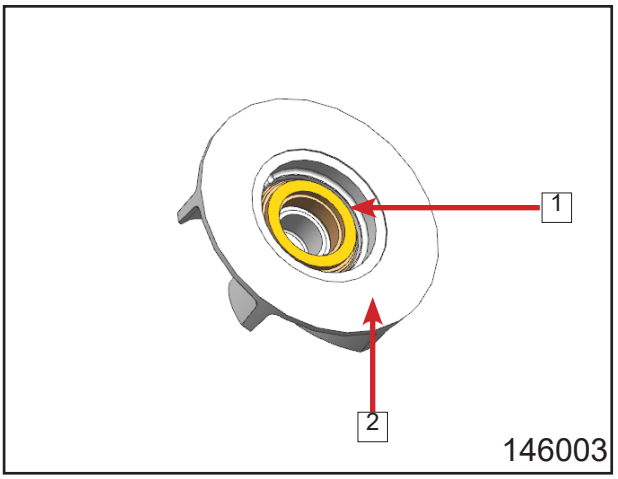
Water Pump Impeller
Disassembly
Remove water seal moving ring [1].



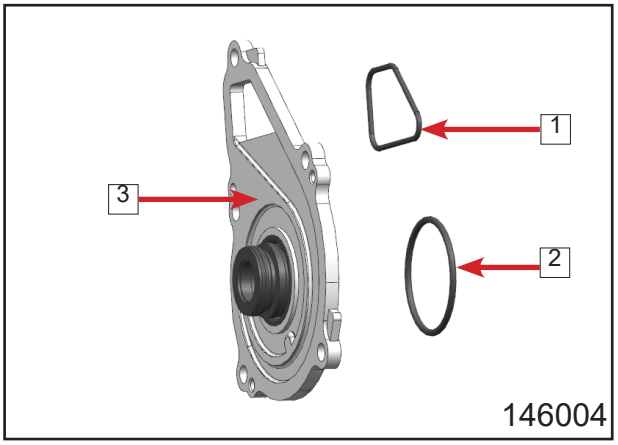
Inspection
Inspect water pump impeller [1] for damage. Replace if it does.



Assembly
Dip some ethyl alcohol with clean cloth to clean water moving ring. Install the ring into the mounting hole on water impeller.



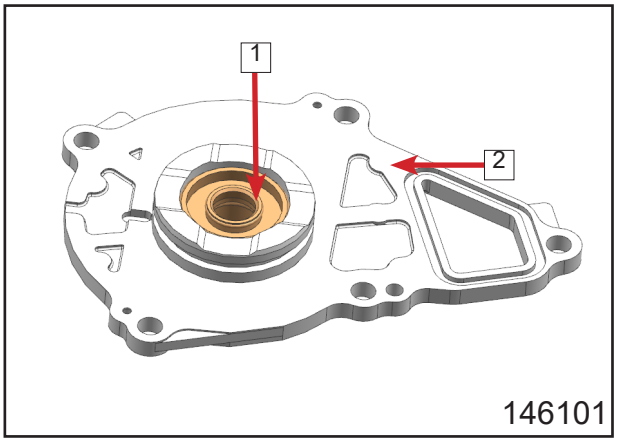
Water Pump Inspection
Inspect 34×2.5 o-seal ring [1] and water pump seal ring [2] for cracks, hardening or damage. Replace if necessary.
Inspect water pump [3] for cracks, damage or severe deformation. Replace if it does.



Water Seal Inspection
Watch the water seal to inspect. If any part breaks, replace the whole water pump assy. If the seal is good, it is not necessary to remove it.

Removal
Remove oil seal [1] from water pump [2].

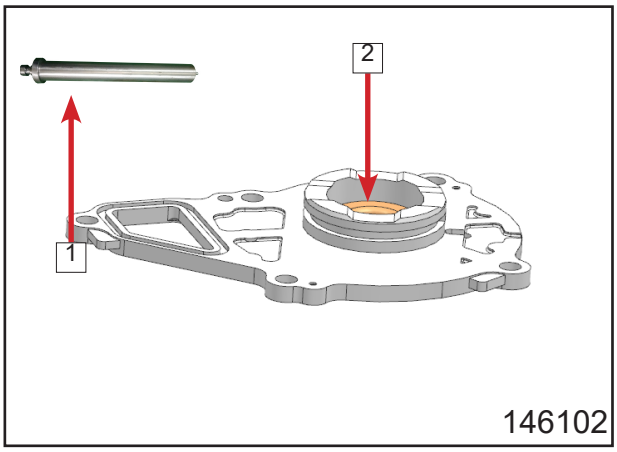
⚠Note: The removed oil seals are sorted into waste. Use new oil seals during installation.



146101

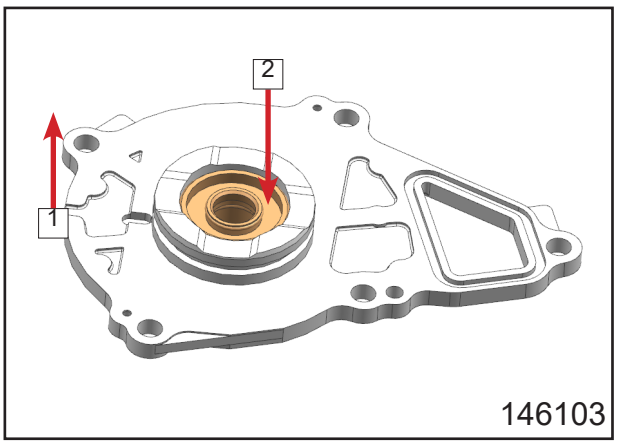
Use special tool: water seal puncher pin [1] to press out the static ring [2] from water pump.

⚠Note: The removed water seals are sorted into waste. Use new water seals during installation.



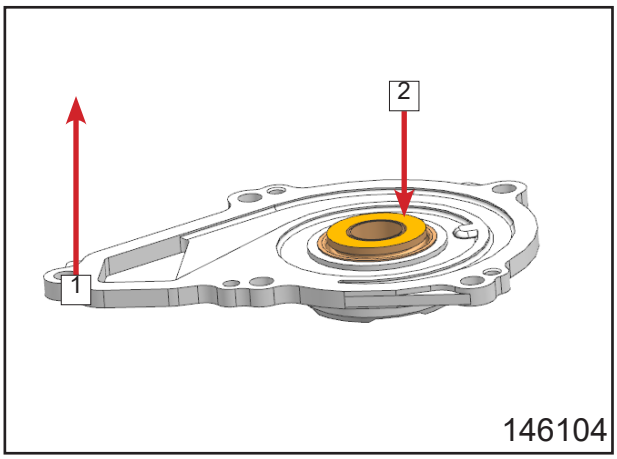
146102

Assembly
Put the water pump on work bench as picture shows. Apply some surface sealing glue on 12×32×5.5 oil seal [2], put the seal on special tool: water pump oil seal puncher pin. Align the seal with water pump mounting hole. Knock puncher pin [1] with hammer to install the oil seal [2].



146103

Apply 5699 sealing glue on water seal static ring assy [2]. Install it into the water pump mounting hole with special tool: water seal puncher pin [1].

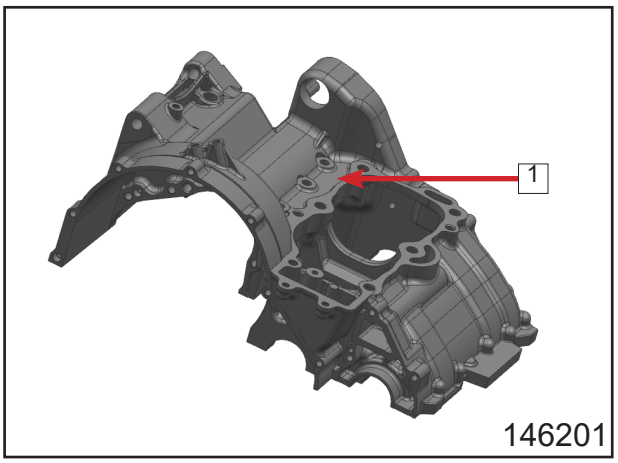


146104

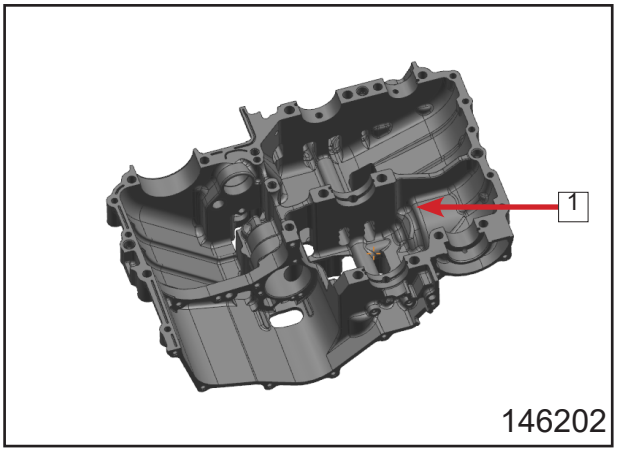
14.5.23 Crankcase Inspection

Inspect plain bearings on crankcase. Replace if severely worn.

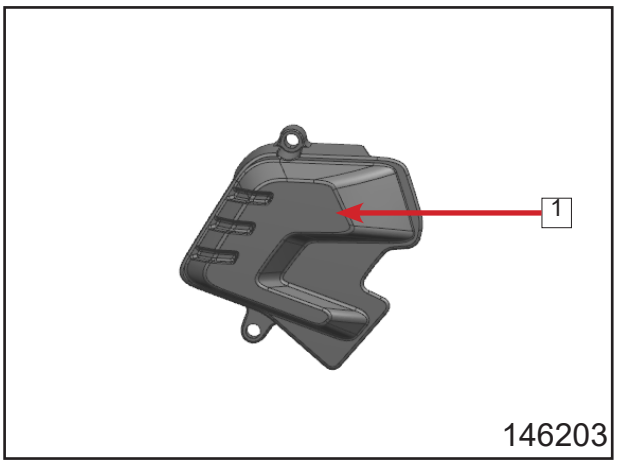
Inspect upper crankcase [1] for cracks or damage. Replace in pairs if necessary.



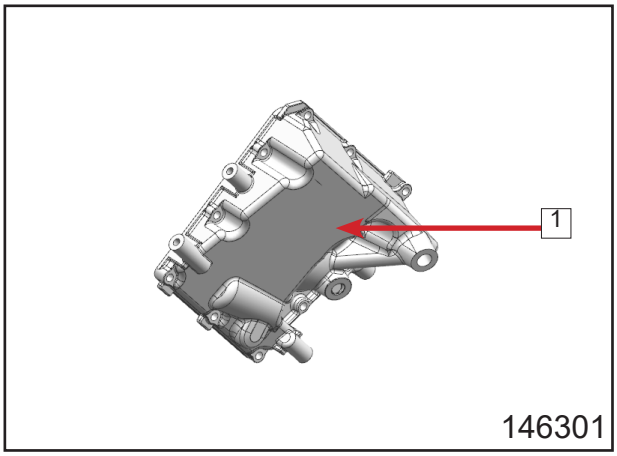
Inspect lower crankcase [1] for cracks or damage. Replace in pairs if necessary.



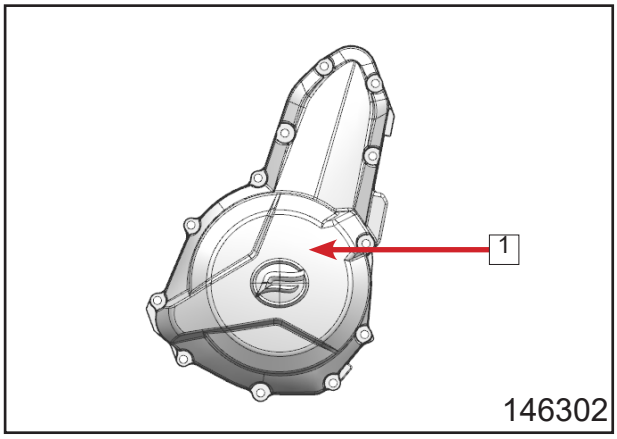
Inspect LH rear cover [1] for cracks or damage. Replace if necessary.



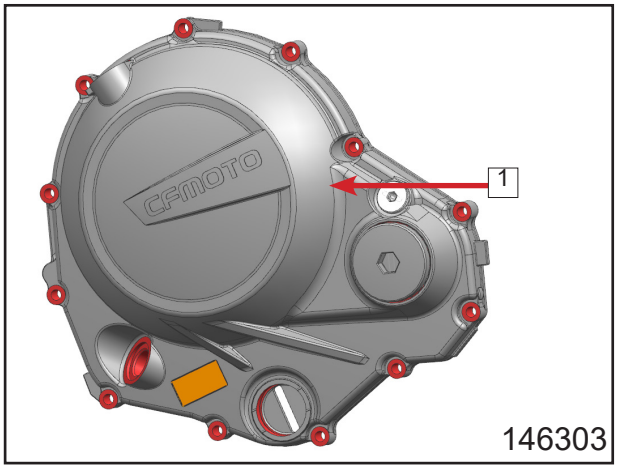
Inspect oil pan [1] for cracks or damage. Replace if necessary.



Inspect LH side cover [1] for cracks or damage. Replace in pairs if necessary.



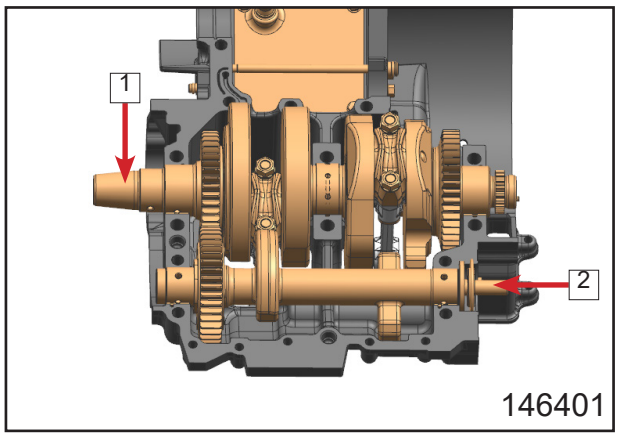
Inspect RH crankcase cover [1] for cracks or damage. Replace in pairs if necessary.



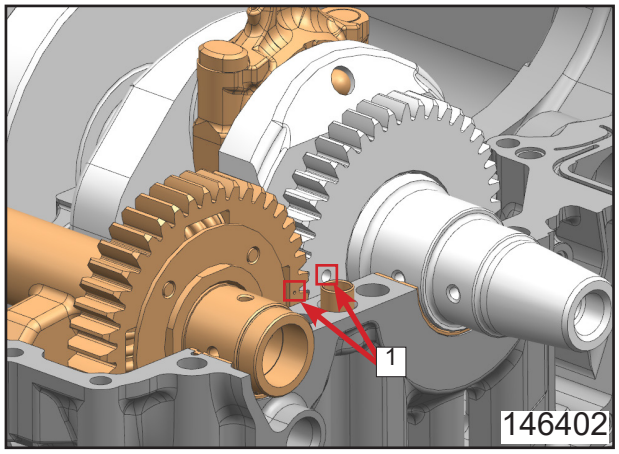
14.6 Engine Assembly

14.6.1 Crankshaft and Balance Shaft Installation

Apply MoS2 on crankshaft [1] and balance shaft [2] journal, then install them.

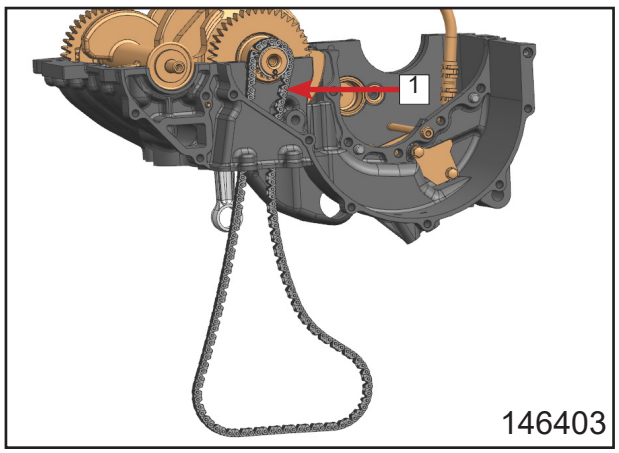


⚠Note: Align teeth marks [1] during installation.



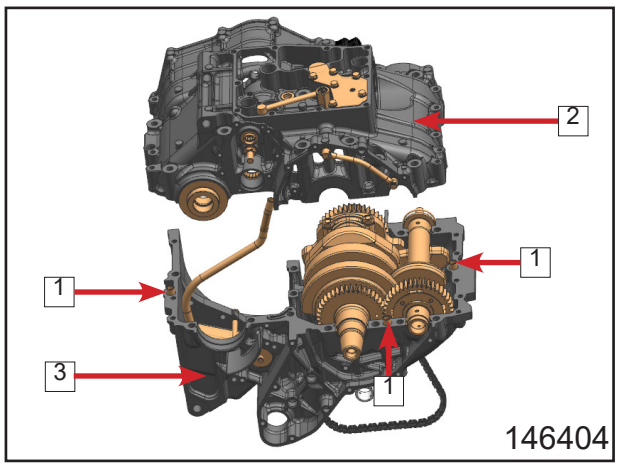
14.6.2 Timing Chain Installation

Install timing chain [1].



14.6.3 Crankcase Installation

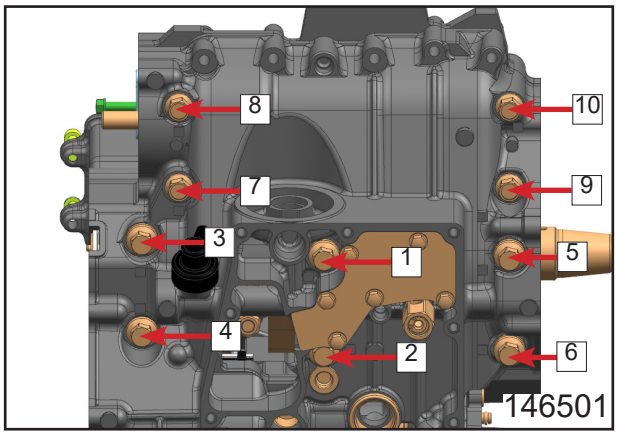
Install dowel pins [1].
Apply sealing glue on joint surface evenly and uninterruptedly.
Combine lower crankcase [2] with upper crankcase [3].



According to the number sequence, pre-tighten the bolts [1]~[10] with 20 N·m torque wrench. (Bolts [1]~[6] are M9, bolts [7]~[10] are M8.)
According to the number sequence, tighten the bolts [1]~[10] with 35 N·m torque wrench. (Bolts [1]~[6] are M9, bolts [7]~[10] are M8.)
According to the number sequence, tighten the bolts [1]~[6] with 44 N·m torque wrench. (Bolts [1]~[6] are M9, bolts [7]~[10] are M8.)

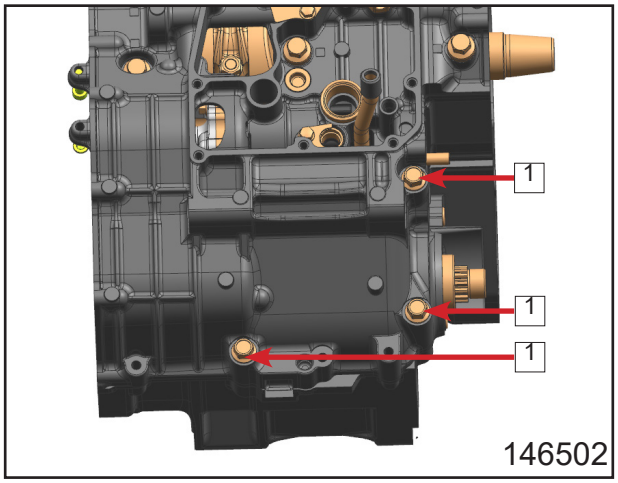
⚠Note: Insert the bolts into holes before installation. The exposed height should be the same. Adjust the bolt if not. Tighten the bolts in criss-cross way.

⚠Note: Apply engine oil on thread of bolts [1]~[10] and both sides of washers.



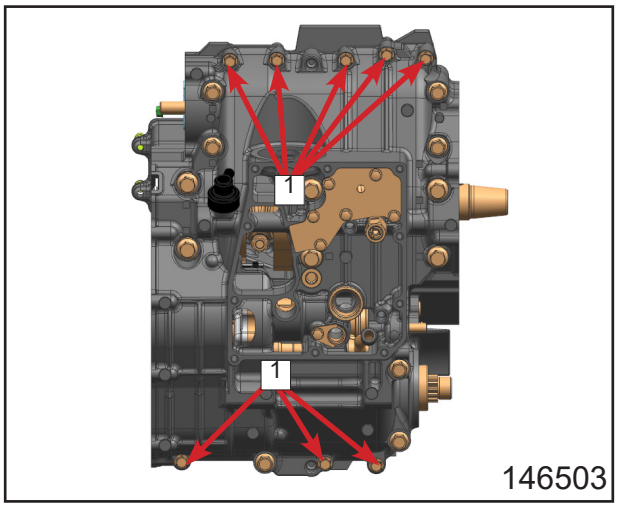
Install M8 bolts [1]. Tighten torque: 27.5 N·m.

⚠Note: Insert the bolts into holes before installation. The exposed height should be the same. Adjust the bolt if not. Tighten the bolts in criss-cross way.



Install M7 bolts [1]. Tighten torque: 20 N·m.

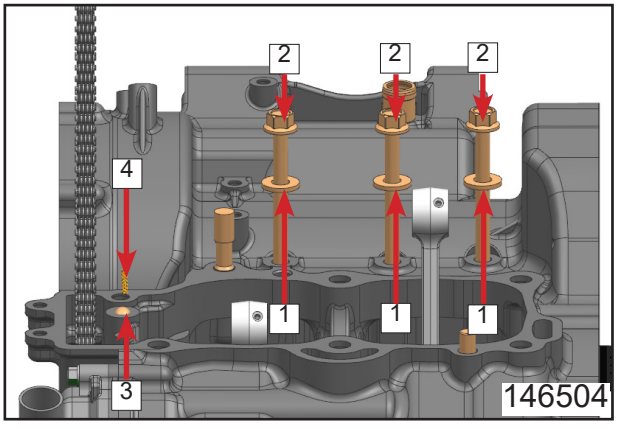
⚠Note: Insert the bolts into holes before installation. The exposed height should be the same. Adjust the bolt if not. Tighten the bolts in criss-cross way.



Put washers [1] on M8 bolts [2] and install the them on crankcase. Tighten torque: 27.5 N·m.

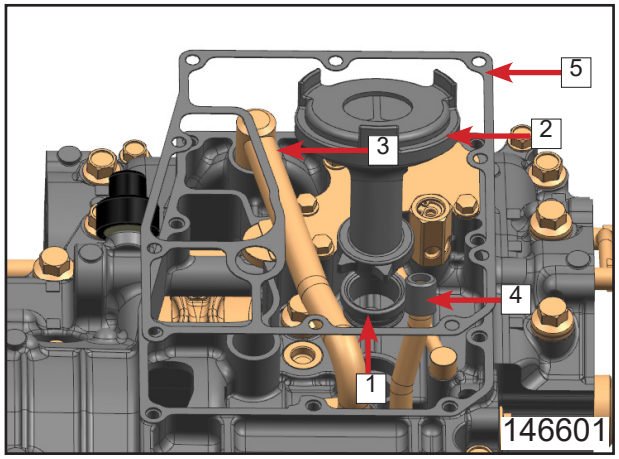
⚠Note: Apply engine oil on thread of bolts and both sides of washers.

⚠Note: When tightening bolts [2], tighten 2~3 times in criss-cross way, from inside to outside.

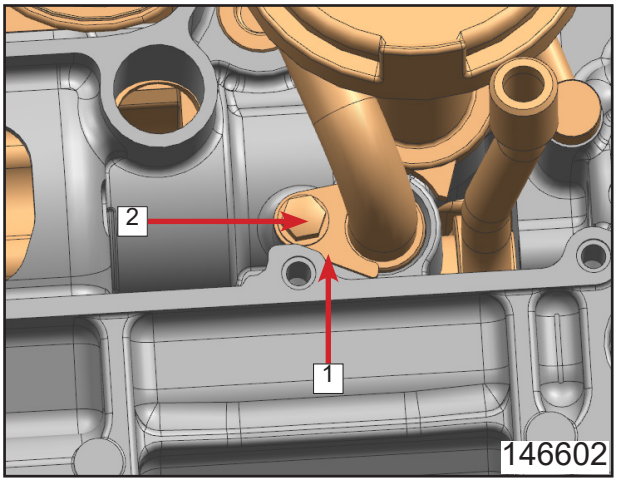


14.6.4 Oil Pan Assy Installation

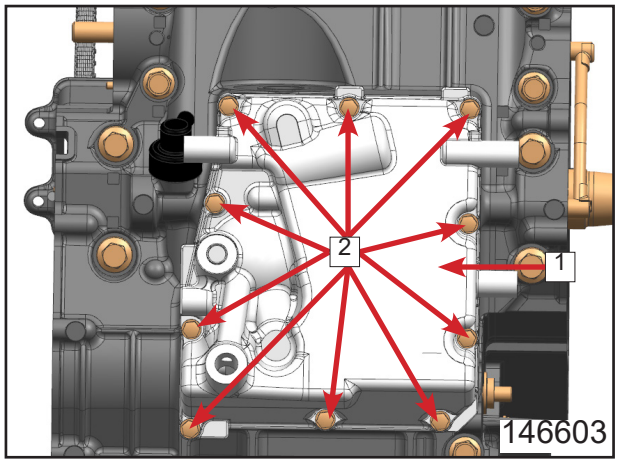
Install oil suction pan seal ring [1].
Install oil suction pan assy [2].
Put two 14x2.5 o-rings on oil pipe I [3].
Apply some engine oil to the mounting hose and install the pipe.
Install oil return hose damping rubber sleeve [4].
Install seal gasket [1].



Install oil pipe I press plate [1].
Install M6 bolt [2] with 243 thread locker.
Tighten torque: 8 N·m



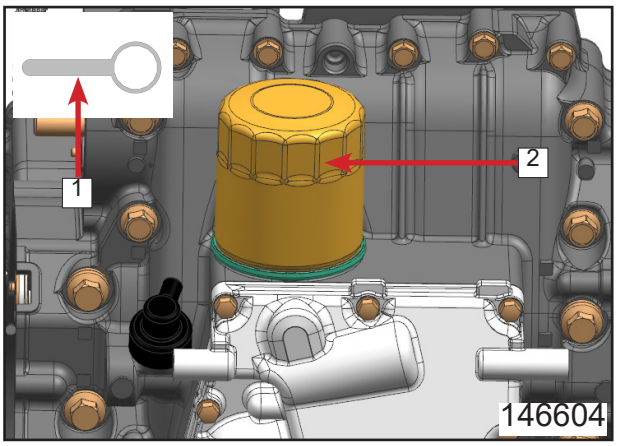
Adjust oil return hose to make it fix into the mounting groove. Then install oil pan assy [1].
Install M6×25 bolts [2].
Tighten torque: 11~13 N·m



14.6.5 Oil Filter Installation

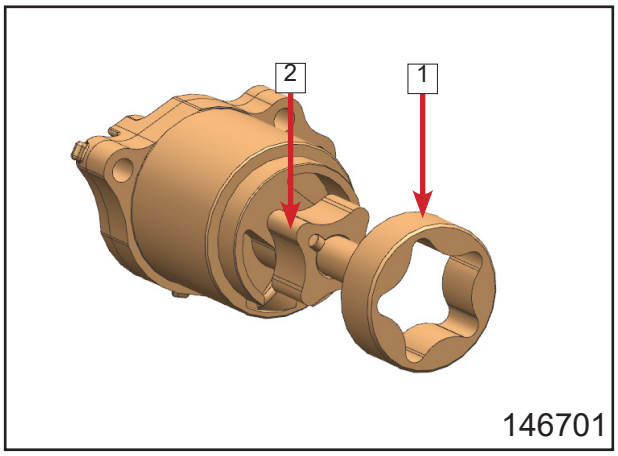
Use special tool: oil filter wrench [1] to install the oil filter [2]. Tighten torque: 16~18 N·m

⚠Note: Wrap oil filter with a cloth or rubber mat, in case the wrench breaks the filter.

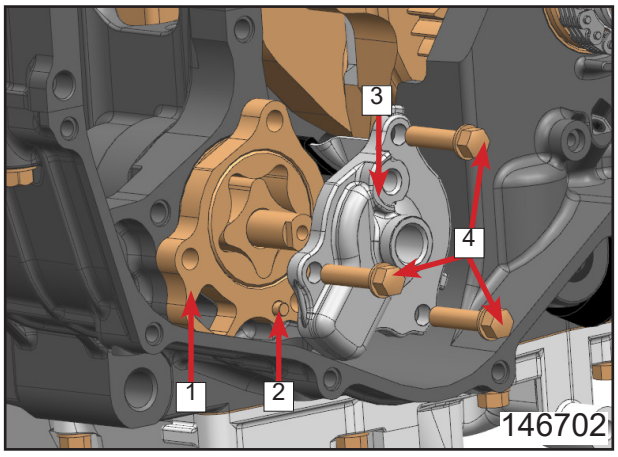


14.6.6 Oil Pump Installation

Install oil pump outer rotor [1] into the inner rotor [2].

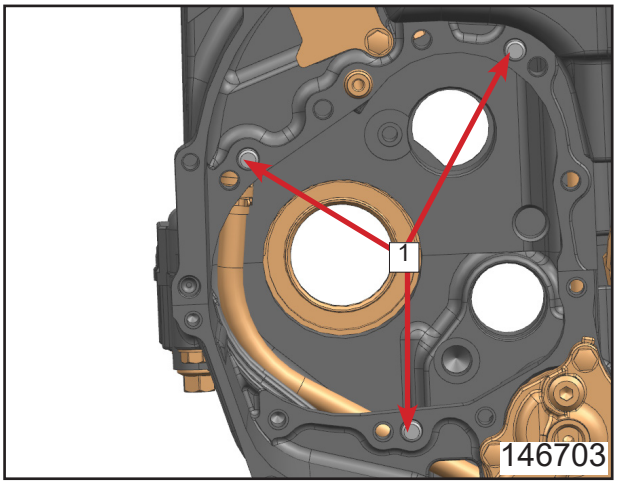


Install oil pump [1].
Install roller pin [2].
Install oil pump cover [3].
Install M6 bolts [4].

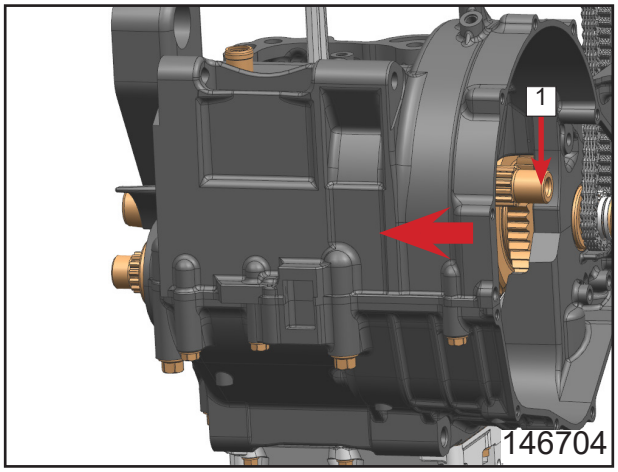


14.6.7 Transmission Case Installation

Install pins [1].

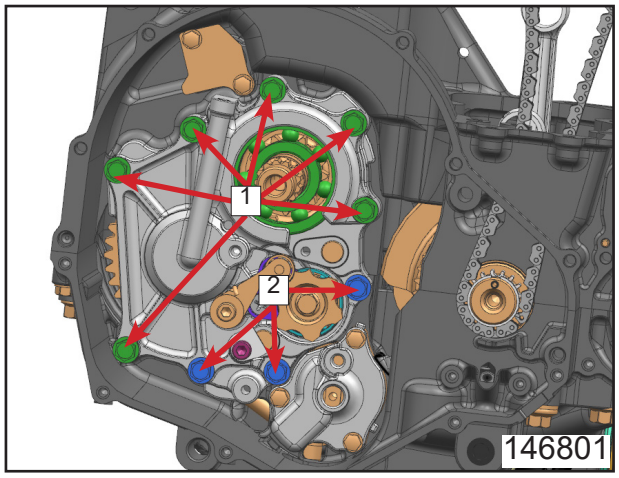


Install the gearshift cover sub assy [1] to the proper position in the direction of the arrow.

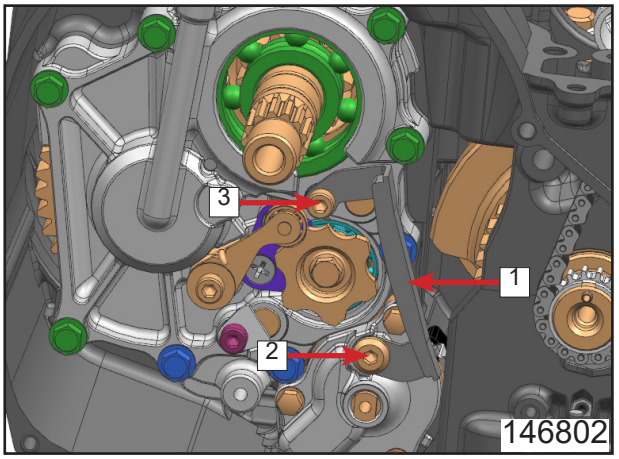


Install M7×30 bolts [1] with 243 thread locker.
Tighten torque: 19~21 N·m
Install M7×26 bolts [2] with 243 thread locker.
Tighten torque: 20 N·m

⚠Note: Tighten the bolts in criss-cross way.

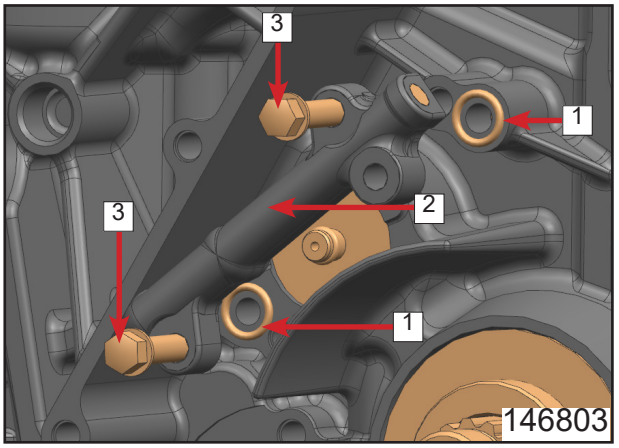


Install oil pump chain guide [1].
Install M6×12 screw [3] with 243 thread locker.
Tighten torque: 10 N·m
Install M6×9 screw [2] with 243 thread locker.
Tighten torque: 10 N·m



14.6.8 Oil Pipe IV Assy Installation

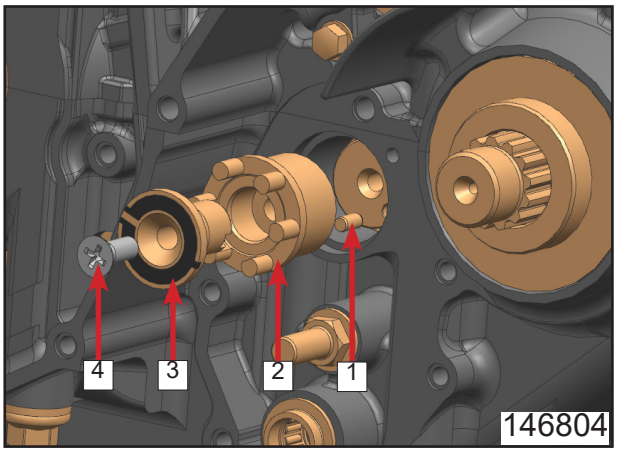
Apply engine oil on o-seal ring [1]. Install the ring on oil pipe IV assy [2].
Insert the oil pipe IV assy [2] into the hole on upper crankcase. After installing position confirmed, knock with rubber hammer to install the pipe.
Install M6 bolts[3]. (Along with a wire clip for each bolt)



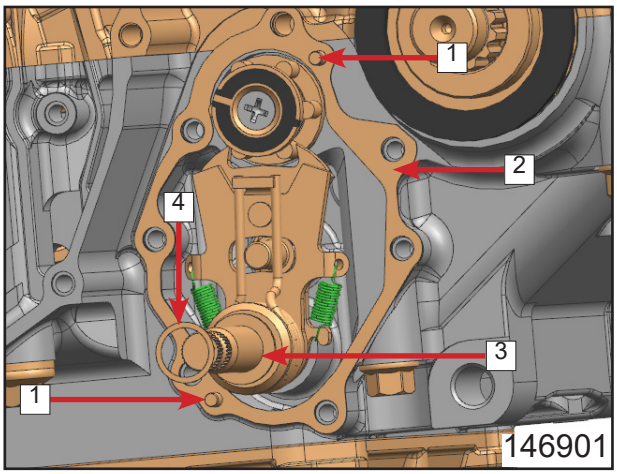
14.6.9 Gearshift Assy Installation

Status 1

Install roller needle [1].
Install shift location drum [2].
Install gear sensor [3].
Install screw [4] with 243 thread locker.

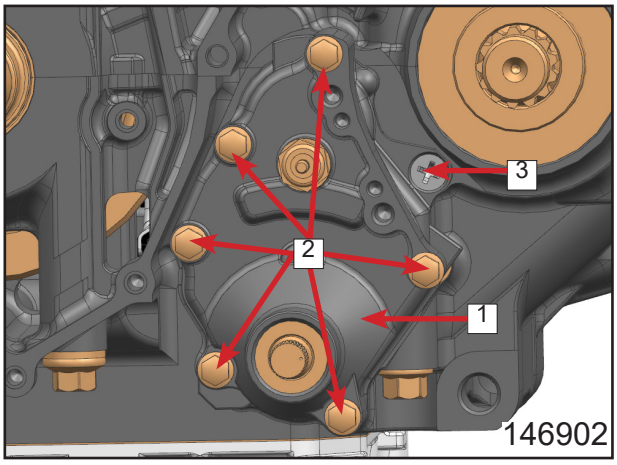


Install dowel pins [1].
Install seal gasket [2].
Install shift shaft sub assy [3].
Install washer [4].



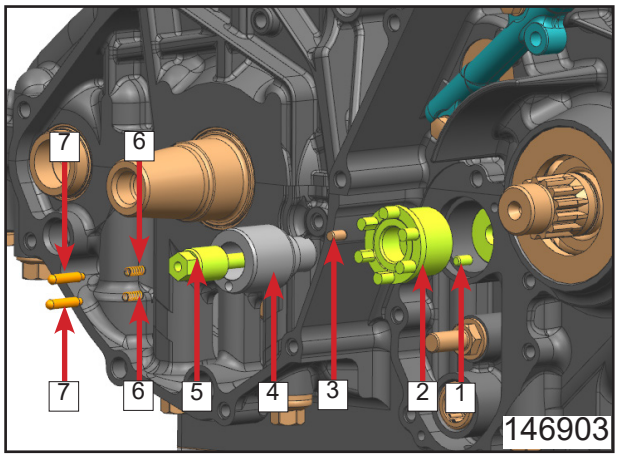
Install gearshift cover [1].
Install M6 bolts [2]. Tighten torque: 12 N·m
Install screw [3].

⚠Note: Insert the bolts into holes before installation. The exposed height should be the same. Adjust the bolt if not. Tighten the bolts in criss-cross way.

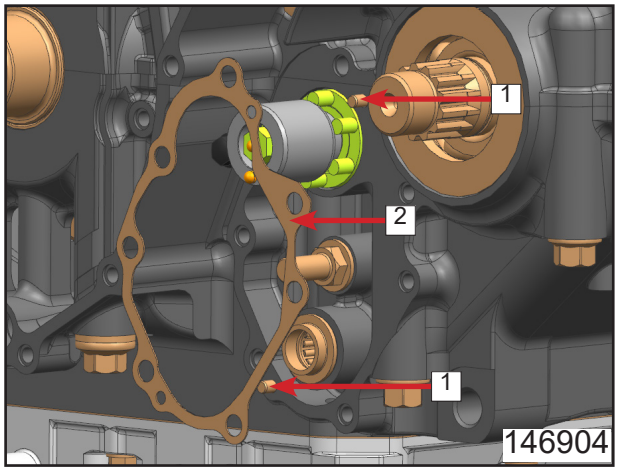


Status 2

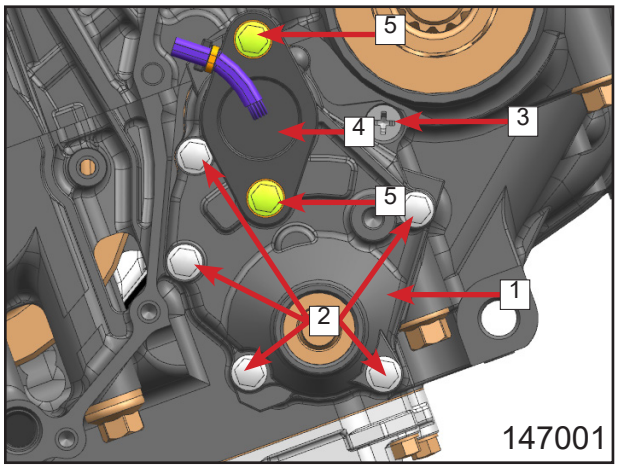
Install roller needle [1].
Install shift location drum [2].
Install dowel pins [3].
Install gear rotor [4]
Install contactor bolt [5].
Install contactor springs [6].
Install ball contactors [7].



Instatll dowel pins [1].
Install gearshift cover gasket [2].

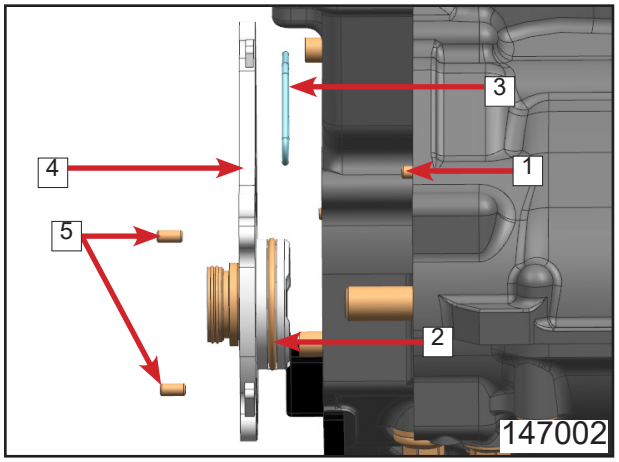


Install gearshift cover [1].
Install M6 bolts [2].
Install screw [3].
Install gear position sensor [4].
Install M6 bolts [5].



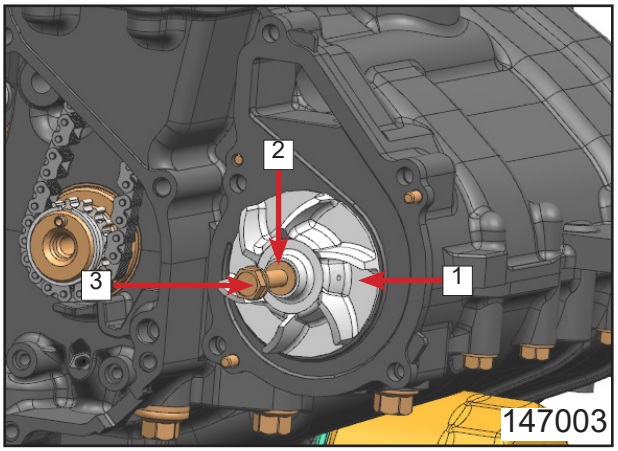
14.6.10 Water Pump Installation

Install roller needle [1].
Apply engine oil on o-ring [2].
Install seal ring [3] on water pump [4]. Do not drop the seal ring.
Install water pump [4].
Install roller needle [5].

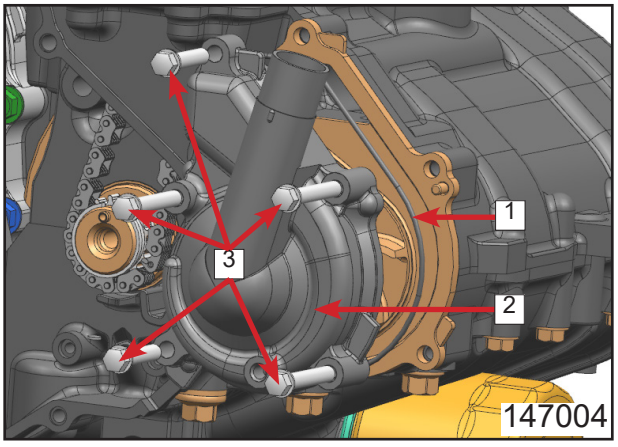


Install water pump impeller [1].
Put washer [2] on M6 bolt [3].
Install M6 bolt [3].

⚠Note: Measure the clearance between water pump and impeller during installation. The clearance should be 0.2~0.7.

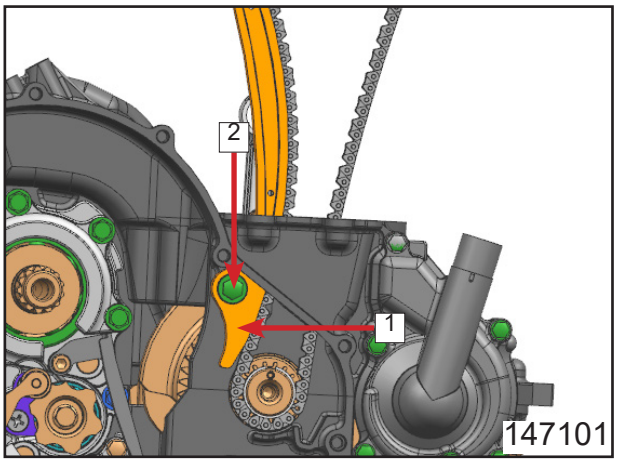


Put seal ring [1] on water pump cover [2].
Install water pump cover [2].
Install M6 bolts [3].



14.6.11 Tensioner Plate Installation

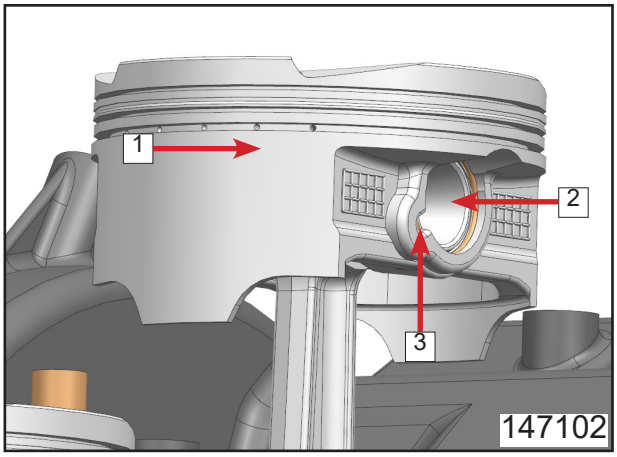
Install tensioner plate assy [1].
Install thread pin shaft [2] with 243 thread locker.
Tighten torque: 20 N·m



14.6.12 Piston Installation

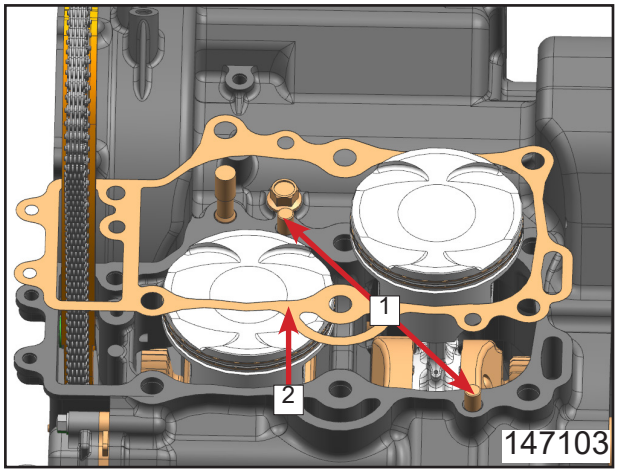
Install piston circlip on one side in advance.
Install piston [1].
Install piston pin [2].
Install piston circlip [3] on the other side.
Adjust the circlip position to make the angle between circlip cut and piston cut approximately 30°.

⚠Note: Use new piston circlips after removal. Replace with new ones if deformed.



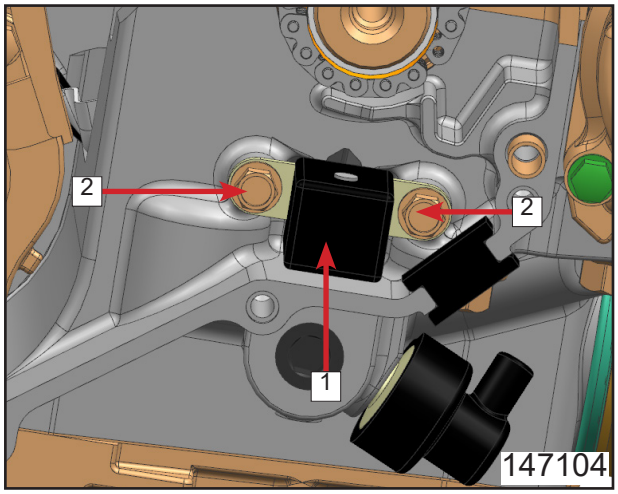
Turn crankshaft to adjust the proper position of the piston. Apply the same procedures to install the other piston.

Install dowel pins [1].
Install cylinder gasket [2].

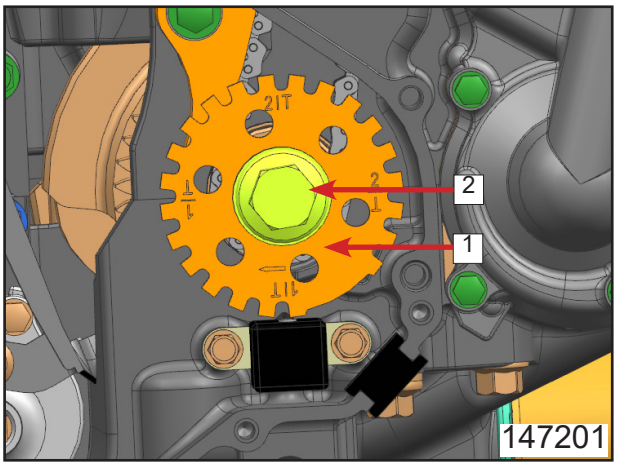


14.6.13 Crankshaft Pulsing Rotor Installation

Install trigger assy [1].
Install M5 bolts [2].

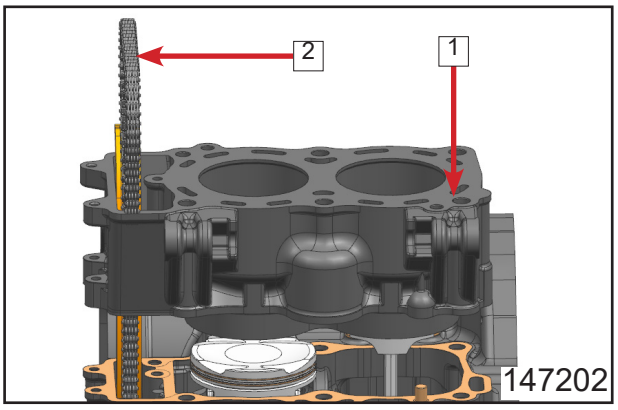


Install crankshaft pulsing rotor [1].
Install M8 bolt [2] with 243 thread locker.
Tighten torque: 40 N·m



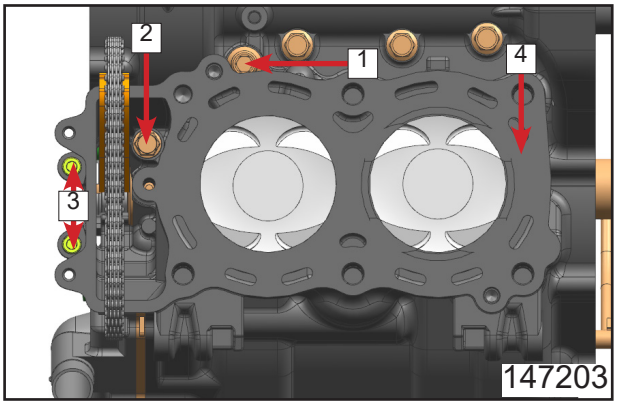
14.6.14 Cylinder Body Installation

Rotate the crankshaft until first cylinder and second cylinder are on the same level.
Apply engine oil inside the cylinder body.
Install cylinder body [1].

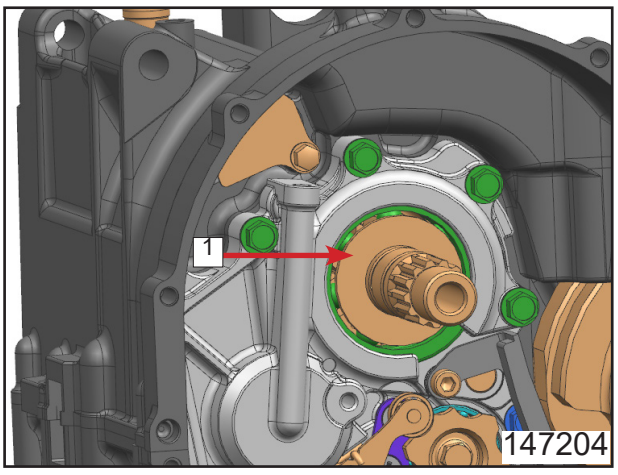


⚠Note: Hook the timing chain [2] in case it falls into the engine.

⚠Note: There three rings [2] [3] [4] on piston. Make sure the top ring [3] cut align with the mark "0" on piston. Make 180° angle between second ring [2] cut and the mark. Oil ring [4] upper and lower rail cuts align with the top ring and second ring respectively. Make 60° angle between spacer and rails. Compress the each ring into the groove before installing into the cylinder. Install the piston rings one by one.



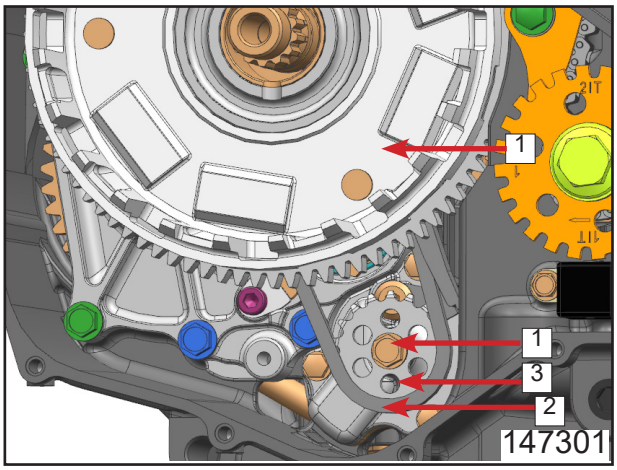
Install M10 nut [1].
Install M8 bolt [2] and washer.
Install M6 bolts [3] and washer.
Install cylinder gasket [4].



14.6.15 Clutch Assy Installation

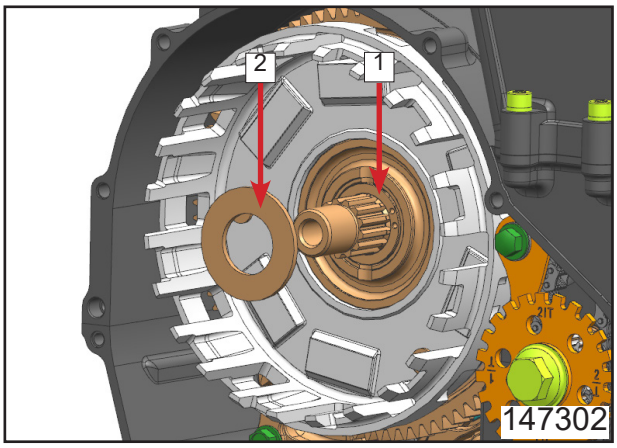
Install washer [1].

Put oil pump chain [2] on clutch housing sprocket [1], then put the oil pump sprocket [3] on chain [2].
Adjust oil pump shaft position, Install oil pump sprocket, chain and drive hub assy.
Apply 243 thread locker on M6×20 bolt [4] (left-hand thread). Install the bolt with 6.3×16.3×1.2 washer to fix the oil pump sprocket.
Tighten torque: 12 N·m



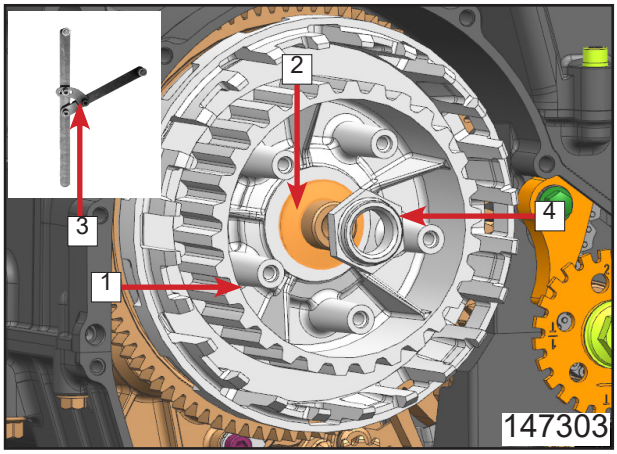
⚠Note: Align the sprocket and gear during installation.

Apply engine oil on clutch sleeve [1]. Insert it (the end with holes faces outside) between main shaft and clutch housing.
Install washer [2].



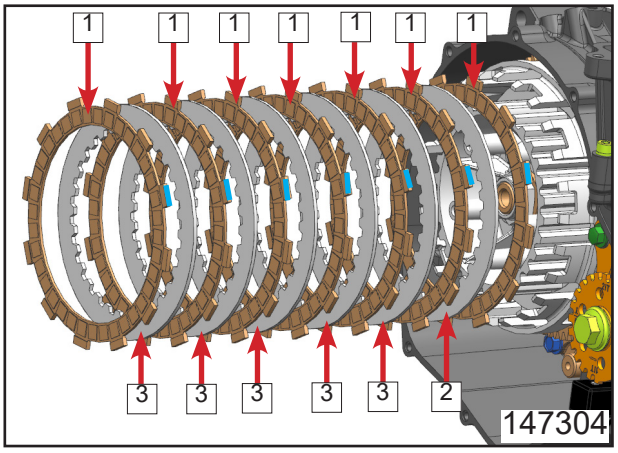
Install central sleeve [1].
Install washer [2].
Use special tool: clutch stopping wrench [3] to fix the clutch housing.
Install M20 nut [4] with 243 thread locker.
Tighten torque: 132 N·m

⚠Note: After tightening the nut, rotate the housing. The movement should be smooth, not blocked.

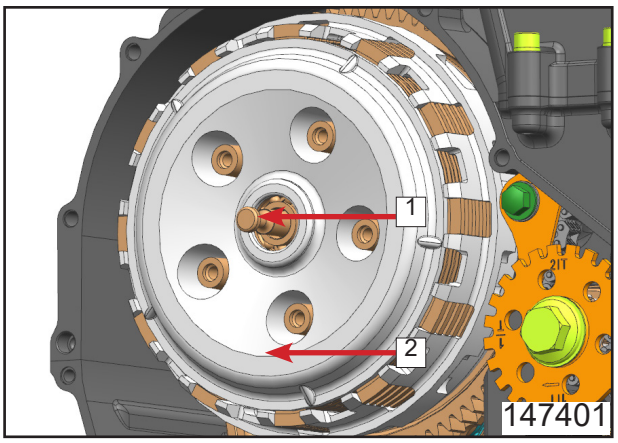


Install friction discs [1].
Install steel plates A [2].
Install steel plates B [3].

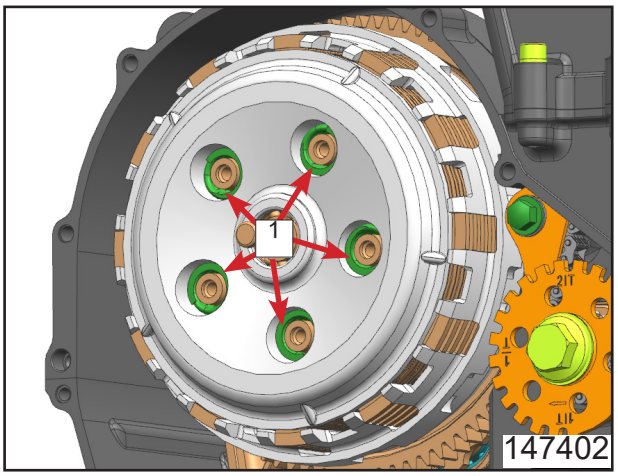
⚠Note: During installation, align first 6 friction discs opening cut. The outermost friction disc is dislocated.



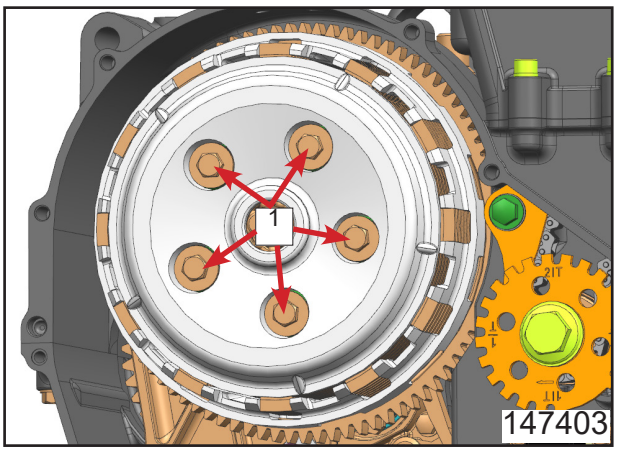
Install tie-rod [1].
Install operating pad [2].



Install springs [1].

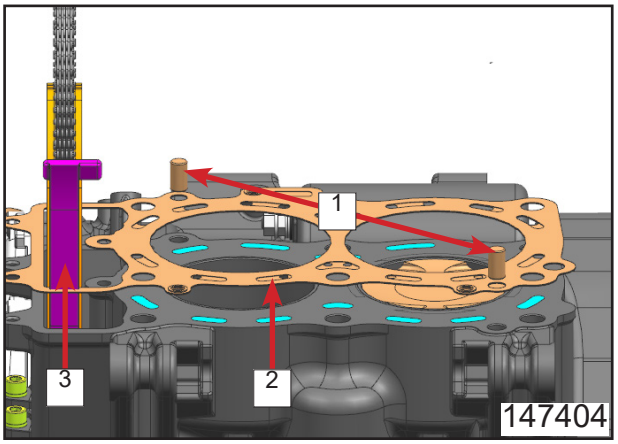


Install M6 bolts assy [1].



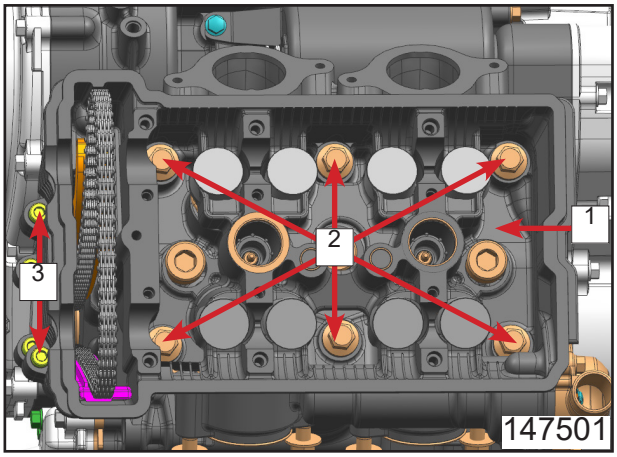
14.6.16 Cylinder Head Installation

Install dowel pins [1].
Install cylinder head gasket [2].
Install chain guide [3].



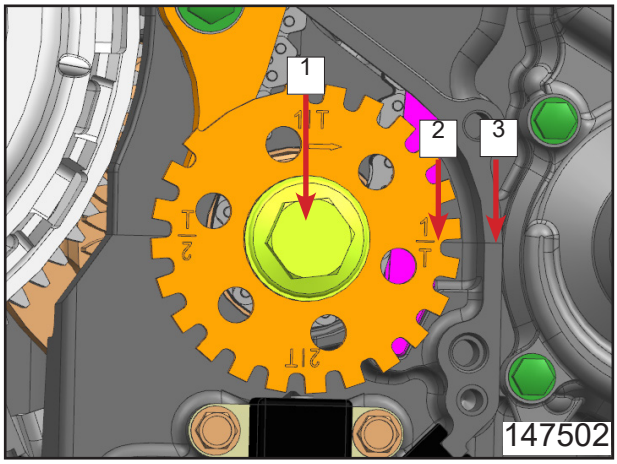
Install cylinder head [1].
Install M10 bolts [2].
Tighten torque: 54 N·m (if the bolts are old ones, tighten torque: 49 N·m)
Install M6 inner hex bolts [3] and washers.

⚠Note: Hook the timing chain in case it falls into the engine.



14.6.17 Camshaft Installation

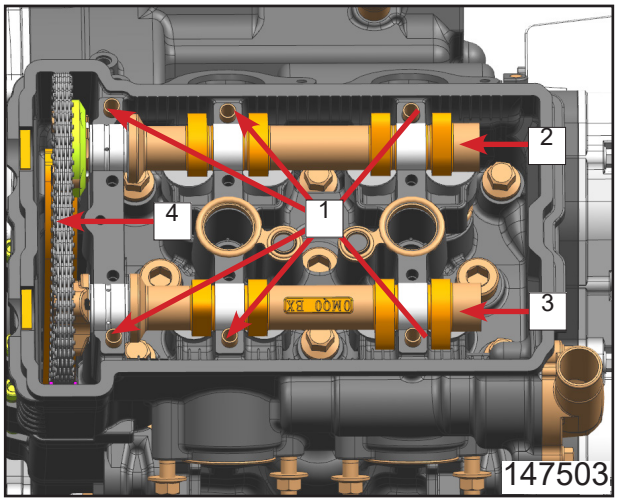
Install M8 bolt [1] with sleeve. Tighten until the mark [2] on pulsing rotor aligns the mark [3] on crankcase.

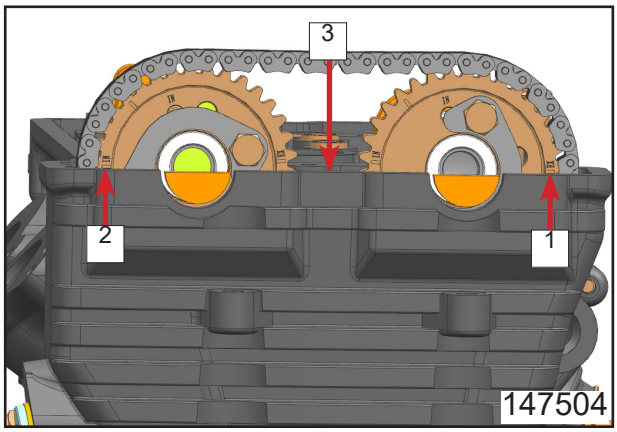


Install dowel pins [1].
Install intake camshaft assy [2]. (There is "IN" mark on the intake camshaft.)
Install exhaust camshaft assy [3]. (There is "EX" mark on the exhaust camshaft.)
Put the timing chain [4] on timing sprocket.

⚠Note: During intake camshaft installation, the "IN" mark line [2] on timing sprocket should be parallel with the cylinder edge [3]. During exhaust camshaft installation, the "EX" mark line [1] on timing sprocket should be parallel with the cylinder edge [3].

⚠Note: The timing chain can not move during installation, the pulsing rotor should be at the right position. After timing chain installation, check if all the marks are qualified or not. Reinstall if not qualified.

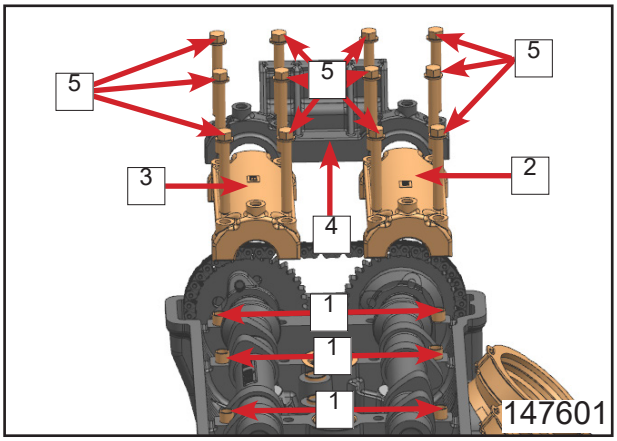




Install dowel pins [1].
Install intake camshaft seat [2].
Install exhaust camshaft seat [3].
Install camshaft position plate [4].
Install M6 bolts [5].

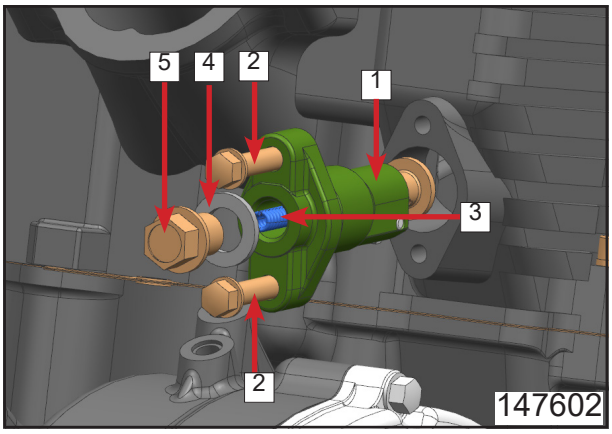
⚠Note: Tighten the bolts [5] for three times. The tighten torque is 5 N·m, 8 N·m and 12 N·m respectively. Tighten the bolts in criss-cross way.

⚠Note: The exhaust camshaft cover has "EX" mark on it while intake camshaft cover has "IN" mark.



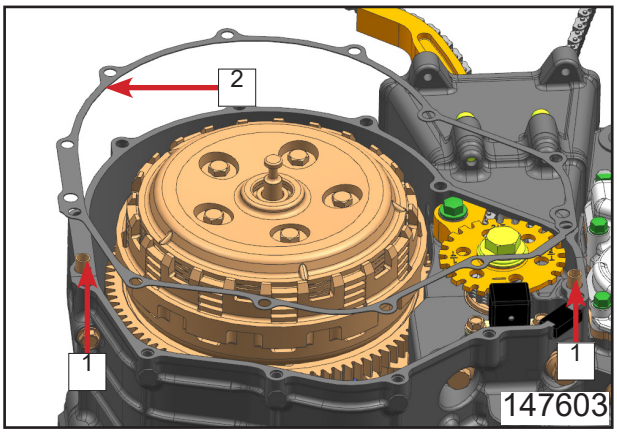
14.6.18 Tensioner Installation

Install tensioner [1].
Install M6 bolts [2] (with thread locker).
Install tensioner spring [3].
Put washer [4] on spring seat bolt [5].
Install M11 spring seat bolt M11[5].

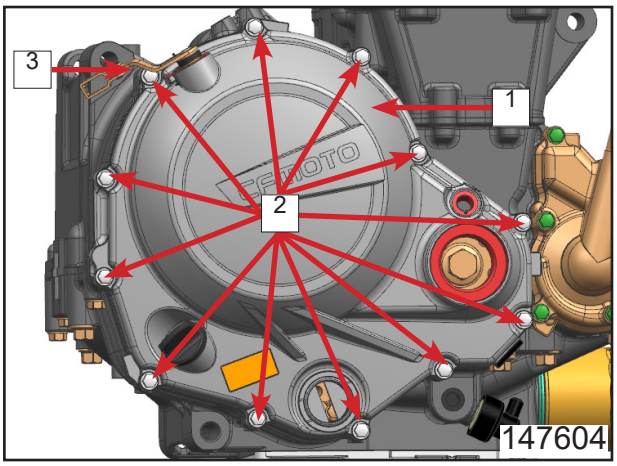


14.6.19 RH Side Cover Installation

Install dowel pins [1].
Install seal gasket [2].

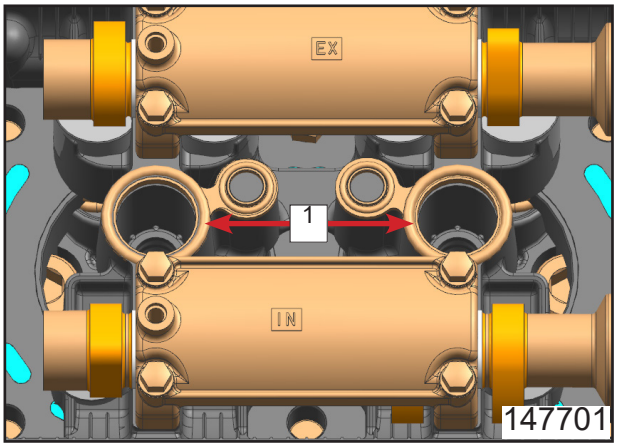


Install RH side cover [2].(During installation, rotate the clutch tie-rod [3] to proper position.)
Install M6 bolts [2].

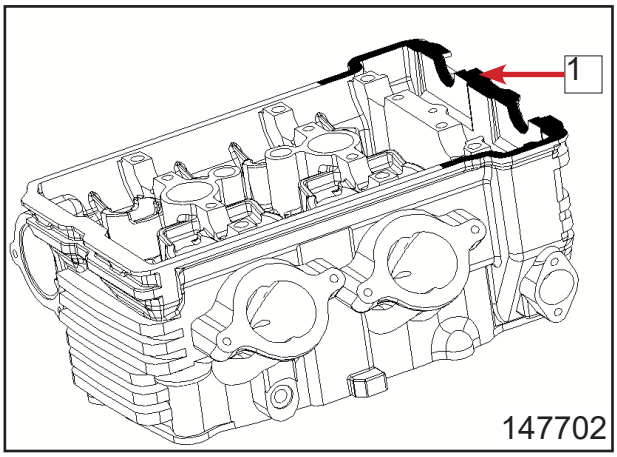


14.6.20 Cylinder Head Cover Installation
14.6.21

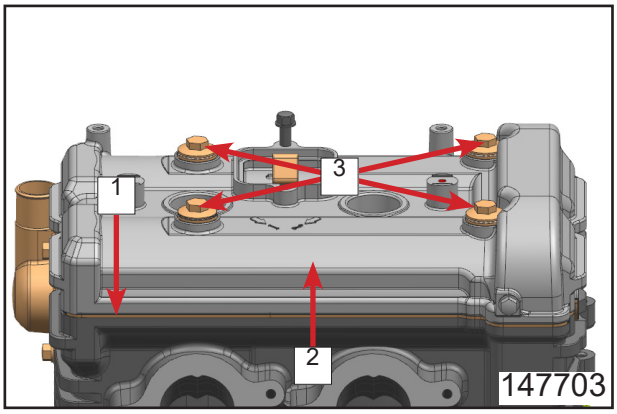
Install spark plug seal rings [1].



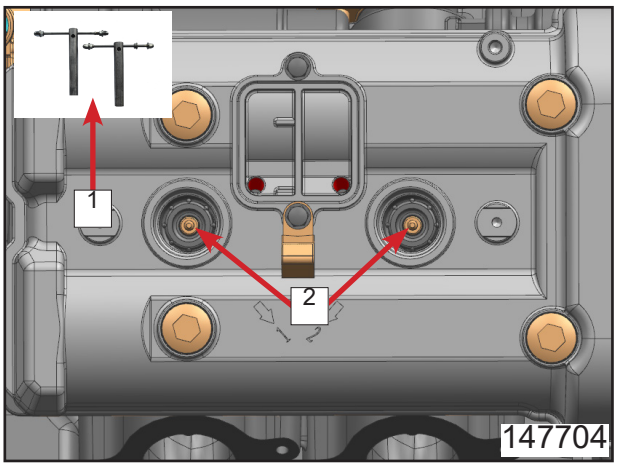
Apply 5699 surface sealing glue on cylinder head [1].



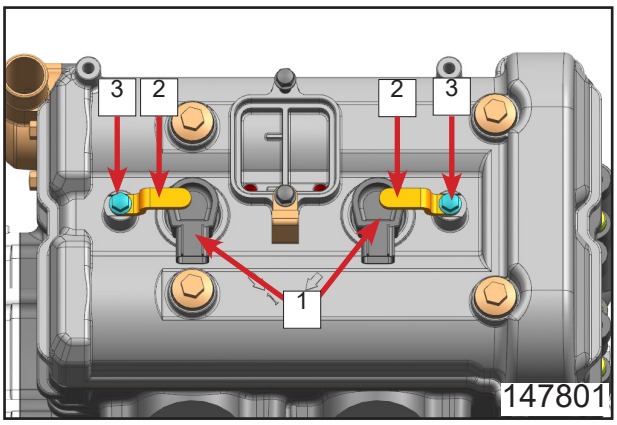
Put cylinder head seal ring [1] on cylinder head cover [2].
Install cylinder head cover [2].
Install M6 cylinder head cover bolts and washers [3].
Tighten torque: 11~13 N·m



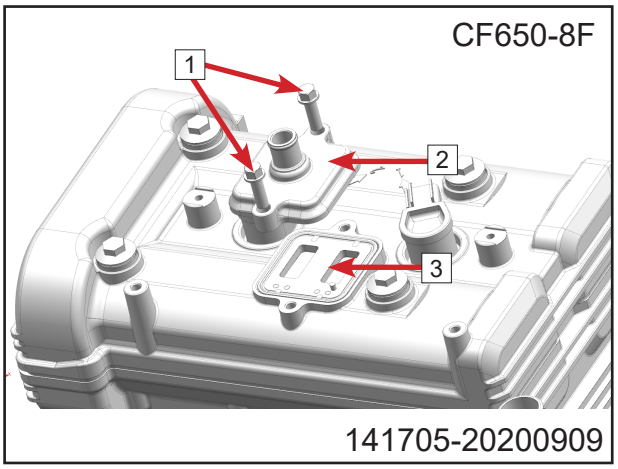
Use special tool: spark plug sleeve [1] to install spark plugs [2].
Tighten torque: 15 N·m



Install ignition coils [1].
Install press plates [2].
Install M6 bolts [3].



Install spring valve assy [3];
Install spring valve cover [2];
Install bolts [1].

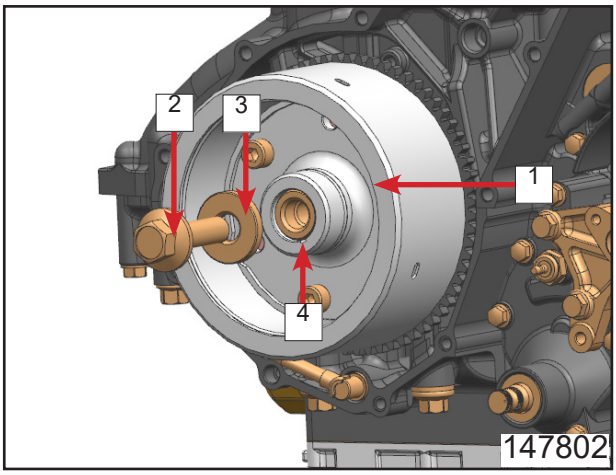


14.6.22 Magneto Rotor Installation

Apply engine oil on crankshaft and magneto rotor inner hole. Install magneto rotor [1].

Put washer [3] on M12 bolt [2]. Install M12 bolt [2] with 243 thread locker.

Tighten torque: 155 N·m



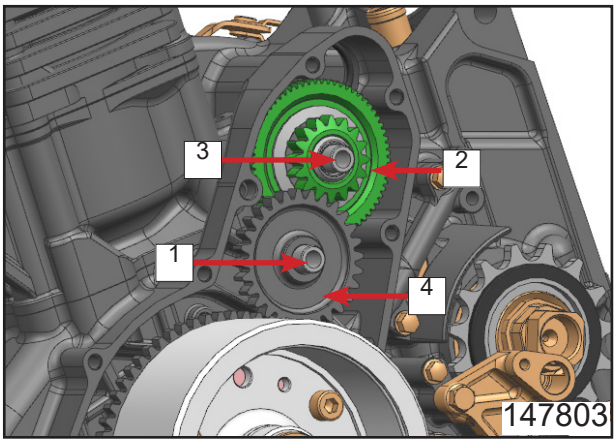
⚠Note: Before tightening the bolt, pull magneto with hand to make sure it doesn't move. Turn the starter big gear with hand, it can rotate in one direction.

Install middle gear shaft [3].

Install dual gear assy [2].

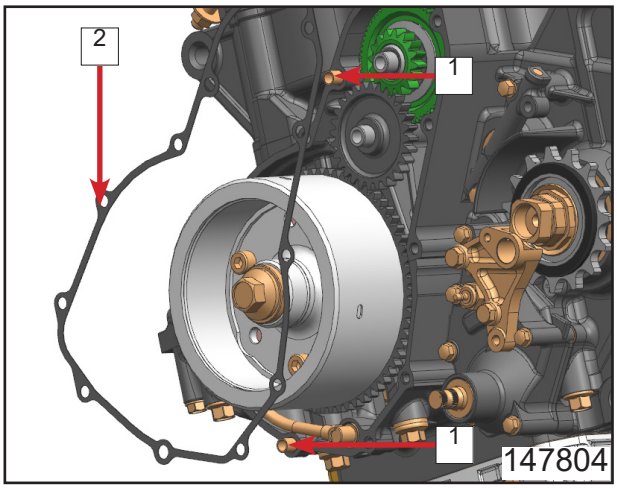
Install middle gear shaft [1].

Install starter middle gear [4].

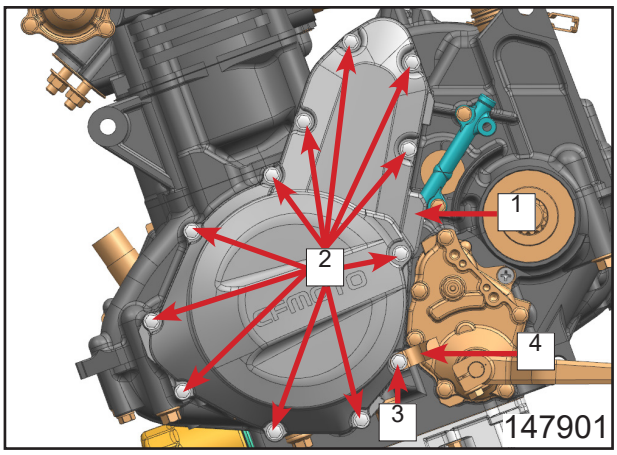


Install dowel pins [1].

Install seal gasket [2].



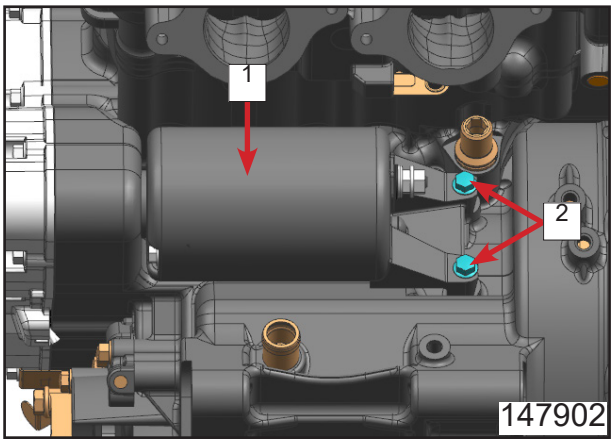
Install front LH cover [1].
Install M6 bolts [2] and M6 bolt [3]. Before installation, put wire clip [4] on M6 bolt, then install it.



⚠Note: Insert the bolts into holes before installation. The exposed height should be the same. Adjust the bolt if not. Tighten the bolts in criss-cross way.

14.6.23 Starter Motor Installation

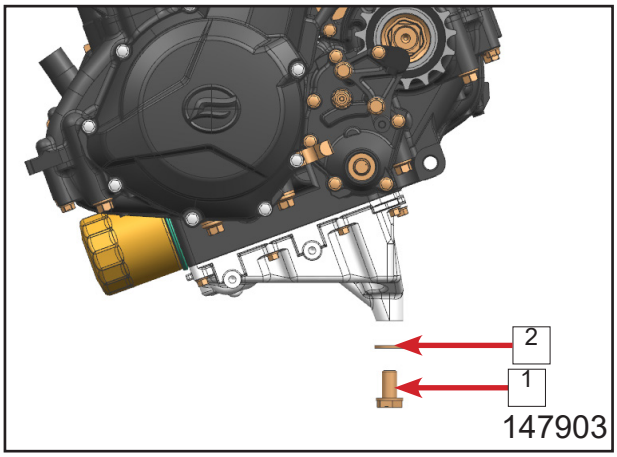
Install starter motor [1]. Use rubber hammer to knock the motor slightly for installation.
Install M6 bolts [2].



⚠Note: Apply engine oil on starter motor o-ring before installation. The o-ring can not be deformed.

14.6.24 Drain Bolt Installation

Install washer [1].
Install M12 magnetic drain bolt [2].
Tighten torque: 28~32 N·m



14.7 Lubrication System

14.7.1 Engine Oil Inspection

⚠Warning: Motorcycle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure, accident, and injury.

Oil Level Inspection

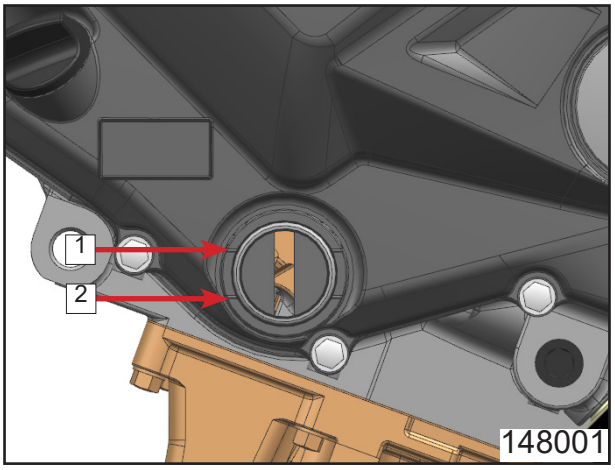
• Check that the engine oil level is between the upper [1] and lower [2] level in the viewer.

⚠Note:
Situate the motorcycle so that it is perpendicular to the ground.
If the motorcycle has just been used, wait several minutes for all the oil to drain down.
If the oil has just been changed, start the engine and run it for several minutes at idle speed. This fills the oil filter with oil. Stop the engine, then wait several minutes until the oil settles.

⚠Warning: Racing the engine before the oil reaches every part can cause engine seizure. If the engine oil gets extremely low or if the oil pump or oil passages clog up or otherwise do not function properly, the oil pressure warning light will light. If this light stays on when the engine is running above idle speed, stop the engine immediately and find the cause.

If the oil level is too high, remove the excess oil, using a syringe or some other suitable device.

If the oil level is too low, add the correct amount of oil through the oil filter opening. Use the same type and make of oil that is already in the engine.



⚠Note: If the engine oil type and make are unknown, use any brand of the specified oil to top off the level in preference to running the engine with the oil level low. Then at your earliest convenience, change the oil completely.

14.7.2 Engine Oil Change

Make sure the engine is on the horizontal position before changing.

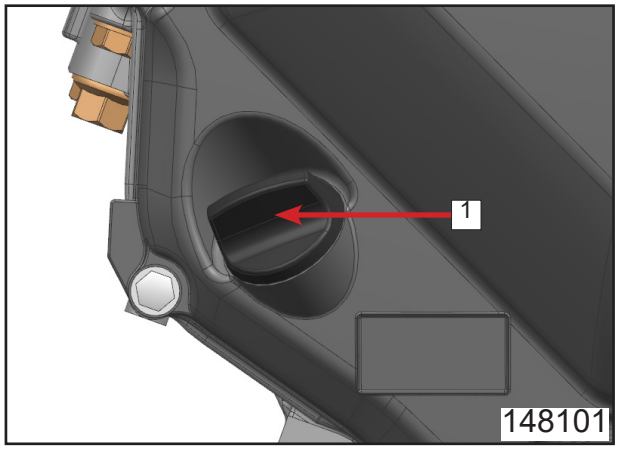
Change the engine oil and oil filter at the same time. Change when the engine is warm.

⚠Note: The engine temperature may be very hot when changing. Wait until the temperature is suitable.

⚠Note: Engine oil filter removal/installation and engine oil drain refer to Engine Disassembly/Assembly section.

⚠Note: The drain oil can reflect some conditions of the engine. Inspect whether there is some metal debris in the drain oil. The debris reflects the engine internal problems. Inspect the engine for trouble shooting.

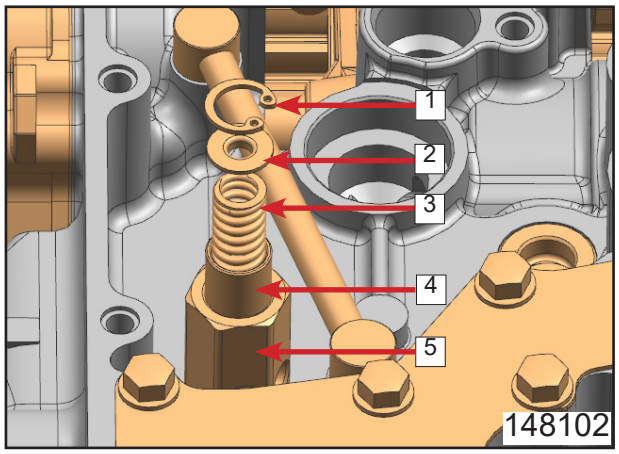
Remove filler screw plug [1]. Add engine oil.



14.7.3 Relief Valve

Disassembly

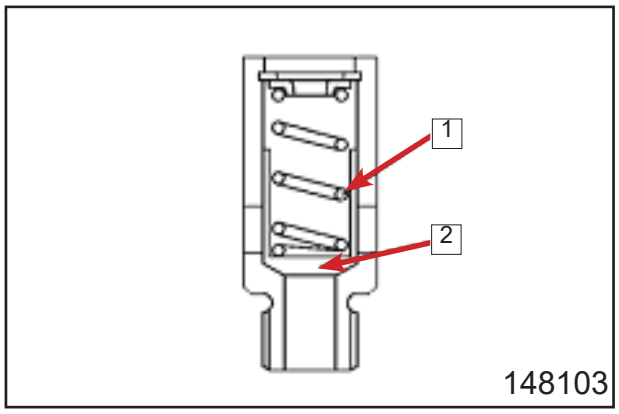
Remove circlip [1] with plier.
Remove relief valve spring seat [2].
Remove relief valve spring [3].
Remove relief valve element [4].
Remove relief valve [5].



Oil Relief Valve Inspection

Inspect to see if the valve [1] slides smoothly when pushing it in with a wooden or other soft rod, and see if it comes back to its seat by spring [2] pressure.

⚠Note: Inspect the valve in its assembled state. Disassembly and assembly may change the valve performance. Usually, the relief valve isn't disassembled.

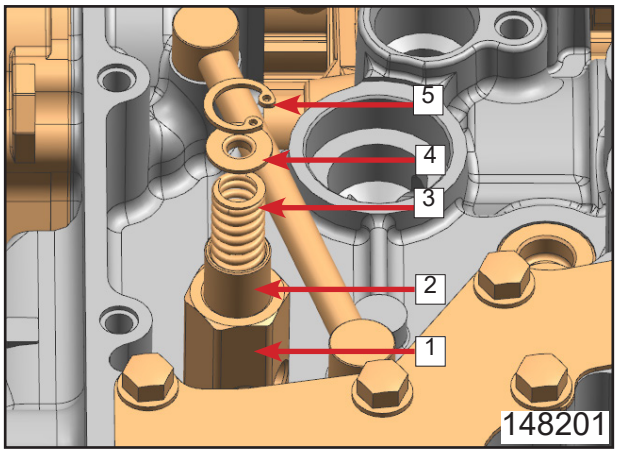


If any rough spots are found during above inspection, wash the valve clean with a high-flash point solvent and blow out any foreign particles that may be in the valve with compressed air.

⚠Warning: Clean the oil pressure relief valve in a well ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low flash point solvent.

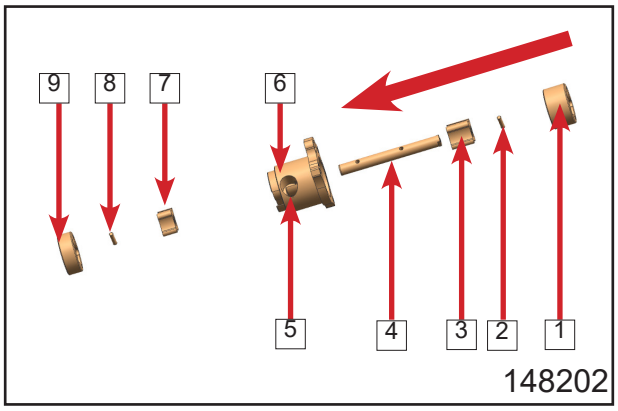
⚠Note: If cleaning does no solve the problem, replace the oil pressure relief valve as an accessory. The oil pressure relief valve is precision made with no allowance for replacement of individual parts.

Assembly
Install relief valve [1] with wrench.
Tighten torque: 15 N·m
Install relief valve element [2].
Install relief valve spring [3].
Remove relief valve spring seat [4].
Clamp circlip [5] with plier. Compress the valve spring seat to install the circlip [5].



14.7.4 Engine Oil Pump

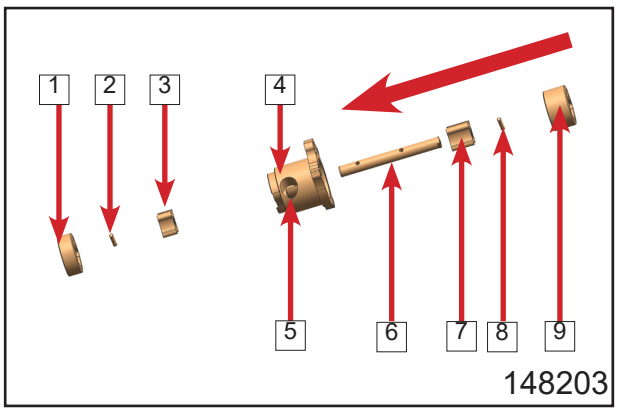
Disassembly
Remove auxiliary oil pump outer rotor [1].
Remove auxiliary oil pump inner rotor [3].
Remove roller needle [2] through hole [5].
Remove main oil pump outer rotor [9].
Push oil pump shaft [4] towards arrow direction. Push the main oil pump inner rotor [7] towards arrow negative direction to remove roller needle [8].
Remove main oil pump inner rotor [7] from pump shaft [4].
Remove oil pump shaft [4] from the oil pump [6].



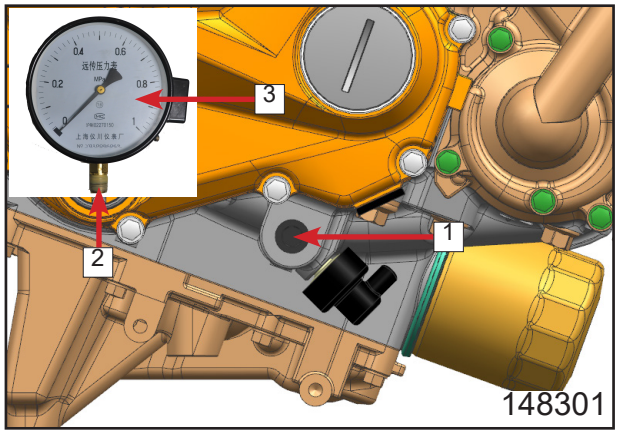
Inspection
Inspect oil pump each part for severe wear and damage. Replace with new oil pump assy.

Assembly
Install pump shaft [6] on oil pump [4].
Install main oil pump inner rotor [3].
Install roller needle [2].
Install main oil pump outer rotor [1].
Install roller needle [8] through hole [5].
Install auxiliary oil pump inner rotor [7].
Install auxiliary oil pump outer rotor [9].

⚠Note: The auxiliary oil pump rotors are wider than main oil pump ones.



14.7.5 14.7.5 Remove engine guard.
Remove main oil passage plug [1] and install the adapter [2] and dashboard [3] into the plug hole.



Tool: Oil pressure gauge 10kgf/cm2
Oil pressure gauge adapter PT3/8

Start and warm up the engine.
Run the engine at the specified speed, and read the oil pressure gauge

If the oil pressure is much lower than the standard, check the oil pump, relief valve, and/ or crankshaft bearing wear immediately.

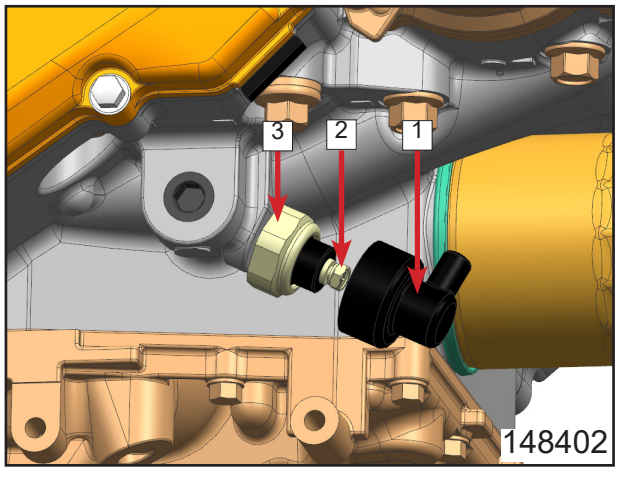
If the reading is much higher than the standard, check the oil passages for clogging.

Oil Pressure
Standard: At 4000r/min(rpm), the temperature is 90°C (194°F) 216~294 kPa (2.2~3.0 kgf/cm2 ,31~43 psi)

Stop engine.
Remove oil pressure gauge and adapter.

⚠Warning: Take care against burns form hot engine oil that will drain through the oil passage when the gauge adapter is removed.

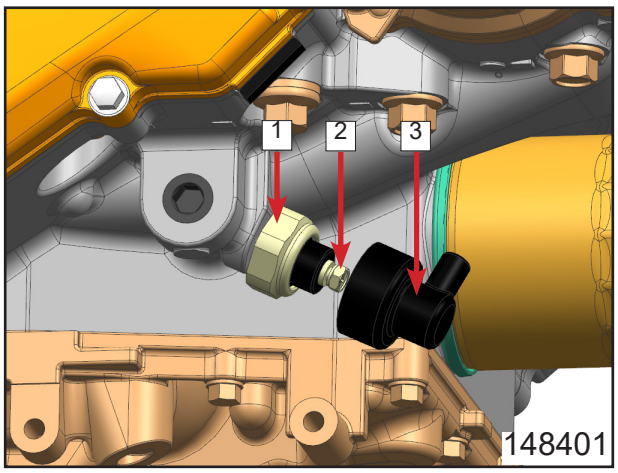
Apply thread locker on main oil passage plug. Install and tighten the oil passage plug.
Tighten torque: 20 N·m



14.7.6 Oil Pressure Warning Switch Removal
Drain engine oil (refer to Engine Disassembly section).
Remove protection cover [1].
Remove screw [2].
Remove oil pressure warning switch [3].

Inspection
Refer to Electrical System chapter.

Assembly
Apply silicone sealant to the threads of the oil pressure switch [1] and tighten it.
Tighten torque: 15 N·m
Put the wire on screw [2] and then install the screw [2].
Install protection cover [3] on warning switch [1].

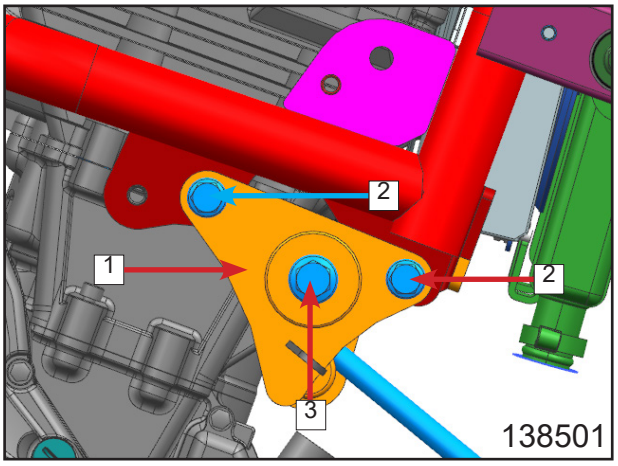


14.8 Engine Installation

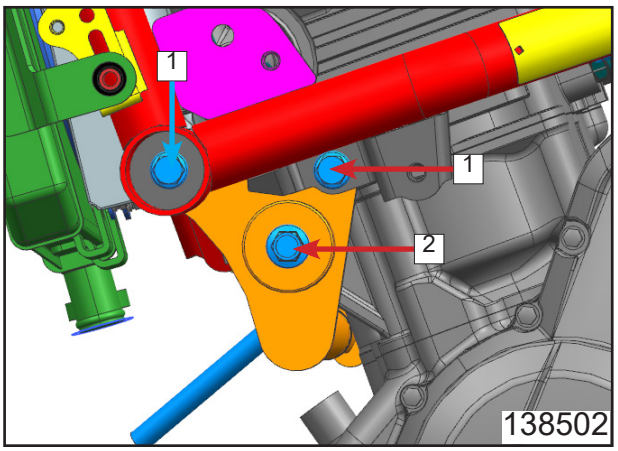
14.8.1 Engine Installation

Put the engine on jack and lift up the engine. Adjust it to the proper position.

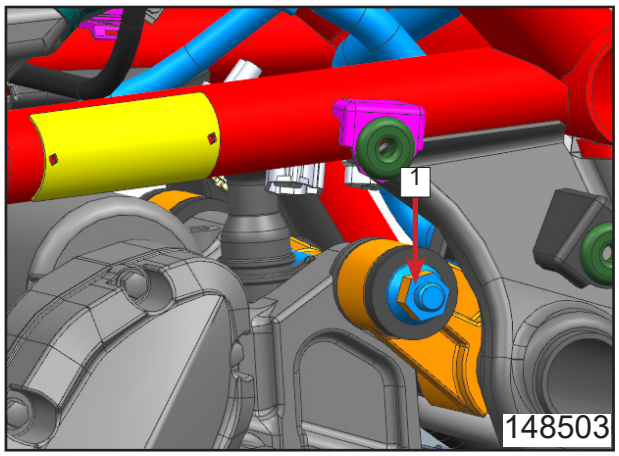
Install engine mounting bracket assy [1].
Install M8 bolts [2].
Put the M10 bolt [3] through the hole and install the nut. Fix the bolt with wrench and then tighten the nut.



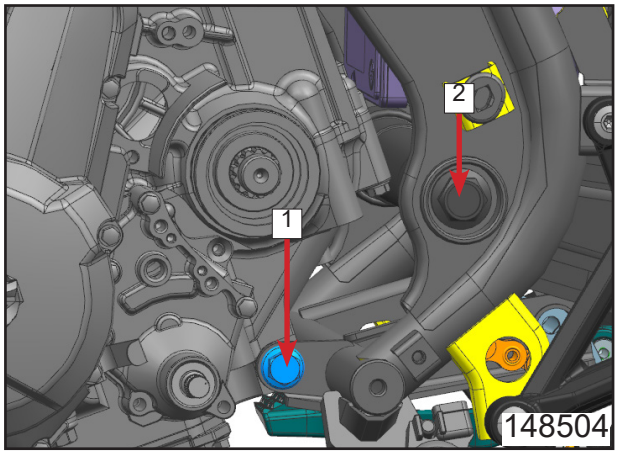
Install M8 bolts [1].
Put the M10 bolt [2] through the hole and install the nut. Fix the bolt with wrench and then tighten the nut.



Put the bolt [1] through the hole and install the M10 nut. Fix the bolt with wrench and tighten the nut.

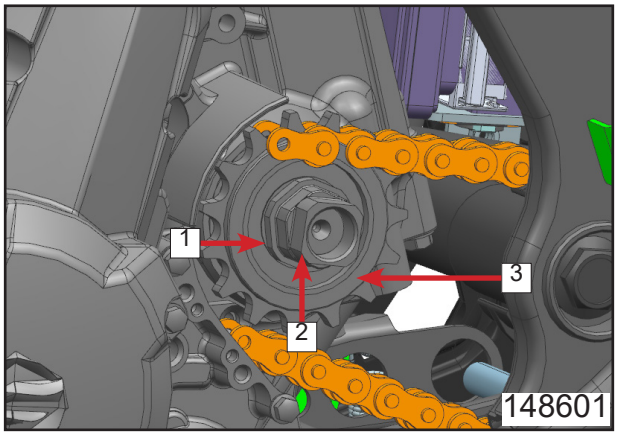


Put the M10 bolt [1] and M20 bolt [2] through the holes and install the nuts. Fix the bolts with wrench and tighten the nuts.



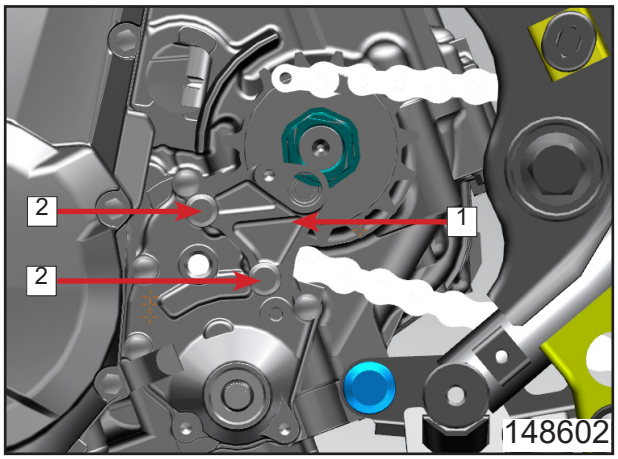
14.8.2 Output Sprocket Installation

Install output sprocket [1].
Install washer [2].
Install M20 pulsing nut [3] with 243 thread locker.
Tighten torque: 125 N·m

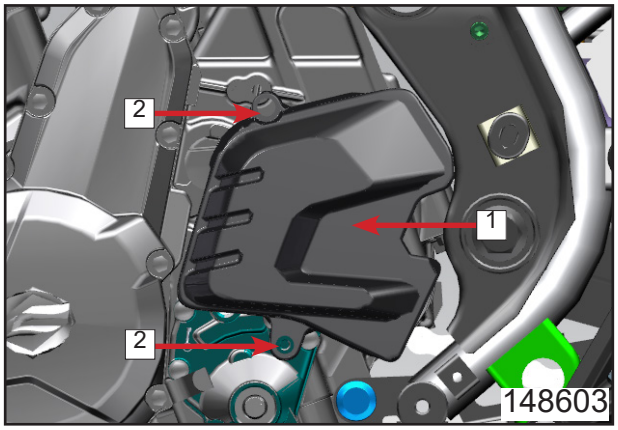


Install bracket [1].
Install M6 bolts [2].

⚠Note: There are two dowel pins [2] under the bracket. Do not lose them during installation.

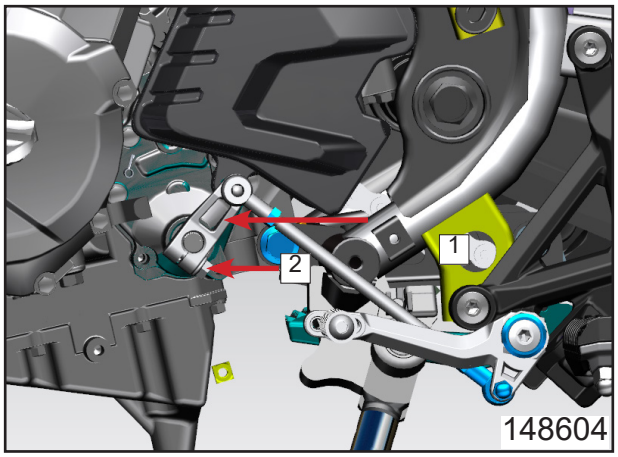


Install engine rear LH cover assy [1].
Install bolts [2].



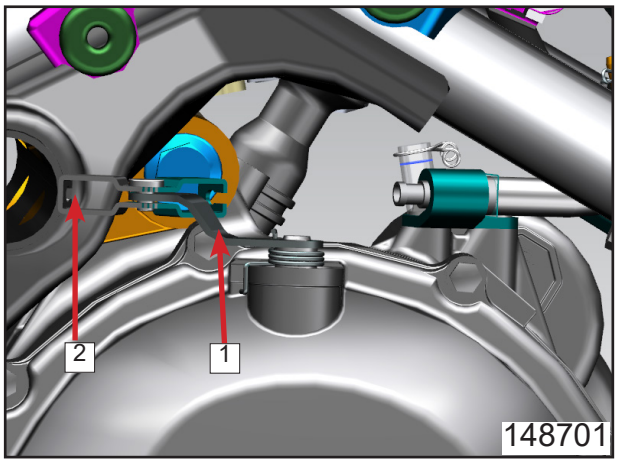
14.8.3 Gearshift Lever Assy Installation

Install gearshift lever assy [1].
Install M6 bolt [2].



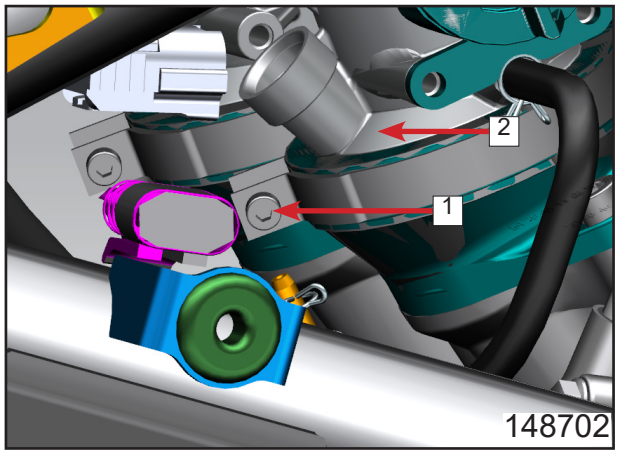
14.8.4 Clutch Cable Installation

Rotate the clutch tie-rod [1] and install the clutch cable [2].

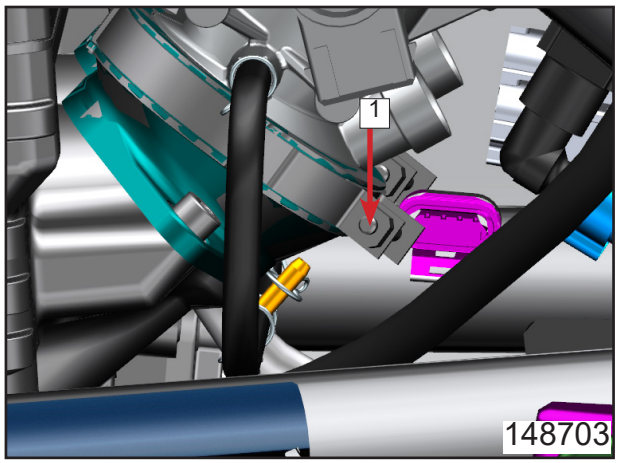


14.8.5 Air Filter Connection

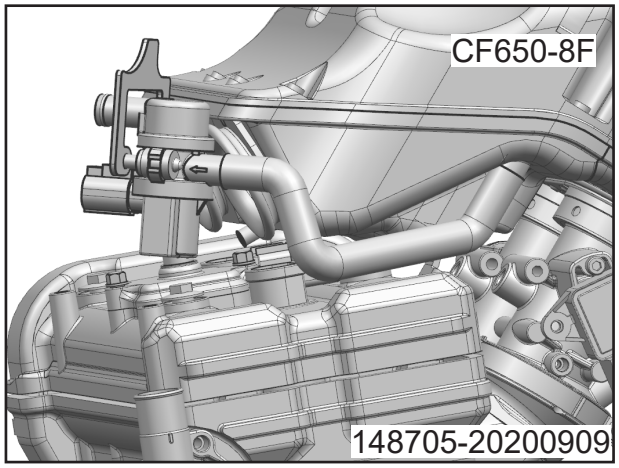
Install throttle valve body [2] properly. Tighten clamp [1].



Tighten clamp [1].

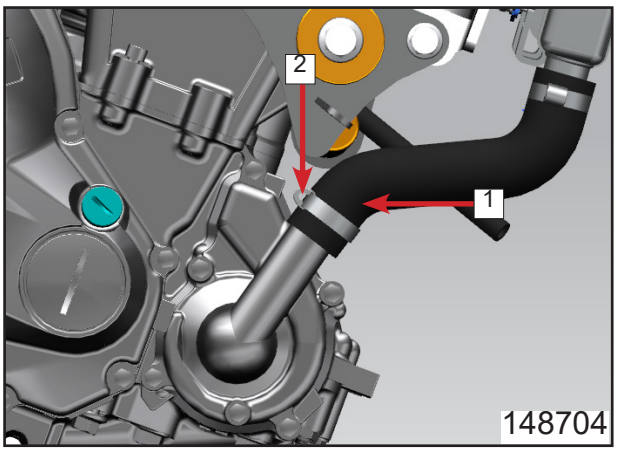


Install AIS valve and air inlet and outlet pipes.

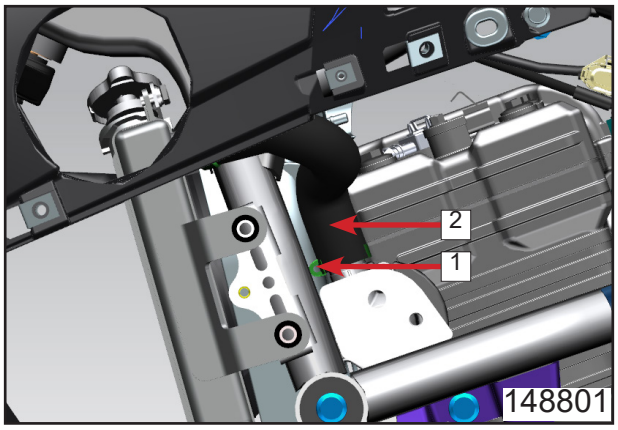


14.8.6 Inlet/Outlet Pipe Installation

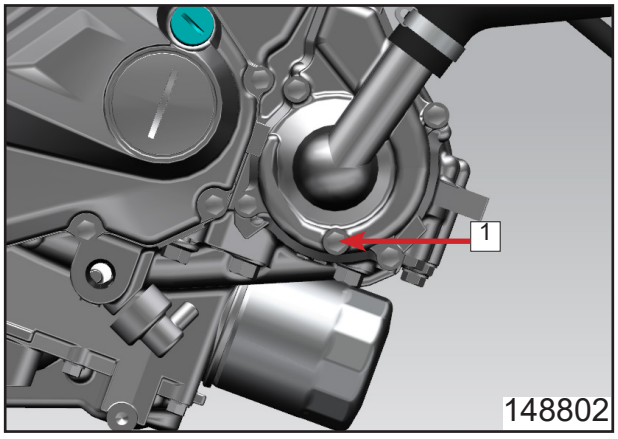
Install the outlet pipe [2] on engine.
Tighten clamp [1].



Install the inlet pipe [2] on engine.
Tighten clamp [1].

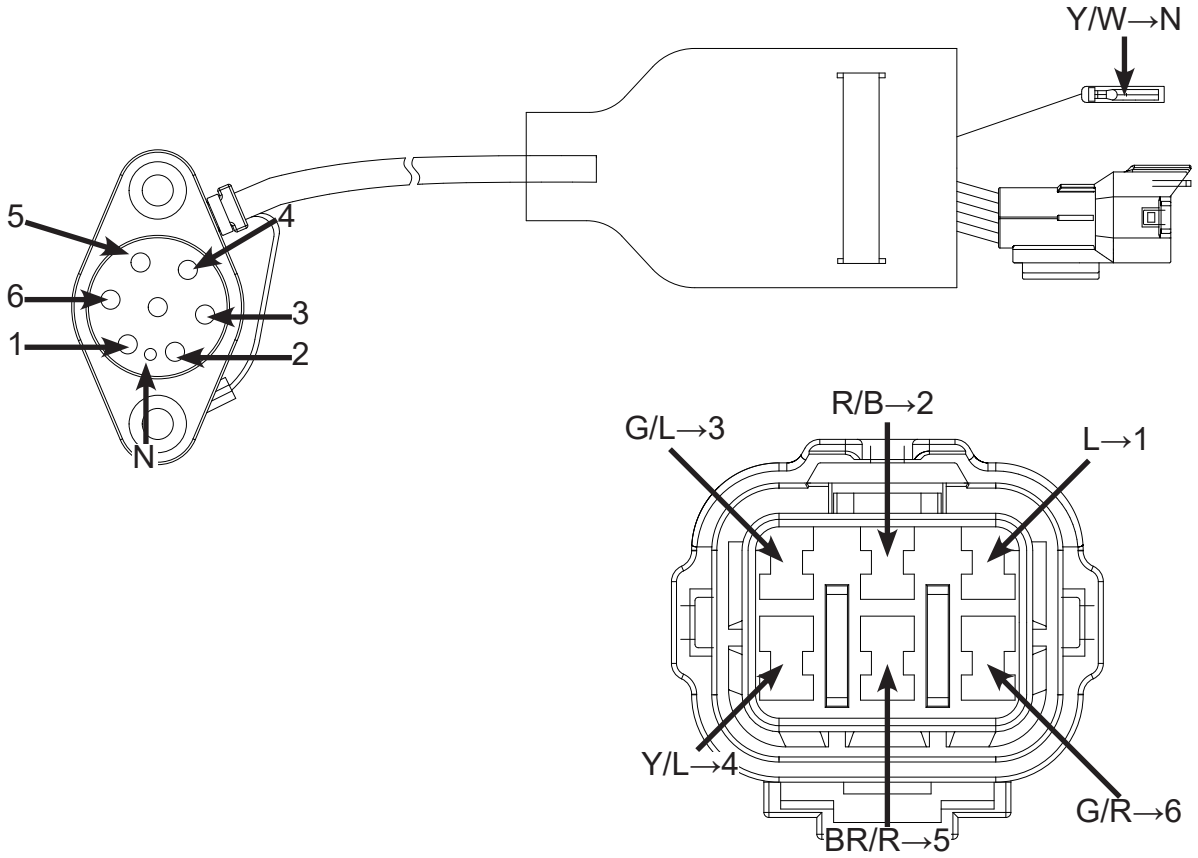


Install M6 drain bolt [1] and washer.



14.9 External gear display

Vehicles will be equipped with external gear display after moder year 2022.

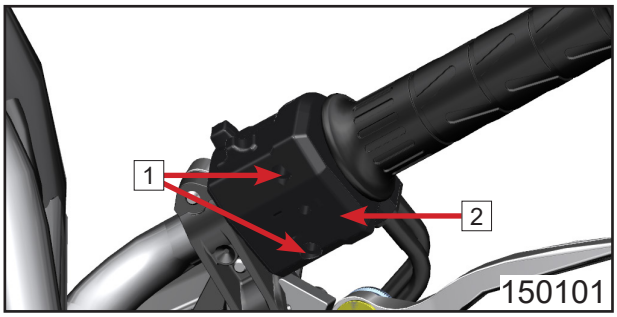


15.1 Handlebar Assy

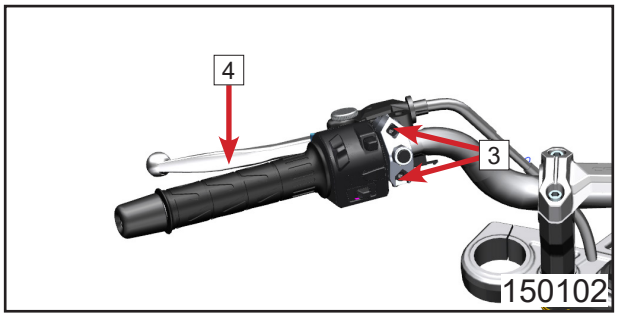
15.1.1 Handlebar Lever

Removal

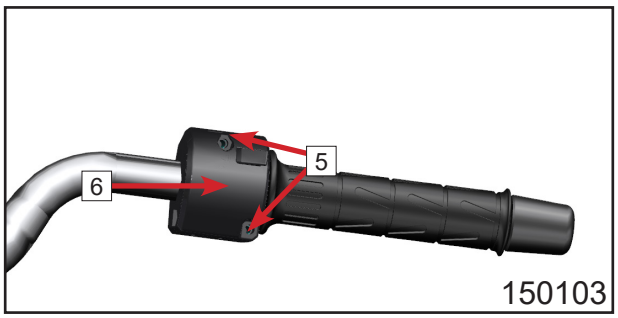
Remove two crossing bolts 1.
Remove RH handlebar switch assy 2.



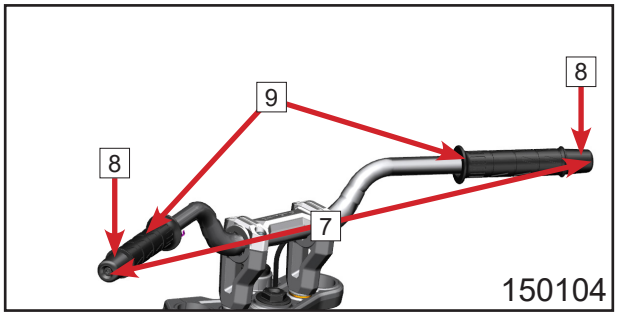
Remove two M6 bolts 3.
Remove clutch lever 4.



Remove crossing bolt 5.
Remove LH handlebar switch assy 6.

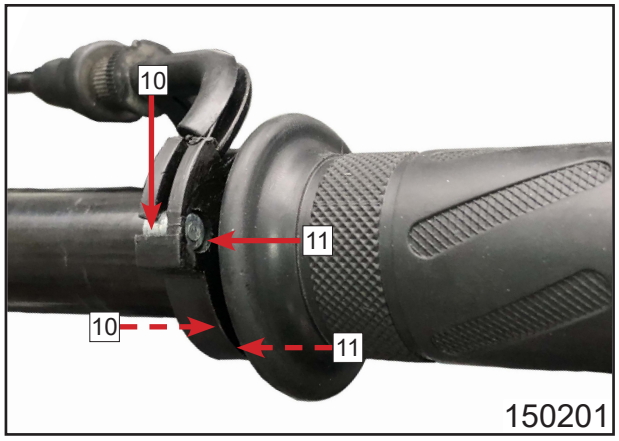


Remove M6 bolt 7.
Remove balance block 8.
Remove rubber hand grips 9.

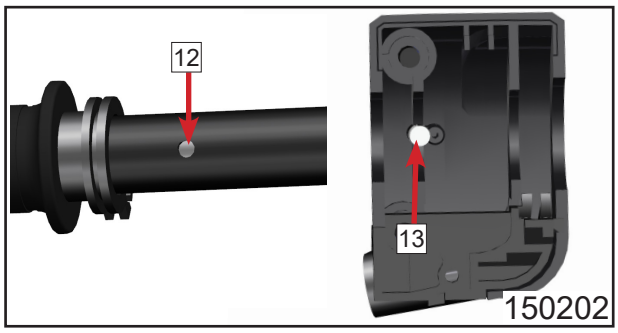


Installation
Reverse the removal procedures for installation.

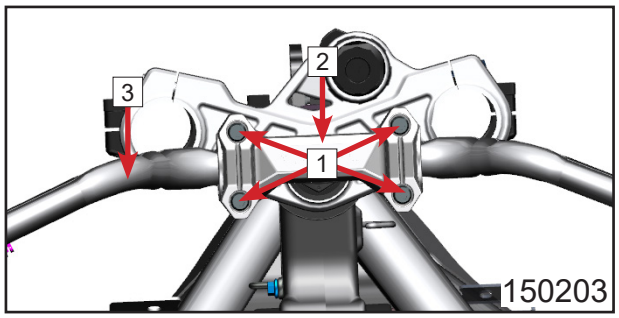
⚠Note: Insert the throttle cable 10 into RH grip 11 before installing RH handlebar switch assy.



⚠Note: Align the dowel pin 12 and its hole 13 during handlebar switch assy installation.



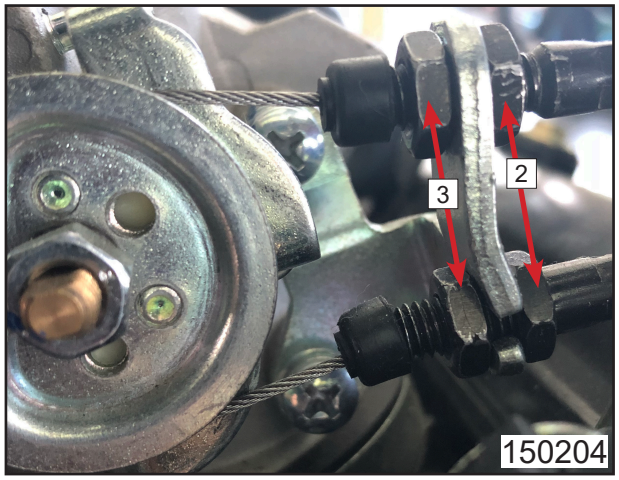
15.1.2 Handlebar Cover
Removal
Remove four M6 bolts 1.
Remove handlebar cover 2.
Remove handlebar 3.



Installation
Reverse the removal procedures for installation.
Handlebar bolt tighten torque: 20 N•m

15.2 Handlebar Assy Inspection

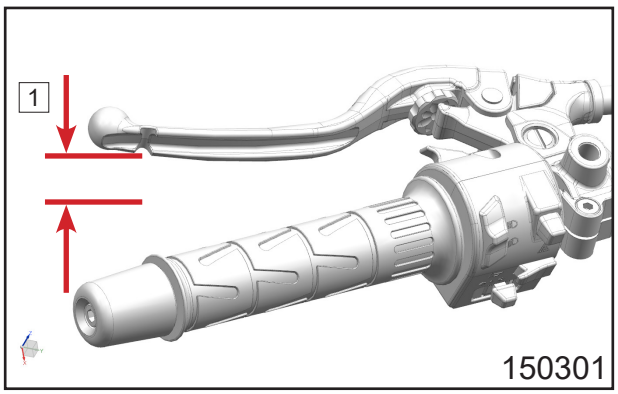
15.2.1 Throttle Cable Free Play
Inspect throttle lever if it is smooth to grip or return.
Inspect throttle cable free play.
Free play standard: 3 mm~6 mm



Throttle Cable Adjustment
Adjustment: Loosen nut 3, place the adjusting screw 2 to proper position and then tighten the nut 3.

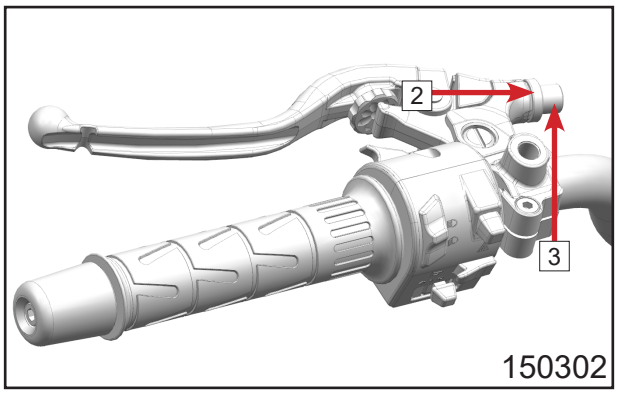
15.2.2 Clutch Lever Free Play Inspection

Inspect clutch lever if it is smooth to return.
Inspect clutch lever free play 1.
Free play standard: 5 mm~15 mm

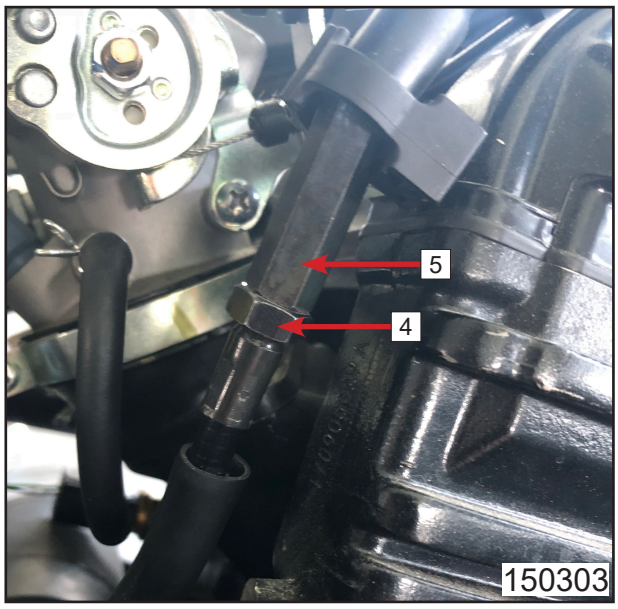


Clutch Cable Free Play Adjustment

Minor adjustment: Loosen lock nut 3 and rotate the adjusting nut 2 for adjustment. At last, tighten the lock nut 3.

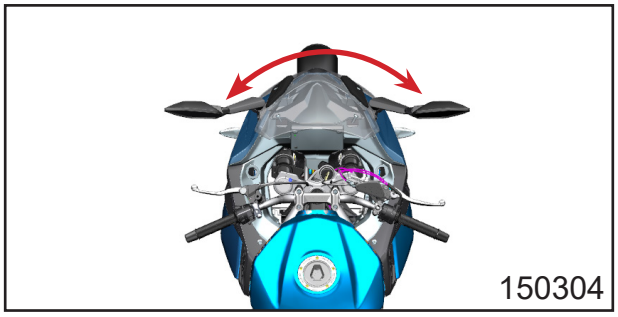


Major adjustment: Loosen lock nut 4 and rotate the adjusting nut 5 for adjustment. At last, tighten the lock nut 4.



15.2.3 Handlebar Interference Inspection

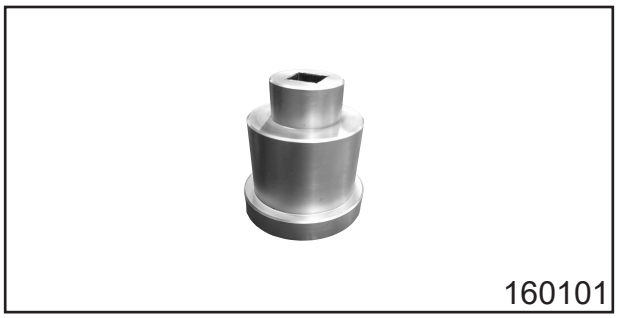
Turn the handlebar left and right to check whether cables interfere front wheel.
When the turning angle is the maximum, check if the handlebar interferes the fuel tank.



16.1 Special Tool

Nut Locking Tool (to remove&installing lock nut)

A000-050006-922-001

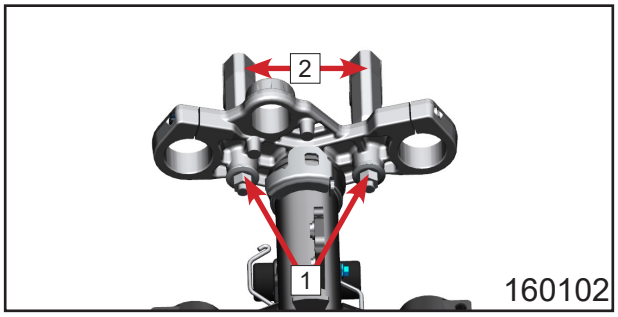


16.2 Upper Triple Clamp and Lower Triple Clamp

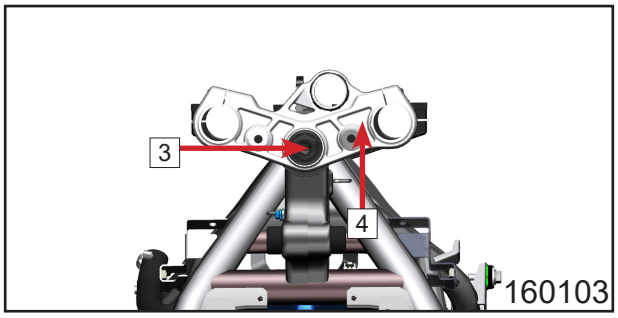
16.2.1 Upper Triple Clamp

Removal

Remove two M10 nuts 1.
Remove handlebar seats 2.



Remove upper triple clamp M27 lock bolt 3.
Remove upper triple clamp 4.



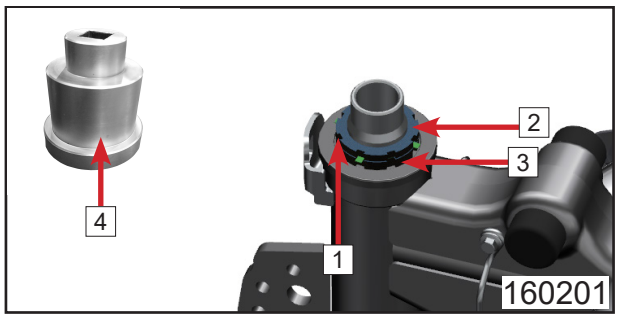
Installation

Reverse the removal procedures for installation.

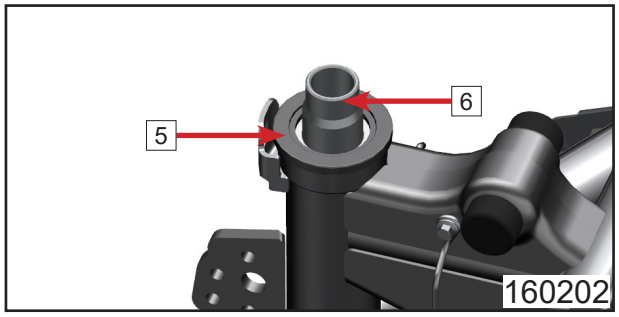
16.2.2 Front Fork Pipe and Lower Triple Clamp Assy

Removal

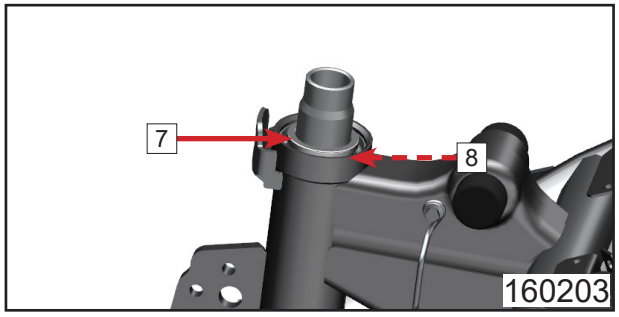
Knock and straighten the flanging of retainer 1.
Remove lock nut I 2 with special tool 4.
Remove retainer 1.
Remove lock nut II 3 with special tool 4.



Remove upper retainer dust cap 5.
Remove front fork pipe and lower triple clamp assy 6.

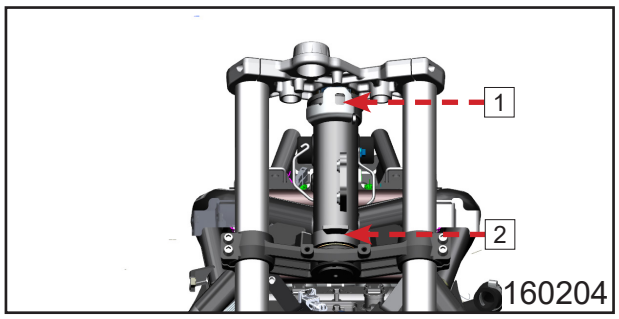


Remove bearing cage 7.
Remove steel ball assy 8.

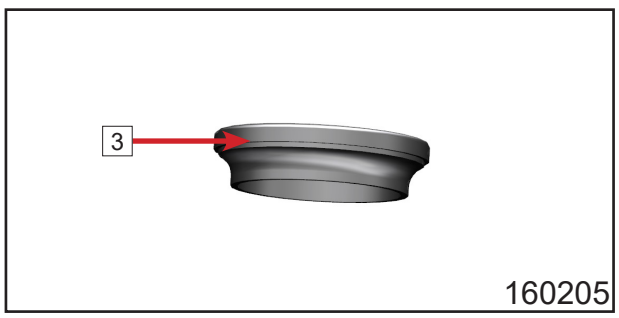


Inspection

Inspect upper steel ball assy 1 and lower steel ball assy 2 for wear or missing. Replace if does.



Inspect bearing cage 3 for cracks or abnormal wear. Replace if does.



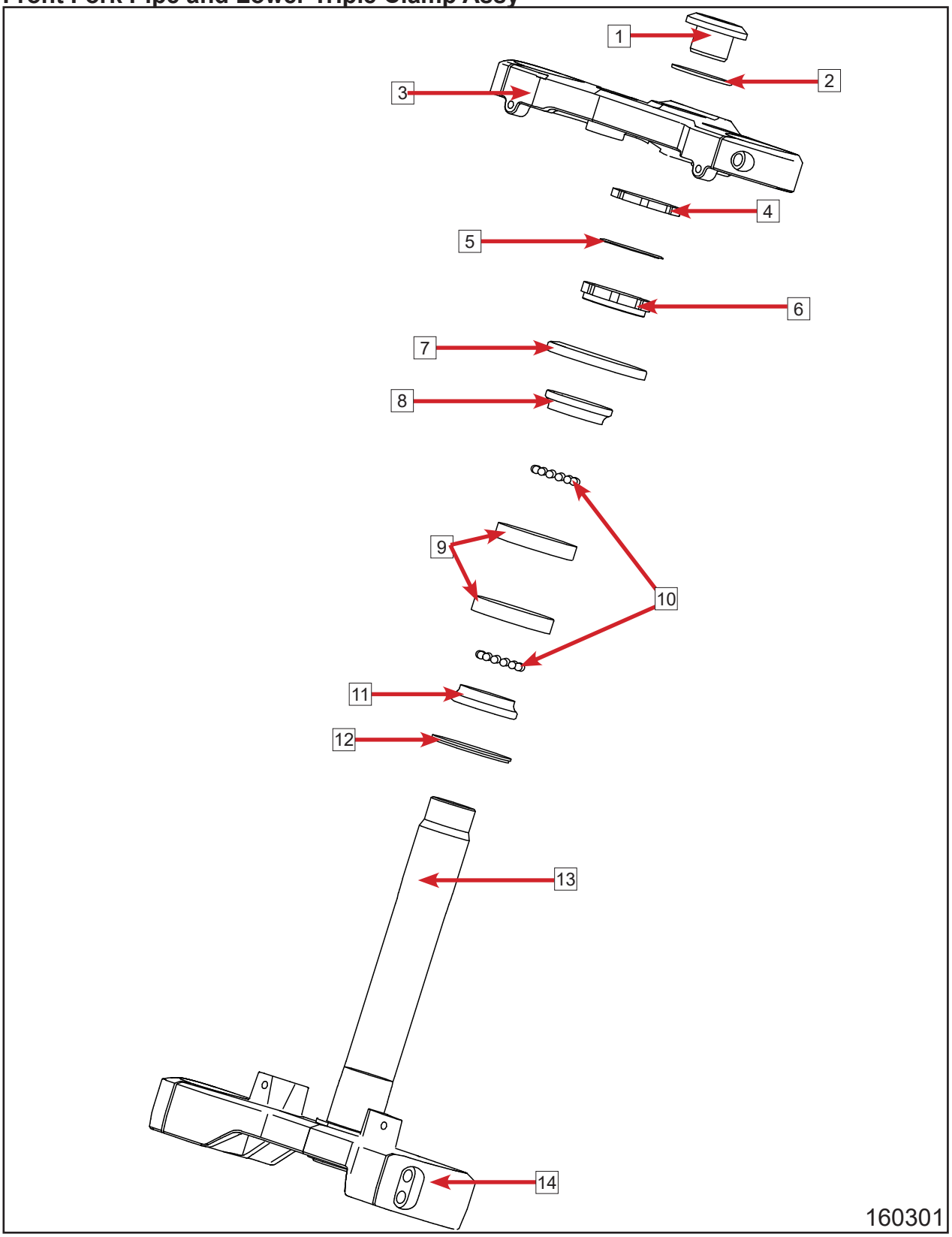
Installation

Reverse the removal procedures for installation.

Upper triple clamp lock nut tighten torque: 20 N•m

⚠Note: During installation and replacement, apply enough grease on bearing top race 3.

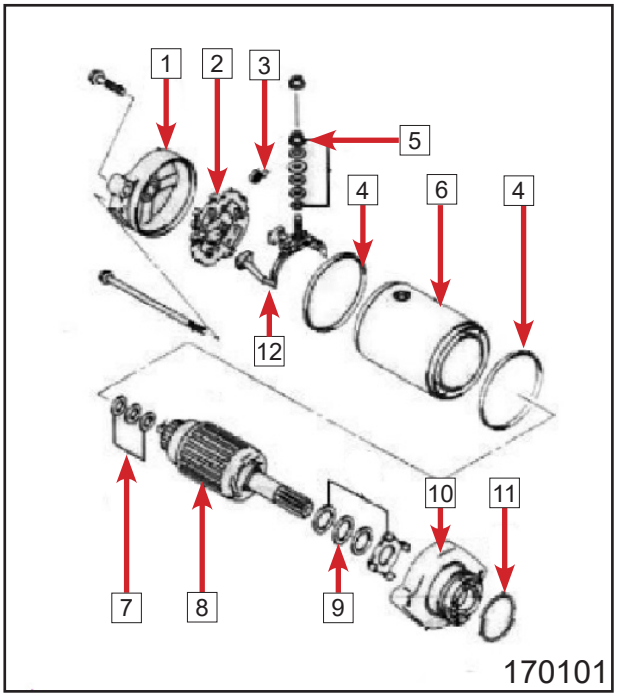
Front Fork Pipe and Lower Triple Clamp Assy



1	Lock bolt, upper triple clamp	5	Retainer	9	Bearing cage	13	Steering column
2	Retainer	6	Lock nut II	10	Steel ball assy	14	Lower triple clamp
3	Upper triple clamp	7	Dust cap, upper retainer	11	Bearing cage		
4	Lock nut I	8	Bearing cage	12	Dust cap, lower retainer		

17.1 Stater Motor

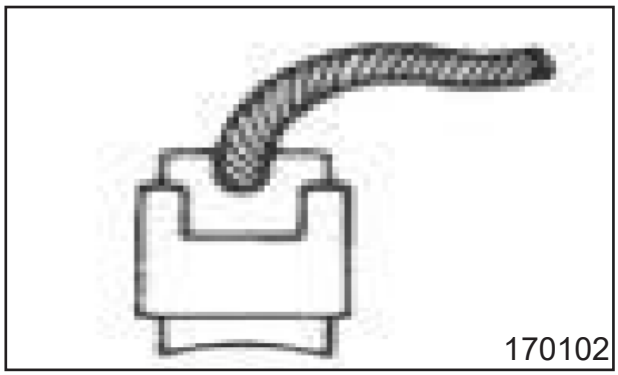
1	Outer side cover	5	Brush connector	9	Washer
2	Brush bracket	6	Starter motor drum	10	Inner side cover
3	Brush spring	7	Washer	11	O-ring
4	O-ring	8	Armature	12	Brush



170101

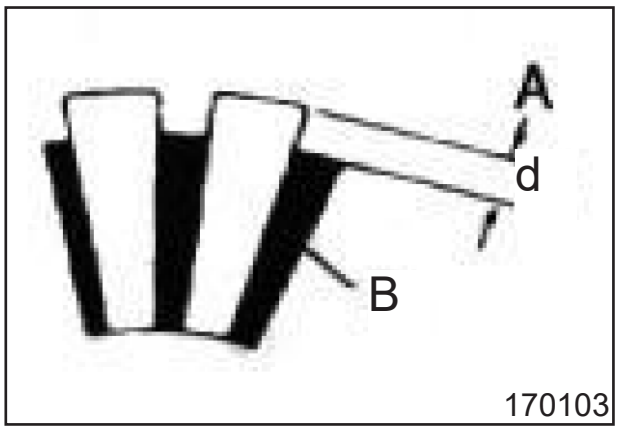
17.1.1 Brush

Inspect brush for damage, crack or other defects.
Replace the brush assy if necessary.


170102

17.1.2 Commutator

Inspect commutator if it changes color, damages or wears.
If damaged, replace a new one.
If the surface of the commutator changes color, wipe it with sand paper and then use a dry cloth to clean the surface.
If it wears too much, saw part of insulator (B). The distance between (B) and (A) is d.
d ≥ 1.5 mm

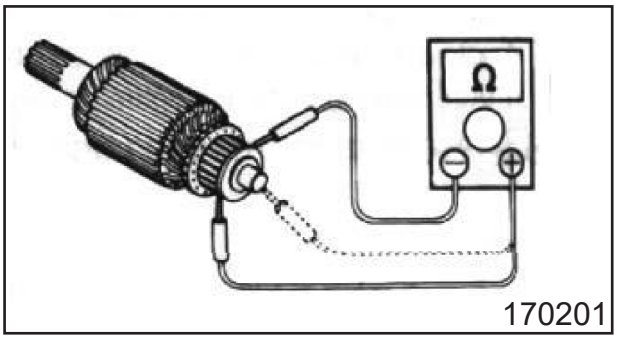


170103

17.1.3 Armature Coil

Use multimeter to check the connection situation between sections, section and armature shaft.

If there is no connection between sections or section and armature are connected, replace a new armature.

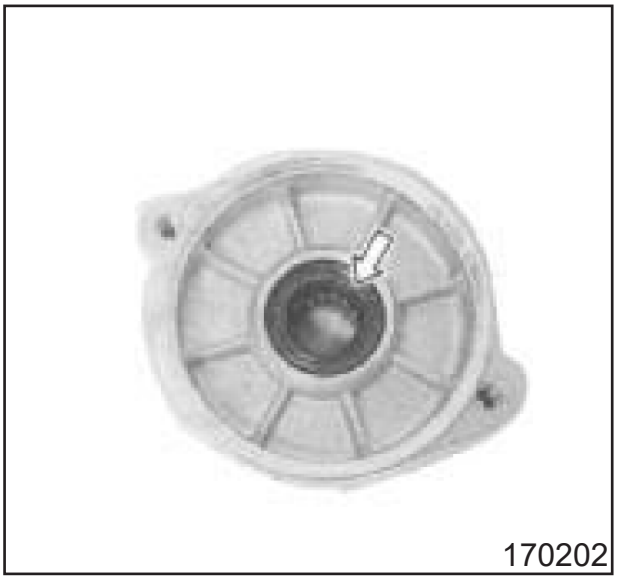


170201

17.1.4 Oil Seal

Inspect the oil seal lip for damage or leakage.

Replace a new one if it does.


170202

17.2 Starter Relay

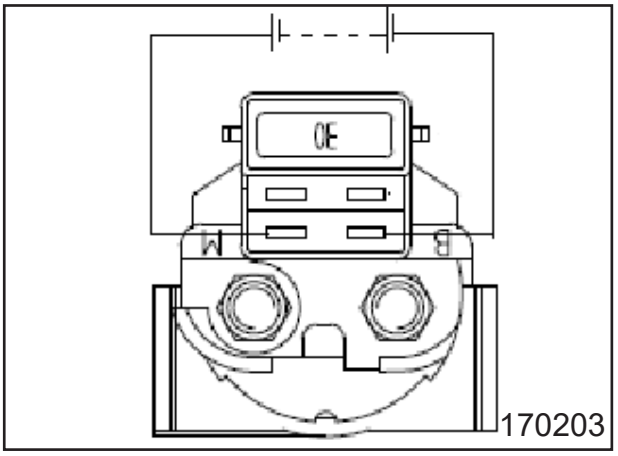
Put 12V battery between positive and negative terminal. Use multimeter to check if there is continuity between 2 contacts.

If multimeter clicks, there is continuity between contacts.

If 12V is removed, no continuity remains between contacts.

If both above 2 items are ok, it indicates the relay is ok.

Turn multimeter to DIODE.



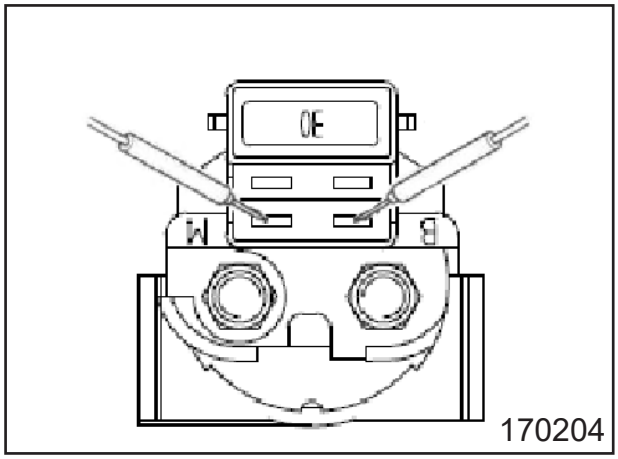
170203

⚠Note: The voltage loaded between terminals can not exceed 2 minutes, otherwise, starter relay may overheat or burn.

Use multimeter to measure starter relay coil resistance, if the reading is out of specification, replace a new relay.

Turn multimeter to 1×10 Ω

Starter relay coil resistance: 3 Ω~5 Ω



170204

Auxiliary Starter Relay and Fuel Pump Relay

Put 12V battery between auxiliary starter relay coil positive and negative terminal. Use multimeter to check if there is continuity between contact A and B.

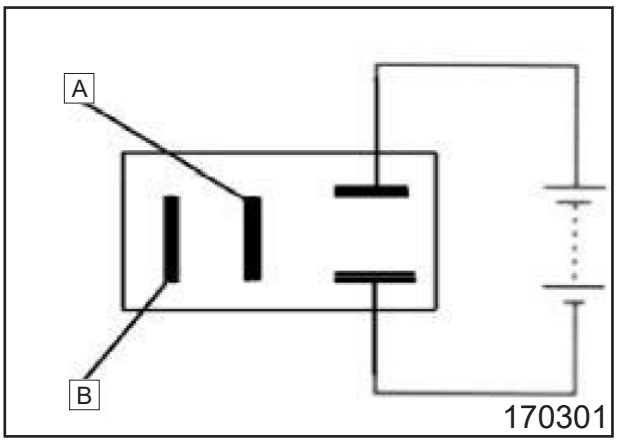
If multimeter clicks, there is continuity between contacts.

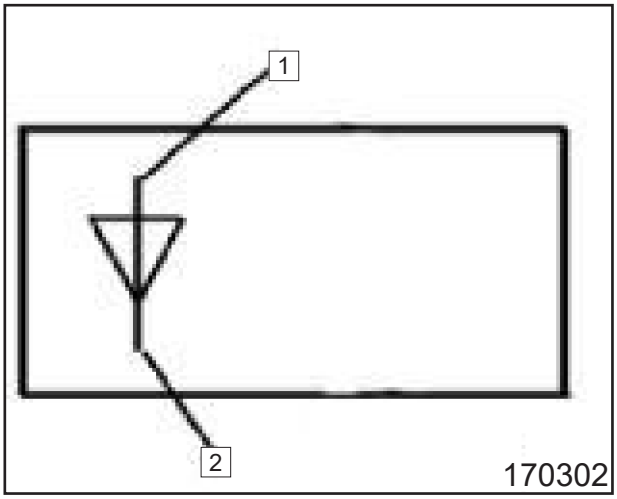
If 12V is removed, no continuity remains between contacts.

If both above 2 items are ok, it indicates the relay is ok.

Turn multimeter to 1×100 Ω to measure the coil resistance.

Auxiliary starter relay coil resistance: 90 Ω~100 Ω





1	Ground	2	Positive pole

⚠Note: On the back side of the auxiliary starter relay, the side, of which the direction is the same with the diode, is the relay coil positive pole.

17.3 Engine Starting Notice

Properly route according to starting schematic diagram.

Before starting, check if all parts are installed correctly. EFI components connection refers to EFI section.

Check air intake system.

Check fuel supply system. Ensure there is no block or leaks.

Test fuel pressure with fuel pressure gauge.

Pressure in fuel pump outlet: 0.33MPa±0.01MPa

Shift to neutral gear.

Check EFI with PDA for fault. If there is, eliminate the trouble according to fault code.

Close the throttle and turn the engine stop switch to “RUN”, then push starter switch for 3~5s to run the engine.

After starting,warm up until idle speed is stable and check it.

Idle speed: 1450 rpm±145 rpm.

Pressure gauge

18.1 Motorcycle Clean

⚠Note: Clean the motorcycle periodically, to help it keep value and appearance. Avoid direct sunlight on the motorcycle while cleaning.

Seal air exhaust system to prevent water into the system.
Clean chunks of dirt with gentle water-jet in advance.
Use common motorcycle cleaner to clean serious smudges and wipe it with hairbrush.

⚠Note:
Use the hot water with specialized cleaner for motorcycle and a piece of sponge. It is not allowed to use the cleaner directly on dry vehicle body. Flush the vehicle with water in advance.
If the vehicle has been used in snow-melting salt, clean it with cold water. Otherwise, the hot water will exacerbate erosion.

Dry the car completely after washing the motorcycle with gentle water-jet.
Remove the seal plug for exhaust system.

⚠Warning: The dirty or damp braking system will reduce the braking performance. Pay attention to keep the brake system clean and dry.

After cleaning, run the vehicle for some distance until the engine reaches certain temperature.
Push the guard upwards from the handlebar, in order to let the water evaporate.
After the motorcycle cools down, lubricate all sliding parts and bearing parts.
Clean the chain.
Use anti-rusting agent on exposed metal parts (except brake discs and exhaust system).
Use gentle curing agent on all painting parts.

⚠Note: Do not polish the plastic parts which is in delivery. Otherwise, it will serious effects on the quality.

Use gentle cleaning agent and curing agent on all plastic parts and powder-coated parts.
Lubricate ignition switch lock/steering lock with engine oil.

18.2 Inspection and Maintenance in Winter

⚠Note:
If the motorcycle is used in winter, it must be taken into consideration that the street is covered with snow-melting salt. Therefore, protective measures must be taken against erosion.
If the vehicle has been used in snow-melting salt, clean it with cold water. Otherwise, the hot water will exacerbate erosion.

Clean the motorcycle.
Clean brake system.

⚠Note:
If the vehicle has been used in snow-melting salt, clean it with cold water after the brake calipers and brake pads cool down. Dry all the parts after cleaning. Do not remove brake parts when cleaning.

Use waxy preservative liquid for engine, swing arms and other exposed or galvanized parts (except brake pad).

⚠Note:
The preservative liquid is not allowed to get into the brake pads. Otherwise, it will reduce the braking effect seriously.

Clean the chain.

19.1 Parking

⚠Note:
If parking for a long time, please execute the following measures.
Before parking the motorcycle, please check its functions and wear condition. If the bike needs maintenance, service or adjustment, operate it during parking (when service station has less work), which prevents long wait at the service station before peak season arrives.

•Add fuel additives for the last refueling before parking the motorcycle.
•Add fuel.
•Clean the motorcycle.
•Replace engine oil, oil filter and clean oil strainer.
•Check coolant and coolant level.
•Check tire pressure.
•Remove battery.
•Charge the battery.

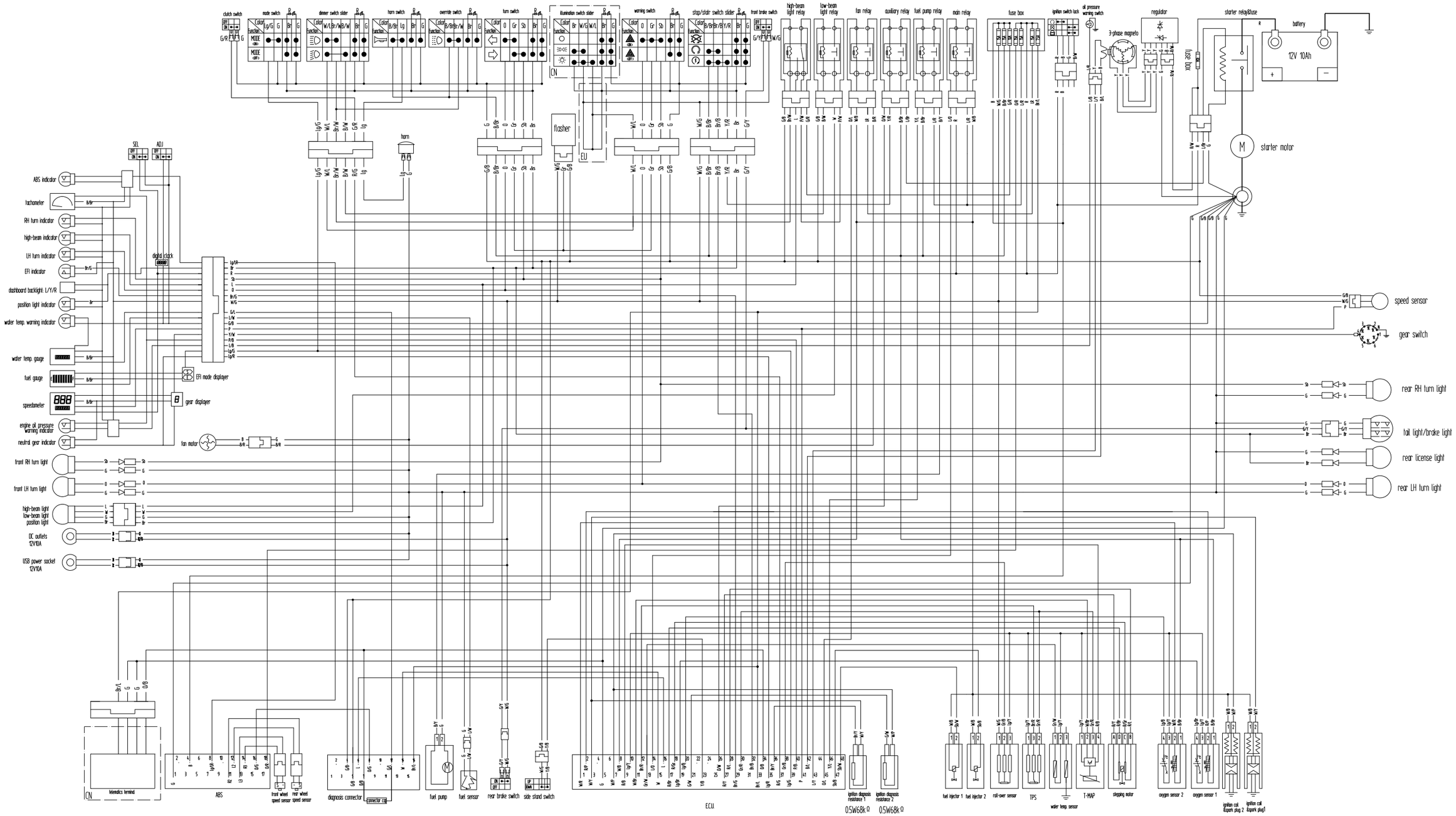
Without direct sunlight condition, battery storage temperature: 0 ～ 35°C
Place the vehicle at a dry place without obvious temperature fluctuation.
Advice to use wheel bracket to lift the motorcycle.
Cover the motorcycle with breathable canvas or cover.

⚠Note:
It is not allowed to use air-proof material to cover the motorcycle. Otherwise, the moisture can not get out which causes erosion.
The short-time running of the engine will cause severe damage if the motorcycle has parked. The temperature of the engine is not high enough after short-time running. The moisture that comes into being during combustion condenses after the engine cools down, which causes valve body and exhaust pipes erosion.

19.2 Motorcycle Use after Storage

•Remove the motorcycle from front wheel bracket.
•Remove the motorcycle from rear wheel bracket.
•Install battery.
•Inspect and maintain the motorcycle before use every time.
•Drive the motorcycle to test it.

Appendix A



Color table:

Code	R	R/Br	R/Y	R/G	R/L	R/P	R/Gr	R/W	R/B	O	O/Br	O/R	O/G	O/L	O/W	O/B	Y	Y/R	Y/L	Y/W	Y/B	G	G/R	G/Y	G/L	G/W	G/B	L	L/Br	L/R	L/O	L/Y	L/G	L/W	L/B	LR	Sb/B
Color	Red	Red/ Brown	Red/ Yellow	Red/ Green	Red/Blue	Red/ Purple	Red/Grey	Red/ White	Red/ Black	Orange	Orange/ Brown	Orange/ Red	Orange/ Green	Orange/ Blue	Orange/ White	Orange/ Black	Yellow	Yellow/ Red	Yellow/ Blue	Yellow/ White	Yellow/ Black	Green	Green/ Red	Green/ Yellow	Green/ Blue	Green/ White	Green/ Black	Blue	Blue/ Brown	Blue/Red	Blue/ Orange	Blue/ Yellow	Blue/ Green	Blue/ White	Blue/ Black	Light red	Sky blue /Black
Code	Br	Br/R	Br/Y	Br/G	Br/L	Br/W	Br/B	P	P/B	Gr	Gr/R	Gr/G	Gr/W	Gr/B	W	W/Br	W/R	W/Y	W/G	W/L	W/P	W/B	B	B/Br	B/R	B/Y	B/L	B/W	Lg	Lg/Br	Lg/R	Lg/Y	Lg/G	Lg/B	Lg/LR	Sb	Sb/W
Color	Brown	Brown/ Red	Brown/ Yellow	Brown/ Green	Brown/ Blue	Brown/ White	Brown/ Black	Purple	Purple/ Black	Grey	Grey/Red	Grey/ Green	Grey/ White	Grey/ Black	White	White/ Brown	White/ Red	White/ Yellow	White/ Green	White/ Blue	White/ Purple	White/ Black	Black	Black/ Brown	Black/ Red	Black/ Yellow	Black/ Blue	Black/ White	Light green	Light green /Brown	Light green /Red	Light green /Yellow	Light green /Green	Light green /Black	Light green /Light red	Sky blue	Sky blue /White